

Hopewell Designs, Inc.

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MODEL GC88-SL

GAMMA IRRADIATOR

OPERATIONS & MAINTENANCE MANUAL

Date: March 17, 2014

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1 Introduction

The Model GC88-SL, designed and manufactured by Hopewell Designs, Inc., is a self contained irradiator that provides radiation beams of varying strength for calibrating radiation detection instruments.

This Operations and Maintenance Manual presents a technical overview of the irradiator system, describes the operation, and reviews maintenance procedures. Appendices include all the supporting information necessary to operate and maintain the system.

WARNING:

Read these instructions carefully before unpacking, using, storing, transporting or disposing of these devices for safety reasons and to ensure correct usage.

1. These systems produce radiation which can cause damage to health unless all instructions and regulations governing their use are observed.
2. The calibration systems must only be operated by authorized, competent, trained personnel. The system should be secured to prevent unauthorized operation of the equipment.
3. All relevant local and national regulations, codes of practice and international transport regulations must be followed.
4. The calibration systems must not be used or operated for purposes not agreed to in writing by Hopewell Designs, Inc., or the warranty is void.
5. The systems may not be modified without written agreement from Hopewell Designs, Inc., or the warranty is void.
6. All accidents must be reported immediately to the local safety authorities.
7. These instructions must be adhered to at all times.

2 Technical Description

The GC88 Superlite (SL) Irradiator is a self contained irradiator in which the source is mounted in the center of the shield and permanently shielded. The irradiator is steel box 15.2" x 8.5" x 10.3" tall. A source is mounted in the middle. An exposure chamber is located under the source. Lead and tungsten surround the source and exposure chamber. A drawer allows instruments to be moved to the center of the shield and exposed. The source locating rod and attenuators provide a means to vary the exposure rate. The irradiator is self-contained and no elevated exposure rates are possible outside the shield.

See drawing 4818RO in the appendix for more information. The major components are described below:

1. radioactive source
2. source locating rod
3. shielded enclosure
4. drawer
5. attenuators

2.1 Radioactive Source

The GC88-SL has a ~30 mCi Cs-137 source in the center of the shield. The source is a doubly encapsulated, hermetically sealed, special form source. The source capsule is fabricated of stainless steel. The source is permanently mounted in the center of the shield through a hole in the top of the shield. After installation, this access hole is bolted and welded closed.

The source shines down into a cavity approximately 3.5" x 3" and then into the drawer channel. When the drawer is either in the closed or open position radiation levels outside the shield are <5 mR/hr 12" from the surface.

The shield is made of a steel box 13" x 7.25" x 9.8" tall. The outer skin is ¼" steel with all seams welded. A channel contains a drawer that slides into and out of the exposure area in the center of the shield. The source is located above this channel. Lead with a minimum thickness of 0.75" fills the shield and surrounds the drawer channel and source.

At the back of the shield is a panel that provides access to the rear of the channel. On top of the shield is a panel for access to the source. On the right side is a panel that contains the attenuators and handles. After installation, these panels are bolted and welded closed. No access is available for service.

2.2 Drawer

A stainless steel drawer slides in and out of the shield. Steel-encased lead shielding is mounted on the front and back of the shield to reduce exposure rates out the front of the drawer channel. The drawer slides onto a shelf at the front of the shield. An interlock on the attenuator prevents the drawer from being opened unless the attenuator is closed.

2.3 Attenuators

An attenuator is located between the source and the drawer channel. The attenuator slides in and out of the beam by pushing a handle on the side of the shield. The nominal attenuation is X20.

3 System Operations

The GC88-SL is used as a calibration check for radiation survey meters and/or dosimetry. It has no electrical components, and the mechanical components are simple to use. The drawer is opened and closed to place an instrument in the exposure chamber. The attenuators are opened or closed to adjust the exposure rate. The source positioning rod raises and lowers the source to adjust exposure rates.

The exposure rates outside the shield remain low for all modes of operation of the GC88-SL.

3.1 Drawer Operation

The drawer is pulled open to load an instrument. The appropriate fixture is placed in the drawer. The instrument is placed on the fixture with the detector closest to the shield. The drawer is fully closed to place the instrument fully in the radiation field.

