ELEVATOR MODEL USING CONTROLLER AND AC DRIVE

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Date:

Place:

DECLARATION

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We appreciate the beauty of a rainbow, but never do we think that we need both the sun and the rain to make its colors appear. Similarly, this project work is the fruit of many such unseen hands. It's those small inputs from different people that have lent a helping to our project.

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ABSTRACT

We are making a elevator model to overcome accuracy and efficiency in the past elevator model. Previously if elevator car moves from one floor to other, then the speed would remain the same throughout from source to destination which use to result in the sensing of jerk which was very annoying and harmful to devices (to tension rope, etc.).

To achieve speed control of motor and smooth flow, we are using variable supply and frequency (VFD) by which the speed of motor is gradually varied according to kind of operation. Different sensors are also used to sense the velocity, load and position of elevator car.

A controller is also used to ensure safety, VFD is also controlled through controller, it operates according to the commands from the controller (like transit time, max speed, etc.)

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CHAPTER 1

INTRODUCTION

There is no need of giving brief introduction of elevator, we are using in our daily life. We are making an Elevator models which is mostly likely going to work as of our normal elevators. The highlight in our project is that obtain speed or operating elevator at different speed according to the required task to get smooth flow and efficient operations.

We are using elevator controller with an AC drive to control the three phase induction motor speed and torque for smooth operation and jerk free movement of the elevator in real time task to get accurate and reliable control of elevator.

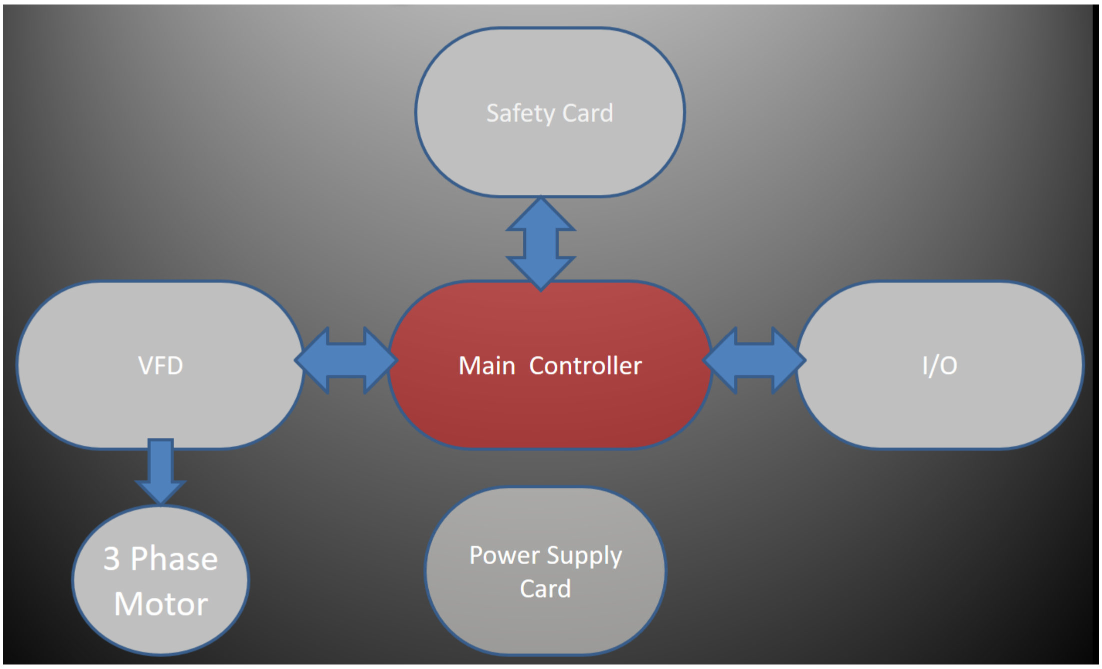
CHAPTER 2

2.1. LITERATURE SURVEY

YEAR	AUTHORS	TECHONOLOY USED	REMARKS/APPLICATION
2002	Jhonatan Echavarria and Christopher M. Frenz	Predict future traffic flow behaviors.	Improving call time responsiveness
2011	Tai Suk Kim, Ho-Shin Cho	PCS	undesirable inter-floor handoffs while the user is inside the elevator elimination
2014	Mahesh M swamy, Juasha Coilins	VFD	An Optimal Solution for Operating a Three-Phase Variable Frequency Drive from a Single-Phase AC Source

CHAPTER 3

BLOCK DIAGRAM

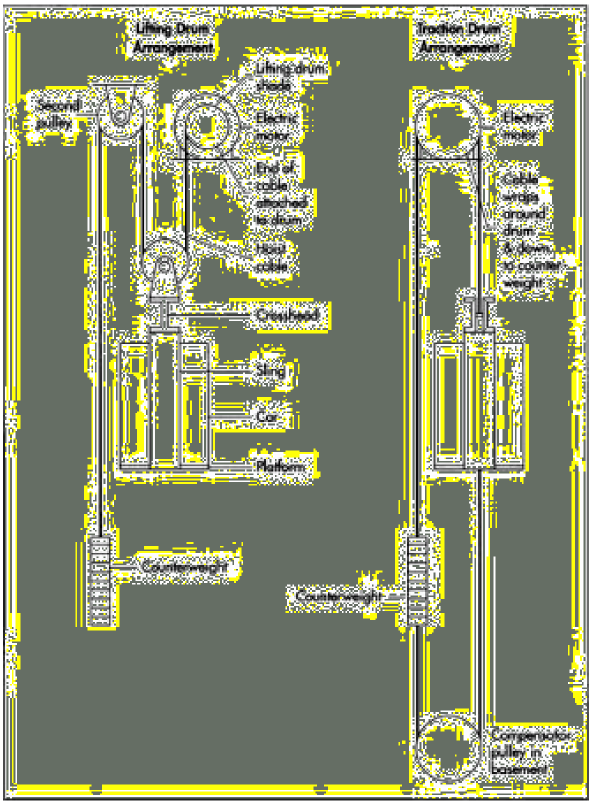


CHAPTER 4

3.1. ELEVATOR BASIC PARTS

ELEVATOR CAR:

Elevator Car is the vehicle that travels between the different elevator stops carrying passengers and/or goods, it is usually A heavy steel frame surrounding a cage of metal and wood panels. From this floor commands can be given also it include fan, light and emergency buttons



COUNTERWEIGHT:

Counterweight is A tracked weight that is suspended from cables and moves within its own set of guide rails along the hoist way walls. Counterweight is used for Balancing the mass of the complete car and a portion of rated load, and it will be equal to the dead weight of the car plus about 40% of the rated load. Also reducing the necessary consumed power for moving the elevator. The counterweight composed of a steel frames that can be filled with cast iron fillers above one another to get the required.

SUSPENSION ROPES:

Suspension Ropes Are Suspension means for car and counterweight, which are represented by steel wire ropes. They are Used on traction type elevators, usually attached to the crosshead and extending up into the machine room looping over the sheave on the motor and then down to the counter weights.Hoisting cable are generally 3 to 6 in number. These ropes are usually 1/2” or 5/8” in diameter.

