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"Do-It-Yourself" Rockcrawler (4x4x2) Steering

West Coast Broncos' Rockcrawler power steering box has been the ultimate in strength and power steering performance in the Early Bronco for years. It is physically larger, stronger and heavier duty than the stock Early Bronco power steering box and many of the aftermarket steering boxes that are available. It also has a quick 17:1 (4 turns lock to lock) steering ratio. The Rockcrawler box is basically a 78/79 Bronco (or F150 4X4) steering box with the valve housing/piston assembly from an '80s Ford truck. This conversion is also popularly known as the "4x4x2" swap because of the erroneous belief that the reverse valve assembly has to come from a 2WD (4x2) pickup. But as you'll see from the application charts below, the reverse valve came in just about every Ford truck from the 1980's to mid-90's. The procedure that follows is for a simple "down and dirty" conversion using only the parts from the two donor steering boxes, including the old seals which may be worn. WCB recommends using a [new seal kit](#) to ensure the best results, and we also offer a complete ["Do-It-Yourself" Rockcrawler Kit](#) with most of the parts you'll need to make the swap easy. Ultimately, if you find the swap more than you want to tackle, or if you want the assurance of a professional rebuild, WCB still offers the famous [Rockcrawler box](#), already reversed, rebuilt and resealed, ready to bolt in.



SOURCING THE DONOR BOXES

• 4x4 Box

The main box you'll need comes from a 78/79 Bronco or 76-79 F150 4X4. You will use everything but the spool valve, piston and worm assembly. The casting, or housing, of this box works great for the Early Bronco because it mounts to the outside of the frame and has a short sector shaft (in comparison to the long shaft on the '70s 2WD box which is also a popular swap for the EB).

• 4x2 Box

It's actually a misconception that this box has to come from a 4X2. There is a long list of vehicles this box can be found in, including everything from Rangers to F450s, regardless of 4WD or 2WD:

- Bronco '80-96 Power Steering
- Bronco II '84-90 Power Steering
- Explorer '91-94 Power Steering
- Ford F100 Pickup '80-83 Power Steering
- Ford F150 Pickup '80-96 Power Steering
- Ford F250 Pickup '80-96 Power Steering
- Ford F250 Pickup '97 Power Steering; over 8500 GVW, 2 bolt cover & flare hose fittings
- Ford F350 Pickup '80-96 Power Steering
- Ford F350 Pickup '97 Power Steering; 2 bolt cover & flare hose fittings
- Ford F450 Pickup '88-96 Power Steering
- Ford F450 Pickup '97 Power Steering; 2 bolt cover & flare hose fittings
- Ford Van '82 Power Steering; from 3/82
- Ford Van '83-91 Power Steering
- Ford Van '92 Power Steering; (E150 thru E350), w/o tag SPA-ER and FG
- Ford Van '93 Power Steering; E150 and E250
- Ford Van '94 Power Steering; from 5/94, tag SPA-GU
- Ford Van '94 Power Steering; thru 4/94, E150 and E250
- Ford Van '95-96 Power Steering; under 4200 lb front/GAWR
- Mazda B-2300 '94-97 Power Steering
- Mazda B-3000 '94-97 Power Steering



Photo 2: The 4X2 box is found on the inside of the frame rail on a wide variety of Ford trucks from the 80's through the mid-90's.



Photo 1: The 4X4 box mounts to the outside of the frame on 78/79 Broncos and 76-79 F150 4X4 pickups.

- Mazda B-4000 '94-97 Power Steering
- Mazda Navajo '91-94 Power Steering
- Ranger '83-97 Power Steering

PROCEDURE

1. **Remove the pitman arms.** If the pitman arms are still attached, remove them from both boxes before you begin.

2. **Drain and clean the boxes.** Try to get as much power steering fluid out of the box as possible. Place the gearbox over a drain pan or bucket with the ports pointed downward, and make sure the ports aren't capped. Clamp vise grips to the splined input shaft as shown in Photo 3. If you are careful to keep the teeth on the vise grips parallel to the splines you won't damage them. Use the vise grips to turn the input shaft back and forth a few times to work as much fluid out of the box as you can. Since you need to be careful not to let dirt or contaminants inside the steering box, it's very important to clean them thoroughly on the outside before opening them up. A steam cleaner is the best method, but a pressure washer or your local coin-op car wash rack would work. Before cleaning, plug the ports in the box by either crimping the old fluid hoses, cutting the hose and plugging it with a bolt and hose clamp, or by using the appropriate inverted flare plugs. **VERY IMPORTANT: Never rotate the input shaft while the ports are capped, you can blow out internal seals if you do!**



Photo 3: Be careful not to damage the splines when using vise grips to rotate the input shaft.

