iDR

SERVICE MANUAL

iCRco

Digital Imaging Made Simple.™

Foreword

Proprietary Notice and Disclaimer

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Terms

Any one of the following ***i***CR products will be referred to as the "CR unit" throughout this document: ***i***CR 1000®, ***i***CR 1000 Dual®, ***i***CR 2600®, ***i***CR 2600 Dual®, ***i***CR 2600SF®, ***i***CR 3600®, ***i***CR Vet®, ***i***CR Vet Dual®, ***i***CR Mobile®, ***i***CR 1-D®, ***i***CR Chiro®, ***i***CR Chiro Dual® ***i***CR VERTX® Any one of the following ***i***CR products will be referred to as "***i***CR dual unit" throughout this document: ***i***CR 1000 Dual®, ***i***CR 2600 Dual®, ***i***CR Vet Dual®, ***i***CR Chiro Dual® Any one of the following ***i***CR products will be referred to as "***i***CR desktop unit" throughout this document: ***i***CR VERTX®. The ***i***DR®will be referred to as the "DR unit" throughout this document.

Contact Information

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*i*DR Information

Please Enter the details of the *i*DR system here:

Serial Number: _____

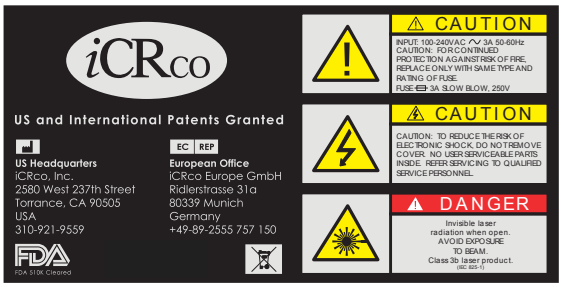
Date Purchased: _____

Interface Type: USB 2.0

Safety Information

Read and understand the installation and operating instructions before applying power to the *i*DR.

Figure 1: *i*DR Safety Labels



(a) *i*DR AC Model Label

(b) *i*DR DC Model Label

Conventions

⚠ DANGER A DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations.

⚠ WARNING A WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION A CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

Note A NOTE indicates important information that helps you make better use of your *i*DR and Software.

Notice A NOTICE indicates either potential damage to hardware or loss of data and tells you how to avoid the problem.

Laser Safety

⚠ CAUTION This equipment employs a laser. Laser radiation may be present if the *i*DR is operated without the covers. Avoid the laser beam. Direct exposure to laser light must be avoided.

The *i*DR incorporates a Red $\geq$ 80mw high-power solid-state laser diode. The *i*DR covers protect the service person from direct exposure to laser light. These covers will protect a user/service person only if they are properly installed. Covers must be removed and replaced by properly trained service personnel. Contact *i*CRco if there are any issues with the covers being damaged or replacement covers are needed.

Electrical Hazards

⚠ WARNING This equipment is operated with hazardous voltages which can shock, burn, or cause death.

Notice The *i*DR must be connected to a uninterruptible power supply (UPS). Failure to use a (UPS) will void the warranty.

The equipment must be serviced by properly trained technicians certified by ***i***CRco, Inc. Do not connect the *i*DR with a damaged or sub-standard power cable. Do not use an extension cord with this device. The *i*DR should be properly grounded and power connections inspected to ensure safe operation. Use at least a 1300VA (780W) uninterruptible power supply (UPS) with this device, as it is sensitive to variations in power.

Malfunctioning Equipment

If any ***i***CRco product shows signs of malfunction, discontinue the use of the product immediately and contact Technical Support at 310-921-9559.

FCC Notification

This equipment generates, uses, and can radiate radio frequency energy, and if not installed properly, can cause interference with radio communications.

Mammography Use

The *i*DR is not intended for Mammographic use.

Guidance and Manufacture's declaration – Electromagnetic Emissions & Immunity

Table 1: Electromagnetic Emissions

Guidance and manufactures' declaration – electromagnetic emissions		
The *i*DR is intended for use in the electromagnetic environment specified below. The customer or the user of the *i*DR should assure that it is used in such an environment.		
Emissions test	**Compliance**	**Electromagnetic environment – guidance**
RF emissions CISPR 11	Group 1	The *i*DR uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class B	The *i*DR is suitable for use in all establishments, including domestic and those directly to the public low voltage pwoer supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class B	
Voltage fluctuations/flicker emissions IEC 61000-3-3	Complies	

Table 2: Electromagnetic Immunity

Immunity Test	**IEC 60601 Test Level**	**Compliance Level**	**Electromagnetic Environment – Guidance**
Electrostatic discharge (ESD) IEC 61000-4-2	±(2, 4, 6) kV Contact ±(2, 4, 8) kV air	±(2, 4, 6) kV Contact ±(2, 4, 8) kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	±2 kV for power supply lines ±1kV for input/output lines	±2 kV for power supply lines ±1kV for input/output lines	Mains power quality should be that of a typical commercial or hospital environment.

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Table 2 continued...

Immunity Test	**IEC 60601 Test Level**	**Compliance Level**	**Electromagnetic Environment – Guidance**
Surge IEC 61000-4-5	±1 kV differential mode ±2 kV common mode	±1 kV differential mode ±2 kV common mode	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	<5% U_T (>95% dip in U_T) for 0.5 cycle. 40% U_T (60% dip in U_T) for 5 cycles. 70% U_T (30% dip in U_T) for 25 cycles. <5% U_T (>95% dip in U_T) for 5 sec.	<5% U_T (>95% dip in U_T) for 0.5 cycle. 40% U_T (60% dip in U_T) for 5 cycles. 70% U_T (30% dip in U_T) for 25 cycles. <5% U_T (>95% dip in U_T) for 5 sec.	Mains power quality should be that of a typical commercial or hospital environment. If the user of the *i*DR requires continued operation during power mains interruptions, it is recommended that the *i*DR be powered from an uninterruptible pwoer supply or a battery.
Power frequency (50/60Hz) magnetic field IEC 61000-4-8	3A/m	3A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
NOTE: U_T is the a.c. mains voltage prior to application of the test level.			

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Table 2 continued...

Immunity Test	**IEC 60601 Test Level**	**Compliance Level**	**Electromagnetic Environment – Guidance**
Conducted RF IEC 61000-4-6 Radiated RF IEC 61000-4-3	3Vrms 150 kHz to 80 MHz 3 V/m 80 MHz to 2.5 GHz	3Vrms 3 V/m	Portable and mobile RF communications equipment should be used no closer to any part of the *i*DR, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separations distance $d = 1.2\sqrt{P}$ $d = 1.2\sqrt{P}$ 80 MHz to 800 MHz $d = 2.3\sqrt{P}$ 800 MHz to 2.5 GHz where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters as determined by an electromagnetic site survey[a], should be less than the compliance level in each frequency range[b]. Interference may occur in the vicinity of equipment marked with the following symbol: 
NOTE 1: At 80 MHz and 800 MHz, the higher frequency range applies. NOTE 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflections from structures, objects and people.			

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Table 2 continued...

Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment – Guidance
[a] Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location where the *i*DR is used exceeds the applicable RF compliance levels above, the *i*DR should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the *i*DR. [b] Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.			

iCRco Warranty

iCRco , Inc. ("iCRco") values your business and always strives to provide high quality products and services. All iCRco products are provided with an initial warranty so the hardware and software are covered from the date of purchase. This limited warranty solely applies to new products manufactured by or for iCRco and originally purchased from iCRco or an authorized dealer of iCRco products for your own use. In addition, an extended warranty is available for most new and recently purchased iCRco products for an additional charge.

Hardware Limited Warranty

iCRco warrants its hardware products to be free of defects in materials and workmanship for a period of one (1) year from the date of original shipment from iCRco subject to the limitations set forth herein. If a product proves to be defective in material or workmanship during the warranty period, iCRco will, at its sole option, repair or replace the product with a similar product. Repaired and replacement products may be or include refurbished or remanufactured parts. Any replacement item assumes the remaining warranty period of the original product. iCRco provides no warranty for any third party hardware or software included with any product or later acquired.

Software Limited Warranty/Support

iCRco warrants that its QPC XSCAN32, Captera, and/or ClarityPACS software originally provided with any product will substantially conform to iCRco's specifications and that the media, not including hard drives, on which the software is furnished will be free from

defects in materials and workmanship under normal use for a period of one (1) year from the date of original shipment from iCRco . iCRco's sole obligation under this warranty is limited to making reasonable efforts to ensure such conformity and to supply the consumer with a corrected version of the software as soon as it is practical after the consumer has notified iCRco of any non conformity. iCRco does not warrant that the operation of any software will be uninterrupted, glitch or error free or that functions contained in the software will operate in the combinations which may be selected for use by the user or meet the user's requirements. This limited software warranty will be void if the software is modified without the written approval of iCRco or is used outside of the recommended parameters or equipment. iCRco does not provide any warranty or support for any other software.

iCRco agrees to provide one (1) year of telephonic and/or e-mail based support for QPC XSCAN32, Captera, and/or ClarityPACS software originally provided with any new iCRco product from the date of original shipment from iCRco . All software support shall be limited to making reasonable efforts to resolve iCRco software issues and shall be limited to iCRco's regular business hours. In addition, iCRco will provide revisions and upgrades to its software upon request (when available) during the first year after the software was originally shipped from the iCRco factory. The initial support period will include support via remote login software (GoToMeeting), only if the customer has access to the Internet from that PC and only if the customer agrees iCRco shall have no liability in connection with its support efforts. Remote login software allows iCRco technical support to remotely access the customer's PC via the Internet for the purposes of rendering technical support. Please note that this warranty, including software support, does not include computer hardware, third party software or operating system or network issues, which are outside the control of iCRco.

Warranty Product Technical Requirements

iCRco requires that all DR, CR, Scanner and/or products requiring PCs be fitted and installed with a 1500VA (1500W) uninterruptible power supply ("UPS"). iCRco recommends the APC 1000 specification UPS or equivalent. For warranty evaluation and service, iCRco requires the customer to provide an Internet connection (DSL or Dial-up) or the minimum of a phone line accessible by an extension cord to the product enabling iCRco technicians to perform remote diagnostics on installed equipment. In addition, each iCRco product must be installed, maintained and operated in accordance with the respective product manual. Failure to comply with these requirements will result in a voided warranty claim.

Requesting Warranty Service

For information on obtaining warranty service, call iCRco's customer support at (310)921-9559. In order to evaluate a warranty service request, iCRco requires the following information: the iCRco serial number of the product, a detailed description of the problem, customer name and contact information; product location and operating conditions; a copy

of the purchase documents, and sufficient information and authorization, including a liability release as to any loss of data (that should always be backed up), software or network injury, or downtime, allowing iCRco technicians remote access to the product. Product may not be returned to iCRco without first obtaining a Return Material Authorization ("RMA") number from iCRco . Prior to providing an RMA, iCRco may require remote access to the product. If iCRco determines that the product may be defective, is under warranty and necessitates a return to iCRco for service, an RMA number and instructions for return of the product will be given. iCRco is not responsible for any unauthorized returned product, i.e. one for which an RMA number has not been issued by iCRco .

Warranty service requires all authorized returns be shipped to the iCRco factory prepaid and insured. All such authorized returns are the customer's responsibility. For products sold and located within the United States, iCRco will pay for return shipping.

Products being returned are only to be shipped in iCRco approved shipping containers. The original box and packaging materials are approved and should be kept for moving and/or shipping the product. Approved packaging my also be purchased from iCRco for an additional charge. iCRco shall have no liability nor responsibility for warranty service to any product that is not shipped in an iCRco approved shipping container or that is damaged from incorrect packaging or damaged during shipping.

Additional Warranty Limitations and Extent of Warranty

This warranty does not apply if the product has been damaged by accident, misuse or abuse. In addition, warranty service does not include the repair of failures or defects caused by: unauthorized attachments to any iCRco product, unsuitable physical or operating environment, maintenance or repair by anyone other than iCRco or the iCRco authorized dealer that sold the product, operation of a product beyond its duty cycle, use of the product outside of its specifications, the use of supplies, parts, materials, software, or interfaces not furnished, authorized or recommended by iCRco . If the product, including any software has been opened, tampered with, modified or altered in any way without written authorization by iCRco , the warranty will no longer apply.

This warranty applies only to products manufactured by, or for, iCRco , and that can be identified by an "iCRco" serial number as originally affixed to the product. Any modification to the iCRco serial number tag or its attachment to the product shall immediately void the warranty.

This warranty is non-transferable and subsequent owners must contact iCRco to establish if the equipment is eligible for an extended warranty.

