

ENGINEERING DRAWING

(NSQF)

2nd YEAR
(For 2 Year Trades)

(As per Revised Syllabus July 2022)

Group 25

Group 25 CTS Trades Covered

Refrigeration and Air conditioning & Central Air condition Plant Mechanic



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 25 Engineering Trades

As per Revised syllabus July 2022 under CTS

Developed & Published by



National Instructional Media Institute

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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 25 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 25 - 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 25 - 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 25 - Engineering Trades** as per NSQF Revised 2022.

MEDIA DEVELOPMENT COMMITTEE MEMBERS

Shri. M. Sangara pandian	-	Training Officer (Retd.) CTI, Govt. of India, Guindy, Chennai - 32.
Shri. G. Sathiamoorthy	-	Jr. Training Officer - SG (Retd.) Govt I.T.I, Trichy, DET - Tamilnadu.
Smt. M.V. Vijayavalli	-	Assistant Training Officer, Govt. I.T.I., Guindy, DET - Tamilnadu.

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 25 - 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 Electrical, Electronic & Mechanical Sign and Symbols used in RAC	2.1.01	4
2	Sketches of Electrical, Electronic & Mechanical components used in RAC	2.2.02	6
3	Reading of Electrical wiring diagram and Layout diagram	2.3.03	10
4	Drawing of Electrical circuit diagram used in RAC	2.4.04	10
5	Drawing of Block diagram of Instruments & equipment of trades	2.5.05	10
			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 Year.

CONTENTS

Exercise No.	Topic of the Exercise	Page No.
2.1.01	Reading of Electrical, Electronic & Mechanical Sign and Symbols used in RAC Reading of electrical, electronic & mechanical sign and symbols used in RAC	1
2.2.02	Sketches of Electrical, Electronic & Mechanical components used in RAC Sketches of electrical, electronic & mechanical components used in RAC	5
2.3.02	Reading of Electrical wiring diagram and Layout diagram Reading of electrical wiring diagram and layout diagram	10
2.4.04	Drawing of Electrical circuit diagram used in RAC Drawing of electrical circuit diagram used in RAC	21
2.5.05	Drawing of Block diagram of Instruments & equipment of trades Drawing of block diagram of instruments & equipment of trades	26

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 25 - Revised syllabus July 2022
2 Year Engineering trades under CTS**

Duration: 2 Year

CTS Trades Covered: Refrigeration and Air conditioning & Central Air condition Plant
Mechanic

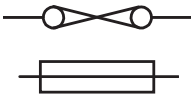

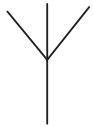

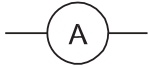

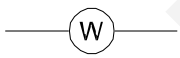

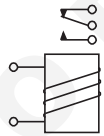

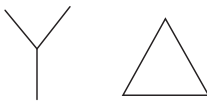
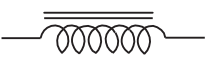
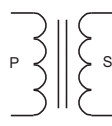
S.no.	Syllabus	Time in Hrs
1	Reading of Electrical, Electronic & Mechanical Sign and Symbols used in RAC	4
2	Sketches of Electrical, Electronic & Mechanical components used in RAC	6
3	Reading of Electrical wiring diagram and Layout diagram	10
4	Drawing of Electrical circuit diagram used in RAC	10
5	Drawing of Block diagram of Instruments & equipment of trades	10
	Total	40

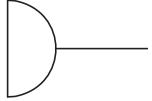
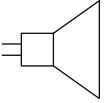

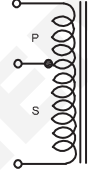
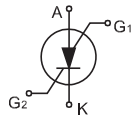
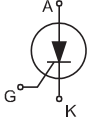
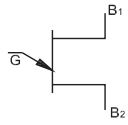
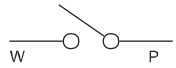
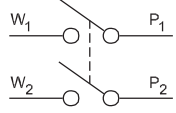
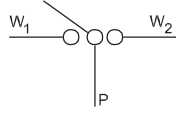
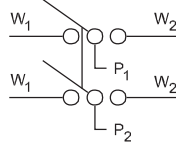
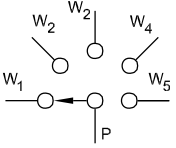
Reading of electrical, electronic & mechanical sign and symbols used in RAC



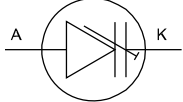
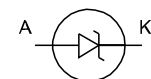
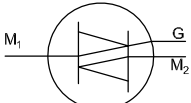
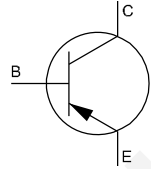
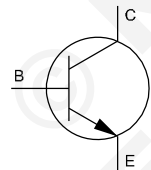
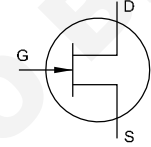
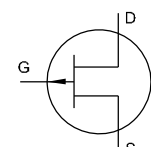
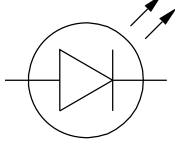
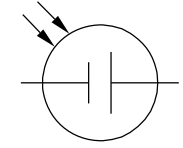
Reading of Signs and Symbols in RAC

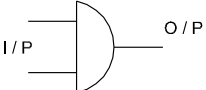
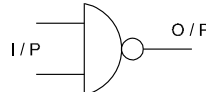


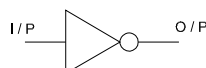

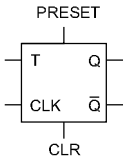
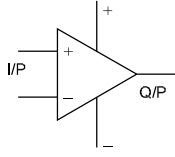



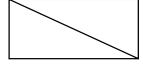
S.No.	Description	Symbol
1	D.C.	
2	A.C.	
3	Positive	
4	Negative	
5	Single Phase A.C. 50 Hz	
6	Three Phase A.C., 50 Hz	
7	A.C. / D.C.	
8	Earth	
9	Cell	
10	Battery	

S.No.	Description	Symbol
11	Single pole single throw 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	

S.No.	Description	Symbol
21	Fuse: ordinary cartridge	
22	Socket 2 pin, 3 pin	
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	

S.No.	Description	Symbol
34	Carbon microphone	
35	Loudspeaker	
36	Diode	
37	Auto transformer	
38	Silicon Bilateral switch (SBS)	
39	SCR	
40	UJT	
41	SPST switch	
42	DPST switch	
43	SPDT switch	
44	DPDT switch	
45	Single Pole 5 way rotary switch	

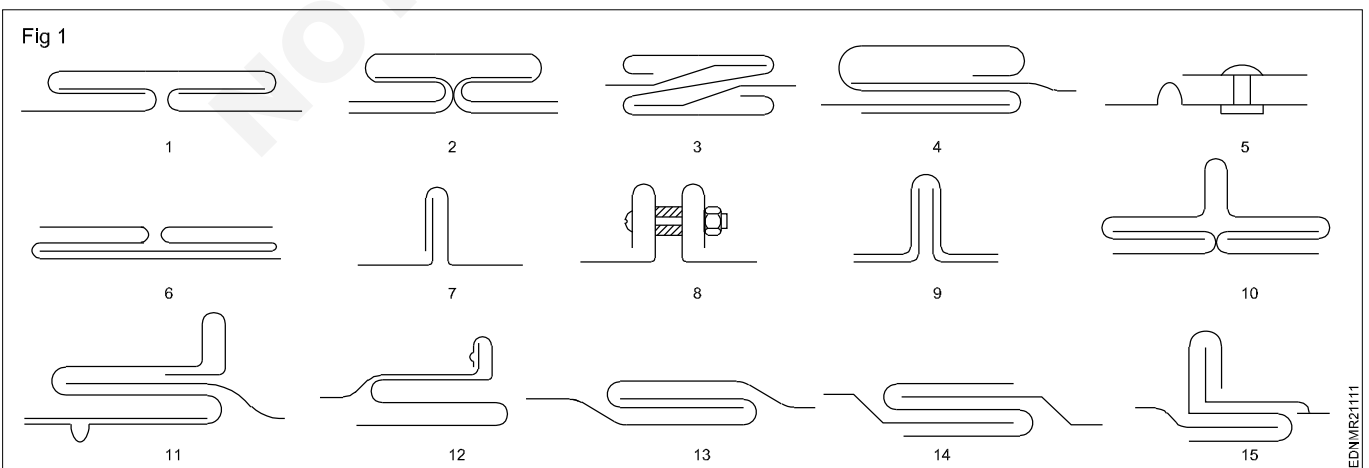
S.No.	Description	Symbol
46	Piezoelectric crystal	
47	Diac	
48	Varactor diode	
49	Zener diode	
50	TRIAC	
51	PNP transistor	
52	NPN transistor	
53	FET N-channel	
54	FET P-channel	
55	Light Emitting Diode	
56	Photo voltaic cell	

S.No.	Description	Symbol
57	AND Gate	
58	NAND Gate	
59	OR Gate	
60	NOR Gate	
61	NOT Gate	
62	EX-OR Gate	
63	T Flip-Flop	
64	Operational amplifier	
65	Analog multimeter	
66	Supply air duct air direction toward reader	
67	Supply air duct air direction away from reader	
68	Return air duct	

S.No.	Description	Symbol
69	Outside air or exhaust air duct	
70	Square - to - round transition	
71	Splitter damper	
72	Volume extractor	
73	Square elbow with turning vanes	
74	Radius elbow	
75	Mitered elbow	
76	Flexible duct connector	
77	Volume damper	

S.No.	Description	Symbol
78	Size transition - Rectangular or round	
79	Centrifugal fan	
80	Thermostat	
81	Round	
82	Square	
83	Equipment identification	
84	Reference to see note 3 elsewhere on the drawing	
85	Centerline	
86	Building outlet with 3-way throw	
87	Supply outlet with 3-way throw	

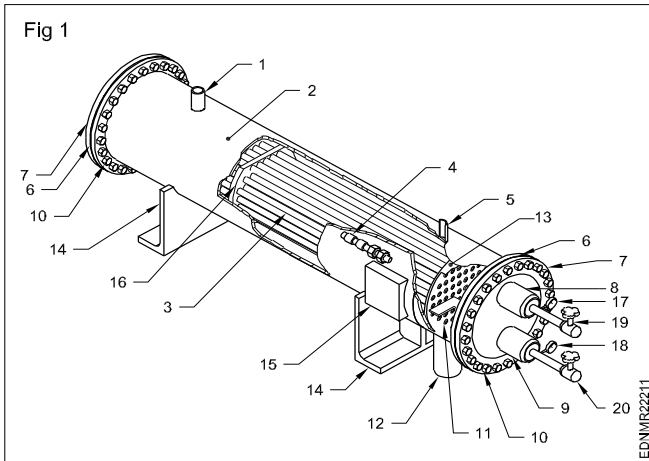
Duct joint/symbols (Fig 1)



Sketches of electrical, electronic & mechanical components used in RAC

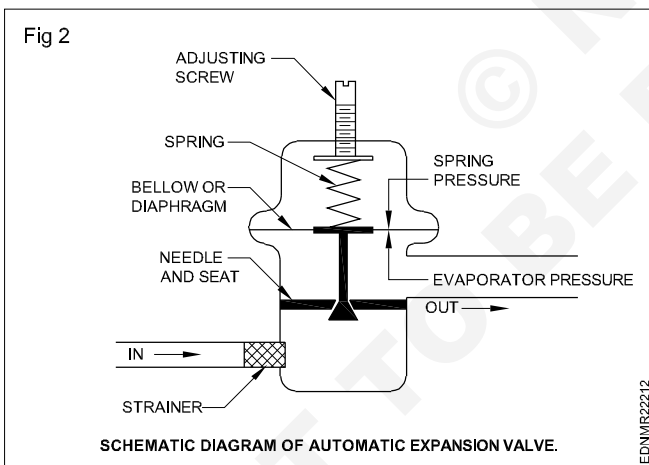
Shell and tube condenser (Fig 1)

A shell and tube condenser consist of a shell, tube sheet and tubes water box's and refrigerant connections. In the smaller sizes shell may be standard pipe but welded shells are used in large sizes.



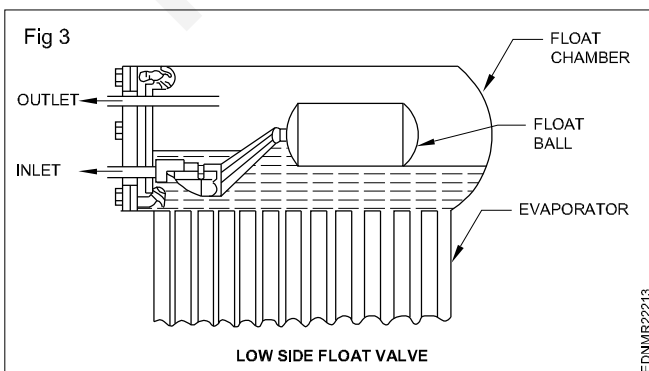
Automatic expansion valve (Fig 2)

The automatic expansion valve functions to maintain a constant pressure in the evaporator.



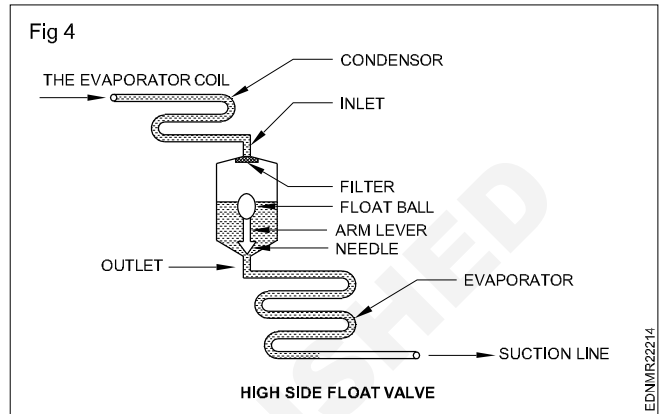
Low side float valve (Fig 3)

Low side float valve is used in flooded type evaporator and on the low side of the system.



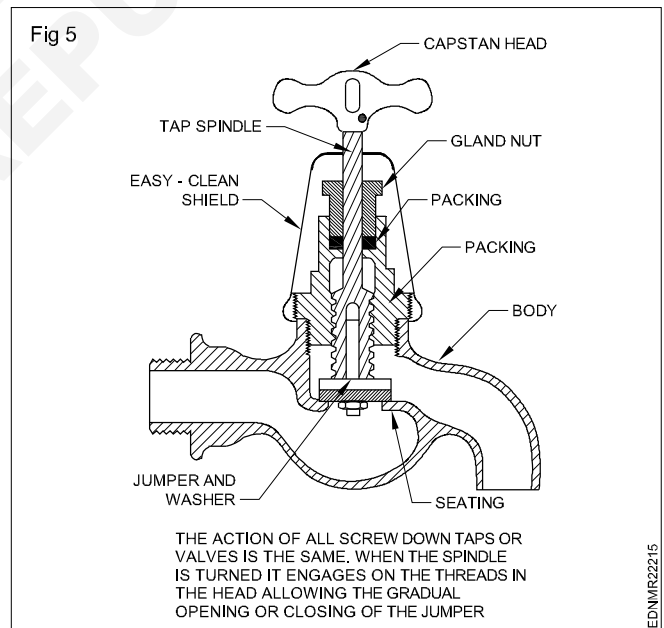
High side float valve (Fig 4)

High side float valve is a refrigeration control device in mechanical refrigeration system.

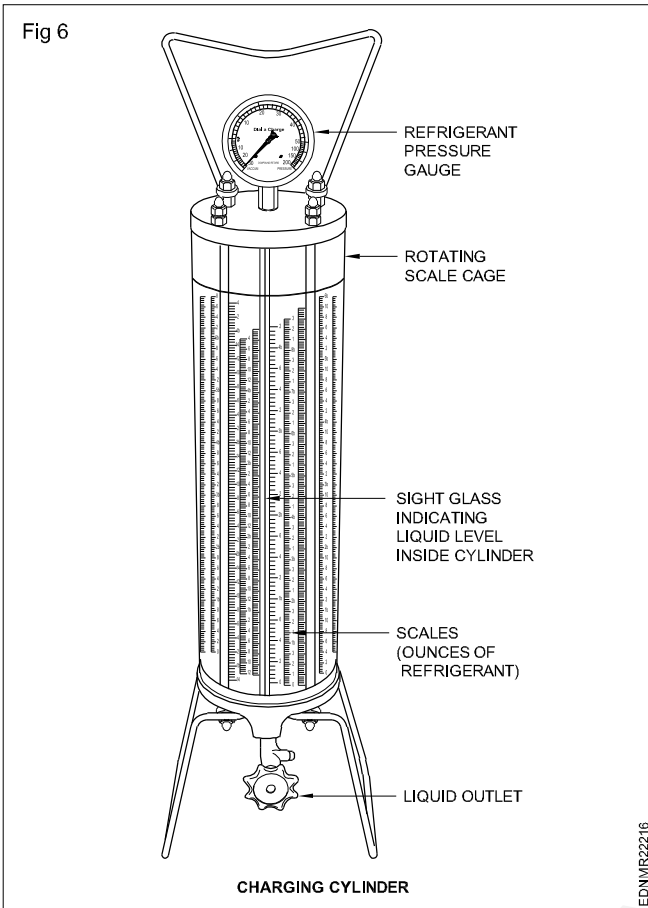


Bib tap for dispensing cold water (Fig 5)

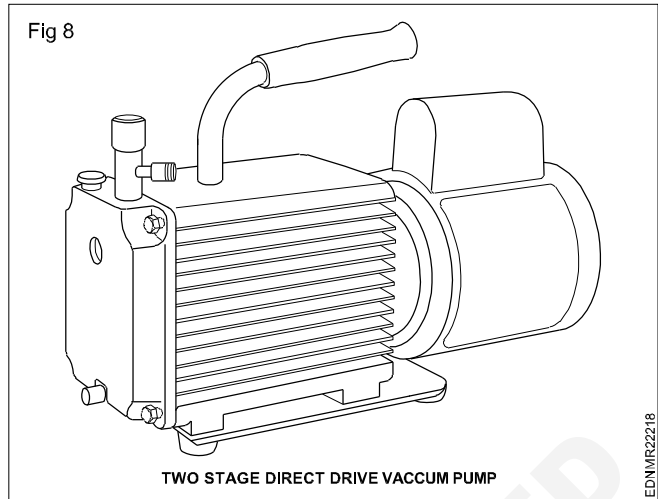
Bib tap The bib tap is a typical example of a screw down tap This could be fitted to a water cooler.



