ELECTRO PNEUMATIC BRAKE SYSTEM

INTRODUCTION

- The E.P. brake is an electrically controlled ‘straight air’ brake which admits compressed air to the brake cylinders under the control of two magnet valves on each of the vehicles of a train.
- All the magnet valves and brake controllers are connected by train wires (usually with contactors included in the circuit).
- Movement of the brake controller handle between positions I and II switches the electrical supply onto the train wires to energize the magnet valves in sequence.
- One of the two magnet valves- the ‘Holding magnet valve-closes the brake cylinder exhaust when it is energized and the other –the ‘Application’ magnet valve- admits compressed air from the main reservoir supply to the brake cylinders, when energized.
- the degree of braking is determined by the amount of handle movement from position I. Maximum E.P. service braking is obtained with the handle in position II.

INTRODUCTION

- The two major components in this Electro Pneumatic system are:-
  - Modular brake controller (Located in cab)
  - Electro Pneumatic brake unit (Located under the chassis)

- The Modular Brake controller in conjunction with Electro Pneumatic brake unit constitute an air brake in which two brakes are combined and work independent of each other.

SALIENT FEATURES

- This brake allows very finely adjusted, simultaneous application of brakes in all the coaches of the train.
- Both application and release can be graduated and steps can be achieved in application as well as in release.
- Required brake cylinder pressure can be achieved by moving the handle in EP zone.
- The second independent brake system is pneumatic air brake which can be used independently in case of power supply failure.

MAJOR COMPONENTS

- Application magnet valve
- Holding magnet valve
- Safety valve
- Triple valve
- Pressure limiting valve
- Stabilizing valve
- Check Valve

OPERATION

The complete range of handle movement has been divided into five distinct positions of brake controller

- Release and running
- Full E.P.
- Lap.
- Auto
- Emergency.

OPERATION

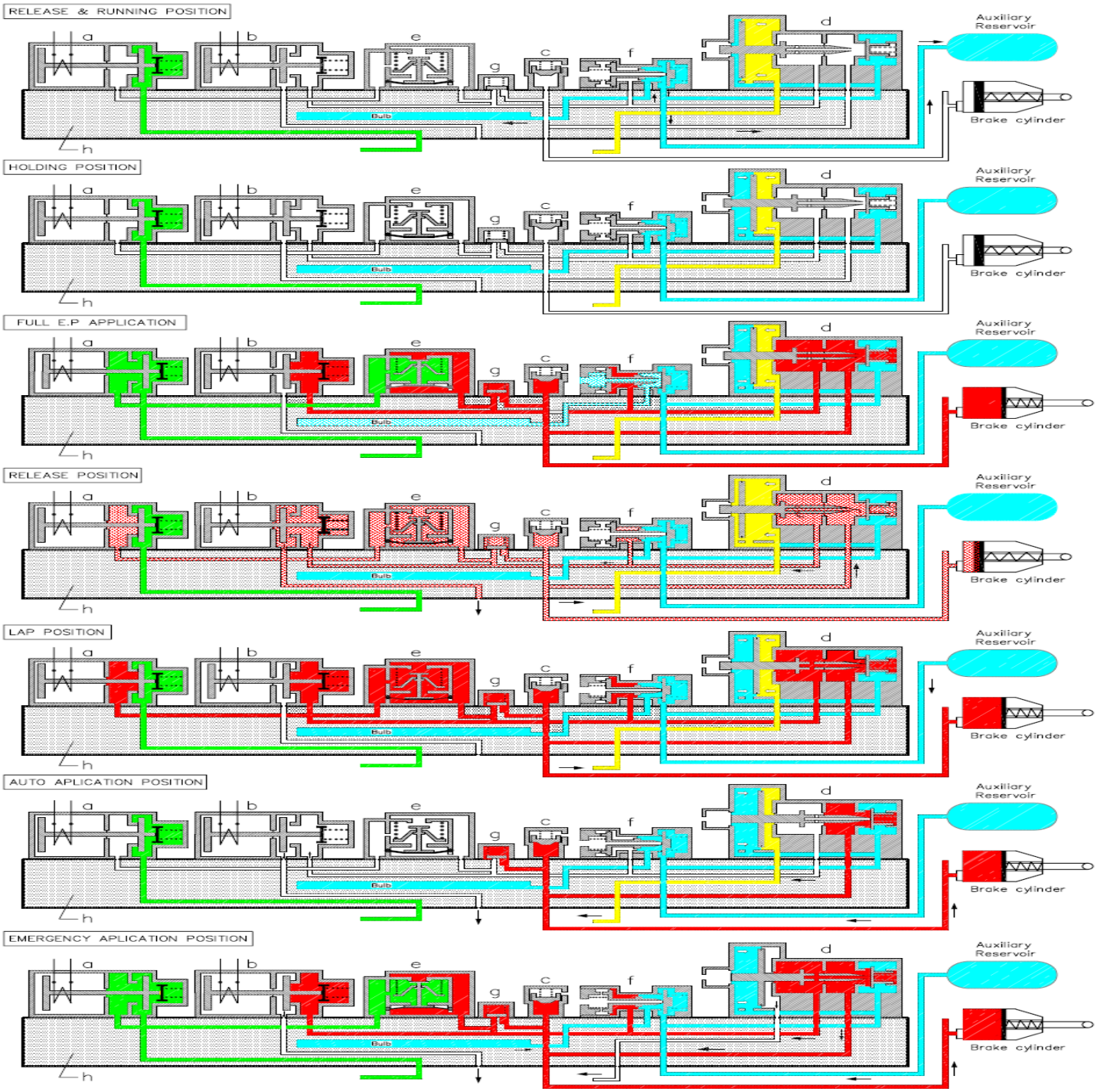
- The Modular brake controller controls the apparatus of both the electrically controlled and the automatic air brakes.
- The contacts are actuated in the brake controller, in accordance with the position of the main handle and the circuit excites the magnet valves, items ‘a’ and ‘b’.
- During application with the automatic air brake, auto valve unit in the modular brake controller regulates the pressure in the brake pipe.