THERE ARE NO WARRANTIES, EXPRESS OR IMPLIED, WITH RESPECT TO ANY iCRco PRODUCT OTHER THAN AS SPECIFICALLY SET FORTH HEREIN, AND iCRco SPECIFICALLY DISCLAIMS ANY IMPLIED WARRANTIES OR CONDITIONS OF MERCHANT ABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND SATISFACTORY QUALITY. ANY WARRANTIES THAT MAY NOT BE DISCLAIMED UNDER APPLICABLE LAW

ARE LIMITED IN DURATION TO THE INITIAL WARRANTY PERIOD AND NO WARRANTIES, EXPRESS OR IMPLIED, WILL APPLY AFTER THIS PERIOD. ALL INFORMATION, SPECIFICATIONS, PRICES, AND SERVICES ARE SUBJECT TO CHANGE AT ANY TIME WITHOUT NOTICE.

Limitation of Remedies and Liability/Exclusion of Damages

The exclusive remedy for any defective product is limited to the repair or replacement of the defective product. iCRco shall have a reasonable time after determining that a defective product exists to repair or replace a defective product. iCRco's entire liability for any product is limited to the actual purchase price for the product. This limitation applies even if iCRco cannot or does not repair or replace any defective product.

IN NO EVENT WILL iCRco BE LIABLE FOR ANY GENERAL, SPECIAL, CONSEQUENTIAL OR INCIDENTAL DAMAGES, including but not limited to, damages related to the loss of use, loss of recorded product, the installation of replacement product, or any inspection, testing, or redesign caused by any defect or by the repair or replacement of any product arising from a defect in any product. This exclusion of damages applies even if the customer advises iCRco or an iCRco dealer of the possiblity of such damages. *This limitation of remedies also applies to claims against any suppliers or dealers of iCRco . iCRco and its suppliers' and dealers' limitations of remedies are not cumulative. Such suppliers and dealers are intended beneficiaries of this limitation. iCRco is not liable for any claim by or against the customer arising from a third party claim.*

Revision History

Revision	Author	Date	Notes
A	MS	2009-11-25	Initial Release
B	MS	2010-03-22	Updated safety information
C	MS	2010-07-01	Updated safety information

Contents

1. Introduction

1.1 Overview

The *i*DR (***i***CRco's patented integrated Digital Radiography system) is a sealed Digital Radiography system that uses a high resolution phosphor to capture high quality images. The photostimulated luminescence is collected, detected, sampled, and digitized. The image data is then digitally processed according to exam and user-specified parameters and displayed on a monitor to confirm patient positioning. The image can optionally be printed by a hard copy device (such as laser printer, or dry printer), or transmitted to a workstation, optical disk file, or other destination. The device performs lossless compression of the image data for efficient transmission.

The Image Reader is cassetteless because the Image Plate is built into the *i*DR. The imaging plate is exposed via conventional X-ray devices. The X-ray irradiated IP is stationary and the scan head moves from the exposure position to the reading position, and images are read. After reading, the IP is erased, and the scan head is moved to the exposure position again. The *i*DR collects 16 Bit data that is converted to a DICOM 3.0 image and can be stored, viewed, and manipulated.

This document contains a basic operational overview of the *i*DR, including the driving software applications, cassette cleaning & handling, and hardware installation. A general description of the system's functionality and user interfaces are included. This document is intended for end users who need to understand the basic operation of the *i*DR.

2. Pre-Installation

2.1 Voltage Requirements

The *i*DR is supplied with a DC power supply that allows the unit to work between 18 to 36 VDC, 4.5 Amps (maximum), and 450 Watts. ***i***CRco provides a medical power converter. Do **not** substitute or switch the power converter. Substituting or switching the power converter will void the warranty. Contact ***i***CRco Tech Support to obtain a replacement power converter.

2.2 Environmental Requirements

The *i*DR should not be placed in a room with a film processor present. This will void the warranty. The humidity and temperature limits are 20 to 80% non-condensing, and 15°F to 95°F (15°C to 35°C) operating, respectively. The room should have good ventilation. Another factor to consider prior to installing the *i*DR is dust and particulates in the environment. The *i*DR is designed to be resistant to dust and particulates that may be present at the installation site.

Installation of the *i*DR near high magnetic fields may cause the CR unit to malfunction. The *i*DR should not be placed in a room with an MRI, CT or any other equipment that produces high magnetic fields.

The room should have good ventilation.

Note It is recommended that the unit be installed and operated in a clean, dry environment.

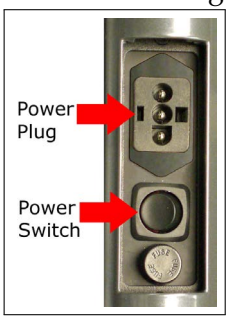
2.3 Connectivity and Power Supply

The room needs to have wall power and the *i*DR should not be used with an extension cord. Use at least a 1300VA (780W) uninterruptible power supply (UPS) between the wall power and the *i*DR. A network connection is required for technical support. Alternatively, the user must have a phone/fax line that can be connected to the PC as a minimum to comply with ***i***CRco warranty terms.

2.4 Power Switch Location

The power switch for the *i*DR is located on the left hand side of the unit, near the power plug.

Figure 2.1: DC Power Plug & Switch



2.5 Power & Scan Lights

The power and scan lights are located on the lower right-hand side of the *i*DR. When the unit is powered on, the green light is illuminated. While the unit is scanning the yellow light blinks.

2.6 Physical requirements

The *i*DR requires a stable operating environment. ***i***CRco requires that the *i*DR be used in the supplied Wall mount or Cart. Failure to use the *i*DR in the supplied Wall mount or Cart will void the warranty.

2.7 Systems Specifications

The ***i***DR has a 14x17 inch active capture area, and is retrofitable to any existing X-ray system.

Pixels per Line Resolution

3500 (High Resolution) over 14 inches (356 mm) 2048 (Normal Resolution) over 14 inches (356 mm).

Scan Rate

Scan Rate 60 lines/second

Grey Scale Resolution

16 bits (65,535 shades of gray)

Interface

USB 2.0

Dimensions

35H x 20W x 6D inches

Power Requirements

Volts:	18-36 VDC
Amps:	4.5 Amps
Max Watts:	450 Watts

Temperature Conditions

15 to 95°F	(10 to 35°C) - operating
-1 to 150°F	(-1 to 65°C) - non-operating

Humidity

20 to 80% non-condensing

Vibration/Acceleration

3-4G Max (in shipping)

Altitude

0 to 9,500 ft. - operating

Weight

50 lbs

3. Hardware Installation

3.1 Unpacking Instructions

1. Open the box from the top.
2. Remove any small accessories loaded into the top of the box.
3. With at least two (2) people, lift the *i*DR out of the box.
   ⚠ CAUTION Always practice proper heavy lifting procedures. Failure to practice proper lifting procedures may result in injury or damage to the unit.
4. Store the box and any foam inserts somewhere safe & dry, so that if the *i*DR needs to be shipped again, there are packing materials available.

3.2 Installing Power & USB 2.0 Cables with Power Cowling

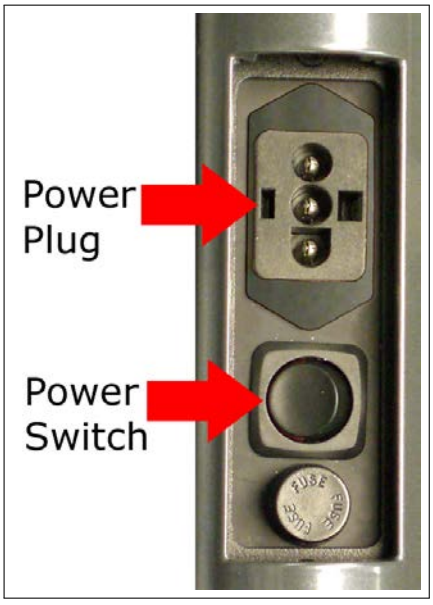
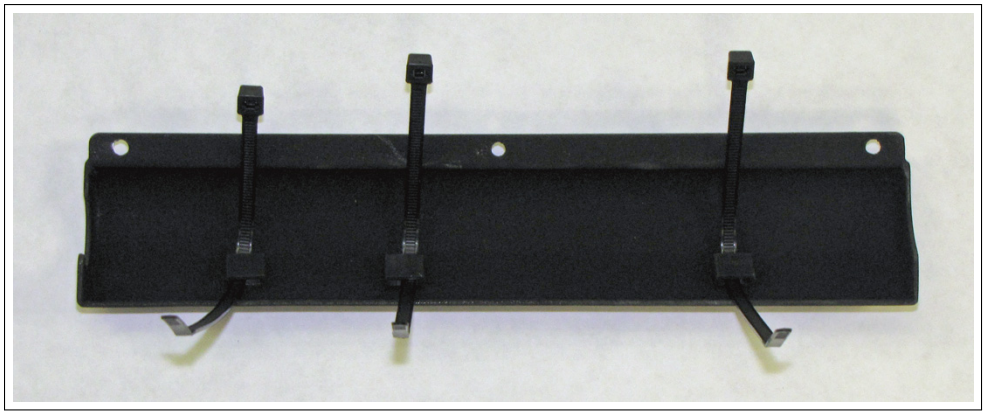


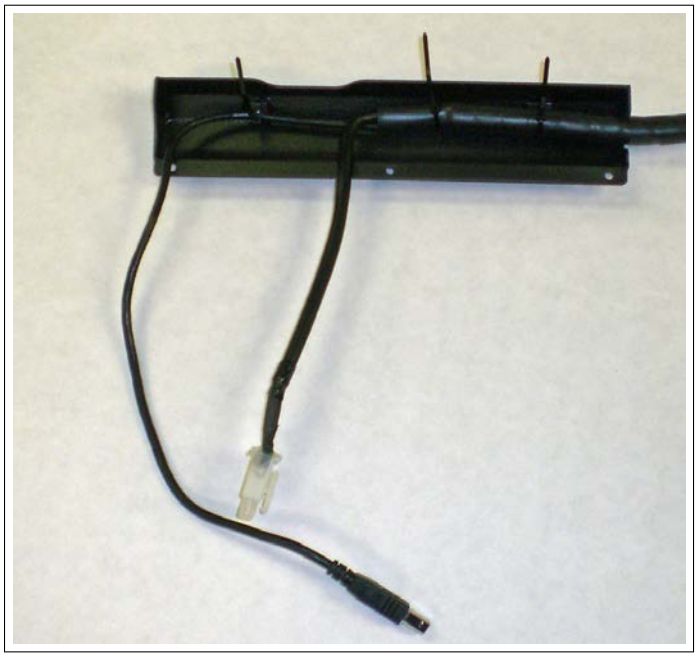
Figure 3.1: DC Power Plug & Switch

Note The following instructions are for both the AC and DC ***i***DR units, though only the AC is shown below.

1. Thread three (3) zip ties through the metal eyelets.



2. Lay the Power and USB 2.0 cord bundle in the Power Cowling, ensuring that the thickest part of the cord bundle is positioned at the bottom of the power cowling.



3. Pull the zip ties as tight as possible around the cord bundle. Gently pull on the cord bundle to ensure it is tightened enough in the Power Cowling. Clip off any excess zip tie.

4. Remove the external fuse from its housing, then pass the USB 2.0 cable under the safety catch and plug in the USB 2.0 cord.

5. Plug the power cord for the *i*DR into the power switch unit.
6. Fasten the Power Cowling to the Shoulder Extrusion using three (3) 6-32 x $\frac{3}{8}$″ flathead screws.

7. Plug the USB 2.0 cord into the Acquisition computer.
8. Ensure the UPS battery is connected to its terminal.
9. Plug the other end of the power cord into the UPS.
10. Plug the UPS power cord into the wall.

