

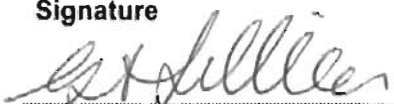

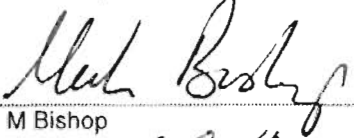
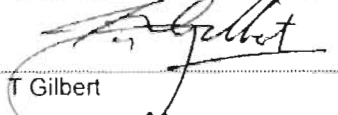


	COMPONENT OVERHAUL INSTRUCTION	CR/CI0510
	Porterbrook Leasing Company Ltd Burdett House Becket Street Derby DE1 1JP	

BT10 BOGIE

Issue: 1

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How To Use This Book

If in doubt as to the location or name of a component, look at the diagrams, and then find the items in Dismantling (3.1), Re-assembly (3.3) or codes in Cleaning, Examination and Repair (3.2).

A comprehensive index, listing item numbers for dismantling and reassembly, and the codes in Section 3.2, will be found in Section 7.

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2. INTRODUCTION

2.1 General

This Component Overhaul Instruction is for use as a subsidiary document called up in a Porterbrook or Angel Trains Ltd Vehicle Overhaul Instruction.

Any other use of this document is strictly prohibited, unless such use is licensed to the user by an Angel Trains Ltd, Porterbrook or First Rail Holdings Component License and the conditions of such license are adhered to strictly.

This instruction describes the overhaul of BT10 bogies fitted to HST trailer vehicles and Mark 3 locomotive hauled vehicles, and is to replace both PB/CI0510 Issue 6A and AT/CI0471 Issue 4A. Hence the use of black lines to indicate changes has not been possible. See the separate Revision Histories for details of the changes from each of the above documents.

2.2 Variations in BT10 Bogies

BT10 Bogies are subject to variations as follows:

2.2.1 The build of each bogie is defined firstly by the frame type:

- BT10A for a frame with a bolted-on fabricated lateral control rod spigot mounting.
 - BT10B for a frame with a welded-in cast lateral control rod spigot mounting.
 - BT10S for a heavy duty frame (small quantity only).
- (This document does not apply to BT10S bogies.)

A frame identification plate fitted to each bogie shows these letters. (See job UF 0201).

2.2.2 Secondly, the equipment fitted to each bogie may vary in the following areas:

- i) Wheel Slide Prevention (WSP) Equipment.
 - a) Early builds have Girling system, most of which have a rechargeable battery associated with each axle. This system can be tested on an assembled bogie. See Section 3.1 Figures 5 and 6 for main features. A small number of vehicles have Girling equipment which is powered from the coach battery. Hence testing can only be done on an assembled vehicle. See Section 8 for vehicle fitment.
 - b) Later builds have BR Mk2 WSP equipment, which has an electronics rack mounted on the vehicle body and only probe and toothed wheel assemblies, and blow down valves mounted on the bogies. Again testing can only be carried out on complete vehicles. See Section 8 for vehicle fitment.

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See 3.1 Figure 1, 2 and 3 for features of BR WSP.

- c) Many HST vehicles have been fitted with Westinghouse Brakes (UK) Ltd, now known as Knorr Bremse equipment. This equipment features two stage dump valves and active speed probes, which fit to the later type of BR WSP Distance Pieces (Alloy type). See Section 8 for vehicle fitment.

ii) Secondary Suspension.

Early builds are of the 'long swing link' variety. Originally these could be identified by having a spring plank safety device being formed of a steel loop. All the pictorial drawings in this instruction show this arrangement.

However the steel loops have been replaced by wire ropes but the arrangement differs from those on short swing link bogies (see below) by the spigots on the spring plank having oval retaining plates.

Later builds are of the 'short swing link' variety, which were built with wire ropes between bogie frames and spring planks, but there are no retaining plates on the spring plank spigots.

A list of assembly drawings defining long and short swing links will be found in Section 6.5.

A Bogie Variables Identification plate (see Job UF 0202), lists these and other variations found on these bogies.

- 2.2.3 For UGMS fitted bogies refer to Delta Rail Document LD47020-ST-004 Issue B May 2008.

2.3 Categories of Work

Work which is carried out will fall into one of three categories.

- 2.3.1 Scheduled Work is that work which is defined within the specification as being required.
- 2.3.2 Arising Work is that work defined within the Specification, as being required in order to complete the Scheduled Work. The item number of the parts correspond, e.g. the work to be done to rectify a fault in item 2 of Scheduled Work will be found in item 2 of Arising Work.
- 2.3.3 Additional Authorised Work is that which is required to be carried out to rectify damage resulting from fire, collision, derailment, vandalism, or other extraordinary cause, and is not defined within the Scheduled Work. Additional charges may be raised for this work, but must be authorised by the Engineer prior to commencement. See the Contract terms and conditions for further information.

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2.4 Definition of Terms

Within this document, any of the terms used from the following list shall be regarded as having the definition stated.

TERM	DEFINITION
CAUTION	Means that negligence may result in material damage.
CHANGE	Remove the original and fit a new or overhauled part or assembly in its place.
CHECK	Determine a particular nominated condition before, during or after repair, e.g. completeness, security, position.
CLEAN	Take off all dirt and deposits.
DISCARD	Set aside on dismantling or disconnecting for subsequent disposal (scrap) not to be reused.
DISMANTLE	Take to pieces.
THE ENGINEER	Reference within this and all related documents to the Engineer shall identify the Authorised Agent of the commercial organisation using this specification for contracting purposes.
EXAMINE	Determine general condition before repair, e.g. wear, cracks, splits, leaks, scoring, corrosion, distortion, looseness.
GAUGE	Determine a nominated dimension by using suitable measuring equipment, e.g. ruler, micrometer, callipers, feeler gauge, or Go/No-Go gauge.
INSPECT	Determine conformity to required standards during and after repair.
NOTE	Means that special attention is being drawn to some technical point because it might not be obvious even to skilled technicians. However, observance of other notes on transport, assembly, operation and maintenance, as well as the technical data (in the operating instructions and in the product documentation) is equally indispensable to avoid malfunctions, which could cause serious injury or material damage directly or indirectly.
OVERHAUL	Do what is necessary to make a component re-usable, i.e. dismantle, strip, clean, examine, fit new parts, repair, re-assemble, test and inspect as required (does not include rewinding or renewal).
REASSEMBLE	Put together.

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RECORD	Put down in writing the result of any specified examination, test or inspection.
RECTIFY	To set right (does not include rewinding or renewal).
REFIT	Put back and reconnect.
REMOVE	Disconnect and take off.
RENEW	Remove and scrap the original part and provide a new part in its place.
REPAIR	Restore an original part to the required condition, e.g. by hand tooling, machining, building up, welding, patching, bending and setting, heat treating, re-securing, etc. (does not include rewinding or renewal).
REPORT	Convey to the Supervisor the condition of the item examined.
SCRAP	Dispose of.
SUPPLIER	Reference within this and any related documents to the Supplier shall identify an organisation which is contracted to one of the Rolling Stock Companies and their authorised agents for the purpose of undertaking a specified task.
TEST	Prove correct operation by specified trial.
WARNING	Means that negligence may result in injury to personnel or death.

NOTE: Where in the job description the phrase "Repair or Renew" is referred to, it means that the cheaper of the alternatives must be adopted.

2.5 Supplier's Responsibilities

Safety

When working to this specification, it is the responsibility of the Supplier to ensure that all relevant local and mandatory safety instructions are strictly followed. This shall include, where applicable, adherence to Industry Standards, Railway Group Standards and legislation.

Condition on Release

The condition of the vehicle and all components and systems on completion of overhaul and repairs shall be such that the safety of public and staff alike is not endangered and that any risk has been fully assessed and minimised to become as low as reasonably practicable. If any doubt exists remedial action shall be taken by the Supplier.

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Railway Group Standards

All applicable Railway Group Standards shall be adhered to, irrespective of whether they are specifically referenced in this document. The Supplier shall advise the Engineer if any requirement of a Railway Group Standard conflicts with any requirement of this document or any subsidiary document

Materials and Components

It is the responsibility of the Supplier to ensure that all repaired components and systems conform to the standards authorised and agreed for the specific contractual use. If the Supplier becomes aware that the contractual issue of a document is not the latest issue, he shall advise the Engineer who will determine whether the revised issue is to be implemented for the contract.

The Supplier shall not carry out any design changes or change any processes or materials detailed in this prescriptive specification without the approval of the Engineer. Requests for changes will be managed in accordance with the principles of ACOP/EC/01006.

Where a component is required to be cleaned, unless otherwise stated, it is the responsibility of the supplier to identify the most suitable method, which will ensure that the component is not in any way damaged.

Whenever it is necessary to remove or isolate a faulty or redundant cable the work must be carried out in accordance with Technical Procedure CR/TP1084.

Welding

All welding shall be to recognised National/International standards. The Supplier shall state the standards and specifications to be used and shall provide documentary evidence to cover the welding procedures, systems and processes. This shall also include preparation of the vehicle prior to welding.

Protection of Components

When disconnected and out of service, all electrical, hydraulic and pneumatic connections shall be sealed to prevent ingress of foreign matter.

Pipes shall be protected from ingress of dirt during cutting, bending, welding or installing. Threaded fittings shall be checked for burrs or metal slivers, which shall be removed if found, before fitting into pipe bores.

Rubber components shall be protected from contamination with cleaning agents when cleaning is undertaken. They shall not be contaminated with lubricants or rust inhibitors.

Joint faces shall be clean and free from damage or burrs before assembly.

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No PTFE thread sealing tape may be used within the components or in any test stand pipework that is not protected by adequate filtration. Alternative sealing material for pipework is Loctite 572 or Loctite 542. It is preferred that no PTFE thread sealing tape is used in air supply pipework to test rigs.

Condition of Components on Arrival at Supplier's Works

The component drawings and specifications provided to the Supplier are believed by the Engineer to represent the current state of the components, subject to normal wear and tear in service.

Should any component be found not to drawing, or to have any non-standard or additional components fitted, the Supplier shall immediately advise the Engineer, who will determine whether the component is to be returned to standard.

Non-destructive Testing

The NDT Management system, the preparation of procedures, the certification of NDT operatives and facilities shall comply with Group Standards GM/RT2005. All non-destructive testing procedures to be used shall be declared by the Supplier. The intention to employ Sub-contractors for the preparation of NDT procedures and carrying out NDT shall be declared by the Supplier. The above standard shall also apply to sub-contractors.

Competencies

In order to carry out this maintenance plan in a manner that will achieve the required safety and quality, the following minimum level of competence required is:

- 1 For all activities the person leading the task must be able to follow and carry out the instructions detailed in the plan.
- 2 All work of a safety critical nature must be carried out by persons assessed as competent in accordance with:
 - ORR Railway Safety Publication 1 "Developing and Maintaining Staff Competence" March 2007;
or procedure(s) which provide compliance with this.
- 3 All work relating to the maintenance and overhaul of axle bearings shall be carried out by persons assessed as competent in accordance with GM/RT2030.
- 4 The Non Destructive Testing of safety critical components (including axle testing) shall be done in accordance with GM/RT2005.

2.6 Facilities

In order to comply with the requirements of GM/RT2004, all work described in Section 7 shall be carried out using facilities (including those of sub contractors) which has a minimum have the following:

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- Clean, dry, covered accommodation for dealing with wheelsets, bearings etc.
- Adequate illumination for inspection of components.
- Cleaning facilities which will not cause damage to the components.
- Handling facilities for removal and refitting of components.
- Protection from the elements for vulnerable areas of the bogies and their components.
- Shot blasting or similar facilities for removing all paint and corrosion from metal components.

Any specific requirements over and above those listed will be identified in the applicable job descriptions or sections.

2.7 Bogie Weights

Complete BT10 bogies with new wheels weigh 5.76 tonnes. When fitted with wheels at minimum ex-works diameter the weight is 5.36 tonnes.

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3. OVERHAUL PROCEDURES

This Section is divided into 3 sections, each of which has its own page numbers.

Pages in Section 3.1 (Dismantling) and Section 3.3 (Re-assembly) are numbered sequentially.

Pages in Section 3.2 (Attention and Repair) are numbered within the job description, which have an alpha-numeric code. The job descriptions should be kept in alpha-numeric order. This is done to facilitate updating.

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	List of Job Descriptions and Codes	1 - 2
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How to Use this Book

If in doubt as to the location or name of a component, look at the diagrams, and then find the items in Dismantling (3.1), Re-assembly (3.3) or codes in Attention and Repair (3.2).

A comprehensive index, listing item numbers for dismantling and reassembly, and the codes in Section 3.2, are provided in Section 7.

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3.1 Dismantling

NOTE 1: The sequence detailed below may be adjusted as experience and expediency dictates. See page 11 for Bogie Diagram.

1. It is recommended that the bogie is given an air test on receipt and the location of any leaks found, are marked for attention.
2. Clean bogie after sealing all electrical and pneumatic connections.
3. Remove the following items:
 - 3.1 BR WSP System (where fitted) see Figures 1, 2 and 3.
 - 3.1.1 Remove the four M8 screws (3). Remove and discard the gasket (4) and spring washers. Slide back the probe cap (1).
 - 3.1.2 Remove the six M10 screws (5). Remove and discard the spring washers. Remove the cover plate (6). Remove and discard the gasket material (7) from both faces.
 - 3.1.3 Remove the three M16 screws (8). Remove and discard the locking plate (9). Remove the toothed wheel (12) using M10 brass bolts in the jacking holes.
 - 3.1.4 Original design (see Figure 1): slacken the two locknuts (20 and 21) and the socket headed grub screw (22). Remove the probe assembly (23) and unscrew the mounting bush (24).
 - 3.1.5 Revised design (see Figure 3). Remove the probe bottom locknut (14) and adjustment nut (15). Remove the probe (2) and temporarily refit the locknut and adjustment nuts.
 - 3.1.6 Remove the five M10 screws. Remove and discard the spring washers (10). Remove distance piece (11) by fitting jacking screws to the tapped holes. Remove and discard the gasket material (13) from both faces. Retain any small M10 flat washers for re-use.

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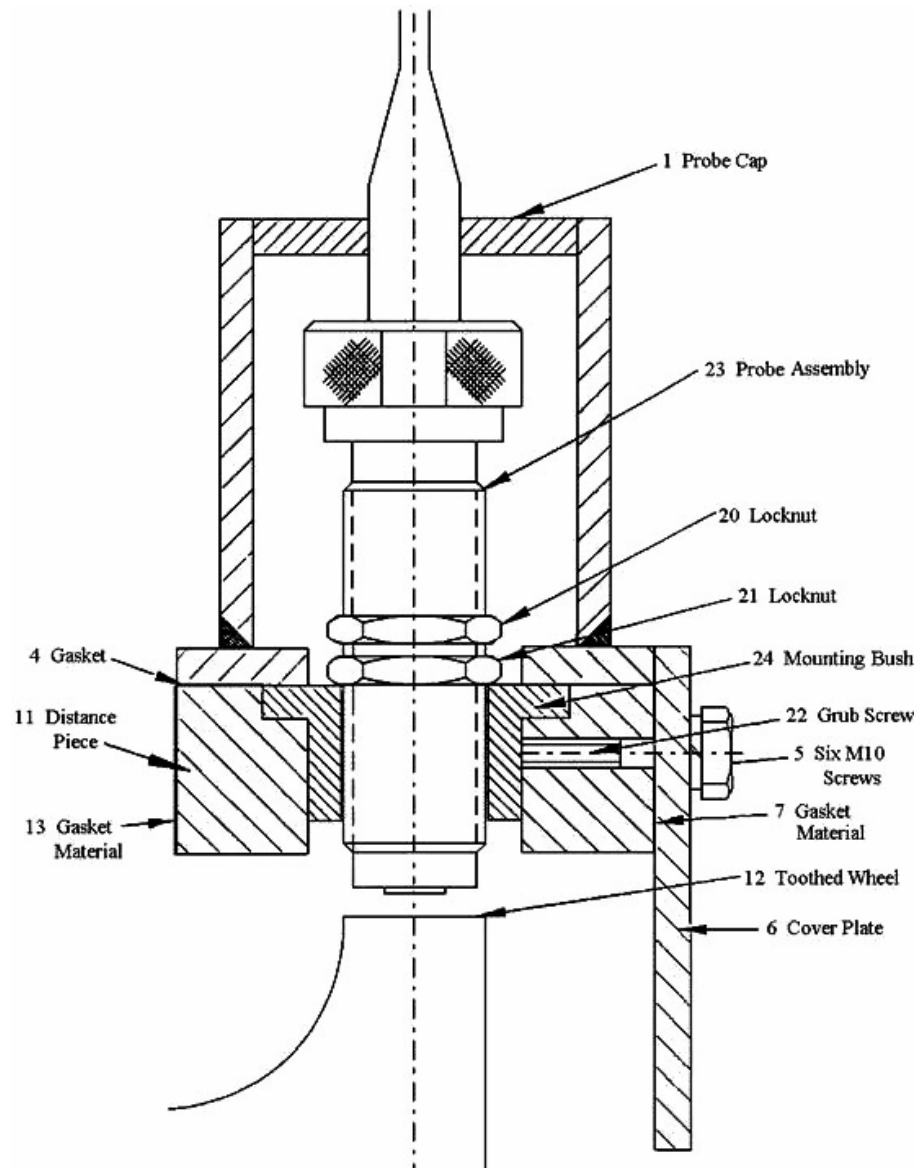


Figure 1: BR WSP Side View (Original Design)

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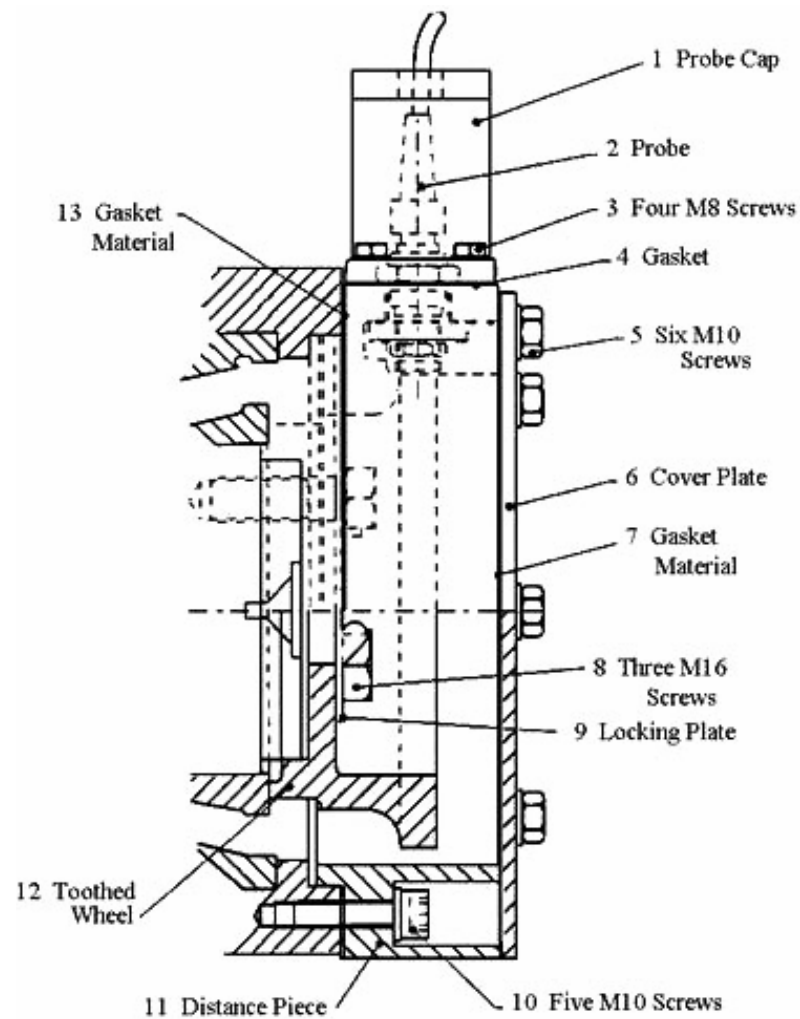


Figure 2: BR WSP Side View - Revised Design

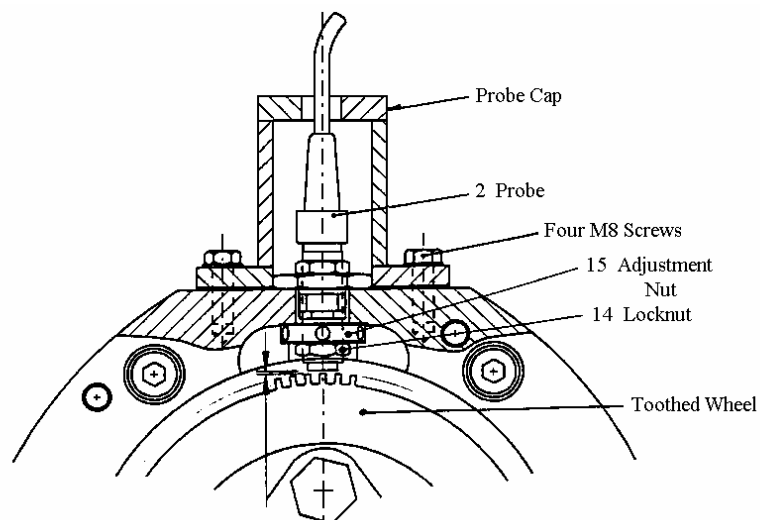


Figure 3: BR WSP Probe Details - Revised Design

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3.2 Westinghouse Equipment see Figure 4.

NOTE 2: Two methods of securing the speed probe exist. See Figure 4 and Steps 3.2.1 and 3.2.2.

EITHER

3.2.1 Remove the four M8 screws (1) and washers (2 and 3) securing the speed sensor probe (4) to the distance piece (6). Discard the spring washers (2) and 'O' ring seal (5).

OR

3.2.2 Remove the four M8 nuts (13) and washers (2) securing the speed sensor probe (4) to the distance piece (6). Discard the nuts (13) and 'O' ring seal (5).

3.2.3 Carefully withdraw the speed sensor probe (4) from the distance piece.

3.2.4 Where fitted, remove and discard the locking wire (10).

3.2.5 Remove the six M10 screws (11) and discard spring washers (12) and remove the cover plate (9) from the distance piece (6). Remove the gasket material from both faces.

3.2.6 Remove the three M16 screws (item 8 on Figure 2). Remove and discard the locking plate. Remove the toothed wheel (7) using M10 brass bolts in the jacking holes.

3.2.7 Remove the five M10 screws (item 10 on Figure 2). Remove and discard the spring washers. Remove distance piece by fitting jacking screws to the tapped holes. Remove and discard the gasket material from both faces. Retain any small M10 flat washers for re-use.

NOTE 3: The Westinghouse WSP uses the same distance piece, cover plate and toothed wheel as the revised BR design.

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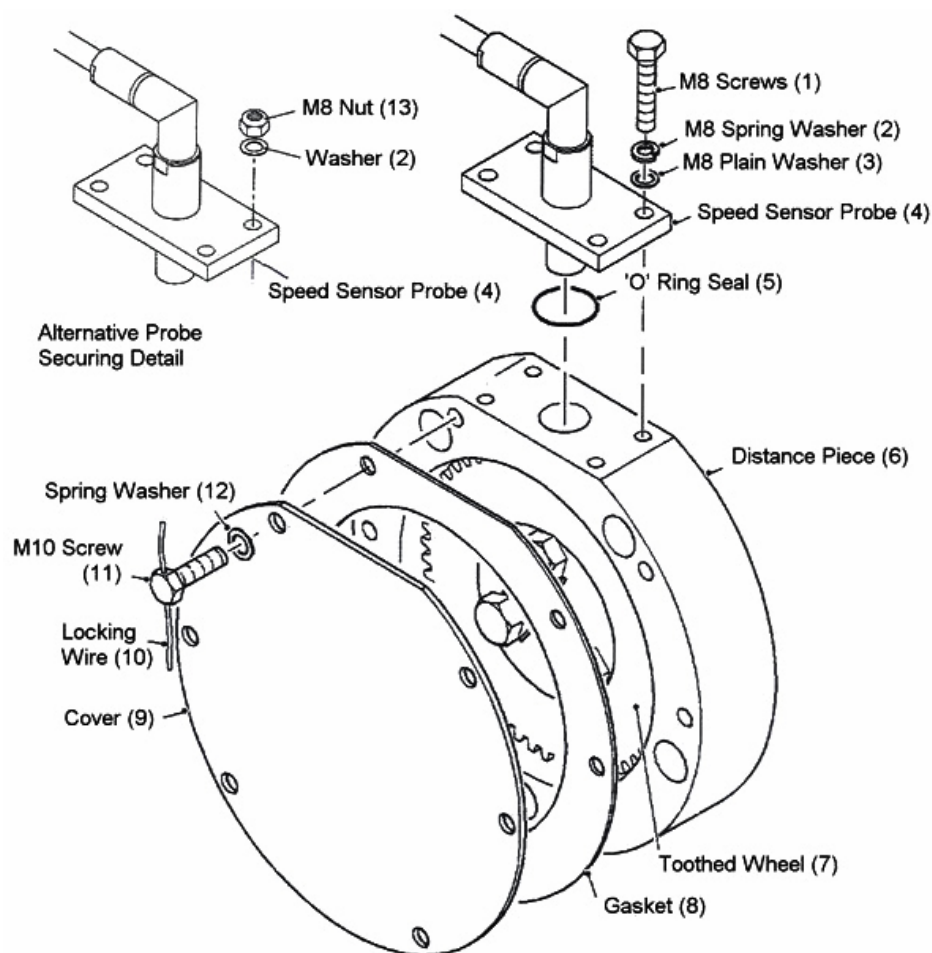


Figure 4: Westinghouse Speed Sensor - Assembly

3.3 Lucas Girling Equipment see Figures 5 and 6

3.3.1 Remove the two M10 screws and tab washers (2). Unplug the lead. Remove and discard the gasket (16).

3.3.2 Remove and discard the locking wire. Remove the three bolts and washers (11) and cover (13). Discard gasket material (15) from both faces.

3.3.3 Self Powered Units Only

- Remove the 2BA self locking nut (17) and terminal cover.
- Disconnect the two alternator leads (18) from the terminals.
- Disconnect, remove and discard the battery (12).
- Temporarily refit the terminal nuts, terminal cover and self locking nut.

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3.3.4 Coach Powered Units Only

Disconnect the two alternator leads (18) from the terminals. Temporarily refit the terminal nuts.

3.3.5 All Girling Units

Remove the four M5 terminal nuts and disconnect all cables from the terminal blocks.

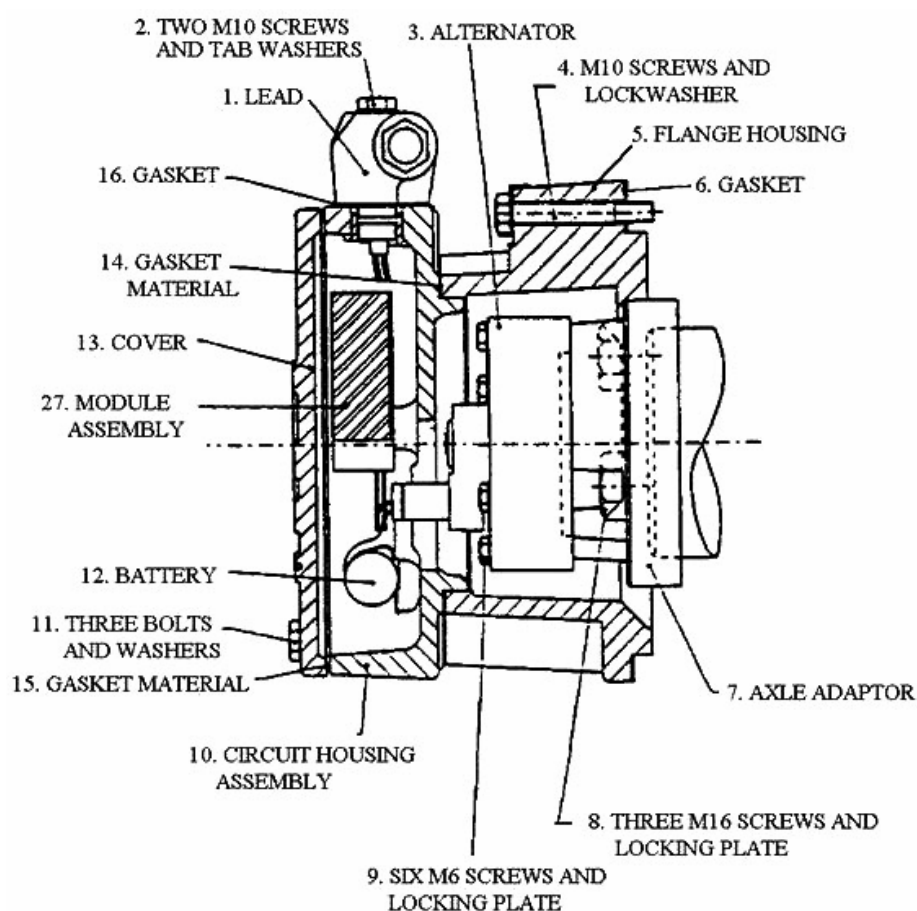


Figure 5: Girling WSP Sectioned View

3.3.6 Remove the connector socket nut (21) using a double ended spanner while holding the socket body (22) with a body shell holder. Remove the socket body and nylon washer (23) from the housing.

3.3.7 Release locking tabs (24) and remove the M6 bolt (25), two M6 nuts and locking tab strip (24) securing the module assembly (27). Remove the module assembly (27).

3.3.8 Remove the M10 socket screw and sealing washer (19).

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3.3.9 Remove the M10 screw and lockwasher (20), circuit housing assembly (10) and gasket material (14).

3.3.10 Remove the six M6 screws and locking plates (9) and alternator (3).

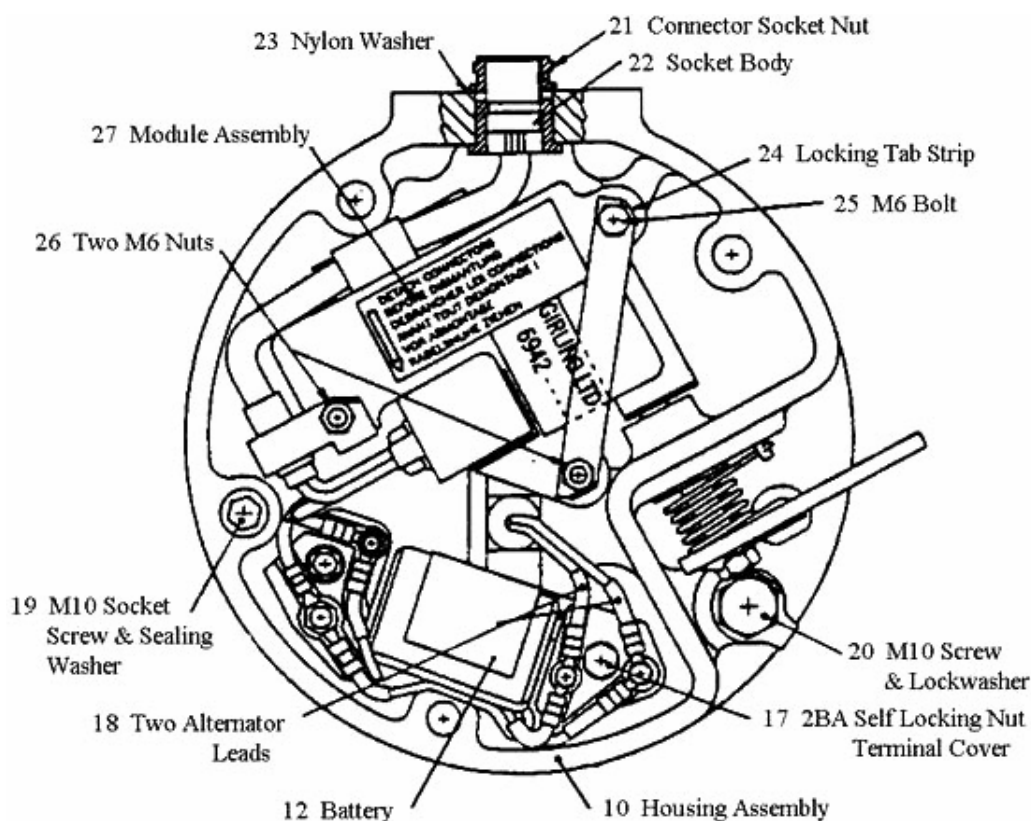


Figure 6: Girling WSP (Cover Removed)

3.3.11 Remove the three M16 screws and locking plate (8) and axle adaptor (7).

3.3.12 Remove five M10 screws and lockwashers (4) and flange housing (5).

4. Remove Westinghouse WSP dump valves as follows:

- 4.1 Disconnect wiring harness (3) from electrical connector (2).
- 4.2 Remove four M6 screws (4) securing dump valve adaptor plate (11) to the manifold block (6).
- 4.3 Remove and discard disc spring washers (5).
- 4.4 Collect and discard two O-rings (7) and one O-ring (8).
- 4.5 Remove manifold block and seal pipe ends.

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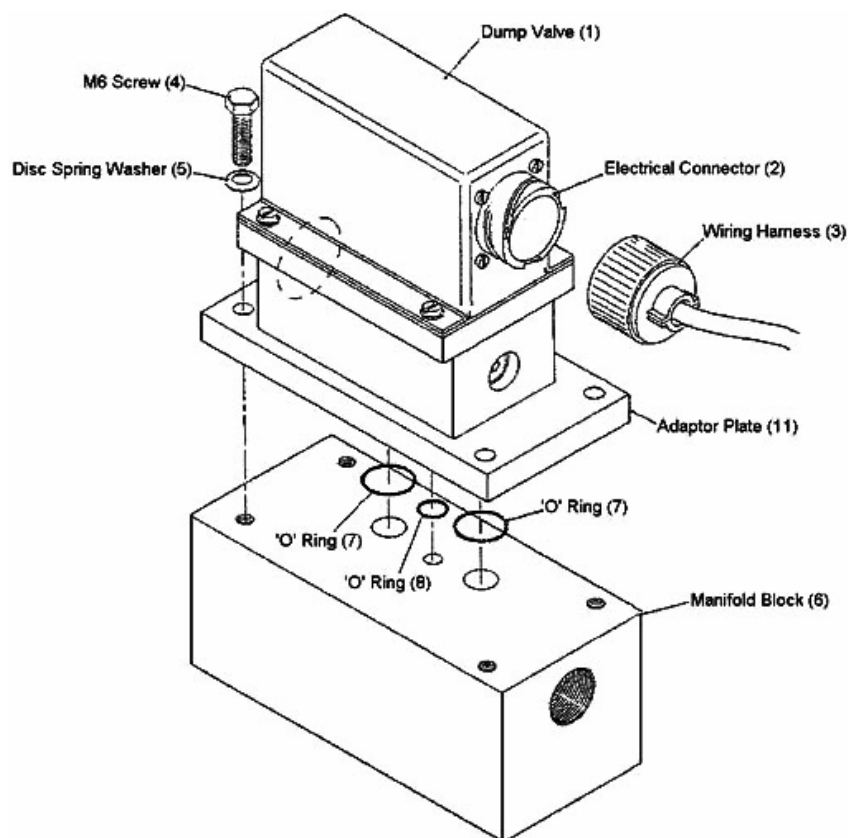


Figure 7: Westinghouse Dump Valve

5. Remove the following:

- 5.1 WSP Blow Down Valves (Girling and BR).
- 5.2 Lateral Control Rod Safety Ropes and Brackets.
- 5.3 Brake Pads, and keep in matched pairs.
- 5.4 Lateral Damper.
- 5.5 Traction Rods, by removing the slotted nut or prevailing torque nut (not the locknuts) and drawing the spindle away from the bolster.

NOTE 4: Where fitted, the traction rod retaining brackets must be removed from the bogie before removing the traction rods. Refer to drawing WSA-C1-8375182 if necessary.

- 5.6 Spring Plank Safety Loops or Wire Ropes. On short swing link bogies keep the nylon bushes with each rope.
- 5.7 Non-WSP axlebox covers and axle end caps.

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5.8 Axlebox Earth Leads.

6. Apply load to bolster to compress primary suspension, remove the primary vertical dampers and lateral control rods. Release load on the bolster. Protect the spigot body on the axlebox to axlebox Lateral Control Rod (LCR) with grease and fit an old M24 nut to prevent thread damage.
7. Remove the wheelsets, complete with axleboxes, primary springs and shims. Note that there are extractor holes in pivot bush spigots.
8. Remove axleboxes from wheelsets as follows:
 - 8.1 Remove six set screws from rear face of axlebox and detach the split retaining ring.
 - 8.2 Pull axlebox forward to slide it off the cartridge bearing unit using a crane or other suitable overhead lifting equipment to support the weight of the axlebox. Do not allow the axlebox to fall to the floor.
 - 8.3 Fit protective covers to the bearings.
9. Remove Brake actuators, hoses, callipers and suspension links.
10. Put solid supports or jacks beneath ends of spring plank and take weight on these, causing swing links to lift. Tap swing links downwards using a lead hammer, to release collets.
11. Remove the bolster/spring plank assembly and dismantle as follows:

Remove the following:

 - 11.1 Anti-roll bar links and anti-roll bar.
 - 11.2 Air Filter.
 - 11.3 Levelling Valves, Links and two in line filters on each valve.
 - 11.4 Compensating Valve with two in line filters.
 - 11.5 Bolster Control Rod.
 - 11.6 Air Springs, hoses and pipework.
 - 11.7 Reservoirs.
12. Record the type of WSP junction boxes (double or single skinned) and remove the boxes.
13. Remove all remaining components such as WSP conduits and pipework.

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14. Remove the swing links and rocking washers from the bogie frame.
15. Clean all components after protecting bearings and sealing all exposed air and electrical connections.

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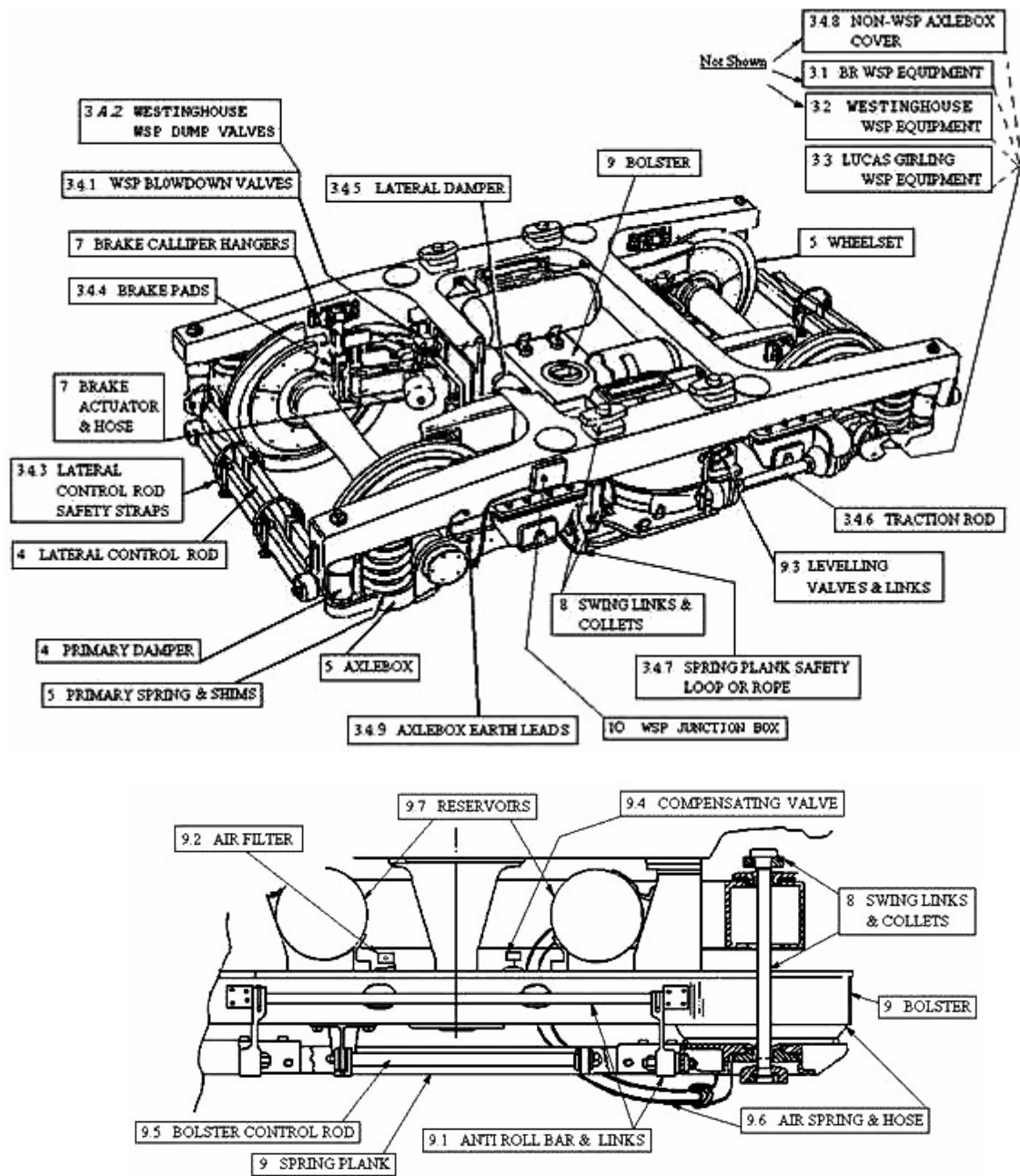


Diagram of BT10, Showing Item Numbers in Dismantling Sequence

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3.2 Cleaning, Examination and Repair

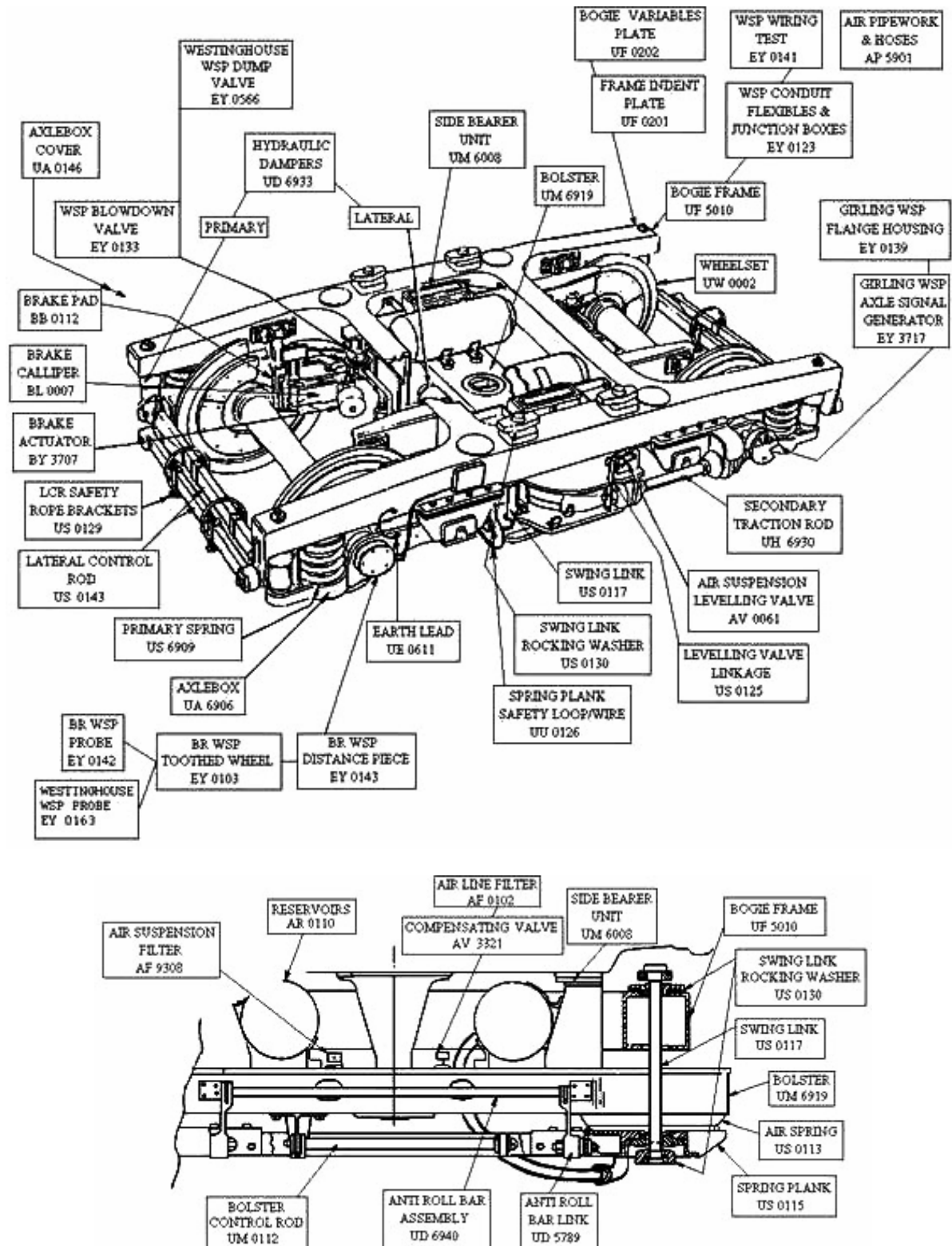
Contents	Job No.	No. of Pages
Air Line Filter - Overhaul	AF 0102	1
Air Suspension Filter - Overhaul	AF 9308	1
Air Pipework and Hoses - Examine	AP 5901	2
Reservoirs - Examine	AR 0110	1
Air Suspension Levelling Valve - Overhaul	AV 0061	5
Compensating Valve - Overhaul	AV 3321	2
Brake Pad Thickness - Check	BB 0112	2
Brake Calliper Assembly - Overhaul	BL 0007	2
Calliper Lever - Overhaul	BL 0113	4
Yoke - Examine	BL 0114	1
Suspension Link - Examine	BL 0115	1
Pad Holders - Examine	BL 0116	2
Pins, Bolts and Spacer Tube - Examine	BL 0117	1
Brake Actuator - Change	BY 3707	1
BR WSP Toothed Wheel - Examine	EY 0103	1
WSP Conduit, Flexibles and Junction Boxes - Examine	EY 0123	4
WSP Blowdown Valve - Change	EY 0133	1
WSP Flange Housing - Examine (Girling equipment only)	EY 0139	1
WSP Wiring - Test	EY 0141	3
BR WSP Probe - Examine	EY 0142	3
BR WSP Distance Piece - Examine	EY 0143	3
Westinghouse WSP Probe - Examine	EY 0163	2
Westinghouse WSP Dump Valves - Overhaul	EY 0566	8
WSP Axle Signal Generator - Change	EY 3717	1
Axlebox Covers - Examine	UA 0146	2
Axlebox - Overhaul	UA 6906	7
Anti-Roll Bar Link - Overhaul	UD 5789	2
Hydraulic Dampers - Change	UD 6933	1
Anti-Roll Bar Assembly - Overhaul	UD 6940	5
Earth Leads – Examine	UE 0611	1
Frame Identification Plate - Examine	UF 0201	1
Bogie Variables Identification Plate - Fit	UF 0202	1
Axle Box Pivot Brackets – Align (See Note below)	UFA0218	8
Bogie Frame - Examine	UF 5010	18
Bogie Frame Weld Repair	UFA5562	2
Secondary Traction Rod - Overhaul	UH 6930	2
Bolster Control Rod - Examine	UM 0112	2
Side Bearer Units - Examine	UM 6008	3
Bolster - Examine	UM 6919	7
Air Spring - Examine	US 0113	2
Spring Plank - Examine	US 0115	4
Swing Link - Examine	US 0117	1
Levelling Valve Linkages - Examine	US 0125	3
Lateral Control Rod Safety Rope Brackets - Examine	US 0129	2
Swing Link Rocking Washers - Examine	US 0130	1

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Contents	Job No.	No. of Pages
Lateral Control Rod - Overhaul	US 0143	1
Rocking Washer - Repair (Arising Work, see job US 0130)	USA1003	3
Primary Spring - Change	US 6909	4
Spring Plank Safety Wire Ropes - Examine	UU 0126	1
Wheelset - Change	UW 0002	1

NOTE: Whether job UFA0218 is required is determined by job UF 5010 Part A.

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Bogie Diagram Showing Location of Components and Job Numbers

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Air-Line Filter - Overhaul

AF 0102

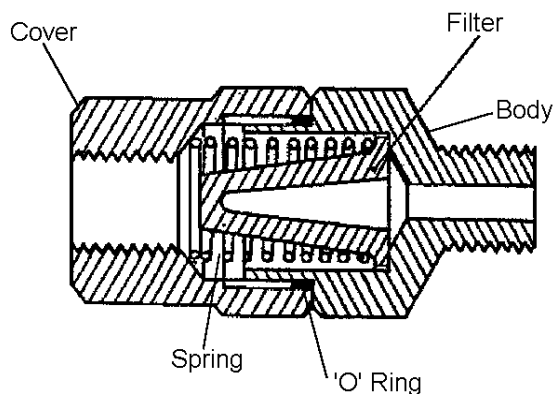


Figure 1: Arrangement of Air Line Filter

NOTE 1: There are 6 of these filters per bogie.

Scheduled Work

1. Unscrew the body from the cover. See Figure 1.
2. Discard the 'O' ring.
3. Examine and clean the filter element.
4. Examine the spring for corrosion. Check that the free height is at least 38mm.
5. Clean and examine the cover and body. Check that the threads and sealing faces are undamaged.
6. Reassemble the filter with a new 'O' ring (Cat No. 070/022528).

Arising Work

3. Renew the filter element (Cat No. 070/006992) if damaged or heavily fouled.
4. Renew the spring (Cat No. 070/006391).
5. Renew the cover (Cat No. 070/022526).
5. Renew the body (Cat No. 070/022525).

NOTE 2: The filter complete (Cat No. 018/043379), or Westinghouse Part No. J79068/001.

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Air Suspension Filter - Overhaul

AF 9308

Scheduled Work

1. Remove 3 screws securing cover. (Hold cover down, against force of spring).
2. Remove cover and discard gasket.
3. Remove and discard filter element.
4. Examine and clean filter bowl and cover.
5. Examine the spring.
6. Re-assemble with new element and gasket.

Arising Work

4. Renew cover or filter bowl if damaged.
5. Renew the spring.

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Air Pipework and Hoses - Examine

AP 5901

Scheduled Work

1. If bogie frame is to be Blast cleaned (see Job UF 5010) proceed as follows:
 - 1.1 Remove all pipework.
 - 1.2 Examine pipes for corrosion and signs of rubbing or chafing.
 - 1.3 Check there are no sharp edges on the pipe clips.
 - 1.4 When bogie frame has been repaired and painted, refit the pipework.
 - 1.5 Ensure that all pipe clips, cleats and bushes are in place and tight and the pipework is securely positioned. Pipes must not rub on each other or foul other items.
2. If bogie frame is not to be blast cleaned, proceed as follows:
 - 2.1 Remove pipe clips one at a time and examine pipes for corrosion and signs of rubbing or chafing.
 - 2.2 Check that there are no sharp edges on the pipe clips.
 - 2.3 Ensure that all pipe clips, cleats and bushes are in place and tight and the pipework is securely positioned. Pipes must not rub on each other or foul other items.
3. Renew all hoses (Cat Nos. are as follows: actuator hoses 063/008197, air suspension hose 063/008384 and associated special nut 008/145374).

Arising Work

- 1.2, Renew defective or corroded pipework and fittings which cannot be repaired, observe the
- 2.1 following precautions:
 - a) All replacement pipework must be inspected to ensure that burrs, both internal and external are removed before assembly.
 - b) Each section must be blown through using an air supply before fitting of the equipment to ensure that it is clean and free from swarf and other debris. Precautions must be taken to ensure that it subsequently remains clean.
 - c) The following drawings are relevant:

Self powered Girling WSP	B1-S-9018032
BR WSP	B2-S-9014627
Coach powered Girling WSP	B1-S-9014628
Bogies with hydraulic parking brake (BFO)	C3-A0-8500415
	C3-A0-8500386, 7 and 8

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Air Pipework and Hoses - Examine

AP 5901

1.3, Remove any sharp edges from pipe clips.
2.2

1.5, Secure loose saddles and clips. Renew defective components.
2.3

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Reservoirs – Examine

AR 0110

Scheduled Work

1. Check date of last overhaul stamped on label.
2. Clean reservoirs in accordance with procedure agreed with the Engineer.
3. Examine reservoirs for corrosion. Pay particular attention to area around and beneath label.
4. Repaint in accordance with CR/PE0102.

Arising Work

1. If label missing, or if date of last overhaul more than 10 years old, overhaul in accordance with WOSS 310/8.
3. If corrosion is light and can be removed, prepare and paint in accordance with CR/PE0102.
3. If corrosion is heavy or has resulted in pitting, overhaul in accordance with WOSS 310/8.

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Air Suspension Levelling Valve - Overhaul

AV 0061

NOTE: Only the following levelling valves are to be used on BT10 bogies:

Description	Catalogue Numbers	
	Left Hand	Right Hand
Cast type: 1.5mm dia hole under rubber flap	070/020625	070/020626
Block type, with Cutout: 1.5mm dia hole under Rubber Flap	070/020625	070/020626



Vent hole under rubber flap 4mm diameter, reducing to 1.5mm

Figure 1: Cast Type Levelling Valve



Figure 2: Block Type Levelling Valve with Cut Out

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Air Suspension Levelling Valve - Overhaul

AV 0061

Scheduled Work

1. Dismantle valve as follows: See Figure 3 on Page 3.
 - 1.1 Make a note of which side of the valve the actuating lever is fitted.
 - 1.2 Unlock the tabwasher (24), undo the nut (25) and remove the actuating lever (5) from the valve. Examine in accordance with Job No. US 0125.
 - 1.3 Unscrew the lever stop screws (26).
 - 1.4 Unscrew the screw (21) and remove the collar (22) and the dirt excluder disc (20).
 - 1.5 Remove the circlip (1) from the outlet port and tap out the strainer disc (2).
 - 1.6 Unscrew the inlet cap nut (4), remove the seal (3), and take out the check valve (7), spring (8), inlet valve (9) and exhaust valve (10).
 - 1.7 Remove the circlip (6) and strainer disc (2) from the inlet cap nut.
 - 1.8 Unscrew the screw (28) and remove retaining plate (27) to expose the end of the drive pin (23) which has an M5 tapped hole. Withdraw the pin using an M5 screw as an extractor.
 - 1.9 Remove the circlip (17) retaining the end bush (18). Push on the exhaust hole end of the piston (13) with a suitable wooden rod and gently push the piston with slipper bearing (19), out through the trunnion (15), carrying out with it the end bush (18).
 - 1.10 Remove the 'O' rings (12), (14) and (16) from the piston and end bush, and the slipper bearing (19) from the piston.
 - 1.11 Withdraw the trunnion (15) from the valve body (11a), and remove the bearings (29).

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Air Suspension Levelling Valve - Overhaul

AV 0061

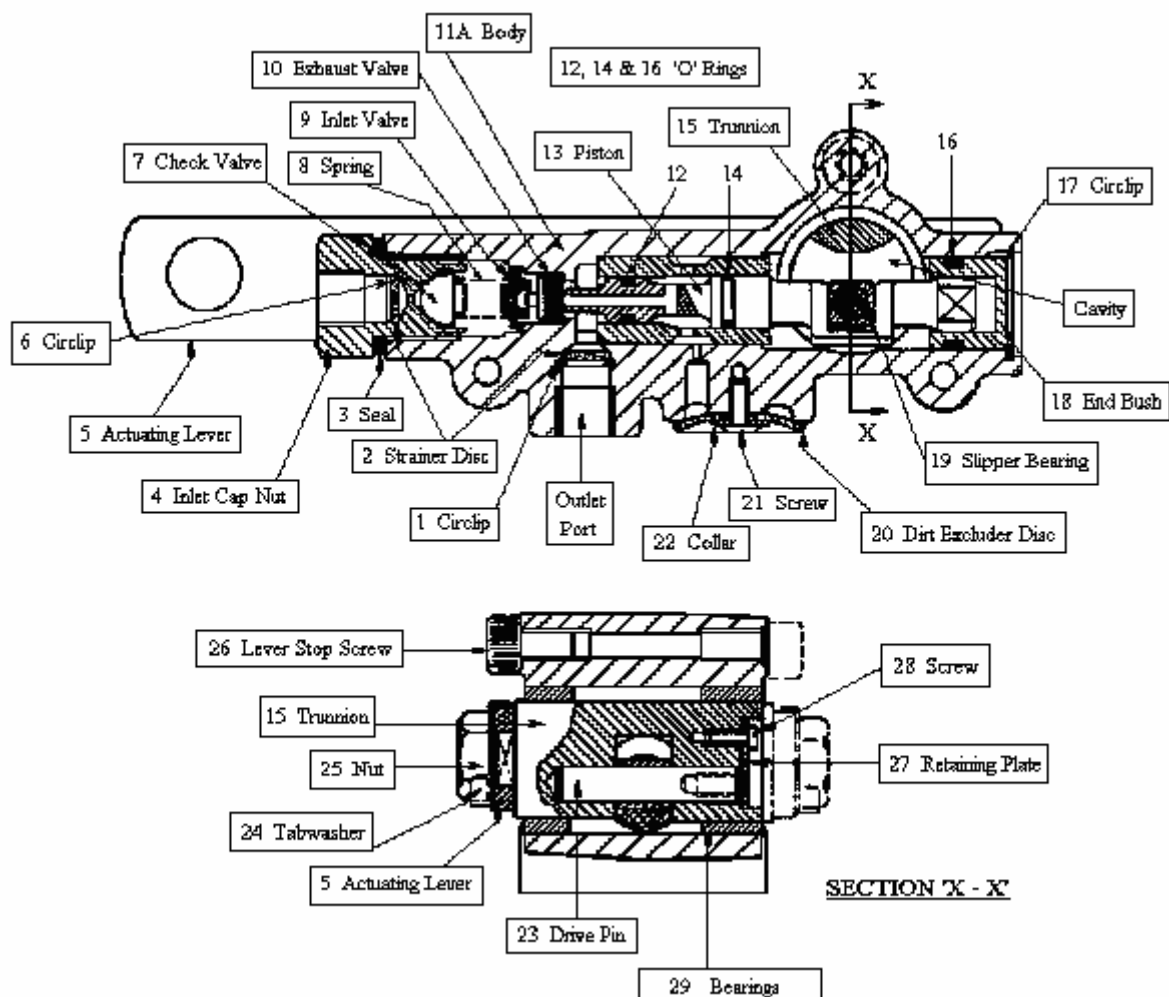


Figure 3: General Arrangement

2. Cleaning and Examination.

2.1 Wash all metal parts in a suitable solvent and dry. Soft stranded wire may be used to remove dirt from small passages, but stiff wire must not be used.

2.2 Discard the following components:

all 'O' rings and circlips, bonded seal (3), check valve (7), inlet valve (9), exhaust valve (10), dirt excluder disc (20), tab washer (24) and bearings (29).

2.3 Examine each metal part for signs of wear and damage. In particular:

2.3.1 Examine the faces for the valves (9 and 10) in body (11a) for wear and scoring.

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Air Suspension Levelling Valve - Overhaul

AV 0061

- 2.3.2 Examine the pressed in bush in the body (11a) for wear and scoring.
- 2.3.3 Examine the piston (13) and check that it is a good sliding fit in the body bush. Check that the exhaust hole is clear, and that the 'O' ring grooves and adjacent lands are not damaged.
- 2.3.4 Check that the slipper bearing (19) is a good fit in the piston (13) and on the drive pin (23).
- 2.3.5 Examine the spring (8) for corrosion and damage. Check the free length is at least 12mm.

Arising Work from Part 2

2.3 Renew any defective part not listed in 2.3.1-2.3.5.

2.3.1 Renew the body (11a) if the valve seats or pressed in bush are scored or worn.

2.3.2

2.3.3 Clear the exhaust hole in the piston if blocked. If the piston end which seats against the exhaust valve is slightly pitted, this may be removed by lapping with metal polish using a suitable dolly. The seat must remain square to the discs of the piston. Otherwise renew the piston.

2.3.4 Renew the slipper bearing (19) if wear is detected.

2.3.5 Renew the spring (8) if corroded or less than 12mm long.

Scheduled Work

3. Assembly.

3.1 Grease the bearings (29) with Ironside 'A' Blend grease (Cat No. 027/004332 or equivalent).

3.2 Press new bearings (29) (Cat No. 070/023527) into the body until they are flush with the face of the body.

3.3 Fit the trunnion (15) with the square for the actuating lever (5) on the correct side of the valve, noted during dismantling.

3.4 Lightly grease the 'O' rings (12), (14) and (16) and their grooves, and the boxes in which they seal or work with grease. Do not apply grease to the valves (7), (9) and (10) on the surfaces on which they seat. Assembly (10), (12) and (14) to piston.

3.5 Insert the piston (13) with the slipper bearing (19).

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Air Suspension Levelling Valve - Overhaul

AV 0061

- 3.6 Insert the drive pin (23) into the trunnion and bearing, making sure that the tapped hole is outermost.
- 3.7 Fill the trunnion cavity, two thirds full with grease.
- 3.8 Fit end cap (18) and retain with new circlip (17).
- 3.9 Fit the remaining parts as follows:
 - 3.9.1 Fit inlet valve (9), spring (8) and check valve (7).
 - 3.9.2 Fit bonded seal (3) and inlet valve cap (4).
 - 3.9.3 Fit a strainer disc (2) in outlet port with circlip (1).
 - 3.9.4 Fit strainer disc (2) in inlet port with circlip (6).
 - 3.9.5 Fit dirt excluder disc (20) and retain with collar (22) and M4 x 10 screw (21)
 - 3.9.6 Fit lever (5) overhauled in Job US 0125 and secure with nut (25) and retain with tab washer (24).
 - 3.9.7 Fit stop screws (26).
 - 3.9.8 Fit retaining plate (27) and secure with screw (28).
4. Testing.
 - 4.1 Test valve on a suitable rig for correct operation.
 - 4.2 Check for leaks. No leakage is permissible.
5. Seal ports to prevent ingress of dirt and moisture.

Arising Work from Part 4

- 4.1, Correct all defects found during test.
- 4.2

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Compensating Valve - Overhaul

AV 3321

Scheduled Work

1. Remove the circlips and dismantle the valve.
2. Discard the circlips, valves and 'O' rings.
3. Clean all parts.
4. Examine the valve body. Check that the valve seating surfaces, and the bores are not scored.
5. Examine the springs for damage and corrosion.
6. Check that the free height of the spring is 37mm.
7. Examine the 'O' ring grooves in the spring guides for scoring.
8. Apply a thin film of MS4 Silicone grease Cat No. 027/004612 onto the 'O' rings and their seatings, and to the ends of the springs.
9. Re-assemble the valve, fitting new valves, circlips and 'O' rings. The valves and their seatings are to be kept dry.
10. Test the valve for correct operation, and for leakage. No leakage is permissible.
11. When testing has been satisfactorily completed seal the ports with adhesive tape.

Arising Work

4. Renew valve body if scored on seating surfaces or bores.
- 5,6. Renew spring if corroded, damaged or less than 37mm free height.
7. Renew spring guide if 'O' ring grooves are damaged.
10. Correct all defects found during test.

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Compensating Valve - Overhaul

AV 3321

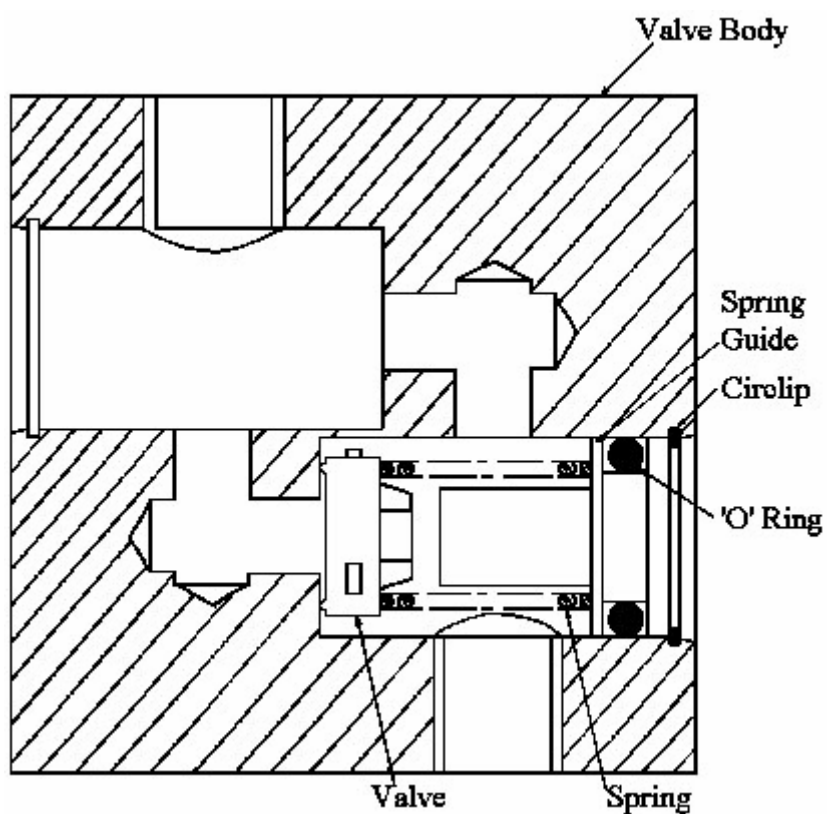


Figure 1: Section of Compensating Valve

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Brake Pad Thickness - Check

BB 0112

Scheduled Work

NOTE 1: PADS ARE TO BE KEPT IN MATCHED PAIRS

1. Measure or gauge pads at thinnest point of matched pair.
2. Check taper wear does not exceed limits of Figure 1.
3. Retain pad pairs for re-use if thickness greater than 13mm and taper wear is less than limits.
4. Scrap pad pairs if thickness less than 13mm, or taper wear exceeds limits.

Arising Work

4. Renew Brake pads in accordance with table and as advised by the Engineer for HST and loco hauled day coaches.

Cat Nos. for matched pairs are as follows:

Vehicles	Make of Pad	Cat No.
HST & Loco Hauled Day Coaches	Ferodo 3204F	070/070591
	Becorit 922-1U	070/070817
Sleepers	Becorit 922/1	070/041094

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Brake Pad Thickness - Check

BB 0112

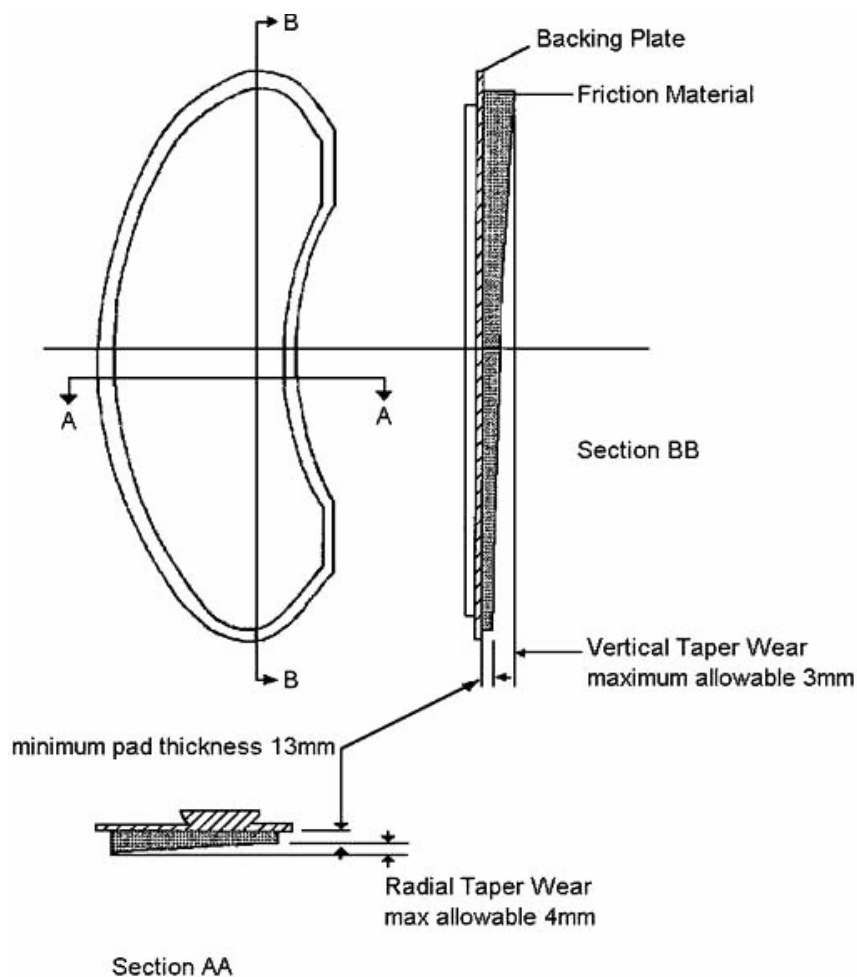


Figure 1: Taper Wear and Pad Thickness Limits

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Brake Calliper Assembly - Overhaul

BL 0007

Scheduled Work

1. Dismantling
 - 1.1 Dismantle the brake calliper assembly by removing all the split pins, nuts, washers and remove all pivot pins.
 - 1.2 Scrap all washers, except 5mm thick stainless steel washer item 12. Scrap all tab washers, nuts, split pins and nylon plugs.
 - 1.3 Scrap any pivot pins which are not stainless steel.
2. Overhaul the components in accordance with the following jobs.

Job Title	Job Code
Calliper Lever - Overhaul	BL 0113
Yokes - Examine	BL 0114
Suspension Links - Examine	BL 0115
Pad Holders - Examine	BL 0116
Pins, Bolts and Spacer Tube - Examine	BL 0117

See Figure 1 on page 2 to identify components.

NOTE 1: For reassembly of Brake callipers assemblies see stage 11 of Section 3.3.

NOTE 2: The component identification numbers used in Jobs BL 0113 to BL 0117 are all shown on Figure 1, and also correspond with those used in the list of components in Section 7.

