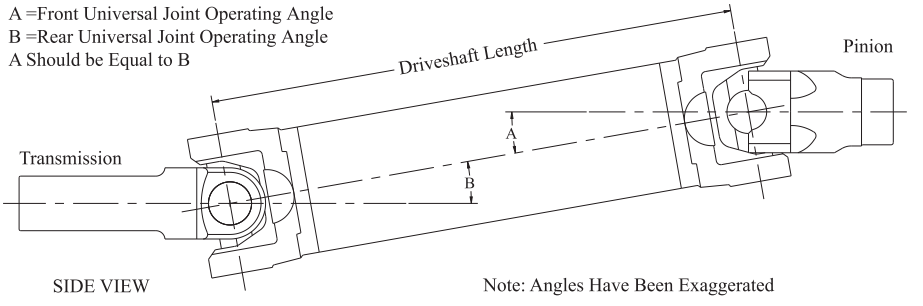
Driveshaft Tips

There are a couple important factors that will ensure the best possible performance from your driveshaft assembly. One is U-joint operating angles and the other is shaft critical speed. Both are explained below. Use these tips to avoid common driveline mistakes.

Operating Angles

The driveline arrangement in most racing applications is known as a parallel, zero degree phasing driveshaft. In order to obtain the minimum power loss from the operation of the universal joints, two things must be addressed with regard to operating angles. First is making sure shaft centerlines are parallel. Second is the actual operating angle of the U-joints. The centerline of the engine/transmission (ØA) should be kept as parallel as possible to the pinion centerline (ØB). This ensures both U-joints are operating at the same angle.



Keeping these centerlines parallel throughout the suspension travel would be ideal but is very hard to do. The type of rear suspension will have an effect on maintaining a parallel condition. A 4-link suspension system is the best when it comes to the pinion maintaining its angle through its travel up and down. Ladder bar and torque arm systems create unique operating angles as the suspension moves since they move from a single point. In any case, the pinion angle should be set to match the engine/trans angle with the car at its ride height by placing a digital level on a machined surface of the engine then on the pinion yoke. Adjust bars or shim accordingly. u-joint operating angles should be kept at a minimum. In general operating angles should be 2° or less for racing applications and should be within 1/2° of each other. Greater operating angles create a power loss and can cause vibration at high RPMs. Again a 4-link is the best at keeping the U-joints operating at the same angles. Increasing the operating angle will also affect the critical speed characteristics of a driveshaft. There is a general misunderstanding about "dropping the pinion down" several degrees. This is a practice that should be applied only to leaf spring cars without any traction control devices where springs can "wrap" and change pinion angle. This practice would not apply to 4-link, ladder bar or torque arm equipped cars. Failure to maintain matched and minimum operating angles increase erratic non-uniform output velocity from the driveshaft to the differential.

Critical Speed

MW Part Number	44"	46"	48"	50"	52"	54"	56"	58"	60"
39155 4.0" Carbon Fiber	14173	12940	11860	10910	10070	9320	8650	8060	7521
39550 4" Bonded 7075	10620	9700	8890	8170	7540	6980	6480	6040	5630
39555 3.5" Bonded 7075	8590	7850	7190	6620	6110	5660	5250	4890	4570
39600 3.0" Mild Steel	7860	7170	6570	6050	5580	5170	4800	4470	4170
39640 4" Mild Steel	10460	9560	8760	8060	7440	6890	6400	5960	5560
39650 3.5" Mild Steel	9210	8410	7710	7090	6550	6060	5630	5240	4890
39800 3" 4130 Steel	7960	7270	6660	6130	5660	5240	4860	4530	4220
39850 3.5" 4130 Steel	9230	8430	7730	7110	6570	6080	5650	5260	4910
39860 4" DOM Mild Steel	10470	9560	8770	8070	7450	6900	6410	5970	5570
39880 3.5" Chromoly 1480	9320	8510	7800	7170	6620	6130	5690	5300	4940
39890 4" 1480 Bonded 7075	10620	9700	8890	8170	7540	6980	6480	6040	5630
39985 3.5" Bonded 6061	9050	8260	7580	6970	6430	5960	5530	5150	4810
39990 4" Bonded 6061	10460	9540	8750	8050	7430	6870	6380	5940	5540

Critical Speeds of MW Driveshafts in RPM'S
Lengths are centers of U-Joints

Any rotating shaft will become dynamically unstable at certain speeds and create vibrations at an amplitude that will cause destruction. The shaft will go into a whirl or "jump rope" effect causing an imbalance that will vibrate violently and ultimately fail. In order to avoid these conditions all drivelines must operate within their critical speed limitations. The factors that determine the critical speed are the stiffness of the material, the diameter of the tubular member and the shaft length. Typically a larger diameter shaft has a higher critical speed than a smaller diameter shaft. The length of a shaft also has a great effect on its speed properties. The chart to the left shows general limits based on a 75% rating. Keeping shafts within these limits will assure smooth operation. Shafts operating higher than the speeds listed can expect vibration at some point.