



InSight
Mini C-arm Imaging System
Technical Reference Manual

April 2007

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Hologic, Inc.

35 Crosby Drive
Bedford, MA 01730
USA

Tel: (781) 999-7300

Fax: (781) 280-0669

Service: (800) 321-HOLX (321-4659)

User Support: (800) 321-HOLX (321-4659)

Hologic Europe

Hologic N.V.
Leuvensesteenweg 250A
1800 Vilvoorde
Belgium

Tel: 32.2.711.4680

Fax: 32.2.725.2087

Table of Contents

Product Specifications	1
Power Requirements	1
Environmental Requirements	1
Weights/Dimensions	1
Space Requirements.....	1
X-Ray Specifications	2
Performance	2
Imaging Specifications	3
Laser Performance Specifications	3
Equipment Classification	4
Symbols	5
InSight Entrance Exposure Rate Data	6
Entrance Exposure Rate Data, Auto Mode	7
Scatter Radiation Survey	8
Insight System Labels	11
Manufacturer Serial Number Label	11
Patent Label	11
X-Ray System Warning Label	12
Electric Shock Warning Label	12
Class 1 Laser Label.....	12
Caution on Incline Label.....	12
Transport Label.....	12
X-Ray Controller Compliance Label	13
X-Ray Source Compliance Label	13
Collimator Compliance Label.....	14
Image Intensifier Compliance Label.....	14
C-Arm Compliance Label.....	15
AC Input Power Fuse Label.....	15
Accessory Fuse Label	15
Printer Fuse Label	16
Explosion Risk Label.....	16
Extremities Only Label	16
Field of View	16
Computer On/Standby Label	17
Ground Labels.....	17
Back Panel Labels.....	17

Product Specifications

Power Requirements

Parameter	Value
AC Input Voltage	Nominal 100/120/220/240 V Single Phase
Wattage	750 watts maximum
AC Input Frequency	Nominal 50/60 Hz
Computer System Backup Time	~ 2 minutes with full charge

Environmental Requirements

Parameter	Value
Temperature Range (Operating)	+15.5° to +32° C (+60° to +90° F)
Temperature Range (Storage)	-20° to +50° C (-4° to +122° F)
Relative Humidity (Operating)	20 - 80% non-condensing
Relative Humidity (Storage and Transport)	20 - 85% non-condensing
Atmospheric Pressure	500 -1060 hPa (375 - 795 mm Hg)

Weights/Dimensions

Height	65 in. (165.1 cm)
Width	35 in. (88.9 cm)
Depth	35in. (88.9 cm)
Weight	500 pounds (227 kg)

Space Requirements

Required Floor Space:	5 ft. x 6.6 ft. (1.5 m x 2.0 m)
Door Size	30 in. (88.9 cm) minimum
Ground Clearance:	3.875 in. (9.8 cm) minimum
Floor Capacity	151.1 lb/ft ² (737.2 kg/m ²)

X-Ray Specifications

Source - Image receptor distance	44 cm (17.5")
X-ray source	Grounded tungsten anode X-ray tube with custom designed high voltage generator.
X-ray tube window	0.005" (0.127mm) Beryllium
Beam filtration	Stainless steel with aluminum equivalence ≥ 2.5 mm
Focal spot	0.045 mm (0.0018") @ 7.5 watts
Field of View	Operator selectable collimation of 4" or 6" diameter (10.16 cm or 15.24 cm) FOV at the plane of the image intensifier
Rated peak tube potential	75 kVp
Tube kVp range	40 to 75 kVp
Tube current range	0.020 to 0.100 mA
Tolerance	kVp $\pm 5\%$ of displayed value mA $\pm 8\% \leq 0.035$ mA of displayed value mA $\pm 5\% > 0.035$ mA of displayed value
Maximum Duty cycle at 75 kVp/0.100 mA	50%

Performance

Parameter	Value
Acquisition Frame Rate	Non-cine recording 30 FPS Cine recording 25 FPS
Fluoroscopic Time Alarm Range	15 seconds – 5 minutes, adjustable in 15 second increments (default is 5 minutes)
Image Storage Capacity	4000 Images (maximum)
Cine Loop Capacity	10 minutes maximum
Laser Alignment Guide Timeout	20 seconds

