भारत सरकार GOVERNMENT OF INDIA
रेल मंत्रालय MINISTRY OF RAILWAYS
(रेलवे बोर्ड RAILWAY BOARD)

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No. 2003/Elect(TRS)/440/1 Pt. New Delhi, dated : 05.04.10

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**SUB : Integrity of BP & FP circuit on electric locomotives**

**Ref:** (i) Board's letter of even number dated 19.11.09
(ii) RDSO Maintenance Instruction no. MP.MI-138/88 of Feb. 1988

With the introduction of air suspension springs on coaches as well as Control Discharge Toilet System (CDTS), importance of maintaining FP as per norms also has become important and critical.

It has been given to understand that feed pipe circuit has been running isolated on certain locomotives.

Zonal Railways are advised to identify such locos and ensure integrity of feed pipe circuit on all electric locomotives. Zonal Railways are also advised to ensure that BP & FP leakages are within the norms as prescribed by RDSO for different types of locomotives.

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# TESTING INSTRUCTIONS FOR IRAVB-2 DUAL BRAKE SYSTEM FITTED ON WAG5 CLASS ELECTRIC LOCOMOTIVES

MAINTENANCE INSTRUCTIONS NO.MP.MI-138/88
FEBRUARY - 1988

Issued by
MOTIVE POWER DIRECTORATE
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LUCKNOW-226011

1. GENERAL

The tests and the test standards given in this manual cover some of the guidelines for checking the function/ operation of IRAVB-2 twin pipe brake system and pneumatically operated auxiliary equipments fitted on WAG5A&B class locomotives during normal maintenance schedule attention and also after overhauling. These tests are for the brake equipment as a whole, to judge the overall performance of the locomotives. Individual valves/pneumatic equipments should be tested on AB test rack or other respective test racks, after overhauling and before fitment on the locomotives.

2. For proper functioning of the brake equipment, following points should be kept in view:

2.1 Drainage: Ensure that there is no accumulation of moisture and other condensate in the main reservoirs, dirt collectors, drip cups and at any other place in the pneumatic circuitry of the locomotive. The drain cocks provided for the same must be operated to ensure complete drainage of the condensate. Auto drain valves fitted on the first and second main reservoirs should be checked for operation.

2.2 Cleanliness: Dirt and foreign matter must not be allowed to enter the pipes and equipment. It increases wear and result in malfunctioning of the valves, specially the rubber components. It also results in excessive leakage in the brake equipment.

2.3 While storing the pneumatic valves after overhauling, the port openings should be covered with protective covers, to avoid entering of dust/dirt.

3. General precautions and attention to be taken during periodic overhauling of locomotives.

3.1 Whenever a pipe fitting needs replacement, it should be replaced by a standard fitting only. Use of hammer and improper size tools should not be made to 'do' and 'undo' pipe joints. If a pipe is required to be changed and needs bending, it should be suitably bent to shape on shop floor, before fitment on the locomotive, area of cross-section of pipe bore at the bend should not get reduced during bending.

3.2 All pipes, pipe fittings and brake components should be stored in clean, dry and cool places. They should be blown with dry compressed air before fitment in the locomotives.

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3.3 White lead should never be used in making pipe joints. Only approved pipe jointings e.g., Teflon tape should be used.

3.4 All reservoirs, the period of whose last testing has exceeded the pre-laid down period for retesting, should be subjected to hydraulic test.

3.5 Inspection plates of the main reservoir should not be painted over.

3.6 Unidirectional valves such as check valves, dirt collectors etc.,should be correctly installed so that arrows cast on the body of the valve, point in normal direction of air flow through the valve.

3.7 Vent holes of the valves should not be blocked by paint

3.8 Filters and strainers should be cleaned in a suitable solvent to ensure maximum air flow through them.

4. LEAKAGE

4.1 Vacuum system: When testing complete vacuum system, leaks from atmosphere into pipe work can be detected by use of a portable flame. Flame will be drawn towards the leak when brought near it.

4.2 Compressed air system: To check leakage in the compressed air system, the pipe and fitting work should be carefully tested with soap and water solution. The leakage will show up as a series of bubbles.

5. PREPARATION FOR TESTS (Ref.SK.DP-2350).

5.1 Ensure for full tightness of all foundation bolts of auxiliary as well as main compressors.

5.2 Check the foundation brake rigging. All pins, hangers, rod etc., must be properly secured and assembled to perform their functions without fouling.

5.3 Check oil level in auxiliary compressor, main compressors, exhausters and oil bath filters, if required fill recommended lubricant.

5.4 Check clearance between brake shoes and wheel. If necessary, adjust the shoes. This should be 10 mm with a piston stroke of 67 mm.

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5.5 Ensure that the self locking angle cocks(A39) for brake pipe and feed pipe and (A40) for BC equalising and main reservoir pipes are closed at both ends of the locomotive and also that the hose coupling heads (A37, A38 and A51) of these pipes are attached to their appropriate dummy couplings..

5.6 Place the vacuum train pipe hose on dummy at both ends.

5.7 Open drain cocks(A7) fitted on main reservoirs(A6) and in compressed air pipe lines (C25) ir panto reservoir (C23), and also open the cocks for centrifugal dirt collector (A9, C7 and C12). Open drain cock(C2) in the auxiliary compressed air circuit and the pipe line to vent the pressure, if any, in the system to atmosphere and also to drain out all condensate present in the pneumatic circuit.

5.8 Close all drain cocks mentioned in para 5.7 and also external compressed air supply cock (A8).

5.9 Check that all other cocks are open.

5.10 Check all the sand boxes. Fill sand in boxes with only dry and clean sand as per IRS specification 28- 66.

5.11 Check that the handle movement of both SA-9 type independent air brake valves, A9 automatic air brake valves and emergency brake valves (A14) are free.