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Brake Calliper Assembly - Overhaul

BL 0007

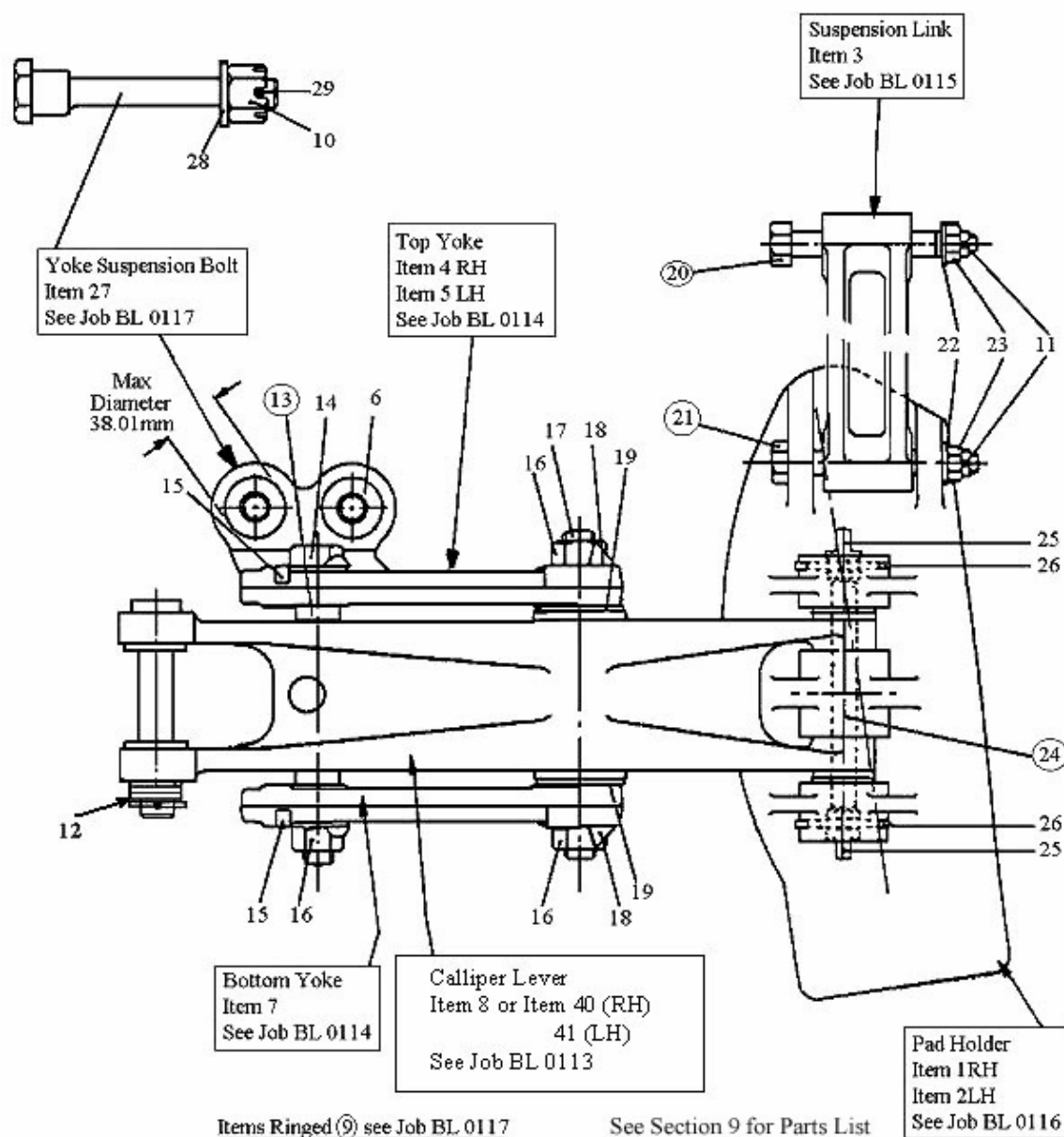


Figure 1: Calliper Assembly
(See Section 5 for Parts List)

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Calliper Lever – Overhaul

BL 0113

Scheduled Work

1. Check that there are no steel bushes at the lever pivot or actuator pivot.
2. Clean and examine the levers for excessive wear or damage.
3. Check that the steel bushes (35) at the pad holder end are not loose.
4. Check that the plastic bushes are secure in the housings and cannot be moved by hand.
5. Gauge the bores of the plastic bushes at the lever pivot and actuator pivot.

Component	Limits
Lever pivot Fitted with single long bush (item 42)	31.90 to 32.15mm
Lever pivot Fitted with short bushes (item 36) at each end of bore	31.80 to 32.00mm
Actuator pivot	22.07 to 22.50mm

6. Gauge the bore of the steel bush at the pad holder pivot.

Limits are: 15.80 to 16.22mm.
7. Measure the thickness of the flange face of the lever pivot bushes.
 - 7.1 If fitted with single long bush (item 42) measure single flange only.
 - 7.2 If fitted with short bushes (items 36) at each end of bore, measure both flanges.
 - 7.3 Minimum acceptable flange thickness is 3.5mm.
8. Paint the calliper levers in accordance with CR/PE0102.

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Calliper Lever – Overhaul

BL 0113

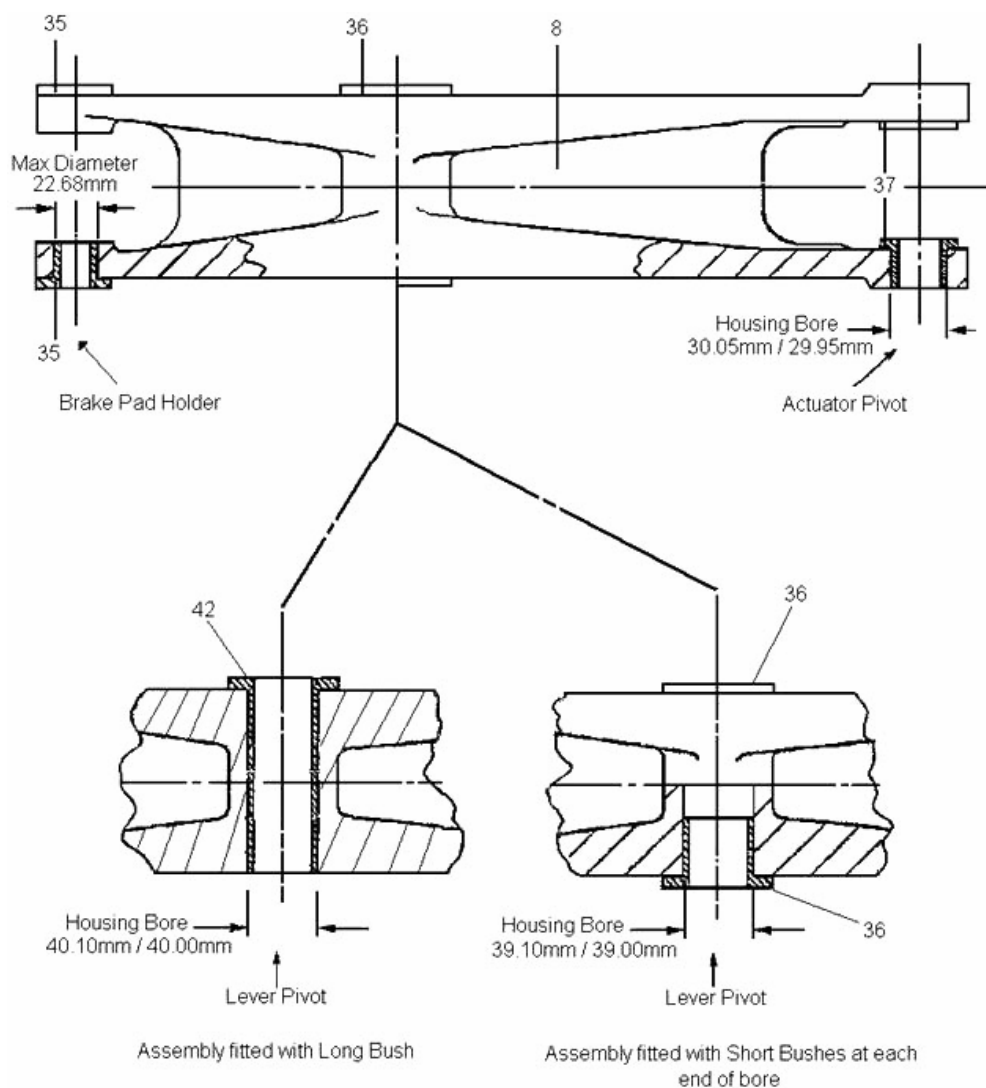


Figure 1: Calliper Lever Assembly

Arising Work

NOTE 1: The calliper lever pivot bush may be either a long single bush (42) or short bushes (36) fitted at each end of the bore. Identify which type is fitted before proceeding.

1. Remove and scrap all steel bushes in lever pivot and actuator pivot, and fit plastic bushes in accordance with Procedure A on pages 3 and 4.
2. Renew lever if it is bent or damaged beyond repair.

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Calliper Lever – Overhaul

BL 0113

3. Fit oversize bushes as follows:

3.1 Remove bushes and bore housing to limits 24.00 to 24.05 diameter.

3.2 Check that the minimum wall thickness after machining is at least 5mm. If less than 5mm renew lever.

3.3 Fit new bushes to Drawing PB-C0-2100626 item 4.

4, 5. Remove bushes which are loose or outside limits and carry out Procedure A.

6. Remove bushes worn above limit, check bush housing bore against Table 1, and renew bushes. If bush housing bore greater than 22.68, see item 3.

7. If flange has worn below 3.5mm thickness renew bushes in accordance with Procedure A.

Position	Bush Material	Bush Bore		Bush Housing	
		Min	Max	Min	Max
Actuator Pivot	Plastic	22.07	22.50	29.95	30.05
Brake Pad Holder	Steel	15.80	16.22	-	22.68
Lever Pivot fitted with single long bush (item 42)	Plastic	31.90	32.15	40.00	40.10
Lever Pivot fitted with short bushes at either end of bore (item 36)	Plastic	31.80	32.00	39.00	39.10

Table 1

NOTE 2: Single Long Bushes may only be fitted following approval from the Engineer.

PROCEDURE A

Fit new plastic bushes as follows:

A1 Gauge the bush housing bores at the actuator and calliper lever pivot positions.

See Table 1 for limits.

If outside limits proceed as follows:

Position	Under-size	Over-size
Actuator Pivot	Ream Out	Reclaim by rebuilding the bore in accordance with a procedure prepared by the Supplier and which has been agreed with the Engineer.
Lever Pivot	Ream Out	

A2 Lightly smear the housing bores with Tectyl 506 or equivalent anti-rust compound.

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Calliper Lever – Overhaul

BL 0113

- A3 Using a wooden mallet, fit Devol polymer bushes to Lever Pivot and Actuator Pivot in accordance with the details given below:

Actuator Pivot (Devol A153 - Cat No. 801/397801)
Lever Pivot (Devol A153 - Cat No. 801/320602) - If short bushes are to be fitted.
Lever Pivot (Nylacast 612 - Cat No. 070/024044) - If single long bush is to be fitted.

- A4 Check that bushes are secure in the housing and cannot be moved by hand.
- A5 Check that the bores of the bushes are still within the limits of Table 1.

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Yokes – Examine

BL 0114

Scheduled Work

1. Examine the two rubber bushes (6) on the top yoke for damage, cracks or bond failure.
2. Clean and examine the two yokes (4 or 5 and 7) for damage.
3. Paint the two yokes in accordance with CR/PE0102.

Arising Work

1. Renew both rubber bushes as follows:
 - 1.1 Remove the old bushes.
 - 1.2 Either:
 - (i) Gauge both bores:

If above 38.01mm see steps A1 or A2.
If below 38.01mm fit new bushes.
 - or
 - (ii) Record the pressing-in force of the new bush:

If below 1.0 tonnes remove the bushes and carry out steps A1 or A2.
 - A1. Renew yoke.
 - A2. Reclaim yoke by rebuilding the bore in accordance with a procedure prepared by the Supplier and which has been agreed with the Engineer.
2. Renew yoke or repair in accordance with a procedure prepared by the Supplier and which has been agreed with the Engineer.

	COMPONENT OVERHAUL INSTRUCTION	CR/CI0510 Issue : 1 Section:3.2 Page : 1 of 1
	BT10 Bogie	

Suspension Links – Examine

BL 0115

Scheduled Work

1. Clean and examine suspension link (3) for signs of damage.
2. Check that bushes (30) are not loose.
3. Gauge the internal bush diameter (30) at both ends.
4. Paint the suspension link in accordance with CR/PE0102.

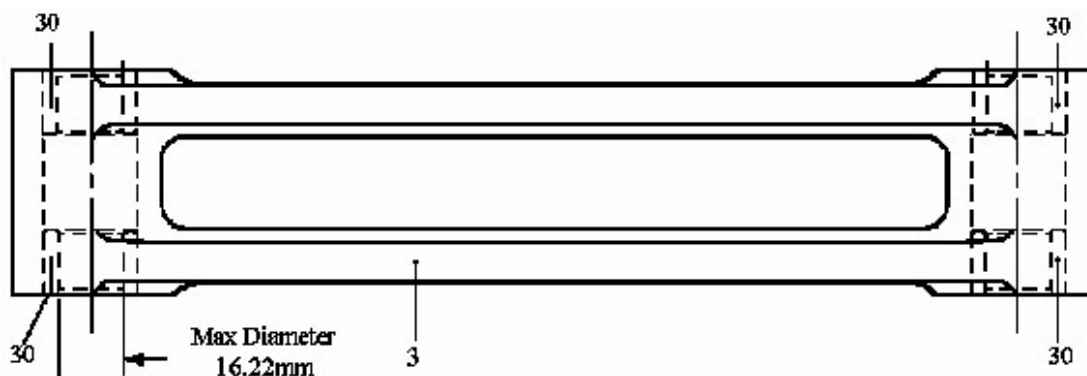


Figure 1: Suspension Link

Arising Work

1. Renew suspension link if it is damaged.
2. Fit oversize bush as follows:
 - 2.1 Remove bush and bore housing to limits 24.00 to 24.05 diameter.
 - 2.2 Check that the minimum wall thickness after machining is at least 4mm. If less than 4mm, renew link.
 - 2.3 Fit new bush to Drawing PB-C0-2100626 item 5.
3. If either dimension exceeds 16.22mm rebush both ends of the suspension link. Check that bushes are secure. If bushes are loose, gauge housing bore which should be 22.68 max. If oversize see item 2.

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	BT10 Bogie	

Pad Holders – Examine

BL 0116

Scheduled Work

NOTE: See Figure 1 for numbered part references.

1. Examine brake pad holders (1 or 2) for signs of obvious damage or wear.
2. Gauge the internal diameter of the suspension link top bush (30).
3. Gauge the internal diameter of vertical pivot pin bushes (31 and 32).
4. Renew the pad retaining clip (Cat No. 070/041073). Replacement clip to have both tension pins (Cat No. 070/041172) renewed. Lightly lubricate with machine oil to Cat No. 027/018002 and check for correct operation.
5. Check surface flatness of pad holder over its length and width using a straight edge. A maximum out of flatness of 1.5mm is permitted.
6. Check the dovetail grooves (see Figure 2).

Arising Work

1. Renew pad holder if defective (RH Cat No. 840/092401, LH Cat No. 840/092402).
2. Renew both bushes (30) (Cat No.070/050711) if any dimension is greater than 16.22mm.
3. Renew all bushes if any dimension is greater than 16.22mm (Cat No. item 31 070/050730 Cat No. item 32 070/050709).
- 2, 3. If housing worn, fit oversize bush in accordance with procedure agreed with the Engineer. Pad holders with oversize bushes are to be identified with a painted red spot.
5. Renew pad holder when the surface flatness exceeds 1.5mm.
6. Renew pad holder with defective dovetail groove.

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	BT10 Bogie	

Pad Holders – Examine

BL 0116

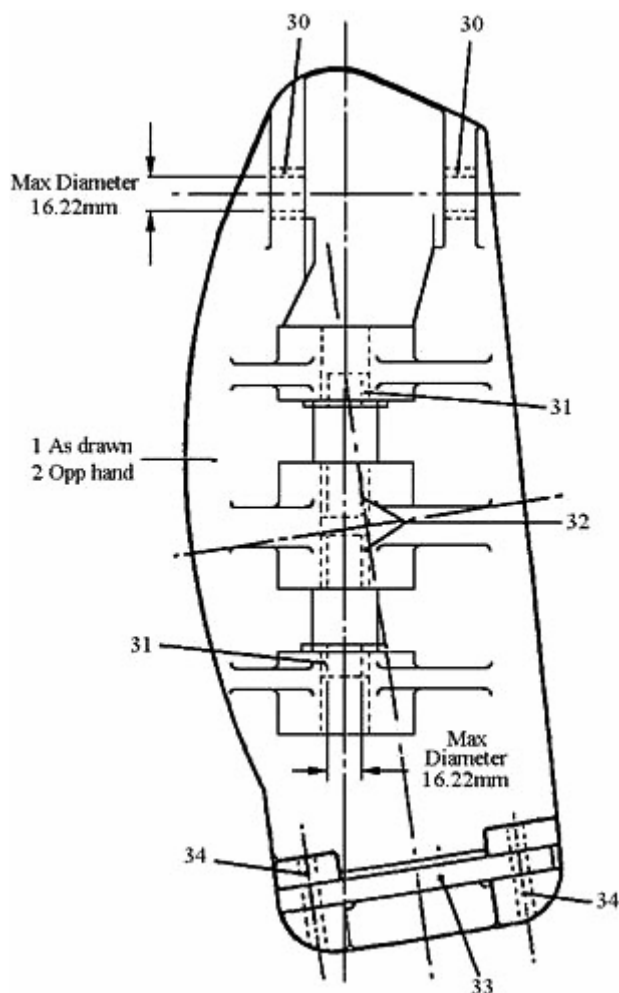
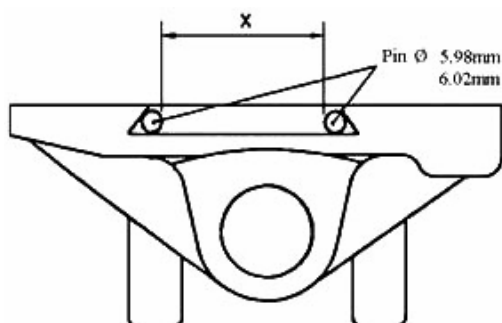


Figure 1: Pad Holder



Scrap Pad holder if dimension "x" exceeds 50mm.
Check at 3 equi-spaced points along the dovetail

Figure 2: Pad Holder Dovetail

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Pins, Bolts and Spacer Tube – Examine

BL 0117

Scheduled Work

NOTE: Refer to job BL 0007, Figure 1, for location of components.

1. Examine the suspension link pin, (20 upper and 21 lower) for signs of damage or excessive wear. Check condition of threads and measure diameter of pin.
2. Examine pad holder pivot pin (24) for signs of wear.
3. Check that the lever pivot pins (17) and actuator pins (9) are stainless steel (stainless steel actuator pins do not have threaded portions).
4. Clean stainless steel pins to remove surface debris and grease to restore bright metal finish, using method that does result in a surface finish of greater than 0.8µm.
5. Examine stainless steel pivot pins for signs of damage or wear. Check wear on diameter against following criteria:

Type	Max (mm)	Min (mm)
Actuator	22.05	21.90
Lever Pivot	31.62	31.50

6. Examine spacer tube (13) for damage.
7. Examine yoke suspension bolt (27) and yoke bolt (14) for signs of damage or wear.

Arising Work (See Section 11, page 7 for details of components).

1. Renew pin if threads are damaged or diameter is below 15.5mm measured at any point (upper 20 Cat No. 070/050719, lower 21 Cat No. 063/009079).
2. Renew pad holder pivot pin if the diameter is below 15.5mm (Cat No. 070/050715).
- 3, 5. Renew actuator and lever pivot pins which are not stainless steel, or which are outside limits.

Position	Cat No.
Actuator	801/397803
Lever Pivot	801/320601

6. Renew defective spacer tube (Cat No. 018/019835).
7. Renew defective yoke suspension bolt (item 27, Cat No. 063/000028).
7. Renew yoke bolt (item 14 Cat No. 070/051070).

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	BT10 Bogie	

Brake Actuator – Change

BL 3707

Scheduled Work

1. Change the brake actuators (4 per bogie). Cat Nos. as follows:

	Ordinary	Parking Brake Fitted
LH	220/213801	070/050847
RH	220/213802	070/050846

2. Overhaul in accordance with Specification CR/CI0555 Issue 2 Revision A, and fit “long” clutches.

	COMPONENT OVERHAUL INSTRUCTION	CR/CI0510 Issue : 1 Section:3.2 Page : 1 of 1
	BT10 Bogie	

BR WSP Toothed Wheel – Examine

EY 0103

Scheduled Work (Where Fitted)

1. Degrease and clean toothed wheel. Examine for signs of damage i.e. contact with the probe.
2. Check that three M10 jacking holes are provided.
3. On toothed wheels to be used with Westinghouse WSP probes check that the diameter across the tooth tips does not exceed 172mm.

Arising Work

1. Reclaim WSP toothed wheel in accordance with Drg No. IC-A1-8013054.
1. Renew toothed wheel if unable to reclaim. New wheels to be to Drg IC-A1-8013054.
2. Provide 3 jacking holes in accordance with Drg No. IC-A1-8013054.
3. Reduce diameter to within limits of 172.0 to 171.0mm, whilst maintaining concentricity within 0.06mm.

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WSP Conduit, Flexibles and Junction Boxes - Examine

EY 0123

This job is in 2 parts - PART A – Examination of Components
 PART B – Assembly of junction box on bogie frame (called up by Section 3.3 steps 34.8 and 35.5) (Applies only to Porterbrook bogies and those fitted with Westinghouse WSP from 2008 onwards).

Scheduled Work Part A

1. Examine WSP conduits and flexibles for corrosion and defects, especially those which could lead to water entry.
2. Where fitted, examine the Westinghouse dump valve harness and plugs for corrosion and damage.
3. With the junction boxes removed, examine for corrosion and damage.
4. Check interiors for signs of water, and if present, determine whether it entered via conduit or cover joints.
5. Examine all exposed cables.
6. Check cable terminations for damage and security. Check idents are clear and correct (see Drawings listed on Page 2).
7. Renew rubber mouldings forming joints for lids (EMKA Part No. 1038-06 Cat No. 010/039156).

Arising Work

1. Renew damaged conduit and flexibles.

NOTE: As 16mm conduit, used for much of the WSP system is now obsolete, it will be necessary to use 20mm conduit.

See following drawings for Westinghouse arrangements:

Porterbrook bogies converted before 2008	PB-C1-2101507
Angel bogies converted before 2008	ATC-C0-2205111
Any bogies converted from 2008 onwards	CR-C0-2301701

Renewals must be free from internal burrs and ridges likely to cause damage to the cable coverings or prevent the formation of sound mechanical connections.

2. Renew dump valve harness (see harness Drawings listed on Page 2).
3. Renew any junction box with pitting corrosion or holes. Remove light rust deposits, clean and paint in accordance with CR/PE0102.

	COMPONENT OVERHAUL INSTRUCTION	CR/CI0510 Issue : 1 Section: 3.2 Page : 2 of 4
	BT10 Bogie	

WSP Conduit, Flexibles and Junction Boxes - Examine

EY 0123

4. Renew junction box and lid if joint faces are damaged. Ensure action taken at step 1 addresses any problems found with junction boxes.
- 5,6. Renew defective or loose cable terminations. Renew defective or incorrect idents. Renew damaged cables or repair in accordance with WOSS 560/3.

The following drawings are relevant to Girling and BR WSP equipment:

Self Powered Girling WSP	B1-S-9018032
BR WSP	B2-S-9014627 B2-A0-8502716
Coach Powered Girling WSP	B1-S-9014628
Bogies with hydraulic parking brake (BFO)	C3-A0-8500414 B2-A0-8502716 C3-A0-8500388
Flexible Conduit Assembly (All bogies)	B-A2-2209

The following drawings are relevant to Porterbrook Westinghouse WSP equipment, fitted before 2008:

Flexible Harness Assemblies for WSP Equipment (items 03, 04, 05 and 06)	PB-C0-2101507
WSP Equipment Connection Box Modification Assemblies	PB-C0-2101509
WSP Axle Probe and Cable Installation	PB-C1-2101510

The following drawings are relevant to Angel Trains Westinghouse WSP equipment, fitted before 2008:

Flexible Harness Assemblies for WSP Equipment	ATC-C0-2205111
WSP Connection Box Assemblies	ATC-C0-2205120
WSP Connection Box Details	ATC-C0-2205125
WSP Axle Probe and Cable Installation - Actual Title Bogie Frame Arrangement (Westinghouse WSP)	ATC-C0-2205123 ATC-C0-2205124

The following drawings are relevant to any bogies converted from 2008 onwards:

Flexible Harness Assemblies for WSP Equipment (items 03, 04, 05 and 06)	CR-C0-2301703
WSP Connection Box Assemblies	CR-C0-2301712
WSP Connection Box Details (including outer box)	CR-C0-2301713
For details of Axle Probe and Cable see: Bogie Mounted Westinghouse WSP Installation (ex BR and Girling WSP Bogies)	CR-C0-2301701

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WSP Conduit, Flexibles and Junction Boxes - Examine

EY 0123

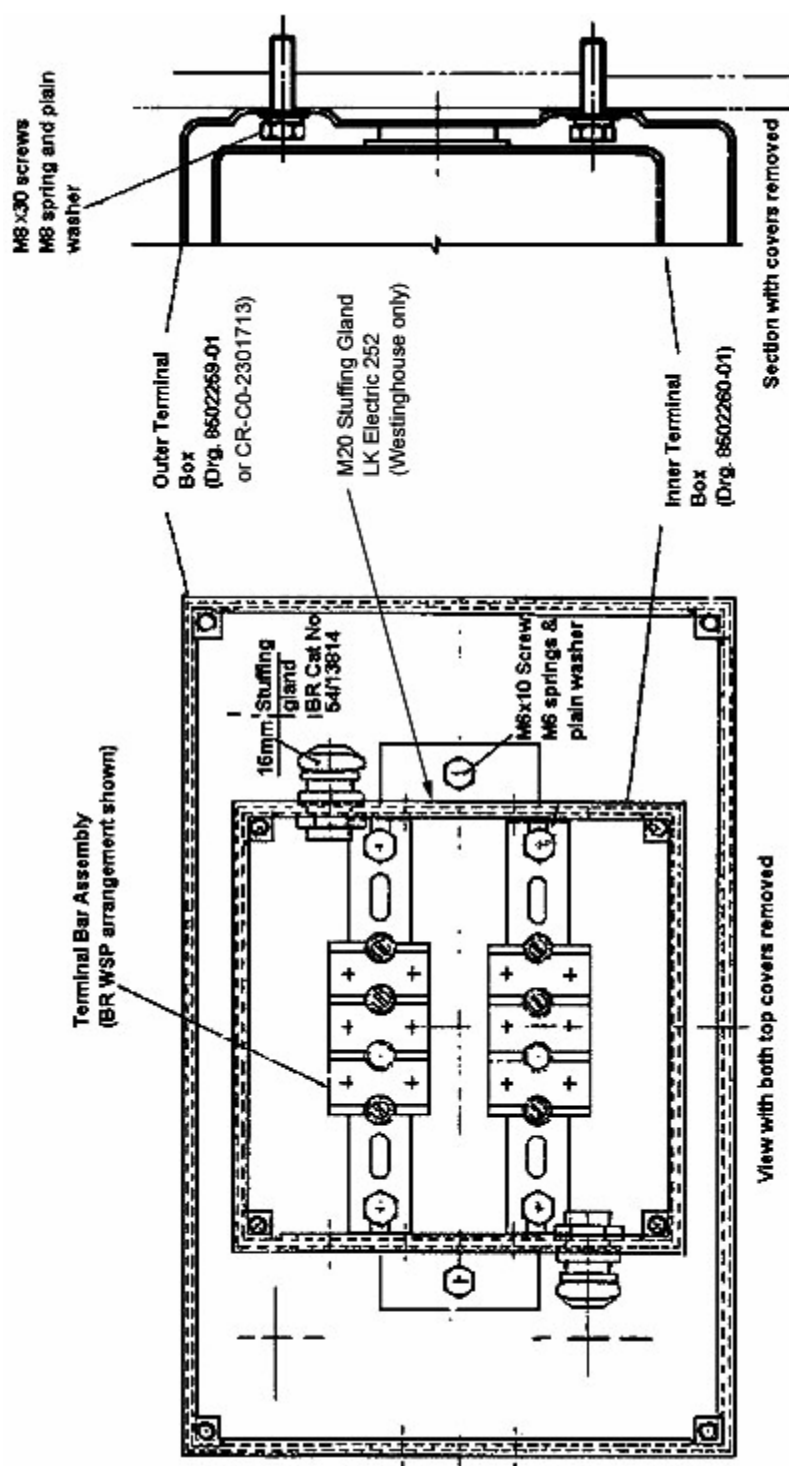


Figure 1: Double Skin Junction Box
 (Applies to BR WSP, All Porterbrook Westinghouse Bogies and any Converted 2008 Onwards)

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WSP Conduit, Flexibles and Junction Boxes - Examine

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Scheduled Work Part B (Applies to Porterbrook Bogies and those converted 2008 onwards)

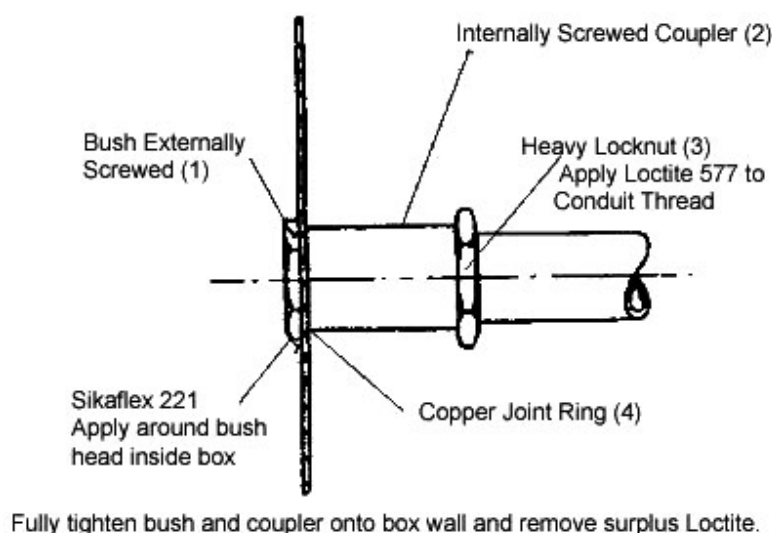


Figure 2: Details of Joint Between Conduits and Outer Terminal Box

Materials for Figure 2			
Item	Description	Cat No. for M20 Conduit	Cat No. for M25 Conduit
1	Male Bush	054/131206	054/131210
2	Coupler	054/132330	054/132332
3	Lock Nut	054/134312	054/134314
4	Copper Joint Ring	008/188298 (21 ID)	008/188373 (26 ID)

- Secure outer terminal box to bogie frame with four M8 x 30 screws, new spring washers and plain washers.
- Tighten M8 screws to 15Nm.
- Assemble three conduits to outer terminal box in accordance with Figure 2.
- Pull cables through conduit into outer terminal box.
- Fit 16mm or 20mm stuffing glands to inner terminal box, and secure assembly to bogie with two M6 x 12 screws, new spring washers and plain washers.
- Pull cables through stuffing glands and terminate. For details see Tables 5 and 6 and Figure 36.1 in Section 3.3.
- Tighten glands to grip outer cable insulation.
- Check that new rubber mouldings are in place and fit lids.
- Tighten captive M6 screws to 10Nm.

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WSP Blowdown Valve - Change

EY 0133

Scheduled Work

1. Change the valves (2 per bogie).
2. Overhaul in accordance with the following:

Equipment Type	Instruction
Girling and BR	CR/CI0569
Westinghouse	Job EY 0566

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	BT10 Bogie	

WSP Flange Housing - Examine

EY 0139

Scheduled Work (Girling Equipment Only)

1. Examine flange housing.
2. Check that the sealing faces are flat and free from burrs and dents.
3. Check that tapped holes are fitted with helical coiled inserts.
4. Examine helical coiled inserts.

Arising Work

1. Renew flange housing if damaged beyond repair.
2. Remove burrs.
3. Fit M10 helical coiled inserts in WSP Flange housing in accordance with manufacturer's current instructions.
- 1-4. If inserts defective or housing is damaged in area of hole, repair in accordance with TL/WP0479.

	COMPONENT OVERHAUL INSTRUCTION	CR/CI0510 Issue : 1 Section:3.2 Page : 1 of 3
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WSP Wiring - Test

EY 0141

Scheduled Work

NOTE: This job is to be carried out after the WSP conduits, junction box and wiring has been refitted to the bogie. See Section 3.3 Step 35.6.

Part 1 - BR WSP

- 1.1 With a Megger on the 250V range, test the insulation of the following circuits, per bogie:

A reading of at least 1M Ω is required.

- 1.1.1 2 wires from body to bogie connection box to each blowdown valve tested to bogie frame.

- 1.1.2 Repeat item 1.1.1, but test to cable screen.

- 1.2 Test continuity of each circuit and screen, by shorting in turn each wire and screen together at one end. Reading to be 1 Ω or less.

Part 2 - Coach Powered Girling

- 2.1 With a Megger on the 250V range, test the insulation of the following circuits, per bogie:

A reading of at least 1M Ω is required.

- 2.1.1 2 wires from body-to-bogie connection box to "outer" connection boxes, tested to bogie frame.

- 2.1.2 Repeat item 2.1, but test to cable screen.

- 2.2 Test continuity of each circuit and screen by shorting in turn each wire and screen together at one end. Reading to be 1 Ω or less.

- 2.3 Test insulation and continuity of one pair of wires from each "outer" connection box to corresponding blow down valve.

Part 3 - Self-Powered Girling

3. Carry out item 2.3 above.

Part 4 - Westinghouse

- 4.1 When testing insulation in the following tests, use a megger set at 250V.

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WSP Wiring – Test

EY 0141

- 4.2 Check the continuity from each pin in each dump valve plug to the corresponding terminal in the bogie frame connection box. Maximum resistance allowable is 1Ω. For locations of terminals see Figure 1 and Table 1.
- 4.3 Check the insulation between each dump valve cable and bogie frame. Minimum resistance allowable is 1MΩ.

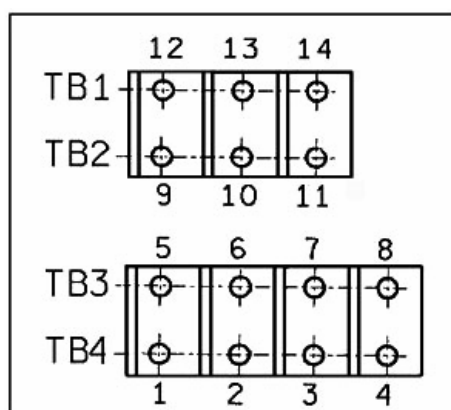


Figure 1: Bogie Connection Box

Terminal No.	No.1 Bogie	No.2 Bogie
1	No.1 Axle Probe (P1) Orange	No.3 Axle Probe (P9) Orange
2	No.1 Axle Probe (P2) Blue	No.3 Axle Probe (P10) Blue
3	No.1 Axle Probe (P3) Yellow	No.3 Axle Probe (P11) Yellow
4	No.1 Axle Probe (P4) Screen	No.3 Axle Probe (P12) Screen
5	No.2 Axle Probe (P5) Orange	No.4 Axle Probe (P13) Orange
6	No.2 Axle Probe (P6) Blue	No.4 Axle Probe (P14) Blue
7	No.2 Axle Probe (P7) Yellow	No.4 Axle Probe (P15) Yellow
8	No.2 Axle Probe (P8) Screen	No.4 Axle Probe (P16) Screen
9	No.1 Dump Valve D1	No.3 Dump Valve D7
10	No.1 Dump Valve D2	No.3 Dump Valve D8
11	No.1 Dump Valve D3	No.3 Dump Valve D9
12	No.2 Dump Valve D4	No.4 Dump Valve D10
13	No.2 Dump Valve D5	No.4 Dump Valve D11
14	No.2 Dump Valve D6	No.4 Dump Valve D12

Table 1: Allocation of Wires to Terminals in Westinghouse Bogie Junction Boxes

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WSP Wiring – Test

EY 0141

Arising Work

1-4. Renew defective wiring or harnesses. See below:

Equipment Type	Drawings
Girling	C-A3-16324
BR	C-A0-22612 or C-A0-16922
Porterbrook Westinghouse, fitted before 2008	PB-C0-2101511 PB-C0-2101508
Angel Trains Westinghouse, fitted before 2008	ATC-C0-2205113 ATC-C0-2205111
Any bogies fitted after 2008: Harness Wiring Diagram	CR-C0-2301703 items 03 to 06 CR-C0-2301705

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BR WSP Probe – Examine

EY 0142

Scheduled Work (Where Fitted)

1. Clean and degrease all threads and contact surfaces.
2. Examine probe and wiring for damage or defects.
3. Check security of probe tip.
4. Test resistance which should be in range 200-300Ω.
5. If the probe is to be fitted into a WSP assembly which uses the revised design of distance piece (Aluminium to Drawing B1-A0-9001022) the probe and square location plate must be correctly aligned. This may be checked during assembly (see Section 3.3 Step 33.7), or using a jig to Drawing NSE-A1-8370379 as follows:
 - 5.1 Slacken the top sensor locknut (16) and the special nut (17).
 - 5.2 Check that the nuts are free running on the probe body thread and take them clear of the location plate.
 - 5.3 Release the two set screws on the jig (see Figure 3) and slide the top plate away from the probe mounting hole.
 - 5.4 Screw the probe into the base plate until the end of the probe is flush with the bottom of the base.
 - 5.5 Slide the top plate of the jig towards the probe and tighten the two set screws.
 - 5.6 Check that top of the location plate (on the probe) is flush with the top of top plate of the jig see Figure 1.
 - 5.7 Check that the probe tip is aligned with the scribed line on the underside of the base plate see Figure 2.

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BR WSP Probe – Examine

EY 0142

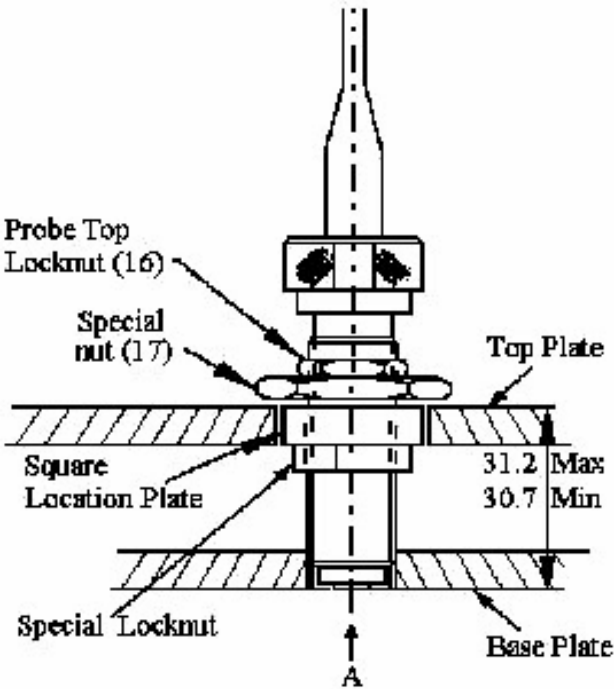


Figure 1: WSP Probe in Jig

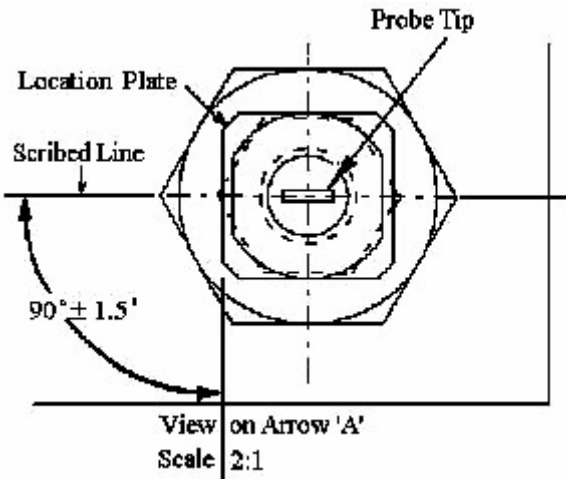


Figure 2: View on Arrow A

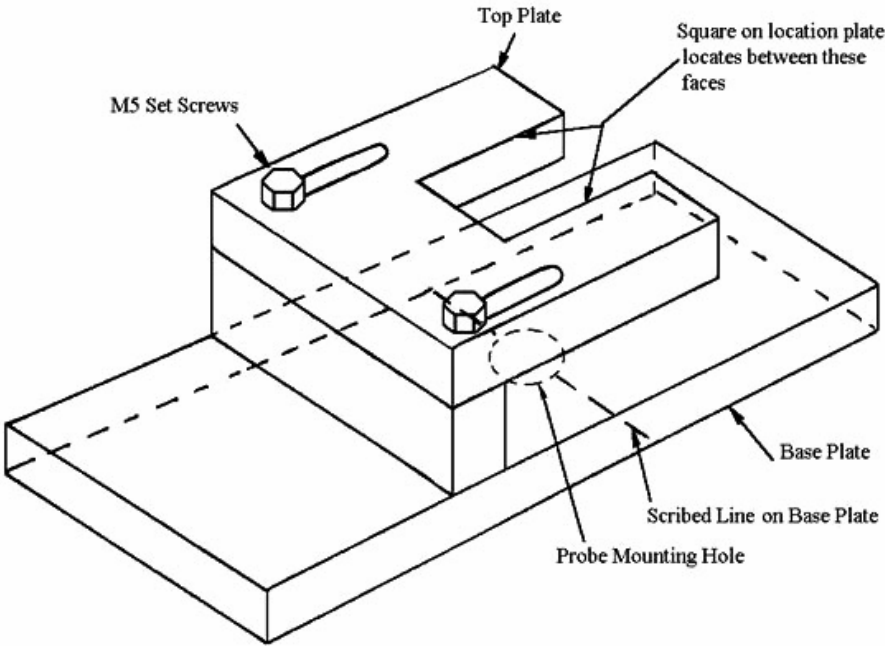


Figure 3: Jig for Setting BR WSP Probe to Drawing NSE-A1-8370379

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BR WSP Probe – Examine

EY 0142

Arising Work

2,3 & 4. Renew WSP probe, and on revised design, re-align tip (see 5 below).

5. Re-align the probe tip and set location plate as follows:

5.1 Remove four items (see Figure 1) from the probe:

- a) special locknut securing the location plate,
- b) location plate,
- c) special nut (17),
- d) probe top locknut (16).

5.2 Clean off all traces of Loctite from threads and probe.

5.3 Refit the two hexagonal nuts (probe top locknut and special nut).

5.4 Fit the square section location plate and then the special locknut, such that the top face of the location plate is approximately 32mm from the probe end. The special locknut should be left at least 10mm below the location plate.

5.5 Release the two set screws on the jig and slide the top plate away from the probe mounting hole.

5.6 Screw the probe into the baseplate until the end of the probe is flush with the bottom of the base. See Figure 1.

5.7 Apply Loctite 242 (Cat Nos. 007/060303-5) to the 10mm of thread below the location plate.

Take care not to put Loctite on any other items.

5.8 Check that the end of the probe is still flush with the bottom of the base plate and align the tip of the probe with the scribed line on the base of the jig.

5.9 Slide the top plate of the jig towards the probe and tighten the two set screws.

5.10 Adjust the top of the location plate (on the probe) until it is flush with the top of the top plate of the jig (see Figure 1).

5.11 Check that sensor tip is still aligned with the scribed line, and lock the location plate in position with the special locknut. Tighten to 15Nm.

5.12 Leave the probe in the jig for 15 minutes.

5.13 Slacken the set screws, slide the top plate of the jig back and unscrew the probe from the base plate.

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BR WSP Distance Piece - Examine

EY 0143

Scheduled Work (Where Fitted)

1. If to the original design (see Figure 1), scrap.
2. Clean and degrease all threads, holes and sealing faces (see Figure 2).
3. Examine the rear spigot and flat surfaces for dents and raised burrs which could cause sealed joints to leak.

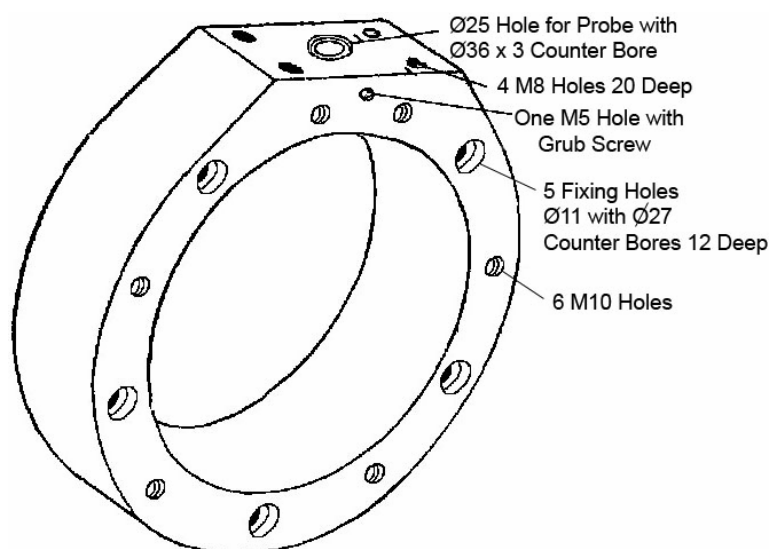


Figure 1: Original Design – Steel to Drawing B1-A0-9000385

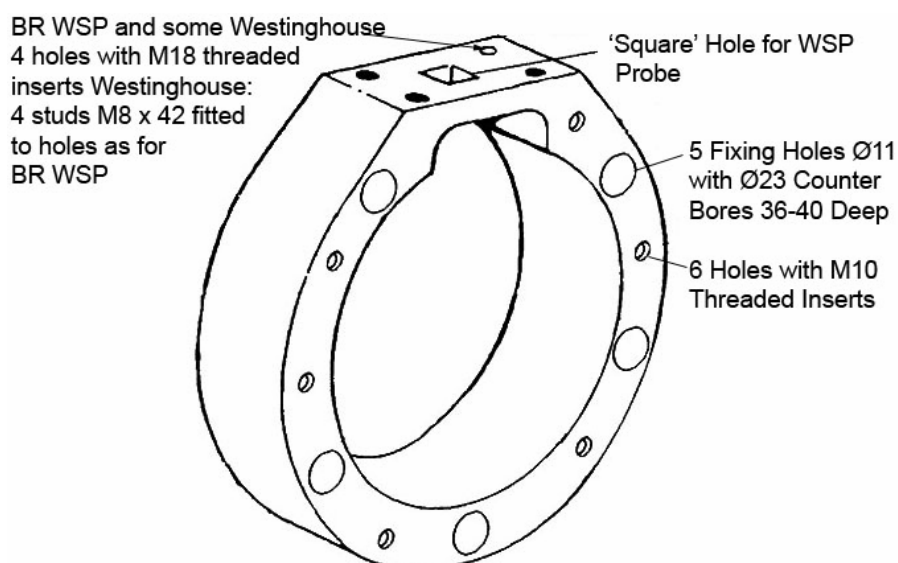


Figure 2: Revised Design – Aluminium to Drawing B1-A0-9001022

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	BT10 Bogie	

BR WSP Distance Piece - Examine

EY 0143

4. Examine the M8 (where studs not fitted) and M10 holes, checking that the threaded inserts are intact and secure.
5. Where fitted on Westinghouse equipment examine four M8 studs for damage. Check that they are tight.
6. Examine the five fixing holes, checking for ovality and burring.
7. Check that the counter bores are between 36 and 40mm deep.
8. On items to be used with Westinghouse probes, check that the distance between the flat surface for the probe and the top of the rear locating spigot, see Figure 3, is between 18.84 and 19.06mm.

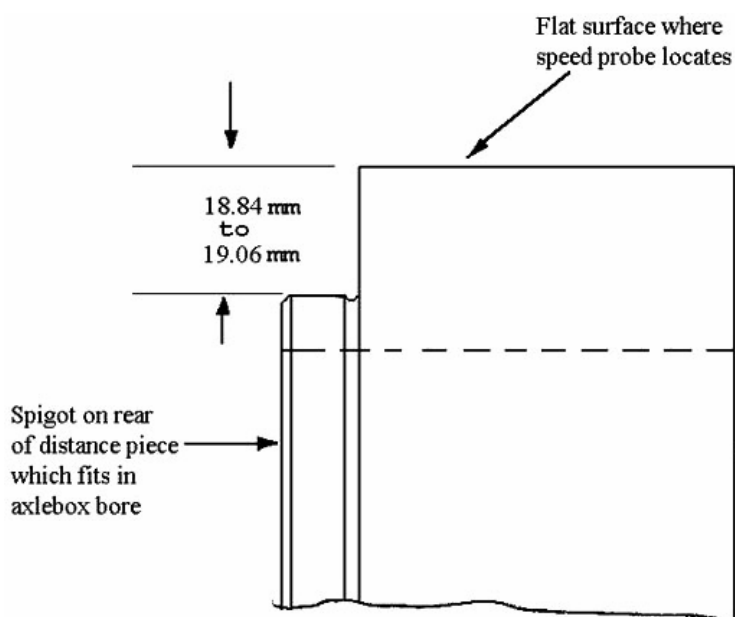


Figure 3: Dimensional Check on Revised Design for Westinghouse Equipment

9. Examine the BR WSP probe cap and check that its sealing face is flat.

Arising Work

1. Renew with item to revised design. See Figure 2.
3. Remove raised burrs.
4. Renew threaded inserts or repair in accordance with good engineering practice.
5. Renew damaged studs.

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BR WSP Distance Piece - Examine

EY 0143

6. Remove burrs. Repair in accordance with good engineering practice.
7. Remachine to correct dimensions see Drawing B1-A0-9001022.
8. Remachine to correct dimensions see Drawing B1-A0-9001022 or use on BR WSP equipment.
- 2-8. If unable to repair, renew distance piece (see Table 1).
9. Renew probe cap (see Table 1).

		Revised
Distance piece	As drawn	097/006528
	Opposite hand	097/006529
Probe cap		097/006522

Table 1: Parts List (Cat No.)

	COMPONENT OVERHAUL INSTRUCTION	CR/CI0510 Issue : 1 Section: 3.2 Page : 1 of 2
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Westinghouse WSP Probe – Examine

EY 0163

Scheduled Work (Where Fitted)

- Clean and degrease all threads and contact surfaces.
- Examine probe and wiring for damage or defects.
- Check security of probe tip.
- Check the resistance values across the probe wires using a DMM (Digital Multimeter), as follows:

4.1 As diodes are fitted across the coils, connect the DMM leads as shown below:

DMM Positive	DMM Negative	Approximate Resistance MΩ
Orange	Yellow	10
Blue	Yellow	4
Orange	Blue	15

- Check that all probe wires are open circuit to screen and probe body.
- Check that the screen is not connected to the probe body.
- Carry out a functional test on the probe using the following equipment:
 - 10V dc power supply
 - Oscilloscope
 - BR WSP Toothed Wheel (see Job EY 0103) mounted on spindle in bearings so that it may be rotated.
- Connect the 10V dc supply positive to the orange probe wire.
- Connect the 10V dc supply negative to the blue probe wire and the screen.
- Connect the oscilloscope probes to the yellow probe wire and the negative.
- Set the oscilloscope as follows:

2V per vertical division
10m sec per horizontal division.
- Place the probe tip close to the toothed wheel whilst it is being rotated.
- Check that a 10V square wave is seen on the oscilloscope, the frequency of which depends on the speed of rotation of the toothed wheel.
- Renew the 'O' ring Westinghouse Part No. C78129/100, Cat No. 064/007671.

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Westinghouse WSP Probe – Examine

EY 0163

Arising Work

2-7. Renew probe if any defects found. Details as follows:

Description	Westinghouse Part No.	Cat No.
<i>For all vehicles except Angel Trains owned FGW operated:</i>		
Speed sensor probe with short cable (1.6m) including 'O' ring	C78129/001	064/008406
Speed sensor probe with long cable (2.4m) including 'O' ring	C78129/002	064/008407
<i>For Angel Trains owned FGW operated:</i>		
Speed sensor probe with short cable (1.15m) including 'O' ring	C78129/004	064/007321
Speed sensor probe with long cable (1.96m) including 'O' ring	C78129/005	064/007320

NOTE 1: The probe ends are identical, only the cable lengths vary. Alternative probes may be used by shortening the cables.

NOTE 2: The shorter cables (1.15 and 1.96m) are used with single skin junction boxes. The longer cables are used with double skin junction boxes.

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Westinghouse WSP Dump Valves – Overhaul

EY 0566

Scheduled Work

NOTE 1: There are two varieties of Dump Valves, but the only difference is in the size of holes in choke plate (27). They are interchangeable as each is within the operating limits of the other type. Those originally fitted to Angel owned FGW vehicles are marked C77967/028 (Cat No. 064/007318) whilst those fitted to all other vehicles are marked C77967/019 (Cat No. 064/071483).

1. Dismantle the valve as follows:
 - 1.1 Place the assembly on a suitable surface which will not score or otherwise damage the exposed mating faces.
 - 1.2 Wipe off any dirt from the external surfaces.
 - 1.3 Referring to Figure 1, remove screws (3) and washers (4) securing the cover (2) to the diaphragm cover (12).

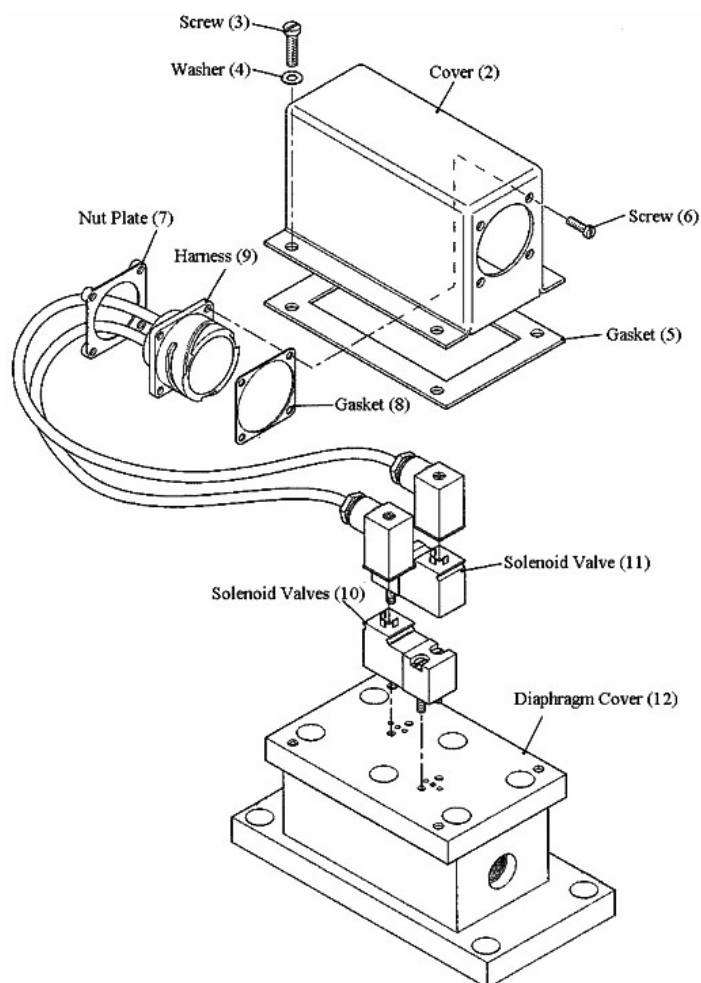


Figure 1: Westinghouse WSP Dump Valve – Solenoid Valve & Harness Removal

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Westinghouse WSP Dump Valves – Overhaul

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- 1.4 Gently lift the cover (2) until it is possible to disconnect the connectors of the wiring harness (9) from the solenoid valves (10) and (11). Note the connector locations and then remove the cover.
- 1.5 Remove screws (6) securing the harness connector to the nut plate (7). Extract the connector and discard the harness (9) and gasket (8).
- 1.6 Remove the gasket (5) from the cover (2), scrape away all remains of the gasket and its adhesive and discard.
- 1.7 Unscrew the screws securing the solenoid valves (10) and (11) to the diaphragm cover. Discard the solenoid valves and protect the exposed ports with adhesive tape.
- 1.8 Referring to Figure 2, remove screws (19) and separate adaptor plate (20) from the valve body (14).

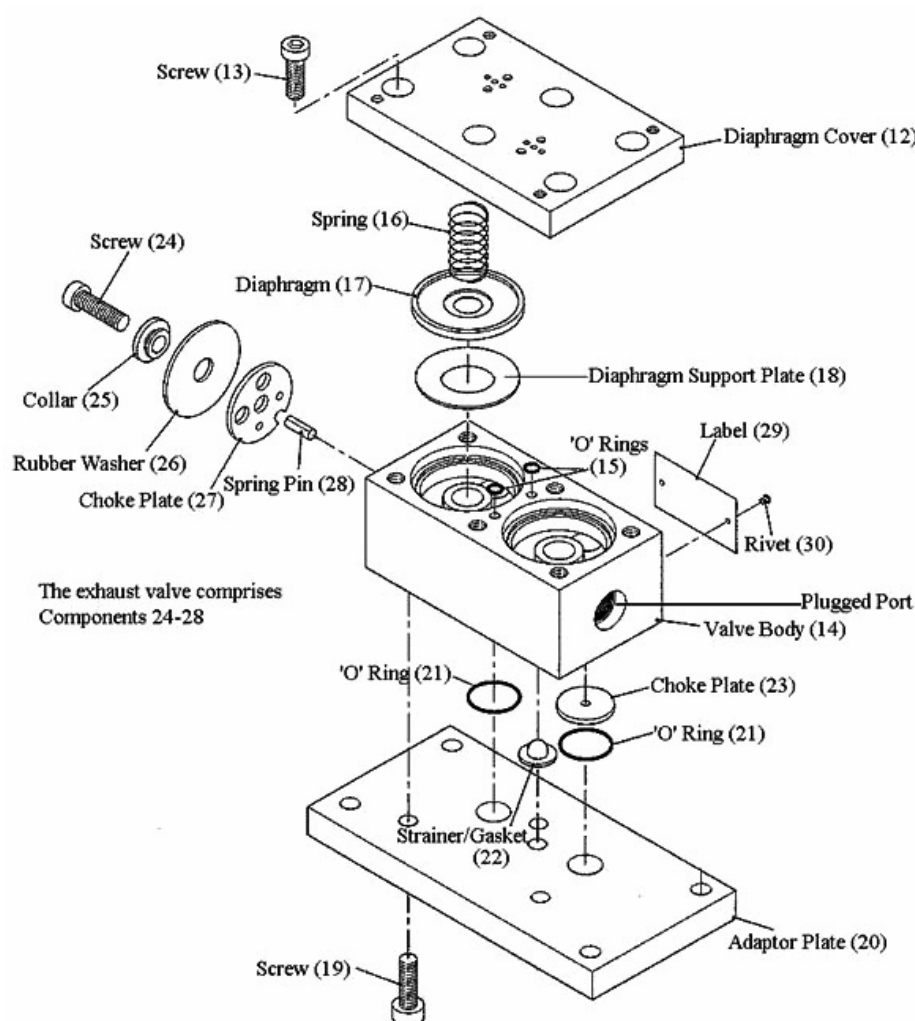


Figure 2: Westinghouse WSP Dump Valve

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Westinghouse WSP Dump Valves – Overhaul

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- 1.9 Extract 'O' rings (21) and strainer/gasket (22) from valve body (14) and discard.
- 1.10 Extract choke plate (23) from valve body (14).
- 1.11 Remove screw (24) and collar (25) with rubber washer (26). Extract choke plate (27) from valve body (14). Ensure spring pin (28) remains in valve body. If loose, remove it for safe keeping. Remove rubber washer (26) from collar (25) and discard.
- 1.12 Mark diaphragm cover and valve body with suitable marker, so that they can be reassembled in their original position.
- 1.13 Remove screws (13) and lift the diaphragm support plates (18) and 'O' rings (15). Discard the diaphragms and the 'O' rings.
2. Clean and examine the parts as follows:
 - 2.1 Wash all parts in a suitable solvent, such as white spirit, and dry with a jet of low pressure, clean, dry compressed air (2 bar maximum).
 - 2.2 When all parts are clean and dry, examine thoroughly for signs of damage, corrosion, wear or abrasion.
 - 2.3 Check that all bores and grooves that accept 'O' rings are clean, free from old 'O' ring particles and smooth with no burring, scoring or pitting.
 - 2.4 Check that all mating surfaces are clean and free from damage or distortion.
 - 2.5 Check that label (29) is legible and securely fixed to the valve body.
 - 2.6 Check the orifices of choke plates (23) and (27) are clear and are not worn or damaged.
 - 2.7 Examine the spring (16) for corrosion or deformation. Check that the free length is 11mm.

Arising Work for Sub Section 2

- 2.2, 2.6 Renew any defective parts.
- 2.3 Dress out light scoring with abrasive, otherwise renew parts.
- 2.4, 2.6 Use soft stranded wire to clean dirt from drillings.
- 2.5 Resecure label.

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Westinghouse WSP Dump Valves – Overhaul

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2.7 Renew spring (Part No. A87821/462).

Scheduled Work

3. Renew the following components:

Item No.	Description	Qty per Valve	Part No.
5	Gasket	1	J80917/002
8	Gasket	1	77382524
9	Wiring Harness	1	C74553/225
10	Solenoid Valve Assembly N/C	1	B88628/002
11	Solenoid Valve Assembly N/O	1	B88627/002
15	'O' Ring	2	D76151/002
17	Diaphragm	2	B88632/001
21	'O' Ring	2	D7151/037
22	Thimble Strainer and Gasket	1	A80748/10
26	Rubber Washer	2	J70689/85

NOTE 2: Items 10 and 11 are supplied with item 9.

4. Assemble the valves as follows:

NOTE 3: If Ironside Blend 'A' is unobtainable Fuchs Renolit HLT 2-KB-N12006-1.1 may be used, but it is only available in large quantities. Ordinary Renolit HLT2 must not be used.

- 4.1 Coat all 'O' rings with a thin film of Ironside Blend 'A' (Cat No. 027/004332).
- 4.2 Remove any protective materials from the faces and ports of the body valve (14). Position the valve body on the bench with the diaphragm orifices uppermost.
- 4.3 Referring to Figure 2, position two new 'O' rings (15) in their recesses in diaphragm cover (12).
- 4.4 Place new diaphragms (17) and their support plates (18) in their orifices within the valve body (14). Position spring (16) on diaphragm closest to the exhaust valve port in the valve body.
- 4.5 Carefully position the diaphragm cover (12) on the valve body (14), ensuring none of the component parts are disturbed, and it is the correct way round, as marked at step 1.13. Secure in position with screws (13) and tighten to 9Nm.
- 4.6 Check that spring pin (28) is in place and protrudes 2.5 – 3.5mm from the recess face. Carefully refit choke plate (27) engaging it correctly with the spring pin (28).

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Westinghouse WSP Dump Valves – Overhaul

EY 0566

- 4.7 Fit new rubber washer (26) to the collar (25) and position on screw (24). Lightly coat the threads of screw (24) with thread sealant (Loctite 241), and secure the rubber washer assembly in place. Wipe off excess thread sealant using a clean lint free cloth.
- 4.8 Place choke plate (23) in its recess in the valve body (14).
- 4.9 Lightly grease (using Ironside Blend 'A'), new 'O' rings (21) and the gasket (22), ensuring no grease comes into contact with the strainer part. Place 'O' rings and strainer/gasket in their recesses in the valve body (14).
- 4.10 Assemble adaptor plate (20) to valve body (14) and secure with screws (19).
- 4.11 Referring to Figure 1, locate new solenoid valves (10) and (11) (supplied with new harness (9)) in their correct positions and secure. Tighten the screws to a torque of 0.4Nm.
- 4.12 Using Loctite Flange Sealant 5900 secure a new gasket (5) to cover (2).
- 4.13 Fit new gasket (8) to electrical connector of harness (9) and place in hole in cover. Align screw holes and nutplate (7), insert screws (6) and tighten to a torque of 0.6Nm.
- 4.14 With the cover conveniently positioned, connect wiring harness (9) to the solenoid valves (10) and (11) as noted on removal.
- 4.15 Secure the cover (2) in position with screws (3) and washers (4). Tighten screws to a torque of 0.8Nm.
5. Test the valve as follows:
 - 5.1 Assemble the test equipment as follows:
 - 5.1.1 Connect the valve to an electrical 24v supply as per Figure 3. Ensure the supply is isolated.

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Westinghouse WSP Dump Valves – Overhaul

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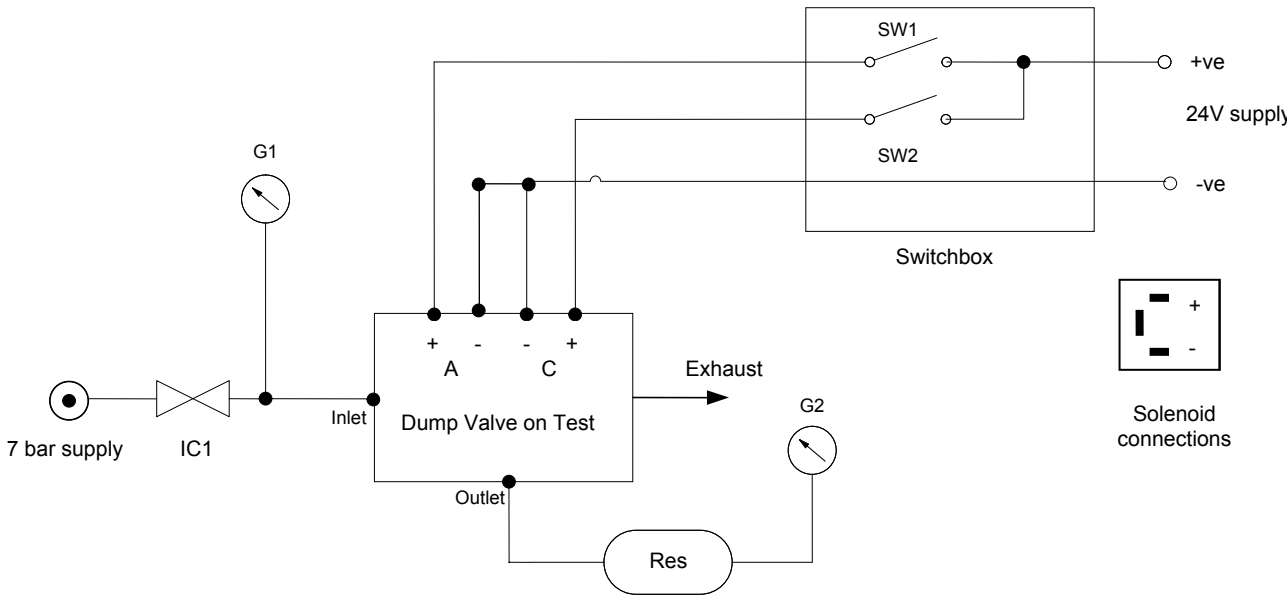


Figure 3: Electrical Schematic

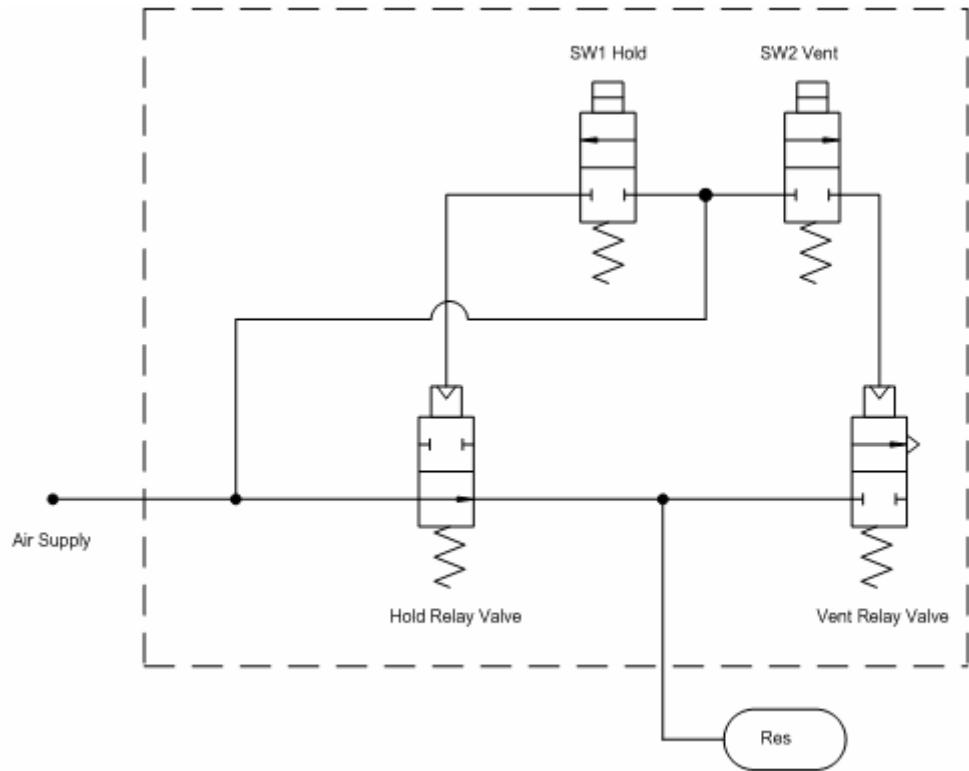


Figure 4: Pneumatic Schematic of Valve

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Westinghouse WSP Dump Valves – Overhaul

EY 0566

NOTE 4: The vent solenoid is labelled 'C' and the hold solenoid is labelled 'A'.

- 5.1.2 Connect the valve to an air supply as per Figure 3. Ensure the supply is isolated.

NOTE 5: The inlet port is the smaller of the 2 ports.

- 5.1.3 Ensure Switches SW1 and SW2 are open and energise power supply ensuring voltage is set at 24v.

5.2 Leakage and Operation Tests

- 5.2.1 Open isolating cock (ICI) and charge the valve to 7 bar. The reservoir gauge G2 should read 7 bar. Check all areas of valve for leaks using soap solution.
- 5.2.2 Close switch SW1 to shut off the air supply. Gauge G2 should remain at 7 bar. Check all areas of valve for leaks using soap solution, including exhaust port.
- 5.2.3 Close switch SW2 to open vent and check that the reservoir exhausts to zero. When the valve has exhausted, soap all over to check for leaks.
- 5.2.4 Open switches SW2 and SW1 to charge the reservoir.
- 5.2.5 Close switch SW1 to shut off supply and momentarily close SW2 so that the pressure on gauge G2 drops to approximately 5 bar and then re-open SW2. Allow to settle and check gauge G2 remains steady. Repeat test twice at lower pressures.
- 5.2.6 Momentarily open switch SW1 to partially fill the reservoir and close. Allow to settle and check that gauge G2 remains steady. Repeat twice at higher pressures.

5.3 Voltage Drop Out Tests

- 5.3.1 Close SW1 to shut off supply and close SW2 to empty reservoir. Open SW2. Slowly reduce the voltage until the hold solenoid drops out (indicated by G2 rising). Record the voltage at which this occurs, which should be 3v or less.
- 5.3.2 Increase voltage to 24v. Open SW1 and close SW2 so that the valve will continuously exhaust. Slowly reduce the voltage until the exhaust solenoid drops out (indicated by cessation of exhaust and increase on G2). Record the voltage at which this occurs, which should be 3v or less.

5.4 Voltage Pick Up Tests

- 5.4.1 Decrease voltage to 0v. Close SW2 and open SW1. Slowly increase voltage until the exhaust solenoid picks up (indicated by air exhausting). Record the voltage at which this occurs, which should be 17v or more.

