Unit 7: Developing Skills in Electronic Assembly

Unit reference number: H/601/0095

QCF level: 1

Credit value: 3

Guided learning hours: 30

Unit aim

This unit introduces learners to the skills needed to assemble electronic components into simple circuits. It will give them the opportunity to think about the precautions and safety requirements needed when using electronic assembly activities. This unit provides some of the knowledge, understanding and skills for the Level 1 Performing Engineering Operations NOS Unit 23: Assembling Electronic Circuits.

Unit introduction

In this unit learners will explore the activities involved in assembling electronic components and making circuits. When preparing for electronic assembly activities they will learn about the necessary safety requirements, components, tools and equipment, and use soldering techniques.

Learners will be involved in the practical activities associated with assembling a simple electronic circuit. They will be able to demonstrate that they can prepare for the activity and also take the necessary precautions to ensure the assembly is carried out safely and correctly. They will have an opportunity to check a range of components, tools and equipment before the circuit is assembled. Having carried out an electronic assembly activity learners will show that they can leave the work area in a safe and tidy condition and that they have produced an assembly to a reasonable standard.

Essential resources

A typical centre engineering workshop should be equipped with the basic requirements of this unit including a range of electronic assembly equipment and components, tools and equipment for assembly operations. All supporting auxiliary equipment should also be available together with appropriate safety equipment.

Workshops should be staffed appropriately to ensure health and safety requirements are met. Technician support may be required during practical work.

Learning outcomes, assessment criteria and unit amplification

To pass this unit, the learner needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria determine the standard required to achieve the unit.

Learning outcomes		Assessment criteria		Unit amplification
1	Be able to prepare for and carry out an electronic assembly activity	1.1	Take precautions ready to carry out an electronic assembly activity	□ *Preparation activities*: precautions eg tidy bench and floor area, planning assembly area layout, checking availability of services such as electrical or air supplies, putting tools and equipment into safe storage after use; preparation eg correct components and how they fit into the assembly, how to use tools and equipment; checking eg bent pins, broken leads, damaged housing, other damage to components, quantity of components
		1.2	Prepare components, tools and equipment ready for an electronic assembly activity	□ *Electronic assemblies*: electronic circuits eg audio amplifiers, signal converters, signal generators, counter/timers, sensor/actuator circuit, digital circuit, signal processing circuit, alarm and protection circuit; connect peripheral components and wiring; assemblies to contain component board including a range of components eg resistor (such as fixed, variable), capacitor (such as fixed, variable, electrolytic), diodes, semiconductor device, integrated circuit IC, connectors, insulators, cables, clips and straps
		1.3	Check components before they are used in an electronic assembly activity	

Learning outcomes		Assessment criteria		Unit amplification
2	Be able to assemble electronic components correctly and safely.	2.1	List the safety aspects for an electronic assembly activity	□ *Correct assembly*: using pliers, wire strippers, side or end cutters, special tools for inserting components; soldering components and the use of heat sinks/shunts; using anti-static procedures; removing correct length of insulation; avoiding damage to conductors; tinning conductor ends when appropriate; terminating cables to connectors; securing cables using clips and straps; making visual checks eg positioning of components and wiring, damaged/burnt insulation, excessive solder or solder spikes/bridges which may cause short circuits to occur; checking circuit function using simple test equipment and/or specific test tools
		2.2	Produce an electronic assembly correctly and safely.	□ *Safety*: personal protection eg wearing protective clothing, removal of loose clothing and jewellery, use of barrier cream, eye protection, safety footwear; preparation of assembly area; fume extraction; good housekeeping eg cleanliness of work area, removal of waste materials, storage of materials and tools; maintenance of access eg clear walkways, emergency exits; anti-static precautions; heat damage eg use of heat sink; handling circuit boards to avoid contamination; inspecting soldering equipment for damaged/burnt insulation

Information for tutors

Delivery

This unit is about preparing for and carrying out an electronic assembly activity correctly and safely. It therefore lends itself to be delivered in a holistic way and by learners practising in the workshop and reflecting on the experiences gained relating to safety and the correct use of components, tools and equipment when carrying out activities.

A key part of delivery is likely to be demonstration and practice. Although some awareness raising may be needed in a safe environment such as a classroom. Although both learning outcomes are practical in nature, some underpinning knowledge will need to be established before learners are allowed access to the practical activities. Checking of this may be best achieved through question and answer sessions. Other activities such as 'card games' or 'word searches' may also be appropriate and helpful.

Outline learning plan

The outline learning plan has been included in this unit as guidance.

Topic and suggested assignments/activities
Be able to prepare for and carry out an electronic assembly activity Whole-class, tutor-led discussions about the importance of good preparation. Whole-class, tutor-led demonstration of good practice and preparation in the electronics workshop. Individual activity: learners visit a poorly laid out assembly area and establish all points of bad practice, set this up as a competition. Individual activity: learners devise and play each others' crossword games about the precautions to take and the checking of components. Assessment of this part of the unit is likely to be achieved within activities to meet the requirement of the second learning.
Be able to assemble electronic components correctly and safely Individual activity completing 'gapped handouts' about safety aspects etc. Whole-class, tutor-led demonstration of electronic assembly activities. Individual learners activity: practise producing electronic assemblies, with formative checks until learners show a reasonable level of competence and safety. Individual summative assessment activity. This will take a large proportion of the time for this part of the unit.

Assessment

The centre will devise and mark the assessment for this unit.

Learners must meet all assessment criteria to pass the unit.

Due to the nature of the assessment requirements of this unit it is likely that summative assessment will take a large proportion of the 30 hours assigned to the unit. Learners should only be assessed once the tutor is comfortable with their level of competence developed during the formative stages of the practical activities.

A single assignment could be developed to address all the assessment criteria. It should be based on the practical activity of assembling electronic components correctly and safely. This does mean that most of the evidence will be in the form of witness statements/observation records supported by annotated photographs of what learners carried out, and work area layout, along with component listings etc, 2.1 will, however, require either a written list of safety aspects produced by learners or a list written by the tutor and extracted from the learner, and authenticated as such.

The circuit given to each learner must include a range of opportunities for them to take appropriate precautions before they prepare for and start the assembly activity in a correct and safe manner. The electronic assembly must include a range of components to be assembled from those listed in the unit content. Whilst the circuit does not need to contain all those listed it should have a simple function. This would add relevance to this activity. When designing the circuit to be assembled, and components to be used, care must be taken, to ensure that learners have opportunities to demonstrate correct assembly methods as defined in the unit content. It would also be sensible to include some components that are not 'fit for purpose' for example have bent pins, so that learners can demonstrate they have checked components before assembling and requested an exchange. The opportunity to check the assembly for correct function is also important and part of the requirements of 2.2.

Suggested resources

Books

Bishop O – *Electronics: A First Course* (Newnes, 2006) ISBN 0750669608

Bishop O – *Electronics: Circuits and Systems* (Newnes, 2003) ISBN 0750658452

Duncan T – *Success in Electronics* (Hodder Murray, 1997) ISBN 0719572053

Sladdin and Johnson – *Elementary Electronics: Basic Electronics* (Hodder & Arnold, 1990) ISBN 978-0340513736

Tooley M – *Electronic Circuits: Fundamentals and Applications* (Newnes, 2006) ISBN 0750669233

Magazines

Engineering – (The Engineering Magazine) ISSN 0013-7782

Engineering & Technology Magazine

Websites

www.maplin.co.uk/

uk.rs-online.com/web/

www.rapidonline.com