Removing And Installing Hardware And Interior Trim (TRM02e)

Self-study Narrations

I-CAR®

Version: 3.4

This page is intentionally left blank.

Module 1 - Hardware

I-CAR®

This page is intentionally left blank.

Learning Objectives

Various types of hardware are used to assemble parts of the vehicle. It is important to know the proper tools that are used to remove and reinstall them. Module 1 will discuss various types of mechanical fasteners, tools used for removal and installation, and considerations regarding replacement.

The learning objectives for this module include:

- identifying the different types of hardware located on the interior and exterior of the vehicle.
- determining the class or grade, length, and thread pitch of a fastener.
- identifying the variables that can affect torquing efficiency.

Fastener (Screw And Bolt) Head Types

In this course, the term fasteners will refer to screws and bolts. Types of fastener heads that may be located on the interior and exterior of a vehicle include phillips, square, slotted or regular, torx, inverted torx, allen, and 6-point hex.

Fasteners should be hand-positioned, tightened, and seated into parts.

The general difference between a screw and a bolt is the hardware used with it and the fastening surface. A bolt is typically slid through a hole and into a nut. The nut is then torqued to specification. In specific applications, if the nut is not unscrewed from the bolt, the bolt can cause damage to the part. A screw is typically installed into a threaded hole without the use of a nut.

Sheet Metal Screws

Sheet metal screws are also called self-tapping screws. Types of sheet metal screws include truss, round, pan, oval, flat, and hexagon.

When installing sheet metal screws, a tapped hole is not required. The hardened points and threads of the screws cut into the surface.

Machine Screws

Machine screws are typically manufactured with a round head, and may be installed and removed with a screwdriver. Machine screws are typically used with a nut. Similar to bolts, nuts may be packaged with machine screws.

Types of machine screws include round, oval, flat, fillister, pan, and truss.

Cap Screws And Bolts

Cap screws and bolts are typically made with a flat head, and may be installed or removed with a socket, wrench, or screwdriver. Cap screws and bolts may contain flats under the head of the fastener for installation and removal points, and are intended to be torqued into a threaded hole. They may be used with or without a nut.

Types of cap screws and bolts include hexagon, carriage, and plow.

Bolt Grade And Class Identification

The Society of Automotive Engineers (SAE), or standard, bolts are classified by grade. Metric bolts are classified by class. Identification for SAE grade is identified by the number of slash marks plus two. General SAE grades include 1 or 2, 5, and 8. Metric class is the number stamped on the bolt head. General metric classes include 4.6, 4.8, 5.8, 8.8, 9.8, and 10.9. Bolt strength is identified by the grade or class number. The higher the grade or class, the stronger the bolt. At least one vehicle maker says that grade 5 or higher bolts must be used to replace production fasteners on the frame and bumper assembly. If this grade of bolt is not used, loosening or failure can occur.

The first number in a metric class, such as 10 in 10.9, indicates that the tensile strength, or the maximum stress that the fastener can withstand, is about 1,000 megapascals (MPa). The actual amount is 1,040 MPa rounded to the nearest tenth. The .9 indicates that the fastener will start to yield, or be permanently stretched, at 90% of the first number. Therefore, a fastener that displays a class of 10.9 has a minimum yield strength of 90% of 1,040 MPa.

A chromate film is applied to protect zinc, cadmium, and alloy plating. Do not use plated fasteners in internal engine parts unless recommended by the vehicle maker. Plating can flake and float through the oil system, causing engine damage.

Use caution when replacing grade 5 or class 8.8 fasteners and stronger that do not contain the manufacturer's trademark.

Measuring Fasteners

Correct measurements will assist in finding the correct replacement fasteners. Use a measuring gauge to measure the length and diameter of SAE and metric screws, nuts, and bolts. Measurements for hex bolts are made from the base of the head to the tip of the bolt. Countersunk screw measurements are made from the top of the head to the tip of the screw. The diameter of the fastener is measured in the threaded area.

Thread Pitch

Individual thread pitch gauges are used to measure the thread pitch of SAE and metric fasteners. The higher the metric pitch number, the coarser the thread. The higher the SAE pitch number, the finer the thread. SAE thread pitch is the number of threads per inch.

Metric pitch is the length between adjacent threads, and is measured in millimeters (mm).