Function of major components

- **Application Magnet Valve**: The application magnet valve, item ‘a’, is excited and hence open in the application and emergency application positions, compressed air flows from the main reservoir pipe via the application magnet valve, item ‘a’, the pressure limiting valve, item ‘e’ and the check valve item ‘g’, into the brake cylinders.
- **Holding Magnet Valve:** The holding magnet valve, item ‘b’, is excited and hence closed in the holding, application, self-lapping and emergency application positions. The brake cylinders are then isolated from the atmosphere.
- **Safety Valve :** During a purely pneumatic application initiated through the triple valve, item ‘e’, the safety valve, item ‘c’ limits the brake cylinder pressure to a maximum of 4 kg/cm2 (57 psi).

Function of major components

- **Triple Valve :**The triple valve for direct release, item ‘d’, serves for application and release on operation of the automatic air brake, in accordance with pressure changes in the brake pipe. In addition, the release of the electrically controlled air brake is effected via the triple valve in release position.
- **Pressure Limiting Valve:** During electrically controlled application the pressure limting valve, item ‘e’, limits the brake cylinder pressure to a maximum of 3.6 kg/cm2 (51psi).
- **Stabilizing Valve:** The stabilizing valve, item ‘f’, in the release position connects the Auxiliary reservoir with a bulb, whereby the pressure in the auxiliary reservoir is reduced by about 0.2 kg/cm2 (3 psi) lower than that in the Brake pipe. The stabilizing valve is controlled by the Brake Cylinder pipe. On brake application, the bulb previously mentioned is exhausted through the stabilizing valve.
- **Check Valve :** During purely pneumatic application, the check valve, item ‘g’, prevents the escape of air from the brake cylinders through the open holding magnet valve.



Main reservoir pressure
Brake pipe pressure
Air reservoir pressure
Brake cylinder pressure

a = Application magnet valve
b = Holding magnet valve
c = Safety valve
d = Triple valve
e = Pressure Limiting valve
f = Stabilising valve
g = Check valve
h = Valve bracket

