SECTION 0

GENERAL INFORMATION

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SECTION 0A

GENERAL INFORMATION

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WHEN TO DISCONNECT THE NEGATIVE BATTERY CABLE

CAUTION: Before removing or installing any electrical unit or when a tool or equipment could easily come in contact with "live" exposed electrical terminals, disconnect the negative battery cable to help prevent personal injury and/or damage to the vehicle or components. Unless instructed otherwise, the ignition switch must be in the "OFF" or "LOCK" position.

HANDLING ELECTROSTATIC DISCHARGE (ESD) SENSITIVE PARTS

Many solid state electrical components can be damaged by electrostatic discharge (ESD). Some will display a label, but many will not (figure 1).

In order to avoid possibly damaging any components, observe the following:

1. Body movement produces an electrostatic charge. To discharge personal static electricity, touch a ground point (metal) on the vehicle. This should be done any time you:
   - Slide across the vehicle seat.
   - Sit down or get up.
   - Do any walking.
2. Do not touch exposed electric terminals on components with your finger or any tools. Remember, the connector that you are checking might be tied into a circuit that could be damaged by electrostatic discharge.
3. When using a screwdriver or similar tool to disconnect a connector, never let the tool come in contact with or come between the exposed terminals.
4. Never jumper, ground, or use test equipment probes on any components or connectors unless specified in diagnosis. When using test equipment, always connect the ground lead first.
5. Do not remove the solid state component from its protective packaging until you are ready to install the part.
6. Always touch the solid state components package to a ground before opening. Solid state components can also be damaged if:
   - They are bumped or dropped.
   - They are laid on any metal work benches or components that operate electrically, such as a TV, radio, or oscilloscope.

SPECIAL TOOL ORDERING INFORMATION

Special service tools shown in this service manual that have tool product numbers beginning with "J" or "BT" are available for worldwide distribution from:

Kent-Moore
SPX Corporation
29784 Little Mack
Roseville, MI 48066-2298
1-800-345-2233
Mon.-Fri. 8:00 p.m. EST
Telex: 244040 KMTR VR
Fax: 313-578-7375

General Motors dealers can purchase TECH 1 scan tools and accessories through Kent-Moore at the above address and phone number. Non-General Motors dealer repair facilities can purchase TECH 1 scan tools and accessories from Kent-Moore at the above address or :

Sun Electric Corporation
One Sun Parkway
Crystal Lake, IL 60014
1-800-CALLSUN (225-5786)
6:45 a.m. - 7:00 p.m. CST

VEHICLE CERTIFICATION LABEL

The vehicle certification label indicates the GVWR (Gross Vehicle Weight Rating), front and rear GAWR (Gross Axle Weight Rating), and the payload rating for the vehicle (figures 2 and 3).

The gross vehicle weight (GVW) is the weight of the originally equipped vehicle and all items added to it after it has left the factory. This would include bodies, winches, booms, etc., the driver and all occupants, and the load the vehicle is carrying. The gross vehicle weight (GVW) must not exceed the gross vehicle weight rating (GVWR). Also, the front and rear gross axle weights (GAW) must not exceed the front and rear GAWR (Gross Axle Weight Rating).

The payload rating shown on the label is the maximum allowable cargo load (including the weight of the driver and all occupants) that the vehicle can carry

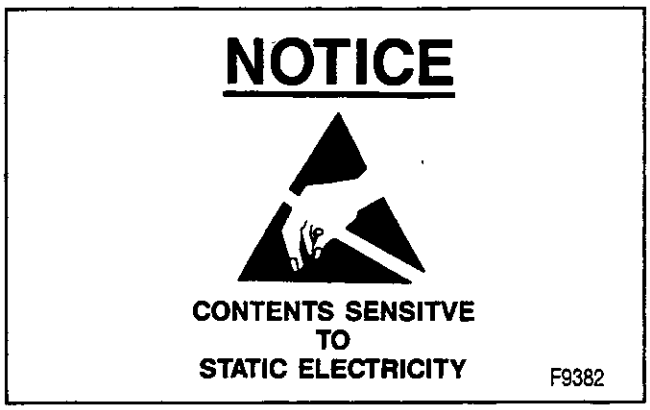


Figure 1—Electrostatic Discharge Symbol

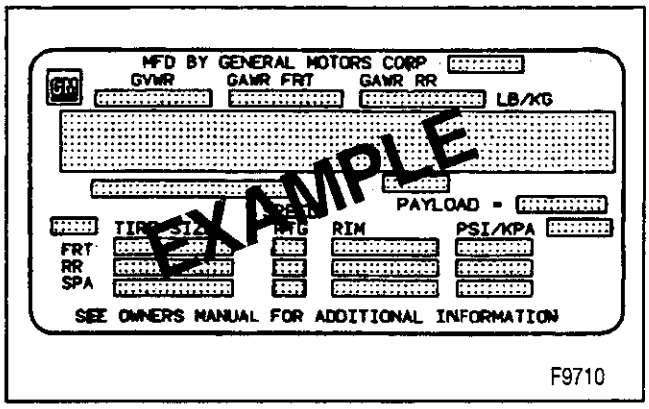


Figure 2—Complete Vehicle Certification Label

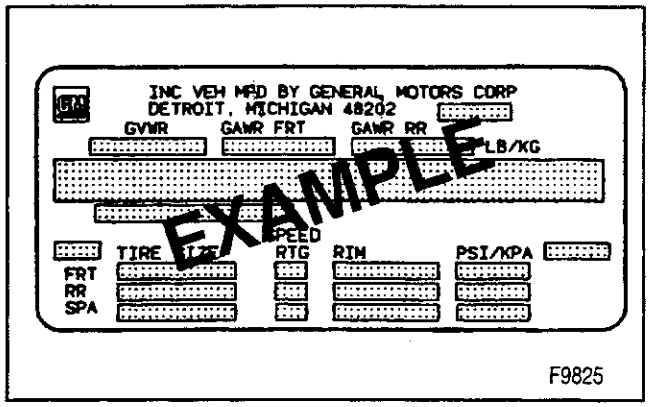


Figure 3—Incomplete Vehicle Certification Label

based on all factory installed equipment on the vehicle. The payload rating is reduced if any accessories or other equipment are added to the vehicle after final date of manufacture. The weight of these items should be determined and deducted from the payload rating.

The vehicle may also have a GCWR (Gross Combination Weight Rating). The GCWR (Gross Combination Weight Rating) is the total weight of the loaded tow vehicle (including passengers) and a loaded trailer.

The tires on the vehicle must be the proper size and properly inflated for the load which you are carrying. The vehicle certification label shows the originally equipped tire size and recommended inflation pressures. For more information on tires, refer to SECTION 3E.

VEHICLE IDENTIFICATION NUMBER

The vehicle identification number (VIN) is the seventeen digit legal identifier of the vehicle. It is located on a plate which is attached to the left top of the instrument panel and can be seen through the windshield (figure 4). To find the manufacturer, model and chassis type, engine type, GVW (Gross Vehicle Weight) range, model year, plant code, and sequential number, refer to figure 5.

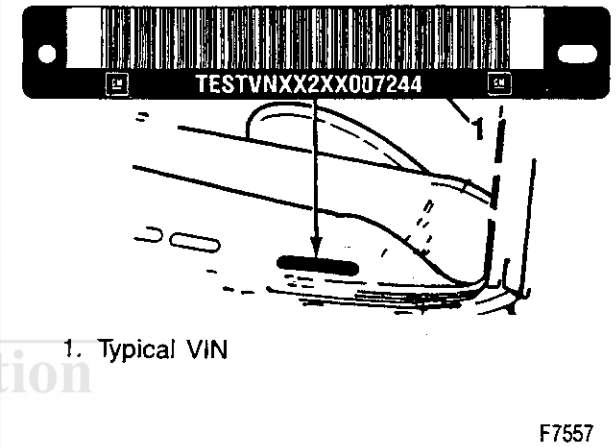


Figure 4—Vehicle Identification Number (VIN) Location

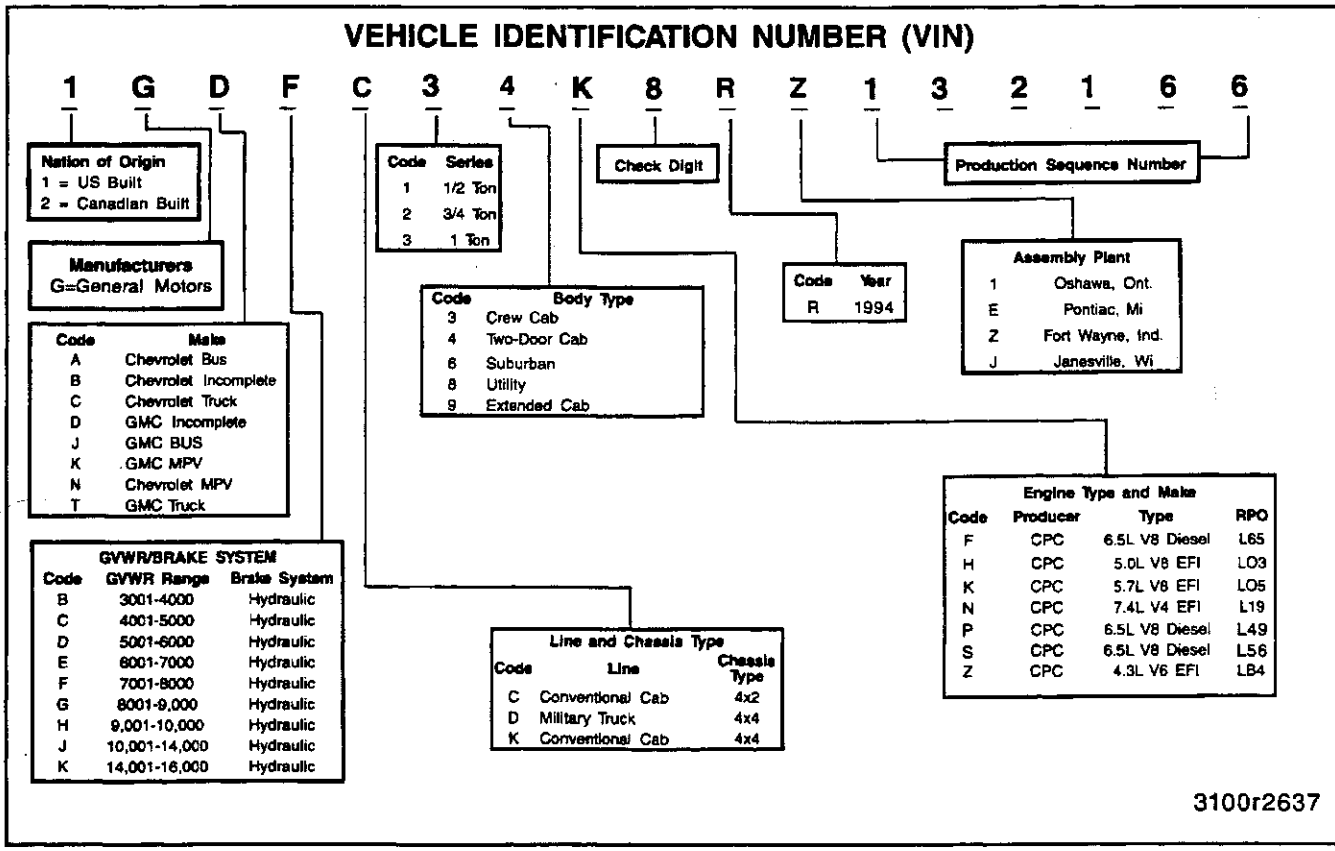


Figure 5—Vehicle Identification Chart

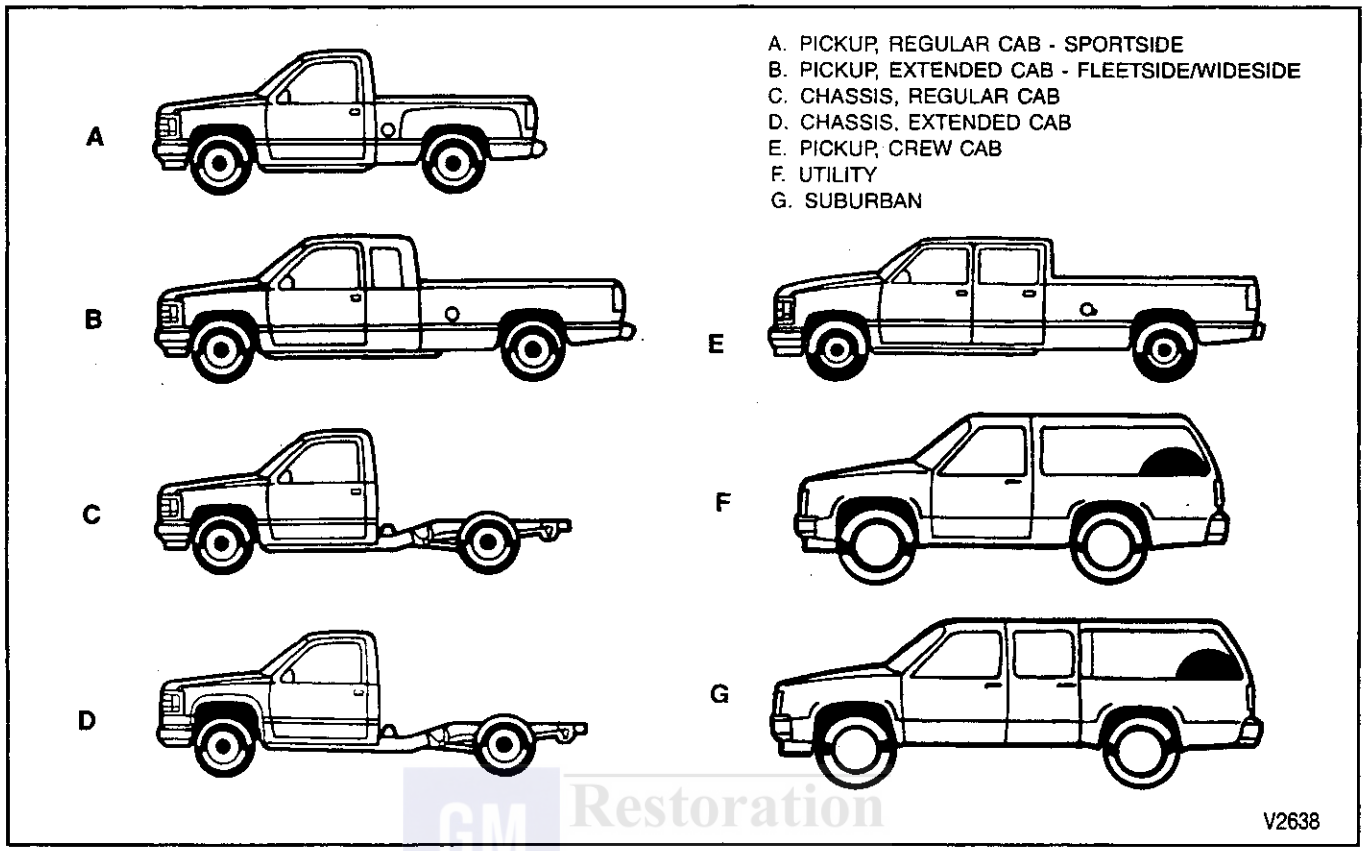


Figure 6—Model Identification

MODEL IDENTIFICATION

Models and body styles are shown in figure 6.

ENGINE IDENTIFICATION NUMBER

The VIN provides detailed engine identification and code information by liter and by the engine code letter located on the vehicle identification plate.

Stick-on labels attached to the engine, or laser etching or stampings on the engine block, indicate the engine unit number or date code.

All engines are stamped with an engine identification number. The stamping contains eight positions (figures 7, 8, 9, and 10).

