

Amersham Corporation
40 North Avenue
Burlington, Massachusetts 01803
Telephone (617) 272-2000

November 27, 1990

Mr. Charles E. MacDonald, Chief
Transportation Branch
Division of Safeguards and Transportation, NMSS
U.S. Nuclear Regulatory Commission
OWFN, 4E4
Washington, D.C. 20555

Dear Mr. MacDonald:

The following information is submitted in response to your November 15, 1990 letter regarding the 660 Series Type B package renewal:

Questions 1. & 2.

Enclosed find engineering drawings for the remaining versions of the 660 which are currently not listed in the USNRC Type B certificate issued October 5, 1990. In addition to the wide body 660, the 660B and the 660E currently approved on the USNRC Type B certificate number 9033, Amersham requests inclusion of the following 660 versions in the same USNRC Type B certificate:

<u>Model #</u>	<u>Drawing #</u>	<u>Revision</u>	<u>Description</u>
660	66025	-	Narrow Body Pre-automatic lock
650A	66030	A	Narrow Body Retrofitted w/automatic locking mechanism
660A	66030	B	Wide Body Retrofitted w/automatic locking mechanism

Amersham Corporation no longer manufactures the narrow body 660. Regarding the retrofitted versions (660A), no fabrication or welding operations as described for the 660B apply, however, the inspection and testing procedures described in Section 8 of the 660 Operations Manual will be followed for all retrofitted units prior to their return or redistribution to specific licensees.

Question 3.

The maximum activity requested for the narrow body Model 660 and the Model 660A's is 120 curies of Ir-192. Regarding the weight and dimensions of those devices, only the narrow body 660 and 660A will have smaller weight and width dimensions than those previously approved on the October 5, 1990 certificate.

9011280239 901127
PDR ADOCK 07109033
C PDC

71-9033
Amersham

N701

Enclosed are copies of Technical Operation's November 8, 1974 application for Type B status of their 660 radiography device. Please note that the general description of the device at the time of application was for the narrow body 660 (width = 4.75 inches, and weight = 44 pounds). Included with the November 8, 1974 application are radiation profiles for this narrow body device with the smaller depleted uranium shield, as well as results of the 30 foot drop and 40 inch puncture tests. Also enclosed is a copy of the May 5, 1977 USNRC Type B certificate for the 660 and 660E radiography devices which is based on this November 8, 1974 application.

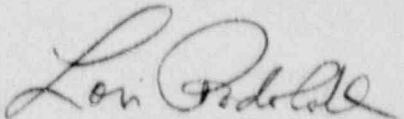
Question 4.

Enclosed is a revised version of page 28 of our original application which corrects the mailing address of the Department of Transportation.

In addition, the maintenance procedure has been revised to include consideration for devices with either automatic or non-automatic locking mechanisms.

Should you require any additional information regarding this application, please contact me at (617) 272-2000, extension 230.

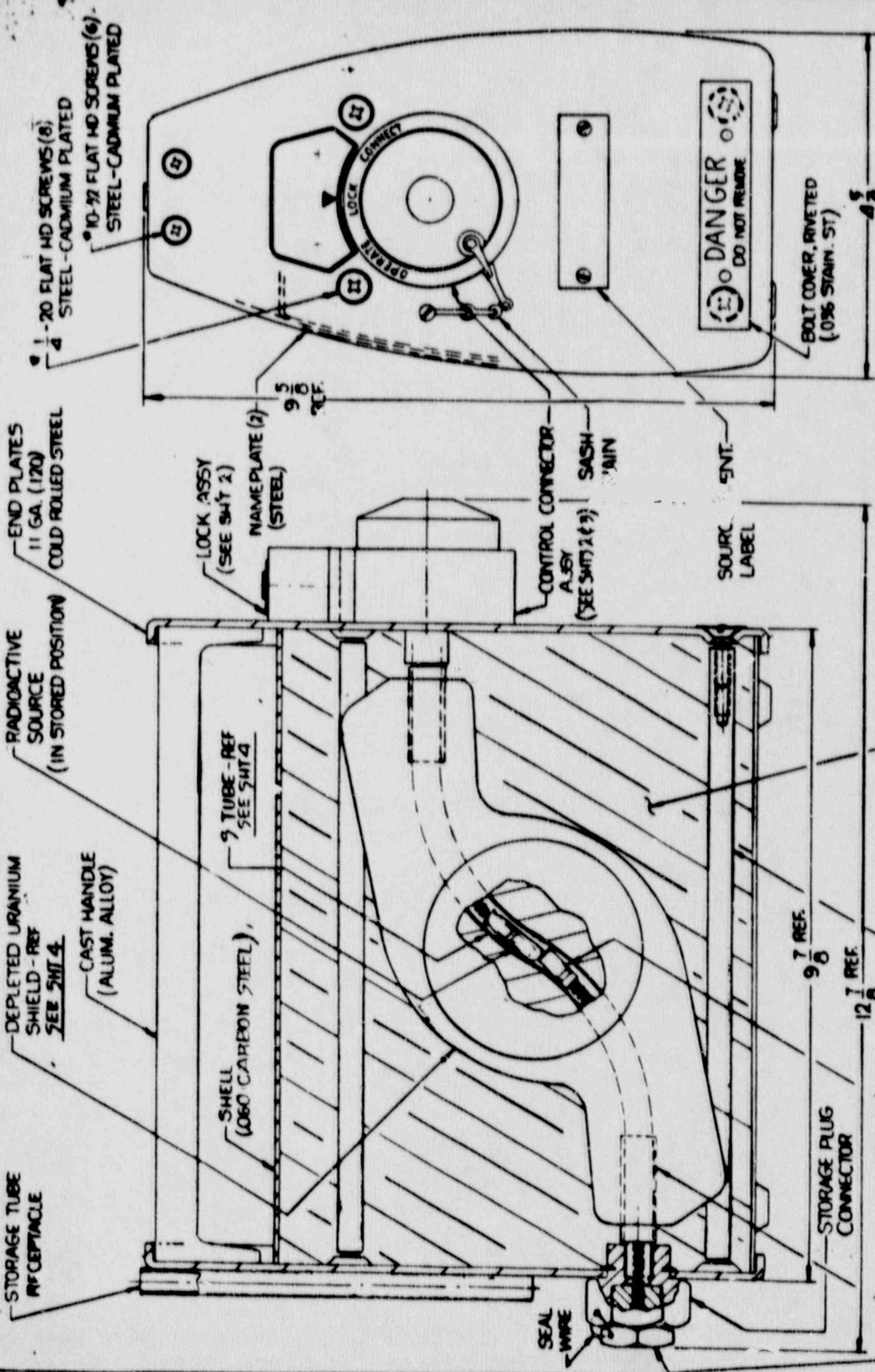
Sincerely,



Lori Podolak
Radiation Safety Specialist

Enclosures

16-6070



END PLATES
11 GA. (120)
COLD ROLLED STEEL

RADIOACTIVE
SOURCE
(IN STORED POSITION)

DEPLETED URANIUM
SHIELD - REF
SEE SHIT 4

CAST HANDLE
(ALUM. ALLOY)

SHELL
(060 CARBON STEEL)

9 TUBE - REF
SEE SHIT 4

SEAL
WIRE

STORAGE PLUG
CONNECTOR

7 9/8 REF

12 7/8 REF

CONNECTING RODS (4)
12LM STEEL

STORAGE PLUG ASSY	MOD. NO.	MAX CAPACITY
	660	120 CI

RIGID
POLYURETHANE
FOAM

REINFORCEMENT
SILVER - REF
SEE SHIT 4

TOTAL WEIGHT - 48 LBS

LOCK ASSY
(SEE SHIT 2)

NAMEPLATE (2)
(STEEL)

5 9/8 REF

CONTROL CONNECTOR
ASSY
(SEE SHIT 2 (3))

SASH
MAIN

SOURCE
LABEL

DANGER
DO NOT REMOVE

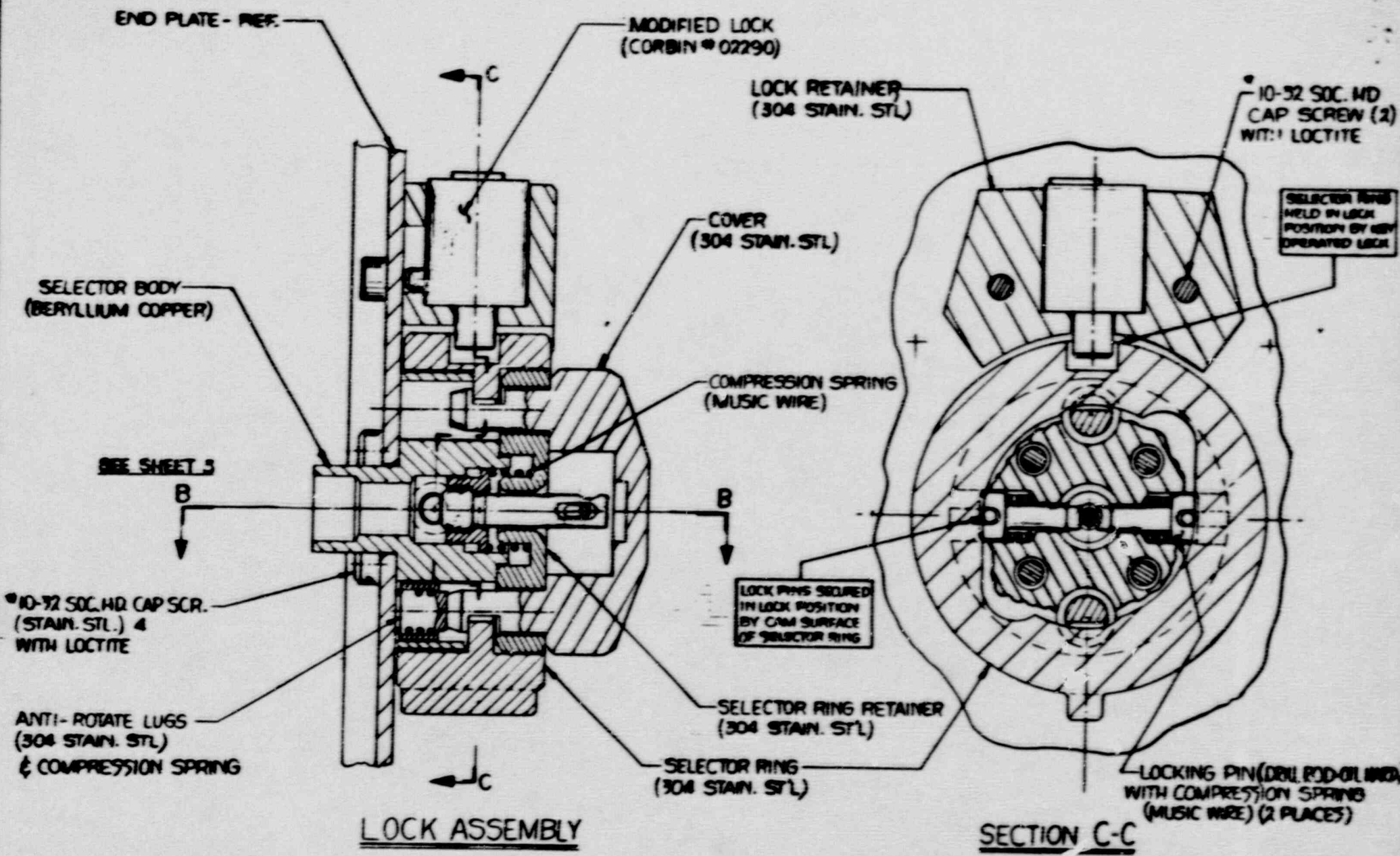
BOLT COVER, RIVETED
(0.3% STAIN. ST)