If a fastener is threaded into a surface or nut with a different pitch, the fastener threads, mating surface, or nut threads will be damaged.

Thread Pitch Identification

Thread types are classified by metric or Unified National. Metric classifications for coarse and fine are identified by the letters SI (International Systems of Units) or ISO (International Organization for Standardizations). SAE classifications for coarse and fine are identified by UNC or NC, and UNF or NF.

Left-Hand Thread

Unlike general fasteners, left-hand threaded fasteners are loosened by turning clockwise, and are tightened by turning counterclockwise. Left-hand threaded fasteners may be identified in the vehicle service information.

To prevent damage to the fastener and other parts, always identify the fastener before attempting to remove or install it. These types of fasteners are typically found on parts that rotate. The direction of the left-hand thread prevents loosening of the fastener while the part is in motion.

Examples of where left-hand threads may be used include a belt tensioner pulley bolt, viscous fan drive, passenger side brake adjuster screw, and diesel engine fan hub and nut.

Nut Types

Nuts are typically used with bolts and machine screws. Types of nuts include castle, self-threading, hexagon, square, 12-point, self-locking, cage, and cap.

It may be a good practice to replace nuts that have been removed. This is especially true when safety is an issue, such as with suspension parts.

Weld-nuts are also used on some vehicles. Check the vehicle maker's recommendation on repair and restoration. If cage nuts in a vehicle frame rail are damaged and cannot be reused, replacement nuts may be available.

Vehicle Protection

Use caution when reusing nuts. Common-grade nuts are slightly softer than most fasteners and become damaged when they are tightened onto the fastener. This is not damage that can be seen or felt. When the nut is reused it will seem just as tight as when it was removed, but there will be a drop-off in holding power that will increase each time the nut is reused.

Speed Nuts And Clips

Types of speed nuts and clips include flat nut, U-nut, J-nut, and barrel nut.

Speed nuts may be integrated into the part.

Nut Grades And Class

Like fasteners, SAE nuts are classified by grade, and metric nuts are classified by class. The higher the number of class or grade, the stronger the nut. Identification for SAE grade is the number of markings on the face of the nut plus two. The types of marks vary from manufacturer to manufacturer. Also, there can be a different design for each mark on the nut.

Metric class is identified by the number printed on the face of the nut.

During installation, make sure that the same coating, plating, and grade or class of the nut matches that of the fastener.

Washers

Types of washers include flat, common lock, internal lock, external lock, internal-external lock, and countersunk lock.

Washers may be used to prevent damage or loosening of fasteners. For example, flat washers reduce the stress created by small fastener heads or nuts. Flat washers spread the clamping load over a larger area, creating an even distribution of the stress. This prevents damage to the surface. If the washer being used shows indentation or is dished, the washer is too soft and may create problems. Damaged washers should be discarded and replaced with new ones.

Heat-treated flat washers act as a barrier between the fastener head or nut and the surface. Locking washers prevent the loosening of fasteners. If the fastener attempts to loosen, the tangs or teeth of the locking washer dig into the surface. Heat-treated flat washers are used under locking washers to protect the surface from the tangs or teeth of the locking washer and to protect against corrosion.

Washers may also be integrated into the nut and require the nut assembly to be replaced if damaged. Some vehicle makers require replacing washers after they have been removed even if they do not show signs of damage.

Hardened washers have been heat-treated for strength, and may be used on grade 1, 2, and 3 fasteners. Hardened washers should be used with grade 5 fasteners, and must be used with grade 8 or stronger fasteners.

Snap Rings

Types of snap rings include expanding or internal rings that fit in a groove on the inside of a part. Contracting or external rings fit in a groove on the outside of a part. Other types of snap rings include e-clips that have internal teeth, c-clips, and special application retainers.

Snap rings prevent end movement of shafts and bearings, and are used in transmissions to hold gears to shafts. Snap rings are so named because of the ring shape and the snapping effect when they are installed.

Snap rings are designed to retain their shape like a spring, and should be replaced if they become distorted. Snap rings may also be color-coded according to their location, or need to be installed facing a certain direction. Some snap rings are concave and require the fingers of the snap ring to face a specific direction.

Snap rings may also be called retaining rings.

Vehicle Protection

Snap rings are made of spring steel and can cause injury if misused. Wear eye protection and use snap ring pliers when removing and installing internal and external snap rings.