3. **Prepare your work area.** Opening up these boxes is a messy job, so clear yourself a section of workbench and keep some grease rags handy. Also make sure the work surface is clean, in order to keep contaminants from entering the steering box while you have it opened up. For tools you won't need much: A 9/16" wrench, a 3/4" wrench, vise grips, and a soft dead-blow hammer. If you have an impact wrench with 9/16" and 3/4" sockets you'll find those more useful than end wrenches or ratchets.
4. **Center each box.** Center each box using the following procedure. Clamp the vise grips to the input shaft as described in Step 2 and shown in Photo 3. Use the vise grips to turn the input shaft all the way to the stop in one direction. Then turn it the opposite direction and count the number of turns until you reach the opposite stop. It should be just over 4 turns but count them anyhow just as a precaution. Then turn the shaft back in the other direction HALF the number of total turns (it should be 2). Now the box is centered. This is important to ensure that the worm gear isn't near the end of its travel when you pull the assembly out of the box later.



Photo 4: Take the time to make sure both boxes, as well as your work area, are clean before you begin.

5. **Remove the sector shaft.** Do this for both boxes. If the pitman arm and/or nut and lockwasher are still attached to the lower end of the sector shaft, remove them. Use the 3/4" wrench or socket to remove the two bolts from the sector shaft cover. Do not disturb the sector shaft adjustment screw and locknut in the center of the cover (we will not be making any adjustments to this). With the two bolts removed, try to twist the cover slightly to loosen it. You may need to tap it lightly with a soft dead-blow hammer. Once it is loosened, the entire sector shaft should easily slide out of the gearbox housing. If you need to, tap it lightly from the bottom end using a soft dead-blow hammer (be careful not to damage the threads on the end of the shaft).



Photo 5: Remove the sector shaft from each gearbox.

VERY IMPORTANT: Now that the box has been opened up, be **VERY CAREFUL** not to scratch or damage any of the internal seal surfaces inside the gearbox housing. Do not insert screwdrivers or tools inside the box to pry or tap parts out. If the seal surfaces are damaged it renders the whole box worthless.

6. **Remove the valve housing and worm assembly.** Do this for both boxes. The valve housing, worm gear and piston/ball nut can all be removed from the housing as a single assembly. Use the 9/16" wrench or socket to remove the four bolts from the valve housing. As you work the valve/worm assembly free from the gearbox, be very careful not to let the input shaft spin independently of the valve housing. After the four bolts are removed, try to rotate the valve housing just slightly in order to free it from the gearbox. You may use a soft dead-blow hammer to lightly tap the valve housing to first rotate it slightly, then separate it from the gearbox. Upon breaking the seal between the valve housing and the gearbox you will get some power steering fluid leakage--have some grease rags ready. Once the seal has been broken you should be able to pull the valve/worm assembly from the gearbox easily by hand. It must again be stressed that it is **VERY IMPORTANT** not to let the input shaft or the valve housing rotate independent of each other. The reason for this is that the worm gear and piston operate with a series of recirculating ball bearings. If the worm gear shaft is pulled too far out, the balls will drop out and it is a tedious procedure to reinstall them. So keep the entire valve housing, worm gear shaft and piston stationary with relation to each other as you handle the assembly.



Photo 6: Make sure the input shaft and valve housing do not spin as you pull the valve/worm assembly out of the gearbox housing.

NOTE THE DIFFERENCE between the two worm shafts. In Photo 7, assembly on the right is from the 78/79 Bronco/F150 4X4 box. The one on the left is from the "4X2" box (the one we will keep and use in the Rockcrawler box). Note that the direction of the spiral on the worm shaft is reversed. This is what makes the steering gear turn in the direction it does. The stock 78/79 Bronco/F150 4X4 box had the pitman arm facing forward, meaning that it would steer backwards if the pitman arm were installed facing

rearward. Swapping these worm assemblies is what allows us to run the 78/79 Bronco/F150 4X4 steering gear on the Early Bronco with the pitman arm in its normal position, facing backward.

