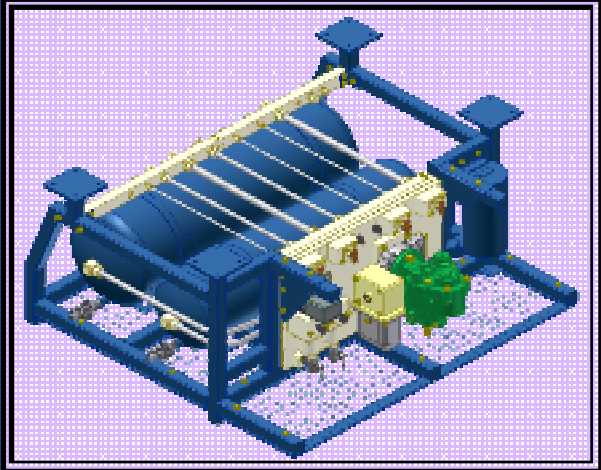




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. of India)  
(Ministry of Railways)

# Handbook On Maintenance of Air Brake System in LHB Coaches (FTIL Type)



(For official use only)  
IRCAMTECH/2013/Mech/Air Brake (LHB)/1.0  
Dec 2013

**आअमा सं RDS**  
रेल अग्रदूत Transforming Railways



**Indian Railways  
Centre for Advanced Maintenance Technology**

MAHARAJPUR, GWALIOR -474005  
महाराजपुर, ग्वालियर

# Foreword

This Maintenance hand book has covered introduction, constructional detail of Air Brake System (FTIL type), instructions and precautions during inspection and maintenance. Wherever required, sketches and colored photographs have been provided to make the understanding clear.

I am sure that this maintenance handbook will be useful to the concerned staff to ensure trouble free service of the train operation.

Technological up-gradation and learning is a continuous process. Hence feel free to write us for any addition / modifications or in case you have any suggestion to improve the Hand Book, your contribution in this direction shall be highly appreciated.

We welcome any suggestion for addition and improvements from our readers.

**Place:** CAMTECH/GWL  
**Date:** 22/12/2013

**(A R Tupe )**  
**Exe. Director**  
**CAMTECH/GWL**

## **PREFACE**

Air Brake System (FTIL type) has been introduced for LHB type coaches. LHB coaching stocks with Brake system (FTIL type) on Indian Railway are working with twin pipe graduated release air brake system. Air brake system of LHB coaches is most efficient and reliable braking system used to run long trains at high speeds. The maintenance & Component details of Air Brake System (FTIL type) for coaching stocks are given in this handbook.

The purpose of this maintenance hand book is to enhance knowledge and competence of C&W staff in dealing with Air Brake System in coaching stock maintenance.

This hand book is aimed at assisting concerned staff and does not supersede any existing instructions from Railway Board, RDSO or IRCA etc. Most of data and informations mentioned here in are available in some form the other in various books and manuals or other printed matters. If any changes are made, these will be used in the form of correction slips. For convenience, this book includes a proforma for entering all correction slips serially.

Technological upgradation and learning is a continuous process. Hence feel free to write us any addition / modification in this handbook or in case you have any suggestion to improve the handbook. Your contribution in this direction will be appreciated.

We welcome any suggestion for addition and improvements from our readers.

**Date: - 26.12.2012**

**K.P. Yadav  
Director/ Mech  
CAMTECH/GWL**



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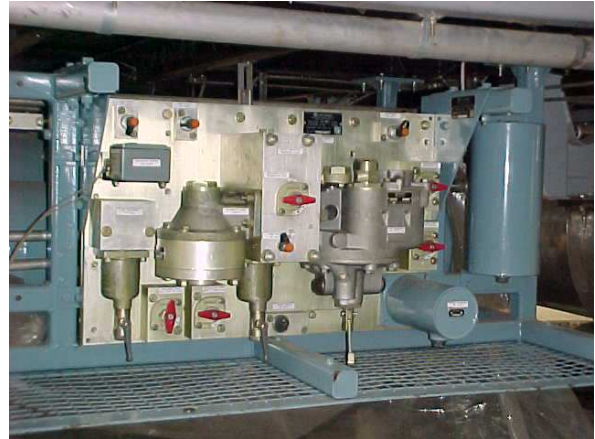


**Handbook  
On  
Maintenance of Air Brake  
System in LHB Coaches  
(FTIL Type)**

## **LHB COACH BRAKE SYSTEM (FTIL Type)**

### **1.0 INTRODUCTION**

The Axle Mounted Disc Brake System of the recent Alstom-LHB design Mainline Passenger Stock for Indian Railways from the layout shown in IR drg no. SK 85155 duly incorporating changes to meet the requirement of the Alstom-LHB specification is shown in air brake schematic drawing No. A2 040 0210 and A2 040 0209. This air brake schematic is for AC-NON AC (EOG)/ACCN (SG) Coaches and Power Car and SLR coaches respectively.



The brake system meets various conditions in the specification laid down by RDSO Indian Railway.

The brake system equipment provided on the Alstom-LHB design coaches meet the requirement for high-speed trains hauled by locomotives and permits the emergency braking for such trains to be within the stipulated limits when brakes are applied on a straight trace at a speed of 160 kmph with loco brakes in operation and standard formation of EOG / SG Coaches as prescribed by RDSO.

### **2.0 FEATURES**

The equipment of the entire brake system in the LHB coach comes on the broad classification as under:

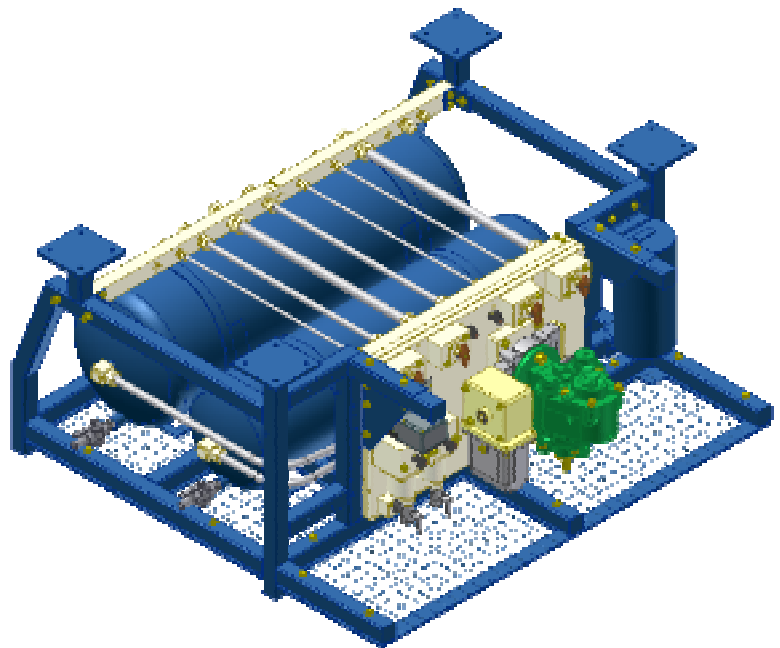
- a) Brake Frame control equipment
- b) Brake Control equipment in the system layout
- c) Disc Brake Equipment on the bogie
- d) Wheel Slide Protection equipment (device)

The basic system of Twin Pipe graduated release air brake conforming to RDSO specification no. 02-ABR-94 & 04-ABR-94 with 25 mm bore dia of BP / FP at 5.0 & 6.0 kg/cm<sup>2</sup> operating pressure respectively in use on Passenger Coaches on IR however is retained. Another set of FP & BP branch pipes are also provided in each Coach on the either side of Central Draw Bar with BP, FP End Cocks and Hose Couplings to provide straight connections of Hose

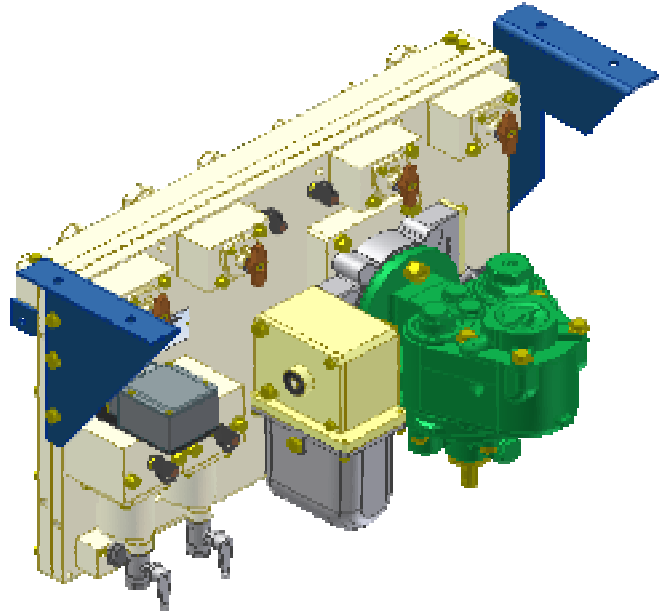
Coupling sets during the reversal and attachment of the Coaches to the formation.

The details of sophistication additionally provided on LHB Coach brake system are as under:

- A Brake Panel with an Aluminium Slab manifold accommodates the Critical Valves of the brake system. This provision protects the Valves from the vulnerability of impact damages from ballast / flying debris during train operations, eliminate substantial piping work and facilitate maintenance by unit replacement. It also contains test points for checking the pressures of BP, AR, DV, BC and CR outputs at one location itself.
- The C3W IP DV incorporates additionally a Relay Valve which ensure consistent application and release timings of Brake Cylinder irrespective of the volumes at all times.
- A Brake Pipe Accelerator Valve with an Isolating Cock is connected to the Brake Pipe of the vehicle that provides rapid venting of the Brake Pipe Air. It comes to action during brake applications whenever the BP pressure is exhausted at an emergency rate and does not get activated during normal braking function up to full service position of the Driver's Brake Valve.
- Five Passenger Emergency Valves are provided inside the Coach of Chair Car to enable a passenger for operation towards stopping the train in case of an emergency. These Valves are connected to a single exhaust Valve that opens the Brake Pipe line to atmosphere whenever any of the Passenger Emergency Valve is operated. The passenger emergency alarm valve are provided limited switches and LED indication lamps to locate the particular valve which is actuated.
- Disc Brakes are mounted on each axle at outer ends within the wheels instead of the conventional system of brake at wheel treads.



- UIC pattern Twin Brake Indicators are provided on each side of the coach that give a visible display of the condition of brakes on each bogie. During brake applied condition, they show a black circle on a red background and in release, a green indication. Chokes are provided in the pipeline to Brake Indicators to dampen the pressure surges and fluctuations.
  
- Wheel Slide Protection Electronic Rack version SWKP AS20R developed with advanced microelectronics and use of microcomputers, enable the braking system to be operated at its optimum performance level by maximizing the use of available adhesion during braking of the train. The present problem of insufficient wheel / rail adhesion depending upon the co-efficient of friction available at wheel rail interface with a constant braking force leading to possible slide and consequent damage to wheel sets (flats) is avoided.



### **3.0 PRINCIPLES OF OPERATION OF BRAKE SYSTEM**

When the Twin Pipe System with BP and FP lines on the coaches of the train is charged to 5.0 & 6.0 kg/cm<sup>2</sup> respectively by the locomotive, the air pressure in the air Brake Pipe connected to the Distributor Valves (A2), controls the brake system of the coaches. To initiate and effect a brake application, the air pressure in the Brake Pipe is reduced and the Distributor Valve in each coach reacts to supply the Auxiliary Reservoir air pressure at a proportionate level as BC pressure to the Actuators. This BC pressure acts as a signal pressure to the large capacity Relay Valve (A17). The Relay Valve in turn quickly supplies air pressure of the same intensity to the four Wheel Slide Dump Valves (D2) and finally reaches the two Brake Actuators provided one for each Brake Disc.

The force developed in each Brake Cylinder causes Piston movement and subsequently through linkage passes on to its Brake Caliper with Pads (C2) to close on the individual Brake Disc provided in each wheel set. The binding causes friction and retardation to wheel rotation. The force applied on the Disc and the brake effect will be proportional to the BC pressure supplied to the Brake Cylinder. The detailed description and maintenance of Disc Brake mechanical arrangement consisting of Caliper with Pads, Brake Cylinder, etc., is dealt with in a separate manual (Refer no. E 9060)

If wheel slip occurs on any wheel consequent to the brake force from the Disc not having been absorbed due to insufficient wheel / rail adhesion factors, a Sensor (D1) provided in axle end cover and Phonic Wheel (D6) fitted on one axle end of each wheel in combination feeds the signal to the Wheel Slide Protection Unit (D3). The WSP Unit in turn energizes through Dump Valve cabling / Connector (D10) instantly and operates the particular wheel slide Dump Valve (Solenoid Valve) provided in the Brake Cylinder circuit of the particular wheel.

The Dump Valve gets opened and exhaust the BC pressure to atmosphere to maximize the braking effort for any given wheel / rail interface coefficient of friction.

As soon as the wheel slide is stopped, the Sensor withdraws the electrical signal to WSP Unit and the later in turn automatically deactivates the Dump Valve to a close position. This allows restoration of BC pressure to the Brake Cylinder circuit due to the pressure-maintaining feature of DV. The Wheel Slide Protection is thus automatic in action and makes optimum use of adhesion during braking with resultant benefits of improved braking distance and prevention of continuous wheel slide / damages. The detailed description and maintenance of WSP unit is covered in a separate manual (Refer no. SWKP AS20 R).

Reduction in the Brake Pipe air pressure can be caused by any one of the operations / events as under:

- a) Driver's Automatic Brake Valve on the Locomotive
- b) Guard's Brake Control in Brake Van
- c) Pilot Valve for Passenger Emergency
- d) Parting of train and disengagement of Brake Pipe

Of these, in respect of Driver's Automatic Valve operation only, it can provide a graduated brake application or release. For any Brake Pipe pressure held steadily below the normal running regime pressure of 5.0 kg/cm<sup>2</sup>, a brake application by way of Brake Cylinder pressure build up will be caused by the DV and will be held steadily at the proportionate level against normal leakage in the system.

Release of brake is affected by the movement of Driver's Automatic Brake Valve handle towards release position causing the BP pressure to increase towards regime pressure limit. The DV in turn causes the BC pressure to be withdrawn proportionately depending upon the increase of BP pressure. A reduced brake application or a complete release of brake can be provided depending upon the position of Brake Valve Handle selected.

#### 4.0 (A) PARTS LIST AND SCOPE OF SUPPLY WITH REFERENCE TO SCHEMATIC A2 040 0210

The identification numbers referred here are in line with the schematic.

Ident No.	Part No.	Description	Qty per Coach
<b>BRAKE FRAME CONTROL EQUIPMENT</b>			
A0	040 0085 00	Brake Frame	1
A1	040 3500 00	Brake Panel	1
A2	501 0040 00	Distributor UIC C3W IP	1
A3	605 2630 00	Control Reservoirs - 6 ltrs	1
A4	009 0070 00	Air Filter FP W/Choke 2 mm	1
	009 0040 00	Air Filter BP	1
A5	Part of A19	Cut Out Cock (DV Isolating Cock) with vent	1
A9	003 0015 00	Cut Out Cock - 1/2" Vent	2
A10	040 1090 00	Pressure Switch 1.3 kg/cm <sup>2</sup> falling pressure; 1.8 kg/cm <sup>2</sup> rising pressure)	1
A11	501 4451 00	Choke (2 mm)	2
A13	040 2090 00	Test Point - BP, FP & BC	3
A14	040 2090 00	Test Point - CR	1
A16	006 1142 00	Check Valve	1
A17	018 0040 00	Relay Valve (1 : 1 Relay of pressure)	1
A18	780 3098 00	Timing Reservoir - 1.5 ltrs	1
A19	040 1075 00	Integral Volume Relay	1
A20	003 0015 00	Cut Out Cock - 3/4" without vent	1
A21	003 0015 00	Cut Out Cock - 3/8" without vent	1
<b>A. BRAKE FRAME CONTROL EQUIPMENT</b>			
B1	040 2610 00	Auxiliary Reservoir (125 ltrs)	1
B2	703 0102 00	Drain Cock 1/2" (fitted to B1 & B7)	2
B3	607 0015 00	End Cock BP 1 1/4"	4
B4	608 0013 00	Hose and Coupling BP 1 1/4"	4
B5	608 0012 00	Hose and Coupling FP 1 1/4"	4
B7	040 2620 00	Door Reservoir (75 ltrs)	1
B8	607 0016 00	End Cock FP 1 1/4"	
B9	045 0011 00	Double Brake Indicator	2
B10	708 0084 00	Hose Connectors for Bogie	4
B11	708 0230 00	Hose Connectors for Brake Cylinder	8

Ident No.	Part No.	Description	Qty per Coach
B12	072 0010 00	Brake Pipe Accelerator Valve	1
B13	023 0170 00	Isolating Cock 1"	1
B21	002 0051 00	Emergency Valve	1
B22	790 040 400	1" Isolating cock with end fittings	1
<b>B. MECHANICAL BRAKE EQUIPMENT</b>			
C2	D127550-600	Caliper with Pads	8
C3	4F-130199	Brake Cylinder PBEC 254-160	4
C4	4F-130200	Brake Cylinder PBEC 254-160	4
<b>C. WSP EQUIPMENT</b>			
D1	1/604 501/2000	Speed Sensor	4
D2	040 0300 00	Dump Valve W/Bracket assy	8
D3	1/600 084	WSP Control Unit	1
D5	1/604 560/1500	Wheel Slide Dump Valve Connector	4
D6	1/604 545	Phonic Wheel (Indigenous)	4
D9	1/604 800/200	WSP Control Unit cabling (Indigenous)	1
	1/604 801/200		
	1/604 803/200		
	1/604 804/200		
	1/604 806/200		
D8	939 0400 00	Speed Sensor cabling / Connectors	
D10		Dump Valve cabling / Connectors	



**(B) PARTS LIST AND SCOPE OF SUPPLY WITH REFERENCE TO SCHEMATIC A2 040 0209**

Ident No.	Part No.	Description	Qty per Coach
<b>A. BRAKE FRAME CONTROL EQUIPMENT</b>			
A0	040 0080 00	Brake Frame	1
A1	040 3500 00	Brake Panel	1
A2	501 0040 00	Distributor UIC C3W IP	1
A3	605 2630 00	Control Reservoirs – 6 ltrs	1
A4	009 0070 00	Air Filter FP W/Choke 2 mm	1
A5	009 0040 00	Air Filter BP	1
	Part of A19	Cut Out Cock (DV Isolating Cock) with vent	1
A9	003 0015 00	Cut Out Cock – 1/2" Vent	2
A10	040 1090 00	Pressure Switch (1.3 kg/cm <sup>2</sup> falling pressure; 1.8 kg/cm <sup>2</sup> rising pressure)	1
A11	501 4451 00	Choke (2 mm)	2
A13	040 2090 00	Test Point – BP, FP & BC	3
A14	040 2090 00	Test Point - CR	1
A16	006 1142 00	Check Valve	2
A17	018 0040 00	Relay Valve (1 : 1 Relay of pressure)	1
A18	780 3098 00	Timing Reservoir – 1.5 ltrs	1
A19	040 1075 00	Integral Volume Relay	1
A20	003 0015 00	Cut Out Cock – 3/4" without vent	1
A21	003 0015 00	Cut Out Cock – 3/8" without vent	1
<b>B. BRAKE FRAME CONTROL EQUIPMENT</b>			
B1	040 2610 00	Auxiliary Reservoir (125 ltrs)	1
B2	703 0102 00	Drain Cock 1/2" (fitted to B1 & B7)	2
B3	607 0015 00	End Cock BP 1-1/4"	4
B4	608 0013 00	Hose and Coupling BP 1-1/4"	4
B5	608 0012 00	Hose and Coupling FP 1-1/4"	4
B7	040 2620 00	Door Reservoir(75 ltrs)	1
B8	607 0016 00	End Cock FP 1-1/4"	4
B9	045 0011 00	Double Brake Indicator	2
B10	708 0084 00	Hose Connectors for Bogie	4
B11	708 0230 00	Hose Connectors for Brake Cylinder	8
B12	072 0010 00	Brake Pipe Accelerator Valve	1
B13	023 0170 00	Isolating Cock 1"	1
B14	022 0080 00	Single Pressure Gauge - BP	1
B17	040 0050 00	Roller Operated Valve (3 way)	1
B17	790 040 330	Gaurds Emergency Cock 3/4"	1
B18	045 0020 00	Single Brake Indicator	1

Ident No.	Part No.	Description	Qty per Coach
B21	002 0051 00	Emergency Valve	1
B22	040 2640 00	Reservoir 5 lts	1
B23	022 0070 00	Single Pressure Gauge - BC	1
B28	022 0090 00	Single Pressure Gauge - FP	1
-	040 1140 00	Flexible Hose Connection	2
B30	790 040 400	1" Isolating Cock 1" w/end fittings	1
<b>C. MECHANICAL BRAKE EQUIPMENT</b>			
C2	090 0020 00	Caliper with Pads	8
C3	4F-125155	Brake Cylinder PBAC 254-130	4
C4	4F-125156	Brake Cylinder PBAC 254-130	4
<b>D. WSP EQUIPMENT</b>			
D1	I/604 501/1210	Speed Sensor	4
D2	040 0300 00	Dump Valve W/Bracket assy	4
D3	I/600 084	WSP Control Unit	1
D5	I/604 560/1500	Wheel Slide Dump Valve Connector	4
D6	I/604 545	Phonic Wheel (Indigenous)	4
D9	I/604 800/200	WSP Control Unit cabling (Indigenous)	1
	I/604 801/200		
	I/604 803/200		
	I/604 804/200		
	I/604 806/200		
D8	939 0400 00	Speed Sensor cabling / Connectors	
D10		Dump Valve cabling / Connectors	

## **5.0 DESCRIPTION, OPERATION AND MAINTENANCE OF BRAKE CONTROL EQUIPMENT**

### **5.1 BRAKE PANEL MODULE (Brake Frame A0)**

#### **5.1.1 INTRODUCTION**

The Brake Panel Module for LHB Coach serves to group together with interconnections in one single assembly all Valves, Cut Out Cock, Drain Cock, Pressure Switch housed in a Braking Panel with Reservoirs, Choke Filters, etc., of the brake equipment within the space marked as A0 of the brake schematic. Other equipment in the schematic are allocated in special places of the Coach braking layout. It facilitates easy removal for overhaul and unit replacement.

#### **5.1.2 CONSTRUCTION**

The Brake Panel Module is a fabricated stainless steel frame and contains a Aluminium Manifold to which component / subassemblies are attached. The list of items forming part of their location is included in the parts list of Brake Container drawing along with the piping circuit details.

#### **5.1.3 LOCATION OF COMPONENTS**

The brake equipment components are positioned in compact groups at convenient locations and pneumatic interconnections are formed by passages within the valve mounting manifold as well as by external piping circuits.

The port identification for the input/output air connections from the overall brake schematic of the Coach is indicated in the schematics.

The Brake Container also includes a Check Valve and four test points for measuring the BP, FP, BC & AR pressures during testing.

Frame Header mounted on rear top position of the Brake Container form an interface connection with Coaching braking system for BP, FP, BC, etc., as indicated in the port connection details in the schematics.

Centrifugal air strainer is provided in the brake pipe entry port in the manifold with a drain cock attachment to trap and drain the condensate periodically with ease. The feed pipe is provided with an air strainer only. Since the pressure fluctuation in the feed pipe are very low to cause condensates collection.

All the mounted components on the Brake Container have identifying labels. For certain items identification letters are punched directly on or near the item itself.

The four Cut Out Cocks have open/close labels indicating the handle position.

#### **5.1.4 INSTALLATION**

The Brake Panel Module frame comprising the pre-assembled pneumatic system with individually tested components installed in position can conveniently be mounted to the LHB Coach under frame mounting bracket (not in our scope of supply). The four mounting flanges on top of the Brake Container carry four 12 mm holes each. The Brake Container flanges are to be secured with fasteners to Coach under frame bracket with Stainless steel washer interfaced in between them.

The mounting has to be done with the DV face on the Brake Panel facing outward to facilitate attention to equipment. Suitable anti-slackening scheme is to be adopted for the Nuts to prevent them working out in service due to likely vibration in operating conditions.

#### **5.1.5 TESTING OF A BRAKE CONTAINER (BRAKE FRAME ASSEMBLY)**

The Brake Panel Module frame comprising the pre-assembled pneumatic system with individual tested equipment is to be tested after overhaul for its performance as per the FTIL test procedure indicated in Annexure - A attached along with the Test Rig Schematic.

#### **5.1.6 TESTING OF BRAKE CONTAINER AFTER INSTALLATION ON LHB COACH**

It is suggested that the Brake Control Rack complete be tested in the workshop before being commissioned in the coach. Even after commissioning, the system performance has to be retested using a Single Car Mobile Test Rig.

#### **5.1.7 MAINTENANCE**

The Brake Panel Module practically does not require any maintenance except for a check on the fastening arrangement to the Coach frame for ensuring soundness and air leak tightness of the system. However, for the brake equipment part, the periodic recommended maintenance schedule between overhauls is indicated in a chart under general chapter covered in Part A. The periodic overhaul and test procedure for the individual equipment forming part of the Brake Container is covered under this section separately.

## **5.1.8 OPERATION OF DEVICES ON PANEL:**

### **5.1.8.1 CHARGING:**

Initially the Brake Pipe pressure enters the Brake Panel through port (HL) and passes through a Centrifugal Air Strainer with Drain Cock (A4). If the DV Isolating Cock (A5) mounted on the Valve Mounting Manifold assembly is opened, the BP pressure enters the C3W Distributor Valve (A2) via a BP test point (A13) and charges the Control Reservoir 6 litres (A3) via a CR test point (A14) and the Auxiliary Reservoir - 125 litres (B1). Externally the BP pressure charges into the BP Accelerator Valve (B12) through an Isolating Cock (B13). The BP pressure also enters the Emergency Exhaust Valve (B21) inlet port and charges the Passenger Emergency Alarm Pilot Valves (B6).

The Feed Pipe pressure enters the Brake panel through port (HBL) and passes through a Air Strainer (A4). Further, filtered air passes from the Strainer passes through a Pressure Switch assy (A10) and a FP test point (A13). If the Isolating Cock (A20) is opened, the air will charge into the Auxiliary Reservoir-125 litres (B7) to maintain continuous supply of compressed for braking purposes.

The air opens the Check Valve (A16) and charges the Auxiliary Reservoir-125 litres to the Feed Pipe pressure. If the Isolating Cock (A21) is opened, the air will leave the panel through port T of the Header which can be used for auxiliary equipment such as for door operation and flushing of toilets etc. The Feed Pipe pressure also enters the MR port of Relay Valve (A17) and Distributor valve (A2) and acts as a Main Reservoir supply to these devices.

