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ARB AIR LOCKER

AIR OPERATED LOCKING DIFFERENTIALS



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Operating & Service Manual

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ARB AIR LOCKER



AIR OPERATED LOCKING DIFFERENTIALS

How the Air Locker Works



How the Air Locker Works

Why Lock a Diff? - The History of Air Locker

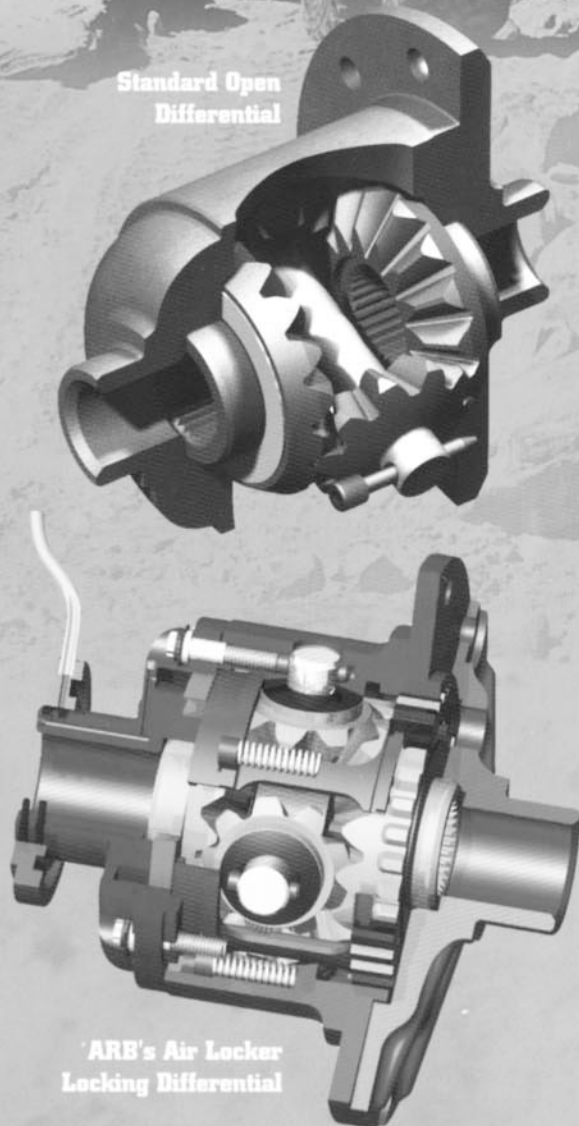
Four wheel driving across rough terrain can lead to some of the most exhilarating adventures one could have. But as any four wheeler can tell you; spinning your wheels and getting stuck leads to nothing but frustration. Often you know you have the right vehicle to take on the most extreme terrain, yet still you find that it baulks at the slightest of obstacles, losing traction at the most inappropriate times, leaving you stranded and embarrassed.

The problem is quite simple – one (or more) of your vehicle's wheels is losing traction, and your highway minded factory differential center is directing ALL of your vehicle's power to those spinning wheels. Newer vehicles with limited slip differentials (LSDs) may offer some improvement over standard diffs, but more often you'll find the slipping is not as 'limited' as you need to keep you going. Automatic locking differentials also have their disadvantages: they can be very noisy when disengaging and will upset the on highway driving characteristics of your vehicle.

ARB has been challenging conventional thinking of off road equipment designs for over 25 years, and the ARB Air Locker has been a success story from the start. Born of the need to get 100% traction when you need it, without sacrificing any of your vehicle's highway driving performance, ARB Air Lockers employ the same air compressor commonly used by four wheel drivers to control their tyre pressures and to activate and deactivate a solid and durable lock inside the differential center. This gives you the traction you need, when you need it, all at the flip of a switch, all within the safety and comfort of the driver's seat.