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Westinghouse WSP Dump Valves – Overhaul

EY 0566

5.4.2 Close switch SW1 and open SW2. Set voltage to 17v. Open and close SW1 several times, each time observing that pressure on G2 rises whenever SW1 is opened.

5.5 Completion

5.5.1 Isolate air supply and close switch SW2 to vent air from valve.

5.5.2 Isolate electrical supply and disconnect the valve from the test rig

Arising Work

5.2.1, Rectify any leaks and repeat whole test.

5.2.2,

5.2.3

5.2.3 If the reservoir does not exhaust, investigate fault and rectify. If valve continues to exhaust, check the hold solenoid and diaphragm and rectify as required. Repeat whole tests.

5.2.5, Investigate cause of leakage and rectify. Repeat whole test.

5.2.6

5.3.1, Change hold solenoid and repeat test.

5.4.2

5.3.2, Change exhaust solenoid and repeat test.

5.4.1

Scheduled Work

6. Cover the exposed ports with masking tape to prevent the ingress of dirt or moisture and to retain loose parts.

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WSP Axle Signal Generator – Change

EY 3717

Scheduled Work

1. Overhaul Girling WSP equipment in accordance with CR/CI0429 (2 units per bogie where fitted).
2. On self powered units, renew the battery and proceed as follows:
 - 2.1 Fully charge the battery. Ensure that the charging regime is appropriate to the type of battery fitted.

NOTE: Both NI-Cad and Ni-MH batteries can be used.
 - 2.2 Mark the battery with the fitting date.
3. Apply unique serial numbers to the battery, the alternator and the control module. The serial number format to be agreed with the Engineer.

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Axlebox Covers - Examine

UA 0146

Scheduled Work

1. Examine the following for dents and other impact damage:
 - 1.1 Axlebox front covers (2 per bogie).
 - 1.2 Cover plates for BR and Westinghouse WSP assemblies (2 per bogie).
2. Clean the sealing faces.
3. Examine the sealing faces for damage such as grooves, cuts and burrs.
4. Check with flat surface that the sealing faces of all front covers are flat within 0.25mm.
5. Examine axlebox rear split covers (4 sets per bogie) for evidence of damage, distortion, corrosion and wear or grooving on the bearing abutment face.

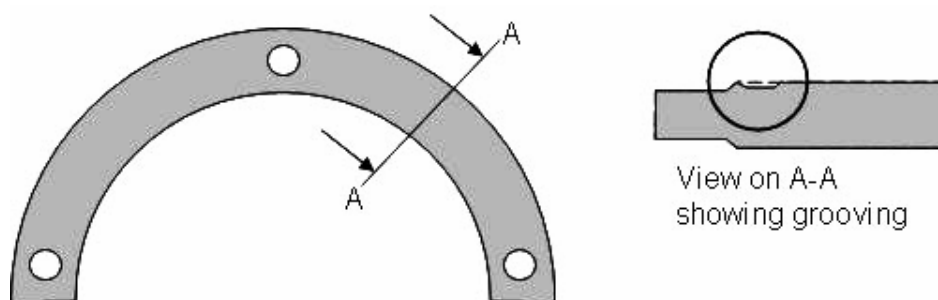


Figure 1: Grooving Damage to Rear Cover Plates

The following are unacceptable:

- 5.1 Wear or grooving on the bearing abutment face above 0.2mm, see Figure 1. It is permissible to reverse the cover plate and use the opposite side if this is not worn or damaged.
- 5.2 Grinding marks or reclamation of the faces outside of the drawing requirements.
- 5.3 Gaps greater than 0.25mm between the bearing abutment face and a flat surface.

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Axlebox Covers- Examine

UA 0146

Arising Work

1,3,4 Renew front cover (Cat No. 064/000077) if any of the following are found:

- a) dents or other damage,
- b) grooves on sealing face,
- c) or it fails flatness test.

3. Carefully remove burrs with a smooth file.

1,3. Renew WSP cover plate (revised design) BR Drg 9001083/05 (Cat No. 097/006526).

5. Renew the split rear cover (Cat No. 018/017375) if it fails any of the acceptance criteria.

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Axlebox – Overhaul

UA 6906

This job description is arranged as follows:

- Part A: Identification and Reclamation Status
- Part B: Cleaning
- Part C: Examination of Axlebox Body
- Part D: Renewal of Pivot Bush
- Part E: Examination of Lateral Control Rod Spigot
- Part F: Painting

The Arising Work is given within each part.

Part A: Identification and Reclamation Status

Scheduled Work

- A.1 This examination criteria applies to axleboxes manufactured to Drg No. PB-C0-2100875 or reclaimed in accordance with Axlebox Reclamation Procedure No. PB/TP1220. All axleboxes to this standard are identified with a painted green square on the body located between the pivot bush and axle centre line, in addition there is a unique serial identification No adjacent to the primary damper mounting, see Drg No. PB-C0-2100875 for details.

Arising Work

- A.1 All axleboxes, which do not comply with the above requirements, shall be reclaimed in accordance with Axlebox Reclamation Procedure No. PB/TP1220.

Part B: Cleaning

Scheduled Work

- B.1 Clean the axlebox using a steam lance, hot caustic bath, solvent cleaners, paraffin or white spirit to remove external dirt and any grease or debris from the axlebox and in the bearing bore. Further cleaning using grit blasting may be used providing the bearing bore and spigot are suitably protected.
- B.2 Tapped holes are to be protected and all dirt and debris is to be removed.
- B.3 After cleaning and drying the machined surfaces shall be coated with machine oil (Cat No. 027/018002), to prevent any corrosion developing whilst stored awaiting examination.
- B.4 The storage area shall be inside a building which is heated during the winter, and shall be always clean, dry and free from condensation. Damage shall be prevented by providing suitable racks as necessary.

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Axlebox – Overhaul

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Part C: Examination of the Axlebox Body

Scheduled Work

- C.1 Visually examine the axlebox body for cracks, distortion or other evidence of damage likely to be detrimental to the integrity of the structure.
- C.2 Measure the bearing bore. The bore shall be measured in two positions 90° apart i.e. 4 individual readings as indicated in Figure 1. The following inspection criteria shall apply:

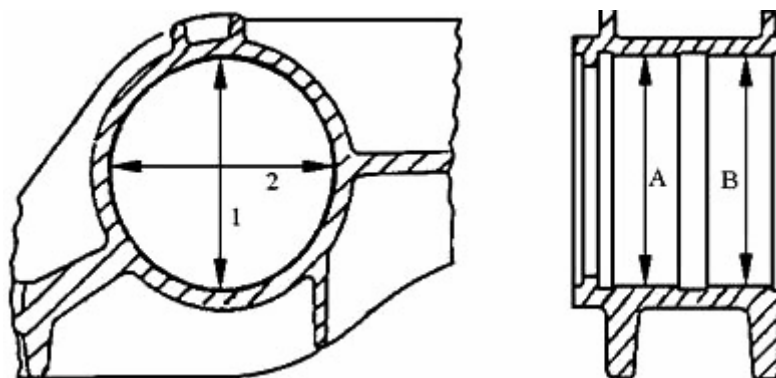


Figure 1: Checking Bore of Bearing Housing

- C.3 No individual dimension shall be greater than 195.35mm.
- C.4 Remove any remnants of gasket material and examine machined surfaces for front and rear cover plates. Any burrs, raised areas or indentations are unacceptable.
- C.5 Examine all tapped holes to ensure that the threads are intact and free from damage and debris in the bottom of the hole.
- C.6 Check that threads in the five M10 and six M16 holes are at least 25mm deep.
- C.7 Check that chamfer 1mm x 45° exists in each tapped hole.
- C.8 Measure the axlebox bore depth from the rear face at four positions equi-spaced. See Dimension 'A' on Figure 2. Dimension 'A' shall not exceed 133.525mm at any of the four positions.

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Axlebox – Overhaul

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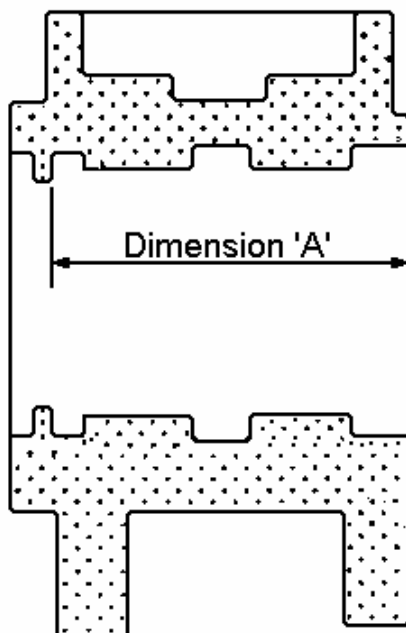


Figure 2: Axlebox Bore Depth

Arising Work

- C.1 Renew axlebox if bent or damaged beyond repair (Cat Nos. 064/007776 Right Hand and 064/007775 Left Hand).
- C.1 If cracks are suspected, the extent shall be verified by use of a non-destructive method of examination, such as magnetic particle testing.
- C.1 Any cracks found shall be reported to the Engineer. No repair shall be attempted unless the Supplier agrees the procedure with the Engineer.
- C.3, If an axlebox fails any of the rejection criteria it shall be reclaimed in accordance with
- C.8 Axlebox Reclamation Procedure No. PB/TP1220.
- C.4 Remove burrs with suitable hand tools. Remove indentations in accordance with a procedure prepared by the Supplier which has been agreed with the Engineer.
- C.5 Repair damaged/tapped holes using helical coiled inserts which shall be fitted using the manufacturers current instructions and tools as follows:
 - 1. M16 hole for earthing strap
This hole shall be drilled and tapped through with the appropriate diameter tools and the insert fitted until slightly below the surface. (Cat No. 035/0160525 M16x25).

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Axlebox – Overhaul

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2. M16 hole around axle bore
This shall be drilled 30mm deep and tapped 25mm deep (min) using the appropriate diameter tools and the insert fitted until slightly below the surface. (Cat No. 035/160525 M16 x 25).
3. M10 hole around axle bore
This shall be drilled 30mm deep and tapped 25mm deep (min) using the appropriate diameter tools and the insert fitted until slightly below the surface. (Cat No. 035/160360 M10 x 25).

C.6 If the tapped depth is less than 25mm deep, check that drilled hole is at least 30mm and tap hole to correct depth. If drilled hole is less than 30mm, repair in accordance with C.5 as required.

C.7 Machine 1mm x 45° lead chamfer.

Part D: Renewal of the Pivot Bush

Scheduled Work

D.1 Renew pivot bush as follows:

D.1.1 Remove pivot bush and discard. See Figure 3 and Section 5 for removal mandrel size details.

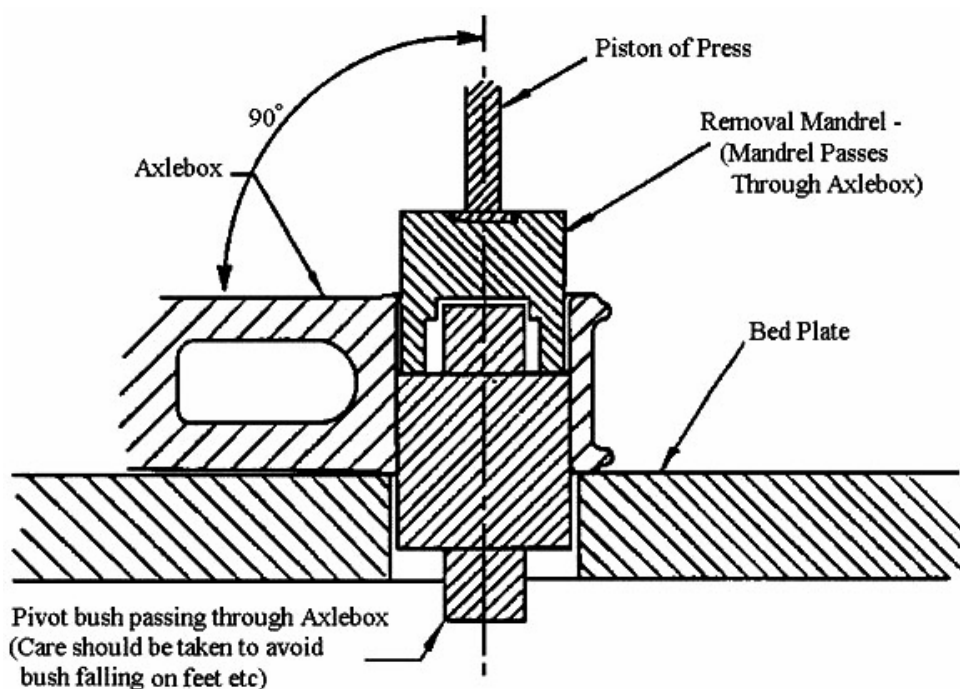


Figure 3: Removal of Axlebox Pivot Bushes

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Axlebox – Overhaul

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- D.1.2 Examine the pivot bush bore for scoring and metal pick up. Displaced material can be removed using a round file and fine grade abrasive cloth.
- D.1.3 Measure the pivot bush bore. The bore shall be measured in two positions (see Figure 4) 90° apart, 10mm in from each end. All measurements shall fall within 128.00 to 128.06mm

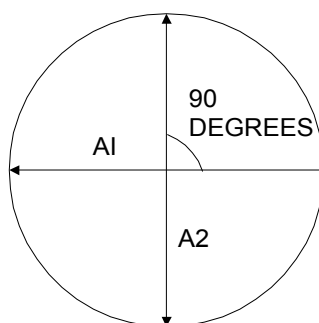


Figure 4: Checking Pivot Bush Bore

- D.1.4 Fit new pivot bush as follows:

See Drg No. PB-C0-2100875.

- D.1.4.1 Lubricate the pivot bore and new bush using machine oil (Cat No. 027/018002.)

- D.1.4.2 Safely support and secure the axlebox.

- D.1.4.3 Place the pivot bush (Cat No. 064/006047) on the axlebox pivot bore and orientate as shown on Drg No. PB-C0-2100875. The bush shall be pressed in until its outer housing end face is flush with the axlebox rear datum face B.

- D.1.4.4 Locate the "fitting" mandrel over the bush. (For typical designs of mandrel see Section 9). Ensure that the pivot bush, mandrel, piston of press and axlebox pivot bore are all in-line and apply a steady load to push the bush into the bore. Record the force to press the bush into the bore, this shall exceed 10 tonnes.

- D.1.4.5 If the force required to insert the bush was less than 10 tonnes, remove the bush and investigate cause by rechecking the pivot bush bore. If the bore conforms to the limits in Item D.1.3 reject the bush.

- D.1.4.6 After pressing check that the orientation of the bush conforms to the drawing requirements. If incorrect rectify by removing and re-fitting.

- D.1.4.7 After insertion, a test force of 4 tonnes shall be applied to the bush in both axial directions. No movement is permissible.

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Axlebox – Overhaul

UA 6906

Arising Work

D1.3 Reclaim the axlebox in accordance with Axlebox Reclamation Procedure No. PB/TP1220.

Part E: Examination of Lateral Control Rod Spigot

Scheduled Work

- E.1 Clean and degrease body and M24 threads of spigot. Examine for damage and wear.
- E.2 Examine back nut M30 and spigot for evidence of loosening and fretting wear. This may appear as gaps or rust marks. Apply a torque of 400Nm to the M30 nut and check there is no movement.
- E3 Check that the distance from the shoulder to the end of the spigot is at least 52mm (see Figure 5).

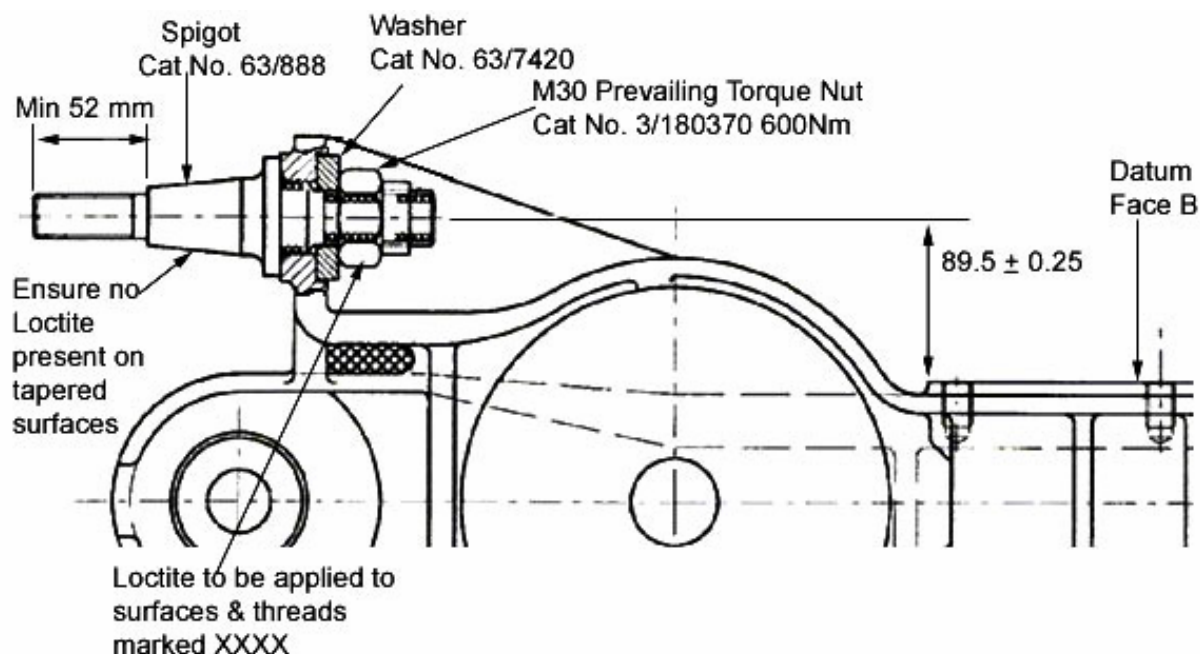


Figure 5: Lateral Control Rod Spigot

- E.4 Measure the position of the centre line of the spigot in relation to the axle box rear face datum 'B', see Figure 5. The lateral offset shall be within 89.5 ± 0.25 mm.

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Arising Work

- E.1 If spigot fails any of the criteria specified in E.1, E.2 and E.3. Renew LCR Spigot as follows:
- E.1.1 Remove the lateral control rod spigot pin and discard. To assist in the removal, the assembly may be heated locally to 150°C to reduce the strength of the Loctite adhesive, or it may be removed by oxyfuel gas cutting. Note care must be taken to prevent damage to the axlebox whilst cutting. Axleboxes shall be scrapped if any damage is sustained whilst cutting.
 - E.1.2 Measure the lateral control rod spigot mounting hole. If the diameter exceeds 40.05mm at any point, reclaim the axlebox in accordance with Axlebox Reclamation Procedure No. PB/TP1220.
 - E.1.3 Fit new spigot (Cat No. 063/000888) as follows:
 - E.1.3.1 Degrease contact surfaces of the new spigot pin and axlebox and the M30 nut (Cat No. 003/180370).
 - E.1.3.2 Apply Loctite 2701 adhesive (Cat No. 007/056158) to the spigot pin only over the M30 thread and contact surfaces, see Figure 5.
 - E.1.3.3 Insert the spigot in the axlebox housing and rotate the pin to ensure even spreading of the adhesive.
 - E.1.3.4 Fit a new washer (Cat No. 063/007420) and M30 nut. Torque tighten the M30 nut to 600Nm.
 - E.1.3.5 After tightening, remove all surplus Loctite from spigot and axlebox surfaces before handling.
 - E.4 If the position of the spigot is outside the limits specified, the axlebox shall be reclaimed in accordance with Axlebox Reclamation Procedure No. PB/TP1220.

Part F: Painting

Scheduled Work

- F.1 Mask off mating faces and paint in accordance with the requirements specified on Drg No. PB-C0-2100875 or ATC-C0-2202004.

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Anti-Roll Bar Link - Overhaul

UD 5789

Scheduled Work

1. Examine link for corrosion, wear or damage. See Figure 1 for minimum thickness.

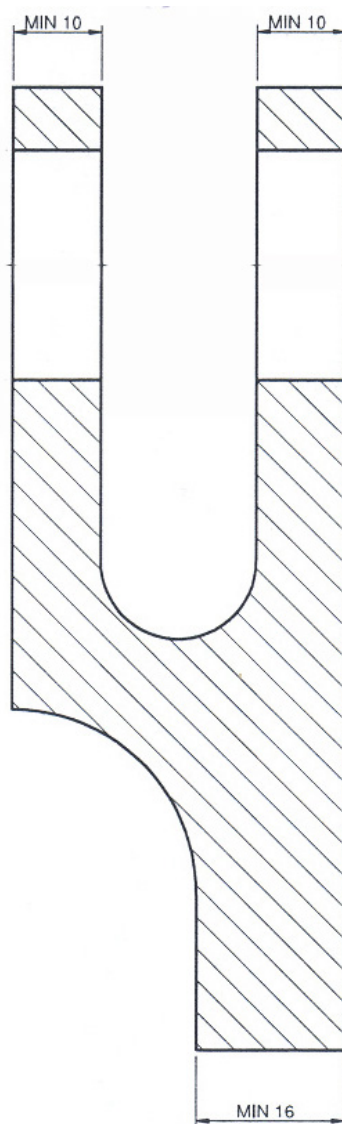


Figure 1: Thickness Limits for Stem and Fork Ends

2. Check that the gap between the fork ends is 21mm minimum.
3. Remove and scrap all bushes except the steel bushes in improved design.
4. Measure the bores for the steel bushes removed in Step 3.
5. For original design renew all bushes (Cat No. 097/000052).

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Anti-Roll Bar Link - Overhaul

UD 5789

- For improved design gauge the steel bushes. Maximum acceptable diameter 22.3mm.
- Renew resilient bush (Cat No. 064/000009).

Arising Work

- Renew anti-roll bar link if beyond repair, or corroded below thickness limits.

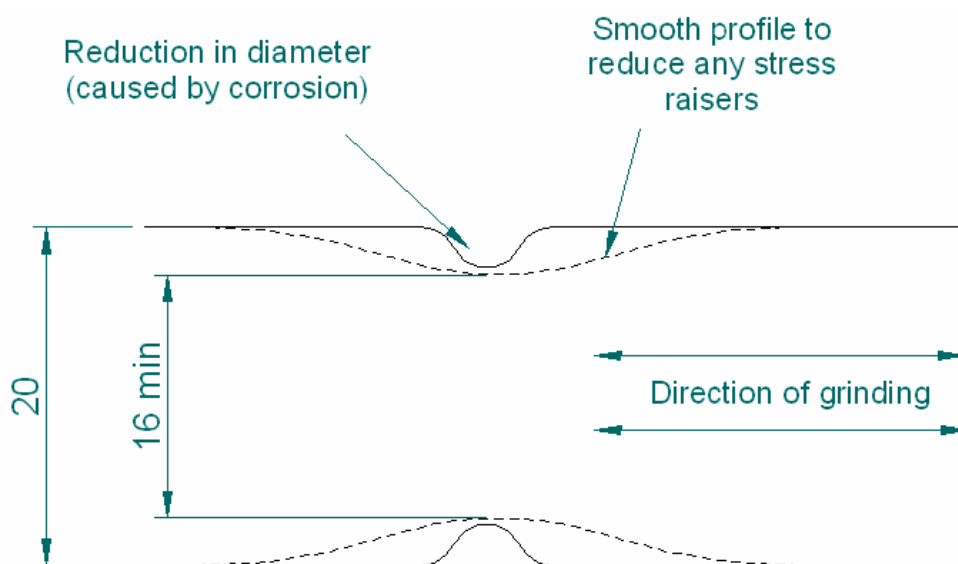


Figure 2: Grinding Guidelines for Treating Corrosion Pits

- Correct gap in accordance with a procedure agreed with the Engineer.
Treat any pits caused by corrosion in accordance with Figure 2.
- If link is to be fitted to anti-roll bar of original design and the bore for the steel bush exceeds 28.033mm, reclaim anti-roll bar link in accordance with Welding Procedure MG 805 and MG 806. See pages 14 and 15 of Section 6. (Dimensions to be taken from Drg No. B1-A2-9015069).
- If link is to be fitted to anti-roll bar of improved design and the bore for the steel bush exceeds 31.150mm, reclaim anti-roll bar link in accordance with Welding Procedure MG 805 and MG 806. See pages 14 and 15 of Section 6.
- Renew steel bushes Part No. 2105261-04 or 2210064-04. These should be 13mm long (see current issue of PB-C1-2105651 and ATC-C0-2210064) and must not protrude into the space between the forks.

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Hydraulic Dampers - Change

UD 6933

Scheduled Work

1. Change primary dampers (4 per bogie) (see Note).
2. Change lateral dampers (one per bogie) (Cat No. 064/000528).
3. Overhaul in accordance with CR/PE0110.
4. Renew rubber mounting pads on primary dampers (4 per damper).

NOTE: Alternative primary dampers are available

Original Woodhead	Cat No. 098/000012
Woodhead Enhanced by Sabrerail	Cat No. 098/072548
Pegasus 9033	Cat No. 072/071311

The type to be fitted to be agreed with the Engineer.

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	BT10 Bogie	

Anti-Roll Bar Assembly - Overhaul

UD 6940

NOTE 1: Identify whether the Anti-roll Bar is of the original design (see Part 1) with straight arms, or of the improved design with cranked arms (see Part 2).

If original design carry out Part 1.

If improved design and bearing housings have no yellow paint carry out Part 2 (Examination).

If improved design and bearing housings have yellow paint carry out Part 3 (Overhaul).

Part 1 - Scheduled Work

- 1.1 Remove bearings from bearing housings or from spindles of anti-roll bar.
- 1.2 Remove and scrap bushes from arms.
- 1.3 Examine anti-roll bar for evidence of a white stripe 25mm wide. If present, examine the bar as detailed in steps 4 and 5 below. If not present, renew the bar.
- 1.4 Clean and crack detect the anti-roll bar using magnetic particle, or similar technique agreed with the Engineer. Test the whole length, checking for longitudinal cracks.
- 1.5 Visually examine the anti-roll bar and the arms for straightness and damage.
- 1.6 Measure diameter of trunnions (see Table 1).
- 1.7 Examine bores for steel bushes for signs of wear.
- 1.8 Renew steel bushes (Cat No. 097/000117).
- 1.9 Check that bearing housing is of "4 hole" design.
- 1.10 Examine bearing bore for signs of wear.

Step No	Feature	Dimensions
1.6	Trunnion Diameter	29.966 to 29.991
1.7	Bores for steel bush	28.000 to 28.033
1.10	Bearing Housing	66.003 to 66.076

Table 1: Dimensions for Anti-Roll Bars

- 1.11 Examine housing for other defects and damage.
- 1.12 Assemble new bearing (Ampep 7793P or Rose MAC 30B (Cat No. 064/002708) in each housing as follows:
 - (a) Use a brush to spread Loctite 2701 (Cat No. 007/056158) thinly over the bearing outer face and housing bore. Keep Loctite out of the bearing. Use a dry cloth to remove surplus Loctite.

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Anti-Roll Bar Assembly - Overhaul

UD 6940

- (b) Assemble the bearing into the housing.
- (c) Check that the bearing outer face makes contact with the location lip.
- (d) Leave the assembly for 15 minutes to achieve handling strength.

1.13 Assemble anti-roll bar to bearings, as follows:

NOTE 2: Care must be taken at all times to keep Loctite out of the bearings. Use a brush to spread the Loctite thinly over the contact areas. Use a dry cloth to remove surplus Loctite.

- (a) Apply Loctite 2701 to each trunnion and bore of Rose Bearing and assemble.
- (b) Check that each bearing has seated against the trunnion shoulder.

1.14 Leave the assembly for 15 minutes to achieve handling strength.

1.15 Paint the anti-roll bar assembly as follows. Take care not to contaminate the bearing assemblies with paint

- 1.15.1 Clean and degrease using cleaning fluid to (Cat No. 007/007186) or approved alternative.
- 1.15.2 When dry, the assembly shall be coated within 1 hour of cleaning with one coat of anti-corrosion primer in accordance with CR/PE0102 followed by a further paint in accordance with the same specification.

NOTE 3: In the event that an Anti-Roll bar is renewed, a white stripe 25mm wide must be painted in the mid-point of the new bar. If the anti-roll bar is reused, the white stripe should have been painted out.

NOTE 4: It is permissible for the Supplier to remove the arms from a bar which is to be scrapped, and then to re-use the arms on the new bar. The Supplier must agree the procedure to be used for the welding of the arms to the new bar with the Engineer. The re-used arms must be examined in accordance with the Scheduled Work element above.

Arising Work

- 1.3, Renew anti-roll bar if no evidence of White Stripe, or if cracked, or if damaged beyond repair.
- 1.4,
- 1.5
- 1.6 Reclaim anti-roll bar trunnions as follows:

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	BT10 Bogie	

Anti-Roll Bar Assembly - Overhaul

UD 6940

1.6.1 Build up the trunnion in accordance with WPS MG 800 (see page 9 of Section 6) such that there is enough weld metal deposited to allow the trunnion end to be machined back to the dimension in Table 1.

1.6.2 Machine the trunnion to restore it to the limits in Table 1.

1.7 If wear visible, measure diameter see Table 1. If outside limits, machine the bush housing to the next smallest suitable bore diameter in accordance with Drawing No. PB-C0-2103813. Fit new bushes manufactured and fitted in accordance with same drawing.

1.9, Renew anti-roll bar housing if it is "3-hole" design, or is beyond repair.

1.10,

1.11

NOTE 5: If changing from 3 hole to 4 hole bearing housing, additional holes will be required in bolster. See Drg No. C-A1-9217.

Part 2 – Scheduled Work

NOTE 6: This work is to be carried out with the anti-roll bar links removed and the bearing housings still attached to the bolster.

2.1 Examine the roll bar and arms for damage and distortion.

2.2 Gauge the steel bush in each arm. Maximum acceptable diameter 22.3mm.

2.3 Check the amount of movement in the bearings. Maximum acceptable 0.3mm.

2.4 Examine the resilient bush for signs of distress such as de-bonding, hardening and cracks.

2.5 Paint the bearing housings yellow.

Part 2 – Arising Work

2.1, Carry out Part 3 Full Overhaul.

2.3,

2.4

2.2 Renew the bushes in accordance with Steps 3.3.2, 3.3.3 and 3.3.4.

Part 3 – Scheduled Work

3.1 Remove bearing housings from the anti-roll bar.

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Anti-Roll Bar Assembly - Overhaul

UD 6940

3.2 Overhaul the bearing housings as follows:

3.2.1 Remove collared bush and resilient bush from each bearing housing (see Figure 1) and scrap.

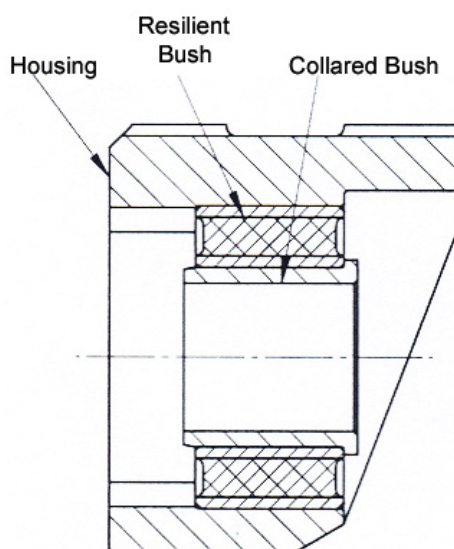


Figure 1: Section of Bearing Housing

3.2.2 Examine housing for other defects and damage.

3.2.3 Examine bearing bore for signs of wear. If wear is visible measure diameter. Limits are 78.000 to 78.030mm.

3.2.4 Renew bearings in each housing as follows:

- a) Press fit collared bush (Part No. 210/5261-02 or 221/0064-02) into inner liner of resilient bush (Ferrabyrne Part No. SKX 003 094 000).
- b) Press fit a bush assembly into each housing, checking that the bush assembly conforms to Figure 1.

3.3 Renew the anti-roll bar assembly (Part No. 221/006101 or 210/525801) or renew the torsion bar (Part No. 221/006102 or 210/525802) by removing the arms from the old bar.

The Supplier must agree the procedure to be used for the welding of the arms to the new bar with the Engineer. The re-used arms must be examined and overhauled in accordance with steps 3.3.1 to 3.3.4.

3.3.1 Examine the arms for straightness and damage. See Figure 2 for shape of arms.

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	BT10 Bogie	

Earth Leads – Examine

UE 0611

Scheduled Work

1. Examine leads (2 per bogie) for damage and fraying.
2. Check end fixings are secure.

Arising Work

- 1,2. Renew earth lead (Cat No. 018/017567).

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	BT10 Bogie	

Frame Identification Plate – Examine

UF 0201

Scheduled Work

1. Examine frame identification plate to ensure that it is fitted, undamaged, legible and correctly coded as follows:

Line 1 to show "BT10", followed by:

Firstly one of three letters:

'A' for a frame with a bolted-on fabricated lateral control rod spigot mounting.

'B' for a frame with a welded-in cast lateral control rod spigot mounting.

('S' for a frame to the heavy duty specification required for certain special vehicle applications not covered by this instruction).

Secondly: a blank or 'H' for a frame drilled to accept hydraulic parking brake equipment.

Line 2 will be the unique bogie frame serial number (up to 4 digits).

Arising Work

1. Re-stamp illegible or incorrectly coded frame identification plates in accordance with item 1.
1. Renew defective plates or those which cannot be restamped (see Drg No. B2-A2-8700232), and stamp coding in accordance with item 1.

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Bogie Variables Identification Plate – Fit

UF 0202

Scheduled Work

1. Fit a plate to Drg No. B2-A2-8700232, which shall be stamped with information relevant to the overhauled bogie as follows:

Position of Letter/Number	Meaning of Letter
1st Space	P for packers fitted under swing link head - leave blank if not fitted NOTE: These Packers MUST be fitted in accordance with Section 3.3 Step 3.
2nd Space	Leave blank
3rd Space	WSP type, as follows: S for Girling self powered G for Girling coach powered B for BR W for Westinghouse
4th Space	Wheel profile, as follows: 8 for P8 P for RD9
5th Space	Type of brake pad holder G for Lucas Girling B for BRB UIC pad
6th Space	Type of swing link L for long S for short
7th Space	H if handbrake fitted Leave blank if not fitted
8th and 9th, after the Oblique Sign	2 numbers as per job US 6909 Table 2, according to vehicle type and position
2nd Line	Date of last overhaul e.g. STD12/93 = Standard Dec 1993

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	BT10 Bogie	

Axle Box Pivot Brackets – Align

UFA0218

Part A: Removal of Secondary Traction Rod Brackets, Axlebox Pivot Brackets and Bearer Plates

Scheduled Work

- A1. Remove the secondary traction rod brackets, the axlebox pivot brackets and bearing plates as follows:
- A1.1 Identify the position of each bracket and bearing plate, with the bogie serial number and bracket position by stamping as shown in Figure 1.

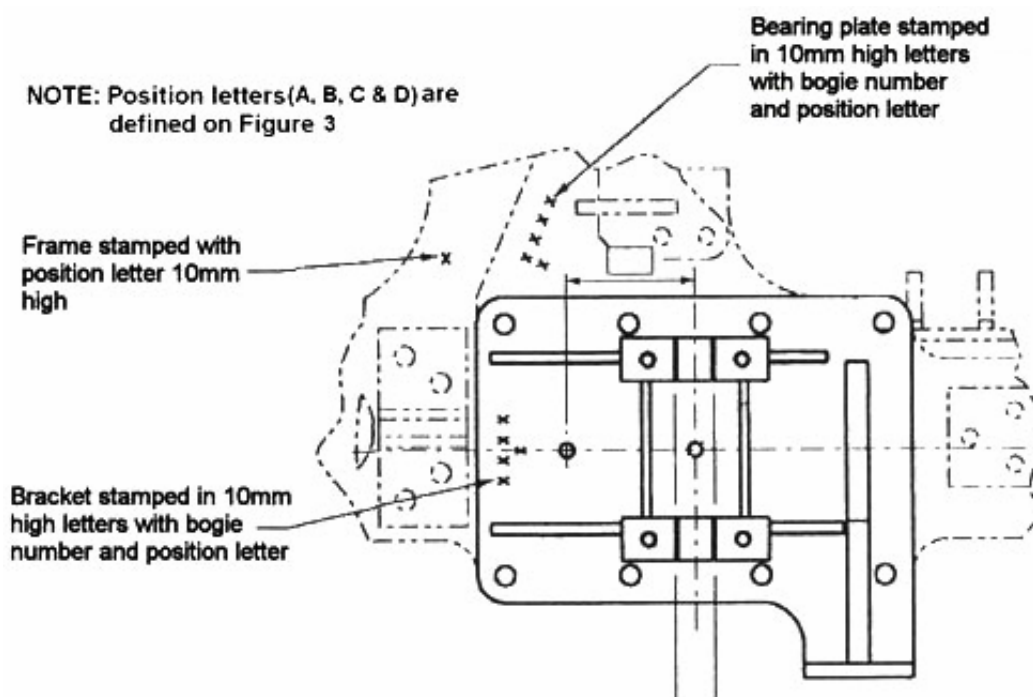


Figure 1: Method of Marking Brackets and Bearer Plates

NOTE 1: This is to ensure that the brackets are refitted in the same position. This is particularly important for the bearing plates as these were fitted and machined flat as part of the original frame machining and are therefore unique to each position.

- A1.2 Remove all of the bolts retaining the brackets and bearing plates and discard.
- A1.3 If the brackets have been previously fitted with dowels, remove the dowels.

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Axle Box Pivot Brackets – Align

UFA0218

Part B: Examination of Brackets and Bearer Plates

Scheduled Work

- B1. Clean and examine all surfaces of the brackets in accordance with Job UF 5010 Part E.
- B1.1 Check for localised corrosion around the fixing holes (see Figure 2). A minimum bearing area of Ø25mm shall exist around all fixing holes. No erosion is permitted in this area.
- B2. Clean and examine the bearer plates as follows:
- B2.1 Remove all rust and debris by shot blasting.
- B2.2 Press each bearer plate flat to within 0.5mm over the whole machined surface, neglecting localised corrosion pitting.
- B2.3 Check for localised corrosion around the fixing holes (see Figure 2). A minimum bearing area of Ø25mm shall exist around all fixing holes. No erosion is permitted in this area.

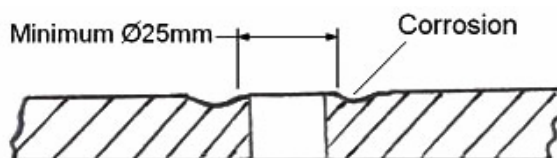


Figure 2: Corrosion Around Fixing Holes in Bearer Plate

NOTE 2: See Job UF 5010 Part B3 for examination of bogie frame when bearer plates are removed.

Arising Work

- B1.1, Restore original thickness by welding and spot facing in accordance with procedure agreed B2.3 with Engineer. Surface finish 3.2 micrometres CLA to BS 1134.

Part C: Refitting the Bearer Plates, Secondary Traction Rod and Axlebox Pivot Brackets

Scheduled Work

- C1. Overview

The four axlebox pivot brackets shall be refitted to their original positions according to the stamped identification marks. The pivot bush brackets shall be aligned in accordance with Step C2.

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Axle Box Pivot Brackets – Align

UFA0218

Alignment shall be undertaken using a procedure approved by the Engineer. This shall include a demonstration verifying that the requirements of C2 can be reliably obtained. The whole procedure shall be completed within 3 hours, whilst the primer in the interfaces remains wet. All fixing bolts shall be fitted and fully torque tightened in this time.

C2. Explanation of the required alignment geometry (see Figure 3):

C2.1 Establish datum lines E, F, G and H:

- Establish the lateral bogie centre line, which is to be derived from the inside faces of the bogie side frames.
- Datum lines E and F are to be parallel to the lateral bogie centre line and 1016mm from it.
- Check that Datum line E is within 0.5mm of the centre lines of the LCR spigots. The LCR spigot location tapers shall be used to define their centre lines (see Figure 5).

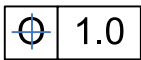
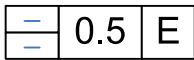
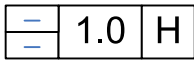
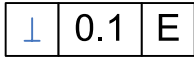
Step and Figure No. References	Geometric Symbol	Definitions
C2.1 (c) Figure 3	 1.0	1016 + 0.5mm from Lateral Bogie Centre Line
C5 (a) and (b) Figure 3	 0.5 E	Centre of bracket is within 2 parallel lines 0.5mm apart (i.e. + 0.25mm) centred on Datum Line E
C5 (c) and (d) Figure 3	 1.0 H	Centre of bracket is within 2 parallel lines 1.0mm apart (i.e + 0.5mm) centre on Datum Line H
C5 (e) Figure 6	 0.1 E	At right angles to Datum Line E, within two parallel lines 0.1mm apart measured over a distance equal to the width of the bracket.

Table 1: Key to Geometrical Tolerances on Figures 3 and 6

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Axle Box Pivot Brackets – Align

UFA0218

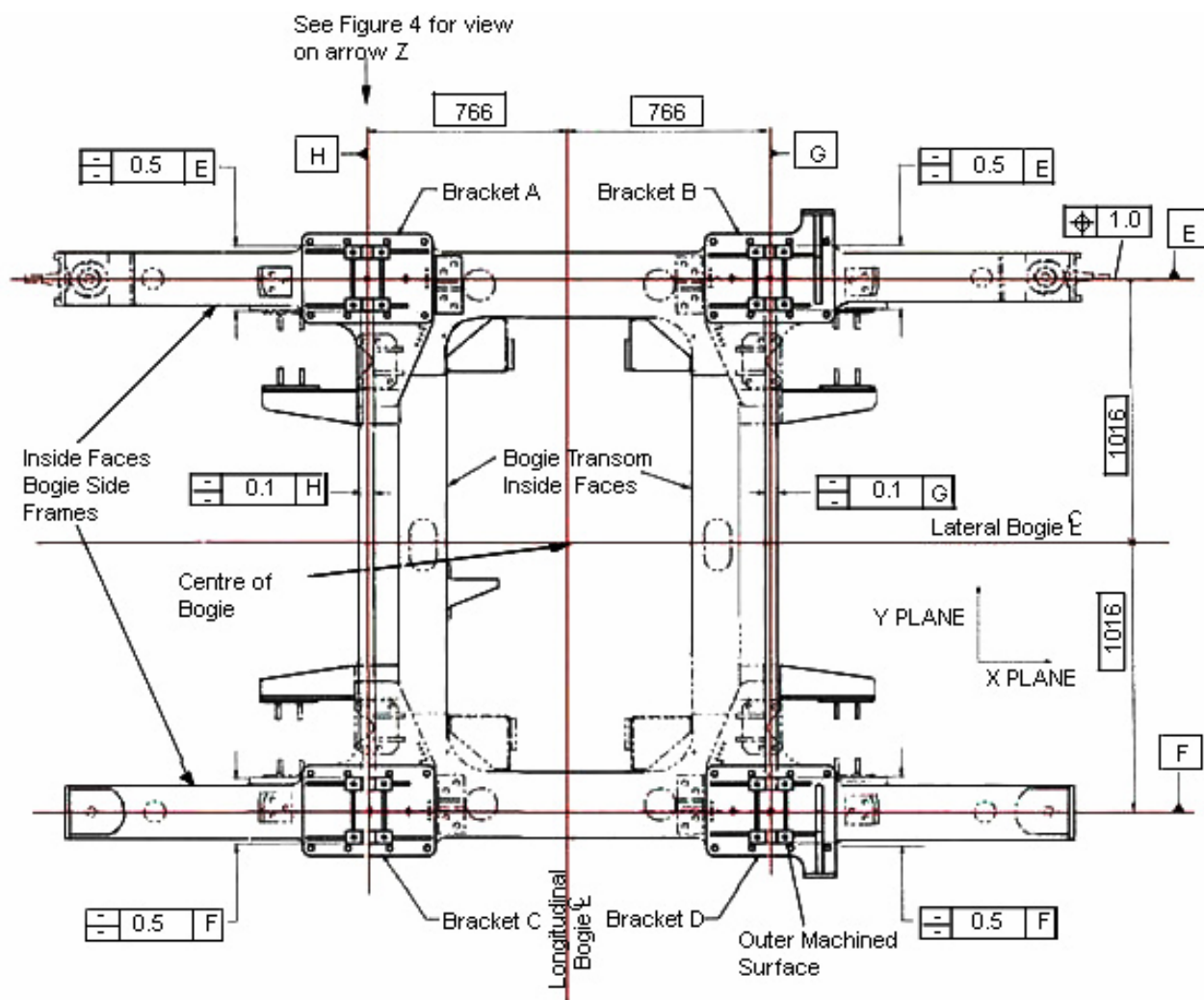


Figure 3: Alignment of Axlebox Pivot Brackets (View on Underside of Bogie Frame)

- d) Datum lines G and H shall be spaced 766mm from the longitudinal centre line of the bogie and parallel to it. The centre line shall be derived from the inside faces of the bogie transoms.

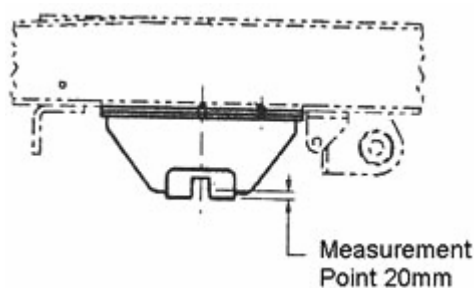


Figure 4: View on Arrow Z

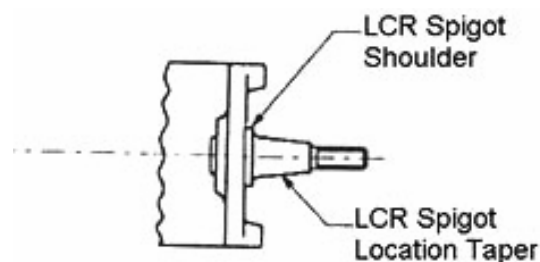


Figure 5: View of Typical Frame End Spigot

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Axle Box Pivot Brackets – Align

UFA0218

C2.2 The measurement points on the axlebox pivot brackets shall be:

- The outer machined faces in the Y plane (see Figure 6).
- The midpoint of the tapered location slots, 20mm from the bottom face (see Figure 4).

Dowels are to be $\varnothing 16.029$ (p6)
16.018
x 45mm long $+0.5$
 -0.0
Steel to BS1804
Part 2 Grade 1

2 Holes Drilled & Reamed Through
16.018 (H7)
 $\varnothing 16.000$
Chamfered 0.5mm & Surface Finish N7 (Typ
4 Positions)

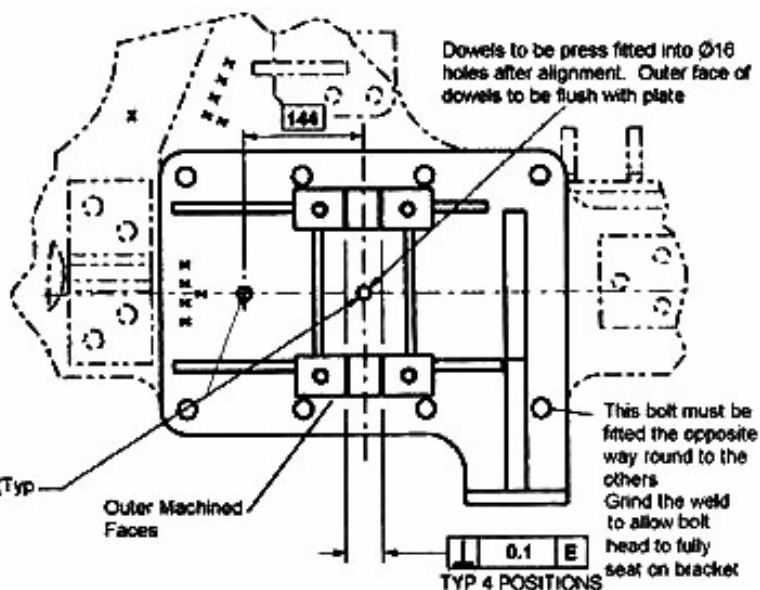
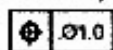


Figure 6: Location of Axlebox Pivot Brackets

C3. Fit the bearer plates as follows:

C3.1 The four bearing plates shall be refitted to their original positions, according to the stamped identification marks (see Figure 3).

C3.2 New bolts, nuts and washers shall be fitted.

C3.3 Where new bearing plates are fitted, all four shall be machined in accordance with Drawings B-S-691 and B-S-780, when fitted to the bogie without paint. They should be removed after machining.

C3.4 Apply one coat of Anti Corrosive Primer, thinned by approximately 20%, by hand to the frame and bearing plate interfaces.

C3.5 Place all four bearing plates in correct position by aligning the existing 22mm dia holes and using temporary 22mm dowel pegs.

C3.6 Ensure excess paint is removed from bolt holes to prevent transfer onto bolt threads which will cause bolts to be overloaded when correct torque applied.

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Axle Box Pivot Brackets – Align

UFA0218

C3.7 Fit four M16 x 45mm grade 8.8 csk bolts (Cat No. 035/106677) and grade 8 prevailing torque nuts (Cat No. 003/180340) to each plate and tighten to 250Nm. Ensure that the bolt threads are clear of paint.

C4. Prepare the brackets as follows:

- a) Clean excess paint from bracket interface using solvent.
- b) Apply one coat of Anti Corrosive Primer, thinned by approximately 20%, by hand to the bearing plate and bracket interfaces, ensuring correct orientation of bracket (note brackets are handed).
- c) Identify and locate each bracket according to the identification marks made in Part A (see Figure 3).
- d) Fit two bolts M20 x 70mm grade 8.8 hex head bolts (Cat No. 003/101190) with washers under the nuts and grade 8 prevailing torque nuts (Cat No. 003/180350), positioned diagonally on the inner bolt holes. The bolt heads shall be on the frame side. Hand tighten only.

C5. Locate the axlebox pivot brackets as follows:

- a) Position brackets A and B in the Y plane, equispaced about Datum line E, within a tolerance of +0.25mm.
- b) Position brackets C and D in the Y plane, equispaced about Datum line F, within a tolerance of +0.25mm.
- c) Position brackets A and C in the X plane equispaced about Datum line H, within a tolerance of 0.5mm.
- d) Position brackets B and D in the X plane equispaced about Datum line G, within a tolerance of 0.5mm.
- e) The tapered location slots shall be at right angles to Datum line E, within two parallel lines 0.1mm apart, measured over a distance equal to the width of the bracket (see Figure 6).

C6. Finally fit the brackets as follows:

- a) Ensure excess paint is removed from bolt holes to prevent transfer onto bolt threads which will cause bolts to be overloaded when correct torque applied.
- b) Fit nuts, bolts and washers in the remaining 6 hole positions. It may be necessary to locally enlarge holes to allow the bolts to fit.

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Axle Box Pivot Brackets – Align

UFA0218

NOTE 3: The outer bolt adjacent to the traction rod bracket positions shall be fitted with the bolt head on the bracket side (see Figure 6). To ensure correct seating of the bolt head it may be necessary to locally blend the weld adjacent to the hole.

- c) Tighten bolts to 475Nm. A method of opposing torque tightening sequence shall be employed starting from the centre outwards (see Section 4.2c). Under no circumstances is the use of air drives permitted on prevailing torque nuts. Paint a Yellow line on each bolt to identify that the first torque tightening has been completed.
- d) Remove excess paint from the joint interfaces.
- e) Re-tighten all the M20 bracket bolts to 475Nm. A method of opposing torque tightening sequence shall be employed starting from the centre onwards (see Section 4.2c). Paint a Green line on each bolt to identify that the second and final torque check has been completed.
- f) Drill and ream 2 x Ø16mm holes per bracket assembly and fit location dowels as shown on Figure 6. The dowels must be a drive fit and fitted flush with the bracket face.
- g) Seal all bearing plate and axlebox pivot bracket interfaces around the whole periphery with Tigerseal, ensuring there are no gaps. A generous bead of sealant shall be applied and smoothed out to give a large blend radius between the frame and bearing plates.
- h) Unless an approved assembly jig has been used, after final assembly and tightening of the fixing bolts, the alignment of the brackets shall be measured and the results recorded (see Record Sheet page 8.)
- i) Where an approved assembly jig has been used the current calibration date for each bogie shall be recorded.

Item No.	Bracket	Qty	Bolt Size	Cat No.	Qty of Bolts per Bogie	Torque Nm
1	Axlebox Pivot Bracket	2	M20 x 70	3/101190	16	475
2	Secondary Traction Rod Bracket	2	M20 x 70	3/101190	16	475
3	Bearing Plate	4	M16 x 45 CSK Screw	35/106677	16	250

Table 2: Bracket Fixing Details

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Axle Box Pivot Brackets – Align

UFA0218

Record Sheet: Bogie Frame Pivot Bracket Alignment Record Sheet

Bogie Number: _____

Jig Certification

Date of Completion: _____

Certificate No.: _____

Signature: _____

Date: _____

Datums referred to are shown on Figure 3.

Symmetry about Datum Line E (Tolerance $\pm 0.25\text{mm}$)

Bracket A _____

Bracket B _____

Symmetry about Datum Line F (Tolerance $\pm 0.25\text{mm}$)

Bracket A _____

Bracket C _____

Symmetry about Datum Line H (Tolerance $\pm 0.5\text{mm}$)

Bracket A _____

Bracket C _____

Symmetry about Datum Line G (Tolerance $\pm 0.5\text{mm}$)

Bracket B _____

Bracket D _____

Squareness of Brackets Relative to Datum Line E (Tolerance 0.1mm)

Bracket A _____

Bracket B _____

Bracket C _____

Bracket D _____

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Bogie Frame - Examine

UF 5010

This job description is arranged as follows:

	Starts on Page
Part A: Initial Assessment	1
Part B: Cleaning and Corrosion Assessment	2
Part C: Alignment Check on Lateral Control Rod Brackets	5
Part D: Crack Detection	6
Part E: Secondary Traction Rod, Axlebox Pivot Brackets and Bearer Plates	8
Part F: Lateral Control Rod Spigot	10
Part G: Brackets other than Secondary Traction Rod and Axlebox Pivot	11
Part H: Completion	18

NOTE 1: Part A determines whether the axlebox pivot brackets have been re-aligned. If they have not, then they must be re-aligned in accordance with Job UFA0218.

Part A: Initial Assessment

Scheduled Work

A1. Check if the following brackets have been re-located in accordance with Job UFA0218, by the presence of dowels and stamped numbers on the brackets listed below and adjacent bogie frame (see Figure 1).

- Axlebox pivot brackets and bearer plates.
- Secondary traction rod brackets and bearer plates.

NOTE 2: Bogies overhauled by Eastleigh had brackets removed and dowelled but not to the requirements of Job UFA0218. Hence the key criterion in deciding is the presence of stamped numbers.

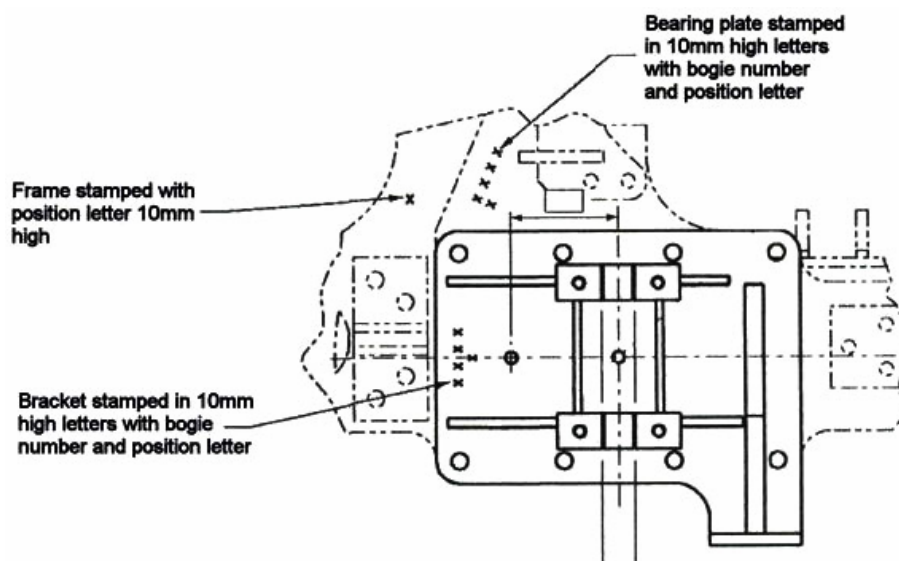


Figure 1: Method of Marking Brackets and Bearer Plates

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Bogie Frame - Examine

UF 5010

- A2. Check that the Engineer has not requested that the alignment of the frame and bearer plates be checked on account of a derailment or other abnormal circumstance.
- A3. Remove any brackets which are corroded or next to corroded areas of the bogie frame.

Arising Work For Part A

- A1. If there is no evidence that the brackets have been relocated as described, remove the brackets in accordance with Job UFA0218 Part A before carrying out Parts B to G inclusive of this job.

Refit the brackets in accordance with Job UFA0218 Part C before Part H of this job.

- A2. If the Engineer advises that the bogie has been involved in a derailment, the frame and brackets shall be checked for alignment and twist in accordance with a procedure, agreed with the Engineer, which should involve the use of a FARO arm or equivalent, to demonstrate the geometry specified in UFA0218 has been achieved.

Part B: Cleaning and Corrosion Assessment

Scheduled Work

- B1. Clean the bogie using the following process.

NOTE 3: All applicable statutory safety regulations shall be observed when performing work to the requirements of this procedure.

B1.1 Prior to shot blasting the bogie shall be stored in a warm dry atmosphere to prevent condensation forming on the metal surface. The frames shall be kept in a similar environment until they are repainted.

B1.2 Protect the lateral control rod spigots, including the threads, by suitable means.

B1.3 Shot blast all areas of the bogie frame using a process approved by the Engineer. The entire bogie frame surface shall be cleaned of paint, corrosion products and other contaminants.

B1.4 Remove all abrasive residues and dust etc from the frame by brushing, compressed air blasting or other suitable means.

- B2. Examine both vertical webs of both transoms for corrosion damage as follows:

NOTE 4: For the purposes of this examination, the vertical web of the transom includes the curved plates connecting the transom with the sideframes.

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Bogie Frame - Examine

UF 5010

A number of distinctly different effects of corrosion have been found on the transom vertical webs which require separate examination requirements as detailed below. If any other corrosion effects are found, which cannot be examined in accordance with the criteria below, advise the Engineer.

B2.1 General Surface Corrosion

This type of corrosion appears as a general loss of thickness of the plate and may vary from small shallow patches a few centimetres across, up to loss of thickness of a large area of the web. The surface may appear coarsely pitted or relatively smooth.

The vertical webs shall first be examined visually, and then the thickness of areas potentially failing the criteria below shall be measured, e.g. with an ultrasonic thickness gauge. If a transom appears to have no significant corrosion, a number of 'spot check' thickness measurements shall be made to check that there has been no overall loss of thickness.

Each transom vertical web shall achieve the following criteria:

B2.1.1 A maximum area of 500cm² (e.g. 25cm x 20cm) may be below 8mm thick.

B2.1.2 A maximum area of 100cm² (e.g. 10cm x 10cm) may be below 7mm thick.

B2.1.3 Within 10mm of the upper and lower weld toe, no material shall be below 7mm thick.

B2.1.4 No material at all shall be below 6mm.

B2.2 Individual Deep Pits

This type of corrosion appears as highly localised fairly deep indentations, usually fairly circular and around 20mm-30mm diameter. The bottom of the pit may be too small to measure its thickness with an ultrasonic probe. In this case the depth of the pit can be measured with a depth gauge and subtracted from the material thickness measured adjacent to the pit to give the minimum plate thickness at the centre of the pit. It is not possible to measure the area of the bottom of the pit and apply the criteria in B2.1 above.

Each transom vertical web shall achieve the following criteria:

B2.2.1 A maximum of 30 pits below 8mm material thickness in the centre of the pit.

B2.2.2 A maximum of 5 pits below 7mm material thickness in the centre of the pit.

B2.2.3 No pits below 7mm material thickness in the centre of the pit, where the centre of the pit is within 10mm of the weld toe.

B2.2.4 No pits below 6mm material thickness in the centre of the pit.

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B2.3 Grooves around the edges of bracket mountings.

This type of corrosion appears as a groove or channel, around 10mm wide, around part or all of brackets mounted on the transom. The trough of the groove is usually fairly smooth. It is not possible to measure the area of the bottom of the groove and apply the criteria in B2.1 above.

Each transom vertical web shall achieve the following criteria:

B2.3.1 A maximum of 50% of the edge length of any bracket mounting below 8mm thickness in the centre of the trough.

B2.3.2 A maximum of 10% of the edge length of any bracket mounting below 7mm thickness in the centre of the trough.

B2.3.3 No material below 6mm thickness in the centre of the trough.

B3. Examine the underside of bogie frame when the axlebox pivot brackets and bearer plates have been removed.

B3.1 Check that bogie frame against which the bearer plates fit has not lost more than 3mm of thickness due to corrosion.

B3.2 Check that in the areas of the welded joint between the transom and side frame has not lost more than 2mm of thickness due to corrosion.

Arising Work for Part B

B2, B3. Any transom or bogie frame failing to meet the above shall be repaired in accordance with a procedure to be agreed with the Engineer.

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Part C: Alignment Checks on Lateral Control Rod (LCR) Brackets

Scheduled Work

- C1. Check that the LCR spigot is horizontal, i.e. parallel to the underside of the bogie side frame, and that the angle between the underside of the bogie side frame and the inner face of the lateral control rod casting is between 85 and 95° (see Figure 2).

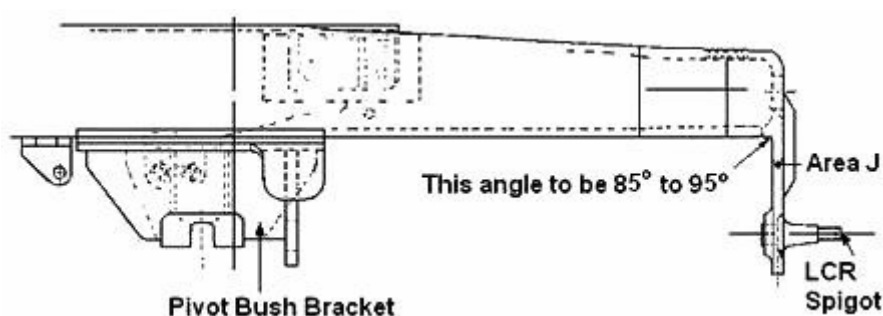


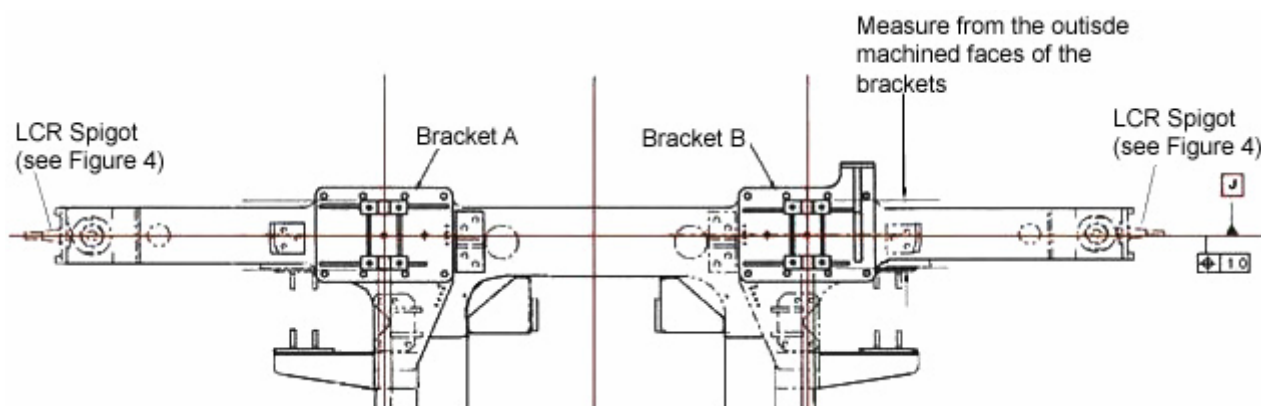
Figure 2: Checking Angle of LCR Bracket

- C2. Check the lateral alignment of the LCR spigots, as follows:

- C2.1 Establish datum line J which is to be the centre line of the axlebox pivot brackets A and B, defined by the mid-point of the outer machined faces of the brackets (see Figure 3).

NOTE 5: See Job UFA0218 Part C for equipment required.

- C2.2 Check that Datum line J is within +0.5mm of the centre line of the LCR spigots. The LCR spigot location tapers shall be used to define their centre lines (see Figure 4).



**Figure 3: Alignment of Axlebox Pivot Brackets
(View on Underside of Bogie Frame)**

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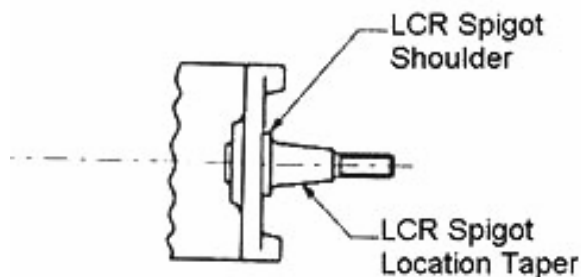


Figure 4: View of Typical Frame End Spigot

NOTE 6: The chief requirement is that the LCR spigot is horizontal. If the angle of the bracket has to be outside the limits to achieve this, the spigot must be renewed in accordance with Part F.

Arising Work For Part C

C1, Re-align the LCR brackets as follows:

C2.

C2.1 Using a propane or oxy-acetylene flame heat the upper part of the bracket to a dull cherry red colour (approximately 700° to 750°C).

Do not exceed the dull cherry red colour or allow the flame to be concentrated in one position.

C2.2 Apply suitable forces to reposition the bracket in accordance with Figures 2 and 3.

C2.3 Allow the LCR bracket to cool naturally in still air.

Part D: Crack Detection

Scheduled Work

D1. On BT10A bogies Crack detect (magnetic particle method) the following areas (see Figure 5):

D1.1 The fabricated frame end at the weld joint attaching the end plate to the bogie frame bottom plate and side plates.

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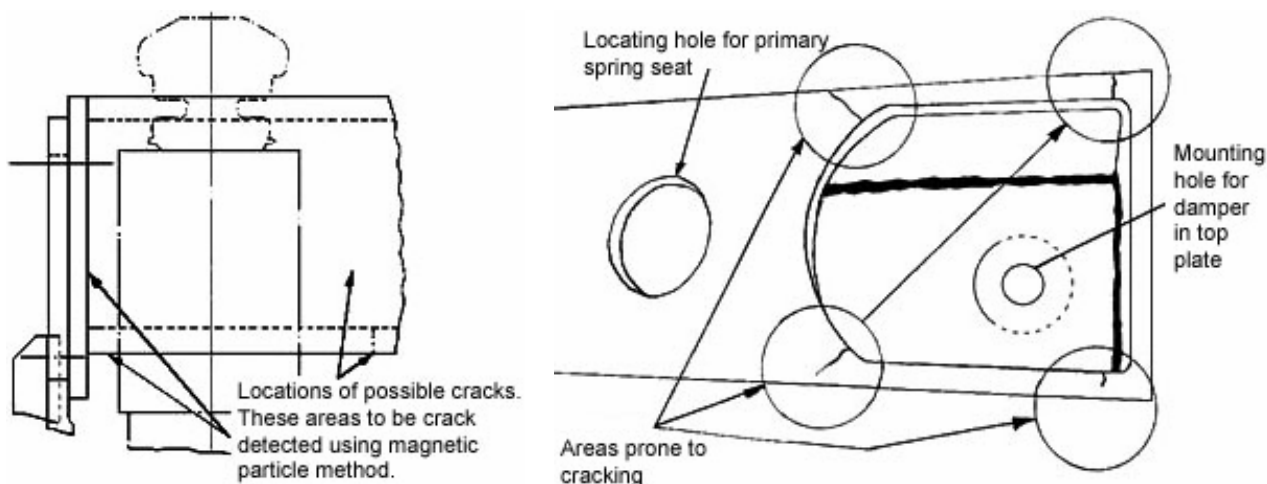


Figure 5: Location of Suspect Areas BT10A Bogies

D1.2 Around the damper hole in bottom plate and side plates and at any existing weld repairs.

The Supplier shall maintain a record of bogie number, crack location and length, and repair date.

D2. On BT10B bogies crack detect (magnetic particle method) the following areas:

D2.1 The underside radius of the lateral control rod casting, see Figure 6 for location of cracks.

D2.2 Around the area of the damper hole in the bottom plate.

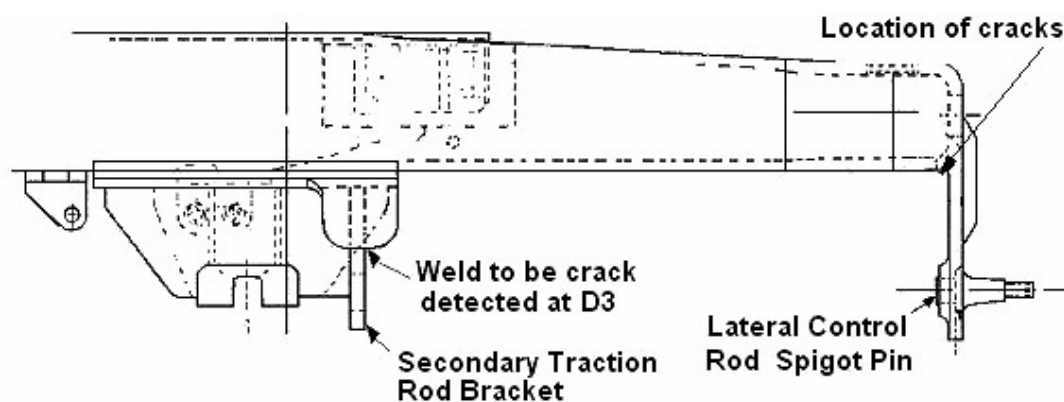


Figure 6: Location of Cracks and Measurements

D3. Crack detect (magnetic particle method) the welds on the Secondary Traction Rod Brackets marked in Figure 3. There are two of these brackets per bogie frame.

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D4. Visually examine all other areas of the bogie for cracks.

Arising Work For Part D

D1, If cracks found, weld fracture and dress off using procedure D2.2, prepared by the Supplier and which has been agreed with the D3 & Engineer.
D4

D2.1 Repair cracks in accordance with Job UFA5562.

Part E: Secondary Traction Rod, Axlebox Pivot Brackets and Bearer Plates

Scheduled Work

E1. Clean the brackets and plates removing all visible corrosion.

E2. Examine the brackets and plates against the original manufacturing drawings, as follows:

- Axlebox Pivot Bracket C-A0-3466
- Secondary Traction Rod Bracket C-A0-8943 and 8944
- Bearing Plate C-A1-3961/1 and 2

Check for distortion.

