

# Envision

## OpenVision™ LT-NDT70 C-arm System



### Man-Portable Video X-ray Users Guide V4.2-EX

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## CAUTION

**The OpenVision™ produces ionizing radiation when energized and must be operated by qualified personnel who must read the Warning section of the manual before operating.**

**Envision Product Design cannot be held responsible for damages caused by inadequate training, misuse, or unsafe practices in the operation of the OpenVision™ System.**

**It is unlawful to use this equipment to intentionally expose humans or to use it for medical radiography.**

# Warning

To ensure proper functioning and use of this product do not use until you read and completely understand this user's guide. It contains set-up, start-up, operating, and troubleshooting procedures.

The OpenVision™ is an industrial x-ray generator that produces hazardous ionizing radiation when energized.

It is unlawful to use this equipment to intentionally expose humans or to use it for medical radiography.

The OpenVision™ is subject to state regulation and registration. Contact your state board of health before operating equipment.

The operator of the OpenVision™ must be properly trained in radiation safety before operating the unit.

Unauthorized personnel should not have access to the OpenVision™ system. Authorized personnel should safeguard the key.

Develop and closely follow a safe operating procedure for using the OpenVision™ X-ray System.

The safe operating procedure must ensure that no one is exposed to radiation above the permissible limits, which are 2 mR (0.02 mSv) per hour or 100 mR (1 mSv) per year for a member of the public.

The safe operating procedure must ensure the OpenVision™ is used within federal and state guidelines.

All operators and users of the OpenVision™ x-ray machine must wear a personal radiation monitoring device, such as a TLD (thermo luminescent dosimeter), film badge, and/or a pocket dosimeter consistent with the appropriate federal, state, territorial or provincial standards.

The OpenVision™ has no explosion proof rating and should not be used in an explosive atmosphere.

All operations should be conducted to expose the operator to radiation levels "As Low As Reasonably Achievable" (ALARA). Always use the "Low" settings for Kv and Ma when hand-holding the system.

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# 1.0 Overview

## 1.1 Overview

This guide contains the operating instructions for the OpenVision™ Radiographic Imaging System, manufactured by Envision Product Design of Anchorage, Alaska.

## 1.2

The OpenVision™ System utilizes a proprietary intensified video imaging system to capture radiographic images created by the interaction of x-ray photons and a phosphor screen. These images are then displayed at the handle-mounted LCD, heads up LCD display, portable VCR, or any other NTSC compatible device in real-time (30 frames/sec).

## 1.3

The OpenVision™ System is designed for applications where the equipment and cabling will not be exposed to harsh handling or environmental extremes.

## 2.0 Safety and Handling

### 2.1 X-Ray training:

It is assumed that the operator of the OpenVision™ System is properly trained and qualified to safely perform radiographic inspections. This guide does not address radiation safety requirements or radiographic inspection procedures.

### 2.1 General precautions:

Although the OpenVision™ System is designed for portability, the equipment is delicate and fragile. Care must be used to avoid strong vibrations or shock to the imager, shipping case, x-ray tube, or the viewing equipment.

Do not attempt to open or modify imager or controller housings. Opening the imager or controller housing voids the system warranty.

Do not allow liquids to contact any part of the OpenVision™ System.

Appropriate care should be taken to protect all cabling and connectors to ensure the reliable and safe operation of the system.

## 3.0 System Contents

### 3.1 Image Viewing Options

- Hand-held or Handle-mounted 7" LCD
- Heads-up LCD Display
- MiniDV VCR / 4"LCD or Electronic DV Recorder

### 3.2 OpenVision™ System and Shipping Case

- System Cable – Controller to Source
- Imager Cable – Imager to Display
- Trigger switch Cable – Controller to Arm
- X-ray Source, C-Arm, Imager, Controller
- Controller Key(s)
- 28V Rechargeable Lithium-ion Battery (2), Charger
- Optional: MiniDV VCR, Memory Stick, Mini DV tape, Charger
- User Manual
- Quick Start Guide