Imaging Specifications

Image intensifier	High sensitivity Cesium Iodide
C-arm dimensions	Source to detector distance: 17.5" (44 cm) Free space: 14" (36 cm) Depth of arc = 14" (36 cm)
Image processing	Digital, with 2 to 8 frames of video averaging and last frame freeze
Video system	21" (53 cm) LCD touch screen monitor Solid state video camera DVI-I output
Resolution (using Nuclear Associates test tool 07-539, located at the minimum SSD in normal (6") mode)	7.0 lp/mm, minimum
Contrast (using Nuclear Associates test tool 07-647, located at the surface of the image intensifier housing in normal (6") mode)	Must resolve, at minimum, 30# mesh At least 3 of 4 low contrast masses (2,4,6,8 mm) visible Low contrast inserts in both monitor adjustment squares visible

Laser Performance Specifications

Parameter	Condition	Value
Laser Power	Device on	IEC Class 1
Laser Wavelength	Device on	650 nm
Projected Line Width	At image intensifier surface	0.05 ± 0.03 inches
Projected Line Length	At center of image intensifier surface	7.00 ± 0.50 inches
Line Intersection Location Accuracy	At center of image intensifier surface	± 0.125 inches
Auto-off delay	Following turn on	20.0 ± 2.0 seconds
Input Power Voltage	N/A	5.00 ± 0.25 volts
Input Power Current	Device off	10 mA, max.
Input Power Current	Device on	100 mA, max.

Equipment Classification

InSight is classified* as follows:













Type of protection against electric shock	CLASS 1
Degree of protection against electric shock	TYPE B
Laser per IEC-60825-1	CLASS 1
Degree of protection against harmful ingress of water	IPXO
Mode of operation	Continuous Operation













InSight is also classified* as: Equipment not suitable for use in the presence of a flammable anesthetic mixture with air or with oxygen or nitrous oxide.

* Medical Electrical Equipment - UL 60601-1

Symbols

The following symbols are found on the InSight system:

	CSA listed device
	Dangerous voltage
	Type B equipment
	Time delay fuse
	Functional ground
	USB connector
	Laser on switch
	Store
	Increase or decrease kV/mA
	Dispose of electrical/electronic equipment properly
	Rear wheels free to move in all directions
	Rear wheels locked

	CE marked device
	Attention - Read the Caution or Warning statement that follows
	X-ray filtration
	Protective ground
	Equipotential ground
	X-ray on switch
	Print
	Rotate image
	Electrostatic sensitive device
	Computer On/Standby switch
	Rear wheels move forward and back only
	Cycle through the noise suppression settings

InSight Entrance Exposure Rate Data

Typical entrance exposure rates, measured at a point in center of image intensifier, 2 cm above surface of the housing.

kV	uA	uGy/s
43	30	3.22
44	34	3.86
45	38	4.65
46	42	5.47
47	44	6.18
48	46	6.81
49	52	8.05
50	56	9.14
51	58	9.98
52	60	10.87
53	62	11.70
54	64	12.69
55	66	13.61
56	68	14.71
57	70	15.64
58	72	16.77
59	74	17.85
60	76	19.08
61	78	20.22
62	80	21.51
63	82	22.75
64	84	24.05
65	86	25.36
66	88	26.77
67	90	28.20
68	92	29.61
69	94	31.32

kV	uA	uGy/s
70	96	32.73
71	99	34.73
72	100	35.84
73	100	36.70
74	100	37.70
75	100	38.41

Entrance Exposure Rate Data, Auto Mode

Typical entrance exposure rates with Auto kV/mA ON.

6" mode	8.9 uGy/s
4" mode	9.6 uGy/s

Measured using RTI Barracuda dosimeter with Multi-Purpose Detector, positioned 2 cm above input surface of the image intensifier housing. There is no additional attenuation of the x-ray beam between the source and the dosimeter detector (open beam).

