5 Safety Systems

This chapter covers the safety systems built into the Hold Baggage Screening (**HBS**) System components and equipment.

5.1 Safety Systems on the X-Ray Scanner

Referring to **Figure 1**, **Figure 2**, and **Figure 3**, the following safety systems are incorporated into the X-Ray Scanner:

[1] X-Ray On Warning Lights

These are red lights located at the front and back top corners, which when lit indicate that the X-ray generators are “on” and generating radiation.

[2] Power “ON” Indicator

This green light when lit indicates the X-Ray Scanner unit is powered “on”.

[3] Leaded Shroud Curtains

Tunnel entrance and exit curtains limit scattered radiation to a maximum of **1 µSv/hr** (0.1 mRem/hr).

See Appendix B for definitions of these units of radiation measure.

Note: In the original Product Manuals, the above Appendix is at the back of the Manual. In this excerpt, the content from the Appendix has been inserted after page **5**.

[4] Emergency Stop Switches

E-Stop buttons on all 4 corners of the machine enable immediate manual shut down of the X-ray generators and conveyor movement.

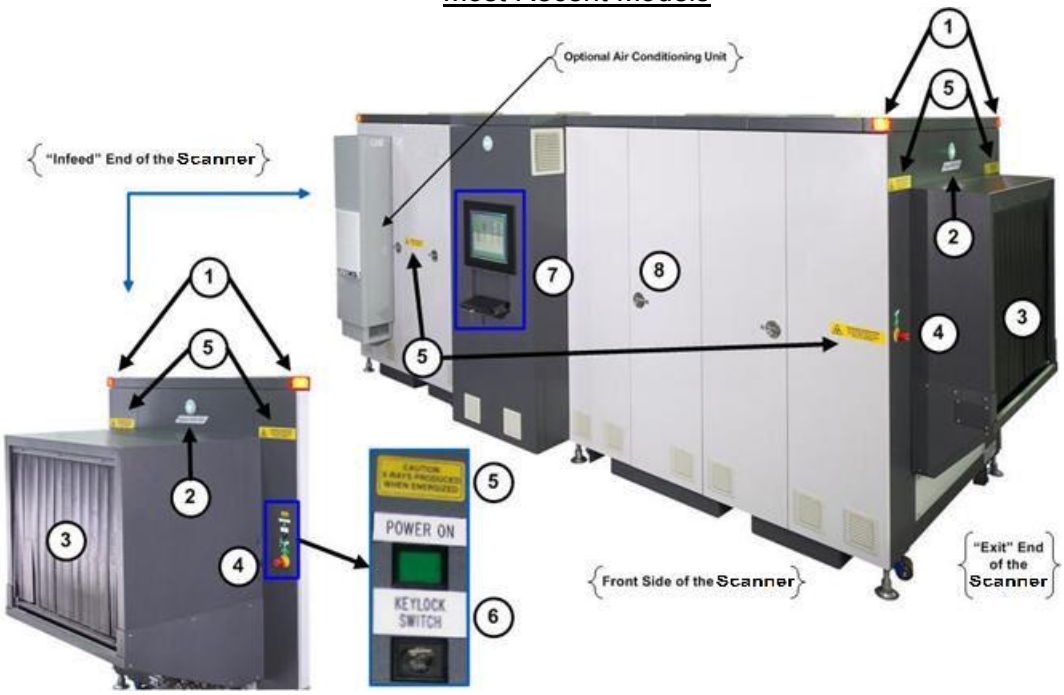
[5] Radiation Safety Signage

This signage provides alerts that the X-Ray Scanner emits radiation when energized.

[6] Key Access for System Power-Up

Power-up of any X-Ray Scanner unit requires key access, providing additional security towards preventing unauthorized operation of the equipment.

