



ANDHRA PRADESH STATE ROAD TRANSPORT CORPORATION

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Office of the VC&MD,
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Sub: **MAINTENANCE**-Maintenance of Dual Brake System and ensuring its proper working condition-Comprehensive guidelines issued-Reg.

- Ref: 1. Cir.No.22/2010-MED, 21.08.2010.
2. Cir.No.20/2007-MED, 11.10.2007.
3. Cir.No.21/2009-MED, 11.09.2009.
4. Cir.No.16/2005-MED, 20.12.2005.
5. Cir.No.23/2003-MED, 07.07.2003.

Dual Air Brake system is standardized from the year 1990 by all chassis manufacturers. Accordingly APSRTC has been procuring Chassis& Buses provided with Dual Air Brake System from M/s. A.L, TATA, Eicher etc.

Since introduction of D.B.System several product developments have been carried out by M/s. Wabco from time to time. The product developments, changes in the maintenance systems, spare parts / kits to be consumed at depots / work shops were communicated through the above referred circulars.

The essential aspects of preventive maintenance of D.B.System, periodicities, spare parts / kits to be consumed are summarized and comprehensive guide lines are now communicated here with

I.DUAL AIR BRAKE SYSTEM:

The advantage of Dual Brake system is that all the three brake systems i.e, Front and Rear Brakes (Power Brakes) and Hand Brake function independently. Even if there is loss of air pressure in Front Brake circuit, Rear Brakes can still function and vice-versa.

The Hand brake can be applied by releasing the compressed air from the hand brake circuit through operation of hand brake valve. Guidelines are already issued earlier to familiarize drivers at depot level on usage of hand brake while parking the buses in depots and bus stations and also to use hand brake in emergency situations when service brakes fail partially / fully to stop the bus and thereby to avert accidents at any speed.

The typical circuit diagram of a Dual air Brake system is furnished below:

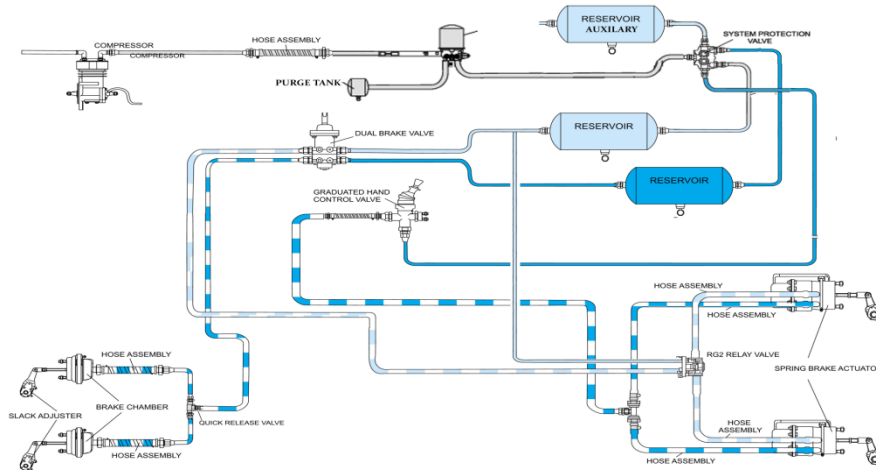


Fig: Dual Air Brake circuit

II. COMPONENTS OF DUAL BRAKE SYSTEM:

- Air Compressor
- Air Dryer & S P Valve / DDU
- Air reservoirs
- Dual Brake Valve
- Relay Valve / Quick Release Valve
- Brake Chambers (Front& Rear)
- Hand Brake Valve
- Polyamide Pipelines
- Rubber Hoses at brake chambers

1. AIR COMPRESSOR:



Function:

Mounted on engine. Supplies compressed air to air tanks through air dryer and SP valve (or through DDU). Air cooled Compressor is of 160 cc capacity and water cooled is of 230cc.

Maintenance:

- Ensure supply of clean air into compressor from air inlet manifold of engine.
- Ensure no leakage of engine oil at compressor mounting 'O' ring.
- Check up and ensure that Air building time doesn't exceed 3.5 minutes in every Sch III / IV at full engine R.P.M.
- If the air build up time exceeds 3.5 minutes for cut out pressure of 8.2 Kg/cm² at full engine RPM, change AC head.
- If any traces of oil is found at air dryer or DDU silencer, change air compressor with CO/NEW Compressor.
- Check for leakages at pipe joints / unions with soap water and attend if leakage is observed.
- Change air compressor once in two years (i.e., Alternate F.C)
- Life of the air compressor is 1.5 lakh kms or 18 months which ever is earlier
- Oil / grease / anabond should not be applied on Air compressor gaskets

2. AIR DRYER- UNLOADER VALVE - PURGE TANK:**Function:**

- Air Dryer eliminates moisture and oil content from compressed air and supplies dry compressed air up to the pre-set cut out pressure of 8.20 bar (in un-loader valve) to 3 air tanks through SP valve.
- Purge tank is connected to outlet line of the air dryer in loop to facilitate clearance of accumulated water and oil from the silencer (bottom of air dryer) through purging action (compressed air flow in reverse direction) at every cut out cycle.
- If purging fails, brake units will be damaged prematurely due to the presence of oil and water in compressed air .

Maintenance:

- Check cut out pressure (8.20 bar) and cut in pressure (7.20 bar) in every Sch- III/IV , adjust cut out pressure if necessary.
- If cut out pressure is not reached, due to compressor defect or pipe leakages purging action will not take place which results in premature failure of the costly silicon desiccant cartridge provided in Air Dryer.
- Ensure no leakages of compressed air from compressor to air dryer (charging circuit) pipe line.
- Always ensure connection to purge tank from the outlet of air dryer.
- Ensure proper clamping and tightness of mounting bolts of air dryer and purge tank.

- Check for air leakages at pipe line joints / unions with soap water and attend leakages.
- Change Air dryer cum un-loader once in two years (alternate F.C).
- Frequent cut out and cut in should not come at air dryer
- Air dryer location should not be changed in the bus
- If water / oil is noticed in air tanks, air dryer and compressor need to be replaced as an assembly.

3. SYSTEM PROTECTION VALVE:



Function:

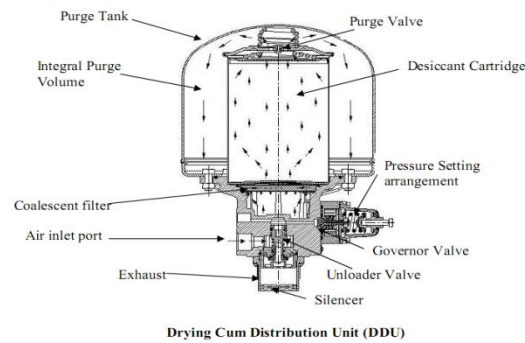
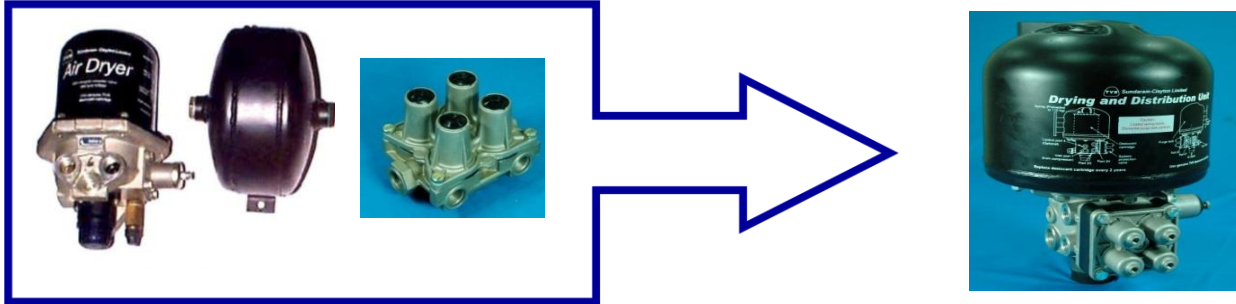
- It regulates compressed air supply to various circuits independently through different ports and facilitates independent working of front, rear and hand brake systems.

