

User Manual

Trauma DR plus

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List of revisions

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| | | |

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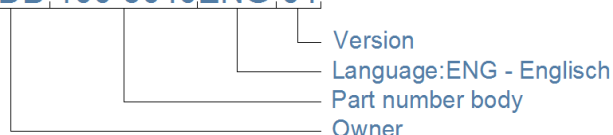
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Preface

Identification Manual








Manuals are identified by a part number.

ODB-100-5040ENG-04



The part number is printed at the bottom of the title page. Numbers printed on other pages are for internal revision control and may differ.


Symbols

| Symbol | Meaning | Remarks |
|--|--|---|
| Location: Near or on the type identification plate.  | Symbol for separated collection of electrical and electronic equipment per Directive 2002/96 of the European Parliament and the Council of the European Union (Directive on Waste of Electrical and Electronic Equipment - WEEE). If applicable to the type of device, it indicates legally imposed obligations within EU member states, Iceland, Norway and Switzerland when the equipment is disposed of, at the end of its life-time. | Owners of marked equipment should contact the organization that imported the equipment into their country, when they want to dispose of the equipment, at the end of its lifetime. The Directive prioritizes re-use of equipment over re-use of components over re-use of materials over disposal as waste. Article 5 part 2d allows producers to decline the return of any used equipment that is or may be biologically or radiologically contaminated. |
|  | Date of manufacture | |
|  | Serial number | |
|  | This mark indicated that this is CLASS I Equipment according to EN60601-1. | |
|  | This mark indicated that this is a Type B Applied Part according to EN60601-1. | |
|  | Consulting the accompanying documents is a mandatory action. | |
|  | General warning sign | Placed together with a supplementary symbol or text. The text associated shall be an affirmative statement (i.e., a safety notice) describing the principal risk(s) foreseen (e.g. "Causes burns", "Risk of explosion", etc.). |

Conventions






The Trauma DR plus has been designed to meet all safety requirements applicable to medical equipment. However, anyone using the Trauma DR plus must be fully aware of potential safety hazards. The information contained in this chapter is provided to help users to operate the Trauma DR plus safely.

Throughout this manual certain conventions are used. These are Warnings, Cautions and Notes. They provide a means of prioritizing information to be brought to the attention of the user. They are given as follows:

| | |
|--|---|
|  WARNING: | Indication of an important warning that is to be obeyed to eliminate the risk of personal injury or an incorrect clinical diagnosis. |
| CAUTION: | Indication of important information to avoid serious system equipment damage. |
| Note: | Additional information for reader understanding or simplification of a task. |

Precautions

The user is expected to use the product (soft and hardware) in accordance with the instructions given in this manual, which must be read before the system is used. Any unauthorized deviation from the procedures laid down in this manual can affect the contractual obligations between purchaser and vendor.

| | |
|--|--|
|  WARNING: | This product was designed and manufactured to ensure maximum safety of use. It should be installed and serviced in strict compliance with safety instructions described in this Document. |
|  WARNING: | Never attempt a shortcut to procedures which may degrade the safety considerations of the system. |
|  WARNING: | Class 1 MD: To avoid the risk of electric shock, this equipment must only be connected to a supply mains with protective earth. |
|  WARNING: | The user shall take care that potential electromagnetic or other interferences between the unit and other equipment is avoided. If necessary certain actions must be taken. |
|  WARNING: | Only trained and qualified personal are allowed to operate the Trauma DR plus system. |



| | |
|--|---|
|  WARNING: | <p>Do not modify any part of Oldelft Benelux supplied hardware, software or software configuration. Any modification, installation or running an application that has not explicitly been approved by Oldelft Benelux may compromise patient safety and will result in termination of all warranty and service contracts.</p> <ul style="list-style-type: none"> a. If this equipment is modified, repaired or maintained, appropriate inspection and testing must be conducted to ensure continued safe use of the equipment. b. Do not leave problems unattended that may affect the safety of the product. In case you have doubts concerning the Trauma DR plus's save operation, call the service number of your vender for further instructions. c. The Trauma DR plus should be cleaned regular to prevent the accumulation of dust. The contact surface should be cleaned after each patient for hygienic reasons. |
|  WARNING: | <p>The Oldelft Benelux products are designed for use and maintenance using only parts available from Oldelft Benelux. No liability for failure can be accepted by Oldelft Benelux through the use of parts obtained from other suppliers unless written permission is obtained from Oldelft Benelux.</p> <p>Copyright All rights reserved. No part of this manual may be reproduced or transmitted in any form whatsoever, including photocopying and recording without written permission of the copyright holder: Oldelft Benelux B.V., Wiltonstraat 41, 3961 KW VEENENDAAL, The Netherlands.</p> <p>Concerning this Publication Information contained in this publication is subject to change without notice. Whenever the equipment is delivered with a documentation medium such as a CD or DVD, the user shall always check the medium for latest information. This information is part of Release Notes and Document Upgrade files.</p> <p>Neither Oldelft Benelux B.V. and its subsidiaries nor anyone else who has been involved with the development, production or delivery of the documentation be liable for any special, incidental or consequential damages, whether based upon breach of warranty, breach of contract, negligence, strict liability in tort or any other legal theory.</p> <p>This manual was originally drafted in the English language.</p> |
| Note: | <p>Any serious incident with the user and/or patient that has occurred in relation to the device should be reported to the manufacturer and the competent authority of the Member State in which the user and/or patient is established.</p> |

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1 Introduction

1.1 About this manual



The Trauma DR plus is a multifunctional X-ray unit. In this manual it is assumed that the operator is a professional and trained X-ray user, who has gained sufficient knowledge to operate the Trauma DR plus safely.

This user manual is a guide for the operator of the Trauma DR plus multifunctional X-ray unit. In this manual it is assumed that the operator is a professional and trained X-ray user, who has gained sufficient knowledge to operate Trauma DR plus system safely.

In particular this document describes the daily operation and interpretation of the user interface for the Trauma DR plus.

1.2 Classification

Trauma DR plus is classified according to Class I type B.

| | | |
|--|--|--|
|  | This mark indicated that this is CLASS I Equipment according to EN60601-1. | Equipment with two levels of protection against electrical shock. - Basic insulation of live parts and touchable conductive casing. - Earth connection of touchable conductive casing. |
|  | This mark indicated that this is a Type B Applied Part according to EN60601-1. | No Electrical contact with Patient and the patient can be immediately released from the Wall Stand or Patient Table. |

The system meets the relevant provisions of the European Medical Device Directive 93/42/EEC.

1.3 Reference manuals

| | |
|--------------|--|
| Note: | This document complements the reference manuals provided with this system and cannot replace these manuals. The user should therefore take note of the reference manuals, especially the safety rules before using the system. When this document and the reference manual differ, the reference manuals are considered as leading. |
|--------------|--|

- GMM: User Manual Trauma DR Ceiling Stand
- Canon: Operation Manual CXDI Control Software NE
- Canon: User's Manual CXDI-710C Wireless
- Canon: User's Manual CXDI-410C Wireless
- Canon: User's Manual CXDI-810C Wireless
- CPI: Operation Manual CPI "MINI-CONSOLE" CONTROL UNIT
- CPI: Operation Manual for Canon Single Console CXDI NE

1.4 General description/indications for use

The Trauma DR+ is a multifunctional X-ray system equipped with a ceiling suspended trauma arm.

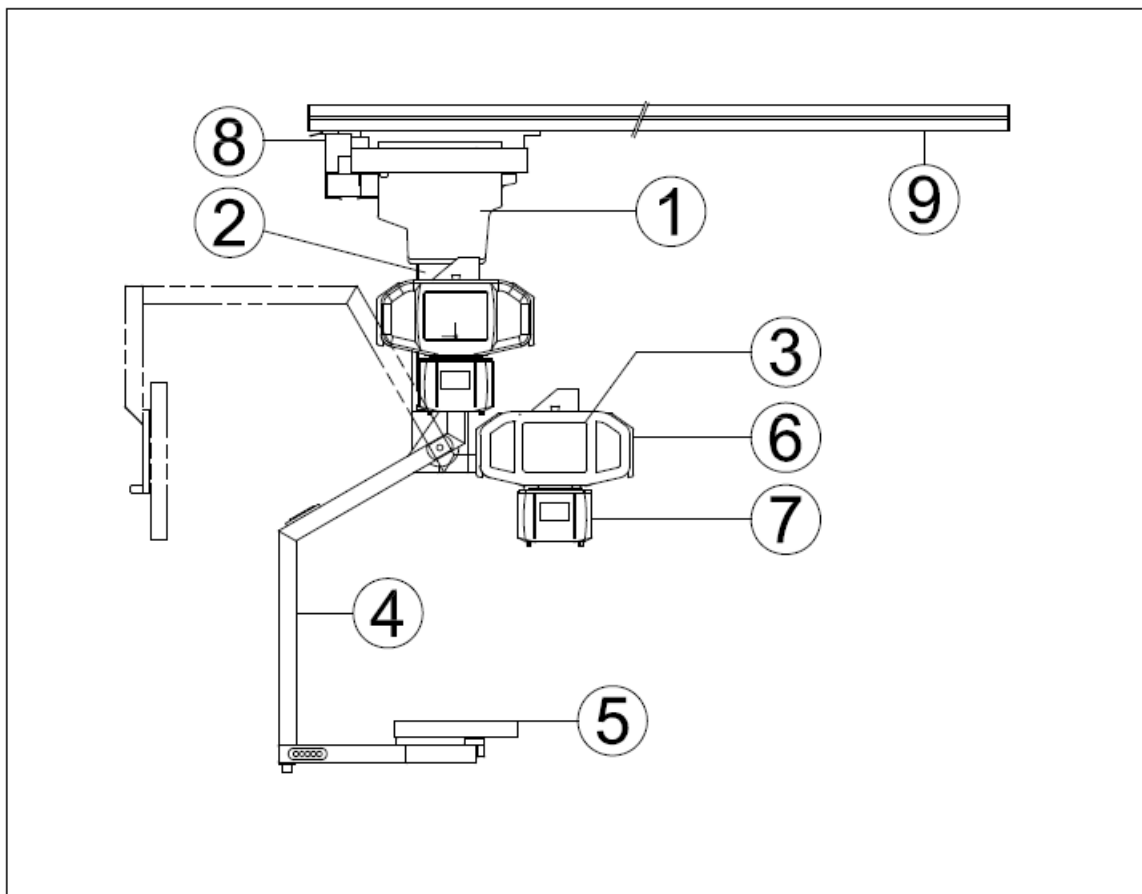


Figure 1: Trauma arm

| | |
|---|----------------------------|
| 1 | Carriage |
| 2 | Telescope |
| 3 | Handlebar |
| 4 | C-Arm |
| 5 | Detector |
| 6 | X-ray tube |
| 7 | Collimator unit |
| 8 | Transversal bridge |
| 9 | Longitudinal support rails |

The Control Computer is controlling the X-ray line. Depending of the Patient's body part the Control Computer configures the generator, X-ray tube and detector. When Patient data is filled in, the patient, X-ray tube and detector are positioned the operator can take an image by pressing the exposure button.

Depending on the configuration the Trauma DR plus system may contain the following sub-systems:

- The Trauma DR plus
- X-ray equipment and detectors (separate manuals)
- The Control Computer (separate manuals)
- Optional PACS and Diagnostic Viewing Station (separate manuals)
- Optional printer (separate manuals)
- Optional UPS/battery system (separate manuals)

1.5 Intended Purpose and Patient population

- Intended Purpose: The Trauma DR plus is a diagnostic X-ray system intended for imaging anatomical features.
- Intended indication: General Radiography.
- Intended Users: Trained professional radiographers.
- Intended environment: Dedicated X-ray room, in medical institutions.
- Patient Population: There are no restrictions in patient population.

1.6 Physical description

In this paragraph only the Trauma DR plus main hardware items are described. These are:

- Trauma arm
- Control Computer
- X-ray Tube
- X-ray Generator and Control Panel
- Collimator

The Trauma DR plus operates without X-ray film: the X-ray image is captured with the X-ray detector and stored in digital memory. Digitized images are stored as DICOM 3.0 compatible files on a local hard disk (short term) and automatically via a network link to the PACS and diagnostic viewer station.

After positioning the patient, the operator prompts the Trauma DR plus to make an X-ray exposure. Before the actual X-ray exposure can be made the patient's data have to be entered on the control computer. After patient data is entered the X-ray exposure is taken.

1.6.1 Trauma Arm

The Trauma Arm Holds the X-ray tube, collimator and detector. The Trauma Arm has many freedoms of movements to position the X-ray tube in almost all positions relative to the Patient Table. This allows for a wide range of radiological exams. The Trauma Arm is designed in such a way that in all positions patient placement is flexible and no cables or frames are in the way.

1.6.2 Control computer

The control computer is used to operate the detector and X-ray unit. The system comes with a wide range of preconfigured protocols for an optimal image quality. By selection of a protocol the correct X-ray settings (kV, mA and mS) are automatically set. The Automatic Exposure Control (AEC) will give the most optimal image quality at the lowest possible patient dose. The Control computer is also used to temporarily store the X-ray images. It is interfaced via a network to the PACS and Diagnostic Viewing stations.

The control computer is the controlling device for the Trauma DR plus rather than a means for advanced diagnostics, which would require very high resolution/brightness as in fast viewing stations. These are beyond the scope of this manual.

The control computer offers a graphical user interface to perform the following functions:

- Input of patient data, either directly (touch screen) or via import from peripheral systems (network, barcode scanner)
- Control of X-ray detector (Data acquisition, post processing and display)
- Control of X-ray unit (kV, mA and mS settings)
- Database management for patient data and related X-ray images
- Export of digital X-ray images to peripheral systems (network)

Radiation on/off switching is controlled by the Control computer and X-ray generator interface but always executed by the two stage exposure switch. Generator technique settings are controlled by the control computer. However Radiographers should follow well-known guidelines and procedures for operating the X-ray generator and are supposed to have read and understood the manufacturer's instructions for that device.

**Advice to consult the accompanying documentation:**

- Operation manual HF generator.

1.6.3 X-ray Tube unit


The X-ray tube unit consists of an X-ray tube, a filter unit and a collimator unit.

The filter unit contains a rotating disc with four types of X-ray filters.

The Collimator is used to collimate, limits the X-ray field to the Field of interest.

1.6.4 X-ray generator and control panel

The X-ray generator has its own documentation.

| | |
|---|--|
|  | <p>Advice to consult the accompanying documentation:</p> <ul style="list-style-type: none">• Operation manual HF generator. |
|---|--|

A two-step radiation exposure switch is connected to the (mini) generator interface panel. The following functions are available on the generator control panel:

- Switching the X-ray system ON or OFF
- Exposure switch and indicator (audible). Starting X-ray radiation.

1.6.5 Collimator unit

The collimator unit comprises an adjustable diaphragm and a field illumination indicator.

The adjustable diaphragm has two setting knobs: one to adjust two vertical shutters for symmetrical lateral adjustment, the other to move the horizontal shutters to adjust vertical field size.

The field illumination indicator delineates the total extent of the field to be exposed. It can be switched on and off by a push button. If left on, the light will turn off automatically.

1.6.6 Exposure interval

The actual exposure starts when the two stage exposure switch is pressed. The AEC automatically switch of the radiation as soon as the desired dose is measured by the system.

2 Safety precautions

2.1 General Warnings

The Trauma DR plus and X-ray line are equipped with safeguards to prevent injury to operator and patient during normal use and in case of system malfunctions. For the safeguards of the system parts refer to the corresponding documentation.

See par.: Reference manuals



The Trauma DR plus is a combination of subsystems that are built to work together.

All subsystems have accompanying technical documentation we advise to consult before starting repair or maintain the system.

In case of equipment malfunction, bring the patient into safety and seek the assistance of a qualified technician.

CAUTION:

Make sure that the operator always will remain in audio and visual contact with the patient when performing the X-rays in the safe zone.

2.2 Radiation precautions

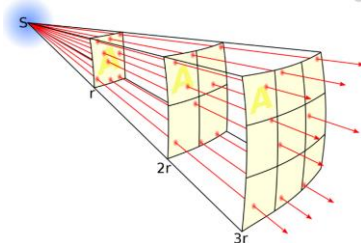
The X-ray equipment must be used in the radiological diagnosis by qualified personnel, who knows exactly what the risks are inherent in systems that use ionizing radiation and is able to take the necessary protective measures.

- The regulations and laws in force in the various countries for the type of equipment considered to be observed by the operator/user.
- The X-ray equipment must be operated only in areas designated for x-ray systems and for medical use (refer to local regulations).
- Operator and staff must only control the x-ray equipment from protected areas. There are no x-ray procedures requiring the Operator or staff to be in the x-ray room. All procedures can be operated from the control room (protected area), protected by lead window, lead walls or equivalent.
- To exclude the possibility of expose for patients to levels where deterministic effects may occur, an overall backup timer or the Body Part backup timer terminates the irradiation.

ALARA is a philosophy of excellence used in one's day-to-day work with radiation sources. It is when one strives to keep one's radiation exposure **As Low As Reasonably Achievable**.

In general, the dose for Operators and Staff can be reduced by the following means:

- Protection by distance
Square law: At large distances from the source, the dose is distributed over larger and larger spherical surfaces as the distance from the source increases. After all, the dose decreases square with the distance.



- Protection by shielding
All procedures can be operated from the control room (protected area), protected by lead window, lead walls or equivalent.

Patient Dose

When not using the AEC it is important to maximize the SID to minimize the patient radiation dose. The square law applies also for the patient dose as explained above.

2.3 Biocompatibility

To prevent infections, clean all parts of the equipment that are touched by the patient, before the next patient is examined. Do this according the instructions in par.: *Cleaning*

2.4 Moving the system


The Trauma DR plus Ceil stand can be moved by hand force or can also be moved motorized.

In order to prevent any possible collision, maintain a free area around the units. The manuals, should be studied to learn about the working zones and the limits of the device and to understand the risks of collisions when the unit is used with other devices and risks when used within the environment in which it is located.

| | |
|--|--|
|  WARNING: | When moving the system by hand or motorized be alert to patients and objects in the direction of movement so that no collision can occur. |
|--|--|

2.4.1 Emergency stop

The Emergency stop is located on top of X-ray tube. In case of an Emergency situation, the activation of the push-button will turns off the Trauma Arm's motorized movements. Once the emergency situation has been controlled, the pushbutton can be reset by twisting it in a clock-wise direction to reset the controller system and return to normal operations.

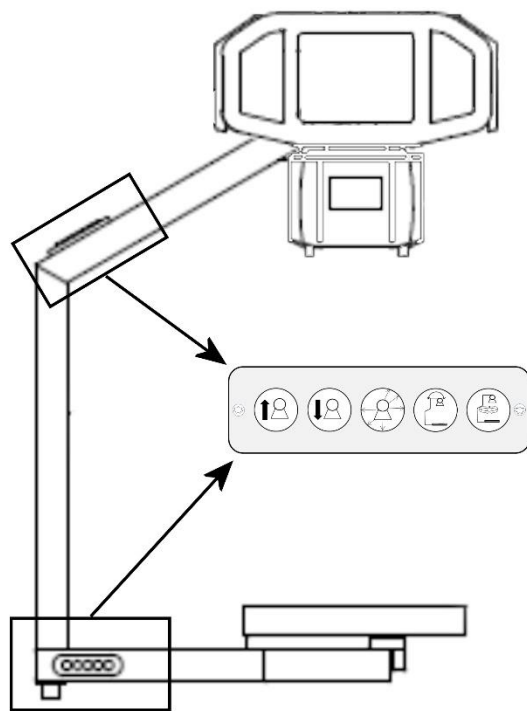
| | |
|--|---|
|  WARNING: | This emergency stop control will not shut off the power to the interfaced equipment. Use the room emergency stop control for emergency situations. |
|--|---|

2.5 X-ray interlock

The Canon detector and X-ray generator are equipped with X-ray interlocks preventing the user from accidentally making exposures. Please refer to the appropriate service manuals for a detailed description.

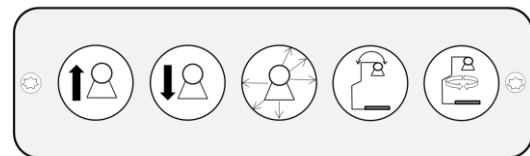
3 Operating controls

The Trauma Arm can be moved in all directions by hand force except for up and down movement. In order to prevent any possible collision, maintain a free area around the units. The manuals, should be studied to learn about the working zones and the limits of the device and to understand the risks of collisions when the unit is used with other devices and risks when used within the environment in which it is located.








The trauma arm contains two button groups which are conveniently positioned for AP position and for Lateral position.

Both button groups are identical but the order of buttons can be different as described here.



Movement buttons

Figure 2: Trauma arm with location of the movement buttons

| Symbol | Description |
|---|-----------------------|
|  | Motorized up |
|  | Motorized down |
|  | X and Y brake release |
|  | AP-Lateral rotation |
|  | Z-axis rotation |



It is the operator's responsibility to observe movements carefully with the trauma arm. The system has a collision detection when motorized down is being used, but all mechanical movements and motorized up do not have collision detection.

It is not allowed to use the trauma arm as a tilting device!