REFER MANUAL FOR ABOVE VALVES OPERATIONS

Drn. By :- V.B.M.R/Harish

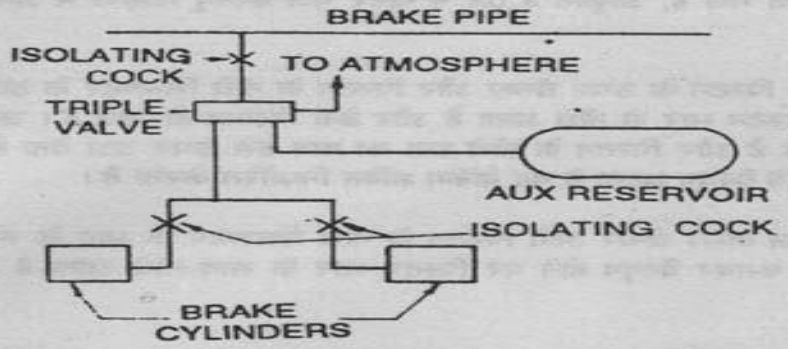


FIG. 4.03 AUTOMATIC BRAKES

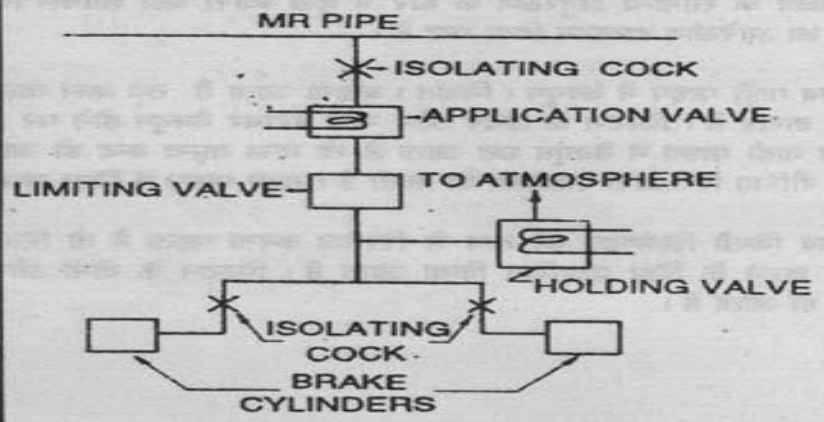


FIG. 4.01 EP BRAKES

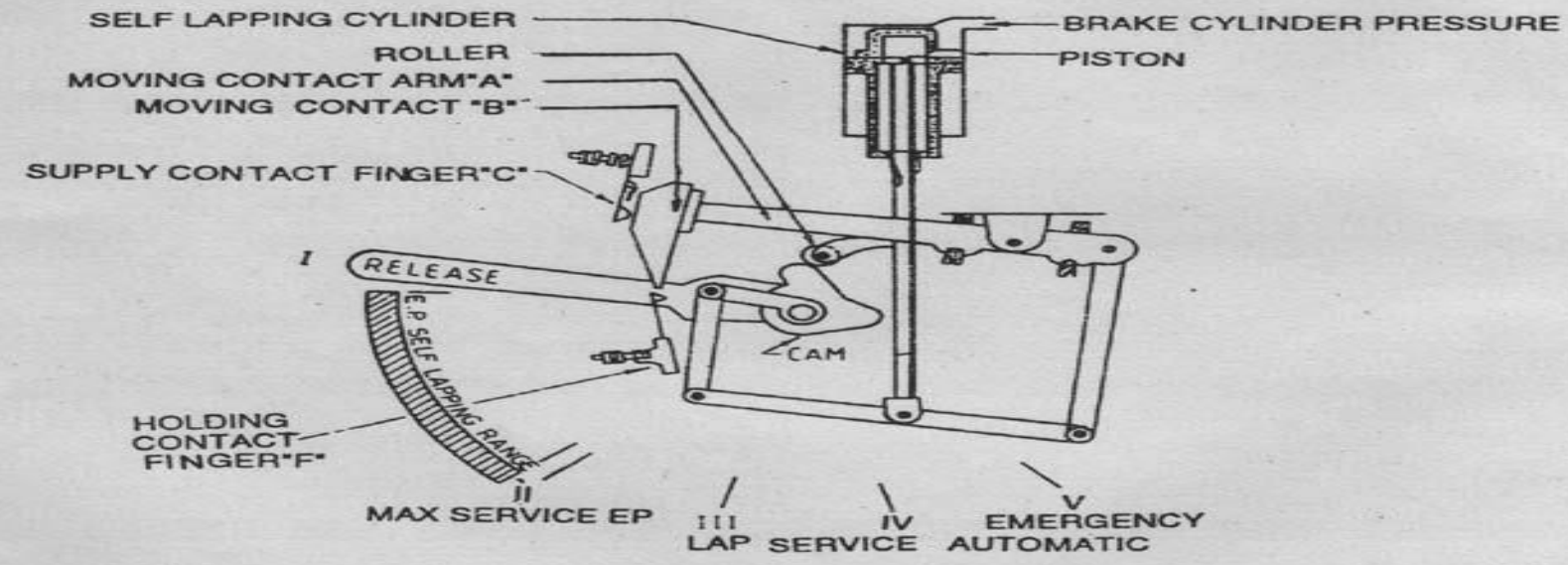
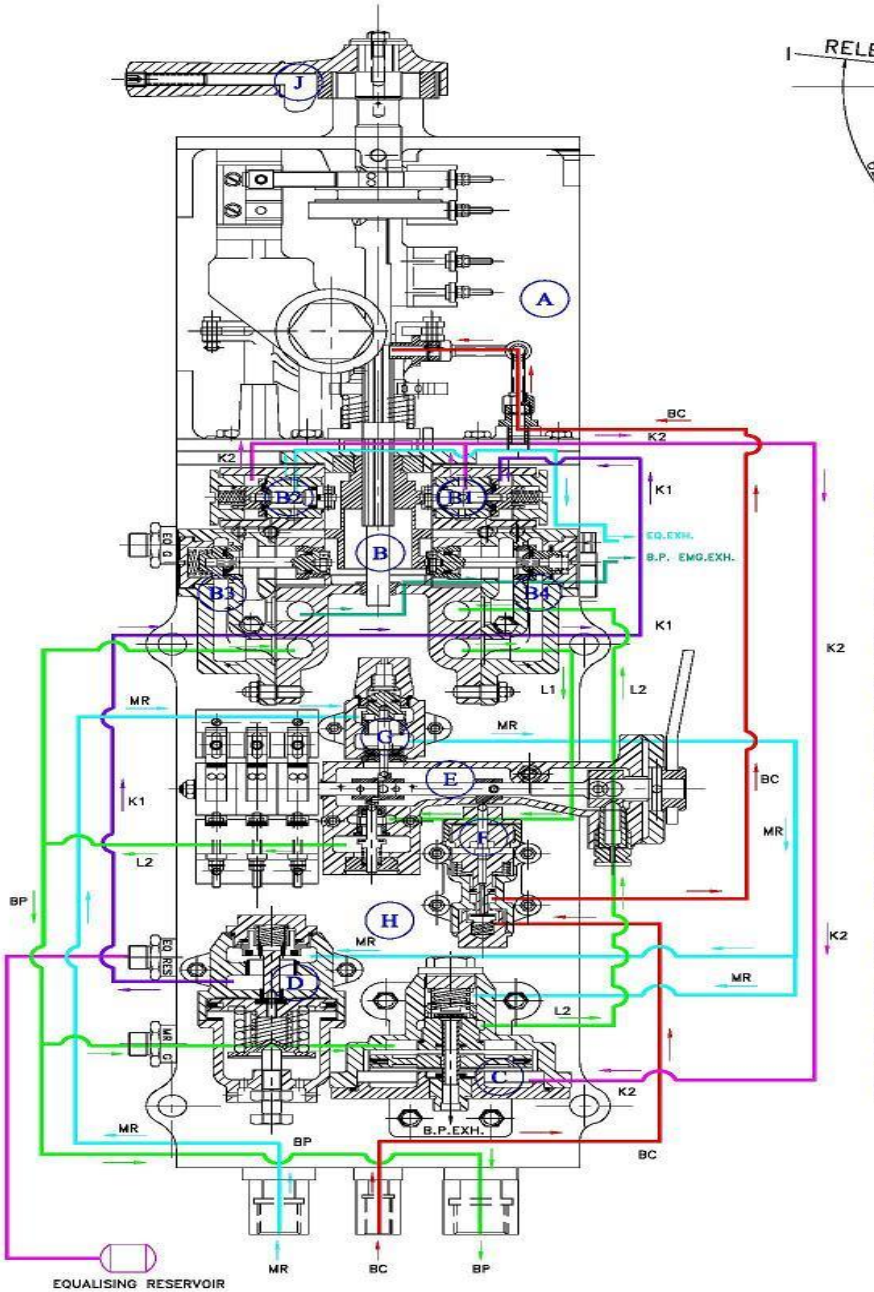


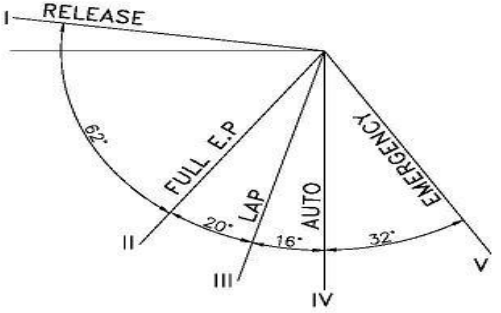
FIG. 4.02 **SELF LAPPING MECHANISM-SCHEMATIC DIAGRAM**

COMPONENTS IN MODULAR BRAKE CONTROLLER

- Feed back unit
- Auto valve unit
- Equalizing discharge valve
- Pressure reducing valve
- Hand operated isolating valve
- Isolating valve for feed back cylinder
- MR isolating valve.

SCHEMATIC DIAGRAM OF ESCORTS MODULAR BRAKE CONTROLLER Esbc-IIIM (2000)





HANDLE POSITION

- A – FEED BACK UNIT
- B – AUTO VALVE UNIT
- B1 – EQ. CHARGING VALVE
- B2 – EQ. EXHAUST VALVE
- B3 – EMERGENCY VALVE
- B4 – ISOLATING VALVE(BP)
- C – EQ. DISCHARGE VALVE
- D – PRESSURE REDUCING VALVE
- E – HAND OPERATED ISOLATING VALVE
- F – ISOLATING VALVE FOR FEED BACK CYLINDER
- G – M.R ISOLATING VALVE
- H – MOUNTING BRACKET S/A
- J – HANDLE

