

TRAIN CREW TRAINING CENTRE
LONDON MIDLAND REGION
CREWE.

F O R W A R D

THIS HANDOUT IS INTENDED TO ASSIST TRAINEES IN THEIR
LEARNING OF THE CLASS 47 LOCOMOTIVE.
IT IN NO WAY SUBSTITUTES ANY OFFICIAL B.R. TRAINING
MANUALS OR PUBLICATION.

C O N T E N T S .

I N T R O D U C T I O N .

L O C O M O T I V E D A T A .

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53.	=	47/401-20 WESTINGHOUSE DISTRIBUTOR.
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55.	=	47/401-20 BRAKE APPLICATION UNIT.
56.	=	47/401-20 LOW RESERVOIR PROTECTION.
57.	=	47/401-20 D.S.D.& A.W.S.

ABBREVIATIONS USED ON CLASS 47 COURSES.

1.	A.B.P.	=	AIR BRAKE PIPE.
2.	A.B.P.G.	=	AIR BRAKE PIPE GOVERNOR.
3.	A.C.	=	ALTERNATING CURRENT.
4.	A.F.I.	=	ACCELERATED FREIGHT INSHOT.
5.	A.F.T.	=	ASSISTANCE TO FAILED TRAINS COCK.
6.	A.G.	=	AUXILIARY GENERATOR.
7.	A.O.L.	=	AUXILIARY OVERLOAD RELAY.
8.	AUTO.	=	AUTOMATIC.
9.	AUX.	=	AUXILIARY.
10.	A.V.I.V.	=	AIR VACUUM ISOLATING VALVE.
11.	A.V.R.	=	AUTOMATIC VOLTAGE REGULATOR.
12.	A.V.R.V.	=	AIR VACUUM RELAY VALVE (D.V.2.)
13.	A.W.S.	=	AUTOMATIC WARNING SYSTEM.
14.	B.C.F.	=	BROMOCHLORODIFLUOROMETHANE.
15.	B.Ch.F.	=	BATTERY CHARGE FUSE.
16.	B.I.S.	=	BATTERY ISOLATING SWITCH.
17.	B.S.S.	=	BRAKE SELECTOR SWITCH.
18.	B.V.	=	BRAKE VALVE.
19.	C.A.P.S.	=	CONTROL AIR PRESSURE SWITCH.
20.	C.C.B.1-2	=	CONTROL CIRCUIT BREAKER 1-2.
21.	C.C.G.	=	CONTROL CIRCUIT GOVERNOR.
22.	C.E.S.	=	CHANGE ENDS SWITCH.
23.	C.F.1-2	=	COMPRESSOR FUSE 1-2.
24.	C.G.	=	COMPRESSOR GOVERNOR.
25.	COMP.	=	COMPRESSOR.
26.	C.O.S.	=	CHANGE OVER SWITCH.
27.	D.A.	=	DIRECT ADMISSION.
28.	D.A.C.V.	=	DOUBLE ACTING CHECK VALVE.
29.	D.A.V.	=	DIRECT ADMISSION VALVE.
30.	D.C.	=	DIRECT CURRENT.
31.	D.E.	=	DIESEL ELECTRIC.
32.	D.Eng.	=	DIESEL ENGINE.

33.	D.S.D.	=	DRIVERS SAFTY DEVICE.
34.	D.V.2.	=	SEE A.V.R.V.
35.	E.F.S.	=	EARTH FAULT SWITCH.
36.	E.G.	=	ENGINE GOVERNOR.
37.	E.G.	=	EQUIPMENT GOVERNOR.
38.	E.I.S.	=	EXHAUSTER ISOLATING SWITCH.
39.	E.M.	=	ELECTRO MAGNETIC.
40.	E.M.S.	=	ENGINE MAINTENANCE SWITCH.
41.	E.O.	=	ENGINE ONLY.
42.	E.P.	=	ELECTRO PNEUMATIC.
43.	E.R.S.	=	ENGINE RUN SOLENOID.
44.	E.R.V.	=	ENGINE RUN VALVE.
45.	E.S.G.	=	ENGINE (SPEED) GOVERNOR
46.	E.S.V.	=	ENGINE SPEED VALVE.
47.	E.T.H.	=	ELECTRIC TRAIN HEAT.
48.	E.T.S.	=	ELECTRIC TRAIN SUPPLY.
49.	F.C.O.V.	=	FEED CUT OFF VALVE.
50.	F.D.1.	=	FEED VALVE TYPE 1.(INDEPENDENT AIR BRAKE VALVE).
51.	F.V.4.	=	FEED VALVE TYPE 4.(DRIVERS AUTO.BRAKE VALVE)
52.	GEN.	=	GENERATOR.
53.	GOV.	=	GOVERNOR.
54.	Hg.	=	HYDARAGYRUM.(MEASUREMENT OF VACUUM).
55.	H.P.	=	HORSE POWER.
56.	I.C.	=	ISOLATING COCK.
57.	L.C.B.1-2	=	LIGHTING CIRCUIT BREAKER 1-2.
58.	L.H.	=	LEFT HAND.
59.	Ltr	=	LITRE.
60.	L.S.T.3.	=	LOCOMOTIVE BRAKE DISTRIBUTOR.(D.& M.)
61.	LUB.	=	LUBRICATION. (I.E.LUB.OIL.)
62.	M.A.P.S.	=	MAIN AIR PRESSURE SWITCH.
63.	M.B.F.	=	MOTOR BLOWER FUSE.

64.	M.C.B.	=	MINITURE CIRCUIT BREAKER.
65.	M.I.S.	=	MOTOR ISOLATING SWITCH.
66.	M.P.H.	=	MILES PER HOUR.
67.	N.R.V.	=	NON RETURN VALVE.
68.	O.V.R.	=	OVER VOLT RELAY.
69.	P.C.R.	=	POWER CONTROL RELAY.
70.	P.S.I.	=	POUNDS PER SQUARE INCH.
71.	Q.S.A.	=	QUICK SERVICE APPLICATION VALVE. (VACUUM)
72.	R.H.	=	RIGHT HAND.
73.	R.O.P.S.	=	RUN OIL PRESSURE SWITCH.
74.	R.P.M.	=	REVOLUTIONS PER MINUTE
75.	S.A.B.	=	INDEPENDENT OR STRAIGHT AIR BRAKE.
76.	S.C.C.	=	START CONTACTOR COIL.
77.	S.M.S.	=	SLOW MOTION SWITCH.
78.	S.O.P.S.	=	START OIL PRESSURE SWITCH.
79.	S.R.V.	=	SPEED RAISE VALVE.
80.	S.S.F.	=	SPEED SENSING FEATURE.
81.	T.H.O.L.	=	TRAIN HEAT OVERLOAD
82.	T.Ms.	=	TRACTION MOTORS.
83.	T.M.B.	=	TRACTION MOTOR BLOWERS.
84.	T.S.C.B.	=	TRAIN SUPPLY CIRCUIT BREAKER.
85.	T.S.O.L.	=	TRAIN SUPPLY OVERLOAD RELAY.
86.	VAC.	=	VACUUM.
87.	V.C.G.	=	VACUUM CONTROL GOVERNOR.
88.	V.R.	=	VOLTAGE RELAY.
89.	V.Reg.	=	VOLTAGE REGULATOR.
90.	W.P.F.	=	WATER PUMP FUSE.
91.	W.P.S.	=	WATER PRESSURE SWITCH.

INTRODUCTION

BUILT BY BRUSH ENGINEERING AT LOUGHBOROUGH BETWEEN 1962 & 1967
ENGINE.....SULZER 12 CYLINDER 12LDA28 RATED AT 2,580 HP.
LOCO WEIGHT.....111-125 TONNES.
R.A.....6. (47/7.....R.A.7)
BRAKE FORCE.....60.
E.T.H. INDEX.....66(WHERE FITTED).
WHEEL ARRANGEMENT. C - C. (ALL WHEELS ARE POWERED).

LOCOMOTIVE DATA

47/0.....001-298 D&M D/BRAKE.
47/3.....301-381 D&M D/BRAKE. (SOME LOCO'S SLOW SPEED FITTED)
47/4.....401-420 WESTINGHOUSE D/BRAKE. E.T.S. FITTED.
47/4.....421-699 D&M D/BRAKE. E.T.S. FITTED.
47/7.....701-710 D&M D/BRAKE. PUSH-PULL LOCO'S.
47/8.....801-853 D&M D/BRAKE. EXTRA FUEL TANKS.
47/9.....901-976 D&M D/BRAKE. DEDICATED TO CIVIL ENGINEERS

PART ONE

THE DIESEL ELECTRIC LOCOMOTIVE.

THE EQUIPMENT WHICH WE REQUIRE FOR TRACTION PURPOSES CAN BE DIVIDED INTO THREE SECTIONS:-

1. THE DIESEL ENGINE:-

DEVELOPS MECHANICAL POWER FROM DIESEL FUEL.

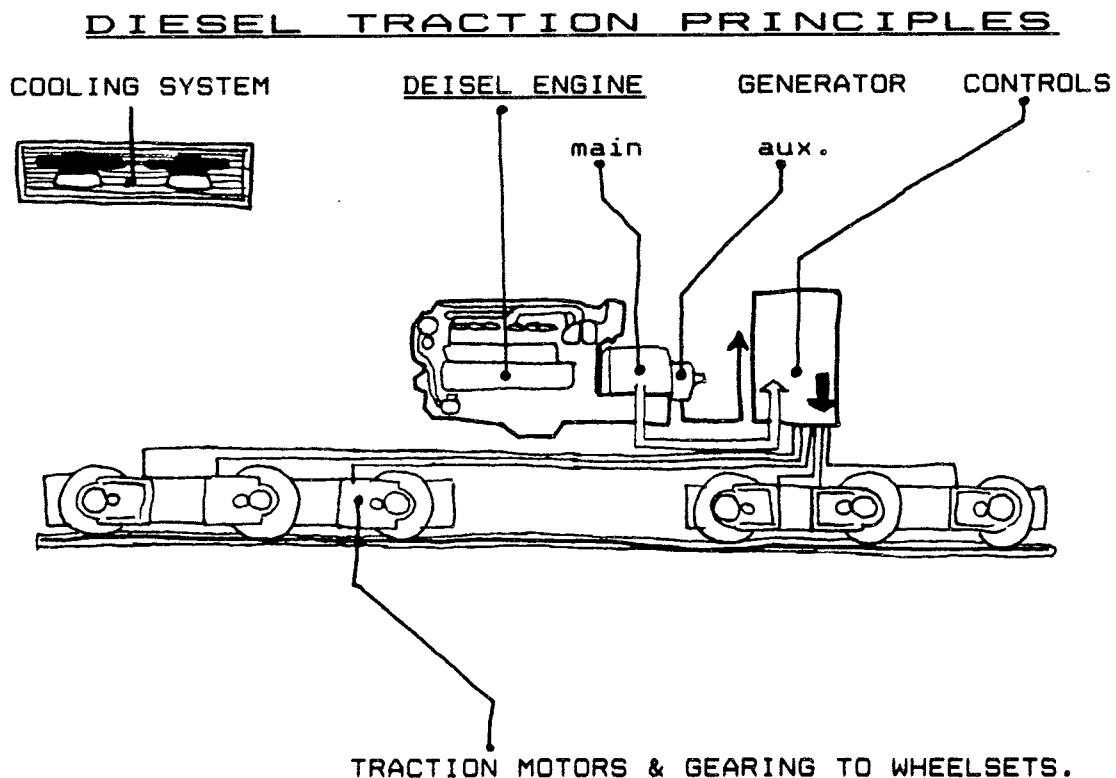
2. GENERATOR:-

CONVERTS MECHANICAL POWER INTO ELECTRICAL ENERGY.

3. TRACTION MOTORS (6) :-

CONVERTS ELECTRICAL ENERGY INTO ROTARY ACTION THEREBY TURNING THE ROAD WHEELS.

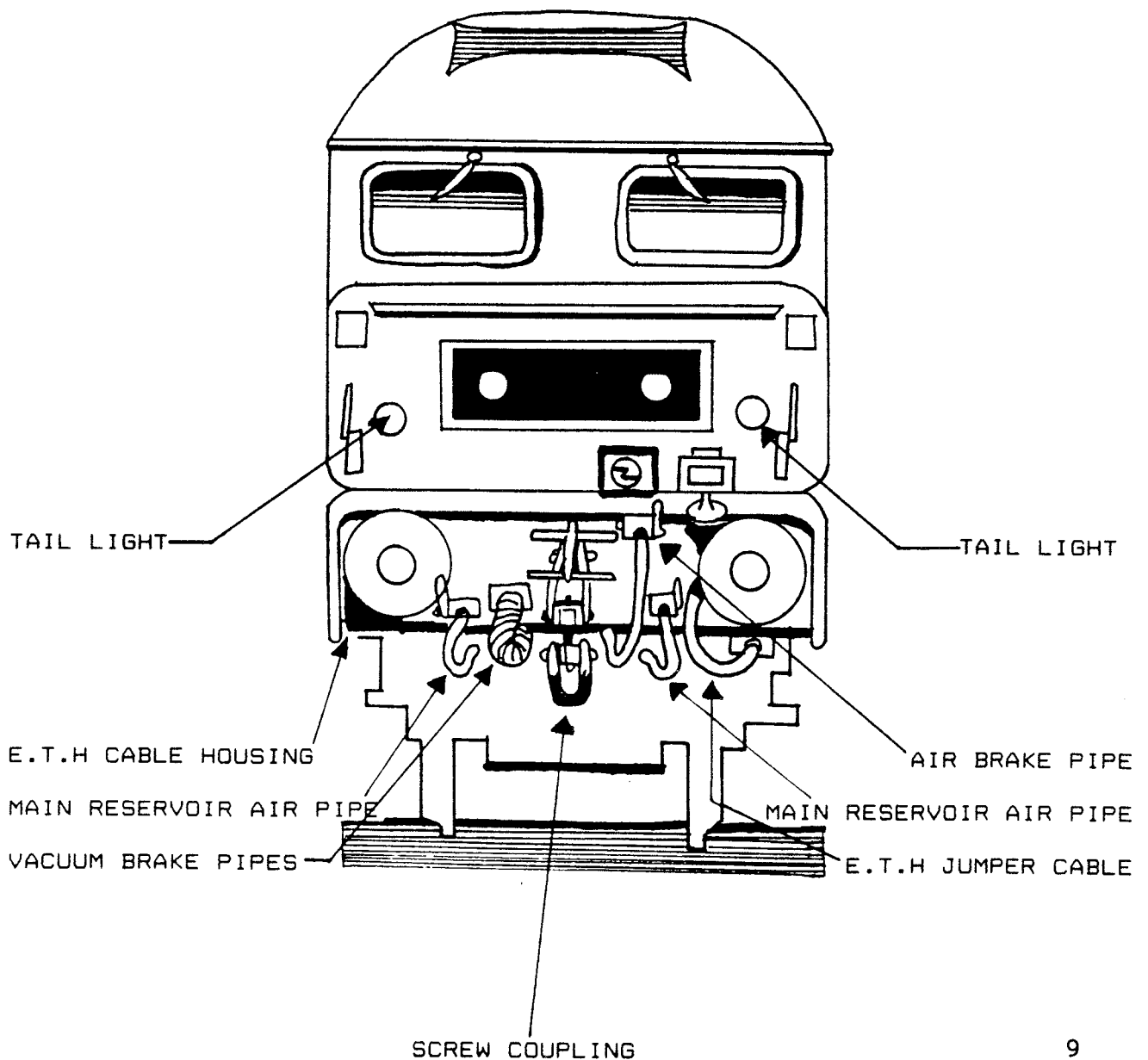
THIS CAN BE SUMMED UP SIMPLY BY SAYING A DIESEL ELECTRICAL LOCOMOTIVE (D.E.L.) IS A LARGE MOBILE GENERATOR SET CAPABLE OF MOVING UNDER ITS OWN POWER.



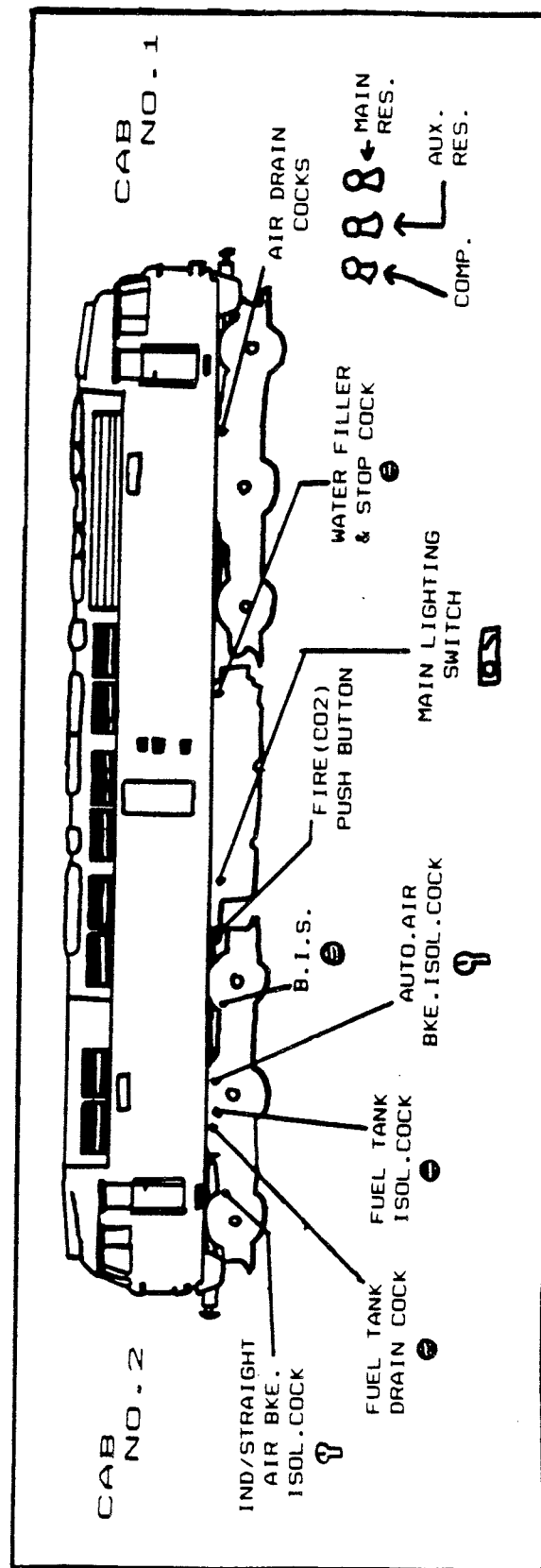
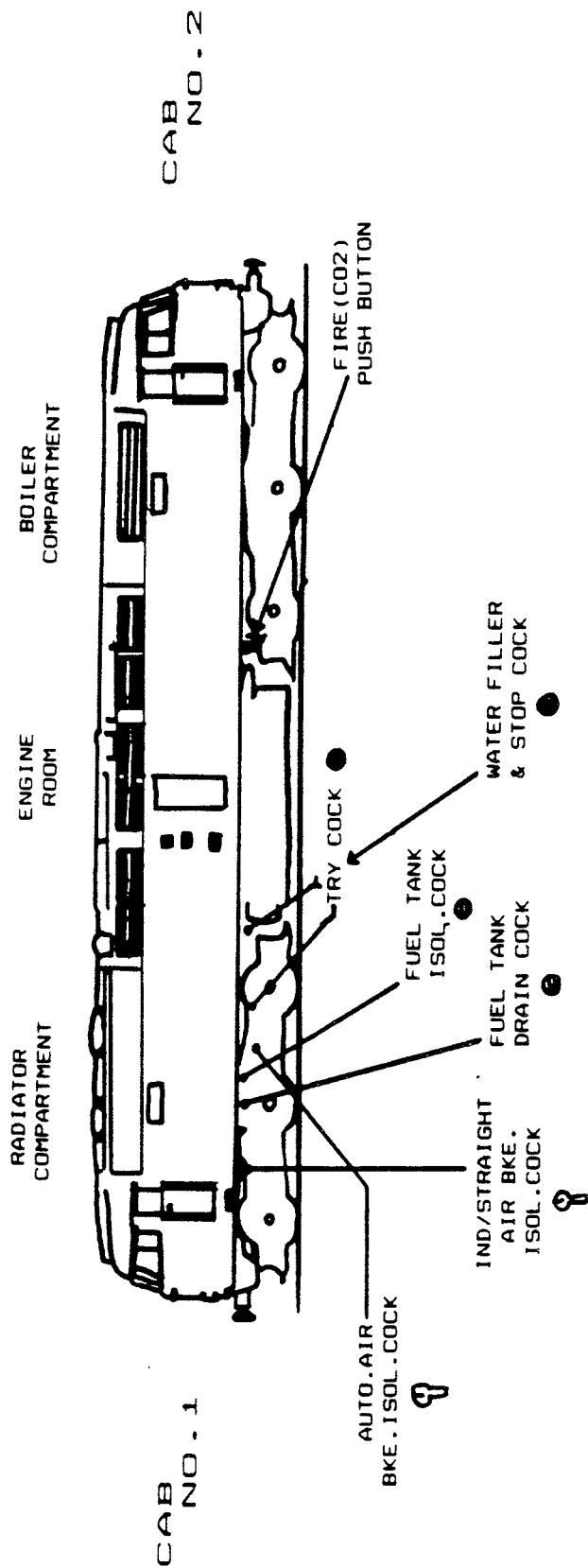
LOCOMOTIVE LAYOUT.

1. NOSE END CONNECTIONS (LEFT TO RIGHT)

- (a) E.T.S. (SOCKET)
- (b) MAIN RESERVOIR PIPE. (6.89 Bar or 100 P.S.I.).
- (c) VACUUM TRAIN PIPE.
- (d) COUPLING.
- (e) AIR BRAKE PIPE.
- (f) MAIN RESERVOIR PIPE. (6.89 Bar or 100 P.S.I.).
- (g) E.T.S. (JUMPER CABLE)



LAYOUT AND EXTERIOR CONNECTIONS



2. EXTERIOR LAYOUT

2.1 ISOLATING COCKS

- (a) STRAIGHT AIR BRAKE (2).
- (b) AUTOMATIC AIR BRAKE (2).
- (c) FUEL TANK (2).

2.2 DRAIN COCKS

- (a) FUEL TANK.
- (b) COOLING WATER FILLER AND DRAIN (2).
- (c) MAIN RESERVOIR AIR (1).
- (d) AUXILIARY RESERVOIR AIR (2).
- (e) COMPRESSOR INTERCOOLER (2).

2.3 ADDITIONAL ITEMS

- (a) FIRE PUSH BUTTON (2)
- (b) COOLANT WATER TRI-COCK (1)
- (c) BATTERY ISOLATION SWITCH (EXTENSION HANDLE).
- (d) MAIN LIGHTING SWITCH (1).

3. DRIVING CAB LAYOUT

3.1 GAUGES (LEFT TO RIGHT)

- (a) A.W.S. INDICATOR.
- (b) MAIN RESERVOIR.
- (c) BRAKE CYLINDERS.
- (d) VACUUM.
- (e) SPEEDOMETER.
- (f) AIR BRAKE PIPE.
- (g) AMMETER

3.2 LIGHTS (LEFT TO RIGHT)

- (a) ENGINE STOP (RED).
- (b) WHEEL SLIP/SPIN (YELLOW).
- (c) GENERAL FAULT (BLUE).
- (d) E.T.S. (WHITE).

3.3 PUSH BUTTONS (LEFT TO RIGHT) DRIVERS DESK & CAB .

- (a) A.W.S. RESET.
- (b) ENGINE START.
- (c) ENGINE STOP.
- (d) WINDSCREEN WASHER.
- (e) E.T.S. ON.
- (f) E.T.S. OFF.
- (g) OVERLOAD RESET (NO LONGER FUNCTIONAL).
- (h) FIRE ALARM TEST.
- (i) STEAM HEAT ON. (NO LONGER FUNCTIONAL).
- (j) STEAM HEAT OFF. (NO LONGER FUNCTIONAL).
- (k) FIRE SYSTEM PUSHBUTTON (REAR OF CAB) TRAIN (WO)MANS SIDE.
- (l) D.S.D.HOLDOVER BUTTON (TRAIN(WO)MANS SIDE.

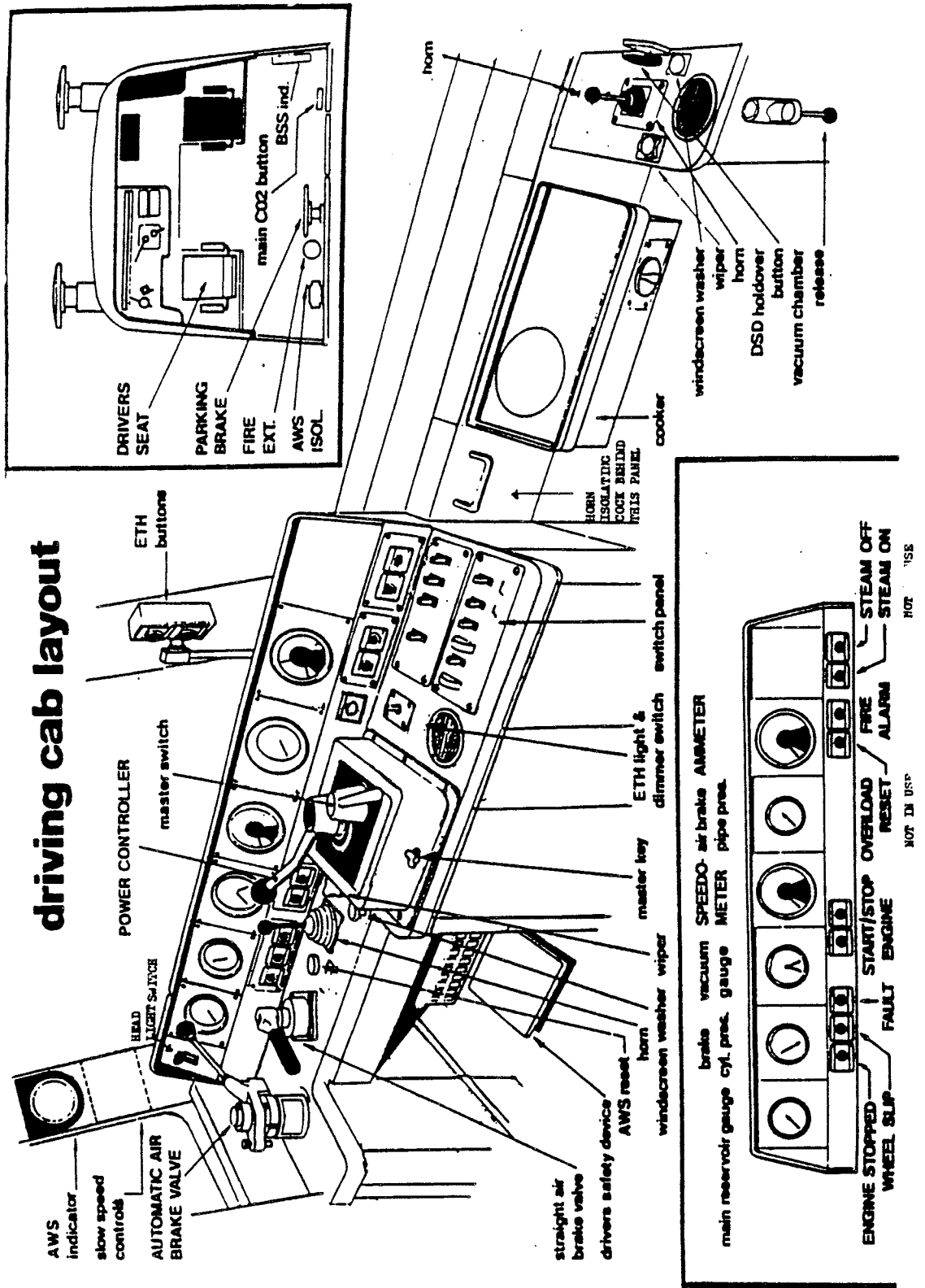
3.4 SWITCHES (DRIVERS DESK)

- (a) HEADLIGHT.
- (b) MASTER.
- (c) E.T.H. DIMMER.
- (d) TAIL.
- (e) COMPARTMENT.
- (f) CAB HEATING SWITCHES.

3.5 OTHER MAJOR ITEMS OF EQUIPMENT.

- (a) AUTO AIR BRAKE VALVE.
- (b) INDEPENDENT OR STRAIGHT AIR BRAKE VALVE.
- (c) HORN (2).
- (d) POWER CONTROLLER.
- (e) WINDSCREEN WIPER.
- (f) VACUUM CHAMBER RELEASE (1).
- (g) CHANGE END SWITCH.
- (h) B.C.F. FIRE EXTINGUISHERS. HAND (1) ONE IN EACH CAB.
- (i) TRACK CIRCUIT OPERATING CLIPS.(2) DETONATORS & RED FLAGS.
- (j) PARKING BRAKE.

driving cab layout



4. RADIATOR COMPARTMENT LAYOUT.

4.1 ELECTRIC MOTORS

- (a) COMPRESSORS (2).
- (b) EXHAUSTERS (2).
- (c) TRACTION MOTOR BLOWER (1).
- (d) TRIPLE PUMP SET (1).

4.2 GOVERNORS

- (a) PRE-START (IF FITTED).
- (b) VACUUM BRAKE PIPE.
- (c) COMPRESSOR.
- (d) MAIN AIR PRESSURE SWITCH (C.C.G.).
- (e) AIR BRAKE PIPE.
- (f) EQUIPMENT.

4.3 ISOLATING COCKS.

- (a) D.S.D.
- (b) F.C.O.V.
- (c) VACUUM BRAKE D.V.2.
- (d) MAIN RESERVOIR.
- (e) FUEL.
- (f) COMPRESSOR GOVERNOR.
- (g) C.C.G. (CONTROL AIR)
- (h) A.F.T.(WHERE FITTED)

4.4 VALVES

- (a) MAIN RESERVOIR AIR HIGH PRESSURE (SAFETY.10.34 Bar or 150 P.S.I.) (2).
- (b) MAIN RESERVOIR AIR LOW PRESSURE (SAFETY.3.1 Bar or 45 P.S.I.) (2).
- (c) D.S.D. T.M.V.7.
- (d) VACUUM/AIR D.V.2.
- (e) OVER CHARGE RELEASE (COW TAIL) AIR.
- (f) OVER CHARGE RELEASE (BUTTON) VACUUM.
- (g) AIR/VAC ISOLATOR.
- (h) EXHAUSTER CHOKE.
- (i) PRESSURE CONTROL.
- (j) AUTO AIR BRAKE RELAY.
- (k) INDEPENDENT OR STRAIGHT AIR BRAKE RELAY.

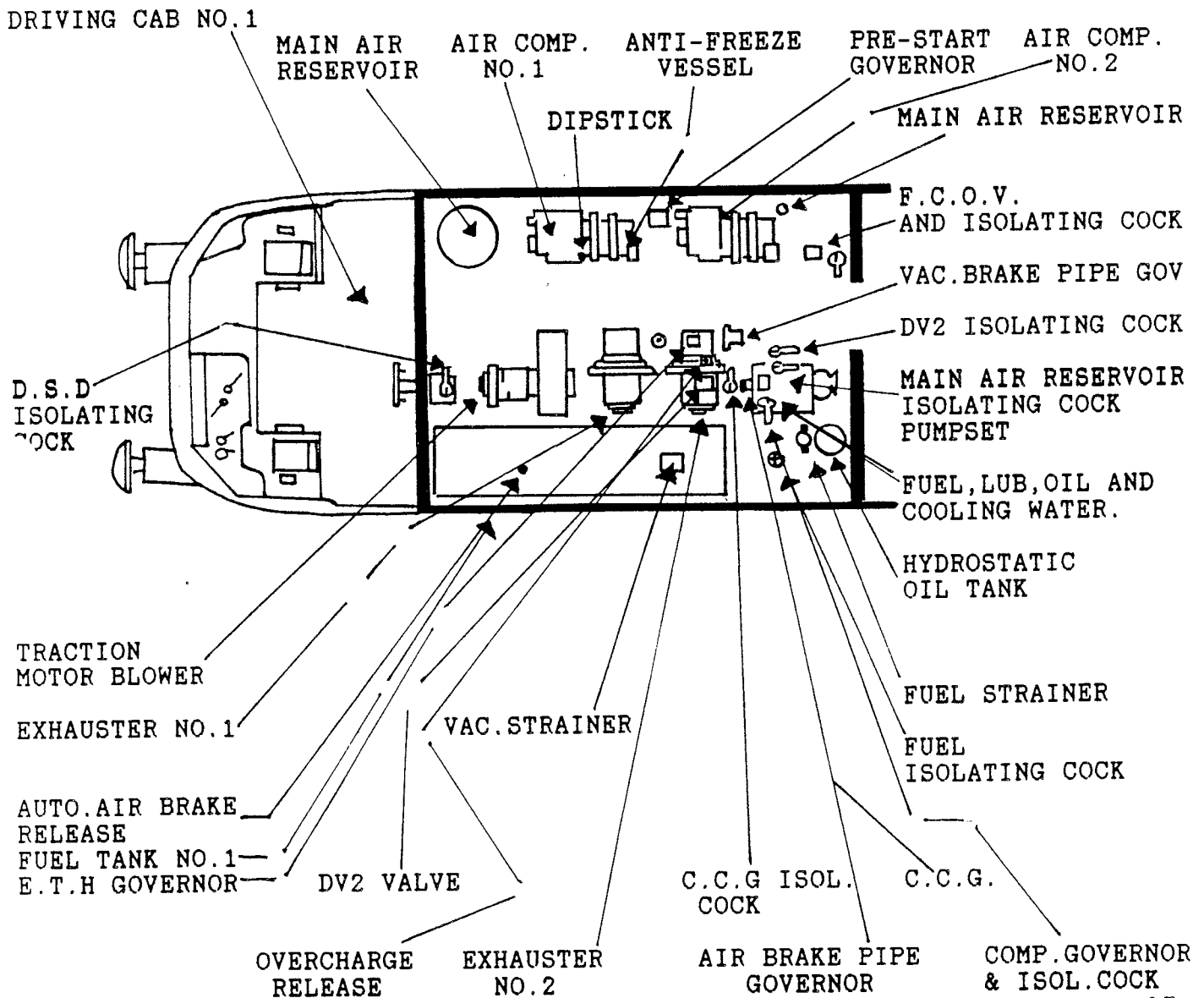
4.5 STRAINERS/FILTERS

- (a) FUEL.
- (b) VACUUM.
- (c) MAIN AIR INTAKE.

4.6 OTHER EQUIPMENT

- (a) MAIN RESERVOIR TANKS.(4)
- (b) FUEL TANK.
- (c) DISTRIBUTER L.S.T.3.
- (d) HYDROSTATIC OIL TANK.(FITTED WITH A SIGHT GLASS GAUGE.)
- (e) VARIOUS OTHER RESERVOIRS.

RADIATOR COMPARTMENT



5. ENGINE ROOM LAYOUT

5.1 12LDA 28 SULZER ENGINE.

5.2 PRESSURE SWITCHES

- (a) START OIL PRESSURE (S.O.P.S.)
- (b) RUN OIL PRESSURE (R.O.P.S.)
- (c) WATER PRESSURE (W.P.S.)

5.3 GAUGES OR INDICATORS

- (a) WATER HEADER TANK.
- (b) CHARGING AIR.
- (c) REGULATING AIR.
- (d) WATER PRESSURE.
- (e) WATER TEMPERATURE.
- (f) OIL PRESSURE.
- (g) OIL TEMPERATURE.
- (h) DIPSTICK.
- (i) BATTERY CHARGE/DISCHARGE.
- (j) CONTROL AIR.

5.4 BUTTONS/SWITCHES/LEVERS

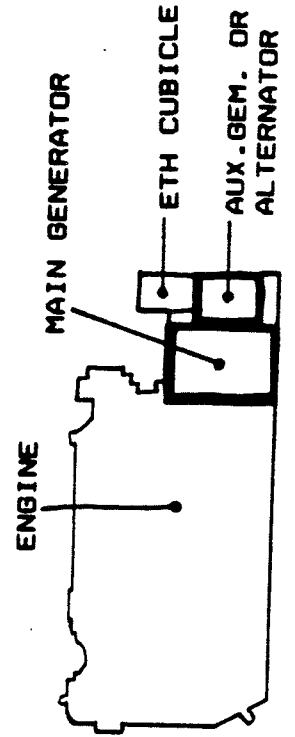
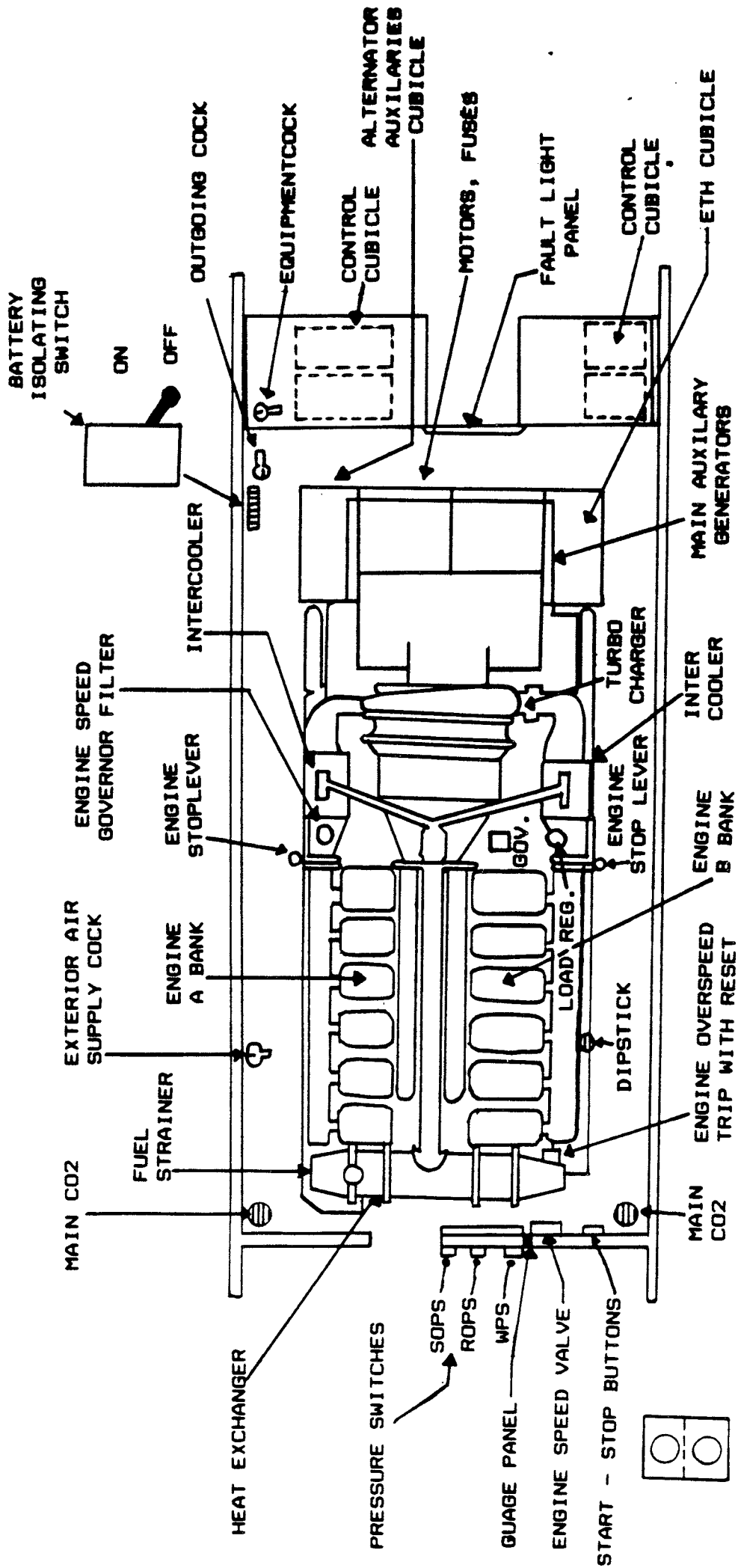
- (a) LOCAL START
- (b) LOCAL STOP.
- (c) ENGINE MANUAL STOP LEVER.
- (d) BATTERY ISOLATING SWITCH (B.I.S)
- (e) CONTROL SWITCHES IN SEPARATE CUBICLE.
- (f) M.C.B. IN SEPARATE CUBICLE.
- (g) ENGINE OVER SPEED RESET LEVER.

5.5 ISOLATING COCKS

- (a) EXTERIOR AIR SUPPLY.
- (b) CONTROL AIR OUT GOING.
- (c) EQUIPMENT (IF FITTED)

- (a) GENERATOR SET.
- (b) HEAT EXCHANGER.
- (c) TURBO CHARGER.
- (d) INTERCOOLER.
- (e) E.T.H. CUBICLE (IF FITTED).
- (f) ENGINE SPEED GOVERNOR.
- (g) LOAD REGULATOR.
- (h) ENGINE GOVERNOR FILTER.
- (i) ENGINE OVERSPEED DEVICE.
- (j) MAIN CO2 FIRE BOTTLES (2).
- (k) FUEL STRAINER.
- (l) ENGINE SPEED VALVE.
- (m) OIL FILTER.

ENGINE ROOM



6. FORMER BOILER COMPARTMENT

6.1 ISOLATING COCKS.

- (a) F.C.O.V.
- (b) CONTROL AIR IN GOING.