Maintenance:

- Ensure proper connections from SP valve ports as below:

21- SPV to Rear reservoir	22- SPV to Front reservoir
23- SPV to Hand brake valve	24- SPV to Auxiliary tank
- Ensure proper working condition of SP valve in every Schedule III/ IV as furnished hereunder:
 - a) If one tank is drained fully, pressure in other tank should not be dropped. Any drop in second tank indicates internal leakage of compressed air in SP valve. Then SP valve should be changed.
 - b) Even after draining compressed air from both tanks to zero pressure, hand brake should not get applied automatically. If hand brake gets applied, change SP valve.
 - c) If air is not building up in one circuit, it may be due to improper pressure setting at diaphragm of SP Valve or internal jam of SP valve piston. Then change SP valve.
- SP Valve pressure settings (over diaphragms) should not be tampered at depot level. Tampering will lead to mal-functioning of SP Valve.
- Always draw compressed air supply to auxiliary connections / tank from port 24 only (i.e., air suspension, pneumatic doors, air horn, pneumatic wiper etc).
- Check for leakages at pipeline joints / unions with soap water and attend leakages.
- Change SP valve once in two years(alternate F.C)

4. DRYING AND DISTRIBUTION UNIT (DDU):



DDU is a combination of Air Dryer, unloader valve, purge tank and SP valve and covers all the functions of these 4 units. Due to fitment of all these units in single assembly, additional pipe lines and joints are avoided to the maximum extent.

Maintenance:

- Check the mounting bolts of DDU for proper tightness and tighten if necessary
- All the maintenance procedures applicable for Air dryer, Un-loader valve, purge tank and SP valve shall be followed.
- Change DDU once in two years (alternate F.C)

5. DUAL BRAKE VALVE (DB VALVE):



- Upper body is meant for rear brake system
- Lower body is meant for front brake system

Function:

- When DB Valve is operated by pressing the brake pedal, compressed air is supplied to front and rear brake systems through independent circuits via Relay Valve (R) / Quick Release Valve (F) and power brake gets applied when compressed air flows into Front and Rear brake chambers.
- Some features of DB valve are:
 - a) Compressed air supply is always available from reservoir to DB valve.
 - b) Total 8 ports are available on the delivery side and 2 on inlet side of DB valve
 - c) On delivery side, 2 ports for Front and Rear brakes, 2 for fitment of Low Air Pressure Warning switches, 2 for fitment of brake light switches and 2 for fitment of Air Pressure gauges
 - d) Port no 11 & 12 (22 X 1.5) are air inlets from respective tanks . Port no 21 & 22 (22 X 1.5) are air out let to respective brake system.

Maintenance:

- Check for internal leakage of air from bottom of DB valve before and after brake application. If leakage is observed, change the DB valve as it indicates internal leakage in DB valve.
- Ensure proper inlet connections to DB valve from front and rear air tanks, i.e., rear and front reservoirs to be connected to 11 and 12 ports of DB Valve respectively.
- If air inlet connections of 11 and 12 ports are interchanged, compressed air will be drawn from rear tank only for both front and rear brake circuits leading to ineffective braking.(in case rear relay valve and front QRV fitted)
- Ensure that flooring near DB valve mounting is free from dust to prevent dust entry and premature failure of valve.
- Ensure fitment of rubber boot on top of DB valve, i.e., around the push rod to prevent dust entry.
- Check for leakages at all joints of DB Valve with soap water and attend leakages.
- Change DB valve once in two years(alternate F.C)

6. RELAY VALVE (Rear):

Function:

- Relay valve gets actuated through compressed air supplied from the control pipe line (connected from DB valve to Relay valve) when brake pedal is applied and supplies compressed air drawn directly from rear air tank to rear brake chambers for quick brake application.
- Exhausts air from the rear brake chambers quickly to release brake when driver removes leg from brake pedal.

Maintenance:

- Check for compressed air leakage from RV in every Schedule III/IV and replace RV/RSBA if leakage is observed.
- If RV is defective due to internal leakage, compressed air leaks continuously when DB valve is kept in pressed condition. Then replace RV.
- Even without pressing DB Valve, if compressed air is leaking through Relay valve (OFF Leak) such leakage may be due to:
 - 1) Internal leakage within Relay Valve
 - 2) Internal leakage in Rear Spring Brake Actuator due to defective Flange Seal which causes air leak from hand brake portion to service brake portion and then to relay valve exhaust.
 - 3) To identify whether RV or RSBA is defective, apply hand brake and observe leakage at RV. If air is still leaking at RV then RV is defective and it needs to be changed. If air leak is stopped at RV then RSBA (LH/RH) is defective.
 - 4) To identify whether LEFT RSBA OR RIGHT RSBA is defective, ensure the hand brake in released condition and disconnect the service brake pipe at port no.11 of both RSBA's and check by applying soap water on adpater. Where leakage is observed, that particular RSBA is defective and needs a change.
- Check for leakages at pipeline joints / unions with soap water and attend leakages.
- Always check relay valve leak in hand brake applied condition (ON)
- Change RV once in two years (alternate F.C).

7. QUICK RELEASE VALVE:**Function:**

- Allows compressed air to front brake chambers for brake application when brake pedal is pressed.
- Exhausts air from the circuit quickly for release of front brakes when the driver removes leg from brake pedal.

Maintenance:

- Check for continuous leakage of air from QRV when DB valve is pressed. If continuous leakage is observed replace QRV.
- Change QRV once in two years.

Note : In some latest version chassis / buses, the OEMs have provided RV at Front brake chambers also in place of QRV. OEMs are also providing a set of RV & QRV at rear brake chambers. i.e., RV for power brake and QRV for hand brake exhaust.

8. SPRING BRAKE ACTUATOR(Rear):**Function:**

- Serves dual purpose i.e., to apply power brake and hand brake.
- Rear power brake is applied upon pressing DB valve by driver.
- Vacuum brake gets applied when air in hand brake circuit is released through hand brake application.

Maintenance:

- Always keep wind off bolts of rear brake chambers in “ **wind in** ” condition to ensure proper functioning of hand brake.
- Check for proper tightness of rear brake chamber mounting bolts in Sch-III/IV maintenance.
- Ensure availability of breather pipe between hand brake chamber and service brake chamber SBA.
- When there is internal air leakage in spring brake actuator, continuous air leakage will be observed at relay valve, then replace SBA.
- Check for leakages at pipeline joints / unions / clamps with soap water and atten leakages.
- Change rear spring brake actuator every two year.
- Ensure standout of 72 mm while fitment

9. FRONT BRAKE CHAMBER:



Function:

- Actuates front brakes when DB Valve is pressed.

Maintenance:

- Check for leakages from brake chambers in schedule III/IV and replace the diaphragm if necessary.
- Check for leakages at pipeline joints / unions / clamps with soap water and attend leakages.
- Change front brake chambers every two year.

10. HAND BRAKE VALVE:



Function:

- Actuates rear brake on release of compressed air from hand brake circuit through application of hand brake.
- Hand brake system functions by spring actuation in rear brake actuators on release of compressed air from hand brake circuit.
- To stop the vehicle safely in the event of power brake failure HB can be applied at any speed of the bus.
- Buses to be parked by applying hand brake to avoid automatic rolling due to gravity in gradients / slope.

Maintenance:

- Ensure supply of compressed air to HB valve from 23 port of SP valve
- Ensure to keep wind off bolts of rear brake actuators in “**wind in**” condition.
- Check for leakages of air from HB valve in Sch II/III/IV and replace HB valve if leakage is observed.
- Check for leakages at pipeline joints / unions with soap water and attend leakages.