Most Recent Models



Earlier Models

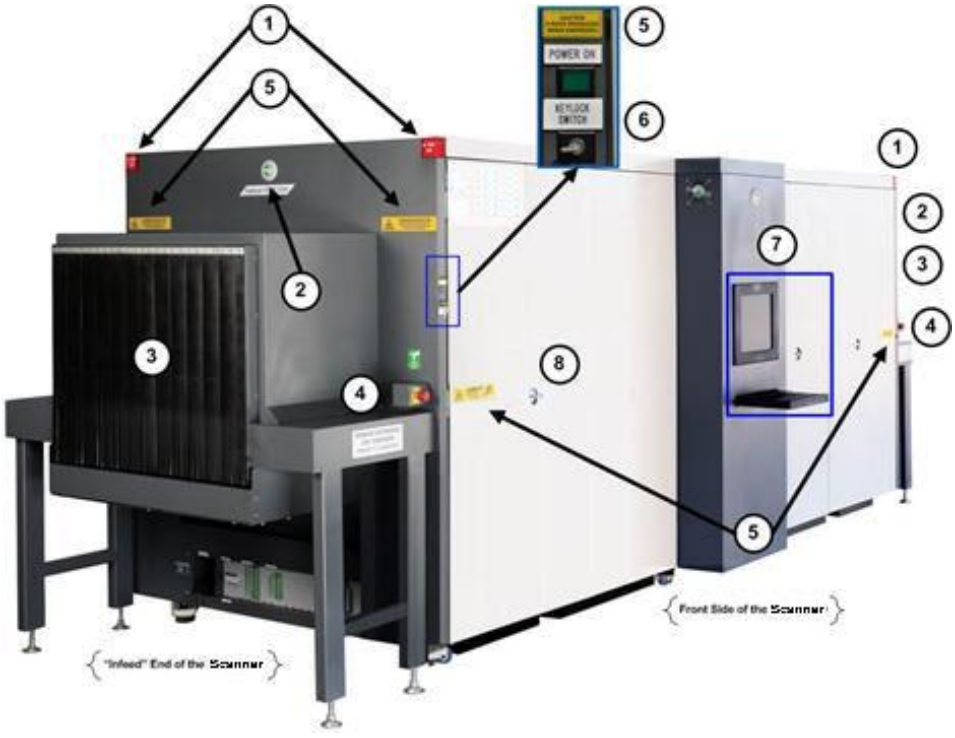


Figure 1: Safety Features on the X-Ray Scanner

[7] Locking Keyboard on the Built-In Control Console

As illustrated in **Figure 2**, the keyboard for the X-Ray Scanner Control Console, locks into the machine itself, preventing unauthorized access.

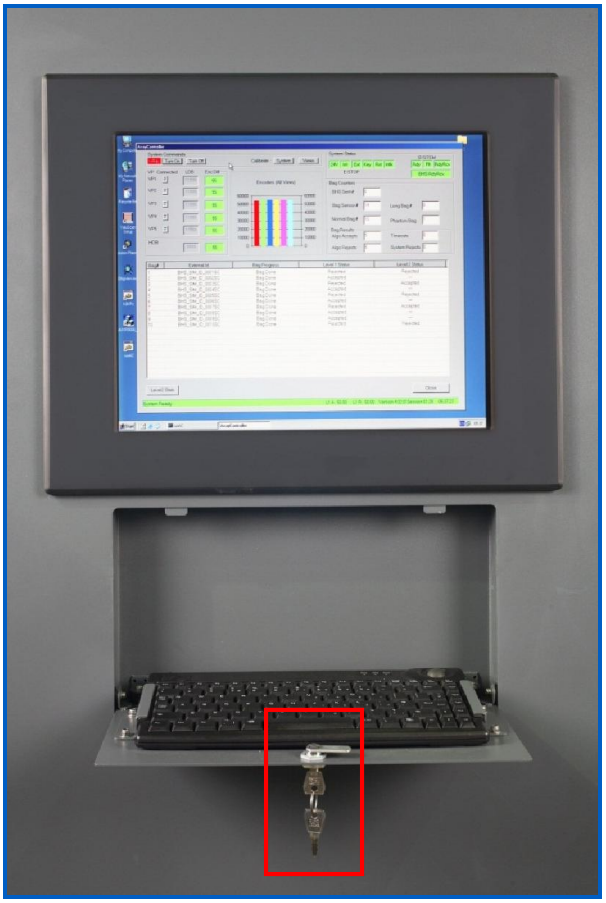
[8] Key-Locks on the Cabinet Door Access Handles

As illustrated in **Figure 3**, the access handle for each cabinet door on the outside of the X-Ray Scanner requires a key-lock to open it, preventing unauthorized access to the internal components of the machine.

[9] Safety Interlocks

Safety interlocks inside the Scanner Cabinet stop X-ray generation when any of the X-Ray detector array covers are open. X-ray generation re-starts when all covers are fully closed and the Scanner resets.

Most Recent Models



Earlier Models

(Above keyboard pushes in to lock.)

Figure 2: Keyboard Lock on the X-Ray Scanner Control Console

Figure 3: Cabinet Door Access Handle Key-Locks on the X-Ray Scanner

5.2 Safety Systems on the HBS Workstation

Access to the HBS Workstation Screening Software is via a Login window that requires a valid username and password, to prevent unauthorized access.

