

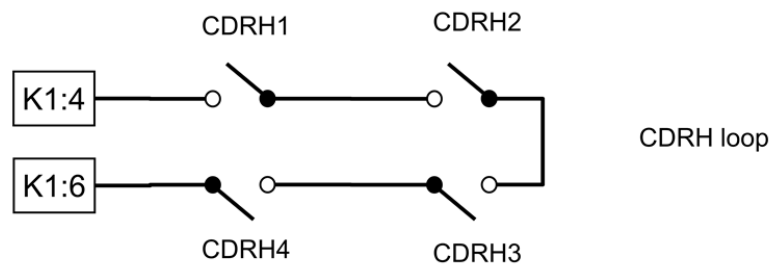
Nevis X-ray calibration facility safety procedures

The document describes the general idea of the interlock system to the user and details the procedures to safely enter the interlocked areas of the Nevis X-ray calibration facility.

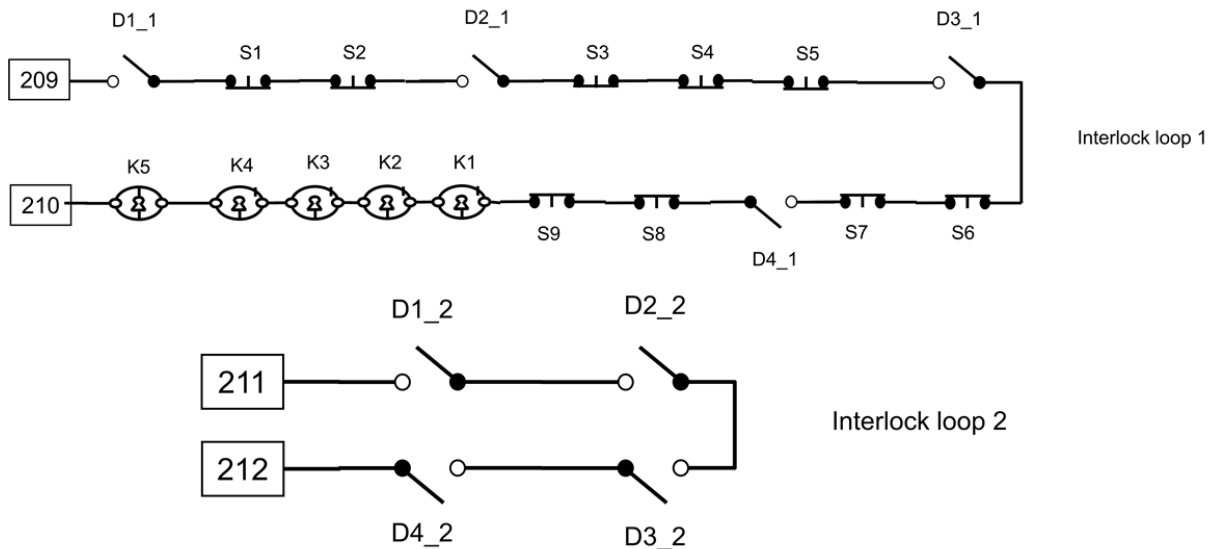
Interlock system outlining

The interlock system consists of three independent cable loops, the CDRH loop and interlock loops 1 and 2, which must be intact for the X-ray unit to be energized, as well as a number of warning signals.

The CDRH loop carries all power used for producing X-rays and therefore effectively unplugs the X-ray unit if a door (CDRH1-CDRH4) is opened.



The interlock loops are broken if a door (D1-D4) is opened, but interlock loop 1 can also be discontinued through the activation of a panic button (S1-S9), distributed throughout the facility, or the control panel (K1-K5), located in the control room.



The panic buttons are large mushroom shaped push-buttons, illuminated by a red diode light and located on the walls of the interlocked areas.



Hitting a panic button breaks interlock loop 1, disallowing the production of X-rays. Panic buttons are reset by an operator-controlled key.

The control panel contains four switch locks, one for each entrance to the interlocked area, as well as the operator button, which must be engaged whenever facility is not in use.



The switch lock keys cannot be removed unless the switch is open, i.e. interlock loop 1 is broken and X-rays are disallowed. The key-chain contains two keys, one for operating the switch lock and one for gaining access to the interlocked areas.



When entering the interlocked areas, a padlock is unlocked, allowing the sliding door to open, and subsequently locked, holding the sliding door open. When exiting, personnel unlocks padlock once more, slide door shut, and locks it in place before returning the key to the control panel or key cabinet. Warning signals are carried from the X-ray unit throughout the facility. The first signal is called the “prewarning” and begins 30 seconds before the X-ray unit is energized. It consists of a flashing red light

and a siren going off inside the interlocked areas so as to warn any individuals still remaining inside, providing them plenty of time to reach a panic button and prevent X-rays from being produced.