3.1 X-ray tube display

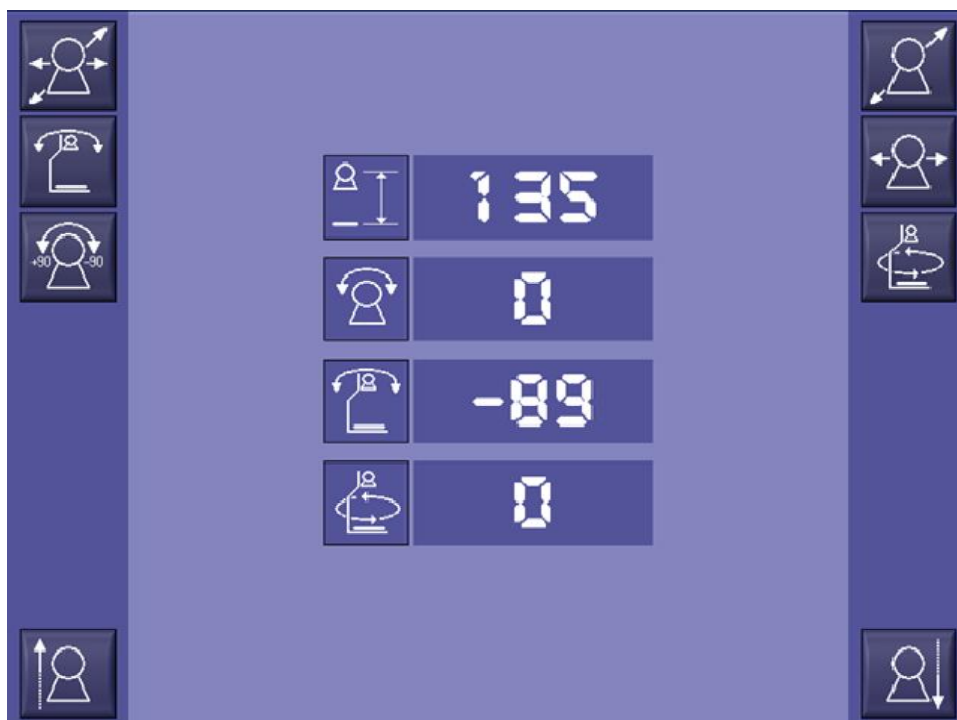




















Figure 3: Tube Display

| Touch handles release break mode | | |
|---|---|--|
| Symbol | Description | |
|  /  | X and Y movement disabled / enabled | |
|  /  | AP-Lateral horizontal rotation disabled / enabled | |
|  /  | Tube rotation disabled / enabled | |
|  /  | Push – pull movement disabled / enabled | |
|  /  | Left- right movement disabled / enabled | |
|  /  | C-arm Vertical axis rotation disabled / enabled | |
|  /  | Motorized up / down | |
|  135 | Information: SID | |
|  0 | Information: Alpha angle | |
|  -89 | Information: Horizontal angle | |
|  0 | Information: Vertical angle | |

3.2 Tube handles

The left and right side of the tube display contains handles to move the tube manually. Each tube handle contains three touch sensors at the back of the handle. If a person grabs one or both handles the sensors are being triggered, and the brakes, as set with the touch handle release break mode, will be released.

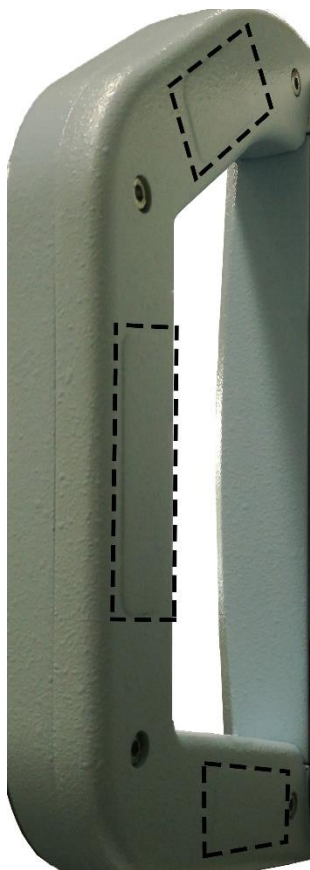


Figure 4: Sensors at the back of the tube handle

3.3 Detector case with anti-scatter grid

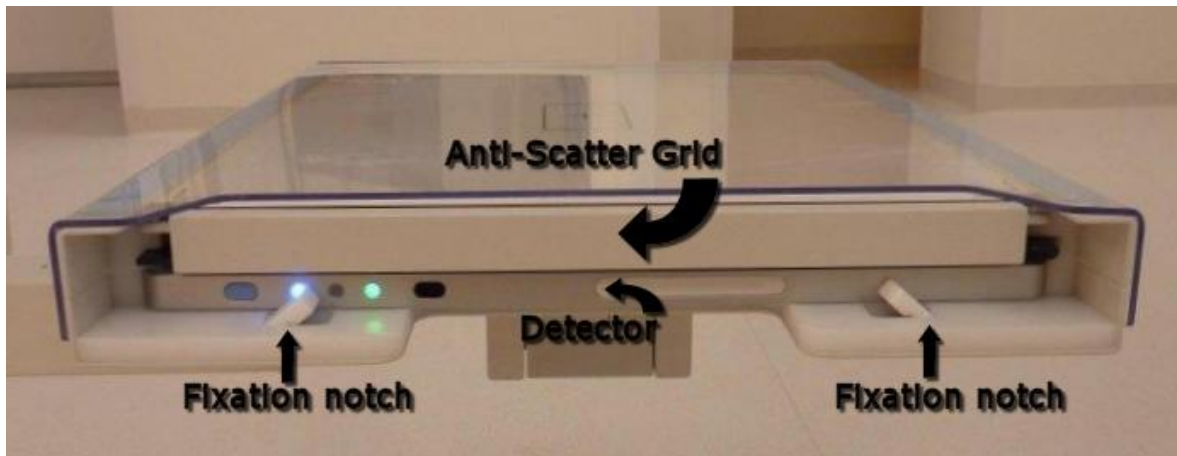


Figure 5: Detector Case with anti-scatter grid and detector

The detector case holds the detector and the anti-scatter grid. Pressing the grid bar will release the grid; press again to lock the grid.

The detector is being fixed by fixation notches to prevent the detector falling out of the detector case when rotated. Press both notches to release the detector. When inserting the detector shift the detector beyond the notches till they lock the detector.

It's advisable to insert the detector as shown on the image with the signal lights facing outside. This way the operator can check the status of the detector and can switch on or off the detector while inserted. It's possible that protocols have to be optimized for orientation.

3.4 X-ray generator control panel

The description in this paragraph applies to the CPI MP200 generator with a special interface to the Trauma DR plus system. For more details, see the documentation of the X-ray generator.



Advice to consult the accompanying documentation:

- Operation manual HF generator.

The X-ray unit may be dangerous to the patient and operator unless safe exposure factors and operating instructions are observed.

The generator mini control panel contains various indicators and controls. The relevant controls are:

- Switching the X-ray system ON or OFF
- Exposure switch and indicator (audible). Starting X-ray radiation.

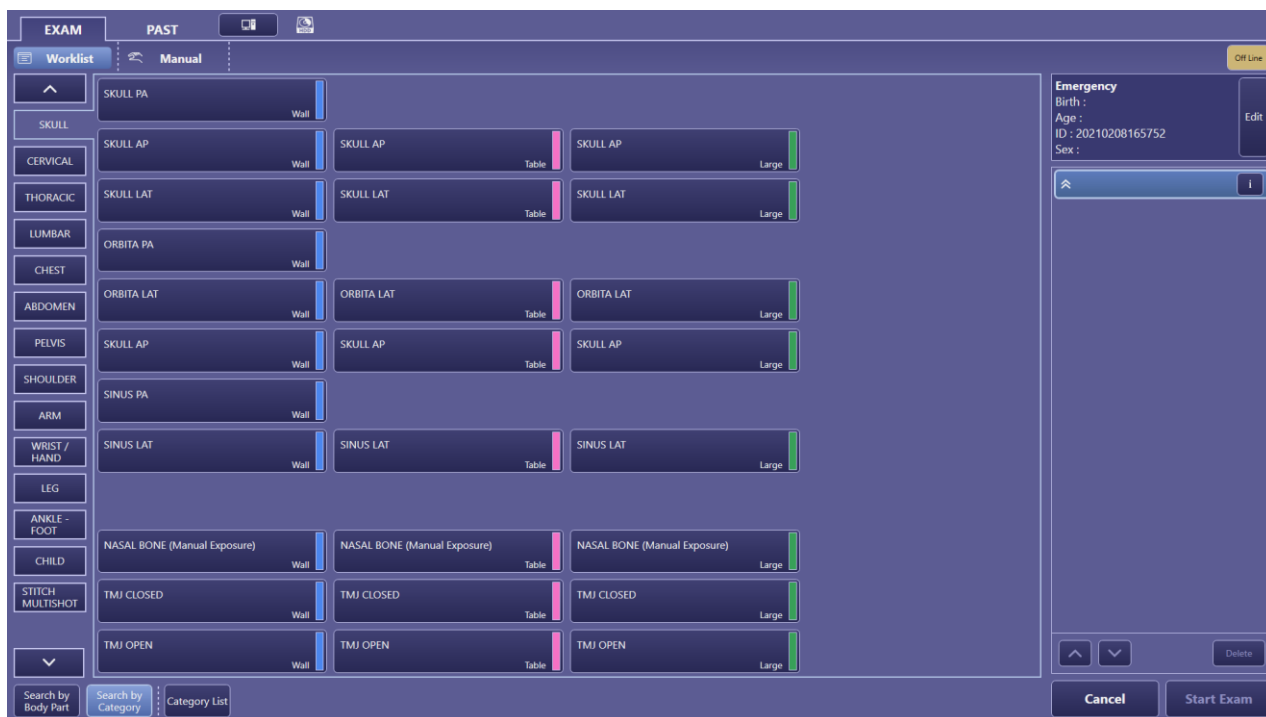
3.5 The user interface of control computer

Note:

Canon Inc. is the legal manufacturer of the CXDI Control Software used on the Trauma DR plus Acquisition/Control Computer.

The control computer is operated by;

- Touch screen buttons, or mouse



3.6 Wireless detector

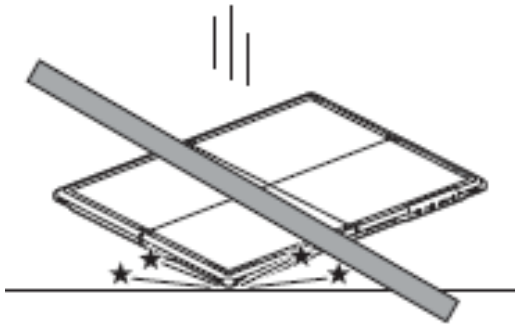
3.6.1 Handling

- Do not touch conductive parts of this equipment and the patient simultaneously. Otherwise, electric shock may result.
- Do not spill liquid or chemicals onto the equipment or, in cases where the patient is injured, allow it to come in contact with blood or other body fluids. Doing so may result in fire or electric shock. The detector is protected against dust (at the level of IP5X*) and liquids (at the level of IPX4**).

** Ingress of dust is not totally prevented, but dust shall not penetrate in a quantity to interfere with satisfactory operation of the apparatus or to impair safety (Dust protected). The equipment is protected so that specified operations and safety are not impaired even if the equipment is exposed to dust (75 µm in diameter) and dust gets inside the equipment and is left for eight hours.*

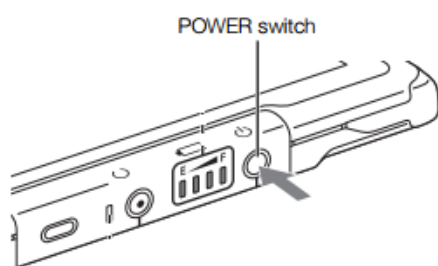
***Water splashing against the enclosure from any direction shall have no harmful effect (Protected against splashing water). There are no damaging effects when the equipment is sprayed with water from spray nozzles located in any direction at a pressure of 50 to 150 kPa by the 10 liter per minute over 5 minutes on the equipment.*

- Handle the equipment carefully as it is precision equipment. The inner device may be damaged if something hits against it, or if it is dropped, or, receives a strong jolt.








- Be sure to use the equipment on a flat surface while using it in horizontal position. If the detector is set on a diagonal and pressure is applied to it, the inner device may be damaged.
- Be sure to securely hold the equipment while using it in upright positions. Otherwise, the equipment may fall over, resulting in injury to the user or patient, or may flip over, resulting in damage to the inner device.
- Do not place excessive weight on the equipment. Do not use the equipment in a manner that will subject it to local loads of 100 kg or more. If the load exceeds the limit, the inner device may be damaged.
- Do not touch the electrode terminals of the equipment and the battery pack.

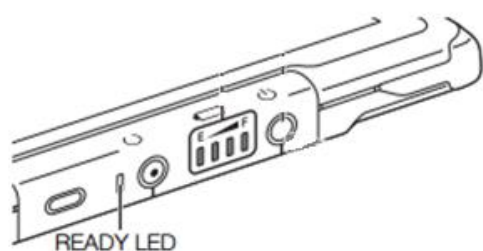
3.6.2 Detector



Press and hold the POWER switch (for at least 0,5 seconds) to turn the power on. The Power LED will light up.

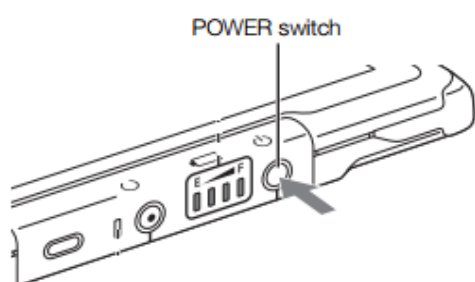
| Power LED |  |  |  |  |  |
|--------------------------|---|---|---|--|---|
| Remaining battery charge | 76% to 100% | 51% to 75% | 26% to 50% | 5% to 25% | 0% to 4%* |

The Power LED to show the remaining battery power



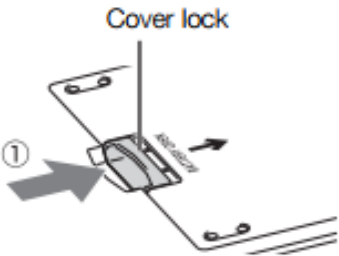
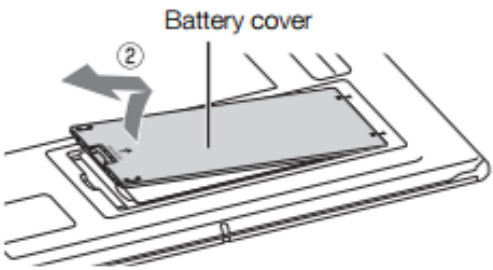
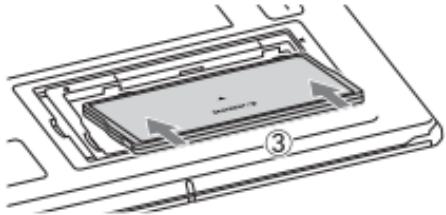
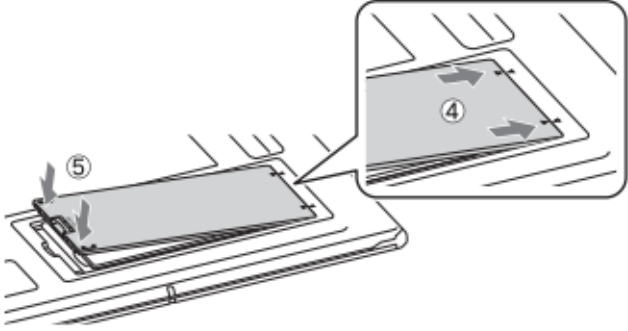
The ready LED to show whether the detector is ready to capture images

- Lights continually when detector status is "Ready"; exposure is possible.
- Flashes before exposure when the detector is in the "waiting" status.

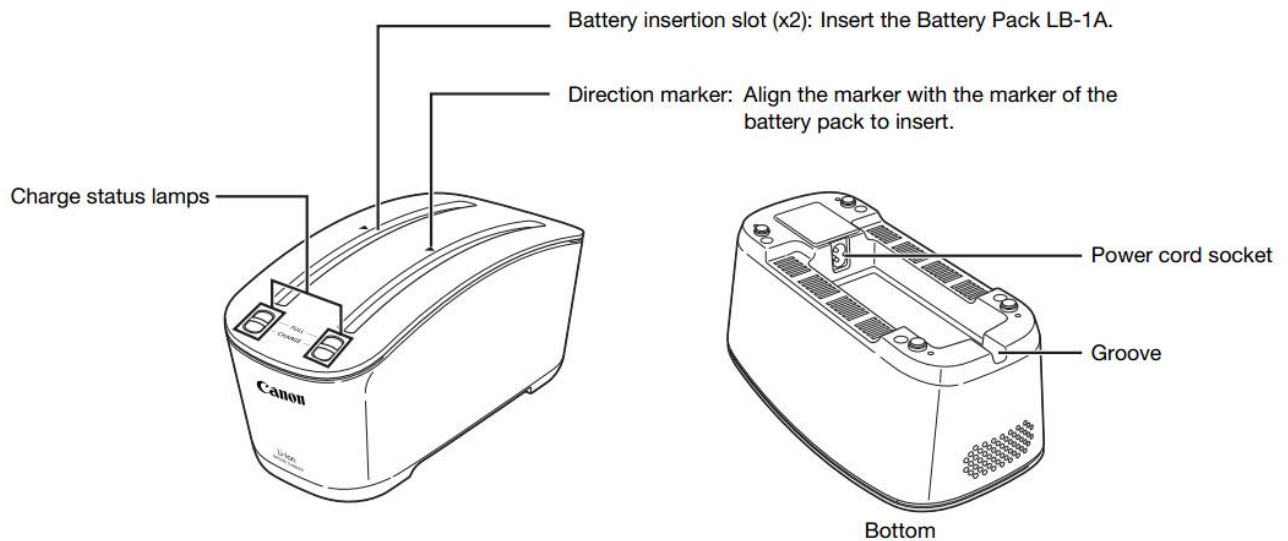


To switch off: press and hold the power switch till the Power LED extinguishes.

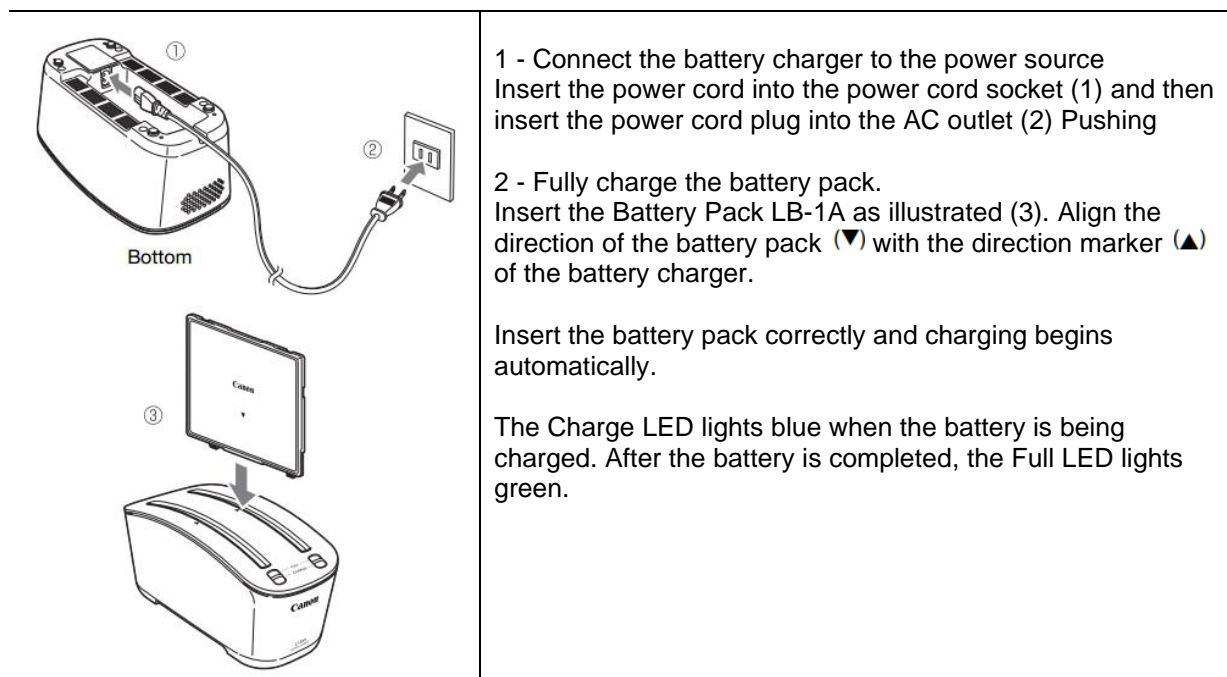
3.6.3 Battery pack

| | |
|--|---|
|  | <p>1 - Press and hold the battery cover lock to release the lock.</p> |
|  | <p>2 - Lift up and pull out the Dust protected battery cover</p> |
|  | <p>3 - Insert the battery pack fully</p> |
|  | |
| <p>4 - Insert the battery cover fully 5 - Press down on the front of the battery cover to lock it.</p> | |

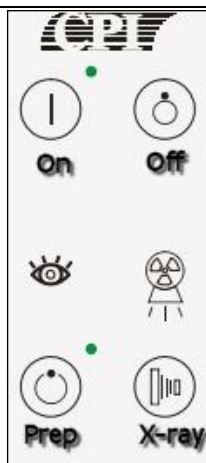
3.6.4 Battery pack charger



| | |
|--------------|---|
| Note: | <p>Fully charge the battery pack the first time it is used.</p> <p>The battery discharges gradually. The battery pack should be charged no more than two days before use.</p> |
|--------------|---|



3.7 Generator mini console with external exposure button



Generator mini console

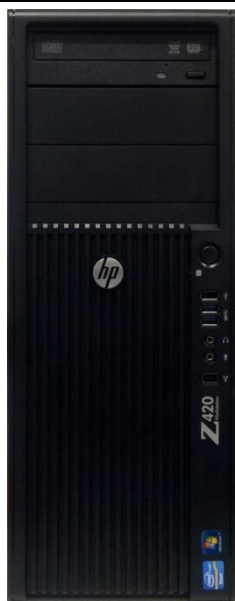
The generator mini console operates the X-ray generator.

