

**CERTIFICATES OF COMPETENCY IN THE MERCHANT NAVY  
MARINE ENGINEER OFFICER**

**STCW 78 as amended MANAGEMENT ENGINEER REG. III/2 (UNLIMITED)**

**040-36 - ENGINEERING, SYSTEMS AND SHIP'S DRAWINGS**

**WEDNESDAY, 17 JULY 2019**

**1315 - 1615 hrs**

Materials to be supplied by examination centres

Candidate's examination workbook Graph paper
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Examination Paper Inserts

DRG - 055 DRG - 056 DRG - 057 DRG - 058 DRG - 059
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Notes for the guidance of candidates:

1. Examinations administered by SQA on behalf of the Maritime & Coastguard Agency
2. Candidates are required to obtain 50% of the total marks allocated to this paper to gain a pass **AND** also obtain a minimum 40% in Sections A and B of the paper.
3. Non-programmable calculators may be used.
4. All formulae used must be stated and the method of working and ALL intermediate steps must be made clear in the answer.



Maritime &  
Coastguard  
Agency



## ENGINEERING, DRAWING AND SHIP SYSTEMS

Attempt ALL questions

Marks for each part question are shown in brackets

### Section A

1. Piping Systems DRG - 055

- (a) State what items C1 and C301 on the boilers are, explaining their function. (2)
- (b) Each boiler has two feed water supplies from the feed pumps. Explain what the difference is and when EACH would be used. (2)
- (c) State what item 'B' is in the drawing, explaining its purpose. (2)
- (d) All of the feed pumps use the same feed water lines, but there are two different designations for use. Explain the difference in the feed pumps, including when each of them would be used. (4)

2. Mechanical Assembly DRG - 056

- (a) State the item numbers of the casing sections that make up the pump assembly. (2)
- (b) Explain the purpose and function of the suction casing design. (2)
- (c) Explain how axial expansion is accommodated in the pump assembly. (2)
- (d) Explain, using item numbers, how the axial location of the impeller within the casing is set. (4)

3. Ship's Construction Drawing DRG - 057

- (a) State the frame numbers between which the flat side of the hull and flat bottom of the hull start. (2)
- (b) State the maximum sounding of the aft peak tank. (2)
- (c) State the length of the plate sections forward of the engine room bulkhead. (2)
- (d) State the approximate length of the vessel between perpendiculars, explaining how this was ascertained. (2)
- (e) Use drawing references to identify the location of the start of the bilge keel. (2)

✓ 4. Hydraulic and Pneumatic System Drawings DRG - 058

- (a) State the identity number of the crossover valve between No.1 & No.2 generator starting air supply. (2)
- (b) With both starting air compressors and working air compressor not available, and no air in reservoirs:
  - (i) describe available options to reinstate safety air for fire flap activation; (3)
  - (ii) describe available options to reinstate main starting air for main generators. (3)
- (c) State what the following symbol indicates and explain its function. (2)



✓ 5. Electrical Power Systems and Control Drawings DRG - 059

- ✗ (a) Using drawing references, state where you could check the supply voltage to the auxiliary control circuit transformer. (2)
- (b) Explain the function of the link between terminals 1 & 2. (2)
- (c) State what item 'L' is, (located between terminals 65 & 66), and explain its function. (2)
- (d) Explain the function of the thermistor in the circuit. (2)
- (e) State the sequence of operation of the main contactors after the start button is pushed. (2)



**Section B**

**6. Drawing 057**

- (a) Describe what is visible on the drawing between frames 66-74 and longitudinal 4-6, indicating what purpose it may serve.

State what is different about this section of the drawing compared to most of the other details on the drawing.

(5)

- (b) Inspection has revealed an indentation in the hull approximately 300 mm deep, running between frames 76-79 and longitudinal 39-42. State the approximate area of the damage, steel involved in the repair, and discuss the complications that are evident from the drawing which may influence the cost of the repair.

(10)

- (c) Inspection has revealed an indentation in the hull approximately 600 mm deep, running between frames ~~85-87~~<sup>81-83</sup> and longitudinal 24-28. State the approximate area of damage, ~~81-83~~ steel involved in the repair and any complications that are evident from the drawing.

(10)

**7. Drawing 059**

- (a) With main supply voltage tested satisfactory, describe the actions required to activate the above circuit, and explain the automated sequence of actions that follow for the circuit to fulfil its function.

(10)

- (b) With the main supply voltage tested satisfactory, the above actions were carried out, but there are no sounds and nothing happens.

