SEMEMI234

Carrying out repairs to communication-electronic systems

Overview

This standard identifies the competences you need to carry out repairs on communication-electronic systems, in accordance with approved procedures. You will be required to carry out repairs on a range of communication-electronic systems, sub-systems, assemblies or components. This will involve dismantling equipment to unit level, making any required repairs, and removing and replacing faulty items on a variety of different types of electronic systems, sub-systems and assemblies.

You will be expected to apply a range of dismantling and reassembly methods and techniques, such as soldering, de- soldering, crimping, harnessing, and securing cables and components. You will be expected to take care that you do not cause further damage to the equipment/circuit during the repair activities, and the application of electrostatic discharge (ESD) procedures will be a critical part of your role.

Your responsibilities will require you to comply with organisational policy and procedures for carrying out the repair activities, 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 will be expected to work to instructions, alone or in conjunction with others, taking personal responsibility for your own actions, and for the quality and accuracy of the work that you carry out.

Your underpinning knowledge will be sufficient to provide a sound basis for your work, and will provide an informed approach to applying electronic repair procedures. You will have an understanding of the function and operating conditions of the electronic equipment or circuit being repaired, and will know about the tools and techniques to be used, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

You will understand the safety precautions required when carrying out the repair activities, especially those for isolating the equipment, and for taking the necessary safeguards to protect yourself and others against direct or indirect electric shock. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to 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 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 timescale
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 maintenance records accurately and pass them on to the appropriate person
7. 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 requirements of the area in which the repair activity is to take place, and the responsibility these requirements place on you
2. your responsibilities under regulations that apply to the electronic repair activities being undertaken
3. the isolation and lock-off procedure or permit-to-work procedure that applies to the repair activities (electrical isolation, locking off switchgear, removal of fuses, placing maintenance warning notices, proving that isolation has been achieved and secured)
4. the importance of wearing protective clothing and other appropriate safety equipment (PPE) during the repair activities
5. the hazards associated with repairing electronic communication equipment, and with the materials, tools and equipment that are used (such as live electrical components, capacitor discharge), and how these can be minimised
6. what constitutes a hazardous voltage and how to recognise victims of electric shock
7. the importance of keeping the work area clean and tidy, and free from waste and surplus materials
8. how to reduce the risks of a phase to earth shock (such as insulated tools, rubber mating and isolating transformers)
9. how the repair activities may affect the work of others, and the procedure for informing them of the work to be carried out
10. the procedures and precautions to be adopted to eliminate electrostatic discharge (ESD) hazards
11. how to obtain and interpret information from job instructions and other documents needed to carry out the repairs (such as drawings, circuit diagrams, specifications, manufacturers' manuals, test procedures)
12. the basic principles of how the electronic circuit functions
13. organisational policy on the repair or replacement of faulty components during the repair process
14. how to check that the replacement units/components meet the required specification/operating conditions
15. methods of removing and replacing the faulty units/components from the equipment (unplugging, de-soldering, removal of screwed, clamped, edge connected, zero insertion force, and crimped connections)
16. the importance of removing faulty components, without causing damage to other components, wiring, or the surrounding structure
17. methods of attaching identification marks/labels to removed components or connections, in order to assist with re- assembly
18. the tools and equipment used in the repair activities (including the use of wire-stripping tools, crimping tools, soldering irons, insertion

devices and connecting tools)

19. how to check that tools and equipment are free from damage or defects, that they are in a safe and usable condition, and are configured correctly for the intended purpose
20. the sequence for reconnecting the equipment, and the checks to be made prior to restoring power (checking components for correct polarity, ensuring that there are no exposed conductors, cable insulation is not damaged, all connections are mechanically and electrically secure, casings are free from loose screws, there are wire ends or solder blobs that could cause short circuits, and that all fuses/protection devices are installed)
21. the importance of making `off-load' checks before proving the equipment with the electrical supply on
22. how to make adjustments to components/assemblies to ensure that they function correctly
23. the documentation and/or reports to be completed following the repair activity, and the importance of ensuring that these reports are completed accurately and legibly
24. the problems that can occur with the repair activity, and how they can be overcome
25. the organisational procedures to be adopted for the safe disposal of waste of all types of materials
26. the extent of your own authority and to whom you should report if you have a problem that you cannot resolve

