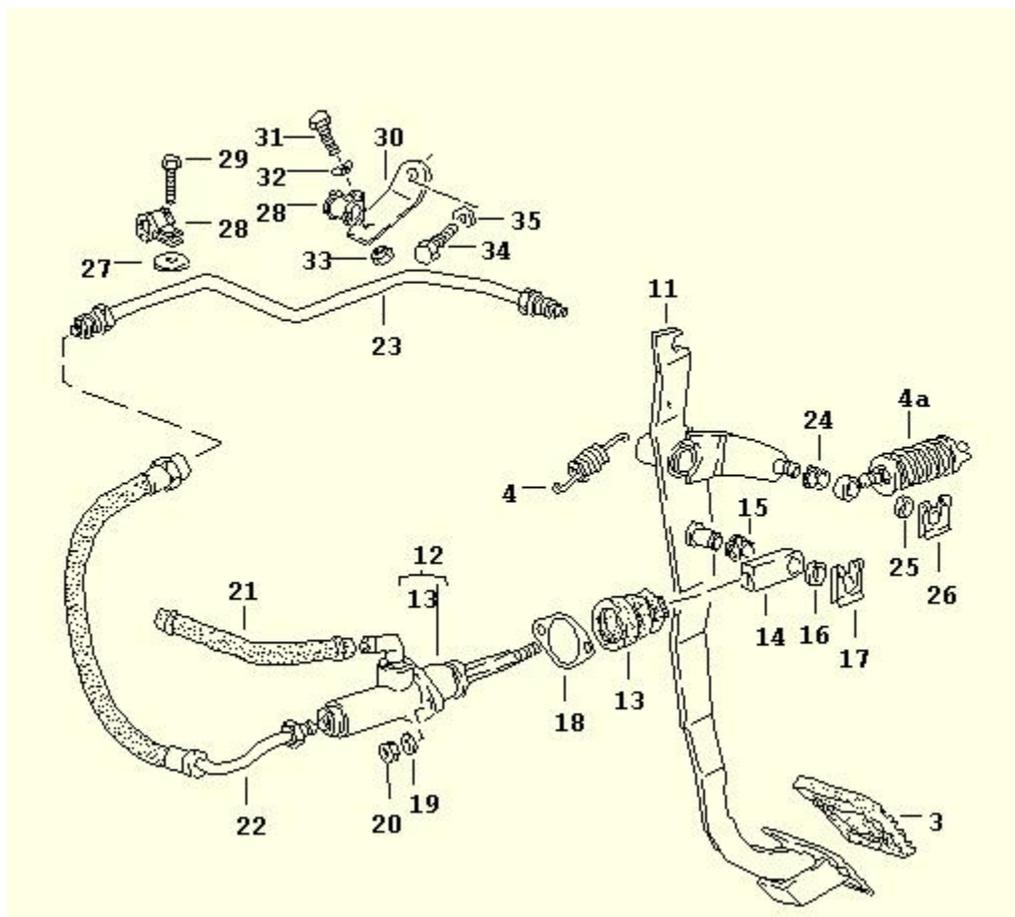


## CLUTCH-04, Clutch Master Cylinder Replacement

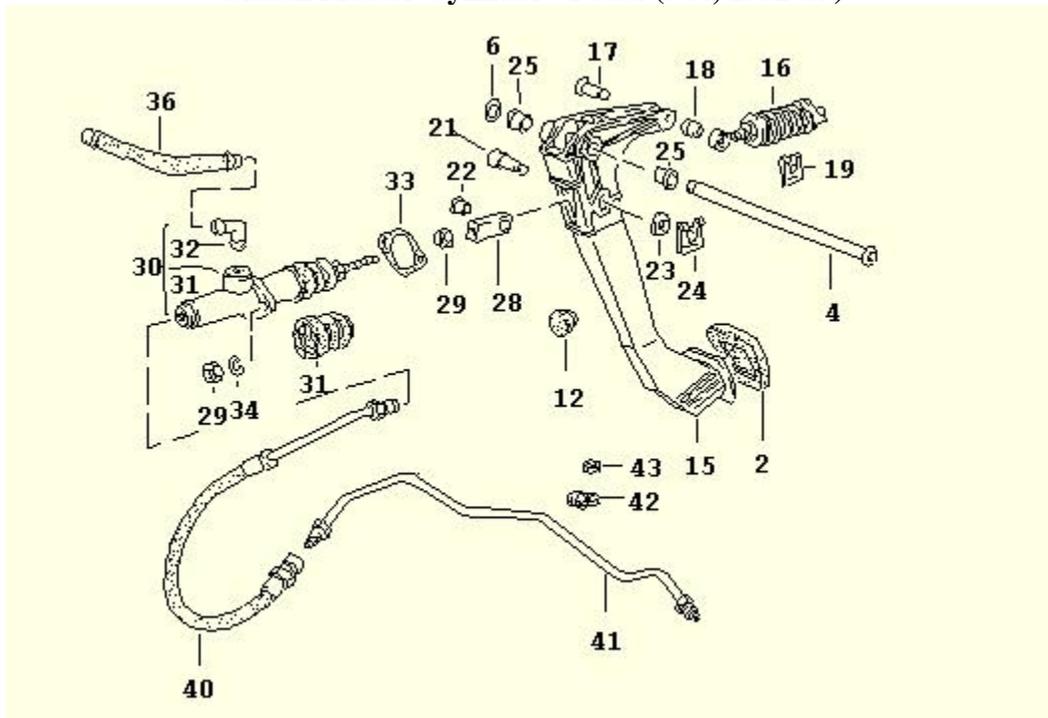
### Introduction

This procedure details replacement of the clutch master cylinder on 944s and 968s. Terry Jenner did a great job with this procedure. He wrote the procedure, took the pictures, and documented everything in such detail (including where the pictures should go in the procedure) that it made my job of rolling it into a web page extremely simple. I made a few minor editorial additions to account for the differences in clutch pedal assemblies. Thanks to Terry for excellent work on this procedure.

There are some differences in the early 944 pedal (1982-89) arrangement and the pedal for the later cars (1990-91 944, 1992-on 968). One notable difference is that they use a different clutch master cylinder (see parts list) and the way the master cylinder push rod assembly attaches to the clutch pedal is slightly different. Below is exploded views of the early and late pedal arrangements. In the procedure that follows I tried to document the exploded view part numbers where appropriate to make things a little easier to follow.



## Clutch Master Cylinder / Pedal (944, 1982-89)



## Clutch Master Cylinder / Pedal (944, 1990-91 / 968, All)

### Tools

- Work light
- 10mm socket, 13mm socket, socket wrench, extensions, universal adapter
- Needle nose pliers
- Slip joint pliers
- 12mm flare nut wrench
- Rags
- Ziploc bags
- Brake fluid
- Motive pressure bleeder or friend, clear plastic tube for bleeding nipple, catch pan
- 7mm wrench for bleeding clutch slave cylinder
- Paint pen or nail polish
- 13mm box/open wrench
- Turkey baster
- Jack stands
- Hydraulic jack
- Side cutters
- Patience