CONTACT ARRANGEMENT DIAGRAM

FIG. NO.:— 3a

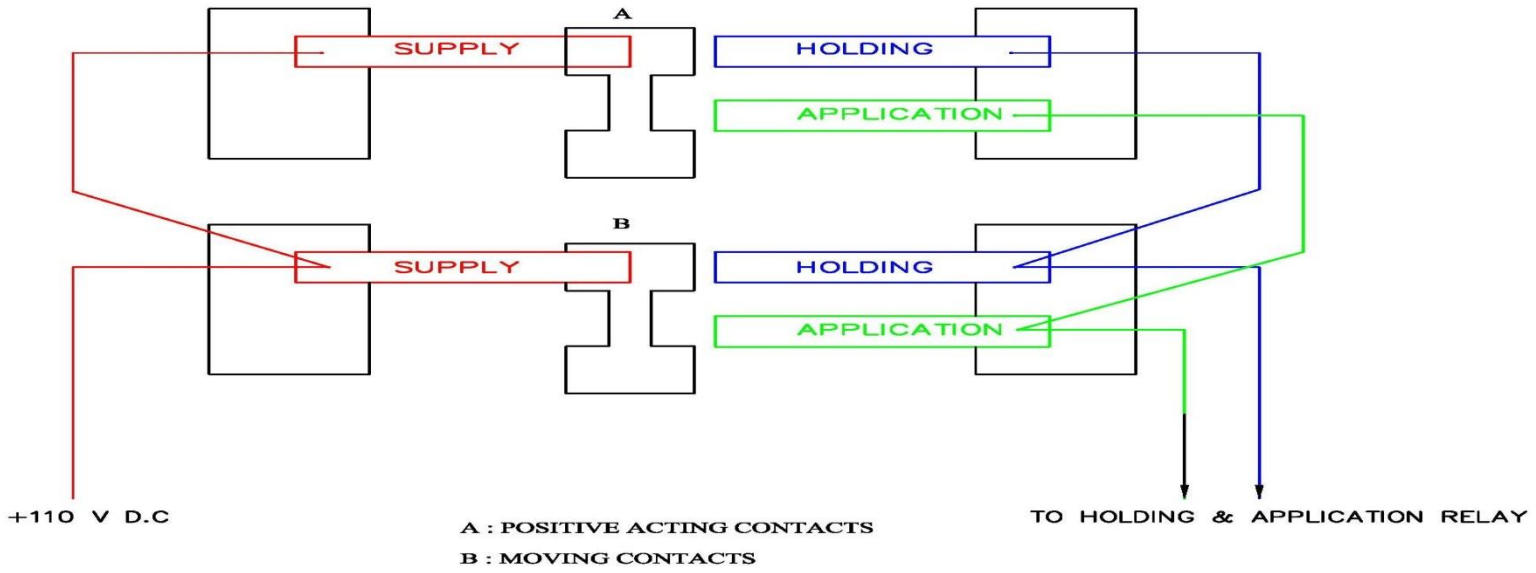
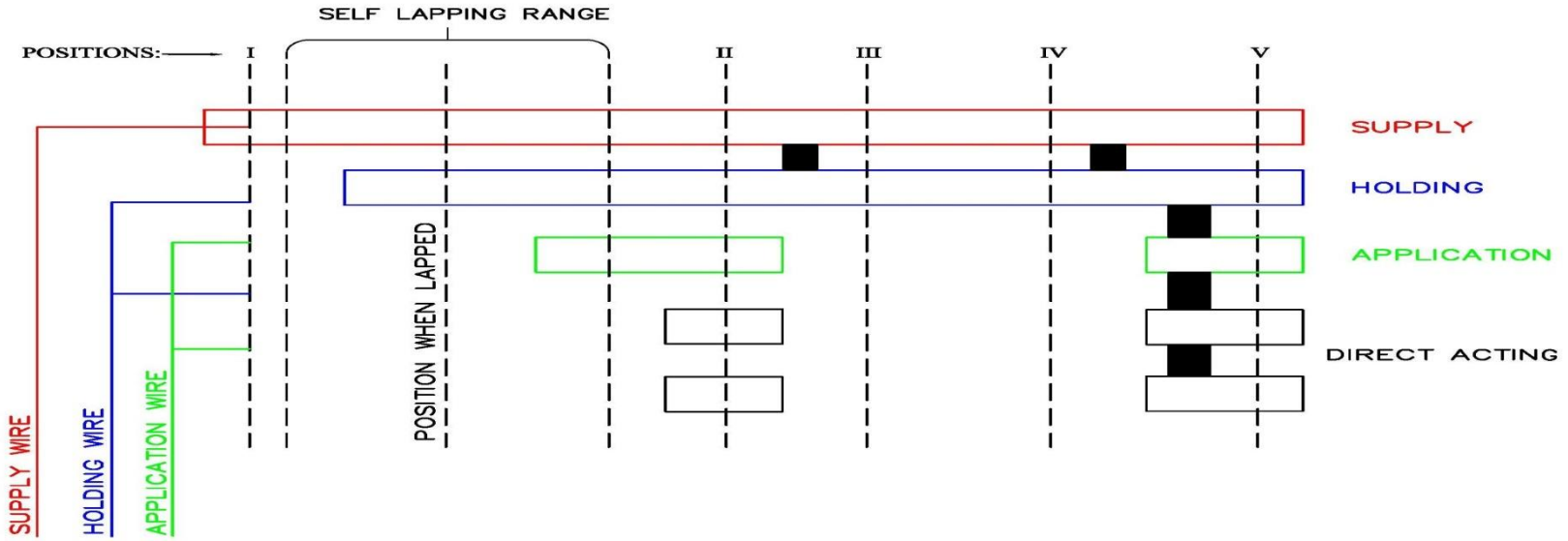
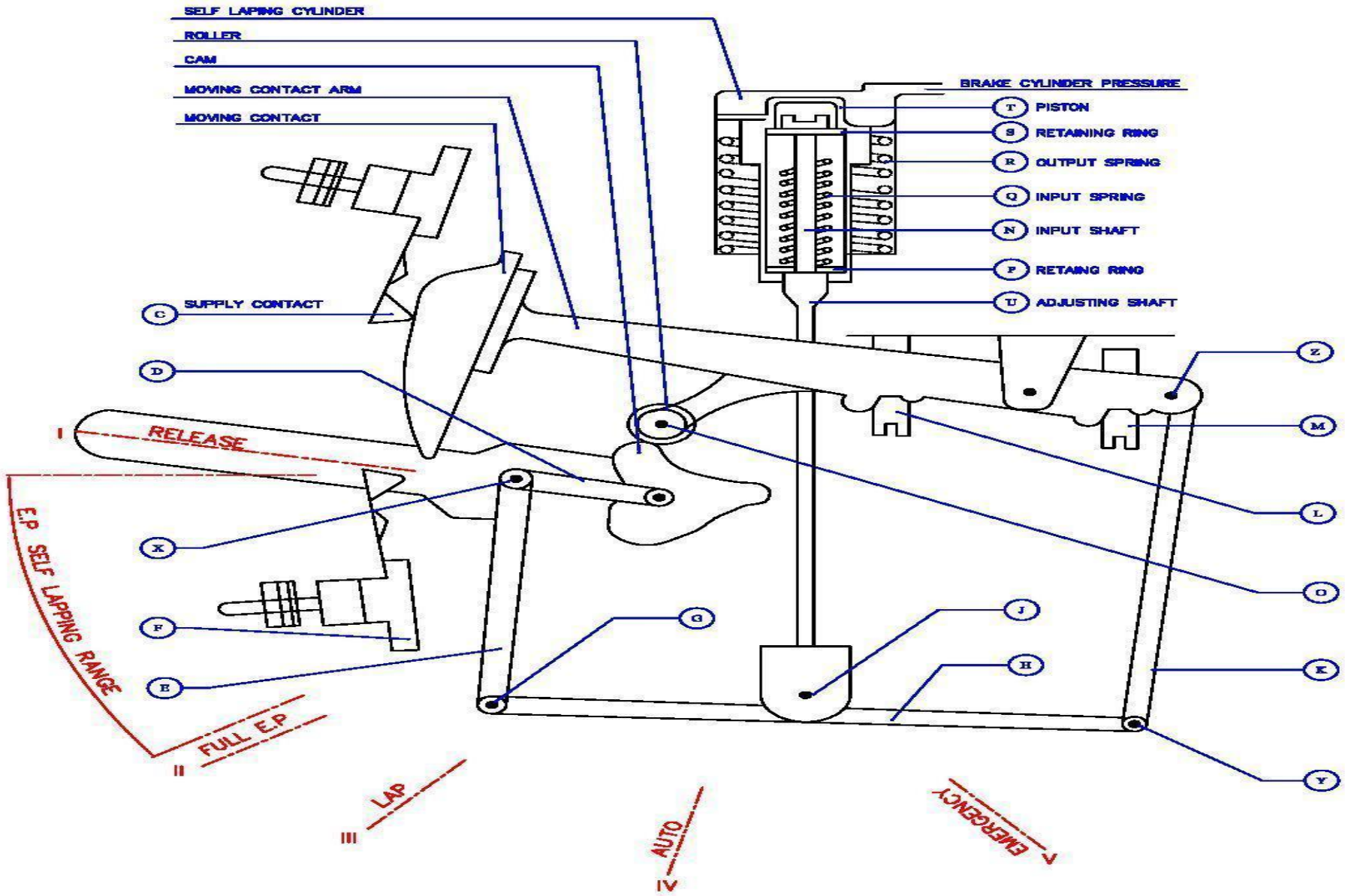