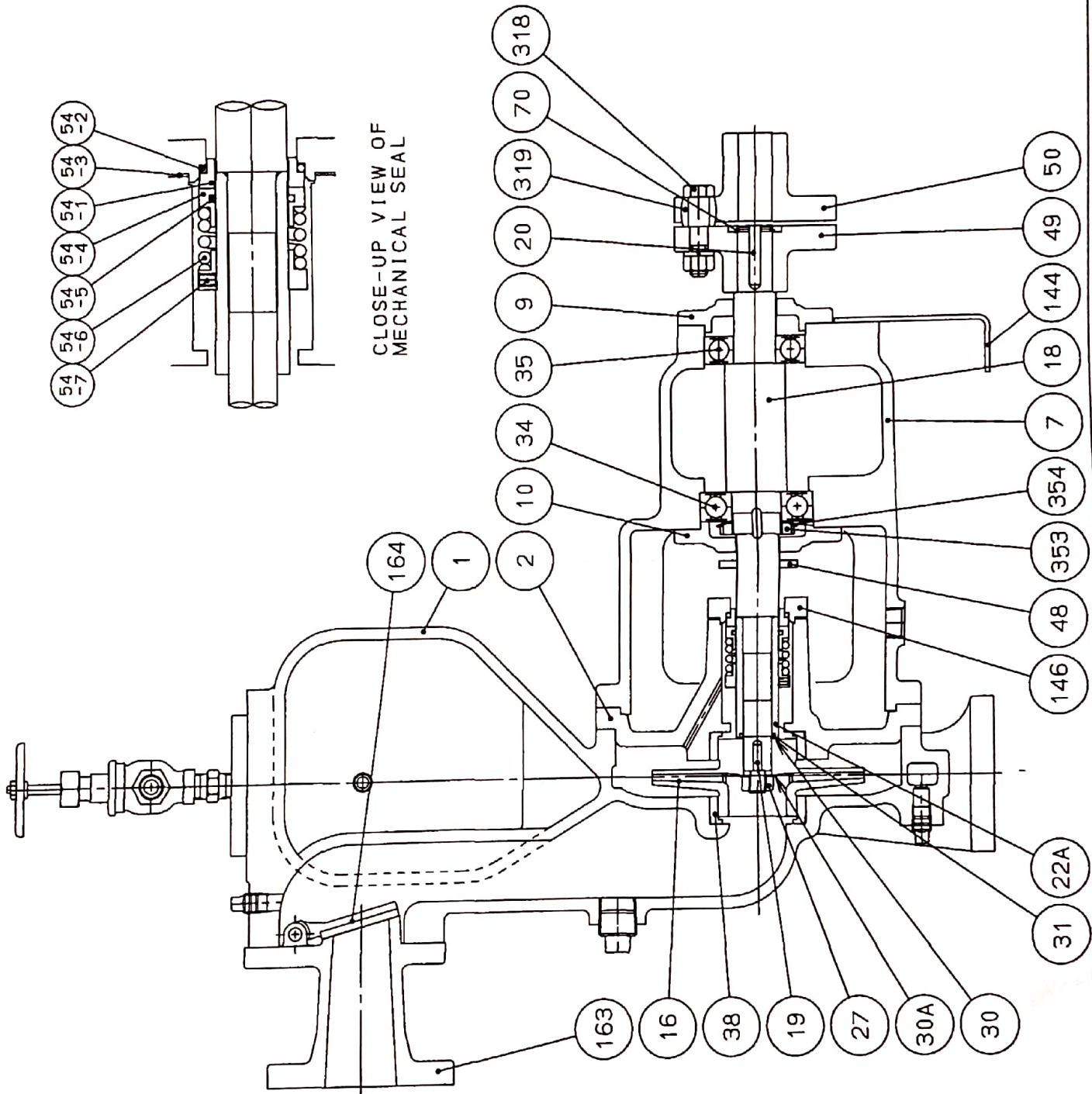
Describe the location of possible faults and tests carried out to identify the cause of the failure.

