

# SLIPPIN' AND GRIPPIN'

BY JIM D. MOORE

There's nothing like hitting a perfect full-throttle powershift to put a grin on your face!



**1** The McLeod Soft-Lok is a hardcore racing part that can work on a hardcore street car.

But it can be rough on the driveline if things aren't designed for the increased power. The key to running fast, not breaking parts, and enjoying your high-horsepower car is clutch management. Nothing like Top Fuel, but it's the same idea; controlled slip so the tires just barely spin and then add in centrifugal assist to hold at higher rpm.

Years ago, people found that as they added power, the stock clutches

couldn't hold the torque and burned up. Obviously, the answer was to increase static spring pressure into the 3,000-lb plus range so it wouldn't slip. This approach ushered in the day of giant left calf muscles, flexing linkage that wouldn't release properly, and broken transmissions and rears. These clutches probably turned more people off to racing with a stick than anything.

Soon, the race folks developed a clutch with “controlled slippage” which helped in several ways. By using less static pressure in the springs, but with a more aggressive and robust disc that could handle the heat, the perfect combination was now available. You could launch at higher rpm and instead of “dead hooking” which pulled the engine down out of its peak torque range, it slipped a little to let the engine rpm stay high to get the car moving with full power. Think of it sort of like a torque converter in an automatic that flashes to a high rpm. While there is no torque multiplication happening, it allows a less than solid connection between the crankshaft and transmission. This saves parts while allowing you to go faster!

Let’s examine the McLeod “Soft-Lok” I use in my car. It’s designed to slip a little on a hard launch to get you moving smoothly, keep rpm up with no bog, and not break parts. When adjusted properly, it does all of that. The trick is the aggressive, sintered iron disc material — the hotter it gets, the harder it grabs. So when you launch and it heats up a little during slipping, it just wants to hold tighter versus a regular organic disc that starts to slip the hotter it gets. The pressure plate is based on a “long” design that was seldom seen on Chevys, usually only on Fords. You can identify it from the three-legged triangular shape of the pressure plate. The levers/arms of a long design also do a great job of releasing at high rpm, so they are very popular in the racing world.

**The Assembly:** First, notice the two blue stripes at six o’clock which indicate the balanced position of the assembly so it can be installed with no vibration issues. Next, notice six of the nine springs have Allen head adjuster screws (identified by the white decals). All clutches have springs, but they aren’t adjustable. Turning the adjusters counter-clockwise increases pressure (sounds backwards, but that’s how



**2** Making adjustments is easy.

they’re threaded). My clutch starts with 250 pounds of static “base” pressure on the disc if all the adjusters are backed off. If you turn all six adjusters one revolution, base pressure increases by 130 pounds. There’s a total of 13 turns available, so you can add up to 1,690 pounds of additional pressure, for a total of 1,940 pounds. You always turn each adjuster the same amount, but it doesn’t have to be in full turns. It can be ¼, ½, or whatever you need.

Now, study the three release arms. On the outside edge of each, there’s a bolt and nut attached to add additional centrifugal assist (the arms already have some built in to the design). As rpm climbs, the weights on the arms want to move outward, which in turn applies more pressure to the clutch disc to keep it from slipping as rpm and load increases. McLeod supplies an assortment of steel and aluminum bolts, nuts, and spacers to provide a wide range of possibilities. Always add the same amount of weight to each arm.

The original disc was .280 inches thick which can wear down to about .250 inches or so before replacement. I had two to three years

of street and racing use from my first disc, in spite of going through the learning curve of adjustments and slipping it way too much the first couple of times out. I replaced it with a disc .380 inches thick which will produce much longer life, especially without going through a learning curve again. “Real” racers will use the thinner/lighter discs, but since I also use it on the street, I like the added meat. To make the thicker disc work, thin spacer shims are installed under each mounting bolt to space the pressure plate away from flywheel; a common trait of high-end clutches. The shims are used to create the 1.890 inch plate height setting you see etched on the plate by the hole drilled into the cover. As the clutch wears, you remove shims to keep the plate height near that setting.

These clutch assemblies are designed to be rebuilt, not replaced. Similar to an aluminum flywheel, the inner plate is actually aluminum with a carbon steel wear plate riveted/screwed to it. During rebuilds, a new steel insert is easily installed.

**The Setup:** Let’s discuss how to tune one for the street or strip and then

# CLUTCH MANAGEMENT

how to drive with one. Whether you have a full-on racing transmission with “dog ring” sliders, or just a good synchronized Muncie or TKO, the proper clutch is vital. Remember something has to give — either the tires, the clutch, or the trans/rearend.

Dead hooking is bad! You want to hit the tires hard enough to get a turn or so during the launch. That doesn't mean it won't still pull the wheels in the air; just that while it's doing it, the clutch is also slipping a little and saving parts! While it sounds counterintuitive, launching at higher rpm is good! To go fast, you'd prefer to launch 1,000-1,500 rpm above peak torque if possible. That way, you fall

right back to the peak on the launch recovery and are immediately on your way to some serious horsepower.

