

Advice on care and maintenance of NHS Breast Screening Programme mammography x-ray equipment and trailers when not in use over a prolonged period

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1. Introduction

On some occasions, it may be necessary for equipment used in the NHS Breast Screening Programme (NHS BSP) to be used only periodically, or to stop being used altogether for a period of time. There may be further advice on this topic in particular advice for specific circumstances that may be found in Appendix 1. This guidance is to support services to ensure that the reintroduction of equipment in the clinical environment is safe and effective.

Advice on the following is provided:

- How should x-ray equipment be stored when not used for months and is any action required?
- What action is required prior to restarting screening following equipment not being used for a period of time?

The plan will depend on the size and location of the screening service and make and age of equipment of each service. The plan must take into consideration the safety of staff and clients, equipment and the stresses on workloads of the screening services, physics services and service companies. The advice of the Medical Physics Expert (MPE) must also be sought during this process. Each supplier has provided advice on the storage and restarting of their equipment, this can be found in Appendix 2 of this report. The advice in this document relates to x-ray equipment and mobile trailers.

2. Systems not in use

2.1 Systems on mobile trailers

If trailers are potentially out of use for many months there may be difficulties safely storing them whilst maintaining the necessary environmental conditions for the digital X-ray systems contained within. However, during the normal course of the year, the trailers are periodically shut down for a number of weeks (e.g. Christmas, summer holidays and during servicing). Each screening unit should therefore already have a procedure for securing the trailer during non-operational periods, see [NHSBSP report 0904](#) for further guidance.

The main concern for longer term storage, will be ensuring that the temperature is kept within manufacturers' guidelines. Different models and systems have different specified requirements (see appendix 2) but maintaining the temperature within the range 15-27

degrees Celsius should prevent damage to all systems currently in the NHSBSP. Rapid change in temperature must also be avoided. Humidity and dew point temperatures may also need to be considered to minimise the risks of condensation. It should be noted that the internal temperature of the trailer may exceed the ambient outside air temperature - particularly if direct sunlight is incident. Shade, power supply, security, and access for checks and maintenance must all be considered when selecting a storage location.

If it is expected that system(s) on trailers will be out of use for an extended period, then it may be worth considering moving the trailers to a centralised location. This may make security and periodic checks easier but may make it harder to provide adequate power. If feasible, this should be considered.

It is recommended that the water tanks are emptied prior to long term storage.

Advice from the x-ray manufacturer must be followed on the care of the uninterruptable power supply (UPS) for the workstation during this time (see Appendix 2). It may also be advisable to switch the UPS off (whilst it is fully charged) and isolate it at the main contactor. This will help to conserve power on the trailer and will additionally reduce the risk of crystallisation damage to the battery. When clients are rescheduled for these systems, the UPS must be switched back on. Initially, there may be some warning lights and auditory warnings, as the unit may be low on charge.

If present, a separate UPS on the trailer should be left on, unless there is different advice from the trailer's manufacturer.

2.2 Fixed location systems

Power and air conditioning requirements for static systems should be less problematic. Leaving the air conditioning operating at approximately 21 degrees should keep the equipment safely within its operational temperature range and prevent condensation from forming. The x-ray system can then remain powered off and isolated during the storage period.

3. General comments for user and physics equipment performance testing

The following sections describe the equipment performance testing of the systems required by users and medical physics staff. The guidance offered is to ensure that the systems will be safe to use when screening restarts. The section contains advice relevant to both staff groups.

If a system has not been used for some time then there should be a careful warm up of the system (x-ray tube and detector). Follow the supplier's instructions or, for example, acquire three exposures per block for progressively greater thickness of PMMA blocks whilst under automatic exposure control (e.g. 20mm, 30mm, 45mm, and 60mm). The results of any testing may be different immediately after switch on compared to a warmed up system.

- Please note the warm up time for each system both to avoid damage to the system and to ensure that the performance testing results are meaningful.
- The care of the UPS may also need to be considered. Some manufacturers recommend that the system is on for longer to charge the UPS (see Appendix 2).
- Any testing should be seen as an opportunity to check on the mammography system, and if relevant, the trailer.