7. **Install the reverse valve into the 4X4 gearbox.** Inspect the rubber valve housing seal and replace if damaged (one is included in WCB's [Rockcrawler seal kit](#) or in our ["Do-It-Yourself" Rockcrawler Kit](#)). Take the reversed valve assembly and gently spin the piston down onto the worm shaft until it stops against the valve housing. While holding the assembly so as to keep the piston from spinning on the worm shaft, insert the piston end of the assembly into the 4X4 gearbox. Keep the gear teeth oriented toward the sector shaft bore in the gearbox housing, and keep the four bolt holes on the valve housing approximately aligned with their corresponding holes in the gearbox as you slide the assembly in. Take care to ensure that the seal seats properly in its groove as the valve housing slides into position. Use the 9/16" wrench or socket to reinstall and tighten the four bolts on the valve housing. Torque the four bolts to 35-50 ft-lbs. Rotate the input shaft 2 turns to center the piston.



Photo 8: Keep the splines pointed toward the sector shaft bore as you install the valve and worm assembly.



Photo 7: Note the different direction of the worm spiral from each gearbox.

8. **Install the sector shaft.** Inspect the rubber sector shaft cover seal and replace if damaged (one is included in WCB's [Rockcrawler seal kit](#) or in our ["Do-It-Yourself" Rockcrawler Kit](#)). Slide the sector shaft into the gearbox from the top, keeping the gear teeth on the sector shaft oriented toward the gear splines on the piston. You may have to rotate the shaft slightly to mesh the teeth together as you slide the shaft into place. Take care to ensure that the seal seats properly in its groove as the sector shaft cover slides into position. Use the 3/4" wrench or socket to reinstall and tighten the two bolts on the sector shaft cover. Torque the two bolts to 55-70 ft-lbs.
9. **Test for proper operation.** Use the vise grips as shown in step 3 to rotate the input shaft. Turn it from lock to lock and make sure there are 4 turns (or slightly over) of rotation. Also note that the rotation of the sector shaft is now reversed. If everything checks out, congratulations—you've just built your own Rockcrawler box!



Photo 9: A pneumatic or electric impact wrench makes quick work of the disassembly and assembly.

OPTIONAL STEPS

There are several extra steps you can take to ensure a better chance of success with your DIY Rockcrawler conversion:

- **Thoroughly clean and flush everything.** If you are careful, you can simply swap the required parts and bolt everything back together with good results. But while you have the box apart, it is a good opportunity to thoroughly flush out the interior of the gearbox housing and re-used parts. Use clean power steering fluid, do not use water or harsh solvents as they may damage some of the seals and soft parts. If you are installing a new power steering pump, contaminants from the used steering gear components could circulate through the system and damage your new pump. Any steps you can take to assure against this happening are warranted.
- **Inspect the sector shaft seal surface.** Check the bearing and seal surfaces near the bottom end of the sector shaft for galling or wear. If there is minor wear, you can place the sector shaft into a lathe and polish the seal surface with fine emery cloth (see the [Rockcrawler Shop Manual](#) for instructions on disassembling the sector shaft). If there are deeper gouges, apply super-glue into the gouge, allow it to dry, then polish on the lathe with emery cloth. Severe damage can only be corrected by re-chroming the shaft at a power steering shop.
- **Replace the input shaft seals.** The input shaft seals can also be replaced with new parts from WCB's [Rockcrawler seal kit](#) or our ["Do-It-Yourself" Rockcrawler Kit](#). A procedure for disassembly and reassembly of the valve housing and input shaft is included in the [Rockcrawler Shop Manual](#) (click to view in a new window or right-click then choose "Save Target As..." to download).
- **Replace the sector shaft seals.** If you bought WCB's [Rockcrawler seal kit](#) or our ["Do-It-Yourself" Rockcrawler Kit](#), you have new sector shaft seals and snap rings. Note the sequence of the parts as you remove them, and reinstall the corresponding parts from the kit in the correct order. The lower sector shaft bearing, which resides just past the seals, is also replaceable although it was not included in the kit from WCB.