### **5.1.8.2 BRAKE APPLICATION:**

When a Brake is applied, BP pressure is reduced in the system through the Driver's Brake Valve and BC pressure charges from the Distributor Valve (A2) into a Timing Volume Reservoir (A16) through a Choke and enters the signal port of the Relay Valve (A17) which in turn delivers the same pressure (1:1 pressure ratio). The output pressure from the Relay Valve (A17) leads to the Bogie Isolating Cocks BC1 and BC2 (Schematic ref. nos. A9 & A10 respectively). When the Cocks are opened the air leaves the panel through ports C1 and C2 and goes to the Actuators (B11) through the Dump Valves (D2) causing a brake application. The BC air also leaves the Panel through ports C1A and C2A and goes to the Double Brake Indicators (B9) through a dia 2 mm Choke. In this condition, window of the Brake Indicator shows a Red colour with a black stripe. When an emergency brake is applied, the BP Accelerator Valve (B12) vents the BP pressure through its exhaust port rapidly causing quicker brake application through the train. Whenever the Passenger Emergency Alarm Pilot Valve handle is pulled, the BP pressure vents at its exhaust port and causes the Emergency Exhaust Valve (B6) to open and thereby vent the BP pressure continuously to cause a brake application. Using the resetting key, the Passenger Emergency Pilot Valve can be reset to stop venting of BP air through the Emergency Exhaust Valve.

### **5.1.8.3 BRAKE RELEASE:**

When the Brake is released, BP pressure is again charged into the system thereby releasing the brakes. Venting the control BC pressure takes place through the DV and the actual BC pressure at the Relay Valve Exhaust port. After release, the windows of the Brake Indicators turn to Green colour signaling a brake release.

### **5.1.9 EQUIPMENT INTERCHANGEABILITY:**

Unit-wise inter-changeability is provided for the following equipment with M/s Knorr Supplies:

1. Brake Control rack assy (A0)
2. Distributor Valve (A2), together with its Integral Sandwich Piece, Relay, Timing Volume & Intermediate plate
3. Brake Pipe Accelerator Valve with Pipe Bracket (B12)
4. Double Brake Indicators (B9) \*
5. Passenger Emergency Alarm Pilot Valve (B6) \*
6. Emergency Exhaust Valve (B21)
7. Isolating Cock (B13)
8. WSP Dump Valves with mounting brackets & Sealing Rings (D2)
9. BP & FP Hoses (B4 & B5)
10. Angle Cocks (B3 & B8)
11. Actuator Hoses (B11)

\* Two sets of holes are drilled in the mounting location of these two devices to provide unit-wise inter-changeability.

### **5.1.10 TEST SPECIFICATION FOR BRAKE MODULE**

TO PART NO. 0400080 00 & 0400085 00

#### **1.0 EQUIPMENT REQUIRED:**

- Pneumatic test stand - RBTR
- Bulb Indication unit to be connected to a Micro Switch for the purpose of verifying the operation of the flasher lights provided in the coach.
- Precision Pressure Gauge (0-10 kg/cm<sup>2</sup>) for connection at CR test point with flexible connection.
- Precision Pressure Gauge for connection at Reservoir 125 ltrs., Drain Cock outlet.
- Stopwatch
- Supply of clean, dry pressure air at a minimum of 8 kg/cm<sup>2</sup> pressure.

#### **RELEVANT DRAWINGS OF**

1. LHB Coach Pneumatic schematic
2. LHB Brake Container Assembly

#### **Note:**

- a) Items numbered with a suffix (F) in the following paragraphs are on the Brake Container. Those without suffixes are on test equipment.
- b) During the course of testing, wait for 2 minutes for the system to charge for a successive brake application and release.
- c) The test specification broadly covers the following features of the system.
  1. Pre-test
  2. Reservoir charging
  3. Sealing test
  4. Full brake application
  5. Release full brake application
  6. Emergency application
  7. Release Emergency brake application
  8. Graduated brake application and release
  9. Pressure governor for anti-skid device
  10. Sealing test Feed Pipe (HB)

11. Normal service with Feed Pipe (HB)
12. Control of indicating devices
13. Control of the insensitivity
14. Control of sensitivity
15. First brake stop
16. Reactivating of quick service feature
17. Emergency brake by passenger

## 2.0 BRAKE PIPE CHARGING:

- Use clean dry air supply of 0.0 to 8.0 kg/cm<sup>2</sup>. Close all Cocks on Test Stand and in Brake Container. Keep the handle of A9 Brake Valve in release position.
- Regulate the pressure in A9 Brake Valve such that gauge G2 reads 5.0 kg/cm<sup>2</sup> and open Cock C2 & C10. Gauge G 6 will charge to 5.0 kg/cm<sup>2</sup>. Ensure air is present at BP pressure test point A13 (F). Fix a pressure gauge in the test point to note the pressure. It should read 5.0 kg/cm<sup>2</sup>.

## 3.0 CHARGING TIME:

- Move the BP Isolating Cock A5 (F) to open position. Control Reservoir and Auxiliary Reservoir will get charged. While charging, note down the timing to charge from 0.0 to 4.8 kg/cm<sup>2</sup> in single pipe mode only. After charging is complete and the specified pressures have stabilised in AR and CR the system has to be changed over to twin pipe mode. The charging times should be between as under.

CR charging time	-	165 ± 20 secs
AR charging time	-	175 ± 30 secs

- Ensure air is present at CR pressure test point A14 (F). Fix a Pressure Gauge in this test point to note down the pressure. It should read 5.0 kg/cm<sup>2</sup>. Ensure there is no air pressure in FP test point.
- Using Regulator R1, set the pressure in gauge G1 to 6.0 kg/cm<sup>2</sup>. Open Cock C1 (for continuous feeding).
- Ensure air is present at FP test point A13 (F). Fix a Pressure Gauge in the test point and note the pressure. It should read 6.0 ± 0.1 kg/cm<sup>2</sup>. Open Cock A20 (F) & A21 (F). The pressure in gauge G5 & AR gauge will charge to 6.0 ± 0.1 kg/cm<sup>2</sup>.

**Note :** The pressure in AR gauge will begin to rise from 5.0 kg/cm<sup>2</sup> only after gauge G5 has reached to 5.0 kg/cm<sup>2</sup>.



#### **4.0 BRAKE CONTAINER ASSEMBLY LEAK TIGHTNESS:**

- Allow the system to settle for 2 minutes and close Cock C1 and C2 and start timing Max.leakage allowed on any of the gauges G6, G5, CR & AR is 0.15 kg/cm<sup>2</sup> in 3 minutes.
- Open the Drain Cock fitted in 75 ltrs Reservoir and observe Gauge G5 that the Pressure Switch contacts at  $1.3 \pm 0.1$  kg/cm<sup>2</sup> (falling pressure). Close the Drain Cock of 75 ltrs Reservoir and open Cock C1 slowly and note that the gauge G5 contacts at  $1.8 \pm 0.1$  kg/cm<sup>2</sup> (rising pressure).
- Open Cock C1 & C2 fully and allow the system to charge.
- Open Cock A9 (F) of BC1 and A9 Brake Valve (F) of BC2 & Cocks C6 and C7. Ensure the BC pressure in both the gauges G7 and G8 reads 0.0 kg/cm<sup>2</sup>.

#### **5.0 DOUBLE BRAKE INDICATOR FUNCTIONAL & LEAKAGE TEST UNDER FULL SERVICE AND RELEASE:**

- Move the A9 Brake Valve Handle to full-service position and observe the following:
- BC Pressure in gauges G7 and G8 should increase to  $3.8 \pm 0.1$  kg/cm<sup>2</sup>. During the increase of pressure, note down the time taken to charge from 0 to 3.6 kg/cm<sup>2</sup>. This should be within 3 to 5 secs. Open Cocks C4 and C5. The windows of both Double Brake Indicators should turn to red colour. Check for leaks in the exhaust ports in Relay Valve and DV.No leaks permitted for one minute.

#### **6.0 BOGIE ISOLATION TEST :**

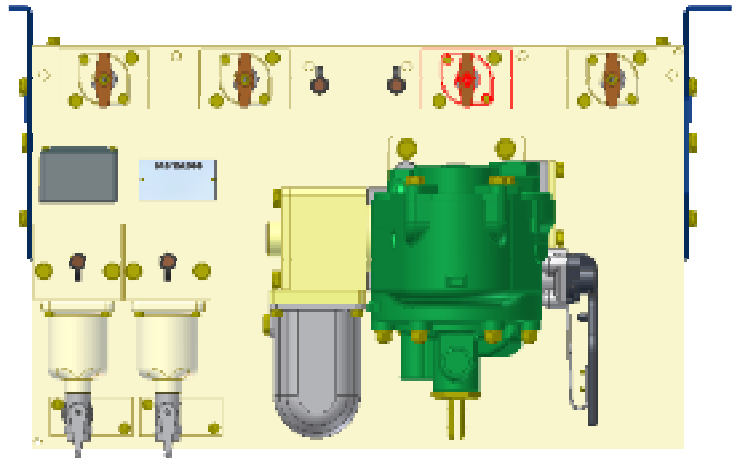
- Close Cock A9 (F) of BC1. The pressure in gauge G7 will fall to 0 kg/cm<sup>2</sup>. The first window alone, of both the Double Brake indicators will turn to green colour. Close Cock A9 (F) of BC2. The pressure in gauge G8 will fall to 0 kg/cm<sup>2</sup>. Now the second window of both the Double Brake Indicators will turn to green colour.
- Open Cock A9 Brake Valve (F) of BC1. The pressure in gauge G7 will rise to  $3.8 \pm 0.1$  kg/cm<sup>2</sup>. The first window alone, of both the Double Brake Indicators will turn to red colour. Open Cock A9 Brake Valve (F) of BC2. The pressure in gauge G8 will rise to  $3.8 \pm 0.1$  kg/cm<sup>2</sup>. Now the second window of both the Double Brake Indicators will turn to red colour.
- Move A9 Brake Valve Handle to release position and observe the following:
  - Pressure in gauges G2 & G6 will charge to 5 kg/cm<sup>2</sup>.

- Pressure in gauges G7 and G8 will drop down to 0 kg/cm<sup>2</sup>. During the dropping of pressure, note down the time taken for dropping of pressure from the maximum pressure to 0.4 kg/cm<sup>2</sup>. This should be between 15 and 20 secs.
- The windows of both the Double Brake Indicators should turn back to green colour. Check for leaks in the exhaust ports in panel. No leaks permitted for one minute.
- Close Cock A9 (F) of BC1.
- Move the A9 handle to full-service application position and observe the following:
  - Pressure in gauge G8 should increase to  $3.8 \pm 0.1$  kg/cm<sup>2</sup>. During the increase of pressure, note down the time taken to charge from 0 to 3.6 kg/cm<sup>2</sup>. This should be between 3 and 5 secs. The second window alone, of both the Double Brake Indicators will turn to red colour.
- Move A9 Brake Valve Handle to release position and observe the following:
  - Pressure in gauges G2 & G6 will charge to 5 kg/cm<sup>2</sup>.
  - Pressure in gauge G8 will drop down to 0 kg/cm<sup>2</sup>. During the dropping of pressure, note down the time taken for dropping of pressure from maximum pressure to 0.4 kg/cm<sup>2</sup>. This should be between 15 and 20 secs
  - The second window alone, of both the Double Brake Indicators will turn to green colour
- Close Cock A9 (F) of BC2 and open Cock A9 (F) of BC1.
- Move the A9 Brake Valve Handle to full-service application position and observe the following:
  - Pressure in gauge G7 should increase to  $3.8 \pm 0.1$  kg/cm<sup>2</sup>. During the increase of pressure, note down the time taken to charge from 0 to 3.6 kg/cm<sup>2</sup>. This should be between 3 and 5 secs.
  - The first window alone of both the Double Brake Indicators will turn to red colour.
- Move A9 Brake Valve Handle to release position and observe the following:
  - Pressure in gauges G2 & G6 will charge to 5 kg/cm<sup>2</sup>.

- Pressure in gauge G7 will drop down to 0 kg/cm<sup>2</sup>. During the dropping of pressure, note down the time taken for dropping of pressure from maximum pressure to 0.4 kg/cm<sup>2</sup>. This should be between 15 and 20 secs.
- The first window of both the Double Brake Indicators will turn to green colour.
- Open Cock A9 (F) of BC2

## 7.0 EMERGENCY APPLICATION & RELEASE, DOUBLE BRAKE INDICATOR FUNCTION TEST:

- Move A9 Brake Valve Handle to Emergency position and observe the following.
  - Pressure in gauges G2 & G6 will reduce to 0 kg/cm<sup>2</sup>.
  - Pressure in gauges G7 & G8 should increase to  $3.8 \pm 0.1$  kg/cm<sup>2</sup>. During the increase of pressure, note down the time taken to charge from 0 to 3.6 kg/cm<sup>2</sup>. This should be between 3 and 5 secs.
  - The windows of both Double Brake Indicators should turn to red colour.
- Move A9 Brake Valve Handle to release position and observe the following:
  - Pressure in gauges G2 & G6 will charge to 5 kg/cm<sup>2</sup>.
  - Pressure in gauges G7 & G8 will drop down to 0 kg/cm<sup>2</sup>. During the dropping of pressure, note down the time taken for dropping of pressure from maximum pressure to 0.4 kg/cm<sup>2</sup>. This should be between 15 and 20 secs.
  - The windows of both Double Brake Indicators should turn to green colour.



## 8.0 OVERCHARGE PROTECTION TEST:

- Move A9 Brake Valve Handle to emergency position. On gauges G2 & G6, pressure will reduce to 0 kg/cm<sup>2</sup>. On gauges G7 and G8, it will rise to  $3.8 \pm 0.1$  kg/cm<sup>2</sup>.
- Close Cock C10.
- Open Cock C3. Gauge G6 will rise to 6 kg/cm<sup>2</sup>. Gauges G7 and G8 will begin to fall. Note that the pressure in the CR at test point gauge [A14 (F)]. It should not get overcharged within 10 secs. The timing should be started at once the Cock C3 is opened.
- Close Cock C3. Move A9 Brake Valve Handle to release position and open Cock C10. Gauge G6 will read 5 kg/cm<sup>2</sup>. Meanwhile the pressure in CR also will fall to 5 kg/cm<sup>2</sup> (if not pull the DV Operating Lever briefly to bring it to 5 kg/cm<sup>2</sup>).
- Pull the Operating Lever of the DV quickly for 1 sec. The pressure in CR should not drop. Even if it drops it should charge back to 5 kg/cm<sup>2</sup>.

## 9.0 PARTIAL BRAKING TEST:

- Move A9 Brake Valve Handle to full-service application position. Pressure in gauges G7 & G8 should increase to  $3.8 \pm 0.1$  kg/cm<sup>2</sup>.
- Pull the Operating Lever briefly. Pressure in Gauges G7 & G8 will drop and stabilize (BC pressure should not drop more than 1 kg/cm<sup>2</sup> from maximum pressure).
- Move A9 Brake Valve Handle to release position. Pressure in gauges G2 & G6 will charge back to 5 kg/cm<sup>2</sup>.

## 10.0 SENSITIVITY TEST:

- Close Cock C2. Fit a Choke in Cock V3 to reduce the pressure in gauge G6 at the rate of 0.6 kg/cm<sup>2</sup> in 6 secs. The pressure in gauges G7 & G8 should start to rise within 6 secs.
- Close Cock V3 and open Cock C2. Gauges G6 should charge back to 5 kg/cm<sup>2</sup>.

### 11.0 INSENSITIVITY TEST:

- Close Cock C2. Fit a Choke in Cock V3 to reduce the pressure in gauge G6 at the rate of 0.4 kg/cm<sup>2</sup> in 60 secs. Gauges G7 & G8 should not rise.
- Close Cock V3 and remove the Choke.

### 12.0 RE-FEEDING TEST:

- Open Cock C2. Fit a 2 mm Choke in Cock V6. Move A9 Brake Valve to Full service application position. The pressure in gauges G7 & G8 will rise to  $3.8 \pm 0.1$  kg/cm<sup>2</sup>. Now open Cock V6. The pressure in gauge G7 will drop initially and stabilise. Close Cock V6 and remove the Choke from Cock V6 and screw into Cock V5. Open Cock V5. The pressure in gauge G8 will drop initially and stabilise. Close Cock V5. Move A9 Brake Valve Handle to release position.

### 13.0 GRADUATED APPLICATION & RELEASE:

- Brake Cylinder pressure increase should be attained when Brake Pipe pressure is reduced in steps. The reduction in BP pressure can be observed in gauge G6 by opening Cock V3 after closing Cock C2. The BC pressure increase can be seen in gauges G7 & G8.
- Close Cock V3 and open Cock C2 slowly and partly for checking the graduated release during which gauge G6 will show an increase in reading and gauges G7 & G8 will fall in pressures.

### 14.0 CHECKING BRAKE INDICATORS DURING RE-FEEDING TEST:

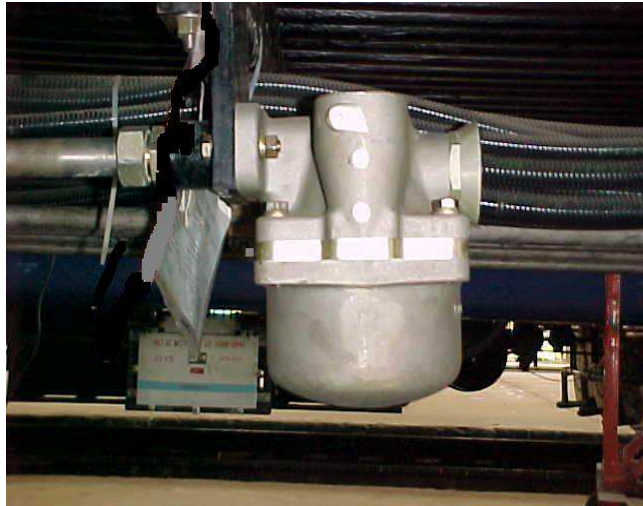
- Open Cock C2. Make a full service application at the A9 Brake Valve and open Cock V7. Pressure in gauge G7 should not fall (the colour in the first window of both the Double Brake Indicators will turn into green and the second window of both the Brake indicators will continue to be red). Close Cock V7. The colour in the first window of both the Brake Indicators will turn to red. Open Cock V8. Pressure in gauge G8 should not fall (the colour in the second window of both the Brake Indicators will turn to green & the first window of both the Brake Indicators will continue to be red). Close Cock V8.



- The colour in the second window of both the Brake Indicators will turn to red. Move A9 Brake Valve Handle to release position. The pressure in gauges G7 and G8 will fall to 0.0 kg/cm<sup>2</sup>. The colour in both the Brake Indicators will turn to green.

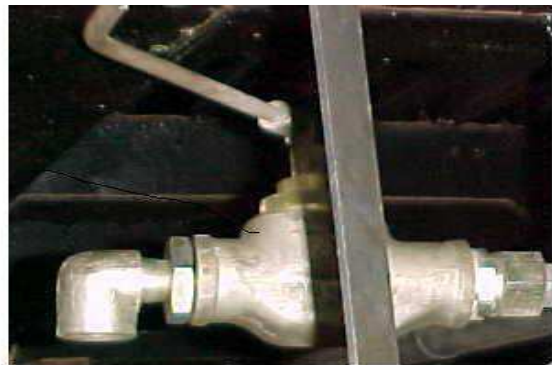
### 15.0 BRAKE PIPE ACCELERATOR VALVE TEST:

- Open Cock C8. Gauge G3 rises to 5 kg/cm<sup>2</sup>. Wait approximately 2 minutes to allow the volume in Accelerator Valve to charge. Move A9 Brake Valve Handle to full-service application position. Brake application will take place. Using soap suds check the exhaust port of BP Accelerator Valve for any leakage. No leaks permitted for one minute.
- Move A9 Brake Valve Handle to release position. Gauges G6 & G3 will charge to 5 kg/cm<sup>2</sup>. Wait approximately 2 minutes to allow the volume in Accelerator Valve to charge. Move the A9 Brake Valve Handle to emergency position. Gauge G3 will fall to 0 kg/cm<sup>2</sup>. Brake application will take place. Observe a sudden blast of air from the exhaust port of the Accelerator Valve.
- Move A9 Brake Valve Handle to release position. G3 will rise to 5 kg/cm<sup>2</sup>. Close Cock C8 and open Cock V4. Gauge G3 will fall to 0 kg/cm<sup>2</sup>. Close Cock V4.



### 16.0 TEST FOR EMERGENCY EXHAUST VALVE AND PILOT VALVE FOR PASSENGER ALARM:

- Open Cock C9. The air will enter into the Emergency Exhaust Valve inlet port and in turn will feed the Pilot Valve for Passenger Alarm through its signal port.
- Pull the Handle of the Pilot Valve. Immediately the Exhaust Valve will exhaust air through the delivery port. Gauge G6 will fall below 2.5 kg/cm<sup>2</sup>. Gauges G7 & G8 will rise to 3.8 ± 0.1 kg/cm<sup>2</sup>. Simultaneously, the light in the flasher unit will glow.
- Using the Re-setting Key reset the



Pilot Valve. The illumination in the flasher unit will turn off. The exhaust in the Emergency Exhaust Valve will also stop and the pressure in the Gauges G7 & G8 will fall to 0 kg/cm<sup>2</sup>. Gauge G6 will rise to 5 kg/cm<sup>2</sup>. The same test should be carried out for all the five numbers of Pilot Valves for Passenger Alarm.

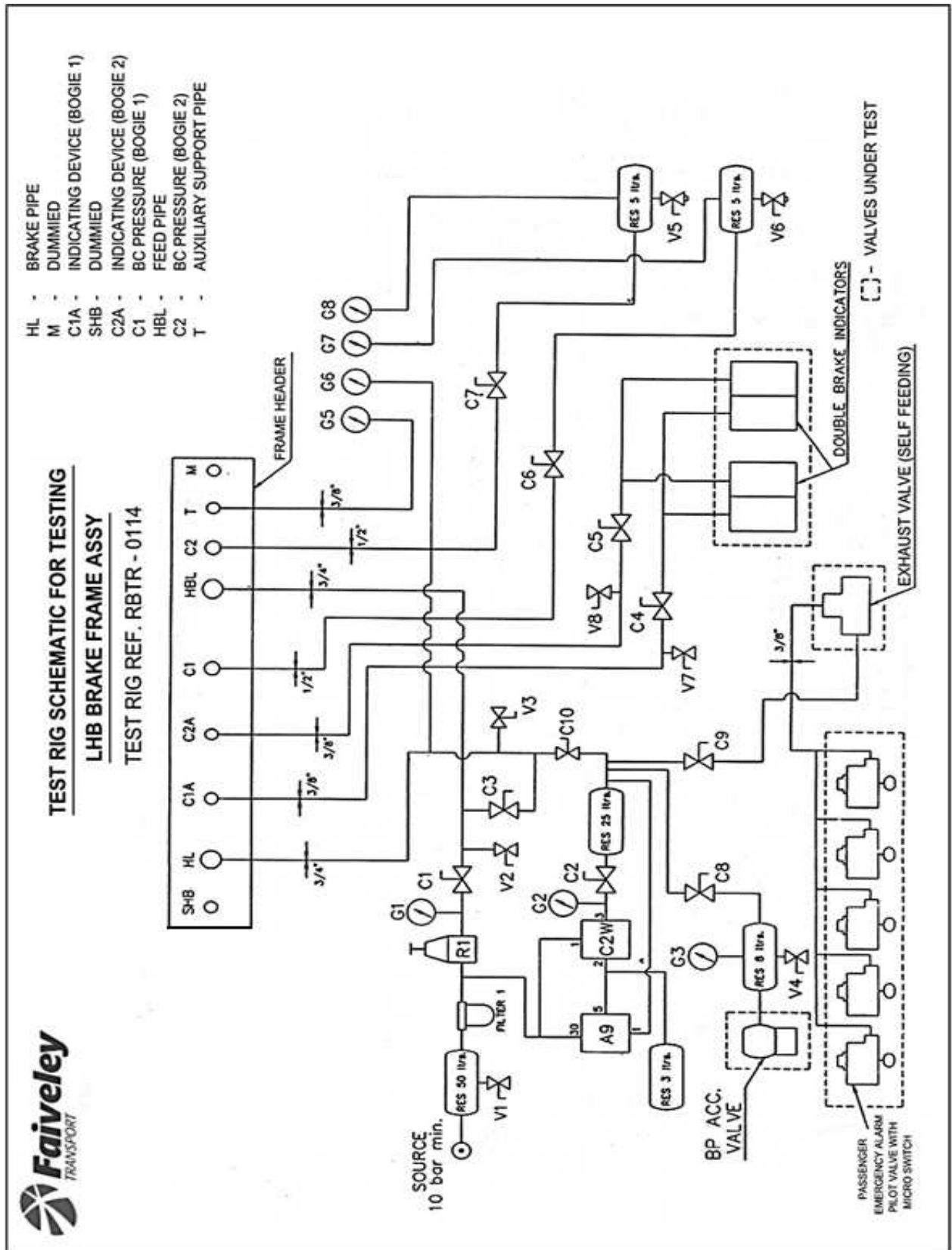
- Close Cock C9 and again pull the Pilot Valve Handle. Air will be vented from the Exhaust Valve. Reset the Pilot Valve.

#### **17.0 BRAKE PIPE ISOLATING COCK TEST:**

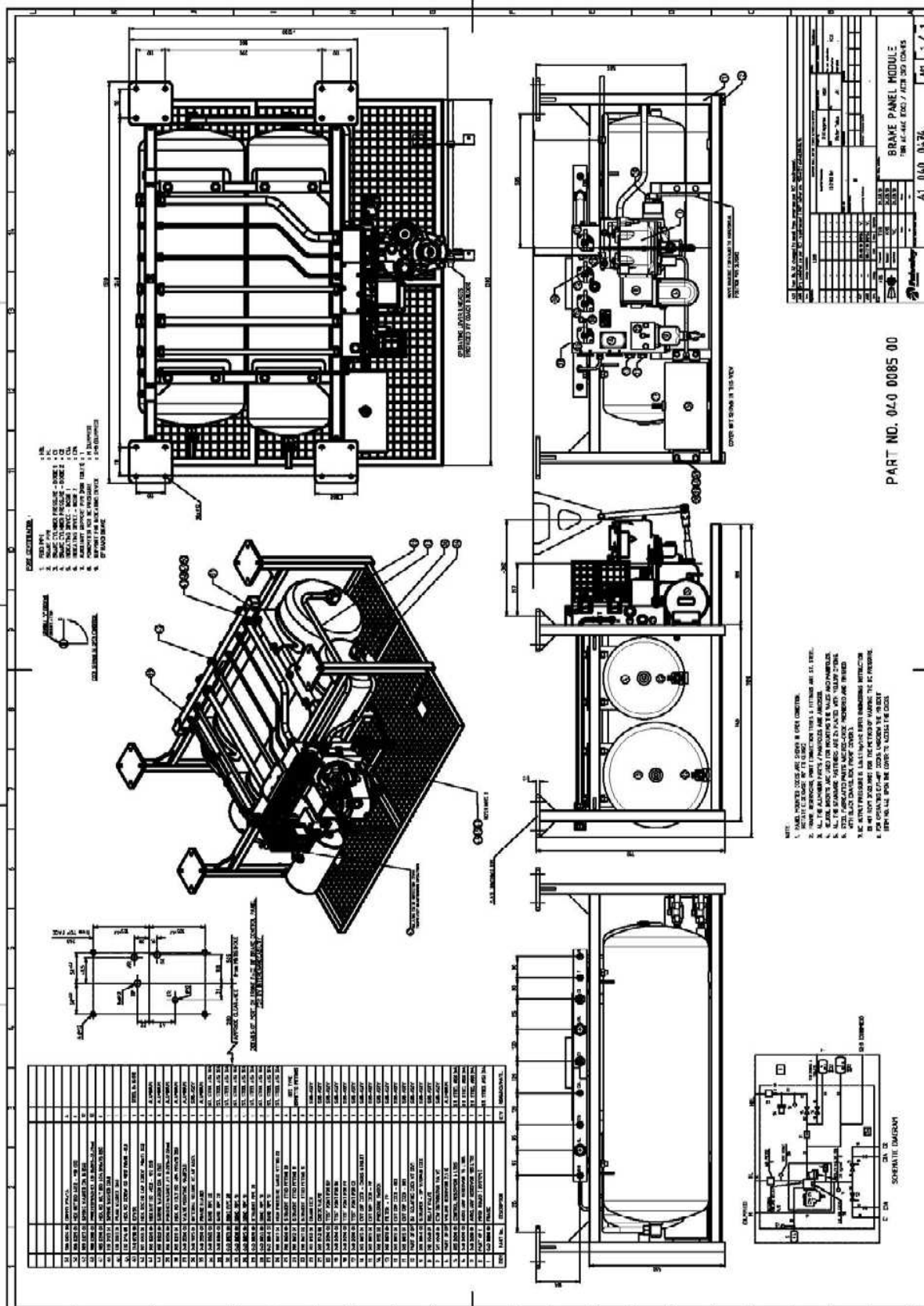
- Move the BP Isolating Cock A5 (F) to close position. Air will vent through the exhaust of Isolating Cock on the Integral Sandwich Piece). Meanwhile, the gauges G7 and G8 will charge to  $3.8 \pm .01$  kg/cm<sup>2</sup>.
- Move the Isolating Cock A5 (F) to open position. Gauges G7 & G8 will fall to 0 kg/cm<sup>2</sup>.

