



# The —Black —Crack —Report



The addiction you don't want to fight

Issue 26, April 2011

## Our VIR and Putnam Park Events

We have finished our first 2 events already and had a great time. As usual, we had a very good group of drivers and friends. A few photos from the April event. There are about 400 photos that have been uploaded to the website for your review. Any of them can be downloaded.



*Our next event is May 7<sup>th</sup> & 8<sup>th</sup> at Putnam Park. This event sold out last year and hopefully we will have another great turnout this year. Come out and join us for a great Mother's Day Week End !!*

The remaining 10/10ths Motorsports schedule for this year is on the website and registration is open for all of them.

- May 7<sup>th</sup> & 8<sup>th</sup> @ Putnam Park
- July 2<sup>nd</sup> & 3<sup>rd</sup> @ Putnam Park
- July 30<sup>th</sup> @ Putnam Park
- July 31<sup>st</sup> @ Putnam Park HorsePower4Hope Charity Event
- August 11<sup>th</sup> @ Mid Ohio
- September 3<sup>rd</sup> @ Putnam Park
- October 22<sup>nd</sup> & 23<sup>rd</sup> @ Putnam Park
- November 5<sup>th</sup> & 6<sup>th</sup> at Carolina Motorsports Park

Several of our great 10/10ths Friends, Drivers and Instructors have been affected in one manner or another by the recent outbreak of Tornadoes. Please keep them in your thoughts ☺



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## 10/10ths Tech Corner

With the inevitable failure of my stock clutch after 5 years of hard driving, the 10/10ths car now has a 7.25" triple disc Quartermaster clutch installed which has made a tremendous difference in the engine response and quickness out of the corners. Although the ease of driveability is the trade off, I am very happy I chose this route. Prior to this, I knew absolutely nothing about clutches and how they worked. Depending on the type of car you have will determine the complexity of such a change. For a Corvette, it is no easy task.



The entire underside and rear assembly had to come off of the car just to get to the clutch. The clutch install itself only took a few minutes.



Once installed, it took several hours to put the whole underside of the car back together.

But it was worth it. 38 pounds less rotating mass !!

Don't forget that your clutch fluid is yet another fluid that should be flushed to keep it clean. Clutch dust build up in the fluid can harm seals etc.



Broken slave cylinder and throw out bearing assembly.

In an effort to assist others in learning the basics of clutch design, function and use, I have included the following information which is found on the internet. Note that there are various configurations based on the type of car you have.

