1

GENERAL INFORMATION AND MAINTENANCE

HOW TO USE THIS BOOK

Chilton's Total Car Care manual for the 1990–00 Mitsubishi Mirage, Galant and Diamante is intended to help you learn more about the inner workings of your vehicle while saving you money on its upkeep and operation.

The beginning of the book will likely be referred to the most, since that is where you will find information for maintenance and tune-up. The other sections deal with the more complex systems of your vehicle. Operating systems from engine through brakes are covered to the extent that the average do-it-yourselfer becomes mechanically involved. This book will not explain such things as rebuilding a differential for the simple reason that the expertise required and the investment in special tools make this task uneconomical. It will, however, give you detailed instructions to help you change your own brake pads and shoes, replace spark plugs, and perform many more jobs that can save you money, give you personal satisfaction and help you avoid expensive problems.

A secondary purpose of this book is a reference for owners who want to understand their vehicle and/or their mechanics better. In this case, no tools at all are required.

Where to Begin

Before removing any bolts, read through the entire procedure. This will give you the overall view of what tools and supplies will be required. There is nothing more frustrating than having to walk to the bus stop on Monday morning because you were short one bolt on Sunday afternoon. So read ahead and plan ahead. Each operation should be approached logically and all procedures thoroughly understood before attempting any work.

All sections contain adjustments, maintenance, removal and installation procedures, and in some cases, repair or overhaul procedures. When repair is not considered practical, we tell you how to remove the part and then how to install the new or rebuilt replacement. In this way, you at least save labor costs. "Backyard" repair of some components is just not practical.

Avoiding Trouble

Many procedures in this book require you to "label and disconnect . . . " a group of lines, hoses or wires. Don't be lulled into thinking you can remember where everything goes—you won't. If you hook up vacuum or fuel lines incorrectly, the vehicle may run poorly, if at all. If you hook up electrical wiring incorrectly, you may instantly learn a very expensive lesson.

You don't need to know the official or engineering name for each hose or line. A piece of masking tape on the hose and a piece on its fitting will allow you to assign your own label such as the letter A or a short name. As long as you remember your own code, the lines can be reconnected by matching similar letters or names. Do remember that tape will dissolve in gasoline or other fluids; if a component is to be washed or cleaned, use another method of identification. A permanent felt-tipped marker or a metal scribe can be very handy for marking metal parts. Remove any tape or paper labels after assembly.

Maintenance or Repair?

It's necessary to mention the difference between maintenance and repair. Maintenance includes routine inspections, adjustments, and replacement of parts which show signs of normal wear. Maintenance compensates for wear or deterioration. Repair implies that something has broken or is not working. A need for repair is often caused by lack of maintenance. Example: draining and refilling the automatic transaxle fluid is maintenance recommended by the manufacturer at specific mileage intervals. Failure to do this can shorten the life of the transmission/transaxle, requiring very expensive repairs. While no maintenance program can prevent items from breaking or wearing out, a general rule can be stated: MAINTENANCE IS CHEAPER THAN REPAIR.

Two basic mechanic's rules should be mentioned here. First, whenever the left side of the vehicle or engine is referred to, it is meant to specify the driver's side. Conversely, the right side of the vehicle means the passenger's side. Second, screws and bolts are removed by turning counterclockwise, and tightened by turning clockwise unless specifically noted.

Safety is always the most important rule. Constantly be aware of the dangers involved in working on an automobile and take the proper precautions. See the information in this section regarding SERVICING YOUR VEHICLE SAFELY and the SAFETY NOTICE on the acknowledgment page.

Avoiding the Most Common Mistakes

Pay attention to the instructions provided. There are 3 common mistakes in mechanical work:

1. Incorrect order of assembly, disassembly or adjustment. When taking something apart or putting it together, performing steps in the wrong order usually just costs you extra time; however, it CAN break something. Read the entire procedure before beginning disassembly. Perform everything in the order in which the instructions say you should, even if you can't immediately see a reason for it. When you're taking apart something that is very intricate, you might want to draw a picture of how it looks when assembled at one point in order to make sure you get everything back in its proper position. We will supply exploded views whenever possible. When making adjustments, perform them in the proper order. One adjustment possibly will affect another.
2. Overtorquing (or undertorquing). While it is more common for overtorquing to cause damage, undertorquing may allow a fastener to vibrate loose causing serious damage. Especially when dealing with aluminum parts, pay attention to torque specifications and utilize a torque wrench in assembly. If a torque figure is not available, remember that if you are using the right tool to perform the job, you will probably not have to strain yourself to get a fastener tight enough. The pitch of most threads is so slight that the tension you put on the wrench will be multiplied many times in actual force on what you are tightening. A good example of how critical torque is can be seen in the case of spark plug installation, especially where you are putting the plug into an aluminum cylinder head. Too little torque can fail to crush the gasket, causing leakage of combustion gases and consequent overheating of the plug and engine parts. Too much torque can damage the threads or distort the plug, changing the spark gap.

There are many commercial products available for ensuring that fasteners won't come loose, even if they are not torqued just right (a very common brand is Loctite®. If you're worried about getting something together tight enough to hold, but loose enough to avoid mechanical damage during assembly, one of these products might offer substantial insurance. Before choosing a threadlocking compound, read the label on the package and make sure the product is compatible with the materials, fluids, etc. involved.

3. Crossthreading. This occurs when a part such as a bolt is screwed into a nut or casting at the wrong angle and forced. Crossthreading is more likely to occur if access is difficult. It helps to clean and lubricate fasteners, then to start threading the bolt, spark plug, etc. with your fingers. If you encounter resistance, unscrew the part and start over again at a different angle until it can be inserted and turned several times without much effort. Keep in mind that many parts, especially spark plugs, have tapered threads, so that gentle turning will automatically bring the part you're threading to the proper angle. Don't put a wrench on the part until it's been tightened a couple of turns by hand. If you suddenly encounter resistance, and the part has not seated fully, don't force it. Pull it back out to make sure it's clean and threading properly.

Be sure to take your time and be patient, and always plan ahead. Allow yourself ample time to perform repairs and maintenance. You may find maintaining your car a satisfying and enjoyable experience.

TOOLS AND EQUIPMENT

See Figures 1 thru 15

Naturally, without the proper tools and equipment it is impossible to properly service your vehicle. It would also be virtually impossible to catalog every tool that you would need to perform all of the operations in this book. Of course, it would be unwise for the amateur to rush out and buy an expensive set of tools on the theory that he/she may need one or more of them at some time.

The best approach is to proceed slowly, gathering a good quality set of those tools that are used most frequently. Don't be misled by the low cost of bargain tools. It is far better to spend a little more for better quality. Forged wrenches, 6 or 12-point sockets and fine tooth ratchets are by far preferable to their less expensive counterparts. As any good mechanic can tell you, there are few worse experiences than trying to work on a vehicle with bad tools. Your monetary savings will be far outweighed by frustration and mangled knuckles.

Begin accumulating those tools that are used most frequently: those associated with routine maintenance and tune-up. In addition to the normal assortment of screwdrivers and pliers, you should have the following tools:

- Wrenches/sockets and combination open end/box end wrenches in sizes from $\frac{1}{8}$–$\frac{3}{4}$ in. or

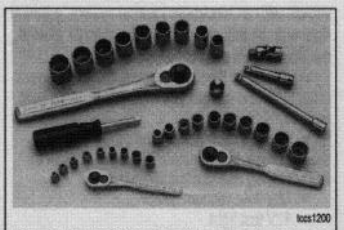
3–19mm, as well as a 13/16 in. or 5/8 in. spark plug socket (depending on plug type).

➡If possible, buy various length socket drive extensions. Universal-joint and wobble extensions can be extremely useful, but be careful when using them, as they can change the amount of torque applied to the socket.

- Jackstands for support.
- Oil filter wrench.
- Spout or funnel for pouring fluids.
- Grease gun for chassis lubrication (unless your vehicle is not equipped with any grease fittings—for details, please refer to information on Fluids and Lubricants, later in this section).
- Hydrometer for checking the battery (unless equipped with a sealed, maintenance-free battery).
- A container for draining oil and other fluids.
- Rags for wiping up the inevitable mess.

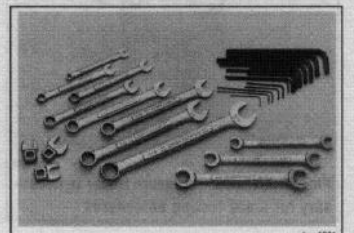
In addition to the above items there are several others that are not absolutely necessary, but handy to have around. These include Oil Dry® (or an equivalent oil absorbent gravel—such as cat litter) and the usual supply of lubricants, antifreeze and fluids, although these can be purchased as needed. This is a basic list for routine maintenance, but only your personal needs and desire can accurately determine your list of tools.

After performing a few projects on the vehicle, you'll be amazed at the other tools and non-tools on



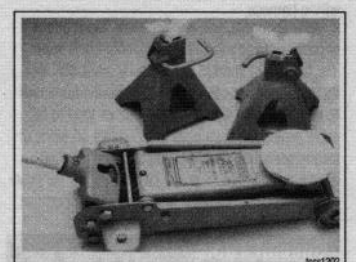
tccs1200

Fig. 1 All but the most basic procedures will require an assortment of ratchets and sockets



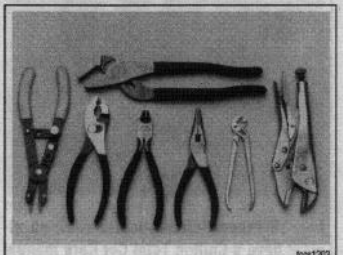
tccs1201

Fig. 2 In addition to ratchets, a good set of wrenches and hex keys will be necessary



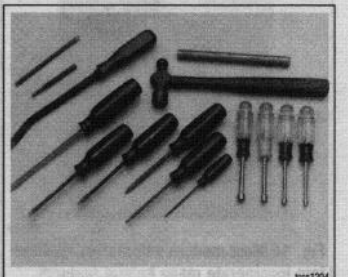
tccs1202

Fig. 3 A hydraulic floor jack and a set of jackstands are essential for lifting and supporting the vehicle



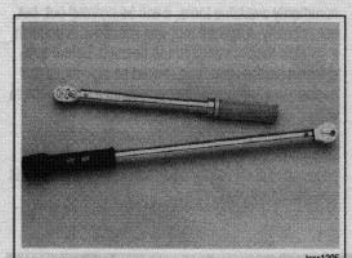
tccs1203

Fig. 4 An assortment of pliers, grippers and cutters will be handy for old rusted parts and stripped bolt heads



tccs1204

Fig. 5 Various drivers, chisels and prybars are great tools to have in your toolbox



tccs1205

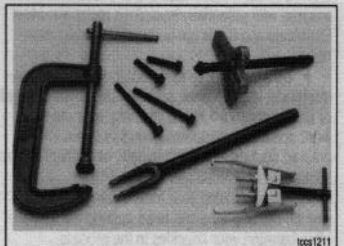
Fig. 6 Many repairs will require the use of a torque wrench to assure the components are properly fastened

tccs1209

Fig. 7 Although not always necessary, using specialized brake tools will save time

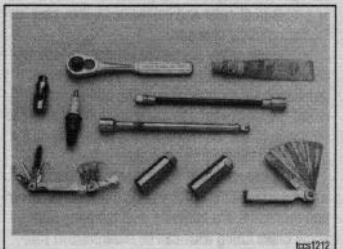
tccs1210

Fig. 8 A few inexpensive lubrication tools will make maintenance easier



tccs1211

Fig. 9 Various pullers, clamps and separator tools are needed for many larger, more complicated repairs

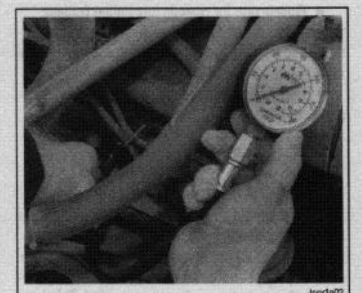


tccs1212

Fig. 10 A variety of tools and gauges should be used for spark plug gapping and installation

tccr1p01

Fig. 11 Inductive type timing light



tccx1p02

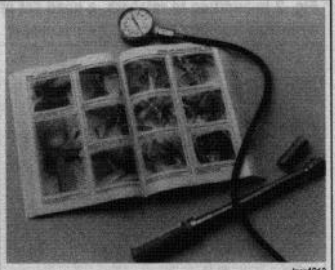
Fig. 12 A screw-in type compression gauge is recommended for compression testing

tccx1p03

Fig. 13 A vacuum/pressure tester is necessary for many testing procedures

tccx1p06

Fig. 14 Most modern automotive multimeters incorporate many helpful features



tccs1213

Fig. 15 Proper information is vital, so always have a Chilton Total Car Care manual handy

your workbench. Some useful household items are: a large turkey baster or siphon, empty coffee cans and ice trays (to store parts), ball of twine, electrical tape for wiring, small rolls of colored tape for tagging lines or hoses, markers and pens, a note pad, golf tees (for plugging vacuum lines), metal coat hangers or a roll of mechanic's wire (to hold things out of the way), dental pick or similar long, pointed probe, a strong magnet, and a small mirror (to see into recesses and under manifolds).

A more advanced set of tools, suitable for tune-up work, can be drawn up easily. While the tools are slightly more sophisticated, they need not be outrageously expensive. There are several inexpensive tach/dwell meters on the market that are every bit as good for the average mechanic as a professional model. Just be sure that it goes to a least 1200–1500 rpm on the tach scale and that it works on 4, 6 and 8-cylinder engines. The key to these purchases is to make them with an eye towards adaptability and wide range. A basic list of tune-up tools could include:

- Tach/dwell meter.
- Spark plug wrench and gapping tool.
- Feeler gauges for valve adjustment.
- Timing light.

The choice of a timing light should be made carefully. A light which works on the DC current supplied by the vehicle's battery is the best choice; it should have a xenon tube for brightness. On any vehicle with an electronic ignition system, a timing light with an inductive pickup that clamps around the No. 1 spark plug cable is preferred.

In addition to these basic tools, there are several other tools and gauges you may find useful. These include:

- Compression gauge. The screw-in type is slower to use, but eliminates the possibility of a faulty reading due to escaping pressure.
- Manifold vacuum gauge.
- 12V test light.
- A combination volt/ohmmeter
- Induction Ammeter. This is used for determining whether or not there is current in a wire. These are handy for use if a wire is broken somewhere in a wiring harness.

As a final note, you will probably find a torque wrench necessary for all but the most basic work. The beam type models are perfectly adequate, although the newer click types (breakaway) are easier to use. The click type torque wrenches tend to be more expensive. Also keep in mind that all types of torque wrenches should be periodically checked and/or recalibrated. You will have to decide for yourself which better fits your pocketbook, and purpose.

Special Tools

Normally, the use of special factory tools is avoided for repair procedures, since these are not readily available for the do-it-yourself mechanic. When it is possible to perform the job with more commonly available tools, it will be pointed out, but occasionally, a special tool was designed to perform a specific function and should be used. Before substituting another tool, you should be convinced that neither your safety nor the performance of the vehicle will be compromised.

Special tools can usually be purchased from an automotive parts store or from your dealer. In some cases special tools may be available directly from the tool manufacturer.

SERVICING YOUR VEHICLE SAFELY

See Figures 16, 17, 18, and 19

It is virtually impossible to anticipate all of the hazards involved with automotive maintenance and service, but care and common sense will prevent most accidents.

The rules of safety for mechanics range from "don't smoke around gasoline," to "use the proper tool(s) for the job." The trick to avoiding injuries is to develop safe work habits and to take every possible precaution.

Do's

- Do keep a fire extinguisher and first aid kit handy.
- Do wear safety glasses or goggles when cutting, drilling, grinding or prying, even if you have 20–20 vision. If you wear glasses for the sake of vision, wear safety goggles over your regular glasses.
- Do shield your eyes whenever you work around the battery. Batteries contain sulfuric acid. In case of contact with the eyes or skin, flush the area with water or a mixture of water and baking soda, then seek immediate medical attention.
- Do use safety stands (jackstands) for any undervehicle service. Jacks are for raising vehicles; jackstands are for making sure the vehicle stays raised until you want it to come down. Whenever the vehicle is raised, block the wheels remaining on the ground and set the parking brake.
- Do use adequate ventilation when working with any chemicals or hazardous materials. Like carbon monoxide, the asbestos dust resulting from some brake lining wear can be hazardous in sufficient quantities.
- Do disconnect the negative battery cable when working on the electrical system. The secondary ignition system contains EXTREMELY HIGH VOLTAGE. In some cases it can even exceed 50,000 volts.
- Do follow manufacturer's directions whenever working with potentially hazardous materials. Most chemicals and fluids are poisonous if taken internally.
- Do properly maintain your tools. Loose hammerheads, mushroomed punches and chisels, frayed or poorly grounded electrical cords, excessively worn screwdrivers, spread wrenches (open end), cracked sockets, slipping ratchets, or faulty droplight sockets can cause accidents.
- Likewise, keep your tools clean; a greasy wrench can slip off a bolt head, ruining the bolt and often harming your knuckles in the process.
- Do use the proper size and type of tool for the job at hand. Do select a wrench or socket that fits the nut or bolt. The wrench or socket should sit straight, not cocked.

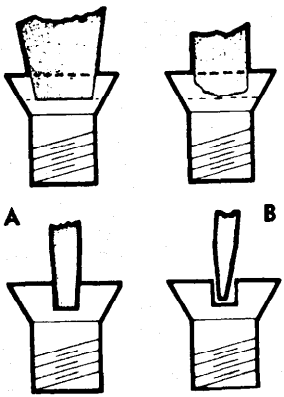


Fig. 16 Screwdrivers should be kept in good condition to prevent injury or damage which could result if the blade slips from the screw

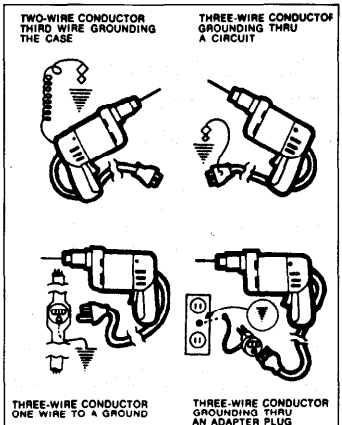


Fig. 17 Power tools should always be properly grounded

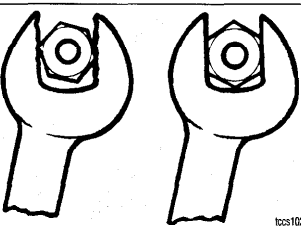


Fig. 18 Using the correct size wrench will help prevent the possibility of rounding off a nut

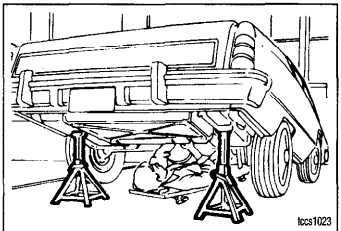


Fig. 19 NEVER work under a vehicle unless it is supported using safety stands (jackstands)

- Do, when possible, pull on a wrench handle rather than push on it, and adjust your stance to prevent a fall.
- Do be sure that adjustable wrenches are tightly closed on the nut or bolt and pulled so that the force is on the side of the fixed jaw.
- Do strike squarely with a hammer; avoid glancing blows.
- Do set the parking brake and block the drive wheels if the work requires a running engine.

Don'ts

- Don't run the engine in a garage or anywhere else without proper ventilation—EVER! Carbon monoxide is poisonous; it takes a long time to leave the human body and you can build up a deadly supply of it in your system by simply breathing in a little every day. You may not realize you are slowly poisoning yourself. Always use power vents, windows, fans and/or open the garage door.
- Don't work around moving parts while wearing loose clothing. Short sleeves are much safer than long, loose sleeves. Hard-toed shoes with neoprene soles protect your toes and give a better grip on slippery surfaces. Jewelry such as watches, fancy belt buckles, beads or body adornment of any kind is not safe working around a vehicle. Long hair should be tied back under a hat or cap.
- Don't use pockets for toolboxes. A fall or bump can drive a screwdriver deep into your body. Even a rag hanging from your back pocket can wrap around a spinning shaft or fan.
- Don't smoke when working around gasoline, cleaning solvent or other flammable material.
- Don't smoke when working around the battery. When the battery is being charged, it gives off explosive hydrogen gas.
- Don't use gasoline to wash your hands; there are excellent soaps available. Gasoline contains dangerous additives which can enter the body through a cut or through your pores. Gasoline also removes all the natural oils from the skin so that bone dry hands will suck up oil and grease.
- Don't service the air conditioning system unless you are equipped with the necessary tools and training. When liquid or compressed gas refrigerant is released to atmospheric pressure it will absorb heat from whatever it contacts. This will chill or freeze anything it touches.
- Don't use screwdrivers for anything other than driving screws! A screwdriver used as an prying tool can snap when you least expect it, causing injuries. At the very least, you'll ruin a good screwdriver.
- Don't use an emergency jack (that little ratchet, scissors, or pantograph jack supplied with the vehicle) for anything other than changing a flat! These jacks are only intended for emergency use out on the road; they are NOT designed as a maintenance tool. If you are serious about maintaining your vehicle yourself, invest in a hydraulic floor jack of at least a 1½ ton capacity, and at least two sturdy jackstands.

FASTENERS, MEASUREMENTS AND CONVERSIONS

Bolts, Nuts and Other Threaded Retainers

See Figures 20, 21, 22, and 23

Although there are a great variety of fasteners found in the modern car or truck, the most commonly used retainer is the threaded fastener (nuts, bolts, screws, studs, etc.). Most threaded retainers may be reused, provided that they are not damaged in use or during the repair. Some retainers (such as stretch bolts or torque prevailing nuts) are designed to deform when tightened or in use and should not be reinstalled.

Whenever possible, we will note any special retainers which should be replaced during a procedure. But you should always inspect the condition of a retainer when it is removed and replace any that show signs of damage. Check all threads for rust or corrosion which can increase the torque necessary to achieve the desired clamp load for which that fastener was originally selected. Additionally, be sure that the driver surface of the fastener has not been compromised by rounding or other damage. In some cases a driver surface may become only partially rounded, allowing the driver to catch in only one direction. In many of these occurrences, a fastener may be installed and tightened, but the driver would not be able to grip and loosen the fastener again. (This could lead to frustration down the line should that component ever need to be disassembled again).

If you must replace a fastener, whether due to design or damage, you must ALWAYS be sure to use the proper replacement. In all cases, a retainer of the same design, material and strength should be used. Markings on the heads of most bolts will help determine the proper strength of the fastener. The same material, thread and pitch must be selected to assure proper installation and safe operation of the vehicle afterwards.

Thread gauges are available to help measure a bolt or stud's thread. Most automotive and hardware stores keep gauges available to help you select the proper size. In a pinch, you can use another nut or bolt for a thread gauge. If the bolt you are replacing is not too badly damaged, you can select a match by finding another bolt which will thread in its place. If you find a nut which threads properly onto the damaged bolt, then use that nut to help select the replacement bolt. If however, the bolt you are replacing is so badly damaged (broken or drilled out) that its threads cannot be used as a gauge, you might start by looking for another bolt (from the same assembly or a similar location on your vehicle) which will thread into the damaged bolt's mounting. If so, the other bolt can be used to select a nut; the nut can then be used to select the replacement bolt.

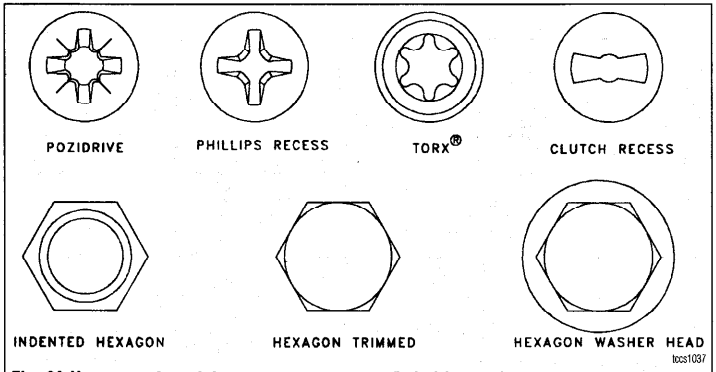


Fig. 20 Here are a few of the most common screw/bolt driver styles

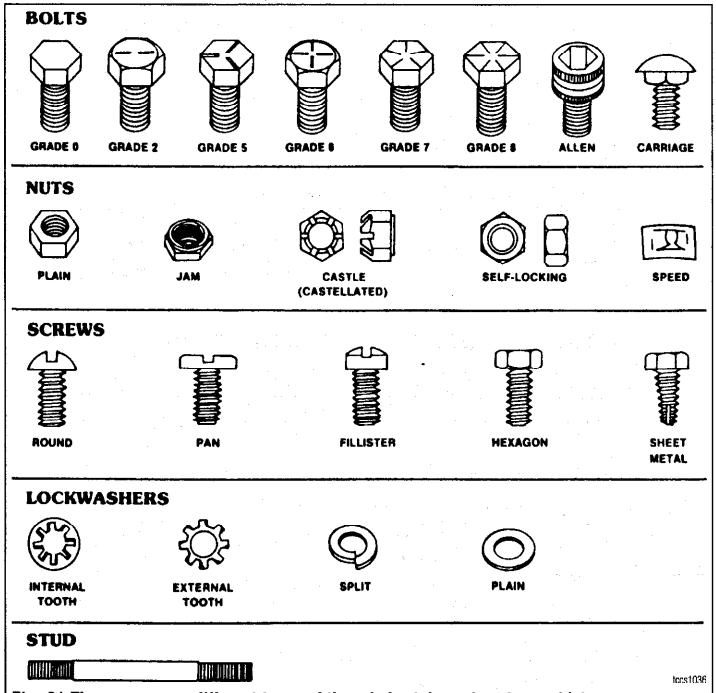


Fig. 21 There are many different types of threaded retainers found on vehicles

In all cases, be absolutely sure you have selected the proper replacement. Don't be shy, you can always ask the store clerk for help.

⁂ WARNING

Be aware that when you find a bolt with damaged threads, you may also find the nut or drilled hole it was threaded into has also been damaged. If this is the case, you may have to drill and tap the hole, replace the nut or otherwise repair the threads. NEVER try to force a replacement bolt to fit into the damaged threads.

Torque

Torque is defined as the measurement of resistance to turning or rotating. It tends to twist a body about an axis of rotation. A common example of this would be tightening a threaded retainer such as a nut, bolt or screw. Measuring torque is one of the most common ways to help assure that a threaded retainer has been properly fastened.

When tightening a threaded fastener, torque is applied in three distinct areas, the head, the bearing surface and the clamp load. About 50 percent of the measured torque is used in overcoming bearing friction. This is the friction between the bearing surface of the bolt head, screw head or nut face and the base material or washer (the surface on which the fastener is rotating). Approximately 40 percent of the applied torque is used in overcoming thread friction. This leaves only about 10 percent of the applied torque to develop a useful clamp load (the force which holds a joint together). This means that friction can account for as much as 90 percent of the applied torque on a fastener.

TORQUE WRENCHES

See Figures 24 and 25

In most applications, a torque wrench can be used to assure proper installation of a fastener. Torque wrenches come in various designs and most automotive supply stores will carry a variety to suit your needs. A torque wrench should be used any time we supply a specific torque value for a fastener. A torque wrench can also be used if you are following the general guidelines in the accompanying charts. Keep in mind that because there is no worldwide standardization of fasteners, the charts are a general guideline

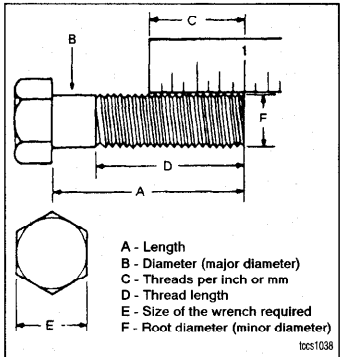


Fig. 22 Threaded retainer sizes are determined using these measurements

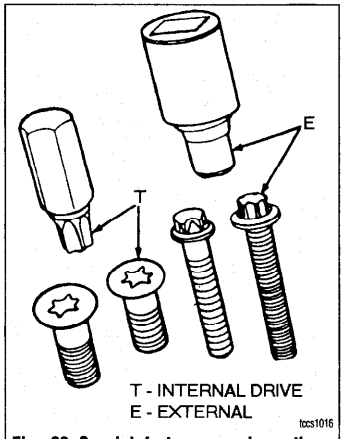


Fig. 23 Special fasteners such as these Torx® head bolts are used by manufacturers to discourage people from working on vehicles without the proper tools

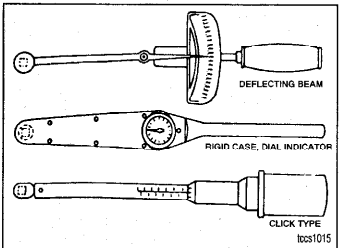


Fig. 24 Various styles of torque wrenches are usually available at your local automotive supply store

and should be used with caution. Again, the general rule of "if you are using the right tool for the job, you should not have to strain to tighten a fastener" applies here.

Beam Type

See Figure 26

The beam type torque wrench is one of the most popular types. It consists of a pointer attached to the head that runs the length of the flexible beam (shaft) to a scale located near the handle. As the wrench is pulled, the beam bends and the pointer indicates the torque using the scale.

Click (Breakaway) Type

See Figure 27

Another popular design of torque wrench is the click type. To use the click type wrench you pre-adjust it to a torque setting. Once the torque is reached, the wrench has a reflex signaling feature that causes a momentary breakaway of the torque wrench body, sending an impulse to the operator's hand.

Pivot Head Type

See Figure 27 and 28

Some torque wrenches (usually of the click type) may be equipped with a pivot head which can allow it to be used in areas of limited access. BUT, it must be used properly. To hold a pivot head wrench, grasp the handle lightly, and as you pull on the handle, it should be floated on the pivot point. If the handle comes in contact with the yoke extension during the process of pulling, there is a very good chance the torque readings will be inaccurate because this could alter the wrench loading point. The design of the handle is usually such as to make it inconvenient to deliberately misuse the wrench.

It should be mentioned that the use of any U-joint, wobble or extension will have an effect on the torque readings, no matter what type of wrench you are using. For the most accurate readings, install the socket directly on the wrench driver. If necessary, straight extensions (which hold a socket directly under the wrench driver) will have the least effect on the torque reading. Avoid any extension that alters the length of the wrench from the handle to the head/driving point (such as a crow's foot). U-joint or wobble extensions can greatly affect the readings; avoid their use at all times.

