DR Detector Calibration

Key User Manual

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Contents

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UK | **RP** Agfa HealthCare UK Limited, 515 Coldhams Lane, CB1 3JS Cambridge, Cambridgeshire, UK

Agfa NV, Septestraat 27, 2640 Mortsel - Belgium

For more information on Agfa products, please visit agfaradiologysolutions.com.

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Introduction to this Manual

Scope

This manual contains information for the calibration and maintenance of the following DR Detectors:

- DR 10e C
- DR 10s
- DR 14e C
- DR 14e G
- DR 14s
- DR 17e C
- DR 17e G
- DR 18M
- DR 24M
- DX-D 10C
- DX-D 10G
- DX-D 20C
- DX-D 20G
- DX-D 25C
- DX-D 30C
- DX-D 35C
- DX-D 40C
- DX-D 40G
- DX-D 45C
- DX-D 45G
- DX-D 60C
- DX-D 60G
- Fixed DR Detector (4343R, Pixium RAD 4343)
- Fixed DR Detector (Pixium RF4343 FL)
- XD 10
- XD⁺10
- XD 14
- XD⁺14
- XD 17
- XD⁺17
- XF⁺10
- XF⁺14
- XF⁺17

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Note In the United States, Federal law restricts this device on order of a physician for prescription use only.

General

- The product has been designed in accordance with Regulation (EU) 2017/745 on medical devices (MDR)

Calibrating the DR Detector

About Gain Calibration

Regular calibration of the DR Detector assures constant image quality. This calibration eliminates the effect of sensitivity deviations over the panel and/or corrects non-unifomity in the X-ray beam. The sensitivity deviations of pixels across the DR Detector are affected by the quantity and pattern of the effective X-ray dose on the detector. Depending on the the panel type it will also correct dead pixels in the acquired images.

Calibration Frequency

The DR Detector must be recalibrated at regular intervals. Messages will be displayed on the NX workstation when recalibration is required.

Perform calibration when exposure conditions have changed significantly and after a major change to the hardware or software configuration of the X-ray system.

A DR detector used for veterinary applications has a calibration interval of 12 months, regardless of the model.

Table 1: Calibration interval

DX-D 10C, DX-D 10G, DX-D 20C, DX-D 20G	3 months
DR 18M, DR 24M DX-D 40C, DX-D 40G, DX-D 45C, DX-D 45G, DX-D 60C, DX-D 60G XD 10, XD⁺10, XD 14, XD⁺14, XD 17, XD⁺17 XF⁺10, XF⁺14, XF⁺17	6 months
DR 10e C, DR 14e C, DR 17e C DR 10s, DR 14s DX-D 25C, DX-D 30C, DX-D 35C Fixed DR Detector (Pixium RF4343 FL)	12 months
Fixed DR Detector (4343R, Pixium RAD 4343)	3 months or 12 months, depending on the DR Detector model. A timely reminder is displayed on the NX workstation.
DR 14e G, DR 17e G XD 10, XD⁺10, XD 14, XD⁺14, XD 17, XD⁺17 (veterinary application) XF⁺10, XF⁺14, XF⁺17 (veterinary application)	no calibration required

Table 2: Using the DR Detector on multiple NX workstations

DR 10s, DR 14s DX-D 10C, DX-D 10G, DX-D 20C, DX-D 20G DX-D 25C DX-D 30C, DX-D 35C DX-D 40C, DX-D 40G, DX-D 45C, DX-D 45G, DX-D 60C, DX-D 60G XD 10, XD 10+, XD 14, XD 14+, XD 17, XD 17+ XF⁺10, XF⁺14, XF⁺17	Each NX workstation has its own set of calibration data. The regular calibration must be performed on each of the workstations.

DR 10e C, DR 14e C, DR 17e C	A single set of calibration data is used for all NX workstations on which the DR Detector is used. Choose one NX workstation that will be used for calibration and perform the regular calibration each time on the same NX workstation. Do not calibrate the DR Detector on another NX workstation.
DR 18M, DR 24M Fixed DR Detector	The DR Detector can only be used on a single NX workstation.

Note If the system has multiple DR Detectors, make a note of the ID that is mentioned in the message on the NX workstation indicating which of the DR Detectors must be calibrated. The ID is required to identify the right detector during calibration.

Calibration Workflow

Required material

For calibration of all DR Detectors, apart from DR 18M, DR 24M and DX-D 25C, an Agfa calibration filter (Cu 1.5 mm) is required.

For calibration of DR 18M and DR 24M, a calibration PMMA block is required.