LANDING DOOR:

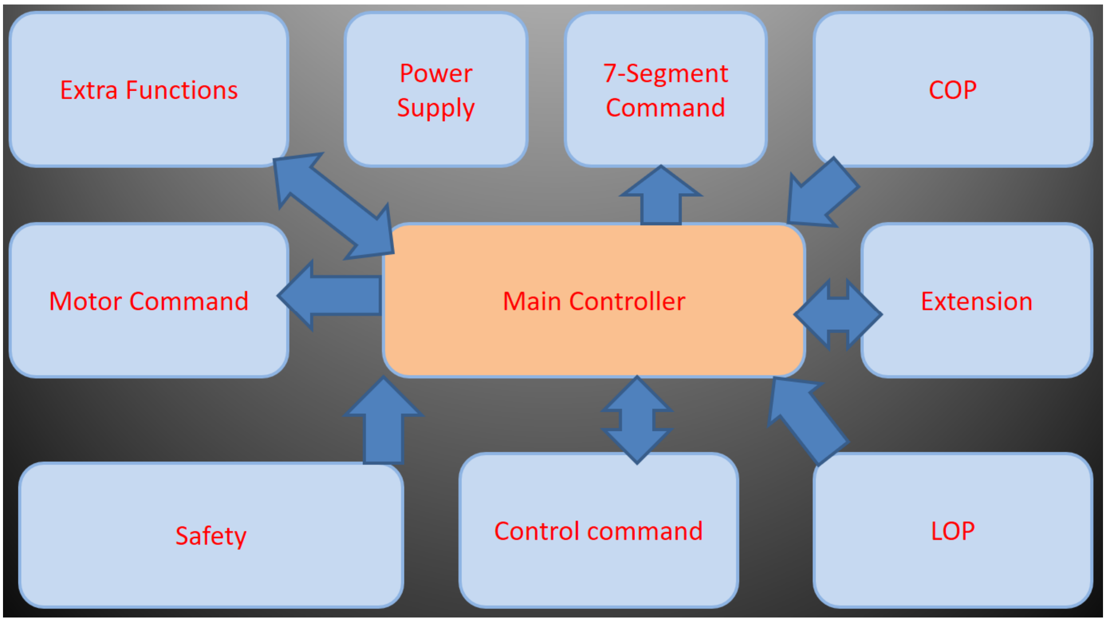
The door that is seen from each floor of a building is referred to as the outer or hoist way door. This hoist way door is a part of the building (each landing). It is important to realize that the car door does all the work; the hoist way door is a dependent. These doors can be opened or closed by electric motors, or manually for emergency incidents. Safety devices are located at each landing to prevent inadvertent hoist way door openings and to prevent an elevator car from moving unless a door is in a locked position. The difference between the car doors and the hoist way doors is that the elevator car door travels through the hoist way with the car but the hoist way doors are fixed doors in each landing floor.

DRIVING MACHINE:

Driving machine this is the power unit of the elevator, and usually located at the elevator machine room. The Driving machine used to refer to the collection of components that raise or lower the elevator. These include the drive motor, brake, speed reduction unit. In our case we are using 3 phase induction motor.

CHAPTER 5

CONTROLLER:



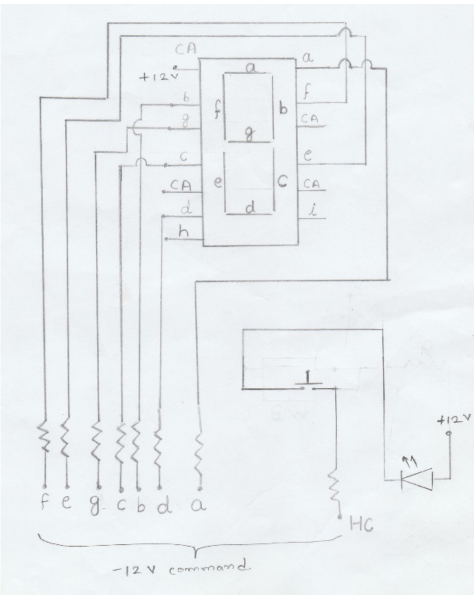
We are using special controller designed for elevator **ICS 3000**, which include the following blocks

- HOP command(INPUT):
- COP command(INPUT):
- Safety Circuit:
- 7-Segment Display(OUTPUT):
- Extra Functions
- Motor Commands

CHAPTER 6

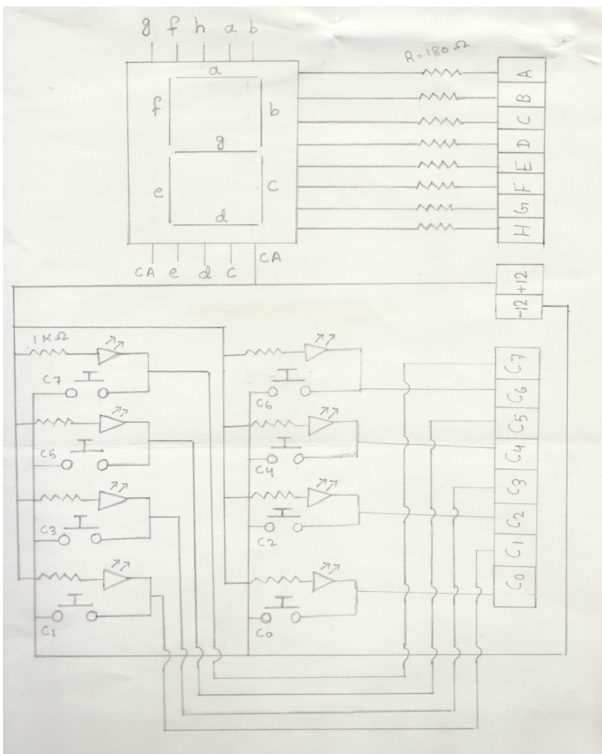
HOP COMMAND (INPUT):

An operating panel for the Destination Oriented Prediction system (DOPS) mounted in the hall of a specified floor. Includes Destination Floor Buttons to register both Hall Calls and Car Call, as well as the Car No. indicators to indicate the number of the car to serve ate destination floor. These are input from user at each floor



COP COMMAD(INPUT):

A device mounted inside a car, on which the items necessary for car operation such as Car Buttons, Door Open/Close Buttons, Alarm Button and inter Communication system are located. Some panel are provided with switches and buttons that are used by elevator operator and others, inside the service cabinet.



CHAPTER 7

SAFETY CIRCUIT

Car door safety: incise an car is moving and completing is input command and the user accidently opens the car door then, there are more often chances of accident, i.e. some child inside the car could let it hand outside car thereby causing risk to life. So for the safety car door safety makes sure that unless the car gate is not properly closed the supply to the motor is cut-off.

CAR-TOP SWITCH & PIT STOP SWITCH:

This is used at the time of repair or troubleshooting in elevator working, once this switch is on from the pit top, then no internal command from the Hall Operating Panel(HOP) or the Car Operating Panel(COP) will be responded as some repair person is at the pit so he is only able to Manually give command to the controller to make the elevator move upward or downward

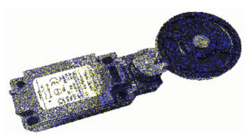
LIMIT SWITCHES:

Consists of UP-limits and DN-limits. UP-limits takes care of three limit Switches viz, UP Extreme limit, UP Terminal Limit and UP Slow limit. Similarly, DN-limits takes care of three limit Switches viz, DN Extreme limit, DN Terminal Limit and DN Slow limit. This are mechanical switch once car cross that patch that switch is activated thereby activating that particular signal

DN/UP slow makes the speed of drive to reduce.

DN/UP Terminal commands the controller that by this point the motor is going to move in opposite direction only and it has reached the terminal point.