Note: The bottom attenuator must be closed before the drawer can be opened. A mechanical interlock will prevent the drawer from opening if the bottom attenuator is open.

3.2 Attenuator Operation

The attenuator provides a nominal 20X attenuation. The attenuator is pushed in to decrease the exposure rate.

3.3 Source Rod Operation

The source can be positioned at 3 different distances. The source rod is lifted and the handle is moved into the slots to position the source. The different distances combined with the attenuator provide 5 different exposure rates. The attenuator must be open to allow the source rod to move to the lower most position.

3.4 Padlock

When the system is not in use, it should be locked to prevent unauthorized use. A padlock should be locked to the shelf in front of the drawer.

4 Maintenance

4.1 Routine Maintenance

The Irradiator has been designed and built using the finest components available to assure maximum performance with minimum maintenance. All components have life cycles that should last beyond the expected useful life of the source and calibrator. The following items should be checked periodically.

Description	Inspection Frequency	Action
Drawer movement	6 months	Check for smooth operation. If drawer sticks, add a few drops of the oil to the shelf. Do not oil the interior of the drawer.
Attenuator(s)	6 months	Check for smooth operation. If attenuators stick, add a few drops of the oil to the handle.

4.2 Installation

The GC88-SL comes partially assembled with the sources already loaded. Installation consists of the following steps:

1. The equipment is unpacked and inspected for shipping damage. A radiation survey is performed.
2. The shipping covers for the drawer and attenuator are removed.
3. The shelf is attached to the front of the shield so the drawer can slide on it.
4. Button head bolts are screwed into the remaining empty holes.
5. The source handle is installed.
6. The source locating cover is installed.
7. Radiation surveys are performed with the attenuators opened and closed, and drawer open and closed.
8. A site acceptance test is conducted to confirm all systems are operational.
9. Training is given to the personnel who will operate the system.

Note: Shipping covers should be saved in the event the unit needs to be shipped in the future.

4.3 Preparation for Shipment

The GC88-SL is a Type A DOT shipping cask. If shipment is required, preparation for shipment consists of the following steps:

1. Close the drawer and all attenuators.
2. Remove the shelf on the front of the shield.
3. Remove the source locating handle and cover.
4. Attach the metal shipping covers to the front of the shield to cover the drawer and the side of the shield to cover the attenuators. Secure with 4 bolts each.
5. Place the shield on a pallet and securely strap it down.
6. Prepare all shipping paperwork and notify proper authorities per regulatory requirements.

4.4 Radioactive Source Requirements

This device contains radioactive source material. Possession of this device requires that the user have a valid radioactive license from state or federal authorities that permits possession of this source material. The device produces a vertical beam of radiation that is fully enclosed inside the irradiator at all times.

Shipment of this device and the radioactive source material must be conducted under proper procedures to assure that all state and federal regulations are followed for the possession and shipment of this material. The device is a Department of Transportation Type A container. To prepare it for shipment, follow Section 4.3 "Preparation for Shipment" above. Proper shipping paperwork for radioactive sources must be completed. The recipient must be notified prior to shipment.

The device contains radioactive sources and lead shielding, both of which could pose an environmental hazard. Both materials are contained inside a steel cover.

This device has a recommended working life of 15 years.

4.4.1 Leak Testing

Leak tests of the radioactive source must be performed at intervals not to exceed 6 months. This test involves taking a cotton swab and wiping the most accessible surface to the source and evaluating the swab for removable contamination. Follow these steps to perform the leak test:

- Open the drawer.
- Using a cotton swab moistened with alcohol, wipe the inside of the drawer. Also wipe the top of the shield where the source cover is located (the disk that is bolted and welded to the top of the shield).
- Allow the swab to dry. Do not handle the portion of the swab used for the wipe with bare hands.
- Perform leak test analysis using instrumentation capable of detecting 0.005 microcuries of radioactive material.

4.4.2 Source Disposal

The irradiator should be returned to an authorized recipient such as the irradiator manufacturer or source manufacturer for purposes of disposal. The recipient should be notified prior to shipment of the device to arrange for shipping instructions and disposal fees.