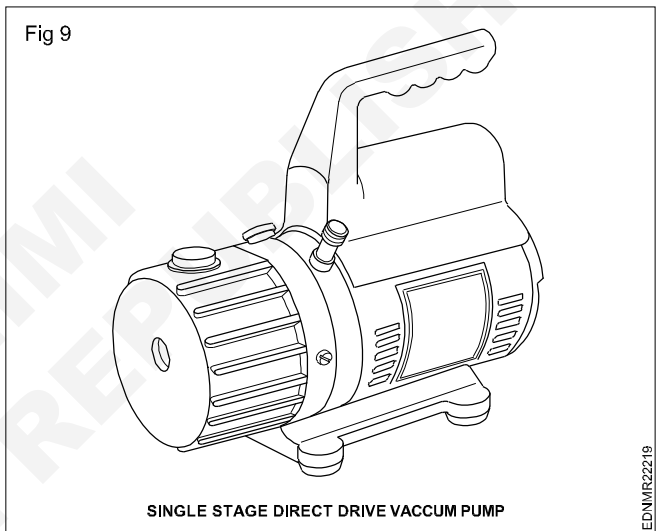
Charging cylinder (Fig 6)



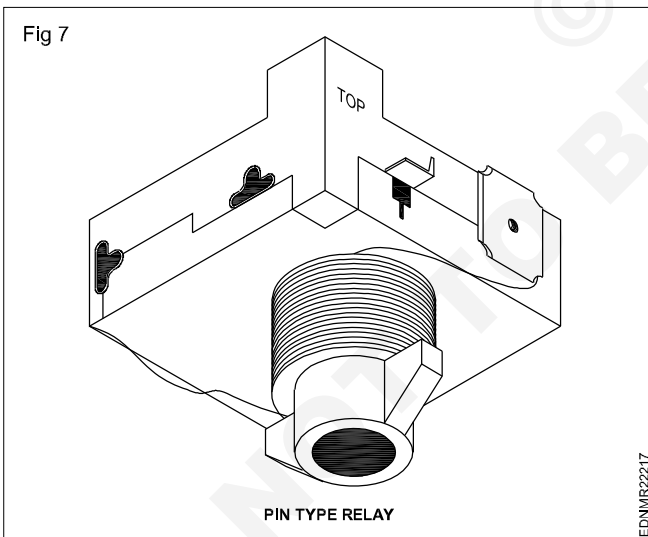
Two stage direct drive vacuum pump (Fig 8)



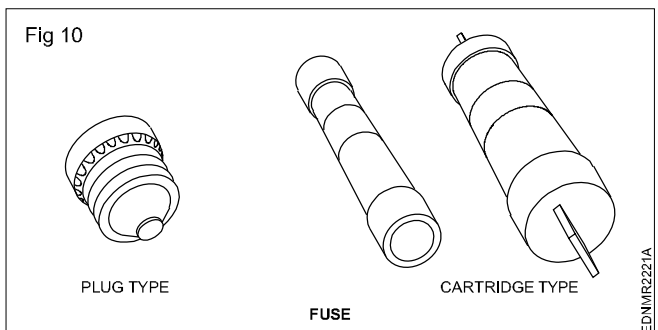
Single stage direct drive vacuum pump (Fig 9)



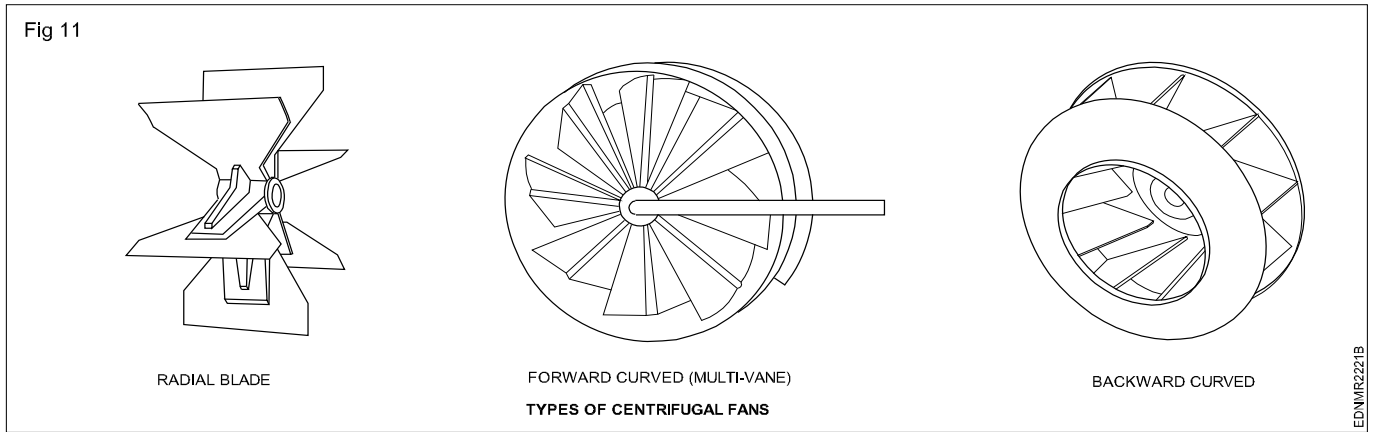
PIN type relay (Fig 7)



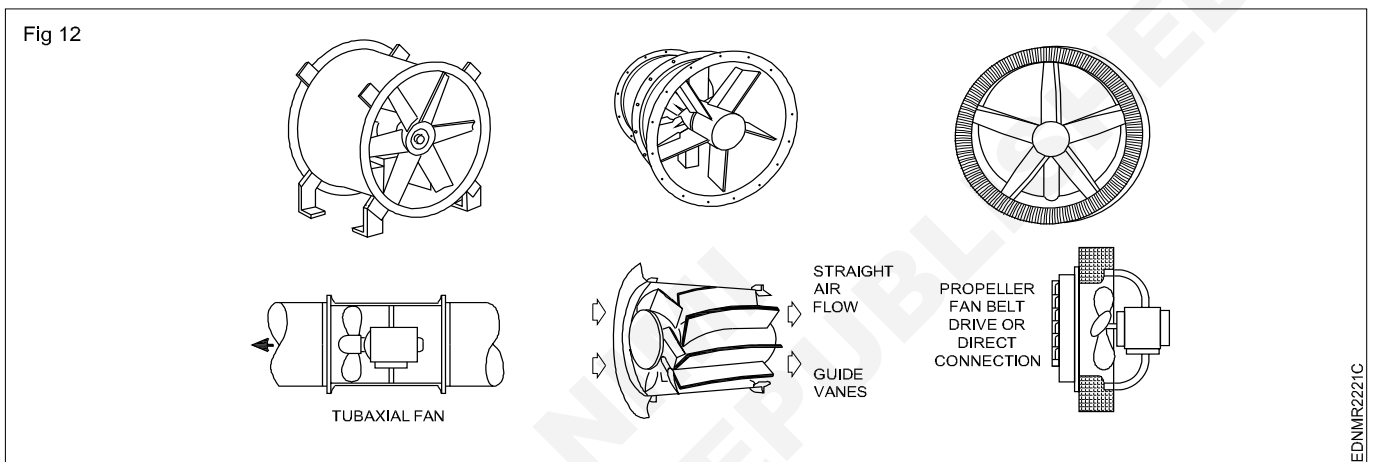
Fuses (Fig 10): Fuses are intact (low melting point) alloys which are formed into links to be inserted into electrical circuit. Their purpose is to melt breaking the circuit when a predetermined temperature related to current is exceeded.



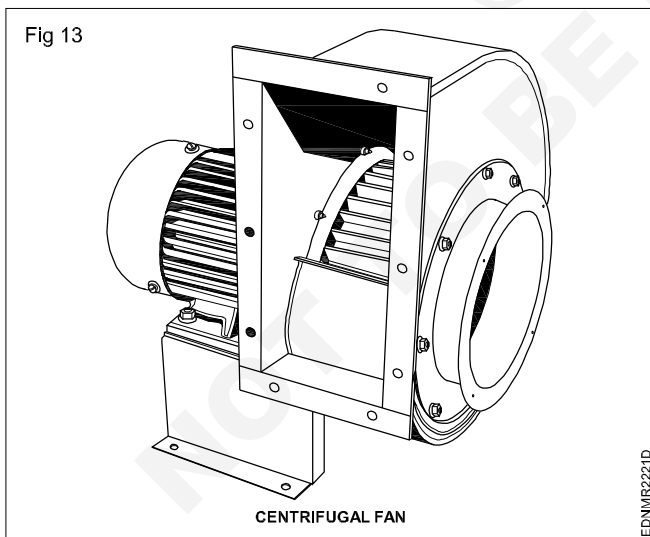
Types of Centrifugal fans (Fig 11)



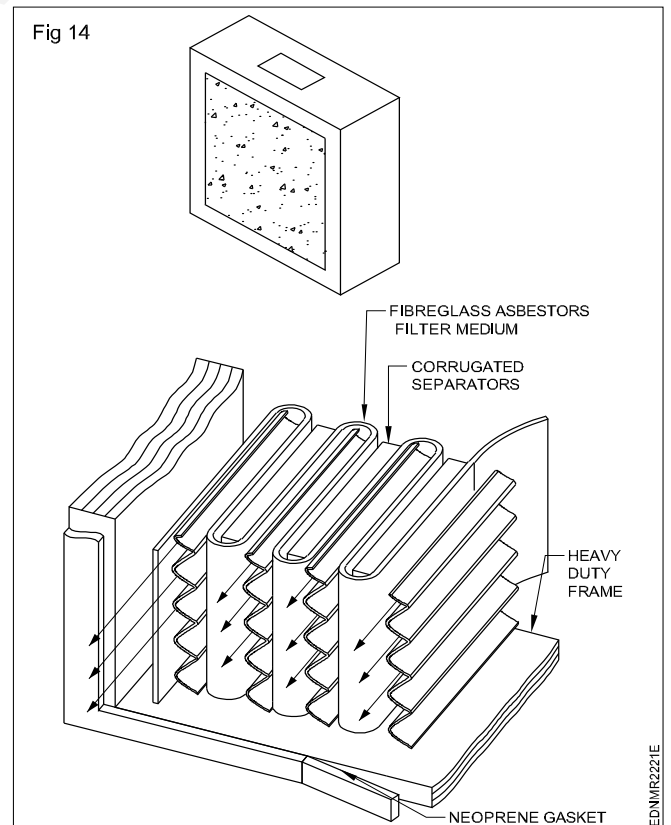
Types of Axial fans (Fig 12)



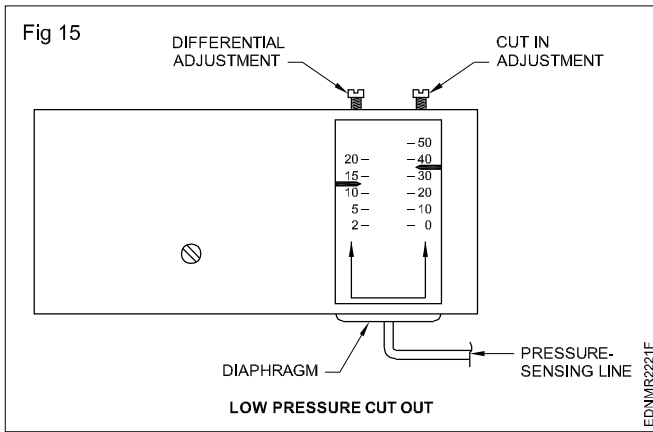
Centrifugal fans (Fig 13)



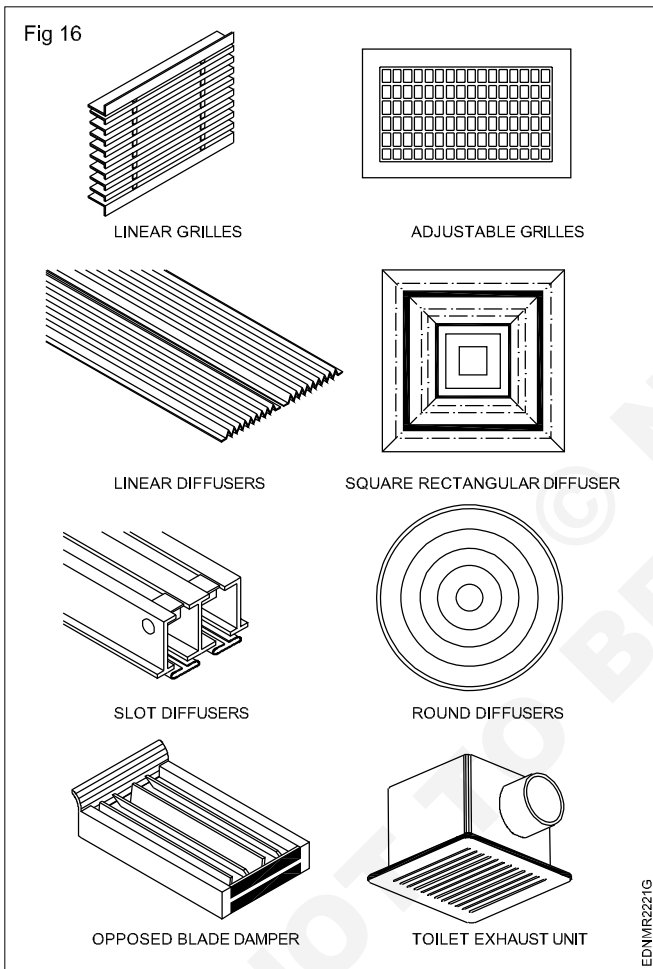
Filters (Fig 14)



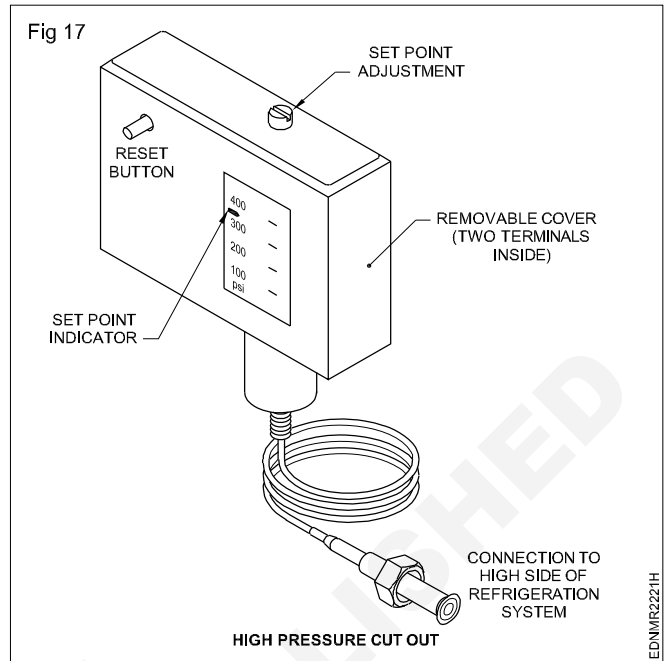
Low pressure cutout switch (Fig 15)



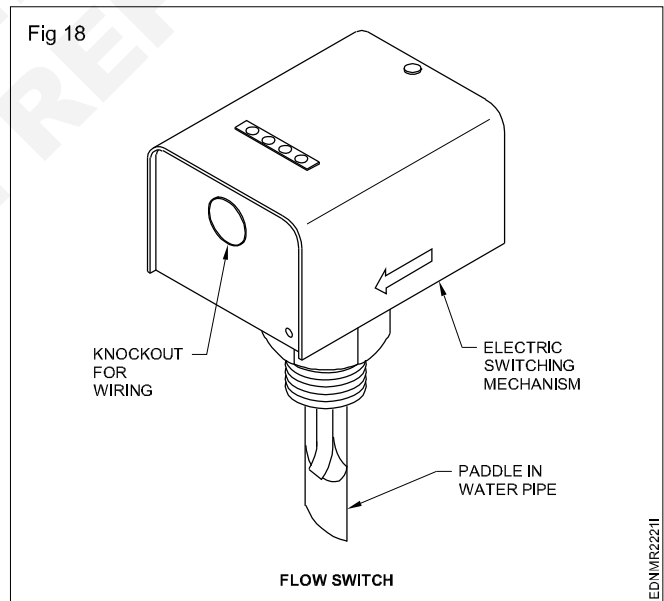
Ducts, grilles and diffusers (Fig 16)



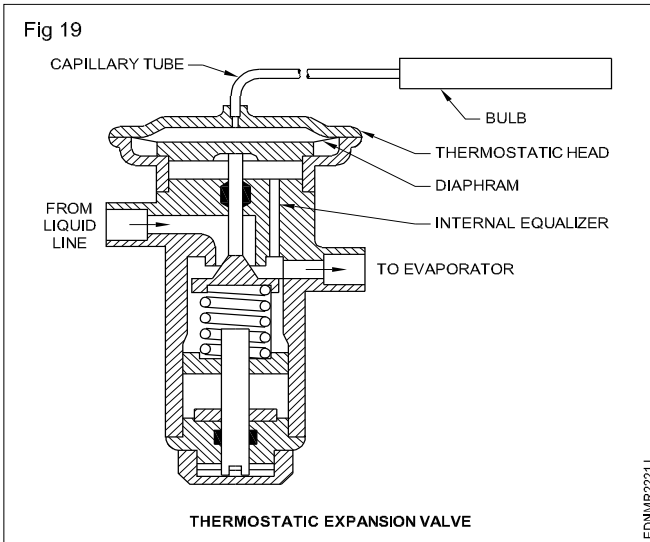
High pressure cutout: When the discharge pressure of the compressor exceeds a certain point, the high pressure switch opens its contact and stops the compressor motor. It is a manual rest (Fig 17)



Water pressure cutout switch: This switches are installed in the condenser water and chilled water lines. When the flow in the lines falls below the safety level, and this stops the compressor (Fig 18).

