

Uniform Collision Repair Procedures

I-CAR has started a special project to develop uniform collision repair procedures. In the past two to three years, both interest and concern have been expressed by vehicle makers, insurance personnel, tool and equipment suppliers, educators, and collision repair businesses regarding uniform collision repair procedures. Issues surfaced over who will develop the procedures, how they will be distributed, who will be affected by them, and how they will be affected.

I-CAR plans to gather information for this project much like material is gathered for I-CAR courses. This is done by actively soliciting and accepting input from all interested parties to help assure accuracy and completeness. This information will be slowly sorted and assembled in draft form, sent out for review, then published.

VISION AND MISSION

The vision and mission statements for the project have already been adopted:

Our vision is "to be a leading provider of Industry-accepted collision repair procedures."

Our mission is "to collect, provide, maintain, and teach uniform colli-

Continued—Page 4

Headlight Aiming



Headlight aiming can be as basic as aiming the lights at a screen, or as high tech as directing a laser beam to record a digital image of the headlight beam. (Courtesy of Hopkins Manufacturing Corporation)

Checking headlight aim is one of the last adjustments you should do on a vehicle involved in a front-end collision. Even if the headlight area wasn't directly involved in the crash, impact forces may have changed the headlight aim. So any vehicle involved in a collision affecting the front end should have the headlights checked for proper aiming.

BACKGROUND

Strict headlight laws date back to the 1940s. Only sealed-beam headlights with limited brightness could be used, and headlights had to be aimed away from oncoming drivers. Some laws prohibited do-it-

yourself adjusting of headlights, leaving this task to an approved shop.

Until about 10 years ago, there were few changes in these early rules. In 1955, headlights were allowed to have up to 3000 candlepower. In the late '50s, vehicle makers started using four headlights instead of two. In the mid '70s, GM led the switch to rectangular shaped lights. Finally, the strict headlight laws were canceled. Vehicle makers successfully argued that they could make vehicles more aerodynamic and fuel efficient if they used smaller headlights that blended into the overall shape of the front end.

Continued—Page 2

IMPORTANCE OF AIMING

Although headlight laws were relaxed in recent years, proper aiming is still important. Many areas require a check of headlight aim as part of a vehicle inspection. Even more important than the requirements, aiming is critical to getting the most efficient use of headlights. A headlight that is misaimed by only one or two degrees can lose a lot of effectiveness.

Aiming is more critical with newer lighting systems. Sealed-beam headlights give a “soft” or “fuzzy” beam pattern, like an outdoor floodlight. There is a very gradual decrease in light intensity as you move away from center, allowing a lot of room for error when adjusting the beam.

Halogen beams and other high-intensity lighting systems produce a more focused, concentrated, light beam. Headlights today can have up to 150,000 candlepower. Not only is the beam brighter, but the intensity at the center falls off quickly toward the sides, producing a very narrow beam. These lights must be aimed very precisely.

The Basics Of Aiming

Despite all the new lighting systems available, the standard aiming procedure is still the same. Readings are taken on a wall or screen 7.6m (25ft) from the front of the vehicle. Ideally, when the low beams are on, the light from each headlight should form an oval pattern. The left edge of the driver-side oval should be about 50mm (2") to the right of the headlight's vertical center line (see Figure 1A). The top of the oval should touch,

but not be above, the headlight's horizontal centerline. Follow the same procedure for the passenger-side low beam.

On high beams, the vertical centerline for both headlight ovals should be on the centerline of each headlight. The horizontal centerline of the ovals should be about 13mm (½") below the horizontal centerline of the headlights (see Figure 1B).

If the vehicle has four headlights, two high and two low, the low beam headlights should be covered when testing the high beams.

For inspection, the beams do not have to be positioned exactly. For both low and high beams, the

position of the oval is acceptable if it is within about 50mm (2") of the vertical centerline and within about 50mm (2") of the horizontal centerline.

If the light beams don't fall within the acceptable limits, the headlights require adjustment. This is done by turning adjusting screws that move the headlight beam. One screw adjusts the beam up and down. The other adjusts it left and right. On most vehicles, the adjusting screws are reached from the front of the vehicle. In some cases, you must first remove trim pieces to get at the screws. On a few vehicles, the adjustment screws are reached from inside the hood or from behind the grille.

