



Salahaddin University-Erbil
College of Engineering
Electrical Engineering Dept.

Electrical Installation and Design Lab

Student Manual

Prepared by
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Exp. No.:- 1

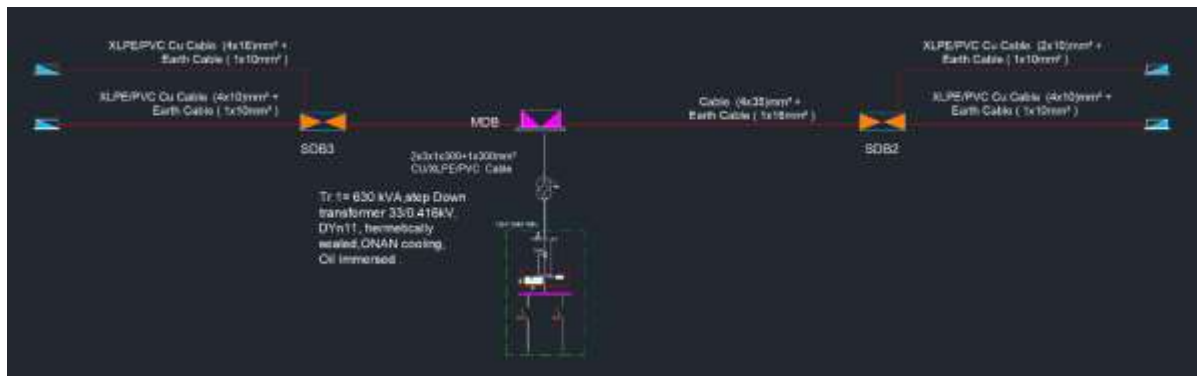
Exp. Name: - AutoCAD Program

Objective :- To familiar Using AutoCAD Program to Design Electrical Drawing

Exp. No.:- 2

Exp. Name: - Single Line Diagram

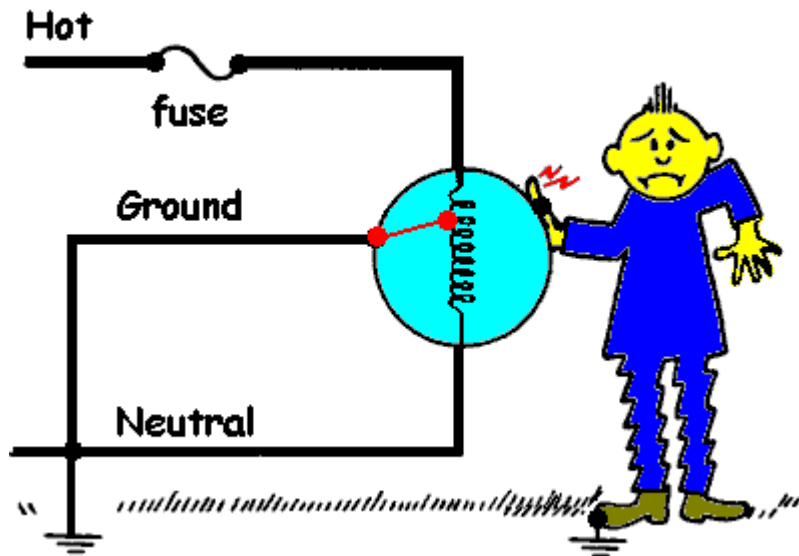
Objective :- Design Single Line Diagram of Electric Simple Power System and How calculate the type and rating of Transformer and Feeders



Exp. No.:- 3

Exp. Name: - Neutral, Ground and Earth

Objective :- To familiar to Neutral, Ground and Earthing System , Symbols and How to connect all parts Located in right place in Buildings Using AutoCAD Program



Neutral

Neutral is the return path for [electric current](#) in an [electric circuit](#) which is supposed to carry current in normal condition. This current may be because of many reasons, primarily because of phase current imbalance and sometimes because of 3rd and 5th harmonics.

There may be other reasons too but the magnitude of this current is in fraction of phase current and in few cases it can be even double of phase current. So Neutral wire is always assumed to be charged (in [active circuit](#)). This neutral wire is connected to the ground (by grounding as in a domestic power supply the Ground is bonded to Neutral, to provide a return path to the transformer at the sub-station) to make the second terminal of neutral wire at zero potential.

Earth or Ground

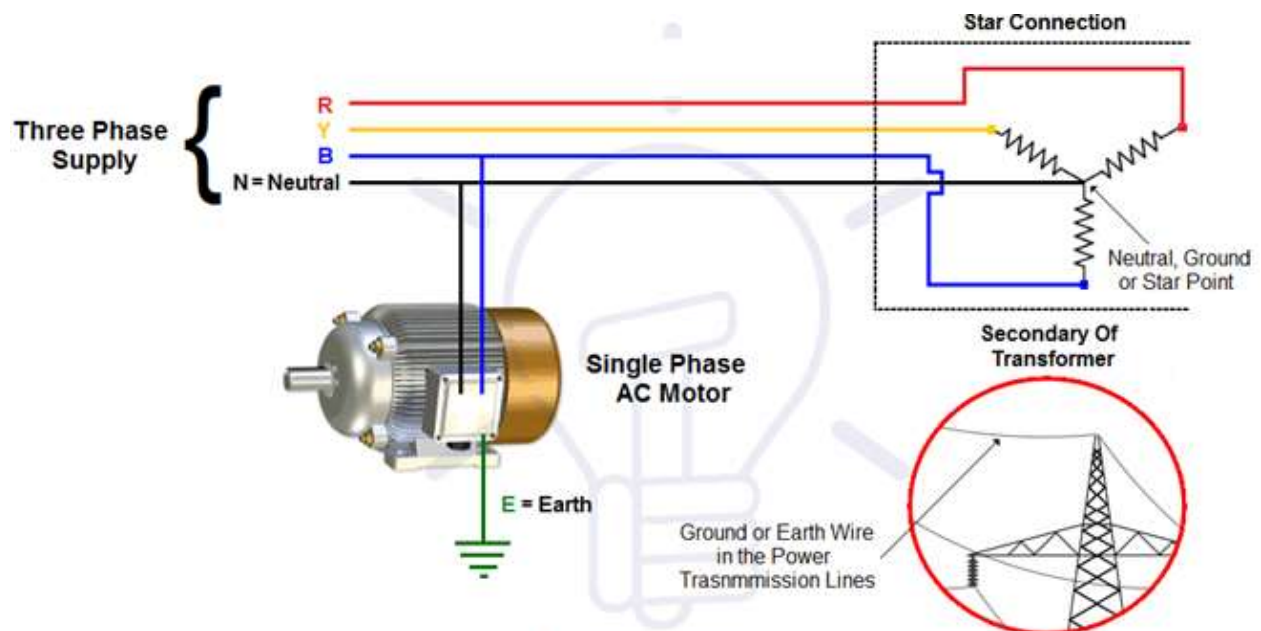
Earth or Ground is for safety concerns against leakage or residual currents on the system via least resistance path. While Phase and Neutral is connected to the main power wiring, earth may be connected to the body of equipment or to any system which in normal condition doesn't carry current but in case of some insulation failure, is supposed to carry some minor current.

This current is not directly coming from Live or Phase (Line or Hot) wire, but is from secondary links which were not in touch with the live system in normal condition. This current is usually

much lesser than the main Line current or Phase current and mostly is in order of mA. But this leakage current is good enough to kill someone (electrocution) or may risk fire with serious damages. Such current is being provided a low resistance path and sent to earth via [earth wire](#). Because of the difference in application we never mix the grounding of Neutral and Earth. However both are grounded (of-course the process may be different). If both will be mixed then the earth wire which is not supposed to carry any current in normal condition , may have some charges across and will become hazardous.

The Main difference between Neutral, Ground and Earth?

To understand the difference between Neutral, Ground and Earth, we must understand the need of these things first.

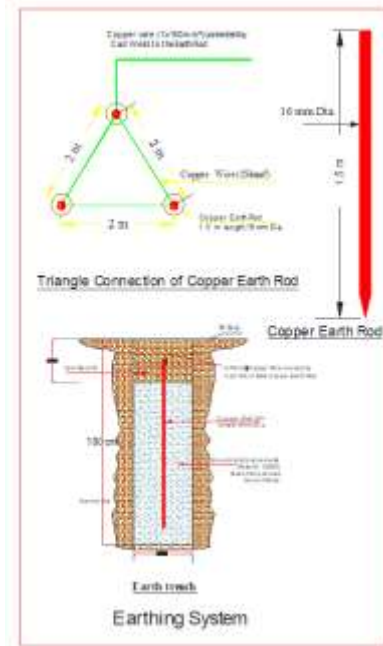





Difference Between Neutral, Ground and Earth?

Difference between Earthing and Grounding.

There is no [difference between Earthing and Grounding](#) but these are the same terms used for Earthing or Grounding.

Grounding (also known as Bonding) is the common word used for earthing in the **North American standards like IEEE, NEC, ANSI and UL** etc. while, **Earthing** is used in **European, Common wealth countries and Britain standards like IS and IEC** etc.



