Overview

This standard identifies the competences you need to carry out servicing activities on medical imaging equipment, in accordance with approved procedures. You will be required to service a range of equipment, which includes static and mobile X-ray suites, dental X-ray equipment, ultrasound equipment, imaging and processing equipment and imaging tables. This will involve dismantling, removing and replacing faulty items on a variety of different types of imaging equipment. You will be expected to apply a range of dismantling and reassembly methods and techniques, which are appropriate to the equipment being serviced and the type of components being removed/replaced, and which will include electrical, electronic and mechanical units and components.

Your responsibilities will require you to comply with organisational policy and procedures for the servicing activities undertaken, and to report any problems with the activities that you cannot personally resolve, or that are outside your permitted authority, to the relevant people. You must ensure that all tools, equipment and materials used in the servicing activities are removed from the work area on completion of the activities, and that all necessary job/task documentation is completed accurately and legibly. You will be expected to work with a minimum of supervision, taking personal responsibility for your own actions, and for the quality and accuracy of the work that you carry out.

Your underpinning knowledge will provide a good understanding of your work, and will provide an informed approach to applying the correct servicing procedures. You will understand the dismantling and reassembly methods and procedures used, and their application. You will know about the medical imaging equipment being worked on, and component properties, functions and associated defects, in adequate depth to provide a sound basis for carrying out the servicing activities, correcting faults and ensuring that the serviced equipment functions to the required specification and remains compliant with all standards and regulations.

You will understand the safety precautions required when carrying out the servicing activities, especially those for isolating the equipment. You will also understand your responsibilities for safety, and the importance of taking the necessary safeguards to protect yourself and others in the workplace.
Performance criteria

You must be able to:

1. work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
2. follow the relevant servicing schedules to carry out the required work
3. carry out the servicing activities within the limits of your personal authority
4. carry out the servicing activities in the specified sequence and in an agreed timescale
5. remove and replace/refit a range of components
6. report any instances where the servicing activities cannot be fully met or where there are identified defects outside the planned schedule
7. complete the relevant servicing records accurately and pass them on to the appropriate person
8. dispose of waste materials in accordance with safe working practices and approved procedures
Knowledge and understanding

You need to know and understand:

1. the health and safety, infection control and de-contamination requirements of the work area and equipment being serviced, and the responsibility these requirements place on you
2. the statutory and advisory documentation relating to medical imaging equipment (such as warnings and guidance from the MHRA or other regulatory authority British and European standards)
3. the ionising and radiation regulations, and the responsibility they place upon you when servicing medical imaging equipment
4. the importance of reporting any equipment adverse incidents to the regulatory authority
5. the isolation procedure that applies to servicing activities (such as electrical isolation, removal of fuses, placing of maintenance warning notices)
6. what constitutes a hazardous voltage and how to recognise victims of electric shock
7. how to reduce the risks of a phase to earth shock (such as insulated tools, rubber mating and isolating transformers)
8. the importance of wearing protective clothing and other appropriate safety equipment (PPE) during the servicing activities
9. how to obtain and interpret documents needed in the servicing activities (such as drawings, circuit and physical layouts, charts, specifications, manufacturers' manuals, history/maintenance reports, graphical electronic/electrical symbols)
10. the working practices of, and the need to respect, the medical imaging department/environment
11. hazards associated with carrying out servicing activities on medical imaging equipment (such as exposure to live conductors and the effects of ionising radiation) and how to minimise them and reduce any risks
12. the basic principles of operation of the medical imaging equipment being serviced, and the function of individual components
13. the human physiology directly associated with medical imaging radiation
14. the risks to the human body from X-ray radiation and other energy sources associated with medical imaging equipment
15. the application and functions of a range of components used in
the equipment (such as switches, sensors, overload protection devices, transformers, thermistors, rectifiers, printed circuit boards)

16. the care, handling and application of multimeters and other electrical measuring instruments (including dedicated test equipment and built-in test equipment)

17. company policy on the repair/replacement of components, and the procedure for obtaining replacement parts, materials and other consumables necessary for the servicing activities

18. how to check that replacement components meet the required specification/operating conditions (such as values, tolerance, current carrying capacity, voltage rating, power rating, working temperature range)

19. the techniques used to dismantle/reassemble medical imaging equipment (such as unplugging, de-soldering, removal of screwed, clamped and crimped connections, removal of pipes, hoses and mechanical components)

20. methods of removing and replacing components without causing damage to the equipment or other components