The Air Locker Concept

Standard Open
Differential



ARB's Air Locker
Locking Differential

The Air Locker Concept

When unlocked, ARB Air Lockers operate much the same as conventional 'open' differentials. Driving force applied to the ring gear rotates the differential center but does not directly drive the axle shafts. Small bevel gears known as pinions rotate freely on the cross shaft(s) which are securely fixed to the body of the differential. The axle shafts are joined by a splined coupling to the two larger bevel gears, known as side gears, which are supported by the differential body in constant mesh with the pinions. When one axle rotates inside the differential, it drives the pinion gears which in turn drives the opposite axle, only in the opposite direction of rotation. This is called 'differential' action. Under normal circumstances this action benefits your vehicle by allowing the outside wheel to spin faster than the inside wheel when turning; an absolute necessity for highway driving. Unfortunately, differential action only works so long as both wheels have full traction with the road. Once one wheel loses grip (e.g., one wheel is on a slippery surface or suspended in mid air) the differential transfers its driving force to the wheel that is easiest to turn (i.e., the slipping wheel) and therefore all the driving torque is lost.

The advantage of the ARB Air Locker lies in the pneumatically operated locking system inside the body of the differential which, when activated, prevents the differential gears from rotating and therefore preventing differential action between the axles. With both wheels tied directly to the rotation of the ring gear (a system sometimes referred to as a 'spool') the vehicle maintains maximum possible traction at all times.

Operating Instructions

General Air Locker Use

Air Locker differentials can be engaged and disengaged at the flip of a switch.

When you need the extra traction, simply turn on your compressor, approach the difficult terrain, and press the Air Locker switch; even if you are still moving! Once you are past your trouble spot, flip the switch back again and the Air Locker will disengage and return your vehicle to normal operation.



Push On

Illuminated With
Dash Lights

Illuminated When
Switch Is Activated

Push Off

Operating Instructions

Although operating a switch may require very little skill, knowing when to use your Air Locker, and what to expect from your vehicle while using it, is indeed a skill and requires a level of understanding and experience before you can safely and effectively get the most out of your vehicle.

Never engage the Air Locker during cornering or when the wheels are spinning as this could damage the locking mechanism. Just as you wouldn't put your vehicle in gear without using the clutch, the gears in your Air Locker need to be doing roughly the same speed before you engage them as well. Also, remember that your Air Locker doesn't necessarily engage instantaneously your vehicle is stationary. You may need to roll the vehicle a little bit until the teeth of the locking mechanism can fall into mesh.

When disengaging your Air Locker, always remember that the teeth of the locking mechanism cannot disengage while under torque. Your Air Locker was designed to stay locked under the harshest of loads, and therefore, even with the switch disengaged you will sometimes need to untorque your axle by rolling your vehicle forward or backward slightly before the locking mechanism will unlock.

On Highway Use

ARB's Air Locker range of locking differentials offers one big advantage that few of its competitors can even come close to...

...on the highway you won't even know it's there!

With your Air Locker disengaged (switched OFF) it behaves and performs no different than any regular open differential that comes standard with most vehicles from the manufacturer. There is no disconcerting jolt or special driving techniques to get used to as there is with most other lockers on the market.

Operating Instructions

In the snow your vehicle can easily lose traction, understeering into gradual corners, oversteering out of tight corners, and often spinning its wheels rather than moving at all. Engaging your Air Locker will help you get rolling through the trouble spots. Some operators prefer to leave them engaged while driving in snow, but remember; engaging your Air Locker will change the way your steering behaves, especially when using a front Air Locker. Take it slow at first and give yourself time to get used to it before you try anything too challenging.

When not in use, simply keep your Air Locker(s) as well as your air compressor switched OFF. ARB's own range of off road, special purpose air compressors come with an isolating switch to keep your air compressor from charging up when you don't need it. We highly recommend an isolating switch for all highway use vehicles.

Off Road Use

DRIVING ON LEVEL, HIGH TRACTION SURFACES - As long as all wheels can stay in contact with a high traction surface, locking a differential is not necessary and could place undue load on your drive train. Cornering on high traction terrain with your differential locked (especially the front) is never recommended as it creates high torque load across your axle shafts and CVs. In these cases it is preferable to leave your Air Lockers unlocked until the need for them arises.