4 1/8

NOTED

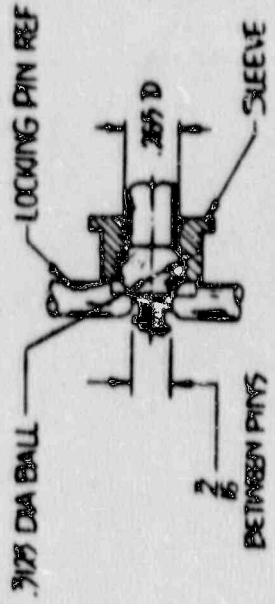
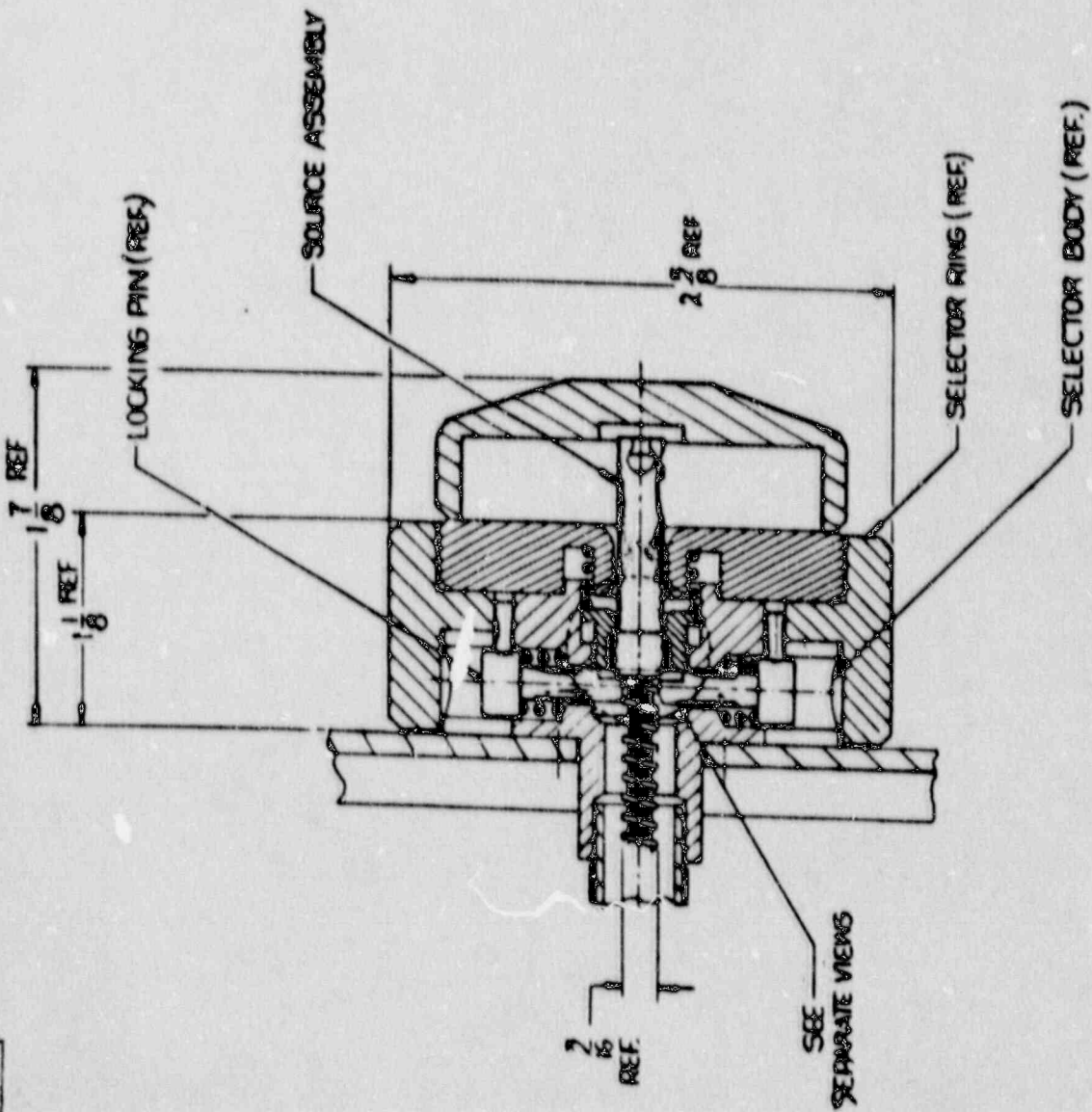
MODEL 660 GAMMA RAY PROJECTOR
SHIPPING CONTAINER
DESCRIPTIVE ASSEMBLY

66030

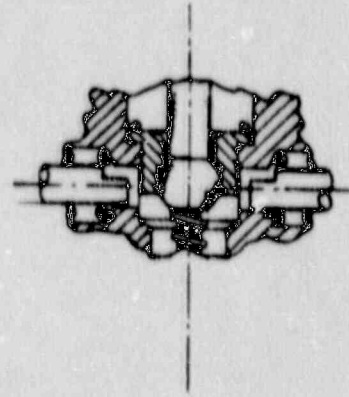


NOTED	REVISIONS	MODEL 660 GAMMA RAY PROJECTOR
	DESCRIPTION	SHIPPING CONTAINER
		DESCRIPTIVE ASSEMBLY
		C 66030

66030



LOCKED POSITION



UNLOCKED POSITION

SECTION B-B

NOTED	
APPROVED	
DATE	
BY	
MODEL 660 GAMMA RAY PROJECTOR	
SHIPPING CONTAINER	
DESCRIPTIVE ASSEMBLY	
66030	
INDUSTRY	

66-60390

5 TUBE FABRICATED FROM:

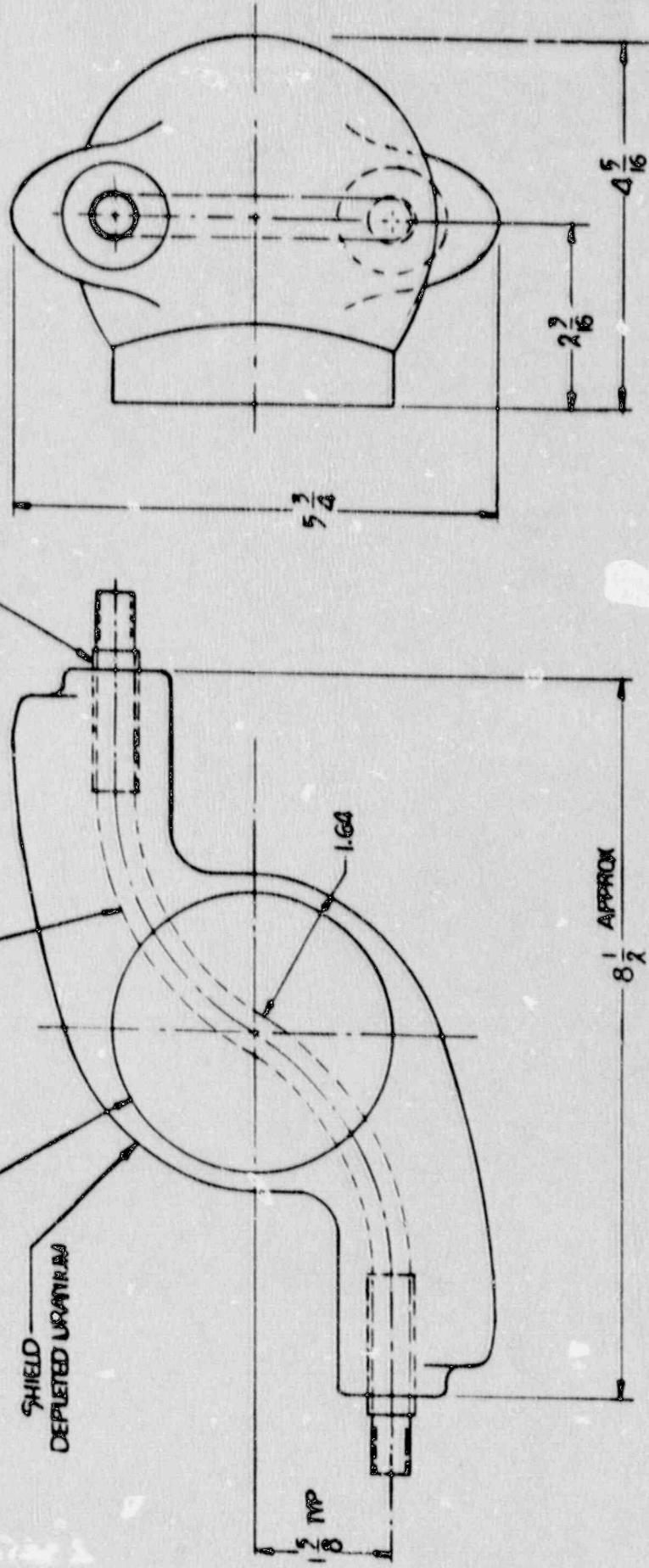
- a) ZIRCALLOY, OR
- b) TITANIUM, OR
- c) TYPE 304L STAINLESS STEEL

COATED WITH 50-100 μm Ni AL AND 400-500 μm AL 2 O₃

7/8 DIA HOT TAP

SHIELD DEPLETED URANIUM

LEEVE (X)
.550 O.D. ± .030 WALL
SAME MATL AS 9 TUBE
(CAST IN SHIELD)