U.S. Bolts

SAE Grade Number	1 or 2			5			6 or 7		
Number of lines always 2 less than the grade number.									
Bolt Size (Inches)—(Thread)	Maximum Torque Ft./Lbs.	Kgm	Nm	Maximum Torque Ft./Lbs.	Kgm	Nm	Maximum Torque Ft./Lbs.	Kgm	Nm
1/4—20	5	0.7	6.8	8	1.1	10.8	10	1.4	13.5
—28	6	0.8	8.1	10	1.4	13.6			
5/16—18	11	1.5	14.9	17	2.3	23.0	19	2.6	25.8
—24	13	1.8	17.6	19	2.6	25.7			
3/8—16	18	2.5	24.4	31	4.3	42.0	34	4.7	46.0
—24	20	2.75	27.1	35	4.8	47.5			
7/16—14	28	3.8	37.0	49	6.8	66.4	55	7.6	74.5
—20	30	4.2	40.7	55	7.6	74.5			
1/2—13	39	5.4	52.8	75	10.4	101.7	85	11.75	115.2
—20	41	5.7	55.6	85	11.7	115.2			
9/16—12	51	7.0	69.2	110	15.2	149.1	120	16.6	162.7
—18	55	7.6	74.5	120	16.6	162.7			
5/8—11	83	11.5	112.5	150	20.7	203.3	167	23.0	226.5
—18	95	13.1	128.8	170	23.5	230.5			
3/4—10	105	14.5	142.3	270	37.3	366.0	280	38.7	379.6
—16	115	15.9	155.9	295	40.8	400.0			
7/8— 9	160	22.1	216.9	395	54.6	535.5	440	60.9	596.5
—14	175	24.2	237.2	435	60.1	589.7			
1— 8	236	32.5	318.6	590	81.6	799.9	660	91.3	894.8
—14	250	34.6	338.9	660	91.3	849.8			

Metric Bolts

Relative Strength Marking	4.6, 4.8			8.8		
Bolt Markings						
Bolt Size Thread Size x Pitch (mm)	Maximum Torque Ft./Lbs.	Kgm	Nm	Maximum Torque Ft./Lbs.	Kgm	Nm
6 x 1.0	2–3	.2–.4	3–4	3–6	4–.8	5–8
8 x 1.25	6–8	.8–1	8–12	9–14	1.2–1.9	13–19
10 x 1.25	12–17	1.5–2.3	16–23	20–29	2.7–4.0	27–39
12 x 1.25	21–32	2.9–4.4	29–43	35–53	4.8–7.3	47–72
14 x 1.5	35–52	4.8–7.1	48–70	57–85	7.8–11.7	77–110
16 x 1.5	51–77	7.0–10.6	67–100	90–120	12.4–16.5	130–160
18 x 1.5	74–110	10.2–15.1	100–150	130–170	17.9–23.4	180–230
20 x 1.5	110–140	15.1–19.3	150–190	190–240	26.2–46.9	160–320
22 x 1.5	150–190	22.0–26.2	200–260	250–320	34.5–44.1	340–430
24 x 1.5	190–240	26.2–46.9	260–320	310–410	42.7–56.5	420–550

tccs1098

Fig. 25 Standard and metric bolt torque specifications based on bolt strengths—WARNING: use only as a guide

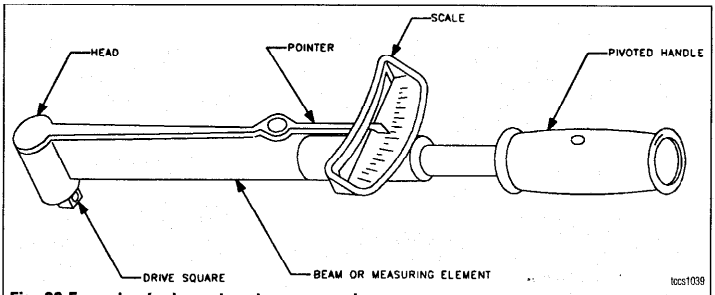


Fig. 26 Example of a beam type torque wrench

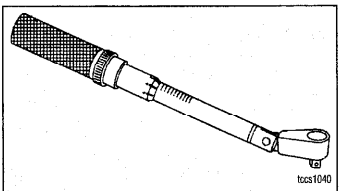
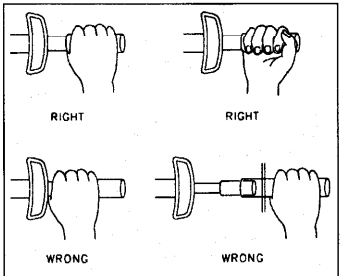

tccs1040

Fig. 27 A click type or breakaway torque wrench—note that this one has a pivoting head



tccs1041

Fig. 28 Torque wrenches with pivoting heads must be grasped and used properly to prevent an incorrect reading

Rigid Case (Direct Reading)

See Figure 29

A rigid case or direct reading torque wrench is equipped with a dial indicator to show torque values. One advantage of these wrenches is that they can be held at any position on the wrench without affecting accuracy. These wrenches are often preferred because they tend to be compact, easy to read and have a great degree of accuracy.

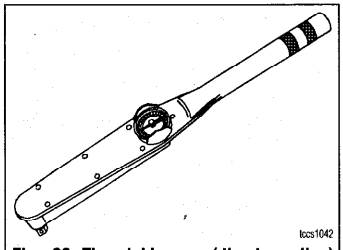
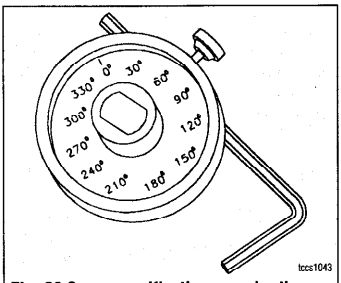

tccs1042

Fig. 29 The rigid case (direct reading) torque wrench uses a dial indicator to show torque

TORQUE ANGLE METERS

See Figure 30

Because the frictional characteristics of each fastener or threaded hole will vary, clamp loads which are based strictly on torque will vary as well. In most applications, this variance is not significant enough to cause worry. But, in certain applications, a manufacturer's engineers may determine that more precise clamp loads are necessary (such is the case with many aluminum cylinder heads). In these cases, a torque angle method of installation would be specified. When installing fasteners which are torque angle tightened, a predetermined seating torque and standard torque wrench are usually used first to remove any compliance from the joint. The fastener is then tightened the specified additional portion of a turn measured in degrees. A torque angle gauge (mechanical protractor) is used for these applications.



tccs1043

Fig. 30 Some specifications require the use of a torque angle meter (mechanical protractor)

Standard and Metric Measurements

See Figure 31

Throughout this manual, specifications are given to help you determine the condition of various components on your vehicle, or to assist you in their installation. Some of the most common measurements include length (in. or cm/mm), torque (ft. lbs., inch lbs. or Nm) and pressure (psi, in. Hg, kPa or mm Hg). In most cases, we strive to provide the proper measurement as determined by the manufacturer's engineers.

Though, in some cases, that value may not be conveniently measured with what is available in your toolbox. Luckily, many of the measuring devices

CONVERSION FACTORS

LENGTH–DISTANCE				
Inches (in.)	x 25.4	= Millimeters (mm)	x .0394	= Inches
Feet (ft.)	x .305	= Meters (m)	x 3.281	= Feet
Miles	x 1.609	= Kilometers (km)	x .0621	= Miles
VOLUME				
Cubic Inches (in3)	x 16.387	= Cubic Centimeters	x .061	= in3
IMP Pints (IMP pt.)	x .568	= Liters (L)	x 1.76	= IMP pt.
IMP Quarts (IMP qt.)	x 1.137	= Liters (L)	x .88	= IMP qt.
IMP Gallons (IMP gal.)	x 4.546	= Liters (L)	x .22	= IMP gal.
IMP Quarts (IMP qt.)	x 1.201	= US Quarts (US qt.)	x .833	= IMP qt.
IMP Gallons (IMP gal.)	x 1.201	= US Gallons (US gal.)	x .833	= IMP gal.
Fl. Ounces	x 29.573	= Milliliters	x .034	= Ounces
US Pints (US pt.)	x .473	= Liters (L)	x 2.113	= Pints
US Quarts (US qt.)	x .946	= Liters (L)	x 1.057	= Quarts
US Gallons (US gal.)	x 3.785	= Liters (L)	x .264	= Gallons
MASS–WEIGHT				
Ounces (oz.)	x 28.35	= Grams (g)	x .035	= Ounces
Pounds (lb.)	x .454	= Kilograms (kg)	x 2.205	= Pounds
PRESSURE				
Pounds Per Sq. In. (psi)	x 6.895	= Kilopascals (kPa)	x .145	= psi
Inches of Mercury (Hg)	x .4912	= psi	x 2.036	= Hg
Inches of Mercury (Hg)	x 3.377	= Kilopascals (kPa)	x .2961	= Hg
Inches of Water (H_2O)	x .07355	= Inches of Mercury	x 13.783	= H_2O
Inches of Water (H_2O)	x .03613	= psi	x 27.684	= H_2O
Inches of Water (H_2O)	x .248	= Kilopascals (kPa)	x 4.026	= H_2O
TORQUE				
Pounds–Force Inches (in–lb)	x .113	= Newton Meters (N·m)	x 8.85	= in–lb
Pounds–Force Feet (ft–lb)	x 1.356	= Newton Meters (N·m)	x .738	= ft–lb
VELOCITY				
Miles Per Hour (MPH)	x 1.609	= Kilometers Per Hour (KPH)	x .621	= MPH
POWER				
Horsepower (Hp)	x .745	= Kilowatts	x 1.34	= Horsepower
FUEL CONSUMPTION*				
Miles Per Gallon IMP (MPG)	x .354	= Kilometers Per Liter (Km/L)		
Kilometers Per Liter (Km/L)	x 2.352	= IMP MPG		
Miles Per Gallon US (MPG)	x .425	= Kilometers Per Liter (Km/L)		
Kilometers Per Liter (Km/L)	x 2.352	= US MPG		

*It is common to covert from miles per gallon (mpg) to liters/100 kilometers (1/100 km), where mpg (IMP) x 1/100 km = 282 and mpg (US) x 1/100 km = 235.

TEMPERATURE	
Degree Fahrenheit (°F)	= (°C x 1.8) + 32
Degree Celsius (°C)	= (°F – 32) x .56

tccs1044

Fig. 31 Standard and metric conversion factors chart

which are available today will have two scales so the Standard or Metric measurements may easily be taken. If any of the various measuring tools which are available to you do not contain the same scale as listed in the specifications, use the accompanying conversion factors to determine the proper value.

The conversion factor chart is used by taking the given specification and multiplying it by the necessary conversion factor. For instance, looking at the first line, if you have a measurement in inches such as "free-play should be 2 in." but your ruler reads only in millimeters, multiply 2 in. by the conversion factor of 25.4 to get the metric equivalent of 50.8mm. Likewise, if the specification was given only in a Metric measurement, for example in Newton Meters (Nm), then look at the center column first. If the measurement is 100 Nm, multiply it by the conversion factor of 0.738 to get 73.8 ft. lbs.

SERIAL NUMBER IDENTIFICATION

Vehicle Identification Number

See Figures 32, 33, and 34

The Vehicle Identification Number (VIN) is located on a plate which is attached to the left top side of the instrument panel. These numbers are visible from the outside of the vehicle. All Vehicle Identification Numbers contain 17 digits. The vehicle number is a code which tells country, make, vehicle type, engine, body and many other important characteristics of that specific vehicle.

There is also a vehicle information code plate which is riveted to the bulkhead in the engine compartment. The plate shows the VIN, model code, engine model, transaxle model and body color codes. The engine code used on this plate differs from the code letter used in the 8th position of the Vehicle Identification Number (VIN). Either code can be used to identify the particular engine in the vehicle. Since the vehicle owners card is usually carried, it may be easier to use the code letter in the VIN for engine reference. A second reason for referring to the VIN for engine identification is that code 4G63, located on the vehicle information code plate, does identify the engine as a 2.0L DOHC engine, but does not tell you if the engine is equipped with a turbocharger. If the 8th VIN number is a U, there is no doubt that the engine in question is a 2.0L DOHC engine equipped with a turbocharger.

The engine codes found on the vehicle information code plate are as follows:

- 4G15—1.5L SOHC engine
- 4G61—1.6L DOHC engine
- 4G93—1.8L SOHC engine
- 4G63—2.0L (SOHC or DOHC) engine
- 4G64—2.4L (SOHC or DOHC) engine
- 6G72—3.0L (SOHC or DOHC) engine
- 6G74—3.5L DOHC engine

A vehicle safety certification label is attached to the face of the left door pillar post. This label indicates the month and year of manufacture, Gross Vehicle Weight Rating (GRVW) front and rear, and Vehicle Identification Number (VIN).

Engine Identification Number

See Figure 35

The engine model number is stamped at the front side on the top edge of the cylinder block. The same 4 character code as on the vehicle information code plate is used. The engine serial number is also stamped near the engine model number. As mentioned above, the engine can also be identified by the 8th digit in the VIN number.

Transaxle Identification

The transaxle model code is located on the vehicle information code plate. The transaxle identification number is etched on a boss located on the front upper portion of the case.

Drive Axle (AWD Galant Only)

The code for the drive axle is etched on a boss located on the case of the differential carrier.

Transfer Case (AWD Galant Only)

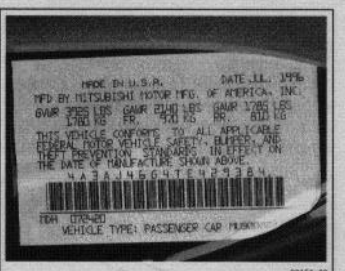
The transfer case has no separate model code, the code is located on the transaxle. The transfer case is only equipped on manual transaxle All Wheel Drive (AWD) models.

93151p08

Fig. 32 The Vehicle Identification Number (VIN) plate is attached to the top left side of the instrument panel

93151p10

Fig. 33 The vehicle model, engine model, transaxle model, and body color code are all noted on the vehicle information code plate



93151p09

Fig. 34 Your car should have a vehicle safety certification label attached to the face of the left door pillar post

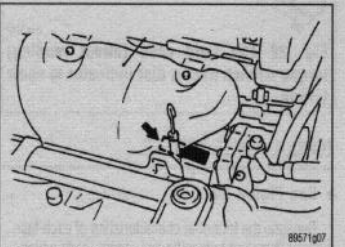
ENGINE AND VEHICLE IDENTIFICATION

Engine Code						
Code ①	Liters (cc)	Cu. In.	Cyl.	Fuel Sys.	Type	Eng. Mfg.
4G15/A	1.5 (1468)	92	4	MFI	SOHC	Mitsubishi
4G61/Y	1.6 (1595)	98	4	MFI	DOHC	Mitsubishi
4G93/C	1.8 (1834)	112	4	MFI	SOHC	Mitsubishi
4G63/V	2.0 (1997)	122	4	MFI	SOHC	Mitsubishi
4G63/R	2.0 (1997)	122	4	MFI	DOHC	Mitsubishi
4G63/U	2.0 (1997)	122	4	MFI-Turbo	DOHC	Mitsubishi
4G64/G	2.4 (2351)	143	4	MFI	SOHC	Mitsubishi
4G64/L	2.4 (2351)	143	4	MFI	DOHC	Mitsubishi
6G72/H	3.0 (2972)	181	6	MFI	SOHC	Mitsubishi
6G72/J	3.0 (2972)	181	6	MFI	DOHC	Mitsubishi
6G72/L	3.0 (2972)	181	6	MFI	SOHC	Mitsubishi
6G74/P	3.5 (3497)	213	6	MFI	SOHC	Mitsubishi

Model Year	
Code ②	Year
L	1990
M	1991
N	1992
P	1993
R	1994
S	1995
T	1996
V	1997
W	1998
X	1999
Y	2000

MFI - Multiport fuel injection
SOHC - Single overhead camsh.
DOHC - Double overhead camshafts
① Engine ID / 8th digit of the VIN
② 10th digit of the VIN

93151c01

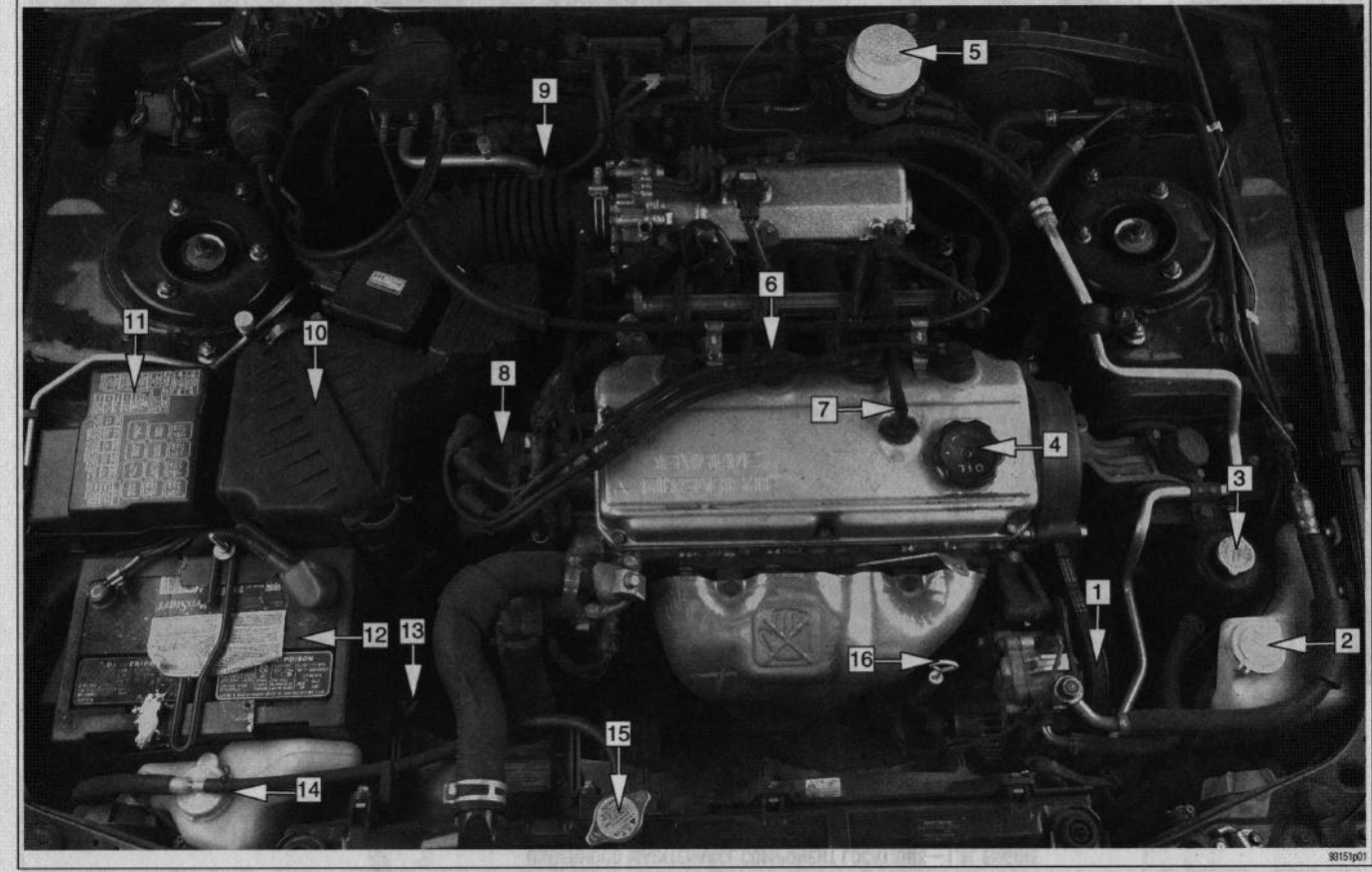


89571g07

Fig. 35 Engine model number location—4G63 (2.0L) engine shown

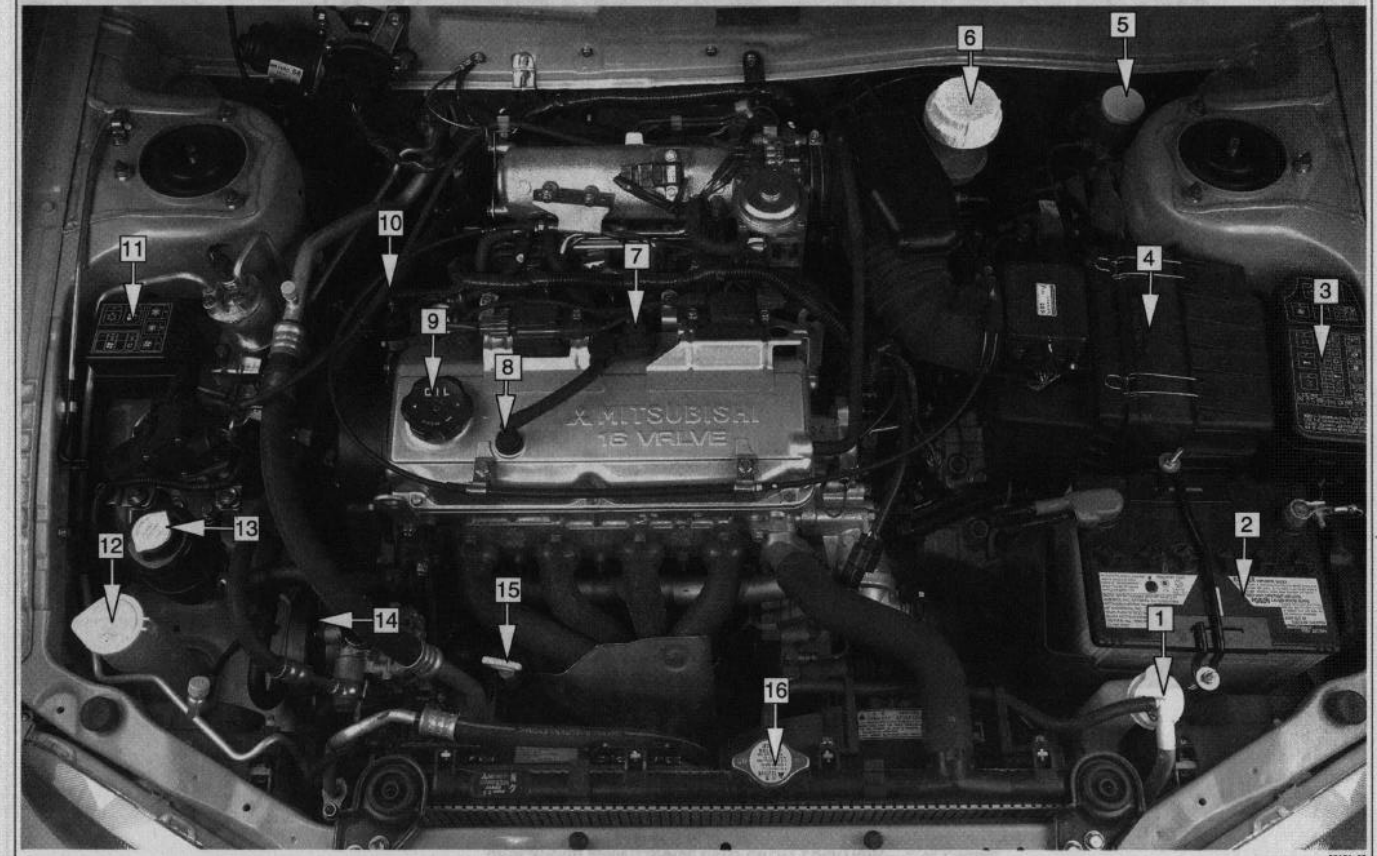
UNDERHOOD MAINTENANCE COMPONENT LOCATIONS—2.4L ENGINE

1. Power steering belt
2. Washer solvent bottle
3. Power steering reservoir
4. Oil fill cap
5. Brake master cylinder reservoir
6. Spark plug and plug wire
7. PCV valve
8. Distributor cap and rotor
9. Fuel filter (under air inlet tube)
10. Air filter housing
11. Engine compartment fuse box
12. Battery
13. Automatic transaxle fluid dipstick
14. Coolant recovery tank
15. Radiator cap
16. Engine oil dipstick



UNDERHOOD MAINTENANCE COMPONENT LOCATIONS—1.8L ENGINE

1. Coolant recovery tank
2. Battery
3. Engine compartment fuse box
4. Air filter housing
5. Clutch fluid reservoir
6. Brake master cylinder reservoir
7. Spark plug and plug wire
8. PCV valve
9. Engine oil fill cap
10. Fuel filter
11. Engine compartment relay center
12. Washer solvent bottle
13. Power steering reservoir
14. Power steering belt
15. Engine oil dipstick
16. Radiator cap



93151p02

GENERAL ENGINE SPECIFICATIONS

Year	Model	Engine Displacement Liters (cc)	Engine ID/VIN	Engine Type	No. of Cyl.	Fuel System Type	Net Horsepower @ rpm	Net Torque @ rpm (ft. lbs.)	Bore x Stroke (in.)	Com-pression Ratio	Oil Pressure @ rpm
1990	Mirage	1.5 (1468)	4G15/A	SOHC	4	MFI	81@5500	91@3000	2.97x3.23	9.2:1	54@2000
	Galant	2.0 (1997)	4G63/V	SOHC	4	MFI	102@5000	116@4500	3.34x3.46	8.5:1	41@2000
	Galant	2.0 (1997)	4G63/R	DOHC	4	MFI	140@6000	125@5000	3.34x3.46	9.0:1	41@2000
1991	Mirage	1.5 (1468)	4G15/A	SOHC	4	MFI	92@6000	93@3000	2.97x3.23	9.4:1	54@2000
	Mirage	1.6 (1595)	4G61/Y	DOHC	4	MFI	123@6500	101@5000	3.24x2.95	9.2:1	54@2000
	Galant	2.0 (1997)	4G63/V	SOHC	4	MFI	102@5000	116@4500	3.34x3.46	8.5:1	41@2000
	Galant	2.0 (1997)	4G63/R	DOHC	4	MFI	140@6000	125@5000	3.34x3.46	9.0:1	41@2000
	Galant	2.0 (1997)	4G63/U	DOHC	4	MFI-T	195@6000	203@3000	3.34x3.46	7.8:1	41@2000
1992	Mirage	1.5 (1468)	4G15/A	SOHC	4	MFI	92@6000	93@3000	2.97x3.23	9.4:1	54@2000
	Mirage	1.6 (1595)	4G61/Y	DOHC	4	MFI	123@6500	101@5000	3.24x2.95	9.2:1	54@2000
	Galant	2.0 (1997)	4G63/V	SOHC	4	MFI	102@5000	116@4500	3.34x3.46	8.5:1	41@2000
	Galant	2.0 (1997)	4G63/R	DOHC	4	MFI	140@6000	125@5000	3.34x3.46	9.0:1	41@2000
	Galant	2.0 (1997)	4G63/U	DOHC	4	MFI-T	195@6000	203@3000	3.34x3.46	7.8:1	41@2000
	Diamante	3.0 (2972)	6G72/H	SOHC	6	MFI	175@5500	185@3000	3.59x2.99	10.0:1	30-80@2000
	Diamante	3.0 (2972)	6G72/J	DOHC	6	MFI	202@6000	201@3500	3.59x2.99	10.0:1	30-80@2000
1993	Mirage	1.5 (1468)	4G15/A	SOHC	4	MFI	92@6000	93@3000	2.97x3.23	9.2:1	54@2000
	Mirage	1.8 (1834)	4G93/C	SOHC	4	MFI	112@6000	116@4500	3.19x3.50	9.5:1	41@2000
	Galant	2.0 (1997)	4G63/V	SOHC	4	MFI	102@5000	116@4500	3.34x3.46	8.5:1	41@2000
	Galant	2.0 (1997)	4G63/R	DOHC	4	MFI	140@6000	125@5000	3.34x3.46	9.0:1	41@2000
	Diamante	3.0 (2972)	6G72/H	SOHC	6	MFI	175@5500	185@3000	3.59x2.99	10.0:1	30-80@2000
	Diamante	3.0 (2972)	6G72/J	DOHC	6	MFI	202@6000	201@3500	3.59x2.99	10.0:1	30-80@2000
1994	Mirage	1.5 (1468)	4G15/A	SOHC	4	MFI	92@6000	93@3000	2.97x3.23	9.2:1	54@2000
	Mirage	1.8 (1834)	4G93/C	SOHC	4	MFI	112@6000	116@4500	3.19x3.50	9.5:1	41@2000
	Galant	2.4 (2350)	4G64/G	SOHC	4	MFI	140@5500	148@3000	3.41x3.94	9.5:1	41@2000
	Galant	2.4 (2350)	4G64/L	DOHC	4	MFI	160@6000	160@4250	3.41x3.94	9.5:1	41@2000
	Diamante	3.0 (2972)	6G72/H	SOHC	6	MFI	175@5500	185@3000	3.59x2.99	10.0:1	30-80@2000
	Diamante	3.0 (2972)	6G72/J	DOHC	6	MFI	202@6000	201@3500	3.59x2.99	10.0:1	30-80@2000
1995	Mirage	1.5 (1468)	4G15/A	SOHC	4	MFI	92@6000	93@3000	2.97x3.23	9.2:1	54@2000
	Mirage	1.8 (1834)	4G93/C	SOHC	4	MFI	112@6000	116@4500	3.19x3.50	9.5:1	41@2000
	Galant	2.4 (2350)	4G64/G	SOHC	4	MFI	140@5500	148@3000	3.41x3.94	9.5:1	41@2000
	Galant	2.4 (2350)	4G64/L	DOHC	4	MFI	160@6000	160@4250	3.41x3.94	9.5:1	41@2000
	Diamante	3.0 (2972)	6G72/H	SOHC	6	MFI	175@5500	185@3000	3.59x2.99	10.0:1	30-80@2000
	Diamante	3.0 (2972)	6G72/J	DOHC	6	MFI	202@6000	201@3500	3.59x2.99	10.0:1	30-80@2000
1996	Mirage	1.5 (1468)	4G15/A	SOHC	4	MFI	92@6000	93@3000	2.97x3.23	9.2:1	54@2000
	Mirage	1.8 (1834)	4G93/C	SOHC	4	MFI	112@6000	116@4500	3.19x3.50	9.5:1	41@2000
	Galant	2.4 (2350)	4G64/G	SOHC	4	MFI	140@5500	148@3000	3.41x3.94	9.5:1	41@2000
	Galant	2.4 (2350)	4G64/L	DOHC	4	MFI	160@6000	160@4250	3.41x3.94	9.5:1	41@2000
	Diamante	3.0 (2972)	6G72/H	SOHC	6	MFI	175@5500	185@3000	3.59x2.99	10.0:1	30-80@2000
	Diamante	3.0 (2972)	6G72/J	DOHC	6	MFI	202@6000	201@3500	3.59x2.99	10.0:1	30-80@2000
1997	Mirage	1.5 (1468)	4G15/A	SOHC	4	MFI	92@6000	93@3000	2.97x3.23	9.2:1	54@2000
	Mirage	1.8 (1834)	4G93/C	SOHC	4	MFI	112@6000	116@4500	3.19x3.50	9.5:1	41@2000
	Galant	2.4 (2350)	4G64/G	SOHC	4	MFI	140@5500	148@3000	3.41x3.94	9.5:1	41@2000
	Diamante	3.5 (3497)	6G74/P	SOHC	6	MFI	214@5000	228@3000	3.66x3.38	9.5:1	30-80@2000
1998	Mirage	1.5 (1468)	4G15/A	SOHC	4	MFI	92@6000	93@3000	2.97x3.23	9.2:1	54@2000
	Mirage	1.8 (1834)	4G93/C	SOHC	4	MFI	112@6000	116@4500	3.19x3.50	9.5:1	41@2000
	Galant	2.4 (2350)	4G64/G	SOHC	4	MFI	140@5500	148@3000	3.41x3.94	9.5:1	41@2000
	Diamante	3.5 (3497)	6G74/P	SOHC	6	MFI	214@5000	228@3000	3.66x3.38	9.5:1	30-80@2000
1999	Mirage	1.5 (1468)	4G15/A	SOHC	4	MFI	92@6000	93@3000	2.97x3.23	9.2:1	54@2000
	Mirage	1.8 (1834)	4G93/C	SOHC	4	MFI	112@6000	116@4500	3.19x3.50	9.5:1	41@2000
	Galant	2.4 (2350)	4G64/G	SOHC	4	MFI	140@5500	148@3000	3.41x3.94	9.5:1	41@2000
	Galant	3.0 (2972)	6G72/L	SOHC	6	MFI	175@5500	185@3000	3.59x2.99	8.9:1	30-80@2000
	Diamante	3.5 (3497)	6G74/P	SOHC	6	MFI	214@5000	228@3000	3.66x3.38	9.5:1	30-80@2000
2000	Mirage	1.5 (1468)	4G15/A	SOHC	4	MFI	92@6000	93@3000	2.97x3.23	9.2:1	54@2000
	Mirage	1.8 (1834)	4G93/C	SOHC	4	MFI	112@6000	116@4500	3.19x3.50	9.5:1	41@2000
	Galant	2.4 (2350)	4G64/G	SOHC	4	MFI	140@5500	148@3000	3.41x3.94	9.5:1	41@2000
	Galant	3.0 (2972)	6G72/L	SOHC	6	MFI	175@5500	185@3000	3.59x2.99	8.9:1	30-80@2000
	Diamante	3.5 (3497)	6G74/P	SOHC	6	MFI	214@5000	228@3000	3.66x3.38	9.5:1	30-80@2000

MFI - Multiport fuel injection
MFI-T - Multiport fuel injection-turbocharged
SOHC - Single overhead camshaft
DOHC - Double overhead camshaft

93151c03

ROUTINE MAINTENANCE AND TUNE-UP

Proper maintenance and tune-up is the key to long and trouble-free vehicle life, and the work can yield its own rewards. Studies have shown that a properly tuned and maintained vehicle can achieve better gas mileage than an out-of-tune vehicle. As a conscientious owner and driver, set aside a Saturday morning, say once a month, to check or replace items which could cause major problems later. Keep your own personal log to jot down which services you performed, how much the parts cost you, the date, and the exact odometer reading at the time. Keep all receipts for such items as engine oil and filters, so that they may be referred to in case of related problems or to determine operating expenses. As a do-it-yourselfer, these receipts are the only proof you have that the required maintenance was performed. In the event of a warranty problem, these receipts will be invaluable.