VERY IMPORTANT: When replacing the sector shaft seals or performing any other work on the inside of the gearbox, be **VERY CAREFUL** not to scratch or damage any of the internal seal surfaces inside the gearbox housing. Be very careful when removing the snap rings for the sector shaft seals—use the appropriate snap ring pliers and not a screwdriver or pick. If the seal surfaces are damaged it renders the whole box worthless.



Photo 9: The seal surface on this sector shaft is showing some wear and should be polished prior to reinstallation.



Photo 11: The sector shaft seals are a common leakage point, but they're easy to get to.

- **Replace the piston ring and o-ring.** The piston ring and o-ring can be replaced with new parts from WCB's [Rockcrawler seal kit](#) or our ["Do-It-Yourself" Rockcrawler Kit](#).
- **Replace the valve sleeve rings.** The valve sleeve rings are include in WCB's [Rockcrawler seal kit](#) or our ["Do-It-Yourself" Rockcrawler Kit](#). However, these rings are difficult to get to and require special tools to install. Only attempt replacing these if you are very confident in your mechanical abilities, as this procedure may require disassembling the ball bearing screw assembly, which is very tedious to reassemble. Details can be found in the [Rockcrawler Shop Manual](#) (click to view in a new window or right-click then choose "Save Target As..." to download).
- **Paint the Rockcrawler Box.** Why put so much effort into doing a great steering modification, then bolting it in as a crusty old piece? Before you install it is a great time to paint your Rockcrawler box. We like either gloss black or smoke gray but the choice is up to you. Be sure to cap the ports and mask the input shaft and sector shaft before you paint. Use a good primer then a color coat of your choice!

INSTALLING THE ROCKCRAWLER BOX

There are two ways to install the Rockcrawler Box onto the Early Bronco frame:

- **Bolt the Rockcrawler box directly to the frame.** The bolt holes on the Rockcrawler box do not match the stock steering gear holes on the frame, so you have to drill two new rearward holes (while using the existing forward hole). WCB's [Steering Box Frame Reinforcement Kit](#) can be helpful in this since it has both bolt patterns already cut into the reinforcement plate, making it easy to locate where the other two holes should be. But even with the reinforcement plate you run into a problem with the top-rear hole, as it comes through the frame at a point that places it inside the crossmember on the inboard side of the frame rail. One method of dealing with this problem is to drill the hole at an angle so that it comes through the frame rail just forward of the crossmember on the inboard side. If doing this, use some thick 1/2" ID spacers and grind one side of each at a matching angle so the bolt head and nut can seat against something flat. But even doing this, the bolt is at an unnatural angle that is not recommended. Further, with an angled hole it is nearly impossible to install the DOM-tube spacers included in the frame reinforcement kit, which is essential when using new mounting holes. A better method is to drill the top-rear hole straight, then cut a notch in the crossmember to access the back side of the hole to install the nut. But even with this method it is still advisable to use the frame reinforcement kit with the tube spacers installed inside the frame rail.
- **Use the WCB Rockcrawler Adapter Kit.** WCB's [Rockcrawler Steering Box Adapter Kit](#) is available by itself or is included in our ["Do-It-Yourself" Rockcrawler Kit](#). This kit consists of a hefty 3/4" thick steel adapter plate and grade 8 hardware. It bolts to the Early Bronco frame using the stock, properly reinforced holes in the frame. Then the Rockcrawler box bolts directly to the adapter plate. There are no compromising holes to drill. One caveat with this method is that it does slightly change the drag link geometry, as it moves the pitman arm 3/4" outboard (the thickness of the plate) and slightly downward. This can be dealt with by slightly lengthening the drag link. If you have an adjustable drag link this is simply a matter of adjusting it a little longer. Otherwise you can cut and sleeve the drag link with some heavy wall tubing to make it a little longer (only attempt this with a skilled welder/fabricator). Another easy fix is to use a [non-indexed pitman arm](#). This pitman arm doesn't have the indexing keys like the stock unit does, so you are able to install it rotated in 1-spline increments. Moving it one spline over will take care of the drag link geometry issue.



Photo 12: The [Frame Reinforcement Kit](#) comes with the correct bolt hole locations.



Photo 13: The Rockcrawler Box Adapter Plate makes the install an easy bolt-on.