5.12 In non-driving cab:

a) Keep SA-9 independent brake valve isolating cocks (A15) in closed position and

b) Keep A-9 automatic brake valve handle in 'Release' position and close isolating cocks(A15) in BP control line of the brake valve.

/&MR pipe

5.13 In Driving/operating cab:

a) Keep the independent brake valve in 'Release' position and open isolating cocks (A15) and

b) Place the automatic brake valve handle in 'Release' position and open the isolating cocks(A15) in BP control and MR pipe line.

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6. TESTING OF AUXILIARY SYSTEM

6.1 Withthe main system at atmospheric pressure, open the 1/2" diaphragm cock (C25) between auxiliary compressor and panto reservoir.

6.2 Close auxiliary compressor switch to start the compressor. The pressure shall start increasing in the panto reservoir (C23) as indicated by pressure gauge (C24).

6.3 Note the time taken for auxiliary compressor to charge panto reservoir from zero to 8kg/cm$^2$ pressure. This should not be more than 8 minutes.

6.4 Check that the auxiliary compressor 1/2" safety valve type T2(C3) blows at a pressure of 8.5 kg/cm$^2$ and does not allow the panto reservoir pressure to rise above this limit. This ensures correct setting of auxiliary compressor safety valve.

6.5 Open auxiliary compressor switch to switch off the compressor. Close 1/2" diaphragm cock (C25) to disconnect the pantograph from its circuit. Allow time for reaching steady pressure and note the leakage rate in the panto reservoir. This shall not be more than 0.1 kg/cm$^2$/hour commencing from a pressure of 8 kg/cm$^2$.

6.6 Open diaphragm cock (C25) connecting panto reservoir (C23) to pantograph and its circuit. Operate the panto key to raise the pantograph. Note the pressure at which pantograph starts raising. Also note the time taken to raise thepantograph to the maximum height.

6.7 Note the pressure at which the pantograph starts lowering. Also note the time taken to lower the pantograph fully.

6.8 Allow time for pressure to stabilise and note the leakage rate. Leakage rate from pantograph reservoir and its circuit should not exceed 0.2kg/cm2 in 10 minutes, commencing from 8 kg/cm2.

6.9 Note the pressure at which low MR pressure governor (PDJ (C13) closes. It should close at 5.5±.1kg/cm$^2$ and open at 4.5±.1kg/cm$^2$.

6.10 Energise the locomotive to operate the pneumatic and other auxiliary equipment.

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## TESTING OF MAIN AIR SYSTEM

7.1 With one compressor started on 'Automatic' note the time to raise the main reservoir pressure to 10 kg/cm$^2$ with one compressor operating at a time. Time taken to build up pressure to 10 kg/cm$^2$ should be within 11 minutes [redacted]. This test should be repeated with other two compressors also.

7.2 Note 'cut-in' and 'cut-out' pressure settings of main compressor governor (C31). These should be 8.5±0.1kg/cm$^2$ and 10±0.1kg/cm$^2$ respectively.

7.3 Note the time taken for charging the system from 8.5kg/cm$^2$ to 10 kg/cm$^2$, (i.e. between cut-in and cut-out pressures). It should be about 90 secs. ( To reduce M.R. Pressure below 8.5 kg/cm$^2$ apply and release Independant brakes. )

7.4 Close isolating cock (C17) to disconnect compressor governor (C31) and with the main compressor running in 'direct' position note:

.1 the main reservoir safety valve (A3) blows at 10.5±0.1kg/cm$^2$ pressure and does not allow MR pressure to exceed this figure. Check the closing pressure of the safety valve - (This should be checked by providing a master gauge on the test plug) - It should be between 9.5 to 9.8 kg/cm$^2$. This ensures correct setting of safety valve.

.2 Remove main reservoir safety valve (A3) and plug the pipe connection. Raise the MR pressure by running the compressor on 'direct' and check that the compressor safety valve(A3) blows at 11.5±0.1kg/cm$^2$ and does not allow MR pressure to exceed this figure.

7.5 Check the leakage rates with the system charged to 10 kg/cm$^2$ for the following:

.1 Maximum leakage rate for complete system with the auxiliary equipment in the circuit and

a) with automatic brake- 0.3kg/cm$^2$/4 min. applied in full

b) with independent brake- 0.3kg/cm$^2$/4 min. applied in full

c) with both independent -0.3kg/cm$^2$/4 min. and auto brake released.

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.2 Lekage in the system without auxiliaries (close isolating cock (C6) of panto circuit line and B A panels, isolating cocks (C20) on the wind screen wipers and horn circuit) should not exceed 0.2 kg/cm$^2$/4 min.

7.6 Charge the system fully. Make 0.6kg/cm$^2$ reduction in BP by automatic brake valve. Close isolating cock(A1 5) in BP control line. Observe the pressure drop on the BP gauge. Pressure drop should not exceed 0.7 kg/cm$^2$ in 5 minutes.

7.7 Charge the system fully. Make 0.6kg/cm$^2$ reduction in BP by automatic brake valve. Close isolating cock (AE) provided near the BP charging C-2 relay valve (A31). Observe the pressure drop on the BP gauge. Pressure drop should not exceed 0.7kg/cm$^2$ in 5 minutes.

7.8 Charge the system fully and ensure the feed pipe is charged to 6.0kg/cm$^2$ pressure. Close isolating cock (A21) provided before the feed valve (A52). After stabilising observe the pressure drop on the feed pipe gauge. Pressure drop should not exceed 0.7 kg/cm$^2$ in 5 minutes.

8. INDEPENDENT BRAKE VALVE

8.1 Application of brake.

.1 Move the driver's independent air brake valve handle in steps towards the 'application' position. Check that brake cylinder pressure rises each time the handle is moved.

