

ENGINEERING DRAWING

(NSQF)

2nd YEAR
(For 2 Year Trades)

(As per Revised Syllabus July 2022)

Group 20

Group 20 CTS Trades Covered

Instrument Mechanic, Tech. Medical Electronics, Technician Mechatronics,
Technician Power Electronics System, Electronics Mechanic,
Mechanic Consumer Electronics Appliances,
Tech. Electronic System Design & Repair



Directorate General of Training

DIRECTORATE GENERAL OF TRAINING
MINISTRY OF SKILL DEVELOPMENT & ENTREPRENEURSHIP
GOVERNMENT OF INDIA



**NATIONAL INSTRUCTIONAL
MEDIA INSTITUTE, CHENNAI**

Post Box No. 3142, CTI Campus, Guindy, Chennai - 600 032

Engineering Drawing (NSQF) 2nd Year (For 2 Year Trades)

Group 20 Engineering Trades

As per Revised syllabus July 2022 under CTS

Developed & Published by



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First Edition : December 2023

Copies : 1000

Rs. 75/-

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FOREWORD

The Government of India has set an ambitious target of imparting skills one out of every four Indians, to help them secure jobs as part of the National Skills Development Policy. Industrial Training Institutes (ITIs) play a vital role in this process especially in terms of providing skilled manpower. Keeping this in mind, and for providing the current industry relevant skill training to Trainees, ITI syllabus has been recently updated with the help of comprising various stakeholder's viz. Industries, Entrepreneurs, Academicians and representatives from ITIs.

The National Instructional Media Institute (NIMI), Chennai, has now come up with instructional material to suit the revised curriculum for **Engineering Drawing 2nd Year (For 2 Year Trades) NSQF Group 20 Engineering Trades (Revised 2022)** under CTS will help the trainees to get an international equivalency standard where their skill proficiency and competency will be duly recognized across the globe and this will also increase the scope of recognition of prior learning. NSQF trainees will also get the opportunities to promote life long learning and skill development. I have no doubt that with NSQF the trainers and trainees of ITIs, and all stakeholders will derive maximum benefits from these IMPs and that NIMI's effort will go a long way in improving the quality of Vocational training in the country.

The Director General of Training, Executive Director & Staff of NIMI and members of Media Development Committee deserve appreciation for their contribution in bringing out this publication.

Jai Hind

ATUL KUMAR TIWARI, I.A.S.

Secretary
Ministry of Skill Development & Entrepreneurship,
Government of India.

December 2023

New Delhi - 110 001

PREFACE

The National Instructional Media Institute(NIMI) was set up at Chennai, by the Directorate General of Training, Ministry of skill Development and Entrepreneurship, Government of India, with the technical assistance from the Govt of the Federal Republic of Germany with the prime objective of developing and disseminating instructional Material for various trades as per prescribed syllabus and Craftsman Training Programme(CTS) under NSQF levels.

The Instructional materials are developed and produced in the form of Instructional Media Packages (IMPs), consisting of Trade Theory, Trade Practical, Test and Assignment Book, Instructor Guide and Wall charts. The above material will enable to achieve overall improvement in the standard of training in ITIs.

A national multi-skill programme called SKILL INDIA, was launched by the Government of India, through a Gazette Notification from the Ministry of Finance (Dept of Economic Affairs), Govt of India, dated 27th December 2013, with a view to create opportunities, space and scope for the development of talents of Indian Youth, and to develop those sectors under Skill Development.

The emphasis is to skill the Youth in such a manner to enable them to get employment and also improve Entrepreneurship by providing training, support and guidance for all occupation that were of traditional types. The training programme would be in the lines of International level, so that youths of our Country can get employed within the Country or Overseas employment. The **National Skill Qualification Framework (NSQF)**, anchored at the National Skill Development Agency(NSDA), is a Nationally Integrated Education and competency-based framework, to organize all qualifications according to a series of **levels of Knowledge, Skill and Aptitude**. Under NSQF the learner can acquire the Certification for Competency needed at any level through formal, non-formal or informal learning.

The **Engineering Drawing** 2nd Year (For 2 Year Trades) NSQF Group 20 - Engineering Trades (Revised 2022) under CTS is one of the book developed by the core group members as per the NSQF syllabus.

The **Engineering Drawing** 2nd Year (For 2 Year Trades) NSQF Group 20 - Engineering Trades under (Revised 2022) CTS as per NSQF is the outcome of the collective efforts of experts from Field Institutes of DGT, Champion ITI's for each of the Sectors, and also Media Development Committee (**MDC**) members and Staff of **NIMI**. NIMI wishes that the above material will fulfill to satisfy the long needs of the trainees and instructors and shall help the trainees for their Employability in Vocational Training.

NIMI would like to take this opportunity to convey sincere thanks to all the Members and Media Development Committee (MDC) members.

Chennai - 600 032

EXECUTIVE DIRECTOR

ACKNOWLEDGEMENT

The National Instructional Media Institute (NIMI) sincerely acknowledge with thanks the co-operation and contribution of the following Media Developers to bring this IMP for the course **Engineering Drawing 2nd Year (For 2 Year Trades) Group 20 - Engineering Trades** as per NSQF Revised 2022.

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NIMI CO-ORDINATORS

Shri. Nirmalya Nath	-	Deputy General Manager, NIMI, Chennai - 32.
Shri. G. Michael Johny	-	Manager, NIMI, Chennai - 32.

NIMI records its appreciation of the **Data Entry, CAD, DTP Operators** for their excellent and devoted services in the process of development of this IMP.

NIMI also acknowledges with thanks, the efforts rendered by all other staff who have contributed for the development of this book.

INTRODUCTION

Theory and procedure along with the related exercises for further practice

This book on theory and procedure along with related exercises contains theoretical information on **2nd Year Engineering drawing** NSQF (For 2 Year Revised syllabus July 2022 Group 20 - Engineering Trades) and procedure of drawing/ sketching different exercise for further practice are also available. Wherever required, BIS specification has been used.

Exercise for further practice

The practice exercise is given with Theory and procedure for 2nd Year book made obsolete as it was felt that, it is very difficult to work in workbook using drawing instruments. It is well known fact that, any drawing is prepared on suitable standard size of drawing sheets only.

The instructor is herewith advised to go through the instructions given below and to follow them in view of imparting much drawing skill in the trainees.

Acquiring the above said ability and doing small drawings is not a simple task. These books will provide a good platform for achieving the said skills.

Time allotment - 2nd Year : 40 Hrs

Sl. No.	Topic	Exercise No.	Time in Hrs
1	Reading of Electronics Sign and Symbols	2.1.01 & 2.1.02	4
2	Sketches of Electronics components	2.2.03 & 2.2.04	6
3	Reading of Electronics wiring diagram and Layout diagram	2.3.05	6
4	Drawing of Electronics circuit diagram	2.4.06	12
5	Drawing of Block diagram of Instruments & equipment of trades	2.5.07	12
			40 Hrs

Instructions to the Instructors

It is suggested to get the drawing prepared on A4/A3 sheets preferably on only one side. If separate table and chair facility is available for every trainee then it is preferred to use A3 sheets and if the drawing hall is provided with desks then A4 sheets may be used. However while preparing bigger drawings on A4 sheets suitable reduction scale to be used or multiple sheets may be used for detailed and assembly drawings.

First the border and the title block to be drawn only for the first sheet of the chapter. Eg. for conical sections only first sheet will have the title block whereas the rest of the sheets of that chapter will have only borders.

Serial number of sheet and total no. of sheets to be mentioned on each sheet.

The completed sheet to be punched and filled in a box file/ suitable files and preserved by the trainees carefully after the approval of instructor, VP and Principal of the Institute.

The file may be referred by the authority before granting the internal marks at the end of the Year.

CONTENTS

Exercise No.	Topic of the Exercise	Page No.
	Reading of Electronics Sign and Symbols	
2.1.01	Reading of electronics sign and symbols	1
2.1.02	Symbols pertaining to contactor and machines	5
	Sketches of Electronics components	
2.2.03	Sketches of electronics components	10
2.2.04	Different types of cable and connectors used in LAN	18
	Reading of Electronics wiring diagram and Layout diagram	
2.3.05	Reading of electronics wiring diagram and layout diagram	21
	Drawing of Electronics circuit diagram	
2.4.06	Drawing of electronics circuit diagram	25
	Drawing of Block diagram of Instruments & equipment of trades	
2.5.07	Drawing of block diagram of instruments & equipment of trades	27

LEARNING / ASSESSABLE OUTCOME

On completion of this book you shall be able to

- **Read and apply engineering drawing for different application in the field of work. NOSCSC/N9401**

SYLLABUS

2nd Year

Group 20 - Revised syllabus July 2022
2 Year Engineering trades under CTS

Duration: 2 Year

CTS Trades Covered: Instrument Mechanic, Tech. Medical Electronics, Technician Mechatronics, Technician Power Electronics System, Electronics Mechanic, Mechanic Consumer Electronics Appliances, Tech. Electronic System Design & Repair

S.no.	Syllabus	Time in Hrs
1	Reading of Electronics Sign and Symbols	4
2	Sketches of Electronics components	6
3	Reading of Electronics wiring diagram and Layout diagram	6
4	Drawing of Electronics circuit diagram	12
5	Drawing of Block diagram of Instruments & equipment of trades	12
	Total	40

Reading of electronics sign and symbols

Reading of Warning Signs

Warning signs

Shape Triangular.

Colour Yellow background with black border and symbols.

Meaning Warns of hazard or danger.

Example Caution, risk of electric shock.


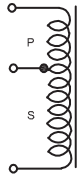
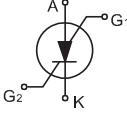

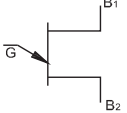
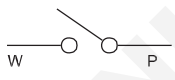
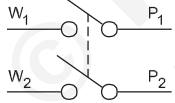
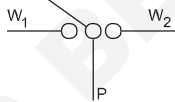
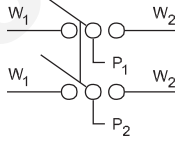
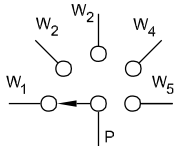

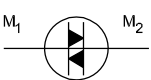
Reading of Electrical and Electronic Symbols

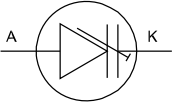


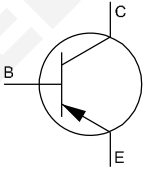
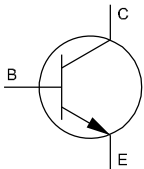
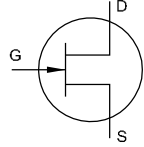
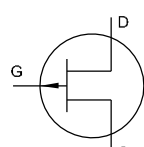
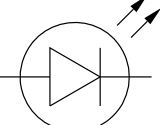
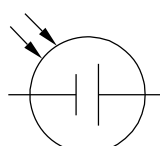
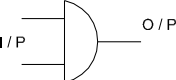
S.No.	Description	Symbol
1	D.C.	————
2	A.C.	
3	Positive	+
4	Negative	—
5	Single Phase A.C. 50 Hz	

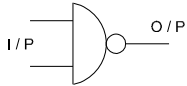
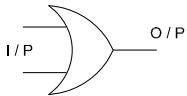
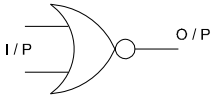
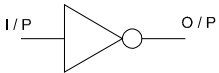
S.No.	Description	Symbol
6	Three Phase A.C., 50 Hz	
7	A.C. / D.C.	
8	Earth	
9	Cell	
10	Battery	

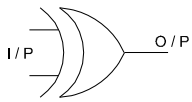
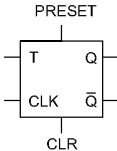
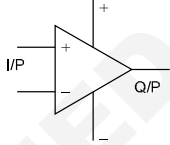

S.No.	Description	Symbol
11	Single pole switch	
12	Push-button switch	
13	Energy meter	
14	Alternator	
15	Generator	
16	D.C. Motor	
17	A.C. Motor Single phase	
18	Capacitor: Fixed, variable	
19	Electrolytic Capacitor	
20	Two-way switch	
21	Fuse: ordinary cartridge	
22	Socket 2 pin, 3 pin	

S.No.	Description	Symbol
23	Aerial / Antenna	
24	Voltmeter	
25	Ammeter	
26	Ohm Meter	
27	Watt Meter	
28	Lamp	
29	Relay	
30	Buzzer	
31	Connections: star, Delta	
32	Choke	
33	Transformers	
34	Carbon microphone	
35	Loudspeaker	

S.No.	Description	Symbol
36	Diode	
37	Auto transformer	
38	Silicon Bilateral switch (SBS)	
39	SCR	
40	UJT	
41	SPS T switch	
42	DPS T switch	
43	SPD T switch	
44	DPD T switch	
45	Single Pole 5 way rotary switch	
46	Piezo-electric crystal	
47	Diac	

S.No.	Description	Symbol
48	Varactor diode	
49	Zener diode	
50	TRIAC	
51	PNP transistor	
52	NPN transistor	
53	FET N-channel	
54	FET P-channel	
55	LED diode	
56	Photo voltaic cell	
57	AND Gate	

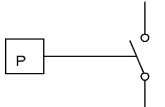
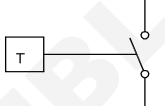


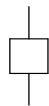


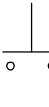
S.No.	Description	Symbol
58	NAND Gate	
59	OR Gate	
60	NOR Gate	
61	NOT Gate	












S.No.	Description	Symbol
62	EX-OR Gate	
63	T Flip-Flop	
64	Operational amplifier	
65	Analog multimeter	



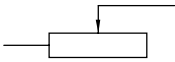







Symbols pertaining to contactor and machines

The table given below contains most of the important symbols used by an electrician. However, you are advised to refer the quoted B.I.S. standards for further additional information.

Table

S.No.	BIS Code No.	Description	Symbol	Remarks
1	BIS 2032 (Part XXV)- 1980 9.3	Pressure switch		
2	9.4	Thermostat		
3	9.5	Circuit-breaker		
4	9.5.1	Alternate symbol of circuit-breaker. Note : The rectangle of symbol 9.5 should contain some indication to a circuit-breaker is concerned.		
5	9.5.2	Alternate symbol for circuit breaker.		
6	9.9	Contactor, normally open.		
7	9.9.1	Contactor, normally closed.		
8	9.10	Push-button with normally open contact.		









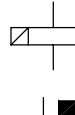
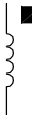
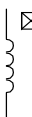
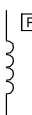
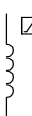


S.No.	BIS Code No.	Description	Symbol	Remarks
9	9.10.1	Push-button with normally closed contact.		
10	9.11	Isolator.		
11	9.16	Thermal overload contact.		
12	9.17	Socket(female).		
13	9.17.1	Socket with switch.		
14	9.18	Plug (male).		
15	9.19	Plug and socket (male and female).		
16	9.20	Starter, general symbol.		
17	9.22	Star- delta starter.		
18	9.23	Auto-transformer starter.		
19	9.24	Pole-changing starter (Example, 8/4 poles).		

S.No.	BIS Code No.	Description	Symbol	Remarks
20	9.25	Rheostatic starter.		
21	9.26	Direct on-line starter.		
22	9.27.1	Resistor with moving contact, general symbol.		
23	9.29	Fuse.		
24	9.29.1	Alternate symbol for fuse.		
25	9.31	Isolating fuse-switch.		
	BIS 2032 Part(XXV11) 1932	Contactors		
	3.2	Qualifying symbols		
26	3.2.2	Circuit-breaker function.		
27	3.2.4	Switch-disconnector (isolator switch) function.		
28	3.14	Winding Note: The number of half circles is not fixed, but if desired a distinction might be made for the different windings of a machine.		
29	3.24	Commutating or compensating winding.		

