

Rad-DX Detector Calibration Process

Introduction

The Rad-DX detector calibration process requires measuring a correctly-oriented Rad-DX unit in several different nonlinearly spaced gamma fields (we recommend 9). Calibration range should use NIST-certified reference equipment to place the appropriate field. The Rad-DX is calibrated against Cs-137. We calibrate the Rad-DX using the following standard conversion for gamma radiation $1R = 1 \text{ rad}$, $1 \text{ rad} = 1 \text{ rem}$.

Measurement Facility

A radiation measurement facility with a Cs-137 source is required. The facility must have the ability to place the Rad-DX in Cs-137 gamma fields that are NIST traceable to within $\pm 1\%$ of the specified strength. Current calibration is required for all applicable instruments used. The measurement facility must also have the ability to place a Rad-DX in a field of 100mR with a beam diameter greater than 10 inches for a single device, and greater than 22 inches for a 4 device fixture (see figure 2). These constraints ensure that slight errors in placement will not have massive impacts on the reading.

Orientation

The Rad-DX should be oriented orthogonal to the source with the gamma field measured at the middle center of the Rad-DX fixture (see figure 1).

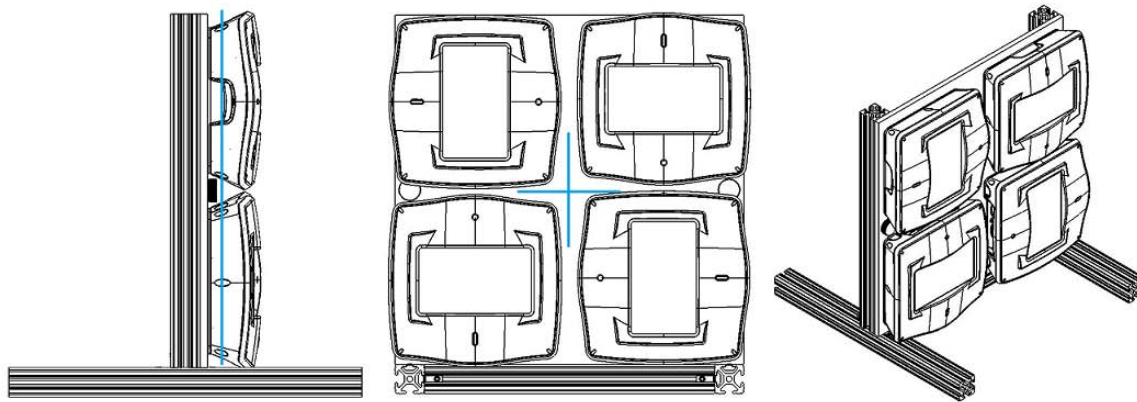


Figure 1. Orientation

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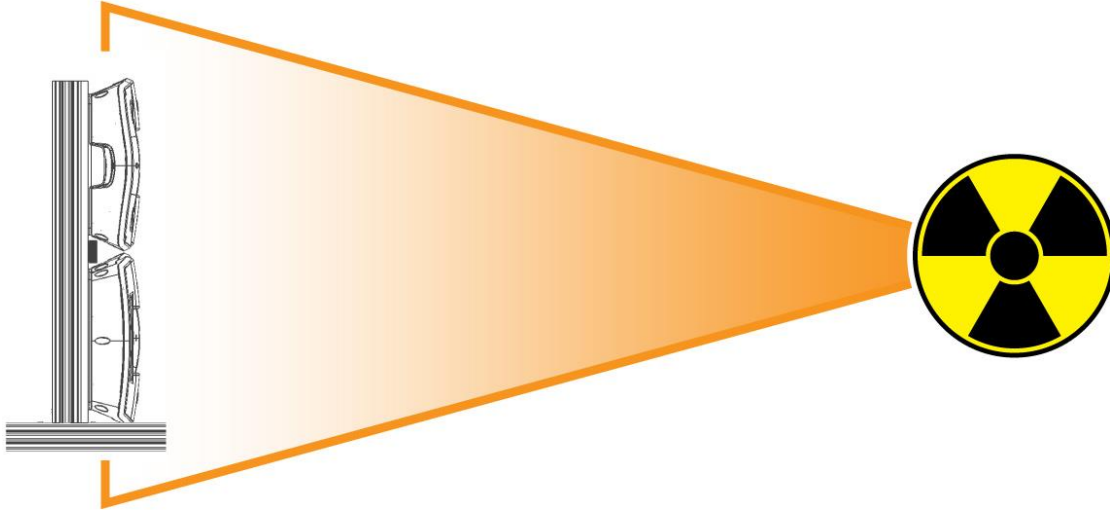


Figure 2: Minimum gamma beam coverage of the device during test.

