ViVIX-S Service Guide

CE 0434

Contents

1. Document Guide

This Service Guide includes various information to forge and operate Vieworks' detectors.

Target

This Service Guide is intended for service engineers who maintain and inspect the Vieworks' detector after its installation. With this document, the service engineer can fully understand about technical contents of Vieworks' detectors.

Contact Department

For any comments or inquiries regarding this document, please contact via e-mail below.

Item	Contents
Department	Technical Support Division in Vieworks
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1.1 Symbols

While using Vieworks' products, follow the safety instructions in this manual along with the warning or caution symbol. It is important for you to read and understand the contents with the following symbol for operating the products safely.

Information

	This symbol is used to indicate reference and complementary information related to the product. The service engineer should read the instructions of this symbol carefully.

1.2 Notation

Bold types

We applied bold font style to the words which indicated products terms, or the words and sentences which are needed to transmit clear meaning. This helps you to easily distinguish the words from other technical ones for explaining functions, and UI (User Interface) of the program as well as the emphasis contents.

2. Performance Inspection Guide

During periodic inspection, the service engineer should inspect the detector and check uniformity of the image quality. In addition, be sure to process calibration in case the image quality is deteriorated during the inspection.

The items of performance inspection are as follows.

Item	Period	Description
Self-Diagnosis	Half-yearly	• Conduct self-diagnosis from the **Setup** program for the internal devices of the detector and check their states. • Refer to <3 Self-Diagnosis> for the way of self-diagnosis.
Resolution	Half-yearly	• Check the resolution of the detector through resolution chart or using a phantom. • Refer to <4 Resolution Measurement> for the way of resolution measurement.
Sensitivity	Half-yearly	• Evaluate the characteristic of the detector through checking pixel values of the image made by responding to X-ray dose which reaches to the surface of the detector. • Refer to <5 Sensitivity> for the way of sensitivity evaluation.
Calibration	Half-yearly	• Updating calibration data. (Offset → Gain → Defect) • Proceed to calibrate when X-ray Generator, Tube, Collimator or exposure environment are changed. • Refer to <6 Calibration> for the way of calibration.

3. Self-Diagnosis

[TBD]

4. Resolution Measurement

This chapter instructs how to measure image resolution of the product.

4.1 Preparing Measurement

- Check the condition of X-ray generator and console.
- Check the condition of X-ray tube.

It is recommended to check if the X-ray dose is accurate by using a dosemeter.

- Prepare the resolution chart.

- Vieworks recommends the following resolution charts.
  - Manufacturer: Test pattern from Fluke Biomedical.
  - Model 1: 07-526 (0.6-10.0 lp/㎜, 0.05 ㎜ Pb)
  - Model 2: 07-535 (0.6-5.0 lp/㎜, 0.05 ㎜ Pb)

- Pre-install the **Setup** program.
- Read **ViVIX-S User Manual** to be fully aware of the **Setup** program in advance.
- Preheat the detector at least 30 minutes after supplying power to the detector.

The measurement result can be inaccurate unless the detector is preheated fully.

4.2 Measurement Standard

- A raw image file is used for the resolution measurement.
- The tube voltage of X-ray generator is **70 kV** while acquiring images.
- **SID** between the X-ray generator tube and the detector is **150cm** while acquiring images.
- The pixel value of the acquired image should be formed within **2000±200**.
- The resolution should be measured **3.5 lp/㎜** or more through the visual identification.

- Since the **Pixel Pitch** of Vieworks' detector is 0.14㎜ (140㎛), the maximum resolution is 3.571 lp/㎜. This means that the resolution cannot be measured 3.6 lp/㎜ or more in theory.
- If the resolution chart is put on the detector diagonally, the resolution can be measured 4.0 lp/㎜ in maximum.