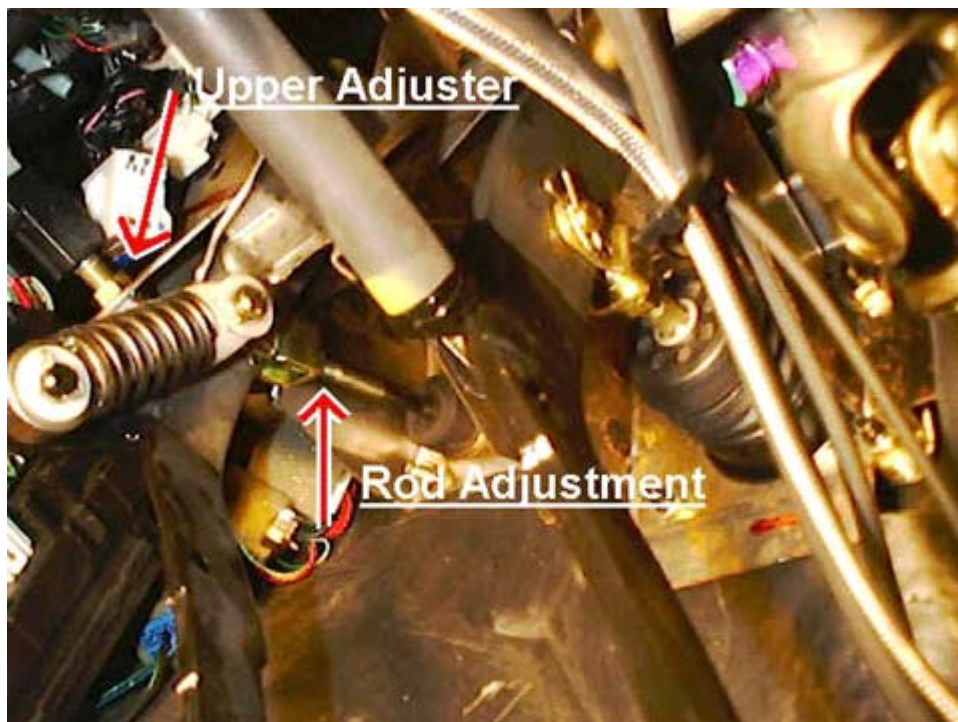


## Clutch Hydraulic System

### Clutch pedal

While not actually a part of the hydraulic system, the pedal connects to and actuates the clutch master cylinder. The pedal assembly is located under the dash. If you were to crawl under the steering column with your back on the floor and look up, you would see something like this:

*Figure 1: View of Clutch Pedal Assembly Located Under Dash*



You can see the clutch pedal spring in this picture as well as the clutch adjustment rod. This component goes through a boot in the firewall (which can also be seen) and connects to the master cylinder. Just a point of interested on most cars, this rod can be turned left or right to alter the point of clutch engagement above the floor, closer or farther.



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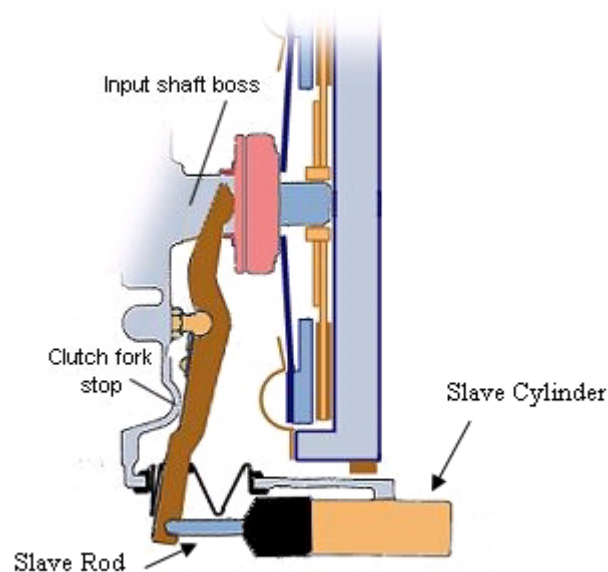
## Clutch Master Cylinder

The master cylinder is bolted to firewall in the back of the engine bay. You can easily locate it as it is connected by a short hose to the clutch fluid reservoir. The internal piston is connected to the clutch adjustment rod. Thus as the clutch pedal is pressed, the fluid in the master cylinder is forced out of the cylinder into the steel clutch fluid line that runs to the slave cylinder.

## Clutch Slave Cylinder

The slave cylinder is bolted to the actual transmission itself. One end of the cylinder is open to the clutch fluid line. On the other side a steel rod connects the piston of the cylinder to the clutch fork on the bell housing of the tranny. A sketch of the cylinder is show below.

Figure 2: Drawing of Clutch Slave Cylinder and Related Components



When clutch fluid is forced to exit the master cylinder from depression of the clutch pedal, it flows through the steel line and into the slave cylinder. The force of the moving fluid actuates the piston in the slave cylinder and forces the slave rod outwards against the clutch fork.

