OWNERS MANUAL







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Congratulations

hank you for choosing Old Man Emu's BP-51 shock absorbers for your vehicle. BP-51 (or Bypass 51mm diameter bore) shock absorbers feature revolutionary, patent pending technology developed to deliver unparalleled off road performance for your 4x4.

Developed and extensively tested under the harshest conditions in Australia, these big bore, position sensitive bypass shock absorbers are designed to bolt onto your vehicle and provide considerable ride comfort around town and significant amounts of end-zone damping for exceptional chassis control and handling off road.

The damping performance is easily adjustable, and the wide adjustment range will result in significant changes in the performance of your vehicle. Due to this wide adjustment range, it is important you understand the operation of your shock absorbers and the effect these damping adjustments can have before making any changes.

These shock absorbers are re-buildable and re-valveable, however, this manual does not contain detailed service instructions. We recommend that your BP-51 service be performed by a qualified suspension technician.

Features

- Bypass, shim controlled, position sensitive damping (patent pending)
- Kidney bypass ports for maximum bore size and bypass flow area
- 51mm bore diameter remote reservoir with hard anodised billet floating piston
- Lightweight, aircraft grade aluminium for heat dissipation and corrosion resistance
- Type 3, hard anodised finish
- High temperature Viton and Teflon seal-pack
- High performance, high viscosity index oil
- External independent compression and rebound adjustment
- Ultra-wide, independent damping adjustment
- Multiple compression and rebound bypass zones for smooth transition
- Dash 6 high temperature Teflon hose with high flow fittings

- High pressure nitrogen gas
- Hard chromed ground shaft
- 1900MPa polished, high strength, high fatigue shims
- Vehicle specific applications - no fitting modifications required
- 3 year/60,000km (40,000mi) warranty
- 100% rebuildable and re-valveable

Additional Coil Over features:

- Adjustable spring preload/ride height
- Large Teflon lined spherical bearings

Additional Non-Coil Over features:

- Impact resistant, replaceable shaft guard
- High durometer, large rubber bushings

The BP-51 Concept

In their simplest form, shock absorbers consist of a body containing working fluid (oil) and a piston connected to a shaft. The piston divides the body into two chambers. When the shock absorber is compressed or extended, fluid flows through the piston from one chamber to the other. The rate at which fluid flows through the piston is typically determined by the size of the holes in the piston and the combination of shims stacked on each side of the piston, whose job it is to generate the compression force in one direction and rebound force in the other. More shims or thicker shims that are harder to flex provide more restriction to the oil passing through the piston, therefore generating more damping force. There are a number of options available for tuning this type of damper such as the shape of the piston and the way the shims are arranged, but in general the faster the piston moves, the more damping generated. This is known as velocity sensitive damping.

When tuning these types of shock absorbers, compromise is usually reached at a point where the ride is soft and compliant enough to absorb smaller bumps and road imperfections, yet firm enough to provide adequate control to keep away from heavy bump stop contacts and top out events when larger bumps are encountered.

In addition to velocity sensitive damping generated by the main damping piston, the BP-51 also generates damping, dependant on the position of the piston in the shock absorber's body. While most shock absorbers only generate damping based on fluid flowing through the piston, the BP-51 offers an alternative path from one chamber to the other around the piston in the form of bypass passages. Some fluid flows through the piston and some fluid bypasses around the piston in the bypass passages. These passages are the kidney shaped tubes spaced around the main piston bore towards the outside of the shock absorber body extrusion. Ports from the main piston bore, to the bypass passages, allow the fluid to pass around the piston from below it to above it in extension, and above it to below it in compression. Bypass flow during the compression stroke is shown by the blue arrow, and through the rebound stroke by the red arrow (see opposite).

At one end of the bypass passages, the fluid passes a regulator that also has shims to control the rate at which fluid can pass through the bypass passages. The resulting damping is a combination of the flow through the main damping piston and the flow through the bypass passages around the piston. The ports from the main bore that allow fluid to enter the bypass passages are placed at different positions so that different levels of damping can be generated at different positions of the shock absorber stroke.

