

## Maintaining electronic equipment in yachts and boats

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### Overview

This standard identifies the competences you need to carry out planned or corrective maintenance activities on electronic equipment and systems in yachts or boats, in accordance with approved procedures. You will be required to carry out maintenance activities on a range of electronic equipment, such as instrument systems, positioning systems, autopilot systems, communication systems and radar systems.

This will involve checking equipment and cables for signs of damage, replacing faulty units and checking and tuning the equipment, as appropriate, to maintain optimal operational performance. You will also be expected to apply a range of testing procedures in order to adjust the equipment correctly.

Your responsibilities will require you to comply with organisational policy and procedures for the electronic maintenance activities undertaken and to report any problems with these activities, or with the tools and equipment used, that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You must ensure that all tools, equipment and materials used in the maintenance 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 full 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 appropriate maintenance procedures to yacht or boat \*\*electronic equipment and systems. You will understand the maintenance process and its application, in adequate depth to provide a sound basis for carrying out the activities to the required specification. In addition, you will be expected to report where the outcome identifies the need for further investigation or maintenance work.

You will understand the safety precautions required when carrying out the maintenance activities, especially those for isolating the equipment and taking the necessary safeguards to protect the equipment and associated systems. You will be required to demonstrate safe working practices throughout and will understand the responsibility you owe to yourself and others in the workplace

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### Performance criteria

#### You must be able to:

1. work safely at all times, complying with health and safety legislation, regulations, directives and other relevant guidelines
2. follow the relevant maintenance schedules to carry out the required work
3. carry out the maintenance activities within the limits of your personal authority
4. carry out the maintenance activities in the specified sequence and in an agreed time scale
5. report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
6. complete relevant documentation in line with organisational procedures, and pass them on to the appropriate person
7. dispose of waste materials in accordance with safe working practices and approved procedures

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### Knowledge and understanding

#### You need to know and understand:

1. the specific safety practices and procedures that you need to observe when maintaining electronic equipment and systems in yachts or boats \*(including any specific legislation, regulations/codes of practice for the activities, equipment or materials)
2. the health and safety requirements of the work area where you are carrying out the activities and the responsibility these requirements place on you
3. how to recognise and deal with emergencies and the procedures to be followed (such as methods of safely evacuating and closing down of compartments in the case of fire or other major incident, first aid, fire fighting and resuscitation of personnel)
4. the isolation procedure that applies to the maintenance activities (to include electrical isolation, removal of fuses, placing maintenance warning notices, proving that isolation has been achieved and secured)
5. the hazards associated with carrying out maintenance activities on yacht or boat electronic equipment (such as exposure to live conductors, misuse of tools) and how they can be minimised
6. the protective equipment that you need to use for both personal protection (PPE) and protection of the equipment and vessel/craft
7. what constitutes a hazardous voltage and how to recognise victims of electric shock
8. how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
9. how to obtain and interpret drawings, circuit and physical layouts, charts, specifications, manufacturers' manuals, history/maintenance reports, graphical electronic symbols and other documents needed in the maintenance process
10. how to carry out currency/issue checks of the specifications you are working with
11. the maintenance schedules and methods to be followed to comply with company procedures for maintenance on yacht or boat electronic systems and equipment
12. the basic principles of operation of the yacht or boat electronic equipment/systems being maintained and the purpose of individual components within the system
13. the various types of yacht or boat electronic equipment and peripheral devices and their maintenance requirements
14. the application and use of a range of electronic components (such as such as modules, terminal blocks, multi-pin plugs/sockets, tray-

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- mounted sockets, earth bonding points) and the likely functions that will require checking
15. methods of checking components are fit for purpose and the need to replace 'lived' items
  16. the precautions to be taken to prevent electrostatic discharge (ESD) damage to electronic circuits and components (such as use of earthed wrist straps)
  17. how to recognise defects in yacht or boat **\*electronic** \*equipment (such as under or over performance)
  18. the adjustments/corrections/tuning required to maintain the equipment/system at operational standard through full range parameters
  19. how to check that the replacement components meet the required specification/operating conditions (such as values, tolerance, current carrying capacity, voltage rating, power rating, ambient temperatures)
  20. the procedure for obtaining the consumables to be used during the maintenance activity
  21. the appropriate testing procedures to be adopted during the maintenance activity
  22. the importance of making 'off-load' checks before proving the equipment with the electrical supply on
  23. the importance of ensuring that the equipment is maintained to the prescribed standard of cleanliness
  24. how to compile maintenance records/logs/reports which satisfy company policy and procedures
  25. the problems that can occur whilst carrying out the maintenance activities and how they can be avoided
  26. the organisational procedure to be adopted for the safe disposal of waste of all types of materials
  27. the extent of your own authority and whom you should report to if you have problems that you cannot resolve