Where the optional **Workstation Desk Kit** (Figure 4) is employed, the workstation computer is kept inside a cabinet that is secured by a key-lock.

Figure 4: Key-Lock on the Optional HBS Workstation Desk Kit

5.3 Safety Systems on the HBS System Network Equipment

To prevent unauthorized access to the HBS System Network equipment:

- access to all server **software** is login-access controlled;
- all network servers and the network UPS are enclosed in a **server cabinet** which has key-locked front and rear access doors; and
- each **server** has a key-locked cover over the power on/off button.

Key-Lock on Server Cabinet Door

Key-Locks on Server Covers

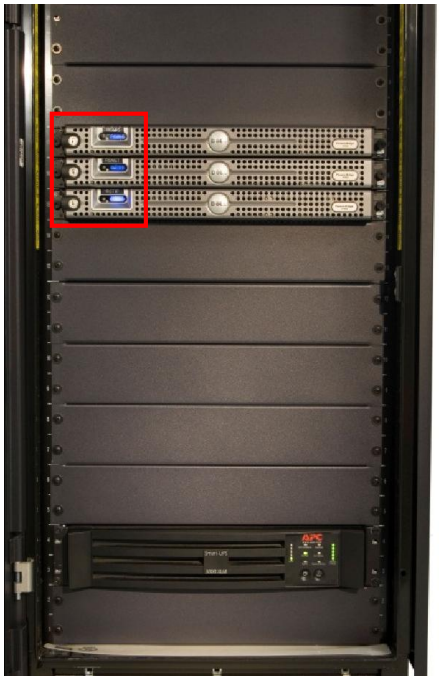
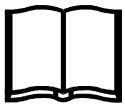


Figure 5: Key-Locks on the Server Cabinet and on each Server

Appendix B: Units Of Radiation Measure

When radiation is measured, different terms are used based on whether we are:

- measuring radiation emitted from a radioactive source,
- measuring the radiation dose absorbed by an individual, or
- measuring the risk an individual may suffer biological effects from exposure to radiation.



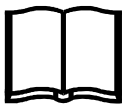
DEFINITION: Exposure

Exposure is a measure of the ability of electromagnetic radiation, such as X-rays, to produce **ionization** in air.

Traditionally, the unit of exposure is the **Roentgen (R)**.

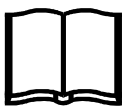
There is no System International (**SI**) unit defined for exposure.

A micro-Roentgen (**µR**) is one millionth of a Roentgen (R).



DEFINITION: SI (International System of Units)

Système International d'Unités (International System of Units) is the international standard set of units of measurement set by the 11th General Conference on Weights and Measures in 1960.

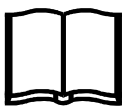


DEFINITION: Absorbed Dose

A measure of the amount of energy absorbed or deposited per unit of mass.

The unit **Rad (R)** can be applied to all types of radiation and is defined as the deposition of 100 ergs of energy in one gram (mass) of any material.

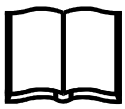
The SI unit of absorbed dose is the **Gray (Gy) = 100 Rad.**



DEFINITION: Dose Equivalent

A measurement that expresses, on a common scale for all ionizing radiations, the magnitude of radiation effects likely to be incurred by exposed persons.

Dose equivalent is computed multiplying the absorbed dose in **Rad** by a **Quality Factor** (**QF**).



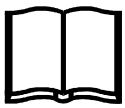
DEFINITION: Quality Factor (QF)

An energy dependent factor which relates:

(a) the amount of radiation effects likely to be incurred by exposed persons from the type of radiation absorbed, to

(b) the amount of radiation effects from the same dose of X-rays.

The **QF** is **1** for X-rays.



DEFINITION: Roentgen Equivalent Man (Rem)

A unit of measurement for dose equivalent, computed as:

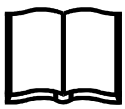
1 Rem = 1 Rad × QF

For X-rays (where the QF is 1):

1 Rad of exposure results in 1 Rem of dosage.

A Rem is a large amount of radiation, so the milli-Rem (**mRem**), which is one thousandth of a Rem, is often used for the dosages commonly encountered, such as that from medical X-rays or background sources.

A micro-Rem (**µRem**) is one millionth of a Rem.



DEFINITION: Sievert (Sv)

The SI unit of dose equivalent, defined as:

1 Sv = 100 Rem

In security equipment, a more applicable unit is the micro Sievert (**µSv**), which is one millionth of a Sievert (Sv).

1 µSv = 100 µRem