4.3 Measurement Sequence

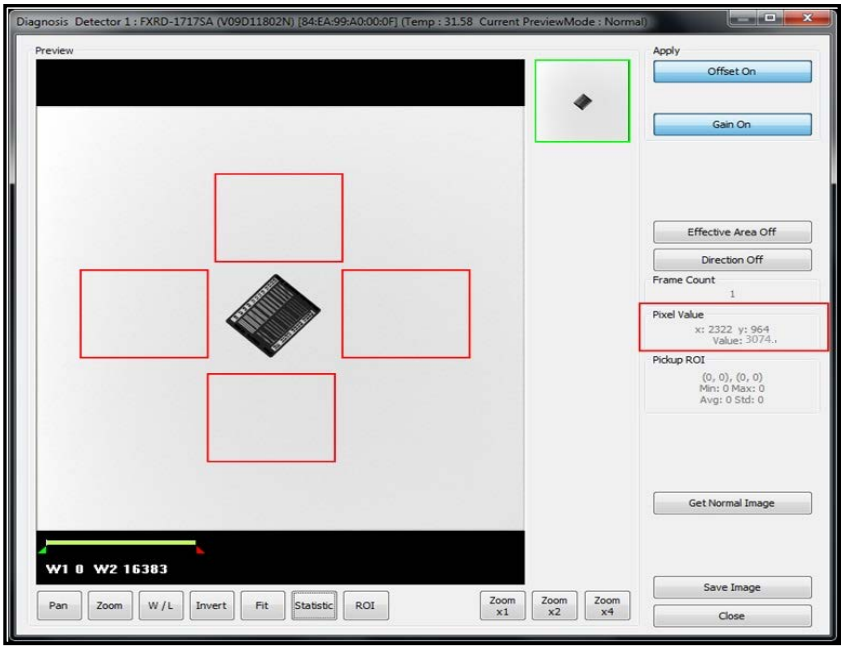
1 Adjust **SID** as **150㎝** between the detector and X-ray tube.

2 Put the resolution chart on center of the detector diagonally.

3 Execute the **Setup** program and move to the **Diagnosis** dialog.

4 Set the tube voltage of X-ray generator as **70kV** or less and then acquire an image. If the image is saturated or unclear, acquire an image again by setting the tube voltage low.

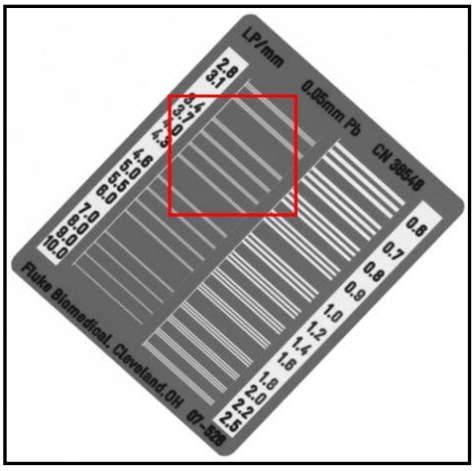
5 While acquiring images, adjust the X-ray dose condition (**㎃** or **㎳**) until the surrounding pixel value of resolution chart is formed as **2000±200**.

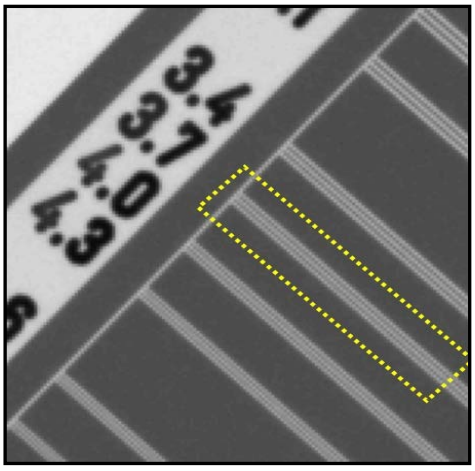


6 When the exposure condition is completed to adjust, take X-rays for measuring image resolution.

7 Magnify the acquired image with **3.7 lp/㎜** area of resolution chart as the center.

8 Check the resolution by visual identification.





If the measurement result is inconsistent with the standards, check the exposure condition and environment, then try to measure the resolution 2 or 3 times again. Contact Vieworks if the result is still discrepant to the standards.