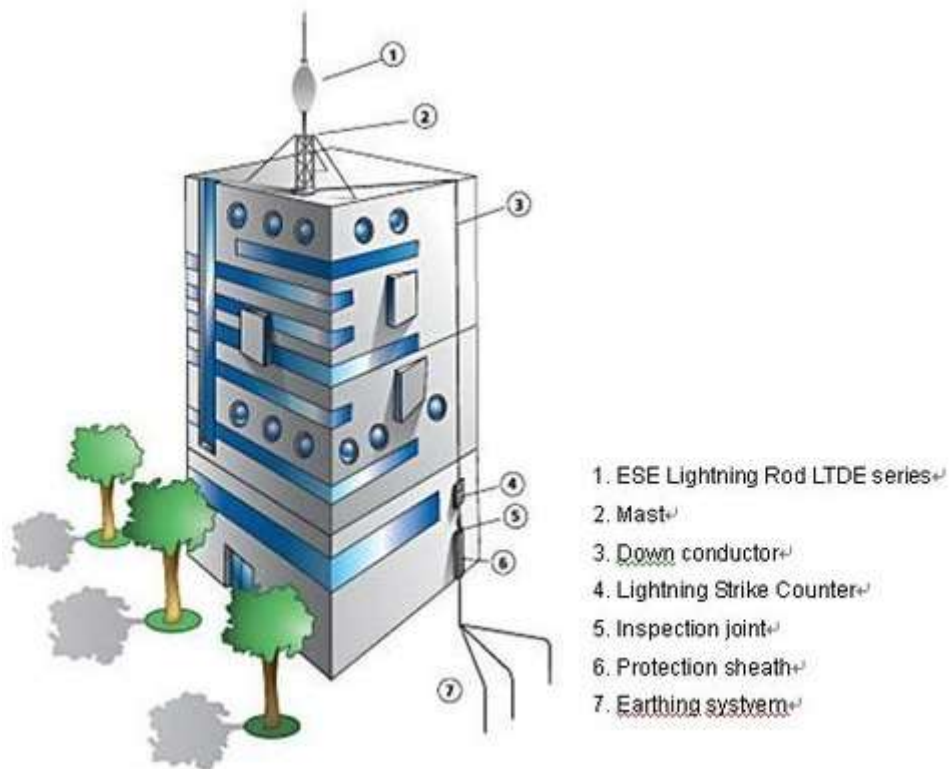
Characteristics	Grounding	Earthing	Bonding
Terminology	Grounding is the commonly word used for earthing in the North American (US) & Canadian standards like, NEC , CEC , IEEE , ANSI and UL .	Earthing is used in European, Common wealth countries and Britain (UK) standards like IS and IEC etc while Grounding is a little bit different.	The electrical bonding is the same term used in both NEC & IEC (US & UK) but totally different than grounding and earthing.
Symbol	<small>PG in US PE in UK</small> 	<small>PE</small> 	
Definition	To connect the current carrying part of the electrical system to the earth electrode buried in the ground through earth continuity conductor.	To connect the metallic (conductive) parts (such as body, frame which in non current carrying during normal operation) of an electric appliance or installation to the earth (ground) is called Earthing (and / or Grounding in the US).	To connect two electrical systems (such as wires, equipment and pipes etc) together to bring them at the same potential level while they are non-current carrying during the normal operation.
Location of Installation	Connection between the current carrying parts of the system (such as Neutral as a return path for current) to the ground.	Connection between the metallic body frame and earth plate in the ground	Connection between two equipment, wires, pipes etc (which are non-current carrying during normal

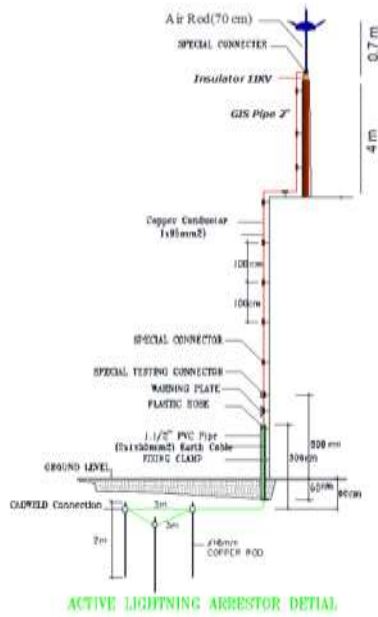
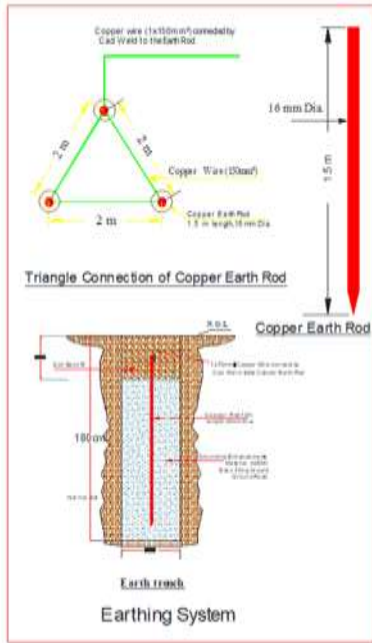
Exp. No.:- 4

Exp. Name: - Lightning Arrester Protection

Objective :- To familiar to **Lightning Arrester Protection** ,Symbols and How to connect all parts Located in right place in Buildings Using AutoCAD Program

Lightning Arrester Protection



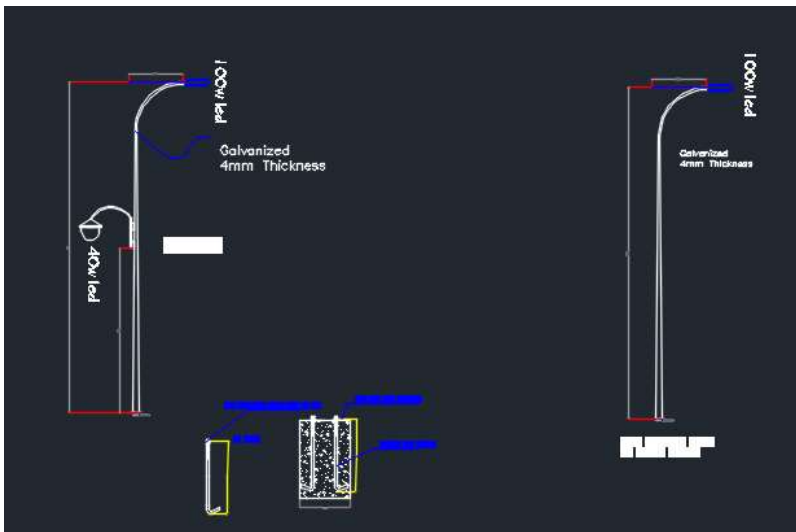


Exp. No.:- 5

Exp. Name: - Lighting System (Indoor, Outdoor and Street light)

Objective :- To familiar How to do Lighting Design Calculation in a Building (Indoor, Outdoor and Street light) , Symbols and How to connect all parts Located in right place in Buildings Using AutoCAD Program

SYMBOL	DESCRIPTION
	Ceiling LED light WARM 50 W , D = 40 cm
	Ceiling LED light WARM 20 W , D = 20 cm
	Ceiling LED light WARM 50 W , D = 35 or 40 cm
	Exterior lighting, spot light WARM 15 W ,D = 12 cm
	Emergency light,Ceiling spot light 7 W
	Emergency light,Wall mounted 7 W
	Industrial Dustproof LED lights 50 W
	Poly carbonate light, single pull for parking 1.25 * 0.15 cm 35 W
	Hidden light WARM 24V ALUMINUM COVER 10 cm 10 W/m
	Outdoor light Wall Mounted 9 W ,D = 12 cm
	Spot light WARM 18 W ,D = 12 cm
	One way one gang switch
	One way two gang switch
	One way three gang switch
	Two way one gang switch



Symbol	Description	Notes

Exp. No.:- 6

Exp. Name:- Single Phase & Three Phase Electrical Wiring Installation in Buildings according to IEC Standard.

Objective :- To familiarize how to connect and distribute single phase & three phase electrical wiring installation in buildings according to IEC standard, symbols and how to connect all parts located in right place in buildings using AutoCAD program.

How to Wire Single Phase & 3-Phase Electrical Distribution Board & Consumer Unit in Building

In our today electrical wiring installation, we will show **how to wire and install a single & three phase distribution board and consumer unit from utility pole to a 3-phase energy meter & 3-phase distribution board.** We will also be showing that **how to connect three phase & single phase load circuits in a three phase wiring distribution system** in home and commercial electric supply system.

Table of Content

- What is Three Phase & Single Phase Power?
 - Why Do We Need Three Phase Power Supply?
 - 3-Phase & 1-Phase Voltage Levels in the UK, EU – IEC
- Requirements for Three Phase Wiring Installation
- How to Wire Three Phase Main Distribution Board?

- [Three Phase Electrical Wiring Installation Diagrams – UK, EU – IEC](#)
- [How to Connect Three Phase, 400V Loads in a 3-Phase Wiring Distribution System? – IEC & UK](#)
- [Schematic Wiring Diagram of Three Phase Distribution Board](#)
- [Three Phase Wiring Color Codes – IEC](#)
- [General Precautions & Instructions](#)

What is Three Phase & Single Phase Power?

In power generation plants, Three Phase power is generated by an electrical [generator or alternator](#). In an alternator, the generated [voltage](#) and [current](#) by three independent coils in the stator are separated by 120 degrees from each other. The generated power from alternators then transmitted and distributed through transmission and distribution lines to the sub distribution. Both [single phase and three phase supply](#) is further distributed by the three single phase [transformers](#) or a single unit of three phase transformer (configured in [Star “Y” or Delta Connection](#)) installed on the utility pole near the residential or commercial area.

The voltage levels are step-up via step-up transformers for power transmission. In the distribution system, they are again step-down the level of voltage via step-down transformer for further utilization. [RCD, MCB, MCCB, CB, RCD, RCBO, Fuses, Switches](#) etc are used as controlling and protective devices in the MDB, DB, Sun & Final Sub circuits. For example, In the UK and EU, 11kV from the step-down [transformer](#) wired in Delta connection via (3 Phase, 3-Wires System) enters the 400V/230V [distribution transformer](#) wired in Star “Y” Connection (Three Phase, 4 Wires System).

