





**User Manual** 





STANDARD IMAGING INC. 3120 Deming Way Middleton, WI 53562-1461 Sep / 2012 ©2012 Standard Imaging Inc. TEL 800.261.4446 TEL 608.831.0025 FAX 608.831.2202

### **General Precautions**

Warnings and Cautions alert users to dangerous conditions that can occur if instructions in the manual are not obeyed. Warnings are conditions that can cause injury to the operator, while Cautions can cause damage to the equipment.



**WARNING:** Proper use of this device depends on careful reading of all instructions and labels.



**WARNING:** This diode is intended for quality assurance measurements. It is not intended to be connected to a patient for real-time dosimetry measurements.



**CAUTION:** Do not apply bias voltage to the diode at any time. Presence of voltage will damage the detector



**CAUTION:** Do not drop, mishandle, or disassemble unit since it may result in a change of signal output or damage to diode. Refer all servicing to qualified individuals.



**CAUTION:** Do not sharply bend triaxial cable. Damage to the cable may result in high leakage currents.



**CAUTION:** Connector end of diode detector should not be submerged in water.

NOTE: Standard Imaging does not assume any liability or guarantees when the detector is used with any electrometer or accessories other than those manufactured by Standard Imaging or expressly specified to be suitable for use with this specific type of detector. To maintain full warranty and product liability rights, always use Standard Imaging detectors together with Standard Imaging electrometers

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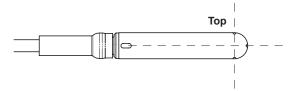


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# **Overview**

The Exradin D1H and D1V Diodes are P-type silicon diodes attached to a 1.5 m length of low-noise flexible triaxial cable that is terminated by a BNC type triaxial connector.

The horizontal design of the D1H allows it to be used in an orientation similar to that of a small volume ion chamber. The flat top and bottom surfaces make the D1H ideal for use with solid water slabs or other phantoms. The internal diode itself has a circular active area of 1.0 mm<sup>2</sup>



The D1V Diode uses the same detector as the D1H, but provides a vertical orientation preferred for water phantom scanning applications. The D1V is also intended for use with the LUCY 3D QA Phantom. When positioned with the circular top facing the radiation source, the circular active area of 1.0 mm2 faces the beam.



As is standard practice for other diodes, it is recommended that the Exradin D1H and D1V Diodes be compared regularly to a known calibrated standard under controlled radiation conditions for accurate relative comparison. Prior to shipment, each diode is verified for radiation performance by comparison to a Standard Imaging Exradin Ion Chamber.

# **General Operation**

- With nothing connected to the input jack of the electrometer, turn the power on and wait at least 15 minutes for warm up.
- Verify the leakage of the electrometer is within the manufacturer's stated acceptable limits.
- Setup the D1H or D1V Diode for measurement in a stand, plastic phantom or water phantom. When positioning, ensure that the active area faces the beam

D1H: The three vertical lines on the sides of the D12H diode provide references to indicate the center of the active area.

D1V: The laser alignment line around the circumference of the D1V diode indicates the position of the active area.

**NOTE:** While the D1H and D1V are inherently waterproof without the assistance of sleeves, caps or other devices, the connector end of the diode should never be submerged in water.

# **General Operation** Continued

- Connect the diode to the electrometer using an extension cable if necessary, being certain there is no bias voltage selected on the electrometer.
- Allow the electrometer and diode system at least 10 minutes to stabilize, making certain that all cabling is lying flat and unkinked.
- 6. Verify the leakages of diode and extension cable (if used) are within the manufacturer's stated acceptable limits. If measured in the presence of background sources, note that this signal will add to the leakage of the diode.
- Some electrometers, such as the Standard Imaging MAX 4000 and SuperMAX electrometers, allow the user to zero the device at any time. If desired, perform this system zeroing now.
- Check the system leakage. Take a reading without exposing the diode to radiation. This reading should be less than 0.1% of the final signal expected. If it is not, the leakage should be subtracted from the signal.
- Irradiate the diode and take at least 3
  measurements. Generally, the measurements
  should not be moving in only one direction (i.e. three
  readings that continue to drop and hence may not
  yet be stabilized). If a current measurement is done,
  allow sufficient time for value to stabilize.
- Analyze the data, taking into account the average of the readings, system leakage, electrometer calibration, and any other appropriate corrections to be made.
- 11. When all measurements are completed, turn off the electrometer and disconnect the diode.

