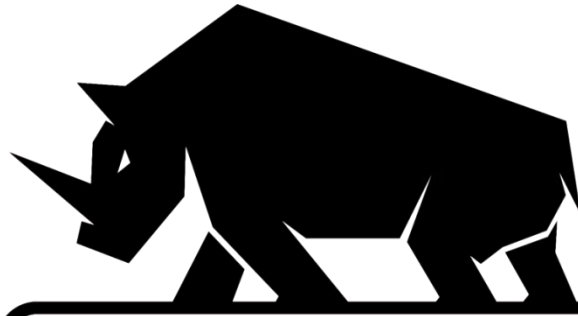


**TRE Air Locker**



***TRE* 4X4**

**AIR LOCKER**  
LOCKING DIFFERENTIAL

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**TRE AIR LOCKER**  
**Installation Manual**

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**TR217**

**LR DISCOVERY 3 + 4, FR, 29 SPL**

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# Introduction

TRE Air Locker designed for traction assistance. It's a driver-controlled differential when additional traction is required. Driver turn on the control button Locking in both axle deliver equal traction to wheels to providing 100% traction.

TRE Air Locker tested by various Pro 4x4 Races.

Available Terrain: snow, sand, muddy, rocky, etc.

## Common use of TRE Air Locker

When you need more traction, turn on the air compressor first before get close to extraordinary terrain, then turn on the Air Locker switch. (ATTENTION: Turn on the rear Air Locker first, we don't suggest you use front Air Locker alone) After passing, press the switch again and the Air Locker will return to normal mode.

Do not turn on the Air Locker when the wheel is Idling, it will break the locking device.

When you turn off TRE Air Locker, the Air Locker is same as Differential, don't worry about any control problem .

**Note: Place a ⊗ mark inside each of the ○ symbols as you complete each step. It is very important NOT to miss any of the steps!**

# Installation Preparation

## A) Tool-Kit Recommendations

Below is a list of tools and supplies you may need to complete this installation. Requirements for your vehicle may vary. Please consult our vehicle service manual for additional recommendations.

### A-1. Tools

- Standard automotive sizes (metric and/or imperial) of sockets, wrenches, Allan keys, and drills.
- A dial indicator or other suitable measuring tool for checking ring & pinion backlash.
- An adjuster-nut pliers
- A razor knife to cut the nylon tubing.
- A torque wrench (See vehicle service manual for required torque range.).
- A lubricant drain reservoir.
- An 11.2mm [7/16"] drill and 1/4" NPT tap for bulkhead fitting installation.
- An 8.5mm drill and 1/8" NPT tap for bulkhead fitting installation.
- An automotive bearing puller or a differential carrier bearing puller.
- A bearing press or arbor press.
- A soft hammer (e.g. copper/rawhide/nylon etc.)

### A-2. Supplies

- Thread lubricant/sealant compound for pressure fittings. (e.g. LOCTITE #567 Teflon paste)
- Thread locking compound (e.g., LOCTITE #272)
- Retaining compound (e.g. LOCTITE #609)
- A gasket sealant or replacement gasket for your third member.
- A sufficient volume of differential oil to completely refill your housing (see the TRE Air Locker Operating and Service Manual for recommended lubricants)
- A soap and water mixture to test for air leaks.

## **B) Remove the Original Differential.**

### **B-1. Support Vehicle by a hoist**

### **B-2. Differential Fluid Drain**

This is a good time to check for metal particles in your oil and in the bottom of the housing which may indicate a worn bearing or differential component.

### **B-3. Removing the axles and Differential**

#### **IMPORTANT :**

**TRE strongly recommends that you have your axle assembly inspected for concentricity and straightness before installing your Air Locker.**

- Remove the axles according to your vehicle's service manual.
- Disconnect the drive shaft from the flange of the differential.
- Remove the differential cover.
- Remove the cross shaft retaining pin.
- Rotate the differential until the ' C ' clip access window is accessible.
- Remove the cross shaft, and thrust block.
- Gently tap the axle ends inward to release the ' C ' clips.
- Remove ' C ' clips with needle nose pliers.
- Gently tap axles outward and remove them from the differential center.

**NOTE : Rubber oil seals can be easily damaged. Support the weight of the axle when extracting it across the edges of the seals.**

- Remove all nuts and washers retaining the differential housing.
- Carefully remove the differential third member from the axle housing.

**NOTE : Pry bars may be required to split the third member from the axle housing.**

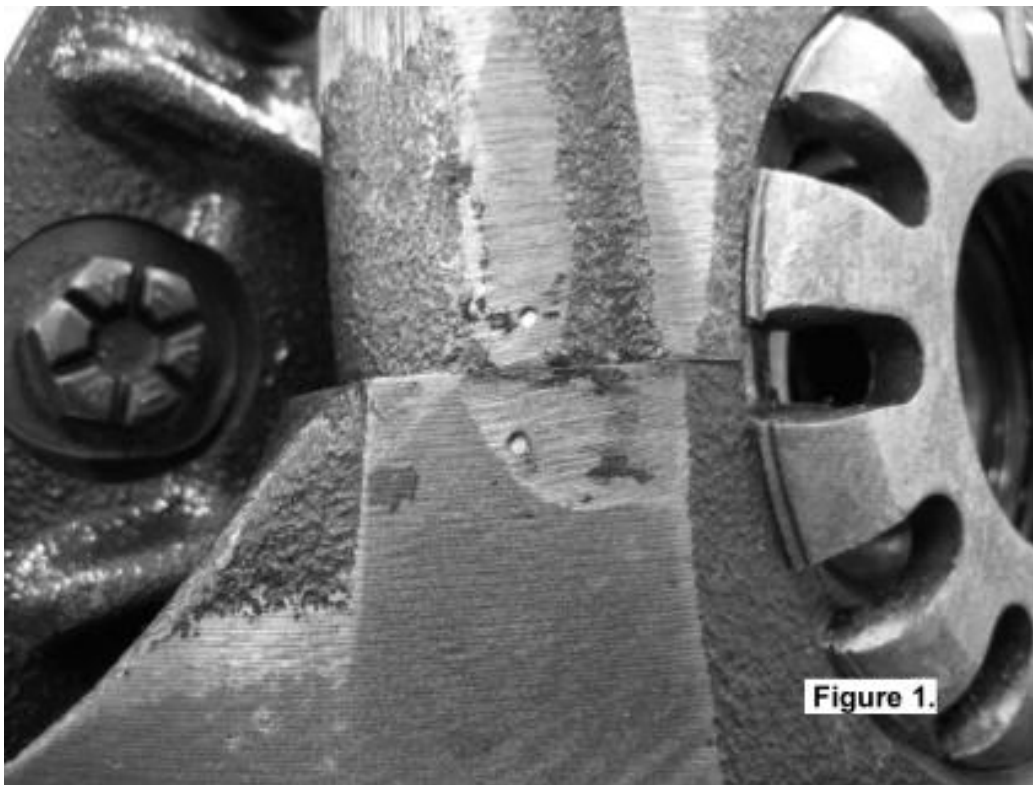
**NOTE : The differential third member is heavy and quite difficult to handle when covered in oil. Do not drop it!**

- Secure the third member to a workbench with the differential carrier facing upward.

#### **B-4. Marking the Bearing Caps**

- Using a small pointed center punch, gently mark the bearing caps in a way that will enable you to know which cap is 'LEFT' and which cap is 'RIGHT', which way is 'UP' and which way is 'DOWN'.(Fig.1.)
- Mark the right hand cap in a similar way.

**HINT : Many installers choose to make one punch mark on the left hand side of the left hand bearing cap and a similar mark on the housing at close proximity to the cap mark. The right hand side is then designated with two punch marks on the right hand side of the cap and two similar punch marks on the housing.**



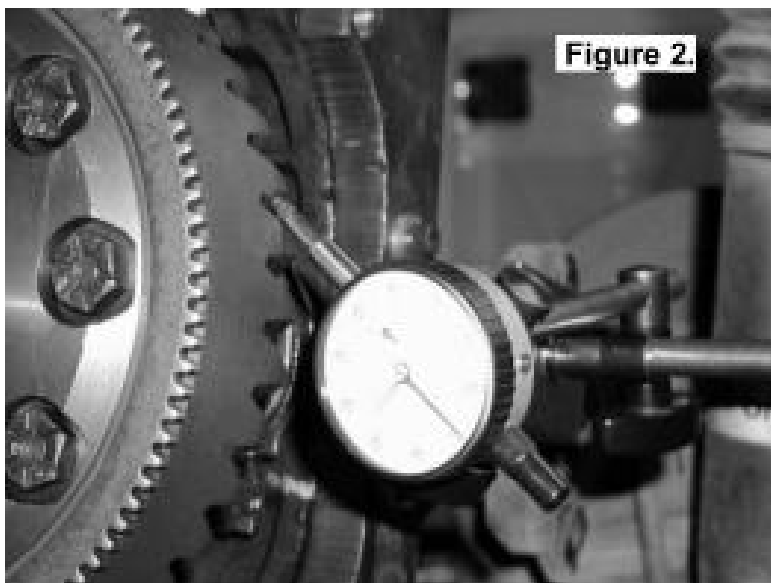
## B-5. Checking the Current Backlash Amount

### IMPORTANT:

This step is a precautionary measure recommended by TRE due to the fact that some aftermarket ring and pinion sets have been manufactured to run with different backlash settings than those specified by your vehicle manufacturer. Although TRE must recommend you set backlash according to your service manual guidelines, we also advise that you compare the backlash measurements taken here to the recommended backlash settings in your vehicle service manual. Measurements found to be outside of your service manual recommendations may indicate the need to deviate from those settings in order to achieve quiet running with a good contact mark.