.2 Move the driver's independent brake valve handle quickly to 'full application' position direct and note that a pressure of 4±.1kg/cm$^2$ is achieved in brake cylinders, thus indicating that the independent valve is set properly.

.3 Move the independent air brake valve handle quickly from the 'release' to the 'full application' position. Record the time taken for the brake cylinder pressure to rise to 95% of maximum pressure of 4±.1kg/cm$^2$.

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8.2 Release of brakes

.1 Return the handle in steps towards the 'release' position, and check that the brake cylinder pressure falls each time the handle is moved and finally to 'zero' at release position. Brakes will be fully released in this position.

.2 Move independent air brake valve handle quickly to the 'release' position and record the time taken for the brake cylinder pressure to fall to 0.4 kg/cm$^2$.

.3 The above tests from 8.1 to 8.2 to be repeated with the other SA-9 independent air brake valve fitted in second driver's cab.

9. TESTING OF VACUUM SYSTEM

9.1 Operate the exhauster selector switch - ZPV. The correct sequence of exhauster speeds at different positions of ZPV should be as follows:

| ZPV position | HPV OFF | | HPV ON QPV not energised | | QPV energised HPV-ON | | Remarks |
|---|---|---|---|---|---|---|---|
| | MPV 1 | MPV2 | MPV1 | MPV2 | MPV1 | MPV2 | |
| I | L | - | L | L | H | H | |
| II | - | L | L | L | H | H | |
| III | L | - | L | - | H | - | |
| IV | - | L | - | L | - | H | |

Note: 'L' for low speed, 'H' for high speed.

9.2 During operation of each exhauster check lube oil metering unit to give, 1 drop/minute indicated at drop oil counter at high speed of Northey exhausters. For other makes of exhausters, follow the maker's instructions.

9.3 Check the following by operating both the exhausters separately in turn.

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.1 Start one exhauster (with appropriate position of exhauster combination selective switch ZPV) at slow speed and adjust the relief/snifter valve to obtain a vacuum of 60 cm maximum (fix a vac. gauge in the test plug provided) when automatic brake valve handle is placed in release position. The functioning of the relief valve at dummy should be checked up by means of a flame or thin strips of paper. Flame or thin strips of paper if drawn towards snifter valve suction filter would ensure that snifter valve suction valve is open.

.2 Run single exhauster at slow speed. Adjust the brake pipe pressure to 5.0 kg/cm2 by A-9 automatic brake valve, and set both snifter valves to 600 mm with HS-4 pressure setting of 1kg/cm$^2$. Raise setting of HS-4 till vacuum level starts dropping. HS-4 should be between 1.4 to 1.7kg/cm$^2$. Move A-9 automatic brake valve handle from 'release' to 'full service' position. Vacuum in train pipe must fall to zero. With the above setting it should be possible to obtain 530 mm against 5/16" dia leak hole. In case vacuum against leak hole is more than 540 mm, reduce the snifter valve setting from 600 mm to obtain a maximum vacuum of 540 mm against leak hole.

9.4 Note the initial charging time of the system. It should be 7 to 10 sec. for 0 to 530mm Hg(21") vacuum in the circuit with brake valve handle in release position. With A-9 driver's vacuum brake valve in release position, operate exhauster control and speed up switch (B23 & B22). Exhauster shall run at high speed and there shall be a rise in vacuum level in VTP needle as indicated by the vacuum gauges(B18). Release the switch(B22&B23) and check up whether vacuum is restored to the original level in train pipe immediately.

9.5 Stop the exhauster. With 510 mm (20" Hg) vacuum level in the circuit, test the vacuum leakage rates in pipes. This should not be more than 7.0 cm/min.

10. AUTOMATIC BRAKE VALVE

10.1 Check the handle movement of A-9driver's automatic brake valve in each position for the free movement in both the cabs. By keeping the brake valve handle in 'Release' position, note that the brake pipe pressure rises to, and remains steady at 5.0±.1kg/cm$^2$.

10.2 Move the A-9 brake valve handle quickly from 'release' position to the 'emergency' position. Check that the brake pipe pressure falls rapidly to 'zero' and that the maximum brake cylinder pressure obtained is 3.8±0.1kg/cm$^2$. Check that vacuum drops immediately to zero and brakes areapplied fully. Check that regression takes place.

10.3 Move the brake valve handle to 'release' position. Note that the brake pipe pressure returns to its normal value. Vacuum is restored to original level and the brakes are fully released.

10.4 Application of brakes:

Record the brake application timings in 'full service' and 'emergency' positions. Timings should be taken in both 'Goods' as well as in 'passenger' positions.

10.5 Release of brakes:

Move the automatic brake handle from 'full service' and 'emergency' position to 'release' position and record release timings in 'Goods' as well as 'passenger' positions.

10.6 Brake application - minimum reductionposition:
After charging the system fully, move A-9 automatic brake valve to 'minimum reduction position. Observe and record the BP and BC pressure.

10.7 Proportionality of brakes:
Test the proportionality of the automatic air brake in application and release by recording brake cylinder pressure at 5, 4.5, 4, 3.5kg/cm$^2$ brake pipe pressure, by moving the automatic brake valve handle from 'release' towards 'full application' and back to 'release' position.

10.8 Leakage in control reservoir of C-3-W distributor:
Move A-9 automatic brake valve from 'Release' position to 'emergency' position. Note the maximum brake cylinder pressure. Observe for leakage in the BC gauge. There should not be any leakage in 10 minutes. Any drop in BC gauge would indicate leakage in control reservoir of distributor valve.