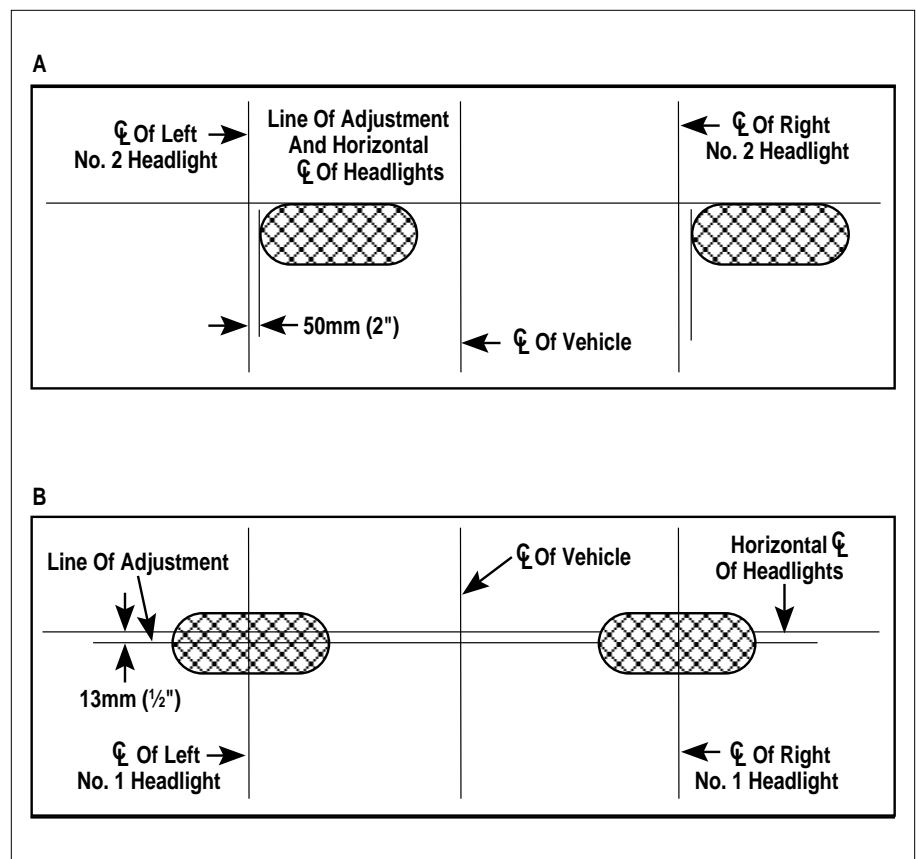


Figure 1—Simple headlight aiming involves comparing the oval pattern with grids drawn on a screen at a distance of 7.6m (25ft) from the vehicle.

VARIETY OF METHODS

There are different ways to aim headlights. The method you use depends upon the equipment available. No matter what type of aiming procedure you use, the basic setup is the same. The vehicle must be on a level surface. If the surface is sloping, it is hard, if not impossible, to get an accurate aim. Even the most advanced aimers require the vehicle to be on a level surface.

The vehicle should also be at its normal operating load. This means that it should be carrying the typical number of passengers and cargo. For most vehicles, this means one or two people in the front seat. Just like setting front end alignment, you need to know if your customer typically carries a heavy load in the trunk so you can aim the headlights properly, to those normal operating conditions.

Screen Method

Position the vehicle on a level surface, 7.6m (25ft) from a screen or vertical wall (see Figure 2). Measure the centerline position of all the headlights and compare the light beams with the centerline measurements. To find the centerline of the headlight, place a piece of white or light-yellow paper over the headlight. You'll see a dark spot on the paper. That is the center of the headlight.

The screen method doesn't require any equipment. It is also easy to do once you've practiced a few times. It does, however, have some limitations.

The test area must be dark or nearly dark. You may get better results with a slight background