### Scope/range related to performance criteria

1. Carry out **all** of the following during the maintenance of the yacht or boat electronic equipment:

1. use the correct issue of vessel/craft system drawings and maintenance documentation
2. adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations
3. obtain clearance to work on the system and observe the appropriate power isolation and safety procedures
4. carry out the maintenance activities, using appropriate techniques and procedures
5. where appropriate apply procedures and precautions to eliminate electrostatic discharge hazards (such as the use of grounded wrist straps)
6. re-connect and return the system to service on completion of the maintenance activities
7. functionally test and adjust equipment to the prescribed level, as specified
8. leave the work area in a safe and tidy condition

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2. Carry out maintenance activities on **three** of the following types of yacht or boat electronic equipment and systems:

1. communications systems (such as very high frequency (VHF) radio, SSB, satellite communications (SATCOM), Navtex, weather fax, on-board entertainment systems, intercom)
2. positioning systems (such as chart plotter, global positioning system (GPS), long range navigation, compass, gyro)
3. instrument systems (such as speed, depth, wind, velocity made good)
4. autopilot systems
5. sensor systems (such as RADAR)
6. other specific electronic system

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3. Carry out maintenance activities on **three** of the following yacht or boat electronic system components:

1. aerials

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2. radar scanners
3. mast transducers\* \*
4. hull transducers
5. instrument heads
6. control units
7. compass or gyro units
8. visual display units
9. loudspeaker units
10. other specific component

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4. Carry out **twelve** of the following maintenance activities, as applicable to the equipment being maintained:

1. visual examination of the condition and security of wiring enclosures (such as conduit, trunking, traywork)
2. removing excessive dirt and dust from panels
3. making visual checks of equipment and cables
4. checking the integrity of all connections
5. making sensory checks (such as sight, sound, smell)
6. replacing damaged or defective connectors
7. re-soldering dry joints and connections
8. servicing battery systems
9. tuning and adjusting components
10. making 'off-load' checks before powering up
11. testing and reviewing the system function
12. removing and replacing damaged or faulty electronic units/components
13. replacing damaged or missing locking and retaining devices (cable ties, clips, proprietary fasteners)
14. recording the results of the maintenance and reporting any defects found
15. other specific maintenance activity

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5. Carry out **five** of the following checks on the maintained electronic system/equipment:

1. earth bonding tests
2. serviceability checks
3. insulation checks
4. continuity checks
5. distortion checks
6. frequency checks
7. signal to noise checks
8. power output

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9. receiver sensitivity
10. voltage standing wave ratio (VSWR) checks
11. other specific check

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6. Ensure that the maintained electronic system/equipment meets **all** of the following:

1. all components and sub-assemblies are fit for purpose
2. all connections are safe and sound
3. equipment static checks, after maintenance, meet specification
4. all potential defects are identified, recorded and reported for future action

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7. Maintain yacht or boat electronic system/equipment, in compliance with **one** of the following:

1. BS or ISO standards and procedures
2. customer (contractual) standards and requirements
3. company standards and procedures
4. specific equipment requirements/manufacturers data
5. recognised compliance agency/body's standards (such as Lloyds, Boat Safety Scheme, BMEA Code)
6. other accepted international standards

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8. Complete the relevant documentation in line with organisational procedures, including **one** from the following and pass it to the appropriate people:

1. job cards
2. system log
3. maintenance logs or reports
4. work authorisation documents
5. vessel/craft wiring documentation
6. other specific recording method

## Behaviours

### **Behaviours:**

You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment



## Maintaining electronic equipment in yachts and boats

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