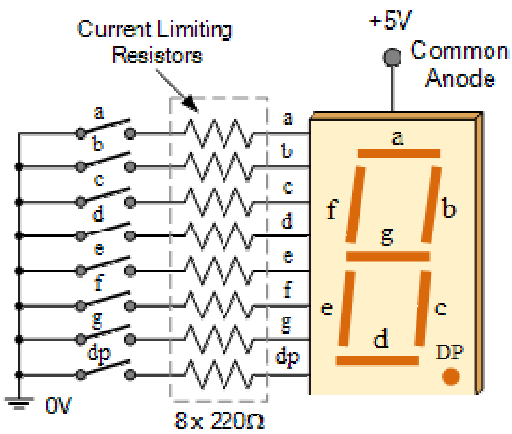
DN/UP Extreme limit has the highest priority of all, once this this command is activated, the AC Motor supply is cut-off



CHAPTER 8

7-SEGMENT DISPLAY(OUTPUT):

These signals given by the controller to display on which floor the car is at that particular time. Theses outputs are driven by the power transistors



EXTRA FUNCTIONS:

This function includes to turn light, fan on/off inside the car when needed

MOTOR COMMAND:

This include the commands when to start the motor, when to stop the motor, motor direction. These commands are given to the AC dive by which motors speed parameters are controlled.

CHAPTER 9

AC MOTOR

An AC motor is an electric motor driven by an alternating current (AC). The AC motor commonly consists of two basic parts, an outside stationary stator having coils supplied with alternating current to produce a rotating magnetic field, and an inside rotor attached to the output shaft producing a second rotating magnetic field. The rotor magnetic field may be produced by permanent magnets, reluctance saliency, or DC or AC electrical windings.

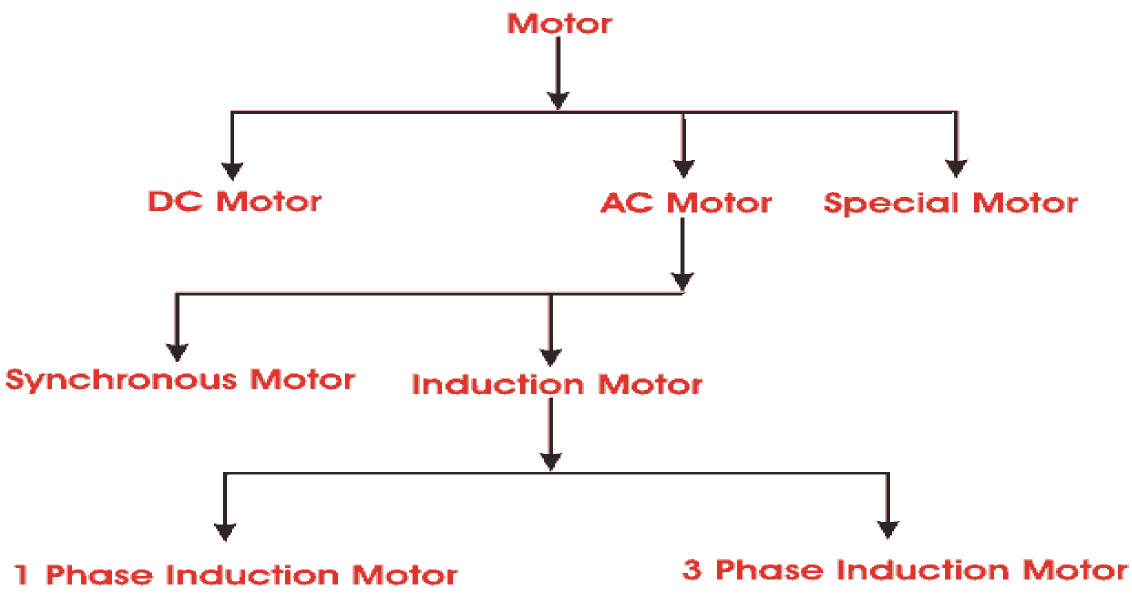
WORKING PRINCIPLE:

When an AC motor is in steady-state rotation (motion), the magnetic fields of the rotor and stator rotate (move) with little or no slippage (near synchrony). The magnetic forces (repulsive and attractive) between the rotor and stator poles create average torque, capable of driving a load at rated speed. The speed of the stator rotating magnetic field and the speed of the rotor rotating magnetic field (relative to the speed of the mechanical shaft must maintain synchronism for average torque production by satisfying the synchronous speed relation. Otherwise, asynchronously rotating magnetic fields would produce pulsating or non-average torque.

TYPES OF AC MOTORS:

The two main types of AC motors are classified as induction and synchronous. The induction motor (or asynchronous motor) always relies on a small difference in speed between the stator rotating magnetic field and the rotor shaft speed called slip to induce rotor current in the rotor AC winding. As a result, the induction motor cannot produce torque near synchronous speed where induction (or slip) is irrelevant or ceases to exist. In contrast, the synchronous motor does not rely on slip-induction for operation and uses either permanent magnets, salient poles (having projecting magnetic poles), or an independently excited rotor winding. The synchronous motor produces its rated torque at exactly synchronous speed. The brushless wound-rotor doubly fed synchronous motor system has an independently excited rotor winding that does not rely on the principles of slip-induction of current. The brushless wound-rotor doubly fed motor is a synchronous motor that can function exactly at the supply frequency or sub to super multiple of the supply frequency.

Other types of motors include eddy current motors, and also AC/DC mechanically commutated machines in which speed is dependent on voltage and winding connection.



What is the basic difference between Synchronous motor and an Induction Motor?

The basic difference between an induction motor and a synchronous AC motor is that in the latter a current is supplied onto the rotor. This then creates a magnetic field which, through magnetic interaction, links to the rotating magnetic field in the stator which in turn causes the rotor to turn. It is called synchronous because at steady state the speed of the rotor is the same as the speed of the rotating magnetic field in the stator.

INDUCTION MOTORS

An induction motor or 3 phase induction motor is an AC electric motor in which the electric current in the rotor needed to produce torque is obtained by electromagnetic induction from the magnetic field of the stator winding. An induction motor can therefore be made without electrical connections to the rotor. An induction motor's rotor can be either wound type or squirrel-cage type.

Three-phasesquirrel-cage induction motors are widely used in industrial drives because they are rugged, reliable and economical. Single-phase induction motors are used extensively for smaller loads, such as household appliances like fans. Although traditionally used in fixed-speed service, induction motors are increasingly being used with variable-frequency drives (VFDs) in variable-speed service. VFDs offer especially important energy savings opportunities for existing and prospective induction motors in variable-torque centrifugal fan, pump and compressor load applications. Squirrel cage induction motors are very widely used in both fixed-speed and variable-frequency drive (VFD) applications