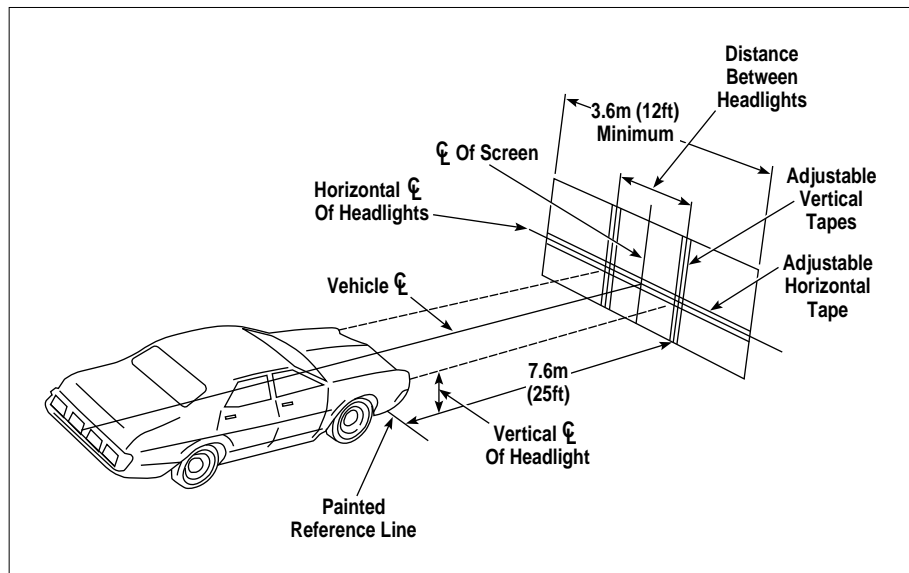


Figure 2—The screen method of aiming headlights requires a darkened area, with the vehicle parked 7.6m (25ft) away from the screen. (Courtesy of the American Automobile Manufacturers Association)

light rather than total darkness. The reason is that the background light eliminates some of the fuzziness of the beam pattern, making the oval easier to see. You also need a long test area. The test area must be at least 10.7m (35ft) long for small vehicles and up to 15.2m (50ft) long for large vehicles and trucks.

On-Vehicle Mechanical Aimer

On-vehicle aimers are devices that attach to the headlights, usually the aiming or mounting pads on the front of the headlights. A level indicator tells you when the headlights are horizontal. Mirrors, or a gauge, show when the headlights are positioned correctly with the headlight centerline.

On-vehicle aimers are relatively inexpensive, easy to use, and don't require a darkened shop and long test area. The only downside to on-vehicle aimers is that the vehicle makers are now designing headlights that don't have aiming pads. Without aiming pads, there is no

place to mount the on-vehicle aimer.

Off-Vehicle Mechanical Aimer

To get around the lack of aiming pads, mechanical off-vehicle aimers were developed. One type uses mirrors and level gauges, similar to an on-vehicle aimer, to set the headlight position. This unit isn't mounted on the headlight, but stands in front of the vehicle.

Off-Vehicle Electronic Aimer

The state of the art in headlight aiming is a fully electronic, laser-sighted beam aimer (see Figure 3). The unit is mounted on a track in the floor of the shop so that it can roll from bay to bay. A laser beam is used to find the centerline of the vehicle and then the center of the headlight.

Once the center of the headlight is located, the headlight is turned on. The light beam is converted into a digital computer image. The image

Continued—Page 4



Figure 3—The latest in headlight aiming equipment is a laser station that travels along a track. (Courtesy of Hopkins Manufacturing Corporation)

is shown on a small monitor screen (see Figure 4). The technician simply adjusts the headlight until the computer image is correctly positioned with the grid shown on the screen.

A printer gives a printout of all readings, both before and after adjusting (see Figure 5). The off-vehicle units, both mechanical and electronic, can handle any vehicle lighting system.

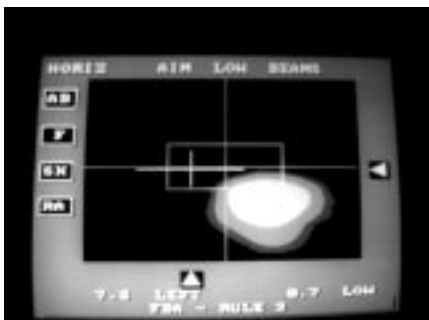


Figure 4—The laser station changes the headlight beam into a digital computer image, shown on a small screen. (Courtesy of Hopkins Manufacturing Corporation)

Automatic Aimers

Some luxury vehicle makers are experimenting with automatic, on-vehicle aimers that will adjust headlight position no matter what load is in the vehicle. These systems are complicated. You must follow the service manual procedures to set the initial aim for these systems.

CONCLUSION

Aiming headlights is an often-ignored task. Unless the headlights are far out of position, people seldom worry about headlight aim. If technicians check and adjust both low and high beams before returning the vehicle to the customer, everyone on the road benefits.

Try to make headlight aiming standard operating procedure, especially when repairing front-end collisions. Use whatever system that works for you. Headlight aiming adds a more professional image to any collision repair business. **A**



Figure 5—A printout of the headlight aiming dimensions is available with the system. (Courtesy of Hopkins Manufacturing Corporation)

Uniform Collision Repair Procedures—

Continued From Page 1

sion repair procedures that meet or exceed the needs of the inter-industry for the ultimate benefit of the consumer.”

The procedures will be published as separate documents, and they will become part of existing I-CAR courses.

