



 **EXRADIN** ION CHAMBERS

**Parallel Plate**  
Ionization Chambers

*STANDARD* **IMAGING** 

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**User Manual**





 **EXRADIN** ION CHAMBERS  
**Parallel Plate**  
Ionization Chambers

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# General Precautions

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**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:** Electrical shock hazard when connected to 300V bias supply.



**WARNING:** Exradin Ion Chambers are intended for quality assurance and calibration measurements. They are not intended to be connected to a patient for real-time dosimetry measurements.



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



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



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



**CAUTION:** The A20 is designed for 70kV application and below without a build-up cap.



**CAUTION:** The A20 is not intended for water tank applications.



**CAUTION:** The A20 should only be irradiated head-on, which is perpendicular to the window and is similar to other parallel plate ion chambers. It should never be irradiated along its length.



**CAUTION:** For best performance, and when practical, use ion chambers as calibrated, matching the sign of the charge collected and the collecting electrode bias with that found on the calibration documents. Measurements performed outside of the calibrated parameters and/or manufacturer recommended specifications should be independently verified, and used with care.

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**This manual applies to the following parallel plate chamber models:**

<b>Model</b>	<b>REF</b>
<b>A10</b>	92702
<b>A11</b>	92701
<b>P11</b>	92703
<b>T11</b>	92704
<b>A11TW</b>	92708
<b>P11TW</b>	92709
<b>T11TW</b>	92710
<b>A20</b>	92736

## General Operation

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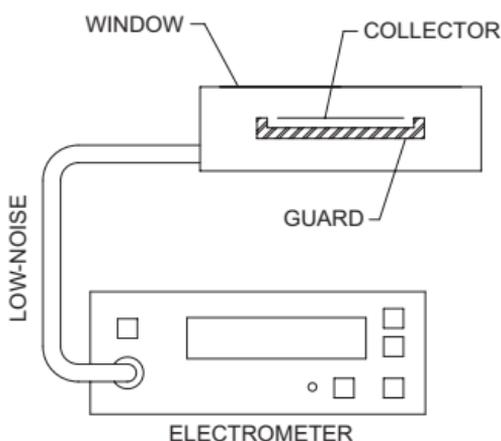
All **Exradin** parallel plate chambers are attached to a 1.5 m length of low-noise flexible triaxial cable that is terminated by a triaxial or coaxial connector. The collector of the chamber is common with the center wire of the cable and the center contact of the connector. The guard is common with the inner cable braid and the middle connector contact, in the case of triaxial connectors, and the connector body, in the case of coaxial connectors. The window (outer electrode), usually ground, is common with the outer braid of the cable and the connector body, in the case of triaxial connectors, and the pigtail extending out the rear of coaxial connectors.

# General Operation Continued

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The design of **Exradin** chambers requires that the collector and guard operate at essentially the same potential. The polarizing potential, supplied by an electrometer, is applied between the window and the guard as shown in **Figure 1**. Either polarity may be applied to the window and either the window or guard may be grounded. Safety and other considerations recommend grounding the window, which then requires an electrometer with a floating input.

All **Exradin** chambers can support 1000 V between window and guard. However, depending on the particular circumstance and radiation intensity, as little as 90 V may yield essentially 100% charge collection.



**Figure 1: Parallel Plate Chamber and Electrometer**

Because **Exradin** ionization chambers do not exhibit voltage soakage phenomena, readings of ionization current may be made immediately after application of the polarizing potential. However, it is good practice to pause a minute or two after changing the potential to allow switching transients induced in the electrometer to completely subside. Such transients are most evident in the rate (current) mode.

## Operating Instructions

1. With nothing connected to the input jack of the electrometer, turn the power on and wait at least 15 minutes for warm up.
2. Verify the leakage of the electrometer is within the manufacturer's stated acceptable limits.
3. Connect the ionization chamber to the electrometer and apply 300 VDC or the desired voltage bias.
4. Allow the electrometer and ionization chamber system at least 10 minutes to stabilize, making certain that all cabling is lying flat and unkinked.