### Maintenance

There are no user-serviceable parts within the Exradin D1H or D1V Diodes. Under no circumstance should the user attempt to repair or disassemble the diode and/or connector, as the warranty will become void. Under normal use, the diode should provide years of trouble-free service.



If assistance is desired in the proper disposal or recycling of this product (including accessories and components), after its useful life, please return to Standard Imaging.

# Cleaning Triax Connectors on Ion Chambers and Extension Cables

Over the years, Standard Imaging has had product reports of drift or leakage involving its detectors. During the investigation and/or servicing of these products it became apparent a significant portion of these reports were caused by dirty triax connectors. The cause is typically dust that has collected on the inside connector. To minimize these reports and unnecessary service, Standard Imaging is providing a triax connector cleaning procedure. This triax connector cleaning procedure should be periodically completed or whenever there are concerns of drift or leakage. Heavier product use may require more frequent cleanings.

Prior to cleaning a triax connector, ensure:

- The detector is disconnected from the electrometer.
- There is no water or moisture visible in the triax connector.

To clean a dirty triax connector:

- Remove the connector cap (if applicable).
- Use only a dry and oil free compressed air source, such as Chemtronics® Ultra Jet.
- Gently blow dirt and contaminants from the inside of the connector, moving the air source in a circular manner a few inches from the connector.

After cleaning a dirty triax connector:

Use the connector cap when not in use (if applicable).

### Maintenance Continued

### Do not:

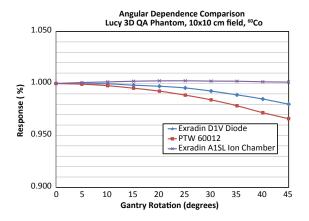
- Use sharp objects to attempt to clean a dirty triax connector.
- Use a compressed gas other than air.
- Use a compressed gas source that may have moisture or oil in the source or lines.
- · Use your mouth to blow on the connector.
- · Disassemble the connector.
- Touch the internal parts of the connector with your finger.

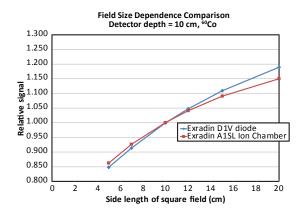
If this procedure does not resolve the drift or leakage issues, contact the Customer Service Administrator to coordinate the return the product to Standard Imaging for further service. If there are any questions or comments regarding this information, please contact Standard Imaging or your authorized dealer.

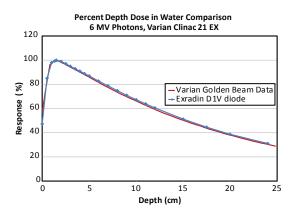
### Parts and Accessories

REF	Description
92740	Exradin D1V Diode Detector, Ø 1mm, (vertical version)
92741	Exradin D1H Diode Detector, Ø 1mm, (horizontal version)
80441	Exradin Diode Detector User Manual
72193	In-Air Comparison Jig
90015	MAX 4000 Electrometer
90018	SuperMAX Electrometer

# **Performance Graphs**







# **Features and Specifications**

#### **Diode Type:**

P-type Si diode

#### Materials:

C552 shell for EMI shielding and durability, potted with near-water equivalent epoxy to eliminate air gaps

### **Outside Diameter:**

D1V (REF 92740): Ø 6.88 mm (0.271") x 46.2 mm (1.817") long,

D1H (REF 92741):

6.88 mm (0.271") x 6.88 mm (0.271") x 34.8 mm (1.37")

### Diameter of Sensitive Area:

1 mm<sup>2</sup> x ~0.05 mm thick

### **Effective Depth Below Surface:**

0.8 mm - Indicator marks or lines clearly identify internal diode orientation and active face

### Intended Energy Range:

Photons: 60Co to 25 MV

#### Low-Noise Triaxial Cable:

50 ohms, 29 pF/ft, 1.5 m long

#### Connector availability:

Standard BNC triax, with HV bias capability disabled. Other connector options such as TNC or type M may be available upon request

### Waterproof:

Yes, may be used in water phantoms, designed to mount cleanly and easily to available chamber holders

### **Operating Voltage:**

0 VDC bias (protected from accidental high voltage application)

#### Signal Polarity:

Positive

#### Radiation response, typ:

~5 nC/Gy

### Leakage current, typ:

<100 fA (typical, depends on electrometer used)

### Temperature dependence, typ:

<0.4 % / °C

### Sensitivity decrease (at 6 MV):

<1.0 % per kGy

### Dose to pulse dependency):

> 99.5% over relevant clinical range.