(15)

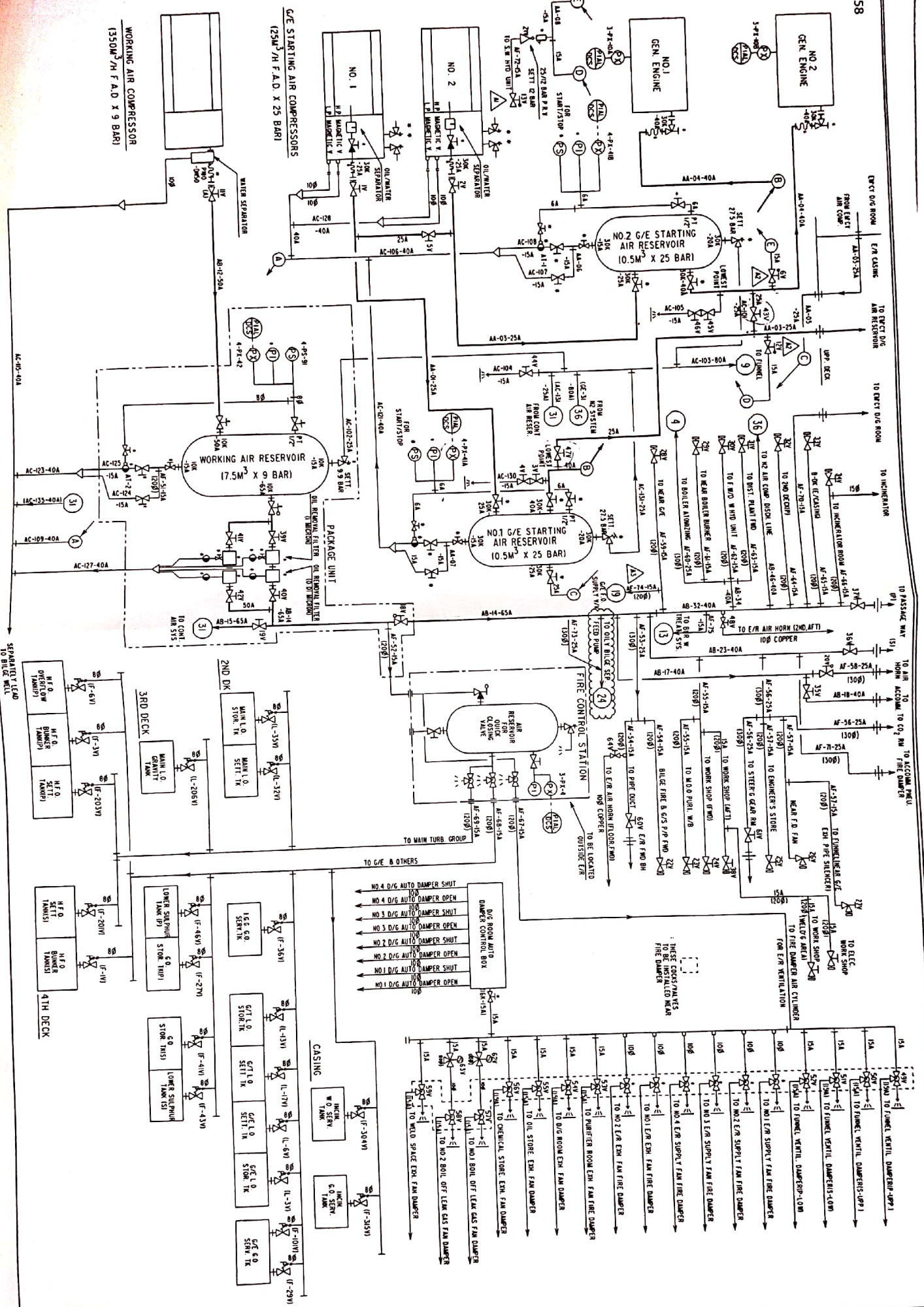






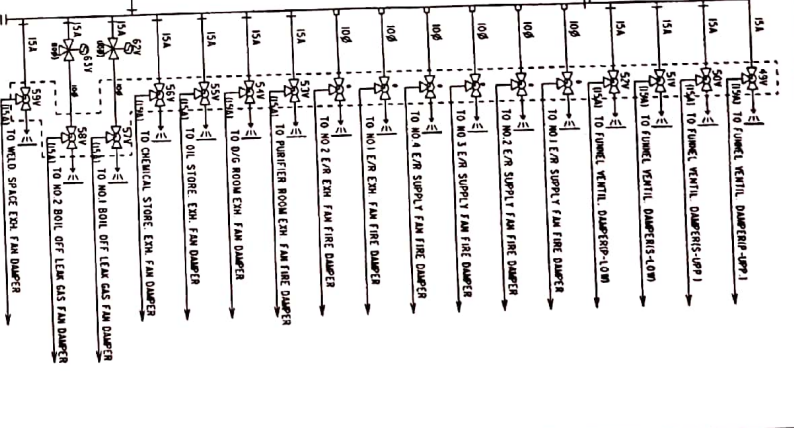






- NO. 4 D/G AUTO DAMPER SHUT
- NO. 4 D/G AUTO DAMPER OPEN
- NO. 3 D/G AUTO DAMPER SHUT
- NO. 3 D/G AUTO DAMPER OPEN
- NO. 2 D/G AUTO DAMPER SHUT
- NO. 2 D/G AUTO DAMPER OPEN
- NO. 1 D/G AUTO DAMPER SHUT
- NO. 1 D/G AUTO DAMPER OPEN

THESE DAMPERS  
TO BE INSTALLED NEAR  
FIRE DAMPER



WORKING AIR COMPRESSOR  
(1350M³/H F.A.D. x 9 BARI)

G/E STARTING AIR COMPRESSORS  
(125M³/H F.A.D. x 25 BARI)

WORKING AIR RESERVOIR  
(17.5M³ x 6.5 BARI)

NO. 1 G/E STARTING  
AIR RESERVOIR  
(10.5M x 25 BARI)

NO. 2 G/E STARTING  
AIR RESERVOIR  
(10.5M x 25 BARI)

AIR RESERVOIR  
QUICK  
CLOSING  
VALVE

3RD DECK  