Following the prewarning a steady-burning red light will be lit inside the interlocked areas while a sign outside will indicate "X-RAY ON".



These warnings will remain on while X-rays are being produced. A sign inside the interlocked areas near each entrance explain the warnings and how to operate the panic buttons.



Entering interlocked areas

When X-ray unit is not being used, all keys must be stored in key cabinet!

Access to key cabinet is controlled by the responsible operator!

X-ray badges must be worn when entering interlocked areas!

Source hut

Entering

- 1) Obtain permission from operator to enter hut
- 2) Enter date and time of entry in logbook and name of all personnel seeking entrance to hut
- 3) Retrieve key number XXX and key number XXX2 from key cabinet
- 4) Use key number XXX to gain access to source room
- 5) Unlock padlock using key number XXX2, slide open door and lock in place with padlock

Exiting

- 1) Account for all personnel, ensuring none have entered tunnel through service hatch
- 2) Unlock padlock using key number XXX2, slide door shut and lock in place with padlock
- 3) Ensure that source room door is locked
- 4) Ensure calibration room service hatches are secured
- 5) Ensure all personnel entered in logbook is accounted for
- 6) Return key number XXX and key number XXX2 to operator

Tunnel

Entering

- 1) Obtain permission from operator to enter tunnel
- 2) Enter date and time of entry in logbook and name of all personnel seeking entrance
- 3) Retrieve key number XXX from key cabinet
- 4) Unlock padlock using key number XXX, slide open door and lock in place with padlock

Exiting

- 1) Account for all personnel, ensuring none have entered source hut through service hatch
- 2) Unlock padlock using key number XXX, slide door shut and lock in place with padlock
- 3) Ensure calibration room service hatches are secured
- 4) Ensure all personnel entered in logbook is accounted for
- 5) Return key number XXX to operator

Calibration room

Entering

- 1) Obtain permission from operator to enter calibration room
- 2) Enter date and time of entry in logbook and name of all personnel seeking entrance
- 3) Retrieve key number XXX and key number XXX2 from key cabinet
- 4) Unlock padlock using key number XXX, slide open door and lock in place with padlock
- 5) Unlock door using key number XXX2 and enter gowning area
- 6) Don clean room outfit and enter clean area

Exiting

- 1) Account for all personnel
- 2) Leave clean area and remove clean room outfit
- 3) Exit gowning area, locking door using key number XXX2
- 4) Unlock padlock using key number XXX, slide door shut and lock in place with padlock
- 5) Ensure calibration room service hatches are secured

- 6) Ensure all personnel entered in logbook is accounted for
- 7) Return key number XXX to operator

Detector room

Entering

- 1) Obtain permission from operator to enter room
- 2) Enter date and time of entry in logbook and name of all personnel seeking entrance
- 3) Retrieve key number XXX from key cabinet
- 4) Unlock padlock using key number XXX, slide open door and lock in place with padlock

Exiting

- 1) Ensure beam stop is secured
- 2) Account for all personnel
- 3) Unlock padlock using key number XXX, slide door shut and lock in place with padlock
- 4) Ensure calibration room service hatches are secured
- 5) Ensure all personnel entered in logbook is accounted for
- 6) Return key number XXX to operator

Operation of the X-ray unit

Operation of the X-ray unit must be carried out by the responsible operator!
Operator must carry key to key cabinet as well as operator key while on duty!
Operator button must be engaged unless facility is in use!

Initial start-up

- 1) Enter date, time and operator name into logbook
- 2) Retrieve key number XXX, key number XXX1 and key number XXX2 from key cabinet
- 3) Use key number XXX to gain access to source room
- 4) Use key number XXX1 to open controller cabinet
- 5) Use key number XXX2 to turn on controller
- 6) Enable remote operation (XXX details)
- 7) Use key number XXX1 to lock controller cabinet
- 8) Ensure that source room door is locked

Remote operation

- 1) Enter date, time and operator into logbook
- 2) Ensure calibration room service hatches are secured
- 3) Ensure beam stop is secured
- 4) Retrieve key number XXX through to key number XXX from key cabinet
- 5) Insert key number XXX through to key number XXX into control panel, locking them in place
- 6) Disengage operator button
- 7) Ensure interlocks are engaged
- 8) Condition tube corresponding to date of last use
- 9) Commence firing