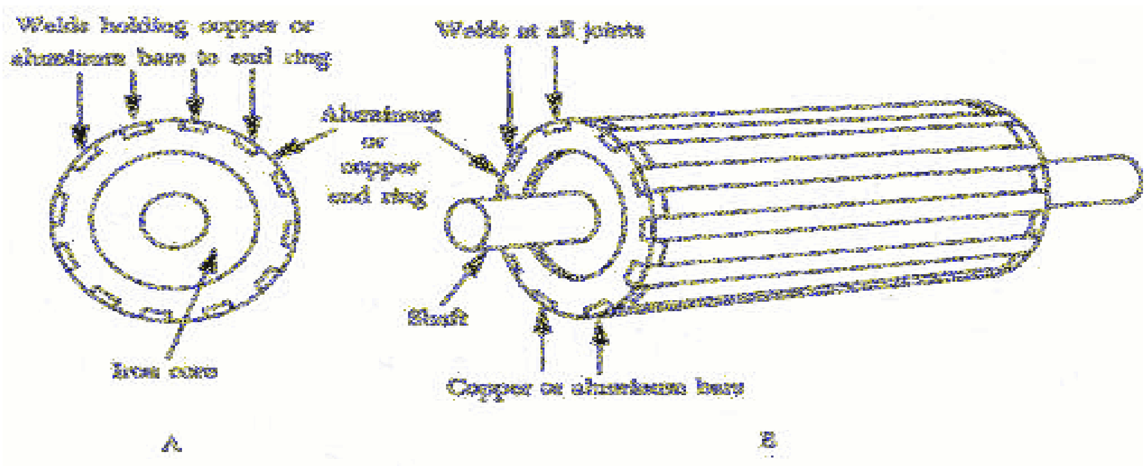


FIGURE 9-34. Squirrel-cage rotor for an a.c. induction motor.

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Types of Induction Motor?

1.Based on type of phase supply

- Three phase induction motor (self-starting in nature)
- Single phase induction motor (not self-starting)

2.Other

- Squirrel-cage induction motor
- Slip ring induction motor

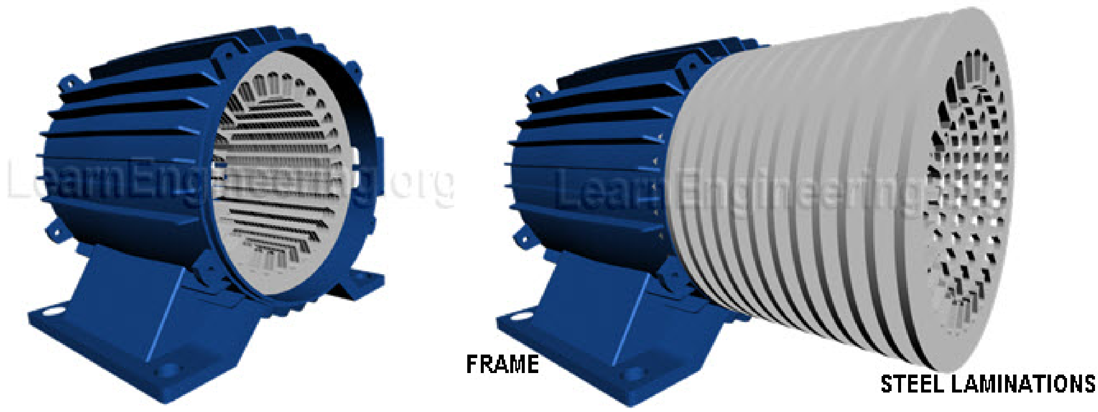
3 PHASE INDUCTION MOTOR:

Three phase motor has three terminal, a two phase motor has two terminals (although frequently single phase have four so split windings can be wired in series or parallel and make the motor 120/240 volts depending upon the wiring).
Three phase has a rotating magnetic field which sets the rotation and it will always self-start. The direction can be reversed by swapping any two phases.

WORKING OF 3-PHASE INDUCTION MOTOR:

Consider a small ferromagnetic substance like a small iron pin pointed on a table at the centre with a screw such that the pin is free to rotate. Now if a magnet is brought nearby the pin, the pin will get an attraction force towards magnet. If the magnet begins to rotate, the pin will also rotate accordingly provided that magnet moves at a uniform velocity such that neither it goes far from the pin nor the pin touches the magnet. So under these circumstances the pin will continue to rotate in the direction following the magnet.

This is similar to how an induction motor works. Here, there are two parts: stator and rotor separated by an air gap. Now, when 3 phase supply is given (3 phase means 3 voltage waveforms of same magnitude but 3 different phases) in the stator conductors(coil), a rotating magnetic flux is generated (which can be proved mathematically). This is similar to *the rotating magnet.* As a result, this flux is cut by the rotor coils and an emf is induced. As rotor conductors are short circuited, 3 phase flux is generated by rotor to. Under the effect of two fluxes, as the stator is fixed the rotor begins to rotate. This is similar to the pin rotation under magnetic effect.



EFFECT OF 3 PHASE CURRENT PASSING THROUGH A STATOR WINDING

When a 3 phase AC current passes through the winding something very interesting happens. It produces a rotating magnetic field *(RMF)*. As shown in the figure below a magnetic field is produced which is rotating in nature. RMF is an important concept in electrical machines. We will see how this is produced in the next section.

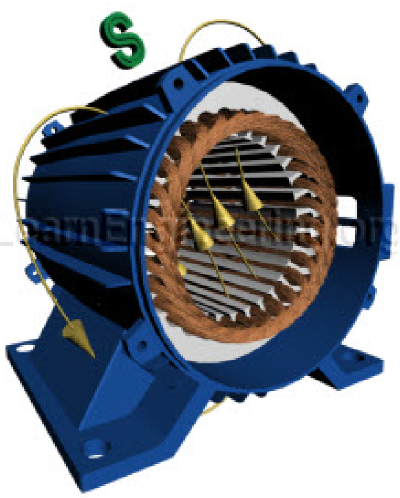


Fig.3 Rotating magnetic field produced in an induction motor

THE CONCEPT OF A ROTATING MAGNETIC FIELD

To understand the phenomenon of a rotating magnetic field, it is much better to consider a simplified 3 phase winding with just 3 coils. A wire carrying current produces a magnetic field around it. Now for this special arrangement, the magnetic field produced by 3 phase A.C current will be as shown at a particular instant.

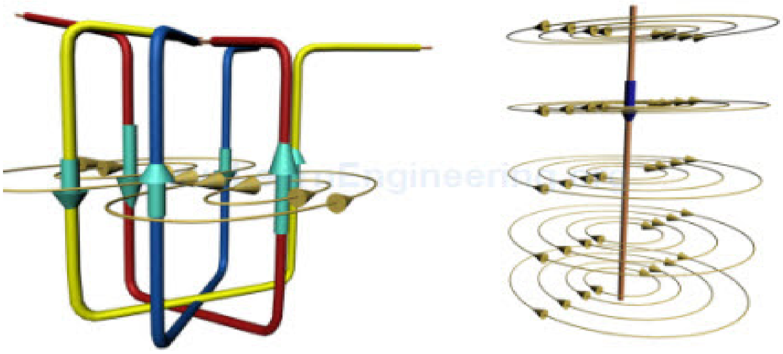


Fig.4 Magnetic field produced around the simplified winding and a single wire

The components of A.C current will vary with time. Two more instances are shown in the following figure, where due to the variation in the A.C current, the magnetic field also varies. It is clear that the magnetic field just takes a different orientation, but its magnitude remains the same. From these 3 positions it's clear that it is like a magnetic field of uniform strength rotating. The speed of rotation of the magnetic field is known as *synchronous speed*.