### Dose linearity:

> 99.9%

# Features and Specifications Cont'd

#### Field size dependency:

> 97.0%

### Intended Field size for use:

up to (20 x 20) cm2

### **Directional Dependence:**

 $< \pm 0.5\%$  tilting  $\pm 20$ 

### Operating Parameters:

Temperature: 15 to 35 °C

# Relative Humidity:

20 to 80% non-condensing

#### Pressure:

650 to 770 mmHg

### Storage Parameters:

#### Temperature:

-15 to 50 °C

## **Relative Humidity:**

10 to 95% non-condensing

#### Pressure:

600 to 800 mmHg

### **Product Standards Compliance:**

IEC 60601-11, IEC 607311, WEEE, RoHS



- Authorized representative for the EU is AMA, Ltd.,
   St. Felix House, Flitcham, King's Lynn, Norfolk,
   United Kingdom, PE31 6BU.
- Competent Authority for the EU is the Medical Products Agency, Sweden.
- Notified Body for the EU is Semko, Sweden.

<sup>&</sup>lt;sup>1</sup>Designed to Meet

Notes			

# Service Policy

If service, including recalibration, is required, please contact Standard Imaging's Customer Service department by phone or email prior to shipping the product. Standard Imaging's Customer Service and Technical Service staff will attempt to address the product issue via phone or email. If unable to address the issue, a return material authorization (RMA) number will be issued. With the RMA number, the product can be returned to Standard Imaging. It is the responsibility of the customer to properly package, insure and ship the product, with the RMA number clearly identified on the outside of the package. The customer must immediately file a claim with their carrier for any shipping damage or lost shipments. Return shipping and insurance is to be pre-paid or billed to the customer, and the customer may request a specific shipper. Items found to be out of warranty are subject to a minimum service fee of 1 hour labor (excluding recalibrations) for diagnostic efforts and require a purchase order (PO) before service is performed. With concurrence from customer, the product may be replaced if it is unserviceable or if the required service is cost prohibitive. Products incurring service charges may be held for payment. Standard Imaging does not provide loaner products. See the Standard Imaging Warranty and Customer Responsibility for additional information.

# **Return Policy**

No merchandise will be accepted for credit without prior approval of return. Please contact Standard Imaging's Customer Service Department to receive a return authorization number before returning any merchandise for exchange or credit. Products manufactured by Standard Imaging must be returned within thirty days of receipt of order in 'like new' condition. No credit will be given for products returned after thirty days from receipt of order. A minimum twenty percent restocking fee will be charged on all returned merchandise. All materials returned must be shipped pre-paid. Credit for returned goods will be issued to customer's account for use against future purchases of merchandise only. Special orders, custom products, re-sale (not manufactured by Standard Imaging) products, and ADCL calibrations will not be accepted for return credit or exchange.

### Serialization Information

Standard Imaging products that are serialized contain coded logic in the serial number which indicates the product, day and year of manufacture, and a sequential unit number for identification:

### A YY DDD X

A Unique product ID

YY Last two digits of the year (e.g. 1999 = 99, 2000 = 00)

**DDD** Day of the year  $(1 \le DDD \le 365)$ 

**X** Unique unit ID Number  $(1 \le X \le 9)$ 

# **Customer Responsibility**

This product and its components will perform properly and reliably only when operated and maintained in accordance with the instructions contained in this manual and accompanying labels. A defective device should not be used. Parts which may be broken or missing or are clearly worn, distorted or contaminated should be replaced immediately with genuine replacement parts manufactured by or made available from Standard Imaging Inc.



CAUTION: Federal law in the U.S.A. and Canadian law restrict the sale, distribution, or use of this product to, by, or on the order of a licensed medical practitioner. The use of this product should be restricted to the supervision of a qualified medical physicist. Measurement of high activity radioactive sources is potentially hazardous and should be performed by qualified personnel.



CAUTION: As desired by IAEA, English is the default language for labeling and manuals. If translated versions are available, resolve any differences in favor of the English versions.



WARNING: Proper use of this device depends on careful reading of all instructions and labels.