#### **18.0 AUTOMATIC RELEASE TEST:**

- Move the Handle of A9 Brake Valve to emergency application position. Gauges G7 & G8 will charge to  $3.8 \pm 0.1$  kg/cm<sup>2</sup>. Pull the Operating Lever briefly. Air pressure in the CR gauge, G7 & G8 will fall to 0 kg/cm<sup>2</sup>.
- If all the above tests have passed, close all the Cocks in the Brake Container and drain the system.
- Provide closure / sealing tape on the pipe openings till its fitment to prevent entry of foreign matter. Ensure Closure Plug / Sealing Tape is removed before making air connections during coach installation.









## Parts List

### Brake Panel Module for for PC & SLR COACHES - 040 0080 00

Item No.	FTIL Part No.	Description	Qty
1	040 8800 00	Brake Frame	1
2	PART OF 1	Mesh Guard	1
3	040 2610 00	Auxiliary Reservoir 125 ltrs	1
4	040 2620 00	Auxiliary Reservoir 75 ltrs	1
5	605 2630 00	Control Reservoir 6 ltrs	1
6	040 2100 00	Timing Reservoir 1.5 ltrs	1
7	501 0040 00	C3W Distributor Valve Assembly	1
8	018 0040	Relay Valve Assembly	1
9	009 0040 00 00	Strainer for BP	1
10	PART OF DV	BP Isolating Cock	1
11	003 0015 00	Cut Off Cock – BC1	1
12	003 0015 00	Cut Off Cock – BC2	1
13	009 0070 00	Strainer FP	1
14	006 1195 00	Pressure Switch	1
15	003 0015 00	Cut Off Cock – FP	1
16	003 0015 00	Cut Off Cock – Doors & Toilets	1
17	040 2090 00	Test Point – CR	1
18	040 2090 00	Test Point - FP	1
19	040 2090 00	Test Point – BC	1
20	040 2090 00	Test Point – BP	1
21	006 1142 00	Check Valve	2
22	703 0102 00	Drain Cock for Reservoirs (75 & 125 ltrs)	2
23	936 0611 00	Straight Stud Fitting 10	19
24	936 0612 00	Straight Stud Fitting 18	6
25	936 0606 00	Straight Stud Fitting 28	6
26	936 0617 00	High Pressure Banjo Fitting 22 BSP	2
27	040 8820 00	BEND PIPE 10	1
28	040 8840 00	BEND PIPE 10	1
29	040 8855 00	BEND PIPE 18	2
30	040 8870 00	STRAIGHT PIPE 28	1
31	040 8825 00	BEND PIPE 10	1
32	040 8830 00	BEND PIPE 10	1
33	040 8875 00	BEND PIPE 28	1
34	040 8835 00	BEND PIPE 10	2
35	040 8845 00	BEND PIPE 10	1
36	040 8860 00	BEND PIPE 22	1
37	040 8865 00	BEND PIPE 10	1

<b>Item No.</b>	<b>FTIL Part No.</b>	<b>Description</b>	<b>Qty</b>
38	040 3550 00	Frame Header	1
39	040 1075 00	INTEGRAL VOLUME RELAY ASSY.	1
40	040 2500 00	Valve Mounting Manifold	1
41	905 0318 00	HEX. HD BOLT ISO 4014 M10x75 (SS)	8
42	908 0206 00	PUNCHED WASHER A11 IS:2016 (SS)	16
43	909 0229 00	SPRING WASHER DIA 10 (SS)	16
44	906 0205 00	HEX NUT ISO 4032 - M10 (SS)	8
45	901 0398 00	HEX. SOC HD CAP SCREW M8x75 (SS)	6
46	905 0271 00	RESERVOIR 5 LTRS	1
47	040 8710 00	COVER	1
48	920 0114 00	HEX. HD SCREW ISO 4017 M8x18 - 8.8	1
49	908 0090 00	PLAIN WASHER DIA8	1
50	909 0183 00	SPRING WASHER DIA8	1
51	905 0390 00	HEX. HD BOLT ISO 4014 M16x75 (SS)	8
52	908 0208 00	PUNCHED WASHER A18 IS:2016-St.Steel	12
53	909 0227 00	SPRING WASHER DIA 16 (SS)	12
54	906 0229 00	HEX NUT ISO 4032 - M10 (SS)	8

## Parts List

### Brake Panel Module for AC-NAC (EOG) / ACCN (SG) COACHES - 040 0085 00

Item No.	FTIL Part No.	Description	Qty
1	040 8800 00	Brake Frame	1
2	PART OF 1	Mesh Guard	1
3	040 2610 00	Auxiliary Reservoir 125 ltrs	1
4	040 2620 00	Auxiliary Reservoir 75 ltrs	1
5	605 2630 00	Control Reservoir 6 ltrs	1
6	040 2100 00	Timing Reservoir 1.5 ltrs	1
7	501 0040 00	C3W Distributor Valve Assembly	1
8	018 0040	Relay Valve Assembly	1
9	009 0040 00 00	Strainer for BP	1
10	PART OF DV	BP Isolating Cock	1
11	003 0015 00	Cut Off Cock – BC1	1
12	003 0015 00	Cut Off Cock – BC2	1
13	009 0070 00	Strainer FP	1
14	006 1195 00	Pressure Switch	1
15	003 0015 00	Cut Off Cock – FP	1
16	003 0015 00	Cut Off Cock – Doors & Toilets	1
17	040 2090 00	Test Point – CR	1
18	040 2090 00	Test Point - FP	1
19	040 2090 00	Test Point – BC	1
20	040 2090 00	Test Point – BP	1
21	006 1142 00	Check Valve	2
22	703 0102 00	Drain Cock for Reservoirs (75 & 125 ltrs)	2
23	936 0611 00	Straight Stud Fitting 10	8
24	936 0612 00	Straight Stud Fitting 18	6
25	936 0606 00	Straight Stud Fitting 28	6
26	936 0617 00	High Pressure Banjo Fitting 22 BSP	2
27	040 8840 00	BEND PIPE 10	1
28	040 8855 00	BEND PIPE 18	1
29	040 8870 00	STRAIGHT PIPE 28	1
30	040 8825 00	BEND PIPE 10	1
31	040 8830 00	BEND PIPE 10	1
32	040 8875 00	BEND PIPE 28	1
33	040 8860 00	BEND PIPE 10	1
34	040 8865 00	BEND PIPE 10	1
35	040 3550 00	Frame Header	1
36	040 1075 00	INTEGRAL VOLUME RELAY ASSY	
37	040 2500 00	Valve Mounting Manifold	1

<b>Item No.</b>	<b>FTIL Part No.</b>	<b>Description</b>	<b>Qty</b>
38	905 0318 00	HEX. HD BOLT ISO 4014 M10x75 (SS)	4
39	908 0206 00	PUNCHED WASHER A11 IS:2016 (SS)	8
40	909 0229 00	SPRING WASHER DIA 10 (SS)	8
41	906 0205 00	HEX NUT ISO 4032 - M10 (SS)	4
42	901 0398 00	HEX. SOC HD CAP SCREW M8x75 (SS)	6
43	040 8710 00	COVER	1
44	920 0114 00	HEX. HD SCREW ISO 4017 M8x18 - 8.8	1
45	908 0090 00	PLAIN WASHER DIA 8	1
46	909 0183 00	SPRING WASHER DIA 8	1
47	905 0390 00	HEX. HD BOLT ISO 4014 M16x75 (SS)	8
48	908 0208 00	PUNCHED WASHER A18 IS:2016-St.Steel	12
59	909 0227 00	SPRING WASHER DIA 16 (SS)	12
50	906 0229 00	HEX NUT ISO 4032 - M10 (SS)	8
51	936 0624 00	DUMMY M14x1.5	4

## **5.2 BRAKE PANEL (A1)**

### **5.2.1 INTRODUCTION**

The Brake Panel provided in the Brake panel module (Brake Frame) serves to mount compactly the brake and air system equipment other than located at special places in the Coach. The schematic drg of the Brake Panel portion with its devices is indicated by a dotted square in the overall schematic of the Coaching brake system.

The list of equipment contained in the Panel is indicated in the part no. drg/ parts list attached.

### **5.2.2 CONSTRUCTION**

The brake frame comprises a valve mounting manifold to which components and subassemblies are attached. The components are positioned in convenient and compact groups and pneumatic interconnections are formed by drilling within the valve mounting manifold.

The valve mounting manifold is constructed from high grade aluminium alloy which is anodized after machining.

All pneumatic assemblies are constructed from corrosion resistant aluminium alloy and with internal components, e.g. Valve Stems, Springs, etc., of Stainless Steel. Valve Finished faces are of hard synthetic rubber with ground faces. The Valves are operated by means of self-seating moulded synthetic rubber Diaphragms, which are fully supported over their working surfaces.

Components are mounted to the outer face of a valve mounting manifold using O Ring Joints to seal the interface connections.

A Header mounted at the top of the Brake Panel forms an interface connection with the Header of Brake Container of the Coach pneumatic system. This is indicated in the part identification given in the drawings.

### **5.2.3 LOCATION OF COMPONENTS**

The physical location of all the components on the progressive three panels is shown in the respective part drawings attached.

Port identification for the input / output air connections with the Brake Container is also indicated in the part drgs. In addition, test points wherever required are indicated.

#### **5.2.4 INSTALLATION**

The Brake Panel comprising the pneumatic system with pre-tested component installed in position has to be secured to the Brake Container.

The Brake Panel Header has to be connected with air pipelines as indicated in the port identification specified in the drawing.

The electrical connections from the Coaching circuit is to be given for the Pressure Switch (A10) separately.

#### **5.2.5 TESTING AFTER INSTALLATION**

As the Brake Panel forms part of Brake Container assembly, no separate test procedure is required since it is included in the Brake Container testing.

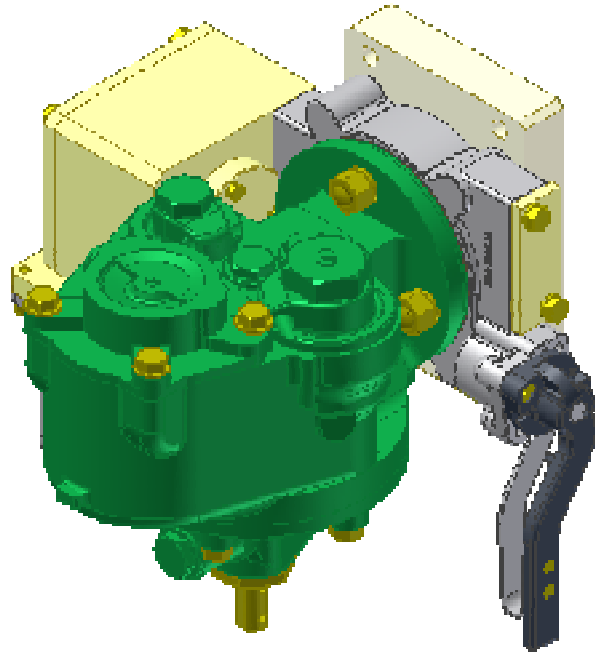


### 5.3 DISTRIBUTOR VALVE(FTILMake)

#### 5.3.1 INTRODUCTION

An UIC approved Distributor Valve type C3W IP is designed to work in conjunction with a Timing Volume and 1:1 Relay. **The existing standard Passenger Coach DV type C3WIP cannot work with the Relay and Timing Volume and hence, it can not be used with the Relay.** To prevent

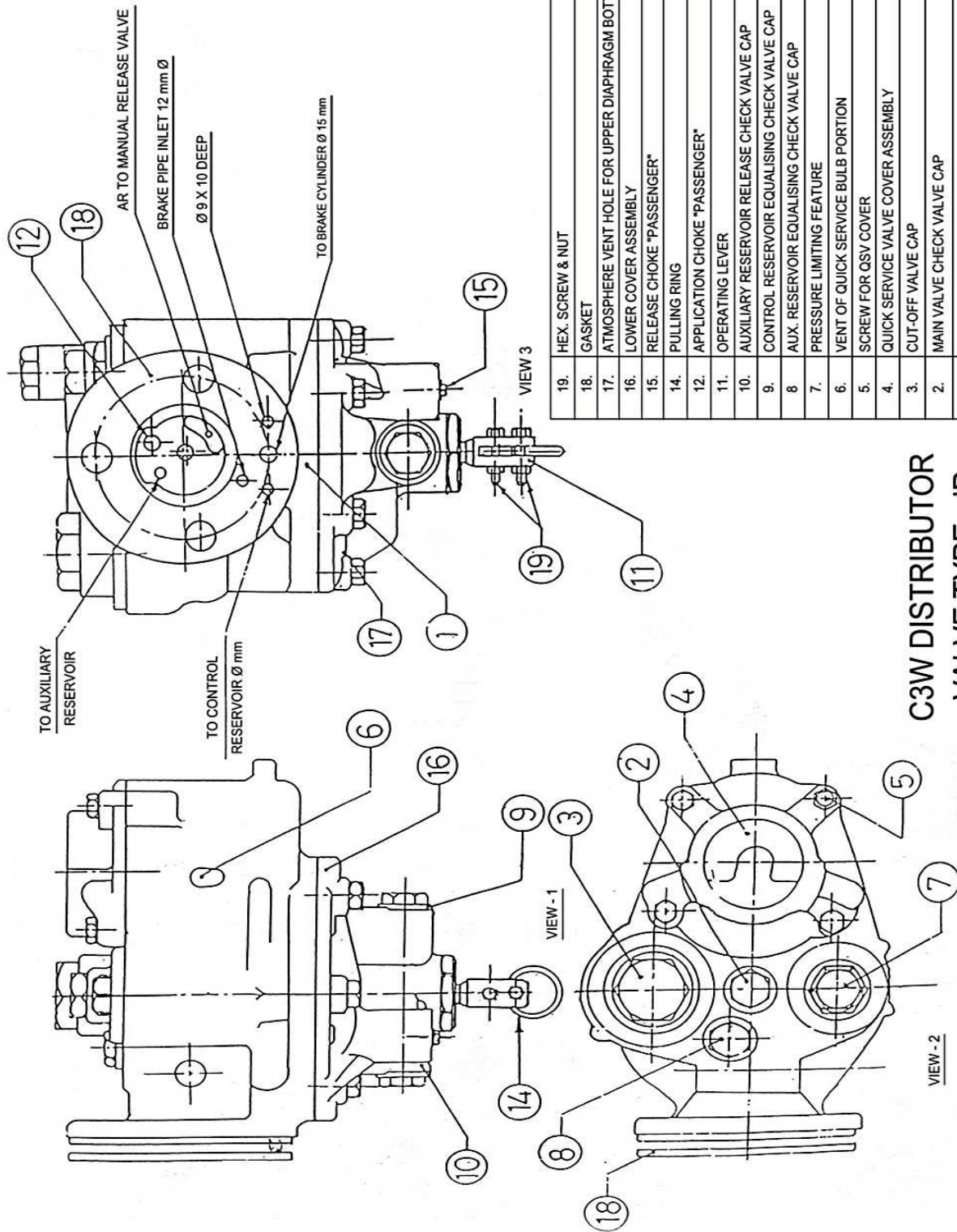
usage of the standard DVs in the Brake Frame, a Dowel Pin is provided on the Integral Volume Sandwich Piece, which will be received by a corresponding hole in the DV Flange. The DV functions to supply or exhaust the Brake Cylinder control pressure to the Relay in response to the changes in the regime Brake Pipe pressure towards decrease or increase respectively. When the regime pressure is restored and maintained at 5 kg/cm<sup>2</sup>, it withdraws the Brake Cylinder control pressure from the Relay to atmosphere and initiates the brake



release. The Distributor Valve gives a maximum BC pressure of 3.8 kg/cm<sup>2</sup> during full service or emergency application of Driver's Brake Valve when the Brake Pipe regime pressure is set at 5.0 kg/cm<sup>2</sup>. It incorporates a pressure limiting feature to ensure the control BC pressure is not exceeded beyond 3.8 kg/cm<sup>2</sup>, even in circumstances of Brake Pipe/ Control Reservoir getting overcharged due to

any reason beyond 5.0 kg/cm<sup>2</sup>. The DV together with the relay has application and release timings of a passenger brake system.

The following information is for combined assy of distributor valve with timing volume & also for individual assemblies.



**C3W DISTRIBUTOR  
VALVE TYPE - IP**

ITEM NO.	DESCRIPTION	QTY
19.	HEX. SCREW & NUT	2
18.	GASKET	1
17.	ATMOSPHERE VENT HOLE FOR UPPER DIAPHRAGM BOTTOM	4
16.	LOWER COVER ASSEMBLY	1
15.	RELEASE CHOKE "PASSENGER"	1
14.	PULLING RING	1
12.	APPLICATION CHOKE "PASSENGER"	1
11.	OPERATING LEVER	1
10.	AUXILIARY RESERVOIR RELEASE CHECK VALVE CAP	1
9.	CONTROL RESERVOIR EQUALISING CHECK VALVE CAP	1
8.	AUX. RESERVOIR EQUALISING CHECK VALVE CAP	1
7.	PRESSURE LIMITING FEATURE	1
6.	VENT OF QUICK SERVICE BULB PORTION	1
5.	SCREW FOR QSV COVER	4
4.	QUICK SERVICE VALVE COVER ASSEMBLY	1
3.	CUT-OFF VALVE CAP	1
2.	MAIN VALVE CHECK VALVE CAP	1
1.	MAIN BODY	1

### 5.3.2 GENERAL

This C3W Distributor Valve meets all the specifications laid down by UIC / RDSO and offers security, sensitivity and reliability for application to air brake system of LHB Coaches. The C3W Distributor Valve is of graduated release type.

### 5.3.3 MAIN CHARACTERISTICS

#### General Features of C3w Distributor Valve

- Compact and sturdy in construction.
- High Sensitivity
- Step less graduation in brake application and release
- High speed of propagation
- Maximum Brake Cylinder Pressure Limiting Device, independent of the BP regime pressure in case of Passenger Distributor Valve.
- Easy access to Chokes for cleaning and replacement.
- Confirms to UIC / RDSO specifications of graduated release Air brake system
- Suitable for both single pipe and twin pipe Air Brake System.

### 5.3.4 PERFORMANCE

The speed of propagation is in the order of 280 m / sec and is obtained by provision of a Quick Service Valve.

The brake is applied within 1.2 sec when Brake Pipe pressure drop is 0.6 bar in 6 secs (UIC No. 547).

The brake does not apply when Brake Pipe pressure drop is less than 0.3 bar in 60 secs. (UIC No. 547).

After full braking, Brake Pipe pressure can be increased to 6 bar with a view to obtain a faster brake release and a protective feature in Distributor Valve prevents the danger of overcharge of the Control Reservoirs from 5.0 Kg/cm<sup>2</sup> to 6 bar for a period of 25 secs min.

Brake application and release graduations of 0.1 bar are possible.

If the Brake Pipe regime pressure is set at 5.0 Kg/cm<sup>2</sup> , the Distributor Valve restricts Brake Cylinder pressure to  $3.8 \pm 0.1$  bar max, irrespective of the drop in Brake Pipe pressure or the Auxiliary Reservoir air pressure (provided it is sufficiently at a higher pressure than 3.8 bar even after repeated brake application in a single pipe system). However, after a brake application is made, full brake release is not achievable till the Brake Pipe pressure builds up to 4.85 bar.

Provision is made for release of brake on the vehicle (manual release) when brakes are fully applied. This is especially useful in marshalling operation by venting Control Reservoir air pressure. It is also possible to vent all the brake equipment air pressure fully. To operate this feature, the handle of Isolating cock on Sandwich Piece is to be moved to the close position and the release lever of the Distributor valve pulled briefly.

### **CAUTION**

- 1) Mere closing of Isolating Cock does not Release the brake in the vehicle.**
- 2) For complete venting of the system including the Auxiliary Reservoir, the Release lever should be held in pulled condition till the air exhaust stops.**

### **5.3.5 DESCRIPTION OF DISTRIBUTOR VALVE**

The Distributor Valve has air pipe connections to

Brake pipe (BP)

Auxiliary Reservoir (AR)

Control Reservoir (CR)

Brake Cylinder (BC)

The Distributor valve consists of major sub assemblies housed in a Body with their functions as under:

Main Valve

Cut off valve

Quick Service Valve

Auxiliary Reservoir Check Valve

Inshot valve

Application and release chokes

Double release valve

### 5.3.5.1 MAIN VALVE

(Ref. Fig 4.1 and Fig 5.1)

The Main Valve provides feeding & exhaust of the Brake Cylinder according to the Brake Pipe pressure variations during operations. It consists of two Diaphragms 6 and 27, a Check Valve 37, two springs 7 & 39, static and Dynamic Seals. The Valve 37 is controlled by the movement of Hollow Stem 30, the top part of which forms the exhaust seat. The valve 37 and Hollow Stem 30 jointly control the connection between Auxiliary Reservoir and Brake Cylinder (for application) or between Brake Cylinder and Exhaust port (for release). The upper face of Diaphragm 27 (top) is exposed to Brake Cylinder pressure and the opposite side to atmosphere through a vent in body. The upper face of Diaphragm 6 is exposed to Brake Pipe pressure and the lower face to Control Reservoir pressure.

When compressed air at a regulated pressure charges through Brake Pipe into the Distributor Valve, it passes first into the Cut off Valve from which it is regulated to charge into the Control Reservoir and simultaneously the Auxiliary Reservoir. The Brake Pipe air also is charged into the connected internal chambers in the Distributor Valve. With the system fully charged, a balanced state is achieved with the main diaphragm assembly in release position and the Main Check Valve (37) in closed condition. Any reduction of pressure in the Brake Pipe during brake application causes a depletion of pressure on top of the Main Valve Large Diaphragm (6) which is moved up due to the reference pressure of Control Reservoir at a constant level of 5 Kg/cm<sup>2</sup> acting underneath. This movement of the Diaphragm causes the Hollow Stem to lift the Main Check Valve and admit Auxiliary Reservoir pressure into the Brake Cylinders. The pressure in the Brake Cylinder increases in the ratio of areas of Diaphragms (27 & 6). Similarly, during brake release any pressure increase on the top side of the Large Diaphragm (6) results in a corresponding pressure reduction in the Brake Cylinder.

In order to limit the maximum Brake Cylinder pressure, the Large Diaphragm Follower is split into two parts and arranged concentrically, one as Large Piston (8) on top and the other a central Small Piston (10) overlapping one another. When a drop in Brake Pipe pressure is in excess of 1.5 Kg/cm<sup>2</sup>, the load on large piston (8) is cancelled due to physical obstruction of its collar with the Body. Only the Control Reservoir constant pressure acting on the Central Piston (10) forces against the Brake Cylinder pressure on the Diaphragm (27). With this a balance of Brake Cylinder pressure is then limited to 3.8 bar.

### 5.3.5.2 CUT OFF VALVE

(Ref. Fig 4. 1 and Fig 5.2)

The Cut Off Valve housed in body below cap connects the Brake Pipe air with Control Reservoir during charging through a Valve (68) fitted with calibrated choke Solex Jet (66) and this determines the charging time of Control Reservoir. It instantly “cuts off” this Control Reservoir pressure at the beginning of each brake application through a Valve (75) and restores the connection when brake release is nearing complete. The Cut Off Valve also controls the charging of compressed air into the Auxiliary Reservoir through Valve (71) which acting in conjunction with a seat formed in Plug (74) controls the charging of Auxiliary Reservoir.

The Cut Off Valve is principally composed of two Diaphragms (77) and (83) (Seal). The Seal (83) and Guide (86) (diaphragm and follower assembly) is subject to the Brake Cylinder pressure on the underside with its upper face being in communication to atmosphere. A Spring (85), which acts on Guide (86) (Follower) makes this to open Valve (75) by means of Push Rod (79).

The upper face of Diaphragm (77) with Follower (76) is subjected to Control Reservoir pressure and lower face to Brake Pipe. Thus Auxiliary Reservoir initial charging from Brake Pipe is piloted by Control Reservoir charging. The Cut Off Valve assembly as can be seen from the Fig 4.1, is a “Floating Cut Off Valve” on Diaphragm (77), which is acted upon by Control Reservoir pressure on the topside and the Brake Pipe pressure at the bottom. When a Brake Pipe pressure drop at the rate of 0.6 bar in 6 secs is made, the pressure of air under the Diaphragm (77) depletes at a much faster rate than the rate of flow of Control Reservoir air from the top face of the Diaphragm. This sudden pressure differential across the face of the Diaphragm (77) causes the Floating Cut Off Valve assembly to move down instantly losing contact with Push Rod (79). Due to the sudden downward movement, the Cut Off Valve (75) is pushed up by Spring (73) to close on its Valve Seat separating the Control Reservoir side from the Brake Pipe.

Similarly, if the Brake Pipe pressure depletion is at a much lower rate of 0.4 bar in 60 secs, the Brake Pipe pressure as well as the Control Reservoir pressure deplete together at a same rate keeping the Diaphragm (77) in a neutral position. Since there is a simultaneous drop of Control Reservoir pressure, no brake application will take place during such “insensitivity drop”.

### 5.3.5.3 QUICK SERVICE VALVE

(Ref. Fig 4.1 and Fig 5.3)

Quick service portion contains the bulb capacity and is closed by Cover Assembly (40). It facilitates to vent a determined volume of air of Brake Pipe pressure into the built-in-chamber (Bulb), whenever brake application is initiated and thus causes “a local sudden pressure depletion in the Distributor Valve”. This local pressure depletion is picked up by the next Distributor Valve in the vicinity in which also such similar local pressure depletion will be caused because of Brake Pipe pressure charging into the Quick Service Bulb. In this fashion, the initial depletion of pressure in the Brake Pipe is relayed from valve to valve in a train formation to propagate the signal of Brake Pipe pressure depletion. As could be seen, this Quick Service function is only for the initial Brake Pipe pressure depletion and is not for successive progressive Brake Cylinder pressure build up. The chamber (Bulb) is exhausted to atmosphere when the Brake Cylinder pressure drops near to 0.8 bar during brake release, to prepare the Distributor Valve for subsequent brake applications.