The mini console contains an on and off button and a prep and exposure button.

Two indicators can light up during fluoroscopy or exposure.

All exposure settings, like kV, mAs or density are controlled within the acquisition software.

3.8 Acquisition Computer with CXDI NE software



Acquisition computer

The acquisition computer contains the CXDI software necessary for controlling the Trauma DR plus.

3.9 Touch Screen

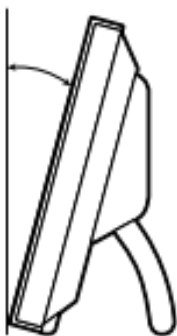
| | |
|--|--|
|  WARNING: | This monitor is not for diagnostic purposes. Use for diagnostics one Dicom Calibrated Diagnostic Workstation. |
|--|--|



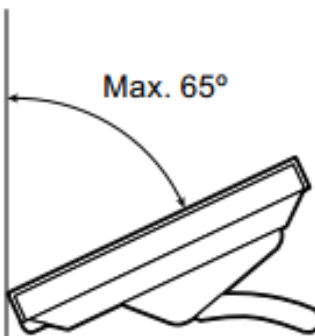
Touch Screen

The acquisition computer contains the CXDI software necessary for controlling the Trauma DR plus.

Min. 15°



Max. 65°



The touch screen can be tilted to angles of 15°, 25°, 35°, 45°, 55°, and 65°

4 Operating Instructions

| | |
|--------------|--|
| Note: | When the system is on 24/7 it is recommended to restart the system once a day for cleaning up computer memory and automatically save the database. First turn on the x-ray generator and then the acquisition computer. |
|--------------|--|

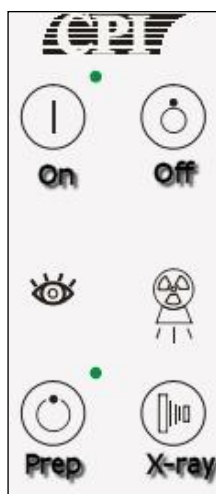
4.1 Powerup and Startup the system

Powerup the system

The Ceiling Stand does not have an on-board power switch. This equipment should normally be connected to the x-ray generator. The X-ray generator is connected to an independent circuit breaker switch located in the main electrical panel of the examination room. This switch should be placed into the RUN position to power the equipment ON.


Startup the system

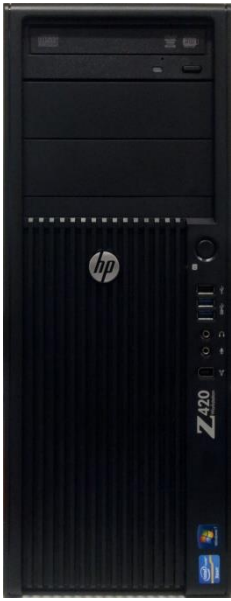
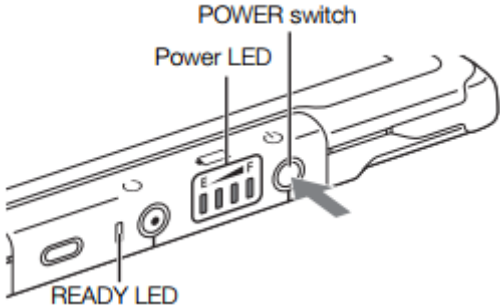
Turning on the x-ray generator



The generator mini console is a small box with on the upper side the on and off button and on the lower side the prep and exposure button.

In the middle there are indicators for fluoro and exposure when active the indicator will light.

Turn on the generator by pressing .

| Turning on the Acquisition computer | Turning on the detector |
|---|--|
|  |  |
| <p>Turn on the acquisition computer by pressing the power button.</p> | <p>Turn on the wireless detector by pressing and holding the Power switch. Release when power led lights up.</p> |

4.2 Tube warmup

To prolong the life of the X-ray tube it is important to warm-up the X-ray tube every day on the start of the day.

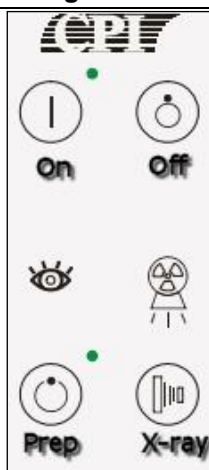
- Start an Emergency Patient.
- Select protocol: Tube warm-up in the Service: QA Category and click on Start Exam.
- Make 3 X-rays with the collimator fully closed with 30 seconds in between each X-ray.
- Click on Cancel. No images are captured; therefore, no images will be sent.


4.3 Shutdown and Power down the system



Shutdown the system

| | |
|--------------|---|
| Note: | Before turning off the system park the system in its parking position. When the power is off the system cannot be moved. |
|--------------|---|

Turning off the x-ray generator



Turn off the generator by pressing .

Turn off the acquisition computer by selecting  and . The computer will shut down automatically. The monitor will go standby.

Turn the detector off by pressing and holding the power button till the power led extinguishes.

| | |
|--------------|--|
| Note: | Before switch off the main power, first bring down the equipment in the right sequence as described before. |
|--------------|--|

Turn Off main circuit breaker

Switch off the main circuit breaker for the Trauma DR plus (depending on installation). This main circuit breaker is not a part of the Trauma DR plus and generally located on the power distribution panel from the hospital. The location of the power distribution panel is depending of the Installation.

4.4 CXDI Software

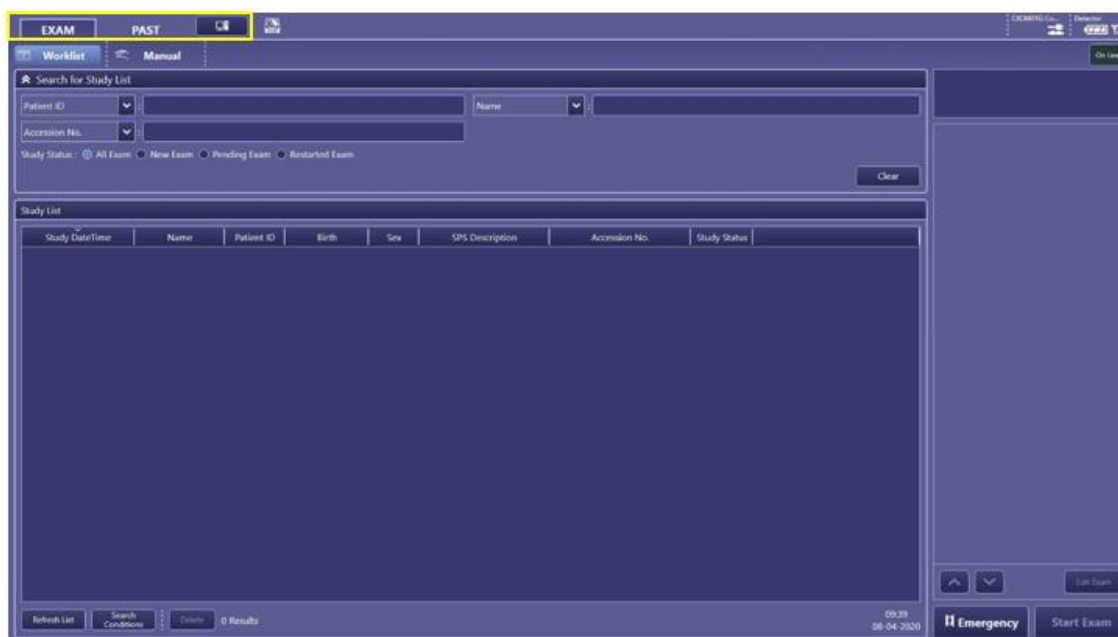
4.4.1 Logging in




It is possible to login to the CXDI software by entering the User Name and the Password and by clicking on Log In.

| | |
|--------------|--|
| Note: | User and Log In setup will be done in consultation with the User and will be implemented during the application training. |
|--------------|--|

4.4.2 Main screens

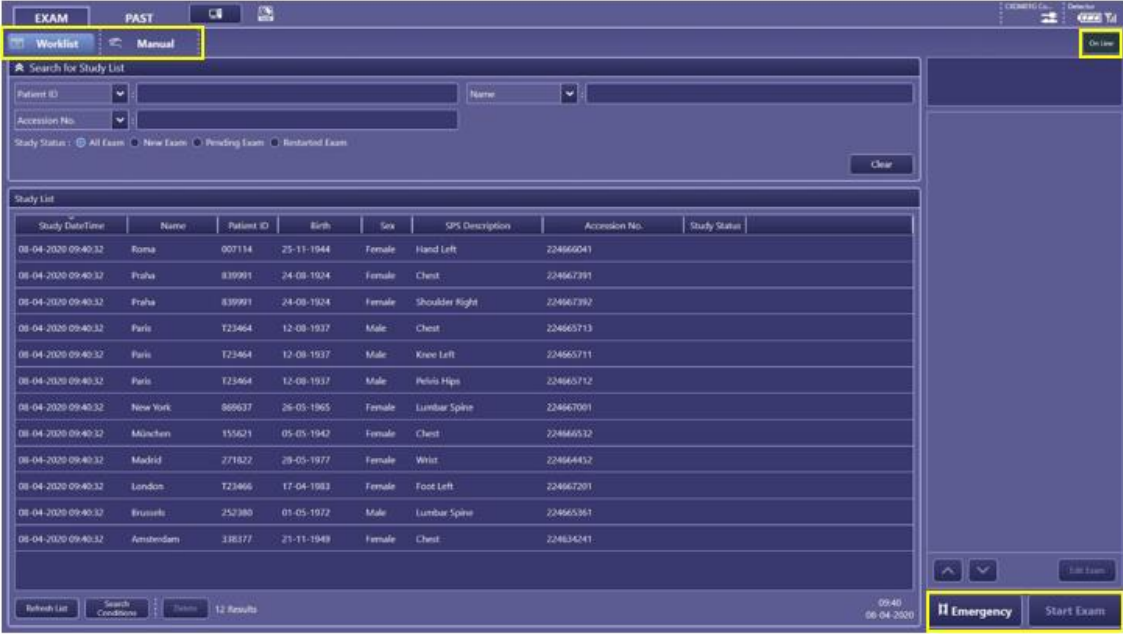


The user interface contains 3 main screens. Each main screen can be called from the upper left side of the screen.




| | |
|---|---|
| EXAM | Worklist and manual input for image acquisition. |
| PAST | Patients who have been examined previously. |
|  | To enhance easy reading this manual calls this screen the “system” screen. Here it is possible to adjust system settings, log out or shutdown the system. |

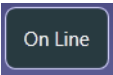
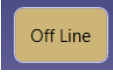
4.4.3 Exam screen

In the Exam screen it is possible to perform the examinations. There are three workflows for doing this:

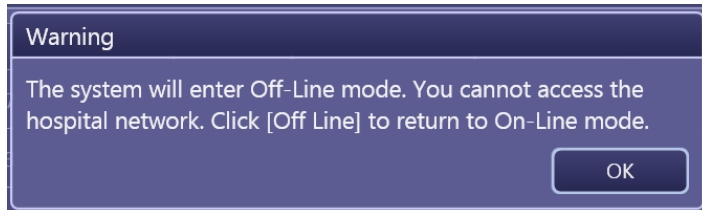


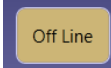
| Study Date/Time | Name | Patient ID | Birth | Sex | SPS Description | Accession No. | Study Status |
|---------------------|-----------|------------|------------|--------|-----------------|---------------|--------------|
| 08-04-2020 09:40:32 | Roma | 007114 | 25-11-1944 | Female | Hand Left | 224665041 | |
| 08-04-2020 09:40:32 | Praha | 839991 | 24-08-1924 | Female | Chest | 224667391 | |
| 05-04-2020 09:40:32 | Praha | 839991 | 24-08-1924 | Female | Shoulder Right | 224667392 | |
| 08-04-2020 09:40:32 | Paris | 723464 | 12-08-1937 | Male | Chest | 224665713 | |
| 08-04-2020 09:40:32 | Paris | 723464 | 12-08-1937 | Male | Knee Left | 224665711 | |
| 08-04-2020 09:40:32 | Paris | 723464 | 12-08-1937 | Male | Pelvis Hips | 224665712 | |
| 08-04-2020 09:40:32 | New York | 869637 | 26-05-1965 | Female | Lumbar Spine | 224667091 | |
| 08-04-2020 09:40:32 | München | 155621 | 05-05-1942 | Female | Chest | 224665532 | |
| 08-04-2020 09:40:32 | Madrid | 271822 | 29-05-1977 | Female | Wrist | 224664432 | |
| 08-04-2020 09:40:32 | London | 723466 | 17-04-1983 | Female | Foot Left | 224667201 | |
| 08-04-2020 09:40:32 | Brussels | 252380 | 01-05-1972 | Male | Lumbar Spine | 224665361 | |
| 08-04-2020 09:40:32 | Amsterdam | 338377 | 21-11-1949 | Female | Chest | 224634241 | |

- By working with a worklist  **Worklist**
- By working with manual patient input  **Manual**
- By doing an Emergency examination  **Emergency**

| | |
|---|---|
| Note: | <p>The system can work in Online and Offline mode.</p> <p>During Offline mode the acquisition computer does not refresh the worklist and acquired images will not be send to a destination, PACS or DICOM printer.</p> |
|  | <p>The system is Online and connected to the hospital information system and destinations. The worklist will be retrieved and when an exam has been ended, the acquired images are being sent automatically when a destination has been set.</p> |
|  | <p>The system is Offline, not connected to hospital information system and destinations. The worklist will show the last patient list at the time the system is set to offline. Acquired images will stay in queue to be sent to their destinations when the system has been set to Online.</p> |

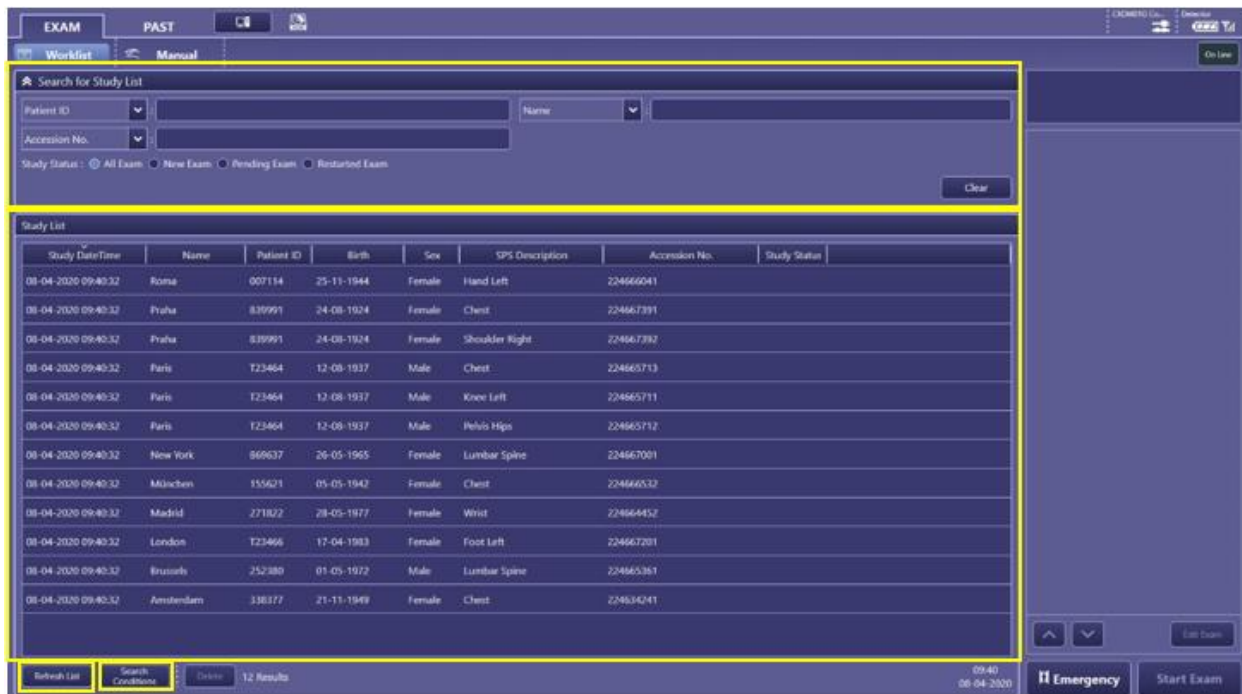
The system will show the following warning when entering offline mode:



It is possible to enter the On-Line mode again by clicking on .

4.4.4 Worklist

In the worklist screen all patients who match the search conditions are retrieved from the worklist server and will be shown in the Study List.

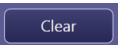




In the "Search for Study List" it is possible to filter the worklist by:


- Patient ID
- Name
- SPS Description
- Accession No.


It is also possible to filter by “Study Status”:

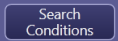
| | |
|---|--|
| <input checked="" type="radio"/> All Exam | All Exams are shown |
| <input type="radio"/> New Exam | Only current worklist patients are shown |
| <input type="radio"/> Pending Exam | Only pending exams are shown |
| <input type="radio"/> Restarted Exam | Only restarted exams are shown |

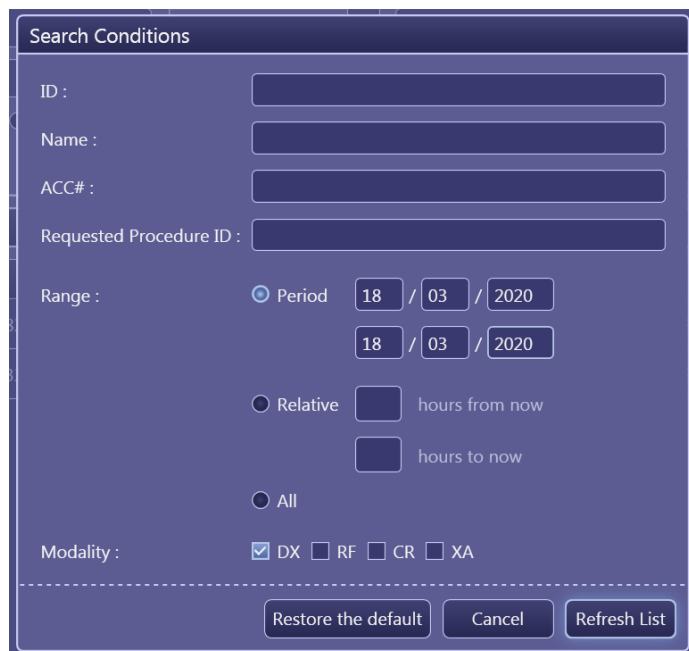
By clicking on  all filters will be cleared, by clicking on  it is possible to fold in the Search for Study List and by clicking on  it is possible to fold out the Search for Study List.

The different information columns (Study Date Time, Name, Patient ID etc.) in the Study List are adjustable in order, width and sorting.

- To change the order of a column: select the column name and drag the column to the desired place while keeping the left mouse button pressed
- To change the column width: select the column separator, when the mouse pointer changes in  press the left mouse button to drag and change the width.
- To change the information column on which the study list is sorting: click on the desired column. By clicking a second time on the column it is possible to change the sorting order, for instance from A to Z or from Z to A.

It is possible to refresh the Study List by clicking on  in the bottom left corner. This is only possible in Online mode; if the Offline mode is active this button will be greyed out.


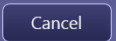

By clicking on  it is possible to change the following search conditions:




The 'Search Conditions' dialog box contains the following fields and options:

- ID :
- Name :
- ACC# :
- Requested Procedure ID :
- Range :
 - ☒ Period / /
 / /
 - ☐ Relative hours from now
 hours to now
 - ☐ All
- Modality : ☒ DX ☐ RF ☐ CR ☐ XA

At the bottom are three buttons: 'Restore the default', 'Cancel', and 'Refresh List'.



- By clicking on  the default settings will be restored. This will happen automatically by logging out.
- By clicking on  all changes will be cancelled.
- By clicking on  the net search conditions will be used to refresh the study list.

4.4.5 Worklist workflow

After selecting a patient from the worklist, start the examination by clicking on . When the patient has multiple studies planned, the software will select them all.