In the US, 4.5k-7.2kV from the step-down transformer wired in Delta connection via 3 Phase, 3-Wires System enters the 240V/120V distribution transformer wired in Star Connection (Two Phase, 3 Wires System). For a three phase system, the arrangement can be different for different levels of voltage. We will show the wiring diagram in the next sections of this post.

In Three Phase Supply, [motors](#) and large electric heaters can be directly connected to the three Phases (Neutral is not needed in all cases) while in Single Phase, load circuits (light, fan etc.) can be connected in between Phase and Neutral through proper protective devices e.g. earthing/grounding wire. In the US, The 240V Single phase load can be connected to two phases without a Neutral wire.

Why Do We Need Three Phase Power Supply?

To operate high power equipment and appliances such as electric motors, high power rated air compressors & air-conditions, water heaters etc. we need Three Phase Power supply instead of Single Phase Power supply. In ordinary homes (domestic as residential), we mostly use Single Phase power supply to operate lighting load, fans, washing machines etc. But in some cases

e.g. industries, high torque motors, multi-story & large buildings (industrial as commercial), Three Phase power supply needed to operate and maintain the high power and voltage systems. In our previous posts about Single Phase electrical wiring installation in home and already know what MDB, DB, Final Sub Circuit, MCB, MCCB, CB and RCD etc. So we will never repeat it again.

3-Phase & 1-Phase Voltage Levels in the UK, EU – IEC

The three phase system is simpler in the UK & EU as compared to the USA and most of the countries (e.g. India, Pakistan, UAE and other Arab countries) follow the same voltage distribution system as UK, EU and IEC voltage levels. Both three phase and single phase voltage are available for residential and commercial application in the same unit as follows.

3-Phase Voltage in the UK & EU

- Phase to Phase = 400V
- Any Phase to Neutral = 230V – (1- Φ)
- Between Three Phases = 400V – (3- Φ)

I.e.

- L_1 to L_2 = 400 V – (3-Phase)
- L_2 to L_3 = 400 V – (3-Phase)
- L_3 to L_1 = 400 V – (3-Phase)

1-Phase Voltage in the UK & EU

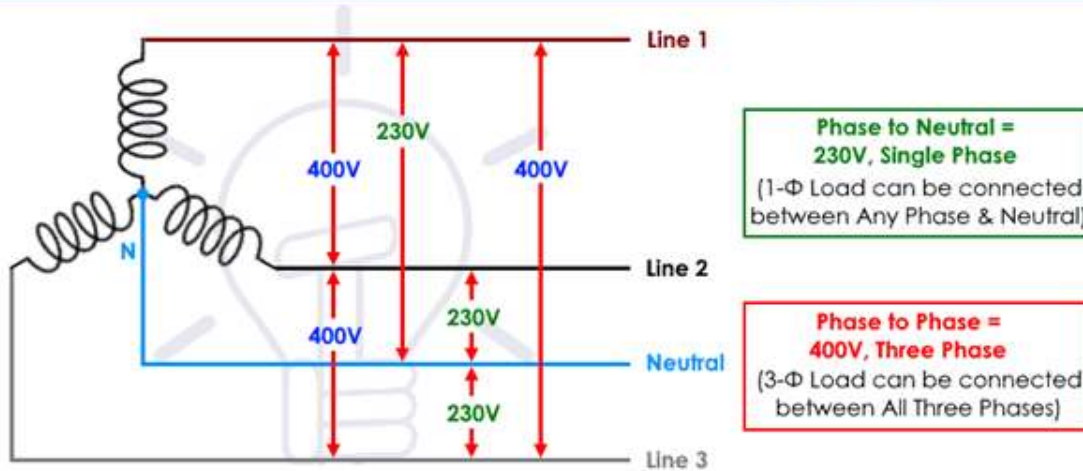
- Phase to Neutral = 230V

i.e.

- L_1 to N = 230 V – (1-Phase)
- L_2 to N = 230 V – (1-Phase)
- L_3 to N = 230 V – (1-Phase)

230V & 400V Single Phase & Three Phase Power Supply Systems – IEC – UK & EU

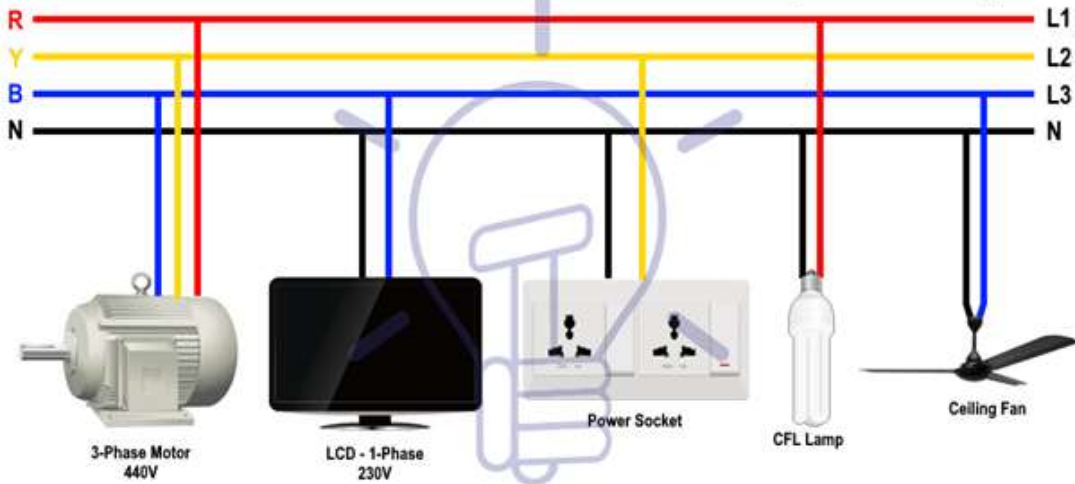
230V & 400V, 1 & 3-Phase Power Supply Systems



How to Connect Three Phase, 400V Loads in a 3-Phase Wiring Distribution System? – IEC & UK

As mentioned above, Three Phase loads (400V, 3-Phase Motors) can be directly connected to the three lines accordingly i.e. there is no need to connect to the neutral point (In some cases, Neutral is still needed in a three phase system which depends on the system design. Refer to the user manual before installing such an appliance). For Single Phase Loads (230V or 120V AC Light, TV, Power socket, Fans etc.), they can be connected to the Phase and Neutral wire as shown below. Note that Earth or ground wire must be connected to the electrical appliances and equipment connected to both single phase and three phase supply systems for safety as it prevents [electric shock](#) hazards.

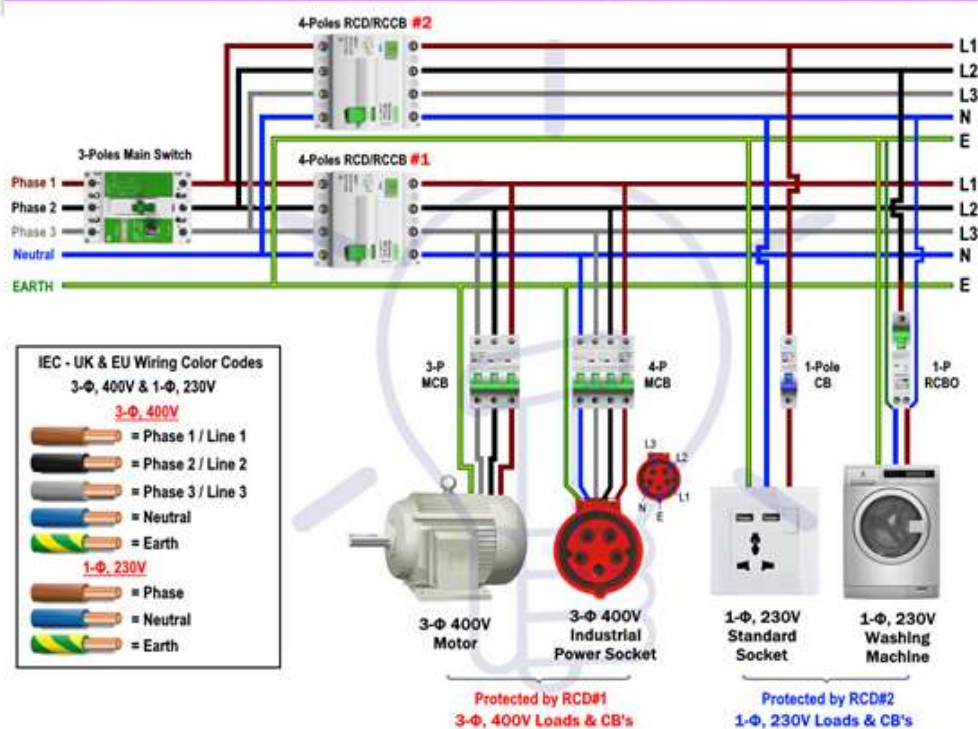
How to Connect 1-Phase & 3-Phase Loads in a 3-Phase Wiring Distribution System



Single Phase & Three Phase Load Connected in Three Phase Supply System

Wiring Three Phase 400V load and MCB's in the Split Load Distribution board and consumer unit with RCD.

Wiring 3- Φ & 1- Φ 400V/230V Load Circuits in Split Load Distribution Board



Wiring Typical Three Phase 400V load circuits and MCB in the Distribution board and consumer unit.

Three Phase Wiring Color Codes – IEC

IEC & UK:

Three Phase 400V:

- **Brown** = Phase 1
- **Black** = Phase 2
- **Gray** = Phase 3
- **Blue** = Neutral
- **Green** or **Green** with **Yellow** Stripe = Earth or Ground wire as protective earth (PE).