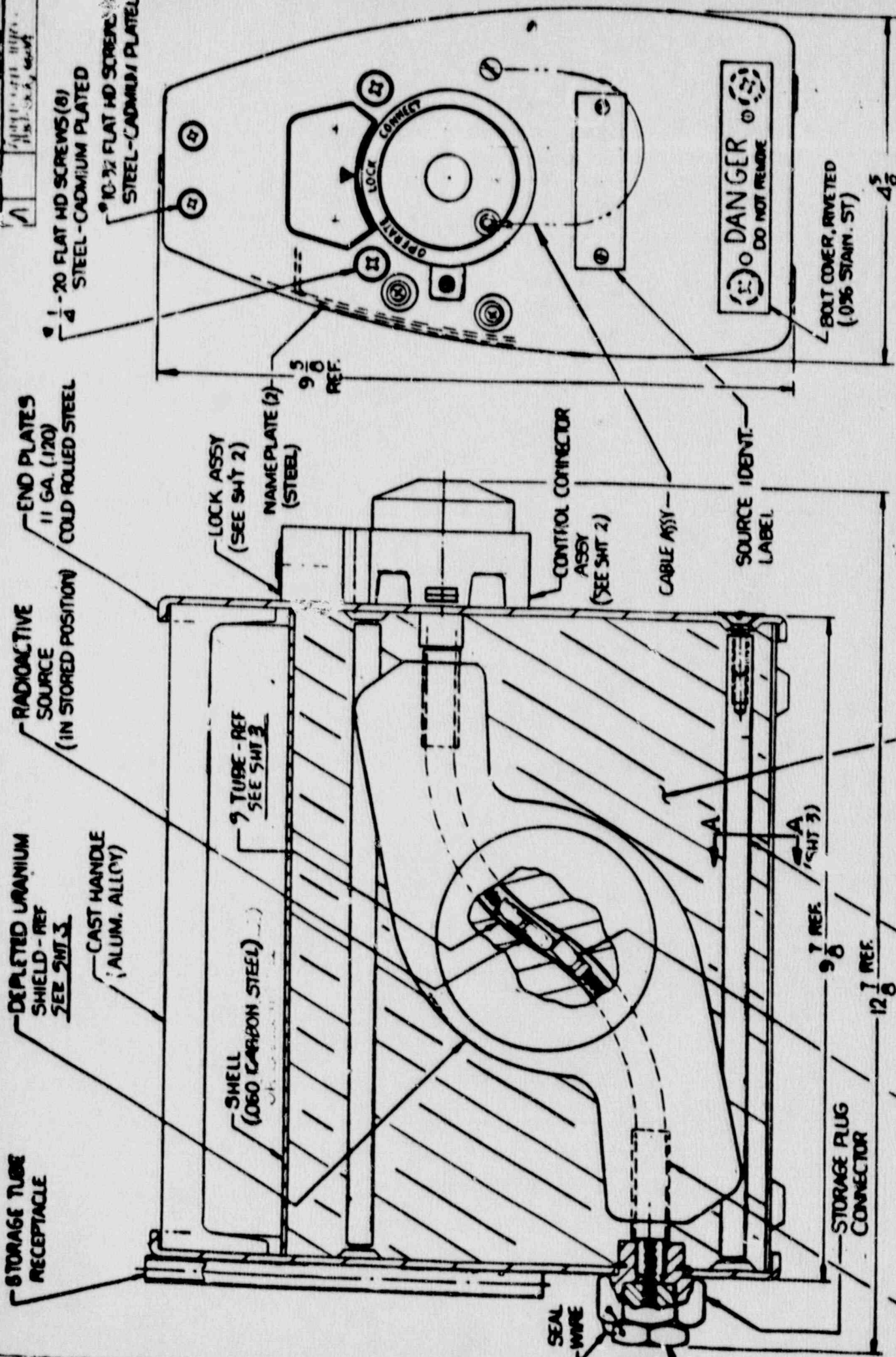


SHIELD DATA
35 LBS

AS NOTED

MODEL 660 GAMMA RAY PROJECTOR
SHIPPING CONTAINER
DESCRIPTIVE ASSEMBLY

66039



NOTED

MODEL 660 GAMMA RAY PROJECTOR SHIPPING CONTAINER DESCRIPTIVE ASSEMBLY

66030

RIGID POLYURETHANE FOAM

CONNECTING RODS (4)	12LM STEEL
MOD 1:0	MAX CAPACITY
660A	120 CI

STORAGE PLUG ASSY

REINFORCEMENT RING - REF SEE SMT 3

TOTAL WEIGHT - 48 LBS

END PLATE - REF.

MODIFIED LOCK
(CORBIN # 02250)

10-32 SDC HD
CAP SCREW (2)
WITH LOCTITE

COMPRESSION SPRING
(LEE # LC-045-14-1)

SELECTOR BODY
(303 ST STL)

COVER
(304 ST-9TL)

SLEEVE
(DRILL ROD)

PROTECTIVE BUMPER (2)
(RUBBER)

LOCK RETAINER
(304 ST. STL)

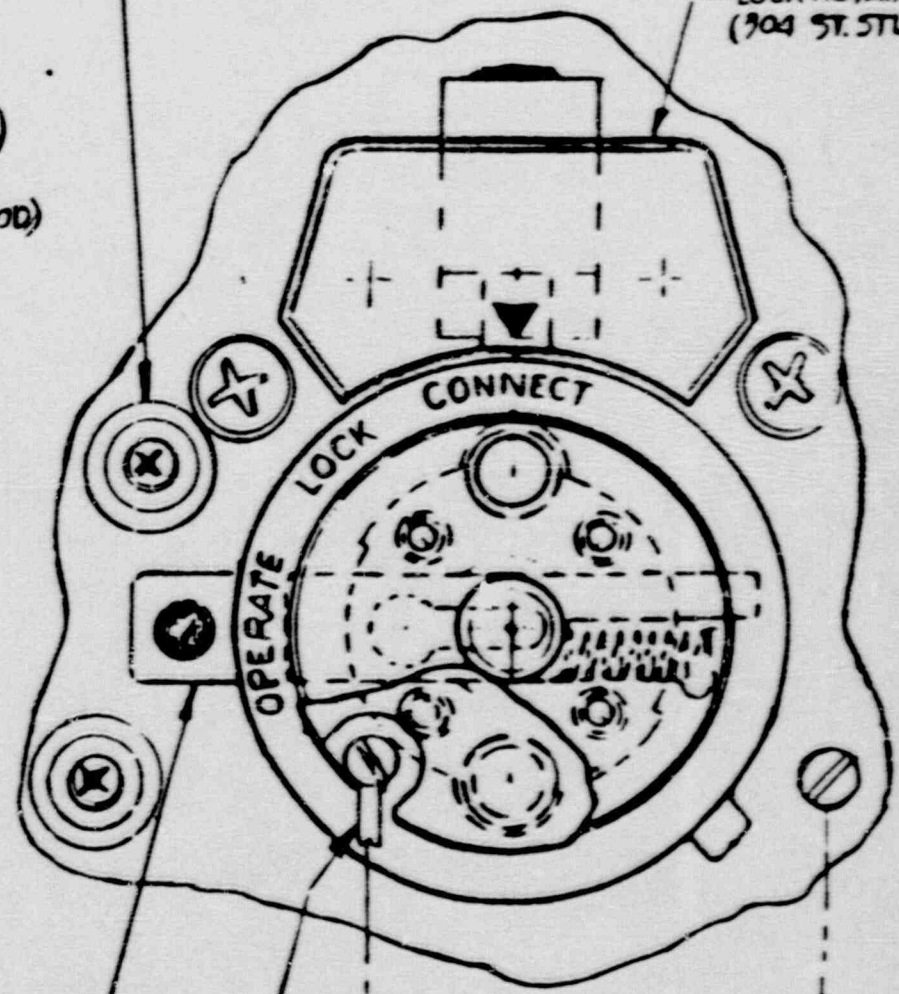
10-32 SDC HD CAP SCR.
(STAIN. STL.) 4
WITH LOCTITE

ANTI-ROTATE LUGS
(308 STAIN. STL.)
& COMPRESSION SPRING

SELECTOR RING
RETAINER
(303 ST. STL)

SELECTOR RING
(303 ST. STL.)