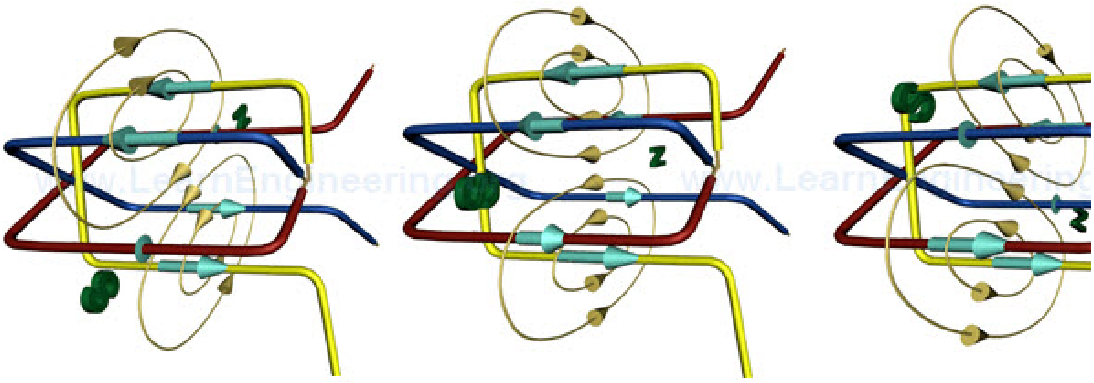


Fig.5 Rotating magnetic field produced over simplified winding

The Effect of RMF on a Closed Conductor

Assume you are putting a closed conductor inside such a rotating magnetic field. Since the magnetic field is fluctuating an E.M.F will be induced in the loop according to *Faraday's law*. The E.M.F will produce a current through the loop. So the situation has become as if a current carrying loop is situated in a magnetic field. This will produce a magnetic force in the loop according to *Lorentz law*, So the loop will start to rotate.

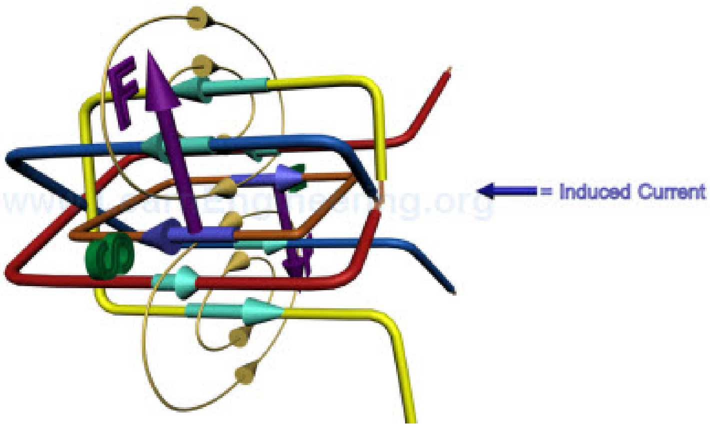


Fig.6 Effect of RMF on a closed conductor

The Working of an Induction Motor

A similar phenomenon also happens inside an induction motor. Here instead of a simple loop, something very similar to a squirrel cage is used. A squirrel cage has got bars which are shorted by end rings.

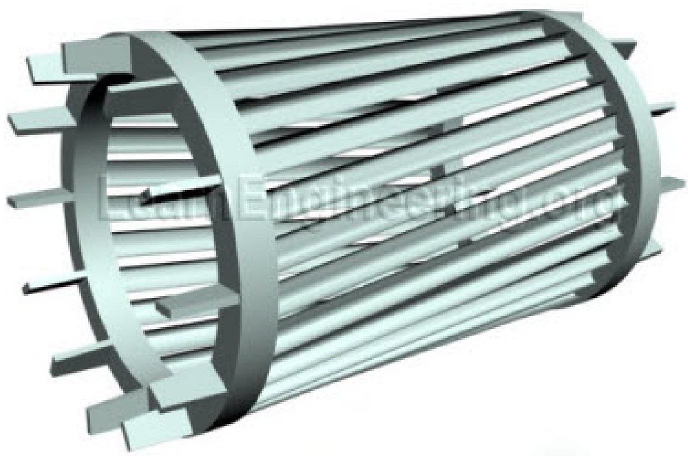


Fig.7 Squirrel cage rotor which is the most commonly used one in induction motors.

A 3 phase AC current passing through a Stator winding produces a rotating magnetic field. So as in the previous case, current will be induced in the bars of the squirrel cage and it will start to rotate. You can note variation of the induced current in squirrel cage bars. This is due to the rate of change of magnetic flux in one squirrel bar pair which is different from another, due to its different orientation. This variation of current in the bar will change over time.

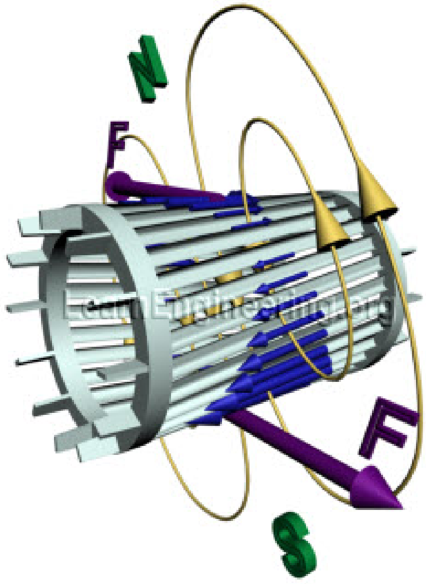


Fig.8 RMF produces a torque on rotor as in the simple winding case

That's why the name *induction motor* is used, electricity is induced in rotor by magnetic induction rather than direct electric connection. To aid such electromagnetic induction, insulated iron core lamina are packed inside the rotor.

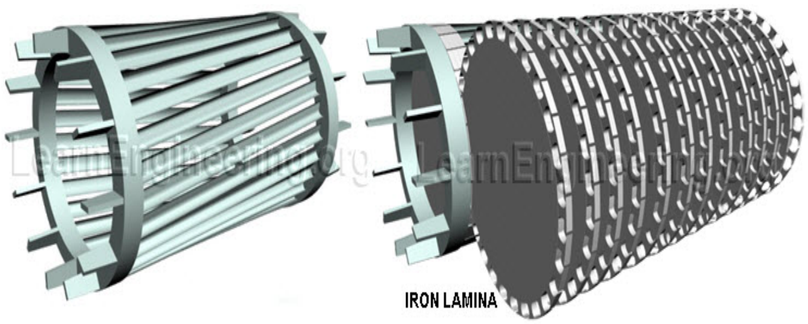


Fig.9 Thin layers of iron lamina which are packed in rotor

Such small slices of iron layers make sure that eddy current losses are at a minimum. You can note one big advantage of 3 phase induction motors, as it is inherently self-starting.

You can also note that the bars of a squirrel cage are inclined to the axis of rotation, or it has got a skew. This is to prevent torque fluctuation. If the bars were straight there would have been a small time gap for the torque in the rotor bar pair to get transferred to the next pair. This will cause torque fluctuation and vibration in the rotor. By providing a skew in the rotor bars, before the torque in one bar pair dies out, the next pair comes into action. Thus it avoids torque fluctuation.

The Speed of Rotation of a Rotor & the Concept of Slip

You can notice here that the both the magnetic field and rotor are rotating. But at what speed will the rotor rotate? To obtain an answer for this let's consider different cases.

Consider a case where the rotor speed is same as the magnetic field speed. The rotor experiences a magnetic field in a relative reference frame. Since both the magnetic field and the rotor are rotating at same speed, relative to the rotor, the magnetic field is stationary. The rotor will experience a constant magnetic field, so there won't be any induced emf and current. This means zero force on the rotor bars, so the rotor will gradually slow down.