5. Sensitivity

This chapter explains about the way of measuring sensitivity which shows the reaction extent of detector output over the incident X-ray dose.

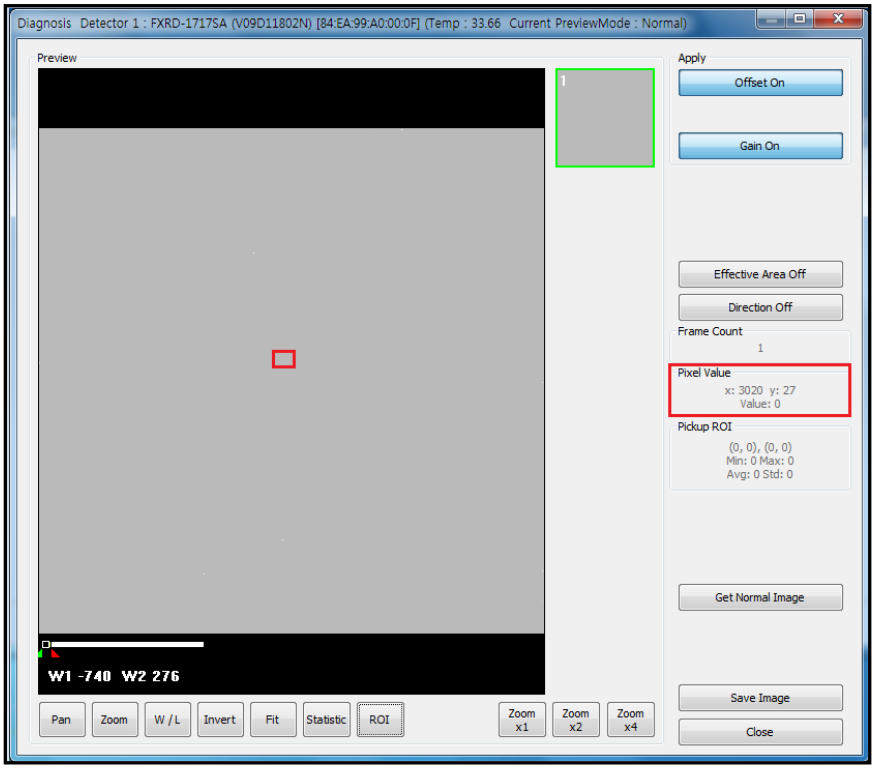
5.1 Preparing Mesurement

- Check the state of X-ray generator, tube and console.
- Put a collimator on center of the detector, and open the collimator completely.
- Prepare a dosemeter.
- Set the **Setup** program in advance.
- Read **ViVIX-S User Manual** and be fully aware about the instructions of **Setup** program in advance.
- Preheat the detector for at leat 30 minutes or more.

The result of measurement can be incorrect if the detector is not preheated sufficiently.

5.2 Measurement Standard

- The recommend SID between X-ray tube and the detector is **130cm~150 ㎝** while taking X-rays.
- The tube voltage of x-ray generator is between **70 ㎸ ~ 80 ㎸** while taking X-rays.
- The measurement is based on pixels in the center of image, and **Pixel Value** is formed between **2000±200**.
- The normal range of **Sensitivity** is **90%** or more of the minimum value, and **110%** or less of the maximum value written in **ViVIX-S 1417W Specifications**.



5.3 Measurement Sequence

1 Making an exposure as adjusting the X-ray condition until the satisfying **Pixel Value** is formed from **Diagnosis** menu in the **Setup** program.

2 When the exposure condition is completed to be adjusted, measure X-ray dose by a dosemeter and record it.

- The unit is uGy.

3 Calculate the result of **Sensitivity** as dividing **Pixel value** by X-ray dose (uGy).

- The condition is **Gain Type** = 1.

Refer to the following fomula.