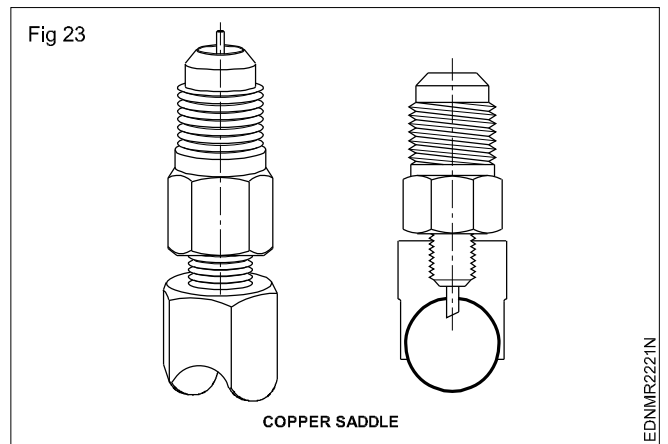


Thermostatic expansion valve (Fig 19)



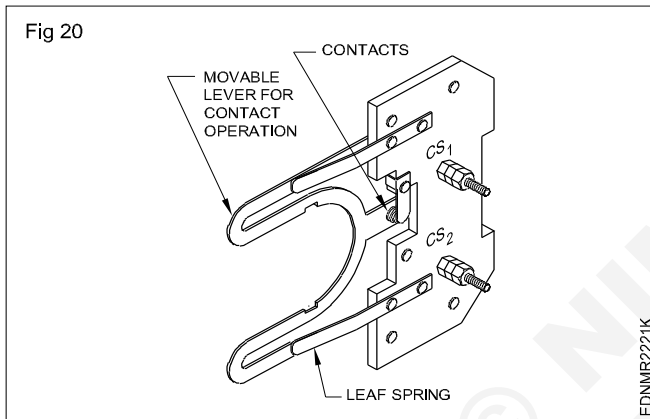
EDNMR2221J

Copper saddle (Fig 23)



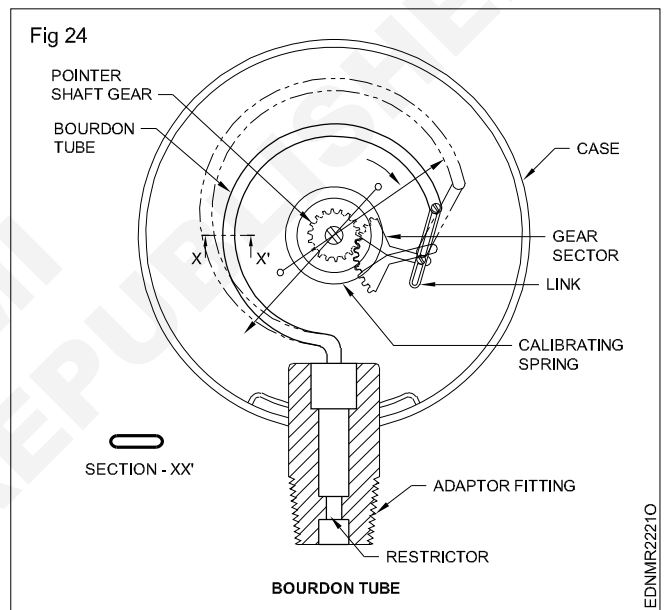
EDNMR2221N

Centrifugal switch (Fig 20)



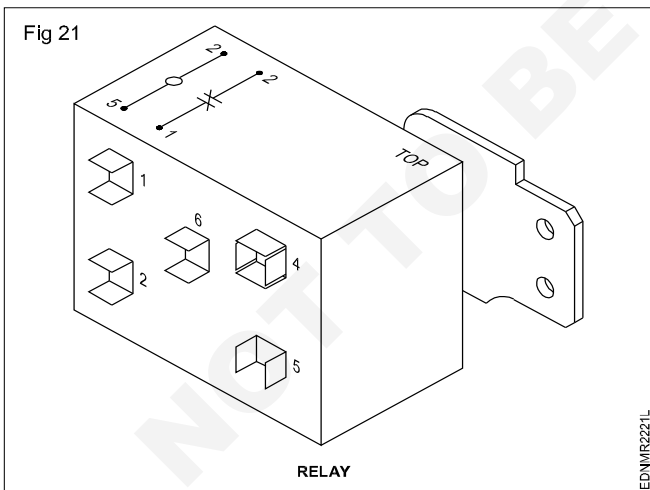
EDNMR2221K

Bourdon tube (Fig 24)



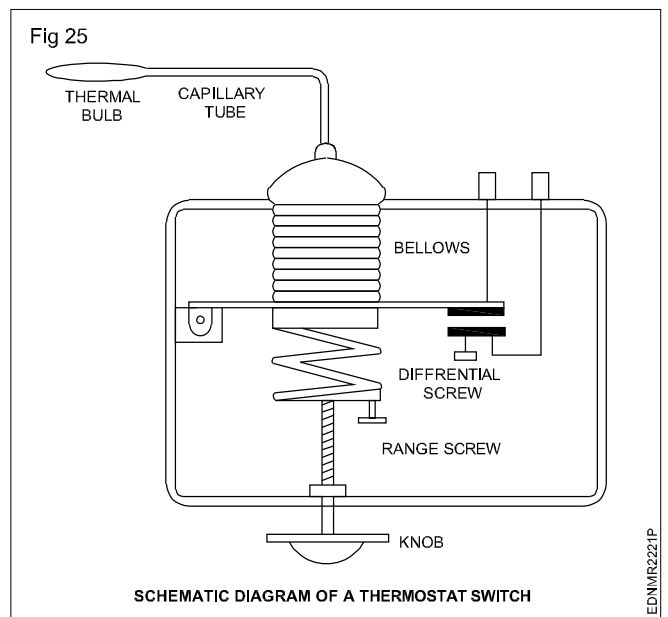
EDNMR2221O

Potential type relay (Fig 21)



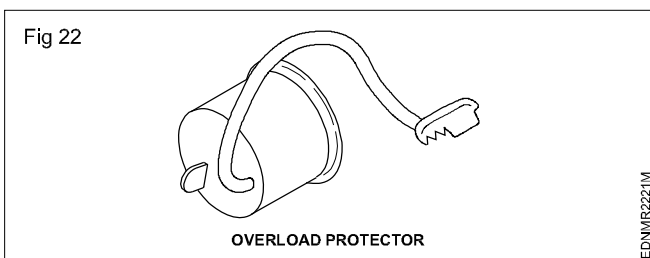
EDNMR2221L

Thermostat (Fig 25)



EDNMR2221P

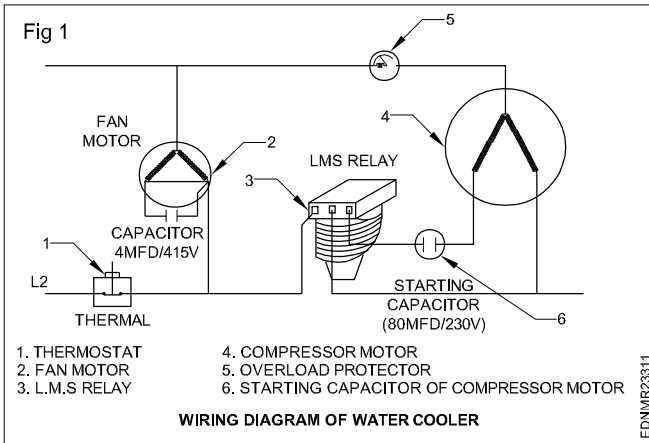
Overload protector (OLP) (Fig 22)



EDNMR2221M

Reading of electrical wiring diagram and layout diagram

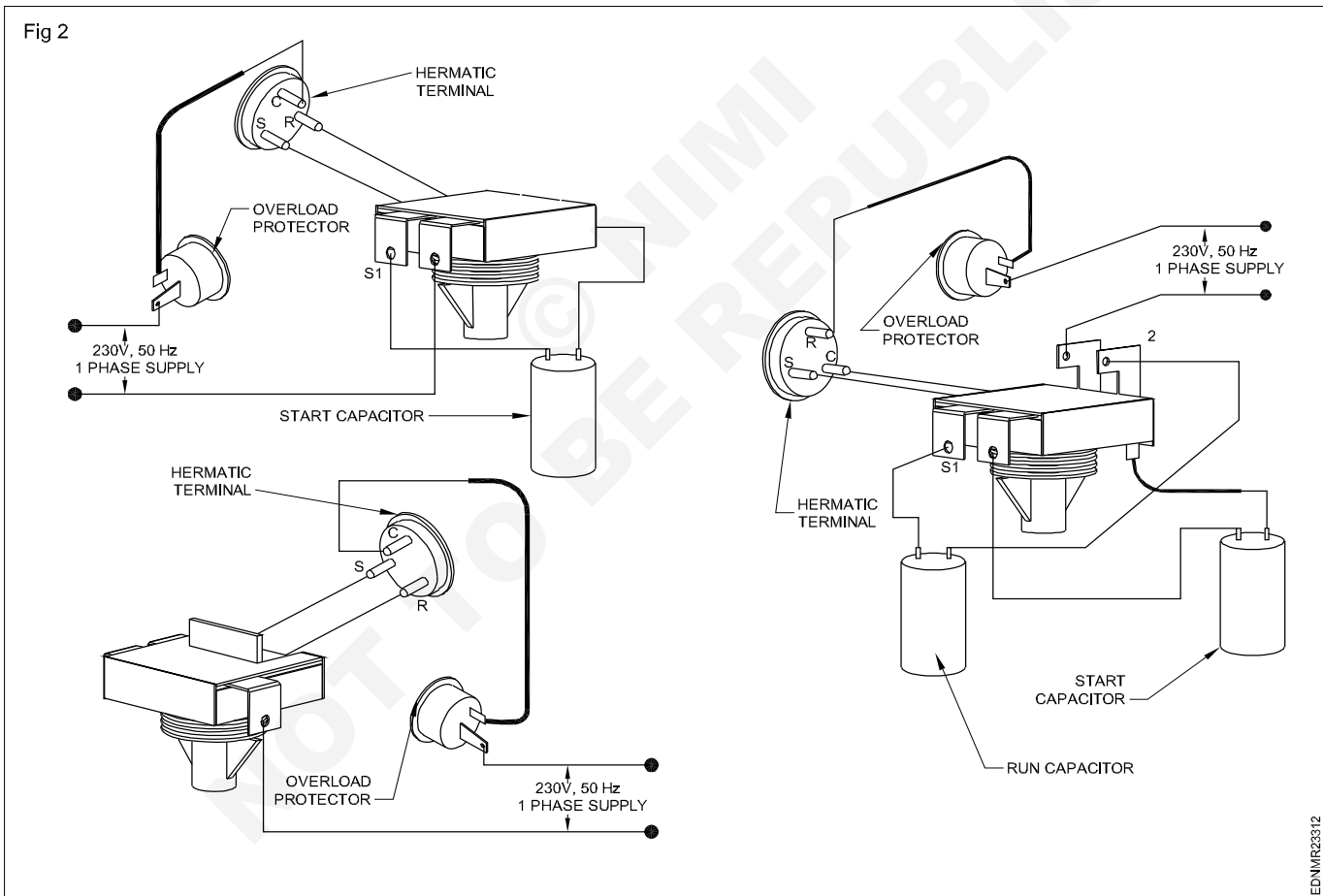
Wiring diagram of water cooler (Fig 1)



Read and write the following. (Fig 1)

- 1 What is the use of LMS Relay?
- 2 Why starting capacitor is used?
- 3 What is the purpose of overload protector?
- 4 What is the function of thermostat?
- 5 Which type of relay is used in this diagram?

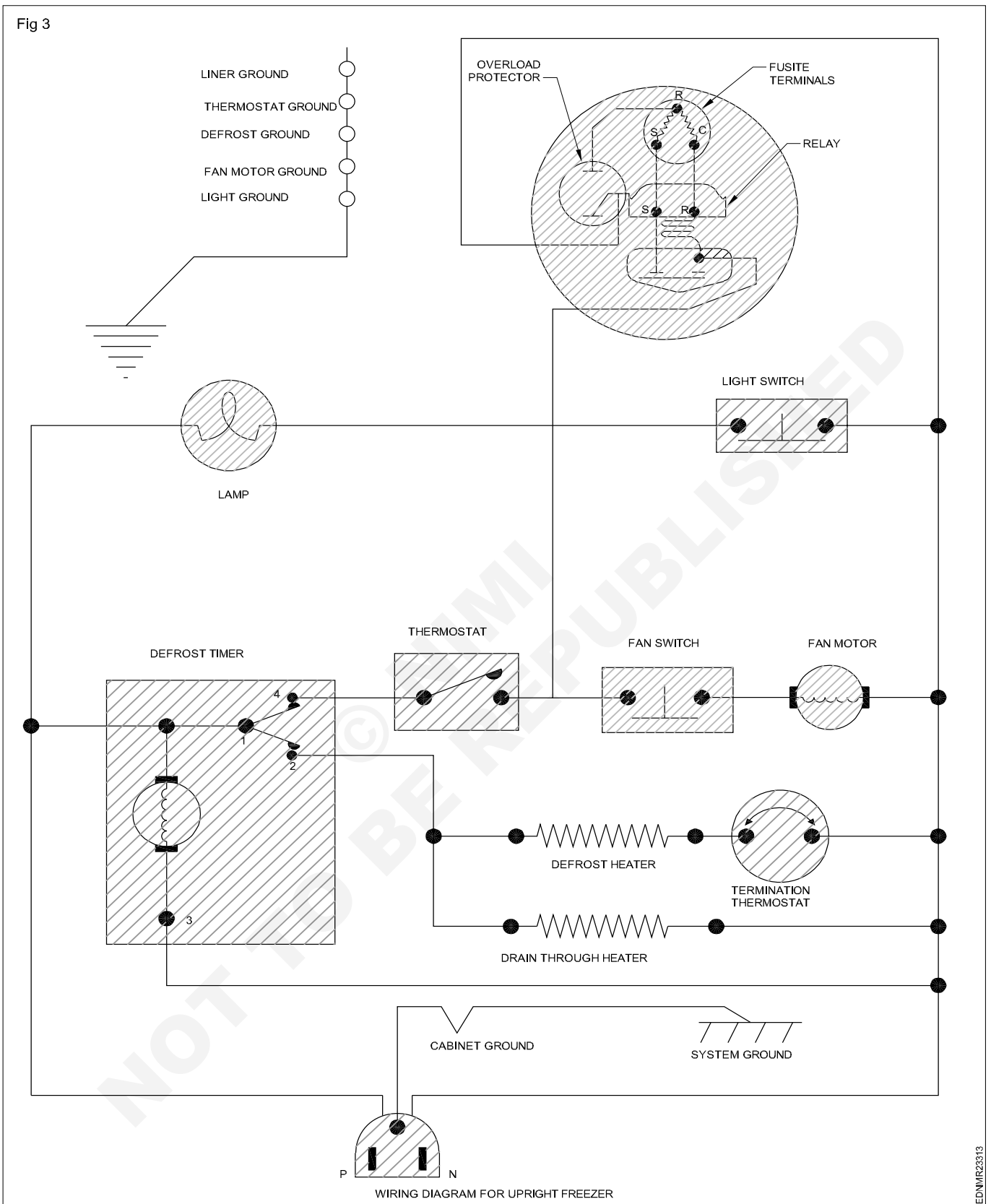
Accessories : There are four major accessories which are required to run the compressor, they are starting capacitor, running capacitor, overload protector (OLP) and starting relay. But the accessories required by the compressor is based on the wiring circuit. RSIR wiring will require relay and OLP only. Both these accessories are available in the form of relay package assembly (RPA) - plug on type. (Fig 2).