Scatter Radiation Survey

**Table 1: Air Kerma (mG/h) Rate Parallel to Cathode - Anode Axis
using ANSI Knee Phantom; 65 kVp/ .088 Ma**

Distance (cm)	45°		22.5°		0°		-22.5°		-45°	
	mG/h	mR/h	mG/h	mR/h	mG/h	mR/h	mG/h	mR/h	mG/h	mR/h
20	0.075	8.9	0.079	9.14	0.086	10.08	0.093	10.71	0.018	2.25
40	0.025	3.03	0.025	2.95	0.032	3.66	0.046	5.67	0.018	2.11
60	0.014	1.9	0.007	0.88	0.014	1.7	0.032	4.06	0.001	0.21
80	0.003	0.74	0.003	0.75	0.009	1.07	0.025	2.9	N/A	N/A
100	0.003	0.72	0.003	0.73	0.006	0.76	0.01	1.54	N/A	N/A

**Table 2: Air Kerma (mG/h) Rate Parallel to Cathode - Anode Axis
using ANSI Knee Phantom; 75 kVp/ .100 mA**

Distance (cm)	45°		22.5°		0°		-22.5°		-45°	
	mG/h	mR/h	mG/h	mR/h	mG/h	mR/h	mG/h	mR/h	mG/h	mR/h
20	0.432	49.35	0.428	49.11	0.378	43.43	0.306	35.03	0.057	3.75
40	0.158	18.14	0.144	16.46	0.133	15.52	0.122	14.08	0.032	3.94
60	0.057	6.86	0.068	8.13	0.07	8.09	0.068	8.01	0.01	1.62
80	0.036	4.5	0.046	5.84	0.043	5.01	0.043	5.28	N/A	N/A
100	0.025	2.91	0.028	3.42	0.029	3.42	0.025	3.03	N/A	N/A

**Table 3: Air Kerma (mG/h) Rate Perpendicular to Cathode - Anode Axis
using ANSI Knee Phantom; 65 kVp/ .088 mA**

Distance (cm)	45°		22.5°		0°		-22.5°		-45°	
	mG/h	mR/h	mG/h	mR/h	mG/h	mR/h	mG/h	mR/h	mG/h	mR/h
20	0.064	7.69	0.05	6.14	0.075	8.67	0.09	10.38	0.025	2.93
40	0.025	3.09	0.032	4.6	0.029	3.42	0.046	5.51	0.003	0.82
60	0.039	4.56	0.028	3.42	0.024	3.2	0.032	3.95	0.003	0.82
80	0.032	3.83	0.018	2.22	0.014	1.14	0.025	3.03	N/A	N/A
100	0.021	2.59	0.007	1.04	0.003	0.56	0.003	0.7	N/A	N/A

**Table 4: Air Kerma (mG/h) Rate Perpendicular to Cathode - Anode Axis
using ANSI Knee Phantom; 75 kVp/ .100 mA**

Distance (cm)	45°		22.5°		0°		-22.5°		-45°	
	mG/h	mR/h	mG/h	mR/h	mG/h	mR/h	mG/h	mR/h	mG/h	mR/h
20	0.345	39.77	0.53	66.85	0.381	47.48	0.298	34.1	0.1	11.83
40	0.136	15.95	0.115	13.44	0.14	16.31	0.122	14.06	0.028	3.57
60	0.086	9.96	0.093	10.7	0.068	7.95	0.064	7.77	0.018	2.26
80	0.061	7.26	0.046	5.63	0.043	4.96	0.036	4.51	N/A	N/A
100	0.043	5.06	0.028	3.41	0.025	3.22	0.018	2.36	N/A	N/A

**Table 5: Air Kerma (mG/h) Rate Parallel to Cathode - Anode Axis
using Anthropomorphic Hand Phantom; 50 kVp/ .058 mA**

Distance (cm)	45°		22.5°		0°		-22.5°		-45°	
	mG/h	mR/h	mG/h	mR/h	mG/h	mR/h	mG/h	mR/h	mG/h	mR/h
20	0.324	36.97	0.21	24.55	0.172	20.2	0.176	20.45	0.046	5.38
40	0.129	15.12	0.09	10.42	0.064	7.73	0.079	9.28	0.014	1.66
60	0.064	7.8	0.046	5.51	0.036	4.22	0.05	5.77	0.021	2.75
80	0.057	6.8	0.032	3.78	0.021	2.71	0.021	2.87	N/A	N/A
100	0.032	4	0.021	2.59	0.014	1.88	0.014	1.84	N/A	N/A