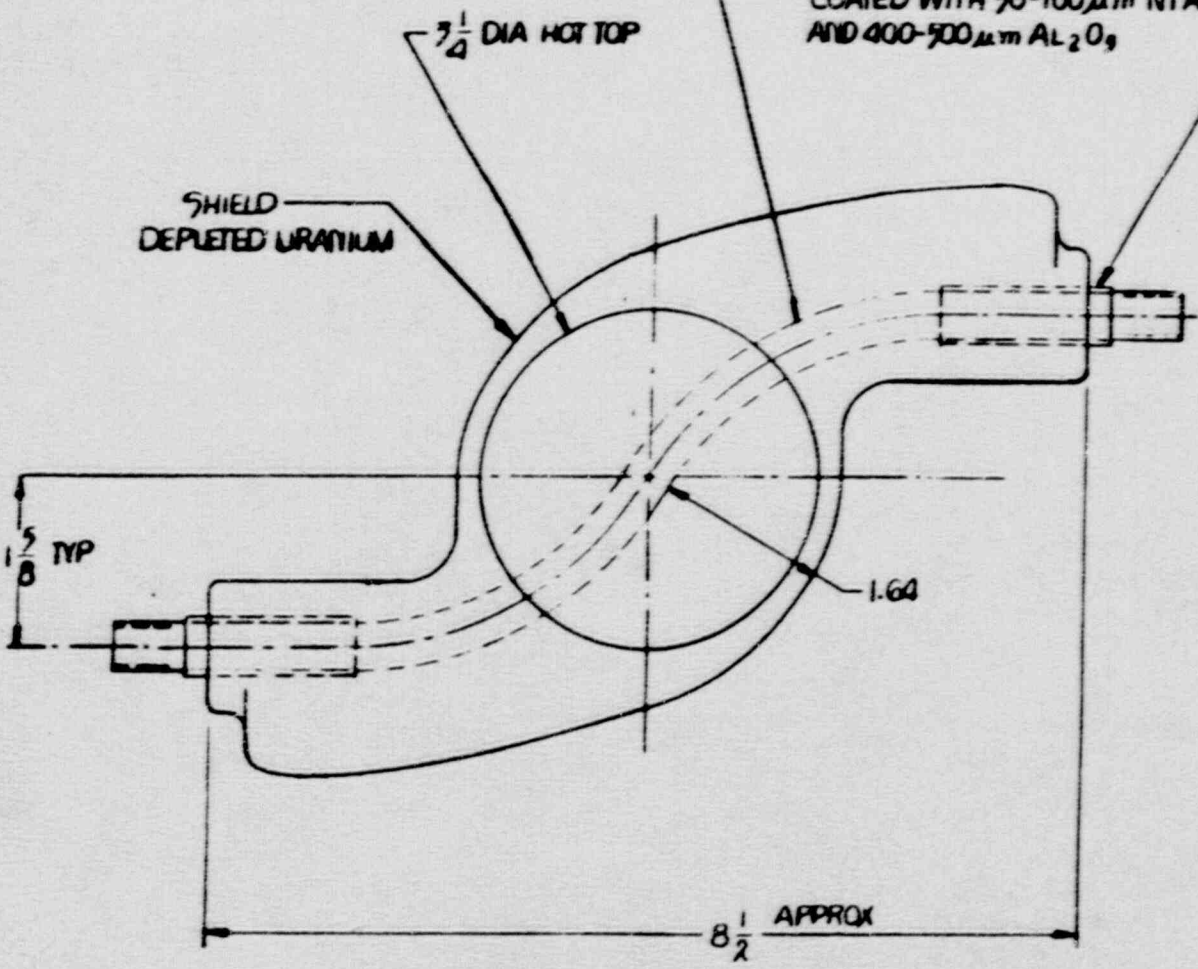
LOCK ASSEMBLY



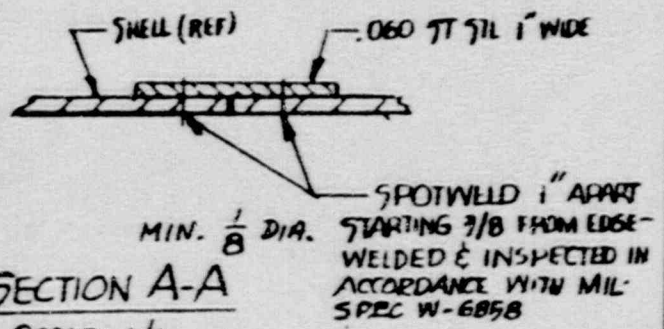
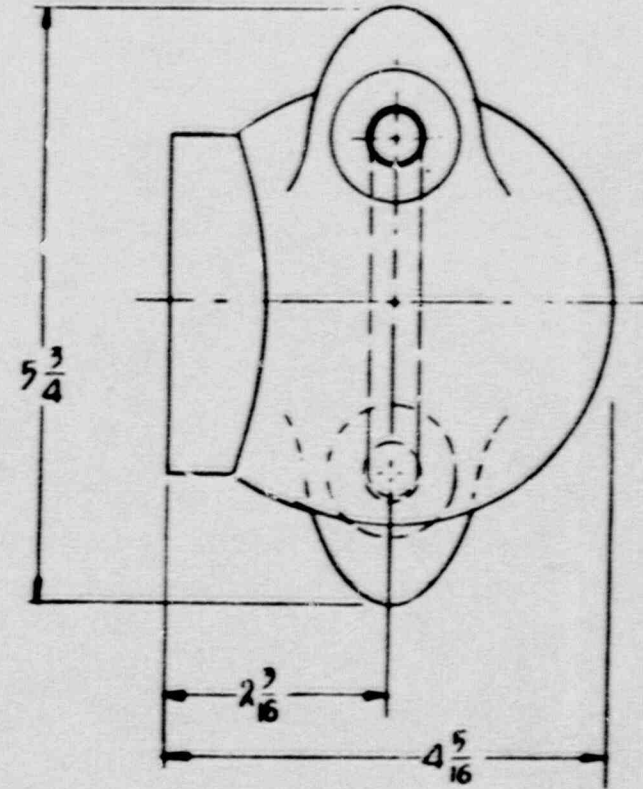
LOCKING SLIDE
(1/4 x 1/2 FLAT GRD STOCK
OIL HARDENING)

NOTED		FEDERAL BUREAU OF INVESTIGATION LABORATORY	
3/2/60		MODEL 660 GAMMA RAY PROJECTOR SHIPPING CONTAINER DESCRIPTIVE ASSEMBLY	
C		66030	

5 TUBE FABRICATED FROM:
 a) ZIRCALLOY, R
 b) TITANIUM, OR
 c) TYPE 304L STAINLESS STEEL
 COATED WITH 50-100μm Ni AL
 AND 400-500μm Al₂O₃



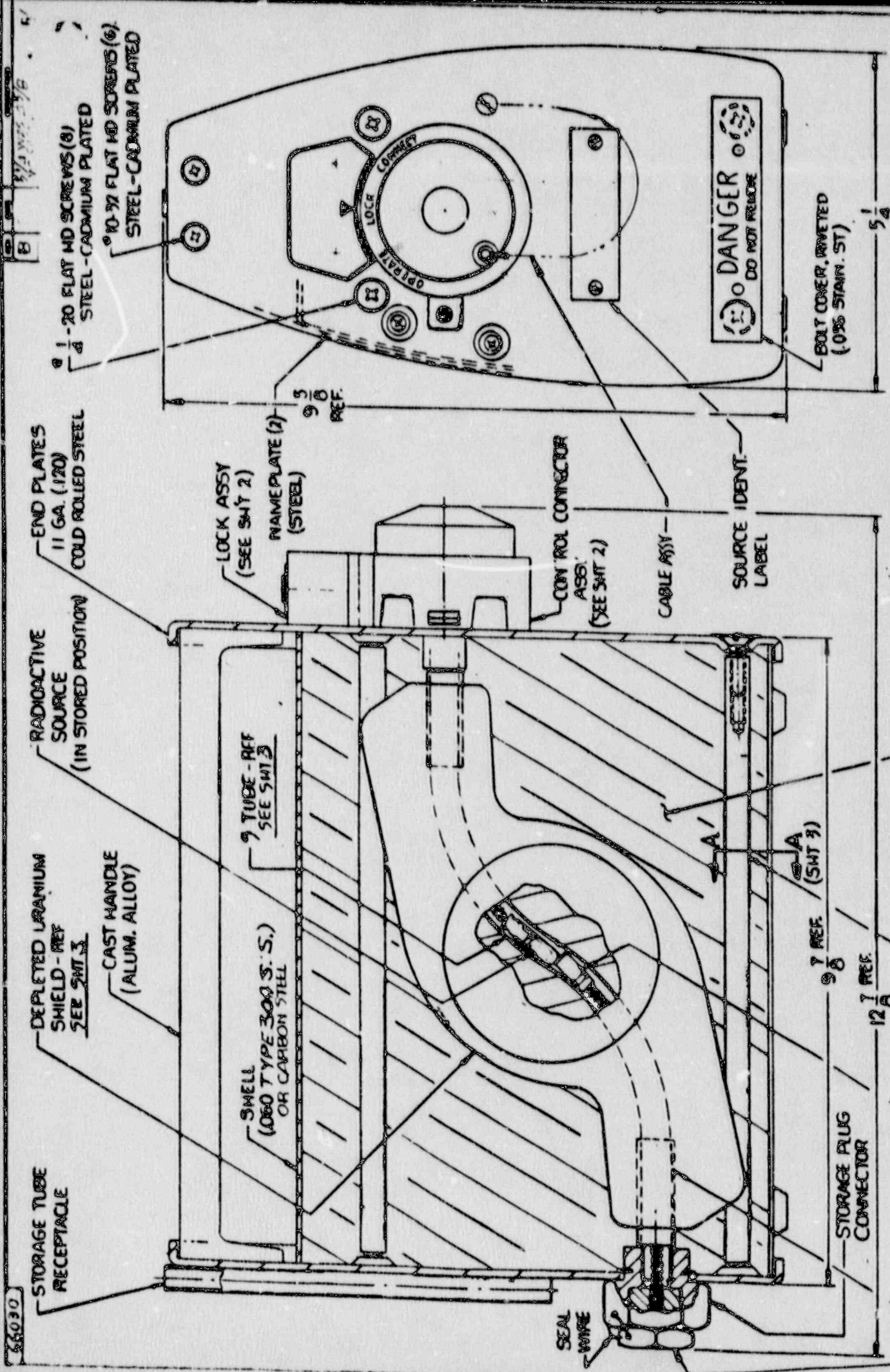
5 SLEEVE (2)
 .550 O.D. x .070 WALL
 SAME MATL AS 5 TUBE
 (CAST IN SHIELD)



SECTION A-A
 SCALE: 1/1

SHIELD DATA
 38 LBS

AS NOTED		RADIATION PRODUCTS DIVISION DUPLICATE OF SPEC	
MODEL 660 GAMMA RAY PROJECTOR SHIPPING CONTAINER DESCRIPTIVE ASSEMBLY		66030	



END PLATES
11 GA. (120)
COLD ROLLED STEEL

RADIOACTIVE
SOURCE
(IN STORED POSITION)

DEPLETED URANIUM
SHIELD - REF
SEE SMT 3

CAST HANDLE
(ALUM. ALLOY)

SMELL
(060 TYPE 300 S. S.)
OR CARBON STEEL

9" TUBE - REF
SEE SMT 3

LOCK ASSY
(SEE SMT 2)

NAMEPLATE (2)
(STEEL)

CONTR. CONN. ASSY.
(SEE SMT 2)

CABLE ASSY

SOURCE IDENT.
LABEL

7 REF.
9/8 (SMT 3)

12 7/8 REF.

STORAGE PLUG
CONNECTOR

CONNECTING RODS (4)
12LM STEEL

STORAGE PLUG ASSY

REINFORCEMENT
SLEEVE - REF
SEE SMT 3

RIGID
POLYURETHANE
FOAM; DENSITY
= 7.5 - 8.5 LBS/CU FT

1 - 20 FLAT HD SCREWS (8)
STEEL-CADMIUM PLATED

9 - 10-32 FLAT HD SCREWS (6)
STEEL-CADMIUM PLATED

5/8 REF.

DANGER
DO NOT REMOVE

BOLT COVER, RIVETED
(0.0% STAIN. ST)

5/4

NOTED	
MODEL 660 GAMMA RAY PROJECTOR	SHIPPING CONTAINER
DESCRIPTIVE ASSEMBLY	
C	66030
B	66030

TOTAL WEIGHT - 57 LBS

END PLATE - REF.

10-32 SOC. HD
CAP SCREW (2)
WITH LOCTITE

COMPRESSION SPRING
(LEE[®] LC-045-14-1)

SELECTOR BODY
(307 ST STL)

10-32 SOC. HD CAP SCR.
(STAIN. STL.) 4
WITH LOCTITE

ANTI-ROTATE LUGS
(308 STAIN. STL.)
& COMPRESSION SPRING

MODIFIED LOCK
(CORBIN # 02250)

COVER
(304 ST. STL.)

