Measuring Drive Line Angles with the DAA

Truck Vibration Technology
http://www.truckvibration.com

Improper driveline angles can be the source of uncomfortable and destructive torsional vibration. Being able to measure these angles correctly is the first step in diagnosing a problem and ultimately taking corrective action.

Basic to correctly measuring driveline angles is investing in the proper tool.
The Roadranger Driveline Angle Analyzer (DAA2) kit has 4 basic elements in diagnosing and correcting improper driveline angularity:
Digital Protractor to measure the angles of the key driveline components
V-block to allow proper measurement of short drive shafts
Tape Measure to measure the length of each shaft
CD with DAA Program to calculate the effect of the component angles on torsional vibration.

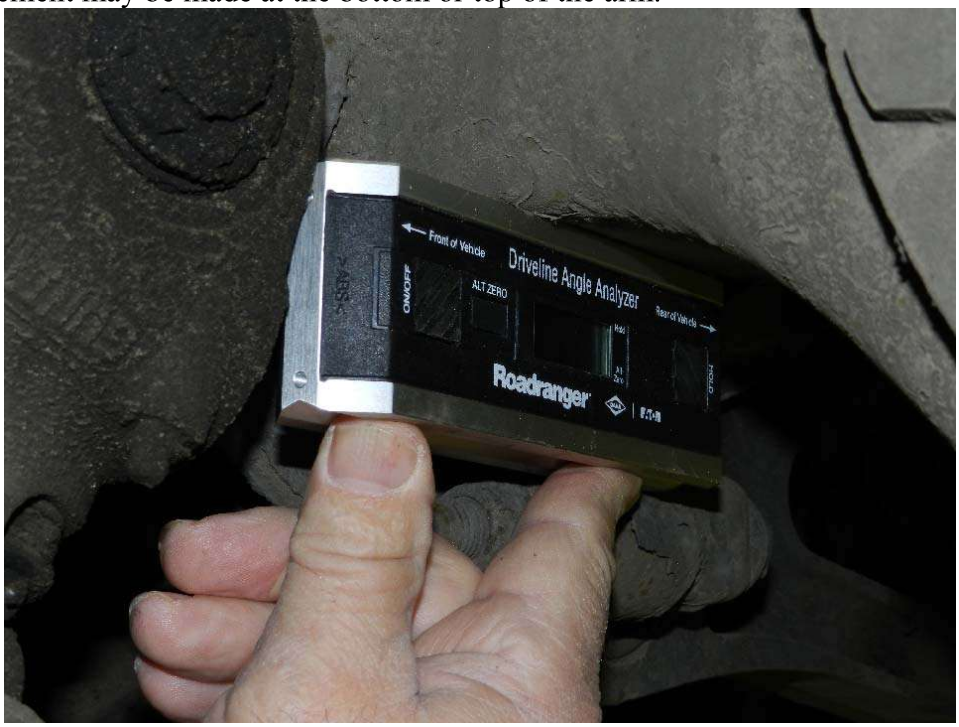
The digital protractor is very easy to use, providing some very basic rules are followed.

- Be sure the truck is sitting on a level surface.
- Make sure the ride height is adjusted to its normal level.
- If there is no ride height load compensation, make sure that the truck is loaded to the level at which it will be most generally used.
- Make sure that the protractor is used in the right side up position so that the labels are clearly readable.
- Hold the protractor so that the Front of Vehicle and Rear of Vehicle arrows on its face point in the designated direction.
- When measuring angles, be consistent with your sign convention. A slope downward toward the rear of the truck is a positive angle. This is shown as a downward pointing arrow on the left of the LED display. If a component slopes upward toward the rear of the truck, it is a negative angle. This is shown as an upward pointing arrow on the left of the LED display.
- Take measurements on a machined surface where possible.
- Make sure that the surface measured is in the same plane as main shaft in the component being measured (like the oil pan rail).
- Use a V-block on interaxle shaft measurements. The welds on these short shafts can generate unacceptable errors in measurement.
- Measure all of the components in the system, which are typically the engine/transmission, the main drive shafts (be sure to measure as many as there are in the system), front drive axle, interaxle drive shaft and rear drive axle.

First, measure the transmission installation angle. This is most easily done by measuring the engine angle (same as transmission angle) by placing the protractor on the valve cover, but make sure that the valve cover is not tapered. The measurement may also be made at the top of the transmission, but it may not be as accessible.

