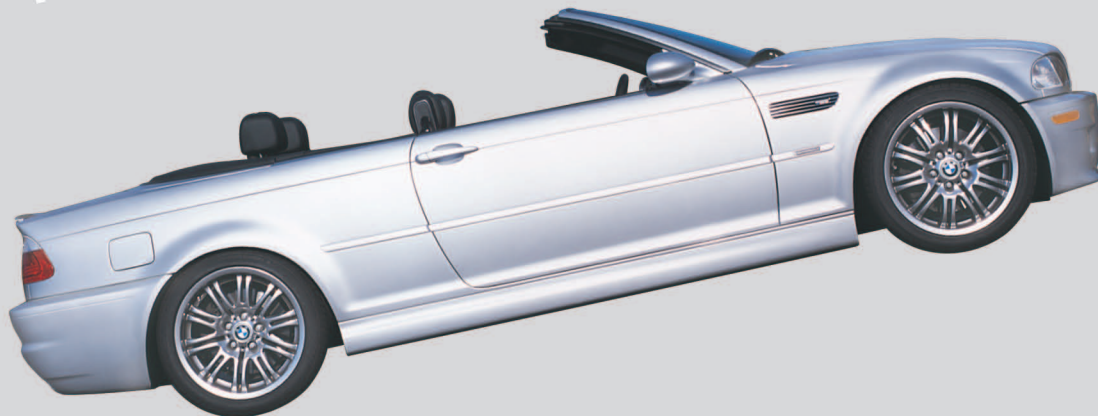


BMW 3 Series

Service Manual

M3, 323i, 325i, 325xi, 328i, 330i, 330xi
Sedan, Coupe, Convertible, Sport Wagon
1999, 2000, 2001, 2002, 2003, 2004, 2005



How to Use This Manual

WARNING!

Your common sense and good judgment are crucial to safe and successful service work. Read procedures through before starting them. Think about whether the condition of your car, your level of mechanical skill, or your level of reading comprehension might result in or contribute in some way to an occurrence that might cause you injury, damage your car, or result in an unsafe repair. If you have doubts for these or other reasons about your ability to perform safe repair work on your car, have the work done at an authorized BMW dealer or other qualified shop.

The manual is divided into ten sections:

- ◆ 0 GENERAL DATA AND MAINTENANCE
- ◆ 1 ENGINE
- ◆ 2 TRANSMISSION
- ◆ 3 SUSPENSION, STEERING AND BRAKES
- ◆ 4 BODY
- ◆ 5 BODY EQUIPMENT
- ◆ 6 ELECTRICAL SYSTEM
- ◆ 7 EQUIPMENT AND ACCESSORIES

- ◆ ELE ELECTRICAL WIRING DIAGRAMS

- ◆ OBD ON BOARD DIAGNOSTICS

0 GENERAL DATA AND MAINTENANCE covers general vehicle information (Repair Group 010) as well as the recommended maintenance schedules and service procedures to perform BMW scheduled maintenance work (Repair Group 020).

The next seven sections (Repair Groups 1 through 7) are repair based and organized by three digit repair groups. Most major sections begin with a General repair group, e.g. 100 Engine–General. These “00” (double zero) groups are mostly descriptive in nature, covering topics such as theory of operation and troubleshooting. The remainder of the repair groups contain the service and repair information. The last two major sections contains detailed electrical wiring schematics and scan tool codes.

A master listing of the individual repair groups can be found on the inside front cover. A comprehensive index can be found at the back of the manual.

Warnings, cautions and notes

Throughout this manual are many passages with the headings WARNING, CAUTION, or NOTE. These very important headings have different meanings.

WARNING!

The text under this heading warns of unsafe practices that are very likely to cause injury, either by direct threat to the person(s) performing

the work or by increased risk of accident or mechanical failure while driving.

CAUTION!

A caution calls attention to important precautions to be observed during the repair work that will help prevent accidentally damaging the car or its parts.

Note:

A note contains helpful information, tips that will help in doing a better job and completing it more easily.

Please read every WARNING, CAUTION, and NOTE at the front of the manual and as they appear in repair procedures. They are very important. Read them before you begin any maintenance or repair job.

WARNING!