SLEEVE
(DRILL ROD)

SELECTOR RING
RETAINER
(307 ST. STL.)

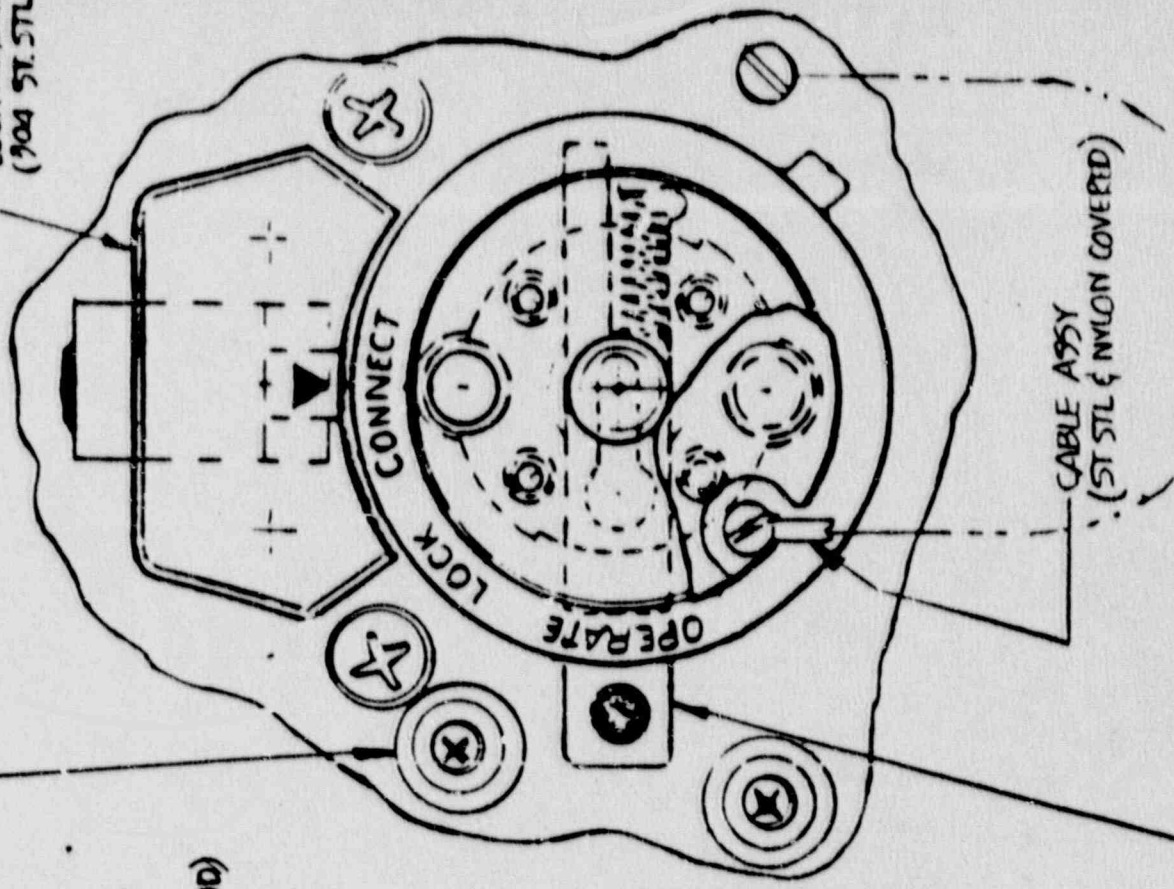
SELECTOR RINGS
(307 ST. STL.)

LOCK ASSEMBLY

LOCKING SLIDE
(1/4 x 1/2 FLAT GRIND STOCK
OIL HARDENING)

PROTECTIVE BUMPER (2)
(RUBBER)

LOCK RETAINER
(304 ST. STL.)

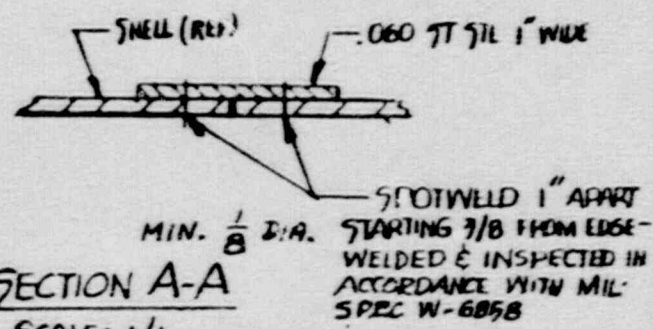
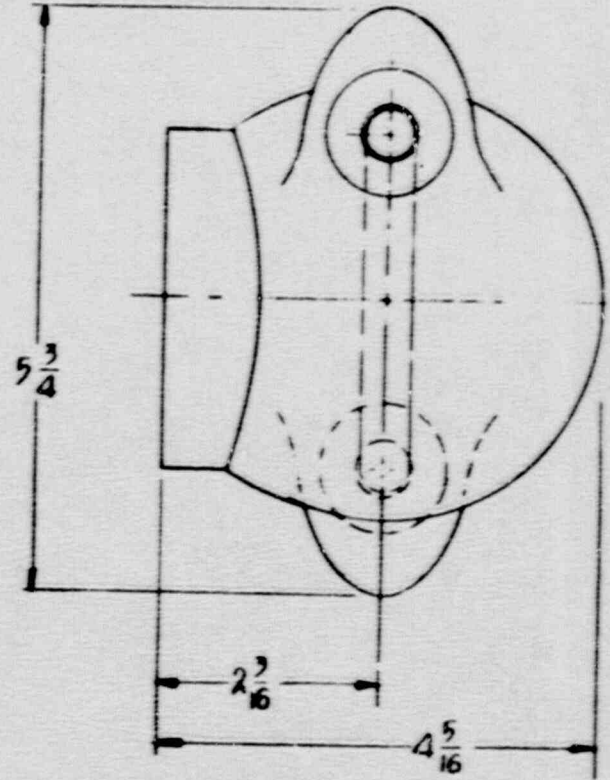
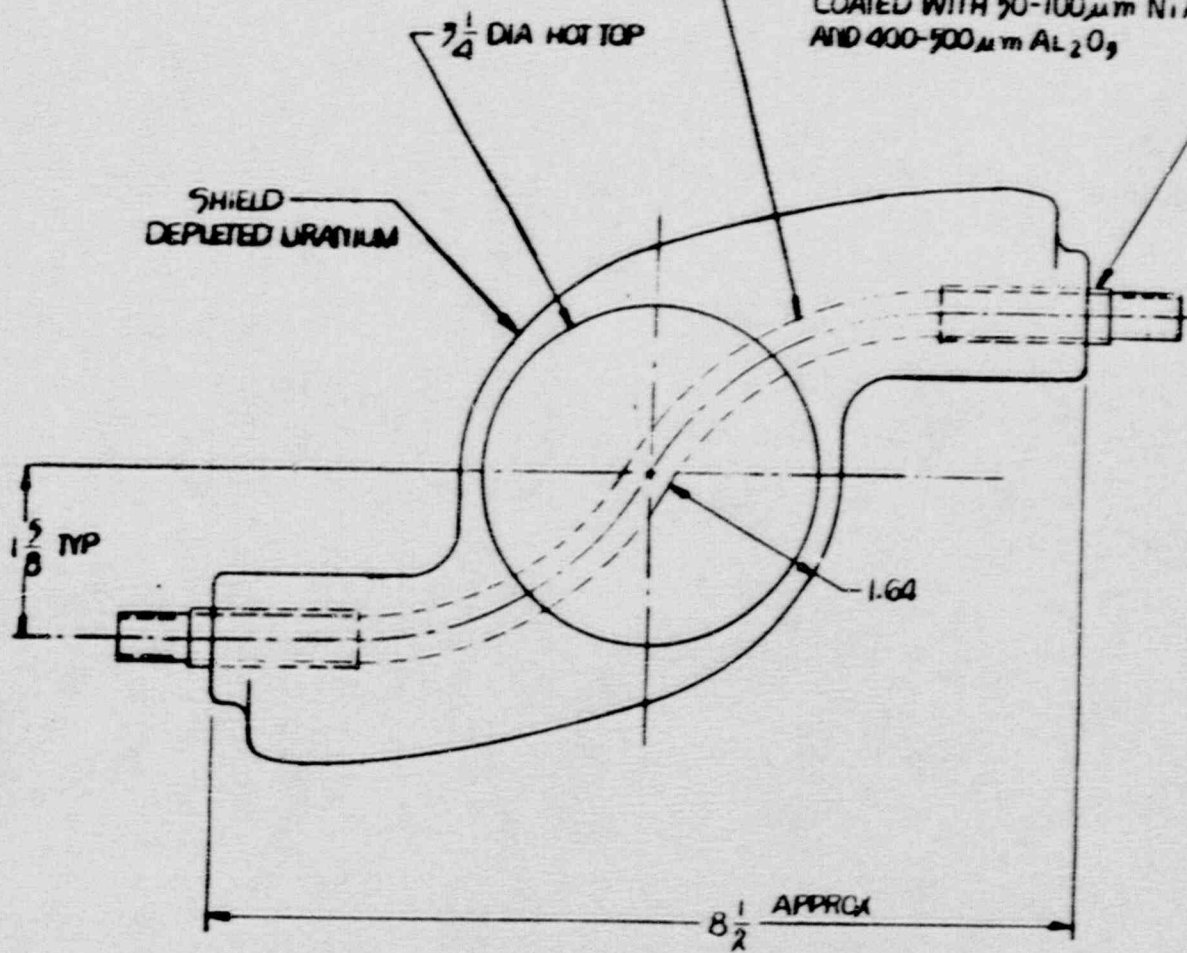


NOTED

MODEL 660 GAMMA RAY PROJECTOR SHIPPING CONTAINER DESCRIPTIVE ASSEMBLY	66030
REVISION PRODUCTS SERVICE INDUSTRIAL PRODUCTS DIVISION	

5 TUBE FABRICATED FROM:
 a) ZIRCALLOY, OR
 b) TITANIUM, OR
 c) TYPE 304L STAINLESS STEEL
 COATED WITH 50-100 μ m Ni AL
 AND 400-500 μ m AL₂O₃

SLEEVE (R)
 .550 O.D. x .030 WALL
 SAME MATL AS 5 TUBE
 (CAST IN SHIELD)



SHIELD DATA
 37 LBS

SECTION A-A
 SCALE: 1/1

AS NOTED		RADIATION PRODUCTS DIVISION DUPLICATE 66-0187	
MODEL 660 GAMMA RAY PROJECTOR SHIPPING CONTAINER DESCRIPTIVE ASSEMBLY		66-0187	
C		66-0187	

MODEL 660
EXPOSURE DEVICE
OPERATION MANUAL

NOTICE

This device is used as a radiographic exposure device and Type B(U) transport package for Amersham Corporation radioactive sources listed in this manual. The user should become thoroughly familiar with the instruction manual before attempting operation of the equipment.