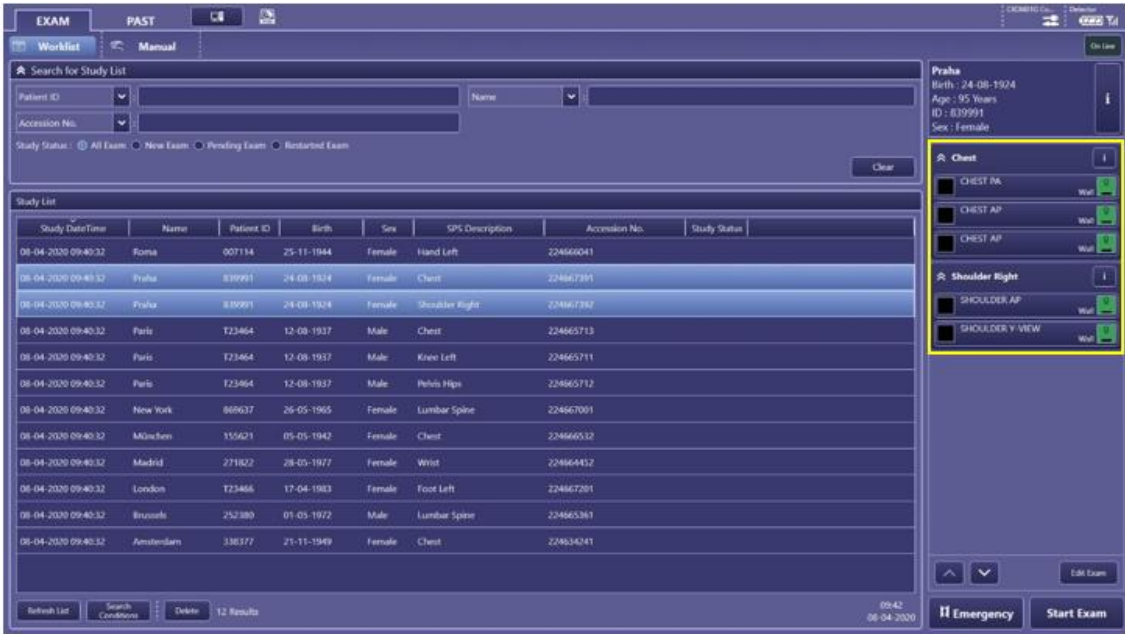
If the patient is not present in the list press refresh. Also, if not all studies aren't visible yet click refresh till all exams are present in the worklist.

When the exam is started by selecting a patient from the worklist there are two options:

- 1 - The system is programmed with prepacked protocols so studies will be filled automatically with protocols. This means the system will automatically go the exam after clicking on 
- 2 - No prepacked protocols have been added. This means you have to manually add protocols to a study after clicking on 

4.4.5.1 Prepacked protocols workflow

When prepacked protocols have been programmed the following screen will show after selecting the patient:



The screenshot shows the 'EXAM' screen with a 'Study List' table and a right-hand panel for protocol selection.

| Study Date/Time | Name | Patient ID | Birth | Sex | SPS Description | Accession No. | Study Status |
|---------------------|-----------|------------|------------|--------|-----------------|---------------|--------------|
| 08-04-2020 09:40:32 | Roma | 007114 | 25-11-1944 | Female | Hand Left | 224660041 | |
| 08-04-2020 09:40:32 | Praha | 839991 | 24-08-1924 | Female | Chest | 224667391 | |
| 08-04-2020 09:40:32 | Praha | 839991 | 24-08-1924 | Female | Shoulder Right | 224667392 | |
| 08-04-2020 09:40:32 | Paris | T23464 | 12-08-1937 | Male | Chest | 224665713 | |
| 08-04-2020 09:40:32 | Paris | T23464 | 12-08-1937 | Male | Knee Left | 224665711 | |
| 08-04-2020 09:40:32 | Paris | T23464 | 12-08-1937 | Male | Pelvis Hips | 224665712 | |
| 08-04-2020 09:40:32 | New York | 869637 | 26-05-1965 | Female | Lumbar Spine | 224667001 | |
| 08-04-2020 09:40:32 | München | 155621 | 05-05-1942 | Female | Chest | 224666512 | |
| 08-04-2020 09:40:32 | Madrid | 271802 | 28-05-1977 | Female | Wrist | 224666452 | |
| 08-04-2020 09:40:32 | London | T23466 | 17-04-1983 | Female | Foot Left | 224667201 | |
| 08-04-2020 09:40:32 | Brussels | 252389 | 01-05-1922 | Male | Lumbar Spine | 224665361 | |
| 08-04-2020 09:40:32 | Amsterdam | 338377 | 21-11-1949 | Female | Chest | 224634241 | |

Right-hand panel details for 'Praha':

- Birth: 24-08-1924
- Age: 95 Years
- ID: 839991
- Sex: Female

Protocol selection on the right (highlighted in yellow):

- Chest**
 - ☒ CHEST PA
 - ☒ CHEST AP
 - ☒ CHEST AP
- Shoulder Right**
 - ☒ SHOULDER AP
 - ☒ SHOULDER Y-VIEW

Buttons at the bottom: Refresh List, Search Conditions, Delete, 12 Results, 09:42 08-04-2020, Emergency, Start Exam.

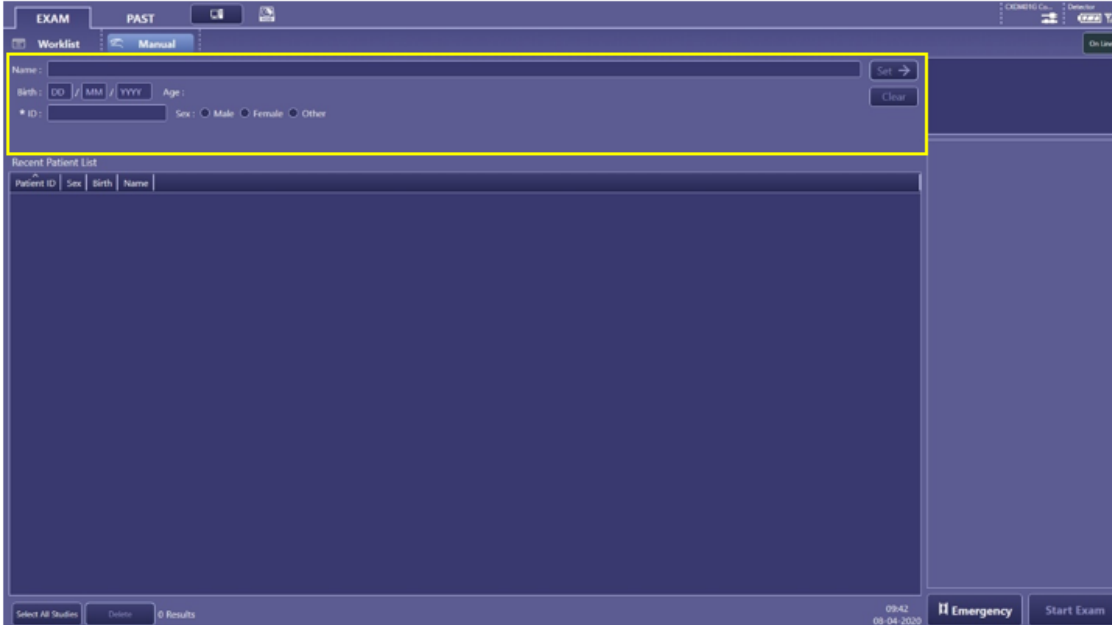
- When the prepacked protocols are sufficient for this patient you can start the exam by clicking on **Start Exam**
- When the prepacked protocols aren't sufficient for this patient you can manually add protocols by clicking on **Edit Exam**.

4.4.5.2 Manually adding protocols workflow

When no prepacked protocols have been programmed you will have to manually add protocols to the study. In chapter "Manually adding protocols" is described how you can do this.

4.4.6 Manual

In the Manual screen you can manually add patients by entering patient data. You can add multiple studies to the patient.



You can insert the patient data displayed in the top left part (Name, Birth etc.). The patient data displayed with an asterisk (*) are mandatory.

- By clicking on **Set →** you can set the entered patient data to start the examination.
- By clicking on **Clear** you can clear the entered patient data.

All manually added patients will show in the “Recent Patient List”.

| | |
|--------------|--|
| Note: | In the screen Exam → Manual all patients are being displayed which have been selected from the worklist or entered manual in the past. It is possible to select a patient from this list but keep in mind that only patient information will be used. Other information, like accession number will not be present. |
|--------------|--|

4.4.7 Manual adding patient workflow

After entering the correct patient data, the following screen will show:



In chapter “Manually adding protocols” is described how you can add protocols.

4.4.8 Adding multiple studies


You can add another study by clicking on **Add Study**. You can delete a study by clicking on **Delete**.

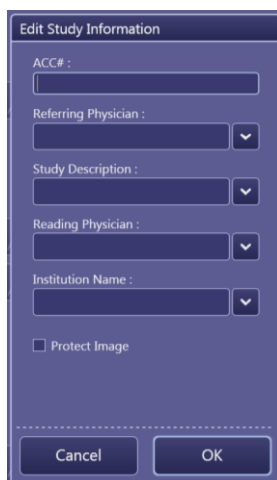



4.4.9 Editing study data

You can edit study data by clicking on . After this the following screen will show:



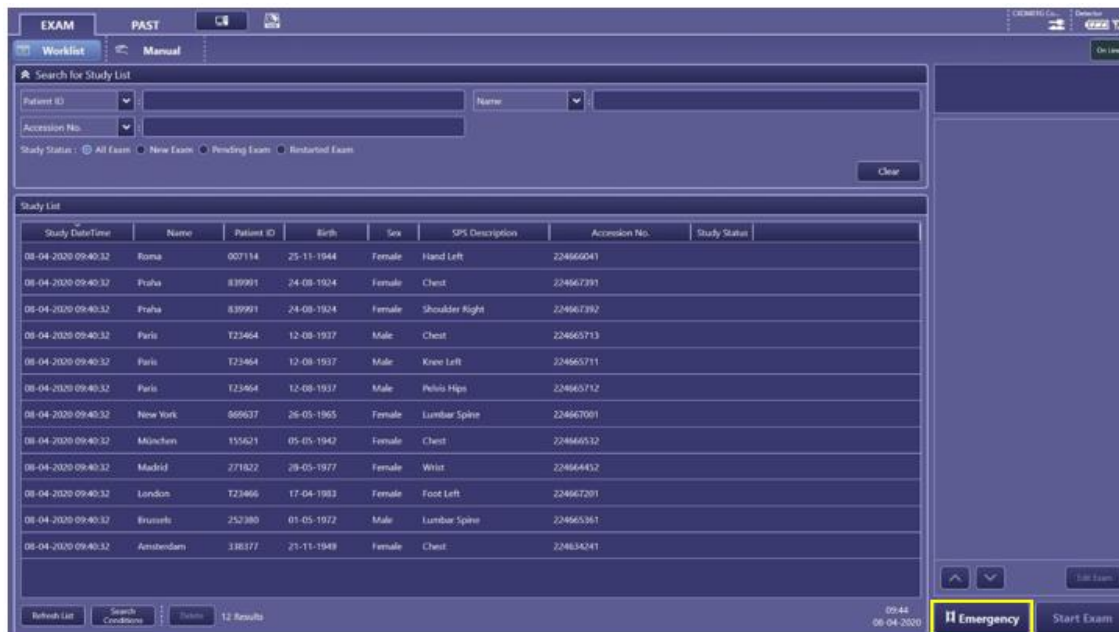
- By clicking on  the following screen will show:



- By clicking on , the study data will be added. Different data can be added to different studies.

4.4.10 Emergency

In both the Worklist screen and the Manual screen, you can perform an emergency examination when there is no patient data available. You can only add one study to a patient.



The screenshot shows the 'Worklist' screen in the DelftDI software. At the top, there are tabs for 'EXAM', 'PAST', and 'Manual'. Below these is a search bar for the 'Study List' with fields for Patient ID, Name, Accession No., and Study Status. A table of studies is displayed with columns: Study DateTime, Name, Patient ID, Birth, Sex, SPS Description, Accession No., and Study Status. The table contains 12 rows of data. At the bottom right, there is a yellow button labeled 'Emergency' and a 'Start Exam' button. The status bar at the bottom shows '09:44 06-04-2020' and '12 Results'.

| Study DateTime | Name | Patient ID | Birth | Sex | SPS Description | Accession No. | Study Status |
|---------------------|-----------|------------|------------|--------|-----------------|---------------|--------------|
| 06-04-2020 09:40:32 | Roma | 007114 | 25-11-1944 | Female | Hand Left | 224665041 | |
| 06-04-2020 09:40:32 | Praha | 839991 | 24-08-1924 | Female | Chest | 224667391 | |
| 06-04-2020 09:40:32 | Praha | 839991 | 24-08-1924 | Female | Shoulder Right | 224667392 | |
| 06-04-2020 09:40:32 | Paris | 723464 | 12-08-1937 | Male | Chest | 224665713 | |
| 06-04-2020 09:40:32 | Paris | 723464 | 12-08-1937 | Male | Knee Left | 224665711 | |
| 06-04-2020 09:40:32 | Paris | 723464 | 12-08-1937 | Male | Pelvis Hips | 224665712 | |
| 06-04-2020 09:40:32 | New York | 869037 | 26-03-1965 | Female | Lumbar Spine | 224667091 | |
| 06-04-2020 09:40:32 | München | 155621 | 05-05-1942 | Female | Chest | 224666532 | |
| 06-04-2020 09:40:32 | Madrid | 271822 | 28-03-1977 | Female | Wrist | 224664432 | |
| 06-04-2020 09:40:32 | London | 723466 | 17-04-1983 | Female | Foot Left | 224667201 | |
| 06-04-2020 09:40:32 | Brussels | 252380 | 01-05-1972 | Male | Lumbar Spine | 224665361 | |
| 06-04-2020 09:40:32 | Amsterdam | 338377 | 21-11-1948 | Female | Chest | 224634241 | |

Note:

- 1 - It is not possible to divide the images into several studies.
- 2 - It is not possible to send images with **Send**.

4.4.11 Emergency patient workflow

After clicking on **Emergency** the following screen will show:



- By clicking on **Edit** you can edit data. The following screen will show:





Here you can enter for example “room 1” in the Name field to differentiate between multiple emergency patients. After this click on **OK**.

In chapter “Manually adding protocols” is described how you can add protocols.

4.4.12 Manually adding protocols

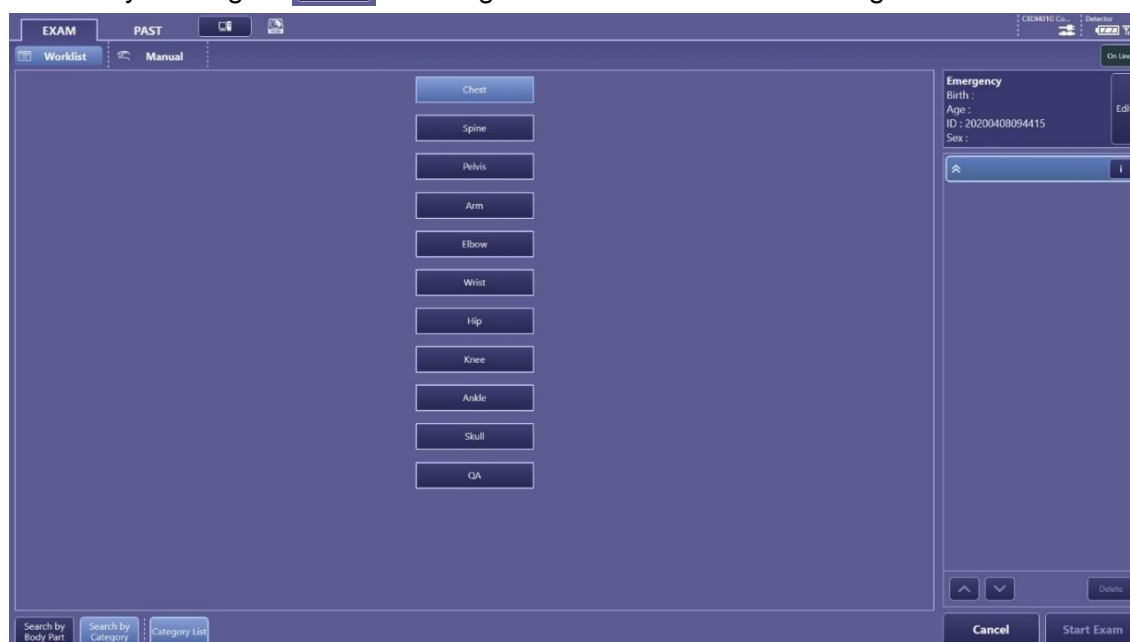
Protocols can be displayed in Categories and in Body Parts.

4.4.12.1 Categories

Different categories are shown. In this case for example: Chest, Spine etc. You can scroll through different tabs by clicking on  or .



- By clicking on  all categories will show in the following screen:

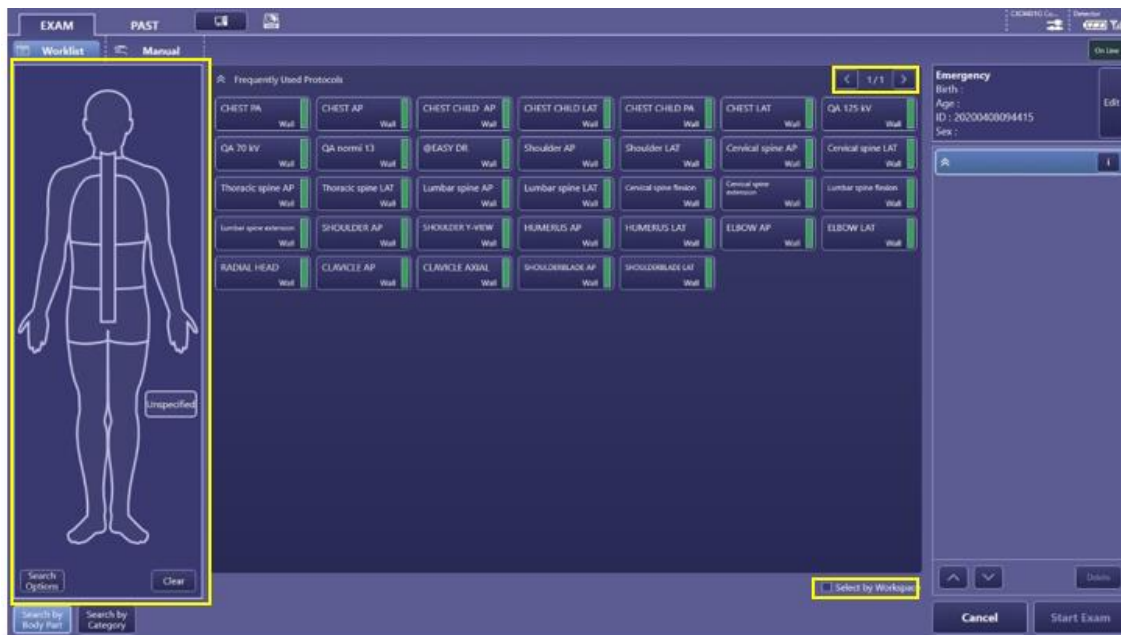


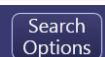
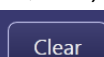
- By clicking on one of the categories this category will open, showing all protocols belonging to this category.

4.4.13 Body Parts

The system has been preloaded with clinical protocols. They have been optimized for optimal image quality and dose. They can be applied directly, but may require adjustments according to local regulations.

It is also possible to search by body part. Here you can find a protocol by using the anatomical diagram showing on the left. Selecting an anatomical region will show all protocols belonging to this region, showing the most frequently or most recent protocols first (depending on the system setup). You can scroll through the different tabs by using






- By clicking on  you can search by Exposure Type (radiography, stitch), View Position (AP, PA, etc.) or by Protocol Name.
- By clicking on  all Search Options and the selected anatomical regions will be cleared.

If ☐ **Select by Workspace** is not selected all different protocols combined with the default workspace (table, wall, free exposure) will show.

If ☒ **Select by Workspace** is selected all different protocols will show but you will have to select the workspace (table, wall, free exposure) after selecting the protocol.

4.4.14 Workspaces

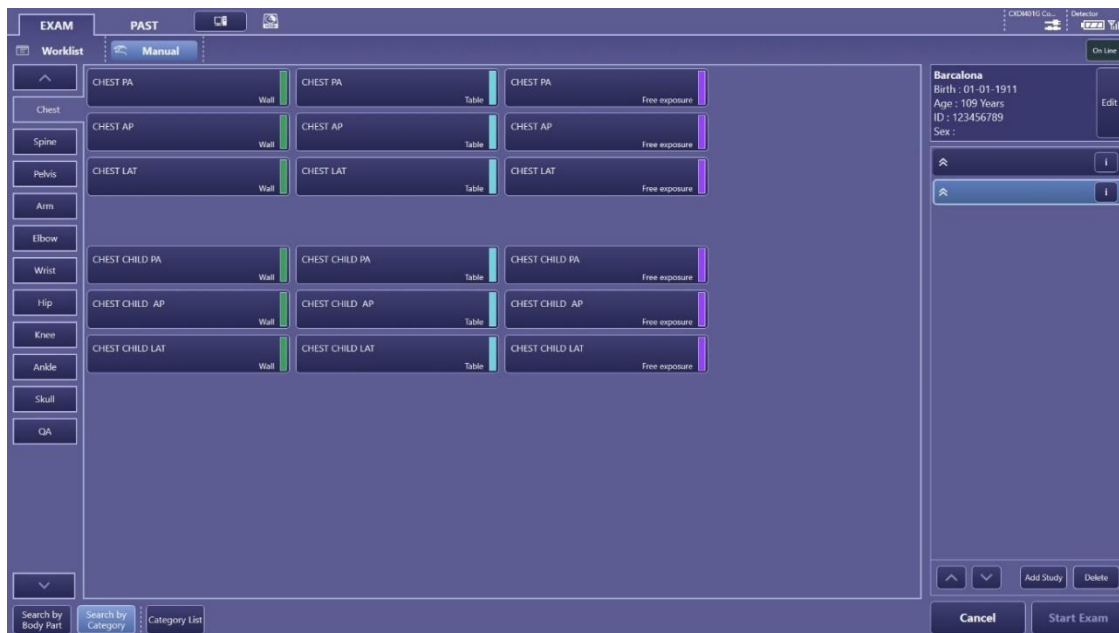
There are different workspaces possible. Every workspace corresponds with a color. In the below case CHEST PA has 3 different workspaces:

| | |
|---|------------------------------|
|  | Thorax AP on the wall stand |
|  | Thorax AP on the table |
|  | Thorax AP with free exposure |

4.4.15 Adding the protocols

Note:


In this example we will use a manual added patient adding protocols for 2 studies using categories.



