



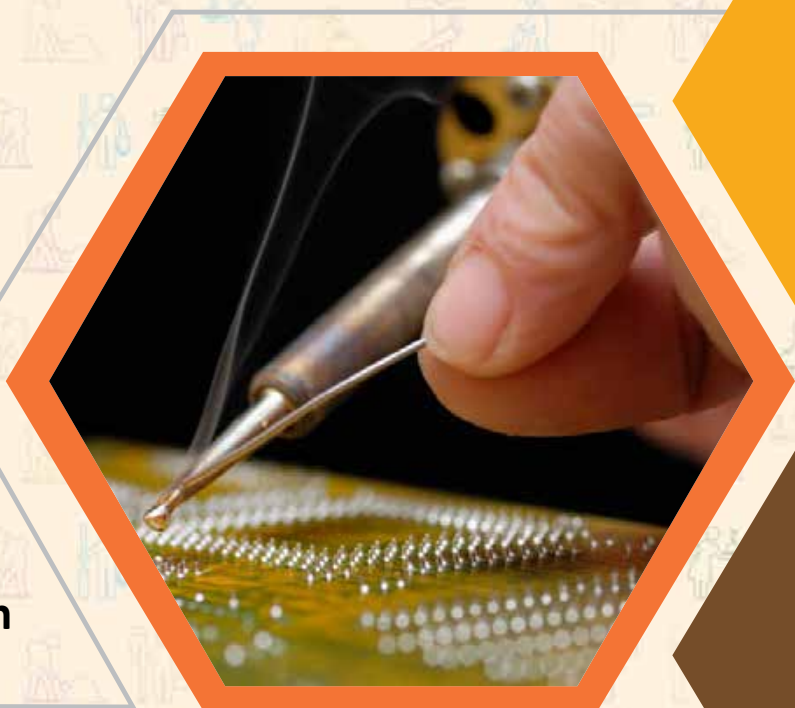
Participant Handbook

Sector
Iron & Steel

Sub-Sector
Steel, Sponge Iron

Occupation
**Electronics & Instrumentation
Maintenance**

Reference ID: **ISC/Q1101, Version 1.0**
NSQF Level 3



**Fitter – Electronic
Assembly**

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Indian Iron & Steel Sector Skill Council

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Prime Minister of India

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If we have to move India towards
development then Skill Development
should be our mission. ”



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SKILLING CONTENT : PARTICIPANT HANDBOOK

Complying to National Occupational Standards of

Job Role/Qualification Pack: 'Fitter - Electronic Assembly' QP No. 'ISC/Q1101 NSQF Level 3'

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Indian Iron & Steel Sector Skill Council

About this book

This Participant Handbook is designed to enable training for the specific Qualification Pack (QP). Each National Occupational (NOS) is covered across Unit/s.

This job is all about assembling and wiring up electronic equipment and systems to mechanical equipment. It involves the assembly of the electronic products, inclusive of components, sub-assemblies, or completed equipment/systems. Along with soldering techniques and anti-static protection techniques assemble with the mechanical equipment.

The candidate should possess basic communication, numerical and computational abilities. Openness to learning, ability to plan and organize own work and identify and solve problems in the course of working.

Key Learning Objectives for the specific NOS mark the beginning of the Unit/s for that NOS. The symbols used in this book are described below.

Symbols Used



Key Learning
Outcomes



Steps



Exercise



Tips



Notes



Unit
Objectives

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Unit 5.1: Electronic components

Unit Objectives



At the end of this unit, you will be able to:

1. Know about various electronic components i.e. resistor, capacitor, diode etc.
2. Discuss about functions and applications of electronics components
3. Know about reading values of electronic components
4. Know about PCB construction

5.1.1 Electronic components

Electronic components are essential electronic element or electronic parts typically bundled in a discrete shape with at least two associating leads or metallic pads.

Electronic Components are proposed to be associated together, as a rule by patching to a printed circuit board (PCB), to make an electronic circuit with a specific capacity (for instance an amplifier, radio receiver and oscillator, wireless). A portion of the fundamental Electronic Components are:

- resistors
- capacitors
- inductors
- diodes
- LED
- transistors
- Integrated circuit (IC)

5.1.2 Resistors


The first and most normal electronic segment is the resistor. There is for all intents and purposes no working circuit I am aware of that and doesn't utilize them, and few viable circuits can be

assembled utilizing nothing else. There are three primary parameters for resistors, yet just two of them are regularly required, particularly for strong state electronics.

