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Pedal Pusher: How to measure and adjust your Clutch Pedal Ratio

Posted on [February 26, 2018](#)

So you just converted your clanky old manual clutch to a hydraulic release bearing setup and you thought the pedal would be easier to operate than before. While that should be the case, it isn't always, and that is due to geometry. Much like a brake pedal, there is a specific ratio that you need to achieve in order for the pedal to be easy to operate. For hydraulic clutch systems, that ratio is 6:1.

Manual clutches are different from hydraulics, they use a bell-crank system that increases the effectiveness of your clutch pedal. With a hydraulic system, it is all in the placement of the master cylinder push rod on the clutch pedal. The higher the pickup point is on the pedal (closer to the fulcrum of the lever), the easier it is to push the pedal. There are three key factors to this equation: pedal length, pick up point to fulcrum length, and master cylinder bore.

The bore of the clutch master cylinder is the smallest part of the equation because most clutch masters are in the 7/8" range. The bigger you go, the more effort is required to operate the master cylinder. Provided you have a 7/8" bore or smaller, the 6:1 standard is used.

To determine the ratio of the pedal, you need to do some measuring. There are two measurements you need to take: the length from the pivot (fulcrum) of the pedal to the pushrod hole (Y), and from the fulcrum to the center of the brake pedal (X). The formula is $X/Y = \text{Ratio}$. For example, your stock clutch pedal is 14 inches long (X), with a pickup point measuring 4 inches from the center of the fulcrum (Y). $14/4 = 3.5$, which is 3.5:1. While this may have worked for the factory manual linkage, it is about half of what it needs to be for a hydraulic set up. In this situation, 100 pounds of foot pressure yields 350 pounds of pressure to the master cylinder. Move the pickup point up 1.75 inches, (Y measurement of 2.25"), and that same 100 pounds of foot pressure yields 600 pounds at the master cylinder.

For most applications, you can raise the pickup point by simply drilling a new hole in the pedal arm, but some cars, like GM A-bodies, use a convolute pedal design that requires welding if you want to raise the pickup point. This can be done with a 1/4" tab of steel welded to the pedal in the location you want it. This process can become more complicated when you are trying to use a factory firewall hole for the master cylinder.

The sharper the angle is on the master cylinder, you run the risk of creating a bind, which no amount of pedal ratio can overcome. There are a couple of solutions for this scenario. The first is to move the master cylinder up on the firewall, decreasing the angle. This is not always possible, as the brake booster or other items that cannot be easily moved are in the way. The other option is the American Powertrain adjustable firewall mount.

The patented firewall mount allows the master cylinder to accommodate the clutch pushrod angle while being mounted above or below the pickup point on the pedal itself. Because the master cylinder is a sealed system, the angle itself does not affect the operation of the master cylinder. If you have this mount and the angle is still too great, then you have to move the master cylinder. A 6 to 1 ratio is recommended with a 3/4" or 13/16" bore master cylinder. If your pedal measures 12" from the pivot point to the pedal foot pad, you should NOT connect your push rod to the pedal any further than 2" down from the pivot point of the pedal.

Here is the diagram for measuring pedal ratio. Always measure to the center of the fulcrum, pickup point, and to the center of the pedal.

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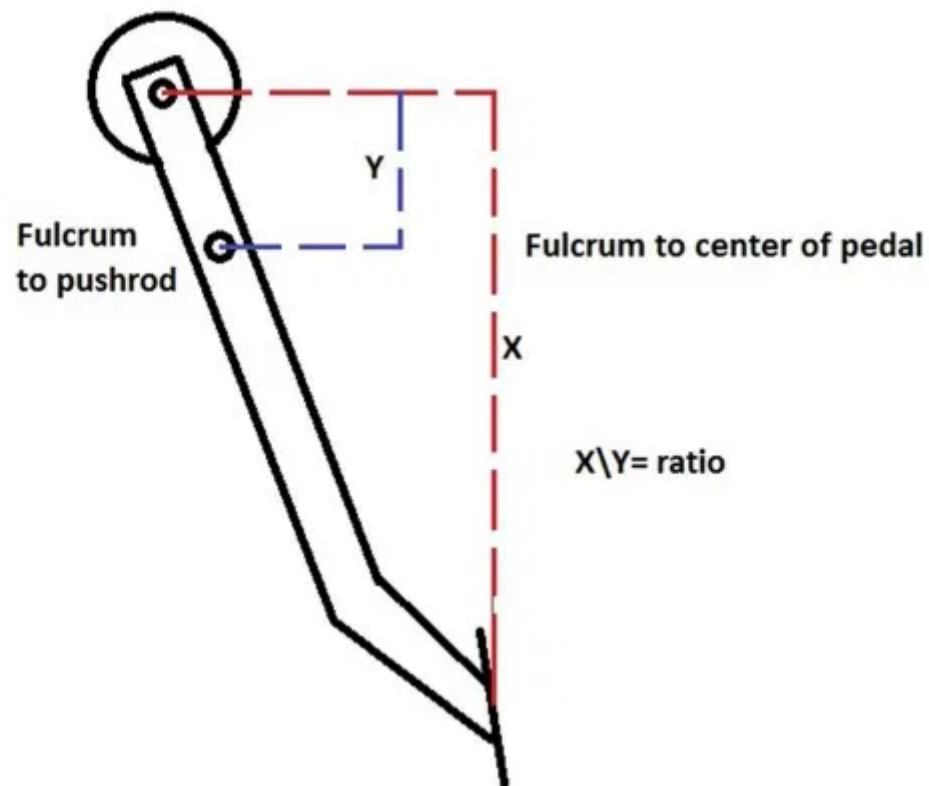
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This is a brake pedal, but the math is the same. On this pedal, the pickup point is 5 5/8" from the fulcrum.