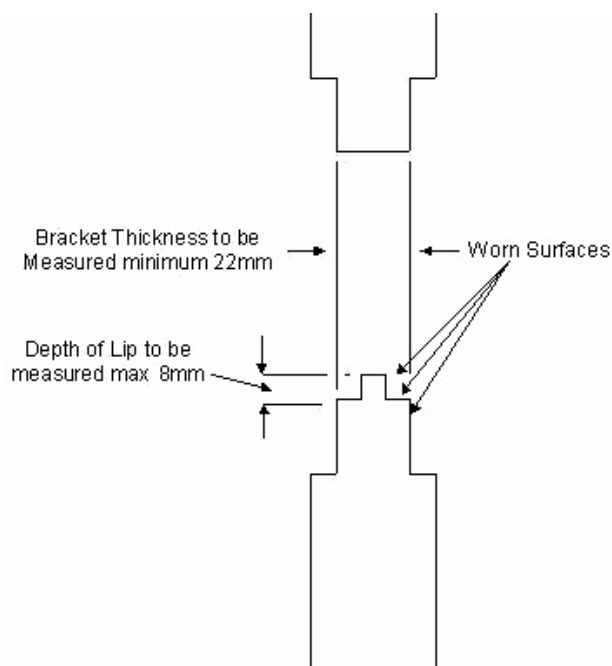


Figure 7: Measurement on Secondary Traction Rod Bracket

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- E3. Measure the thickness of the secondary traction rod bracket around the mounting hole. Minimum thickness 22mm (see Figure 7).
- E4. If a lip has been worn (see Figure 7) measure its depth at the lower edge. Maximum allowable 8mm.
- E5. Check that the four M16 x 30 tapped holes on each traction rod and axlebox pivot brackets are in good condition and are free from dirt and debris for the full thread depth.
- E6. Examine the two slotted 'V' pivot bush location, faces eight per bogie, for evidence of burrs or damage. Localised dressing with emery cloth and a smooth file is permitted. Under no circumstances shall power tools be used.
- E7. Gauge each side of the slotted 'V', see Figure 8, using a gauge manufactured to the tolerances on Drg No. B2-A1-9039194. Using firm hand pressure to locate the gauge into each slot there shall be a minimum gap of 2.5mm between the top of the gauge face and the bottom face of the slotted 'V'.

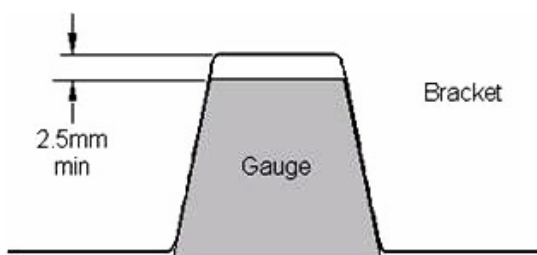


Figure 8: Gauging of Tapered Slots in Pivot Bush Brackets

Arising Work For Part E

- E2,3, Repair in accordance with Welding Procedures contained in Section 10 where applicable.
- & 4. If none of the procedures are applicable, contact the Engineer.
- E5. Damaged or worn threads shall be repaired using helicoil inserts. These shall be fitted using the manufacturer's current instructions and tools as follows:
 - E.5.1 The hole shall be drilled 40mm deep and tapped 35mm deep (min) using the appropriate diameter tools and the helicoil insert (Cat No. 035/160530) fitted until slightly below the surface.
- E7. If the gap is less than 2.5mm but greater than 1.5mm the bracket may be used under a concession granted by the Engineer.

Where the gap is less than 1.5mm the bracket shall be reclaimed by a procedure agreed with the Engineer or renewed. Where this is done, the alignment of the bracket must be checked in accordance with Job UFA0218 Part C. Alternatively it is possible to machine up to 1mm off the top face of the axlebox pivot bush spigots prior to assembly (see Figure 9).

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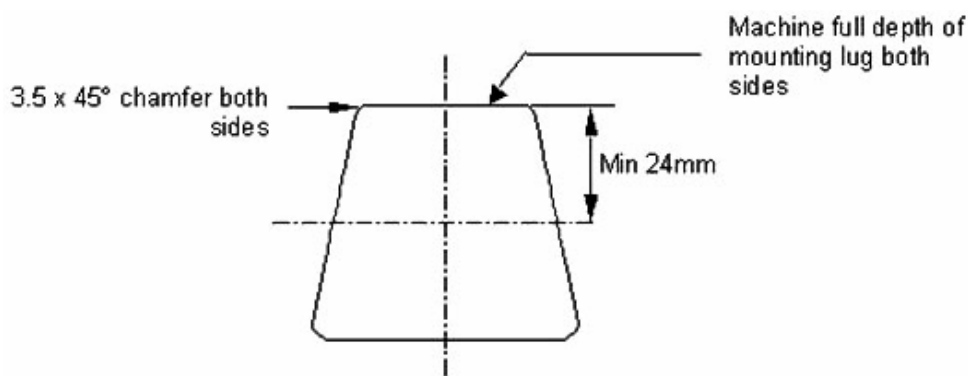


Figure 9: Dimensions for Re-machined Bush Spigots

Part F: LCR Spigot

Scheduled Work

- F1. Check lateral control rod spigot pins are secure and crack detect (magnetic particle method) the weld and surrounding areas.
- F2. Examine the spigots for wear and thread damage and distortion.
- F3. Check that the threaded portion of the spigot is at least 47mm long.

Arising Work For Part F

F1, 2, If an LCR spigot is too short, worn, damaged, distorted/bent or the weld is cracked,
& 3. proceed as follows:

F1.1 Remove the existing LCR spigot in accordance with Welding Procedure 339CS.

NOTE 7: Ensure that the new spigot is a good location fit in the hole, is properly aligned and sitting hard up against the bracket abutment face prior to welding. The tapered and threaded section of the spigot shall be suitably protected to prevent damage during welding.

F1.2 On "cast ends" (BT10B bogies) renew LCR spigot (Cat No. 801/078810) in accordance with Welding Procedure 339CS and Drg No. ATC-C0-2202003.

F1.3 On fabricated ends (BT10A bogies), renew spigot (Cat No. 801/078810) and weld in accordance with Welding Procedure 339CS (see Drg No. PB-C0-2100874 for bracket details).

NOTE 8: If LCR bracket is removed for welding, refit in accordance with Drg No. C-A0-3810 and align in accordance with Job UFA0218 Part C.

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Part G: Brackets other than Secondary Traction Rod and Axlebox Pivot

Scheduled Work

- G1. Clean and remove all corrosion by a suitable method.
- G2. Examine in situ brackets shown on Figure 10 for distortion and damage.

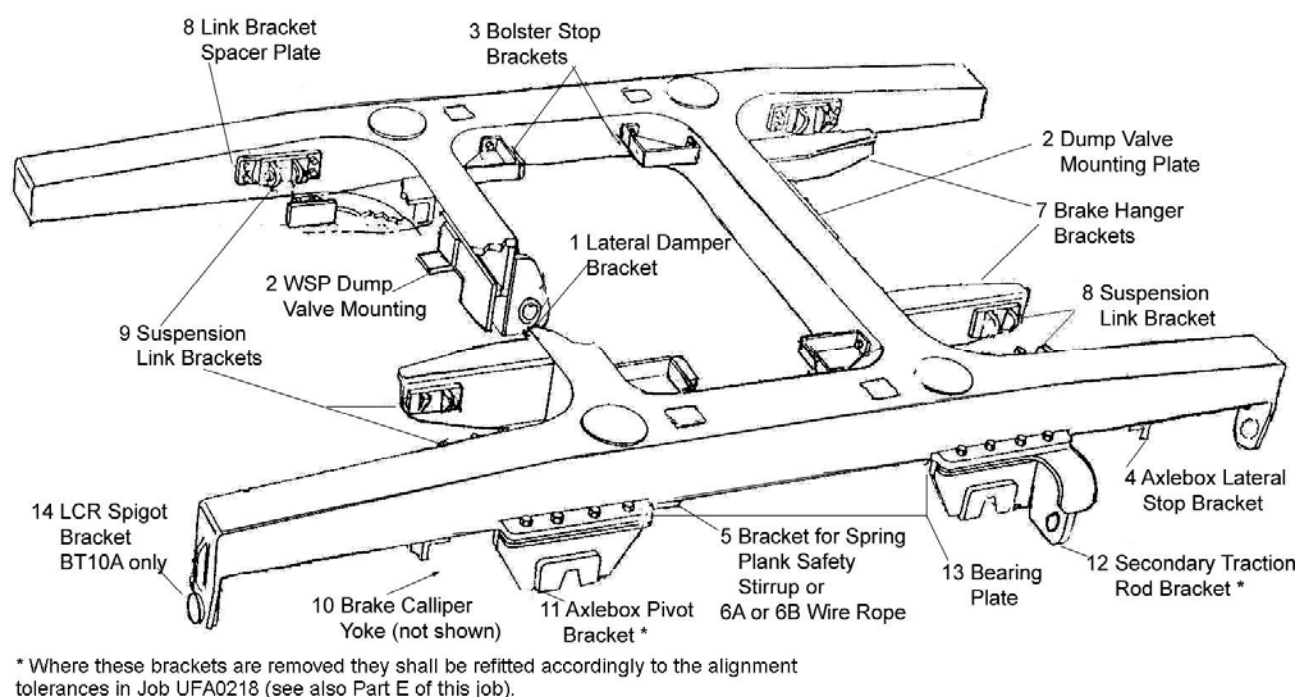


Figure 10: Brackets on BT10 Bogie Frame

- G3. Assess corrosion against the following criteria:
- G3.1 Except where specified below, up to 3mm loss of thickness is acceptable.
- G3.2 Brake Hanger Bracket
Check that the minimum thicknesses not less than the following:

	Area	Min Thickness
a	Around bolted connections	Original thickness
b	End plate	9mm
c	Bottom face of channel section	4mm
d	Side and top face except shaded face in Figure 11	7mm
e	Side face within shaded area in Figure 11	7mm

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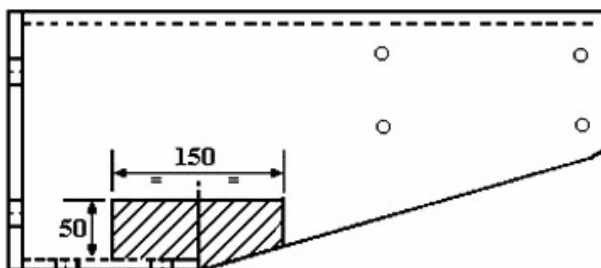


Figure 11: Elevation of Brake Hanger Bracket (Item 7 on Figure 7)

G3.3 Lateral Damper Bracket.
Minimum thickness 6mm.

G4. Gauge the following bushes:

Ref No. on Figure 10	Bracket	Type of Bush	Max Ø
10	Calliper Yoke	Stepped	16.55
10	Calliper Yoke	Plain	24.55
9	Suspension Link	Plain	16.25

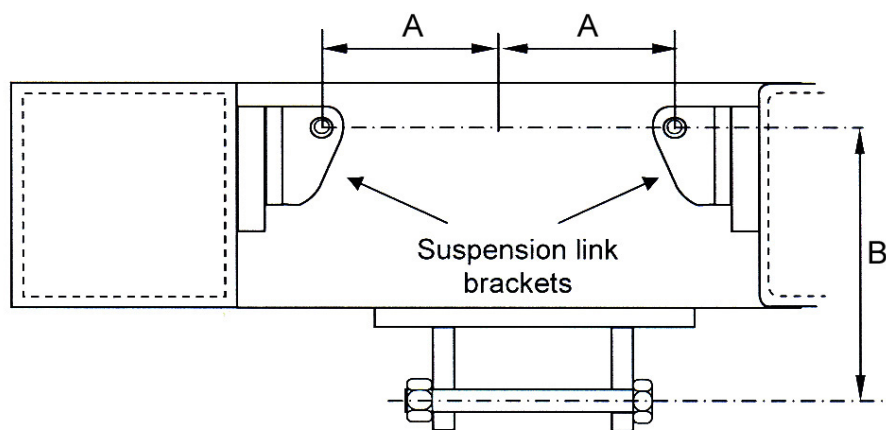
G5. Check that the alignment and relative position of the brake calliper yoke and suspension link mounting points comply with the requirements specified on Figure 12, (extract from Drg No. B-S-780), at all four positions. It is recommended that an alignment jig is produced for the purpose, and the associated procedure agreed with the Engineer.

NOTE 9: There are two types of suspension link mounting brackets available which give different bush hole centres. The different bracket types must not be mixed on the same calliper position. It is acceptable to fit different brackets on the same bogie but they must be fitted in pairs.

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Type	A	B
Original Design	96	259
New Design	104	258.3

All dimensions in mm
Tolerance $\pm 1.0\text{mm}$

View towards transom

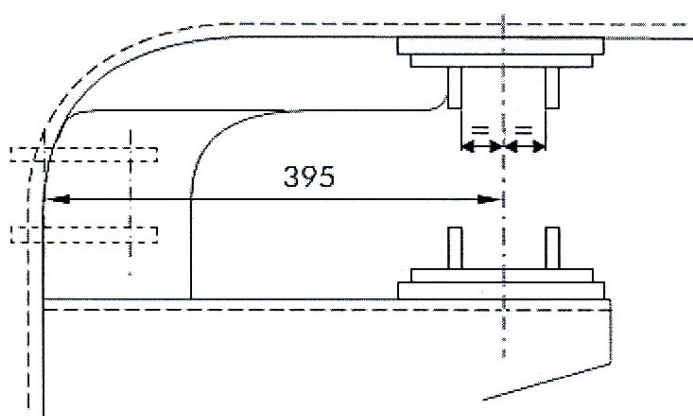


Figure 12: Critical Dimensions for Brake Hanger Brackets

- G6. Check that the nuts and bolts securing the brackets are tight and not corroded. At least one turn of the thread must exist beyond the hole for the split pin.

Check that the nuts are either:

- of the prevailing torque type, or
- castle nuts secured by split pins which are not corroded.

- G7. Examine the brake suspension link brackets (9) for signs of contact with the wheel rim.

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Arising Work for Part G

G2. Renew or repair distorted or corroded brackets in accordance with the drawings listed on Table 1.

Ref No.	Bracket	Drg	Qty	Note (see below)
1	Lateral Damper	B1-A1-9014111	1	
2	WSP Dump Valve BR	PB-C0-2100872 PB-C0-2100873 ATC-C0-2202001 & ATC-C0-2202002	2	2
2	WSP Dump Valve Girling	PB-C0-2100870 PB-C0-2100871 ATC-C0-2201999 & ATC-C0-2202000	2	2
2	WSP Dump Valve Westinghouse	PB-C0-2101514 PB-C0-2101515 ATC-C0-2205116 & ATC-C0-2205117	2	2
3	Bolster Stop	B1-A2-9014112	4	4
4	Axlebox Lateral Stop	C-A3-4265/1 & 2	4	
5	Spring Plank Safety Stirrup	C-A3-4489	4	2
6A	Spring Plank Wire Rope Short Swing Link	B1-A2-9014951	4	2
6B	Spring Plank Wire Rope Long Swing Link Arrgt	PB-C1-2101116 ATC-C0-2202254	4	2
7	Brake Hanger	C-A1-3882/3 & 4	4	1, 3
8	Link Bracket Spacer Plate	B1-A2-9014072	4	3
9	Suspension Link Bracket	C-A1-9577/8	8	3
10	Calliper Yoke Bracket	C-A1-9577/1 or 2	2 of each	
11A	Secondary Traction Rod Safety Bracket	WSA-C1-837518244	2	2
14	LCR Bracket	PB-C1-2100874	2	5

Table 1: Details of Brackets

Notes from Table 1:

Note 1: Used with plate B2-A2-8501099/01, glued to bogie frame.
Use C-A1-3882/1 and 2 when plate not fitted.

Note 2: Where fitted.

Note 3: Cat No. for C-A1-9577/8 is 063/0007838. See Scheduled Work step G5 for alignment.

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Note 4: Reassemble bolster stop bracket as follows:

- a) Fit a bolster stop plate (Drg No. B1-A3-9014914) to each bracket with four M12 x 65 bolts, countersunk nibbed heads, to (Cat No. 3/112232) with spring washer (Cat No. 3/105014), and plain nut (Cat No. 3/175018).
- b) Shims to Drg No. B1-A3-9014915 will be fitted during the assembly of the bogie.

Note 5: BT10A only.

G3.2a Restore original thickness using weld repair.

G3.2b, Repair bracket using weld repair, or new sections of plate.

c & d

G3.2e Cut away corroded area, using an angle grinder followed by a pencil grinder to ensure a good edge detail. A template for the cut-out is shown in Figure 13.

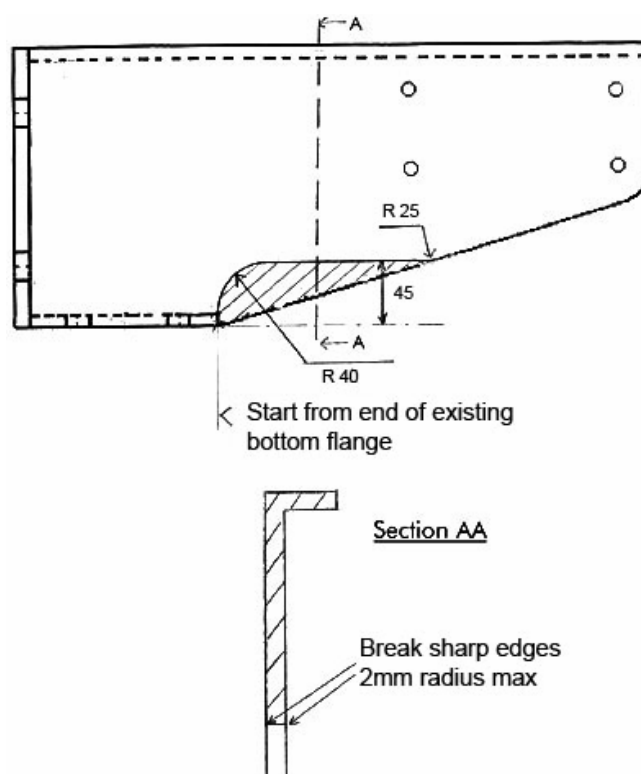


Figure 13: Template for Cut Out in Brake Hanger Bracket

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G4. Renew the bushes, checking the housing diameters as follows:

Bracket	Type of Bush	Cat No.	Max Ø
Calliper Yoke	Stepped	018/018974	22.033
Calliper Yoke	Plain	067/118162	32.039
Suspension Link	Plain	098/000088	22.68

Renew or reclaim brackets in accordance with a procedure agreed with the Engineer.

G5. If re-alignment is necessary, this shall be carried out in accordance with a procedure produced by the Supplier and agreed with the Engineer.

NOTE 10: Originally these brackets were machined to provide the correct alignment with the bearer plate. New brackets are not machined.

G5. If renewal of brackets is necessary the Supplier should prepare a procedure which is agreed with the Engineer and will either:

- Machine the brackets to fit the bogie without distorting the bearer plates, or
- Obtain brackets without holes and drill them to meet the requirements of Figure 12.

G6. Renew any loose or defective fixings. If one is found loose renew all others securing the bracket.

Renew corroded split pins.

See Table 2 for details of fixings (Item Nos. correspond with Figure 10).

Use prevailing torque nuts throughout, Cat Nos. as follows:

M12	Grade 8	003/180330
M16	Grade 8	003/180340
M20	Grade 8	003/180350
M20	Grade 12	003/180016 (see Note 1 for Table 2 on page 17)

Items 7, 8 and 9 to be aligned in accordance with Scheduled Work step G5 and Figure 12.

G7. Remove light scoring marks by lightly dressing out the damage.

G7. If heavy contact marks are found change brake hanger bracket for the design shown on Drg C-A1-9577, item 8 (Cat No. 63/7838). Refer to Scheduled Work step G5 and Figure 12, for positioning tolerance for fitting bracket.

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Item No.	Bracket	Qty	Bolt Size Grade 8.8 Except Where Stated	Cat No.	Qty of Bolts per Bogie	Torque Nm	Notes (see below)
1	Lateral Damper	1	M20 x 60	003/101180	4	475	
2	WSP Dump Valve	2	M16 x 55	003/100935	8	250	
3	Bolster Stop	4	M16 x 55	003/100935	16	250	
4	Axlebox Lateral Stop	4	M16 x 55	003/100935	12	250	
5	Spring Plank Safety Stirrup	4	M20 x 65	003/101185	16	475	
6A	Spring Plank Wire Rope Short Swing Link	4	M20 x 65	003/101185	16	475	
6B	Spring Plank Wire Rope Long Swing Link	4	M20 x 80 GD 12.9	-	8	620	1
7A	Brake Hanger - End	4	M20 x 65	003/101185	16	475	
7B	Brake Hanger - Bottom	2	M16 x 55	003/100935	8	200	
8	Link Bracket Spacer Plate	4	M16 x 60	003/100940	16	250	2
9A	Suspension Link Bracket (fitted to frame)	4	M12 x 30	035/101060	16	100	3
9B	Suspension Link Bracket (fitted to brake hanger item 7)	4	M12 x 55	003/100705	16	100	
10	Calliper Yoke Assembly	4	M16 x 55	003/100935	16	250	
11	Axlebox Pivot Bracket	2	See Job UFA0218	-	-	-	
12	Secondary Traction Rod Bracket	2	See Job UFA0218	-	-	-	
13	Bearing Plate	4	See Job UFA0218	-	-	-	
14	LCR Bracket	2	M20 x 55	003/101175	16	475	

Table 2: Frame Bracket Fixings

Notes from Table 2:

Note 1: Assemble with M20 plain washers (3/190940) and M20 Grade 12 prevailing torque nuts.

Note 2: Assemble with two washers. Secure with slotted nut and split pin.

Note 3: These are set screws, locked in pairs by tab washers.

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Part H: Completion

Scheduled Work

- H1. Paint the complete bogie frame in accordance with Painting Schedule CR/PE0102 or in accordance with a procedure agreed with the Engineer. This is to be done not more than four hours after blast cleaning. If the extent of repairs prevents this, the frame shall be blast cleaned again.
- H2. Check that inspection hole covers are intact and secure.

Arising Work for Part H

- H2. Renew cover.

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Bogie Frame - Weld Repair

UFA5562

Scheduled Work

1. If required turn the bogie up side down to permit down hand welding.
2. Remove all oil, grease, rust, scale, paint, etc. from the control rod casting (see Figure 1) by degreasing, wire brushing or grinding.
3. Lightly grind the casting rear surface to give a clean datum mark for measurement.

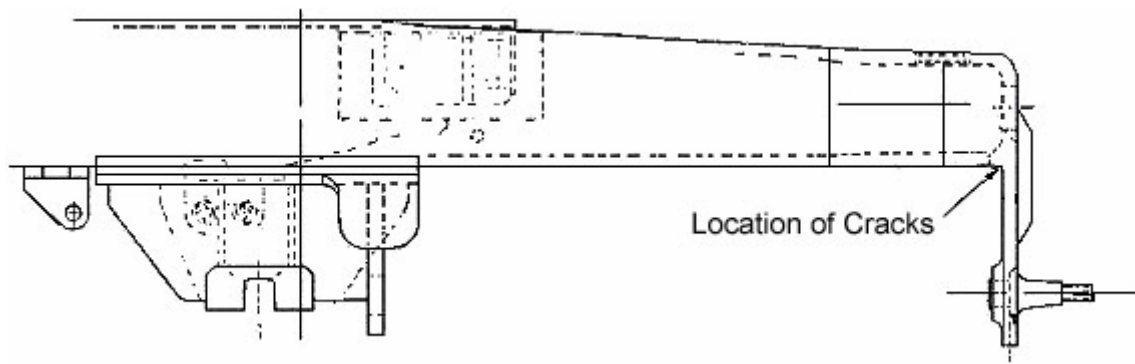


Figure 1: Location of Cracks

4. Crack detect the suspect area to determine the extent of surface breaking defects in accordance with Procedure TL/NP0117.
5. Excavate the defects to form the preparation shown in Welding Procedure Specifications MG 924, MG 925 and MG 926 (see Section 6) using a non-thermal and/or thermal process followed by grinding.
6. Crack detect the prepared area to ensure complete removal of the defect. If the defect has not been completely removed continue with operation 6 until removal of the defect is achieved.
7. If the prepared area has encompassed the edge of the casting fit a suitable run-on plate to the edge of the bogie casting.
8. Pre-heat and weld to fill the prepared area in accordance with Welding Procedure Specifications MG 924 for MAG welding in the flat position, MG 925 for MAG welding in the vertical and horizontal and overhead positions and MG 926 for MMA welding.
9. Dress the repaired area by grinding to form a smooth transition between the weld metal and the casting.
10. Visually examine the weld in accordance with BS 5289.

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Bogie Frame - Weld Repair

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11. Crack detect the repaired area in accordance with Procedure TL/NP0117. If defects are found, excavate, crack detect, weld, dress and crack detect until proven defect free, in accordance with this instruction.
12. Check alignment of LCR bracket in accordance with Job UF 5010 Part C.

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Secondary Traction Rod - Overhaul

UH 6930

Scheduled Work

1. Discard spindle, locknut, rubber bushes and plain nut.
2. Examine spacer tube as follows:
 - 2.1 Examine spacer tube for distortion and end face damage.
 - 2.2 Check visually that the end faces are square to the tube.
 - 2.3 Measure the overall length of the spacer tube. Limits are 464.75 to 465.25mm.
3. Renew rubber bushes (Cat No. 098/008601).
4. Measure the length of each new bush, as defined in Figure 1. Limits are 59 to 61mm.

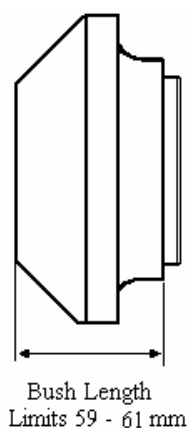


Figure 1: Measurement of Traction Rod Rubber Bush

5. Assemble new spindle, to drawing PB-C1-2100415 or ATC-C1-2200832 as follows:
 - 5.1 Degrease threads at the end of the spindle with the longest threaded portion.
 - 5.2 Apply Loctite 242 (Cat Nos. 007/060303-5) to longest threaded portion.
 - 5.3 Examine a plain M30 nut (Cat No. 003/175034) and check that it meets the following criteria:
 - the end face countersink just exceeds the thread major diameter;
 - the end face is uniform width and defect free;
 - correct fit on the spindle thread;
 - concentricity of the thread with the flats;
 - ensure the nut end face fit uniformly up to the spindle shoulder.

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Secondary Traction Rod - Overhaul

UH 6930

5.4 Fit plain M30 nut (Cat No. 003/175034) up to shoulder, and tighten to 500Nm. Ensure that the plain nut is in contact with the shoulder.

5.5 Fit lock nut (Cat No. 003/175834) and tighten to plain nut to 300Nm.

Arising Work

2. Reface ends of spacer tube to remove damage and bring within limits.
2. Renew spacer tube (see Drg PB-C1-2100415 item 3 or ATC-C1-2200832 item 3) if damage cannot be removed, or under length.
4. Reject any bush outside limits.
- 5.3 Reject nut if it does not meet the criteria. Advise Supervisor/Team Leader if more than one nut is defective.

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Bolster Control Rod - Examine

UM 0112

Scheduled Work

1. Remove nuts from spindle and discard.
2. Clean the spindle and tube in accordance with a procedure agreed with the Engineer.
3. Examine spindle as follows:
 - 3.1 Check that it is straight, and free from corrosion.
 - 3.2 Check that the threads and under cuts are undamaged. Remove corrosion.
4. Examine the tube (spacing ferrule) as follows:
 - 4.1 Check that it is straight and free from corrosion.
 - 4.2 Check that the end faces are square to tube and undamaged. Remove corrosion.
5. Examine the rubber elements (pads) as follows:
 - 5.1 Check for signs of cracking or hardening.

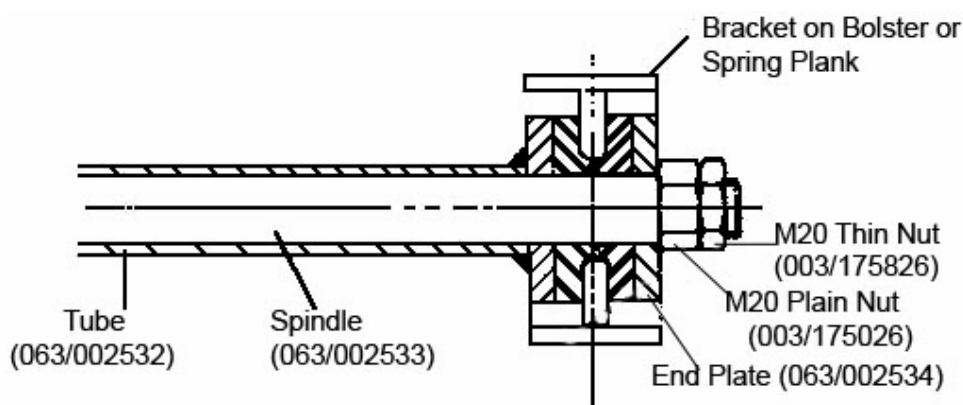


Figure 1: Bolster Control Rod End Fixing

6. Paint the tube as follows. Take care not to contaminate the threads with paint.
 - 6.1 Clean and degrease using cleaning fluid to (Cat No. 007/007186) or approved alternative.
 - 6.2 When dry, the tube shall be coated within 1 hour of cleaning with one coat of anti-corrosion primer in accordance with CR/PE0102, followed by further paint in accordance with the same specification.
7. If required loosely assemble components as shown in Figure 1.

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Bolster Control Rod - Examine

UM 0112

Arising Work

3. Renew spindle (Cat No. 063/002533).
4. Renew tube (Spacing ferrule) (Cat No. 063/002532).
5. Renew defective rubber elements (pads) (Cat No. 018/009112).

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Side Bearer Units - Examine

UM 6008

Scheduled Work

1. Remove bearer pad, cork seating, and seal from carriers.

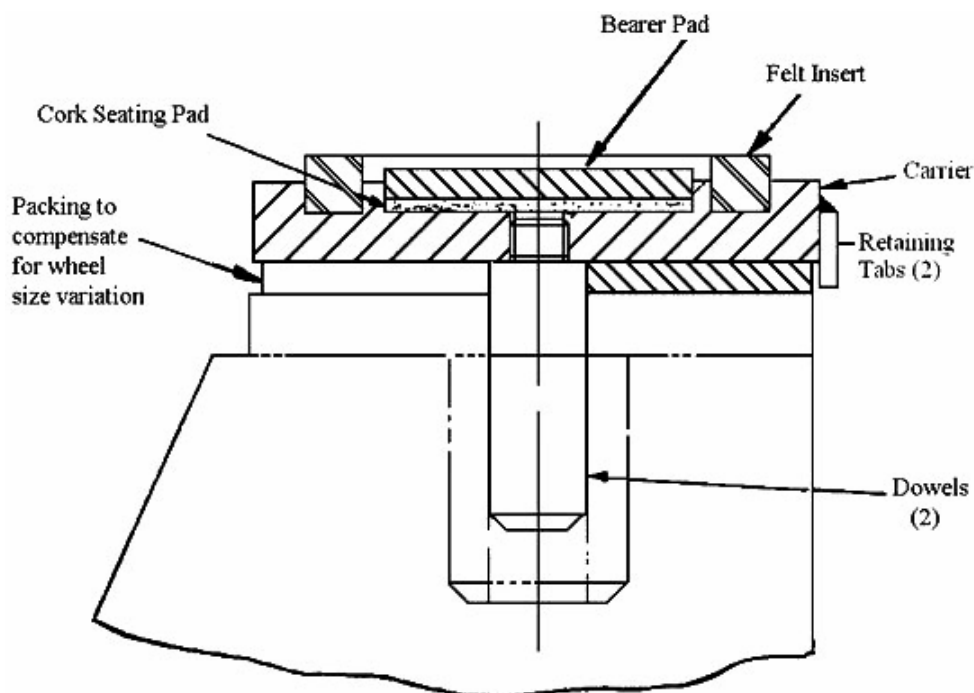


Figure 1: Section Through Side Bearer Unit

2. Clean the carrier and remove corrosion by wire brushing or grit blasting. Check all cork and seal residue has been removed from the holder and that both recesses are free of metal burrs.
3. Check the two packing retaining tabs for damage.
4. Check that the base of the carrier is flat. Using a straight edge placed on the base alongside the two dowels (see Figure 2) attempt to place a 0.5mm feeler gauge between the straight edge and base. Renew any carrier where a 0.5mm feeler gauge can be inserted.

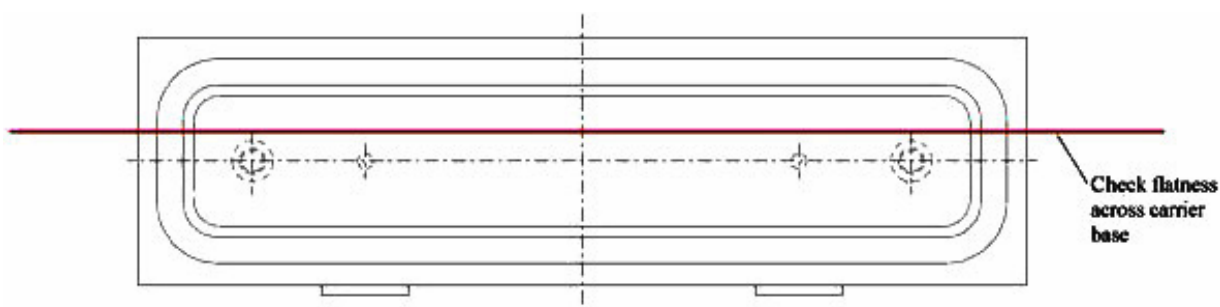


Figure 2: Side Bearer Holder Flatness Checks

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Side Bearer Units - Examine

UM 6008

5. Check the height of the pad end retaining face, see Figure 3, using a depth gauge.

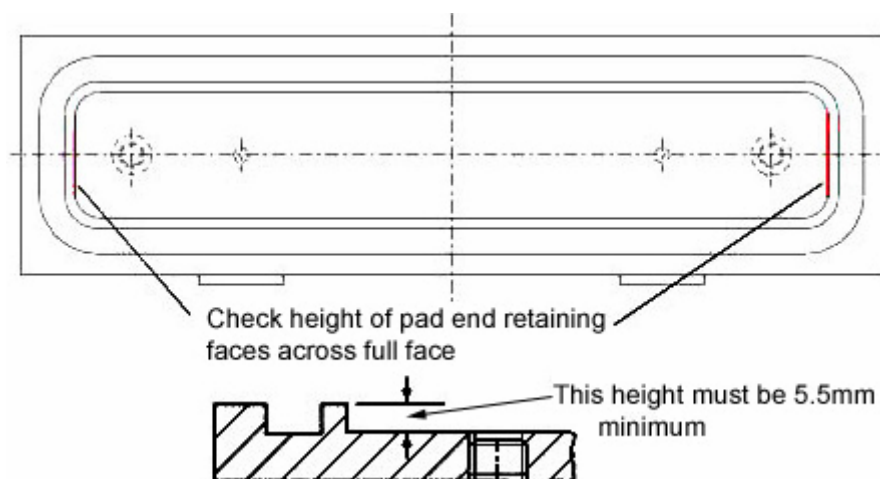


Figure 3: Side Bearer Holder

6. Check that the recess for the cork and bearer pad is flat. Using a straight edge placed in the base of the recess attempt to place a 0.5mm feeler gauge between the straight edge and recess base. Renew any carriers where a 0.5mm feeler gauge can be inserted.
7. Examine the two locating dowels, checking that they are present, secure and not worn. They must be of the improved type with flats on the shank (see Figure 4). Confirm with the Engineer which dowel thread is to be used.

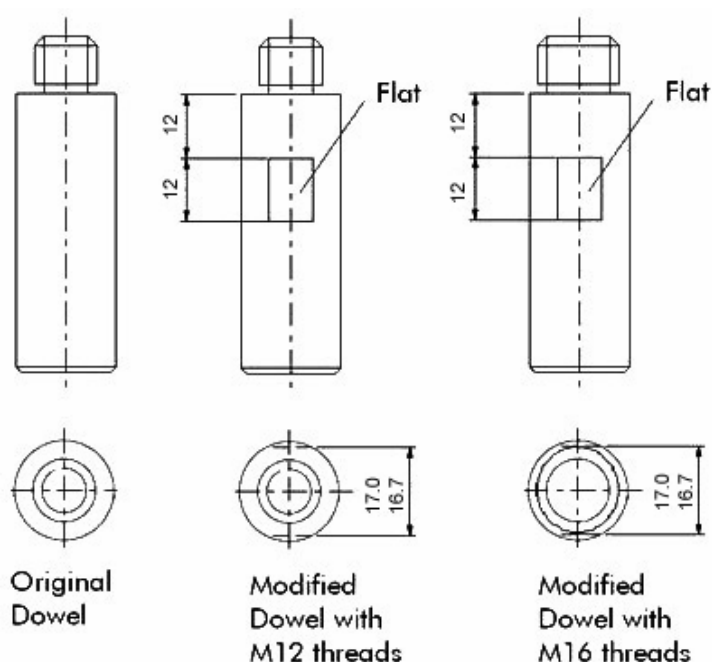


Figure 4: Improved Locating Dowels Compared to Original Type

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Side Bearer Units - Examine

UM 6008

8. Paint the carrier in accordance with CR/PE0102.
9. Fit a new cork seating pad (Cat No. 230/012001), placing the pad centrally in the recess.
10. Fit a new seal. The seal is to be bonded to the side bearer carrier using contact adhesive (Cat No. 7/5687).
11. Fit a new side bearer pad (Cat No. 072/071304 for 8mm thick Tufnol pad or Cat No. 072/071305 for 8mm thick Fluon pad, if requested by the Engineer).
12. Lightly lubricate the locating dowels ONLY with Tectyl 506 or equivalent anti rust compound.

NOTE: SIDE BEARER PADS MUST NOT BE LUBRICATED.

Arising Work

3,5,6. Renew side bearer carrier if worn or damaged. See table below.

4. Renew side bearer or straighten in accordance with procedure agreed with Engineer.
7. Renew dowels (Cat No. 230/012004 or 072/071306 for M12, or 230/099301 for M16) as follows:
 - 7.1 Coat threads with Loctite 2701 (Cat No. 007/056158).
 - 7.2 Fit and tighten each dowel to 38Nm.
 - 7.3 Check that assembled dowels are square to base. Reject any assemblies where this is not the case.

Thread Size	Type of Carrier Cat No.'s for Side Bearer Carriers	
	Machined	Casting
M12	092/002373	018/022536
M16	230/099401	230/099402

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Bolster - Examine

UM 6919

Scheduled Work

1. Examine the bolster top plate for signs of damage caused by contact with the swing links.
2. If the following brackets are corroded, or next to corroded areas remove them from the bolster.
 - a) Bearing stop plate
 - b) Lateral damper
 - c) Lateral control rod bracket.
3. Remove corrosion from and clean all surfaces including the bolster control rod and traction rod brackets with shot blasting or other process to give bright metal finish.
4. Assess the area of each plate (2 sides, bottom and top) as follows:

See Figures 1-3 and Table 1 on page 2.

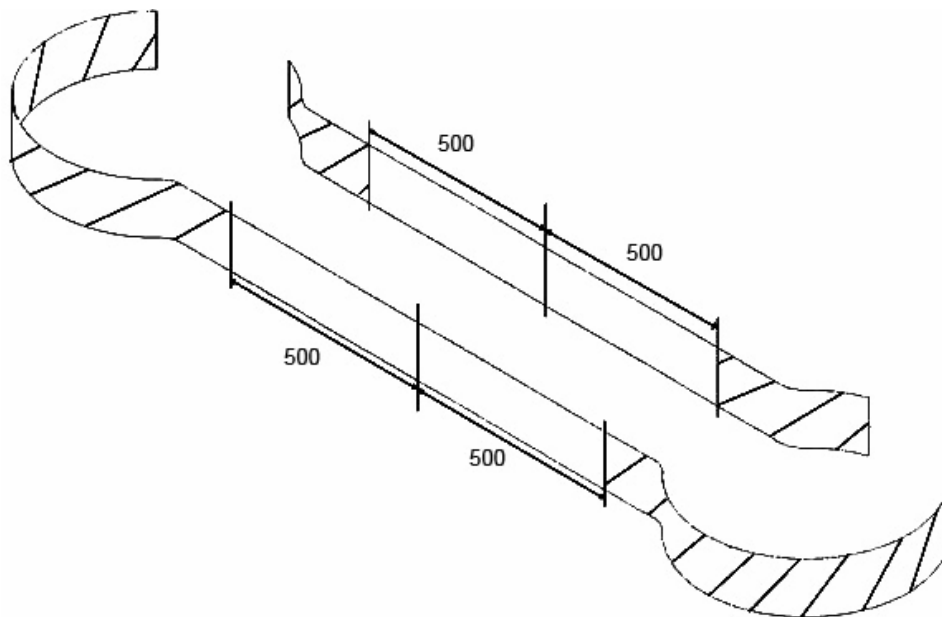


Figure 1: Bolster Side Plates: High Stress Areas

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Bolster - Examine

UM 6919

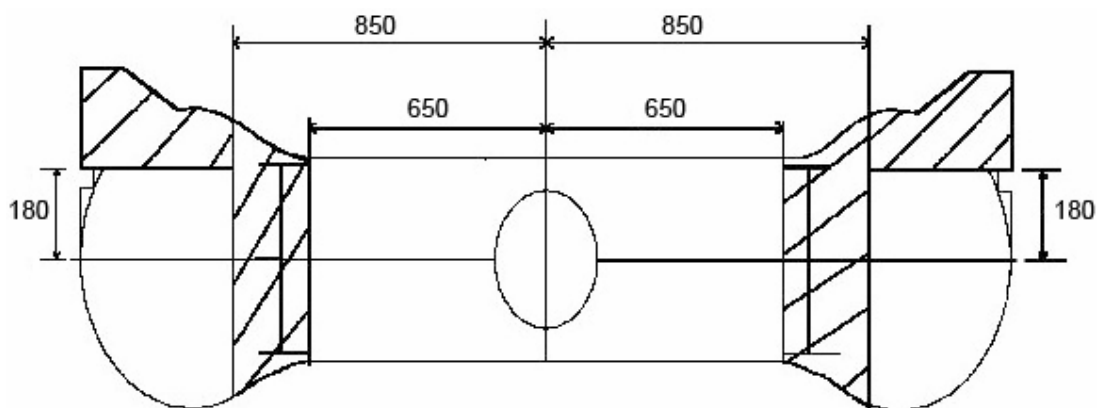


Figure 2: Bolster Top Plate: High Stress Areas

Corrosion Limits		High Stress (Shaded Areas)	Elsewhere
Thickness	Area		
0-1	None	No further action	No further action
1-3	Less than 2000mm ²	Magnetic Particle Inspection	No further action
1-3	More than 2000mm ²	See Arising Work 4.1	No further action
3-6	Less than 2000mm ²	See Arising Work 4.1	See Arising Work 4.2
3-6	More than 2000mm ²	See Arising Work 4.1	See Arising Work 4.1
More than 6	Any	See Arising Work 4.1	See Arising Work 4.1

Table 1: Corrosion Criteria and Action Required

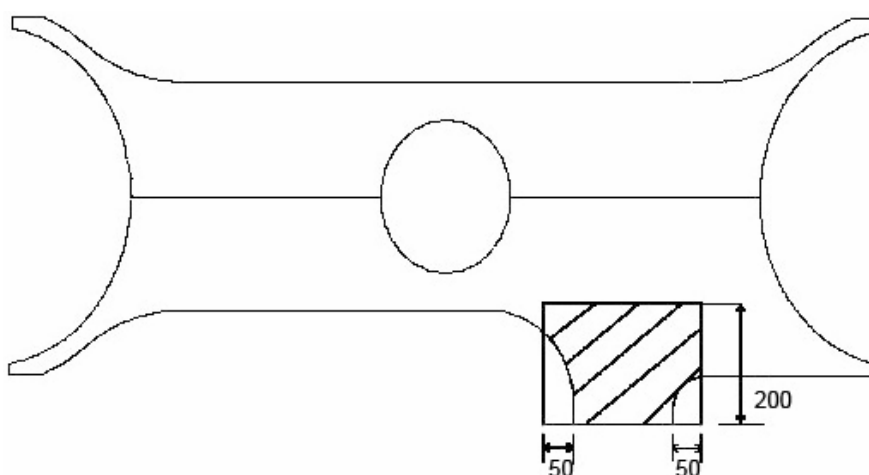


Figure 3: Bolster Bottom Plate : High Stress Area

5. Measure the thickness of the Secondary traction rod bracket around the mounting hole, see Figure 4. Minimum thickness 22mm.

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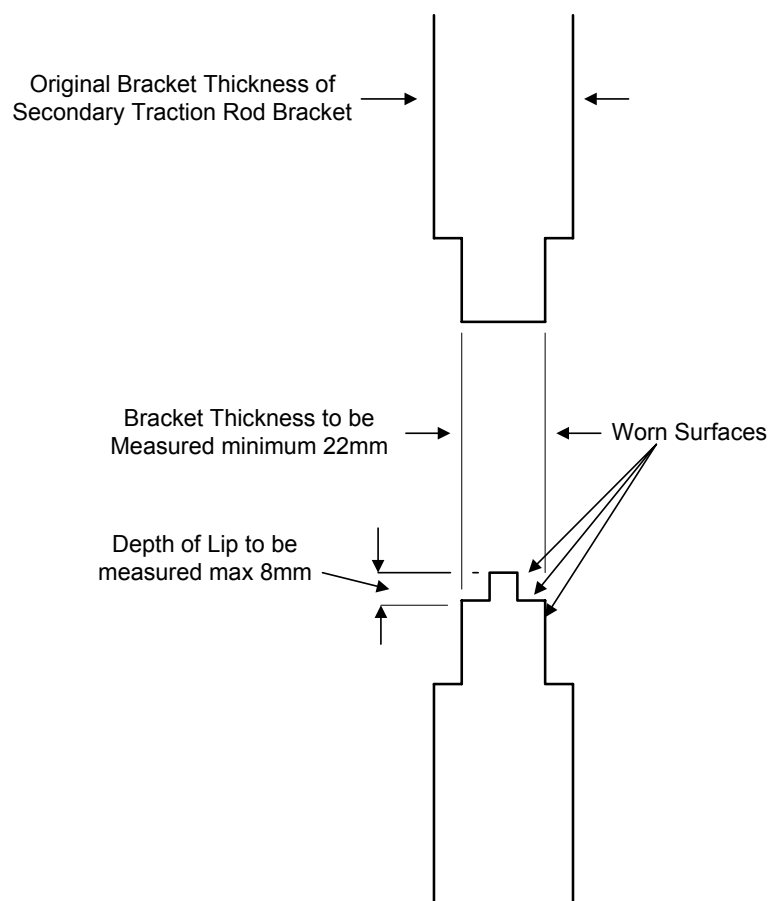


Figure 4: Measurements on Secondary Traction Rod Brackets

6. If a lip has been worn (see Figure 4) measure its depth at the lower edge. Maximum allowable 8mm.
7. Examine the centre pivot bush. Surface cracks deeper than 1.5mm or bond failure exceeding 6mm are unacceptable. Check for date on centre pivot bush.
8. Measure height of vertical bumpstop, which should be between 38 and 42mm.
9. Check that the seating areas for the anti-roll bar bearing housings and side bearers are flat and free from high spots.
 - 9.1 Remove all dirt and debris from the two holes in the top of each side bearer pedestal.
 - 9.2 All dirt must be removed to ensure that the side bearer carriers sit flat when fitted at assembly.
10. Examine Anti Roll Bar housing fixing holes.

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Bolster - Examine

UM 6919

11. Examine the lateral bumpstops. The following conditions are unacceptable:
 - i) Free height less than 85mm.
 - ii) Surface cracks exceed 2mm in depth.
 - iii) Bond failure exceeds 6mm in depth. (Measure from the edge of the base) or 40mm in length (measure around the periphery).
 - iv) Seating face is corroded or damaged preventing full seating.
 - v) M12 stud is corroded or damaged.
 - vi) Full thread engagement plus 1mm by the nut cannot be achieved when necessary packing is applied (see item 12 below).
12. Measure lateral bumpstop projection beyond metal stop, which should be between 19 and 22mm. See Figure 5.

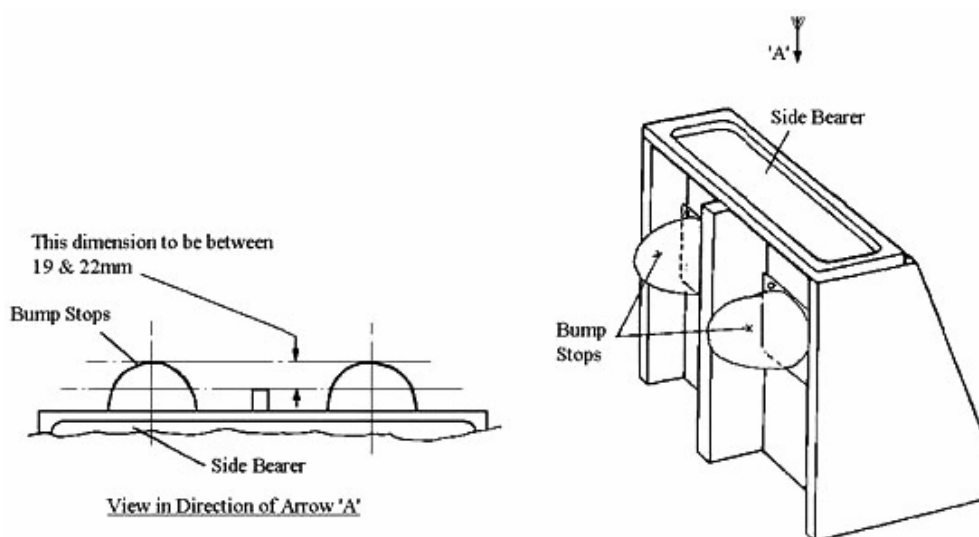


Figure 5: Lateral Bumpstop Projection

13. Examine the following brackets for corrosion and distortion:
 - Bearing stop plate
 - Lateral damper bracket
 - Control rod bracket

Corrosion limit loss of up to one quarter of plate thickness is acceptable.
14. Clean and paint the bolster as follows:
 - 14.1 Clean and degrease using cleaning fluid to (Cat No. 007/007186) or approved alternative.

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Bolster - Examine

UM 6919

14.2 When dry, bolster shall be coated within 1 hour of cleaning with anti-corrosion primer in accordance with CR/PE0102, followed by further paint in accordance with the same specification.

15. If removed refit the brackets in accordance with Table 2:

Item	Bolt Details	Qty	Bolt Cat No.	Torque Nm	Prevailing Torque Nut Cat No.
Bearing Stop Plate	M16 x 45	4	003/100925	250	003/180340
Lateral Damper Bracket	M20 x 55	4	003/101175	475	003/180350
Control Rod Bracket	M16 x 50	4	003/100930	250	003/180340

Table 2: Bolster Bracket Fixings

Arising Work

1. In the event that the Bolster exhibits damage caused by contact with the Swing Links, the Supplier must ensure that particular attention is paid to Job US 0117 to ensure that the Swing Link has not been damaged.

The Bolster top plate may have damage caused by contact with Swing Links dressed out by grinding. However, any grinding operation **MUST NOT** impinge on the weld fillets at the joint between the top and side plates of the bolster.

4. Repair bolster as follows:

4.1 Repair the bolster by cutting out part or all of the plates as follows:

4.1.1 The area of the plate which is to be replaced shall be cut out to leave square, flush edges to the surrounding plates.

4.1.2 A plate (or section thereof) is to be fabricated in accordance with the following drawings:

Top Plate	C-A1-8963
Side Plate	C-A1-9217
Bottom Plate	C-A1-3241

The appropriate weld preparations are to be incorporated all around the edges of this new plate.

4.1.3 Any areas which have been stripped of paint which will be inaccessible after the new plate is welded on shall be painted in accordance with CR/PE0102.

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Bolster - Examine

UM 6919

- 4.1.4 The new plate is to be welded in place in accordance with Drawing PB-C0-2100886 or ATC-C0-2202015, and Welding Procedure Specifications MG 803 and 804 for side plates, or MG 803, 804 and 832 for bottom plates. See Section 10.
 - 4.1.5 The repaired area shall be painted in accordance with CR/PE0102.
- 4.2 Repair bolster by building up thickness of plates.
 - 4.2.1 Ensure that the areas to be repaired are cleaned back to shiny metal.
 - 4.2.2 Build up metal thickness in accordance with Welding Procedure Specification MG 801, see Section 10, making sure that enough metal is deposited to allow grinding to the original profile.
 - 4.2.3 The built up areas are to be ground or machined to the original profile.
 - 4.2.4 Paint the repaired area in accordance with CR/PE0102.
6. If the bracket thickness is less than 22mm or the lip is deeper than 8mm repair in accordance with a procedure produced by the Supplier and agreed with the Engineer.
7. Renew centre pivot spherical bush if:
 - i) Surface cracking of the rubber exceeds 1.5mm depth.
 - ii) Bond failure exceeds 6mm in depth.
 - iii) It is older than 7 years, or if no date is visible.
8. Renew or build up vertical bump stop if height less than 38mm. Remove excessive material by machining or grinding if more than 42mm.
9. Grind flat any weld heads or high spots. Check with side bearer carrier if any doubt exists.
10. If holes are enlarged:
 - 10.1 Weld up fixing holes.
 - 10.2 Dress and re-drill fixing holes.
11. Renew lateral bumpstop if outside limits.
12. Shim the lateral bumpstop to regain the correct projection beyond the metal bumpstop. Maximum of 2 shims allowed behind each bumpstop.

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Bolster - Examine

UM 6919

13. Repair or renew brackets in accordance with drawings listed in Table 3.

Bracket	Drawing
Bearing Stop Plate	B1-A2-9015819
Lateral Damper	B1-A2-9015429
Bolster Control Rod	B1-A2-9015427

Table 3: Details of Bolster Brackets

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Air Spring - Examine

US 0113

Scheduled Work

1. Remove 24 countersunk headed M6 screws and separate spring from Bottom Plate.
2. Examine air spring. The following are unacceptable:
 - i) The air bag has burst.
 - ii) There is any surface crack in the rubber.
 - iii) The girder hoop around the middle of the air spring has corroded resulting in a diameter less than 10mm.
 - iv) Any of the cords are exposed.
 - v) There is any evidence of delamination between the rows of cords.
3. Examine bead ring for damage and corrosion.
4. Measure the bumpstop stack height which should be between 163 and 166mm (see Figure 1).

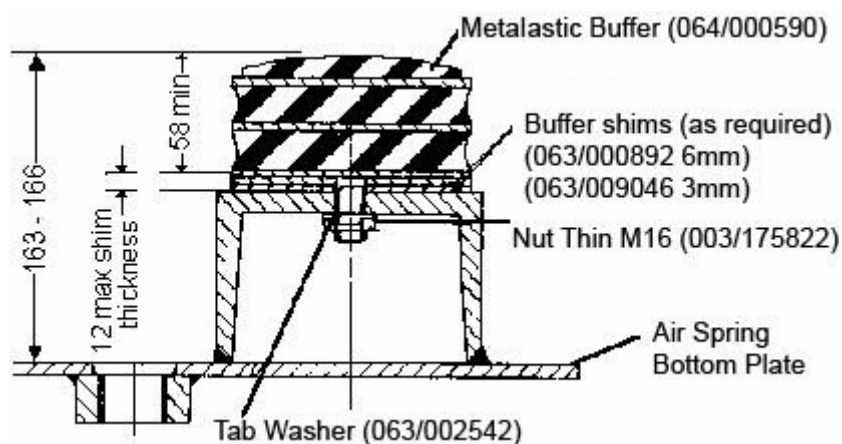


Figure 1: Bumpstop Assembly

5. Remove and examine the Metalastic Buffer. The following are unacceptable:
 - i) Worn to less than 58mm in height.
 - ii) Surface cracks exceed 2mm depth.
 - iii) Bond failure exceeds 8mm (measured from edge of the plate) or 60mm in length (measure around the periphery).
 - iv) Seating face is corroded or distorted.
 - v) M16 stud is corroded or damaged.
6. Paint all internal metal parts with priming paint in accordance with CR/PE0102.
7. Reassemble bump stop, with M16 spring or tab washer and tighten M16 nut to 100Nm.

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Air Spring - Examine

US 0113

8. Reassemble spring to bottom plate using new M6 x 16 countersunk head screws to Cat No. 035/106524, tightened to 12Nm, in a crosswise fashion and Butyl Rubber sealant to Cat No. 028/022202 (see Figure 2).

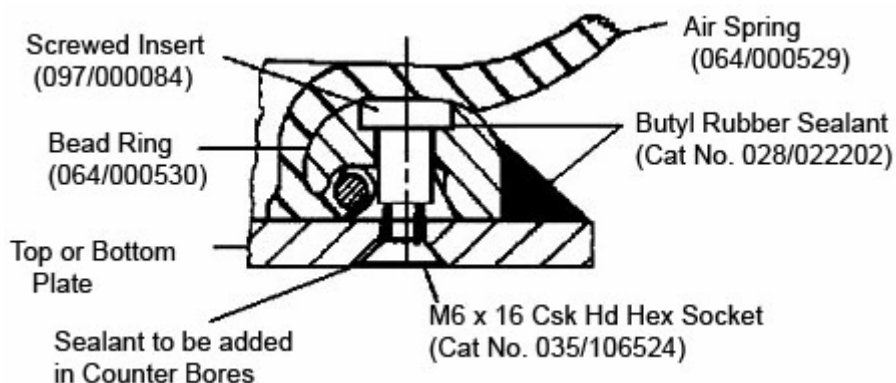


Figure 2: Part Section of Air Spring Joint

Arising Work

2. Renew air spring (Cat No. 064/000529) if it fails any of the criteria.
3. Renew bead ring (Cat No. 064/000530) if damaged or corroded.
4. Shim to regain the bumpstop stack height using 3mm and 6mm shims (Cat No. 063/009046 and 063/000892 respectively). Maximum total shim thickness 12mm.
5. Renew metalastic buffer (Cat No. 064/000590) if it fails any of the criteria.

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Spring Plank - Examine

US 0115

Scheduled Work

1. Dismantle the spring plank and scrap all nuts, bolts and washers.
2. Clean the spring plank casting and tie bars with blast cleaning or similar process to give a bright metal finish.
3. Examine the spring plank casting for defects and corrosion. If defects are suspected, confirm using a suitable method. Corrosion up to 1mm deep is permitted on the ribs on the underside of the casting. Up to 4mm loss of thickness on the top plate is acceptable but this must include any casting defects. If corrosion exceeds this then seek advice from the Engineer. See Figure 1 for identification of critical area.

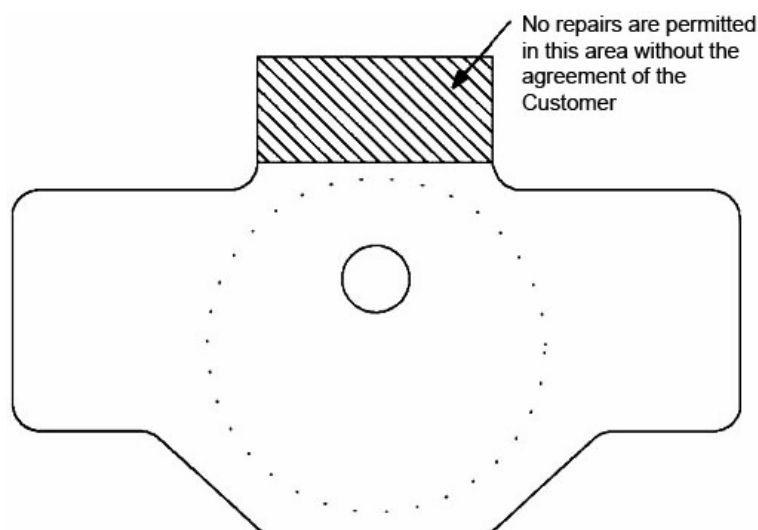


Figure 1: Spring Plank End Casting

4. Examine tie bars for wear, damage and corrosion. Up to 1mm loss of thickness is acceptable except in the areas 200mm from the ends.

NOTE: Cat Nos. for Grade 12.9 Bolts and Nuts:

M12 X 50mm Hexagonal Bolt (Grade 12.9)	003/101676
M12 Hardened Washers	003/195400
M12 Prevailing Torque Nuts (Grade 12)	003/185109

5. Examine bearing spindles for anti-roll bar links for damage and wear. Limit on diameter is 37.88mm. Check that they are secure.
6. Renew all tie bar to casting bolts using grade 12.9 bolts, grade 12 nuts and hardened steel washers and tighten to 150Nm. See Note for Cat Numbers.

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Spring Plank - Examine

US 0115

7. Clean and paint the spring plank as follows:
 - 7.1 Clean and degrease using cleaning fluid to (Cat No. 007/007186) or approved alternative.
 - 7.2 When dry, the spring plank shall be coated within 1 hour of cleaning with one coat of anti-corrosion primer in accordance with CR/PE0102 followed by further paint in accordance with the same specification.

Arising Work

3. Renew defective spring plank tray. Check that the bracket for bolster control rod is located 380mm from the centre line. See Drawing ATC-C0-2202011 or PB-CI-2100882 for short swing link bogies, and drawing B1-A1-9012428 for long swing link.
4. Renew defective tie bar or repair in accordance with procedure prepared by Supplier and agreed with the Engineer.
5. Renew Bearing spindle as follows:
 - 5.1 Remove worn spindle.
 - 5.2 Examine hole in casting for ovality. Reclaim in accordance with Procedure R.
 - 5.3 Assemble new spindle (Cat No. 063/000035) with new washer (Cat No. 063/000036) and new M20 slotted nut.
 - 5.4 Tighten nut to 250Nm. Align slots with hole by further tightening to next available hole, and fit 4 x 30 split pin.

Procedure R

1. Position the spring plank casting upside down on the machine bed using the air spring seat as the horizontal datum. See Figure 2.
2. Align the axis of the boring tool perpendicular to the two outer faces of the anti roll bar spigot locations. See Figure 2.
3. Centre the axis of the boring tool on the top and bottom and side walls of the hole to be reclaimed, approximately halfway through the depth of the hole. See Figure 3.

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Spring Plank - Examine

US 0115

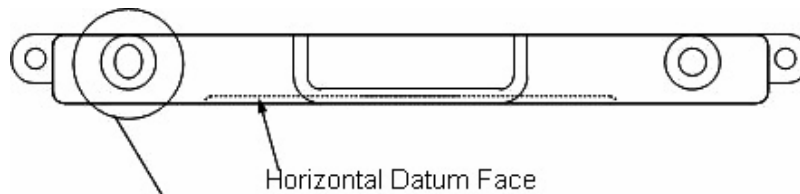


Figure 2: Horizontal Datum Face

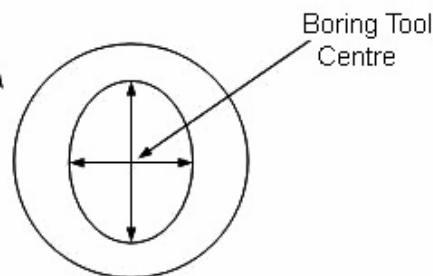


Figure 3: Hole Centre Datum

3. Bore the hole to a diameter of 38mm $+0.025/-0.000$ [H7]. If the wear in the hole is not reclaimed after boring advise the Engineer.
4. Check that the vertical faces on either side of the hole for wear. If necessary skim the faces perpendicular to the hole, to a finished thickness of no less than 19.5mm. If the worn faces are not reclaimed after skimming advise the Engineer.
5. Manufacture a bush as shown in Figure 4.

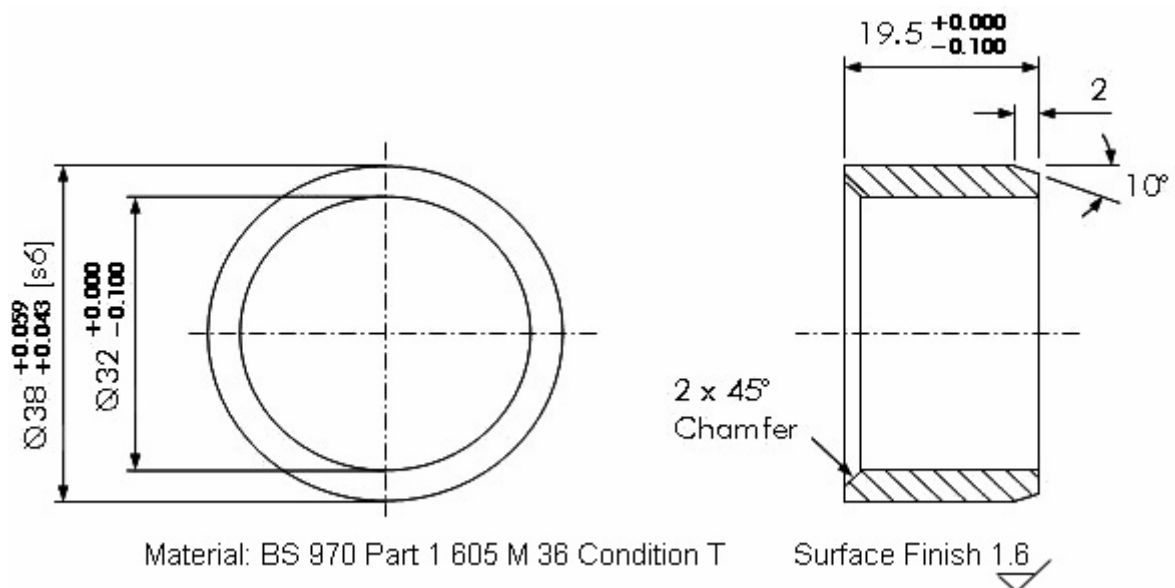


Figure 4: Reclamation Bush

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Spring Plank - Examine

US 0115

6. Press the bush into the spring plank casting with the tapered lead-in towards the inside, until the outer chamfered edge is flush with the outer face of the casting.
7. Set up spring plank casting using the inner bore of the bush for alignment, generally as described in items 1 to 3.
8. Grind the inner bore of the bush to a final diameter of 32mm + 0.039/-0.000 [H8], surface finish $\sqrt{1.6}$.
9. Refit the casting to the tie bars in accordance with Scheduled Work item 6.

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Swing Link - Examine

US 0117

Scheduled Work

1. Remove protective coating (Denso tape), paint, rust or scale by scraping or wire brushing. (Do not use grinding).
2. Examine the swing link for straightness and wear.

NOTE: In the event that the Bolster exhibits damage caused by contact with the Swing Links (see Job No. UM 6919 Step 1), then particular attention must be paid to the Swing Links in order to check for any damage.

If a Swing Link shows any visual indication of having been in contact with the Bolster (e.g. damaged paint), then the Swing Link shall be crack detected in the area of the contact using magnetic particle, or similar technique agreed with the Engineer.

3. Crack detect in the area of the lower head/shank transition radius using magnetic particle, or similar technique agreed with the Engineer.
4. Examine link for signs of corrosion.
5. Clean and paint the swing link as follows:
 - 5.1 Clean and degrease using cleaning fluid to (Cat No. 007/007186) or approved alternative.
 - 5.2 When dry, links shall be coated within 1 hour of cleaning with one coat of anti-corrosion primer in accordance with CR/PE0102 followed by further paint in accordance with the same specification.
6. If links are not to be used immediately they shall be stored in a dry environment.

Arising Work

- 2, 3. Renew bent, cracked or worn swing link (Cat No. 063/000019 (long) or 063/007669 (short)).
4. Renew swing link with any corrosion within 200mm of the base of the link, or heavy corrosion.
4. If surface corrosion is found more than 200mm from the base of the link, the corrosion shall be removed using emery paper.

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Levelling Valve Linkages - Examine

US 0125

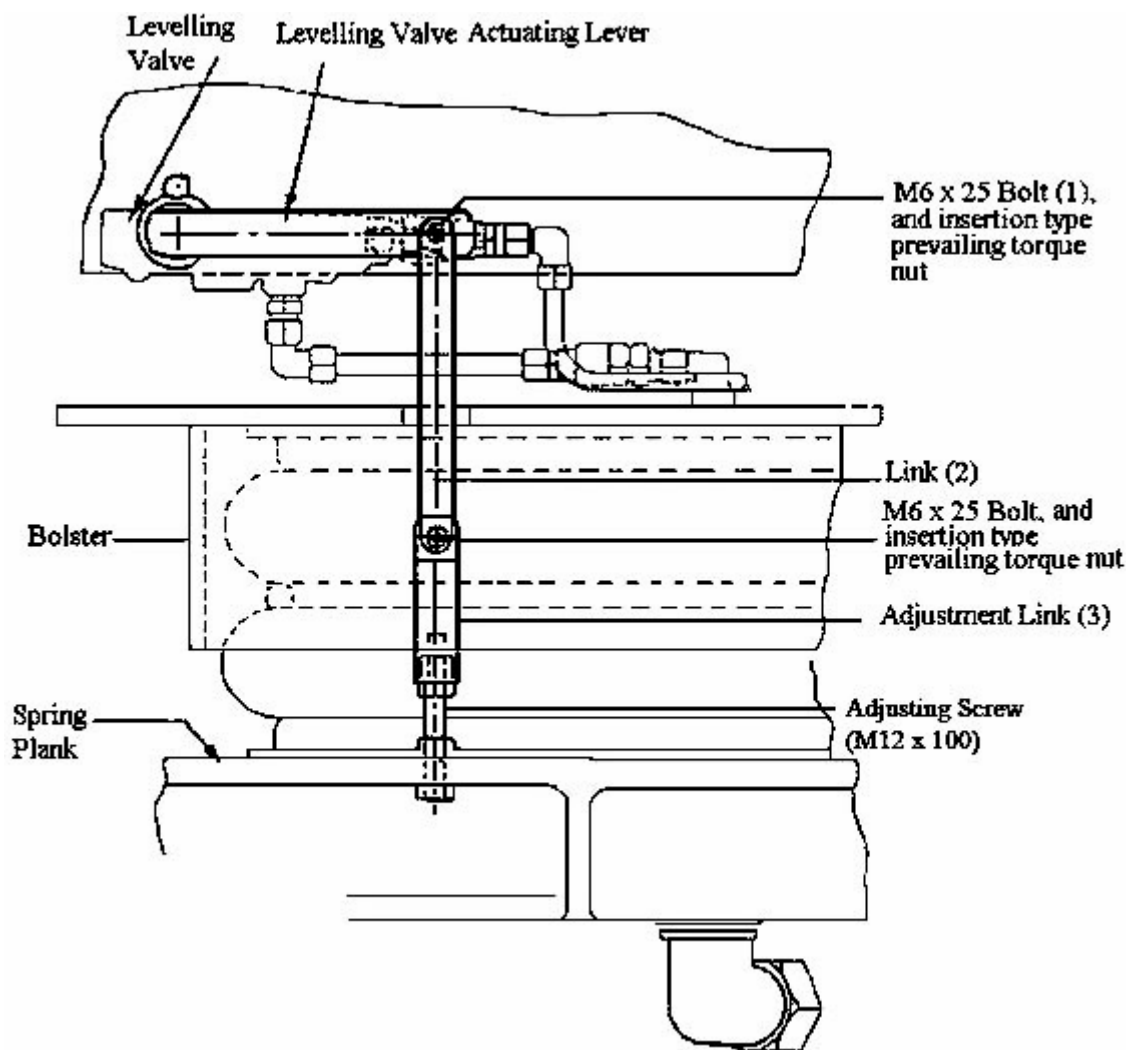


Figure 1: Arrangement of Levelling Valve Linkage

Scheduled Work

1. Examine the levelling valve actuating lever as follows:
 - 1.1 Check that lever is undamaged and conforms to Figure 2.
 - 1.2 Check that the spherical bearing is securely fitted.
 - 1.3 Check that there is no free play between the two halves of the bearing.
 - 1.4 Check that bore is not visibly worn.