The literature provided with your vehicle when it was originally delivered includes the factory recommended maintenance schedule. If you no longer have this literature, replacement copies are usually available from the dealer. A maintenance schedule is provided later in this section, in case you do not have the factory literature.

Air Cleaner (Element)

REMOVAL & INSTALLATION

Except 2.0L Turbocharged Engine

See Figures 36 thru 41

1. Disconnect the negative battery cable.
2. Release the retaining clips from the air cleaner housing.
3. Loosen the clamp on the air outlet tube at the throttle body.
4. Detach the breather hose from the air inlet tube.
5. Unplug the MAF sensor connector.
6. Separate the upper and lower air cleaner housings and remove the air outlet tube and upper housing from the lower housing.
7. Remove the air cleaner element from the housing.

To install:

8. Clean the inside of the air cleaner housing of any dirt and debris that has collected inside.
9. Place a new air cleaner element inside the lower housing. Make sure the seal on the element is fully seated in the groove.
10. Install the upper air cleaner housing and inlet tube onto the lower housing.
11. Tighten the clamp on the inlet tube at the throttle body.
12. Attach the breather hose onto the air inlet tube.
13. Plug the connector into the MAF sensor.
14. Attach the air cleaner housing retaining clips.
15. Connect the negative battery cable.

2.0L Turbocharged Engine

See Figure 42

1. Disconnect the negative battery cable.
2. Detach the air flow sensor connector.
3. Unfasten the boost hose.
4. Disconnect the solenoid valve with hoses.
5. Disconnect the air intake hose.
6. Unfasten the air cleaner retainer bolts and the air cleaner assembly.
7. Unclamp the cover and remove from the housing.

Care must be taken when removing the air cleaner cover. The air flow sensor is attached and could be damaged during cover removal.

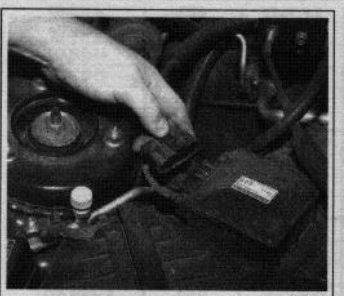
8. Remove the air cleaner element. Thoroughly clean the air cleaner housing prior to replacing the air filter.

To install:

9. Install the new air cleaner element into the housing. Install and secure the cover in place.

93151p50

Fig. 36 Release the retaining clips from the air cleaner housing



93151p47

Fig. 37 Unplug the MAF sensor connector

93151p46

Fig. 38 Detach the breather hose from the air inlet tube

93151p44

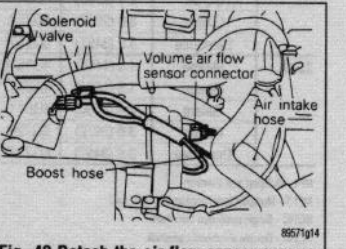
Fig. 39 Loosen the clamp on the air outlet tube at the throttle body . . .

93151p43

Fig. 40 . . . then remove the air outlet tube and upper housing from the lower housing

93151p42

Fig. 41 Remove the air cleaner element from the housing



89571g14

Fig. 42 Detach the air flow sensor connector, the boost hose and the solenoid valve connector

10. Install the air cleaner assembly and the retainer bolts.
11. Connect the air intake hose.
12. Attach the solenoid valve.
13. Connect the boost hose.
14. Attach the air flow sensor connector.
15. Connect the negative battery cable.

Fuel Filter

REMOVAL & INSTALLATION

See Figures 43 thru 48

On most vehicles covered by this manual, the fuel filter is located in the engine compartment, mounted to the firewall.

CAUTION

Do not use conventional fuel filters, hoses or clamps when servicing fuel injection systems. They are not compatible with the injection system and could fail, causing personal injury or damage to the vehicle. Use only hoses and clamps specifically designed for fuel injection systems.

1. Properly relieve the fuel system pressure as outlined in Section 5 of this manual.
2. If not already done, disconnect the negative battery cable.
3. On most models, the job is made easier if the air inlet hose and upper air cleaner housing is removed from the vehicle.

➡Wrap shop towels around the fitting that is being disconnected to absorb residual fuel in the lines.

4. Cover the hose connection with shop towels to prevent any splash of fuel that could be caused by residual pressure in the fuel pipe line. Hold the fuel filter nut securely with a backup wrench, then remove the banjo bolt on the engine feed line. Disconnect the high-pressure fuel line from the filter. Remove and discard the gaskets.
5. While holding the fuel filter nut securely with a back-up wrench, loosen the filter feed pipe flare nut on the bottom of the filter. Separate the flare nut connection from the filter. If equipped, remove and discard the gaskets.
6. Remove the mounting bolts and remove the fuel filter. If necessary, remove the fuel filter bracket.

To install:

7. Install the filter to its bracket only finger-tight. Movement of the filter will ease attachment of the fuel lines.

WARNING

Ensure that the filter is installed with the flow arrow in the proper direction. The flow arrow typically points toward the engine side of the filter. Improper installation of the fuel filter will cause the vehicle to run poorly.

➡Make sure new O-rings are installed prior to installation.

8. Insert the filter feed pipe to the lower connection of the filter and manually screw in the main pipe's flare nut.
9. While holding the fuel filter nut with a back-up wrench, tighten the banjo bolt to 22 ft. lbs. (30 Nm). Tighten the flare nut to 25 ft. lbs. (35 Nm), with a back-up wrench on the nut.
10. Tighten the filter mounting bolts to 10 ft. lbs. (14 Nm).
11. Connect the negative battery cable. Turn the key to the **ON** position to pressurize the fuel system and check for leaks.
12. If repairs of a leak are required, remember to release the fuel pressure before opening the fuel system.

PCV Valve

REMOVAL & INSTALLATION

See Figures 49, 50, and 51

1. Disconnect the negative battery cable.
2. If necessary for access, remove the air intake hose and air cleaner assembly.
3. If necessary, unfasten the retaining clamp, then disconnect the ventilation hose from the PCV valve.
4. Remove the PCV valve from the camshaft (rocker) cover.

To install:

5. Install the PCV valve into the rocker cover. If the valve is threaded, tighten the valve until snug.
6. Reconnect the ventilation hose to the valve.
7. If removed, install the air intake hose and the air cleaner assembly.
8. Connect the negative battery cable.


93151p97

Fig. 43 Use a back-up wrench on the fuel filter nut when loosening the banjo-bolt on the engine feed line


93151p96

Fig. 44 After the banjo-bolt is loose, remove from the fuel filter

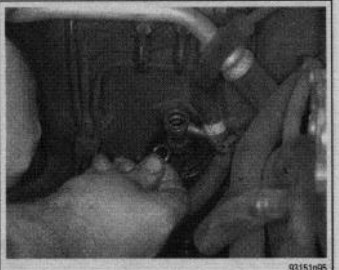

93151p95

Fig. 45 Make sure to replace the copper washers on the banjo-bolt fitting

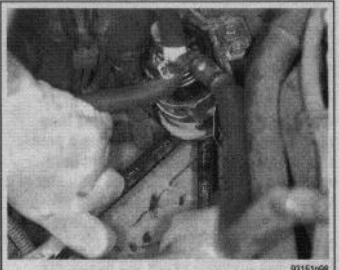

93151p98

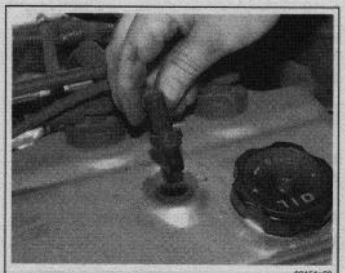
Fig. 46 Make sure to use a back-up wrench when unfastening the main fuel pipe also


93151p94

Fig. 47 Remove the two filter bracket retaining bolts . . .


93151p93

Fig. 48 . . . then remove the filter from the vehicle

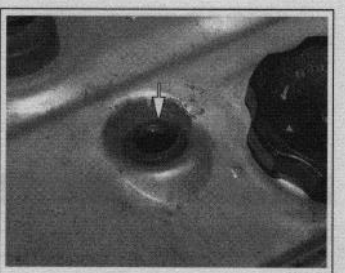


93151p62

Fig. 49 Grasp the valve and gently remove it from the valve cover

93151p63

Fig. 50 Twist and pull on the valve to remove it from the hose



93151p64

Fig. 51 Inspect the grommet and replace if cracked or leaking oil

Evaporative Canister

SERVICING

See Figure 52

The evaporative canister requires no periodic servicing. However, a careful inspection of the canister and hoses should be made frequently. Replace damaged components as required.

The canister is typically located under one of the front fenders, however on some later models it may be under the rear of the vehicle, near the gas tank.

93151p91

Fig. 52 The EVAP canister is typically located inside of the fender on most models covered by this manual

Battery

PRECAUTIONS

Always use caution when working on or near the battery. Never allow a tool to bridge the gap between the negative and positive battery terminals. Also, be careful not to allow a tool to provide a ground between the positive cable/terminal and any metal component on the vehicle. Either of these conditions will cause a short circuit, leading to sparks and possible personal injury.

Do not smoke, have an open flame or create sparks near a battery; the gases contained in the battery are very explosive and, if ignited, could cause severe injury or death.

All batteries, regardless of type, should be carefully secured by a battery hold-down device. If this is not done, the battery terminals or casing may crack from stress applied to the battery during vehicle operation. A battery which is not secured may allow acid to leak out, making it discharge faster; such leaking corrosive acid can also eat away at components under the hood.

Always visually inspect the battery case for cracks, leakage and corrosion. A white corrosive substance on the battery case or on nearby components would indicate a leaking or cracked battery. If the battery is cracked, it should be replaced immediately.

GENERAL MAINTENANCE

See Figure 53

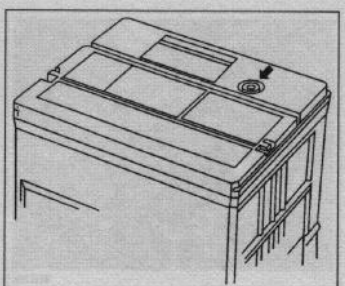
A battery that is not sealed must be checked periodically for electrolyte level. You cannot add water to a sealed maintenance-free battery (though not all maintenance-free batteries are sealed); however, a sealed battery must also be checked for proper electrolyte level, as indicated by the color of the built-in hydrometer "eye."

Always keep the battery cables and terminals free of corrosion. Check these components about once a year. Refer to the removal, installation and cleaning procedures outlined in this section.

Keep the top of the battery clean, as a film of dirt can help completely discharge a battery that is not used for long periods. A solution of baking soda and water may be used for cleaning, but be careful to flush this off with clear water. DO NOT let any of the solution into the filler holes. Baking soda neutralizes battery acid and will de-activate a battery cell.

Batteries in vehicles which are not operated on a regular basis can fall victim to parasitic loads (small current drains which are constantly drawing current from the battery). Normal parasitic loads may drain a battery on a vehicle that is in storage and not used for 6–8 weeks. Vehicles that have additional accessories such as a cellular phone, an alarm system or other devices that increase parasitic load may discharge a battery sooner. If the vehicle is to be stored for 6–8 weeks in a secure area and the alarm system, if present, is not necessary, the negative battery cable should be disconnected at the onset of storage to protect the battery charge.

Remember that constantly discharging and recharging will shorten battery life. Take care not to allow a battery to be needlessly discharged.



tccs1p02

Fig. 53 A typical location for the built-in hydrometer on maintenance-free batteries

BATTERY FLUID

Check the battery electrolyte level at least once a month, or more often in hot weather or during periods of extended vehicle operation. On non-sealed batteries, the level can be checked either through the case on translucent batteries or by removing the cell caps on opaque-cased types. The electrolyte level in each cell should be kept filled to the split ring inside each cell, or the line marked on the outside of the case.

If the level is low, add only distilled water through the opening until the level is correct. Each cell is separate from the others, so each must be checked and filled individually. Distilled water should be used, because the chemicals and minerals found in most drinking water are harmful to the battery and could significantly shorten its life.

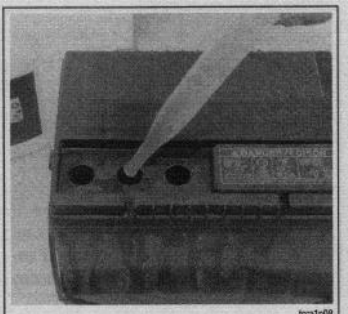
If water is added in freezing weather, the vehicle should be driven several miles to allow the water to mix with the electrolyte. Otherwise, the battery could freeze.

Although some maintenance-free batteries have removable cell caps for access to the electrolyte, the electrolyte condition and level on all sealed maintenance-free batteries must be checked using the built-in hydrometer "eye." The exact type of eye varies between battery manufacturers, but most apply a sticker to the battery itself explaining the possible readings. When in doubt, refer to the battery manufacturer's instructions to interpret battery condition using the built-in hydrometer.

➡Although the readings from built-in hydrometers found in sealed batteries may vary, a green eye usually indicates a properly charged battery with sufficient fluid level. A dark eye is normally an indicator of a battery with sufficient fluid, but one which may be low in charge. And a light or yellow eye is usually an indication that electrolyte supply has dropped below the necessary level for battery (and hydrometer) operation. In this last case, sealed batteries with an insufficient electrolyte level must usually be discarded.

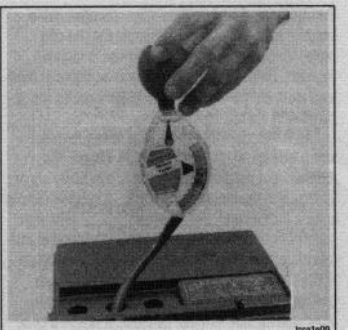
tcca1p07

Fig. 54 On non-maintenance-free batteries, the fluid level can be checked through the case on translucent models; the cell caps must be removed on other models



tcca1p08

Fig. 55 If the fluid level is low, add only distilled water through the opening until the level is correct



tcca1p09

Fig. 56 Check the specific gravity of the battery's electrolyte with a hydrometer

Checking the Specific Gravity

See Figures 54, 55, and 56

A hydrometer is required to check the specific gravity on all batteries that are not maintenance-free. On batteries that are maintenance-free, the specific gravity is checked by observing the built-in hydrometer "eye" on the top of the battery case. Check with your battery's manufacturer for proper interpretation of its built-in hydrometer readings.

CAUTION

Battery electrolyte contains sulfuric acid. If you should splash any on your skin or in your eyes, flush the affected area with plenty of clear water. If it lands in your eyes, get medical help immediately.

The fluid (sulfuric acid solution) contained in the battery cells will tell you many things about the condition of the battery. Because the cell plates must be kept submerged below the fluid level in order to operate, maintaining the fluid level is extremely important. And, because the specific gravity of the acid is an indication of electrical charge, testing the fluid can be an aid in determining if the battery must be replaced. A battery in a vehicle with a properly operating charging system should require little maintenance, but careful, periodic inspection should reveal problems before they leave you stranded.

As stated earlier, the specific gravity of a battery's electrolyte level can be used as an indication of battery charge. At least once a year, check the specific gravity of the battery. It should be between 1.20 and 1.26 on the gravity scale. Most auto supply stores carry a variety of inexpensive battery testing hydrometers. These can be used on any non-sealed battery to test the specific gravity in each cell.

The battery testing hydrometer has a squeeze bulb at one end and a nozzle at the other. Battery electrolyte is sucked into the hydrometer until the float is lifted from its seat. The specific gravity is then read by noting the position of the float. If gravity is low in one or more cells, the battery should be slowly charged and checked again to see if the gravity has come up. Generally, if after charging, the specific gravity between any two cells varies more than 50 points (0.50), the battery should be replaced, as it can no longer produce sufficient voltage to guarantee proper operation.

CABLES

See Figures 57, 58, 59, 60, and 61

Once a year (or as necessary), the battery terminals and the cable clamps should be cleaned. Loosen

tccs1206

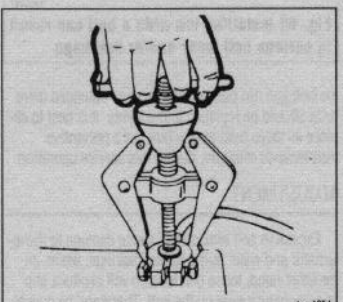
Fig. 57 Maintenance is performed with household items and with special tools like this post cleaner

tccs1207

Fig. 58 The underside of this special battery tool has a wire brush to clean post terminals

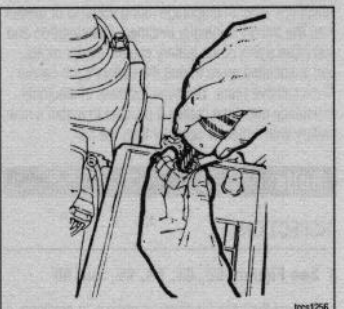
tccs1208

Fig. 59 Place the tool over the battery posts and twist to clean until the metal is shiny



tccs1254

Fig. 60 A special tool is available to pull the clamp from the post



tccs1256

Fig. 61 The cable ends should be cleaned as well

the clamps and remove the cables, negative cable first. On batteries with posts on top, the use of a puller specially made for this purpose is recommended. These are inexpensive and available in most auto parts stores. Side terminal battery cables are secured with a small bolt.

Clean the cable clamps and the battery terminal with a wire brush, until all corrosion, grease, etc., is removed and the metal is shiny. It is especially important to clean the inside of the clamp thoroughly (an old knife is useful here), since a small deposit of foreign material or oxidation there will prevent a sound electrical connection and inhibit either starting or charging. Special tools are available for cleaning these parts, one type for conventional top post batteries and another type for side terminal batteries. It is also a good idea to apply some dielectric grease to the terminal, as this will aid in the prevention of corrosion.

After the clamps and terminals are clean, reinstall the cables, negative cable last; DO NOT hammer the clamps onto battery posts. Tighten the clamps securely, but do not distort them. Give the clamps and terminals a thin external coating of grease after installation, to retard corrosion.

Check the cables at the same time that the terminals are cleaned. If the cable insulation is cracked or broken, or if the ends are frayed, the cable should be replaced with a new cable of the same length and gauge.

CHARGING

⁂ CAUTION

The chemical reaction which takes place in all batteries generates explosive hydrogen gas. A spark can cause the battery to explode and splash acid. To avoid serious personal injury, be sure there is proper ventilation and take appropriate fire safety precautions when connecting, disconnecting, or charging a battery and when using jumper cables.

A battery should be charged at a slow rate to keep the plates inside from getting too hot. However, if some maintenance-free batteries are allowed to discharge until they are almost "dead," they may have to be charged at a high rate to bring them back to "life." Always follow the charger manufacturer's instructions on charging the battery.

REPLACEMENT

When it becomes necessary to replace the battery, select one with an amperage rating equal to or greater than the battery originally installed. Deterioration and just plain aging of the battery cables, starter motor, and associated wires makes the battery's job harder in successive years. The slow increase in electrical resistance over time makes it prudent to install a new battery with a greater capacity than the old.

Belts

INSPECTION

See Figures 62, 63, 64, 65, and 66

Inspect the belts for signs of glazing or cracking. A glazed belt will be perfectly smooth from slippage, while a good belt will have a slight texture of fabric visible. Cracks will usually start at the inner edge of the belt and run outward. All worn or damaged drive belts should be replaced immediately. It is best to replace all drive belts at one time, as a preventive maintenance measure, during this service operation.

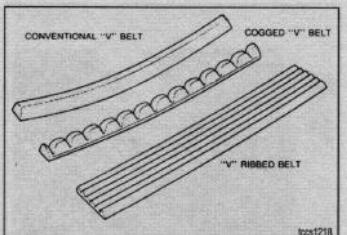


Fig. 62 There are typically 3 types of accessory drive belts found on vehicles today

Fig. 63 An example of a healthy drive belt

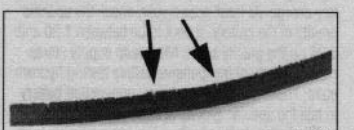


Fig. 64 Deep cracks in this belt will cause flex, building up heat that will eventually lead to belt failure

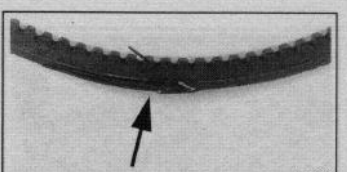


Fig. 65 The cover of this belt is worn, exposing the critical reinforcing cords to excessive wear

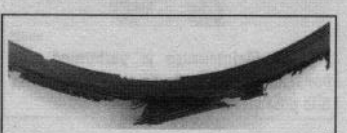


Fig. 66 Installing too wide a belt can result in serious belt wear and/or breakage

ADJUSTMENT

Excessive belt tension will cause damage to the alternator and water pump pulley bearings, while, on the other hand, loose belt tension will produce slip and premature wear on the belt. Therefore, be sure to adjust the belt tension to the proper level.

To adjust the tension on a drive belt, loosen the adjusting bolt or fixing bolt locknut on the alternator, alternator bracket or tension pulley. Then move the alternator or turn the adjusting bolt to adjust belt tension. Once the desired value is reached, secure the bolt or locknut and recheck tension.

REMOVAL & INSTALLATION

1.5L, 1.6L, 1.8L, 2.0L and 2.4L Engines

ALTERNATOR BELT

See Figures 67, 68, and 69

1. Loosen the alternator support nut.
2. Loosen the adjuster lock bolt.
3. Rotate the adjuster bolt counter clockwise to release the tension on the belt.
4. Remove the belt.

To install:

5. Install the belt on the pulleys.
6. Rotate the adjuster bolt clockwise until the proper tension is reached.
7. Tighten the adjuster lock bolt and the alternator support nut.

POWER STEERING BELT

See Figures 70 and 71

1. Remove the alternator belt as described above.
2. Loosen the power steering pump adjusting bolts.
3. Remove the power steering pump fixed bolt on the rear of the bracket.
4. Rotate the pump toward the engine and remove the belt.

To install:

5. Install the belt on the pulleys.

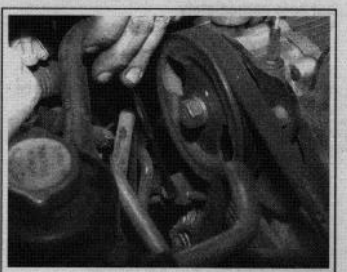


Fig. 67 Loosen the adjuster lock bolt . . .

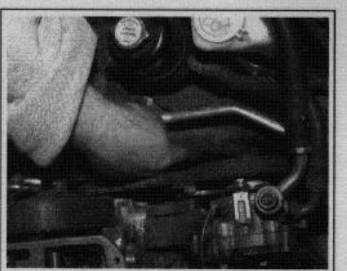


Fig. 68 . . . then remove the alternator belt from the engine

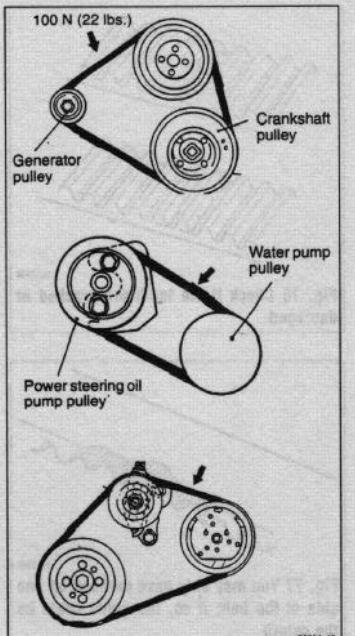


Fig. 69 Accessory V-belt routing—Mitsubishi 1.5L, 1.6L, 1.8L, 2.0L and 2.4L engines

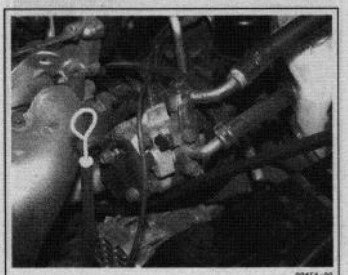


Fig. 70 After the adjusting and fixed bolts are loosened, rotate the pump . . .

Fig. 71 . . . then remove the power steering belt from the engine

6. Rotate the pump until the proper tension is reached.
7. Tighten the adjusting bolts on the pump.
8. Tighten the fixed bolt on the rear of the bracket.
9. Install the alternator belt.

A/C COMPRESSOR BELT

1. Loosen the tension pulley and remove the belt.
2. The installation is the reverse of the removal.

3.0L DOHC, 3.0L SOHC (Galant models only) and 3.5L Engines

See Figures 72 and 73

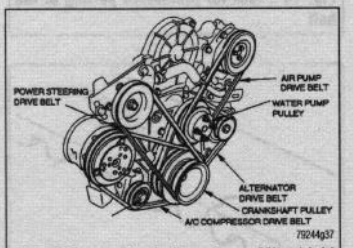


Fig. 72 Serpentine belt routing—Mitsubishi 3.0L engines (except 1998–00 Galant models)

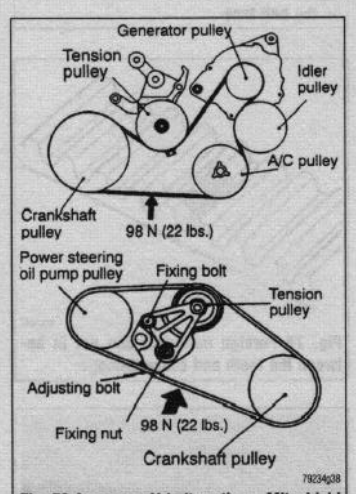


Fig. 73 Accessory V-belt routing—Mitsubishi 3.5L and 1998–00 3.0L SOHC Galant engines

CAUTION

Wait at least 90 seconds after the negative battery cable is disconnected to prevent possible deployment of the air bag.

2. Raise and safely support the vehicle and remove the front undercover.
3. Loosen the tension pulley fixing nut and relieve the tension on the belt by turning the adjusting bolt.
4. Remove the belt.

To install:

5. Install the belt on the crankshaft and alternator pulleys.
6. Using the adjusting bolt on the tensioner, tighten the belt to the desired tension.
7. Tighten the fixing nut to hold the adjustment.
8. Install the undercover and lower the vehicle to the floor.
9. Connect the negative battery cable.

POWER STEERING BELT

1. Disconnect the negative battery cable.

CAUTION

Wait at least 90 seconds after the negative battery cable is disconnected to prevent possible deployment of the air bag.

2. Raise and safely support the vehicle and remove the undercover.
3. Remove the alternator and A/C compressor belt.
4. Lower the vehicle and remove the cruise control pump link assembly.
5. Place the power steering hose under the oil reservoir.
6. Loosen the tension pulley fixing bolts and remove the power steering pump drive belt.

To install:

7. Install the power steering pump drive belt.
8. Insert an extension bar or equivalent into the opening at the end of the tension pulley bracket and pivot the pulley to apply tension to the belt.
9. Tighten the fixing bolts.
10. Raise the vehicle and install the alternator and A/C compressor belt.
11. Install the undercover and lower the vehicle.
12. Connect the negative battery cable.

3.0L SOHC (Diamante Models Only) Engine

1. Disconnect the negative battery cable.
2. Loosen the lockbolt on the face of the A/C tensioner pulley.
3. Turn the adjusting bolt of the A/C tensioner pulley to loosen the tension of the A/C belt.
4. Remove the A/C compressor belt.
5. Loosen the locknut on the face of the power steering/alternator tensioner pulley.
6. Turn the adjusting bolt of the tensioner pulley to loosen the tension of the belt.
7. Remove the power steering/alternator belt.

To install:

8. Install the power steering/alternator belt first and then the A/C compressor drive belt.
9. Adjust the belts to the proper tension by turning the adjusting bolts and tighten pulley fixing nut/bolt.
10. Tighten the mounting nut of the power steering/alternator tensioner pulley to 36 ft. lbs. (50 Nm).