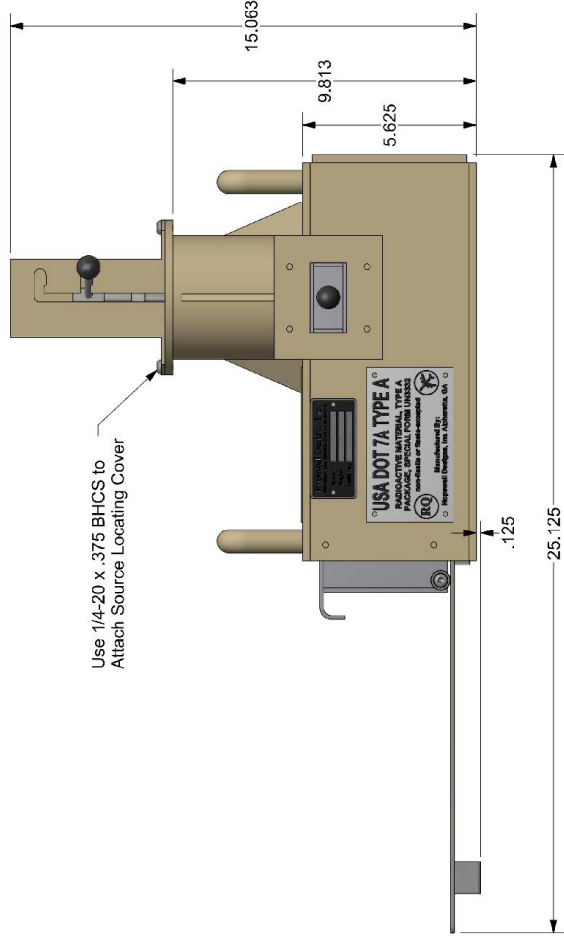
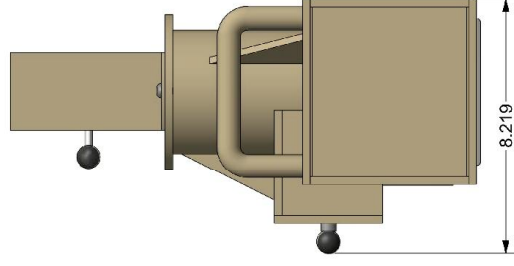
5 Warranty Information

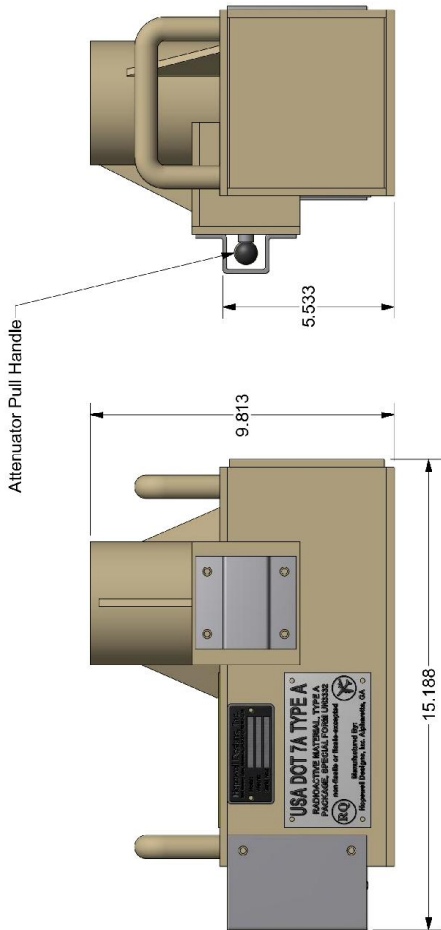
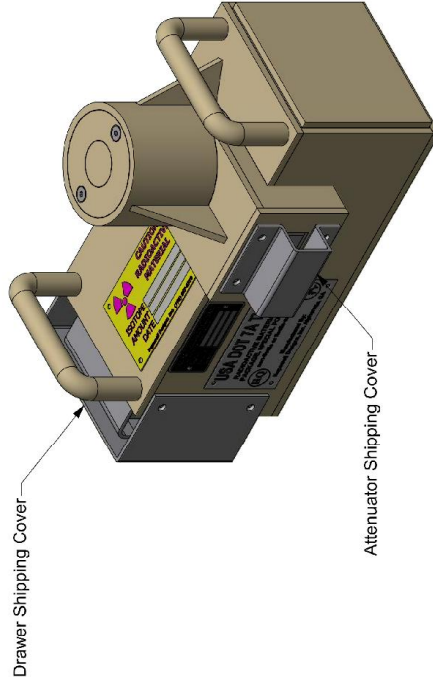
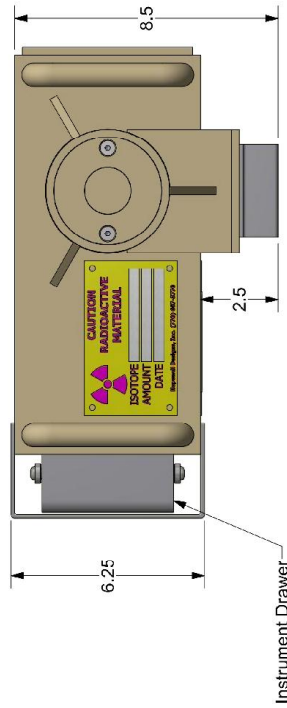
Hopewell Designs, Inc. hereby grants conditional warranty for one (1) year from the date of purchase to cover parts and labor required to correct equipment, which it manufactures.