Single Phase 230V AC:

- **Brown** = Phase or Line
- **Blue** = Neutral
- **Green** or **Green** with **Yellow** stripe = Earth/Ground or Protective Earth “PE”.

For reference, here is the **OLD UK Wiring Color Codes (Prior 2004)** which still applicable in other countries i.e. India, Pakistan, UAE, KSA and other Arab Countries.

400V Three Phase

- **Red** = Phase 1
- **Yellow** = Phase 2
- **Blue** = Phase 3
- **Black** = Neutral
- **Green** = Earth or Ground wire.

230V Single Phase

- **Red** = Phase
- **Black** = Neutral
- **Green** = Earth or Ground wire

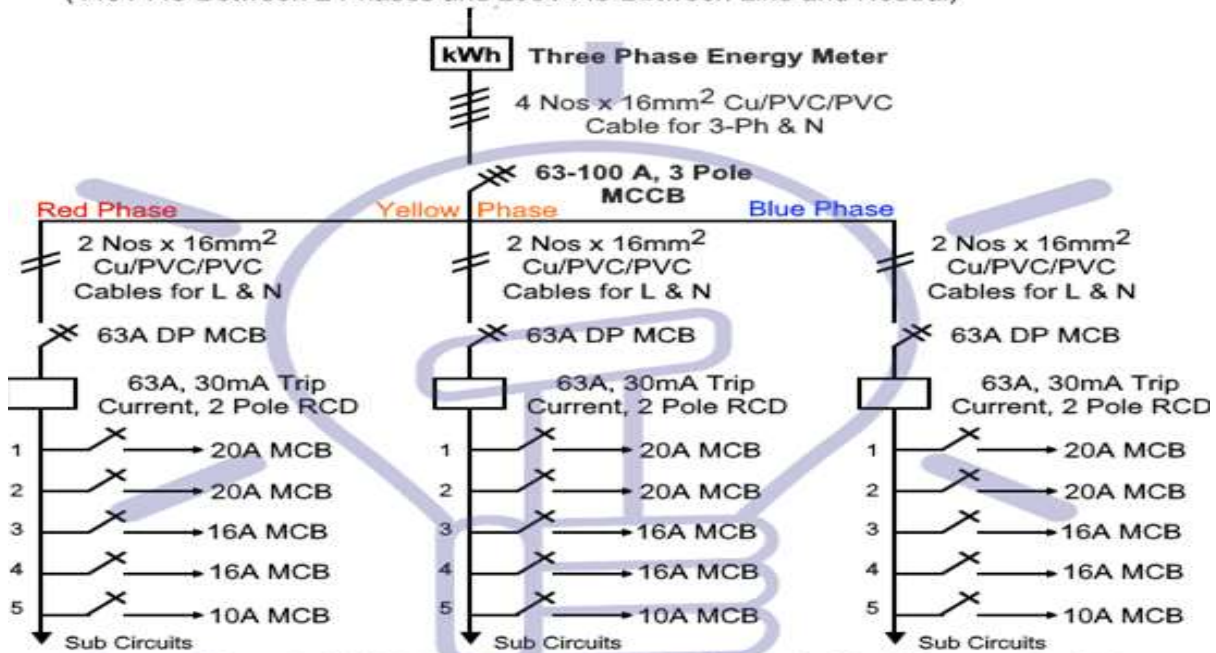
Schematic Wiring Diagram of Three Phase Distribution Board

The following typical layout wiring diagram shows three phase distribution board and consumer unit installation in a residential/commercial area.