The Quick Service Valve basically consists of: (Fig 5.3)

- A Large Diaphragm (214) and Diaphragm Clamp (215) Assembly, whose upper surface is subjected to Control Reservoir pressure and the underside to Brake Pipe pressure.
- A Lip Seal (208) (Diaphragm) and a Washer (Follower) Assembly (209), whose faces are subjected during service condition to atmospheric pressure on the upper face and Brake Pipe pressure or Quick Service Bulb pressure on lower face.
- A Valve (204) fitted in Seat Holder and Seat Assembly (206) operates in conjunction with seats formed on the Seal Holder (212) and end of Guide Plunger (219). When operated by Guide Plunger (219), it facilitates to connect the Quick Service Bulb to Brake Pipe during brake application or to isolate it during release. The lower part of the Guide Plunger forms the vent port through which the bulb air is vented to atmosphere.
- A Valve Assembly (59) that prevents premature venting of the Quick Service Bulb to atmosphere during release as long as a certain amount of Brake Cylinder pressure is acting on it.

### 5.3.5.4 DOUBLE RELEASE VALVE

(Ref. Fig 4.1 and Fig. 5.1)

The Double Release Valve provides a manual release of brakes and is contained in the lower cover assembly. The valve by a single movement of operating lever with pull of the ring causes:

- Elimination of overcharge in the Control Reservoir on a vehicle whose brake is applied.
- Brake release when Brake Pipe is vented by exhausting the Control Reservoir.
- By continuous action of pulling the ring on the Operating Lever, complete venting of all brake equipment and system.

It consists basically of:

- Two Valves with Seals (11) & (18) which are held together against their seats by Springs (19). These valves isolate the Control and Auxiliary Reservoir from atmosphere.
- An Operating Lever which when operated lifts the spring seat and valve operator (pivot piece). This in turn tips open and vents to atmosphere the Control Reservoir pressure first through Valve (11) and then through Valve (18) Auxiliary Reservoir pressure, if the displacement continues.

The release device is located in Bottom Cover and consists of:

- A locking rod maintains the Valve (11) (Control Reservoir) in open position and prevents re-closing after a single action on operating lever i.e. if a manual release is carried out when the Brake Pipe pressure is lower than that in the Control Reservoir. When the Brake Pipe pressure is higher than the Control Reservoir pressure, a Ring (23) (under Diaphragm Follower) is moved downwards by Lower Diaphragm (6) and causes a trigger 2C (Fig. 5.1) to raise Latching Stem (2D). This releases Valve (11) (Control Reservoir) and allows it to re-close.



### **5.3.5.5 AUXILIARY RESERVOIR CHECK VALVE**

(Ref. Fig 4.1 & Fig 5.3)

This Check Valve permits recharge of Auxiliary Reservoir and prevents any flow back towards the Brake Pipe during brake application. The Cap (44) is provided with an 'O' Ring (99) as a sealing joint between Body and Cap.

### **5.3.5.6 PRESSURE LIMITING FEATURE**

(Ref. fig 4.2 and fig 5.4)

A separate attachment is provided on top of Inshot Valve to limit the Brake Cylinder pressure not to exceed beyond 3.8 bar, under any circumstances even if the Control Reservoirs are overcharged due to any reason above 5.0 bar. The arrangement is indicated in the sketch. The Spring (712) is adjusted to regulate the Brake Cylinder pressure to 3.8 bar during DV testing. The Pressure Limiting feature is controlled by Spring (712) which constantly exerts pressure on Guide (711) downwards. Due to this, the Valve Finished (223) and Spring (709) is continuously kept pressed down in the open condition. As and when BP reduction takes place, Main Valve is lifted allowing Auxiliary Reservoir pressure to enter the Inshot passage and passes through opening made by Valve Finished. The Auxiliary Reservoir air pressure further passes into the Brake Cylinder through the opening of Cup (710) into the bottom of Diaphragm (77). As the pressure increases under the Diaphragm, the Spring (712) assumes a position to close Valve Finished (223) on the Seat by the Spring (709), thereby cutting off the further air supply. With this feature, any pressure from Auxiliary Reservoir above 3.8 not allowed in the Brake Cylinder area.

### **5.3.6 OPERATION**

(Ref. Fig. 4.2)

#### **5.3.6.1 CHARGING AND RUNNING**

Compressed air at 5.0 Kg/cm<sup>2</sup> from Brake Pipe enters the following regions of Distributor Valve colored blue:

Chamber 2, the top side of Lower Large Diaphragm of Main Valve.

Chamber 7 of Cut Off Valve

Chamber 4, the lower side of the Upper Diaphragm of QSV (Quick Service Valve)

Chamber D, chamber below the inlet valve of QSV

Further, the air from chamber 7 of cut off valve charges through the Solex jet and valve (6) to fill the following regions coloured Yellow:

Chamber 1, the bottom side of Lower Large Diaphragm of Main Valve. The top side of the Lower Diaphragm of Cut Off Valve.

Chamber 3, the top side of the Upper Diaphragm side of QSV.

### Control reservoir (CR)

In addition, the air from chamber 7 lift the Check Valve (15) to fill the Auxiliary Reservoir, coloured Red. All the chambers mentioned above are brought to the charging pressure of 5.0 Kg/cm<sup>2</sup> . Due to the “zero pressure” differential across the Large Diaphragm of the Main Valve when Control Reservoir is fully charged, the Diaphragm Assembly will be in neutral position. This keeps the central passage of the Main Valve Stem (Hollow Stem 30) that leads to atmosphere, open to Brake Cylinder, as a gap by design will prevail between Main Valve Check Valve (37) and Hollow Stem end at top.

### 5.3.6.2 GRADUATED APPLICATION

When a reduction in BP pressure is caused by the Driver’s Brake Valve, the air pressure under the Diaphragm in chamber 5 of Cut Off Valve drops quickly. This makes the Diaphragm to flex down and closes the passage to the Control Reservoir, thus isolating it from BP. Due to the isolation of Control Reservoir in chambers 1 & 2 of Main Valve portion, a pressure difference is set across the Bottom Diaphragm (6) separating these two chambers causing a lift of the Hollow Stem to open the Inlet Valve (Main Check Valve). Then, air from Auxiliary Reservoir will flow into chamber 9 from where it is led into chambers 11 (Cut Off Valve portion) and 16 (QSV portion) and also to the bottom side of Inshot Valve. In chamber 11, the air pressure builds up under Diaphragm and lifts up, thereby withdrawing the Pin from Valve (6). In In shot Valve, air passes through the valve opening and also through “Application Choke” into Brake Cylinder.

This sudden rush of air into the Brake Cylinder will help to bring the brake rigging / shoes quickly to position. Air also enters chamber 10 and lifts the Diaphragm of Inshot Valve and closes the valve passage. A pressure of about  $0.5 \pm 0.2$  bar is enough to close the Inshot Valve passage. Once this passage is closed, air flows only through the Application Choke into the Brake Cylinder. In chamber 8 on top of the Upper Diaphragm of the Main Valve, the Brake Cylinder pressure builds up bringing the Diaphragm Assembly downwards and finally bringing the Inlet Check Valve to lap position. As soon as the balance is reached in this Diaphragm Assembly, no more air can flow into Brake Cylinder. Similarly, every time the Brake Pipe pressure is reduced in steps, the phenomenon will repeat and air from Auxiliary Reservoir will gradually flow into Brake Cylinder in corresponding steps. In case of full service application OR an emergency application, the maximum Brake Cylinder pressure that is required to balance the main valve diaphragm assembly is  $3.8 \pm 0.1$  bar with Brake Pipe regime pressure set at 5.0 Kg/cm<sup>2</sup> .

### 5.3.6.3 QUICK SERVICE APPLICATION

As soon as the Brake Pipe pressure is reduced, the pressure in chamber 4 under the Quick Service Bulb (QSB) Upper Diaphragm is reduced, causing the diaphragm assembly of the

bulb to move down to open Inlet Valve (13). Then air enters bulb 12 and builds up pressure under the Seal in chamber 17, developing an upward force on the Diaphragm Assembly. This sudden surge and filling up of a large volume of air into the additional space causes local pressure depression of about 0.4 bar in chamber 2 of the Main Valve, help in the quick propagation of the Brake Pipe pressure reduction through the length of train. The bulb is exhausted once the Brake Cylinder pressure reaches around 0.8 bar during the brake release operation. This facilitates quick service propagation should an application be made immediately.

#### **5.3.6.4 GRADUATED RELEASE**

When the pressure in Brake Pipe is increased, the balance in the Diaphragm Assembly in the Main Valve is upset due the pressure rise in chamber 2, causing the Piston Assembly to move downwards and thus opening the exhaust passage. Air from Brake Cylinder is released through passage of Hollow Stem and finally is let off to atmosphere through the “Release Choke” located inside Exhaust Protector.

#### **5.3.6.5 OVERCHARGE PROTECTION**

Pressure in chamber 11 of the Cut Off Valve under the Seal causes the guide to lift up, making the pin free. The guide will not come down till the Brake Cylinder pressure reaches as low a value as 0.2 bar and till such time the Valve (6) would be kept closed isolating Control Reservoir and eliminating overcharge into Control Reservoir.

#### **5.3.6.6 AUTOMATIC RELEASE**

When the Operating Lever is pulled briefly, the locking rod slides down and gets wedged in between Double Release Valve and its Seat, thereby facilitating draining of Control Reservoir air from chamber 1 and also all the connected chambers. This upsets the balance of the Diaphragm Assembly and opens the exhaust passage. Air pressure from Brake Cylinder and chamber 8 (upper portion of Top Diaphragm) is reduced till a new balance is achieved, thus facilitating a partial brake release. If the Operating Lever is pulled for a long time, the Double Release Valve in the Lower Cover will be moved off from their seats permitting complete draining of the entire system.

**FIG 4.1 – CHARGING AND NORMAL RUNNING CONDITION**

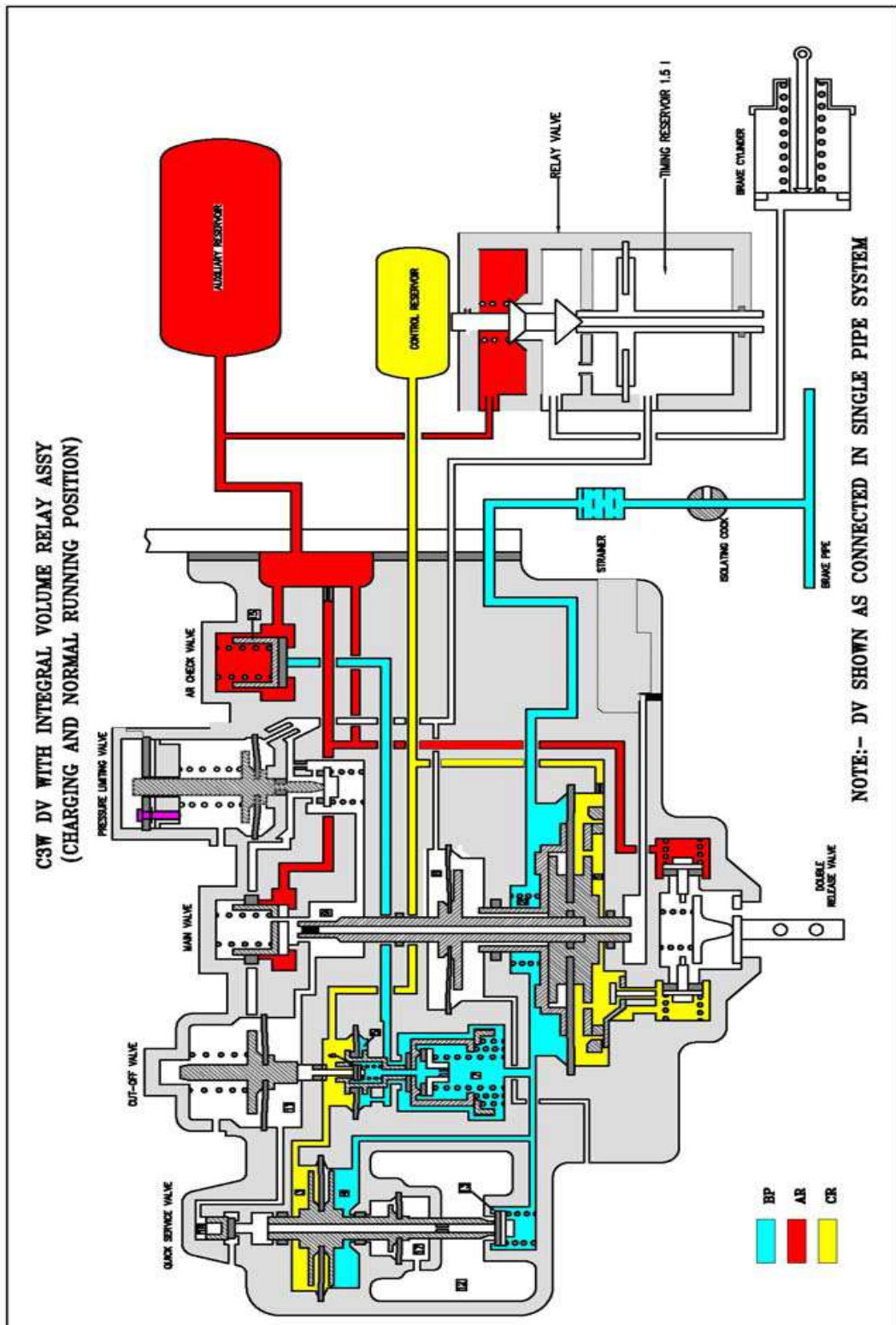


FIG 4.2 – GRADUATED APPLICATION

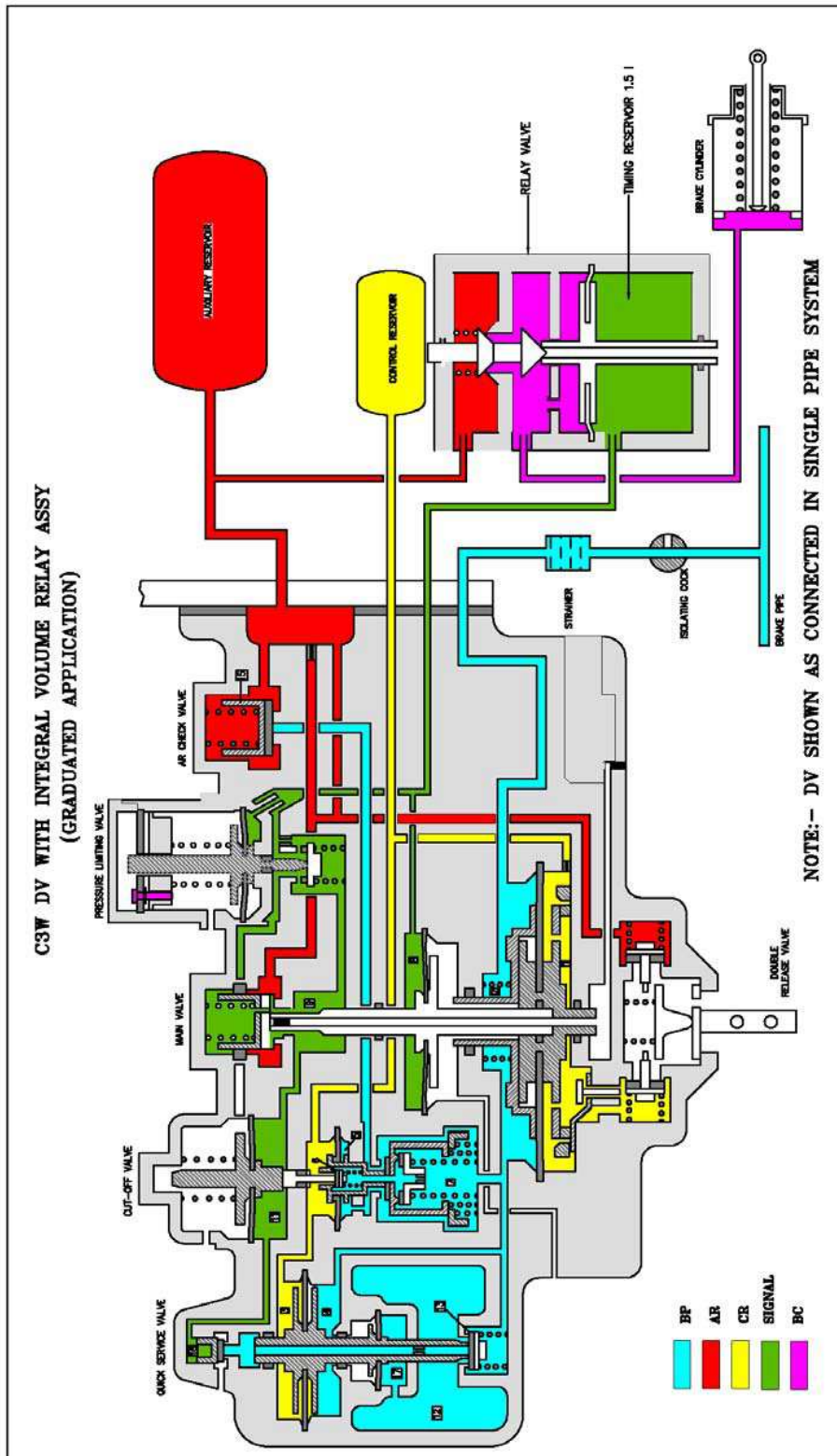


FIG 4.3 – GRADUATED RELEASE

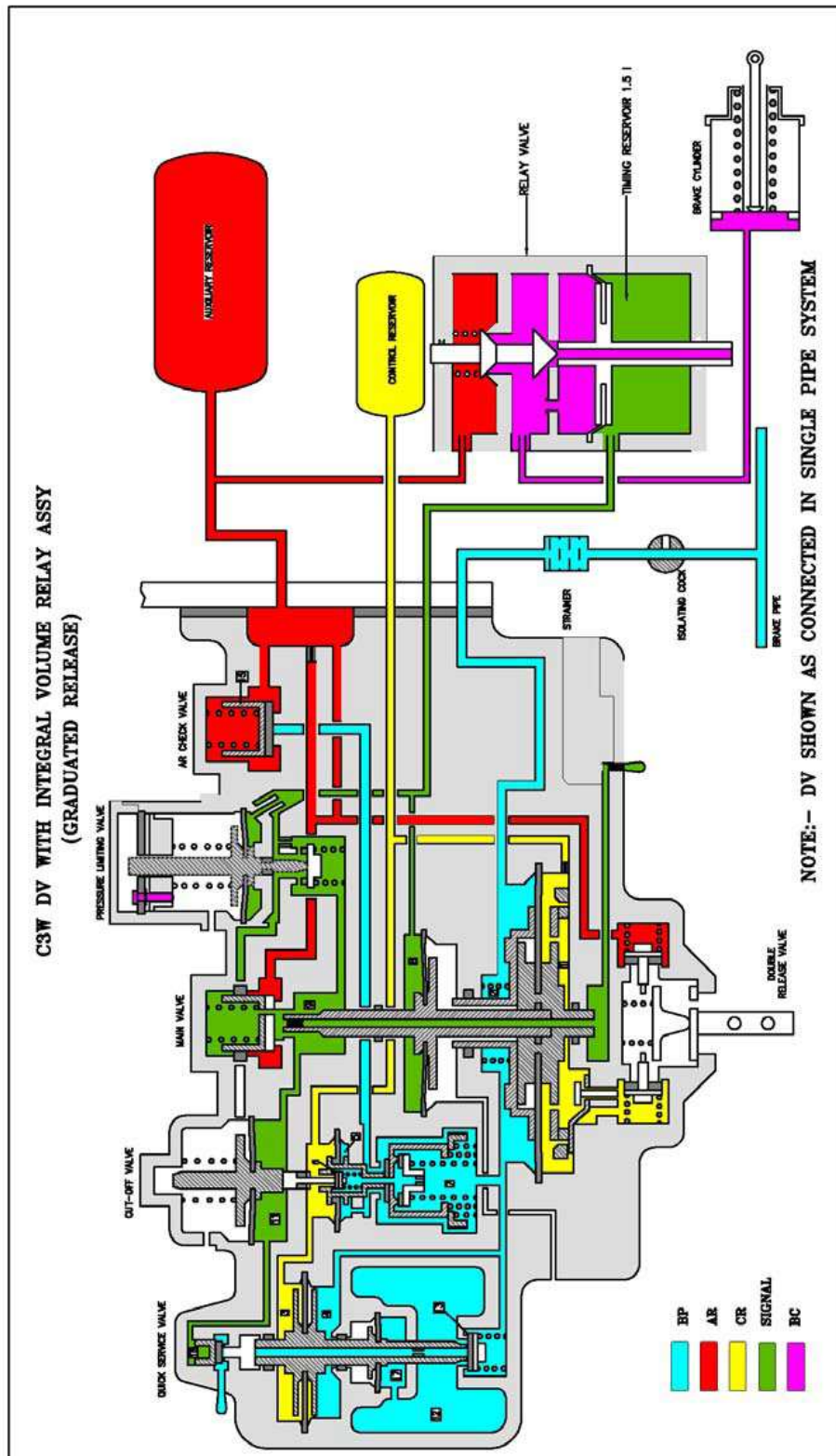




FIG 5.1 MAIN VALVE

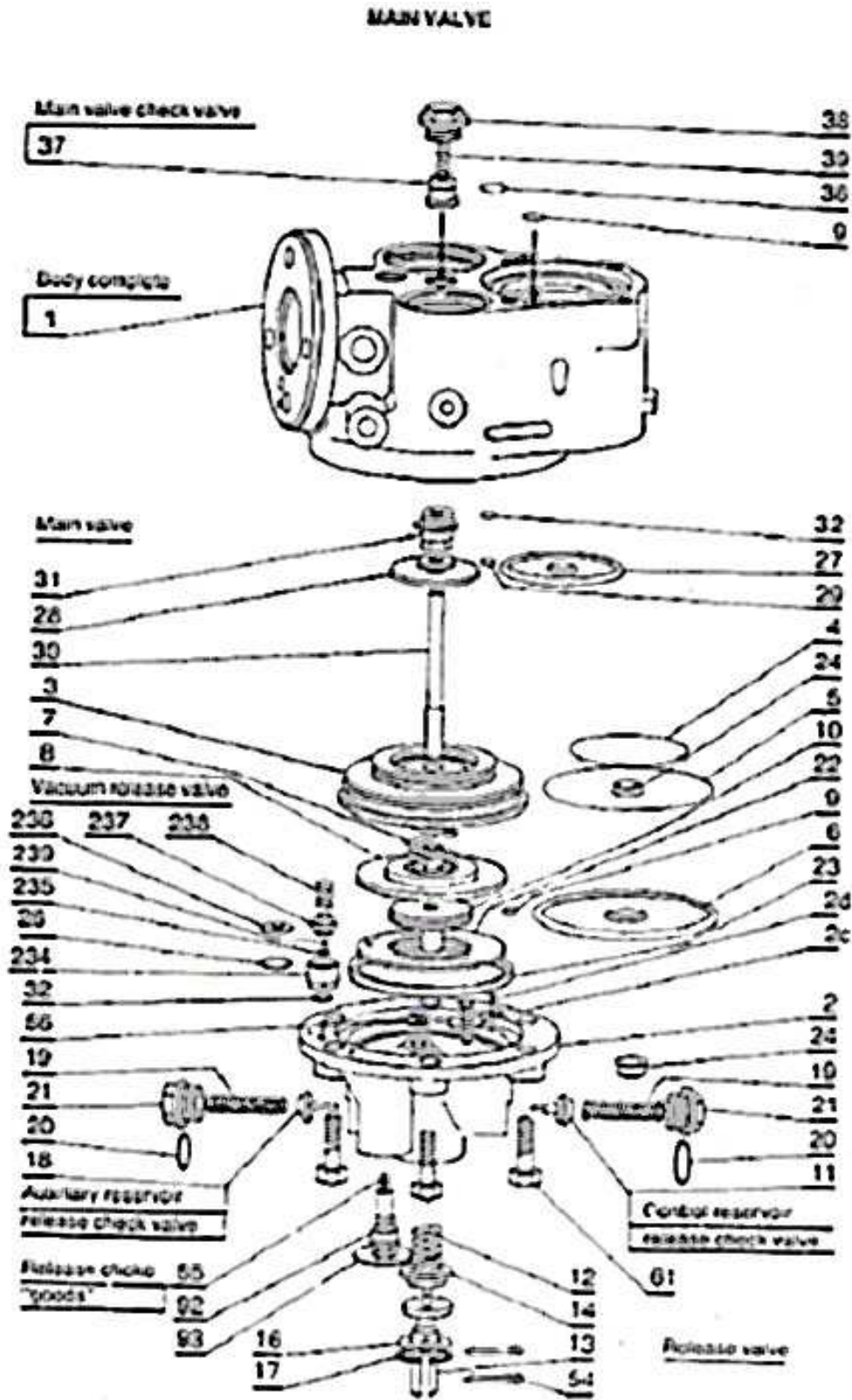
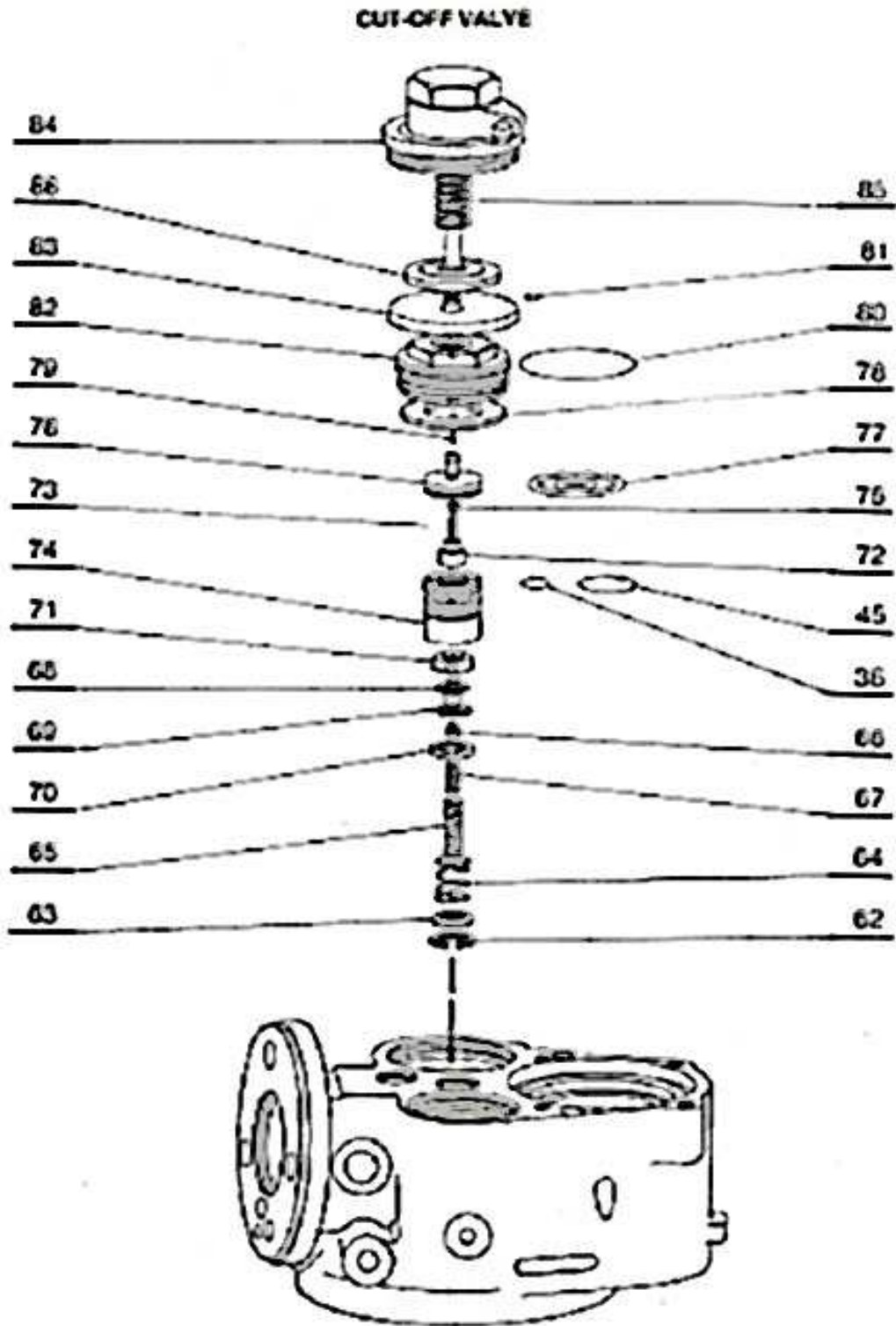
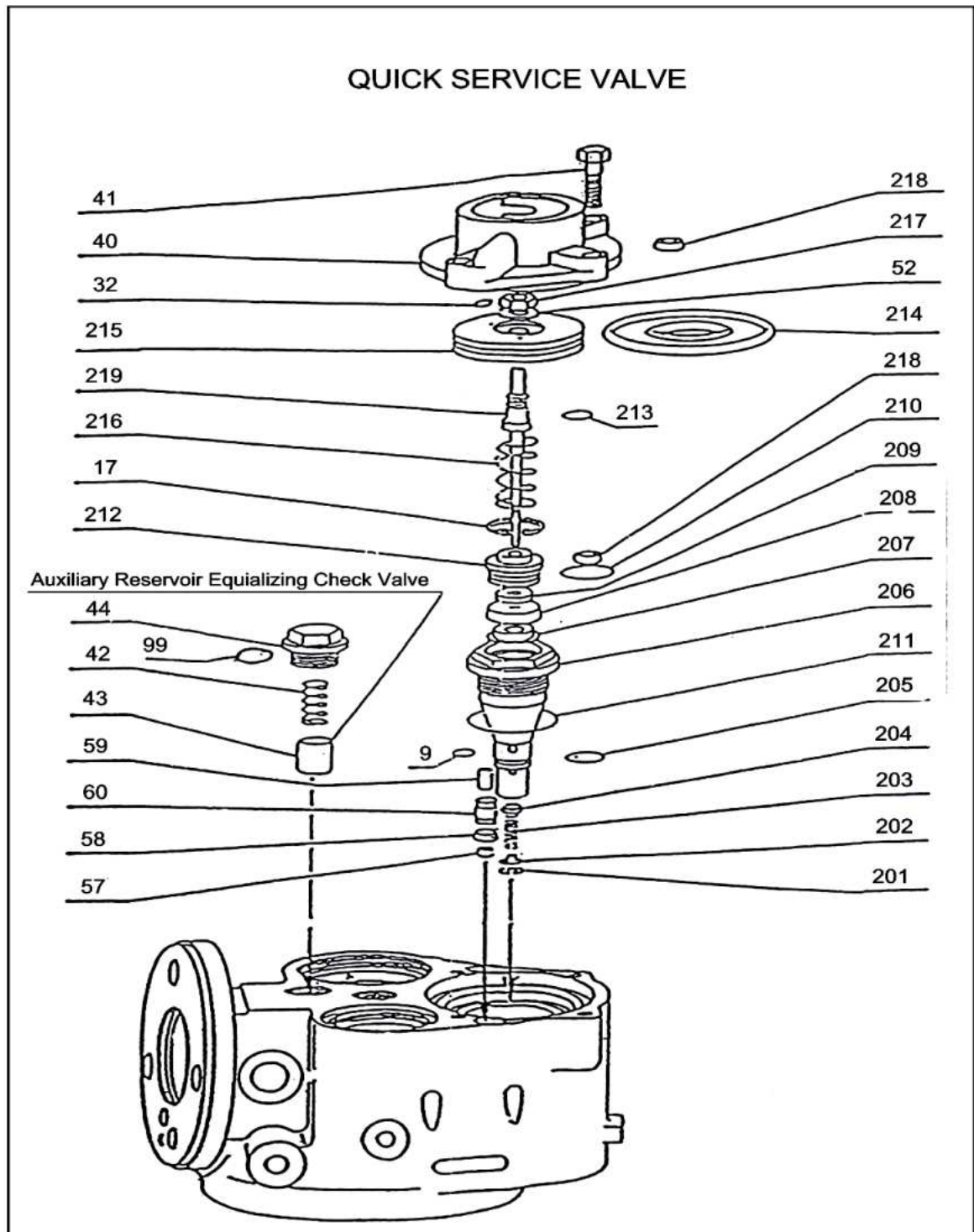