- ◆ ***Never run the engine in the work area unless it is well-ventilated. The exhaust should be vented to the outside. Carbon monoxide (CO) in the exhaust kills.***

- ◆ ***Remove all neckties, scarfs, loose clothing, or jewelry when working near running engines or power tools. Tuck in shirts. Tie long hair and secure it under a cap. Severe injury can result from these things being caught in rotating parts.***

- ◆ ***Remove rings, watches, and bracelets. Aside from the dangers of moving parts, metallic jewelry conducts electricity and may cause***

shorts, sparks, burns, or damage to the electrical system when accidentally contacting the battery or other electrical terminals.

- ◆ **Disconnect the battery negative (-) cable whenever working on or near the fuel system or anything that is electrically powered. Accidental electrical contact may damage the electrical system or cause a fire.**
- ◆ **Fuel is highly flammable. When working around fuel, do not smoke or work near heaters or other fire hazards. Keep an approved fire extinguisher handy.**
- ◆ **The fuel system is designed to retain pressure even when the ignition is off. When working with the fuel system, loosen the fuel lines slowly to allow the residual pressure to dissipate gradually. Take precautions to avoid spraying fuel.**
- ◆ **Illuminate the work area adequately and safely. Use a portable safety light for working inside or under the car. A fluorescent type light is best because it gives off less heat. If using a light with a normal incandescent bulb, use rough service bulbs to avoid breakage. The hot filament of an accidentally broken bulb can ignite spilled fuel or oil.**
- ◆ **Keep sparks, lighted matches,**

and any open flame away from the top of the battery. Hydrogen gas emitted by the battery is highly flammable. Any nearby source of ignition may cause the battery to explode.

- ◆ ***Never lay tools or parts in the engine compartment or on top of the battery. They may fall into confined spaces and be difficult to retrieve, become caught in belts or other rotating parts when the engine is started, or cause electrical shorts and damage to the electrical system.***

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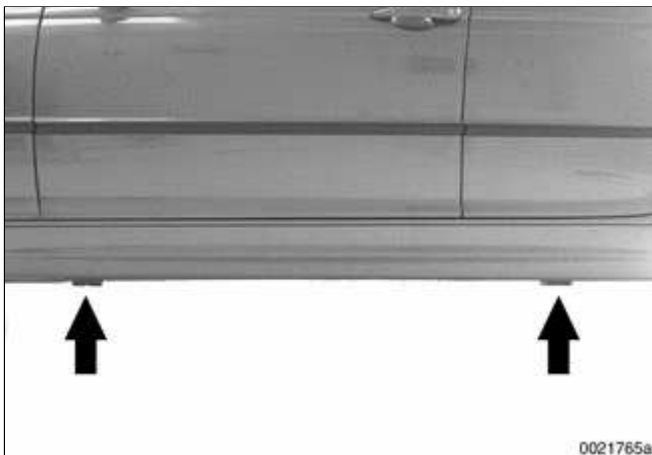
Getting Started

Most of the necessary maintenance and minor repair that an automobile will need can be done with ordinary tools. Below is some important information on how to work safely, a discussion of what tools will be needed and how to use them.

Safety

Although an automobile presents many hazards, common sense and good equipment can help ensure safety. Many accidents happen because of carelessness. Pay attention and stick to safety rules in this manual.

Lifting the car



- ✦ The proper jacking points should be used to raise the car safely and avoid damage. The jack supplied with the car can only be used at the four side points (arrows)—just behind the front wheels or just in front of the rear wheels.

WARNING!

- ✦ ***Never work under a lifted car unless it is solidly supported on jack stands that are intended for that purpose.***
- ✦ ***When raising the car using a floor jack or a hydraulic lift, carefully position the jack pad to prevent damaging the car body. Plastic pads are provided for this purpose by the manufacturer at the jacking***

points.

- ♦ **Watch the jack closely. Make sure it stays stable and does not shift or tilt. As the car is raised, it may roll slightly and the jack may shift.**

Raising car safely

- Park car on flat, level surface.
- If changing a tire, loosen lug bolts before raising car. See ⇒ [Changing a tire.](#)



- ▲ Place jack into position. Make sure jack is resting on flat, solid ground. Use a board or other support to provide a firm surface for the jack, if necessary
- Raise car slowly while constantly checking position of jack and car.
- Once car is raised, block wheel that is opposite and farthest from jack to prevent car from unexpectedly rolling.

WARNING!