III. POLYAMIDE PIPE LINES – REVISED INSTRUCTIONS:

Guidelines were issued earlier regarding jointing procedure to be followed whenever leakage of compressed air is observed from the damaged / punctured portions of Polyamide pipelines. After conducting a detailed joint study by OEMs and APSRTC team consequent to the observations made on failure of rear brake system due to leakages of compressed air from joints, it is now decided to dispense with the jointing of Polyamide pipelines with immediate effect.

It is now decided to replace the entire pipeline (end to end) even if a portion of Polyamide pipeline is damaged due to rubbing or for any other reason. This decision is taken after observing the deficiencies in workmanship at depot level while making joints at the damaged portions of Polyamide pipelines.

The Polyamide pipelines of different lengths are now being supplied by M/s Ashok Leyland along with end fittings. These pipelines of different lengths are made stock items in Zonal stores. In case of TATA buses pipelines are being supplied in bundles of 50 mts length by M/s Wabco and ZWSs are being directed to provide end fittings through out sourced people and supply to depots through ZWSs.

IV. VOSS TYPE END FITTINGS ON DIFFERENT BRAKE UNITS AND POLYAMIDE PIPELINES:

In some old version BS II & BS III buses VOSS type end fittings have been provided by OEMs at the Joints near the brake units. Voss type is very user friendly “push in” type end fitting. The procedure to be followed to arrest air leakage is explained below:

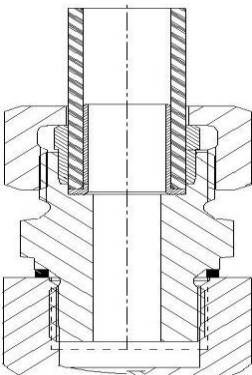
- Air leakage from the joint occurs due to failure of “O” rings provided on Conical Tree insert and Nut.
- To hold the Tree insert in proper position one retainer lock (circlip) is provided.
- One more O- ring is provided on Tree insert to prevent dust entry in to the joint.

These items are being supplied by M/s Wabco along with all types of Brake valve repair kits. Workshops have been supplying these 5 items for each pipe to depots keeping them in a polythene cover along with Brake units fitted with VOSS type end fittings.

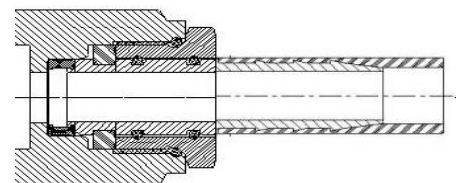
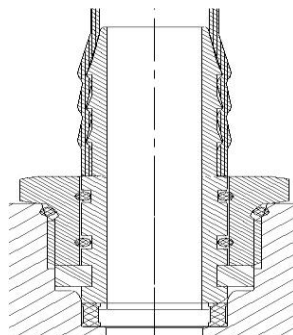
Depots shall collect these 5 items from ZWS and keep stocks available in depots to attend leakages from VOSS type joints. The procedure to be followed to rectify the air leakages from VOSS type joints was explained to the Supervisors and Mechanics duly conducting Trainings at ZWSs.

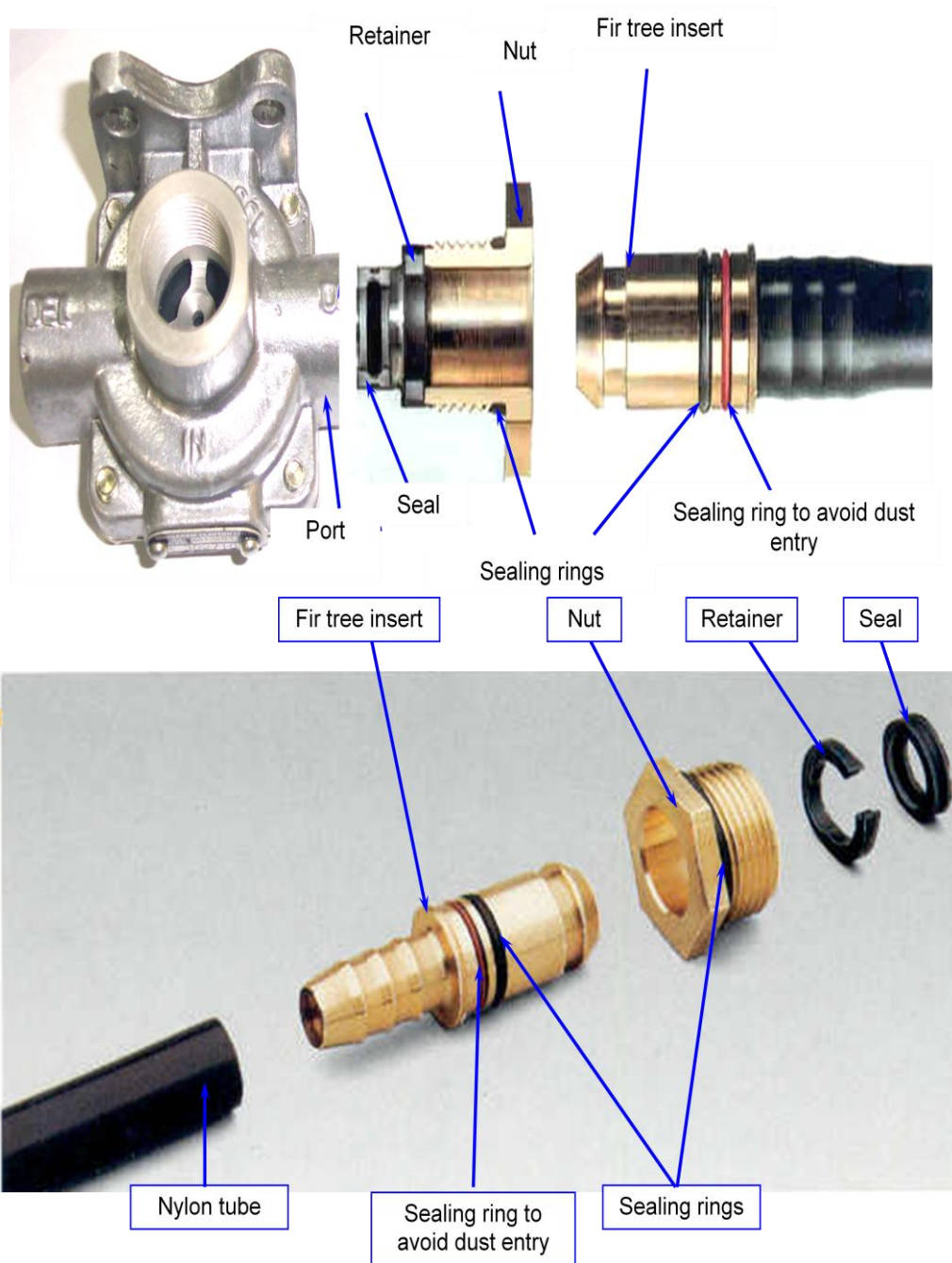
The details of VOSS type joints, pictorial view of different components are given below:

CONVENTIONAL



VOSS TYPE





V. AIR LEAKAGES:

- Leakage of air in the air brake system leads to ineffective braking, brake failures and also reduces the life of Air Compressor.
- Leakage of air also contributes to excess fuel consumption
- During 6-7 hrs period of parking the allowable drop in air pressure is a maximum of 1 bar only.
- Drivers take 3 to 5 minutes to build up air pressure and consumes 300 ml. of diesel per vehicle.
- For the depot having 100 vehicles the diesel consumption would be 30lts. Per day.

Some of the common points where the leakage of air occurs in Air Brake System are:

1) Leakage of air from Air Compressor to Air Dryer / DDU : The leakage of air occurs mainly from AC Head gasket, Delivery unions & pipe joints. The leakage in the area between Air compressor & Air dryer / DDU can be identified only when the engine is running.

Therefore, Air leakage from air compressor to air dryer / DDU shall be checked with soap water when the engine is under operation.

2) Leakage of Air after Air dryer / DDU: Leakage occurs near the pipe joints, sensing tank & service reservoir drain valves, pipe lines upto DB valve ports 11 & 12, Air pressure gauge pipes & connectors, DB valve unconnected ports and DB valve electrical switch connectors.