## 4.0 Set-up

### 4.1 Set-up

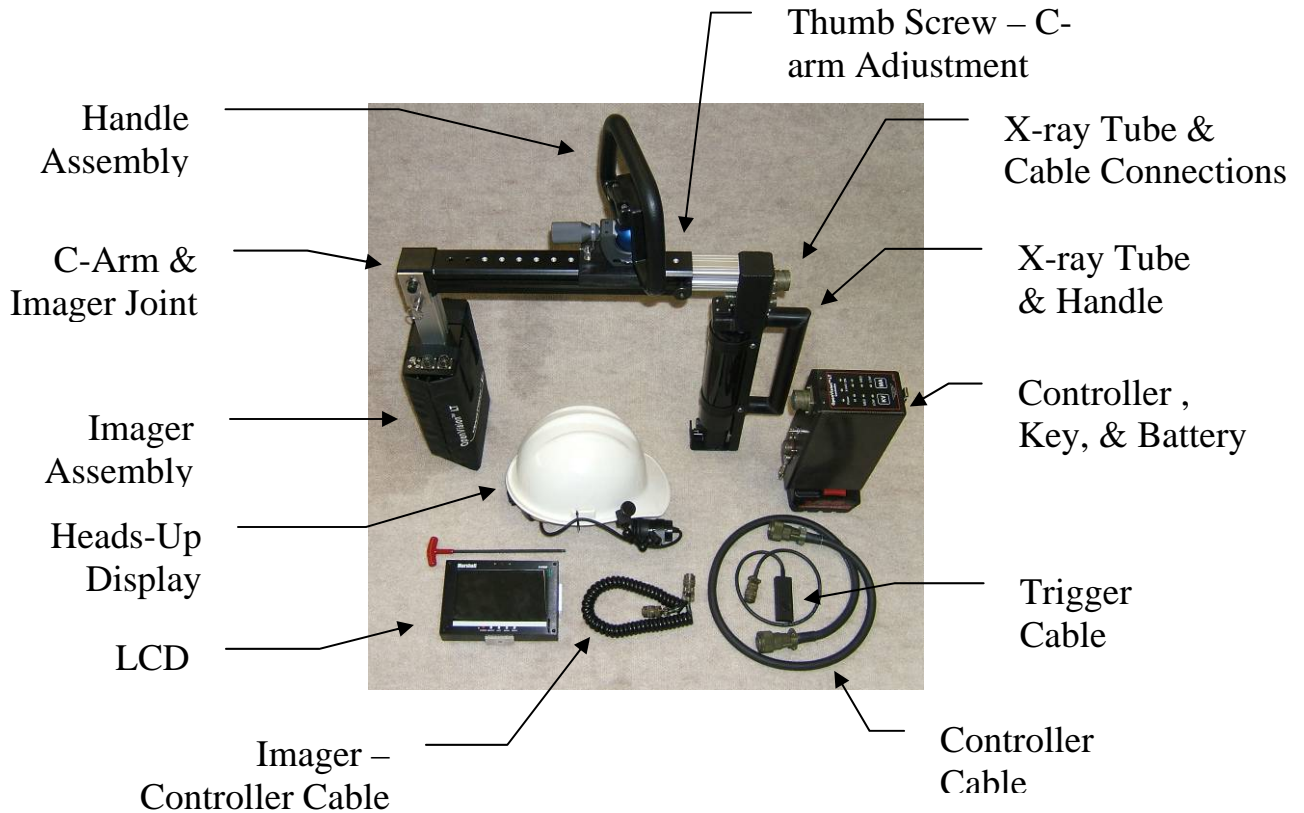


Figure 1. System components.

- A) Mount Imager box to C-Arm – Tighten Allen lock-nut
- B) Slide handle (if it is to be used) on to the end of the C-Arm. Loosen thumb screw to allow base to slide on arm.
- C) Mount x-ray tube to C-Arm – Tighten Allen lock-nut.
- D) Connect large cable from controller to x-ray tube.
- E) Connect small coil cable from imager to x-ray tube.