6.2 TRACTION MOTOR BLOWER (ALSO COOLS H.T.CUBICLES).

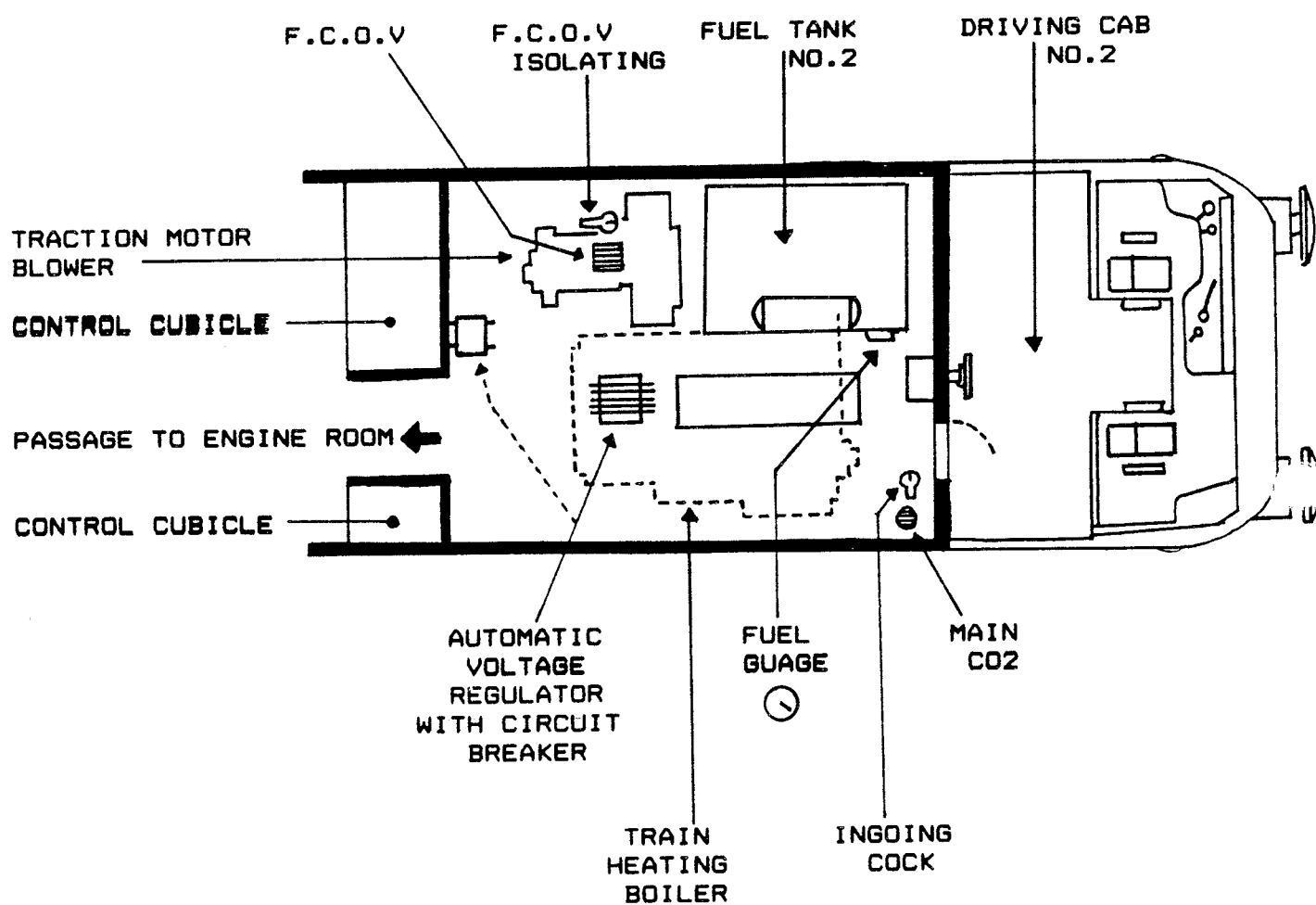
6.3 AUTOMATIC VOLTAGE REGULATOR (A.V.R.).

6.4 E.T.H. CUBICLE (IF FITTED).

6.5 FUEL TANK No.2 WITH GAUGE.

6.6 STEAM TRAIN HEAT BOILER (IF FITTED) ONLY THREE IN SERVICE
SPRING 1990.

BOILER COMPARTMENT



7. ENGINE ROOM GAUGES ON BULK HEAD AT THE FREE END OF ENGINE

7.1 WATER HEADER TANK.

- (a) HOLD APPROXIMATELY 136.38 Ltr. or 30 GALLONS.
- (b) REGISTERS E, 1/4, 1/2, 3/4, F.
- (c) IF BELOW 1/2 TO BE TOPPED UP BEFORE ENTERING SERVICE.

7.2 CHARGING AIR.

WILL REGISTER 0-1.3 Bar or 15 P.S.I. THIS IS THE PRESSURE ABOVE ATMOSPHERIC WHICH IS 1 Bar or 14.503 P.S.I.

7.3 REGULATING AIR.

WILL REGISTER 0-3.44 Bar or 50 P.S.I. DEPENDANT ON THE AMOUNT OF POWER CONTROLLER OPENING.

7.4 WATER PRESSURE.

- (a) WHEN PRIMING = .68 Bar or 10 P.S.I.
- (b) ENGINE RUNNING = 1.03-1.37 Bar or 15-20 P.S.I.

7.5 WATER TEMPERATURE.

- (a) NORMAL = 75.5-81.01 C. or 168-178 F.
- (b) HIGH WATER TEMPERATURE = 87.7 C or 190 F.

7.6 OIL PRESSURE.

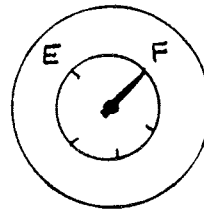
WITH ENGINE RUNNING = 2.06-4.13 Bar or 30-60 P.S.I.

7.7 OIL TEMPERATURE.

NORMALLY APPROXIMATELY -16.6 C or 2 F BELOW THAT OF WATER TEMPERATURE.

G A U G E P A N E L

PRESSURE SWITCHES



COOLING WATER HEADER TANK GAUGE



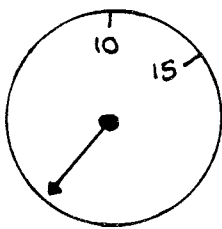
WPS



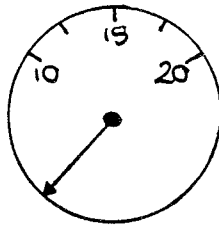
ROPS



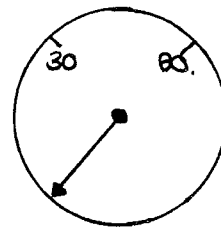
SOPS



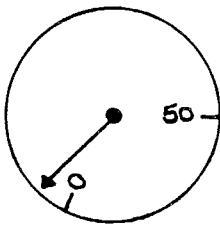
CHARGING AIR



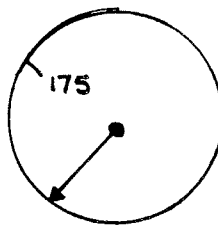
WATER PRESSURE



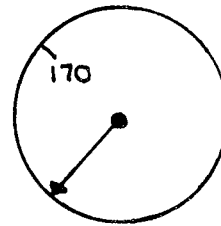
OIL PRESSURE



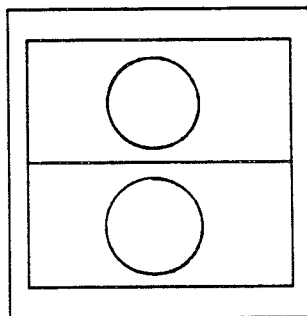
REGULATING AIR



WATER TEMPERATURE

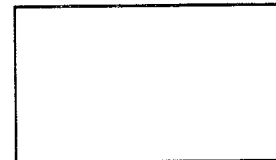


OIL TEMPERATURE



START

STOP



ENGINE SPEED VALVE

8. LOCAL FAULT LIGHT PANEL ON BULK HEAD AT FIXED END OF ENGINE

THESE ARE NORMALLY DIM BLUE BUT WILL BRIGHTEN UNDER FAULT CONDITIONS.

8.1 WATER TEMPERATURE (H.W.T.)

- (a) NORMALLY CAB AND LOCAL FAULT SHOWS DIM.
- (b) TEMPERATURE 87.7 C or 190 F WILL GIVE A CONSTANT BLUE LIGHT BRIGHT ON BOTH.
- (c) DIMS WHEN TEMPERATURE FALLS TO 83.8 C or 183 F.

8.2 WATER PRESSURE/LEVEL.

- (a) BLUE LIGHT BRIGHT ENGINE SHUTS DOWN WHEN PRESSURE FALLS TO .27 Bar or 4 P.S.I.
- (b) WILL REMAIN BRIGHT UNTIL RELAY RESET BY MAINTENANCE STAFF.
- (c) IF HEADER TANK LEVEL FALLS A FLOAT SWITCH WILL OPERATE CAUSING A BLUE LIGHT BRIGHT BUT NO ASSOCIATED LOSS OF POWER.
- (d) TOP UP SYSTEM TO RETURN FAULT LIGHT TO DIM,

8.3 OIL PRESSURE.

- (a) DIM UNTIL PRESSURE FALLS BELOW .82 Bar or 12 P.S.I. THEN BLUE LIGHT BRIGHT FOLLOWED BY DIESEL ENGINE SHUT DOWN.
- (b) WILL REMAIN BRIGHT UNTIL RELAY RESET BY MAINTENANCE STAFF.

8.4 TRACTION MOTOR BLOWER.

- (a) T.M.B. FUSE BLOWS RESULTING IN CONSTANT BLUE LIGHT BRIGHT.
- (b) CHANGE FUSE TO DIM FAULT LIGHT.

8.5 EARTH FAULT.

INDICATES ON DRIVERS DESK A FAULT.

8.6 POWER EARTH FAULT.

- (a) BLUE LIGHT BRIGHT WITH POWER CONTROLLER OPEN NO AMPS AVAILABLE.
- (b) DRIVER DESK FAULT LIGHT INTERMITTENTLY BRIGHT I.E. BRIGHT CONTROLLER OPEN, DIM CONTROLLER CLOSED.
- (c) LOCAL FAULT REMAINS BRIGHT UNTIL RELAY RESET BY MAINTENANCE STAFF.

8.7 AUXILIARY EARTH FAULT.

- (a) DETECTS AN AUXILIARY EARTH FAULT INDICATION ONLY ON LOCAL FAULT PANEL NOT ON DRIVERS DESK.

8.8 BATTERY AMMETER.

SHOWS THE STATE/CONDITION OF BATTERY.

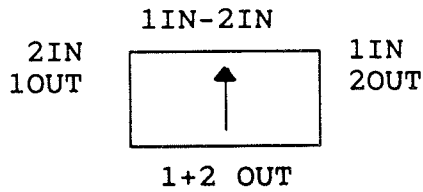
8.9 CONTROL AIR GAUGE.

MAXIMUM WORKING PRESSURE 4.82 Bar or 70 P.S.I.

9 CONTROL PANEL SWITCHES

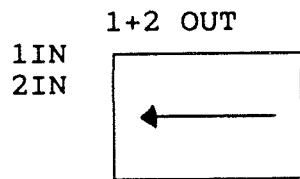
9.1 TRACTION MOTOR ISOLATION.

(a) MOTORS IN PARALLEL.



MOTORS CAN BE ISOLATED INDIVIDUALLY.

(b) MOTORS IN SERIES PARALLEL.

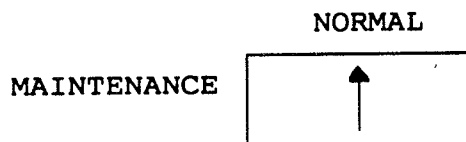


MOTORS CAN ONLY BE ISOLATED IN PAIRS.

WHEN TRYING TO LOCATE A DEFECTIVE MOTOR CHECK BY ELIMINATION OF ONE POSITION AT A TIME.

NEVER ISOLATE ALL THEN SWITCH IN ONE AT A TIME.

9.2 ENGINE MAINTENANCE.



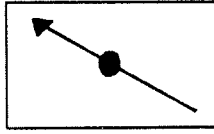
(a) NORMALLY ONLY USED BY MAINTENANCE STAFF.

(b) IF IN MAINTENANCE NO AMPS ARE AVAILABLE.

9.3 BRAKE SYSTEM SELECTOR (B.S.S.)

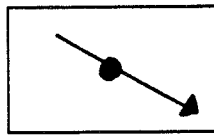
(a) HAS FOUR POSITIONS.

AIR PASSENGER



- (i) BOTH COMPRESSORS RUN MAINTAINING AIR PRESSURE BETWEEN 8.14-9.65 Bar or 118-140 P.S.I. (NOTE No.2 STARTS APPROXIMATELY 10 SECONDS AFTER No.1).
- (ii) AIR VACUUM ISOLATING VALVE (A.V.I.V.) SETS THE DISTRIBUTOR (L.S.T.3.) TO WORK UNDER AIR CONDITIONS ONLY.
- (iii) EXHAUSTERS WILL NOT RUN.
- (iv) CAB INDICATION LIGHT SHOWS AIR PASS.
- (v) IN THIS POSITION IT TAKES JUST 3-5 SECONDS FOR BRAKES TO BE FULLY APPLIED (PASSENGER TIMING).

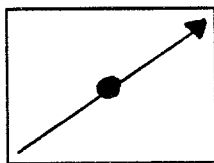
(b)



AIR GOODS

- (i) AS PER PASSENGER POSITION EXCEPT FOR:-
 - * CAB INDICATOR SHOWS GOODS.
 - ** FIRST .69 Bar or 10 P.S.I. OF BRAKE CYLINDER PRESSURE AT NORMAL RATE, THEN IT TAKES 20-28 SECONDS FOR BRAKE CYLINDER TO RISE TO 4.82 Bar or 70 P.S.I.

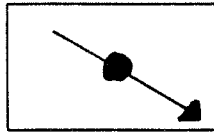
(c)



VACUUM PASS OR BRAKED

- (i) BOTH EXHAUSTERS RUN.
- (ii) ONLY ONE COMPRESSOR WILL RUN.
- (iii) A.V.I.V. WILL SET DISTRIBUTOR (L.S.T.3.) TO WORK UNDER VACUUM, ONLY WHEN VACUUM PRESENT IN CHAMBER SIDE OF L.S.T.3.
- (iv) CAB INDICATOR SHOWS VACUUM PASS/BRAKED.
- (v) LOCOMOTIVE BRAKES ARE SLIGHTLY DELAYED TO ALLOW TRAIN BRAKES TO APPLY FIRST.

(d)



VACUUM GOODS OR UNBRAKED.

(i)

AS FOR THE PASS/BRAKED POSITION EXCEPT FOR:-

CAB INDICATOR SHOWS VACUUM GOODS/UNBRAKED.

VACUUM TRAIN PIPE FALLS AT NORMAL RATE BUT LOCOMOTIVE BRAKE WILL APPLY AT A SLOW RATE 25-30 SECONDS TO REACH 4.82 Bar or 70 P.S.I.

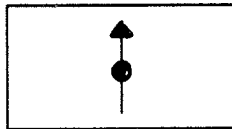
IF D.S.D. OPERATES THE BRAKE APPLICATION RATE IS SLIGHTLY LONGER 30-40 SECONDS TO REACH 4.82 Bar or 70 P.S.I.

9.4 WATER PUMP.

(a)

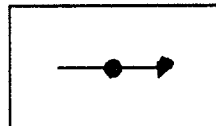
HAS THREE POSITIONS.

AUTO



PRIOR TO ENGINE BEING STARTED THE PUMPSET WILL RUN FOR APPROXIMATELY TWO MINUTES WHEN MASTER SWITCH IS MOVED TO ENGINE ONLY.

(b)



OFF

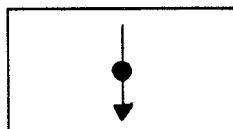
(i)

PUMP SET WILL NOT RUN.

(ii)

PLACED IN THIS POSITION IF ENGINE IS TO BE PREVENTED FROM BEING STARTED.

(c)



DIRECT

(i)

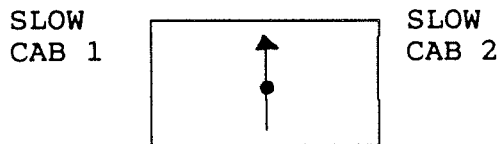
IF PUMPSET WILL NOT RUN AT AUTO PLACE TO DIRECT IN AN ATTEMPT TO START IT.

(ii)

PUMPSET RUNS OFF BATTERY ALL THE TIME WITH MASTER SWITCH AT ANY POSITION.

9.5 SLOW MOTION (IF FITTED)

HAS THREE POSITIONS.
NORMAL

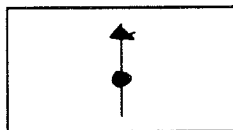


SWITCH TOWARDS CAB DRIVING FROM. (SEE SLOW-SPEED CONTROL SECTION).

9.6 EARTH FAULT.

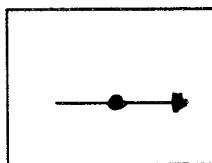
HAS FOUR POSITIONS.

(a) NORMAL



EVERYTHING RUNS NORMAL.

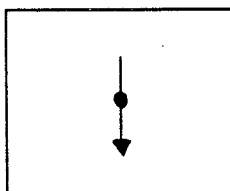
(b)



AUXILIARIES
ISOLATED

(i) EARTH FAULT LIGHT BRIGHT WITH NO OTHER SYMPTOMS, OR WITH CONTROL M.C.B.'S TRIPPING. LOCAL FAULT LIGHT REMAINS BRIGHT.

(c)

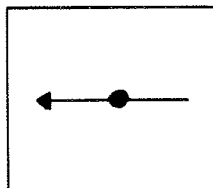


POWER & AUX.
ISOLATED

(i) USED IF YOU HAVE BOTH A POWER AND AN AUXILIARY EARTH FAULT.

(d)

POWER
ISOL.



(i) IF POWER EARTH FAULT PLACED TO THIS POSITION.
DESK FAULT LIGHT DIMS, BUT LOCAL STAYS BRIGHT.

10. CONTROL CIRCUIT BREAKERS.

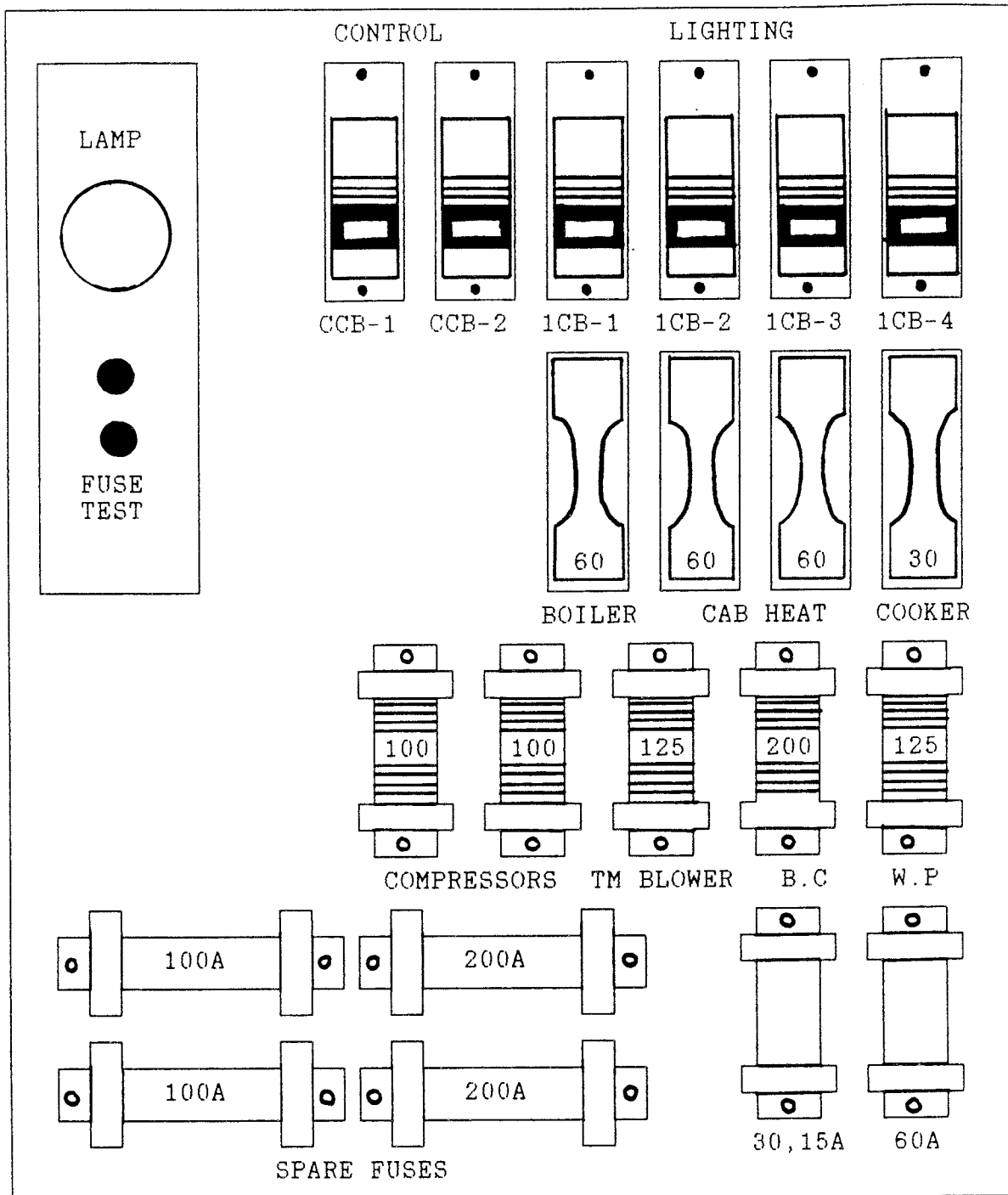
(C C B 1 & 2)

- (a) PROTECTS THE POSITIVE AND NEGATIVE CONTROL CIRCUITS OF LOCOMOTIVE.
- (b) IF EITHER TRIPS:-
 - (i) UNABLE TO CANCEL A.W.S.
 - (ii) DESK AND LOCAL FAULT LIGHT WILL GO OUT.
 - (iii) ENGINE WILL STOP.
 - (iv) BRAKES WILL APPLY VIA D.S.D.
- (c) IF TRIPS AND DIFFICULTY RESETTING USE EARTH ISOLATING SWITCH BY PLACING TO AUXILIARIES ISOLATED.

11. LIGHTING CIRCUIT BREAKERS.

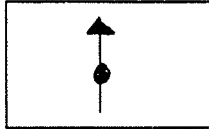
PROTECTS POSITIVE AND NEGATIVE SIDE OF LIGHTING CIRCUITS. SUCH THINGS AS CAB LIGHTS, INSTRUMENTS LIGHTS, ENGINE ROOM, MARKER, TAIL LIGHTS, FUSE TESTER, AND RADIO TELEPHONE.

FUSE PANEL



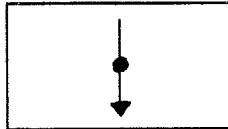
9.7 EXHAUSTER ISOLATING

(a) NORMAL



(i) WITH B.S.S. IN A VACUUM POSITION EXHAUSTER WILL RUN.

(b)

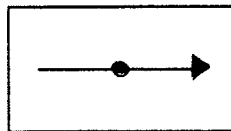


TEST

(i) NO AMPS AVAILABLE.

(ii) EXHAUSTER WILL RUN OFF BATTERIES. COULD USE FOR ONLY A MAXIMUM OF 15 MINUTES UNDER FAILURE CONDITION. IF YOU DO THIS A VERY BIG DRAIN ON BATTERIES WILL TAKE PLACE.

(c)

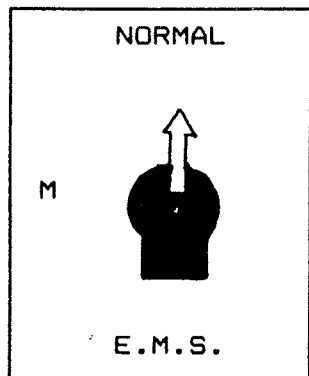
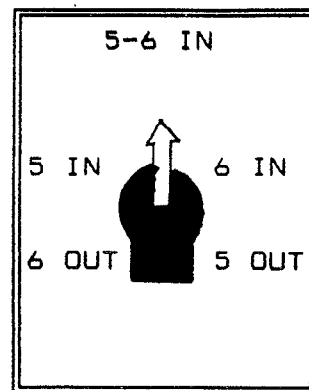
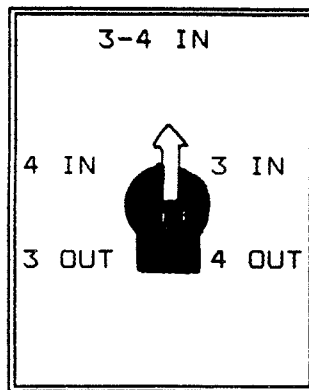
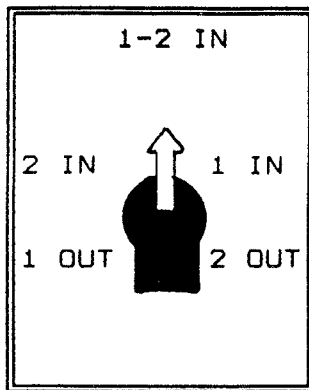


OFF

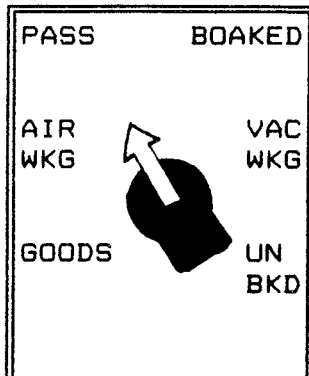
(i) EXHAUSTERS WILL NOT RUN.

(ii) USED WHEN IN TANDEM.

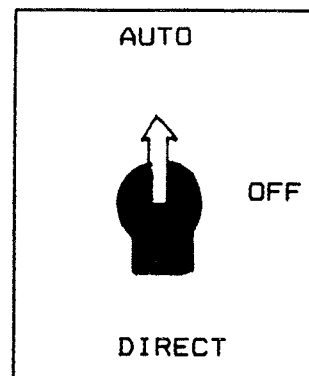
SWITCH PANEL



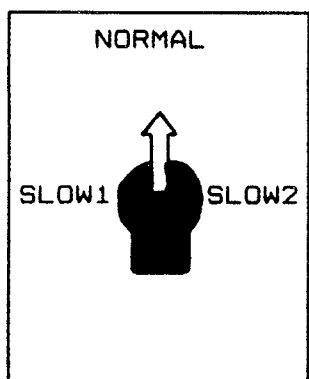
SWITCH



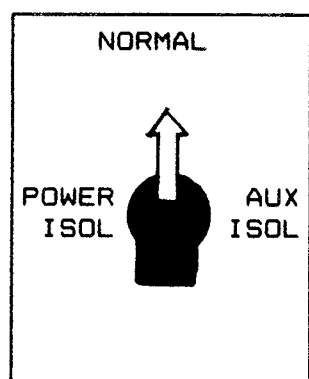
BRAKE SELECTOR



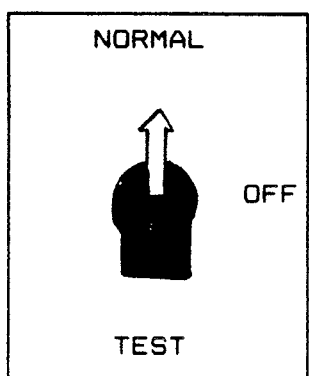
PUMPSET



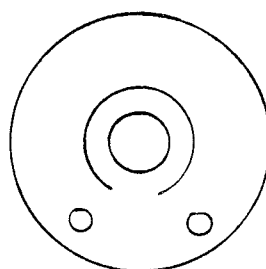
SLOW MOTION SWITCH



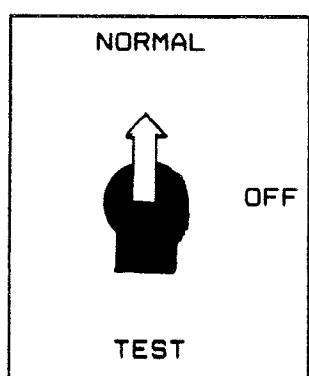
EARTH FAULT



EXH. ISOL.



WHEEL WEAR
COMPENSATOR



EXH. ISOL.

12. FUSES AND FUSE CHANGING.

12.1 THERE ARE EIGHT FUSES.

(i)	No.1 CAB HEATERS =	60 AMP.
(ii)	No.2 CAB HEATERS =	60 AMP.
(iii)	COOKER =	15 OR 30 AMP.
(iv)	No.1. COMPRESSOR (CF1) =	100 AMP.
(v)	No.2 COMPRESSOR (CF2) =	100 AMP.
(vi)	TRACTION MOTOR BLOWER (MBF) =	125 AMP.
(vii)	PUMPSET (WPF) =	125 AMP.
(viii)	BATTERY CHARGING (BCF) =	200.300 or 400 AMP.

12.2

SOME LOCOMOTIVES HAVE A BATTERY RECTIFIER FUSE INSTEAD OF A CHARGING FUSE. IT IS NOT POSSIBLE FOR A DRIVER TO CHANGE A (B.R.F.) FUSE. AS IT IS BOLTED IN POSITION. (NO SPARE) IF A FUSE BLOWS THE ENGINE WILL NOT START AND FAULT LIGHTS GO OUT. IF A FUSE BLOWS WHILST THE ENGINE IS RUNNING, BATTERY CHARGING WILL STOP AND THE BATTERY AMMETER WILL READ ZERO.

NOTE.

(B.C.F.) = PARALLEL LOCOMOTIVES.
(B.R.F.) = SERIES/PARALLEL LOCOMOTIVES

12.3 CHANGING A FUSE.

1. STOP ENGINE.
2. MASTER SWITCH TO OFF.
3. SECURE LOCOMOTIVE.
4. B.I.S. OUT.
5. REMOVE SUSPECT FUSE USING A CARRIAGE KEY.
6. TEST IT ON THE FUSE TESTER.
7. IF DEFECTIVE, SELECT ANOTHER FUSE OF THE CORRECT AMPERAGE. TEST IT.
8. REPLACE GOOD FUSE IN CIRCUIT.
9. CLOSE B.I.S.
10. START ENGINE AND TEST EQUIPMENT.
11. REPORT IN THE REPAIR BOOK.
12. HAND DEFECTIVE FUSE IN. (DO NOT PUT BACK INTO CARRIER)

13. DIESEL ENGINE.

INTRODUCTION.

1876 DOCTOR N.A. OTTO DEVELOPED A GAS ENGINE.

1878 AN AMERICAN BY THE NAME OF CLARKE FOUNDED THE FOUR STROKE CYCLE.

1884 GOTTLICH DAIMLER PRODUCED HIS FIRST PETROL ENGINE.

1886-90 JAMES ACROYD STUART A SCOTSMAN PATENTED THE FIRST COMPRESSION-IGNITION ENGINE.

1896-1904 DOCTOR RUDOLPH DIESEL INTRODUCED A FUEL CONSISTING OF PULVERISED COAL AND OIL, WHICH WAS FORCED INTO THE ENGINE CYLINDER BY A BLAST OF AIR.

BY 1904 HE WAS USING OIL ONLY BUT THIS TIME IT WAS FORCED INTO THE CYLINDER AS A FINE SPRAY. HIS NAME STILL APPLIES.

DIESEL ENGINE.

DIESEL FUEL OIL.

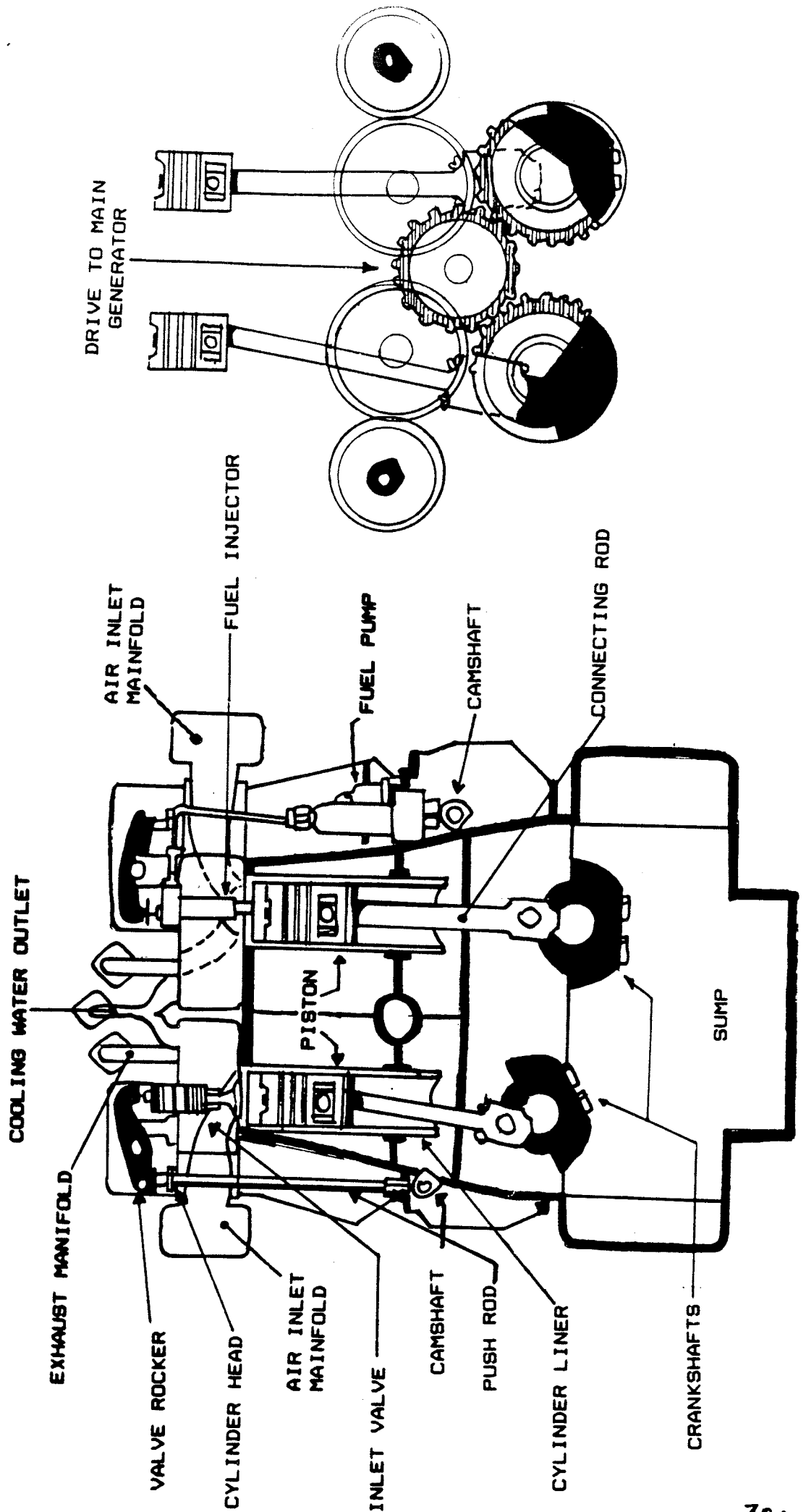
13.1 DIESEL ENGINE CONSTRUCTION.

13-1-1 THE ENGINE IS MADE UP OF MANY COMPONENTS THE MAIN ONES TO REMEMBER ARE:-

- | | |
|---------------------|----------------------|
| (a) BEDPLATE | (e) CYLINDER LINERS. |
| (b) CYLINDERS BLOCK | (f) CRANKCASE. |
| (c) CYLINDERS | (f) CRANKSHAFT. |
| (d) CYLINDER HEAD. | (g) VALVES. |

SULZER 12 LDA 28.C

DIESEL ENGINE



13.2 FOUR STROKE CYCLE.

FOR THE ENGINE TO FUNCTION CORRECTLY, ALL THE EVENTS MUST BE IN A STRICT SEQUENCE, HENCE FOUR STROKES. LET US NOW TAKE A LOOK AT WHAT HAPPENS IN EACH OF THE FOUR STROKES.

13-2-1 INDUCTION.

THIS IS THE FIRST DOWNWARDS STROKE, DURING WHICH AIR IS FORCED INTO THE CYLINDER VIA THE OPEN INLET VALVE. AIR IS ABOVE THAT OF ATMOSPHERIC PRESSURE.

13-2-2 COMPRESSION.

THIS IS THE FIRST UPWARDS STROKE.

WITH BOTH INLET AND EXHAUST VALVE CLOSED AIR IS TRAPPED IN THE CYLINDER. UPWARD MOVEMENT OF THE PISTON BEGINS TO COMPRESS AIR, WHICH IN TURN WILL INCREASE IN TEMPERATURE. JUST BEFORE THE PISTON REACHES THE TOP OF STROKE, FUEL IS INJECTED INTO THE CYLINDER. TEMPERATURE WILL BE APPROXIMATELY 482.2 C or 900 F.

13-2-3 POWER.

NOW COME TO THE THIRD STROKE OR WORKING STROKE.

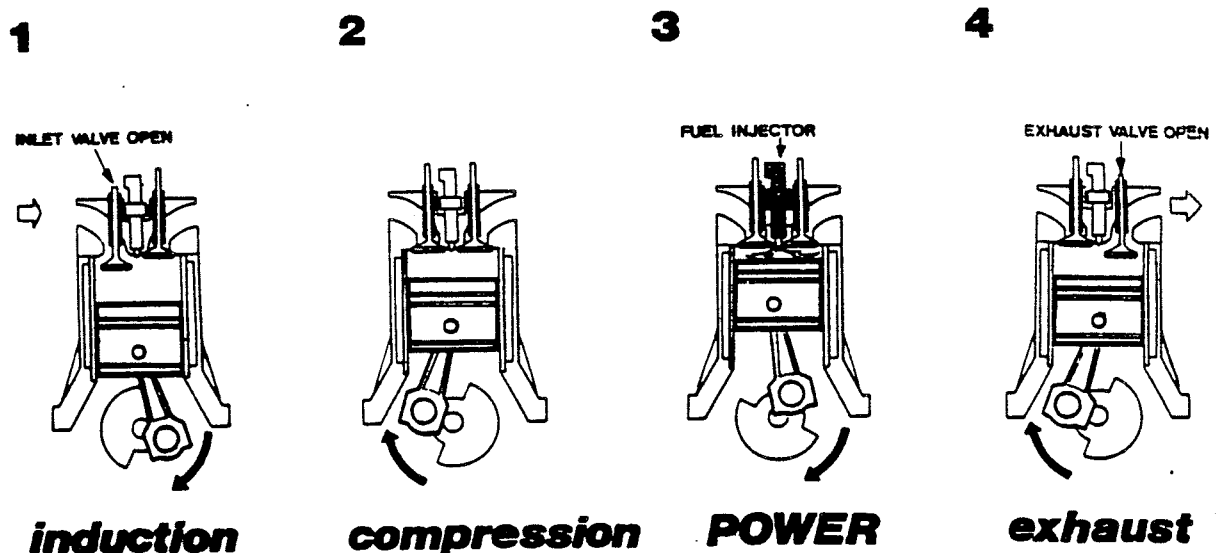
THE INJECTED FUEL MIXES WITH THE COMPRESSED AIR AT A HIGH TEMPERATURE, RESULTING IN THE FUEL BURNING. THIS IN TURN CAUSES A RAPID EXPANSION OF GASES AND AN INCREASE IN PRESSURE, PISTON NOW FORCED DOWNWARDS.

13-2-4 EXHAUST.

THE FINAL UPWARDS STROKE WHERE THE SPENT GASES ARE FORCED OUT OF THE CYLINDER THROUGH AN OPEN EXHAUST VALVE.

THE EXHAUST GASES ARE NOT WASTED, FOR THEY ARE USED TO DRIVE THE

four stroke cycle



14. FUEL OIL SYSTEM.

14.1 CAPACITY =

- (i) NORMAL 3682.26 Ltr. or 810 GALLONS
- (ii) 47/7 6273.48 Ltr. or 1380 GALLONS
- (iii) ADDITIONAL FUEL TANKS FITTED TO 47/8 =6273.48 Ltr.or 1380 GALLONS

14-2 LOCATION OF FUEL TANKS.

- (i) No.1 = RADIATION/BRAKE COMPARTMENT.
- (ii) No.2 = FORMER BOILER COMPARTMENT. THIS ONE IS FITTED WITH A CONTENTS GAUGE.
- (iii) No.3 = IF FITTED IS UNDERSLUNG BETWEEN No.1 AND No.2 BOGIE.

14-3 FILTERS.

THERE ARE THREE:-

- (i) ZWICKY. THIS IS A COURSE FILTER.
- (ii) TWO KNECHT FINE FILTERS. ONE FOR EACH BANK OF FUEL INJECTION PUMPS.

14.4 FUEL INJECTION PUMPS.

PURPOSE OF THESE PUMPS IS TO DELIVER FUEL OIL AT HIGH PRESSURE, IN THE CORRECT QUANTITY AND AT THE RIGHT TIME TO THE FUEL INJECTORS.

14-4-1 OPERATION.

- (i) FUEL FLOWS INTO BARREL OF PUMP, THE RISING PISTON FORCES THE VOLUME OF FUEL PAST THE DELIVERY VALVE INTO THE BUS RAIL, THEN ONTO THE FUEL INJECTORS.
- (ii) VARIATION IN THE AMOUNT OF FUEL PASSING THE BUS RAIL IS ACHIEVED THROUGH HELICAL GROOVES CUT INTO THE PISTON BARREL. THERE ARE TWO GROOVES CUT ON HELIX.
- (iii) TOP HELIX.
THIS DECIDES WHEN FUEL IS TO BE INJECTED. TIME PERIOD.
- (iv) LOWER HELIX.

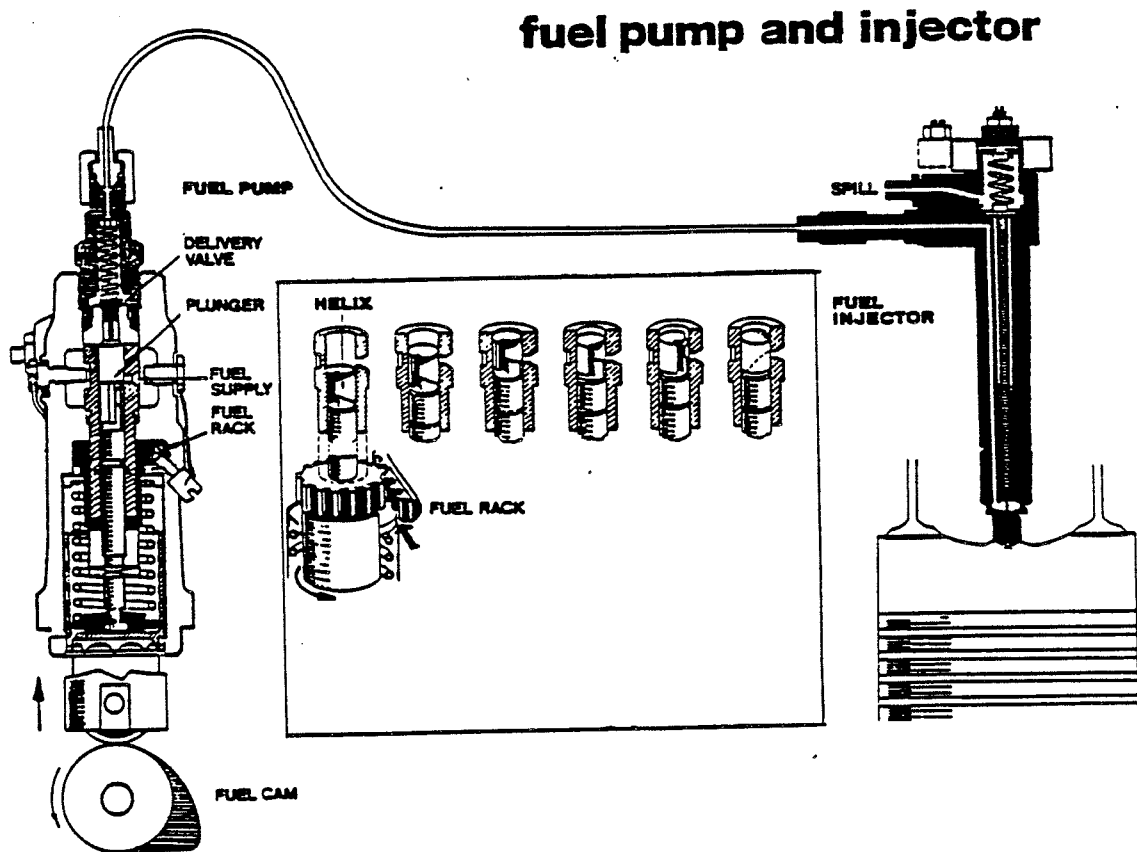
DECIDES THE AMOUNT OF FUEL TO BE DELIVERED.

