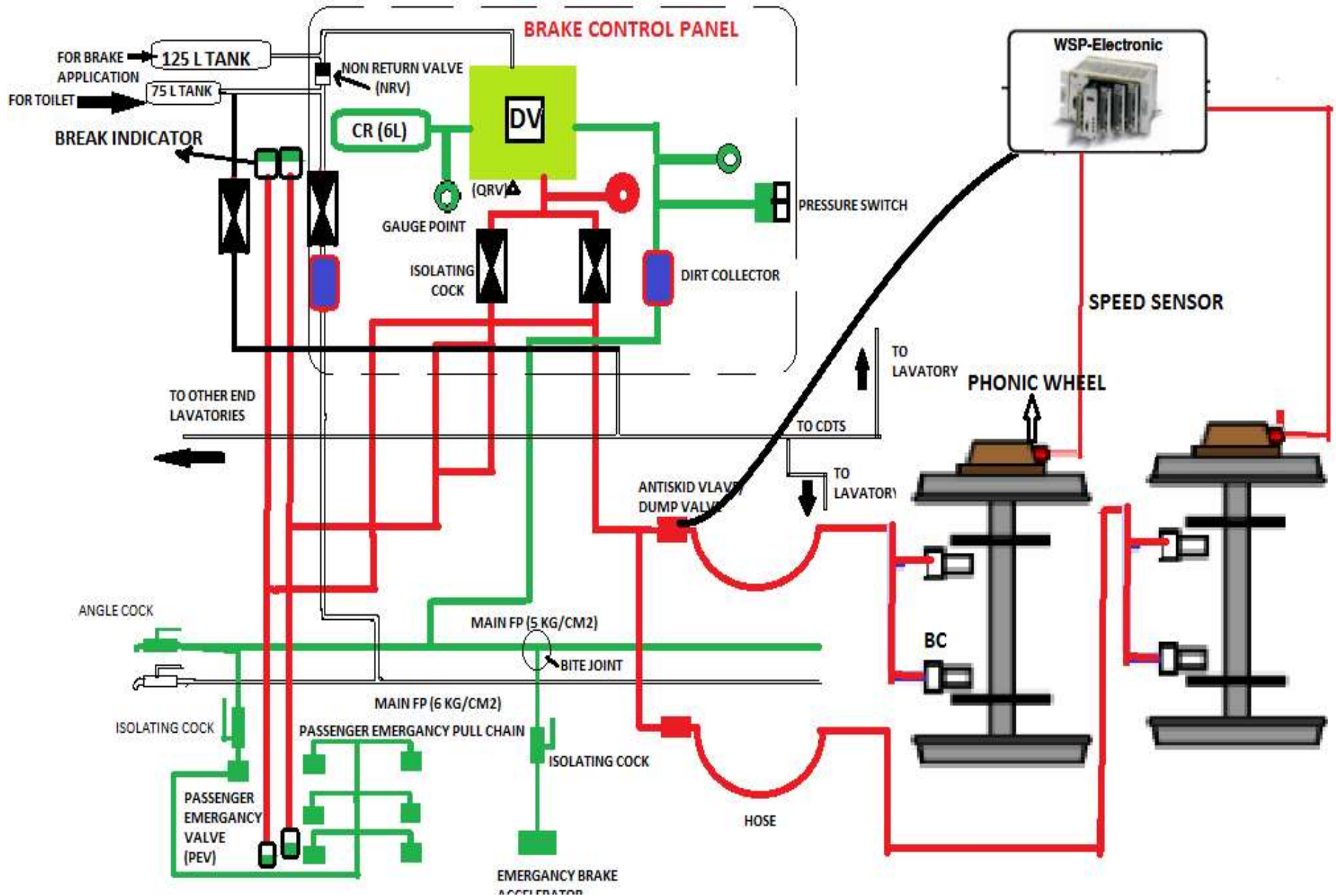


AIR BRAKE SYSTEM

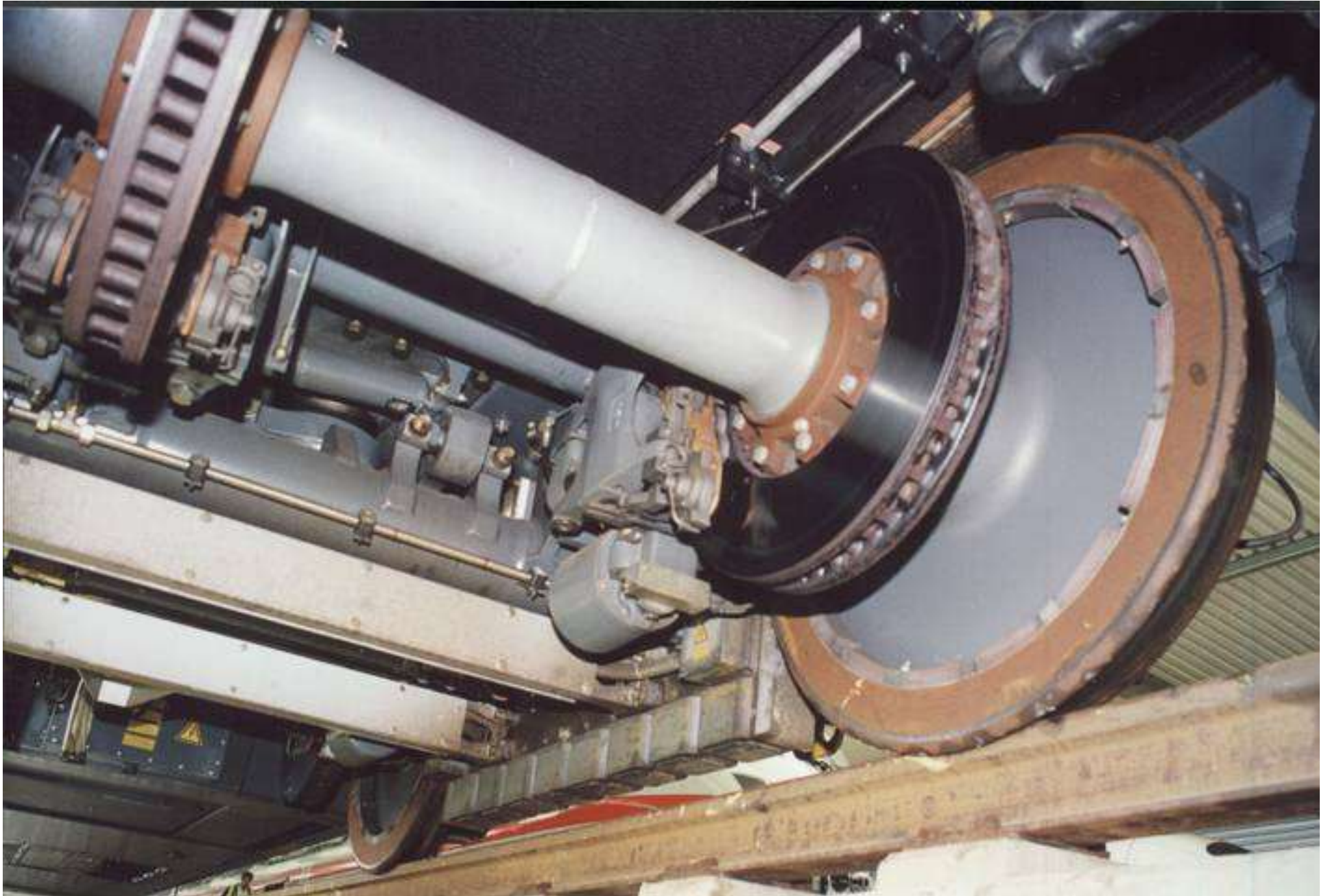
LHB COACHES

(Axle Mounted Disc Brake
With
Wheel Slide Protection Unit)