**Table 6: Air Kerma (mG/h) Rate Parallel to Cathode - Anode Axis
using Anthropomorphic Hand Phantom; 75 kVp/ .100 mA**

Distance (cm)	45°		22.5°		0°		-22.5°		-45°	
	mG/h	mR/h	mG/h	mR/h	mG/h	mR/h	mG/h	mR/h	mG/h	mR/h
20	0.507	58.03	0.352	40.42	0.356	41.07	0.266	30.4	0.072	8.47
40	0.212	24.39	0.144	16.74	0.111	12.73	0.111	12.93	0.028	3.34
60	0.1	11.51	0.079	9.06	0.061	7.11	0.064	7.72	0.025	2.97
80	0.072	8.53	0.05	5.91	0.036	4.47	0.032	4.05	N/A	N/A
100	0.043	5.31	0.032	3.97	0.025	3.11	0.021	2.7	N/A	N/A

Table 7: Air Kerma (mG/h) Rate Perpendicular to Cathode - Anode Axis using Anthropomorphic Hand Phantom; 50 kVp/ .058 mA

Distance (cm)	45°		22.5°		0°		-22.5°		-45°	
	mG/h	mR/h	mG/h	mR/h	mG/h	mR/h	mG/h	mR/h	mG/h	mR/h
20	0.324	37.32	0.18	20.67	0.198	28.87	0.187	21.58	0.068	7.81
40	0.126	14.47	0.118	13.92	0.075	8.87	0.09	10.37	0.018	2.41
60	0.05	5.98	0.07	9.02	0.039	4.56	0.05	6.13	0.007	1.03
80	0.028	3.31	0.036	4.45	0.025	3.11	0.025	3.19	N/A	N/A
100	0.021	2.84	0.025	2.95	0.014	1.87	0.014	1.74	N/A	N/A

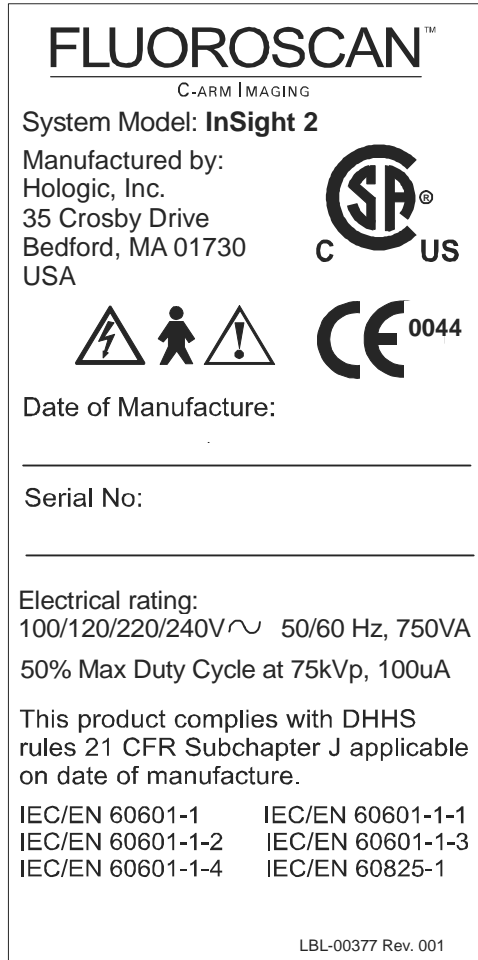
Table 8: Air Kerma (mG/h) Rate Perpendicular to Cathode - Anode Axis using Anthropomorphic Hand Phantom; 75 kVp/ .100 mA