## General Operation Continued

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5. Verify the leakage of the ionization chamber is 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 chamber.
6. Some electrometers, such as the Standard Imaging MAX 4000 Electrometer, allow the user to zero the device at any time. If desired, perform this system zeroing now.
7. Check the system leakage. Take a reading without exposing the chamber 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.
8. Measure atmospheric temperature and pressure. For well chambers, measure the temperature in the well of the chamber.
9. Insert the ion chamber 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.
10. Analyze the data taking into account the average of the readings, system leakage, temperature/pressure corrections, calibration factors and any other appropriate corrections to be made. Keep in mind that the calibration factor consists of the electrometer calibration and the ionization chamber calibration factor.
11. When all measurements are completed, set bias voltage to 0 VDC, turn off the electrometer and disconnect the ionization chamber.

## Calibration

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As is standard practice for other ionization chambers, it is recommended that Exradin chambers be calibrated every (2) years. This calibration should be performed by an Accredited Dosimetry Calibration Laboratory (ADCL). Standard Imaging offers calibrations from the University of Wisconsin ADCL. You need only one purchase order to cover calibrations, shipping and handling, and service. Standard Imaging hand carries all instruments to and from the University of Wisconsin ADCL.

# Parts and Accessories

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REF	Description
72136	A10 Waterproof cap; 1.0 mm; acrylic
72137	Model 11 Waterproof cap; 1.0 mm; acrylic
72130	A11 Co-60 Calibration Cap; 1.8 mm
72131	P11 Co-60 Calibration Cap; 3.2 mm
72132	T11 Co-60 Calibration Cap; 3.4 mm
72133	A11TW Co-60 Calibration/ Waterproof Cap; 2.8 mm
72134	P11TW Co-60 Calibration/ Waterproof Cap; 4.2 mm
72135	T11TW Co-60 Calibration/ Waterproof Cap; 4.4 mm
72271	A20 – 70 - 100 keV Buildup Cap, 15.4mg/cm <sup>2</sup> ; Polyimide
72272	A20 – 300 keV and above buildup cap, 88 mg/cm <sup>2</sup> , C552

# General Chamber Specifications

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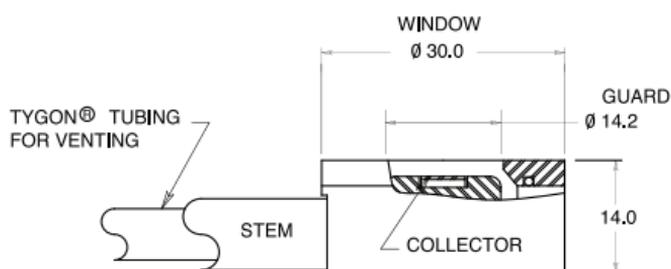
<b>Nominal Collection Efficiency:</b>	100%
<b>Maximum Polarizing Potential:</b>	1000 V
<b>Nominal Inherent Leakage Currents:</b>	10 <sup>-15</sup> A
<b>Low-Noise Triaxial Cable:</b>	50 ohms, 29 pF/ft, 1.5 m long (2.5 m long for the A20)
<b>Signal Connector:</b>	Triaxial BNC Plug (2-Lug Male); unless requested as other
<b>High Voltage Connector:</b>	Integral with triaxial connector (shell of chamber is common with connector body)
<b>Humidity:</b>	10-80%, non-condensing
<b>Temperature:</b>	-15 - 50 °C
<b>Pressure:</b>	680 - 770 mm Hg
<b>Product Standards:</b>	IEC 60601-1 <sup>1</sup> , IEC 60731 <sup>1</sup>