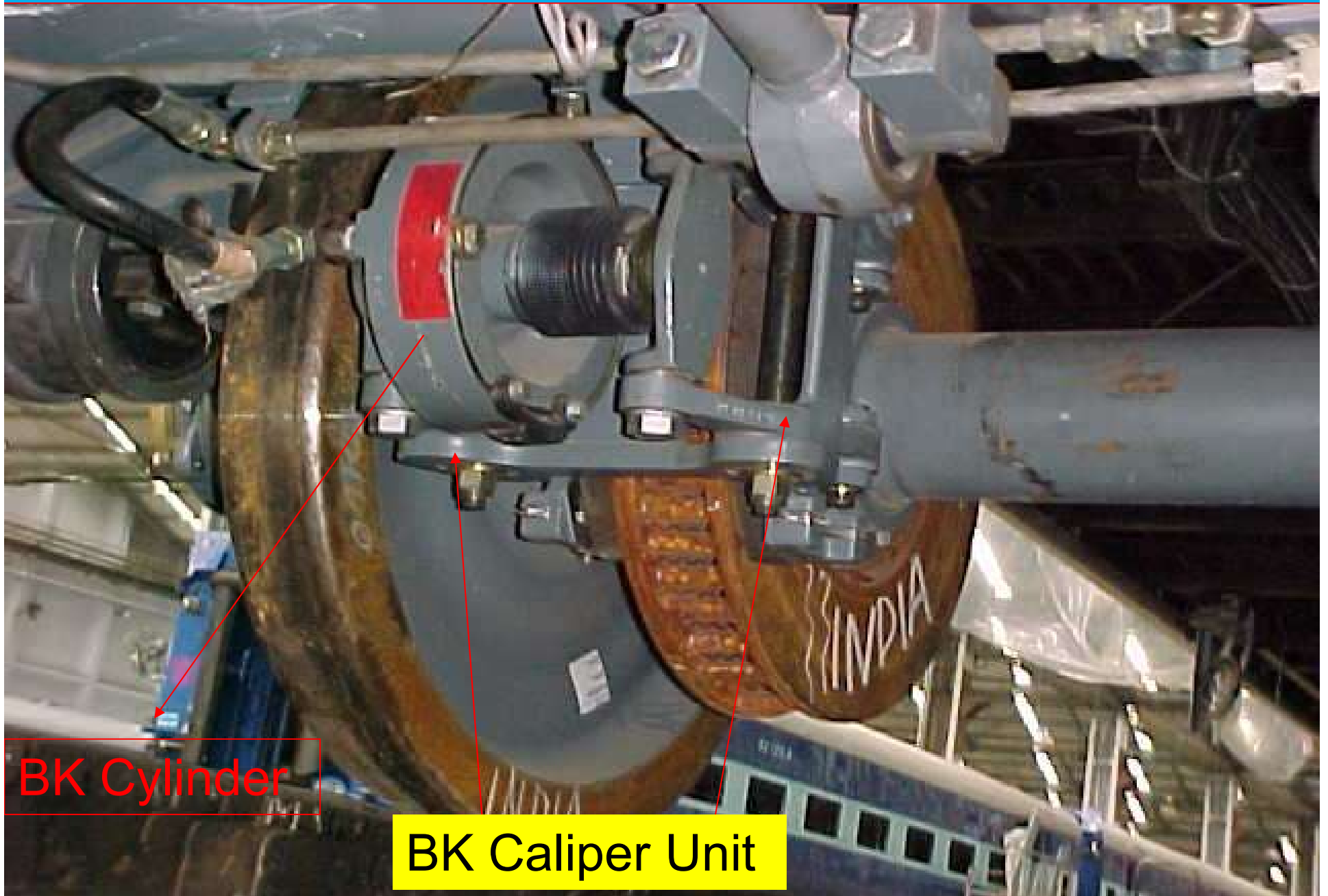
LHB BK system



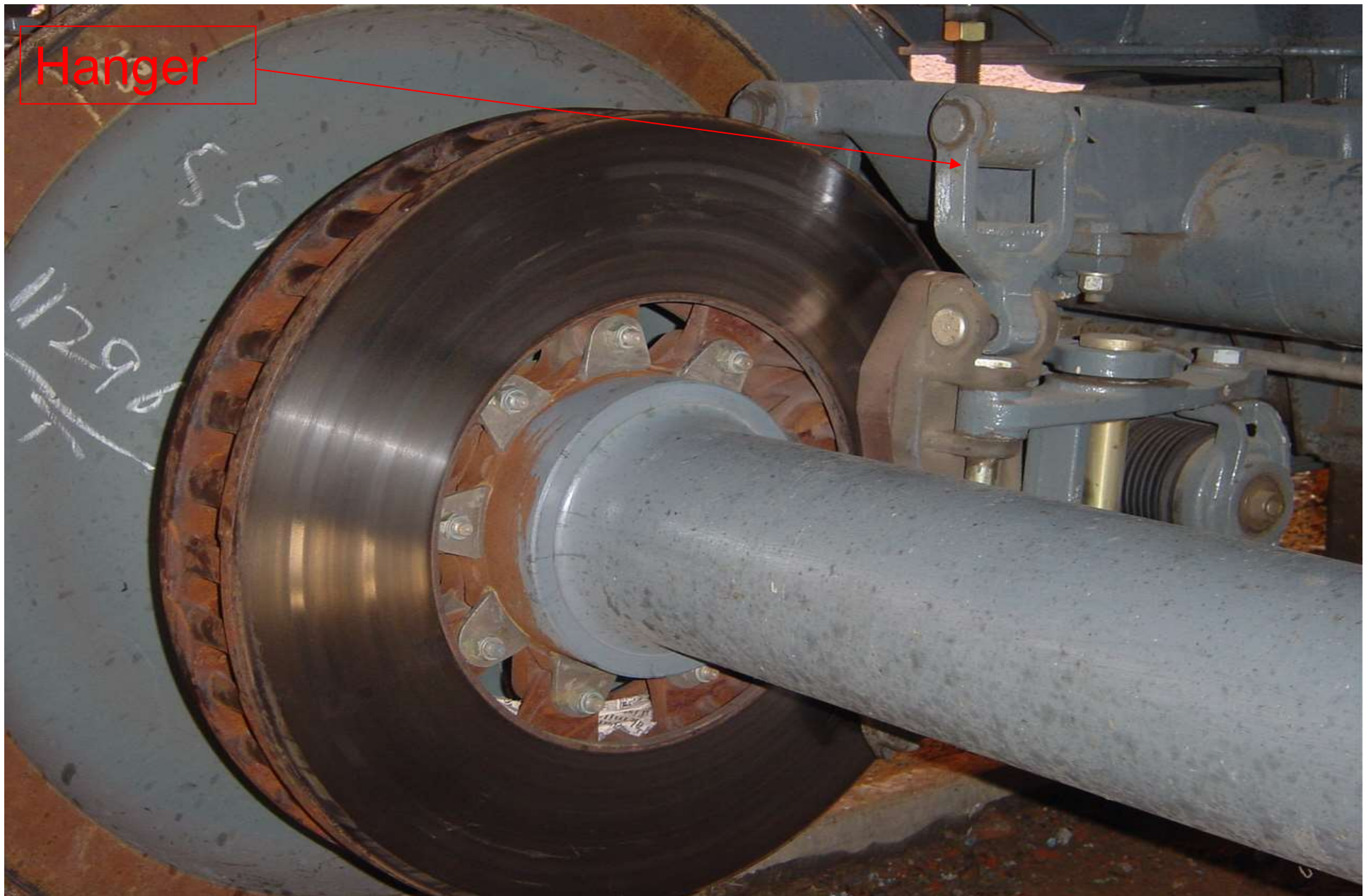
View of Axle Mounted Disc Brake System



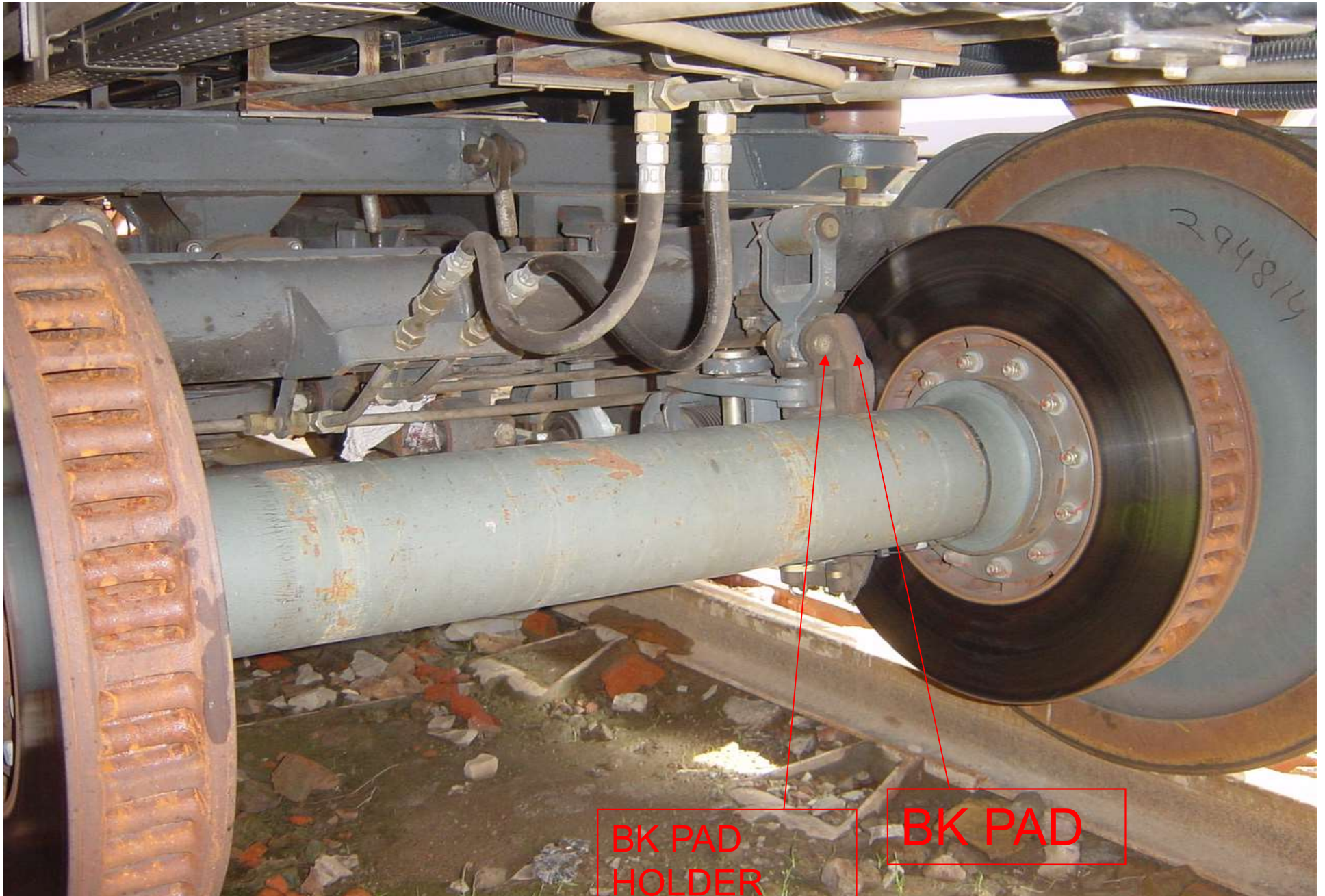
BRAKE CYLINDER AND CALIPERS



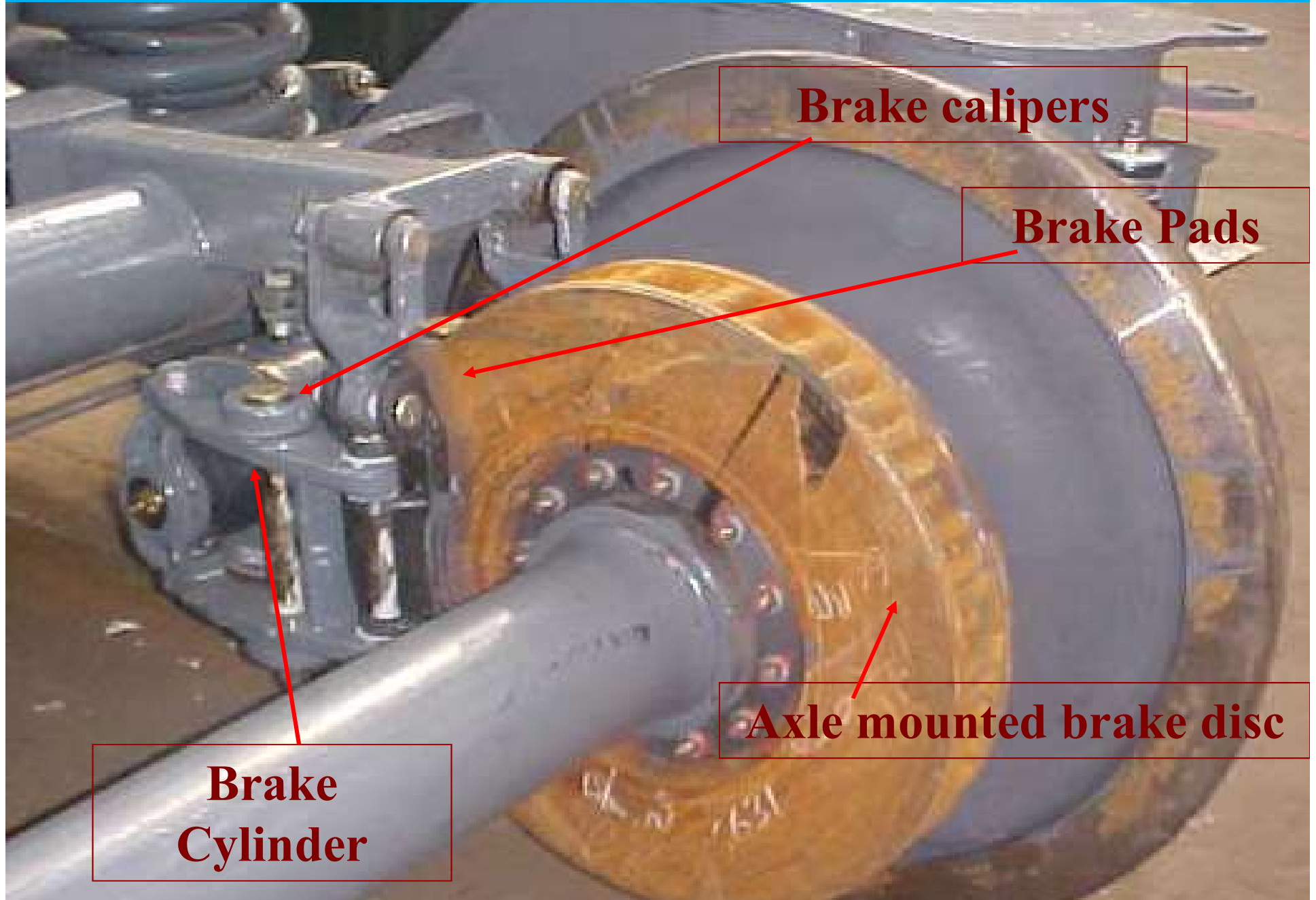
Axle Mounted Disc Brake System



Axle Mounted Disc Brake System



Brake Rigging Components



– Brake pads

- 35mm thick and 200 Cm²
(Composite type)
- Quantity per coach: 32 Nos. (16 LH & 16 RH)
(16 on each bogie-2 on each caliper)
- Wear limit - 28mm max.(7 mm)

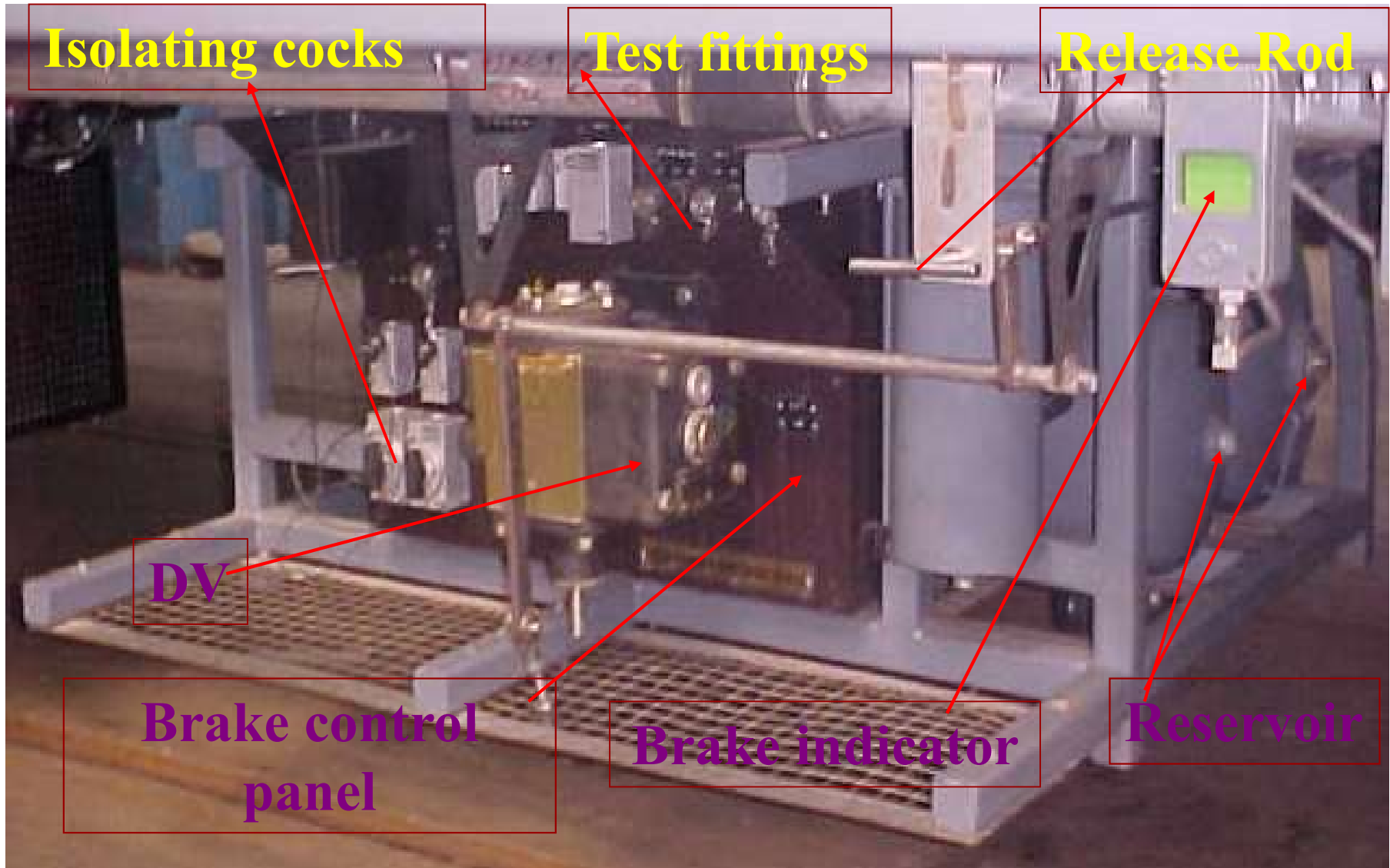
– Brake Disc:

- Quantity per coach - 8 Nos (two per axle)
- Disc dimensions - 640X110 mm
- Material: - Grey cast iron

– Speed Sensor cable with pole wheel (80 teeth):

- 4 Nos. - One per axle)
- Gap between speed-Sensor and pole wheel - 0.9 to 1.4 mm