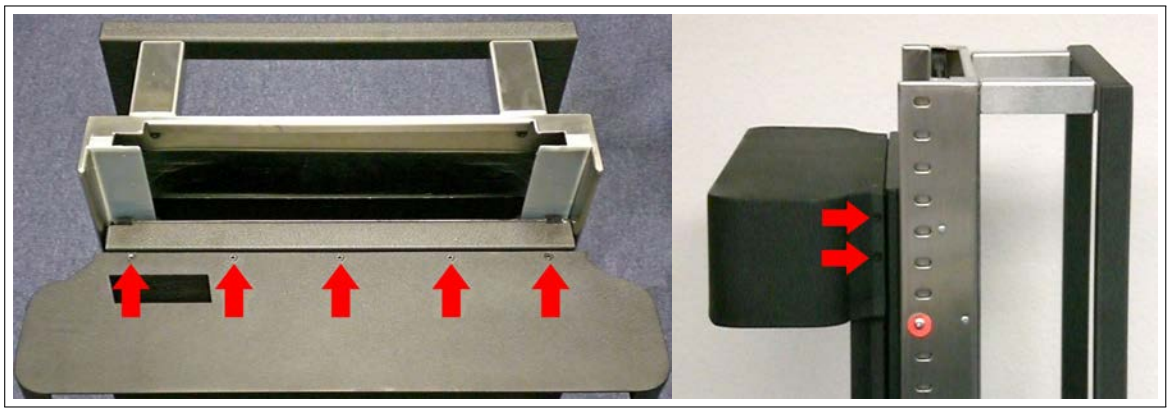
3.3 *i*DR Cart Mount

⚠ CAUTION The *i*DR cannot be transported in a vehicle while attached to the cart. Remove the *i*DR from the cart before transporting the *i*DR in a vehicle.

⚠ WARNING Do **not** remove the Spring Mount screw (shown below) until the *i*DR has been secured in the mount.

The *i*DR Spring Mount screw.

1. Remove nine (9) 6-32 x 3/4″ flathead screws from the Top Mount End Cap. There are five (5) screws on the top and two (2) on either side.



2. Ease the Top Mount End Cap off the *i*DR mount.
3. With at least two (2) people, lift the *i*DR into the Bottom Mount End Cap.
   ⚠ CAUTION Always practice proper heavy lifting procedures. Improper lifting may cause injury.
4. Refasten nine (9) 6-32 x 3/4″ flathead screws to the Top Mount End Cap.
5. Carefully remove the Spring Mount screw.

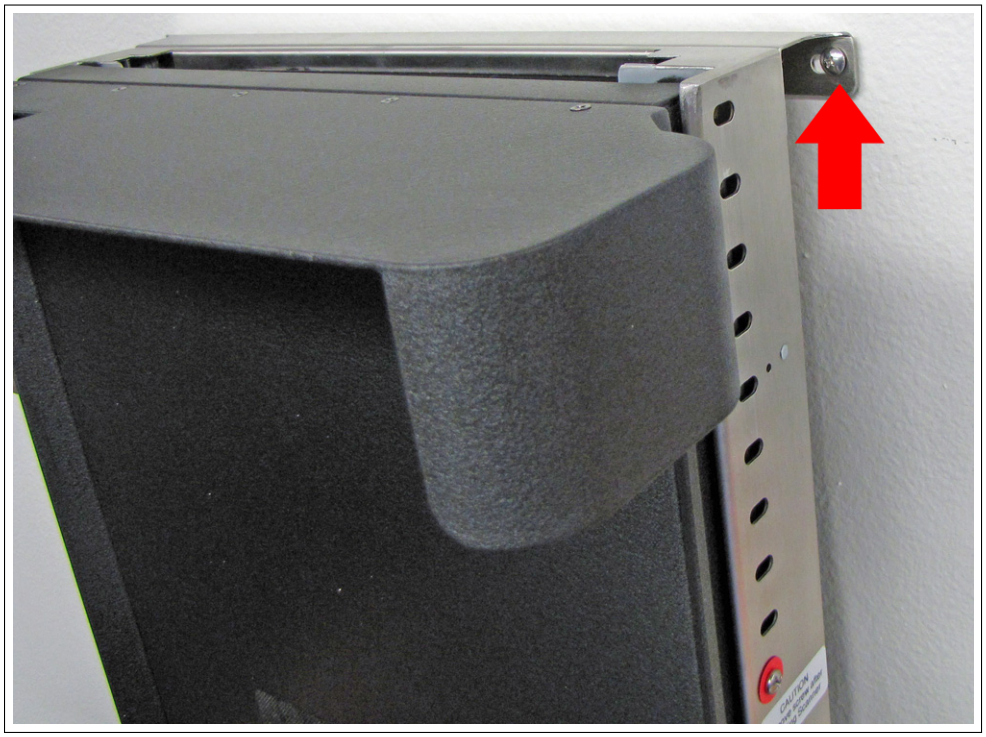
3.4 *i*DR Wall Mount

Notice Wall mounting equipment must be installed by a licensed contractor.

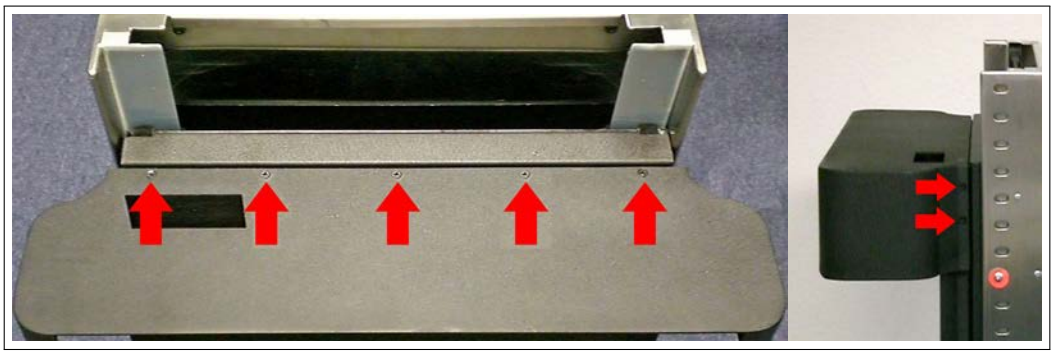
⚠ WARNING Do **not** remove the Spring Mount screw (shown below) until the *i*DR has been secured in the mount.

The *i*DR Spring Mount screw.

1. Position the Wall Mount in the desired location on the wall.
2. Allow the contractor to determine the precise location and proper screws to fasten the Wall Mount to the wall. The Wall Mount should be fastened to the wall through the four (4) available mounting holes.



3. Remove nine (9) 6-32 x 3/4" flathead screws from the Top Mount End Cap.



4. Ease the Top Mount End Cap off the *i*DR mount.
5. With at least two (2) people, lift the *i*DR into the Bottom Mount End Cap.
   ⚠ CAUTION HEAVY LIFT! Always practice proper heavy lifting procedures. Improper lifting may cause injury.
6. Refasten nine (9) 6-32 x 3/4″ flathead screws to the Top Mount End Cap.
7. Carefully remove the Spring Mount screw.

4. Software Installation

4.1 PC Specifications

The minimum requirements for the Acquisition computer are as follows:

Processor:	Pentium D
RAM:	2 GB or more
OS:	Windows XP
HDD:	250 GB or more

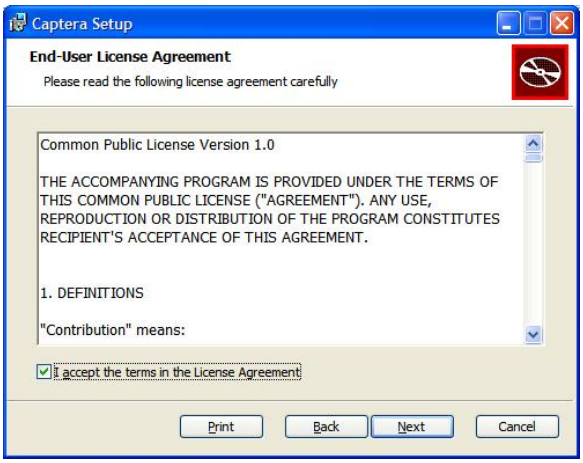
4.2 Installing USB Drivers

USB drivers for *i*CRco hardware are installed automatically with the installation of Captera.

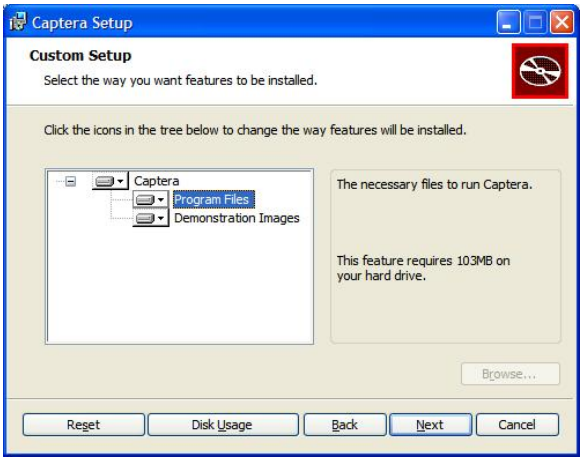
4.3 Installing Captera

1. Insert the media containing the Captera installing in the computer.
2. Double click **Setup.exe** to begin the installation process.
3. Click **Next** at the Welcome screen.

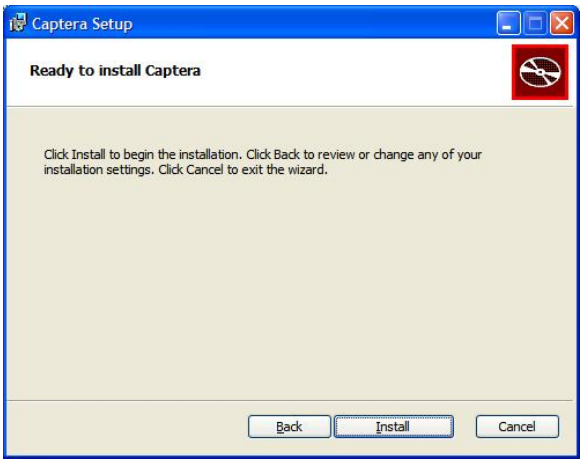
4. Check the box next to *I accept the terms in the Licence Agreement*, then click **Next** to continue.



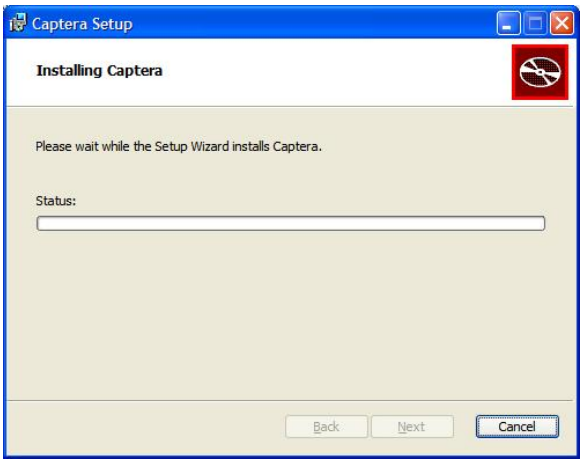
5. Click **Next** at the Custom Setup screen to continue.



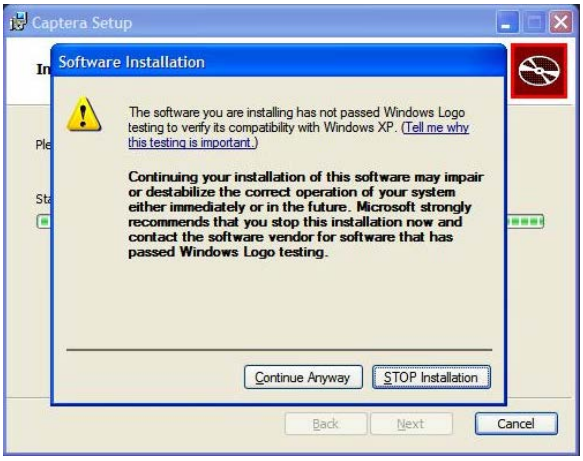
6. Click **Install** to begin the installation.



7. Please be patient while Captera installs. Depending on the speed of the computer and available RAM, this process could take a few minutes.

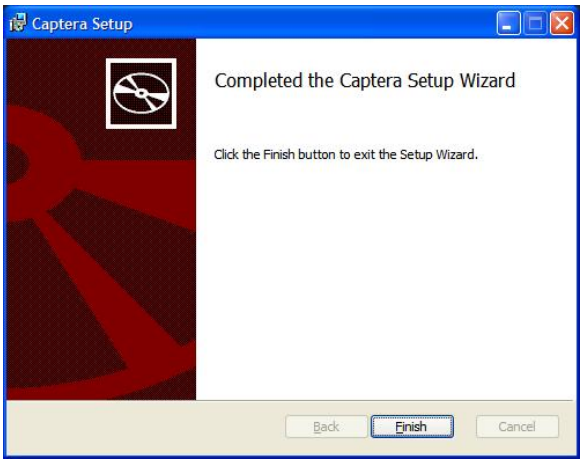


8. Click **Continue Anyway** if prompted by the Windows compatibility wizard.



9. Click **Ok** at the Captera device attachement dialog.

10. Click **Finish** to finish the Captera installation.



4.4 USB Driver Installation

Installation of USB drivers are automatic with the installation of the ***i***CRco software (i.e., QPC XSCAN32).

