SEMEEE319

Locating and diagnosing faults in post-production electronic components and circuits

Overview

This standard identifies the competences you need to investigate, locate and diagnose the causes of faults in electronic components or circuits, on completion of or during the production stages, in accordance with approved procedures. You will be required to diagnose faults on a range of electronic components and circuits, such as capacitors, resistors, inductors, sensor devices, optic devices, display screens, switching devices, microwave components, printed circuit board assemblies and thin, thick and flexible film circuitry. You will be expected to use a variety of fault diagnosis methods and techniques and to utilise a number of diagnostic aids and equipment. You will be required to review the fault symptoms, interpret technical data, apply systematic fault-finding procedures and fully record and report your findings.

Your responsibilities will require you to comply with organisational policy and procedures for the fault diagnostic and 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 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 fault diagnosis procedures on electronic components and circuits. You will know about the electronic products being produced and will understand the various fault diagnosis methods and techniques used and their application. You will also know how to apply and interpret the information obtained from diagnostic aids and equipment, in adequate depth to provide a sound basis for carrying out the activities and for identifying faults or conditions that are outside the required specification.

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

Performance criteria

You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
P2 review relevant information on the symptoms and issues associated with the products or assets
P3 investigate and establish the most likely causes of the faults
P4 locate faults, using appropriate diagnostic techniques, tools and aids
P5 complete the fault diagnosis within the agreed time and inform the appropriate people when this cannot be achieved
P6 determine the implications of the fault for other work and for safety considerations

P7 draw valid conclusions about the nature and probable cause of the fault using evidence from the fault diagnosis
P8 deal with problems within your control and report those that cannot be solved
P9 complete and store all relevant documentation in accordance with organisational requirements
P10 leave the work area in a safe condition on completion of the activities, as per organisational requirements

Knowledge and understanding

You need to know and understand:

K1 how to work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
K2 the importance of wearing the appropriate personal protective equipment (PPE), and of keeping the work area clean and tidy
K3 what constitutes a hazardous voltage and how to reduce the risks of a phase to earth shock
K4 how to effectively deal with emergency situations in relation to electric shock and safe isolation
K5 how to obtain the authority to conduct fault location and diagnosis, the relevant work areas and any specific permit-to-work procedures that are used
K6 the clean work area protocols that should be used
K7 how to obtain and use data that relates to the post-production fault issues
K8 how to check the calibration status of authorised test facilities and equipment to be used
K9 the various fault diagnosis and location techniques, what they are, how to use them and the risks associated with them
K10 how to set up, care for and use the range of test equipment items for the post-production fault location
K11 how to read and interpret circuit diagrams and related symbols
K12 how to recognise, read values and the polarity of electronic components
K13 the basic operating principles of the electronic components, systems/equipment being diagnosed
K14 component types being processed/assembled and the different values and ratings of the components used
K15 how to analyse and evaluate the results of the fault diagnosis checks carried out
K16 the faults that can occur and the typical actions needed to deal with them
K17 the extent of your own responsibility and to whom you should report if you have problems that you cannot resolve
K18 how to access, use and maintain information to comply with organisational requirements and legislation

Scope/range related to performance criteria

1. Carry out all of the following during the fault location/diagnosis activities:

1.1 use the correct issue of drawings, job instructions and specifications

1.2 adhere to health and safety regulations, systems and procedures to realise a safe system of work

1.3 follow clean work area protocols, where appropriate

1.4 use grounded wrist straps and other electrostatic discharge (ESD) precautions, as appropriate

1.5 comply with organisational procedures

1.6 create and store records, in accordance with appropriate procedures

2. Conduct fault diagnosis on one of the following manufactured components or circuits:

2.1 capacitors

2.2 microwave components

2.3 resistors

2.4 spark gaps

2.5 inductors

2.6 charge-coupled devices

2.7 interconnection devices

2.8 printed circuit boards/assemblies

2.9 sensor devices

2.10 thin film circuits

2.11 optical devices

2.12 thick film circuits

2.13 visual display screens

2.14 flexible film circuits

2.15 switching components

2.16 other type of components or circuits (specify)

3. Collect fault diagnosis evidence from two of the following sources:

3.1 test instrument measurements (such as multimeter, oscilloscope, logic probe, pulse sequencing analyser, signal generator/tracer)

3.2 automatic optical inspection equipment

3.3 automatic flying probes tester

3.4 functional test equipment

3.5 in circuit test equipment (such as bed of nails/probes)
3.6 circuit meters
3.7 circuit self-diagnosis
3.8 automated X-ray inspection equipment
3.9 recording devices (such as for shock, vibration, humidity, temperature)
3.10 sensory input (such as sight, sound, smell, touch)

4. Use two of the following types of technical information to assist with fault finding activities:
4.1 technical manuals
4.2 circuit diagrams
4.3 logic diagrams
4.4 flow charts/fault algorithms
4.5 fault finding/trouble shooting guides

5. Use two of the following fault diagnostic techniques:
5.1 half-split technique
5.2 unit substitution
5.3 emergent sequence
5.4 input/output technique
5.5 injection and sampling
5.6 function testing
5.7 six-point technique

6. Use all of the following fault diagnosis procedures:
6.1 visual inspection (such as for breakages, signs of overheating, missing parts, loose fitting, dry joints)
6.2 operation (such as manual switching off and on, automatic switching/timing/sequencing, outputs)
6.3 measurement (such as voltage, current, continuity, logic states, noise, frequency, signal shape and level)

7. Locate two of the following types of faults:
7.1 intermittent component/circuit failure
7.2 partial failure/reduced performance
7.3 complete component/circuit failure

8. Prepare fault diagnosis reports using one of the following:

8.1 customer report

8.2 company specific report

8.3 other appropriate media

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