- ♦ **Do not rely on the transmission or the emergency brake to keep the car from rolling. They are not a substitute for positively blocking the opposite wheel.**
- ♦ **Never work under a car that is supported only by a jack. Use jack stands that are designed to support the car. See ⇒ [Tools.](#)**

Working under car safely

- Disconnect negative (–) cable from battery so that no one can start car. Let others know what you will be doing.

CAUTION!

Prior to disconnecting the battery, read the battery disconnection cautions given at the front of this manual on page viii.

- Raise car slowly as described above.
- Use at least two jack stands to support car. Use jack stands designed for the purpose of supporting a car. For more information on jack stands, see ⇒ [Tools](#).

WARNING!

- ♦ ***A jack is a temporary lifting device and should not be used alone to support the car while you are under it.***
- ♦ ***Do not use wood, concrete blocks, or bricks to support a car. Wood may split. Blocks or bricks, while strong, are not designed for that kind of load, and may break or collapse.***
- Place jack stands on firm, solid surface. If necessary, use a flat board or similar solid object to provide a firm footing.

- Lower car slowly until its weight is fully supported by jack stands. Watch to make sure that the jack stands do not tip or lean as the car settles on them.

- Observe all jacking precautions again when raising car to remove jack stands.

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Advice for the Beginner

The tips in the paragraphs that follow are general advice to help any do-it-yourself BMW owner perform repairs and maintenance tasks more easily and more professionally.

Planning ahead

To prevent getting in too deep, know what the whole job requires before starting. Read the procedure thoroughly, from beginning to end, in order to know just what to expect and what parts will have to be replaced.

Cleanliness

Keeping things organized, neat, and clean is essential to doing a good job. When working under the hood, fender covers will protect the finish from scratches and other damage. Make sure the car finish is clean so that dirt under the cover does not scratch the finish.

Any repair job will be less troublesome if the parts are clean. For cleaning old parts, there are many solvents and parts cleaners commercially available.

For cleaning parts prior to assembly, commercially available aerosol cans of parts cleaner or brake cleaner are handy to use, and the cleaner will evaporate completely.

WARNING!

Most solvents used for cleaning parts are highly flammable as well as toxic, especially in aerosol form. Use with extreme care. Do not smoke. Do not use these products indoors or near any source of heat, sparks or flame.

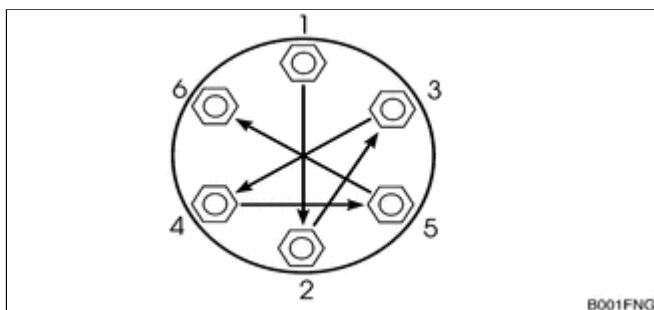
Non-reusable fasteners

Many fasteners used on the cars covered by this manual must be replaced with new ones once they are removed. These include but are not limited to: bolts, nuts (self-locking, nylock, etc.), cotter pins, studs, brake fittings, roll pins, clips and washers. Genuine BMW parts should be the only replacement parts used for this purpose.

Some bolts are designed to stretch during assembly and are permanently altered rendering them unreliable once removed. These are known as torque-to-yield fasteners. Always replace fasteners where instructed to do so. Failure to replace these fasteners could cause vehicle damage and personal injury. See an authorized BMW dealer for applications and ordering information.

Tightening fasteners

When tightening the bolts or nuts that attach a component, it is always good practice to tighten the bolts gradually and evenly to avoid misalignment or over stressing any one portion of the component. For components sealed with gaskets, this method helps to ensure that the gasket will seal properly.



Where there are several fasteners, tighten them in a sequence alternating between opposite sides of the component. Repeat the sequence until all the bolts are evenly tightened to the proper specification.

For some repairs a specific tightening sequence is necessary, or a particular order of assembly is required. Such special conditions are noted in the text, and the necessary sequence is described or illustrated. Where no specific torque is listed, ⇒ [Table a](#) can be used as a general guide for tightening fasteners.

WARNING!