HOSES AND COUPLERS

The Rockcrawler box uses a smaller pressure port fitting than the stock Early Bronco box. If you're converting from the stock box you will need a new high pressure hose (available [by itself](#) or as part of WCB's ["Do-It-Yourself" Rockcrawler Kit](#)). If you would like to source your own hoses or convert to AN lines you'll need a 1/2"-20 inverted flare hose end or adapter. The return line uses the same size fitting as the stock Early Bronco box (5/8-18 inverted flare).

The splines on the input shaft of the Rockcrawler box are 3/4"-36 spline. Adapting to your steering shaft depends on which shaft you have or want, and whether you're converting from manual steering or an existing power steering setup. If converting from manual, the cheapest, easiest solution is to cut the stock manual steering shaft at the correct length to install a [3/4-36 X 3/4 round](#) steering u-joint between it and the Rockcrawler box. The 3/4" round side of the u-joint slips onto the shortened manual steering shaft and is welded to it. When welding, be careful to weld in short stitches and place a wet towel around the joint to keep it from heating up and damaging the bearings and seals. Alternatively you can drill and pin the joint to the shaft. If converting to an aftermarket steering column and/or lower shaft, simply choose the correct u-joint to adapt the Rockcrawler box to the new lower shaft (typically 3/4" DD with most aftermarket lower shafts).

If you are converting from stock Early Bronco power steering, keep in mind that the input shaft splines on the Rockcrawler box (3/4"-36) are different from those on the stock power steering box (13/16"-36). Even if you already have an aftermarket u-joint for your stock steering box you will need to replace it with one that fits the Rockcrawler box.

STARTUP AND TESTING

Once the box is installed, plumbed to the power steering pump, and connected to the steering shaft, its time to bleed the system. After doing hundreds of power steering installations over the years here at West Coast Broncos, here is what we have found is the best procedure for bleeding the system:

1. **Make sure the pitman arm or drag link are disconnected.** Simply jacking the tires off the ground is not good enough. Properly bleeding the box involves turning the steering box completely from stop to stop, and if the drag link is still connected, external steering stops or tire clearance limitations will prevent the box from bottoming out against its own internal limits.

2. **Fill the power steering pump or reservoir** to the indicated full line or slightly above.
3. (OPTIONAL) **Attach a short hose or tube** to the fill neck on the pump or reservoir and tighten with a hose clamp. This will prevent any overflow from splashing out into your engine bay. If you don't have a suitable piece of hose, keep some shop rags handy.
4. **Disable the engine from firing up** by removing the coil wire or other means, then turn the engine over briefly for 10 seconds or so. This should circulate fluid down into the gearbox, pump and fluid cooler. We disabled the engine because it is very important not to run the pump dry. Check the fluid level again and re-fill to the fill line. Re-connect the coil wire.
5. **Start the engine** and keep an eye on the fluid level as it starts up (have a friend start the engine). Add fluid as necessary or immediately kill the engine if needed in order to keep the pump from running dry. Keep an eye on the fluid level during the remainder of the bleeding process and add fluid when necessary.
6. **Turn the steering wheel** from stop to stop at medium speed. Hold the wheel for a second or two at each stop before turning back the other direction. Do this 10-20 times per side.
7. **Turn the engine off** and watch the fluid level. If there are bubbles rising in the fluid at shut-down there is still air in the system, repeat the previous step.
8. **When bleeding is complete**, re-start the engine and closely check all of your plumbing connections for leaks.

DISCLAIMERS

This information is provided with no guarantee of performance or suitability for any purpose, nor is any claim made as to the safety of any modifications you perform on your own. **ATTEMPT THESE MODIFICATIONS AT YOUR OWN RISK!** You should be a competent mechanic, familiar with tools and their proper use, as well as a basic familiarity with steering systems and the mechanical systems of the Bronco. West Coast Broncos does not provide technical assistance for performing this modification, other than the information provided here. Additional information can be found on the Internet. West Coast Broncos does not provide any warranty on modifications that you perform yourself, beyond the warranty of workmanship on any *new* parts we provide.



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56060 Cedarbird Rd., Yucca Valley, CA 92284 • Tel. (760) 364-4425 • email: bronco@wcb4x4.com