- **Pixel value** = A x (X-ray Dose[uGy]) + B
  - A (Sensitivity) = Pixel value / uGy
  - B (Offset)

4 If **Gain Type** is not 1, divide **Pixel value** by the result value as much as the configured magnification of the following **Gain Type.**

Gain Type	0	1	2	3
1417WA (CsI)	0.62	1	1.14	1.33
1417WB (Gadox)	0.86	1	1.2	1.5

5.4 Checking the Result of Measurement

- Contanct the service engineer if the result value of **Sensitivity** is less than 90% of the minimum value or more than 110% of the maximum value written in **ViVIX-S 1417W Specifications**.
  - $(minimum\ limit)\ X\ 90\% < \frac{\left(\frac{Pixel\ \ Value}{X-ray\ \ Dose}\right)}{Gain\ \ Ratio} < (maximum\ limit)\ X\ 110\%$

Refer to the following example.

- 1417WB (Gadox)
- Gain Type = 2
- Pixel Value = 2152
- X-ray dose = 16uGy
- Sensitivity = (2152 / 16) / **1.2** = 112.292
- Result: 112.292 > 90% of the minimum value→ Normal

Refer to **ViVIX-S 1417W Specifications** about the min./max. specifications of **Sensitivity**.

6. Calibration

This chapter instructs how to calibrate the detector while the service engineer acquires images, and how to create calibration data with calibration.

Refer to **ViVIX-S User Manual** on how to calibrate the detector by loading calibration data provided by Vieworks.

6.1 Preparing Calibration

- Precheck the condition of X-ray generator and console.
- Precheck the condition of X-ray tube.

It is recommended to check if the X-ray dose is accurate by using a dosemeter.

- Preheat the detector at least 30 minutes after supplying power to the detector.

The measurement result can be inaccurate unless the detector is preheated fully.

- Pre-install the **Setup** program.
- Read **ViVIX-S User Manual** to be fully aware of the **Setup** program use and calibration way in advance.

In case the service engineer cannot create calibration data directly, it is recommended to prepare the calibration data CD provided by Vieworks and save the data to a specific folder of PC.