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10.9 Capacity of A-9 brake valve:
The capacity of the valve in the 'Release' position whenthe supply is stabilised, must conform to certain limits in order to ensure compensation for leakage for verylong trains, without interfering with the automatic functioning of the brake. Couple a 7.5 mm dia leak hole special test coupling as per SKDP-2691 to the brake pipe hose coupling of thelocomotive. Check pressure in the loco BP gauge with brake valve handle in release position. It should not be less than 4 kg/cm$^2$.

11. 1" BRAKE PIPE CUT-OUT COCK (A8) LEAKAGE:

Apply emergency brake through A-9 automatic brake valve (A12). Close 1" brake pipe cutout cock (A8) fitted in the BP charging line and bring A-9 valve in release position. There should not be any rise in brake pipe pressure in 10 minutes. Open 1" cut out cock. The brake pipe pressure should stabilise at 5±0.1kg/cm$^2$.

12. PARTING BETWEEN LOCOS WHILE WORKING IN MULTIPLE UNIT

The performance of the system should be checked by simulating locoparting conditions:

12.1 With the system fully charged and A-9 handle in release position with MR & BP pressure of 10 kg/cm$^2$ and 5kg/cm$^2$ respectively, the end cocks of MR, BP & BC should be opened. Every 15 seconds of readings of MR, BP & BC should be noted for the first 2 minutes and every 30 seconds for another 3 minutes.

12.2 Test mentioned in para 12.1 above should be repeated with the MR system charged to 7 kg/cm$^2$ instead of 10 kg/cm$^2$.

12.3 Test mentioned in 12.1 and 12.2 should be repeated but after opening the end cocks of MR, BP & BC, the A-9 handle should be moved to emergency position after 15 seconds (reaction time) of opening of end cocks.

12.4 Repeat tests as in para 12.1 and 12.2 above, but apply independent brakes after parting.

13. DOUBLE CHECK VALVE(A33)

13.1 Make independent air brake application of approx 2.0 kg/cm$^2$ and when BC pressure has stabilised, superimpose this with a full application, through automatic brake handle. Note that the BC pressure rises to 3.3kg/cm$^2$. Return automatic brake handle to release position and see that the BC drops to former level of approx.2.0kg/cm$^2$. Bring IAB handle to release and note that the BC drops to 'zero'.

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13.2 Make automatic brake application by automatic brake valve/approximately 2.0 kg/cm$^2$ BC pressure and when this pressure has stabilised, superimpose upon this a full application by SA-9 handle movement. Note that brake cylinder pressure rises to 4.0kg/cm$^2$, thus indicating the double check valve (A33) is operative. Return the IAB handle to 'release' position and see BC is restored to its level of 2.0 kg/cm$^2$. Return automatic brake handle to release position and note that BC drops to 'zero'.

14. BRAKE RELEASE SWITCH(A41)

Reduce the BP pressure by 1 kg/cm$^2$ and when corresponding BC pressure is stabilised, depress the brake release switch (A41). Note that BC pressure is reduced to 'zero'. This will show that brake release switch is in working condition. Release the brake release switch and observe that BC pressure is restored to original position.

15. D-1 EMERGENCY BRAKE VALVE

Operate emergency brake valve (A14) and note that the BP pressure drops at a very fast rate. Note the time taken for BC build up and BP pressure drop, by keeping the C-3-W distributor in both goods and passenger positions.

16. REGRESSION OF POWER

16.1 H-5 Relay air valve:
Charge the brake pipe by keeping the A-9 automatic brake valve handle in release position. Reduce the brake pipe pressure by A-9 brake valve. When the BP pressure drops to $1.9^{+0.2}_{-0.0}$ kg/cm$^2$ regression of power should take place, and power should cut in when BP is restored to 2.4 - 3.2kg/cm$^2$.

16.2 HR-5 relay air valve:
Left D-1 emergency brake valve lever partially ensuring that only vacuum in train pipe drops slowly and does not permit BP pressure to drop. Regression of power should take place when the vacuum level has dropped between 360-410 mm.

HAND BRAKES

In order to check the efficacy of hand brakes, apply hand brakes and notch up with master controller. Loco should not move in second notch.

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18. MULTIPLE UNIT OPERATION

18.1 'Lead' position:

For checking the proper working in 'Lead' position, apply and release by independent and auto brake valves and see that the brakes are applied and released.

18.2 'Trail' position:

While changing over to 'trail' position place A-9 brake valve in emergency position. Check that BP should not charge in release position and in full service position of auto brake valve BC pressure should not drop in both release and full service positions.

18.3 Charge the system by placing MU-2B in 'Lead' and then place it in 'Trail' position. Move A-9 brake valve handle to full service in steps. The brakes will not come and BP pressure should not drop. Move the handle to emergency position. The BP pressure should drop from 5.0 kg/cm$^2$ to zero and BC pressure will not rise

19. AIR FLOW INDICATION DEVICE (A47)

19.1 Adjustment: Keep A-9 automatic brake valve handle in 'release' position and close isolating cocks (A15) provided in ports 5 and 30 of A-9 brake valve (A12). When MR pressure approaches the cutout pressure (10±0.1kg/cm$^2$), open selfcalibrating choke plug from air flow measuring valve (A47) until side vents are fully uncovered. Check that the air flow measuring valve gauge (A49) fitted inthe cab shows a reading of about 100. check with soap water solution the pipe joints between air flow measuring valve, relay valve and gauge for leakages. In case the gauge is showing less than 100, tighten the needle screw 'in' and if it is more than 100, 'unscrew' the needle till the gauge shows 100. Tighten the self calibrating choke plug and record the reading after opening cocks (A15) provided in A-9 brake valve in 'release' position.

20. SETTING OF THE VALVE:

20.1 With normal supply of 10 kg/cm$^2$ MR pressure and with auto brake valve in release position, set the D-24-3 feed valve (A44) provided in electrical auxiliary circuit to 8±0.1kg/cm$^2$.