Wiring 3- Φ & 1- Φ 400V/230V Load Circuits in Split Load Distribution Board

4-Poles RCD/RCCB #2

3 Phase Power Supply from Utility Pole
(440V AC Between 2 Phases and 230V AC Between Line and Neutral)

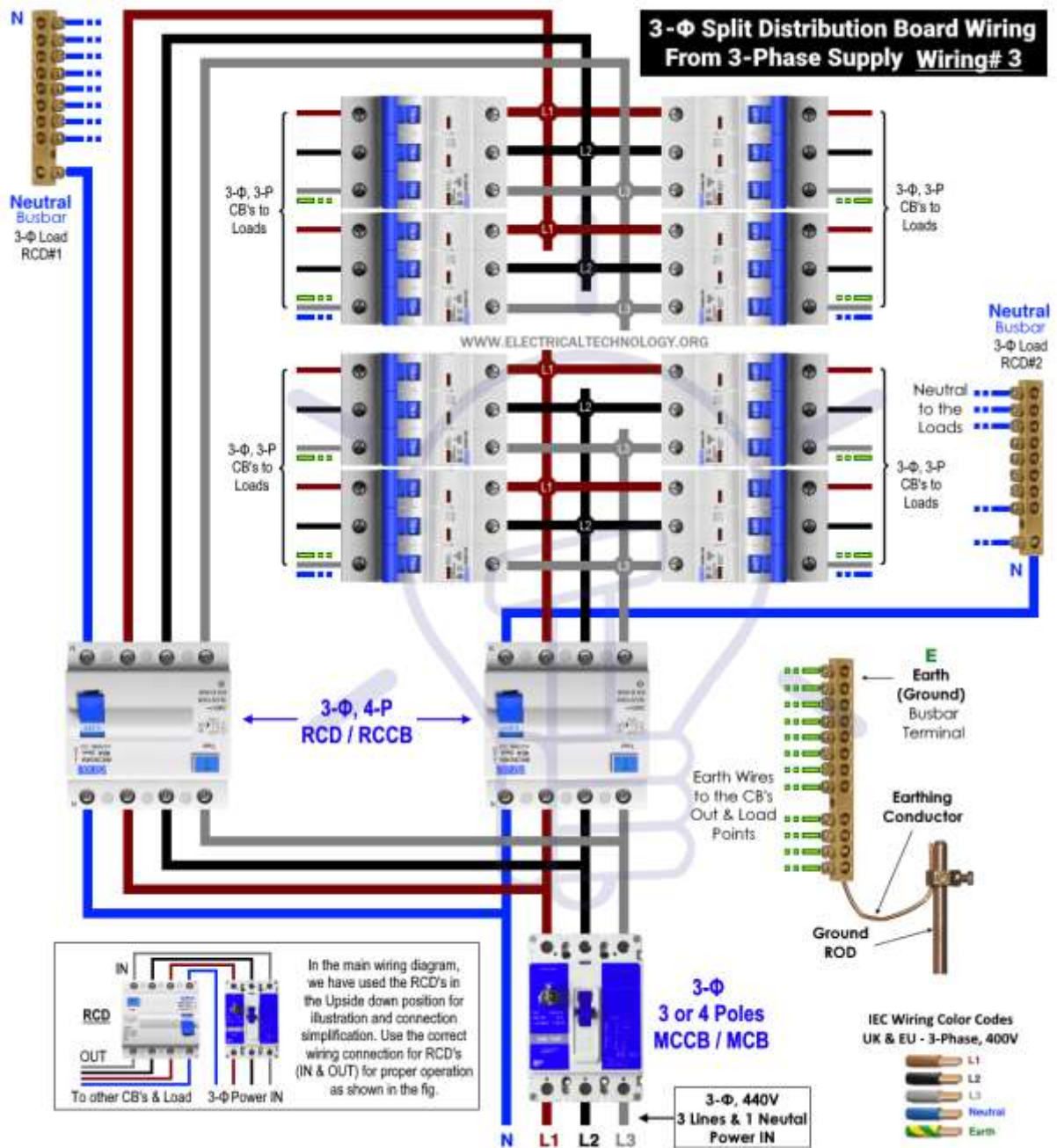


3 Phase Electrical Wiring Installation in Single & Multi Storey Building

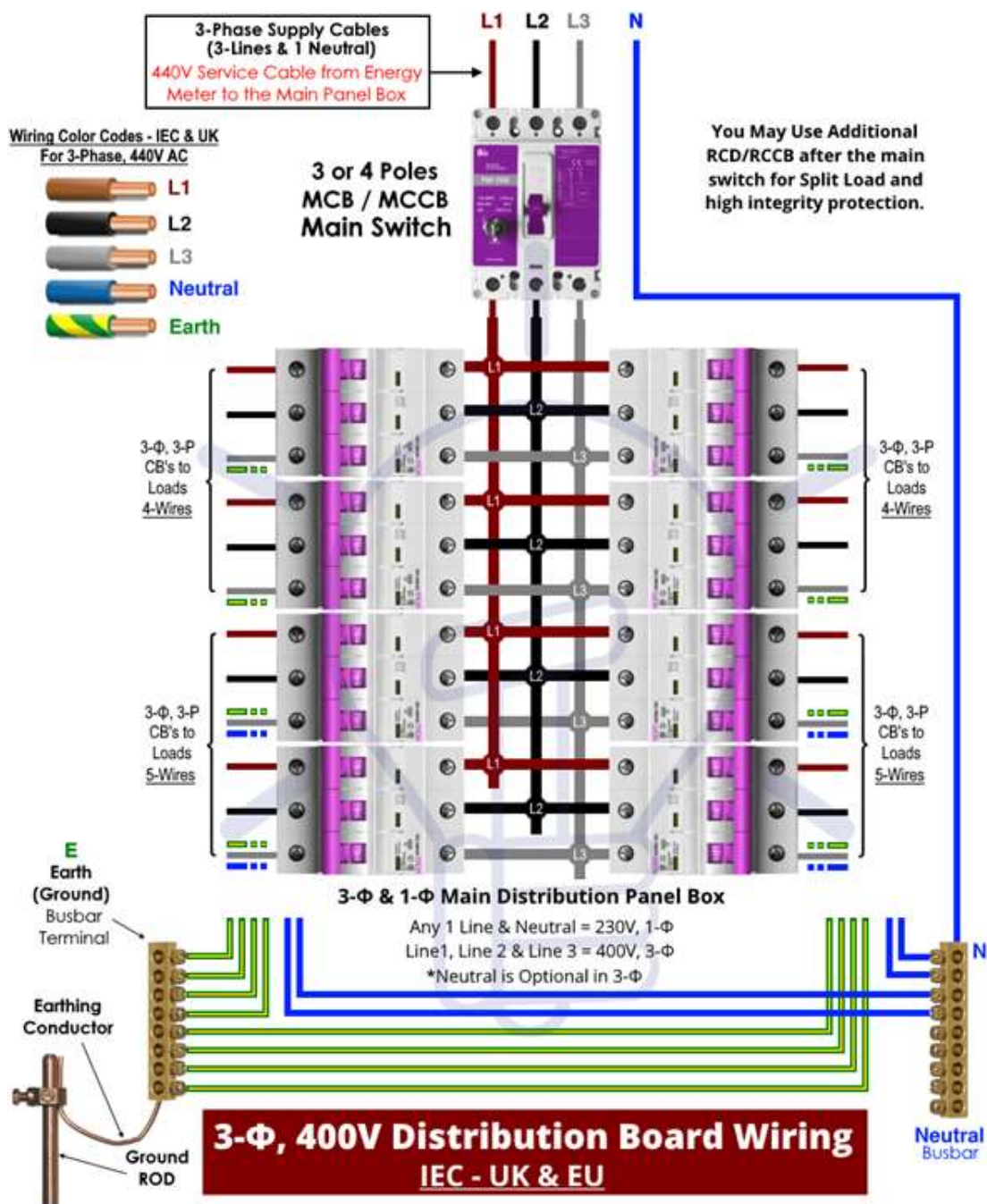
Electrical Wiring Diagram of a 440V AC, 3-Phase 63A Distribution Board (Consumer Unit) With 1-Phase Power Distribution for Lighting, AC Units & Final Sub Circuits for each Phase



Three Phase, 400V, Split Distribution Board Wiring with RCD – Only 3- Φ Loads



Three Phase, 400V, Typical Distribution Board Wiring with RCD for 3- Φ Load Circuits



Light current systems



systems

Fire alarm

CCTV

Sound
system

Telephone

Data

TV

Nurse call
system

FAIRE ALARM SYSTEM



Exp. No.:- 7 .

Exp. Name: -Fire Alarm System.

Objective:- To familiar All type of Detectors and How configuration Fire Alarm System ,Symbols and How to connect all parts Located in right place in Buildings Using AutoCAD Program

Types of Fire Alarm Systems and Their Wiring Diagrams

What is a Fire Alarm System?

A fire alarm system is a mechanism of different interconnected devices and components used to alert us in case of emergency especially fire to protect the staff and general public by taking appropriate actions.

Fire alarm system is the combination of different components such as smoke detector, heat detector, carbon monoxide detector, multi sensor detector, call points, sounders, bells,

LEGEND	
Item	Description
	Intelligent Addressable Optical Heat Detector Fixed Temperature
	Intelligent Addressable Optical Smoke Detector
	Intelligent Addressable Call Point
	Intelligent Addressable Wall Sounder IP66
	Fire Resistant Halogen Free ERVITAL JE-H(S)HQH FE 180° PH 120 (2x1.5 mm²) (Typically)
	Intelligent Addressable Fire Alarm Control Board
	Single Side Emergency Exit Lighting Fixture 1x8W Lamp
	Double Sides Emergency Exit Lighting Fixture 1x8W Lamp
	Exit Lighting Fixture 1x8W Lamp
	Emergency Light 1*20 Watt Build Battery

relay module, repeater, annunciator, fire control panel and other related and optional security devices designed for fire alarm control system.

Like a CPU (central processing unit) in a computer system, the fire alarm control panel is the brain of fire alarm system which sends a status indication and notification to the connected detectors and sounders in case of manual or automatic operation.

Fire alarm systems are wired in industrial factories, offices, public buildings and nowadays even in homes. Different types of fire alarm system such as conventional, addressable, intelligent and smart wireless designs are used for the same purpose i.e. in case of emergency, the sounders will operate to warn the people around to evocative via general or emergency exit.

The main purpose of a fire alarm system is to protect the wealth, health and life of individual or society.

A smart fire control system is also connected to the fire brigade and related emergency personnel through remote control via control panel.



The following tutorial will explain the different fire alarm system and their wiring diagrams and connection

Types of Fire Alarm Detectors

There are multiple detectors used in a fire alarm system including the basic call point (manual break glass unit) and smart multi sensors detector. The fire detection devices can be categorized as follow.

- Smoke Detector
- Heat Detector
- Multi Sensors Detector
- Carbon Monoxide Detector
- Manual Call Point

Smoke Detectors

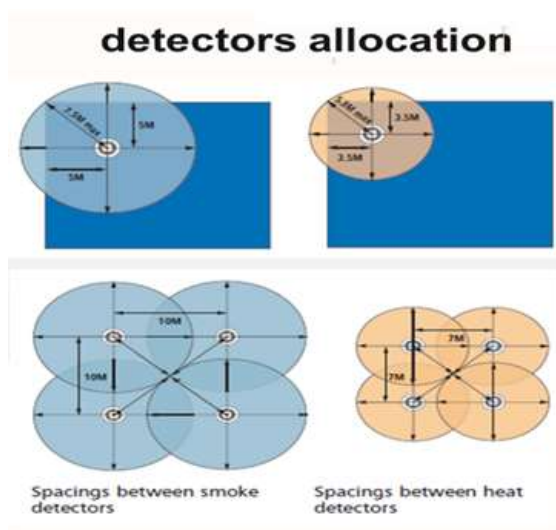
Smoke detectors can be categorized as follow based on design and working principles.

- Ionization Smoke Detectors
- Light Scattering Smoke Detectors
- Light Obscuring Smoke Detectors

Heat Detectors

Hear detectors work based on the rate of change in temperature or a specific value of a fixed temperature rate.

In case of heat rise to the pre-set value, the eutectic alloy inside the heat detector (which is heat sensitive to the specific temperature) turns from a solid to the liquid. The process is same like the working of a [fuse](#) where fuse element melts when needed. The same process will trigger the alarm circuit in case fire.



Carbon Monoxide Detectors

Carbon monoxide detector is also known as CO detector. It is an electronic device which contains on different [types of sensors](#) used to measure and sense the amount of carbon monoxide gas in the air.

When the level of carbon monoxide (it is a poisonous gas produced by combustion) crosses the specified limit, it indicates and triggers the fire alarm system. The electrochemical cell inside the carbon monoxide detector only sense and measure the amount of CO gas and not other combustion gases like smoke etc.

Keep in mind that the carbon monoxide detectors designed for fire alarm system are more sensitive with quick response as compared to the CO detectors used in homes for CO protection in case of incomplete combustion process in appliances such as boilers etc.

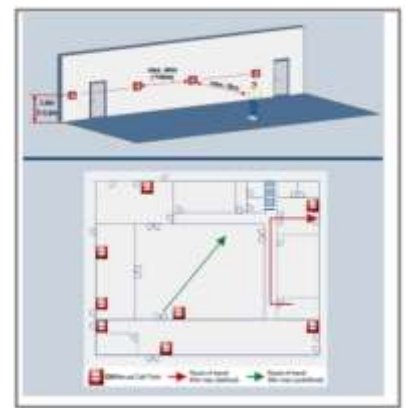
Multi-Sensor Detectors

The multi sensor detector (also known as multi-criteria alarm) is a sensitive device which combines the input signal from both heat and optical sensors and used for wide range of fires with lower rate of unwanted false alarms.

Manual Call Points

A fire alarm manual call point (also known as break glass point) is a device which is used to trigger the alarm circuit by breaking the glass and pressing a frangible element in case of emergency or fire.

Call points are installed at 1.4 meter above the floor level for ease access in case of emergency. The maximum length between two call points is 30 meters and installed on the entry floor landing of stair cases, exit routes and at all exits to the open air.



Types of Fire Alarm Systems with Wiring Diagrams

Following are the different types of fire alarm systems with wiring and connection diagrams.

- Basic Fire Alarm in Home
- Conventional Fire Alarm System
- Addressable Fire Alarm System
- Intelligent Fire Alarm System
- Wireless Fire Alarm System

Lets discuss each one in details as follow:

Conventional Fire Alarm System

In a conventional fire alarm system, all devices such as detectors, sounders and call points are connected to the control panel through separate wire or cable instead of shared one. In other words, the first end of the wire is connected to the detectors and second one to the control panel.

Wiring of Conventional Fire Alarm System

Addressable Fire Alarm System

In an addressable fire alarm system, all the devices such as detectors, call points and alarm bells are connected in a loop system to the fire addressable control panel and each device has an address (to tell about their location). This way, it is very easy to find the exact location of the device which has been triggered in the connected circuitry.