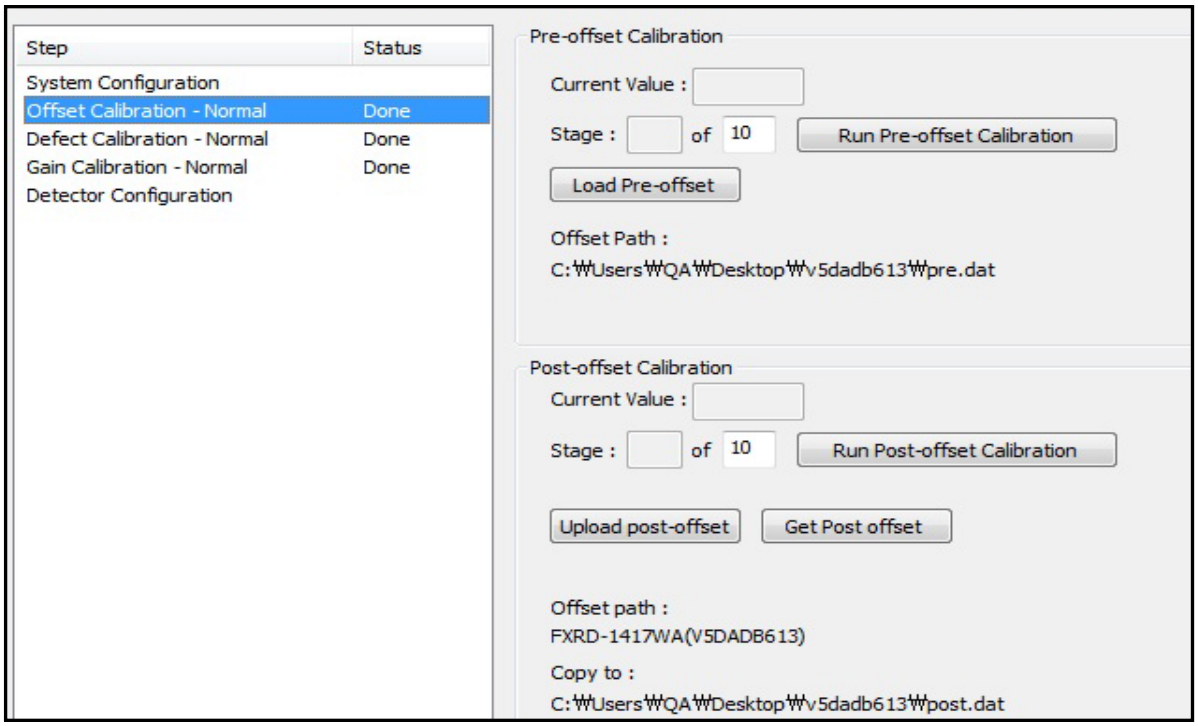
6.2 Starting Calibration

1 Supply power to the detector and wait for 30 minutes or more.

2 Execute the **Setup** program and check if the serial number of connected detector is correct.

As the serial number of detector is the only information that recognizing the calibration data, it is recommended to record it separately before calibrating the detector.

6.3 Offset Calibration



Post-offset Calibration

1 Set the number of **Stage** as **10** in the **Post-offset Calibration** area.

2 Click **Run Post-offset Calibration** button and progress Post Offset calibration.

3 Save the Post Offset calibration data as a file after the Post Offset calibration is completed.

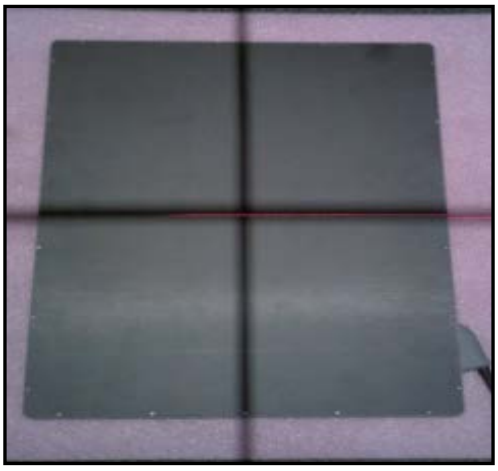
- Follow the generation rule of a calibration data file name when saving the calibration data as a file.
- Refer to **ViVIX-S User Manual** for the generation rule of a calibration data file name.

6.4 Gain Calibration

1 Put a collimator on center of the detector, and open the collimator completely.

2 Adjust **SID** as **130㎝ ~ 150㎝** to make X-ray exposure range include the detector.

3 Remove any objects or foreign materials between the tube and the detector.



4 Choose **Gain Calibration -Normal**.

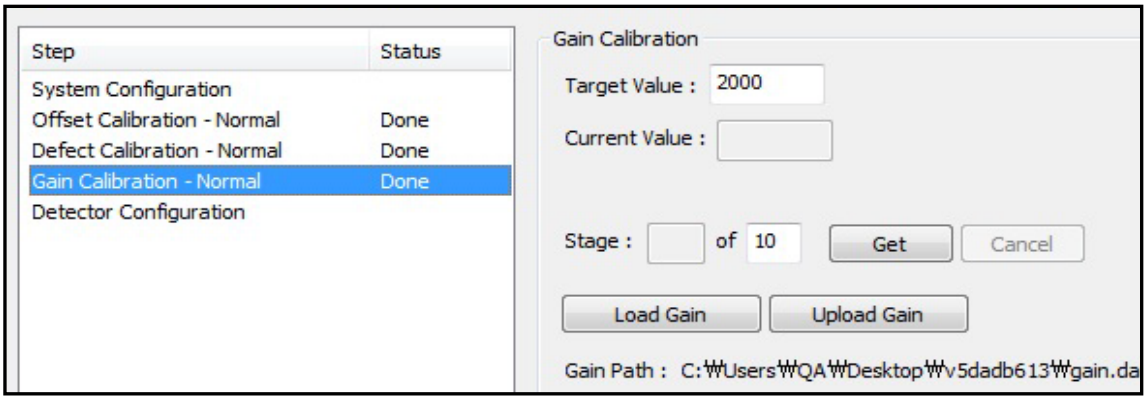
5 Set the tube voltage of X-ray generator as **70㎸ ~ 80㎸**.