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20.2 With the normal supply of 10 kg/cm$^2$ MR pressure, set the D-24-6 feed valve (A52) provided in the feed pipe line to 6.0±0.1kg/cm$^2$.

20.3 Check the setting of MR switch (C33). It should close and give audio visual indication when pressure falls to 5±0.1kg/cm$^2$ and stop giving indication when pressure in auxiliary circuit is restored to 6±0.1kg/cm$^2$.

20.4 The 'SWC' switch cuts off the dynamic brake, if the application of brakes is done by independent brake valve. The 'SWC' pressure switch (A26) is set to cut out at 1.0±0.1kg/cm$^2$ and cut in 0.2±0.1 kg/cm$^2$.

20.5 Air flow measuring valve pressure switch (A48) is set to cut in at 7.0±0.1kg/cm$^2$ and cut out 6.0±0.1kg/cm$^2$. Whenever the pressure from the R-6 relay valve to air flow indicator reaches 7.0±0.1 kg/cm$^2$ the light provided in the driver's cab glows and gives an indication to the driver and the light is switched off at 6.0±0.1kg/cm$^2$.

20.6 With compressor "shut down" open the self locking angle cock (A40) in 3/4" main reservoir equalising pipe. Note the flow of air through the hose ceases when MR pressure is reduced to 5.0±0.1kg/cm$^2$, thus indicating the duplex check valve (A23) is correctly set. Close the angle cock and restart the compressor.

21. AUTO DRAIN VALVE

Check the operation of boththe automatic drain valves fitted on reservoirs during cut-in and cut-out operation:

| | | |
|---|---|---|
| .1 | Loading cycle | 1 sec. |
| .2 | Loading cycle | 8 to 9 sec. |

22. DYNAMIC BRAKES

22.1 Apply partial service braking by the automatic brake valve (A12) handle and note the BC pressure. Simulate the condition of application of dynamic brakes. Observe that the automatic brakes will be cut off and brake cylinder pressure would drop to 'zero'. This shows that D-1 pilot air valve (A28) 'VEF' functions properly.

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22.2 Simulate the condition of application of dynamic brakes. Apply emergency brakes by the automatic brake valve (A12). Dynamic brake would trip off and the maximum brake cylinder pressure would be developed.

22.3 Simulate thecondition of application of dynamic brakes. Move independent brakes to application position. Dynamic brakes should trip off at 1.0kg/cm2 BC pressure. This proves that the SWC pressure switch (A26) fitted in the independent brake circuit is functioning properly.

22.4 After applying dynamic brakes inthe locomotive, trip off the dynamic brakes intentionally simulating as if dynamic brake has become defective and observe that BP pressure falls and automatic brakes 'come on'. This proves that the 'IP' magnet valve (A20) and E-3 emergency application valve fitted in the brake pipe line is functioning properly.

23. GENERAL

23.1 Wipers:

Check the operation of wind screen wipers and ensure that they function properly between 5-10 kg/cm2 MR pressure. The number of strokes are approximately 60 strokes/minute (for modified EIGI design of wipers).

23.2 Sanding;

.1 Check the operation of sanding equipment. It should work properly between 5-10kg/cm2 pressure. The sand ejected should be directed towards the point of contact of wheel on rail head.

.2 Note the rate of sanding. It should be between 0.125 kg/min. to 0.250 kg/min. per sander.

.3 Check the operation of sanding magnet valves and equipment for each direction of travel.

23.3 Horns:

.1 See that horns operate properly and give a distinct and clear sound between 5-10 kg/cm2 pressure in MR.

.2 Check that difference between high and low tone horns (with operation of different horn valves in the cab) is clearly distinguishable

## TEST STANDARDS FOR IRVB-2 BRAKE SYSTEM FITTED IN WG5 ELECTRIC LOCOS:

(Ref: SKDP-2350)

| S.No. | Test | Standard |
|---|---|---|
| 1. | Auxiliary compressor and its system: (with main compressor isolated and withdiaphragm cock (C25) open. Start auxiliary compressor). | |
| 1.1 | Time takento charge pantograph reservoir from 0 to 8 kg/cm². | 8 minutes(max.) |
| 1.2 | Auxiliary compressor safety valve (C3) | |
| | blows at | 8.5±0.1kg/cm² |
| | closes at | 7.5 to 7.8kg/cm² |
| 1.3 | Leakage in panto reservoir - commencing from 8.0 kg/cm² (Allow one minute for stabilising of temperature in panto reservoir. Close diaphragm cock (C25) and stop auxiliary compressor). | ≤ 0.1 kg/cm²/1hr. |
| 1.4 | Minimum air pressure for raising pantograph. - $I_c$ | Notemore than 4.5 kg/cm². |
| .5 | Time taken for full raising of partograph. | 6to 10 sec. |
| .6 | Air pressure at which panto starts lowering. - $I_c$ | Between 3.0 to 3.5 kg/cm². |
| .7 | Time taken for panto falling | ≤ 10 sec. |
| .8 | Leakage from pantograph reservoir and its circuit. (Open diaphragm cock(C25). Raise the pantograph. After one minute check the leakage.) | ≤ 0.2 kg/cm²/10 mt. |
| .9 | Low MR pressure governor (C13) - DJ | |
| | cut out | 4.5±0.1kg/cm² |
| | cut in | 5.5±0.1kg/cm² |

