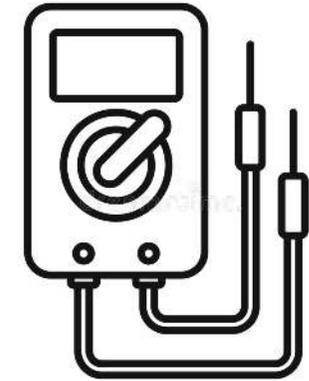


Knowledge Organiser



Learners will investigate the operation of common electronic test devices and measure and test analogue and digital circuit to diagnose faults

Learning Aim A

learners will present a balanced evaluation of the operational features of common measurement and test devices used in industry. They will cover the operational features of at least four measurement devices, including digital and analogue multimeters, a dual beam oscilloscope and a logic probe, and two test devices, for example a stabilised power supply, and a signal generator identifying applications for each. They will discuss the relative merits of digital and moving coil meters in testing electronic circuits, including accuracy and ease of reading displays/scales. Learners' evidence will identify inherent problems with accuracy for the different types of device and suggest ways to improve confidence in measurements, for example appropriate calibration.

Unit Overview

The majority of industrial and domestic processes are controlled by electronic circuitry, so it is important for engineers in a range of sectors to be proficient with fault finding and testing techniques, even though they may not be an expert in electronics. In this unit, you will explore the operational features, including the construction of a range of devices used in the testing of analogue and digital electronic circuits, using discrete and integrated circuit components. You will also explore fault finding techniques and prepare a test plan for diagnosing faults. You will go on to measure and test operational circuits to diagnose the location and nature of faults. The standard fault finding techniques introduced as part of this unit can be applied to a wide range of industries, including aerospace, automotive, audio and video, wireless communications, industrial controls and factory automation. This unit will help to prepare you for employment, for example as an electrical/electronic technician, an apprenticeship or for entry to higher education.

Learning Aims:

- A** Explore the operational features of common electronic test devices used to measure and test signals in electronic circuits
- B** Examine fault finding techniques and test plans used when measuring and testing electronic circuits
- C** Carry out measurements and tests on analogue and digital electronic circuits to identify faults safely
- D** Review the measurement and testing of electronic circuits and reflect on own performance.

Learning Aim D

learners will demonstrate relevant behaviours and general engineering skills to a professional standard, for example they will plan all activities in advance and meet all the deadlines. Their evidence will show consistently good technical understanding of measurement and testing as well as the fault finding processes. They will include accurate technical engineering terms and grammar, and will clearly differentiate facts from opinion. Overall, the evidence will include a balanced view about the actions taken, electronic circuit fault finding (including measurement, testing, calculations and using devices), including health and safety compliance, and technical engineering terms will have been used correctly and consistently.

Learning Aim B and C

learners will optimise their fault finding test plans using at least two fault finding techniques. They will justify their choice of technique, making comparisons between the available options as part of the test plan and provide details of preparatory tasks. They will explain how the results will be consistent and accurate, for example identifying the serial numbers of measurement and test equipment and making comparisons using the same equipment for Learners will use a range of documentation to produce an efficient fault finding plan, including safe working practice, to identify the cause of a single fault in each circuit. For example, the plan may be in the form of a flow chart and will include accurately validated signal values and waveforms at key test points on unfaulted circuits for comparison purposes. Learners will use their plan to find each fault in at least two complex analogue electronic circuits and two digital logic circuits (one combinational, and one sequential). Learners will systematically document the steps taken in logical sequence, the devices used and the detailed observations made, reaching insightful conclusions using standardised documentation. The conclusions reached at each stage will lead logically to the next measurement in the sequence, for example a permanently low voltage level on the base of a transistor leading to checking for a short circuit between base and emitter, or a permanently low logic level (stuck-at zero) on a logic gate leading to the search for a short circuit to signal ground.

Key Vocabulary

Transducers, Microcontrollers, Discreet Semi-conductors, Capacitors

Work Related Learning:

Gaining knowledge in fault finding that can be used in any electronics engineering role

Numeracy links:

electronics uses specific mathematics that is needed to calculate values such as voltage across different parts of a circuit

SMSC and British Values

Understanding the importance that electronics has in solving critical issues in the world.