

VW TYPE 2 MINI LOCKER

Updated 1/14/12

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HOW THE MINI LOCKER FUNCTIONS

The Type 2 Mini Locker consists of two bi-directional over-running dog clutches. Each one has a driving member (the driver) and a driven member (the existing sidegear). Both clutches are rotated by the differential cross shafts to form a fully locking combination when engine torque is applied (see Figure 1).

The Mini Locker provides differential action when cornering by allowing the rear wheels to rotate at different speeds. Because the outside wheel is "ground driven" faster than the inside wheel, the dog clutch disengages, allowing the outside wheel to rotate freely; power continues to be applied to the slower (inside) wheel. In low traction situations, the Mini Locker will always deliver power to the wheel with the most grip, with up to 100% of the engine's torque available to either wheel.

In contrast, a standard "open" differential always divides torque equally between the wheels. With an open differential, if one wheel slips and starts spinning with only a small amount of torque applied, the same small amount of torque is sent to the wheel with traction. In other words, one wheel spins and you don't move forward.

The Mini Locker eliminates this problem. Power will always be delivered to the wheel with the most traction, which helps you keep moving forward instead of getting stuck.

MINI LOCKER FEATURES

The Mini Locker's design is simple and rugged, with no Belleville washers, clutch packs or cone clutches to break or wear out. It uses stainless steel springs for excellent resistance to high temperatures and fatigue. The drivers and couplers are made from high-carbon steel and are heat-treated for toughness and durability. Because it is "all gears", it does not require special limited-slip differential additives in the gear oil.

VEHICLE OPERATION

The Mini Locker is recommended for off-highway use only. A vehicle equipped with a Mini Locker will have much more traction than before. We suggest that you get used to its new capabilities slowly. Take it to an off-road area in which several types of terrain are present and try each one carefully to see how well your "new" vehicle performs. Only after becoming thoroughly familiar with its new capabilities should you put it through its paces with serious off-roading.

Remember, the Mini Locker will extend the capabilities of your vehicle and let you get places more easily, but it doesn't make up for carelessness and inexperience. Whatever the driving conditions, be careful and have fun!

CAUTION - BREAKING A DRIVE AXLE: A drive axle can break when it

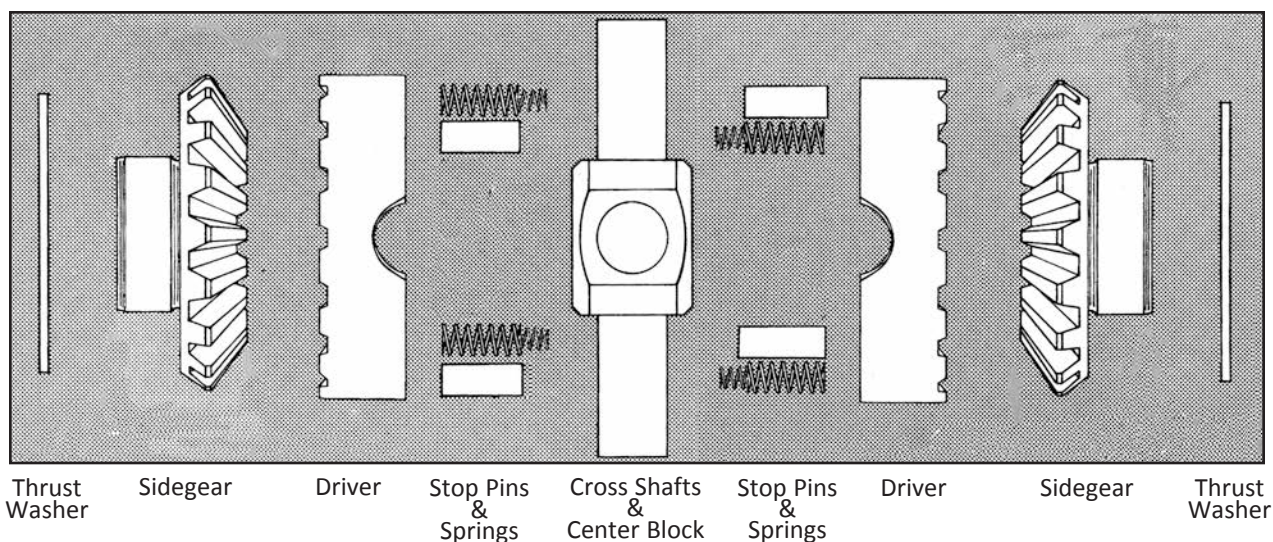


Figure 1. Mini Locker Exploded View

is under a lot of power. A locking differential can effectively deliver double the power to an axle (100% vs. 50% for an open differential). If an axle breaks, the wheel on the opposite side will still be powered because of the torque transferring capability of the locking differential, and the vehicle will tend to turn quickly toward the side on which the break occurred. Vehicle control will be affected by a broken axle shaft and further damage can occur. Replace it as soon as possible!