⇒ [Table a](#) is a general reference only. Th

values listed in the table are not intended to be used as a substitute for torques specifically called out in the text.

Note:

- ◆ *Metric bolt classes or grades are marked on the bolt head.*
- ◆ *Do not confuse wrench size with bolt diameter. For a listing of the common wrenches used on various bolt diameters, see ⇒ [Basic tool requirements](#).*

Table a. General bolt tightening torques in Nm (max. permissible)

Bolt diameter	Bolt Class (according to DIN 267)					
	5.6	5.8	6.8	8.8	10.9	12.9
M5	2.5	3.5	4.5	6	8	10
M6	4.5	6	7.5	10	14	17
M8	11	15	18	24	34	40
M10	23	30	36	47	66	79
M12	39	52	62	82	115	140
M14	62	82	98	130	180	220
M16	94	126	150	200	280	340
M18	130	174	210	280	390	470

Gaskets and seals

Gaskets are designed to crush and become thinner as the mating parts are bolted together. Once a gasket has been used, it is no longer capable of making as good a seal as when new, and is much more likely to leak. For this reason, gaskets should not be reused.

Some gaskets—such as head gaskets—are directional. Make sure that these are installed correctly. This same logic applies to any part used for sealing, including rubber O-rings and copper sealing washers.

In places where a shaft must pass through a housing, flexible lip seals are used to keep the lubricating oil or grease from leaking out past the rotating shaft. Seals should never be reused once they have been removed. When removing a seal, be careful not to damage the metal surfaces.

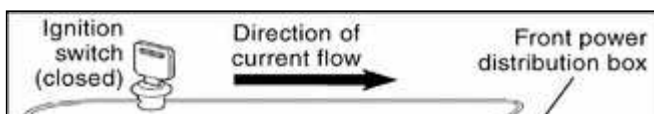
The key to seal installation is to get the seal in straight without damaging it. Use a seal driver that is the same diameter as the seal housing to gently and evenly install into place. If a proper size seal driver is not available, a socket of the right size will do.

Some seals are directional and special installation instructions apply. Make sure a seal is installed with the lip facing the correct way. Note the installation direction of the old seal before removing it.

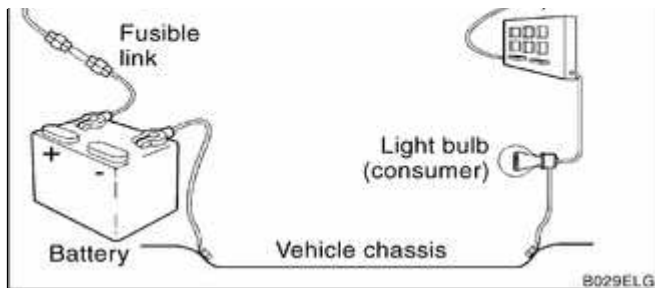
Electrical testing

Many electrical problems can be understood and solved with only a little fundamental knowledge of how electrical circuits function

Electric current only flows in a complete circuit. To operate, every electrical device in the car requires a complete circuit including a voltage source and a path to ground. The positive (+) side of the battery is the original voltage source, and ground is any return path to the negative (–) side of the battery, whether through the wiring harness or the car body. Except for portions of the charging system, all electrical current in the car is direct current (DC) and flows from positive (+) to negative (–).



Switches are used to turn components on or off by completing or interrupting the circuit.



switch is “open” when the circuit is interrupted, and “closed” when the circuit is completed. See ⇒ [600 Electrical System–General](#) for electrical troubleshooting.

Wire repairs

Repairs to a wiring harness require special care to make the repair permanent. The wire ends must be clean. If frayed or otherwise damaged, cut off the end. If the wire is too short, splice in a new piece of wire of the same size and make two connections.

Use connectors that are designed for the purpose. Crimped-on or soldered-on connectors are best. Crimp connectors and special crimping pliers are widely available. If soldering, use needlenose pliers to hold the wire near the solder joint and create a “heat dam”. This keeps the heat and the solder from traveling up the wire. Always use a solder made specifically for electrical work (rosin core).

Note:

Twisting wires together to make a repair is not recommended. Corrosion and vibration will eventually spoil the connection and may lead to irreparable damage to sensitive electronic components.