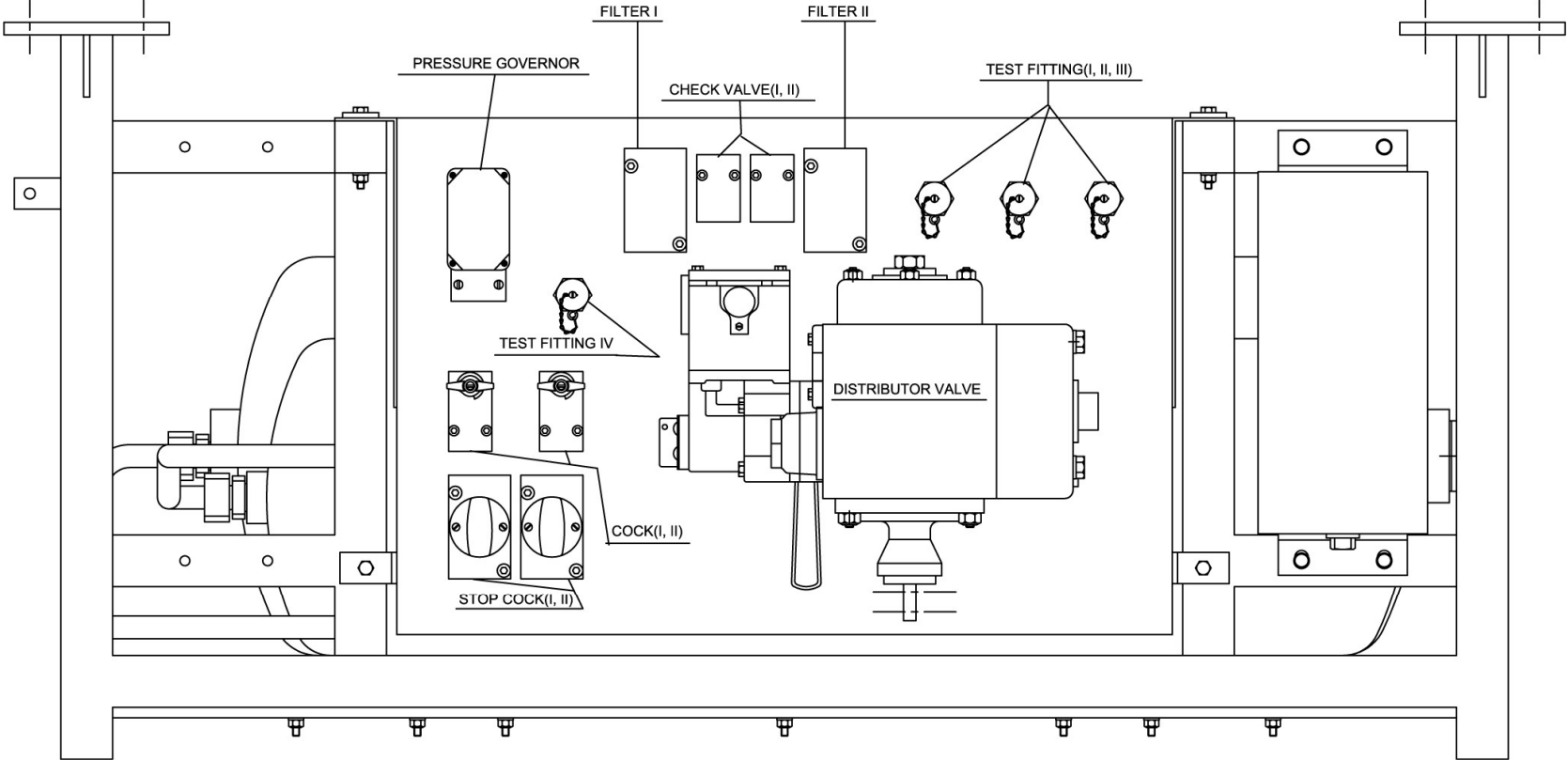
BRAKE CONTROL PANEL AND INDICATOR UNIT



SAB WABCO CONTROL PANEL

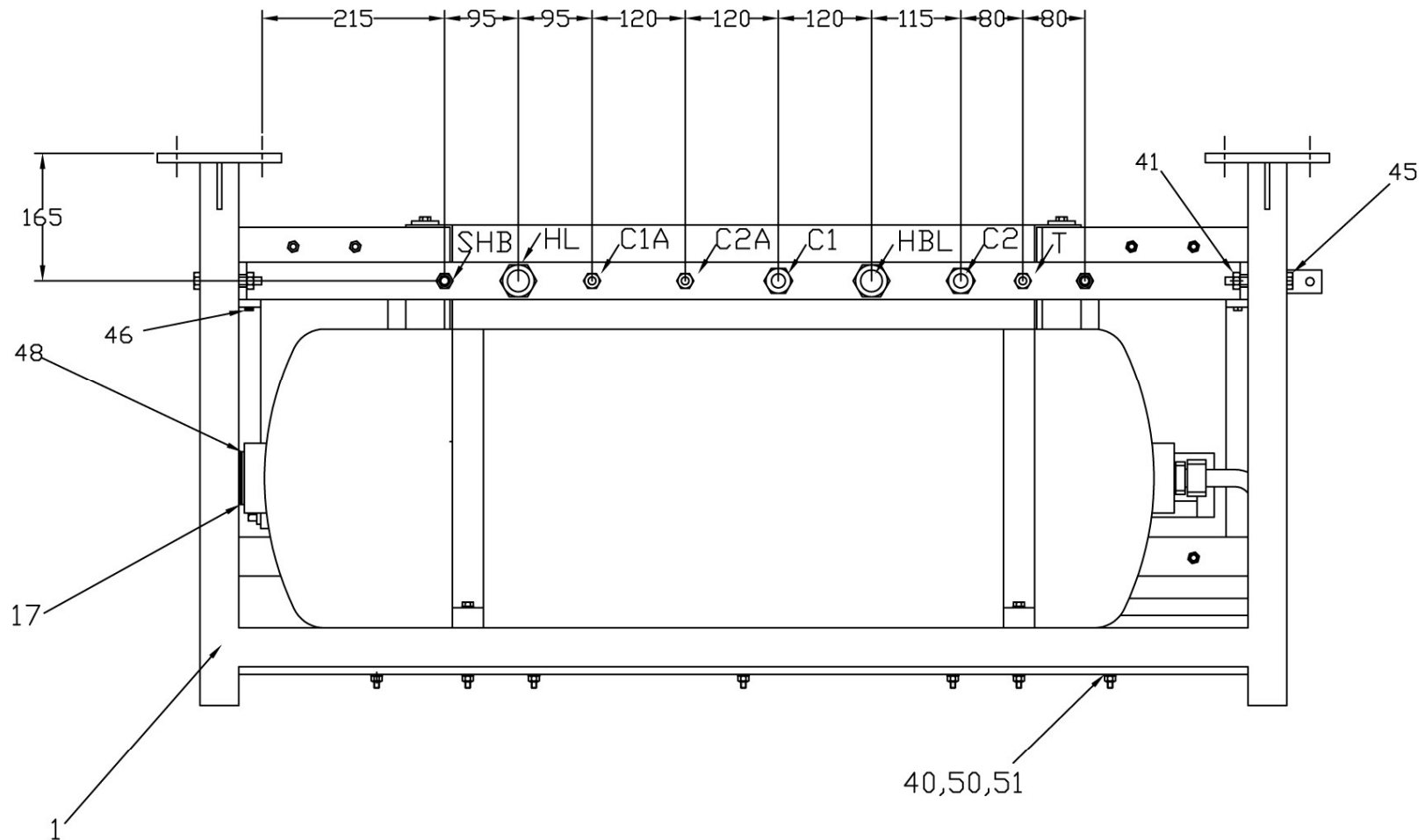


BRAKE CONTROL PANEL



CONTROL PANEL FOR PASSENGER CAR

BRAKE CONTROL PANEL (Rear View)



DETALIL OF END CONNECTION: (GENERATOR CAR)

- | | |
|-----|--|
| HBL | -FEED PIPE |
| HL | -BRAKE PIPE |
| C1 | -BRAKE CYLINDER-BOGIE1-C1 |
| C2 | -BRAKE CYLINDER-BOGIE2-C2 |
| C1A | -INDICATING DEVICE-BOGIE1 |
| C2A | -INDICATING DEVICE-BOGIE2 |
| T | -AUXILIARY SUPPORT PIPE(FOR TOILET) |
| MC | -MANOMETER FOR C-PRESSURE. |
| SHB | -SUPPORT FOR INDICATING DEVICE OF HAND BRAKE |

Pressure Switch in Brake Control Panel



BRAKE CONTROL PANEL (Top Rear View)



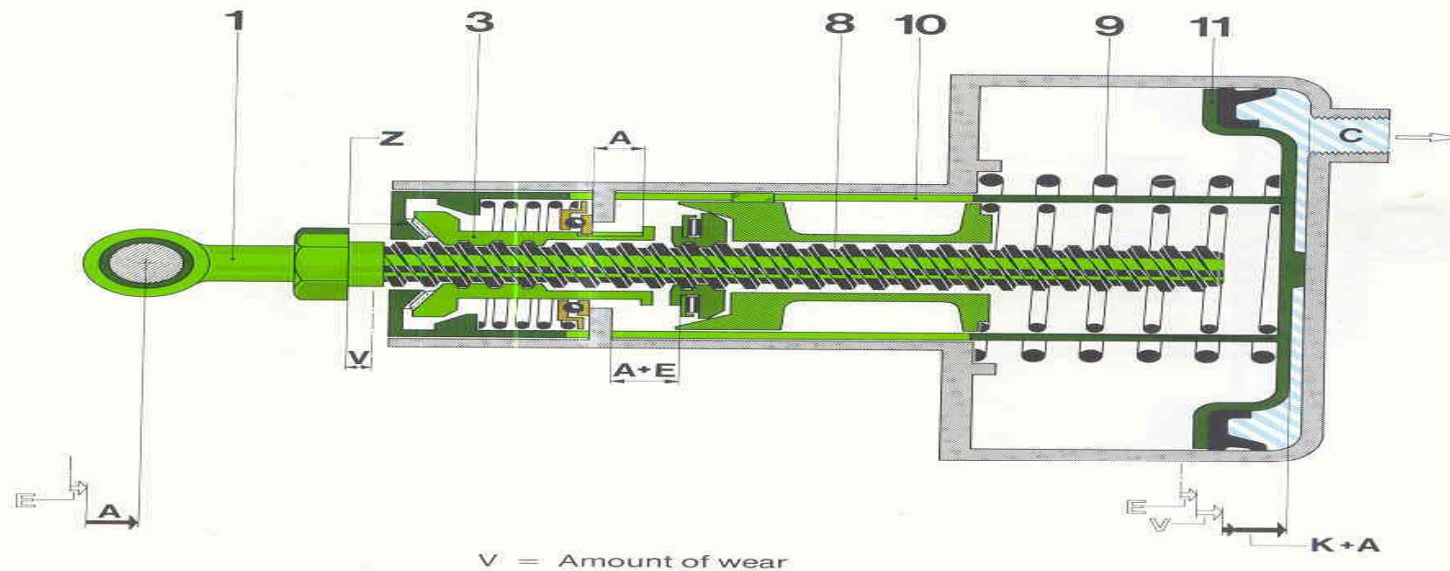
BRAKE EQUIPMENTS- POSITIONS & FUNCTIONS

- Mainly Brake Equipments are placed at four locations:
 - Container Frame (On Under frame):
 - Pressure Tanks (Air Reservoirs):
 - Main Reservoir -One 125L for brake application (Protected by check valve)
 - Auxiliary Reservoir - One75L for toilets
(Capacity of Both 125 L and 75 L available for brake application)
 - Controlled Reservoir -One 6 L for DV
 - Brake Control Panel (Centralized control, On under frame):
 - Test fittings (To Check Pressure) :
 - Feed Pipe pressure
 - Brake Pipe pressure
 - Control Reservoir pressure
 - Brake Cylinder pressure

Brake Cylinder

Brake release after braking with wear (cont.)

Fig. 13



4.4.3 Change of couplings and return stroke to release position

The operations occurring in the cylinder are identical to those described in sections 4.2.2 and 4.2.3. At the end of brake release the piston rod head (1) is located, by the amount V , away from the starting point at the beginning of brake application.

- 1 Piston rod head
- 3 Thrust nut
- 8 Adjusting spindle
- 9 Piston return spring
- 10 Piston tube
- 11 Piston head
- z Geared coupling

 Parts moving longitudinally

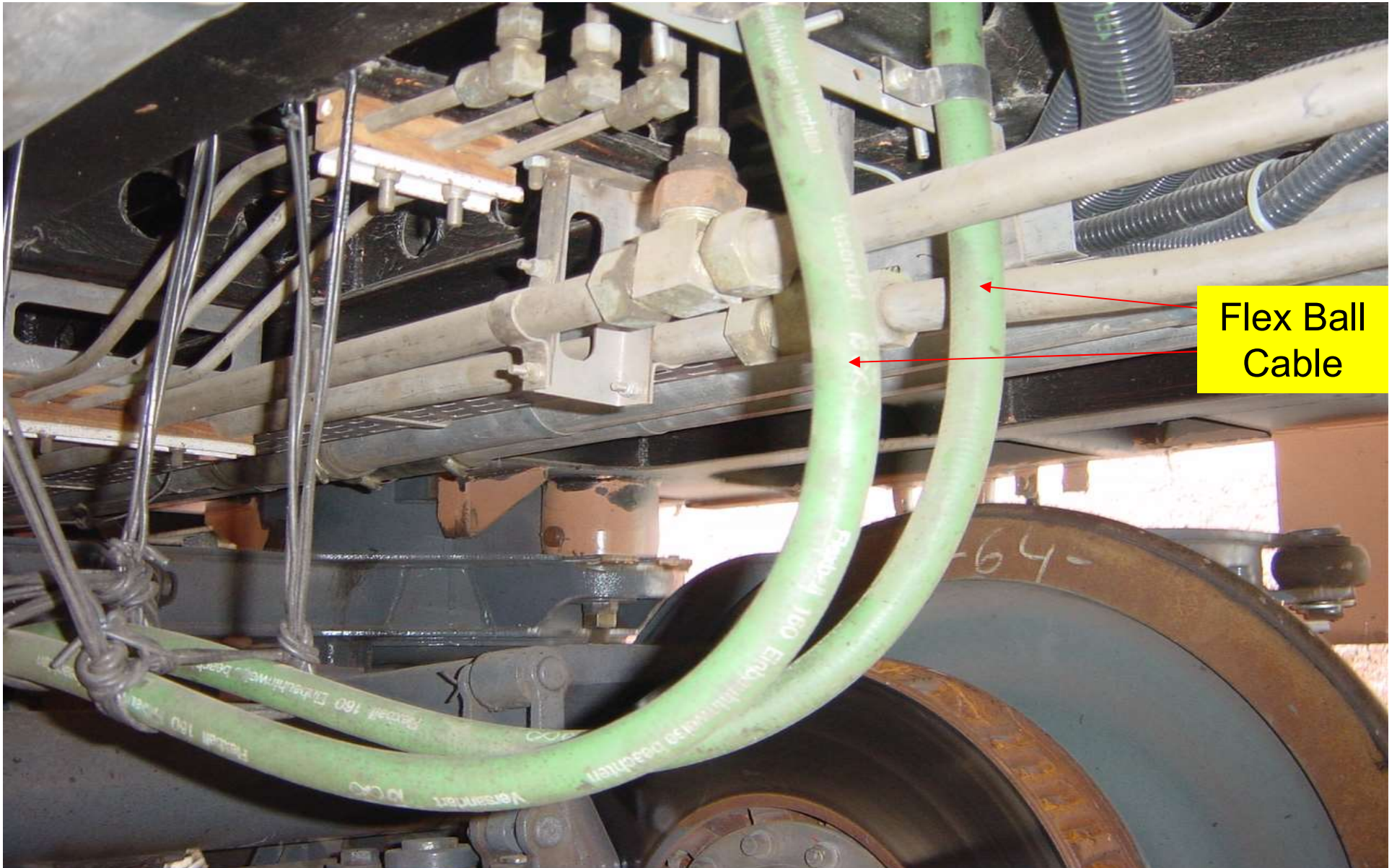
Emergency Brake Valve (Guard Cabin)