This covers the major elements of the clutch hydraulic system, however certain vehicles will have extra fluid reservoirs and/or restrictors in-between the two cylinders to help smooth out clutch engagement and disengagement. These are not essential components and are not discussed. Now, let's take a quick recap of how the hydraulic system functions

- Clutch pedal is pressed
- Master cylinder is actuated
- Fluid is forced out of the master cylinder and into the slave cylinder
- Slave cylinder is actuated, forcing the slave rod out against the clutch fork

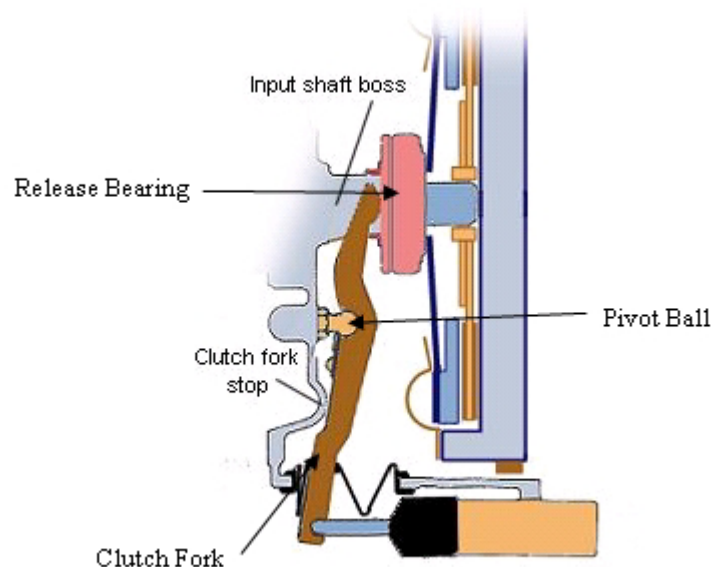


## Clutch Mechanical System

### Clutch Fork

The clutch fork connects the slave cylinder to the clutch release bearing, commonly called the throw out bearing. We can see this by looking at the same figure above, this time with the fork and related components labeled.

Figure 3: View of Clutch Fork and Related Components



When the master cylinder is actuated and the slave rod extends, pressure is applied to one end of the clutch fork. This causes the fork to rotate on the pivot ball and slide the release bearing along the transmission input shaft into the clutch unit itself.

### Release Bearing (Throw Out Bearing)

As mentioned before, the release bearing is connected to the end of the fork inside the transmission bell housing and rests on the tranny input shaft and the clutch unit. When the fork swings, the bearing applies pressure to the clutch and gives the force necessary for disengagement.

### Clutch Unit

When a clutch kit is purchased, it contains two pieces, a pressure plate and a clutch disc. These pieces are then bolted to the flywheel.

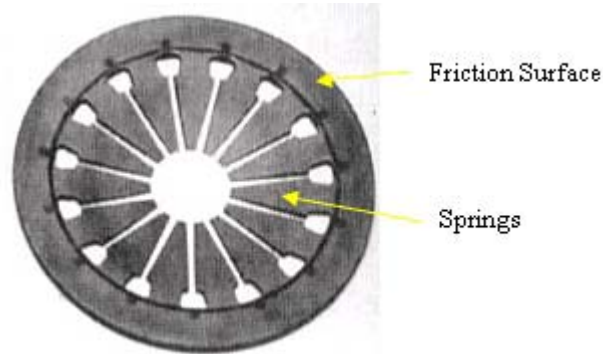
### Pressure Plate

The pressure plate is simply a steel diaphragm composed of a friction surface that mates to the clutch disc and a series of extremely stiff springs. A typical pressure plate can be seen in the following picture:



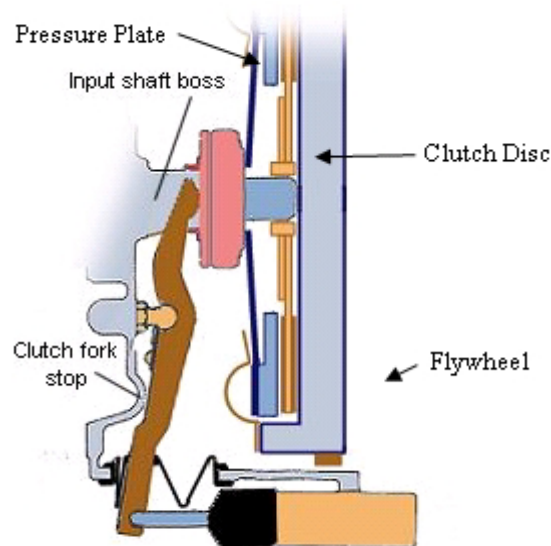
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Figure 4: Pressure Plate Without Cover Showing Friction Surface and Springs