Preconditions

- Clean the DR Detector (see the DR Detector user manual for instructions).
- Make sure that all parts of the X-Ray system that may affect imaging (e.g. the DAP meter) are in their normal position and clean.
- Make sure the battery is fully charged before starting the calibration (battery powered DR Detectors only).
- The DR Detector must be powered on before starting the NX workstation.
- Allow the DR Detector to warm up before performing the calibration. During warm-up no exposures should be made. Warm-up time is one hour, unless specified otherwise.
- The ID of the DR Detector must be known.
- The X-ray generator is operational.
- Make sure that there are no foreign objects in the exposed area (e.g. stitching grid).
- Move the floating tabletop to its normal position to avoid that the tabletop borders become visible on the DR Detector image.

Procedure

To calibrate the DR Detector:

1. Log in to NX.

   To calibrate DR 10e C, DR 14e C or DR 17e C, you have to log in to a user account with administrator rights.
2. Stop the NX software completely.

   In the Start menu, select **All programs** > **Agfa** >**NX** > **Service** > **Stop NX.**
3. Start the DR Calibration Tool.

   In the Start menu, select **All programs** > **Agfa** > **DR Calibration Tools** > **Calibration Tool**.

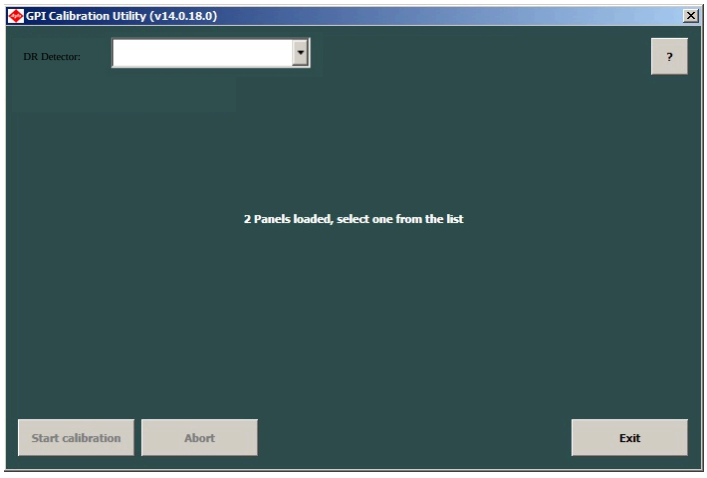
   The software console is started.

   The splash screen is displayed. Click the splash screen to make it disappear.

4. Check the DR Detector staus in the software console or on the generator console (if applicable).

   If the DR Detector can be used on different NX workstations, make sure that it is registered to the NX workstation where calibration is performed.

   Note If the DR Detector status is displayed, it may stay red or undefined.
5. Use the DR Detector drop-down to select the detector that will be calibrated.



   A portable DR Detector is identified by its nickname. A fixed DR Detector is identified by its serial number.

   On DX-D 300 and DX-D 600 the modality position is not selected automatically. Use the drop-down button on the software console to select the modality position.

   Connection to the detector is set up.

6. Click **Start Calibration**.
   A message may be displayed to remind you of using the correct modality settings.
7. The DR Calibration Tool will request to perform a series of exposures.

   Refer to the Exposure Sequences further in this manual.

   Before making each next exposure, make sure that the X-ray system is ready for making the exposure and that the DR Calibration Tool is ready for receiving the exposure.
8. After the last exposure, the calibration is finished.
   - Make a flat field exposure and check that there are no abnormal inhomogeneities in the image.
   - If the calibration was successful, the new calibration values are stored and used for all new exposures on the DR Detector. Proceed with step 10.
   - If the calibration was not successful, the old calibration values are restored and the DR Detector remains operational.

     In that case, it is advised to check collimation and modality setup (tube position) and retry the calibration procedure as soon as possible.
9. Try out the following remedy (problem solving):
   - If the calibration fails this may be due to magnetic or electromagnetic interference or power supply interference. Check the environment, reposition the DR Detector and restart the calibration procedure.
   - If the calibration fails this may be due to uneven exposure. Check the X-ray beam path for presence of X-ray opaque objects or particles, e.g. on the upper surface of the DAP meter.

   Note If calibration fails again contact your local service representative.
10. Exit the Calibration Tool.
11. Start the NX software.

    In the Start menu, select **All programs** > **Agfa** > **NX** > **Restart NX completely**.