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Levelling Valve Linkages - Examine

US 0125

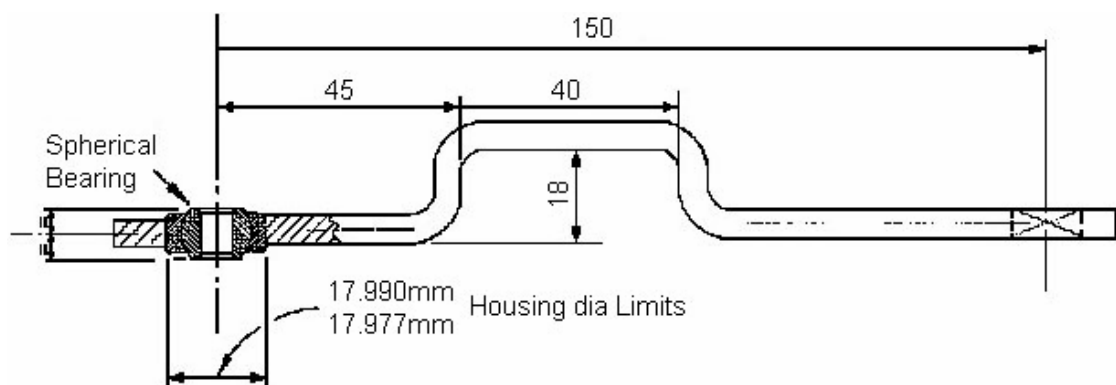


Figure 2: Levelling Valve Actuating Lever

2. Examine the link as follows:
 - 2.1 Visually check that the link is undamaged and straight.
 - 2.2 Check that the diameter of the holes does not exceed 7.0mm.
3. Examine the Adjustment link as follows:
 - 3.1 Check that the link is undamaged.
 - 3.2 Check that the spherical bearing is securely fitted.
 - 3.3 Check that there is no free play between the two halves of the bearing.
 - 3.4 Check that bore is not visibly worn.
 - 3.5 Check that the M12 threads are undamaged.
 - 3.6 Ensure adjusting screw is a M12 x 100 set screw.

Arising Work

- 1.1,2.1, Repair, or renew item if beyond repair.
 3.1,3.5

Item	Drg No.
Actuating Lever	B1-A3-9015410
Adjusting Link	B1-A2-9014578

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	BT10 Bogie	

Levelling Valve Linkages - Examine

US 0125

1.2,3.2 If bearing is loose, gauge housing diameter which should be:

Item	Min	Max
Actuating Lever	17.977	17.990
Adjustment Link	17.972	17.993

If outside these limits, renew or repair in accordance with a procedure agreed with the Engineer.

1.3,3.3, Renew spherical bearings as shown:

1.4,3.4

Item	Cat No.	Rose Part No.	Ampep Part No.
Actuating Lever	64/57	MST O6	11/6859P
Adjustment Link	-	MST Q6	-

2.2 Renew link. See Drg B1-A3-9014577 item 1.

3.6 Renew adjusting screw (Cat No. 035/101190).

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Lateral Control Rod Safety Rope Brackets - Examine

US 0129

Scheduled Work

1. Check that the "rod to rod" lateral control rod safety rope brackets are to Figure 1 (taken from Drgs PB-C1-2100877 or ATC-C1-2200669). If it is carry out item 3.

NOTE: Modified brackets to PB-C1-2100877 and ATC-C1-2200699 are recognised by having three bolts through each bracket; the unmodified brackets have only two bolts.

2. Check that the rod to axlebox rope and bracket is to Figure 2 (taken from Drg B2-A1-8504080). If it is carry out item 3.
3. Examine brackets for cracks, damage and corrosion.
4. Examine safety ropes.

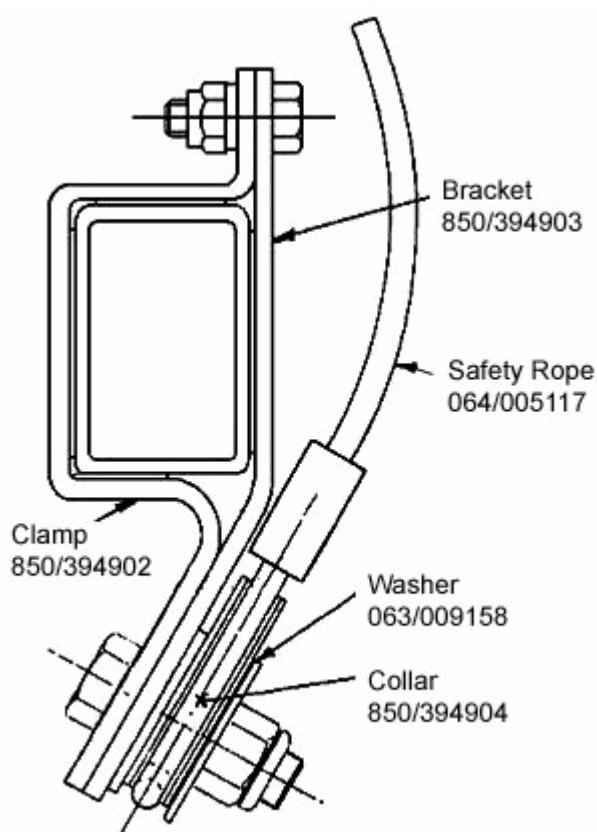


Figure 1: Rod to Rod Safety Rope Brackets

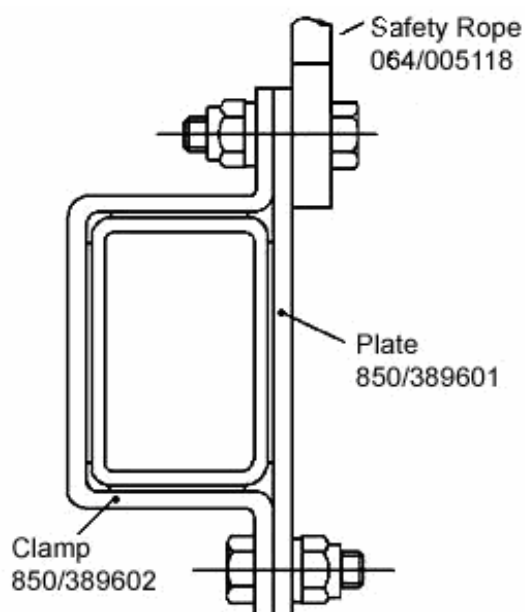


Figure 2: Rod to Axlebox Safety Rope Bracket

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Lateral Control Rod Safety Rope Brackets - Examine

US 0129

Arising Work

1. Renew 'Rod to Rod' safety rope brackets in accordance with PB/MP0799 if not compliant with drawing.
2. Renew the 'rod to axlebox' brackets if not to drawing.
3. Renew damaged or corroded brackets.
3. If corrosion can be removed using an appropriate method, clean and repaint in accordance with CR/PE0102.
4. Renew safety rope if frayed or corroded.

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Swing Link Rocking Washers - Examine

US 0130

Scheduled Work

1. Clean debris and corrosion from all surfaces especially the flat seating surfaces.
2. Examine the rocking washers and determine the amount of wear.
3. Check whether the washer has been reclaimed. If it has there will be identification marks 'A' or 'B' on the flat seating surfaces.
4. Examine rubber mounting pads for cracking and deterioration.

Arising Work

- 2, 3. If the washers are undamaged, reclaimed and have no more than 1mm of wear at any point they may be re-used.
- 2, 3. If the washers are undamaged, and not reclaimed they shall be reclaimed by the process defined in Job USA1003.
- 2, 3. Change reclaimed swing link washers with damage, and change reclaimed washers with more than 1mm of wear, preferably for other reclaimed washers.
4. Renew rubber mounting pad.

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Lateral Control Rod - Overhaul

US 0143

Scheduled Work

1. Examine rod for evidence of a white stripe on the body. If present renew the rod: if not present, either renew the rod or proceed with the repair.
2. Remove and scrap both resilient bushes.
3. Examine rod for signs of damage, corrosion, fretting, particularly under the area of the safety rope brackets.
4. Check straightness using a straight edge, which is the same length as the rod. Maximum curvature allowable: 1mm over the length of the rod.
5. Examine the bores at both ends of the rod for signs of scoring or metal pick up.
6. Gauge the distance between the bush centres which should be as follows:

Axlebox to axlebox	1720 ± 0.25mm
Frame to axlebox	1626 ± 0.25mm
7. On the axlebox to axlebox rod, gauge the distance between the centre line of the spigot and the centre of the nearest bush which should be 250 ± 0.5mm
8. Shot or grit blast rod to remove all paint and corrosion. Bores and the spigot are to be suitably protected during this operation.
9. Fit new bushes (Cat No. 098/008602) by pressing in using a suitable mandrel and observe the pressing force throughout.
10. Paint the lateral control rod in accordance with CR/PE0102.
11. When dry, paint a 50mm white band the length of the rod on one of the vertical surfaces.

Arising Work

- 3, 4. If damaged, outside the dimensional limits or the limit of straightness or if corrosion or fretting
6, 7, is found:

Renew the plain rod (Cat No. 801/078801)
Renew the rod with spigot (Cat No.801/078802)
Record details for rejecting rods, noting type, date and reason for rejection.

5. Remove displaced metal using a smooth half round file.
9. If the pressing force falls below 4 tonnes, remove bush and inspect the rod and bush and reject which-ever is outside limits.

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Rocking Washer - Repair

USA1003

(Arising Work, see Job US 0130)

1. Purpose of Reclamation Procedure

- 1.1 The purpose of this procedure is to detail the product requirements for the reclamation of BT10 bogie rocking collars, by vacuum spray fusion.

2. Note

- 2.1 In view of the hardness and relatively brittle nature of used and reclaimed rocking collars, the hardened surfaces should be adequately protected and sufficient care should be taken at all times to avoid injury. Particular attention is drawn to clause 5 in respect of identification stamping.

3. Associated Drawings

3.1 Original drawings

Male Bottom	B1-A2-9015426
Female Bottom	B1-A2-9015425
Male Top	B1-A2-9015424
Female Top	B1-A2-9015408

3.2 Machining drawings

Male Bottom	B1-A2-8503639
Female Bottom	B1-A2-8503640
Male Top	B1-A2-8503637
Female Top	B1-A2-8503638

4. Preparation

- 4.1 The rocking collars shall be annealed at a temperature of 850-900°C, followed by furnace cooling. They shall be allowed to soak at the annealing temperature for sufficient time to permit correct machining.
- 4.2 The rocking collars shall be machined to profile 'A' as shown on the appropriate drawing given in clause 3.2. If after machining the collars do not clean up in the area specified, i.e. a witness mark remains, the collars shall be further machined to profile 'B'.

If after machining to profile 'B', the collars do not clean up in the area shown on the appropriate drawing, they may be reclaimed by agreement with the Engineer.

5. Identification

- 5.1 After machining, the rocking collars shall be identified by stamping the following information:

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Rocking Washer - Repair

USA1003

- 5.2 'A' or 'B', depending on the profile to which the rocking collars have been machined.
- 5.3 Date (Month, Year).
- 5.4 Supplier's identification mark. To avoid duplication, the Supplier shall state the type of identification mark to be used.
- 5.5 The rocking collars shall be stamped in the area shown on the relevant drawings given in clause 3.2.
- 5.6 Following identification, the collars shall be stored in a dry environment until required for rebuilding. No anti-corrosion treatment shall be used.

6. Spray Fusion Processing

- 6.1 The rocking collars shall be built up by metal spraying, and consolidated by vacuum fusion, using material/materials listed in Section 8 of this job description.
- 6.2 The fused material shall contain no gross porosity. There shall be no individual pore size greater than 0.5mm in diameter.
- 6.3 The rebuilt rocking collars shall have a minimum hardness of 650HV 30 throughout the depth of the deposit.
- 6.4 The profile and dimensions of the rebuilt rocking collars shall be to the relevant drawings given in clause 3.1.
- 6.5 The minimum surface finish shall be 0.8µm.
- 6.6 Sufficient samples shall be taken throughout the production process to ensure that consistency is being obtained. These samples shall be subject to hardness testing and dye penetrant flaw detection.
- 6.7 Following rebuilding the rocking collars shall be coated in Shell Ensio Oil, or similar substance and stored in a dry environment.

7. Material Specification

- 7.1 The deposit and the interface between the deposit and the parent material shall be capable of withstanding, without detriment the full range of ambient conditions likely to be experienced in normal operation. These conditions include: dust, detritus, flying ballast, rain, snow, ice, toilet effluent, diesel and mineral oils, and be capable of being taken through a carriage washing plant.

Washing plants incorporate high pressure water sprays and chemical treatment, containing alkalis, oxalic acid and detergents.

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Rocking Washer - Repair

USA1003

- 7.2 When reclaimed pairs of collars are assembled the deposit material and the interface between the deposit material and the parent material shall be capable of:
 - 7.3 Sustaining without detriment, a compressive load of 25 tonnes through a temperature range of -25°C to 30°C.
 - 7.4 Operating under the conditions given in clause 7.1 and have a minimum service life of 4 years.
8. Approved Materials
 - 8.1 Colmonoy No. 75 alloy followed by an overlay of Colmonoy No 6.2.

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	BT10 Bogie	

Primary Spring - Change

US 6909

Scheduled Work

1. Change primary springs (4 per bogie).
2. Overhaul springs as follows:
 - 2.1 Clean the spring by controlled shot blasting to remove all dirt, paint, rust, grease and oil contamination etc. The springs shall be kept in a warm, dry environment during inspection until after painting. The following criteria apply to the process:
 - a. The shot blast shall use shot size between S170 and S330 inclusive, as defined in BS2451 'Chilled Shot and Grit'. The shot shall be graded in accordance with BS1796 'Method for test sieving' using sieves to BS410 'Test sieves' suitable to the size of shot specified before the shot blast process.
 - b. The use of shot with sharp edges or a high proportion of broken or deformed shot is not permitted.
 - c. Solvent degreasing and paint stripping may be carried out before shot blasting at the Suppliers discretion.
 - 2.2 Examine the spring after shot blasting process for corrosion, indentations, sharp notched damage and arcing damage.
 - 2.3 Perform a non-destructive test on the spring using the fluorescent magnetic particle technique in accordance with BS6072 'Method of magnetic flaw detection' and TL/NP0314. Select a current value of between 1800 and 2100 Amps for the Threaded Bar Technique, Section 4.2.2 and a current value of 550 Amps for the Current Flow Technique, (Section 4.3.2 of TL/NP0314).
 - 2.4 The magnetic particle inspection technique shall not cause any metallurgical damage to the spring.
 - 2.5 View the spring under the conditions using the specified procedure (TL/NP0314 and BS6072 'Method of magnetic flaw detection') to inspect for cracks.
 - 2.6 The spring shall be painted within a maximum of four hours of being shot blasted. Ensure the spring is dry and free from grease, oil, crack detection fluid and any other contamination.
 - 2.7 Load test the springs using a machine which must be calibrated to $\pm 1\%$ of maximum test load. See columns 3 to 5 of Table 1. Record the spring height under load (H).

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Primary Spring - Change

US 6909

2.8 Remove load and measure free length of spring. See columns 6 and 7 of Table 1.

Item No.	Colour	Test Load KN	Height Under Load H(mm)		Free Length (mm)	
			Used Springs	New Springs	Used Springs	New Springs
1	Yellow	27.4	309-327	318-327	438-452	446-452
2	Green	29.9	334-353	344-353	480-494	486-494

Table 1: Spring Test Data

NOTE 1: Green springs are not to be used on HST vehicles.

2.9 Repaint the springs as follows:

2.9.1 Paint bare metal with one coat of QD 'touch in' primer/undercoat in accordance with CR/PE0102.

2.9.2 Apply two coats, by hand, of black paint.

2.9.3 Apply one coat, by hand, of finishing paint.

3. The Supplier shall select springs and packings in bogie sets as follows:

3.1 Springs and packers shall be selected in bogie sets, to give vertical test load heights within 6mm of each other and in accordance with Table 2.

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Primary Spring - Change

US 6909

Arising Work

2. Renew primary springs which fail tests (Cat Nos. 063/000005 - Yellow; 063/000293 - Green).

Vehicle	No. 1 End			No. 2 End		
	Spring Colour	Required Height of Spring & Packing (mm)	Bogie Variables ID Plate Code	Spring Colour	Required Height of Spring & Packing (mm)	Bogie Variables ID Plate Code
Mk3A FO 11005-60	Yellow	335	02	Yellow	335	02
Mk3A TSO & TSOD 12 XXX	Yellow	339	05	Yellow	339	05
Mk3B FO & FOD 11064-101	Yellow	341	06	Yellow	335	02
Mk3B BFO 17173-5	Yellow	341	06	Yellow	335	02
Mk3A TSOB 10401-6	Yellow	See Table 3	09B	Yellow	See Table 3	09A
Mk3A RF 102XX	Yellow	352	12	Yellow	347	10
Mk3A, SLE, SLEP SLED 105XX onwards	Green	354	14	Green	354	14
HST TGS 44XXX	Yellow	328	01	Yellow	335	02
HST TS & TSD 42XXX	Yellow	335	02	Yellow	335	02
HST TF 41XXX	Yellow	335	02	Yellow	335	02
HST TFD 41XXX	Yellow	340	07	Yellow	335	02
HST TSB 401XX	Yellow	342	08	Yellow	335	02
HST TRBF 402XX/409XX	Yellow	352	12	Yellow	340	07
HST TRSB 404XX	Yellow	347	10	Yellow	342	08
HST TRFB 407XX	Yellow	352	12	Yellow	341	08
HST TBRF 408XX	Yellow	352	12	Yellow	342	08
HST TCC 45001-5	Yellow	352	12	Yellow	342	08

Table 2: Data for Spring and Packing Selection

- 3.2 The maximum allowable packing is:

Maximum height of packing above spring	6mm
Maximum height of packing beneath spring	18mm

- 3.3 It is recommended that new yellow springs are used for vehicles with codes 08, 10 and 12.

NOTE 2: Springs shall be selected to minimise the amount of packing required.

NOTE 3: Bogies previously coded 03 and 04 are now to be coded 02.

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Primary Spring - Change

US 6909

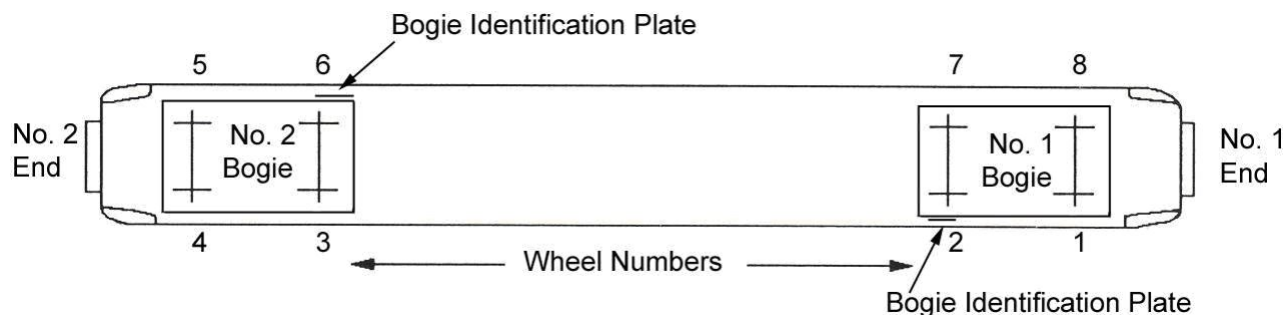


Figure 1: Wheel Positions on Mark 3 Coach

No. 1 End		No. 2 End	
Wheel Positions	Required Height of Spring and Packing (mm)	Wheel Positions	Required Height of Spring and Packing (mm)
1 & 2	348	3 & 4	348
7 & 8	342	5 & 6	336

Table 3: Data for Spring and Packing Selection for TSOB Vehicles

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Spring Plank Safety Wire Ropes - Examine

UU 0126

Scheduled Work

1. On long swing link bogies, check that wire ropes have been fitted in place of safety loops.
2. Examine the wire rope for signs of wear or other damage.
3. On ropes for short swing link bogies, examine the nylon bushes which must be kept with each rope.

Arising Work

1. Modify bogie in accordance with procedure AT/MP0719 or PB/MP0702, but use rope to Cat No. 230/107101.
2. Renew worn or corroded wire rope (Cat No. 230/107101).
3. Renew complete assembly including nylon bushes (Cat No. 230/107102).

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Wheelset - Change

UW 0002

Scheduled Work

NOTE 1: Wheelsets must be stored and handled in accordance with GM/GN2498. In particular care must be taken to protect bearings from the ingress of foreign matter.

1. Change wheelset assembly (2 per bogie).
2. Overhaul or repair wheelset in accordance with the following Specifications:

WOSS 612/10
IB/TS0648
TN/TS0574
GM/GN2498

NOTE 2: 'Long axles' which measure up to 1852 +3.5/-1.5mm over abutments (as defined by drawing C-A1-2857) may be used, provided a white band is painted around the axle centre. Any axle exceeding these limits must be scrapped.

3. Gauge the axle body diameter
 - 3.1 Any axle found to have been previously skimmed by between 1.5mm and 3mm (i.e. a minimum diameter of between 150.5 and 149mm) must be scrapped if the wheel pans are removed for any reason.

NOTE 3: For Angel Trains vehicles, any axle previously skimmed by more than 1.5mm (i.e. a minimum diameter of less than 150.5mm) must be scrapped regardless of whether the wheelset requires wheel pan removal.

- 3.2 Any axle found to have been previously skimmed by between 1.5mm and 3mm (i.e. a minimum diameter of between 150.5 and 149mm) must, if not scrapped, be subject to MPI examination of the axle body in accordance with GM/RT2466 Issue 2. This examination must be done even if the wheelset is "repaired".
4. Overhaul brake discs in accordance with CR/CI0538 unless otherwise advised by the Engineer.
5. Fit Rear Seals of either the Timken "HDL" type, or the SKF "LL" type (see Notes 4 and 5).

NOTE 4: Timken "HDL" seals shall be fitted in accordance with Timken drawing E38393. If an HDL seal is fitted to a wheelset which has not previously been fitted with an HDL seal, then it must be reported by the Supplier to RAVERS modification code UAMSB001 against the wheelset serial number (RAVERS specific type CSR10).

NOTE 5: The use of SKF "LL" seals is permitted at the request of the Supplier and with the specific authorisation of the Engineer. SKF "LL" seals shall be fitted in accordance with SKF drawing P37367. The Engineer shall supply a RAVERS mod code against which the fitting of the SKF "LL" seal shall be reported by the Supplier.

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Wheelset - Change

UW 0002

Scheduled Work

6. Ensure all labelling is removed from wheelsets prior to fitting.

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3.3 Re-Assembly

See Section 4 for Diagram showing Torque values, and general instructions on threaded fasteners.

Bogies must be assembled in order stated. New locking washers and stainless steel split pins shall be used throughout. Unless otherwise stated threaded fasteners should be fitted clean and free from lubricant.

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3	Fit Swing Links	7
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1. Bolster/Spring Plank Assembly

- 1.1 Fit reservoirs to bolster, together with compensating valve, air filters (2 in-line and 1 surface mounted) and pipework (see Figure 1.1).
- 1.2 Fit an elbow (Cat No. 008/500008) to each air spring hose connection point on the spring plank, together with nut (Cat No. 008/500005) and olive (Cat No. 008/500006).

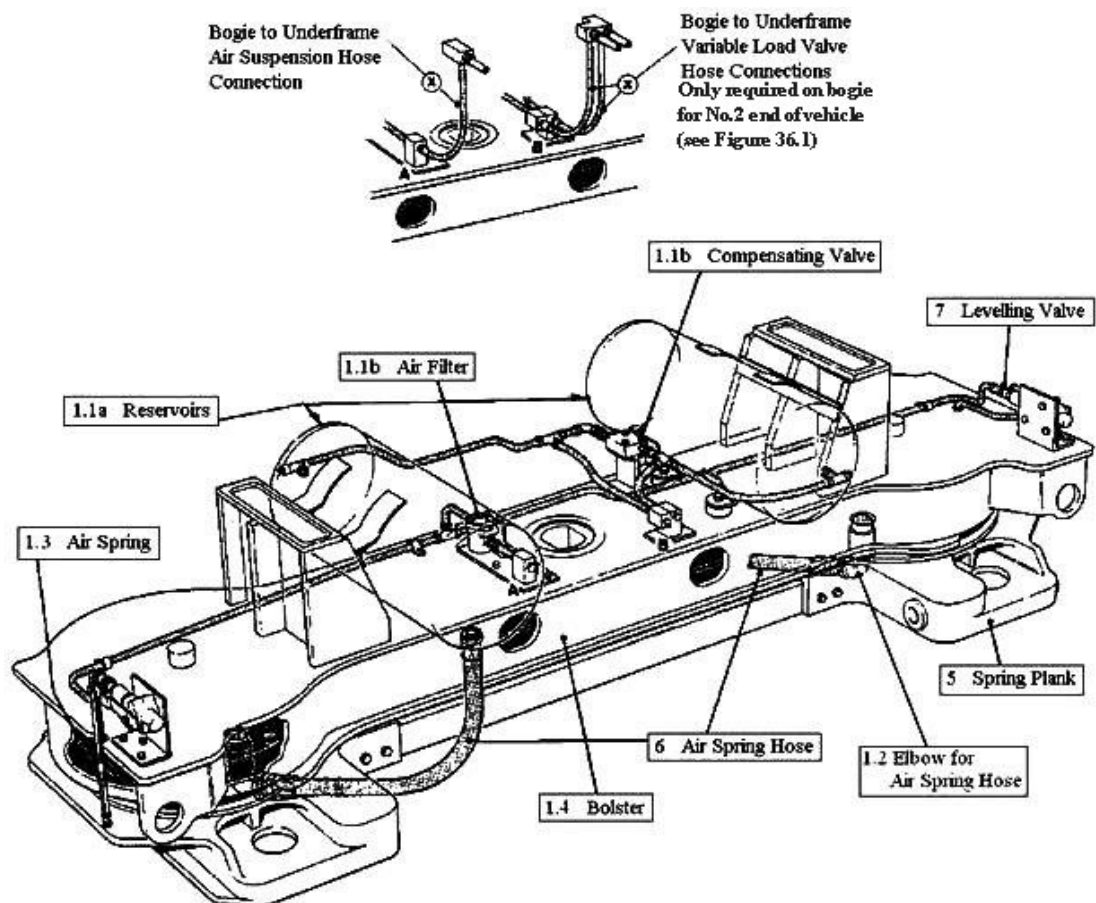


Figure 1.1: Air Suspension Pipework

- 1.3 Fit air springs to spring plank.
- 1.4 Fit bolster to air springs and spring plank.
- 1.5 Fit bolster control rod as follows:
 - 1.5.1 Assemble a pad, the tube and another pad onto the spindle (see Figure 1.2 for orientation of pads).
 - 1.5.2 Fit assembly between brackets on bolster and spring plank.

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- 1.5.3 At each end, fit another pad and an end plate.
- 1.5.4 Degrease threads at the ends of the spindle.
- 1.5.5 Apply Loctite 242 (Cat No. 007/060303, 007/060304 or 007/060305) to threads.
- 1.5.6 Fit a plain M20 nut (Cat No. 003/175026) up to each shoulder, then fit a thin nut (Cat No. 003/175826). Tighten nuts together to 140Nm.

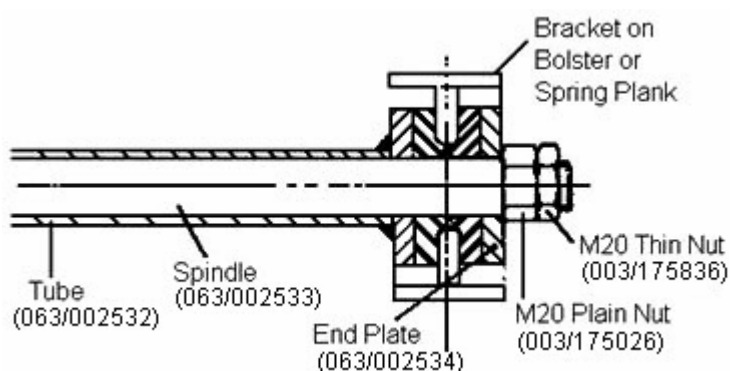


Figure 1.2: Bolster Control Rod End Fixing

- 1.6 Fit the design of Anti-roll Bar specified by the Engineer. See Sections 1.7 and 1.8 for original design or Section 1.9 for improved design.
- 1.7 Fit original design of Anti-roll Bar Assembly as follows:
 - 1.7.1 Remove paint, scale rust and grease from bracket seating areas on bolster.
 - 1.7.2 Fit Anti-roll Bar Assembly to bolster with the following:

Description	Qty	Cat No.	Grade
M12 x 130 bolt	4	003/106763	BS3692 Grade 12.9
M12 x 40 bolt	4	003/100697	BS3692 Grade 12.9
M12 Prevailing Torque Nut	8	003/180332	BS4929 Grade 12

- 1.7.3 Align anti-roll bar with bolster top plate (see Figure 1.3).

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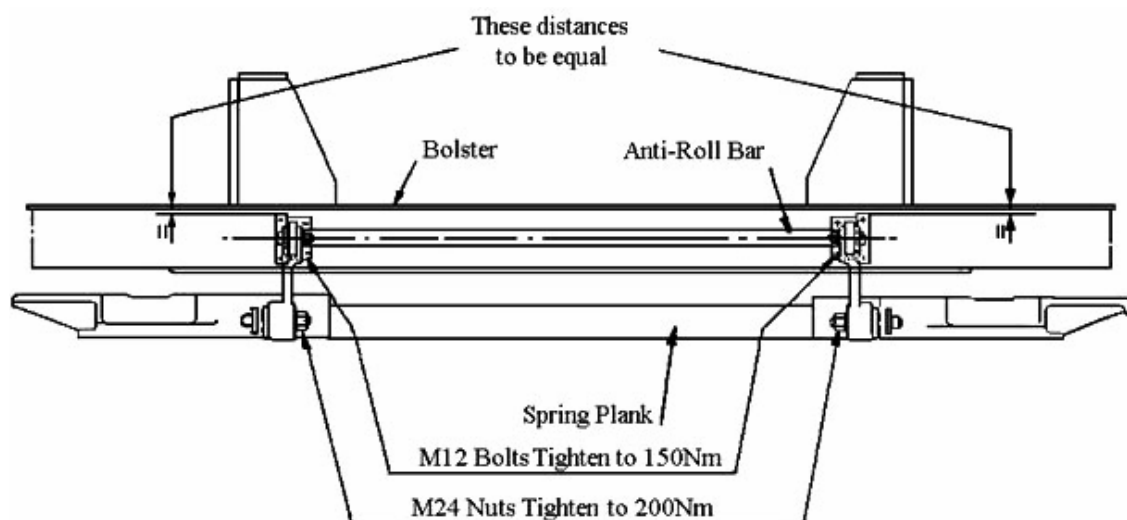


Figure 1.3: Alignment of Anti-Roll Bar

- 1.7.4 Check that both bearing housings make full seated contact against bolster side plate with nuts finger tight only.
- 1.7.5 Gradually tighten bolts, checking that anti-roll bar rotates smoothly.
- 1.7.6 Tighten M12 Bolts to 150Nm.
- 1.7.7 Check that anti-roll bar can be rotated smoothly. If juddering is felt release load from bolts and investigate cause.
- 1.8 Fit original design of anti-roll bar links as follows:
 - 1.8.1 Fit lower end of spring plank spindles and secure with M24 slotted nut and M24 washer. Tighten to 200Nm. Further tighten to align slots with hole and fit 5 x 30 split pin. Check that there is no axial movement.
 - 1.8.2 Secure upper end of link to anti-roll arms with new bolts and M16 slotted nuts. Secure with 4 x 30 split pins. Check that there are gaps between the fork ends and the anti-roll bar arms.
- 1.9 Fit improved design of Anti-roll Bar Assembly as follows:

NOTE 1A: Steps 1.9.1 to 1.9.3 are only necessary if the Anti-roll Bar has been removed.

 - 1.9.1 Remove paint, scale, rust and grease from bearing housing seating areas on bolster.
 - 1.9.2 Check that captive M12 bolts in bolster are grade 12.9. If not renew in accordance with table in step 1.7.2 above.

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- 1.9.3 Fit bearing housings, complete with anti-roll bar, onto captive M12 bolts in bolster side plate and secure with new M12 bent beam nuts (Cat No. 003/180156). Tighten to 160Nm. (See Figure 1.4).

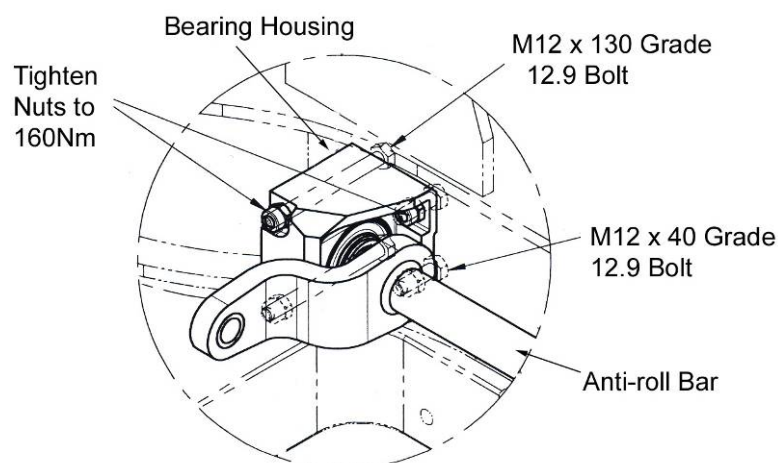


Figure 1.4: Assembly of Improved Anti-roll Bar Bearing Housings

- 1.9.4 Fit Anti-roll Bar links to bearing spindles on spring plank castings. Check that each link is the correct way round (see Figure 1.5).

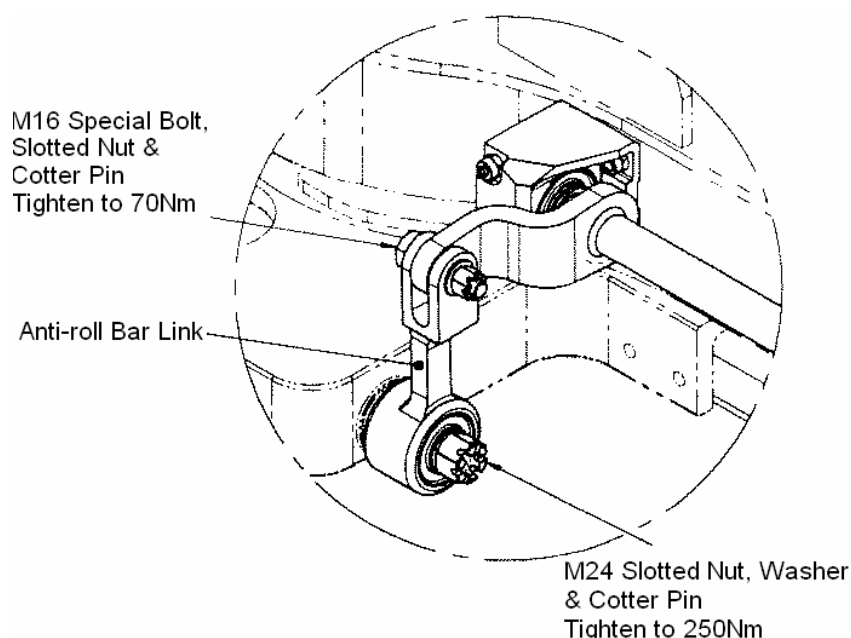


Figure 1.5: Assembly of Links to Improved Anti-roll Bar

- 1.9.5 Secure links with new M24 slotted nut (Cat No. 003/175522), and M24 washer (Cat No. 003/190844) but do not tighten at this stage.
- 1.9.6 Swing each link on its spindle until each clevis and anti-roll bar lever can be connected by a new special bolt (Part No. 2105261-01).

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1.9.7 Secure each bolt with new M16 slotted nut (Cat No. 003/175514). Tighten to 70Nm and fit 4 x 32 split cotter pin (Cat No. 029/127140). Tighten M16 nut further until next slot in nut aligns with hole in bolt. **(Do not loosen nut to fit split cotter pin).**

1.9.8 Tighten M24 slotted nuts at lower end of links to 250Nm. Fit 5 x 32 split cotter pin (Cat No. 029/127170). Tighten M24 nut further until next slot in nut aligns with hole in bolt. **(Do not loosen nut to fit split cotter pin.)**

2. Prepare swing links as follows:

Wrap in one piece of "Denso" tape to Cat No. 007/120509 for a distance of 200mm from the bottom end, including the 66mm diameter shoulder. The tape shall be wound without gaps from the central area of the link, ensuring free end is trapped under the first turn. At the end of the link the tape shall be of single thickness only, since greater thickness will prevent the fitting of split collars. The tape shall be moulded by hand around the body and the shoulder, ensuring that the tape adheres to the link.

3. Fit swing links as follows:

- 3.1 Check that mating surfaces of rocking washers are free from paint contamination.
- 3.2 Fit swing links, rocking washers and swing link packing (see Drg B2-A2-8503273) to the bogie frame and align them to the spring plank.
- 3.3 Fit a new rubber shield (Cat No. 850/395901) to each swing link.
- 3.4 Do not use excessive force, i.e. hammer, when assembling the swing link and rocking washers. If difficulty is experienced, investigate cause and rectify.

4. Secure spring plank as follows:

Fit collets and secure spring plank to swing links. Check that collets are flush with underside of spring plank. Check that the bolster sits approximately square within the bogie frame.

5. Fit spring plank safety ropes as follows:

- 5.1 On long swing link bogies check that modification PB/MP0702 or AT/MP0719 has been implemented. (Safety hanger loop replaced by wire rope.) Proceed as follows:
 - 5.1.1 Ease bottom loop of wire rope (Cat No. 230/107101) over sling guide fitted to spring plank spigot.

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- 5.1.2 Align top of wire with bracket on frame, and secure with the following items:

Item	Details
Pin	PB-C2-2101117 Item 2 or ATC-C2-2202255 Item 2
Washer	PB-C2-2101117 Item 3 or ATC-C2-2202255 Item 3
Split Pin	Ø6x50 (Cat No. 029/127210) (Corrosion Resistant)

- 5.1.3 Check that the wire rope is a loose fit at top and bottom.

- 5.2 On short swing links bogies, fit wire ropes, complete with two bushes (Cat No. 230/107102), using castellated nuts and split pins on spring plank fixing. Tighten both top and bottom fixings to 100Nm.

6. Fit hoses between air springs and reservoirs. Align elbows fitted at step 1.2 and tighten the nuts.
7. Fit two levelling valves each with two in-line filters and linkages (see Figure 7.1).

NOTE 7A: These valves are handed, and of two varieties, as follows:

Variety	Cat No. (LH and RH)	Fitting Restriction
Earlier cylindrical cast type	070/020625 070/020626	None
Later square block type, with cut out	070/020625 070/020626	Supplier to ensure no fouls with pipework and support bracket

- 7.1 Ensure adjusting screw is M12 x 100mm long (Cat No. 035/101190).

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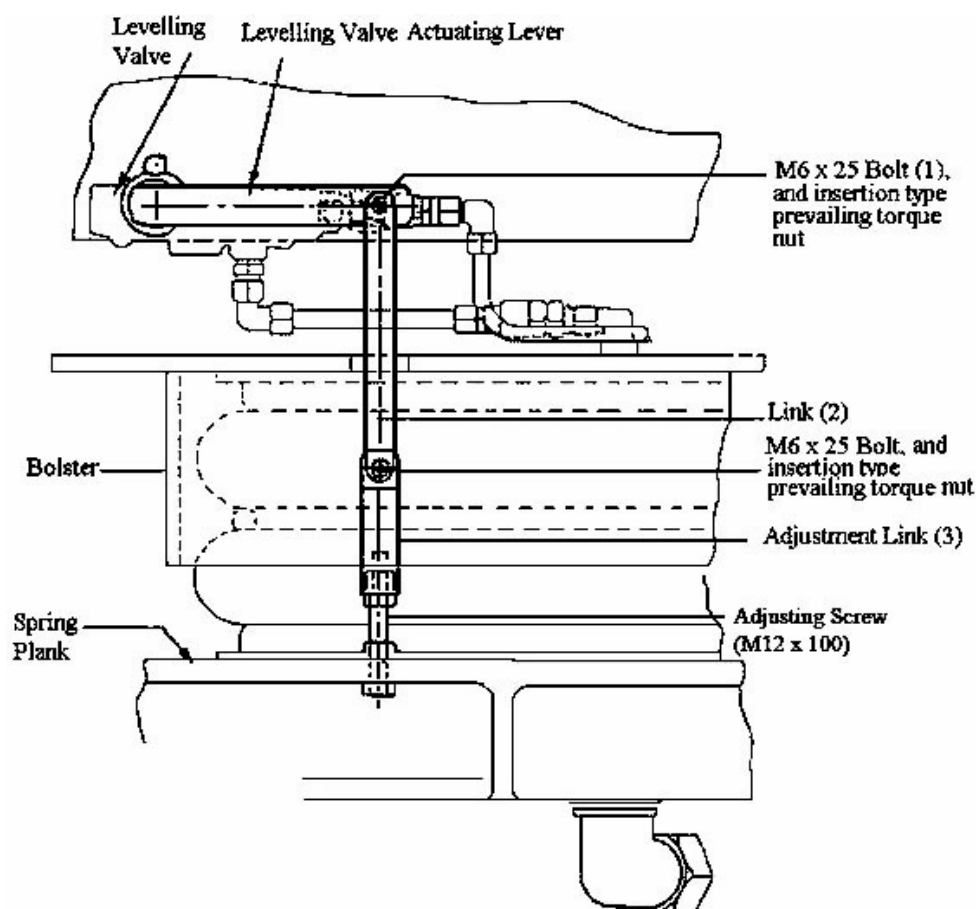


Figure 7.1: Arrangement of Levelling Valve Linkage

8. Determine the requirement for the secondary traction rod spacing washers as follows:
 - 8.1 Measure the length of each of the four bushes as shown in Figure 8.1.

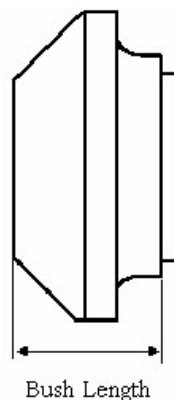


Figure 8.1: Measurement of Traction Rod Rubber Bush

- 8.2 Measure the thickness of the brackets on the bogie frame and bolster immediately adjacent to the mounting hole, as shown in Figure 8.2.

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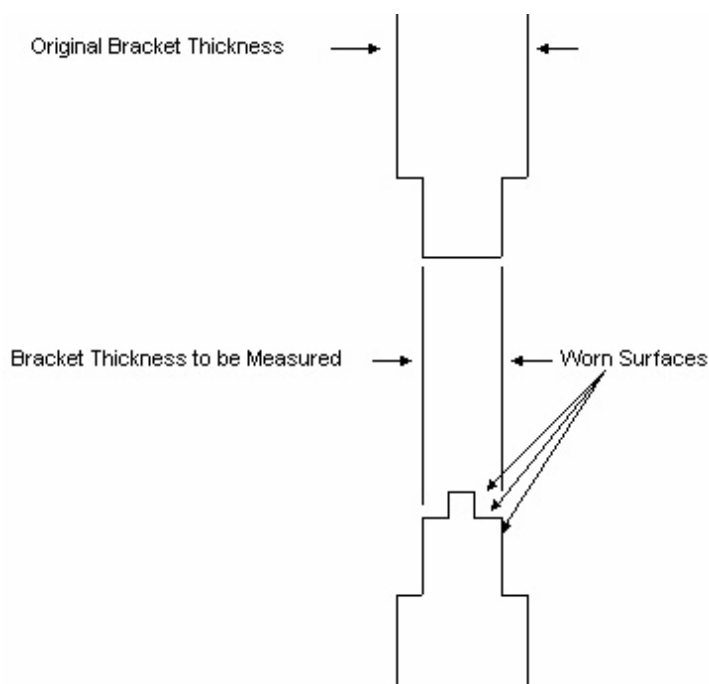


Figure 8.2: Measurements of Bogie and Bolster Traction Rod Brackets

8.3 Calculate dimension 'X' for the assembly as follows:

Add the following:		See Para No.
Length of Rubber Bush	_____mm	8.1
Length of Rubber Bush	_____mm	8.1
Length of Rubber Bush	_____mm	8.1
Length of Rubber Bush	_____mm	8.1
Thickness of Bogie Bracket	_____mm	8.2
Thickness of Bolster Bracket	_____mm	8.2
Total	_____mm	
Subtract correction for lengths of rod and tube	<u>280.00</u> mm	
Giving Dimension 'X'	_____mm	

8.4 Select two packing washers of equal thickness as shown below:

Dimension 'X'	Packer Washer Thickness 'T' per packer	Item on Drg PB-CI-2100415 or ATC-C1-2200832
0-3mm	6mm	07
3 to 7mm	4mm	06
7mm or more	2mm	08

NOTE 8A: Only one packing washer should be used in each of the two locations shown in Figure 9.1.

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9. Assemble secondary traction rod as follows (see Figure 9.1):

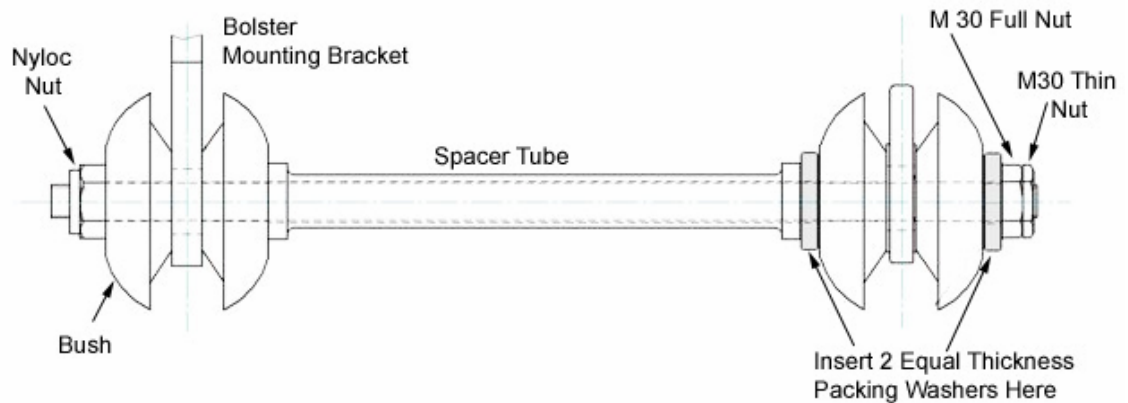


Figure 9.1: Assembly of Secondary Traction Rod

- 9.1 Thread the spindle through:

- i) packing washer (if required see 8.4 above)
- ii) frame mounted bracket, with rubber bush on each face
- iii) packing washer (if required - see 8.4 above)
- iv) spacer tube
- v) bolster mounting bracket with a rubber bush on each face.

NOTE 9A: Use packing between spring plank and bolster to ensure that secondary traction rod is horizontal when assembled and tightened.

- 9.2 Degrease the threads at the inner end, and fit M30 Nyloc nut (Cat No. 003/018067).
- 9.3 Tighten nut to shoulder on spindle.
- 9.4 Check that the clearances between the bolster and the bolster stop brackets are between 8 and 12mm (see Figure 9.2).

Remove or add packers (3mm thick, Cat No. 063/000026).

Advise Engineer if outside these limits.

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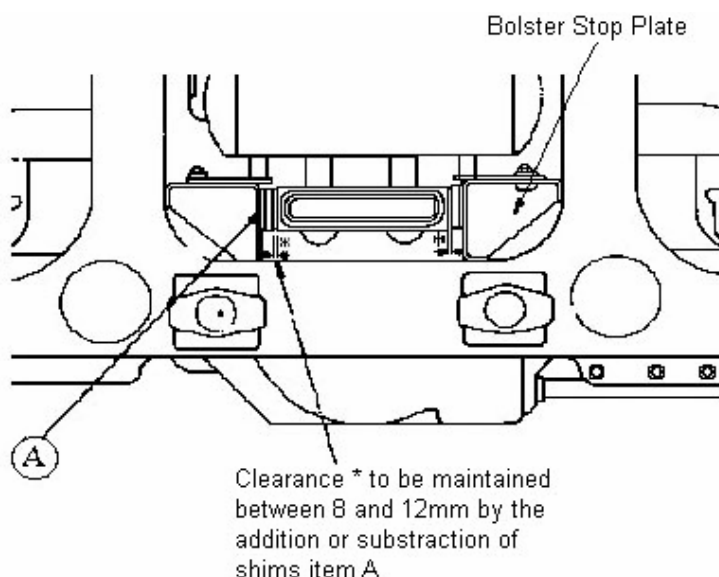


Figure 9.2: Bolster Stop Shims

- 9.5 Tighten the Nyloc nut to 500Nm, whilst holding the rod still on the plain nut fitted in Job UH 6930.
- 9.6 With this torque applied it should be clearly felt that the nut has been tightened against the shoulder of the rod.
- 9.7 Check that the lock nut is tightened to 300Nm.
- 9.8 Coat the exposed threads of the spindle with Tectyl 506 or equivalent anti-rust compound.

NOTE 9B: Where required the traction rod retaining brackets that were removed in section 3.1 must be refitted. Prior to fitting examine the brackets for corrosion, up to 3mm loss of thickness is acceptable. Renew brackets as appropriate. Fit the brackets to the bogie using one M20 x 85 bolt (Cat No. 003/107205), an M20 washer (Cat No. 003/190940) and a bent beam nut (Cat No. 003/180352). Refer to drawing WSA-C1-8375182.

10. Fit lateral dampers as follows:

- 10.1 Prime the damper in a damper priming machine.
- 10.2 Keep the damper so that the dust shield end is always above the reservoir dome end, and the dome always facing upwards.
- 10.3 Fit the damper to the bogie. Tighten nuts to 100Nm.
- 10.4 Apply a coat of Tectyl 506 or equivalent anti-rust compound to the exposed threads.

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NOTE 10A: If a damper priming machine is not available, grip the damper in a vice with the dome facing upwards, but with this end below the dust shield end. Extend and compress the damper fully by hand and repeat operation until considerable resistance is felt in both directions over whole of travel.

11. Fit brake callipers and actuators, (see Figure 11.1) as follows:

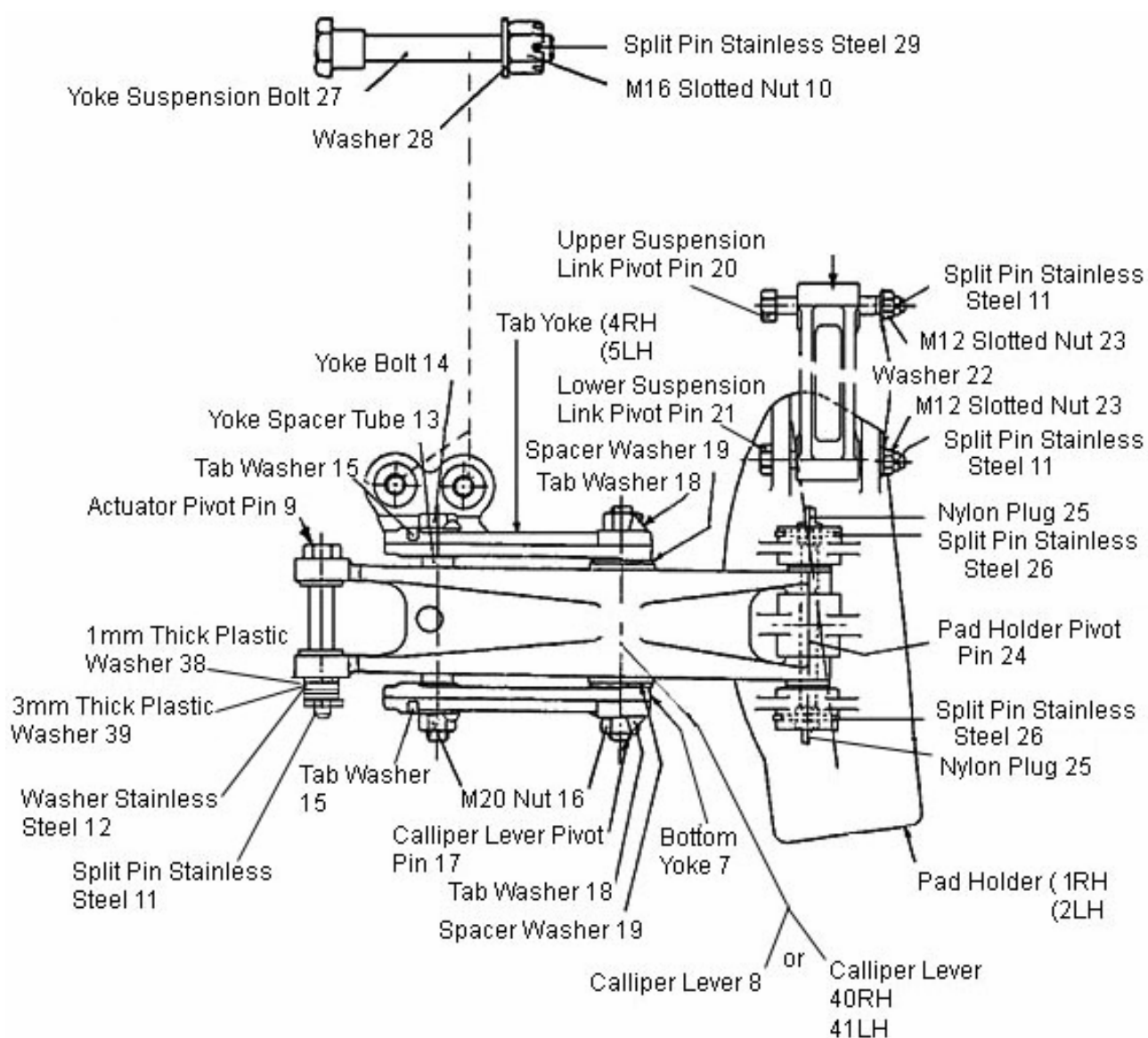


Figure 11.1: Brake Calliper Assembly

NOTE 11A: The bushed calliper levers may be either (8) or (40) RH and (41) LH, dependant on which type of pivot bush is fitted. Always assemble the levers with a bush flange on the top surface.

11.1 Renew all steel washers, plastic washers, tab washers and split pins.

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- 11.2 Fit pad holders (1 and 2) to the calliper levers, with pivot pins (24), and secure with new nylon plugs (Cat No. 098/000063) and new split pins (Cat No. 029/127216).
- 11.3 Fit top yoke (4 and 5) and pivot pins (17) to bogie frame with bolt (27) M16 slotted nut and new stainless steel split pin (Ø4 x 36).
- 11.4 Fit actuator pins (9) into calliper levers (8) ensuring head of pin is at the top of the calliper levers and fit calliper levers (8), spacer washers (19) and bottom yoke (7). Tighten pivot pin nuts and yoke spacer tube nut and bolt (14) to 275Nm and knock over tab washers.
- 11.5 Fit actuator by lifting pivot pins and sliding it into position. Ensure drain hole is at bottom of the actuator body.
- 11.6 Secure each pivot pin (9) with a stainless steel washer (12) (Cat No. 801/397804), and a combination of plastic washers (38, 39) and a stainless steel split pin 5.75mm dia x 40mm long (11). Select a combination of 1mm and 3mm thick plastic washers (Cat Nos. (38) 801/397805 and (39) 801/397806) to give between 1 and 2mm of vertical free play in the pin when assembled. Not more than two plastic washers shall be used.
- 11.7 Fit Suspension links (3) with Pivot pins (20), washers (22) and M12 slotted nut (23). Tighten to 55Nm. Secure with new stainless steel split pin (Cat No. 029/127120).

12. Fit WSP dump or blow down valves as follows:

- 12.1 Fit BR and Girling WSP blowdown valves (tighten bolts to 35Nm) and new brake hoses (Cat No. 063/008197). Ensure all plastic bungs are removed.
 - 12.1.1 Connect wires to WSP blowdown valves.
 - 12.1.2 Refit connecting box cover and tighten screws to 10Nm.
- 12.2 Fit Westinghouse dump valves (as specified by Customer (see Job EY 0566)) to the manifold blocks (see Figure 12.1), as follows:
 - 12.2.1 Remove masking tape from ports on valves and manifold blocks, and pipes.
 - 12.2.2 Refit manifold blocks to bogie and connect pipes.
 - 12.2.3 Coat the following new 'O' rings with a thin film of Ironside Blend A grease (Cat No. 027/004332) or equivalent. (See Note in Job EY 0566.)

Item No.	Qty	Westinghouse Part No.
7	2	D76151/037
8	1	D76151/031

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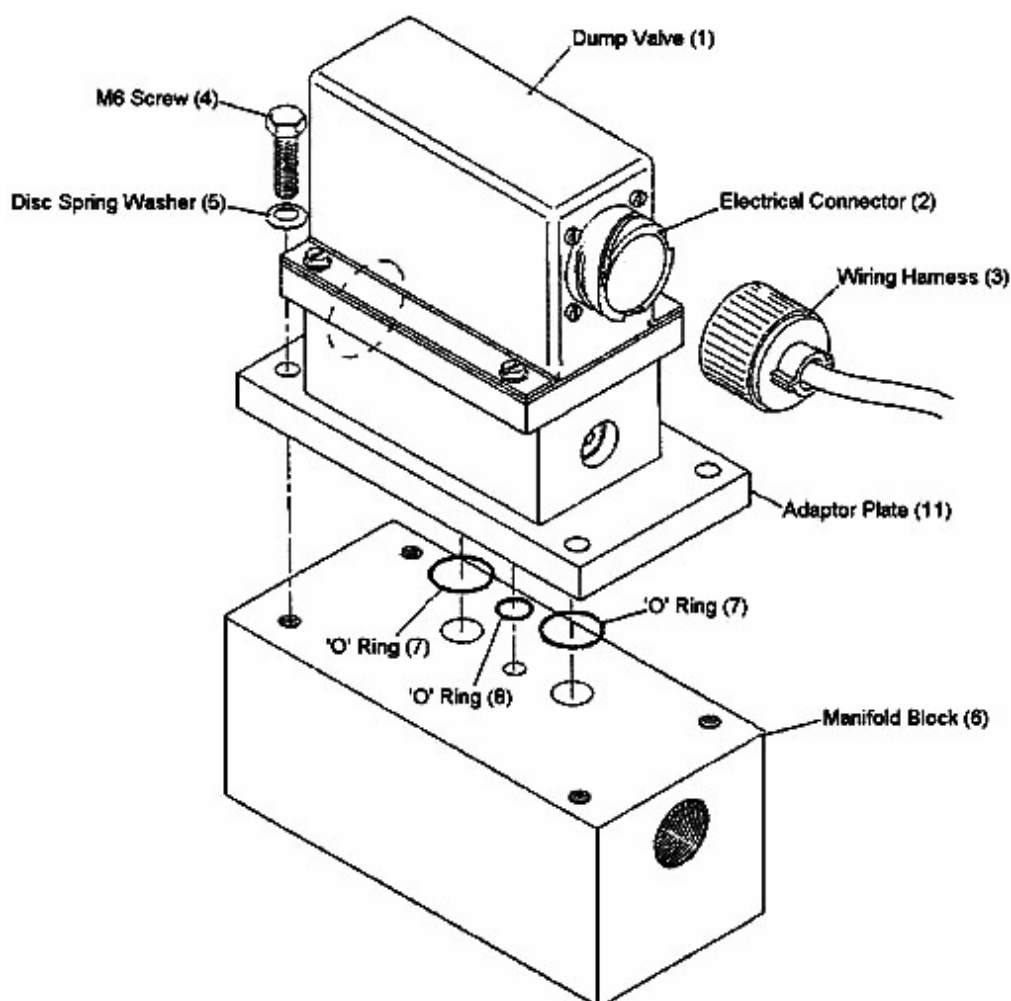


Figure 12.1: Westinghouse Dump Valve

- 12.2.4 Place 'O' rings into their recesses in the mounting face of the adaptor plate (11).
 - 12.2.5 Position the valve and adaptor plate assembly on the manifold block (6), ensuring the ports are aligned. Fit the four M6 screws (4) with new Disc Spring washers (5) (Westinghouse Pt No. 77882723). Tighten to 9Nm.
 - 12.2.6 Reconnect wiring harness (3) at connector (2) and secure harness to dump valve bracket with Ty-wrap.
 - 12.2.7 Fit new brake hoses (Cat No. 063/008197). Ensure all plastic bungs are removed.
13. For each pair of bogies select 4 wheelsets with wheel diameters within 20mm for BR WSP and Westinghouse, and 25mm for Girling. Minimum size to be agreed with the Engineer.

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14. Fit axleboxes as follows:

- 14.1 Degrease the internal bore of the axlebox with Genklene or similar approved cleaning agent and allow to dry.

NOTE 14A: On no account should Molykote D321R be used in this application.

- 14.2 Coat the internal bore with lithium based No. 3 grease (Cat No. 027/001353 or 027/001354).

NOTE 14B: This is to ensure adequate sealing and reduce the risk of water ingress from rear.

- 14.3 Ensure that the three bore recesses are full of grease over the full diameter by smoothing with a metal spatula or similar tool (see Figure 14.1).

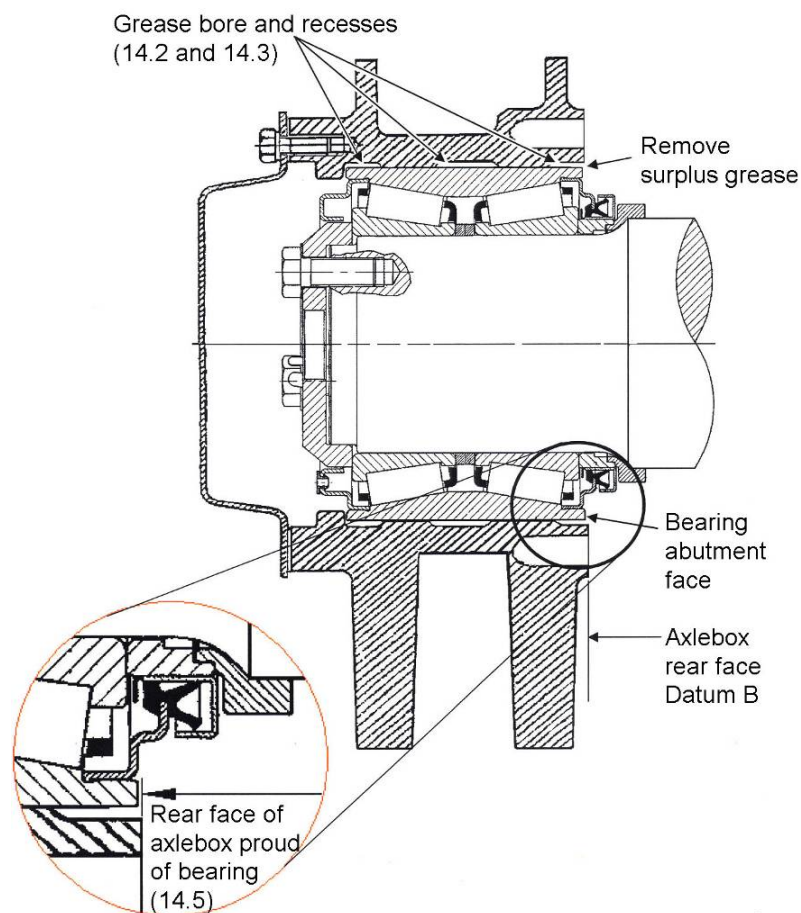


Figure 14.1: Diagram of Axlebox and Bearing

- 14.4 Support the axlebox using a suitable sling and crane so that the pivot bush and axlebox bearing centres are horizontal and in alignment with the axle centreline. Locate the axlebox bore onto the bearing and slide into position by hand, ensuring alignment of the axlebox bore and bearing is maintained at all times.

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NOTE 14C: If the axlebox becomes misaligned and will not slide onto the bearing this shall be corrected using hand pressure only. Under no circumstances shall hammers, crowbars or any other means of excessive force be used as this will damage the bearing.

- 14.5 Position the axleboxes on each bearing so that the back face is just proud of the rear bearing abutment face. This can be checked using a straight edge held against the back face of the axlebox, reference Figure 14.1 detail.
- 14.6 Wipe away any surplus grease from the rear bearing face and in or around the tapped fixing holes. Do not fit the rear cover plates at this stage.
- 14.7 Support the axleboxes using wooden blocks so that the pivot bush and axlebox bearing centres are horizontal.
15. Fit the Lateral Control Rod (LCR) between the axleboxes as follows:
 - 15.1 On new axlebox to axlebox LCR's gauge the distance between the bush centres which should be $1720 \pm 0.25\text{mm}$. Reject any rod outside these limits.
 - 15.2 Remove paint and grease debris from the axlebox taper spigot body and threads.
 - 15.3 Coat the tapered part of the spigot body, excluding the threads, with Molykote D321R lubricant (Cat No. 027/004058) and allow to dry for five minutes (see Figure 15.1).

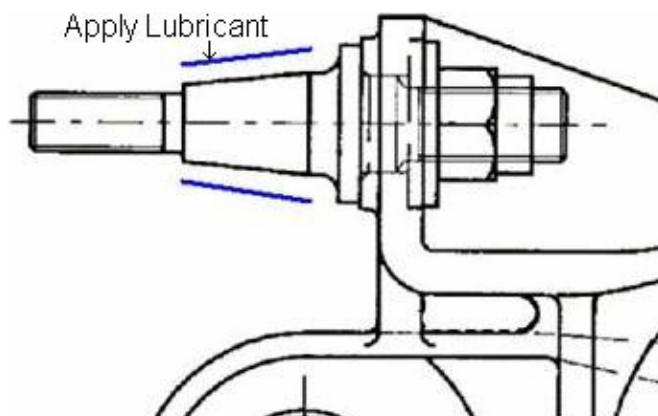


Figure 15.1: Application of Molykote Lubricant to Tapered Part of Spigots on Axlebox

WARNING: This product shall only be used by personnel wearing Orinasal respirators. A safety data sheet for this product is available from Dow Corning Ltd, Avco House, Castle Street Reading Berkshire RG1 7DZ.

- 15.4 Remove paint, grease and any corrosion debris from the new axlebox LCR spigot bush bores and degrease using cleaning fluid (to Cat No. 007/007186), or similar approved cleaning agent, and allow to dry.

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15.5 Fit the LCR between the two axleboxes and ensure it is pushed fully home on the axlebox spigots. Fit two temporary M24 nuts and washers finger tight to retain the LCR in position.

16. Align the axleboxes as follows:

16.1 Check that the bearing abutment face is not standing proud of the axlebox rear face on both sides of the axle. Adjust the axleboxes, by hand, with the LCR fitted so that the distance between the axlebox rear face and bearing abutment face is approximately equal both sides (see Figure 14.1).

16.2 Using a FARO arm measuring machine (or approved equivalent), set up datums from the axle centre line and the back faces of the wheels. Measure the distance between the axlebox rear faces on the axle centre line and record the dimension 'x', see Figure 16.1.

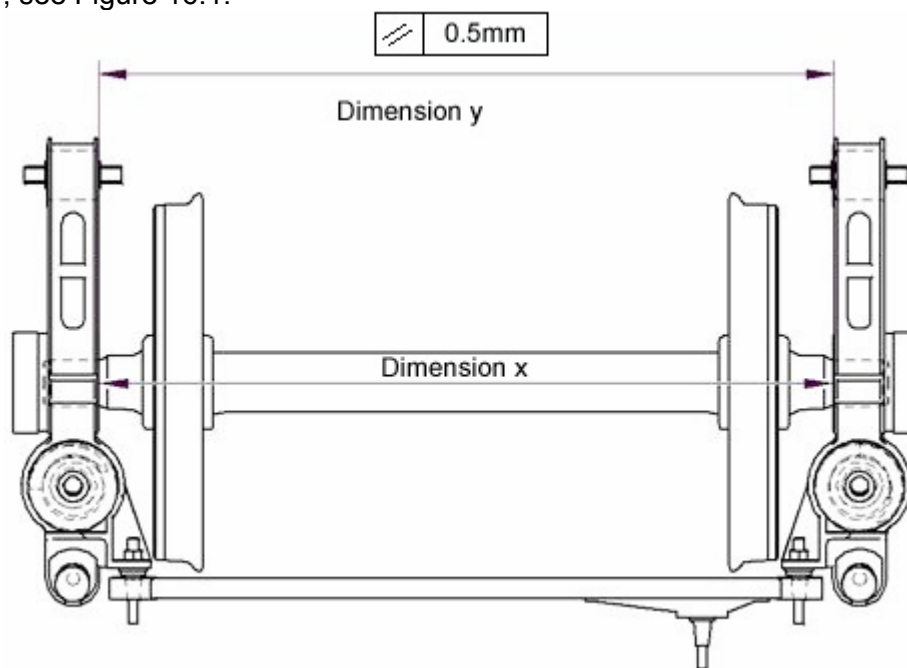


Figure 16.1: Measurement of Axlebox Parallelism

16.3 Maintaining the same datums, measure the distance between the axlebox rear faces at the pivot bush centre line and record dimension 'y', see Figure 16.1.

16.4 Adjust the axleboxes on the bearings so that the measurement across the back face of the axlebox at the centre line (Dimension 'x') is equal to that measured at the pivot bush centre line (Dimension 'y'), within 0.5mm, see Figure 16.1. This shall be achieved with the bearing abutment faces remaining flush to under flush measured against the axlebox rear face, see Figure 14.1.

16.5 Record the final Dimension 'y' on the appropriate record sheet (see pages 47 and 48), this will be used to align the axleboxes when assembling the wheelset into the bogie.

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NOTE 16A: With the components manufactured within the drawing tolerance limits it should be possible to achieve the above assembly criteria and correct alignment of the axleboxes with no axial or twisting loads imposed on the bearings.

If the above assembly procedure cannot be achieved the cause must be investigated and rectified before continuing with the wheelset assembly. Typical areas for investigation are:

- LCR bush centre distance ($1720 \pm 0.25\text{mm}$)
- Axle bearing abutment shoulder distance ($1852 \pm 0.20\text{mm}$)
- Axlebox LCR spigot offset to rear face ($89.5 \pm 0.05\text{mm}$)
- Axlebox bearing bore depth ($133.150 \pm 0.125\text{mm}$)

17. Final assembly of the axlebox LCR

17.1 Remove the temporary M24 nuts and washers retaining the LCR and degrease the M24 threads on the LCR spigots using cleaning fluid (Cat No. 007/007186), or similar approved cleaning agent, and allow to dry.