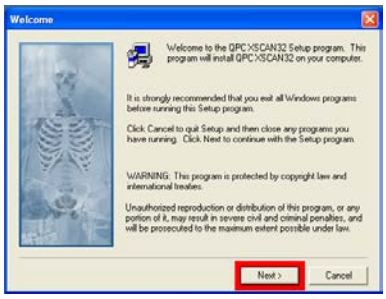
4.5 Installing QPC XSCAN32

QPC XSCAN32 software comes bundled with the *i*DR. This software package will allow the user to interface with the *i*DR.

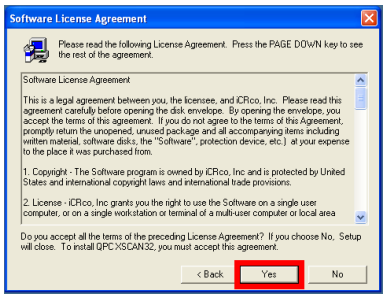
Note If you have QPC XSCAN32 already installed on your computer and it is running while you are trying to install the new version, an error will appear in the install process. Please close QPC XSCAN32 and reinstall the new version.

Notice The *i*DR requires QPC XSCAN32 build 848 or greater.

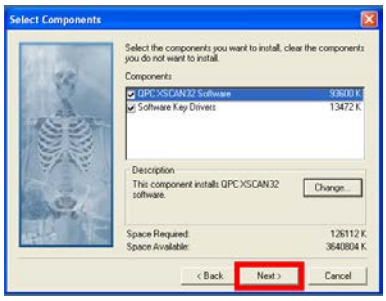
1. Insert the media containing the QPC XSCAN32 installer into the computer. Navigate to the *QPC XSCAN32* folder.
2. Launch the QPC XSCAN32 installer by double clicking **Setup.exe**.
3. Click **Next** at the welcome screen.



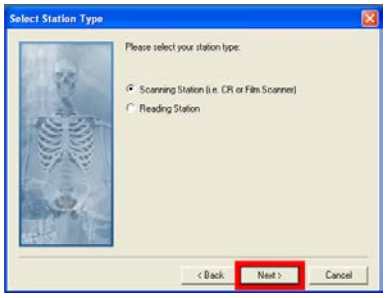
4. Click **Yes** to agree to the Software License Agreement.



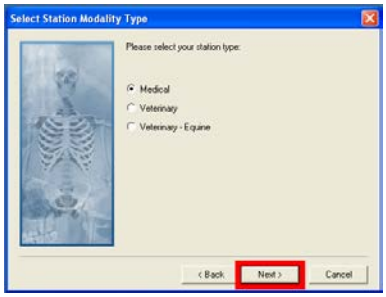
5. Make sure both *QPC XSCAN32 Software* and *Software Key Driver* boxes are checked, then click **Next**.



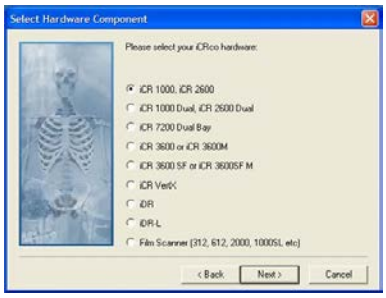
6. Select *Scanning Station* or *Reading Station* depend on the use, then click **Next** to continue.



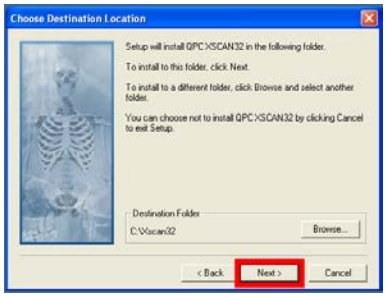
7. Select the appropriate modality, then click **Next** to continue.



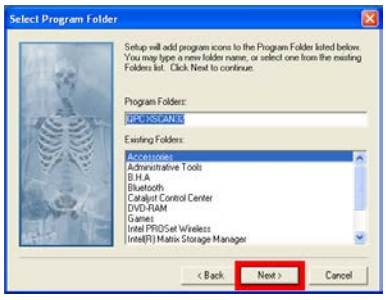
8. Select the appropriate hardware profile, then click **Next** to continue.



9. The Destination Folder should be set to *C:\Xscan32*, then click **Next** to continue.

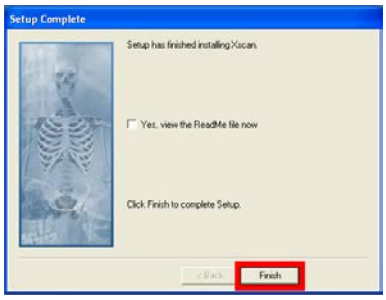


10. The Program Folder name should be set to *QPC XSCAN32*, then click **Next**.



11. QPC XSCAN32 will begin to install. Be patient while XSCAN32 installs.

12. Click **Finish** to complete the installation of QPC XSCAN32. The installer will exit.



Note The Calibration Toolkit (The X-ray Calibration Toolkit is designed to test and maintain a consistent correlation between the x-ray source and *i*DR) is located at

`C:\XSCAN32\XRAYCALIBRATIONTOOLKIT.PDF`

5. System Operation

5.1 Power-Up

The power switch is located on the middle, left-hand side of the device. Ensure the UPS is powered on, then toggle the *i*DR's power switch to the **ON** position & press the **Reset** button in the scan interface.

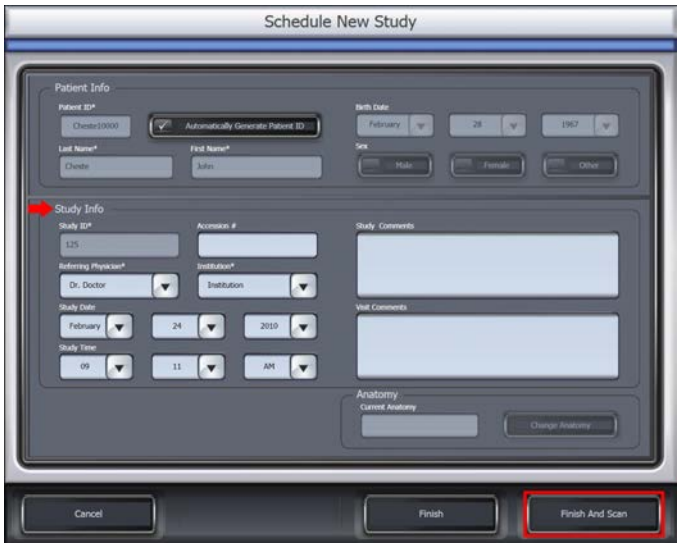
Note The *i*DR should be allowed to warm up for 5 minutes prior to use in order to stabilize the system.

5.2 Acquiring an Image

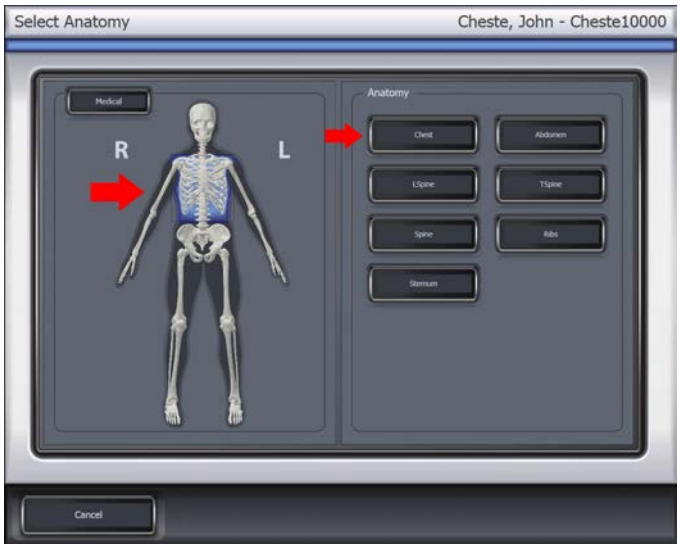
1. In the *Patient List* window, open the desired patient's **Patient Information Bar**. This will open the *Study Information* window.

2. Create a new study by clicking the **Schedule New Study** button.

3. Enter the desired study information, then click the **Finish and Scan** button.

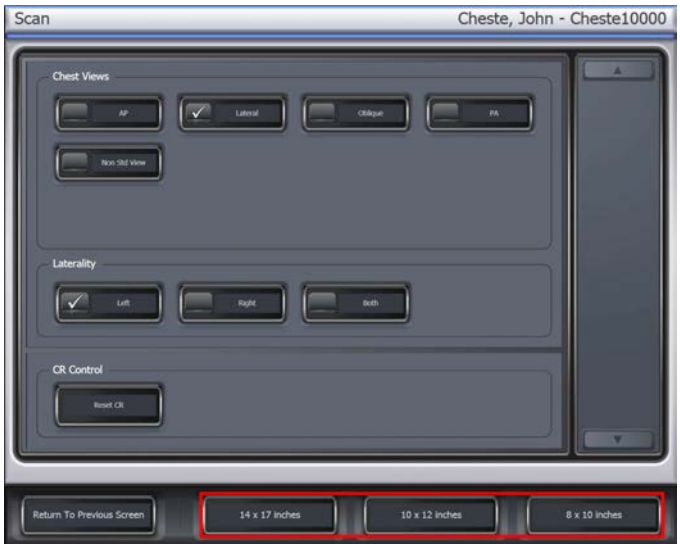


4. Select the region of the anatomy by clicking on the appropriate body region, then select the anatomy by clicking on the appropriate body part.



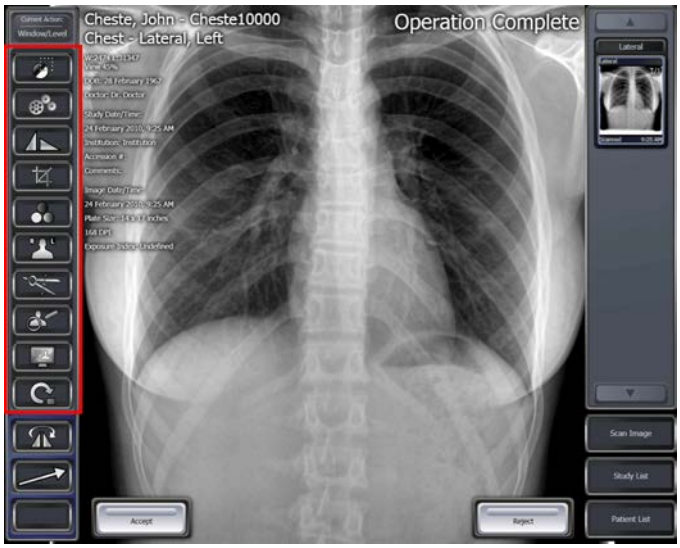
5. Select the appropriate view for the anatomy, then select the appropriate laterality, e.g., left or right if necessary.
   Note If the anatomy selected in the previous step does not require a laterality selection, the buttons for laterality will be grayed-out and not selectable. If this is the case, please skip to the next step.

6. Select the cassette size to begin scanning the cassette.

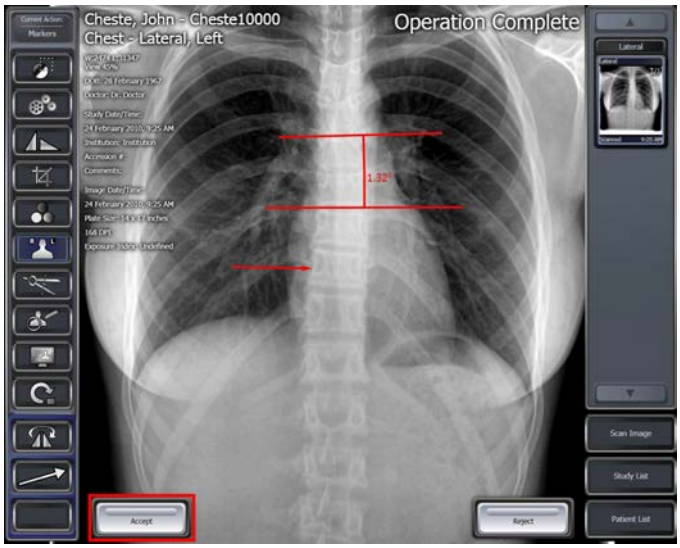


7. As the image is acquired, it will be displayed in the *Image Display* window.

8. When the image is finished scanning, make the desired manipulations and annotations. All Captera manipulation and annotation tools are selected in the Tools Menu Bar on the left side of the *Image Display* window.



9. When the User is finished manipulating the image, click the **Accept** button in the lower, left-hand corner of the *Image Display* window. When the Accept button is clicked, it will save the current image manipulations and DICOM Send the image.