GENERAL INSTALLATION NOTES

The VW Type 2 Mini Locker is designed to fit into a “4-spider” 091 differential housing only. If you have a 002 differential housing (standard in 1969-1975 model year VW Bus transaxles), you will need to purchase a 1976 and later 091 4-spider diff housing, thrust washers, bearings, sidescrew adjusters, final drive flanges, and a few other parts before proceeding. Weddle Industries offers a complete 002 to 091 differential conversion kit at a very reasonable price.

For racing vehicles or vehicles that will be subject to extreme abuse, we also recommend that you use a heavy duty differential cover (such as Weddle Industries part # 5212) instead of the stock VW differential cover.

Installing a Mini Locker is a relatively simple operation. However, some special tools and a basic understanding of the VW transaxle assembly procedure is required to remove and re-install the differential housing. Therefore, we recommend that an experienced VW mechanic or transaxle builder perform the installation. These instructions assume that the person installing the Mini Locker has the Bentley VW Service Manual for reference to transaxle and differential removal, torque values, settings, clearances, etc.

These installation instructions are provided to assist you or your mechanic with the installation of your new Mini Locker. However, the ultimate responsibility for the success of the Mini Locker installation and the subsequent proper operation of your vehicle rests with you, the vehicle owner. Be sure to read and understand the driving information above!

PRELIMINARY OPERATIONS

The transaxle must be out of the vehicle and the oil must be drained before the differential can be removed. If the same differential housing, differential cover, bearings, and adjusters are to be re-used, it is not necessary to change the ring and pinion settings. However, you must remember to mark the sidescrew adjusters and the transaxle case with witness marks before disassembly so that each adjuster can be set back to the same position upon re-assembly (also: mark the adjusters left and right to make sure that they go back on the correct side). These marks are very important for correct re-assembly! Any uncertainty about the correct positioning of the adjusters means that backlash and pre-load will have to be reset.

1. Remove the bell housing, input shaft, final drive flanges, and sidescrew adjuster locks from the transaxle. Before removing the sidescrew adjusters, be sure to mark them as outlined above.
2. Remove the differential section from the transaxle.

3. Remove the ring gear bolts and the ring gear. It may need to be tapped off the housing with a brass drift or soft mallet.
4. Separate the differential cover from the diff housing by tapping the end of the sidegear gently from side to side with a soft mallet.
5. Remove the cross shaft retaining pins.
6. Remove the cross shafts, spider gears, sidegears, all thrust washers, and the center block.

INSPECTION OF THE PARTS

These steps are important. If inspection shows that any of the following parts are not in excellent condition, they must be replaced. Please note that the spider gears and their concave thrust washers will be eliminated.

1. Thoroughly wash all the differential parts, then dry them.
2. The condition of the sidegears is very important to the proper operation of your new Mini Locker. We recommend installing new sidegears (which should have been included with your Mini Locker if you purchased it from Weddle Industries). If you are going to re-use your old sidegears, carefully check the teeth for pitting, cracking, or excessive wear. Most importantly, make sure that the top edges of the teeth (where the sidegear engages the Mini Locker driver) are not excessively worn. For the Mini Locker to function properly, there must be good square top edges on both sides of the teeth.
3. Inspect the sidegear thrust washers. They are important for the correct positioning of the Mini Locker parts. If they are excessively worn or are cracked, obtain new ones.
4. Inspect the differential housing and cover for any wear, cracks, or similar damage. Also inspect the bearings to make sure that they are in good condition and that they fit tightly on the differential housing and cover. If the housing, cover, or bearings look bad, replace them. However, if you do, remember that the ring and pinion backlash and bearing pre-load will need to be reset using a dial indicator, as described in the Bentley VW Service Manual.

INSTALLATION OF THE MINI LOCKER PARTS

Before beginning Mini Locker installation, study Figure 1 so that you will be familiar with the terminology used to describe the various parts that came with your Type 2 Mini Locker.