FIG 5.2 CUTOFF VALVE

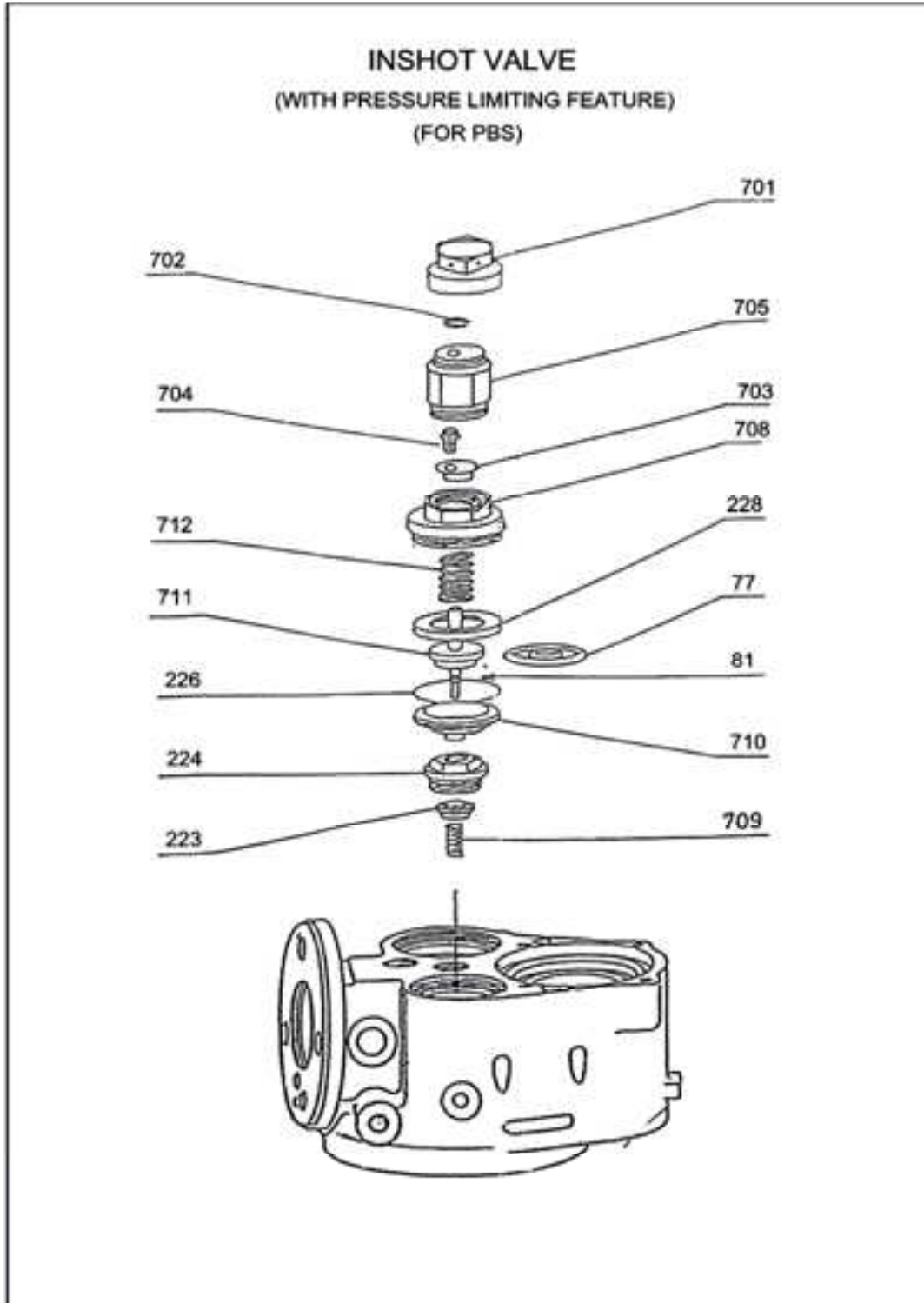




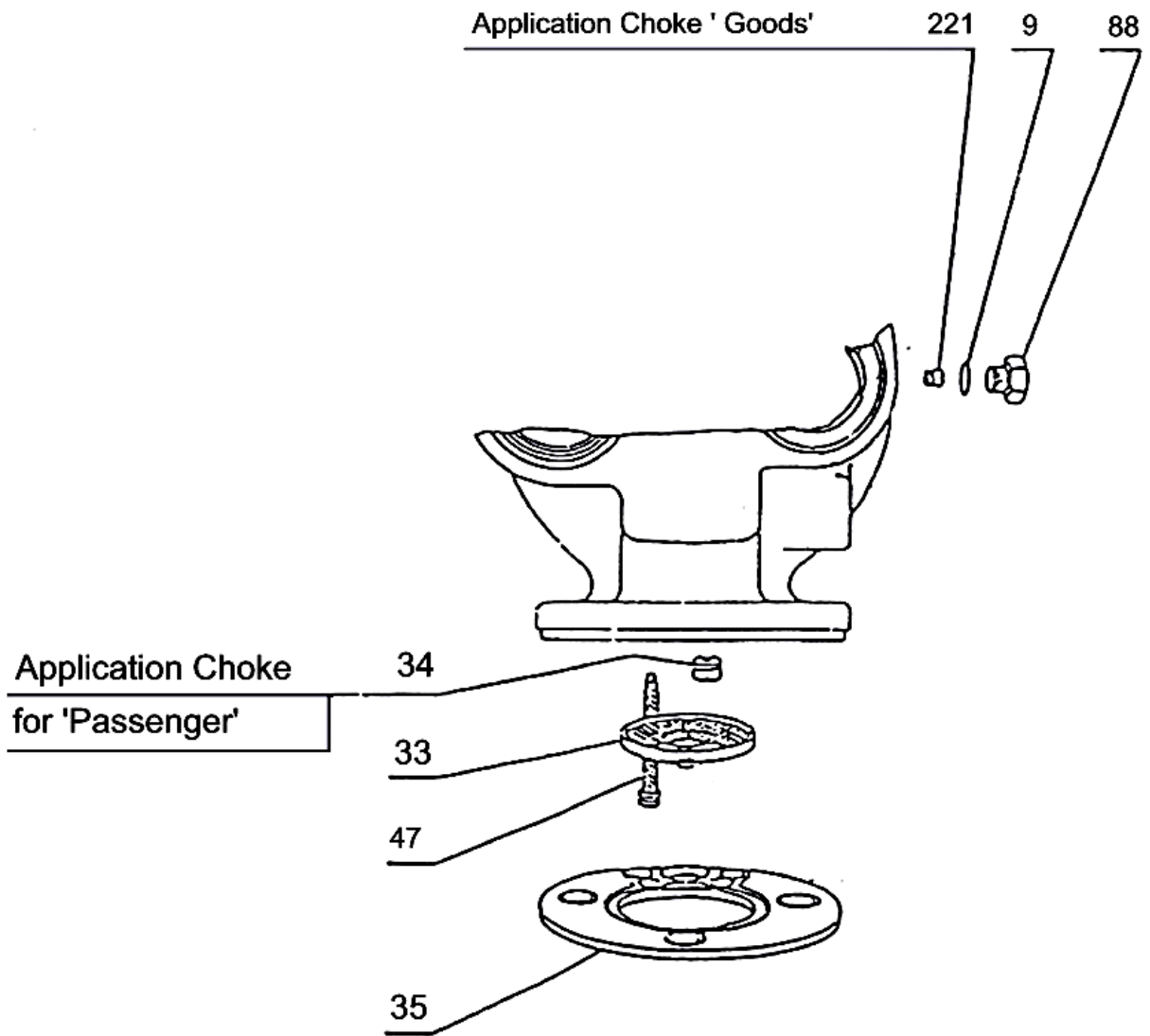
**FIG 5.3 QUICK SERVICE VALVE**



**FIG 5.4 PRESSURELIMITING FEATURE**



**FIG 5.5 APPLICATION CHOKES**



**5.3.7. OVERHAULING****5.3.7.1 RECOMMENDED OVERHAUL RUBBER KIT TO FTIL PART No. 790 0402 80 FOR C3W DV – 501 0040 00**

SN	Item No	WABTE C Cat No.	FTIL Part No.	Description	Quantity				
					Main Valve Double Release	Cut Off Valve Quick Service	AR Equalisin	Irshot	
1	4	705 132	501 7010 00	O Ring	1				
2	5	705 134	501 7020 00	O Ring	1				
3	6	191 858	501 7030 00	Diaphragm	1				
4	9	705 012	501 7040 00	O Ring	2	1		1	
5	11	191 874	501 8040 00	Valve Finished	1				
6	18	191 873	501 8090 00	Valve Finished	1				
7	20	191 879	501 7050 00	Sealing Washer	2				
8	24	705 818	501 7060 00	Lip Seal	2				
9	27	191 849	501 7070 00	Diaphragm	1				
10	29	705 011	501 7080 00	O Ring	1				
11	32	705 239	501 7090 00	O Ring	5	1			
12	33	191 840	501 602000	Filter				1	
13	35	-	501 7101 00	Joint				1	
14	36	705 249	501 7110 00	O Ring	1	1			
15	37	190 220	501 4060 00	Valve Finished	1				
16	43	190 115	501 4080 00	Valve Finished				1	
17	45	705 255	501 7120 00	O Ring		1			
18	47	787 686	501 6030 00	Filter				1	
19	57	191 920	501 7140 00	Sealing Ring		1			

SN	Item No	WABTE C Cat No.	FTIL Part No.	Description	Quantity					
					Main Valve Double Release	Cut Off Valve Quick Service	AR Equalisin	Inshot		
20	58	191 921	501 7150 00	Sealing Ring		1				
21	59	191 923	501 8180 00	Valve Finished		1				
22	68	189 888	501 4130 00	Valve Finished		1				
23	71	189 887	501 4160 00	Valve Finished		1				
24	75	191 942	501 4190 00	Valve Finished		1				
25	77	183 019	501 7160 00	Diaphragm		1			1	
26	80	705 215	501 7170 00	O Ring		1				
27	81	705 212	501 7180 00	O Ring		1			1	
28	83	191 964	501 7190 00	Seal		1				
29	99	704 819	501 7330 00	O Ring	1				1	
30	204	191 917	501 4220 00	Valve Finished		1				
31	205	705 091	501 7210 00	O Ring		1				
32	208	191 914	501 7220 00	Seal		1				
33	210	705 164	501 7230 00	O Ring		1				
34	211	705 128	501 7240 00	O Ring		1				
35	213	700 378	501 7250 00	O Ring		1				
36	214	191 894	501 7260 00	Diaphragm		1				
37	218	705 817	501 7270 00	Seal		2				
38	223	190 116	501 4260 00	Valve Finished					1	
39	226	705 252	501 7280 00	O Ring					1	

**5.3.7.2 OVERHAUL SPRING KIT FOR C3W DISTRIBUTOR VALVE**

SN	Item No	WABTE C Cat No.	FTIL Part No.	Description	Quantity								
					Main Valve	Double	Delco Valve	Cut Off Valve	Quick Service Valve	AR Equalising	Check Valve	Inshot Valve	Pressure Limiting
<b>SPRING KIT No. 790 5011 07 FOR C3W DISTRIBUTOR VALVE</b>													
1	7	191 870	501 8030 00	Spring	1								
2	12	191 881	501 8050 00	Spring		1							
3	19	191 882	501 8100 00	Spring		2							
4	39	189 931	501 8130 00	Spring	1								
5	42	191 968	501 8140 00	Spring						1			
6	64	191 990	501 8190 00	Spring			1						
7	65	191 856	501 8200 00	Spring			1						
8	67	182 714	501 8210 00	Spring			1						
9	73	190 272	501 8220 00	Spring			1						
10	85	789 650	501 8240 00	Spring			1						
11	203	191 918	501 8320 00	Spring				1					
12	216	191 922	501 8270 00	Spring				1					
13	709	-	501 8370 00	Spring									1
14	712	-	501 8590 00	Spring									1

### **5.3.7.3 DISMANTLING FROM COACH**

Before dismantling the distributor from the coach for overhauling ensure that the compressed air in the system is drained completely by pulling the operating lever and holding it in position till all the air pressure is fully exhausted.

#### **NOTE:**

Since the draining of air supply from the vehicle would release the brakes fully, care should be taken to protect the vehicle and prevent its accidental movement by suitable means.

Remove the DV along with its sandwich piece, relay valve & Timing reservoir.

Carefully supporting the Distributor Valve, unscrew the three M16 Nuts fixing the DV to its sandwich piece.

For further work on the Distributor Valve in the workshop, it is recommended to have a bench mounted clamp bracket with three Studs of M16 threads, fixed in the same fashion. Make sure that the fixture has a corresponding hole to accommodate the pin driven in the flange face of the DV. It should also have a facility to rotate by 180° and be locked in either position. (Refer fig. 7). The pipe connections to and from the mounting bracket on the vehicle need not be disturbed. However, it should be protected by a suitable covering to prevent ingress of dirt and dust till the Distributor Valve is reinstalled.

#### **NOTE**

Before the DV is opened, it should be thoroughly dusted and cleaned externally. The workbench on which the components are to be placed should also be cleaned thoroughly.

### **5.3.7.4 DISMANTLING THE DISTRIBUTOR VALVE**

- Mount the Distributor Valve on to the Fixture (Fig 7) with the bottom side up.
- Follow the sequence of this operation as given below for dismantling.
- The item numbers in this description are with reference to the pull-out diagrams provided under the relevant heading.
- It is imperative that as and when the components are removed from the assembly, they have to be carefully handled and arranged, preferably in identifiable group sequence.

#### **5.3.7.4.1 MAIN VALVE**

(Ref fig. 5.1)

Unscrew the 6 Nos. of Screws (61) & carefully pull upwards the Lower Cover Assembly (2). Take out the Ring (23), the Diaphragm Follower (22) and the Small Piston of Lower Diaphragm (10) along with its Diaphragm (6), the Large Piston of Lower Diaphragm (8), and the five 'O' Rings (32).

Press a jet of compressed air into the bore of the Hollow Stem (30) taking care to hold the Hollow Stem (30) the moment it ejects out under pressure. After removing the hollow stem (30), unscrew the release choke from the top opening of the hollow stem.

Remove the Diaphragm Holder (3) and pull out the Hollow Stem from Diaphragm Holder.

Take out the Diaphragm Clamp (28) with its Diaphragm (27).

Unscrew the Plug (31) using the appropriate socket wrench.

Turn the Distributor Valve by 180° on the bracket and ensure that it is again locked in the new position (bottom side down).

Unscrew the Cap (38) [with O' Ring (99) provided in the latest version] and take out the Spring (39) and Check Valve (37) with the 'O' Ring (36).

Carefully remove the Diaphragm (6) from the small Piston of Lower Diaphragm (10) and Diaphragm (27) from the Diaphragm Clamp (28). Also remove the O Rings (4) and (5) from the Diaphragm Holder (3). Similarly remove the 'O' Ring (36) from the Check Valve (37).

Using a blunt tool, remove the two Lip Seals (24) from the Diaphragm Holder (3) and from the Lower Cover (2). Similarly, remove the 'O' Ring (9), 'O' Ring (29) and the 'O' Ring (32) from the small Piston of Lower Diaphragm (10), Diaphragm Clamp (28) and the Plug (31) respectively.

**NOTE:**

Care should be taken not to scratch the rubber components while removing. In case any such damage is suspected, replace such part by a new one.

#### **5.3.7.4.2 DOUBLE RELEASE VALVE**

(Ref fig. 5.1)

The Locking Rod (233) would have already come out when the Lower Cover (2) is pulled out. If not, remove it from the hole.

**NOTE:**

Do not try to remove the grooved Pin (2D) and Trigger (2C). These are permanently fixed in our factory and do not require any attention. While the cover is open, take care to see that no heavy object falls on the pin or on the Trigger.

Keep the flange face down on a soft surface like a rubber pad and press the Operating Lever (13) hard by hand and using the appropriate circlip plier, remove the Circlip (17). Remove the Lower Seat (16) and take over the Operating Lever. Take out the Spring Seats and Valve Operator (14) and the Spring (12).



Slowly unscrew the two Cap Screws (21) on either side and take out the two Springs (19). Take out the Sealing Rings (20) and pull out the Valves (11) and (18).

**NOTE**

Observe carefully the sides in which these Valves (11) and (18) are to be fixed while assembly.

Unscrew the Exhaust Protector (92) carefully and unscrew the Release Choke (55) from the Exhaust Protector (92) and take out the Exhaust Ring Protector (93).

### 5.3.7.4.3 CUT-OFF VALVE

(Ref fig. 5.2)

With the Distributor Valve mounted in its normal position, proceed as follows:

- Unscrew the bigger Cap (84) by using the appropriate socket wrench. Alternatively, a rod of suitable diameter that can go into the side hole on the cap can also be used.
- Carefully lift off the Cap (84) and remove the Spring (85), the Guide (86) and the Seal (83). If the Seal does not come out alone with the Guide and remain in stuck in position, use a bent tool and carefully lift it up. Rotating the tool all around, lift the seal uniformly and gradually from underneath. Ensure that the tool has no sharp edges.

**NOTE**

Ensure after removing the Seal that the two Springs in the Seal are properly seated in their position. The ends of the Springs are inserted into one another to form a ring of a specified diameter. Improper handling of the seal while pulling out may disturb the position of the Springs.

Remove the 'O' rings (81) from the Guide (86) taking proper care.

Unscrew the Diaphragm Clamping Screw (82) using the appropriate socket wrench. Take out the Push Rod (79).

**NOTE**

The direction in which the push rod has to be inserted again during reassembly should be carefully noted down.

Holding the stem part of Guide (76), pull it out carefully so that the Diaphragm Clamp (78) also comes out. The Guide (76) is a sub-assy consisting of Seat (72) which is screwed into the Guide (76) Valve (75), Spring (73) & the Diaphragm (77).

Keep the sub-assembly in the special Fixture RPBF 0003 (Fig 6.3) in such a way that the flange part of the Guide (76) sits in the circular recess of the fixture and the Seat (72) is facing up. Keep the Fixture in a vice. Tighten the vice lightly. Using the special tool

SCT6016 (Fig 6.3) unscrew the Seat (72) by inserting the two Pins of the tool into the two holes on the Seat (72) and turning the handle.

Take out Valve (75) and the Spring (73).

#### **NOTE**

While using the fixture RPBF 0003 (Fig 6.3), exercise care to avoid denting the flange of the Guide (76) due to over tightening of the vice. The Spring (73) and the Valve (75) are quite small in size and should be handled carefully.

Pull out Diaphragm (77).

Using special tool SCT 6014 (Fig 6.1) in the same way as for SCT 6016 (Fig 6.3), unscrew the Plug (74) and remove the outer 'O' Ring (45) as well as the inner 'O' Ring (36). The Plug is a sub-assembly consisting of an Internal Circlip (62), Spring Seats (63), (69) and (70), Spring (64) (65) and (67), a Solex Jet (66) and Valve Finished (68) and (71). Using a suitable circlip plier, remove the Circlip (62). Take out the Spring Seat (63) exercising caution in avoiding falling of loose components. Take out the Springs (64) (65) and (67). By pulling at Solex Jet (66), remove the Spring Seats (69) and (70).

Take out the Valve Finished (68) and (71). Unscrew the Solex Jet from the Valve (68).

#### **5.3.7.4.4 QUICK SERVICE VALVE**

(Ref fig. 5.3)

With Clamp bracket in the same position as for Cut Off Valve, unscrew the four Screws (41).

Take the Cover Assembly (40) out, taking care to pull it up vertically.

Remove the 'O' Ring (32) and 'O' Ring (9) on the top surface of the Body.

Slowly pull out the Glide Plunger (219) sub-assembly consisting of parts (52), (213), (214), (215), (217) and (219) by pulling at the Guide Plunger top.

Remove the Spring (216).

Remove the Diaphragm (214) from the Piston (215) of the sub-assembly.

Holding the sub-assembly in hand, unscrew the Nut (217), remove the Washer (52) and pull out the Piston (215).

Remove the "O" Ring (213) without twisting it. Using the special tool SCT 6092 (Fig. 6.1) unscrew the Seat Holder (206).

Remove the "O" Rings (211) and (205).

Take out the Seat Holder Assembly (206) and using the appropriate circlip plier, remove the Internal Circlip (17). Pull out the Seal Holder (212) using the special tool SCT 6093 (Fig 6.2). Remove the "O" Ring (210)

Using a blunt tool, carefully pull out the seal (218) from the Seal Holder (212).

Remove the Washer (209). Carefully pull out the Seal (208) by using a bent tool and dragging up uniformly all round. Do not use any sharp hook to do this work.

Take out the Spring Seat (207).

Using the appropriate internal circlip plier, extract the Circlip (201) at the bottom of Seat Holder (206), taking care to prevent loose parts from inside falling off.

Remove the Spring Seat (202), Spring (203) and Valve Finished (204).

Using the same tool as was used for pulling out the Seal (218) from the Seal Holder (212), pull out the second Seal (218) from the Cover Assembly (40).

Take out the Bush (60) carefully by pressing a jet of compressed against the vent of quick service and the Valve Finished (59) from the hole in the top face of Body (1).

Extract the Seal (58) and the Sealing Ring (57) by carefully pressing on the Seal (58) on an edge to tilt it on Washer (57). Use only a blunt tool.

#### **NOTE**

While extracting the Seal (58) be careful not to damage it. However, as this cannot be pulled out in any other way than described above, if any damage to this component is suspected, make sure to replace it by a new one during reassembly.

#### **5.3.7.4.5 AUXILIARY RESERVOIR VALVE**

(Refer fig. 5.3)

With Body (1) in the normal position, unscrew the Cap (44) & O Ring (provided in latest version) slowly & take out the Check Valve Spring (42) & Check Valve (43).