5.3 Schedule of Maintenance

The following is a schedule of maintenance for the *i*DR.

The following maintenance may be performed by end users:

Maintenance Procedure	**Frequency**
Clean cassettes	Weekly
Clean *i*DR exterior covers	Monthly

The following *i*DR maintenance must be performed by an ***i***CRco authorized service engineer only:

Maintenance Procedure	Frequency
Clean mirrors	Yearly
Vacuum inside case	Yearly
Clean fan filters	Monthly or when visibly dirty.

The following *i*DR calibration maintenance must be performed by an ***i***CRco authorized service engineer only:

Maintenance Procedure	Frequency
Check image performance (Contrast/Noise Ratio and Spacial Resolution)	Quarterly
Perform Exposure Index calibration	Yearly

5.4 Periodic Cleaning

Periodic cleaning of ***i***CRco products should be done on a monthly basis.

5.4.1 Cleaning the Outside of the *i*DR

Note It is important that the covers remain on the *i*DR at all times. The covers should only be removed for service by an ***i***CRco authorized technician, then immediately replaced.

⚠ CAUTION Do **not** clean the galvo mirror. Dust and fibers in the laser beam path may affect the radiographic image.

The outside covers of the *i*DR should be cleaned with a slightly dampened cloth or a dry cloth moistened with Ball®SUNUP®glass cleaner or Sprayway©glass cleaner.

5.4.2 Cassette Cleaning

⚠ CAUTION At no time should abrasive cleaners or chemicals be used to clean the cassette or plate.

Cleaning the Outside of the Cassette

1. Moisten a clean, lint-free cloth with a mild soap or detergent using soft water.
2. Wipe down the cassette covers thoroughly.
3. Allow the cassette to air dry.

Cleaning the IP Plate

1. With a finger, press the cassette catch located on the bottom rail on the cassette. This will release the carbon fiber door from the cassette.

2. Examine the imaging plate for dust or particulates.
3. Using ***i***CRco plate cleaner, apply the plate cleaner to a clean, lint-free cloth.

Note If ***i***CRco Plate Cleaner is not available, please contact Technical Support at 1-310-921-9559 to obtain more.

4. Gently wipe down the imaging plate with the clean, lint-free cloth.
5. Allow the plate to air dry before sliding the carbon fiber door back into place.

5.5 *i*DR Cleaning and Disinfection Procedure

If the *i*DR is visually contaminated with blood or body fluids, remove the blood and/or body fluids, then follow Section 5.5.3 prior to use.

⚠ CAUTION Consult the manufacture's Material Safety Data Sheet before use.

5.5.1 Disinfection Materials

1. Sporicidin® Disinfectant Solution and Spray

2. Sporicidin® Disinfectant Towelettes

5.5.2 Disinfection method to be performed after each patient use

1. Wipe the Carbon Fiber material with Sporicidin® Disinfectant Towelettes or Sporicidin® Disinfectant Solution and Spray.
2. Allow to air dry.

5.5.3 Higher level of disinfection

1. Unplug form the power source.
2. Clean the exterior surface with Sporicidin® Disinfectant Towelettes or Sporicidin® Disinfectant Solution and Spray.
3. The surface shall remain wet for ten minutes.
4. Then allow to air dry.

6. Theory of Operation

6.1 Product Overview

The *i*DR produces a diagnostic quality, 16 bit image from a medical grade storage-phosphor image plate. The optical assembly provides a flying spot laser with a focal spot size of 80 microns. The laser scans across the plate and data is captured at a given rate. Each sample is reassembled to create an image. The capture sampling rate can be modified to create images with resolutions from 100 microns (250 DPI) to 200 microns (120 DPI). The unit can scan images up to 35 cm x 48 cm. The laser spot focused to 80 microns is moved back and forth across an imaging plate as the plate is moved through the digitizer. The resultant Digital X-ray can be viewed, manipulated and stored and even printed to a film or paper image. The images are stored and manipulated using the standard medical image format (DCM) and the medical imaging transfer protocol, DICOM 3.0.

6.2 System Configuration

6.2.1 Optical Beam Path

The *i*DR contains a 664 nm 15 mW laser, Lens optic and four mirrors, a scanning galvanometer, and a light collection system.

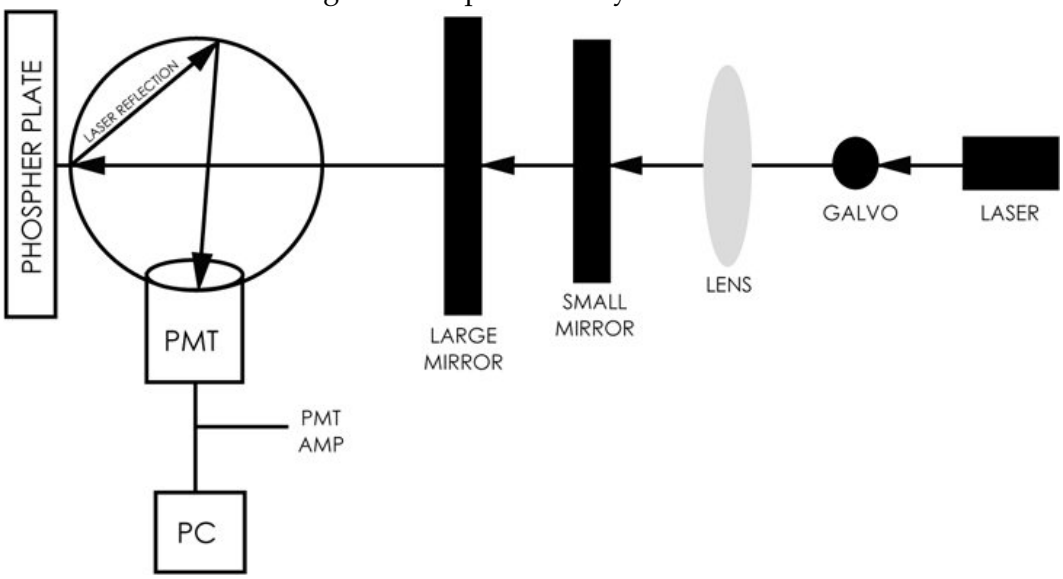
The round laser spot is focused through a focusing lens to produce a round output beam. The beam is deflected by a galvanometer scanner to produce the scan across the plate. The folding mirrors bend the beam and the focused laser spot travels vertically down the plate as it moves horizontally across the scan head.

In order to reach the plate, the beam passes through an integrating collection cylinder. As it hits the surface of the plate, the red light from the focused laser stimulates blue emission from the image plate in direct proportion to the X-ray energy stored in the image plate as a result of the exposure. This blue light is collected by the integrating cylinder. The red light is blocked from reaching the sensors by blue glass filters.

The collected blue light is detected by photomultiplier sensors, which convert the photons into a signal.

This signal is then logarithmically amplified, corrected for spatial variations in the system sensitivity across the width of the screen, and then digitized by an A/D converter.

Figure 6.1: Optical Cavity Overview



6.2.2 Digital and Electrical Systems

6.2.3 Galvonometer Board

The Galvo Servo board contains a feedback amplifier that results in extremely accurate control of the mirror mounted on the shaft of the scanning galvanometer.

The galvo motor shaft oscillates back and forth through an arc of approximately 30 degrees at a rate of 148Hz. A small mirror attached to the shaft intercepts the static laser beam and sweeps (scans) it across the width of the image plate.

6.2.4 Indicator Board

Two LED indicator lamps are used to signal scanner power ON and SCAN status. The SCAN indicator is turned on only while a scan is in process; it also blinks whenever the plate is in the optical path.

6.2.5 Anti-Jitter Board

A small L shaped board located at the end of the integration cylinder.

6.2.6 PMT Board

The photomultiplier tube amplifies the photons from the plate and converts them into electrical signals.

6.2.7 Power Distribution Board

The *i*DR use an external, medical-grade AC-DC power converter that converts standard wall power to 24V DC.

⚠ WARNING Do not handle the power supply when the *i*DR is on. Do not disconnect cables when unit is powered up.

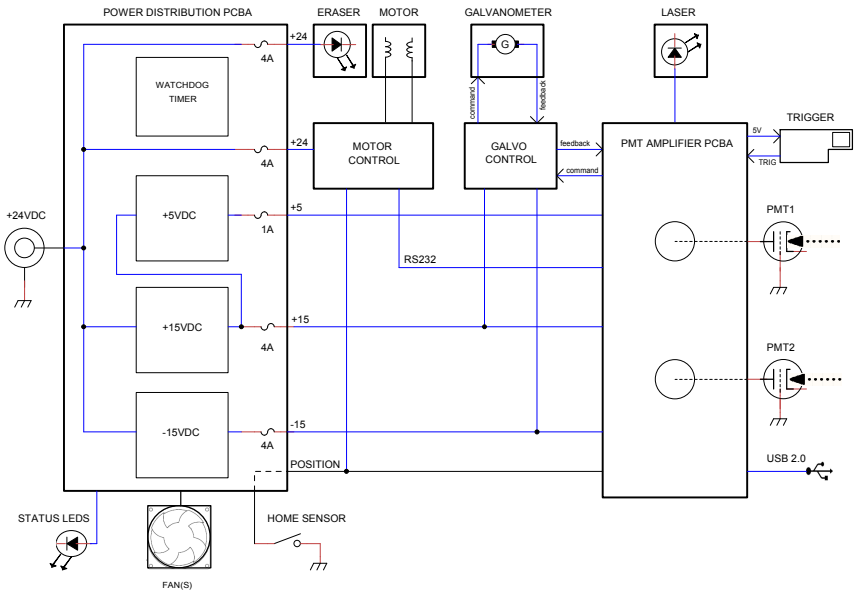
6.2.8 LED Eraser Board

The LED Eraser board provides single wavelength light to erase plate.

6.2.9 Motor Controller Board

This section of the *i*DR controls the stepping motor to drive the plate past the scan head and return it to the *home* position.

Figure 6.2: *i*DR DC Block Diagram



6.2.10 Analog to Digital Conversion

During the scanning process signals are generated by the PMT sensors and transmitted to the computer through a USB 2.0 interface cable. A trigger signal generated by the laser spot is transmitted to the PMT board to trigger a line capture. Image is assembled from lines of captured data that is held in registers and translated into a 16 bit raw source file. There is no way to pause the data capture process. Cancel will cause the machine to stop and return to home position. Data on the plate will be lost.

Note If an image is cancelled during the scan process, the plate will have to be erased again to ensure that the plate is entirely erased.

6.2.11 Calibration

Gain Adjustment

Gain Control is used to compensate for reduction in sensitivity of the PMT detectors due to age. The gain can be adjusted in the software.

1. Open QPC Xscan32
2. Create/open patient
3. Click on Scan (if it is a patient with no images the scan dialog will automatically appear).
4. The Quality Processing Center dialog will appear.
5. Click on the Settings button and type in the password 'earl'. It is case sensitive.
6. A dialog box will appear where the user can manually change the gain.

6.2.12 PMT Amplifier

The amplifier is the interface between the PMT receiving the stimulated light from the collection chamber. The amplifier serves as a current to voltage converter and a log amplifier.

7. Diagnostics

7.1 Overview

If a system failure occurs, it is necessary to diagnose the cause before beginning the repair. This section describes the diagnostic tools and techniques used to isolate various types of system failures. This chapter covers the most common failures and their fixes. If the user is unsure how to proceed with troubleshooting, please contact Technical Support.

The cause of some failures may be obvious. In these cases, the Service Engineer may proceed directly to the repair. Before beginning an investigation, it is a good practice to record as much information about the current state of the system as possible. This information may include, but is not limited to, symptoms, conditions under which symptoms exist, voltages, settings, cleanliness, and visual state. Normal generic troubleshooting techniques apply. With knowledge of the system, isolate the failure to a particular subsystem. With knowledge of the subsystem, trace the symptom back to its cause. In many cases, failures are caused by lack of periodic maintenance and cleaning. If a system is known to be behind schedule for its maintenance and cleaning at the time of the failure, it is a good practice to clean and re-calibrate the system before extensive troubleshooting. In many cases this solves the problem or provides clues as to the cause.

⚠ WARNING This equipment is operated with hazardous voltages which can shock, burn, or cause death.

⚠ CAUTION This equipment uses a laser. Direct exposure to the laser beam must be avoided.

⚠ CAUTION Do **not** operate the unit with the covers removed. Operating the *i*DR with the covers removed may result in damage to *i*DRand/or cause harm to the operator.