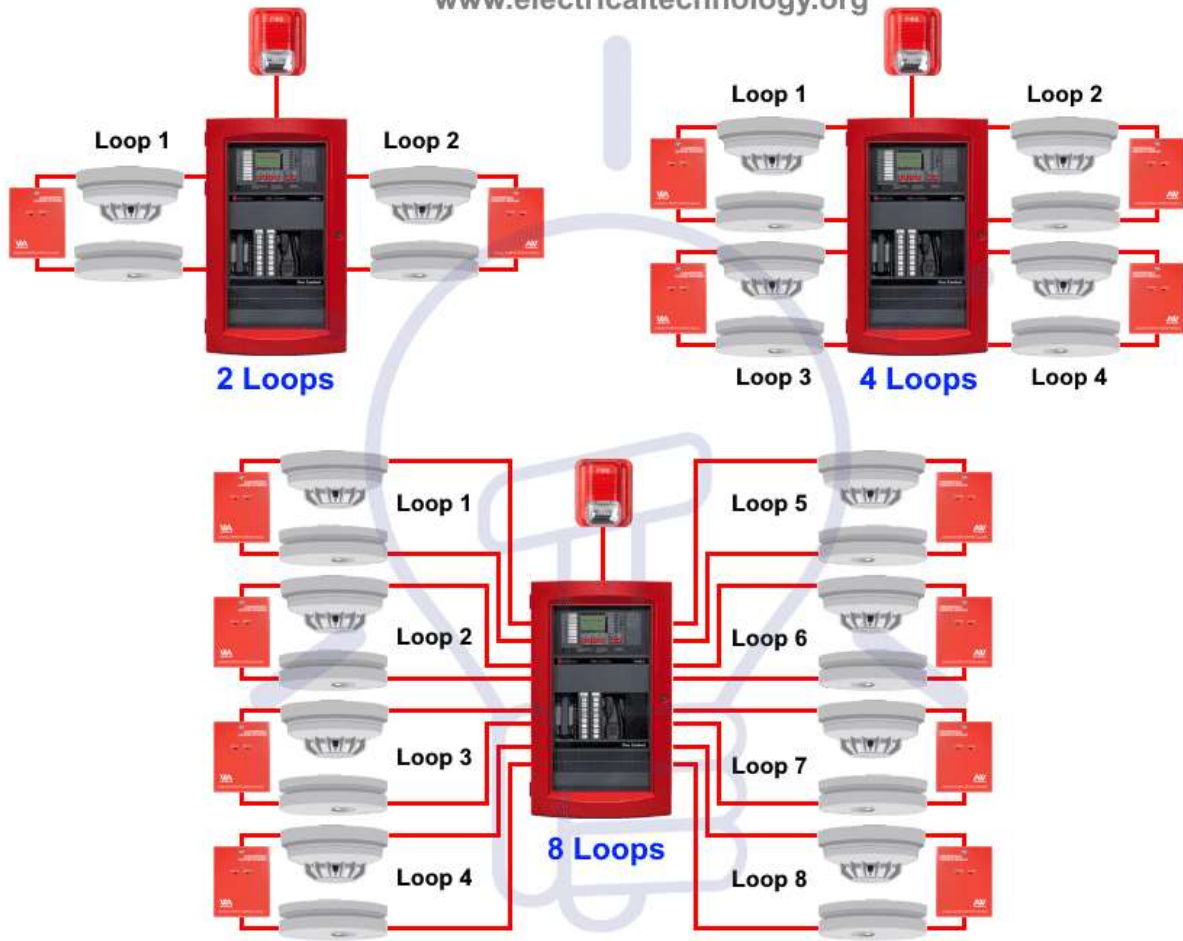


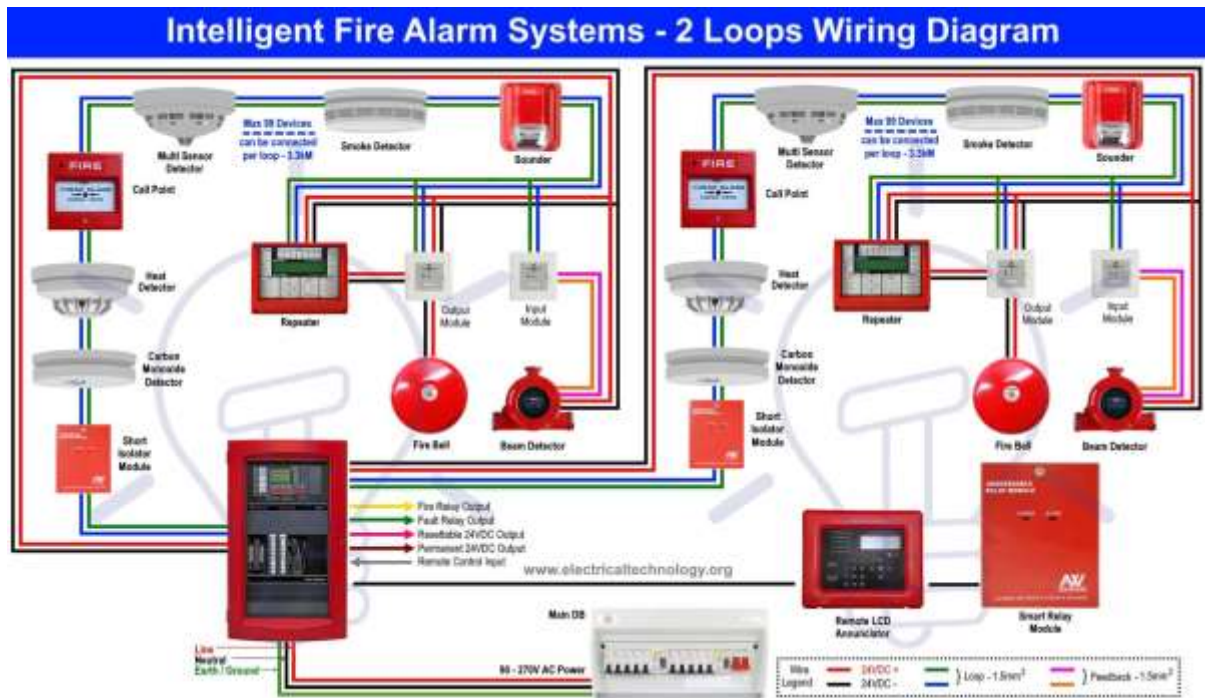
Intelligent Fire Alarm System

In an intelligent fire alarm system, each device has the ability to analyze the environment around it and communicate the central control panel to take further action(s) in case of fault, fire or the device needs cleaning or scheduled maintenance of the detectors.

Intelligent Fire Alarm Systems

www.electricaltechnology.org



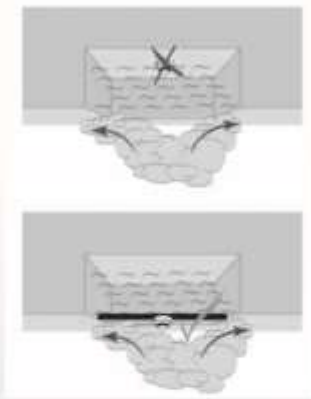


Wireless Fire Alarm System

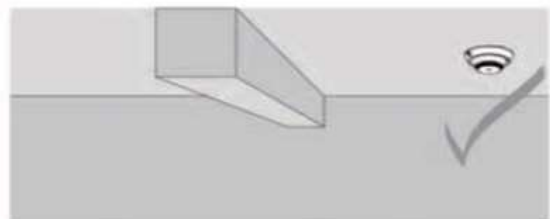
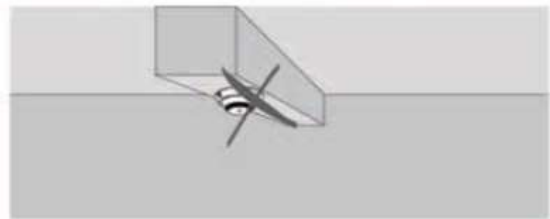
In a wireless fire alarm system, all the detectors and related devices are interconnected remotely through radio communication to the fire control panel.



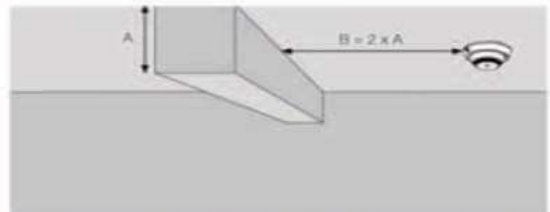
Notes;



Place the detector at the highest point in the room.



Keep the correct distance to ceiling obstacles.





Exp. No.:- 8 .

Exp. Name: -CCTV System .

Objective :- To familiar All type of camera , require Devices and How configuration CCTV System ,Symbols and How to connect all parts Located in right place in Buildings Using AutoCAD Program

Things You Need

- DVR / NVR
- CCTV Camera (Bullet, Dome or PTZ Cameras)
- Monitor / LCD (PC, Laptop etc)
- Power supply, adopter, power splitter and other related cables and connectors

Optional:

- PTZ Camera
- USB / Mouse
- Speaker / Microphone
- Router (To view and control the camera by smartphones through Wi-Fi)

Before we go in details, lets know that what is the difference between DVR and NVR.

What is DVR?

DVR also known as “Digital Video Recorder” is an electronic device which processes the video signals in the recorder and stores in the mass storage i.e. Hard driver or USB flash drive. It is slimier to the VCR and also known as PVR “Personal Video Recorder”.