Related information

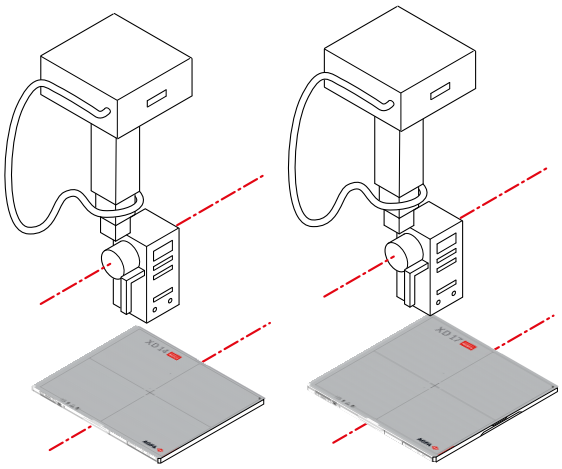
DR 10s and DR 14s Exposure Sequence on page 18
DR 10e C, DR 14e C and DR 17e C Exposure Sequence on page 20
DR 18M and DR 24M Exposure Sequence on page 22
DX-D 10C, DX-D 10G, DX-D 20C, DX-D 20G Exposure Sequence on page 23
DX-D 25C Exposure Sequence on page 25
DX-D 30C and DX-D 35C Exposure Sequence on page 27
DX-D 40C and DX-D 40G Exposure Sequence on page 29
DX-D 45C, DX-D 45G, DX-D 60C and DX-D 60G Exposure Sequence on page 31
Fixed DR Detector (4343R, Pixium RAD 4343) Exposure Sequence on page 33

XD 10, XD⁺10, XD 14, XD⁺14, XD 17, XD⁺17, XF⁺10, XF⁺14, XF⁺17 Exposure Sequence

Modality Settings

Apply these modality settings:

Table 3: Modality settings

kV	75 kV
mAs (indicative value for first exposure level)	25 mAs (XD 10, XD⁺10, XF⁺10) 32 mAs (XD 14, XD⁺14, XD 17, XD⁺17, XF⁺14, XF⁺17)
mAs (indicative value for second exposure level)	12.5 mAs (XD 10, XD⁺10, XF⁺10) 4 mAs (XD 14, XD⁺14, XD 17, XD⁺17, XF⁺14, XF⁺17)
Focus	large focus
SID	Use the (average) SID for normal operation.
Position	If the DR Detector is used in a fixed position, use the same position for calibration. If the DR Detector is used in different positions, perform the calibration with the short side of the DR Detector parallel to the axis of the X-ray tube. 
Grid	Remove the grid.
Filtration	Mount the Agfa calibration filter (Cu 1.5 mm). Check that there is no additional filtration.
Collimation	The collimation area should extend at least 1.5 cm on each side of the DR Detector.

Note If the exposure settings used for a previous calibration are known, use these settings.

On modalities that support automatic collimation, the collimation settings are applied automatically and must be checked by the user.

Ralco collimators may limit the X-ray field. To overrule the limitation, the collimator must be unlocked using a key and the collimation must be applied manually.

Exposure Sequence

Procedure:

1. Set the mAs value to the indicative value for the first exposure level.
2. Make two exposures.

   The DR Calibration Tool may instruct to increase or decrease the mAs setting to reach the required exposure level.
3. Make 10 exposures.
4. Set the mAs value to the indicative value for the second exposure level.
5. Make two exposures.

   The DR Calibration Tool may instruct to increase or decrease the mAs setting to reach the required exposure level.
6. Make one exposure.

Partial calibration

For veterinary applications, a partial calibration can be performed. The exposed area during calibration is not covering the whole detector surface. A minimum exposed area of 10 by 12 cm is required.

Warning: It is not allowed to use a partially calibrated DR detector for human patients.

Procedure:

Make the exposures as instructed by the DR Calibration Tool.

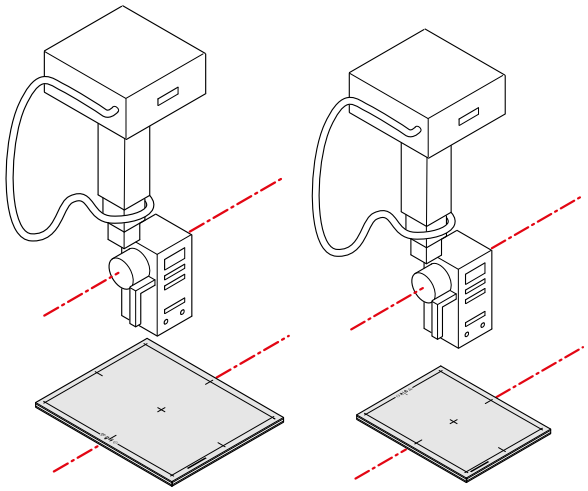
The tool will detect the partial exposure and ask for confirmation that a partial calibration can be applied.

DR 10s and DR 14s Exposure Sequence

Modality Settings

The indicative exposure levels for each exposure are specified by the DR Calibration Tool.

Table 4: Modality settings

Focus	large focus
SID	Use the (average) SID for normal operation.
Position	If the DR Detector is used in a fixed position, use the same position for calibration. If the DR Detector is used in different positions, perform the calibration with the short side of the DR Detector parallel to the axis of the X-ray tube. 
Grid	Remove the grid.
Filtration	Mount the Agfa calibration filter (Cu 1.5 mm). Check that there is no additional filtration.
Collimation	The collimation area should extend at least 1.5 cm on each side of the DR Detector.