4. User equipment performance testing

The circumstances of each centre needs to be taken into consideration before deciding on what user quality control (QC) should be undertaken. They should bear in mind manufacturer guidance, knowledge of their own equipment, practicalities and primarily staff safety. The decision may be different for each system. Advice from the medical physics expert should be sought. Guidance from the equipment suppliers has been gathered (see Appendix 2).

4.1 Systems in use

For systems that may be used occasionally during a period of suspension or reduced screening, NCCPM recommends that user monthly and weekly testing must continue to be undertaken. User daily testing must be undertaken on the day that the system is used, ensuring that the system is warmed up and a few test exposures have been

acquired. The equipment suppliers all give this recommendation and no additional tests are specifically required.

4.2 Systems not in use

For systems that are out of use for a prolonged period, all of the suppliers have confirmed that the mammography units may be switched off safely for many months providing that the environmental conditions are kept within the acceptable range.

It is worth visiting these systems at least monthly, especially those on trailers.

- Check for leaks on water cooled systems
- Air conditioning is working
- Ensure that the unit is secure

5. Physics equipment performance testing

It is not practical to give definitive advice for each centre in this report. However, the centres should take manufacturers' guidance and knowledge of each particular system into consideration.

5.1 Systems not in use

There is no requirement to undertake physics equipment testing on these systems while they are not in use. Some centres may decide to undertake the 6 monthly testing of these systems, in that case any advice from the relevant regulators must be considered. Undertaking testing would have the advantage of reducing a future backlog.

5.2 Systems returning to use following long period of inactivity

The screening service must involve the physics service on the restart plan for screening. The planned start dates for each piece of mammography equipment and their availability must be agreed.

If a system is due for the 6-monthly physics testing, then ideally this should be undertaken before clinical use. If this is not practical, then it may be acceptable for the equipment to re-enter clinical use subject to satisfactory results from user testing, provided this is agreed with the medical physics expert.

5.3 Second and subsequent rounds of physics equipment testing

Departments will normally plan to spread the workload of performance testing throughout the year. The subsequent testing round should be ideally undertaken within 6 months with one month of leeway. There is provision within the guidance (NHSBSP Guidance: Breast screening: guidelines for medical physics services) for exceeding testing every 6 months in exceptional circumstances. If this arises, the physics service will need to plan bring their testing back in line and even out the workload, but it may take 2 or 3 rounds to do so. Any decrease in testing will need to be agreed with the clinical services.

6. Servicing of equipment

6.1 Equipment in use

A risk assessment must be undertaken between the screening service and the service company before preventative maintenance servicing is undertaken, using criteria of national advice, equipment history and QC test results. Further information from the suppliers is in Appendix 2.

6.2 Equipment out of use

The preventative maintenance service does not necessarily need to be undertaken until a few weeks before the system will be brought back into clinical use or if a fault has developed.

6.3 Equipment being brought back into use

If a preventative maintenance service is not due, and performance testing as set out in section 7 is satisfactory, then a service visit may not be required. There may be a cost associated with an extra routine service visit. Otherwise, the preventative maintenance service or repair visit should be arranged. The service company should have as much notice as possible to organise this visit.

7. Reintroducing mammography equipment into use

Once the decision has been made to reschedule new screening, there are a number of steps that will be required. The physics services need to be involved in the restart plan. Service companies should be given as much notice as possible to arrange visits if required. It must be borne in mind that physics and service engineers may also have competing pressures from mammography services and other imaging services.

The units will need to be brought back into use. If the service visit is due then it must be undertaken. The user QC must be restarted at least one week before the first client is due. After suitable warm up exposures (see supplier's advice) daily, weekly and monthly QC should be undertaken. Daily QC should then continue as normal (including on the days prior to the first client appointment). On the first day of clinical use daily, weekly and monthly QC should be repeated. Clinical imaging should only be restarted if confident that the system is within tolerance.

8. Summary of recommendations

It may be acceptable to switch off systems for a long time until the screening is rescheduled, providing that the environmental conditions are kept within the manufacturer's recommendations. However, screening units must give consideration to undertaking checks on all of their systems.

8.1 Equipment out of use

- Routine monthly QC should ideally continue.