Refer to your vehicle service manual or your local authorized TRE installer for more information.

- Set a depth indicator on one of the ring gear teeth as in Figure 2.

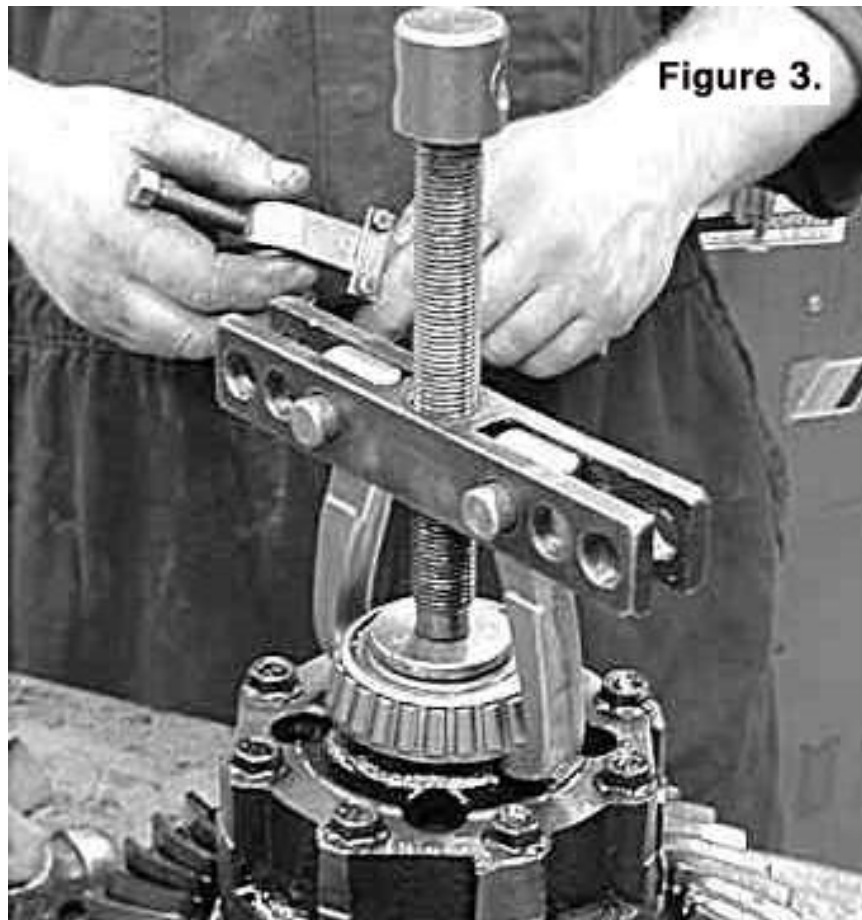


- While supporting the pinion gear by holding the drive flange, rotate the differential in both directions while observing the maximum variation in depth from the indicator (i.e., the highest value minus the lowest value). This value is referred to as the ring and pinion backlash.
- Rotate the differential center 90° and measure again for accuracy.
- Record the average of all measurements.

## B-6. Removing the Differential Carrier

- Remove the adjuster nut locking tabs.
- Remove the bearing caps from the third member.

- Remove the adjuster nuts.
- Carefully remove the differential carrier from the third member.
- Remove the tapered roller bearings from the differential carrier with a bearing puller (Fig.3.)



## C) Air locker installation

### C-1. Approximate Backlash Shimming

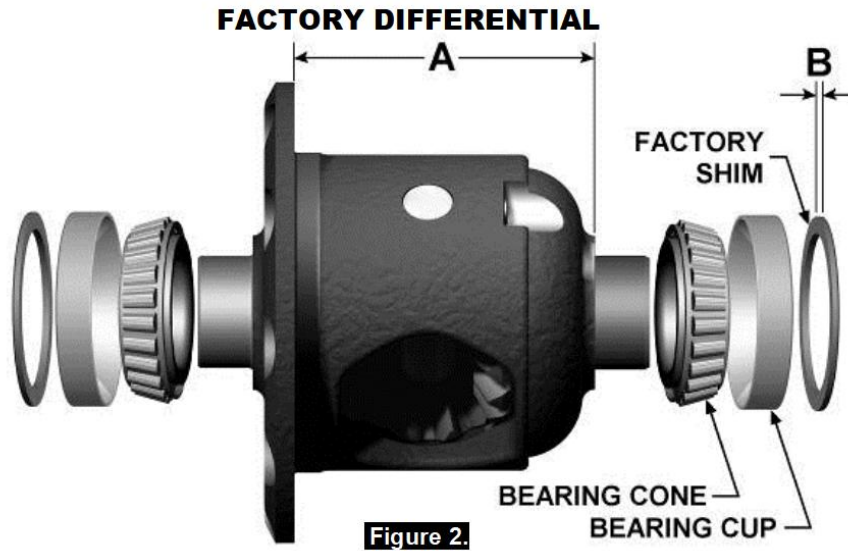
In order to reproduce a similar preload and ring and pinion backlash in your Air Locker to that of your existing differential, measurements need to be taken so that a shim thickness can be calculated.

- Secure the differential to a work bench.
- Remove the bolts that hold the ring gear in place.
- Using a plastic or copper hammer, gently tap in a circle around the outside of the ring gear to separate it from the differential carrier.
- Remove the original bearings from the differential center using a bearing puller.

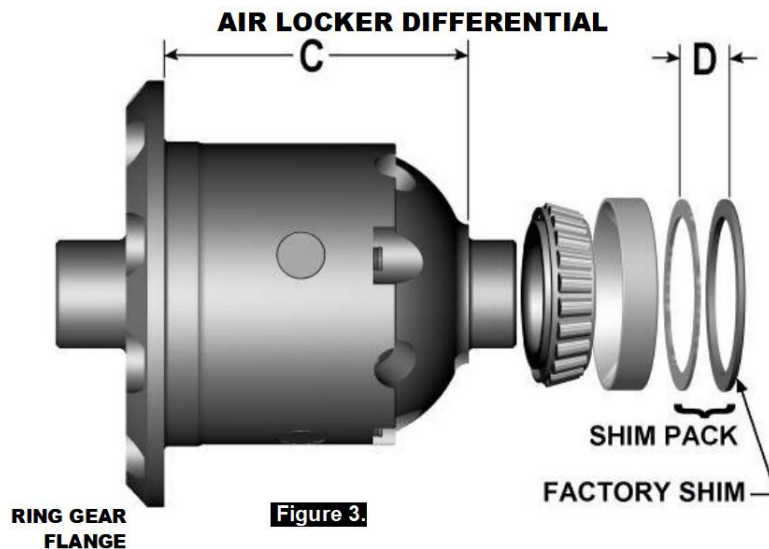


**NOTE :** The OE differential has a different sized bearing on each end. The Air Locker has been designed to use both of these bearing sizes as well.

- Examine the bearing cups and cones for damage or wear and, if necessary, discard them and replace with the same size and type of bearings.



- Using a caliper or similarly accurate measurement method (i.e., able to take accurate measurements within 0.04mm [0.0015"]), measure the distance from the shoulder of the bearing journal to the ring gear mounting face (shown as 'A' in Figure 2.) and record this measurement as 'A'.
- Measure the thickness of the factory shim removed from the end of the differential carrier (shown as 'B' in Figure 2.) and record this measurement as 'B'.



- Measure the distance from the Air Locker bearing shoulder to the ring gear mounting face (shown as 'C' in Figure 3.) and record this measurement as 'C'.

## **C-2. Calculation & Selection of Backlash Shims**

Ideally, the measurement you recorded as 'C' from the Air Locker differential will closely match 'A' on the existing differential (within 0.1mm [0.004"] ) and then the factory shim can be reused, however, quite often these measurements will vary slightly between one factory differential and the next.

If this is the case you must create a new shim pack thickness by using the measurements you recorded earlier to find a desired measurement for 'D' in Figure 3.

$$\mathbf{A + B - C = D \text{ (Replacement Shim Pack)}}$$

If your calculations are correct then the following calculation will also be true:

$$\mathbf{A + B - C - D = ZERO}$$

- Create a shim pack to match the thickness calculated as 'D'.

To achieve the desired shim thickness you can:

Machine down the factory shim thickness.

Add shims between the factory shim and the bearing cup.

**A selection of shims of this size have been supplied with your Air Locker kit.**

Purchase new factory shims at the desired thickness.

Use a universal shim kit available from most drive trainspecialists.

Add small amounts of shim between the bearing cone and the bearing seat.