Scope/range related to performance criteria

1. Carry out **all** of the following during the repair activities:
    1. confirm the type and level of repair to be carried out
    2. undertake the repair activities to cause minimal disruption to normal working
    3. use the correct issue of company and/or manufacturers' drawings and documentation
    4. adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations
    5. ensure the safe isolation of equipment
    6. ensure that safe access and working arrangements have been provided in the work area
    7. carry out the repair activities using appropriate techniques and procedures
    8. take electrostatic discharge (ESD) precautions when handling sensitive components and circuit boards
    9. leave the work area in a safe and tidy condition
2. Carry out repair and replacement activities on **three** of the following types of communication-electronic systems, sub-systems, assemblies or components to LRU level (at least **two** of which must be selected from group **A**):
   note: Any of the items below can be identified as a system, sub-system or assembly in its own right

group A – communication-electronic

1. transmitters (such as HF, VHF, UHF, microwave)
2. transceivers (such as HF, VHF, UHF, microwave)
3. receiver (such as HF, VHF, UHF, microwave)
4. signal processing (analogue) (such as radar anti-clutter, comms audio and AGC stages
5. signal processing (digital) (such as digital MTI, multiplexers, AGC)
6. aerial systems (such as phased arrays, long wire and parabolic reflectors)
7. transmission lines (such as optical fibres, co-axial, baluns, twin wire, waveguide)
8. display systems (such as CRT, Plasma, TFT, TV Tab, LED)
9. man-machine interface (such as IS/ICT equipment or peripherals: keypads, keyboards, microphones)
10. electro-optical systems (such as cameras, thermal imaging, targeting systems)
11. hydraulic-electrical systems (such as hydraulic motors, HSUs, and actuators)
12. cryptographic systems (such as data encryption and de-encryption)
13. built-in test equipment
14. data network systems (such as LANs, WANs)
15. data network Interfaces (such as switch, router, bridging networks)
16. any other identifiable electronic system, sub-system or assemblies to LRU level

group B - sssociated equipment
17. environmental control systems (such as temperature, humidity, vibration, shock, alarm and protection)
18. electro/mechanical systems (such as servos, motors, relays, complex switches)
19. power generation systems (such as fixed/transportable AC/DC generators, batteries)
20. power distribution systems (such as single phase/3-phase distribution panels)
21. power supply control systems (such as voltage/current, series/shunt regulator/stabiliser)
22. hybrid systems (such as ADC, DAC)

3. Carry out **all** of the following repair/replacement activities:

    1. applying electrostatic discharge (ESD) precautions
    2. preparation of areas for repairing
    3. disconnection/dismantling of required LRUs
    4. replacement of faulty LRUs
    5. carrying out all necessary repairs
    6. re-assembly of LRUs in line with specification
    7. functionally check the completed equipment
    8. making any adjustments required

4. Use the correct joining/connecting techniques to deal with **three** of the following types of connection:

    1. push-fit connectors
    2. soldering or de-soldering
    3. clip assemblies
    4. threaded connections
    5. crimped connections
    6. zero insertion force (ZIF) connectors
    7. adhesive joints/assemblies
    8. edge connectors
    9. insulation displacement connections (IDC)

5. Carry out repairs to communication-electronic systems, in accordance with **one** of the following:

    1. organisational guidelines and codes of practice
    2. equipment manufacturer's operation range
    3. BS, ISO and/or BSEN standards
    4. Ministry of Defence (MoD)

6. Complete **one** of the following records, and pass it to the appropriate person:

    1. job cards
    2. permit to work/formal risk assessment

3. maintenance logs and action reports
4. company-specific documentation

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