You can add a protocol to a study by first selecting the study and then by clicking on the desired protocol. You can add multiple protocols to one study. In the below case 2 protocols are added to 2 studies. You can change the order of the protocols by selecting the protocol you want to move (the light blue highlighted protocol is the selected protocol)

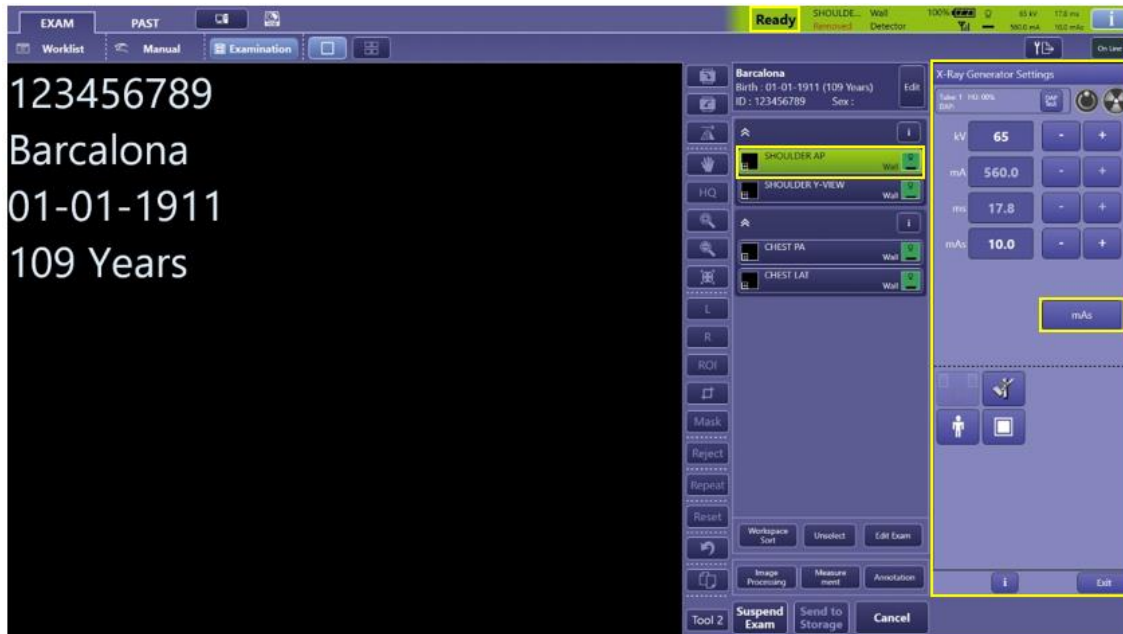
and by clicking on  . By clicking on  you can delete a protocol.



When all desired protocols are added, start the exam by clicking on .

4.4.16 Making x-rays

After starting the exam, the following screen will show. The green highlighted protocol is the selected protocol. You can select another protocol by clicking on it.



In the upper right part of the screen it is possible to see if the system is ready to make an x-ray

| | |
|-------------------|---|
| Ready | The system is ready to make the x-ray |
| Not Ready | The system is not ready to make the x-ray |
| Waiting... | The system is getting ready to make the x-ray |

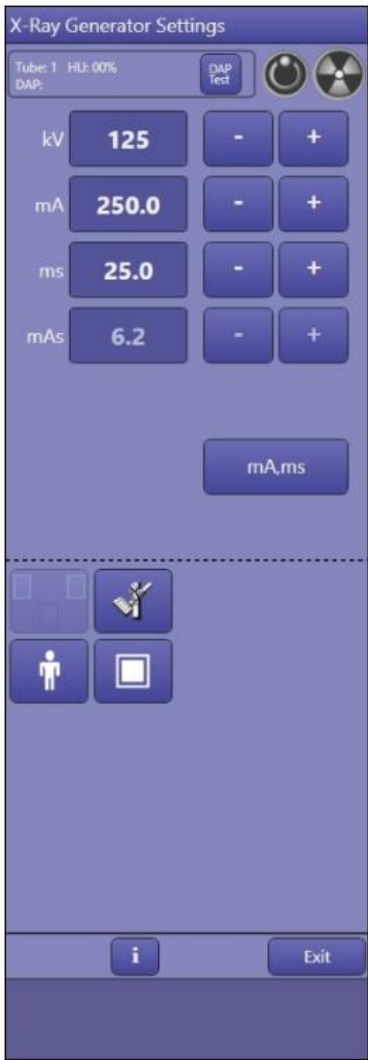
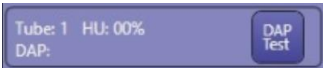





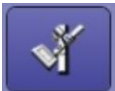


You can add a protocol by clicking on .

It is possible to change the workspace of a protocol by clicking on the selected protocol a second time and then selecting the desired workspace.

| | |
|-----------------|--|
| CAUTION: | Adding materials or objects into the X-ray beam will affect the dose and image quality. |
|-----------------|--|

Generator Window

In the right part of the screen the x-ray generator screen is shown. Here it is possible to change the x-ray parameters (kV, mA, ms, mAs, exposure type, density, AEC fields, body size, focus size).

| | | |
|--|---|---|
|  |  | Information window for: - Tube heat: (HU ...%) - DAP: |
| |  | Performs a DAP meter test and resets the DAP meter |
| |  | System is ready for exposure |
| |  | Exposure / irradiation indication |
| |  | X-ray parameters adjustment fields to optimize exposure parameters. |
| |  | Select exposure type: - 2-point (kV and mAs) exposure - Automatic Exposure Control (AEC) exposure - 3-point (kV, mA, ms) exposure. |
| |  | Select receptor type |
| |  | Select Body type |
| |  | Select focus type |

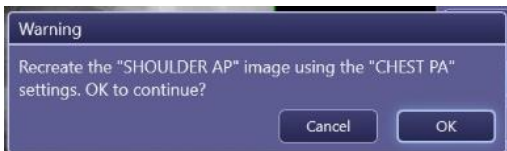
4.4.17 Moving an x-ray from one study to another study

When an x-ray is made in one study, but it belongs to another study it is possible to change it from one study to another. This is only possible from a workspace to the same workspace.

In the below case for example and x-ray of the thorax has been made with shoulder x-ray parameters and postprocessing. By clicking on the thumbnail of the x-ray that has been made you can drag the x-ray to the THORAX PA on the same workspace (wall).



After this, the following warning will show:



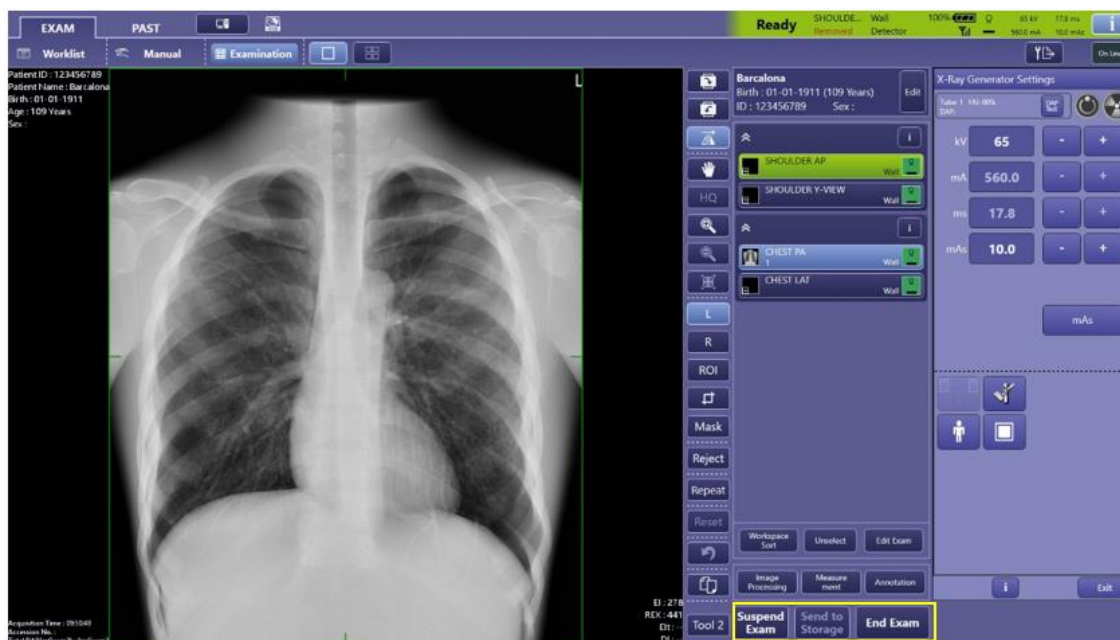
- By clicking on **OK**, the x-ray will move to the correct study and the x-ray will be processed with the correct image processing as shown in the image below.



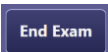
**Note:**

The x-ray has already been made with the x-ray parameters belonging to the wrong protocol. By moving it to the correct study, this can't be undone.

4.4.18 Ending the exam

After making the x-rays the following screen will show:



| | |
|---|--|
|  | Ending the exam temporarily. The made x-rays will not be send to the default destinations and the patient will sustain in the worklist with the study status "pending" |
|  | Sending the x-rays that have been made till now to the default destinations. The exam will not end. This button is not available in an emergency examination. |
|  | Ending the exam and automatically sending all acquired x-rays to the default destinations. |

4.4.19 Dose Indication

REX Value

The Rex value given after every exposure is an indication that the dose received by the detector is sufficient to create a good image. This value needs to be between 100 and 400.

When this value is too low, the dose is too low, resulting in a grainy image. When the value is high, the dose is too high resulting in an unnecessarily high dose to the patient.

| | |
|--------------|--|
| Note: | In digital imaging it is hard to see on the image itself when the dose is too high, because of dynamic range compression. That's why it is important to always check the REX value. |
|--------------|--|

The REX value is shown in the lower right corner of the image:

DAP(mGycm2) : --
 REX : 148
 EI : 111

Check REX Value

Use the following procedure to check the REX value.

Use for all the exposures the following protocol and settings.

Category Service > protocol QA (table)

Post processing parameters that influences the REX Value must be always the following:

- Anatomical part
 - Category: Upper-Extremity
 - Anatomical Part: Humerus
 - Direction: Front
- LUT:
 - Curve Shape: LN (linear)
 - Brightness Adjustment: Auto
 - Base Brightness: 15
 - Base Contrast: 15

Make an exposure to test the automatic exposure control and measure the Screen dose.

Filter: 2mm Cu, measuring chamber in the middle above the middle AEC field.

Setting: 80 kV, large focus, density 0.

SID table: 120cm, SID wall: 200cm

Read the REX-value from the Canon monitor. REX (Reached EXposure index)

Note the mAs and REX-value of the left, middle and right field.

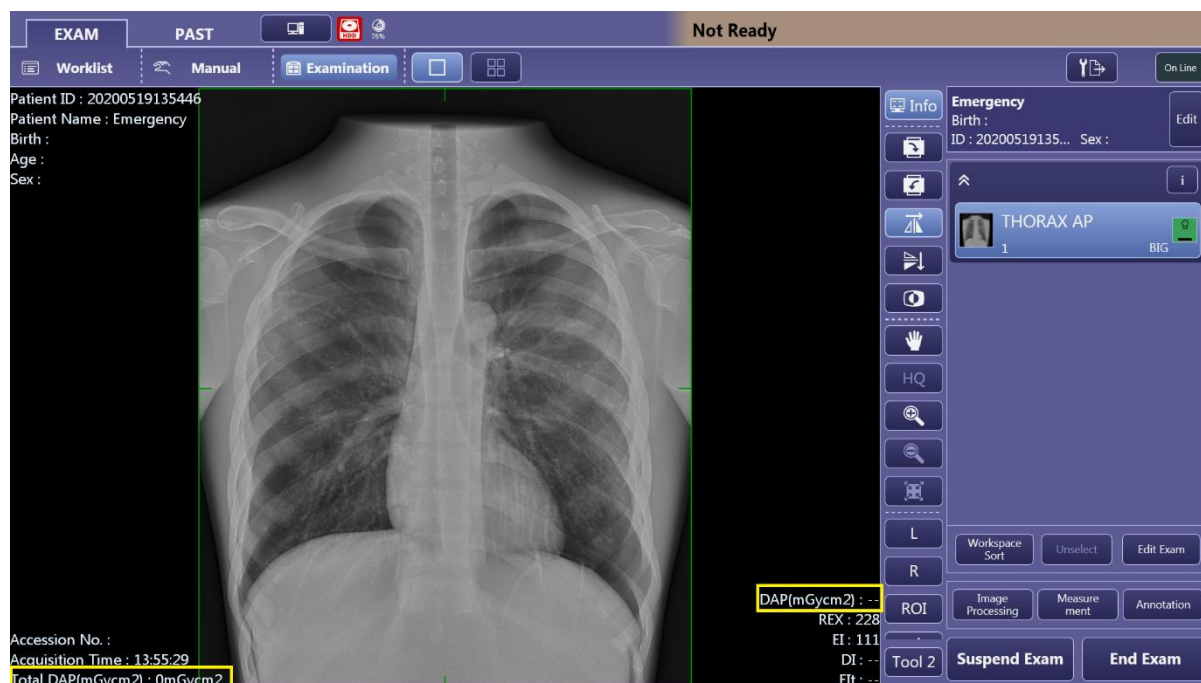
| | SID | Left | Middle | Right | REX-value |
|----------------|--------|----------|----------|----------|-----------|
| Detector Table | 1.20 m |mAs |mAs |mAs | |
| Detector Wall | 2.00 m |mAs |mAs |mAs | |

Compare the value with the reading made during installation or the last maintenance visit
 The reading should be $\leq 5\%$.

if the readings are outside the specs, Call your service representation

DAP meter

The systems contain an integrated Dose Area Product (DAP) measurement device. DAP values will be shown on the monitor of the system in mGycm² or in μ Gycm² (depending on local settings).



Check DAP meter

Setup the system with the following parameters

SID = 100cm

Generator: 100kV, 20mAs, large focus



Use the Normi 13 phantom to collimate the collimator on 10x10cm, collimated field 100cm²
 Take the x-ray and record the DAP reading

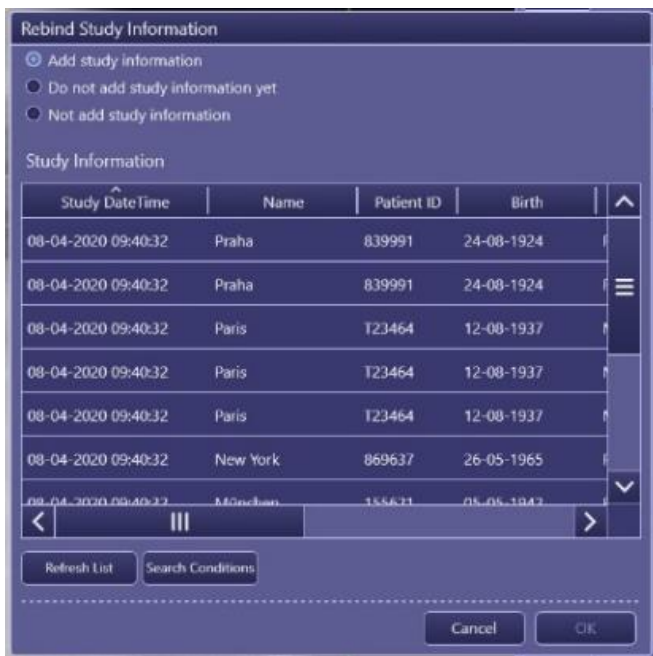
| | | | | | |
|---|-----|-----|-----|-----|-----|
| kV | 50 | 70 | 80 | 100 | 125 |
| mAs | 10 | 10 | 10 | 10 | 10 |
| DAP reading (mGy.cm ²) | | | | | |
| Calculated DAP (mGy) | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 |
| Deviation | % | % | % | % | % |
| Calculation: Calculated DAP = DAP reading / 100 | | | | | |
| Deviation = Calculated DAP – Measured DAP / Calculated DAP *100 | | | | | |

Compare the value with the reading made during installation or the last maintenance visit
 The value should be $\leq 25\%$.

If the readings are outside the specs, Call your service representation.

4.4.20 Ending an emergency exam

When patient data is available and inserted in RIS, click on **End Exam** and the following screen will show:



The dialog box titled "Rebind Study Information" contains three radio buttons: "Add study information" (selected), "Do not add study information yet", and "Not add study information". Below is a table of study information.

| Study DateTime | Name | Patient ID | Birth |
|---------------------|----------|------------|------------|
| 08-04-2020 09:40:32 | Praha | 839991 | 24-08-1924 |
| 08-04-2020 09:40:32 | Praha | 839991 | 24-08-1924 |
| 08-04-2020 09:40:32 | Paris | T23464 | 12-08-1937 |
| 08-04-2020 09:40:32 | Paris | T23464 | 12-08-1937 |
| 08-04-2020 09:40:32 | Paris | T23464 | 12-08-1937 |
| 08-04-2020 09:40:32 | New York | 869637 | 26-05-1965 |
| 08-04-2020 09:40:32 | Moscow | 155631 | 05-05-1942 |

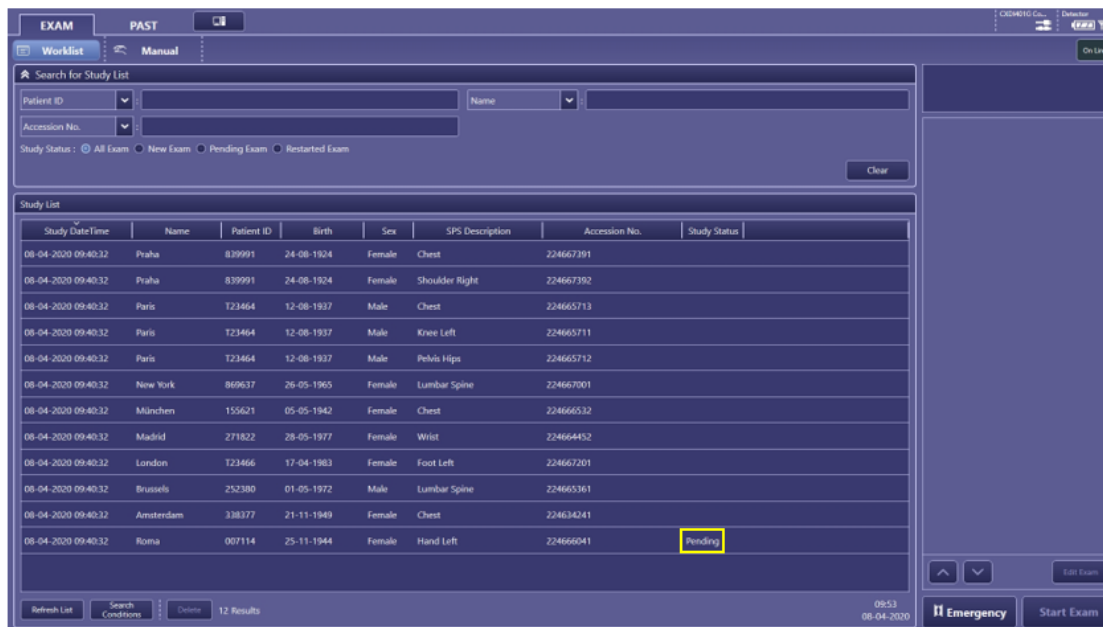
At the bottom are buttons for "Refresh List", "Search Conditions", "Cancel", and "OK".

Click on the correct patient (that has been entered in RIS) and click on **OK**. To verify, click on **OK** again.

| | |
|--------------|-------------------------------------|
| Note: | This action can't be undone. |
|--------------|-------------------------------------|

4.4.21 Pending patients

Patients who have been suspended with the **Suspend Exam** button will have the Study Status **Pending** in the worklist.