S.No.	BIS Code No.	Description	Symbol
30	3.34	Series winding.	
31	3.44	Shunt winding	
32	3.54	Brush on slip-ring.	
33	3.64	Brush on commutator.	
34	4.2.1	Direct current generator, general symbol.	
35	4.2.2	Direct current motor, general symbol.	
36	4.3.1	AC generator, general symbol.	
37	4.3.2	AC motor, general symbol	
	5.1	General Symbols	
38	5.1.1	Transformer with two separate windings.	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> Simplified multiline representation </div> <div style="text-align: center;"> Complete multiline representation </div> </div>
39	5.1.2	Transformer with three separate windings.	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> Simplified multiline representation </div> <div style="text-align: center;"> Complete multiline representation </div> </div>
40	5.1.3	Auto-transformers	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> Simplified multiline representation </div> <div style="text-align: center;"> Complete multiline representation </div> </div>

Elements of electro-mechanical relays

(Except measuring and protective relays)

Relay coils		
1	Relay coil (General symbol)	
2	Relay coil of a slow-releasing relay	
3	Relay coil of a slow operating relay	
4	Relay coil of a slow-operating and slow-releasing relay	
5	Relay coil of a high speed relay (fast-operating and fast-releasing) Note: This symbol should be used only if it is desirable to emphasize that a certain relay is essentially more rapid than other relays and that use is made thereof.	
6	Relay coil of an AC relay	
7	Relay coil of a mechanically latched relay	
8	Note: The two windings of the relay coil are to be marked by the same sign, for example, the letter A.	
9	Actuating device for a thermal relay	
Windings		
10	Winding of a slow releasing relay	
11	Winding of a slow operating relay	
12	Winding of a polarised relay	
13	Winding of a permanent relay	
14	Energy flow from the bus-bars	
15	Energy flow towards the bus-bars	

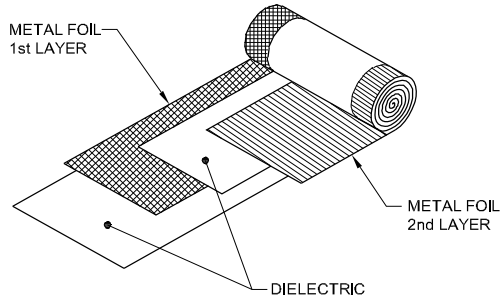
Sketches of electronics components

FIXED VALUE RESISTORS			
CARBON TYPES	CERAMIC TYPES	WIRE WOUND TYPES	SPECIAL TYPES
<p>CARBON COMPOSITION</p> <p>2W 1W 1/2W 1/4W 1/8W</p>	<p>10W 5W</p>	<p>14W</p>	<p>SPECIAL TYPES</p>
<p>METAL FILM</p> <p>2W 1W 1/2W 1/4W 10W</p>	<p>RADIAL LEADS</p> <p>10W 2W 1W</p>	<p>RADIAL LEADS</p> <p>10W 2W 1W</p>	<p>PRECISION RESISTOR</p>
<p>METAL OXIDE</p> <p>2W 1W 1/2W</p>	<p>RADIAL LEADS</p> <p>10W 2W 1W</p>	<p>RADIAL LEADS</p> <p>10W 2W 1W</p>	<p>METAL FILM RESISTOR</p>
	<p>VERTICAL MOUNT</p>	<p>VERTICAL MOUNT</p>	<p>NETWORK RESISTOR</p>
		<p>LOW OHM METAL FILM RESISTOR</p>	<p>LOW OHM METAL FILM RESISTOR</p>
		<p>RADIAL LEADS</p> <p>2W 1W 1W</p>	<p>INTEGRATED RESISTOR (DIL)</p>

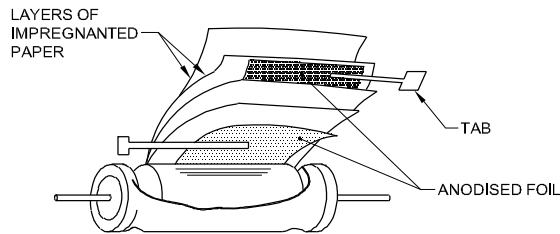
CONSTRUCTION DETAILS OF FIXED VALUE CAPACITORS

PAPER CAPACITORS

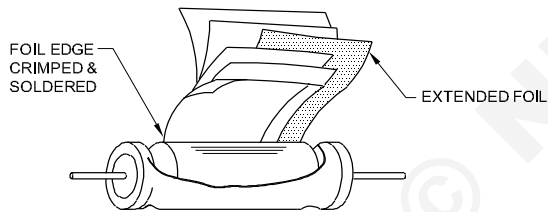
PRINCIPLE



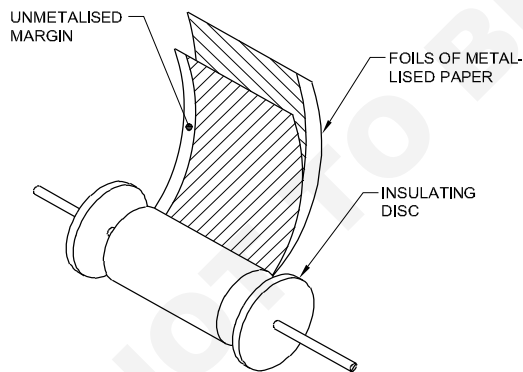
TAD TYPE



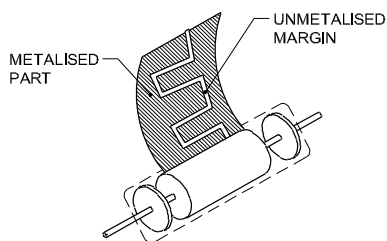
EXTENDED FOIL TYPE



METALISED PAPER CAPACITOR

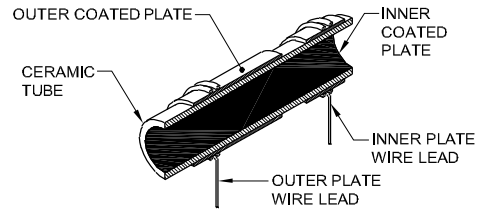


CASTELLATED TYPE PAPER CAPACITOR

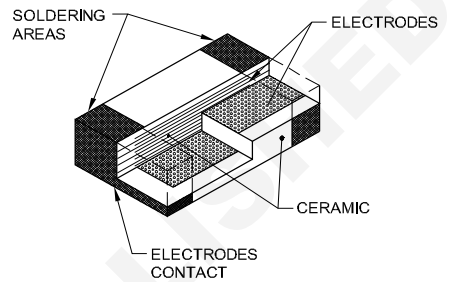


CERAMIC CAPACITORS

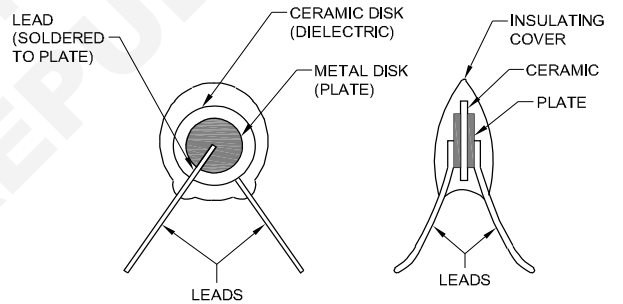
TUBULAR CERAMIC CAPACITOR (CROSS SECTIONAL VIEW)



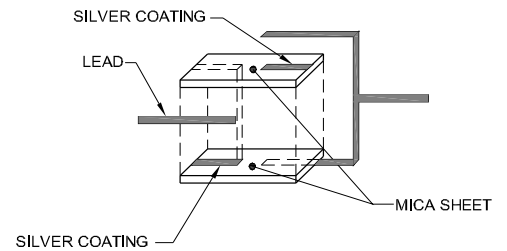
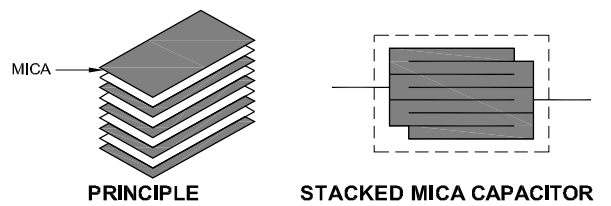
CERAMIC CAPACITOR



CERAMIC CAPACITORS

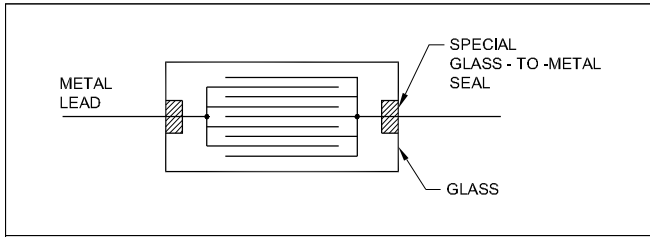


SILVER MICA CAPACITOR

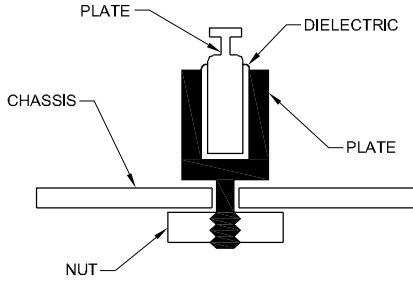


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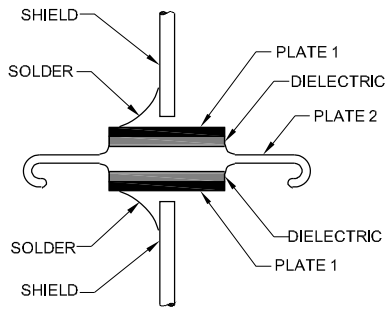
GLASS CAPACITORS



STAND-OFF CAPACITOR

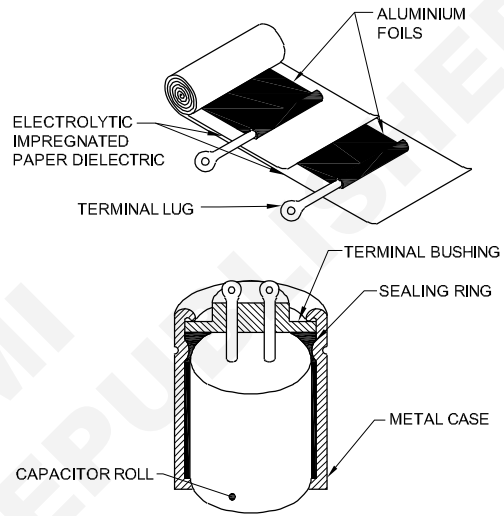
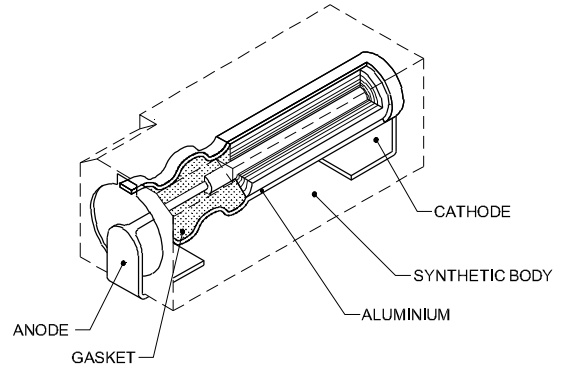


FEED-THROUGH CAPACITOR

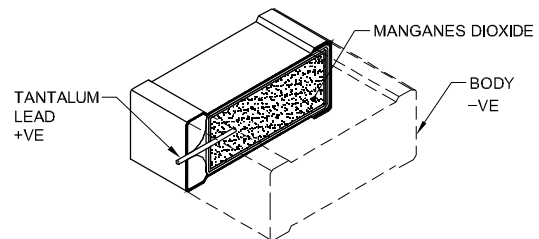
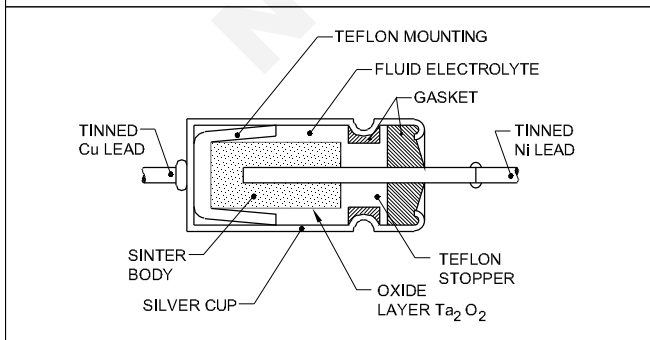
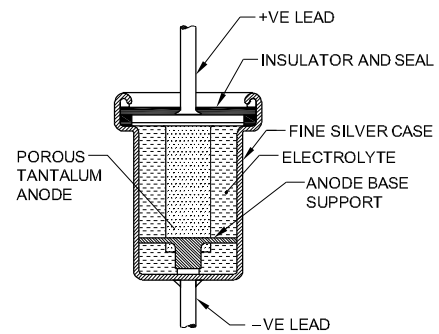
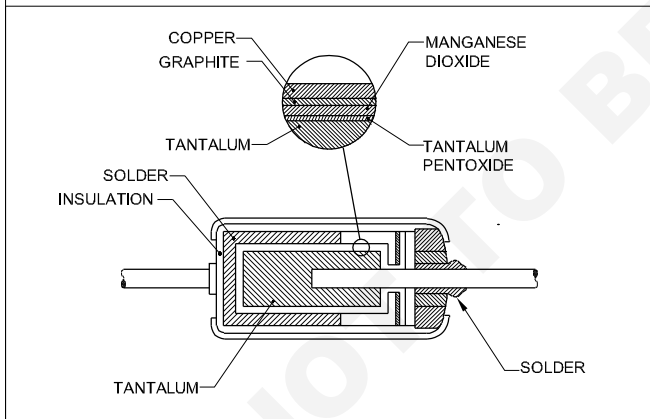


ELECTROLYTIC CAPACITORS ALUMINIUM TYPE

ALUMINIUM CHIP ELECTROLYTIC CAPACITOR



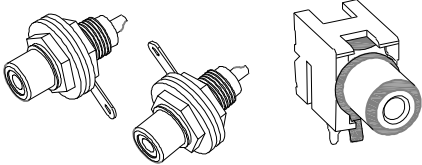
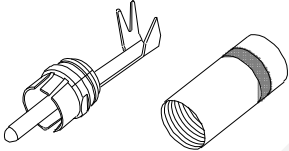
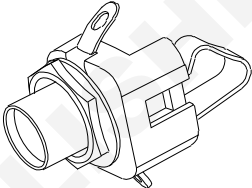
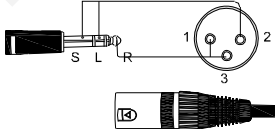
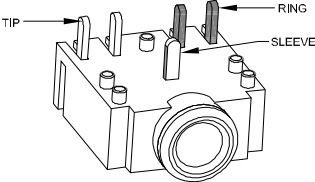
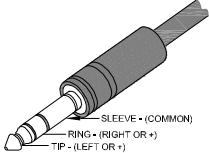
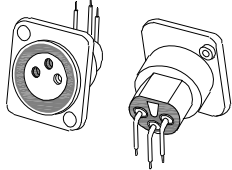
TANTALUM CAPACITORS

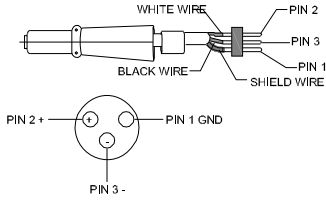
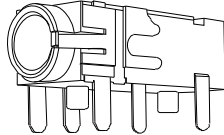
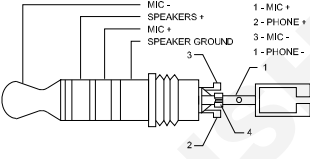
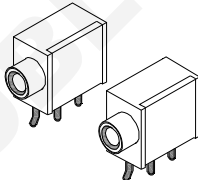
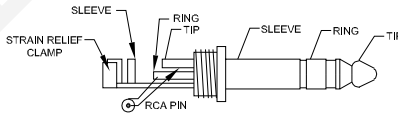
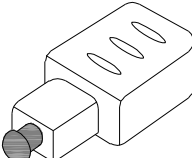
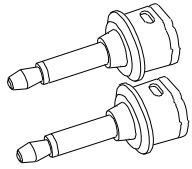
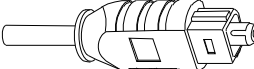