**NOTE : NEVER machine the Air Locker.**

### **C-3. Mounting the Ring Gear**

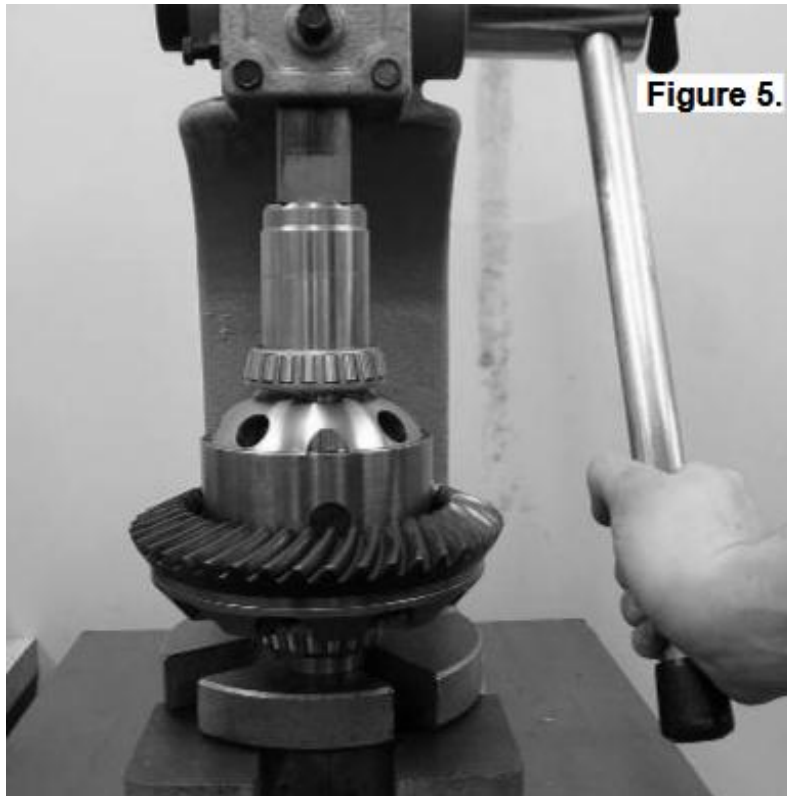
- Apply a thin film of high pressure grease to the ring gear shoulder of the Air Locker to prevent seizing.
- Thoroughly clean any thread locking compound or other foreign matter from the holes of the ring gear, the threads of the ring gear bolts, and the mating surfaces between the ring gear and the Air Locker flange.
- Heat the ring gear to between 80 and 100 °C [175 - 212 °F] in hot water or in an oven to slightly expand the gear and facilitate assembly.

**NOTE : NEVER HEAT GEARS WITH A FLAME! This could damage the hardened surface of the gear and result in premature wear or failure**

- Dry the gear and bolt holes with compressed air (if wet).
- Install the ring gear onto the Air Locker by aligning the bolt holes and then gently tapping it around in a circle with a soft mallet. Avoid using the bolts to pull down the ring gear as this puts excess strain on the bolts and the differential flange.
- Apply a thread locking compound to the thread of each ring gear bolt before inserting it. Do not apply threading compound directly into the threaded hole as this could prevent the bolt from reaching its full depth.
- Tighten the ring gear bolts in a star pattern with a torque wrench according to your vehicle manufacturer's specified torque

### C-3. Installing the Carrier Bearings

- Apply a thin film of high pressure grease to both bearing journals of the Air Locker.
- Using a bearing press or arbor press, press the smaller tapered roller bearing cones onto the bearing journal opposite to the ring gear flange of the differential carrier (as shown in Figure 4.) until the bearing seats firmly against the bearing journal shoulder.



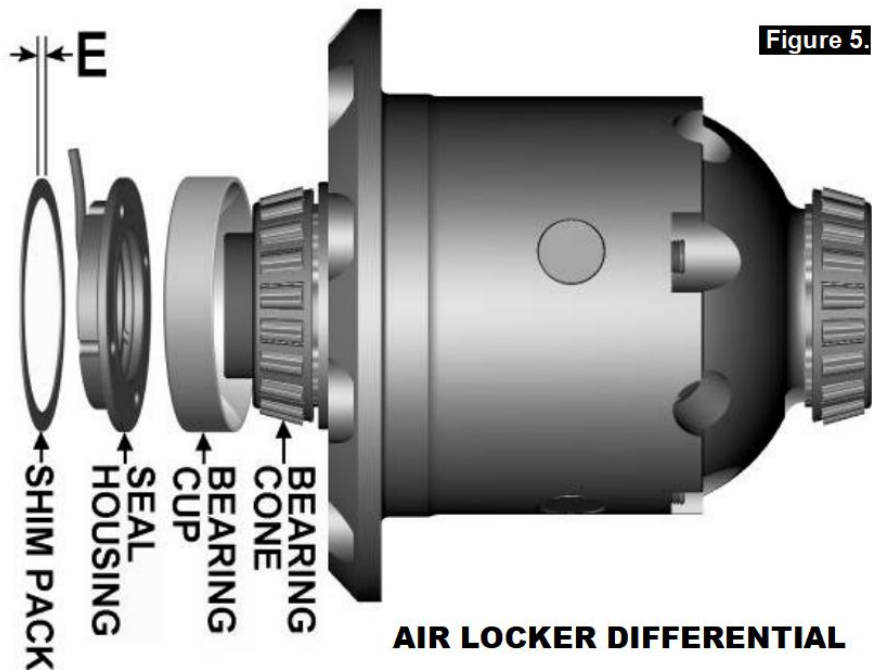
- Invert the Air Locker and press the larger bearing cone onto the bearing journal on the ring gear flange side of the differential (the seal housing side) until the bearing seats firmly against the bearing journal shoulder.

**NOTE : Never re-use any bearings which are damaged or worn.**

**Do not add any shims between the seal housing bearing and the bearing seat.**

## C-5. Preload Shim Measurement

In order to preload the tapered roller bearings in your Air Locker, measurements need to be taken so that a value can be calculated for the total shim thickness 'E' in Figure 5.

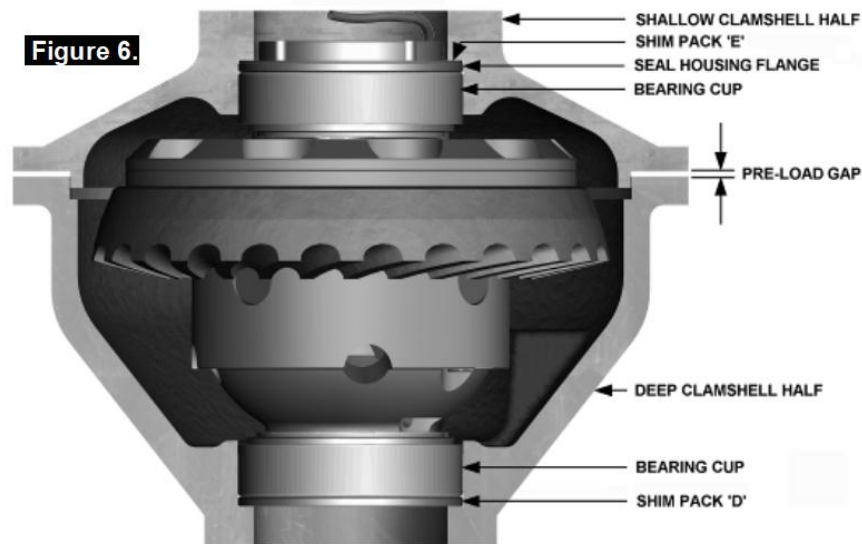


- Assemble the shim pack determined earlier as 'D' (Fig.3.) into the bearing bore of the deep half of the clamshell.
- Using a bearing press or arbor press, press the appropriate bearing cup into the bottom of the same bearing bore (i.e., until it stops against the shim pack).

**HINT : You should not be able to rotate the shim pack underneath the bearing cup if it has been pressed in far enough.**

- With the deep half of the clamshell sitting firmly on a horizontal surface, set the Air Locker into the bearing cup inside the clamshell.
- Bend the seal housing tube so that it points straight away from the seal housing flange.
- Assemble any remaining shims from the Air Locker shim kit (supplied) together into one shim pack and measure the total thickness.
- Assemble the shim pack onto the seal housing flange on the same side as the seal housing tube's solder joint.
- Assemble the seal housing into the bearing bore in the shallow half of the clamshell (shims against the clamshell).

- Using a bearing press or arbor press, press the remaining bearing cup into the bottom of the same bearing bore (until it stops against the seal housing).
- Carefully assemble the shallow half of the clamshell over the top of the Air Locker.
- Measure the preload gap that exists between the two halves of the clamshell housing with a feeler gauge. (Refer to Fig.6.)



**NOTE :** The preload gap should be the same when measured all the way around the housing. If this is not true, then reposition the shallow clamshell half and re-measure.

**HINT :** Sit the assembly in an arbor press and lightly push down on it. This will help to ensure that the clamshells halves are sitting evenly.

- Subtract the amount measured at the preload gap from the thickness of the shim pack placed onto the seal housing flange.
- Record the result as this is your true 'end float' amount.

$$\text{TOTAL SHIMS} - \text{PRELOAD GAP} = \text{END FLOAT}$$

## C-6. Calculation & Selection of Preload Shims

- Consult your vehicle manufacturer's service manual to determine the carrier bearing preload amount specified for your vehicle.

**NOTE :** If your service manual specifies preload in terms of a torque value measured off the drive pinion flange, then assume a preload amount of 0.25mm [0.01"] for the following calculations. Once you have assembled the housing to check the final backlash (Refer to Section 3.12 Checking the Backlash) you should verify that your preload is correct using a torque wrench and your service manual's table of values.

- Add the specified preload amount to the end float measurement determined with the feeler gauge to determine a shim amount for 'E' (Refer to Figure 5.).

