

BMW Z3 Roadster Convertible Top DIY Hydraulic Cylinder Replacement



Created by M.D.

With the help of this Do-It-Yourself Guide, you should be able to replace your roadster top hydraulic cylinder in a short time. I have broken this down into many small steps. Some folks might be able to get the job done in less than an hour with the use of these instructions... 😊

Disclaimer

This is a Do-It-Yourself (DIY) guide, and as such, places all responsibility for safety and quality of the resulting repair, and any other potential liability on yourself. Please use common sense. I am only sharing information in good faith.

Neither the author or Top Hydraulics, Inc. (who is publishing this guide on their website www.bmwcylinders.com) are liable for any damage or injury.

Safety

- **Wear eye protection.**
- **Be careful of sharp edges and pinch points.**
- **Latex, nitrile or rubber gloves help keep hydraulic oil off of your skin. Latex gloves allow you to feel the most detail, but they also wear out quickly.**
- **Cleanliness is essential with hydraulics.** Any dirt or grit that gets in a hydraulic system can cause scores to sealing surfaces, resulting in leaks, or totally clog tiny passages designed only to pass fluid. Keep the ports on the cylinder and hoses clean or covered so nothing enters the cylinder while being removed or installed.
- **Hydraulic fluid could theoretically be under pressure in unexpected places.** Wear eye protection (safety glasses) any time hydraulic lines are opened or fittings disconnected.

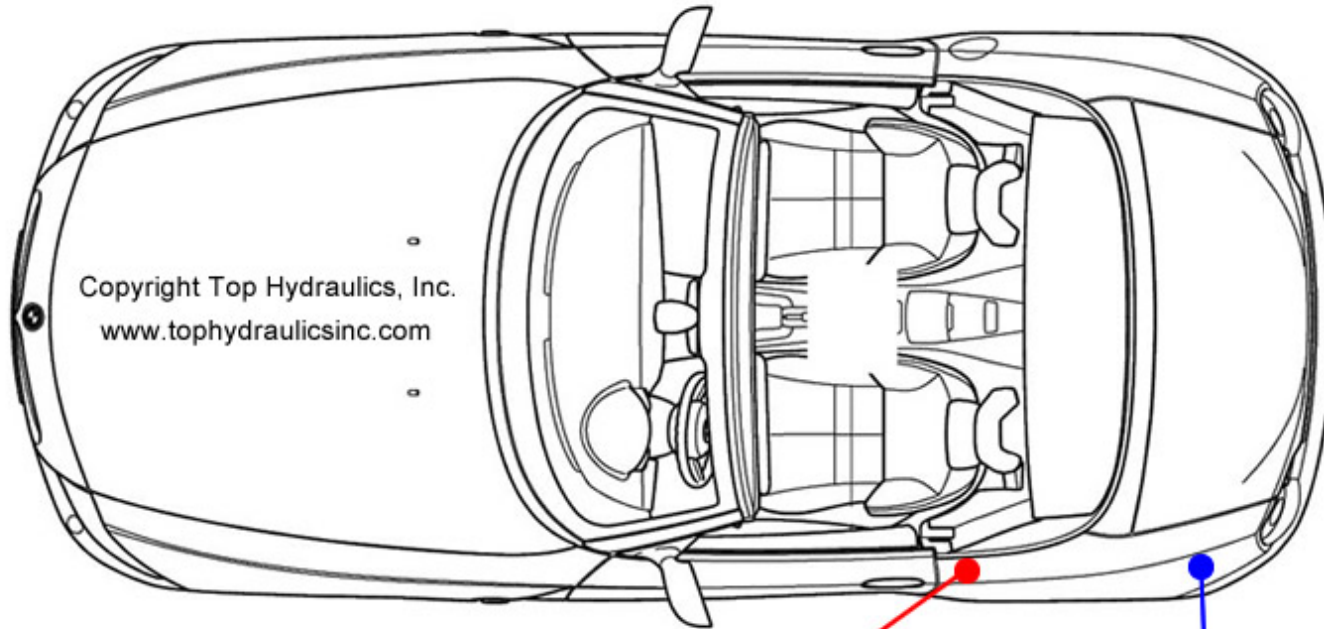
Cylinder Location

- The hydraulic cylinder on the BMW Z3 Roadster is located in an area that is fairly accessible. It is located behind the left shoulder of the seated driver.
- I used scrap wood to hold the plastic cover panel open to access the cylinder, as detailed later.