Studs

Studs are rods that are threaded on the ends or the full length of the rod. When installing a stud into a part, a specific length of threads may be required to protrude above the surface. If the threaded lengths of the stud differ, identify which end should be installed into the part.

The class of a large stud uses a number or symbol stamped on the end. The class of a small stud uses symbols as a geometric code stamped on the end of the stud. A square indicates a class 10.9. A plus sign indicates a class 9.8. A circle indicates a class 8.8.

Pins

Pins are used to link or hold parts together, and may be one-time use, depending on their location or purpose. Pins that are damaged should be replaced.

Types of pins include roll, hair, clevis, taper, and cotter.

Cotter Pins

Cotter pins are installed by sliding them through a hole in a shaft and bending over the ends to lock the parts together. Cotter pins are used with castle nuts. Parts that are attached with a nut and cotter pin must be torqued to specifications. If the slot in the nut does not line up with the cotter pin hole, tighten until it is aligned. Do not loosen the nut to align the slot in the nut to the cotter pin hole.

Cotter pins are used on linkages, spindles, and tie-rod ends, and should not be reused. Some cotter pins may be case hardened. This process creates a hard casing over a soft core of steel. Case-hardened cotter pins can only be bent once. After the metal is bent, it is work hardened, or fatigued, to the point that it will break if it is reshaped.

Rivets

Rivets are one-time use fasteners because they are destroyed during removal. Rivets are made of various materials depending on their intended application. Rivets may be made of plastic, aluminum, steel, or a combination of materials. Some types of rivets include blind rivets, solid rivets, and self-piercing rivets (SPRs). Blind rivets may be used to attach both non-structural and structural parts, and do not require access to the backside. Solid rivets require access to the backside so that part of the rivet gun can be used to form the backing, or bucktail, of the rivet. SPRs are primarily used for attaching structural parts.

Parts Of A Blind Rivet

The mandrel is the part of the rivet that is placed into the rivet gun and disposed of after the rivet has been installed.

The rivet head is the round top of the rivet that faces the exterior, or the side the rivet was installed.

The rivet shank is the length or body of the rivet.

The mandrel head is the bottom, or backside, of the rivet that deforms during installation.

Rivet Applications

Some applications include using stainless steel rivets and stainless steel mandrels for replacing welded-on studs, or stainless steel rivets and steel mandrels for bodyside molding retainers.

Steel rivets and steel mandrels are commonly used for door moldings, plastic bumper energy absorbers, outside handles, and headlamp retainers.

Aluminum rivets and aluminum mandrels may be used for replacing welded-on studs on body panels, trim moldings, welded-on luggage racks, hood prop rods, and window hinges. They are also used for instrument panel installation, trunk lock cylinders, attaching air dams to the fascia, wheel openings, fascias, and attaching climate controls.

Aluminum rivets with steel mandrels are commonly used for window regulators, rocker panel attachments, door lock actuators, cladding, and fender skirts. Aluminum rivets are also used for replacing welded-on studs, trunk lock swivel emblems, and heat shields. Plastic rivets may be used for attaching wheelhouse flaring and other types of cladding.

Replacement rivets should match the appearance, material, and size of the original replacement rivets. Rivet metal types and applications may be located in fastener catalogs by vehicle make, model, and part location or specified in the vehicle-specific service information.

Rivet Removal And Installation

Rivets are removed by drilling or tapping out the mandrel. Some vehicle makers specify a special pneumatic or power tool to remove SPRs.

To install rivets, a hole must be drilled in the panel surface. Blind rivets are installed using a standard rivet gun. Rivet guns may be manual or pneumatic. The mandrel part of a blind rivet is installed into the rivet gun and disposed of after installation. High-strength blind rivets use a manual or pneumatic heavy duty rivet gun. Blind and high-strength blind rivets are removed by drilling out the center pin and prying out the rivet.

Plastic rivets are installed using a plastic rivet gun. Plastic rivets are removed by using a hammer and punch to dislodge the center pin and pry out the rivet. A side cutter may also be used for removal of plastic rivets.

Solid rivets are installed by striking them with a ball peen hammer. A solid rivet can be removed by drilling through the head and into the shaft and prying it out. Other methods

for installing solid rivets include using a pneumatic rivet gun, which may have a bucking bar built into the tool.

When installing an SPR, it is pressed into a panel flange that does not have a pre-made hole.