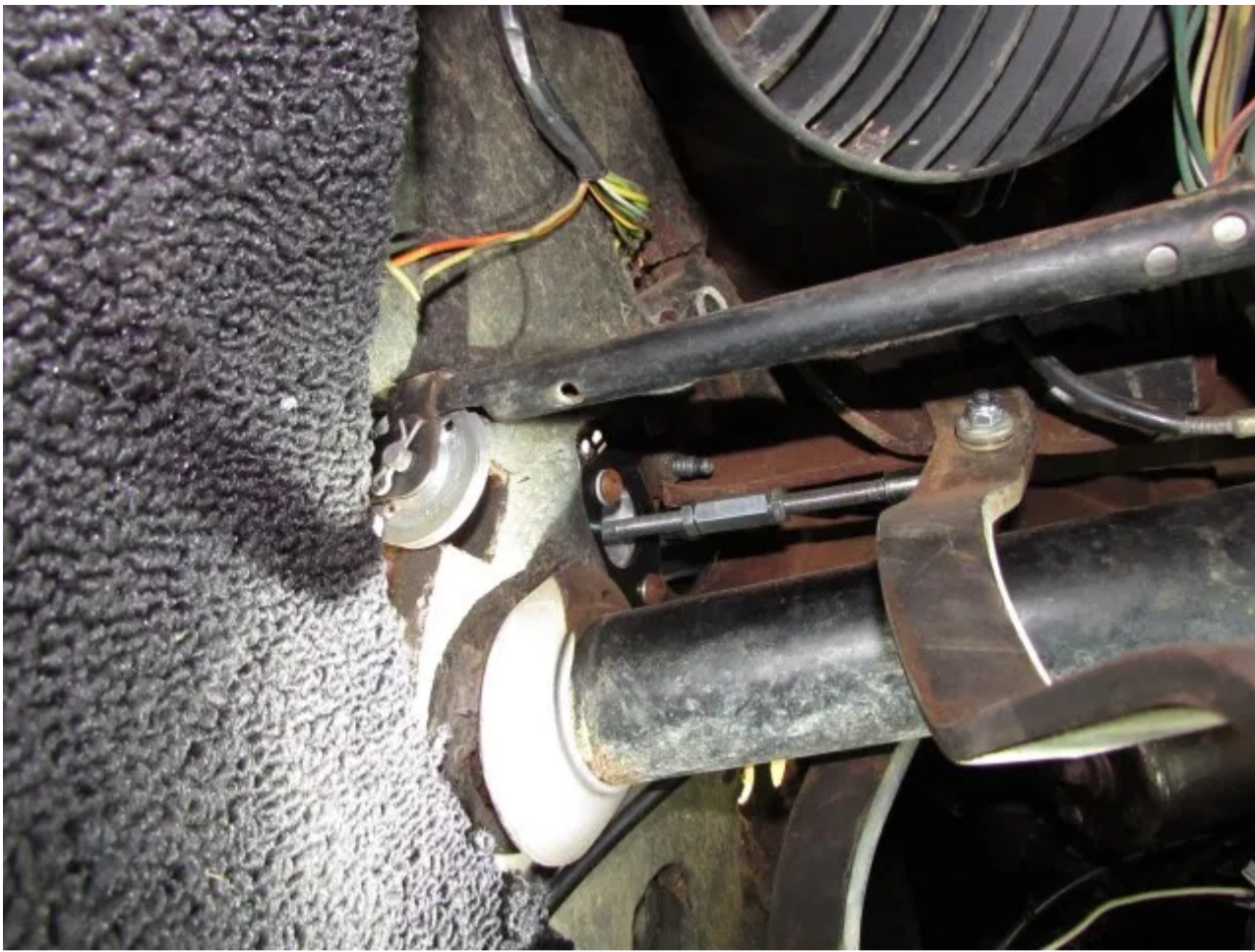
The pedal measures 14 inches from the fulcrum to the center of the pedal. The math reveals this is a 2.48:1 ratio, which is ludicrously low.



To make this pedal match the 6:1 (which is also the optimum ratio for brake pedals), we drilled a new pickup point. All better.



On this 1965 Mustang, the factory clutch pedal is very close to the fulcrum, yielding a suitable ratio for the master cylinder. We were even able to use the original firewall hole.



GM A-body cars (Chevelle, Skylark/GS, 442, etc) have funky clutch pedal as shown here. If you have to change the ratio, fabrication and welding is required.



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Sources:

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1.  **Ken Hooper** says:

September 14, 2019 at 2:33 am

what is the original distance from the clutch pedal to the floor ,both down and forward to the firewall while in a stationary position

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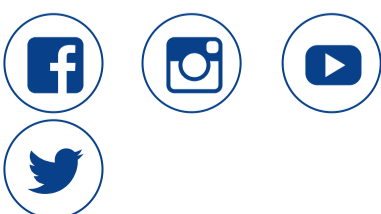
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