### **PRELOAD + END FLOAT = SHIM PACK**

- Create a shim pack 'E' to closely match the measured amount

**NOTE :** Do not add shims between the bearing cone and the bearing seat and NEVER machine the Air Locker.

## C-7. Drilling and Tapping the Bulkhead Port

- Remove the Air Locker from the housing.
- Press the shims, seal housing and bearing cup out of the bearing bore of the shallow half of the clamshell.
- Mark a spot on the shallow half of the clamshell in the same position shown in the photographs in Figures 7. & 8.



**NOTE :** To best determine the correct vertical position of the drilled hole, measure down from the machined face (shown at the top of the picture in Figure 8.) a distance of 19mm [3/4"] and mark the horizontal line which the hole is centered on. Then refer to Figure 9. for the correct position on that line to start drilling.

**NOTE :** To Ensure that the bulkhead fitting hole will not interfere with the existing bolt hole.



## C-8. Installing the Seal Housing

- Sit the seal housing on top of the shallow clamshell half.
- Without using sharp, jagged tools such as pliers (usually your hands are the best tool for this job), gently bend the seal housing tube so that it lines up with the bulk head fitting hole as shown in Figure 10.
- Mark the tube approximately 8mm [5/16"] out from the end of the hole (Fig 10. ), and cut with an automotive brake line tubing cutter.



- Make sure the seal housing tube and the grooves of the seal housing are clean and free from any contaminants (e.g., water, dirt, metal filings, etc.).
- Inspect the seal housing O-rings (supplied) for dirt, damage or other conditions which might cause leaks.

**NOTE : Be careful not to bend the seal housing tube or damage the O-ring grooves.**

- Generously lubricate the O-rings with oil prior to assembly, then insert them into the grooves of the seal housing.

**NOTE : When assembling the O-rings, be careful not to leave them twisted when seated in the grooves as this could cause excessive wear and leakage.**

- Assemble the shim pack and seal housing ('E' in Figure 5.) into the bearing bore of the shallow half of the clamshell.

- Position the seal housing so that the end of the seal housing tube goes through the center of the bulkhead port hole(Refer to Figure 11.)



Figure 11.

- Using a bearing press or arbor press, press the bearing cup into the bottom of the bearing bore until it stops against the seal housing.

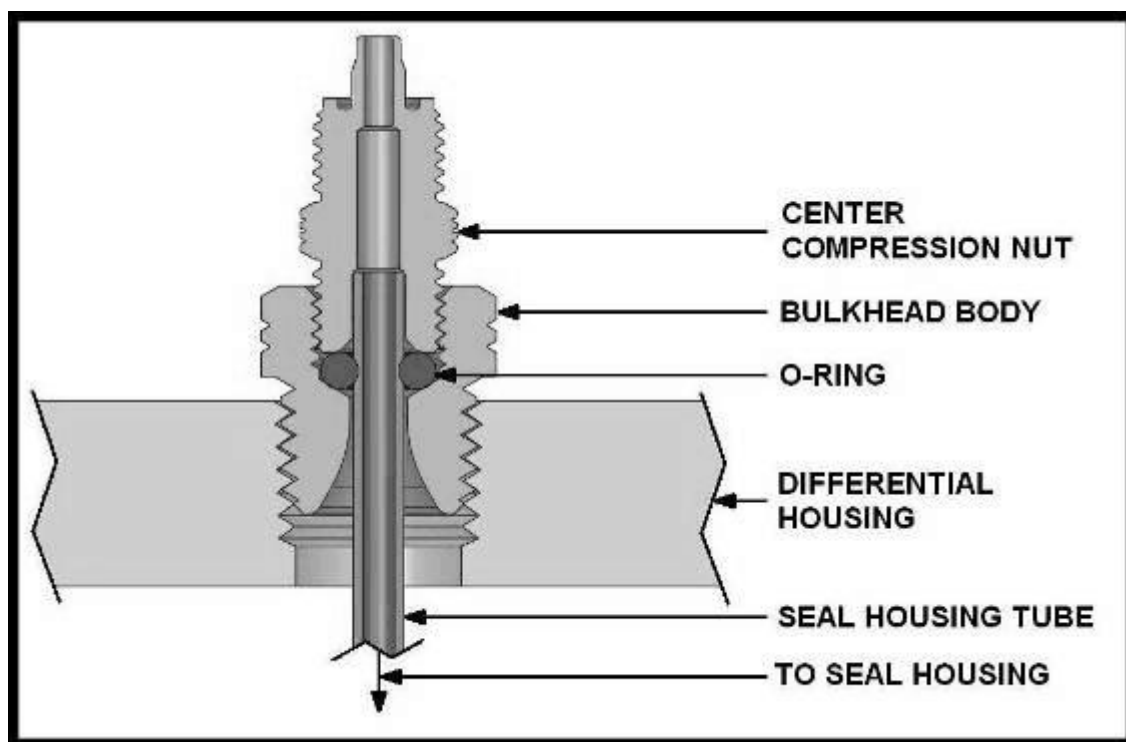
**NOTE : Do not use excessive force when pressing as this may damage the seal housing assembly.**

### C-9. Installing the Bulkhead Fitting

- To obtain an oil tight seal, apply a thread sealant to the threads of the bulkhead body.
- Slide the bulkhead body over the seal housing tube and screw it into the bulkhead port, and tighten.
- Wipe the area clean of any excess thread sealant (inside and outside of the housing)

### C-10. Setting up the Bulkhead Fitting

- From the outside of the housing, assemble the small O-ring over the top of the small length of seal housing tube that can be seen inside the bulkhead fitting.
- While holding the seal housing tube at depth, insert the small drilled end of the center compression nut over the extended tube as shown in the assembly diagram (Fig.12.), and screw it into the bulkhead body, and tighten.



**NOTE :** Excessive tightening of the center compression nut is not necessary to form a good seal around the tube and may damage the O-ring or the threads of the compression nut.

**NOTE :** Make sure the seal housing tube is all of the way into the center compression nut while you are tightening it.

## C-11. Final Assembly

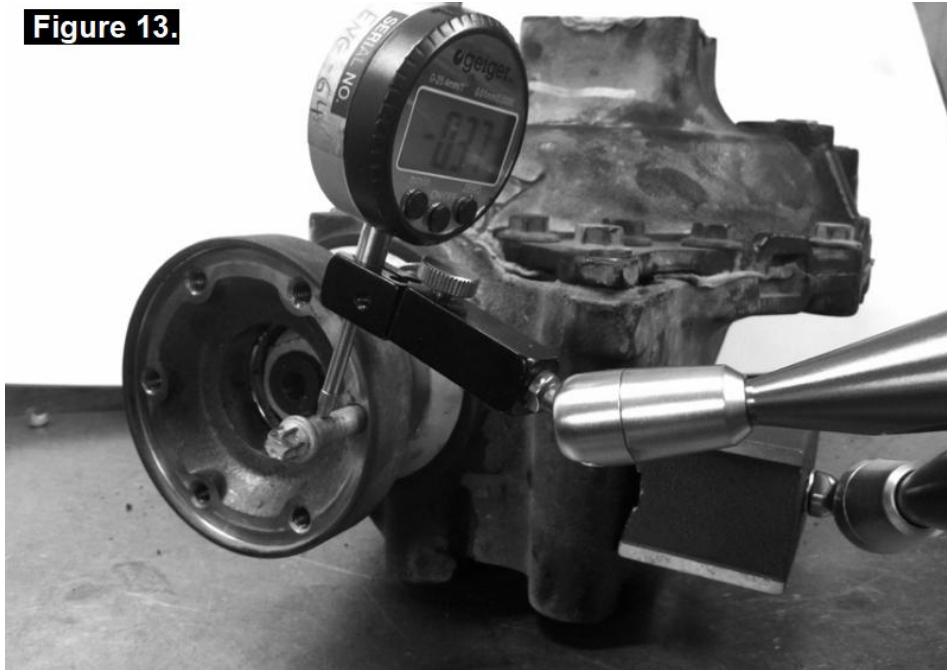
- Turn the shallow half of the clamshell upside down and insert the Air Locker into the seal housing by gently lowering it through the bearing cup and into the seal housing with a gentle twisting motion. This will allow the O-rings to engage gently.
- Rotate the Air Locker a few turns to make sure it rotates freely and smoothly.
- Carefully assemble the deep half of the clamshell over the top of the Air Locker.
- Bolt the clamshell assembly closed.
- Check that some backlash can be felt between the ring and pinion gears. No backlash would be an early indication of incorrect shim thickness.
- The seal housing tube needs to be carefully bent so that it will stay clear of any moving parts of the differential and not rub against any sharp stationary edges on the clamshell.

**NOTE : The seal housing can be rotated slightly by lightly tapping the oil drain holes in the flange using a drift or pin punch.**

## C-12. Checking the Backlash

- Refer to your vehicle manufacturer's service manual for the specified maximum and minimum amounts of backlash. If the backlash measured here is not within the specifications then the differential will have to be re-shimmed.
- Screw a bolt into the flange to measure off, and set a dial indicator in place as shown. (Refer to Figure 13.)

**Figure 13.**



- Insert a large flat screwdriver or pry-bar through the oil drain hole so that you can stop the differential from rotating (Figure 14.)
- Gently rotate the pinion gear in both directions and observe the maximum variation in depth from the indicator (i.e., the highest value minus the lowest value). This value is referred to as the ring and pinion backlash.
- Rotate the differential center 90° and measure again for accuracy.
- Record the average of all measurements.