Cylinder Location



Cylinder Location



Convertible Top Cylinder
p/n 54348410307



Hydraulic Pump Unit
p/n 840722402

Banjo Bolts

- Through either good design, or chance, the fittings on the hydraulic cylinder are located where a socket can access the "banjo bolts" without removing panels. Then the cylinder can be simply pried from its mounts and pulled.
- **NOTE:** Certain terms used in this DIY are merely descriptive, and may not be the proper technical terms used in official manuals.

Banjo Bolts and Crushable Washers



“I hear banjo music”...

Banjo bolts have no significance to the musical instrument, but are very important to the proper function of your hydraulic system. If you look closely, you will see strategically placed holes in the bolt. Along with the crushable washers, this forms the seal between your hydraulic lines and the cylinder. *Never substitute a standard bolt.* The hydraulic oil will not flow, and the cylinder will not operate. It is recommended to replace the crushable washers any time the seal is broken. (Though, I admit, I re-used my own.)

Tools

- Plastic pry bar or scraper
- #2 Phillips Screwdriver
- 1/4" Flat Screwdriver
- Diagonal Cutters
- Needle-nose Pliers
- 6" Socket Extension
- 3/8" Socket Ratchet Handle
- 12mm Socket
- 5mm Allen(Hex) Wrench
- Safety Glasses
- Nitrile or Rubber Gloves
- Scrap Wood or Plastic Blocks

(Optional Items)

- Magnetic Pick-Up Tool
- Stiff Wire
- Prying tool
- 17mm Wrench
- Flashlight



Supplies

- Replacement Cylinder from Top Hydraulics, Inc.
www.tophydraulicsinc.com
- Zip ties



You may also need:

- Hydraulic fluid:
as specified by BMW, or you can use FeBi 02615 or Mercedes Benz fluid p/n A0009899103, or Pentosin CHF-11S, or Aral Vitamol. Do not use “bottle jack fluid”.
- (Optional) Crushable washers 8x12mm for banjo bolts

Preparation

- Keep a positive attitude. You can do this!
- Gather needed tools and supplies beforehand.
- Always keep safety in mind as you proceed.
- Take a break if you get tired or frustrated.
- Consider doing this job on warmer days, or indoors, if possible. Plastic parts become much more brittle and subject to breakage in colder weather.

Step #1

Ensure that the source of the leak is the cylinder. The lines can be wet with hydraulic fluid, appearing that they are leaking, when in reality, they are just being dripped on by the leaking cylinder. I could see fluid pumping from the top of the cylinder as the ram moved, indicating bad cylinder seals. As shown, there was no mistaking that my leak was in this area. Top Hydraulics replaces the original seals with much more durable ones.