Importance Of Torque

Fasteners and hardware are used to hold parts together. To secure the parts, the clamping force, the force applied to the fastener, must be greater than the working force, the force that causes the parts to twist or pull apart.

When an assembly is clamped by tightening a threaded fastener, the tension causes the fastener to stretch. This stretch applies tension between the external threads of the fastener and the internal threads of the nut. However, fasteners are designed to stretch only so far before the threads are permanently deformed, or to the yield point. Threaded fasteners are designed to be tightened between 75% and 90% of the yield point.

The threaded fastener may fail if the initial tightening is too low or too high. The force of torque is used to control the tension of the fastener.

Vehicle makers provide torque specifications for many threaded fasteners on a vehicle. These must be observed to prevent damage and part failure.

Torque Specification Charts

Torque specification charts give the amount of force that should be applied to a specific fastener or nut. General charts give torquing specifications according to the size, thread pitch, and class or grade of the fastener. Torque specification chart values are found in vehicle-specific service information. Use a vehicle-specific torque specification chart whenever possible. Torque specifications differ between specific and generic charts. Torque values are given in wet or dry torque. If the source does not specify wet or dry, the value is for dry torque, without a lubricant.

When applying torque, use the 25, 50, 75, 100% guideline. The fastener or nut is first torqued to 25% of the total torque required, then 50%, then 75%, and finally fully torqued to the number given on the chart. This will prevent damage to the hardware and surfaces. Specific torquing sequences may also be given in the vehicle-specific service information. If the fasteners are not torqued following this sequence, damage may occur to the parts or fasteners.

Torque Wrenches

Torque wrenches are used to measure the amount of force that is being applied to a fastener. Depending on the specifications of the wrench, tightening force is measured

in foot pounds, inch pounds, newton - meters, kilogram - centimeters, or kilogram - meters.

Torque wrenches should be stored in a clean, dry place away from extreme temperature changes. Different types of torque wrenches and how they indicate torquing force include click-type, needle-type with a dial, needle-type with a bar, and digital-type.

Click-type torque wrenches use an audible click when the set force is reached. During storage, this type should be adjusted to the lowest setting to prevent internal spring damage.

Needle-type torque wrenches may use a dial indicator, or a pointer on a gauge to indicate torquing force.

Digital type torque wrenches use a digital display and possibly an audible tone when the proper torque is reached.

Vehicle Protection

Do not use an air-powered impact wrench to fully tighten hardware, including nuts, unless using “torque sticks.” Impact wrenches can easily over-tighten. Over-tightening hardware can cause microscopic cracks in the hardware, nuts, or the parts being attached resulting in failure under stress. This is especially dangerous on steering and suspension parts.

Torque Wrench Calibration

Refer to the manufacturer’s recommendations to determine how often a torque wrench should be calibrated. Generally, a torque wrench should be tested and calibrated at least once a year. Depending on the amount and type of use, torque wrenches may require testing and calibration more often.

Torque Variables

Torque wrenches can be modified for different applications without affecting the calibration or efficiency of the tool. These modifications include using short extensions, or short wrenches and crow foot attachments. Do not use long or weak extensions with a torque wrench. In some instances, an extension can twist, causing improper torque.

Crow foot attachments can be used as long as they are positioned at a 90° angle to the torque wrench head and do not bend under tension.

Lubricants should only be used when recommended and when there is a wet torquing value provided. Swivel sockets and swivel joints can be used as long as the head of the torque wrench does not exceed a 15° angle to the center of the square drive.

Many things can cause a reduction in torquing efficiency, such as paint, thread-locking compounds, corrosion inhibitors, and sealants. Do not use these unless specified.

One-Time Use Hardware

One-time use hardware is specific hardware that the vehicle maker does not recommend reusing after they have been loosened or removed. One-time use hardware includes torque-to-yield bolts. Torque-to-yield bolts are designed to stretch during the torquing process. These fasteners become out-of-round and cannot be reused because of the excess amount of stress that was caused during installation.

Fasteners with a special coating to prevent galvanic corrosion are also one-time use. Galvanic corrosion is a chemical reaction that occurs when dissimilar metals, such as steel and aluminum, come in contact with each other. Vehicles made with aluminum panels may have specially coated hardware, or use rubber or plastic insulators to separate the dissimilar metals.