Note If the exposure settings used for a previous calibration are known, use these settings.

On modalities that support automatic collimation, the collimation settings are applied automatically and must be checked by the user.

Ralco collimators may limit the X-ray field. To overrule the limitation, the collimator must be unlocked using a key and the collimation must be applied manually.

Exposure Sequence

Procedure:

1. Set the mAs value to the indicative value for the exposure level.
2. Make exposures as instructed by the DR Calibration Tool.
   To avoid overheating of the X-ray tube, limit the rate of exposures to two per minute.

Calibrating DR 10s and DR 14s on DX-D 100

On a DX-D 100 mobile X-ray unit that is upgraded to support DR 10s or DR 14s, an extra step is needed to activate the DR Detector during calibration.

In the modality position drop-down list on the software console, push the icon for free exposure with **ETHERNET** written on top.

DR 10e C, DR 14e C and DR 17e C Exposure Sequence

Using DR 10e C, DR 14e C and DR 17e C on multiple NX workstations

If the DR Detector is used on multiple NX workstations, choose one NX workstation that will be used for calibration and perform the regular calibration each time on the same NX workstation. Do not calibrate the DR Detector on another NX workstation.

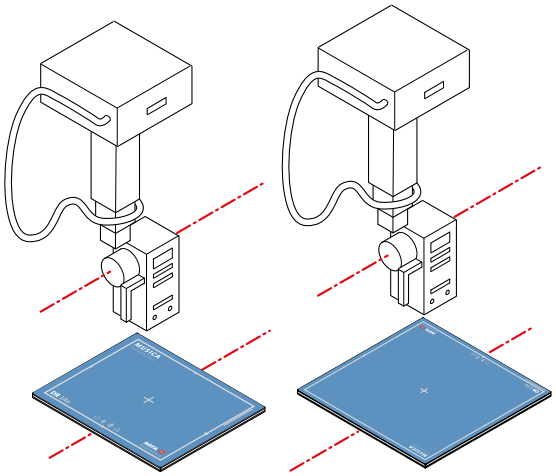
Performing the calibration on multiple NX workstations leads to an inconsistent situation, because the DR Detector is not able to store calibration data for multiple NX workstations and each calibration completely discards the calibration data of any previous calibration. Nevertheless each NX workstation will independently request recalibration of the DR Detector every 12 months.

Modality Settings

Note To calibrate DR 10e C, DR 14e C or DR 17e C, you have to log in to a user account with administrator rights.

The indicative exposure levels for each exposure are specified by the DR Calibration Tool.

Table 5: Modality settings

Focus	large focus
SID	Use the (average) SID for normal operation.
Position	If the DR Detector is used in a fixed position, use the same position for calibration. If the DR Detector is used in different positions, perform the calibration with the short side of the DR Detector parallel to the axis of the X-ray tube. 
Grid	Remove the grid.
Filtration	Mount the Agfa calibration filter (Cu 1.5 mm). Check that there is no additional filtration.
Collimation	The collimation area should extend at least 1.5 cm on each side of the DR Detector.

Note If the exposure settings used for a previous calibration are known, use these settings.

On modalities that support automatic collimation, the collimation settings are applied automatically and must be checked by the user.

Ralco collimators may limit the X-ray field. To overrule the limitation, the collimator must be unlocked using a key and the collimation must be applied manually.

Exposure Sequence

Procedure:

1. Set the exposure parameters to the indicative value for the exposure level.
2. Make exposures as instructed by the DR Calibration Tool.

   Do not initiate a next exposure before the DR Calibration Tool displays the instruction.

   To avoid overheating of the X-ray tube, limit the rate of exposures to two per minute.

   Warning: Check if the exposure time of the exposures is less or equal to 200 ms. If you notice longer exposure times, contact your local service organization.

DR 18M and DR 24M Exposure Sequence

Modality Settings

The indicative exposure levels for each exposure are specified by the DR Calibration Tool.

Table 6: Modality settings

kV	28 kV
mAs (indicative value for first exposure level)	160 mAs
Filtration	MoMo

Note If the exposure settings used for a previous calibration are known, use these settings.

Exposure Sequence

Procedure:

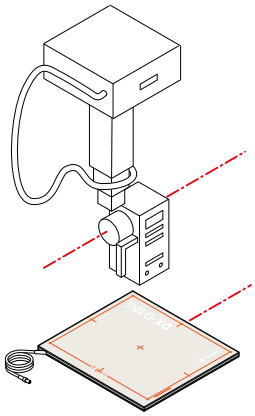
1. Allow the DR Detector to warm up for 30 minutes before performing the calibration.
2. Remove the compression paddle.
3. Position the calibration PMMA block on the bucky.
4. Set the mAs value to the indicative value for the exposure level.
5. Make exposures as instructed by the DR Calibration Tool.
   The rate of exposures is limited to one per minute.