TECHNICAL COMMITTEE

A Technical Committee has been invited to begin planning the project. One of the first tasks of the Committee is to recommend initial subjects for development.

The Technical Committee will help define the various forms the project could take. This may include electronic formats and printed material. The Technical Committee will work closely with a Steering Committee, Marketing Committee, and I-CAR Staff in this effort.

The Committee will then produce a task list defining the operations to be covered in the procedures. Technical Development Committees will be formed for each subject area. These committees will be made up of people with specific expertise in each area.

CONCLUSION

A set of uniform collision repair procedures for all collision facilities to use could be the beginning of a new era for the Collision Industry. I-CAR is pleased to be involved with the project. We are going forth with enthusiasm to bring new levels of quality and uniformity to our Industry. **A**

Vehicle Parts Theft

Theft of vehicles for parts has become big business around the world. In the U.S., more than 1.5 million vehicles were stolen in 1993, about one every 20 seconds (see Figure 1). In Canada, 147,000 vehicles were stolen that same year, about one every 3½ minutes. Many of these vehicles are disassembled at "chop shops," with thieves selling the parts to individuals, recyclers, and repair shops. Many of these parts get exported to Mexico or overseas in containers. The containers are labeled "household parts" and never checked.

The National Insurance Crime Bureau (NICB), a not-for-profit organization supported by about 1,000 property-casualty insurers and self-insured companies, is dedicated to combatting insurance crime in the U.S. The NICB estimates that vehicle theft has become an \$8 billion annual business in the United States.

AIR-BAG PARTS POPULAR

Although neither the NICB nor law enforcement agencies track which parts are stolen most frequently,

Vehicle Thefts Reported	
1987	1,288,674
1988	1,432,916
1989	1,564,800
1990	1,635,907
1991	1,635,907
1992	1,610,834
1993	1,561,047

Source: FBI Uniform Crime Reports

Figure 1—Vehicle thefts have been a major problem for several years.

they agree that air-bag parts are becoming a favorite target of parts thieves.

The most often stolen air-bag parts are the driver-side modules installed in steering wheels. This module generally consists of an inflator canister, a backing plate, horn buttons, and an electrical connector (see Figure 2). Stolen modules are sold for a fraction of their replacement cost.

A collision repair shop that purchases and installs a stolen air-bag part may face criminal and civil penalties, especially if the device malfunctions and threatens passenger safety.

Air-bag parts and systems are designed for the specific vehicle make and model in which they are installed. Several different modules may look alike and fit in a particular vehicle, but only the one designed for that vehicle will perform properly. Bag size and deployment speed vary, based on the size and design of the vehicle. An air bag from a 2-door vehicle may not perform properly in a 4-door vehicle of the same make.

Stolen air-bag parts may also have been improperly stored or exposed to certain environmental conditions that may prevent them from operating properly. An air bag that has been dropped a distance of more than 90cm (3ft), for example, should not be used. All vehicle makers now recommend that only new air-bag parts be used for replacement.

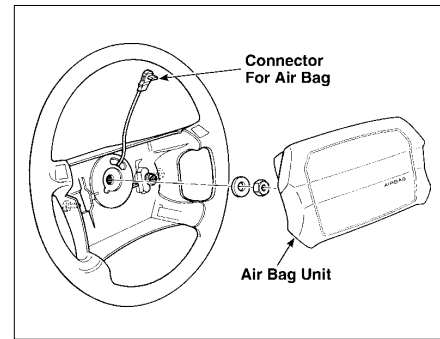


Figure 2—Driver-side air bag modules are one of the most frequent vehicle parts stolen. (Courtesy of Volkswagen of America)

TRACING PARTS IN THE U.S.

In an effort to make stolen parts easier to trace, 1984 laws required vehicle makers to inscribe VIN numbers on up to 14 major parts of popular makes and models. More recently, the 1992 Anti Car-Theft Act expanded the parts-marking requirements to include all makes and models by 1997.

This 1992 act requires that a national computerized database be established in order to allow repair shops installing a used part to verify that the part was not from a stolen vehicle. Failure to check the part's identification number could result in fines of up to \$25,000.

PILOT PROGRAM

A new program, designed to reduce the theft and resale of vehicle parts, will soon be tested in Texas. This could result in dramatic changes in the way insurers, recyclers, and collision repair shops handle salvage parts. This pilot program is designed to help determine if, and how stolen parts can be tracked.

Continued—Page 6

This project is being led by an inter-industry committee, along with the NICB, which will serve as the parts identification number clearing-house.