DX-Link

The calibration process requires constant communication between the PC running the DX-View software and the device(s) placed in the calibration range. We recommend using a DX-Link USB radio transmitter.

If you do not have a DX-Link, then you could use another Rad-DX device connected via USB to the PC in place of a DX-Link. **Do not** attempt to calibrate the Rad-DX connected to the PC.

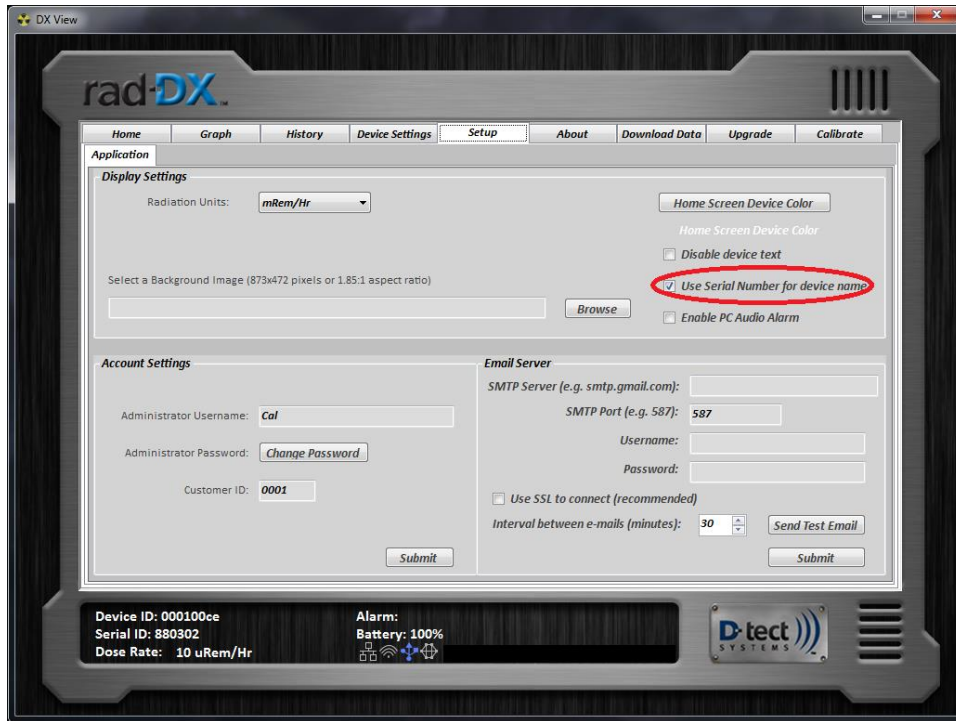
Enable DX-View Calibration Software

DX-View Version 491 or later supports Rad-DX calibration. The calibration feature is not enabled by default in the DX-View software. To open the DX-View shortcut with calibration enabled please follow the instructions below.

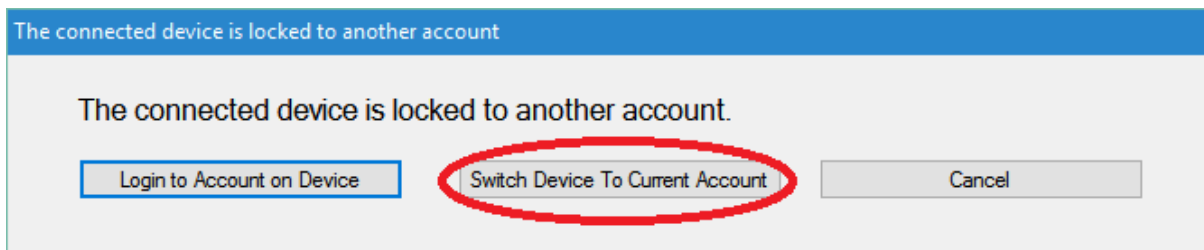
1. Press the Windows Start button.
2. Click on All Apps.
3. Find and click on the D-tect Systems folder.
4. Find and click on the DX-View Calibrate icon.