DX-D 10C, DX-D 10G, DX-D 20C, DX-D 20G Exposure Sequence

Modality Settings

Apply these modality settings:

Table 7: Modality settings

kV	75 kV
mAs (indicative value for first exposure level)	28 mAs
Focus	large focus
SID	Use the (average) SID for normal operation.
Position	If the DR Detector is used in a fixed position, use the same position for calibration. If the DR Detector is used in different positions, perform the calibration with the short side of the DR Detector parallel to the axis of the X-ray tube. 
Grid	Remove the grid. If the grid is fixed, use 32 mAs as indicative mAs-value.
Filtration	Mount the Agfa calibration filter (Cu 1.5 mm). Check that there is no additional filtration.
Collimation	Collimation area should extend at least 1.5 cm on each side if the detector.

Note If the exposure settings used for a previous calibration are known, use these settings.

On modalities that support automatic collimation, the collimation settings are applied automatically and must be checked by the user.

Ralco collimators may limit the X-ray field. To overrule the limitation, the collimator must be unlocked using a key and the collimation must be applied manually.

Exposure Sequence

Procedure:

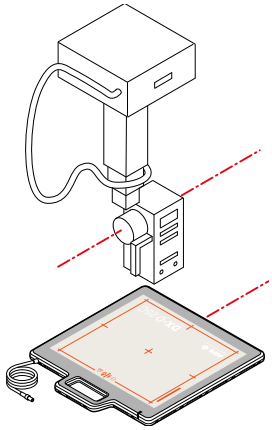
1. Set the mAs value to the indicative value for the exposure level.
2. Make exposures as instructed by the DR Calibration Tool.

DX-D 25C Exposure Sequence

Modality Settings

Apply these modality settings:

Table 8: Modality settings

kV	75 kV
mAs (indicative value for first exposure level)	12.5 mAs
mAs (indicative value for second exposure level)	8 mAs
mAs (indicative value for third exposure level)	4 mAs
Focus	large focus
SID	Use the (average) SID for normal operation.
Position	If the DR Detector is used in a fixed position, use the same position for calibration. If the DR Detector is used in different positions, perform the calibration with the short side of the DR Detector parallel to the axis of the X-ray tube. 
Grid	Remove the grid.
Filtration	No filtration.
Collimation	The collimation area should extend at least 1.5 cm on each side of the DR Detector.

Note If the exposure settings used for a previous calibration are known, use these settings.

On modalities that support automatic collimation, the collimation settings are applied automatically and must be checked by the user.

Ralco collimators may limit the X-ray field. To overrule the limitation, the collimator must be unlocked using a key and the collimation must be applied manually.

Exposure Sequence

Procedure:

1. Set the mAs value to the indicative value for the first exposure level.
2. Make three exposures.

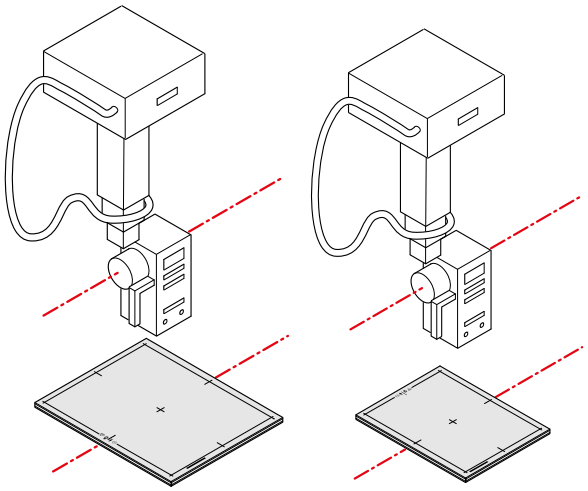
   The DR Calibration Tool may instruct to increase or decrease the mAs setting to reach the required exposure level.
3. Adjust the mAs value for the second exposure level. The second exposure level is approximately at 2/3 of the first exposure level.
4. Make three exposures.
5. Adjust the mAs value for the third exposure level. The third exposure level is approximately at 1/3 of the first exposure level.
6. Make three exposures.

