Part 3:

CHECKING TOE ANGLE -

With the caster and camber out of the way and the vehicle on a properly leveled surface, it's time to lay out the string network that will allow you to take accurate measurements off of the wheel locations in order to set the toe. These measurements are what you will use to adjust your suspension into the correct position for a proper alignment.

The parts that I used for this string network are two stick of conduit (must be at least 7' long), string, four jack stands and four clamps. You will also need a quality ruler to set up the string network, but we will get to that in a minute.

Starting with the two sticks of conduit, I drilled holes in each end exactly 73" apart. The exact distance is not important as long as the strings are positioned wider than the widest part of the vehicle and at least 2" wider than the distance between the outer edges of the tires. What *is* important is that the holes are drilled at exactly the same distance from each other. Place two jack stands at each end of the vehicle at the corner of the vehicle. Try to position each jack stand the same distance from the vehicle as the one next to it.

Position each conduit piece on top of two jack stands (one front, one rear) and secure one clamp on each jack stand in such a way that it prevents the conduit from coming off of the stand but still allows the conduit to be moved side to side.

With the conduit in place, you can then tie a string between each conduit through the drilled holes. Tying through the drilled holes ensures that the strings stay exactly the same distance apart. Pull the strings as taught as possible without tipping over the jack stands.

Please look at the pictures below for reference while reading the above descriptions.

With the strings in place, you will now need to raise or lower the position of the conduit in order to position the string at the exact centerline of the wheel hubs. Again, use whatever means you have to accomplish this. Refer to the photos above for two different approaches.

It is now time to square the strings with the chassis of the vehicle. People use various methods for this, but in the interest of keeping things as simple as possible, I like to measure off of the centers of the hubs. Even though it shows it in the pictures below, it is not perfectly accurate to measure off of the front grease caps. The caps are so easily damaged and distorted over time that they are not suited for precise measurements. The best practice is to remove the grease caps and measure from the end of the spindle.

It's now just a simple matter of making sure that the strings are the same distance between the left and right front hubs and between the left and right rear hubs.

This distance will not be the same front and rear, but making the distances the same left to right will set the strings so that they are parallel with the chassis. Being parallel to the chassis is important because it helps set the thrust angle as described above.

It must be noted that it may take several tries in order to get the strings sitting exactly where they should be. I like to do a quick set-up first just making sure that the strings are kind of close. That way, when I do my final settings, the movements that I do to the string at the front of the vehicle does not have too much effect on the measurement at the rear. It usually takes me about three trips around the vehicle to get it right, but if you are not paying attention or don't do an initial setting to get the strings close, you could make many more trips back and forth.

It should also be noted that the string that I used has a thickness of just about 1mm. I like to use the inside edge of the string for my measurement points. String with a lot of fuzz is not going to be very helpful to you as smooth string gives you a crisp line of sight measurement.

Now we can move on to actually measuring the toe angle. Again, this is where the thrust angle can come into play. Toe angle adjustments can be performed without the use of the string jig. All it takes is a simple flat bar across each front wheel and a tape measure. Measure in front of the tire and in back of the tire. The difference is your toe angle. There are two problems with this method.

One is that without the strings, when checking/setting the rear wheel toe angle, there is no way to reference to the centerline of the vehicle. This means that even though the left and right rear wheels have the correct toe angle relationship, they still could be pointing off to the left or off to the right of the vehicle's centerline.

This would result in the vehicle going down the road like a crab as described in the definition of thrust angle.

The second problem is that when checking/adjusting the toe on the front without the strings for reference, there is no way to tell where the steering wheel will be positioned relative to the wheels pointing straight ahead. While the car could still go down the road straight (assuming that the rear toe is set correctly), the steering wheel could end up way off center.

Setting up the strings eliminates both of these issues.

Luckily for us, the Bentley manual spells out the front wheel total toe angle in minutes, millimeters and inches and the rear toe angle is spelled out at zero minutes so as long as it measures equal, your good. Total toe needs to be divided in half to know the single wheel toe angle.

The rest is all very simple. The Bentley manual describes how to center the steering wheel. Once this is done, it's a simple matter of measuring from the front lip on the wheel at string height and the rear lip on the wheel and again, the difference is your single wheel toe angle. Combine the measurement differences for the left and right wheels to know the total to angle.

The pictures below show the right front toe angle at 3mm (26mm at the rear lip of the wheel and 29mm at the front lip of the wheel). Assuming that the left front wheel shows the same 3mm toe angle, this would result in a total toe angle of 6mm. An adjustment of 1mm toe out per side (or 2mm total toe out) would be needed in order to adjust the toe angle into specs. Guess I need a minor adjustment!


mm
10
20
30
40
50
60
70
16ths
1
2
3

The pictures below show the real world measurements of the right rear wheel of my van. You can see that both front and rear lips measure 37mm (actually one of the photos looks like 37.5mm, but the ruler is angled slightly making it look that way. Taking pictures while holding rulers is hard) resulting in zero toe angle for the right rear.


mm
10
20
30
40
50
60
16ths
1
2

That's it …really! Honestly, I know that it looks like a lot because of all of words, but once you have the string jig and you purchase the RPW tool (or build the camber bar), the rest is really very simple. Any weekend warrior should be able to perform these operations without any real difficulty (frozen nuts and bolts not included).