DRIVING ON LEVEL, LOW TRACTION TERRAIN - Heavy traction loss can affect overall vehicle control with open or unlocked differentials, as traction is randomly transferred from side to side across the axle. Off road driving control will be greatly enhanced through mud, snow, water, loose gravel and other forms of low traction surfaces when one or both Air Lockers are engaged. Gentle throttle and smooth methodical steering will keep the vehicle moving steadily where you point it.

Operating Instructions

DRIVING ON UNEVEN TERRAIN - Rock crawling, ditch crossing and other highly challenging forms of off road driving can render it impossible to keep four wheels on the ground. Locking your Air Locker(s) can often be your only alternative to a winch or a tow. Plan your path across such obstacles so you don't compromise your vehicle's center of gravity and roll over. Use low range and idle throttle where possible and proceed slowly.

DRIVING UPHILL - Try to align the vehicle straight up the incline and keep the rear Air Locker engaged to maintain a constant push. Maintain a very light approach to throttle use (AIM FOR ZERO WHEEL SPIN). Use of the front Air Locker in this situation is greatly dependent on the nature of the terrain and mostly dependent on the 'feel'.

DRIVING DOWNHILL - Again, as with all hill driving, straight down the hill is preferable to descent at an angle. Always use engine braking, if possible, over foot braking. Engage the rear Air Locker once you start moving. Use of the front Air Locker can be of great benefit when engine braking downhill as it prevents the sudden surge felt when one wheel breaks traction, but driver preference must still make the final decision.

DRIVING OFF CAMBER - When traversing an incline sideways on a surface with low or unpredictable traction (a situation best avoided if possible), leave both Air Lockers disengaged. Having both wheels driven together may promote slipping, where an unlocked axle should allow each wheel to find its deepest traction point. Limiting your throttle to a low range idle and not braking unless necessary will help your tyres bite into a loose surface.

Operating Instructions

Safety Considerations - PLEASE READ THOROUGHLY

Your ARB Air Locker was engineered as a *safety enhancement* to the use of your vehicle. While ensuring you have the same road handling ability that your vehicle came with, it also gives you that extra ability to get safely through the situations which may otherwise leave you and your passengers stranded; & all with only the flip of a switch! Air Locker differentials are simple to use, and very safe when used correctly, however a few points should be understood and followed to ensure the least risk to your vehicle and occupants:

- Driving on high traction surfaces (e.g., dry pavement, concrete, bitumen, sandstone, etc.) with your Air Lockers engaged (locked) is very harsh on drive train components and could result in damage to your vehicle. Lock your Air Locker(s) only when necessary to overcome limited traction.
- Having your Air Locker(s) engaged **will affect your steering** even if you only have one in the rear axle. Make sure you take the time to get to know the effects of driving with a locked differential before you attempt any use which may put you, your passengers, or your vehicle at risk.
- Air Locker switches should always be located within easy reach of the driver, but they **must** be located where they will not accidentally be operated by the driver, passengers or loose objects moving within the cabin. **Accidental locking or unlocking could result in loss of control of the vehicle.**

Operating Instructions

- If used, an isolating switch ensures that the air compressor will not start unnecessarily. To avoid risk of unintentional Air Locker engagement, always leave your Air Locker actuator switch in the OFF position when not in use, and therefore, never use the isolator switch to engage the Air Locker. This will prevent your Air Locker from engaging when using the compressor for other purposes such as inflating tyres.
- Although ARB Air Lockers are engineered tough they should never be engaged during wheel spin (i.e., a situation when one wheel is spinning faster than the other on the same axle). This could cause undue wear or damage to your Air Locker or other drive train components as a result of the shock created when both wheels are suddenly forced to turn at the same speed. Be sure you are stopped or driving in a straight line without any acceleration or deceleration (i.e., do not have either the accelerator or the brakes pressed or engaged while locking the Air Locker).
- To reduce the risk of vehicle drive train damage and/or the loss of control of your vehicle, always reduce speed when your Air Locker(s) are engaged, or anytime you are negotiating rough terrain. Slow and methodical off road driving will prolong the life of all drive train components.

ARB Not Just Air Lockers

Welcome to the world of ARB 4x4 Accessories. Alongside Air Lockers ARB has been manufacturing a complete range of quality, reliable and practical 4x4 accessories for over 25 years which we proudly export, along with the Air Locker, to over 50 countries. Here, a selection of some of our most popular products.