### Parts

**Clutch Master Cylinder Parts List**

Part Description	Porsche Part Number	Approximate Cost
Clutch Master Cylinder (12)	477-721-171 (1982-1989 944 - All)	\$65.00 USD (Vertex) \$110.66 USD (Porsche)
Clutch Master Cylinder (30)	944-423-149-00 (1990-91 944, 968 - All)	\$60.00 USD (Vertex) \$109.83 USD (Porsche)
Gasket (18, 33)	928-423-191-00	\$3.17 USD (Porsche)
Bushing / Slide Bearing (15, 944 - 1982 to 1988)	999.924.002.40	\$1.27 USD (Porsche)
Bushing / Slide Bearing (22, 944 - 1989-1991, 968 - All)	999-924-039-00	\$5.38 USD (Porsche)
Blue Brake Reservoir Hose (21, 36)	N/A	\$2.00 USD/ foot from Paragon (need approximately 2 feet) \$27.00 USD from Porsche
Stainless Hose Clamps	N/A	\$3.00 USD
Brake Fluid (ATE Super Blue Recommended)	N/A	(\$10.00 USD / quart

### **Removal**

1. Place the front of the car on ramps or jack stands so you can work under the car and get to the clutch slave cylinder to bleed the clutch once you're done with this project. It also raises the car to a level you can work at without ruining your back.
2. First, you will discover that, unless you remove the seat, you're going to be on your back in a small space until you get a few pieces off. I don't know how large people do this. Have patience. You can do it.
3. At the pedal cluster, there is a plastic cover over the connecting rod between the master cylinder and clutch pedal. I think it was put there to keep large feet from ripping all that wiring out, but it also keeps you from getting the clutch master cylinder disconnected, so you need to remove this cover to get at the connecting rod/spring clip/bushing.
4. Using a 10mm socket, remove the three nylon nuts that hold a plastic cover in place. There are two on the left edge (as viewed from behind the vehicle looking forward) and one on the aft right corner.