1. Before assembly, it is a good idea to coat the teeth of the sidegears and both sides of the thrust washers with a light layer of medium grease. Also place a little grease in each of the four holes in each driver. The grease will help hold the springs and pins in place during assembly and assist with functioning of the parts until the gear oil circulates.
2. Place a thrust washer and the long sidegear in the diff housing (Figure 2). At this point, it is easiest to clamp the protruding splines of the long sidegear in the soft jaws of a vise so that the large end of the differential housing is facing up and the sidegear is held firmly seated in the housing. This will give you two free hands to complete the rest of the assembly.



Figure 2. Place the long sidegear (with thrust washer) into the housing.



Figure 3. Place a driver onto the sidegear with teeth meshed.

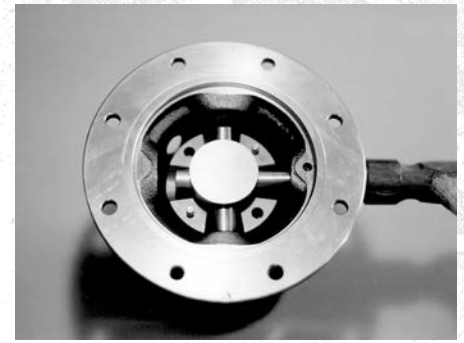


Figure 4. Tap the cross shaft through the housing and the center block.

3. Place a driver onto the sidegear in the housing with the teeth meshed (Figure 3).

4. Place the center block into the center of the driver. Carefully tap the long cross shaft through the housing and the center block (Figure 4). Be very careful not to let the long shaft become caught on the driver or the center block as it comes through! Also, make sure you keep the retaining pin hole in the long cross shaft lined up with the hole in the housing. If the shaft is hard to insert, use a brass or plastic mallet to drive it in to avoid damaging the ends. If you have problems getting everything lined up, check to make sure that the sidegear is all the way down in the housing.

5. Carefully drive the short shafts into the remaining two holes in the housing and center block. Once all the shafts are in place, install the cross shaft retaining pins.

6. Place a double spring assembly (a small spring inside a large spring) into each oblong hole in the bottom driver and place a stop pin into each of the two round holes (Figure 5). **IMPORTANT!** The springs should be about flush with the surface of the driver and they must sit all the way in the bottom center of the oblong holes.

7. Repeat step 6 with the second driver (the one that is not yet in the housing). The grease placed in the holes earlier will help hold things in place (Figure 6). Note: at this point, each driver should have two stop pins and two double spring assemblies installed.

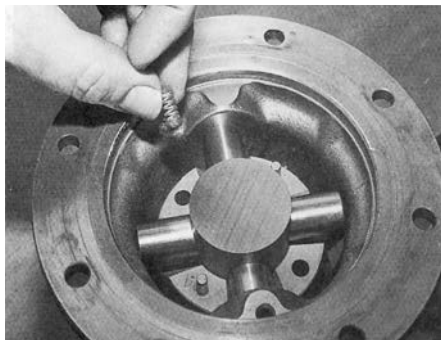


Figure 5. Place a double spring assembly into each oblong hole in the bottom driver and a stop pin into each round hole.

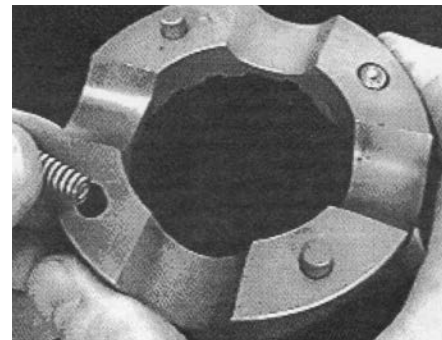


Figure 6. Repeat step 6 with the other driver. The grease placed in the holes earlier will help hold everything in place.

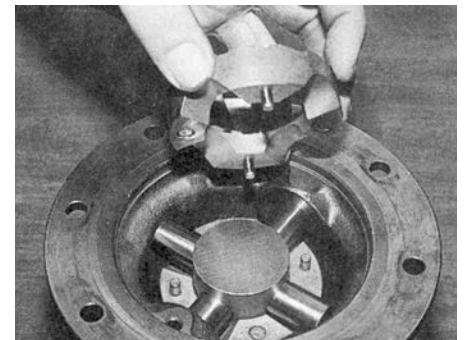


Figure 7. Install the top driver so that the pins in the top driver rest on the springs in the bottom driver.

8. Turn the top driver over and hold it so that the stop pins line up with the springs in the opposite driver. Carefully lower it until the pins rest on the springs (Figure 7). Push it up and down to be absolutely sure that all pins and springs are in place and are functioning properly. Proper operation of the parts at this point is very important!