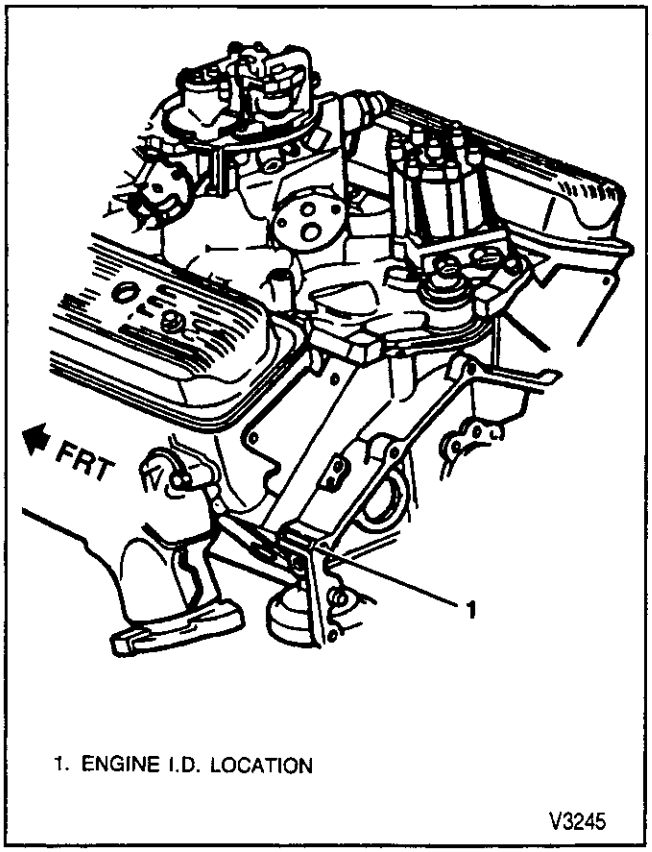


Figure 7—4.3L Engine I.D. Location

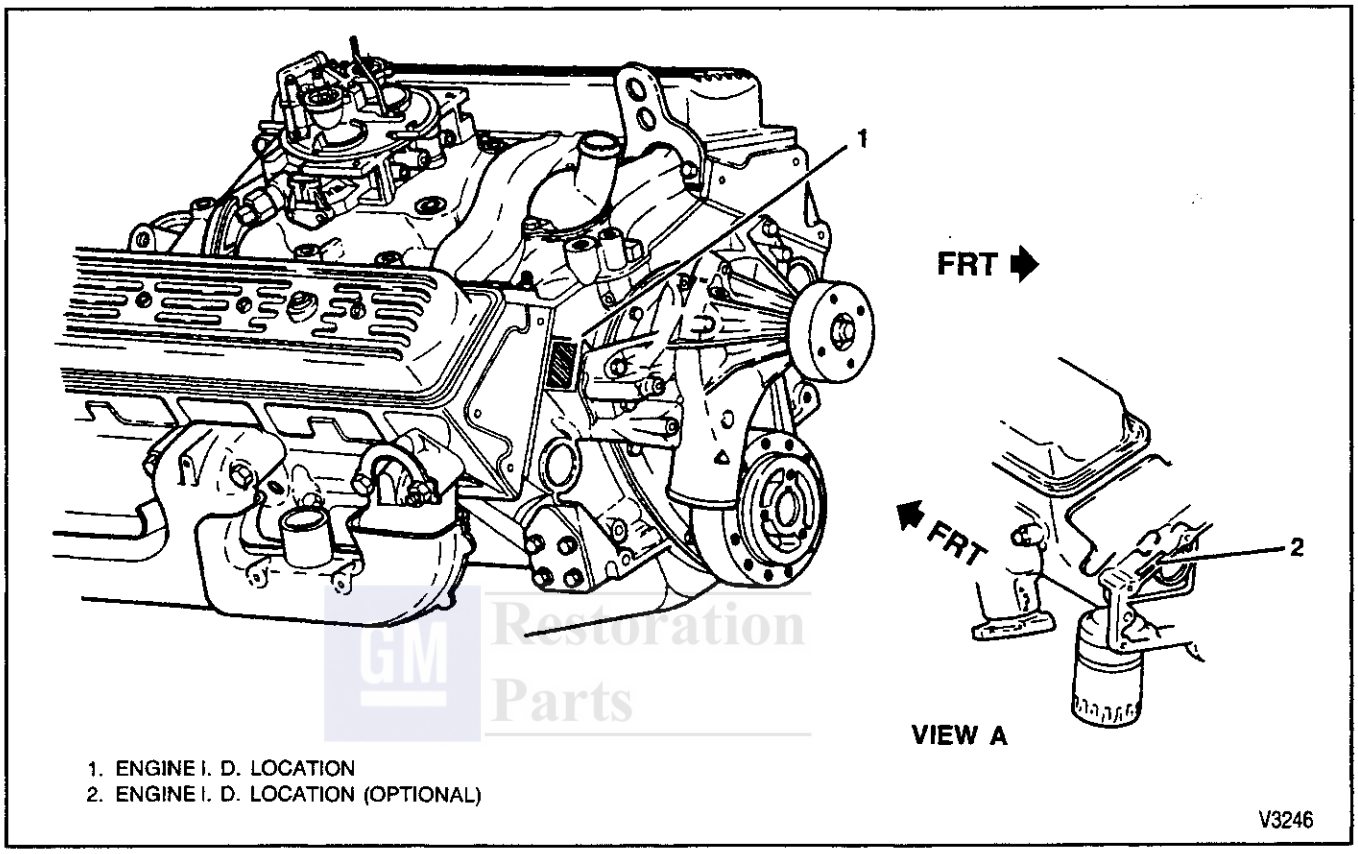


Figure 8—5.0L and 5.7L Engine I.D. Location

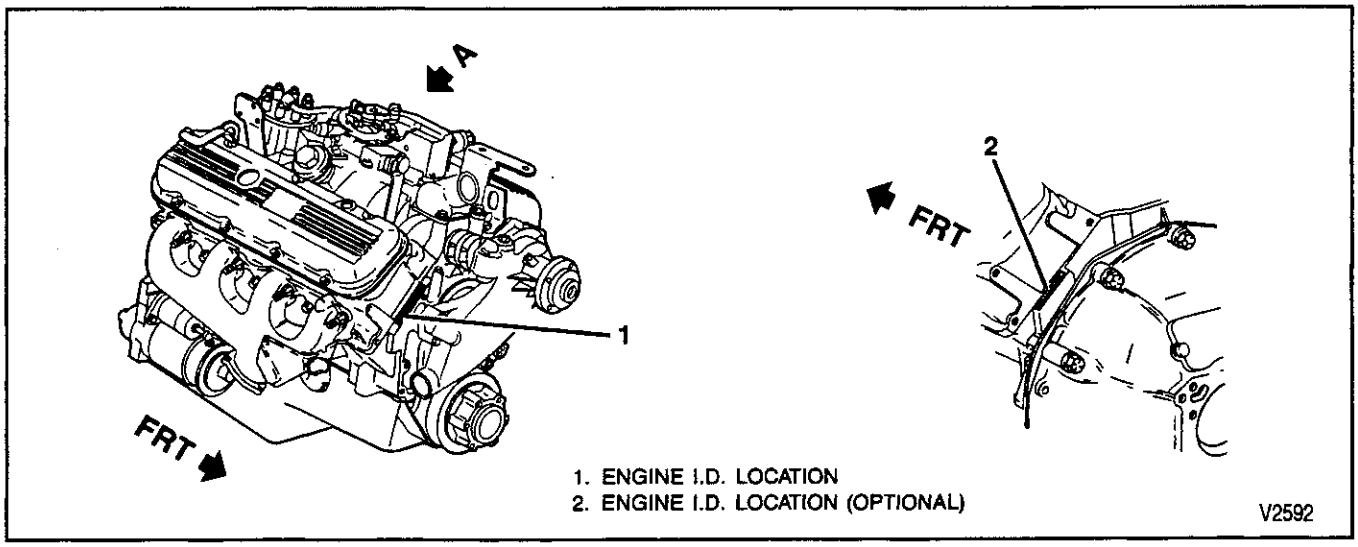


Figure 9—7.4L Engine I.D. Location

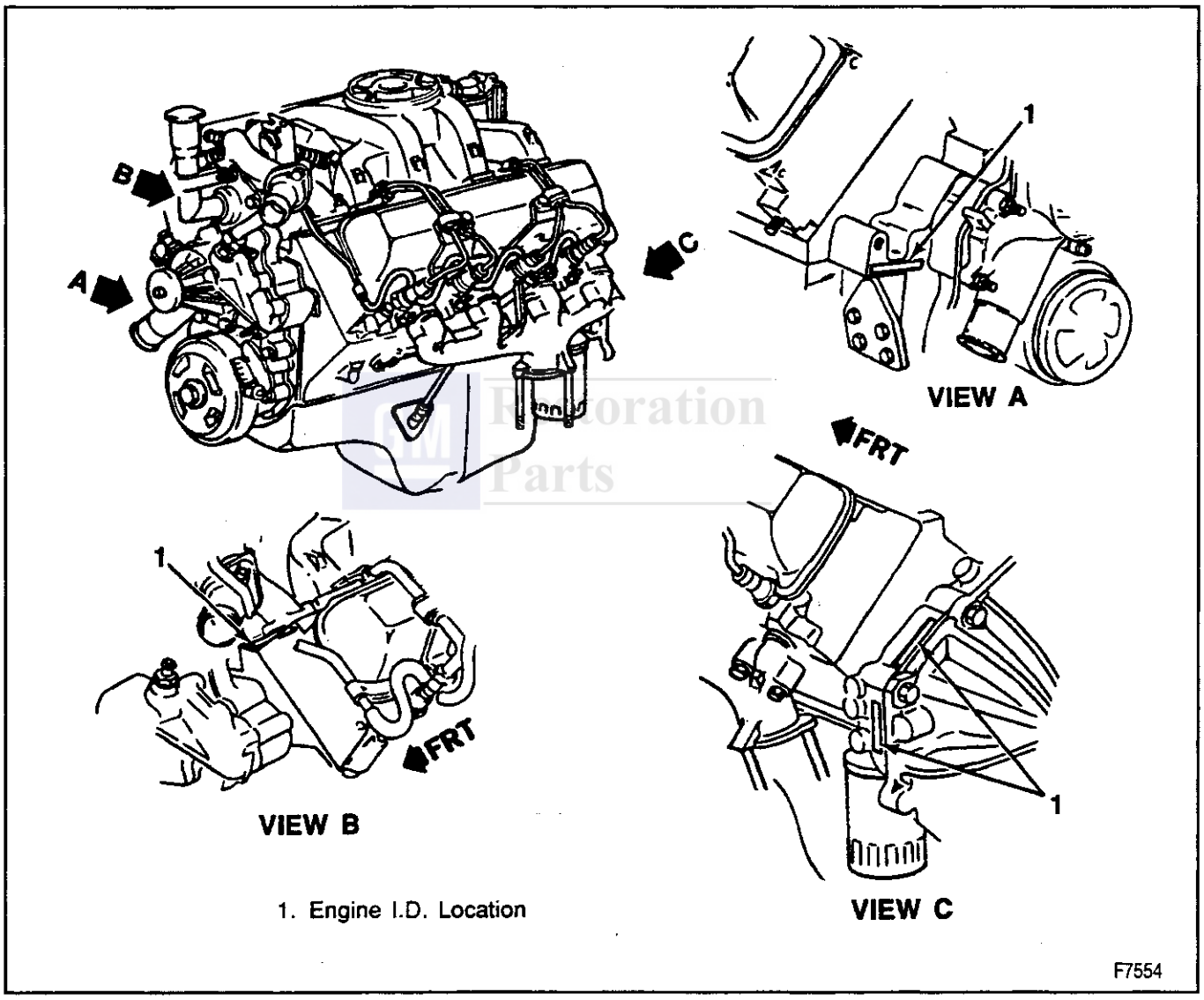


Figure 10—6.5L Diesel Engine I.D. Location

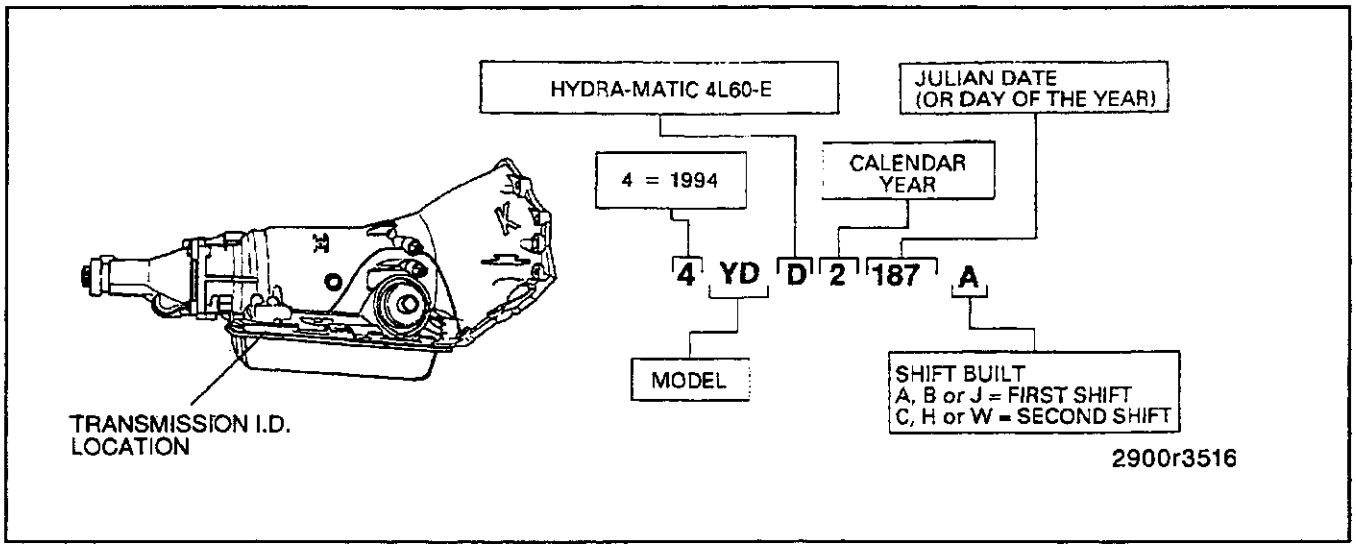


Figure 11—Hydra-Matic 4L60-E Transmission I.D.Location

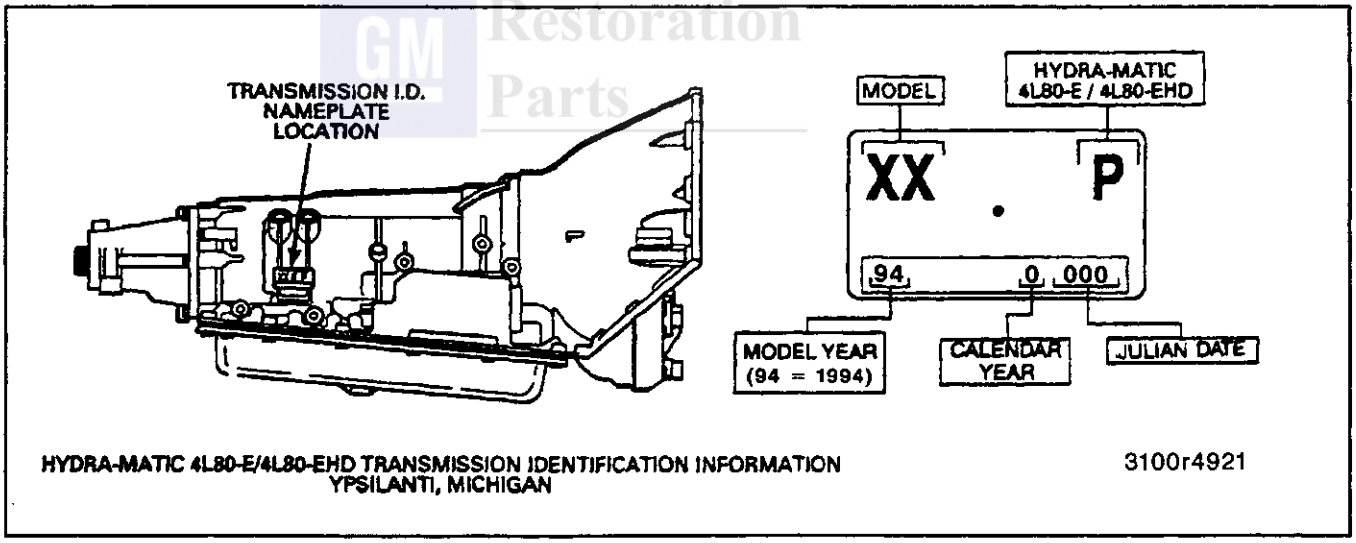
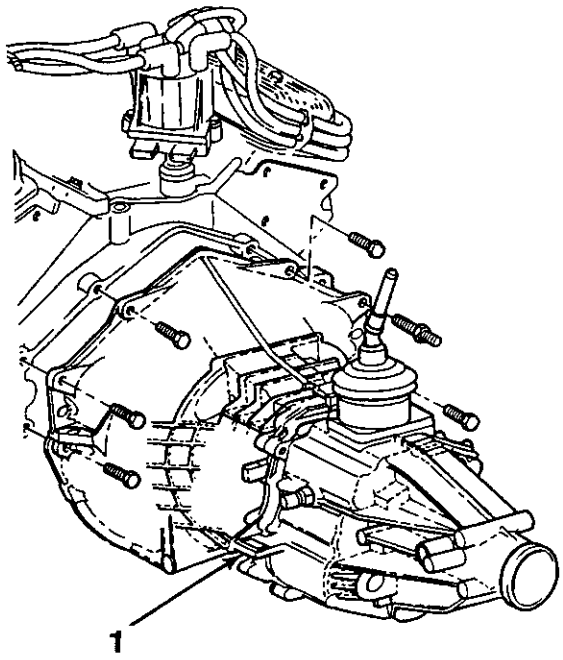


Figure 12—Hydra-Matic 4L80-E Transmission I.D. Location

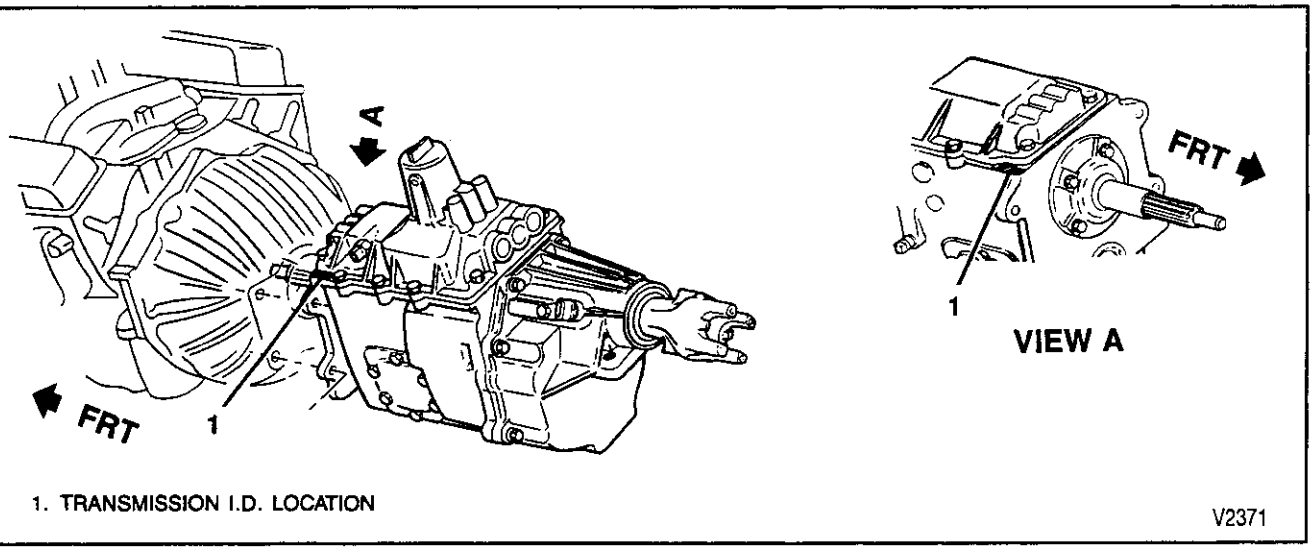
TRANSMISSION IDENTIFICATION NUMBER

Manual and automatic transmission model identification is located on a label or tag applied to the transmission case. If the label or tag is missing or unreadable, use the Service Parts Identification label to determine which transmission was installed in the vehicle (figures 11 through 15).



1. Transmission I.D. Location

Figure 13—New Venture Gear 3500 (5LM60) Transmission I.D. Location



1. TRANSMISSION I.D. LOCATION

Figure 14—New Venture Gear 4500 Transmission I.D. Location

Model	Engine		Transmission	
	Base	Option	Base	Option
C107 (03)	4.3L V6 (LB4)	5.0L V8 (L03) 5.7L V8 (L05)	5 Spd. Manual (MG5)	4 Spd. Auto (M30) 5 Spd. Manual (MG5)
C107 (53)	4.3L V6 (LB4)	5.0L V8 (L03) 5.7L V8 (L05) 6.5L V8 (L49) 6.5L V8 (L56)	5 Spd. Manual (MG5)	5 Spd. Manual (MT8) 4 Spd. Auto (MT1) 4 Spd. Auto (M30) 5 Spd. Manual (MG5)
C109 (03)	4.3L V6 (LB4)	5.0L V8 (L03) 5.7L V8 (L05) 6.5L V8 (L56) 6.5L V8 (L49)	5 Spd. Manual (MG5)	5 Spd. Manual (MT8) 4 Spd. Auto (MT1) 4 Spd. Auto (M30) 5 Spd. Manual (MG5)
C109 (06)	5.7L V8 (L05)	6.5L V8 (L56)	4 Spd. Auto (M30)	4 Spd. Auto (MT1)
C109 (53)	4.3L V6 (LB4)	5.0L V8 (L03) 5.7L V8 (L05) 6.5L V8 (L49) 6.5L V8 (L56)	5 Spd. Manual (MG5)	5 Spd. Manual (MG5) 4 Spd. Auto (MT1) 5 Spd. Manual (MT8) 4 Spd. Auto (M30)
C207 (53)	4.3L V6 (LB4)	5.0L V8 (L03) 5.7L V8 (L05) 6.5L V8 (L56)	5 Spd. Manual (MG5)	5 Spd. Manual (MG5) 4 Spd. Auto (MT1) 5 Spd. Manual (MT8) 4 Spd. Auto (M30)
C209 (03)	4.3L V6 (LB4)	5.0L V8 (L03) 5.7L V8 (L05) 7.4L V8 (L19) 6.5L V8 (L49) 6.5L V8 (L56) 6.5L V8 (L65)	5 Spd. Manual (MG5)	5 Spd. Manual (MG5) 5 Spd. Manual (MT8) 4 Spd. Auto (M30) 4 Spd. Auto (MT1)
C209 (06)	5.7L V8 (L05)	6.5L V8 (L65)	4 Spd. Auto (MT1)	4 Spd. Auto (MT1)
C209 (53)	4.3L V6 (LB4)	5.0L V8 (L03) 5.7L V8 (L05) 7.4L V8 (L19) 6.5L V8 (L49) 6.5L V8 (L56) 6.5L V8 (L65)	5 Spd. Manual (MG5)	5 Spd. Manual (MG5) 5 Spd. Manual (MT8) 4 Spd. Auto (M30) 4 Spd. Auto (MT1)
C309 (03)	5.7L V8 (L05)	7.4L V8 (L19) 6.5L V8 (L65)	5 Spd. Manual (MT8)	5 Spd. Manual (MT8) 4 Spd. Auto (MT1)
C309 (43)	5.7L V8 (L05)	7.4L V8 (L19) 6.5L V8 (L65)	5 Spd. Manual (MT8)	5 Spd. Manual (MT8) 4 Spd. Auto (MT1)
C309 (53)	5.7L V8 (L05)	7.4L V8 (L19) 6.5L V8 (L65)	5 Spd. Manual (MT8)	5 Spd. Manual (MT8) 4 Spd. Auto (MT1)
C310 (03)	5.7L V8 (L05)	7.4L V8 (L19) 6.5L V8 (L65)	5 Spd. Manual (MT8)	5 Spd. Manual (MT8) 4 Spd. Auto (MT1)
C314 (03)	5.7L V8 (L05)	7.4L V8 (L19) 6.5L V8 (L65)	5 Spd. Manual (MT8)	5 Spd. Manual (MT8) 4 Spd. Auto (MT1)
C318 (03)	5.7L V8 (L05)	7.4L V8 (L19) 6.5L V8 (L65)	5 Spd. Manual (MT8)	5 Spd. Manual (MT8) 4 Spd. Auto (MT1)
K105 (16)	5.7L V8 (L05)	6.5L V8 (L56)	5 Spd. Manual (MG5)	4 Spd. Auto (M30) 4 Spd. Auto (MT1)
K107 (03)	4.3L V6 (LB4)	5.0L V8 (L03) 5.7L V8 (L05)	5 Spd. Manual (MG5)	5 Spd. Manual (MG5) 4 Spd. Auto (MT1) 5 Spd. Manual (MT8) 4 Spd. Auto (M30)
K107 (53)	4.3L V6 (LB4)	5.0L V8 (L03) 5.7L V8 (L05) 6.5L V8 (L49) 6.5L V8 (L56)	5 Spd. Manual (MG5)	5 Spd. Manual (MG5) 4 Spd. Auto (MT1) 5 Spd. Manual (MT8) 4 Spd. Auto (M30)
K109 (03)	4.3L V6 (LB4)	5.0L V8 (L03) 5.7L V8 (L05) 6.5L V8 (L49) 6.5L V8 (L56)	5 Spd. Manual (MG5)	5 Spd. Manual (MG5) 4 Spd. Auto (MT1) 5 Spd. Manual (MT8) 4 Spd. Auto (M30)