6 While acquiring images, adjust the X-ray dose condition (**㎃** or **㎳**) until **Current Value** of the **Gain Calibration** area is formed between **2000±200**.

7 Set the exposure number of **Stage** as **10** when the adjustment of exposure condition is completed.

8 Click **Get** button, and keep making an X-ray exposure at **15 sec** intervals.

9 Save the Gain calibration data as a file.



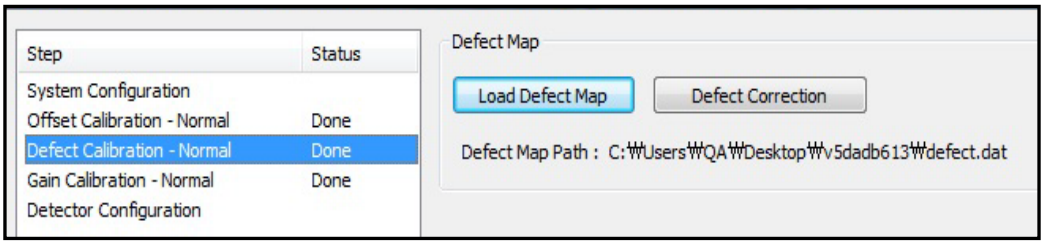
- Make sure to progress Gain calibration again if the cases below are applicable.
  - When the settings of **Exposure Section** or **Gain Type** is changed from the **Setup** program.
  - When the exposure devices like X-ray generator are repaired.
  - When the exposure environment is changed.
  - When the service engineer decides that it is need to progress Gain calibration.

6.5 Defect Calibration

1 Choose **Defect Calibration –Normal** in the **Calibration** window.

2 Click **Defect Correction** button and progress Defect calibration.

3 Save the Defect calibration data as a file after the Defect calibration is completed.



Refer to **ViVIX-S User Manual** for the detailed information about Defect calibration.

- Stop proceeding Defect calibration if new defect is not displayed in the detector, and maintain the existing settings of Defect Map data.

6.6 Checking the Calibration Result

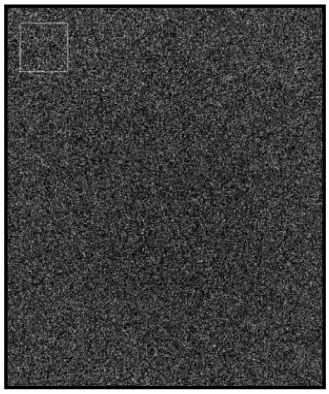
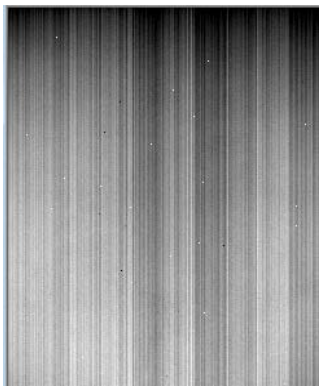
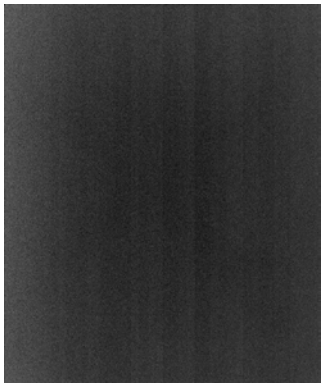
1 Move to the **Diagnosis** window in the **Setup** program after completing calibration.

2 Adjust the exposure condition as the image pixel value (Gray Level) is formed **2000±200**, and acquire images.

3 Check the acquired image.

4 Complete the calibration if the image is FLAT.

5 If the image is improper, progress Post Offset and Gain Offset again.

Image	State	Result
	Normal FLAT Image	OK
	Vertical Line Offset Fail	Failure
	Vertical Line	Failure

After the calibration, it is recommended to check the image quality from the **Setup** program as well as from the acquisition software viewer actually used.

7. Revision History

Ver.	Date	Descriptions
1.0	2014-09-23	• Initial Release

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