Other types of one-time use hardware include certain nylon retainers, cotter pins, and rivets.

Hardware may be considered one-time use because of its type, coating, or location. These fasteners may require replacement for safety reasons, fastener coating specifications, or insufficient reusable strength. One-time use hardware may be located anywhere on the vehicle. One-time use hardware for a specific application may be identified in a repair procedure.

Two fasteners with the same strength, thread pitch, and length may be used on a vehicle. One may require replacement and the other may not. Vehicle-specific service information must be used to determine how fasteners should be treated.

Common locations of one-time use hardware include steering and suspension parts, restraint system parts, drivetrain parts, subframe mounting points, and pickup box mounting points.

Vehicle Protection

If the replacement part comes with replacement fasteners, do not reuse the original fasteners. Previous torquing applications may have fatigued the fastener or damaged the coating.

Module Summary

Module 1 discussed various types of mechanical fasteners, tools used for removal and installation, and considerations regarding replacement.

Topics discussed in this module included:

- different types of hardware located on the interior and exterior of a vehicle.
- classes or grades, lengths, and thread pitches of fasteners.
- variables that can affect torquing efficiency.

This page is intentionally left blank.

Module 2 - Hardware Removal and Restoration

I-CAR®

This page is intentionally left blank.

Learning Objectives

To limit delays during the repair process, hardware must be removed and stored in an organized manner. Module 2 will discuss best practices for removal and storage of hardware. Methods for removing damaged fasteners and thread restoration will also be discussed.

The learning objectives for this module include:

- identifying different ways to organize and store hardware.
- explaining different ways that a fastener with an undamaged head can be removed.
- explaining different ways that a fastener with a damaged head or a stud can be removed.
- using various methods to restore damaged threads.

Plastic, Sealable Bags

The proper storage of hardware is essential for efficient reassembly. Plastic, resealable bags are available in a variety of sizes. Plastic bags can be labeled with the hardware location. The bags can be reused by covering the original label with an additional piece of tape and labeling it with the new location. Plastic bags can be labeled with a number that coordinates with a drawing of the hardware location. If numbers are used, the bags may be used for future vehicle disassembly without having to relabel them.

Plastic bags can be stored with the vehicle, on the part the hardware was removed from, or on a parts rack with the rest of the removed parts. To limit wasted time, store all of the bags in one location so that none of the pieces are lost or misplaced, or use tape, rubber bands, or plastic ties to attach the bag to the part.

Vehicle Protection

When working with one-time use hardware:

Attached To The Part

Some hardware may be taped on, or installed in its original location. Do not damage the threads, or the part, with excessive tightening or flexing when installing the fastener into the original location.

After the hardware has been attached to the part, it should be stored in a clean, dry place.

Storage Bins

Storage bins are available in many shapes and sizes. Examples of different types of storage bins include plastic bins shaped like the vehicle. Because of the shape of the bin, the location of the hardware is also displayed. These bins need to be stored on a flat surface away from areas where they could be easily knocked over.

Storage bins may be designed as plastic and metal sectioned boxes labeled according to location or numbered to coordinate with a drawing of the location. Adjustable sections allow different lengths of hardware to be stored in the same place. A box cover prevents hardware from moving from bin to bin, or scattering if the box is dropped. The covered area also provides a storage area for paperwork. The boxes can either be stored with the vehicle, parts, or on the parts rack.

A parts rack or cart may have storage bins attached.

Storage bins may be labeled according to location. Different sizes and colors of bins can be used to organize hardware location. The ability to remove and replace the bins is also helpful.

Hardware Organization

When organizing hardware, an inventory of commonly broken or discarded hardware will help limit delays in getting the replacement hardware. Computer programs can be used to assist in organizing and inventorying hardware. This inventory information can also be used to write better estimates, estimate supplements, evaluate employee practice, and track lost revenue. Methods of inputting data into the computer program includes manual entry of part numbers and quantities, or scanning the part number and quantity bar codes. Manual entry may also be required with a scanning program.

Inventory can be stored in bar-coded or labeled vertical bins and in stackable, sectioned, covered drawers or cabinets. Hardware can be organized by vehicle, application, or type.

General Removal Guide

Always refer to the vehicle-specific service information for part location, hardware type and location, removal procedures, and the type of tools to be used to remove specific parts and hardware.