In order to use this equipment to perform industrial radiography within the United States, the user must be specifically licensed to do so. Application for a license should be filed on Form NRC 313 with the appropriate U.S. Nuclear Regulatory Commission Regional Office listed in Appendix D of 10 CFR 20 or with the appropriate agreement state office.

Prior to initial use of a radiographic exposure device as a transport package, the user in the United States must register his name, license number and package identification number with:

Director
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

The user must have in his possession a copy of USNRC Certificate of Compliance No. 9033 issued for this package.

Prior to the first export shipment of this exposure device from the United States, the user must also register his identity with:

U.S. Department of Transportation
Office of Hazardous Materials Technology
400 Seventh Street S.W.
Washington, D.C. 20590

The user must have in his possession a copy of International Atomic Energy Agency Certificate of Competent Authority Number USA/9033/B(U) issued for this radiographic exposure device.

Users of this equipment outside the United States must comply with the regulatory, licensing and transportation rules and regulations as they apply in their respective countries.

General

The Model 660 series portable gamma radiography systems are used primarily for industrial radiography. The systems operate in similar manner and differ only in the specific control unit supplied.

Maintenance

Quarterly Maintenance

At intervals not to exceed three months:

- (a) Clean, inspect and maintain the drive cable, control housings and source guide tubes as follows:
 1. Disconnect the control unit from the exposure device.
 2. Turn the hand crank of the control unit in the EXPOSE (counterclockwise) direction until the crank will no longer turn. Do not use force, as this may damage the drive wheel inside the control box. The emergent cable should be cranked into a bucket or other container to keep it clean.
 3. Disconnect the control housing from the RETRACT side of the crank and remove the stop spring from the drive cable. The drive cable will now pass through the crank.
 4. Turn the crank until the drive cable is totally disconnected.
 5. Pull the drive cable out through the Model 661 control cable connector and coil it with a radius of no less than 4 inches.
 6. Remove the Model 661 control cable connector and connector plug from the control housings, and disconnect the other control housing from the crank. Label the housings for proper reassembly.
 7. Clean the drive cable with 1:1:1 trichloroethane solvent and flush the control housings and source guide tubes. (Observe the solvent manufacturer's recommended precautions.)
 8. Using compressed dry air (15 psi max.), thoroughly dry the drive cable, control housings and guide tubes. Any remaining solvent can cause permanent damage.
 9. Check the source guide tubes for binding by holding them vertical and dropping a dummy source (or jumper) through them.
 10. Wipe the guide tubes and control housings with a cloth soaked in trichloroethane and flex them to check for internal damage. Damage is evidenced by a crunching feeling when the housing or tube is bent. While doing this, feel for dents. Cut, flattened or burnt control housings or guide tubes should be repaired or replaced.

11. The guide tubes or control housings may be covered with tape where only the outer plastic is cut through.
12. Use the NO GO (TAN 550) gauge to check for wear in the female slot width of the source coupling. (See Figure 7.1.)

The gauge thickness should NOT GO in the slot. The source fails the test if the gauge can enter the slot; in which case contact Amersham for advice on disposal of the source.

Use the gauge also to check the drive cable male coupling: Check the ball diameter and shank. Couple the cable to the source and check the connector gap width. In each case the gauge must NOT GO.

If the ball of the connector fits through the hole of the gauge or the ball shank fits into the slot in the gauge, the connector is worn and the cable must be replaced.

13. Lightly grease the cable using MIL-G-23827 B grease. Other greases may form tars or corrosive compounds when exposed to radiation.
 - (b) Clean and inspect the projector for wear or obvious damage. Report any defect which might affect safe operation and **withdraw from service** until repairs can be effected.
 - (c) See that the radioisotope warning labels are secure and legible. Do not cover with any other labels.
 - (d) Check that the source outlet shipping plug is in place and that the screw and nut turn freely, but are not loose.
 - (e) Check that the selector ring and lock mechanism operate freely. If operation is faulty, contact Amersham to arrange servicing or see the appropriate section on Complete Service in this manual.

Complete Service

Equipment which is used under good conditions should only require complete service annually.

In addition to the schedule of operations listed in Quarterly Maintenance, the connector and the lock mechanism must be stripped for maintenance.

This service requires removal of the source, which is potentially a dangerous operation together with work on components which are critical to safety.

This service must be done only by persons specifically trained and qualified for this work.

Amersham will service these units at one of their laboratories or in the field on request.

Alternatively, trained and qualified persons who wish to do this work should use the applicable procedure which follows based on the type of locking mechanism installed on their device.

Devices with Non-Automatic Locking Mechanisms

- (a) Use the NO GO (TAN 550) gauge to check for wear in the female slot width of the source coupling. (See Figure 7.1.)

The gauge thickness should NOT GO in the slot. The source fails the test if the gauge can enter the slot; in which case contact Amersham for advice on disposal of the source.

Use the gauge also to check the drive cable male coupling: Check the ball diameter and shank. Couple the cable to the source and check the connector gap width.

In each case the gauge must NOT GO.

Proceed with (b) if the source coupling passes these tests.

- (b) Transfer the source out of the projector and into a source changer for safe storage.

This transfer must be carried out in a restricted area by licensed and properly trained personnel.

Use a survey meter to ensure that the source is properly transferred.

Remove the source identity plate from the projector and fasten it with wire onto the source changer.

The source must be replaced by a test connector jumper (found inside the cover) so that when the drive cable is returned to the projector storage position, the drive cable control can be removed from the projector.

- (c) After removal of Source Assembly, carry out a wipe test on the inside of the 'S' tube to check for uranium contamination. Uranium is slightly radioactive, so the wipe test swab should be sent to Amersham in a sealed plastic container to be checked for low level radioactive contamination.

The presence of uranium indicates wear-through of the 'S' tube. It is recommended the projector be taken out of service. Contact Amersham for recommendations.

Clean the tube with a swab soaked in 1:1:1 trichloroethane solvent (observe the solvent manufacturer's recommended precautions).

(d) Cover Plate Removal

1. Remove the Danger Tag (secured with rivets) from the bottom of the rear plate.
2. Remove the rear plate by unscrewing the six phillips head screws securing it to the exposure device body.

(e) Unlock the connector lock, and then remove the lock assembly and control unit connector assembly by unscrewing the six socket head screws securing them to the rear plate.

(f) Disassemble the control unit connector assembly, referring to Figure 7.2 for component identification and for order of removal. There are several spring loaded parts in the connector assembly, so care should be taken that these parts are not lost.

(g) To disassemble the lock assembly, refer to Figure 7.2 for component identification and for order of removal. Remove the lock (2) from the lock retainer (3) by unscrewing the screw (4) and turning the key about 90 degrees.

(h) Remove the front end plate from the exposure device, and remove the guide tube connector and retaining ring with Tru Arc pliers, referring to Figure 7.2. The handle may be left on the front plate.

(i) Clean all parts in trichloroethane and flush the source tube with solvent. Dry the parts and the source tube thoroughly using dry compressed air (20 psi maximum). Clean the 'S' tube in the exposure device by running a cloth soaked with trichloroethane through it several times. Dry the 'S' tube by running a dry cloth through the tube.

(j) Inspect all parts for damage or excessive wear, and replace if necessary. Use Figure 7.2 for component identification numbers.

(k) Lightly grease all moving parts at their contact surfaces with MIL-G-23827 B grease or equivalent.

(l) Reassemble the front end plate, and secure it to the exposure device with the proper screws.

- (m) Reassemble the lock by placing the return springs and spring guides into the lock (2), depressing the internal plunger, inserting the lock (2) into the lock retainer (3), and securing the lock with the set screw (4).
- (n) Attach the lock assembly to the rear plate with two socket head screws.
- (o) To reassemble the control unit connector assembly, refer to Figure 7.2.
- (p) Refer to Figure 7.2 and place the compression spring (11) on the hub of the selector ring retainer. The spring should be firmly seated over the hub. Then place the sleeve (12) on top of the compression spring (11).
- (q) Place the selector body (6) on a flat surface so that it is resting on its 5/8" hub.
- (r) Insert the two short compression springs (8) and locking pins (7) into the holes on the edge of the selector body.
- (s) Place the selector ring (10) over the selector body (6) while restraining the locking pins (7). Ensure that the lettering (OPERATE-LOCK-CONNECT) on the selector ring is facing up and that the stop pin on the selector body is in the cam slot of the selector ring. This is shown in Figure 7.2.
- (t) Hold the selector ring (10) and selector body (6) together and place them over the assembly shown in Figure 7.2. The resulting assembly is shown in Figure 7.2. Align the resulting assembly such that the two large holes in the selector ring retainer (9) line up with the two large holes in the selector body (6). The internal locking cam will partially block these holes.
- (u) Insert the anti-rotation lugs (13) and long compression springs (14) into the two large holes in the selector body. Secure the resulting assembly onto the rear plate with four socket head screws. The word OPERATE should be facing outward, and should be in the 12 o'clock position.
- (v) Connect the jumper to the short length drive cable and insert the cable through the rear end plate and control unit connector assembly.
- (w) Insert a "U-tool" into the control unit connector assembly and check the operation by turning the selector ring from OPERATE to CONNECT several times. If the connector assembly does not operate properly, disassemble and inspect the parts for damage and proper alignment. Relubricate the parts and reassemble.

- (x) Secure the rear end plate to the exposure device and handle using the six attaching phillips head screws and replace the protective plate over the bottom two rear plate screws using pop rivets (0.125 in diameter by 0.295 in long).
- (y) Check the system for proper reassembly. Check all connections and fittings for tightness. Check for proper operation of the control unit and control unit connector assembly.
- (z) Transfer the source from the source changer back to the projector as described in the source transfer procedures in this manual.

Use a survey meter to check that radiation levels do not exceed 2 mSv/h, (200 mR/h) at any point on the surface.

Replace the source identity plate back on to the projector.

Check that the fixed labels are in good condition.