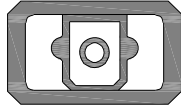
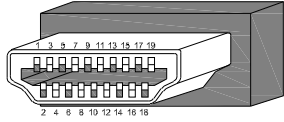
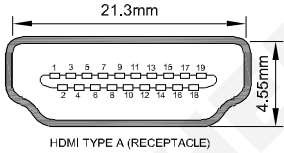
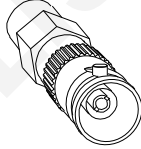
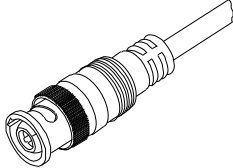
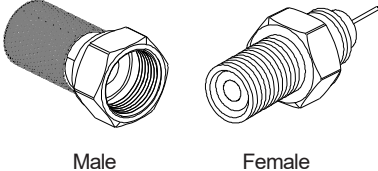
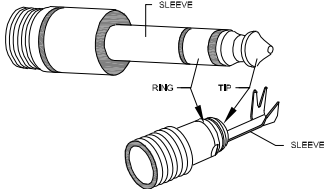
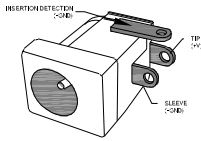
TANTALUM CHIP CAPACITOR

EDNEM2023T3

Audio/Video and DC power connectors

Sl.No.	Socket / connector Name	Socket / connector Image
1	RCA socket -Female	
2	RCA plug- Male	
3	TRS-Jack- Female (6.35mm)	
4	TRS plug - Male(6.35mm)	
5	TRS Jack- Female (6.35mm)	
6	TRS plug - Male (6.35mm)	
7	XLR connector-female	

SI.No.	Socket / connector Name	Socket / connector Image
8	XLR connector-Male	 <p>The diagram shows a male XLR connector with three pins. The top pin is labeled 'PIN 2' and is connected to a 'WHITE WIRE'. The middle pin is labeled 'PIN 3' and is connected to a 'BLACK WIRE'. The bottom pin is labeled 'PIN 1' and is connected to a 'SHIELD WIRE'. Below the connector is a circular pin layout diagram with three pins: 'PIN 2 +', 'PIN 1 GND', and 'PIN 3 -'.</p>
9	TRRS jack- Female	
10	TRRS plug- male	 <p>The diagram shows a TRRS plug connector with four contacts. Labels include: 'MIC -', 'SPEAKERS +', 'MIC +', 'SPEAKER GROUND', '1 - MIC +', '2 - PHONE +', '3 - MIC -', and '1 - PHONE -'. The contacts are numbered 1, 2, 3, and 4.</p>
11	Headphone Jack- Female	
12	Headphone plug- Male	 <p>The diagram shows a male headphone plug connector with labels: 'SLEEVE', 'RING TIP', 'SLEEVE', 'RING', 'TIP', 'STRAIN RELIEF CLAMP', and 'RCA PIN'.</p>
13	TOS Link -optical Jack -female	
14	TOS link - optical plug- male	
15	S/PDIF connector- male	

SI.No.	Socket / connector Name	Socket / connector Image
16	S/PDIF connector female	
17	HDMI Male Connector	
18	HDMI Female connector	
19	BNC Female connector	
20	BNC Male Connector	
21	F - Connector	
22	Barrel DC connector- plug	
23	Barrel DC connector -jack	

Types of Transformers

Fig 1 CORE-TYPE TRANSFORMER

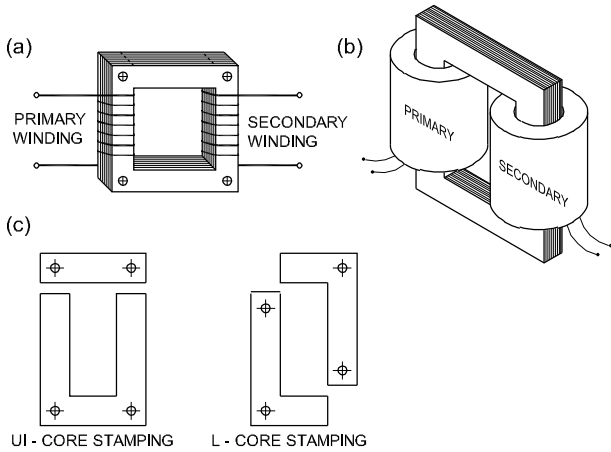


Fig 2 SHELL-TYPE TRANSFORMER

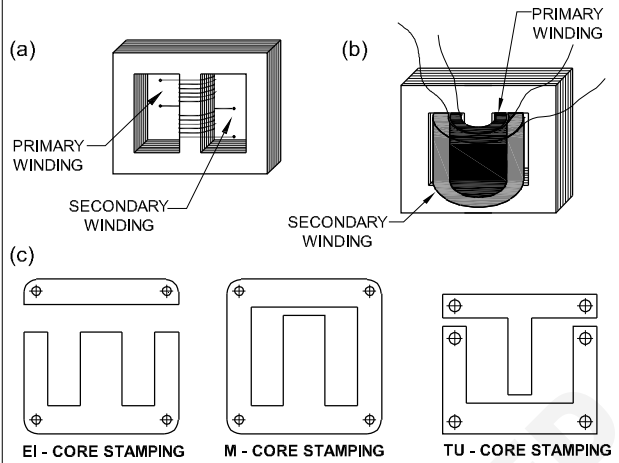


Fig 3 RING - TYPE TRANSFORMER

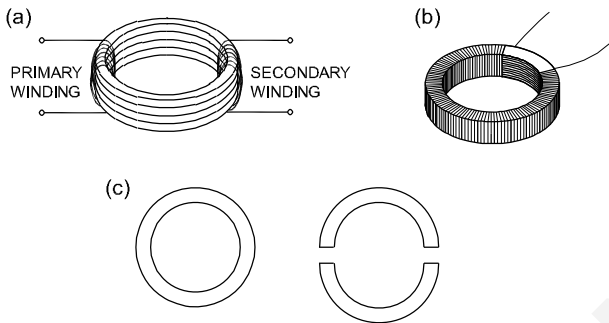


Fig 4 MAINS FREQUENCY TRANSFORMER

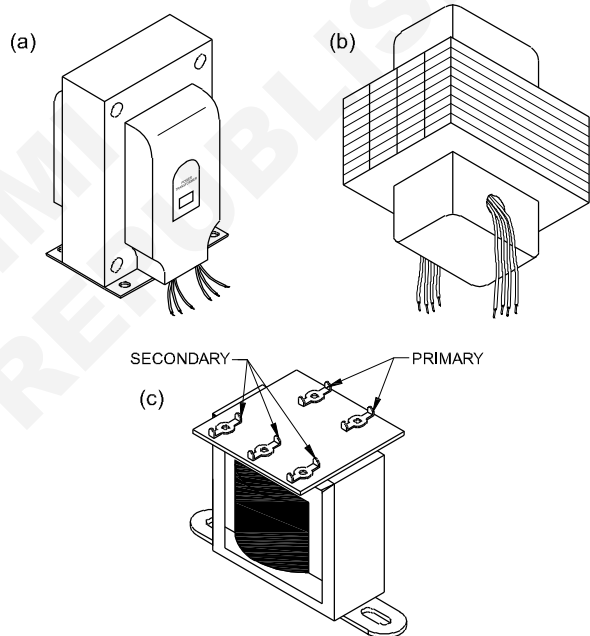


Fig 5 AUDIO FREQUENCY TRANSFORMER

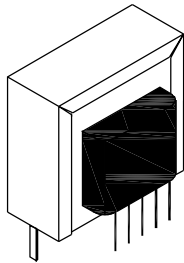
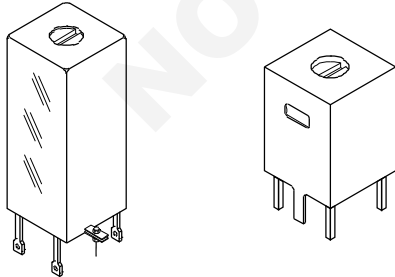
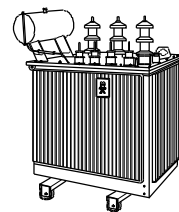


Fig 6 HIGH FREQUENCY TRANSFORMER

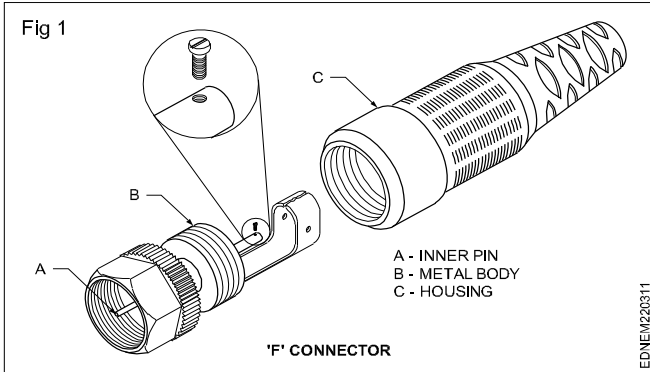


RFT's/IFT's

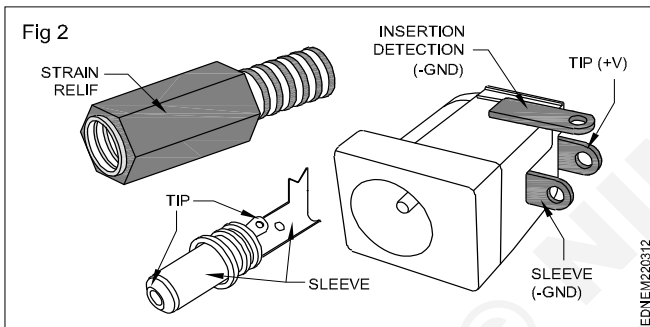
Fig 7 POLY - PHASE TRANSFORMER



'F' connectors: The general view of the F connector is given in Fig 1. It consists of an inner pin and outer housing separated and insulated from one another. The housing (outer) is hexagonal in the outside and cylindrical and threaded inside. The threading is used for tightening the connector after pushing it to the female receptable. The leads on the cable side are similar as in the case of RCA plug where the inner and outer leads of the cable are connected.

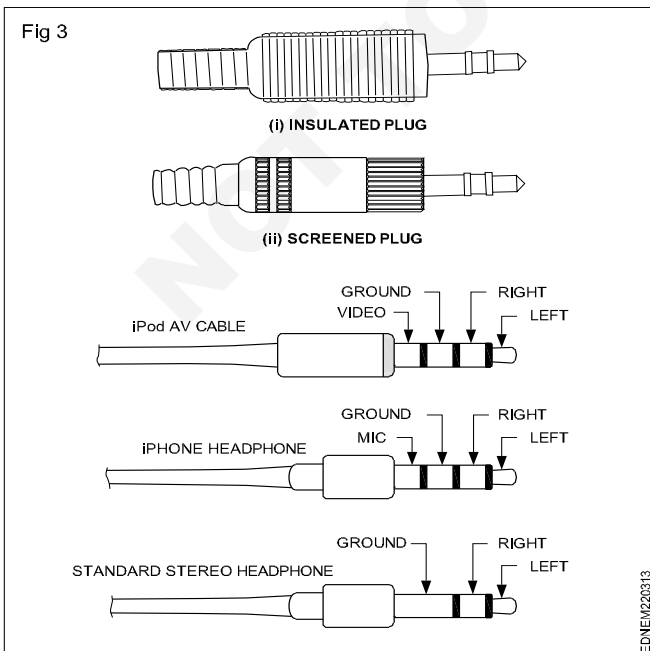


Barrel power connector is one of them used specifically to provide power connection to devices as shown in fig 2 below.

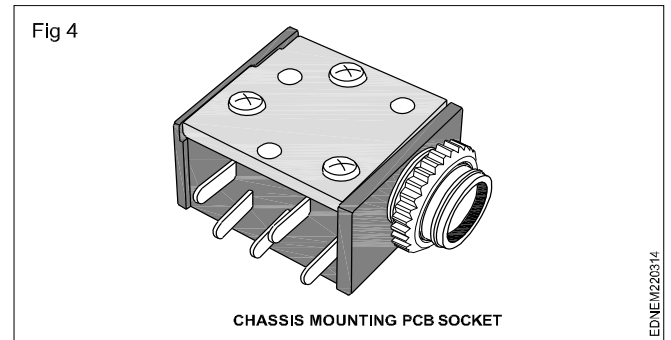


Jack connectors

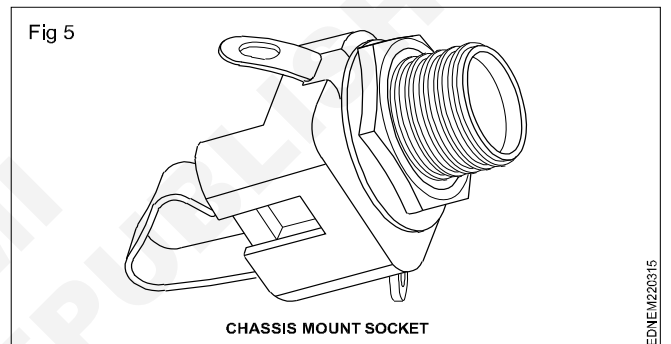
Stereo 3.5 mm Plugs: These are shown in Fig 3. Available in two versions, insulated plug or screened plug. The insulated type has a moulded body with a cable strain relief sleeve and the screened type has a metal body with a moulded cable strain relief sleeve. Miniature 2.5 mm plugs also are in use.



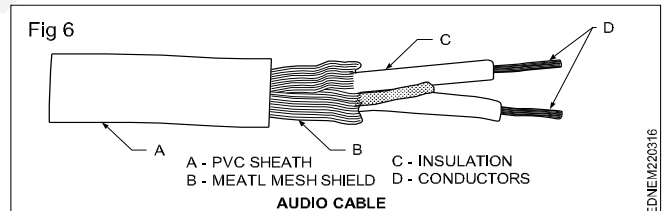
Chassis Mounting PCB Socket: This is shown in Fig 4. Enclosed chassis socket with silver plated normally closed contacts (Double circuit). Plated mounting bush. Earth contact connected to bush. (Stereo socket)



Chassis Socket: This is shown in Fig 5. Enclosed chassis socket with silver-plated closed circuit contacts (single circuit). Plated mounting bush. Earth contact connected to bush.



The general construction of an audio cable is shown in the Fig 6.

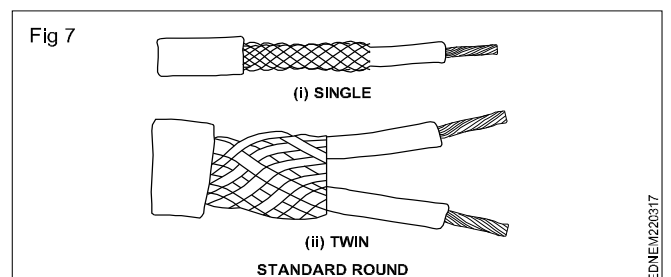


Standard Round: Fig 7 shows standard type braided screen cables. They offer low noise for use in low-level signal circuits.

16/0.2mm tinned copper stranded conductors, PVC insulated, braided screen and grey PVC sheath.

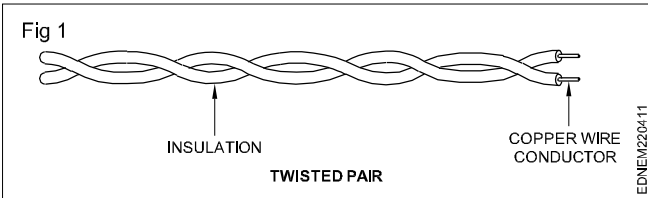
Cores: Red (single), blue and red (twin).

Capacitance: 360 pF/m (single); core to screen 288 pF/m and core to core 171 pF/m (twin). Twin type has twisted cores for hum reduction.