The screenshot shows the 'Worklist' tab in the DelftDI software. At the top, there are tabs for 'EXAM', 'PAST', and 'Manual'. Below these is a search bar for the 'Study List' with fields for 'Patient ID', 'Name', and 'Accession No.', and radio buttons for 'Study Status' (All Exam, New Exam, Pending Exam, Restarted Exam). A 'Clear' button is also present. The main area displays a table of patients. The last row in the table has the 'Study Status' column highlighted in yellow with the word 'Pending'.

| Study DateTime | Name | Patient ID | Birth | Sex | SPS Description | Accession No. | Study Status |
|---------------------|-----------|------------|------------|--------|-----------------|---------------|--------------|
| 08-04-2020 09:40:32 | Praha | 839991 | 24-08-1924 | Female | Chest | 224667391 | |
| 08-04-2020 09:40:32 | Praha | 839991 | 24-08-1924 | Female | Shoulder Right | 224667392 | |
| 08-04-2020 09:40:32 | Paris | 723464 | 12-08-1937 | Male | Chest | 224665713 | |
| 08-04-2020 09:40:32 | Paris | 723464 | 12-08-1937 | Male | Knee Left | 224665711 | |
| 08-04-2020 09:40:32 | Paris | 723464 | 12-08-1937 | Male | Pelvis Hips | 224665712 | |
| 08-04-2020 09:40:32 | New York | 869637 | 26-05-1965 | Female | Lumbar Spine | 224667001 | |
| 08-04-2020 09:40:32 | München | 155621 | 05-05-1942 | Female | Chest | 224666532 | |
| 08-04-2020 09:40:32 | Madrid | 271822 | 28-05-1977 | Female | Wrist | 224664452 | |
| 08-04-2020 09:40:32 | London | 723466 | 17-04-1983 | Female | Foot Left | 224667201 | |
| 08-04-2020 09:40:32 | Brussels | 252380 | 01-05-1972 | Male | Lumbar Spine | 224665361 | |
| 08-04-2020 09:40:32 | Amsterdam | 338377 | 21-11-1949 | Female | Chest | 224634241 | |
| 08-04-2020 09:40:32 | Roma | 007114 | 25-11-1944 | Female | Hand Left | 224666041 | Pending |

At the bottom of the interface, there are buttons for 'Refresh List', 'Search Conditions', 'Delete', and '12 Results'. On the right side, there are buttons for 'Emergency' and 'Start Exam'.


Pending patients will sustain in the worklist. To delete a pending patient, select the pending patient, start the exam and then click on **End Exam** when images are acquired or on **Cancel** if no images are acquired.

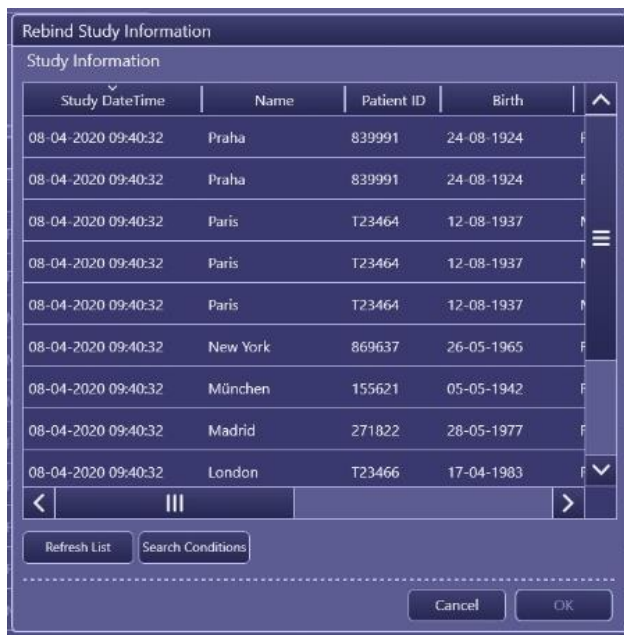
4.4.22 Correcting patient data after making images with the wrong patient data

Note:

This is only possible when the images have not been sent to PACS/has not been ended

After selecting the patient from the worklist and making images it is possible to correct the patient data. Click on **Suspend Exam** after making the images. The study will remain in the worklist.

Select the patient and click on  in the upper right part of the screen. After this the following screen will show:



Rebind Study Information

Study Information

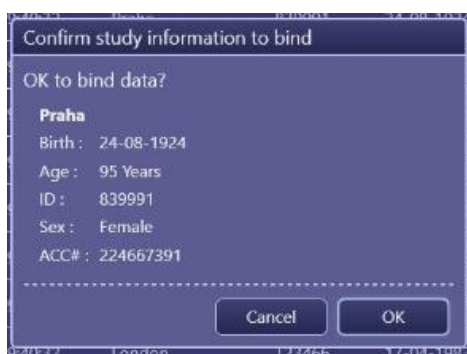
| Study DateTime | Name | Patient ID | Birth | |
|---------------------|----------|------------|------------|---|
| 08-04-2020 09:40:32 | Praha | 839991 | 24-08-1924 | ↑ |
| 08-04-2020 09:40:32 | Praha | 839991 | 24-08-1924 | ↑ |
| 08-04-2020 09:40:32 | Paris | T23464 | 12-08-1937 | ≡ |
| 08-04-2020 09:40:32 | Paris | T23464 | 12-08-1937 | ≡ |
| 08-04-2020 09:40:32 | Paris | T23464 | 12-08-1937 | ≡ |
| 08-04-2020 09:40:32 | New York | 869637 | 26-05-1965 | ≡ |
| 08-04-2020 09:40:32 | München | 155621 | 05-05-1942 | ≡ |
| 08-04-2020 09:40:32 | Madrid | 271822 | 28-05-1977 | ≡ |
| 08-04-2020 09:40:32 | London | T23466 | 17-04-1983 | ↓ |

< ||| >

Refresh List Search Conditions

Cancel OK

Select the correct patient and click on **OK**. After this the following screen will show:



Confirm study information to bind

OK to bind data?

Praha

Birth : 24-08-1924

Age : 95 Years

ID : 839991

Sex : Female

ACC# : 224667391

Cancel OK

Click on **OK** when the new patient data is correct. After this the study will appear in the worklist with the new correct patient data. To end the study, select the study and click on

Start Exam


End Exam



















4.4.23 Post Processing









It is possible to perform different kind of postprocessing on the images. This chapter will explain them.

| | |
|--------------|--|
| Note: | <p>The quality of an image is to a large extent determined by the digital image processing.</p> <p>Keep in mind that the digital image processing is strongly dependent on sufficient exposure parameters.</p> |
|--------------|--|



4.4.24 Toolbar

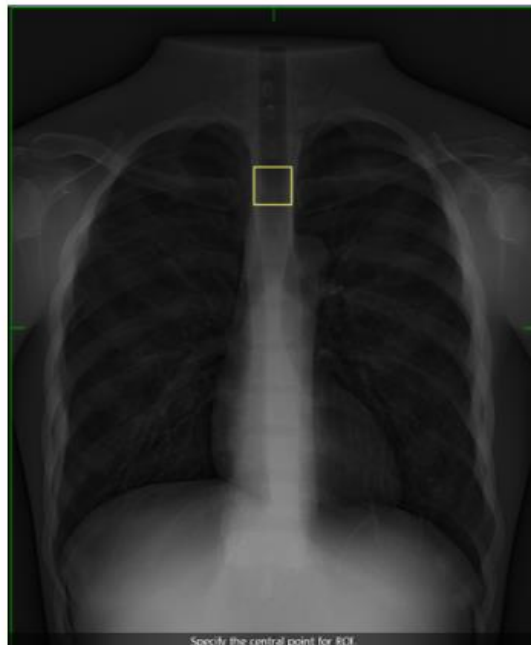
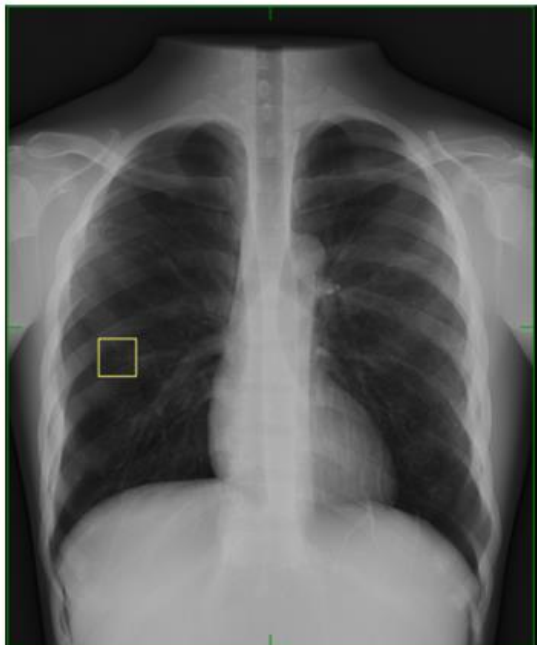
Next to the image the toolbar is displayed. The Toolbar can be adjusted in the system properties. The order or presence of buttons within the toolbar may differ in this manual by the system. A toolbar button will turn light blue  when activated. You can deactivate it by clicking on the button again.

| | |
|---|---|
|  | Overlay on/off (Patient name, DoB, REX etc.) |
|  | Rotate the image 90° clockwise |
|  | Rotate the image 90° anti-clockwise |
|  | Flip the image horizontal |
|  | Flip the image vertical |
|  | Invert the contrast of the image from positive to negative or vice versa |
|  | Pan the image |
|  | High Quality mode |
|  | Zoom in |
|  | Zoom out |
|  | Make the image fit to the screen |
|  | Left marker |
|  | Right marker |
|  | Region of Interest. The brightness (density) of the photo using the ROI can be modified. |
|  | Crop box. The system will automatically put a crop box around the X-ray field. The content of this crop box is sent to the specific destinations. With this button the crop box size can be changed. |
|  | Normally, the area outside the X-ray field will be blackened, called black mask. With this button the black mask can be customized. |
|  | The currently selected photo is rejected and the same protocol is automatically added to the study to retake the x-ray. The rejected image will not be sent to a destination, but will remain on the workstation. The rejected image can be restored by clicking on  . |

| | |
|---|---|
|  | The currently selected photo is rejected. The rejected image will not be sent to a destination, but will remain on the workstation. The rejected image can be restored by clicking on  . |
|  | Repeat the selected x-ray. This will automatically add the same protocol to the study without deleting the image. |
|  | All actions will be undone |
|  | Undo the last action |
|  | Make a copy of the image |
|  | Change WW/WL |
|  | Activate/deactivate Advanced Edge Enhancement |

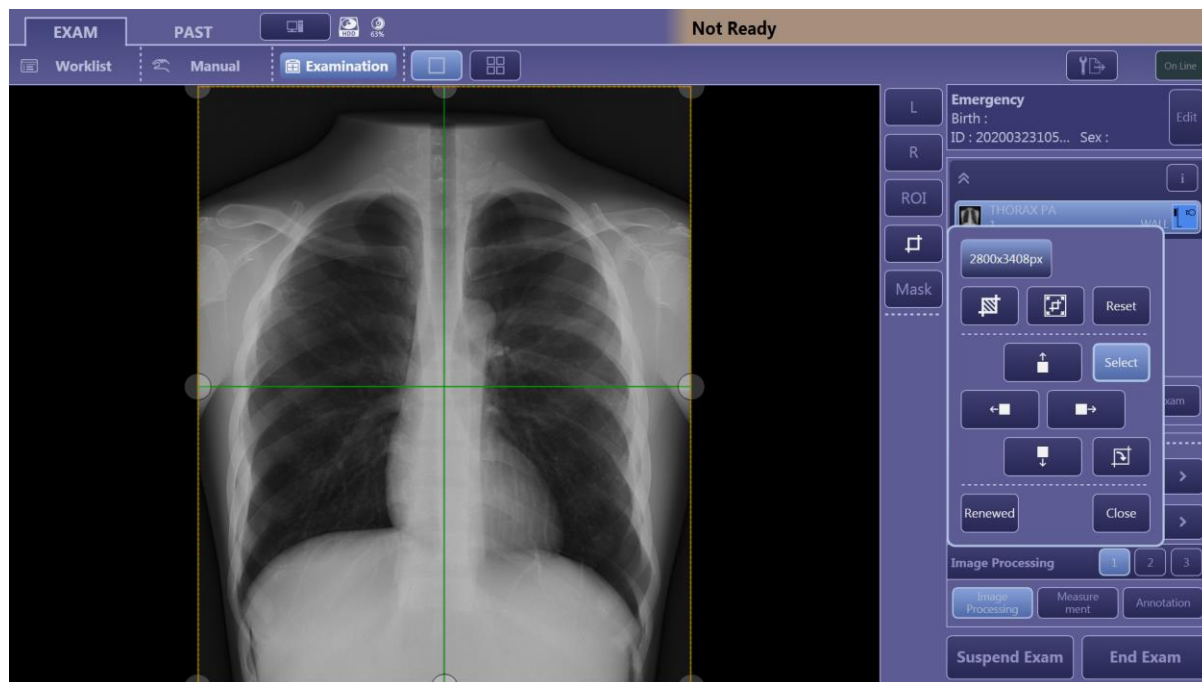
4.4.24.1 ROI (Region Of Interest)











When the  button is activated you can adjust the brightness (density) of the image by replacing the ROI. By clicking on the region of interest (for example a lung or a vertebra in the below examples) the brightness will change matching the new ROI. Click on  to save the new ROI/brightness



4.4.24.2 Crop box

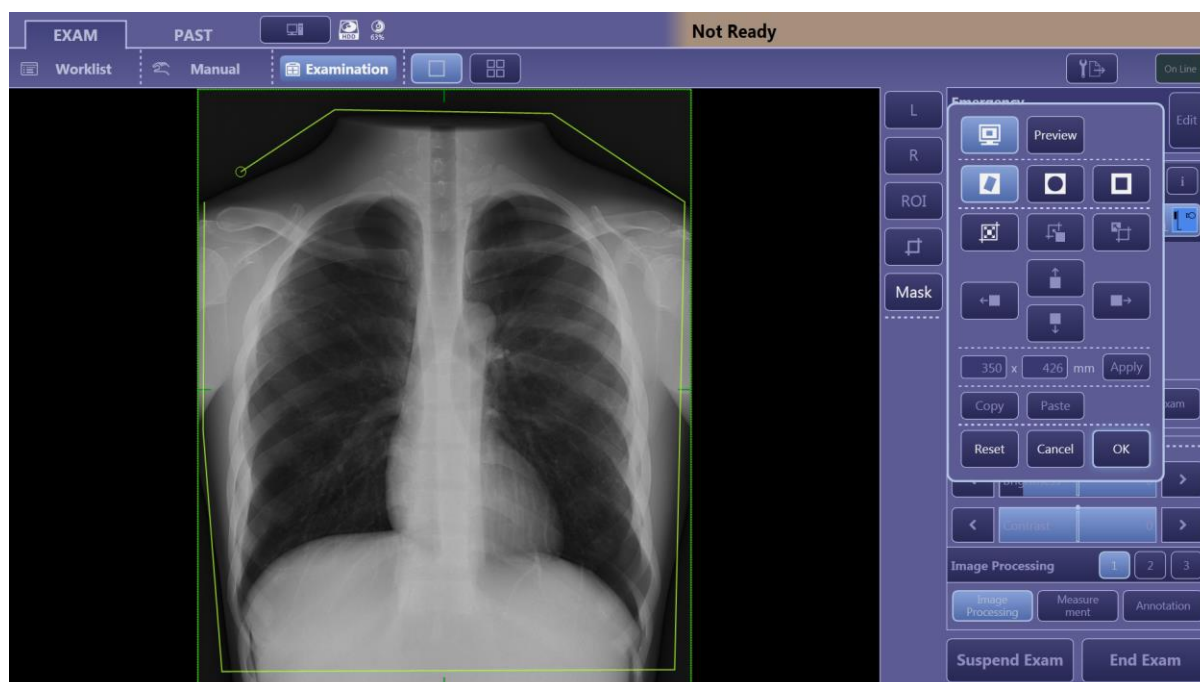
The system automatically puts a crop box around the x-ray field. Only the content inside this crop box is sent to the specific destinations. With this button the crop box size can be changed. You can change this crop box by clicking on 2 opposite corners with the left mouse button. You can also change the crop box by dragging the dots around the crop box.






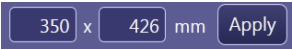




| | |
|---|--|
|  | Crops the irradiated field only |
|  | Crops the whole detector |
|  | All actions will be undone |
|  | Select/deselect the crop box |
|  | Move the crop box upwards |
|  | Move the crop box downwards |
|  | Move the crop box to the left |
|  | Move the crop box to the right |
|  | Turn the crop box 90° clockwise |
|  | Select renewed to make a new crop box by clicking on two opposite corners. |

4.4.24.3 Mask

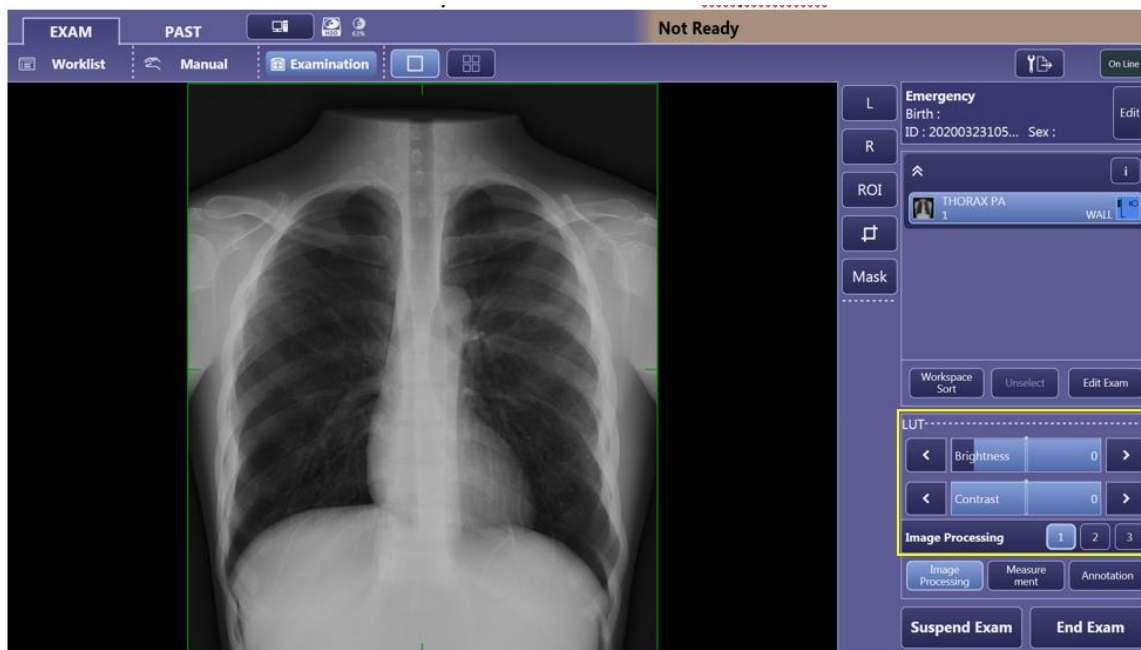
The system automatically gives the area outside the exposed area a black mask. With this button it is possible to change this black mask area. When the **Mask** button is activated you can draw a self-defined field. By pressing the left mouse button, you can create up to 12 anchor points to define the field. The black mask on the system is shown semitransparent but on a PACS screen or on a hard copy it will be shown completely black. Click on **OK** to confirm.



| | |
|---|---|
|  | Polygonal, round or square mask |
|  | Fit the mask to the current crop box |
|  | Move the mask box to the center of the crop box |
|  | Move the crop box the center of the mask box |
|  | Move the mask upwards, downwards, left or right |
|  | Define a specific size of the mask |
|  | Copy/paste the mask |
|  | All actions will be undone |

4.4.25 Image Processing

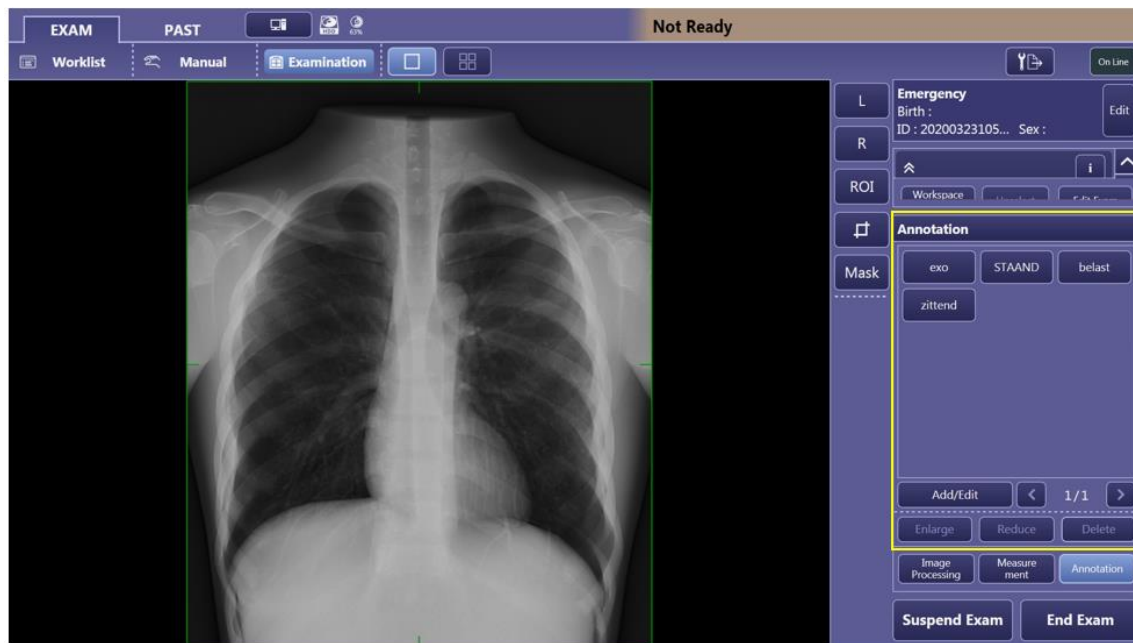
In image processing 3 tabs are available. The first tab is available for every user, the second and third tab is only available for the key users.