#### **5.3.7.4.6 PRESSURE LIMITING FEATURE**

(Ref. fig 5.4)

Open the Cap (701) remove Circlip (702), Stem Adjusting Screw (704) using special tool (Fig 12 A) and remove Spring Seat (703) from Clamping Flange (708).

Unscrew Clamping Flange and remove Spring (712) extract Diaphragm Clamp (228) and pull out Guide (711). Remove Diaphragm (77) from Guide (711). Remove O Ring (226) from its seating position on Cup (710) and remove the cup. Unscrew Plug (224) and remove Valve Finished (223) and extract the Spring (709).

### 5.3.7.4.7 APPLICATION AND RELEASE CHOKES

(Ref fig. 5.5)

#### APPLICATION CHOKE

Remove from the side of Body the Application Choke (34) provided inside the Filter (32). The Filter has to be removed for renewal or cleaning of Choke.

#### RELEASE CHOKE

The Release Choke is provided in the hollow stem(30).

Choke description	FTIL PART NO
Application Passenger	501 4309 00
Release Passenger	011 3062 00

### 5.3.7.5 CLEANING OF PARTS

Refer guidelines given under "CLEANING PROCEDURE (AIR BRAKE EQUIPMENTS / COMPONENTS)"

#### REPLACE PARTS IF,

Refer the guidelines given under "INSPECTION / REPLACEMENT CRITERIA (AIR BRAKE EQUIPMENT / COMPONENTS)"

#### STEPS BEFORE REASSEMBLY

Smear carefully and lightly "MOLYKOTE M33" or equivalent grease to all

- Sliding parts
- Dynamic and static O rings and the parts onto which they slide.
- Diaphragms and seals
- Threaded parts except on the chokes and the Solex jet.

Smear carefully and lightly "Shell Rhodina RL3" grease or equivalent to all

- Threaded parts of chokes and Solex jet
- Bearings of all guides

### 5.3.7.6 ASSEMBLY

Follow the same instructions of each sub-assembly in the reverse sequence to assemble the valves. However, suggestions given as under while reassembly may be followed.

After mounting the Diaphragms on the Diaphragm Clamps, get the entrapped air out by inserting the special tool SCT 6026 (Fig 6.3) between the inside the Lip and the side of the Groove.

The elastomer surfaces of the valve must be free from grease.

Blow a jet of compressed air on to the valve surfaces before assembling them into position.

Ensure that the tips of the screwdrivers, the circlip pliers and the other tools used are free from any sticky matter and are not carrying any dirt.

The 'O' Ring (226) in the Inshot Valve Cup (225) is not mounted outside but is dropped into position after fixing the cup in its place with the help of a special tool SCT 6015 (Fig 6.1) suitably pushed uniformly into position. Keep the edge of the tool on the 'O' Ring & rotate the tool with light pressure till 'O' ring is seated properly without twist.

After assembling the parts (62) – (71) of the Cut Off Valve into the Plug (74), shake it lightly; a metallic sound should be heard. If not, extract the Circlip (62), remove the Spring Seat (63) and make sure that the Springs are correctly positioned. Also ensure a Spring Seats (69) and (70) are freely moving. Then reassemble the parts and repeat the operation.

To insert the Hollow Stem (30) through the Diaphragm Clamp (28), use the special feeding tool SCT 6017 (Fig 6.3) to avoid scratching of the 'O' Ring (29) in the Diaphragm Clamp (28). This is done by the inserting tool into the Hollow Stem (30) on the side of the small diameter and pushing the tapered face of the tool into the Diaphragm Clamp slowly. Pull out the tool from the stem on the other side.

For the Inshot Valve portion, the Pressure Limiting arrangement consisting of items 701, 702, 703, 704 & 705 are also required to be assembled in the Inshot Valve portion.

#### NOTE

**The limiting pressure is to be adjusted for a cut off pressure of 3.8 Kg/Cm<sup>2</sup> during DV test.**

### 5.3.7.7 TIGHTENING TORQUE

**TIGHTEN TO A TORQUE OF 20 – 25 Nm,**

The Plug (74) and Seat (72) of the Cut Off Valve.

The Nut (217) of the Quick Service Valve Guide Plunger and Seat Holder (206) of the Quick Service Valve sub-assembly.

The Plug (31) in the Main Valve.

The Valve Seat (224) in the Inshot Valve and

The Caps (21) of the Double Release Valve.

After assembling the Double Release Valve in the Lower Cover (2), pull the Operating Lever (13) to the side in which the Trigger is pinned and press the Locking Rod (233) down, so that it gets jammed between the Valve Seat and the Valve (11). Then even if the Operating Lever is released, the entire Lower Cover Sub-assembly (2) can be turned upside down to be mounted on Body (1) without the Locking Rod falling down. This Locking Rod gets released automatically once the DV is charged with air pressure to the required limits.

### **5.3.8 TESTING OF C3W DISTRIBUTOR VALVE AFTER OVERHAUL**

After the Distributor Valve is overhauled thoroughly and assembled as described, fix the DV on the sandwich piece & attach the relay valve & timing volume as a unit assembly. Then it is to be mounted on to BRAKE PANEL MODULE (A0). Compressed air is to be charged at the specified pressure and Distributor Valve should be operated a few times, say 20 operations to execute a few applications and release cycles. Do not check for the leak tightness of the Distributor Valve during this cyclic operation.

After cycling, charge the Distributor Valve to 5.0 Kg/cm<sup>2</sup> in a single pipe system and wait till the Auxiliary Reservoir and Control Reservoir also attain 5.0 Kg/cm<sup>2</sup> .

At this stage, soap solution can be used to detect leak bubbles. If any leaks are observed, proper remedial action should be taken as per troubleshooting guide (attached) and Distributor Valve is to be rechecked for leak tightness and the performance. It is not required to check for leaks for duration of 5 minutes each. It is enough if a leak did not appear in one minute and even if it starts surfacing after a period of one minute, it can be considered as negligibly small and hence can be ignored.

#### **NOTE:-**

1. Distributor Valve (501 0040 00) alone cannot be tested as it is working along with the relay valve assembly (018 0040 00).
2. However the trouble shooting can be followed independently as provided under distributor valve & Relay valve.

### **5.3.8.1 FREQUENCY OF OVERHAULING**

The Valve once put into field service needs no attention as long as the operating conditions and maintenance practices are as under are followed till its periodic overhaul.

“Reliable performance of C3W Distributor Valve is assured provided basic cleanliness inside the pipelines, reservoirs and at hose pipe ends is maintained and proper attention is given to air tightness, draining of reservoirs, filters, prevention of dust/dirt/moisture ingress.”

However, observation on Distributor Valves during Sick Line / workshop attention generally indicate substantial presence of some of the factors like moisture, dirt, water / oily sludge, corrosion rust, scales, etc, on the inside of BP/FP pipelines and brake system equipments. These are collected / formed over a period primarily due to non-supply of dry air / other operational reasons & may affect the performance parameters during operation. As such in order to ensure a sustained reliable performance, it is recommended to remove the Distributor Valve once in three years after the date of commissioning and coinciding the nearest POH towards performance test/examination and overhaul at a centralized workshop. In practice, it is enough to pay attention to the DV for any performance deviations noticed when the vehicle is serviced during the test in POH.

### **5.3.8.2 TROUBLE SHOOTING**

Some of the distress symptoms / failures are given below for guidance duly indicating the possible sources of causes and contributory factors. The sequence of these failures and the possible sources are arranged in their decreasing order of probability of occurrence. However, while analyzing any such failure in the suggested sequential priority, the check need not be stopped at any particular cause of failure but better be continued to cover the other remaining causes that could also contribute to the same observation.

**5.3.8.2.1 CONTROL RESERVOIR ALONE AT 5.0 Kg/cm<sup>2</sup>****Operation Failure**

<i>Observations</i>	<i>Causes of failure</i>	<i>Remedial Action</i>
Leak at Exhaust Ring Protector (93).	In the Main Valve Lip Seal (24) in the Lower Cover (2) is defective or fixed upside down.	Replace the Lip Seal (24) or assemble correctly.
Leak at Quick Release Chamber Outlet (F)	Lip Seal (218) in the Cover (40) of Quick Service Bulb defective or fixed upside down.	Replace or assemble correctly.
Leak back to the Brake Pipe, when the Brake Pipe pressure is reduced.	Surface condition of Valve (75) in the Cut-off valve defective.	Replace the valve
	Spring (73) wrapped.	Replace.
	Diaphragm (6 & 214) or Diaphragm (77) defective or wrongly assembled.	Replace or relocate
	'O' Ring (213) defective or twisted between 215 & 219.	d. Replace or relocate.
Leak at the Release Valve Lever (L)	Surface condition of Valve (11) defective in Double Release Valve (the one on the opposite side of the flange)	Replace the valve and attend.
Leak to atmosphere at the Hole (s) in the bottom cover, under Brake Cylinder reaction pressure.	Wrongly assembled diaphragm (6)	Relocate the diaphragm.
	'O' Ring (32) between body (1) and lower cover (2) defective	Replace 'O' Ring



Leak to the Brake Cylinder.	'O' Rings (80) and (81) defective.	a. Replace.
External leakage between Lower Cover (2) and Body (1) or between Cover (40) and Body (1).	Diaphragm (6) or (214) wrongly assembled.	a. Relocate.
	'O' Rings (32) between lower Cover (2) and Body (1) defective.	b. Replace
External leakage to atmosphere from the Auxiliary Reservoir.	a. Sealing Ring (20) defective.	a. Replace.

### 5.3.8.2.2 AUXILIARY RESERVOIR ALONE AT 5.0 Kg/cm<sup>2</sup>

#### Operation Failure

Observations	Causes of failure	Remedial Action
Leak back to Brake Pipe when the Brake Pipe pressure is decreased.	Surface condition of the Valve (43) defective.	Replace.
Leak at the Release Choke (Q)	Condition of Valve (37) defective.	Replace.
	'O' Ring (36) of Valve (37) twisted or defective.	Relocate or replace 'O' Ring.
Leak to atmosphere at Brake Cylinder pressure.	'O' Ring (32) between Body (S) under reaction to (1) and Cover (2) defective.	a. Replace.
Leak at Release Valve (L) at the bottom.	Surface condition of Valve (18) defective.	Replace.
External Leakage	'O' Ring(s) (32) between Body (1) and Cover (2) and between Body (1) and top Cover (40)	Replace.

defective.	
Metallic joints between Body (1) and Caps (38 & 40) defective.	Unscrew Caps and apply the Sealing grease and fix again.
Sealing Ring (20) defective.	Replace

### 5.3.8.2.3 BRAKE CHARGING, BRAKE PIPE AT 5 BAR

#### Operation Failure

Observations	Causes of failure	Remedial Action
Filling time of the Reservoirs too short.	Valve (71) does not close.	Reassemble the entire Cut off valve sub assembly (74)
	Springs (64,65 & 67) are wrapped or tangled up.	If wrapped, replace and reassemble properly.
	Spring Seats (69 & 70) jammed.	Replace if damaged and reassemble.
Vibrations while charging	'O' Ring (36 or 45) defective.	a. Replace.
Filling time of the Reservoirs too long	The Solex Jet (66) is clogged partly.	Clean the orifice.

### 5.3.8.2.4 BRAKE CHARGED BRAKE PIPE AT 5 BAR

#### Operation Failure

Observations	Causes of failure	Remedial Action
1. Leak at the Quick Release chamber outlet (F)	a. Surface condition of Valve (204) defective.	a. Replace.
	b. Seal (218) in Seal Holder (212) assembled upside down are defective.	b. Assemble properly or replace.
	c. 'O' Ring (205, 210 & 211) are twisted or	c. Relocate or replace.

	damaged.	
2. Leak to atmosphere under reaction of Brake Cylinder pressure at (S)	a. Seal (24) in Diaphragm Holder (3) wrongly positioned or defective.	a. Relocate or replace.
	b. 'O' Ring (5) defective on Diaphragm Holder (3).	b. Replace.
	c. Diaphragm (6) wrongly assembled or defective.	c. Relocate or replace.

### 5.3.8.2.5 INSENSITIVITY

#### Operation Failure

<i>Observations</i>	<i>Causes of failure</i>	<i>Remedial Action</i>
1. Brake Pipe pressure drop too slow, accompanied by drop in pressure in Auxiliary Reservoir.	a. Improper closing of Valve (43 or 75)	a. Check the surface condition and if required replace.
2. Brake Pipe pressure drop too quick.	a. Improper closing of the Quick Release bulb inlet Valve (204) thus allowing partial filling of the Quick Service Bulb.	a. Check the surface condition and if required replace.
3. Quick action in Brake Pipe while brake releasing	a. Improper closing of valve (204).	a. Same as above.
	b. Valve (71) of Cutoff Valve does not open.	b. Same as above.
	c. Springs (64, 65 & 67) tangled up.	c. Assemble properly.

**5.3.8.2.6 SENSITIVITY**

**Operation Failure**

<i>Observations</i>	<i>Causes of failure</i>	<i>Remedial Action</i>
1. No quick action.	a. Valve (204) improperly functioning.	a. Check, relocate or replace.
	b. Valve (75) not closing properly due to defective surface of the defective spring (73)	b. Check, relocate or replace.
	c. Faulty assembly of quick service valve complete	c. Open fully (Quick service valve) and reassemble properly

**5.3.8.2.7 BRAKE APPLICATION STEP, BRAKE PIPE AT 5 BAR**

**Operation Failure**

<i>Observations</i>	<i>Causes of failure</i>	<i>Remedial Action</i>
1. Full brake application with large leak to atmosphere at (S) under pressure of brake cylinder.	a. Diaphragm (27) improperly assembled.	a. Reassemble.
2. Full brake application with no leak at (S).	a. Atmosphere leak hole at (S) clogged with dirt.	a. Open bottom Cover (2) and clean hole.

**5.3.8.2.8 BRAKE APPLICATION BRAKE PIPE AT '0' PRESSURE**

**Operation Failure**

<i>Observations</i>	<i>Causes of failure</i>	<i>Remedial Action</i>
1. Application time less than 3 secs.	a. Leak around the threads of choke (221)	a. Unscrew (88) and (221) apply the sealing grease

<i>Observations</i>	<i>Causes of failure</i>	<i>Remedial Action</i>
	b. Improper closing of valve (223) or delayed closing.	and retighten. b. Check valve surface condition. If defective replace.
	c. Leak at metallic joints of Plug (31 & 224).	c. Unscrew and apply sealing grease. Retighten properly.
	d. 'O' Ring(32) of Plug (31) defective.	d. Replace.
2. Application time a. Clean Choke. exceeds 5 secs.	a. Choke (221) partially blocked/clogged.	a. Clean Chock.
	b. Valve (223) closing too soon.	b. Check the whole inshot Valve Assembly.
3. Leak at Release Choke (Q).	a. Defective surface condition of Valve (37).	a. Replace Valve.
4. Leak at (S) hole to atmosphere under reaction of brake cylinder pressure.	a. Diaphragm (27) of Main Valve incorrectly.	Relocate or replace.
	b. Defective 'O' Ring (29)	b. Replace.
5. Leak at the Quick Service Chamber outlet (F).	a. Seal (58) of the Quick Service Outlet incorrectly assembled or defective	a. Relocate or replace.
6. Leak at the Cut-off Valve Cap (84).	a. Seal (83) improperly assembled or defective.	a. Relocate or replace.
7. Leak at the Inshot Valve Cap (87)	a. Diaphragm (77) of Inshot improperly assembled or defective.	a. Relocate or replace.
	b. 'O' Ring(226) defective.	b. Replace

### 5.3.8.2.9 BRAKE RELEASE BRAKE PIPE AT 5 BAR

#### Operation Failure

<i>Observations</i>	<i>Causes of failure</i>	<i>Remedial Action</i>
1. Release time less than 15 secs.	a. Leak around Release Choke (55) and (231).	a. Open Exhaust Protector (92) remake the joint with sealing grease. Also open screw (53), remove Choke (231), apply grease on threads and retighten.

**5.3.9 PARTS LIST****5.3.9.1 MAIN VALVE**

<b>Item</b>	<b>NO. FTIL Part NO.</b>	<b>Description</b>	<b>Qty/ASSY</b>
1	501 1014 00	Body complete	1
3	501 3070 00	Diaphragm holder	1
4	501 7010 00BA	O Ring	1
5	501 7020 00BA	O Ring	1
6	501 7030 00	Diaphragm	1
7	501 8030 00	Spring	1
8	501 3080 00	Large Piston of lower diaphragm	1
9	501 7040 00A	O Ring	2
10	501 3090 00	Small Piston	1
22	501 3110 00	Diaphragm Follower	1
23	501 3120 00	Ring	1
24	501 7060 00A	Seal	2
27	501 7070 00	Diaphragm	1
28	501 3130 00	Diaphragm Clamp	1
29	501 7080 00A	O Ring	1
30	501 4041 00	Hollow Stem	1
31	501 4050 00	Plug	1
32	501 7090 00BA	O Ring	5
36	501 7110 00BA	O Ring	1
37	501 4060 00A	Valve Finished	1
38	501 8120 00	Cap	1

39	501 8130 00	Spring	1
61	920 0021 00	Hex. Screw	6
99	501 7330 00A	O Ring	1
--	011 3062 00	Choke	1

### 5.3.9.2 DOUBLE RELEASE VALVE

Item	NO. FTIL Part NO.	Description	Qty/ASSY
2	501 1131 00	Lower Cover Assy	1
11	501 8040 00	Valve Finished	1
12	501 8050 00	Spring	1
13	501 8060 00	Operating Lever	1
14	501 8070 00	Valve Operator	1
16	501 8080 00	Seat	1
18	501 8090 00	Valve Finished	1
19	501 8100 00	Spring	2
20	501 7050 00	Sealing Washer	2
21	501 8110 00	Cap	2
54	920 0151 00	Hex. Screw M6 x 30	2
54a	906 0110 00	Hex. Nut M6	2
56	501 4300 00	Choke	1
92	501 6040 00	Exhaust Protector	1
93	501 7200 00	Exhaust Ring Protector	1
233	5011 8300 00	Locking Rod	1
706	740 8118 00	Pulling Ring	1
707	501 8600 00	Threaded Cap	1



**5.3.9.3 CUT-OFF VALVE**

<b>Item</b>	<b>NO. FTIL Part NO</b>	<b>Description</b>	<b>Qty/ASSY</b>
36	501 7110 00	'O' Ring	1
45	501 7120 00	'O' Ring	1
62	915 0020 00	Internal Circlip	1
63	501 4110 00	Spring Seat	1
64	501 8190 00	Spring	1
65	501 8200 00	Spring	1
66	501 4121 00	Solex Jet	1
67	501 8210 00	Spring	1
68	501 4130 00	Valve Finished	1
69	501 4140 00	Spring Seat	1
70	501 4150 00	Spring Seat	1
71	501 4160 00	Valve Finished	1
72	501 4170 00	Seat	1
73	501 8220 00	Spring	1
74	501 4180 00	Plug	1
75	501 4190 00	Valve Finished	1
76	191 2740 008	Guide	1
77	501 7160 00	Diaphragm	1
78	501 3270 00	Diaphragm Clamp	1
79	191 9530 008	Push Rod	1
80	501 7170 00	'O' Ring	1
81	501 7180 00	'O' Ring	1

82	501 1040 00	Diaphragm Clamping Screw Assembly	1
83	501 7190 00	Seal	1
85	501 8240 00	Spring	1
86	501 3170 00	Guide	1
84	501 3160 00	Cap	1

#### 5.3.9.4 QUICK SERVICE VALVE

Item	NO. FTIL Part NO.	Description	Qty/ASSY
17	915 0010 00	Internal Circlip	1
32	501 7090 00	'O' Ring	1
40	501 1030 00	Cover Assembly	1
41	920 0010 00	Screw M10 x 35	4
52	909 0050 00	Washer	1
57	501 7140 00	Sealing Ring	1
58	501 7150 00	Seal	1
59	501 8180 00	Valve Finished	1
60	501 4100 00	Bush	1
201	915 0030 00	Internal Circlip	1
202	501 8310 00	Spring Seat	1
203	501 8320 00	Spring	1
204	501 4220 00	Valve Finished	1
205	501 7210 00	'O' Ring	1
206	501 1050 00	Seat Holder Assembly	1
207	501 8330 00	Spring Seat	1

208	501 7220 00	Seat	1
209	501 3200 00	Washer	1
210	501 7230 00	'O' Ring	1
211	501 7240 00	'O' Ring	1
212	501 3210 00	Seat Holder	1
213	501 7250 00	'O' Ring	1
214	501 7260 00	Diaphragm	1
215	501 3220 00	Piston	1
216	501 8270 00	Spring	1
217	501 4240 00	Nut	1
218	501 7270 00	Seat	2
219	501 4250 00	Guide Plunger	1
9	501 7040 00	'O' Ring	1

### 5.3.9.5 AUXILIARY RESERVOIR EQUALISING CHECK VALVE

Item	NO. FTIL Part NO.	Description	Qty/ASSY
42	501 8140 00	Check Valve Spring	1
43	501 4080 00	Check Valve Finished	1
44	501 8150 00	Cap	1
99	501 7330 00	'O' Ring	1

### 5.3.9.6 INSHOT VALVE WITH PRESSURE LIMITING FEATURE

Item	NO. FTIL Part NO.	Description	Qty/ASSY
77	501 7160 00	Diaphragm	1

81	501 7180 00	O Ring	1
223	501 4260 00	Valve Finished	1
224	501 3230 00	Plug	1
226	5017280 00	O Ring	1
228	501 6060 00	Diaphragm Clamp	1
701	501 8560 00	Cap	1
702	916 0060 00	External Circlip	1
703	501 8570 00	Spring Seat	1
704	501 8550 00	Stem Adjusting	1
705	501 8580 00	Spring Housing	1
708	501 3540 00	Clamping Flange	1
709	501 8370 00	Spring	1
710	501 3500 00	Cup	1
711	501 3460 00	Guide	1
712	501 8590 00	Spring	1

### 5.3.9.7 MISCELLANEOUS

Item	NO. FTIL Part NO.	Description	Qty/ASSY
33	501 6020 00	Filter	1
34	501 4309 00	Choke	1
35	501 7101 00	Joint	1
47	501 6030 00	Filter	1

## 5.4 CONTROL RESERVOIR (A3) - PART NO. 040 1630 00

### 5.4.1 INTRODUCTION

The Control Reservoir of 6 ltrs capacity is fitted separately to the Brake Container and connected to the Distributor Valve. This performs a critical function by providing stored air pressure of fixed reference to the Distributor Valve reaction, whenever the pressure is altered on the Brake Pipeline. Based on this reference pressure, brake application and release are controlled by the Distributor Valve. As the unit serves functional requirement, periodical inspection and leak tightness under charged condition of the assembly is necessary.

#### CAUTION :

Leaking or damaged CR will lead to release of brake after a brake application. Subsequent application of brake will have no effect and would render the brake system in the Rolling Stock unit totally inoperative.

### 5.4.2 REMOVAL, CLEANING AND INSPECTION

Remove the Control Reservoir from the Brake Container. Unscrew the Drain Plug along with Sealing Washer.

Clean inside and outside as necessary with wire brush using kerosene or environmental friendly cleaning solution. Check for any damage, corrosion, pit mark or crack. Replace as necessary.

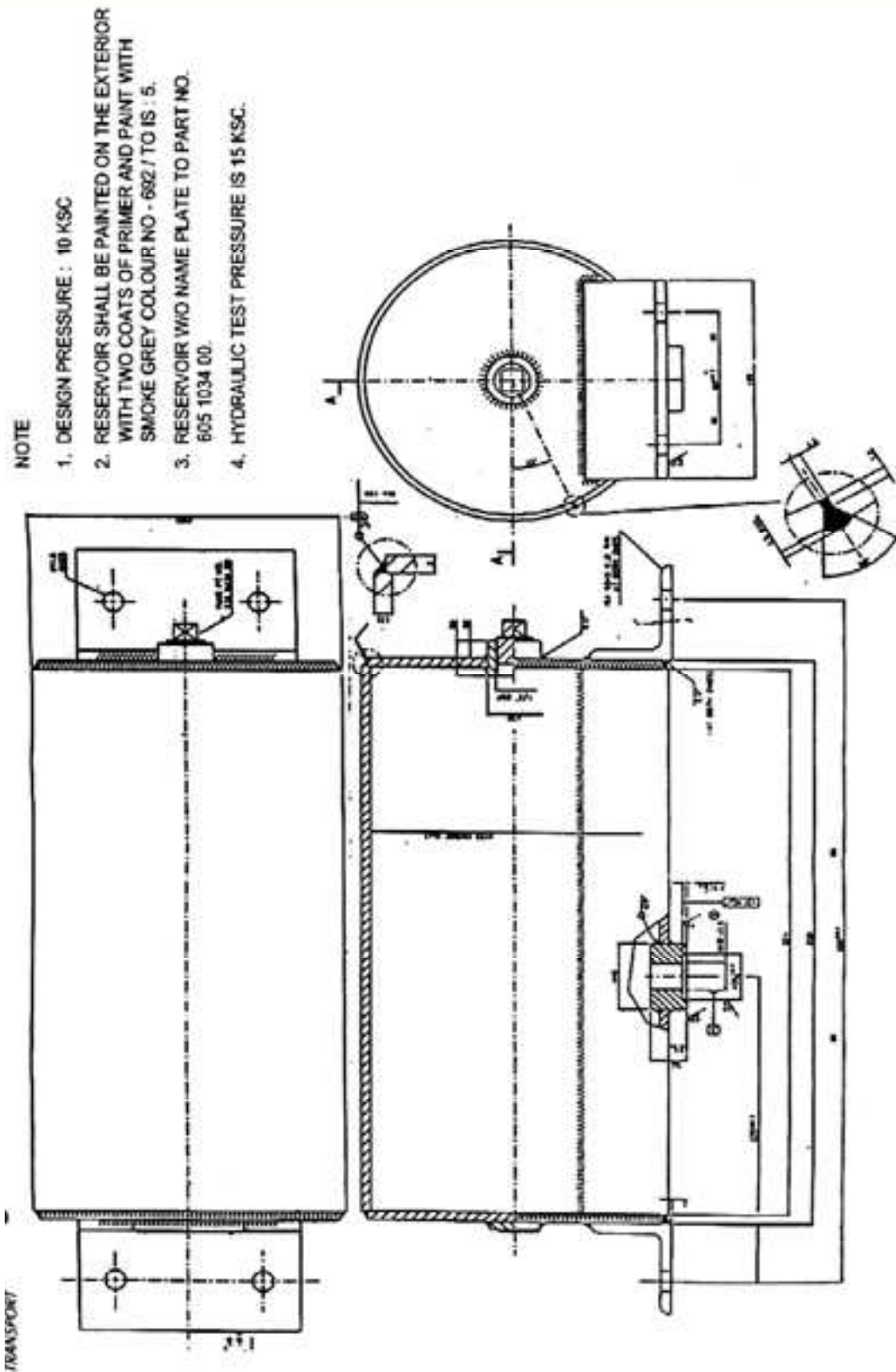
Clean the Drain Plug, Washer and the threaded portion on Housing / Drain Plug. Wash the Sealing Washer in soap solution and wipe it dry with a clean cloth. Replace the same during overhaul.