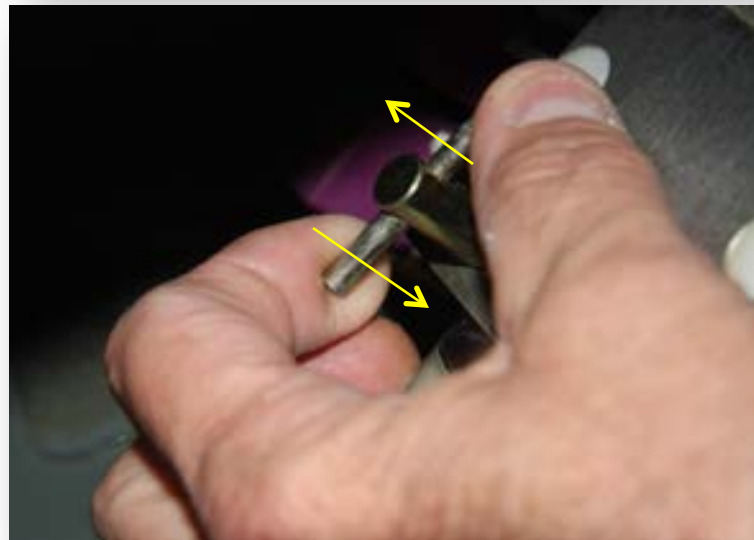
Step #2

- Access the hydraulic pump in the trunk by pulling the carpet away on the driver's side. There may be clips holding the carpet in place.



Step #3

- The T-handle is the valve to release and equalize the pressure on the hydraulic system. By opening this valve (turning counter-clockwise), the top can be readily raised and lowered. This gives the ability to manually operate the top until repairs can be made to the hydraulic system.
- Open this valve before disconnecting the lines on the cylinder.



Step #4

Next, turn your attention to the cab of the car.

Slide the driver's seat all the way forward.



Step #5

- Locate and unscrew the Phillips head screw in the panel directly behind the driver's seat. This is the only panel screw that needs to be removed.



Step #6

- Slide the plastic coupling cover rearwards until it clears the large rubber molding.

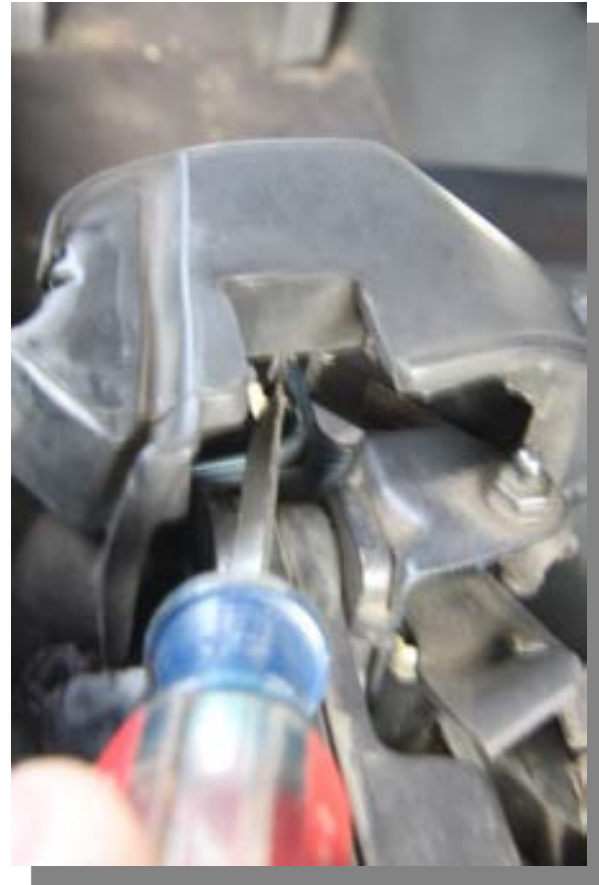
The large rubber molding is attached in three places:

1. At the cover you just slid back.



Step #7

2. Underneath the molding, use a screwdriver to pry the tabs apart from the metal tab on the body . The rubber tabs “clamp” around the metal tab, which has a square hole.



Step #7

3. Using a plastic prying tool, carefully pry the plastic door trim away at the top to expose the tab that locks the remaining section of the large rubber molding in place. Pry carefully to prevent breaking the tabs.



Step #8

- After all clips and tabs are released, the large rubber molding can be lifted up and removed.



Step #9

- Pull the rubber weather seal away from the body, down to the point where it curves to the kick plate.



Step #10

- Use a plastic prying tool to release the plastic clip holding the rear part of the kick plate.
- This will release the plastic panel to the rear of the kick plate. The kick plate does not have to be totally removed.



Step #11

- Using small pieces of scrap wood or plastic, wedge the panel open enough to access the cylinder. Do this carefully, and no more than required to get to the cylinder to prevent breaking or cracking the plastic panel.