Brake Indicator View (Power Car)

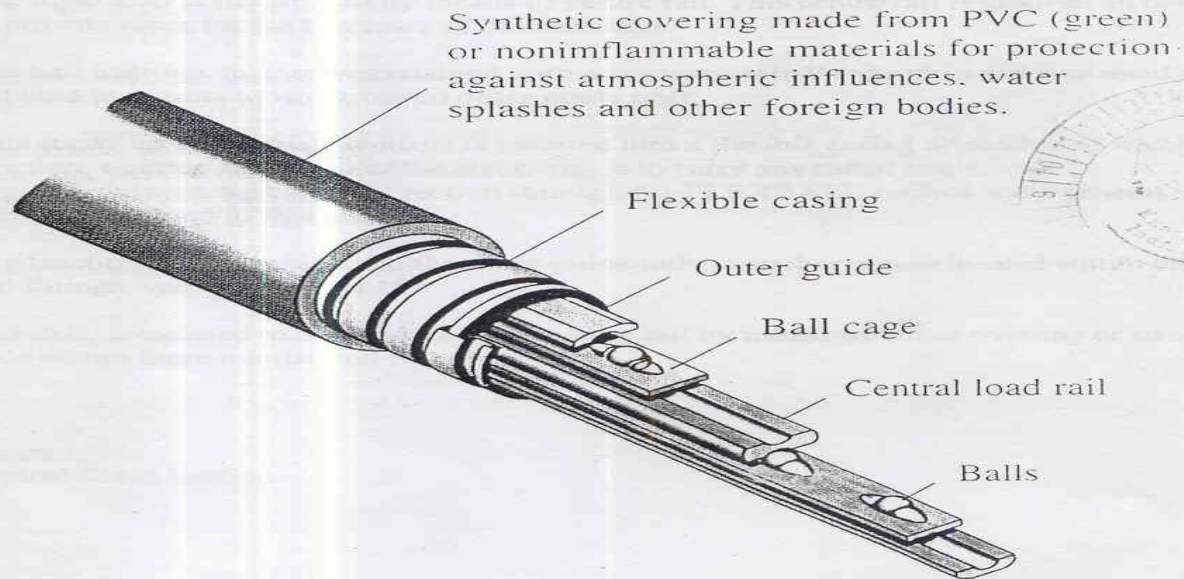


Flex-ball Cable Fixing Arrangement



Flex-ball Cable

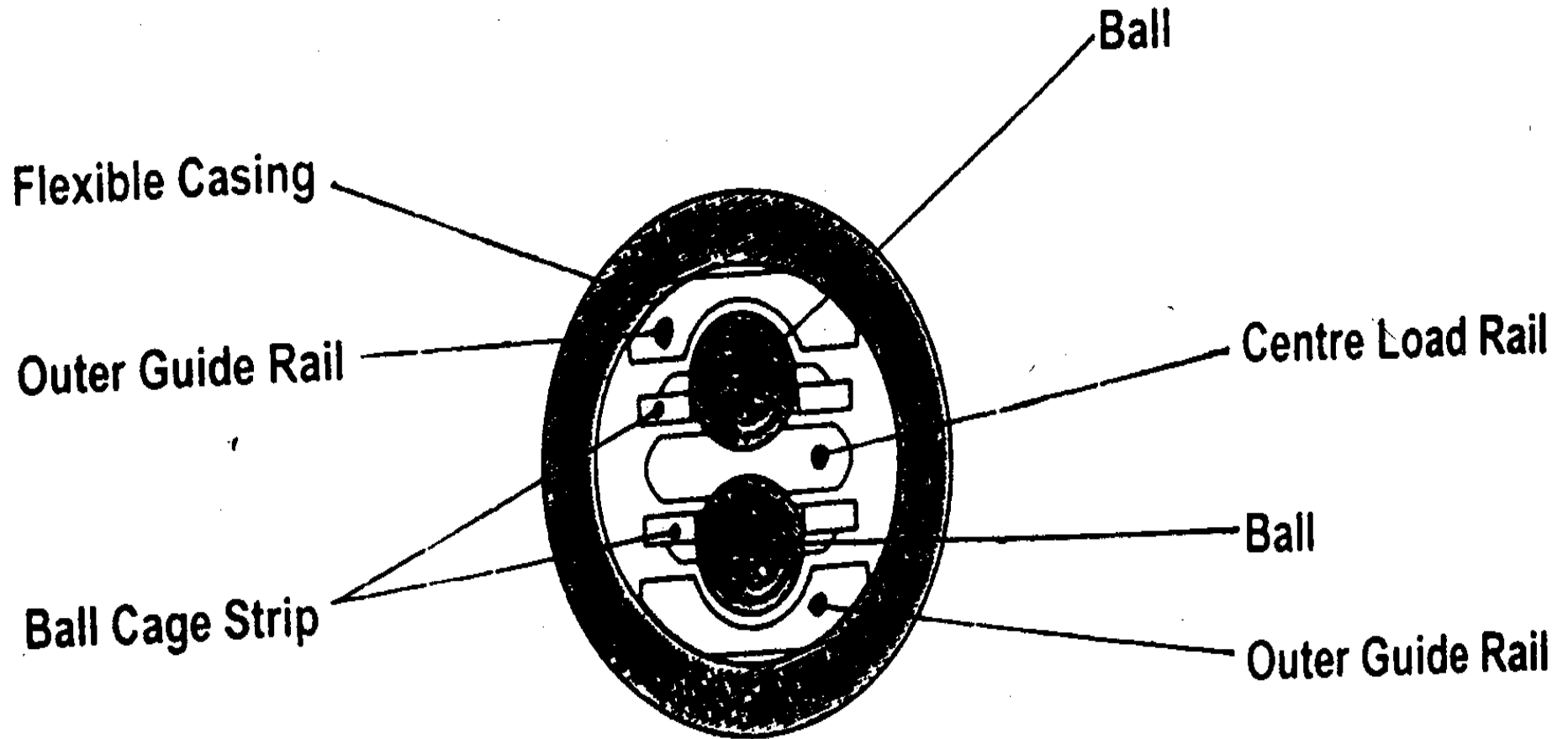
FLEXBALL-Remote Controls



INSTRUCTION

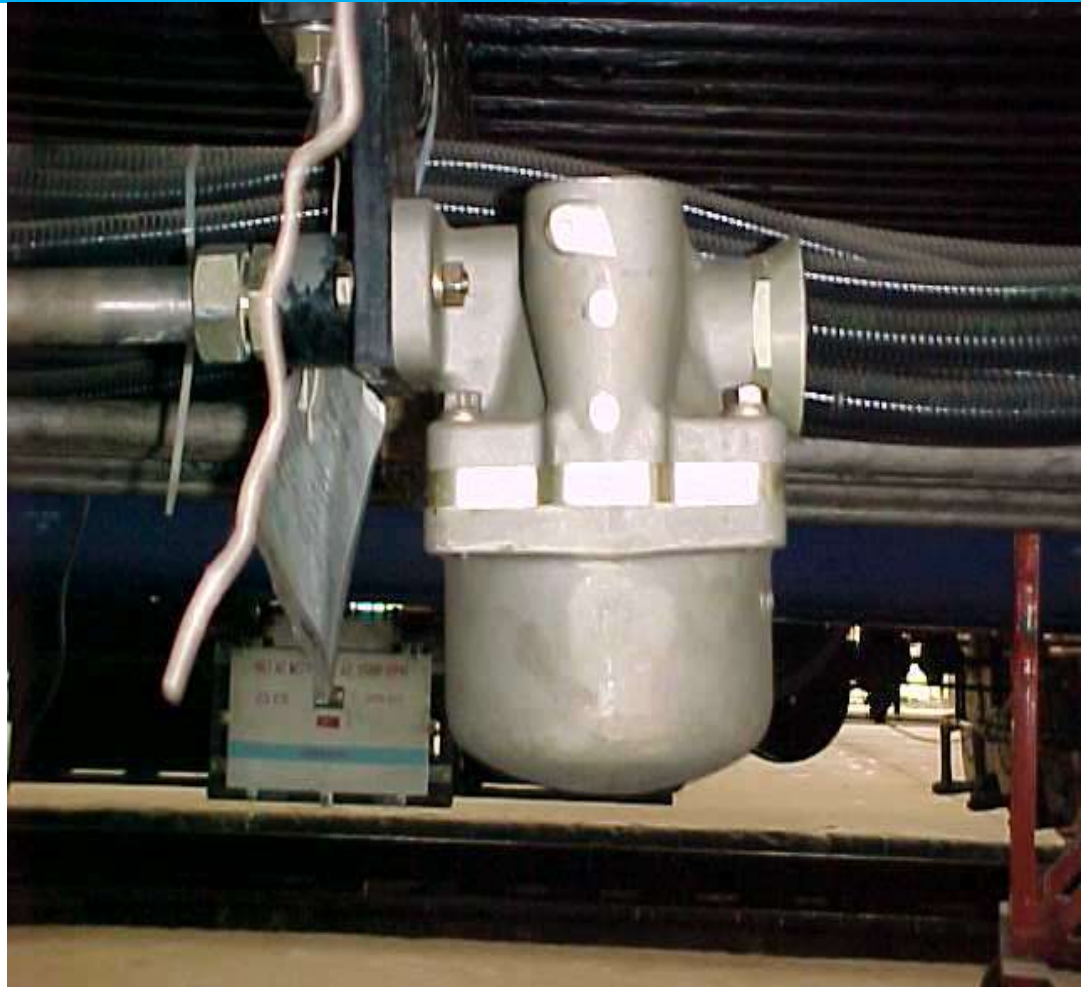
FOR INSTALLATION

Cross-Section View of Flex-ball cable



BRAKE ACCELERATOR

Mounted in brake pipe. If any fast pressure reduction in BP, equal to emergency brake application it support this pressure reduction and vents the BP via a large orifice. This causes an equal BP reduction over the whole train, so the actuation speed of the Brake cylinders at the end of a train will be as fast as in coaches near the actuation point.