But as it slows down, the rotor loops will experience a varying magnetic field, so induced current and force will rise again and the rotor will speed up.

In short, the rotor will never be able to catch up with the speed of the magnetic field. It rotates at a specific speed which is slightly less than synchronous speed. The difference in synchronous and rotor speed is known as *slip*.

ENERGY TRANSFER IN THE MOTOR

The rotational mechanical power obtained from the rotor is transferred through a power shaft. In short in an induction motor, electrical energy is entering via the Stator and output from the motor, the mechanical rotation is received from the rotor.

Fig.10 Power transfer in a motor

But between the power input and output, there will be numerous energy losses associated with the motor. Various components of these losses are friction loss, copper loss, eddy current and hysteresis loss. Such energy loss during the motor operation is dissipated as heat, so a fan at the other end helps in cooling down the motor.

Fig.11 A cooling fan is used to remove heat liberated by motor

Advantages of 3-Phase Motors:

- A three phase induction motor runs on a three phase AC supply. 3 phase induction motors are extensively used for various industrial applications because of their following advantages -
- They have very simple and rugged (almost unbreakable) construction
- they are very reliable and having low cost
- they have high efficiency and good power factor
- minimum maintenance required
- 3 phase induction motor is self-starting hence extra starting motor or any special starting arrangement is not required

SPEED CONTROL OF 3 PHASE INDUCTION MOTOR

- Speed Control of 3 phase induction motor can be controlled by many parameters like,
- Stator voltage stator

- Rotaryvoltage control
- frequency control
- current control
- frequency and voltage control
- voltage, current and frequency control

In our case we are Variable Frequency Drive(VFD) by which we are controlling the speed of 3 phase induction by means of frequency control

RPM= 120*f/p

Where, f=synchronous frequency

P= no. of Poles

FREQUENCY CONTROL

The torque and speed of induction motors can be controlled by changing the supply frequency. If the voltage is maintained fixed at its rated value while the frequency is reduced below its rated value, the flux increases. This would cause saturation of the air-gap flux, and motor parameters would not be valid in determining the torque-speed characteristics. At low frequency, the reactance's decrease and the motor current maybe too high. This type of frequency control is not normally used.

RPM= 120*f/p (no. of Poles)

As number of poles of motors are fixed, hence by varying frequency proportional RPM can be obtained.

If the frequency is increased above its rated value, the flux and torque would decrease. If the synchronous speed corresponding to the rated frequency is called the base speed ω_b, the synchronous speed at any other frequency becomes

$$\omega_b = \beta\omega_b$$

The typical torque-speed characteristics are shown, for various values of β. The three-phase inverter can vary the frequency at a fixed voltage. If R_s is negligible, the below equation gives maximum torque at base speed as follows

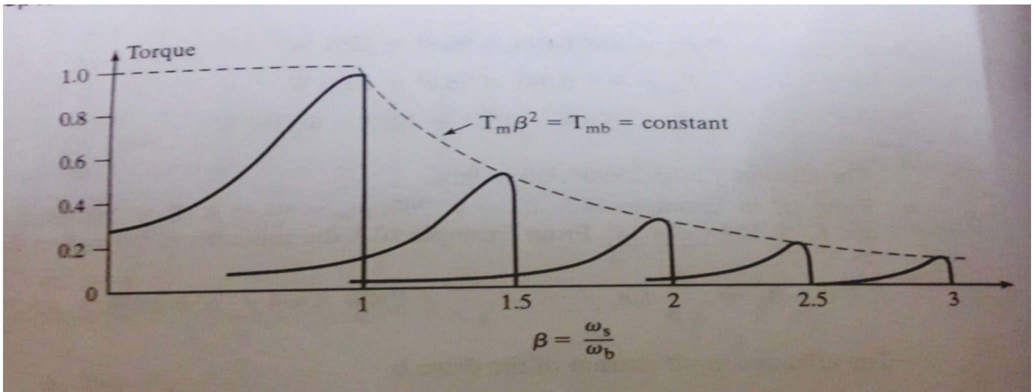


FIGURE 16.9
Torque characteristics with frequency control.

$$T_{mb} = \frac{3V_a^2}{2_{wb}(X_s + X'_,)}$$

the corresponding slip is

$$s_m = \frac{R'_,}{\beta(X_s + X'_,)}$$

therefore, after normalizing the equation becomes as follows

$T_m\beta^2 = T_{mb}$

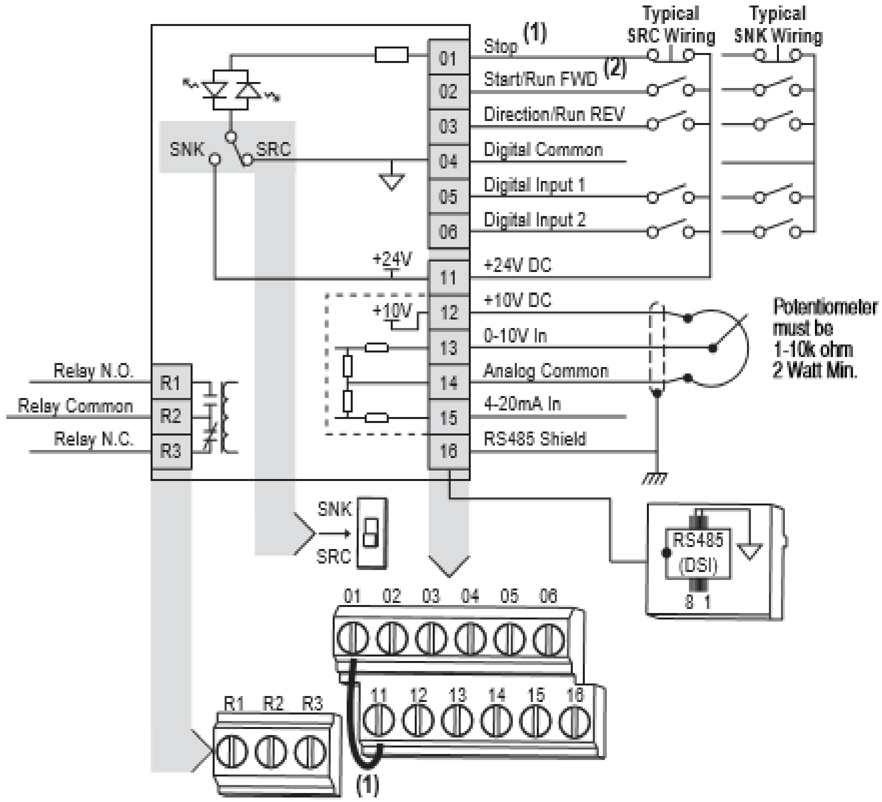
Thus for the above equations, it can be concluded that the maximum torque is inversely proportional to frequency squared, and $T_m\beta^2$ remains constant, similar to the behaviour of the dc series motors. In this type of control, the motor is operated at a constant terminal voltage and the flux is reduced, thereby limiting the torque capability of the motor. For $1<\beta<1.5$, the relation between T_m and β can be considered approximately linear. For $\beta<1$, the motor is normally operated at a constant flux by reducing the terminal voltage V_a along with the frequency so that the flux remains constant.

CHAPTER 10

WHAT DRIVES ARE?

Often in the industry, need arises for controlling the speed of a 3-phase induction motor. Delta's AC motor drives are able to efficiently control motor speed, improve machine automation and save energy. Each drive in its variable frequency drive (VFD) series is designed to meet specific application needs.