Setup Rad-DX Units for Calibration

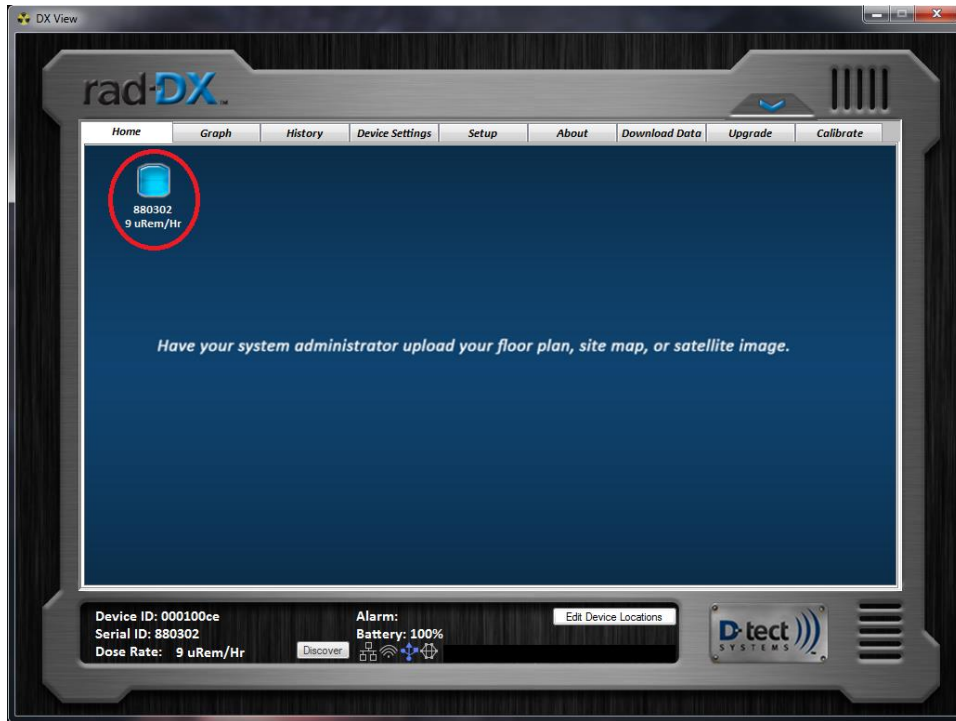
1. Open DX View - Calibrate
2. The first time you open the application you will be asked enter you username, password, and customer ID credentials. If you are a calibration lab using different credentials than those on the Rad-DX units you are calibrating, then you may create your own credentials, such as “CalLab” for the User Name, “CalLab” for the Password, and “1111” as your customer ID.
3. Go to the setup tab and check the “Use Serial Number for Device Name” box.



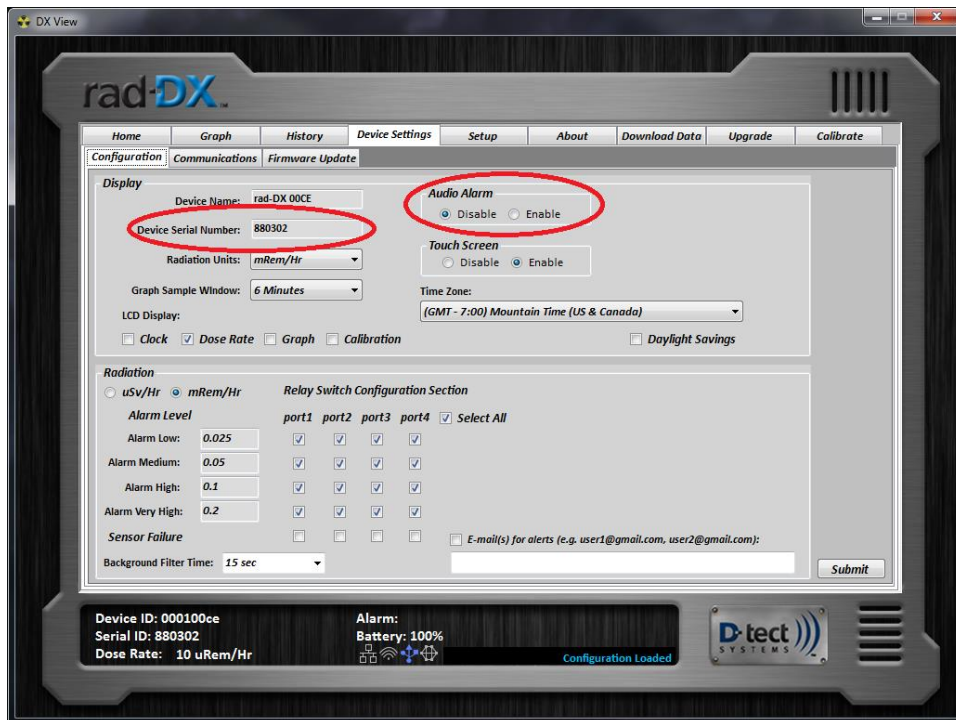
4. Return to the home screen.
5. Connect the Rad-DX unit to a PC via USB cable. Make sure there is only one device connected at a time, and that the DX link USB dongle is not connected to the PC.
6. A popup will appear indicating that the device is locked to another account; click the “Switch Device to Current Account” button.