17.2 Fit the butterfly washer and disc spring to each of the axlebox LCR spigots. The disc spring shall be fitted with the centre portion of the cone abutting the nut clamping face, see Figure 17.1.

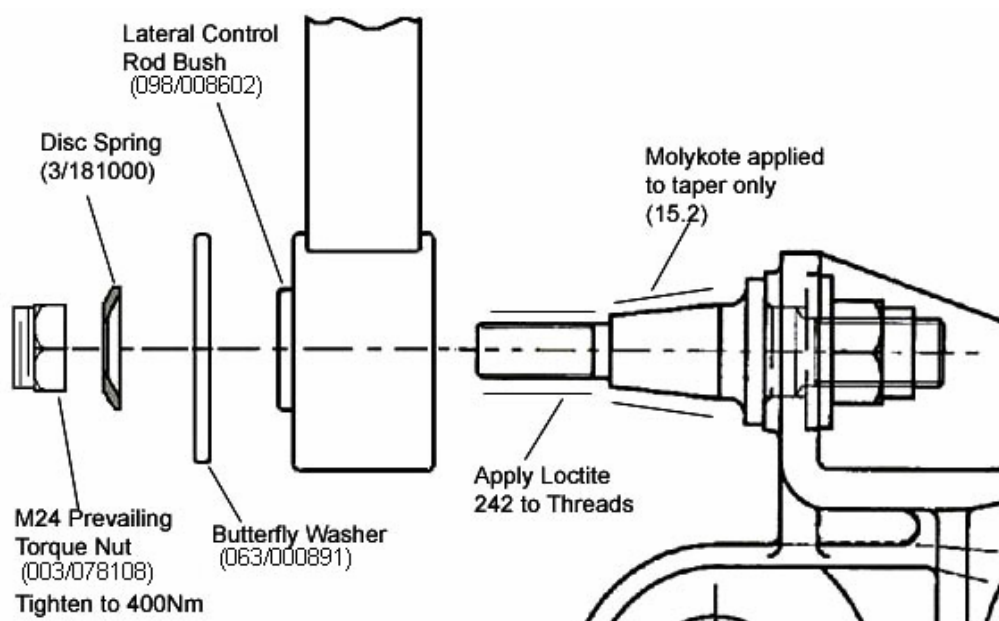


Figure 17.1: Exploded View of Assembly of LCR onto Axlebox Spigot

17.3 Coat the spigot threads with Loctite 242 and fit new M24 prevailing torque nuts. Two complete threads must protrude through the nuts. Torque tighten to 400Nm ensuring that the butterfly washers are positioned with the longest sides horizontal.

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17.4 Check that the axleboxes remain parallel within 0.5mm using the FARO arm and record all the wheelset build details on the appropriate Wheelset Record Sheet (see pages 48 and 49).

18. Fit the axlebox rear cover plates as follows:

18.1 Prior to assembling the axlebox rear cover plates check the mating faces for evidence of wear or grooving, reference Figure 18.1. Wear or grooving above 0.2mm is not acceptable on the bearing abutment face side. It is permissible to reverse the cover plates and use the opposite face if this is not worn or damaged. Grinding or reclamation of the faces outside the drawing requirements is not acceptable.

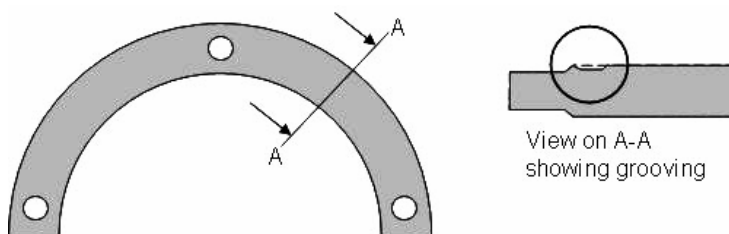


Figure 18.1: Grooving Damage to Rear Cover Plates

18.2 Fit the rear cover plates with six M16 x 35 set screws (Cat No. 035/101248) and spring washers (Cat No. 003/195118) per axlebox. Nip the set screws up by hand to retain the rear cover plates in position.

18.3 Using a feeler gauge check the radial clearance between the bore of the cover plates and the outside diameter of the bearing HDL seal. Check that the radial clearance is at least 1.0mm around the whole circumference. Adjust the rear cover plates as necessary to achieve this.

18.4 Torque tighten the six M16 set screws to 120Nm.

NOTE 18A: No sealing compound or gasket is required when assembling the rear cover onto axleboxes.

19. Fit Axle End Caps as follows:

19.1 Ensure all components are clean and dry before fitting.

19.2 Identify the components required for the assembly, i.e. plain end cap, or toothed wheel/adaptor type end caps. (WSP equipment is fitted at wheel positions 1, 2, 5 and 6) (see Figure 35.1).

19.3 Ensure before fitting that the correct end caps, locking plates and set screws are used on assembly.

NOTE 19A: It is not sufficient to ASSUME that axle end caps and end cap screws removed from axles are correct. End cap screw length varies with make of bearing. Checks should be made with Tables 1 and 2 in every case.

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19.4 Using a NEW locking plate, assemble the axle end cap, locking plate and set screws onto the axle.

19.5 Tighten the axle end cap screws to 90Nm.

19.6 Secure each set screw (see Figures 19.1 and 19.2). Use adjustable rib-jointed pliers, (Cat No. 039/143220). Be careful not to bend the locking tabs against the corners of the set screw heads or break the tabs.

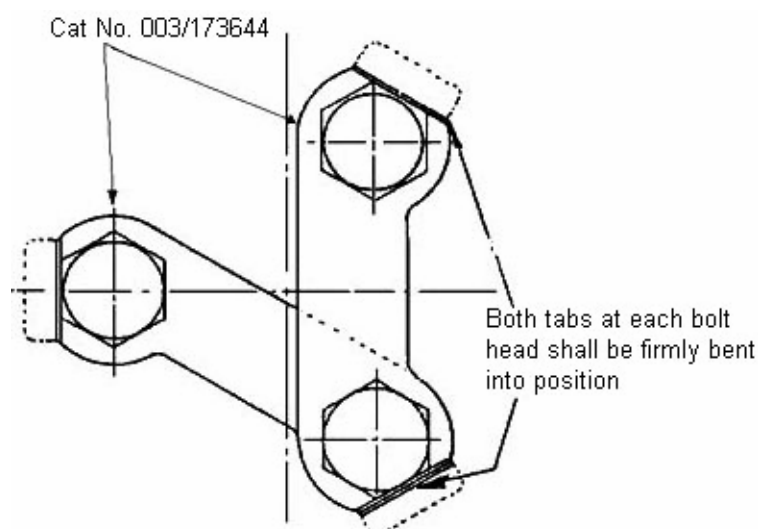


Figure 19.1: Method of Fitting Locking Plates to Axle Ends with Girling WSP

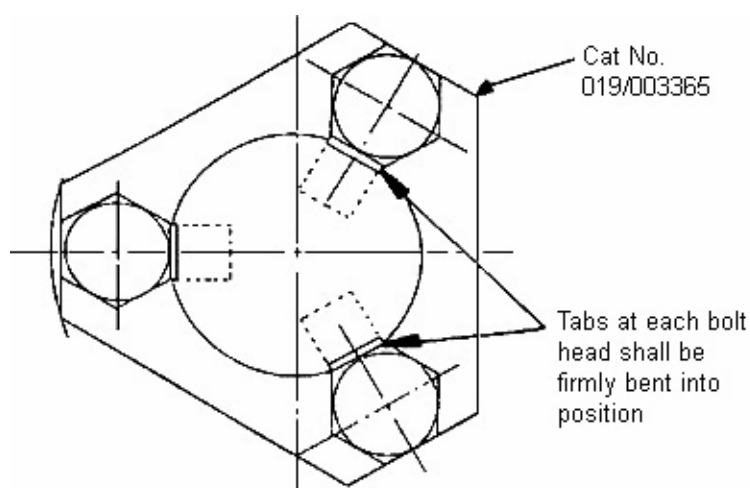


Figure 19.2: Method of Fitting Locking Plates to Axle Ends with BR WSP and Plain End Caps

Bearing Type	Application	M16 Set Screw Length	Cat No.
TIMKEN SP120	Plain/WSP	40mm	035/101252
SKF 120 TBU	Plain/WSP	40mm	

Table 1: BT10 – Bogie Wheelset Axle End Cap Set Screw Length

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Plain End Caps			
Bearing Type	Item	Drawing or Part No.	Cat No.
Timken SP120	End Cap	K468761	064/000038
	Locking Plate	B1-A1-9000386/05 *	019/003365
SKF TBU	End Cap	1637511-11	098/009701
	Locking Plate	B1-A1-9000386/05 *	019/003365
WSP End Caps			
All	Girling WSP Arrangement	PB-C0-2100888 ATC-C1-2202017	-
	End Cap	64422886	018/015727
	Locking Plate	MA-1-9004457-06	003/173644
All	BR & Westinghouse WSP Arrangement	PB-C0-2100890 ATC-C0-2202019 (revised)	-
	Toothed Wheel	IC-A1-8013054	097/006348
	Locking Plate	B1-A1-9000386/05	019/003365

Table 2: Axle End Caps and Locking Plates

* NOTE 19B: Alternatively the locking plate supplied with bearing may be used.

20. Refit Non WSP Front covers as follows:

- 20.1 Ensure all traces of the old gasket are removed from the front cover and the front face of the axlebox.
- 20.2 Fit a front cover with a new gasket (Cat No. 002/127105) to which Blue Hylomar (Cat No. 081/938255) has been applied. Secure with five M10 x 20 set screws (Cat No. 035/100792) and M10 spring washers (Cat No. 003/195112). Tighten the set screws to 30Nm.
- 20.3 Do not overtighten the front cover as this will cause excessive compression. See Section 8.5.
- 20.4 Check that the gasket is compressed uniformly between cover and axlebox.
- 20.5 For vehicles operated by First Great Western only, the axlebox cover bolts shall be wire locked in accordance with drawing PB-C0-2101565 or ATC-C0-2204045.

21. Assemble the wheelsets into the bogie as follows:

- 21.1 Position the wheelsets on "straight and level track" with the axle centres 2600mm apart and the axleboxes supported on blocks so that the axle centre and pivot bush centre are approximately level (see Figure 21.1). Record bogie build details on the Bogie Assembly Record Sheet (see page 48).

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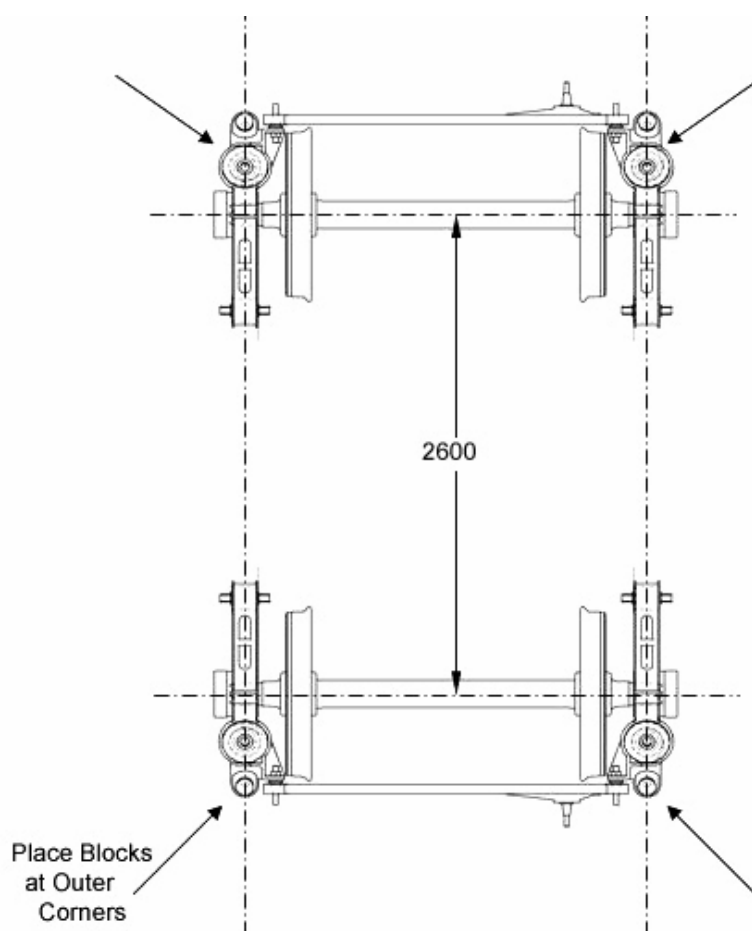


Figure 21.1: Positioning of Wheelset Assemblies for Fitment onto Bogie

NOTE 21A: "Straight and level track" is defined as: The rail head is flat within 1.0mm over a length of 4000mm for both rails. Each rail is straight and parallel with each other within 1.0mm over the same length, 4000mm.

- 21.2 Using adjustable slings and lifting the bogie from the primary damper mounting points, fitted with suitable lifting eyes and shackles, level the bogie frame in both directions using a spirit level.
- 21.3 Lightly coat the pivot bush and bogie bracket tapered location faces with lithium based No. 3 grease (Cat No. 027/001353 or 027/001354), to ease assembly.

NOTE 21B: Avoid grease contact with the pivot bush rubber element. Remove any surplus grease with an approved cleaning agent.

- 21.4 Position the bogie frame over the two wheelsets and lower into position taking care to align the pivot bush brackets evenly both laterally and longitudinally. Do not locate the pivot bush brackets into the tapered slots on the bogie brackets at this stage.

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NOTE 21C: The primary springs must NOT be fitted at this stage.

- 21.5 Carefully lower the bogie frame down to the tare height position (see Table 4). It should now be possible to locate the axlebox pivot bushes into the tapered slots loosely by pivoting the axleboxes about the axle bearings. Remove the packings supporting the axleboxes.
- 21.6 Centralise the bogie about the axlebox pivot bush brackets so that the outside edge of the bush and pivot bush bracket is approximately equal both sides, see Figure 21.2, Dimension 'z'.

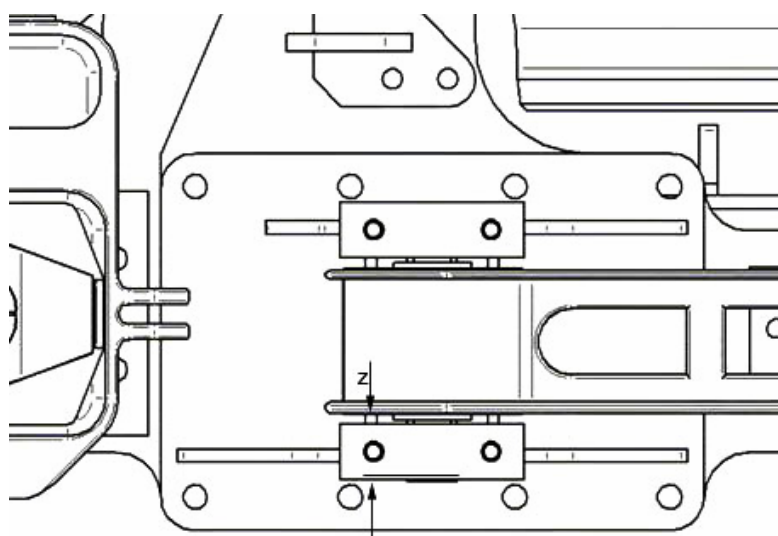


Figure 21.2: Measurement of Dimension 'z'

- 21.7 Using the FARO arm measuring machine suitably positioned in the pit, datums set from the axle centre line and back faces of the wheels, adjust the axleboxes so that they are parallel within 0.5mm using the Dimension 'y' measured from the axlebox rear faces at the pivot bush centre line (see step 16.5).

NOTE 21D: Take care that no force is used, which will induce pre-loading of the axle bearings.

22. Carry out alignment and assembly of the bogie LCR and axlebox pivots to the bogie as follows:

22.1 On new bogie LCR's gauge the following:

- the distance between bush centres, which should be $1626 \pm 0.25\text{mm}$
- the distance between the centre of the spigot and the centre of the nearest bush which should be $250 \pm 0.5\text{mm}$
- reject any rod outside limits.

22.2 Remove paint and grease debris from the LCR spigot location points on the bogie frame and axlebox LCR.

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- 22.3 Coat the tapered part of the spigot body, excluding the threads, with Molykote D321R bonded lubricant (Cat No. 027/004058) and allow to dry for five minutes (see Figure 22.1).

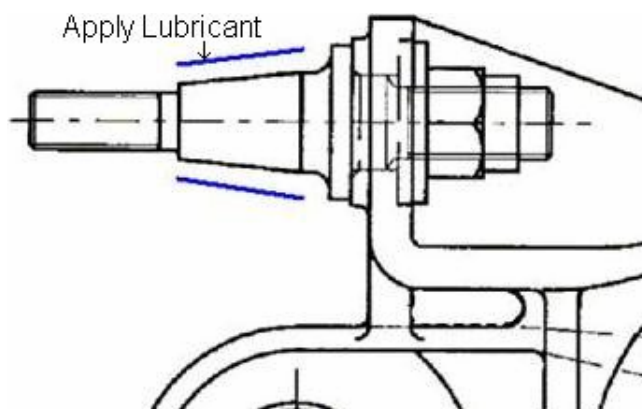


Figure 22.1: Application of Molykote Lubricant to Tapered Part of Spigot on Frame

- 22.4 Remove paint, grease and any corrosion debris from the new bogie LCR spigot bush bores and degrease using cleaning fluid (Cat No. 007/007186), or similar approved cleaning agent and allow to dry.
- 22.5 Offer up the bogie LCR onto the tapered spigots to identify if there is any misalignment. If the wheelset is positioned correctly it should be possible to locate the LCR onto both spigots with no axial force. The LCR should slide on and off the tapered parts of the spigots easily. Where the wheelset is misaligned the direction of the misalignment can be assessed by checking the offset between the LCR spigot and bush centre lines (see Figure 22.2).

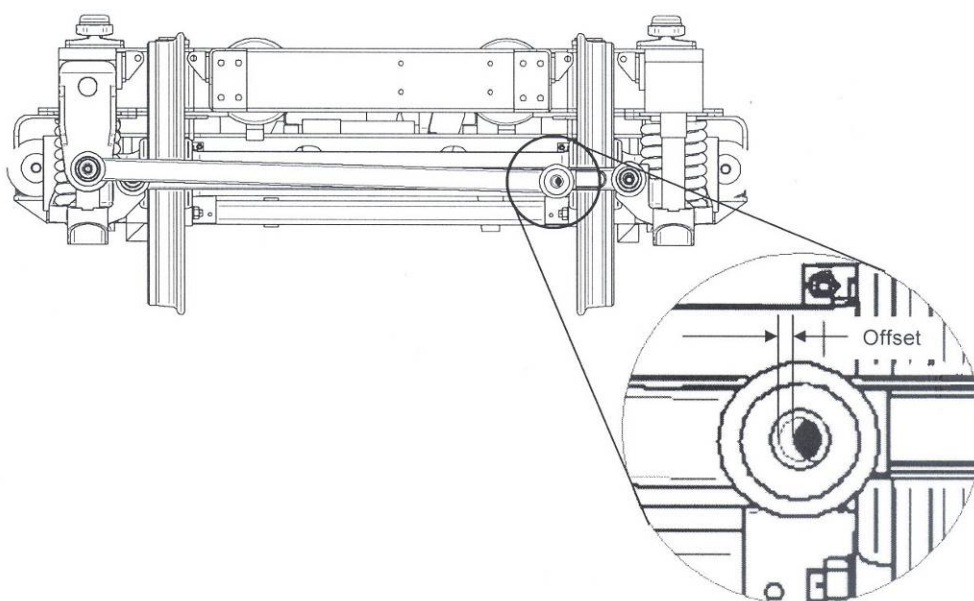


Figure 22.2: Assessment of Offset of Wheelset Assembly Using LCRS

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22.6 The misalignment shall be corrected by moving to the wheelset and axlebox pivot bushes laterally in relation to the bogie frame until the LCR can be fitted correctly as described above. The axleboxes must remain parallel within 0.5mm using Dimension 'y' measured between the axlebox rear face at the pivot bush centre line. The FARO arm measuring machine shall be used to ensure that the axlebox rear faces remain parallel.

22.7 With the LCR in position fit two temporary M24 nuts and washers finger tight to retain the LCR in position.

22.8 Fit the axlebox pivot bush keeper plates with four special M16 x 60 bolts (Cat No. 003/100942) per side and torque tighten to 60Nm. Ensure that the keeper plate remains level and has good seating contact with the underside of the axlebox pivot bush spindle.

22.9 Measure the clearance between the top of the pivot bush location spindle and the underside of the bogie bracket tapered slot (see Figure 27.1). If less than 0.25mm, remove the axlebox and machine 1.0mm from the top face of the pivot spindle and reassemble.

NOTE 22A: If the bogie is lifted, or wheelset removed the alignment process must be repeated.

22.10 Repeat steps 21.6 to 22.9 for correct alignment and assembly of the second wheelset and fitting of the bogie LCR.

23. Fit the primary springs as follows:

23.1 Identify the bogie and axlebox LCRs as number 1 and 2 end. This is to ensure that the correct bogie LCR is refitted in the same position after fitting of the primary springs.

23.2 Remove the temporary M24 retaining nuts and washers and bogie LCRs from each end of the bogie frame.

23.3 Remove packings from under the axleboxes and any which may have been used to position the wheelsets.

23.4 Select four spring assemblies including packings in accordance with the vehicle type and job number US 6909.

NOTE 23A: If the spring bottom plate has a slot, this shall be positioned facing the primary damper.

23.5 Raise the bogie frame from the nominal tare height just sufficiently to permit the springs and backings to be fitted. The springs shall be located and held in position at each corner whilst the bogie frame is lowered until the full weight is taken on the springs.

NOTE 23B: The axlebox pivot bushes must not exceed an angular/radial movement from the nominal position of more than 14°. If this value is exceeded the bushes will suffer permanent damage and must be renewed.

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23.6 Remove the adjustable slings, lifting eyes and shackles from the bogie frame primary damper mounting holes.

NOTE 23C: Lifting of the bogie and wheelset assembly shall only be undertaken in a manner which will not result in excessive movement or strain of the axlebox pivot bushes or LCR bushes. General practice is to lift using slings suitably attached to the axles between the wheels.

24. Bogie load/height test

With the bogie on straight and level track, using a suitable beam to distribute the load evenly over the secondary suspension side bearers, apply the appropriate pivot load, see Table 3. Ensure that the bolster remains square and central in the bogie.

NOTE 24A: The Test Rig used to apply this load must be calibrated to $\pm 1\%$ of the maximum load.

NOTE 24B: It is ESSENTIAL that all bearings are fitted with end caps in accordance with step 19 before carrying out the test.

NOTE 24C: "Straight and level track" is defined as: The rail head is flat within 1.0mm over a length of 4000mm for both rails. Each rail is straight and parallel with each other within 1.0mm over the same length, 4000mm.

Vehicle	No.1 End		No.2 End	
	Pivot Load (kN)	Bogie Variables ID plate code	Pivot Load (kN)	Bogie Variables ID plate code
Mk3A FO 11005-60	118	02	118	02
Mk3A SO 12XXX	123	05	123	05
Mk3B FO, FOD 11064-101	124	06	118	02
Mk3B BFO 17173-5	124	06	118	02
Mk3A TSOB 10401-6	130	09B	128	09A
Mk3A RFM 102XX	140	12	133	10
Mk3A SLE, SLEP, SLED 105XX 106XX	154	14	154	14
HST TGS 44XXX	109	01	118	02
HST TS & TSD 42XXX	118	02	118	02
HST TF 41XXX	118	02	118	02
HST TFD 41xxx	125	07	118	02
HST TSB 401XX	128	08	116	02
HST TRBF 402XX/409XX	140	12	124	07
HST TRSB 404XX	133	10	127	08
HST TRFB 407XX	140	12	126	08
HST TBRF 408XX	140	12	127	08
HST TCC 45001-5	140	12	127	08

Table 3: Data for Spring and Packing Selection

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NOTE 24D: Code 03 and 04 bogies are to have the same pivot loads as Code 02 bogies.

24.1 Apply and release the load twice before a final application.

25. Check frame height under load, and wheel loads as follows:

25.1 Using a suitable gauge placed across the rail measure the frame height, from top of rail to the underside of bogie frame, at all four corners near each primary spring. See Figure 25.1.

NOTE 25A: The frame height at each end of the bogie is determined by the wheel diameter fitted (see Table 4).

Wheel Diameter (mm)	Nominal Frame Height (mm)	Wheel Diameter (mm)	Nominal Frame Height (mm)	Wheel Diameter (mm)	Nominal Frame Height (mm)
914	671±5	890	659±5	866	647±5
912	670±5	888	658±5	864	646±5
910	669±5	886	657±5	862	645±5
908	668±5	884	656±5	860	644±5
906	667±5	882	655±5	858	643±5
904	666±5	880	654±5	856	642±5
902	665±5	878	653±5	854	641±5
900	664±5	876	652±5	852	640±5
898	663±5	874	651±5	850	639±5
896	662±5	872	650±5	848	638±5
894	661±5	870	649±5	846	637±5
892	660±5	868	648±5		

Table 4: Required Frame Height

25.2 Check that the frame height difference across a wheelset does not exceed 10mm.

25.3 Check that the frame height difference between the ends of a bogie does not exceed the following limit:

$$\text{Permitted Variation of Frame Height between ends of a bogie} = 10\text{mm} + \frac{\text{Maximum Wheel Diameter} - \text{Minimum Wheel Diameter}}{2}$$

Example

To calculate the variation of frame height between wheelsets on a bogie fitted with 914mm and 904mm diameter wheels:

$$\begin{aligned} &\text{Permitted Variation of Frame Height between wheelsets on a bogie} \\ &= 10\text{mm} + \frac{(914\text{mm} - 904\text{mm})}{2} \end{aligned}$$

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Therefore permitted variation of frame height = 15mm

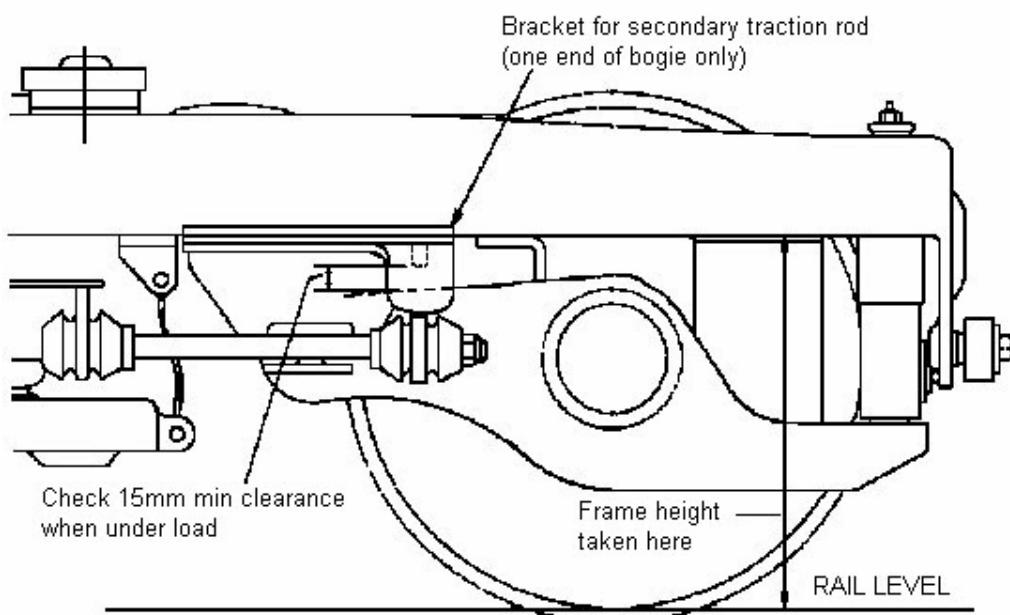


Figure 25.1: Measuring Bogie Frame Height

25.4 Using wheel load measuring equipment, check that the loads on the wheels of each axle are within 0.25 tonnes. This requirement shall take precedence over frame height requirements. See step 25.5 below.

25.5 Where the wheel loads are outside the limits of 25.4, or the frame height is outside the limits given in Table 4 or the variation in frame height exceeds that determined in 25.2 and 25.3, adjust the primary spring packing until the best compromise is reached.

NOTE 25B: Spring packing must not exceed 24mm in total, of which not more than 18mm shall be below the spring, and not more than 6mm shall be above the spring. Packing shall be clean and free from corrosion. Packing is available in thicknesses of 3, 6 and 12mm (Cat No. 063/070123, 097/000070 and 097/000071 respectively).

NOTE 25C: Packings to compensate for smaller wheels are fitted beneath the bogie side bearers (see step 38).

NOTE 25D: On the TSOB vehicles, which have differential springing, the frame heights will be higher for wheel positions 1 – 4 than those for wheel positions 5 – 8 (see Job US 6909). (When the bogies are under the vehicle the situation should be corrected).

25.6 Check clearance between top of axlebox and underside of rib of secondary traction rod bracket (see Figure 25.1). Minimum clearance 15mm.

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26. Final assembly of the bogie LCRs

26.1 Using the test rig apply the appropriate pivot load for the vehicle and bogie type.

26.2 Refit the bogie LCRs to each end of the bogie frame, ensuring that the painted numbers matched with those painted on the axlebox LCR.

26.3 Fit the butterfly washer and disc spring to each of the four bogie LCR spigots. The disc spring shall be fitted with the centre portion of the cone abutting the nut clamping face (see Figure 26.1).

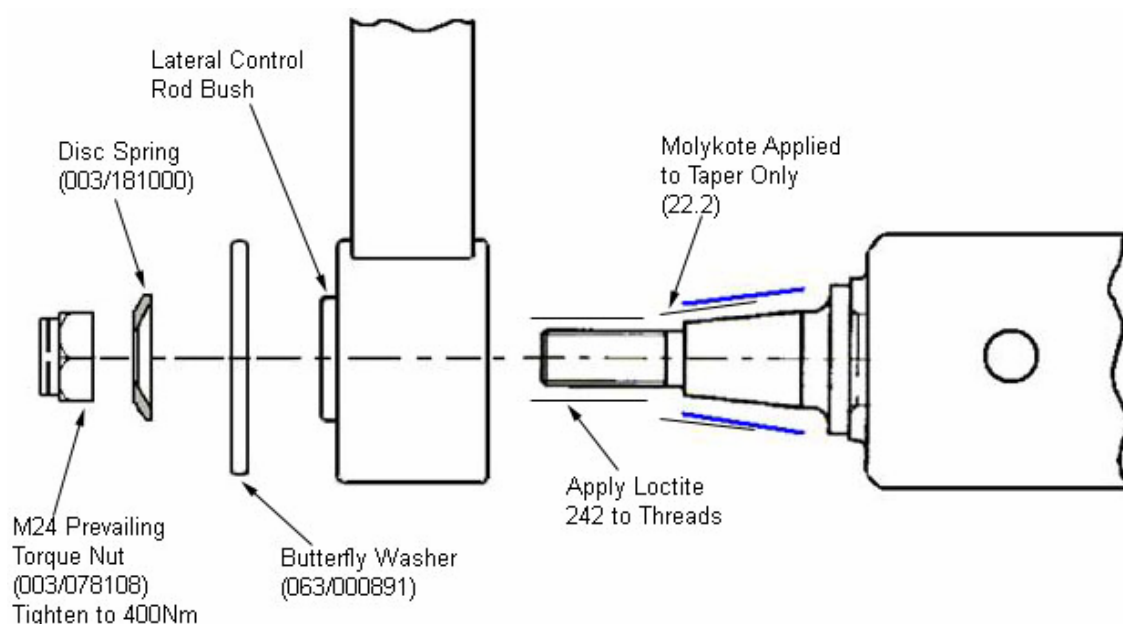


Figure 26.1: Exploded View of Assembly of LCR onto Frame Spigot

26.4 Coat the spigot threads with Loctite 242 and fit new M24 prevailing torque nuts (Cat No. 003/078108). Two complete threads must protrude through the nuts. Torque tighten to 400Nm ensuring that the butterfly washers are positioned with the longest sides horizontal.

27. Final tightening of the axlebox pivot bush keeper plates

27.1 With the load applied to the bolster, torque tighten the axlebox and pivot bush keeper plate bolts to 100Nm (four positions per bracket).

27.2 Measure the clearance between the top of the pivot bush location spindle and underside of the bogie bracket tapered slot (see Figure 27.1). This shall not be less than 0.25mm.

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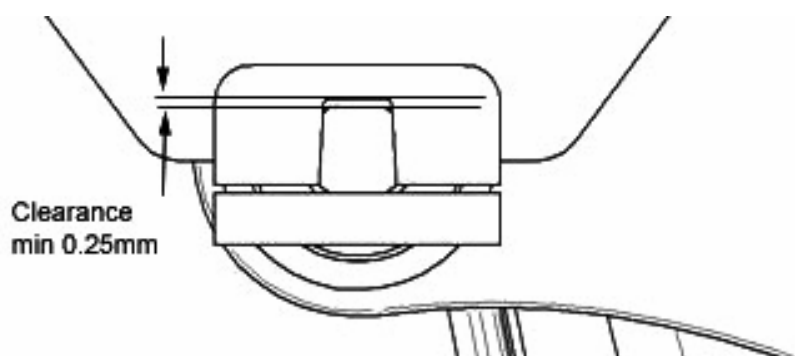


Figure 27.1: Measurement of Clearance at Top of Tapered Slot

- 27.3 When the two bolts retaining each keeper plate have been fully torque tightened, wire lock the bolt heads together in a figure of eight using 1mm grade 316 annealed stainless-steel wire. The wire shall be configured to prevent anti-clockwise rotation of the bolt heads, using wire locking pliers to leave a twisted length of approximately 25mm (see Figure 27.2). Check that the wire has not fractured during tensioning.

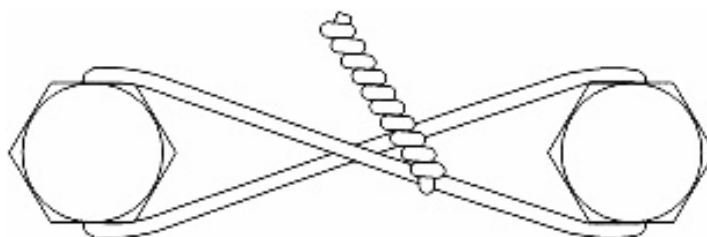


Figure 27.2: Arrangement of Locking Wire

28. Fit Primary Dampers as follows:

28.1 The bolster load shall remain applied.

28.2 Assemble damper with mounting pads as shown in Figure 28.1.

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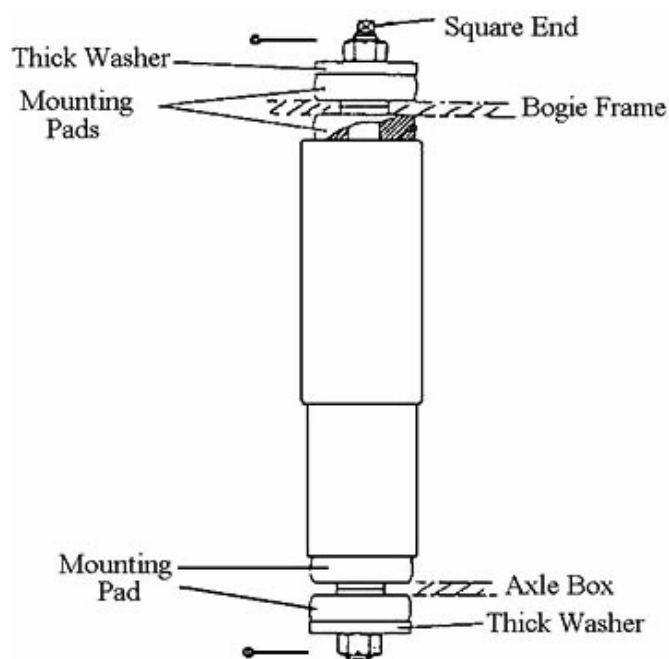


Figure 28.1: Assembly of Primary Damper

- 28.3 Fit thick washer and castellated nut to lower stem and holding body with one hand, tighten until metal contact between the washer and lower stem is achieved.
- 28.4 Align a castellation slot in the nut with the hole in the lower stem. The alignment should only be made when tightening the nut.
- 28.5 Fit a new split pin to the lower stem and open the ends.
- 28.6 Fit thick washer and castellated nut over the piston rod, and tighten the nut while holding the piston rod from rotating with a 13mm spanner on the square on the top of the piston rod.
- 28.7 Align a castellation slot with the hole in the piston rod. The alignment should be made only when tightening the nut.
- 28.8 Fit a new split pin to the piston rod and open the ends.
29. Fit Lateral Control Rod safety loops as follows:
 - 29.1 Fit the Rod to Axle Box Rope and Brackets as follows:
 - 29.1.1 Apply Commercial Quality SBR/NBR nitrile rubber, shaw hardness 70 degrees (25 wide x 5 thick) to the Lateral Control Rod under the bracket seating area. See Figures 29.1 and 29.2 for locations of rubber and brackets.
 - 29.1.2 Ensure that the tape is wide enough to protrude from both sides of the bracket.

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29.1.3 Fit the rod to axlebox rope safety bracket onto the lateral control rod and fit the rope (Cat No. 064/005118) between the safety bracket and the axlebox. Check that brackets do not overhang the rubber.

29.1.4 The rope shall initially be assembled with the end terminals vertical and with the axlebox and bracket fixing bolts finger tight to allow the rope end terminals to assume a line of minimum strain.

29.1.5 Tighten the M10 bolts to 55Nm retaining the rope alignment after tightening.

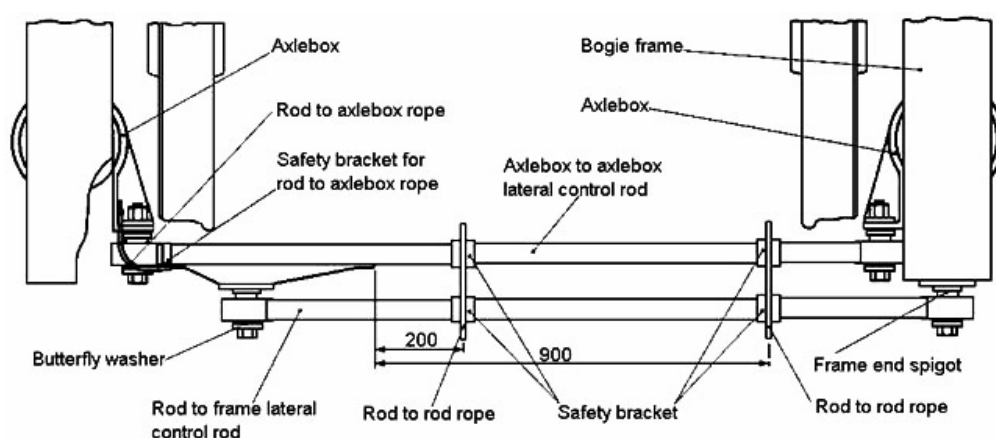


Figure 29.1: Assembly of Lateral Control Rods

29.1.6 Apply a 70mm band of Tectyl 506 Liquid Wax over and around the safety bracket. Brush out the Tectyl to achieve an even finish, and smooth out the edges making sure that any gaps are filled.

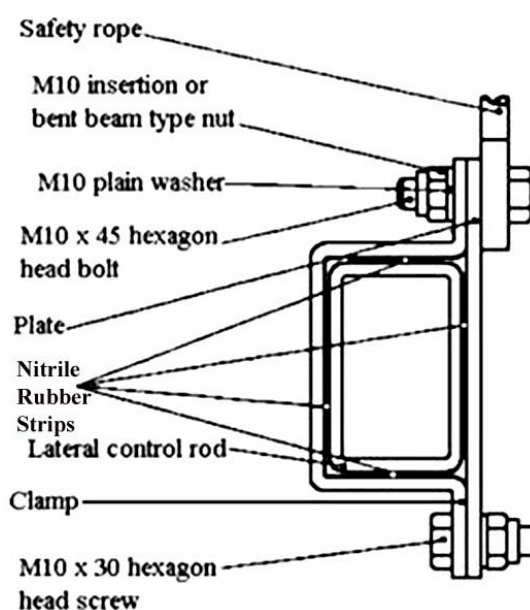


Figure 29.2: Lateral Control Rod to Axlebox Safety Rope Bracket

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29.2 Fit the Rod to Rod Ropes and Brackets as follows:

29.2.1 Apply Commercial Quality SBR/NBR nitrile rubber, Shaw hardness 70 degrees (25 wide and 5 thick) approximately 250mm long, to the lateral control rods on the seating area for the rod-to-rod rope safety brackets (see Figures 29.1 and 29.3).

29.2.2 Apply beads of Loctite 5910 sealant, approximately 5mm wide, to both vertical faces of the control rods on both sides of the tape.

29.2.3 Fit the safety brackets onto the lateral control rods.

29.2.4 Check that brackets do not overhang the tape.

Fit each safety bracket with two M10 x 35 hexagon head screws, two M10 insertion or bent beam type nuts and four M10 plain washers. One washer per screw is to be inserted between the bracket and the clamp, the other washer to be positioned under the nut.

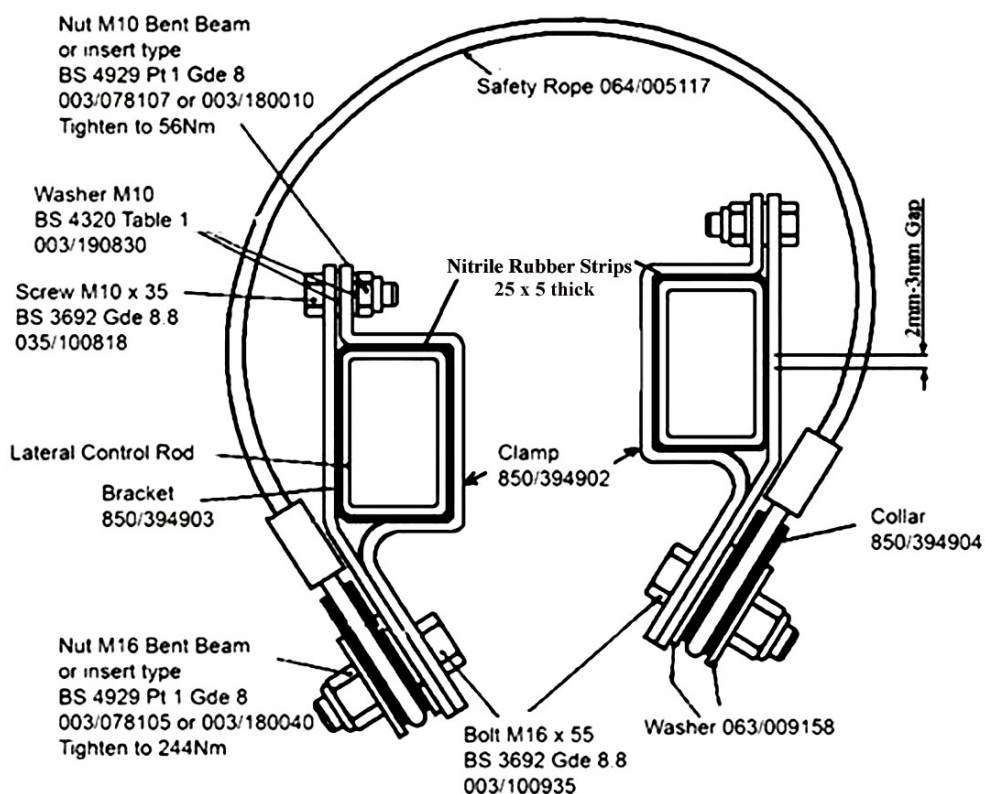


Figure 29.3: Assembly of Rod-to-Rod Safety Rope and Brackets

29.2.6 Fit the rope (Cat No. 064/005117) vertically to each safety bracket with a M16 x 55 hexagon head bolt, M16 insertion or bent beam type nut, collar and two washers.

29.2.7 Tighten the M10 nuts progressively and in turn to 55Nm.

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29.2.8 Tighten each M16 nut securing the rope to 245Nm, ensuring that the safety rope remains vertical.

29.3 The load on the bolster may now be released.

30. Fit Axlebox Earth Leads as follows:

30.1 Clean the surfaces around the bolt holes with fine abrasive paper.

30.2 Fit earth leads between 2 axleboxes and bogie frame.

30.3 Tighten bolts to 100Nm.

30.4 Test the earth lead using a portable low resistance meter (4 terminal) capable of delivering at least 2 Amps dc, with a minimum resolution of 0.01mΩ. The maximum acceptable value is 1.0mΩ between bogie frame and bonded axlebox.

31. Fit brake pads, keeping any re-used as matched pairs.

32. Fit Girling WSP as follows (see Section 4.5 and Figures 32.1 and 32.2):

32.1 Fit the alternator (3) and the six M6 x 50 screws (9) at Cat No. 003/100420), with new locking plates (Cat No. 003/173628). Tighten to 10Nm and bend up the locking tabs (see Section 4.3).

32.2 Clean the faces of axleboxes at wheel positions 1, 2, 5 and 6 (see Figure 36.1).

32.3 Fit the flange housing (5) with 5 M10 x 70 (Cat No. 003/100610) bolts and new lock washers (4) and a new gasket (6) (Cat No. 002/500001) to which Blue Hylomar (Cat No. 081/938255) has been applied. Tighten bolts to 50Nm.

32.4 Check that the gasket is compressed uniformly between flange housing and axlebox.

32.5 Apply Blue Hylomar (Cat No. 081/938255) to the circuit housing assembly (10) and gasket (14) (Cat No. 002/500016) and fit to the flange housing (5). Fit the M10 screw with new locking plate (20) (Cat No. 003/173074). Fit the M10 x 60 socket screw (19) (Cat No. 035/106105), with new lock washer (Cat No. 018/013884). Tighten both to 35Nm.

32.6 Fit the module assembly (27) with M6 x 12 screws (Cat No. 035/100492) (25), two M6 nuts (26) and new locking plate (24) (Cat No. 003/172390).

32.7 Fit the connector socket body (22) with new nylon washer (23) into the housing.

32.8 Hold the socket body (22) with a body shell holder, fit connector socket nut (21) and tighten with a double ended spanner.

32.9 Connect 4 cables to the terminal blocks.

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32.10 Coach Powered Units

32.10.1 Connect the two alternator leads (18) to the terminals.

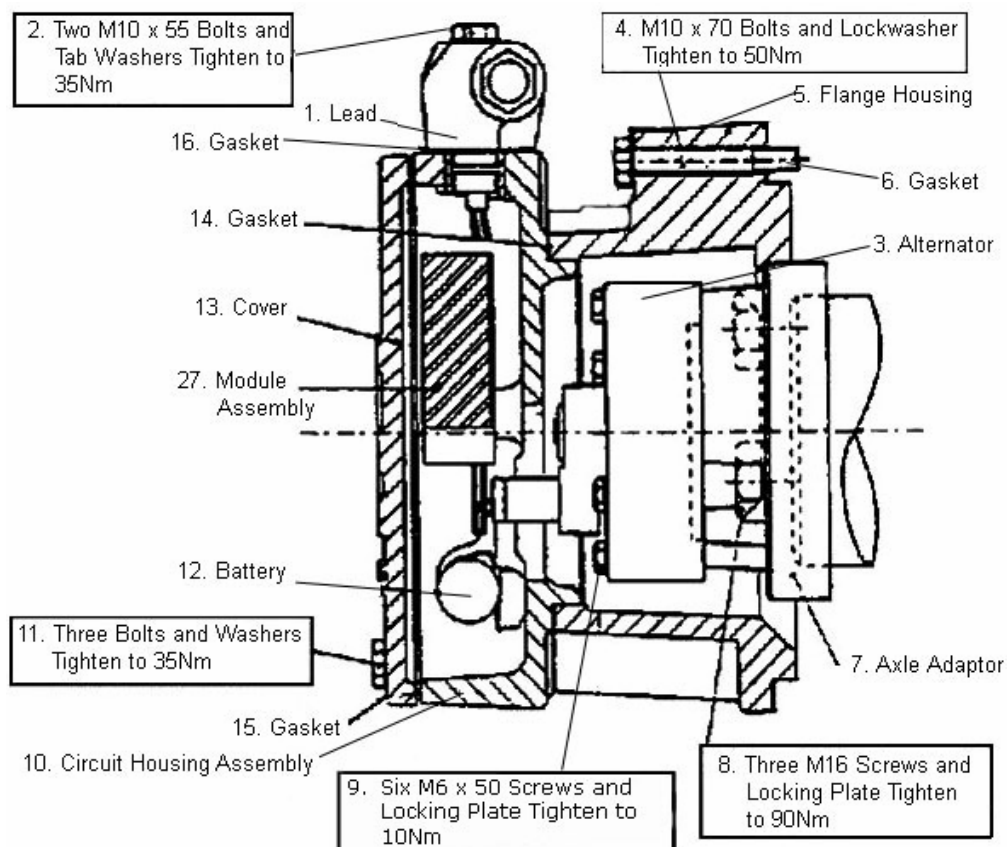


Figure 32.1: Girling WSP Sectioned View

32.11 Self Powered Units

32.11.1 Fit and connect a new battery (12), charged and tested in accordance with CR/CI0429, section 2.

32.11.2 Connect the two alternator leads (18) to the terminals.

32.11.3 Fit the terminal cover and 2BA self locking nut (17).

32.11.4 Test in accordance with TI/TP0430.

NOTE 32A: In low temperatures, the alternator resistance may be lower than specified. In such conditions, it is permissible to measure the alternator resistance between unit terminals. The resistance should be between 6.8 and 9.2Ω. Do not measure between unit plug terminals as this will give false readings.

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32.12 Fit the gasket (16) (Cat No. 002/500003) and plug in the jumper (1). Fit the two M10 x 55 bolts (Cat No. 003/100515) and new locking plate (2) (Cat No. 003/172434) tighten to 35Nm.

32.13 Examine cover (13) for damage which could prevent effective sealing.

32.14 Apply Blue Hylomar (Cat No. 081/938255) to the cover (13) and a new gasket (15) (Cat No. 002/500002), and fit to the circuit housing. Tighten three M10 x 85 bolts (11) (Cat No. 003/100625) to 35Nm.

32.15 Check that the gasket is compressed uniformly between cover and circuit housing.

32.16 Fit locking wire to cover bolts (11) in accordance with drawing ATC-C0-2204045 or PB-C0-2101565.

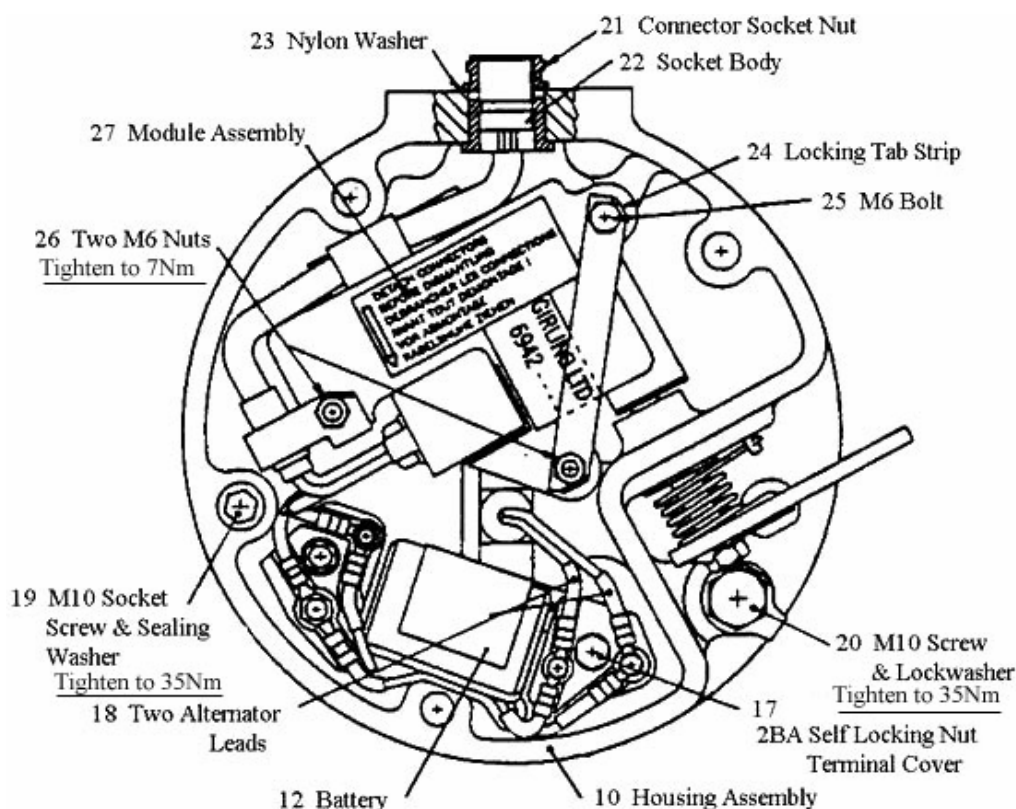


Figure 32.2: Girling WSP (Cover Removed)

33. Fit the distance piece for BR and Westinghouse WSP Equipment as follows:

33.1 For a distance piece (11) to Drawing B1-A0-9001022 (deep counter-bore: revised design) in aluminium, trial fit an M10 x 40mm Hex socket head screw (Cat No. 035/106097). Check that the screw protrudes between 21 and 27mm from each hole (see Figure 33.1). If this protrusion is not achieved report findings to Engineer.

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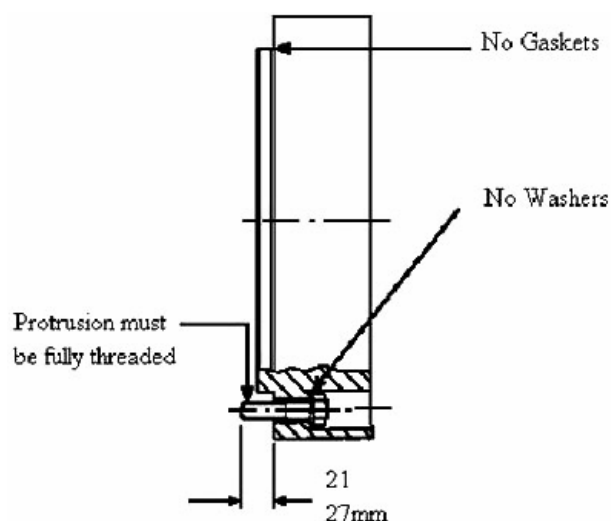


Figure 33.1: Screw Protrusion on Revised Distance Piece (Aluminium)

33.2 Clean faces of axleboxes at wheel positions 1, 2, 5 and 6 (see Figure 36.1).

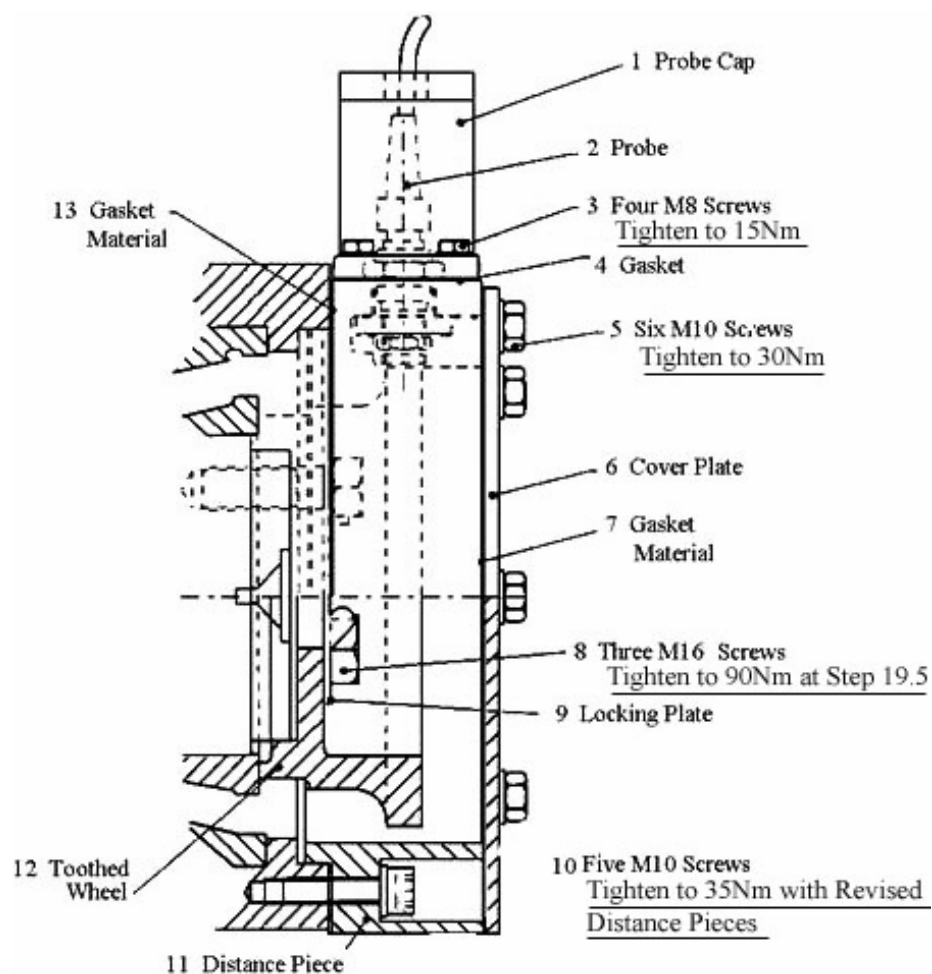


Figure 33.2: BR WSP Side View (Revised Design)

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33.3 Assemble the following components to the distance piece.

Description	Cat No.	Qty Per Axle
Gasket	002/127107	1
Spring Washer M10	003/195112	5
Special Washer	PB-C3-2101886	5

Fit to the axlebox with the holes for probes at '8' or '4' O'clock positions, pointing towards the centre of the bogie.

33.4 Tighten five M10 screws to 35Nm, and check that distance piece is secure. If not, reject axlebox (depth of thread in M10 hole should be 25mm).

33.5 Check that the gasket is compressed uniformly between the distance piece and the axlebox.

34. Fit the BR WSP Probe as follows (see Figure 34.1):

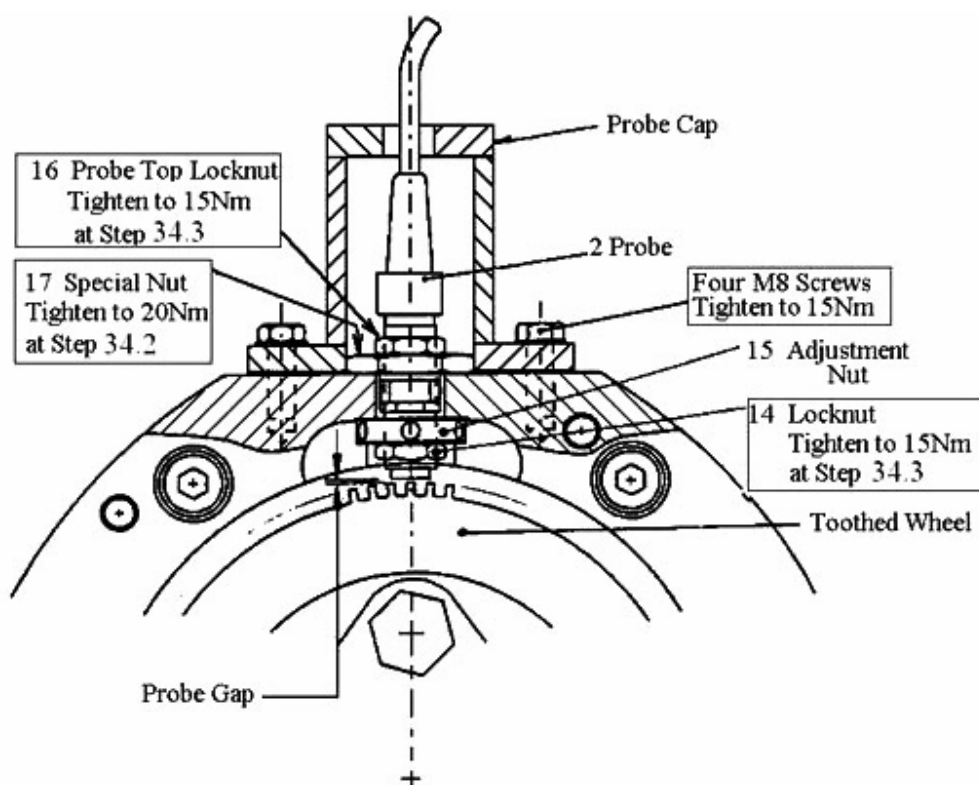


Figure 34.1: BR WSP Probe Detail - Revised Design

34.1 Ensure that the probe top locknut (16) and special nut (17) run freely on the probe thread. Fit the probe to the distance piece (11), aligning as per Figure 34.2.

34.2 Set the probe gap to 0.46-0.51mm with a tooth under the probe using the adjusting nut (15) and special nut (17). Tighten the special nut to 20Nm.

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- 34.6 For vehicles operated by First Great Western only, the WSP cover bolts shall be wire locked in accordance with PB-C0-2101565 or ATC-C0-2204045.
- 34.7 Fit the probe cap, with gasket (Cat No. 002/123650). Secure with four M8 x 20 screws and new spring washers. Tighten to 15Nm.
- 34.8 On Porterbrook bogies only and those converted to Westinghouse from 2008 onwards, reassemble the WSP junction box onto the bogie frame in accordance with job EY 0123 (Part B).
- 34.9 Secure the cables to the bogie and connect at the junction box.
35. Fit the Westinghouse speed sensor probes as follows (see Figure 35.1):
- 35.1 Check that 'O' ring (5) are present on the speed probes (4).
- NOTE 35A: Take care during the next step not to allow the tip of the probe to touch the toothed wheel. A small gap must always be left between the two faces as indicated in Figure 35.2.
- 35.2 Taking care not to damage 'O' ring (5), insert each speed sensor probe (4) in the distance piece (6) and secure with nuts (13) and washers (2) or M8 screws (1), M8 Spring Washer (2) and M8 Plain Washer (3).
- 35.3 Measure the distance between the tip of each speed probe and the tips of the teeth on the toothed wheels (see Figure 35.2). This must be 0.3 to 2.0mm.
- 35.4 If a gap is outside the tolerance, then the speed sensor (4), the distance piece (6) and/or the toothed wheel should be changed until the correct gap is achieved.

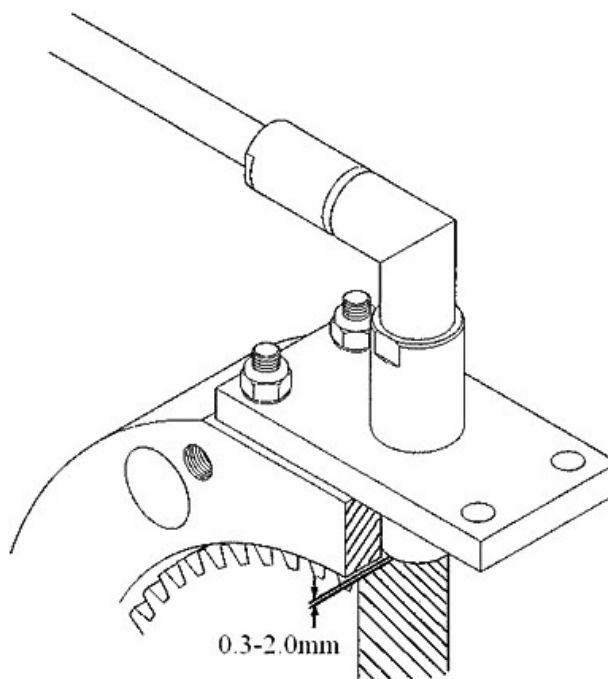


Figure 35.2: Westinghouse Speed Sensor Probe Gap

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35.5 On Porterbrook bogies and those converted to Westinghouse after 2008, reassemble the WSP junction box onto the bogie frame in accordance with Job EY 0123 (Part B).

35.6 Secure the cables to the bogie and connect at the junction box.

35.7 Fit the cover plates (9), with gaskets (Cat No. 002/127294) to which Blue Hylomar (Cat No. 081/938255) has been applied. Secure each with six M10 x 20 screws (for FGW only drilled as shown on Drg PB-C0-2101565 or ATC-C0-2204045) (Cat No. 035/100790) and new spring washers (Cat No. 003/195112). Tighten to 30Nm.

35.8 Check that the gasket is compressed uniformly between the cover and distance piece.

35.9 For vehicles operated by First Great Western only the WSP cover bolts shall be wire locked in accordance with PB-C0-2101565 or ATC-C0-2204045. Note that the arrangement depicted for BR WSP covers shall be applied to vehicles fitted with Westinghouse WSP.

36. Check wiring on each pair of bogies with BR WSP as follows:

36.1 Locate the position of the axles as follows:

On No. 1 bogie No. 2 axle is adjacent to the bogie identification plate
On No. 2 bogie No. 3 axle is adjacent to the bogie identification plate (see Figure 36.1).

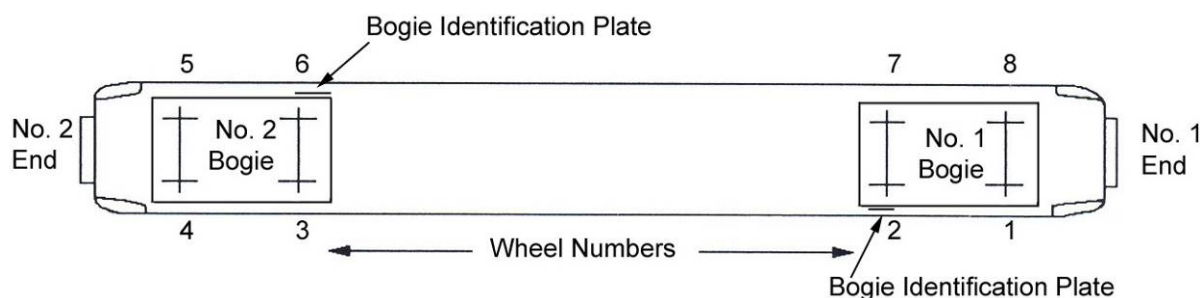


Figure 36.1: Axle Identification

36.2 Check that the wires at the bogie to body connection boxes on the bogies are identified as follows:

Axle No.	Probe Wires	Blowdown Valves
1	1905 and 1906	1901 and 5 WW
2	1907 and 1908	1902 and 5 WW
3	1909 and 1910	1903 and 5 WW
4	1911 and 1912	1904 and 5 WW

Table 5

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37. On bogies for vehicles with coach powered Girling WSP equipment, check that the wiring is connected as follows:

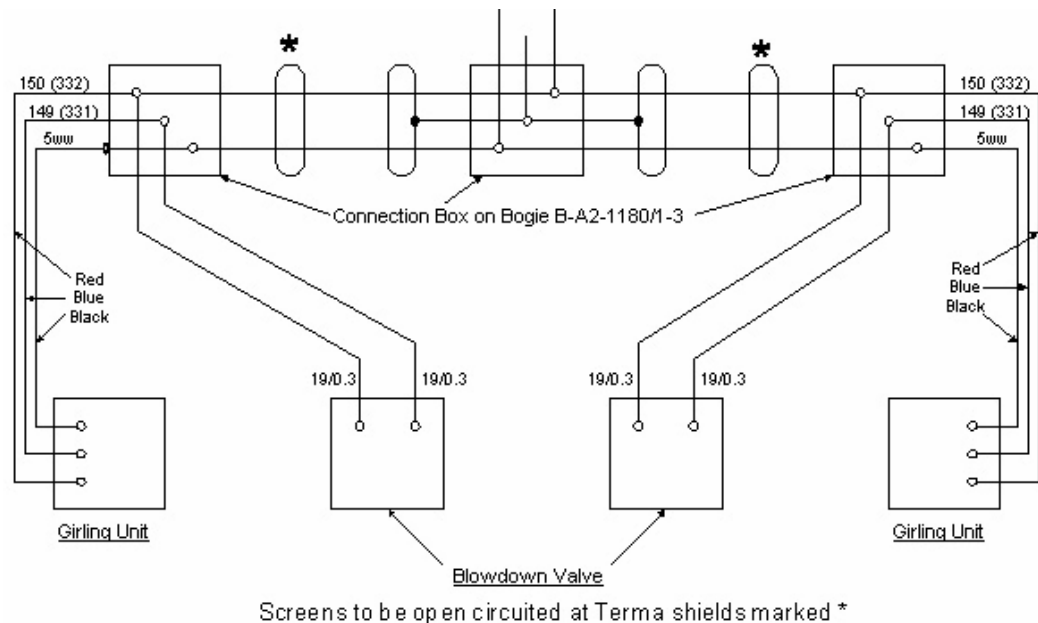


Figure 37.1: Coach Powered Girling Wiring

38. On bogies fitted with Westinghouse WSP equipment check that the wiring is connected within the junction boxes as shown in Table 6 and Figure 38.1. (See Figure 36.1 for identification of axles).

Terminal No.	No.1 Bogie	No.2 Bogie
1	No.1 Axle Probe (P1) Orange	No.3 Axle Probe (P9) Orange
2	No.1 Axle Probe (P2) Blue	No.3 Axle Probe (P10) Blue
3	No.1 Axle Probe (P3) Yellow	No.3 Axle Probe (P11) Yellow
4	No.1 Axle Probe (P4) Screen	No.3 Axle Probe (P12) Screen
5	No.2 Axle Probe (P5) Orange	No.4 Axle Probe (P13) Orange
6	No.2 Axle Probe (P6) Blue	No.4 Axle Probe (P14) Blue
7	No.2 Axle Probe (P7) Yellow	No.4 Axle Probe (P15) Yellow
8	No.2 Axle Probe (P8) Screen	No.4 Axle Probe (P16) Screen
9	No.1 Dump Valve D1	No.3 Dump Valve D7
10	No.1 Dump Valve D2	No.3 Dump Valve D8
11	No.1 Dump Valve D3	No.3 Dump Valve D9
12	No.2 Dump Valve D4	No.4 Dump Valve D10
13	No.2 Dump Valve D5	No.4 Dump Valve D11
14	No.2 Dump Valve D6	No.4 Dump Valve D12

**Table 6: Allocation of wires to terminals in Westinghouse Bogie Junction Boxes
(Taken from PB-C0-2101511 and ATC-C0-2205113)**

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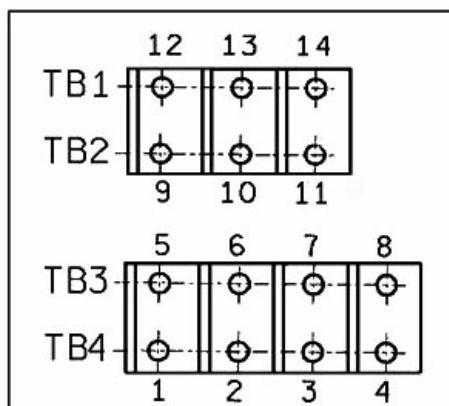


Figure 38.1: Identification of Terminal Numbers within Westinghouse Bogie Junction Boxes

39. Fit lids to WSP junction boxes, ensuring seals are correctly fitted. Tighten M6 screws to 10Nm.
40. Set Bolster height as follows:
 - 40.1 Measure or obtain wheel diameters on bogie.
 - 40.2 Calculate average wheel diameter for the bogie and select packing thickness from Table 7.