Model	Engine		Transmission	
	Base	Option	Base	Option
K109 (06)	5.7L V8 (L05)	6.5L V8 (L56)	4 Spd. Auto (M30)	4 Spd. Auto (MT1)
K109 (53)	4.3L V6 (LB4)	5.0L V8 (L03) 5.7L V8 (L05) 6.5L V8 (L49) 6.5L V8 (L56)	5 Spd. Manual (MG5)	5 Spd. Manual (MT8) 4 Spd. Auto (M30) 4 Spd. Auto (MT1)
K207 (53)	4.3L V6 (LB4)	5.0L V8 (L03) 5.7L V8 (L05) 6.5L V8 (L49) 6.5L V8 (L56)	5 Spd. Manual (MG5)	5 Spd. Manual (MG5) 5 Spd. Manual (MT8) 4 Spd. Auto (M30) 4 Spd. Auto (MT1)
K209 (03)	4.3L V6 (LB4)	5.0L V8 (L03) 5.7L V8 (L05) 7.4L V8 (L19) 6.5L V8 (L49) 6.5L V8 (L56) 6.5L V8 (L65)	5 Spd. Manual (MG5)	5 Spd. Manual (MG5) 5 Spd. Manual (MT8) 4 Spd. Auto (M30) 4 Spd. Auto (MT1)
K209 (06)	5.7L V8 (L05)	7.4L V8 (L19) 6.5L V8 (L65)	4 Spd. Auto (MT1)	4 Spd. Auto (MT1)
K209 (53)	4.3L V6 (LB4)	5.0L V8 (L03) 5.7L V8 (L05) 7.4L V8 (L19) 6.5L V8 (L49) 6.5L V8 (L56) 6.5L V8 (L65)	5 Spd. Manual (MG5)	5 Spd. Manual (MG5) 5 Spd. Manual (MT8) 4 Spd. Auto (M30) 4 Spd. Auto (MT1)
K309 (03)	5.7L V8 (L05)	7.4L V8 (L19) 6.5L V8 (L65)	5 Spd. Manual (MT8)	5 Spd. Manual (MT8) 4 Spd. Auto (MT1)
K309 (43)	5.7L V8 (L05)	7.4L V8 (L19) 6.5L V8 (L65)	5 Spd. Manual (MT8)	5 Spd. Manual (MT8) 4 Spd. Auto (MT1)
K309 (53)	5.7L V8 (L05)	7.4L V8 (L19) 6.5L V8 (L65)	5 Spd. Manual (MT8)	5 Spd. Manual (MT8) 4 Spd. Auto (MT1)
K310 (03)	5.7L V8 (L05)	7.4L V8 (L19) 6.5L V8 (L65)	5 Spd. Manual (MT8)	5 Spd. Manual (MT8) 4 Spd. Auto (MT1)
K314 (03)	5.7L V8 (L05)	7.4L V8 (L19) 6.5L V8 (L65)	5 Spd. Manual (MT8)	5 Spd. Manual (MT8) 4 Spd. Auto (MT1)

Model Codes:
C—Two-Wheel Drive
K—Four-Wheel Drive
03—Two Door Cab
06—Four Door Suburban
16—Two Door Utility
43—Four Door Cab
53—Two Door Extended Cab

T2960

Figure 15—Engine and Transmission Application

GENERAL VEHICLE LIFTING AND JACKING

CAUTION: When a vehicle is on a hoist, support the vehicle at the opposite end from which components are being removed in order to reduce the possibility of the vehicle falling off the hoist and causing personal injury.

NOTICE: When jacking or lifting a vehicle, be certain that the lift pads do not contact the catalytic converter, brake lines, brake cables, or fuel lines. Such contact may result in damage or unsatisfactory vehicle performance.

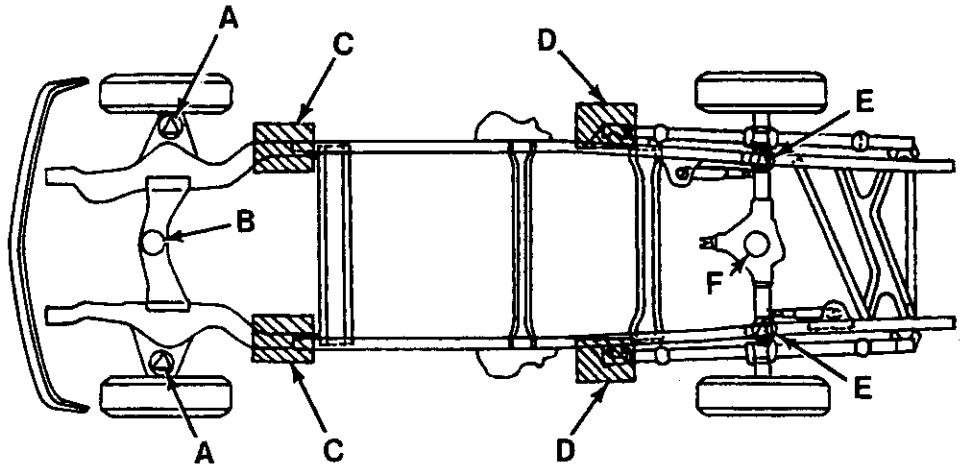
When removing major components from the vehicle while the vehicle is on a hoist, the vehicle frame should be chained to the hoist pads at the same end as the removed components in order to prevent tip-off and personal injury.

VEHICLES WITHIN 11,000 LBS. GVWR

NOTICE: Do not attempt to use a hoist to lift a vehicle equipped with a camper body. The weight distribution of the body may make the vehicle unstable during hoisting and cause damage to the frame.

The only lift points for these vehicles are shown in figures 16 and 17, and are described in the following paragraphs.

When lifting a C or K model vehicle with a hoist, the front pads should be positioned under the frame rails, just forward of the second crossmember. The rear pads should be positioned under the rear spring front brackets.



A. Lower control arm; inboard of the lower ball joint.
B. Center of front suspension crossmember.
C. Frame at forward edge of crossmember.
D. Rear spring at front bracket.
E. Rear axle just inboard of the spring.
F. Rear axle at the center of the differential case.

F2916

Figure 16—Chassis Lift Points—C Models (6,000 to 11,000 Lb. GVWR)

When lifting a C model vehicle front end with a floor jack, position the jack pad under the lower control arm and inboard from the ball joint. The C model vehicle front end can also be lifted by positioning the floor jack pad under the center of the front crossmember.

When lifting a C model vehicle front end with a vehicle jack, position the jack under the lower control arm and inboard from the ball joint.

When lifting a C or K model vehicle rear end with a floor jack, position the jack pad either between the spring pad and the shock absorber hanger or under the axle differential case.

When lifting a C or K model vehicle rear end with a vehicle jack, position the jack pad between the spring pad and the shock absorber hanger.

When lifting a K model vehicle front end with a floor jack, position the jack pad either under the middle of the front crossmember or under the lower control arm at the lowest point of the control arm.

Any time a vehicle is lifted with a vehicle jack or a floor jack, the wheels at the opposite end of the lifted end should be chocked. Also, jack stands should be used to provide support. When supporting the vehicle with jack stands, the jack stands should be placed under the frame, the front suspension crossmember, or the axle.

When removing major components from the vehicle while the vehicle is on a hoist, the vehicle frame should be chained to the hoist pads in order to prevent tip-off.

VEHICLES WITHIN 12,000 OR 15,000 LBS. GVWR

Lifting With A Hoist:

Do not attempt to lift either of these vehicles with a single-post hoist. Single-post hoists are not rated to lift vehicles of these weights. The 12,000 lb. GVWR vehicle may be lifted with a wheel hoist if the hoist is rated for more than 12,000 lbs.

A twin-post hoist can be used, provided each post is rated for more than the GAWR of the vehicle being lifted. This is particularly true for the rear axle. The addition of various types of bodies and other equipment to the original cab chassis may have resulted in heavier GAWRs than indicated on the certification label.

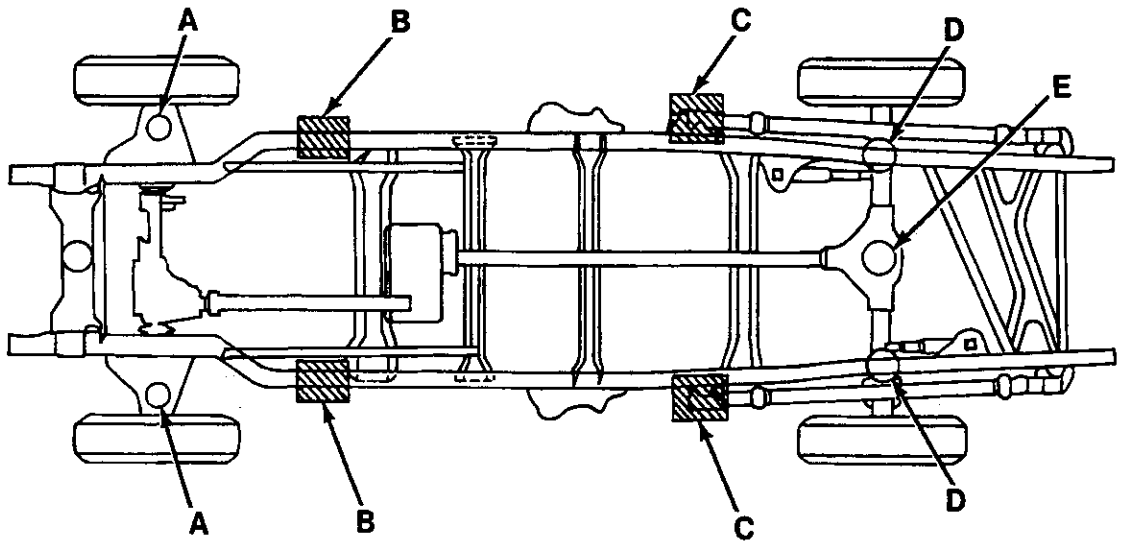
If the 12,000 lb. GVWR vehicle is being lifted, place the front hoist supports at the lower control arms, inboard of the lower ball joints. Place the rear support at the axle tube.

If the 15,000 lb. GVWR vehicle is being lifted, the front support can be placed under the I-beam front axle. Place the rear support under the axle tube.

When removing major components from the vehicle while the vehicle is on a hoist, the vehicle frame should be chained to the hoist pads in order to prevent tip-off.

Lifting with a Floor Jack:

NOTICE: Do not attempt to use an in-vehicle type jack, such as a bumper or scissors jack, on the 15,000 lb. GVWR vehicle. These jacks are not strong enough for the weight of the vehicle, and could collapse suddenly, causing damage to the vehicle.



A. Lower Control Arm; Inboard of the Lower Ball Joint
B. Frame Just Forward of the Crossmember
C. Rear Spring at Front Bracket
D. Rear Axle Just Inboard of the Spring Mount
E. Rear Axle at the Center of the Differential Case

F3513

Figure 17—Chassis Lift Points—K Models (6,000 to 11,000 Lb. GVWR)

When lifting the front end of the vehicle with a floor jack, position the jack pad under the frame rail just rearward of the body mount or under the lower control arm and inboard from the ball joint. The 15,000 lb. GVWR vehicle can also be lifted under the front axle.

When lifting the rear end of the vehicle, position the jack pad under the rear axle between the spring attachment and shock bracket.

Any time a vehicle is lifted with a vehicle jack or a floor jack, the wheels at the opposite end of the lifted end should be chocked. If jack stands are also used for support, they may only be placed just rearward of the body mounts. Do not place jack stands under the rear section of the frame or under any crossmember.

LOCK CYLINDER CODING

KEY IDENTIFICATION AND USAGE

The lock cylinder keyway is designed so that other model keys will not enter a current model lock cylinder. Two non-interchangeable keys are used. The square-headed key is used in the ignition lock cylinder. The oval-headed key is used in all other lock cylinders.

Key identification is obtained from the four-character key code stamped on the knockout portion of the key head and an identification letter stamped on the key shank. After the code number has been recorded by the owner, the plugs should be knocked out of the key head. From these numbers, the lock combination can be determined by use of a code list. This list is available to owners of key cutting equipment from equipment suppliers. If the key code numbers are not available from records or from the knockout plug, the lock combination (tumbler numbers and position) can be determined by laying the key on the diagram in figure 18.

CUTTING KEYS

1. Determine the code from the code list or the key code diagram (figure 18).
2. Cut a blank key to the proper level for each of six tumbler positions.
3. Check the key operation in the lock cylinder.

REPLACEMENT LOCK CYLINDERS

Lock cylinders are available from service parts warehouses. The new cylinder has a locking bar staked in place. Tumblers are also available and must be assembled into the cylinder.

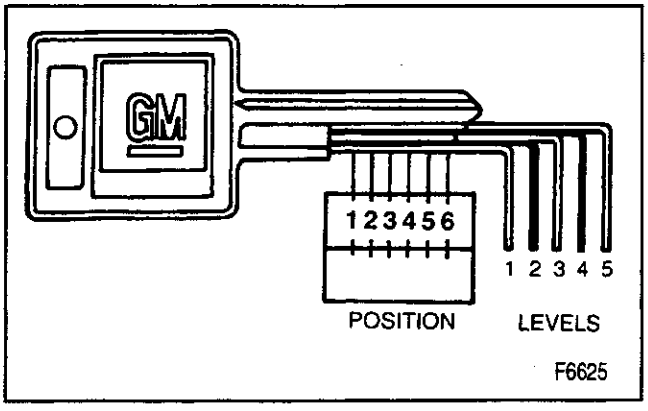


Figure 18—Key Code Diagram

ASSEMBLING AND CODING LOCK CYLINDERS

All Lock Cylinders Except Instrument Panel Compartment

Tumblers for all locks are shaped exactly alike with the exception of the notch position on one side. As the key is inserted in the lock cylinder, tumblers are lowered to the correct heights so that notches on each tumbler are at the same level. When the notches on all tumblers line up, the side bar is pushed into the notches by two small springs. This allows the cylinder to turn in its bore. Five types of tumblers are used to make the various lock combinations. Each tumbler is coded according to a number, 1 through 5, stamped on its side.

Assemble (Figures 19 and 20)

1. Determine the tumbler numbers and arrangement.
   - With the numerical key code, use the code list provided by a key cutting equipment supplier.
   - Without the numerical key code or without a code list, refer to figure 18.
     A. Lay the key on the key code diagram. Be sure the key is outlined by the diagram.
     B. Start with position number one. Find and record the lowest level (tumbler number) that is visible. Repeat for each of the remaining five positions.
2. Starting with position one (the open end or head of the cylinder), insert tumblers in their proper slots in the order called for by the code (figure 19).
3. Pull the side bar out so that the tumblers will drop completely into place.
4. Insert one tumbler spring above each tumbler.

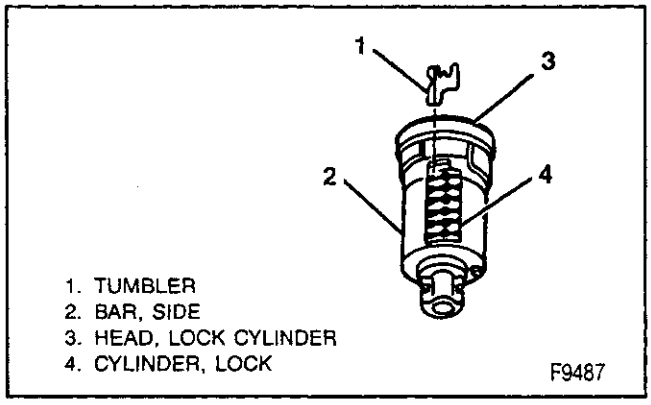


Figure 19—Installing Tumblers

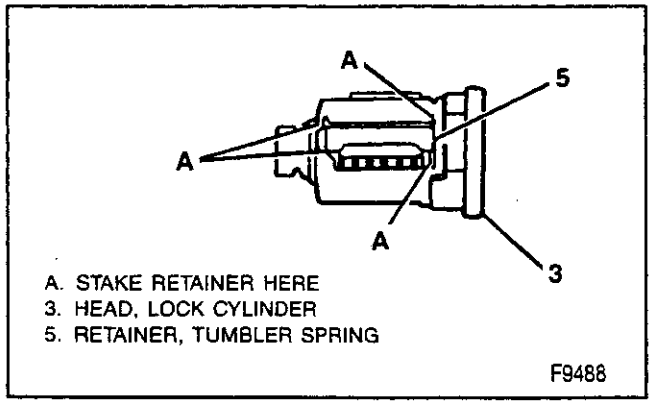


Figure 20—Installing Spring Retainer

5. Insert the spring retainer so that the end prongs slide into the slots at each end of the cylinder. Press the retainer down (figure 20).
6. Insert the key into the lock cylinder to check for proper installation. If the tumblers are installed properly, the side bar will drop down. If it doesn't, take the cylinder apart and reassemble it.

NOTICE: Use leather or wood at each vise jaw to prevent damage to the cylinder.

7. Remove the key, and secure the cylinder in a vise with the spring retainer exposed.
8. Stake the spring retainer securely in place at each end. Use a suitable staking tool, and stake the cylinder metal over the retainer.
9. Lock cylinders should be lubricated with GM multi-purpose lubricant P/N 12345120 or with a light oil (5W30).