For more information please contact your nearest, authorised ARB distributor.



ARB Air Locker Service Guide

Recommended Lubricants' Specifications

Type of Use	Recommended Lubricant
Normal/Typical Use: highway and light to medium off road use between -12 and +100°C [10 to 212°F]	Shell Diff Oil (SAE 90) Mobil Mobilube GX90
Heavy Off Road Use: high horsepower/high torque use between -9 and +100°C [16 to 212°F]	Shell Spirax HD 85W-140 Mobil Mobilube GX140
High Temperature/Desert Use: mainly off road use between -30 and +100°C [-22 to 212°F]	Shell Spirax S 80W-140 Mobil Mobilube SHC 80W-140
Low Temperature/Winter Use: mainly off road use between -48 and +100°C [-54 to 212°F]	Shell Spirax S 75W-90 Mobil Mobilube SHC 75W-90

To find other lubricants which are equivalent to the examples above, please contact your authorised ARB Air Locker distributor.

ARB Air Locker Service Guide

Recommended Regular Service Schedule

Frequency of Service	Description of Service Check or Operation
After the first 2,500km (1,500 miles) of use, and after each subsequent 50,000km (31,000 miles) of off road use or 75,000km (46,600 miles) of highway only use.	Change differential oil. Clean or replace axle breather. NOTE: Always fill until almost level with filler plug hole, manually rotate differential several times, then fill again until level with filler plug hole. (See Recommended Lubricants' Specifications.) If the axle installation angle has been modified (i.e., the vehicle has been raised) or is used for lengthy steep incline climbs, a standpipe may be needed to modify the filler level of the housing.
After every 12,000km (7,460 miles).	Check differential oil level and inspect for leaks.
After each use in water and/or mud.	Change differential oil to maintain viscosity and to flush out any trapped water, mud, or other foreign particles. Clean or replace breather.
After each use in dense bush and/or protruding rocks.	Inspect all sections of exposed air line for abrasion or cuts.
After each heavy use (i.e., competition use).	Change differential oil to maintain viscosity and to flush out any foreign particles.
Every 6 months (maximum).	Operate the Air Locker to ensure it is in good working condition. Check air system for deposits of moisture condensation or oil. Flush clean with compressed air if necessary. Clean or replace axle breather.

NOTE: In addition to the service schedule above, always adhere to all service guidelines set forth in your vehicle manufacturer's service manual.

In Field Service/Repair

ARB Air Lockers are engineered to give you years of trouble free use, however, harsh terrain can sometimes find a way of taking its toll; often when you least expect it! Just as you carry spare tyres, fuses, drive belts, etc., you should also consider packing an air line repair kit, part no. ASK001, and some cable ties along with the necessary tools to ensure you are prepared for any unforeseen damage to your air line.

Refer to page 18 for our listing of Genuine Air Locker Accessories.

Trouble Shooting

Symptom	Possible Cause(s)	Solution(s)
Running noise from differential ONLY WHEN CORNERING.	Differential gear(s) damaged. Foreign object/particles present in differential oil. Wheel bearing(s) damaged.	Inspect all differential gears and internal running surfaces for signs of damage and replace as necessary. Inspect all differential components for damage and repair or replace as necessary. Refer to your vehicle service manual.
Running noise from differential WHEN MOVING STRAIGHT AS WELL AS WHEN CORNERING.	Carrier bearings damaged or worn out. Incorrect backlash setup between ring and pinion gears. Ring and pinion set damaged. Differential oil level too low. Wheel bearing(s) damaged.	Inspect and replace damaged bearings. (Refer to your vehicle service manual.) Adjust ring and pinion backlash. (Refer to your vehicle service manual for correct backlash setup procedure.) Inspect and replace if necessary. Fill oil level until level with filler plug hole. Refer to your vehicle service manual.
Intermittent noise from differential occurring approx. once per meter [3 feet] of vehicle movement regardless of vehicle speed.	Damaged ring gear.	Inspect and replace if necessary.
Noise from differential while decelerating from any speed.	Damaged pinion bearing.	Inspect and replace if necessary.
Metallic particles are present in differential oil.	Carrier bearings damaged. Differential gear worn or damaged. Foreign object loose in differential housing.	Inspect and replace damaged bearings. (Refer to your vehicle service manual.) Inspect differential gears and ring and pinion set for signs of wear or damage and replace if necessary. Inspect all differential components for damage and replace as necessary.