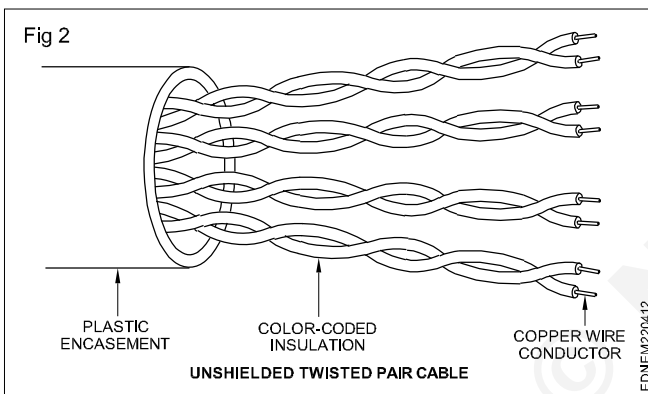
Different types of cable and connectors used in LAN

Twisted pairs are formed by two insulated 22 to 26 gauge copper wires that are twisted each other as in Fig 1. These twisted cables are available in two types.



Unshielded twisted pair cable (UTP)

Unshielded twisted pair cable is composed of a set of twisted pairs with a simple plastic encasement as in Fig 2.

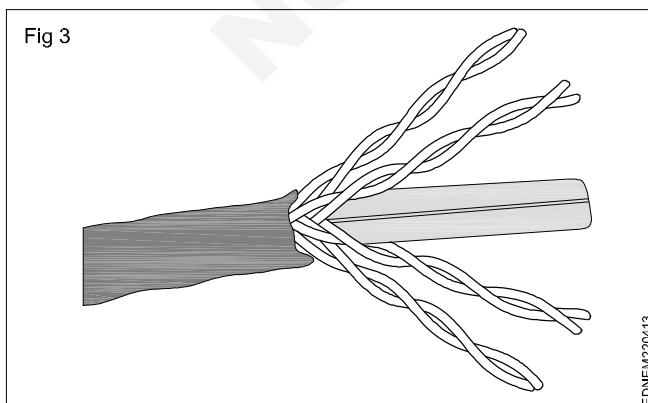


It is commonly used in telephone systems and has been largely standardized.

Twisted pair network cables are rated in terms of their capability to carry network traffic. They are referred as category 3, 4 5e and cat 6.

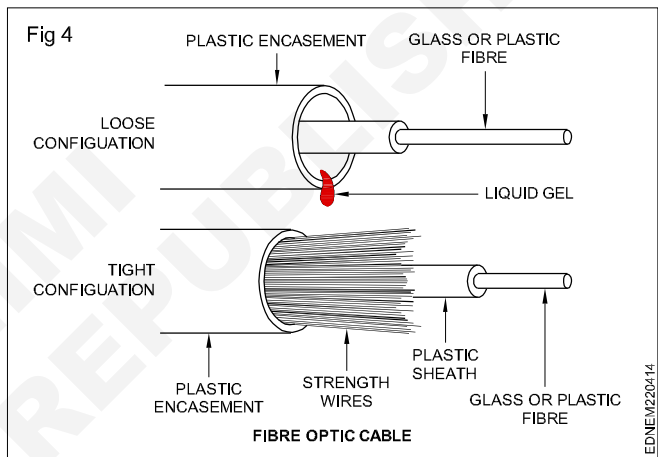
CAT 6 cable

Cat6 is backward compatible with the CAT 3, 5, 5e cable standards. As with Cat5 and Cat5e cabling, Cat6 cables consists of 4 unshielded twisted pairs(UTP) of copper wires with a soft supporting member in the center of the cable as shown in Fig 3.



Fiber optic cable

Fiber optic cable is made of light- conducting glass or plastic core surrounder by more glass and a tough outer sheath as in Fig 4 The center core provide the light path or wave guide while the galss or cladding is composed of varying layers of reflective glass. The glass or cladding is composed of varying layers of reflective glass. The glass cladding is designed to refract ligh back into the core. Each core and cladding strand is surrounded by a tight or loose sheath in tight configurations, the strand is completely surrounded by the outer plastic sheath. Loose configuration use a liquid gel or other material between the strand and the protective sheath.



Diffrent Types of Level Sensors and their Workings

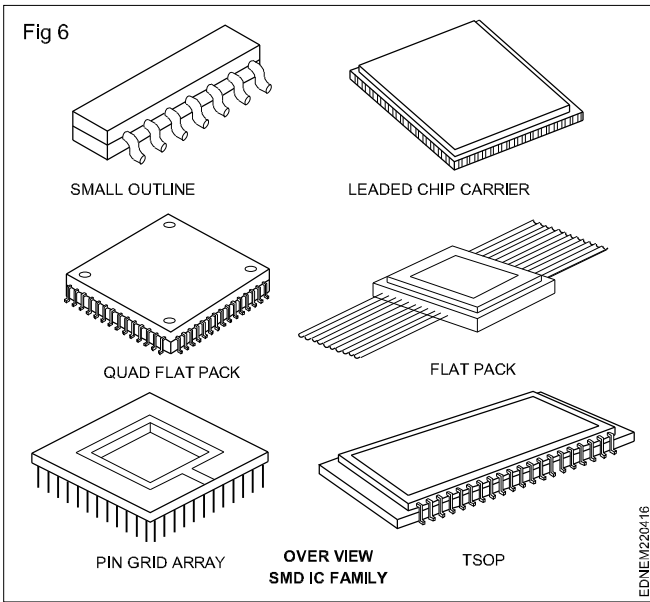
A level sensor is one kind of device used to determine the liquid level that flows in an open system or closed system The level measurements can be available in two types namely continous measurements and point level measurements. The continuous level sensor is used to measure the levels to a precise limit whereas point level sensors used to determine the level of liquid wheather that is high or low. (Fig 5)



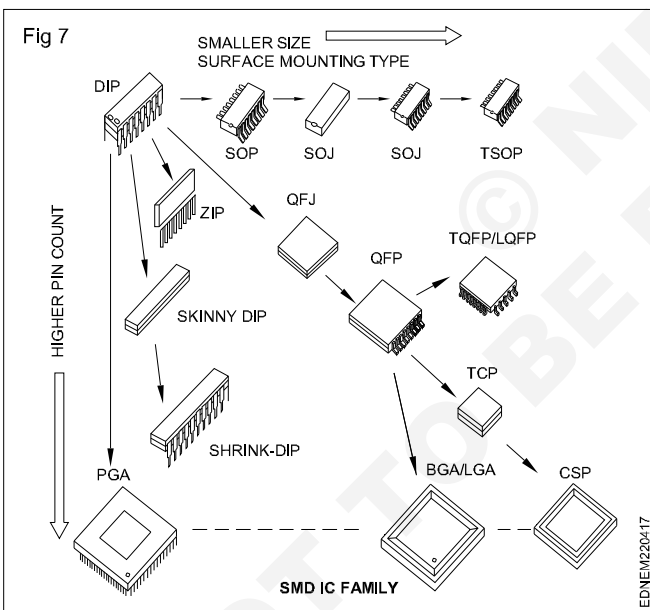
Generally these sensors are connected to an output unit for sending out the results to a monitoring system The present technologies use wireless transmission of

information to the monitoring system, which is very useful in important and hazardous locations that cannot be simply accessed by common workers.

SMD IC family overview (Fig 6)

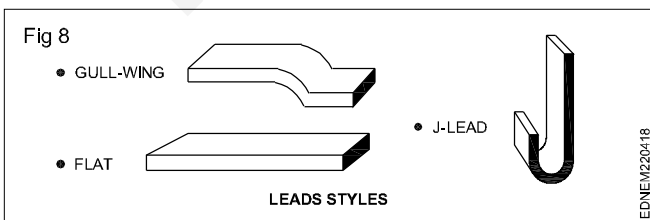


Package classifications (Fig 7)



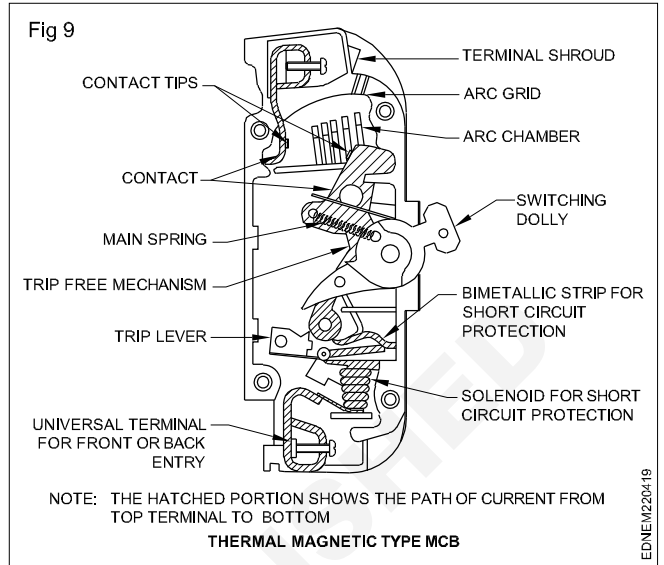
Lead styles

Heads system as shown in Fig 8.

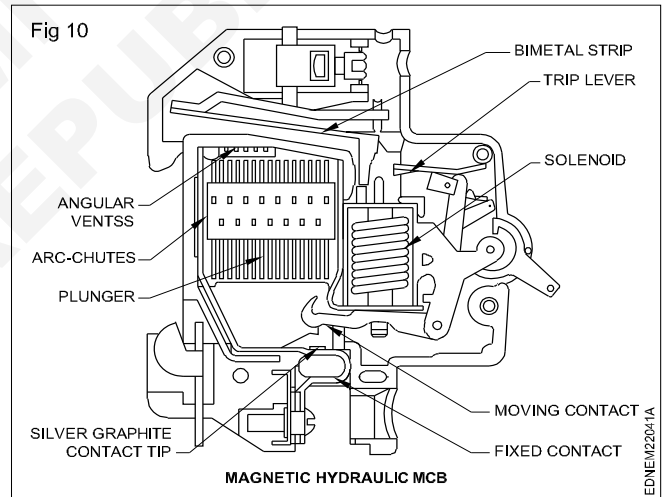


Thermal magnetic MCB

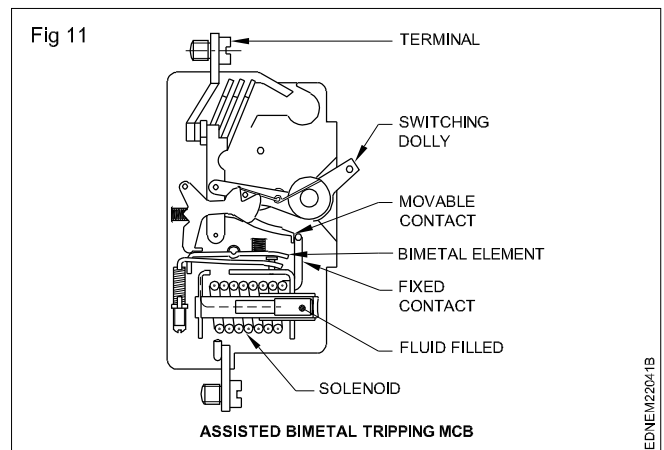
As shown in Fig 9, the switching mechanism is housed in a moulded housing with phenolic moulded high mechanically strong switching dolly. This type of MCB is also provided with bimetallic over load release.



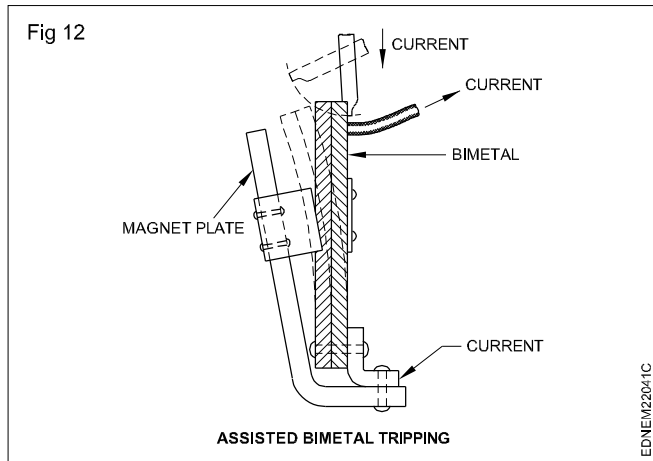
Magnetic hydraulic MCB (Fig 10)



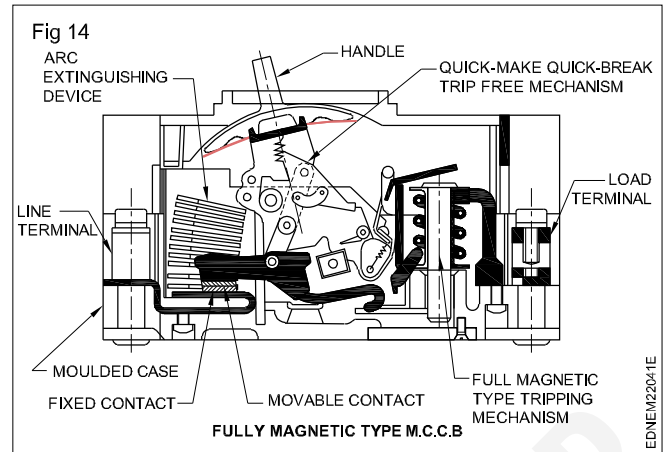
Assisted Bimetal Tripping MCB (Fig 11)



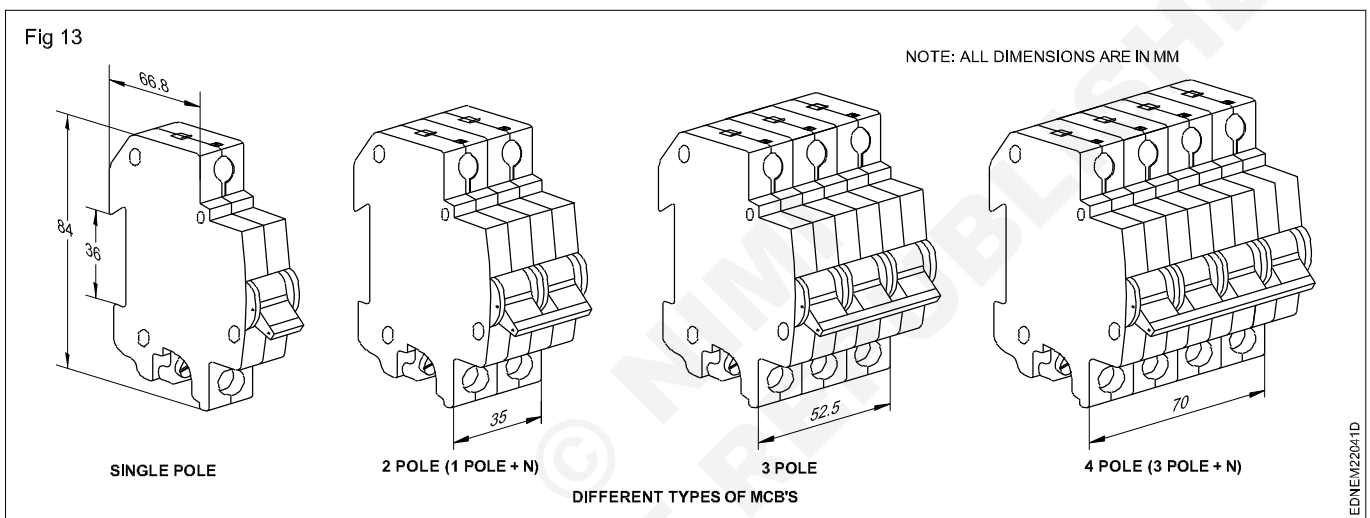
Assisted bimetal tripping (Fig 12)



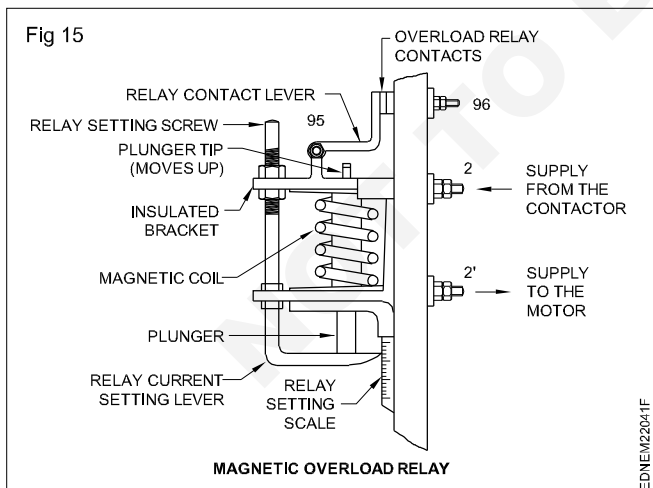
The constructional feature of a fully magnetic MCCB design is shown in Fig 14.