Preliminary Checks

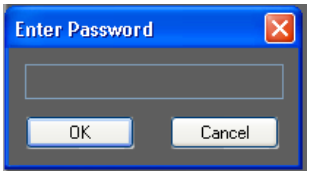
1. Make sure the *i*DR is powered by at least a 1300VA (780W) UPS (uninteruptable power supply).
2. Make sure that the *i*DR is connected to the acquisition computer using a USB 2.0 cable (USB 1.0 or 1.1 cabling is **not** sufficient).
3. Check that the *i*DR is powered by the provided power cable or source as covered in Section 2.1.
4. Make sure that other devices that emit strong radio frequencies are not in close proximity to the *i*DR.

7.2 Using the Focus Tool for Hardware Diagnostics

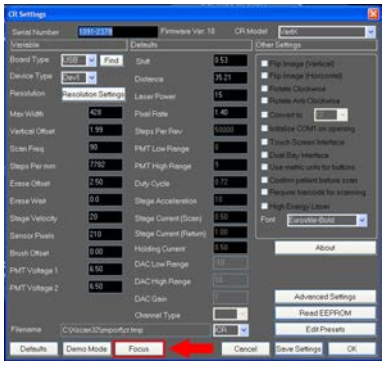
The Focus tool is an efficient test that can provide the Service Engineer with valuable feed back regarding the functionality of the *i*DR's hardware. There are a series of questions following the work instructions that are designed to help include/eliminate potential failures in the *i*DR's subsystems.

1. Leave the Cassette out of the unit and close the bay door.
2. Open QPC XSCAN32, access the Scan interface, then click the **Settings** button on the Scan interface.

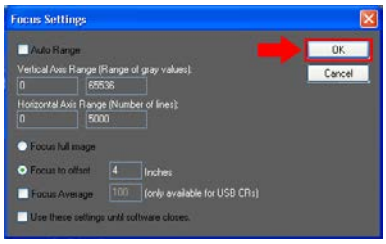
3. Enter the password *earl* in the dialog box.



4. Click on the FOCUS tool Button along the bottom edge of the settings window.



5. A new window will come up, indicating the settings for the FOCUS tool. Use the standard settings in the focus tool. Click **OK** in the dialog box. This moves the carriage 4 inches into the unit, and begins to capture data.



6. If the unit is working correctly, you will see a red data line, moving as the data is passed to the PC, one line at a time. In the default configuration, the scale is 65,000 levels of gray along the vertical axis of the window, and pixel location along the horizontal axis of the window. The Data line will be between zero and 2,500. If the line is not between zero and 2,500, you may need to re-adjust the zero point of the scanner.

7. Open the dust cover of the *i*DR, the Data line should rise and lower slightly according to the position of the bay door. If the room is illuminated by high frequency fluorescent lights, the line may become sinusoidal (Wavy) and move away from the zero point.

What can we see by looking at the digital output of the *i*DR?

1. The unit must be capturing data because there is data being captured by the PC
2. The Laser is working because the laser moving past a start scan sensor tells the unit to start capturing data
3. The Start Scan sensor is working
4. The Galvanometer is working, swinging the laser back and forth
5. The Motor is working, moving the carriage 4 inches into the *i*DR
6. The unit is sensing light variations as the line is rising due to more light leaking into the scan head.
7. The electronics are functional, and the cables are connected properly
8. The unit's amplifier is working, as is the ADC and the USB 2.0 interface on the unit

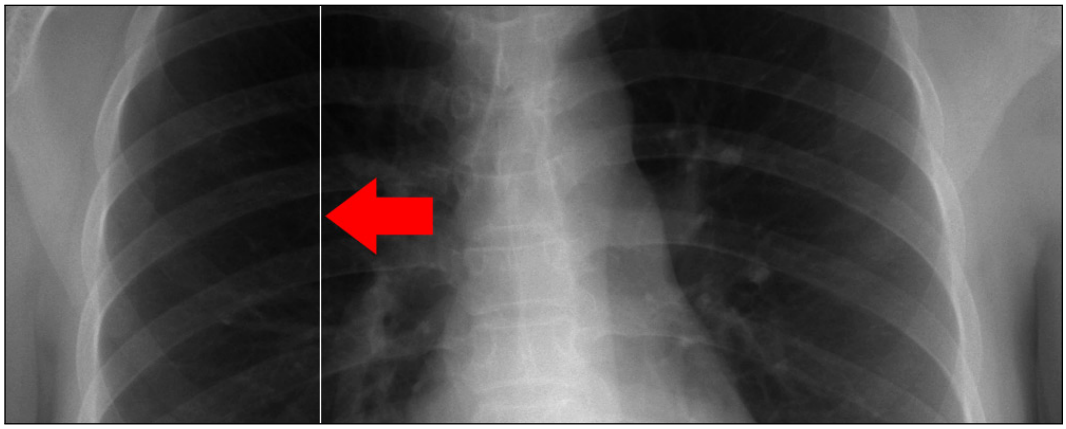
If the focus tool does not come up, what questions can we ask?

1. Is there power to the unit (Green Power light on and steady?, Orange scan light off, or on and blinking?)
2. Does the unit move before an error condition is seen? If so, motor is working and carriage is functioning. If not, several things can be wrong: No connection to PC, No power to Unit, bad USB cable.
3. Is there a NO DATA ACQUIRED error after the motor comes to rest at the scan position?

   This indicates that the unit is not transmitting data to the PC. Please see Section 7.5 for more information.

7.3 Image Symptoms

7.3.1 Lint in the Scan Path



Symptom: Sharp, white lines, usually only a pixel or two in width and spanning the length of the entire image.

Cause: Lint or other particulate matter in the scan slot.

Solution: See Section 8.3 for instructions on accessing the IP Plate. Once the user has access to the scan slot, visually inspect the area in and around the scan slot for particulates and remove the particulates with a vacuum if necessary.

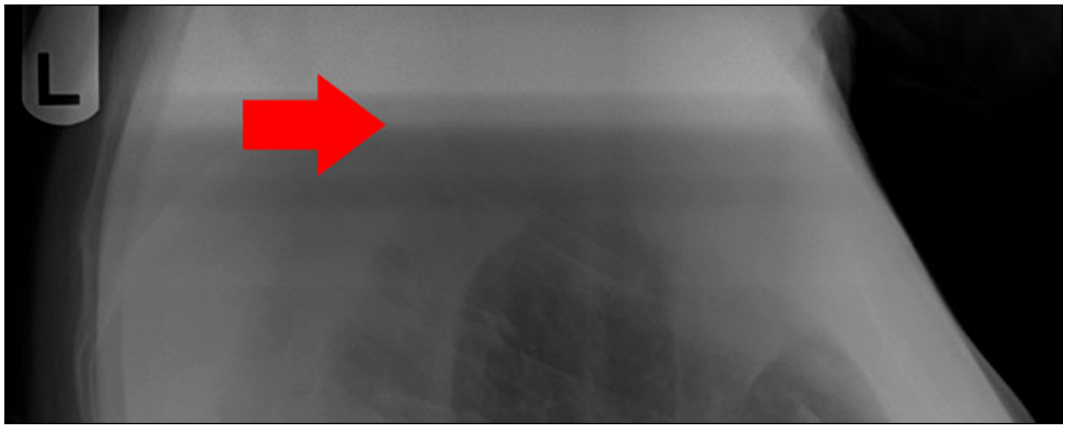
7.3.2 Dust Lines

Symptom: Light, blurred lines across the long axis of the cassette.

Cause: Dust or lint on the mirrors.

Solution: To clean the mirrors, please see Section 8.2 for instructions.

7.3.3 Banding Top/Bottom 17" Length



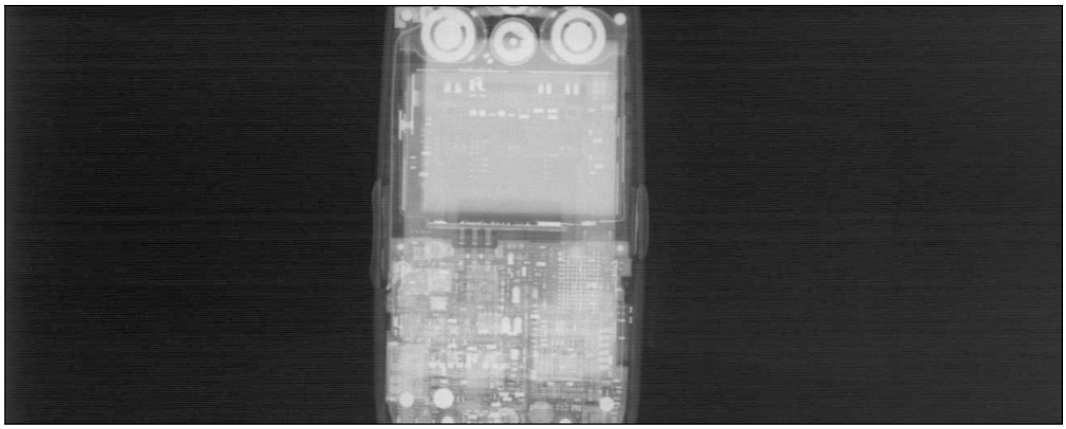
Symptom: Horizontal line in image.

Cause: Unstable power supply / Excessive ambient light / Bad PMT board / PMT sensor / Bad Galvo

Solution:

1. Ensure that the *i*DR is powered via a UPS. Ensure the UPS is not in bypass mode.
2. Ensure that the ambient room light is no more than 2EV. Turning off or dimming the room light should be adequate.
3. Unplug the network cable from the computer, then make a test scan to see if the banding is eliminated.

7.3.4 Grid Lines/Moiré Effect



Symptom: Grid lines/Moiré Effect

Cause: A grid with the wrong LPI, or a misoriented cassette under the grid.

Solution: To alleviate grid lines/ moiré effect, first ensure that the grid being used is 178 LPI. If the grid in use is 178 LPI, then, if possible rotate the grid 90°.

7.3.5 Sensor Pixels

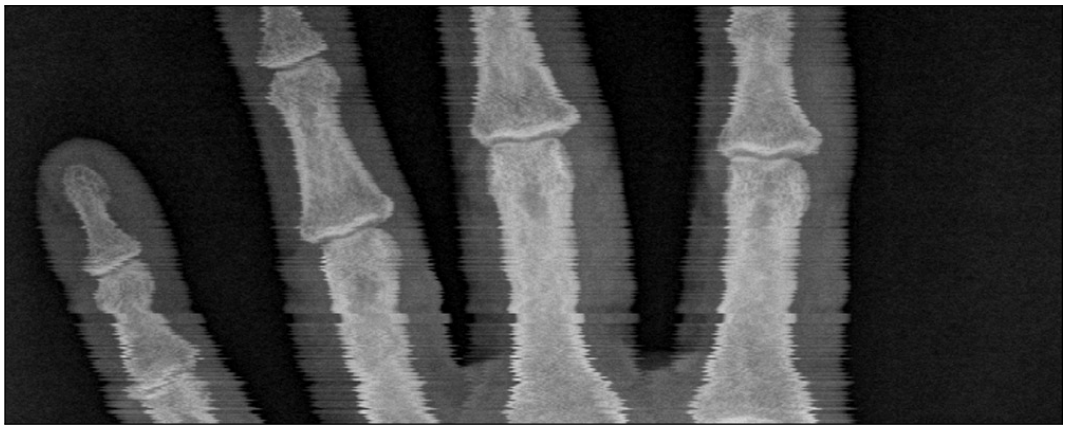
Symptom: A gap of white space between the edge of the image and the physical edge of the cassette after scanning.

Cause: Sensor Pixel value needs to be increased or decreased.

Solution:

1. Open XSCAN32.
2. Create/edit a patient, then click **Save & View**.
3. Click the **Scan** button (if it is a patient with no images, the Scan interface will automatically open).
4. Click the **Settings** button, then enter the password *earl* (case sensitive).
5. Locate the setting for Sensor Pixels.
6. The user may need to adjust this setting several times before achieving the desired result. Expose a couple of cassettes, then scan and adjust the Sensor Pixels value until the image is acceptable.