In the compression direction, there are four passages of different length to provide bypass around the piston. At normal ride height, fluid can pass through the piston as well as around it, through four bypass passages. When a bump is encountered and the piston moves to compress the shock absorber, it will progressively move past and block ports that provide access to the bypass passages. As the piston approaches the end, four passages become three, then two, one, and eventually none, leaving the piston as the only passage for fluid to move from the compression chamber to the rebound chamber. The result is increasing compression damping as the shock absorber moves towards its fully compressed position. There are large improvements to the ride/control compromise that result from this bypass design. During normal on-road use (where the piston is situated around the middle of the stroke), the damping force provided by the shock absorber is relatively low, and so the ride is comfortable as minimal force is transmitted to passengers. However, when the vehicle is driven off road and subjected to much higher impact forces and travel, the damping force provides significant increases to minimise heavy bump stop contact.

In a similar way, two rebound bypass passages contribute to controlling the extension of the shock absorber. When close to fully compressed, there is no access to any bypass ports, so all fluid must pass through the piston. This provides significant damping to control the potential energy of the compressed spring. As the shock absorber extends, access is given to two ports to provide softer, more compliant rebound control around ride height. As the shock absorber extends further, it moves past one port and then another to ramp up damping as it approaches full extension. As with compression, in the rebound end zone all fluid must flow through the piston, so damping reaches its maximum to reduce the occurrence and severity of top out events.

The addition of bypass passages with ports allows the BP-51 to provide optimal damping for comfort at ride height and control towards the compression and extension end zones.

Each BP-51 is tuned for vehicle specific applications, however, compression and rebound bypass flows can be adjusted independently by the user while fitted to the vehicle to fine tune the damping for individual accessory fitments, loading scenarios, terrain types and driver preference.





Mounting the BP-51

The below instructions are intended as a general guide only. Please refer to the specific installation guide provided with the mounting kit for your vehicle.

- Take care when removing your old shock absorbers from your vehicle
- Ensure the vehicle is safely supported and that you use the appropriate tools and safety equipment
- Inspect the general condition of your vehicle (brakes, driveline, etc) to ensure they are in good mechanical condition
- Mount the shock absorber as per your vehicle manufacturer's recommended installation procedure, with the factory torque settings if reusing factory mounting hardware

IMPORTANT: Vehicle models vary in different markets, and slight changes may exist between model years. We have made every reasonable effort to ensure suitability for your vehicle but, ultimately, the shock absorber installer must conduct a final verification that the shock absorber is installed correctly.

Quick Checklist:

- Adequate brake line lengths are at full extension
- Steering tie rods and drive shafts turn freely at full droop
- Shock absorber body does not contact any part of the chassis or suspension
- Mount bolt/bushing and sleeve widths/diameters are correct
- Hose and fittings do not rub the chassis with movement of the shock
- Articulate the car and check for clearance through the range of travel

Remote Reservoir Clamp

The clamp should be used in conjunction with the appropriate mounting hardware for your application (see mounting kit and instructions).

Take care to ensure that the hose and fittings cannot contact the body during normal shock operation. The hose should not be excessively side-loaded or it will 'kink' and fail.

IMPORTANT: Articulate the vehicle and check for adequate clearance at full range of travel and steering.

Piggyback Reservoir Clamp

The clamp should be located towards the top of the shock absorber on a rear shock absorber that uses a shaft guard. Ensure the orientation of the shaft guard cut-out is aligned with the piggyback clamp. Use thread locking compound and torque with a 5mm Allen key to ~5Nm.

The piggyback reservoir or reservoir clamp bracket must not contact the vehicle chassis or tyre during the full range of steering and wheel motion.

IMPORTANT: Articulate the vehicle and check for adequate clearance at full compression and full droop.

Shaft Guard

Some shock absorber installations require the shaft guard to be installed or torqued after the shock absorber fitment is complete to allow access to the shock lower mount. The shaft guard must still overlap the shock absorber body at full droop and must not contact the chassis or piggyback reservoir clamp at full compression.

Check the guard doesn't foul on the lower mount during suspension articulation.

NOTE: The bolts must be tight.

IMPORTANT: Use thread locking compound to secure.





Adjusting your BP-51

Compression Damping

Compression damping controls the rate at which the shock absorber compresses when it encounters a bump. The proper compression setting also varies somewhat with personal preference and conditions.