Devices with Automatic Locking Mechanisms

- (a) Use the NO GO (TAN 550) gauge to check for wear in the female slot width of the source coupling. (See Figure 7.1.)

The gauge thickness should NOT GO in the slot. The source fails the test if the gauge can enter the slot; in which case contact Amersham for advice on disposal of the source.

Use the gauge also to check the drive cable male coupling: Check the ball diameter and shank. Couple the cable to the source and check the connector gap width.

In each case the gauge must NOT GO.

Proceed with (b) if the source coupling passes these tests.

- (b) Transfer the source out of the projector and into a source changer for safe storage.

This transfer must be carried out in a restricted area by licensed and properly trained personnel.

Use a survey meter to ensure that the source is properly transferred.

Remove the source identity plate from the projector and fasten it with wire onto the source changer.

The source must be replaced by a test connector jumper (found inside the cover) so that when the drive cable is returned to the projector storage position, the drive cable control can be removed from the projector.

- (c) After removal of Source Assembly, carry out a wipe test on the inside of the 'S' tube to check for uranium contamination. Uranium is slightly radioactive, so the wipe test swab should be sent to Amersham in a sealed plastic container to be checked for low level radioactive contamination.

The presence of uranium indicates wear-through of the 'S' tube. It is recommended the projector be taken out of service. Contact Amersham for recommendations.

Clean the tube with a swab soaked in 1:1:1 trichloroethane solvent (observe the solvent manufacturer's recommended precautions).

- (d) Cover Plate Removal

1. Remove the Danger Tag (secured with rivets) from the bottom of the rear plate.
2. Remove the rear plate by unscrewing the six phillips head screws securing it to the exposure device body.

- (e) Refer to Figure 7.3 and dismantle the selector assembly taking care not to lose the spring loaded parts.

Remove the lock (2) from the lock retainer (3) by undoing screw (4) and turning the key through 90 degrees.

- (f) Remove 4 screws securing the front end plate.

Remove the guide tube connector nut (17) and retaining ring (18).

- (g) Clean all parts with trichloroethane and inspect for wear. Replace as necessary.

When ordering spare parts, quote the serial number of the projector as well as the component number to ensure correct replacement.

- (h) Lightly grease the inside surfaces of the selector ring (10) and the lock retainer (3) using type MIL-G-23827 B grease.

Note that other types of grease may form tars when exposed to radiation.

Lubricate the lock barrel (2) with 2 drops of light oil.

All screws should be treated with 'VIBRATITE'.

Reassemble the lock by placing the return springs and spring guides into the lock, depressing the internal plunger (5), inserting the lock into the retainer (3) and securing the lock with the cap screw (4).

Attach the lock assembly to the mounting plate with two socket screws (1).

- (i) Begin the Selector Assembly reassembly by lightly coating the components with type MIL-G-23827 B grease. See Figure 7.3.

Hold rear end plate horizontally, face up and the lock in the 12 o'clock position. (NOTE: The face plate may be held carefully in a vise or other fixture so as to free both hands for this assembly procedure.)

Insert the 5/8 diameter of the selector body (6) into the mating hole in the center of the rear plate. The narrow end of the slot opening is to be at the 3 o'clock position.

Locate the locking slide (7) and return spring (8) into mating slot of selector body.

Place the selector ring (10), with the work "CONNECT" at the 12 o'clock position, over the selector body. Push the locking slide in slightly so the selector ring will clear and rest the selector ring on the top surface of the selector body.

Insert springs (14) into holes at the top and bottom of the selector body. Place the anti-rotation lugs (13) over the springs.

Place the sleeve (12), with the large diameter facing down, on the center of the locking slide. Place the spring (11) over the sleeve.

Install the selector ring retainer (9) into the selector ring. Ensure that the three non-threaded holes line up under the word "CONNECT". See Figure 7.3. Depress the selector ring retainer into the selector ring until its top is flush with the top of the selector ring.

- (j) While holding the assembly firmly against the end plate, turn it over to expose the back side. Install the four socket head screws (15) and the lock washers (16) to secure the connector assembly to the rear plate.

Insert the "U-Tool" into the top and bottom holes of the selector assembly. Rotate the selector ring toward the "OPERATE" position. Remove the "U-Tool". Continue rotating to "OPERATE" position.

Push the locking slide until the sleeve snaps into place.

- (k) While still in the "OPERATE" position, wind out a short length of the drive cable and pass it through the front of the selector assembly. Couple the cable to the test jumper connector and withdraw it into the selector assembly.

Pull on the cable and confirm that the locking slide snaps shut to lock the connector in the safe position. Push in the locking slide and repeat to assure smooth operation. If smooth operation is not attained, disassemble the selector assembly and thoroughly inspect components for rough edges, burrs, etc. which could cause jamming or irregular selector assembly action. Replace parts as necessary. Re-lubricate the components and reassemble the selector assembly.

Run through the normal operations of the lock and selector assembly.

- (l) A gap of at least 0.53 mm (0.021 in) should be visible between the drive cable collar and the selector ring and it should be impossible to rotate the ring. Do not use excessive force. See Figure 7.3.

If the selector ring can be rotated, this indicates unacceptable wear, distortion, or damage in the connector, lock mechanism or drive cable connector which must be corrected before using the equipment again.

- (m) Secure the rear end plate to the exposure device and handle using the six attaching phillips head screws and replace the protective plate over the bottom two rear plate screws using pop rivets (0.125 in diameter by 0.294 in long).
- (n) Lightly grease the guide tube connector nut hub with MIL-G-23827 B lubricant.

Reassemble to the front mounting plate, ensuring that the retaining ring is seated in the inner slot.

Secure the mounting plate to the projector.

Inspect the shipping plug, making sure that the lead insert is present.

- (o) Run through the normal operating sequence several times, using the test connector or a dummy source assembly (non-radioactive), to ensure smooth operation.
- (p) Check that the fixed labels are in good condition.
- (q) Transfer the source from the source changer back to the projector as described in the source transfer procedures in this manual.

Use a survey meter to check that radiation levels do not exceed 2 mSv/h, (200 mR/h) at any point on the surface.

Replace the source identity plate back on to the projector.

WARNING

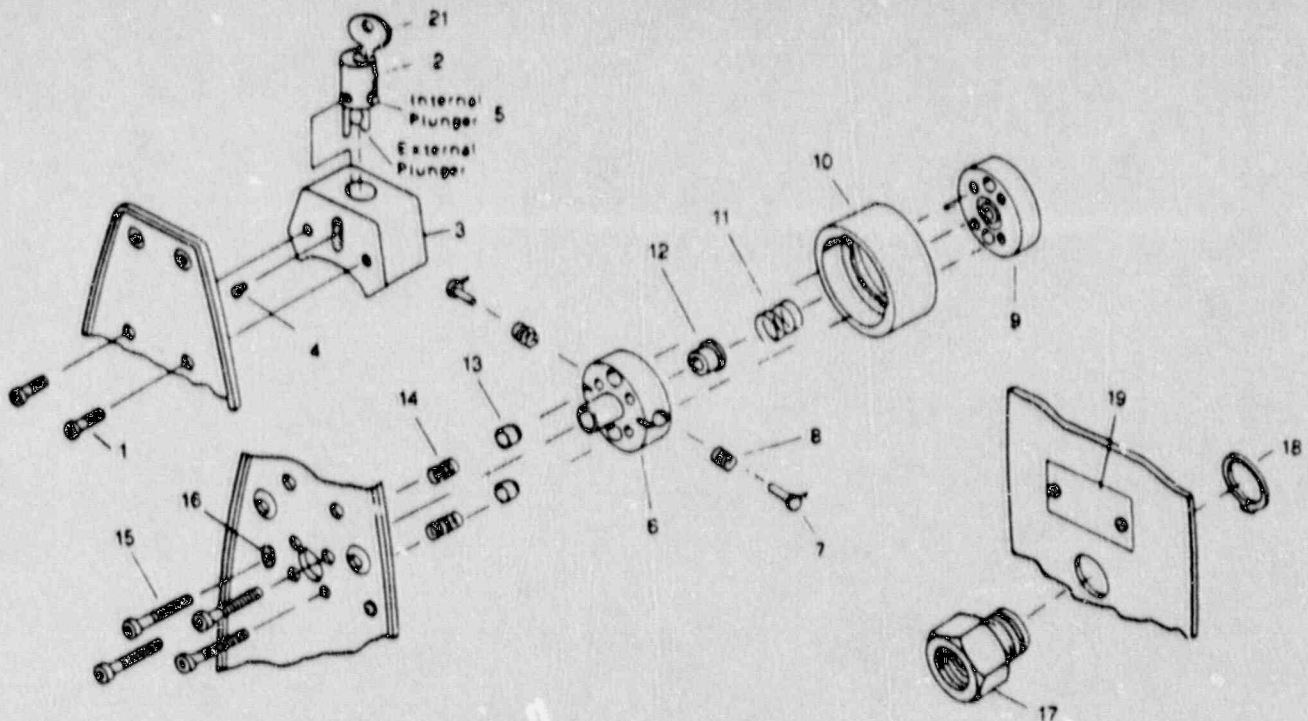
Some operators use the misconnect test on the fully assembled projector complete with its radioactive source. If this is done, proper safety precautions must be carefully observed:

The source exit port must be closed by the shipping plug securely screwed in place.

When the cable connector is presented to the projector (without coupling the cable to the source) care must be taken to ensure that the selector ring is NOT turned past the LOCK position.

If the ring can be turned at all, the equipment is faulty.

This procedure has the advantage of testing all the connector components and selector mechanism simultaneously, but risks losing control of the source if the components are worn or damaged and the selector ring is rotated past LOCK.