14-5 FUEL INJECTORS.

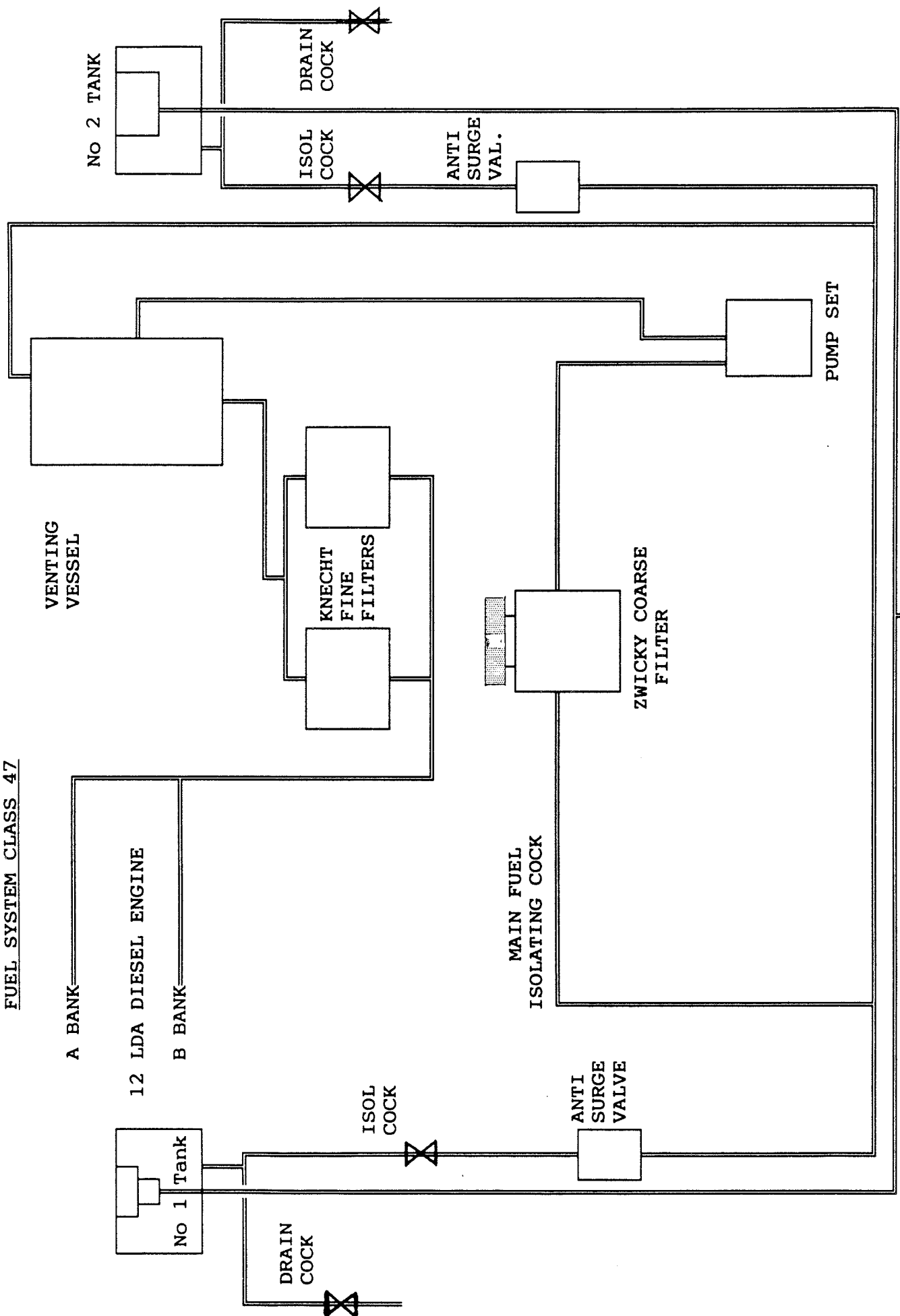
THESE ARE GUN LIKE, THE NOZZLE END PROTRUDES INTO THE CYLINDER AS THE NAME SUGGESTS THEY INJECT UNDER HIGH PRESSURE INTO EACH CYLINDER.

14-5-1 OPERATION.

PRESSURISED FUEL WILL FORCE THE NEEDLE VALVE TO OVERCOME THE HIGH PRESSURE SPRING WHICH IS SET AS APPROXIMATELY 172.5 Bar or 2500 P.S.I. ONCE THE NEEDLE VALVE HAS LIFTED FUEL OIL IS NOW FORCED THROUGH VERY FINE HOLES IN THE INJECTOR NOZZLE, THEREBY CAUSING A FINE SPRAY OF FUEL OIL. AS THIS MIXES WITH HOT COMPRESSED AIR IT WILL IGNITE. (POWER STROKE.)

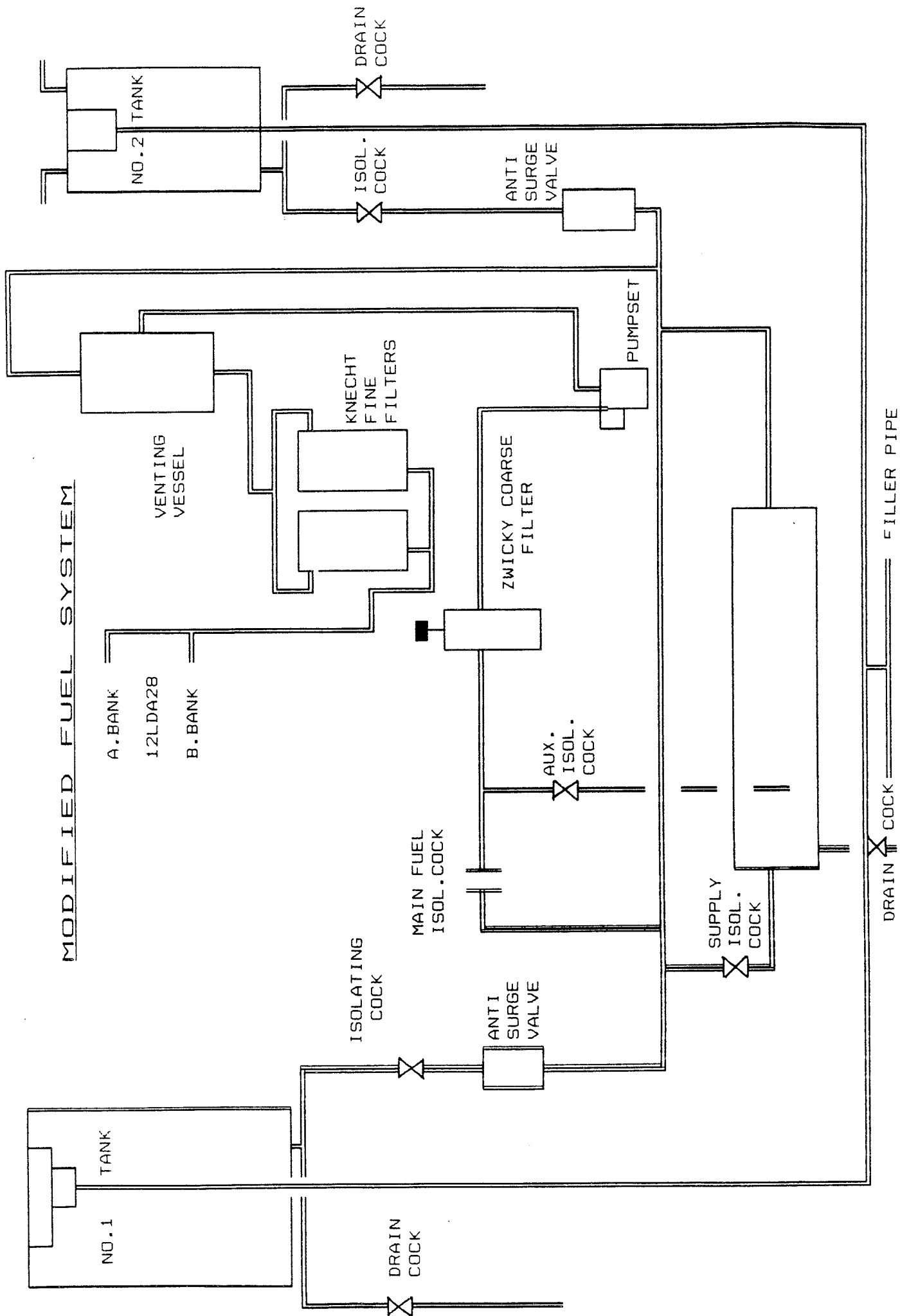


FUEL SYSTEM CLASS 47

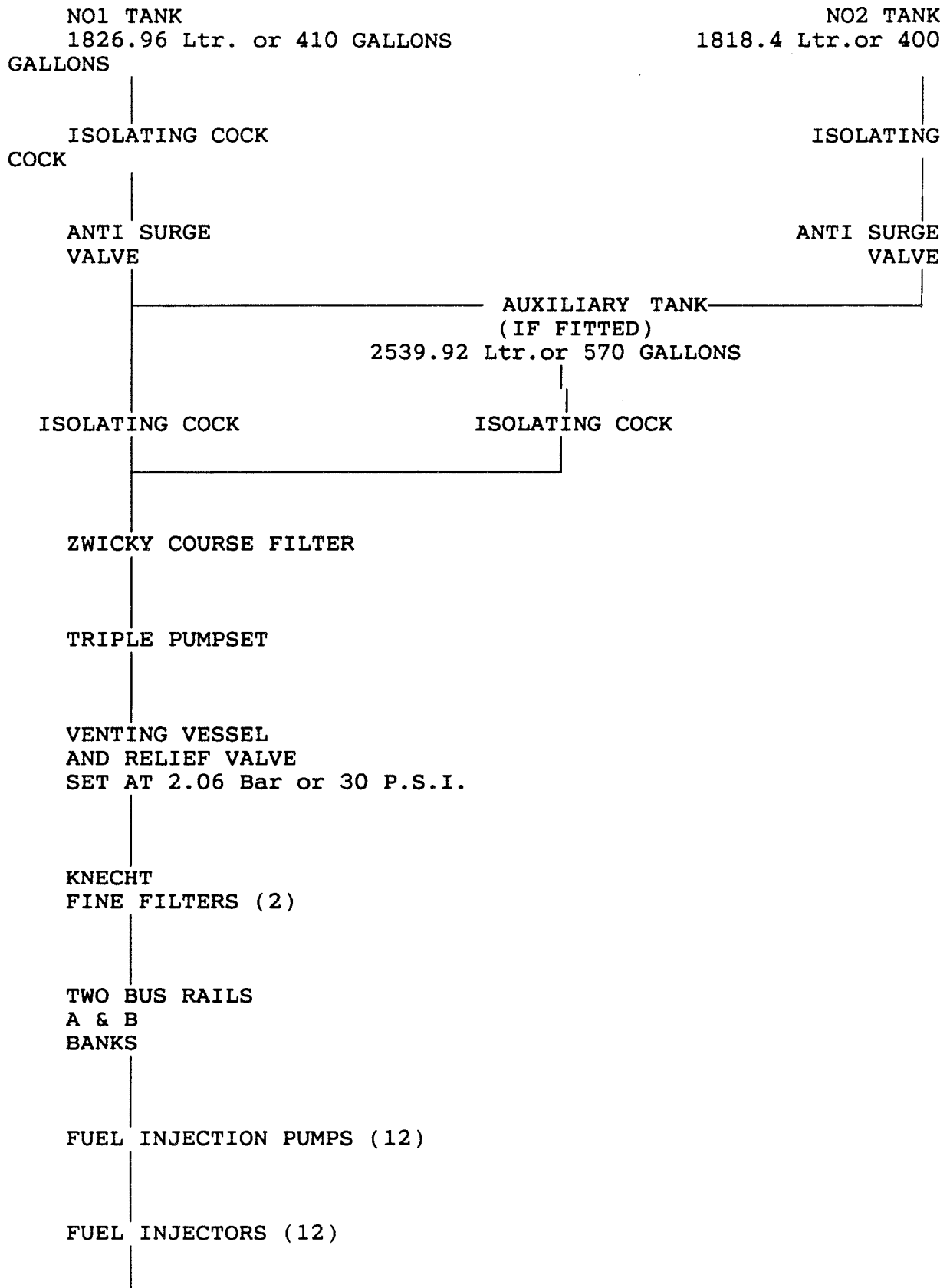


FILLER POINTS

MODIFIED FUEL SYSTEM



CAPACITY 810 GALLONS OR 1380 GALLONS.



15. FUEL PUMP LATCHING DEVICE.

15-1 ISOLATION OF FUEL PUMPS.

ON SULZER ENGINES ANY INDIVIDUAL PUMP MAY BE ISOLATED IN THE EVENT OF A DEFECTIVE INJECTOR OR IT'S ASSOCIATED PIPE.
ONLY ONE INJECTOR PER BANK AT ANY ONE TIME.

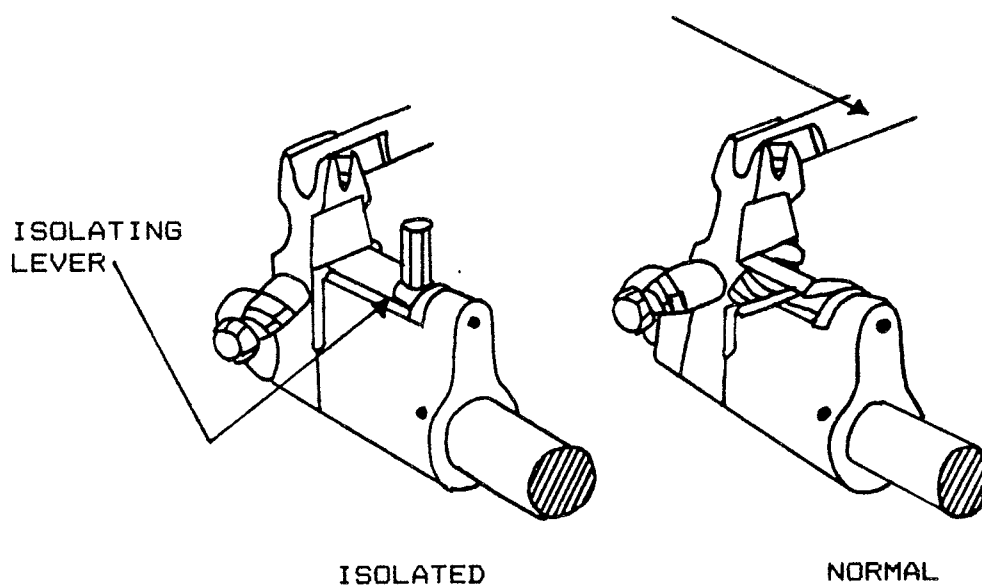
ISOLATION PROCEDURE IS AS FOLLOWS.

- (a) REMOVE THE COVER FROM THE FUEL PUMP GALLERY.
- (b) PUSH THE ISOLATING LEVER TO THE RIGHT AND LOCK IT BY PUSHING TOWARDS THE ENGINE.
- (c) PUSH THE FUEL PUMP CONTROL RACK RIGHT IN TOWARDS THE ENGINE.

TO DE-ISOLATE THE FUEL PUMP:-

- (a) PULL ISOLATING LEVER FORWARD.
- (b) GENTLY PULL THE CONTROL RACK ON THE PUMP UNTIL THE LEVER SPRINGS INTO IT'S NORMAL POSITION FOR RUNNING.

CONTROL RACK



16. LUBRICATING OIL SYSTEM

(CAPACITY 686.22 Ltr. or 154 GALLONS)

16.1 HAS THREE FUNCTIONS

- (i) LUBRICATES MOVING PARTS.
- (ii) ABSORBS HEAT.
- (iii) MEDIUM FOR THE ENGINE SPEED GOVERNOR.

16.2 THERE ARE TWO PRESSURISING PUMPS IN THE SYSTEM.

- (i) PRIMING. PART OF THE TRIPLE PUMPSET. THIS ENABLES THE ENGINE LUB OIL SYSTEM TO BE PRIMED BEFORE STARTING ENGINE AND WHEN STOPPED ALLOWS OIL CIRCULATION TO BE MAINTAINED FOR A SHORT TIME, ENSURING AN EVEN COOLING OF PISTONS AND BEARINGS. THIS ALSO PROVIDES OIL TO THE ENGINE SPEED GOVERNOR A SPRING LOADED PRESSURE VALVE ENSURES A RAPID BUILD UP OF OIL PRESSURE AT THE GOVERNOR, MOVING FUEL RACKS TO THE CORRECT SETTING FOR ENGINE STARTING.
- (ii) MAIN ENGINE DRIVEN. THIS TAKES OVER FROM THE PRIMING PUMP ONCE DIESEL ENGINE IS RUNNING.

NOTE THE PRIMING PUMP IS STILL RUNNING, ONLY PROVIDING OIL PRESSURE FOR ENGINE GOVERNOR VIA A FILTER.

16.3 THERE ARE TWO OIL PRESSURE SWITCHES:-

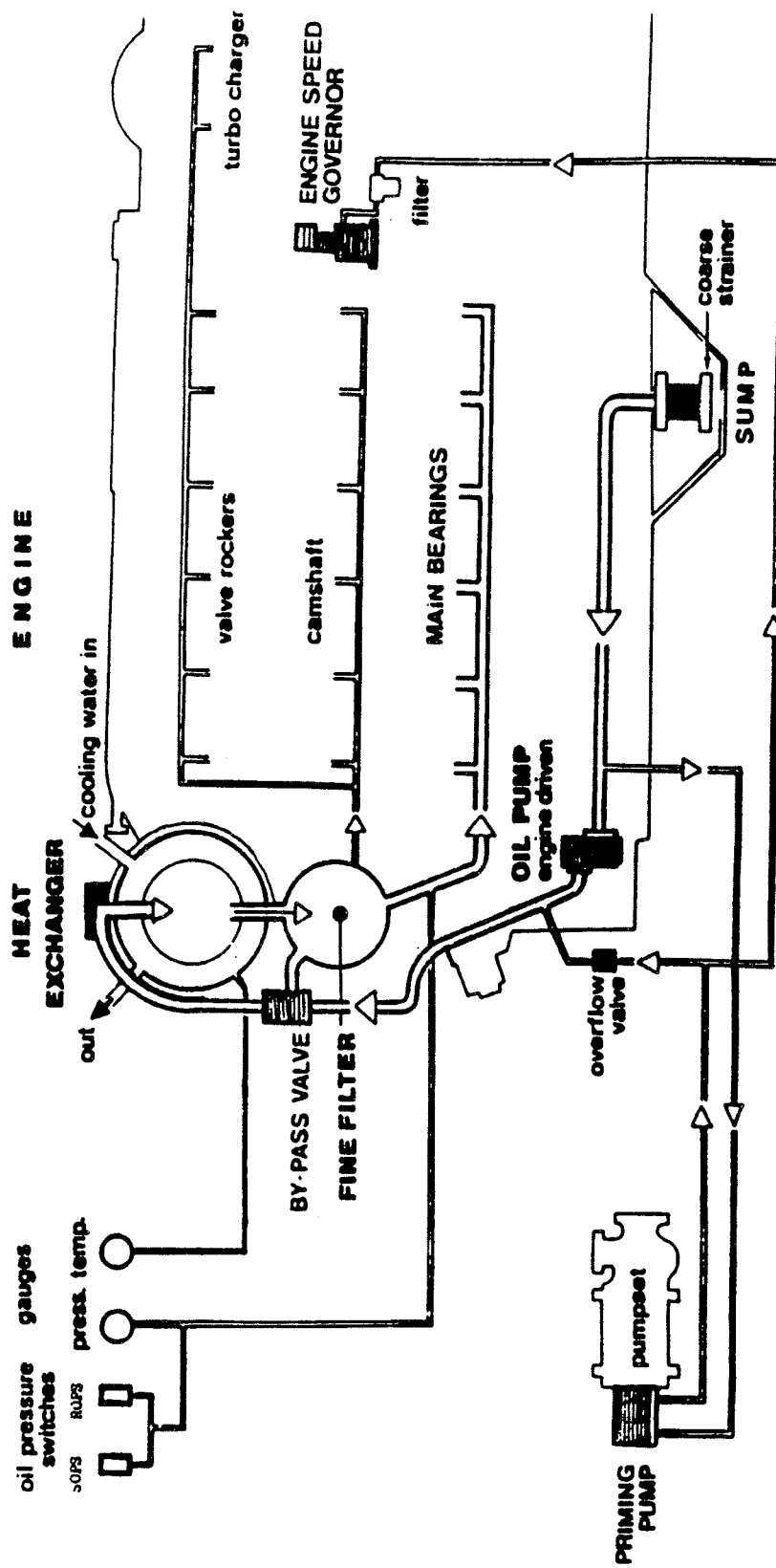
- (i) THE RUN OIL PRESSURE SWITCH (R.O.P.S.). THIS SWITCH OPERATES TO STOP THE DIESEL ENGINE SHOULD OIL PRESSURE FALL TO .82 Bar or 12 P.S.I. AND GIVES A CUBICAL FAULT INDICATION.
- (ii) THE START OIL PRESSURE SWITCH (S.O.P.S.). THIS SWITCH CAUSES THE RED ENGINE STOPPED LIGHT TO DIM WHEN, AFTER THE DIESEL ENGINE HAS BEEN STARTED, THE LUBRICATING OIL PRESSURE HAS BUILT UP TO 1.44 Bar or 21 P.S.I.

16.4 CHECKING OIL LEVEL.

THIS IS NORMALLY DONE BY THE MAINTENANCE STAFF AND SHOULD NOT BE CARRIED OUT BY DRIVERS AS PART OF PREPARATION DUTIES. IF DUE TO FAULT/DEFECT THE DRIVER REQUIRES TO CHECK THE OIL LEVEL BY MEANS OF THE DIPSTICK, THEN THE FOLLOWING PROCEDURE SHOULD BE ADOPTED:-

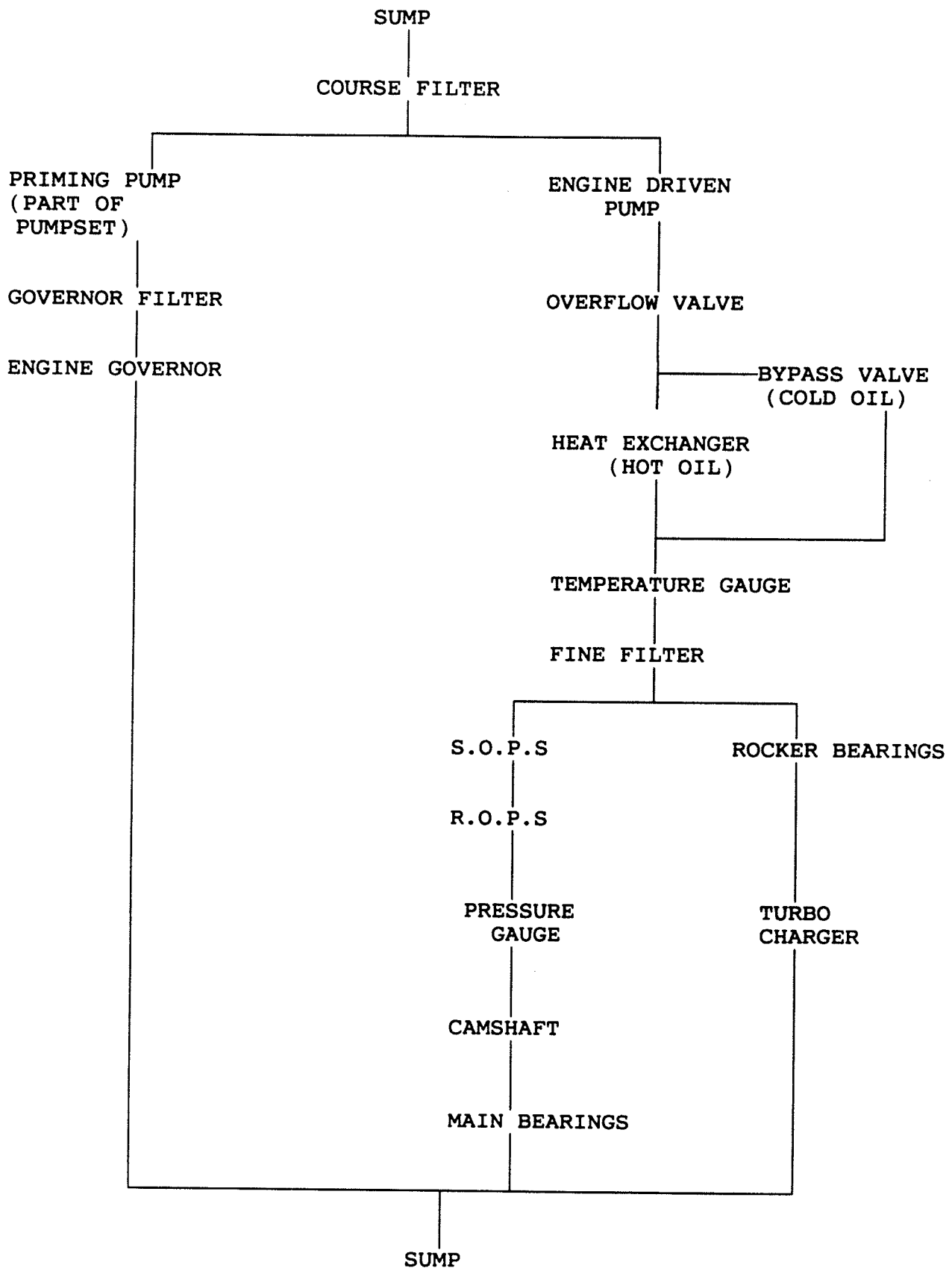
- (a) STOP DIESEL ENGINE.
- (b) SECURE LOCOMOTIVE.
- (c) REMOVE DIPSTICK AND WIPE CLEAN.
- (d) RE-INSERT DIPSTICK, REMOVE AND TAKE A READING. LEVEL SHOULD BE BETWEEN MIN.- MAX.
- (e) IF BELOW MINIMUM, ARRANGE FOR SUMP TO BE TOPPED UP.
- (f) IF ABOVE MAXIMUM, SUSPECT FUEL OR WATER DILUTION.
DO NOT RE-START THE DIESEL ENGINE.

lubricating oil system



16-5 FLOW OF LUB. OIL SYSTEM.

CAPACITY 686.22 Ltr. or 154 GALLONS.



17. COOLING WATER SYSTEM.

(CAPACITY 1336.8 Ltr.or 300 GALLONS.)

THE SYSTEM IS REQUIRED TO COOL THE DIESEL ENGINE DOWN TO WITHIN REASONABLE LIMITS OF TEMPERATURE.

17-1 DESCRIPTION.

A WATER PUMP, PART OF THE TRIPLE/COMBINED PUMPSET WHICH CIRCULATES WATER THROUGH THE HEAT EXCHANGER, CYLINDER LINERS, CYLINDER HEADS, TURBO CHARGER AND INTER COOLERS BEFORE RETURNING TO THE RADIATORS. THESE ROOF MOUNTED RADIATORS ARE EQUIPPED WITH TWO FANS. ON SOME LOCOMOTIVES, SHUTTERS ARE AUTOMATICALLY CONTROLLED BY THE WATER TEMPERATURE.

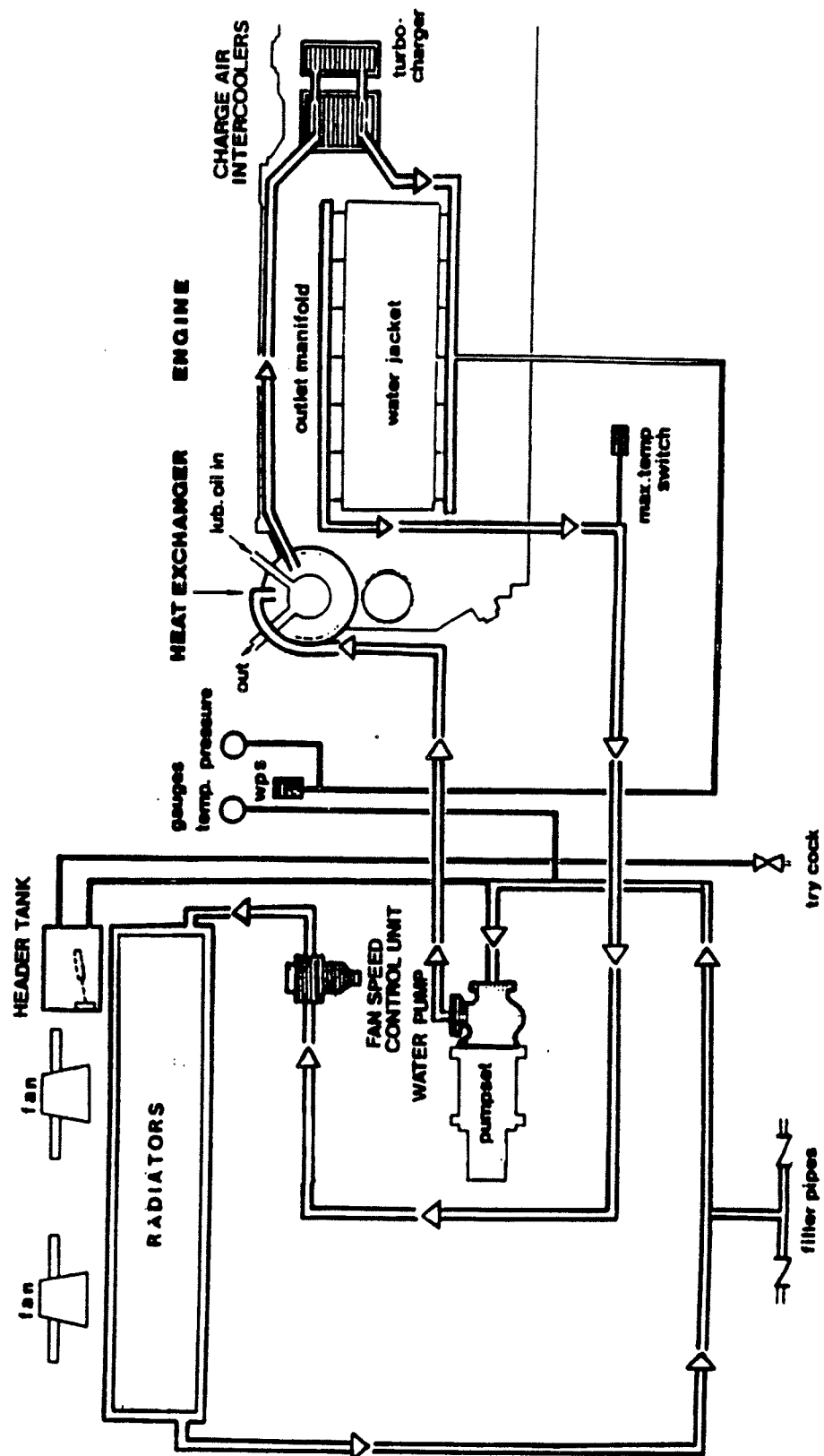
SYSTEM IS FITTED WITH A HEADER TANK, PROVIDED WITH A GAUGE AND ACTS AS AN EXPANSION TANK. SOME LOCOMOTIVES HAVE A BLUE FAULT LIGHT ON LOCAL ENGINE ROOM FAULT LIGHT PANEL. FOR LOW WATER INDICATION WITH THE PUMPSET RUNNING PRIOR TO THE ENGINE BEING STARTED PRESSURE WILL REACH .68 Bar or 10 P.S.I. AS THE PRESSURE REACHES .55 Bar or 8 P.S.I. THE WATER PRESSURE SWITCH (W.P.S.) WILL CLOSE IN THE START CIRCUIT.

ONCE THE ENGINE IS RUNNING PRESSURE WILL BE 1.35-1.38 Bar or 15-20 P.S.I. BUT SHOULD THE PRESSURE FALL TO .276 Bar or 4 P.S.I. (W.P.S.) WILL OPEN AND SHUT THE ENGINE DOWN.

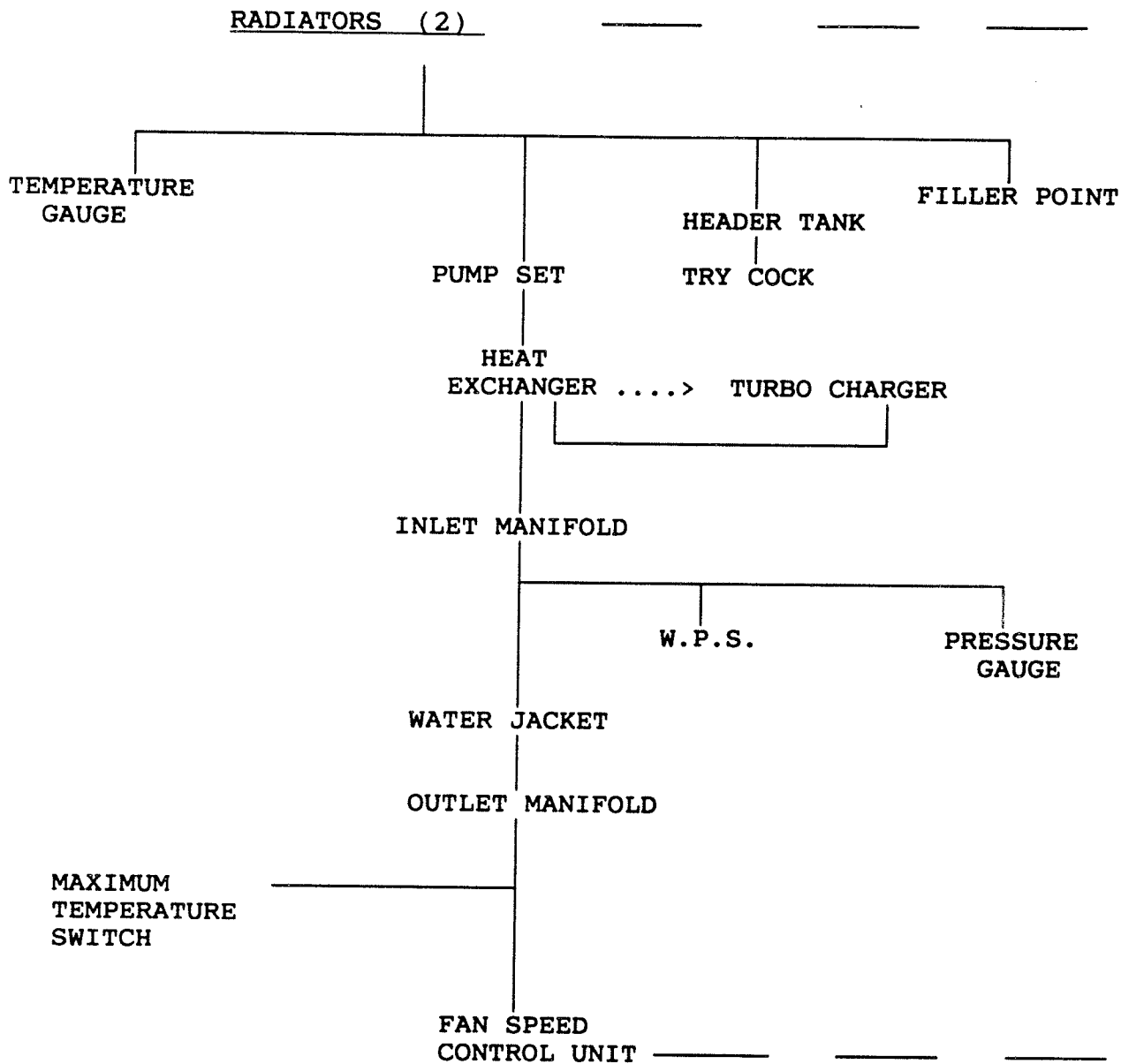
17-2 FILLING SYSTEM IN AN EMERGENCY.

- (a) MASTER SWITCH TO OFF.
- (b) SHUT DOWN ENGINE.
- (c) SECURE LOCOMOTIVE.
- (d) OPEN TRY COCK.
- (e) CONNECT WATER SUPPLY.
- (f) TURN ON WATER.
- (g) OPEN FILLER COCK.
- (h) WHEN WATER RUNS FROM TRY COCK CLOSE FILLER COCK.
- (i) TURN OFF MAINS.
- (j) REMOVE FILLER PIPE.
- (k) ALLOW WATER TO DRAIN FROM COCK THEN CLOSE IT.
- (l) NOW BOOK IT IN THE REPAIR BOOK BECAUSE THE COOLING WATER IS SPECIALLY TREATED TO AVOID CORROSION AND FREEZING. SHOULD IT BE NECESSARY TO FILL SYSTEM IN AN EMERGENCY, MAINTENANCE STAFF MUST ADJUST THE TREATMENT.

cooling water system



17-3. FLOW OF WATER SYSTEM.



17-4. WATER TEMPERATURE.

17-4-1 NORMAL WATER TEMPERATURE IS 73.8-79.4 C or 165'-175'F.

WHEN RISES TO 87.7 C or 190 F BLUE FAULT LIGHT BRIGHT IN CAB AND ON LOCAL FAULT LIGHT PANEL.
THERE WILL NO LOSS OF POWER UNDER HIGH WATER TEMPERATURE CONDITIONS.
DRIVER MUST REDUCE POWER UNTIL TEMPERATURE FALLS TO 83.8 C or 183 F.
WHEN BLUE LIGHT DIMS AGAIN.

18. HYDROSTATIC FAN SYSTEM.

(CAPACITY 44.56 Ltr. or 10 GALLONS.)

AUTOMATICALLY CONTROLS THE FANS SPEED IN REACTION TO THE WATER TEMPERATURE. THE DRIVE FOR THE HYDROSTATIC PUMP IS FROM THE FREE END OFF B BANK CRANKSHAFT, OIL PASSES THROUGH PIPES TO TWO HYDRAULIC MOTORS ONTO WHICH ARE MOUNTED THE FANS.

18-1. OPERATION.

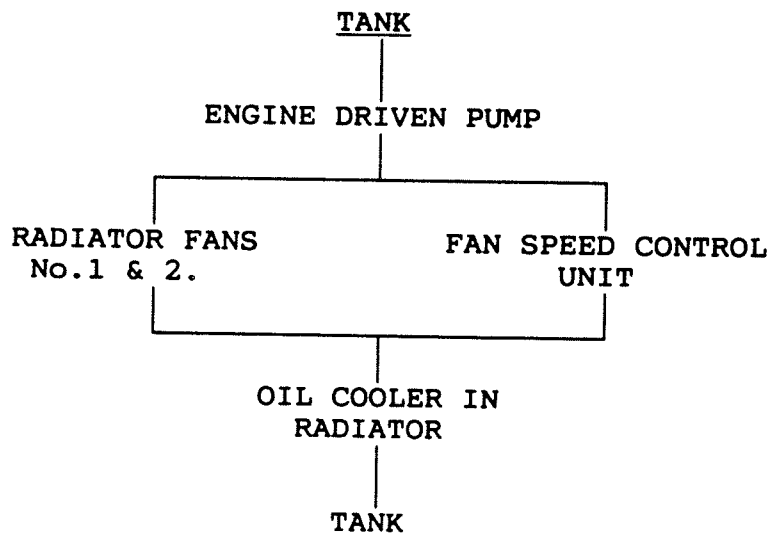
AN INCREASE IN WATER TEMPERATURE IS DETECTED BY THE THERMOSTATIC BY-PASS VALVE WHICH BEGINS TO CLOSE, THEREBY CONTROLLING THE OIL PRESSURE WHICH IN TURN CAUSES:-

- (A) AT 70 C or 158'F THE RADIATOR SHUTTERS START TO OPEN. WHEN THE TEMPERATURE REACHES 73.3 C or 164 F THEY ARE FULLY OPEN.
- (B) ONCE THE TEMPERATURE REACHES 75.5 C or 168 F FANS START TO ROTATE. THIS WILL INCREASE IN SPEED AS TEMPERATURE INCREASES, UNTIL AT 81.1 C or 178 F FANS RUN AT MAXIMUM SPEED.

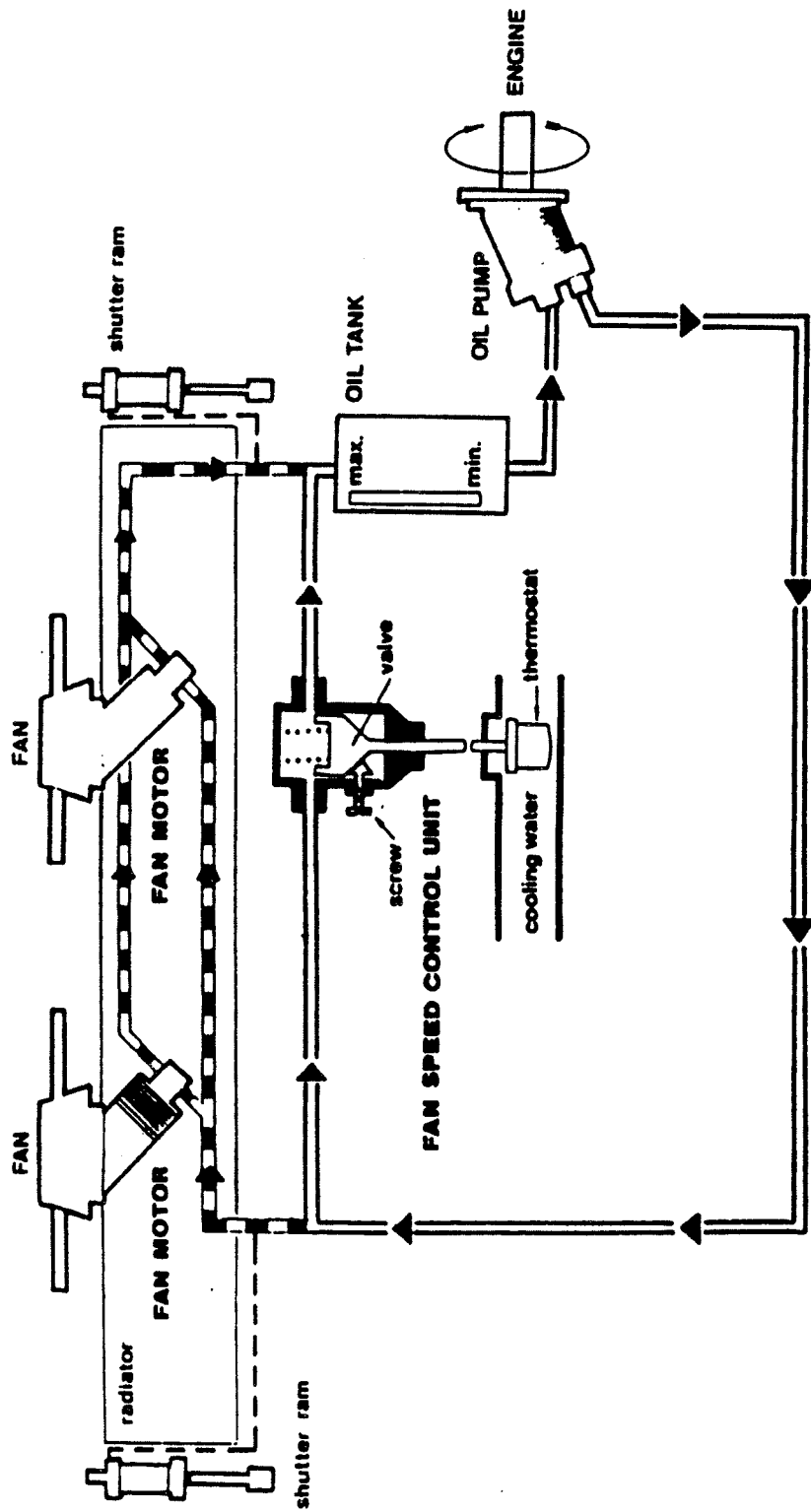
18-2 FAULTS.