DX-D 30C and DX-D 35C Exposure Sequence

Modality Settings

Apply these modality settings:

Table 9: Modality settings

kV	75 kV
mAs (indicative value for uniformity check)	50 mAs
mAs (indicative value for calibration)	20 mAs
Focus	large focus
SID	Use the (average) SID for normal operation.
Position	If the DR Detector is used in a fixed position, use the same position for calibration. If the DR Detector is used in different positions, perform the calibration with the short side of the DR Detector parallel to the axis of the X-ray tube. 
Grid	Remove the grid.
Filtration	Mount the Agfa calibration filter (Cu 1.5 mm). Check that there is no additional filtration.
Collimation	The collimation area should extend at least 1.5 cm on each side of the DR Detector.

Note If the exposure settings used for a previous calibration are known, use these settings.

On modalities that support automatic collimation, the collimation settings are applied automatically and must be checked by the user.

Ralco collimators may limit the X-ray field. To overrule the limitation, the collimator must be unlocked using a key and the collimation must be applied manually.

Exposure Sequence

Procedure:

1. Set the mAs value to the indicative value for the uniformity check.
2. Make the exposure.

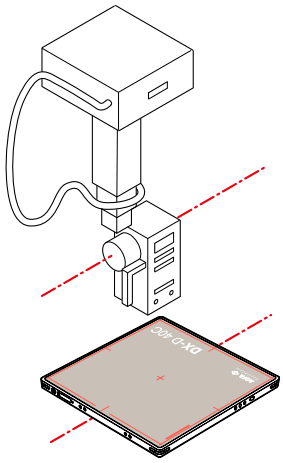
   The DR Calibration Tool may instruct to increase or decrease the mAs setting to reach the required exposure level.
3. Set the mAs value to the indicative value for the calibration.
4. Make exposures as instructed by the DR Calibration Tool.

DX-D 40C and DX-D 40G Exposure Sequence

Modality Settings

Apply these modality settings:

Table 10: Modality settings

kV	75 kV
mAs (indicative value for first exposure level)	25 mAs
mAs (indicative value for second exposure level)	12.5 mAs
Focus	large focus
SID	Use the (average) SID for normal operation.
Position	If the DR Detector is used in a fixed position, use the same position for calibration. If the DR Detector is used in different positions, perform the calibration with the short side of the DR Detector parallel to the axis of the X-ray tube. 
Grid	Remove the grid.
Filtration	Mount the Agfa calibration filter (Cu 1.5 mm). Check that there is no additional filtration.
Collimation	The collimation area should extend at least 1.5 cm on each side of the DR Detector.

Note If the exposure settings used for a previous calibration are known, use these settings.

On modalities that support automatic collimation, the collimation settings are applied automatically and must be checked by the user.

Ralco collimators may limit the X-ray field. To overrule the limitation, the collimator must be unlocked using a key and the collimation must be applied manually.

Exposure Sequence

Procedure:

1. Set the mAs value to the indicative value for the first exposure level.
2. Make two exposures.

   The DR Calibration Tool may instruct to increase or decrease the mAs setting to reach the required exposure level.
3. Make 10 exposures.
4. Set the mAs value to the indicative value for the second exposure level.
5. Make two exposures.

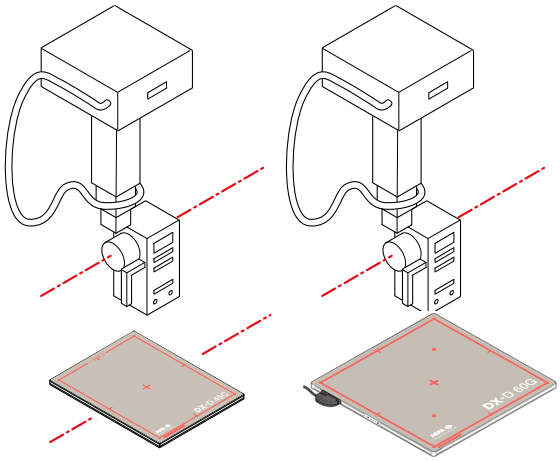
   The DR Calibration Tool may instruct to increase or decrease the mAs setting to reach the required exposure level.
6. Make one exposure.

DX-D 45C, DX-D 45G, DX-D 60C and DX-D 60G Exposure Sequence

Modality Settings

Apply these modality settings:

Table 11: Modality settings

kV	75 kV
mAs (indicative value for first exposure level)	32 mAs
mAs (indicative value for second exposure level)	4 mAs
Focus	large focus
SID	Use the (average) SID for normal operation.
Position	If the DR Detector is used in a fixed position, use the same position for calibration. If the DR Detector is used in different positions, perform the calibration with the short side of the DR Detector parallel to the axis of the X-ray tube. 
Grid	Remove the grid.
Filtration	Mount the Agfa calibration filter (Cu 1.5 mm). Check that there is no additional filtration.
Collimation	The collimation area should extend at least 1.5 cm on each side of the DR Detector.

Note If the exposure settings used for a previous calibration are known, use these settings.

On modalities that support automatic collimation, the collimation settings are applied automatically and must be checked by the user.