### **5.4.3 TESTING**

During overhaul, an air pressure test is required to be conducted. Fix a dummy plate with flat surface and gasket to seal the open end of the CR. With a suitable adapter and flexible connection at the 1/2" drain port, admit an air pressure of 10 kg/cm<sup>2</sup>. No leakage by way of a bubble formation is allowed on outside surface with soap water application. Remove dummy plate / adapter, clean and dry.

Refix the Drain Plug with Sealing Washer and tighten. Ensure leak proof joint.

Cover the open end of the Reservoir and ports, using suitable Closure Plugs. Retain the Closure Plugs till the CR is reassembled.



**NOTE**

1. DESIGN PRESSURE : 10 KSC
2. RESERVOIR SHALL BE PAINTED ON THE EXTERIOR WITH TWO COATS OF PRIMER AND PAINT WITH SMOKE GREY COLOUR NO - 602.7 TO IS : 5.
3. RESERVOIR WHO NAME PLATE TO PART NO. 605 1034 00.
4. HYDRAULIC TEST PRESSURE IS 15 KSC.

(BRAKE CONTROL FOR LHB COACHES)  
**RESERVOIR 6 LITRES**

PART NO. 605 0034 00

## 5.5 CHECK VALVE PART NO 006 1142 00

### 5.5.1 INTRODUCTION:

The check valve is used in compressed air systems to ensure that the air flows in one direction only and to prevent a back feed should the air supply fail.

### 5.5.2 OPERATION:

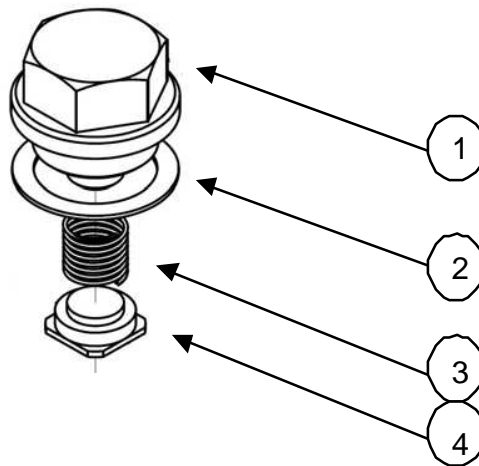
The check valve parts are screwed on to the manifold directly. Compressed air from the air supply source is fed to the input port of the manifold. When the pressure of the source exceeds the pressure held on the output side plus the setting of the spring of the check valve, the valve moves up and allows a through flow of air. If the pressure of the air supply falls below that held on the output side of the check valve, then the valve closes, preventing a back feed.

### 5.5.3 MAINTENANCE:

The Check valve parts are to be replaced as scheduled in the system maintenance plan. If no system maintenance plan is provided, the device must be replaced regularly as required by the Operator's rules, the mission profile and the environmental conditions. Typical replacement periodicity: 3 years.

### 5.5.4 CLEAN :

The check valve can be removed from the manifold procedure is as follows:



#### Removal procedure :

1. Remove the the screw capnut (1) from the manifold
2. Recover the insert (2), spring (3) and the check valve insert (4).



After cleaning the components reassemble components into the manifold as per following procedure

**Installation procedure:**

Refer to Figure

Place the check valve Insert (4) and Spring (3). Install the joint (2) on the face of the manifold. Lock the screw Capnut (1).

**5.5.5 OVERHAUL**

The Check valve maintenance kit should be used for overhaul (Refer for details of the contents of kit in the Parts List). The Check valve parts are to be removed from its manifold.

Remove the Check valve parts and carry out the cleaning instructions as mentioned in maintenance. Wash out the valve body and wipe with a soft lint free cloth. Examine the valve seat in the body for scoring on its upper face, where serious scoring is occurs the valve should be renewed. Examine the valve (4) for signs of an even circular indtion corresponding to the dia of the valve seat . The presence of such an indentation together with the absence of other distortions or cut means the valve(4) and insert(2) may be re used if not must be renewed and check the spring(3) for its fitness replace if required.

The Maintenance Kit Comprises the following item:

**Kit Part No : 790 006 10**

<b>SN</b>	<b>Part No</b>	<b>Description</b>	<b>QTY.</b>
1.	AB11-265A	CONTROL AIR RELEASE VALVE	1 No
2.	006814000	SPRING 0.80MM	1 No
3.	006724000A	JOINT RING (26x35x1)	1 No.

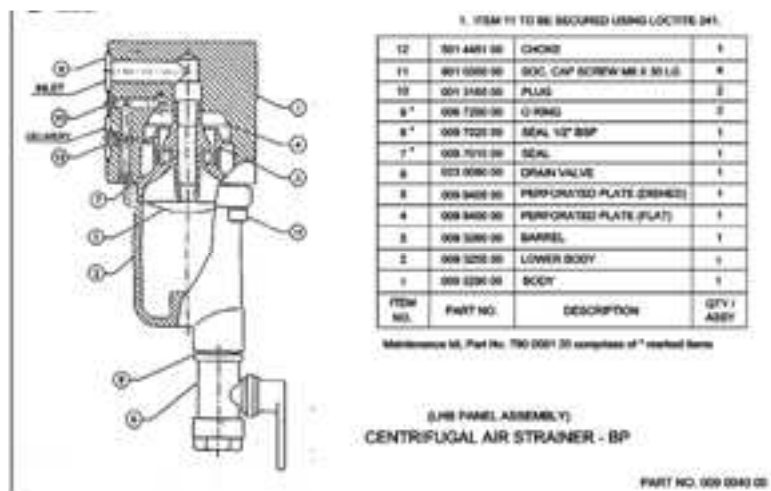
## 5.6 CENT AIR STRAINER - 009 0040 00

### 5.6.1 INTRODUCTION

The Centrifugal Air Strainer (Filter) is designed for installation in the air supply system to pneumatic control valves etc. It removes dirt and other foreign matter from the air supply. When the air is passing through unit in a particular spiral path, the dust and dirt particles carried in the air slide down to the dirt chamber at the bottom by centrifugal action. A drain cock is provided to the dirt chamber to facilitate easy draining of condensate.

### 5.6.2 INSTALLATION

The accumulated debris can be removed out periodically with the system pressure by opening the Drain Cock. Draining the Filter Bowl at the interval specified in the Coaching maintenance schedule at the end of round trip is necessary. In the absence of such a schedule, it is recommended that the Bowl be drained every 7 days to prevent possible accumulation.



In the absence of such a schedule, it is recommended that the Bowl be drained every 7 days to prevent possible accumulation.

The Air Strainer should also be cleaned at the intervals specified in the system maintenance schedule given in Part A under Recommended Schedule Maintenance attention. It is recommended that the Bowl be drained every 30 days to prevent possible accumulation.

The Air Strainer should be overhauled at the intervals specified in the system maintenance under periodical overhaul of the Coach.

### 5.6.3 MAINTENANCE

#### 5.6.3.1 Weekly

Drain the filter bowl at the intervals specified in the system maintenance schedule. In the absence of such a schedule, the bowl should be drained every 7 days.

### **5.6.3.2 Monthly**

The air strainer should be cleaned out at the intervals specified in the system maintenance schedule. In the absence of such a schedule, the drain cup should be cleaned every 30 days.

### **5.6.3.3 6 years**

The air strainer should be overhauled at the intervals specified in the system maintenance schedule. In the absence of such a schedule, the strainer should be overhauled every 6 years.

## **5.6.4 DRAIN BOWL**

The following table With the air pressure isolated and vented, remove the Drain Cock allowing condensate to drain out. Clean the Bowl and refix the Drain Cock.

## **5.6.5 CLEAN**

The Air Strainer can be cleaned without removing the units from its manifold mounting. However, the air supply must be isolated and vented to atmosphere before this procedure.

Undo M8 Screws (11) and remove the Drain Cup (10) together with Lower Body (2) and perforated plates (4 & 5). Reassemble after cleaning the components using a new Seal (7). Ensure the air supply is restored and no air leak is present around the Drain Cup.

## **5.6.6 OVERHAUL**

The maintenance kit should be used for overhaul (Refer for details of the contents of kit in the Parts List). The Air Strainer should be removed from its manifold mounting on the Panel.

Remove the Drain Valve and Bowl. Carry out the cleaning instructions described above under Maintenance. Clean the Body (1), paying particular attention to the mating faces.

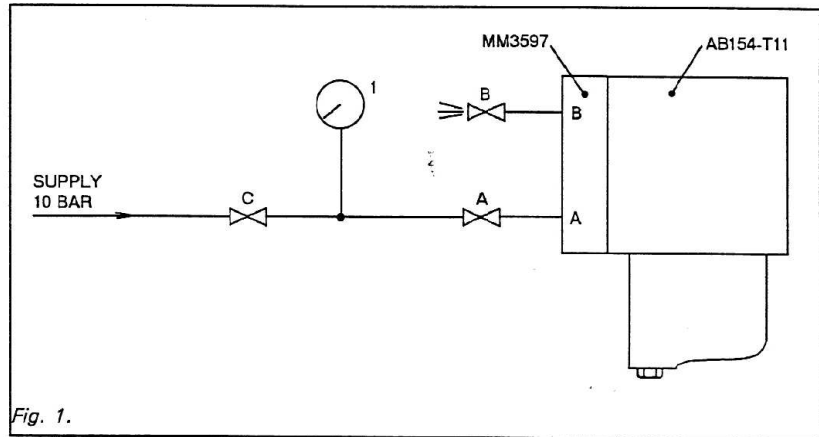
Reassemble the Air Strainer using new Seals (7 & 8). When refitting to the manifold on Panel, new O Ring should be used.

### 5.6.7 TESTING

Subject the Strainer to the test procedure as under.

- Connect the Air Strainer to a clean, dry air supply as shown in test schematic.

Ensure jointing Gaskets (O Rings) are fitted between the Air Strainer and the test manifold (can be fabricated by Railways) for in and outlet connections suiting the Air Strainer.



- Before start of the test, ensure all Isolating Cocks are closed.
- Open Isolating Cock (C). Gauge 1 should rise to 10 kg/cm<sup>2</sup>. Open Isolating Cock A and allow one minute for settlement.
- Using a soapy water solution, check all over the Air Strainer Body and test manifold for leaks. No leaks permitted.
- Open Isolating Cock (B). There should be a continuous flow of air from the Air Strainer. Close Isolating Cock (B).
- Close Isolating Cock (C) and open Isolating Cock (B) to drain the remaining air. Gauge 1 should fall to 0 kg/cm<sup>2</sup>. Close Isolating Cock (B).
- Remove the Air Strainer from the Test Manifold and seal all ports to prevent the entry of foreign matter (masking tape is suitable).

## **5.7 FILTER KIT TO PART NO 009 0070 00**

### **5.7.1 INTRODUCTION :**

Compressed air contains dirt, dust, rust, condensates, moisture contents, oil impurities & exhaust fumes. The air filter cleans and remove the foreign particles enter into the air supply to the system.

### **5.7.2 OPERATION :**

The Filter parts are screwed on to the manifold directly. Compressed air from the air supply source is fed to the input port of the manifold. When the air is passing through filter (vion) element its getting filtered .

### **5.7.3 INSTALLATION**

The accumulated debris can be removed out periodically with the system pressure by opening the cap nut. Drain the condensate/dusts at the interval specified in the Coaching maintenance schedule. In the absence of such a schedule, it is recommended that the condensate/dusts drained every 7 days to prevent possible accumulation.

The Air FILTER should be overhauled at the intervals specified in the system maintenance under periodical overhaul of the Coach.

### **5.7.4 MAINTENANCE**

#### **5.7.4.1 Weekly**

The filter should be examine for loose fastenings or leakages and drain the condensate & dusts as specified in the system maintenance schedule. In the absence of such a schedule, the plan shall be 7 days.

#### **5.7.4.2 Monthly**

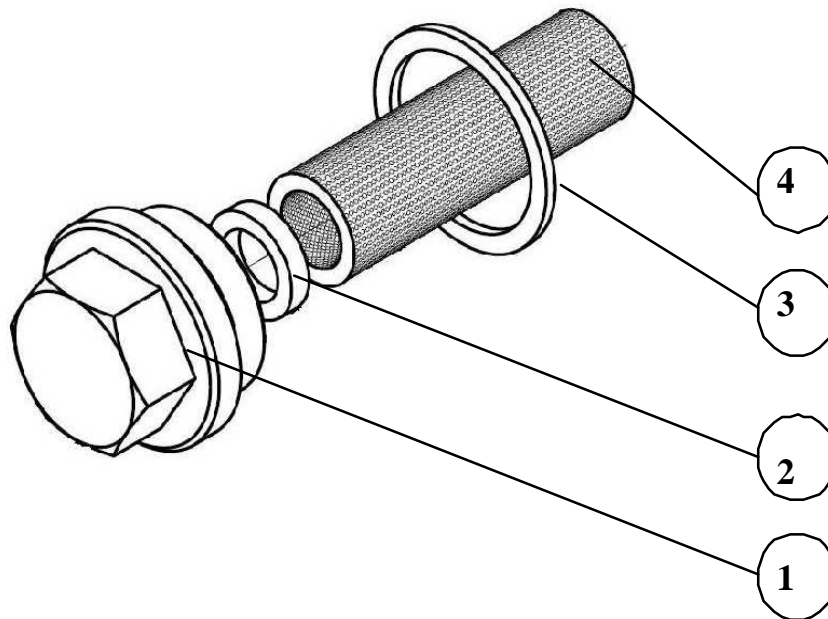
The Filter should be Examine & clean at the intervals specified in the system maintenance schedule. In the absence of such a schedule, The plan shall be every month.

### 5.7.4.3 1-2years

The Filter should be overhauled at the intervals specified in the system maintenance schedule. In the absence of such a schedule, the check valve shall be overhauled every 1-2 years.

### 5.7.5 CLEAN :

The Filter kit removal procedure from the manifold is as follows:



**Figure :1**

#### **Removal procedure :**

1. Remove the the screw capnut (1) from the manifold
2. Recover the insert (2), Jointt (3) and the Filter (4).

After cleaning the components reassemble into the manifold as per following

#### **Installation procedure :**

- Refer to Figure 1.
- Place the Filter (4) and insert (2).
- Install the joint (2) on the face of the manifold.
- Lock the screw cap nut (1).

### 5.7.6 OVERHAUL

The Filter maintenance kit should be used for overhaul (Refer for details of the contents of kit in the Parts List). The Filter parts are to be removed from its manifold.

Remove and Clean carefully the filter element (3) with a clean, dry compressed air line and replace the if it is heavily soiled or contaminated with oils and examine the assembly and remove any foreign matter blowing out any solid deposits.

The Maintenance Kit Comprises the following item Kit Part No : 790 009 106

<b>SN</b>	<b>Part No</b>	<b>Description</b>	<b>QTY.</b>
<b>1</b>	029702500A	Insert	1
<b>2</b>	029602000	Filter	1
<b>3</b>	029702000A	Joint Ring	1

## **5.8 RELAY VALVE TO PART NO 018 0040 00**

### **5.8.1 INTRODUCTION:**

The pneumatic Relay Valve enables a demand for relatively large amount of compressed air to be adequately met and regulated efficiently by a Control Valve of limited capacity. The volume of compressed air required for braking purposes is often far greater than that could be met by the normal Driver's Brake Valve or other Control Device. To meet such a demand, a Relay Valve is used in combination with Driver's Brake Valve and a Distributor Valve and is controlled under the signal pressure.

Sensitive to signal input pressure, the Relay Valve admits air from the compressed air supply to the Brake Actuators in direct proportion to the signal input pressure. The Valve ensures rapid Brake

Actuator filling and exhaust under all braking conditions.

### **5.8.2 OPERATION**

Air connections to the Relay Valve are made via the control unit manifold with the exception of the Relay Valve exhaust which is direct to atmosphere. The air connections are:

The variable pressure Regulator and Auxiliary Reservoir air connection which is sealed by O Ring (34),

The Brake Actuator connection which is sealed by O Ring (3) connected to the Chamber on the upper side of Separating Cover (16),

The Control Reservoir / Regulating air connection which is sealed by O Ring (3) and connected to the chamber below the Pressure Plate (20).

The Valve Spindle (22) is hollow with attachment of two Pressure Plates (20 & 22). One end of the Valve Spindle is open to atmosphere while the other end makes or breaks contact with the Valve Seat Assembly (2) under brake application or release conditions. The Pressure Plate (22) is subject to Control Reservoir pressure both under application and release conditions. The Valve Cover (25) contains the exhaust port.



### **5.8.21 BRAKE APPLICATION**

During brake application air pressure in chamber A increases. The pressure, acting on the surface area of the Pressure Plate (20), forces it and the attached Hollow Valve Spindle (18) to move in the direction of the Valve Assembly (4). The Hollow Valve Spindle Tip, already in contact with the Valve Assembly surface before brake application, lifts the Valve Assembly from the Valve Seat (2). With the Valve now open, chambers B and C are connected and Main Reservoir air can reach the Brake Actuators for initiating braking.

As air pressure in chamber B and on the Pressure Plate (22) tends to equalize, the Valve Spindle (18), attached to this Pressure Plate, moves towards its prebraking position.

During this movement, the Valve Assembly (4) under the force of the Compression Spring (05), remains in contact with the Valve Spindle Tip, preventing any venting of air to atmosphere via the Hollow Valve Spindle. Finally, at pressure equalization, the Valve closes completely, cutting off all connection between chambers B and C yet maintaining brake application.

Because the Relay Valve is highly sensitive, Brake Actuator pressure can be increased in small increments in direct relation to chamber A pressure. Also, in the event of leaks, i.e. Piston Seals, Pipe connections etc., the Valve Assembly (4) will be eased from its Seat to maintain Brake Actuator pressure.

### **5.8.22 BRAKE RELEASE**

During brake release, the air pressure in chamber A decreases and the force acting on Pressure Plate (20) becomes smaller than that acting on Pressure Plate (22). This pressure imbalance causes the tip of the Valve Spindle (10) to lose contact with the Valve Assembly (4). Compressed air from the Brake Actuator and from chamber B is now free to vent to atmosphere via the Hollow Valve Spindle while chamber B is isolated from chamber C by the seated Valve Assembly.

Compressed air vents until the respective pressures in chambers A and B equalize allowing the Valve spindle tip to re-establish contact with the Valve assembly surface and to seal off at atmospheric contact.

Thus pressure reduction in chamber A results in a corresponding pressure reduction in chamber B and sensitive Valve design means that small pressure reductions allow the brakes to be released step-by-step as required.

### **5.8.3 MAINTENANCE**

The Valve requires no routine maintenance between overhauls of the Rolling Stock and should be carried out at the intervals specified in the system maintenance schedule.

The only routine maintenance required is a period check to ensure that the exhaust port is not continuously venting during braking as this indicates poor Valve Seating Joint. The Relay Valve should be overhauled at the intervals specified in the system maintenance schedule.

The Relay Valve is removed from its mounting by releasing two Hex. Headed Bolts and the Valve ports should be sealed with adhesive tape until the overhaul procedure is carried out.

### **5.8.4 OVERHAUL**

Dismantle the Valve by reference to part drg no. 018 0040 00.

### **5.8.5 RE-ASSEMBLY**

Reassemble the Valve with reference to the drawing by using new Gaskets, O Rings and Seals in the reverse order of disassembly.

### **5.8.6 TESTPROCEDURE**

After overhaul, subject the Relay Valve to the test procedure attached.

### **5.8.7 REASSEMBLY ON BRAKE PANEL**

The tested and passed Valves is to be mounted to the Integral Sandwich Piece with Isolating Cock Assembly with two Hex. Bolts with the Sealing Gasket in position.

The tightening torque for the M10 Fixing Screws is 20 ft. lbs.

#### **NOTE:**

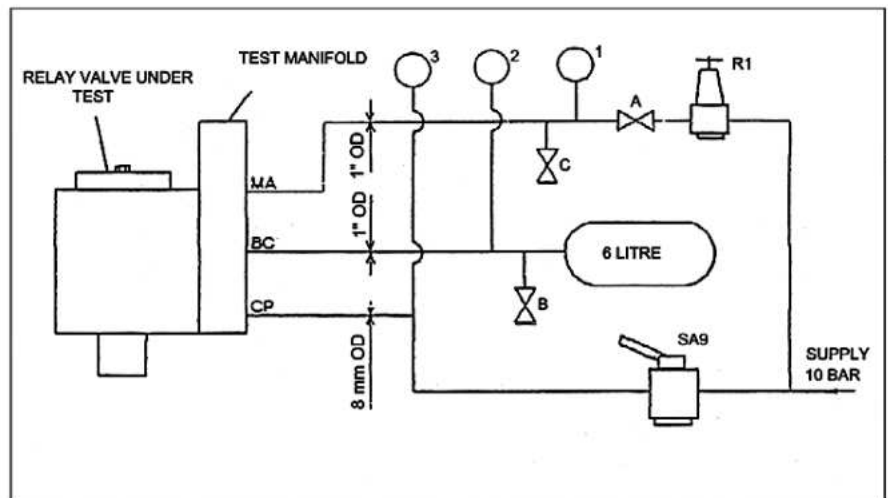
The Relay Valve performance is also to be checked during the overall brake system test of the individual Coach.

### **5.8.8 PROCEDUREFOR TESTING**

Refer test schematic attached.

1. Connect the Test Manifold as shown in the schematic (Railways may fabricate). Use only clean, dry air supply. Close all Isolating Cocks.
2. Mount the Relay Valve on the Manifold ensuring good O Rings in position on the ports.
3. Open Isolating Cocks A & B and regulate the air supply pressure so that gauge 1 reads 0.4 kg/cm<sup>2</sup>. There must be no leaks from Isolating Cock B.

4. Regulate air supply pressure to 10 kg/cm<sup>2</sup> as indicated on gauge 1. There must be no leak from the Isolating Cock B with checking on soap water solution. Close Isolating Cock B.



1. 0 - 15 KSC
2. 0 - 7 KSC
3. 0 - 7 KSC

5. Using the Controller (SA-9 Brake Valve), operate the Relay Valve several times to allow it to settle under operating conditions.
6. Move the SA-9 Controller to the release position. Open Isolating Cock B and test for leaks with soap water solution. No leak is permitted. Close Isolating Cock B.
7. Operate SA-9 Controller in steps so that gauge 3 reads the value indicated as under. Gauge 2 should read the corresponding value within the tolerance of  $\pm 0.1$  kg/cm<sup>2</sup>.

**Gauge 3 (SA-9)**

**Gauge 2**

1 kg/cm <sup>2</sup>	1 kg/cm <sup>2</sup>
2 kg/cm <sup>2</sup>	2 kg/cm <sup>2</sup>
3 kg/cm <sup>2</sup>	3 kg/cm <sup>2</sup>
3.5 kg/cm <sup>2</sup>	3.5 kg/cm <sup>2</sup>

**NOTE:**

**When operating the Controller SA-9, the air pressure on gauge 3 must never be reduced to achieve the required figures.**

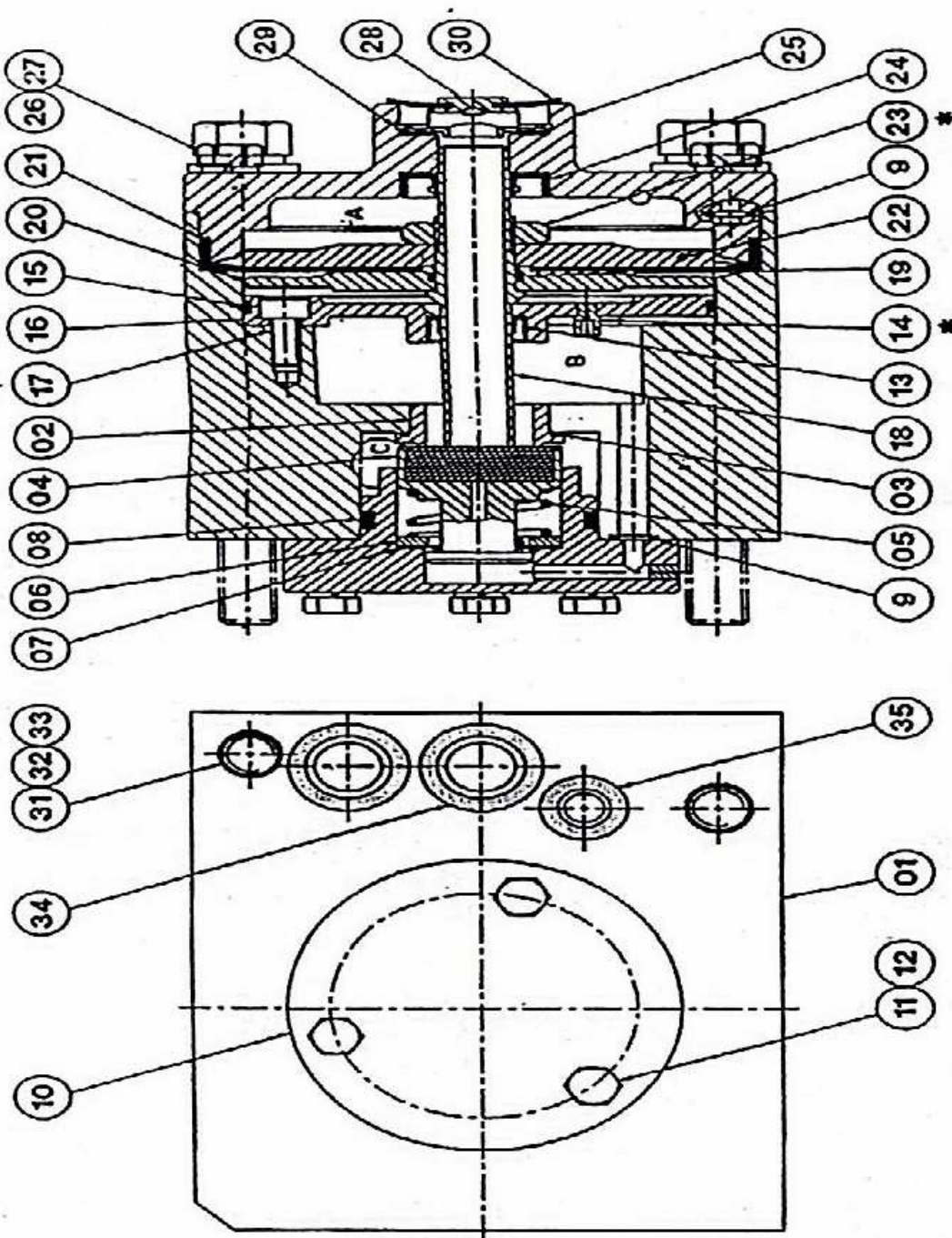
8. Operate SA-9 Controller to lower the air pressure on gauge 3 to the values shown as under. Gauge 2 should read the corresponding value within the tolerance of  $\pm 0.1 \text{ kg/cm}^2$ .

<b>Gauge 3 (SA-9)</b>	<b>Gauge 2</b>
3 kg/cm <sup>2</sup>	3 kg/cm <sup>2</sup>
2 kg/cm <sup>2</sup>	2 kg/cm <sup>2</sup>
1 kg/cm <sup>2</sup>	1 kg/cm <sup>2</sup>

**NOTE:**

**When operating the Controller SA-9, the air pressure in gauge 3 must never be increased to achieve the required figures.**

9. Close Isolating Cock A and open Isolating Cock B & C. Ensure the SA-9 Controller is in release and that gauge 3.0 reads 0.0 kg/cm<sup>2</sup>.
10. Remove the Relay Valve from the Test Manifold and seal all ports to prevent re-entry of foreign matter till its reuse.