Distance (cm)	45°		22.5°		0°		-22.5°		-45°	
	mG/h	mR/h	mG/h	mR/h	mG/h	mR/h	mG/h	mR/h	mG/h	mR/h
20	0.507	58.24	0.295	33.82	0.345	39.82	0.28	33.06	0.104	11.98
40	0.198	22.81	0.194	22.32	0.129	14.91	0.126	14.66	0.032	4.09
60	0.082	9.62	0.118	13.68	0.068	7.92	0.068	8.21	0.014	1.73
80	0.079	9.15	0.057	6.96	0.039	4.83	0.039	4.58	N/A	N/A
100	0.054	6.2	0.036	4.39	0.025	3.18	0.021	2.49	N/A	N/A

Insight System Labels

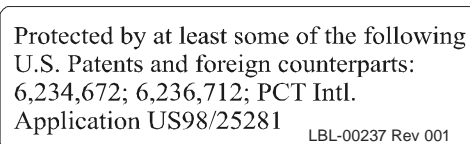
Manufacturer Serial Number Label

The Manufacturer Serial Number Label is on the back of the base cabinet.



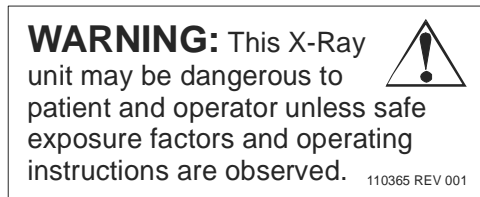
Patent Label

The Patent Label is on the back of the base cabinet.



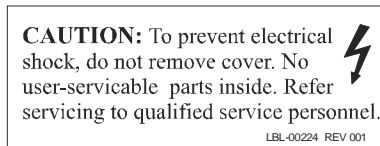
X-Ray System Warning Label

The X-Ray System Warning Label is on the front of the base cabinet below the Computer On/Standby switch.



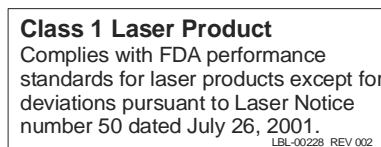
Electric Shock Warning Label

The Electric Shock Warning Label is located near the fasteners for panels covering high voltage components.



Class 1 Laser Label

The Class 1 Laser Label is on the High Voltage Power Supply cover near the laser aperture.



Caution on Incline Label

The Caution on Incline Label is on the back of the unit, above the handle.



Transport Label

The Transport Label is on the back of the unit, above the handle.



X-Ray Controller Compliance Label

The X-Ray Controller Compliance Label is on the X-Ray Controller assembly and on the back of the base cabinet.

This X-ray controller complies with DHHS rules 21 CFR Subchapter J applicable on date of manufacture.
Manufactured by: Hologic, Inc. 35 Crosby Drive Bedford, MA 01730 USA
Type: X-Ray Controller Assembly Part Number: ASY-00776 Serial Number:

Date of Manufacture:

LBL-00225 Rev. 001

X-Ray Source Compliance Label

The X-Ray Source Compliance Label is on the X-Ray source module and on the back of the base cabinet.

Thermo Kevex X-Ray		320 El Pueblo Road Scotts Valley, CA 95066
Model		S/N Gen
Part Number		Mfg. Date
Max. Voltage	kV	S/N Tube
Max. Power	Watts	Target Material
Max. Current	mA	Spot Size
Covered by one or more of US Patents No.		
4,646,338; 4,694,480; 5,077,771; 6,229,876 B1		
Place of Manufacture: Scotts Valley, CA, USA		

Collimator Compliance Label

The Collimator Compliance Label is on the X-Ray source module (near the collimator assembly) and on the back of the base cabinet.


<p>This X-ray collimator complies with DHHS rules 21 CFR Subchapter J applicable on date of manufacture.</p> <p>Filtration: 2.5 mm Al equiv. @ 70 kVp</p> <p>Manufactured by: </p> <p>Hologic, Inc. 35 Crosby Drive Bedford, MA 01730 USA</p> <p>Type: X-Ray Collimator Assembly Part Number: 210509 Part Number: ASY-00871 Date of Manufacture:</p> <hr/> <p style="text-align: right;">LBL-00227 Rev. 002</p>

Image Intensifier Compliance Label

The Image Intensifier Compliance Label is on the back of the Radiological Imaging Unit cover.