Instrument Panel Compartment Lock Cylinder

A lock cylinder with snap-in tumblers is used for the instrument panel compartment lock (figures 21 and 22). The lock cylinder has four or five tumbler positions. The

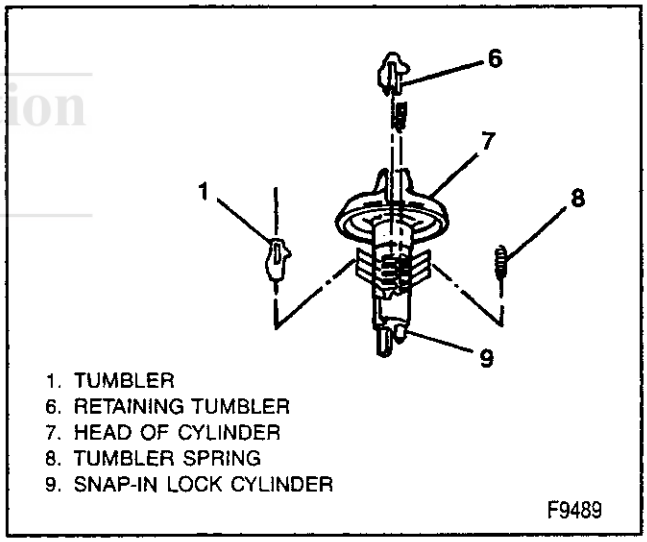


Figure 21—Installing Tumblers

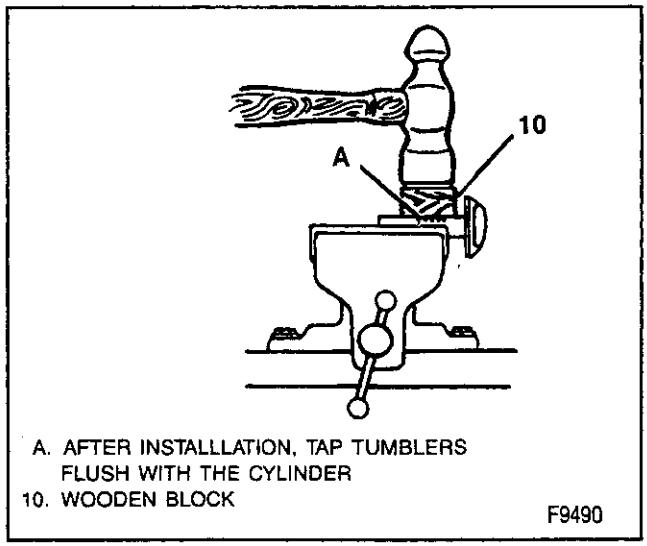


Figure 22—Locking the Tumblers in Place

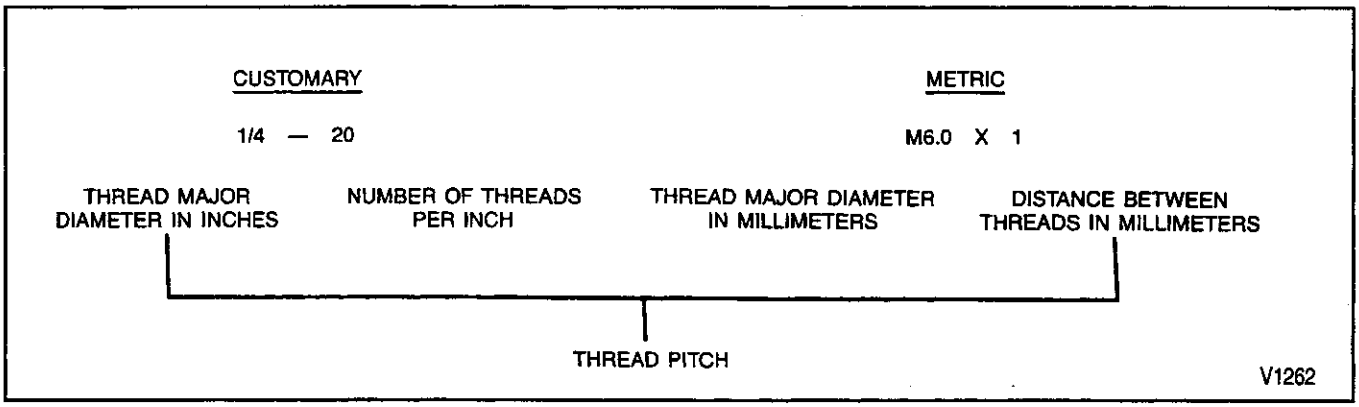


Figure 23—Thread Notation

number 1 or 2 position (closest to the cylinder head) is a brass retainer tumbler. The 2 through 5 positions or 3 through 5 positions are standard tumbler positions depending on cylinder type. Therefore, only the last 4 or 5 tumbler combinations are required. To assemble the lock cylinder, determine the tumbler numbers and arrangement as previously described and install the tumblers.

METRIC FASTENERS

Current model GM vehicles are primarily dimensioned in the metric system. Many fasteners are metric and are very close in dimension to well-known customary fasteners in the inch system. It is most important that replacement fasteners be of the correct nominal diameter, thread pitch, and strength.

Original equipment metric fasteners (except "beauty" bolts, such as exposed bumper bolts and cross-recess head screws) are identified by a number of markings indicating the strength of the material in the fastener as outlined later. Metric cross-recess screws are identified by a Posidriv or Type 1A. Either a Phillips head or Type 1A cross-recess screwdriver can be used in Posidriv recess screw heads, but Type 1A cross-recess screwdrivers will perform better.

Important

- Most metric fasteners have a blue color coating. However, this should not be used as positive identification, as some fasteners are not color coated.

General Motors Engineering Standards, along with other North American Industries, has adopted a portion of the standard metric fastener sizes defined by ISO (International Standards Organization). This was done to reduce the number of fastener sizes used and yet retain the best strength qualities in each thread size. For example, the customary 1/4-20 and 1/4-28 screws are replaced by the metric M6.0X1 screw which has nearly the same diameter and has 25.4 threads per inch. The thread pitch is in between the customary coarse and fine thread pitches.

Metric and customary thread notation differ slightly. The difference is described in figure 23.

FASTENER STRENGTH IDENTIFICATION

Most commonly used metric fastener strength property classes are 9.8 and 10.9 with the class identification embossed on the head of each bolt. Customary (inch) strength classes range from grade 2 to 8 with radial line identification embossed on each bolt head. Markings correspond to two lines less than the actual grade (i.e., grade 7 bolt will exhibit 5 embossed radial lines on the bolt head). Some metric nuts will be marked with single digit strength identification numbers on the nut face. To review the different strength markings available, refer to figure 24.

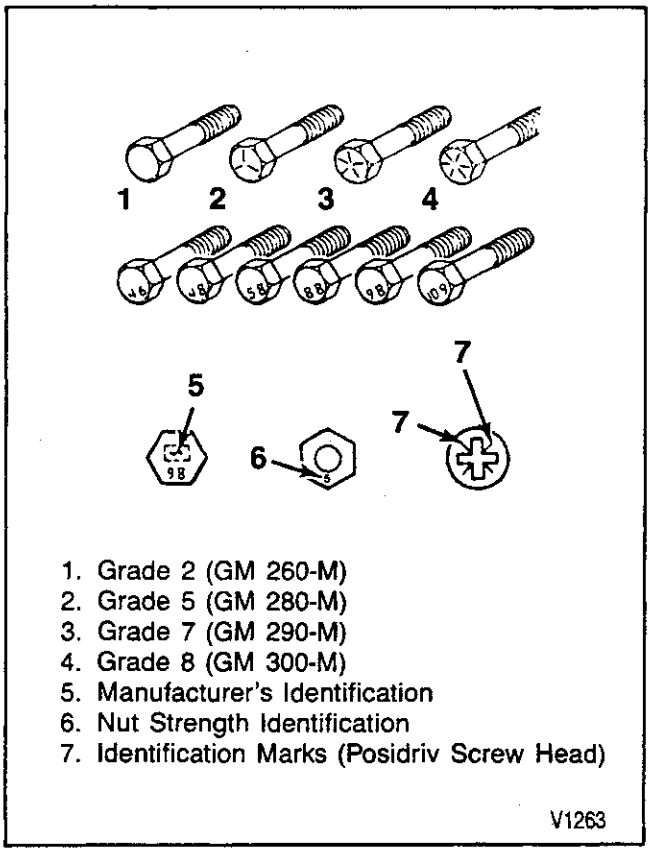


Figure 24—Fastener Strength Markings (Identification)

When replacing metric fasteners, be careful to use bolts and nuts of the same strength or stronger than the original fasteners (the same number marking or higher). Likewise, it is important to select replacement fasteners of the correct size. Correct replacement bolts metric fasteners available in the aftermarket parts channels were designed to metric standards of countries other than the United States, and may be of a lower strength, may not have the numbered head marking system, and may be of a different thread pitch. The metric fasteners used on GM products are designed to new, international standards that may not yet be manufactured by some non-domestic bolt and nut suppliers.

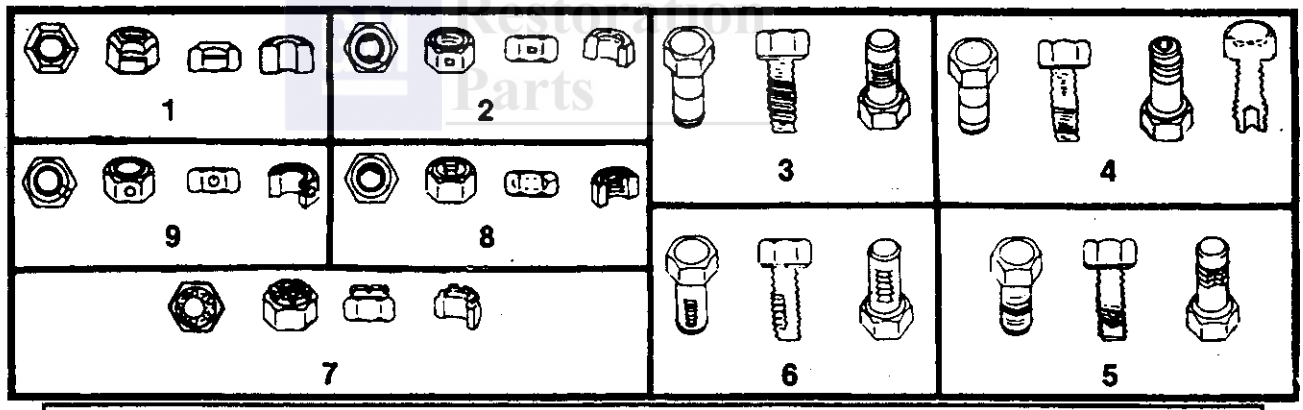
PREVAILING TORQUE FASTENERS

A prevailing torque nut is designed to develop an interference between the nut and bolt threads. This is most often accomplished by distortion of the top of an all-metal nut by using a nylon patch on the threads in the middle of the hex flat. A nylon insert may also be used as a method of interference between nut and bolt threads (figure 25).

A prevailing torque bolt is designed to develop an interference between bolt and nut threads, or the threads of a tapped hole. This is accomplished by distorting some of the threads or by using a nylon patch or adhesive.

Recommendations For Reuse:

1. Clean, unrusted, prevailing torque nuts and bolts may be reused as follows:
   A. Clean dirt and other foreign material off the nut or bolt.
   B. Inspect the nut or bolt to ensure there are no cracks, elongation, or other signs of abuse or overtightening. (If there is any doubt, replace with a new prevailing torque fastener of equal or stronger strength.)
   C. Assemble the parts, and hand start the nut or bolt.
   D. Observe that, before fastener seats, it develops torque per the chart in figure 25. (If there is any doubt, replace with a new prevailing torque fastener of equal or stronger strength.)
   E. Tighten the fastener to the torque specified in the appropriate section of this manual.
2. Bolts and nuts which are rusty or damaged should be replaced with new parts of equal or stronger strength.



A								
		6 & 6.3	8	10	12	14	16	20
4, 5	N·m	0.4	0.8	1.4	2.2	3.0	4.2	7.0
	In. Lbs.	4.0	7.0	12	18	25	35	57
1, 2, 3, 6,	N·m	0.4	0.6	1.2	1.6	2.4	3.4	5.6
7, 8, 9	In. Lbs.	4.0	5.0	10	14	20	28	46

B									
		.250	.312	.375	.437	.500	.562	.625	.750
4, 5	N·m	0.4	0.6	1.4	1.8	2.4	3.2	4.2	6.2
	In. Lbs.	4.0	5.0	12	15	20	27	35	51
1, 2, 3, 6,	N·m	0.4	0.6	1.0	1.4	1.8	2.6	3.4	5.2
8, 9	In. Lbs.	4.0	5.0	9.0	12	15	22	28	43

A. Metric Sizes
B. Inch Sizes

1. Top Lock Type
2. Center Lock
3. Dry Adhesive Coating
4. Out Of Round Thread
5. Deformed Thread Profile
6. Nylon Strip Or Patch
7. Nylon Washer Insert
8. Nylon Patch
9. Nylon Insert

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Figure 25—Prevailing Torque Nuts and Bolts

METRIC-ENGLISH CONVERSION

For determining metric-english conversions, refer to figure 26.

CONVERSION TABLE

Multiply	by	to get equivalent number of:
LENGTH		
Inch	25.4	millimeters (mm)
Foot	0.304 8	meters (m)
Yard	0.914 4	meters
Mile	1.609	kilometers (km)
AREA		
Inch^2	645.2	millimeters^2 (mm^2)
	6.45	centimeters^2 (cm^2)
Foot^2	0.092 9	meters^2 (m^2)
Yard^2	0.836 1	meters^2
VOLUME		
Inch^3	16.387	mm^3
	16.387	cm^3
	0.016 4	liters (l)
Quart 0.946 4	liters	
Gallon	3.785 4	liters
Yard^3	0.764 6	meters^3 (m^3)
MASS		
Pound	0.453 6	kilograms (kg)
Ton	907.18	kilograms (kg)
Ton	0.907	tonne (t)
FORCE		
Kilogram	9.807	newtons (N)
Ounce	0.278 0	newtons
Pound	4.448	newtons
TEMPERATURE		
Degree Fahrenheit	(1°F-32) ÷ 1.8	degree Celsius (C)

Multiply	by	to get equivalent number of:
ACCELERATION		
Foot/sec^2	0.304 8	meter/sec^2 (m/s^2)
Inch/sec^2	0.025 4	meter/sec^2
TORQUE		
Pound-inch	0.112 98	newton-meters (N-m)
Pound-foot	1.355 8	newton-meters
POWER		
Horsepower	0.746	kilowatts (kW)
PRESSURE OR STRESS		
Inches of water	0.249 1	kilopascals (kPa)
Pounds/sq. in.	6.895	kilopascals
ENERGY OR WORK		
BTU	1 055	joules (J)
Foot-pound	1.355 8	joules
Kilowatt-hour	3 600 000 or 3.6 x 10^6	joules (J $ one W)
LIGHT		
Foot candle	1.076 4	lumens/meter^2 (lm/m^2)
FUEL PERFORMANCE		
Miles/gal	0.425 1	kilometers/liter (km/l)
Gal/mile	2.352 7	liter/kilometer (l/km)
VELOCITY		
Miles/hour	1.609 3	kilometers/hr. (km/h)

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Figure 26—Metric-English Conversion Table

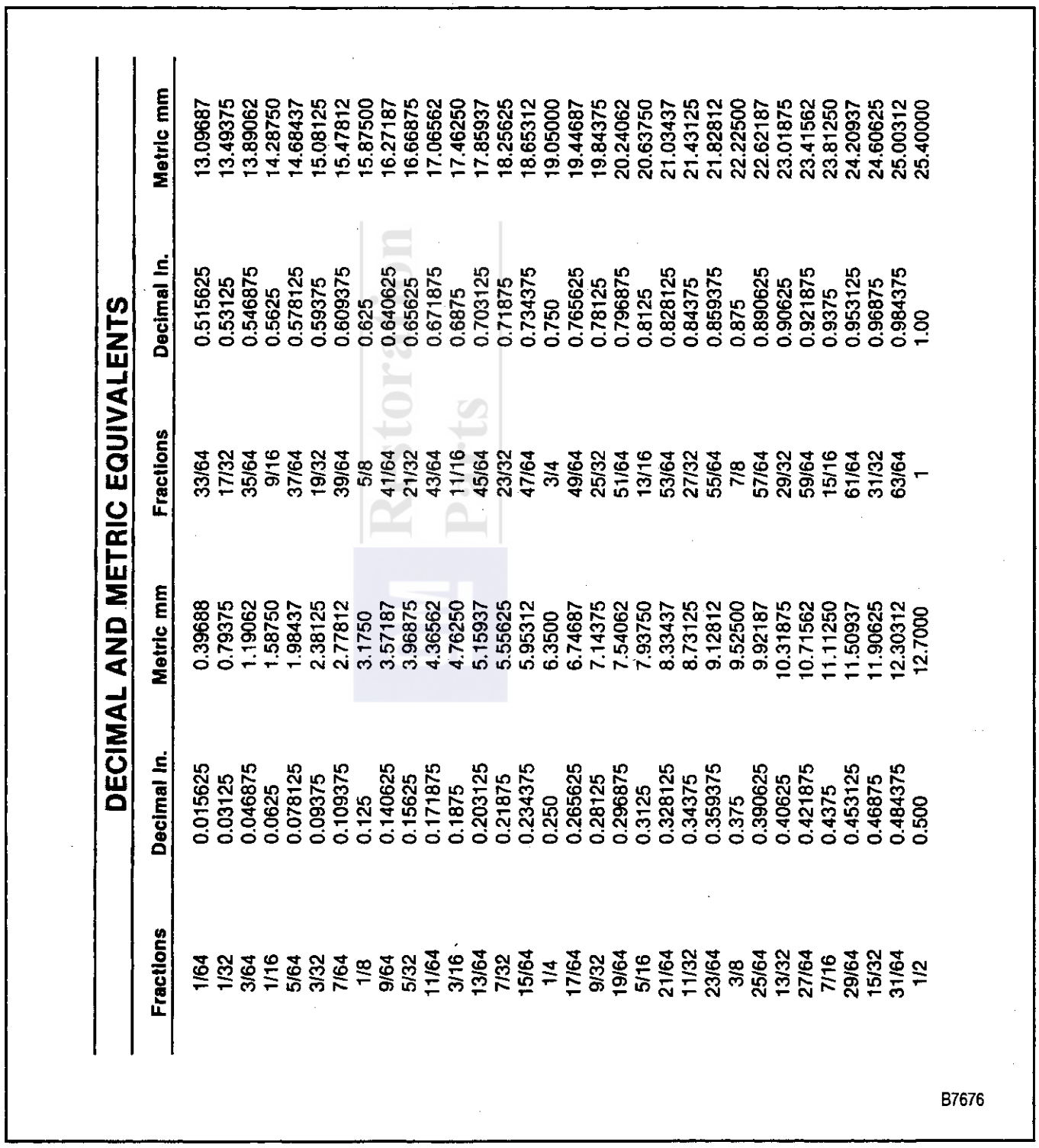
DECIMAL AND METRIC EQUIVALENTS

For determining decimal and metric equivalents, refer to figure 27.

J1930 WORD CONVERSION

Starting with the 1993 model year, General Motors will be complying with the Society of Automotive Engineers (SAE) Recommended Practice J1930. J1930 is an industry-wide standard that was adopted into government regulations and requires certain electrical and electronic components and systems be known by the same nomenclature that have the same function. This standard is also being applied to abbreviations and acronyms. This standard is being used in all GM service publications.

To make this standard work, some names and abbreviations are being replaced with those recommended by the SAE standard.



DECIMAL AND METRIC EQUIVALENTS

Fractions	Decimal In.	Metric mm	Fractions	Decimal In.	Metric mm
1/64	0.015625	0.39688	33/64	0.515625	13.09687
1/32	0.03125	0.79375	17/32	0.53125	13.49375
3/64	0.046875	1.19062	35/64	0.546875	13.89062
1/16	0.0625	1.58750	9/16	0.5625	14.28750
5/64	0.078125	1.98437	37/64	0.578125	14.68437
3/32	0.09375	2.38125	19/32	0.59375	15.08125
7/64	0.109375	2.77812	39/64	0.609375	15.47812
1/8	0.125	3.1750	5/8	0.625	15.87500
9/64	0.140625	3.57187	41/64	0.640625	16.27187
5/32	0.15625	3.96875	21/32	0.65625	16.66875
11/64	0.171875	4.36562	43/64	0.671875	17.06562
3/16	0.1875	4.76250	11/16	0.6875	17.46250
13/64	0.203125	5.15937	45/64	0.703125	17.85937
7/32	0.21875	5.55625	23/32	0.71875	18.25625
15/64	0.234375	5.95312	47/64	0.734375	18.65312
1/4	0.250	6.3500	3/4	0.750	19.05000
17/64	0.265625	6.74687	49/64	0.765625	19.44687
9/32	0.28125	7.14375	25/32	0.78125	19.84375
19/64	0.296875	7.54062	51/64	0.796875	20.24062
5/16	0.3125	7.93750	13/16	0.8125	20.63750
21/64	0.328125	8.33437	53/64	0.828125	21.03437
11/32	0.34375	8.73125	27/32	0.84375	21.43125
23/64	0.359375	9.12812	55/64	0.859375	21.82812
3/8	0.375	9.52500	7/8	0.875	22.22500
25/64	0.390625	9.92187	57/64	0.890625	22.62187
13/32	0.40625	10.31875	29/32	0.90625	23.01875
27/64	0.421875	10.71562	59/64	0.921875	23.41562
7/16	0.4375	11.11250	15/16	0.9375	23.81250
29/64	0.453125	11.50937	61/64	0.953125	24.20937
15/32	0.46875	11.90625	31/32	0.96875	24.60625
31/64	0.484375	12.30312	63/64	0.984375	25.00312
1/2	0.500	12.7000	1	1.00	25.40000

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Figure 27—Decimal and Metric Equivalents

For determining J 1930 word conversions, refer to figure 28.