Verify that the ignition is in the OFF position and the key is removed, unless the service procedure requires it to be ON.

Always remove rings, watches, loose hanging jewelry, and loose clothing before working on a vehicle.

Penetrating Oil

Penetrating oil should be allowed to soak in for an extended period of time. Several applications of penetrating oil may be required to free the fastener. Penetrating oil may be available as an aerosol or in a drip spout can.

Penetrating oil is generally used as a first step by applying the oil to hardware with undamaged heads that are seized because of corrosion or contaminants. There are different types of penetrating oils, which include water-soluble formulas.

Personal Safety

Wear proper safety equipment when working with penetrating oils.

Vehicle Protection

Use caution when applying penetrating oil near the vehicle finish. Some penetrating oils contain solvents that will damage the finish.

Do not allow penetrating oil to come in contact with the vertical surface between the wheel and the rotor or drum. Penetrating oil can cause the wheel to work loose while the vehicle is moving.

Do not apply penetrating oil or grease to the wheel, studs, or nuts.

Tightening To Loosen

When loosening fasteners with undamaged heads that are frozen because of corrosion or contaminants, use the tighten-to-loosen method. To perform this method of removal:

1. Tighten the fastener slightly. Use caution to not snap off the head of the fastener.
2. Attempt to loosen slightly.
3. Continue rocking the fastener back and forth until it is loose. By applying pressure in both directions, the corrosion or contaminants break loose, and the fastener can be removed.

Manual Impact Drivers

Manual impact drivers can assist in loosening fasteners with undamaged heads. Manual impact drivers operate by turning when the driver is struck with a hammer. Manual impact drivers are used with the attachments included in the kit. Attachments can include slotted, phillips, torx, and impact sockets.

Using Heat To Loosen Fasteners

When using heat to loosen corroded fasteners, whatever is heated must be replaced.

For corroded nuts, always apply the heat directly on the nut. The bolt or cap screw must also be replaced. The heat is also directed at the head of a fastener if the corroded bolt or cap screw head is all that is visible or there is no nut. In these cases, the fastener may loosen easier if the part that the fastener is threaded into is heated. Direct the heat around the head. This should not be done if the part holding the fastener will be reused, or if there are hazardous or flammable materials within the part that will be released if the part is heated.

When using heat to loosen corroded fasteners, move in a slow circular motion either on the nut or head or around the head. After withdrawing the heat, try removing nuts immediately. Allow bolt and cap screw heads to cool before trying to remove them. If the fastener does not come loose, try heating again.

Personal Safety

Wear proper eye protection, clothing, and gloves when using a torch.

Vehicle Protection

Keep open flame away from wires, lines, and fuel tanks. Ensure that fire extinguishers are easily accessible and in proper working order.

Do not use heat to loosen a wheel. Heat could cause damage to the wheel, studs, or hub and bearings.

Jam-Nut Method

The jam-nut method is used to remove broken studs or fasteners that have enough exposed threads above the surface for threading on two nuts. When using the jam-nut method:

1. Thread two nuts onto the stud. Keep the nuts tight against each other.
2. Wrench upward on the nut closest to the work surface.

Screw Extractor

A screw extractor is used on fasteners or studs that have broken flush to the surface. Using a screw extractor is a two-part process. First, a pilot hole is drilled. Then, the screw extractor is installed and turned to remove the fastener. Screw extractors are left-hand bits.

Pilot Hole

When drilling the pilot hole the drill bit size is identified on a screw extractor chart, on the side of the extractor bit, or included in the screw extractor kit. The drill bit should be slightly smaller than the extractor bit that will be used. Depending upon the size of the fastener, an additional pilot hole may need to be drilled before the selected drill bit size is used. The pilot hole is used to guide the selected drill bit through the center of the fastener in preparation for the screw extractor.

Use a center punch before drilling to mark and indent the center of the fastener to provide a stable starting point for the drill bit. Cutting oil should be applied to the drill bit and the broken fastener to avoid overheating and dulling the drill bit.

When drilling the pilot hole it's important to keep the drill bit straight. If the drill bit is not kept straight, it will cut through the fastener and into the threaded hole causing damage and requiring additional repair. Do not drill through the fastener. Drilling through the fastener may not allow the extractor to remove the remains of the fastener from the threaded hole.