When starting out, you must take into account the weight, horsepower, rpm range, gearing, traction, and how you're willing to drive it. Change any one of those and the setup changes. The amount depends on how much or how many you changed. There are two schools of thought: The clutch guys will tell you to start with a lot of base pressure and back off slightly until it slips, then add a little back in. The transmission folks will tell you to start with low pressure and then add some in until it doesn't slip. It all depends on what parts you're trying to save!

With the combination of base/centrifugal pressures set right, you also get a benefit on the gear changes. As rpm drops, the pressure reduces slightly and helps cushion the driveline from the shock. If you can get by with less counterweight added, it's usually better, but use what you need to keep the base where it should be so you don't blow the tires away. But be careful — with a lot of counterweight, the clutch will try to add pressure as you raise rpm to launch at the line with the pedal depressed. Launching at high rpm (7,000+) can be real hard on the crankshaft thrust bearing as well as make the car creep forward if the clutch linkage flexes and the clutch tries to engage.

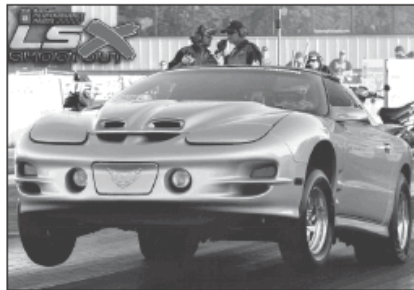
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**Real Life Examples:** Small-block stockers with lots of rules on the motor combos have only so much power available. Often not enough, so they work on everything they can to make it 60' and pull to the eighth mile and then just scream to the end. Usually lots of rpm and gearing makes it all work. In a deal like that, they will put static pressure down real low into the 400-pound range and often, even lower, such as 250 pounds, to allow the motor to stay high in rpm when the clutch is sidestepped. It will really slip a lot through low gear, but they add enough centrifugal assist to keep it from slipping down track. Clutches don't last long, but that's how you win races.

I know of an LS-1 Camaro racer running high 8s/low 9s using a McLeod Soft-Lok. The disc lasted for

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# CLUTCH MANAGEMENT



**3** McLeod makes a neat throwout bearing (P/N 16505) that solves many clutch linkage geometry issues. Years ago, you could purchase bearings in three different lengths, but that's not so easy today. You can get this cool adjustable bearing with removable sleeves that varies the length to either 1.325 inch, 1.525 inch, or 1.725 inch, which allows easy transformation to fit any clutch combo.

years while running 1.28 60-footers on 10.5-inch tires. McLeod always told him he needed to slip the clutch more since it wasn't wearing much, but he preferred to hit it hard with just enough slip to get it moving smoothly. This strategy was a little tougher on the driveline and a little more slip would have saved parts, but it might have run a hundredth or two slower. This particular car used 800 pounds static and no added centrifugal assist. Weight was in the 3,200-pound range with just under 900 hp and rpm in the high 8,000-9,000 range.

My car makes 742 pound-foot of torque, weighs 3,850 pounds at the line, and only has a 10.71 overall first gear ratio which certainly stacks the deck against that poor clutch! My first baseline adjustment attempt was 900 pounds of static. That's five turns on the adjusters plus the 250-pound base pressure. With five grams of weight added to each lever, I headed to the track.

As a side note, I had previously used a custom McLeod Street Twin dual-disc clutch. With 1,600 pounds base and dual discs, it never slipped, no matter what I did. It really drove the rear tires into the ground, but I never knew where it would come down after the launch. The Street Twin is a great clutch, but I was using it in the wrong application.

The first time I launched with the Soft-Lok was like heaven. The car just sat up, went straight, and was so smooth it was crazy. It ran about the same time right off the bat as the previous best the Street Twin had ever done and was super easy to drive. Racing with the Street Twin required launching at only 2,500 rpm to keep the violence down, which bogged the motor and made it hard to pull back up to rpm. On this outing, I launched at about 3,500 rpm to get a feel for it. What I learned from the initial runs was that you could raise rpm a lot; it really did work better and I needed more