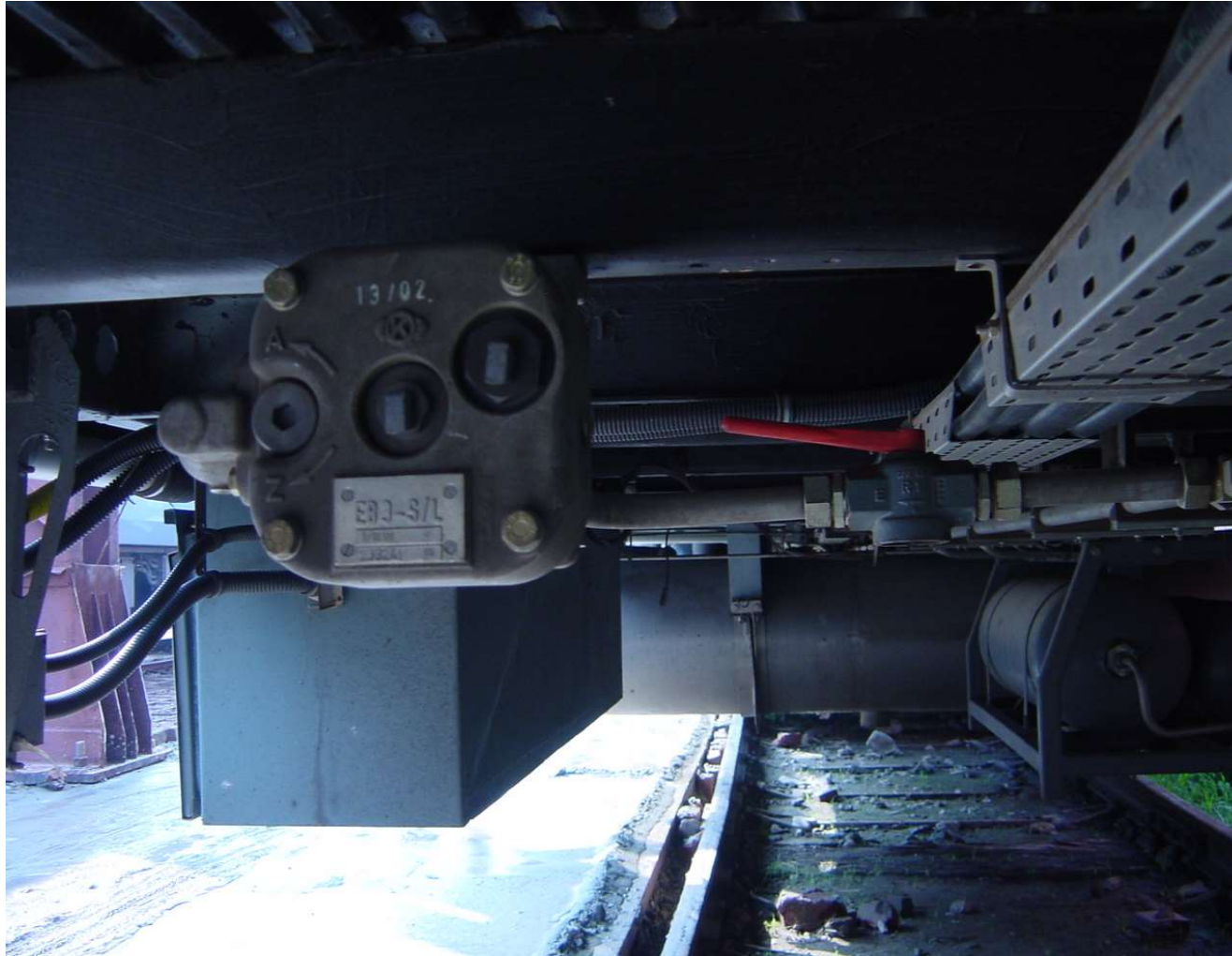


BRAKE ACCELERATOR

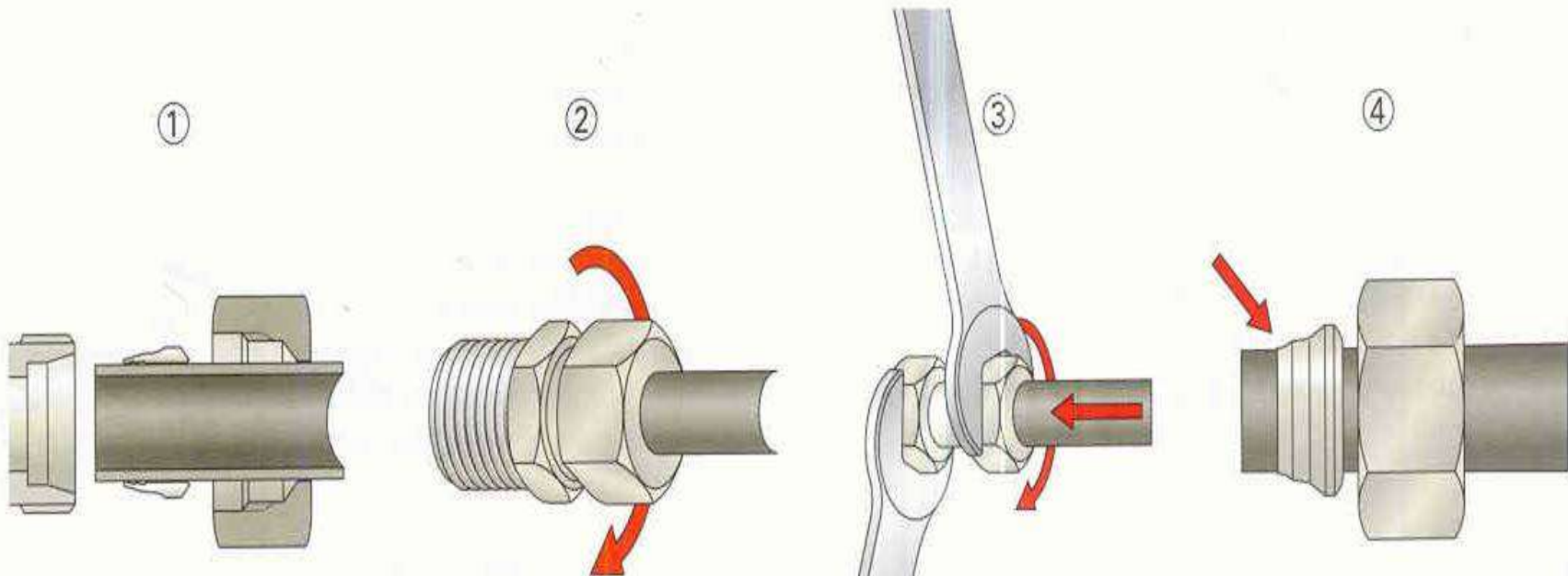


Isolating Cock

BRAKE ACCELERATOR



Coupling of Bite Type Fitting



- 1&2-** Push the nut and cutting edge ring on the pipe and screw on until contact is perceptible (ring must face towards pipe end)
- 3** Press the pipe against the stop in the coupling body. Tighten the nut approx. 1 ½ turns keeping body in position
- 4** Cutting ring after dismantling the joint

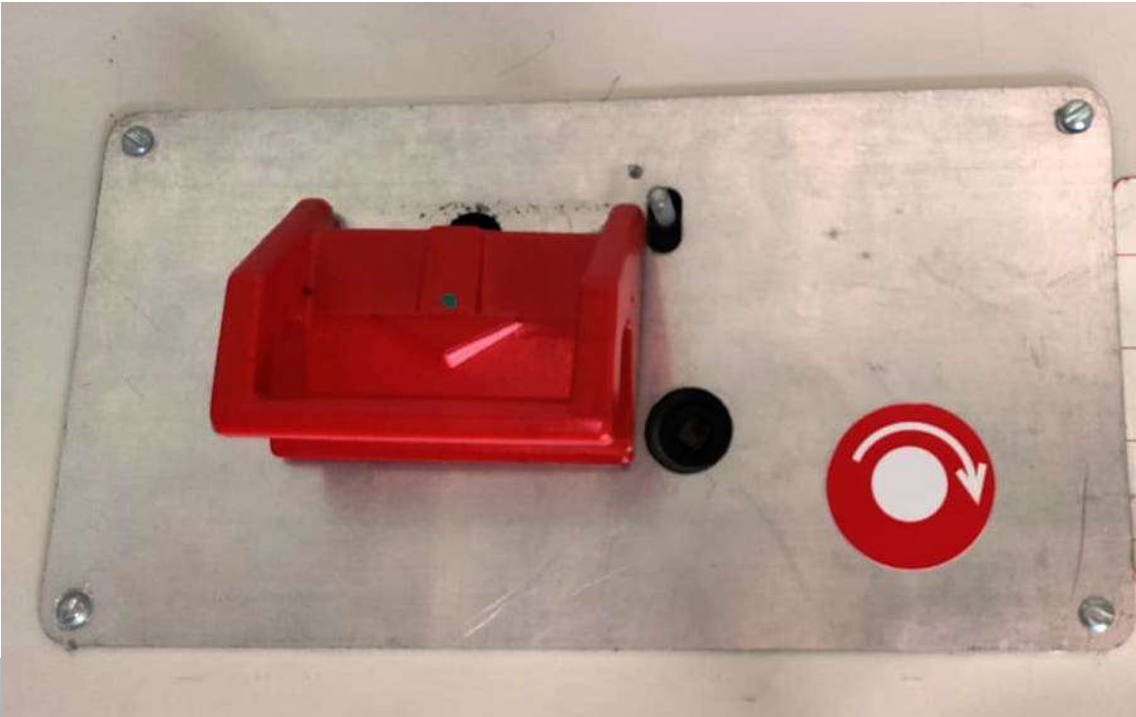
Coupling of Bite Type Fitting



EMERGENCY ALARM CHAIN



Type-1



Type-2



Type-3



“Alarm Pulled”- Indication Lamp



Alarm Chain Exhaust line With Isolating cock



Alarm Chain Exhaust line Without Isolating cock



Local provision of Isolating cock at Alarm Chain Exhaust line



Wheel Slide Protection System (WSP)

- This is Microprocessor based wheel slide/skid control system
- This system operates on Electro pneumatically

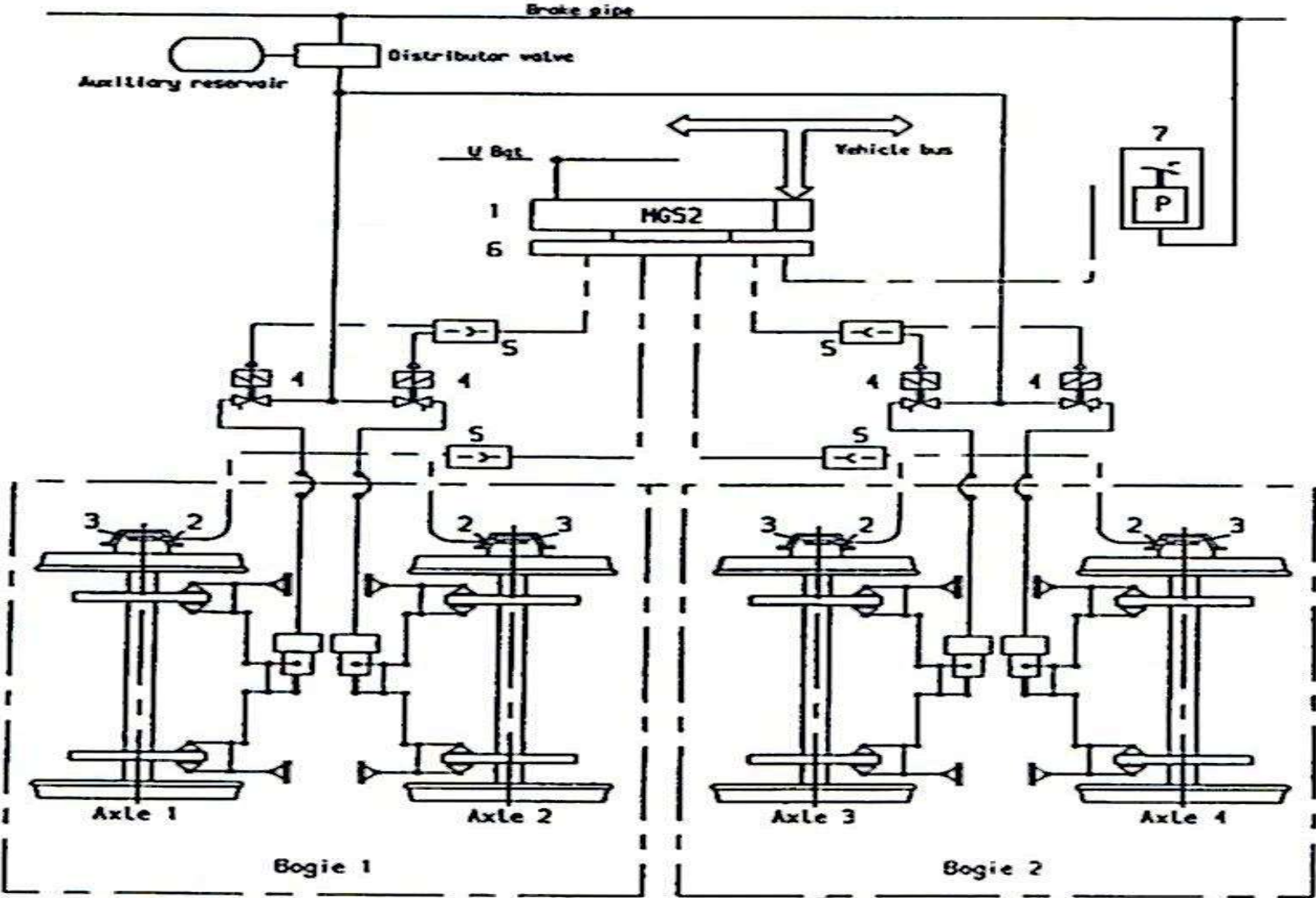
Function

- *Prevents the wheel sets from locking in all kinds of weather even extremely low adhesion due to wet rail and slippery*
- *By regulating the braking force at low adhesion it minimises the braking distance.*

Essentials

Description	FTIL	KBI
Supply Voltage	110 V DC	110 V DC
Working Pressure	1.5 -1.7 kg/sq.cm (FP Pressure)	0.2 - 0.5 kg/sq.cm (BP Pressure)
Gap between Phonic wheel & Speed sensor probe	0.9 mm to 1.4 mm	0.9 mm to 1.4 mm

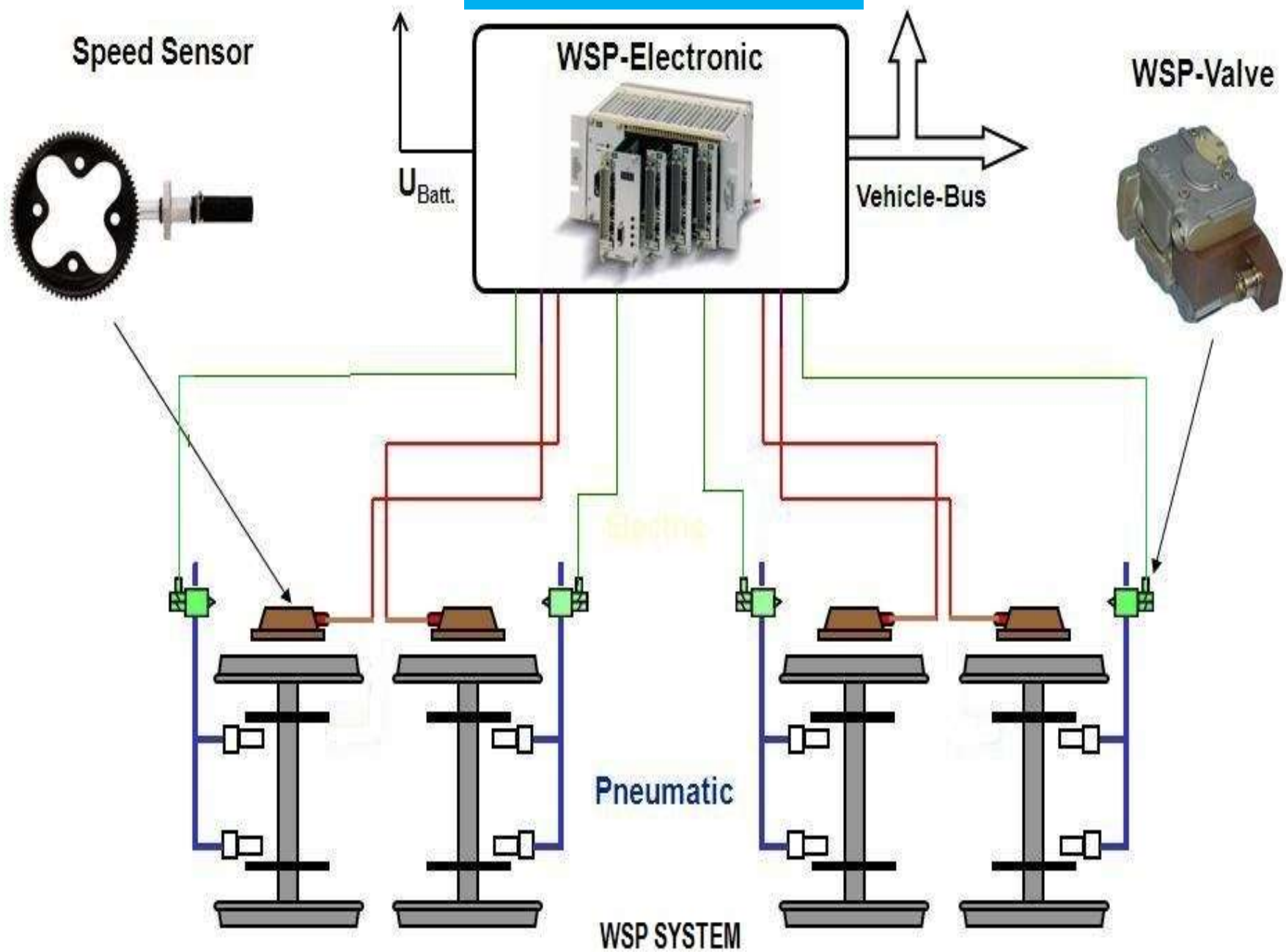
WSP line diagram



- 1 MGS2 control unit (connection to vehicle optional)
- 2 Speed sensor
- 3 Rotating gear