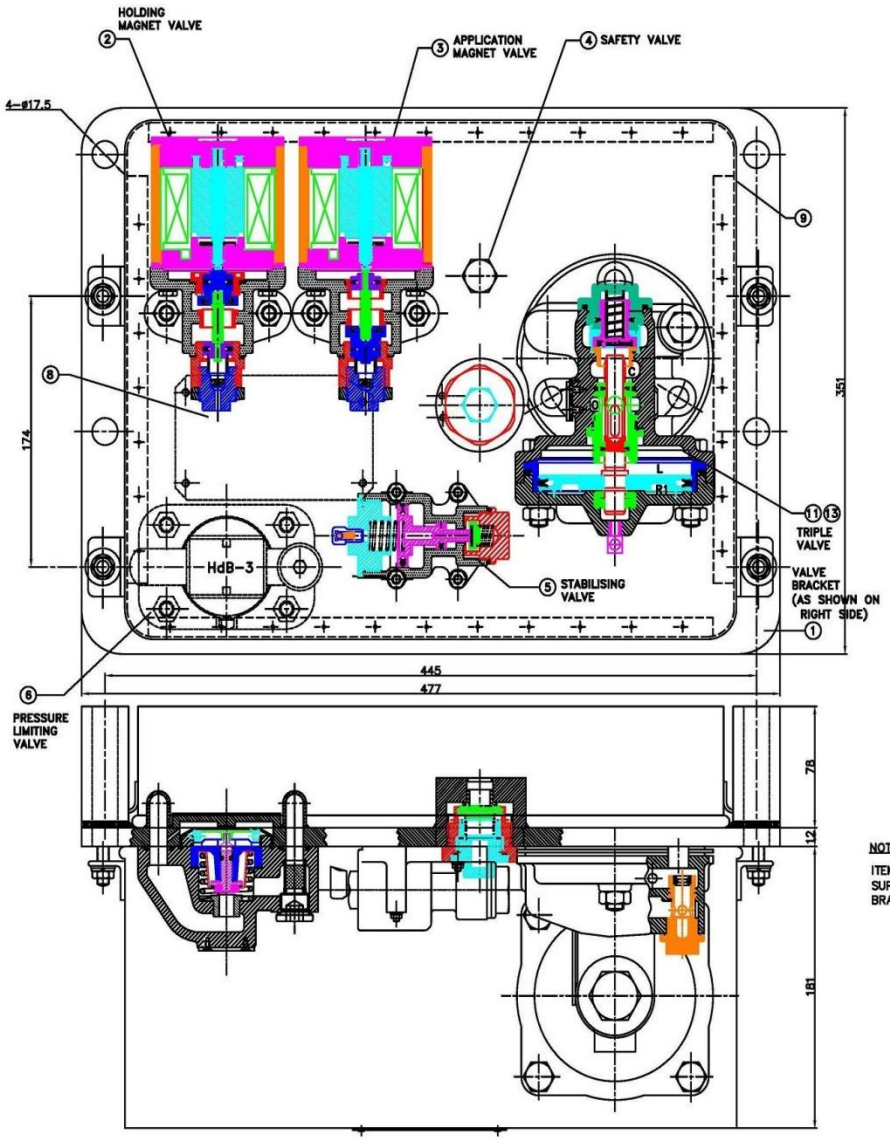
FIG. NO.:— 3b

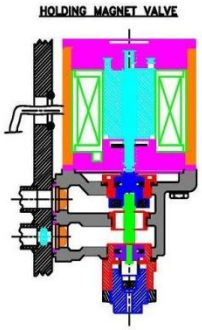
CONTACT SEQUENCE DIAGRAM

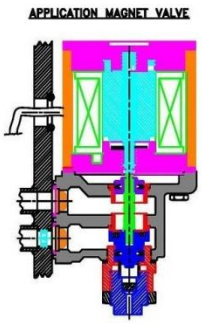


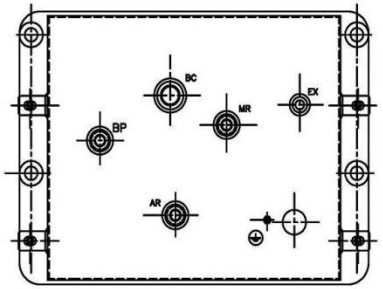

SELF LAPING CYLINDER
ROLLER
CAM
MOVING CONTACT ARM
MOVING CONTACT
BRAKE CYLINDER PRESSURE
T PISTON
S RETAINING RING
R OUTPUT SPRING
Q INPUT SPRING
N INPUT SHAFT
F RETAING RING
U ADJUSTING SHAFT
C SUPPLY CONTACT
D
Z
M
L
O
X
F
E
G
J
H
K
Y
I RELEASE
E.P SELF LAPPING RANGE
II FULL E.P
III LAP
IV AUTO
V EMERGENCY

EP UNIT

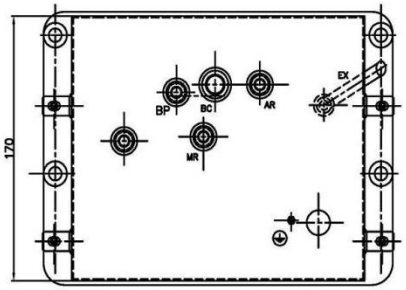








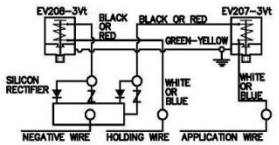
BRACKET (DRG. NO. KB 404) WITH BACK COVER TYPE STANDARD



BRACKET (DRG. NO. 1EP 5144) WITH BACK COVER TYPE WSF

NOTE:-

ITEM NO.4 i.e. SAFETY VALVE NOT TO BE SUPPLIED FOR EP-UNITS MENT FOR SYNTHETIC BRAKE BLOCKS, OPENING TO BE PLUGED.