In this picture, there is no pressure plate cover. This is the often brightly colored piece that bolts the plate to the flywheel. Next, taking a look at that now familiar inner bell housing figure, we'll look at the location of the clutch components

Figure 5: Location of Clutch Components Within the Transmission



Here, when the release bearing is forced against the pressure plate it causes the metal springs of the plate to bend. This bending action warps the friction surface of the plate and causes it to relax and hold on to the clutch disc. Simply put this "unlocks" the clutch disc from the friction surface of the flywheel allowing the flywheel to free spin. At this point, the clutch is disengaged and everything looks like this:



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Figure 6: View of Clutch Components When Clutch is Disengaged

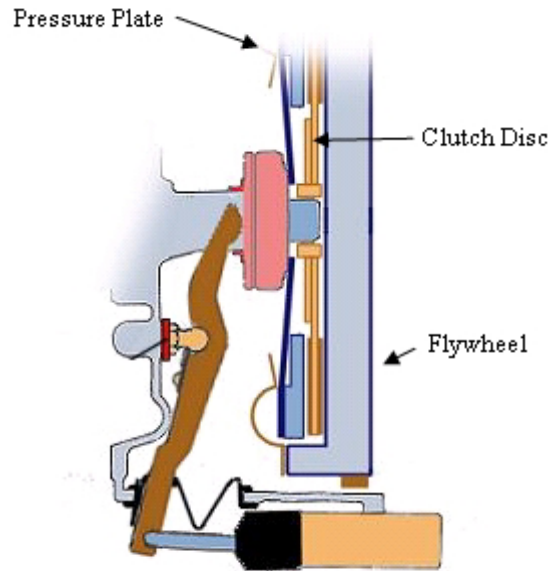
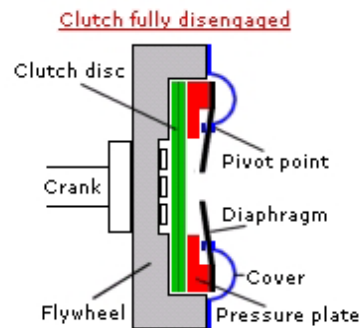


Figure 7: View of Clutch Unit Close Up





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When the clutch pedal is raised, everything works in reverse, the clutch reengages and now we have a picture that looks like this:

Figure 8: View of Clutch Components When Clutch is Engaged

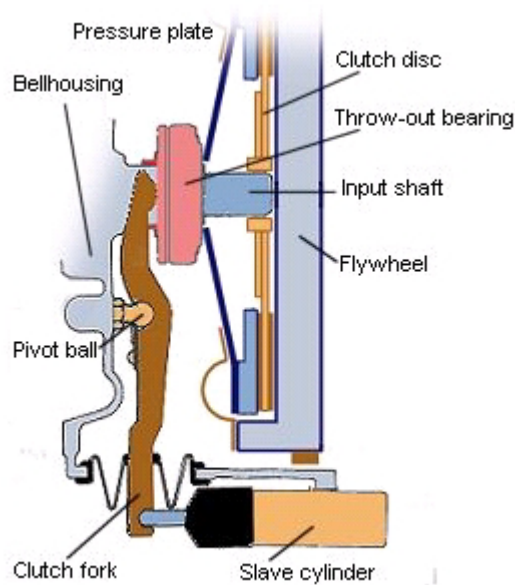
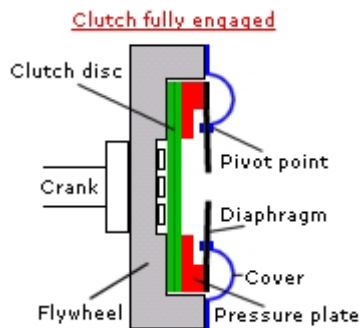