The first tab contains 2 sliders for Brightness and Contrast. You can increase the brightness of the image by sliding the slider to the right and you can decrease the brightness by sliding the slider to the left. To increase the contrast of the image you can slide the slider to the right. To decrease the contrast, move the slider to the left.

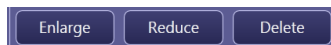
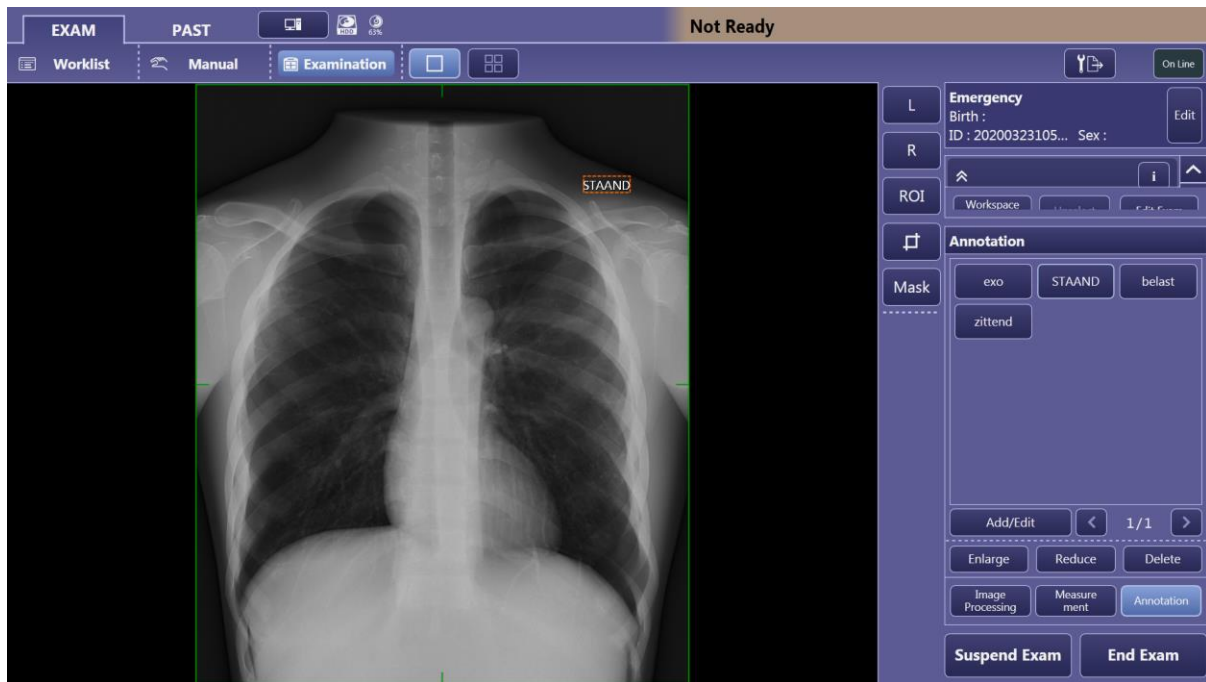
4.4.26 Annotation

It is possible to add annotation to the image. You can either add existing annotation or you can type annotation yourself.



4.4.26.1 Add existing annotation

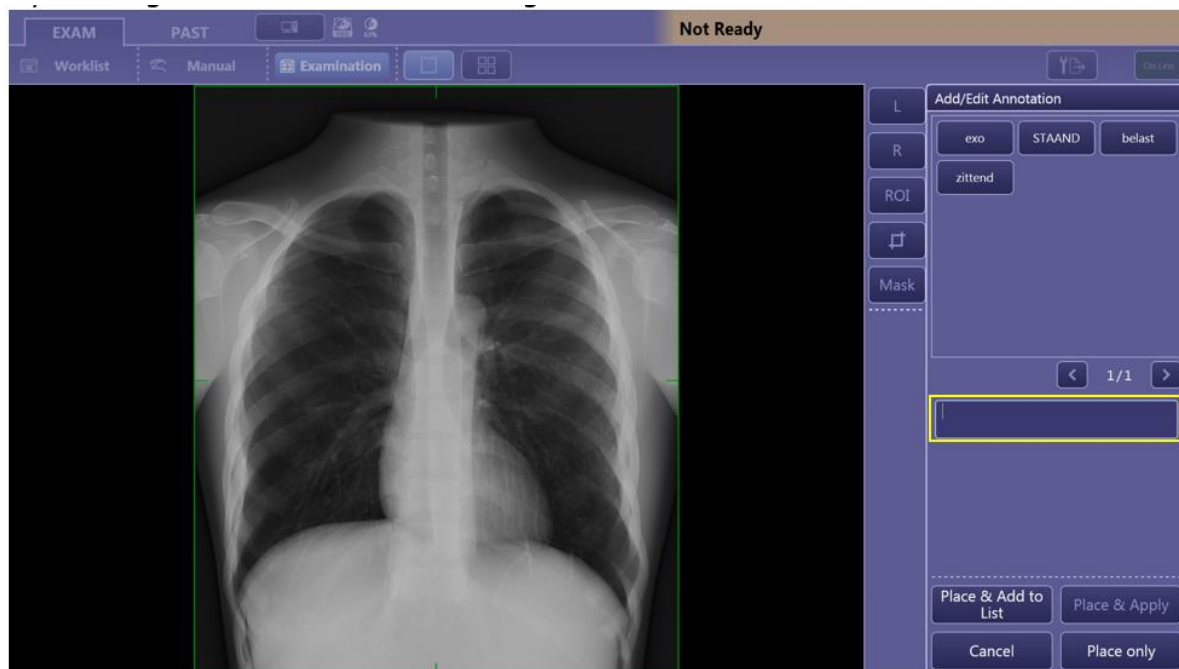
By clicking on the desired annotation, the annotation will appear in the upper right corner of the image. Move the annotation to the desired place by clicking on the desired space. You can move the annotation again by clicking on the annotation (an orange box will appear) and then clicking on the desired space.



Enlarge, Reduce or Delete the annotation.

4.4.26.2 Add new annotation

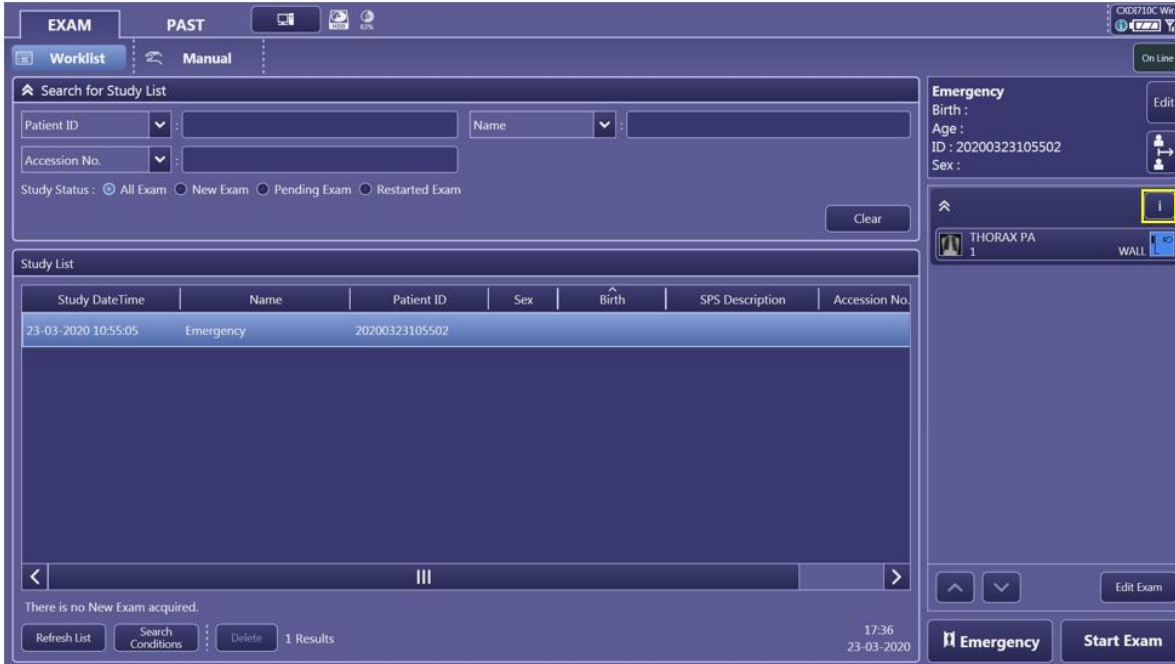
By clicking on **Add/Edit** the following screen will show:



Type the desired annotation. By clicking on **Place & Add to List** the annotation will be added to this image and to the annotation list for future use. By clicking on **Place only** the annotation will only be added to this image.

4.4.27 Protecting images for deletion

To protect images for deletion, click on the patient and click on .

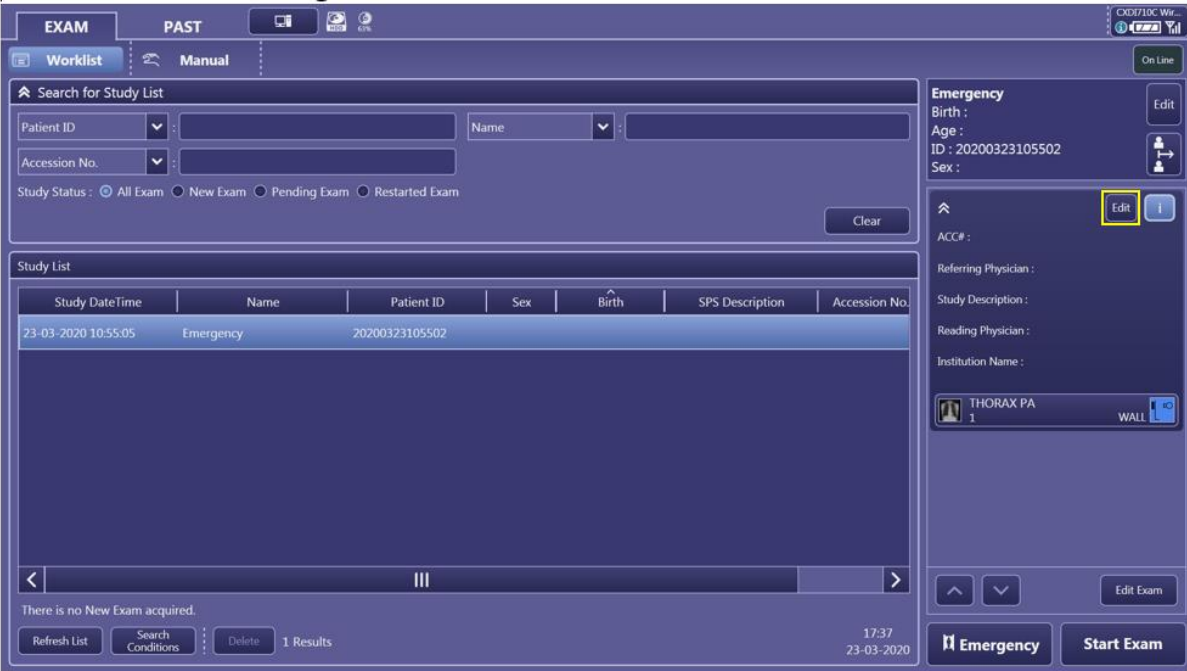


The screenshot shows the 'EXAM' tab in the DelftDI interface. The 'Study List' table contains one entry:

| Study DateTime | Name | Patient ID | Sex | Birth | SPS Description | Accession No. |
|---------------------|-----------|----------------|-----|-------|-----------------|---------------|
| 23-03-2020 10:55:05 | Emergency | 20200323105502 | | | | |

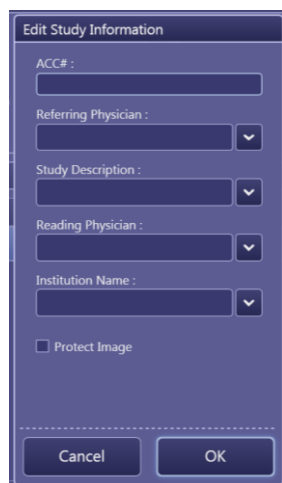
Below the table, it states 'There is no New Exam acquired.' and shows '1 Results'. On the right, the 'Emergency' patient details are visible, including Birth, Age, ID, and Sex. A yellow box highlights the 'i' icon next to the patient name 'THORAX PA 1'.

After this the following screen will show:







The screenshot shows the 'EXAM' tab in the DelftDI interface. The 'Study List' table is the same as in the previous screenshot. On the right, the 'Emergency' patient details are visible. A yellow box highlights the 'Edit' icon next to the patient name 'THORAX PA 1'.

Click on  and the following screen will show:



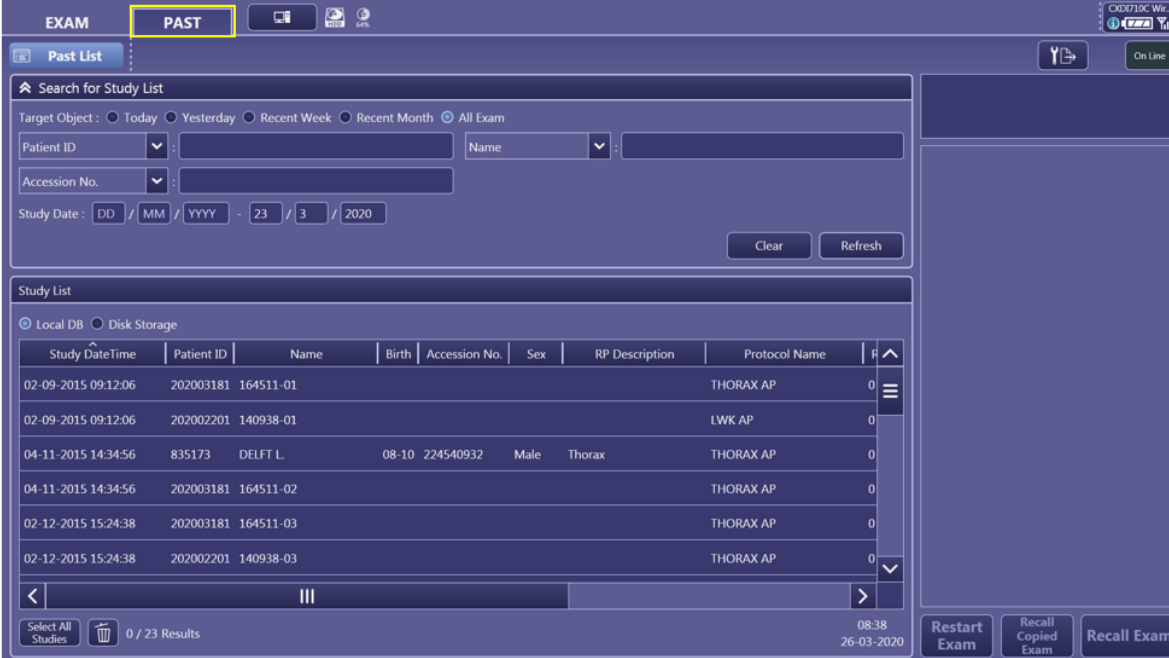
The 'Edit Study Information' dialog box contains the following fields and controls:

- ACC# :
- Referring Physician : 
- Study Description : 
- Reading Physician : 
- Institution Name : 
- ☐ Protect Image
- Buttons: Cancel, OK

Click on  and on .

4.4.28 Past Screen

In the Past List old images can be retrieved. The retrieved images can be changed and resend.



EXAM **PAST**

Past List

Search for Study List

Target Object : ☐ Today ☐ Yesterday ☐ Recent Week ☐ Recent Month ☒ All Exam

Patient ID : Name :

Accession No. :

Study Date : DD / MM / YYYY - 23 / 3 / 2020

Clear Refresh

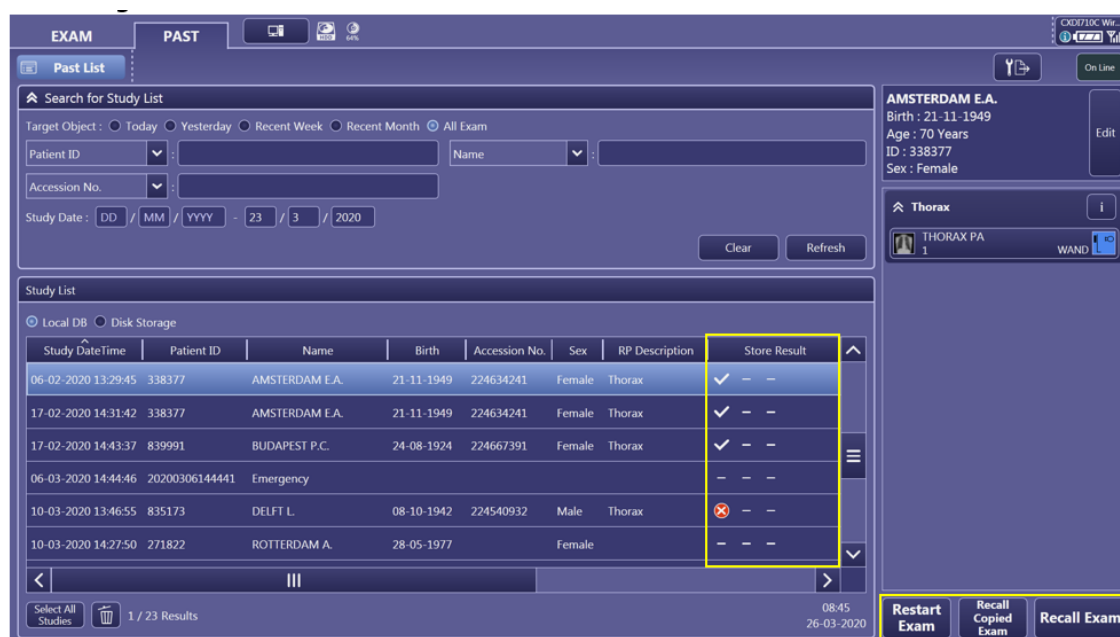
Study List

☒ Local DB ☐ Disk Storage

| Study DateTime | Patient ID | Name | Birth | Accession No. | Sex | RP Description | Protocol Name | |
|---------------------|------------|-----------|-------|---------------|------|----------------|---------------|---|
| 02-09-2015 09:12:06 | 202003181 | 164511-01 | | | | | THORAX AP | 0 |
| 02-09-2015 09:12:06 | 202002201 | 140938-01 | | | | | LWK AP | 0 |
| 04-11-2015 14:34:56 | 835173 | DELFT L | 08-10 | 224540932 | Male | Thorax | THORAX AP | 0 |
| 04-11-2015 14:34:56 | 202003181 | 164511-02 | | | | | THORAX AP | 0 |
| 02-12-2015 15:24:38 | 202003181 | 164511-03 | | | | | THORAX AP | 0 |
| 02-12-2015 15:24:38 | 202002201 | 140938-03 | | | | | THORAX AP | 0 |




Select All Studies 0 / 23 Results 08:38 26-03-2020 Restart Exam Recall Copied Exam Recall Exam

It is possible to search in this list by study date (today, yesterday, recent week, recent month, all exam or a specified date), by Patient ID, name, Accession No., RP description and Protocol Name. After selecting the correct patient, the following screen will show:



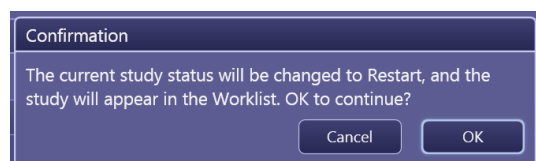
| Study Date/Time | Patient ID | Name | Birth | Accession No. | Sex | RP Description | Store Result |
|---------------------|----------------|----------------|------------|---------------|--------|----------------|--------------|
| 06-02-2020 13:29:45 | 338377 | AMSTERDAM E.A. | 21-11-1949 | 224634241 | Female | Thorax | ✓ - - |
| 17-02-2020 14:31:42 | 338377 | AMSTERDAM E.A. | 21-11-1949 | 224634241 | Female | Thorax | ✓ - - |
| 17-02-2020 14:43:37 | 839991 | BUDAPEST P.C. | 24-08-1924 | 224667391 | Female | Thorax | ✓ - - |
| 06-03-2020 14:44:46 | 20200306144441 | Emergency | | | | | - - - |
| 10-03-2020 13:46:55 | 835173 | DELFT L. | 08-10-1942 | 224540932 | Male | Thorax | ✗ - - |
| 10-03-2020 14:27:50 | 271822 | ROTTERDAM A. | 28-05-1977 | | Female | | - - - |


In the **Store Result** column it is possible to see whether the image(s) have been sent to the destination(s)

| | |
|---|---|
|  | All images have been sent to one destination. |
|  | No images have been sent. |
|  | Failed to send images to the destination. |



4.4.29 Restarting an exam

After ending an exam, it is possible to restart an exam and add protocols to this study. This is possible by selecting the correct study and by clicking on **Restart Exam**. After this the following screen will show:

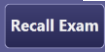


By clicking on **OK**, the study will reappear in the worklist. After selecting the patient again in the worklist and starting the exam you can add protocols to this study. Images that already have been taken will appear with a yellow overlay . It is not possible to post process these images in the exam screen. After ending the exam this will be possible again in the past list.