J1930 CONVERSION CHART	
From	**To**
Absolute Pressure Sensor (APS)	Manifold Absolute Pressure Sensor (MAPSensor)
Accelerator (ACCEL)	Accelerator Pedal (AP)
Air Cleaner Assembly	Air Cleaner (ACL)
Air Cleaner Filter Element	Air Cleaner Filter (ACL Filter)
Air Induction System	Air Intake System
Air Injection Reaction System (A.I.R. System)	Secondary Air Injection System (AIR System)
Assembly Line Communication Link (ALCL)	Data Link Connector (DLC)
Assembly Line Data Link (ALDL)	Data Link Connector (DLC)
BCM-PCM Data Problem	BCM-PCM Data Link
Calibration Pack (CAL-PAK)	1. Electronically Erasable Programmable Read Only Memory (EEPROM) 2. Erasable Programmable Read Only Memory (EPROM) 3. Programmable Read Only Memory (PROM)
Camshaft Sensor	Camshaft Position Sensor (CMP Sensor)
Canister Purge (CP)	Evaporative Emission Canister Purge (EVAP Canister Purge)
Catalytic Converter (Cat. Conv.)	1. Oxidation Catalytic Converter (OC) 2. Three Way Catalytic Conveter (TWC) 3. Three Way and Oxidation Catalytic Converter (TWC&OC) 4. Warmup Oxidation Catalytic Converter (WU-OC) 5. Warmup Three Way Catalytic Converter (WU-TWC)
Check Engine Indicator	Malfunction Indicator Lamp (MIL)
Code	Diagnostic Trouble Code (DTC)
Computer Controlled Coil Ignition (C3I)	Electronic Ignition (EI)
Computer Command Control (CCC)	Engine Control Module (ECM)
Controlled Canister Purge (CCP)	Evaporative Emission Canister Purge (EVAP Canister Purge)
Coolant Temperature Switch (CTS)	Engine Coolant Temperature Switch (ECT Switch)
Coolant Temperature Sensor (CTS)	Engine Coolant Temperature Sensor (ECT Sensor)
Cooling Fan Control	Cooling Fan Control (Cooling FC)
Detonation Sensor	Knock Sensor (KS)
Diagnostic Circuit Check	Onboard Diagnostic System Check (OBD System Check)
Digital Fuel Injection (DFI)	1. Multiport Fuel Injection (MFI) 2. Sequential Multiport Fuel Injection (SFI)
Digital Electronic Fuel Injection (DEFI)	1. Multiport Fuel Injection (MFI) 2. Sequential Multiport Fuel Injection (SFI)
Direct Ignition System (DIS)	Electronic Ignition System (EI System)
Distributor HEI Module	Distributor Ignition Control Module (DI Control Module)
Distributorless Ignition System (DIS)	Electronic Ignition (EI)
Dual Bed Monolith (DBM)	1. Oxidation Catalytic Converter (OC) 2. Three Way Catalytic Converter (TWC)
Electric Air Control (EAC)	Secondary Air Injection Bypass Valve (AIR Bypass Valve)
Electric Air Switching (EAS)	Secondary Air Injection Switching Valve (AIR Switching Valve)
Electronic Control Module (ECM)	Engine Control Module (ECM)
Electronic Fuel Injection	1. Multiport Fuel Injection (MFI) 2. Sequential Multiport Fuel Injection (SFI) 3. Throttle Body Fuel Injection (TBI)
Electronic Spark Timing (EST)	Ignition Control (IC)
Electronic Spark Timing Circuit (EST Circuit)	Ignition Control Circuit (IC Circuit)

J1930 CONVERSION CHART	
From	**To**
Electronic Spark Timing System (EST System)	Distributor Ignition System (DI System)
Electronic Spark Control Circuit (ESC Circuit)	Knock Sensor Circuit (KS Circuit)
Electronic Spark Control System (ESC System)	Knock Sensor System (KS System)
Electronic Vacuum Regulator Valve (EVRV)	Exhaust Gas Recirculation Electronic Vacuum Regulator Solenoid Valve
Engine Calibration Unit (ECU)	Programmable Read Only Memory (PROM)
Evaporative Emission Control System (EECS)	Evaporative Emission Control System (EVAP Control System)
Evaporative Emission Control System (EECS)	Evaporative Emission System (EVAP System)
Exhaust Gas Recirculation/Thermostatic Vacuum Switch (EGR/TVS)	Exhaust Gas Recirculation Thermal Vacuum Valve (EGR TVV)
Fuel Cal-Pak Missing	PROM Missing
Generator (Gen)	Generator (GEN)
Governor	Engine Speed Governor (RPM Governor)
High Energy Ignition (HEI)	Distributor Ignition (DI)
Lean Exhaust	1. Heated Oxygen Sensor Signal (HO2S Signal) 2. Oxygen Sensor Signal (O2S Signal)
Manifold Air Temperature Sensor (MAT Sensor)	Intake Air Temperature Sensor (IAT Sensor)
Mem-Cal Error	1. EPROM Error 2. PROM Error
Memory and Calibration Unit (MEM-CAL)	1. Erasable Programmable Read Only Memory (EPROM) 2. Programmable Read Only Memory (PROM)
Mixture Control (M/C)	Mixture Control (MC)
Multi-Port Fuel Injection (MPFI)	Multiport Fuel Injection (MFI)
Nitrogen Oxides (NO_x)	Nitrogen Oxides (NOx)
Oxygen (O_2)	Oxygen (O2)
Oxygen Sensor (02)	1. Heated Oxygen Sensor (HO2S) 2. Oxygen Sensor (O2S)
Park/Neutral Switch (P/N Switch)	Park/Neutral Postion Switch (PNP Switch)
Port Fuel Injection (PFI)	Multiport Fuel Injection (MFI)
Power Steering (P/S)	Power Steering (PS)
Power Steering Switch	Power Steering Pressure Switch (PSP Switch)
Pulse Air Injection System (PAIR)	Pulsed Secondary Air Injection System (PAIR System)
Revolutions Per Minute (RPM)	Engine Speed (RPM)
Rich Exhaust	1. Heated Oxygen Sensor Signal (HO2S Signal) 2. Oxygen Sensor Signal (O2S Signal)
"Scan" Data	Scan Tool Data (ST Data)
Sequential Fuel Injection (SFI)	Sequential Multiport Fuel Injection (SFI)
Sequential-port Fuel Injection (SFI)	Sequential Multiport Fuel Injection (SFI)
Service Engine Soon Indicator (SES Indicator)	Malfunction Indicator Lamp (MIL)
Thermal Vacuum Switch (TVS)	Thermal Vacuum Valve (TVV)
Thermostatic Air Cleaner (TAC)	Air Cleaner (ACL)
Throttle Body Injection (TBI)	Throttle Body Fuel Injection (TBI)
Throttle Switch	1. Closed Throttle Position Switch (CTP Switch) 2. Wide Open Throttle Switch (WOT Switch)
Throttle Position Sensor (TPS)	Throttle Position Sensor (TP Sensor)
Throttle Position Switch (TPS)	1. Closed Throttle Position Switch (CTP Switch) 2. Wide Open Throttle Switch (WOT Switch)
Tuned Port Injection (TPI)	Multiport Fuel Injection (MFI)
Transmission/Transaxle Converter Clutch (TCC)	Torque Converter Clutch (TCC)
Viscous Converter Clutch (VCC)	Torque Converter Clutch (TCC)
	T2934

Figure 28—J 1930 Conversion Chart

ABBREVIATIONS

AC—Alternating Current
A/C—Air Conditioning
ACL—Air Cleaner
ADJ—Adjust
A/F—Air Fuel Ratio
AIR—Secondary Air Injection
Alt—Altitude
AMP—Ampere(s)
ANT—Antenna
AP—Accelerator Pedal
ASM—Assembly
AT—Automatic Transmission
ATDC—After Top Dead Center
Auth—Authority
Auto—Automatic
BARO—Barometric Pressure
Bat—Battery
B+—Battery Positive Voltage
BP—Back Pressure
BTDC—Before Top Dead Center
°C—Degrees Celsius
CAC—Charge Air Cooler
Calif—California
CCOT—Cycling Clutch Orifice Tube
CD—Compact Disc
CFI—Continuous Fuel Injection
CID—Cubic Inch Displacement
CKP—Crankshaft Position
CL—Closed Loop
CMP—Camshaft Position
CO—Carbon Monoxide
Coax—Coaxial
Conn—Connector
Conv—Converter
CPP—Clutch Pedal Position
CPS—Central Power Supply
Crank—Crankshaft
CTP—Closed Throttle Position
CV—Constant Velocity
Cyl—Cylinder(s)
DC—Direct Current
DFI—Direct Fuel Injection
Diff—Differential
DI—Distributor Ignition
Dist—Distributor
DLC—Data Link Connector
DTC—Diagnostic Trouble Code
DTM—Diagnostic Test Mode
DVM—Digital Voltmeter (10 meg.)
EAC—Electric Air Control
EAS—Electric Air Switching
ECL—Engine Coolant Level
ECM—Engine Control Module
ECT—Engine Coolant Temperature
ECU—Engine Calibration Unit (PROM)
EEPROM—Electronically Erasable Programmable Read Only Memory
EFE—Early Fuel Evaporation
EGR—Exhaust Gas Recirculation
EGR TVV—Exhaust Gas Recirculation Thermal Vacuum Valve
EI—Electronic Ignition
EM—Engine Modification
EPROM—Erasable Programmable Read Only Memory
ESC—Electronic Spark Control
ESD—Electrostatic Discharge
ETR—Electronically Tuned Receiver
EVAP—Evaporative Emission
EXH—Exhaust
°F—Degrees Fahrenheit
FC—Fan Control
FED—Federal (All States Except Calif.)
GAL—Gallon
GEN—Generator
Gov—Governor
g—Gram
GND—Ground
Harn—Harness
HC—Hydrocarbons
HD—Heavy Duty
Hg—Mercury
HiAlt—High Altitude
HO2S—Heated Oxygen Sensor
IAC—Idle Air Control
IAT—Intake Air Temperature
IC—Ignition Control
ICM—Ignition Control Module
ID—Identification or Inside Diameter
IFI—Indirect Fuel Injection
IGN—Ignition
ILC—Idle Load Compensator
INJ—Injection
IP—Instrument Panel
IPC—Instrument Panel Cluster
INT—Intake
ISC—Idle Speed Control
km—Kilometer
km/h—Kilometer per hour
kPa—KiloPascals
KS—Knock Sensor
kV—Kilovolts (thousands of volts)
L—Liter
LF—Left Front
LH—Left Hand
LR—Left Rear
LS—Left Side
L4—Four Cylinder In-Line engine
MAF—Mass Air Flow
MAN--Manual
MAP—Manifold Absolute Pressure
MAT—Manifold Air Temperature
Max—Maximum
MC—Mixture Control
MDP—Manifold Differential Pressure
MFI—Multiport Fuel Injection
MIL—Malfunction Indicator Lamp
Min—Minimum
mL—Milliliter
mm—Millimeter
MPG—Miles Per Gallon
MPH—Miles Per Hour
MST—Manifold Surface Temperature
mV—MilliVolt
NC—Normally Closed
N.m--Newton Meters
NO—Normally Open

NOx—Nitrogen, Oxides of
NVRAM—Non-Volatile Random Access Memory
OBD—On-Board Diagnostic
OC—Oxidation Catalytic Converter
OD—Outside Diameter
OL—Open Loop
O2—Oxygen
O2S—Oxygen Sensor
PAIR—Pulse Secondary Air Injection
P/B—Power Brakes
PCM—Powertrain Control Module
PCV—Positive Crankcase Ventilation
PNP—Park/Neutral Position
PRESS—Pressure
PROM—Programmable Read Only Memory
PS—Power Steering
psi—Pounds per Square Inch
Pt—Pint
PTO—Power Takeoff
PWM—Pulse Width Modulated
Qt—Quart
RAM—Random Access Memory
REF—Reference
RF—Right Front
RFI—Radio Frequency Interference
RH—Right Hand
ROM—Read Only Memory
RPM—Engine Speed
RPO—Regular Production Option
RR—Right Rear
RS—Right Side
RTV—Room Temperature Vulcanizing
RVB—Rear Vacuum Break
RVR—Response Vacuum Reducer
SAE—Society of Automotive Engineers
Sec—Secondary
SFI—Sequential Multiport Fuel Injection
SI—System International
Sol—Solenoid
SPEC—Specification
Speedo-Speedometer
SPL—Smoke Puff Limiter
SRI—Service Reminder Indicator
SRT—System Readiness Test
ST—Scan Tool
SYN—Synchronize
TAC—Thermostatic Air Cleaner
Tach—Tachometer
TB—Throttle Body
TBI—Throttle Body Fuel Injection
TCC—Torque Converter Clutch
TCM—Transmission Control Module
TDC—Top Dead Center
Term—Terminal
Thermo—Thermostatic Air Cleaner
TEMP—Temperature
TP—Throttle Position
TRANS—Transmission
TV—Throttle Valve
TVRS—Television & Radio Suppression
TVV—Thermal Vacuum Valve
TWC—Three Way Catalytic Converter
TWC+OC—Three Way + Oxidation Catalytic Converter
U-Joint—Universal Joint
V—Volt(s)
VAC—Vacuum
VAF—Volume Air Flow
VDOT—Variable Displacement Orifice Tube
VIN—Vehicle Identification Number
VR—Voltage Regulator
V-ref—ECM Reference Group
VRV—Vacuum Reducer Valve
VSS—Vehicle Speed Sensor
V6—Six Cylinder "V" Engine
V8—Eight Cylinder "V" Engine
w/—With
w/b—Wheel Base
w/o—Without
WOT—Wide Open Throttle
WU-OC—Warmup Oxidation Catalytic Converter
WU-TWC—Warmup Three Way Catalytic Converter

REPLACEMENT LABELS

Replacement labels are available through GM Service Parts Operations (SPO) for the following:

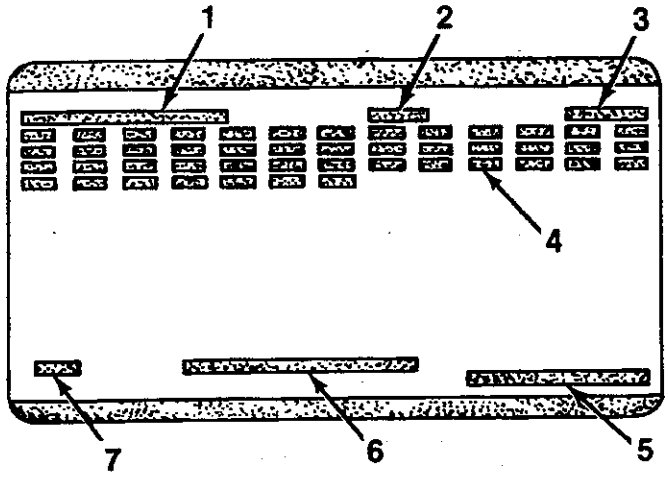
- Vehicle Emission Control Information (Exhaust Emission Tune-Up)
- Spare Wheel Caution
- Jacking
- Spare Tire Storage
- Serpentine Belt Routing
- Engine Fan Caution

These and other labels will be found in the Standard Parts Catalog.

The Vehicle Certification Label, Tire Pressure Placard, and Service Parts Identification Label are **NOT** available as service parts.

SERVICE PARTS IDENTIFICATION LABEL

The Service Parts Identification Label has been developed and placed on the vehicle to aid service and parts personnel in identifying parts and options originally installed on the vehicle (figure 29).



1. Vehicle Identification Number (VIN)
2. Wheel Base
3. Model Designation
4. RPO and/or SEO Options
5. Order Number
6. Exterior Color
7. Paint Technology

F2911

Figure 29—Service Parts Identification Label

OPTION AND PROCESS CODES

AE7	Seating: 40/60 Split Front Bench
AG9	Seat Adjuster: Power, 6 Way
AJ1	Window: Deep Tint, All Except Windshield and Door Glass
AK9	Restraint System: Rear Seat Shoulder
AM7	Seat: Rear Folding Bench
AS3	Rear Seat: Suburban
ATZ	Rear Seat: Delete
AT5	Rear Seat: Center, Folding
AU3	Lock: Side Door, Electric
AU6	Lock: Tailgate, Elect. Release
A20	Window: Rear Quarter Vent, Swing Out
A28	Window: Rear Full Width, Sliding
A31	Window: Side, Power
A50	Seat: Front Bucket
A52	Seat: Front Folding Bench
A82	Head Restraint System
A95	Front Bucket Seats, High Back and Reclining
BG9	Covering: Floor, Rubber
BYP	Sales: Sport Equipment Package
B3J	Diesel Equipment
B32	Floor Mats: Front Removable, Color Keyed
B33	Floor Mats: Rear Removable, Color Keyed
B37	Covering: Floor Mats, Frt. & Rear, Aug
B71	Moldings: Wheel Opening, Colored
B85	Moldings: Bright Body Side
B96	Moldings: Chrome Wheel Opening
C3F	7700 Lbs. GVW Rating
C25	Wiper System: Rear Window
C36	Heater: Auxiliary
C49	Defogger: Rear Window, Electric
C5B	15,000 Lbs. GVW Rating
C5G	5600 Lbs. GVW Rating
C5I	8050 Lbs. GVW Rating
C5M	6100 Lbs. GVW Rating
C5P	6250 Lbs. GVW Rating
C5S	6600 Lbs. GVW Rating
C5U	6800 Lbs. GVW Rating
C5Z	7200 Lbs. GVW Rating
C6P	8600 Lbs. GVW Rating
C6U	9000 Lbs. GVW Rating
C6W	9200 Lbs. GVW Rating
C6Y	9600 Lbs. GVW Rating
C60	Air Conditioning: Front, Manual
C69	Air Conditioning: Rear, Roof Mounted
C7A	10,000 Lbs. GVW Rating
C7E	11,000 Lbs. GVW Rating
C7I	6450 Lbs. GVW Rating
C7L	12,000 Lbs. GVW Rating
C95	Roof Lamp: Courtesy, Dual Reading
DF2	Mirrors Exterior: Camper Type, Stainless Steel
DG5	Mirrors Exterior: West Coast Type, Stainless Steel
DK6	Console: Instrument, Roof
DR1	Mirrors, Exterior: LH & RH Man. Cont., Painted
D44	Mirrors, Exterior: Below-Eye-Line Type, Black
D45	Mirrors, Exterior: Below Eyeline, Bright
D48	Mirrors, Exterior: Electric, Painted
D55	Console: Frt. Compt., Floor
E55	Endgate: Suburban
E62	Pickup Box: Sportside/Stepside
E63	Pickup Box: Fleetside
FF4	Torsion Bar Spring Adjust Arm, Left
FF5	Torsion Bar Spring Adjust Arm, Right
FF6	Torsion Bar Spring Adjust Arm, Left
FF7	Torsion Bar Spring Adjust Arm, Right
FF8	Torsion Bar Spring Adjust Arm, Left
FF9	Torsion Bar Spring Adjust Arm, Right
FK2	Torsion Bar Spring Adjust Arm, Left
FK3	Torsion Bar Spring Adjust Arm, Right
FWI	Plant Code: Fort Wayne, IN
F44	Chassis Equipment, Heavy Duty
F51	Shock Absorbers: Front & Rear, Heavy Duty
F60	Springs, Front: Heavy Duty
F61	Rear Stabilizer Shaft
GK9	Axle: Rear, 4.63 Ratio
GMC	Plant Code: Pontiac, MI
GQ1	Axle: Rear, Standard Ratio
GTY	Rear Axle, Wide Track
GT4	Axle: Rear, 3.73 Ratio