Read and write the following. (Fig 2)

- 1 What is hermetic terminal?
- 2 Why overload protector is used?
- 3 How to connect the run capacitor?
- 4 What is the frequency of single phase supply?
- 5 What is the purpose of start capacitor?
- 6 Why run capacitor is used?
- 7 What is RSIR wiring?
- 8 How to connect start capacitor?
- 9 What are the precautions to be taken?
- 10 What is the function of S₁?

Wiring diagram for Upright freezer (Fig 3)



Read and write the following. (Fig 3)

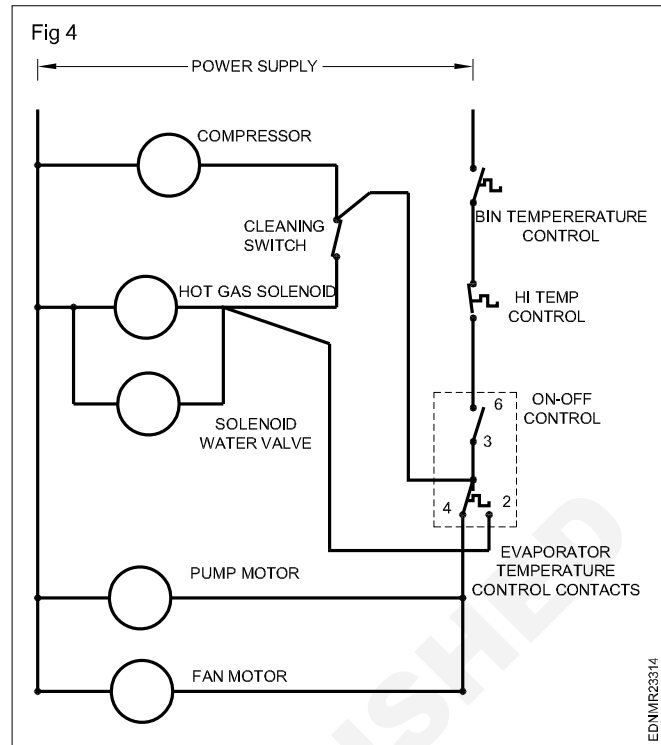
- 1 What is the purpose of thermostat?
- 2 What is drain?
- 3 What is termination thermostat?
- 4 Why system is grounded?
- 5 Explain defrost timer?
- 6 What is the functions of relay?
- 7 What is the difference between cabinet ground and system ground?

Terminal boards (Fig 4)

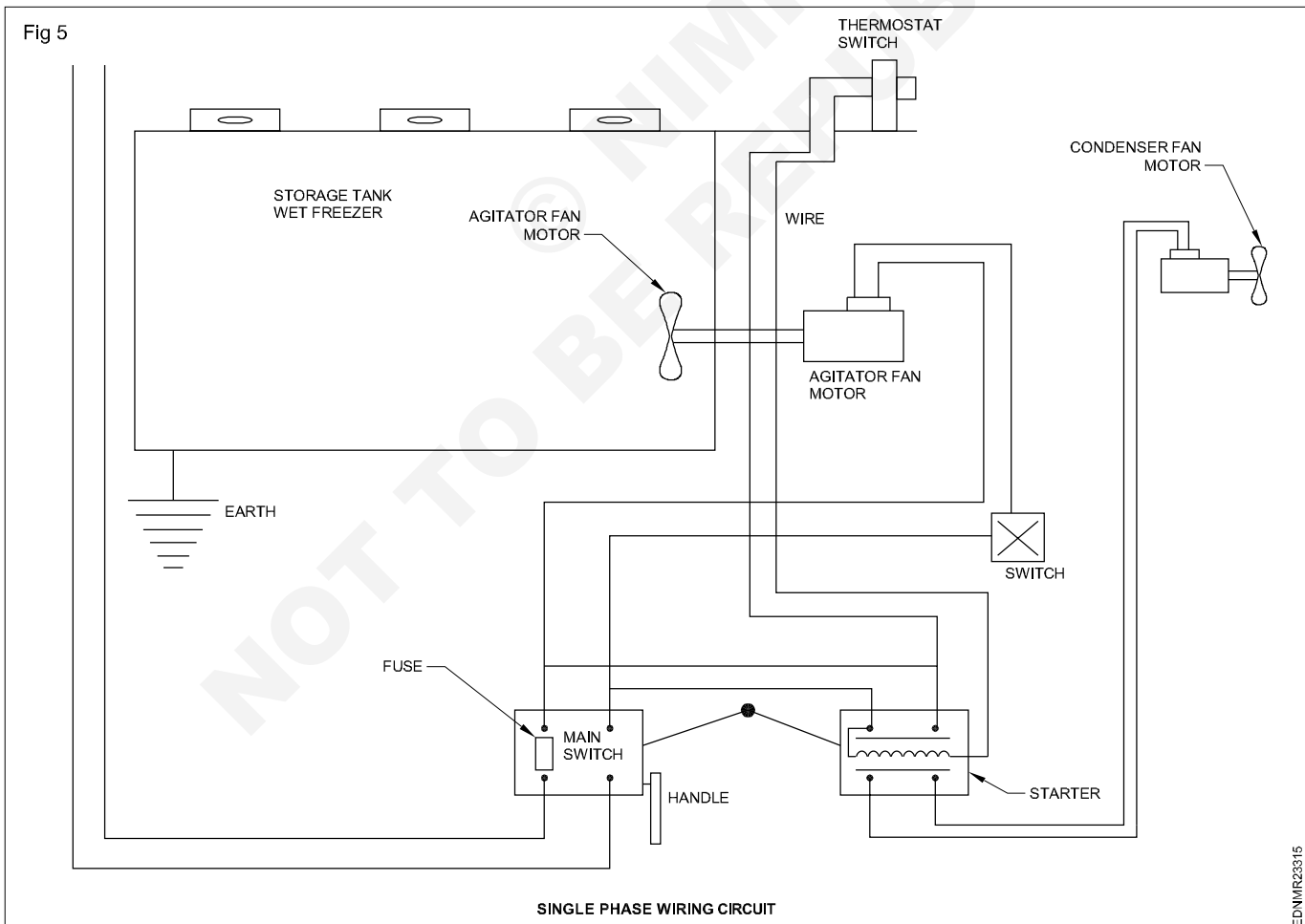
Bin temperature control, high temperature control and on-off controls are connected in series with the compressor as shown in (Fig 4) when cleaning switch is on then compressor hot gas solenoid, solenoid water valve are working pump motor and fan motor are working when contact 4 is in live condition.

Read and write the following. (Fig 4)

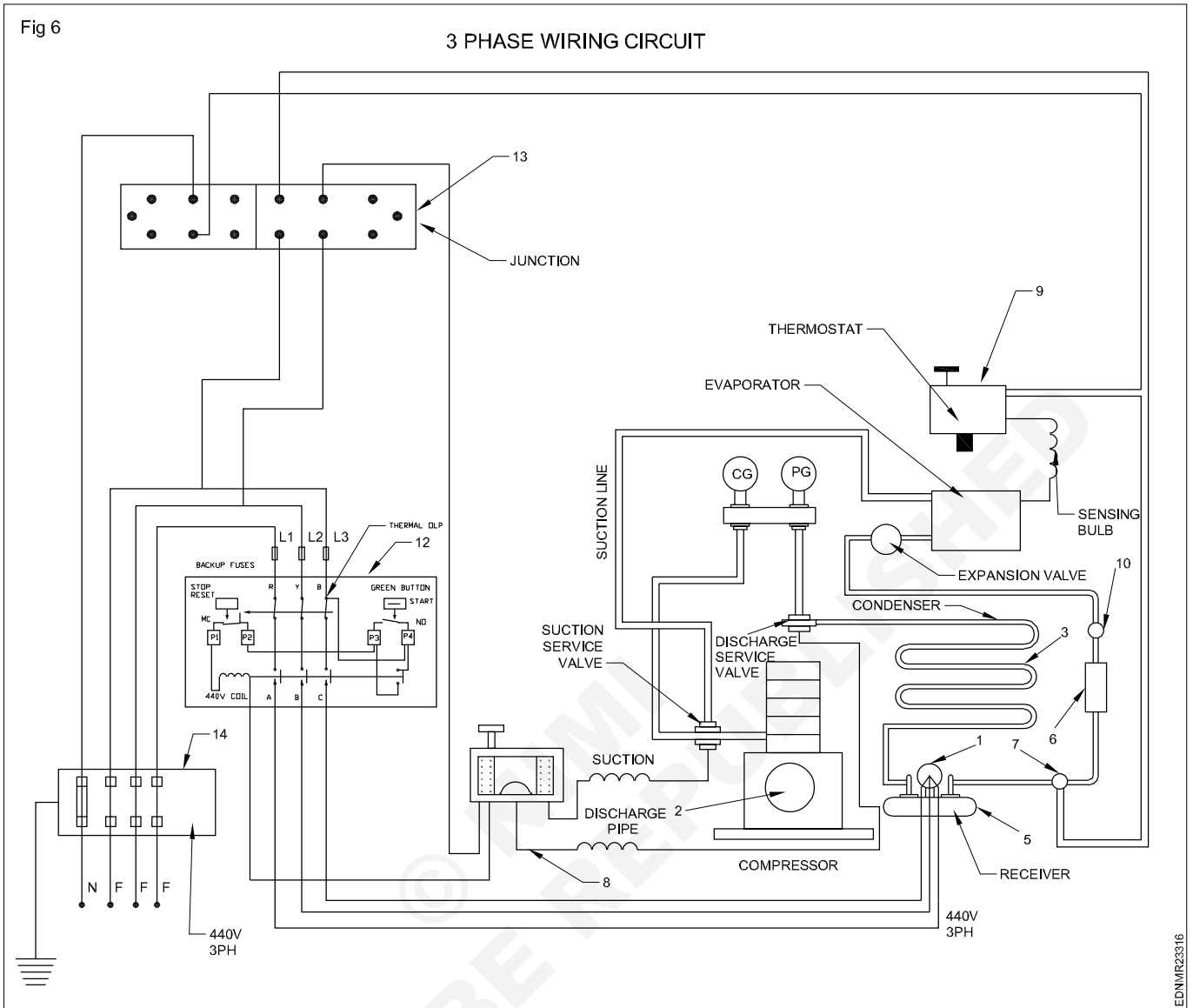
- 1 What is the functions of compressor?
- 2 What is hot gas solenoid?
- 3 What is the use of solenoid water valve?
- 4 How fan motor works?
- 5 Which principle pump motor works?



Single phase wiring circuit (Fig 5)



3 Phase wiring circuit (Fig 6)



Read and write the following. (Fig 5&6)

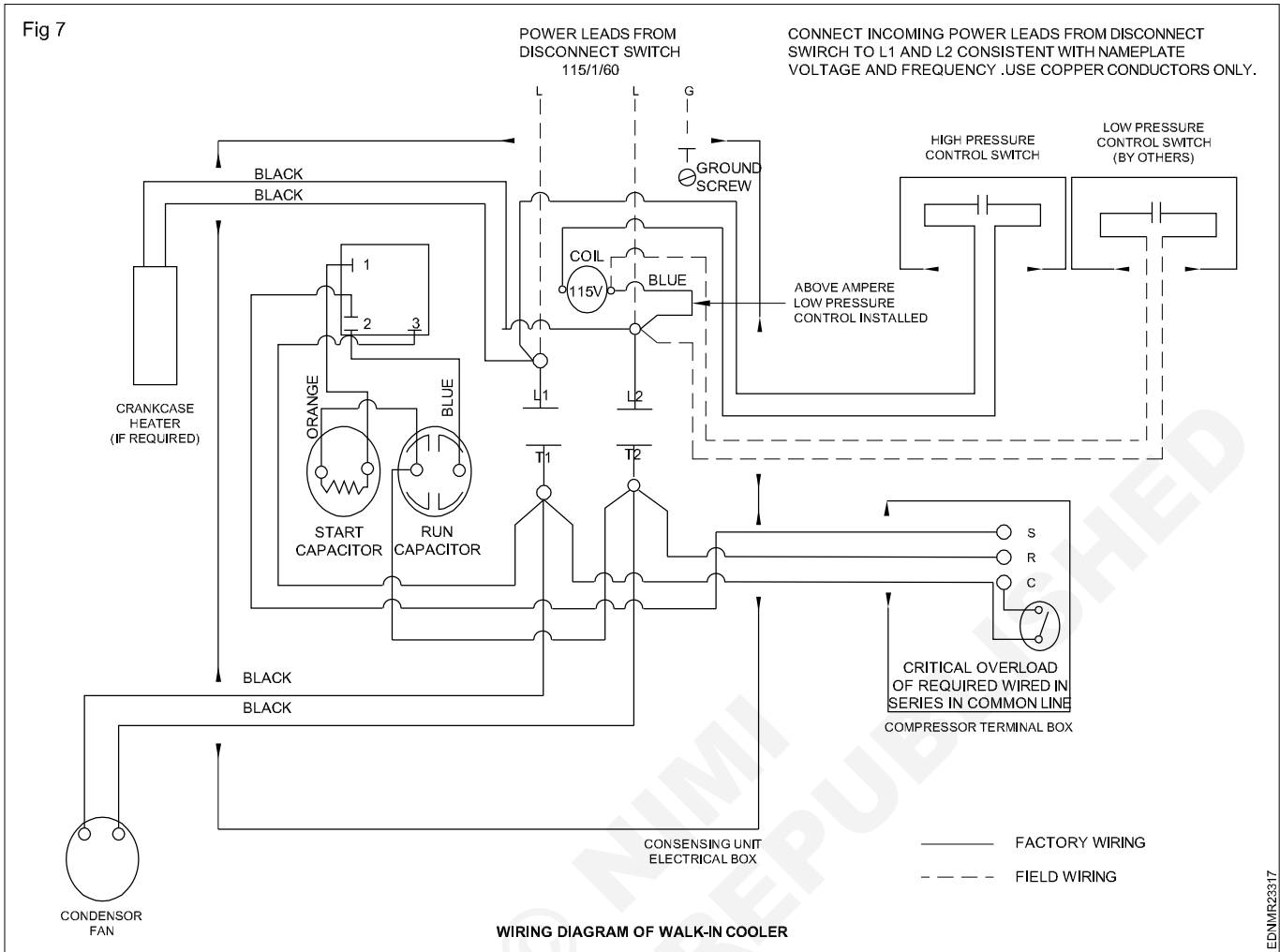
- 1 What is agitator fan motor? (Fig 5)
- 2 What is the function of thermostat switch? (Fig 5)
- 3 How condenser fan motor works? (Fig 5)
- 4 How to make single phase wiring circuit? (Fig 5)
- 5 What is suction? (Fig 6)

- 6 what is the use of discharge pipe? (Fig 6)
- 7 How compressor works? (Fig 6)
- 8 What is the use of condenser? (Fig 6)
- 9 How to make 3 phase wiring circuit? (Fig 6)
- 10 What is the use of suction service valve? (Fig 6)

Electrical system of walk in cooler (Fig 7)

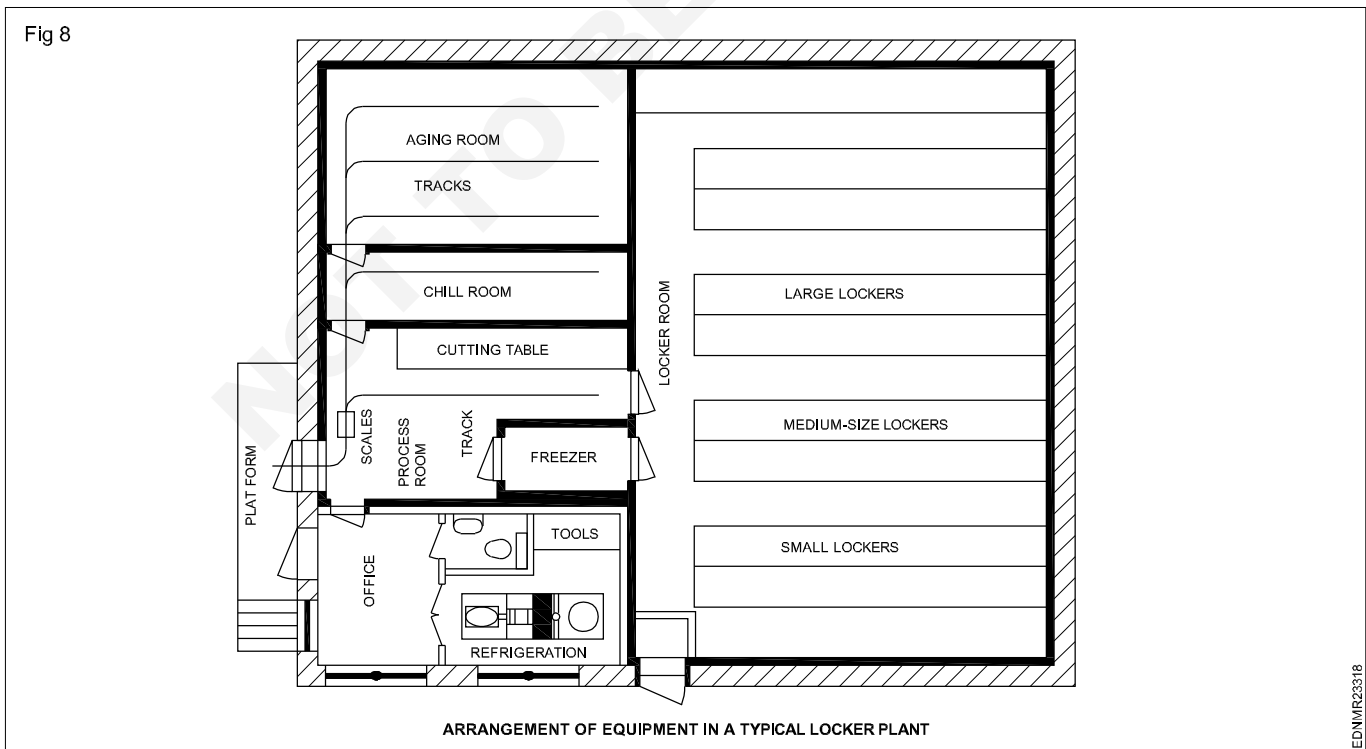
In low capacity walk in coolers PSC motor is used as compressor motor. But medium capacity to high capacity CSCR single phase motor or three phase motors are used there one wiring diagram with CSCR motor, relay and capacitors are included.