ANY FAULT IN THE SYSTEM WILL RESULT IN AN INCREASE IN WATER TEMPERATURE, WHICH IN TURN WILL RESULT IN THE H.W.T. SWITCH OPERATING AT 87.7 C or 190'F. INDICATIONS ARE BLUE FAULT LIGHT BRIGHT ON DRIVERS DESK AND ON LOCAL FAULT LIGHT PANEL IN ENGINE ROOM.

18-3. FLOW OF HYDROSTATIC OIL.



hydrostatic fan drive



19. TURBO CHARGER.

THE AMOUNT OF POWER THAT A DIESEL ENGINE CAN DEVELOP DEPENDS ON THE PRESSURE PRODUCED BY THE COMBUSTION OF FUEL IN THE CYLINDER. NOW THE AMOUNT OF FUEL THAT CAN BE BURNT DEPENDS ON THE AIR AVAILABLE, BECAUSE EACH UNIT OF FUEL REQUIRES A CERTAIN AMOUNT OF AIR. IN ORDER TO INCREASE THE POWER OF THE ENGINE, MORE AIR WILL HAVE TO BE DRAWN INTO THE CYLINDER ON THE INDUCTION STROKE TO ENABLE MORE FUEL TO BE BURNT. THIS IS DONE BY FORCING MORE AIR INTO THE CYLINDER UNDER PRESSURE ON THE INDUCTION STROKE. THIS IS THE PURPOSE OF A TURBO CHARGER.

19-1 OPERATION.

WORKED BY EXHAUST GASES PASSING THROUGH FIXED BLADES (STATIC) WHICH IS NOW DIRECTED ONTO MOVEABLE (TURBINE) BLADES THESE ROTATE AT SPEEDS, UP TO 25,000 R.P.M. THIS IN TURN ROTATES A COMPRESSOR FAN (NOT UNLIKE INSIDE A DOMESTIC VACUUM CLEANER) AIR IS DRAWN INTO SYSTEM VIA A FILTER AND PASSED DOWN TO THE INLET VALVE OF EACH CYLINDER. AT BETWEEN 12-15 P.S.I. ABOVE ATMOSPHERIC PRESSURE.

19-2 CHANGING AIR PROTECTION/SAFETY.

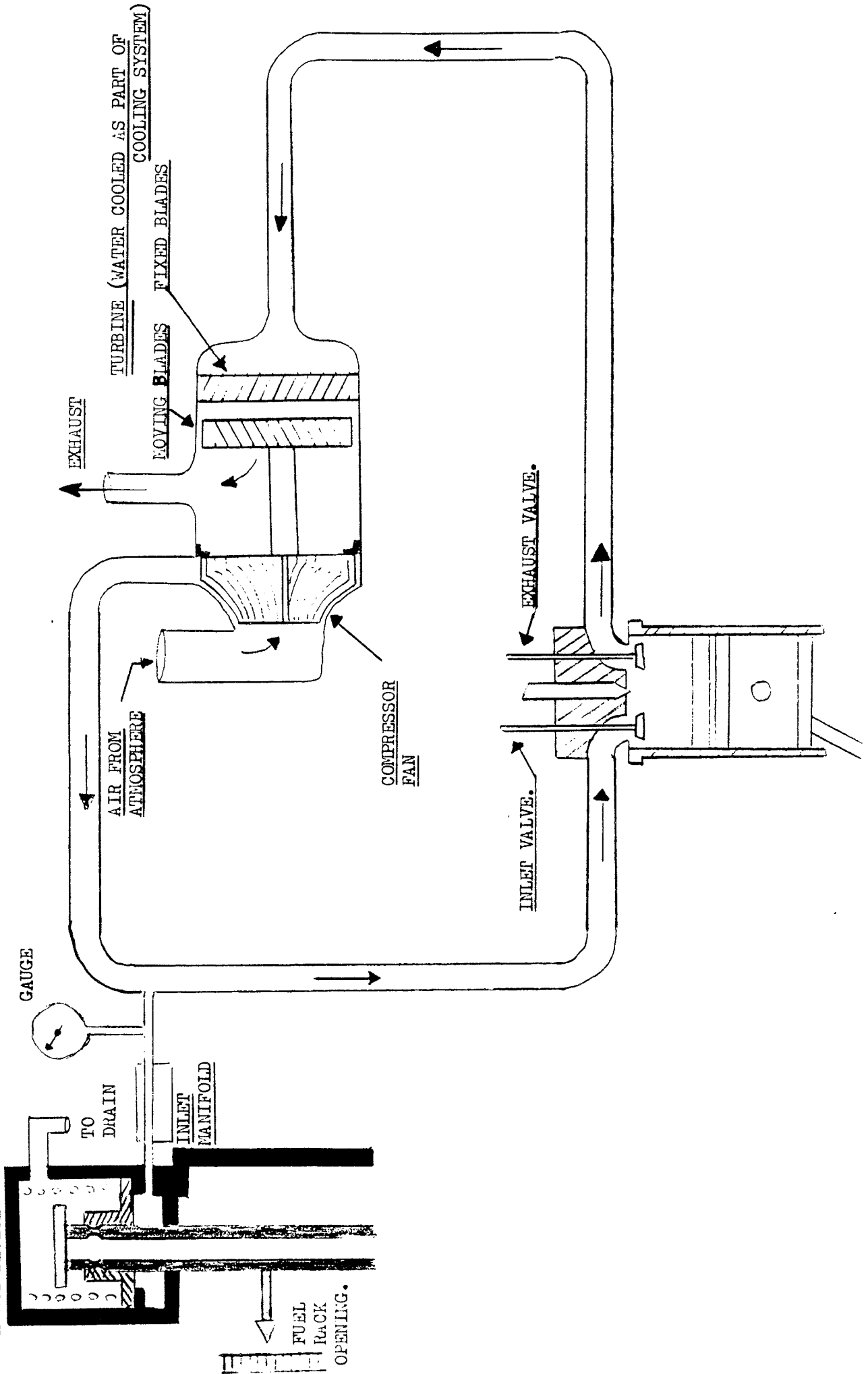
RESTRICTS THE AMOUNT OF FUEL RACK OPENING WHEN FIRST MOVING THE CONTROLLER, UNTIL CHARGING AIR IS CONSISTENT WITH FUEL UNDER LOAD.

OR

SHOULD CHARGING AIR PRESSURE FALL, A SPILL PORT IN THE LUB OIL SERVO PISTON WITHIN THE ENGINE SPEED GOVERNOR WILL BE UNCOVERED, THEREBY REDUCING LUB OIL PRESSURE WITHIN SERVO AND RESULTING IN THE FUEL RACKS MOVING TO RESTRICT AMOUNT OF FUEL BEING SUPPLIED TO EACH CYLINDER.

TURBO CHARGER SAFETY DEVICE

TURBO CHARGER



20. ENGINE SPEED GOVERNOR.

THIS IS THE MECHANICAL BRAIN OF THE CLASS 47 LOCOMOTIVE FOR IT LOOKS AFTER THE MECHANICAL SIDE OF THE DIESEL ENGINE AND CONTROL.

20-1 WHY DO WE NEED AN ENGINE SPEED GOVERNOR?

- (I) IF THE LOAD ON MAIN GENERATOR WHICH IS DRIVEN BY THE DIESEL ENGINE CRANKSHAFT IS REDUCED R.P.M. WOULD INCREASE.
- (II) CONVERSELY IF YOU INCREASE THE LOAD, ENGINE REVS. WOULD DECREASE. IT IS POSSIBLE TO STALL A DIESEL ENGINE.
- (III) BY CONTROLLING THE AMOUNT OF FUEL BEING INJECTED IT IS POSSIBLE TO CONTROL THE R.P.M. KEEPING THEM CONSTANT UNDER ALL LOAD CONDITIONS.

20-2. PRINCIPLE

- (I) THIS IS BASED ON CENTRIFUGAL FORCE. IF WEIGHTS ARE SPUN THEY WILL FLY OUTWARDS AND UPWARDS.
THE VERTICAL MOVEMENT OPENS A VALVE, ALLOWING LUBRICATING OIL TO EXERT PRESSURE ON THE SERVO PISTON, WHICH IN TURN IS CONNECTED TO FUEL CONTROL SHAFTS.

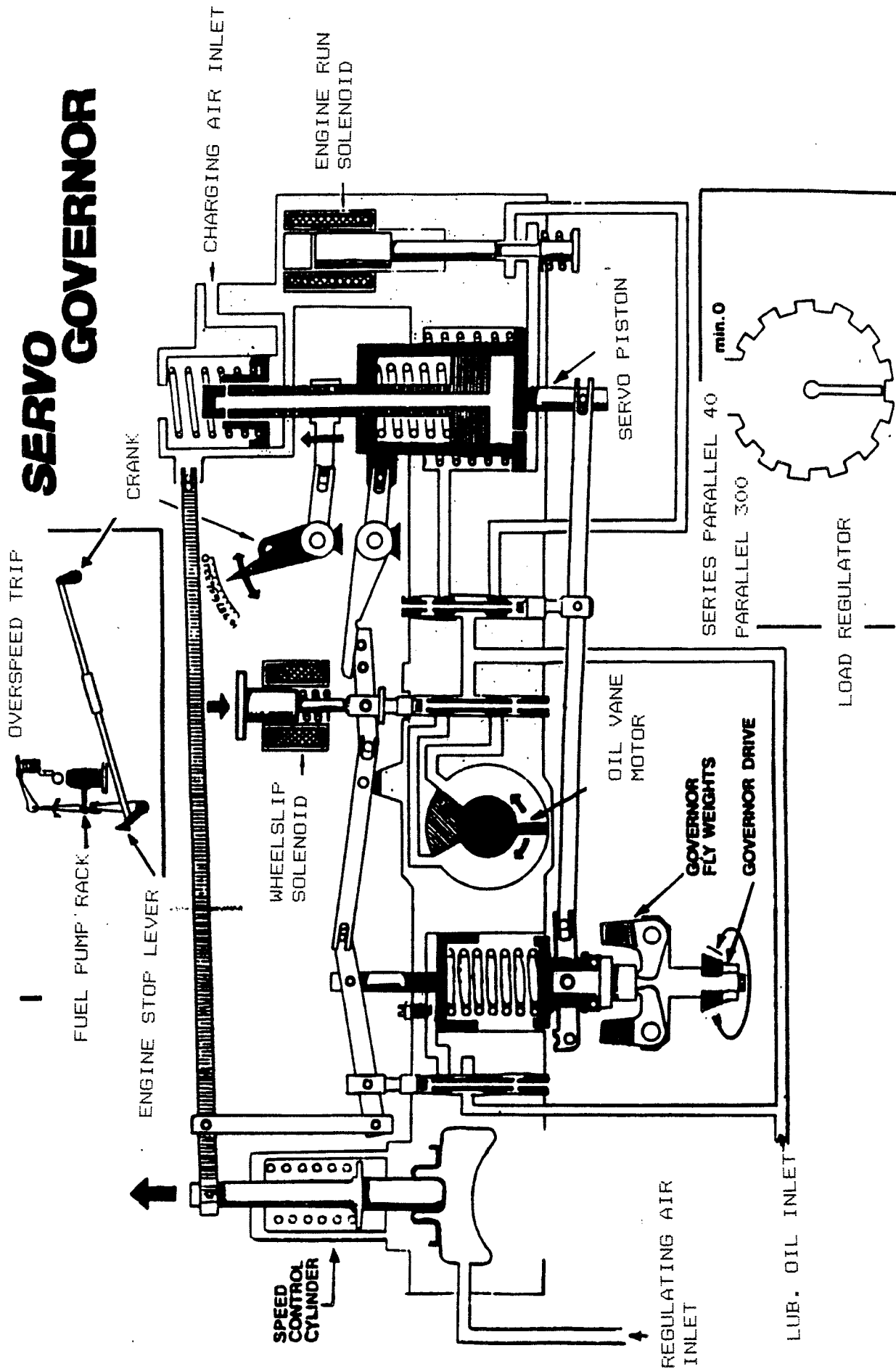
20-3 OPERATION.

- (I) POWER CONTROLLER, WHEN OPENED AIR FROM 0-3.44 Bar or 50 P.S.I. REACTS ON THE ENGINE GOVERNOR, ALLOWING LUB OIL TO FLOW VIA A PILOT VALVE TO MOVE THE SERVO PISTON, THEN VIA LINKAGES TO OPEN THE FUEL RACKS.
- (II) THE GOVERNOR WEIGHTS NOW START TO ROTATE FASTER AND FLY OUTWARDS.
IN TURN CAUSING A BALANCE OF REVOLUTIONS AT 800 RPM. TO MEET THE NEW DEMAND.

20-4 REACTION WHEN CLIMBING A GRADIENT.

- (I) ROAD SPEED FALLS CAUSING ENGINE TO BECOME LOADED, THIS IN TURN WILL REDUCE RPM.
MORE LUB OIL FLOWS TO SERVO PISTON AND OPENS FUEL RACKS TO MEET THE NEW DEMANDS.

SERVO GOVERNOR

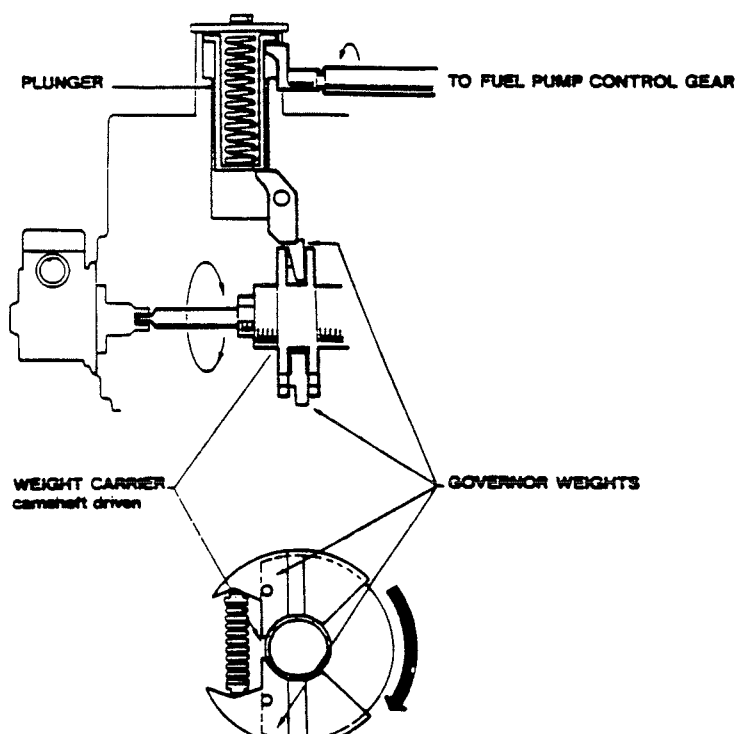


- (I) LOCATED ADJACENT TO THE ENGINE SPEED GOVERNOR AND REMAINS OPEN (ENERGISED) ALL THE TIME THE ENGINE IS RUNNING, ALLOWING LUB OIL TO THE UNDERSIDE OF SERVO PISTON.
- (II) FOLLOWING ARE THE THINGS THAT COULD STOP THE DIESEL ENGINE.
 - (A) R.O.P.S.
 - (B) W.P.S.
 - (C) OVERSPEED
 - (D) FUEL OR LUB OIL FILTERS
 - (E) MAIN FUEL ISOLATING COCK CLOSED
 - (F) NO FUEL
 - (G) D.F.R. TRIPPED
 - (H) O.V.R. TRIPPED
 - (I) FIRE SYSTEM OPERATED ON CLASS 47/7

21. ENGINE OVERSPEED DEVICE.

- (I) THIS DEVICE ALSO WORKS ON CENTRIFUGAL FORCE. WHEN WEIGHTS ROTATE AT SPEED THEY FLY OUTWARDS, AT 850 RPM. IT TRIPS THE DEVICE WHICH CLOSES THE FUEL RACK. THEREBY SHUTTING DOWN DIESEL ENGINE.
- (II) RESETTING IS DONE BY OPERATING MANUAL LEVER PROVIDED.

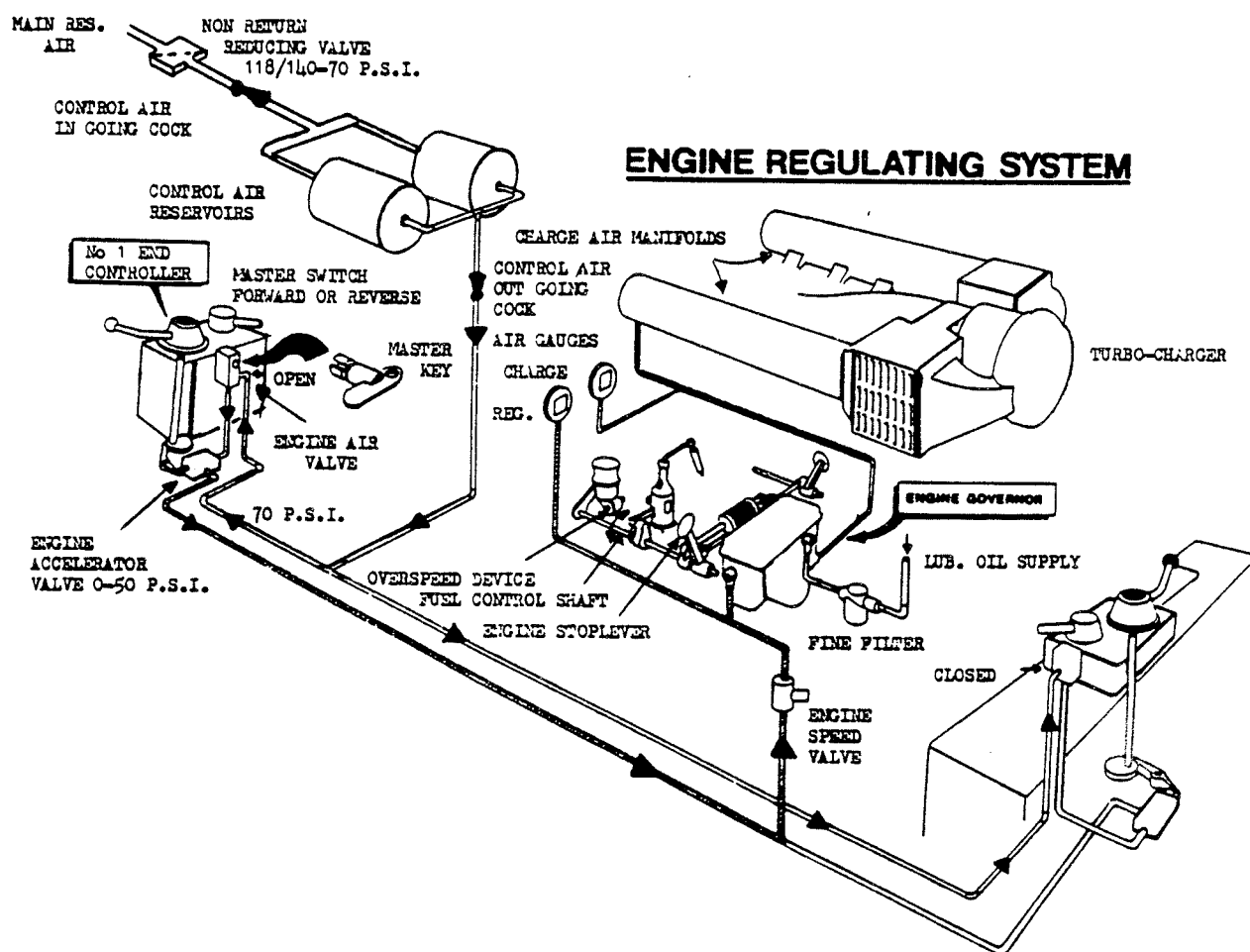
**overspeed
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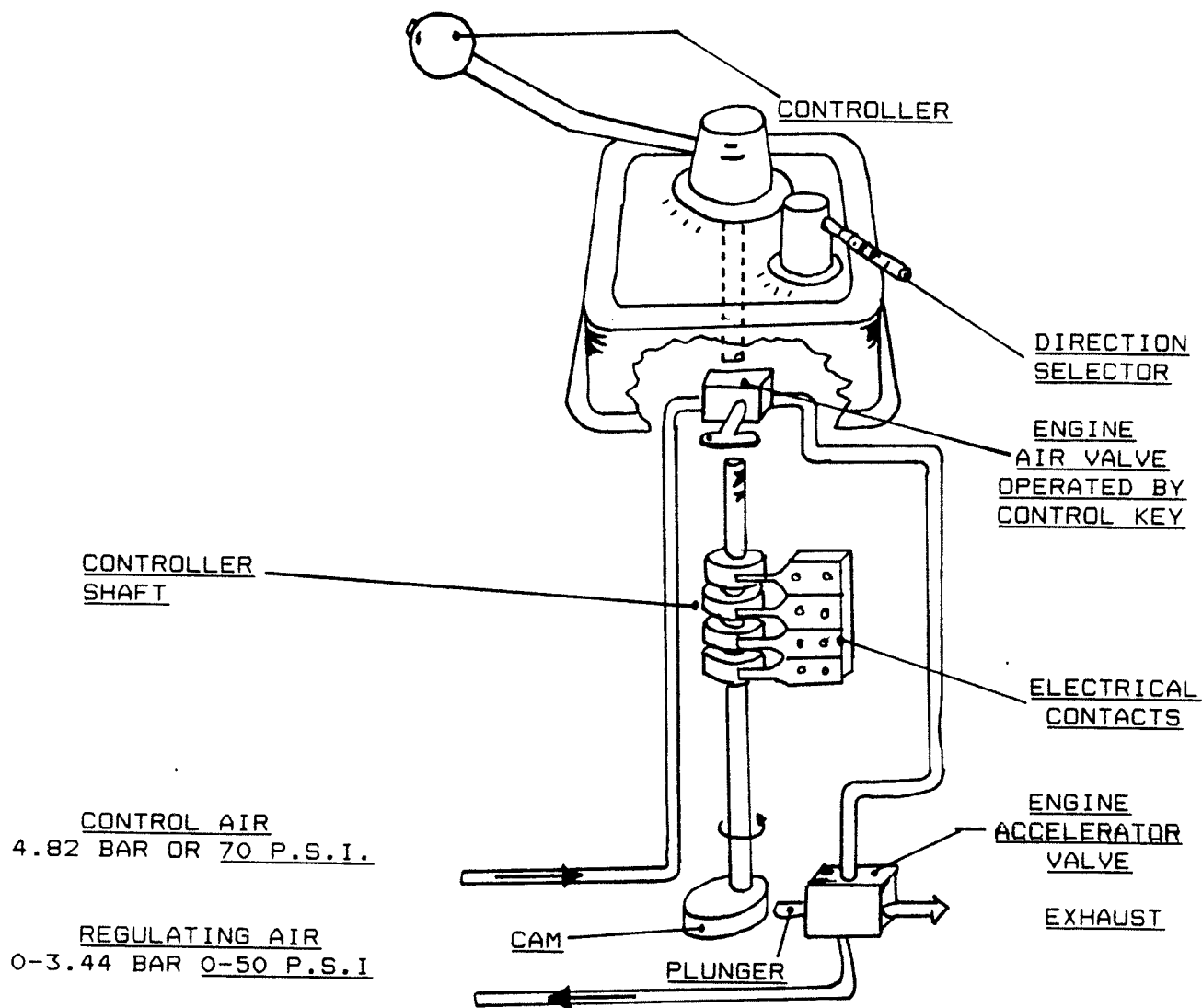


22. REGULATING AIR SYSTEM.

22-1. MAIN RESERVOIR AIR (8.14-9.6 Bar or 118-140 P.S.I.) IS CONVERTED INTO CONTROL AIR (4.82 Bar or 70 P.S.I.) WHICH FEEDS VIA AN OPEN MASTER SWITCH ENGINE AIR VALVE ONTO ENGINE ACCELERATOR (AN F.D.I. VALVE.) VALVE. THIS IN TURN IS OPENED VIA A CAM ON THE POWER CONTROLLER, AS IT IS MOVED AWAY FROM OFF TOWARDS FULL OPEN, AIR PRESSURE GOES FROM 0-3.44 Bar or 50 P.S.I.

22-2. ENGINE SPEED VALVE (E.S.V.) IS ENERGISED BY THE POWER CONTROLLER MOVEMENT, REGULATING AIR NOW PASSES TO ACCELERATING AIR VALVE WITHIN THE ENGINE SPEED GOVERNOR. VIA LINKAGE LUB OIL FLOWS TO THE SERVO PISTON CAUSING FUEL RACK MOVEMENT ALLOWING MORE FUEL TO CYLINDERS. ENGINE REV'S RISE FROM IDLING 325 RPM TO MAXIMUM OF 750 RPM.





ENGINE SPEED CONTROL-REGULATING AIR
SIMPLIFIED LAYOUT BENEATH DRIVERS
DESK - CLASS 47

23. AUXILIARY ALTERNATOR/GENERATOR AND

LOW TENSION SUPPLY AT 110V.

23-1. COUPLED DIRECTLY TO THE MAIN GENERATOR ON THE FIXED END OF THE DIESEL ENGINE.

23-2. SUPPLY OF 110V TO FOLLOWING EQUIPMENT.

- (I) COMPRESSOR MOTORS (2)
- (II) EXHAUSTER MOTORS (2)
- (III) TRACTION MOTOR BLOWERS (2)
- (IV) HEATERS, DEMISTERS, FOOT WARMERS
- (V) COOKERS
- (VI) CONTROL CIRCUITS
- (VII) BATTERY CHARGING
- (VIII) MAIN GENERATOR FIELD EXCITATION
- (IX) FIRE ALARM SYSTEM
- (X) COMBINED/TRIPLE PUMPSET
- (XI) LOCO. LIGHTING AND INDICATOR FAULT LIGHTS.

23-3. ONE OF THE MAIN THINGS SUPPLIED BY AUXILIARY ALTERNATOR/GENERATOR ARE THE BATTERIES THESE IN TURN SUPPLY SOME OF THE FOLLOWING WHEN DIESEL ENGINE IS NOT RUNNING.

- (I) AUXILIARY MACHINES
- (II) CONTROL CIRCUITS
- (III) ALL LIGHTS
- (IV) FIRE SYSTEM
- (V) EXHAUSTER SWITCH IS IN "TEST" POSITION.

THERE IS ONE OTHER MAJOR FUNCTION PERFORMED BY THE BATTERIES. THIS IS TO TURN THE MAIN GENERATOR FOR STARTING THE DIESEL ENGINE.

23-4 VOLTAGE REGULATOR

TO ENSURE THE 110V SUPPLY IS KEPT CONSTANT NO MATTER WHAT SPEED THE DIESEL ENGINE IS RUNNING AT.

23-5 BATTERY ISOLATING SWITCH (B.I.S.)

- (I) THIS IS THE ON/OFF SWITCH FOR THE LOCOMOTIVE.

NOTE IT IS IMPORTANT THAT THE B.I.S. IS NEVER OPENED WHILST DIESEL ENGINE IS RUNNING.

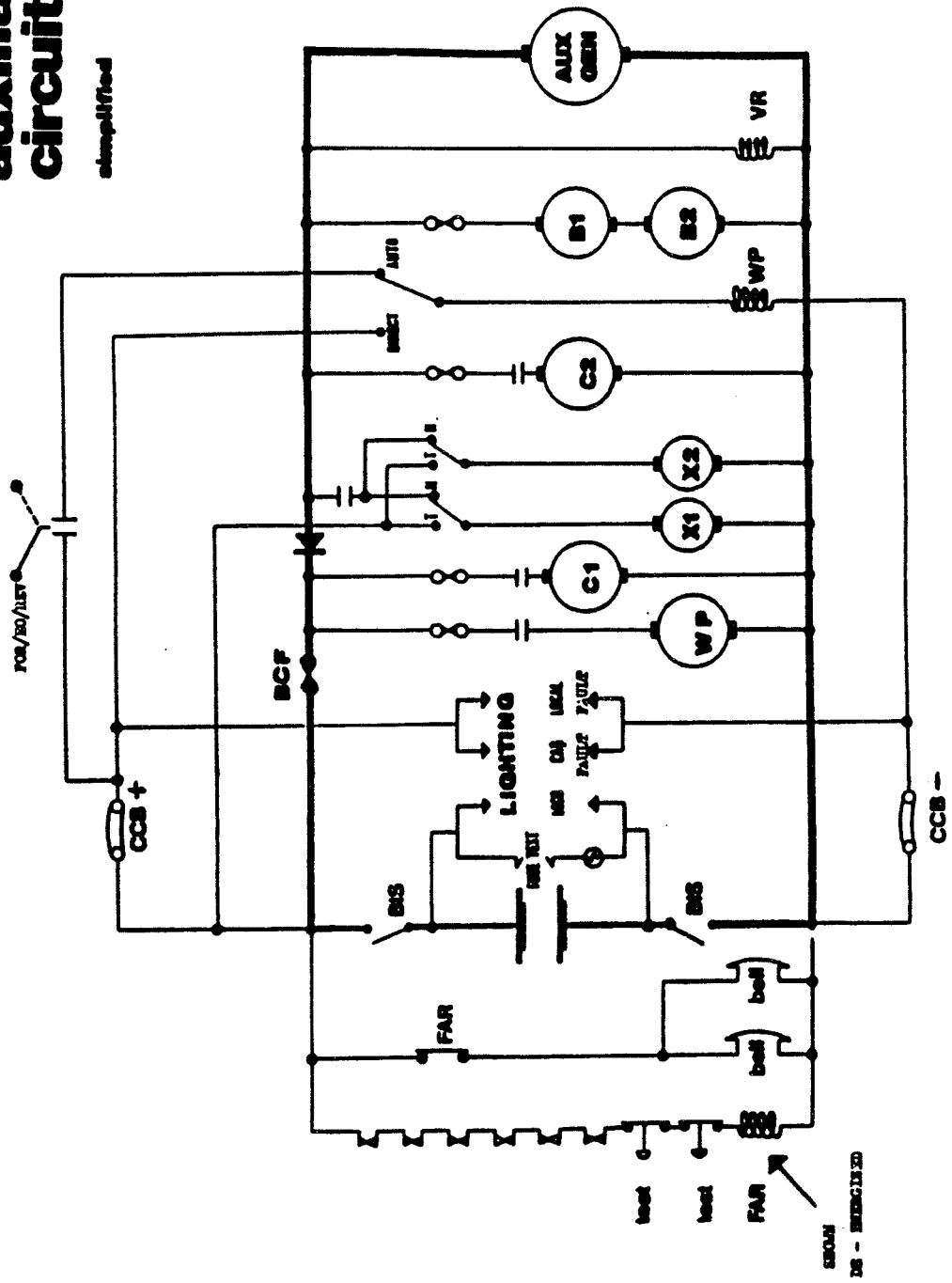
- (II) WITH THE B.I.S. OPEN/OUT ALL ELECTRICAL CIRCUITS ARE CUT OFF

EXCEPT:-

- (A) LOCOMOTIVE LIGHTING
- (B) FUSE TESTER
- (C) FIRE EXTINGUISHERS

auxiliary circuits

simplified

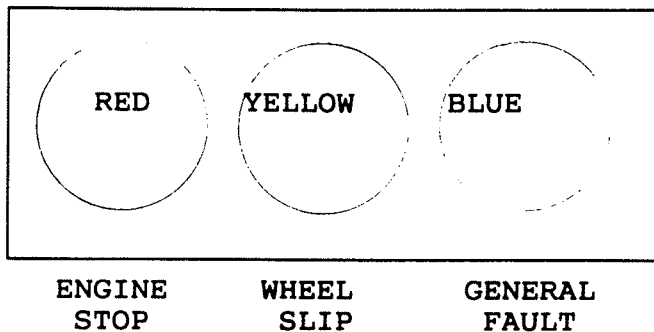


24. FAULT LIGHTS.

24-1. THERE ARE THREE FAULT LIGHTS ON DRIVERS DESK AND FIVE LOCAL ONES IN THE ENGINE ROOM.

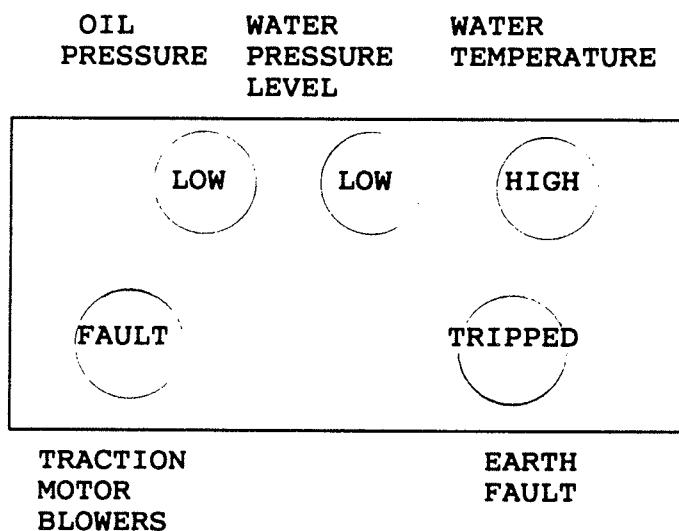
(A)

DRIVERS DESK FAULT LIGHTS.



(B)

LOCAL FAULT LIGHTS.



NORMAL = DIM. BLUE.
FAULT = BRIGHT. BLUE.

WHEN FAULT OCCURS REFER TO BR 33056/12.

25. PUMPSET.

25-1. LOCATED IN THE RADIATOR/BRAKE COMPARTMENT AND HAS THREE FUNCTIONS:-

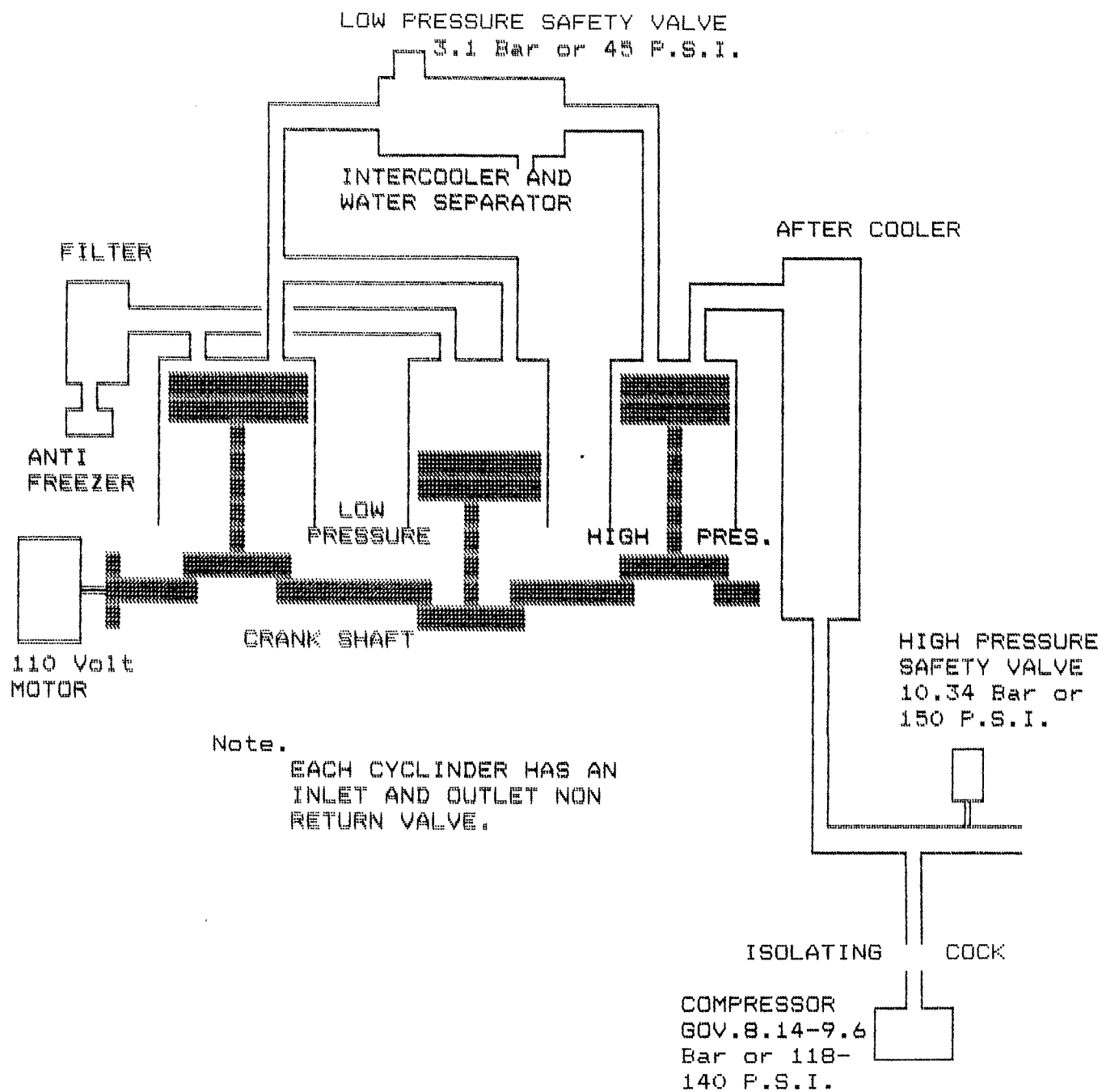
- (I) TRANSFERS FUEL FROM FUEL TANK
- (II) FOR LUB OIL PRIMING
- (III) COOLANT WATER CIRCULATION.

ALL THREE PUMPS ARE DRIVEN FROM ONE ELECTRIC MOTOR EITHER FROM THE BATTERIES WITH DIESEL ENGINE STOPPED OR AUXILIARY GENERATOR/ALTERNATOR DIESEL ENGINE RUNNING.

25-2. THINGS THAT MUST BE RIGHT FOR THE PUMPSET TO RUN ARE:-

- (i) B.I.S. IN/CLOSED
- (ii) BATTERY CHARGE FUSE
- (iii) C.C.B.I.+C.C.B.2.-
- (iv) MASTER SWITCH AWAY FROM OFF
- (v) PUMPSET FUSE (125 AMP).
- (vi) PUMPSET SWITCH SET AT AUTO.

BASIC COMPRESSOR LAYOUT.



26. COMPRESSORS

26-1 THERE ARE TWO COMPRESSORS LOCATED IN THE RADIATOR/BRAKE COMPARTMENT

26-2 MAKE UP AND OPERATION

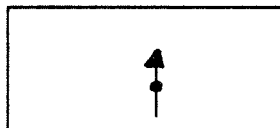
- (I) THESE ARE THREE CYLINDER MACHINES RUN BY AN ELECTRICAL MOTOR
- (II) HAS TWO LOW AND ONE HIGH PRESSURE CYLINDER WITH THE AIR BEING PASSED FROM LOW TO HIGH BEFORE PASSING INTO THE SYSTEM

26-3 AS THE ATMOSPHERE CONTAINS MOISTURE AND COULD IF ALLOWED, IN TIME, BUILD UP AND REDUCE THE AMOUNT OR AIR VOLUME IN THE MAIN RESERVOIR TANKS. CERTAIN DEVICES HAVE BEEN FITTED TO HELP REDUCE THE PROBLEM:-

- (I) INTERCOOLER FITTED BETWEEN LOW AND HIGH PRESSURE CYLINDER, ONCE WATER COOLS IT FALLS TO THE LOWEST POSITION.
- (II) AFTER COOLER LOCATED IN THE SYSTEMS BETWEEN THE COMPRESSOR AND MAIN RESERVOIR TANKS
- (III) AUTOMATIC DRAIN VALVES THESE OPERATE DURING AIR PRESSURE FLUCTUATION AND AUTOMATICALLY DISCHARGES WATER FROM THE SYSTEM.
- (IV) DRAIN VALVES/COCKS THESE ARE MANUAL HAND OPERATED USUALLY BY MAINTENANCE STAFF.