Insulate the finished connection. Electronics stores can supply heat-shrinkable insulating tubing that can be placed onto the wire before connecting, slid over the finished joint, and shrunk to a tight fit with a heat gun or hair dryer. The next best alternative is electrical tape. Make sure the wire is clean and free of solder flux or other contamination. Wrap the joint tightly to seal out moisture. See ⇒ [600 Electrical System–General](#) for more information.

Buying Parts

Many of the maintenance and repair tasks in this manual call for the installation of new parts, or the use of new gaskets and other materials when reinstalling parts. Most often, the parts that will be needed should be on hand before beginning the job. Read the introductory text and the complete procedure to determine which parts will be needed.

Note:

For some bigger jobs, partial disassembly and inspection are required to determine a complete parts list. Read the procedure carefully and, if necessary, make other arrangements to get the necessary parts while your car is disassembled.

Genuine BMW parts

Genuine BMW replacement parts from an authorized BMW dealer are designed and manufactured to the same high standards as the original parts. They will be the correct material, manufactured to the same specifications, and guaranteed to fit and work as intended by the engineers who designed the car. Some genuine BMW parts have a limited warranty.

Many independent repair shops make a point of using genuine BMW parts, even though they may at times be more expensive. They know the value of doing the job right with the right parts. Parts from other sources can be as good, particularly if manufactured by one of BMW's original equipment suppliers, but it is often difficult to know.

BMW is constantly updating and improving their cars, often making improvements during a given model year. BMW may recommend a newer, improved part as a replacement, and your authorized dealer's parts department will know about it and provide it. The BMW parts organization is best equipped to deal with any BMW parts needs.

Non-returnable parts

Some parts cannot be returned, even for credit. The best example is electrical parts, which are almost universally considered non-returnable. Buy electrical parts carefully, and be as sure as possible that a replacement is needed, especially for expensive parts such as electronic control units. It may be wise to let an authorized BMW dealer or other qualified shop confirm your diagnosis before replacing an expensive non-returnable part.

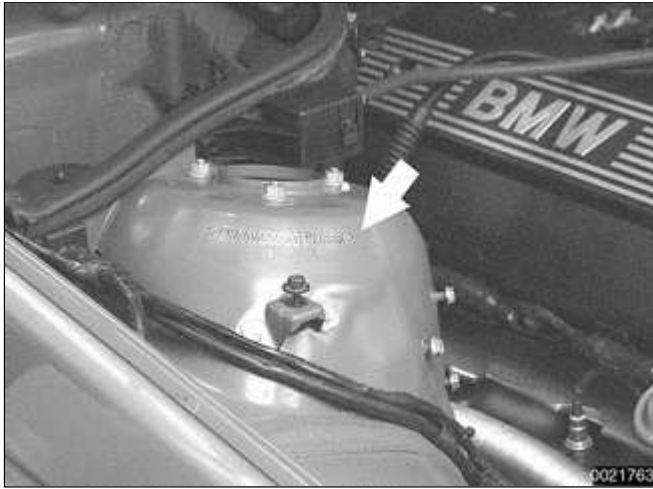
Information you need to know

Model. When ordering parts it is important that you know the correct model designation for your car. Models covered in this E46 manual are 323i/Ci, 325i/Ci, 325Xi, 328i/Ci, 330i/Ci 330Xi in Sedan, Coupe, Convertible and Sport Wagon body styles.

Model year. This is not necessarily the same as date of manufacture or date of sale. A 1999 model may have been manufactured in late 1998, and perhaps not sold until early 2000. It is still a 1999 model. Model years covered by this manual are 1999 to 2001.

Date of manufacture. This information is necessary when ordering replacement parts or determining if any

of the warranty recalls are applicable to your car. The label on the driver's door below the door latch will specify the month and year that the car was built.



- Vehicle Identification Number (VIN). This is a combination of letters and numbers that identify the particular car. The VIN appears on the state registration document, and on the car itself. One location is on the right front strut tower in the engine compartment (**arrow**), another in the lower left corner of the windshield.

Engine code. 3 Series cars covered in this manual are powered by 6-cylinder engines. For information on engine codes and engine applications, see ⇒ [100 Engine-General](#).

Transmission code. The transmission type with its identifying code may be important when buying clutch parts, seals, gaskets, and other transmission-related parts. For information on transmission codes and applications, see ⇒ [200 Transmission-General](#).