<p>This Image Intensifier conforms to all applicable standards under Title 21 of the U.S. Code of Federal Regulations (21 CFR) Subchapter J.</p> <p>Manufactured by:</p> <p>Hologic, Inc. 35 Crosby Drive Bedford, MA 01730 USA</p> <p>Type: Image Intensifier Part Number: MEL-00084 Serial Number:</p> <hr/> <p>Date of Manufacture:</p> <hr/> <p style="text-align: right;">LBL-00232 Rev. 003</p>

C-Arm Compliance Label

The C-Arm Compliance Label is on the back of the High Voltage Power Supply cover.

This C-Arm Assembly conforms to all applicable standards under Title 21 of the U.S. Code of Federal Regulations (21 CFR) Subchapter J.

Manufactured by:
Hologic, Inc.
35 Crosby Drive
Bedford, MA 01730
USA

Type: **C-Arm Assembly**
Part Number: **ASY-01246**
Serial Number:

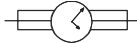
Date of Manufacture:

LBL-00372 Rev. 001

AC Input Power Fuse Label

The AC Input Power Fuse Label is on the back of the base cabinet near the AC power connector.

<u>Input Voltage</u>	<u>Fuse Type</u>	<u>Size</u>
100-120V \sim	T10.0A/250V	5x20mm
220-240V \sim	T6.3A/250V	5x20mm

(fuses are slow blow) 

LBL-00220 Rev. 002

Accessory Fuse Label

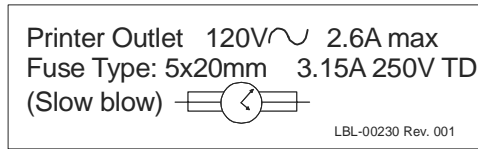
The Accessory Fuse Label is on the back of the base cabinet near the accessory outlet.

Accessory Outlet 120V \sim 0.8A max
Fuse Type: 5x20mm 1.0A 250V TD
(Slow blow) 

LBL-00229 Rev. 001

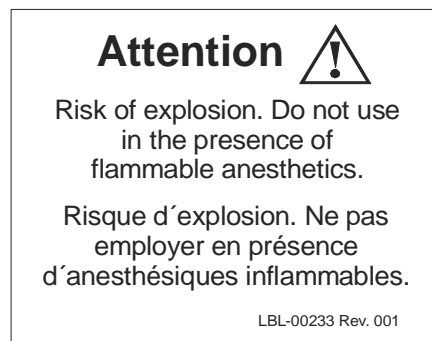
Printer Fuse Label

The Printer Fuse Label is located at the back of the printer compartment near the printer outlet.



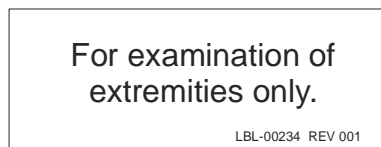
Explosion Risk Label

The Explosion Risk Label is located on the back of the base cabinet.



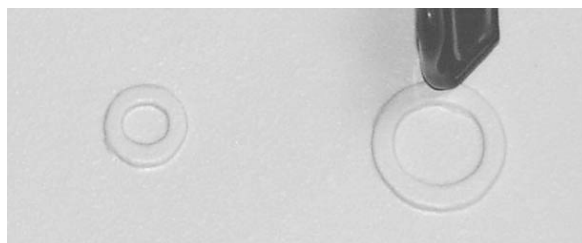
Extremities Only Label

The Extremities Only Label is located on the back of the base cabinet.



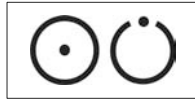
Field of View

Field of View is represented by raised circles on the underside of the High Voltage Power Supply. When the Field of View selection lever is positioned at the large circle (shown below) full field of view is selected. When the Field of View selection lever is positioned at the small circle reduced field of view is selected.



Computer On/Standby Label

The Computer On/Standby Label is on the front of the base cabinet above the Computer On/Standby switch.



Ground Labels

Each system grounding point, depending upon type of ground, has one of the Ground Labels shown below.



Protective Ground



Functional Ground



Equipotential Ground

Back Panel Labels

The Ethernet and DVI labels are located in the middle of the system back panel below their respective connectors.

