TCE Performance Products

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CURRENT KITS

- 350Z and G35
- 370Z and G37
- Camaro 2010+
- Charger, Challenger, Magnum, 300C
- Cobalt and HHR
- Contour and Cougar
- Corvette C2&C3
- Corvette C4
- Corvette C5, Z06
- Corvette C6, Z06
- Corvette C7
- Countryman/Paceman by MINI
- Crown Vic- Panther
- Dart
- Eclipse 1G
- Eclipse 2G
- F150 (2010+)
- Fiesta
- Focus 00-'07
- Focus 2012+
- Ford Ranger
- Fusion '13+
- Impala SS 94-96
- Impala/Caprice '71-'76
- Jeep Cherokee
- Juke
- Lancia Scorpion
- Lightning, Harley F150 99-04
- Marauder

Dual Master Cylinder Bias and Torque Calculator

This new calculator will produce torque results based upon projected maximum deceleration demands and allow users to built a dual master cylinder brake system with a wide variety of variables used in its design criteria. Additionally, the calculator can be used to fine tune desired brake bias based upon altering the pivot point of the balance bar in the pedal assembly thus giving an accurate picture of what true 'adjustable bias' can produce via the cockpit cable adjuster. ***To use the dual MC calculator as a single bore design- set both MCs in the table to the same spec, then set the "pivot offset" value to zero. This will give the same line pressure to both axles and not favor one or the other.**

The calculators requires a fair amount of data to get the desired results. In the brake bias calculator you will need the dimensions of many of the components of your current or desired brake system. This includes things such as the pedal dimensions, piston sizes, rotor diameter and brake pad coefficient of friction. The Torque table will require you to know the estimated weight of your vehicle per axle as well as an estimated 'center of gravity' as well as the desired g-force or "g" you feel your vehicle can achieve. When fully populated the tables work in tandem with one another allowing you to tune the bias calculator to achieve the goals set in and by the torque calculator.

A few opening thoughts:
1. The calculator has a default built into it to serve as a sample. In the sample vehicle we have designed a fairly reasonable 14"/13", 6/4 piston front and rear brake system with a modest .45 pad Cf and a common pedal ratio design. Note how the 68/32 brake bias is produced by fine tuning of the balance bar (+.150") so that the "required" toque per axle matches that of the "toque from left" cells. The total toque should also match relative to the leg input pressure for 100% value.

2. Use reasonable data. Don't make unreasonable assumptions that your car cannot achieve. A full 1g deceleration is possible on a vehicle with very high grip tires and optimum conditions. Most street tires will work best at perhaps a .6g target. If you can achieve more at some point it will only be relative to the amount of rotor torque and thus a bump in pedal effort to get to .8g may be minimal. Watch you "leg effort" number; the default 93lbs is huge. A more realistic value is in the 50-60lb range. Test this with a bathroom scale propped up againt a wall and find your comfort level.

3. Surface conditions. The calculator does not take into account surface conditions. We are assuming simple Mu of 1 or a clean, dry surface. Obviously you cannot achieve 1.2g deceleration on a gravel surface regardless of the tires or brakes. Again, be realistic in your input.

Differences in this calculator vs the Bias Calculator; Here the calculator will require you input much of the same data as the other, however there are some changes also. The pedal ratio will need to be calculated by supplying the measurements of the short and long portions of the brake pedal. You will need to populate the diameter of all pistons in the calipers to represent the total pressure- as opposed to 1/2 of the caliper when comparing only bias and an oe sliding/floating caliper. While bias will not change one way or the other we now want to calculate the total force produced by clamping. *If using a single or dual piston sliding/floating caliper populate the "Outboard" piston data to match that of the "Inboard" to compensate for the slide force factor.

Brake Bias Calculator

Leg force effort (lbs.)		100
Distance: pedal pad center to pushrod center		10.000
Distance: pushrod center to mount pivot center		1.500
	Pedal ratio	6.667
	Force applied	666.700
Distance: ctr. to ctr. of pushrods.		2.500
Pivot offset (+ Front or - Rear)		0.
	% Front offset	0.500
FRONT Master Cylinder bore		0.625
	Front MC area	0.307
	Front line PSI	1085.831
REAR Master Cylinder bore		0.625
	Rear MC area	0.307
	Rear line PSI	1085.831

Weight Transfer Values

Front axle wt.	1000	37.74%
Rear axle wt. lbs.	1650	62.26%
Total Weight lbs.	2650.000	100%
CG Ht. inches	12.0	
Wheelbase; inches	100.0	
Deceleration; 'g'	1	
Total Transfer	318.000	
Net Dynamic Front wt.	1318.000	49.74%
Net Dynamic Rear wt.	1332.000	50.26%

Required Brake Torque

Desired 'g' from above	1
Dynamic front wt. above	1318
Front tire dia. Inches	26.25.0
Dynamic rear wt above	1332

- **Mazda 3**
- **Mazda 6**
- **Mazda RX8**
- **MINI 01-06**
- **MINI 07-13**
- **MINI 2014+**
- **Mustang 05-13**
- **Mustang 2015-**
- **Mustang 94-04**
- **RSX**
- **SHO '89-95**
- **SHO, Flex, Explorer, MKS 2010+**
- **Solstice/Sky**
- **SRT-4**
- **Subaru WRX 08+**
- **Subaru WRX 99-05**
- **Super Duty 1999-2004**
- **Super Duty 2005-2012**
- **Super Duty 2013+**
- **Tiburon**
- **Titan-Armada**
- **XXX Customs**

Front Outer piston 1 dia		1.75
Front Outer piston 2 dia		1.75
Front Outer piston 3 dia		0
Front Outer piston 4 dia		0.000
Front Inner piston 1 dia		1.75
Front Inner piston 2 dia		1.75
Front Inner piston 3 dia		0
Front Inner piston 4 dia		0.000
	Total front area	9.621
Pad coefficient of friction- Cf (Mu)		0.550
Diameter: Outside of rotor		12.000
Radial height of pad		1.750
	Swept radius	5.125
Front torque (ft. lbs)	Combined corners	4907.810
Brake bias front %		0.663
Rear Outer piston 1 dia		1.38
Rear Outer piston 2 dia		1.38
Rear Outer piston 3 dia		0.000
Rear Inner piston 1 dia		1.38
Rear Inner piston 2 dia		1.38
Rear Inner piston 3 dia		0.000
	Total rear area	5.983
Pad coefficient of friction- Cf (Mu)		0.450
Diameter: Outside of rotor		12.000
Radial height of pad		1.750
	Swept radius	5.125
Rear torque (ft. lbs)	Combined corners	2497.103
Brake bias rear %		0.337

Rear tire dia. Inches	27	
Front Torque **req.**	1441.563	49.03%
Rear Torque **req.**	1498.500	50.97%
Total Torque **req.**	2940.063	100%
Front from bias table	4907.81	66.28%
Rear from bias table	2497.103	33.72%
Total from bias table	7404.913	251.86%

After thoughts: in the example above we have a relatively high "leg" or input level. This is fine to show the relationship of these designs but the value should be closer to 60-70lbs total. To achieve that low a value and retain the total necessary rotor toque what would you do?? You'd use less leg input and either decrease the mc bores or more likely; increase the total piston area of both calipers. Give it a try and see. Or you can also put huge rotors on the car or even change the pedal ratio- all the while these changes will require you match the values in the right hand tables.

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