## C-12.1. Re-Shimming the Backlash

**NOTE :** This step is only necessary when adjusting for incorrect backlash.

- Remove the bolts from the clamshell housing.
- With the shallow half of the clamshell sitting firmly on a horizontal surface, lift off the deep half of the clamshell.
- Gently lift the Air Locker straight upward out of the seal housing in the shallow half of the clamshell.
- Remove the center compression nut from the bulkhead fitting. (Fig.12.)
- Pull the seal housing tube free of the bulkhead fitting.

**NOTE :** This may require rotating the seal housing slightly.

- Using an arbor press or bearing press, press out the seal housing assembly and the bearing cup from the deep half of the clamshell.
- To decrease the amount of backlash, reduce the shim thickness 'D' (Fig.3.) and increase the shim thickness 'E' (Fig.5.) by the same amount. Reverse this step to increase the backlash.
- Reinstall the Air Locker into the differential assembly.
- Check backlash again as before.

### C-13. Bench Testing the Air Locker

- To bench test the Air Locker; when 620kPa [90 PSI] shop air is applied to the seal housing tube, the Air Locker should engage.
- Check all fittings and the seal housing for air leaks.
- Rotate the differential carrier by turning the pinion flange whilst applying air pressure.

**NOTE :** An accurate way to test for air leaks is to fit a shut-off valve to an air pressure gauge. Once 620 KPA [90 PSI] is reached close the valve, disconnect the air hose, and watch to see if there is any drop in pressure. If so, this will indicate an air leak.



- If a leak is found to be present, spray a soap and water mixture onto the bulkhead air fitting. Bubbles should appear at any leak points.

**NOTE :** Do not spray this soapy mixture inside the differential

- Check that leaky fittings have been adequately tightened.
- Disassemble, clean threads, and reapply thread sealant if leaking persists.
- If a leak is found at the seal housing, remove the Air Locker and carefully remove the seal housing assembly and examine the O-rings. Be very careful with the O-rings and check for defects, damage, wear, or presence of foreign material in the O-ring grooves. Replace if necessary.

## C-14. Reinstalling the Differential Assembly

- Ensure that any oil seals you removed from the differential housing have been either re-installed or replaced.
- Reassemble the differential assembly according to your vehicle manufacturer's service manual using gasket sealant where necessary.
- Install the differential assembly into the vehicle.
- Insert both CV axles completely into the housing and gently tap them inward until the retaining clips have seated.

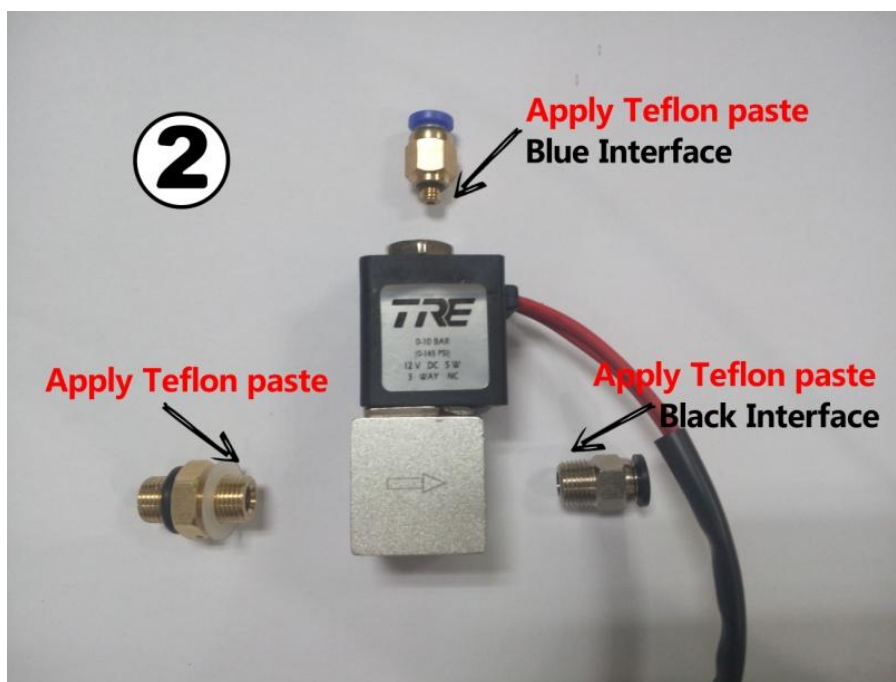
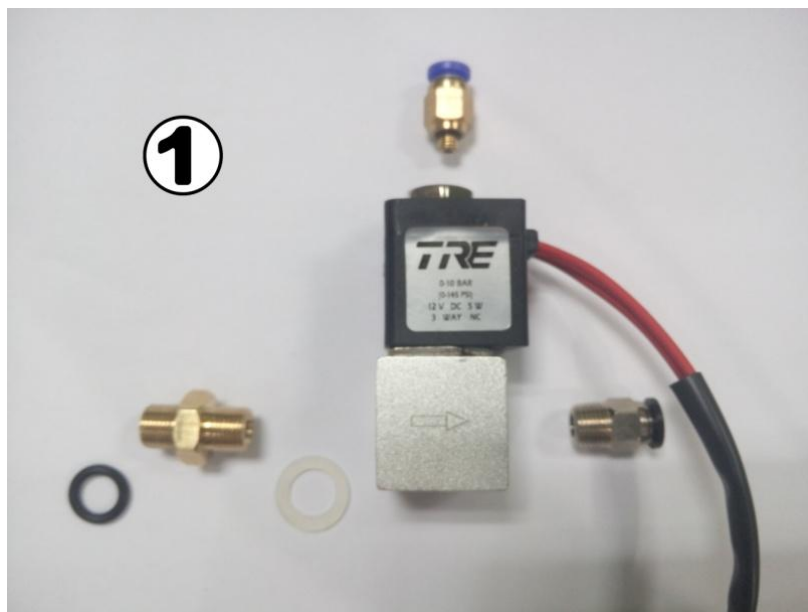
**NOTE : Be careful not to damage oil seals with the axles.**

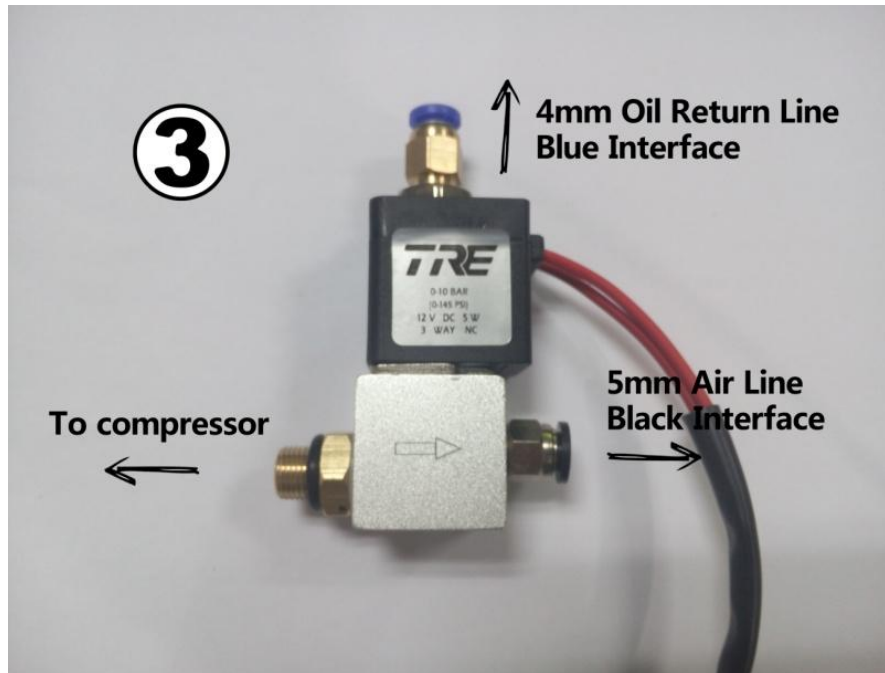
- Reassemble brakes and wheels according to your vehicle's service manual.
- Reconnect the drive shaft flange.



## D) Air System

### D-1. Mounting the Solenoid





## D-2. Connection to Air Compressor

- Remove one of the 1/8 " BSP plugs from its port in the compressor tank.
- Apply Teflon paste to the nipple (1/8 " X 1/8 " BSP) and insert it into the port and tighten.
- Apply Teflon paste to the free end of the nipple.
- Assemble the inlet port side of the solenoid (opposite arrow side) onto the nipple and tighten.

The solenoid should be rotated into a position that does not obstruct any other ports on the compressor tank.