- **Resistance** - the estimation of resistance, estimated in Ohms. This is the essential parameter, and decides the present stream for any connected voltage.
- **Power** - The measure of power the resistor can deal carefully. Expansive resistors (physically) for the most part have a higher power rating than little



Fig 5.1.1 Resistor

- ones, and this is constantly determined by the manufacturer. Abundance power will make the resistor overheat and bomb, regularly in a stunning way.
- **Voltage** - Rarely indicated, however this is the most extreme voltage that may show up over a resistor. It has nothing to do with power rating, which might be surpassed at evaluated voltage. It is a measure of the most extreme voltage that may show up over any estimation  of resistance for this style with no breakdown.

The resistance value is indicated in ohms, the standard representation is "R" or Ω .

Representation of resistor is

The tolerance of resistors is mostly 1%, 2%, 5% and 10%.

5.1.2.1 Types of resistor

There are a wide range of sorts of resistors utilized as a part of electronics. Each kind is produced using diverse materials. Resistors are additionally made to deal with various measures of electrical power. A few resistors may change their value when voltages are set crosswise over them.

Wire wound Resistor

A wire wound resistor is an electrical passive segment that restricts current. The resistive component exists out of a protected metallic wire that is wined around a center of non-conductive material.

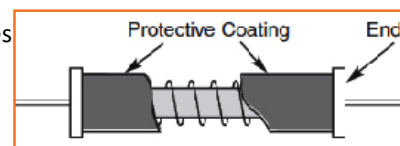


Fig 5.1.2 Wire wound resistor

The rule by which resistors work can likewise be connected to warming components in irons, toasters, heaters, electric stoves and hair dryers, which disperse voltage as heat. Variable resistors may work as sensors, switches or voltage dividers.

5.1.2.3 How to read the resistor value

The estimation of the resistor is set apart on the body utilizing hues. Each color is diverse number and you can recollect these numbers or you can simply utilize the table.

Colours

Here is the table with the colors and numbers. As should be obvious they are:

- Black : 0
- Brown : 1
- Red : 2
- Orange: 3
- Yellow : 4
- Green : 5
- Blue : 6
- Violet : 7
- Grey : 8
- White : 9

Be that as it may, this is not for all colors. From right to left the second color is multiplier. Digits from the main colors must be increased with the quantity of this color.

