Overview

This unit identifies the competences you need to locate faults on electronic equipment/circuits, in accordance with approved procedures. You will be required to investigate faults on a range of electronic equipment such as power supplies, motor control systems, sensors and actuators circuits, digital circuits and systems, analogue circuits and systems, and hybrid circuits and systems, at assembly or component level. You will be expected to use a variety of fault location methods and procedures, such as gathering information from the person who reported the fault, using recognised fault finding techniques and diagnostic aids, measuring, inspecting and operating the equipment. You will be expected to take care that you do not damage the equipment/circuit during the maintenance activities and, where appropriate, the application of electrostatic discharge procedures will be a critical part of your role.

Your responsibilities will require you to comply with organisational policy and procedures for the fault location 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 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 fault location procedures to electronic equipment and circuits. You will have an understanding of the basic fault location methods and techniques used, and their application. You will also know how to interpret the information obtained from diagnostic aids and equipment, in adequate depth to provide a sound basis for carrying out the activities.

You will understand the safety precautions required when carrying out the fault location 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:*

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<td><strong>P1</strong></td>
<td>work safely at all times, complying with health and safety and other relevant regulations and guidelines</td>
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<td><strong>P2</strong></td>
<td>review and use all relevant information on the symptoms and problems associated with the products or assets</td>
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<td><strong>P3</strong></td>
<td>investigate and establish the most likely causes of the faults</td>
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<td><strong>P4</strong></td>
<td>select, use and apply diagnostic techniques, tools and aids to locate faults</td>
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<td><strong>P5</strong></td>
<td>complete the fault diagnosis within the agreed time and inform the appropriate people when this cannot be achieved</td>
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<td><strong>P6</strong></td>
<td>determine the implications of the fault for other work and for safety considerations</td>
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<td><strong>P7</strong></td>
<td>use the evidence gained to draw valid conclusions about the nature and probable cause of the fault</td>
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<td><strong>P8</strong></td>
<td>record details on the extent and location of the faults in an appropriate format</td>
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Carrying out fault location on electronic equipment and circuits

Knowledge and understanding
You need to know and understand:

K1 the health and safety requirements of the area in which the fault location is to take place, and the responsibility these requirements place on you
K2 the isolation and lock-off procedure or permit-to-work procedure that applies in the work area
K3 how to recognise and deal with victims of electric shock (to include methods of safely removing the victim from the power source, isolating the power source, and methods of first aid resuscitation)
K4 the importance of wearing protective clothing and other appropriate safety equipment during fault location activities
K5 the hazards associated with carrying out fault location activities on electronic equipment (live electrical components, stored energy, misuse of tools), and how they can be minimised
K6 the procedure to be adopted to establish the background of the fault
K7 how to use the various diagnostic aids to help identify the location of the fault
K8 the various fault location techniques that can be used, and how they are applied (such as half-split, input-to-output, function testing, unit substitution, and equipment self-diagnostics)
K9 how to evaluate sensory information (such as sight, sound, smell, touch)
K10 how to assess evidence and evaluate the possible causes of faults/problems
K11 how to use a range of fault diagnostic equipment to investigate the problem
K12 the care, handling and application of electrical test equipment (such as multimeter, signal generator, logic probe, signal tracer and oscilloscope)
K13 the precautions to be taken to prevent electrostatic discharge (ESD) damage to electronic circuits and components (such as the use of wrist straps, special packaging and handling areas)
K14 how to use a range of fault diagnostic equipment to investigate the problem
K15 how to check that electronic test equipment is within calibration and that it is free from damage and defects
K16 how to obtain and interpret information from job instructions and other documentation used in the maintenance activities (such as drawings, specifications, history/maintenance reports, manufacturers’ manuals, BS7671/IEE regulations, symbols and terminology)
K17 the functions of different types of electronic components (analogue or digital), and their operation
K18 how to evaluate the likely risk to yourself and others, and the effects the fault could have on the overall process or system
K19 the problems that can occur during the fault location activity, and how
they can be minimised
K20  the importance of completing the correct documentation, following the maintenance activity
K21  the extent of your own authority and to whom you should report if you have problems that you cannot resolve
Carrying out fault location on electronic equipment and circuits

Additional Information

Scope/range related to performance criteria

You must be able to:

1. carry out all of the following during the fault location activity:
   1.1. plan the fault location methods and procedures in conjunction with others
   1.2. obtain and use the correct issue of maintenance documentation (such as drawings, manuals, maintenance records)
   1.3. adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations
   1.4. ensure the safe isolation of equipment (such as electricity, mechanical, gas, air or fluids)
   1.5. ensure that safe access and working arrangements have been provided for the maintenance area
   1.6. use grounded wrist straps and other electrostatic discharge (ESD) precautions, where appropriate
   1.7. disconnect or isolate components or parts of the circuit to confirm the diagnosis, where appropriate
   1.8. carry out the fault location activities using approved procedures
   1.9. identify the fault, and consider appropriate corrective action
   1.10. in conjunction with others, take actions to resolve the problem
   1.11. dispose of waste items in a safe and environmentally acceptable manner
   1.12. leave the work area in a safe and tidy condition

2. carry out fault location on two of the following types of equipment:
   2.1. power supply systems (such as switched mode, series regulation, shunt regulation)
   2.2. motor control systems (such as closed-loop servo/proportional, inverter control)
   2.3. sensors and actuators (such as linear, rotational, temperature, level, photo-optic, pressure, flow)
   2.4. digital circuits and systems (such as programmable controller, microprocessor, ROM/RAM, logic gates)
   2.5. analogue circuits and systems (such as frequency modulation/demodulation, amplifiers, filters, oscillators)
   2.6. hybrid circuits and systems (such as analogue to digital converters (ADC), d-to-a converters (DAC))

3. use four of the following diagnostic techniques, tools and aids to assist in locating the fault:
   3.1. information gathered from the person who reported the fault
   3.2. fault finding techniques (such as six point, half-split, input/output,
unit substitution, emergent sequence)

3.3. diagnostic aids (such as manuals, flow charts, troubleshooting guides, electronic aids, equipment records)

3.4. inspecting (such as checking for breakages, wear/deterioration, overheating, missing parts, poor joints)

3.5. operating (such as manually switching off and on, test buttons, running the equipment)

4. use **two** of the following types of instruments to assist in locating faults:
   4.1. multimeter
   4.2. signal generator
   4.3. oscilloscope
   4.4. logic probe
   4.5. signal tracer
   4.6. other specific test/measurement instruments

5. locate faults that have resulted in **two** of the following breakdown categories:
   5.1. intermittent action or circuit failure
   5.2. partial failure or reduced performance
   5.3. complete breakdown

6. complete **one** of the following maintenance records, and pass it to the appropriate person:
   6.1. scheduled maintenance report
   6.2. corrective maintenance report
   6.3. other company-specific report
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