The leakage in this area can be identified when the engine is in off condition and the air is filled up to cutout pressure. For easy identification of leakages, soap water shall be applied.

3) Leakage of Air from Dual Brake Valve :

a) Continuous leakage from DB valve exhaust port: Continuous leakage of Air from the DB valve exhaust port is an indication of malfunctioning of valves inside the DB valve.

b) Leakage from DB valve exhaust port when the Brakes are applied: Leakage shall be checked by applying the foot brake. If the leakage occurs from exhaust port keeping the brake pedal in applied condition then it is due to internal leakage of DB valve.

4) Leakage in lines between outlet Ports (21 & 22) of DB Valve to QRV / RV and Brake chambers: Leakage occurs at the unions of DB valve ports, pipes & connectors, polyamide pipes, Relay valve / Quick Release Valve, Rubber hoses, Brake chamber diaphragm (in case of puncture) and Brake chamber diaphragm clamping area. This leakage can be identified by keeping the brakes in applied condition and checking with soap water.

5) Leakage between the port No.23 of SP Valve and Hand brake valve & between port No.24 of SP valve to auxiliary systems like Air horn, wiper, Air suspension system etc., : Leakage can be identified only when the system pressure reaches above 6.2 kg/cm² and by applying soap water.

6) Leakage between Hand brake valve and QRV & QRV to Spring brake actuators: This leakage can be identified when the hand brake is in released condition. To identify the leakages, soap water shall be applied on all pipes and connectors.

7) Leakage of air from the auxiliary items like Air horn, Wiper and Air suspension system: Check for leakage from the Air horn switches, wiper switch, pneumatic wiper motor, Air suspension leveling valve, pipes & pipe connectors by applying soap water.

8) Leakages during overnight parking for 6 to 7 hours: Park the vehicles by applying hand brake after night maintenance duly charging air upto cutout pressure of 8.2 bar.

Check the reading in both the Air pressure gauges:

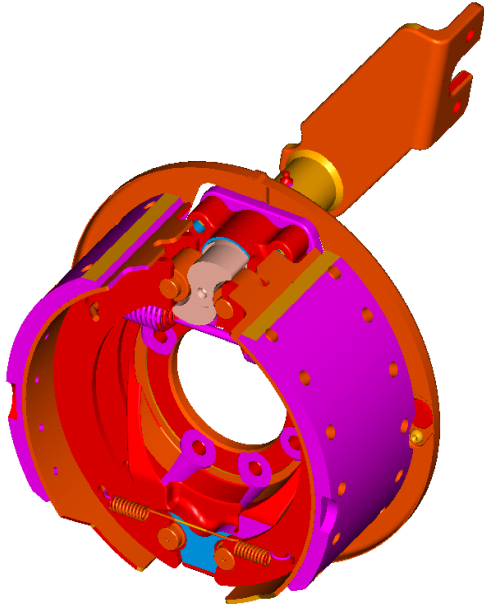
- a) If the pressure in both the gauges is zero bar then the leakage is in service brake circuit, hence check for leakages from pipes and joints between 21 & 22 ports of SP valve and DB valve and from Air Reservoirs to Relay valves (F/R).
- b) If the pressure in both the gauges drops and maintains at 4.5 bar, then the leakage is in hand brake and auxiliary system circuits, hence check for leakages from pipes and joints between
 - i) 23 port of SP valve and rear spring brake actuator (i.e., SP valve to HB valve, HB valve to QRV, QRV to SBA).
 - ii) 24 port of SP valve and various auxiliary connections like air horn, wiper, pneumatic doors, air suspension etc.,.

CHECK LIST FOR ENSURING PROPER FUNCTIONING OF DUAL BRAKE SYSTEM:

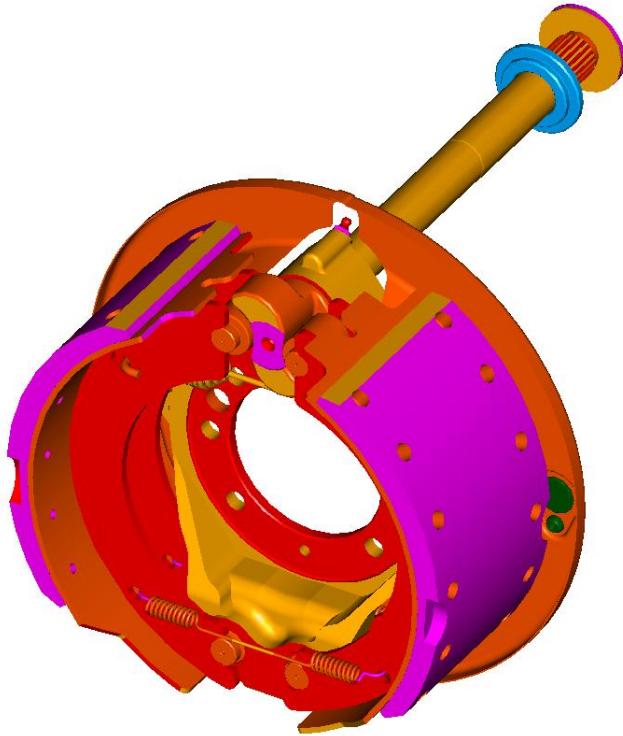
S.No.	ITEM TO BE CHECKED	REMARKS
1	Air Build up time from "0" Bar to "8.2" Bar at full rpm	Time shall not exceed: 3.5 Minutes for any 697 Engine, 2.5 Minutes for Cummins engine & 3 Minutes for Hino engine
2	Brake system Cut out pressure	Should not be more than 8.2 Bar for Air dryer/DDU fitted buses.
3	Presence of water /Oil in Air tanks	Water & Oil should not come to air tanks
4	Air dryer to Purge tank Connection	Ensure proper connection between air dryer and purge tank. Not applicable for DDU fitted buses
5	Air leak in brake system-Overnight parking	Pressure drop should not be more than 1 bar in 6 to 7 hours parking (i.e., from 8.2 bar to 7.2 bar)
6	Hand Brake working condition	Rear Brake Chamber wind off bolt should be in "Windin" condition
7	Brake light switch working Condition	Ensure working condition of brake lights.
8	Low Pressure warning lamp/beeper working condition	Bring the air pressure to 4.5 bar by repeated application of brakes. Then beeper should work.
9	Oil traces at Air dryer/ DDU Exhaust	No oil traces at Air dryer / DDU should be observed.
10	Air pressure drop on one application of Brakes	0.3 to 0.5 Bar Eligible
11	SP Valve Working condition	Deplete air from front & rear air tanks separately, then Pressure drop should be independent (Drop should not be observed in both the gauges when one tank is depleted). Hand brake should not apply automatically
12	Brake rubber hoses condition	Ensure good condition of rubber hoses and replace during FC.
13	Air Horn connection from SP Valve Port No. 24	There should not be in any deflection in air pressure gauges if air horn blown.
14	On leak in brake system	Press the brake pedal and hold it-Check for any leakages in all the valves & pipe lines

FOUNDATION BRAKE (S-CAM BRAKE SYSTEM)