8.2 Equipment out of use (additional information for trailers)

- Monthly visits to the trailers should be undertaken
- Trailers should have power
- Temperature control: avoid low and high temperatures and rapid temperature changes, see recommendations for each manufacturer.
- Consider keeping trailers in the shade
- UPS on system off to reduce power (check supplier advice – Appendix 2)
- Ensure the security of trailers
- Empty water tanks
- Consider moving trailers to central location.

8.3 Systems with intermittent use (expected be fixed units)

- Need to identify systems which will be used intermittently
- Ensure that service company and physics service are aware of the system in use.
- Risk assess to determine what equipment performance testing is required, with advice from the medical physics expert

8.4 Reintroducing mammography equipment into use

- X-ray system should be warmed up before testing.
- The screening service must include the physics service in the planning of the rescheduling of screening.
- The plan needs to include user quality control and any service checks, physics performance testing.
- Service companies need to be have as much notice as possible about the planned screening

Appendix 1: Advice for particular circumstances

A. COVID-19 Pandemic

Public Health England (PHE) has provided advice to all services in the National Health Service Breast Screening Programme (NHS BSP) for the rescheduling of screening during the COVID-19 pandemic. All routine screening appointments are being rescheduled. The remaining assessment cases are completing their diagnostic pathways, which may include imaging. Some centres are continuing with imaging high-risk women in line with advice from PHE. Occasionally symptomatic women may be imaged. It is unknown, when the breast screening appointments can be rescheduled, but it is likely to be of the order of months rather than weeks. This is an unprecedented situation in the screening programme and so a careful plan must be drawn up for equipment that is periodically being used, not being used and then re-entering clinical use prior to restarting of the new screening appointments at a future, as yet unspecified, date.

The following advice must take into consideration the current government guidelines. Government advice will change as the pandemic progresses.

Location of trailers

Some screening services may move their trailers to a central location if out of use for a period of time. This may make security and periodic checks easier but may make it harder to provide adequate power. If feasible, this should be considered.

Physics equipment performance testing

The Care Quality Commission (CQC) have recommended that equipment testing of systems in use during the pandemic must be guided by local risk assessment and advice from the MPE, taking into account equipment age and historical performance. The departments must also take into account government advice on reducing unnecessary travel to reduce the spread of COVID-19.

Physics services may consider undertaking equipment performance testing within their current timescales in line with these recommendations, if it is practical and safe to undertake and the system is accessible. Physics services and breast screening services need to be satisfied that protocols are in place to ensure safety of the tester, and staff and patients at the host site. If it is decided not to undertake the physics equipment testing, then a system of close scrutiny of user quality control must be undertaken.

The decision to visit and test a system may have to take into consideration the length of the journey. It may be necessary to keep travelling to a minimum to reduce the spread of COVID-19 from areas with higher numbers of infected people.

Other testing

Acceptance and commissioning of new equipment, testing following installation of new critical components such as tubes and detectors, and visits for troubleshooting and emerging faults, should continue as usual according to local policies and procedures.

Planning for restarting

In the restarting of the screening, there may be pressures to test many systems at the same time. Discussion with the medical physics service and service engineers will be required. It may be helpful to stagger the start of screening for each system. It should be noted that there will be some systems that will already be in use for assessment and symptomatic imaging. There will naturally be a gap before screening can be started, i.e. clients need to be invited to screening. It would also be expected that screening units will be started before all of the assessment units are required.

Safety of staff

Staff undertaking any testing or checking of systems out of use must have procedures for infection control.

It is likely that any testing will involve lone working and so lone working procedures should be followed.