7. The device’s icon should appear on the home screen.



8. Go to the “Device Settings” tab and input the serial number, and disable the audio and vibration alarms.



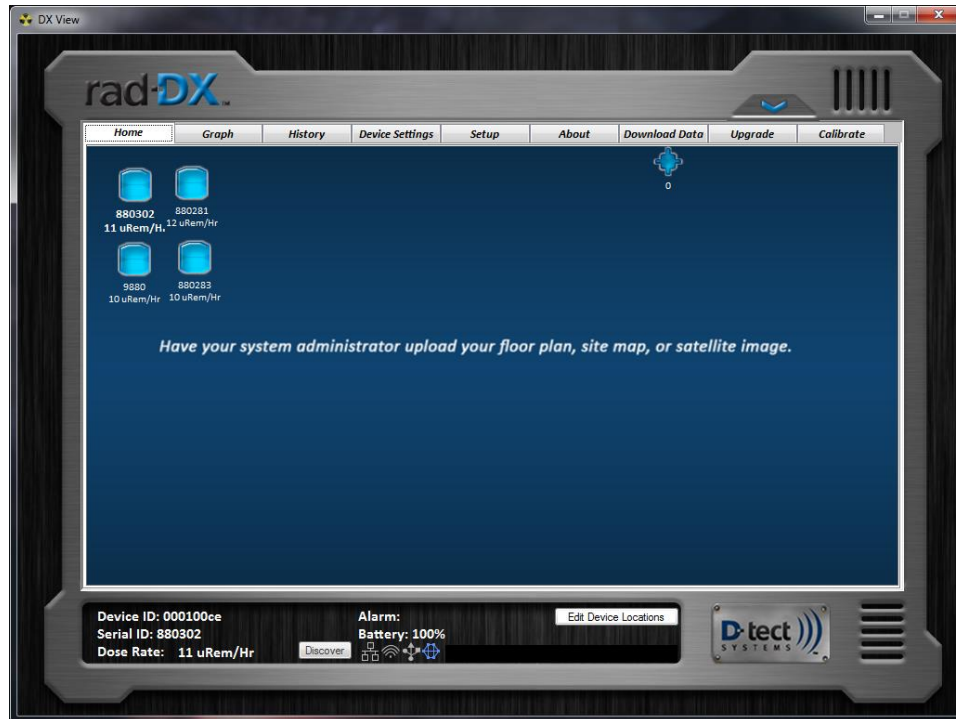
9. Remove USB cable and place on fixture.