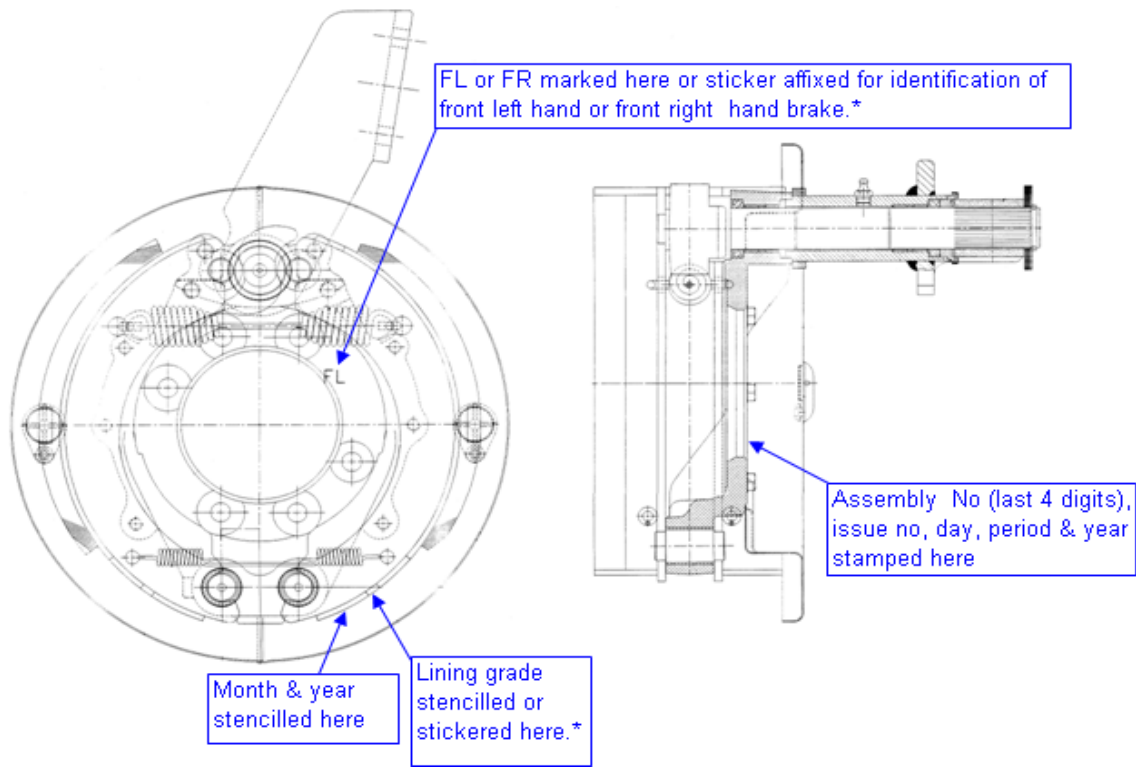
FRONT BRAKE ASSEMBLY



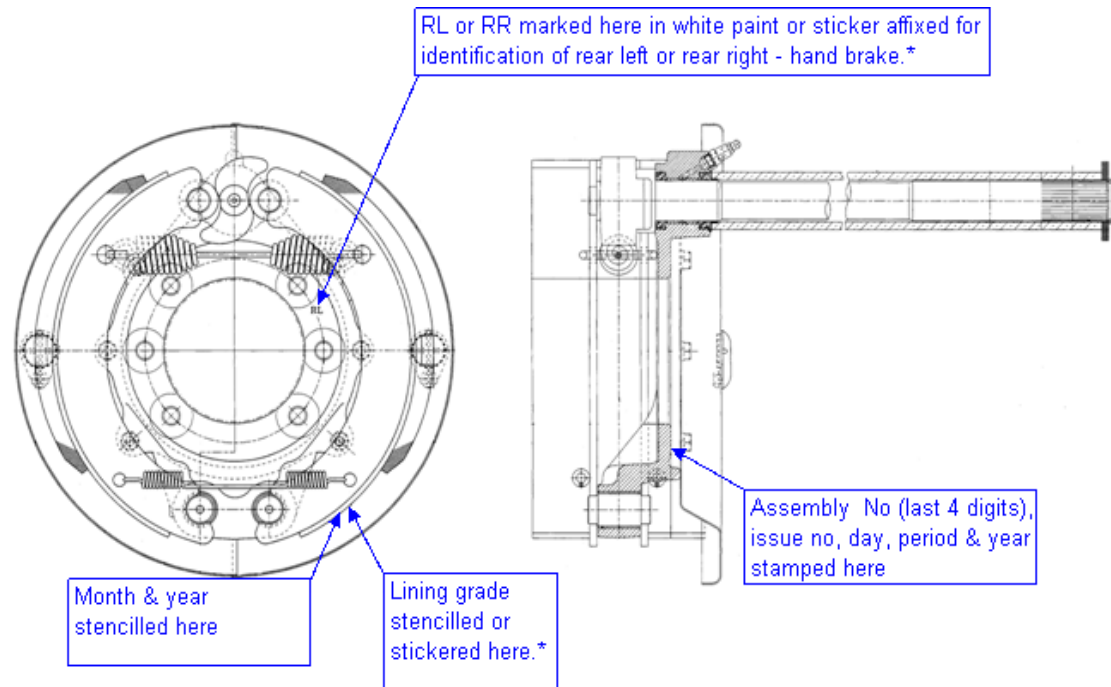
REAR BRAKE ASSEMBLY



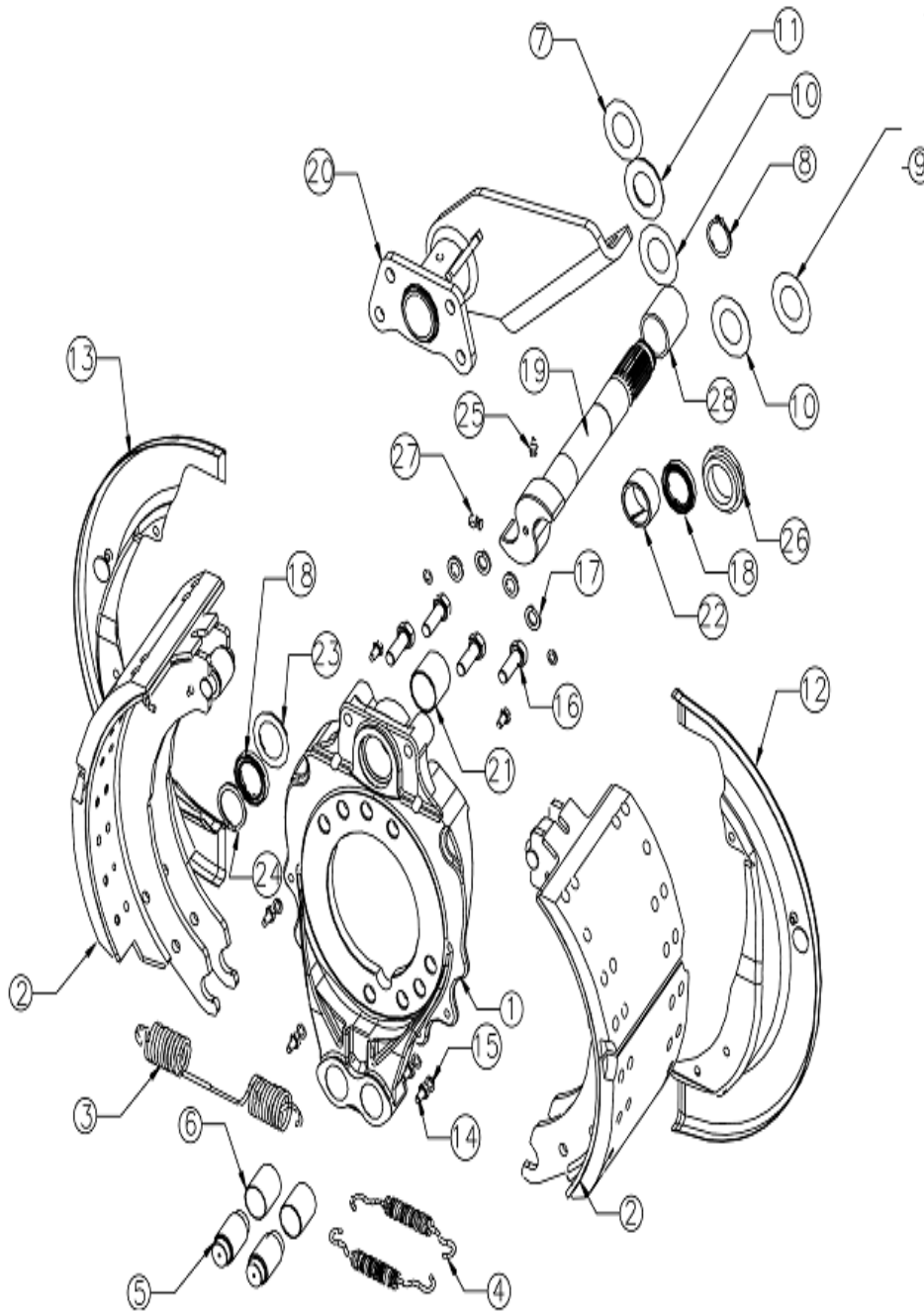
IDENTIFICATION OF FRONT BRAKE ASSEMBLY:



IDENTIFICATION OF REAR BRAKE ASSEMBLY:



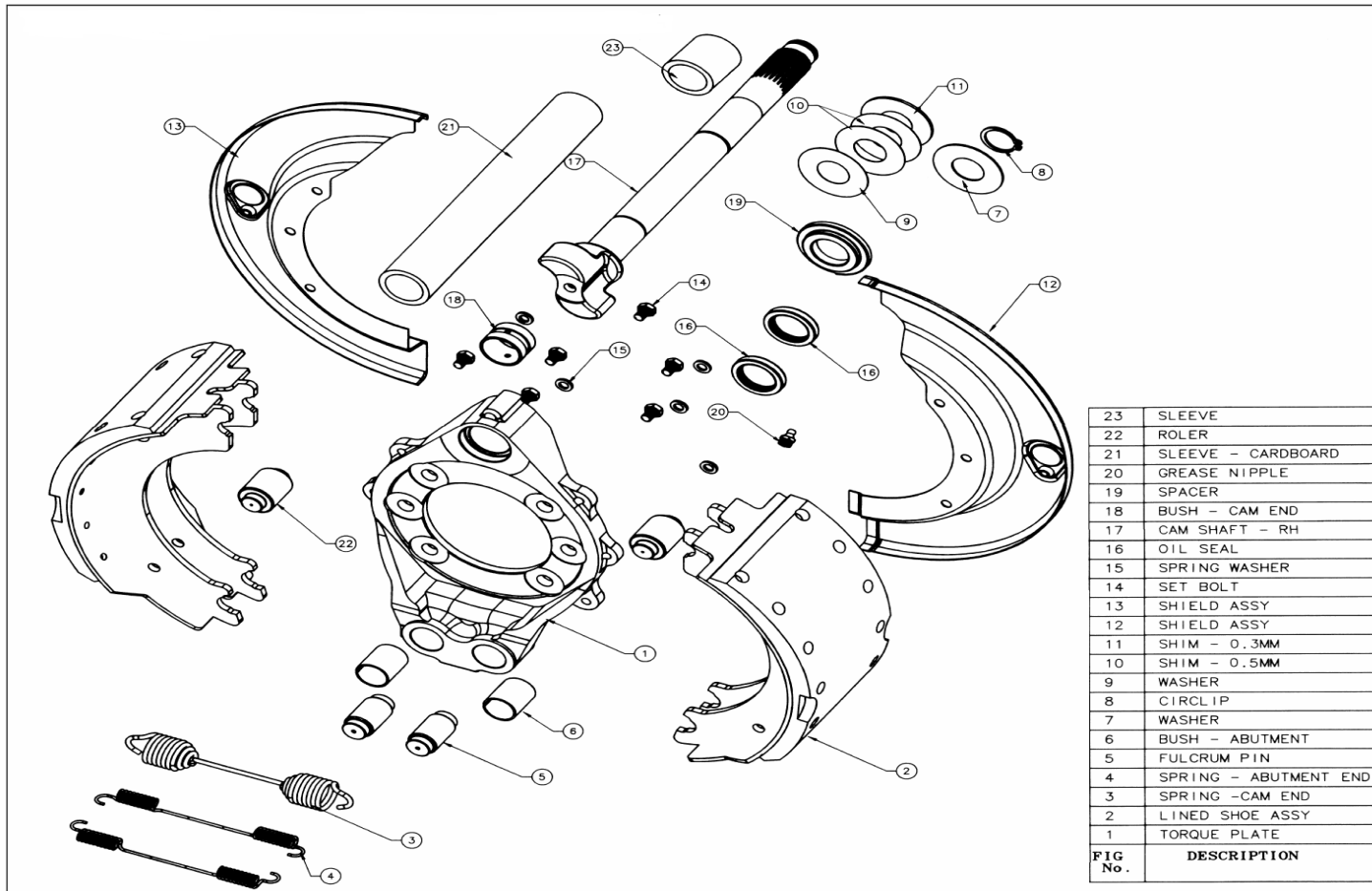
EXPLODED VIEW - 'S' CAM BRAKE ASSEMBLY FRONT



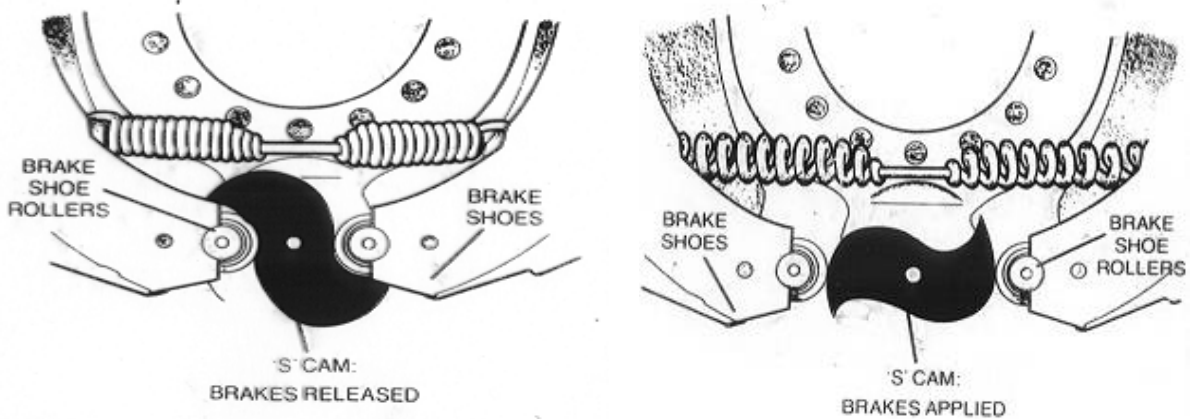
TYPICAL ILLUSTRATION OF S CAM BRAKE ASSEMBLY

28	SLEEVE - CARDBOARD	2
27	RELIEF VALVE	2
26	SLEEVE - DELRIN	2
25	GREASE NIPPLE	2
24	CIRCLIP - CAM END	2
23	SPACER	2
22	BUSH - BRACKET END	2
21	BUSH - CAM END	2
--	TUBE FLANGE AND BRACKET ASSY - RH	1
20	TUBE , FLANGE AND BRACKET ASSY - LH	1
--	CAM SHAFT - RH	1
19	CAM SHAFT - LH	1
18	OIL SEAL	4
17	WASHER	8
16	MOUNTING BOLT	8
15	SPRING WASHER	12
14	SET BOLT	12
--	SHIELD ASSY - RH	1
13	SHIELD ASSY - LH	1
--	SHIELD ASSY - RH	1
12	SHIELD ASSY - LH	1
11	SHIM - 0.3MM	2
10	SHIM - 1.0MM	4
9	SHIM - 0.5MM	2
8	CIRCLIP	2
7	WASHER	2
6	BUSH - ABUTMENT	4
5	FULCRUM PIN	4
4	SPRING - ABUTMENT END	4
3	SPRING -CAM END	2
2	LINED SHOE ASSY	4
1	TORQUE PLATE - RH	1
1	TORQUE PLATE - LH	1
FIG No.	DESCRIPTION	QTY PER AXLE

EXPLODED VIEW – REAR BRAKE ASSEMBLY



OPERATION OF S- CAM



Adjust the drum to lining clearance by setting the slack adjuster as per manufacturer recommendation.