Appendix 2: Suppliers' advice on the storage of equipment out of use for months

FujiFilm	GE	Hologic	MIS	Philips	Siemens
1. Are there any special requirements for storing the equipment?					
a. Do they need air conditioning in the case of hot weather?					
A constant temperature control environment is required while in storage at normal operating temperatures	Not to exceed 30 degrees	Yes always observe temp requirement for the system, keep room at constant temperature	Yes, see temperature range	No - As long as the Microdose system is powered down.	It is advisable to use air conditioning unit to control
b. Do they need heating in the case of cold weather?					
As above	Essential not to go below 15, Pristina -5	As above	Yes, see temperature range	No – The system including the detector can handle temperatures in the minus figures.	It is advisable to use air conditioning unit to control the temperature during colder weather.
c. Storage conditions?					
Operating: 20 to 30°C Not operating: 15 to 35°C	Pristina: Operating: 15 to 30°C; Not operating: -5 to 50°C Essential: 15 to 35°C Humidity: 10 to 80% (up to 95% for Pristina – not operating)	Recommended 20 to 30°C Max duration 12 hours: 10 to 35°C Indefinitely: 10 to 30°C	12 to 27°C	None	Storage ambient temperature range +10 to +40 °C. If possible, use air conditioning unit to keep a ambient room temperature of 21 °C.

Care of mammography system out of use for a prolonged period

FujiFilm	GE	Hologic	MIS	Philips	Siemens
<p>d. Some centres may wish to leave the system off for the duration of the shutdown of screening. Assuming that detector temperature is controlled during this period and that there is a careful restart procedure, would any adverse impacts on clinical performance be anticipated? Is there a maximum time that the system can be left unused?</p>					
<p>If the temperature is controlled during the period and standard start up processes are followed we would not anticipate any adverse impact on clinical performance. There is no maximum time for the system to be left switched off</p>	<p>Providing detector and bucky temperature is controlled, and humidity, then no risk. There is no time limit.</p> <p>For liquid-chilled detectors (Senographe DS and Essential), additional precaution should be taken to ensure there was no fluid leakage and that the fluid circuit is operating correctly. Please contact service for preliminary check before restarting operations.</p>	<p>No adverse impacts on clinical performance is anticipated, and no maximum time is specified for systems left unused, warm up of tube recommended when systems powered on for first use.</p>		<p>No maximum time.</p>	<p>If room temperature is controlled, we would expect no adverse impact on clinical performance. No maximum time if system is left unused but CSE visit will be required to condition tube if not used within 12months of being switched off.</p>
<p>e. Are there any other factors to be considered, either for those on a trailer or fixed location?</p>					
<p>See temperatures</p>	<p>Regulating trailer temperature as per attached, for both fixed and mobile I would recommend to complete a full QA (GE and NHSBSP) before shutting down so to have a reference for Q3.b)</p>	<p>Turn off UPS on console to reduce battery drain, also suggested for static units.</p>	<p>I would pay attention to the vans. In my experience some vans with temperature changes can condensate so the users should be keeping an eye on these systems.</p>	<p>Yes – Both fixed and trailer installations require warm up of the tube before use to prevent arcing. Also if the environment has been cold you may see 5-5-4 errors as the detector will need a 15 minimum warm up period.</p>	<p>Ensure the Mammomat system is switched off at the mains contactor.</p>

Care of mammography system out of use for a prolonged period

FujiFilm	GE	Hologic	MIS	Philips	Siemens
2a. Are there any special requirements for bringing equipment back into use after several months of not being used.					
We would recommend Physics checks alongside the Daily, Weekly and monthly checks as standard	If Q1.c) is not followed may see a UPS failure on boot up preventing system use. Otherwise same as Q2. Complete full QA (GE and NHSBSP) and compare results against Q1.e), plus perform functional checks, rotation, lift and compression.	The normal warm up time as specified on the AWS for the detector to warm up and stabilise, I would recommend tube warm up before starting from low KV and mAs gradually moving to higher KV.	Standard tests after tube warm up. Maybe 2, 4, 6 cm	warm do a tube warm up and be aware detector may need to warm up for 15 minutes if environment has been cold.	When the system is switched on again for the first time, perform low KV & low mAs exposures to allow the tube and detector to warm up slowly. Perform AEC Test, Artefact detection, Detector uniformity, Detector linearity, Image quality, Monitor and Mechanical checks if system. If any issues are noted, please contact the Customer Care Centre.
b. Do you recommend a service visit for each piece of equipment before imaging is commenced, and if so, will there be any cost implications					
Standard services as per scheduled would be recommended	When PHE / NHSBSP notify sites of go live again, we recommend testing as per Q3.b) the week before in preparation and notifying Our Customer Service Centre of any defects in the usual way.	Systems requiring serving will be serviced, no cost implication as this is part of the service contract	Not required from our perspective	Yes – If off for several months we recommend a service visit (included with a current service contract in place) to check functionality of equipment,	No service visit is required short term. If the system has not been used within 12months, a CSE will need to attend and complete a tube conditioning procedure. Any visit outside of normal contractual T&Cs is chargeable however; if planned with a service commitment it would be absorbed by Siemens Healthineers.