Ralco collimators may limit the X-ray field. To overrule the limitation, the collimator must be unlocked using a key and the collimation must be applied manually.

Exposure Sequence

Procedure:

1. Set the mAs value to the indicative value for the first exposure level.
2. Make two exposures.

   The DR Calibration Tool may instruct to increase or decrease the mAs setting to reach the required exposure level.
3. Make 10 exposures.
4. Set the mAs value to the indicative value for the second exposure level.
5. Make two exposures.

   The DR Calibration Tool may instruct to increase or decrease the mAs setting to reach the required exposure level.
6. Make one exposure.

Fixed DR Detector (4343R, Pixium RAD 4343) Exposure Sequence

For using the fixed DR Detector, the temperature difference between calibration and usage must be within the recommended range of +/-6°C (for a DR Detector with CsI conversion screen) or +/-10°C (for a DR Detector with GOS conversion screen). Check the environmental conditions and observe the warming-up time of the DR Detector.

Modality Settings

Depending on the DR Detector model, modality settings may be specified by the DR Calibration Tool.

If the DR Calibration Tool does not specify modality settings, refer to following table.

Table 12: Modality settings

	DR Table	DR Wall Stand	DX-D 300 U-arm
kV	75 kV	75 kV	75 kV
mAs (indicative value for first exposure level)	28 mAs	32 mAs	32 mAs
Focus	large focus	large focus	large focus
SID	Use the (average) SID for normal operation.		
Position	-	-	arm angle 0° detector angle 0°
Grid	Remove the grid. If the grid is fixed, use 32 mAs as indicative mAs-value.		
Filtration	Mount the Agfa calibration filter (Cu 1.5 mm). Check that there is no additional filtration.		
Collimation	46 cm x 46 cm (collimation area should extend at least 1.5 cm on each side of the detector)		

Note If the exposure settings used for a previous calibration are known, use these settings.

On modalities that support automatic collimation, the collimation settings are applied automatically and must be checked by the user.

Ralco collimators may limit the X-ray field. To overrule the limitation, the collimator must be unlocked using a key and the collimation must be applied manually.

Exposure Sequence

Procedure:

1. Set the mAs value to the indicative value for the exposure level.
2. Make exposures as instructed by the DR Calibration Tool.

Fixed DR Detector (Pixium RF 4343 FL model 3 - 30 fps) Exposure Sequence

For using the fixed DR Detector, the temperature difference between calibration and usage must be within the recommended range of +/-6°C. Check the environmental conditions and observe the warming-up time of the DR Detector.

Modality Settings

The indicative exposure levels for each exposure are specified by the DR Calibration Tool.

Table 13: Modality settings

Focus	large focus
SID	135 cm
Grid	No grid is used.
Position	The X-ray tube must be centered on the DR detector. Check the position using the collimator light, before the filter is mounted.
Filtration	Mount the Agfa calibration filter (Cu 1.5 mm). Check that there is no additional filtration.
Collimation	Maximum collimation area

Note If the exposure settings used for a previous calibration are known, use these settings.

On modalities that support automatic collimation, the collimation settings are applied automatically and must be checked by the user.

The collimator may limit the X-ray field. To overrule the limitation, the collimator must be set to manual collimation using the positioning controls in the software console and the collimation must be applied manually.

Exposure Sequence

Procedure:

1. Allow the DR Detector to warm up for 4 hours before performing the calibration. During warm-up no exposures should be made.
2. Apply the modality settings as specified above.
3. Make exposures as instructed by the DR Calibration Tool.

   Calibration steps are performed for each mode (continuous fluo, pulsed fluo, rad, rapid sequence) and different dose settings (kV, mAs or mA and ms). The DR Calibration Tool displays the values and applies them on the software console. Check if the correct values are applied and then press the exposure button or pedal.

   For each mode, exposures with 4 different doses settings are requested.

   The images made at the first dose setting will be used to calculate the gain calibration map.

   The images made at the other dose settings will be combined to calculate the defect calibration map. This calculation can take a long time, up to several minutes!

   The requested dose setting is specified in µGy and a suggestion is provided on how to accomplish this by setting kV and mAs (or mA and ms). Note that the suggested settings may not effectuate the requested dose: some panels have a higher sensitivity, there may be temperature effects etc. The DR Calibration Tool may instruct to increase or decrease the dose settings to reach

the required exposure level. After adjusting the dose setting, it may be necessary to repeat previous exposures as well.

During calibration for static image mode, the DR Calibration Tool may request to perform a rapid sequence exposure.

Do not initiate a next exposure before the DR Calibration Tool displays the instruction. Initiating the exposure while the DR detector is not ready, invalidates the calibration.