➡The manufacturer does not provide a torque specification for the bolt that secures A/C tensioner pulley.

11. Connect the negative battery cable.

Timing Belts

INSPECTION

See Figures 74 thru 81

All engines covered by this manual utilize timing belts to drive the camshaft from the crankshaft's turning motion and to maintain proper valve timing. Some manufacturer's schedule periodic timing belt replacement to assure optimum engine performance, to make sure the motorist is never stranded should the belt break (as the engine will stop instantly) and for some (manufacturer's with interference motors) to prevent the possibility of severe internal engine damage should the belt break.

Although the 1.5L and 1.8L engines are not listed as an interference motors (it is not listed by the manufacturer as a motor whose valves might contact the pistons if the camshaft was rotated separately from the crankshaft) the first 2 reasons for periodic replacement still apply and the timing belt should be replaced at 60,000 miles (96,000 km). The 1.6L, 2.0L, 2.4L, 3.0L, and 3.5L engines are listed as interference motors, so the timing belt MUST be replaced at 60,000 miles (96,000 km) to avoid severe engine damage if the belt should break.

But whether or not you decide to replace the timing belt in the manufacturers schedule, you would be wise to check it periodically to make sure it has not become damaged or worn. Generally speaking, a severely worn belt may cause engine performance to drop dramatically, but a damaged belt (which could give out suddenly) may not give as much warning. In general, any time the engine timing cover(s) is (are) removed you should inspect the belt for premature parting, severe cracks or missing teeth. Also, an access plug is provided in the upper portion of the timing cover so that camshaft timing can be checked without cover removal. If timing is found to be off, cover removal and further belt inspection or replacement is necessary.

For the timing belt removal and installation procedure, please refer to Section 3 of this manual.

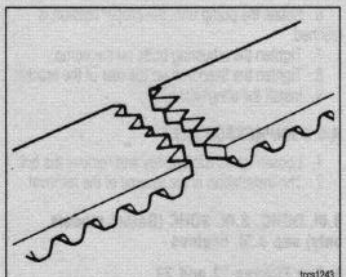

tccs1243

Fig. 74 Check for premature parting of the belt

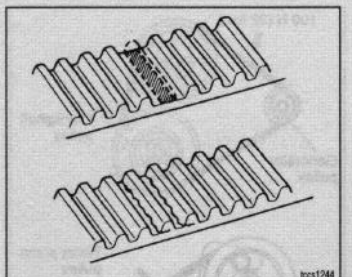

tccs1244

Fig. 75 Check if the teeth are cracked or damaged

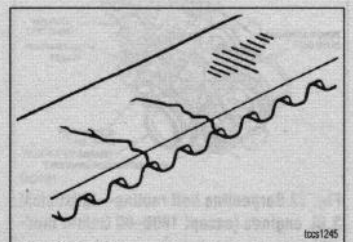

tccs1245

Fig. 76 Look for noticeable cracks or wear on the belt face

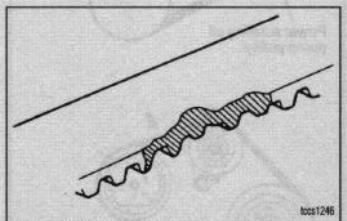

tccs1246

Fig. 77 You may only have damage on one side of the belt; if so, the guide could be the culprit

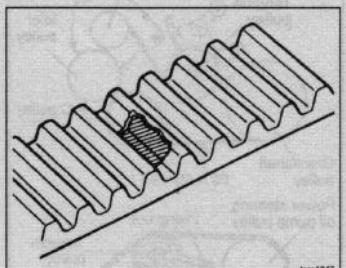

tccs1247

Fig. 78 Foreign materials can get in between the teeth and cause damage

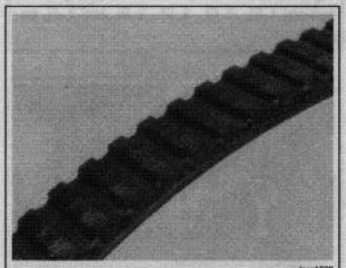

tccs1300

Fig. 79 Inspect the timing belt for cracks, fraying, glazing or damage of any kind

Hoses

INSPECTION

See Figures 82, 83, 84, and 85

Upper and lower radiator hoses, along with the heater hoses, should be checked for deterioration, leaks and loose hose clamps at least every 30,000 miles (48,000 km). It is also wise to check the hoses periodically in early spring and at the beginning of the fall or winter when you are performing other maintenance. A quick visual inspection could discover a weakened hose which might have left you stranded if it had remained unrepaired.

Whenever you are checking the hoses, make sure the engine and cooling system are cold. Visually inspect for cracking, rotting or collapsed hoses, and replace as necessary. Run your hand along the length of the hose. If a weak or swollen spot is noted when squeezing the hose wall, the hose should be replaced.

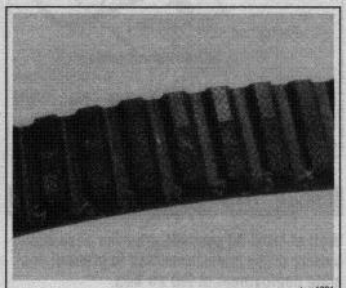

tccs1301

Fig. 80 Damage on only one side of the timing belt may indicate a faulty guide

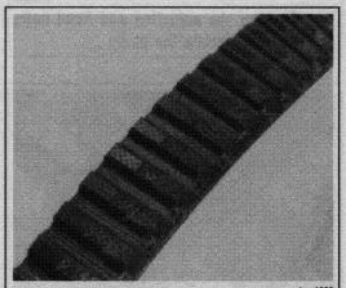
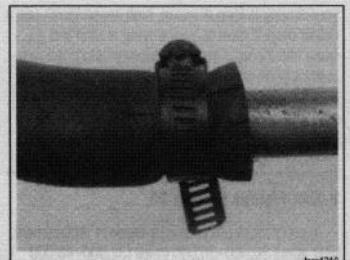
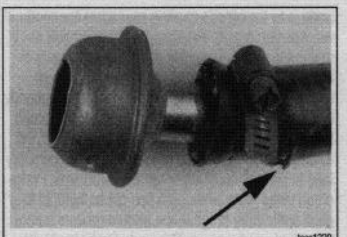

tccs1302

Fig. 81 ALWAYS replace the timing belt at the interval specified by the manufacturer



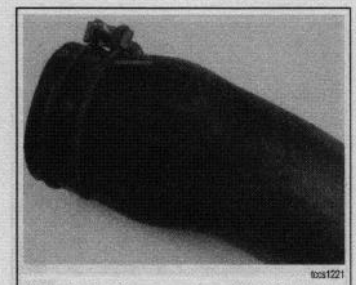
tccs1219

Fig. 82 The cracks developing along this hose are a result of age-related hardening



tccs1220

Fig. 83 A hose clamp that is too tight can cause older hoses to separate and tear on either side of the clamp



tccs1221

Fig. 84 A soft spongy hose (identifiable by the swollen section) will eventually burst and should be replaced

tccs1222

Fig. 85 Hoses are likely to deteriorate from the inside if the cooling system is not periodically flushed

REMOVAL & INSTALLATION

1. Remove the radiator pressure cap.

CAUTION

Never remove the pressure cap while the engine is running, or personal injury from scalding hot coolant or steam may result. If possible, wait until the engine has cooled to remove the pressure cap. If this is not possible, wrap a thick cloth around the pressure cap and turn it slowly to the stop. Step back while the pressure is released from the cooling system. When you are sure all the pressure has been released, use the cloth to turn and remove the cap.

2. Position a clean container under the radiator and/or engine draincock or plug, then open the drain and allow the cooling system to drain to an appropriate level. For some upper hoses, only a little coolant must be drained. To remove hoses positioned lower on the engine, such as a lower radiator hose, the entire cooling system must be emptied.

CAUTION

When draining coolant, keep in mind that cats and dogs are attracted by ethylene glycol antifreeze, and are quite likely to drink any that is left in an uncovered container or in puddles on the ground. This will prove fatal in sufficient quantity. Always drain coolant into a sealable container. Coolant may be reused unless it is contaminated or several years old.

3. Loosen the hose clamps at each end of the hose requiring replacement. Clamps are usually either of the spring tension type (which require pliers to squeeze the tabs and loosen) or of the screw tension type (which require screw or hex drivers to loosen). Pull the clamps back on the hose away from the connection.

4. Twist, pull and slide the hose off the fitting, taking care not to damage the neck of the component from which the hose is being removed.

➡If the hose is stuck at the connection, do not try to insert a screwdriver or other sharp tool under the hose end in an effort to free it, as the connection and/or hose may become damaged. Heater connections especially may be easily damaged by such a procedure. If the hose is to be replaced, use a single-edged razor blade to make a slice along the portion of the hose which is stuck on the connection, perpendicular to the end of the hose. Do not cut deep so as to prevent damaging the connection. The hose can then be peeled from the connection and discarded.

5. Clean both hose mounting connections. Inspect the condition of the hose clamps and replace them, if necessary.

To install:

6. Dip the ends of the new hose into clean engine coolant to ease installation.

7. Slide the clamps over the replacement hose, then slide the hose ends over the connections into position.

8. Position and secure the clamps at least $^1/_4$ in. (6.35mm) from the ends of the hose. Make sure they are located beyond the raised bead of the connector.

9. Close the radiator or engine drains and properly refill the cooling system with the clean drained engine coolant or a suitable mixture of ethylene glycol coolant and water.

10. If available, install a pressure tester and check for leaks. If a pressure tester is not available, run the engine until normal operating temperature is reached (allowing the system to naturally pressurize), then check for leaks.

CAUTION

If you are checking for leaks with the system at normal operating temperature, BE EXTREMELY CAREFUL not to touch any moving or hot engine parts. Once temperature has been reached, shut the engine OFF, and check for leaks around the hose fittings and connections which were removed earlier.

CV-Boots

INSPECTION

➧ See Figures 86 and 87

The CV (Constant Velocity) boots should be checked for damage each time the oil is changed and any other time the vehicle is raised for service. These boots keep water, grime, dirt and other damaging matter from entering the CV-joints. Any of these could cause early CV-joint failure which can be expensive to repair. Heavy grease thrown around the inside of the front wheel(s) and on the brake caliper/drum can be an indication of a torn boot. Thoroughly check the boots for missing clamps and

tccs1011

Fig. 86 CV-boots must be inspected periodically for damage

tccs1010

Fig. 87 A torn boot should be replaced immediately

tears. If the boot is damaged, it should be replaced immediately. Please refer to Section 7 for procedures.

Spark Plugs

See Figure 88

A typical spark plug consists of a metal shell surrounding a ceramic insulator. A metal electrode extends downward through the center of the insulator and protrudes a small distance. Located at the end of the plug and attached to the side of the outer metal shell is the side electrode. The side electrode bends in at a 90° angle so that its tip is just past and parallel to the tip of the center electrode. The distance between these two electrodes (measured in thousandths of an inch or hundredths of a millimeter) is called the spark plug gap.

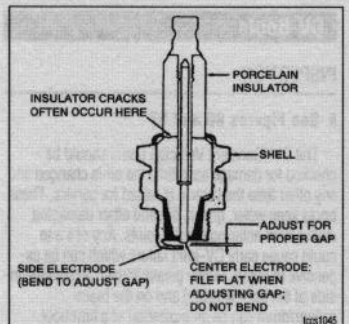


Fig. 88 Cross-section of a spark plug

The spark plug does not produce a spark, but instead provides a gap across which the current can arc. The coil produces anywhere from 20,000 to 50,000 volts (depending on the type and application) which travels through the wires to the spark plugs. The current passes along the center electrode and jumps the gap to the side electrode, and in doing so, ignites the air/fuel mixture in the combustion chamber.

SPARK PLUG HEAT RANGE

See Figure 89

Spark plug heat range is the ability of the plug to dissipate heat. The longer the insulator (or the farther it extends into the engine), the hotter the plug will operate; the shorter the insulator (the closer the electrode is to the block's cooling passages) the cooler it will operate. A plug that absorbs little heat and remains too cool will quickly accumulate deposits of oil and carbon since it is not hot enough to burn them off. This leads to plug fouling and consequently to misfiring. A plug that absorbs too much heat will have no deposits but, due to the excessive heat, the electrodes will burn away quickly and might possibly lead to preignition or other ignition problems. Preignition takes place when plug tips get so hot that they glow sufficiently to ignite the air/fuel mixture before the actual spark occurs. This early ignition will usually cause a pinging during low speeds and heavy loads.

The general rule of thumb for choosing the correct heat range when picking a spark plug is: if most of your driving is long distance, high speed travel, use a colder plug; if most of your driving is stop and go, use a hotter plug. Original equipment plugs are generally a good compromise between the 2 styles and most people never have the need to change their plugs from the factory-recommended heat range.

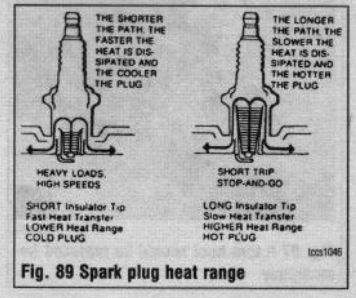


Fig. 89 Spark plug heat range

REMOVAL & INSTALLATION

See Figures 90 thru 95

A set of spark plugs usually requires replacement after about 20,000–30,000 miles (32,000–48,000 km), depending on your style of driving. In normal operation plug gap increases about 0.001 in. (0.025mm) for every 2,500 miles (4,000 km). As the

Fig. 90 Carefully twist the boot end of the spark plug wire and withdraw the spark plug wire boot from the cylinder head

Fig. 91 A special spark plug socket with a rubber insert is required to remove the spark plugs. Typically the spark plugs require a 5/8 spark plug socket

Fig. 92 A locking extension such as this is extremely helpful when removing spark plugs that are centrally located in the cylinder head such as on the 2.4L engine

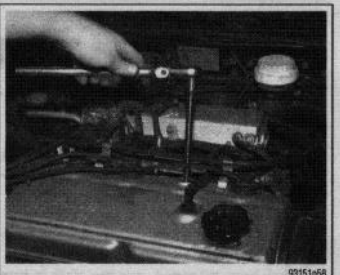


Fig. 93 Using the appropriate sized spark plug socket, necessary extensions and drive tools, loosen the spark plug . . .

Fig. 94 . . . then carefully withdraw the spark plug from the engine

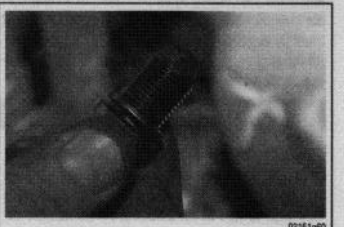


Fig. 95 After removing the plug from the engine, inspect it using the spark plug condition chart in this section to determine the running condition of your engine

gap increases, the plug's voltage requirement also increases. It requires a greater voltage to jump the wider gap and about two to three times as much voltage to fire the plug at high speeds than at idle. The improved air/fuel ratio control of modern fuel injection combined with the higher voltage output of modern ignition systems will often allow an engine to run significantly longer on a set of standard spark plugs, but keep in mind that efficiency will drop as the gap widens (along with fuel economy and power).

When you're removing spark plugs, work on one at a time. Don't start by removing the plug wires all at once, because, unless you number them, they may become mixed up. Take a minute before you begin and number the wires with tape.

1. Disconnect the negative battery cable, and if the vehicle has been run recently, allow the engine to thoroughly cool.
2. If equipped, remove the center cover.
3. On the 3.0L (SOHC and DOHC) and 3.5L engines, the upper intake manifold must be removed to access the rear spark plugs. Refer to Section 3 for the removal procedure.
4. Carefully twist the spark plug wire boot to loosen it, then pull upward and remove the boot from the plug. Be sure to pull on the boot and not on the wire, otherwise the connector located inside the boot may become separated.
5. Using compressed air, blow any water or debris from the spark plug well to assure that no harmful contaminants are allowed to enter the combustion chamber when the spark plug is removed. If compressed air is not available, use a rag or a brush to clean the area.

➡Remove the spark plugs when the engine is cold, if possible, to prevent damage to the threads. If removal of the plugs is difficult, apply a few drops of penetrating oil or silicone spray to the area around the base of the plug, and allow it a few minutes to work.

6. Using a spark plug socket that is equipped with a rubber insert to properly hold the plug, turn the spark plug counterclockwise to loosen and remove the spark plug from the bore.

⁂ WARNING

Be sure not to use a flexible extension on the socket. Use of a flexible extension may allow a shear force to be applied to the plug. A shear force could break the plug off in the cylinder head, leading to costly and frustrating repairs.

To install:

7. Inspect the spark plug boot for tears or damage. If a damaged boot is found, the spark plug wire must be replaced.
8. Using a wire feeler gauge, check and adjust the spark plug gap. When using a gauge, the proper size should pass between the electrodes with a slight drag. The next larger size should not be able to pass while the next smaller size should pass freely.
9. Carefully thread the plug into the bore by hand. If resistance is felt before the plug is almost completely threaded, back the plug out and begin threading again. In small, hard to reach areas, an old spark plug wire and boot could be used as a threading tool. The boot will hold the plug while you twist the end of the wire and the wire is supple enough to twist before it would allow the plug to crossthread.

⁂ WARNING

Do not use the spark plug socket to thread the plugs. Always carefully thread the plug by hand or using an old plug wire to prevent the possibility of crossthreading and damaging the cylinder head bore.

10. Carefully tighten the spark plug. If the plug you are installing is equipped with a crush washer, seat the plug, then tighten about ¼ turn to crush the washer. If you are installing a tapered seat plug, tighten the plug to specifications provided by the vehicle or plug manufacturer.
11. Apply a small amount of silicone dielectric compound to the end of the spark plug lead or inside the spark plug boot to prevent sticking, then install the boot to the spark plug and push until it clicks into place. The click may be felt or heard, then gently pull back on the boot to assure proper contact.
12. On the 3.0L (SOHC and DOHC) and 3.5L engines, install the upper intake manifold. Refer to Section 3 for the installation procedure.
13. If equipped, install the center cover.

INSPECTION & GAPPING

♦ See Figures 96, 97, 98, 99, and 100

Check the plugs for deposits and wear. If they are not going to be replaced, clean the plugs thoroughly. Remember that any kind of deposit will decrease the efficiency of the plug. Plugs can be cleaned on a spark plug cleaning machine, which can sometimes be found in service stations, or you can do an acceptable job of cleaning with a stiff brush. If the plugs are cleaned, the electrodes must be filed flat. Use an ignition points file, not an emery board or the like, which will leave deposits. The electrodes must be filed perfectly flat with sharp edges; rounded edges reduce the spark plug voltage by as much as 50%.

Check spark plug gap before installation. The ground electrode (the L-shaped one connected to the body of the plug) must be parallel to the center electrode and the specified size wire gauge (please refer to the Tune-Up Specifications chart for details) must pass between the electrodes with a slight drag.

➡NEVER adjust the gap on a used platinum type spark plug.

Always check the gap on new plugs as they are not always set correctly at the factory. Do not use a flat feeler gauge when measuring the gap on a used plug, because the reading may be inaccurate. A round-wire type gapping tool is the best way to check the gap. The correct gauge should pass through the electrode gap with a slight drag. If you're in doubt, try one size smaller and one larger. The smaller gauge

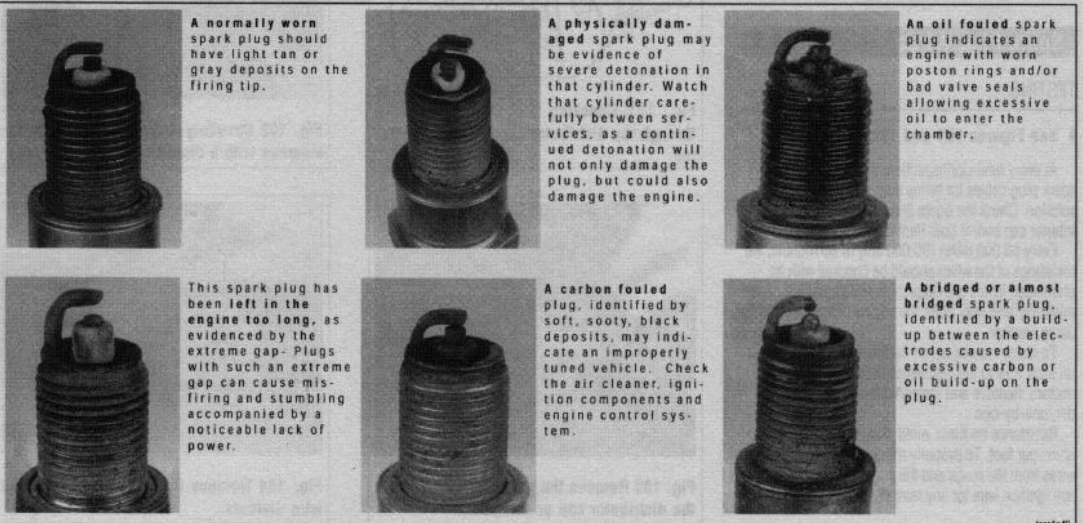
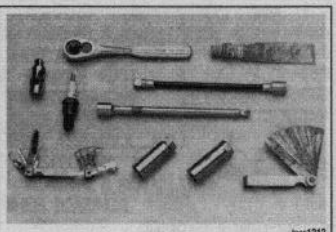
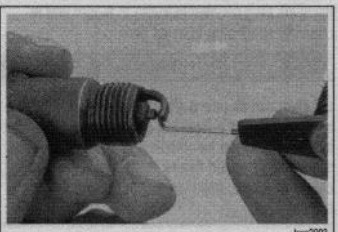


Fig. 96 Inspect the spark plug to determine engine running conditions



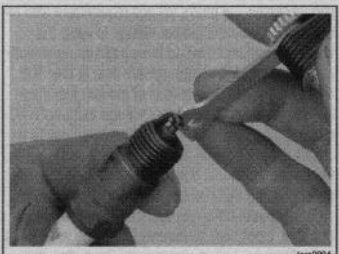
tccs1212

Fig. 97 A variety of tools and gauges are needed for spark plug service



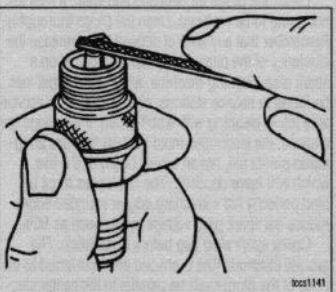
tccs2903

Fig. 98 Checking the spark plug gap with a feeler gauge



tccs2904

Fig. 99 Adjusting the spark plug gap



tccs1141

Fig. 100 If the standard plug is in good condition, the electrode may be filed flat—WARNING: do not file platinum plugs

should go through easily, while the larger one shouldn't go through at all. Wire gapping tools usually have a bending tool attached. Use that to adjust the side electrode until the proper distance is obtained. Absolutely never attempt to bend the center electrode. Also, be careful not to bend the side electrode too far or too often as it may weaken and break off within the engine, requiring removal of the cylinder head to retrieve it.

Spark Plug Wires

TESTING

See Figures 101 and 102

At every tune-up/inspection, visually check the spark plug cables for burns cuts, or breaks in the insulation. Check the boots and the nipples on the distributor cap and/or coil. Replace any damaged wiring.

Every 50,000 miles (80,000 km) or 60 months, the resistance of the wires should be checked with an ohmmeter. Wires with excessive resistance will cause misfiring, and may make the engine difficult to start in damp weather.

To check resistance, an ohmmeter should be used on each wire to test resistance between the end connectors. Remove and install/replace the wires in order, one-by-one.

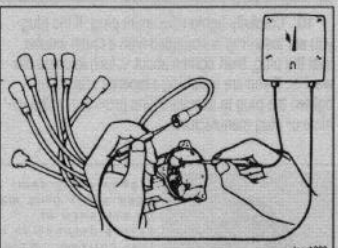
Resistance on these wires should be 4,000–6,000 ohms per foot. To properly measure this, remove the wires from the plugs and the coil pack. Do not pierce any ignition wire for any reason. Measure only from the two ends. Take the length and multiply it by 6,000 to achieve the maximum resistance allowable in each wire, resistance should not exceed this value. If resistance does exceed this value, replace the wire.

➡Whenever the high tension wires are removed from the plugs, coil, or distributor, silicone grease must be applied to the boot before reconnection. Coat the entire interior surface with a suitable silicone grease.

REMOVAL & INSTALLATION

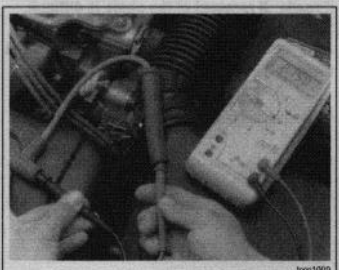
See Figures 90, 103 and 104

1. Remove the air cleaner inlet tube.
2. If equipped, remove the center cover from the valve cover.
3. Label each spark plug wire and make a note of its routing.



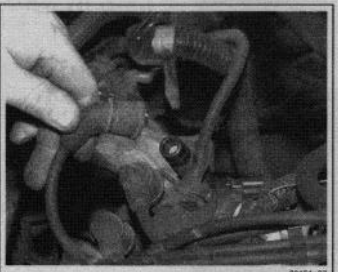
tccs1008

Fig. 101 Checking plug wire resistance through the distributor cap with an ohmmeter



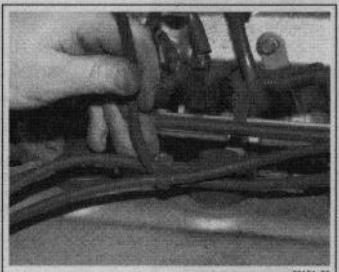
tccs1009

Fig. 102 Checking individual plug wire resistance with a digital ohmmeter



93151p37

Fig. 103 Remove the spark plug wires from the distributor cap or coil pack



93151p35

Fig. 104 Remove the plug wires from the wire dividers

➡Don't rely on wiring diagrams or sketches for spark plug wire routing. Improper arrangement of spark plug wires will induce voltage between wires, causing misfiring and surging. Be careful to arrange spark plug wires properly.

4. Starting with the longest wire, disconnect the spark plug wire from the spark plug and then from the coil pack or distributor cap.

To install:

5. If replacing the spark plug wires, match the old wire with an appropriately sized wire in the new set.
6. Lubricate the boots and terminals with dielectric grease and install the wire on the coil pack. Make sure the wire snaps into place.
7. Route the wire in the exact path as the original and connect the wire to the spark plug.
8. Repeat the process for each remaining wire, working from the longest wire to the shortest.
9. Install the air cleaner inlet tube.

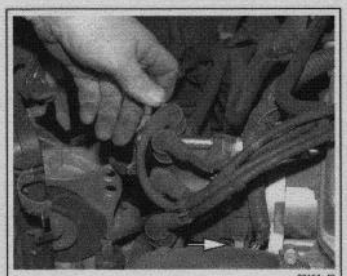

93151p40

Fig. 105 Loosen the distributor cap retaining screws . . .

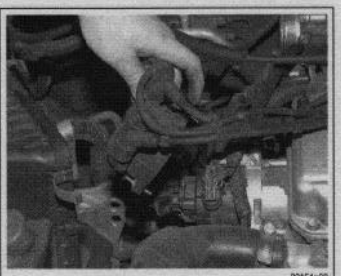

93151p39

Fig. 106 . . . then remove the cap from the distributor

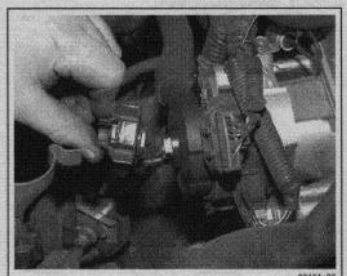

93151p36

Fig. 107 Grasp the rotor and pull it straight off of the distributor shaft

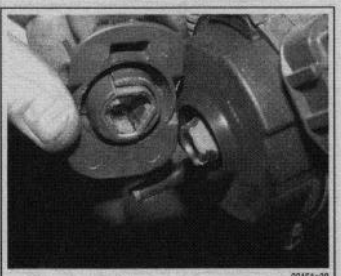

93151p38

Fig. 108 The rotor must be aligned correctly to the distributor shaft before installation

Distributor Cap and Rotor

REMOVAL & INSTALLATION

See Figures 105, 106, 107, and 108

1. Disconnect the negative battery cable.

Depending on the reason for removing the distributor cap, it may make more sense to leave the spark plug wires attached. This is handy if you are testing spark plug wires, or if removal is necessary to access other components, and wire length allows you to reposition the cap out of the way.

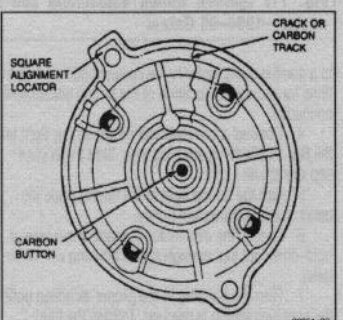
2. Label and disconnect the spark plug wires from the distributor cap.
3. Remove the distributor cap retaining screws or clips and remove the cap from the distributor.
4. Note its installed position, then remove the rotor from the distributor shaft.
5. The installation is the reverse of the removal.

INSPECTION

See Figures 109 and 110

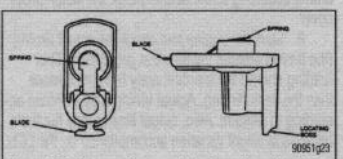
After removing the distributor cap and rotor, clean the components (both inside and outside of the cap) using soap and water. If compressed air is available, carefully dry the components (wearing safety goggles) or allow the parts to air dry. You can dry them with a clean, soft cloth, but don't leave any lint or moisture behind.

Once the cap and rotor have been thoroughly cleaned, check for cracks, carbon tracks, burns or other physical damage. Make sure the distributor cap's center button is free of damage. Check the cap terminals for dirt or corrosion. Always check the rotor blade and spring closely for damage. Replace any components where damage is found.



90951g22

Fig. 109 Inspection points for the distributor cap



90951g23

Fig. 110 Inspection points for the distributor rotor

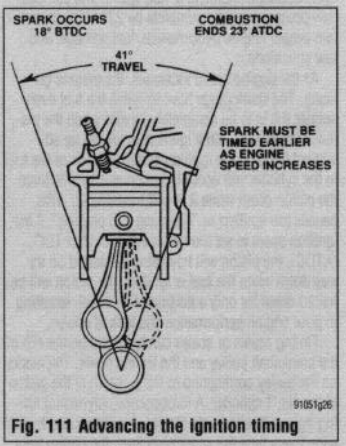
Ignition Timing

GENERAL INFORMATION

See Figures 111 and 112

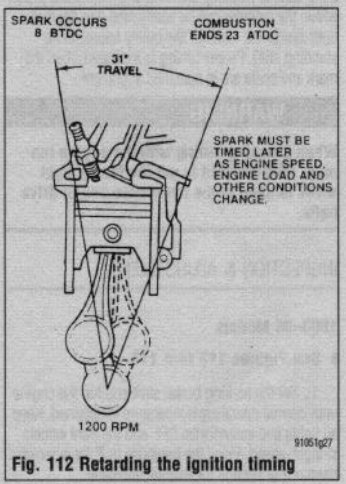
Ignition timing is the measurement, in degrees of crankshaft rotation, of the point at which the spark plugs fire in each of the cylinders. It is measured in degrees before or after Top Dead Center (TDC) of the compression stroke.