5. Remove Spring Clip from clutch pedal where the clevis (exploded views 14, 28) connects to the clutch pedal assembly. Simply pull down on the clip with needle nose pliers. Mark with a paint pen where the clevis connects to the clutch master cylinder connecting rod. This rod will need to be adjusted for the proper play when you reinstall the clutch master cylinder. Do not remove the clevis from clutch master cylinder push rod until you've measured the length of the push rod / clevis assembly (detailed in installation section).

#### **NOTE**

- On late model 944s and 968s, the spring clip was put there to hold the rather beefy bolt (944-423-387-00) that is mounted transversely on the clutch pedal assembly through the clevis. On early 944 clutch pedals (1982-89), instead of a bolt which holds the clevis, there is a post which is physically part of the pedal assembly (see exploded views).**
6. On late 944s and 968s, once the spring clip is removed, push the clevis bolt out through the right side (to your left as you do your gymnastic routine on your back under the steering wheel). The master cylinder push rod / clevis should now be

- free of the clutch pedal. On early 944s, once the spring clip is removed, you should be able to pull the clevis straight off the post on the clutch pedal assembly. Retain the plastic bushing (common to early and late assemblies). Replace if broken. Put the spring clip, large rod, bushing, and 3 nylon nuts in a ziploc bag.
7. Using rags to protect your paint from corrosive brake fluid, use a turkey baster to remove most of the brake fluid from the brake fluid reservoir.
  8. Loosen the hose clamp connecting the blue brake fluid line to the fluid reservoir, and then remove the hose, taking care not to break the plastic where the reservoir connects to the blue hose. Make sure you have plenty of rags under the connections you are removing. You may need to cut the factory hose clamps off with a side cutter and replace them with new stainless clamps available at hardware stores.
  9. With a 12-mm flare nut wrench, remove the solid line from the front of the clutch master cylinder. Push the line aside so you can pull the master cylinder out when it's time to do so.



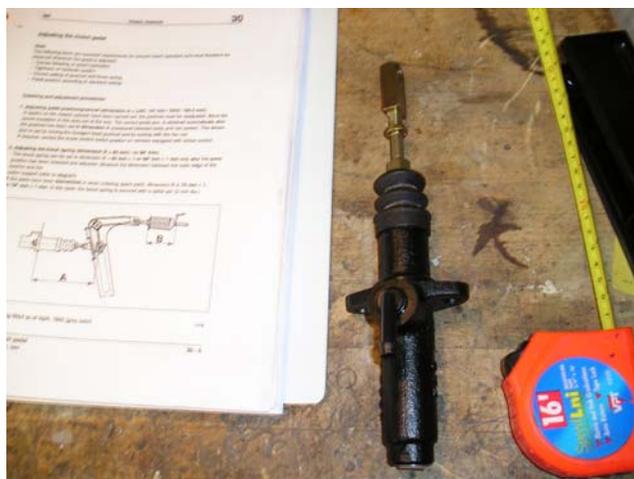
10. Using a universal joint type adapter on your socket wrench, remove the two 13mm bolts holding the clutch master cylinder to the firewall. Place a magnet near the socket as you work in order to catch the nut and concave washer. I stuffed rags in the open spaces below the master cylinder to help catch flying parts.



11. If the paper gasket is torn, replace it with new. Take care to ensure that you don't upset the angle pipe at the top of the clutch master cylinder. If it breaks or comes out of the clutch master cylinder body, you will be where I am, which is replacing the cylinder with a new OEM one.



12. Using slip-joint pliers, gently pull the clutch master cylinder away from the firewall. Once clear of the studs, pull up at an angle to pull the entire clutch master cylinder, boot, connecting rod and clevis from the firewall. Bag the parts.