<sup>1</sup> Designed to Meet

# Exradin A10 Ion Chamber

## A10 (REF 92702)



ALL DIMS ARE APPROX AND IN MM

SIDE VIEW

<b>Collecting Volume:</b>	0.051 cm <sup>3</sup>
<b>Nominal Calibration Factor:</b>	60 R/nC
<b>Centroid of Collecting Volume:</b>	1.0 mm from top of window
<b>Collector Diameter:</b>	5.4 mm
<b>Window-Collector Gap:</b>	2.0 mm
<b>Window:</b>	Polyimide film, 3.86 mg/cm <sup>2</sup>

**Window Support Rings, Collector, and Guard Material:** A10 - Shonka Air-Equiv. plastic C552

**Included Waterproofing Cap:** Wall thickness of 1.0 mm; constructed of acrylic; TG-51 compliant

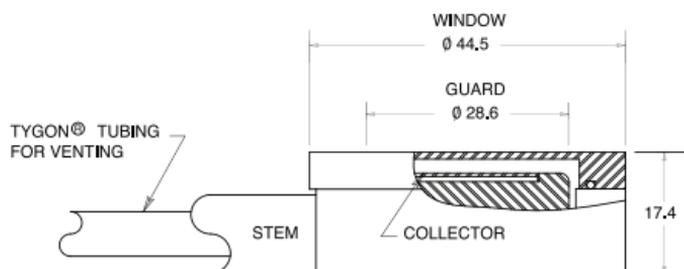
**Polarity:** < 1%

# Exradin 11 Ion Chamber

## A11 (REF 92701)

## P11 (REF 92703)

## T11 (REF 92704)



ALL DIMS ARE APPROX AND IN MM

SIDE VIEW

<b>Collecting Volume:</b>	0.62 cm <sup>3</sup>
<b>Nominal Calibration Factor:</b>	5.5 R/nC
<b>Centroid of Collecting Volume:</b>	2.0 mm from top of window
<b>Collector Diameter:</b>	20.0 mm
<b>Window-Collector Gap:</b>	2.0 mm
<b>Window:</b>	1.0 mm

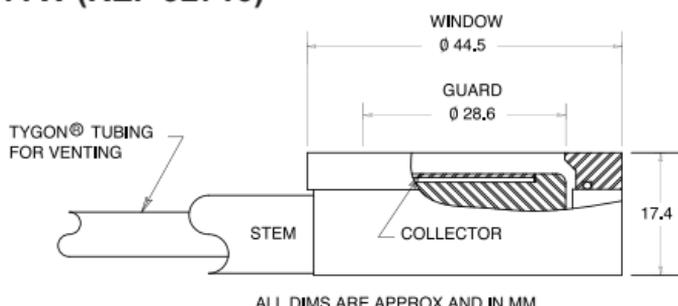
**Window Support Rings, Collector, and Guard Material:** A11 - Shonka Air-Equiv. plastic C552  
P11 - Polystyrene-Equiv. plastic D400  
T11 - Shonka Tissue-Equiv. plastic A150

# Exradin 11TW Ion Chamber

**A11TW (REF 92708)**

**P11TW (REF 92709)**

**T11TW (REF 92710)**



**SIDE VIEW**

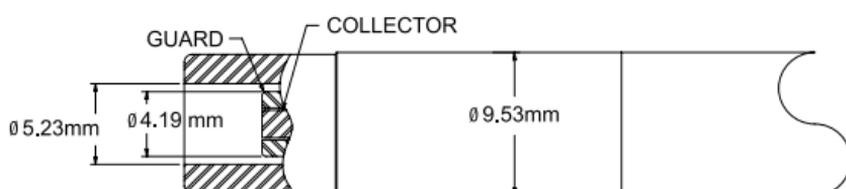
**Collecting Volume:** 0.92 cm<sup>3</sup>  
**Nominal Calibration Factor:** 3.4 R/nC  
**Centroid of Collecting Volume:** 1.5 mm from top of window  
**Collector Diameter:** 20.0 mm  
**Window-Collector Gap:** 3.0 mm  
**Window:** Polyimide film, 3.86 mg/cm<sup>2</sup>