NOTE 40A: Only one packing can be used per side bearer.

Average Wheel Diameter (mm)	Packing Thickness	Cat No.
914-903	No Packing	-
902-891	6mm	097/000076
890-875	12mm	097/000121
874-855	20mm	097/000122
854-842	30mm	097/000123

Table 7: Packing Sizes

Example: Wheel 1 - 886mm Wheel 2 - 873mm
 Average wheel dia = $886 + 873 \div 2 = 879.5\text{mm}$
 Packing size = 12mm

- 40.3 Lift up side bearers and fit correct packing beneath each side bearer.
41. Pressure Test Secondary Suspension
 - 41.1 Connect air supply, regulated to 4.8 bar to the ½" BSP boss on the bolster.

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41.2 Place 45mm thick steel packer between the lift top on the bolster and underside of the bogie solebar. The packer must be of a large enough area to evenly distribute the load across the solebar when the bolster rises.

41.3 Raise both levelling valve arms to admit air into the system, the arms to remain raised during the test. The bolster will rise until the packers contact the solebar.

41.4 Allow the air pressure within the system to build up until 4.8 bar is achieved, and maintain this pressure for 5 minutes.

41.5 Isolate the bogie air system from the air supply and check for leaks, maximum allowable pressure drop is 0.14 bar in 10 minutes from a starting pressure of 4.8 bar.

41.6 Locate and rectify air leaks and repeat the above test procedure.

42. Functional and Pressure Test of the Brake System.

42.1 Connect brake test rig to bogie brake manifold, set operating pressure to 3.8 bar.

42.2 With the brakes released manually retract all slack adjusters to give piston strokes in excess of the normal working strokes. Operate the brakes and check that all slack adjusters take up. Apply and release several times until all the slack adjusters have fully taken up. With the brake released, pull all the pad to disc clearance to one side and check that the clearance is between 1.5mm and 4.0mm.

42.3 Apply the brakes and shut off the air supply. The maximum leakage permitted in 15 minutes is 0.25 bar.

Locate and rectify all leaks and repeat 42.3.

43. Paint in accordance with CR/PE0102 all unpainted components and any area of previously painted components when the paint has been damaged during the assembly process.

44. Grease the bore of the pivot centre bearing in the bolster.

45. If specified by Engineer paint horizontal white lines across bushes and tubes of secondary traction rods, with date and agreed depot code as follows:

ZC Bombardier Crewe

ZH Railcare Springburn

ZN Railcare Wolverton

PBU Unipart Production Unit

Any other code to be agreed with the Engineer.

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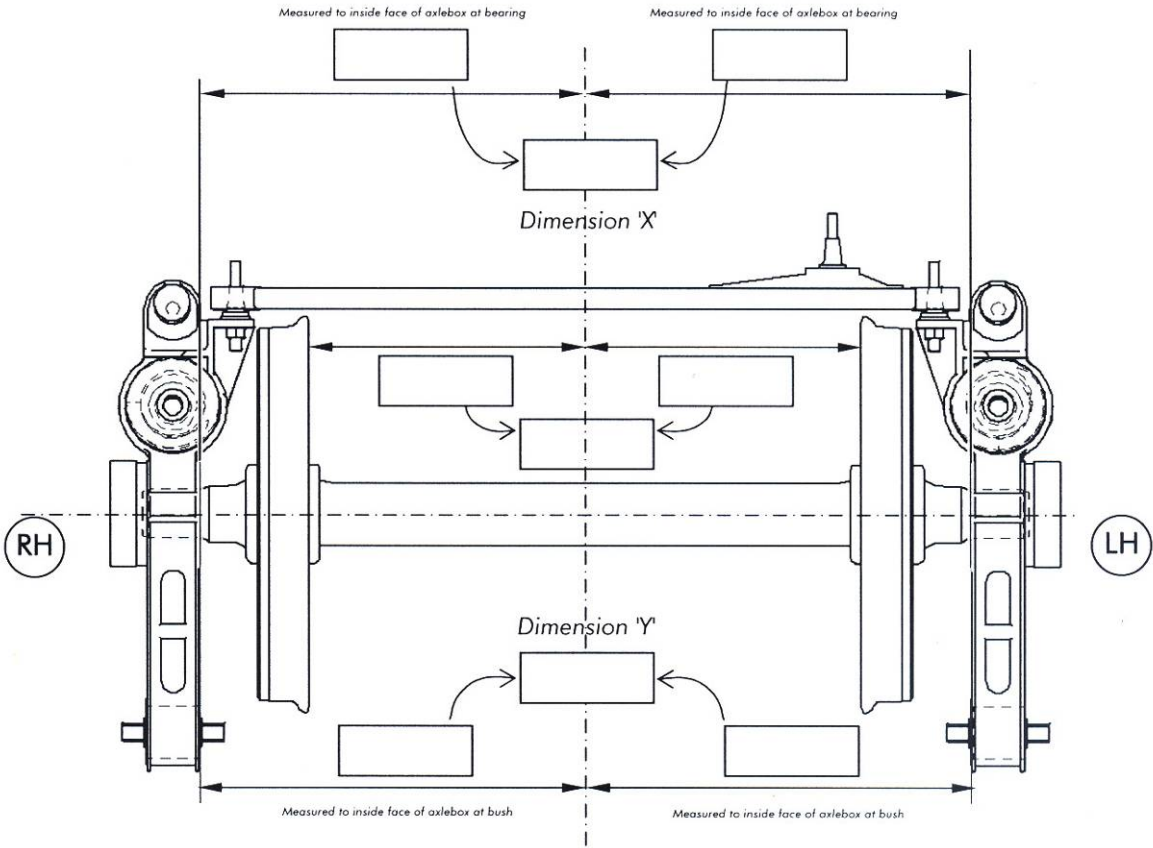
RECORD SHEET

OUTER END WHEELSET

Axle number:

Wheel diameter:

Date:



Axlebox serial numbers		Bearing number	Brg date	End float
LH				
RH				

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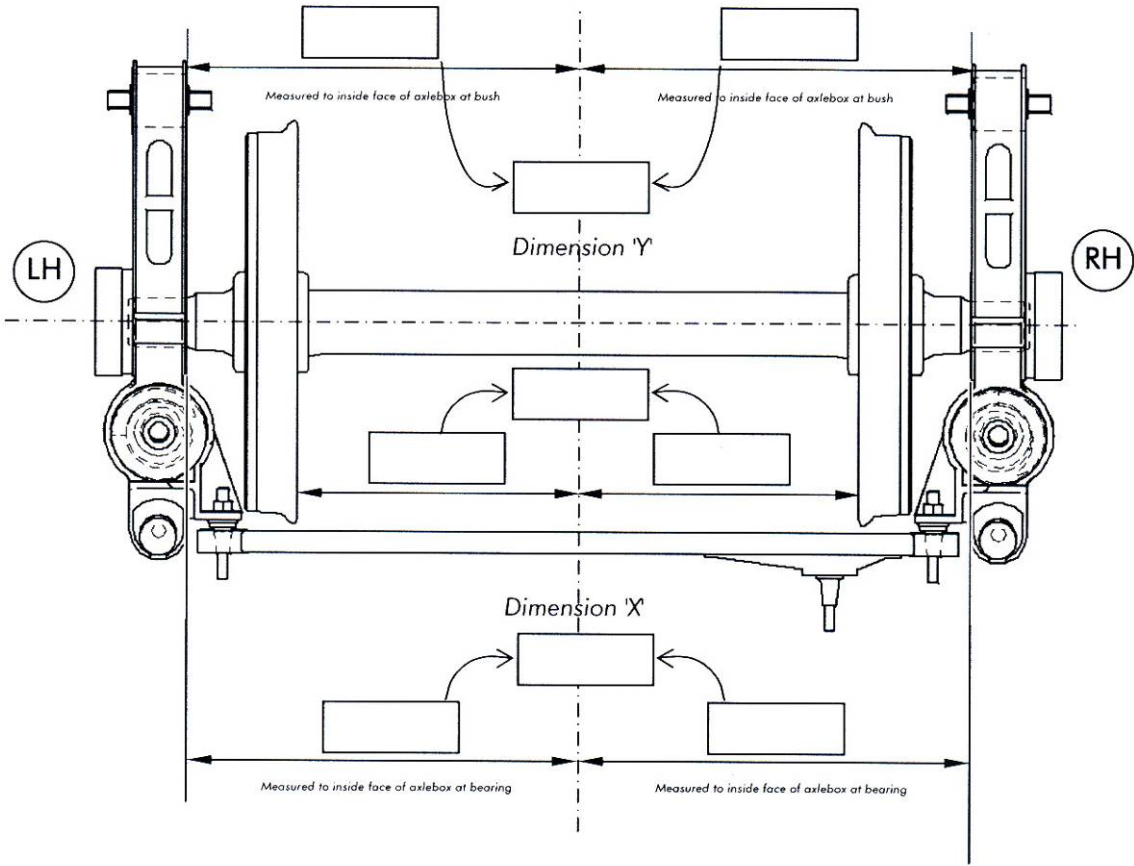
RECORD SHEET

INNER END WHEELSET

Axle number:

Wheel diameter:

Date:

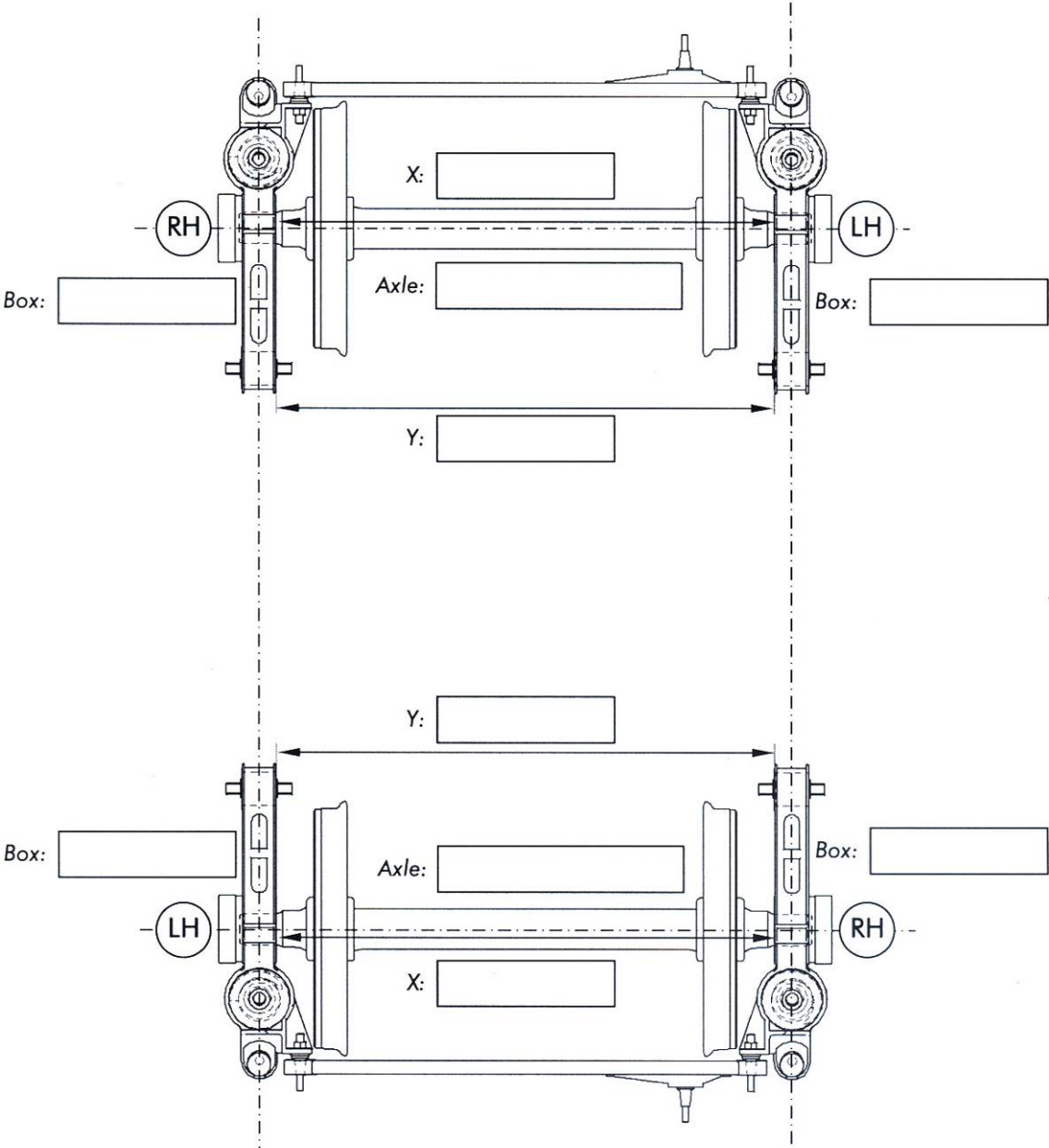


Axlebox serial numbers		Bearing number	Brg date	End float
LH				
RH				

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RECORD SHEET
BOGIE ASSEMBLY

Bogie number:	
Date:	



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4. ASSEMBLY REQUIREMENTS

4.1 Threaded Fasteners Renewal Policy

All split cotter pins, star washers, locking tabs, spring washers and torque prevailing nuts removed during this overhaul **MUST BE RENEWED**. All other fasteners removed during this overhaul shall be renewed if any part of them is worn or distorted.

4.2 Tightening of Threaded Fasteners

- Where a torque loading is specified, nuts must only be tightened by means of a calibrated torque wrench. If the Supplier considers that any joint where torque loadings are not specified is critical, he shall consult the Engineer.
- Threads are not to be lubricated but a thin film of corrosion inhibitor can remain on the threads.
- It is essential to check that all bolts, in a multi-hole fixing, carry their allotted proportion of the load. Unless otherwise specified, they shall first be tightened in a staggered pattern from the centre outwards and subsequently re-tightened in the same sequence. This second tightening is necessary since bolts may lose tension when adjacent bolts are tightened (see Figure 1).

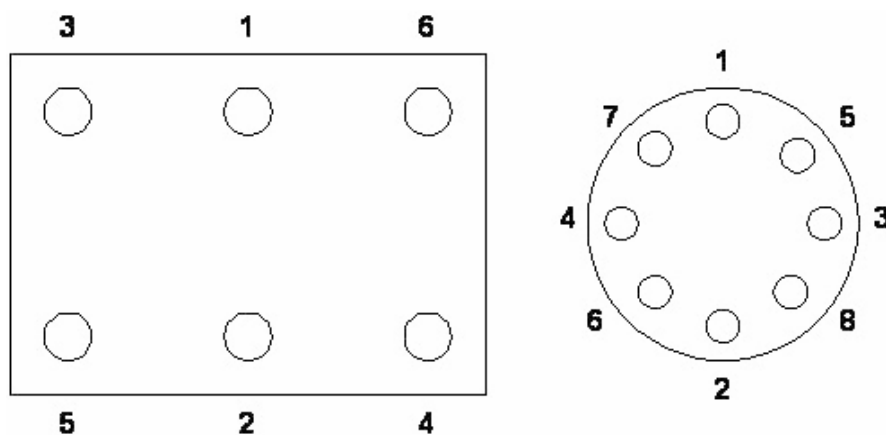


Figure 1

- Unless otherwise specified slotted nuts shall subsequently be overtightened if necessary to align the next slot to allow for the insertion of split cotter pins. Under no circumstances shall nuts be eased back.
- A diagram showing all torques specified in this instruction is given in Figure 2 on page 3.

4.3 Tab Washers

Flats on bolt heads and nuts must be aligned with the tabs. Unless otherwise specified, fasteners must be over tightened if necessary to align the flat with the tab. Under no circumstances shall fasteners be eased back.

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4.4 Prevailing Torque Nuts

- a) Where Grade 8 or Grade 12 prevailing torque nuts of the bent beam type are specified, the Supplier may use the nylon insert type in order to obtain economic supplies. However, under no circumstances may a nylon insert type nut be used on a drilled bolt.
- b) When either type is used at least 2 complete threads of the bolt must protrude through the nut.

4.5 Castellated Nuts and Split Pins

Where a castellated nut and split pin are specified these must be used. All split pins shall be stainless steel.

4.6 Axlebox Sealing

It is vital that axleboxes are effectively sealed to prevent water ingress degrading bearing performance. The Supplier is required to use, as a minimum, NEW gaskets on axle end caps and WSP covers when carrying out the following tasks:

- Fitting non-WSP end covers (Section 3.3 Step 20).
- Girling WSP assemblies (Section 3.3 Step 32).
- BR WSP assemblies (Section 3.3 Steps 33 and 34).
- Westinghouse assemblies (Section 3.3 Steps 33 and 35).

In addition, Blue Hylomar (Cat No. 081/938255) shall be used on the three joints in the Girling WSP axlebox mounted assembly.

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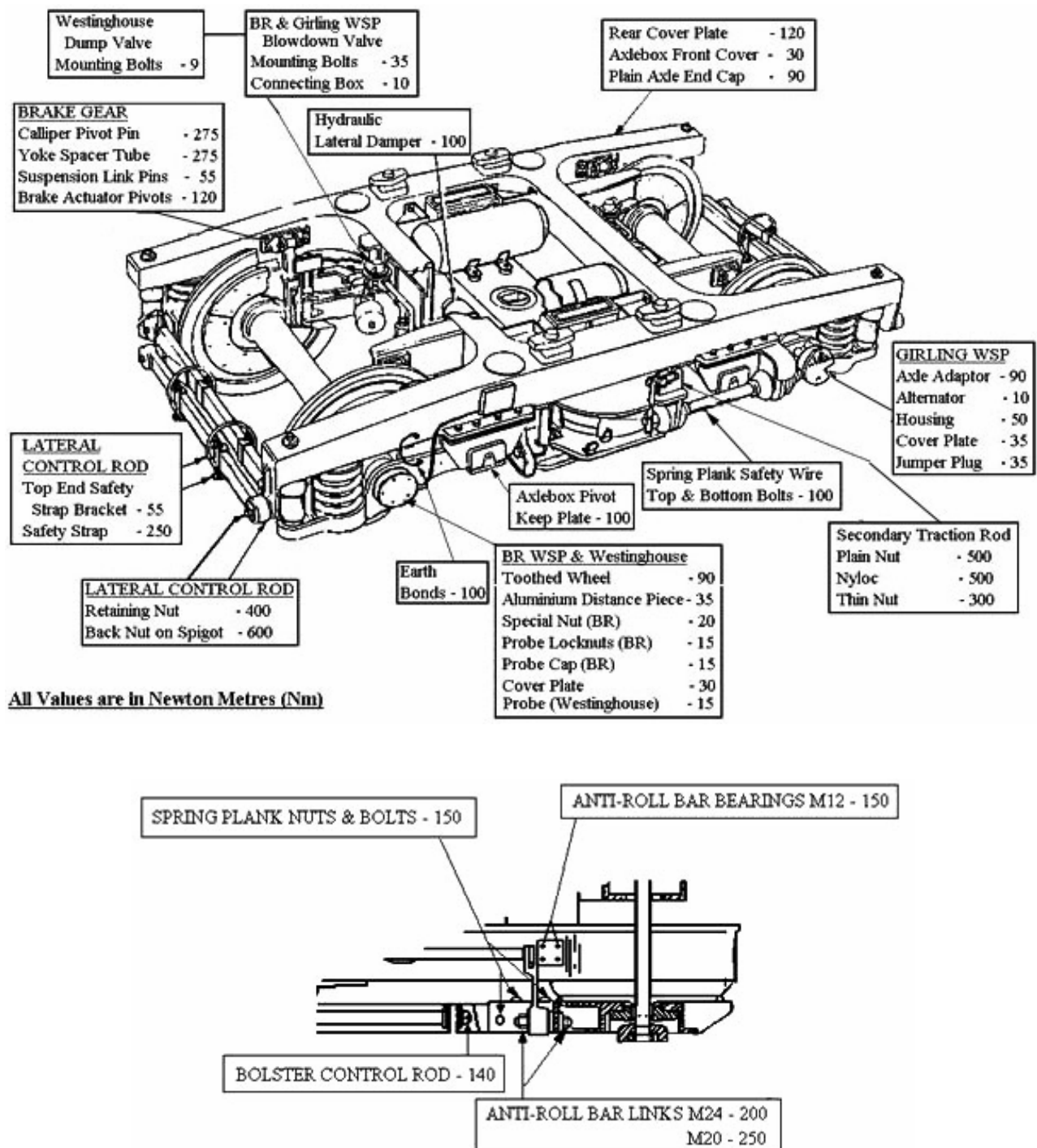


Figure 2: BT10 Bogie Diagram - Torque Settings

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5. TOOLS & MATERIALS

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5.5	Paints	3
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5.7	Mandrels for Axlebox Pivot Bushes	4
5.8	Brake Calliper Parts List	4
	Diagram for Callipers	6

5.1 Hand Tools

Item	Description	Cat No.	Item in Document
1	Pliers, Adjustable, Rib Jointed	039/143220	Sect 3.3 Step 19.6
2	Spanners		
	a) Plessey Socket Body Shell Holder	064/001528	Sect 3.3 Step 32.8
	b) Plessey Socket Tube Spanner	064/001527	Sect 3.3 Step 32.8
	c) Plessey Socket Double-Ended Spanner	064/001529	Sect 3.3 Step 32.8
3	Helical Coiled Inserts - M8		EY 0143
	Drill, Taps and Insertion Tool M10	035/160360	EY 0139, EY 0143, UA 6906
	M16	035/160525	UA 6906
4	Bolts, Brass M10, for Removal of Toothed Wheel		Sect 3.1 Step 3.1.3 Sect 3.1 Step 3.2.6

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5.2 Testing Equipment

Item	Description	Cat No.	Item in Document
1	Megger Insulation Testing Apparatus	-	EY 0141
2	Portable Low Resistance Meter Capable of Delivering at Least 2 Amp D.C. with a Minimum Resolution of 0.01mΩ	-	Sect 3.3 Step 30.4
3	SAB WABCO Test Equipment for Girling WSP	Part No. 69042349	Sect 3.3 Step 32 10.4
4	Hydraulic Press, to Apply Load to Bolster, Capacity 160kN	-	Sect 3.3 Step 24
5	Hydraulic, Press to Apply Load to Primary Springs, Capacity 30kN		US 6909
6	BR WSP Probe Alignment Jig	Drg No. NSE A1-8370379	EY 0142
7	FARO Measuring Machine or Approved Equivalent	-	UF5010, UFA0218 Sect 3.3

5.3 Lubricants, Adhesives and Sealants

Item	Description	Cat No.	Item in Document
1	Adhesive, Swifts No K 9708	007/005687	UM 6008
2	Blue Hylomar	081/938255	Sect 3.3 step 32 & Sect 4.5
3	Loctite 2701	007/056158	UA 6906, UD 6940
4	Loctite Superfast Nutlock 242	007/060303, 007/060304, 007/060305	Sect 3.3 steps 17.3 & 26.4 EY 0142, UH 6930
5	Molykote D321R Bond Lubricant	027/004058	Sect 3.3 step 15.2 and 22.2
6	Tape, Inseal	059/105105	Sect 3.3 step 29
7	Tape, Denso	007/120509	Sect 3.3 step 2
8	Machine Oil	027/018002	BL 0116, UA 6906, EY 0143
9	Grease, Lithium Based	027/001353, 027/001354	Sect 3.3 step 14
10	Sealant, Tigerseal	007/056212	UFA0218
11	Sealant, Butyl Rubber	028/022202	US 0113
12	Loctite 5910 Sealant	007/060046	Sect 3.3 step 29.2
13	Loctite Flange Sealant 5900		EY 0566 step 4.12
14	Grease Ironside Blend A*	027/004332	EY 0566, Sect 3.3 step 12.2.2

* See note re alternative in Job EY 0566.

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5.4 Protective Equipment

Item	Description	Cat No.	Item in Document
1	Orinasal Respirator		Sect 3.3 step 15 and 22.2

See Safety Data Sheet on Molykote D321R supplied by:
Dow Corning Ltd
Arco House
Castle Street
Reading
Berkshire
RG1 7DZ.

5.5 Paints (see also Painting Procedure MT/308)

Item	Description	Cat No.	Item in Document
1	Black VTA Finish, Airless Spray, to BR Spec 81, Item 456	028/000250	UD 6940, UM 6919, US 0115, US 0117
2	Black, Gloss Finish, to BR Spec 81, Item 205	028/005319	UD 6940, UM 6919, US 0115, US 0117
3	Tectyl 506 Liquid Wax		BL 0113 UM 6008 Sect 3.3 steps 9.8, 10.4 and 29

5.6 Packings and Shims

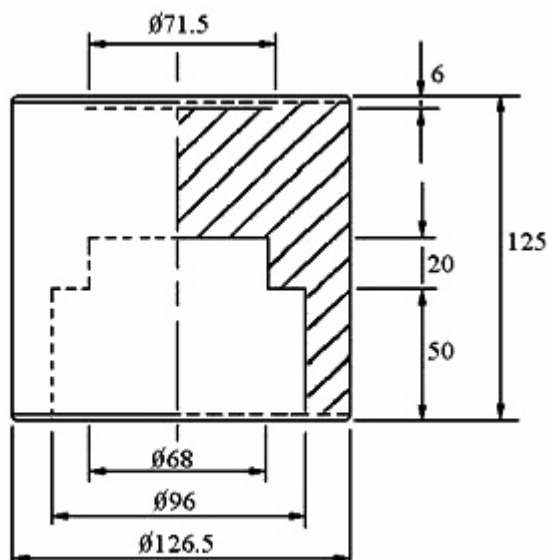
Description	Drg No.	Thickness (mm)	Cat No.	Location in COI
Swing Link Packing	B2-A2-8503273			UF 0202 & Sect 3.3 Step 3
Side Bearer		6 12 20 30	097/000076 097/000121 097/000122 097/000123	Sect 3.3 step 40
Secondary Traction Rod	PB-C12100415 or ATC-C12200832 Issue D	2 4 6	Item No. 08 Item No. 06 Item No. 07	Sect 3.3 step 8.4
Bolster Stop Brackets	B1-A3-9014915	3	063/000026	Sect 3.3 step 9.4
Primary Spring	C-A3-1332	3 6 12	063/070123 097/000070 097/000071	Job US 6909 & Sect 3.3 step 25.4
Air Spring Bump Stop	C-A3-9300	6 3	063/000892 063/009046	Job US 0113

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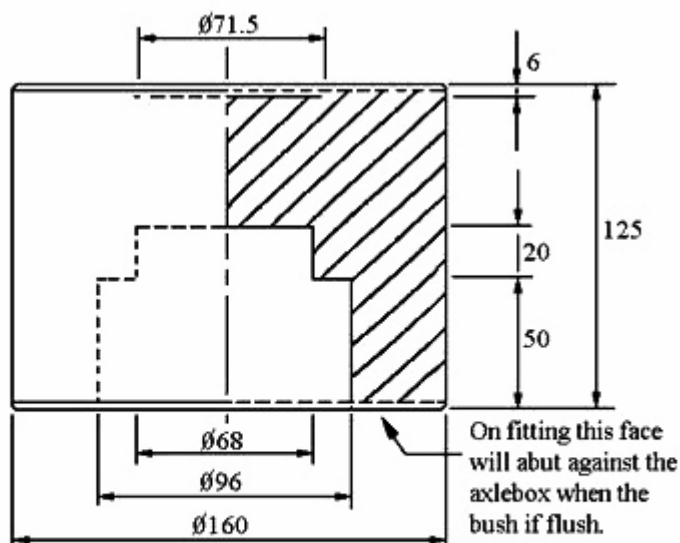
5.7 Mandrels (for Removal and Refitting of Axlebox Pivot Bushes)

Removal Mandrel

On removing old bush this mandrel will pass through the pivot bore.
(Axlebox pivot bore dia 128).



Fitting Mandrel



Material: BS 970 P11. 070 M75 Condition T. All dimensions in millimetres.
Chamfer all external sharp corners - 2mm x 45°.

5.8 Disc Brake Calliper Parts List

Item	Description	Part No.	Cat No.
	Calliper Assembly - Right Hand	8504128-01	850/412801
	Calliper Assembly - Left Hand	8504128-02	850/412802
1	UIC Style Pad Holder - Right Hand	D&M 3.00.135	840/092401
2	UIC Style Pad Holder - Left Hand	D&M 3.00.134	840/092402
3	Suspension Link Bushed	LG 69421948	070/050808
4	Top Yoke Bushed - Right Hand	LG 64423785	064/001032
5	Top Yoke Bushed - Left Hand	LG 64423786	064/001037
6	Metalastik Bush	LG 64422659	098/000070

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Item	Description	Part No.	Cat No.
7	Bottom Yoke	LG 64423752	018/018798
8	Calliper Lever Bushed	9005042-02	070/070632
9	Actuator Pivot Pin	IC-CI-8013978-03 ATC-C0-2001834-05	801/397803 2201834-05
10	M16 Nut Slotted Grade 8		003/175414
11	Split Pin Stainless Steel 3.2 x 32		029/127120
12	Washer	IC-CI-8013978-04 ATC-C0-2201834-06	801/397804 2201834-06
13	Yoke Spacer Tube	LG 64423141	018/019838
14	Yoke Bolt	LG 69130083	070/051070
15	Tab Washer	9001006/06	003/173156
16	M20 Nut		003/175026
17	Calliper Lever Pivot Pin	IC-C1-8013206-01 ATC-C0-2201834-01	801/320601 2201834-01
18	Tab Washer	9004457-01	003/173610
19	Spacer Washer	ATC-C2-2200282/01	064/006441
20	Suspension Link Pivot Pin - Upper	9006680-25	070/050719
21	Suspension Link Pivot Pin - Lower	9006680-26	063/009079
22	Washer	LG 64141503	070/051068
23	M12 Nut Slotted		003/175410
24	Pad Holder Pivot Pin	9006680-21	070/050715
25	Nylon Plug	LG 64422636	098/000063
26	Split Pin Stainless Steel 6.3 x 71	-	029/127216
27	Yoke Suspension Bolt	9016585-01	063/000028
28	Washer	-	003/190836
29	Split Pin Stainless Steel 4.0 x 36	-	
30	Bush - Pad Holder Susp Pivot Susp Link Pivot	9006680-07	070/050711
31	Bush Shouldered- Pad Holder Lever Pivot	9005043-06	070/050730
32	Bush - Pad Holder Lever Pivot	9006680-06	070/050709
33	Snaplock Device	D&M 4.00.094	070/041073
34	Connex Tension Pin	D&M 0101/1	070/041172
35	Bush Shouldered - Calliper Lever P/Holder Pivot	9005043-05	070/050703
36	Bush Shouldered - Calliper Lever Yoke Pivot	IC-C1-8013206-02 ATC-C0-2201834-02	801/320602 2201834-02
37	Bush Shouldered - Calliper Lever Actuator Pivot	IC-CI-8013978-01 ATC-C0-2201834-03	801/397801 2201834-03
38	Washer, Plastic 1mm Thick	IC-CI 8013978-05 ATC-C0-2201834-07	801/397805 2201834-07
39	Washer, Plastic 3mm Thick	IC-CI 8013978-06 ATC-C0-2201834-08	801/397806 2201834-08
40	Calliper Lever Arm – Right Hand	PB-C0-2101801-01	210/180101
41	Calliper Lever Arm – Left Hand	PB-C0-2101801-02	210/180102
42	Bush Shouldered (Nylacast Bush) – Calliper Lever/Yolk Pivot	PB-C0-2101801-A	070/024044
43	Washer, Plastic, 5mm Thick	Nylacast M0100249-2	070/024043

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- NOTES i: Right Hand is defined as the right hand side when looking from the bogie pivot centre towards the wheelset.
ii: D&M - Davies and Metcalfe.
iii: LG - Lucas Girling now SAB WABCO.

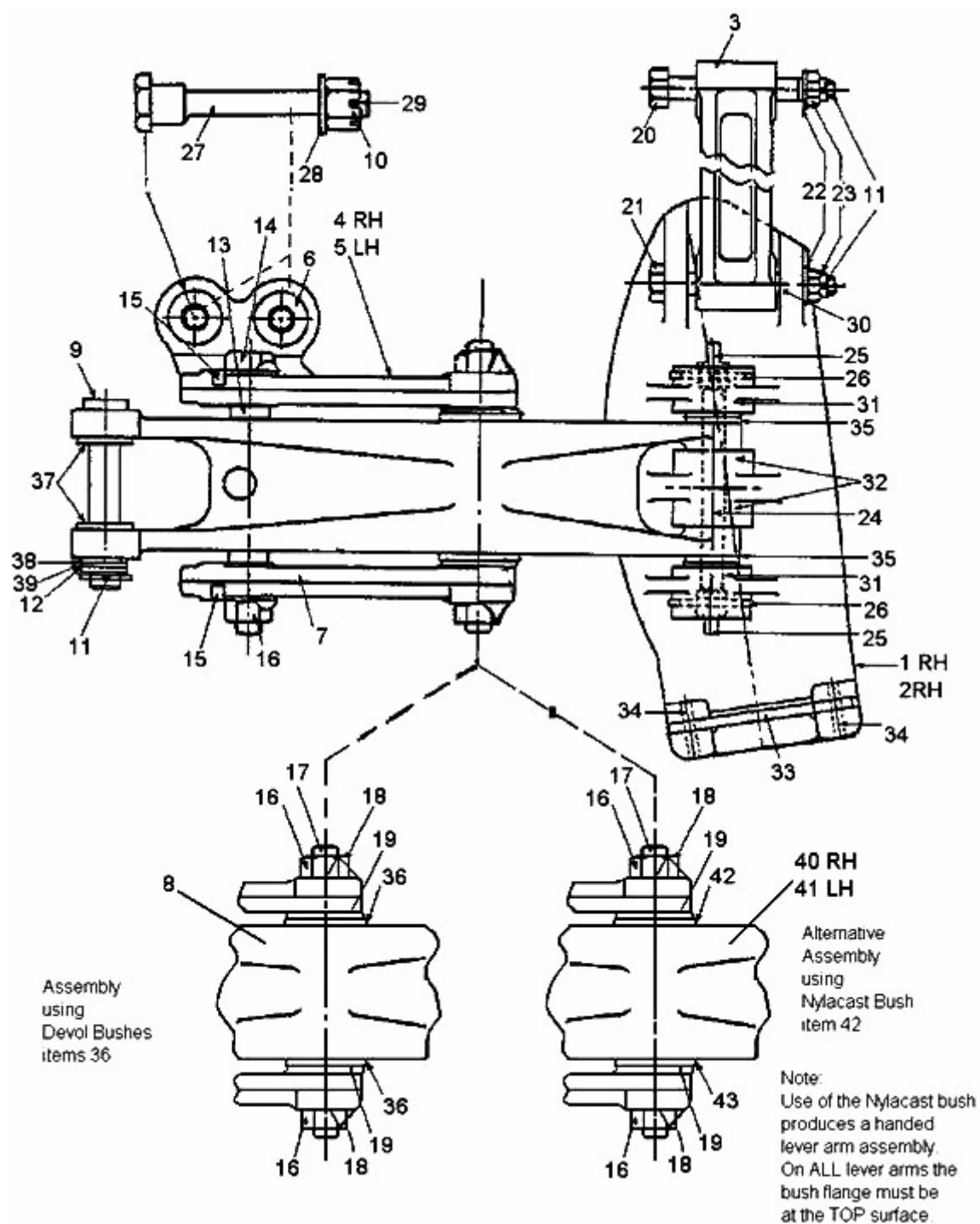


Figure 1: Calliper Assembly

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6.1 Instructions

Component Overhaul Instructions

Identification	Title	Job or Item No.
CR/CI0429	WSP Equipment Lucas Girling	Sect. 3.1 Step 3.3.3 EY 3717 Sect. 3.3 Step 32.11.1
CR/CI0538	Brake Discs for BT10 Bogies	UW 0002
CR/CI0555	Overhaul of CAU2 Brake Actuators	BY 3707
CR/CI0569	WSP Blowdown Valve	EY 0133
IB/TS0648	Data for wheelset Overhaul & Repair	UW 0002
PB/TP1220	Axlebox Reclamation Procedure for BT10 Bogies	UA 6906
TN/TS0574	Wheelset Off-Vehicle Repair Specification	UW 0002

Workshop Overhaul Standard Specifications

Identification	Title	Job or Item No.
WOSS 310/8	Air Reservoirs	AR 0110
WOSS 612/10	Wheelset Overhaul Procedures	UW 0002

Testing Procedures

Identification	Title	Job or Item No.
TI/TP0430	Full Test of Girling WSP System Using Test Set Type 69042349	Sect 3.3 Step 32.11.4
TL/NP0314	Magnetic Particle Inspection Procedure PC M22	US 6909
TL/NP0117	Magnetic Particle Inspection Procedure PC M19 Magnetic Particle Inspection of Ferro-Magnetic Steel Components Using Hand Held Permanent Magnetic and AC Electromagnetic Yokes	UFA5562

Performance Specifications

Identification	Title	Job or Item No.
CR/PE0110	Overhaul of Hydraulic Dampers	UD 6933

Miscellaneous Specifications

Identification	Title	Job or Item No.
CR/PE0102	Repainting of Rail Vehicles	Various
I-850-27	Westinghouse WSP Test Specification	EY 0566
GM/GN2498	Guidance on Wheelset Handling, Storage and Transportation	UW 0002

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Identification	Title	Job or Item No.
GM/RT2005	Certification Processes for NDT Operatives, Equipment and Facilities Used for Inspecting Rail Vehicles	Section 2
LD47020-ST-004 Issue B	Overhaul Instructions for the Unattended Geometry Mesuring System (UGMS) Fitted to a BT10 Bogie.	Sub-section 2.2.3
MT/308	Inter-City Procedure for Maintenance Painting of Traction and Rolling Stock	Sub-section 5.5

Modification Procedures

Identification	Title	Job or Item No.
AT/MP0719 PB/MP0702	Procedure for Replacement of the Long Swing Link Safety Stirrups by Wire Ropes on BT10 Bogies	UU 0126 & Sect 3.3 Step 5.1
PB/MP0799	Lateral Control Rod Safety Brackets	US 0129 & Sect 7.3 Step 29

Welding Procedures

Identification	Title	Job or Item No.
TL/WP0479	Reclamation of Worn Holes & Repair of Cracks on WSP Housings Fitted to BT10 Bogies	EY 0139
WP 339-CS	Replacement of Worn Spigots	UF 5010
See below for list of Welding Procedure Specifications with MG prefixed numbers.		

The following Welding Procedure specifications (WPS) do not have titles.
They are used in the areas shown below, and copies have been included as pages 19 to 25, Section 6.

Spec No.	Areas of Bogie	Job No.	Comment
MG 800	Anti Roll Bar journal end	UD 6940	
MG 801	Bolster side plates	UM 6919	
(MG 802)	(Spring Plank Castings)	(US 0115)	Not called up. To be used only by agreement with the Engineer.
MG 803	Bolster side and bottom plates	UM 6919	
MG 804	Bolster side and bottom plates	UM 6919	
MG 805	Reclamation of worn holes: Anti Roll bar link Anti Roll bar	UD 5789 UD 6940	
MG 806	Rewelding Locking Plate on Anti Roll Bar link	UD 5789	
MG 832	Bolster Bottom Plates	UM 6919	

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6.2 BRB Drawings Referred to in this Instruction

Drawing No.	Title	Job or Item
B-S-691	Bogie Frame Initial Assembly	UF 5010
B-S-780	Final Assembly of Bogie Frame	UF 5010
B-A2-2209	Flexible Conduit Assembly	EY 0123
C-A3-1332	Packing Ring	Sect 3.3 step 25
C-A1-3241	Detail of Bolster Bottom Plate	UM 6919
C-A1-3466	Arrgt Axlebox Location Brackets	UF 5010
C-A1-3882	Assy of Brake Link Support Bracket	UF 5010
C-A1-3961	Bearing Plate	UF 5010
C-A3-4265	Axlebox Lateral Stop	UF 5010
C-A3-4489	Safety Hanger Bracket	UF 5010
C-A0-8943	Arrgt of Axlebox Location Bracket	UF 5010
C-A0-8944	Arrgt of Axlebox Location Bracket	UF 5010
C-A1-9217	Detail of Bolster Side Plates	UM 6919
C-A1-9577	Brackets for Suspension of Girling Disc Unit	UF 5010
C-S-14502	Final Assembly of Bogie Frame, BT10	UF 5010
C-A3-16324	Wiring diagram for Girling WSP	EY 0141
C-A0-16922	Wiring diagram for BR WSP Mk3B & HST	EY 0141
C-A0-22612	Wiring diagram for BR WSP Sleepers	EY 0141
IC-A1-8013054	Reclamation of BR WSP Toothed Wheel	EY 0103 & Sect 3.3 step 19
NSE-A1-8370379	Jig for Setting BR WSP Probe	EY 0142 step 5
C3-A0-8500386	Arrangement of EP Valve Support Plate and Manifolds (Leading End)	AP 5901
C3-A0-8500387	Arrangement of EP Valve Support Plate and Manifolds (Trailing End)	AP 5901
C3-A0-8500388	Parts List for Brake Pipework Arrangement	AP 5901, EY 0123
C3-A0-8500414	Brake Pipework Arrangement Sheet 1	EY 0123
C3-A0-8500415	Brake Pipework Arrangement Sheet 2	AP 5901
B2-A0-8502716	WSP Pipework Modification	EY 0123
B2-A2-8503520	Reclamation of Swing Link	US 0117
B1-A2-8503637	Rocking Washer Machining Male Top	USA1003
B1-A2-8503638	Rocking Washer Machining Female Top	USA1003
B1-A2-8503639	Rocking Washer Machining Male Bottom	USA1003
B1-A2-8503640	Rocking Washer Machining Female Bottom	USA1003
B2-B1-8504080	Safety Rope Arrangement for Lateral Control Rods	US 0129
B2-A2-8700232	Frame Identification Plate	UF 0201 & UF 0202
B1-A1-9000386	Axlebox Details	Sect 3.3 step 19
B1-A0-9001022	BR WSP Distance Piece (Revised Design)	EY 0143 & Sect 3.3 step 33
M-A1-9004457	Details of Locking Plates	Sect 3.3 step 19
B1-A2-9014072	Spacer Plate (for Link Bracket)	UF 5010
B1-A1-9014111	Bracket, Lateral Damper	UF 5010

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Drawing No.	Title	Job or Item
B1-A2-9014112	Bolster Stop Bracket	UF 5010
B1-A3-9015410	Levelling Valve and Lever arrangement	US 0125
B1-A3-9014577	Link - Levelling Valve Control Linkage	US 0125
B1-A2-9014578	Adjustment Link	US 0125
B2-S-9014627	General Arrangement of Air Brake Pipework BT10 with BR WSP	AP 5901, EY 0123
B1-S-9014628	General Arrangement of Air Brake Pipework with Girling WSP	AP 5901, EY 0123
B1-A2-9014951	BT10 Bogie Safety Rope Bracket	UF 5010
B1-A3-9014914	Bolster Stop Plate	UF 5010
B1-A3-9014915	Bolster Stop Shim	UF 5010 & Sect 3.3 step 9
B1-A2-9015069	Torsion Bar Link Repair	UD 5789
B1-A3-9015408	Rocker Washer (Original) Female Top	USA1003
B1-A2-9015424	Rocker Washer (Original) Male Top	USA1003
B1-A2-9015425	Rocker Washer (Original) Female Bottom	USA1003
B1-A2-9015426	Rocker Washer (Original) Male Bottom	USA1003
B1-A2-9015427	Arrangement of Bolster Control Arm Bracket	UM 6919
B1-A2-9015428	Air Spring	US 0113
B1-A1-9015429	Bracket Lateral Damper Doc 2	UM 6919
B1-A2-9015819	Bogie Bolster Bearing Stop Plate	UM 6919
B1-S-9018032	General Arrangement of Air Brake	AP 5901, EY 0123
B2-A1-9039194	Radial Arm Bush	UF 5010
TEE-A0-8502259	Wheelslide Outer Conn Box Dtls Mk III	EY 0123
TEE-A0-8502260	Wheelslide Inner Connection Box Details	EY 0123
WSA-C1-8375182	Traction Rod Retaining Bracket Modification to BT10 Bogies	Sect 3.1 step 3, Sect 3.3, step 9

6.3 Suppliers Drawings Referred to in this Instruction

Drawing No.	Title	Job or Item
SKF P37367	Arrangement of LL Axlebox Seal	UW 0002
Timken E38393	Arrangement of HDL Axlebox Seal	UW 0002
Westinghouse C78129	Axle End Probe	EY 0163

6.4 Angel, Porterbrook and 'Common Rosco' Drawings Referenced to in this Instruction

Drawing No.		Title	Job or Item
Angel	Porterbrook		
ATC-C0-2205116	PB-C0-2101514	Arrangement of Support Plate EP Valve and Manifold (Leading end)	UF 5010
ATC-C0-2205117	PB-C0-2101515	Arrangement of Support Plate EP Valve and Manifold (Trailing end)	UF 5010
ATC-C0-2205120	No Porterbrook equivalent	WSP Connection Box Assemblies	EY 0123

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Drawing No.		Title	Job or Item
Angel	Porterbrook		
ATC-C0-2205123	No Porterbrook equivalent	Bogie Frame Arrangement Westinghouse WSP Equipment (Sheet 1 of 2)	EY 0123
ATC-C0-2205124	No Porterbrook equivalent	Bogie Frame Arrangement Westinghouse WSP Equipment (Sheet 2 of 2)	EY 0123
ATC-C0-2205125	No Porterbrook equivalent	WSP Connection Box Details	EY 0123
ATC-C1-2202254	PB-C1-2101116	Bracket	UF 5010
ATC-C2-2202256	PB-C2-2101118	Wire Rope Swing Link	UU 0126
ATC-C0-2205111	PB-C0-2101507	Flexible Harness Assemblies for WSP Equipment	EY 0123
No ATC equivalent	PB-C0-2101508	Cable Assemblies for WSP Equipment	EY 0141
No ATC equivalent	PB-C0-2101509	WSP Equipment Connection Box Modification Assemblies	EY 0123
	PB-C1-2101510	WSP Axle Probe and Cable Installation	EY 0123
ATC-C0-2205113	PB-C1-2101511	Wiring Diagram for WSP Equipment. Westinghouse System	EY 0141 Sect 3.3, step 38
No ATC equivalent	PB-C3-2101886	Special Washer for BR WSP Distance Piece	Sect 3.3, step 33.3
ATC-C1-2200832	PB-C1-2100415	Arrangement and details of Traction Rod	UH 6930 & Sect 3.3 steps 8 & 9
No ATC equivalent	PB-C0-2100626	Oversize Bush Machining and Assembly Details	BL 0113, BL 0115
No ATC equivalent	PB-C1-2100874	Support Bracket Lateral Control Rod BT10A Bogies	UF 5010
ATC-C0-2201999	PB-C0-2100870	Arrangement of Support Plate, EP Valve and Manifolds (Leading)	UF 5010
ATC-C0-2202000	PB-C0-2100871	Arrangement of Support Plate, EP Valve and Manifolds (Trailing)	UF 5010
ATC-C0-2202001	PB-C0-2100872	Arrangement of Support Plate, EP Valve and Manifolds (Leading)	UF 5010
ATC-C0-2202002	PB-C0-2100873	Arrangement of Support Plate, EP Valve and Manifolds (Trailing)	UF 5010
ATC-C0-2202009	PB-C0-2100875	Radial Arm Axlebox Arrangement for SP120 Bearing Unit	UA 6906
ATC-C1-2200669	PB-C1-2100877	Inclined Restraint Bracket for Safety Ropes	US 0129
ATC-C0-2202007	PB-C0-2100878	Arrangement of Primary Suspension	UA 6906
ATC-C0-2202015	PB-C0-2100886	Bolster	UM 6919
ATC-C0-2202017	PB-C0-2100888	Arrangement of Girling WSP	Sect 3.3 step 19

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Drawing No.		Title	Job or Item
Angel	Porterbrook		
ATC-C0-2202019	PB-C0-2100890	Arrangement of BR WSP (Revised Design)	Sect 3.3 step 19
No ATC equivalent	PB-C0-2103813	Repair of Anti Roll Bar Levers using Oversize Bushes. Assy & Details	UD 6940
ATC-C0-2204045	PB-C0-2101565	Wire Locking Installation for Axle End Cap Applicable to Vehicles Operated by FGW	Sect 3.3 steps 20.5, 32.16, 34.6 & 35.9
Drawing No.		Title	Job or Item
Common Rosco			
CR-C0-2301701		Bogie Mounted Westinghouse WSP Installation	EY 0123
CR-C0-2301703		Flexible Harness Assemblies for WSP Equipment	EY 0141 EY 0123
CR-C0-2301705		Westinghouse WSP Equipment Wiring Diagram XCT and NXE vehicles only.	EY 0141
CR-C0-2301712		WSP Connection Box Assemblies	EY 0123
CR-C0-2301713		WSP Connection Box Details (including Outer Box)	EY 0141

6.5 Arrangement Drawings

Title	Long Swing Link	Short Swing Link
Arrangement of Trailer Bogie. See Drawing PB-C0-2100869 for Bogies Fitted to Mk3B BFO	PB-C0-2100891 ATC-C0-2202020	PB-C0-2100892 ATC-C0-2202021
Section through Secondary Suspension	PB-C0-2100899 ATC-C0-2202028	PB-C0-2100900 ATC-C0-2202029
Arrangement of Air Spring	C-A2-9225	B1-A2-9015428
Arrangement of Spring Plank	B1-A1-9012428	PB-C1-2100882 ATC-C0-2202011

The following Drawings apply to both types:

Final Assembly of Bogie Frame		B-S-780 C-S-14502 B-S-692
Initial Assembly of Bogie Frame		B-S-691
Arrangement of Anti-Roll Bars		B-A0-2062
Arrangement of (Secondary) Traction Rods		PB-C1-2100415 ATC-C1-2200832
Arrangement of Safety Ropes for Lateral Control Rods		B2-A1-8504080 PB-C0-2100991 PB-C0-2100992
Arrangement of Lateral Control Arm		PB-C1-2100881 ATC-C0-2202010

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Arrangement of Primary Suspension		B1-A1-9015071
Arrangement of Side Bearer Unit		PB-C1-2100887 ATC-C0-2202016
Arrangement of Bogie Bolster		PB-C0-2100886 ATC-C0-2202015
Arrangement of Air Suspension Pipework		C-A0-9470
Arrangement of Air Brake Pipework		
Girling Self Powered WSP		B1-S-9018032
BR WSP		B2-S-9014627
Girling (Coach Powered) WSP		B1-S-9014628
BR WSP Probe Arrangement	Revised Design	ATC-C0-2202019 PB-C0-2100890
Axlebox		S1-C0-8008710
Lateral Control Rod Spigot Pin		B1-A1-9015061
Space Envelope for Radial Arm Bush		B2-A1-9039194
Radial Arm Axlebox Arrangement, SP120 Bearing		PB-C0-2100875 ATC-C0-2202004
Axlebox Arrangement		PB-C0-2100876 ATC-C0-2202005
Disc Brakes		
Disc Brake Assembly		PB-C0-2100880 ATC-C0-2202009
Disc Brake Assembly		PB-C0-2100883 No ATC equivalent
Calliper Levers, Yokes, Shoes and Suspension Links		PB-C0-2100884 ATC-C1-2202012

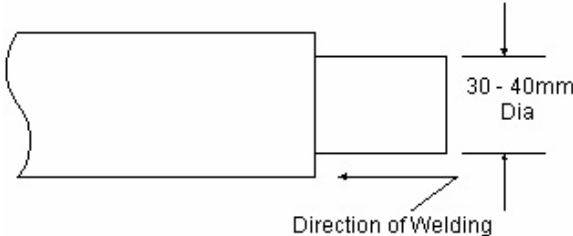
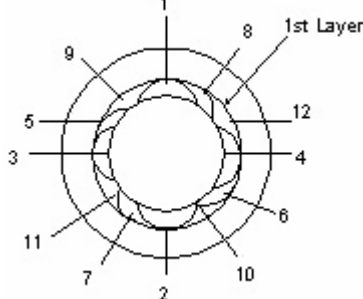
The following apply to the improved design of Anti-Roll Bar (Jobs UD 5789 and UD 6940).

Installation of Anti-Roll Bar		PB-C0-2105256 ATC-C0-2210031
Assembly of Anti-Roll Bar		PB-C0-2105257 ATC-C0-2210041
Assembly and Details of Torsion Bar		PB-C0-2105258 ATC-C0-2210061
Assembly and Details of Anti-Roll Bar Bush Housing		PB-C0-2105259 ATC-C0-2210062
Assembly and Details of Torsion Bar Link		PB-C0-2105260 ATC-C0-2210063
Details of Pin and Bushes		PB-C1-2105261 ATC-C0-2210064

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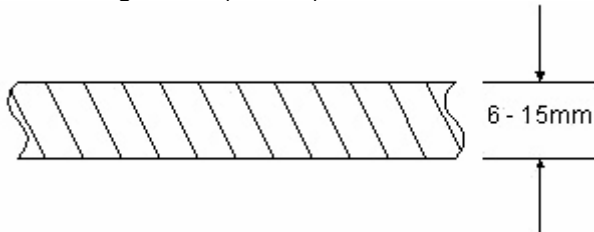
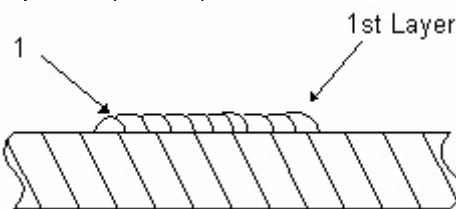
6.6 Copies of Weld Procedure Specifications

MG 800

BRITISH RAILWAYS BOARD				
WELDING PROCEDURE SPECIFICATION				
Joint Type: Weld Overlay (See Note 4)		Procedure No: MG 800 Issue: 1		WPAR No. 23201/A
Welding Process: MAG		Welding Spec: TL/TT0005 & BS 5135		
Material Spec: BS 970 Part 3. Grade 080M40 (formerly BS 970: EN 6A)		Material Thickness Range: 30 to 40mm Dia.		
Joint Configuration (Sketch) 		Run Sequence (Sketch) 		
WELDING PARAMETERS		WELDING CONSUMABLES		
Run No.	ALL	Specification: BS 2901 Part 1: A18 BR Catmaster No: 46/150285 Shield gas/Flux: CO ² Storage Conditions: (See Note 1)		
Electrode/wire dia	1.2mm			
Amperage	150-170			
Arc Voltage	18-20			
Polarity	DC + ve	HEAT TREATMENT PARAMETERS		
Position	FLAT	Preheat temp: 140 to 160°C (See Note 3) Interpass temp: 250°C Max Measuring method: (See Note 2)		
Travel Speed mm/sec	4-7			
Gas flow rate L/min	18-20			
Method of preparation: Degrease followed by blast cleaning, grinding and/or wire brushing		NDT method: 100% Visual and MPI if required		
Second Side Treatment: N/A		Note: 1. As per manufacturer's recommendation 2. A digital thermometer. 3. The area to be welded shall be preheated immediately prior to welding. This temperature shall be maintained during the welding operations. 4. Single overlapping runs with 50% overlay. A weaving technique may be used providing that the amount of weaving does not exceed 9mm.		
Other Information: More than one layer may be required to complete the build up. The run sequence is for example only, more or less runs may be required.				

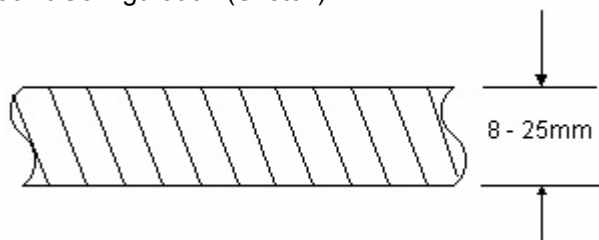
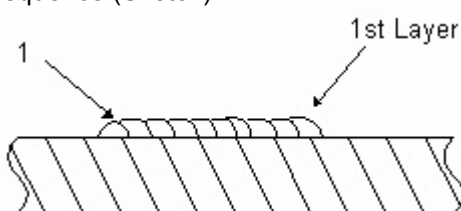
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MG 801

BRITISH RAILWAYS BOARD				
WELDING PROCEDURE SPECIFICATION				
Joint Type: Weld Overlay (See Note 3 &4)		Procedure No: MG 801 Issue: 1		WPAR No. 21992A & B
Welding Process: MMA		Welding Spec: TL/TT0005 & BS 5135		
Material Spec: BS EN 10083-1 Grade C22E (Max CEV 0.40%) or BS EN 10 025 S275JR (Max CEV 0.40%)		Material Thickness Range: 6 to 15mm		
Joint Configuration (Sketch) 		Run Sequence (Sketch) 		
WELDING PARAMETERS				WELDING CONSUMABLES
Run No.	ALL			Specification: BS 639: E43 XX R BR Catmaster No: 3.25mm - 46/140645 4.00mm - 46/140647 5.00mm - 46/140650
Electrode/wire dia	3.25mm or 4.0mm or 5.0mm			
Amperage	100-130	140-160	180-230	
Arc Voltage	18-20	19-22	22-24	Storage Conditions: (See Note 1)
Polarity	AC/DC+	AC/DC+	AC/DC+	HEAT TREATMENT PARAMETERS
Position	F & H	F & H	F & H	Preheat temp: N/A
Travel Speed mm/sec	2-4	3-5	3-7	Interpass temp: 250°C Max
Gas flow rate L/min	N/A	N/A	N/A	Measuring method: (See Note 2)
Method of preparation: Degrease followed by blast cleaning, grinding and/or wire brushing				N.D.T. method: 100% Visual and MPI if required
Second Side Treatment: N/A				
Other Information:				Note: 1. As per manufacturer's recommendation. 2. A digital thermometer. 3. Single overlapping runs with 50% overlay. 4. More than one layer may be required to complete the build up.

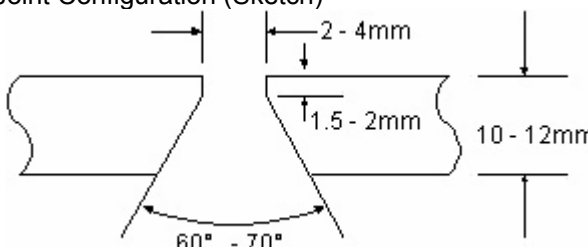
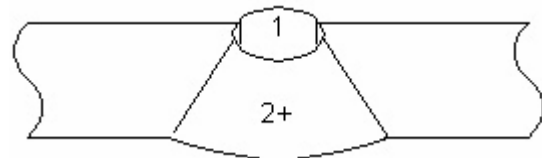
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MG 802

BRITISH RAILWAYS BOARD				
WELDING PROCEDURE SPECIFICATION				
Joint Type: Weld Overlay (See Note 4 &5)		Procedure No: MG 802 Issue: 1		WPAR No. 21730A & B
Welding Process: MMA		Welding Spec: TL/TT0005 & BS 5135		
Material Spec: BS 3100 Grade A1 or A2		Material Thickness Range: 8 to 25mm		
Joint Configuration (Sketch) 		Run Sequence (Sketch) 		
WELDING PARAMETERS		WELDING CONSUMABLES		
Run No.	ALL			Specification: BS 639: E51 XX B
Electrode/wire dia	3.25mm or 4.0mm			BR Catmaster No: 3.25mm - 46/141135
Amperage	100-130	135-150		4.00mm - 46/141135
Arc Voltage	18-20	20-23		Storage Conditions: (See Note 1)
Polarity	AC/DC+	AC/DC+		HEAT TREATMENT PARAMETERS
Position	F & H	F & H		Preheat temp: 100 to 150°C (See Note 3)
Travel Speed mm/sec	2-4	3-5		Interpass temp: 250°C Max
Gas flow rate L/min	N/A	N/A		Measuring method: (See Note 2)
Method of preparation: Degrease followed by blast cleaning, grinding and/or wire brushing		NDT method: 100% Visual and MPI if required		
Second Side Treatment: N/A		Note:		
Other Information: The electrodes are Basic Low Hydrogen type and are to be dried at 250°C for 2 hours immediately prior to use.		1. As per manufacturer's recommendation.		
		2. A digital thermometer.		
		3. The area to be welded shall be preheated immediately prior to welding. This temperature shall be maintained during the welding operations.		
		4. Single overlapping runs with 50% overlay.		
		5. More than one layer may be required to complete the build up.		

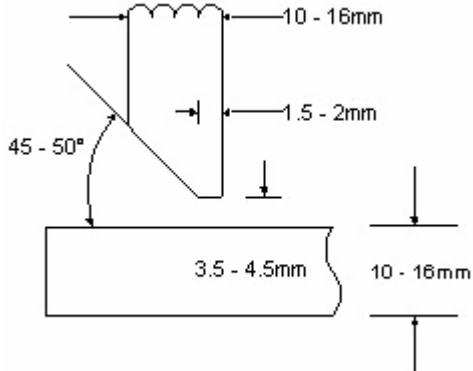
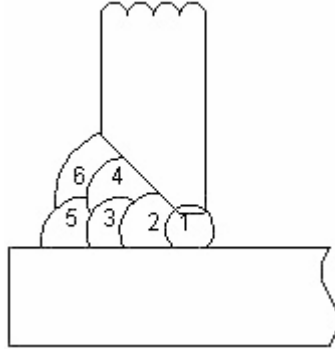
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MG 803

BRITISH RAILWAYS BOARD				
WELDING PROCEDURE SPECIFICATION				
Joint Type: Single V Butt Joint (from one side only)			Procedure No: MG 803 Issue: 1	WPAR No. WPQ 009
Welding Process: MMA			Welding Spec: TL/TT0005 & BS 5135	
Material Spec: BS EN 10 025 S275J2G (Max CEV 0.04%) or BS EN 10 025 S275RJ (Max CEV 0.4%)			Material Thickness Range: 10 to 12mm	
<div>Joint Configuration (Sketch)</div> 			<div>Run Sequence (Sketch)</div> 	
WELDING PARAMETERS			WELDING CONSUMABLES	
Run No.	ALL		Specification: BS639: E51 XX B	
Electrode/wire dia	3.25mm		BR Catmaster No: 46/14135	
Amperage	100-125		Shield gas/Flux: N/A	
Arc Voltage	18-20		Storage Conditions: (See Note 1)	
Polarity	AC/DC +		HEAT TREATMENT PARAMETERS	
Position	V/Up		Preheat temp: N/A	
Travel Speed mm/sec	2-4		Interpass temp: 250°C Max.	
Gas flow rate L/min	N/A		Measuring method: (See Note 2)	
Method of preparation: Machine, flame cut and/or grind, degrease wire brush.			N.D.T. method: 100% Visual and MPI if required	
Second Side Treatment: N/A			Note:	
Other Information: The electrodes are Basic Low Hydrogen type and are to be dried at 250°C for 2 hours immediately prior to use and held in a suitable quiver during use.			1. As per manufacturer's recommendation.	
			2. A digital thermometer.	

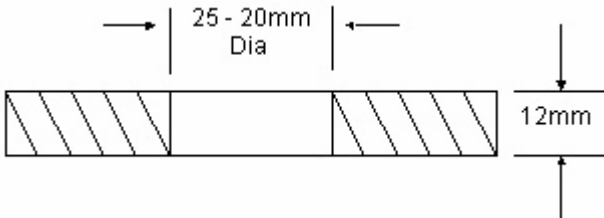
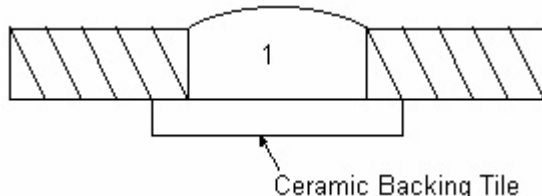
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MG 804

BRITISH RAILWAYS BOARD				
WELDING PROCEDURE SPECIFICATION				
Joint Type: Single Bevel Tee Butt Joint (See Note 3: from one side only)		Procedure No: MG 804 Issue: 1	WPAR No. 23232/1	
Welding Process: MMA		Welding Spec: TL/TT0005 & BS 5135		
Material Spec: BS EN 10 025 S275J2G (Max CEV 0.04%) or BS EN 10 025 S275RJ (Max CEV 0.4%)		Material Thickness Range: 10 to 16mm		
Joint Configuration (Sketch) 		Run Sequence (Sketch) 		
WELDING PARAMETERS		WELDING CONSUMABLES		
Run No.			Specification: BS639: E51 XX B	
Electrode/wire dia	4.00mm	4.00mm	BR Catmaster No: 46/141137	
Amperage	145-165	145-165	Shield gas/Flux: N/A	
Arc Voltage	21-23	22-24	Storage Conditions: (See Note 1)	
Polarity	AC	AC/DC+	HEAT TREATMENT PARAMETERS	
Position	H/V	H/V	Preheat temp:	N/A
Travel Speed mm/sec	1-1.5	2-4	Interpass temp:	250°C Max
Gas flow rate L/min	N/A	N/A	Measuring method:	(See Note 2)
Method of preparation: Machine, flame cut and/or grind, degrease wire brush.		N.D.T. method: 100% Visual and MPI if required		
Second Side Treatment: N/A		Note:		
Other Information: The electrodes are Basic Low Hydrogen type and are to be dried at 250°C for 2 hours immediately prior to use and held in a suitable quiver during use.		1. As per manufacturer's recommendation.		
		2. A digital thermometer.		
		3. The run sequence is for example only, more or less runs may be required.		

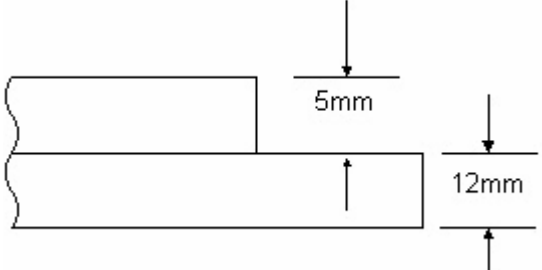
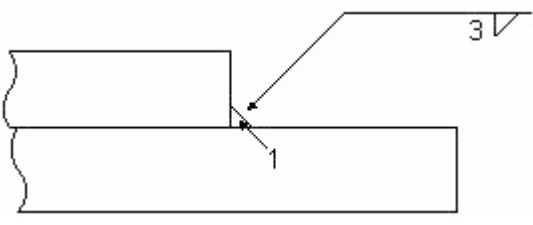
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MG 805

BRITISH RAILWAYS BOARD			
WELDING PROCEDURE SPECIFICATION			
Joint Type: Reclamation of Worn Holes (See Note 4)		Procedure No: MG 805 Issue: 1	WPAR No. 23142/28
Welding Process: <div>MAG</div>		Welding Spec: <div>TL/TT0005 & BS 5135</div>	
Material Spec: <div>BS 970 Part 1: 045M10</div>		Material Thickness Range: Forging - 12mm Hole Dia. - 25 to 30mm	
Joint Configuration (Sketch) 		Run Sequence (Sketch) 	
WELDING PARAMETERS		WELDING CONSUMABLES	
Run No.	1	Specification: BS 2901 Part 1: A/18 B BR Catmaster No: 46/150285 Shield gas/Flux: Argoshield 80/20 * Storage Conditions: (See Note 1)	
Electrode/wire dia	1.2mm		
Amperage	260-280		
Arc Voltage	26-28		
Polarity	DC +		
Position	FLAT	HEAT TREATMENT PARAMETERS	
Travel Speed mm/sec	N/A	Preheat temp: 50 to 100°C (See Note 3) Interpass temp: 250°C Max. Measuring method: (See Note 2)	
Gas flow rate L/min	15-18		
Method of preparation: Degrease followed by grinding and/or wire brushing.		NDT method: 100% Visual and MPI if required	
Second Side Treatment: Remove the ceramic backing tile, de-slag and deposit enough weld metal for final dressing, if required.		Note: 1. As per manufacturer's recommendation. 2. A digital thermometer. 3. The area to be welded shall be preheated immediately prior to welding. This temperature shall be maintained during the welding operations. 4. Use a circular technique to ensure adequate side wall fusion. * Argoshield 80/20 = 80% Argon, 20% CO2	
Other Information:			

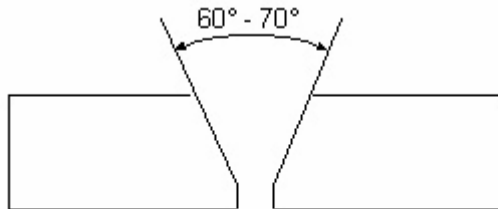
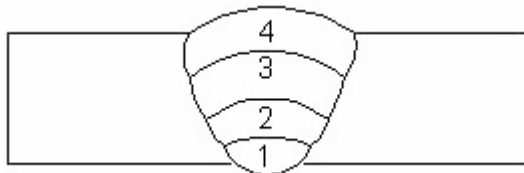
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MG 806

BRITISH RAILWAYS BOARD			
WELDING PROCEDURE SPECIFICATION			
Joint Type: FILLET WELD		Procedure No: MG 806 Issue: 1	WPAR No. WPQ 009
Welding Process: MMA		Welding Spec: TL/TT0005 & BS 5135	
Material Spec: Plate - BS EN 10083-1 Grd C22E (Max CEV 0.4%) Forging - BS 970 Part 1: 045M10		Material Thickness Range: Plate - 5mm Forging - 12mm	
Joint Configuration (Sketch) 		Run Sequence (Sketch) 	
WELDING PARAMETERS		WELDING CONSUMABLES	
Run No.	1	Specification: BS 639: E51 XX B	
Electrode/wire dia	3.25mm	BR Catmaster No: 46/14135	
Amperage	100-130	Shield gas/Flux: N/A	
Arc Voltage	22-24	Storage Conditions: (See Note 1)	
Polarity	AC/DC+	HEAT TREATMENT PARAMETERS	
Position	H/V	Preheat temp: 50 to 100°C (See Note 3)	
Travel Speed mm/sec	2-4	Interpass temp: N/A	
Gas flow rate L/min	N/A	Measuring method: (See Note 2)	
Method of preparation: Degrease followed by blast cleaning, grinding and/or wire brushing.		NDT method: 100% Visual and M.P.I. if required	
Second Side Treatment: N/A		Note: 1. As per manufacturer's recommendation. 2. A digital thermometer. 3. The area to be welded shall be preheated immediately prior to welding. This temperature shall be maintained during the welding operations.	
Other Information: The electrodes are Basic Low Hydrogen type and are to be dried at 250°C for 2 hours immediately prior to use and held in a suitable quiver during use.			