Ideally, the air/fuel mixture in the cylinder will be ignited by the spark plug just as the piston passes



91051g26

Fig. 111 Advancing the ignition timing



91051g27

Fig. 112 Retarding the ignition timing

TDC of the compression stroke. If this happens, the piston will be at the beginning of the power stroke just as the compressed and ignited air/fuel mixture forces the piston down and turns the crankshaft. Because it takes a fraction of a second for the spark plug to ignite the mixture in the cylinder, the spark plug must fire a little before the piston reaches TDC. Otherwise, the mixture will not be completely ignited as the piston passes TDC and the full power of the explosion will not be used by the engine.

The timing measurement is given in degrees of crankshaft rotation before the piston reaches TDC (BTDC). If the setting for the ignition timing is 10° BTDC, each spark plug must fire 10 degrees before each piston reaches TDC. This only holds true, however, when the engine is at idle speed. The combustion process must be complete by 23°ATDC to maintain proper engine performance, fuel mileage, and low emissions.

As the engine speed increases, the pistons go faster. The spark plugs have to ignite the fuel even sooner if it is to be completely ignited when the piston reaches TDC. If the ignition is set too far advanced (BTDC), the ignition and expansion of the fuel in the cylinder will occur too soon and tend to force the piston down while it is still traveling up. This causes pre ignition or "knocking and pinging". If the ignition spark is set too far retarded, or after TDC (ATDC), the piston will have already started on its way down when the fuel is ignited. The piston will be forced down for only a portion of its travel, resulting in poor engine performance and lack of power.

Timing marks or scales can be found on the rim of the crankshaft pulley and the timing cover. The marks on the pulley correspond to the position of the piston in the No. 1 cylinder. A stroboscopic (dynamic) timing light is hooked onto the No. 1 cylinder spark plug wire. Every time the spark plug fires, the timing light flashes. By aiming the light at the timing marks while the engine is running, the exact position of the piston within the cylinder can be easily read (the flash of light makes the mark on the pulley appear to be standing still). Proper timing is indicated when the mark and scale are in specified alignment.

⁂ WARNING

When checking timing with the engine running, take care not to get the timing light wires tangled in the fan blades and/or drive belts.

INSPECTION & ADJUSTMENT

1990–96 Models

▸ See Figures 113 thru 119

1. Set the parking brake, start and run the engine until normal operating temperature is obtained. Keep all lights and accessories OFF and the front wheels straight-ahead. Place the transaxle in **P** for automatic transaxle or Neutral for manual transaxle.
2. If not at specification, set the idle speed to the correct level.
3. Turn the engine **OFF**. Remove the waterproof cover from the ignition timing adjusting connector, and connect a jumper wire from this terminal to a good ground. Refer to the corresponding illustrations for the correct location of the timing adjustment connector.
4. Connect a conventional power timing light to the No. 1 cylinder spark plug wire. Start the engine and run at idle.
5. Aim the timing light at the timing scale located near the crankshaft pulley.
6. Loosen the distributor or crank angle sensor hold-down nut just enough so the housing can be rotated.
7. Turn the housing in the proper direction until the specified timing is reached. Tighten the hold-down nut and recheck the timing. Turn the engine **OFF**.
8. Remove the jumper wire from the ignition timing adjusting terminal and install the water-proof cover.
9. Start the engine and check the actual timing (the timing without the terminal grounded). This reading should be approximately 5 degrees more than the basic timing. Actual timing may increase according to altitude. Also, actual timing may fluctuate because of slight variation accomplished by the ECU. As long as the basic timing is correct, the engine is timed correctly.
10. Turn the engine **OFF**.
11. Disconnect the timing apparatus and tachometer.

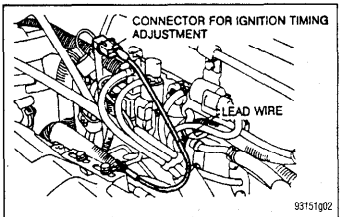


Fig. 113 Ignition timing adjustment connector—1990–92 Mirage with 1.5L engine

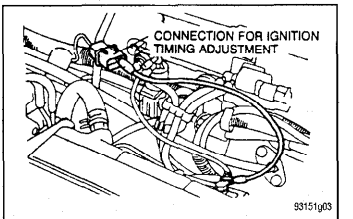


Fig. 114 Ignition timing adjustment connector—Mirage with 1.6L engine

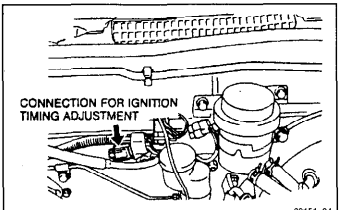


Fig. 115 Ignition timing adjustment connector—Galant with 2.0L engines

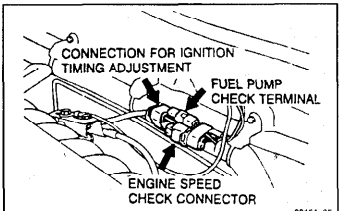


Fig. 116 Ignition timing adjustment connector—1992–96 Diamante

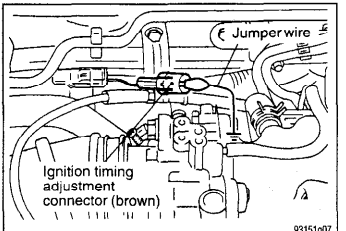


Fig. 117 Ignition timing adjustment connector—1994–96 Galant

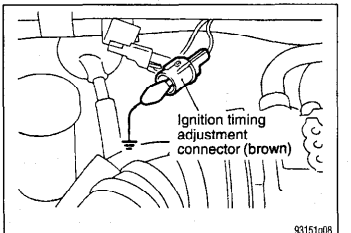


Fig. 118 Ignition timing adjustment connector—1993–96 Mirage with 1.5L engine

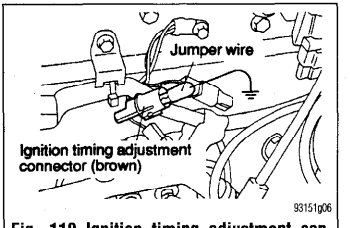


Fig. 119 Ignition timing adjustment connector—1993–96 Mirage with 1.8L engine

1997–00 Models

The ignition timing is controlled by the Engine Control Module (ECM) and is not adjustable. However it can be inspected using a scan tool.

Valve Lash

ADJUSTMENT

See Figures 120 and 121

The only engines that require periodic adjustment of the valves are the 1.5L engine in the 1990–95 Mirage and the 1.8L in the 1993–95 Mirage.

⁂ WARNING

Incorrect valve clearance will cause noisy and/or unsteady engine operation, reduced engine output, and possible engine damage. Check the valve clearances and adjust as required while the engine is hot.

1. Warm the engine to operating temperature. Turn the engine **OFF**. Disconnect the negative battery cable.
2. Remove all spark plugs so engine can be easily turned by hand.
3. Remove the valve cover.
4. Turn the crankshaft clockwise until the notch on the pulley is aligned with the **T** mark on the timing belt lower cover. This brings both No. 1 and 4 cylinder pistons to Top Dead Center (TDC).
5. Wiggle the rocker arms on No. 1 and 4 cylinders up and down to determine which cylinder is at TDC on the compression stroke. Both rocker arms should move if the piston in that cylinder is at TDC on the compression stroke.
6. Measure the valve clearance with a feeler gauge. When the No. 1 piston is at TDC on the compression stroke, check No. 1 intake and exhaust; No. 2 intake and exhaust. Then turn the crankshaft clockwise 1 turn to bring No. 4 to TDC on its compression stroke. With No. 4 on TDC, compression stroke, check No. 2 exhaust and intake; and No. 4 intake and exhaust. Clearance is as follows:

1990–92 1.5L engine:

- Exhaust valve: 0.0098 in. (0.25mm)
- Intake valve: 0.0059 in. (0.15mm)

1993–95 1.5L engine:

- Exhaust valve: 0.0098 in. (0.25mm)
- Intake valve: 0.008 in. (0.20mm)

1993–95 1.8L engine:

- Exhaust valve: 0.012 in. (0.30mm)
- Intake valve: 0.008 in. (0.20mm)

7. If the valve clearance is out of specification, loosen the rocker arm locknut and adjust the clearance using a feeler gauge while turning the adjusting screw. When at specification, tighten the locknut. Be sure to hold the screw securely in place when tightening the locknut to prevent it from turning when tightening the locknut. Tightening torque of the locknut is as follows:
   - 1.5L engine: 9–11 ft. lbs. (12–15 Nm)
   - 1.8L engine: 7 ft. lbs. (9 Nm)
8. Recheck the clearance and readjust.
9. After adjusting the valves, install the valve cover and spark plugs, and connect the negative battery cable.

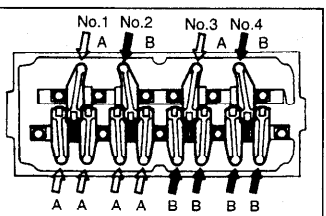


Fig. 120 Valve adjustment positions: (A) when engine is on TDC of cylinder 1 and (B) when engine is on TDC of cylinder 4

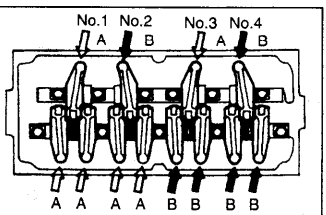


Fig. 121 Adjusting the valve clearance

ENGINE TUNE-UP SPECIFICATIONS

Year	Engine Displacement Liters (cc)	Engine ID/VIN	Spark Plugs Gap (in.)	Ignition Timing (deg.) MT	Ignition Timing (deg.) AT	Fuel Pump (psi)	Idle Speed (rpm) MT	Idle Speed (rpm) AT	Valve Clearance In.	Valve Clearance Ex.
1990	1.5 (1468)	4G15/A	0.040-0.043	3-7B	3-7B	48	700-800	700-800	0.015 ①	0.025 ①
	2.0 (1997)	4G63/V	0.039-0.043	3-7B	3-7B	48	650-850	650-850	HYD	HYD
	2.0 (1997)	4G63/R	0.039-0.043	3-7B	3-7B	48	650-850	650-850	HYD	HYD
1991	1.5 (1468)	4G15/A	0.040-0.043	3-7B	3-7B	48	700-800	700-800	0.015 ①	0.025 ①
	1.6 (1595)	4G61/Y	0.040-0.043	3-7B	3-7B	38	700-800	700-800	HYD	HYD
	2.0 (1997)	4G63/V	0.039-0.043	3-7B	3-7B	48	650-850	650-850	HYD	HYD
	2.0 (1997)	4G63/R	0.039-0.043	3-7B	3-7B	48	650-850	650-850	HYD	HYD
	2.0 (1997)	4G63/U	0.028-0.031	3-7B	3-7B	37	650-850	650-850	HYD	HYD
1992	1.5 (1468)	4G15/A	0.040-0.043	3-7B	3-7B	48	700-800	700-800	0.015 ①	0.025 ①
	1.6 (1595)	4G61/Y	0.040-0.043	3-7B	3-7B	38	700-800	700-800	HYD	HYD
	2.0 (1997)	4G63/V	0.039-0.043	3-7B	3-7B	48	650-850	650-850	HYD	HYD
	2.0 (1997)	4G63/R	0.039-0.043	3-7B	3-7B	48	650-850	650-850	HYD	HYD
	2.0 (1997)	4G63/U	0.028-0.031	3-7B	3-7B	37	650-850	650-850	HYD	HYD
	3.0 (2972)	6G72/H	0.039-0.043	—	3-7B	38	—	600-800	HYD	HYD
	3.0 (2972)	6G72/J	0.039-0.043	—	3-7B	38	—	600-800	HYD	HYD
1993	1.5 (1468)	4G15/A	0.040-0.043	3-7B	3-7B	38	650-850	650-850	0.015 ①	0.025 ①
	1.8 (1834)	4G93/C	0.039-0.043	3-7B	3-7B	38	650-850	650-850	0.008 ①	0.012 ①
	2.0 (1997)	4G63/V	0.039-0.043	3-7B	3-7B	48	650-850	650-850	HYD	HYD
	2.0 (1997)	4G63/R	0.039-0.043	3-7B	3-7B	48	650-850	650-850	HYD	HYD
	3.0 (2972)	6G72/H	0.039-0.043	—	3-7B	38	—	600-800	HYD	HYD
	3.0 (2972)	6G72/J	0.039-0.043	—	2-8B	38	—	600-800	HYD	HYD
1994	1.5 (1468)	4G15/A	0.040-0.043	3-7B	3-7B	48	700-800	700-800	0.015 ①	0.025 ①
	1.8 (1834)	4G93/C	0.039-0.043	5B	5B	38	600-800	650-850	0.008 ①	0.012 ①
	2.4 (2350)	4G64/G	0.039-0.043	3-7B	3-7B	38	650-850	650-850	HYD	HYD
	2.4 (2350)	4G64/L	0.039-0.043	2-8B	2-8B	38	700-800	700-800	HYD	HYD
	3.0 (2972)	6G72/H	0.039-0.043	—	3-7B	38	—	600-800	HYD	HYD
	3.0 (2972)	6G72/J	0.039-0.043	—	2-8B	38	—	600-800	HYD	HYD
1995	1.5 (1468)	4G15/A	0.039-0.043	5B	5B	38	650-850	650-850	0.008 ①	0.010 ①
	1.8 (1834)	4G93/C	0.039-0.043	5B	5B	38	600-800	650-850	0.008 ①	0.012 ①
	2.4 (2350)	4G64/G	0.039-0.043	3-7B	3-7B	38	650-850	650-850	HYD	HYD
	2.4 (2350)	4G64/L	0.039-0.043	2-8B	2-8B	38	700-800	700-800	HYD	HYD
	3.0 (2972)	6G72/H	0.039-0.043	—	3-7B	38	—	600-800	HYD	HYD
	3.0 (2972)	6G72/J	0.039-0.043	—	2-8B	38	—	600-800	HYD	HYD
1996	1.5 (1468)	4G15/A	0.039-0.043	5B	5B	38	650-850	650-850	0.008 ①	0.010 ①
	1.8 (1834)	4G93/C	0.039-0.043	5B	5B	38	600-800	650-850	0.008 ①	0.012 ①
	2.4 (2350)	4G64/G	0.039-0.043	3-7B	3-7B	38	650-850	650-850	HYD	HYD
	2.4 (2350)	4G64/L	0.039-0.043	2-8B	2-8B	38	700-800	700-800	HYD	HYD
	3.0 (2972)	6G72/H	0.039-0.043	—	3-7B	38	—	600-800	HYD	HYD
	3.0 (2972)	6G72/J	0.039-0.043	—	2-8B	38	—	600-800	HYD	HYD
1997	1.5 (1468)	4G15/A	0.039-0.043	5B	5B	38	650-850	650-850	0.008 ①	0.010 ①
	1.8 (1834)	4G93/C	0.039-0.043	5B	5B	38	600-800	650-850	0.008 ①	0.012 ①
	2.4 (2350)	4G64/G	0.039-0.043	3-7B	3-7B	38	650-850	650-850	HYD	HYD
	2.4 (2350)	4G64/L	0.039-0.043	2-8B	2-8B	38	700-800	700-800	HYD	HYD
	3.5 (3497)	6G74/P	0.039-0.043	—	2-8B	38	—	600-800	HYD	HYD
1998	1.5 (1468)	4G15/A	0.039-0.043	2-8B	2-8B	38	600-800	600-800	HYD	HYD
	1.8 (1834)	4G93/C	0.039-0.043	2-8B	2-8B	38	600-800	600-800	HYD	HYD
	2.4 (2350)	4G64/G	0.039-0.043	3-7B	3-7B	38	650-850	650-850	HYD	HYD
	2.4 (2350)	4G64/L	0.039-0.043	2-8B	2-8B	38	700-800	700-800	HYD	HYD
	3.5 (3497)	6G74/P	0.039-0.043	—	2-8B	38	—	600-800	HYD	HYD
1999	1.5 (1468)	4G15/A	0.039-0.043	2-8B	2-8B	38	600-800	600-800	HYD	HYD
	1.8 (1834)	4G93/C	0.039-0.043	2-8B	2-8B	38	600-800	600-800	HYD	HYD
	2.4 (2350)	4G64/G	0.039-0.043	2-8B	2-8B	38	650-850	650-850	HYD	HYD
	3.0 (2972)	6G72/L	0.039-0.043	2-8B	2-8B	38	600-800	600-800	HYD	HYD
	3.5 (3497)	6G74/P	0.039-0.043	—	2-8B	38	—	600-800	HYD	HYD
2000	1.5 (1468)	4G15/A	0.039-0.043	2-8B	2-8B	38	600-800	600-800	HYD	HYD
	1.8 (1834)	4G93/C	0.039-0.043	2-8B	2-8B	38	600-800	600-800	HYD	HYD
	2.4 (2350)	4G64/G	0.039-0.043	2-8B	2-8B	38	650-850	650-850	HYD	HYD
	3.0 (2972)	6G72/L	0.039-0.043	2-8B	2-8B	38	600-800	600-800	HYD	HYD
	3.5 (3497)	6G74/P	0.039-0.043	—	2-8B	38	—	600-800	HYD	HYD

NOTE: The Vehicle Emission Control Information label often reflects specification changes made during production. The label figures must be used if they differ from those in this chart.
B - Before top dead center
HYD - Hydraulic
① Hot engine

93151c05

Idle Speed

The idle speed is factory set and usually no adjustments are ever necessary. If an adjustment becomes necessary, first check that the spark plugs, injectors, idle air control servo and compression pressure are all normal.

Data from various sensors and switches are used by the ECU to determine the proper fuel/air mixture for optimal engine performance.

Air Conditioning System

SYSTEM SERVICE & REPAIR

See Figure 122

➡It is recommended that the A/C system be serviced by an EPA Section 609 certified automotive technician utilizing a refrigerant recovery/recycling machine.

The do-it-yourselfer should not service his/her own vehicle's A/C system for many reasons, including legal concerns, personal injury, environmental damage and cost. The following are some of the reasons why you may decide not to service your own vehicle's A/C system.

According to the U.S. Clean Air Act, it is a federal crime to service or repair (involving the refrigerant) a Motor Vehicle Air Conditioning (MVAC) system for money without being EPA certified. It is also illegal to vent R-12 and R-134a refrigerants into the atmosphere. Selling or distributing A/C system refrigerant (in a container which contains less than 20 pounds of refrigerant) to any person who is not EPA 609 certified is also not allowed by law.

State and/or local laws may be more strict than the federal regulations, so be sure to check with your state and/or local authorities for further information. For further federal information on the legality of servicing your A/C system, call the EPA Stratospheric Ozone Hotline.

➡Federal law dictates that a fine of up to $25,000 may be levied on people convicted of venting refrigerant into the atmosphere. Additionally, the EPA may pay up to $10,000 for information or services leading to a criminal conviction of the violation of these laws.

When servicing an A/C system you run the risk of handling or coming in contact with refrigerant, which may result in skin or eye irritation or frostbite. Although low in toxicity (due to chemical stability), inhalation of concentrated refrigerant fumes is dangerous and can result in death; cases of fatal cardiac arrhythmia have been reported in people accidentally subjected to high levels of refrigerant. Some early symptoms include loss of concentration and drowsiness.

93151p11

Fig. 122 A label with information concerning the A/C system is typically located in the engine compartment

➡Generally, the limit for exposure is lower for R-134a than it is for R-12. Exceptional care must be practiced when handling R-134a.

Also, refrigerants can decompose at high temperatures (near gas heaters or open flame), which may result in hydrofluoric acid, hydrochloric acid and phosgene (a fatal nerve gas).

R-12 refrigerant can damage the environment because it is a Chlorofluorocarbon (CFC), which has been proven to add to ozone layer depletion, leading to increasing levels of UV radiation. UV radiation has been linked with an increase in skin cancer, suppression of the human immune system, an increase in cataracts, damage to crops, damage to aquatic organisms, an increase in ground-level ozone, and increased global warming.

R-134a refrigerant is a greenhouse gas which, if allowed to vent into the atmosphere, will contribute to global warming (the Greenhouse Effect).

It is usually more economically feasible to have a certified MVAC automotive technician perform A/C system service on your vehicle. Some possible reasons for this are as follows:

- While it is illegal to service an A/C system without the proper equipment, the home mechanic would have to purchase an expensive refrigerant recovery/recycling machine to service his/her own vehicle.
- Since only a certified person may purchase refrigerant—according to the Clean Air Act, there are specific restrictions on selling or distributing A/C system refrigerant—it is legally impossible (unless certified) for the home mechanic to service his/her own vehicle. Procuring refrigerant in an illegal fashion exposes one to the risk of paying a $25,000 fine to the EPA.

R-12 Refrigerant Conversion

If your vehicle still uses R-12 refrigerant, one way to save A/C system costs down the road is to investigate the possibility of having your system converted to R-134a. The older R-12 systems can be easily converted to R-134a refrigerant by a certified automotive technician by installing a few new components and changing the system oil.

The cost of R-12 is steadily rising and will continue to increase, because it is no longer imported or manufactured in the United States. Therefore, it is often possible to have an R-12 system converted to R-134a and recharged for less than it would cost to just charge the system with R-12.

If you are interested in having your system converted, contact local automotive service stations for more details and information.

PREVENTIVE MAINTENANCE

See Figures 123 and 124

Although the A/C system should not be serviced by the do-it-yourselfer, preventive maintenance can be practiced and A/C system inspections can be performed to help maintain the efficiency of the vehicle's A/C system. For preventive maintenance, perform the following:

- The easiest and most important preventive maintenance for your A/C system is to be sure that it is used on a regular basis. Running the system for five minutes each month (no matter what the season) will help ensure that the seals and all internal components remain lubricated.

➡Some newer vehicles automatically operate the A/C system compressor whenever the windshield defroster is activated. When running, the compressor lubricates the A/C system components; therefore, the A/C system would not need to be operated each month.

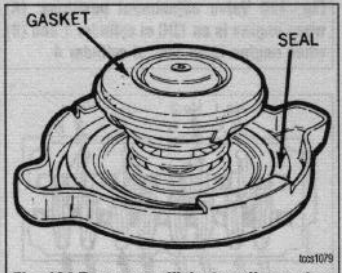
- In order to prevent heater core freeze-up during A/C operation, it is necessary to maintain proper antifreeze protection. Use a hand-held coolant tester (hydrometer) to periodically check the condition of the antifreeze in your engine's cooling system.

➡Antifreeze should not be used longer than the manufacturer specifies.

- For efficient operation of an air conditioned vehicle's cooling system, the radiator cap should have a holding pressure which meets manufacturer's specifications. A cap which fails to hold these pressures should be replaced.
- Any obstruction of or damage to the condenser configuration will restrict air flow which is essential to its efficient operation. It is, therefore, a good rule to keep this unit clean and in proper physical shape.

tccs1233

Fig. 123 A coolant tester can be used to determine the freezing and boiling levels of the coolant in your vehicle



tccs1079

Fig. 124 To ensure efficient cooling system operation, inspect the radiator cap gasket and seal

Bug screens which are mounted in front of the condenser (unless they are original equipment) are regarded as obstructions.

- The condensation drain tube expels any water which accumulates on the bottom of the evaporator housing into the engine compartment. If this tube is obstructed, the air conditioning performance can be restricted and condensation buildup can spill over onto the vehicle's floor.

SYSTEM INSPECTION

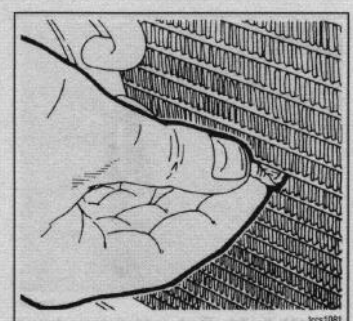
See Figure 125

Although the A/C system should not be serviced by the do-it-yourselfer, preventive maintenance can be practiced and A/C system inspections can be performed to help maintain the efficiency of the vehicle's A/C system. For A/C system inspection, perform the following:

The easiest and often most important check for the air conditioning system consists of a visual inspection of the system components. Visually inspect the air conditioning system for refrigerant leaks, damaged compressor clutch, abnormal compressor drive belt tension and/or condition, plugged evaporator drain tube, blocked condenser fins, disconnected or broken wires, blown fuses, corroded connections and poor insulation.

A refrigerant leak will usually appear as an oily residue at the leakage point in the system. The oily residue soon picks up dust or dirt particles from the surrounding air and appears greasy. Through time, this will build up and appear to be a heavy dirt impregnated grease.

For a thorough visual and operational inspection, check the following:



tccs1081

Fig. 125 Periodically remove any debris from the condenser and radiator fins

- Check the surface of the radiator and condenser for dirt, leaves or other material which might block air flow.
- Check for kinks in hoses and lines. Check the system for leaks.
- Make sure the drive belt is properly tensioned. When the air conditioning is operating, make sure the drive belt is free of noise or slippage.
- Make sure the blower motor operates at all appropriate positions, then check for distribution of the air from all outlets with the blower on **HIGH** or **MAX**.

Keep in mind that under conditions of high humidity, air discharged from the A/C vents may not feel as cold as expected, even if the system is working properly. This is because vaporized moisture in humid air retains heat more effectively than dry air, thereby making humid air more difficult to cool.

- Make sure the air passage selection lever is operating correctly. Start the engine and warm it to normal operating temperature, then make sure the temperature selection lever is operating correctly.

Windshield Wipers

ELEMENT (REFILL) CARE & REPLACEMENT

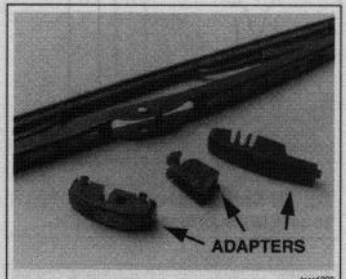
See Figures 126 thru 135

For maximum effectiveness and longest element life, the windshield and wiper blades should be kept clean. Dirt, tree sap, road tar and so on will cause streaking, smearing and blade deterioration if left on the glass. It is advisable to wash the windshield carefully with a commercial glass cleaner at least once a month. Wipe off the rubber blades with the wet rag afterwards. Do not attempt to move wipers across the windshield by hand; damage to the motor and drive mechanism will result.

To inspect and/or replace the wiper blade elements, place the wiper switch in the **LOW** speed position and the ignition switch in the **ACC** position. When the wiper blades are approximately vertical on the windshield, turn the ignition switch to **OFF**.

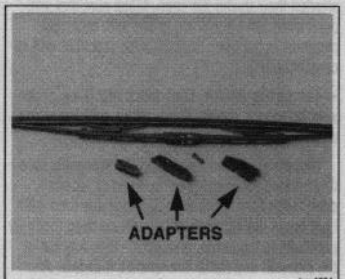
Examine the wiper blade elements. If they are found to be cracked, broken or torn, they should be replaced immediately. Replacement intervals will vary with usage, although ozone deterioration usually limits element life to about one year. If the wiper pattern is smeared or streaked, or if the blade chatters across the glass, the elements should be replaced. It is easiest and most sensible to replace the elements in pairs.

If your vehicle is equipped with aftermarket blades, there are several different types of refills and your vehi-



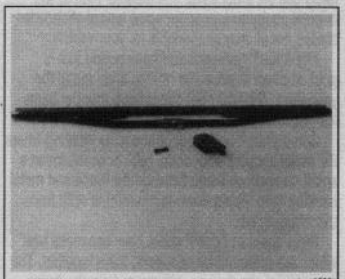
tccs1223

Fig. 126 Bosch® wiper blade and fit kit



tccs1224

Fig. 127 Lexor® wiper blade and fit kit

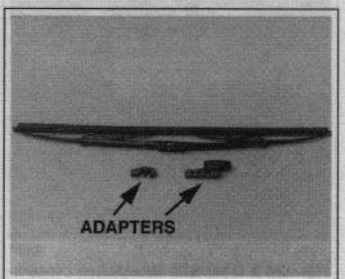


tccs1225

Fig. 128 Pylon® wiper blade and adapter

tccs1226

Fig. 129 Trico® wiper blade and fit kit

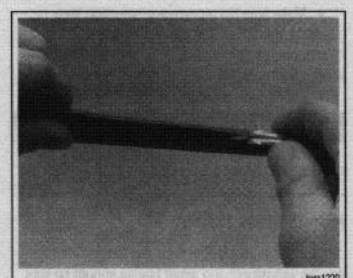


tccs1227

Fig. 130 Tripledge® wiper blade and fit kit

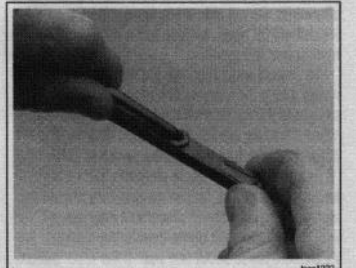
tccs1228

Fig. 131 To remove and install a Lexor® wiper blade refill, slip out the old insert and slide in a new one



tccs1229

Fig. 132 On Pylon® inserts, the clip at the end has to be removed prior to sliding the insert off



tccs1232

Fig. 135 The Tripledge® wiper blade insert is removed and installed using a securing clip

cle might have any kind. Aftermarket blades and arms rarely use the exact same type blade or refill as the original equipment. Here are some typical aftermarket blades; not all may be available for your vehicle:

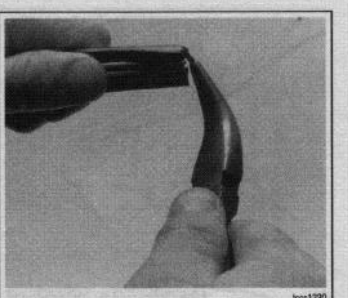
The Anco® type uses a release button that is pushed down to allow the refill to slide out of the yoke jaws. The new refill slides back into the frame and locks in place.

Some Trico® refills are removed by locating where the metal backing strip or the refill is wider. Insert a small screwdriver blade between the frame and metal backing strip. Press down to release the refill from the retaining tab.

Other types of Trico® refills have two metal tabs which are unlocked by squeezing them together. The rubber filler can then be withdrawn from the frame jaws. A new refill is installed by inserting the refill into the front frame jaws and sliding it rearward to engage the remaining frame jaws. There are usually four jaws; be certain when installing that the refill is engaged in all of them. At the end of its travel, the tabs will lock into place on the front jaws of the wiper blade frame.