Step #12

- Carefully cut the zip tie that is securing the hydraulic hoses to the cylinder.
- Be very careful not to nick the lines with the cutters.
- Also be extremely careful not to cut the wire harness that runs through this location, and may be tied to this same zip tie.
- Have plenty of light, so that you can clearly see what you are doing.



Special note:

Take care not to bend or scratch the rod (also known as shaft) as you are removing the cylinder, or installing your new one. There is ample room to safely remove the cylinder on the Z3. Make sure not to have tools slipping and hitting the black polished shaft.



I suggest placing any small parts (clips, bolts, washers, etc) in a sandwich bag as they are removed, on in a magnetic tray. This helps to keep track of the parts, and keep them clean.



Step #13

Now, to the actual removal of the cylinder!

- Using a 6" extension on a 3/8" ratchet, attach a 12mm socket.
- Unscrew the top banjo bolt, being very careful to not drop the crushable washer. The best way to avoid this is to use your hand to remove the last few threads as you cup underneath with your opposite hand to catch the washer or bolt if they fall loose from the hydraulic hose. It is a tight fit, but *you can do it!*



Step #14

- Use the same procedure to remove the bottom banjo bolt.
- You may want to tie the hoses out of the way.

“Darn it! I dropped the banjo bolt / washer / clip, etc.
Now what??”

The banjo bolt and bottom cylinder clip are magnetic, and can be retrieved with a magnetic tool. Unfortunately the washer is non-ferrous, so a magnet will not pick it up. If you drop it (as I did), use a stiff wire with a hook bent on the end to retrieve the washer.



Step #15

- Release the upper ball mount by prying with a screwdriver or similar tool to “pop” the socket loose from the ball. The socket is held in place with considerable spring tension, so it takes a bit of prying to get the ball to release.



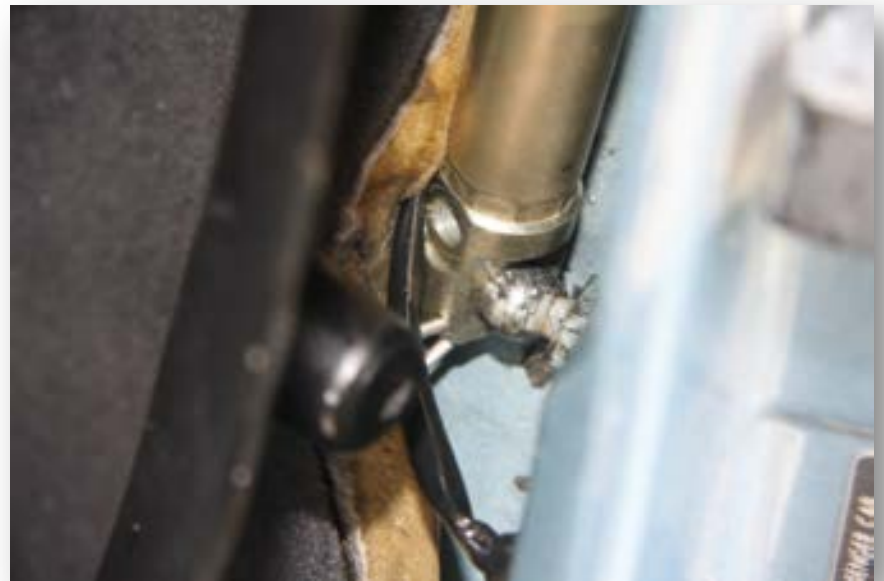
Step #16a

- The lower attachment point of the cylinder is also a ball and socket arrangement, with the addition of a locking clip that must be released to allow the ball to be detached from the socket.
- The clip does not have to be totally pulled out, only to the second detent point. It is okay to totally pull it out, but the detent helps to keep from losing the clip if fully released.