GT5 Axle: Rear, 4.10 Ratio
GU4 Axle: Rear, 3.08 Ratio
GU6 Axle: Rear, 3.42 Ratio
G50 Spring: Rear, Heavy Duty, Variation 1
G80 Axle, Rear: Limited Slip Differential
HC4 Axle: Rear, 4.56 Ratio
HC7 Axle: Rear, 5.13 Ratio
JAN Plant Code: Janesville, WI.
JB5 Power Brake, Disc/Drum, 6400 Lbs.
JB6 Power Brakes, Disc/Drum, 7200 Lbs.
JB7 Power Brakes, Disc/Drum, 8400 Lbs.
JB8 Power Brakes, Disc/Drum, 10,000 Lbs.
JD5 Dual Power Brakes, Disc/Drum, 6400 Lbs.
JD6 Hydraulic Power Brakes, Disc/Drum, 7200 Lbs.
JD7 Hydraulic Power Brakes, Disc/Drum, 8400 Lbs.
JF9 Hydraulic Power Brakes, 4 Wheel Discs
KC4 Cooling System: Engine Oil
KL5 Conversion: Natural Gas
K05 Heater: Engine Coolant
K19 Reactor System: Air Injection
K34 Cruise Control: Electric
K60 Generator: 100 Ampere
K68 Generator: 105 Ampere
LB4 Engine: 4.3 Liter V6, TBI
L03 Engine: 5.0 Liter V8, TBI
L05 Engine: 5.7 Liter V8, TBI
L19 Engine: 7.4 Liter V8, TBI
L49 Engine: 6.5 Liter V8, Diesel
L56 Engine: 6.5 Liter V8, Turbo Diesel
L65 Engine: 6.5 Liter V8, Turbo Diesel, HO
MG5 Transmission: New Venture Gear 3500 (5LM60), 5-Speed Manual
MM5 Transmission: Manual, 5-Speed w/Overdrive
MT1 Transmission: Hydra-Matic 4L80-E, 4-Speed Automatic
MT8 Transmission: New Venture Gear 4500, 5-Speed Manual
MXO Transmission: Automatic w/Overdrive
M30 Transmission: Hydra-Matic 4L60-E, 4-Speed Automatic
NA1 Emission System (Less than 8500 Lbs.)
NA4 Emission System (Above 8500 Lbs.)
NA5 Emission System: Federal
NA6 Emission System: High Altitude
NB2 Emission System: California
ND3 Vehicle Label: Emission Control
NK3 Steering Wheel: Sport
NK7 Fuel Tank, 117 L, 31 Gal.
NM8 Emission System: Leaded Fuel
NRQ Exhaust: Close Coupled
NY1 Shield: Fuel Tank Steel
NZZ Skid Plate: Off Road
N33 Steering Column: Tilt
N83 Wheels: 15 X 7, Chrome, Styled
N90 Wheels: Aluminum, Cast
OSG Plant Code: Oshawa, ONT, GM of Canada
PF4 Wheel: 16 x 7, Aluminum, Forged
P01 Wheel Trim: Wheel Covers
P06 Wheel Trim: Trim Rings
P13 Carrier, Spare Wheel, Side Mounted
P18 Carrier, Spare Tire with Hoist
QBN Tire: All, LT245/75R16/C BW R/PE ST TBL OOR
QBX Tire: All, LT245/75R16/C WOL R/PE ST TBL OOR
QB5 Wheel: 16X16.5, Steel, H.D.
QHA Tire: All, P235/75R15/X BW R/PE ST TL ALS
QHB Tire: All, P235/75R15/X WS2 R/PE ST TL ALS
QHP Tire: All, LT225/75R16/D BW R/PE ST TL ALS
QHR Tire: All, LT225/75R16/D BW R/PE ST TL OOR
QIT Tire: All, LT245/75R16/C BL R/PE ST TL ALS
QIW Tire: All, LT245/75R16/E BL R/PE ST TL OOR
QIX Tire: All, LT265/75R16/C BL R/PE ST TL OOR
QIY Tire: All, LT265/75R16/C WOL R/PE ST TL OOR
QIZ Tire: All, LT245/75R16/E BL R/PE ST TL OOR
QJV Tire: All, LT225/75R16/C BL R/PE ST TL ALS
Q4B 6200 Lbs. GVW Rating
R04 Wheels, Rear: Single
R05 Wheels, Rear: Dual
SVA Holder: Cup, I/P Mounted
TP2 Battery: Auxiliary, Camper
TR9 Lighting, Auxiliary
TS6 Lamp: Stop, High Level
T61 Daytime Running Lights
UD4 Speed Alarm: 120 km/hr.
UL5 Radio: Delete
UF2 Lamp: Cargo Area
UK1 Frequencies: Japanese Radio
UL2 Frequencies: European Radio
UL5 Radio: Delete
UM6 Radio Equipment: ETR AM/FM Stereo Cassette, Clock w/Seek & Scan
UM7 Radio Equipment: ETR AM/FM Stereo, Clock w/Seek & Scan
UP4 Radio Equipment: AM ETR
UW0 Speaker System: Dual Frt. I/P Mounted, Dual Roof Mounted
UX1 Radio Equipment: ETR AM/FM Stereo, Seek & Scan, Cassette w/ Search and Repeat, Graphic Equalizer, Digital Clock
UY1 Camper Wiring Harness
UY7 Harness, Wiring: Trailer Heavy Duty (7 Wire)
U01 Lamps, Roof Marker
U16 Tachometer, Engine
U18 Speedometer (Kilo.).
U66 Radio Equipment: Four Speakers (avail. w/UM6 & UM7)
U88 Radio Equipment: Six Speakers (Dual I/P Mounted, Dual Rear Side Door, Dual Roof Mounted)
VB3 Bumper: Chromed Rear Step
VG3 Bumper: Deluxe Front Bumper
VK3 Bracket, License Plate: Front
VR4 Trailering Equipment: Weight Distributing Platform Hitch
V01 Cooling System: Radiator, Heavy Duty
V02 Cooling System: Transmission Oil Cooler, Heavy Duty
V08 Cooling System: Heavy Duty
V10 Cold Climate Package
V22 Appearance: Deluxe Front
V27 Bumper Guards, Front
V43 Bumper: Painted Rear Step
V54 Luggage Carrier: Roof, Painted
V76 Towing Device: Front
XBK Tire: Front, LT245/75R16/C BL R/PE ST TBL ALS

XBN Tire: Front, LT245/75R16/C BL R/PE ST TBL OOR
XBX Tire: Front, LT245/75R16/C BL R/PE ST TBL OOR
XCN Tire: Front, P275/60R15 BW R/PE ST TL AL3 107H
XDE Tire: Front, 7.50-16LT/D BL D/NY TL HWY
XDL Tire: Front, 7.50-16LT/D BL D/NY TL HWY
XET Tire: Front, P225/75R15/N BL R/PE ST TL ALS
XEV Tire: Front, P225/75R15/N RWL R/PE ST TL ALS
XFL Tire: Front, P235/75R15/N BW R/PE ST TL ALS 105S
XFM Tire: Front, P235/75R15/N XNW R/PE ST TL ALS
XFN Tire: Front, P235/75R15/N RWL R/PE ST TL ALS
XGK Tire: Front, LT245/75R16/E BL R/PE ST OOR
XGL Tire: Front, LT265/75R16/C BL R/PE ST OOR
XGM Tire: Front, LT265/75R16/C WOL R/PE ST OOR
XHA Tire: Front, P235/75R15/X BW R/PE ST TL ALS
XHB Tire: Front, P235/75R15/X XNW R/PE ST TL ALS
XHE Tire: Front, LT225/75R16/C BL R/PE ST ALS
XHH Tire: Front, LT245/75R16/E BL R/PE ST ALS
XHJ Tire: Front, LT225/75R16/C BL R/PE ST OOR
XHN Tire: Front, LT225/75R16/C WOL R/PE ST OOR
XHP Tire: Front, LT225/75R16/D BL R/PE ST TL ALS
XHR Tire: Front, LT225/75R16/D BL R/PE ST TL OOR
XTN Tire: Front, 225/70R19.5/F BW R/ST TL HWY
X88 Conversion: Nameplate, Chevrolet
YA9 Axle: Front, 3,400 Lbs.
YBK Tire: Rear, LT245/75R16/C BL R/PE ST TBL ALS
YBN Tire: Rear, LT245/75R16/C BL R/PE ST TBL OOR
YBX Tire: Rear, LT245/75R16/C WOL R/PE ST TBL OOR
YCN Tire: Rear, P275/60R15 BW R/PE ST TL AL3 107H
YDE Tire: Rear, 7.50-16LT/D BL D/NY TL HWY
YDL Tire: Rear, 7.50-16LT/D BL D/NY TL OOR
YD3 Axle: Base Equipment
YD6 Spring: Rear, Base Equipment
YET Tire: Rear, P225/75R15/N BL R/PE ST TL ALS
YEV Tire: Rear, P225/75R15/N RWL R/PE ST TL ALS
YE9 CL/SLE Equipment
YFL Tire: Rear, P235/75R15/N BW R/PE ST TL ALS 105S
YFM Tire: Rear, P235/75R15/N XNW R/PE ST TL ALS
YFN Tire: Rear, P235/75r15/N RWL R/PE ST TL ALS
YGK Tire: Rear, LT245/75R16/E BL R/PE ST OOR
YGL Tire: Rear, T265/75R16/C BL R/PE ST OOR
YGM Tire: Rear, LT265/75R16/C WOL R/PE ST OOR
YHA Tire: Rear, P235/75R15 XL ST ALS BL
YHB Tire: Rear, P235/75R15/X XNW R/PE ST TL ALS
YHE Tire: Rear, LT225/75R16/C BL R/PE ST ALS
YHH Tire: Rear, LT245/75R16/E BL R/PE ST ALS
YHJ Tire: Rear, LT225/75R16/C BL R/PE ST OOR
YHN Tire: Rear, LT225/75R16/D BL R/PE ST TL ALS
YHP Tire: Rear, LT225/75R16/D BL R/PE ST TL ALS
YHR Tire: Rear, LT225/75R16/D BL R/PE ST TL OOR
YTN Tire: Rear, 225/70R19.5/F BW R/ST ST TL HWY
ZBK Tire: Spare, LT245/75R16/C BL R/PE ST TBL OOR
ZBN Tire: Spare, LT245/75R16/C BL R/PE ST TBL OOR
ZBX Tire: Spare, LT245/75R16/C WOL R/PE ST TBL OOR
ZCN Tire: Spare, P275/60R15 BW R/PE ST TL AL3 107H
ZDE Tire: Spare, 7.50-16LT/D BL D/NY TL HWY
ZDL Tire: Spare, 7.50-16LT/D BL D/NY TL OOR
ZET Tire: Spare, P225/75R15/N BL R/PE ST TL ALS
ZEV Tire: Spare, P225/75R15/N RWL R/PE ST TL ALS
ZFL Tire: Spare, P235/75R15/BW R/PE ST TL ALS 105S
ZFM Tire: Spare, P235/75R15/N XNW R/PE ST TL ALS
ZFN Tire: Spare, P235/75R15/N XNW R/PE ST TL ALS
ZGK Tire: Rear, LT245/75R16/E BL R/PE ST OOR
ZGL Tire: Spare, LT265/75R16/E BL R/PE ST OOR
ZGM Tire: Spare, LT265/75R16/E BL R/PE ST OOR
ZHA Tire: Spare, P235/75R15/X BW R/PE ST TL ALS
ZHB Tire: Spare, P235/75R15/X XNW R/PE ST ALS
ZHE Tire: Spare, LT225/75R16/C BL R/PE ST ALS
ZHH Tire: Spare, LT245/75R16/E BL R/PE ST ALS
ZHJ Tire: Spare, LT225/75R16/C BL R/PE ST OOR
ZHN Tire: Spare, LT225/75R16/C WOL R/PE ST OOR
ZHP Tire: Spare, LT225/75R16/D BL R/PE ST TL ALS
ZHR Tire: Spare, LT225/75R16/D BL R/PE ST TL OOR
ZQ8 Chassis Package: Sport
ZTN Tire: Spare, 225/70R19.5/F BW R/ST ST TL HWY
ZW9 Body Equipment: Base Body or Chassis
ZY1 Color Combination: Solid
ZY2 Color Combination: Two-Tone
ZY4 Color Combination: Deluxe Two-Tone
Z49 Daytime Running Lights
Z71 Chassis Package: Off-Road
Z81 Chassis: Basic Camper Equipment
Z82 Trailering Equipment: Heavy Duty
01L Secondary Color: Exterior, Special
01U Primary Color: Exterior, Special
12U Primary Color: Exterior, Yellow White
13C Trim Combination: Cloth, Light Gray
13D Trim Combination: Cloth, Light Gray
13I Interior Trim: Light Smoke Gray
13V Trim Combination: Vinyl, Light Gray
13W Trim Combination: Vinyl, Light Gray
15A Stripe: Color Accent, Two Tone, Teal/Silver

19U	Primary Color: Exterior, Lamp Black
20L	Secondary Color: Exterior, Lt. Quasar Blue Metallic
20U	Primary Color: Exterior, Lt. Quasar Blue Metallic
24U	Primary Color: Exterior, Medium Blue Metallic
26A	Stripe: Color Accent, Two Tone, Blue/Silver
26C	Trim Combination: Cloth, Navy
26D	Trim Combination: Cloth, Navy
26I	Interior Trim, Navy
26V	Trim Combination: Vinyl, Navy
26W	Trim Combination: Vinyl, Navy
27A	Stripe Color Accent: Two-Tone, Light Blue/Dark Blue
29U	Primary Color: Exterior, Dark Blue
30L	Secondary Color: Exterior, Atlantic Blue Metallic
30U	Primary Color: Exterior, Atlantic Blue Metallic
36L	Secondary Color: Exterior, Medium Dark Teal Metallic
36U	Primary Color: Exterior, Medium Dark Teal Metallic
38L	Secondary Color: Exterior, Bright Teal Metallic
38U	Primary Color: Exterior, Bright Teal Metallic
39A	Stripe Color Accent: Two-Tone, Light Teal Metallic/Silver
39L	Secondary Color: Exterior, Indigo Metallic
39U	Primary Color: Exterior, Indigo Metallic
41L	Secondary Color: Exterior, Black
41U	Primary Color: Exterior, Black
46U	Primary Color: Exterior, Dark Green
47C	Trim Combination: Cloth, Dark Red
47D	Trim Combination: Cloth, Dark Red
47I	Interior Trim: Dark Red
47V	Trim Combination: Vinyl, Dark Red
47W	Trim Combination: Vinyl, Dark Red
50L	Secondary Color: Exterior, Olympic White
50U	Primary Color: Exterior, Blue White
51A	Stripe: Color Accent, Two Tone, Gray/Silver
55L	Secondary Color: Exterior, Light Autumnwood Metallic
55U	Primary Color: Exterior, Light Autumnwood Metallic
56L	Secondary Color: Exterior, Dark Autumnwood Metallic
56U	Primary Color: Exterior, Dark Autumnwood Metallic
6Y4	Wheel and Tire: Spare, Delete
60A	Stripe: Color Accent, Two Tone, Beige/Black
61U	Primary Color: Exterior, Tan
64C	Trim Combination: Cloth, Light Beige
64D	Trim Combination: Cloth, Light Beige
64I	Interior Trim, Light Beige
64V	Trim Combination: Vinyl, Light Beige
64W	Trim Combination: Vinyl, Light Beige
65A	Stripe: Color Accent, Two Tone, Beige Metallic/Dark Autumnwood Metallic
71A	Stripe: Color Accent, Two Tone, Silver/Red
71U	Primary Color: Exterior, Red Orange
72U	Primary Color: Exterior, Standard Red
74L	Secondary Color: Exterior, Victory Red
74U	Primary Color: Exterior, Victory Red
8E6	Bumper: Rear Painted
80A	Stripe: Color Accented, Two Tone, Gunmetal/Red
84L	Secondary Color: Exterior, Dark Hunt Club Red Metallic
84U	Primary Color: Exterior, Dark Hunt Club Red Metallic
90U	Primary Color: Exterior, Gray Metallic
91L	Secondary Color: Exterior, Dark Argent
93A	Stripe: Color Accent, Two Tone, Gold/Red
95L	Secondary Color: Exterior, Garnet Red Metallic
95U	Primary Color: Exterior, Garnet Red Metallic
96L	Secondary Color: Exterior, Ultra Silver Metallic
96U	Primary Color: Exterior, Ultra Silver Metallic

NOTES

SECTION 0B

MAINTENANCE AND LUBRICATION

CONTENTS

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SCHEDULED MAINTENANCE SERVICES

NORMAL VEHICLE USE

The maintenance instructions contained in the Maintenance Schedule are based on the assumption that the vehicle will be used as designed:

- To carry passengers and cargo within the limitation indicated on the vehicle certification label located on the edge of the driver's door.
- On reasonable road surfaces within legal operating limits.
- On unleaded gasoline.

MAINTENANCE SCHEDULE I

Follow Maintenance Schedule I if the vehicle is operated under one or more of the following conditions:

- When most trips are less than 6 km (4 miles).
- Operating when outside temperatures remain below freezing and when most trips are less than 16 km (10 miles).
- When most trips include extended idling and/or frequent low-speed operation as in stop-and-go traffic.
- Towing a trailer.
- Operating in dusty areas.

Maintenance Schedule I should also be followed if the vehicle is used in delivery service or other commercial applications.

MAINTENANCE SCHEDULE II

Follow Maintenance Schedule II only if none of the driving conditions specified in Maintenance Schedule I apply.

EXPLANATION OF SCHEDULED MAINTENANCE SERVICES

Refer to figures 1 through 6 for the schedules of time and/or mileage intervals. The following text gives the details of the required maintenance services.

ENGINE OIL AND ENGINE OIL FILTER CHANGE

Important

Always use "SH" quality energy conserving II oils of proper viscosity.

The "SH" designation may be shown alone or in combination with other designations such as SH/CC, SH/CD, SF, SG, CC, etc.

Oil Filter

Important

To prevent leakage of all oil filters such as PF-35, PF-51, etc., it is very important that the installation instructions listed below are closely followed.

Remove the old filter by turning counterclockwise. Clean the gasket sealing area on the engine oil filter mounting surface. (If the engine has an adapter base, make sure the threaded nipple or bolt is properly torqued.).

Item No.	If your driving conditions meet those specified in "Scheduled Maintenance Services" in this Section (or see Index), use Maintenance Schedule I (+)																								
	Service	Miles (000)	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60
		Kilometers (000)	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
1	Engine Oil Change*—Every 3 Months, or		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	Oil Filter Change*—Every 3 Months, or		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2	Chassis Lubrication—Every 12 Months, or		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3	Clutch Fork Ball Stud Lubrication (5-speed manual transmission with deep-low only)											+										+
5	Cooling System Service *—Every 24 Months or											+										+
6	Air Cleaner Filter Replacement*$											+										+
7	Front Wheel Bearing Repack						+					+					+					+
8	Transmission Service **																					
10	Fuel Filter Replacement*$											+										+
11	Spark Plugs Replacement*											+										+
12	Spark Plug Wire Inspection*																					+
15	Engine Timing Check*$																					+
16	Fuel Tank, Cap and Lines Inspection *$																					+
18	Engine Accessory Drive (Serpentine) Belt Inspection*																					+
24	Tire and Wheel Rotation**			+					+					+					+			
25	Drive Axle Service**		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
26	Brake Systems Inspection**																					

* An Emission Control Service

** See "Explanation of Scheduled Maintenance Services" in the Index

$ The California Air Resources Board has determined that the failure to perform this maintenance item will not nullify the emission warranty or limit recall liability prior to the completion of vehicle useful life. General Motors, however, urges that all recommended maintenance services be performed at the indicated intervals and the maintenance be recorded.

T0401/T0901

THE SERVICES SHOWN ON THIS CHART UP TO 60,000 MILES (100 000 km) ARE TO BE DONE AFTER 60,000 MILES AT THE SAME INTERVALS.