The compression adjust ring is at the shaft end of the shock absorber body and is adjusted using the adjusting tool provided.

For more compression damping, turn the compression ring to the right. For less compression damping, turn the compression ring to the left.



WARNING: Do not adjust the shocks while hot.

Shock absorbers must be clean before adjusting. This will help prevent dirt ingress while rotating the compression adjust ring.

Note: Park your car with the corner you are trying to adjust in a drooped condition to gain access through the coil spring (if necessary) or above the dirt shield. You may also consider jacking the car to droop the wheel.

Compression Damping Troubleshooting

Symptom	Remedy
Bottoms out easily on larger bumps	Increase compression damping
Suspension feels harsh and does not soak up small bumps	Decrease compression damping
Shock absorber rarely bottoms out, even off big drop offs	Decrease compression damping
Shock absorber is not using all of its available travel	Decrease compression damping

Adjusting damping for weight or towing

Adding load to your vehicle will typically require more compression damping, particularly in the rear of utility vehicles or trucks. If you mostly use your vehicle unladen, on highway, decreasing compression damping will result in improved traction and comfort.

Adjusting damping for surface conditions

Different driving conditions require different levels of compression damping. Driving in sand dunes requires significantly increased compression damping to prevent suspension "bottoming out" – comfort is less of an issue as tyre pressures are typically reduced. Hard-packed surfaces comprised of small bumps will require less compression damping.

Rebound Damping

Rebound damping controls the rate at which the shock absorber returns after it has been compressed. The correct rebound setting changes with load, driving style and conditions, and is to some extent dependent on personal preference.

The rebound adjust ring is located above the compression ring, and can be turned using the adjusting tool provided.

For more rebound speed (more damping), turn the rebound ring to the right. For less rebound speed (less damping), turn the rebound ring to the left.



Rebound Damping Troubleshooting

Symptom	Remedy
Vehicle bounces and carries on repeatedly after larger bumps	Increase rebound damping
Suspension "tops out" too hard	Increase rebound damping
Wheels lose traction on gravel corners with corrugated surfaces	Decrease rebound damping
Suspension feels harsh	Decrease rebound damping
Packing in repetitive bumps	Decrease rebound damping
Loss of traction when braking or accelerating on corrugations	Decrease rebound damping

Ride Height

The BP-51 spring preload is adjustable to change your vehicle's ride height. Individual variations in vehicle weight can require different spring preload settings in order to achieve the appropriate ride height.

NOTE: Your spring rate and preload are preset from the factory. Refer to your fitting instructions for the correct settings for your vehicle weight. If unsure, contact your shock absorber dealer.

To achieve optimal performance from your BP-51 shock absorber, ensure that you have 60mm (2.5") of travel available in rebound droop.

It is recommended that ride height adjustment is performed by a qualified fitter.

Check relevant state or national laws for lifting (or lowering) your vehicle's ride height.

Maintenance

Proper maintenance is important to ensure your BP-51 shock absorber continues to deliver superior damping performance for many years. Periodic inspection and maintenance can help prevent premature suspension or chassis component failure.

You should keep your suspension clean for optimal performance. Clean your vehicle after use in mud, sand or abrasive conditions. This will also allow you to spot any damage that may have occurred to suspension components. Avoid using a pressure washer directly on the shock absorber as this can drive dirt past the shaft seal and O-rings. Also check for damage to the stone guard after extended periods on gravel roads.

You should also periodically inspect:

- 1. Reservoir and hose for any signs of damage
- 2. Shaft for any signs of leakage or damage
- 3. Spring and shock absorber body for any signs of contact or damage
- 4. Shock absorber mounts
- 5. Bolts to ensure they are properly fastened

Checklist	After 500km	After 5000km or At time of vehicle service	After heavy road use	Every 12 months
500km check done at store of install	•			
Clean Damper Body and reservoir		•	•	
Check body & reservoir for physical damage		•	•	
Wipe down piston rod		•	•	
Check Shaft Guard		٠	٠	
Check condition of bushes		•	•	
Check condition of spherical bearings		•	•	
Check hose condition		٠	•	
Check nitrogen pressure				•
Check adjuster settings	•	٠	•	

The table below outlines the recommended checks to conduct & how often. For more detailed information the 2nd table, on the next page, outlines details of the recommend check.