PART NO. 018 0040 00

NOTE:

- \* 1. SECURE ITEMS 14, 17 & 23 IN POSITION WITH LOCTITE 241.

### RELAY VALVE ASSEMBLY

**5.8.9 Parts List**

<i>Item No.</i>	<i>FTIL Part No.</i>	<i>Description</i>	<i>Qty</i>
1	780 3166 00	Relay Body Plugged	1
2	018 8110 00	Valve Seat	1
3*	018 7130 00	O Ring	1
4*	018 1100 00	Valve Assembly	1
5*	018 8120 00	Compression Spring	1
6	018 3230 00	Diaphragm Clamp Plate	1
7*	018 7100 00	Diaphragm	1
8*	018 7010 00	O Ring	1
9*	010 7030 00	O Ring	2
10	018 1110 00	Valve Guide Cap Plugged	1
11	920 0137 00	Hex. Head Screw M 16 x 25 LG	3
12	909 0070 00	Spring Washer Ø 6	3
13*	018 7110 00	Seal	1
14	011 4015 00	Choke	1
15*	016 7060 00	O Ring	1
16	018 3200 00	Chamber Separating Cover	1
17	901 0290 00	Socket Head Cap Screw M 6 x 12 LG	3
18	018 3210 00	Valve Spindle	1
19*	501 7110 00	O Ring	1
20	018 3240 00	Pressure Plate	1
21*	018 7120 00	Diaphragm	1
22	018 3250 00	Pressure Plate	1
23	018 3260 00	Clamp Nut	1
24*	018 7020 00	Seal	1
25	780 3175 00	Seal	1
26	920 0100 00	Cover Plugged	2
27	909 0178 00	Spring Washer Ø 8	2
28	038 3050 00	Exhaust Cap	1
29	915 0097 00	Internal Circlip 830 x 1.2 N	1
30*	038 7020 00	Exhaust Cover	1
31	905 0315 00	Hex. Head Bolt M 12 x 130 LG	2
32	909 0010 00	Spring Washer Ø 12	2
33	908 0030 00	Plain Washer Ø 12	2
34*	009 7020 00	O Ring	2
35*	006 7200 00	O Ring	1

**Maintenance kit, 790 0182 05 comprises of items marked thus (\*).**

## **5.9 PRESSURE SWITCH TO PART NO 040 1090 00**

### **5.9.1 INTRODUCTION**

The single pole, double throw snap NO/NC switch has double break contacts offering one normally open circuit and one normally closed circuit.

The Pressure Switch has an adjustable "switch - on" pressure and an independently adjustable differential to the "switch - off" pressure.

### **5.9.2 FUNCTION**

The Pressure Switch controls the electrical circuit of WSP unit operation for an OFF/ ON mode. It is connected in the Feed Pipe Circuit and normally open type. As soon as the pressure in Feed Pipe rises to a level of 1.8 kg/cm<sup>2</sup>, the contacts are closed automatically and WSP electrical circuit gets energized by the electrical supply of the LHB Coach and brings it to functional mode. When the FP pressure drops down to 1.3 kg/cm<sup>2</sup> during reduction stage, the Pressure Switch assumes the OFF mode. This disconnects the electrical circuit governing the WSP operation in the Coach and makes it non-operational.

### **5.9.3 RATINGS**

#### **5.9.3.1 PRESSURE**

Maximum allowable pressure 11 (kg/cm<sup>2</sup>)

#### **WARNING**

If the Pressure Switch Actuators are exposed to system or surge pressure greater than the maximum allowable pressure indicated, leakage from the actuator and / or change in operating values may result. The more frequent the application and the greater the value of excessive pressure, the more actuator life will be decreased.

#### **5.9.3.2 ELECTRICAL**

The normal rating of the switch is limited to 110-230 volts DC and 2 amps. maximum operation.

#### **5.9.3.3 TEMPERATURE**

Pressure Switches, are suitable for continuous use, provided that the process fluid does not freeze and the conditions of application do not give rise to the formation of frost or ice inside the Pressure Switch, due to operating ambient factors.

## **59.4 INSTALLATION**

### **WIRING**

The terminals of the switch will accept 1.0 to 2.5 mm solid or stranded copper wire. However 1 sq. mm of stranded copper wire has been used in the supplies.

For securing the wires to the terminals, tighten to 0.7 to 1.0 Nm torque. The terminals are not suitable for use with aluminium wire.

## **59.5 MAINTENANCE:**

The Pressure Switch requires only checking of its operating pressures in service. No other maintenance is desirable. If a Pressure Switch fails to operate correctly in service despite adjustment, it is recommended for renewal.

## **59.51 OPERATING PRESSURE ADJUSTMENT:**

### **SETPOINT ADJUSTMENT**

The Pressure Switch is set at the factory to operate at the correct pressures as per the requirement of Railways. It is good practice to cycle the switch to determine the actual operating points before proceeding with re-adjustment.

**Important: Adjust switching pressure only under steady supply pressure.**

### **ADJUSTMENT PROCEDURE**

- Remove the Dust Cover.
- Operate the Pressure Switch few times to settle before varying / adjusting the Pressure Switch.
- Ensure that the supply air pressure (in Coach or test set up) is steady and constant.
- Connect continuity tester (buzzer) across common and NO terminal.

### **TO SET RISING PRESSURE (1.3 kg/cm<sup>2</sup>)**

- Remove Safety Lock Screw from the Flower Knob.
- Hold the Hexagonal Nut (beneath the Flower Knob) with appropriate spanner.
- Slowly bleed the pressure. Check the point when NO contact is made (listen to buzzer noise).



- If needed, rotate the Flower Knob to increase or to decrease the pressure based on the direction shown on the wheel for the correct value.
- Replace the Safety Lock Screw and secure the Flower Knob.

#### **TO SET THE FALLING PRESSURE (1.9 kg/cm<sup>2</sup>)**

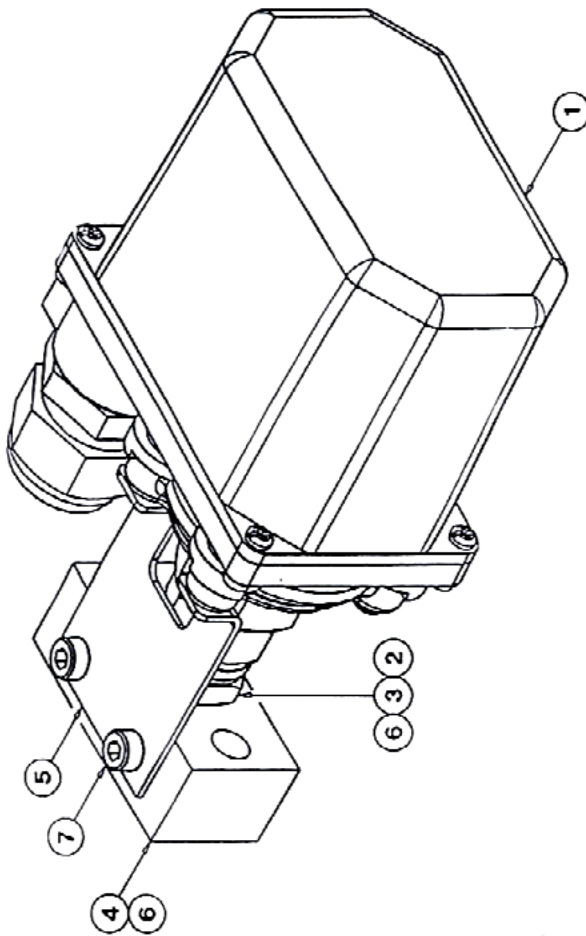
- Slowly increase the pressure. Check the following pressure points.
- Adjust the Hexagonal Nut with help of appropriate spanner. To increase or decrease the pressure, if needed, following the direction mentioned in the Flower Knob.
- Adjust the Hexagonal Nut to 1.9 kg/cm<sup>2</sup> till NO contact is made.

#### **5.9.5.2 REPLACEMENT OF PRESSURE SWITCH**

If a Pressure Switch is changed, it is essential that its operating pressures are set correctly. The procedure for replacement is as follows:-

- Open the cover by releasing 4 screws.
- Disconnect the electrical wiring from the terminal block, note the wiring arrangements so that a new switch can be connected correctly.
- Disconnect the air connection.
- Release 2 screws holding the Pressure Switch in position and remove the switch.
- Fit a new switch in the reverse order, and ensure the electrical wiring is correct.
- Check switch opens and closes at the correct pressures after fitment in the Coaching braking system as per adjustment procedure.

Maintenance list part no. for 006 1195 00  
Pressure Switch is 790 006 171.



7	901 0317 00	ALLEN CAP SCREW M5 x 12	2
6*	013 7010 00	O RING	2
5	040 8340 00	SUPPORT BRACKET	1
4	040 3250 00	MANIFOLD	1
3	040 8330 00	ADAPTOR	1
2*	040 7020 00	DOWTY SEAL (3/8")	1
1	1/604990	MOELLER PRESSURE SWITCH	1
ITEM	PART NO.	DESCRIPTION	QTY

Maintenance kit Part No. 790 0402 00 comprises of \* marked items

(BRAKE CONTROLLER LHB)

## PRESSURE SWITCH ASSEMBLY

PART NO. 040 1090 00

## **5.10 HEALTH AND SAFETY**

The following points must be considered and appropriate precautions should be taken when working on this equipment during disassembly, overhaul assembly and tests. These should not be taken as an exclusive list of hazards.

- 1.1 Individual sections of this publication may include specific health and safety information relating to that section. It is important that these pages are read and appropriate actions taken.
- 1.2 This is compressed air equipment. Compressed air is dangerous. “Bottled up” air under pressure despite supply cut-off, may cause component, diaphragm, trapped foreign particles, etc., to be air borne during disassembly.
- 1.3 Some components / sub-assemblies use powerful springs in a compressed state. Care must be taken to release the forces in a controlled manner during disassembly.
- 1.4 Oils and greases are used which could be a hazard.
- 1.5 Air jet used for cleaning parts should be less than 30 psi. Higher air pressure may cause particles of dirt or droplets of cleaning solution to be air borne and result in skin / eye irritation.
- 1.6 Chemical cleaning agents may be used for certain operations, which need a strict compliance to the manufacturer’s handling procedures.
- 1.7 Before performing any test / repair on brake system of rolling stock, steps against possible “run away of the vehicle” are to be taken. In addition, staffs working in undergear area are to be cautioned of likely brake rigging movement.

## **5.11 GENERAL HINTS ON MAINTENANCE OF AIR BRAKE SYSTEM**

### **ROUTINE MAINTENANCE**

The high standard and performance obtained from air brake equipment will be maintained in service with the minimum of maintenance providing that water / dirt are kept out of the equipment and that the compressed air supply is kept reasonably clean from dust, oil and condensate. At regular intervals, filters must be removed, cleaned and checked for damage before being renewed or replaced. Drain cocks should be opened at regular intervals to remove collected condensate and other foreign matter.

The use of blanking piece or sealing tape is recommended to seal open ports to prevent ingress of moisture and foreign matter into the components of the brake system.

When carrying out maintenance, the instructions given in the catalogue applicable to a particular item should be followed.

### **INSTALLATION**

PTFE tape is not recommended to be used on any pipe joints associated with air brake system. A suitable pipe sealant is "Loctite 577" or equivalent.

### **SPARES**

Only approved and recommended overhaul kit / spare parts as given in the parts catalogue should be used during overhaul / renewing components.



### **5.12.1 ADDITIONAL GENERAL TOOLS FOR PERIODIC OVERHAUL AT WORKSHOPS**

All the general tools mentioned above for base Depots :

Allen Key set	2 sets
Pliers 6" straight nose	2 Nos
Pliers 6" bent nose	2 Nos
Circlip pliers for internal circlip of sizes	
B40 IS 3075 all light series	2 sets
B14 IS 3075 all light series	2 sets
B28 IS 3075 all light series	2 sets
Torque wrench 9.3 M Kg	2 Nos

The Special Tools and Fixtures additionally required during the overhaul of the brake equipment are covered as under in the relevant chapters. The sketches are attached in the respective equipment chapters.

#### **FORC3W - DV**

Bench Mounting Fixture for holding C3W during overhaul.

Special tools for overhaul under FTIL Part nos. SCT 6092, SCT 6015, RPBF 0003, SCT 6026, SCT 6016, ACT 6017, SCT 6093.

Assembly and Disassembly special fixture FTIL - RPBF 0202

Extractors during dis-assembly

Hand Press

Pressing Fixtures during assembly.

Special Tool for dia 20mm Cock and Special Box Spanner.

**5.13 TEST RIGS FOR IOH & POH REPAIRS**

<b>Description</b>	<b>FTIL drawing / sketch no.</b>	<b>Base IOH depot</b>	<b>POH Workshop</b>
Mobile Single Car test	795 0003 00	1	1
Mobile Rake Test Rig	RBTR 0016	1	1
Test Bench for functional tests of BC, End Angle Cock, Air Strainer, Isolating Cock, Check Valve, PEASD, PEAV, Guard's Brake Van Valve, Cut Out Cock, etc. Details are given at each equipment chapter by way of sketches wherever necessary		-	1

**AIR TEST ARRANGEMENTS**

Pneumatic test arrangements for functional checking CR, AR, Hose Coupling BP/FP, PVPA, Emergency Valve.	1	1
Hydraulic test arrangements for checking CR and AR.	-	1

**FACILITIES COMMON FOR ALL CENTRES**

Air supply source with a working pressure 10 kg/cm<sup>2</sup> with a delivery capacity of minimum 2000 litres/min.

Air Reservoir Capacity 350 litres - 1 no (minimum)

**OTHER FACILITIES**

Facilities like handling, cleaning, lifting equipments, work table with plastic storage bins for keeping components / spares, clean dust-free room for assembly / testing etc., preferably air conditioned, may be decided by Railways in view of the sophistication of work, level of activity at the center.

## **5.14 CLEANING PROCEDURE (AIR BRAKE EQUIPMENTS /COMPONENTS)**

The cleaning method depends upon the component to be cleaned, the degree and the type of dirt to be removed and the facilities available.

Whatever cleaning agents are used, due care must be taken to ensure the health and safety of the personnel involved. The manufacturer's recommended safety precautions including the use of approved cleaning plant must be followed. Since every installation is different, the responsibility for safety lies with the user and the manufacturer of the cleaning plant and materials. However, general guidelines on the cleaning procedure for the air brake equipment during maintenance and scheduled overhauls as under are recommended.

Blow the exterior of the equipment / assembly with a low pressure jet of air to remove the external dirt. After removal of sub-assemblies, wipe the exterior portions with a cloth.

Clean with environment friendly agents like White spirit, etc /all the stripped components by using a cloth or nylon bristle brush as the case may be based on the sensitivity of item. If kerosene is used, special care must be taken in protecting the user with proper gloves as well as the environment from the likely fumes. Sufficient care is to be taken to ensure that the residual deposit of kerosene, if trapped inside the cavities / bores of the components, is removed thoroughly before the components being re-used. In addition, the contaminated kerosene after use should also be disposed off by proper environment friendly action.

Blow a low pressure jet of dry compressed air inside the machined bores, cored passages, port holes, cavities and seating grooves on the subassemblies.

Wipe the parts with a clean lint free cloth and allow them to dry on a clean rubber sheet on the work table. Take good care to protect the finish on the various components and place them. Avoid keeping the components piled up one over the other.

All rubber components including rubber seated valves must not be exposed to petroleum or chemical cleaning solvent. Items like Gasket, "O" Ring, Seal, Diaphragm, Nylon filter / Strainer etc., are to be cleaned only with a detergent dissolved in warm water or soap water solution. Blow a jet of compressed air in the reverse direction on the Nylon Filters and wipe clean with soft cloth.



Chokes / Choke passages are to be cleaned by a blow of clean low pressure air jet. Clogged chokes may be cleaned with a wire of smaller diameter without using a sharp tool. Application and Release choke plugs, in DV valve body are to be cleaned, blown with air, and kept free of dirt/dust, grease, paint, etc., by suitable covering till they are fitted.

### **Caution:**

While cleaning the equipment / components with chemical / petroleum compounds, care must be taken to prevent inhalation of fumes emanating from the cleaning agent and for any possible injury to persons handling the equipment. Similarly, for any chemical fumes likely to cause a fire hazard, steps must also be taken for adequate protection to equipments/ installation. Consult manufacturer's recommendation in handling such chemicals.

### **5.15 INSPECTION/REPLACEMENT CRITERIA (AIR BRAKE EQUIPMENT/ COMPONENTS)**

Visual inspection and replacement criterion as under, is recommended during scheduled overhaul of the equipments used in the air brake system of rolling stock.

Ensure a thorough external and internal cleaning after disassembly and stripping of components with proper cleaning agent.

Inspect visually with the help of a magnifying glass of at least 100mm dia.

All components for any external damages, dents, cracks, corrosion, pit marks, cuts, deep scratches, abnormal wear, sharp corners on mounting / seating / sliding / mating faces.

Threaded portion on components / parts, for any damages / abnormal wear.

#### **Replace components if,**

1. Moving parts appear abnormally worn out or scratches/burrs observed on the mating parts.
2. Threaded portion on components exhibit damages / abnormal wear.
3. Valve Seat cut or scratched, tips of Hollow Stem / Guide Plunger cracked, cut, dented or oval flat / sharp.
4. Spring found in damaged, cracked, heavily rusted, permanent set condition and Spring seats indicate any damage or abnormal wear. Refer to our separate DV manual under ref. WBS/PBS/006 for spring information.
5. Filter/Strainer found with rupture, damaged seating face, presence of large blocked passages despite cleaning.
6. Rubber items like Gaskets, Diaphragms, etc., found with cut, minute crack, loss of shape & flexibility, high stiffness, bubble formation or disintegration at mounting/seating surfaces, etc.
7. O" Ring especially the dynamic ones found with loss of shape, flattened out, nick, cut or exhibition of twisted / sharp flashes due to constant

squeeze, etc. Rubber to metal bonded valve found with any sharp / cut marks, swelling, depression, groove, taper wear, etc., on the valve seating surface.

8. The lips of the Seal have worn out, become blunt and Coil Springs inside Seal deformed.

In general, all rubber items and other gaskets are recommended to be replaced near to a service period of 24 months when the equipment is removed for examination / overhaul or opened for service attention, to ensure reliability of performance.

### 5.16 LUBRICATION AND RECOMMENDED GREASES

The recommended lubricants during assembly after overhaul/out of course repair attention for other equipments used in the system are as under:

- **Molykote 33M Grease (Silicon base) or equivalent.**

Rubber sliding parts, dynamic and static "O" ring internal surface contacting metal and the parts on which they slide.

Diaphragm, Seal.

- **Shell Rhodina RL3/ Esso Mobilith SHC 220.**

Caps, main valve plugs, threaded parts of choke.

#### SPECIFICATIONS OF GREASES

Tests	Molykote 33M	Shell Rhodina RL3	Esso Mobilith SHC 220
Physical Aspect	Soft	Semi solid at ambient temperature	Red Colour, Semisolid at ambient temperature
Base	Silicon	Calcium	Lithium Complex
Depth of penetration	280 mm, <i>Worked 60 strokes, As per ASTM D 217</i>	220-250 <i>as per ISO 2137</i>	280 at 25°C, <i>as per ASTM D 217</i>
N.L.G.I. Number <i>as per DIN 51818</i>	2	3	5
Kinematic Viscosity of	-	100 mm <sup>2</sup> /sec <i>as per ISO 3104</i>	220 cSt at 40°C <i>as per ASTM D</i>

Tests	Molykote 33M	Shell Rhodina RL3	Esso Mobilith SHC 220
Oil at 50°C as per DIN 51561			445
Base oil viscosity at 25°C	100 mm <sup>2</sup> /s	-	-
Drop Point Degrees C (F)	226 (439)	-	-

The movement of valves, rubber diaphragms etc., in air brake equipment is very limited and therefore only very small quantities of lubricant are needed. A light smear of recommended grease in the manual or equivalent should be applied to sliding seals and valve stems.

Grease must not be applied to the working surface of diaphragms but may be applied sparingly to the lips to aid assembly.

## 5.17 SPECIAL INSTRUCTIONS FOR STORAGE OF RUBBER COMPONENTS :

### 5.17.1 RUBBER ITEM STORAGE CONDITIONS:

The following instructions are applicable for rubber components

Rubber components should be stored for long duration periods at controlled temperatures and away from excessive heat. The storage temperature is  $20 \pm 5^\circ \text{C}$  and kept away from humidity. However, the specified storage temperature is not application for fast moving items (not exceeding three months) like Piston lining, Piston Seals, Protection Cover, Packing Cup, Gasket, etc and can be stored at ambient temperature and humidity.

Irrespective of storage in controlled or ambient condition, the points mentioned as under in paras 1.1 to 1.9 should be adhered to.

They should not come into contact with non-mineral automatic brake fluids.

They should be kept away from the vicinity of any possible sources of Ozone like electric motor, fluorescent and mercury lamps and should not be exposed to sunlight.

- 1.1. They should be kept away from Ketones, alcohol and acids.
- 1.2. They should be stored away from strong artificial light having ultraviolet content.
- 1.3. They should be stored in plastic bags / opaque boxes.
- 1.4. They should be stored without subjecting to tension, compression or twist.
- 1.5. They should not come into contact with solvents and volatile matters.

- 1.6. They should not come into contact with metals especially Copper and Manganese.
- 1.7. They should not be cleaned with solvents like Tri-chloro-ethylene, Carbon tetra-chloride and Hydrocarbons. They can be cleaned with mild soapsuds and dried at room temperature.
- 1.8. They should not come into contact with metals especially Copper and Manganese.
- 1.9. They should not be cleaned with solvents like Tri-chloro-ethylene, Carbontetra-chloride and Hydrocarbons. They can be cleaned with mild soapsuds and dried at room temperature.

### **5.17.2 SHELF LIFE**

The rubber components can be stored for a period of two years from the date of manufacture (indicated wherever possible on the component), before usage, if stored under controlled conditions.

Drawal from storage is to be on first-in-first-out basis in order to obtain the maximum service life.

Shelf life means strictly storage life beyond which the rubber properties will deteriorate if stored for longer period even in controlled conditions. However, if it is drawn from Stores during any part of the shelf life, it can serve satisfactorily much longer period than two years from the date of manufacture, as the component will be in dynamic conditions being subjected to flexible forces inside the brake equipment.

Such dynamic life can extend to as long as 5 years, subjected to normal regular periodic maintenance and protected from damages due to external reasons such as abrasive particles in the air system, coagulation of grease due to water entry and sharp / rough edges / surfaces in the mating components.

### **5.17.3 EQUIPMENT**

Brake equipment are sensitive and critical. Sufficient care is to be taken during handling, transportation, storage and installation, to avoid damages,

Performance deviation and reworking. C3W Distributor Valve assembly and Brake Cylinder need extra care.

Brake equipment are to be stored under covered roof to prevent entry and collection of dust / dirt / rain water.

Pipelines of brake system are to be kept with end protection caps under proper storage conditions till its fitment, to prevent collection of dust, moisture & rain.

**6.0 RECOMMENDED SCHEDULE MAINTENANCE ATTENTION FOR LHB COACH EQUIPMENT**

S.No	Description	APPROXIMATE INTERVAL						
		Intensive examination	D1 Trip/Weekly	D2 Monthly	D3 H/YLY	SS-1	SS-II	SS-III
1	Brake Frame (A0)	E	E	E	E	0	0	0
2	Brake Panel (A1)	E	E	E	E	0	0	0
3	Distributor Valve (A2)	E/T*	E/T*	E/T*	E/T*	0	0	0
4	Control Reservoir (A3)	E	E	E/D	E/D	0	0	0
5	Air Filter for BP & FP (A4)	E/D	E/C	E/C	E/C	0	0	0
6	Cut Out Cock for DV (A5)	E	T*	T*	T*	0	0	0
7	Cut Out Cock A 1/2" (A9), 3/4" (A20), 3/8" (A21)	E	T*	T*	T*	0	0	0
8	Pressure Switch (A10)	E	T*	T*	T*	0	0	0
9	Check Valve (A16)	E			T*	0	0	0
10	Relay Valve (A17)	E	T*	T*	T*	0	0	0
11	Auxiliary Reservoir (B1) & Door Reservoir (B7)	E	E	E	E	0	0	0
12	Drain Cocks (B2) fitted to (B1) & (B7)	D	D	D	D	0	0	0

S.No	Description	APPROXIMATE INTERVAL						
		Intensive examination	D1 Trip/Weekly	D2 Monthly	D3 H/YLY	SS-1	SS-II	SS-III
13	End Cocks BP (B3 & B8)	D	E/T	E/T	E/T	O	O	O
14	Hose Coupling BP and FP (B4 & B5)	E	E	E	E	O	O	O
15	Pilot Valve for Passenger Alarm (B6)	E	E/T	E/T	E/T	O	O	O
16	BP Accelerator Valve (B12)	E	E/T	E/T	E/T	O	O	O
17	Isolating Cock (B13)	E	E/T	E/T	E/T	O	O	O
18	Emergency Valve (B21)	E	E/T	E/T	E/T	O	O	O
19	Installation Lever Assy (B25)	E	E	E	E	O	O	O

**E – Visually examine for loose fastenings, leaks or other damage.**

**C – Clean**

**D – Drain condensate / Dust**

**T – Operate and check performance**

**T\* - Operate and/ or check performance as part of brake eqpt. System.**

**O – Overhaul**

**X – Renew material**

## **7.0 About the Brake Panel**

- 1.** The overall weight of the frame is reduced by about 80 kgs to facilitate easier handling apart from offering lower accelerations during dynamic conditions, thus reducing the effect of vibration.
- 2.** Header ports are in the same location as in existing with identification.
- 3.** Material of frame is changed from Carbon steel to Stainless steel to avoid rusting during service.
- 4.** The mounting dimensions of the frame including position of piping have been retained to fit in the existing coaches also (This means no change is foreseen in the mounting or any other interface by the car builder).
- 5.** The overall frame is provided with a protective mesh-guard to safeguard against the trackside ballast hits.
- 6.** Adequate space is maintained on the panel for interchange ability of the DV with that of other approved manufacturers as per the specification
- 7.** The positioning of the DV on the brake frame is made in such a way that the releaser lever arrangement can be attached even to this frame without any change.
- 8.** Overall size of the Brake Panel is reduced from 765 x 472 x 43 mm to 480 x 350 x 72 mm to facilitate easier handling during maintenance.
- 9.** The compact size of the brake panel has permitted a simplified design of the protective cover instead of the current method of the sliding Door, Locking arrangement etc. as used in the current supplies. All the critical Isolating cocks are totally concealed from the free accessibility.
- 10.** BP Isolating cock locking arrangement to avoid un-authorized operation.
- 11.** The reservoirs (75 and 125 ltrs) are mounted at the top side of the frame to facilitate easy removal for servicing. The design adopted is positive holding principle.

## **OUR OBJECTIVE**

To upgrade maintenance technologies and methodologies and achieve improvement in productivity and performance of all Railway assets and man power which inter-alia would cover reliability, availability, utilisation and efficiency.

If you have any suggestions and any specific comments, please write to us.

**Contact person** : *Executive Director*

**Postal address** : *Indian Railways,  
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