Using Screw Extractor Bit

When using the screw extractor use the proper size extractor bit that corresponds with the pilot hole drill bit. Start the extractor by inserting it into the hole and turning it counterclockwise with a T-handle tap wrench. If having difficulties getting the extractor started, lightly tap the end of the extractor with a hammer. The screw extractor should grip the sides of the fastener and remove it without damaging the threaded hole.

It may be necessary to set the drill motor in reverse or counterclockwise rotation. Verify that the removal was successful by threading the replacement fastener into the hole.

Rethreading Taps And Dies

Rethreading taps and dies are used to recondition or clean threads. Rethreading taps and dies look similar to cutting taps and dies. Do not use rethreading taps and dies for

hardened threads or for cutting new threads. Hardened threads can damage rethreading taps and dies. Rethreading taps and dies are also not designed to be used for cutting new threads.

Rethreading taps and dies are used with a ratchet and sockets, not a specialized tool. Rethreading taps and dies are also commonly called thread chasers.

Thread Files

Thread files are used to clean the threads of fasteners. Characteristics of thread files include having a rectangular shape, and 4 – 8 cutting sides. Depending on design, the multiple cutting sides can be located on one or both ends of the tool.

Rethreading taps and dies are used with a ratchet and sockets, not a specialized tool. Rethreading taps and dies are also commonly called thread chasers.

After cleaning the fastener, check it with the proper size nut, if applicable.

Module Summary

Module 2 discussed best practices for removal and storage of hardware. Methods for removing damaged fasteners and thread restoration was also discussed.

Topics discussed in this module included:

- different ways to organize and store hardware after removing it.
- various methods that a fastener with an undamaged head can be removed
- various ways that a fastener with a damaged head or a stud can be removed.
- methods for restoring damaged threads.

Module 3 - Interiors

I-CAR®

This page is intentionally left blank.

Learning Objectives

To prevent damage and personal injury, care must be taken when removing interior parts. Module 3 will discuss methods and procedures regarding removal and installation of interior parts.

The learning objectives for this module include:

- identifying general attachment methods for interior pieces.
- observing selected removal and installation procedures for interior pieces.

Interiors

Interior parts that will be discussed in this module include, speakers, seats, consoles, carpeting, the headliner, and the third brake light.

Plastic Trim Removal Tools

Generally, tools that are made of plastic are more gentle on fragile trim pieces. Use caution to not scratch any painted surfaces or mar plastic or vinyl pieces.

Vehicle panels, trim pieces, and hardware should be about 70°F before installation. Plastic parts become brittle when they are cold and break easily.

Disable Supplemental Restraints System (SRS)

There are various airbag sensors located throughout the vehicle. To prevent accidental airbag deployment, disable the supplemental restraints system before removing parts of the interior. This is commonly done by removing and isolating the negative battery cable. Time must also be allowed to pass for the system to completely discharge. Refer to vehicle-specific service information for the proper procedure to disable the restraint system.

Restraint system parts located in the vehicle interior may include the restraints control module (RCM), side curtain airbags, seat side airbags, side impact sensors, and seat belt pre-tensioners.

The RCM may be located under the center portion of the instrument panel, under the center console, or under a seat. Side curtain airbags are located along the roof rails, from the front to the rear of the vehicle. Seat side airbags may be designed to deploy through the seat cover, or be a separate replaceable module. Side impact sensors are located on both sides of the vehicle, and may be mounted in doors, on B- and C-pillars, or on the rear wheelhouse. Seat belt pre-tensioners are designed to remove seat belt slack

during a collision. Seat belt pre-tensioners may be built into the front and rear seat belt assemblies.

Speaker Mounting Locations

Speaker mounting locations include, but are not limited to the A-pillars, B-pillars, C-pillars, instrument panel, doors, and the rear shelf.

Vehicle Protection When Removing Speakers

Use the proper tools when removing speakers or adjacent panels to avoid damaging speakers.

Seat Mounting Locations

Seats are mounted to the floor pan through the carpet. To locate the seat mount locations, adjustable seats may need to be in the complete forward and rearward position to access the mounting fasteners. Use the vehicle-specific service information for proper removal and installation procedures and torquing specifications.

Seats with a manual adjuster may require them to be placed in the full forward position to remove the rear attaching nuts. If the seat is not in the forward position when removing the nuts, the seat track can spring forward, causing personal injury.