7.3.6 Image Jitter

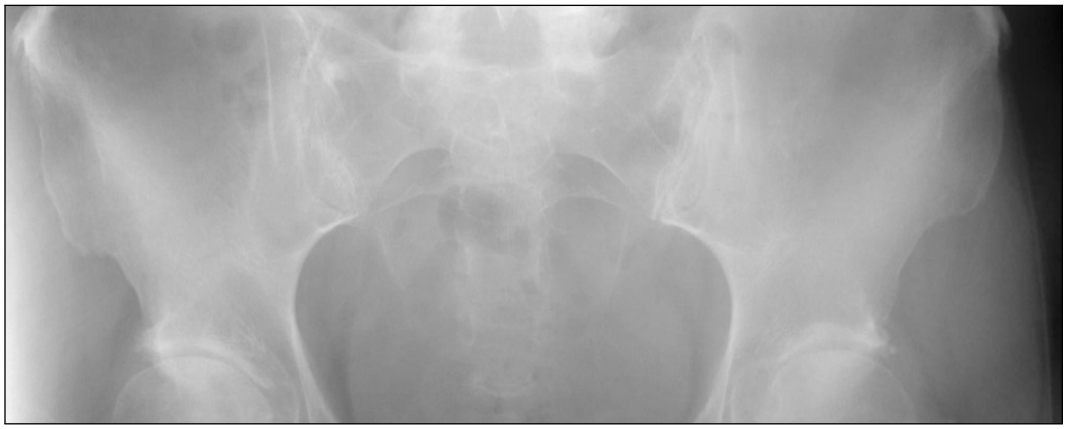


Symptom: Jittery image.

Cause: Inconsistency in the *i*DR's galvanometer.

Solution: Image jitter issues are **not** serviceable in the field. Please contact Technical Support for assistance with image jitter.

7.3.7 Over Exposure



Symptom: Lines in images / images look more "translucent"– the images lack the proper contrast and density.

Cause: Over exposure.

Solution: Make an exposure using your current exposure settings. Scan and evaluate the image. Then, reduce the exposure parameters, expose another plate, then scan and evaluate the image. Compare the results of both exposures, then adjust the "standard" exposure accordingly.

7.3.8 Random Imaging Shifting

Symptom: Random Image Shifting.

Cause: Bad USB 2.0 connection.

Solution: Visually inspect the USB 2.0 cable connecting the *i*DR to the computer. Make sure there are no visible cuts, frays or other damage. Move the USB 2.0 cable to a different USB port on the computer. If the problem persists, try swapping out the USB 2.0 cable for a new one.

7.4 Hardware Symptoms

7.4.1 Failure to Initialize USB

The *Failure to Initalize USB* error can be caused by several issues:

1. Make sure the *i*DR is powered on.
2. Make sure the USB cable is firmly connected to both the *i*DR and PC.
3. Visually inspect the USB cable for cuts or freys. The user may want to swap out the USB cable to ensure its integrity.

4. Make sure the *i*DR is recognized in the Windows Device Manager. Additionally, make sure the device drivers are properly installed. To do this:
   (a) Go to *Start* → *Control Panel* → *System* → *Hardware* → *Device Manager*
   (b) In the *Device Manager*, make sure there are no unrecognized USB devices.
   (c) In the *Universal Serial Bus* entry, the user should see an entry for the *i*DR. If there is no entry, or there are yellow question marks in the Device Manager, please re-install the device drivers. If the user does not have the original installation CD containing the device drivers, please contact Technical Support.

7.4.2 No Motor Movement

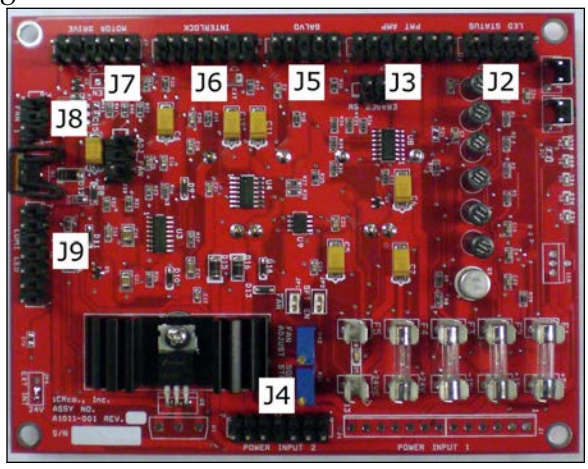
Symptom: When initiating a scan from the software interface, no sound is heard from the *i*DR.

Cause: Bad fuses, motor controller, cable, or motor.

Solution:

1. Check the fuses as cover in Section 8.4.
2. If the fuses are not at fault, remove the back cover as covered in Section 8.1, and check that connectors J2, J3, J4, J5, J7, J8, and J9 are firmly connected to their respective boards.

Figure 7.1: The ***i***DR DC Power Distribution Board



⚠ WARNING Do **not** operate the *i*DR with the covers removed. Laser & LED lights may cause harm to the operator.

3. If the motor controller light is flashing or solid red, then the motor controller board will need to be replaced.

7.4.3 Clicking Noise Returning to Home

Symptom: Clicking noise heard from *i*DR when returning to the home position.

Cause: At the end of the scan: Eraser offset.
At home position: Fuses / sensor.

Solution: At the end of the scan: Change eraser offset.
At home position: Check fuses as cover in Section 8.4. Check the Power Distribution board / Move sensor.

7.4.4 Not Finding Home Position

Symptom: The *i*DR is not finding the home position.

Cause: Bad fuses, Power Distribution board, or Move sensor.

Solution: Check fuses as cover in Section 8.4. Check the Power Distribution board / Move sensor.

7.5 Error Message: No Data Acquired

7.5.1 Failure Analysis 1

1. When turning on the CR, see if there is a pop-up message in the lower right hand corner of the Windows task bar stating "This USB device can perform faster if it is connected to a hi-speed USB 2.0 port." If so:
   - make sure the CR is plugged into a USB 2.0 port. Some older PCs only have USB 1.0 or 1.1 ports. These older variety of USB ports are **not** sufficient in speed to acquire data from the CR unit.
   - make sure the BIOS does not have any options set for conserving power (especially on laptops). Sometimes the PC will not run the USB ports at their full potential to save power. Please consult the PC's user manual for more information.

- try unplugging the USB cable from the CR unit and then plugging it back in. If the message does not appear try to scan. In some instances, turning the CR unit on with the USB cable plugged in causes Windows to recognize the device as USB 1.0. In some instances, unplugging and replugging the USB cable can correct this.

2. After clicking on the scan button, listen for the motor and see if the CR slide moves at all. If it does not move at all, then the motor controller board may be at fault.
   - open the back of the CR unit (see Section 8.1 for instructions) and locate the motor controller board on the lower left. The motor has cables directly connected to the board.
   - look for either a red or green indicator light on the board. It may be covered by silicone, which can be removed.
   - a green light on the motor controller board indicates that the board is in working condition, while a red light indicates a faulty board that will need to be replaced. If the board needs replacement, please contact Technical Support.
3. Check the following:
   - check the fuses on the power distribution board (see Section 8.4 for instructions)
   - check that the laser and eraser lights turn on: With the slide away from the home position, see if the laser turns on (full beam from top to bottom). The laser beam must also overlap the trigger board behind the long mirror.
   - if the laser does not turn on, check if the galvo mirror oscillates.
   - if the galvo is on and the laser is not, wiggle the cable coming from the laser body to see if the laser turns on.
   - follow the cable to the laser connector on the PMT board and make sure it is not loose. Unplug and replug the connector.

     Note the slide must be away from the home position fro the laser to turn on.
   - if the galvo does not turn on, check the galvo cables. Wiggle them, then unplug and replug the connectors.
4. If the galvo does not turn on, the galvo or PMT board may need to be replaced. If the galvo turns on the but the laser does not, replace or repair the laser

7.5.2 Failure Analysis 2

Note Failure possibilities are listed in order or likelihood.

Fault: Laser trigger pulses are not being received by XSCAN32.

Assumptions: In order for the CR unit to arrive at this point:

- The CR unit is powered up and communicating via the USB to the XSCAN32 software.
- Motor movement and magnet/reed switch are most likely functional as RETURN TO HOME followed by START SCAN commands operate without apparent error. These commands are executed prior to expecting laser triggers.

Setup:

1. Power off the CR unit.
2. Remove back cover (see Section 8.1 for instructions) and back optical cover (see step 3 from Section 8.2 for instructions).
3. Switch **off** PMT board hi-voltage by switching the one red switch on the PMT board inward, towards the center of the PCBA.
4. Power on the CR unit.
5. Press and hold the two Power Distribution board push-button switches. If all five Diagnositc LEDs do **not** brightly illuminate, stop! Possible failures include:
   - Power Distribution fuses are blown (see Section 8.4 for instructions)
     ⚠ CAUTION If fuse(s) are found to be bad and replacement fuse(s) continue to blow, **STOP**! A potentially dangerous electrical situation may exit and the CR unit should be returned to the factory for repair.
   - Bad Power Distribution board or cabling.
   - Bad +24V Power Supply or cabling
   - Bad Quad Power Supply or cabling
   - If a fix has not been accomplished by this point, the machine should be returned to the factory for repair.
6. Turn the slide motor shaft by hand until the slide is observed to be well away from the HOME position.

Checks:

1. If the Eraser LEDs do **not** illuminate, **STOP**! Possible failures:
   - If eraser lights are switch-able, then verify the eraser switch is in the ON position.
   - Power Distribution fuse(s) has blown.
     ⚠ CAUTION If fuse(s) are found to be bad and replacement fuse(s) continue to blow, **STOP**! A potentially dangerous electrical situation may exit and the CR unit should be returned to the factory for repair.
   - Bad Power Distribution board or cabling
   - Bad +24V Power Supply or cabling
   - Bad Quad Power Supply or cabling
   - If a fix has not been accomplished by this point, the machine should be returned to the factory for repair.

2. If the galvo mirror is **not** oscillating, **STOP**! Possible failures:
   - Bad PMT board or cabling
   - Bad Galvo/Controller or cabling
   - Bad Quad Power Supply or cabling
   - If a fix has not been accomplished by this point, the machine should be returned to the factory for repair.
3. If the Laser is **not** illuminated, **STOP**! Possible failures:
   - If the laser has an external power supply, check to verify that the programmable power setting is not set too low
   - Bad laser, laser/supply combo, or cabling
   - Bad PMT board or cabling
   - Bad Quad Power Supply or cabling
   - If a fix has not been accomplished by this point, the machine should be returned to the factory for repair.
4. Temporarily place a Post-it®or similarly light-colored paper behind the Trigger board. This enables viewing of the laser beam.
5. If the laser beam is **not** observed to OVERLAP the Trigger board, **STOP**! Possible failures:
   - Galvo AMP setting too low; try increasing AMP setting
   - Bad PMT board or cabling
   - Bad Galvanometer/Controller or cabling
   - Beam may require re-alignment. This alignment is accomplished by galvo adjustment and is beyond the scope of this failure analysis. Please contact Technical Support for further assistance.
   - If a fix has not been accomplished by this point, the machine should be returned to the factory for repair.
6. If the laser beam does **not** cross through the center of the trigger sensor, **STOP**! Possible failures:
   - Bad Trigger board
     Note The Trigger board cable is un-keyed and is therefore prone to misconnection.
   - Bad PMT board or cabling, specifically the TILO cable
   - Bad Quad Power Supply or cabling

If a fix has not been accomplished by this point, the machine should be returned to the factory for repair.

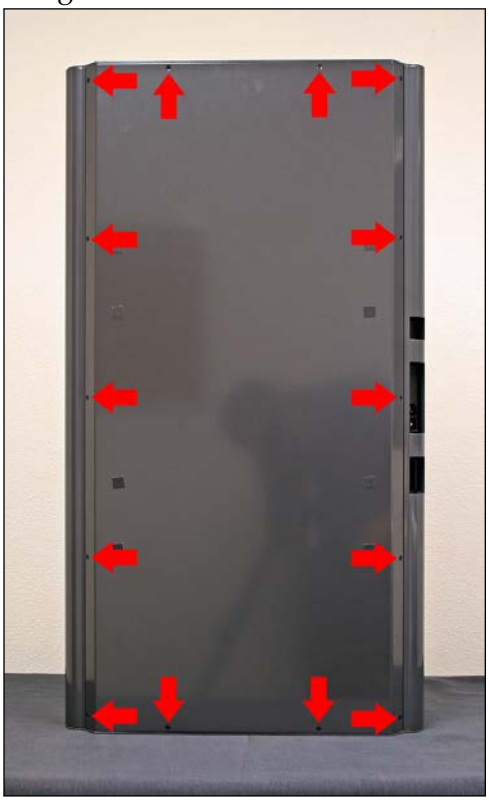
8. Service & Maintenance Procedures

8.1 Removing the Back Cover

Note Ensure the ***i***DR is removed from the wall or cart mount.

1. Ensure the PMT voltages are set to zero (see Section 8.7), then run one scan.
2. Power OFF the *i*DR.
3. Orient the unit on its front (the carbon fiber side facing down) on a clean, soft, dry surface.
4. Remove fourteen (14) 6-32 x $\frac{3}{8}$" flathead screws from the back cover (Figure 8.1).