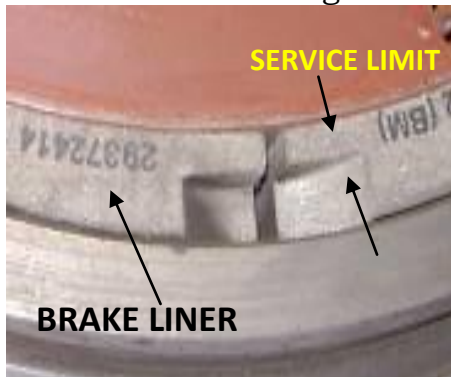
DOs:

- Always adjust the brakes with hand brake off condition.
- Always leave the rollers and 's' cam profile dry
- Always replace the shoe return springs whenever relining is done

- Always use only approved grade of lining along with rivets
- Ensure angle between RSBA push rod and Slack adjuster at 90 degrees in the brake applied condition
- Ensure the RSBA push rod standout is 72 mm when brakes not applied condition.
- Ensure S-Cam shaft run out is within allowable limit of 0.1 mm and brake drum run out within 0.15 mm.

DON'Ts:

- Never allow the lining to wear below service limit



- Never lubricate the rollers and 's' cam profile



- Never use same shoe return and retaining springs while relining the shoes



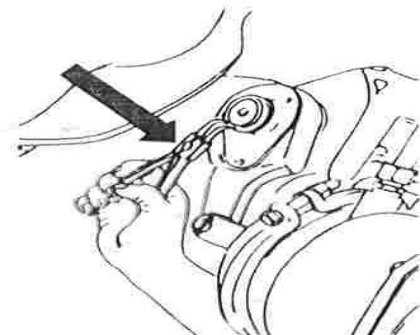
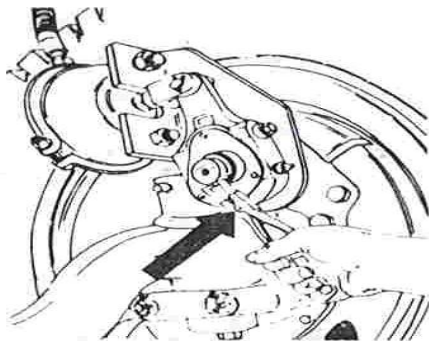
- Never machine the brake drum beyond the specified service limits

SERVICE STANDARDS:

DESCRIPTION		NORMAL VALUE	SERVICE LIMIT	REMARKS
Front/Rear brake drum I.D	TATA/ Eicher	STD-410 mm 1 st O/S-412 mm 2 nd O/S-414 mm	STD-412 mm 1 st O/S-414 mm 2 nd O/S-416 mm	Replace Drum if the wear is beyond service limit.
	Ashok Leyland	STD-393.7 mm 1 st O/S-395.3 mm 2 nd O/S-396.9 mm	STD-395.3 mm 1 st O/S-396.9 mm 2 nd O/S-398.5 mm	
Front / Rear Brake drum run out		0.15 mm	0.15 mm	Machine the drum within the service limit
Cam shaft axial play *should be checked at S-Cam end when slack adjuster is fitted.		0.3-0.8mm	1.3 mm	Add/remove shims
Cam shaft radial play *should be checked at S-Cam end with oil seal in position.		0.6 mm	1.2 mm	Replace Bushes

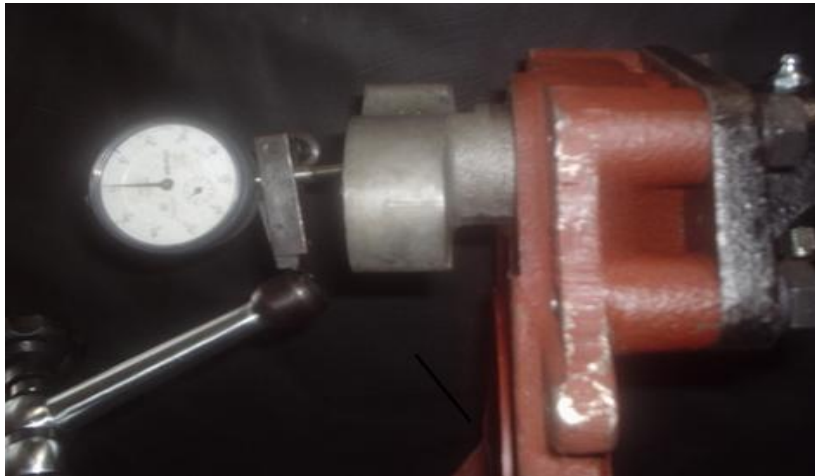
- Lining should be checked for wear in every 15,000 kms or Sch-III.
- Lining should not be allowed to wear below the **“Service limit”**

CIRCLIP FITMENT:



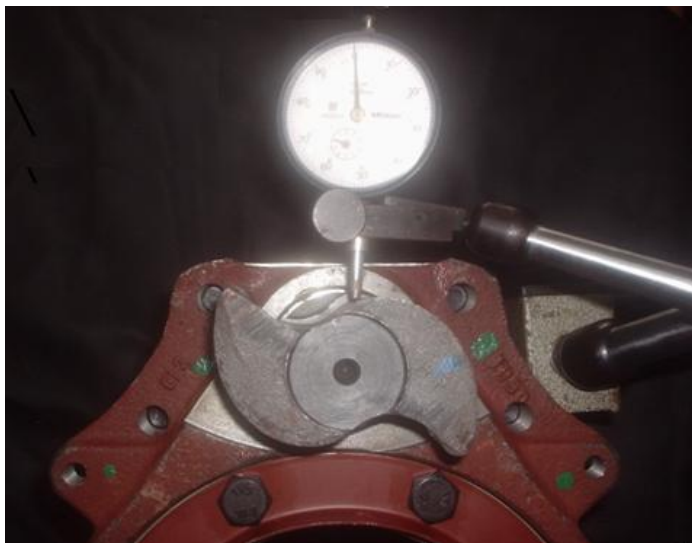
USE ALWAYS EXTERNAL CIRCLIP PLIER FOR REMOVAL AND FITMENT OF THE CIRCLIP AT THE CAM SHAFT END.

PROCEDURE TO MEASURE AXIAL PLAY:



- AXIAL PLAY SERVICE LIMIT - 1.3 mm
- AXIAL PLAY OF CAM SHAFT AFTER ASSEMBLING OF SLACK ADJUSTERTO BE MAINTAINED BY ADDING / REMOVING SHIMS : **0.3 – 0.8 mm**

PROCEDURE TO MEASURE RADIAL PLAY:



- RADIAL PLAY OF CAM SHAFT : 0.6 mm
- SERVICE LIMIT : 1.2 mm

Maintenance Schedules for S-Cam Brakes:

Schedule II Maintenance:

- Check & attend Brakes in every Sch II maintenance.
- Grease the Slack adjuster & S-Cam shaft derline bushes

Schedule III maintenance:

- Check the brake liners for wear and change if necessary.
- Check & Tighten the mounting bolts of brake torque plate.
- Check S-cam shaft axial and radial play and adjust if needed duly removing the brake shoes.
- Apply graphite grease to roller ends (in shoe seating area)& Fulcrum pin.
- Check the Brake chamber push rod movement and adjust.
- Check & tighten the Brake chamber mounting bolts.
- Grease the Slack adjuster & S-Cam shaft derlin bushes.
- Ensure proper fitment of Brake shoe dust covers.
- Interchange the top and bottom brake shoes to ensure uniform wear of brake liner and improve its life.
- Ensure matching of brake drum and lining.
- Conduct Brake test.

Schedule IV maintenance:

- Remove S-Cam shaft clean, check and refit.
- Replace derlin bushes kit. Lubricate derlin bushes.
- Check S-Cam Shaft "O" ring and replace (BIL axle).
- Check S-Cam Shaft Oil seal and replace (AAL Axle).
- Check & tighten the Brake chamber mounting bolts.
- Ensure proper fitment of Brake shoe dust covers.
- Conduct Brake test.