4.4.30 Recalling an exam

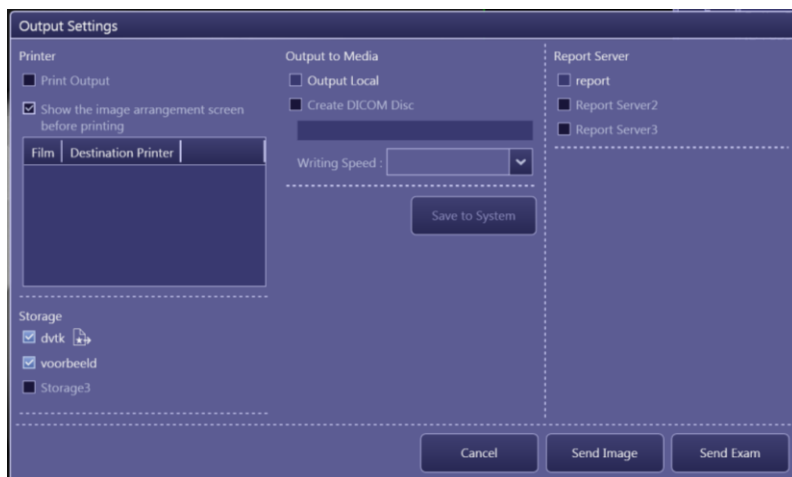
After ending an exam, it is possible to recall an exam to perform post-processing on the image(s). This is possible by selecting the correct study and by clicking on  or .

By clicking on  the system will make a copy of the whole exam and will recall this copy.


By clicking on  the system will only recall the exam. After this it is possible to post-process these image(s).

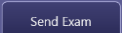
4.4.31 Resending images

It is possible to resend images from both the Past List Screen and after recalling an exam with the  button. Select the study (in the past list) or the image (after recalling the exam) and click on . The following screen will show:



The destinations with a checkmark are the active destinations. Changing the active destination will change it for this time only.

By clicking on , only the selected image will be resent (this button will only be available when you are resending after recalling an exam).

By clicking on , the whole exam will be resent.

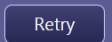
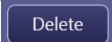
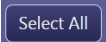
4.4.32 System Screen

In the system screen you can log out, shut down the system or consult the Process Viewer.

4.4.33 Logging out

Click on  to log out.

4.4.34 Process Viewer

In the Process Viewer it is possible to see errors transferring data. By selecting the process, you can either  or  the process. By clicking on  you can select all processes to retry or delete.



The screenshot shows the 'Process Viewer' window. At the top, it says 'Process Viewer' and 'User Name : operator'. There is a green 'In Process' button in the top right corner. Below this is a table with columns: Transfer Date, Patient ID, Name, ACC#, Protocol Name, Destination, and Status. The table contains two rows of data, both with a status of 'Error'. Below the table, there is a 'Select All' button on the left and 'Retry' and 'Delete' buttons on the right. At the bottom, there is a section with details: 'Transfer Date : 26-03-2020 09:38:45', 'Patient ID : 839991', 'Name : BUDAPEST^P.C.', and 'ACC# : 224667391'. To the right of these details is a text box containing the message: 'Association negotiation failed. Network communication with other communication party failed. Check the network condition and setting information.' At the bottom right, there is an 'Exit' button.

| Transfer Date | Patient ID | Name | ACC# | Protocol Name | Destination | Status |
|---------------|------------|-------------|-----------|---------------|-------------|--------|
| 26-03-2020 0 | 839991 | BUDAI 22466 | THORAX PA | voorbeeld | Error | |
| 26-03-2020 0 | 839991 | BUDAI 22466 | - | report | Error | |

Buttons: Select All, Retry, Delete

Details:
Transfer Date : 26-03-2020 09:38:45
Patient ID : 839991
Name : BUDAPEST^P.C.
ACC# : 224667391

Message: Association negotiation failed. Network communication with other communication party failed. Check the network condition and setting information.

Exit

4.4.35 Filtration Indication

Filters are materials (for example metal sheets) placed in the x-ray beam between the window and the patient that are used to attenuate the low-energy (soft) x-ray photons from the spectrum. Filtering is the removal of these low energy x-rays from the beam spectrum which would otherwise not contribute to image quality but would add to patient dose and scatter.

There are two types of filtration.

- Permanent filtration: inherent filtration from components in the x-ray tube, collimator, docking, AEC etc....
- Added filtration: added filtration from interchangeable metal sheets (Al, Cu) integrated to the collimator.

All Items in the x-ray beam shall marked with the mm AL equivalent:

| Item | AL Equivalent (mm) |
|-----------------------|--|
| Tube assembly: | 0.7 mm AL |
| Collimator permanent | 2.0 mm AL |
| Collimator selectable | <ul style="list-style-type: none">- 1mmAL+0.1mmCu- 1mmAL+0.2mmCu- 2mmAL- none |

5 Cleaning

| | |
|--------------|---|
| Note: | The mains power must be disconnected before proceeding with the cleaning operations. |
|--------------|---|

- Clean the equipment with a damp cloth or a cotton swab. Use a non-abrasive cleaning material. To moisten use water or lukewarm water with a diluted solution of liquid detergent of the common household type.
- Do not use abrasive cleaners or organic solvents or cleaning agents containing solvents (e.g. alcohol, ether, etc.). Do not use hydrogen peroxide which enhances the corrosion of metals.
- Do not use spray liquids! Agents for cleaning fluids must not enter under any circumstances within the enclosures!
- For cleaning the screen, use a microfiber cloth. Any conventional screen cleaner can be used. Be aware that buttons can be pressed accidentally on the touchscreen while cleaning when the system is powered on.
- For cleaning the wireless detector we refer to the User's Manual of the detector.

| | |
|--------------|--|
| Note: | Test commercial cleaning to ensure there is no adverse effect on the cover. |
|--------------|--|

5.1 Disinfecting

- For surface disinfection, it is recommended to use aqueous solutions commercially available for the disinfection of surfaces based on aldehyde or amphoteric surfactants (e.g., Tego 103, Korsolin). Disinfectant substitutes based on phenolic and chlorine-containing compounds are partially aggressive and therefore normally to be avoided. The same limitations apply to agents which have an alcohol content when they are applied in undiluted form (e.g. for the disinfection of hands).
- Strictly prohibited are spray disinfectants, because the spray could penetrate inside the device. As a result, the safety of the appliance can no longer be guaranteed (damage to electronic components, formation of flammable mixtures of air and solvent vapors).
- Where the entire exam room is to be disinfected, remember to cover the unit with plastic sheeting.
- For disinfecting the wireless detector we refer to the User's Manual of the detector.

6 Troubleshooting

The detector does not become “Ready”

Possible Solution:

Is the correct detector selected?

Is the battery from the detector depleted?

Is the detector turned on?

Is the appropriate protocol selected?

Shows the Wi-Fi access point the blue light? Yes = connection. No = No connection

Image acquisition fails

Possible Solution:

Is there ready in the screen? Image acquisition is possible only when the status is on “Ready”.

Worklist cannot be retrieved

Possible Solution:

Is the acquisition computer Online (upper right corner)

Are there troubles with the network?

Image cannot be sent

Possible Solution:

Is the acquisition computer Online (upper right corner)

Are there troubles with the network?

Some columns are missing from the worklist



Possible Solution:

The columns are perhaps resized to small. Check width of the columns.

The exposure values are not set correctly for the selected protocol.

Possible Solution:

Is the system on “Ready”? The exposure settings are being set after the check if the detector is available.

Check the generator status with . If the button  is visible. If so, press this button to recover generator communication.

Incomplete protocols exist appears

This means that not all added protocols are used for exposure, check if necessary exposures are being made.


Error while retrieving worklist or sending images

Possible Solution:

Probably there is a malfunction on the hospital network. Check all possible network settings, restart the acquisition computer. If problem remains call hospital IT department.

PACS is temporarily not available.

Possible Solution:

Press  and select the secondary PACS if available, or uncheck the PACS and save settings. Check back on when PACS is available again and resend from PAST list all un-send images.

DAP accumulated value has been exceeded

Possible Solution:

Press in the generator screen on DAP test (above kV). Select DAP reset. If error remains: temporarily end this patient and select a new one for resetting the DAP.

Error Image analysis processing failed

Cause

The image processing tries to identify the ROI in the image and it fails to do so.

Possible Solution:

Check image brightness and adjust if necessary, by setting the ROI.

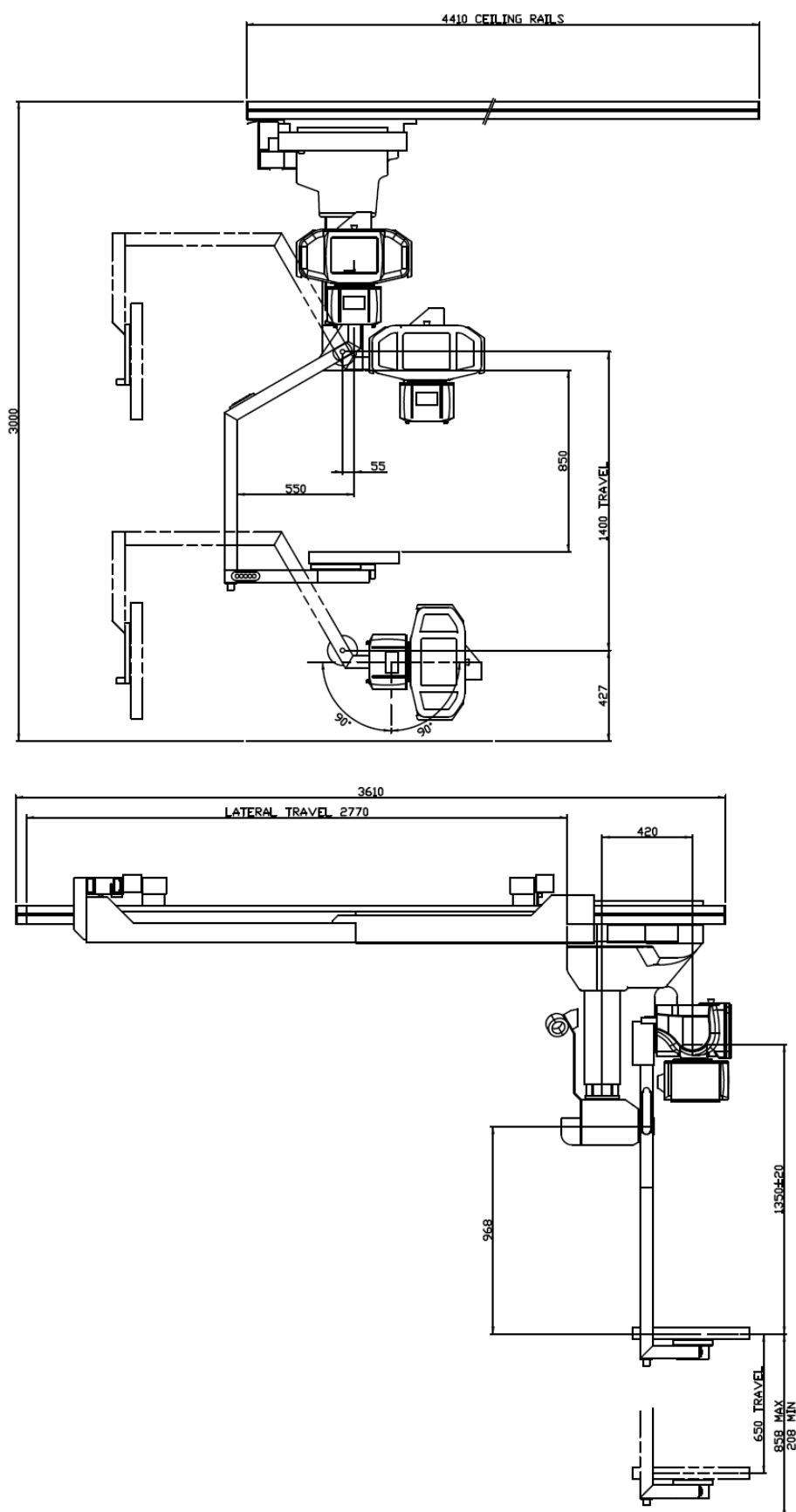
7 Technical Specifications

| 1. Specifications Detector | | | |
|-----------------------------------|--|---------------------------|---------------------------|
| | CXDI-710C Wireless | CXDI-410C Wireless | CXDI-810C Wireless |
| Purpose | General Radiography | | |
| Scintillator | CsI (Cesium Iodide) | | |
| Effecttime imaging area | 350 x 426 mm | 415 x 426 mm | 350 x 274 mm |
| Resolution | 4.0 lp/mm | | |
| DQE | A typical DQE value at 4μGy in 0lp/mm is 0.6 +-10% | | |
| Fill factor | 87% | | |
| Gray scale | 65536 gradations | | |
| Pixel size | 125 x 125 μm | | |
| Image matrix size | 2800 x 3408 pixels | 3320 x 3408 pixels | 2800 x 2192 pixels |
| Dimensions Sensor | 384 x 460 x 15.7 mm | 460 x 460 x 15.7 mm | 384 x 307.5 x 15.7 mm |
| Weight Sensor | 2.3 kg | 2.8 kg | 1.8 kg |
| Load capacity | 310 kg (over the whole area of the detector surface) | | |
| Preview image access time | +- 1 sec | | |
| Cycle time | +- 9 sec | | |

| 2. Specifications X-ray generator | |
|---|---|
| Type, CMP200DR, 150 kV / 50 kW (optional 65 or 80 kW available) | Line voltage: 3 phase 400/480 VAC +- 10% / 65 kVA / 50/60Hz |
| | High frequency generator 200kHz |
| kV range | 50 to 150 kV +- 5% + 1 kV |
| mA range | 10 to 630 mA (50kW) |
| mAs range non-AEC | Tube dependent, 0,1 to 630 mAs |
| Time range | 1.0 to 6300 ms |
| Technique selections | kV with AEC option |
| | kV/mAs |
| | kV/mA/time |

| 3. Specifications X-ray tube and Collimator | | 4. Specifications Ceil stand |
|--|-------------------------|--|
| X-ray tube | 400 kHU high capacity | Motorized vertical column up to 1750mm vertical travel (depending on ceiling height) |
| | 0,6/1,2 focal spot | Manual X/Y/Alpha/Beta and Tube rotation with electromagnetic brakes |
| | 12° target angle 150 kV | X-ray tube rotation (Alpha) 270° |
| | Low speed 24/58 kW | C-arm rotation around the telescope vertical axis (Beta) 300° |
| | High speed 38/91 kW | C-arm rotation around the telescope horizontal axis (Alpha) +120° -120° |
| Collimator | Manual | Large U-shape depth of 550mm for optimal positioning |
| | LED lamp | SID of 1350 mm |
| | DAP integration | Dockingstation with AEC and removable grid |

8 Dimensions



9 Glossary

Units of Measurement

| | |
|----------|---|
| °C | degrees in Celsius |
| cm | centimeters (metric) |
| hPa | hectopascal. Related to measurement of barometric pressure. |
| Kbit/sec | kilobits per second. Related to communication protocols. |
| kg | kilogram (metric) |
| m / M | meters (metric) |
| N | Newton. It is the International System of Units (SI) derived unit of force. |
| s | Second. A measurement of Time. |

Radiographic Terminology

| | |
|---------------|--|
| AEC | Automatic Exposure Control (AEC) |
| Anode | The positive terminal of an x-ray tube |
| APR | Anatomical programmed radiography |
| Bucky | It is a radiology device that holds the x-ray film cassette or Detector and moves the grid during x-ray exposure. |
| Bucky grid | A component used in radiography to prevent the scattered rays from reaching the film, aiding in the clarity and definition of the picture. May also be called Potter–Bucky grid. |
| CAN / CAN bus | Controller Area Network (CAN). CAN bus is a message-based protocol, designed for use in areas such as industrial automation and medical equipment |
| Cathode | A negative electrode from which electrons are emitted. In x-ray tubes, the cathode usually consists of a helical tungsten filament behind which a molybdenum reflector cup is located to focus the electron emission toward the target of the anode. |
| Central Ray | The center point of the X-ray beam. |
| Collimator | A device, sometimes called a diaphragm, which filters and controls the direction and the dimensions of the x-ray beam. |
| CR | Computed Radiography (CR). Uses an imaging plate made of photo stimulated phosphor storage in place of a film to create the image. |
| DAP | Dose Area Product meter. An electro-mechanical device used in assessing the radiation risk from diagnostic X-rays examination and interventional procedures. |
| Diaphragm | A collimation device, which filters and controls the direction and the dimensions of the x-ray beam. |
| DICOM | Digital Imaging and Communications in Medicine |
| DR | DR Digital Radiography (DR). Also called Direct Radiography. Employs the use of a special electronic x-ray detector which converts the radiographic image into a digital picture for review on a computer monitor. |
| FFD (DFF) | Focal Film Distance. More common term for use of Focal Distance with traditional film imaging systems. This is determined by the Focal Point of the X-ray tube to the surface of the media in use. (see also SID) |
| Filament | A coiled tungsten wire, which emits electrons when heated to incandescence. |
| Filter | The material (usually aluminium) placed in the useful primary beam of x radiation. |

| | |
|--------------------|--|
| flat panel | Generic term for use to describe a digital-type media radiography component to create a digital image |
| Focal Distance | Also seen as 'FFD' or 'SID'. The measurement between the Focal Point of the X-ray tube and the type of media in use. |
| Ionizing Radiation | Electromagnetic radiation (e.g., x rays or gamma rays) or particulate radiation (e.g., electrons, neutrons, and protons) capable of ionizing air directly or indirectly. |
| kVp | Peak kilovoltage (kVp). It is the maximum voltage applied across an X-ray tube. |
| mA | Milliamperage refers to the current flow from the cathode to the anode, which, in turn, regulates the intensity of radiation emitted by the x-ray tube and, hence, directly influences the radiographic density. |
| mAs | Milliampere-Seconds (mAs): The product of the x-ray tube operating amperage and exposure time, in seconds. |
| MPD | Maximum Permissible Dose (MPD). For radiation workers, 50 mSv per year is permissible. Oblique An angular view of a surface or object. |
| OFD | Object-to-Film Distance (OFD). Distance between the object or skin and the cassette or Film/detector. |
| PACS | Picture Archiving and Communication System. A Technology which provides economical storage of, and convenient access to, images. |
| Projection | A term for the position of a part of the patient with relation to the x-ray film and the x-ray beam. |
| Rad | Radiation Absorbed Dose (RAD). A unit of measurement for the absorbed dose of any type of ionizing radiation in any medium. |
| Radiation | The emission and propagation of energy, in the form of waves or particles, through space or a material medium. |
| Radiograph | A visible image on a radiation-sensitive film emulsion to ionizing radiation that has passed through an area, region, or substance of interest. |
| Radiography | The technical process of positioning, exposing, and processing radiographs. |
| RIS | Radiology Information System |
| SID | Source to image distance. More common term of Focal Distance for use with digital imaging systems. |
| Source | The point of emanation of gamma or x rays when used as an origin of radiation. The X-ray tube. |
| TFD | Target-Film Distance (TFD). This is the same as focal-film distance (FFD). |
| Wall Bucky | Stand Also written as: Wall Bucky, Wall stand, Wall Receptor Stand. Mobile radiology receptor component mounted to vertical column that is usually attached to the wall. This term is generically used also if different media is used such as 'bucky', 'DR' or CR' receptor components. (see also Teleradiograph) |
| Workstation | Operator working station. Mainly in reference to a work area dedicated to the X-ray generator console and Digital Imaging PC workstation for use in DR or CR applications. |
| X-ray | A type of electromagnetic radiation characterized by wavelengths of 100 angstroms or less. |
| X-ray Beam | The radiation emerging from an x-ray generator or source. |

Patient Orientation

| | |
|-------------------------------|--|
| Normal Anatomical Position | To avoid misunderstanding, a standard position of the human body is arbitrarily taken to be the erect (standing) position with feet flat on the floor, heels together, upper extremities at the sides, and palms, toes, and eyes directed forward. |
| AP | Anteroposterior (AP). The prefix indicates the surface from which the Central Ray (CR) enters the part and the suffix indicates the surface from which the CR emerges. |
| PA | Posteroanterior (PA). The prefix indicates the surface from which the Central Ray (CR) enters the part and the suffix indicates the surface from which the CR emerges. |
| Anterior, frontal, or ventrum | The front side of the body. |
| Posterior or dorsum | The back, or dorsum, of the body. |
| Median | Pertaining to the midline of the body. |
| Lateral | Away from the midline or lateral side of the body. |
| Proximal | Nearest to a point under consideration or the point of origin. |
| Superior | Above |
| Inferior | Below |
| Cephalic | Towards the head |
| Caudal | Toward the feet |
| Sagittal plane | plane Any vertical plane that divides the body into right and left unequal portions. |
| Transverse plane | Also known as Axial or Horizontal plane, it is an X-Z plane that is parallel to the ground which divides the body into upper and lower portions (head from feet). |
| Coronal plane | Also known as Frontal plane, it is a Y-X plane that is perpendicular to the ground. A vertical plane that divides the body into front and rear portions. |
| Sagittal plane | Also known as Lateral plane, it is a Y-Z plane that is perpendicular to the ground. The vertical plane that divides the body into right and left halves. |

Body Axes

H = Head

F = Feet

L = Left

R = Right

P = Posterior

A = Anterior