Figure9: View of Clutch Unit Close Up





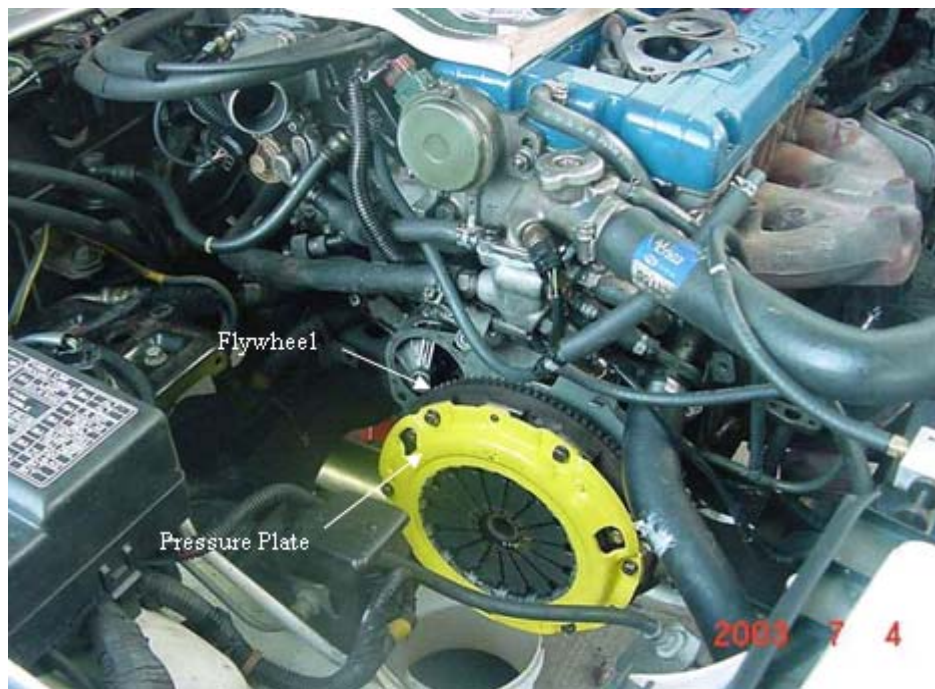
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In the first picture, the angle of the pressure plate springs has been exaggerated for the purposes of comparison between the engaged and disengaged states. In reality, the springs are completely flat when engaged, as in the second picture, and conical when disengaged.

### Flywheel

The flywheel connects the clutch and driveline to the engine. On one side it is bolted directly to the crank shaft, on the other the clutch assembly. When a clutch is installed, the pressure plate is bolted to the flywheel with the clutch disc wedged in-between the two. While there are volumes of more information on flywheels, this is the essential information relating them to clutch operation. An assembled clutch looks like this:

*Figure 10: Exposed Clutch Installed on an Engine*



### Clutch Disc

The clutch disc is merely a disc with each side covered in a high friction material to mate with the friction surfaces of the pressure plate and flywheel. It is also the only part of the entire clutch system that connects to the transmission. The center of the disc is splined to match the splines on the input shaft of the tranny. When the clutch is engaged, the disc is wedged against the flywheel and transfers power from the crankshaft to the transmission shaft. When disengaged, the pressure plate relaxes and the disc is no longer pressed against the flywheel. Simply put, at this point there isn't enough clamping force to cause the disc to spin with the flywheel, so no power is transferred.

Another point of interest, when a clutch goes bad, it is typically because the friction material wears out on the disc. When this occurs, even though the pressure plate is engaged and applying a clamping force, there isn't enough friction between the disc and the flywheel to transfer power and the clutch "slips". This feels like the clutch is disengaged when it is actually engaged. At this point, usually the disc and pressure plate are replaced. There are many other modes of clutch failure, including explosion, breakage, warpage, etc. but those won't be discussed here.



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At this point, an overview of the mechanical aspect of clutch disengagement might help in the understanding of all this information.