F.C Attention:

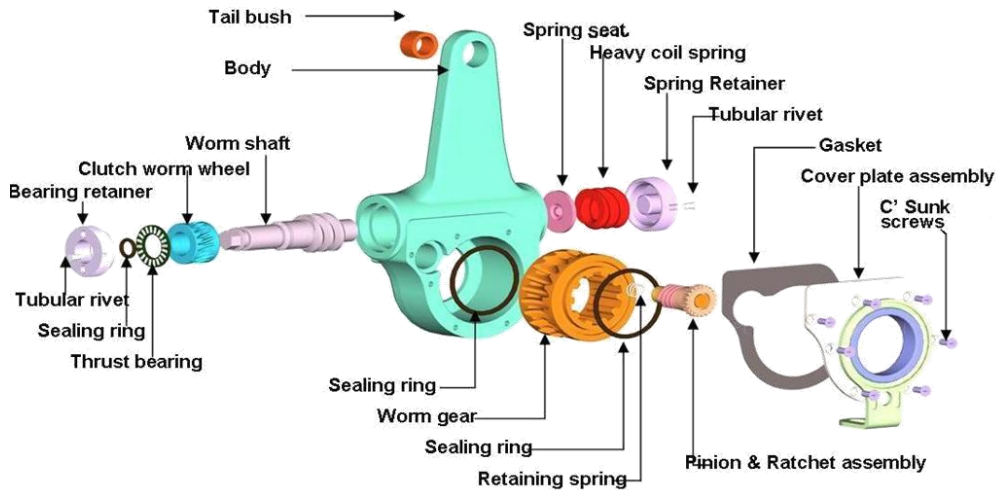
- Check the foundation brake system completely and replace the spares.

S-Cam Brake Service Standards:

S.No	To Inspect	Activity	Period
1	Lining should be checked for wear once in	Inspection	Every 15,000 kms or Sch-III whichever is earlier.
2	Changing the shoe return springs	Replacement	At every lining replacement
3	Radial play, axial play of S-Cam shaft (If play exceeds service limit overhaul by replacing Derlin bush kit / adjusting the shims)	Inspection / Overhauling	Every 45,000 kms or Sch IV or lining replacement whichever is earlier.
4	Oil seals to be inspected for grease leak and if found grease leakage replace oil seal	Inspection	Whenever brake drum is opened.
5	Overhaul by replacing the parts : shim, circlip, washer, Oil seal, Bushes - S-cam end& fulcrum end, slack adjuster end, Grease nipple, Relief Valve, Sleeve (derlin), Springs - Cam end& fulcrum end.	Overhauling	45,000 kms or Sch IV whichever is earlier.
6	Inspecting the condition of the components as per the service instruction recommended: Torque plate, cam shaft, shoe assembly, Chamber bracket assembly, Dust shield, Roller, Fulcrum pin.	Inspection	45,000 kms or Sch IV whichever is earlier.
7	Greasing of Slack adjuster, S-cam shaft bushes	Lubrication	At every Sch II, III, IV and every hub greasing.

AUTOMATIC SLACK ADJUSTERS:

Working Principle:



- The self setting automatic slack adjuster functions basically by sensing the clearance between the liner and the drum during return stroke of the brake application.
- When brake is applied, slack adjuster rotates and the control arm fixed on to the anchor bracket permits the mechanism to rotate through the clearance angle and shoe contacts the drum.
- On further application the torque increases and worm shaft moves axially, causing heavy coil spring to compress & disengagement of the clutch wheel. Thus only the stroke related to the clearance between lining and drum is sensed by the ASA.
- During the brake release, the torque decreases and the clutch mechanism advances, reducing the sensed excess clearance by rotation of worm shaft in small increments.
- An automatic adjustment takes place during brake release. (During retraction of chamber push rod)

Advantages of using Automatic Slack Adjusters:

- ✓ No need for periodical brake adjustments. Hence vehicle downtime for brake adjustment is eliminated.
- ✓ Increases safety of operation of vehicle since consistent stopping distance is maintained throughout the lining life.
- ✓ Brake setting is required only during initial fitment and also every time brake liners are replaced.

Operational check of Automatic Slack Adjusters:

- Operational check of the slack adjuster can be performed on the vehicle by using the procedure given below:
- Block wheels to prevent vehicle from rolling.
- Ensure tank pressure is above 7 bar.
- Ensure that the foundation brake and its components are in good condition.
- **Ensure that both the service and hand brakes are in released condition.**
- Manually turn adjustment hexagonal bolt in counter clockwise direction for one full turn to create an excessive drum to lining clearance. (A ratcheting sound should occur. This ratcheting sound indicates healthy condition of the clutch mechanism)
- Apply the service brake for 10 to 15 times. On release of brake pedal allow sufficient time for brake to fully retract.
- During the brake release, adjustment hexagonal nut should rotate.
- This rotation indicates that the slack adjuster has sensed an excessive clearance condition and it is making an adjustment to compensate. On each subsequent brake release, the amount of adjustment and the push rod travel will be reduced until desired clearance is achieved.
- If rotation of the adjustment hexagonal nut is not observed even though foundation brake assembly is in satisfactory condition, replace the Slack Adjuster.
- Brake setting with self-adjusting slack adjusters should not be disturbed.
- Clearance between brake drum and brake lining will get set to 0.3 to 1.2 mm. With the wear of brake lining during vehicle operation the increase in clearance will automatically get adjusted within above limits.
- Hence clearance of 0.3 to 1.2 mm with self adjusting slack adjusters is normal and should not be considered as excessive.

Preventive maintenance of automatic slack adjuster:

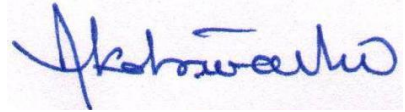
- Carry out the following preventive maintenance during every Schedule IV:
- Remove the adjuster and apply the grease on S-Cam shaft splines.
- Check S cam Bush play and replace the bush. (Radial clearance should not exceed 1.2 mm)
- Check the tightness of anchor bracket nuts and retighten.
- Check for correct axial play (0.3 to 1.3 mm) on 'S' camshaft and adjust.
- During Schedule-III maintenance brake lining wear has to be checked to avoid consequential damage to brake drum in case linings are excessively worn out, as there is no need for periodical brake setting with Automatic Slack Adjusters.
- Lubricate the slack adjuster through the grease nipple.
- No greasing is required for the slack adjusters of MEI make.

Precautions to be taken for effective functioning of ASA:

- The control Arm of the ASA shall always be connected firmly to the Anchor bracket slot. If the bolt (in front) or the nut (in rear) is missed or loosened, the automatic adjustment is not possible. There is likelihood of poor braking in such instances
- Drum run out and ovality are to be strictly maintained to specification.
- Matching of Lining and Drum size is essential (Never use different size of lining and brake drum)
- Excess wear in Camshaft bush, defective shoe return Spring and improper shimming for positioning the ASA are to be avoided
- Misalignment of the control arm with the anchor bracket will lead to sluggish return of ASA during brake release causing overheating of brake drum.

All the Depot Managers and Maintenance In-charges are advised to follow the above circular instructions, educate the maintenance staff and ensure that the Brake System is maintained in good condition on all the buses.

Dy.CMEs are advised to ensure implementation of the Circular guidelines and pay special attention especially on air leakages during their inspection of depots.



EXECUTIVE DIRECTOR (E&IT)

To

All Dy. Chief Mechanical Engineers of Regions.

Copy to: Dir (V&S), ED (O &MIS), ED (A&P), ED (T&C) & Secretary to Corporation,
FA and CAO for information

Copy to: All EDs (ZONE) for information & necessary action

Copy to: CME(O),CCOS, CME(C&B) and CE(IT) for information

Copy to: All RMs for information and necessary action

Copy to: Dy CME(O),Dy CME(P) and Dy CME(C&B) for information

Copy to: All WMs & COSs for necessary action

Copy to: Principal, TA/HPT & all ZSTCs for information

Copy to: All DMs & Maintenance Incharges for necessary action

Copy to: Incharge Manual section for record.