

TECHNICAL FEATURE

PROPER WHEEL INSTALLATION

We have all seen a technician in a shop or a tire technician in a tire service facility use a pneumatic impact wrench (gun) to tighten every lug nut until they hear a clicking poof poof sound of the gun as it tightens all the way. However, not too many people know or even understand that all that is happening is the *over-tightening* of the lug nut. This is NOT something you should ever do. Tight is good, but *over-tight* is NOT. Over-tightening the lug will stretch the stud and cause failure around the rotor hub. Every OEM has a lug nut torque specification for each vehicle they produce. The proper way to tighten the wheel lugs is to use a torque wrench to torque every lug nut to its recommended torque specification when the car is on the floor. Some cars even require a more complex procedure, which is hand tight first, then torque to a specific lower torque while the car is up in the air, then torque to its final torque specification when the car is on the floor. After that, most OEMs require a one-mile drive and re-torque of the lug nuts.

There are a few different types of torque wrenches in the market. The most common type is the “*Click Type*” torque wrench. Using this wrench is a simple process; just turn the torque wrench handle until it reaches the torque mark you are looking for, then start tightening the nuts slowly. As soon as the set torque is reached, you will feel a click around the head of the torque wrench. Generally, it is recommended that you turn the wrench one more time to ensure the nut is set properly. Do not turn it more, but barely apply the force one more time just to verify there was a click. There is also the “*Dial Type*” torque wrench, which has a little meter on the handle. You can see the torque getting higher and higher while you are applying force; you stop when you reach the desired torque. Some *Dial Torque Wrenches* come with an electronic meter on the handle, which allows you to read the exact torque. You may also find a *Torque Adapter*, which is a little

electronic device that goes in between a regular wrench or a breaker bar and the socket. It will act like a torque meter, and these are more affordable than the actual torque wrenches (which are very handy for home use, but generally not recommended for collision and/or mechanical repairs).

The general rule for steel wheel lug nut torque is usually around 80ft/lb, and around 100ft/lb for an aluminum wheel. But you must check with the OEM for the exact torque for every particular model before you start working on the vehicle.

As always, we want you to do everything properly, so let's look at the steps to torque the lug nuts. The following steps are required to tighten the wheel lug nut:

1. Wipe every stud with a rag and air blow the inside of each lug nut to clean them.
2. Hand-tighten each lug nut onto the studs.
3. If you have an impact wrench, you may use it to barely snug up each lug nut, if you first set the pressure to a lower setting when you hear a couple of clicks.
4. Set the vehicle under its own weight; the car is on the floor.
5. Set the manufacturer recommended torque on the torque wrench and tighten each nut according to it.

The right order to tighten the lug nuts is not clockwise or counterclockwise; it is as follows:

1. If it is a four-stud wheel (rare setup to see on late-model vehicles), you should tighten them in a cross



order, which means first tighten the top one, second the bottom one, third the left one, last the right one and so forth.

2. If it is a five-stud wheel, then you should follow an order of drawing a STAR.

3. If it is a six-lug wheel, then the first to tighten would be the top one (12 o'clock position), next the 6 o'clock position, 1 o'clock, 7 o'clock, 5 o'clock and finally the 11 o'clock.

4. If it is an eight-lug wheel, then the first to tighten would be the top one (12 o'clock position), next the 6 o'clock position, 9 o'clock, 3 o'clock, 7 o'clock, 1 o'clock, 5 o'clock and finally the 11 o'clock.

We, along with Hunter and [tirerack.com](#), recommend that you do not use impact guns or torque sticks when installing wheels.

Impact guns deliver torque as torsional impacts, made by internal hammers. Delivering torque as torsional impacts can damage hardware, result in rotor warpage caused by over tightening and damage the wheel finish. Some vehicles, such as Porsche and Mercedes-Benz, require the use of special sockets to tighten the hardware without damaging their anodized coating.

Torque sticks are designed to limit applied torque by absorbing input torque through torsion deflection, or twist. They come in multiple colors to represent different torque values. However, many variables can affect the torsional deflection (absorbed torque) and the applied (delivered) torque. These can lead to inaccurately applied torque or variations in applied torque.

Some of the variables that can cause inaccurate torque are as follows:

- Type of impact used (air, electric, cordless) (Some identical ones are stronger than others.)
- Power (air pressure, air volume, length of hose pipe, length of hose, size of the fittings, battery power, battery age, electric cord length, power to the facility)
- Impacts per second
- Size of internal hammers
- Possible use of additional adapters, such as extensions
- Socket size, weight, length
- Operator grip strength
- Weight of the impact
- Applied angle during use

Attempting to fully tighten hardware with impact guns/torque sticks also prevents using a click-type torque wrench to confirm the specified amount of torque is present. This is the reason a click-type torque wrench should be used, as it can identify when the selected torque has been reached. (It cannot diagnose excessive torque.)

Once you have the right tools, use the appropriate crisscross sequence (mentioned on the previous page) for the number of the vehicle's wheel-attaching hardware positions until all have reached their specified torque value.

Once all the original wheels that were removed are tightened, it is now time for a test drive. Most OEMs say the vehicle should be test driven for one to five miles. Any collision-damaged vehicle requires a safety test drive, but you may also need to test drive the vehicle to relearn computer controlled components and navigation position. Another reason to test drive is to make sure clamping loads have changed following the metal compression/elongation or thermal stresses. Once the test drive is complete, go and re-torque the wheels once they have cooled off.

When installing new OEM wheels, they should be re-torqued after the first 50 to 100

miles of driving. This is due to the fact that after the initial installation, the metal compression/elongation or thermal stresses affecting the wheels are different than those affecting the original wheels as the new wheels are breaking in. Additionally, re-torque of the wheels will verify the accuracy of the original installation.

When rechecking torque value, wait for the wheels to cool to ambient temperature (never torque a hot wheel). Loosen and retighten to value, in sequence using the torque procedures listed.

Remember that it is your liability, and checking the torque of the wheels on your customers' vehicles can save lives. We cannot tell you how many cases we have been involved in where there was wheel separation. Eighty-five percent of the time, the cause was fractured studs, generally from overtightening. Too loose or too tight is never good; the tightness must be as per the values set by the OEM.

We hope this article has explained the proper way to torque wheels. Please feel free to contact us if you have any questions. **H&D**

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