- 4 Anti-skid valve
- 5 Terminal box
- 6 Terminal block
- 7 Pressure switch

WSP Diagram



Major parts

- Phonic wheel
- speed sensor
- Micro Processor
- Anti skid valve or Dump valve
- Pressure switch

WSP Components



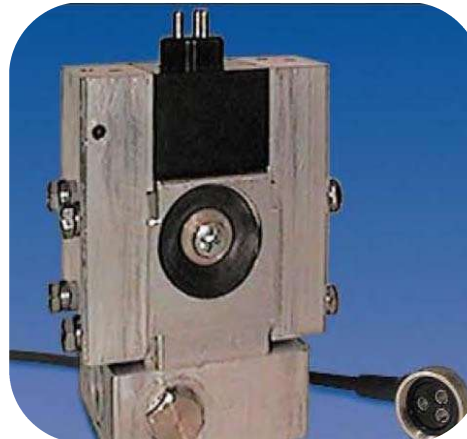
WSP control panel/Micro Processor



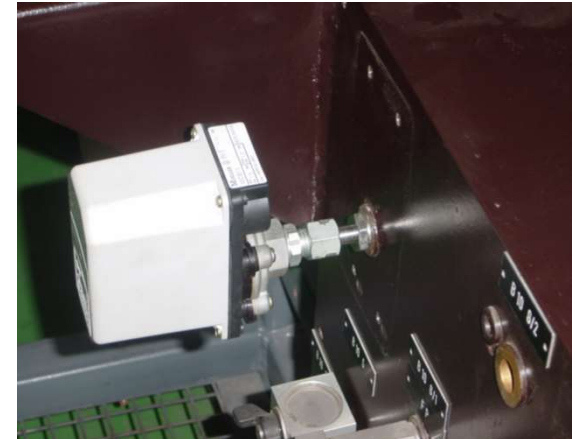
Speed sensor probe



Phonic wheel



Dump Valve/Anti skid valve



Pressure Switch

Enlarged view of PHONIC/POLE WHEEL



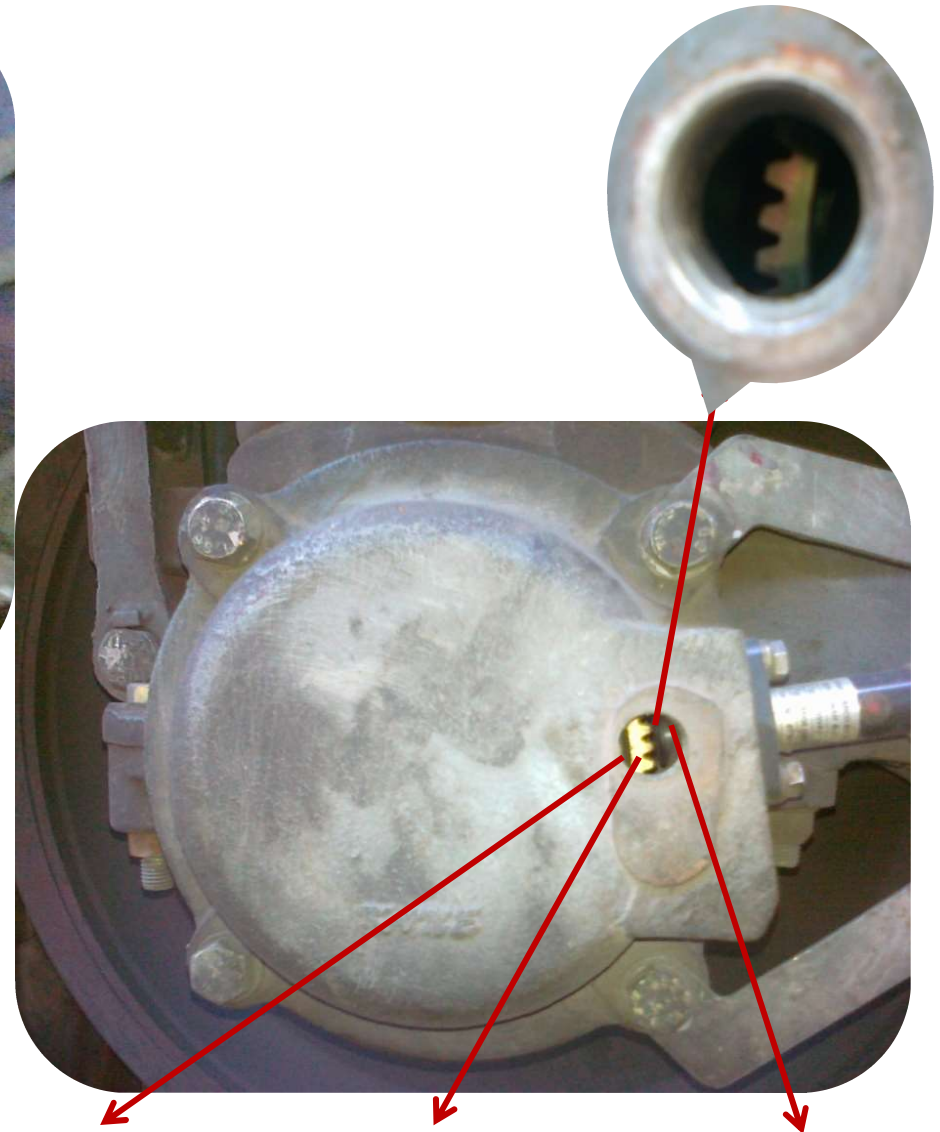
80 Nos Teeth

Phonic wheel & Speed sensor



Phonic wheel

Speed sensor



Peep hole

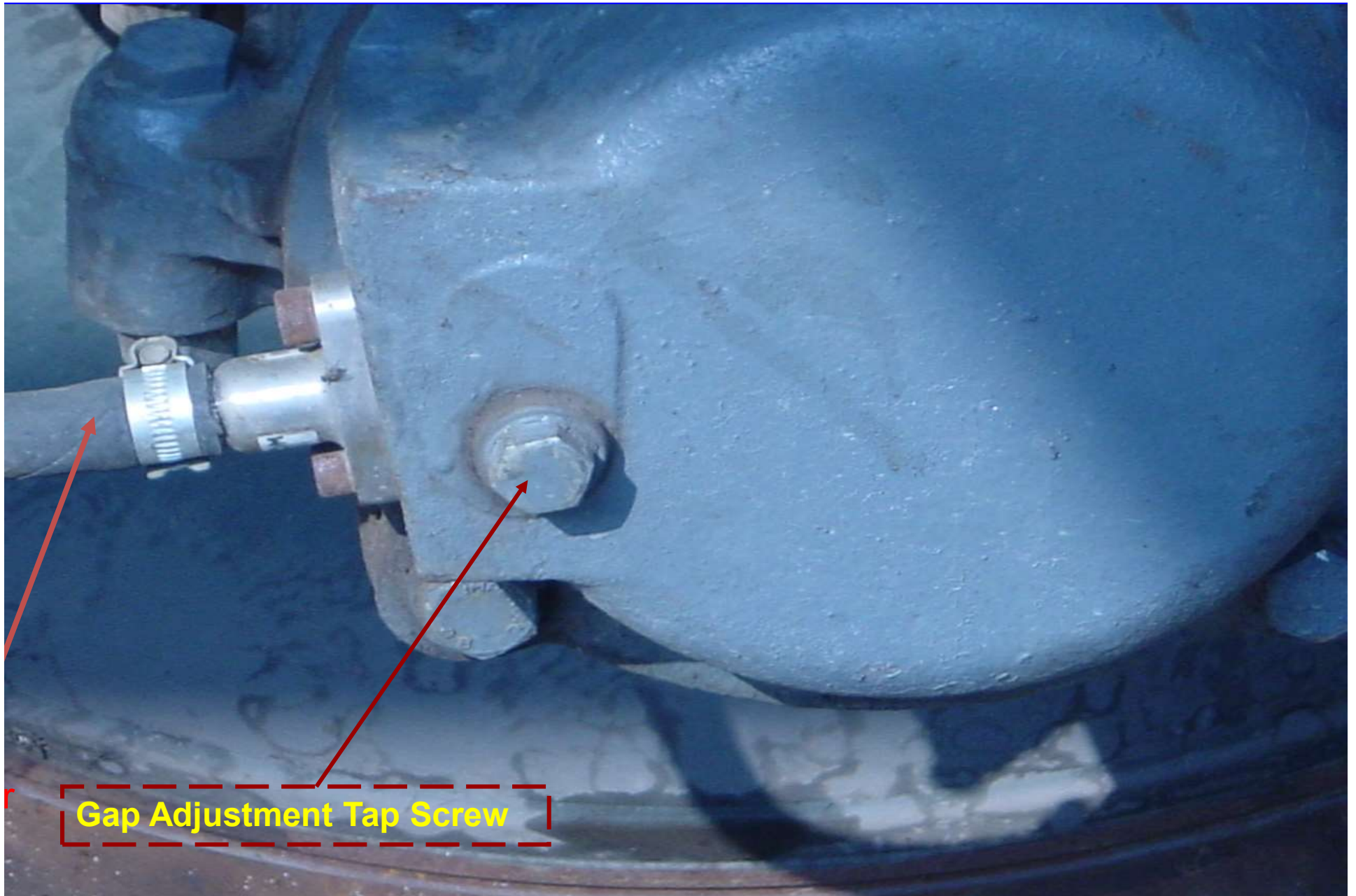
Phonic wheel

Speed sensor

Phonic Wheel

- Fitted over the CTRB with 3 high tensile bolts
- Toothed wheel/gear wheel with 80 teeth
- Alters internal inductance near by sensor
- The change in internal inductance is *evaluated as* axle speed
- Even *small variation* in speed of different axles on same coach can be measured

Speed sensor cable with Pole wheel



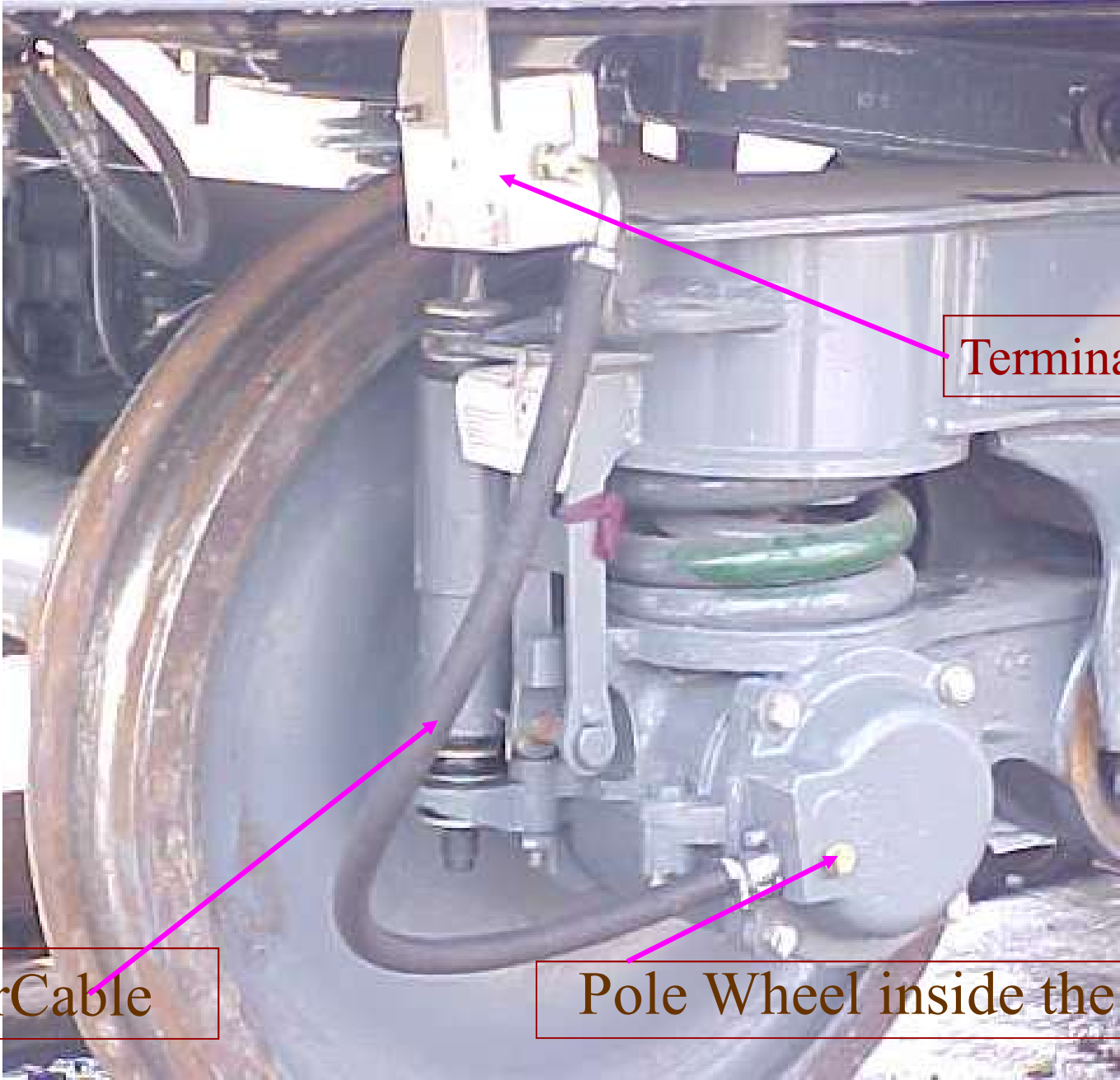
Speed Sensor

Working Principle:

- The speed sensor scans a ferromagnetic rotating gear (tooth module 2) that is centered over the axle. It works without physical contact and does not wear. The air gap between the rotating gear and sensor is 0.9 to 1.4 mm. Both items are sealed inside aluminium die-casting.
- Magnetic field changes are converted into electric signals



SPEED SENSOR CABLE WITH TERMINAL BOX



Terminal Box

sensorCable

Pole Wheel inside the cover

Speed Sensor

- Gap between sensor probe and phonic wheel plays vital role
- Gap can be measured through peep hole on the axle box cover
- The gap should be checked in every D3 schedule



**FILLER
GUAGE**

Speed Sensor

Description	Effect
<i>Decrease in gap</i> between speed sensor & phonic wheel	<i>Damages the sensor</i> probe results in <i>bearing</i> problems
<i>Increase in gap</i> between speed sensor & phonic wheel	<i>Sensor</i> probe <i>will not pick up</i> speed signals

- The *gap* can be adjusted by *providing shims*
- *Working* of speed sensor observed by watching *LED indication*

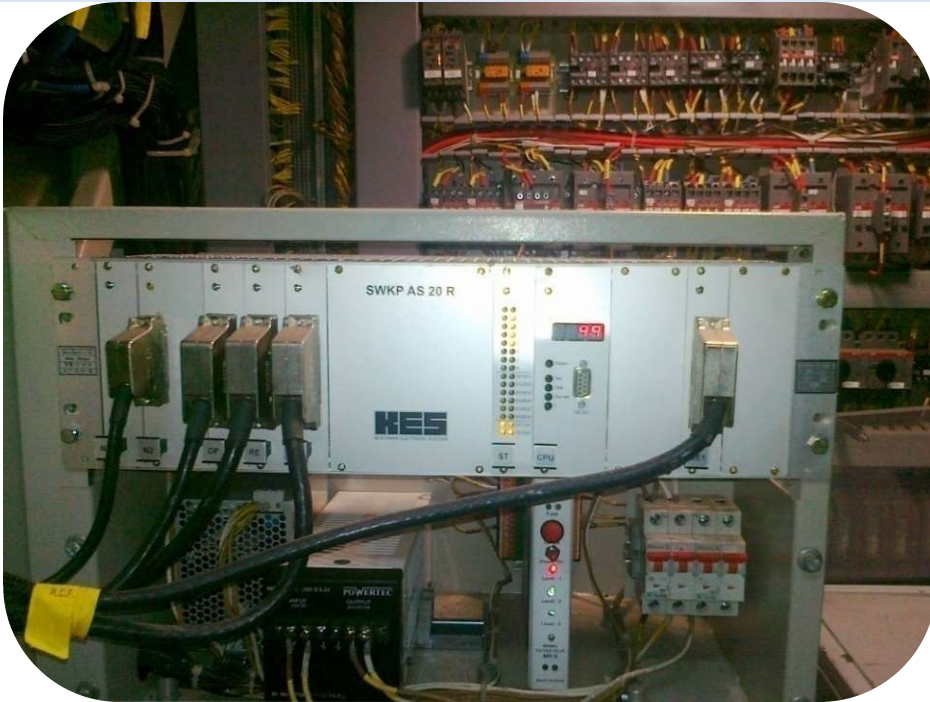


Shims



Working condition

Micro Processor



Micro Processor

- *Heart* of the WSP system
- *Evaluates the vehicle speed by gathering signals* from Phonic wheel & Speed sensor
- *Monitors and bridges* the sharp drop of speed in *particular axle* during *application* of brakes
- Enable the *Dump valve/Anti skid valve* to adjust the Brake cylinder pressure

Micro Processor

RE-CDTS SPEED SIGNAL

OP-DURING DOOR TEST (Not in use)

N1 CARD
15V /5V DC INPUT

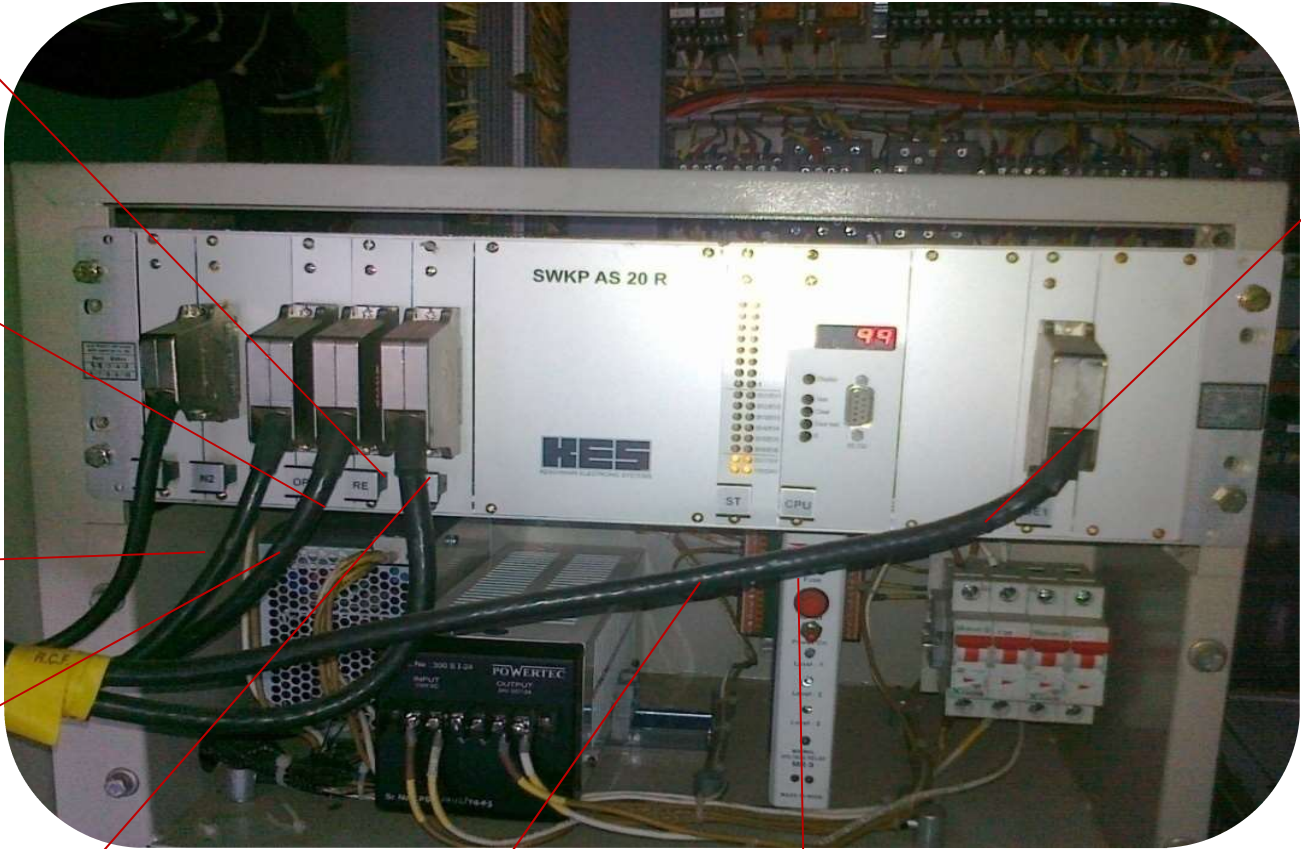
N2 CARD MAIN POWER
-110 V DC input
-24 V DC output

