

How To Calibrate A Torque Wrench

Using a torque wrench to get just the right pressure on a bolt head is great if your torque wrench is calibrated correctly. What if it's not? Joseph Cannon found that three out of five of his torque wrenches were 5 to 15 lbs. off. A friend's new Craftsman clicker wrench was 20 lbs. off. When exchanged for a new wrench, they found it was off by 10 lbs. So the torque wrench tester Cannon had just built more than paid for itself.



Using scrap metal and an old slave cylinder, Joseph Cannon built this torque wrench tester. It lets him make sure he has just the right pressure on a bolt head.

"I made it from several pieces of scrap and an old slave cylinder," explains Cannon. "I needed a bolt that the wrench could exert pressure on and a link that would exert a force on the piston and fluid in the slave cylinder. I also needed a pressure gauge to interact with the fluid in the cylinder."

An engineer by training and by trade, Cannon understood the math behind his device... Torque = Force X Distance. To turn a psi pressure gauge into a torque gauge, he needed to determine how much force would be applied over the length of the link he had chosen to achieve 60 lbs. of torque. Once he had that, he could revise the dial on a pressure gauge to correlate to torque instead of psi.

He used a hex bolt inserted through a square tube and linked to the slave cylinder by a piece of scrap metal. A shear pin connected the link to the bolt. The slave cylinder was secured in place and mounted to the steel tube with a second piece of scrap.

When the hex bolt is turned, it exerts pressure on the slave cylinder. To calculate the pressure-torque equivalent, he needed to first know the length of the link.

With his device, the length of the link is 0.3 ft. When placed in his equation of Torque = Force X Distance, with the torque being 60 ft. lbs, and distance being 0.3 ft., the only unknown was force. By dividing both sides by 0.3, force was shown to be 200 lbs.

He also needed the area of the cylinder. To determine that, he multiplied 3.14 times the radius of the cylinder (0.4 in.) and squared it. This gave him an area of 0.502 sq. in.

Once he had this information he could divide the force (200 lbs.) required for 60 ft. lbs. of torque by the area of the piston (0.502 in.) it was exerted against to get the pounds psi. In this case it was 298 psi.

It became a simple matter to install a 300 psi pressure gauge and put a home made face on it replacing the 300 psi mark with a 60 ft. lbs. mark and dividing the remainder of the dial accordingly.

"The important thing to remember is to use the same units of measurement throughout. If you start with feet, stay with feet. If you start with pounds, stay with pounds," says Cannon. "If you know the area of the cylinder you are using and the length of the link, you can figure out everything else."

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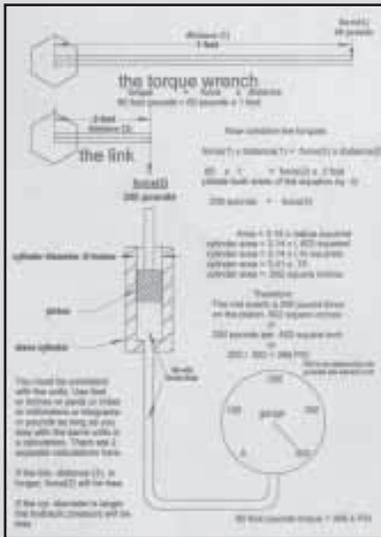


Diagram shows exact dimensions of metal pieces and size of bolt used to make torque wrench.

Heavy Duty Shop Hoist Made From Old Disk Gangs

Changing the blades on his riding mower is an easy job for Robert Vickers, Clarence, Mo., who used the gangs off an old disk to build his own fold-up shop hoist.

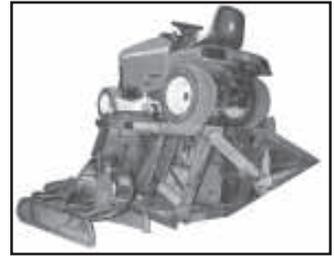
"All I used was scrap metal, so it cost almost nothing to build," says Vickers.