The pilot project is not planned as an enforcement program, but as a way to gather information. Committee representatives from the recycling, insurance, repair, and manufacturing industries have all expressed interest in helping reduce parts theft. They want to develop a system that does not create undue labor or expense for any one segment.

SUMMARY

The best way collision repair facilities can help slow down the rate of vehicle parts theft is to always deal with legitimate parts dealers. This isn't always easy. Shops could be unknowingly receiving stolen parts from recycling yards or parts dealers. Collision repair facilities can help track down dealers of stolen parts by reporting any unusual situations to the NICB or the local police. These situations could include:

- receiving parts that had a label, but the label is disfigured, or removed.
- getting offers from parts dealers to sell parts at huge discounts.

If you experience anything suspicious concerning recycled parts, call the NICB hotline for reporting vehicle parts theft at:

1-800-TEL-NICB

They will investigate the situation, and you'll be doing your part to reduce fraud in our industry. **A**

Ask I-CAR...

The I-CAR Tech Centre receives many questions on collision repair subjects and articles that appear in the *Advantage*. Some of those questions, and the answers, are being published as a regular feature.

Q Some earlier GM repair manuals showed quarter panel sectioning procedures. When I went to an I-CAR Class, I was told that GM did not recommend quarter panel sectioning. What is going on?

A Our contact at GM Service Technology Group says that those quarter panel sectioning recommendations were published at one time, but they have now been revised. GM does not generally recommend vertical, horizontal, or "belt cuts" in the quarter panels. This is because these areas are subject to an extreme amount of vehicle stress and flex.

There are some vehicle-specific exceptions you can find in GM body repair manuals. For example, there is a quarter panel belt cut procedure described in the 1995 Aurora/Riviera Body Repair Manual (see *Figure 1*).

Q What are I-CAR recommendations for wheel alignment following a collision?

A Collision repairs should restore the vehicle to pre-accident condition. Besides having the vehicle look good, the owner expects to have a vehicle which rides and handles the same as it did before the collision.

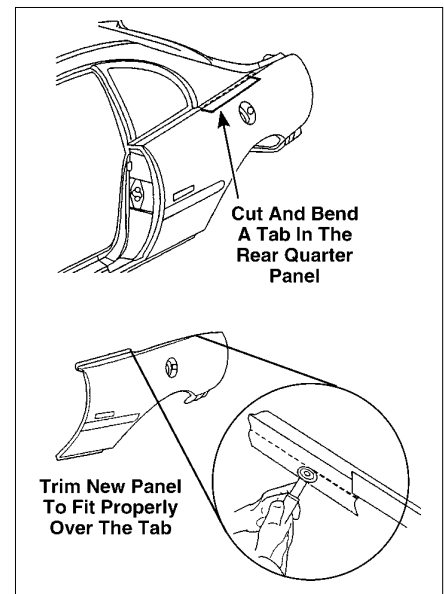


Figure 1—Sectioning recommendations for the quarter panels on the 1995 Aurora/Riviera include making belt cuts. Use this procedure on GM quarter panels only when recommended in the body repair manual. (Courtesy of GM)

Following collision repairs, a vehicle would require front-wheel alignment if there was:

- damage to any steering or front suspension part.
- suspected damage or mislocation of any steering and front suspension mounting locations.
- front-mounted engine cradle damage or position change.
- a front steering or suspension part removed for access.

Check the alignment of the rear wheels on vehicles that:

- have damage to rear suspension parts.
- had an adjustable rear suspension part removed for access.
- have damage to a rear suspension mounting location.
- have damage that caused a camber or toe change in the rear suspension.
- have received a side impact that caused a change in wheel-base.

If a four-wheel alignment is going to be performed, be sure to do the rear-wheel alignment first.

Q I have heard that GM has revised its policy on air-bag sensor replacement. Is this true?

A Yes. At one time General Motors recommended that all SRS sensors be replaced following an air bag deployment. The new replacement policy requires that only those sensors located in the collision-damaged area be replaced.

According to GM, the collision area is defined as that area of the vehicle which is crushed, bent, or damaged. Sensors in the area of collision damage should be replaced, even if those sensors do not appear to be damaged. Do not attempt to determine whether a sensor is OK. Always replace it if it is in the area of collision damage, regardless of whether the air bags have deployed.

The "sensor" is defined as the sensor case itself, mounting brackets, and the wiring pigtail (see Figure 2). Therefore, if the wiring pigtail of the sensor runs through the area of collision damage but the sensor case or bracket is not damaged, the sensor should still be replaced. Sensors in the passenger compartment, such as the arming sensor, would not require replacing.