MAIN L.O.  
GRAVITY  
TANK

2ND DECK  
MAIN L.O.  
STOR. TK  
SETT. TK

LOWER SUPPLY  
TANK (P)

6/7 L.O.  
STOR. TK

6/7 L.O.  
SETT. TK

6/7 L.O.  
STOR. TK

6/7 L.O.  
SETT. TK

6/7 L.O.  
STOR. TK

6/7 L.O.  
SETT. TK

6/7 L.O.  
STOR. TK

6/7 L.O.  
SETT. TK

6/7 L.O.  
STOR. TK

LOWER SUPPLY  
TANK (P)

6/7 L.O.  
STOR. TK

6/7 L.O.  
SETT. TK

6/7 L.O.  
STOR. TK

6/7 L.O.  
SETT. TK

6/7 L.O.  
STOR. TK

6/7 L.O.  
SETT. TK

6/7 L.O.  
STOR. TK

6/7 L.O.  
SETT. TK

6/7 L.O.  
STOR. TK

LOWER SUPPLY  
TANK (P)

6/7 L.O.  
STOR. TK

6/7 L.O.  
SETT. TK

6/7 L.O.  
STOR. TK

6/7 L.O.  
SETT. TK

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SETT. TK

6/7 L.O.  
STOR. TK

LOWER SUPPLY  
TANK (P)