**NOTE : The solenoid exhausts compressed air through the center of the black retaining cap when the Air Locker is disengaged. Make sure this orifice cannot be obstructed (the TRE equipped 4mm Oil return line should mount into the solenoid black retaining cap hole)**

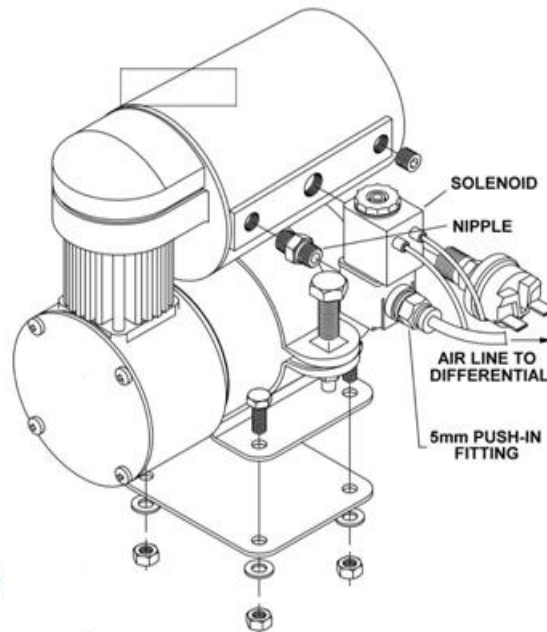
- Apply Teflon paste to the threads of the 5mm push-in fitting and assemble it into the solenoid outlet port (arrow side) and tighten.

**Note : Do not screw the plastic black part of the solenoid when mounting the solenoid.**

**Figure 19.**

# TRE

## Air Compress



### IMPORTANT:

TRE cannot warrant your Air Locker(s) against damage caused as a result of using an alternate air supply. If you have any doubts as to the suitability of your air system to use in an Air Locker system, consult your TRE distributor.

### D-3. Running and Securing the 5mm Air Line and 4mm Oil Return Line

The path taken by the air line from your air compressor to your Air Locker is unique to your vehicle and the position of your air source. Plan ahead carefully when running the air line and always follow these guidelines:

- Account for axle travel when running the line from the axle to a fixed point on the vehicle. Leave enough slack in the air line to allow for maximum suspension travel in both directions.
- Avoid leaving large lengths of air line hanging underneath the vehicle where they may get tangled on rocks, sticks, etc.

**HINT : Cable tying the air line to one of your flexible brake lines will account for axle travel and should help keep your line from getting snagged.**

- Run the air line all the way from the compressor to the differential before trimming either end of the line to length. This will save complications that may arise if the air line has to be removed.
- Make sure the line does not contact sharp edges or abrasive surfaces that may damage the air line over time.
- Do not run the air line around tight bends which may kink the air line and restrict or block the air flow.
- Keep the air line well away from your vehicle's exhaust components. Air lines will melt if subjected to extreme heat.
- Do not run more air line than necessary. Excess line volume created when coiling the left over hose, using unusually large diameter hose, etc., will increase drain on the compressor tank resulting in the compressor running more often than needed.
- Support the air line by tying it back with cable ties wherever possible.
- At the solenoid end of the air line, trim the line to length with a sharp knife.

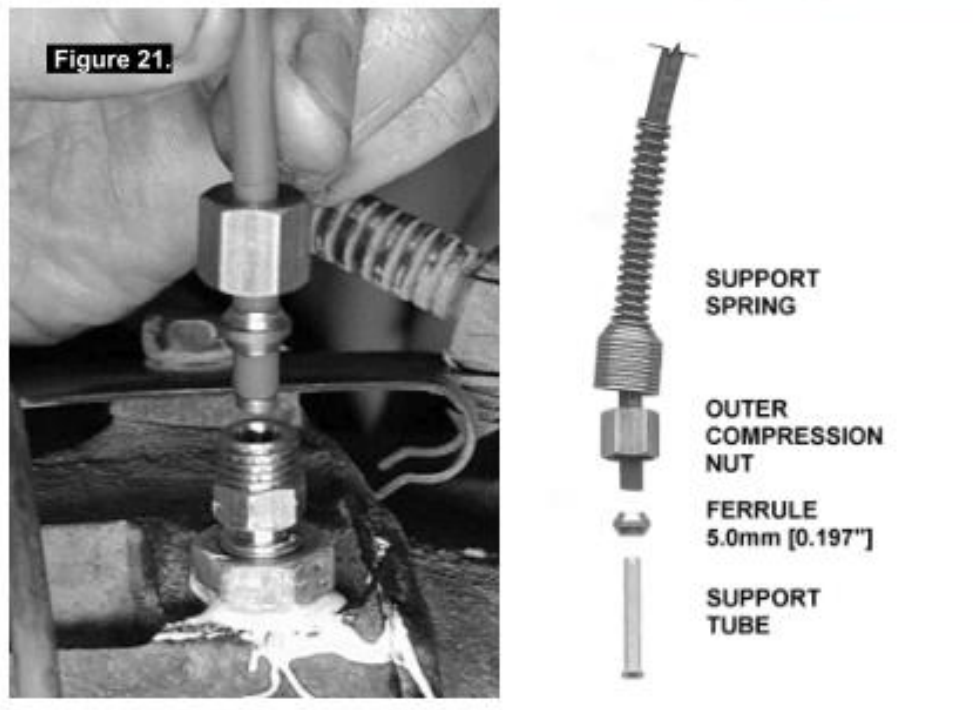
**NOTE : To remove the air line from the push-in fitting; while holding the flange of the fitting out, push the air line into the fitting as far as possible, then press the flange inward, then pull the air line free of the fitting**

- To attach the air line to the push-in fitting of the solenoid; insert the line firmly into the fitting, pull outward on the flange of the fitting while holding the line as far into the fitting as possible, and then gently pull outward on the air line to clamp the line in place.

#### **D-4. Connection to the Bulkhead Fitting(5mm Air Line)**

- Trim the air line to length using a sharp knife.
- Insert the support spring over the end of the air line - small end first. (Fig. 21.)
- Insert the outer compression nut over the air line.

- Push the air line onto the barb on the center compression nut, ensuring that it is pushed all the way to the end.



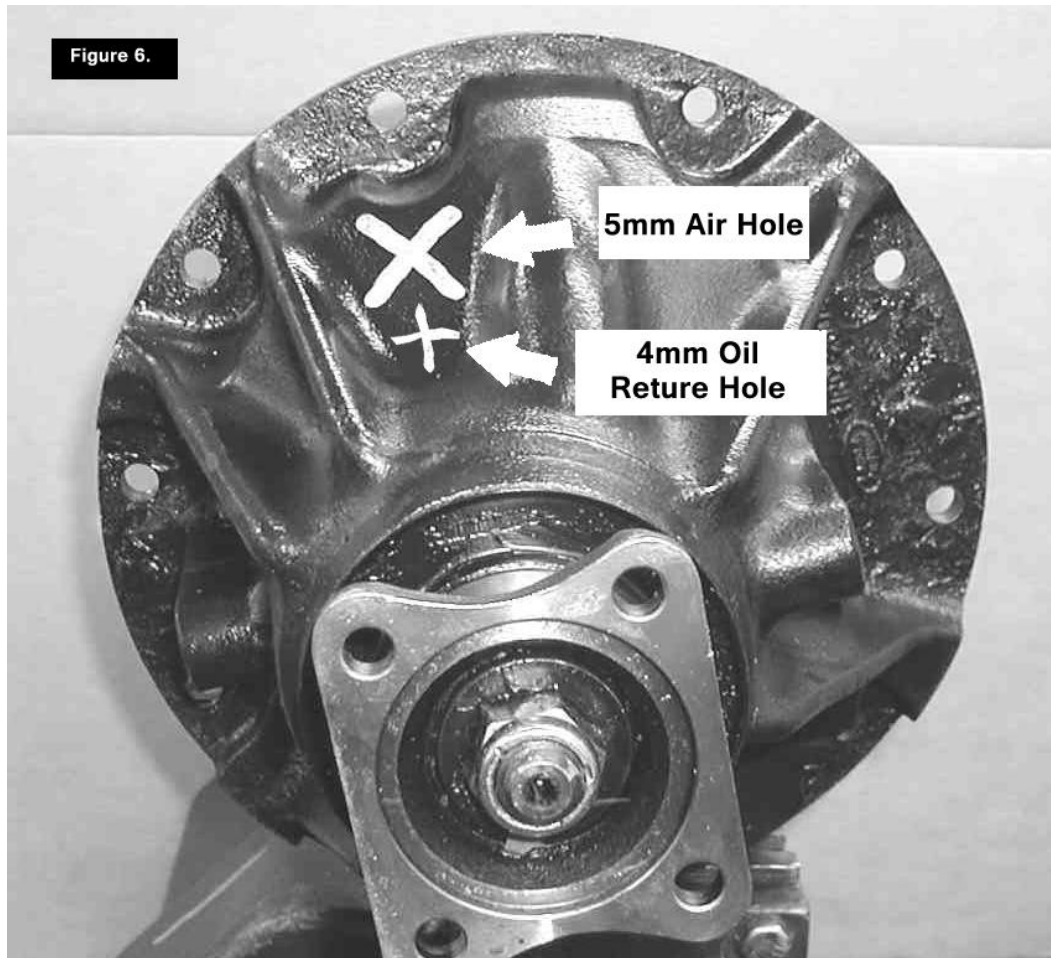
**HINT :** If the tube is too difficult to push on, place the end of the air line into a cup of boiled water to soften the tubing.

- Screw on the outer compression nut and tighten, while supporting the center compression nut with a 3/8" spanner. The airline is now attached to the center compression nut.