AMERTEST™ 660 GAMMA RAY PROJECTOR

Ref #	Cat Code	Part # U.S.A.	Qty	Description	660 Repair Kit Code K11-002 Qty in Kit
1	TMN1		2	Socket Head screw 10-32x5/8 in.	4
2	TSN66011	66001-11	1	Lock	
3	TSN66012	66001-12	1	Lock Retainer	
4			1	Screw (supplied w/item 2)	1
5			1	Internal Plunger	
6	TSN66001	66001-1	1	Selector Body	
7	TSN66005	66001-5	2	Locking Pin	
8	TSN0321		2	Compression spring (LC-032E-1)	2
9	TSN66003	66001-3	1	Selector Ring Retainer	
10	TSN66008	66001-8	1	Selector Ring	
11	TSN0541		1	Compression Spring	1
12	TSN66004	66001-4	1	Sleeve	
13	TSN66006	66001-6	2	Anti-Rotation Lugs	2
14	TSN0267		2	Compression Spring	8
15	TMN1		4	Socket Head Screws 10-32x1 1/4 in. (st. steel)	4
16	TMN1		4	Lock Washer, #10	4
17	TSN53311	53301-11	1	Guide Tube Connector Nut	
18	TMN1		1	Retaining Ring	
19	TSN002	LBL-010	1	Source Identification Plate	
20				1/4-20x3/4" PH Screws	8
21		66001-811		Key	2
22			4	4-40 3/16 BHMS (for lock)	4
23			1	6-32 x 5/8" (for	2
24			1	10-32x3/8" S.S. Allen Screw	4
.		66001-20	1	Jumper Connector	1
.				#30 Drill Bit	1
.			12	1/8" S.S. Pop Rivets	12
.			1	6 Links of Cover Chain	1
.			1	#4 Scott Drive Screws 5/6"	2
.		GRE-TUB		Grease	1
.		660-CL		Check List	1
.		MAN-006	1	660 Operations/Maint. Manual	1

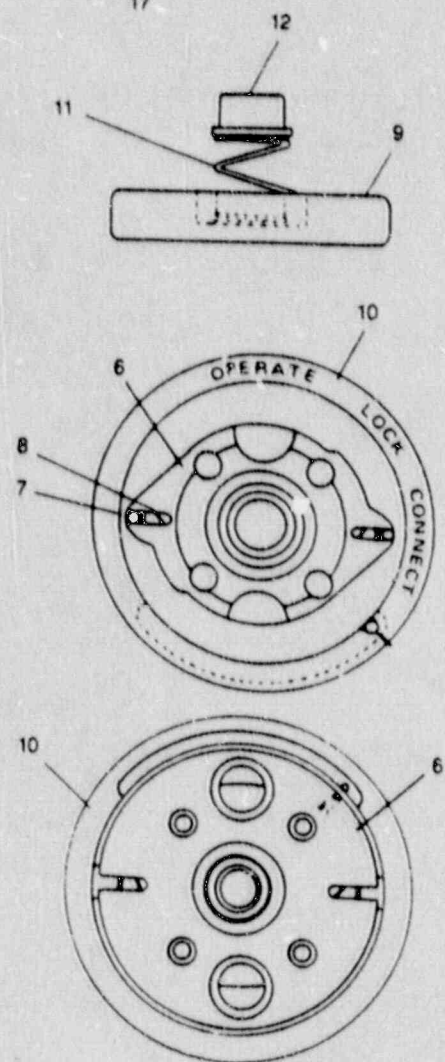


Figure 7.2

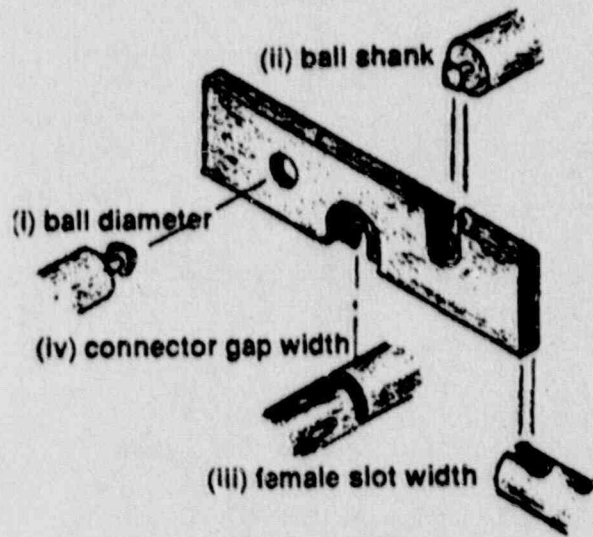
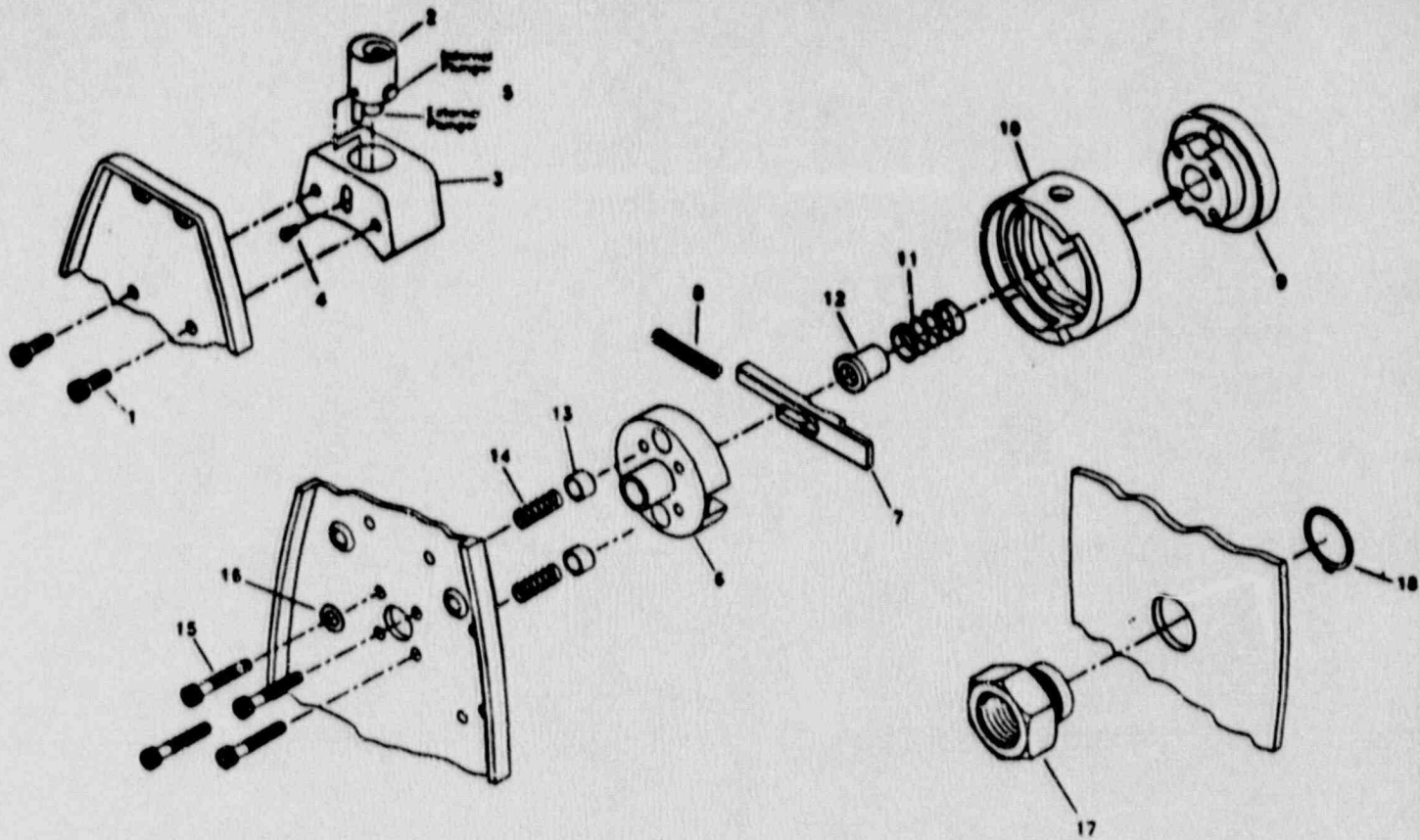


Figure 7.1



1	TMM1		2	10-32x5/8" Socket Head Screw	4
2	TSN66011	66001-11	1	Lock	
3	TSN66012	66001-12	1	Lock Retainer	
4			1	4-40x3/16" Socket Head Screw	1
5			1	Internal Plunger	
6	TSN85712	85701-2	1	Selector Body	
7	TSN85714	85701-4	1	Locking Slide	
8	TSN0321		1	Compression Spring (LC-022C-7)	2
9	TSN85715	85701-5	1	Selector Ring Retainer	
10	TSN85713	85701-3	1	Selector Ring	
11	TSN0541		1	Compression Spring (LC-045E-5)	1
12	TSN85716	85701-6	1	Sleeve	
13	TSN66006	66001-6	2	Anti-Rotation Lugs	
14	TSN0267		2	Compression Spring (LC-026D-7)	2
15	TMM1		4	Socket Head Screws	
16	TMM1		4	10-32x1 1/4" in. (st. steel)	8
17	TSN53311	53301-11	4	Lock Washers, #10	4
18	TMM1		1	Guide Tube Connector Nut	
19	TSN002	LBL-010	1	Retaining Ring S160-98	1
20			1	Source Identification Plate	
21		66001-811	4	1/4-20x3/4" Flat Head Phillips	8
22		66001-20	4	Key	2
23			1	Jumper Connector	1
24			2	4-40x1/4" SEMS	
25			4	10-32x3/4" Flat Head Phillips	4
26			2	Protective Bumper SH-2082	4
27			3	6-32x1/2" Binder Head Phillips	3
.			1	6 Links of Cover Chain	1
.			1	#30 Drill Bit	1
.			12	1/8" S.S. Pop Rivets	12
.			1	#4 Scott Drive Screws 5/6"	2
.	GRE-YUB			Grease	1
.	660-CL			Check List	1
.	MAN-006		1	660 Operations/Maint. Manual	
.	BSK1761		1	U-Tool	
.	66001-39		1	COVER (SELECTOR ASSEMBLY)	

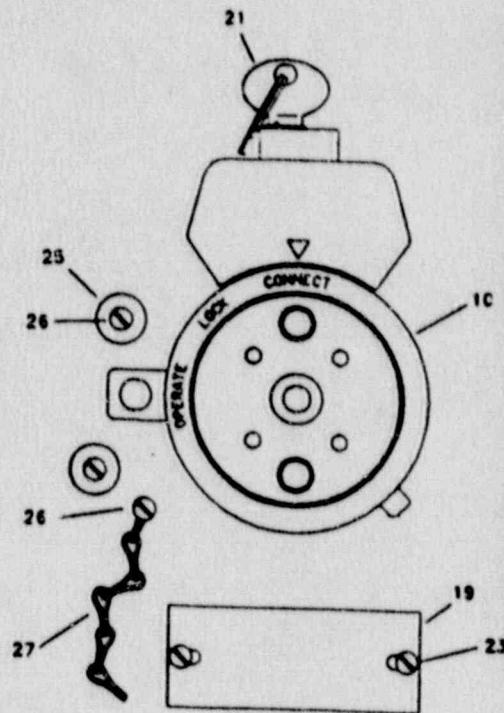


FIGURE 7.3