AC drives accurately control torque, smoothly handle increased load and provide numerous custom control and configuration operating modes. A VFD can be used to vary speed, direction and other parameters of a 3-phase motor. We use the 2-wire method for controlling the speed and direction of the motor.



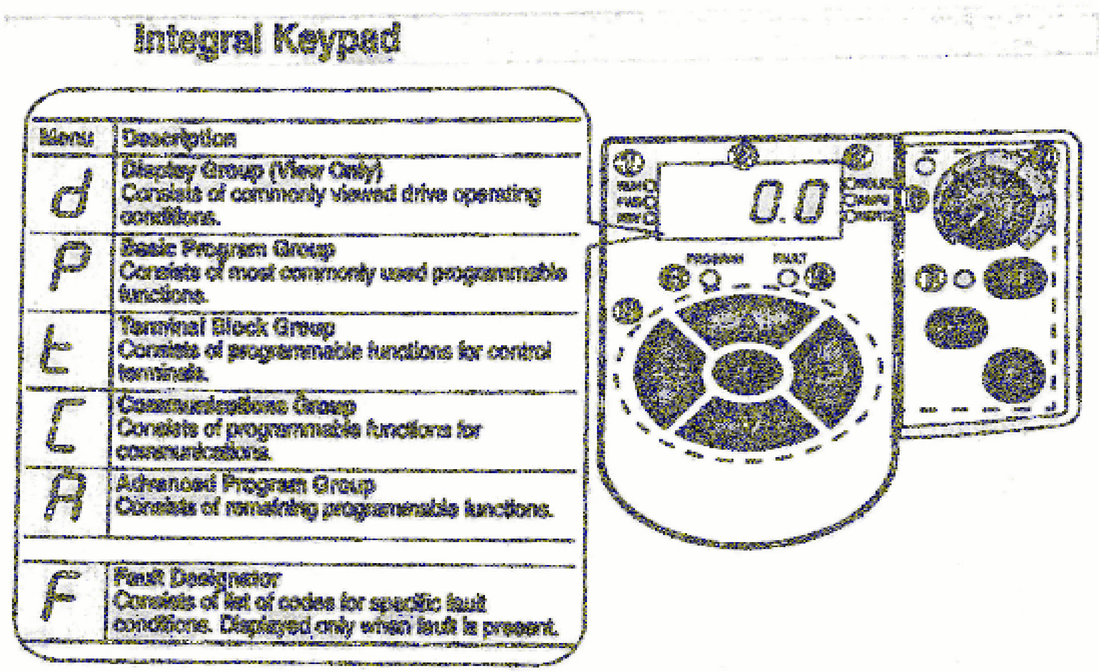
No.	Signal	Default	Description	Param.
R1	Relay N.O.	Fault	Normally open contact for output relay.	t221
R2	Relay Common	–	Common for output relay.	
R3	Relay N.C.	Fault	Normally closed contact for output relay.	t221
Sink/Source DIP Switch		Source (SRC)	Inputs can be wired as Sink (SNK) or Source (SRC) via DIP Switch setting.	
01	Stop (1)	Coast	The factory installed jumper or a normally closed input must be present for the drive to start.	P106 (1)
02	Start/Run FWD	Not Active	Command comes from the integral keypad by default. To disable reverse operation, see A095 [Reverse Disable].	P106, P107
03	Direction/Run REV	Not Active		P106, P107, A434
04	Digital Common	–	For digital inputs. Electronically isolated with digital inputs from analog I/O.	
05	Digital Input 1	Preset Freq	Program with t201 [Digital In1 Sel].	t201
06	Digital Input 2	Preset Freq	Program with t202 [Digital In2 Sel].	t202
11	+24V DC	–	Drive supplied power for digital inputs. Maximum output current is 100mA.	
12	+10V DC	–	Drive supplied power for 0-10V external potentiometer. Maximum output current is 15mA.	P108
13	0-10V In (3)	Not Active	For external 0-10V input supply (input impedance = 100k ohm) or potentiometer wiper.	P108
14	Analog Common	–	For 0-10V In or 4-20mA In. Electronically isolated with analog inputs from digital I/O.	
15	4-20mA In (3)	Not Active	For external 4-20mA input supply (input impedance = 250 ohm).	P108
16	RS485 (DSI) Shield	–	Terminal should be connected to safety ground - PE when using the RS485 (DSI) communications port.	

Sorces by VFD is controlled

- **Keypad control(manually controlling through external buttons drive)**
- **3 wire control**
- **2 wire control**
- **Communication port using rockwell automation software.**

In our project we are using keypad control in which we are setting the parameters manually which include min speed of motor, maximum speed of motor, Transit time of motor i.e how gradually the speed of motor increase and decrease according to the paramter set in drive.

Once the parameters are set forward and reverse command from control will control the polarity of motor.



Basic Program Group *(continued)*

P106 [Start Source]

Stop drive before changing this parameter.

Sets the control scheme used to start the drive.

Refer to Start and Speed Reference Control on page 1-19 for details about how other drive settings can override the setting of this parameter.

Important: For all settings except option 3, the drive must receive a leading edge from the start input for the drive to start after a stop input, loss of power or fault condition.

Options	0	"Keypad" (Default)	• Integral keypad controls drive operation. • I/O Terminal 1 "Stop" = coast to stop. • When active, the Reverse key is also active unless disabled by A434 [Reverse Disable].
	1	"3-Wire"	I/O Terminal 1 "Stop" = stop according to the value set in P107 [Stop Mode].
	2	"2-Wire"	I/O Terminal 1 "Stop" = coast to stop.
	3	"2-W Lvl Sens"	Drive will restart after a "Stop" command when: • Stop is removed and
	4	"2-W Hi Speed"	**Important:** There is greater potential voltage on the output terminals when using this option. • Outputs are kept in a ready-to-run state. The drive will respond to a "Start" command within 10 ms. • I/O Terminal 1 "Stop" = coast to stop.
	5	"Comm Port"(1)	• Remote communications. Refer to Appendix C for details. • I/O Terminal 1 "Stop" = coast to stop.

What's inside VFD?

The first stage of a VFD is the converter, which comprises six diodes, which are similar to check valves used in plumbing systems. These allow current to flow in only one direction; the direction shown by the arrow in the diode symbol. For example, whenever A-phase voltage (voltage is similar to pressure in plumbing systems) is more positive than B- or C-phase voltages, that diode opens and allows current to flow.

When B phase becomes more positive than A phase, B-phase diode opens and A-phase diode closes. The same is true for the three diodes on the negative side of the bus. Thus, we get six current pulses as each diode opens and closes. This is called a 6-pulse VFD, which is the standard configuration for current VFDs.

We can get rid of AC ripple on DC bus by adding a capacitor. A capacitor operates in a similar fashion to a reservoir or accumulator in a plumbing system. It absorbs AC ripple and delivers smooth DC voltage.

The diode bridge converter that converts AC to DC is sometimes just referred to as a converter. The converter that converts DC back to AC is also a converter, but to distinguish it from the diode converter, it is usually referred to as an inverter. It has become common in the industry to refer to any DC-to-AC converter as an inverter.

When we close one of the top switches in the inverter, that phase of the motor is connected to the positive DC bus and voltage on that phase becomes positive. When we close one of the bottom switches in the converter, that phase is connected to the negative DC bus and becomes negative. Thus, we can make any phase on the motor positive or negative at will and can thus generate any frequency that we want. So we can make any phase positive, negative or zero.