MV-DUMP VALVES CARD

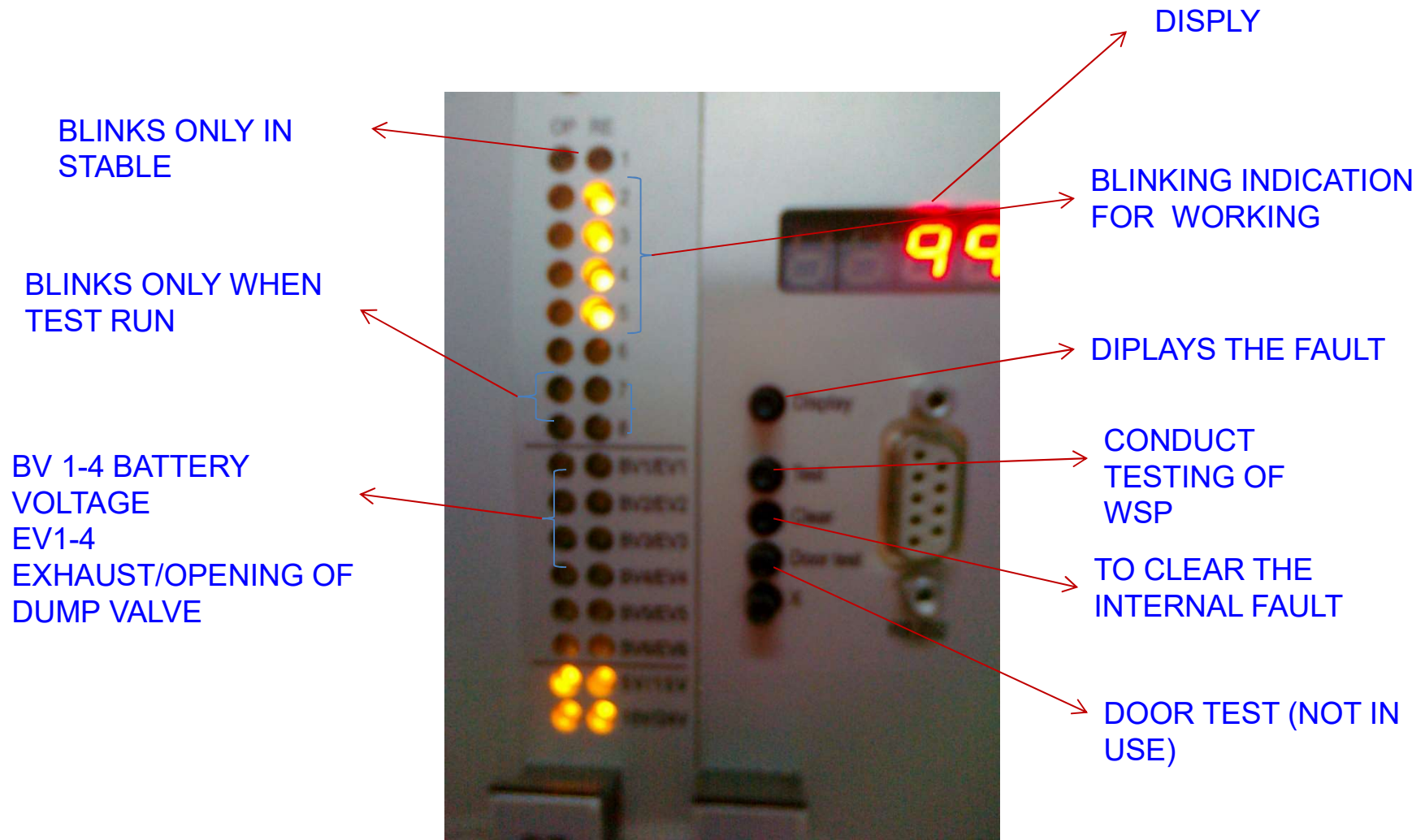
ST-STATUS SIGNALLING

CENTRAL PROCESSOR UNIT

GE-SPEED SENSOR



Display unit



Anti Skid valve or Dump valve



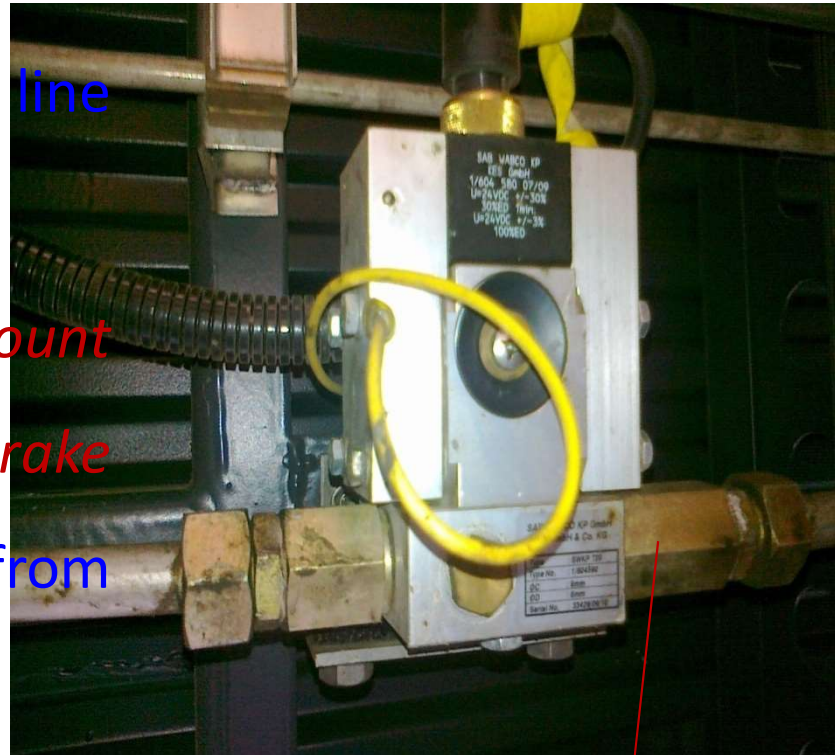
FTIL Make

KBI Make



Anti Skid valve or Dump valve

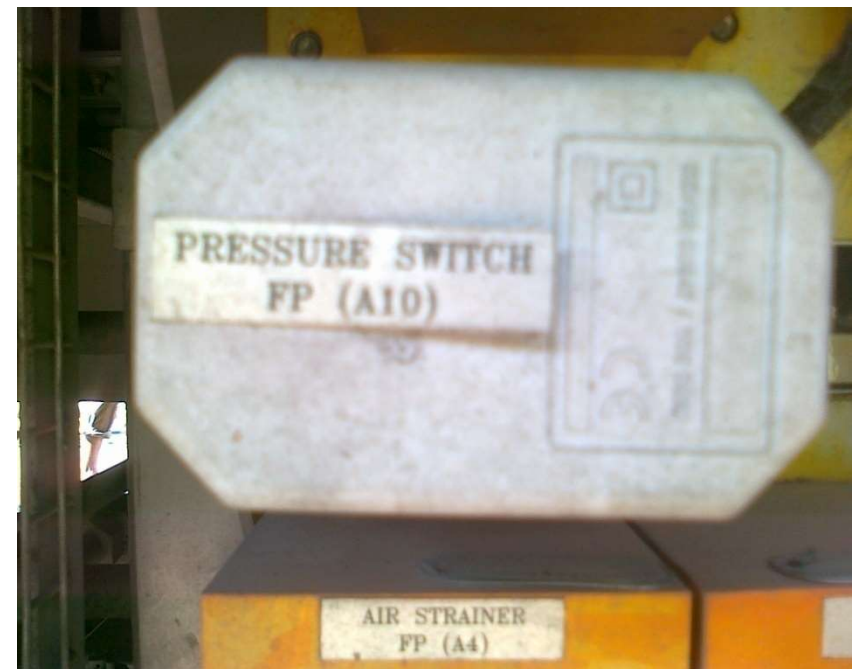
- It is a type of *solenoid valve*
- *Mounted* on B.C pipe line *between D.V & BC*
- Allows to make *smaller amount of air in BC* during *brake application* as per signals from microprocessor
- *Vent feature* of the Dump valve should be *downward* in B.C pipe line



VENT

Pressure Switch

- Provided on the Brake control panel
- It activates WSP when pressure reaches as given:
 - BP 0.2 to 0.5 kg/sq.cm (KBI)
 - FP 1.5 to 1.7 kg/sq.cm (FTIL)



Pressure Switch in Brake Control Panel



Testing of WSP

- Ensure the WSP in all coaches should be *OFF* position *without pressure in FP & BP*
- If, any processor is in *ON* condition there is *problem* in
 - Pressure switch
 - problem in Wiring or
 - Problem K-05 relay



K-05 Relay
valve

Testing of WSP

- Start the BP and FP pressures the processor should automatically ON When
 - BP pressure reaches to 0.5kg/sq.cm in KNORR
 - FP pressure reaches to 1.5kg/sq.cm in FTIL
- Check any loose/improper fitment of WSP components like
 - Speed sensor
 - Junction Box
 - Dump valve connections
 - Pressure switch
- Attend all connections



Testing of WSP

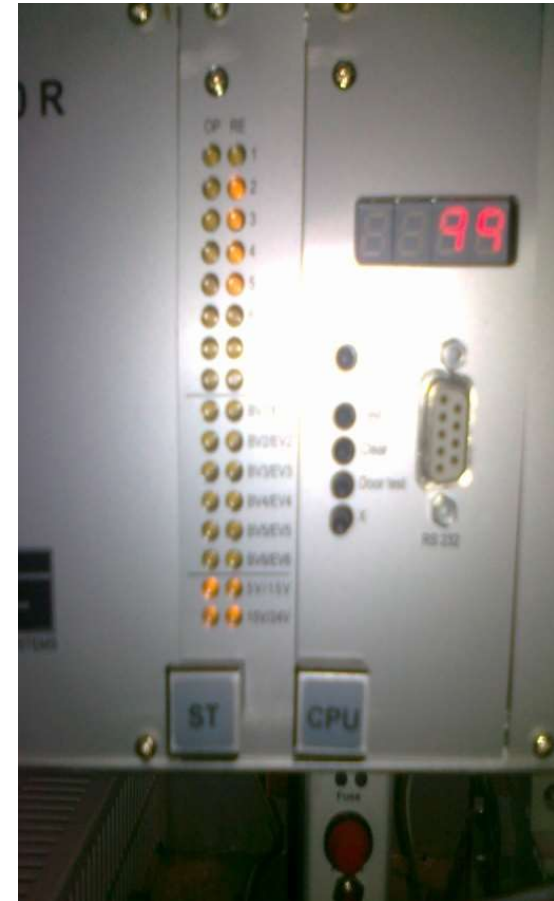
- Drop BP pressure by *1.6kg/sq.cm* & brakes should apply in all coaches
- Check *WSP processor* for correct reading *99* on electrical panel inside the coach.
- If the reading shows *99* the WSP system is *OK*.
- Operate the *test button* on the processor to check *proper working* of the Dump valves.
- Ensure the *Dump valves* should *operate* in *proper sequence* & pressure should exhaust from Brake cylinder

Testing of WSP

- If the Dump valves are not operating in proper sequence.
 - Check wire connections in panel
 - Near junction box for any wrong connection
 - Dump valve connections in under gear for any wrong wire connection.
- Attend the same, conduct the test again and ensure proper working
- Similarly check and attend the WSP system of all coaches
- All should be in operating condition in the Rake

Some display codes

- 99 -Good condition
- 95 -Intermittent fault
- 89 -Test Run
- 8888 -Segment test
- 70/71-Relay failure
- 72 -Disturbance on one axle
- 73 -Disturbance on several axles
- Most of Intermittent faults can troubleshoot by pressing the CLEAR button



Some display codes

- 10 -Safety shut down of Dump valve(MV)
 - 11 -Short circuit/interruption in speed sensor(GE)
 - 13 -Short circuit in Dump valve(MV)
 - 14 -Interruption in Dump valve(MV)
- * In the display **1st number** will indicates Axle number.
- * **Counting of axles:** It should be always *from other end to the WSP system.*

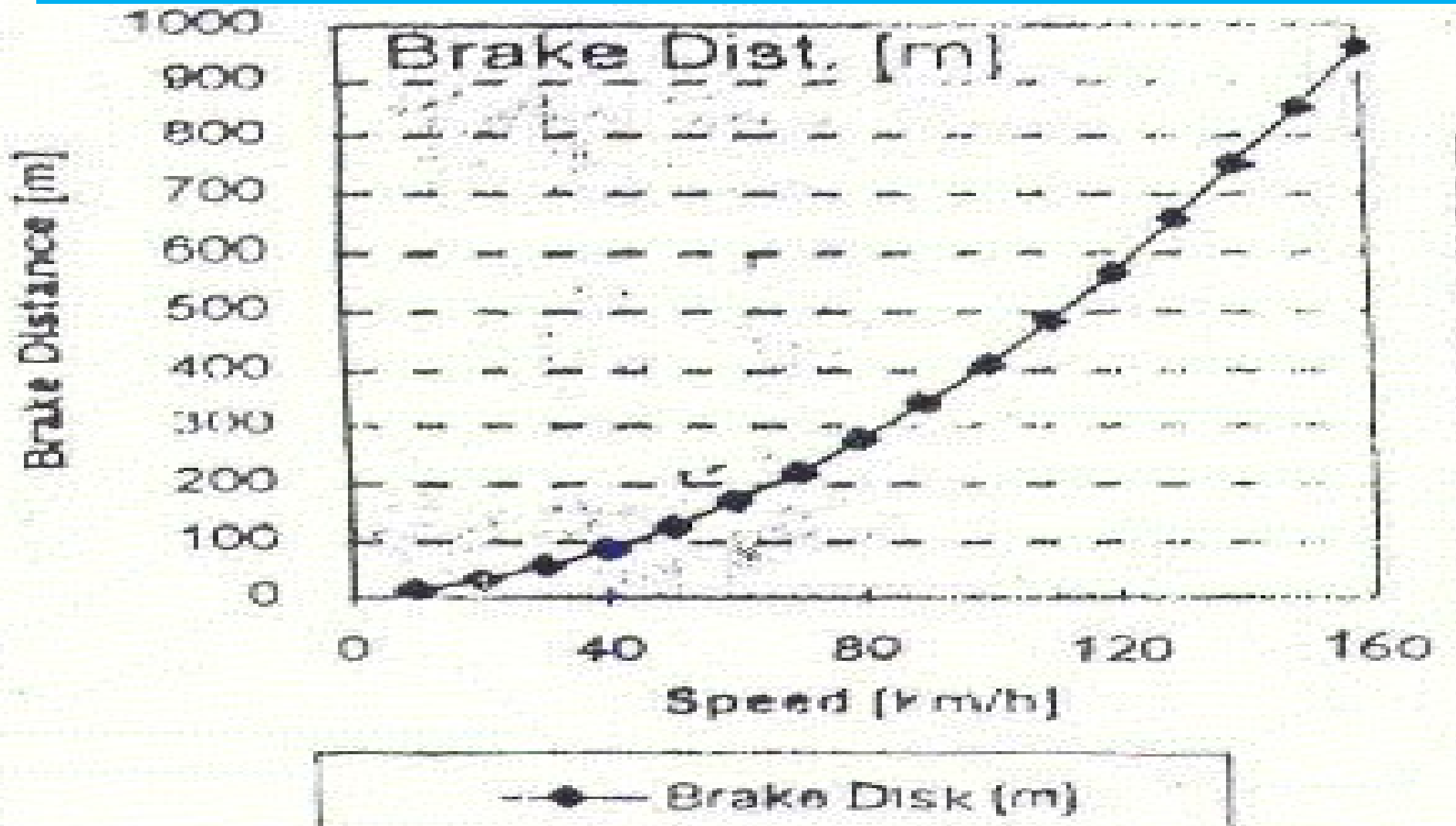
Steps to control Wheel Shelling

S.No	Guideline	Reference									
i.	Brake cylinder pressure of LHB coaches as specified value of $3.0 \pm 0.1 \text{ Kg/cm}^2$	RDSO L/ no-MC/LHB / Brake dated-20.04.18									
ii.	<table border="1"> <thead> <tr> <th>Brake System Make/Model</th> <th>Exhaust Choke Size</th> <th>Charging choke size</th> </tr> </thead> <tbody> <tr> <td>KBIL (Model MGS2)</td> <td>Remove existing 7 mm choke</td> <td>Replacement existing 5 mm choke with 9 mm choke</td> </tr> <tr> <td>FTRIL (Model SWKP AS20R)</td> <td>Remove existing 7 mm choke</td> <td>Replacement existing 6 mm choke with 9 mm choke</td> </tr> </tbody> </table>	Brake System Make/Model	Exhaust Choke Size	Charging choke size	KBIL (Model MGS2)	Remove existing 7 mm choke	Replacement existing 5 mm choke with 9 mm choke	FTRIL (Model SWKP AS20R)	Remove existing 7 mm choke	Replacement existing 6 mm choke with 9 mm choke	RDSO L/ no-MC/LHB / Brake dated-27.09.18
Brake System Make/Model	Exhaust Choke Size	Charging choke size									
KBIL (Model MGS2)	Remove existing 7 mm choke	Replacement existing 5 mm choke with 9 mm choke									
FTRIL (Model SWKP AS20R)	Remove existing 7 mm choke	Replacement existing 6 mm choke with 9 mm choke									
iii.	Self Lubrication Bushes for brake callipers/Actuators.	RDSO L/no-MC/LHB / Brake dated-08.03.18									
iv.	Ensure Integrity of electrical connections of WSP and free movement of brake clippers	RDSO L/ no-MC/ LHB/ Brake dated-15.04.19									
v.	Replacement of nylon washers in flexible hose connecting pipe line from coach body to bogie and branch pipeline to brake cylinder	RDSO L/no-MC/ LHB / Brake dated-12.04.19									
vi.	Excessive joints restricting air flow	RDSO L/no-MC/LHB/ Brake dated-12.04.19									
vii.	A checklist is included as Annexure B- for prevention and control of shelling in LHB coaches	CAMTECH L/no-CAMTECH/L/GWL/M/ LHB Dated 08.07.19									

Check List control Wheel Shelling

Sl.No	Description of item	Action taken
1	Condition of slack adjusting mechanism of brake calliper whether free or jammed	
2	Check the type of bushes in brake calliper (metallic /polyamide).	
3	Condition of brake levers /pins lubrication (whether free or jammed).	
4	Play of brake pads in brake pad holders.	
5	Clearance between brake disc and brake pad(1 to 1.5mm)	
6	Uneven wear of brake pads (Yes/No)	
7	Any previous history of skidding/shine/shelling).	
8	Functioning of PEABP box and check for any leakages.	
9	Condition of BP filters (leakage/blockage).	
10	Conditions of dampers (oil leakage/rubber bush worn out).	
11	Clearance between longitudinal bump stop and lateral bump stop.	
12	Fault code of the WSPD (Data download to be taken).	
13	Self –test of the dump valves.	
14	Check the choke sizes of Dump valves whether it is as per guideline	
15	Check the Air gap between phonic wheel and sensor cable probe.	
16	Bogie BC flexible hose washer condition (hole through/perished/shrinkage dia less).	
17	Brake cylinder hose id (through/blocked).	
18	BC pressure in coach also any fluctuation in BC pressure noticed w.r.t last schedule pressure reading.	
19	Check the bogie body BC flexible hose pipe is of Ermeto type or std design.	
20	Check the size of BC flexible hose pipe bogie to body whether fitted corrected size.(700 mm ICF hose should not be provided in LHB coaches as id is less).	
21	Whether correct size (id 14mm) of male stud connector fitted in bogie body BC flexible pipe connection.	
22	Check the BC flexible hose pipe for any Twist ,bent etc.	
23	Check the fitment of Bite joints in Body bogie flexible pipe line as per drawing .(Mode no. of bite joints are not allowed)	

Braking Distance with speed of complete train set



(Train set including: Loco-2 + Powercar-2 + C/Car-16)

BRUNNEN