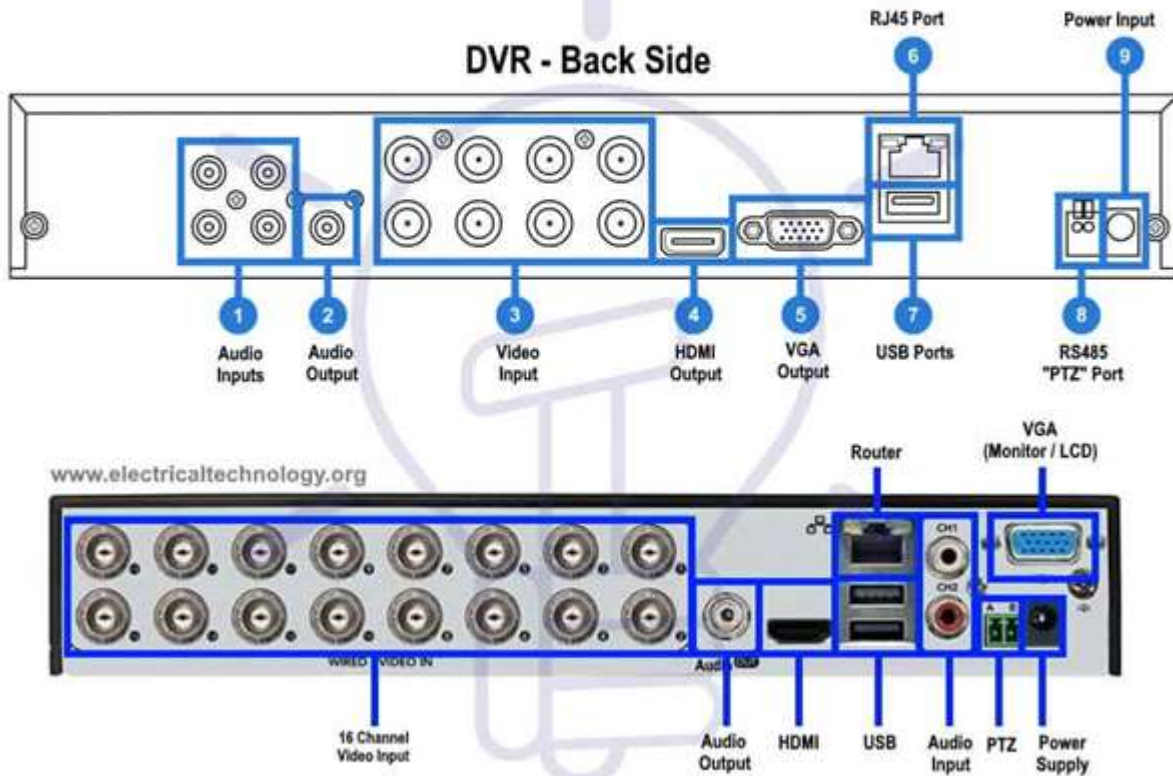
The chip inside DVR is used to convert the analog video signals from camera to digital signals and stores in the hard-drive which can be seen and playback the camera recording latter.

The following fig shows the different slots for connection on the rear / back side of a typical DVR.

DVR Front View



DVR - Back Side



An Overview of DVR

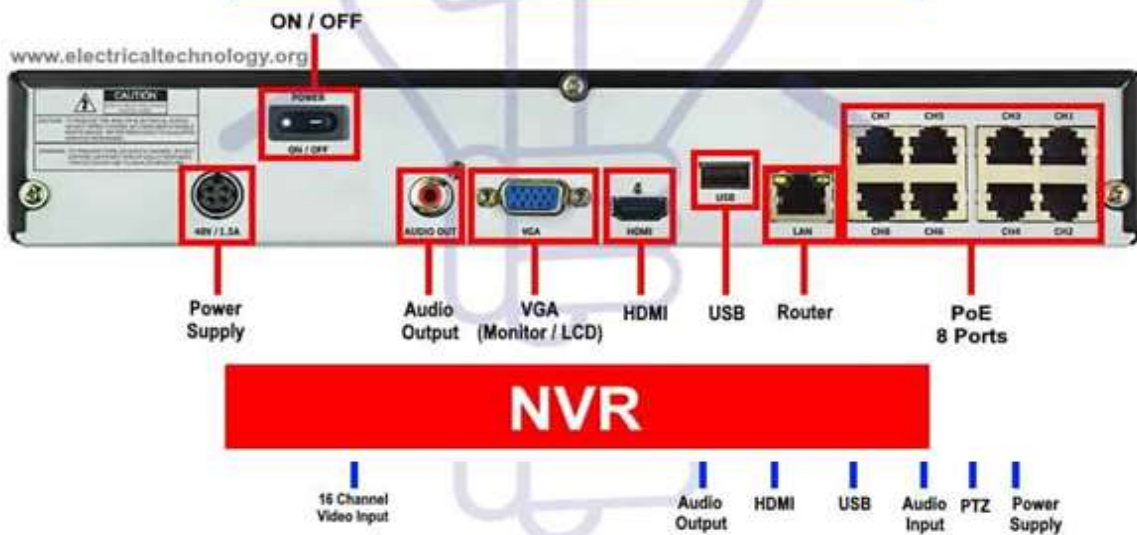
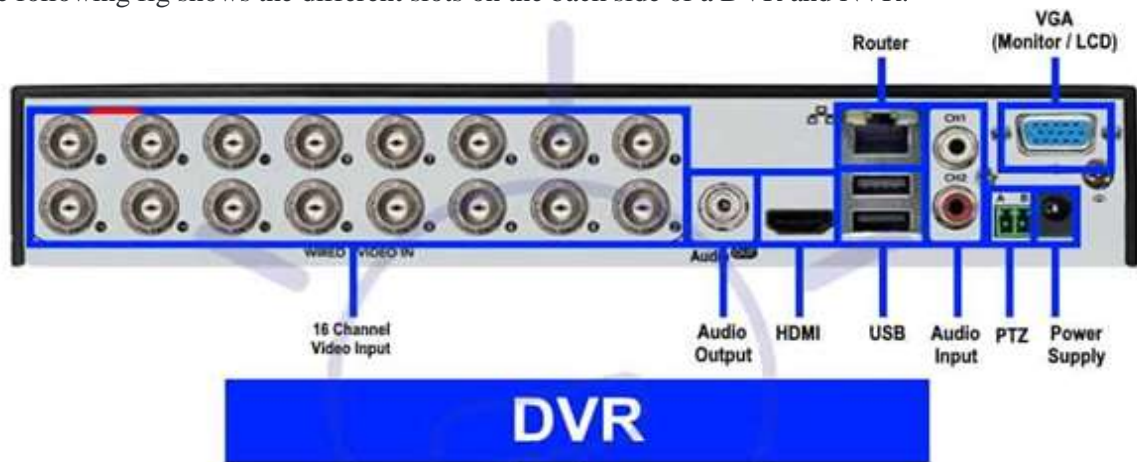
Difference Between DVR and NVR

DVR stands for “Digital Video Recorder” and NVR stands for “Network Video Recorder”. The main purpose of both DVR and NVR is to record the video. The main difference between the DVR and NVR is that DVR processes the video signal data at the recorder while the NVR encodes the video signal data and process in the camera where the remote viewing and data storage functions performed by NVR recorder.

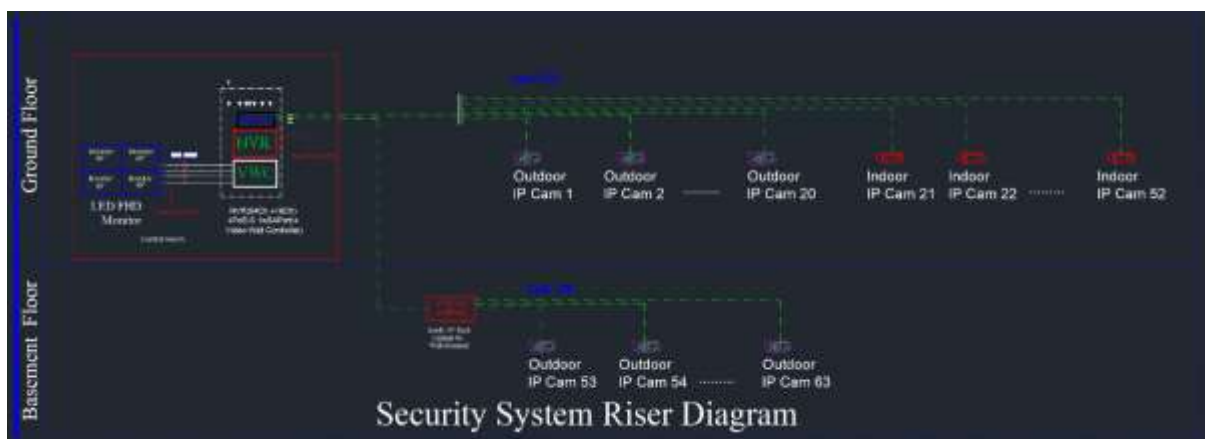
Another difference between DVR and NVR is that analog cameras are needed in DVRs with [coax cables](#) while IP cameras (Internet Protocol) are required in NVRs as they process the video data signals differently through Ethernet cables. Keep in mind that NVR can be wired or wireless system whereas DVR can be wired security system.

If image quality is the consideration factor, NVR security system is better than DVR system as NVR process the data via digital System as compared to DVR analog system. In addition, the video and image

quality of NVR system is better than DVR but NVR security system is little bit expensive than DVR. In recent technologies era, both systems are reliable and the suitable option depends on the user needs. The following fig shows the different slots on the back side of a DVR and NVR.