**NOTE :** The outer compression nut will tighten against a stop. Over tightening will not create a better seal.

- Assemble the support spring over the outside of the outer compression nut.
- Secure any loose sections of tube with a cable tie

## D-5. Connection to the Bulkhead Fitting (4mm Oil return Line)



- Screw the blue interface bulkhead fitting on the mark of differential case and tighten.
- Trim the air line to length using a sharp knife.

**HINT : If the tube is too difficult to push on, place the end of the air line into a cup of boiled water to soften the tubing.**

- Connect the 4mm air line to the blue interface bulkhead fitting from solenoid.
- Secure any loose sections of tube with a cable tie.

## D-6. Mounting the Actuator Switch(es)

Air Locker actuator switch(es) can be easily panel mounted inside the vehicle in a 21mm x 36.5mm [0.83 " x 1.44 " ] rectangular cutout.

**NOTE : Only attach the cover plate to the face of the switch once the switch has been mounted and wired correctly as the cover plates are designed to be difficult to remove.**

For reasons of safety and for ease of operation, the Air Locker actuator switch(es) should be mounted in a location picked to best suit the operator. Make sure you have taken the following points into consideration:

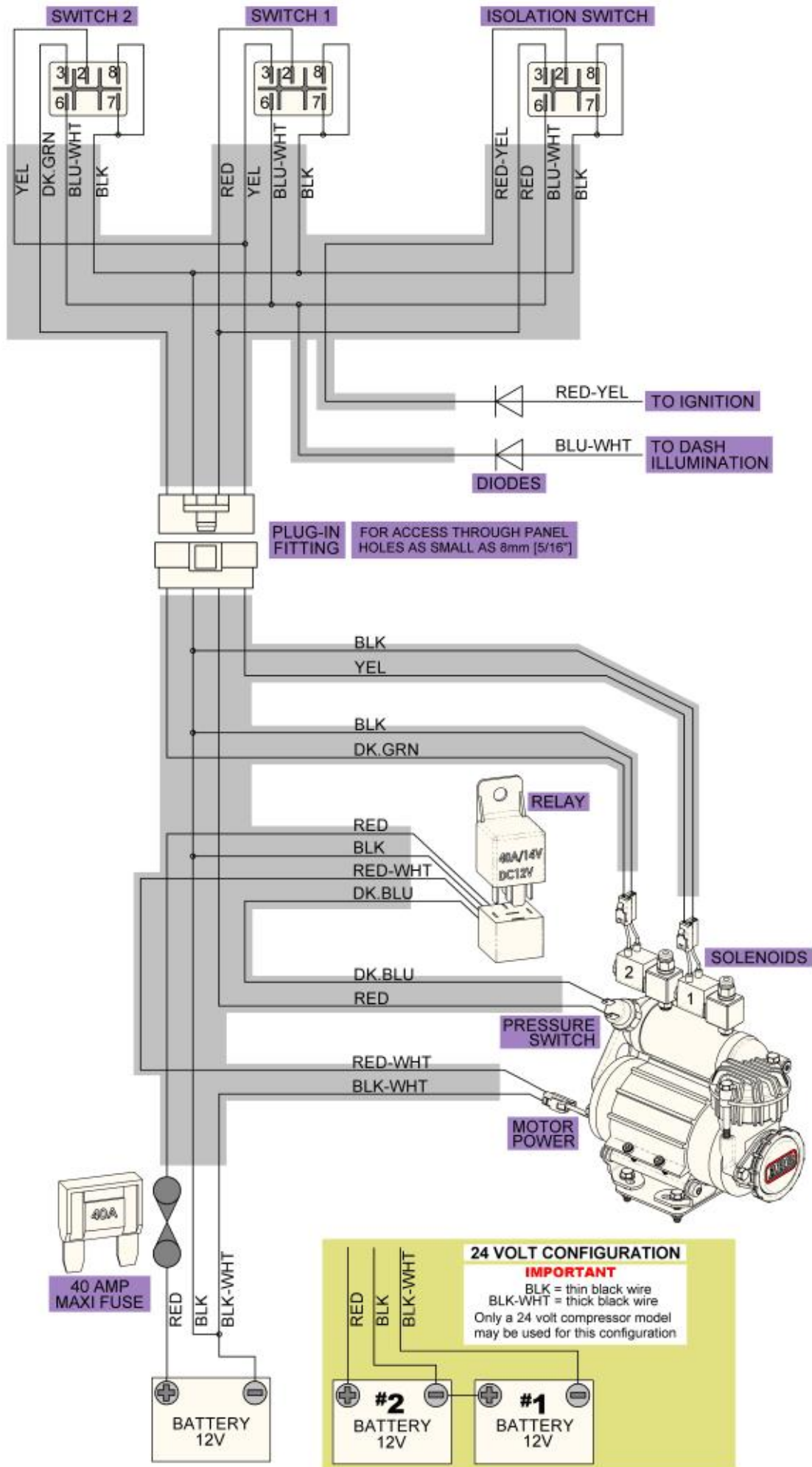
- Switch (es) MUST be mounted and should never be allowed to simply dangle from the wiring loom during vehicle use.
- Switch(es) should be within easy reach of the driver. Ideally, any Air Locker switch should be able to be operated without physical effort or distraction to the driver.
- Switch(es) should be mounted within the line of sight of the driver so that switch position ( ' ON ' or ' OFF ' ) can be visually determined by the rocker position and the illumination state.
- The position of the switch(es) should best eliminate any possibility of accidental operation by the driver or one of the passengers.
- Switch cutout position(s) must be located in an area with a minimum of 50mm [2 " ] of clearance behind the face of the cutout.
- Switch(es) should not be mounted where they will be exposed to water (e.g., in the lower section of an inner door panel).

## **E) Mounting & Connecting the Electrical System**

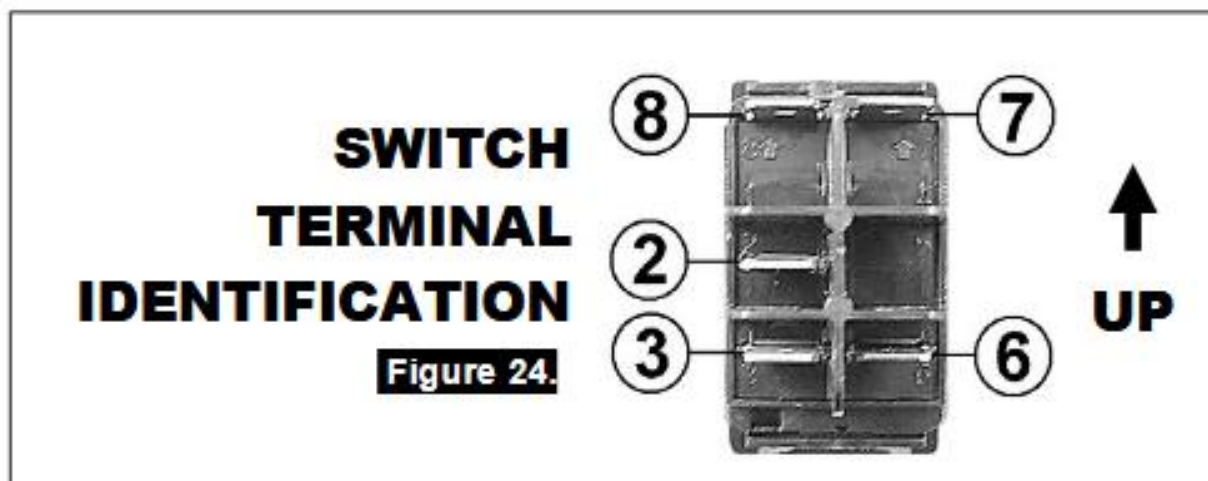
### **E-1. Wiring the Actuator System**

### **E-2. Connection to an Air Compressor**

When wiring the Air Locker actuator switch(es) and solenoid(s) to an TRE Air Compressor, all connections can easily be set up directly from the supplied wiring loom







## F) Testing & Final Assembly

### F-1. Leak Testing

- With the vehicle parked and the engine off, turn the compressor on and wait until the air system is fully charged.

**NOTE :** With the Air Locker(s) disengaged, the air compressor should not have to recharge over time. Intermittent recharging without Air Locker use usually indicates a leak at the solenoid fittings or at the compressor tank O-ring seal.

- Actuate the Air Locker(s).
- The compressor should not come on again for a rapid period. Air system recharging within that time period would indicate that a leak is present in the system.

**NOTE :** If an alternate air source (e.g., an air cylinder or a belt driven air pump) is used instead of a compressor, the air system will have to be leak tested with a pressure gauge and a shut-off valve in series before the solenoid input. (Fig.19.)

- If a leak is found to be present, spray a soap and water mixture onto all air fittings in the system while the compressor is fully charged. Bubbles should appear at any leak points.
- Check that leaky fittings have been adequately tightened.
- Disassemble, clean threads, and reapply thread sealant if leaking persists.