WARNING: Where applicable, Standard Imaging products are designed to be used with the versions of common radiation delivery devices, treatment planning systems and other products or systems used in the delivery of ionizing radiation, available at the time the Standard Imaging product is released. Standard Imaging does not assume responsibility, liability and/or warrant against, problems with the use, reliability, safety or effectiveness that arise due to the evolution, updates or changes to these products or systems in the future. It is the responsibility of the customer or user to determine if the Standard Imaging product can be properly used with these products or systems.

Should repair or replacement of this product become necessary after the warranty period, the customer should seek advice from Standard Imaging Inc. prior to such repair or replacement. If this product is in need of repair, it should not be used until all repairs have been made and the product is functioning properly and ready for use. After repair, the product may need to be calibrated. The owner of this product has sole responsibility for any malfunction resulting from abuse, improper use or maintenance, or repair by anyone other than Standard Imaging Inc.

The information in this manual is subject to change without notice. No part of this manual may be copied or reproduced in any form or by any means without prior written consent of Standard Imaging Inc.

# Warranty

Standard Imaging, Inc. sells this product under the warranty herein set forth. The warranty is extended only to the buyer purchasing the product directly from Standard Imaging, Inc. or as a new product from an authorized dealer or distributor of Standard Imaging, Inc.

For a period provided in the table below from the date of original delivery to the purchaser or a distributor, this Standard Imaging, Inc. product, provided in the table is warranted against functional defects in design, materials and workmanship, provided it is properly operated under conditions of normal use, and that repairs and replacements are made in accordance herewith. The foregoing warranty shall not apply to normal wear and tear, or if the product has been altered, disassembled or repaired other than by Standard Imaging, Inc. or if the product has been subject to abuse, misuse, negligence or accident.

Product	Warranty Period		
Standard Imaging Ionization Chambers	2 years		
Standard Imaging Well Chambers	2 years		
Standard Imaging Electrometers	5 years		
Standard Imaging BeamChecker Products	2 years		
Standard Imaging Software Products	1 year		
All Other Standard Imaging Products	1 year		
Standard Imaging Custom Products	1 year		
Standard Imaging Remanufactured Products	180 days		
Standard Imaging Custom Select Products	90 days		
Consumables	90 days		
Serviced Product	90 days		
Resale Products	As defined by the Original Equipment Manufacturer		
ADCL Product Calibration (Standard Imaging uses the UW-ADCL for recalibrations required under warranty, unless otherwise requested)	0 - 90 days = 100% of ADCL Calibration Costs 91 - 182 days = 75% of ADCL Calibration Costs 183 - 365 days = 50% of ADCL Calibration Costs 366 - 639 days = 25% of ADCL Calibration Costs (days from date of shipment to customer)		

Standard Imaging's sole and exclusive obligation and the purchaser's sole and exclusive remedy under the above warranties are, at Standard Imaging's option, limited to repairing, replacing free of charge or revising labeling and manual content on, a product: (1) which contains a defect covered by the above warranties; (2) which are reported to Standard Imaging, Inc. not later than seven (7) days after the expiration date of the warranty period in the table; (3) which are returned to Standard Imaging, Inc. promptly after discovery of the defect; and (4) which are found to be defective upon examination by Standard Imaging Inc. Transportation related charges, (including, but not limited to shipping, customs, tariffs, taxes, and brokerage fees) to Standard Imaging are the buyer's responsibility. This warranty extends to every part of the product excluding consumables (fuses, batteries, or glass breakage) or material reactions. Standard Imaging, Inc. shall not be otherwise liable for any damages, including but not limited to, incidental damages consequential damages, or special damages. Repaired or replaced products are warranted for the balance of the original warranty period, or at least 90 days.

This warranty is in lieu of all other warranties, express or implied, whether statutory or otherwise, including any implied warranty of fitness for a particular purpose. In no event shall Standard Imaging, Inc. be liable for any incidental or consequential damages resulting from the use, misuse or abuse of the product or caused by any defect, failure, malfunction or material reactions of the product, whether a claim of such damages is based upon the warranty, contract, negligence, or otherwise.

This warranty represents the current standard warranty of Standard Imaging, Inc. Please refer to the labeling or instruction manual of your Standard Imaging, Inc. product or the Standard Imaging, Inc. web page for any warranty conditions unique to the product.