Another type of refill is made from polycarbonate. The refill has a simple locking device at one end which flexes downward out of the groove into which the jaws of the holder fit, allowing easy release. By sliding the new refill through all the jaws and pushing through the slight resistance when it reaches the end of its travel, the refill will lock into position.

To replace the Tridon® refill, it is necessary to remove the wiper blade. This refill has a plastic backing strip with a notch about 1 in. (25mm) from the end. Hold the blade (frame) on a hard surface so that the frame is tightly bowed. Grip the tip of the backing



tcca1230

Fig. 133 On Trico® wiper blades, the tab at the end of the blade must be turned up . . .

strip and pull up while twisting counterclockwise. The backing strip will snap out of the retaining tab. Do this for the remaining tabs until the refill is free of the blade. The length of these refills is molded into the end and they should be replaced with identical types.

Regardless of the type of refill used, be sure to follow the part manufacturer's instructions closely. Make sure that all of the frame jaws are engaged as the refill is pushed into place and locked. If the metal blade holder and frame are allowed to touch the glass during wiper operation, the glass will be scratched.

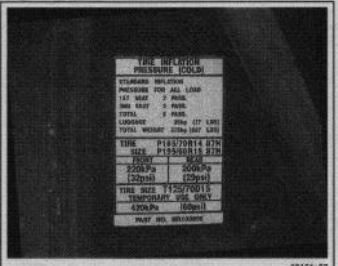
Tires and Wheels

See Figure 136

Common sense and good driving habits will afford maximum tire life. Fast starts, sudden stops and hard cornering are hard on tires and will shorten their useful life span. Make sure that you don't overload the vehicle or run with incorrect pressure in the tires. Both of these practices will increase tread wear.

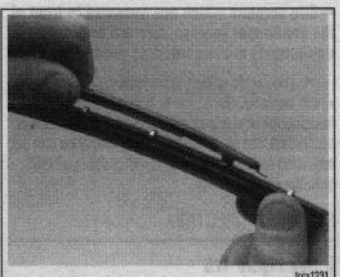
➡For optimum tire life, keep the tires properly inflated, rotate them often and have the wheel alignment checked periodically.

Inspect your tires frequently. Be especially careful to watch for bubbles in the tread or sidewall, deep cuts or underinflation. Replace any tires with bubbles in the sidewall. If cuts are so deep that they penetrate to the cords, discard the tire. Any cut in the sidewall of a radial tire renders it unsafe. Also look for uneven tread wear patterns that may indicate the front end is out of alignment or that the tires are out of balance.



93151p07

Fig. 136 A label with information concerning the tires is typically located on one of the door pillars



tccs1231

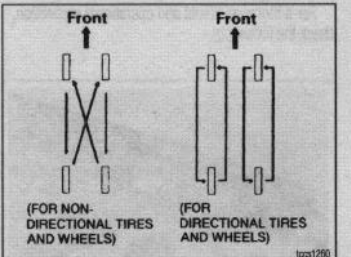
Fig. 134 . . . then the insert can be removed. After installing the replacement insert, bend the tab back

TIRE ROTATION

See Figures 137 and 138

Tires must be rotated periodically to equalize wear patterns that vary with a tire's position on the vehicle. Tires will also wear in an uneven way as the front steering/suspension system wears to the point where the alignment should be reset.

Rotating the tires will ensure maximum life for the tires as a set, so you will not have to discard a tire early due to wear on only part of the tread. Regular rotation is required to equalize wear.



tccs1260

Fig. 137 Compact spare tires must NEVER be used in the rotation pattern

tccs1234

Fig. 138 Unidirectional tires are identifiable by sidewall arrows and/or the word "rotation"

When rotating "unidirectional tires," make sure that they always roll in the same direction. This means that a tire used on the left side of the vehicle must not be switched to the right side and vice-versa. Such tires should only be rotated front-to-rear or rear-to-front, while always remaining on the same side of the vehicle. These tires are marked on the sidewall as to the direction of rotation; observe the marks when reinstalling the tire(s).

Some styled or "mag" wheels may have different offsets front to rear. In these cases, the rear wheels must not be used up front and vice-versa. Furthermore, if these wheels are equipped with unidirectional tires, they cannot be rotated unless the tire is remounted for the proper direction of rotation.

➡The compact or space-saver spare is strictly for emergency use. It must never be included in the tire rotation or placed on the vehicle for everyday use.

TIRE DESIGN

See Figure 139

For maximum satisfaction, tires should be used in sets of four. Mixing of different types (radial, bias-belted, fiberglass belted) must be avoided. In most cases, the vehicle manufacturer has designated a type of tire on which the vehicle will perform best. Your first choice when replacing tires should be to use the same type of tire that the manufacturer recommends.

When radial tires are used, tire sizes and wheel diameters should be selected to maintain ground clearance and tire load capacity equivalent to the original specified tire. Radial tires should always be used in sets of four.

CAUTION

Radial tires should never be used on only the front axle.

When selecting tires, pay attention to the original size as marked on the tire. Most tires are described using an industry size code sometimes referred to as P-Metric. This allows the exact identification of the tire specifications, regardless of the manufacturer. If selecting a different tire size or brand, remember to check the installed tire for any sign of interference with the body or suspension while the vehicle is stopping, turning sharply or heavily loaded.

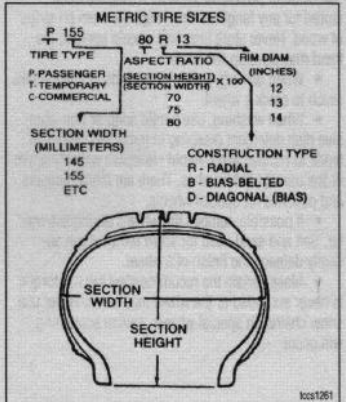


Fig. 139 P-Metric tire coding

Snow Tires

Good radial tires can produce a big advantage in slippery weather, but in snow, a street radial tire does not have sufficient tread to provide traction and control. The small grooves of a street tire quickly pack with snow and the tire behaves like a billiard ball on a marble floor. The more open, chunky tread of a snow tire will self-clean as the tire turns, providing much better grip on snowy surfaces.

To satisfy municipalities requiring snow tires during weather emergencies, most snow tires carry either an M + S designation after the tire size stamped on the sidewall, or the designation "all-season." In general, no change in tire size is necessary when buying snow tires.

Most manufacturers strongly recommend the use of 4 snow tires on their vehicles for reasons of stability. If snow tires are fitted only to the drive wheels, the opposite end of the vehicle may become very unstable when braking or turning on slippery surfaces. This instability can lead to unpleasant endings if the driver can't counteract the slide in time.

Note that snow tires, whether 2 or 4, will affect vehicle handling in all non-snow situations. The stiffer, heavier snow tires will noticeably change the turning and braking characteristics of the vehicle. Once the snow tires are installed, you must re-learn the behavior of the vehicle and drive accordingly.

➡Consider buying extra wheels on which to mount the snow tires. Once done, the "snow wheels" can be installed and removed as needed. This eliminates the potential damage to tires or wheels from seasonal removal and installation. Even if your vehicle has styled wheels, see if inexpensive steel wheels are available. Although the look of the vehicle will change, the expensive wheels will be protected from salt, curb hits and pothole damage.

TIRE STORAGE

If they are mounted on wheels, store the tires at proper inflation pressure. All tires should be kept in a cool, dry place. If they are stored in the garage or basement, do not let them stand on a concrete floor; set them on strips of wood, a mat or a large stack of newspaper. Keeping them away from direct moisture is of paramount importance. Tires should not be stored upright, but in a flat position.

INFLATION & INSPECTION

See Figures 140 thru 147

The importance of proper tire inflation cannot be overemphasized. A tire employs air as part of its structure. It is designed around the supporting strength of the air at a specified pressure. For this reason, improper inflation drastically reduces the tire's ability to perform as intended. A tire will lose some air in day-to-day use; having to add a few pounds of air periodically is not necessarily a sign of a leaking tire.

Two items should be a permanent fixture in every glove compartment: an accurate tire pressure gauge and a tread depth gauge. Check the tire pressure (including the spare) regularly with a pocket type gauge. Too often, the gauge on the end of the air hose at your corner garage is not accurate because it suffers too much abuse. Always check tire pressure when the tires are cold, as pressure increases with temperature. If you must move the vehicle to check the tire

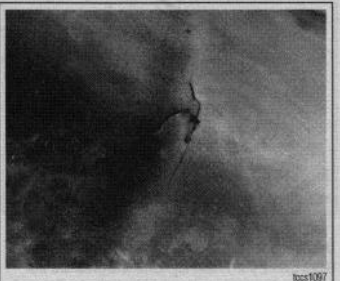


Fig. 140 Tires should be checked frequently for any sign of puncture or damage

Fig. 141 Tires with deep cuts, or cuts which bulge, should be replaced immediately

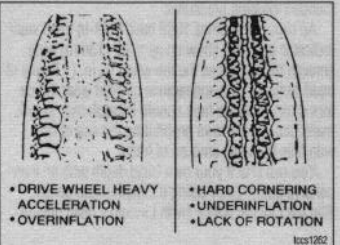


Fig. 142 Examples of inflation-related tire wear patterns

Fig. 143 Radial tires have a characteristic sidewall bulge; don't try to measure pressure by looking at the tire. Use a quality air pressure gauge

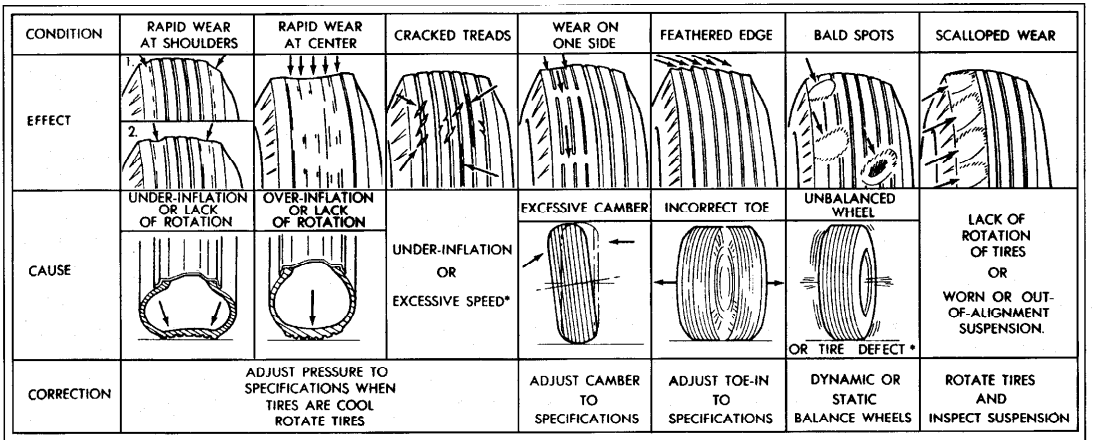


Fig. 144 Common tire wear patterns and causes

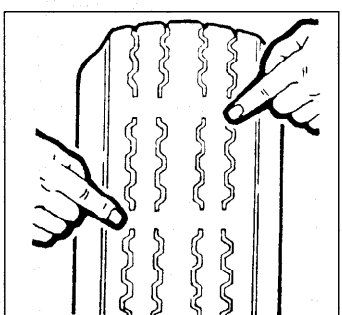


Fig. 145 Tread wear indicators will appear when the tire is worn

inflation, do not drive more than a mile before checking. A cold tire is generally one that has not been driven for more than three hours.

A plate or sticker is normally provided somewhere in the vehicle (door post, hood, tailgate or trunk lid) which shows the proper pressure for the tires. Never counteract excessive pressure build-up by bleeding off air pressure (letting some air out). This will cause the tire to run hotter and wear quicker.

CAUTION

Never exceed the maximum tire pressure embossed on the tire! This is the pressure to be used when the tire is at maximum loading, but it is rarely the correct pressure for everyday driving. Consult the owner's manual or the tire pressure sticker for the correct tire pressure.

Once you've maintained the correct tire pressures for several weeks, you'll be familiar with the vehicle's braking and handling personality. Slight adjustments in tire pressures can fine-tune these characteristics,

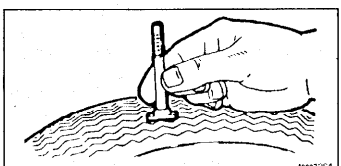


Fig. 146 Accurate tread depth indicators are inexpensive and handy

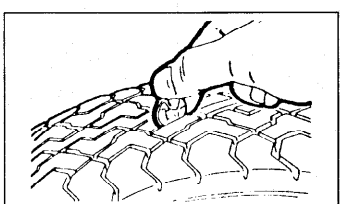


Fig. 147 A penny works well for a quick check of tread depth

but never change the cold pressure specification by more than 2 psi. A slightly softer tire pressure will give a softer ride but also yield lower fuel mileage. A slightly harder tire will give crisper dry road handling but can cause skidding on wet surfaces. Unless you're fully attuned to the vehicle, stick to the recommended inflation pressures.

All tires made since 1968 have built-in tread wear indicator bars that show up as 1/2 in. (13mm) wide smooth bands across the tire when 1/16 in. (1.5mm) of tread remains. The appearance of tread wear indicators means that the tires should be replaced. In fact, many states have laws prohibiting the use of tires with less than this amount of tread.

You can check your own tread depth with an inexpensive gauge or by using a Lincoln head penny. Slip the Lincoln penny (with Lincoln's head upside-down) into several tread grooves. If you can see the top of Lincoln's head in 2 adjacent grooves, the tire has less than 1/16 in. (1.5mm) tread left and should be replaced. You can measure snow tires in the same manner by using the "tails" side of the Lincoln penny. If you can see the top of the Lincoln memorial, it's time to replace the snow tire(s).

CARE OF SPECIAL WHEELS

If you have invested money in magnesium, aluminum alloy or sport wheels, special precautions should be taken to make sure your investment is not wasted and that your special wheels look good for the life of the vehicle.

Special wheels are easily damaged and/or scratched. Occasionally check the rims for cracking, impact damage or air leaks. If any of these are found, replace the wheel. But in order to prevent this type of damage and the costly replacement of a special wheel, observe the following precautions:

- Use extra care not to damage the wheels during removal, installation, balancing, etc. After removal of the wheels from the vehicle, place them on a mat or other protective surface. If they are to be stored for any length of time, support them on strips of wood. Never store tires and wheels upright; the tread may develop flat spots.
- When driving, watch for hazards; it doesn't take much to crack a wheel.
- When washing, use a mild soap or non-abrasive dish detergent (keeping in mind that detergent tends to remove wax). Avoid cleansers with abrasives or the use of hard brushes. There are many cleaners and polishes for special wheels.
- If possible, remove the wheels during the winter. Salt and sand used for snow removal can severely damage the finish of a wheel.
- Make certain the recommended lug nut torque is never exceeded or the wheel may crack. Never use snow chains on special wheels; severe scratching will occur.

FLUIDS AND LUBRICANTS

Fluid Disposal

Used fluids such as engine oil, transaxle fluid, antifreeze and brake fluid are hazardous wastes and must be disposed of properly. Before draining any fluids, consult with your local authorities; in many areas, waste oil, antifreeze, etc. is being accepted as a part of recycling programs. A number of service stations and auto parts stores are also accepting waste fluids for recycling.

Be sure of the recycling center's policies before draining any fluids, as many will not accept different fluids that have been mixed together.

Fuel and Engine Oil Recommendations

ENGINE OIL

See Figure 148

➡Mitsubishi recommends that SAE 5W-30 viscosity engine oil should be used for all climate conditions, however, SAE 10W-30 is acceptable for vehicles operated in moderate-to-hot climates.

tccs1235

Fig. 148 Look for the API oil identification label when choosing your engine oil

When adding oil to the crankcase or changing the oil or filter, it is important that oil of an equal quality to original equipment be used in your car. The use of inferior oils may void the warranty, damage your engine, or both.

The SAE (Society of Automotive Engineers) grade number of oil indicates the viscosity of the oil (its ability to lubricate at a given temperature). The lower the SAE number, the lighter the oil; the lower the viscosity, the easier it is to crank the engine in cold weather but the less the oil will lubricate and protect the engine in high temperatures. This number is marked on every oil container.

Oil viscosity's should be chosen from those oils recommended for the lowest anticipated temperatures during the oil change interval. Due to the need for an oil that embodies both good lubrication at high temperatures and easy cranking in cold weather, multigrade oils have been developed. Basically, a multigrade oil is thinner at low temperatures and thicker at high temperatures. For example, a 10W-40 oil (the W stands for winter) exhibits the characteristics of a 10 weight (SAE 10) oil when the car is first started and the oil is cold. Its lighter weight allows it to travel to the lubricating surfaces quicker and offer less resistance to starter motor cranking than, say, a straight 30 weight (SAE 30) oil. But after the engine reaches operating temperature, the 10W-40 oil begins acting like straight 40 weight (SAE 40) oil, its heavier weight providing greater lubrication with less chance of foaming than a straight 30 weight oil.

The API (American Petroleum Institute) designations, also found on the oil container, indicates the classification of engine oil used under certain given operating conditions. Only oils designated for use Service SJ heavy duty detergent should be used in your car. Oils of the SJ type perform may functions inside the engine besides their basic lubrication. Through a balanced system of metallic detergents and polymeric dispersants, the oil prevents high and low temperature deposits and also keeps sludge and dirt particles in suspension. Acids, particularly sulfuric acid, as well as other by-products of engine combustion are neutralized by the oil. If these acids are allowed to concentrate, they can cause corrosion and rapid wear of the internal engine parts.

⁂ WARNING

Non-detergent motor oils or straight mineral oils should not be used in your engine.

Synthetic Oil

There are many excellent synthetic and fuel-efficient oils currently available that can provide better gas mileage, longer service life and, in some cases, better engine protection. These benefits do not come without a few hitches, however; the main one being the price of synthetic oil, which is significantly more expensive than conventional oil.

Synthetic oil is not for every car and every type of driving, so you should consider your engine's condition and your type of driving. Also, check your car's warranty conditions regarding the use of synthetic oils.

FUEL

All models equipped with a SOHC (Single Overhead Camshaft) engine are designed to operate using regular unleaded fuel with a minimum of 87 octane. All models equipped with a DOHC (Dual Overhead Camshaft) engine are designed to operate using regular unleaded fuel with a minimum of 91 octane. Mitsubishi warns that using gasoline with a lower octane rating can cause persistent and heavy knocking, and may cause internal engine damage.

If your vehicle is having problems with rough idle or hesitation when the engine is cold, it may be caused by low volatility fuel. If this occurs, try a different grade or brand of fuel.

OPERATION IN FOREIGN COUNTRIES

If you plan to drive your car outside the United States or Canada, there is a possibility that fuels will be too low in anti-knock quality and could produce engine damage. It is wise to consult with local authorities upon arrival in a foreign country to determine the best fuels available.

Engine

OIL LEVEL CHECK

See Figures 149, 150, and 151

⁂ CAUTION

The EPA warns that prolonged contact with used engine oil may cause a number of skin disorders, including cancer! You should make every effort to minimize your exposure to used engine oil. Protective gloves should be worn when changing the oil. Wash your hands and any other exposed skin areas as soon as possible after exposure to used engine oil. Soap and water, or waterless hand cleaner should be used.

The engine oil dipstick is typically located in the front of the engine near the exhaust manifold.


93151p24

Fig. 149 Grasp the oil level dipstick and pull upward to remove it from the dipstick tube


93151p22

Fig. 150 Wipe the dipstick clean and reinsert it into the dipstick tube to get the correct oil level

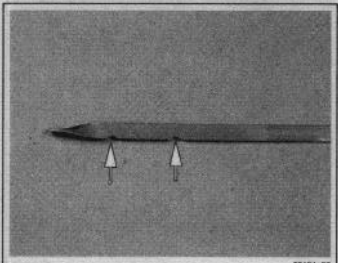

93151p52

Fig. 151 The oil level should be between the marks/notches on the dipstick

Engine oil level should be checked every time you put fuel in the vehicle or are under the hood performing other maintenance.

1. Park the vehicle on a level surface.
2. The engine may be either hot or cold when checking oil level. However, if it is hot, wait a few minutes after the engine has been turned **OFF** to allow the oil to drain back into the crankcase. If the engine is cold, do not start it before checking the oil level.
3. Open the hood and locate the engine oil dipstick. Pull the dipstick from its tube, wipe it clean, and reinsert it. Make sure the dipstick is fully inserted.
4. Pull the dipstick from its tube again. Holding it horizontally, read the oil level. The oil should be between the MIN and MAX marks or the notches on the dipstick. If the oil is below the MIN mark or lower notch, add oil of the proper viscosity through the capped opening of the valve cover.
5. Replace the dipstick, and check the level again after adding any oil. Be careful not to overfill the crankcase. Approximately one quart of oil will raise the level from the low mark to the high mark. Excess oil will generally be consumed at an accelerated rate even if no damage to the engine seals occurs.

OIL & FILTER CHANGE

See Figures 152 thru 163

The oil and filter should be changed every 7,500 miles (12,000 km) under normal service and every 3,000 miles (5,000 km) under severe service.

CAUTION

The EPA warns that prolonged contact with used engine oil may cause a number of skin disorders, including cancer! You should make every effort to minimize your exposure to used engine oil. Protective gloves should be worn when changing the oil. Wash your hands and any other exposed skin areas as soon as possible after exposure to used engine oil. Soap and water, or waterless hand cleaner should be used.

The engine oil and oil filter should be changed at the recommended intervals on the Maintenance Chart. Though some manufacturers have at times recommended changing the filter only at every other oil change, Chilton recommends that you always change the filter with the oil. The benefit of fresh oil is quickly lost if the old filter is clogged and unable to do its job. Also, leaving the old filter in place leaves a significant amount of dirty oil in the system.

The oil should be changed more frequently if the vehicle is being operated in a very dusty area. Before draining the oil, make sure that the engine is at operating temperature. Hot oil will hold more impurities in suspension and will flow better, allowing the removal of more oil and dirt.

It is a good idea to warm the engine oil first so it will flow better. This can be accomplished by 15–20 miles of highway driving. Fluid which is warmed to normal operating temperature will flow faster, drain more completely and remove more contaminants from the engine.

1. Raise and support the vehicle safely on jackstands. Make sure the oil drain plug is at the lowest point on the oil pan. If not, you may have to raise the vehicle slightly higher on one jackstand (side) than the other.
2. Before you crawl under the vehicle, take a look at where you will be working and gather all the necessary tools, such as a few wrenches or a ratchet and strip of sockets, the drain pan, some clean rags and, if the oil filter is more accessible from underneath the vehicle, you will also want to grab a bottle of oil, the new filter and a filter wrench at this time.
3. Position the drain pan beneath the oil pan drain plug. Keep in mind that the fast flowing oil, which will spill out as you pull the plug from the pan, will flow with enough force that it could miss the pan. Position the drain pan accordingly and be ready to move the pan more directly beneath the plug as the oil flow lessens to a trickle.
4. Loosen the drain plug with a wrench (or socket and driver), then carefully unscrew the plug with your fingers. Use a rag to shield your fingers from the heat. Push in on the plug as you unscrew it so you can feel when all of the screw threads are out of the hole (and so you will keep the oil from seeping past the threads until you are ready to remove the plug). You can then remove the plug quickly to avoid having hot oil run down your arm. This will also help assure that have the plug in your hand, not in the bottom of a pan of hot oil.


93151p65

Fig. 152 Loosen the drain plug on the engine oil pan with a wrench. The drain plug's head is usually 17mm


93151p66

Fig. 153 When loosened sufficiently, slowly turn the drain plug by hand, keeping constant inward pressure on the plug to prevent oil from streaming out until you are ready

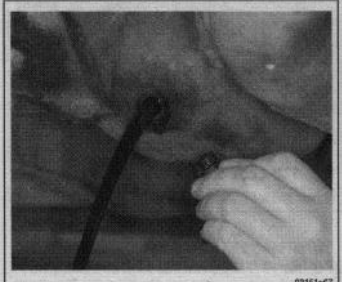

93151p67

Fig. 154 When you are ready, carefully pull the drain plug out and to the side, out of the way of flowing oil


93151p68

Fig. 155 Clean and inspect the threads on the oil pan

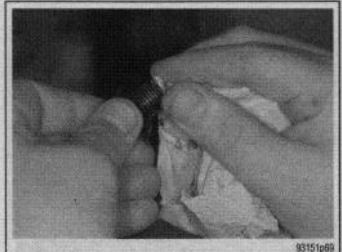

93151p69

Fig. 156 Also inspect the drain plug threads before installing it back into the oil pan. Make sure the gasket on the drain plug is in place and does not require replacement


93151p70

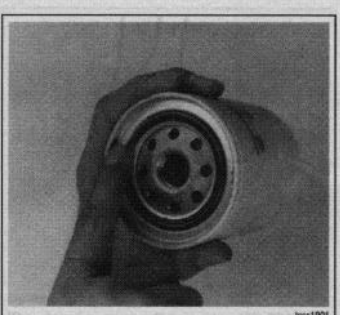
Fig. 157 A plier-type filter wrench is used here to loosen the filter

93151p77

Fig. 158 When the filter is sufficiently loosened with the filter wrench, turn the filter by hand, but be careful, as oil will start to run out of the filter

93151p78

Fig. 159 Once the oil filter is completely unthreaded, remove the filter from the engine

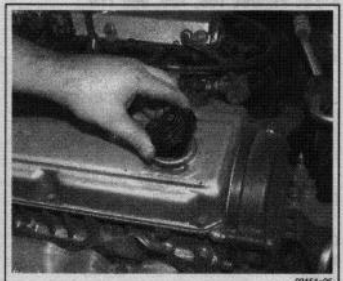


tccs1901

Fig. 160 Before installing a new oil filter, lightly coat the rubber gasket with clean oil

93151p72

Fig. 161 Before installing a new oil filter, clean the gasket mounting surface of the oil filter housing and inspect the threads



93151p25

Fig. 162 Loosen and remove the oil filler cap . . .

93151p26

Fig. 163 . . . then insert a funnel, and pour oil directly into the engine

⚠ CAUTION

Be careful of the oil; when at operating temperature, it is hot enough to cause a severe burn.

5. Allow the oil to drain until nothing but a few drops come out of the drain hole. Check the drain plug to make sure the threads and sealing surface are not damaged. Carefully thread the plug into position and tighten it snug, and give a slight additional turn. You don't want the plug to fall out (as you would quickly become stranded), but the pan threads are EASILY stripped from overtightening (and this can be time consuming and/or costly to fix).

6. To remove the filter, you may need an oil filter wrench since the filter may have been fitted too tightly and/or the heat from the engine may have made it even tighter. A filter wrench can be obtained at any auto parts store and is well-worth the investment. Loosen the filter with the filter wrench. With a rag wrapped around the filter, unscrew the filter from the boss on the side of the engine. Be careful of hot oil that will run down the side of the filter. Make sure that your drain pan is under the filter before you start to remove it from the engine; should some of the hot oil happen to get on you, there will be a place to dump the filter in a hurry and the filter will usually spill a good bit of dirty oil as it is removed.

7. Wipe the base of the mounting boss with a clean, dry cloth. When you install the new filter, smear a small amount of fresh oil on the gasket with your finger, just enough to coat the entire contact surface. When you tighten the filter, rotate it about a quarter-turn after it contacts the mounting boss (or follow any instructions which are provided on the filter or parts box).

⚠ WARNING

Operating the engine without the proper amount and type of engine oil will result in severe engine damage.

8. Remove the jackstands and carefully lower the vehicle, then IMMEDIATELY refill the engine crankcase with the proper amount of oil. DO NOT WAIT TO DO THIS because if you forget and someone tries to start the vehicle, severe engine damage will occur.

9. Refill the engine crankcase slowly, checking the level often. You may notice that it usually takes less than the amount of oil listed in the capacity chart to refill the crankcase. But, that is only until the engine is run and the oil filter is filled with oil. To make sure the proper level is obtained, run the engine to normal operating temperature, shut the engine **OFF**, allow the oil to drain back into the oil pan, and recheck the level. Top off the oil at this time to the fill mark.

➡If the vehicle is not resting on level ground, the oil level reading on the dipstick may be slightly off. Be sure to check the level only when the vehicle is sitting level.

10. Drain your used oil in a suitable container for recycling.

Manual Transaxle

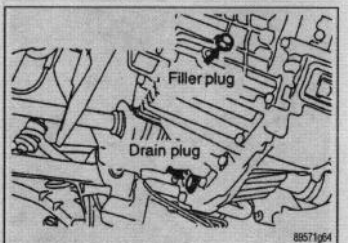
FLUID RECOMMENDATIONS

For all vehicles with manual transaxles, use Hypoid gear oil SAE 75W-85W, or 75W-90W conforming to API specifications GL-4 or higher.

LEVEL CHECK

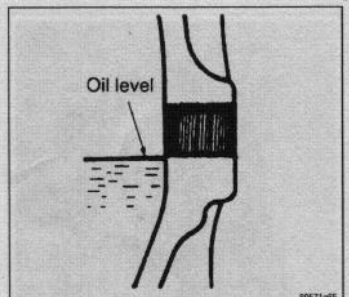
♦ See Figures 164 and 165

Inspect each component for leaking. Check the oil level by removing the filler plug. If the oil is contaminated, it is necessary to replace it with new oil. Check the oil level as follows:



88571g64

Fig. 164 Typical manual transaxle drain and filler plug location



89571g65

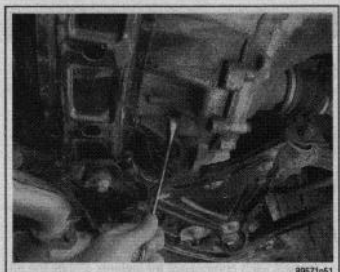
Fig. 165 Oil, when at the proper level, will reach the lower edge of the filler hole opening

1. Make sure the vehicle is parked on a level surface.
2. Remove the filler plug and make sure the oil level is up to the lower edge of the filler plug hole.
3. Check to be sure that the transaxle oil is not noticeably dirty and that it has a suitable viscosity.

DRAIN & REFILL

See Figures 166 and 167

1. Make sure the vehicle is parked on a level surface.
2. Raise and safely support the vehicle. Place a suitable drain pan under the manual transaxle.
3. Remove the filler plug and the drain plug and allow the oil to drain completely.



89571p51

Fig. 166 Use a box-end wrench to loosen the manual transaxle drain plug . . .

89571p52

Fig. 167 . . . then withdraw the plug and drain the manual transaxle oil into a suitable container

4. Install the drain plug and tighten to 22 ft. lbs. (30 Nm).
5. Refill the transaxle to the proper level, as shown in the Capacities chart, with the appropriate fluid. The oil level should be at the bottom of the oil filler hole.
6. When the oil reaches the proper level, install the filler plug and tighten to 22 ft. lbs. (30 Nm).

Automatic Transaxle

FLUID RECOMMENDATIONS

Mitsubishi recommends the use of Mercon® automatic transmission fluid.