Wiring diagram of walk-in cooler (Fig 7)



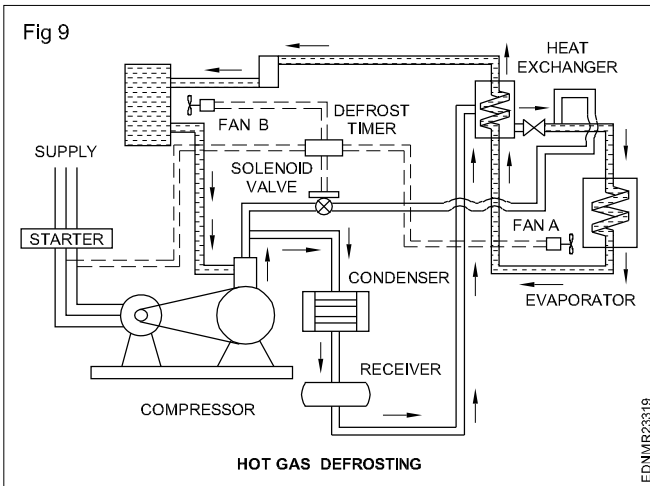
EDNMR23317

Basic compressor refrigeration system with all components for cold storage (Fig 8)

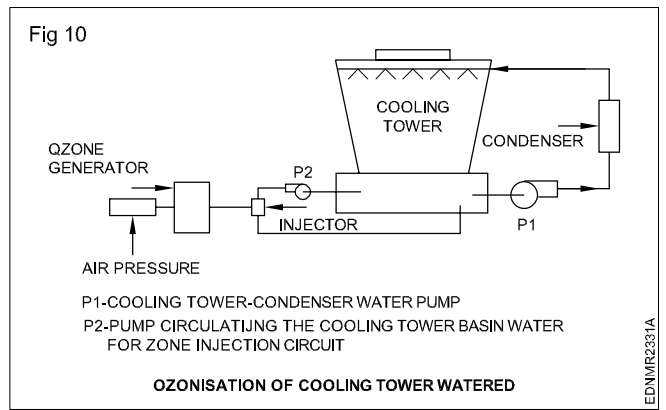


EDNMR23318

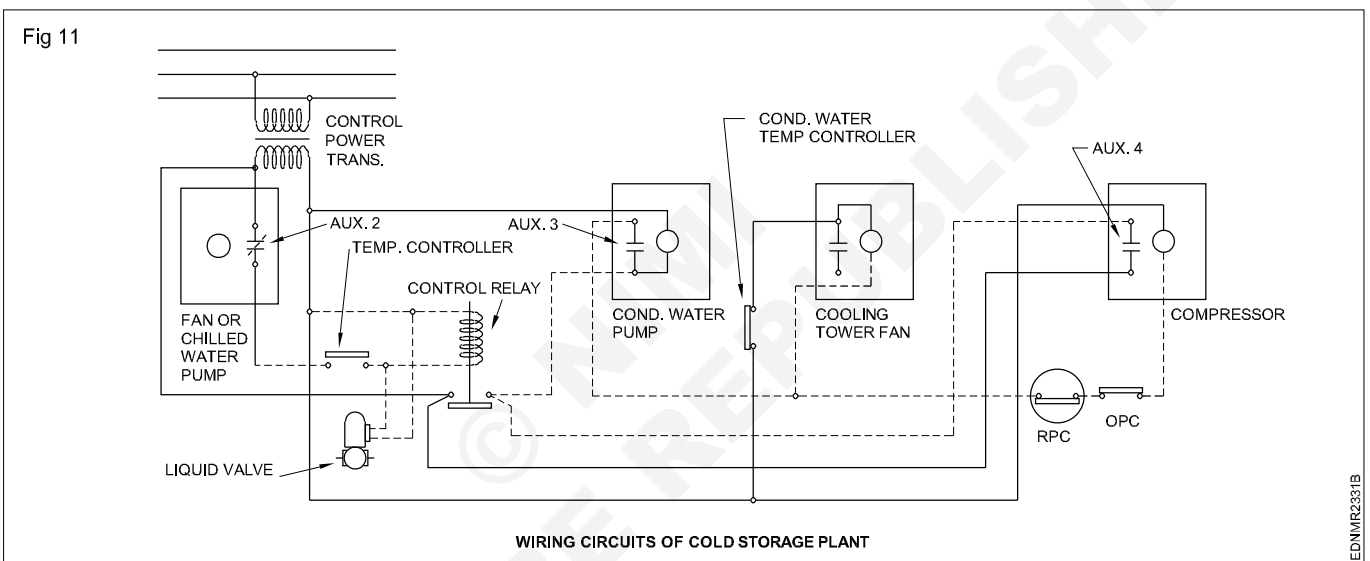
Hot gas defrosting (Fig 9)



Ozonisation of cooling tower water (Fig 10)



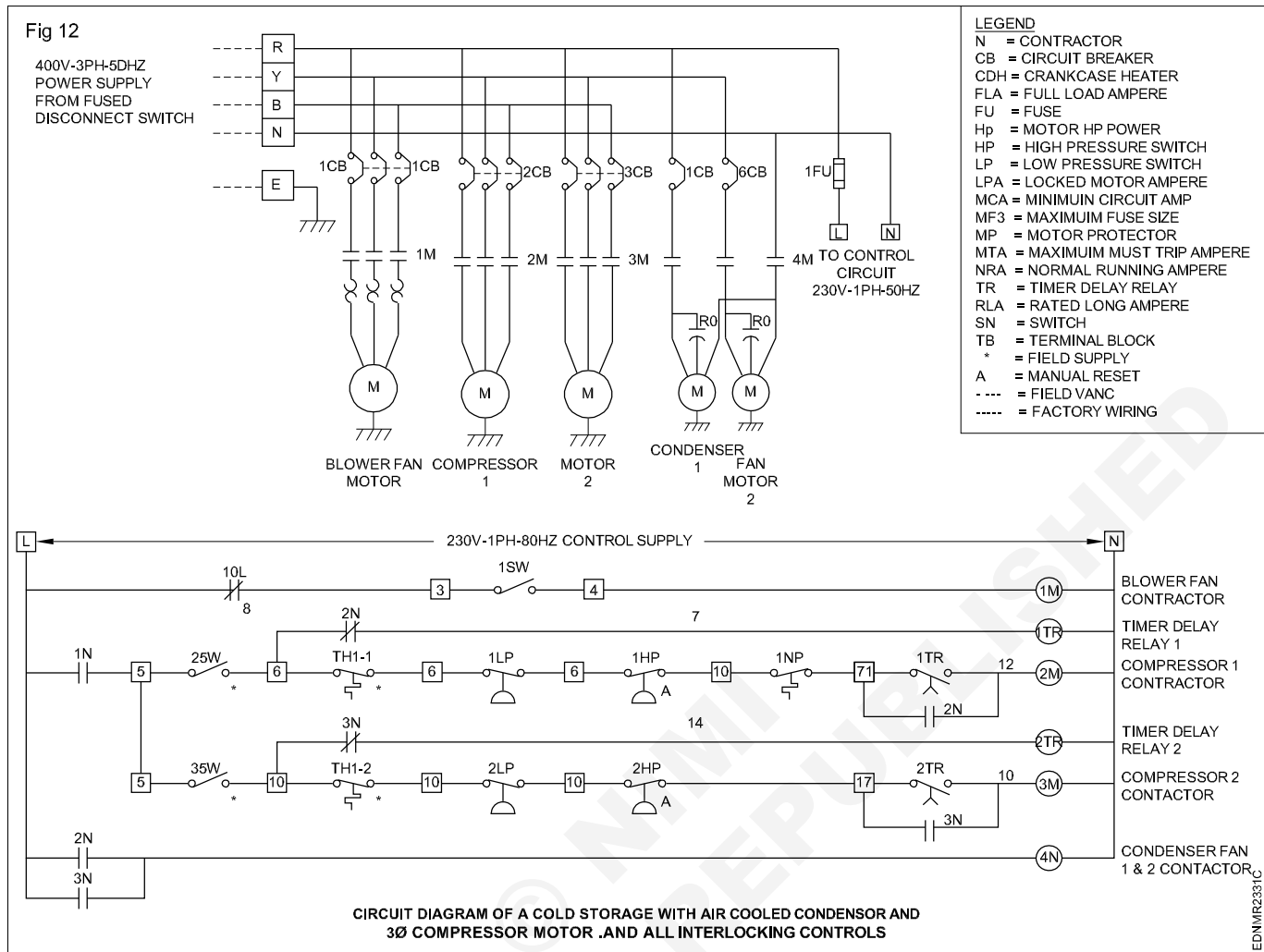
Wiring circuit of cold storage plant (Fig 11)



Read and write the following. (Fig 7,8,9,10&11)

- 1 What is the purpose of high pressure control switch? (Fig 7)
- 2 What is the use of run capacitor? (Fig 7)
- 3 What is the use of fan condenser? (Fig 7)
- 4 What is crankcase heater? (Fig 7)
- 5 What is compressor terminal box? (Fig 7)
- 6 What is the use of freezer? (Fig 8)
- 7 What is factory wiring? (Fig 7)
- 8 What is the purpose of ionization? (Fig 10)
- 9 What is the use of control relay? (Fig 11)
- 10 What is the function of chilled water pump? (Fig 11)
- 11 What is the use of pump down solenoid valve? (Fig 9)
- 12 Explain the Locker plant? (Fig 8)
- 13 Why platform is necessary for locker plant? (Fig 8)
- 14 How cooling system works? (Fig 9)
- 15 What is the function of evaporator? (Fig 9)
- 16 Why defrost timer is necessary in cold storage plant? (Fig 9)
- 17 Why temperature controller is used? (Fig 11)
- 18 What is field wiring? (Fig 7)
- 19 What is the use of start capacitor? (Fig 7)
- 20 How solenoid valve works in hot gas defrosting system? (Fig 9)

Circuit diagram of a cold storage with air cooled condenser and 3Ø compressor motor and all interlocking controls (Fig 12)

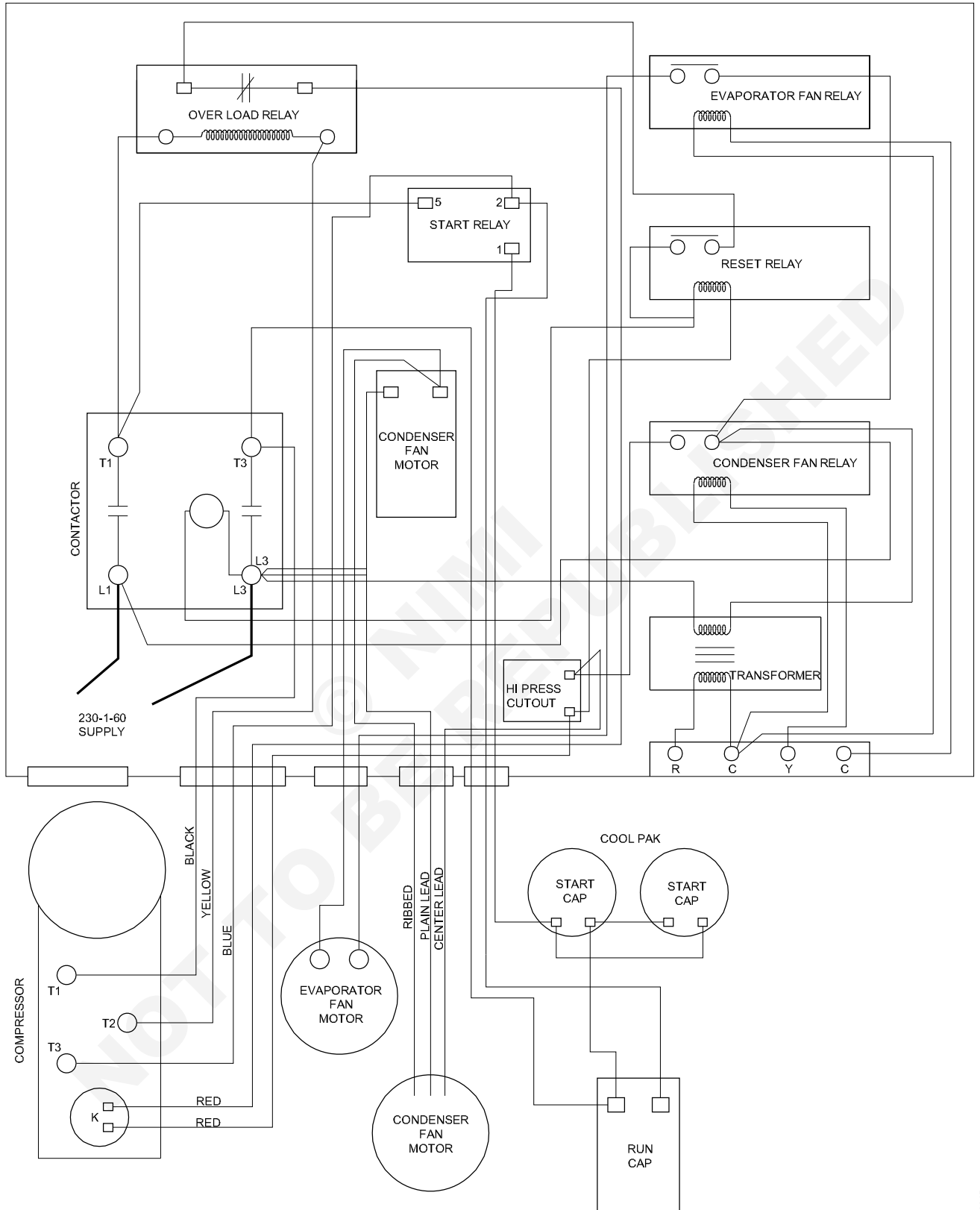


Read and write the following. (Fig 12)

- 1 How blower fan motor works?
- 2 What is the use of condenser?
- 3 Explain the functions of compressor?
- 4 How control circuit works?
- 5 How circuit breaker works?
- 6 What is the function of contactors?
- 7 How time delay relay works?
- 8 What is the use of low pressure switch?
- 9 How high pressure switch works?
- 10 What are the safety precautions needed for cold storage plant?
- 11 How three phase compressor motor works?
- 12 How relay works?
- 13 What is the use of condenser fan contractor?
- 14 What is the use of blower fan contractor?
- 15 What is the use of fan motor?
- 16 What is the use of compressor contractor?
- 17 What is the function of interlocking controls?