Exceptions to the new policy are the Corvette and Geo Metro Convertible. These vehicles still require all sensors be replaced after a deployment-level collision.

Of course, if the DERM sets a diagnostic trouble code and the diagnostic chart tells you to replace a sensor that was not in the area of collision damage, that sensor should also be replaced.

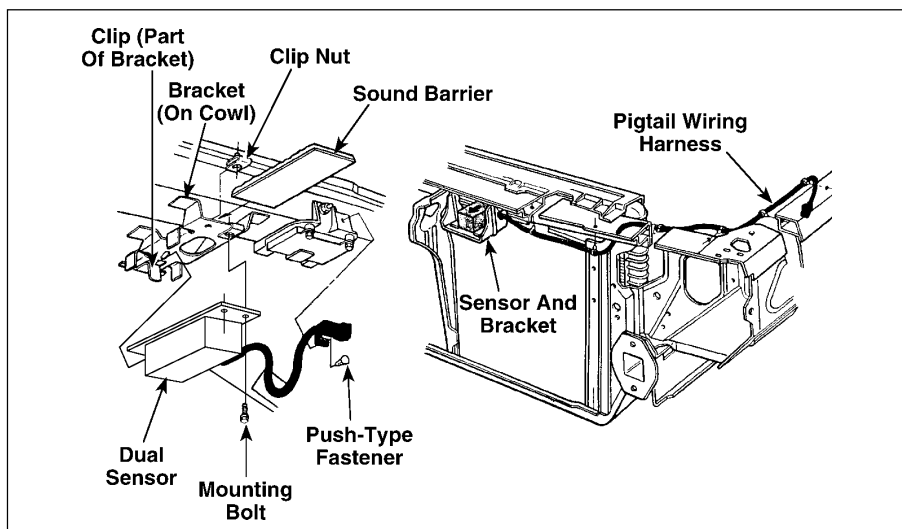


Figure 2—The air-bag sensor includes the sensor body, mounting bracket, and wiring pigtail. Shown is the mounting information for a discriminating sensor from a 1993 Pontiac Bonneville. (Courtesy of GM)

Q While repairing a vehicle, we noticed spots on the hood. We were told that they were caused by battery acid which splashed on the hood during the collision. We washed it off thoroughly. Is that enough?

A Unfortunately, no. The acid must be neutralized or the spots will keep reappearing, even if the hood is refinished.

Neutralize the acid using a baking soda solution. Mix 1 teaspoon of baking soda in a gallon of water (1½ fluid drams per liter) and soak towels in the solution. Lay the towels over the area and leave them for several minutes. Remove the towels and wash with car soap and water.

Another way is to put the baking soda solution in a spray bottle. Apply liberally to the spotted area, and allow it to remain in place for a few minutes, followed by washing.

You must check to make sure that the acid has been neutralized. Even though you cannot see the spots

anymore, the acid may not have been completely neutralized.

The easiest way to check is to purchase litmus paper strips from a hobby store, drug store, or school supply store. Dip one strip in distilled water (it is important to make sure the water is neutral) and place the strip on the dry hood where the spots were. The litmus paper will turn a color. Check the color of the litmus paper against the color band that comes with the paper.

You want a pH of 7, which is neutral. Anything lower than 7 is considered acidic. Pure battery acid has a pH of about 1 or 2. Keep applying the baking soda solution and washing the hood until you get a pH of 7.

The new I-CAR Detailing Course includes information on neutralizing paint surfaces and testing with litmus paper. Watch for it in your area.

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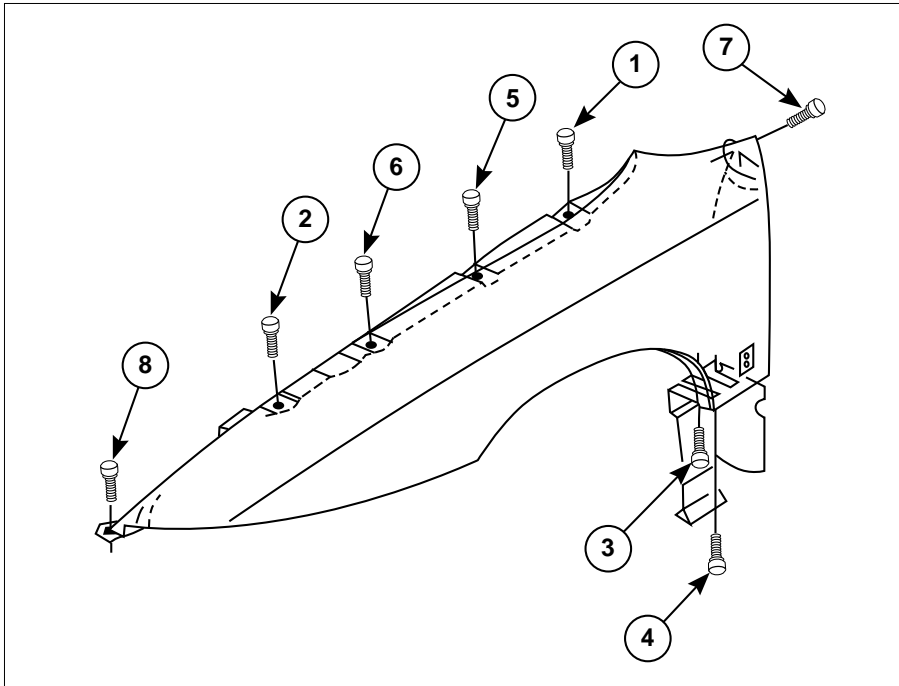