To begin:

- The slave rod pushes against the clutch fork
- The fork transfers this motion and forces the release bearing against the pressure plate
- The springs of the pressure plate warp and distort the friction surface
- This removes pressure from the clutch disc allowing slippage to occur between the disc and the friction surface of the flywheel
- At this point, no power is being transferred to the transmission and gear changes can be made

When the clutch is reengaged, as in after a shift, the force from the distorted pressure plate springs actually supplies enough force to reverse the entire disengagement process and raise the clutch pedal off the floor. Thus, the pressure you feel on the clutch pedal when you depress it is the springs of the pressure plate fighting back.

Hopefully this article can help in the understanding of the entire clutch system and its function. This is by no means a summary of all things clutch related as there are entire books published on just the design of the mechanical advantage of the hydraulic system alone; however this should be a good basic overview for anyone who desires to learn just what goes on when the clutch pedal is pushed.

## SAFETY NOTE

Many of us have portable gas cans we use for track day events. Remember **NEVER** to fill up a plastic gas can while it is sitting in the bed of your pick-up truck. Take it out and set it on the ground before filling.

This is a link to a video showing a plastic gas can being filled in the back of a pickup truck, catching on fire.  
<http://www.youtube.com/watch?v=1tYO4jvnJHw&feature=related>

From the CDC

### Recommendations For Prevention

Construction workers and others, like HPDE drivers who often work with gasoline-powered equipment commonly use portable gasoline containers. Homeowners use gasoline cans for their lawnmowers and other equipment.

- **Avoid the hazardous practice of leaving the portable gasoline containers in pickup trucks or cars when refueling!**
- **Before filling, always remove the containers from the vehicle and place them on the ground at a safe distance from the vehicle (provides path to dissipate static charge to ground).**
- **Touch the container with the gas dispenser nozzle before removing the container lid (provides another path to dissipate static charge to ground).**
- **Keep the nozzle in contact with the container inlet when filling (to dissipate static charge buildup from flow of gasoline).**



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## Don't forget about this great event !

We are still working on putting this very worthwhile event together and I have high hopes for a successful outcome. If all goes well, this will certainly become an annual event.

Everyone is welcome to register and please pass this along to any person or company you think might want to help by becoming a sponsor. Anyone can email me at [1010ths@zoomtown.com](mailto:1010ths@zoomtown.com) for details on sponsorships.



### July 30<sup>th</sup>, 2011

## Hope Haven Horse Farm, Inc.

Hope Haven Horse Farm, Inc. is a recognized non-profit dedicated to promoting growth, learning, hope and opportunities for at-risk and special needs residents in Hendricks County, Putnam County and surrounding communities.



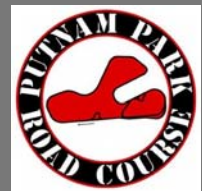
Come join us for the 1<sup>st</sup> Annual HORSEPOWER 4 HOPE Charity Event at Putnam Park Raceway.

*All proceeds to benefit the Hope Haven Horse Farm*

### EVENT ACTIVITIES

- 10/10ths Motorsports High Performance Driving Event
  - There will be some serious race cars turning is loose at this event !
  - Take a look, sit in them, photos and maybe even a ride.
- Touring group and lunchtime on track touring session
- Guest ride-alongs with instructors
- Cookout and Music
- Photo sessions
- Trophy(s) for best looking race / street car
- Some Very Cool Cars and Lots of Fun
- Sponsor Booths
- Door Prizes

## Sponsors Welcome !



Registered Drivers, Guests and Spectators welcome !



Event Details can be found at [www.1010thsmotorsports.com](http://www.1010thsmotorsports.com) or by calling 513.615.2861



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## Did You Know

**10/10ths Motorsports, LLC is a Hawk Brake Distributor.** I can get you some great brakes at a great price. With your 10/10ths driver discount, I can almost always provide you with the best pricing. They can be shipped to your house or brought to the track at our events. Email me or call if you have questions or need to order. Thanks !!!!! Your support will no doubt help 10/10ths Motorsports in providing track days for all our drivers.

## Please Visit our Great Sponsors

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