Checklist	Comments
500km check done at store of install	To be completed by the store of fitment to retention hardware, check component condition and re-measure for final lift measurements. Refer to the 500km check document.
Clean damper body	Wipe down using a cloth & general-purpose car cleaning detergent. Do not pressure wash. Do not use abrasive cleaning chemicals.
Wipe down piston rod	Wipe down using a cloth & general-purpose car cleaning detergent. Do not pressure wash. Do not use abrasive cleaning chemicals.
Check body & shaft for physica damage	Pay close attention to the piston rod looking for any pitting or physical damage that could cause damage to seals & critical components.
Check shaft guard	Ensure shaft guard is in good condition & still seated correctly. Replace as required.
Check condition of bushes	Look for deformation of the bush, any cracks & play in the bush. Replace as required.
Check condition of spherical bearings	Check for any sound/noise from the bearing – if a noise is present the bearing has started to wear out. Replace as required. Ensure the reducers and O-rings are seated correctly to limit ingress. Application specific spare parts and tools are available to purchase from ARB.
Check hose condition	Check for any physical damage. Check for any excessive leaks. If a light weep is occurring, wipe down & reassess at the next check interval.
Check adjuster settings (where required)	If experiencing a loss in performance and/or a change in ride characteristics, ensure the BP-51 is adjusted correctly.
Check nitrogen pressure	If experiencing a loss in performance check the gas pressure. The internal pressure of BP-51 nitrogen is extremely high. Work should only be conducted by a trained technician with specialist tools.
Shock weep or mist	Noticing oil on the outside of the shock does not necessarily mean the shock has failed. Weeping is completely normal and is a result of oil that has held onto the shaft for lubrication and correct seal operation which has pushed past the seal. If concerned, consult & assess at your closest ARB Store or Stockist.

Shock absorber rebuild and re-valve

For consumer safety, we recommend that shock absorber rebuilds and re-valving are performed by a qualified suspension technician.

Consumer Safety

Keep your vehicle and suspension components in good condition.

These BP-51 shock absorbers contain high pressure nitrogen. Opening a pressurised shock absorber can result in serious injury. The shock absorber should only be opened by a qualified person.

Warranty

ARB warrants the ARB Products against defects in workmanship and materials for the Warranty period. If defective workmanship or materials become apparent in the Warranty period, ARB will replace or repair the defective ARB product.

The benefits to the customer given by this warranty are in addition to other rights and remedies of the customer under a law in relation to the goods or services to which the warranty relates.

- 1) In this warranty:
 - ARB means ARB Corporation Limited (ABN 31 006 708 756) of 42-44 Garden St, Kilsyth, Victoria 3137, Australia
 - ARB Outlet means an outlet which has been authorised by ARB to sell and fit ARB Products
 - Product Information means the information about the relevant ARB Product which may be contained in any of: documentation provided with the ARB Product, owner's manual, operating manual, service manual, the manufacturer's manual or labels attached to the ARB Product
 - Warranty Period means, in respect of an ARB Product, the period that this warranty against defects applies and which is set out in paragraph 8
- 2) To be entitled to claim the warranty, the customer must:
 - a. have the ARB Product fitted in accordance with the product information
 - b. carry out normal care and maintenance of the ARB Product, including any required by the product information
 - c. provide proof of purchase of the ARB Product
 - d. make the claim in the Warranty Period
- 3) The warranty will not apply in circumstances where the defect is caused by:
 - a. unusual, improper or negligent use or misuse of the ARB Product
 - b. incorrect fitting of the ARB Product other than at an ARB Outlet
 - c. loading of the ARB Product with weights in excess of the product information
 - d. use of non-genuine ARB components in or with the ARB Product
 - e. use on vehicles with modifications not approved in the Product Information or at an ARB Outlet at the time of fitting
 - f. caused by racing or competition use
 - g. use of the ARB Product outside of the requirements of the Product Information
- 4) The procedure for the customer to claim a warranty is:
 - a. return the ARB Product to the nearest ARB Outlet or contact ARB to arrange a time to bring a vehicle fitted with the ARB Product to the ARB Outlet for inspection. Contact details are in paragraph 7 if further information is required regarding local outlet details
 - b. bring proof of purchase of the ARB Product to the ARB Outlet
 - c. ARB will review the ARB Product and advise whether the conditions of this warranty have been met