LEVEL CHECK

See Figures 168, 169, and 170

The transaxle dipstick is located behind the air inlet hose, towards the firewall.

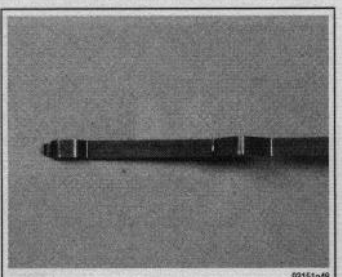
1. Park the vehicle on a level surface.
2. The transaxle should be at normal operating temperature when checking fluid level. To ensure the fluid is at normal operating temperature, drive the vehicle at least 10 miles.
3. With the selector lever in **P** and the parking brake applied, start the engine.
4. Open the hood and locate the transaxle fluid dipstick. Pull the dipstick from its tube, wipe it clean, and reinsert it. Make sure the dipstick is fully inserted.

93151p20

Fig. 168 The automatic transaxle dipstick is typically located under the air cleaner inlet tube. Pull the dipstick up to remove it from the transaxle

93151p21

Fig. 169 Wipe the dipstick clean and insert it into the transaxle again to get the correct fluid level reading



93151p48

Fig. 170 The fluid level is OK if it is within the between the HOT and ADD areas on the dipstick. Do not overfill the transaxle or problems could occur

5. Pull the dipstick from its tube again. Holding it horizontally, read the fluid level. The fluid should be between the MIN and MAX mark. If the fluid is below the MIN mark, add fluid through the dipstick tube.
6. Insert the dipstick, and check the level again after adding any fluid. Be careful not to overfill the transaxle.

DRAIN & REFILL

See Figures 171 thru 177

1. Raise and support the vehicle safely.
2. Place a suitable drain pan under the transaxle drain plug.
3. Remove the transaxle pan drain plug. Let the fluid completely drain out of the transaxle.
4. Install the drain plug and tighten it to 22–25 ft. lbs. (30–35 Nm).
5. If equipped, remove the drain plug on the differential of the transaxle.
6. Install the differential drain plug and tighten it to 22–25 ft. lbs. (30–35 Nm).
7. Remove the drain pan.
8. Lower the vehicle.
9. Fill the transaxle through the dipstick to the proper level.
10. Place the gear selector lever in **P** and start the engine. Run the engine at idle, engage the emergency brake and hold the brake pedal down. Move the gear selector lever through all transaxle ranges for approximately 5 minutes.
11. Return the selector lever to **P** and leave the engine running at idle.
12. Check the transaxle fluid level. The fluid level at normal operating temperature should read within the crosshatched area of the fluid level dipstick.
13. If the fluid level reads below the crosshatched area, adjust the level by adding fluid in small increments until the correct fluid level is obtained.

PAN & FILTER SERVICE

See Figures 178 thru 184

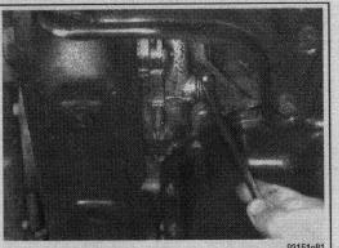
The fluid should be changed according to the schedule in the Maintenance Intervals chart. If the car is normally used in severe service, such as stop and start driving, trailer towing, or the like, the interval should be halved. If the car is driven under especially nasty conditions, such as in heavy city traffic where the temperature normally reaches 90°F (32°C), or in very hilly or mountainous areas, or in police, taxi, or

93151p79

Fig. 171 The transaxle drain plug is located on the bottom of the fluid pan. Typically the drain plug requires a 17mm wrench

93151p80

Fig. 172 Carefully pull the transaxle drain plug out and to the side, out of the way of flowing transaxle oil



93151p81

Fig. 173 The differential drain plug is located at the bottom of the transaxle, to the left of the fluid pan. Typically the drain plug requires a 17mm wrench

93151p82

Fig. 174 Carefully pull the differential drain plug out and and to the side, out of the way of flowing transaxle oil

93151p54

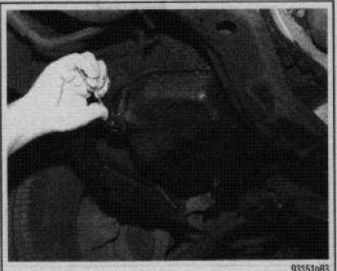
Fig. 175 A long, thin funnel is necessary to access the transaxle dipstick tube

93151p53

Fig. 176 Place the funnel into the opening on the dipstick tube

93151p49

Fig. 177 Pour the fluid directly into the funnel, periodically checking the fluid level to make sure you do not overfill the transaxle



93151p83

Fig. 178 Typically to remove the transaxle pan mounting bolts, a 10mm wrench is required. Remove the pan retaining bolts . . .

93151p85

Fig. 179 . . . then carefully lower the fluid pan from the transaxle

93151p86

Fig. 180 Remove the four filter retaining bolts . . .

93151p87

Fig. 181 . . . then remove the transaxle filter from the valve body

93151p89

Fig. 182 Remove the transaxle pan gasket from the pan

93151p90

Fig. 183 Thoroughly clean the mating surfaces of the pan and . . .

93151p88

Fig. 184 . . . the transaxle case before installing the gasket and pan onto the case

delivery service, the fluid should be changed according to the severe service schedule.

The fluid must be hot before it is drained; a 20 minute drive should accomplish this.

1. Raise and safely support the vehicle.
2. Drain the fluid from the transaxle. See the procedure above.
3. Place a drain pan underneath the transaxle pan, then remove the pan attaching bolts.
4. If the pan is stuck on the transaxle, very carefully pry the pan loose on one corner. You can use a small prybar for this if you work CAREFULLY. Do not distort the pan flange, or score the mating surface of the transaxle case. You'll be very sorry later if you do.

➡If the drained fluid is discolored (brown or black), thick, or smells burnt, serious transaxle troubles, probably due to overheating, should be suspected. Your car's transaxle should be inspected by a reliable transaxle specialist to determine the problem.

5. Remove the pan and gasket.
6. Clean the pan with solvent and allow it to air dry. If you use a rag to wipe out the pan, you risk leaving bits of lint behind, which will clog the dinky hydraulic passages in the transaxle.
7. Remove the filter retaining bolts and remove the filter from the valve body.

To install:

8. Install a new filter, then install the retaining bolts and tighten them to 5 ft. lbs. (7 Nm).
9. Position the gasket on the pan, then install the pan. Tighten the bolts evenly and in rotation to 8–9 ft. lbs. (10–12 Nm.). Do not overtighten.
10. Lower the vehicle.
11. Add the recommended automatic transaxle fluid to the transaxle through the dipstick tube. You will need a long necked funnel, or a funnel and tube to do this. A quick check of the capacities chart later in this Section will reveal the capacity of the transaxle in your vehicle. On a first fill after removing the pan and filter, this number should be cut into a 1/3 and checked on the dipstick before refilling.
12. With the transaxle in **P**, put on the parking brake, block the front wheels, start the engine and let it idle. DO NOT RACE THE ENGINE. DO NOT MOVE THE LEVER THROUGH ITS RANGES.
13. With the lever in Park, check the fluid level. If it's OK, take the car out for a short drive, park on a level surface, and check the level again, as outlined earlier in this section. Add more fluid if necessary. Be careful not to overfill, which will cause foaming and fluid loss.

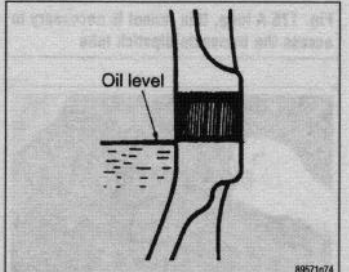
Transfer Case (AWD Galant Only)

FLUID RECOMMENDATIONS

When adding fluid or refilling the transfer case, use Hypoid gear oil SAE 75W-85W or 75W-90W conforming to API specifications GL-4 or higher.

LEVEL CHECK

➧ See Figure 185



89571g74

Fig. 185 Check to be sure the fluid reaches the bottom edge of the transfer case filler plug hole

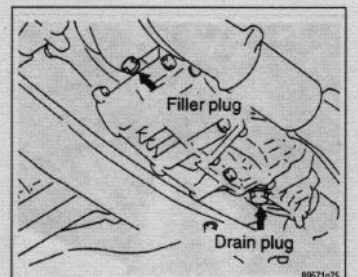
Inspect each component for leaking. Check the oil level by removing the filler plug. If the oil is contaminated, it is necessary to replace it with new oil.

1. Park the vehicle on level surface.
2. Remove the filler plug and make sure the oil level reaches the lower edge of the filler plug hole.
3. Check to be sure that the oil is not noticeably dirty and that it has the proper viscosity.
4. If necessary, add oil through the filler hole until is runs out of the hole.

DRAIN & REFILL

➧ See Figure 186

1. Raise and safely support the vehicle, for access to the transfer case.
2. Place a suitable drain pan under the transfer case fluid drain plug.



89571g75

Fig. 186 Location of the transfer case filler and drain plugs

3. Remove the filler and the drain plug and allow the oil to drain into the drain pan.
4. After the fluid has drained completely, install the drain plug and tighten to 24 ft. lbs. (32 Nm).
5. Refill the transfer case to the proper level with Hypoid gear oil SAE 75W-85W/75W-90W conforming to API specifications GL-4 or higher. The oil level should reach the bottom edge of the oil filler hole.
6. Install the transfer case filler plug and tighten to 24 ft. lbs. (32 Nm).
7. Carefully lower the vehicle.

Rear Drive Axle (AWD Galant Only)

FLUID RECOMMENDATIONS

➧ See Figure 187

Since fluid viscosity range may vary depending on specific temperature range of operation, please refer to the accompanying chart for the proper fluid for your vehicle.

Lubricant	API classification GL-5 or higher
Anticipated temperature range	Viscosity range
Above −23°C (−10°F)	SAE 90 SAE 85W-90 SAE 80W-90
−23°C to −34°C (−10°F to −30°F)	SAE 80W, SAE 80W-90
Below −34°C (−30°F)	SAE 75W

89571g76

Fig. 187 Rear axle lubricant application chart

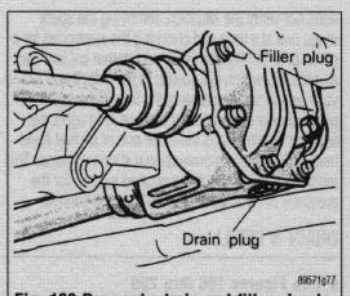
LEVEL CHECK

1. Make sure the vehicle is parked on level ground.
2. Remove the oil fill plug to check the oil level.
3. The oil level is sufficient if it reaches the lower portion of the filler plug hole. If the fluid is low, add as required through the filler plug.

DRAIN & REFILL

➧ See Figure 188

1. Position the vehicle on a flat surface or raise and safely support the vehicle in a level position.
2. Place a suitable drain pan under the rear axle.



89571g77

Fig. 188 Rear axle drain and filler plug locations—AWD models

3. Remove the filler and the drain plugs and allow the oil to drain completely into the pan.
4. Install the drain plug and tighten to 24 ft. lbs. (32 Nm).
5. Refill the rear axle with the proper type and amount of fluid. The level should reach the bottom of the oil filler hole.
6. Install the filler plug and tighten to 24 ft. lbs. (32 Nm).
7. If raised, carefully lower the vehicle.

Cooling System

FLUID RECOMMENDATIONS

A good quality ethylene glycol based or other aluminum compatible antifreeze is recommended for use in the vehicles covered by this manual. It is best to add a 50/50 mix of antifreeze and distilled water to avoid diluting the coolant in the system.

LEVEL CHECK

See Figure 189

The coolant recovery tank is located in the engine compartment, typically on the fender well.

The proper coolant level is slightly above the **FULL COLD** marking on the recovery tank when the engine is cold. Top off the cooling system using the recovery tank and its marking as a guideline.

➡Never overfill the recovery tank.

A coolant level that consistently drops is usually a sign of a small, hard to detect leak, although in the worst case it could be a sign of an internal engine leak. In most cases, you will be able to trace the leak to a loose fitting or damaged hose.

Evaporating ethylene glycol antifreeze will have a sweet smell and leave small, white (salt-like) deposits, which can be helpful in tracing a leak.

⁂ CAUTION

Never open, service or drain the radiator or cooling system when hot; serious burns can occur from the steam and hot coolant. Also, when draining engine coolant, keep in mind that cats and dogs are attracted to ethylene glycol antifreeze and could drink any that is left in an uncovered container or in puddles on the ground. This will prove fatal in sufficient quantities. Always drain coolant into a sealable container. Coolant should be reused unless it is contaminated or is several years old.

TESTING FOR LEAKS

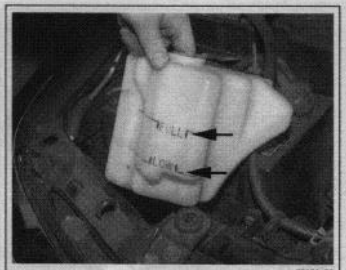
See Figures 190 thru 195

If a the fluid level of your cooling system is constantly low, the chances of a leak are probable. There are several ways to go about finding the source of your leak.

The first way should be a visual inspection. During the visual inspection, look around the entire engine area including the radiator and the heater hoses. The interior of the car should be inspected behind the glove box and passenger side floorboard area, and check the carpet for any signs of moisture. The smartest way to go about finding a leak visually is to first inspect any and all joints in the system such as where the radiator hoses connect to the radiator and the engine. Another thing to look for is white crusty stains that are signs of a leak where the coolant has already dried.

If a visual inspection cannot find the cause of your leak, a pressure test is a logical and extremely helpful way to find a leak. A pressure tester will be needed to perform this and if one is not available they can be purchased or even rented at many auto parts stores. The pressure tester usually has a standard size radiator cap adapter on the pressure port, however, other adapters are available based on the size of the vehicle's radiator neck or recovery tank depending on where the pressure tester connects. when pressurizing the cooling system, make sure you do not exceed the pressure rating of the system, which can be found on the top of the radiator cap, however, if you have and aftermarket or replacement cap that does not have the rating on it, 16psi is a standard to use but some cars are higher. Overpressurizing the system can cause a rupture in a hose, or worse, in the radiator or heater core and possibly cause an injury or a burn if the coolant is hot. Overpressurizing is normally controlled by the radiator cap which has a vent valve in it which is opened when the system reaches it's maximum pressure rating. To pressure test the system:

➡The pressure test should be performed with the engine OFF.

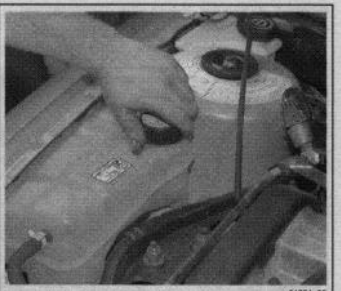


93151p28

Fig. 189 The coolant level should be between the FULL and LOW levels on the coolant recovery tank

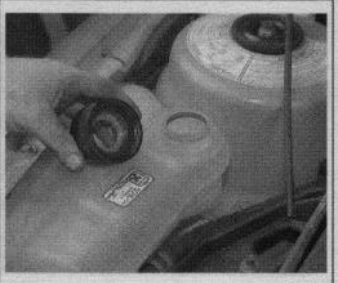
93151p23

Fig. 190 A visual inspection for leaks will sometimes find a leak. This photo shows evidence of a leak at the upper radiator hose-to-thermostat housing junction



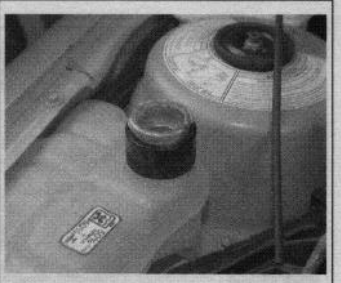
91051p85

Fig. 191 Remove the recovery tank cap to allow the pressure tester to be connected to the system



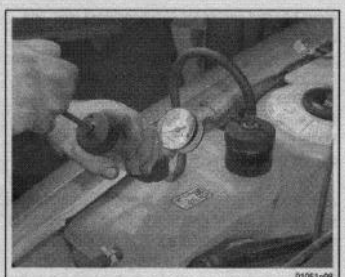
91051p96

Fig. 192 This cooling system requires a threaded adapter for the recovery tank to allow the pressure tester to be connected



91051p97

Fig. 193 Thread the adapter onto the recovery tank



91051p98

Fig. 194 Pump the cooling system with pressure, making sure not to overpressurize the system or damage can occur

91051p99

Fig. 195 Watch the gauge on the system and observe the pressure reading

1. Remove the radiator or recovery tank cap.
2. Using the proper adapter, insert it onto the opening and connect the pressure tester,
3. Begin pressurizing the system by pumping the pressure tester and watching the gauge, when the maximum pressure is reached, stop.
4. Watch the gauge carefully and see if the pressure on the gauge drops, if it does, a leak is definitely present.
5. If the pressure stayed somewhat stable, visually inspect the system for leaks. If the pressure dropped, repressurize the system and then visually inspect the system.
6. If no signs of a leak are noticed visually, pressurize the system to the maximum pressure rating of the system and leave the pressure tester connected for about 30 minutes. Return after 30 minutes and verify the pressure on the gauge, if the pressure dropped more than 20%, a leak definitely exists, if the pressure drop is less than 20%, the system is most likely okay.

Another way coolant is lost is by a internal engine leak, causing the oil to be contaminated or the coolant to be burned in the process of combustion and sent out the exhaust. To check for oil contamination, remove the dipstick and check the condition of the oil in the oil pan. If the oil is murky and has a white or beige "milkshake" look to it, the coolant is contaminating the oil through an internal leak and the engine must be torn down to find the leak. If the oil appears okay, the coolant can be burned and going out the tailpipe. A quick test for this is a cloud of white smoke appearing from the tailpipe, especially on start-up. On cold days, the white smoke will appear, this is due to condensation and the outside temperature, not a coolant leak. If the "smoke test" does not verify the situation, removing the spark plugs one at a time and checking the electrodes for a green or white tint can verify an internal coolant leak and identify which cylinder(s) is the culprit and aiding your search for the cause of the leak. If the spark plugs appear okay, another method is to use a gas analyzer or emissions tester, or one of several hand-held tools that most professional shops possess. This tools are used to check the cooling system for the presence of Hydrocarbons (HC's) in the coolant.

DRAIN & REFILL

See Figures 196 thru 205

Ensure that the engine is completely cool prior to starting this service.

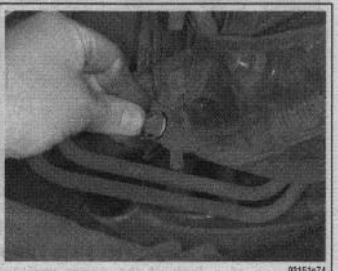
CAUTION

Never open, service or drain the radiator or cooling system when hot; serious burns can occur from the steam and hot coolant. Also, when draining engine coolant, keep in mind that cats and dogs are attracted to ethylene glycol antifreeze and could drink any that is left in an uncovered container or in puddles on the ground. This will prove fatal in sufficient quantities. Always drain coolant into a sealable container. Coolant should be reused unless it is contaminated or is several years old.

1. Remove the recovery tank or radiator cap.
2. Raise and support the vehicle.
3. If necessary, remove the splash shield from under the front of the vehicle.

93151p73

Fig. 196 The draincock is usually located at the bottom of the radiator

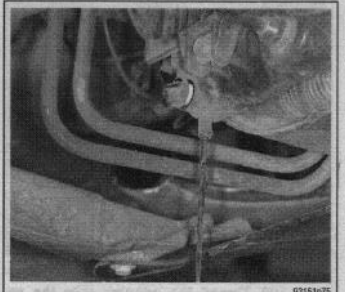


93151p74

Fig. 197 Gently rotate the draincock counterclockwise to open the draincock . . .

93151p76

Fig. 198 . . . then allow the coolant to drain out of the radiator and cooling system

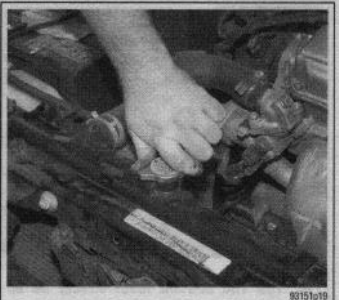


93151p75

Fig. 199 Allow the fluid to drain until it stops and tighten the draincock hand tight

93151p27

Fig. 200 Make sure to heed the caution on the radiator cap and NEVER open the cap when the engine is hot

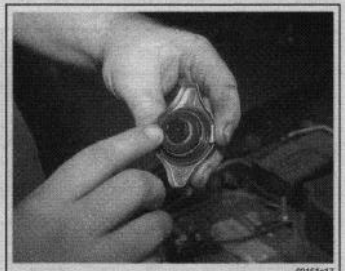


93151p19

Fig. 201 Grasp the radiator cap and rotate it counterclockwise . . .

93151p18

Fig. 202 . . . to remove the cap from the radiator



93151p17

Fig. 205 Be sure the rubber gasket on the radiator cap has a tight seal

4. Place a drain pan of sufficient capacity under the radiator and open the petcock (drain) on the radiator.

➡Plastic petcocks easily bind. Before opening a plastic radiator petcock, spray it with some penetrating lubricant.

5. Drain the cooling system completely.
6. Close the petcock.
7. Remove the drain pan.
8. If necessary, install the splash shield under the vehicle.
9. Lower the vehicle.
10. Determine the capacity of the cooling system, then properly refill the system at the recovery tank and radiator with a 50/50 mixture of fresh coolant and distilled water until it reaches the **FULL COLD** line.
11. Leave the recovery tank or radiator cap off to aid in bleeding the system.
12. Start the engine and allow it to idle until the thermostat opens (the upper radiator hose will become hot). The coolant level should go down, this is normal as the system bleeds the air pockets out of the system.
13. Refill the system with coolant to the proper level.
14. Turn the engine **OFF** and check for leaks.

FLUSHING & CLEANING THE SYSTEM

1. Drain the cooling system completely as described earlier.
2. Close the petcock and fill the system with a cooling system flush (clean water may also be used, but is not as efficient).
3. Idle the engine until the upper radiator hose gets hot.

93151p16

Fig. 203 Pour the proper 50/50 coolant mixture into the radiator . . .

4. Allow the engine to cool completely and drain the system again.
5. Repeat this process until the drained water is clear and free of scale.
6. Flush the recovery tank with water and leave empty.

⁂ CAUTION

Never open, service or drain the radiator or cooling system when hot; serious burns can occur from the steam and hot coolant. Also, when draining engine coolant, keep in mind that cats and dogs are attracted to ethylene glycol antifreeze and could drink any that is left in an uncovered container or in puddles on the ground. This will prove fatal in sufficient quantities. Always drain coolant into a sealable container. Coolant should be reused unless it is contaminated or is several years old.

7. Fill and bleed the cooling system as described earlier.

Brake Master Cylinder

The brake master cylinder reservoir is located under the hood, attached to the brake booster and firewall on the driver's side of the engine compartment.

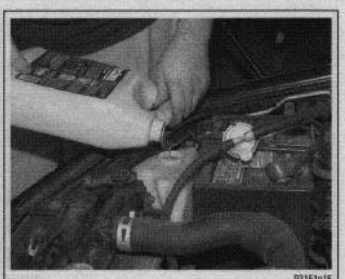
FLUID RECOMMENDATIONS

⁂ CAUTION

Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with the eyes and wash your hands thoroughly after handling brake fluid. If you do get brake fluid in your eyes, flush your eyes with clean, running water for 15 minutes. If eye irritation persists, or if you have taken brake fluid internally, IMMEDIATELY seek medical assistance.

⁂ WARNING

Clean, high quality brake fluid is essential to the safe and proper operation of the brake system. You should always buy the highest quality brake fluid that is available. If the brake fluid becomes contaminated, drain and flush the system, then refill the master cylinder with new fluid. Never reuse any brake



93151p15

Fig. 204 . . . make sure to fill the coolant recovery tank to the proper level also

fluid. Any brake fluid that is removed from the system should be discarded. Also, do not allow any brake fluid to come in contact with a painted surface; it will damage the paint.

When adding fluid to the system, ONLY use fresh DOT 3 brake fluid from a sealed container. DOT 3 brake fluid will absorb moisture when it is exposed to the atmosphere, which will lower its boiling point. A container that has been opened once, closed and placed on a shelf will allow enough moisture to enter over time to contaminate the fluid within. If your brake fluid is contaminated with water, you could boil the brake fluid under hard braking conditions and lose all or some braking ability. Don't take the risk, buy fresh brake fluid whenever you must add to the system.

LEVEL CHECK

◗ See Figures 206 thru 211

⁂ CAUTION

Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with the eyes and wash your hands thoroughly after handling brake fluid. If you do get brake fluid in your eyes, flush your eyes with clean, running water for 15 minutes. If eye irritation persists, or if you have taken brake fluid internally, IMMEDIATELY seek medical assistance.

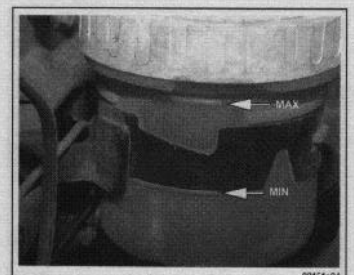
⁂ WARNING

Be careful to avoid spilling any brake fluid on painted surfaces, because the paint coat will become discolored or damaged.

Observe the fluid level indicators on the master cylinder; the fluid level should be between the **MIN** and **MAX** lines.

Before removing the master cylinder reservoir cap, make sure the vehicle is resting on level ground and clean all dirt away from the top of the master cylinder. Unscrew the cap and fill the master cylinder until the level is between the **MIN** and **MAX** lines.

If the level of the brake fluid is less than half the volume of the reservoir, it is advised that you check the brake system for leaks. Leaks in a hydraulic brake system most commonly occur at the wheel cylinder and brake line junction points.

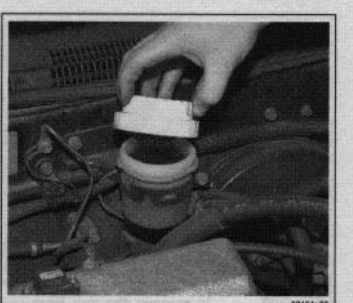


93151p34

Fig. 206 The fluid level should be between the MAX and MIN lines; if the fluid level is low, be sure to check the brakes

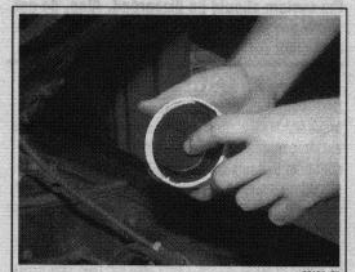
93151p29

Fig. 207 Wipe the master cylinder reservoir clean before opening the cap to ensure that no contamination enters the brake fluid



93151p29

Fig. 208 Unscrew the master cylinder cap and remove it from the reservoir

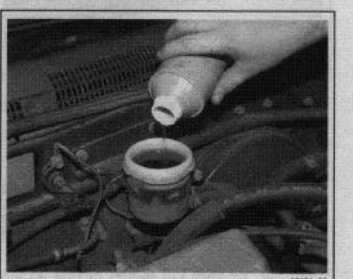


93151p31

Fig. 209 If the master cylinder cap gasket is swelled like such, it can be a sign of contamination. If the gasket is swelled . . .

93151p32

Fig. 210 . . . make sure to push the gasket back to the normal position



93151p33

Fig. 211 Carefully pour approved brake fluid from a fresh, sealed container directly into the reservoir

Clutch Master Cylinder

FLUID RECOMMENDATIONS

When adding or changing the fluid in the systems, use a quality brake fluid conforming to DOT 3 specifications from an sealed container. Never reuse old brake fluid.

LEVEL CHECK

See Figures 212, 213, and 214

1. Wipe the clutch master cylinder reservoir cap and the surrounding area clean with a shop towel.
2. Inspect the fluid in the reservoir, making sure fluid is between the MAX and the MIN marks.
3. If required, remove the clutch master cylinder reservoir lid, then add fresh fluid to fill to the top full mark on the reservoir.

WARNING

Be careful to avoid spilling any brake fluid on painted surfaces, because the paint coat will become discolored or damaged.

4. Reinstall the lid onto the clutch master cylinder.
5. If removed, install the air cleaner assembly.

Power Steering Pump

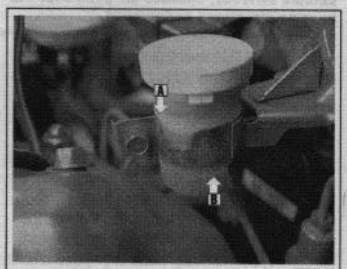
FLUID RECOMMENDATIONS

When adding or changing the power steering fluid, use Dexron®II ATF (Automatic Transmission Fluid).

LEVEL CHECK

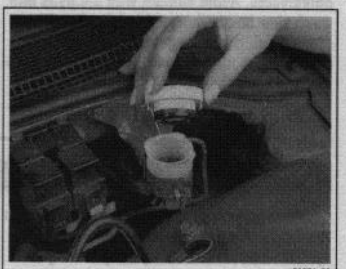
See Figures 215, 216, 217, and 218

Like all other general maintenance items, check every 3,000 miles (4,800 km) or once a month. Inspect the oil level in the reservoir by checking the po-



89571p21

Fig. 212 The clutch master cylinder has MAX (A) and MIN (B) fill lines on the reservoir



89571p22

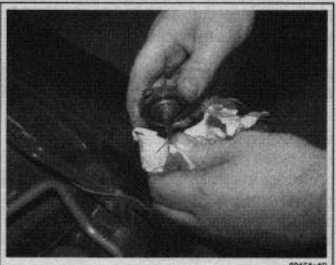
Fig. 213 Remove the clutch master cylinder lid by pulling it straight up and off the reservoir

89571p23

Fig. 214 If the fluid is low, add until it reaches the proper level on the side of the reservoir

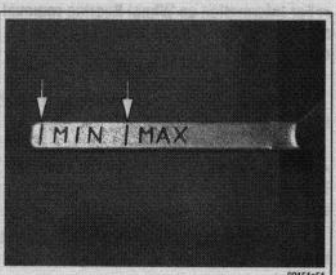
93151p14

Fig. 215 Twist the reservoir cap, then lift up on the integral cap/dipstick assembly



93151p12

Fig. 216 Wipe the dipstick off, reinsert it into the reservoir and check the level



93151p51

Fig. 217 Make sure the fluid lines are between the MIN and MAX lines on the dipstick

93151p13

Fig. 218 If the power steering level is low, add fluid to the reservoir until the proper level is reached

sition of the fluid against the mark on the dipstick. Add fluid to the reservoir if the fluid does not reach the appropriate full line.

Chassis Greasing

On most models, the manufacturer doesn't install lubrication fittings on lube points on the steering linkage or suspension. However, if the lubrication point does have a grease fitting, lubricate with multi-purpose NLGI No. 2 (Lithium base) grease.