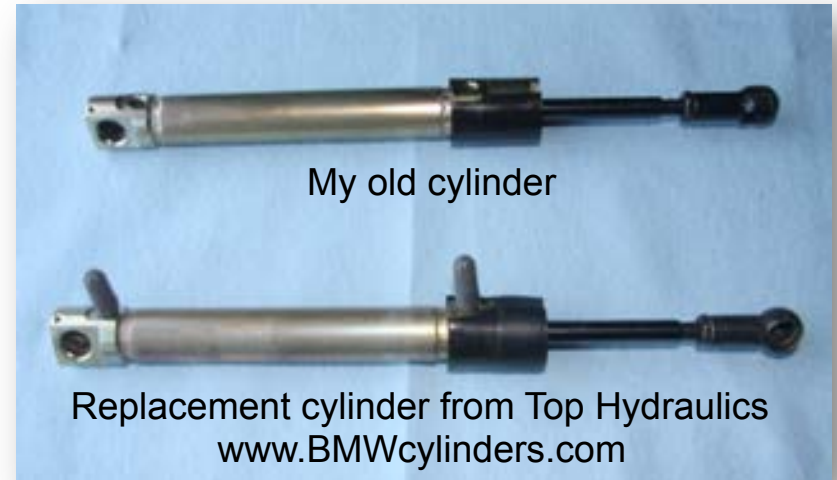
Step #16b

- If you cannot “feel” the clip fall into the second detent point, then pull it all the way out to allow the cylinder to fully release.
- Pry the lower socket of the cylinder away from the ball.
- This will totally release the cylinder for removal.



Step #17

- Compare the replacement cylinder with the original cylinder. If you ordered a cylinder from Top Hydraulics, then you received the proper part.
- Ensure the length is the same.
- The hydraulic fittings should readily screw into the ports on the cylinder.
- Make sure the end of the ram with the socket that attaches to the ball is close to the same length as the original cylinder.



Step #18

- Slide the new cylinder into the general position, taking care not to tangle or pinch the wire harness passing through this area.
- Align the socket on top of the cylinder with the upper ball mount.
- Press very firmly to attach the two.



Step #19

- Attach the lower socket to the lower ball. Again, as in the top ball and socket, considerable pressure is required to attach the ball. (*See my comments on the next page regarding this, especially if you are having problems reattaching the cylinder here!*).
- Be sure the locking pin is pulled out to the back detent, or completely removed before attempting to push the socket over the ball.





“The Pareto Principle”...

Many times, in the pursuit of DIY, there comes a time of self-doubt, when you look at the job and wonder why you ever started it, asking yourself why you didn't just “have it done”. Mine came with this job when trying to reattach the bottom cylinder support. No matter how hard I pressed or pried, I couldn't reattach the cylinder. After walking away, having a cup of coffee, and a fresh start, I removed the lower ball-shaped bolt with a 17mm wrench and was able to reattach the cylinder, then screw the whole assembly back into the car frame without problem.

The Pareto Principle states that 80% of effects come from 20% of the causes.

In years of working with mechanical devices, I would add a corollary to say that 80% the work and time of a DIY project comes from 20% of the job!

Step #20

- Attach the hydraulic hose by passing the banjo bolt, with its captive washer, through one of the hose fittings, followed by the crushable washer.
- Screw the assembly into the proper port on the cylinder.
- Do the same for the opposite side of the cylinder.
- *This illustration has the cylinder removed to clearly show the proper assembly of the bolt, washers and hose.*
- *Take care not to drop the washer when screwing the bolt into the cylinder.*



Step #21

- Tighten the bolts using the 12mm socket.