21. the procedures and precautions to be adopted to eliminate/protect against electrostatic discharge (ESD) when working on sensitive equipment or devices

22. the different types of cabling (such as multicore cables, single core cables, steel wire armoured (SWA), mineral insulated (MI), screened cables, data cables) and their application

23. methods of attaching identification markers/labels to removed components or cables to assist with re-assembly

24. the tools and equipment used in the servicing activities (including the use of cable stripping tools, crimping tools, soldering irons)

25. methods of checking that components are fit for purpose, and the need to replace ‘lifed’ items

26. how to make adjustments to components/assemblies to ensure that they function correctly

27. how to check that tools and equipment are free from damage or defects, are in a safe and usable condition, and are configured correctly for the intended purpose

28. the importance of carrying out electrical safety tests on medical imaging equipment, and the implications if this is not carried out

29. the importance of making visual checks before proving the equipment with the electrical supply on
30. the generation of documentation and/or reports following the servicing activity
31. the equipment operating and control procedures to be applied during the servicing activity
32. the problems that can occur during the servicing activity, and how they can be overcome
33. the organisational procedure(s) to be adopted for the safe disposal of waste of all types of material such as WEEE directive
34. the extent of your own authority and to whom you should report if you have a problem that you cannot resolve
1. Carry out **all** of the following during the servicing activities:
   1. plan and communicate the servicing activities so as to minimise disruption to normal working
   2. obtain and use the correct issue of company and/or manufacturers' drawings and servicing documentation
   3. adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work
   4. ensure that the correct equipment decontamination procedure has been adhered to before and after the servicing activities
   5. ensure the safe isolation of equipment (such as electricity, mechanical, gas, air or fluids)
   6. provide and maintain safe access and working arrangements for the servicing area
   7. carry out the servicing activities, using appropriate techniques and procedures
   8. return the equipment to service on completion of the activities
   9. dispose of waste items in a safe and environmentally acceptable manner, and leave the work area in a safe condition

2. Carry out servicing on **both** of the following types of medical imaging equipment:
   1. X-ray equipment (static and/or mobile equipment)
   2. ultrasound equipment (static and/or mobile equipment)
      plus **two** more of the following
   3. digital imaging equipment
   4. X-ray processing equipment
   5. imaging tables

3. Carry out **all** of the following activities, as applicable to the equipment being serviced:
   1. isolating the equipment
   2. applying electrostatic discharge (ESD) precautions
   3. dismantling equipment to the appropriate level
   4. disconnecting and reconnecting wires and cables
   5. removing and replacing electrical units/components
6. removing and replacing mechanical units/components
7. checking components for serviceability
8. replacing damaged/defective components
9. soldering and de-soldering (as applicable)
10. attaching suitable cable identification markers
11. replacing all `liffd' items
12. setting and adjusting replaced components
13. re-calibrating and/or adjusting equipment
14. tightening fastenings to the required torque
15. making visual checks before powering up
16. checking equipment operating parameters
17. carrying out electrical safety tests
18. functionally testing the serviced equipment

4. Remove and replace/refit a range of components, to include twelve of the following:
   1. cables and connectors
   2. diaphragms
   3. timers
   4. display units
   5. printed circuit boards
   6. rectifiers
   7. seals
   8. indicators (lamps, LEDs)
   9. overload protection devices
  10. filters
  11. batteries
  12. valves
  13. switches
  14. sensors
  15. gears
  16. pumps
  17. locking and retaining devices
  18. thermistors
  19. bearings
  20. motors
  21. power supplies
  22. transformers
  23. lighting bulbs
  24. hoses/pipework
Servicing medical imaging equipment

- 25. analogue or digital integrated circuits
- 26. transducers
- 27. potentiometers
- 28. regulators
- 29. gauges
- 30. structural components
- 31. other specific components

5. Service medical imaging equipment, in compliance with **all** of the following:
   - 1. organisational guidelines and codes of practice
   - 2. equipment manufacturer’s operation range
   - 3. relevant and current documentation such as those provided by MHRA or the regulatory authority
   - 4. equipment and associated BSEN standards, CE marking and, where appropriate, wiring regulations
   - 5. the equipment functions to specification
   - 6. the equipment remains compliant with all standards and regulations
   - 7. all potential defects are identified and reported for future action

6. Complete the relevant paperwork from **one** of the following, and pass it to the appropriate people:
   - 1. job cards
   - 2. servicing logs or reports
   - 3. company-specific documentation
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