Do not wait longer than 3 minutes before initiating a next exposure when the DR Calibration Tool instructs to do so. Delaying the exposure may cause the DR Calibration Tool to require to be restarted.

The calibration may take up to two hours.

If there's not enough time to complete the whole calibration, after finishing a mode the remaining modes can be skipped. Push the Skip button for the remaining modes and finalize the calibration. Later on the calibration can be started again. The modes for which calibration was already performed, can be skipped.

If the ECV check fails, repeat the calibration for that mode to make sure that the result is not caused by an error made during the exposure sequence. If the ECV check fails again, contact your local service representative.

The calibration remains valid for 13 months.

Fixed DR Detector (Pixium RF 4343 FL model 4 - 40 fps) Exposure Sequence

For using the fixed DR Detector, the temperature difference between calibration and usage must be within the recommended range of +/-10°C. Check the environmental conditions and observe the warming-up time of the DR Detector.

Modality Settings

The indicative exposure levels for each exposure are specified by the DR Calibration Tool.

Table 14: Modality settings

Focus	large focus
SID	135 cm
Grid	No grid is used.
Position	The X-ray tube must be centered on the DR detector. Check the position using the collimator light, before the filter is mounted.
Filtration	Mount the Agfa calibration filter (Cu 1.5 mm). Check that there is no additional filtration.
Collimation	Maximum collimation area

Note If the exposure settings used for a previous calibration are known, use these settings.

On modalities that support automatic collimation, the collimation settings are applied automatically and must be checked by the user.

The collimator may limit the X-ray field. To overrule the limitation, the collimator must be set to manual collimation using the positioning controls in the software console and the collimation must be applied manually.

Exposure Sequence

Procedure:

1. Allow the DR Detector to warm up for 4 hours before performing the calibration. During warm-up no exposures should be made.
2. Apply the modality settings as specified above.
3. Make exposures as instructed by the DR Calibration Tool.

   Calibration steps are performed for each mode (continuous fluo, pulsed fluo, rad, rapid sequence) and different dose settings (kV, mAs or mA and ms). The DR Calibration Tool displays the values and applies them on the software console. Check if the correct values are applied and then press the exposure button or pedal.

   For each mode, exposures with 4 different doses settings are requested.

   The images made at the first dose setting will be used to calculate the gain calibration map.

   The images made at the other dose settings will be combined to calculate the defect calibration map. This calculation can take a long time, up to several minutes!

   During calibration for static image mode, the DR Calibration Tool may request to perform a rapid sequence exposure. In this mode, no delay is allowed for initiating a next exposure when the DR Calibration Tool instructs to do so. Delaying the exposure may cause the DR Calibration Tool to require to be restarted.

Do not initiate a next exposure before the DR Calibration Tool displays the instruction. Initiating the exposure while the DR detector is not ready, invalidates the calibration.

Do not wait longer than 3 minutes before initiating a next exposure when the DR Calibration Tool instructs to do so. Delaying the exposure may cause the DR Calibration Tool to require to be restarted.

The calibration takes typically 10 minutes.

If there's not enough time to complete the whole calibration, after finishing a mode the remaining modes can be skipped. Push the Skip button for the remaining modes and finalize the calibration. Later on the calibration can be started again. The modes for which calibration was already performed, can be skipped.

If the ECV check fails, repeat the calibration for that mode to make sure that the result is not caused by an error made during the exposure sequence. If the ECV check fails again, contact your local service representative.

The calibration remains valid for 13 months.

Problem solving

DR Calibration Tool Stalls

Problem	The DR Calibration Tool stalls.
Cause	A virus scanner interferes with the DR Calibration Tool.
Workaround	Disable the virus scanners on the workstation and restart the calibration procedure.

Problem	The DR Calibration Tool stalls for a short time.
Cause	Information must be retrieved from the DR Detector.
Workaround	Wait until the communication to the DR Detector has finished and the DR Calibration Tool reacts again. This may take a number of seconds.

Generator error

Problem	The calibration of a detector for dynamic imaging is interrupted by a generator error. The software console displays the following error code. `RAD_RUN_TIME_LIMIT` .
Cause	The remaining heat capacity of the X-ray tube is insufficient for the next exposure.
Workaround	**1.** Abort the calibration procedure. **2.** Reset the generator. **3.** Restart the calibration when the X-ray tube is cooled down. **4.** The initial uniformity check has to be repeated, but the modes for which calibration was already performed, can be skipped.

Generator controls are disabled

Problem	The calibration of a detector for dynamic imaging cannot be continued because the generator controls in the software console are suddenly disabled.
Cause	A communication problem with the generator has occurred.
Workaround	**1.** Abort the calibration procedure. **2.** Restart the calibration. **3.** The initial uniformity check has to be repeated, but the modes for which calibration was already performed, can be skipped.