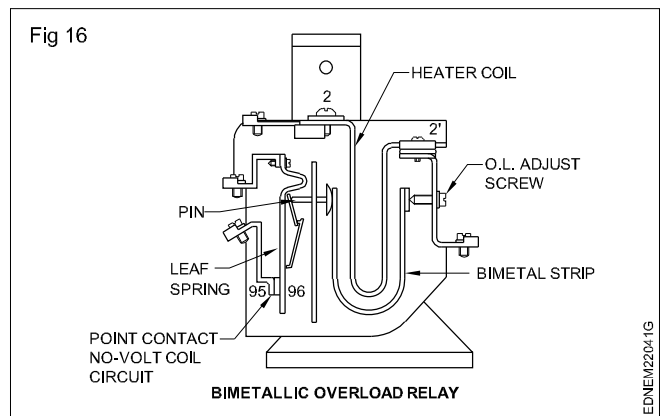
Different types of MCB (Fig 13)



Magnetic overload relay (Fig 15)



Bimetallic overload relay (Fig 16)

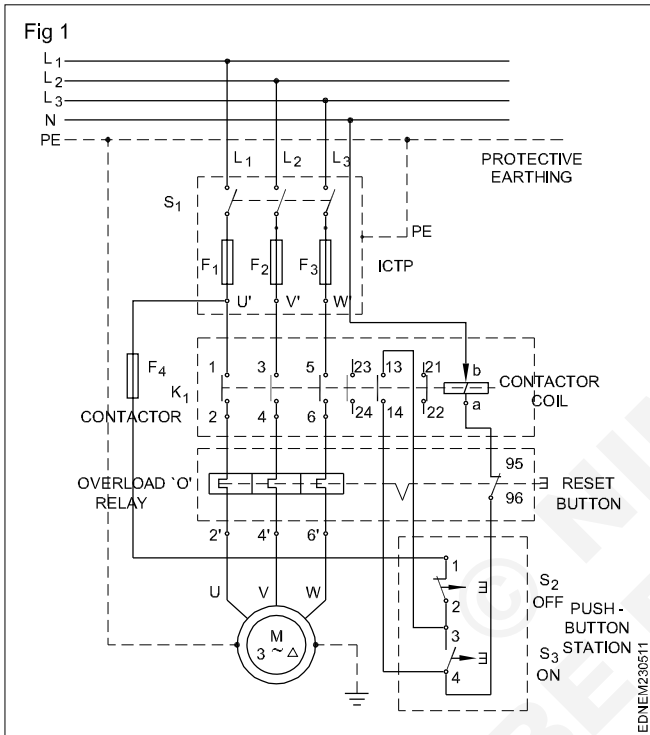


Reading of electronics wiring diagram and layout diagram

Wiring Diagram

Functional description

Power circuit: As shown in Fig 1, when the main ICTP switch is closed and the contactor K_1 is operated, all the three windings U V & W of the motor are connected to the supply terminals R Y B via the ICTP switch, contactor and OL relay.

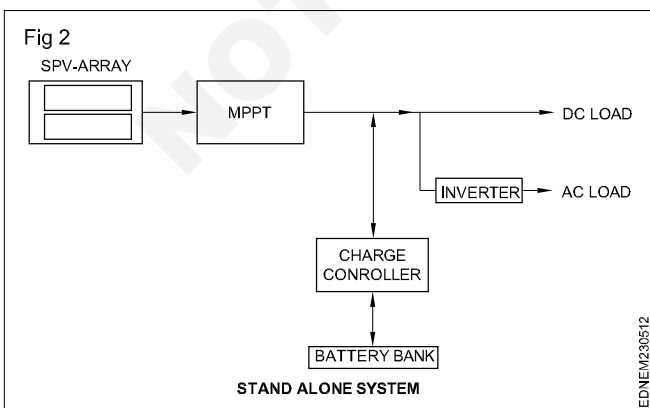


SPV system and solar charge controller

SPV system

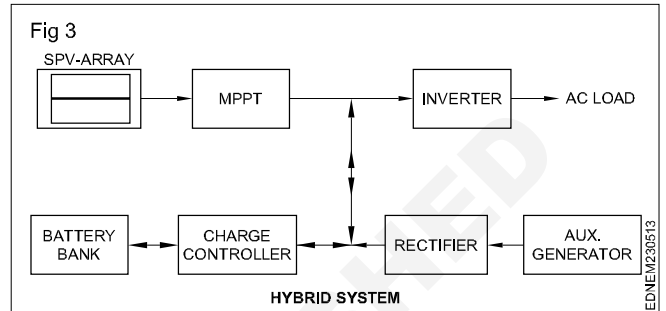
Stand alone system

The entire power is generated by an SPV array and stored in a battery to be provided in response to demand. (Fig 2)



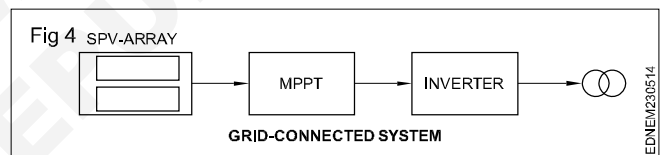
Hybrid system

In addition to an SPV array, other means such as AC mains, wind and diesel generators are also used to supply power. (Fig 3)

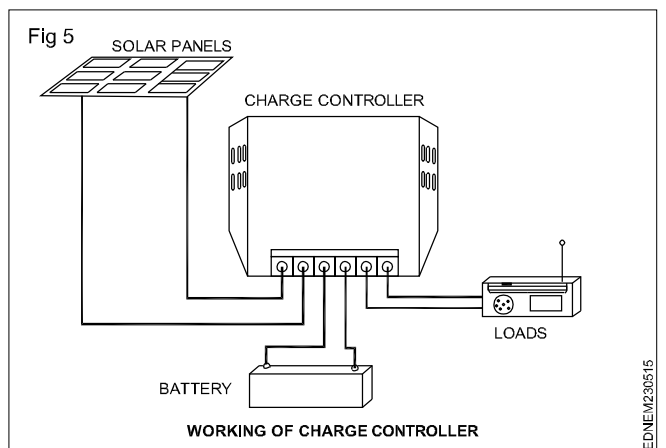


Grid-Connected system

In such system the output of SPV planes is connected to the grid and there is no storage battery; metering is used to keep account of imported and exported power by the user. (Fig 4)



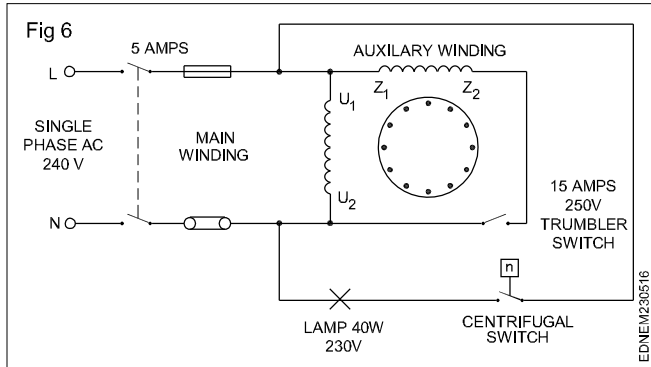
Working of charge controller (Fig 5)



This unit performs 4 major functions

- 1 Charges the battery.
- 2 Gives an indication when battery is fully charged.
- 3 Monitors the battery voltage and when it is minimum, cuts off the supply to the load switch to remove the load connection.
- 4 In case of overload, the load switch is in OFF condition ensuring the load is cut off from the battery supply.

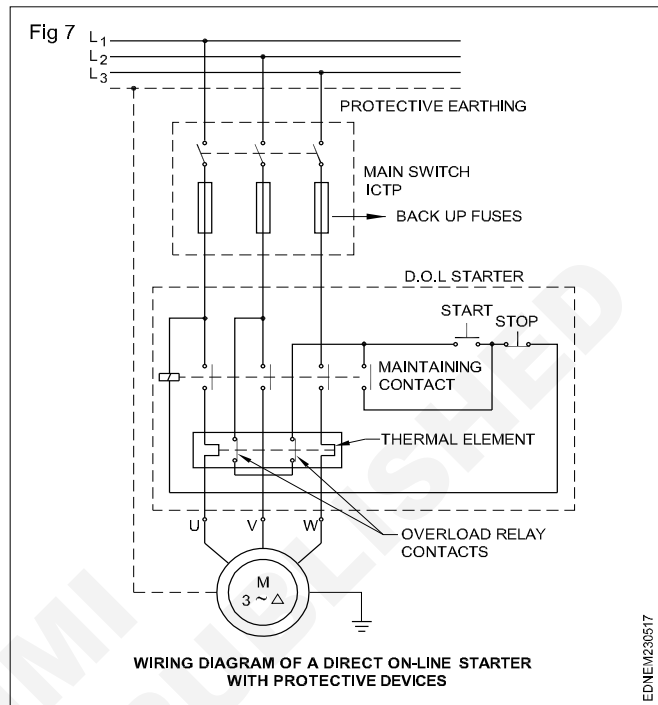
Connect the terminals of the centrifugal switch, through a lamp as shown in Fig 6. Switch 'ON' the motor. When the centrifugal switch is in the closed position, the lamp will light. As the motor picks up speed, say in about 20 seconds, open the tumbler switch to disconnect the starting winding. When the speed of the motor attains about 75% of the rated value, the centrifugal switch, if it operates correctly, will open its contacts which could be observed from the lamp going 'off'. Soon after switching 'on' the main supply, if the lamp is not lighted, or if it lights up but does not go out after 30-40 seconds (75 % of the rated speed) then the centrifugal switch is deemed to be not working, and should be repaired or replaced.



Manual D.O.L. starter: A starter is necessary for starting and stopping the motor, and for providing overload protection.

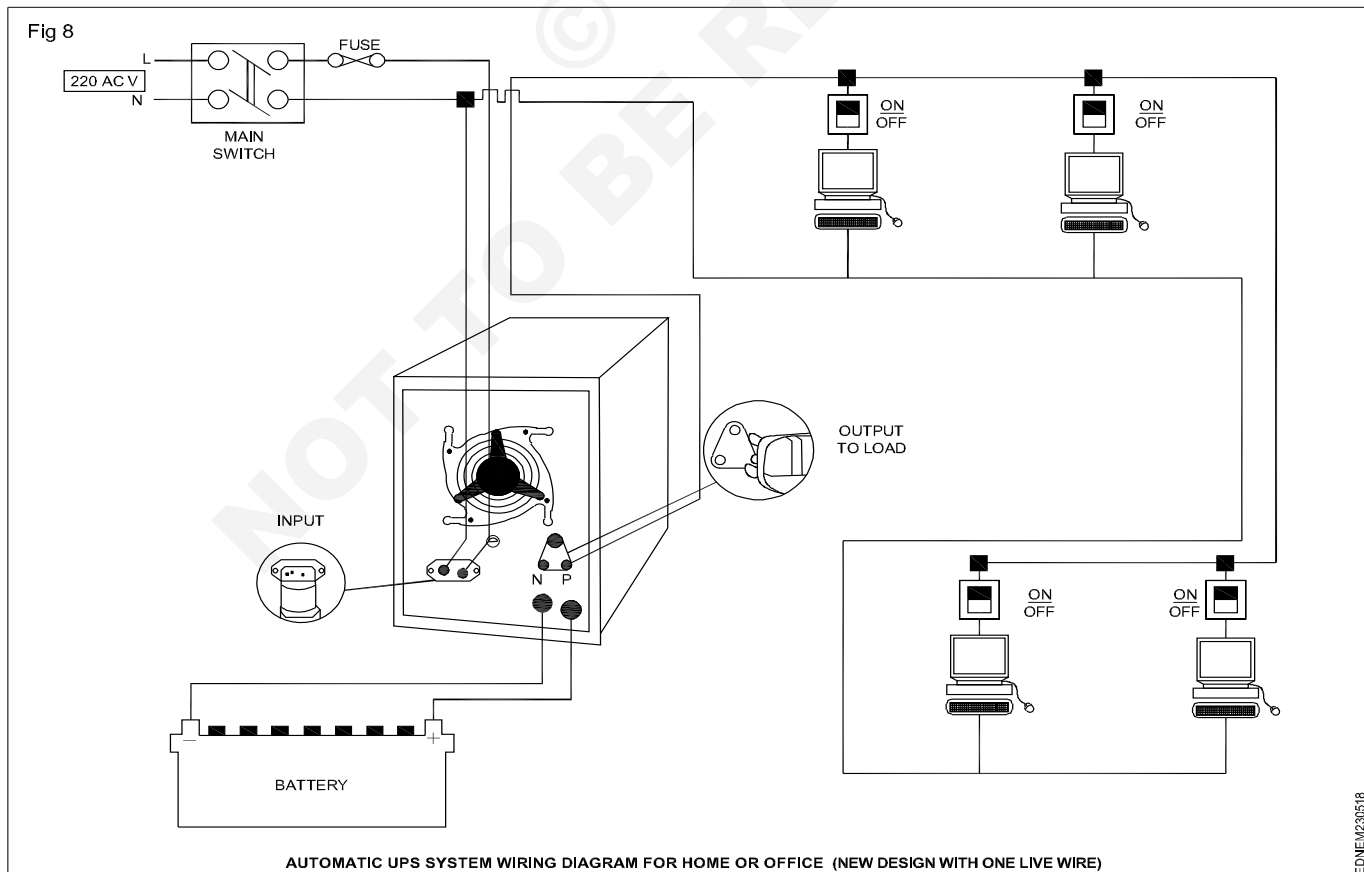
Necessity of starter: A squirrel cage induction motor just before starting is similar to a polyphase transformer with a short-circuited secondary. If normal voltage is applied to

the stationary motor, then, as in the case of a transformer, a very large initial current, to the tune of 5 to 6 times the normal current, will be drawn by the motor from the mains. This initial excessive current is objectionable, because it will produce large line voltage drop, which in turn will affect the operation of other electrical equipment and lights connected to the same line. (Fig 7)



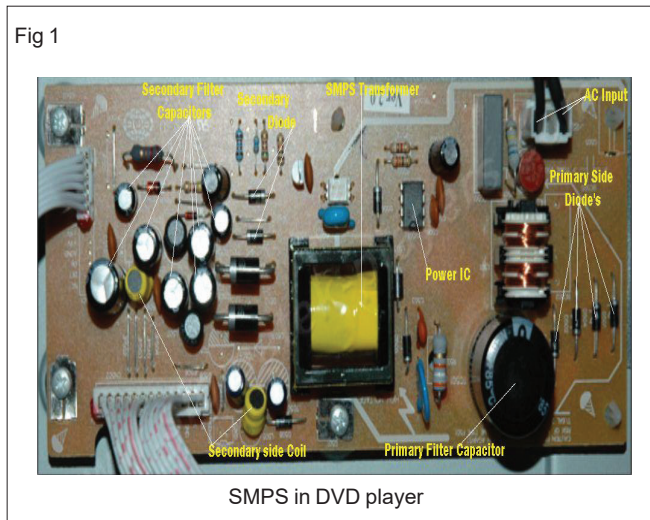
Electrical wiring of UPS

Single phase UPS system wiring diagram (Fig 8)

