

Back2Basics⁴

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Step-by-Step **TIRE/WHEEL BALANCING**

This article on how to properly balance tire and wheel assemblies is the final 2012 installment in our series covering basic tasks performed in tire dealerships.

The first in the series was an article on Basic Tire Repair (February), the second on Tire Mounting/De-mounting (May) and the third on Tire Rotation (August).

This latest article covers generally accepted practices for balancing tire and wheel assemblies. It is intended not only for new tire technicians, but also veterans who want to brush up on their techniques.

Photos, diagrams and background information

were supplied by Hennessey Industries' Coats brand. The recommendations made in this article are based on the use of a Coats 1250 tire/wheel balancer. There are other brands of wheel balancers on the market, and this does not mean that we endorse any one brand over another. We suggest that you save this article – and the entire Back2Basics series – for future reference.

It is important to note this article only applies to consumer tires and does not address commercial tire applications – light or medium truck tires – or the use of outside balancing aids that would be installed into the tire/wheel cavity.

Background On Tire/Wheel Balancing

Tire/wheel assembly balancing is a very basic service, and still a good profit center for tire dealers who invest in the necessary equipment.

Modern cars and light trucks/SUVs are highly tuned vehicles, and anticipated performance, driver comfort, fuel economy and tire life all can be negatively impacted by even the slightest imbalance. Fractions of an ounce truly do matter today.

Current tire/wheel balancers are much easier to use than earlier machines or the old-school bubble balancers, with many automatic and computer-generated features designed to deliver exceptional balance. Many modern tire/wheel balancers include features such as direct drive motors, multiple balancing modes, laser guides, automatic starting with a cycle of seconds, weight storage bins and automatic static balancing.

There are a number of reasons why you should be checking the balance of the tires/wheels on your customers' vehicles. The three basic times when balancing should be done include:

- When a tire is replaced or repaired
- When a balance weight is moved or falls off
- When new tires are purchased

Tire technicians know that balancing tire/wheel assemblies can eliminate vibration and wobbling. This will improve tire wear, increase fuel mileage and remove stress from a vehicle. Vibration caused by out-of-balance tires usually occurs at speeds of 50 mph to 70 mph. Consumers who only drive around town and not on expressways may never notice their tires are unbalanced, but damage is still being done.

Today's high-quality tires will hold their balance well unless an outside force, such as hitting a curb or the loss of a weight, occurs. Technicians also should check to see if a customer has locking wheel lugs in some positions. Some locking lugs are up to 1.5 ounces heavier than conventional lug nuts,

which may cause a half-ounce or so translation to the wheel.

Types Of Balancing

In many cases, when a tire is manufactured, it is inspected for static and dynamic balance. Not every tire, even among the major makers, is directly tested, though. Tires that don't measure up in either factor are rejected.

Tire manufacturers measure static balance by the use of a sensor mounted to the spindle assembly, and measure dynamic balance by mounting a tire on a test wheel, accelerating the assembly to 300 rpm or higher and then measuring the forces of imbalance as the tire rotates.

In most cases, the old-school bubble balancer is a thing of the past. Dynamic balancers – also referred to as "spin balancers" or "computer balancers" – are the most prevalent piece of equipment. Even among dynamic balancers, though, there are vast differences in not only features but, more importantly, precision.

Dynamic balancers not only determine the location of any imbalance, but also point out the exact amount of counter weight that must be added to correct the imbalance. Various available equipment features can make that an even more precise operation.

Road force variation balancing is yet another method that has been in use at the OE level for many years. While only in limited use in the aftermarket, road force variation equipment is becoming increasingly popular as vehicle sensitivity to imbalance becomes ever greater.

Steps for Balancing a Tire/Wheel Assembly

Depending on the equipment you have, tire/wheel assemblies are balanced in a number of ways. The steps are outlined as follows if you are using one of the more modern, automated machines, like the Coats 1250. These instructions are not meant to cover every balancing situation.

Before a tire can be balanced, it must be concentrically seated. You



Today's balancers can handle almost any car or light truck assembly that rolls into a bay in a quick and efficient manner.

can determine this by measuring the distance between the molded rib on the lower sidewall of the tire and the edge of the wheel's rim flange. The tire must be deflated and reseated if the distance between the two points is greater than 2/32-inch.

After ensuring that the beads have reseated properly, the tire should be inflated to the recommended pressure.

1. Turn your machine OFF then ON, which resets the balancer. The machine wakes up using standard clip-on wheel weight locations.

2. Remove stones/rocks or other debris from tread and any weights already attached to the wheel. During this process you also should remove any mud, dirt or snow on the inside of the wheel and make sure that the mounting surface of the wheel is completely



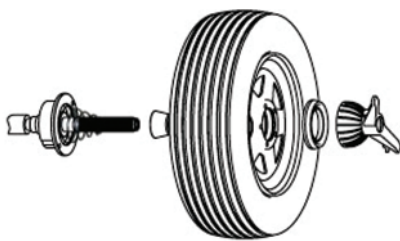
Cleaning the wheel prior to balancing is important.

clean of debris.

3. Mount a tire/wheel assembly on a balancer that will use standard clip-on wheel weights. Use the most appropriate mounting method. Technicians should be careful to avoid back injury and should seek assistance when lifting a heavy tire/wheel assembly onto a balancing shaft.