**Window Support Rings, Collector, and Guard Material:**  
**A11TW** - Shonka Air-Equiv. plastic C552  
**P11TW** - Polystyrene-Equiv. plastic D400  
**T11TW** - Shonka Tissue-Equiv. plastic A150

**Included Waterproofing Cap:** Wall thickness of 1.0 mm; constructed of acrylic; TG-51 compliant

# Exradin A20 Ion Chamber

**A20 (REF 92736)**



**Collecting Volume:** 0.074 cm<sup>3</sup>  
**Nominal Calibration Factor:** 3.7 x 10<sup>8</sup> Gy/C or 4.2 x 10<sup>10</sup> R/C  
**Centroid of Collecting Volume:** 1.80 mm from top of window  
**Collector Diameter:** 1.93 mm  
**Window-Collector Gap:** 5.0 mm  
**Window:** Kapton film, 7.72 mg/cm<sup>2</sup>  
**Window Support Rings, Collector, and Guard Material:** Shonka Air-Equiv. plastic C552

# Service Notes

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## Stem

The one-piece polycarbonate stem (0.9 cm OD, 7.6 cm long) found on these chambers is an integral part of the chamber assembly and is not to be removed under any circumstances.

## Venting

These particular ionization chambers are equipped with a Tygon® tube secured to the chamber stem and running the full length of the triaxial cable. (The triaxial cable is inside the tubing.) The tubing is sealed to the chamber stem, and is open to ambient conditions at the connector end. This tubing is not intended to be removed or altered by the customer, and doing so will void the warranty.

## Calibration Cap

Calibration caps constructed of the same material as the major elements of the chamber are available to provide more than adequate build-up for Cobalt-60 radiation.

**To secure cap on chamber:** Simply place cap over chamber window until it bottoms.

## Waterproofing Cap (A10 and 11TW ONLY)

The waterproofing cap, available for these chambers, is made of acrylic and has a 1.0 mm thick window as recommended by the AAPM TG-51 protocol. The O-Ring inside the cap is designed to offer a snug fit to the chamber's outer diameter, to ensure its seal.

**To secure cap on chamber:** press cap firmly down onto chamber until it bottoms on chamber window ring. Occasionally, the O-Ring inside the cap will become twisted and prevent complete bottoming. If this occurs, simply rotate the cap (either clockwise or counterclockwise) while continuing downward pressure, until it bottoms on chamber window ring.

**To remove cap from chamber:** Gently rotate (either clockwise or counterclockwise) cap while pulling slightly upward.

## Service Notes Continued

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### **Kapton® Window (A10, 11TW, and A20 only)**

The window is made of thin conducting Kapton film and is under tension. Touching anything to the window is to be avoided.

Even though these T versions of Exradin Ion Chambers are designed to be waterproof, as a result of the hygroscopic properties of A150, they are not recommended for submerged use in water. Submerged use typically involves ion chamber use with a water tank.

By definition, the hygroscopic properties of A150 may cause the material to absorb minute amounts of water under certain conditions. This water can alter the physical characteristics of the material to an extent which may cause the ion chamber's measurements and calibration factors to change over time.



### **Service and Maintenance**

There are no user-serviceable parts within these ionization chambers. Under no circumstance should the user attempt to repair or disassemble the chamber and/or connector, as the warranty will become void and the calibration factor will change. Under normal use, the chambers 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.

## Service Notes Continued

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### **Cleaning Triax Connectors on Ion Chambers and Extension Cables**

Over the years, Standard Imaging has had product reports of drift or leakage involving its ion chambers. 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 ion chamber 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).

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.

## Service Policy

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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

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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 ( $1 \leq DDD \leq 365$ )

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



# Customer Responsibility

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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.