Typical wiring diagram of Air-cooled self-contained unit (Fig 13)

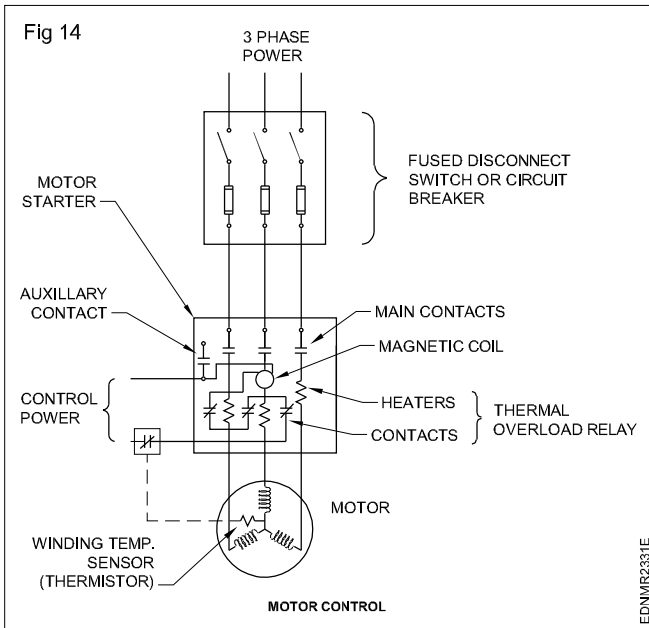
Fig 13



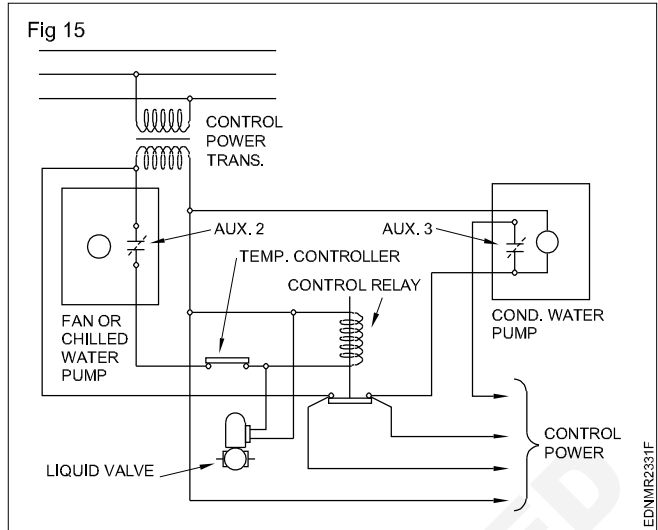
TYPICAL WIRING DIAGRAM AIR-COOLED SELF-CONTAINED UNIT

EDNMR2331D

Motor control with protective device (Fig 14)



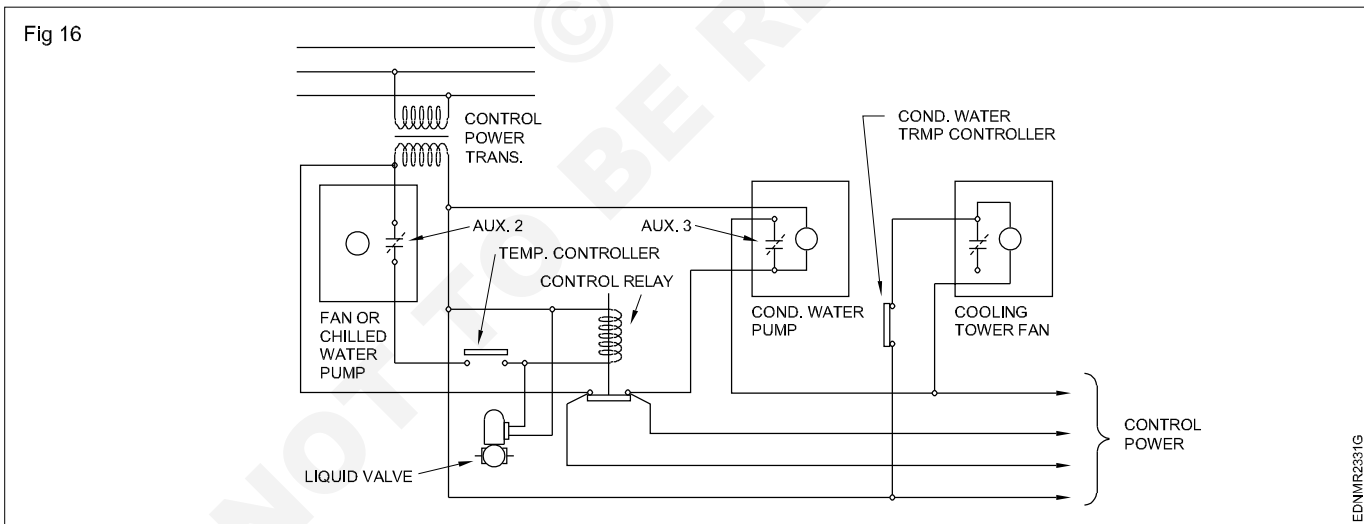
Condenser water pump (Fig 15)



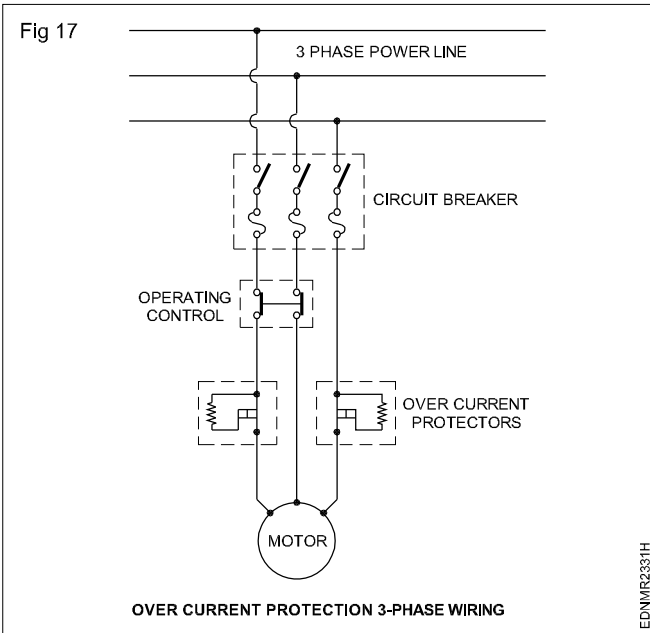
Read and write the following. (Fig 13,14&15)

- 1 What is the use of fan motor? (Fig 13)
- 2 What is auxiliary contact? (Fig 14)
- 3 What is the function of thermal overload relay? (Fig 14)
- 4 Why magnetic coil is used? (Fig 14)
- 5 What is the function of thermistor? (Fig 14)
- 6 What is the purpose of liquid valve? (Fig 15)

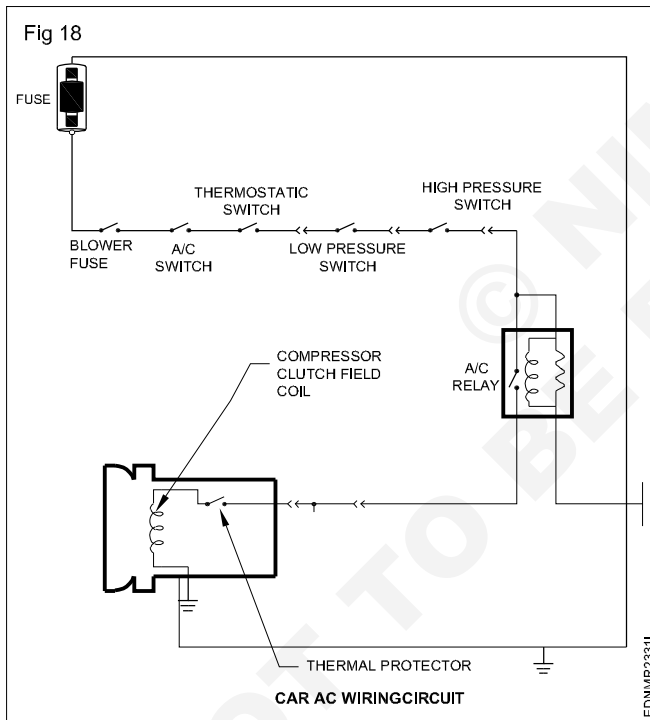
Control power to the cooling tower fan starter (Fig 16)



Electrical overload (over current protector) (Fig 17)



Car AC wiring circuit (Fig 18)

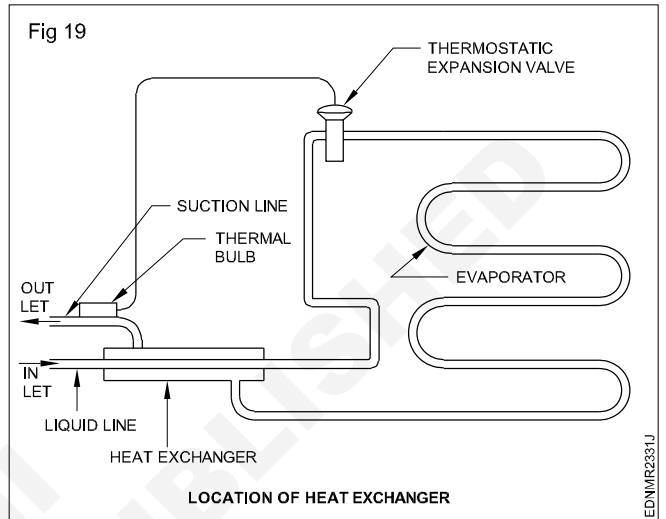


Read and write the following. (Fig 16 to 18)

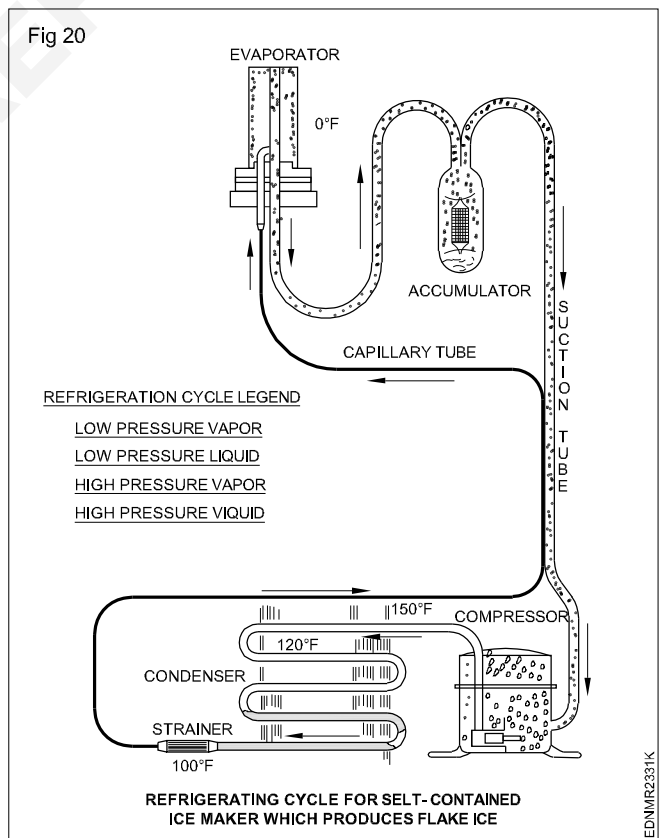
- 1 What is the function of liquid valve? (Fig 16)
- 2 What is the function of control relay? (Fig 16)
- 3 Explain temperature controller? (Fig 16)
- 4 What is the use of control power transformer? (Fig 16)
- 5 What is the use of circuit breaker? (Fig 17)

- 6 Why over current protectors are used? (Fig 17)
- 7 Why pressure switches are connected in series? (Fig 18)
- 8 What is the function of compressor clutch? (Fig 18)
- 9 What is the use of thermostatic switch? (Fig 18)
- 10 What is thermal protector? (Fig 18)

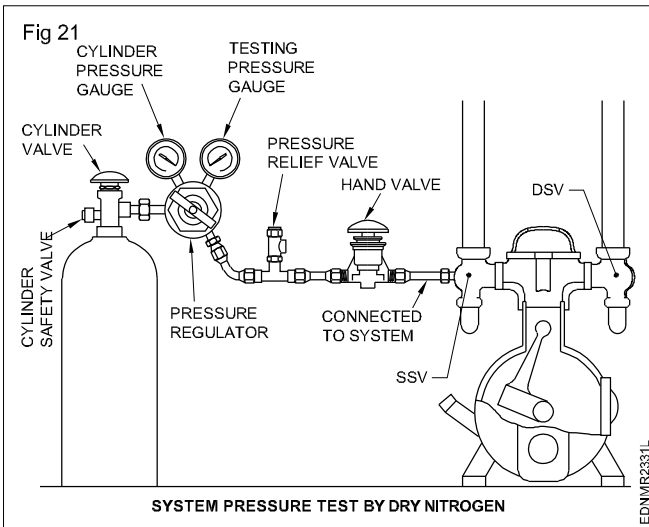
Location of heat exchanger (Fig 19)



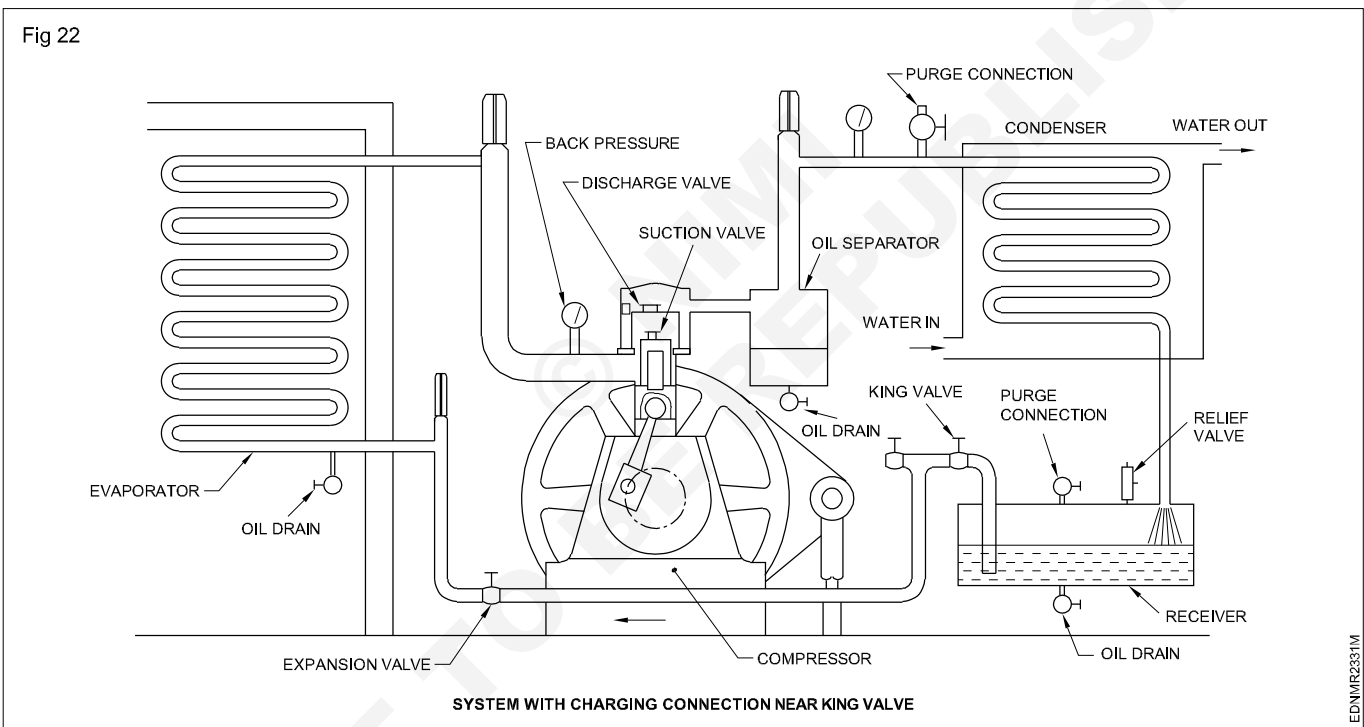
Flake ice maker machine (Fig 20)



System pressure test by dry nitrogen (Fig 21)

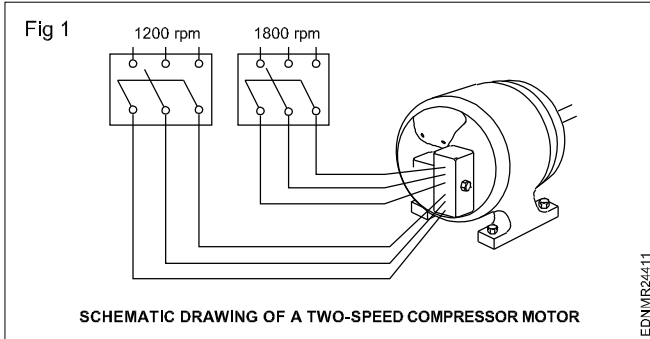


System with charging connection near king valve (Fig 22)