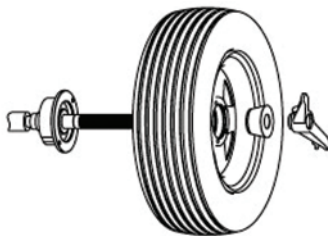
4. There are three main mounting methods. They include:

- **Back Cone** – Most original equipment and steel wheels can be mounted properly using this method. The wheel is centered on a cone from the inner side of the wheel.



The Back Cone method of mounting is most common.

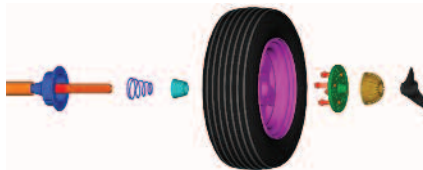
- **Front Cone** – A wheel should be centered by the outer side of the hub only when the inner surface will not provide an accurate sur-



Front Cone mounting is one alternate method.

face to center on.

- **Pin-Plate** – An alternate method of securing and aligning an assembly on a balancing machine is the pin-plate method. A pin-plate is



The Pin-Plate method is a variation of the Back Cone method using a pin-plate.



There are a variety of pin-plates. These are just a few of the many that are designed for the different sizes of bolt-hole chamfers and sizes.

added instead of a pressure cup.
5. Enter A & D wheel dimensions using offset arm.

Before a wheel can be balanced, wheel dimensions must be entered into the computer on your unit. These include:

- A = Offset** – The distance measured from the balancer ("0" on offset arm) to inner plane of the wheel rim (inner weight location).
- W = Width** – The width of the wheel at the rim flanges, measured



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D = Diameter – The diameter of



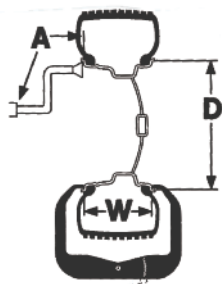
Note the clip-on weight location on the wheel flange.



A view of the pressure monitoring sensor being placed on the rim of the wheel.

the wheel as indicated on the tire.

6. For automatic measurement, pull the offset arm out to the wheel, hold it still at clip-on weight position against the wheel flange and wait for a “beep.” Re-



A, W and D dimensions on assembly.

turn the arm to home position.

7. Enter the wheel width dimension. Use plastic calipers to measure wheel width for manual entry. Press the W key. Use the keypad to enter width value (between 2 and 20 inches.) Lower the hood for automatic measurement (see above). Note the value entry of the W dimension.



Screens with newer balancers show inboard and outboard measurements automatically.

8. Lower the hood. The wheel will spin and unbalances are measured and displayed. The corrective weight amount appears in the weight display window for inboard



Screen on a typical balancer prior to lowering the hood for automatic measurement.

and outboard weight locations.

9. Raise the hood after the tire stops rotating. Make sure that the wheel has stopped before raising the hood.

10. Inboard center bar blinks. If an inboard corrective weight is not required, the wheel will stop at the outboard corrective weight location and you can go to Step 13.

11. Attach inboard corrective weight. Attach specified weight amount at top-dead-center on the inside flange of the wheel. NOTE: Wheel weight suppliers often will supply a rim flange contour gauge to help technicians select the correct clip-on weight for the wheel.

12. Press NEXT, causing the wheel to rotate.

13. The outboard center bar will blink.



Measuring the rim flange ensures selection of the proper clip-on weight.

14. Attach outboard corrective weights. Attach specified weight amount at the top-dead-center on the outside flange of the wheel.

15. Lower the hood to respin the tire/wheel and check balance. The weight readings should now be 0.00.

Balancing In A Nutshell

The balancing steps outlined in this article are typical but will vary somewhat depending on the type of equipment used.

Recapping the steps, a technician must:

1. Turn on the balancer
2. Clean the tire, rim flange and wheel
3. Mount the tire/wheel assembly on a balancer
4. Enter the A & D wheel dimensions
5. Enter width wheel dimensions
6. Lower the hood to spin the wheel and check dimensions
7. Raise the hood after the tire stops rotating
8. Note when the inboard center bar blinks
9. Attach inboard corrective weight
10. Press NEXT, which rotates the wheel
11. Note when the outboard center bar blinks
12. Attach outboard corrective weights
13. Lower the hood to respin

A Look at Wheel Weights

and check balance

Disclaimer

Tire/wheel balancing is a serious business. The preceding article was researched and written using material furnished by Hennessy Industries, including photos and diagrams. This information is NOT meant as a substitute for proper training by TIA, balancing equipment manufacturers or tire manufacturers.

The balancing recommendations made here are consistent with practices used in the industry when operating this type of balancing equipment. This article is meant purely for educational purposes and those who use the methods recommended are solely responsible for any injuries or losses resulting from their application. ■

Just as there are a number of assembly balancing methods, there are a variety of weights for balancing purposes. There are standard clip-on weights of various types that are made to accommodate the contours of different rim flanges.

There are MC weights used on a number of U.S. vehicles, EN weights used on VW and Honda vehicles, FN weights for Japanese vehicles and IAW weights used on many South Korean and European vehicles. A few of these types are shown in this box.

There also are adhesive weights

that are not covered in this article. They are used for custom wheels or those that do not have an outside flange.

Additionally, there are three primary materials used to produce wheel weights. Lead weights, the original weights used to balance assemblies, are making their way out of the scene. Several states have outlawed lead weights – as have the European Union and Japan – and the EPA is considering national action. Remaining alternatives for both clip-style and stick-on weights include zinc and steel.



Standard clip-on weight



Clip-on mass weight



FN weights used on Japanese vehicles

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