27 COMPRESSOR CHANGE OVER SWITCH (IF FITTED)

NORMAL



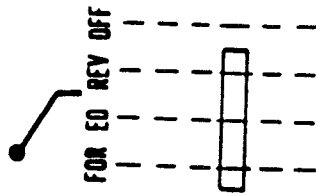
NORMAL

27-1

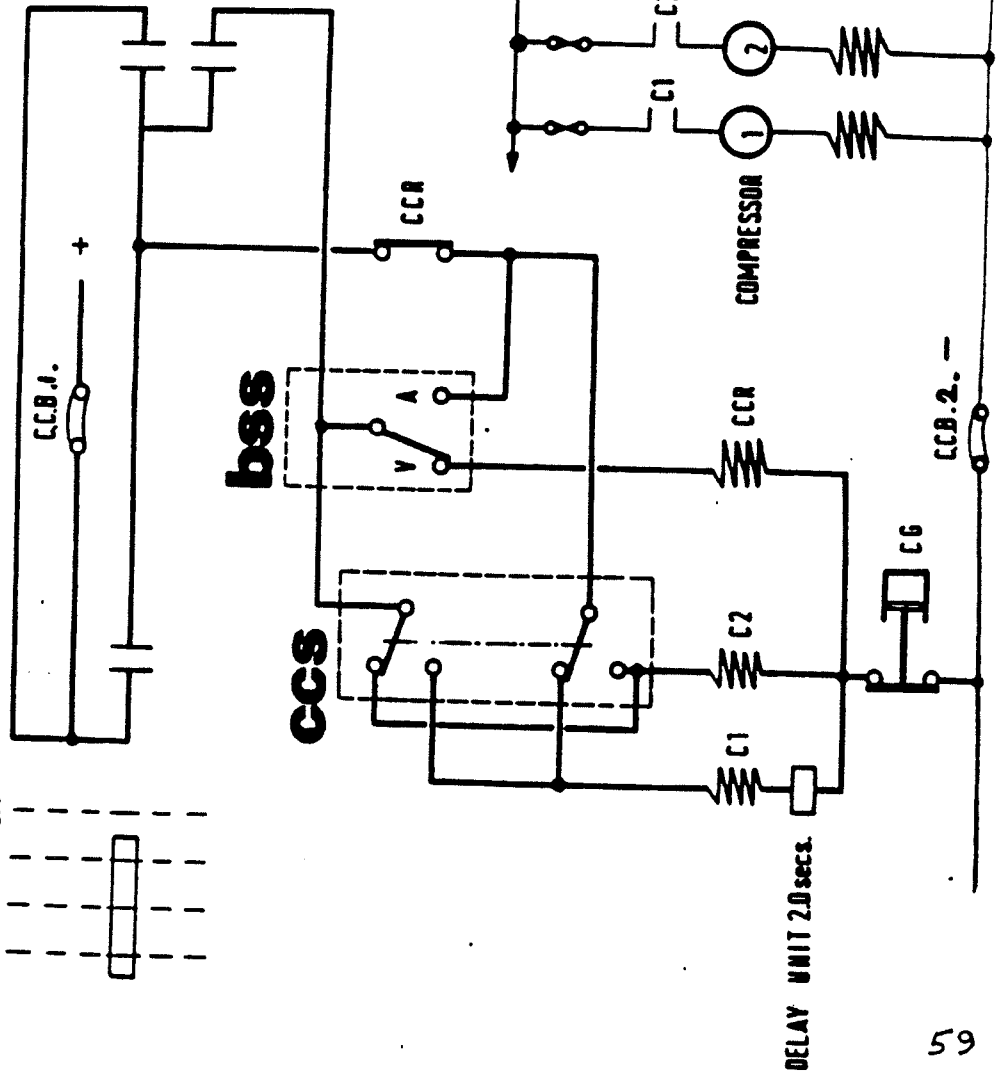
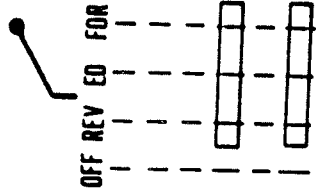
- (I) WITH THE B.S.S IN AN AIR POSITION BOTH COMPRESSORS RUN. SHOULD A COMPRESSOR FAIL THE ONLY NOTICEABLE EFFECT WOULD BE A SLOW BUILD UP OF PRESSURE.
- (II) WITH THE B.S.S IN A VACUUM POSITION:-
No 1 COMPRESSOR WILL RUN WHEN DRIVING FROM No 2 CAB
No 2 " " " " " " " No 1 CAB
- (III) IF A COMPRESSOR SHOULD FAIL WHEN WORKING IN A VACUUM POSITION THE COMPRESSOR CHANGE OVER SWITCH MUST BE PLACED TO:-

compressors and change over switch

CAB NO.1 MASTER SWITCH

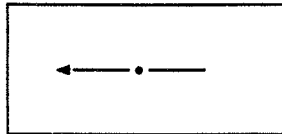


CAB NO.2 MASTER SWITCH



- C - C - D - = COMPRESSOR CHANGE OVER SWITCH.
- B - S - D - = BRAKE SYSTEM SELECTOR.
- C - C - B - = CONTROL CIRCUIT BREAKER.
- C - C - R - = COMPRESSOR CONTROL RELAY.
- C - 1 - = COMPRESSOR No.1.
- C - 2 - = COMPRESSOR No.2.
- C - G - = COMPRESSOR GOVERNOR
- V - = VACUUM.
- A - = AIR.

CHANGE OVER
No 1



CHANGE OVER
No 2

THIS WILL CHANGE THE COMPRESSORS OVER:-

No 1 COMPRESSOR WILL RUN WHEN DRIVING FROM No 1 CAB
No 2 " " " " " " No 2 "

NOTE UNDER THESE CONDITIONS YOU MUST USE CHANGE OVER SWITCH EACH TIME YOU CHANGE ENDS.

27-3 THINGS THAT MUST BE RIGHT FOR COMPRESSOR TO RUN

- (I) B.I.S MUST BE IN/CLOSED
- (II) MASTER SWITCH AWAY FROM OFF
- (III) C.C.B 1+2
- (IV) COMPRESSOR FUSE (100 AMP)
- (V) COMPRESSOR GOVERNOR CONTRACTS MADE
- (VI) COMPRESSOR CONTACT COIL ENERGISED
- (VII) PRE-START GOVERNOR MADE ON SOME LOCOMOTIVES

27-4 COMPRESSOR GOVERNOR

- (I) WHILST CONTACTS ARE MADE GOVERNOR WILL RUN
- (II) WHEN PRESSOR REACHES 9.6 Bar or 140 P.S.I CONTACTS ARE FORCED OPEN COMPRESSOR WILL STOP
- (III) SHOULD THE PRESSURE FALL BELOW 8.14 Bar or 118 P.S.I CONTACTS CLOSE AND COMPRESSOR WILL RUN AGAIN
- (IV) SHOULD THE CONTACTS REMAIN CLOSED EACH COMPRESSOR HAS A HIGH PRESSURE SAFETY VALVE WHICH BLOWS OFF AT 10.34 Bar or 150 P.S.I

28 MAIN AIR SYSTEM

ON LEAVING THE COMPRESSOR AIR PASSES THROUGH A NON-RETURN VALVE INTERCOOLER AND HIGH PRESSURE SAFETY VALVE INTO THE MAIN RESERVOIR TANKS.

28-2 THINGS FED FROM MAIN RESERVOIR AIR:-

- (I) CONTROL RESERVOIR VIA A NON-RETURN AND REDUCING VALVE, (70 P.S.I) INGOING COCK.
- (II) COMPRESSOR GOVERNOR VIA AN ISOLATING COCK
- (III) MAIN RESERVOIR ISOLATING COCK
- (IV) AUXILIARY RESERVOIR VIA A NON-RETURN VALVE
- (V) MAIN RESERVOIR AIR PRESSURE SWITCH (M.A.P.S.) VIA AN ISOLATING COCK
- (VI) HORNS-WINDSCREEN WIPERS AT BOTH ENDS VIA ISOLATING COCKS
- (VII) STRAIGHT AIR BRAKE VALVES
- (VIII) AUTOMATIC BRAKE VALVES, VIA ISOLATING COCK AND D.S.D FEED CUT OFF VALVES
- (IX) PRESSURE GAUGE
- (X) PRESSURE CONTROL/REDUCING VALVE (6.89 Bar or 100 P.S)
- (XI) MAIN RESERVOIR EQUALISING PIPE NOSE END CONNECTIONS

28-3 THINGS FED FROM CONTROL RESERVOIR

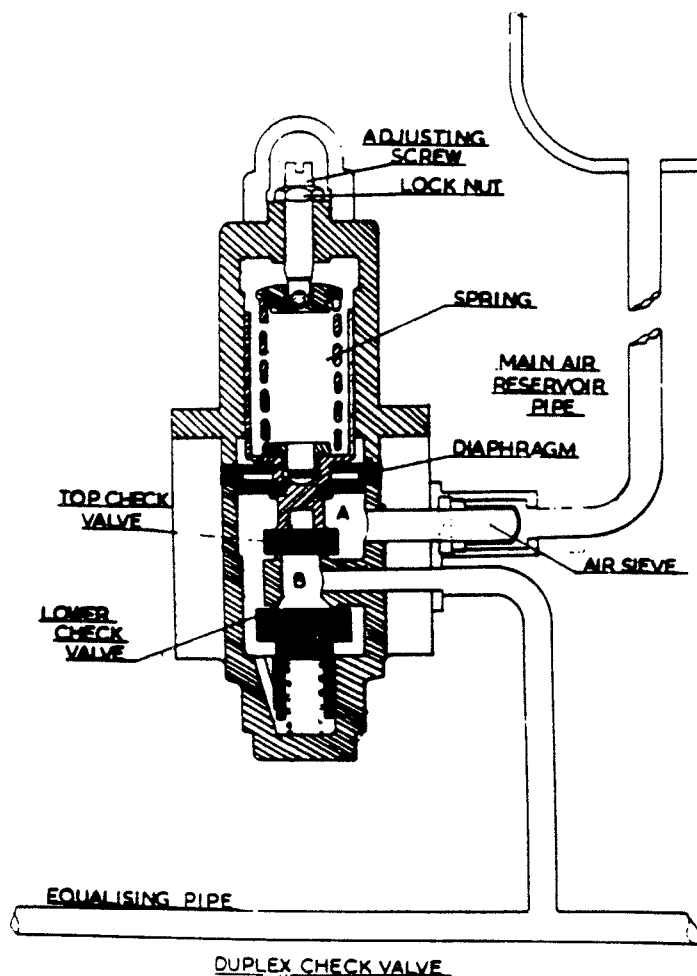
- (I) OUT GOING COCK
- (II) CONTROL AIR GAUGE
- (III) ENGINE SPEED VALVE
- (IV) ANTI-SLIP E.P. VALVE
- (V) CONTROL EQUIPMENT
- (VI) EQUIPMENT COCK IF FITTED

28-4 MAIN AIR PRESSURE SWITCH

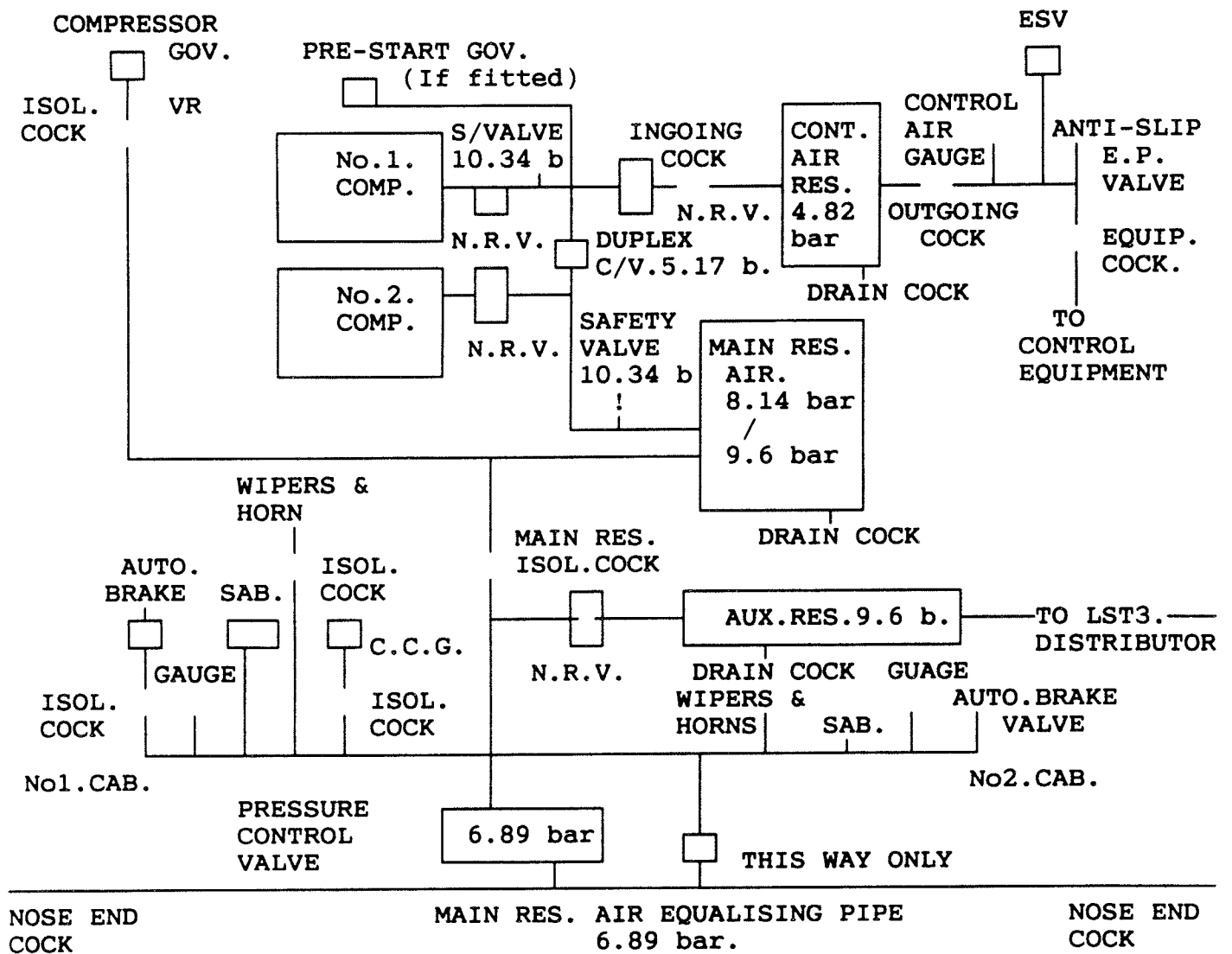
- (I) PREVENTS POWER BEING TAKEN UNTIL AT LEAST 5.65 Bar or 82 P.S.I OF MAIN RES.AIR PRESSURE
- (II) IF MAIN RES PRESSURE FALLS TO 4.48 Bar or 65 P.S.I AMPS WILL BE LOST. NO POWER

28-5 DUPLEX CHECK VALVE

- (I) PREVENTS AIR PASSING UNTIL A GIVEN PRESSURE IS REACHED (5.17 Bar or 75 P.S.I)
- (II) CLOSSES IF PRESSURE FALLS TO 5.17 Bar or 75 P.S.I
- (III) ALSO USED TO DIVERT AIR VIA ALTERNATIVE ROUTE
- (IV) USED AS A PROTECTION AGAINST TOTAL LOSS OF AIR



MAIN AIR SYSTEM.



28-6 FLOW OF MAIN AIR SYSTEM

No 1 COMPRESSOR (BATTERY SUPPLIED)

NON RETURN VALVE

HIGH PRESSURE SAFETY VALVE
10.34 Bar or 150 P.S.I.

REDUCING VALVE 4.82 Bar or 70 P.S.I.

INGOING COCK

CONTROL AIR SERVICE

OUT GOING COCK

CONTROL AIR GAUGE

ENGINE SPEED VALVE

ANTI-SLIP

EQUIPMENT COCK (IF FITTED)

CONTROL EQUIPMENT

No 1 COMPRESSOR (DIESEL ENGINE RUNNING)

NON RETURN VALVE

HIGH PRESSURE SAFETY VALVE
10.34 Bar or 150 Psi

DUPLEX CHECK VALVE

MAIN RESERVOIR TANKS (4) 9.6 Bar or 140 psi

COMPRESSOR GOVERNOR

ISOLATING COCK

COMPRESSOR GOVERNOR

MAIN RESERVOIR ISOLATING COCK

CCG MAIN AIR PRESSURE SWITCH

HORNS AND WIPERS

NON RETURN VALVE

AUXILIARY RESERVOIR

RELAY VALVES

BRAKE CYLINDERS

INDEPENDENT AIR BRAKES

MAIN RES AIR GAUGE

AUTOMATIC BRAKE

PRESSURE CONTROL REDUCING VALVE 6.89 Bar or 100 P.S.I

MAIN RESERVOIR EQUALISING PIPE NOSE END CONNECTION

29 STARTING THE DIESEL ENGINE

CERTAIN THINGS THAT MUST BE RIGHT BEFORE ANY DIESEL ENGINE CAN BE STARTED.

THERE ARE LAID DOWN PROCEDURES TO FOLLOW DURING PREPARATION OR DISPOSAL.

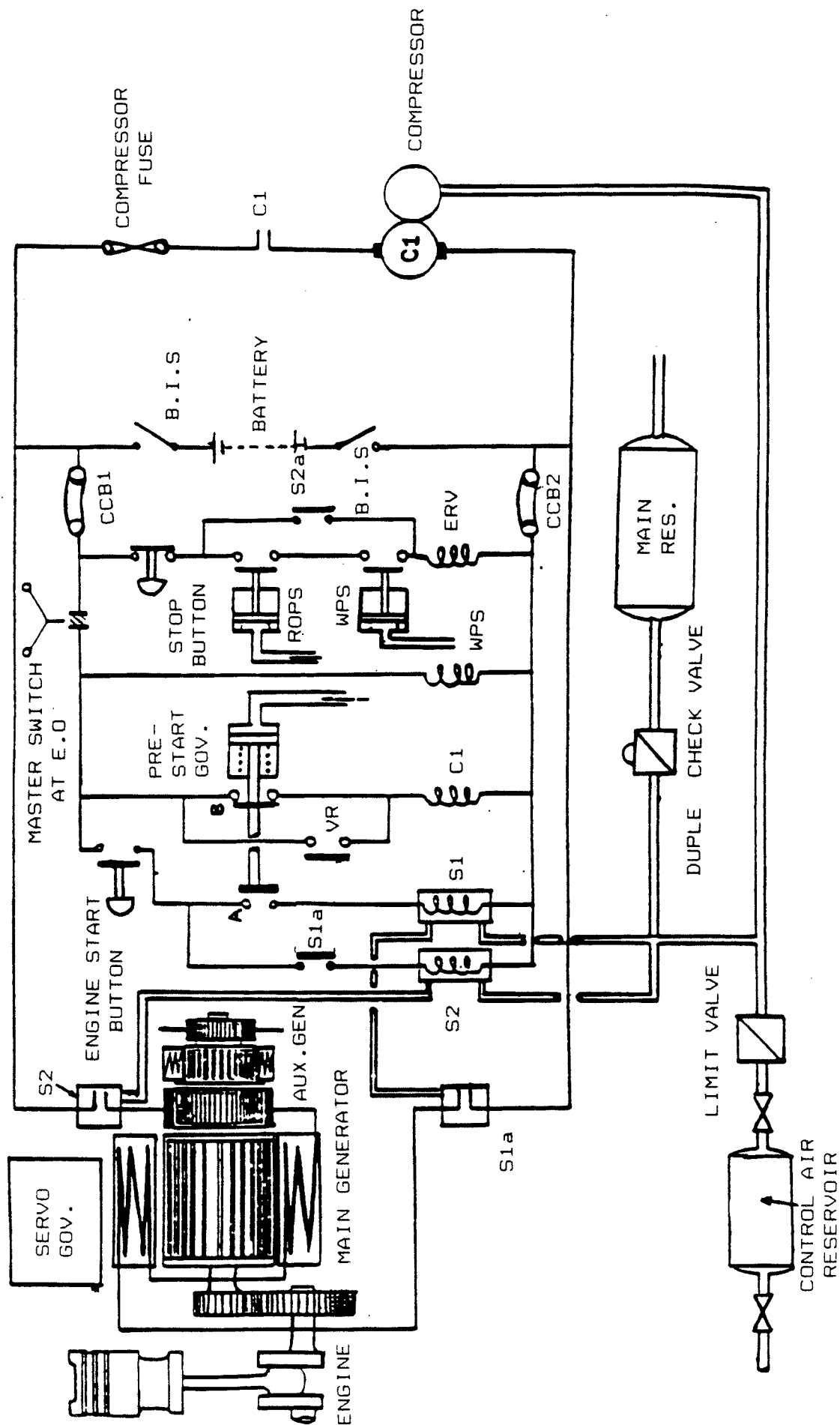
THESE ARE CONTAINED IN BR 33056/87

THERE ARE TWO TYPES OF DIESEL ENGINE STARTING ON CLASS 47 LOCOMOTIVES EP AND EM

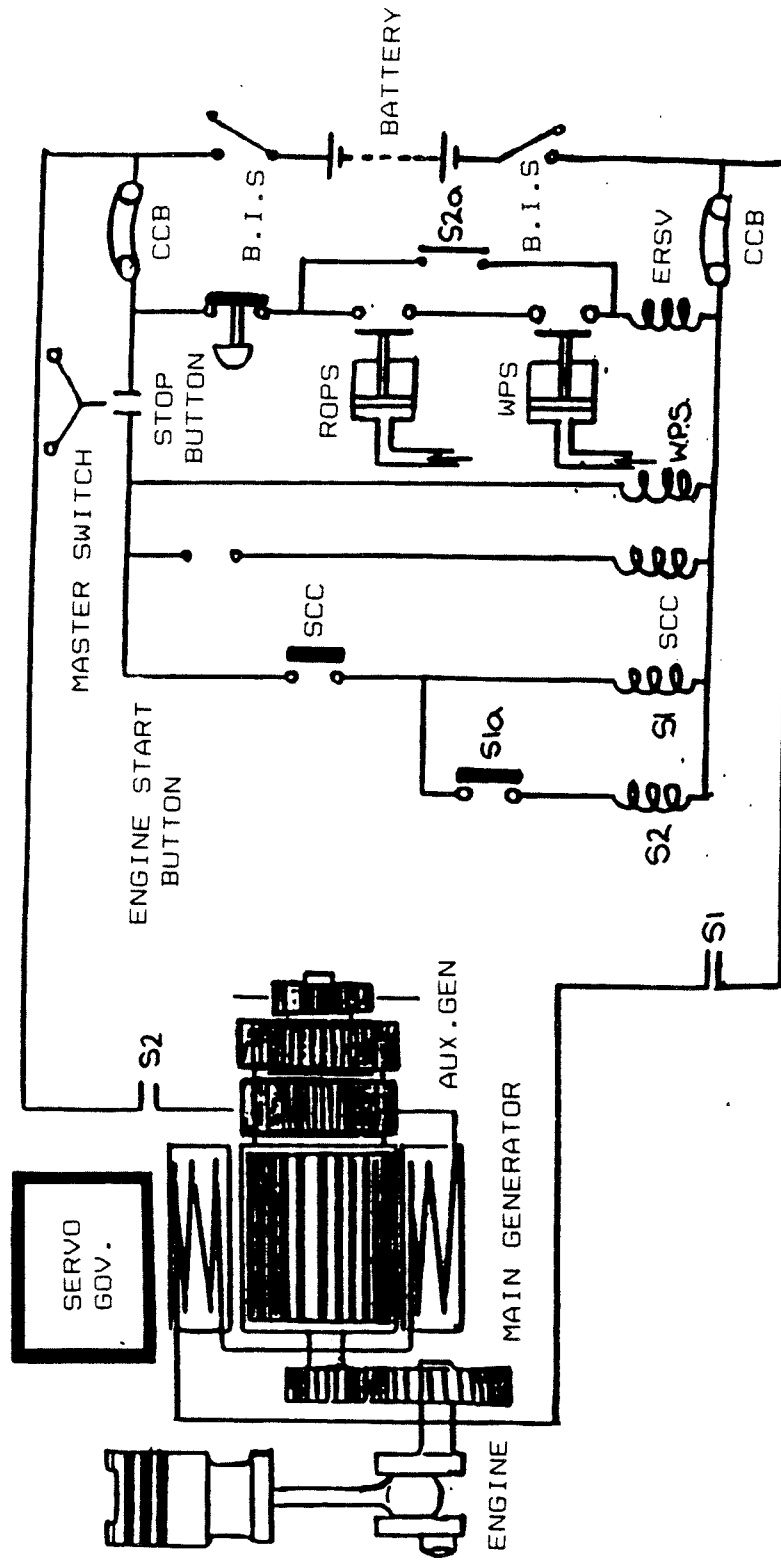
29-1 STARTING OPERATION (E.P. LOCOMOTIVES)

- (A) CLOSE B.I.S TO OBTAIN AN ELECTRICAL SUPPLY
- (B) INSERT MASTER KEY AND TURN, THIS UNLOCKS THE MASTER SWITCH
- (C) MOVE MASTER SWITCH TO ENGINE ONLY (E.O) NOW THE FOLLOWING SEQUENCE OF EVENTS TAKES PLACE:-
 - (I) PUMPSET RUNS TO SUPPLY LUB OIL, WATER AND FUEL OIL IN THEIR RESPECTIVE SYSTEMS. ALLOW A MINIMUM OF 15 SECONDS
 - (II) COMPRESSOR RUNS UNTIL 4 Bar or 58 P.S.I IS OBTAINED. THE PRE-START GOVERNOR WILL OPEN AND STOP THE COMPRESSOR. THIS MEANS THAT UNTIL SUFFICIENT AIR IS OBTAINED TO CLOSE OTHER CONTRACTS IT IS NOT POSSIBLE TO START THE DIESEL ENGINE. WITH THE ENGINE RUNNING THE PRE-START GOVERNOR PLAYS NO FURTHER PART IN THE OPERATION. CONTROL IS UNDER THE COMPRESSORS
 - (III) A DUPLEX CHECK VALVE PREVENTS AIR FROM CHARGING THE MAIN RES AIR SYSTEM UNTIL THE CONTROL AIR PRESSURES EXCEEDS 5.17 Bar or 75 P.S.I
 - (IV) BOTH PRE-START AND COMPRESSOR GOVERNORS CAN BE MANUALLY OPERATED.
- (D)
 - (I) DEPRESS THE START BUTTON TO CONNECT THE BATTERIES TO THE MAIN GENERATOR VIA NOW CLOSED CONTACTS S.1-S.2 AT THE SAME TIME THE ENGINE RUN SOLENOID IS ENERGISED ALLOWING LUB OIL TO SERVO POSITION OF THE ENGINE SPEED GOVERNOR.
 - (II) OIL PRESSURE HAS BUILT UP IN THE RUN OIL PRESSURE SWITCH (R.O.P.S)
 - (III) WATER PRESSURE BUILDS UP TO CLOSE THE WATER PRESSURE SWITCH (W.P.S)
 - (IV) R.O.P.S. AND W.P.S. ARE IN THE RETAINING CIRCUIT FOR E.R.S. VALVE. THIS ENSURES THAT WHEN YOU TAKE YOUR FINGER OFF THE START BUTTON THE ENGINE WILL CONTINUE TO RUN.

DIESEL ENGINE START (E.P. SIMPLIFIED)



DIESEL ENGINE (E.M SIMPLIFIED)



29-2 STARTING OPERATION (E.M. LOCOMOTIVES)

IT WAS FOUND THAT ON E.P. START WITH PUMPSET AND COMPRESSOR RUNNING THERE WAS A VERY HEAVY DRAIN ON THE BATTERIES.

- (A) CLOSE B.I.S.
- (B) INSERT MASTER KEY AND TURN
- (C) MASTER SWITCH TO E.O. PUMPSET RUNS
- (D) DEPRESS START BUTTON
- (I) AS THE CURRENT IS REQUIRED TO GO DIRECT FROM BATTERY TO MAIN GENERATOR AND IS TOO HIGH TO PASS THROUGH A THE START BUTTON ALONE A COIL IS ENERGISED, START CONTROL CONTACTOR (S.C.C.) THIS CLOSES COMPLETE CIRCUIT BATTERIES TO MAIN GENERATOR AND ENERGISE E.R.S.V.
- (II) R.O.P.S. AND W.P.S. ARE CLOSED IN THE RETAINING CIRCUIT TO E.R.S.V.
- (III) ENGINE CRANKS FIRES AND RUNS.

30 TRACTION MOTORS

30-1 THERE ARE SIX MOTORS EACH OF 346.6 H.P. WHICH GIVES 2080 H.P. AND ARE MOUNTED ON THE AXLES VIA A CONSTANT MESHED GEAR WHEEL.

30-2 CONTINUOUS RATING OF EACH IS 710 AMPS. GIVING A GAUGE READ OF:-

- (I) 2130 AMPS - SERIES/PARALLEL LOCOMOTIVES
- (II) 4260 AMPS - PARALLEL LOCOMOTIVES

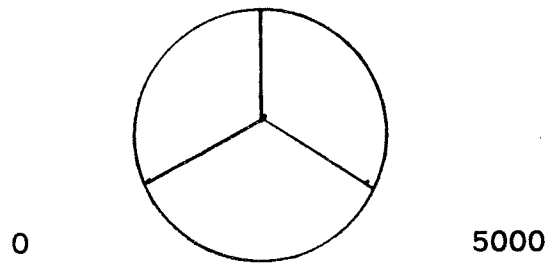
30-3 DEFECTS

- (I) SHOULD A DEFECT/FAULT OCCUR A CONTINUOUS YELLOW FAULT LIGHT WILL SHOW ON THE DRIVERS DESK. TRACTION MOTOR CAN BE ISOLATED EITHER IN PAIRS OR INDIVIDUALLY
- (II) IF MOTORS ARE ISOLATED DUE TO A FAULT THEN THE RATINGS SHOWN IN FOLLOWING TABLE MUST BE COMPLIED WITH.

31. AMMETER READINGS.

31-1 SERIES PARALLEL LOCOMOTIVES

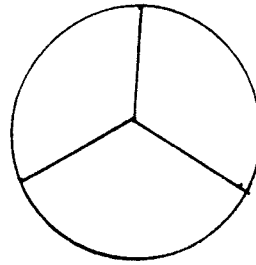
2130



MAXIMUM AMPS TO BE DRAWN

	ALL MOTORS IN CIRCUIT	ONE PAIR ISOLATED	TWO PAIRS ISOLATED
BRIEF PERIODS STARTING	5.000	3.300	1.650
5 MINUTES IN ANY HOUR	3.800	2.530	1265
15 MINUTES IN ANY HOUR	3000	2000	1000
ONE HOUR CONTINUOUS	2130	1400	700

4260



0

10,000

MAXIMUM AMPS. TO BE DRAWN.

	ALL MOTORS IN CIRCUIT	ONE MOTOR ISOLATED	TWO MOTORS ISOLATED
BRIEF PERIODS STARTING	8000	6670	5340
5 MINUTES IN ANY HOUR	6500	5420	4340
15 MINUTES IN ANY HOUR	5500	4600	3700
ONE HOUR CONTINUOUS	4260	3550	2850

31.3 MOTOR OVERLOADS. (DECOMPOUNDING)

OVER RELAYS HAVE BEEN DISPENSED WITH ON CLASS 47 LOCOMOTIVES AND REPLACED BY A DECOMPOUNDING FIELD. THIS WORKS ON A SEPARATE FIELD FOUND IN OPPOSITION TO THE MAIN GENERATOR FIELD, AND IS ONLY ENERGISED WHEN AMPS ARE AT A PREDETERMINED HIGH LEVEL THERE BY REDUCING AMPS AGAIN.

32 TRACTION MOTOR BLOWERS

32-1 THERE ARE TWO MOTOR BLOWER MOTORS PROTECTED BY ONE FUSE (125 AMPS)

32-2 PURPOSE

THEY ARE FITTED TO THE CLASS 47 FOR THE PURPOSE OF COOLING THE TRACTION MOTORS, SHOULD THEY FAIL DRIVER WILL GET A BLUE FAULT LIGHT BRIGHT ON THE DESK INDICATORS. THERE WILL BE NO LOSS OF POWER BUT THE DRIVER MUST REDUCE AMPS UNTIL ABLE TO CHECK THE BLOWER MOTOR FUSE.

33 MOVEMENTS OF LOCOMOTIVE
33-1 SEQUENCE OF EVENTS WHEN POWER CONTROLLER IS OPENED

- (I) REVERSERS THROW OR HOLD OVER
- (II) MOTOR CONTRACTORS CLOSE
- (III) AUX GEN/ALT NOW EXCITES MAIN GENERATOR FIELD VIA LOAD AIR TO REGULATOR AT 40 OR 300
- (IV) ENGINE SPEED VALVE (E.S.V) IS ENERGISED ALLOWING REGULATING AIR TO ENGINE SPEED GOVERNOR
- (V) R.P.M. INCREASES PRODUCING HIGHER MAIN GENERATOR OUTPUT TO TRACTION MOTORS TO ACCELERATE THE LOCOMOTIVE

33-2 MOVING AWAY AT LOAD REGULATION

- (I) ENGINE REVS INCREASE TO 800 RPM
- (II) LUB OIL NOW FLOWS TO THE LOAD REGULATOR OIL VALVE MOTOR WHICH MOVES AWAY FROM 40 OR 300 TOWARDS 0 TAKING OUT RESISTANCES.
- (III) FIELD IS STRENGTHENED GIVING MORE POWER TO THE TRACTION MOTORS

33-3 THE TWO TYPES OF LOAD REGULATOR

- (I) HAS A MOVING CONTACT WHICH PASSES OVER CONTACTS CUTTING IN OR OUT 40 SEPARATE RESISTANCES.
- (II) RHEOSTAT TYPE WITH RESISTANCES CALIBRATED FROM 0-300 DEGREES A MOVING CONTACT INCREASING OR DECREASING RESISTANCE.

33-4 OBTAINING POWER

- (I) BEFORE CAN BE OBTAINED THE LOAD REGULATOR MUST BE ON 40 OR 300 DEPENDING UPON THE TYPE OF LOAD REGULATOR FITTED.
- (II) ALWAYS ALLOW APPROXIMATELY 20 AFTER CLOSING THE POWER CONTROLLER BEFORE RE-OPENING TO GIVE LOAD REGULATOR TIME TO RUN BACK.

33-5 FIELD DIVERSION

- (I) AS THE LOCOMOTIVE ROAD SPEED INCREASES SO WILL BACK EMF FROM THE SIX TRACTION MOTORS.
- (II) WHEN THE BACK EMF IS EQUAL TO THE APPLIED EMF THE LOCOMOTIVE WILL NOT INCREASE ITS ROAD SPEED.
- (III) TO ENABLE US TO GO FASTER WE MUST REDUCE THE BACK EMF THIS IS DONE BY WEAKENING THE TRACTION MOTORS FIELD ON THE CLASS 47 THIS IS DONE BY THREE STAGES OF FIELD DIVERSION.
- (IV) THE THREE STAGES COME IN AT:-
 - (A) 31 MPH
 - (B) 45 MPH
 - (C) 60 MPH
- (V) THERE ARE TWO METHODS USED ON 47'S TO BRING ABOUT FIELD DIVERSION:-
 - (A) BY A LOAD REGULATOR CONTACT AND INTERLOCKING RELAYS
OR
 - (B) ON OTHER LOCOMOTIVES BY MEANS OF A ELECTRONIC CONTROL UNIT CONTROLLED BY THE SPEEDOMETER GENERATOR

34 WHEEL SLIP

34-1

IS DETECTED BY ANY IMBALANCE BETWEEN TWO TRACTION MOTORS
ie:-

1-2 OR 3-4 OR 5-6

34-2

- (I) WHEN DETECTED DRIVER IS WARNED BY A MEANS OF A BRIGHT YELLOW FAULT LIGHT ON DESK.
- (II) LOAD REGULATOR WILL AUTOMATICALLY RUN BACK TOWARDS MINIMUM FIELD THEREBY REDUCING AMPS AND PREVENTING FIELD DIVERSION.

34-3 TO STOP WHEEL SLIP

EASE CONTROLLER AND APPLY ANTI-SLIP BRAKE. WHEN YELLOW FAULT LIGHT DIMS RE-APPLY POWER GRADUALLY.

35 SLOW SPEED CONTROL
(THIS DEVICE IS NOT FITTED TO ALL CLASS 47's)

35-1 CONTROL EQUIPMENT

- (I) IN EACH CAB MOUNTED ON THE CORNER PILLAR IS A SPEEDOMETER WITH A CONTROL KNOB MARKED FROM 0-3 M.P.H..
- (II) THE CONTROL UNIT IS MOUNTED IN THE ENGINE ROOM ON THE BODY SIDE ADJACENT TO THE B.I.S. WITH A SLOW MOTION SWITCH HAS TWO POSITIONS No 1 CAB AND No 2 CAB ALSO A WHITE LIGHT AND TEST BUTTONS

35-2 OPERATIONS

- (I) WITH LOCOMOTIVE STATIONARY. SECURE AND WITH PARKING BRAKE PLACE MASTER SWITCH TO E.O.
- (II) ENGINE ROOM, PLACE SLOW MOTION SWITCH TO DESIRED CAB (ie - No 1 OR No 2) WHICH YOU WILL BE DRIVING FROM.
- (III) RETURN TO CAB, SET SLOW CONTROL KNOB TO 0.5 M.P.H.. RELEASE PARKING BRAKE.
- (IV) DEPRESS D.S.D THEN MOVE MASTER SWITCH TO FORWARD AND TAKE POWER.
- (V) GRADUALLY RELEASE THE STRAIGHT AIR BRAKE.
- (VI) IT MIGHT BE NECESSARY TO ADJUST THE SLOW KNOB.
- (VII) A SLIGHT BRAKE APPLICATION MIGHT BE REQUIRED ON A FALLING GRADIENT.

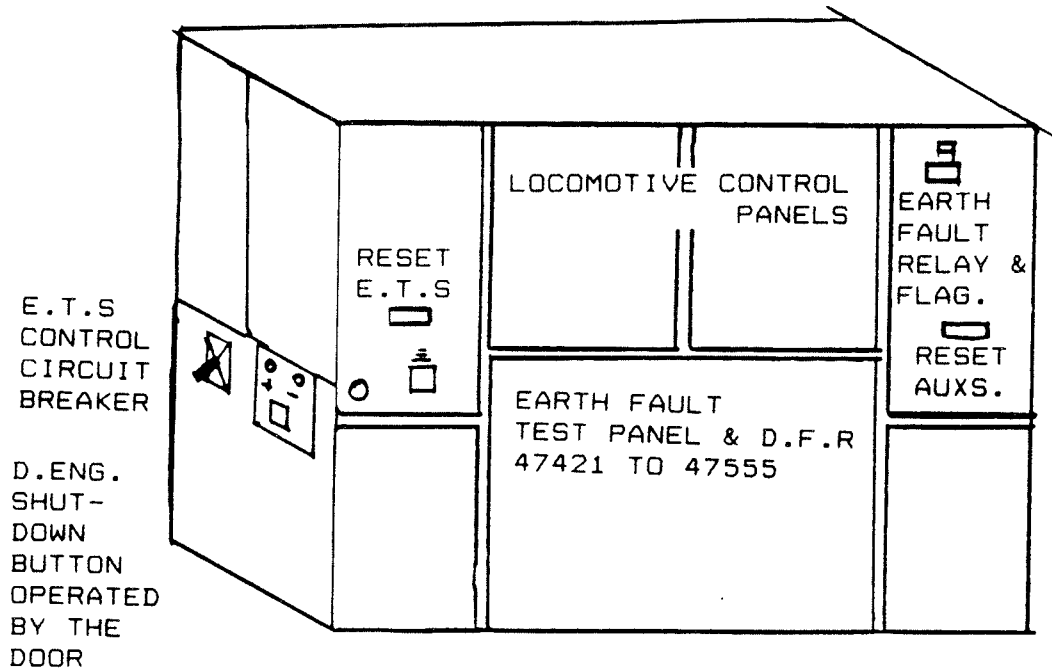
35-3 RESETTING THE CONTROL UNITS

SHOULD THE ROAD SPEED SET FOR, BE EXCEEDED BY MORE THAN 2 MPH OR A FAILURE OCCURS. POWER WILL BE CUT OFF AND A WHITE LIGHT WILL SHOW ON THE CONTROL UNIT.

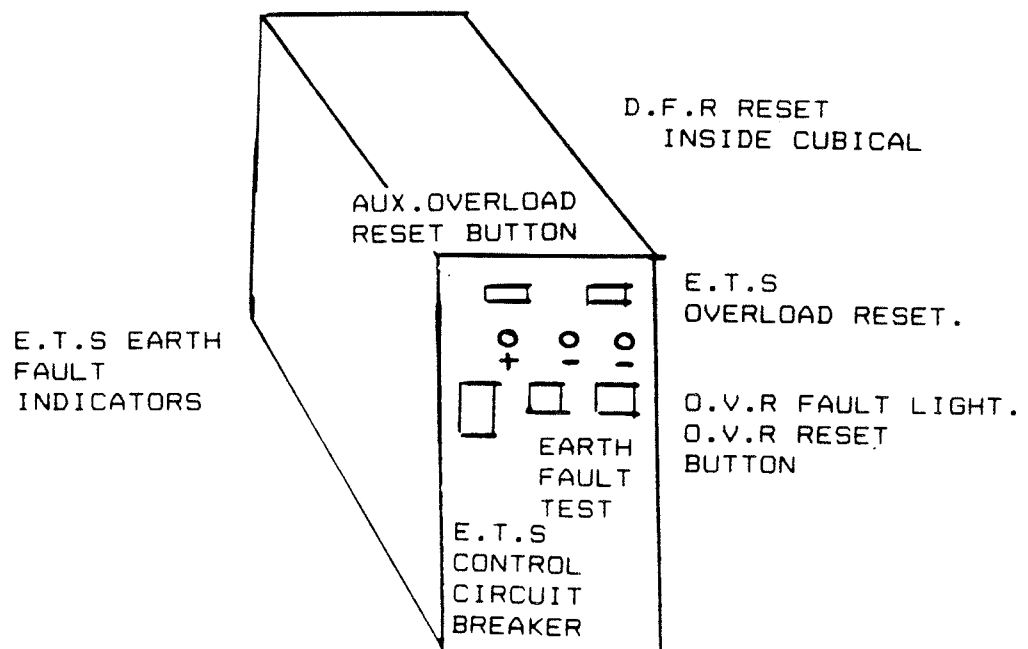
- (I) POWER CONTROLLER TO OFF. STOP AND SECURE LOCOMOTIVE WITH PARKING BRAKE. MASTER SWITCH TO E.O.
- (II) PLACE SLOW MOTION SWITCH TO NORMAL THEN BACK TO SLOW FOR CAB IN USE.
- (III) CHECK CONTROL UNIT LIGHT HAS GONE OUT.
- (VI) CONTINUE WITH SLOW SPEED WORKING AFTER RELEASING PARKING BRAKE.

ELECTRIC TRAIN SUPPLY - CLASS 47.

1. E.T.S CUBICAL WHEN IN THE ENGINE ROOM.



2. E.T.S CUBICAL WHEN IN THE FORMER BOILER ROOM 47556 ONWARDS.



36-1 THE AUXILIARY ALTERNATOR HAS TWO SEPARATE WINDINGS AND RECTIFIERS WHICH PROVIDE:-

- (I) 800V D.C. E.T.S
- (II) 110V D.C AUXILIARY CONTROL SUPPLY

36-2 E.T.S IS CONTROLLED BY "ON - OFF" BUTTONS IN EACH CAB

NOTE CAB BUTTONS ARE NOT AFFECTED BY THE MASTER SWITCH POSITIONS SWITCH.

36-3 EACH CAB IS FITTED WITH A WHITE LIGHT WHICH HAS A DIMMER SWITCH.