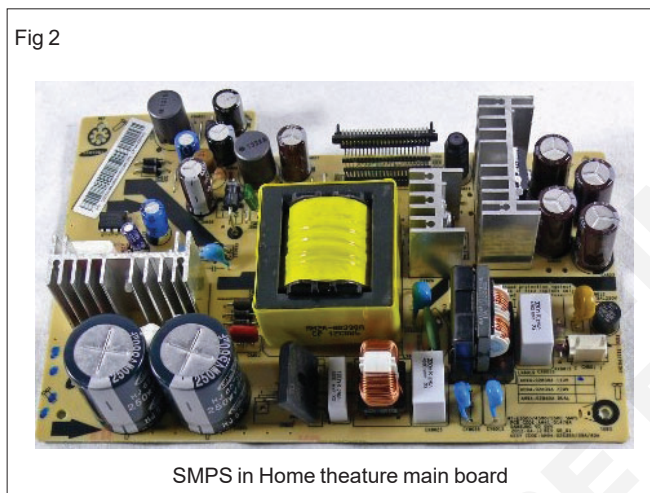


Layout Diagram

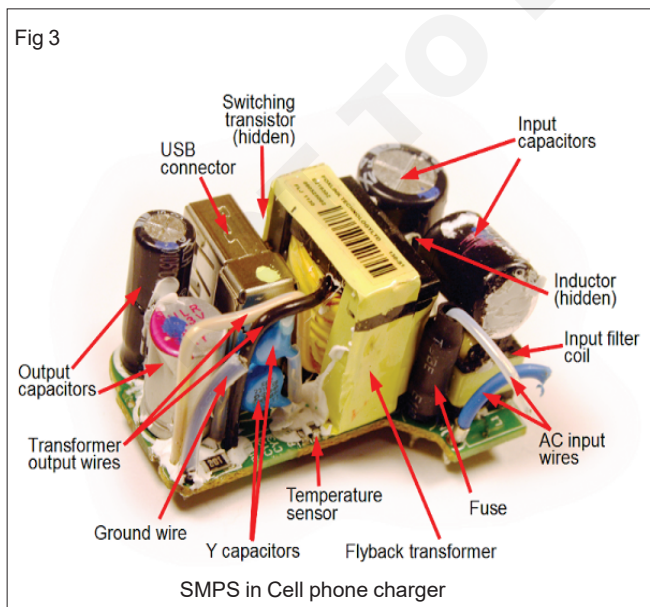
SMPS in DVD player (Fig 1)



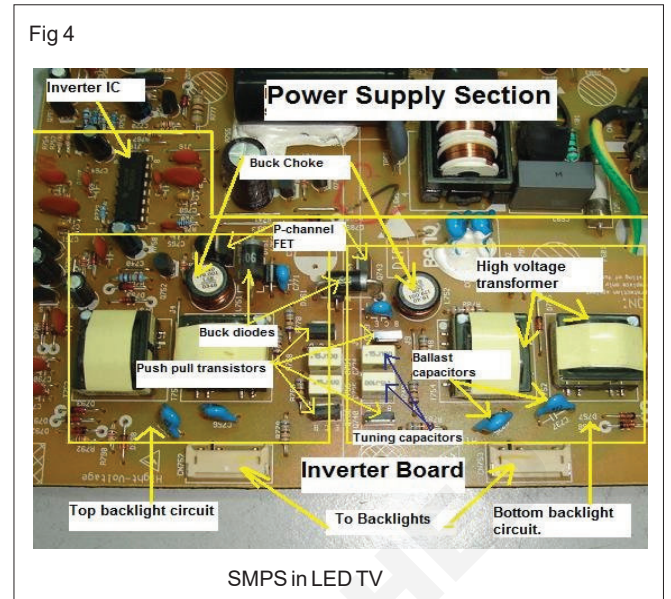
SMPS in Home theatre main board (Fig 2)



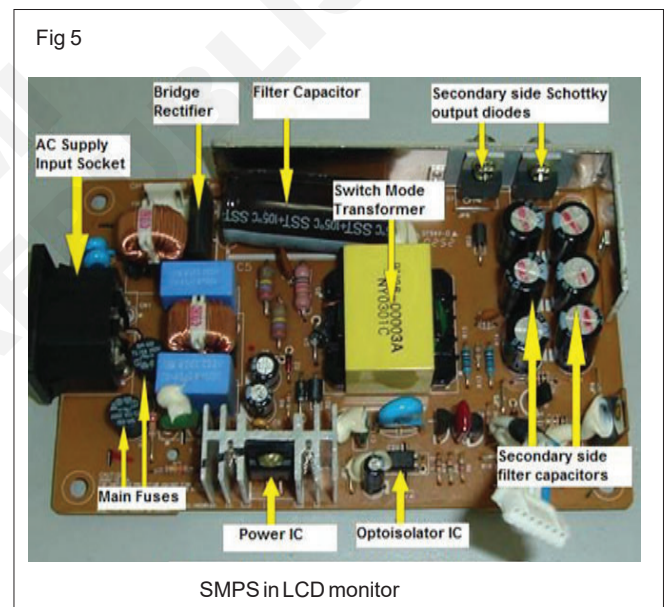
SMPS in Cell phone charger (Fig 3)



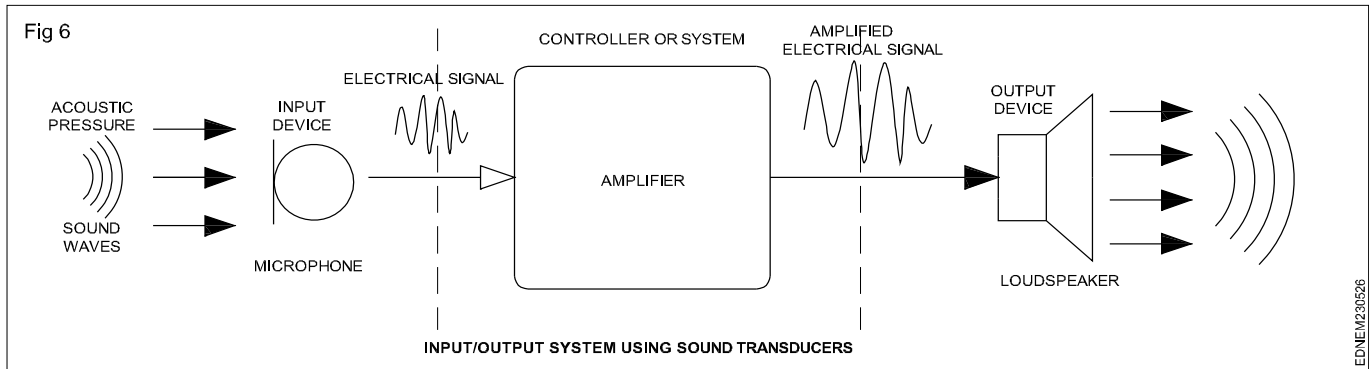
SMPS in LED TV (Fig 4)



SMPS in LCD monitor (Fig 5)



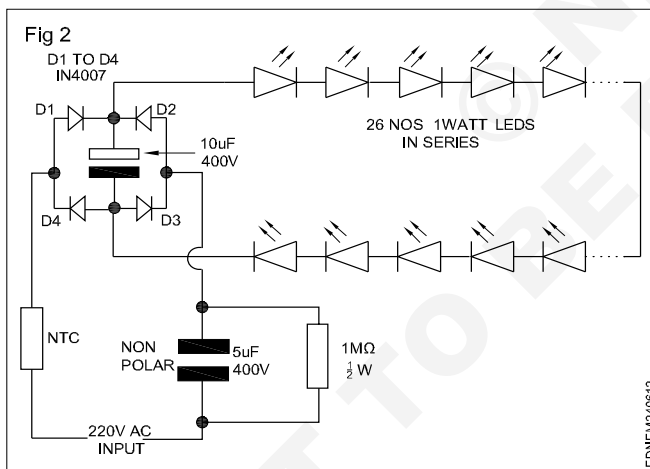
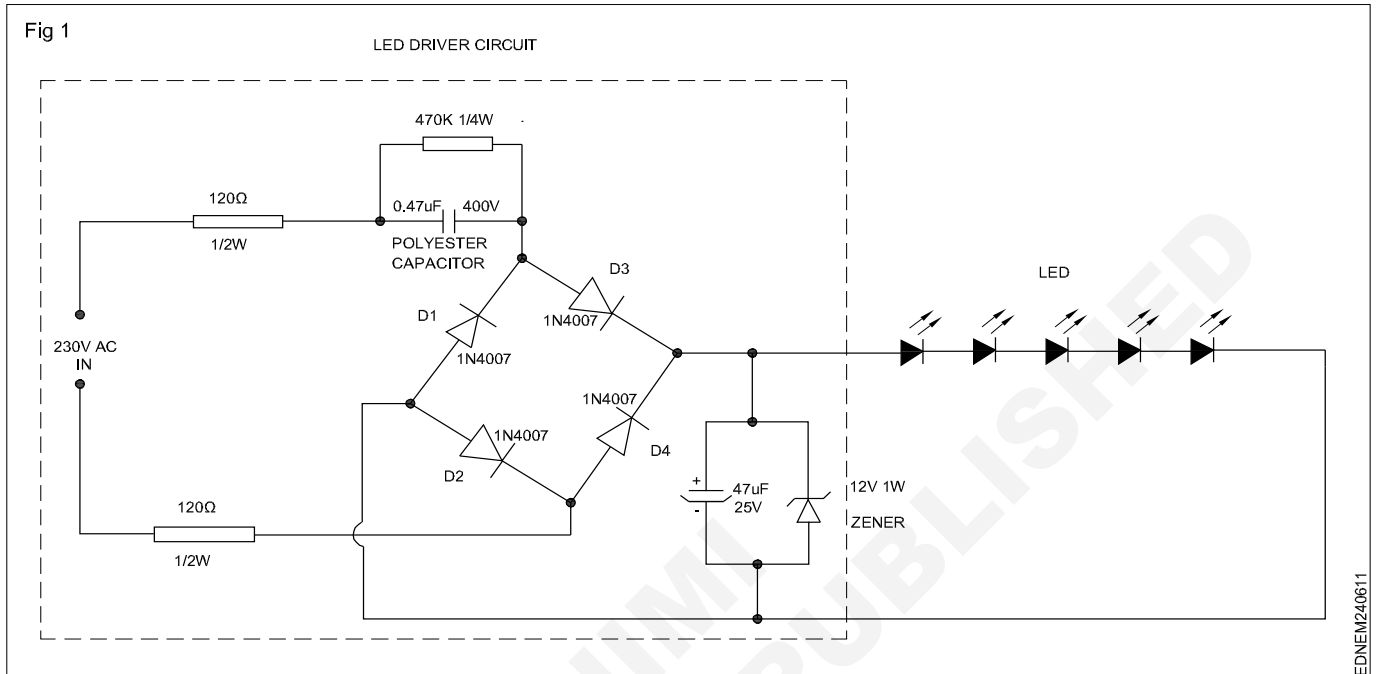
Simple Input/Output System using Sound Transducers as shown in Fig 6.



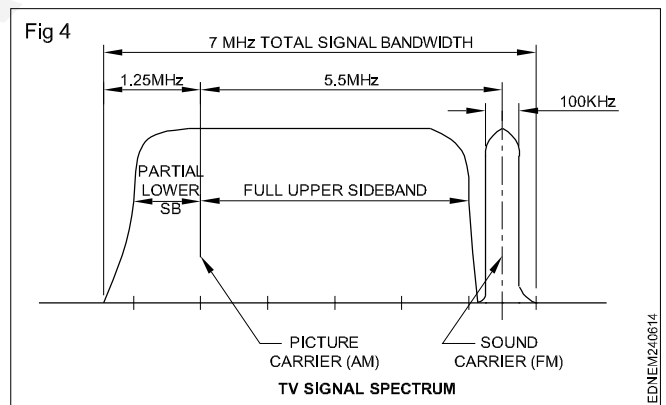
Drawing of electronics circuit diagram

Circuit Diagram

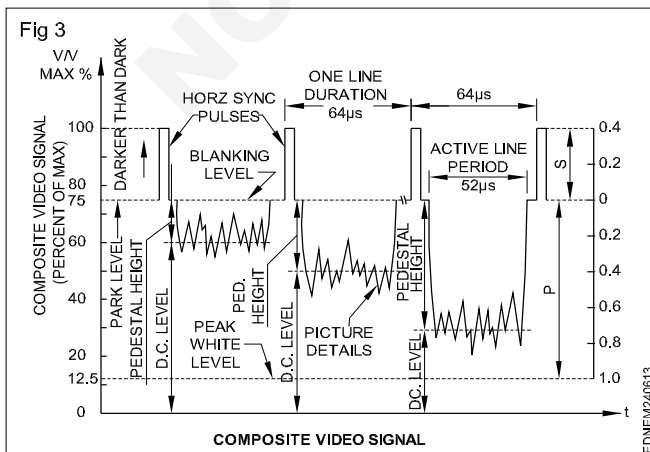
Different schematic of LED drivers (Fig 1&2)



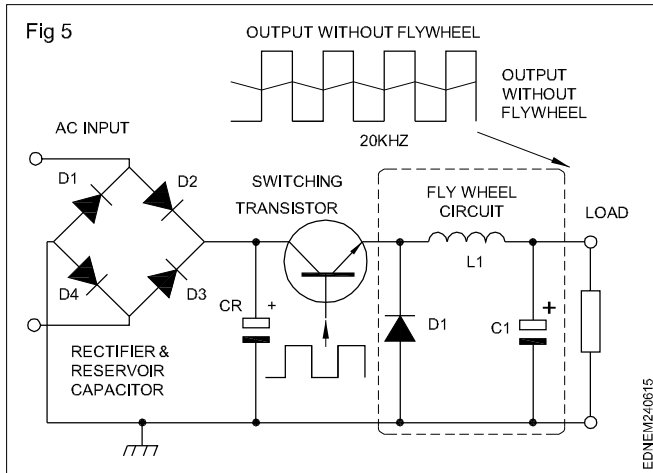
TV signal spectrum (Fig 4)



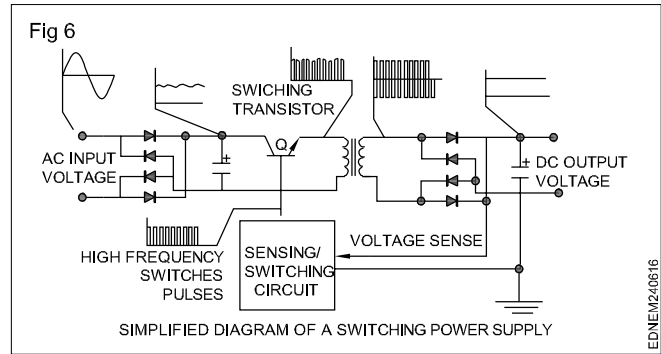
Composite video signal (Fig 3)



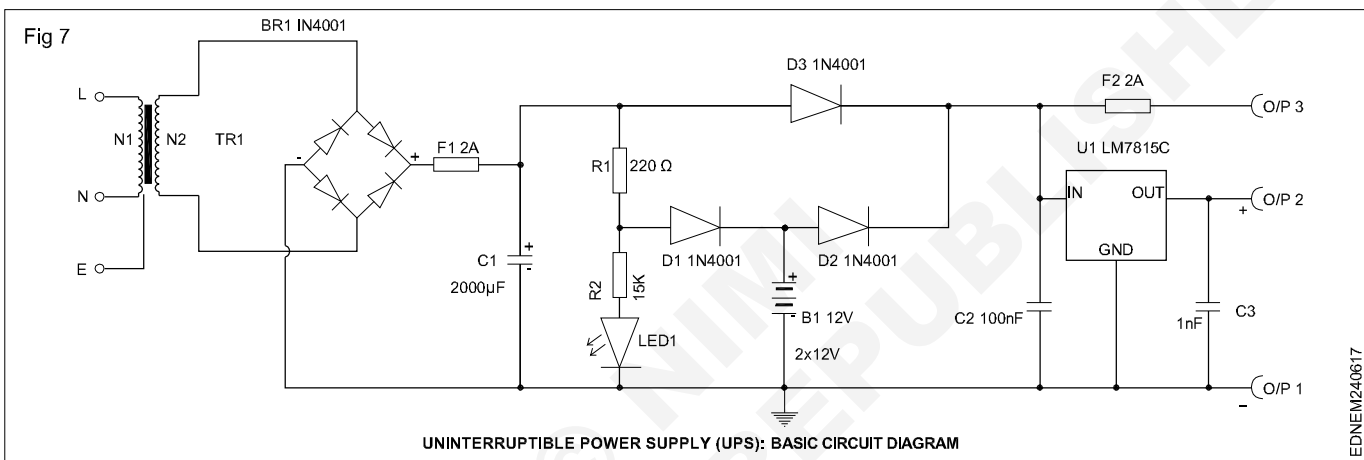
Buck converter (Fig 5)