Care of mammography system out of use for a prolonged period

FujiFilm	GE	Hologic	MIS	Philips	Siemens
c. Are you planning that the service visits should continue as planned or only for equipment that may be occasionally used?					
<p>Servicing will continue as planned subject to engineer pre-attendance risk profiling of any jobs</p>	<p>GE will continue to Service Equipment as planned. If GE postpone the service due to resource, logistical or regulatory restrictions we will be in touch with them to inform them of any change of circumstance.</p>	<p>Servicing are temporarily put on hold.</p> <p>preventive maintenance on hospital sites is on hold for the time being until the situation improves,</p>	<p>MIS have delayed some services at the moment and are focusing on equipment that is required within the pandemic, however MIS will continue to support all booked services.</p>	<p>For systems temporarily mothballed we suggest postponing service visits, but if the equipment is to be used intermittently then PM scheduled visits should continue.</p>	<p>Siemens Healthineers is running a reduced service in line with NHS England and WHO guidelines however</p>
e. Are you able to service equipment that is still in use?					
<p>Preventative maintenance of this equipment will continue as planned subject to engineer pre-attendance risk profiling of any jobs</p>	<p>Yes, as above</p>	<p>Yes we will attend for breakdowns, preventive maintenance on mobile vans will be going ahead as the mobiles are remote and been standing idle for some time now and would be safe to work on.</p>	<p>MIS will continue to support all booked services.</p>	<p>Yes we can service the equipment.</p>	<p>if the customer would want Siemens Healthineers to honour the planned maintenance we will endeavour to achieve this expectation.</p>
f. Warm up time of systems after long time without use.					
<p>Amulet Innovality has a standard warm up time of 8 minutes, inclusive of auto calibration function. This warm up time and function is still applicable even after a period of shut down</p>	<p>No specific warm-up time. QC manual mentions adequate warm-up time (typ. 30 min).</p>	<p>The normal warm up time as specified on the AWS for the detector to warm up and stabilise. Tube warm up before starting from low kV and mAs gradually moving to higher kV.</p>		<p>15 minutes will be sufficient to give consistent results.</p>	<p>User manual indicates the detector requires 15min to warm up before images can be generated.</p>

Care of mammography system out of use for a prolonged period

FujiFilm	GE	Hologic	MIS	Philips	Siemens
3. Care of UPS					
Fujifilm would recommend leaving the UPS charged the same way they would if they were leaving the system over a weekend/ night.	See below	Turn off UPS on console to reduce battery drain, also suggested for static units		Turn off the UPS if the unit is to be left off for a long period, otherwise the UPS may drain and need to be replaced.	

Specific manufacturer advice

GE Medical

Bucky: GE recommend that bucky of systems in trailers are removed and stored safely in the main department. It should be noted that this is to prevent damage for temperatures of 40°C and above. NCCPM state, for the UK it may be safer to leave the bucky on the unit unless a heat wave is predicted.

Detector: If temperature or humidity can reach values out of the operating range (as for vans) for an undefined duration, GE strongly recommend to ask service to dismount detectors and take them to a place with environmental conditions compatible with operating conditions, together with breast support (bucky and biopsy positioner in case of Senographe Pristina).

UPS: Recommendation: if possible, keep UPS connected to mains.

- Do not switch off the wall breaker while system is not being used
- For mobile system, keep truck connected to shore power supply

In case it is not possible during this long term storage period

- It is recommended to **disconnect the battery from UPS** as it will avoid its discharge. The battery fully charged can hold charge for up to one year in such case. Instructions are available in service manual: Job Card D/R A105 - UPS Battery : 6-3 Disassembly of the UPS Battery
- Before returning to regular activity, the UPS should be reconnected by qualified personnel according to **Job Card CHK A002 - UPS Checks to confirm UPS is fully functional.**