Hopewell Designs, Inc. makes no guarantees with respect to the merchantability or use of the equipment for any purpose other than the express function for which it was sold. The customer shall not hold Hopewell Designs, Inc. responsible or liable for any implied warranty or consequences accruing due to the performance of this equipment, but only for the operation of this equipment. Hopewell Designs, Inc. reserves the right to repair or replace faulty equipment at its discretion. The preferred mode of repair or replacement is through the return of defective parts or components. Remote diagnostics will be supported to determine the nature of a suspected warranted problem. Should on-site service be required and the failure is determined to be a result of negligence, abuse, or improper use of the equipment, the customer will be responsible for service and travel expenses in addition to the cost of any equipment or materials. Hopewell Designs, Inc. will honor the terms of warranty of the manufacturer for any equipment not produced by Hopewell Designs, Inc. but supplied as part of a system. For non-domestic customers, the same terms apply with a maximum limit of two unpaid service visits. Hopewell Designs, Inc. agrees to provide service and replacement parts for periods beyond the initial warranty agreement at time and materials rates.

Appendices

Appendix - System Drawings and Diagrams

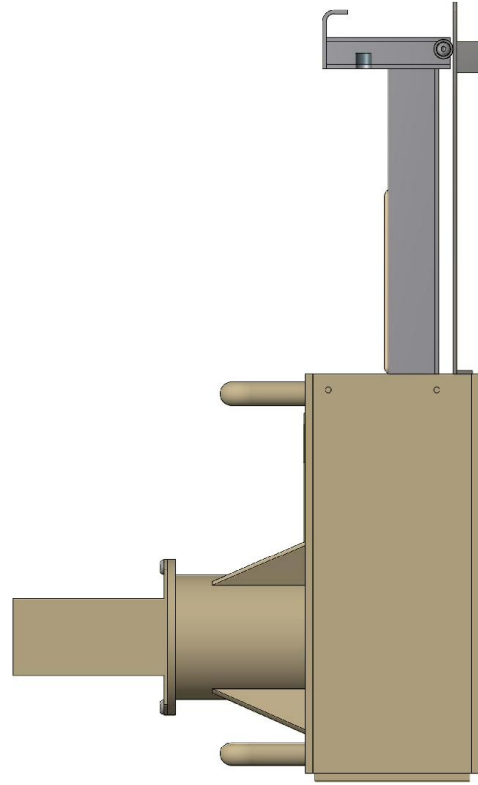
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Irradiator Assembled for Shipping with Covers

Approximate Weight for Shipping: 167 lbmass

PROJECT NAME		2175 Redstone/ US Army		HOPEWELL DESIGNS, INC.	
PROJECT CODE		GC88SL		5940 Gateway Drive, Alpharetta, GA 30004	
DESIGNER	DATE	REV	DATE	GC88SL	
	3/5/2014				
A. Kocakalis	RAK	3/5/2014	RLH	Assembled for Shipping	
R. Howell	RLH	3/5/2014			
REVISIONS		4.0.125			
DATE		2/25/2014			
SCALE		1:4			
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DATE		4/18			
REV NO.		3 of 24			
DESCRIPTION		3/5/2014			



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