## **Installation**

1. Remove new clutch master cylinder from box. Remove plastic cap protecting threads on front of master cylinder.

### **NOTE**

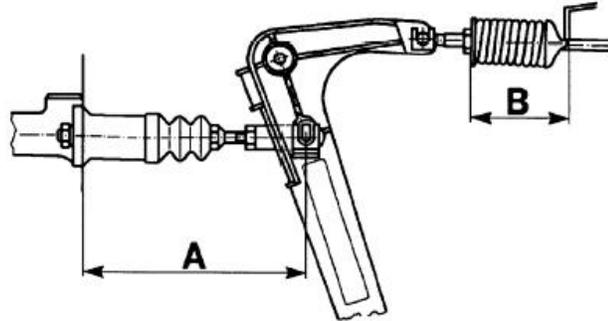
**The Porsche 968 manual discusses checking and adjusting the clutch pedal push rod (clevis) length to ensure proper pedal position (this also applies to 1990-91 944 pedal assemblies). However, it is not discussed in the 944 factory manual. Since the 968 clutch pedal and 944 clutch pedal arrangements are different, the push rod lengths are likely different as well (haven't been able to verify that). Therefore, on early 944s before you remove the remove the clevis from the old clutch master cylinder push rod, measure and record the distance from the mounting plate (dog ears) of the master cylinder body to the center of the mounting hole on the clevis.**

2. Remove clevis and stop nut from old clutch master cylinder push rod and place on new master cylinder.
3. For early 944s, adjust the length of the push rod to the length measured in the note above and lock in position using the stop nut.
4. For late 944s and 968s, adjust the length of the push rod / clevis assembly (Distance A in the picture below) to the length listed below. Once adjusted, lock the clevis in position using the stop nut.

### **NOTE**

**Distance A below is normally measured from the body of the car to the center of the mounting hole on the clevis after the master cylinder is installed in the car. However, it's much easier to install the clevis and set the length before the master cylinder is installed. Therefore, if you add 3 mm to the lengths listed below (to account for the thickness of the firewall) you can**

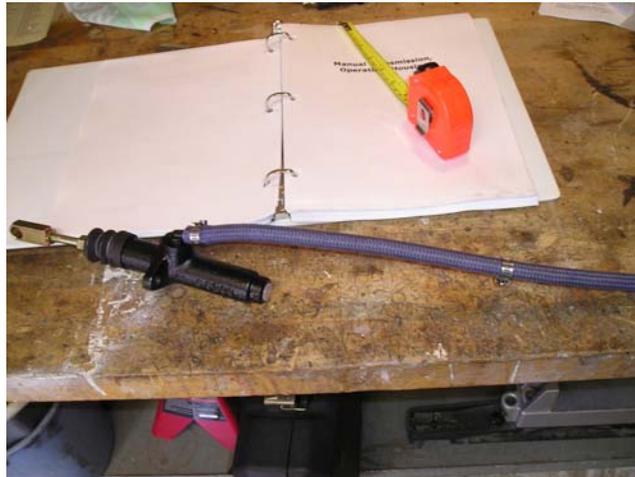
**adjust the length of the push rod / clevis assembly prior to installing the master cylinder. Otherwise, it must be done after the master cylinder is installed.**



A = 147.0 mm for LHD cars

A = 109.5 mm for RHD cars

5. Cut 16-18 inches of new blue hose. Attach to clutch master cylinder angle pipe carefully with stainless hose clamp. Do not over-tighten. Install other stainless clamp only tight enough to keep it from falling off as you work.



6. Install new clutch master cylinder with hose attached to firewall gasket. Have a friend guide the rod into place on the clutch pedal so it's not jammed up.



Tighten the nuts with the concave washers behind them. I used a universal joint on the socket wrench, but I found a ¼ inch drive socket worked without the universal attachment. Your mileage may vary.



7. Install hard line to front of clutch master cylinder with 12mm-flare nut wrench. Have patience, as there is little room to work here.



8. Install blue hose to brake fluid reservoir. Be careful not to over-tighten and break the plastic nipple.



9. Now get back under the dash to install the clevis bolt, plastic bushing and spring clip. When adjusted properly, the clutch master cylinder should have about 1/8 inch of foreplay before it engages. You can adjust this after bleeding the system.
10. Fill brake reservoir to somewhere above minimum (MIN) line.
11. Install empty power bleeder on reservoir. Pressurize to 10-15 psi and check for leaks. Fix any leaks before adding fluid to the power bleeder.
12. After checking for and fixing any leaks, add one quart of fresh brake fluid to power bleeder. Pump up to 15 psi and slide under the car with the catch pan, 7mm wrench, and clear plastic tubing.
13. Open the bleed nipple on the clutch slave cylinder and watch the flow for air, there should be lots of air in the system. Once the fluid runs solid with no bubbles, close the bleed nipple and detach hose and wrench from nipple. Clean up where spills may have occurred.
14. Remove any rags you may have stuffed in the area of the clutch master cylinder.
15. Test the clutch. It should have plenty of resistance and spring back.

16. Remove the car from the ramps/jack stands and test drive.

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