- F) Connect trigger cable to the remaining connector on the x-ray tube, imager or back of LCD if used. (All six pin connections have same pin functions.)
- G) Slide battery onto the bottom of the controller and click into place.
- H) Visually confirm that the lead collimator is in place at the x-ray tube port and oriented towards the imager.
- I) Place key in switch and turn on (display will show video image from the camera that is adjacent to the port of the x-ray tube. See Figure 2.
- J) Confirm that the Kv and Ma lights flash and stop on “Low” settings.

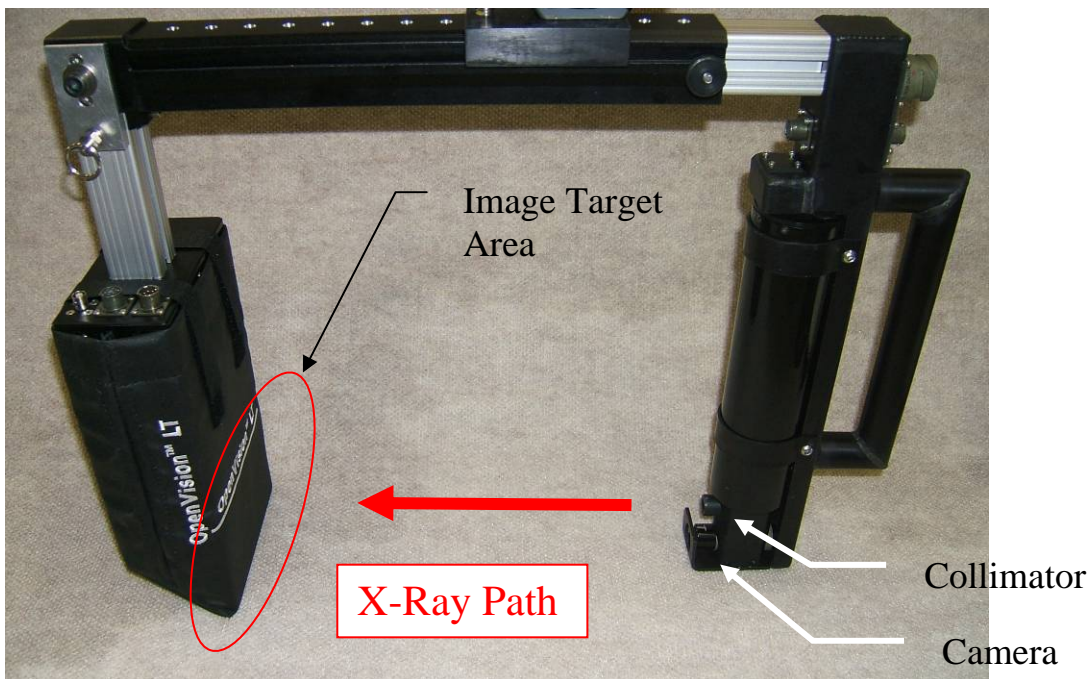


Figure 2. Xray Source and Imager Target

## 5.0 Start Up

### 5.1 Start Up

Orient the C-arm so that the object to be inspected is between the x-ray tube and the imager. Place the imager in the farthest position from the operator.

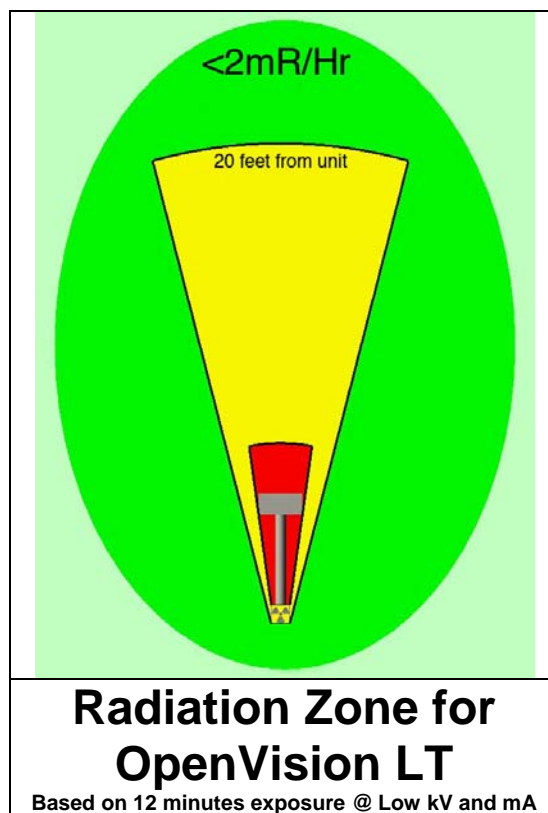
Confirm Kv and Ma on “Low”, and Key Switch “ON”.