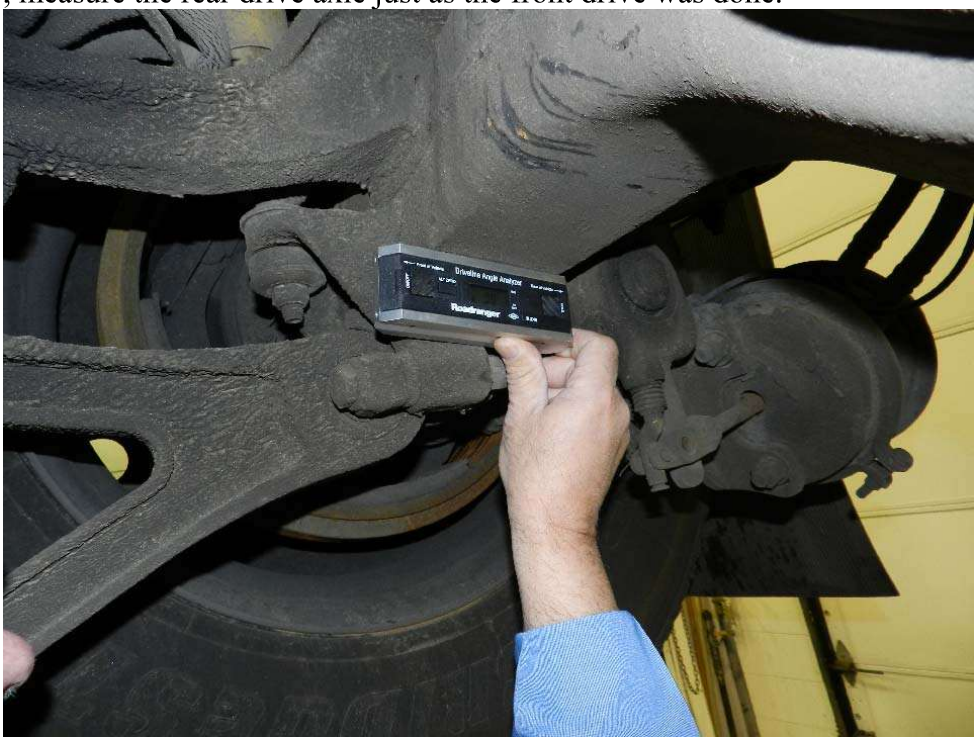
Next, measure the angles of the various main drive shafts. Make as many measurements as there are drive shaft segments. These measurements may be made at the top or the bottom of the shaft. Heed the direction of the arrows “Front of Vehicle “and “Rear of Vehicle”. Note also the arrow pointing down at the left of the LED. This reading is a positive 0.9 degree angle with a downward slope toward the rear of the vehicle. (See Rules)

Next, measure the front axle on the arm of the axle near the spring mounts. This measurement may be made at the bottom or top of the arm.