6/7 L.O.  
STOR. TK

6/7 L.O.  
SETT. TK

6/7 L.O.  
STOR. TK

6/7 L.O.  
SETT. TK

6/7 L.O.  
STOR. TK

6/7 L.O.  
SETT. TK

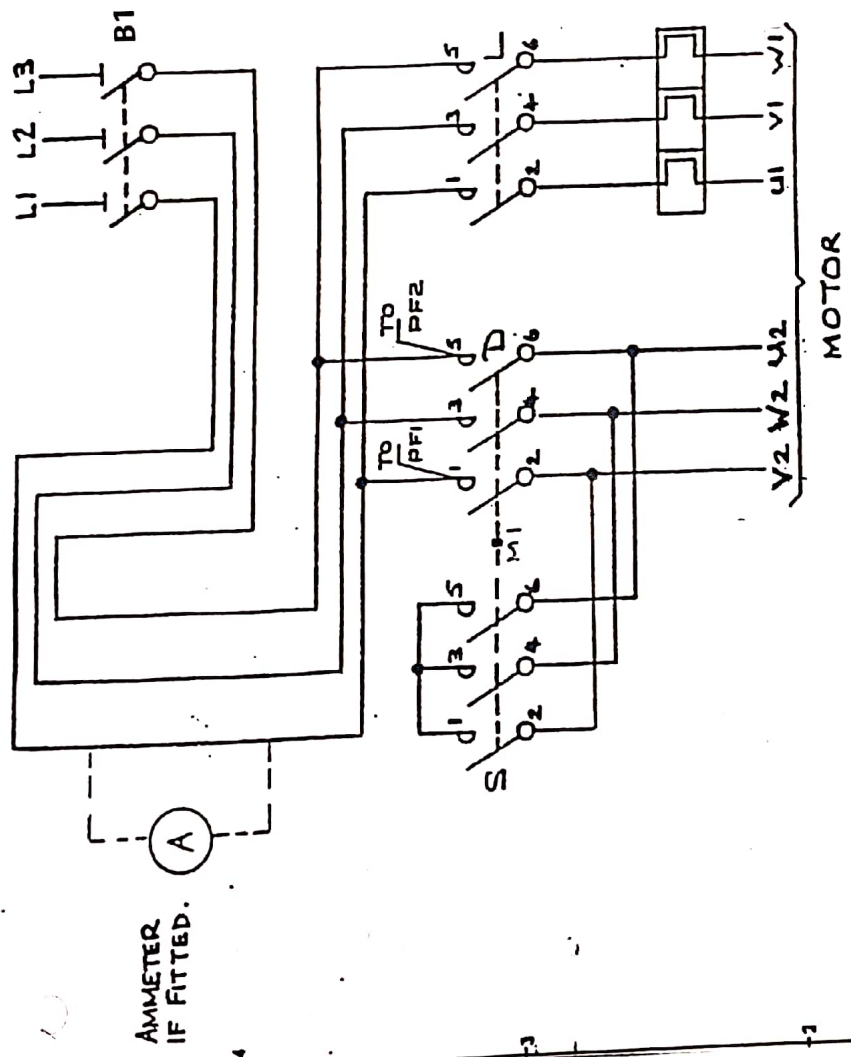
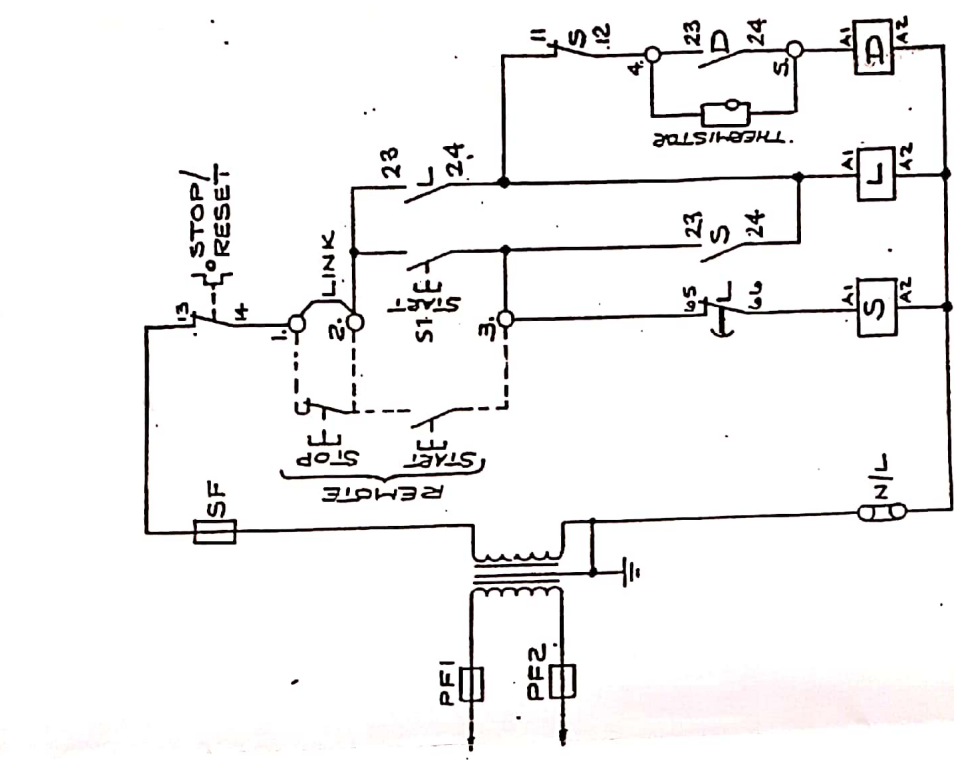
6/7 L.O.  
STOR. TK

6/7 L.O.  
SETT. TK

6/7 L.O.  
STOR. TK



DRG. No. DRG. 059  
CONTD. ON SHT. SHT. No. A



AMMETER  
IF FITTED.

MAIL.	APPROVED	TOLERANCES	TITLE
FINISH	DATE 20/1/01	FRACTIONS/DECIMALS	DEPT. ENGR. LOCAL
		DECIMALS	
		ANGLES	

90 11 13 11 TO ENGR. DEPT. 03/03/00