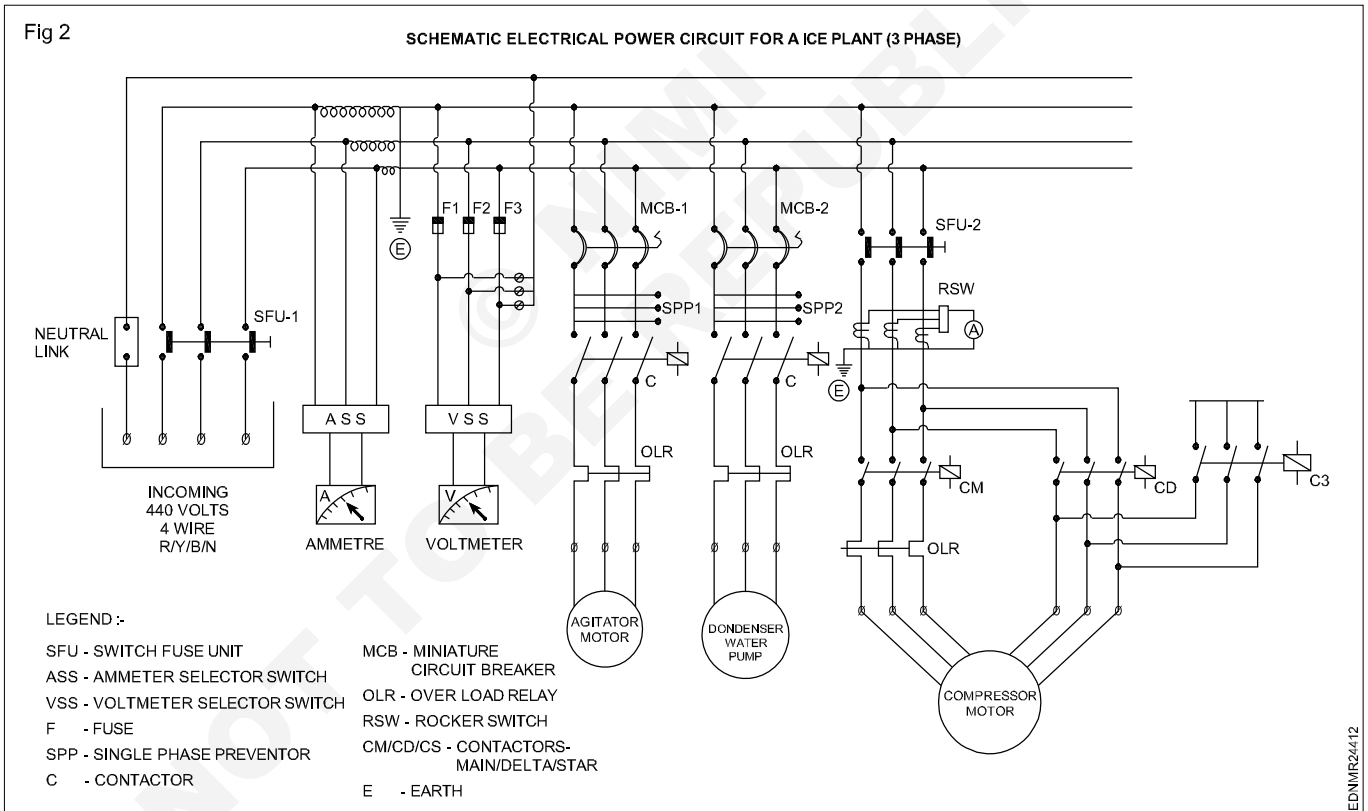


Drawing of electrical circuit diagram used in RAC

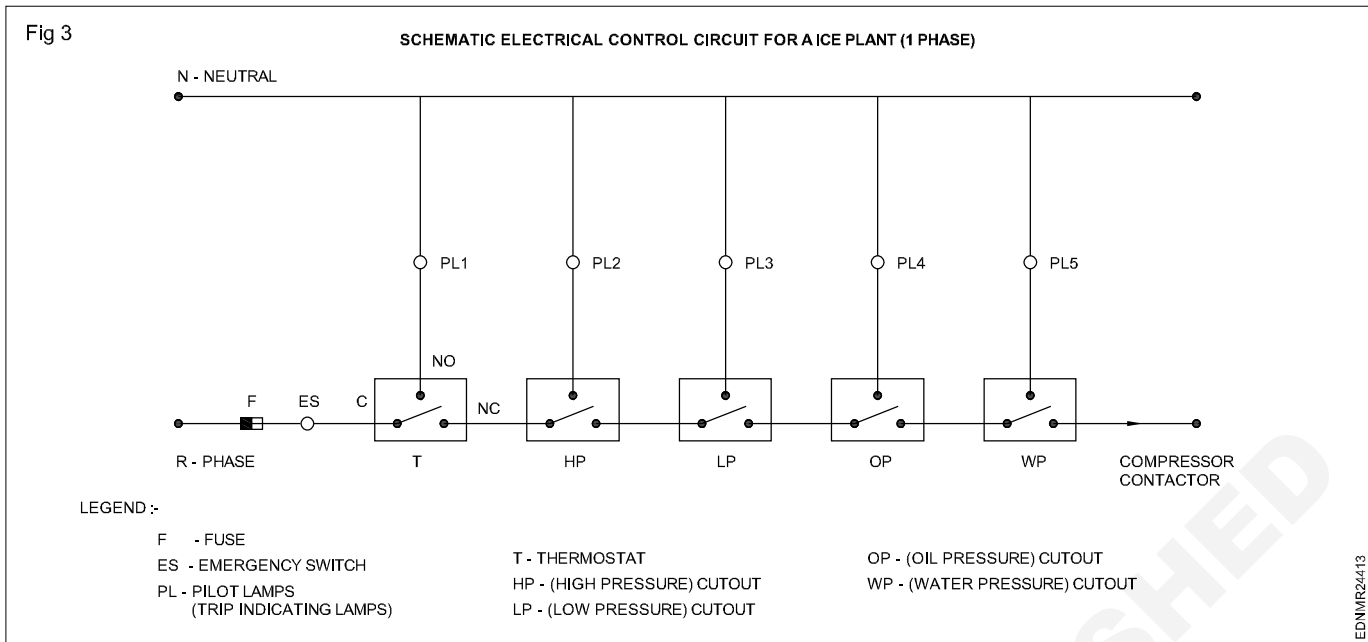
Two speed motor-control capacity control (Fig 1)



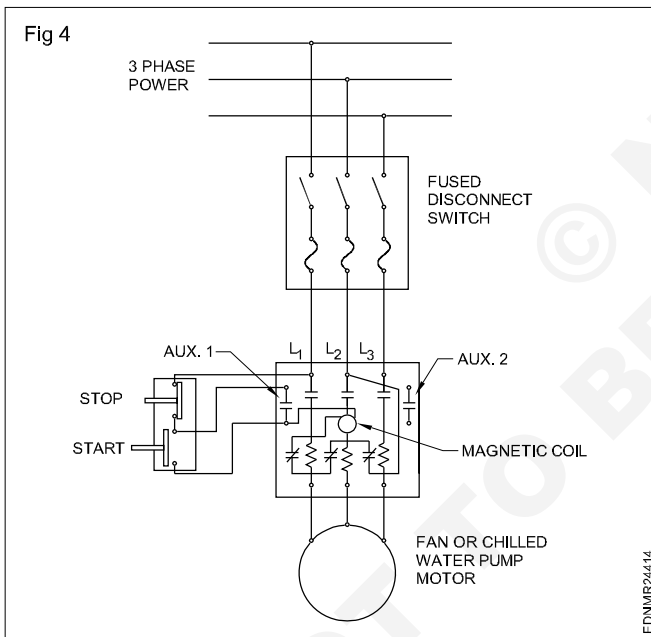
Schematic electrical power circuit for a ice plant (3 phase) (Fig 2)



Schematic electrical control circuit for a ice plant (Single phase) (Fig 3)



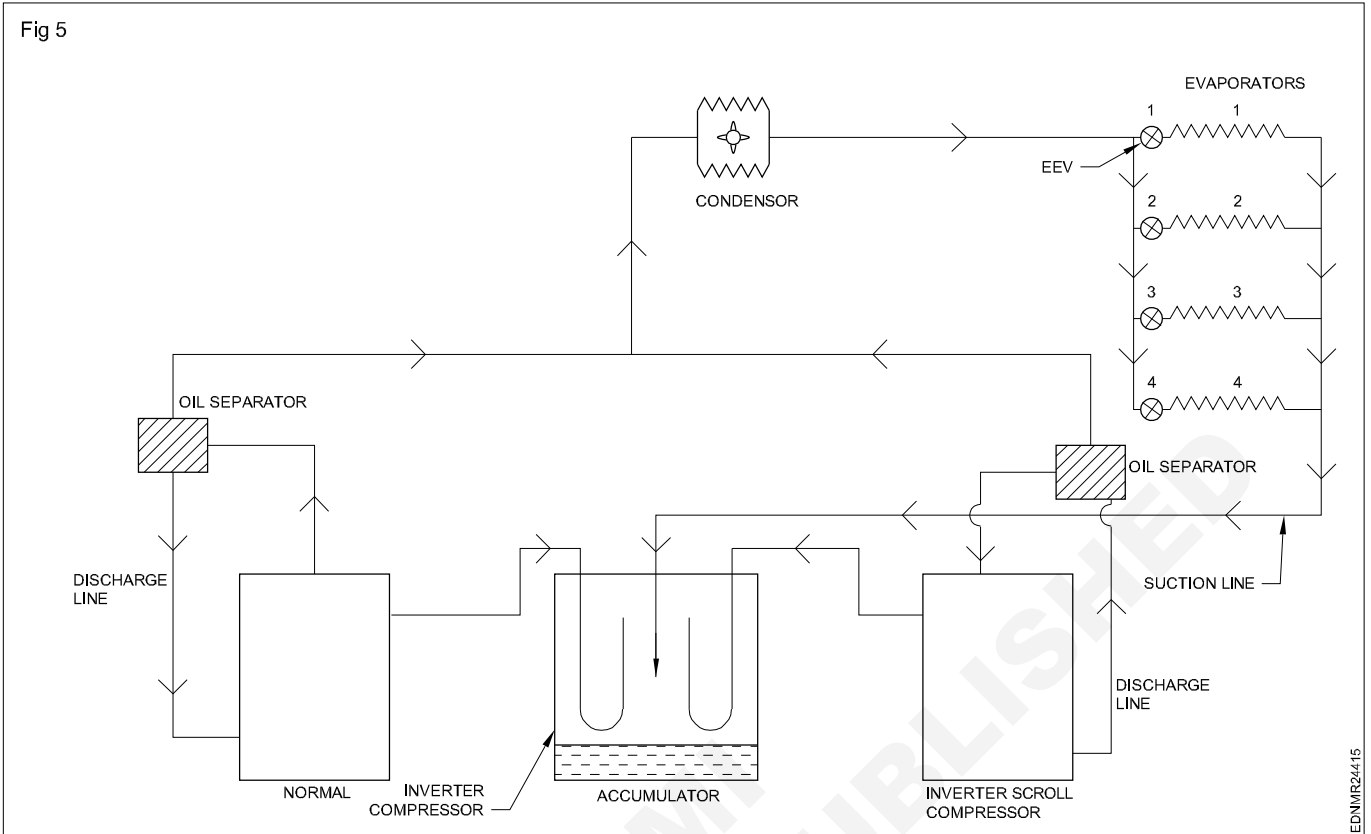
Three wire control of a magnetic contactor type on line starter (Fig 4)



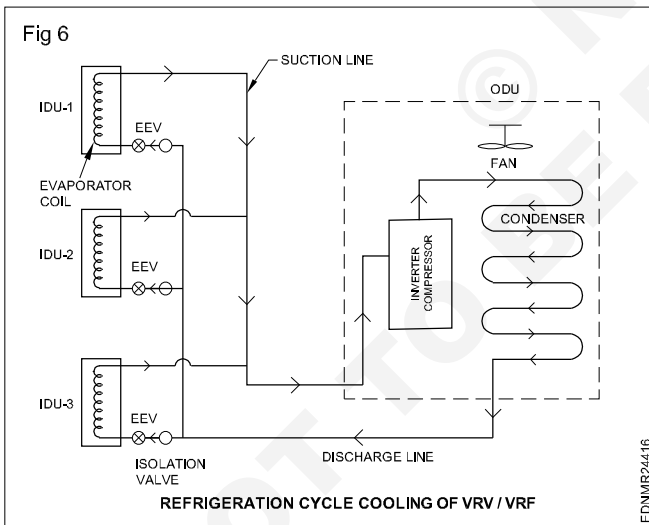
Read and write the following. (Fig 1 to 4)

- 1 Explain the function of thermostat switch?
- 2 What is bellows in thermostatic switch?
- 3 What is capillary tube in thermostatic switch?
- 4 How MCB are used in ice plant?
- 5 What is rocker switch?
- 6 Explain contractor?
- 7 What is the use of overload relay?
- 8 What is single phase preventer?
- 9 What is oil pressure cut out?
- 10 How magnetic contactors works?
- 11 What is the use of push button switch?

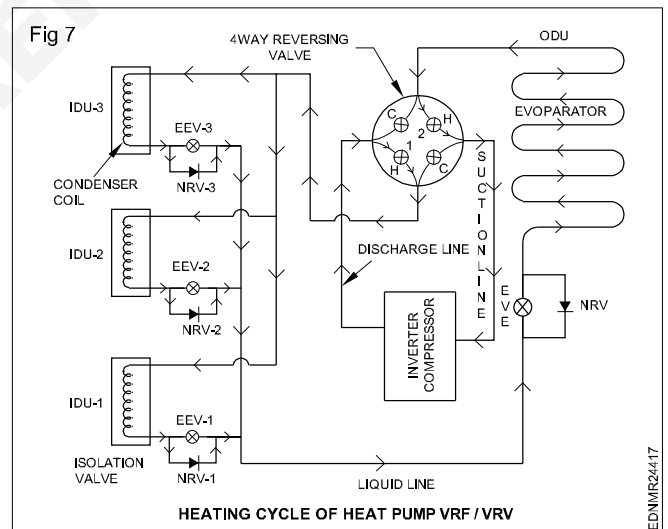
Basic refrigeration cycle in a VRV/VRF system (Fig 5)



Refrigeration cycle cooling of VRV/VEF (Fig 6)



Heating cycle of heat pump VRF/VRV (Fig 7)

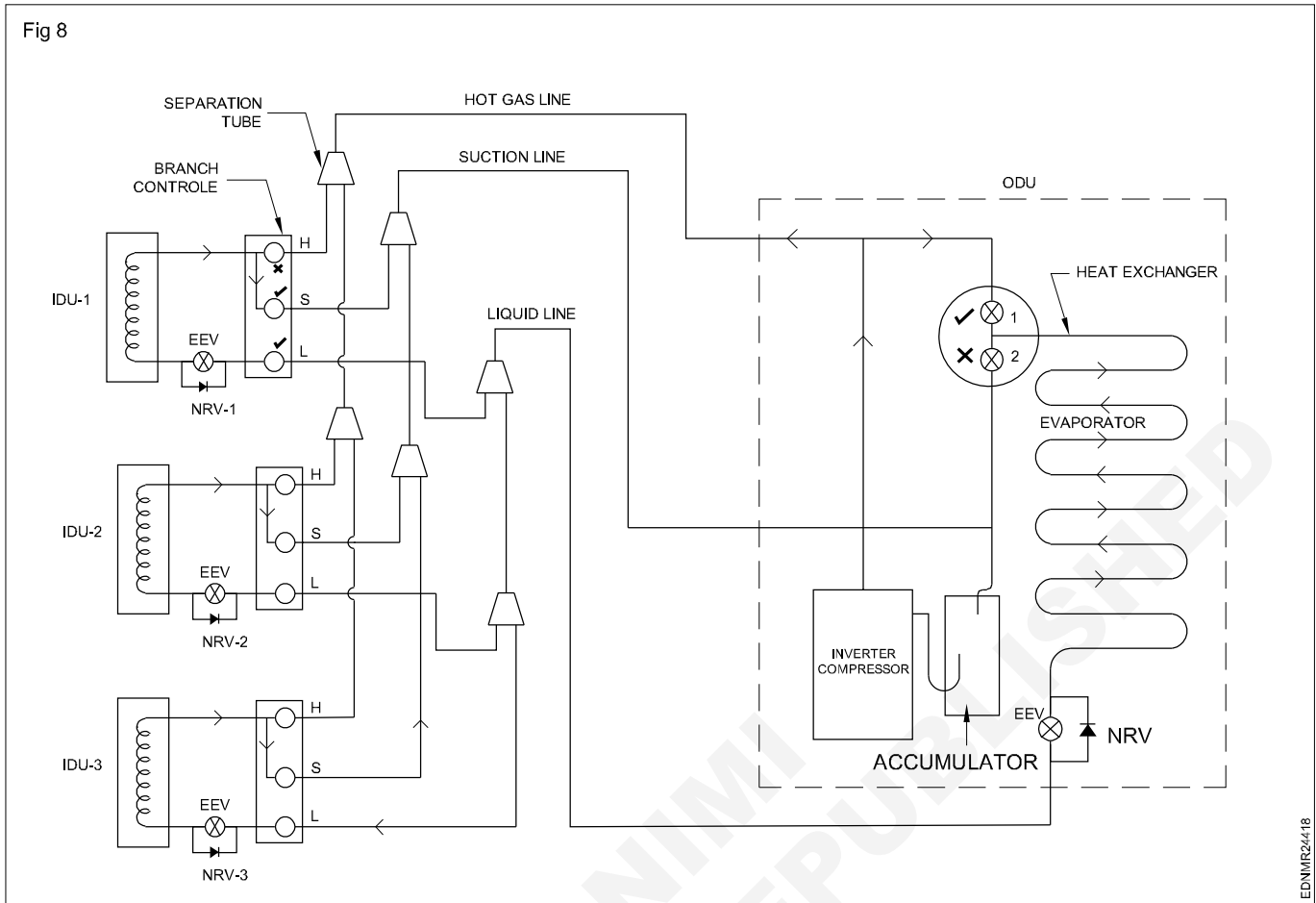


Read and write the following. (Fig 5 to 7)