36-4 IF TWO OR MORE LOCOMOTIVES ARE COUPLED TO A TRAIN

- (I) THE E.T.S WILL BE FROM LOCOMOTIVE ON WHICH THE "ON" BUTTON HAS BEEN OPERATED. THIS WILL RENDER ALL OTHER BUTTONS INOPERATIVE.
- (II) ALL WHITE LIGHTS WILL ILLUMINATE
- (III) ANY "OFF" BUTTON WILL SWITCH OFF E.T.S.

36-5 EQUIPMENT 47421 - 47555

LOCATED IN TWO CUPBOARDS ONE EACH SIDE OF THE FUSE AND SWITCH CUPBOARDS ON THE FIXED END OF DIESEL.

(A) LEFT HAND CUPBOARD (OUTSIDE)

- (I) E.T.S CONTROL CIRCUIT BRAKES
- (II) AN EARTH TEST SWITCH WITH LIGHT NORMALLY LIT. THESE ARE FOR MAINTENANCE STAFF.

(B) LEFT HAND CUPBOARD (INSIDE)

- (I) E.T.S OVERLOAD
- (II) DIODE FAULT RELAY (D.F.R) IF FITTED BOTH HAVE MANUAL RESETS. IN THE CASE OF D.F.R THIS IS FITTED WITH TWO RESETS WHICH MUST BE OPERATED TOGETHER.

NOTE THE CUPBOARD IS PROTECTED BY A DOOR OPERATED PROTECTION SWITCH.

- (C) RIGHT HAND CUPBOARDS (INSIDE)
- (I) AUXILIARY OVERLOAD RELAY AND RETEST
- (D) FORMER BOILER ROOM
- (I) AUTOMATIC VOLTAGE REGULATORS (A.V.R) FITTED WITH EITHER A RESET BUTTON OR A CIRCUIT BREAKER.
- (E) RADIATOR COMPARTMENT
- (I) EQUIPMENT GOVERNOR. IF NOT CLOSED WILL CAUSE LOSS OF E.T.S AND WITH CONTROLLER AWAY FROM "OFF" AMPS WILL BE LOST AND A GENERAL BLUE FAULT LIGHT WILL BE BRIGHT.

NOTE SHOULD D.F.R TRIP, DIESEL ENGINE WILL SHUT DOWN IF ANY OF THE FOLLOWING OCCUR:-

- (I) A.V.R TRIPPING
- (II) DOOR SWITCH OPERATING
- (III) AUXILIARY OVERLOAD
- (VI) TRAIN HEAT OVERLOAD (SOME LOCOMOTIVES)
E.T.S AND AMPS WILL BE LOST THE TWO MINUTES LATER
ENGINE SHUTS DOWN.

36-6 EQUIPMENT 47556 UPWARDS

FITTED WITH A MODIFIED E.T.S WHICH IS HOUSED IN A CUBICAL LOCATED IN THE FORMER BOILER COMPARTMENTS (KNOWN AS THE COFFIN)

(A) OUTSIDE

LOCATED ON THE CONTROL PANEL IS:-

- (I) EARTH FAULT TEST AND LIGHTS NORMALLY LIT. THESE ARE FOR MAINTENANCE STAFF.
- (II) E.T.S CIRCUIT BREAKER
- (III) OVER VOLT RELAY (O.V.R) LIGHT AND RESET.
- (IV) E.T.S OVERLOAD RESET BUTTON
- (V) AUXILIARY OVERLOAD RESET BUTTON

(B) INSIDE

- (I) D.F.R WITH ITS TWO RESETS. BEFORE RESETTING D.F.R (ONLY ONCE) TRAIN HEAT OVERLOAD RESET BUTTON MUST BE OPERATED.

37. FIRE ALARM SYSTEM

37-1 MAIN FIRE SYSTEM

THIS IS NON AUTOMATIC.THEREFORE IF FIRE ALARM BELLS RING THE DIESEL ENGINE MUST BE SHUT DOWN,THEN ONE OF THE FOUR PUSH BUTTONS MUST BE PRESSED TO ELECTRICALLY DISCHARGE THE MAIN EXTINGUISHERS.

37-2 MAIN FIRE EXTINGUISHERS CO2

(A) THERE ARE THREE MAIN FIRE BOTTLES LOCATED:-

(I) IN FORMER BOILER COMPARTMENT.

(II) + (III) ONE IN EACH CORNER OF ENGINE ROOM AT THE FREE END.

(B) FOLLOWING ITEM OF EQUIPMENT ARE TO BE FOUND ON EACH BOTTLE.

(I) ELECTRICAL LEAD

(II) ISOLATING PIN

(III) CLIP ON THE TOP

37-3 DISCHARGE PUSH BUTTONS (4)

THERE ARE FOUR GLASS COVERED PUSH BUTTONS SITUATED THUS:-

(I) ONE ON EACH BULK HEAD IN No 1 & No 2 CAB

(II) ONE EACH SOLE BAR "A" & "B" BANK SIDE

NOTE THE ELECTRICAL SUPPLY COMES DIRECT FROM THE BATTERIES THEREFORE BOTTLES CAN BE DISCHARGED WITH B.I.S IN OR OUT.

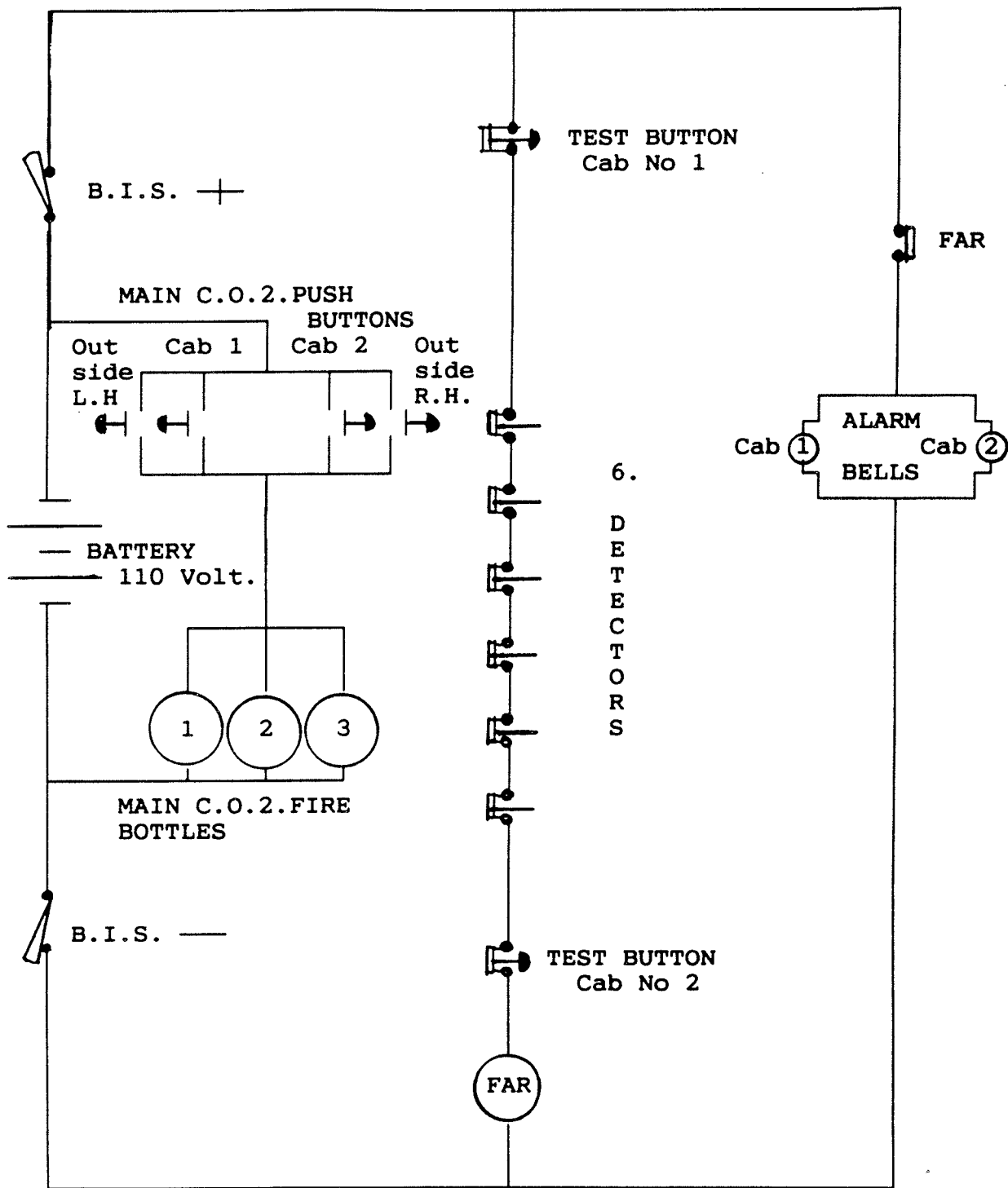
37-4 ALARM TEST BUTTONS

THERE ARE TWO, ONE IN EACH CAB SITUATED ON THE DRIVERS DESK.IF FIRE ALARM BELLS FAIL TO RING WHEN TESTED THE LOCOMOTIVES MUST NOT BE TAKEN IN TO SERVICE.

37-5 THERMOSTATIC DETECTORS

THESE ARE BAR METAL STRIPS WHICH EXPAND WHEN HOT.THIS CAUSES FIRE BELLS RING.

37-6 FIRE ALARM SYSTEM.
(SHOWN DE-ENERGISED)



37-7 FIRE BELLS RING IN SERVICE

- (I) STOP TRAIN SHUT DOWN DIESEL ENGINE
- (II) SECURE LOCO
- (III) TAKE A HAND EXTINGUISHER AND CARRY OUT AN INSPECTION OF ENGINE ROOM ETC.
 - (A) IF MINOR, USE HAND EXTINGUISHER
 - (B) IF MAJOR, LEAVE ENGINE ROOM ENSURING ALL DOORS ARE CLOSED BEFORE BREAKING GLASS AND FIRMLY PRESSING BUTTON. IF POSSIBLE ENSURE BOTTLES HAVE DISCHARGED.
- (IV) CARRY OUT THE PROVISIONS OF RULE BOOK SECTION "M" AS NECESSARY.
- (V) CHECK FIRE HAS BEEN EXTINGUISHER THEN OPEN ALL DOORS AND WINDOWS FOR A MINIMUM OF 5 MINUTES BEFORE AGAIN ENTERING THE ENGINE ROOM WITH A HAND EXTINGUISHER TO EXAMINE THE LOCOMOTIVE.
- (VI) NOW PLACE THE WATER PUMP SWITCH TO "OFF" AND PUSH IN THE LOCAL PUSH BUTTON.
- (VII) REPORT IN THE REPAIR BOOK
- (VIII) OBTAIN ASSISTANCE, AS THE LOCOMOTIVE IS A FAILURE.

38 INDEPENDENT OR STRAIGHT AIR BRAKE SYSTEM

38-1 THERE ARE TWO INDEPENDENT OR STRAIGHT AIR BRAKE VALVES ONE IN EACH CAB TO THE DRIVERS LEFT HAND SIDE ON DRIVING DESK.

38-2 USES

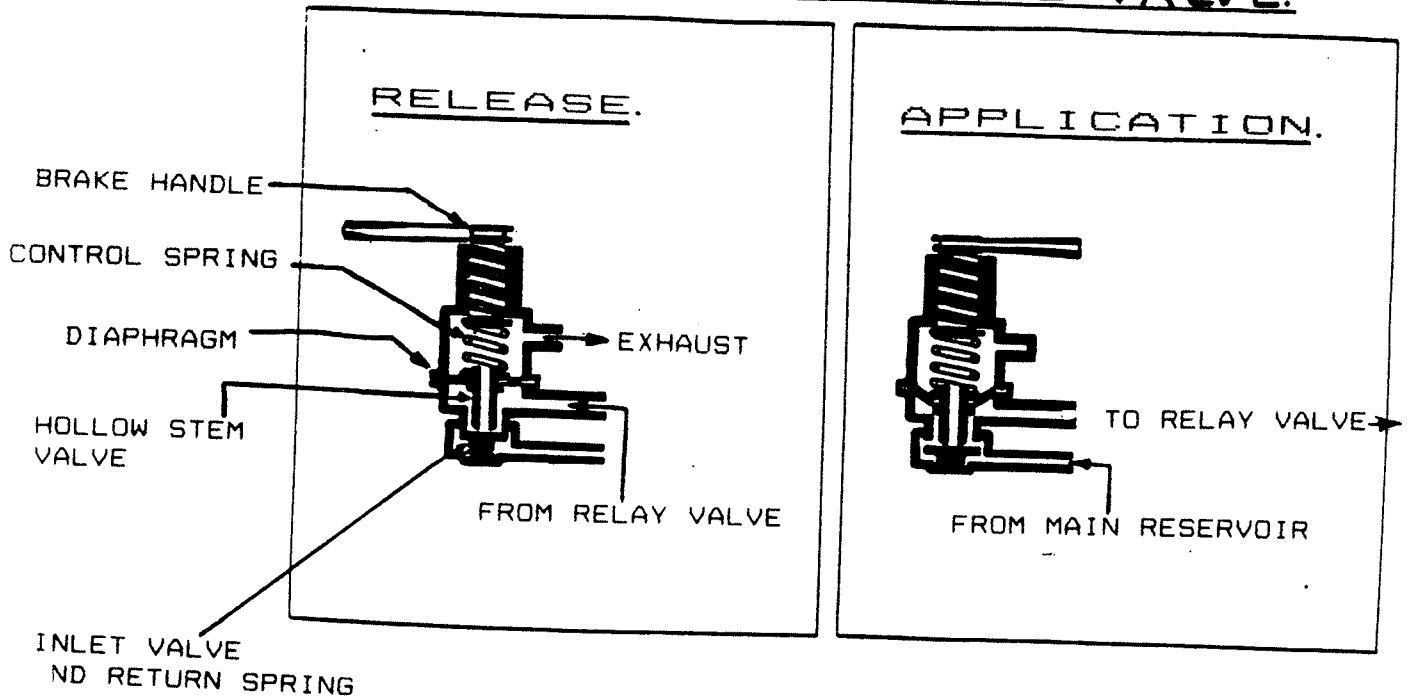
USED FOR THE FOLLOWINGS:-

- (I) AS A HOLDING BRAKE
- (II) FOR SHUNTING PURPOSES
- (III) WHEN BUFFERING UP
- (IV) RUNNING LIGHT LOCOMOTIVE
- (V) WHEN WORKING LOOSE COUPLED TRAINS
- (VI) IF AUTO BRAKE ON LOCOMOTIVE IS ISOLATED

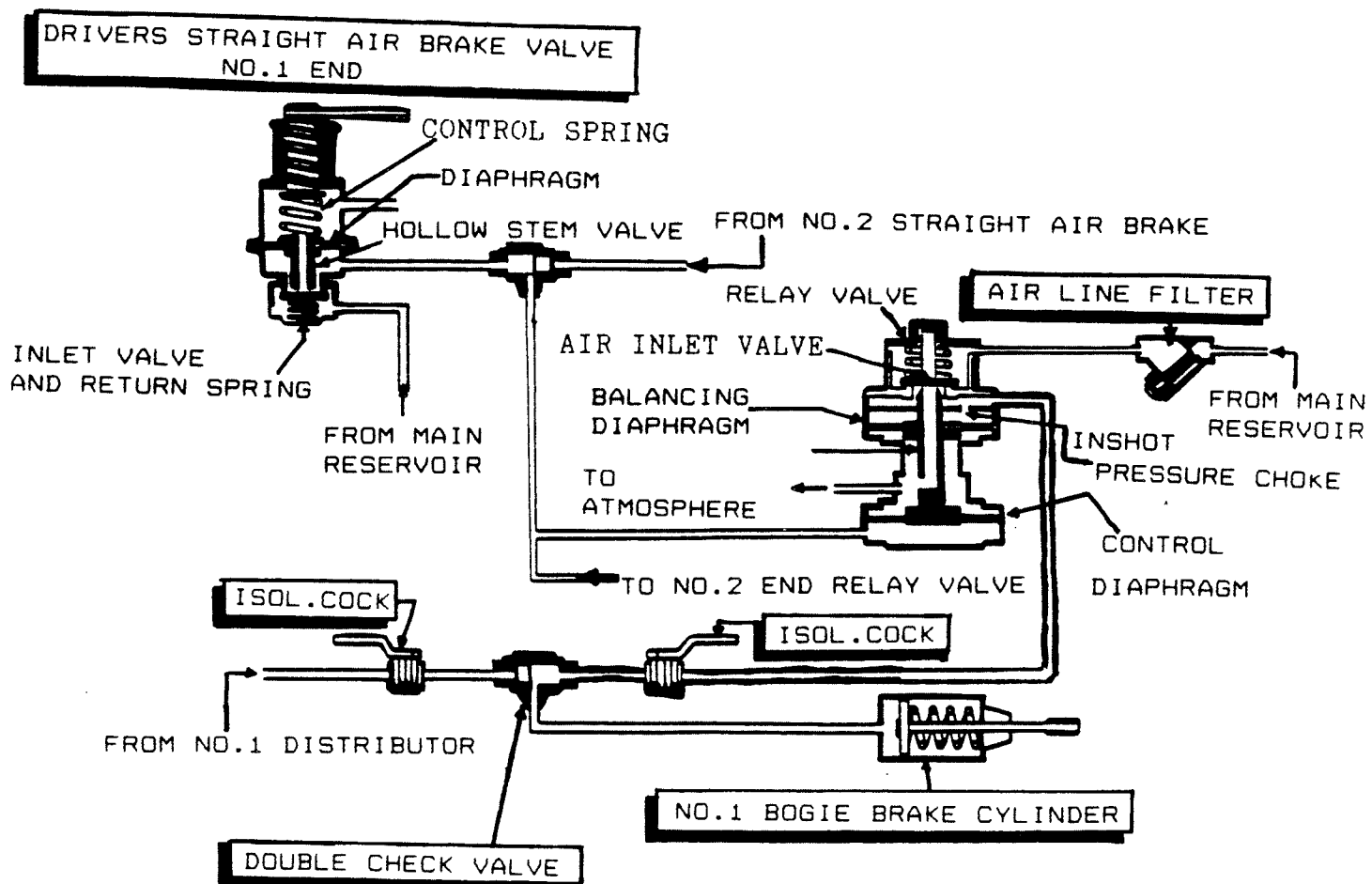
38-3 OPERATION

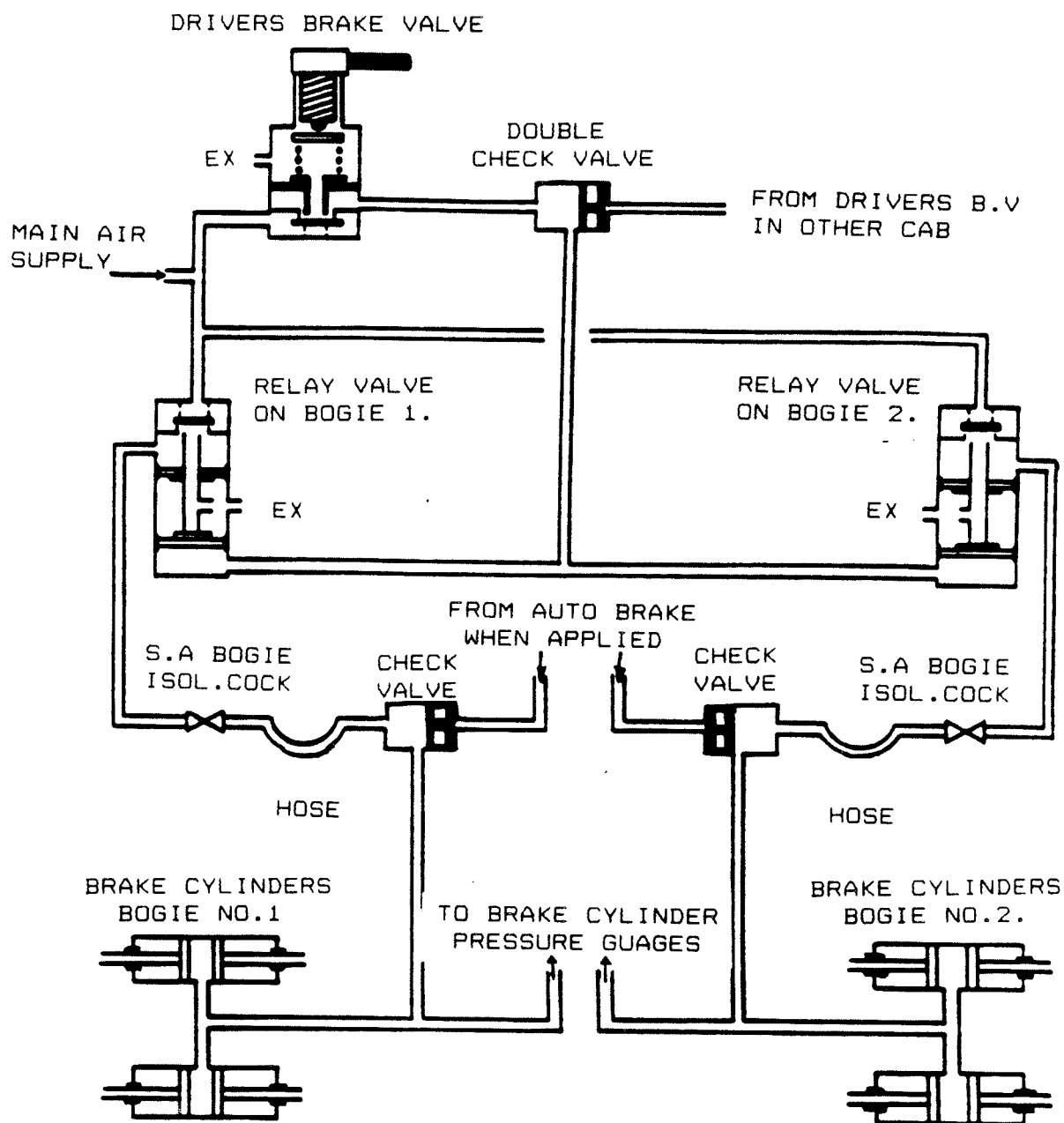
- (A) TO APPLY THE INDEPENDENT OR STRAIGHT AIR BRAKE YOU MUST MOVE THE HANDLE IN AN ANTI - CLOCKWISE DIRECTION. THIS PUTS TENSION ON THE SPRING OF THE DRIVERS STRAIGHT AIR BRAKE VALVE (F.D.I) WHICH FORCES THE HOLLOW STEM VALVE DOWN FIRMLY SEATING ON THE LOWER VALVE. FURTHER DOWNWARD MOVEMENT UNSEATS THE LOWER VALVE TO ALLOW MAIN RESERVOIR AIR TO FLOW ONTO THE DOUBLE ACTING CHECK VALVE (D.A.C.V) BETWEEN CABS THEREBY CUTTING OFF ONE CAB FROM THE OTHER. AIR NOW FLOWS TO THE RELAY VALVES. RELAY VALVES DETECT A SLIGHT INCREASE IN PRESSURE WHICH NOW CAUSES THE HOLLOW STEM VALVE TO RISE AND LIFT THE INLET VALVES. MAIN RESERVOIR AIR NOW FLOWS VIA BOGIE ISOLATING COCKS TO TWO MORE D.A.V.C WHICH ISOLATES THE AUTOMATIC BRAKE FROM THE STRAIGHT AIR BRAKE SIDE. TWO MORE D.A.C.V GIVES THE BRAKE CYLINDER GAUGE READINGS. AS THE D.A.V.C'S MOVE OVER AIR CAN NOW FLOW FREELY TO THE EIGHT BRAKE CYLINDERS. BRAKE NOW APPLIES.
- (B) TO RELEASE THE BRAKE, MOVE THE HANDLE IN A CLOCK WISE DIRECTION TAKING TENSION OFF THE SPRING. THIS ALLOWS AIR TO VENT TO ATMOSPHERE VIA HOLLOW STEM VALVE UNTIL AIR AND SPRING PRESSURE BALANCES. AT THE SAME TIME AIR IS RELEASED FROM UNDERSIDE OF RELAY VALVES CAUSING ITS HOLLOW STEM VALVE TO FALL RELEASING AIR FROM THE BRAKE CYLINDERS. BRAKES NOW RELEASED.
- (C) THE INDEPENDENT OR STRAIGHT AIR BRAKE WILL SELF LAP ON AND OFF.

INDEPENDENT AIR BRAKE VALVE.



INDEPENDENT OR STRAIGHT AIR BRAKE VALVE





STRAIGHT AIR BRAKE SYSTEM. — CLASS 47.

39. AUTOMATIC BRAKE EQUIPMENT

DAVIES AND METCALFE AUTOMATIC AIR/VACUUM BRAKE EQUIPMENT FITTED.

39-1 DRIVERS BRAKE VALVE (F.V.4)

- (A) 5.86 Bar or 82 P.S.I OF MAIN RESERVOIR AIR PRESSURE IS REQUIRED TO CLOSE THE MAIN AIR PRESSURE SWITCH (M.A.P.S) BEFORE AIR BRAKE PIPE CAN BE CHARGED. IT WILL ALSO BE NECESSARY TO PLACE THE MASTER SWITCH TO FORWARD OR REVERSE AND D.S.D DEPRESSED TO SET THE SPEED SENSING FEATURE (S.S.F)

(B) SIX BRAKES VALVE POSITIONS

- (I) RELEASE/OVERCHARGE
(II) RUNNING
(III) INITIAL APPLICATION
(IV) FULL SERVICE
(V) EMERGENCY
(VI) NEUTRAL/SHUTDOWN

39-1-1 RELEASE/OVERCHARGE

IN THIS POSITION VALVE MUST BE HELD OVER AGAINST A SPRING, AIR BRAKE PIPE WILL CHARGE TO APPROXIMATELY 5.38 Bar or 78 P.S.I USED WHEN:-

- (I) FOLLOWING A BRAKE CONTINUITY TEST.
(II) A BRAKE DRAG OCCURS ON THE TRAIN
(III) AN APPLICATION IS MADE WHILST IN OVERCHARGE
NOTE IT WILL TAKE APPROXIMATELY 4 MINUTES TO BLEED DOWN FROM 5.38 Bar or 78 P.S.I TO 5 Bar or 72.5 P.S.I

39-1-2 RUNNING

- (I) THE AIR BRAKE PIPE IS CHARGED TO 5 Bar or 72.5 P.S.I.
(II) BRAKES ARE RELEASED

39-1-3 INITIAL

- (I) AIR BRAKE PIPE PRESSURE IS REDUCED TO 4.51 Bar or 65.5 P.S.I
(II) INITIAL BRAKE APPLICATION
(III) BRAKE CYLINDER PRESSURE WILL RISE TO APPROXIMATELY .55 Bar or 18 P.S.I

39-1-4 FULL SERVICE

- (I) AIR BRAKE PIPE IS REDUCED TO 3.48 Bar or 50.5 P.S.I
(II) MAXIMUM BRAKE CYLINDER PRESSURE OF 4.83 Bar or 70 P.S.I

39-1-5 EMERGENCY

- (I) AIR BRAKE PIPE VENTED TO ZERO DIRECT TO ATMOSPHERE
- (II) BRAKES RAPIDLY APPLY

39-1-6 NEUTRAL SHUTDOWN

IN THIS POSITION FV4 IS LOCKED OUT OF USE AND PLACED THERE WHEN:-

- (I) DRIVING FROM THE OTHER CAB
- (II) WHEN STABLING LOCOMOTIVE
- (III) TANDEM WORKING.

39-2 F.V.4 OPERATIONS

39-2-1 RUNNING

- (I) IN THIS POSITION TENSION IS PUT ONTO THE REGULATOR SPRING (SET AT 5 Bar or 72.5 P.S.I) WHICH FORCES THE HOLLOW STEM VALVE DOWN ONTO THE REGULATOR DIAPHRAGM, FURTHER DOWNWARD MOVEMENT FORCES OPEN THE INLET VALVE AT THE BOTTOM.
- (II) MAIN RESERVOIR AIR WILL NOW FLOW TO THE UNDERSIDE OF THE APPLICATION VALVE WHICH IS NOW FORCED UPWARDS, UNSEATING THE INLET VALVE AT THE TOP.
- (III) AIR PASSES VIA A CAM OPENED SEALING VALVE INTO THE AIR BRAKE PIPE.
- (IV) AT THE SAME TIME PRESSURE HAS BUILT UP ON THE UNDERSIDE OF THE REGULATING DIAPHRAGM, WHEN THE DOWNWARDS SPRING PRESSURE AND THE UPWARDS AIR PRESSURE EQUALISES. INLET VALVES CLOSE. AIR BRAKE PIPE NOW CHARGED TO 5 Bar or 72.5 P.S.I

39-2-2 INITIAL

- (I) SEVEN POUND OF TENSION IS NOW TAKEN OFF THE REGULATING SPRING. AIR PRESSURE UNDER THE APPLICATION VALVE AND REGULATING DIAPHRAGM WILL PUSH UP THE HOLLOW STEM VALVE UNSEATING IT CAUSING AIR TO VENT VIA CHOKE VALVE TO ATMOSPHERE.
- (II) ONLY .48 Bar or 7 P.S.I HAS BEEN TAKEN FROM THE UNDERSIDE OF THE APPLICATION VALVE DIAPHRAGM. THE IMBALANCE OF PRESSURE UNSEATS THE HOLLOW STEM VALVE CAUSING .48 Bar or 7 P.S.I OF AIR BRAKE PIPE PRESSURE TO VENT TO ATMOSPHERE (NOW 4.51 Bar or 65.5 P.S.I)
- (III) BOGIE BRAKE CYLINDER PRESSURE RISES 1.24-1.37 Bar or 18 TO 20 P.S.I

39-2-3 FULL SERVICE

- (I) EXACTLY THE SAME SEQUENCE OF EVENTS WILL TAKE PLACE AS IN INITIAL. THIS TIME THE AIR BRAKE PIPE PRESSURE IS REDUCED BY 1.51 Bar or 22 P.S.I. DOWN TO 3.48 Bar or 50.5 P.S.I
- (II) BOGIE CYLINDER PRESSURE WILL RISE TO 4.82 Bar or 70 P.S.I

39-2-4 EMERGENCY

- (I) THIS POSITION TWO CAMS WILL OPERATE ON THE F.V.4one TO CLOSE THE SEALINGS VALVE, SECONDS TO OPEN THE QUICK ACTING EMERGENCY VALVE.
- (II) AIR BRAKE PIPE PRESSURE IS VENTED DIRECT TO ATMOSPHERE CAUSING A RAPID BRAKE APPLICATION.

39-2-5 NEUTRAL SHUT DOWN

- (I) THE SEALINGS VALVE IS CLOSED ENSURING THEIR IS NO CONNECTION BETWEEN MAIN RESERVOIR AND AIR BRAKE PIPE.
- (II) PLACED IN THIS POSITION WHEN:-
 - (A) CAB NOT IN USE
 - (B) BERTHING
 - (C) DURING A BRAKE CONTINUITY TEST

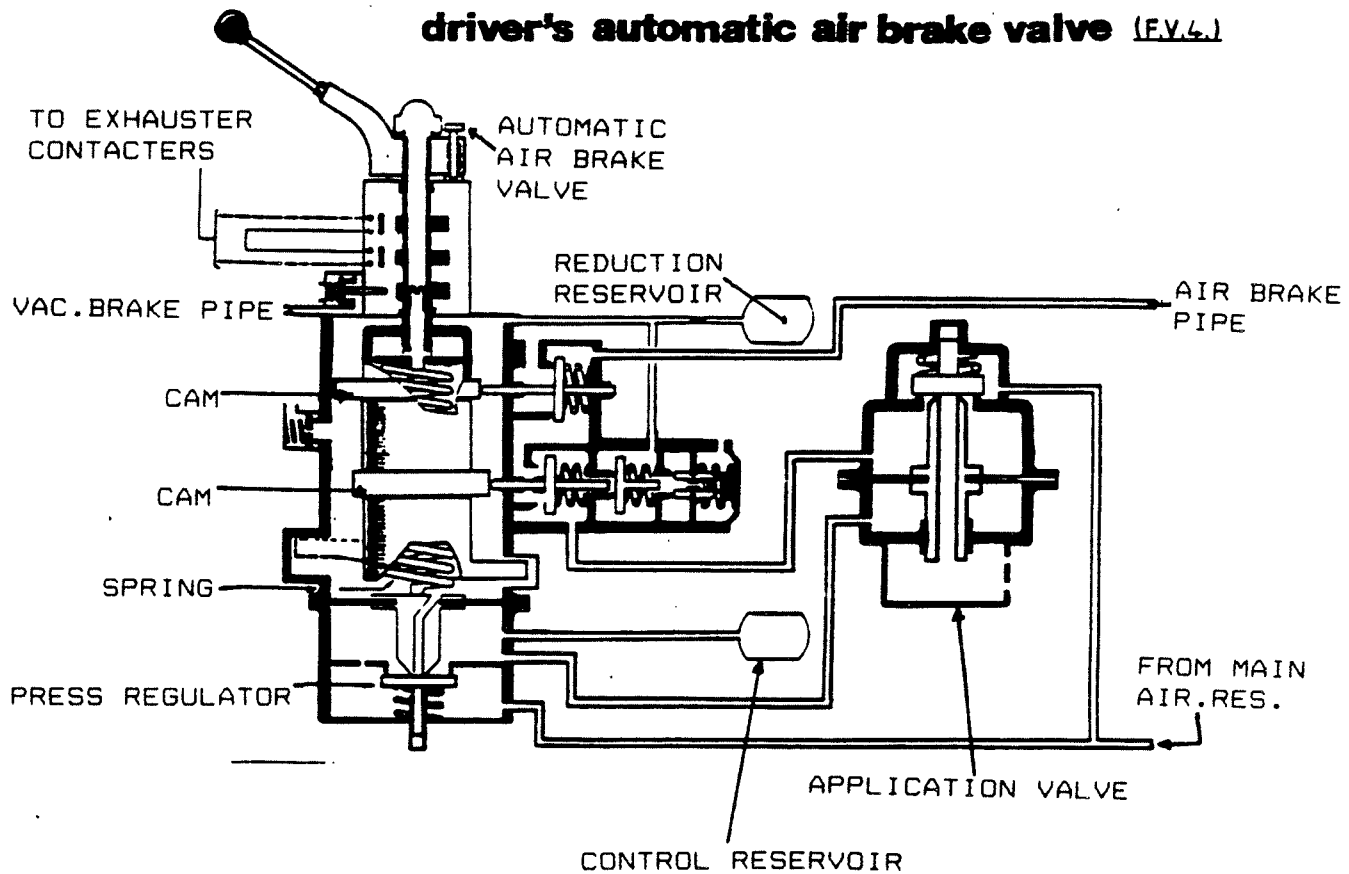
39-2-6 RELEASE/OVERCHARGE

- (I) THE CAM WHICH OPENS THE SEALINGS VALVE ALSO FORCES IT FURTHER OVER ALLOWING A QUICKER CHARGING OF THE AIR BRAKE PIP, IT ALSO SENDS AIR TO THE FILL RESERVOIR. THEN VIA VARIOUS VALVES TO PUT EXTRA PRESSURE ON THE TOP SIDE OF THE REGULATING DIAPHRAGM CAUSING AIR BRAKE PIPE TO OVER CHARGE (78PSI)
- (II) USED ALSO WHEN WORKING UNDER VACUUM CONDITIONS TO HIGH SPEED THE EXHAUSTERS.

39-3 FEED CUT OFF VALVES OR BRAKE VALVE ISOLATORS

39-3-1 PURPOSE OF

- (I) THE D.S.D AND A.W.S FEED CUT OFF VALVES IS TO ENSURE THAT SHOULD THE DRIVERS AUTOMATIC BRAKE VALVE (F.V.4) IS LEFT IN RUNNING WHILST A BRAKE APPLICATION IS MADE VIA A D.S.D OR A.W.S. PREVENTS F.V.4 FROM TRYING TO RECHARGE THE AIR BRAKE PIPE.



40 LOCOMOTIVE DISTRIBUTOR

LOCATED IN THE BRAKE/RADIATOR COMPARTMENT.

40-1 PURPOSE

TO ENSURE THE LOCOMOTIVE BRAKE IS APPLIED OR RELEASED IN PROPORTION TO THE AIR OR VACUUM BRAKE PIPE APPLICATION OR RELEASE. ALSO TO GIVEN AN 1.24-1.37 Bar or 18-20 P.S.I. BRAKE CYLINDER PRESSURE WHEN THE ANTI-SLIP BUTTON IS PRESSED.

40-2 DISTRIBUTOR CONTROL

THIS IS DONE BY FOUR DIAPHRAGM:-

- (I) VACUUM WHEN WORKING UNDER VACUUM CONDITIONS
- (II) AIR WHEN WORKING UNDER AIR CONDITIONS
- (III) ANTI-SLIP
- (IV) EQUALISING, WHICH LAPS IN APPLICATION AND RELEASE

40-3 CONTROL VALVES

THERE ARE THREE OF THEM:-

40-3-1 GOODS PASSENGER CHANGE OVER

- (I) TO ENSURE LOCOMOTIVE AND TRAIN APPLICATION/RELEASE ARE AT THE SAME RATE.
- (II) VALVE CHANGED OVER B.S.S BEING IN AIR OR VACUUM PASSENGER OF GOODS.

40-3-2 SEALING VALVE

- (I) WHEN CHARGING A.B.P THIS ALLOWS A FAST BUILD UP OF PRESSURE ON THE TOP OF CONTROL DIAPHRAGM, AND A SLOW BUILD UP OF PRESSURE BELOW. REASON FOR THIS IS TO ENSURE LOCOMOTIVE BRAKE ARE RELEASED.
- (II) WHEN DRIVE REDUCE A.B.P PRESSURE THIS ALLOWS APPROXIMATELY .34 Bar or 5 P.S.I OF AIR ONTO THE TOP OF SEALING VALVE DIAPHRAGM WHICH CAUSES IT TO CLOSE. THEREBY PREVENTS LOSS OF CONTROLLING AIR BELOW CONTROL DIAPHRAGM.

40-3-3 LIMIT VALVE

HAS TWO FUNCTIONS:-

- (I) LIMITS BRAKE CYLINDER PRESSURE TO A MAXIMUM OF 4.82 Bar or 70 P.S.I.
- (II) ENSURE 3.44 Bar or 50 P.S.I. OF AIR IS TRAPPED ON TOP OF THE CONTROL DIAPHRAGM WHEN THE AIR BRAKE PIPE IS REDUCED BY AN EMERGENCY APPLICATION.

40-4 OPERATION UNDER AIR CONDITION

40-4-1 INITIAL BRAKE APPLICATION

- (I) APPROXIMATELY .48 Bar or 7 P.S.I OF AIR BRAKE PIPE PRESSURE IS TAKEN FROM THE TOP SIDE ON CONTROL DIAPHRAGM, AS THERE IS 5 Bar or 72.5 P.S.I BELOW AND 4.51 Bar or 65.5 ABOVE THE VALVE MOVES UPWARDS,
- (II) THIS MOVEMENT OPENS THE INLET VALVE AT THE TOP, ALLOWING AUXILIARY RESERVOIR AIR TO FLOW INTO THE BRAKE RELAY VALVES. THESE DETECT A SLIGHT INCREASE IN PRESSURE WHICH CAUSES VALVE TO OPEN ALLOWING AIR TO THE BRAKE CYLINDERS.
- (III) BRAKE NOW LAPS. ACHIEVED BY SLOWLY LETTING AIR, VIA A CHOKE, ONTO THE TOP OF THE EQUALISING DIAPHRAGM. PRESSURE JOINS WITH THE 4.51 Bar or 65.5 P.S.I STILL ON THE TOP SIDE OF CONTROL DIAPHRAGM. RESULTING IN 5 Bar or 72.5 P.S.I ON BOTH SIDES.

40-4-2 FULL SERVICE

- (I) PRESSURE ABOVE CONTROL DIAPHRAGM IS REDUCED TO 3.48 Bar or 50.5 P.S.I VALVE AGAIN MOVES UPWARDS. THE SAME SEQUENCE OF EVENTS TAKE PLACE AS FOR INITIAL, ONLY DIFFERENCE BEING IS THAT 1.51 Bar or 22 P.S.I MUST BE LET ONTO THE TOP OF EQUALISING DIAPHRAGM TO CAUSE THE BRAKE TO LAP.

40-4-3 EMERGENCY

- (I) A.B.P RAPIDLY REDUCED TO ZERO. NOW AIR ON TOP OF CONTROL DIAPHRAGM AND LIMIT VALVE ALSO FALLS RAPIDLY, AS THE PRESSURE FALLS BELOW 3.48 Bar or 50.5 P.S.I THE LIMIT VALVE SNAPS SHUT TO RETAIN 3.44 Bar or 50 P.S.I ABOVE CONTROL DIAPHRAGM, ALSO ENSURES BRAKE CYLINDERS REMAIN AT A MAXIMUM OF 4.82 Bar or 70 P.S.I

40-5 SOME POSSIBLE FAULTS

40-5-1 BRAKE DRAG ON LOCOMOTIVE

- (I) WHEN PRESSURE ON THE UNDERSIDE OF CONTROL DIAPHRAGM IS GREATER THAN ABOVE CAUSING VALVE TO MOVE UP OPENING THE INLET VALVE AT THE TOP OF LST 3. ALLOWING AIR TO THE BRAKE CYLINDERS.
- (II) CAN BE CAUSED BY OPERATING THE OVERCHARGE RELEASE VALVE IN THE BRAKE COMPARTMENT, SITUATED ABOVE THE EXHAUSTERS. THIS BEING A LONG LEVER, OFTEN REFERRED TO AS THE COWTAIL.

40-5-2 BRAKE APPLIED NO BRAKE READING.