Trouble Shooting

Symptom	Possible Cause(s)	Solution(s)
Excessive oil visible at solenoid exhaust port.	Pneumatic seals damaged. Pneumatic seal running surfaces worn or damaged. Misaligned or damaged seal housing. Foreign particles present in differential oil.	Replace all pneumatic seals. Disassemble differential and inspect all sealing surfaces for scoring. Repair or replace as necessary. Inspect seal housing for damage and <u>make sure</u> seal housing is fitted according to the supplied installation instructions. Disassemble and thoroughly clean all components.
Please Note: Some oil mist around the solenoid is perfectly normal.		
Air Locker engages slowly or will not engage at all when switch is activated.	Internal mechanical damage. Air line blocked. Compressor malfunction. Electrical fault. Seized solenoid. Dump valve (if fitted) is slowing actuation. Dump valve (if fitted) is seized and passing air into the differential housing.	Inspect differential unit for damage or lodged foreign objects. Repair or replace as necessary. Inspect full length of air line for kinks, pinched sections or presence of oil or foreign matter in the line which may restrict air flow. Make sure the compressor is functioning and is capable of supplying at least 85 psi. Check for blown fuse or relay on compressor. Check all electrical connections to switch and solenoid. Solenoid should instantly open allowing free flow of air when switch is activated. Replace solenoid if faulty. Slight actuation delays are normal when dump valves are fitted. If delay is too long then dump valve should be replaced. Replace dump valve.

Trouble Shooting

Symptom	Possible Cause(s)	Solution(s)
Air Locker will not disengage when switched OFF.	Wheels under torque.	With the Air Locker switch turned OFF and the wheels turned straight, slowly move the vehicle back and forth until the unit unlocks.
	Electrical fault.	Inspect all electrical connections for a possible short. If it is necessary to move the vehicle you can manually disconnect the air line from the compressor.
	Internal damage.	Inspect differential unit for damage or lodged foreign objects. Repair or replace as necessary.
	Solenoid seized. Solenoid exhaust port is blocked.	Replace solenoid. Remove any obstruction from the exhaust port located in the middle of the round knob on the top of the solenoid.
Air Locker disengages slowly when switched OFF.	Air line blocked.	Inspect full length of air line for kinks, pinched sections, or presence of foreign matter in the line which may restrict air flow. Check for oil in air line.
Air Locker engages when switch is in the OFF position and disengages when switch is turned ON.	Switch cover installed upside down.	Carefully remove switch cover and replace in correct position.
Leakage in bulkhead fitting.	Fitting too loose to form seal.	Inspect and appropriately tighten all compression fittings.
	Worn or damaged sealing components.	Replace all damaged fittings, ferrules, etc. Trim or replace any damaged mating sections of tubing.
Leakage at solenoid.	Fitting too loose or too tight to form adequate seal.	Inspect, and if necessary apply thread sealant to fittings and retighten.
	Solenoid body damaged (i.e., cracked, cross threaded).	Replace solenoid.