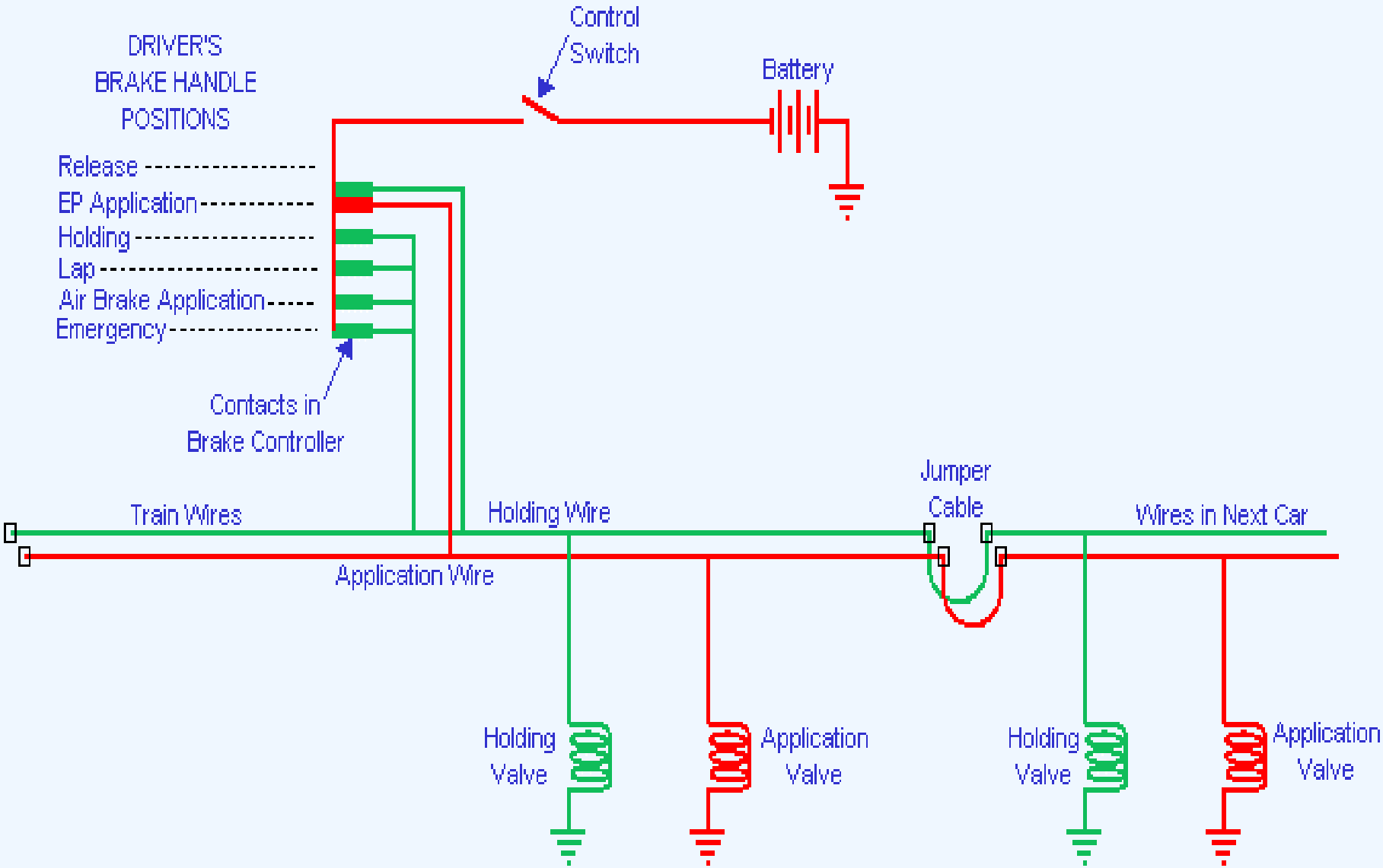


TERMINAL BOARD

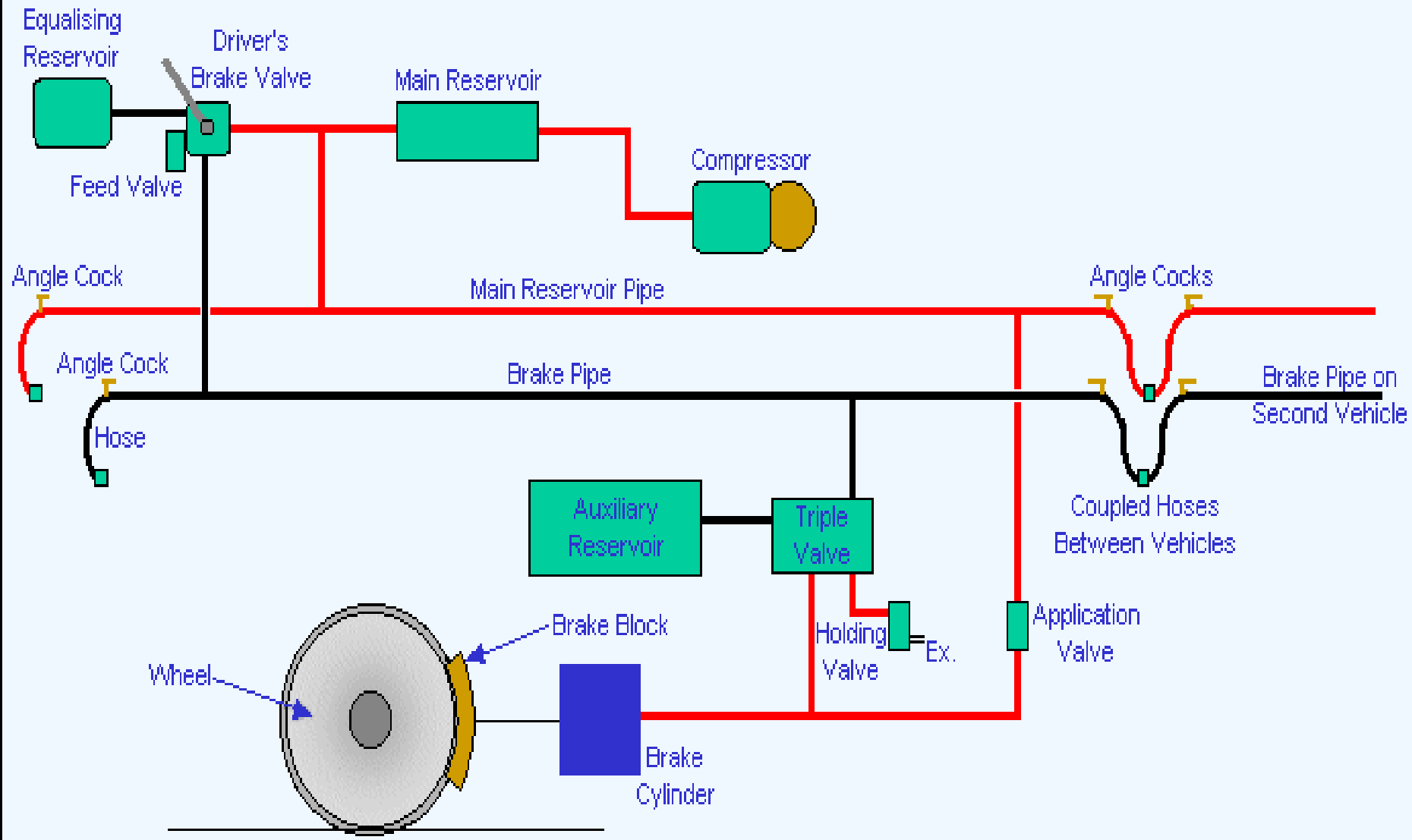
ELCTRO PNEUMATIC BRAKE UNIT-0A68051/--

E.P UNIT 16" (I/29385)- /A

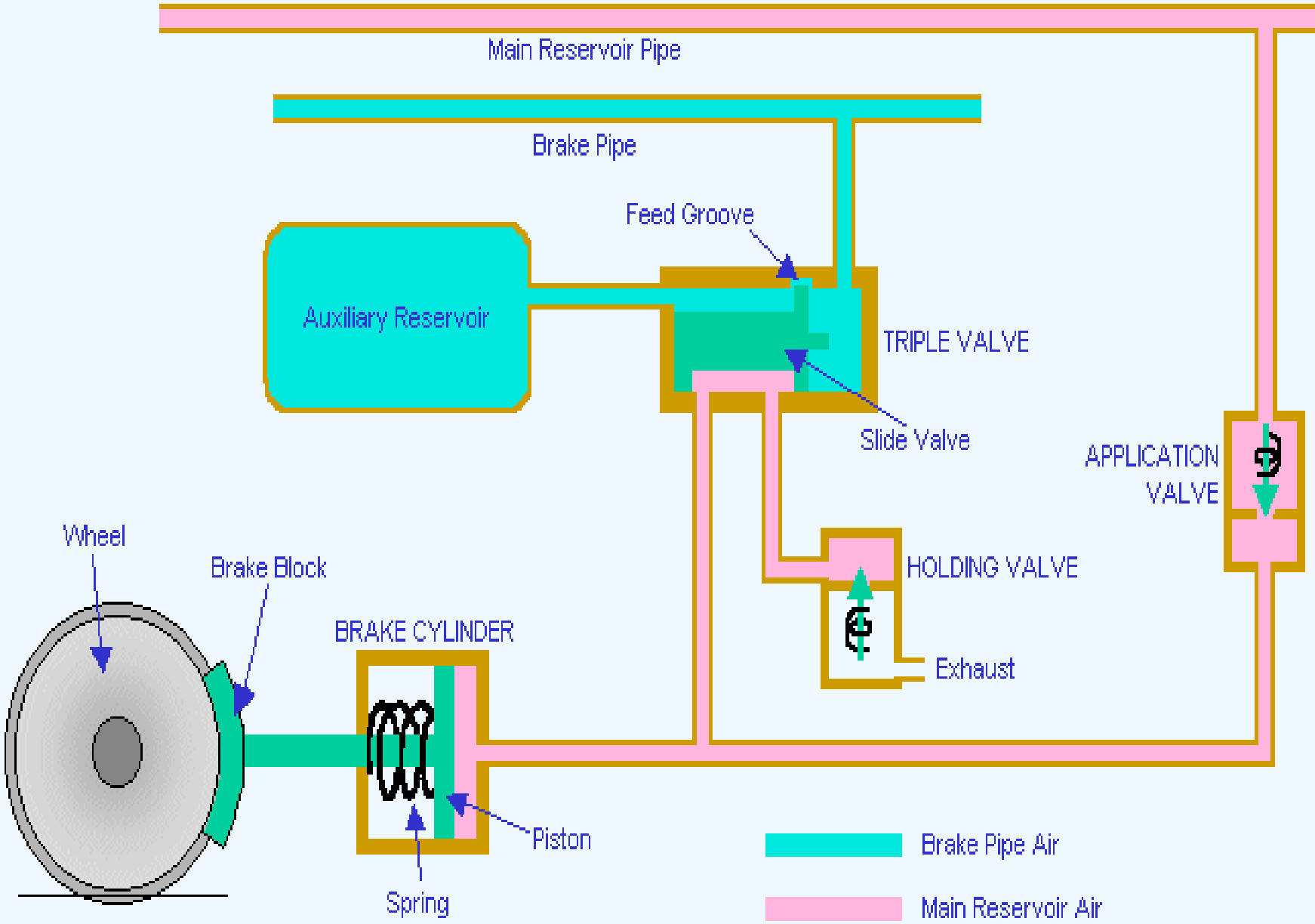
E.P UNIT 12" (I/29422)- /C



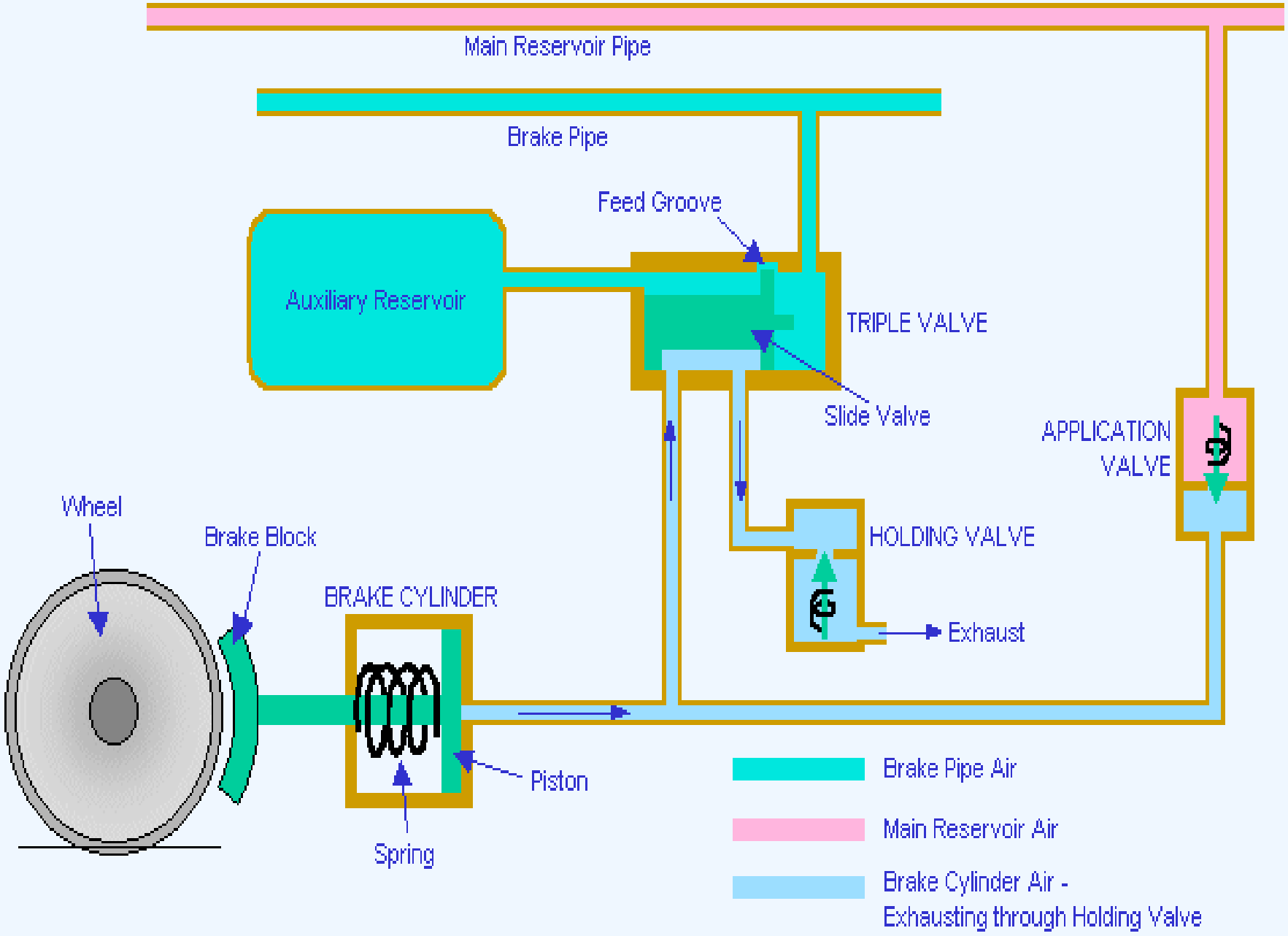
Schematic Diagram of E-P Brake Electrical Control System



Block Diagram of Electro-Pneumatic Brake System



Schematic Diagram of Electro-Pneumatic Brake on Vehicle in Application Position



Schematic Diagram of Electro-Pneumatic Brake on Vehicle in Release Position

ADVANTAGES

- Both Electrical and pneumatic brakes are available and both can be used independently.
- Braking more effective. Both application and release can be graduated and steps can be achieved in application and release also.
- All the valves are mounted on a single bracket.
- Maintenance and trouble shooting is easy.
- On application of Electrical brakes, no BP pressure will be drop hence loading on compressor will be less.

THANK YOU