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| S.No. | Test | Standard |
|---|---|---|
| 2. | Main reservoir air system: Main compressor started, on 'Automatic' one at a time. | |
| 2.1 | Time taken to charge the system from 0 to 10 kg/cm$^2$. | [redacted] 11 mt. |
| 2.2 | Compressor governor RGCP(C31) | |
| | cut out | 10±0.1kg/cm$^2$ |
| | cut in | 8.5±0.1kg/cm$^2$ |
| 2.3 | Time taken to recharge from 8.5 kg/cm$^2$ to 10 kg/cm$^2$. | 90 sec. |
| 2.4 | Safety valve setting | |
| | a) Compressor safety valve(A3) | |
| | blows off | 11.5±0.1kg/cm$^2$ |
| | closes at | 10.5 to 10.8kg/cm$^2$ |
| | (Close isolating cock(C17) to disconnect compressor governor (C31). Fit dummy on main reservoir safety valve(A3). Run main compressor in 'direct' position). | |
| | b) Main reservoir safety valve(A3) | |
| | blows off | 10.5±0.1kg/cm$^2$ |
| | closes at | 9.5 to 9.8 kg/cm$^2$ |
| | (Remove the dummy provided on main reservoir safety valve (A3). Provide a master gauge in the test plug provided near the safety valve). | |
| 3. | Leakage tests: | |
| | (Main compressor leakage to commence from 10 kg/cm$^2$ | |
| 3.1 | Whole system with auxiliary equipments: | |
| | a) With both independent and auto brakes released. | 0.3 kg/cm$^2$/4 mt. |
| | b) With automatic brakes applied in full. | 0.3 kg/cm$^2$/4 mt. |
| | c) with independent brakes applied in full. | 0.3 kg/cm$^2$/4 mt. |

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| S.No. | Test | Standard |
|---|---|---|
| 3.2 | Whole system without auxiliary equipments.<br><br>(Close cock(C6) in the panto circuit line and sanding circuit. Close cock(C30) in horn and wiper circuit). | 0.2 kg/cm$^2$/4mt. |
| 3.3 | Leakage in the brake pipe<br>(Commence from 4.4 kg/cm$^2$ pressure).<br>a) by closing cock (A15)<br>b) by closing cock (A8). | 0.7 kg/cm$^2$/5mt.<br>0.7 kg/cm$^2$/5 mt. |
| 3.4 | Leakage in the feed pipe.<br>(commence from 6.0 kg/cm$^2$ feed pipe pressure. Close isolating cock(A21) in the feed pipe line). | 0.7 kg/cm$^2$/5 mt. |

4. Vacuum system:

Operate each exhauster separately on slow speed by operating exhauster cut out switch and selector switch ZPV.

4.1 Operate the exhauster selector switch ZPV. The sequence of exhauster speeds at different ZPV should be as follows:

| ZPV Position | HPV switch 'off' | | HPV switch 'On' | | | |
|---|---|---|---|---|---|---|
| | MPV1 | MPV2 | QPV not energised. MPV1 | QPV not energised. MPV2 | QPV energised MPV1 | QPV energised MPV2 |
| I | L | - | L | L | H | H |
| II | - | L | L | L | H | H |
| III | L | - | L | - | H | - |
| IV | - | L | - | L | - | H |

4.2 Check lube oil metering unit (in case of Northey exhauster).

Minimum one drop /min.
Maximum two drops/min.

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| S.No. | Test | Standard |
|---|---|---|
| 4.3 | Maximum setting of eachvacuum relief valve against dummy (after setting the system as indicated in para 4.3). | 600 mm max. |
| 4.4 | Vacuum in trainpipe with 5/16" dia leak hole. | 530+10 mm -0 |
| 4.5 | Setting of HS-4 control air valve (B7). | 1.4 to 1.7kg/cm$^2$ |
| 4.6 | Initial charging time of VTP from 0 to 530 mm Hg.with the A-9 brake valve handle in release position. | 7 to 10 sec. |
| 4.7 | Leakage in the vacuum system (commence from 510 mm Hg.) | 7.0 cms/min. |
| 5. | Independent brake valve: | |
| 5.1 | BC pressure when independent brake valve applied in full. | 4.0±0.1kg/cm$^2$ |
| 5.2 | Time for 95% BC pressure build up. | 4 to 8 sec. |
| 5.3 | Time to release BC pressure to 0.4kg/cm$^2$. | 8 to 12 sec. |
| 6. | Automatic brake valve: | |
| 6.1 | Full service application: | |
| | a) BP stabilising pressure | 3.2 to 3.4kg/c |
| | b) Time for BP to drop. | 3 to 5 sec. |
| | c) Time for VTP to drop to zero inches Hg. | 3 to 6 sec. |
| | d) Time for BC pressure build up to 95% of maximum BC pressure in 'Goods' position of C-3-W distributor. | 25 to 30 sec. |
| | e) Time for BC pressure build upto 95% of maximum BC pressure in 'passenger' position of C-3-W distributor. | 9 to 12 sec. |
| | f) Maximum BC pressure | 3.8±0.1kg/cm$^2$ |

| S.No. | Test | Standard |
|---|---|---|
| 6.2 | Release after full service application: | |
| | a) BP stabilising pressure | 5±0.1kg/cm$^2$ |
| | b) Time for BP to charge to 5 kg/cm$^2$. | 2to 4 sec. |
| | c) Time for VTP to build up to 530 mm Hg. | 3 to 5 sec. |
| | d) Time for BC pressure to drop to 0.4 kg/cm$^2$ in 'Goods' position of distributor. | (40 to 50 sec.) |
| | e) Time taken for BC pressure to drop to 0.4 kg/cm$^2$ in 'passenger' position of distributor. | 10 to 15 sec. |
| 6.3 | Emergency application: | |
| | a) Time for BP to drop to '0'kg/cm$^2$ | [illegible] to [illegible] sec. |
| | b) Time for VTP to drop to zero cms of Hg. | 1 to 3 sec. |
| | c) Time taken for BC pressure build upto 95% of maximum BC pressure in 'Goods' position of C-3-W distributor. | 25 to 30 sec. |
| | d) Time taken for BCpressure build upto 95% of maximum BC presure in 'Passenger' position of C-3-W distributor. | 7 to 10 sec. |
| | e) Maximum BC presure | 3.8±0.1kg/cm$^2$ |
| 6.4 | Release after emergency application: | |
| | a) BP stabilising pressure | 5±0.1kg/cm$^2$ |
| | b) Time for BP to charge to 5.0 kg/cm$^2$. | 3 to 6 sec. |
| | c) Time for VTP to build upto 530 mm Hg. | 7 to 10 sec. |
| | d) Time taken for BC presure to drop to 0.4 kg/cm$^2$ in 'Goods' position of distributtor. | 40 to 50 sec. |
| | e) Time takenfor BC pressure to drop to 0.4kg/cm$^2$ in 'Passenger' position of distributor. | 15 to 20 sec. |