Trouble Shooting

Symptom	Possible Cause(s)	Solution(s)
Leakage inside differential housing.	Worn or damaged sealing components.	Replace all damaged fittings, ferrules, etc. Trim or replace any damaged mating sections of tubing.
	Pneumatic seals damaged.	Replace all pneumatic seals.
	Dump valve (if fitted) is seized.	Replace dump valve.
Compressor runs continuously ONLY when Air Locker is switched ON.	Leak in air system.	Inspect air line and all air connections for leaks using a soap and water mixture.
	Air leak inside differential housing.	Remove filler plug and listen for leaking or bubbling when air is switched ON. Inspect bulkhead fitting and transfer tube inside housing and replace/repair leaking component(s) and seals as necessary.
	Dump valve (if fitted) is seized and passing air into the differential housing.	Replace dump valve.
Compressor ALWAYS runs continuously.	Compressor malfunction.	Make sure compressor is working correctly and is capable of supplying at least 85 psi.
	Pressure cutout switch malfunction.	Inspect and replace cutout switch if necessary.
	Seized solenoid.	Replace solenoid.
Compressor runs continuously and blows air through solenoid only when Air Locker is switched OFF.	Solenoid connected backwards.	Connect the compressor to port 1 and the Air Locker air line to port 2. (Refer to fitting instructions.)
No illumination occurs in switches when headlights are turned ON.	Illumination terminal not correctly connected to dashboard.	Refer to fitting instructions for correct wiring procedure and diagrams.
	Illumination bulb(s) blown or not functioning.	Clean bulb socket and all terminal connections. Replace bulb if necessary.
	Switch cover installed upside down.	Carefully remove switch cover and replace in correct position.

Genuine Air Locker Accessories

Air Locker Heavy Duty Air Line Kit - Part No. HDAL

This optional, 'Aeroquip' reinforced air line and adapter kit installs directly to your existing Air Locker differential.

Air Locker Bulkhead Fitting Kit - Part No. 170102

It's a good idea to carry spare parts for any vehicle accessory when challenging the unknown perils of the bush. ARB recommends you also take along a spare bulkhead fitting kit.

Air Locker Switch Bracket Kit - Part No. ALSB1/2/3

ARB's genuine Air Locker switch plates are powder coated black for a durable finish and are a perfect fit for your Air Locker actuation switch or your ARB air compressor isolator switch. Kits come with either 1, 2 or 3 switch brackets (ALSB1, ALSB2 or ALSB3).

Air Locker Air Line Service Kit - Part No. ASK001

This convenient kit contains everything you'll need to repair a damaged air line.

ARB Air Compressor Kit - Part No. RDCKA

The ARB air compressor kit was developed specifically for use with ARB's Air Locker range. The kit comes complete with 12v air compressor with automatic pressure switch, 12v 30amp relay, compressor mounting bracket and hardware, on/off switch & plug in Air Locker wiring loom.

Air Compressor Pump Up Kit - Part No. PUKT

Use your ARB air compressor to inflate your tyres, air mattresses, water toys, etc. by installing a pump up kit. This kit is specially designed to fit ARB's compressor and installs easily.

Warranty

ARB Air Locker Limited Warranty

ARB's Air Locker locking differentials are warranted to be free from defects in materials and workmanship for a period of twenty four (24) months or 40,000 kilometers (24,000 miles), whichever occurs first, from the date of first retail purchase.

Except where otherwise implied by the Trade Practices Act, ARB's obligation under this warranty shall be limited to repairing or replacing or crediting, at ARB's option, any part found to be defective.

ARB does not warrant or make any representations outside of those implied by the Trade Practices Act concerning its ARB Air Locker locking differentials when:

- (i) The product(s) are not installed, used and maintained in strict accordance primarily with the manufacturer's instructions and, second, with all good installation and maintenance practices of the automotive industry.
- (ii) The product(s) are installed in any vehicle which is used in competition of any type.
- (iii) The product(s) are installed in any vehicle fitted with tyres which have diameters in excess of 5% greater

than that vehicle's factory standard diameter tyre.

(iv) The product(s) are installed in any vehicle which has undergone drive line modifications resulting in an increase of torque and/or power in excess of that vehicle's factory standard, except where such modifications have been approved by ARB.

When settlement is sought under the terms of this warranty a claim shall be made as follows:

- (i) The ARB Air Locker locking differential which the customer claims to be defective is to be returned along with all other supplied accessories and hardware accompanied by the proof of purchase to an authorised ARB Air Locker distributor.
- (ii) The authorised ARB Air Locker distributor shall contact ARB to have the claim approved prior to any settlement.

The benefits conferred by this warranty are in addition to the rights and remedies which the customer has under the Trade Practices Act and similar state and territory laws in respect of the product by an authorised ARB Air Locker locking differentials' distributor or any other person.