9. Place the short sidegear onto the top driver with the teeth meshed, then place the thrust washer onto the sidegear (Figure 8).

10. Place the differential cover onto the housing (Figure 9). Line up the bolt holes and tap it down until seated.

11. Heat the ring gear to about 200° F and tap it into place on the differential housing with a soft mallet. Make sure that the bolt holes in the ring gear line up with those in the housing. This is easiest if dowel studs are used to guide the ring gear into the proper position on its way down. Once everything is correctly in place, torque the ring gear bolts to 40 ft-lb in a criss-cross pattern to make sure everything pulls up evenly. We strongly recommend that you use a high strength thread locking compound (such as Loctite 272) to help prevent the ring gear bolts from coming loose.

12. Inspect your work. Look for anything that is not correct. Turn the sidegears by the splines to make sure that the drivers easily rotate back and forth a short distance, stopping at the cross shafts.

FINAL ASSEMBLY

1. Place the assembled differential back into the transaxle case. The ring gear should be on the left hand side of the car.
2. Thread the input shaft and the mainshaft together until the two shafts meet and then back off one spline. Slide the coupler all the way onto the splines and install a new snap ring to hold it in place. If the same bearings, main housing, differential cover, and adjusters are being re-used, the ring and pinion backlash and pre-load should not have to be reset. Install the adjusters on their correct sides and screw them in to their original positions, as marked before disassembly. During the final positioning of the adjusters, the tightening should become more difficult as pre-load is being applied to the bearings. If any of the parts mentioned above have been replaced, the ring and pinion backlash must be reset using the method outlined in the Bentley VW Service Manual.
3. Install the sidescrew adjuster locks and final drive flanges using new snap rings. Install new oil seal plugs into the final drive flange centers to prevent transaxle fluid from leaking into your CV joints and contaminating the grease.
4. When all the above steps are completed, the ring and pinion backlash and pre-load should be unchanged and no further adjustments will be needed. It is a good idea to rotate the ring gear one revolution to be sure that nothing is binding, then rock the ring gear back and forth to see if the backlash appears to be close to the factory recommended setting of .15mm to .25mm (.006" to .010"). If you have any doubt about the correct positioning of the ring gear, you must check the backlash and pre-load with a dial indicator, as outlined in the Bentley VW Service Manual.
5. Once you are confident everything has been put back together correctly, replace the bell housing (using a new gasket) and tighten the bell housing bolts (or nuts) to 18 ft-lb. Clean and re-install the magnetic drain plug.
6. Add gear oil. Most standard GL-4 rated 90-weight gear oils are adequate, but you or your transaxle builder may prefer a specific brand of "high performance" transaxle lubricant.
7. Re-install the transaxle in the vehicle.

TESTING THE COMPLETED INSTALLATION

Before you put the engine back in the vehicle you should test the Mini Locker installation to make sure it is functioning properly. First, make sure that the vehicle is adequately blocked so that it cannot roll forward or backward. Put the transaxle in 1st gear and make sure the parking brake is off. Leave one rear tire on the ground to hold it, and jack the other one up until it can turn freely.

Rotate the transaxle input shaft in either direction until it stops, and hold it there tightly. Rotate the free tire; if it tends to turn the input shaft, rotate it in the opposite direction. The tire should rotate and the Mini Locker should "click" as the wheel turns. Rotate the input shaft in the other direction until it stops again and check the rotation of the tire in the opposite direction. Repeat this test on the other side of the vehicle.

Note: Sometimes we have noticed that initially the parts may not unlock easily because they need to become "broken in." If this occurs, jack up both tires and rotate them a few times to circulate the gear oil. Lower one tire back down to hold it and rock the other one back and forth; the free tire should soon unlock. If it still does not do so, your installation may need to be rechecked. Contact Weddle Industries for assistance.

TIRE DIAMETERS

To help ensure a long life for your new Type 2 Mini Locker, tire diameters should be as nearly equal as possible, although an exact match is not required. Contrary to instructions that you may have read elsewhere, DO NOT change inflation pressures to vary the rolling radius of the tires! This can be dangerous if one of the tires is underinflated, producing excess heat and making vehicle control more difficult. The best way to equalize the rotation is to measure the circumferences of all the tires, including the spare. Choose ones that are within about 3/8-inch or less of each other if possible. If one tire is worn much more than the other one, they both should be replaced for safety reasons.



Figure 8. Place the short sidegear with thrust washer onto the top driver with the teeth meshed.



Figure 9. Place the differential cover onto the housing, making sure to line up the bolt holes.