Figure 3—The special bolts on a Saturn fender have a specific tightening sequence. The special order of tightening helps assure proper expansion and contraction of the thermoplastic. (Courtesy of Saturn Corporation)

Q Why are there specific torque requirements and a special bolt-tightening sequence for Saturn fenders?

A Saturn exterior panels are made from thermoplastic materials which will expand and contract with changes in temperature. Saturn engineers manage this expansion and contraction by specially designed fasteners. These fasteners have specific torque requirements which hold the panel in place while allowing the necessary movement.

A special bolt-tightening sequence is used to ensure proper panel expansion and contraction (see Figure 3).

Q I have a damaged 1995 Nissan 240SX. I want to straighten a lower front rail. Is it HSS? Can I heat it and straighten it?

A The lower rails on that vehicle are made of high-strength steel (HSS). Follow the “kink vs bend” rule, that is, if the part is kinked, replace it. If it is bent, it can be straightened.

The Nissan Body Repair Manual does not recommend heating since it involves the risk of lowering the strength of the part. However, the Nissan Body Repair Manual also

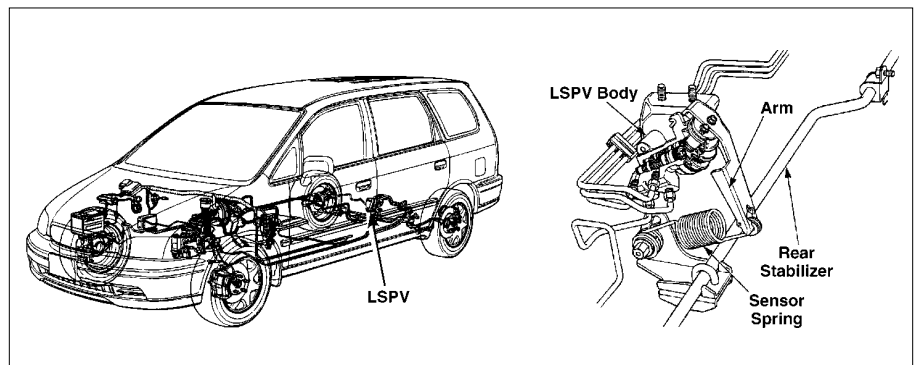


Figure 4—The 1995 Honda Odyssey van uses a Load-Sensing Proportioning Valve to modulate brake pressure to the rear wheels depending on vehicle load. (Courtesy of AMERICAN HONDA MOTOR CO., INC.)

says that if heating is unavoidable, parts can be heated to a temperature of not more than 550°C (1,022°F). Monitor heat build-up with a heat crayon. The part can be heated more than once, if absolutely necessary.

Q I’m working on the rear brake system on a 1995 Honda Odyssey and noticed a spring mechanism in the center. What is this?

A The Odyssey uses a Load-Sensing Proportioning Valve (LSPV) mounted near the rear suspension, to modulate rear-wheel brake pressure based upon vehicle load (see Figure 4).

The LSPV is mounted near the rear suspension and controls the pressure of the fluid to the rear brakes. As the ride height decreases with increased vehicle load, the rear brake pressure increases. As the ride height increases with decreased load, the rear brake pressure is reduced.

The LSPV can be adjusted, and the adjustment procedure in the Service Manual must be followed whenever the LSPV, stabilizer bar, or other rear suspension parts are removed for service. **A**

R134a Compressor Oils

Since the phase-out of R12 refrigerant began, vehicle makers have been switching to the alternate R134a. Some vehicles began using R134a as early as 1993. All vehicles are using R134a for the 1995 model year.