10. Repeat steps 4-8 for each device.

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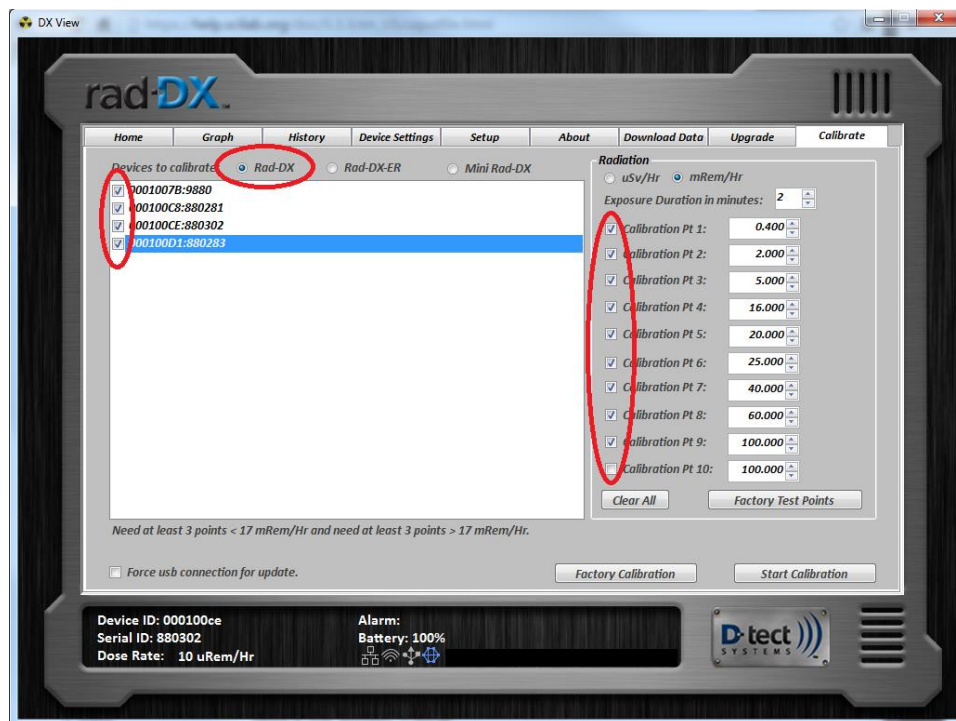
Recording Process

1. Make sure that all devices to be calibrated are no longer connected to the PC via USB, and that all devices are powered up.
2. Plug the DX-Link USB dongle or DX-Link stand-in device into your PC, and configure the DX-Link. If necessary, enter the same username, password, and customer ID as the other devices.
3. After a few moments the Home screen should look like the figure below:



4. It is recommended that the devices be arranged on the home tab in the same pattern they are attached to the fixture for easy correlation.
 - Click the “Edit Device Locations” button to move the icons.
 - When done, click “Save Device Locations” to lock the icons.
5. Go to the calibration tab. Verify that the device type is set as Rad-DX. Select all of the devices you wish to calibrate. Select 9 calibration points, and set values for calibration.

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○ Recommended points:

Calibration Point	Radiation Level (mRem)
1	0.4
2	2
3	5
4	16
5	20
6	25
7	40
8	60
9	100

6. Place the fixture in the radiation chamber setup for calibration point 1.
7. Click “Start Calibration.”
8. A window will pop up to indicate that the software is ready to start the process. Click “Ok”.
9. Wait for the attenuator to open and the devices to reach field strength.
10. A popup will ask you to proceed with the 2 minute soak. Click “Ok”.
11. Allow to soak.
 - While the device(s) are being exposed, record the radiation dose rate values displayed on the home screen and calculate the percent difference to the actual dose rate.
12. Close attenuator.
13. Move fixture to next point.
14. Repeat steps 9-13 until they have been completed for all of the calibration points.

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15. A popup will appear after the last soak asking you to calculate the new calibration data. Click the “Calculate new Calibration Data” button.
16. A popup will ask you if you want to update the device calibration tables. Click “Upload Calibration Tables.”
17. Wait for all devices to finish updating.
 - Please note that this process takes place while the devices are still in the calibration range. It takes 2 to 3 minutes per device and only one device will be updated at a time.

Validation

1. Subject the device to each of the following radiation levels.

Validation Point	Radiation Level (mRem)
1	0.4
2	2
3	5
4	16
5	20
6	25
7	40
8	60
9	100

2. At each point record the device reported values on the Home Screen and calculate percent difference the actual dose rate and the dose rate displayed by the device.
 - If the percent difference is within 10% at every point, then proceed to the Return stage.
 - If the percent difference is outside 10% at any point, then proceed to step 3.
3. Verify the calibration upload was successful by selecting the device on the home screen then going to the Device Settings -> Firmware and view the date and time at the bottom.
 - If the date and time **do not match** the date and time when you uploaded the new calibration table, then manually update the table. To do this, plug in the device via USB, select it on the Home Screen, then proceed to Device Settings -> Firmware and navigate to Documents\D-tect_Systems_Data\DXView\Calibrate and select the file with matching serial number and the correct date modified info. Click submit.
 - If the date and time **match** the date and time when you uploaded the new calibration table, then contact D-tect Systems at techsupport@dtectsystems.com or call 1-801-260-4000.



4. Reset Account Settings on each device.
 - Click on a device icon on the home screen.
 - Go to the Device Settings Tab -> Firmware Update tab.
 - Click the “Reset Account Settings” button. Repeat with each calibrated device.

Return

1. Apply calibration stickers.
2. Return device(s) to customer.

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