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| S.No. | Tests | Standard |
|---|---|---|
| 6.5 | Minimum reduction position of auto brake valve. | |
| | a) BP should be stabilised at | 4.5 to 4.7 kg/cm$^2$ |
| | b) BC pressure should be | 0.5 to 1.1 kg/cm$^2$ |
| 6.6 | Proportional functioning of air brake in application and release | |

| BP Pressure kg/cm$^2$ | BC pressure kg/cm$^2$ | |
|---|---|---|
| | Application | Release |
| 5.0 | | |
| 4.5 | | |
| 4.0 | | |
| " 3.5 | | |

| | | |
|---|---|---|
| 6.7 | Proper function of distributor: | |
| | Leakage in BC pressure (Move auto brake valve to emergency application). | No leakage/10 mt. |
| 6.8 | Capacity of auto brake valve: | |
| | BP pressure against 7.5 mm dia. leak hole in Release position of auto brake valve. | Not less than [redacted] 4.0 kg/cm$^2$ |
| 7. | BP cut out cock(A8) | |
| 7.1 | Brake pipe pressure (After moving A-9 automatic brake valve to emergency position, close BP cut-out cock(A8). Then move A-9 brake valve to 'Release' position). | Should not rise from '0'kg/cm$^2$ in 10 min. |
| 7.2 | Open BP cut-out cock and observe - BP pressure stabilises at | 5±0.1kg/cm$^2$ |

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| .No. | Tests | Standard |
|---|---|---|

Simulation of loco parting:

| Postion<br>Time-Sec. | Move A.9 valve from release to emergency after 15 sec. of opening BP, BC&MR cocks | | | | With A-9 valve in release position open BP, BC&MR cocks & S1-9 in release. | | | |
|---|---|---|---|---|---|---|---|---|
| | 10kg/cm² | | 7kg/cm² | | 10kg/cm² | | 7kg/cm² | |
| | MR | BP BC | MR | BP BC | MR | BP BC | MR | BP BC |
| 0 | | | | | | | | |
| 15 | | | | | | | | |
| 30 | | | | | | | | |
| 60 | | | | | | | | |
| —"— | | | | | | | | |
| 300 | | | | | | | | |

Repeat the tests with A-9 valve in release and S1-9 in application position.

Double check valve(133):

a) Move independent brake valve to 'partial application' - BC pressure. — 2.0kg/cm²

b) Move auto brake valve to 'full service' position - BC pressure. — 3.8±0.1kg/cm²

c) Move autobrake valve to 'Release' position from 'full service' - BC pressure should be — 2.0kg/cm²

d) Move auto brake valve from 'Release' to 'partial' application' position - BC pressure. — 2.0 kg/cm²

e) Move indepdnent brake valve to 'application' position - BC pressure. — 4.0±0.1kg/cm²

f) Move independent brake valve from 'application' to 'Release' - BC pressure should be — 2.0kg/cm²

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| S.No. | Tests | Standard |
|---|---|---|
| 10. | Operation of brake release switch(141): | |
| | (Reduce the BP pressure by 1.0kg/cm$^2$. When corresponding BC pressure is stabilised, press the brake release switch). | |
| | a) Check BC pressure drops to | 0 kg/cm$^2$ |
| | b) Release the brake release switch. BC pressure should be restored to the original position. | Yes |
| 11. | Emergency brake valve: | |
| 11.1 | Time for BP to drop to 2.5kg/cm$^2$. | 2 to 4 sec. |
| 11.2 | Time for BC build up to 95% of maximum BC pressure - | |
| | a) For passenger position of distributor. | 7 to 10 sec. |
| | b) For goods position of distributor. | 25 to 30 sec |
| | c) Regression takes place. | Yes/No |
| 12. | Regression of power: | |
| 12.1 | H-5 Relay air valve: | |
| Sl No. 611 of CD Dev. I RAVB-2 | a) Power should regress when BP pressure drops to | 1.9+0.4 -0.0kg/c |
| | b) Power should cut-in when BP pressure rises to | Between 2.4 2.8 kg/cm$^2$. |
| 12.2 | HB-5 Relay air valve: | |
| | Vacuum (VTP) at which regression of power takes place. | Between 360 mm Hg. |
| 13. | Hand brakes: | |
| | With hand brakes applied, move throttle controller to 2nd notch. | Loco should move. |