SUSPECT:-

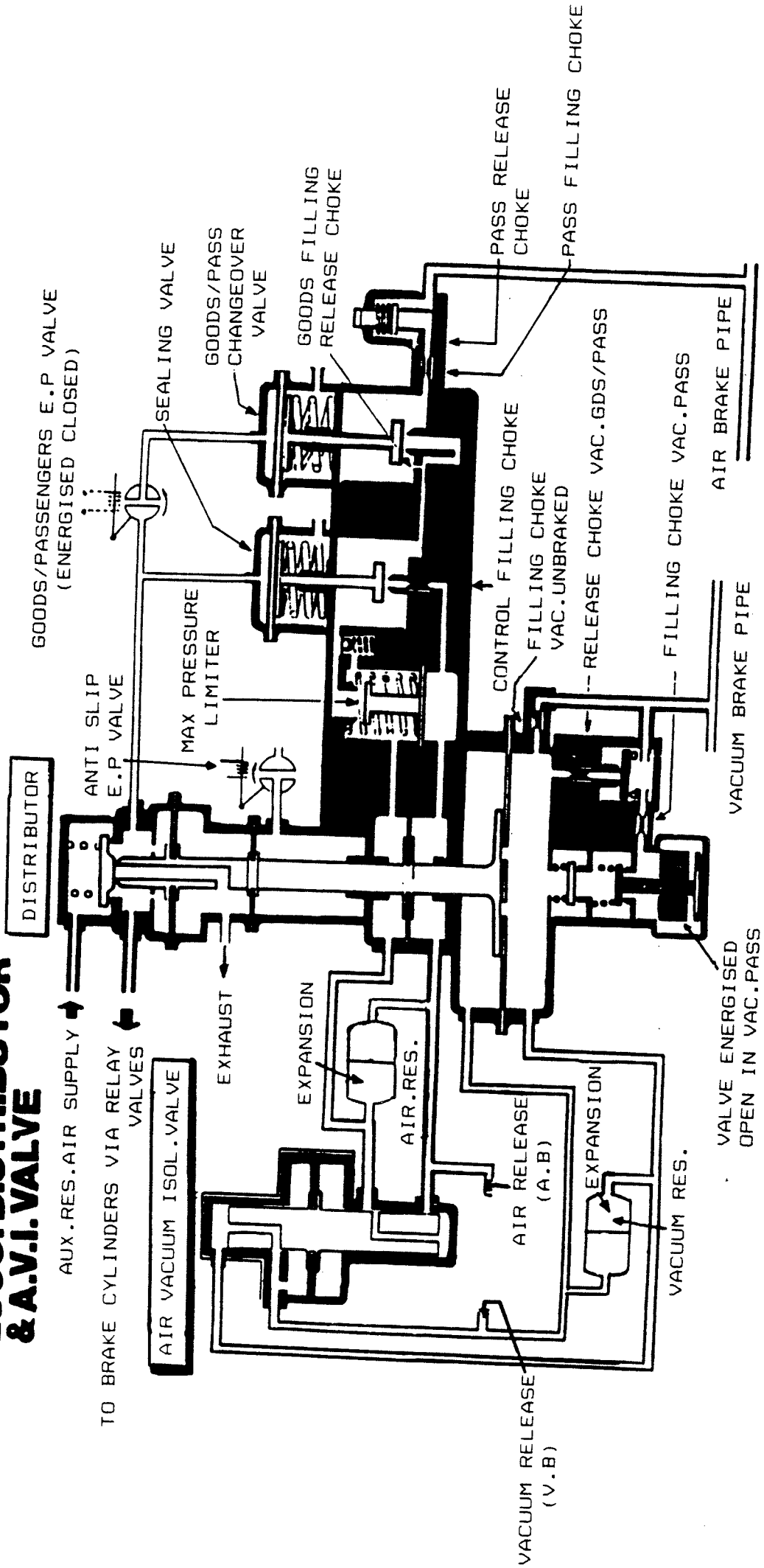
- (I) ISOLATING COCKS CLOSED.
- (II) IF BRAKE APPLIES WHEN OTHER CAB BRAKE VALVE APPLIED, THEN REPORT THE DOUBLE ACTING CHECK VALVE.

40-5-3 BRAKE APPLIED. NO READING. WITH LOSS OF MAIN RES.

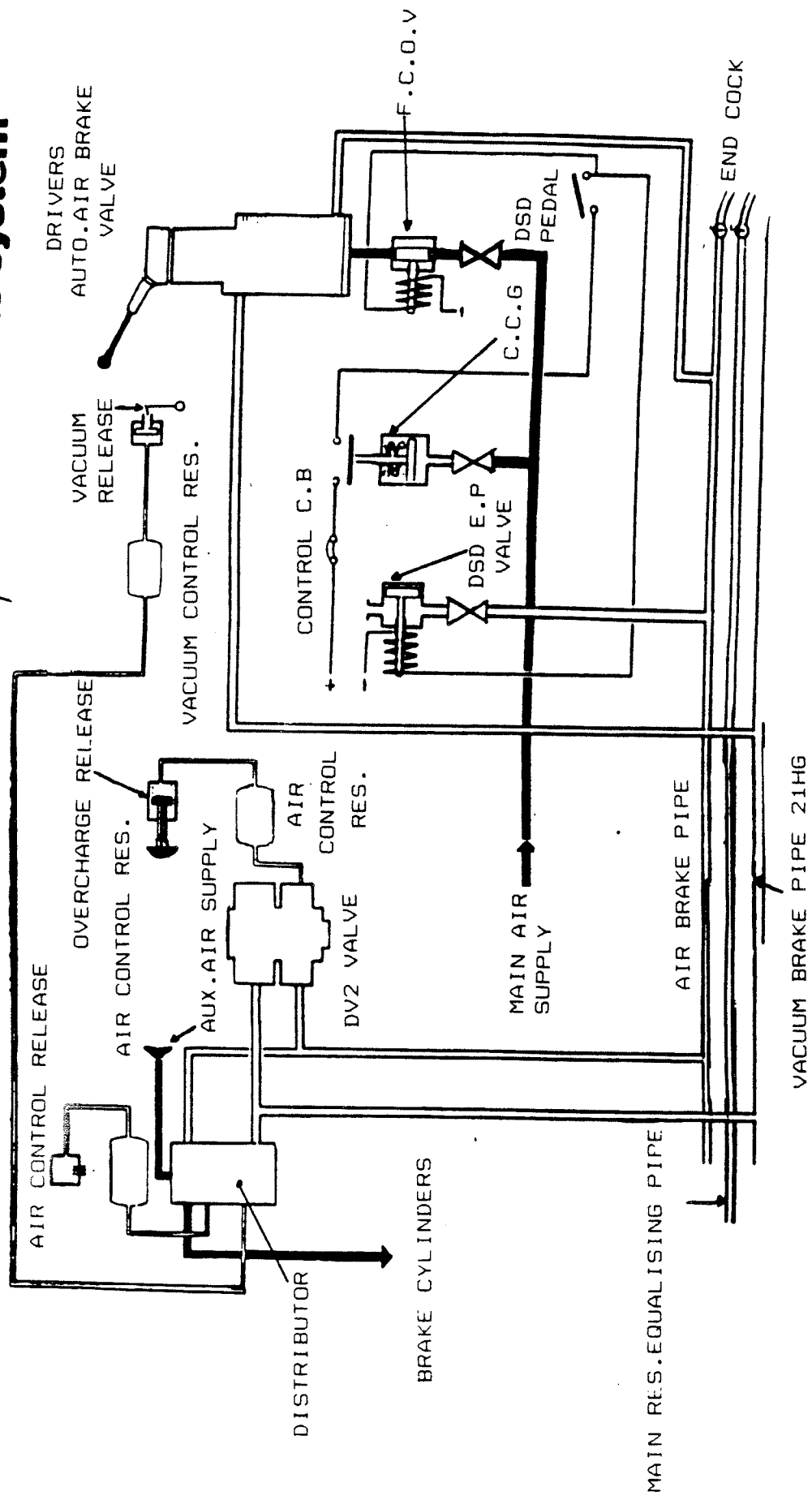
AIR.

- (III) CHECK FLEXIBLE HOSE CONNECTIONS.
- (IV) ISOLATE AUTO. BRAKE ON BOGIE

LOCO. DISTRIBUTOR & A.V.I. VALVE



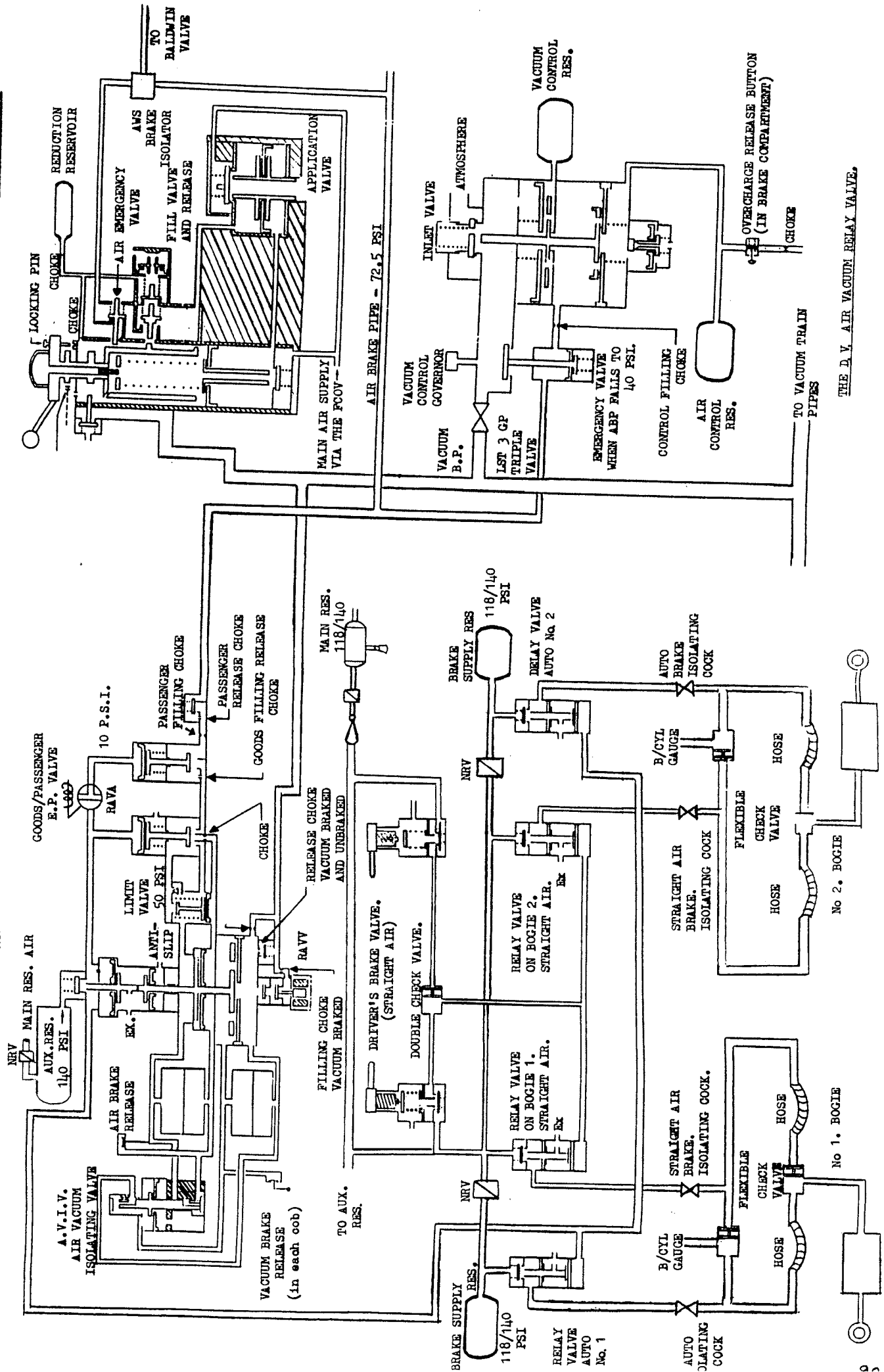
automatic air/vacuum brake system



THE 1ST 3GP DISTRIBUTOR & A.V.I.V. AIR VACUUM ISOLATING VALVE SHOWN IN THE AIR PASS RUNNING POSITION

CLASS 17

DRIVERS AUTOMATIC BRAKE VALVE F.V.I.



THE D.V. AIR VACUUM RELAY VALVE.

40-5-4 BRAKE FAILS TO RELEASE

- (I) ISOLATE BOGIE, THIS SHOULD SELF VENT THAT BOGIE
- (II) REPORT SUSPECT RELAY VALVE OF D.A.V.C.
- (III) IF ONE OR MORE AUTO BRAKE BOGIE COCKS ARE ISOLATED. USE INDEPENDENT OR STRAIGHT AIR BRAKE HANDLE IN PROPORTION TO THE AUTO BRAKE.

40-6 ANTI-SLIP

- (I) WHEN OPERATED PUTS AIR IN INTO LST 3. UNDER THE ANTI-SLIP DIAPHRAGM CAUSING VALVE UP, OPENING INLET VALVE ALLOWING EXTRA AIR TO THE BRAKE CYLINDERS 1.35-1.104 Bar or 15-16 P.S.I

40-7 LST 3. OPERATION UNDER VACUUM CONDITIONS

- (I) WITH THE B.S.S. IN A VACUUM POSITION AND BOTH EXHAUSTERS SWITCHES AT NORMAL EXHAUSTERS WILL RUN WHEN MASTER SWITCH IS MOVED AWAY FROM OFF.
- (II) UNDER VACUUM CONDITIONS THE VACUUM CONTROL DIAPHRAGM IS BROUGHT INTO USE, AND AIR CONTROL IS NOT USED.
- (III) OPERATION OF LST 3. WILL BE THE SAME UNDER VACUUM AS AIR CONDITIONS.

40-8 AIR VACUUM RELAY VALVE(DV2).

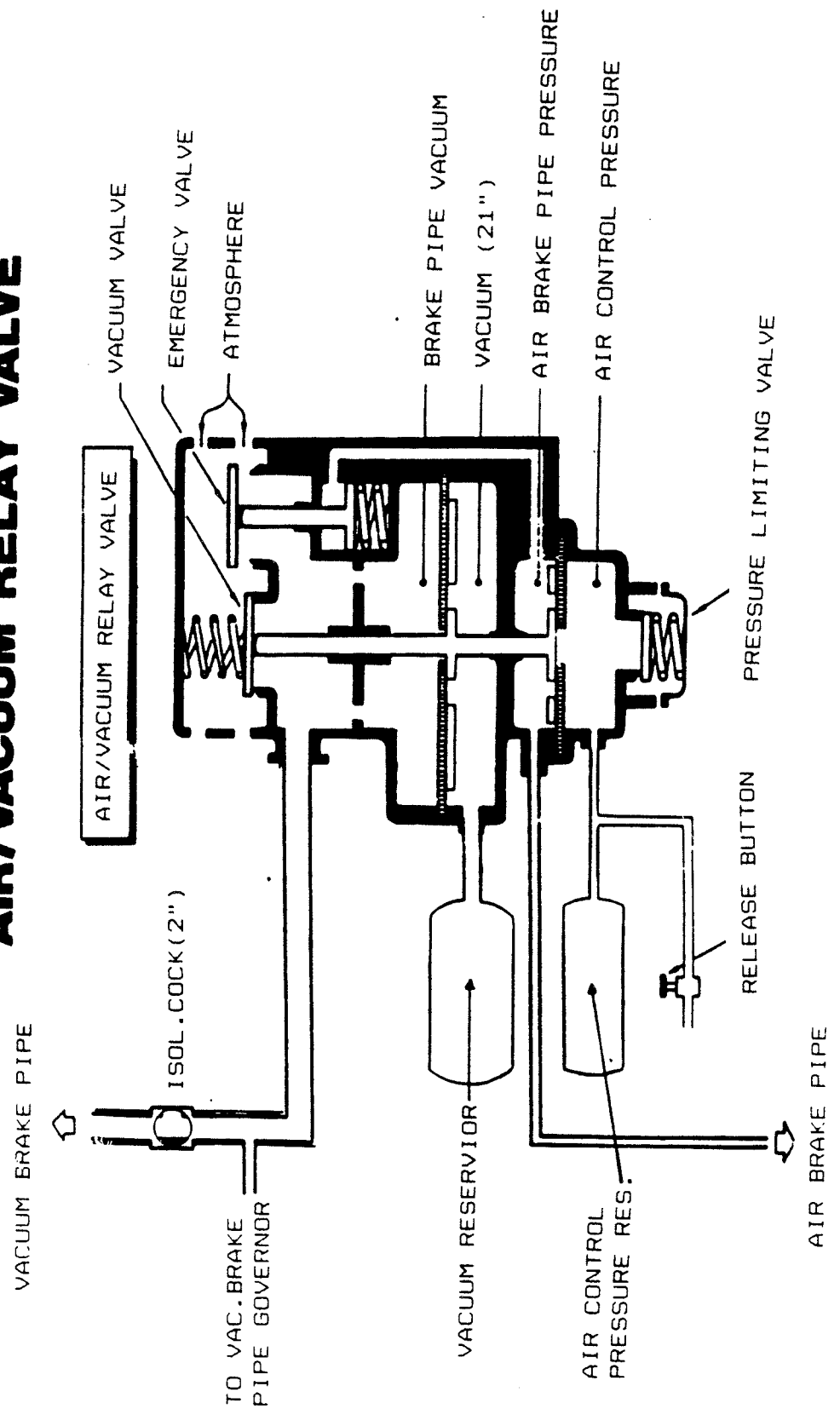
- (I) REACTS TO ANY REDUCTION IN THE AIR BRAKE PIPE PRESSURE AND WILL PROPORTIONALLY DESTROY THE VACUUM.
- (II) FITTED WITH AN ISOLATING COCK, WHICH ALSO ISOLATES THE VACUUM CONTROL GOVERNOR.
- (III) IF THE COCK IS CLOSED WITH B.S.S. IN A VACUUM POSITION NO AMPS ARE AVAILABLE, AND THE VACUUM BRAKE PIPE CAN NOT BE DESTROYED EXCEPT IN AN EMERGENCY.

NOTE. IF ISOLATED AND NO AIR AVAILABLE ON LOCOMOTIVE, IT

BECOMES A PIPED VEHICLE (BLOW THROUGH).

- (IV) ALSO FITTED WITH A MANUAL OVERCHARGE BUTTON ON THE BRAKE FRAME, FOR USE WHEN UNABLE TO CREATE 21" OF VACUUM

AIR/VACUUM RELAY VALVE



41 AUTOMATIC WARNING SYSTEM (A.W.S)

41-1 PURPOSE

- (I) TO INDICATE TO THE DRIVER WHEN THE AUDIBLE BELL RINGS THAT THE SIGNAL SHOULD BE GREEN (CLEAR) ASPECT
- (II) SHOULD THE HORN SOUND THE DRIVER MUST PRESS AND RELEASE THE BUTTON. THIS ONLY INDICATES TO THE DRIVER THAT HE/SHE HAS COMPLETE CONTROL OF THE BRAKE.

41-2 OPERATION ON LOCOMOTIVE

THE FOLLOWING IS A BRIEF DESCRIPTION OF WHAT TAKES PLACE WHEN:-

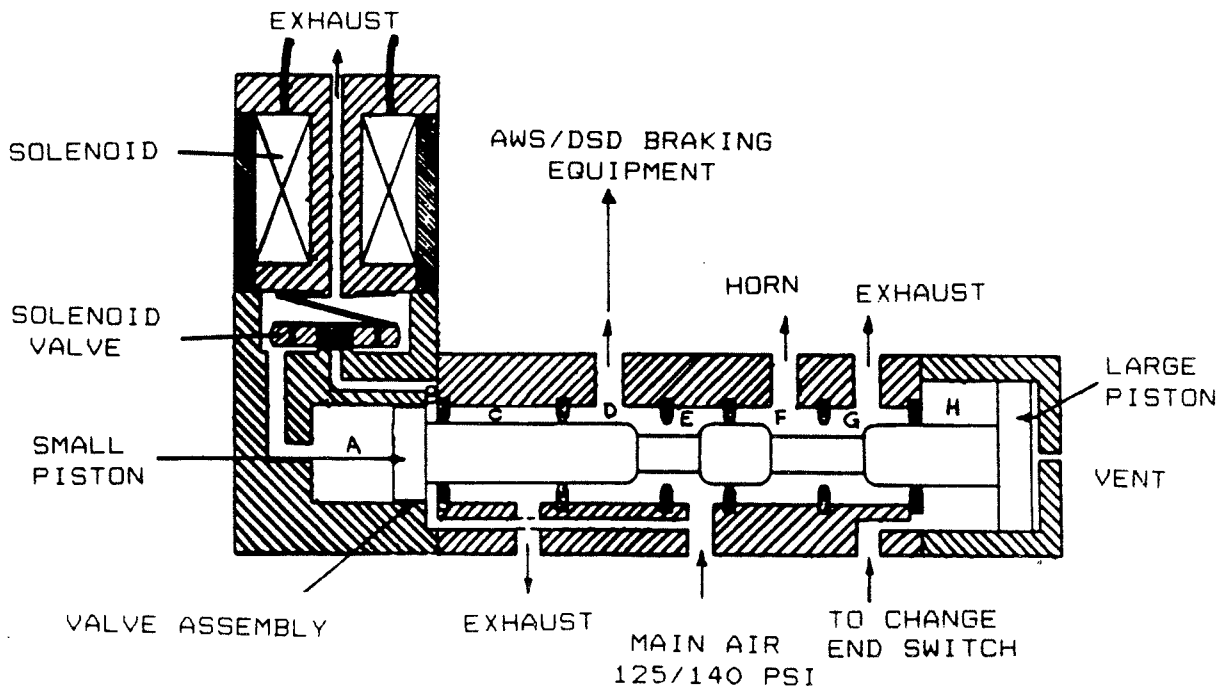
41-2-1 CHANGE END SWITCH PLACED TO ON (UP)

- (I) IN THIS POSITION THE HORN WILL SOUND UNTIL CANCELLED
- (II) CAMS ON A CENTRAL SPINDLE CLOSE ELECTRICAL CONTACTS SENDING A FEED TO THE CHANGE END SWITCH IN THE OTHER CAB WHICH IS IN THE OFF POSITION. FEED WILL NOW RETURN TO ORIGINAL CAB A CONVERTER UNIT.

41-2-2 A.W.S CONVERTER FEEDS

- (I) A 12 VOLT SUPPLY FOR THE BELL. E.P VALVE AND INDICATOR
- (II) A 40 VOLT SUPPLY FOR THE RESET BUTTON

WE NOW COME TO THE HEART OF THE SYSTEM



BALDWIN E.P. VALVE

FIG.3
ISOLATED

41-2-3 A.W.S BALDWIN VALVE

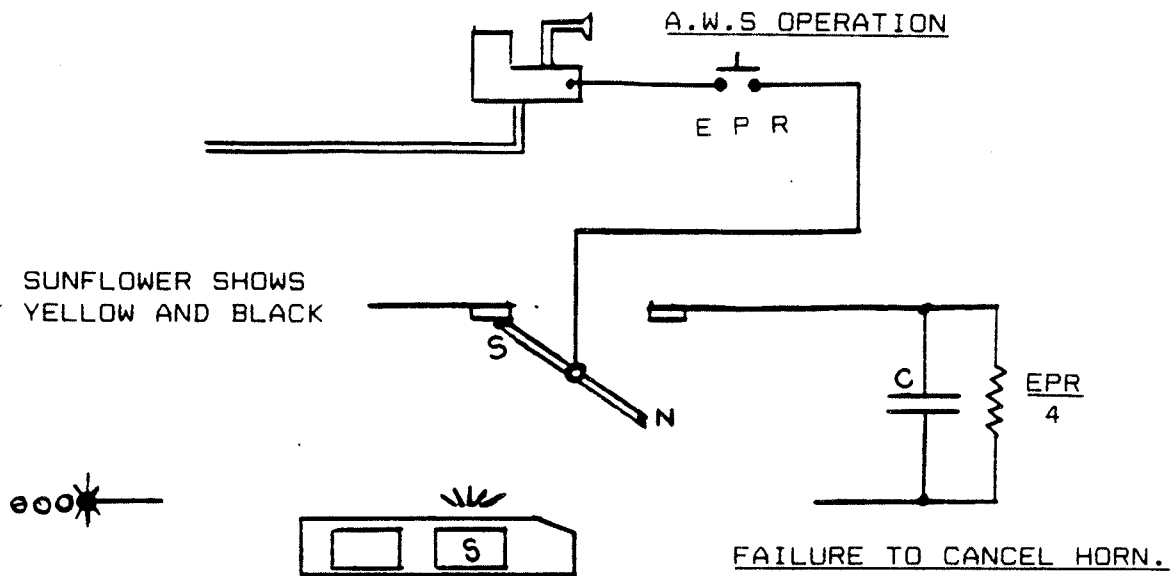
- (I) WHEN THE CHANGE END SWITCH IS PLACED TO THE ON POSITION AIR IS VENTED FROM CHAMBER (F)
- (II) AIR IN CHAMBER (B) FORCES THE VALVE ACROSS TO THE LEFT. THIS WILL CONNECT THE HORN TO MAIN PRESERVER AIR SUPPLY VIA CHAMBER (E) CAUSING THE HORN TO SOUND.
- (III) THE TIMING RESERVOIR NOW CONNECTED TO EXHAUST VIA CHAMBER (D)
- (IV) CHANGE END SWITCH NOW TAKES FEED FROM REAR CAB CHANGE END SWITCH TO OFF AT THE CONVERTER.
- (V) ON PRESSING AND RELEASING THE RESET BUTTON THE E.P VALVE IS ENERGISED, ALLOWING AIR TO FLOW INTO CHAMBER (A) FORCING THE VALVE OVER TO THE RIGHT. MAIN RESERVOIR AIR TO HORN CUT OFF. HORN STOPS.
- (VI) BY MOVING THE VALVE MAIN RESERVOIR AIR IS NOW CONNECTED TO THE 3 SECOND TIMING RESERVOIR, EXHAUST VALVE AND BRAKE VALVE ISOLATOR. AIR BRAKE PIPE PRESSURE CAN NOW FLOW TO A.W.S EXHAUST VALVES.

41-2-4 OPERATION WHEN SIGNAL AT CAUTION OR DANGER

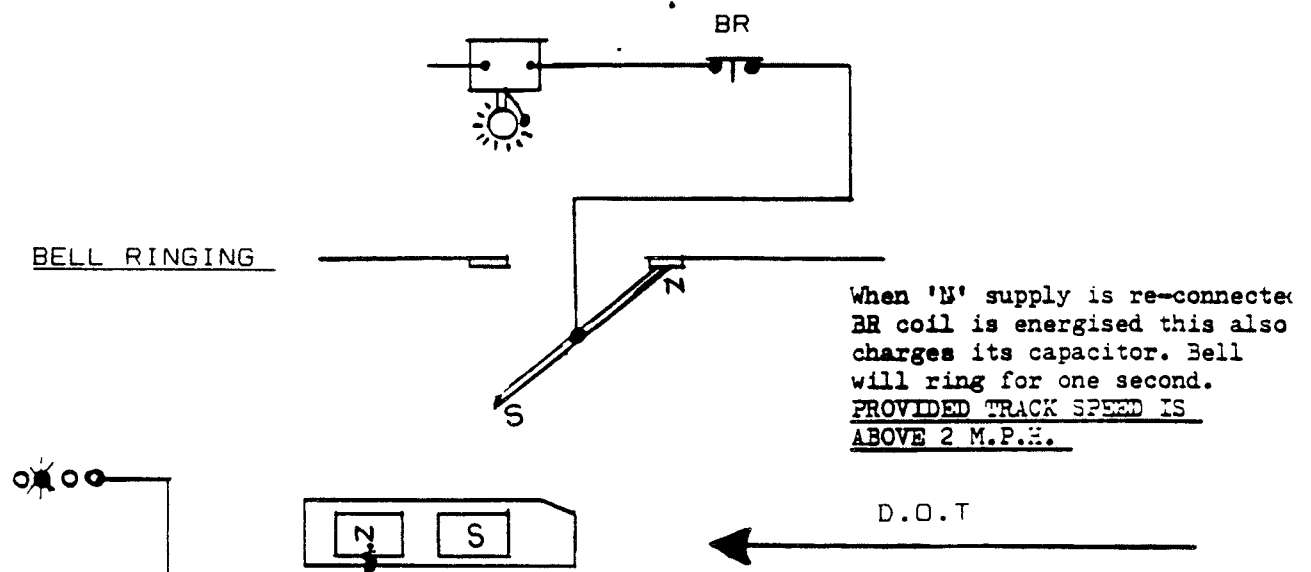
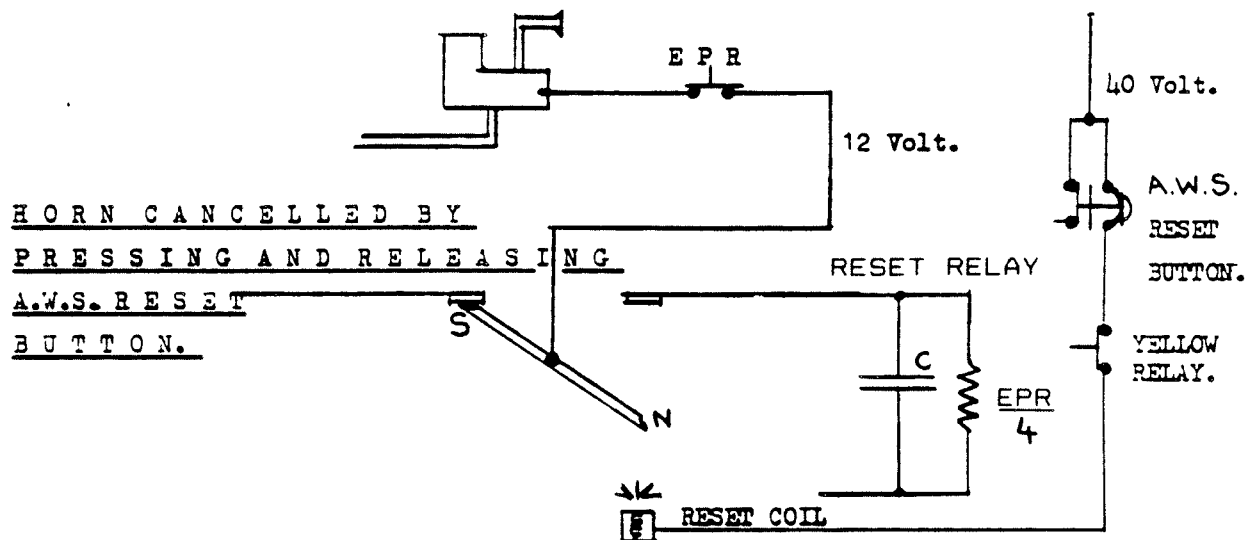
- (I) WHEN PASSING OVER THE PERMANENT TRACK MAGNET THE TIPPING MAGNET SITUATED UNDERNEATH LOCOMOTIVE WILL TIP FROM SOUTH POLE TO NORTH POLE DOWNWARDS.
- (II) THIS BREAKS THE ELECTRICAL FEED TO THE BALDWIN E.P. VALVE A.W.S CAB INDICATOR NOW TURNS TO ALL BLACK.
- (III) AIR IN CHAMBER (A) OF THE BALDWIN VALVE IS EXHAUSTED. THIS WILL ALLOW AIR PRESSURE IN CHAMBER (B) TO FORCE VALVE OVER.
- (IV) A THREE SECOND TIMING RESERVOIR NOW EXHAUSTS. AT THE SAME TIME MAIN RES. AIR AGAIN CONNECTED TO THE HORN.
- (V) TIMING VALVE (T.M.7) WILL OPERATE.
- (VI) ON PRESSING AND RELEASING THE RESET BUTTON THE CAB INDICATOR WILL CHANGE TO YELLOW AND BLACK SPOKES. ALSO ON RELEASING BUTTON THE TIPPING MAGNET REVERTS TO SOUTH POLE DOWNWARDS.
- (VII) BALDWIN E.P VALVE AGAIN ENERGISED. DRIVER HAS COMPLETE CONTROL OF THE BRAKES.

41-2-5 OPERATION WHEN A SIGNAL SHOWS A GREEN ASPECT

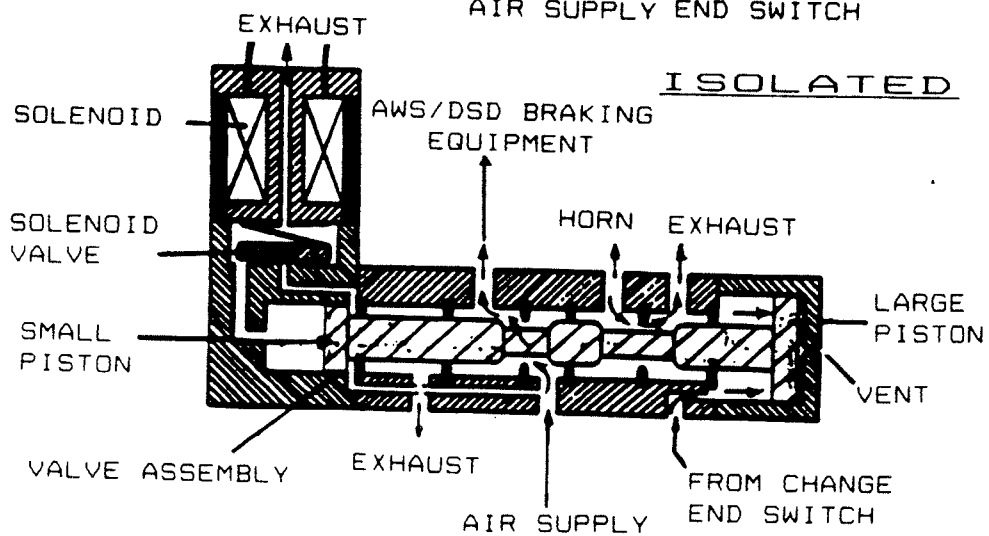
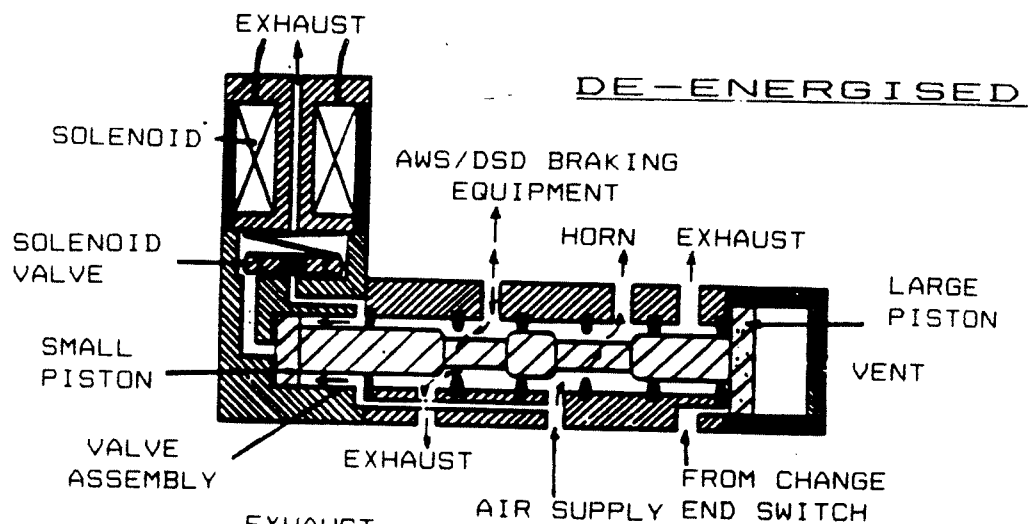
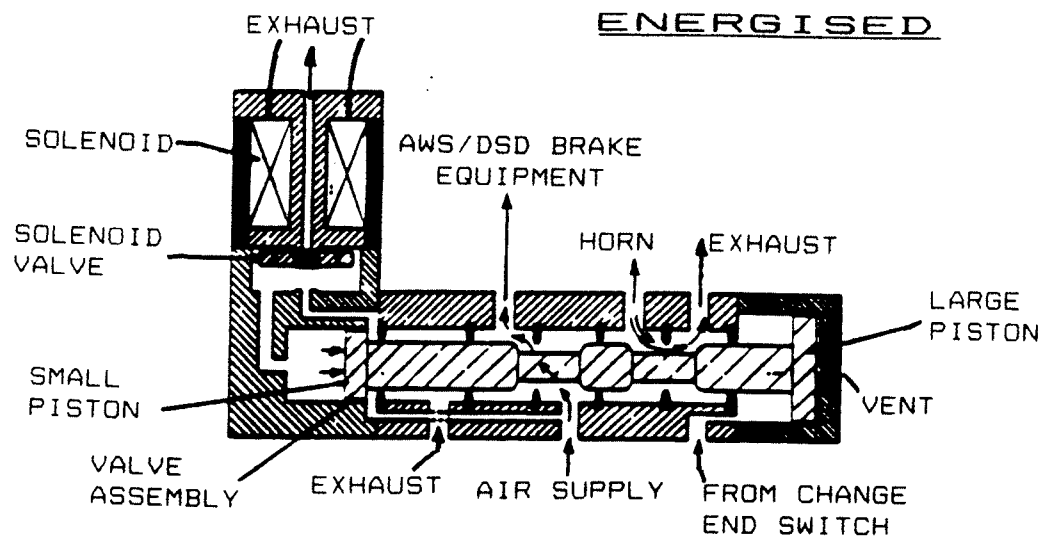
- (I) LOCOMOTIVE RECEIVER TIPS FROM NORTH TO SOUTH POLE DOWN.
- (II) CAB INDICATOR GOES TO ALL BLACK
- (III) BELL WILL RING



When 'N' is broken a capacitor will hold for one second, then it is de-energised
E.P.R opens in the feed to (Baldwin) E.P. valve. Horn will now sound.
Will now get a D.S.D. brake application after 3 seconds.



BALDWIN VALVE BOTH CAB'S (1-2)



41-2-6 STOPPED OVER A PERMANENT TRACK MAGNET.

- (I) PULL ISOLATING HANDLE DOWN (RED)
- (II) MOVE AWAY FROM MAGNET
- (III) NOW YOU MUST REINSTATE A.W.S

NOTE BEFORE PUTTING ISOLATING HANDLE BACK TO "ON" THE CHANGE-END-SWITCH MUST BE PUT TO "OFF"

42 DRIVERS SAFETY DEVICE (D.S.D)

41-1 PURPOSE

TO BRING A LOCOMOTIVE OR TRAIN TO A STAND VIA AUTOMATIC BRAKE APPLICATION AFTER A 7 SECOND DELAY SHOULD THE D.S.D TREADLE BE RELEASED WITH MASTER SWITCH AT FORWARD OR REVERSE.

42-2 D.S.D OPERATION WITH B.S.S IN PASSENGER POSITION

- (I) ON RELEASING THE D.S.D TREADLE, AIR IN THE 7 SECOND TIMING RESERVOIR BEGINS TO EXHAUST VIA TIMING CHOKE.
- (II) AIR PRESSURE ON THE D.S.D EXHAUST VALVE IS NOW REDUCED, ALLOWING IT TO OPEN. THIS CAUSES AIR BRAKE PIPE PRESSURE TO FLOW INTO A TIMING VALVE (TMC7)
- (III) HOLLOW STEM VALVE IS UNSEATED, WHICH VENTS AIR BRAKE PIPE PRESSURE TO ZERO, APPLYING THE BRAKES. THIS WHOLE OPERATION TAKES APPROXIMATELY 12 SECONDS.

42-3 D.S.D.OPERATION WITH B.S.S. IN GOODS POSITION.

- (I) IN ADDITION TO THE OPERATION AS PER PASSENGER POSITION AN E.P.VALVE OPENS
- (II) AN ADDITIONAL TIMING RES. IS NOW BROUGHT INTO USE, CAUSING LOCOMOTIVE BRAKES TO APPLY AND RELEASE AT A SLOWER RATE.

NOTE THERE IS A HOLD OVER BUTTON ON THE DRIVERS ASSISTANTS SIDE FOR USE BY DRIVER IF HAVING TO LOOK BACK FROM THAT SIDE.

43 VIGILANCE DEVICE (IF FITTED)

A BLEEPER WILL SOUND AT ONE MINUTE INTERVALS, IF NOT CANCELLED BY RELEASING AND REAPPLYING PRESSURE ON THE D.S.D.TREADLE.THE BRAKES WILL BE APPLIED VIA THE D.S.D.EQUIPMENT.

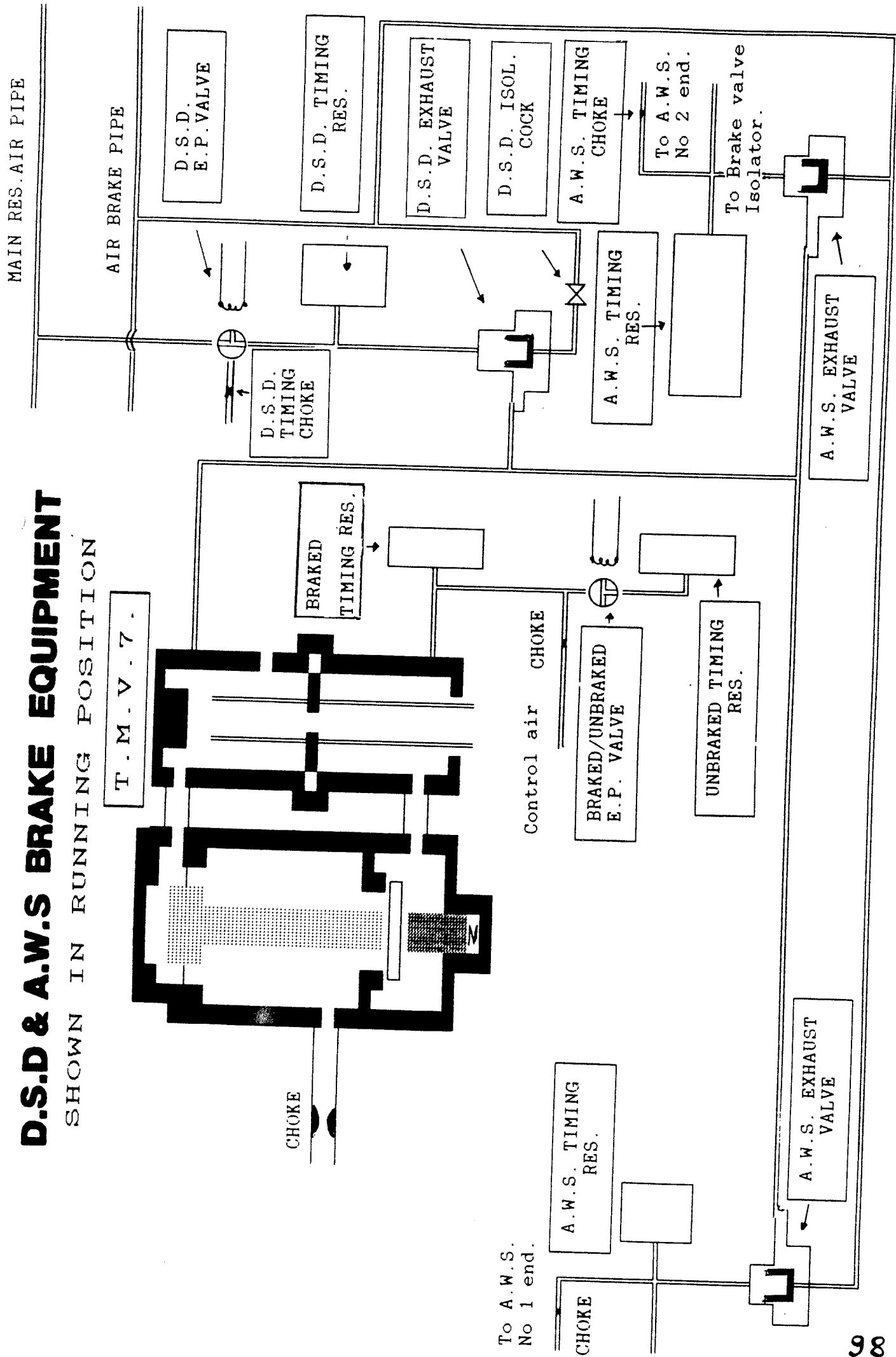
44 SPEED SENSING FEATURE (S.S.F.)