- Black : 1
- Brown : 10
- Red : 100
- Orange : 1000

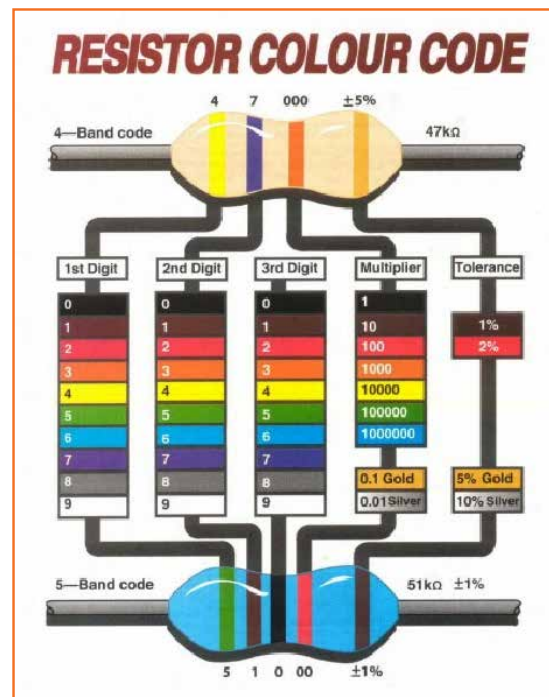






Fig 5.1.7 Resistor colour coding

TOOL	USAGE	IMAGE
<p>Hammers</p> <ul style="list-style-type: none"> • Ball peen hammer • Engineers hammer • Soft faced • Rubber mallet • Dead blow • Brass • Leather 	<p>Hammers are used to drive nails, fit parts, forge metal, and break apart objects. To use a hammer:</p> <ul style="list-style-type: none"> • Select the weight of the hammer appropriate to the fastener to be struck. • Make tight grip at the hammer handle lower half, then swing the hammer slowly and hit the fastener head squarely. • Do not strike your hand by the hammer head or handle. • Wave the hammer with extra power to strike the fastener head. • Continue the process of striking the fastener head to drive it into the material. 	
<p>Testing Lamps</p>	<p>A testing lamp is used to diagnose and troubleshoot an electrical problem.</p>	
<p>Ampere Meter</p>	<p>It is used to measure electrical current in an appliance. To use it break the circuit and attach the instrument to allow the electrical current to flow through the meter for measuring.</p>	
<p>Volt Meter</p>	<p>Volt meter is used to measure AC or DC voltages of electrical components. Voltmeter is used to measure the voltage available in the circuit.</p>	


TOOL	USAGE	IMAGE
<p>Megger</p> <ul style="list-style-type: none"> • Manual Megger • Electronic Megger 	<p>This device is used to measure electrical leakage in wire. It is used for checking the electrical insulation level of electrical machines and devices like motor, generator winding, etc.</p>	
<p>Wire wrapping tool</p>	<p>It is a process to build electronic circuit boards. Electronic components riding on an insulating board are connected by insulated wire run with the connections made around a component lead or socket pin.</p>	
<p>Crimping Tool</p>	<p>It is assembling 2 pieces of metal or other ductile material by distorting one or both of them to grip the other. The bend or irregularity is called the crimp.</p>	
<p>Static Safe Tweezers</p>	<p>These well-made tweezers are a cheap solution to your soldering requirement and perfect for picking or placing small electronic components on SMD and through hole in PCBs. The non-metallic/non-static material creates these tweezers appropriate for use with voltage sensitive devices and decreased the risk of scratching or damaging components.</p>	
<p>Wire Stripper</p>	<p>To strip the electrical insulation from electric wires a wire stripper hand-held device used.</p>	

Table 5.3.1 Tools and measuring instruments

Unit 5.5: Electronic symbols



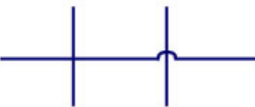

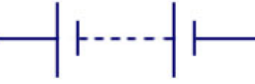
Unit Objectives




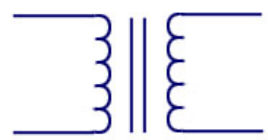


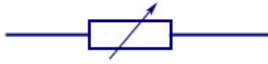
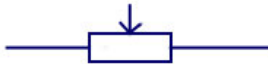
At the end of this unit, you will be able to:










1. Know about various electronic symbols









5.5.1 Electronic symbols

The symbols for different electronic devices are shown below. Click on each link given below to view the symbols. Apart from the circuit symbols, each device are also designated a short name. Though these names are not approved as standard notations, they are commonly used by most people. These designations are also given in the list.

Electronic Component	Circuit Symbol	Description
Wires		
Wire		Used to interface one segment to another.
Wires Joined		One gadget might be associated with another through wires. This is spoken to by drawing "blobs" on the point where they are shorted.
Un-joined Wires		At the point when circuits are drawn a few wires may not touch others. This must be appeared by crossing over them or by drawing them without blobs. In any case, connecting is usually rehearsed as there won't emerge any perplexity.
Power Supplies		
Cell		Used to provide a provision to a circuit.
Battery		A battery has more than a cell and is utilized for a similar reason. The littler terminal is negative and the bigger one is positive. Shortened as "B".

Electronic Component	Circuit Symbol	Description
DC Supply		Utilized as a DC power supply, that is, the current will dependably stream one way.
AC Supply		Utilized as AC power supply, that is, the current will continue exchanging directions.
Fuse		Utilized as a part of circuits where a likelihood of extreme current streams. The fuse will break the circuit if exorbitant current streams and spares alternate gadgets from harm.
Transformer		Utilized as an ac power supply. Comprises of two loops, the primary and secondary that are connected together through an iron center. There is no manual association between the two coils. The guideline of common inductance is utilized to get power. Truncated as 'T'.
Earth/Ground		Utilized as a part of electronic circuits to speak to the 0 volts of the power supply. It can likewise be characterized as the real earth, when it is connected in radio circuits and power circuits.
Resistor		
Resistor		A resistor is utilized to confine the measure of current course through a gadget. Condensed as 'R'.
Rheostat		A rheostat is utilized to control the current stream with two contacts. Pertinent in controlling light brightness, capacitor charge rate, and so on.
Potentiometer		A potentiometer is utilized to control the voltage stream and has three contacts. Have applications in changing a mechanical edge change to an electrical parameter. Curtailed as 'POT'.
Capacitor		