T0402/T0902

3100r5284

Figure 1—Maintenance Schedule I - Gasoline Engines with Light Duty Emissions

Item No.	If your driving conditions meet those specified in "Scheduled Maintenance Services" in this Section (or see Index), use Maintenance Schedule I (+)								
	Service	Miles (000)	7.5	15	22.5	30	37.5	45	52.5	60
		Kilometers (000)	12.5	25	37.5	50	62.5	75	87.5	100
1	Engine Oil Change*—Every 12 Months, or		•	•	•	•	•	•	•	•
	Oil Filter Change*—Every 12 Months, or		•		•		•		•	
2	Chassis Lubrication—Every 12 Months, or		•	•	•	•	•	•	•	•
3	Clutch Fork Ball Stud Lubrication					•				•
5	Cooling System Service* —Every 24 Months or					•				•
6	Air Cleaner Filter Replacement*					•				•
7	Front Wheel Bearing Repack					•				•
8	Transmission Service **									
10	Fuel Filter Replacement*$									•
11	Spark Plugs Replacement*					•				•
12	Spark Plug Wire Inspection*									•
15	Engine Timing Check*$									•
16	Fuel Tank, Cap and Lines Inspection*$									•
18	Engine Accessory Drive (Serpentine) Belt Inspection*									•
24	Tire and Wheel Rotation**		•		•		•		•	
25	Drive Axle Service**		•	•	•	•	•	•	•	•
26	Brake Systems Inspection**									

* An Emission Control Service

** See "Explanation of Scheduled Maintenance Services" in the Index

$ The California Air Resources Board has determined that the failure to perform this maintenance item will not nullify the emission warranty or limit recall liability prior to the completion of vehicle useful life. General Motors, however, urges that all recommended maintenance services be performed at the indicated intervals and the maintenance be recorded.

THE SERVICES SHOWN ON THIS CHART UP TO 60,000 MILES (100 000 km) ARE TO BE DONE AFTER 60,000 MILES AT THE SAME INTERVALS.

T0403/T0903

3100r528

Figure 2—Maintenance Schedule II - Gasoline Engines with Light Duty Emissions

Item No.	If your driving conditions meet those specified in "Scheduled Maintenance Services" in this Section (or see Index), use Maintenance Schedule I (+)																				
	Service	Miles (000)	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60
		Kilometers (000)	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
1	Engine Oil Change*—Every 3 Months, or		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	Oil Filter Change*—Every 3 Months, or		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2	Chassis Lubrication—Every 12 Months, or		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3	Clutch Fork Ball Stud Lubrication											+										+
5	Cooling System Service *—Every 24 Months or									+								+				
6	Air Cleaner Filter Replacement*									+								+				
7	Front Wheel Bearing Repack					+				+				+				+				
8	Transmission Service **																					
10	Fuel Filter Replacement*					+				+				+				+				+
11	Spark Plugs Replacement*										+									+		
12	Spark Plug Wire Inspection*																					+
13	EGR System Inspection*																					+
14	Electronic Vacuum Regulator Valve (EVRV) Inspection*																					+
15	Engine Timing Check▲*									+								+				
16	Fuel Tank, Cap and Lines Inspection *																					+
17	Thermostatically Controlled Air Cleaner Inspection▲*									+								+				
18	Engine Accessory Drive (Serpentine) Belt Inspection*					+				+				+				+				+
19	Evaporative Control System Inspection*																					+
20	Shields and Underhood Insulation Inspection▲■					+				+				+				+				+
21	Air Intake System Inspection▲■									+								+				
22	Thermostatically Controlled Engine Cooling Fan Check▲■—Every 12 Months or					+				+				+				+				+
24	Tire and Wheel Rotation**			+					+					+					+			
25	Drive Axle Service**		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
26	Brake Systems Inspection**																					

* An Emission Control Service

** See "Explanation of Scheduled Maintenance Services" in this section.

▲ Also a Noise Emission Control Service

■ Applicable only to vehicles sold in the United States

T0404

THE SERVICES SHOWN ON THIS CHART UP TO 60,000 MILES (100 000 km) ARE TO BE DONE AFTER 60,000 MILES AT THE SAME INTERVALS.

T0405

Figure 3—Maintenance Schedule I - Gasoline Engines with Heavy Duty Emissions

3100r5286

Item No.	If your driving conditions meet those specified in "Scheduled Maintenance Services" in this Section (or see Index), use Maintenance Schedule I (+)																										
	Service	Miles (000)	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60
		Kilometers (000)	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
1	Engine Oil Change*—Every 12 Months, or			•		•		•		•		•		•		•		•		•		•
	Oil Filter Change*—Every 12 Months, or			•				•				•				•				•		
2	Chassis Lubrication—Every 12 Months, or			•		•		•		•		•		•		•		•		•		•
3	Clutch Fork Ball Stud Lubrication											•										•
5	Cooling System Service *—Every 24 Months or									•								•				
6	Air Cleaner Filter Replacement*									•								•				
7	Front Wheel Bearing Repack									•								•				
8	Transmission Service**																					
10	Fuel Filter Replacement*									•								•				
11	Spark Plugs Replacement*										•									•		
12	Spark Plug Wire Inspection*																					•
13	EGR System Inspection*																					•
14	Electronic Vacuum Regulator Valve (EVRV) Inspection*																					•
15	Engine Timing Check▲*									•								•				
16	Fuel Tank, Cap and Lines Inspection *																					•
17	Thermostatically Controlled Air Cleaner Inspection▲*									•								•				
18	Engine Accessory Drive (Serpentine) Belt Inspection*					•				•				•				•				•
19	Evaporative Control System Inspection*																					•
20	Shields and Underhood Insulation Inspection▲■					•				•				•				•				•
21	Air Intake System Inspection▲■									•								•				
22	Thermostatically Controlled Engine Cooling Fan Check▲■—Every 12 Months or					•				•				•				•				•
24	Tire and Wheel Rotation**			•				•				•				•				•		
25	Drive Axle Service**			•		•		•		•		•		•		•		•		•		•
26	Brake Systems Inspection**																					

* An Emission Control Service

** See "Explanation of Scheduled Maintenance Services" in this section.

▲ Also a Noise Emission Control Service

■ Applicable only to vehicles sold in the United States

T0406

THE SERVICES SHOWN ON THIS CHART UP TO 60,000 MILES (100 000 km) ARE TO BE DONE AFTER 60,000 MILES AT THE SAME INTERVALS.

T0407

Figure 4—Maintenance Schedule II - Gasoline Engines with Heavy Duty Emissions

3100r5287

Item No.	If your driving conditions meet those specified in "Scheduled Maintenance Services" in this section, use Maintenance Schedule I (+).																													
	Service	Miles (000)	2.5	5	7.5	10	12.5	15	17.5	20	22.5	25	27.5	30	32.5	35	37.5	40	42.5	45	47.5	50	52.5	55	57.5	60
		Kilometers (000)	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84	88	92	100
1	Engine Oil Change*—Every 3 Months, or		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	Oil Filter Change*—Every 3 Months, or		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2	Chassis Lubrication—Every 12 Months, or		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3	Clutch Fork Ball Stud Lubrication													+												+
4	Engine Idle Speed Adjustment*			+										+												+
5	Cooling System Service *—Every 24 Months or													+												+
6	Air Cleaner Filter Replacement*★																									
7	Front Wheel Bearing Repack							+						+						+						+
8	Transmission Service**																									
9	CDRV System Inspection*																									+
10	Fuel Filter Replacement*													+												+
13	EGR System Inspection*																									+
18	Engine Accessory Drive (Serpentine) Belt Inspection*																									+
20	Shields and Underhood Insulation Inspection▲■					+				+				+				+				+				+
21	Air Intake System Inspection▲■					+				+				+				+				+				+
22	Thermostatically Controlled Engine Cooling Fan Check▲■—Every 12 Months or					+				+				+				+				+				+
23	Exhaust Pressure Regulator Valve Inspection*																									+
24	Tire and Wheel Rotation**				+						+						+						+			
25	Drive Axle Service**			+		+		+		+		+		+		+		+		+		+		+		+
26	Brake Systems Inspection**																									

★ Change filter every 15,000 miles (24 000 km), except when operating in dusty conditions. Dusty conditions may require more frequent filter replacement. Extreme dust and dirt operating conditions (off-road), may require the air filter to be checked as often as every 300 miles (483 km) and replaced as necessary.

* An Emission Control Service

** See "Explanation of Scheduled Maintenance Services" in this section.

▲ Also a Noise Emission Control Service

■ Applicable only to trucks sold in the United States

T0408/T0908

THE SERVICES SHOWN ON THIS CHART UP TO 60,000 MILES (100 000 km) ARE TO BE DONE AFTER 60,000 MILES AT THE SAME INTERVALS.

T0409/T0909

Figure 5—Maintenance Schedule I - Diesel Engines

3100r5288

Item No.	If your driving conditions meet those specified in "Scheduled Maintenance Services" in this section, use Maintenance Schedule I (+). Service																													
	Miles (000)		2.5	5	7.5	10	12.5	15	17.5	20	22.5	25	27.5	30	32.5	35	37.5	40	42.5	45	47.5	50	52.5	55	57.5	60
	Kilometers (000)		4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84	88	92	100
1	Engine Oil Change*—Every 12 Months, or			•		•		•		•		•		•		•		•		•		•		•		•
	Oil Filter Change*—Every 12 Months, or			•		•		•		•		•		•		•		•		•		•		•		•
2	Chassis Lubrication—Every 12 Months, or			•		•		•		•		•		•		•		•		•		•		•		•
3	Clutch Fork Ball Stud Lubrication													•												•
4	Engine Idle Speed Adjustment*			•										•												•
5	Cooling System Service *—Every 24 Months or													•												•
6	Air Cleaner Filter Replacement*★													•												•
7	Front Wheel Bearing Repack													•												•
8	Transmission Service**																									
9	CDRV System Inspection*																									•
10	Fuel Filter Replacement*													•												•
13	EGR System Inspection*																									•
18	Engine Accessory Drive (Serpentine) Belt Inspection*																									•
20	Shields and Underhood Insulation Inspection▲■					•				•				•				•				•				•
21	Air Intake System Inspection▲■					•				•				•				•				•				•
22	Thermostatically Controlled Engine Cooling Fan Check▲■—Every 12 Months or					•				•				•				•				•				•
23	Exhaust Pressure Regulator Valve Inspection*																									•
24	Tire and Wheel Rotation**			•				•				•				•				•				•		
25	Drive Axle Service**			•		•		•		•		•		•		•		•		•		•		•		•
26	Brake Systems Inspection**																									

* An Emission Control Service
** See "Explanation of Scheduled Maintenance Services" in this section.
▲ Also a Noise Emission Control Service (applicable to vehicles with engine VIN code Y).
■ Applicable only to trucks sold in the United States

T0410/T0910

THE SERVICES SHOWN ON THIS CHART UP TO 60,000 MILES (100 000 km) ARE TO BE DONE AFTER 60,000 MILES AT THE SAME INTERVALS.

T0411/T0911

Figure 6—Maintenance Schedule II - Diesel Engines

3100/5289

Lightly oil gasket with clean oil, and install filter. After the oil filter gasket contacts the oil filter mounting surface, tighten 3/4 to 1 full turn. When necessary, use a cap-type wrench, strap-type wrench with handle, or equivalent to ensure proper installation.

With engine oil at the proper level, run the engine 3 minutes and thoroughly check the filter area for leaks.

Engine Oil Viscosity

Engine oil viscosity (thickness) has an effect on fuel economy and cold-weather operation (starting and oil flow). Lower viscosity engine oils can provide better fuel economy and cold weather performance; however, higher temperature weather conditions require higher viscosity engine oils for satisfactory lubrication.

NOTICE: Using oils of any viscosity other than those viscosities recommended could result in engine damage.

When choosing an oil, consider the range of temperatures the vehicle will be operated in before the next oil change.

OTHER REQUIRED SERVICES EACH TIME OIL IS CHANGED

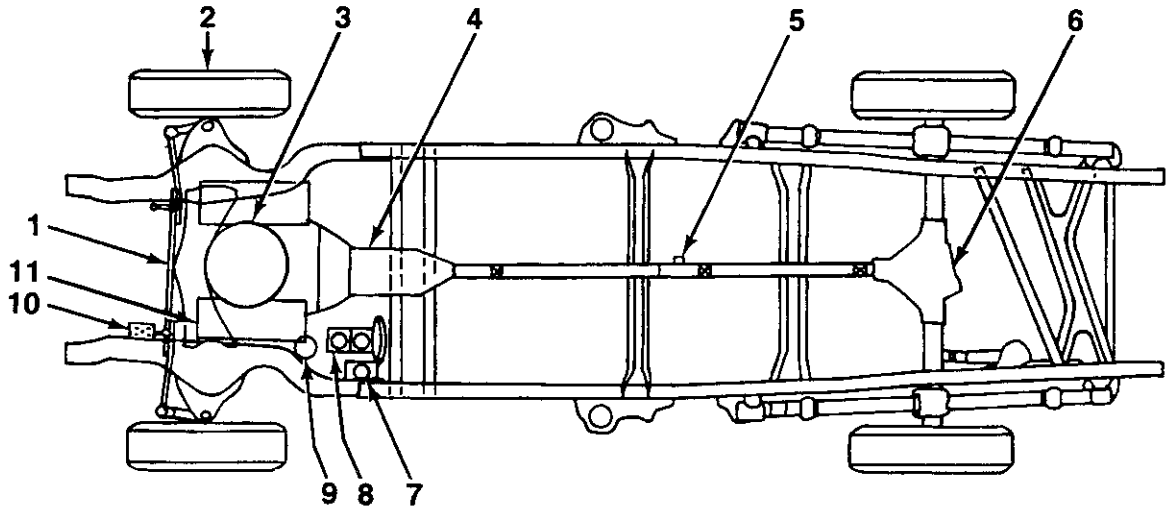
1. **Automatic Transmission Fluid Level**--Maintain fluid level within operating range on the oil level indicator. Refer to "Approximate Fluid Capacities."
2. **Manual Transmission Fluid Level**--Check fluid level and add as required. Refer to "Approximate Fluid Capacities."
3. **Engine Coolant Level and Condition**--Check the coolant level in the coolant reservoir and add if necessary. If an overheating condition has occurred, check the coolant level in the radiator after the engine has cooled. Inspect the coolant and replace if it is dirty or rusty.
4. **Brake Systems Inspection**--Inspect lines and hoses for proper hookup, binding, leaks, cracks, chafing, etc. For convenience, the following should be done when the wheels are removed for rotation: Inspect the disc brake pads for wear and rotors for surface condition. Inspect the drum brake linings for wear and cracks. Inspect other brake parts, including drums, wheel cylinders, parking brake, etc., at the same time. Check the parking brake adjustment. Inspect the brakes more often if habit or conditions result in frequent braking.
5. **Tire Inflation Pressure Check**--Check the tires for proper inflation.
6. **Drive Axle Service**--Check front/rear axle fluid level and add as needed. Check constant velocity joints and axle seals for leaking.
   - On vehicles with a locking differential—Drain fluid at first oil change and refill. Check fluid level and add as needed at subsequent oil changes. In dusty areas or trailer towing applications, drain fluid at every 24,135 km (15,000 miles) and refill.
   - On vehicles with a standard differential—Check fluid level and add as needed at every oil change. In dusty areas or trailer towing applications, drain fluid every 24,135 km (15,000 miles) and refill.
   - More frequent lubrication may be required for heavy-duty or off-road use.
   - On 3500 H.D. models with applications requiring extreme overload/trailer tow conditions and high speed conditions (above 72 km/h (45 mph) for extended periods of time—Change lubrication every 4,828 km (3,000 miles) or 3 months, whichever comes first, or use 75W-140 synthetic lubrication.
7. **Windshield Washer Fluid Level**--Check the level in the reservoir and add if necessary.
8. **Hood Latch Operation**--When opening the hood, note the operation of the secondary latch. It should keep the hood from opening all the way when the primary latch is released. Make sure the hood closes firmly.
9. **Lamp Operation**--Check the operation of the license plate lamp, side marker lamps, headlamps and high beams, parking lamps, tail lamps, brake lamps, turn signals, backup lamps, and hazard warning flasher.
10. **Power Steering System Reservoir Level**--Check and keep at proper level as described in SECTION 3B1.
11. **Brake Master Cylinder Reservoir Level**--Check the fluid as described in SECTION 5A and keep it at the proper level. A low fluid level can indicate a leak or worn disc pads that may need service.
12. **Transfer Case (Four Wheel Drive) Inspection**--Every 12 months or at oil change intervals, check front axle and transfer case and add lubricant when necessary. Oil the control lever pivot point and all exposed control linkage. Check the vent hose at the transfer case for kinks and proper installation. More frequent lubrication may be required on heavy-duty or off-road use.

CHASSIS LUBRICATION

Lubricate the front suspension, king pin bushings, steering linkage, transmission and transfer case shift linkage, parking brake cable guides, rear driveline center splines and front axle propshaft splines, brake pedal springs, and clutch pedal spring at the intervals specified (figures 7, 8, 9, and 10).

If you have a 3500 HD, lubricate the king pins and bushings every 2,500 km (1,500 miles) for Schedule I, or every 5,000 km (3,000 miles) for Schedule II.

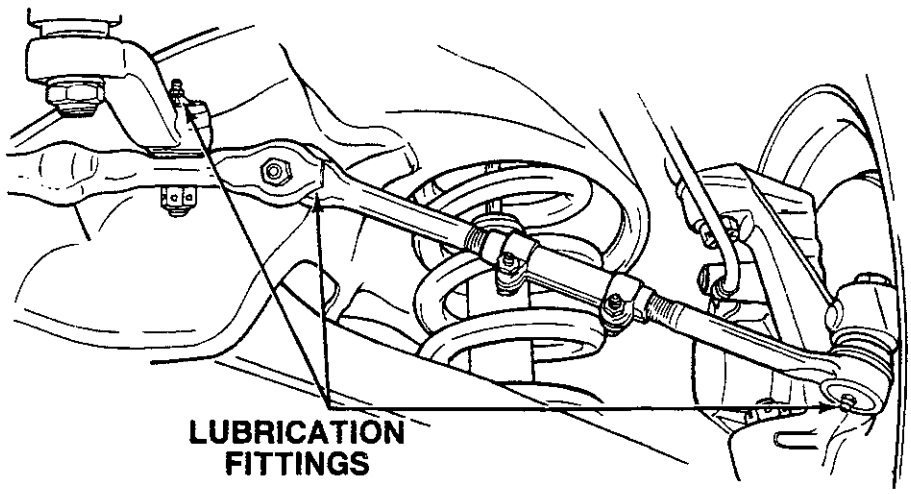
Ball joints and king pin bushings should not be lubricated unless their temperature is -12° C (10° F) or higher. During cold weather, the ball joint should be allowed to warm up as necessary before being lubricated. Use a low-pressure grease gun on all joints to prevent seal damage.