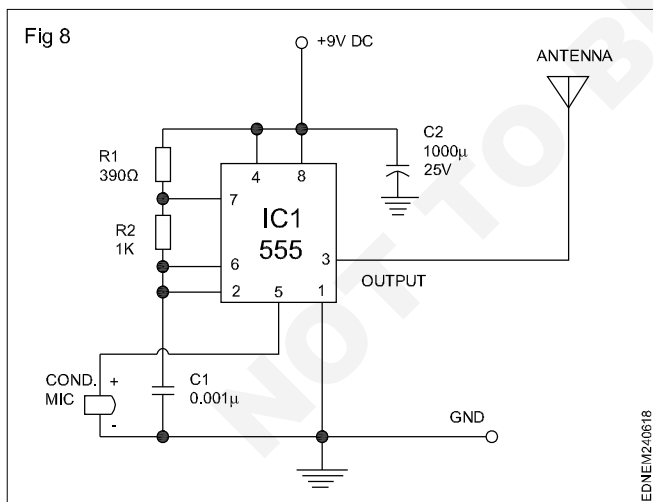
Function of SMPS in PC (Fig 6)



Un-interruptible power supply (UPS) : Circuit description and working (Fig 7)



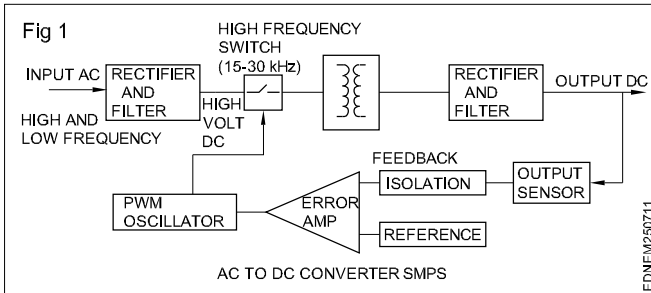
IC based AM transmitter circuit (Fig 8)



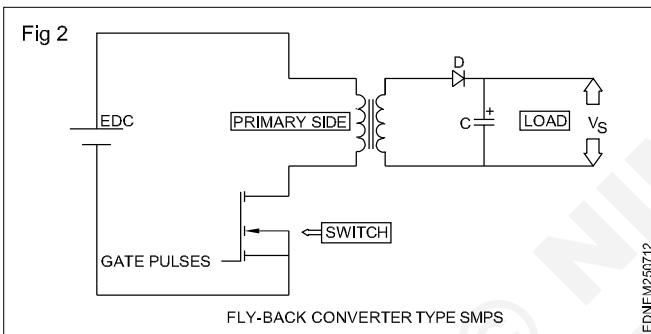
Drawing of block diagram of instruments & equipment of trades

Block Diagram

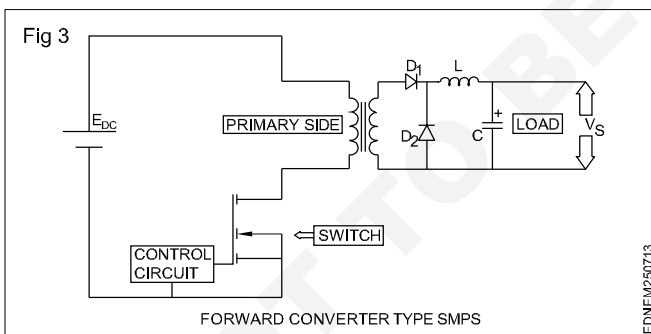
The block diagram of AC to DC converter SMPS is shown in Fig 1.



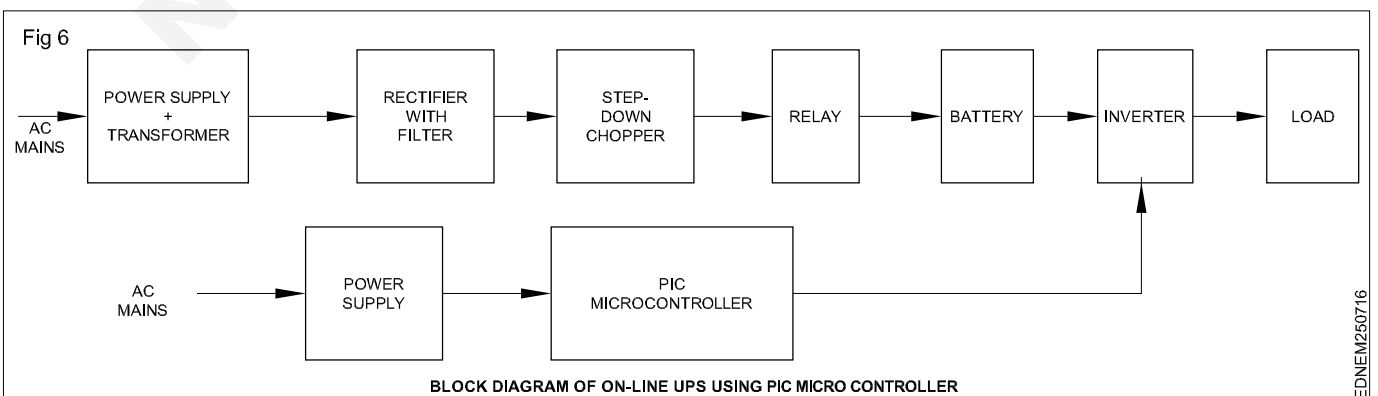
Fly-back converter type SMPS (Fig 2)



Forward converter type SMPS (Fig 3)



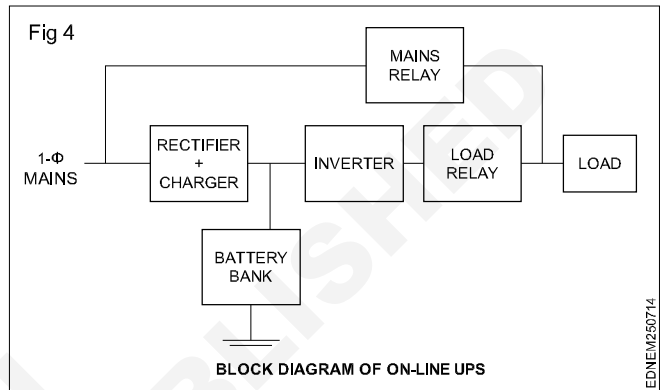
Block diagram of On-line UPS using pic micro controller (Fig 6)



Block diagram of Types of UPS

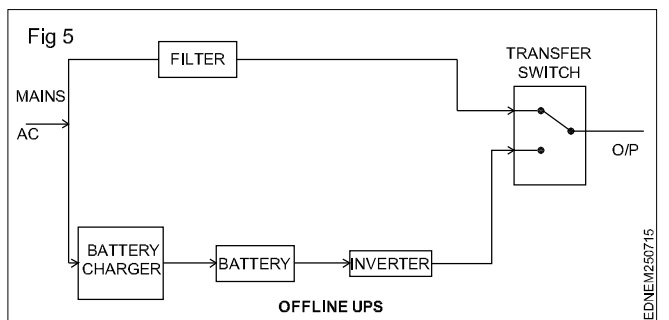
ON line UPS

When mains AC is available normal operation continues and the rectifier recharges the battery. A bypass switch connects mains AC directly to the output in case there is some problem with the UPS. (Fig 4)



OFF line UPS

An OFF line UPS is shown in Fig 5. It is also known as stand by UPS or Backup UPS and supplies emergency power when mains AC fail. The capacity of an off line UPS is generally below 1kVA. A very common application is with PC. In the event of sudden load shedding the off line UPS supplies emergency power to the PC so that work can be continued till normal power is restored or the PC can be safely switched off.



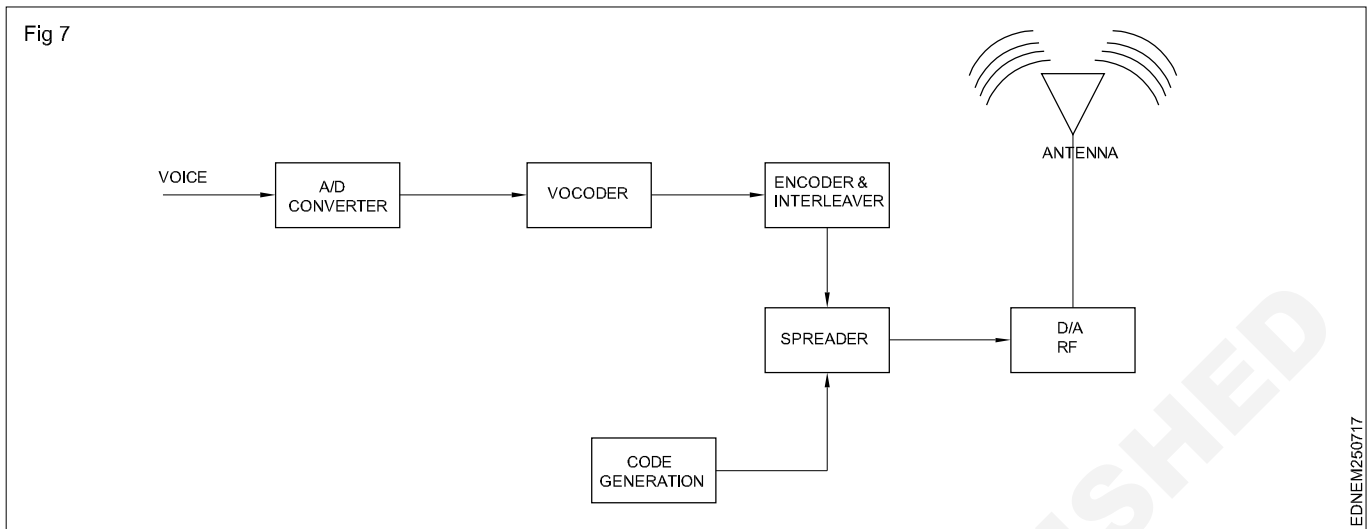
Block diagram of CDMA system

Fig 7 shows the block diagram of a CDMA system. It consists of

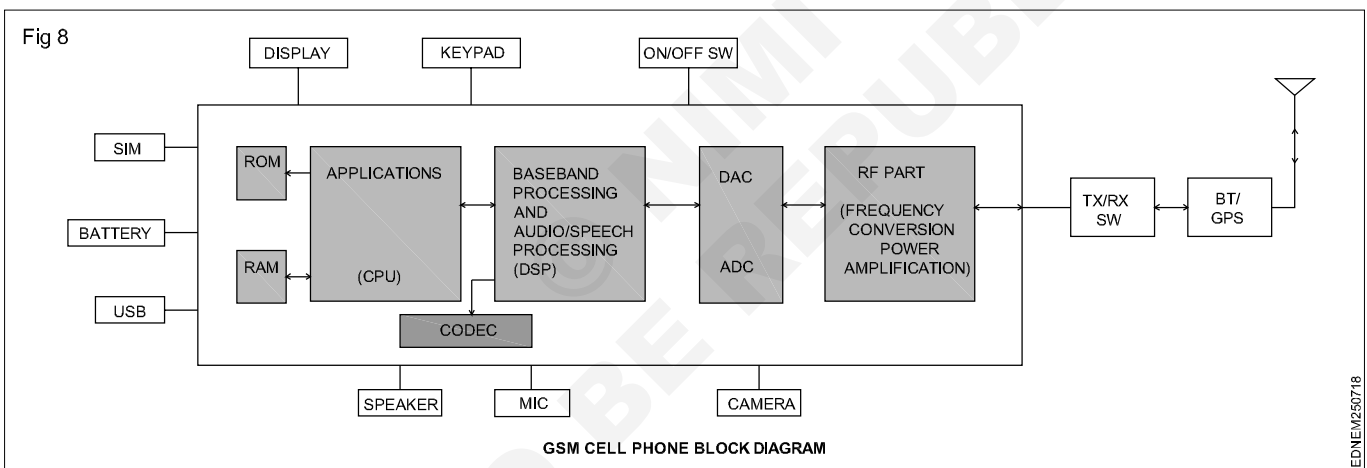
1 **A/D converter** - It converts analog voice signal to digital signal.

2 **Vocoder**-Digitalized voice is vocoded. Here the digital voice is variably compressed to make more efficient use of the air link and system resources.

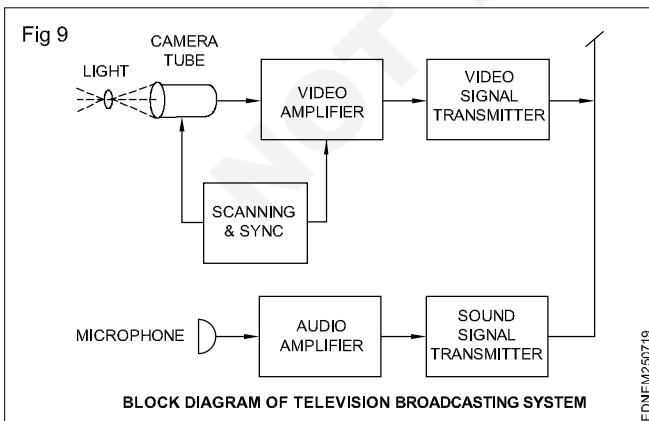
3 **Encoder and Interleaver** - The purpose of encoder is to build redundancy into the signal.