Clear personnel from the Red and Yellow areas as shown here:

To energize x-rays, press the trigger switch connected to the C-Arm handle. The image will change from live video (from the camera adjacent to the port of the x-ray tube) to live x-ray video from the imager.

Move the C-Arm around the object to be inspected. Adjust Kv and Ma as necessary to view the object, or to meet an inspection specification. Always use the lowest Kv and Ma setting which will still provide an acceptable image. (ALARA)

Release trigger as soon as inspection is complete to limit radiation dosage.



## 6.0 Shutdown

### 6.1 Shutdown

Turn off and remove the key at the controller. The system is now ready to be dismantled. Locate the key in a secure place.

#### **Notes:**

**Audible Alarm:** During start up, hold the Kv and Ma switches down until three beeps are heard to silence the audible alarm. The audible alarm will remain off until the system is restarted.

**Handle Extension:** Extend handle by loosening thumb screw and extending arm gently until arm reaches internal stop. Tighten thumb screw to avoid bearing damage. Handle can be moved to any position by lifting spring pin. Return arm to shortest position to pack in case.

**Imager Joint:** The imager can be temporarily rotated to align with the C-arm to assist with entry in tight areas and then repositioned. Lift spring pin to straighten arm, rotate back to lock in position.

## 7.0 Troubleshooting

### 7.0 Troubleshooting

*Problem:* Light on the x-ray tube blinks momentarily when key switch is turned on.

*Solution:* This is a normal feature to show that the X-ray on light will function properly.

*Problem:* Light on the x-ray tube blinks repeatedly when X-ray trigger is pressed.

*Solution:* Battery is low. Replace / Recharge the battery.

*Problem:* No output, unit does not turn on.

*Solution:* Check all connections. Check battery condition.

*Problem:* LCD Display too dark or too light in center.

*Solution:* Adjust brightness and contrast. Start with brightness at 50% of full scale and contrast at 40% of full scale. Adjust further for best image.

*Solution:* Adjust kV and mA to increase or decrease X-ray flux and power.

# 8.0 Specifications

## 8.1 Specifications

<b>imaging area:</b>	4"x 6" field of view, continuously moveable
<b>dimensions:</b>	Adjustable for 14" to 24" between x-ray tube and imager. . 17.25" throat depth.
<b>acquisition time:</b>	Real-time NTSC video (30 frames per second)
<b>energy:</b>	40/55/70 Kv, .1/.2/.3 Ma
<b>spatial resolution:</b>	250 micron (0.010")
<b>contrast resolution:</b>	8 bit, 256 grayscale
<b>weight:</b>	C-arm: 16.5 pounds including imager and X-ray tube Extended handle: 5 pounds including 7" LCD Controller: 6 pounds including battery and shoulder strap
<b>temperature:</b>	Imager and tube: -30°F to +120°F ambient
<b>display:</b>	7" LCD Military-grade heads-up display mounted to hard hat or head-band
<b>recording:</b>	PV800 Digital video recorder/display with 30Gb HD and 4Gb SD Card. 3.5" TFT LCD display.
<b>packaging:</b>	All components housed in a wheeled ATA field case, 23 x 31 x 13 inches, shipping weight 75 pounds. May vary with accessories.

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