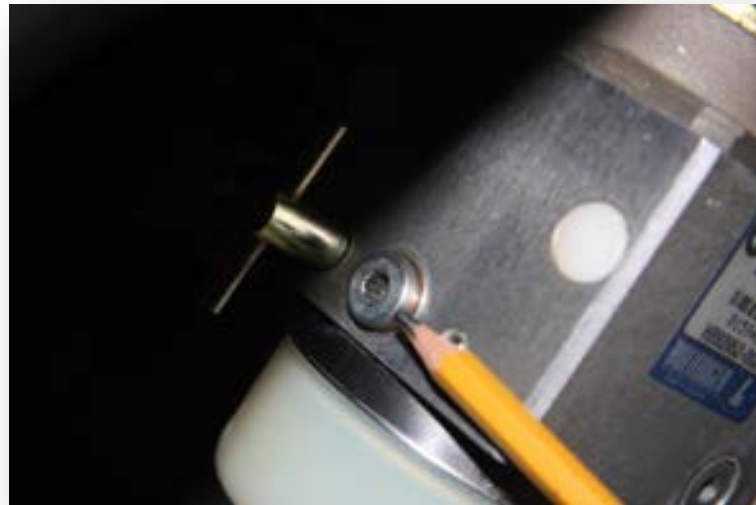
Step #22

- Thread a plastic zip tie behind the cylinder.
- Bundle the hydraulic hoses, and the wire harness, if desired, and pull the tie hand tight.
- Use needle-nose pliers to firm up the zip tie.
- Do not pull so tight as to pinch or compress the hydraulic hoses.



Step #23a

- *In order to check for leaks, it will be necessary to turn attention once again to the trunk and hydraulic pump/reservoir.*
- Using BMW-approved hydraulic fluid, refill the reservoir, if low.
- Remove the plug and washer at the port shown to fill the reservoir. Use a 5mm Allen(Hex) Wrench.



Step #23b

- *I used a large syringe used to infuse liquids into meat, with the end filed blunt. This fit easily into the fill port of the reservoir.*
- *Fill to the “bulls eye” on the fluid reservoir.*
- *Replace the plug and washer.*



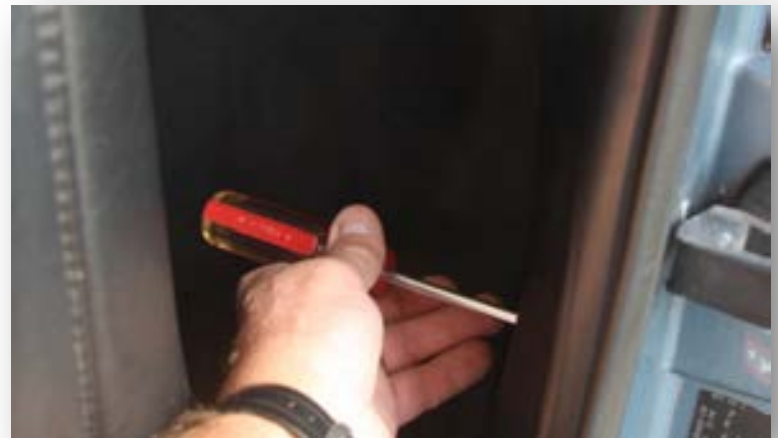
Step #24

- Close the bypass valve by turning clockwise until finger tight.
- Test the operation of the cylinder by raising and lowering the top.
- There may be some hesitation until the air has worked its way out of the system.
- Pay attention to the fittings to ensure that there are no leaks.
- As air is released, the fluid level may need to be topped off. There may be some slight foaming until the air makes its way out of the system.



Step #25

- Remove the wood or plastic blocks used to hold the panel open.
- Screw the Phillips screw back into place. You may have to move the panel slightly to find the screw hole.



Step #26

- Carefully re-align the plastic panel tab end back into position under the kick plate.
- Align the kick plate plastic tabs back into their holes and press firmly to seat the tabs.
- Check to be sure everything is properly aligned.



Step #27

- Press the rubber weather seal strip back into place.
- Using the reverse of the disassembly method shown above, reattach the large rubber molding and the associated trim.



Final Considerations

- Use a cloth to wipe down any place where hydraulic fluid may have spilled or been smeared to protect painted surfaces.
- Return your tools and supplies to proper storage.
- Don't forget to return your old cylinder, if a "core charge" is applicable.
- Stand back and admire your great handiwork!
- Enjoy the smooth, leak-free operation of your power top.

Happy Driving!