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Tools

Most maintenance can be accomplished with a small selection of the right tools. Tools range in quality from inexpensive junk, which may break at first use, to very expensive and well-made tools for the professional. The best tools for most do-it-yourself BMW owners lie somewhere in between.

Many reputable tool manufacturers offer good quality, moderately priced tools with a lifetime guarantee. These are your best buy. They cost a little more, but they are good quality tools that will do what is expected of them. Sears' Craftsman® line is one such source of good quality tools.

Some of the repairs covered in this manual require the use of special tools, such as a custom puller or specialized electrical test equipment. These special tools are called out in the text and can be purchased through an authorized BMW dealer. As an alternative, some special tools mentioned may be purchased from the following tool manufacturers and/or distributors:

Assenmacher Specialty Tools 6440 Odell Place, Boulder, CO 80301 303-530-2424 http://www.asttool.com
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Baum Tools Unlimited, Inc. P.O. Box 5867, Sarasota, FL 34277-5867 800-848-6657 http://www.baumtools.com
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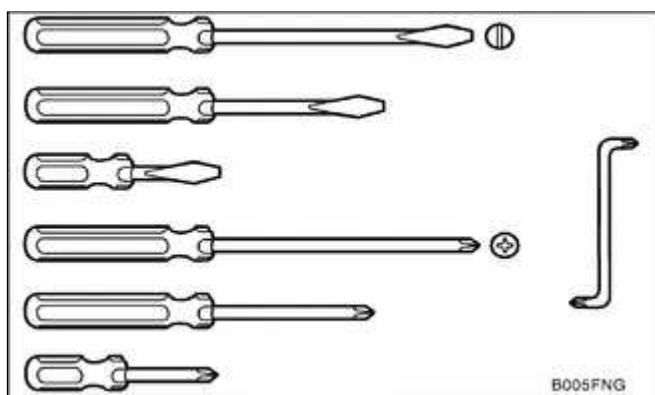
Schley Products, Inc. 5350 E. Hunter Ave., Anaheim Hills, CA 92807 714-693-7666
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<http://www.sptool.com>

Zelenda Machine and Tool Corp.
65-60 Austin Street, Forest Hills, NY
11374-4695
718-896-2288
<http://www.zelenda.com>

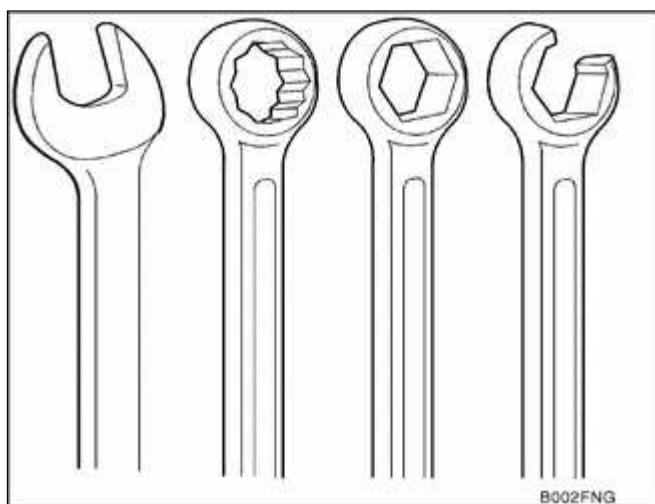
Basic tool requirements

The basic hand tools described below can be used to accomplish most of the simple maintenance and repair tasks.



- ◀ Screwdrivers. The common flat-blade type and the Phillips type will handle almost all screws used on BMWs. Two or three different sizes of each type will be required, since a screwdriver of the wrong size will damage the screw head.

A complete set of screwdrivers should also include Torx® type screwdrivers.



- ◀ Wrenches. Wrenches come in different styles, including open-end, 12-point box-end, 6-point box-end and flare nut. The basic open-end wrench is the most widely used, but grips on only two sides. The box-end wrench has better grip on all six sides of a nut or bolt.

A 12-point box-end can loosen a nut or bolt where there is less room for movement, while a 6-point box-end provides better grip. For hex fasteners on fluid lines, like brake lines and fuel lines, a flare-nut wrench offers the advantages of a box-end wrench with a slot that allows it to fit over the line.

The combination wrench is the most universal. It has one open-end and one box-end. 10 mm and 13 mm wrenches are the most common sizes needed. A more complete set of wrenches would include 6 mm through 19 mm sizes.