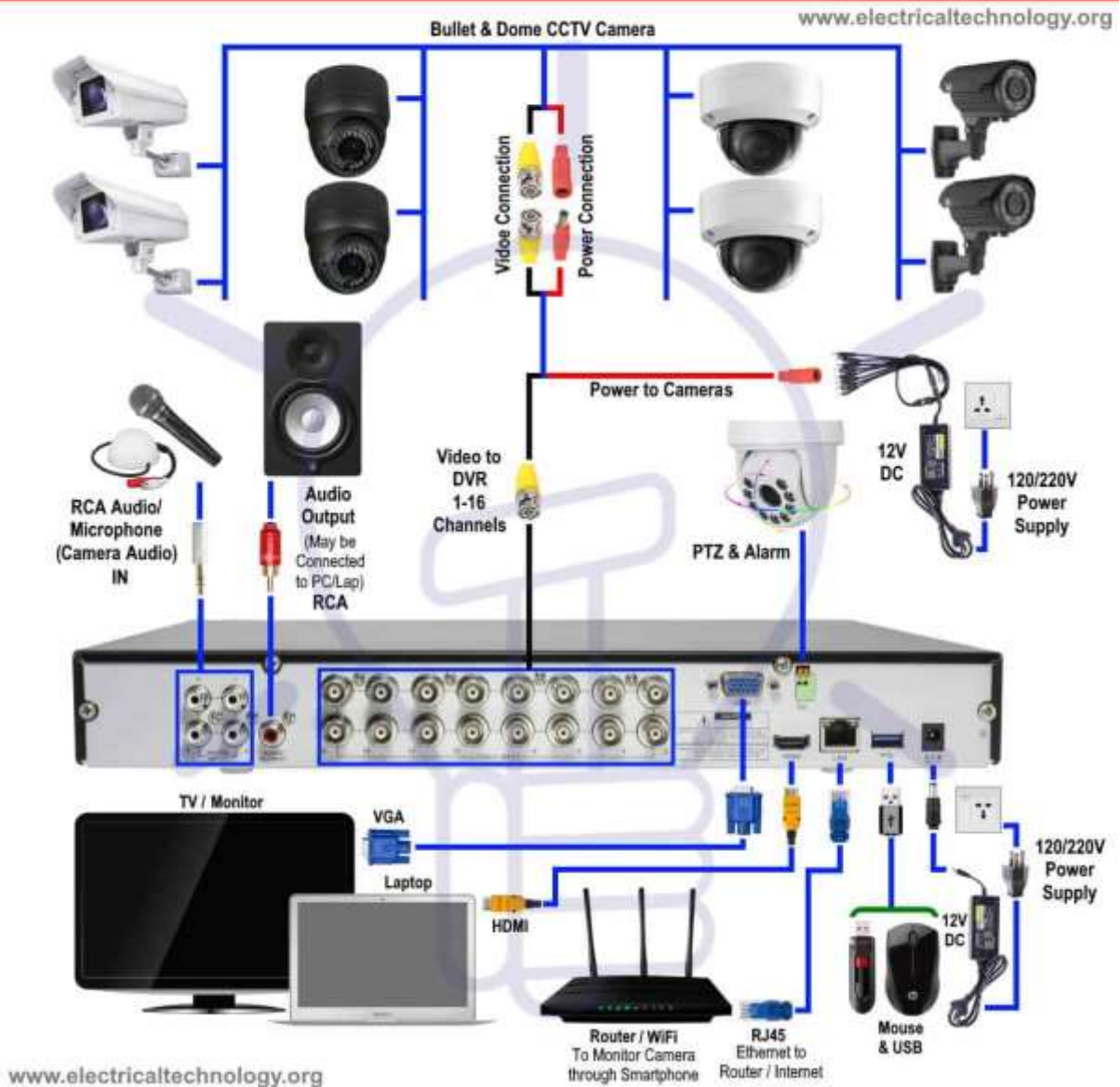


An Overview of DVR



CTV Camera Installation Wiring Diagram with DVR System

CCTV Camera Installation





Sound system

Exp. No.:- 9 .

Exp. Name: -Sound System.

Objective :- To familiar All type of speaker , require Devices and How configuration Sound System ,Symbols and How to connect all parts Located in right place in Buildings Using AutoCAD Program

Sound system

main component of sound system

- Microphones or any other input
- Matrix / mixer
- Rack
- power amplifiers
- attenuators
- Loud speakers
 - wall mounted
 - surface mounted
 - recessed mounted

Speaker types



Sound system

Distance between 2 speakers

$$d=2(H-1)B$$

H: height of speaker from floor

B: Coefficient

d: distance between two speakers

A	B
80	0.84
90	1
100	1.19
110	1.43
120	1.73
130	2.14

A: angle of loudspeaker emission

Sound system

Standard watt

6,10,20,.....

power amplifier

120, 180, 240, 360, 400, 500, 640, Watt

Matrix

depend on number of input and output

i/p 1,2,4,8

o/p 2,4,8,16,24,36,48,64

Attenuator

used to control of sound level

rack



Telephone system

Exp. No.:- 10 .

Exp. Name: -Telephone System.

Objective :- To familiar Telephone System, require Devices and How configuration Sound System ,Symbols and How to connect all parts Located in right place in Buildings Using AutoCAD Program

Telephone system

main component of telephone system

- EPABX - Electronic Private Automatic Branch Exchange
- main distribution frame [MDF]
- telephone junction box [TJB]
- telephone outlets
- cable of telephone ((cat6 , thermal cu telephone cable))



Data system

Exp. No.:- 11 .

Exp. Name: -Data System.

Objective :- To familiar Data System, require Devices and How configuration Sound System ,Symbols and How to connect all parts Located in right place in Buildings Using AutoCAD Program

Data system

main component of data system

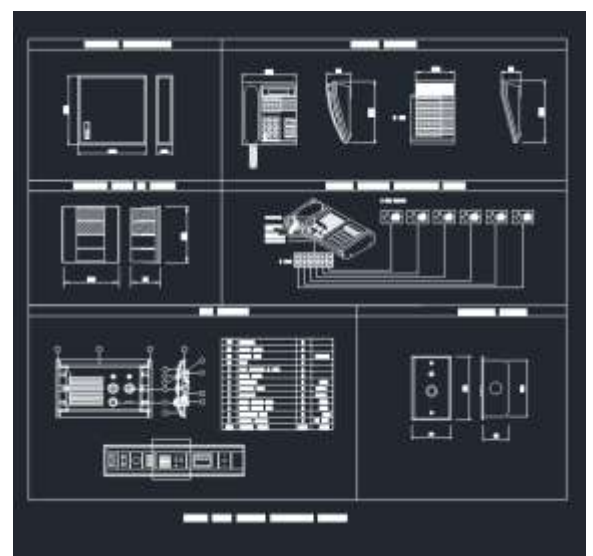
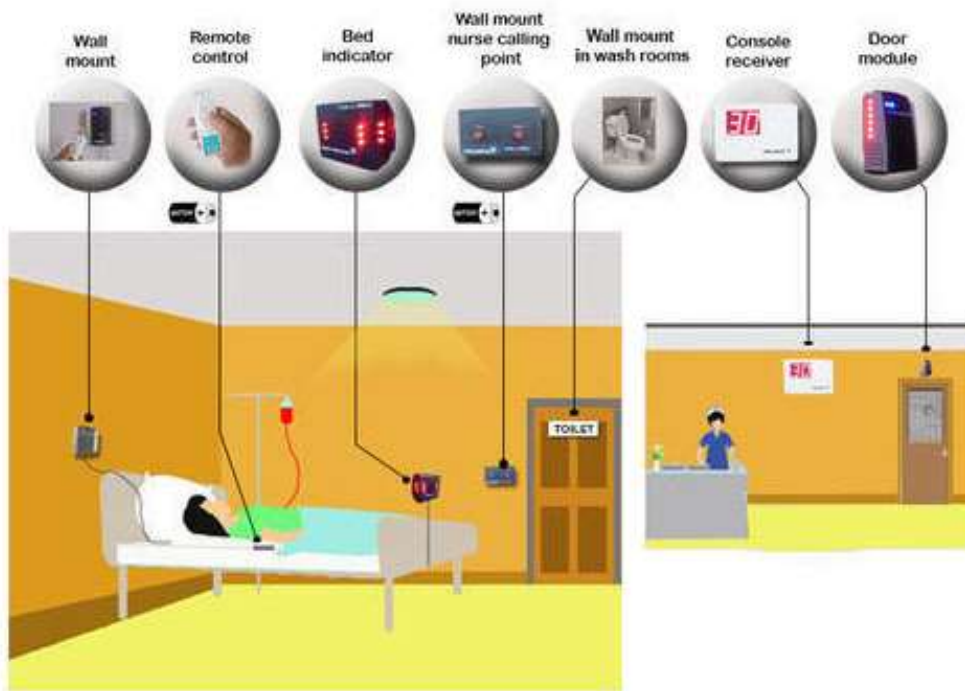
- Data switch
- Data patch panel 6, 12, 24, 36, 48 port
- Data outlets
- Cable of data system (F2TP CAT6 CABLE, or other)

Exp. No.:- 112 .

Exp. Name: - Nurse Call System

Objective :- To familiar Nurse Calling System, require Devices and How configuration Sound System ,Symbols and How to connect all parts Located in right place in Buildings Using AutoCAD Program

Nurse call system components, usage model



Nurse Calling System

IP and Analog Based Nurse Call Systems

Nurse Call System offers products that conduct the communications of hospitals, healthcare institutions and nurseries, activate their control services and increase their efficiency.

Analog Nurse Call System

- Room Control Unit
- Lamp Control Unit
- Nurse Call Panel
- Analog Bed Set Unit
- Analog WC Call Unit
- Analog Overdoor Corridor Lamp
- Analog Patient Hand Set

IP Nurse Call Systems

- Bed Set Unit
- Patient Hand Set
- WC Call Unit
- Overdoor Corridor Lamp
- Versatile Room Control Unit
- Versatile Nurse Call Panel
- Versatile Nurse Call Consult
- ZKRUS Nurse Call Hospital Server
- Pager Device
- Wireless Call Transmitter

SYMBOL	EQUIPMENT
MS	MASTER STATION
CC	CENTRAL CONTROLLER
N	SUB STATION
P	PRESENCE SWITCH
	CORRIDOR LIGHT
EN	EMERGENCY CALLER(SHARED TOILET) H: 900 - ELECTRIC SQUARE BOX -