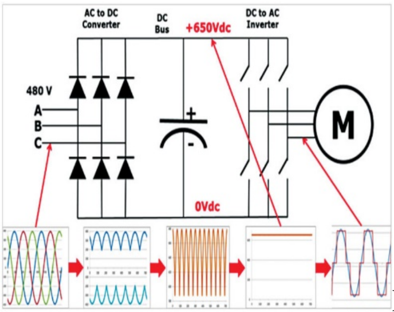


Fig. 3: Circuit model of a VFDF

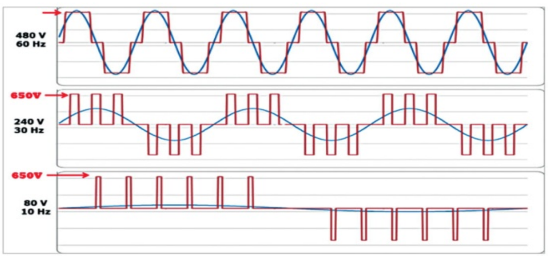


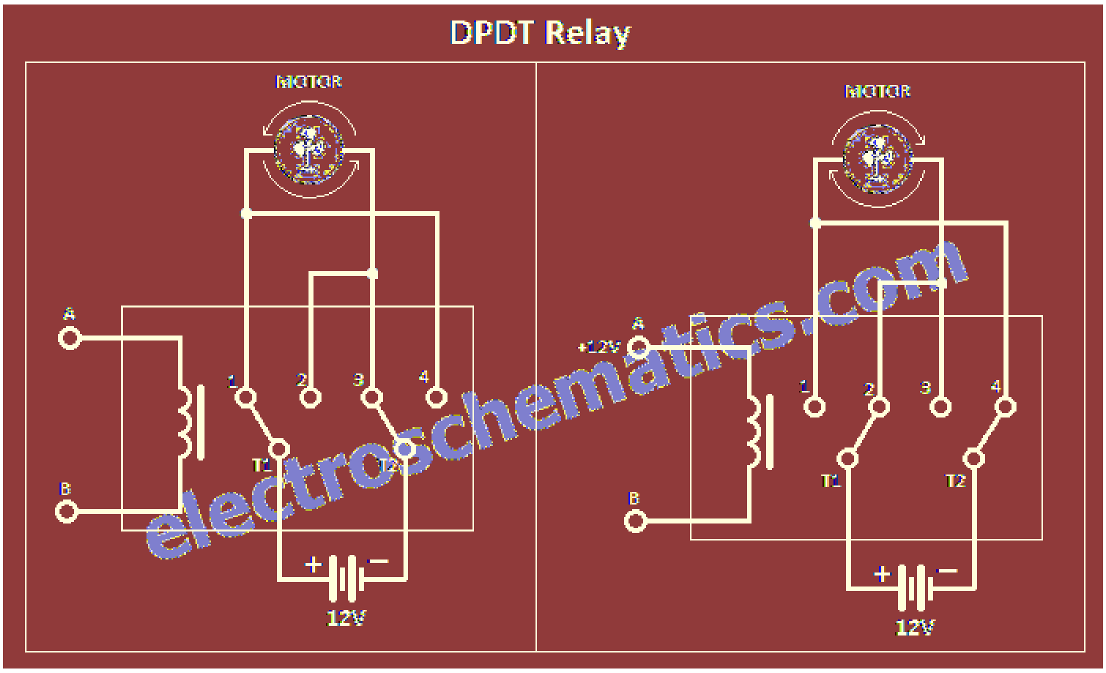
fig: waveforms at different operating frequencies and average voltages

Notice that, output from the VFD is a rectangular waveform. VFDs do not produce a sinusoidal output. This rectangular waveform would not be a good choice for a general-purpose distribution system, but is perfectly adequate for a motor.

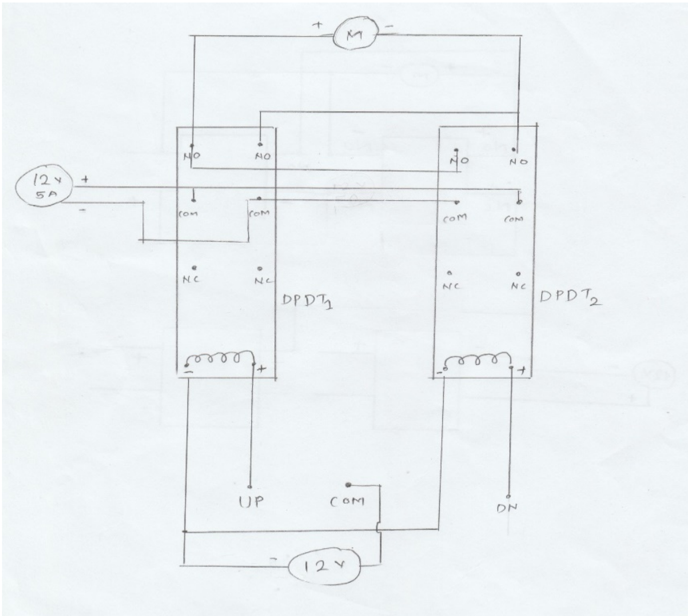
CHAPTER 11

MOTOR POLARITY CHANGING

The DPDT relay (Double Pole Double Throw) is quite interesting and can be used in various scenarios, including for changing the direction of a motor as you can see in the picture below. It has 2 terminals and 4 connectors and you can look at the DPDT **relay** as the equivalent of 2 Single Pole Double Throw **SPDT relays**.



We are using two pair of DPDT to control the polarity of motor, from the controller two commands are coming to control the direction of motor forward and reverse command, theses commands are individually given to each DPDT, to operate in particular direction corresponding DPDT relay is made to switch ON by these command



As you can see in the schematic the 12V battery (or use other voltages) is connected with the plus at terminal T1 and minus at terminal T2. The contact 1 and 4 are connected together as 2 and 3 are too.

Without voltage applied to the coil the battery plus is connected to contact 1 (and 4) and minus to 3 (and 2) therefore the motor is turning in one direction (let's say clockwise). When voltage is applied to the coil then the relay switches and now T1 (plus) is connected to contact 2 (and 3) and T2 (minus) is connected to 4 (and 1) therefore the motor is changing the direction of rotate

CHAPTER 12

WORKING OPERATION

Firstly, commands from COP or HOP to moving a car to reach the particular floor, these commands are single command from individual user on which floor to go. These commands are registered in shift register PISO or SIPO IC. Commands are processed in controller. Accordingly, motor movement is controlled. But the system is not that simple, all the safety circuits must be correct to complete the logic of motor movement. the safety includes three main logics viz, the EXTREME LIMIT (UP/DN extreme limit), CAR GATE (CAR gate is locked) and the LANDING GATE (all the landing gate must be closed) these logics are connected in series, if anyone of these logic breaks the motor supply will cut-off. Generally, this consists of 110V in series to avoid voltage malfunctioning.

CHAPTER 13

CONCLUSION

As our project was study based elevator model we had learned basic technical things involved in an elevator system, i.e. how it operates, the flow of commands, speed control, safety in the system etc.

FUTURE SCOPE

For the future we can implement the elevator system on PLC (programmable logic controller) which is mainly used for these kind of automotive systems, which will the elevator system more efficient and reliable

CHAPTER 14

DATA SHEETS:

- **74LS595**
- **74LS195**
- **ULN280**

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