- (I) THIS DEVICE HAS BEEN FITTED TO PREVENT DRIVERS FROM INADVERTENTLY PLACING THE MASTER SWITCH TO ENGINE ONLY WHILST IN MOTION, AND RENDERING THE D.S.D. INOPERATIVE.
- (II) IF THE MASTER SWITCH IS MOVED TO OFF OR E.O. WITH LOCOMOTIVE SPEED ABOVE APPROXIMATELY 5 m.p.h. THE AIR BRAKE PIPE PRESSURE WILL BE REDUCED TO ZERO. VIA THE D.S.D..
- (III) TO RESET S.S.F. PLACE MASTER SWITCH TO FORWARD OR REVERSE AND DEPRESS D.S.D. TREADLE.

D.S.D. & A.W.S. BRAKE EQUIPMENT

SHOWN IN RUNNING POSITION

T.M.V. 7.



45 VACUUM EXHAUSTER (SEE DIAGRAM)

- (I) THERE ARE TWO PROVIDED ON CLASS 47. THERE PURPOSE IS TO DRAW AIR OUT OF THE VACUUM TRAIN PIPE.
- (II) WILL RUN PROVIDED EXHAUSTER ISOLATING SWITCH IS AT NORMAL AND THE B.S.S IS IN A VACUUM POSITION.

46 VACUUM BRAKE AS FITTED TO VEHICLES

46-1 VACUUM BRAKE CYLINDER

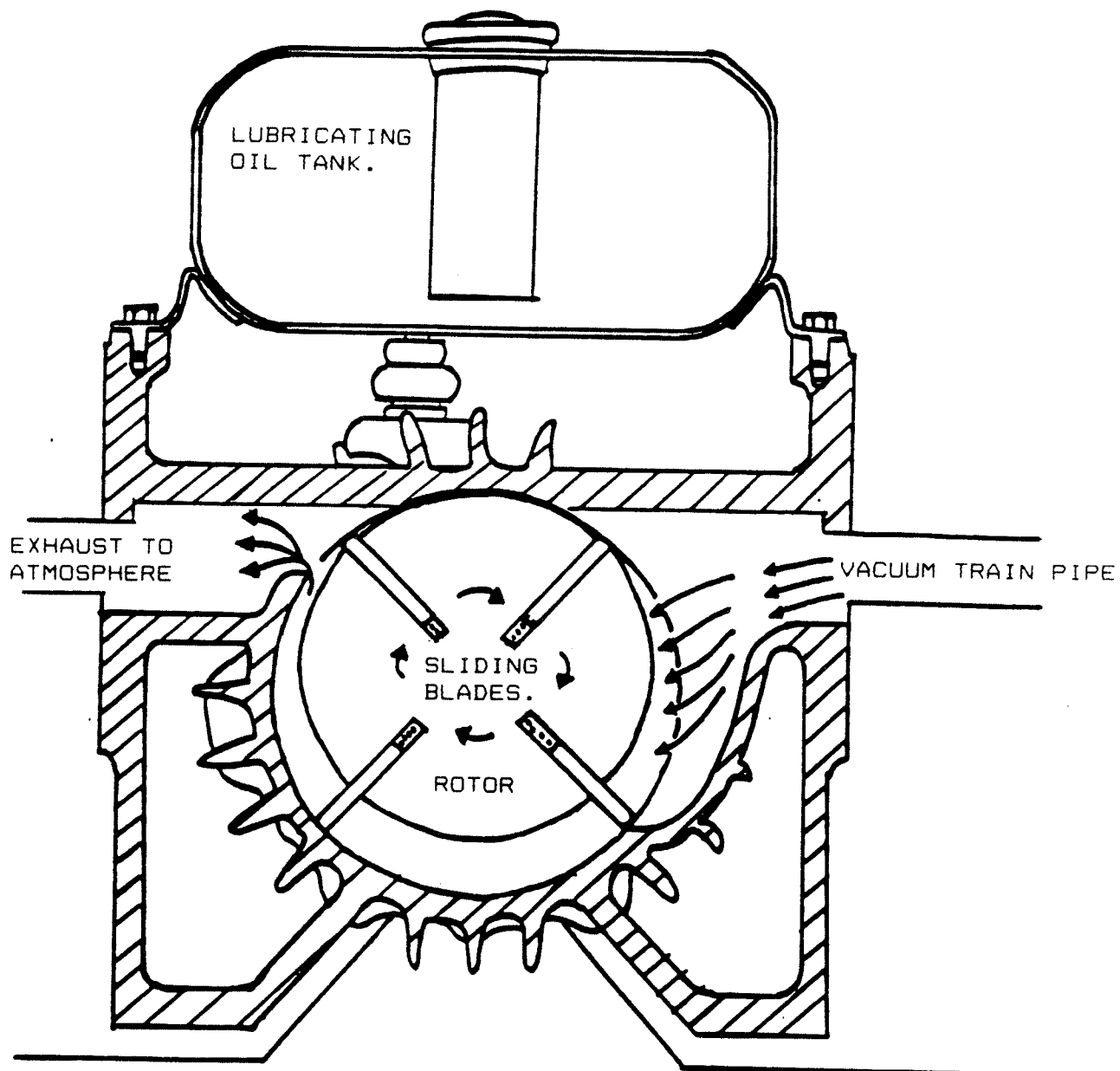
DUE TO ATMOSPHERIC AIR PRESSURE BEING ONLY 1.01 Bar or 14.7 P.S.I THE CYLINDERS AND PISTON MUST BE LARGE. IT IS ALSO HEAVY.

46-1-1 OPERATION (RELEASE)

- (I) WITH EXHAUSTERS RUNNING AIR IS DRAWN OUT OF THE VACUUM TRAIN PIPE AND ALL CONNECTION INCLUDING ALL BRAKE CYLINDERS. WHEN THIS HAS BEEN DONE THE PISTON WILL FALL DUE TO GRAVITY AND ITS WEIGHT.
- (II) WITH SUITABLE BRAKE RODS ATTACHED BRAKES ARE RELEASED.

46-1-2 OPERATION (APPLICATION)

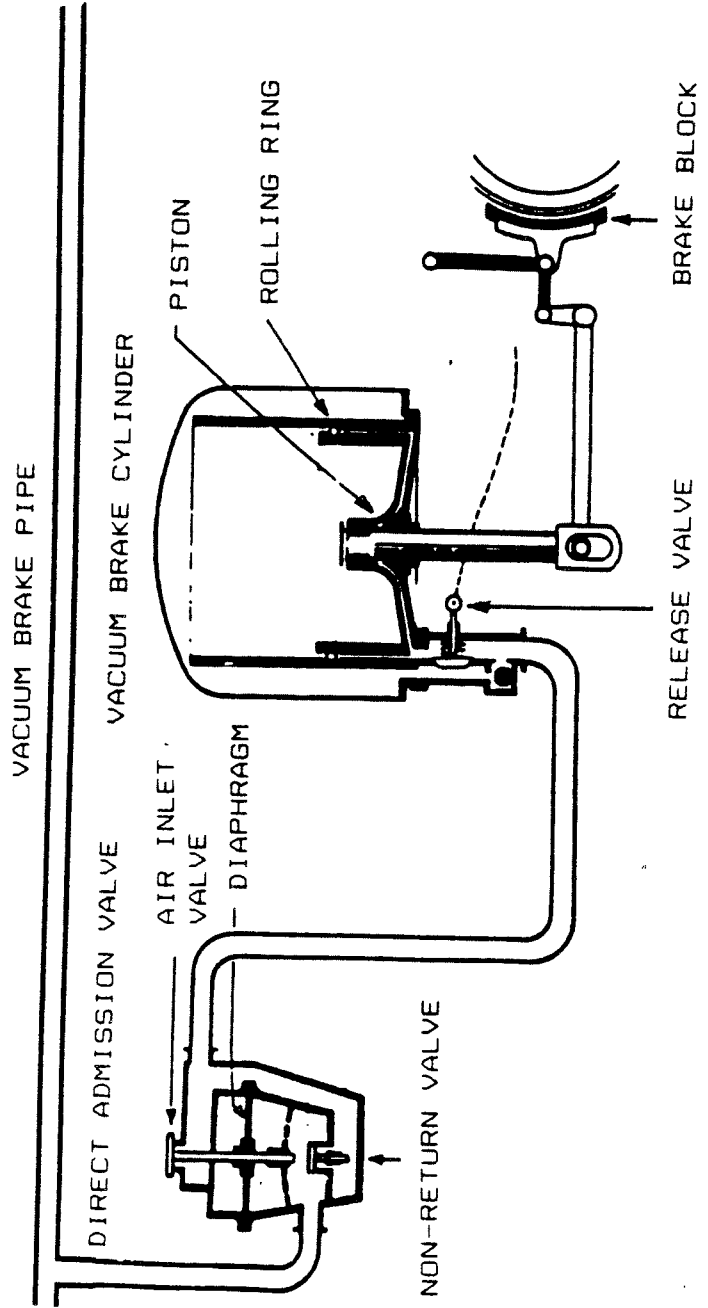
- (I) ONCE AIR IS ALLOWED INTO THE VACUUM TRAIN PIPE AIR PRESSURE AT 1.01 Bar or 14.7 P.S.I IS APPLIED TO THE UNDERSIDE OF PISTON WHICH IS FORCED UPWARDS CAUSING BRAKE TO APPLY.
- (II) TO ENSURE AIR DOES NOT GET INTO THE TOP SIDE OF CYLINDER A RUBBER SEAL IS PROVIDED ON PISTON WALL.
- (III) IN THE EVENT OF BRAKE STICKING ON, A MANUAL RELEASE VALVE IS FITTED WITH A STRONG CORD ATTACHED TO IT.



REAVELL ROTARY EXHAUSTER

VACUUM BRAKE CYLINDER

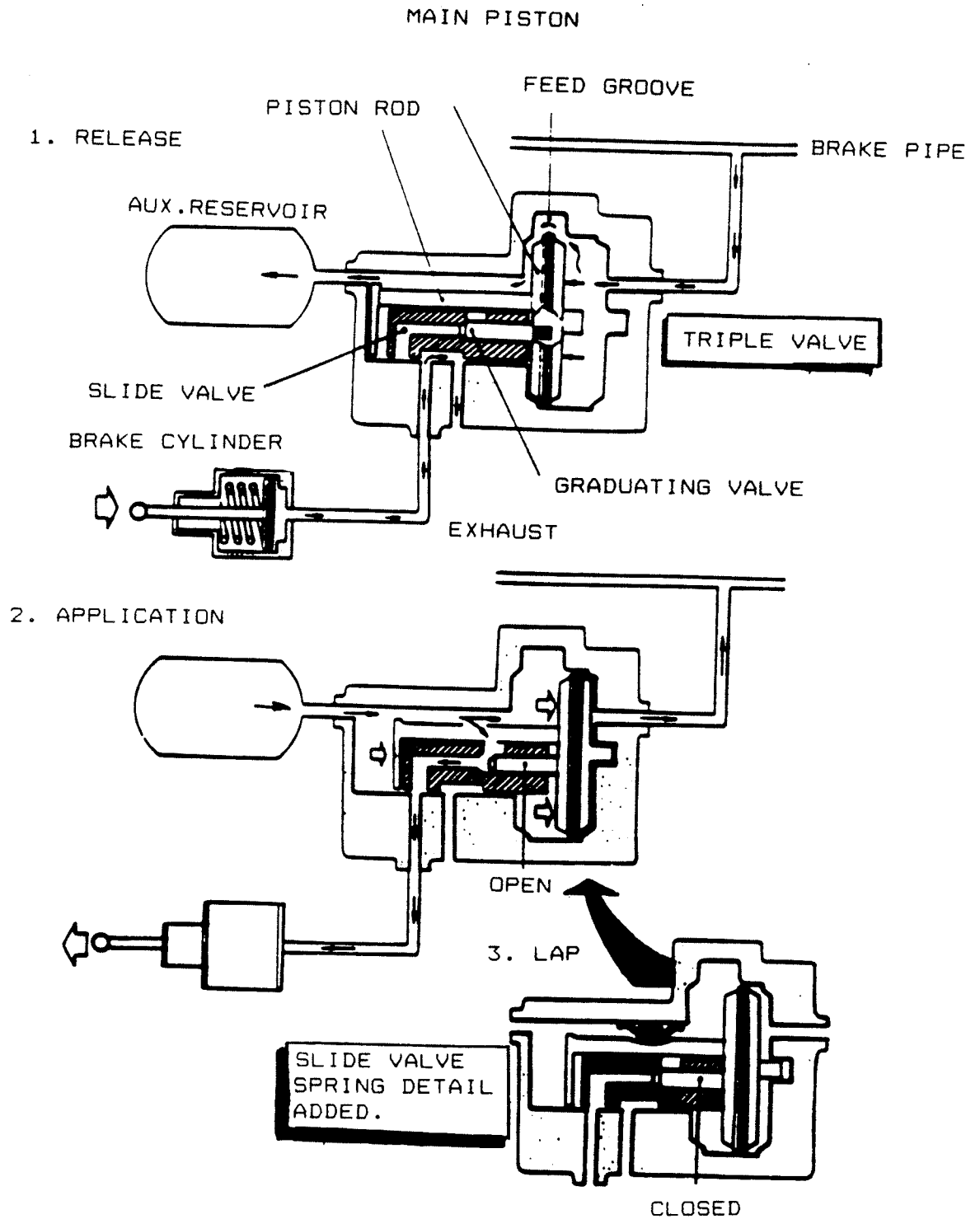
AND DIRECT ADMISSION VALVE



TRIPLE VALVE

BRAKING SYSTEM

AUTO.AIR BRAKE - TRIPLE VALVE OPERATION



47 TRIPLE VALVES AS FITTED TO SOME AIR BRAKE VEHICLES

47-1 EACH TRIPLE VALVE IS MADE UP AS FOLLOWS:-

- (I) MAIN PISTON WITH ROD
- (II) GRADUATING AND SLIDING VALVE
- (III) AUXILIARY RESERVOIR

46-2 OPERATIONS (CHARGE RELEASE)

- (I) WHEN A.B.P PRESSURE IS CREATED THE PISTON WILL MOVE OVER EXPOSING A FEED GROOVE THIS ALLOWS THE AUXILIARY RESERVOIR TO BE CHARGED UP.
- (II) ALSO BRINGS THE EXHAUST PORT INTO COMMUNICATION WITH BRAKE CYLINDERS AND RELEASE AIR THEREBY RELEASE THE BRAKES.

47-3 OPERATION (APPLICATION)

- (I) AS SOON AS A.B.P PRESSURE FALLS THE PISTON IS FORCED OVER BY THE GREATER PRESSURE IN AUXILIARY RESERVOIR. CLOSING EXHAUST PORT.
- (II) AUXILIARY RESERVOIR AIR CAN NOW FLOW TO THE BRAKE CYLINDER. BRAKE APPLIED.

47-4

- (A) THIS BRAKE CAN BE LAPPED ON BUT CANNOT BE LAPPED OFF
- (B) IF WORKING A TRAIN FITTED WITH TRIPLE VALVE WITH A CLASS 47

THEN REMEMBER THIS:-

- (I) IF YOU KEEP MAKING SMALL APPLICATIONS YOU WILL USE UP YOUR AUXILIARY RESERVOIR AIR.
- (II) IF YOU MOVE THE DRIVERS AUTOMATIC BRAKE VALVE ONLY THE VERY SLIGHTEST AMOUNT TOWARDS RUNNING AFTER APPLICATION YOUR TRAIN BRAKE WILL FULLY RELEASE LEAVING JUST LOCOMOTIVE BRAKES ON. THIS IS A DANGEROUS POSITION TO BE IN.
- (III) REMEMBER TO PLACE DRIVERS AUTO BRAKE VALVE FULLY TO RUNNING FOR A LEAST 9 SECONDS TO ALLOW THE AUXILIARY RESERVOIRS TO BE FULLY RECHARGED.

48 LOCOMOTIVES FITTED FOR PUSH/PULL WORKING 47701-47716

THESE ARE CONVERTED 47/4 LOCOMOTIVES FOR THE EDINBURGH - GLASGOW PUSH/PULL SERVICE. BUT ARE NOT CONFINED TO THIS WORK ALONE.

48-1

FITTED WITH ADDITIONAL AUXILIARY FUEL TANK (2539.92 Litre or 570 GALLONS) IN PLACE OF THE FORMER BOILER WATER TANK. THIS SYSTEM IS THE SAME AS THAT FITTED TO 47/8'S.

- 48-2 THE REMOTE CONTROL EQUIPMENT FOR PUSH/PULL WORKING IS LOCATED IN THE FORMER BOILER COMPARTMENT.
- 48-3 MAIN FIRE SYSTEM IS MODIFIED, HAVING B.C.F. EXTINGUISHERS INSTEAD OF C.O.2
- 48-4 AN ADDITIONAL BRAKE VALVE IS PROVIDED IN EACH CAB FOR BRAKE CONTINUITY TEST AND FOR EMERGENCY PURPOSES.
- 48-5 PROVIDED IN EACH CAB IS A TELEPHONE HANDSET FOR CAB COMMUNICATION.
- 48-6 IF THE LOCOMOTIVE IS MOVED WITH THE PARKING BRAKE APPLIED, THE D.S.D. WILL APPLY.
- 48-7 ALSO FITTED WITH STANDARD LIGHTING JUMPER CABLES FOR PUSH/PULL WORKING, AND CAB TO CAB COMMUNICATION.

49 MODIFIED FIRE SYSTEM

- 49-1 INSTEAD OF THESE CO2 FIRE BOTTLES THERE IS ONLY ONE GRAVINER B.C.F. LOCATED IN THE FORMER BOILER COMPARTMENT.
- 49-2 CAB PUSH BUTTONS CAN ONLY BE USED WITH B.I.S CLOSED WHEN A CAB BUTTON IS OPERATED THE ENGINE WILL SHUT DOWN THEN B.C.F. WILL DISCHARGE.
- 49-3 THERE IS A FIRE ALARM CIRCUIT BREAKER ON THE REMOTE CONTROL PANEL. SHOULD THE CIRCUIT BREAKER TRIP WITH THE B.I.S. IN (CLOSED) BELLS WILL RING CONTINUOUSLY AND THE CAB WILL NOT WORK.
- 49-4
- (I) FITTED WITH A SAFETY BOLT SCREW HAVING A PLAIN LONG END AND A SHORT RED PAINTED END. DURING PREPARATION THE DRIVER MUST CHECK THAT THE RED END IS NOT VISIBLE.
 - (II) A TELL TALE "PIP" WILL APPEAR SHOULD THE B.C.F. EXTINGUISHER DISCHARGE. WHEN THE "PIP" IS PROTRUDING, THE DIESEL ENGINE CAN NOT BE STARTED.

50-1 THESE LOCOMOTIVES ARE BASICALLY THE SAME AS OTHER CLASS 47'S. THE FOLLOWING IS A BRIEF DESCRIPTION OF THE DIFFERENCES.

50-2 FANS ARE ELECTRICALLY DRIVEN FROM AN E.T.S. GENERATOR SUPPLY IS ALSO TAKEN FOR:-

(I) TWO TRACTION MOTORS BLOWERS.

(II) TWO COMPRESSORS.

50-3 RADIATOR FAN SPEED IS CONTROLLED BY TWO TEMPERATURE SENSOR SWITCHES IN THE AUXILIARY WATER TANK:-

(I) NUMBER ONE WILL START THE FANS IN SERIES WHEN TEMPERATURE REACHES 71.1 C or 160 F AND STOP THEM WHEN TEMPERATURES FALLS TO 70 C or 158 F.

(II) SECOND SWITCH REGROUPS FANS IN PARALLEL TO INCREASE FAN SPEED TO MAXIMUM AT 80 C or 176 F. RETURNING TO STARTING SPEED AND GROUPING AT 75 C or 167 F.

(II) FANS ARE PROTECTED BY FUSES.

50-4 RADIATOR SHUTTERS

(I) THESE ARE OPERATED VIA AN E.P. VALVE AND TEMPERATURE SENSOR SWITCH.

(II) AN ISOLATING COCK IS PROVIDED. IF HIGH WATER TEMPERATURE CHECK COCK IS FULLY OPEN.

50-5 LOCAL FAULT PANEL

THESE DIFFER IN COLOUR BEING:-

(I) GREEN LIGHT NORMAL

(II) RED LIGHT FAULT

50-6 EARTH FAULTS

50-6-1 POWER

THERE IS NO P.E.F.R SWITCH ONLY TRACTION MOTOR ISOLATING SWITCHES.

50-6-2 AUXILIARY

THERE IS NO WAY OF ISOLATING AN AUXILIARY EARTH FAULT.

50-6-3 TRAIN SUPPLY

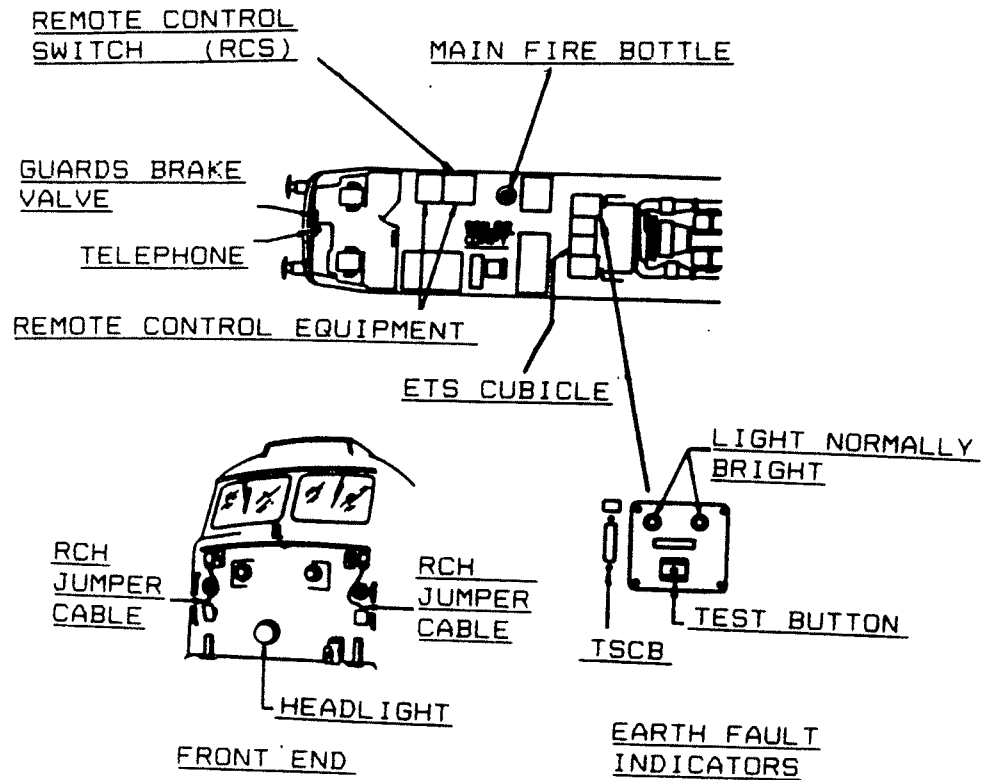
(I) SWITCH "OFF" E.T.S. STOP DIESEL ENGINE.

(II) MASTER SWITCH TO "OFF" NOW RESET RELAY IN CUPBOARD ABOVE THE SWITCH PANEL.

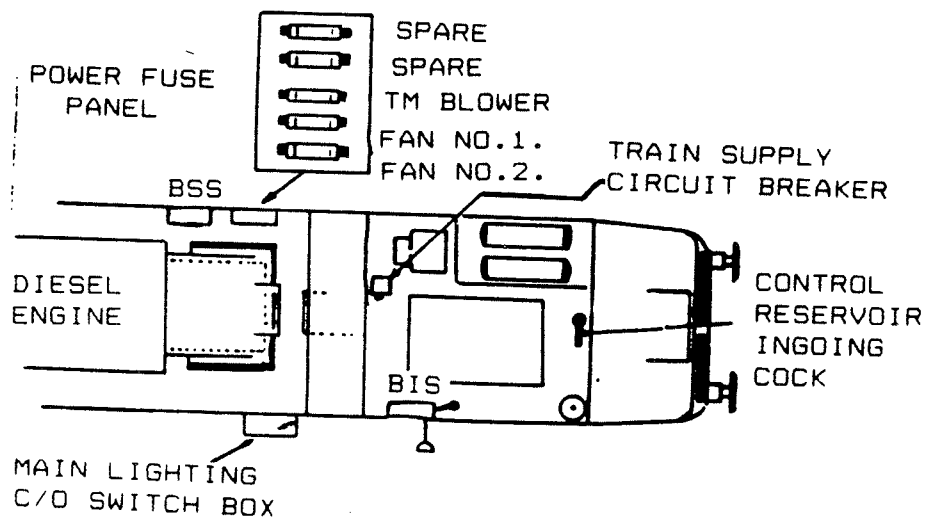
50-7 ELECTRIC TRAIN SUPPLY

(I) MASTER SWITCH MUST BE AWAY FROM "OFF" FOR E.T.S. ON BUTTONS TO BE OPERATIVE.

(II) WHEN SWITCHED ON ENGINE RE-EVALUATION WILL INCREASE BY APPROXIMATELY 50 R.P.M.

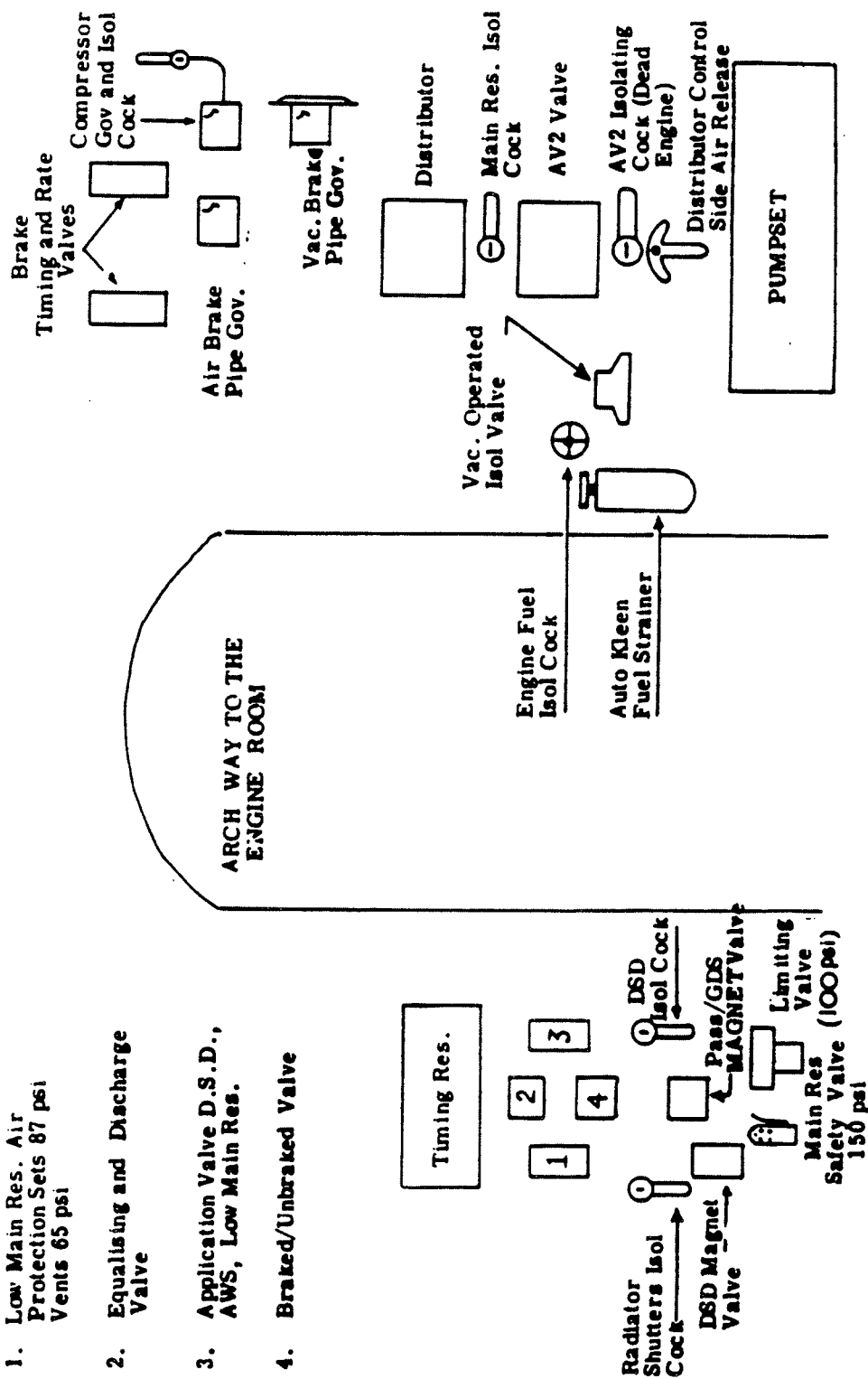


REMOTE CONTROL & OTHER EQUIPMENT CLASS 47/7



LOCATION OF POWER FUSES, MAIN LIGHTING SWITCH ETC. 47401 TO 47420 INCLUSIVE

1. Low Main Res. Air Protection Sets 87 psi Vents 65 psi
2. Equalising and Discharge Valve
3. Application Valve D.S.D., AWS, Low Main Res.
4. Braked/Unbraked Valve

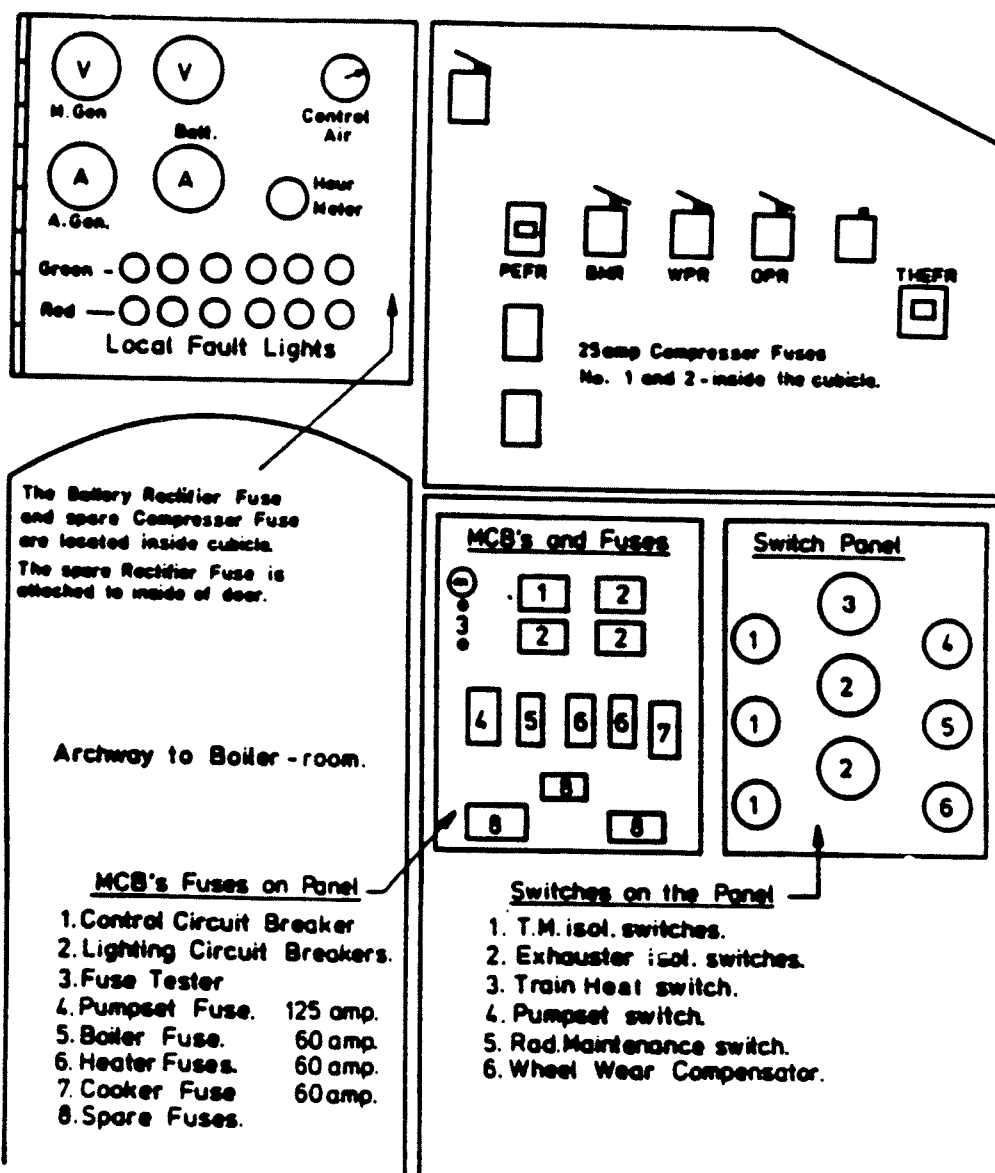


THE BRAKE COMPARTMENT : 47 401 - 47 420

The Control Switches, MCB's and Fuse Panels.

The panels, similar to those located above the auxiliary generator of other Class 47 Locomotives, are fitted outside the R.H. control cubicle.

The fuses for Compressors No.1 and 2 are located above the fuse panel inside the cubicle.



51 INDEPENDENT OR STRAIGHT AIR BRAKE 47401-20
BASICALLY THE SAME AS OTHER 47'S WITH TWO EXCEPTIONS:-

- (I) MAXIMUM BRAKE CYLINDER PRESSURE 5.17 Bar or 75 P.S.I.
- (II) BOGIE ISOLATING COCKS ARE ON THE DRIVERS ASSISTANTS SIDE.

52 DRIVERS BRAKE VALVE

POSITIONS ARE SIMILAR TO DAVIES AND METCALFE BRAKED LOCOMOTIVES WITH SOME DIFFERENCES:-

- (I) RELEASE UNDER VACUUM

EXHAUSTERS ARE SPEEDED UP BY DRIVER PLACING THE BRAKE VALVE TO THE OVER CHARGE POSITION. A GOVERNOR DETECTS THE A.B.P. OVER CHARGE AND IT IS THIS THAT SPEEDS UP THE EXHAUSTERS.

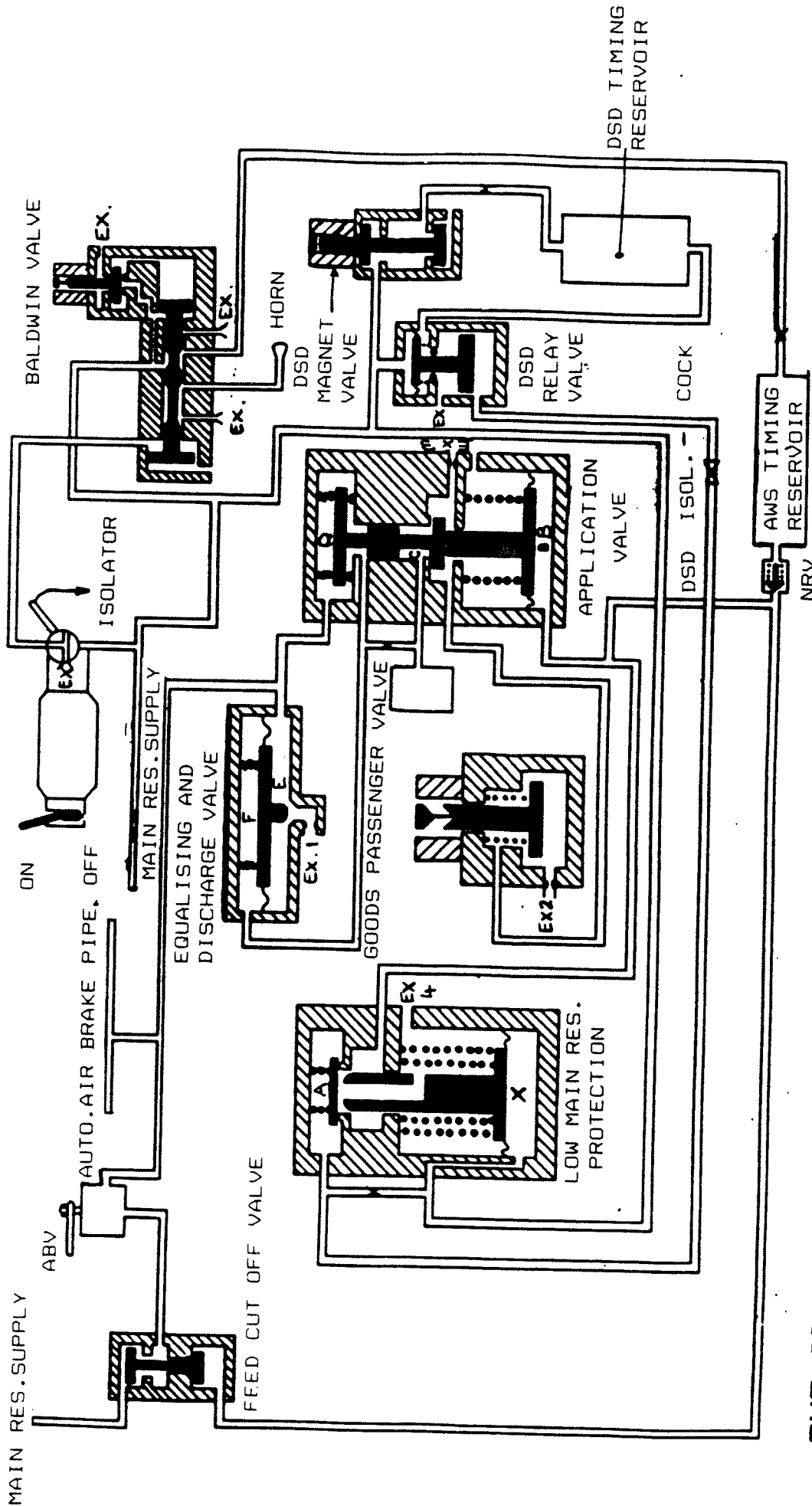
NOTE THE EXHAUSTER WILL CONTINUE IF HIGH SPEED FOR APPROXIMATELY 15 SECONDS AFTER RETURNING BRAKE VALVE TO RUNNING.

53-1 WESTINGHOUSE DISTRIBUTOR

53-1-1 AGAIN SIMILAR TO THE D&M WITH THE FOLLOWING DIFFERENCE

- (I) THERE IS NO ANTI-SLIP DIAGRAM
- (II) SEALING VALVE IS REPLACED BY A "BELL" VALVE
- (III) HAS A LIMITING VALVE SET AT 5.17 Bar or 75 P.S.I THIS REDUCES AUXILIARY RESERVOIR AIR PRESSURE TO THE DISTRIBUTOR

CHANGE END SWITCH



THE BRAKE APPLICATION UNIT. AWS-DSD-AND LOW AIR PROTECTION DEVICES

53-1-2 TIMING VALVES
WITH B.S.S. IN FOLLOWING:-

(I) AIR PASS

BRAKE RATE AND TIMING VALVES WILL BE OPEN WITH PASSENGER/GOOD P&G VALVE CLOSED LOCOMOTIVES

(II) "AIR GOODS"

P/G VALVE OPEN THE P/G CHANGE OVER VALVES WILL CLOSE TO GIVE A SLOWER RATE OF APPLICATION AND RELEASE

(II) VACUUM PASSENGER

AIR BRAKE TIMING VALVE WILL BE CLOSED AND BRAKE RATE VALVE OPEN, THUS GIVING A SLIGHTLY RETARDED APPLICATION OF LOCOMOTIVE BRAKES TO MATCH TRAIN BRAKING. BRAKES RELEASE AT NORMAL RATE.

(IV) VACUUM GOODS

BOTH BRAKE RATE AND TIMING VALVES ARE CLOSED LOCOMOTIVE BRAKES APPLY AT AN EVEN SLOWER RATE. BRAKE RELEASE AT NORMAL RATE.

54 AIR VACUUM RELAY VALVE (AV2)

PRINCIPLE IS SIMILAR TO THE D & M DV2 BASIC DIFFERENCE BEING THAT THE VACUUM DIAPHRAGM IS CONTROLLED BY MAIN RES. AIR REDUCED TO 1.65 Bar or 24 P.S.I.

55 THE BRAKE APPLICATION UNIT

55-1 THIS UNIT REPLACES THE DAVIES AND METCALFE DSD APPLICATION VALVE, THE MAIN AIR PRESSURE SWITCH, (MAPS) AND BY CLOSING THE FEED CUT OFF VALVE IT ALSO REPLACES THE AWS BRAKE ISOLATOR.

55-2 THE UNIT WILL REDUCE THE AIR BRAKE PIPE IF:-
MAIN RESERVOIR AIR PRESSURE FALLS BELOW 4.41 Bar or 64 PSI.
THE DSD IS RELEASED WITH THE MASTER SWITCH AT "FOR" OR "REV".
THE A.W.S. HORN SOUNDS AND IS NOT CANCELLED.

56 THE LOW RESERVOIR PROTECTION

56-1 UNLIKE THE MAIN AIR PRESSURE SWITCH ON OTHER CLASS 47 LOCOMOTIVES THIS VALVE IS AIR OPERATED. IT WILL PREVENT THE BRAKE PIPE FROM BEING CHARGED UNTIL THE MAIN RESERVOIR PRESSURE RISES ABOVE 6 Bar or 87 PSI. (FEED CUT OFF VALVE CLOSED). SHOULD THE MAIN PRESSURE FALL BELOW 4.41 Bar or 64 PSI DUE TO A COMPRESSOR FAILURE OR LEAKS ON THE LOCOMOTIVES THE UNIT WILL OPERATE TO CLOSE THE FEED CUT OFF VALVE AND REDUCE THE AIR BRAKE PIPE AT A CONTROLLED RATE VIA THE APPLICATION VALVE.

57 DRIVERS SAFETY DEVICE (DSD)

AND

AUTOMATIC WARNING SYSTEM (AWS)

BOTH THESE SYSTEMS OPERATE IN THE SAME MANNER AS THEY WILL ON ALL OTHER CLASS 47 LOCOMOTIVES. THE FEED CUT OFF VALVE WILL CLOSE AND THE BRAKE PIPE WILL REDUCE AT A CONTROLLED RATE VIA THE LOW MAIN RESERVOIR PROTECTION UNIT AND THE APPLICATION VALVE.

NOTE WITH THE BSS AT VACUUM GOODS THE AIR BRAKE PIPE WILL REDUCE AT A SLOWER RATE CAUSING THE VACUUM BRAKE PIPE TO FALL SLOWER.

THE END