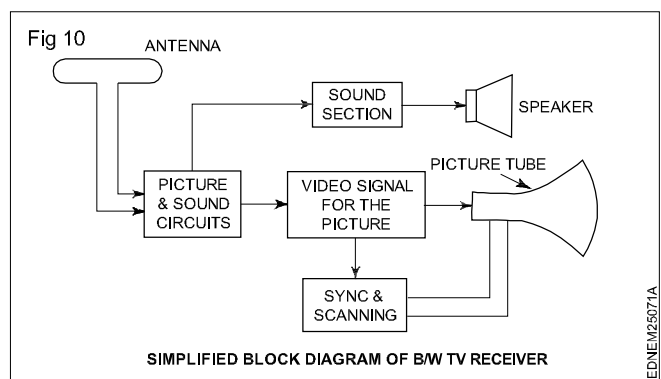
Block diagram and features of cell phones (Fig 8)



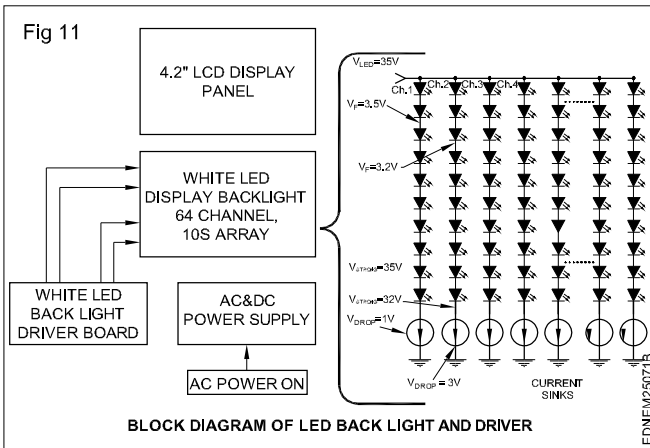
Block diagram of Television broadcasting system (Fig 9)



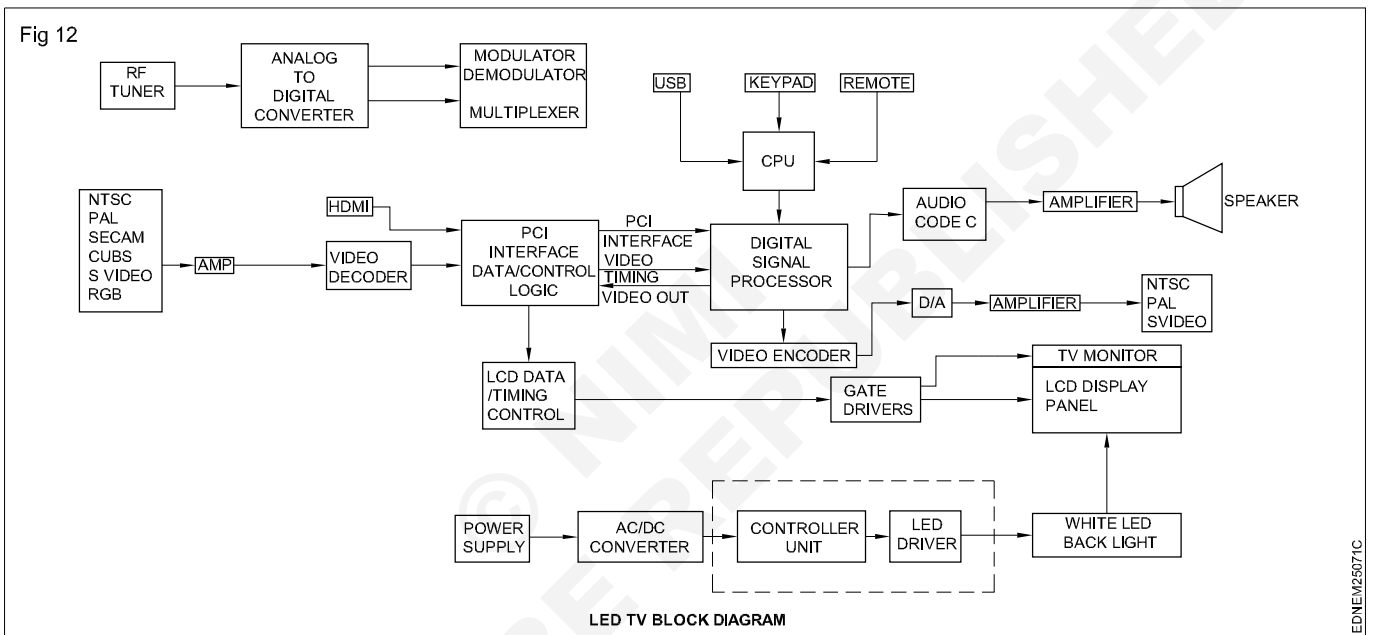
Simplified block diagram of B/W TV receiver (Fig 10)



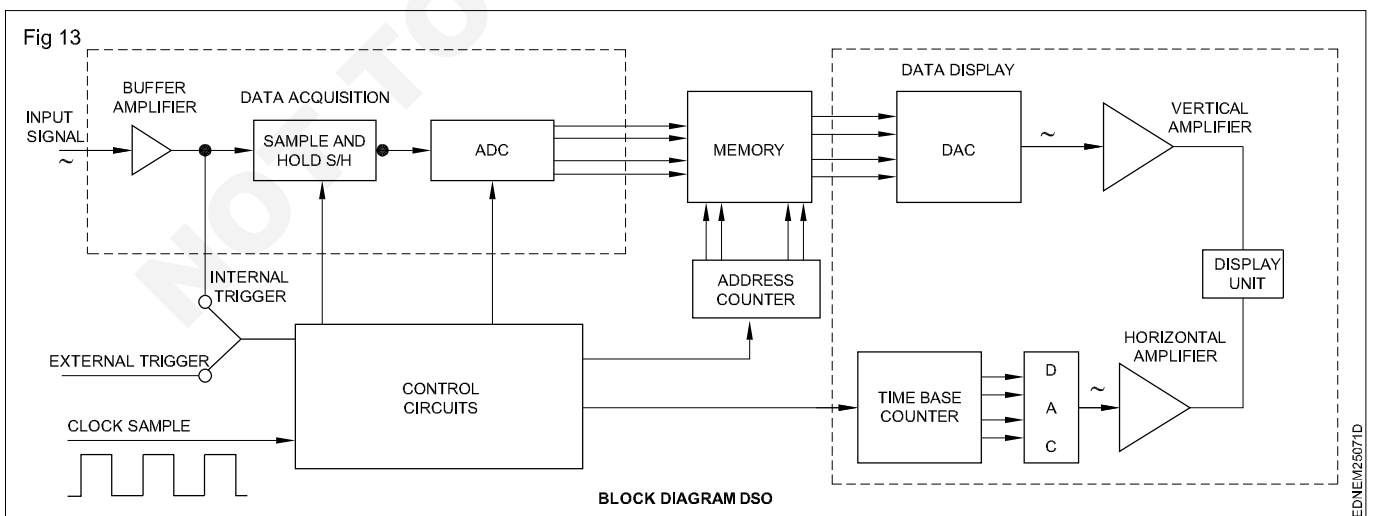
Block diagram of LED back light and driver (Fig 11)



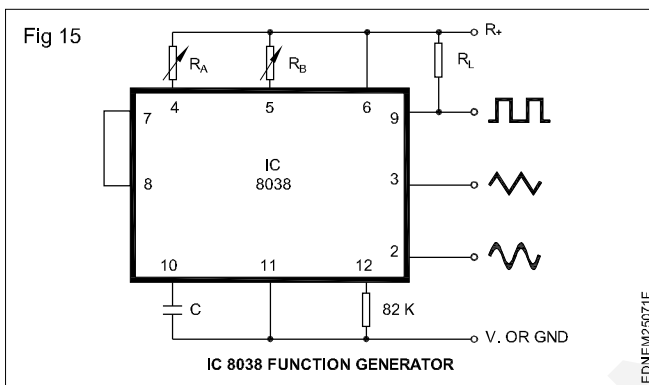
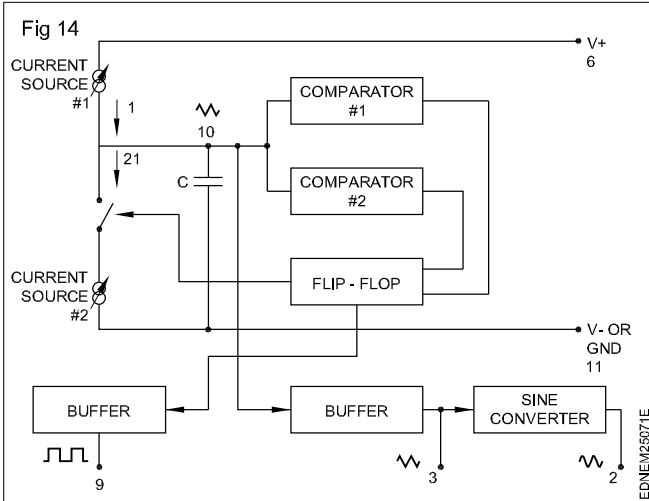
Block diagram of LED TV (Fig 12)



Block diagram of DSO (Fig 13)



Block diagram of Function generator using IC 8038 (Fig 14&15)

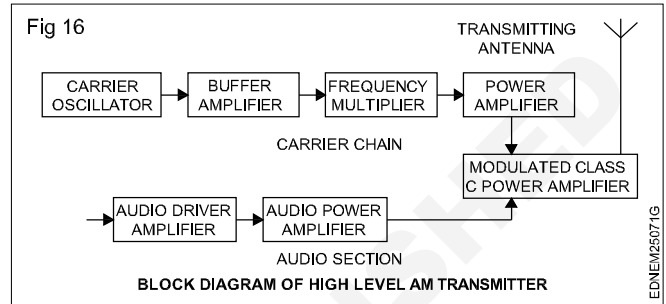


High level and low level transmitters

Below figure 16 show the block diagram of high level and low level transmitters. The basic difference between the two transmitters is the power amplification of the carrier and modulating signals.

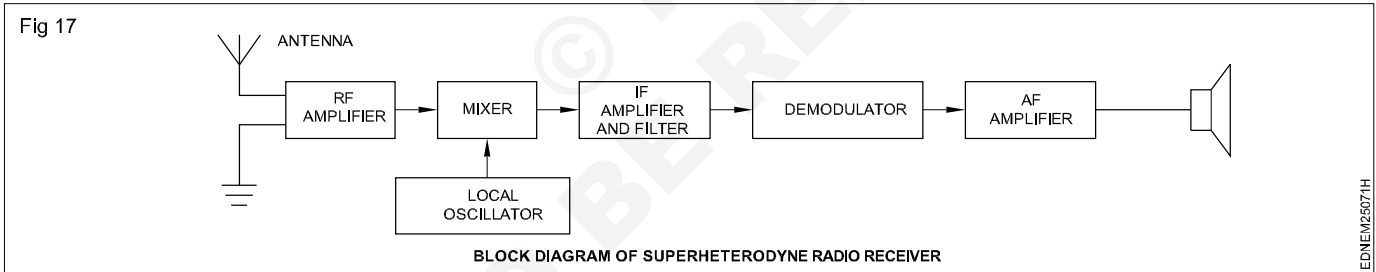
High level AM transmitter

Figure (16) is drawn for audio transmission. In high level transmission, the powers of the carrier and modulating signals are amplified before applying them to the modulator stage, as shown in figure (16). In low level modulation, the powers of the two input signals of the modulator stage are not amplified.



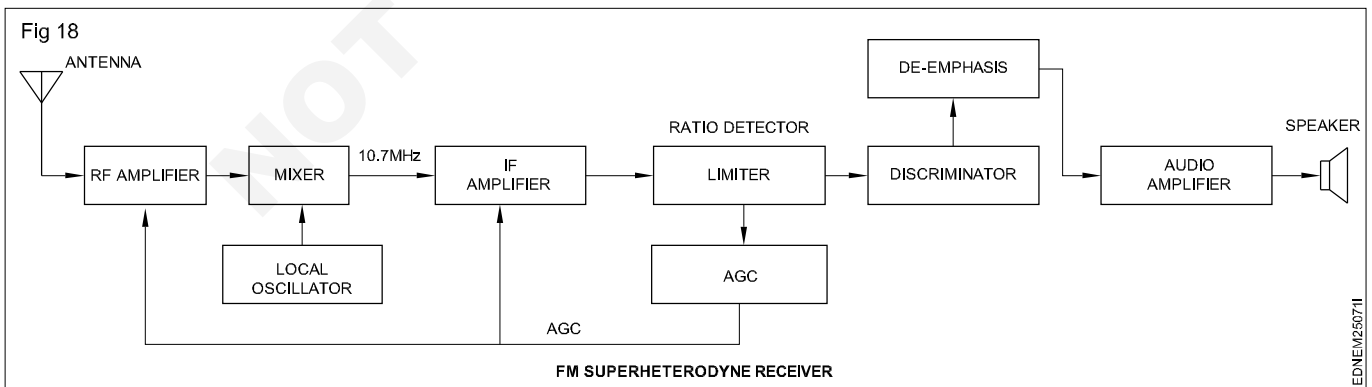
Basic superheterodyne block diagram and functionality

The basic block diagram of a basic superhet receiver is shown below in Fig 17. This details the most basic form of the receiver and serves to illustrate the basic blocks and their function.



FM Receiver

The block diagram of an FM superheterodyne receiver is shown in Fig 18



A typical FM receiver block diagram shown in Fig 18 is quite similar to that of AM receiver. The RF amplifier amplifies the received signal intercepted by the antenna. The amplified signal is then applied to the mixer stage.

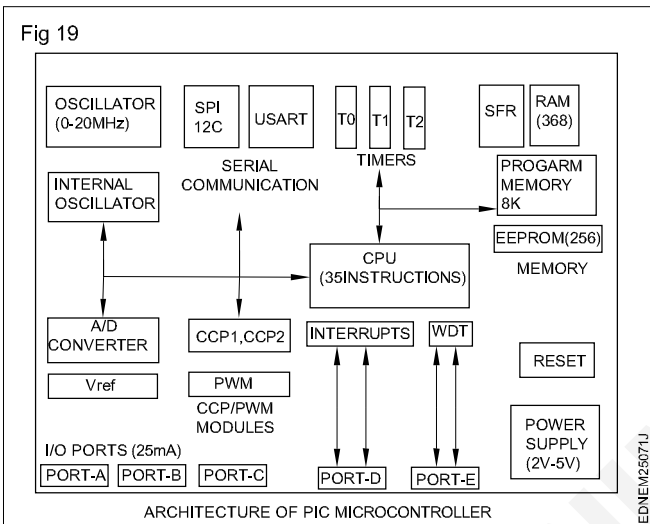
The second input of the mixer comes from the local oscillator. The two input frequencies of the mixer generate an IF signal of 10.7 MHz. This signal is then amplified by the IF amplifier. The output of the IF amplifier is applied to

the limiter circuit. The limiter removes the noise in the received signal and gives a constant amplitude signal.

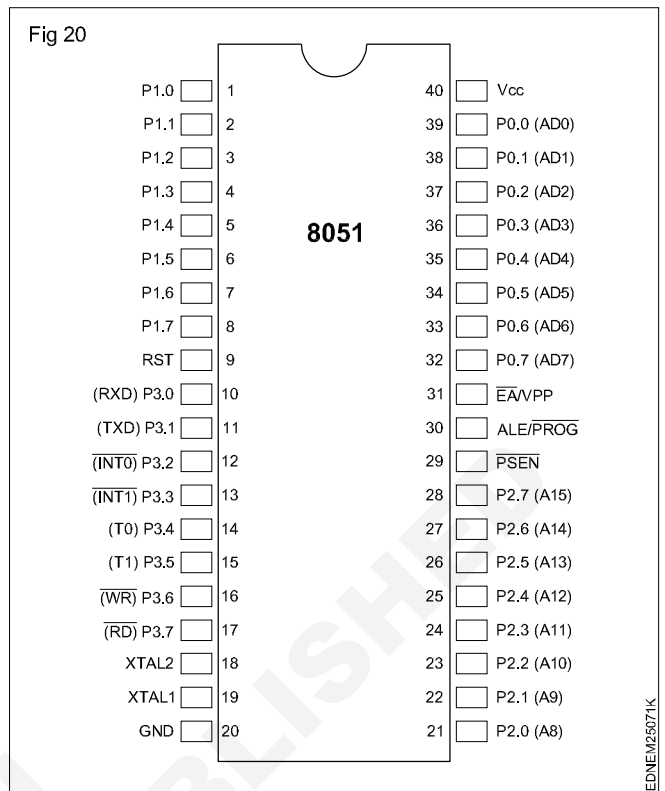
This circuit is required when a phase discriminator is used to demodulate an FM signal.

The output of the limiter is now applied to the FM discriminator or detector, which recovers the modulating signal.

The block diagram of PIC microcontroller architecture is shown in (Fig 19) comprises of central processing unit (CPU), I/O ports, A/D converter, memory organization, timers/counters, serial communication, interrupts, oscillator and CCP module.



Pin configuration of micro controller IC 8051 (Fig 20)



Pin description

Pin name	Function
A0 to A16	Address input
I/00 to I/07	Data input/output
CS 1	Chip Select 1
CS 2	Chip Select 2
WE	Write Enable
OE	Output Enable
V _{cc}	Power supply
V _{ss}	Ground
NC	No Connection

Port 0 (p 0.0 to p 0.7)

It is 8-bit bi-directional I/O port. It is bit/byte addressable. During external memory access, it functions as multiplexed data and low - order address bus AD0 - AD7.

Port 1 (p 1.0 to p 1.7)

It is 8-bit bi - directional I/O port. It is bit/byte addressable. When logic '1' is written into port latch them it works as input mode. It functions as simply I/O port and it does not have any alternative function.