The following chart lists the code name for the type of compressor each vehicle maker has used since switching to R134a refrigerant, and the recommended oil for the com-

pressor. If the compressor is not original, you will need to determine the type of compressor in the vehicle to determine the proper oil. All systems use polyalkylene glycol (PAG) oil, except Volvo, which uses an ester oil. There will eventually be a standard grading system for refrigerant oil, like there is for motor oil. Until then, many vehicle makers are recommending their own part numbers for the type of oil they require.

The chart does not list flushing recommendations, since most systems do not require flushing. Only Ford Motor Company recommends flushing for some model vehicles. If flushing is recommended for retrofit installations, follow the guidelines given by the retrofit kit manufacturer.

If the system has been opened, the receiver-drier may need to be replaced. Refer to vehicle maker recommendations for how long the system can be open before the receiver-drier must be replaced. **A**

VEHICLE MAKER	COMPRESSOR TYPE	RECOMMENDED OIL
Acura	10P	ND-8
Alfa Romeo	SDV	SP-10
Audi	DCW	ZXL100
BMW	10P	#82111468042 or ND-8
	SS/10P (3 series)	SX10/ND-8
Chrysler	10PA 6C 10P	ND-8
	TRS Scroll (Dodge Colt)	SP-10
	SD	SP-20
	Scroll (Stealth, Eagle Summit, Plymouth Colt)	SUN-56
Citroen	SD-7	SP-20
Ferrari	SDV	SP-10

VEHICLE MAKER	COMPRESSOR TYPE	RECOMMENDED OIL
Ford	FS-10	#YN-126
	10P (Escort 1.8L, Taurus SHO, 3.0L Topaz, 1.8L Tracer)	
	Sanden TRS (Capri) Panasonic (Probe)	
Geo	10P Rotary	ND-8
GM	HR6HE	PN#12345923
	V5	
	HD6	
	10P	
	R4	
	HD6/V5	
	HR6	
	HR17	
	Sanden	
	HR110	
A6		
Zexel		

VEHICLE MAKER	COMPRESSOR TYPE	RECOMMENDED OIL
Honda	Sanden, spiral type (Prelude, Civic, Del Sol)	SP-10
	10 piston (some Accord)	ND-8
	Hadsys 7 piston (some Accord)	S10X
	Zexel swash plate (Passport-L4)	AIPND 2-901-88-300-0
	Zexel rotary vane	AIPND 2-901-88-301-0
Hyundai	piston type	ND-8
	rotary vane type	ND-9
Infinti	Zexel	KLH00-PAG SO
Isuzu	Zexel	ZXL100
	KC50 Rotary	ZXL200
Jaguar	SD	SP-20
	SD7H	
Lamborghini	SD-7	SP-20
Lancia	SD-7	SP-20
Land Rover	TRS	SP-10
	SD-7	SP-20
Lexus	10PA20	ND-8
Lotus	SD-7	SP-20

VEHICLE MAKER	COMPRESSOR TYPE	RECOMMENDED OIL
Mazda	Rotary	ATMOS10
	10P	ND-8
	TV-12	ND-9
	FS-10	YN-12
Mercedes-Benz	10P	PN 001-989-08-03 or ND-8
Mitsubishi	Scroll	SUN-56
	10P 10PA	ND-8
	FX80 (scroll)	SP-10
Nissan	DXV (Altima)	Type R
	Rotary (Maxima, 240SX, 300ZX)	Type S
	DKV (Sentra, P/U) FS-10 (Quest)	ZXL200 YN-12
Peugeot	SD-7	SP-20
Porsche	10P	ND-8
Renault	SD-7	SP-20
	SDV TRS	SP-10
Rolls Royce	SDV	SP-20
Rover	SD-7	SP-20
	SDV	SP-10
	10P	ND-8

VEHICLE MAKER	COMPRESSOR TYPE	RECOMMENDED OIL
Saab	SS	PN 4074-787-900 or S10X
Saturn	DKV	PAG#21030821
Subaru	15CH	ZXL100
	Rotary	ND K001OP 5000 or Type R
Suzuki	SD	SP-20

Information for this chart courtesy of Automotive International Refrigeration (AIR) and vehicle manufacturers.

VEHICLE MAKER	COMPRESSOR TYPE	RECOMMENDED OIL
Toyota	10P 10PA	ND-8
	TV10 rotary vane TV12 rotary vane	ND-9
Volkswagen	SD	SP-20 SD-7
	SDV	SP-10
Volvo	SS	S10X
	SD-7	SP-20
	DKS	SP-10