Figure 8.1: The *i*DR's Back Cover

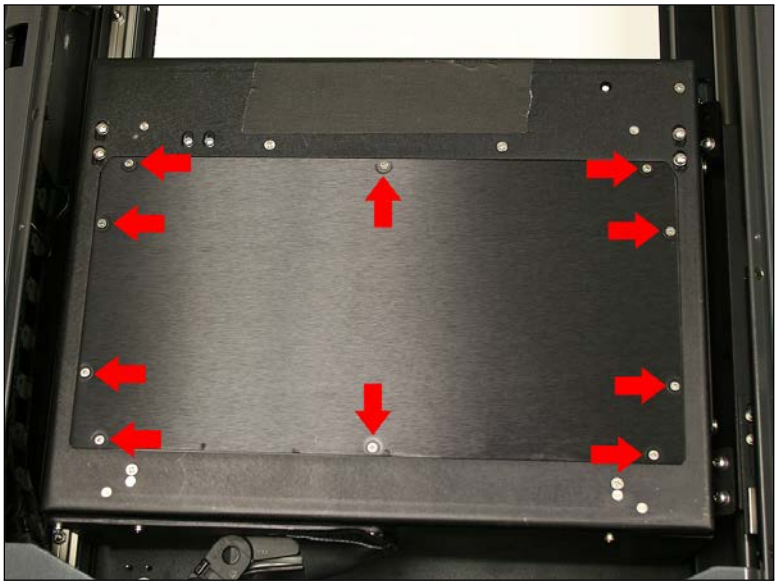


5. Gently lift the back cover off the unit.

   ⚠ CAUTION Once the back cover is removed, the IP plate will be exposed. The technician should take extra care not to touch or otherwise damage the IP plate.

8.2 Cleaning the Mirrors

1. Remove the back cover as covered in Section 8.1.
2. Remove ten (10) 4-40 x $\frac{1}{8}$" flathead screws from the rear optical cover.



3. Remove the rear optical cover.

   ⚠ CAUTION Do not touch mirrors or trigger board directly. Any marks on the mirrors may cause a degradation in image quality. If the trigger board changes position, it may cause a *No Data Acquired* error.

4. Inspect each mirror for any particulates or contaminates and carefully remove before cleaning.
5. Apply the glass cleaner on the soft, lint-free tissue. If possible, use Kimtech Kimwipes and Windex. Do not put cleaner directly on the mirrors. Clean the mirrors in a circular motion and do not apply force. Use a flashlight to make sure that there are no dust particles or smearing residue on mirrors.
6. The location of the mirrors is shown in Figures 8.2 & 8.3.

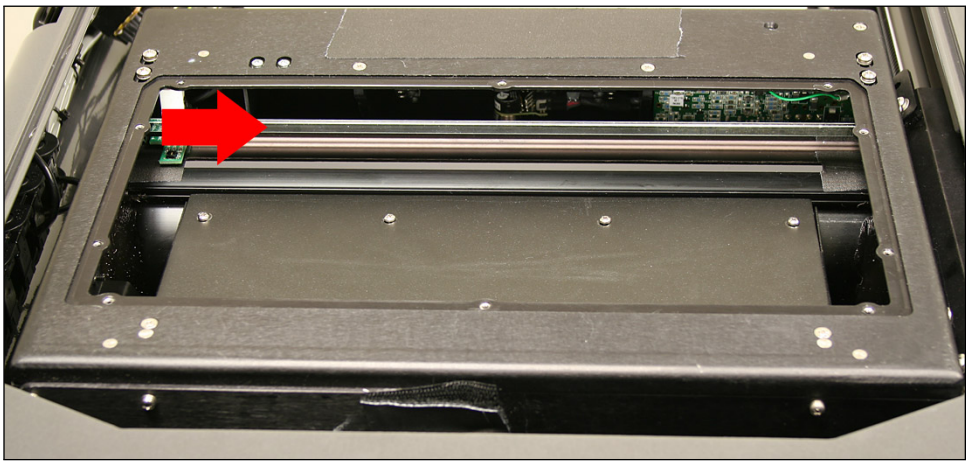


Figure 8.2: The *i*DR long mirror

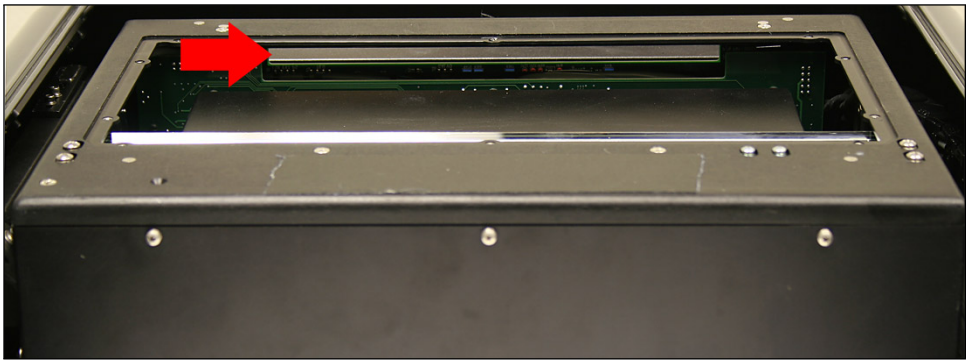


Figure 8.3: The *i*DR short mirror

7. Reassemble the *i*DR in reverse order of these instructions, and ensure the PMT Voltage is set back to the proper value.

8.3 Cleaning the IP Plate

1. Remove the back cover as covered in Section 8.1.
2. Manually rotate the lead screw to move the scan head to the top of the unit.
3. Using *i*CRco plate cleaner, apply the plate cleaner to a Kimtech Kimwipe.

   Note If *i*CRco Plate Cleaner is not available, please contact Technical Support at 1-310-921-9559 to obtain more.
4. Gently wipe down the bottom half imaging plate.

5. Manually rotate the lead screw to move the scan head to the bottom of the unit.
6. Using ***i***CRco plate cleaner, apply the plate cleaner to a clean, lint-free cloth.
7. Gently wipe down the top half of the imaging plate.
8. Allow the plate to air dry.
9. Refasten fourteen (14) 6-32 x $\frac{3}{8}$″ flathead screws to the back cover.

8.4 Checking the Fuses

8.4.1 External Fuses

1. Twist the fuse housing counter-clockwise.
2. Gently removed the fuse housing.
3. The fuse is located on the back of the fuse housing.
4. The fuse is 10A.

8.4.2 Power Distribution Board Fuses

1. Remove the back cover as covered in Section 8.1.
2. Manually rotate the lead screw to move the scan head to the top of the unit.
3. Locate the Power Distribution Board.
4. Visually inspect each of the five (5) fuses.
5. Replace any blown fuses. See Table 8.1 for fuse ratings.
6. Refasten fourteen (14) 6-32 x $\frac{3}{8}$″ flathead screws to the back cover.

Table 8.1: Power Distribution Board Fuse Ratings

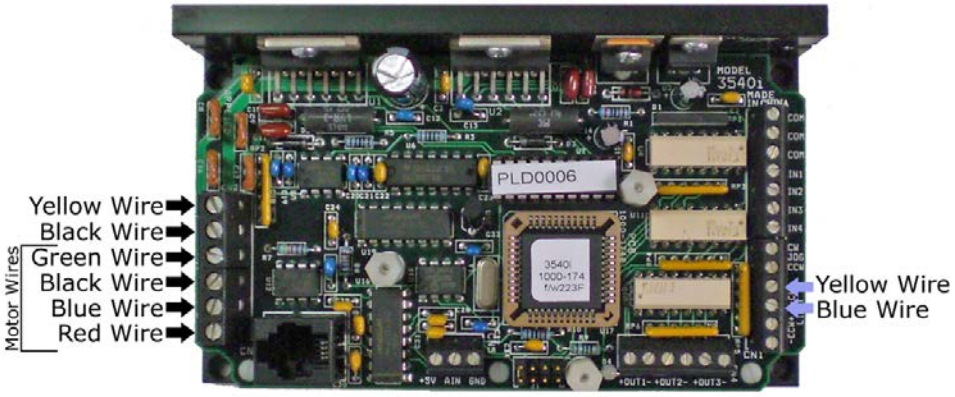
Power Rating	**DC**
+5	1
+15	4
-15	4
+24 (Motor)	5
+24 (Eraser)	10

8.5 Replacing the Power Distribution Board

1. Remove the back cover as covered in Section 8.1.
2. Manually rotate the lead screw to move the scan head to the top of the unit.
3. Remove power connectors J2, J3, J4, J5, J7, J8, and J9.
4. Remove four (4) 6-32 x $\frac{1}{4}$" pan head screws from the Power Distribution Board.
5. Ease the Power Distribution Board away from the unit.
6. Replace the new Power Distribution Board in the unit.
7. Refasten four (4) 6-32 x $\frac{1}{4}$" pan head screws to the Power Distribution Board.
8. Reconnect power connectors J2, J3, J4, J5, J7, J8, and J9.
9. Refasten fourteen (14) 6-32 x $\frac{3}{8}$" flathead screws to the back cover.

8.6 Replacing the Motor Controller Board

1. Remove the back cover as covered in Section 8.1.
2. Manually rotate the lead screw to move the scan head to the top of the unit.
3. Remove the phone cord from the jack.
4. Using a #00 flathead screwdriver, remove the Motor Controller wires from their terminals.
5. Using a pair of needle nose pliers, pinch each of the four (4) fasteners, freeing the Motor Controller board.
6. Ease the Motor Controller Board from the unit.
7. Ease the new Motor Controller Board onto the four (4) fasteners.
8. Using a #00 flathead screwdriver, open the flaps of fasteners.
9. Reconnect the Motor Controller wires to their terminals.



10. Plug the phone cord into the jack.
11. Refasten fourteen (14) 6-32 x $\frac{3}{8}$" flathead screws to the back cover.

8.7 Setting PMT Voltages to Zero

For instructions on setting the PMT voltages to zero using QPC XSCAN32, see Section 8.7.1. For instructions on setting the MPT voltages to zero using Captera, see Section 8.7.2.

8.7.1 QPC XSCAN32

1. Ensure the *i*DR is powered on and connected via USB 2.0 to the Acquisition computer.
2. Open QPC XSCAN32.
3. Open a patient file from the *Patient Information* window.
4. Click the **Scan** button in the main tool bar to bring up the *Scan Interface*.
5. In the *Scan Interface*, click the **Settings** button.
6. At the password prompt, enter the password *earl*. Click **Ok** to continue.
7. Locate the *PMT Voltage 1* and *PMT Voltage 2* settings and make note of the value.

   Notice Potential loss of data. Be sure to take note of the PMT Voltage settings, as once the setting is saved with a value of zero (0), there is no way to recover the old value.
8. Set the values of both *PMT Voltage 1* and *PMT Voltage 2* to zero (0).
9. Click the **Save Settings** button to save the changes. Then click the **Ok** button to exit the *CR Settings* dialog.
10. Run one (1) scan to ensure the settings were changed. The resulting image should be very faint.

8.7.2 Captera

1. Ensure the *i*DR is powered on and connected via USB 2.0 to the Acquisition computer.
2. Open Captera.
3. Click the **Configuration** button.
4. Click the **Device Settings** tab.
5. In the *CR Settings* section, click the **Advanced** button.
6. In the *CR Settings* section, click the **Read EEPROM** button.
7. Locate the values in the *PMT Low* and *PMT High* and make note of the value.

   Notice Potential loss of data. Be sure to take note of the PMT Voltage settings, as once the setting is saved with a value of zero (0), there is no way to recover the old value.
8. Set the values of both *PMT Low* and *PMT High* to zero (0).
9. Click the **Write EEPROM** button to save the changes, then click the **Finish** button.
10. The PMT voltages will be set to zero (0)
11. Run one (1) scan to ensure the settings were changed. The resulting image should be very faint.

8.8 Removing the *i*DR from the Wall/Cart Mount

1. Ensure the *i*DR is powered OFF.
2. Remove three screws from the power cowling, then remove the power and USB 2.0 cord from the *i*DR.

3. Adjust the wall or cart mount such that the top end cap is flush with the top of wall or cart mount.
4. Insert the Spring Mount screws to secure the wall or cart mount.

5. Remove five (5) screws from the top end cap, then gently lift the top end cap away from the wall or cart mount.

   ⚠ CAUTION Heavy lift. Always practice proper heavy lifting procedures. Improper lifting may cause injury.

6. With at least two people, life the *i*DR out of the wall or cart mount.