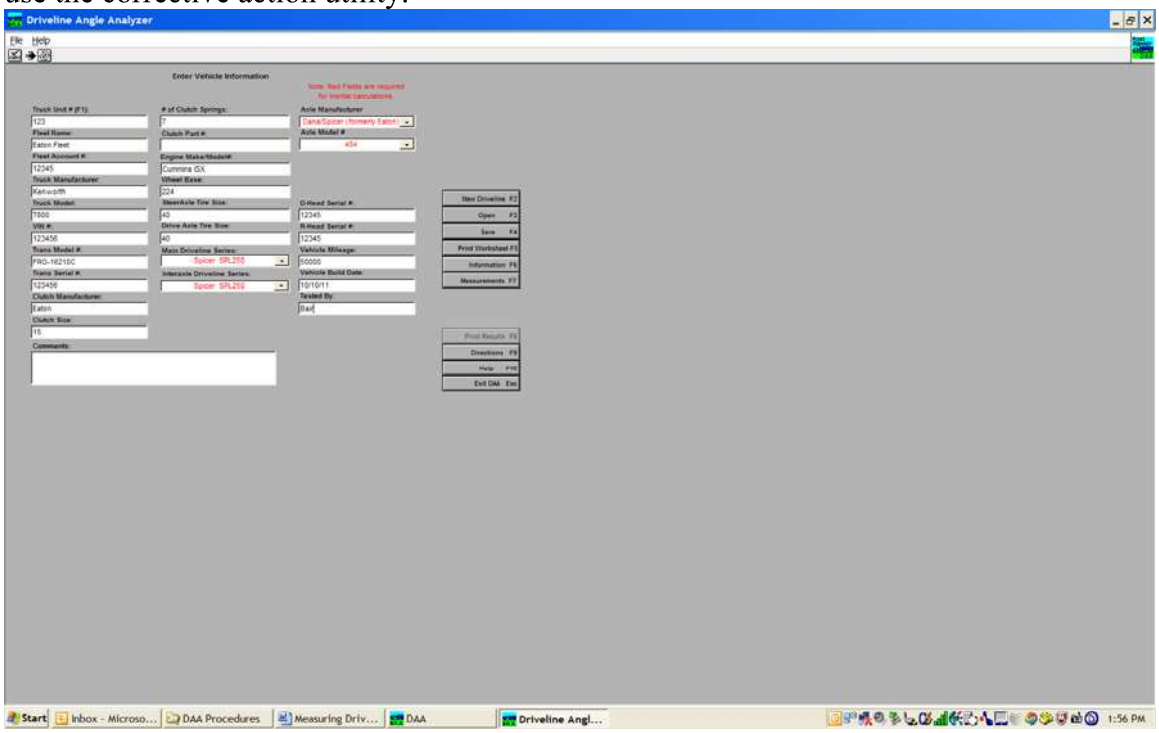


Next measure the interaxle drive shaft. A v-block is available to assure that the measurement can be made without weld interference.

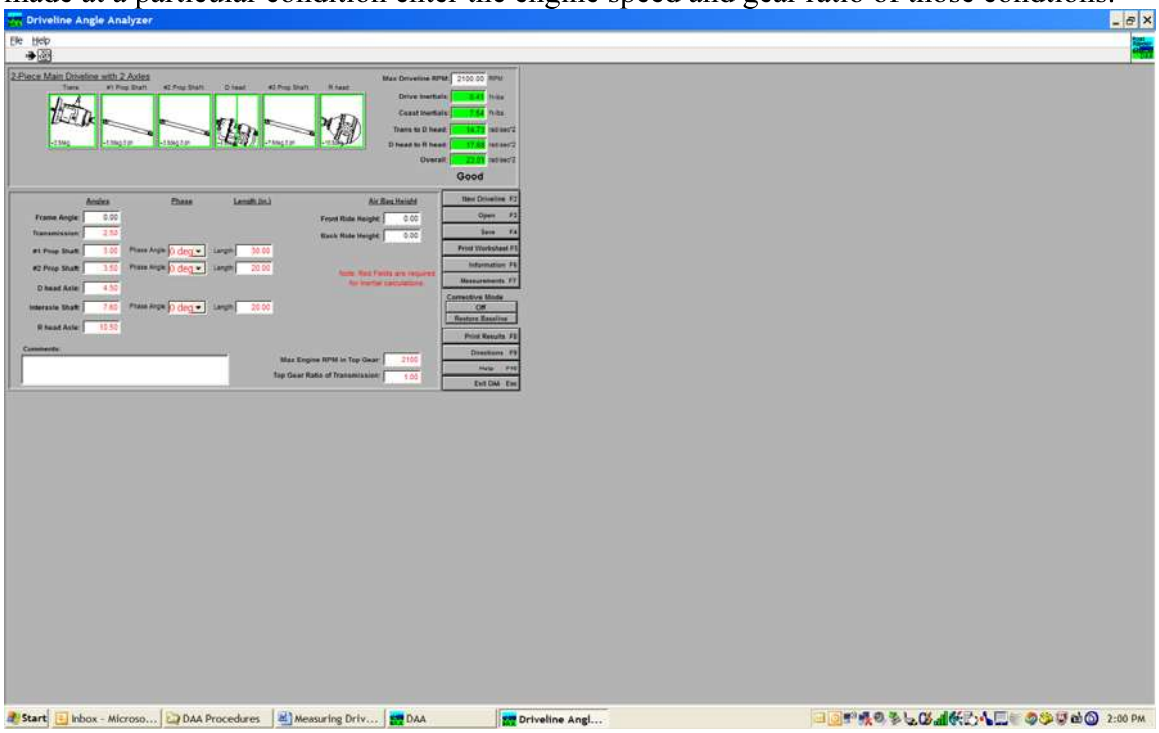
Finally, measure the rear drive axle just as the front drive was done.



After all of the component angles are measured with the digital protractor, they may be entered in the DAA program. First enter all of the required information on the Information page. Be sure to enter the driveline and axle models. This will allow you to use the corrective action utility.



Next enter your measurements on the Measurements page. Be sure to include the drive shaft lengths. It is important to enter the proper information on the engine top speed and to check the top gear ratio of the transmission as the calculation is made at the highest driveline speed achievable. If you are attempting to compare the results to measurements made at a particular condition enter the engine speed and gear ratio of those condtions.



On the upper right, the calculated torsional vibration due to u-joint excitation will be displayed. In the Corrective Mode, changes to the axle angles and drive shaft angles can be made and the resulting torsional vibration measured.