The hydraulic-operated hoist has an upper hinged "floor" that folds down flat. The floor moves forward and upward at the same time.

He started with an 18-ft. Deere tandem disk and cut off the wings, keeping only the 4 by 4-in. hinged frame members that allowed the wings to fold up. He pinned the frame members together so there are four hinges on each side. He also welded material in between the two sides. The floor measures 4 ft. wide by 5 ft. long and is raised or lowered by a 4-in. hydraulic cylinder attached to a pair of metal legs. The cylinder is operated by a pump that's belt-driven by an electric motor.

The motor and pump, as well as a hydraulic reservoir, mount together on a metal "sled" next to the hoist. To raise or lower the hoist, Vickers simply operates a valve on the pump.

"It works great. It raises and lowers slowly but that's what you want for safety," says Vickers. "The cylinder is off an old wagon



Hydraulic-operated hoist has an upper hinged "floor" that folds down flat. Floor moves forward and upward at the same time.

and the pump off a combine. My only cost was for welding rod. I use it with my 20 hp riding mower. I just drive the mower onto the platform, raise it up, and go to work. Once the mower is up in place I remove a steel plate from the floor, which gives me full access to the underside of the mower."

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Free Up Floor Space With Handy Rack Organizer

If you can't get the car in the garage or the truck in the shed, maybe the Handy Rack Organizer will help. The portable storage unit only takes up 44 by 58 in. of floor space, but would hold 30,000 lbs if you loaded it with solid steel. Each of the 15 shelves holds 2,000 lbs.

"The Handy Rack Organizer was designed as a storage unit for dimension lumber or steel," says Darryl Perry, president, Perry Industries. "People are using it for everything from cleaning up their garages so they can get their cars in, to organizing material at construction sites."

Perry says one advantage to the portable unit over built-in storage is the ability to adjust it as storage needs change. Another advantage is being able to pick up an empty unit and move it or quickly disassemble it for storage in a compact 48 by 67 by 4-in. space.

Optional Sheet Mate extensions slip over the bottom shelf rungs. The 800-lb. capacity extensions allow storage of large flat materials such as wood sheathing, sheet metal or dry-wall. At the same time upper shelves can continue to store dimension lumber, metal or poly rods, piping or other components.

Outside weatherproof storage is made easier with the racks, suggests Perry. "People put sheet material on both sides and it's easy to tarp," he explains. "Tarps won't flap and



Portable organizer is designed as a storage unit for dimension lumber or steel.

tear up in the wind as they will without that flat base."

The unit consists of two A-frames with slanted arms extending out from each side, 3 cross braces and one diagonal brace for added strength. The unit is priced at \$299.99 (Can.) with a pair of Sheet Mates costing \$28.99 (Can.).

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"Cord Lock" Keeps Connection Tight

"My homemade cord lock keeps extension cords and receptacles from disconnecting while they're in use. It also keeps the plugs off the ground and out of moisture," says Richard Layden, Hoopeston, Ill.

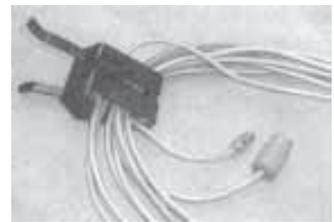
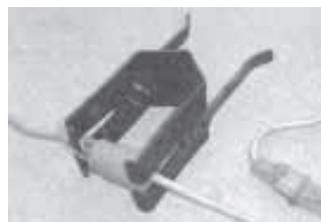
Other commercial cord lock mechanisms have a slip joint that can become loose and slip, making them useless.

His cord lock is a one-piece unit made from Lexan plastic and has no moving parts. The cord lock is then held tightly inside a spring-

loaded metal bracket with slots in it. The slots keep the plugs from becoming separated when tension is applied to the cord. Afterward, it can also be used as an extension cord carrier.

The idea was a finalist in the national Farm Bureau invention contest.

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Cord lock is held tightly inside a spring-loaded metal bracket with slots in it. Cord lock can also be used to store extension cord.