- 5) Where ARB accepts a customer's warranty claim, ARB will rectify any defective workmanship or materials, at its own expense
- 6) Expenses incurred by the customer in claiming the warranty are to be borne by the customer
- This warranty is given by: ARB Corporation Ltd 42-44 Garden St Kilsyth, Victoria 3137, Australia Phone: (03) 9761 6622 • Fax: (03) 9761 6807 www.arb.com.au
- 8) The period within which a defect in the ARB Products must appear if the customer is to be entitled to claim the warranty is 3 years or 60,000km (40,000mi) (whichever comes first) starting on the date of purchase unless:

The ARB Product is used in Commercial Use. Commercial Use means use in industry or commerce including (without limitation) use in the mining industry or as a hire vehicle. In this case, the warranty period is the lesser of 1 year or 20,000km (13,000mi) starting with the date of purchase..

Our goods come with guarantees that cannot be excluded under the Australian customer law. You are entitled to a replacement or refund for a major failure and compensation for any other reasonably foreseeable loss or damage. You are also entitled to have the goods repaired or replaced if the goods fail to be of acceptable quality and the failure does not amount to major failure.

Not Covered Under Warranty

- Accidental damage
- Shock bushing wear/abrasion
- Coil spring failure or sagging due to preload adjustment and coil-bind
- Damage caused by rocks
- Damage or loss during shipping (purchase of insurance is recommended)

Disclaimer

ARB Corporation Ltd is not responsible for any damages to you or others arising from use of the BP-51. In the event that your shock absorber breaks or malfunctions, ARB Corporation Ltd shall have no liability beyond the repair or replacement of your shock absorber pursuant to the terms outlined in the product warranty policy.

Quick Reference Guide

- Articulation: suspension movement in a diagonally opposite direction
- Bottoming/Bottoming Out: abrupt stop of suspension travel in a compression direction
- Bump: suspension movement in the compression direction
- **Chassis:** structural frame of motor vehicle. In this guide, it should be assumed that this term also refers to the body part of a monocoque (chassis-less) motor vehicle
- **Compression:** actions that move the two ends of the shock closer together; movement to compress the suspension
- Compression Damping: damping force generated in response to a compression movement
- Damping: force generated by the shock absorber in response to movement
- **Droop:** suspension movement in the rebound direction
- Fade/Fading: loss of shock damping performance, usually due to elevated temperatures
- OEM: Original Equipment Manufacturer
- **Preload:** initial force on the shock absorber spring at full extension. Varying preload will change vehicle ride height
- **Rebound:** actions that move the two ends of the shock further apart, extending action of the suspension
- Rebound Damping: damping force generated during rebound movements
- Suspension: components that move relative to the vehicle chassis in response to uneven surfaces. In this guide this term is used to refer to all suspension arrangements: live axle, independent, double-wishbone, MacPherson strut, and can also refer to suspension components including but not limited to sway bars, axles, spindles, wishbones, and leading and trailing arms
- **Spring Rate:** force required to compress a spring a defined distance. Typically expressed as pounds per inch (lb/in) or Newtons per mm (N/mm)
- Topping-Out: abrupt stop of suspension travel at the rebound limit (suspension fully extended)
- **Travel:** typically, vertical distance that the suspension moves through from full rebound to full compression
- Valving: combination of shims arranged on the damping piston to restrict oil flow, achieving a specific ride characteristic

BP-51 Fitment Record

VEHICLE DETAILS:

Make:	_ Model: B	Build Date:
Registration No:	Speedo:	Km/Mi
ITEM FITTED	FRONT	REAR
BP-51		
Preload Measurement		N/A
Compression Adjuster Setting	01234567891	012345678910
Rebound Adjuster Setting	01234567891	012345678910

RIDE HEIGHT MEASUREMENTS/RIM TO GUARD (mm)

(Take bump stop clearances on older leaf sprung vehicles)





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