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MG 832

BRITISH RAILWAYS BOARD				
WELDING PROCEDURE SPECIFICATION				
Joint Type: Single Vee Butt Weld		Procedure No: MG 832 Issue: 1		WPAR No. MG 417
Welding Process: MMA		Welding Spec: TL/TT0005 & BS 5135 & BS 4570		
Material Spec: Casting - BS 3100: A2 (CEV Max. 0.45) Wrought - BS 10 025 S275 (CEV Max 0.4)		Material Thickness: 12mm to 16mm		
Joint Configuration (Sketch)  Root Face 1.5 - 2mm Root Gap 2 - 3mm		Run Sequence (Sketch) 		
WELDING PARAMETERS		WELDING CONSUMABLES		
Run No.	1	2+	Specification: BS 639: E51 XX B BR Catmaster : See Note 1 Shield gas/Flux: N/A Storage Conditions: (See Note 2)	
Electrode/wire dia	3.25mm	4mm		
Amperage	100-120	155-165		
Arc Voltage	18-20	20-22		
Polarity	AC/DC+	AC/DC+	HEAT TREATMENT PARAMETERS Preheat temp: 50 to 100°C (See Note 3) Interpass temp: 250°C Measuring method: (See Note 4)	
Position	FLAT	FLAT		
Travel Speed mm/sec	1.5-2.5	2-4		
Gas flow rate L/min	N/A	N/A		
Method of preparation: Degrease followed by, grinding.		NDT method: 100% Visual Examination in accordance with BS 5289		
Second Side Treatment: N/A		Note: 1. 3.25mm dia 46/14135; 4mm dia. 46/141137. 2. As per Manufacturer's Recommendations. 3. Wrought to wrought welds - N/A Welds Incorporating castings - 100°C. 4. Digital Thermometer or Temperature Indicating Crayon.		
Other Information: Basic coated hydrogen controlled electrodes are used. They shall be dried at 250°C for 2 hours and held in a suitable quiver immediately prior to use.				

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6.7 Procedures Requiring the Approval of the Engineer

In the following areas of work, the Supplier is required to prepare their own procedure in order to achieve the required performance of the overhauled items. In each case, the content of the proposed procedure must be approved by the Supplier before the procedure can be used.

Job No.	Location	Procedure
AR 0110	Step 2	Procedure For Cleaning Reservoirs
BL 0113	Procedure A	Reclaiming Actuator or Lever Pivot Bores
BL 0114	A2 & Arising Work 2	Reclaiming Yoke Bores
BL 0116	Arising Work 2, 3	Use of Oversize Bushes in Pad Holders
UA 6906	Arising Work C1	Rectification of Cracks in Axleboxes
UA 6906	Arising Work C4	Removal of Indentations in Axleboxes
UD 6940	Note 3	Welding Arms to Anti-Roll Bar
UFA0128	Part C1	Bracket Alignment Procedure
UF 5010	Arising Work A2	Alignment Procedure When Bogie Involved in Derailment
UF 5010	Step B1.3	Shot Blasting Bogie Frames
UF 5010	Arising Work B2	Reclamation of Corroded Transoms
UF 5010	Arising Work D1, D2.2, D3 & D4	Repairing Bogie Frame Fractures
UF 5010	Arising Work E2, E3, E4	Repairing Bogie Secondary Traction Rod Brackets
UF 5010	Arising Work E7	Reclamation of Axlebox Pivot Brackets
UF 5010	Step G5	Alignment of Brake Suspension Mounting Points
UF 5010	Arising Work G5	Fitting New Brake Suspension Mounting Brackets
UM 6919	Arising Work 6	Reclamation of Worn Traction Rod Brackets
US 0115	Arising Work 5.2	Reclamation of Holes for Anti-Roll Bar Link Spindles
US 0117	Arising Work 4	Repairs to Tie Bar Assembly
US 0117	Note & Step 3	Alternative Method of Crack Detection on Swing Links
US 0125	Arising Work 1.2, 3.2	Reclamation of Holes In Levelling Valve Linkages
UFA0128	Arising Work B1.1 and B2.3	Repairs to Bearer Plates And Brackets
Section 3.3	Step 20	Method of Assembling Wheelsets to Bogie Frame

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7. COMPONENT INDEX

Component/Item	Dismantling	Repair	Reassembly
	Section 3.1	Section 3.2	Section 3.3
Actuator, Brake	7	BY 3707	11.5
Adaptor, Girling WSP	3.3.11		19
Alternator, Girling WSP	3.3.10	EY 3717	32.1
Anti-Roll Bar, Assembly	11.1	UD 6940	1.6
Anti-Roll Links	11.1	UD 5789	1.7
Axlebox	7.	UA 6906	14, 16, 22 & 27
Bar, Anti-Roll, Assembly	11.1	UD 6940	1.6
Bearer, Side	(11)	UM 6008	(1.4)
Bolster	11	UM 6919	1.4
Bolster Height set	-	-	40
Box, Junction WSP	12	EY 0123	34.8 or 35.5, 39
Brackets, Bogie Frame	-	UF 5010 Parts C, E & G	-
Brackets, Safety LCR	3.5.2	US 0129	29
Calliper, Brake, Assembly	9	BL 0007	11
Cap, Axle End	5.7	-	19
Cap, BR WSP Probe	3.1.1	EY 0143	34.7
Collets, Swing Links	10	-	4
Conduit, WSP	-	EY 0123	-
Cover, Axlebox, Non WSP	5.7	UA 0146	20
Cover, Axlebox Rear	8.1	UA 0146	18
Cover, BR WSP	3.1.2	EY 0143	34.4
Cover Westinghouse WSP	3.2.5	EY 0143	35.7
Damper, Lateral	5.4	UD 6933	10
Damper, Primary	6	UD 6933	28
Distance Piece	3.1.6 or 3.2.7	EY 0143	33.4
Earth Lead (Bond)	5.8	UE 0611	30
Filter, Air	11.2	AF 9308	1.1
Flexible Cables, WSP	13	EY 0123	32.9, 34.9 or 35.6
Filter Air Line	11.3	AF 0102	1.1
Frame, Bogie	-	UF 5010	-
Generator, Signal, WSP	3.3.10	EY 3717	32.1
Hanger, Brake	9	BL 0007	11.7
Holder, Brake Pad	9	BL 0116	11.2
Hoses, Brake Actuator	9	AP 5901	12.2.7
Hoses, Air Spring	11.6	AP 5901	6
Housing, Flange, Girling WSP	3.3.12	EY 0139	32.2, 32.3
Housing, Circuit WSP	3.3.9	EY 3717	32.5
Lead, Earth	5.8	UE 0611	30
Lever, Brake Calliper	9	BL 0113	11.4
Link, Anti-Roll Bar	11.1	UD 5789	1.7
Link, Brake Suspension	9	BL 0115	11.7
Linkage, Levelling Valve	11.3	US 0125	7

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Component/Item	Dismantling	Repair	Reassembly
	Section 3.1	Section 3.2	Section 3.3
Module, Girling WSP	3.3.7	EY 3717	32.6
Pad, Brake	3.3.4, 5.3	BB 0112	31
Paint	-	-	43
Pipework, Air	1 (Test)	AP 5901	39 (Test)
Plank, Spring	11	US 0115	4
Plate, Frame Identification	-	UF 0201	-
Plate, Bogie Variable	-	UF 0202	-
Probe, BR WSP	3.1.3 & 3.1.4	EY 0142	34.1 – 34.3
Probe Westinghouse WSP	3.2.1 or 3.2.2 & 3.2.3	EY 0163	35.2
Reservoir, Air Suspension	11.7	AR 0110	1.1
Rod, Bolster Control	11.5	UM 0112	1.5
Rod, Lateral Control	6	US 0143	15, 17, 22 & 26
Rod, Secondary Traction	5.5	UH 6927	8 & 9
Safety Brackets LCR	5.2	US 0129	29
Safety Loop - Spring Plank	5.6	Not to be reused	-
Safety Wire - Spring Plank	5.6	UU 0126	5
Spring, Air	11.6	US 0113	1.3
Spring, Primary	7	US 6909	23
Swing Link	10	US 0117	2, 3
Swing Link, Collets	10	-	4
Tests	-	25.5	
- Axlebox to bracket rib clearance	-		
- Bolster Height	-	-	40
- Bolster Stop Clearance	-	-	9.4
- Frame Height Under load	-	-	25
- Leakage in Secondary Suspension	-	-	41
- Leakage in Brake System	-	-	42
- Wiring	-	EY 0141	36, 37 & 38
Toothed Wheel, Westinghouse and BR WSP	3.1.6 & 3.2.6	EY 0103	19
Valve, Compensating	11.4	AV 3321	1.1
Valve, Air Suspension Levelling	11.3	AV 0061	7
Valve, WSP Blowdown (Girling & BR)	5.1	EY 0133	12.1
Valve, Westinghouse Dump	4	EY 0133 & EY 0566	12.2
Washer, Rocking	10	US 0130	3
Wheelset	7	UW 0002	13, 21 & 22
Wire, Safety Spring Plank	5.6	UU 0126	5
Wiring, WSP, BR	13	EY 0141 Test	34.9, & 36
Wiring, WSP, Girling	13	EY 0141 Test	32.9 & 37
Wiring, WSP, Westinghouse	13	EY 0141 Test	35.6 & 38
Yoke, Brake Calliper	9	BL 0114	11.3

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8. TABLE OF WSP FITMENTS

Key to vehicle ownership

A Angel Trains Ltd
F First Rail Holdings
P Porterbrook Leasing Ltd

Note that only vehicles owned by the signatories to this document are included in this list.
Other vehicles may exist.

Variations from Girling Self Powered

* Coach powered pressure switch
Ø Energised from Train Wire 12

Future Changes:

The following vehicles are to be fitted with Westinghouse WSP:

National Express East Coast
Arriva Cross Country currently fitted with Girling WSP
Any first Great Western not yet fitted.

NOTE: FGW TS vehicles to be converted to TSB (40101 – 40119) are subject to confirmation.

Vehicle No.	Owner	Type	WSP Type: G = Girling B = BR Mk2 W = Westinghouse
10200	P	RFM	G
10203	P	RFM	G
10206	P	RFM	G
10212	P	RFM	G
10214	P	RFM	G
10216	P	RFM	G
10217	P	RFM	G
10219	P	RFM	G
10223	P	RFM	G
10225	P	RFM	G
10228	P	RFM	G
10229	P	RFM	G
10231	P	RFM	G*
10232	P	RFM	G*
10240	P	RFM	G*
10241	P	RFM	G
10245	P	RFM	G*
10247	P	RFM	G
10253	P	RFM	G
10256	P	RFM	G*
10259	P	RFM	G*
10260	P	RFM	G*
10401 (12168)	P	TSOB	G

Vehicle No.	Owner	Type	WSP Type: G = Girling B = BR Mk2 W = Westinghouse
10402 (12010)	P	TSOB	G
10403 (12135)	P	TSOB	G
10404 (12068)	P	TSOB	G
10405 (12157)	P	TSOB	G
10406 (12020)	P	TSOB	G
11006	P	FO	G
11007	P	FO	G
11011	P	FO	G
11018	P	FO	G
11021	P	FO	G
11026	P	FO	G
11048	P	FO	G
11066	P	FO	B
11067	P	FO	B
11068	P	FO	B
11069	P	FO	B
11070	P	FO	B
11072	P	FO	B
11073	P	FO	B
11074	P	FO	B
11075	P	FO	B

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Vehicle No.	Owner	Type	WSP Type: G = Girling B = BR Mk2 W = Westinghouse
11076	P	FO	B
11077	P	FO	B
11078	P	FOD	B
11080	P	FO	B
11081	P	FO	B
11082	P	FO	B
11085	P	FOD	B
11087	P	FOD	B
11088	P	FOD	B
11090	P	FOD	B
11091	P	FO	B
11092	P	FOD	B
11093	P	FOD	B
11094	P	FOD	B
11095	P	FOD	B
11096	P	FOD	B
11098	P	FOD	B
11099	P	FOD	B
11100	P	FOD	B
11101	P	FOD	B
12005	P	TSO	G
12008	P	TSO	G
12009	P	TSO	G
12011	P	TSO	G
12012	P	TSO	G
12013	P	TSO	G
12015	P	TSO	G
12016	P	TSO	G
12019	P	TSO	G
12021	P	TSO	G
12022	P	TSO	G
12024	P	TSO	G
12026	P	TSO	G
12027	P	TSO	G
12029	P	TSO	G
12030	P	TSO	G
12031	P	TSO	G
12032	P	TSO	G
12034	P	TSO	G
12035	P	TSO	G
12036	P	TSO	G
12037	P	TSO	G
12040	P	TSO	G
12041	P	TSO	G
12042	P	TSO	G
12045	P	TSO	G
12046	P	TSO	G
12047	P	TSO	G
12049	P	TSO	G
12051	P	TSO	G
12056	P	TSO	G
12057	P	TSO	G
12060	P	TSO	G
12061	P	TSO	G

Vehicle No.	Owner	Type	WSP Type: G = Girling B = BR Mk2 W = Westinghouse
12062	P	TSO	G
12063	P	TSO	G
12064	P	TSO	G
12065	P	TSO	G
12066	P	TSO	G
12067	P	TSO	G
12073	P	TSO	G
12078	P	TSO	G
12079	P	TSO	G
12081	P	TSO	G
12082	P	TSO	G
12083	P	TSO	G
12084	P	TSO	G
12087	P	TSO	G
12089	P	TSO	G
12090	P	TSO	G
12091	P	TSO	G
12092	P	TSO	G
12093	P	TSO	G
12095	P	TSO	G
12097	P	TSO	G
12098	P	TSO	G
12099	P	TSO	G
12100	P	TSOD	G
12101	P	TSO	G
12103	P	TSO	G
12105	P	TSO	G
12107	P	TSO	G
12108	P	TSO	G
12109	P	TSO	G
12110	P	TSO	G
12111	P	TSO	G
12114	P	TSO	G
12115	P	TSO	G
12116	P	TSO	G
12118	P	TSO	G
12120	P	TSO	G
12122	P	TSOD	G
12125	P	TSO	G
12126	P	TSO	G
12129	P	TSO	G
12130	P	TSO	G
12132	P	TSO	G
12133	P	TSO	G
12134	P	TSO	G
12137	P	TSO	G
12138	P	TSO	G
12139	P	TSO	G
12141	P	TSO	G
12142	P	TSOD	G
12143	P	TSO	G
12144	P	TSO	G
12146	P	TSO	G
12147	P	TSO	G

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Vehicle No.	Owner	Type	WSP Type: G = Girling B = BR Mk2 W = Westinghouse
12148	P	TSO	G
12150	P	TSO	G
12151	P	TSO	G
12153	P	TSO	G
12154	P	TSO	G
12156	P	TSO	G
12158	P	TSO	G
12159	P	TSO	G
12160	P	TSO	G
12161	P	TSOD	G
12163	P	TSO	G
12164	P	TSO	G
12166	P	TSO	G
12167	P	TSO	G
12170	P	TSO	G
12171	P	TSO	G
17173	P	BFO	B
17174	P	BFO	B
17175	P	BFO	B
40101 (42170)	P	TSB	W
40102 (42223)	P	TSB	W
40103 (42316)	P	TSB	W
40104 (42254)	P	TSB	W
40105 (42084)	P	TSB	W
40106 (42162)	P	TSB	W
40107 (42334)	P	TSB	W
40108 (42314)	P	TSB	W
40109 (42262)	P	TSB	W
40110 (42187)	P	TSB	W
40111 (42248)	P	TSB	W
40112 (42336)	P	TSB	W
40113 (42309)	P	TSB	W
40114 (42086)	P	TSB	W
40115 (42320)	P	TSB	B
40116 (42147)	P	TSB	W
40117 (42249)	P	TSB	W
40118 (42338)	P	TSB	W

Vehicle No.	Owner	Type	WSP Type: G = Girling B = BR Mk2 W = Westinghouse
40119 (42090)	P	TSB	GØ
40204	A	TRB	W
40205	A	TRB	W
40207	A	TRB	W
40208	A	TRB	W
40209	A	TRB	W
40210	A	TRB	W
40221	A	TRB	W
40228	A	TRB	W
40231	A	TRB	W
40402	P	TRSB	G
40403	P	TRSB	G
40416	P	TRSB	G
40419	P	TRSB	G
40434	P	TRSB	B
40700	P	TRFB	W
40701	P	TRFB	W
40702	P	TRFB	W
40703	A	TRFB	W
40704	A	TRFB	B
40705	A	TRFB	B
40706	A	TRFB	B
40707	A	TRFB	W
40708	P	TRFB	W
40709	A	TRFB	W
40710	A	TRFB	W
40711	A	TRFB	B
40712	A	TRFB	W
40713	A	TRFB	W
40714	A	TRFB	W
40715	A	TRFB	W
40716	A	TRFB	W
40717	A	TRFB	W
40718	A	TRFB	W
40720	A	TRFB	B
40721	A	TRFB	W
40722	A	TRFB	W
40723	A	TRFB	B
40724	A	TRFB	W
40725	A	TRFB	B
40726	A	TRFB	W
40727	A	TRFB	W
40728	P	TRFB	W
40729	P	TRFB	W
40730	P	TRFB	W
40731	A	TRFB	W
40732	A	TRFB	B
40733	A	TRFB	W
40734	A	TRFB	W
40735	A	TRFB	B
40736	A	TRFB	W
40737	A	TRFB	B
40738	A	TRFB	W

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Vehicle No.	Owner	Type	WSP Type: G = Girling B = BR Mk2 W = Westinghouse
40739	A	TRFB	W
40740	A	TRFB	B
40741	P	TRFB	W
40742	A	TRFB	B
40743	A	TRFB	W
40744	A	TRFB	W
40745	A	TRFB	W
40746	P	TRFB	W
40747	A	TRFB	B
40748	A	TRFB	B
40749	P	TRFB	W
40750	A	TRFB	B
40751	P	TRFB	W
40752	A	TRFB	W
40753	P	TRFB	W
40754	P	TRFB	W
40755	A	TRFB	W
40756	P	TRFB	W
40757	A	TRFB	W
40801	P	TBRF	W
40802	P	TBRF	W
40803	P	TBRF	W
40804	P	TBRF	W
40805	P	TBRF	W
40806	P	TBRF	W
40807	P	TBRF	W
40808	P	TBRF	W
40809	P	TBRF	W
40810	P	TBRF	W
40811	P	TBRF	W
40900	F	TRB	G
40901	F	TRB	B
40902	F	TRB	G
40903	F	TRB	B
40904	F	TRB	G
41003	A	TF	W
41004	A	TF	W
41005	A	TF	W
41006	A	TF	W
41007	A	TF	GØ
41008	A	TF	GØ
41009	A	TF	W
41010	A	TF	W
41011	A	TF	W
41012	A	TF	W
41015	A	TF	W
41016	A	TF	W
41017	A	TF	W
41018	A	TF	W
41019	A	TF	W
41020	A	TF	W
41021	A	TF	W
41022	A	TF	W
41023	A	TF	W

Vehicle No.	Owner	Type	WSP Type: G = Girling B = BR Mk2 W = Westinghouse
41024	A	TF	W
41025	A	TF	GØ
41026	A	TF	GØ
41027	A	TF	GØ
41028	A	TF	GØ
41029	A	TF	W
41030	A	TF	W
41031	A	TF	W
41032	A	TF	W
41033	A	TF	W
41034	A	TF	W
41035	A	TF	GØ
41036	A	TF	GØ
41037	A	TF	W
41038	A	TF	W
41039	A	TF	W
41040	A	TF	W
41041	P	TFD	W
41043	A	TF	G
41044	A	TF	W
41045	F	TF	G
41046	P	TFD	W
41051	A	TF	W
41052	A	TF	W
41055	A	TF	W
41056	A	TF	W
41057	P	TF	W
41059	F	TF	B
41061	P	TF	W
41062	P	TF	W
41063	P	TF	W
41064	P	TFD	W
41065	A	TF	W
41066	A	TF	B
41067	P	TFD	W
41068	P	TFD	W
41069	P	TFD	W
41070	P	TFD	W
41071	P	TF	W
41072	P	TFD	W
41075	P	TF	W
41076	P	TFD	W
41077	P	TF	W
41078	P	TF	W
41079	P	TF	W
41081	P	TF	W
41083	P	TF	W
41084	P	TFD	W
41085	F	TF	B
41086	F	TF	B
41087	A	TF	B
41088	A	TF	B
41089	A	TF	W
41090	A	TF	B

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Vehicle No.	Owner	Type	WSP Type: G = Girling B = BR Mk2 W = Westinghouse
41091	A	TF	B
41092	A	TF	B
41093	A	TF	W
41094	A	TF	W
41095	P	TF	W
41096	P	TF	W
41097	A	TF	B
41098	A	TF	B
41099	A	TF	B
41100	A	TF	B
41101	A	TF	W
41102	A	TF	W
41103	A	TF	W
41104	A	TF	W
41105	A	TF	W
41106	A	TF	W
41108	P	TF	W
41109	P	TF	W
41110	A	TF	W
41111	P	TF	W
41112	P	TF	W
41113	P	TFD	W
41114	F	TF	B
41115	P	TF	W
41116	A	TF	W
41117	P	TF	W
41118	A	TF	B
41119	P	TF	W
41120	A	TF	B
41121	A	TF	W
41122	A	TF	W
41123	A	TF	W
41124	A	TF	W
41125	A	TF	W
41126	A	TF	W
41127	A	TF	B
41128	A	TF	B
41129	A	TF	W
41130	A	TF	W
41131	A	TF	W
41132	A	TF	W
41133	A	TF	W
41134	A	TF	W
41135	A	TF	W
41136	A	TF	W
41137	A	TF	W
41138	A	TF	W
41139	A	TF	W
41140	A	TF	W
41141	A	TF	W
41142	A	TF	W
41143	A	TF	W
41144	A	TF	W
41145	A	TF	W

Vehicle No.	Owner	Type	WSP Type: G = Girling B = BR Mk2 W = Westinghouse
41146	A	TF	W
41147	P	TF	W
41148	P	TF	B
41149	P	TF	W
41150	A	TF	B
41151	A	TF	B
41152	A	TF	B
41153	P	TF	W
41154	P	TFD	W
41155	P	TF	W
41156	P	TF	W
41157	A	TF	W
41158	A	TF	W
41159	P	TF	W
41160	F	TF	B
41161	P	TF	W
41162	F	TF	B
41163	F	TF	B
41164	A	TF	B
41165	P	TF	W
41166	F	TF	B
41167	F	TF	B
41168	P	TF	W
41169	P	TF	B
41170	A	TF	B
41176 (42352)	P	TF	W
41179	A	TF	W
41180	A	TF	W
41181	P	TF	W
41182	P	TF	W
41183	P	TF	W
41184	P	TF	W
41185	P	TF	W
41186	P	TF	W
41187	P	TF	W
41189	P	TF	W
41190 (42088)	P	TF	W
41191 (42318)	P	TF	B
41192 (42246)	P	TF	W
41193 (11060)	P	TFD	W
41194 (11016)	P	TFD	W
41195 (11020)	P	TFD	W
42003	A	TS	W
42004	A	TS	W
42005	A	TS	W
42006	A	TS	W
42007	A	TS	W

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Vehicle No.	Owner	Type	WSP Type: G = Girling B = BR Mk2 W = Westinghouse
42008	A	TS	W
42009	A	TS	W
42010	A	TS	W
42012	A	TS	W
42013	A	TS	W
42014	A	TS	W
42015	A	TS	W
42016	A	TS	W
42019	A	TS	W
42021	A	TS	W
42023	A	TS	W
42024	A	TS	G
42025	A	TS	G
42026	A	TS	G
42027	A	TS	W
42028	A	TS	W
42029	A	TS	W
42030	A	TS	W
42031	A	TS	W
42032	A	TS	W
42033	A	TS	W
42034	A	TS	W
42035	A	TS	W
42036	A	TS	G
42037	A	TS	G
42038	A	TS	G
42039	A	TS	G
42040	A	TS	G
42041	A	TS	G
42042	A	TS	W
42043	A	TS	W
42044	A	TS	W
42045	A	TS	W
42046	A	TS	W
42047	A	TS	W
42048	A	TS	W
42049	A	TS	W
42050	A	TS	W
42051	A	TS	G
42052	A	TS	G
42053	A	TS	G
42054	A	TS	W
42055	A	TS	W
42056	A	TS	W
42057	A	TS	G
42058	A	TS	G
42059	A	TS	GØ
42060	A	TS	GØ
42061	A	TS	GØ
42062	A	TS	W
42063	A	TS	G
42064	A	TS	G
42065	A	TS	G
42066	A	TS	W

Vehicle No.	Owner	Type	WSP Type: G = Girling B = BR Mk2 W = Westinghouse
42067	A	TS	W
42068	A	TS	W
42069	A	TS	W
42070	A	TS	W
42071	A	TS	W
42072	A	TS	W
42073	A	TS	W
42074	A	TS	W
42075	A	TS	W
42076	A	TS	W
42077	A	TS	W
42078	A	TS	W
42079	A	TS	GØ
42080	A	TS	GØ
42081	A	TS	W
42083	A	TS	W
42085	P	TS	W
42087	P	TS	W
42089	A	TS	W
42091	A	TS	B
42092	F	TS	B
42093	F	TS	B
42094	F	TS	B
42095	F	TS	B
42096	A	TS	W
42097	A	TS	B
42098	A	TS	B
42099	A	TS	W
42100	P	TS	W
42101	P	TS	W
42102	P	TS	W
42103	F	TS	B
42104	A	TS	B
42105	F	TS	B
42106	A	TS	B
42107	A	TS	W
42108	F	TS	B
42109	P	TS	W
42110	P	TS	W
42111	P	TS	W
42112	P	TS	W
42113	P	TS	W
42115	P	TS	W
42116	A	TS	B
42117	P	TS	W
42118	A	TS	W
42119	P	TS	W
42120	P	TS	W
42121	P	TS	W
42122	A	TS	B
42123	P	TS	W
42124	P	TS	W
42125	P	TS	W
42126	A	TS	W

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Vehicle No.	Owner	Type	WSP Type: G = Girling B = BR Mk2 W = Westinghouse
42127	A	TS	B
42128	A	TS	B
42129	A	TS	W
42130	P	TS	W
42131	P	TS	W
42132	P	TS	W
42133	P	TS	W
42134	A	TS	B
42135	P	TS	W
42136	P	TS	W
42137	P	TS	W
42138	A	TS	W
42139	P	TS	W
42140	P	TS	W
42141	P	TS	W
42143	A	TS	W
42144	A	TS	W
42145	A	TS	W
42146	A	TS	B
42148	P	TS	W
42149	P	TS	W
42150	A	TS	B
42151	P	TS	W
42152	P	TS	W
42153	P	TS	W
42154	A	TS	B
42155	P	TS	W
42156	P	TS	W
42157	P	TS	W
42158	A	TS	B
42159	P	TSD	W
42160	P	TS	W
42161	A	TS	B
42163	P	TS	W
42164	P	TS	W
42165	P	TS	W
42166	P	TS	W
42167	F	TS	B
42168	F	TS	B
42169	F	TS	B
42171	A	TS	B
42172	A	TS	B
42173	P	TSD	W
42174	P	TSD	W
42175	F	TS	B
42176	F	TS	B
42177	F	TS	B
42178	P	TS	W
42179	A	TS	B
42180	A	TS	B
42181	A	TS	B
42182	A	TS	B
42183	A	TS	W
42184	A	TS	W

Vehicle No.	Owner	Type	WSP Type: G = Girling B = BR Mk2 W = Westinghouse
42185	A	TS	W
42186	A	TS	B
42188	A	TS	B
42189	A	TS	B
42190	A	TS	B
42191	A	TS	B
42192	A	TS	B
42193	A	TS	B
42194	P	TS	W
42195	P	TSD	W
42196	A	TS	B
42197	A	TS	B
42198	A	TS	B
42199	A	TS	B
42200	A	TS	W
42201	A	TS	W
42202	A	TS	W
42203	A	TS	W
42204	A	TS	W
42205	P	TS	W
42206	A	TS	W
42207	A	TS	W
42208	A	TS	W
42209	A	TS	W
42210	P	TS	W
42211	A	TS	W
42212	A	TS	W
42213	A	TS	W
42214	A	TS	W
42215	A	TS	B
42216	A	TS	W
42217	P	TSD	W
42218	P	TSD	W
42219	A	TS	B
42220	P	TS	W
42221	A	TS	W
42222	P	TS	W
42224	P	TSD	W
42225	P	TS	W
42226	A	TS	B
42227	P	TS	W
42228	P	TS	W
42229	P	TS	W
42230	P	TS	W
42231	F	TS	B
42232	F	TS	B
42233	F	TS	B
42234	P	TS	W
42235	A	TS	B
42236	A	TS	B
42237	P	TS	W
42238	A	TS	B
42239	A	TS	B
42240	A	TS	B

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Vehicle No.	Owner	Type	WSP Type: G = Girling B = BR Mk2 W = Westinghouse
42241	A	TS	B
42242	A	TS	B
42243	A	TS	B
42244	A	TS	B
42245	A	TS	W
42246	P	TS	W
42247	P	TS	W
42250	A	TS	W
42251	A	TS	W
42252	A	TS	W
42253	A	TS	W
42255	A	TS	W
42256	A	TS	W
42257	A	TS	W
42258	P	TS	W
42259	A	TS	W
42260	A	TS	W
42261	A	TS	W
42263	A	TS	W
42264	A	TS	W
42265	A	TS	W
42266	P	TSD	W
42267	A	TS	W
42268	A	TS	W
42269	A	TS	W
42272	A	TS	W
42273	A	TS	W
42275	A	TS	W
42276	A	TS	W
42277	A	TS	W
42279	A	TS	W
42280	A	TS	W
42281	A	TS	W
42283	A	TS	W
42284	A	TS	W
42285	A	TS	W
42286	P	TSD	W
42287	A	TS	W
42288	A	TS	W
42289	A	TS	W
42290	P	TS	W
42291	A	TS	W
42292	A	TS	W
42293	A	TS	W
42294	P	TS	B
42295	A	TS	W
42296	A	TS	W
42297	A	TS	W
42299	A	TS	W
42300	A	TS	W
42301	A	TS	W
42302	F	TS	B
42303	F	TS	B
42304	F	TS	B

Vehicle No.	Owner	Type	WSP Type: G = Girling B = BR Mk2 W = Westinghouse
42305	F	TS	B
42306	P	TS	W
42307	P	TS	W
42308	P	TS	W
42310 (41188)	P	TSD	W
42315	P	TS	W
42317	P	TSD	W
42319	P	TS	B
42321	P	TS	B
42322	P	TS	W
42323	A	TS	B
42324	P	TS	W
42325	A	TS	W
42326	P	TSD	W
42327	P	TS	W
42328	P	TS	W
42329	P	TS	W
42330	P	TS	W
42331	P	TS	W
42332	A	TS	B
42333	A	TS	W
42335	P	TS	W
42337	P	TS	W
42339	P	TS	W
42340	A	TS	B
42341	P	TS	W
42342	A	TS	B
42344	A	TS	W
42345	A	TS	W
42346	A	TS	W
42347	A	TS	W
42348	A	TS	W
42349	A	TS	W
42350	A	TS	W
42351	A	TS	W
42353	F	TS	B
42354	A	TS	B
42355	A	TS	B
42356	A	TS	W
42357	A	TS	B
42360	A	TS	W
42361	A	TS	W
42362	A	TS	W
42363	A	TS	B
42364 (41080)	P	TSD	W
42365 (41107)	P	TS	W
42366 (12007)	P	TSD	W
42367 (12025)	P	TS	W
42368	P	TS	W

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Vehicle No.	Owner	Type	WSP Type: G = Girling B = BR Mk2 W = Westinghouse
(12028)			
42369 (12050)	P	TS	W
42370 (12086)	P	TS	W
42371 (12052)	P	TSD	W
42370 (12055)	P	TS	W
42373 (12071)	P	TS	W
42374 (12075)	P	TS	W
42375 (12113)	P	TS	W
42376 (12085)	P	TSD	W
42377 (12102)	P	TS	W
42378 (12123)	P	TS	W
42379 (41030)	A	TS	W
42380 (41025)	A	TS	W
42381 (41058)	P	TS	W
42382 (12128)	P	TS	W (TBC)
42383 (12172)	P	TS	W (TBC)
44000	P	TGS	W
44001	A	TGS	W
44002	A	TGS	W
44003	A	TGS	W
44004	A	TGS	W
44005	A	TGS	W
44007	A	TGS	W
44008	A	TGS	W
44009	A	TGS	W
44010	A	TGS	W
44011	A	TGS	W
44012	A	TGS	B
44013	A	TGS	B
44014	A	TGS	W
44015	A	TGS	W
44016	A	TGS	W
44017	A	TGS	B
44018	A	TGS	W
44019	A	TGS	B
44020	A	TGS	B
44021	P	TGS	W
44022	A	TGS	W
44023	A	TGS	W
44024	A	TGS	W

Vehicle No.	Owner	Type	WSP Type: G = Girling B = BR Mk2 W = Westinghouse
44025	A	TGS	W
44026	A	TGS	B
44027	P	TGS	W
44028	A	TGS	W
44029	A	TGS	W
44030	A	TGS	W
44031	A	TGS	B
44032	A	TGS	W
44033	A	TGS	W
44034	A	TGS	W
44035	A	TGS	W
44036	A	TGS	W
44037	A	TGS	W
44038	A	TGS	W
44039	A	TGS	W
44040	A	TGS	W
44041	P	TGS	W
44042	P	TGS	W
44043	A	TGS	W
44044	P	TGS	W
44045	A	TGS	B
44046	P	TGS	W
44047	P	TGS	W
44048	P	TGS	W
44049	A	TGS	W
44050	P	TGS	W
44051	P	TGS	W
44052	P	TGS	W
44054	P	TGS	W
44056	A	TGS	B
44057	P	TGS	B
44058	A	TGS	B
44059	A	TGS	W
44060	P	TGS	W
44061	A	TGS	B
44063	A	TGS	B
44064	A	TGS	W
44065	P	TGS	B
44066	A	TGS	W
44067	A	TGS	W
44068	F	TGS	B
44069	P	TGS	W
44070	P	TGS	W
44071	P	TGS	W
44072	P	TGS	W
44073	P	TGS	W
44074	F	TGS	B
44075	P	TGS	W
44076	F	TGS	B
44077	A	TGS	B
44078	P	TGS	W
44079	P	TGS	W
44080	A	TGS	B
44081	F	TGS	B

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Vehicle No.	Owner	Type	WSP Type: G = Girling B = BR Mk2 W = Westinghouse
44083	P	TGS	W
44085	P	TGS	W
44086	A	TGS	W
44090	P	TGS	W
44091	P	TGS	B
44093	A	TGS	W
44094	A	TGS	B
44097	P	TGS	W
44098	A	TGS	B
44100	F	TGS	B
44101	P	TGS	W
45001 (12004)	P	TCC	W
45002 (12106)	P	TCC	W
45003 (12076)	P	TCC	W
45004 (12071)	P	TCC	W
45005 (12080)	P	TCC	W

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9. REVISION HISTORY

There are no black lines used in this document as CR/CI0510 Issue 1 has been developed from two documents:

- PB/CI0510 Issue 6
- AT/CI0471 Issue 4A

Revision history information is provided below.

9.1 Revision History for PB/CI0510 Issue 6A

This revision letter details the changes made in re-issuing PB/CI0510 from Issue 6 to CR/CI0510 Issue 1 and was last updated on 27 August 2009.

Contents of the previous issue have been deleted, moved and/or modified as detailed in the table below:

Section	Page	Change	Change Category	Reason for Change
All		Re-formatted whole document in accordance with new requirements.	M	Compliance with CR/DT0001.
Front Sheet	1	Changed to Issue 1 and consequential changes.	-	-
1	1	Section 8 added.	-	-
2		General Section amended.	-	CR/CI0510 replaces AT/CI0471 and PB/CI0510.
	1	Para 2.2.2i(c) amended list of vehicles moved to Section 8.	-	More fleets have vehicles fitted with Westinghouse WSP.
	2	Sub Section 2.2.3 added re UGMS fitted bogies.	A	To align with AT/CI0471
	3	Definition of The Engineer improved.	G	Organisations other than leasing companies may use the document.
	4	Reference to MT/234 deleted.	L	-
	5-7	Section 2.5 Supplier's Responsibilities revised.	-	To comply with CR/DT0001.
	6	Competence requirements updated.	-	Changes arising from ROGS legislation.
	7	New paragraph added advising weights of bogie.	-	-
3.1	4	Steps 3.2.1 and 3.2.2 describe alternative methods of securing speed probe.	A	Two methods exist.
	5	Figure 4 amended.	A	Two methods exist.

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Section	Page	Change	Change Category	Reason for Change
3.1		Step 3.3.3(c) amended to discard battery.	A	New batteries to be fitted to improve reliability.
	7	Step 4 added giving details for removing Westinghouse dump valves.	F	To align with AT/CI0471.
	8	Sentence re nylon fittings added to step 5.6.	A	To ensure assemblies are kept together.
3.2	1 & 2	Contents list updated.	-	To show new jobs and amended numbers of pages.
AF 0102	1	Westinghouse Part No. added to Note 2.	-	To align with AT/CI0471.
		Job No. corrected.	L	
AP 5901	1	2 Cat Nos. added.	-	Additional information.
AV 0061	1-5	Detailed procedure for overhauling valves added.	E	Now aligns with AT/CI0471. Previously Job AV 3316 called up OEM document.
AV 3321	1-2	Detailed procedure for overhauling valves added.	E	Now aligns with AT/CI0471. Previously Job AV 0132 called up OEM document.
AV 0132	-	Job deleted.	E	Replaced by AV 3321.
AV 3316	-	Job deleted.	E	Replaced by AV 0061.
BB 0112	1	Arising 4 amended & Becorit 922-IU added.	A	To align with AT/CI0471.
BL 0007	2	Item 12 shown correctly in Figure 1.	L	Correction of error.
BL 0113	3	Tectyl 506 now used in place of Texaco product in Step A2.		
	4	Step A5 added to check that bore of bush is still within limits after pressing in.	A	
BL 0116	1	Step 4 amended to mention both tension pins.	L	Correction of error.
BL 3707	1	And fit "long" clutches added to Step 2.	A	There is an option but long type clutches give better results.
EY 0123	1	Step 2 rewritten to examine Westinghouse dump valve harness & plugs. (Original Step 2 deleted as conduits etc removed in Section 3.1).	A	Address concerns re poor condition.
		Steps 5 & 6 added to check condition of cables & terminations.	A	Address concerns re condition of cables and terminals.

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Section	Page	Change	Change Category	Reason for Change
EY 0123		New drawing added to table in Arising Work Step 1.	A	Conversions done 2008 onwards are to 'CR' drawings.
	1	Note re Ø16mm conduit being obsolete added.	K	
	2	Tables of drawings amended	A	Conversions done 2008 onwards are to 'CR' drawings.
	3	Figure 1 amended.	A	Conversions done 2008 onwards are to 'CR' drawings.
	4	Figure 2 amended and Materials List provided showing items for both versions.	A	Conversions done 2008 onwards are to 'CR' drawings, which have M25 conduit rather than M20.
		Part B Step 6 now refers to 36.1 in Section 3.3.	-	
EY 0133	1	CR/CI0569 called up in place of WOSS 318/1 & 2.	B	New reference document.
EY 0141	1	Note added re sequence of work.	-	
	2-3	Step 4 expanded to include better testing of circuits.	A	Address concerns arising from service problems.
EY0143	1	Job revised as original design to be scrapped. Step 4 deleted, Steps 4.1 to 4.5 now 4 to 8, and 5 now 9.	A	Those to original designs to be scrapped.
	1 & 2	Figure 2 amended to include features for some Westinghouse assemblies. Steps 4.1 and 4.2 amended. Previous Step 6 deleted.	L	Requirement covered in UA 0146.
EY 0163	1 & 2	Probe tests added as steps 4 to 7. Old Step 4 now 8. Cat Nos. added to table.	-	-
EY 0566	3	Note 1 added re variations in choke plate (27). Existing Note 1 now 2.	A	Those on FGW vehicles are different, but interchangeable.
	4	Note 3 added re grease.	A	Use of correct grease is vital, but not always easily available.
	5-8	Step 5 replaced by complete Test Specification.	E	Westinghouse Test Spec 1-850-27 not readily available.
EY 3717	1	Step 2 added to renew and charge battery.	A	Old batteries potentially unreliable.

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Section	Page	Change	Change Category	Reason for Change
EY 3717		Step 3 added to apply serial numbers to key components.	A	To permit traceability.
UA 0146	1-2	Acceptance Criteria put in Scheduled Work and arising work amended accordingly.	F	To align with AT/CI0471.
		Step 4 amended to cover all types of front covers.	A	WSP types moved from EY 0143.
UA 6906	6 & 7	Loctite 2701 specified at Step E1.3.2.	A	2701 tolerates oil contamination better than 270.
UD5789	1	Job number corrected.	L	Was UD5879.
	1	Steps 1 to 4 resequenced. Step 5 amended & Steps 6 & 7 added.	A	To accommodate improved design of anti-roll bar.
	1-2	'Corrosion' added to Scheduled Work Step 1 and Figure 1 added. Arising Work Step 1 amended to cover corrosion and treatment of corrosion pits, referring to Figure 2.	A	Incorporation of changes to address corrosion. Interfleet Task T24167.
UD 6933	1	Note added re alternative primary dampers & Step 1 altered to suit.	A	Alternative primary dampers available.
UD 6940	1-6	Original design covered by Part 1, Part 2 (examination) and Part 3 (overhaul) prepared to cover improved design.	A	New design of anti-roll bar to be introduced by agreement with the Engineer.
		Changes to Part 1 include: Use of Loctite 2701 at Step 1.13(a) and more details in Step 1.4.	A	2701 tolerates oil contamination better than 270.
		Painting out white stripe added in Note 3 (was Note 2).	C	Clarification of requirement.
		Note: Originally it was thought that the improved torsion bar had infinite life, but review of stress levels has led to decision to renew tension bar at every second overhaul.		

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Section	Page	Change	Change Category	Reason for Change
UFA0218	1 – 8	New job which replaces content of drawing PB-CI-2102973 which was referred to in Job UF 5010.	A	The requirements of PB/CI-210973 were refined in AT/TP1285 and again in Issue 4 of AT/CI0471, which is the source of this job.
		This job is identical to the one in AT/CI0471 except Note 2 added to examine bogie frame when brackets and bearer plates removed and prevailing torque units specified rather than Nyloc.	A	
UF 5010	1-17	Job revised as follows: Part A is new Part B was A Part C is new Part D was B Part E was C and extended to cover Bearer plates Part F was E Part G was D Part H was F.	A	To align with AT/CI0471.
	1-2	Part A now determines whether brackets require realigning.	A	Bogies with brackets previously realigned now receiving overhauls.
	2	Note after A1.2 (now B1.1) re PB-C1-2102973 removed. A1.2 now A3.	A	Realignment now covered by UFA 0218.
	4	New section B3 added to check loss of thickness when pivot brackets and bearer plates removed.	A	Based on AEA Report ATT/95/ ET 141 000 Dated 31/03/04.
	4-6	Part C added to check position of LCR brackets in 2 planes with suitable arising work.	A	To ensure LCR spigot brackets have not been bent (NIR 2097 refers).
	8	Arising D2.1 refers to job UFA5562.	A	To align with AT/CI0471.
		Steps E1 and E2 added to examine brackets and bearer plates (whether fitted or removed).	A	
	9	Step C6 and Note referring to PB-C1-2102973 deleted.	A	Realignment now covered by Job UFA 0218.

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Section	Page	Change	Change Category	Reason for Change
UF 5010	10	Note 8 amended to include Job UFA 0218.	A	Realignment now covered by Job UFA 0218.
		Limit at Step F3 changed from 52 to 47mm	A	Unipart advise that 47mm allows 2 threads protrusion.
	11	Figure 10 amended.	-	To call up revised section numbers and job UFA0218.
	11 & 15	Step G3.2 (was D3.2) revised acceptance criteria and arising work.	A	Incorporation of improvements made in Interfleet Task T20540.
	12	Clause re Procedure added to Step G5.	A	Correct alignment of brackets vital.
	13	Figure 12 amended to improve clarity.	M	
	13	Additional requirement added to Step G6.	A	Ends of bolts now found to be corroding.
	14	Table 1 amended.	A	Angel drawing nos. added.
	16	Two steps of Arising Work for Step G5 added.	A	To overcome difficulty arising from original installation.
		G6 amended to call up G5 and Figure 12, not B-S-780.	A	To overcome difficulty arising from original installation.
	17	Items 1, 3, 6B, 7A, 8, 9 and 10 in table 2 corrected and Notes 1, 2 and 3 added. Grade 8.8 added to column heading.	L	Item 6B changed as AT/MP0719 and PB/MP0702 re-issued.
UFA5562	1 & 2	New job based on UFA0128 in AT/CI0471 and renumbered, however original Step 4 has been deleted.	-	Renumbered to avoid confusion with job UFA0218.
				Check now done in job UF 5010 Part C, which is referred to in Step 12 (was 13).
UM 0112	1	Painting to be done to CR/PE0102 at Step 6.	B	
UM 6008	1 - 3	Rewritten to include: Improved locating dowels (Step 7).	A	Incorporation of improvements made in Interfleet Task T18032.
		Additional checks on flatness (Steps 4 and 6).	A	
		Fitting of new seal and 8mm bearer pad (Steps 10 & 11).	A	
		Step 11 amended to give details of alternative pads.	A	

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Section	Page	Change	Change Category	Reason for Change
UM 6008		Lubricant updated at Step 12.	K	
		Sketch of dowels with M16 threads added to Figure 4.	A	
		Arising Work amended to give details of carriers and dowels.	A	
UM 6919	1 & 2	(Steps 2 to 4) Improved corrosion assessment.	A	To align with AT/CI0471.
	2	Step 5 unchanged was 3.		
	3	Step 6 unchanged was 4. Steps 7 & 8 still 7 & 8.	-	
		Step 9 enhanced, still 9.	A	
	4	Step 10 unchanged still 10. Step 11 unchanged, was 5. Step 12 unchanged, was 6. Step 13 unchanged, was 11. Step 14 was 12 and painting to be done to CR/PE0102.	B	To align with AT/CI0471.
	5	Step 15 table added with bracket fixing detail.	A	Was in Arising Work
		Arising Work simplified for Step 12.	L	
US 0115	2	Arising Work 5.2 calls up Procedure R.	A	Repair procedure produced under Interfleet task T22641.
		Painting to be done to CR/PE0102 at Step 7.	B	
	2, 3 & 4	New procedure R for repair added.	A	
US 0117	1	Painting to be done to CR/PE0102 at Step 5.	B	
US 0125	1 – 3	Check on length of adjusting screw added by Step 3.6. Fig 1 also amended.	A	Longer screw required as a result of swing link packer mod done 15 years ago.
US 0129	1	'PB' drawing no corrected in Step 1.	L	Correction of error.
		3 Pt Nos. updated in Figure 1.	M	
US 0143	1	New Steps 6 & 7 to gauge critical dimensions. Steps 6 to 8 now 8 to 11 (old 8 split) at fitting.	A	To avoid misalignment of wheelsets.
		Painting to be done to CR/PE0102 at Step 10.	B	

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Section	Page	Change	Change Category	Reason for Change
US 6909	3	Table 2 updated. Following vehicle types added: TSOB, TSOD, TFD, TCC & TSB. Bogies coded 03 and 04 now code 02 (all were same height) and Note 3 amended to this effect.	A	New vehicle types.
		Height for code 12 corrected.	L	Correction of error.
	4	Figure 1 and Table 3 added to cover TSOB springs.	A	New vehicle type.
UU 0126	1	Job title amended and number corrected. Step 3 added to examine nylon bushes on short swing link bogies. Arising Work improved, with new Cat Nos.	A	Results of investigation into safety ropes.
UW 0002	1	MT300 replaced by GM/GN2498.	J	
		'or repair' added to Step 2A		
		Existing Note 2 deleted and 3 and 4 rewritten as Scheduled Work steps 4 and 5.	C	
		PB/CI0538 now CR/CI0538.	J	
		New Note 2 added to cover use of long axles.	A	
		New Step 3 added to gauge axle body diameter.	A	
		Steps 3.1 and 3.2 added to define actions with skimmed axles.	A	
		Step 6 added to remove labels.	A	
		Notes 3 and 4 were 4a and 4b.		
3.3 Re-Assembly	3	Step 1.2 added to give details of elbow, nut and olive. Figure 1.1 amended to show connection to variable load valve on No. 2 end bogie only.	C	
	4	Step 1.6 added.	A	To explain location of steps for the 2 types of Anti-roll bar.
		1.7 (was 1.5) now covers original design of anti-roll	A	To enable improved design to be covered.

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Section	Page	Change	Change Category	Reason for Change
		bar.		
3.3	5	1.8 (was 1.6) now covers original design of anti-roll bar links.	A	To enable improved design to be covered.
	5 – 7	1.9 added to cover improved design of anti-roll bar and links.	A	To cover improved design
	7	Existing 3 broken up into 3 Steps, 3.2 – 3.4 and new Step 3.1 added re paint contamination.	A	Comment from recent audit.
	7 & 8	New Cat Nos. added to steps 5.1.1 & 5.2.	A	New drawing produced to clarify existing situations, hence new Cat Nos.
	8	Step 5.1.2 deleted. 5.2 words “complete with two bushes” added.	F	Bush deleted from drawings and PB/MP0702 and AT/MP0719.
	8	Table of details updated.	M	
		Step 7.1 added.	A	To ensure screw is 100mm long.
	11	Tectyl 506 used in place of Texaco product at Step 9.8.	K	
	12	Detail of bolt amended in Note 9B.	M	To align with AT/CI0471.
		Tectyl 506 used in place of Texaco product at Step 10.4.	K	
	13	Figure 11.1 corrected to show plastic washers items 38 and 39 and washer 12 correctly placed.	L	Correction of error.
	14	Step 11.4 amended to ensure actuator pin is assembled first with pin head at top. Actuator pin cannot be fitted once calliper assembly has been fitted.	A	Improved security of actuator pin.
	14	Step 12.2 amended to allow dump valve type to be specified by the Engineer	A	Different types of dump valve.
	15	Ref to job EY 0566 re grease added at Step 12.2.3.	A	Need to ensure correct grade of grease used.
		Sentence re minimum wheel sizes added to step 13.	A	Contractual requirement.
	16	Notes 14A & 14B added.	A	To prevent bearings seizing in axlebox and reducing risk of water ingress.
	17	New Step 15.1 added to	A	To avoid misalignment of

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Section	Page	Change	Change Category	Reason for Change
3.3		gauge length of LCR.		wheelset at Step 16.5.
		Note 15A now WARNING.	C	To comply with CR/DT0001.
	22	Blue Hylomar to be used on gasket in Step 20.2.	A	Better seal to prevent water ingress to axle bearing.
	25	Arrow in Fig 22.1 redrawn	L	
	27	New vehicle types added to Table 3.	A	New vehicle types.
	28	Tolerance on Table 4 now 5 (was 8).	A	To align with Vehicle Overhaul Instructions.
	29	Note 25D added regarding TSOB vehicles.	A	TSOB vehicles are out of balance.
	32	Nitrile Rubber to be used in place of Inseal in Step 29.1.1.	K	Inseal no longer regarded as satisfactory.
		New step 29.1.2 to ensure tape is wide enough.	A	Avoid corrosion traps.
	33	Further check added to 29.1.3.	A	Avoid corrosion traps.
		Tectyl 506 used in place of Texaco product at Step 29.1.6.	K	
	34	In step 29.2.1 Rubatec replaced by Nitrile Rubber.	K	Rubatec no longer available.
		Step 29.2.4 added to match 29.1.3.	A	To avoid corrosion traps.
		Figure 29.3. Three part numbers updated and Nitrile Rubber shown in place of Inseal.	K	
	35	Sequence of fitting alternator improved – Step 32.4 now 32.1, and Steps 32.1 to 3 now 32.2 to 4. Ref to clause 4.3 added.	A	To give better access when fitting alternator.
	35–37	Blue Hylomar used on joints described in Steps 32.2, 5 & 14 and asbestos free gaskets called up.	K	Better seal to prevent water ingress.
	35-37	Bolt and screw details added to Step 32 and Figure 32.1.		
	36	Note 32A added re alternator resistance measurement.	A	To overcome problem with alternator resistance measurement in low temperatures.

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Section	Page	Change	Change Category	Reason for Change
3.3	37–42	In Issue 6, Section 33 fitted BR WSP complete and 34 Westinghouse WSP complete. In AT/CI0471 and CR/CI0510 Issue 1 Section 33 fits the distance piece, applicable to both systems, 34 covers BR probe etc and 35 covers Westinghouse probe etc.	F	
	40 & 42	Blue Hylomar to be used on gaskets at Steps 34.4 and 35.7 (was 35.1).	K	Improved sealing on WSP fitted axleboxes.
	42	Step 36.1 rewritten to refer to new Figure 36.1.	L	Complete coach not available at bogie overhaulers.
	44	Step 39 added to fit lids to WSP junction boxes.	L	Correction of error.
	45	Step 43 (was 41) amended.	A	Most components painted before assembly.
		Step 45 (was 43) Railcare instead of Alstom for codes ZH & ZN.	L	Correction of error.
		PBU code added to Step 45.		New overhauler since last issue.
4	2	New Sub-section 4.3 added re tab washers and existing 4.3 to 4.5 now 4.4 to 4.6.	L	Correction of omission.
4.6	2	Note re Golden Hermatite replaced by one re Blue Hylomar.	K	Golden Hermatite difficult to remove.
5	2	Item 15 Blue Hylomar added instead of Golden Hermatite (was step 16).	K	Golden Hermatite difficult to remove.
5.3	2	Item 15 in 5.3 deleted.	-	Rubatec no longer available.
5.5	2	Item 2 Texaco Rustproof compound deleted.	K	No longer available.
		Blue Hylomar was Item 15 now 2	-	Avoidance of gap in table.
	3	Loctite 2701 in place of 270.	-	2701 tolerates contamination better.
		Sub-section 5.5 Item 3, '506' added to Tectyl liquid wax & additional location of use added.	K	See above re Texaco compound.

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Section	Page	Change	Change Category	Reason for Change
6.1	2	Gresham Cravens instructions deleted.	E	Content now included in jobs AV 0061 and AV 3321.
		TL/NP0117 added.	B	Required in Job UFA5562.
		CR/CI0538 was PB/CI0538.	J	
		CR/CI0569 added.	J	Required in Job EY0133.
		WOSS 318/1 and 318/2 deleted.	J	Replaced by CR/CI0569.
		MT300 replaced by GM/GN2498.	J	
		WOSS 612/7 deleted.	J	No longer called up.
	3	LD47020-ST 00 Issue B added.	-	Called up in Sub-section 2.2.3
		Eng/Pro/338 deleted.	-	Not available.
		TL/WP0052 deleted.	-	Replaced by PB/TP1220.
6.2	4	B-S-692 deleted.	L	No longer called up.
		C-A3-3942 now B1-A2-9014072.	L	Drawing renumbered.
	6	First entry ATC-C1-2200669 deleted.	L	Duplicate entry.
	7	PB-C1-2100991 deleted.	L	No longer called up.
6.4	5	Drgs PB-C0-2101514 & 5 added.	-	
	7	'CR' drawings added.	-	Required for new conversions to Westinghouse WSP.
6.5	8	Improved Anti-roll bar drawings added.	-	Required for modification and subsequent repairs.
8	1 – 9	New list of vehicles showing type of WSP fitted.		

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9.2 Revision History for AT/CI0471 Issue 4A

This revision letter details the changes made in re-issuing AT/CI0471 from Issue 4A to CR/CI0510 Issue 1, and was last updated on 27 August 2009.

Contents of the previous issue have been deleted, moved and/or modified as detailed in the table below:

Section	Page	Change	Change Category	Reason for Change
All		Re-formatted whole document in accordance with new requirements.	M	Compliance with CR/DT0001.
1	1 & 2	Raised to Revision 1 and consequential changes.	-	-
	2	Section 8 added.	-	-
2	2	UGMS overhaul document raised to Issue B.	J	
	2.1	General Introduction has been added.		Background to document.
	2.5	Supplier's responsibilities amended.		Section updated.
	3	Definition of The Engineer improved.	G	Organisations other than leasing companies may use the document.
	5-7	Section 3.5 Supplier's Responsibilities added.	-	To comply with CR/DT0001.
	7	New paragraph added advising weights of bogie.	-	-
3.1	5	Step 3.3.3(c) amended to discard battery.	A	New batteries fitted to improve reliability.
	8	Sentence re nylon fittings added to step 5.6.	A	To ensure assemblies are kept together.
3.2	1 & 2	Contents list updated.	-	To show new jobs and amended numbers of pages.
AP 5901	1	2 Cat. Nos added.	-	Additional Information.
AR 0110	1	Overhaul period for air reservoirs reduced from 12 years to 10 years.		To cater for Mk3 Sleepers and periodicity extension.
BL 0113	3	Tectyl 506 now used in place of Texaco product at Step A2.	K	
		Reference to AT/WP0478 deleted.		Allow Supplier to develop own procedure.
BL 0116	1	Step 4 amended to mention both tension pins.	L	Correction of error.
BL 3707	1	And fit "long" clutches added to Step 2.	A	There is an option but long type clutches give better results.

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Section	Page	Change	Change Category	Reason for Change
EY 0123	1	Step 2 rewritten to examine Westinghouse dump valve harness & plugs. (Original Step 2 deleted as conduits etc removed in Section 3.1).	A	Address concerns re poor condition.
		Steps 5 & 6 added to check condition of cables & terminations.	A	Address concerns re condition of cables and terminals.
		New drawing added to table in Arising Work step 1.	A	Conversions done 2008 onwards are to 'CR' drawings.
		Note re Ø16mm conduit being obsolete added.	K	
	2	Tables of drawings amended	A	Conversions done 2008 onwards are to 'CR' drawings.
	3	Figure 1 amended.	A	Conversions done 2008 onwards are to 'CR' drawings.
	4	Figure 2 amended & Materials List provided showing items for both versions.	A	Conversions done 2008 onwards are to 'CR' drawings, which have M25 conduit rather than M20.
		Step 6 now refers to 36.1 in Section 3.3.	-	
EY 0141	1	Note added re sequence of work.	-	
	2-3	Step 4 expanded to include better testing of circuits.	A	Address concerns arising from service problems.
EY 0143	2	Figure 2 amended to include features for some Westinghouse assemblies. Step 4 deleted, steps 4.1 and 4.2 amended and now Steps 4 & 5, 4.3 to 4.5 (unchanged) now Steps 6 to 8. Previous 5 now 9.	A L	Some Westinghouse probes held by bolts and others by nuts and studs.
		Previous Step 6 deleted.	-	Requirement covered in UA 0146.
EY 0163	1 & 2	Probe tests added as steps 4 to 7. Old Step 4 now 8. Cat Nos. added to table.	-	-

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Section	Page	Change	Change Category	Reason for Change
EY 0566	3	Note 1 added re variations in choke plate (27). Exsisting Note 1 now 2.	A	Those on FGW vehicles are different but interchangeable.
	5-7	Step 5 replaced by complete Test Specification.	E	Westinghouse Test Spec 1-850-27 not readily available.
EY 3717	1	Step 2 added to renew and charge battery.	A	Old batteries potentially unreliable.
	1	Step 3 added to apply serial numbers to key components.	A	To permit traceability.
UA 0146	1	Step 4 amended to cover all types of front covers.	A	WSP types moved from Job EY 0143.
UD 5789	1	Steps 1 to 4 re-sequenced. Step 5 amended and Steps 6 and 7 added.	A	To accommodate improved design of anti-roll bar.
	1-2	'Corrosion' added to Scheduled Work Step 1 and Figure 1 added. Arising Work Step 1 amended to cover corrosion and treatment of corrosion pits, referring to Figure 2.	A	Incorporation of changes to address corrosion. Interfleet Task T24167.
UD 6933	1	Pegasus Damper added.		Details of new damper type included.
UD 6940	1-6	Original design covered by Part 1, Part 2 (examination) and Part 3 (overhaul) prepared to cover improved design.	A	New design of anti-roll bar to be introduced by agreement with the Engineer.
		Changes to Part 1 include: More details in Step 1.4.	A	2701 tolerates contamination better than 270.
		Painting out white stripe added in Note 3 (was Note 2).	C	Clarification of requirement.
		Note: Originally it was thought that the torsion bar had infinite life, but review of stress levels has led to decision to renew tension bar at every second overhaul.		
UFA0128	1&2	Deleted. See Job UFA5562.	-	-
UFA0218	2	Note 2 added to examine bogie frame when brackets and bearer plates removed.	A	
	7	Prevailing torque units specified rather than Nyloc.	A	

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Section	Page	Change	Change Category	Reason for Change
UF 5010	4	New section B3 added to check loss of thickness when pivot brackets and bearer plates removed.	A	Based on AEA Report ATT/95/ ET 141 000 Dated 31/03/04.
	5	Step C1 amended to check spigot parallel and limits for angle of bracket changed from +/-1 to +/-5°.		
	6	Note 6 added to Part C		Clarification of angle of LCR spigot.
	8	Arising D2.1 refers to job UFA5562.	A	UFA job renumbered
	10	Limit at Step F3 changed from 52 to 47mm.	A	Unipart advise that 47mm allows 2 threads protrusion.
	13	Figure 12 amended to improve clarity.	M	
		Additional requirement added to Step G6.	A	Ends of bolts now found to be corroding.
	14	Table 1 amended.	A	Porterbrook drawing nos. added.
	17	Items 7A, 8, 9 and 10 in Table 2 corrected and Notes 1, 2 and 3 added. Grade 8.8 added to column heading.	L	Item 6B changed as AT/MP0719 re-issued.
UFA5562	1 & 2	Job UFA0128 renumbered Step 4 deleted. Check now done in job UF 5010 Part C, which is referred to in Step 12 (was 13).	-	To avoid confusion with job UFA0218.
UM 0112	1	Painting to be done to CR/PE0102 at Step 6.	B	
UM 6008		Step 4 and Arising Work 4 amended to allow for straightening of side bearer units	A	To allow for repair rather than renew.
UM 6919	5	Arising Work added for Step 1. In Step 14 painting to be done to CR/PE0102.	B	
US 0115	2	Arising Work 5.2 calls up Procedure R.	A	Repair procedure produced under Interfleet task T22641.
		Painting to be done to CR/PE0102 at Step 7.	B	
	3 & 4	New procedure R for repair added.	A	
US 0117	1	Painting to be done to CR/PE0102 at Step 5.	B	

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Section	Page	Change	Change Category	Reason for Change
US 0125	1 – 3	Check on length of adjusting screw added in Step 3.6. Fig 1 also amended.	A	Longer screw required as a result of swing link packer mod done 15 years ago.
US 0129	1	'PB' drawing no corrected in Step 1.	L	Correction of error.
		3 Pt Nos updated in Figure 1.	M	
US 0143	1	New Steps 6 and 7 added to gauge critical dimensions. Steps 6 to 8 now 8 to 11 (old 8 split)	A	To avoid misalignment of wheelsets.
		Painting to be done to CR/PE0102 at Step 10.	B	
US 6909	2	Note 2 deleted.		Red springs no longer required.
	3	Table 2 updated. Following vehicle types added: TSOB, TSOD, TFD & TCC. Bogies coded 03 and 04 now code 02 (all were same height) and Note 3 amended to this effect.	A	New vehicle types.
	3	Height for code 12 corrected.	L	Correction of error.
	4	Figure 1 and Table 3 added to cover TSOB springs.	A	New vehicle type.
UU 0126	1	Job title amended. Step 3 added to examine nylon bushes on short swing link bogies. Arising work improved.	A	Results of investigation into safety.
UW 0002	1	MT300 replaced by GM/GN2498.	J	
		'or repair' added to Step 2.	A	
		Existing Note 2 deleted and 3 & 4 rewritten as Scheduled Work Steps 4 & 5.	C	
		PB/CI0538 now CR/CI0538	J	
		New Note 2 added to cover use of long axles.	A	
		New Step 3 added to gauge axle body diameter.	A	

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Section	Page	Change	Change Category	Reason for Change
UW 0002		Steps 3.1 and 3.2 added to define actions with skimmed axles.	A	
3.3		Notes 3 and 4 were 4a and 4d.	-	
		Step 6 was Note 5.	-	
	3	Figure 1.1 amended to show connection to variable load valve on No.2 end bogie only.		
	4	Step 1.6 added.	A	To explain location of steps for the 2 types of anti-roll bar.
		1.7 (was 1.5) now covers original design of anti-roll bar.	A	To enable improved design to be covered.
	5	1.8 (was 1.6) now covers original design of anti-roll bar links.	A	To enable improved design to be covered.
	5 -7	1.9 added to cover improved design of anti-roll bar and links.	A	To cover improved design.
	7	Existing 3 broken up into 3 Steps, 3.2 – 3.4 and new Step 3.1 added re paint contamination.	A	Comment from recent audit.
	7 & 8	New Cat Nos. added at steps 5.1.1 & 5.2.	A	New drawing produced to clarify existing situations, hence new Cat Nos.
	8	Step 5.1.2 deleted. 5.2 words “complete with two bushes” added.	F	Bush deleted from drawings and PB/MP0702 and AT/MP0719.
	8 & 9	Step 7.1 added and Fig. 7.1 amended.	A	To ensure screw is 100mm long.
	11	Tectyl 506 used in place of Texaco product at Step 9.8.	K	
	12	Tectyl 506 used in place of Texaco product at Step 10.4.	K	
	13	Figure 11.1 corrected to show plastic washers items 38 and 39 and washer 12 correctly placed.	L	Correction of error.
		Notes 14A & 14B added.	A	To prevent bearings seizing in axlebox and reducing risk of water ingress.

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Section	Page	Change	Change Category	Reason for Change
3.3	14	Step 11.4 amended to ensure actuator pin is assembled first with pin head at top. Actuator pin cannot be fitted once calliper assembly has been fitted.	A	Improved security of actuator pin.
	14	Step 12.2 amended to allow dump valve type to be specified by the Engineer	A	Different types of dump valve.
	17	New Step 15.1 added to gauge length of LCR.	A	To avoid misalignment of wheelset at Step 16.5.
		Note 15A now WARNING.	C	To comply with CR/DT0001.
	22	Blue Hylomar to be used on gasket in Step 20.2.	A	Better seal to prevent water ingress to axle bearing.
	25	Arrow in Fig 22.1 redrawn.	L	
	27	New vehicle types added to Table 3.	A	New vehicle types.
	28	Tolerance on Table 4 now 5 (was 8).	A	To align with Vehicle Overhaul Instructions.
	29	Note 25D added regarding TSOB vehicles.	A	TSOB vehicles are out of balance.
	32	Nitrile Rubber to be used in place of Inseal in Step 29.1.1.	K	Inseal no longer regarded as satisfactory.
		New Step 29.1.2 to ensure tape is wide enough.	A	Avoid corrosion traps.
	33	Further check added to 29.1.3.	A	Avoid corrosion traps.
		Tectyl 506 used in place of Texaco product at Step 29.1.6.	K	
	34	In step 29.2.1 Rubatec replaced by inseal (as used in Step 29.1).	K	Rubatec no longer available.
		Step 29.2.4 added to match 29.1.3.	A	To avoid corrosion traps.
		Figure 29.3 three part numbers updated and Nitrile Rubber shown in place of Inseal.	K	
	35	Sequence of fitting alternator improved. Step 32.4 now 32.1 and Steps 32.1 to 3 now 32.2 to 4. Ref Clauses 4.3 added.	A	To give better access when fitting alternator.

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Section	Page	Change	Change Category	Reason for Change
3.3	35 – 37	Blue Hylomar used on joints described in steps 32.2, 5 & 14 and asbestos free gaskets called up.	K	Better seal to prevent water ingress.
	35-37	Bolt and screw details added to Step 32 and Figure 32.1.		
	36	Note 32A added re alternator resistance measurement.	A	To overcome problem with alternator resistance measurement in low temperatures.
	40 & 42	Blue Hylomar to be used on gasket at Steps 34.4 and 35.7.	K	Improved sealing on WSP fitted axleboxes.
	41	Step 34.8 amended to include conversions from 2008 onwards.		
	42	Step 36.1 rewritten to refer to new Figure 36.1.	L	Complete coach not available at bogie overhaulers.
	45	Step 43 amended.	A	Most components painted before assembly.
		Step 45 'Railcare' instead of Alstom for codes ZH & ZN.		
		PBU code added to step 45.		New overhauler since last issue.
4 (was 8)	2	New Sub-section 4.3 added re tab washers and existing 8.3 to 8.5 now 4.4 to 4.6.	L	Correction of omission.
		Sentence re Blue Hylomar added.	A	
5.3 (was 9.3)	2	Item 15 deleted.	K	Rubatec no longer available.
		Item 2 (Texaco Rustproof) deleted.	K	No longer available.
		Blue Hylomar added as item 2.	K	Required at Sub-section 4.6.
5.5 (was 9.5)	3	Item 3, '506' added to Tectyl liquid wax. Four additional locations of use added.	K	See above re Texaco compound.
6.1 (was 10.1)	2	WOSS 612/7 deleted.	J	See Job UW 0002.
	3	MT300 replaced by GM/GN2498.	J	
		TL/WP0052 deleted.	-	Replaced by PB/TP1220.

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Section	Page	Change	Change Category	Reason for Change
6.1 (was 10.1)		LD47020-ST-004 Isse B.	-	Document raised to Issue B.
6.2 (was 10.2)	3	B-S-692 deleted.	L	No longer called up.
	4	C-A3-3942 now B1-A2-9014072.	L	Drawing renumbered.
	6	First entry ATC-C1-2200669 deleted.	L	Duplicate entry.
		PB-C1-2100991 deleted.	L	No longer called up.
6.4 (was 10.4)	5	Drgs PB-C0-2101514 & 5 added.	-	
	7	'CR' drawings added.	-	Required for new conversions to Westinghouse WSP.
6.5 (was 10.5)	8	Improved anti-roll bar drawings added.	-	Required for modification and subsequent repairs.
8	1 – 9	New list of vehicles showing type of WSP fitted.		

The coding system used in the 'Change Category' column provides at-a-glance information on the type of change as defined thus:

Change Category	Definition
A	New Requirement – Additional technical requirement following investigation.
B	Document Reference - Additional document reference called up in text.
C	Clarification - There has been no change in the technical requirements, but the text has been redrafted to improve understanding.
D	Group Standard and Technical Standard for Interoperability Compliance - Change incorporated to comply with standards.
E	Subsidiary Document Requirements - The technical details were previously identified in subsidiary documents and included in this document following review.
F	Clearer Drafting - There has been no change to the technical requirements, but the location of the text has been changed to improve understanding.
G	New Commercial Requirement - Additional commercial requirements as a result of change in industry structure.
H	New Reference - New reference document has been included in the table as it is now covered in the text.
I	British Standard Compliance - Change incorporated to comply with standards.
J	Changed Reference - Reference document including any Group Standard has changed its identification.
K	New Material - A new material is now called up.
L	Correction - Previous document contained an error.
M	Format Change - Layout of document has altered but there has been no change to the technical content.
N	No Longer Required - The previous requirement is no longer valid.