Seat Options

Seat options can affect removal procedures. Seat options include seat-mounted airbags, motorized seat positioning switches, heating elements, massage capabilities, lumbar adjustments, and entertainment systems. Some vehicles have entertainment systems built into the back of the front seats for the rear passengers.

To prevent damage to wiring or electrical connectors, make sure all electrical connectors to the seat are disconnected before removing the seat.

Additional maintenance may be required, such as lubricating the seat track. Memory seat positioning settings must be returned to their original position.

Seat Cover Removal

Seat covers can be retained using hog rings. Wire snips can be used to remove hog rings, but hog ring pliers are required for installation. Plastic channeled strips typically attach to a flanged area. A combination of clips and fasteners may be used to attach accessories, such as headrests, lumbar adjustment, and power accessories.

Vehicle Protection: Seats

Do not remove the seat without disarming the passive restraint system even if it has been deployed. Never sit on the seat when the seat and the track assembly are not installed in the vehicle.

Shims should not be used for alignment, unless recommended by the vehicle maker. Never straighten or weld the seat-track adjuster assemblies.

Diagnostic operations should not be used on a seat system that has side airbags and seat belt pre-tensioners without installing the restraint system diagnostic tools. Install them under the seats in the side airbag and seat belt pre-tensioner-to-floor connectors. Seat removal may be required.

Seat covers that split during a seat side airbag deployment should not be re-sewn. This is because they use a special thread that allows the seam to split and the airbag to properly deploy.

Seat Installation

When installing seats, torque seat belt mountings and any additional fasteners to specifications. Verify that all brackets and parts have been installed in the correct order and location. Improper installation can lead to malfunctions.

Most front passenger seats in vehicles built after the 2006 model year are equipped with an occupant classification system (OCS). The OCS disables the passenger airbag when the seat is not occupied or if the passenger does not meet a specific weight.

The OCS may require recalibration following a collision or if the seat is removed or replaced. Recalibration is typically done using a vehicle maker-specific scan tool, and may require a special set of weights.

Center Consoles

Center consoles are used as storage areas and for electronic and mechanical parts. A center console may also have various system controls, and contain vents for rear heating, ventilation, and air conditioning (HVAC). Center consoles can be located in the front of the vehicle, in the rear of the vehicle, between the seats on the floor, between the seats in the headliner as an overhead console, or as part of a bench seat.

On some vehicles, the RCM is located under the center console.

Carpet Removal

Interior trim and other parts that generally require removal to remove the carpet include the upper and lower trim pieces, seats, seat belt anchors, the center console, and weatherstripping.

Retainers

Types of hardware that can be used on the carpet or related areas include screws, carpet retainers, and wire retainers.

Do not apply spray-on sound deadeners and trim adhesive to the top of the floor pan in areas directly over the catalytic converter or muffler. These areas are exposed to excessive amounts of heat and require the proper floor pan insulators.

Identify the correct location of all fasteners. If fasteners are installed in the incorrect location, they can damage the fuel tank.

Headliner Removal

Interior trim that generally requires removal to remove the headliner includes A-pillar, B-pillar, and C-pillar trim, HVAC vents, coat hooks, dome lamps, overhead consoles, sun visors, assist handles, door opening trim or weatherstripping, door sill trim, and glass trim.

Seats may need to be reclined and in the far rear position to remove the headliner.

The first time the headliner is removed, an adhesive bond between the structural membrane and the headliner may need to be broken. The structural membrane is typically a piece of cardboard that stays permanently bonded to the roof panel. Generally, adhesive is not applied during installation.

Patches of hook and loop material are also used to attach headliners to the roof.

To assist in removing the headliner from the vehicle, the backglass or seats may need to be removed.

Headliner Precautions

Use caution to avoid damaging the side curtain airbags when removing upper trim panels and the headliner.

Stains and damage can be difficult to repair if the headliner is mishandled. Ensure hands or gloves are clean before handling. Use care when storing molded headliners. A headliner may require full replacement if it becomes bent or folded. Use a plastic covering and store the headliner in a clean and dry place.

Third Brake Lamp Locations

Interior third brake lights are located at the rear of the vehicle, on the rear shelf or liftgate as a low mount, or in the headliner or liftgate as a high mount.

Module Summary

Topics discussed in this module included:

- general attachment methods for interior trim.
- removal and installation procedures for interior trim.

This page is intentionally left blank.