Electronic Component	Circuit Symbol	Description
Capacitor		Capacitor is a gadget that is utilized to accumulate electrical energy. It comprises of two metals plates that are isolated by a dielectric. It is relevant as a filter, that is, to restrict DC signals and permit AC signals. Contracted with the letter 'C'.
Capacitor – Polarized		Capacitor can be utilized as a part of a clock circuit by including a resistor.
Variable Capacitor		Used to shift the capacitance by turning the handle. A sort of variable capacitor is the trimmer capacitor that is little in estimate. The documentations are all the same.
Diode		
Diode		A diode is utilized to enable electric current to stream in just a single heading. Shortened as 'D'.
Light Emitting Diode (LED)		LED is utilized to discharge light when a current is gone through the gadget. It is curtailed as LED.
Zener Diode		After a breakdown voltage, the gadget enables current to stream in the turnaround course also. It is contracted as 'Z'.
Photo Diode		Photodiode fills in as a photo detector and changes over light into its comparing voltage or current.
Transistor		
NPN Transistor		This is a transistor with a layer of P-doped semiconductor settled amid two layers of N-doped semiconductors that go about as the emitter and collector. Abridged as 'Q'.
PNP Transistor		This is a transistor with a layer of N-doped semiconductor settled between two layers of P-doped semiconductors that go about as the emitter and collector. Contracted as 'Q'.

Electronic Component	Circuit Symbol	Description
Phototransistor		The working of a phototransistor is like that of a bipolar transistor with a distinction that it changes over light into its corresponding current. The phototransistor can likewise go about as a photodiode if the emitter is not associated.
Field Effect Transistor		A FET has three terminals: Gate, Source and Drain. FET has an electric field which controls the conductivity of a channel in a semiconductor substance.
N-Channel Junction FET		The Junction Field Effect Transistor (JFET) is the least difficult kind of FET with applications in Switching and voltage variable resistor. In an N-channel JFET an N-sort silicon bar has two littler bits of P-sort silicon material diffused on each sides of its center part, shaping P-N junctions.
P-Channel Junction FET		P-channel JFET is comparable in development to N-channel JFET with the exception of that P-sort semiconductor base is sandwiched between two N-sort junctions. For this situation dominant part carriers are gaps.
Meters		
Voltmeter		Voltmeter is utilized to gauge the voltage at one point in the circuit.
Ammeter		An Ammeter is utilized to gauge the current that goes through the circuit at a specific point
Galvanometer		A galvanometer is utilized to quantify little currents in the request of 1 milli ampere or less.
Ohmmeter		Resistance of the circuit is estimated utilizing an Ohmmeter.

Unit 7.1: Preliminary checks on the completed work

Unit Objectives

At the end of this unit, you will be able to:

1. Discuss about Preliminary checks on the completed work
2. Know about Insulation resistance testing between housing assembly and interconnection wiring
3. Know about continuity test of all interconnections
4. Know about unwanted short circuits test between wires
5. Know about Oscilloscope testing

7.1.1 Security of assembled and interconnected items

Assembly boards proposed for outrageous conditions frequently have a conformal covering, which is connected by plunging or spraying after the parts have been welded. The coat forestalls corrosion and leakage currents or shorting because of compression. The initial conformal coats were wax; These days conformal coats are normally plunges of dilute solutions of silicone elastic, polyurethane, acrylic, or epoxy. An extra strategy for applying a conformal coating is



Fig 7.1.1 Security of assembles items

for plastic to be sputtered onto the PCB in a vacuum chamber. The main inconvenience of conformal coatings is that adjusting of the board is rendered to a great degree troublesome.

Many assembled boards and interrelated are static sensitive, and in this way should be put in antistatic bags amid transportation. When dealing with these boards, the client must be grounded (earthed). Inappropriate dealing with systems may transmit a collected static charge through the board, harming or decimating parts. Indeed, even uncovered boards are in some cases static sensitive. Follows have turned out to be fine to the point that it's very conceivable to pass an engraving over the board (or change its attributes) with a static charge. This is particularly valid on non-customary PCBs, for example, MCMs and microwave PCBs.



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