- 1 What is the use of condenser in VRV/VRF system? (Fig 5)
- 2 What is the use of accumulator? (Fig 5)
- 3 Explain the inverter scroll compressor? (Fig 5)
- 4 What is suction line? (Fig 5)
- 5 What is the use of oil separator? (Fig 5)

- 6 What is the multiple evaporators? (Fig 5)
- 7 What is the function of isolation valve? (Fig 7)
- 8 What is IDU? (Fig 6)
- 9 What is the purpose of liquid line? (Fig 7)
- 10 What is the use of inverter compressor? (Fig 5)
- 11 What is the purpose of discharge line? (Fig 5)

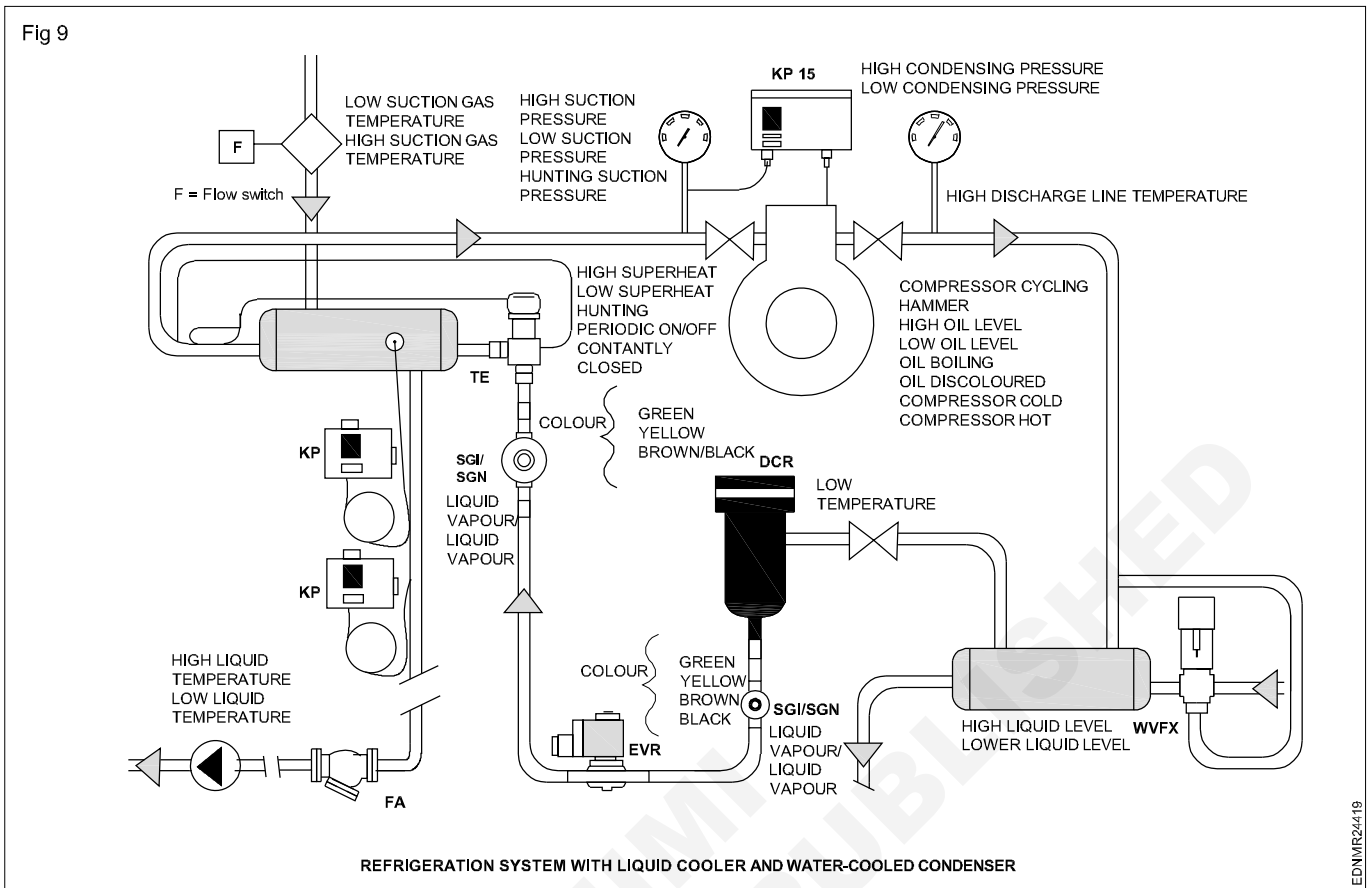
Heat recovery VRF (Fig 18)



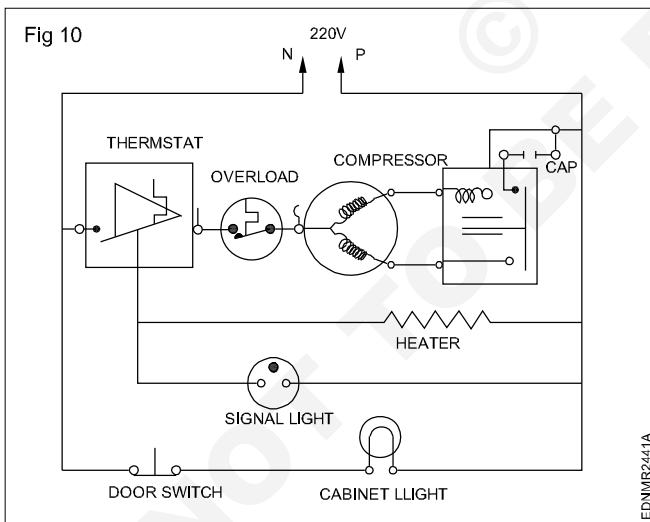
Read and write the following. (Fig 8)

- 1 What is the use of separation tube?
- 2 Explain hot gas line?
- 3 What is liquid line?
- 4 What is the purpose of evaporators?
- 5 Why heat exchanger is used?
- 6 What is NRV and EEV?
- 7 What is the use of inverter compressor?
- 8 What is the function of accumulator?
- 9 What is IDU and ODU?

Refrigeration system with liquid cooler and water-cooled condenser (Fig 9)



Wiring diagram of circuit for upright freezer (Fig 10)

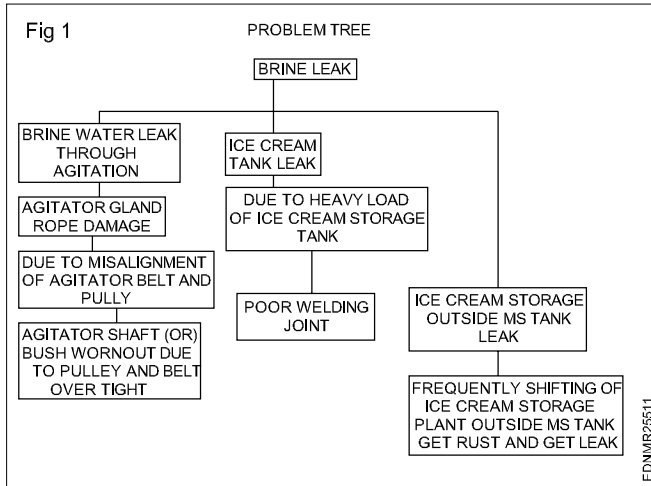


Read and write the following. (Fig 9&10)

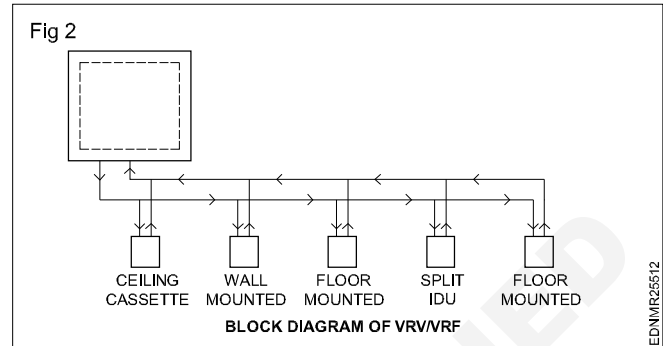
- 1 What is the use of liquid vapour?
- 2 What is the purpose of using color codes in liquid cool refrigeration system?
- 3 What is the use of flow switch?
- 4 What is hunting suction pressure?
- 5 What is DCR and EVR?
- 6 What is the use of blower switch?
- 7 What is ECC system?
- 8 How thermostat works?

Drawing of block diagram of instruments & equipment of trades

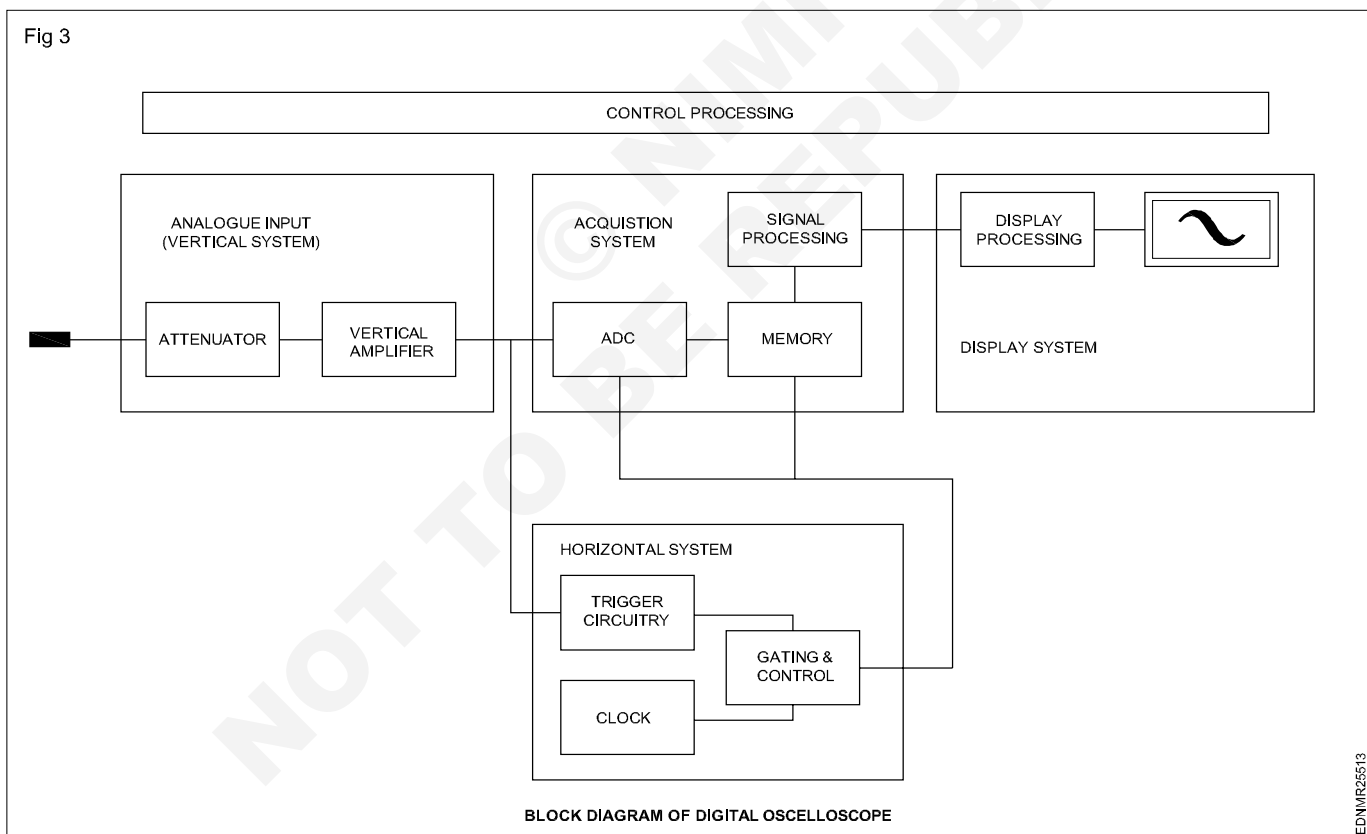
Problem tree of brine leak in ice plant (Fig 1)



Block diagram of VRV/VRF (Fig 2)



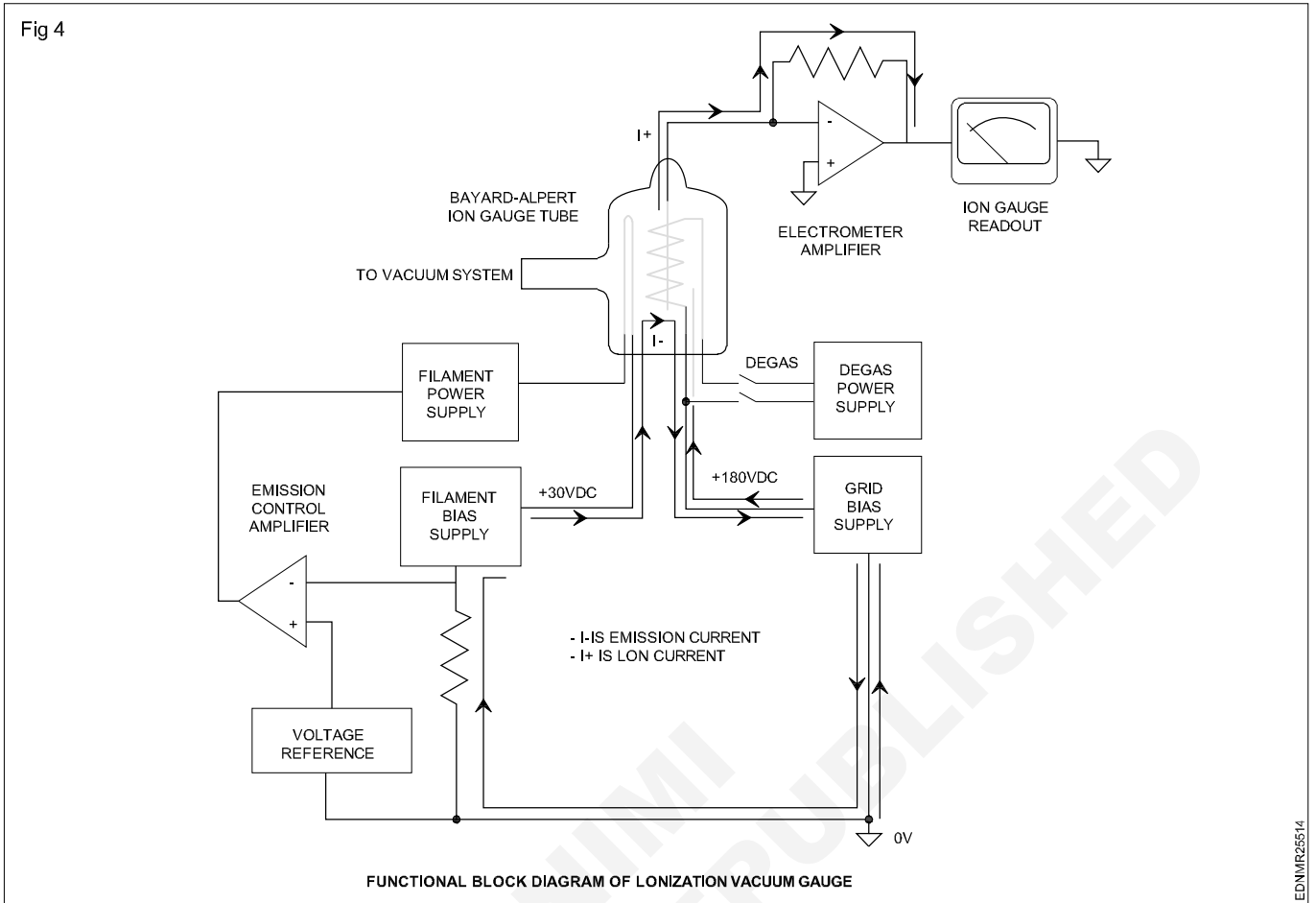
Block diagram of Digital Oscilloscope (Fig 3)



Read and write the following. (Fig 3)

- 1 What is the function of Attenuator?
- 2 Why vertical amplifier is used?
- 3 What is the advantage of ADC?
- 4 How signal processing done?
- 5 What is Acquisition system?
- 6 What is the use of horizontal system?
- 7 What is the advantage of trigger circuitry?
- 8 What is clock cycle?
- 9 How Digital Oscilloscope works?
- 10 What is the advantage of control processing?
- 11 How display system works?

Functional block diagram of Ionization Vacuum Gauge (Fig 4)



Block diagram of Digital Speed Tachometer (Fig 5)

