

X-RAY TUBE OR DETECTOR REPLACEMENTS AND REPAIRS PROCEDURE: BREAST SCREENING

(QUALITY MANAGEMENT – SG 090)

Summary of Changes

	NEW	Previous
BC Cancer	July 2023	01-July-1995 01-FEB-2018

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1. Introduction

1.1. Focus

The focus of this procedure is to provide guidance to the Breast Screening Centres and Breast Screening Quality Assurance (QA) Support Group on the expectation of all parties regarding the acceptance testing of a recently replaced x-ray tube and / or digital detector in an existing full-field digital mammography unit.

1.2. Health Organization Site Applicability

All BC Cancer Breast Screening Centres

1.3. Practice Level

- Breast Screening Program Chief Radiologists
- Breast Screening Program Chief Technologists
- Breast Screening Quality Assurance Support Group
- Breast Screening Centre Managers

1.4. Need to Know

The Breast Screening Centre must involve the physicist if the diagnosis of the equipment problem is not straightforward to ensure replacement is required.

The Breast Screening Centre shall pay for and maintain coverage on the equipment for tube and detector maintenance and replacement. Refer to [SG 070 - Preventative Maintenance and Service Contracts Procedure](#)

Any replacement or repairs to tube and detectors requires appropriate physics testing to be performed before the equipment may be put back into clinical service. This testing must be performed by a Breast Screening Program Physicist or a qualified service technician (under the direction of the physicist), immediately following the repairs.

2. Procedure

2.1. Steps and Rationale

Outlined below are the scenarios that may arise in scheduling a physics acceptance site visit following a new x-ray tube/detector installation.

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Workflow Step	#	Procedure	Role
Notifying the Program	1.	Contact the Centre's Medical Physicist, Technical Quality Management Coordinator and Provincial Practice Leader immediately to inform them of the x-ray tube/detector change, indicating the installation date.	Chief Technologist Centre Manager
Determining Availability for Immediate Testing	2.	Arrange travel to the centre on the DAY OF or MORNING AFTER an x-ray tube/detector change. Refer to Step 3 Performing Acceptance Testing to allow for the centre to be operational within one business day of x-ray tube/detector replacement.	Program Medical Physicist
	2.1	a) If unavailable, contact other members of the Physics Support Group to determine if immediate coverage can be provided. b) If the centre's Medical Physicist is away on vacation or educational leave, members at Program Head Office will help to arrange coverage. c) If another physicist is immediately available, refer to Step 2 .	Program Medical Physicist Technical Quality Management Coordinator Provincial Practice Leader
	2.2	If no medical physicist is available for immediate testing , arrange for travel to the centre as soon as possible to perform acceptance, no later than 3 weeks following the x-ray tube/detector change. Refer to Step 4 for provisional acceptance procedure	Program Medical Physicist

Acceptance Tests / Provisional Acceptance

Workflow Step	#	QC Test	Role
Performing Acceptance Testing: Minimum Tests to be Performed	3.	FOR X-RAY TUBE ACCEPTANCE: <ul style="list-style-type: none"> SDNR image (DD with disc): decide whether a new 5-day baseline is required Artefact assessment of all target/filter combinations AEC evaluation Collimation assessment Spatial resolution assessment Output, kVp reproducibility, HVL measurements (measure the full range of kVp) 	Medical Physicist

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		<ul style="list-style-type: none"> • Dose calculation for RMI • X-Ray tube leakage and scatter measurements • RMI image general image quality and verify dose < 2.5 mGy 	
		<p>FOR FULL DETECTOR ACCEPTANCE:</p> <ul style="list-style-type: none"> • SDNR confirmation (DD with disc): centre to start a new 5-day baseline • Artefact testing of all target/filter combinations • AEC evaluation • Collimation assessment • Noise & Linearity • Spatial resolution assessment • RMI image quality and dose confirmation • CNR re-set, if necessary (Hologic, only) 	
Provisional Acceptance	4.	<p>Send the following images to the Medical Physicist via the transfer grid, or file sharing website for review and approval:</p> <p>a) Artefact images for all target/filter combinations (“For Processing” and “For Presentation” images)</p> <p>b) RMI image</p> <p>Provisional acceptance of the new x-ray tube/detector can be issued, in order to minimize down-time for the Centre.</p>	<p>Centre Manager</p> <p>Service Vendor</p> <p>Biomed Engineer</p>
	4.1	<p>i. Review Artefact images and ensure acceptable image quality.</p> <p>ii. Review RMI Image:</p> <ul style="list-style-type: none"> • Independently calculate the mean glandular dose and ensure MGD < 2.5 mGy • Note the exposure settings following the x-ray tube/detector change and ensure that image quality is acceptable <p>iii. When possible, contact the equipment service provider before the x-ray tube/detector is changed and ask for the following data to be provided:</p> <p>For new x-ray tube:</p> <ul style="list-style-type: none"> • Output and HVL data for (at minimum) the kVp and target/filter for the RMI and AEC thickness tracking tests. • Collimation alignment (light field, x-ray field, image receptor congruence), especially along the chest-wall. <p>For new detectors:</p> <ul style="list-style-type: none"> • Collimation alignment (light field, x-ray field, image receptor congruence), especially along the chest-wall. 	Program Medical Physicist

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3. Related Documents and References

3.1. Related Documents

[SG 070 - Preventative Maintenance and Service Contracts Procedure](#)

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