Body Lubrication and Maintenance

CAR WASHING

The car should be washed at regular intervals to remove dirt, dust, insects, and tar and other possibly damaging stains that can adhere to the paint and may cause damage. Proper exterior maintenance also helps in the resale value of the vehicle by maintaining its like-new appearance.

➡It is particularly important to frequently wash the car in the wintertime to prevent corrosion, when salt has been used on the roads.

There are many precautions and tips on washing, including the following:

- When washing the car, do not expose it do direct sunlight.
- Use lukewarm water to soften the dirt before you wash with a sponge, and plenty of water, to avoid scratching.
- A detergent can be used to facilitate the softening of dirt and oil.
- A water-soluble grease solvent may be used in cases of sticky dirt. However, use a washplace with a drainage separator.
- Dry the car with a clean chamois and remember to clean the drain holes in the doors and rocker panels.
- If equipped with a power radio antenna, it must be dried after washing.

⁂ CAUTION

Never clean the bumpers with gasoline or paint thinner, always use the same agent as used on the painted surfaces of the vehicle.

- Tar spots can be removed with tar remover or kerosene after the car has been washed.
- A stiff-bristle brush and lukewarm soapy water can be used to clean the wiper blades. Frequent cleaning improves visibility when using the wipers considerably.
- Wash off the dirt from the underside (wheel housings, fenders, etc.).
- In areas of high industrial fallout, more frequent washing is recommended.

⁂ CAUTION

During high pressure washing the spray nozzle must never be closer to the vehicle than 13 inches (30cm). Do not spray into the locks.

- When washing or steam cleaning the engine, avoid spraying water or steam directly on the electrical components or near the distributor or ignition components. After cleaning the engine, the spark plug wells should be inspected for water and blown dry if necessary.
- Special car washing detergent is the best to use. Liquid dishwashing detergent can remove wax and leave the car's paint unprotected and in addition some liquid detergents contains abrasives which can scratch the paint.
- Bird droppings should be removed from the paintwork as soon as possible, otherwise the finish may be permanently stained.

⁂ WARNING

When the car is driven immediately after being washed, apply the brakes several times in order to remove any moisture from the braking surfaces.

⁂ WARNING

Engine cleaning agents should not be used when the engine is warm, a fire risk is present as most engine cleaning agents are highly flammable.

Automatic car washing is a simple and quick way to clean your car, but it is worth remembering that it is not as thorough as when you yourself clean the car. Keeping the underbody clean is vitally important, and some automatic washers do not contain equipment for washing the underside of the car.

When driving into an automatic was, make sure the following precautions have been taken:

- Make sure all windows are up, and no objects that you do not want to get wet are exposed.
- In some cases, rotating the side view mirrors in can help to avoid possible damage.
- If your car is equipped with a power antenna, lower it. If your vehicle has a solid mounted, non-power antenna, it is best to remove it, but this is not always practical. Inspect the surroundings to reduce the risk of possible damage, and check to see if the antenna can be manually lowered.

⁂ WARNING

Most manufacturers do not recommend automatic car washing in the first six months due to the possibility of insufficient paint curing; a safe bet is to wait until after six months of ownership (when purchased new) to use an automatic car wash.

WAXING

➡Before applying wax, the vehicle must be washed and thoroughly dried.

Waxing a vehicle can help to preserve the appearance of your vehicle. A wide range of polymer-based car waxes are available today. These waxes are easy to use and produce a long-lasting, high gloss finish that protects the body and paint against oxidation, road dirt, and fading.

Sometimes, waxing a neglected vehicle, or one that has sustained chemical or natural element damage (such as acid rain) require more than waxing, and a light-duty compound can be applied. For severely damaged surfaces, it is best to consult a professional to see what would be required to repair the damage.

Waxing procedures differ according to manufacturer, type, and ingredients, so it is best to consult the directions on the wax and/or polish purchased.

INTERIOR CLEANING

Upholstery

Fabric can usually be cleaned with soapy water or a proper detergent. For more difficult spots caused by oil, ice cream, soda, etc., use a fabric cleaner available at most parts stores. Be sure when purchasing the cleaner to read the label to ensure it is safe to use on your type of fabric. A safe method of testing the cleaner is to apply a small amount to an area usually unseen, such as under a seat, or other areas. Wait a while, perhaps even a day to check the spot for fading, discoloring, etc., as some cleaners will only cause these problems after they have dried.

Leather upholstery requires special care, it can be cleaned with a mild soap and a soft cloth. It is recommended that a special leather cleaner be used to clean but also treat the leather surfaces in your vehicle. Leather surfaces can age quickly and can crack if not properly taken care of, so it is vital that the leather surfaces be maintained.

Floor Mats and Carpet

The floor mats and carpet should be vacuumed or brushed regularly. They can be cleaned with a mild soap and water. Special cleaners are available to clean the carpeted surfaces of your vehicle, but take care in choosing them, and again it is best to test them in a usually unseen spot.

Dashboard, Console, Door Panels, Etc.

The dashboard, console, door panels, and other plastic, vinyl, or wood surfaces can be cleaned using a mild soap and water. Caution must be taken to keep water out of electronic accessories and controls to avoid shorts or ruining the components. Again special cleaners are available to clean these surfaces, as with other cleaners care must taken in purchasing and using such cleaners.

There are protectants available which can treat the various surfaces in your car giving them a "shiny new look", however some of these protectants can cause more harm than good in the long run. The shine that is placed on your dashboard attracts sunlight accelerating the aging, fading and possibly even cracking the surfaces. These protectants also attract more dust to stick to the surfaces they treat, increasing the cleaning you must do to maintain the appearance of your vehicle. Personal discretion is advised here.

Wheel Bearings

On most models covered by this manual, the wheel bearings used are sealed units and do not require routine maintenance. However on some Galant and Mirage models, the rear wheel bearing do require periodic repacking. For removal and installation instructions, please refer to Section 7 (for rear bearings) or Section 8 (for front bearings).

REPACKING

➡Sodium based grease is not compatible with lithium based grease. Read the package labels and be careful not to mix the two types. If there is any doubt as to the type of grease used, completely clean the old grease from the bearing and hub before replacing.

Before handling the bearings, there are a few things that you should remember to do and not to do.

DO the following:

- Remove all outside dirt from the housing before exposing the bearing.
- Treat a used bearing as gently as you would a new one.
- Work with clean tools in clean surroundings.
- Use clean, dry gloves, or at least clean, dry hands.
- Clean solvents and flushing fluids are a must.
- Use clean paper when laying out the bearings to dry.
- Protect disassembled bearings from rust and dirt. Cover them up.
- Use clean, lint-free rags to wipe the bearings.
- Keep the bearings in oil-proof paper when they are to be stored or are not in use.
- Clean the inside of the housing before replacing the bearing.

Do NOT do the following:

- Do not work in dirty surroundings.
- Do not use dirty, chipped or damaged tools.
- Do not work on wooden work benches or use wooden mallets.
- Do not handle bearings with dirty or moist hands.
- Do not use gasoline for cleaning. Use a safe solvent.
- Do not spin dry bearings with compressed air. They will be damaged.
- Do not use cotton waste or dirty cloths to wipe bearings.
- Do not scratch or nick bearing surfaces.
- Do not allow the bearing to come in contact with dirt or rust at any time.

The rear wheel bearings on some Galant and Mirage models require periodic maintenance. A premium high melting point grease meeting Grade Multipurpose Grease NLGI Grade #2 or equivalent must be used. Long fiber type greases must not be used. This service is recommended every 30,000 miles (48,000 km).

➡For information on Wheel Bearing removal and installation, refer to Section 7 of this manual.

1. Remove the wheel bearing.
2. Clean all parts in a non-flammable solvent and let them air dry.

➡Only use lint-free rags to dry the bearings. Never spin-dry a bearing with compressed air, as this will damage the rollers.

3. Check for excessive wear and damage. Replace the bearing as necessary.

➡Packing wheel bearings with grease is best accomplished by using a wheel bearing packer (available at most automotive parts stores).

4. If a wheel bearing packer is not available, the bearings may be packed by hand.
   a. Place a "healthy" glob of grease in the palm of one hand.
   b. Force the edge of the bearing into the grease so that the grease fills the space between the rollers and the bearing cage.
   c. Keep rotating the bearing while continuing to push the grease through.
   d. Continue until the grease is forced out the other side of the bearing.
5. Place the packed bearing on a clean surface and cover it until it is time for installation.
6. Install the wheel bearing.

TOWING THE VEHICLE

Front Wheel Drive Models

See Figures 219 and 220

To prevent the bumper from deforming, these vehicles cannot be towed by a wrecker using sling-type equipment. If these vehicles require towing, use a wheel lift or flat bed equipment. It is recommended that the vehicle be towed from the front if a flat bed is not available.

Manual transaxle vehicles may be towed from the rear provided that the transaxle is in Neutral and the driveline has not been damaged. The steering wheel must be clamped in the straight-ahead position with a steering wheel clamping device designed for towing service use.

⁂ CAUTION

Do not use the steering column lock to secure the front wheel position for towing.

Automatic transaxle vehicles may be towed on the front wheels at speeds not to exceed 30 mph (50 km/h) for a distance not to exceed 18 miles (30 km). If these limits can not be met, then the front wheels must be placed on a tow dolly.

All Wheel Drive Models

See Figure 221

All Wheel Drive (AWD) vehicles should only be towed with all 4 wheels on the ground or lifted from the road surface. This means that the vehicle is to be towed either with flatbed equipment, with all wheels on dollies or flat towed. Damage to the viscous coupling may result if the vehicle is towed with only 2 wheels on the ground.

JUMP STARTING A DEAD BATTERY

See Figure 222

Whenever a vehicle is jump started, precautions must be followed in order to prevent the possibility of

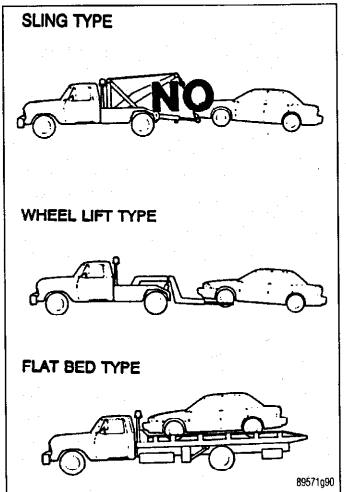


Fig. 219 Front towing position—FWD vehicles

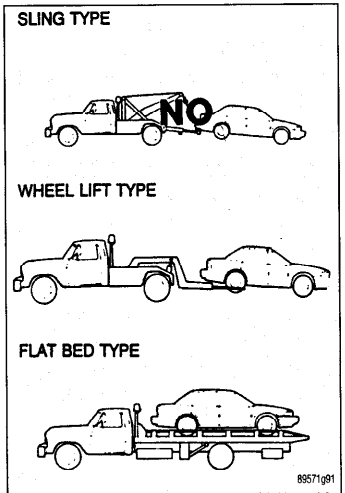


Fig. 220 Rear towing position—FWD vehicles

Towing methods	Remarks
If a tow truck is used Lifting method for 4 wheels—**Good**	• For 4WD models, the basic principle is that all four wheels are to be raised before towing. • The shift lever should be set to 1st gear and the parking brake should be applied.
Front wheels lifted—**No good**	• The vehicle must not be towed by placing only its front wheels or only the rear wheels on a rolling dolly, because to do so will result in deterioration of the viscous coupling and result in the viscous coupling causing the vehicle to jump forward suddenly.
Front wheels lifted—**No good**	• If only the front wheels or only the rear wheels are lifted for towing, the bumper will be damaged. In addition, lifting of the rear wheels causes the oil to flow forward, and may result in heat damage to the rear bushing of the transfer, and so should never be done.
Rear wheels lifted—**No good**	
Towing by rope or cable—**Good**	• The front and rear wheels must rotate normally. • The various mechanisms must function normally. • The shift lever must be set to the neutral position and the ignition key must be set to "ACC".

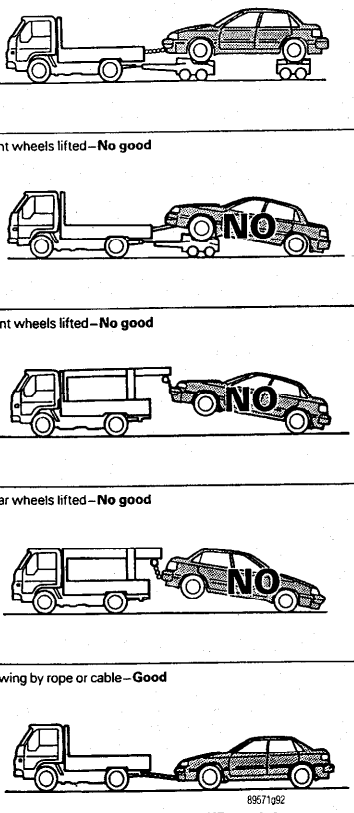


Fig. 221 Towing instructions—AWD models

personal injury. Remember that batteries contain a small amount of explosive hydrogen gas which is a by-product of battery charging. Sparks should always be avoided when working around batteries, especially when attaching jumper cables. To minimize the possibility of accidental sparks, follow the procedure carefully.

⁂ CAUTION

NEVER hook the batteries up in a series circuit or the entire electrical system will go up in smoke, including the starter!

Vehicles equipped with a diesel engine may utilize two 12 volt batteries. If so, the batteries are connected in a parallel circuit (positive terminal to positive terminal, negative terminal to negative terminal). Hooking the batteries up in parallel circuit increases battery cranking power without increasing total battery voltage output. Output remains at 12 volts. On the other hand, hooking two 12 volt batteries up in a series circuit (positive terminal to negative terminal, positive terminal to negative terminal) increases total battery output to 24 volts (12 volts plus 12 volts).

Jump Starting Precautions

- Be sure that both batteries are of the same voltage. Vehicles covered by this manual and most vehicles on the road today utilize a 12 volt charging system.
- Be sure that both batteries are of the same polarity (have the same terminal, in most cases NEGATIVE grounded).
- Be sure that the vehicles are not touching or a short could occur.
- On serviceable batteries, be sure the vent cap holes are not obstructed.
- Do not smoke or allow sparks anywhere near the batteries.
- In cold weather, make sure the battery electrolyte is not frozen. This can occur more readily in a battery that has been in a state of discharge.
- Do not allow electrolyte to contact your skin or clothing.

Jump Starting Procedure

1. Make sure that the voltages of the 2 batteries are the same. Most batteries and charging systems are of the 12 volt variety.

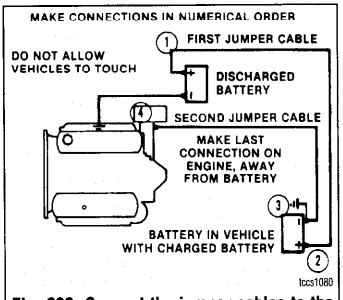


Fig. 222 Connect the jumper cables to the batteries and engine in the order shown

2. Pull the jumping vehicle (with the good battery) into a position so the jumper cables can reach the dead battery and that vehicle's engine. Make sure that the vehicles do NOT touch.

3. Place the transmissions/transaxles of both vehicles in **Neutral** (MT) or **P** (AT), as applicable, then firmly set their parking brakes.

➡If necessary for safety reasons, the hazard lights on both vehicles may be operated throughout the entire procedure without significantly increasing the difficulty of jumping the dead battery.

4. Turn all lights and accessories OFF on both vehicles. Make sure the ignition switches on both vehicles are turned to the **OFF** position.

5. Cover the battery cell caps with a rag, but do not cover the terminals.

6. Make sure the terminals on both batteries are clean and free of corrosion or proper electrical connection will be impeded. If necessary, clean the battery terminals before proceeding.

7. Identify the positive (+) and negative (–) terminals on both batteries.

8. Connect the first jumper cable to the positive (+) terminal of the dead battery, then connect the other end of that cable to the positive (+) terminal of the booster (good) battery.

9. Connect one end of the other jumper cable to the negative (−) terminal on the booster battery and the final cable clamp to an engine bolt head, alternator bracket or other solid, metallic point on the engine with the dead battery. Try to pick a ground on the engine that is positioned away from the battery in order to minimize the possibility of the 2 clamps touching should one loosen during the procedure. DO NOT connect this clamp to the negative (–) terminal of the bad battery.

CAUTION

Be very careful to keep the jumper cables away from moving parts (cooling fan, belts, etc.) on both engines.

10. Check to make sure that the cables are routed away from any moving parts, then start the donor vehicle's engine. Run the engine at moderate speed for several minutes to allow the dead battery a chance to receive some initial charge.

11. With the donor vehicle's engine still running slightly above idle, try to start the vehicle with the dead battery. Crank the engine for no more than 10 seconds at a time and let the starter cool for at least 20 seconds between tries. If the vehicle does not start in 3 tries, it is likely that something else is also wrong or that the battery needs additional time to charge.

12. Once the vehicle is started, allow it to run at idle for a few seconds to make sure that it is operating properly.

13. Turn ON the headlights, heater blower and, if equipped, the rear defroster of both vehicles in order to reduce the severity of voltage spikes and subsequent risk of damage to the vehicles' electrical systems when the cables are disconnected. This step is especially important to any vehicle equipped with computer control modules.

14. Carefully disconnect the cables in the reverse order of connection. Start with the negative cable that is attached to the engine ground, then the negative cable on the donor battery. Disconnect the positive cable from the donor battery and finally, disconnect the positive cable from the formerly dead battery. Be careful when disconnecting the cables from the positive terminals not to allow the alligator clips to touch any metal on either vehicle or a short and sparks will occur.

JACKING

◗ See Figures 223, 224, 225, 226, and 227

Your vehicle was supplied with a jack for emergency road repairs. This jack is fine for changing a flat tire or other short term procedures not requiring you to go beneath the vehicle. If it is used in an emergency situation, carefully follow the instructions provided either with the jack or in your owner's manual. Do not attempt to use the jack on any portions of the vehicle other than specified by the vehicle manufacturer. Always block the diagonally opposite wheel when using a jack.

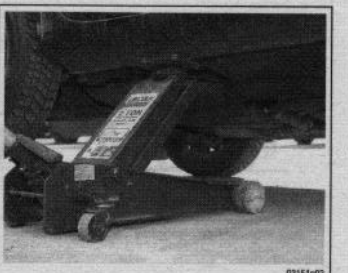
A more convenient way of jacking is the use of a garage or floor jack. You may use the floor jack to raise the front of the vehicle by placing it under the front subframe. The rear of the vehicle is most easily raised by using the lift points on the drip rail. All models are equipped with lift points located on the mid- crossmember in the front and a bracket located on the floorpan underneath the trunk.

Never place the jack under the radiator, engine or transaxle components. Severe and expensive damage will result when the jack is raised. Additionally, never jack under the floorpan or bodywork; the metal will deform.

Whenever you plan to work under the vehicle, you must support it on jackstands or ramps. Never use cinder blocks or stacks of wood to support the vehicle, even if you're only going to be under it for a few minutes. Never crawl under the vehicle when it is supported only by the tire-changing jack or other floor jack.

➡Always position a block of wood or small rubber pad on top of the jack or jackstand to protect the lifting point's finish when lifting or supporting the vehicle.

Small hydraulic, screw, or scissors jacks are satisfactory for raising the vehicle. Drive-on trestles or

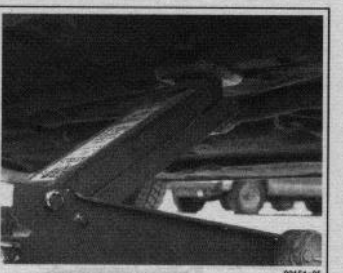


93151p03

Fig. 223 The easiest and most accessible place to place the jack when raising the rear of the vehicle is on the drip rail

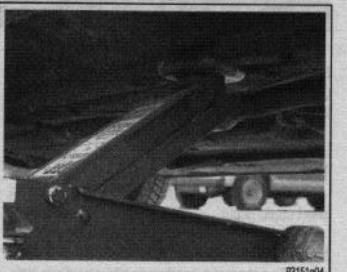
93151p06

Fig. 224 Place the jackstands also on the drip rail to support the rear of the vehicle once it is raised to the working position



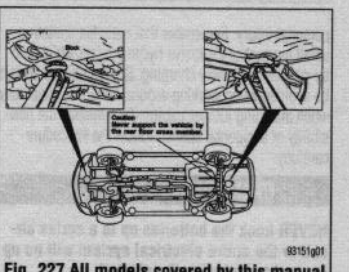
93151p05

Fig. 225 The most practical place to place the jack to raise the front of the vehicle is under the front subframe



93151p04

Fig. 226 Place the jackstands also on the subframe to support the front of the vehicle once it is raised to the working position



93151g01

Fig. 227 All models covered by this manual are equipped with lift points on the mid-crossmember in the front and on a bracket on the floorpan in the rear

ramps are also a handy and safe way to both raise and support the vehicle. Be careful though, some ramps may be too steep to drive your vehicle onto without scraping the front bottom panels. Never support the vehicle on any suspension member (unless specifically instructed to do so by a repair manual) or by an underbody panel.

Jacking Precautions

The following safety points cannot be overemphasized:

- Always block the opposite wheel or wheels to keep the vehicle from rolling off the jack.
- When raising the front of the vehicle, firmly apply the parking brake.
- When the drive wheels are to remain on the ground, leave the vehicle in gear to help prevent it from rolling.
- Always use jackstands to support the vehicle when you are working underneath. Place the stands beneath the vehicle's jacking brackets. Before climbing underneath, rock the vehicle a bit to make sure it is firmly supported.

SCHEDULED MAINTENANCE INTERVALS
(MITSUBISHI DIAMANTE, GALANT, & MIRAGE)

TO BE SERVICED	TYPE OF SERVICE	VEHICLE MILEAGE INTERVAL (x1000)												
		7.5	15	22.5	30	37.5	45	52.5	60	67.5	75	82.5	90	97.5
Engine oil & filter	R	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Automatic transaxle fluid & filter	S/I		✓		✓		✓		✓		✓		✓	
Brake hoses	S/I		✓		✓		✓		✓		✓		✓	
Disc brake pads	S/I		✓		✓		✓		✓		✓		✓	
Driveshaft boots	S/I		✓		✓		✓		✓		✓		✓	
Valve clearance (Mirage)	S/I		✓		✓		✓		✓		✓		✓	
Air cleaner element	R				✓				✓				✓	
Engine coolant	R				✓				✓				✓	
Spark plugs (except Diamante w/platinum tip)	R				✓				✓				✓	
Spark plugs (Diamante w/platinum tip)	R								✓					
Ball joints & steering linkage seals	S/I				✓				✓				✓	
Drive belt(s)	S/I				✓				✓				✓	
Exhaust system	S/I				✓				✓				✓	
Fuel hoses	S/I				✓				✓				✓	
Manual transaxle oil (Mirage)	S/I				✓				✓				✓	
Manual transaxle oil (including transfer)	S/I				✓				✓				✓	
Manual transaxle oil (Galant)	S/I				✓				✓				✓	
Rear axle oil	S/I				✓				✓				✓	
Rear drum brake linings & rear wheel cylinders (Galant & Mirage)	S/I				✓				✓				✓	
Ignition cables	R								✓					
Timing belt(s)	R								✓					
Distributor cap & rotor	S/I								✓					
EVAP system (except canister)	S/I								✓					
Fuel system (tank, pipe line, connection & fuel tank filler tube cap)	S/I								✓					

R - Replace S/I - Service or Inspect

FREQUENT OPERATION MAINTENANCE (SEVERE SERVICE)

If a vehicle is operated under any of the following conditions it is considered severe service:

- Extremely dusty areas.

- 50% or more of the vehicle operation is in 32°C (90°F) or higher temperatures, or constant operation in temperatures below 0°C (32°F).

- Prolonged idling (vehicle operation in stop and go traffic).

- Frequent short running periods (engine does not warm to normal operating temperatures).

- Police, taxi, delivery usage or trailer towing usage.

Oil & oil filter change - change every 3000 miles.

Disc brake pads - service or inspect ever 6000 miles.

Air filter element - service or inspect every 15,000 miles.

Automatic transaxle fluid & filter - replace every 15,000 miles.

Rear drum brake linings & rear wheel cylinders (Galant & Mirage).

Spark plugs (except Diamante w/platinum tip) - replace every 15,000 miles.

Manual transaxle oil (including transfer (Galant & Mirage) - replace every 30,000 miles.

93151c09

CAPACITIES

Year	Model	Engine Displacement Liters (cc)	Engine ID/VIN	Engine Oil with Filter (qts.)	Transmission (qts.)		Transfer Case (qts.)	Drive Axle		Fuel Tank (gal.)	Cooling System (qts.)
					Manual	Auto.		Front (qts.)	Rear (qts.)		
1990	Mirage	1.5 (1468)	4G15/A	3.4	1.8	6.5	—	—	—	13.2	5.3
	Galant	2.0 (1997)	4G63/V	4.1	1.9	6.4	—	—	—	15.9	7.6
	Galant	2.0 (1997)	4G63/R	4.6	2.4	6.4	—	—	—	15.9	7.6
1991	Mirage	1.5 (1468)	4G15/A	3.4	1.8	6.5	—	—	—	13.2	5.3
	Mirage	1.6 (1595)	4G61/Y	4.6	1.9	6.5	—	—	—	13.2	5.3
	Galant	2.0 (1997)	4G63/V	4.1	1.9	6.4	—	—	—	15.9	7.6
	Galant	2.0 (1997)	4G63/R	4.6	2.4	6.4	—	—	—	15.9	7.6
	Galant	2.0 (1997)	4G63/U	4.6	2.4	6.9	—	—	0.74	15.9	7.6
1992	Mirage	1.5 (1468)	4G15/A	3.4	1.8	6.5	—	—	—	13.2	5.3
	Mirage	1.6 (1595)	4G61/Y	4.6	1.9	6.5	—	—	—	13.2	5.3
	Galant	2.0 (1997)	4G63/V	4.1	1.9	6.4	—	—	—	15.9	7.6
	Galant	2.0 (1997)	4G63/R	4.6	2.4	6.4	—	—	—	15.9	7.6
	Galant	2.0 (1997)	4G63/U	4.6	2.4	6.9	—	—	0.74	15.9	7.6
	Diamante	3.0 (2972)	6G72/H	4.5	—	7.9	—	—	—	19.0	8.5
	Diamante	3.0 (2972)	6G72/J	4.5	—	7.9	—	—	—	19.0	8.5
1993	Mirage	1.5 (1468)	4G15/A	3.5	2.2	6.3	—	—	—	13.2	5.3
	Mirage	1.8 (1834)	4G93/C	4.0	2.3	6.3	—	—	—	13.2	6.3
	Galant	2.0 (1997)	4G63/V	4.1	1.9	6.4	—	—	—	15.9	7.6
	Galant	2.0 (1997)	4G63/R	4.6	2.4	6.4	—	—	—	15.9	7.6
	Diamante	3.0 (2972)	6G72/H	4.5	—	7.9	—	—	—	19.0	8.5
	Diamante	3.0 (2972)	6G72/J	4.5	—	7.9	—	—	—	19.0	8.5
1994	Mirage	1.5 (1468)	4G15/A	3.5	2.2	6.3	—	—	—	13.2	5.3
	Mirage	1.8 (1834)	4G93/C	4.0	2.3	6.3	—	—	—	13.2	6.3
	Galant	2.4 (2350)	4G64/G	4.5	2.2	6.3	—	—	—	16.9	7.4
	Galant	2.4 (2350)	4G64/L	4.5	2.2	7.9	—	—	—	16.9	7.4
	Diamante	3.0 (2972)	6G72/H	4.5	—	7.9	—	—	—	19.0	8.5
	Diamante	3.0 (2972)	6G72/J	4.5	—	7.9	—	—	—	19.0	8.5
1995	Mirage	1.5 (1468)	4G15/A	3.5	2.2	6.3	—	—	—	13.2	5.3
	Mirage	1.8 (1834)	4G93/C	4.0	2.3	6.3	—	—	—	13.2	6.3
	Galant	2.4 (2350)	4G64/G	4.5	2.2	6.3	—	—	—	16.9	7.4
	Galant	2.4 (2350)	4G64/L	4.5	2.2	7.9	—	—	—	16.9	7.4
	Mirage	1.8 (1834)	4G93/C	4.0	2.3	6.3	—	—	—	13.2	6.3
	Galant	2.4 (2350)	4G64/G	4.5	2.2	6.3	—	—	—	16.9	7.4
	Galant	2.4 (2350)	4G64/L	4.5	2.2	7.9	—	—	—	16.9	7.4
	Diamante	3.0 (2972)	6G72/H	4.5	—	7.9	—	—	—	19.0	8.5
	Diamante	3.0 (2972)	6G72/J	4.5	—	7.9	—	—	—	19.0	8.5
1997	Mirage	1.5 (1468)	4G15/A	3.5	2.2	8.2	—	—	—	13.2	5.3
	Mirage	1.8 (1834)	4G93/C	4.0	2.3	8.2	—	—	—	13.2	6.3
	Galant	2.4 (2350)	4G64/G	4.5	2.2	6.0	—	—	—	16.9	7.4
	Diamante	3.5 (3497)	6G74/P	4.5	—	9.0	—	—	—	18.7	10.0
1998	Mirage	1.5 (1468)	4G15/A	3.5	2.2	8.2	—	—	—	13.2	5.3
	Mirage	1.8 (1834)	4G93/C	4.0	2.3	8.2	—	—	—	13.2	6.3
	Galant	2.4 (2350)	4G64/G	4.5	2.3	6.3	—	—	—	16.9	7.4
	Diamante	3.5 (3497)	6G74/P	4.5	—	9.0	—	—	—	18.7	10.0
1999	Mirage	1.5 (1468)	4G15/A	3.5	2.2	8.2	—	—	—	13.2	5.3
	Mirage	1.8 (1834)	4G93/C	4.0	2.3	8.2	—	—	—	13.2	6.3
	Galant	2.4 (2350)	4G64/G	4.5	2.3	8.2	—	—	—	16.3	7.4
	Galant	3.0 (2972)	6G72/L	4.5	2.3	9.0	—	—	—	16.3	7.4
	Diamante	3.5 (3497)	6G74/P	4.5	—	9.0	—	—	—	18.7	10.0
2000	Mirage	1.5 (1468)	4G15/A	3.5	2.2	8.2	—	—	—	13.2	5.3
	Mirage	1.8 (1834)	4G93/C	4.0	2.3	8.2	—	—	—	13.2	6.3
	Galant	2.4 (2350)	4G64/G	4.5	2.3	8.2	—	—	—	16.3	7.4
	Galant	3.0 (2972)	6G72/L	4.5	2.3	9.0	—	—	—	16.3	7.4
	Diamante	3.5 (3497)	6G74/P	4.5	—	9.0	—	—	—	18.7	10.0

NOTE: All capacities are approximate. Add fluid gradually and ensure a proper fluid level is obtained.

93151c07