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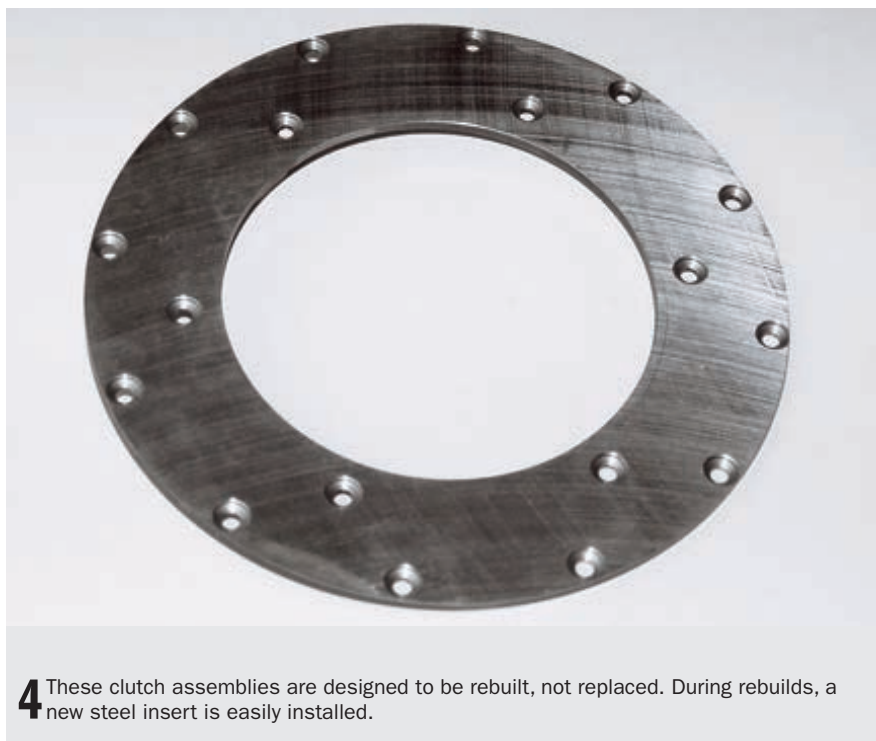
static pressure. I was slipping through low gear, but was fine on the shifts and at the end of the track. Also, by coming out at so low of an rpm, I was causing the slip to be worse because I needed rpm for the centrifugal assist to be effective.

I added one turn of adjustment to the static for a total of 1,030 pounds. Better, but it still slipped a lot in first gear. I was slipping bad enough to slow down to the mid 1.60s at 60 feet (from the normal low-mid 1.40s) yet the rpm was staying up so well on launch that the end result was identical one-fourth mile times! When you lose two tenths in 60 feet and run the same times, something wild is going on!

I added one more turn to the base for a total of 1,160 pounds and used 6.5 grams of centrifugal assist. The idea was to bring it in earlier so it locked up quicker at the top of first gear. Now I started to play with launch rpm. The first run was launched at 4,500 rpm and ran a 9.94. Next pass launched at 5,000 rpm and hit a 9.90. Then I tried 5,500 rpm and that created a little too much wheel spin on the hot track, but still ran a 9.92. I've run that same combo for years now and it's worked nice with the same settings on the street and track. I can drive in, bolt on the slicks, and stay within a few hundredths from run to run. Not bad for a real street car!

**The Bottom Line:** You can see how a little adjustment goes a long way and that it takes a lot more static pressure with my heavy, torquey, and poorly geared combo to get it to act just like a better/different combo. We end up with similar results, but it takes a different setting combination to do it. You're shooting for it to not be violent on the shifts. It should be smooth on engagement with just a hint of slip to save parts. You shouldn't really hear or feel the slip, as it will only be around 50 to 100 rpm.

Another advantage of an adjustable clutch is the ability to tune for varying track conditions. Serious racers might make clutch changes for a marginal track, but just varying



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## SOURCE

**McLeod Racing** / 714-630-2764 / [www.mcleodracing.com](http://www.mcleodracing.com)

the launch rpm or playing with tire pressure will give most folks what they need. Some will like more static pressure on the street. Driving at low-pressure settings might cause excessive slippage if you're not careful before "pouring the steam" to it. "Goosing" it at 2,000 rpm in high gear will slip. If you drop to the right gear, or if the street tires light up, no problem. If it's an issue, just add a couple of turns of base pressure.

**Can You Adjust in the Car?** You'll need to drill an access hole in your scattershield (usually on the right side between the two trans mounting bolts) or get one already modified, but be aware of sanctioning body rules if you modify it. I'm using an old two-piece Lakewood that allows easy counterweight access, plus I drilled a hole to adjust the base pressure. Once you have access to the adjusters, you rotate the motor in 60-degree increments and use a long Allen socket and ratchet to turn the adjusters.

What I've described here is the use of a serious/hardcore racing

clutch to its full advantage. While the pedal effort is like a Toyota, it's not designed to be a smooth "get caught in traffic/daily commuter" clutch assembly, so it's not for everyone; but it's great for a hot-rod street toy that you want to race. The sintered iron disc sometimes makes a squealing noise during initial engagement when hot (like a brake squeal). There are numerous other clutches that work great in pure street applications and will also work well for occasional dragstrip usage with slicks. Some use low pressure diaphragm-style pressure plates with aggressive discs, some use discs with two different friction materials as a balance, and some use multiple discs with real low pressures since the added clutch disc area gives incredible holding power. Check with your favorite clutch supplier and discuss your options; be honest with your expectations and don't buy the cheapest thing you see. You've spent a lot of money building the power, now select a clutch to put it to the ground without breaking the bank or all your stuff! **BP**