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| S.No. | Tests | Standard |
|---|---|---|
| 14. | Multiple Unit Operation: | |
| 14.1 | MU-2-B Lead Position - | |
| | a) A-9 brake valve in 'Release' position - | |
| | BP Pressure | 5±0.1kg/cm$^2$ |
| | BC -do- | 0.0 kg/cm$^2$ |
| | b) SA-9 brake valve applied - | |
| | BC pressure | 4±0.1kg/cm$^2$ |
| 14.2 | MU-2-B Trail position - | |
| | Move A-9 brake valve to emergency application position and then change MU-2-B to 'Trail' position, and then move A-9 brake valve to - | |
| | a) Release position - | |
| | BP Pressure | 0.0 kg/cm$^2$ |
| | BC Pressure | 3.8±0.1kg/cm$^2$ |
| | b) Full service - | |
| | BP Pressure | 0.0 Kg/cm$^2$ |
| | BC pressure | 3.8±0.1kg/cm$^2$ |
| 14.3 | Charge the BP to 5.0kg/cm$^2$ Keeping MU-2-B lead position and then change MU-2-B trail position and then move A-9 brake valve to - | |
| | a) Full service - | |
| | BP pressure | 5.0±0.1kg/cm$^2$ |
| | BC Pressure | 0.0 kg/cm$^2$ |
| | b) Emergency - | |
| | BP pressure | will drop from 5.0 kg/cm$^2$ |
| | BC Pressure | 0.0 Kg/cm$^2$ |
| 15. | Air flow measuring valve gauge reading in 'Release' position of the automatic brake valve. | ---- |

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| S.No. | Tests | Standard |
|---|---|---|
| 16. | Settings: | |
| 16.1 | Feed valve (144) fitted in auxiliary electrical circuit. (Provide a gaure in the test plug provided near the feed valve)- Set at | 8.0±0.1kg/cm$^2$ |
| 16.2 | Feed valve (A52) fitted in the feed pipe line - Set at | 6.0±0.1kg/cm$^2$ |
| 16.3 | Buzzer (C35) | |
| | cut-in(Starts working) | 5.0±0.1Kg/cm$^2$ |
| | cut-out(buzzer off) | 6.0±0.1kg/cm$^2$ |
| | (Provide a gauge in the test plug provided near the feed valve(144). This shows that the pressure setting of D-24-B feed valve pressure switch(GCR). (C33) is correct. Light indication (C34) provided in driver's cab) will also glow during 'cut-in' position. | |
| 16.4 | 'BWC' pressure switch( 126) in Independent brake circuit - | |
| | cut-out | 1.0±0.1kg/cm$^2$ |
| | cut-in | 0.2±0.1kg/cm$^2$ |
| 16.5 | Air flow measuring valve pressure switch (148) - | |
| | (RGMF) cut-in | 7.0±0.1kg/cm$^2$ |
| | cut-out | 6±0.1kg/cm$^2$ |
| | (Light provided in cab will glow at 7.0±0.1kg/cm$^2$ and cut off at 6.0+0.1kg/cm$^2$). | |
| 16.6 | Duplex check valve (A23) [illegible] of MR causes at [illegible] the compressor and [illegible] MR equalising pipe angle [illegible] ck (A-4). | 5±0.1kg/cm$^2$ |
| 16.7 | Brake cylinder piston stroke of all cylinders. | 67 mm. |

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| S.No. | Tests | Standard |
|---|---|---|
| 16.8 | Brake block clearance - (with BC piston stroke of 67 mm). | 10 mm (Nominal) |
| 17. | Auto Drain valve: | |
| | UnLoading cycle. | 1 sec. |
| | Loading cycle. | 8-9 sec. |
| | (Readings should be recorded for both the auto drainvalves provided in the first and second main reservoirs). | |
| 18. | Dynamic brakes: | |
| 18.1 | Function of 'VEF' D-1 pilot air valve (A28). | |
| | a) Move A-9 brake valve to partial application - BC pressure. | 2.0 kg/cm$^2$ |
| | b) Energise dynamic brake circuit and observe - BC pressure. | 0.0 kg/cm$^2$ |
| | c) Release dynamic brake - BC pressure restores to | 2.0 kg/cm$^2$ |
| | d) After BP pressure is built up to 5.0 kg/cm$^2$. Energise, dynamic brake circuit and then move auto brake valve to emergency - BC pressure. | 3.8±0.1kg/cm$^2$ |
| 18.2 | Function of 'SWC' Switch(A26) - | |
| | a) Energise dynamic brake circuit - BC pressure (Energise, after BP pressure is built up to 5.0kg/cm$^2$). | 0.0 kg/cm$^2$ |
| | b) Move A-9 brake valve to application position - BC pressure. | 4.0±0.1kg/cm$^2$ |
| | c) Observe dynamic brake trips off at 1.0±0.1 kg/cm$^2$ - BC pressure. | Yes |

Pressure Switch RGEB (BIS)

Cut out 4·2 ± 0·1 kg/cm$^2$ ..26

Cut in 2·8 ± 0·1 kg/cm$^2$

| S.No. | Tests | Standard |
|---|---|---|
| 18.3 | Function of 'I.P' magnet valve (A20) - | |
| | a) Move A-9 brake valve to partial application - BC pressure. | 2.0 kg/cm$^2$ |
| | b) Energise dynamic brake circuit - BC pressure | 0.0 kg/cm$^2$ |
| | c) Simulate dynamic brake failure - BC pressure should build upto | 3.8±0.1kg/cm$^2$ |
| 19. | Auxiliary equipments: | |
| 19.1 | Wipers - | |
| | Operation of wipers between 5-10 kg/cm$^2$ MR pressure. | Satisfactory or not |
| 19.2 | Sanders: | |
| | a) Operation of sanders between 5-10 kg/cm$^2$ pressure. | Satisfactory or not. |
| | b) Rate of sand flow for each sander. | 0.125-0.25kg/min |
| 19.3 | Horns: | |
| | a) Operation of low tone horn between 5-10kg/cm$^2$ MR pressure. | Satisfactory or not. |
| | b) Clarity of sound - low tone<br>- high tone | Clear or not. |
| | c) Operation of high tone horn between 5-10 kg/cm$^2$ MR pressure. | Satisfactory or not. |