## **F-2. Testing the Air Locker Actuation**

To test that your air system, electrical system, and your Air Locker differential is functioning correctly:

- Support the vehicle such that the wheels are free to rotate (e.g., on axle stands , a chassis hoist, etc.)
- Leave the parking brake off, the transmission in neutral, and the Air Locker switch ' OFF ' .
- Turn the ignition to the ' ON ' position (leaving the motor off). The large illuminating symbol on the Air Locker switch cover should be ' OFF ' .
- Turn the compressor (or alternate air source) on to charge the air supply up to its maximum pressure.
- Rotate one wheel by hand.
- The wheel should rotate freely and the opposite wheel should be turning in the opposite direction without any resistance or mechanical noise from within the differential.
- Turn the Air Locker switch to the ' ON ' position. The illuminated symbol on the switch cover should light up.
- Rotate the same wheel again.
- Both wheels should rotate together.
- Turn the switch off again.
- Rotate the same wheel.
- The wheels should again rotate in opposite directions

## **F-3. Re-Sealing & Filling the Differential**

**NOTE : Consult the TRE Air Locker Operating & Service Manual for recommendations on differential lubricant specifications.**

- Replace the differential cover using gasket sealant or a new standard differential cover gasket for your make of vehicle.
- Refill the differential until level with the filler hole.
- Rotate the differential center 2 full turns.
- Check the oil level and add oil if necessary.
- Replace filler plug (apply thread sealant to filler plug before inserting if it is a threaded type plug).
- Wipe differential housing clean of any oil or grease which may collect dirt or other abrasive particles.

#### **F-4. Post-Installation Check List**

Now that the Air Locker installation has been completed, TRE recommends that you take the time to complete the following check list just to insure that you haven't missed any of the vital steps.

- The air system has been leak tested.
- Thread locking compound was used on the ring gear bolts.
- All torque settings comply with the vehicle manufacturer's specs and were set with an accurate torque wrench.
- Differential fluid complies with TRE recommendations and has been filled to the correct level.
- All air lines and wiring have been securely cable tied to resist snagging.
- Switch(es) have been securely mounted within operator reach, yet well away from danger of accidental engagement.
- Switch(es) function properly and illuminate to indicate that Air Locker(s) are engaged.
- All operators who are to use the Air Locker have read, and fully understand the TRE Air Locker Operating & Service Manual.

# ATTENTION

For the safety of vehicles and occupants, there are several points that must be understood and complied with:

- 1、 When driving at high speed on high traction pavement (IE: dry pavement, cement pavement, asphalt pavement, gravel pavement, etc.)The differential locking device has great damage to the transmission components and may cause an accident. The locking device can only be turned on when the road surface with high traction is required.
- 2、 Turn on the differential lock will affect the steering. User should cost time to understand how the differential will affect the steering. Otherwise, if you don't understand it, you can not use it rashly, which may put you and the occupants at risk.
- 3、 The switch should be installed in the proper range of the driver, but must ensure that the switch will not be accidentally touched by the driver, the occupant or the object loosened in the car, accidental turn on, or turn off will cause the vehicle out of control.
- 4、 When in use, the independent switch can avoid the unnecessary work of the air pump. To avoid accidental turn on the differential locker , the differential locker switch should be turned off when not in use. Do not use a independent air pump switch to simultaneously control the locking device. The air pump switch must be used separately.
- 5、 Although the stable and quality of the TRE differential lock is very strong, the locking device should not be turn on when the wheel is idling. Otherwise, the impact force generated when the two wheels are suddenly forced to rotate at the same speed may cause the half shaft be damaged , locking part worn. When turning on the locking device, make sure that the vehicle in a stopped state , is not activated or decelerated. Do not turn on the locking device when turning, do not turn on the locking device while braking.

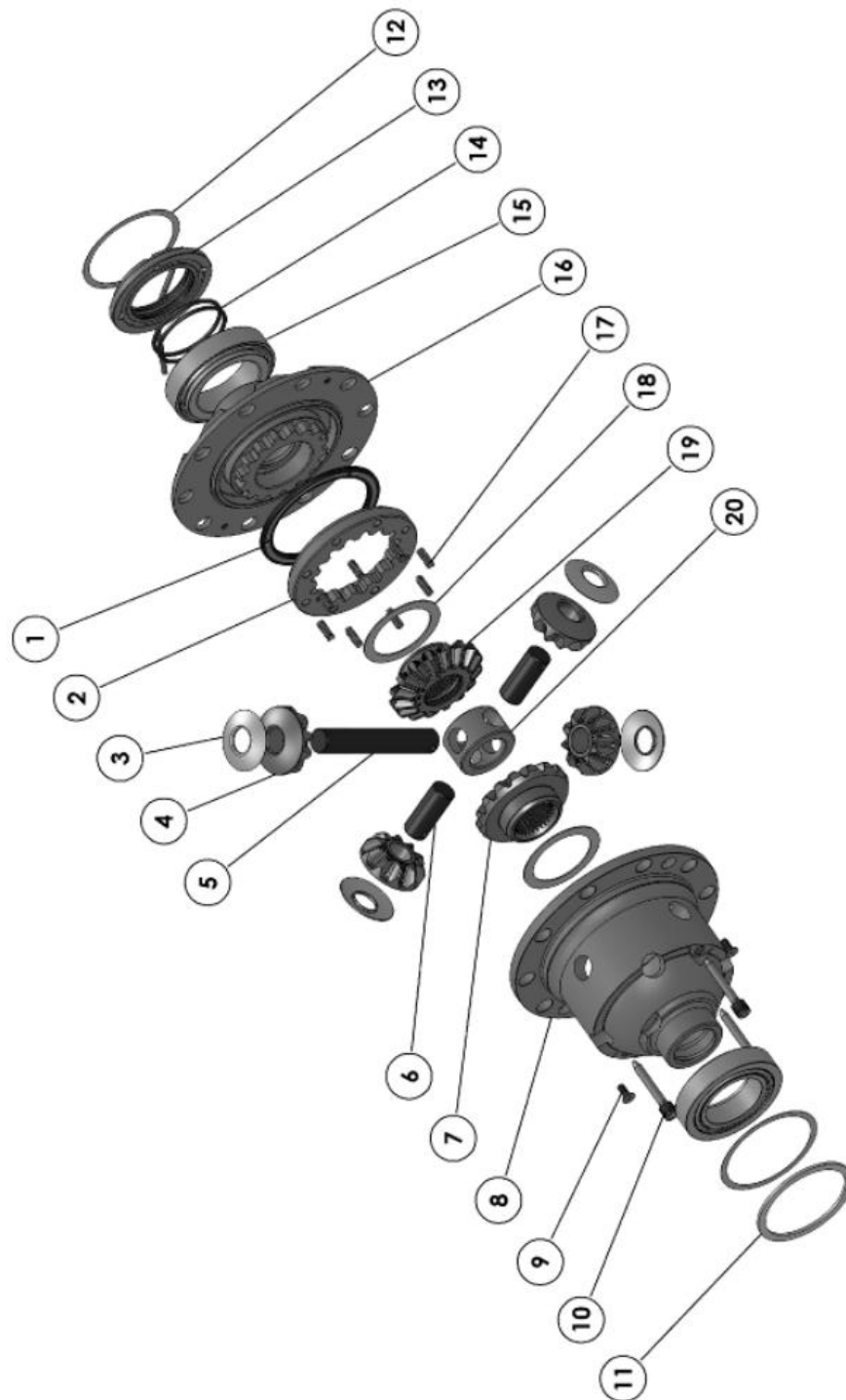
- 6、 In order to reduce the damage to the vehicle transmission system and reduce the risk of vehicle control, the speed should be reduced when turning on the locking device, slowly and skillfully off-road driving to achieve the best years of vehicle use
  
- 7、 Do not make sharp turns after locking the differential . Especially when the front and rear locks are locked at the same time, keep the straight line as much as possible. Otherwise, it is easy to twist the half shaft or Differential.
  
- 8、 If the locking device is not used frequently, it will produce oil film. Please test it .

# PART LIST

## Air Locker model: TR 217

### LR DISCOVERY 3 + 4, FR, 29 SPL

#### 1. Exploded Assembly diagram



## 2. Component List

<b>MODEL No. : TR217</b>			
<b>ITEM #</b>	<b>QTY</b>	<b>DESCRIPTION</b>	<b>NOTES #</b>
01	1	BONDED SEAL	
02	1	CLUTCH GEAR	
03	4	PINION THRUST WASHER	
04	4	PINION GEAR	
05	1	LONG CROSS SHAFT	
06	2	SHORT CROSS SHAFT	
07	1	SIDE GEAR SIDE GEAR	
08	1	DIFFERENTIAL CASE	
09	2	COUNTERSUNK SCREW	
10	3	RETAINING PIN	
11	N/A	OE MASTER SHIM	
12	1	SHIM KIT	
13	1	SEAL HOUSING ASSEMBLY	
14	2	O-RINGS	
15	2	BEARING	
16	1	FLANGE CAP ASSEMBLY	
17	8	RETURN SPRING	
18	2	SIDE GEAR THRUST WASHER	
19	1	SPLINED SIDE GEAR	
20	1	SPIDER BLOCK	
*	1	BULKHEAD KIT, O-RING TYPE, 3.5-5mm	
*	1	5mm PUSH-IN FITTING (RI 5 1/8" )	
*	1	NIPPLE, 1/8" BSP, MALE TO MALE	
*	1	NYLON AIR LINE (5mm Dia X 6m long)	
*	1	NYLON OIL RETURN LINE (4mm Dia X 6m long)	
*	1	SOLENOID VALVE	
*	1	ON/OFF SWITCH	
*	1	SWITCH COVER 'REAR'	
*	10	CABLE TIE	
*	1	WARNING LABEL	
*	1	RHINO STICKER	
*	1	TRE 4X4 BROCHURE	
*	1	WARRANTY CARD	
*	1	INSTALLATION MANUAL	