1. Steering Linkage
2. Wheel Bearings
3. Air Cleaner
4. Transmission
5. Propeller Shaft-Slip Joint
6. Rear Axle-Differential
7. Clutch Actuator
8. Master Cylinder
9. Oil Filter
10. Steering Gear
11. Engine

F3533

Figure 7—Lubrication Points (Two-Wheel Drive Models)

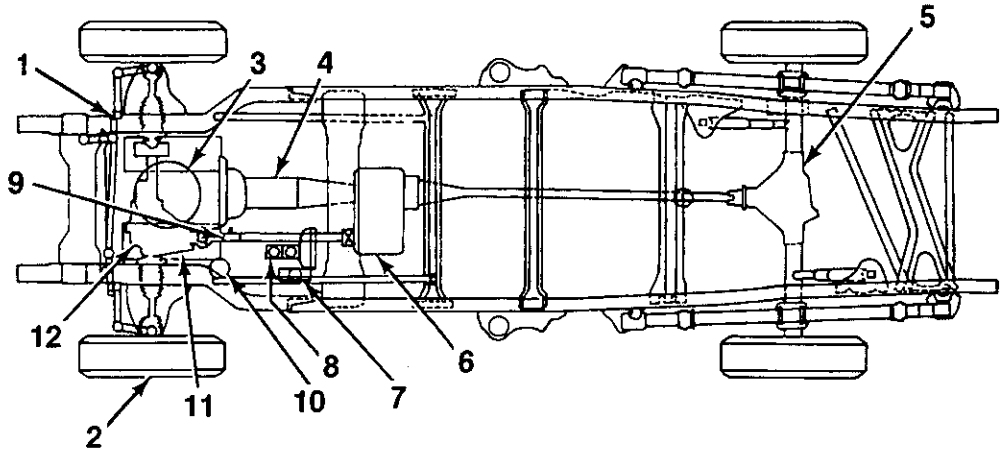


F6209

Figure 8—Lubrication Fittings (Driver Side)

SERVICES TO BE PERFORMED AT LEAST TWICE A YEAR

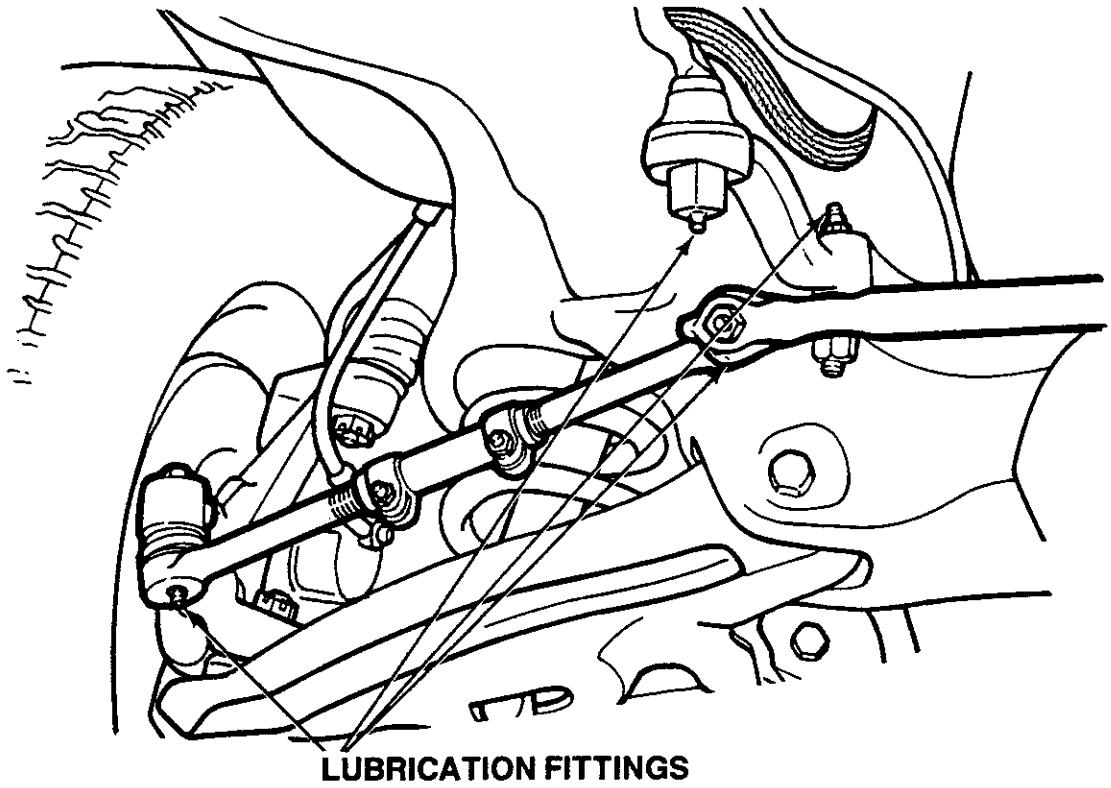
1. **Weatherstrip Lubrication**--Apply silicone grease. Apply a thin film using a clean cloth.
2. **Steering and Suspension Inspection**--Inspect the front and rear suspension and steering systems for damaged, loose or missing parts, signs of wear, or lack of lubrication. Inspect power steering lines and hoses for proper hookup, binding, leaks, cracks, chafing, etc. Clean and inspect the front drive axle boot seals for damage, tears, or leakage and replace as necessary.
3. **Exhaust System Inspection**--Inspect the complete system including the three-way catalytic converter. Inspect the body near the exhaust system. Look for broken, damaged, missing, or out-of-position parts as well as open seams, holes, loose connections, or other conditions that could cause a heat buildup in the floor pan or let exhaust fumes seep into the passenger compartment.



1. Steering Linkage
2. Wheel Bearings
3. Air Cleaner
4. Transmission
5. Rear Axle - Differential
6. Transfer Case
7. Clutch Actuator
8. Brake Master Cylinder
9. Front Propeller Shaft
10. Oil Filter
11. Engine
12. Front Axle - Differential

F3534

Figure 9—Lubrication Points (Four-Wheel Drive Models)



F6210

Figure 10—Lubrication Fittings (Passenger Side)

4. **Throttle Linkage Inspection**--Lubricate all pivot points with engine oil, except the TBI throttle shaft. Do not oil any accelerator or cruise control cables. Replace any cables that have high effort or excessive wear.
5. **Drive Axle Inspection**--Check front/rear axle fluid level and add as needed. Check constant velocity joints and axle seals for leaking.

SERVICES TO BE PERFORMED AT LEAST ANNUALLY

1. **Parking Brake and Transmission "Park" Mechanism Operation**--Before checking the holding ability of the parking brake and automatic transmission "Park" mechanism, park on a fairly steep hill with enough room for movement in the downhill direction.
   - To check the parking brake: With the engine running and the transmission in "N" (Neutral), slowly remove foot pressure from the regular brake pedal. Do this until the vehicle is held by the parking brake only.
   - To check the "P" (Park) mechanism holding ability: Apply the regular brake and shift to "P" (Park). Release the manual parking brake, then slowly release the regular brake.

CAUTION: To reduce the risk of personal injury or property damage, be prepared to apply the regular brakes promptly if the vehicle begins to move.

2. **Transmission Neutral or Clutch Start Switch Operation**
   - Before you start, be sure you have enough room around the vehicle.
   - Firmly apply both the manual parking brake and the regular brake. Do not use the accelerator pedal.
   - Be ready to turn off the engine immediately if it starts.
   - On automatic transmission vehicles, try to start the engine in each gear. The starter should crank only in the "P" (Park) or "N" (Neutral) positions.
   - On manual transmission vehicles, put the shift lever in "N" (Neutral), push the clutch down halfway, and try to start the engine. The starter should work only when the clutch is pushed down all the way to the floor.

CAUTION: Before performing the above transmission neutral starter switch check, be sure to have enough room around the vehicle. Then, firmly apply the parking brake and regular brakes. Do not use the accelerator pedal. If the engine starts, be ready to turn off the ignition promptly. Take these precautions because the vehicle could move without warning and possibly cause personal injury or property damage.

3. **Steering Column Lock Operation**--While parked, try to turn the key to "Lock" in each gear range.
   - With a automatic transmission, the key should turn to "Lock" only when the gear shift is in "P" (Park).
   - With a manual transmission, the key should turn to "Lock" only when the gear shift is in "R" (Reverse).

   On vehicles with a key release lever, try to turn the key to "Lock" without depressing the lever. The key should turn to "Lock" only with the key lever depressed. On all vehicles, the key should come out only in "Lock."
4. **Lap and Shoulder Belt Condition and Operation**--Inspect the seatbelt system, including webbing, buckles, latch plates, retractor, guide loops, and anchors. Have a belt assembly replaced if the webbing has been cut or otherwise damaged.
5. **Seatback Recliner Operation (If Equipped)**--Make sure the recliner is holding by pushing and pulling on the top of the seat back while it is reclined.
6. **Spare Tire and Jack Storage**--Be alert to rattles in the rear of the vehicle. Make sure the spare tire, all jacking equipment, any tire inflator, and any covers or doors are securely stowed at all times. Oil the jack ratchet or screw mechanism after each use.
7. **Key Lock Service**--Lubricate all key lock cylinders.
8. **Body Lubrication Service**--Lubricate all body door hinges, including the endgate, endgate handle pivot points, and endgate mounted spare tire carrier (if equipped), lubricate the body hood, fuel door, and rear compartment hinges, latches, and locks including interior glove box and console doors, and any moving seat hardware. Lubricate the hood safety lever pivot and prop rod pivot. More frequent lubrication may be required when exposed to a corrosive environment.
9. **Cooling System Service**--Drain, flush, and refill the system with new coolant. Inspect the hoses and replace them if they are cracked, swollen, or deteriorated. Tighten all hose clamps (except constant tension clamps). Remove debris and clean the outside of the radiator and air conditioning condenser (if equipped). Wash the radiator neck. To ensure proper operation, pressure test the radiator and cap.
10. **Transfer Case Service**--Check the transfer case fluid level. Check the vent hose at the transfer case for kinks and proper installation. More frequent lubrication may be required in heavy or frequent trailer towing applications. A fluid loss may indicate a problem. Have it inspected and repaired at once.

CONTINUATION OF SCHEDULED MAINTENANCE SERVICES

1. **Tire and Wheel Inspection and Rotation**--For proper wear and maximum tire life, rotate tires at the first 10,000 km (6,000 miles) for Schedule I or 12,500 km (7,500 miles) for Schedule II and then every 25,000 km (15,000 miles) thereafter. Check the tires for uneven wear or damage. If irregular or premature wear exists, check the wheel alignment. Also, check for damaged wheels. For dual rear

wheels, whenever the vehicle, wheels, or fasteners are new; have the wheel fastener torque set at the first 160, 1,600, and 10,000 km (100, 1,000 and 6,000 miles).

For 3500 HD models, block the tires opposite those being removed to keep the vehicle from moving.

2. **Engine Accessory Drive Belt Inspection**--Inspect belts. Look for cracks, fraying, wear, and proper tension. Replace as needed. Refer to SECTION 6B1.
3. **Transmission Service**--On vehicles with a automatic transmission, change the transmission fluid and filter every 25,000 km (15,000 miles) for vehicles under 8,600 GVWR or every 20,000 km (12,000 miles) for vehicles over 8,600 GVWR if the vehicle is mainly driven under one or more of these conditions:
   - In heavy city traffic, where the outside temperature regularly reaches above 32° C(90° F)or higher.
   - Hilly or mountainous terrain.
   - Frequent trailer towing.
   - Uses such as found in taxi, police car, or delivery service.

   If the vehicle is not used mainly under any of these conditions, change the fluid and filter every 50,000 km (30,000 miles) for vehicles under 8,600 GVWR or every 40,000 km (24,000 mile) for vehicles over 8,600 GVWR.

   On vehicles with a manual transmission, the transmission fluid does not require periodic changing.
4. **Spark Plug Replacement**--Replace the spark plugs with the type listed in this section. Refer to "Maintenance Items."
5. **Spark Plug Wire Inspection**--Clean wires and inspect for burns, cracks, or other damage. Check the wire boot fit at the distributor and at the spark plugs. Replace wires as needed.
6. **EGR System Service**--Perform "EGR System Check." Refer to the Driveability, Emissions, and Electrical Diagnosis Manual.
7. **Air Cleaner Filter Replacement**--Replace the air cleaner filter every 50,000 km (30,000 miles) or more often under dirty conditions.
8. **Engine Timing Check**--Adjust the timing to underhood label specifications. Inspect the inside and outside of the distributor cap and rotor for cracks, carbon tracking, and corrosion. Clean and replace as needed.
9. **Fuel Tank, Cap, and Lines Inspection**--Inspect the fuel tank, cap, and lines (including fuel rails and injection assembly) for damage or leaks. Inspect the fuel cap gasket for an even filler neck imprint or any damage. Replace parts as needed.
10. **PCV System Inspection**--Check that the PCV (Positive Crankcase Ventilation) system works properly. Replace the valve and any worn, plugged, or collapsed hoses as necessary.
11. **Fuel Filter Replacement**--Replace the fuel filter at the specified interval or sooner if clogged.
12. **Front Wheel Bearing Repack (2WD Only)**--Clean and repack the front wheel bearings at each brake relining, or at the specified interval, whichever comes first.
13. **Clutch Fork Ball Stud Lubrication**--Lubricate the clutch fork ball stud through the fitting on the clutch housing. Lubricant must be added sparingly to the fitting, as only 0.0066 lb. (0.003 kg) is required to lubricate the ball stud surface. Do not add lubricant more often than required as clutch damage may occur (5-Speed w/Low Gear Models Only).
14. **Transfer Case Fluid Change**--In heavy or frequent trailer towing applications, drain the fluid and refill every 50,000 km (30,000 miles).
15. **Engine Idle Speed Adjustment (6.5L VIN Y Diesel Engines)**--Adjust to the specifications shown on the underhood label. You must use calibrated test equipment.
16. **CDRV System Inspection**--Check the Crankcase Depression Regulator Valve System for any worn, plugged or collapsed hoses.
17. **Electronic Vacuum Regulator Valve (EVRV) Inspection**--Inspect filter for excessive contamination or plugging. If required, clean element with a solution of biodegradable soap and water, let dry and reinstall element.
18. **Evaporative Control System (ECS) Inspection**--Check all fuel and vapor lines and hoses for proper hookup, routing, and condition. Check that the purge valve operates properly, if equipped. Replace as needed.
19. **Shields and Underhood Inspection**--Inspect shields and underhood insulation for damage or looseness. Adjust or replace as required.
20. **Air Intake System Inspection**--Check the air intake system to see that the gaskets are seated properly and all hose connections, fasteners, and other components are tight. Also, check to be sure that the air cleaner housing is properly seated, the cover fits tightly, and the wingnut is tight. Tighten connections and fasteners or replace damaged parts as required.
21. **Thermostatically Controlled Air Cleaner Inspection (If Equipped)**--Inspect all hoses and ducts for proper hookup. Make sure valve works properly.
22. **Exhaust Pressure Regulator Valve Inspection**--Check that the valve works properly. Correct any binding. Inspect hoses for cracks, chafing, and decay. Replace parts as needed.
23. **Accelerator Cable Replacement**--Replace the accelerator cable on all gasoline equipped engines at 160,000 km (100,00 miles). The 6.5L diesel engines used on this vehicle are equipped with an electronic accelerator, so cable replacement is not required.

RECOMMENDED FLUIDS AND LUBRICANTS

Engine Oil—GM Goodwrench motor oil or equivalent for API Service SG or SG/CE of the recommended viscosity.
Engine Coolant—Mixture of water and a good quality ethylene glycol base antifreeze conforming to GM Specification 6038M, (GM P/N 1052103) or equivalent.
Hydraulic Clutch System—Hydraulic clutch fluid (GM P/N 12345347) or equivalent DOT-3 brake fluid.
Hydraulic Brake System—Delco Supreme II (GM P/N 1052535) or equivalent DOT-3 brake fluid.
Parking Brake Cables—Chassis grease meeting requirements of NLGI Grade 2, Category LB or GC-LB (GM P/N 1052497) or equivalent.
Power Steering System—Power steering fluid meeting requirements of GM specification 9985010, (GM P/N 1050017) or equivalent.
Automatic Transmission—DEXRON® III or II-E automatic transmission fluid.
Key Lock Cylinders—Lubricate with Multi-Purpose Lubricant, (GM P/N 12345120) or equivalent or synthetic SAE 5W30 engine oil.
Differential (Standard Front and Rear Axle)—SAE 80-W-90 GL-5 gear lubricant (GM P/N 1052271).
Differential (Locking)—SAE 80-W-90 gear lubricant (GM P/N 1052271).
Clutch Fork Ball Stud—Chassis grease meeting requirements of NLGI Grade 2, Category LB or GC-LB (GM P/N 1052497).
Front Wheel Bearings—Chassis grease meeting requirements of NLGI Grade 2, Category LB or GC-LB (GM P/N 1052497).
Chassis Lubrication—Chassis grease meeting requirements of GM 6031-M (GM P/N 1052497).
Weatherstrips—Silicone grease (GM P/N 1052863) or equivalent.
Windshield Washer Solvent—GM Optikleen washer solvent (GM P/N 1051515) or equivalent.
Hood Latch Pivots and Spring Anchor—Engine oil.
Hood Latch Release Pawl—Chassis grease meeting requirements of GM specification 6031M (GM P/N 1052497).
Automatic Transmission Shift Linkage, Floor Shift Linkage, Hood and Door Hinges, and Body Door Hinge Pins—Engine oil.
Manual Transmission:
A. **5-Speed (RPO MT8)**—Castrol Syntorq or equivalent (GM P/N 12345871).
B. **5-Speed (RPO MG5)**—Standard transmission fluid (GM P/N 12345349).
Transfer Case—DEXRON®IIE automatic transmission fluid (GM P/N 12345881).
Transfer Case Shift Lever, Propeller Shaft—Chassis grease meeting requirements of NLGI Grade 2, Category LB or GC-LB (GM P/N 1052497).
Constant Velocity Universal Joint—Chassis grease meeting requirements of GM 6031-M (GM P/N 1052497).
Key Lock Cylinders—GM Multi-Purpose lubricant (GM P/N 12345120) or a synthetic light weight engine oil (SAE 5W-30).

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MAINTENANCE ITEMS

Air Cleaner Element

4.3L (VIN Z)	AC Type A-178CW
5.0L (VIN H)	AC Type A-348C
5.7L (VIN K)	AC Type A-348C
6.5L (VIN F, P, and S)	AC Type A-917C
7.4L (VIN N)	AC Type A-348C

Engine Oil Filter

4.3L (VIN Z)	AC Type PF-51
5.0L (VIN H)*	AC Type PF-35
5.7L (VIN K)*	AC Type PF-35
6.5L (VIN F, P, and S)	AC Type PF-35
7.4L (VIN N)	AC Type PF-35

*Four-wheel drive vehicles use a PF-51 oil filter.

PCV Valve

4.3L (VIN Z)	AC Type CV-789C
5.0L (H), 5.7L (K), 7.4L (N)	AC Type CV-774C

Spark Plugs and Gap

4.3L (VIN Z)	AC Type CR43TS (90 mm, .035")
5.0L (VIN H)	AC Type CR43TS (90 mm, .035")
5.7L (VIN K)	AC Type CR43TS (90 mm, .035")
7.4L (VIN N)	AC Type CR43TS (90 mm, .035")

Fuel Filter

4.3L (VIN Z) ..... AC Type GF-481
5.0L (VIN H) ..... AC Type GF-481
5.7L (VIN K) ..... AC Type GF-481
6.5L (VIN F, P, and S) ..... AC Type TP-1006
7.4L (VIN N) ..... AC Type GF-481

Radiator Cap

4.3L (VIN Z) ..... AC Type RC-36
5.0L (VIN H) ..... AC Type RC-36
5.7L (VIN K) ..... AC Type RC-36
6.5L (VIN F, P, and S) ..... AC Type RC-32
7.4L (VIN N) ..... AC Type RC-32

APPROXIMATE FLUID CAPACITIES

Engine Cooling System

4.3L (VIN Z)
With Air Conditioning ..... 10.3 L (11 qts.)
Without Air Conditioning ..... 10.3 L (11 qts.)
5.0L (VIN H)
With Air Conditioning ..... 17.0 L (18 qts.)
Without Air Conditioning ..... 16.5 L (17.5 qts.)
5.7L (VIN K)
With Air Conditioning ..... 17.0 L (18 qts.)
Without Air Conditioning ..... 16.5 L (17.5 qts.)
With Air Conditioning—3500 H.D. ..... 25.5 L (27 qts.)
Without Air Conditioning—3500 H.D. ..... 25.0 L (26.5 qts.)
6.5L (VIN F, P, and S)
With Air Conditioning ..... 25.0 L (26.5 qts.)
Without Air Conditioning ..... 25.0 L (26.5 qts.)
7.4L (VIN N)
With Air Conditioning ..... 23.5 L (25 qts.)
Without Air Conditioning ..... 22.0 L (23 qts.)
With Air Conditioning—3500 H.D. ..... 27.0 L (28.5 qts.)
Without Air Conditioning—C3500 H.D. ..... 25.0 L (26.5 qts.)

Engine Crankcase

4.3L (VIN Z)
With Filter ..... 4.3 L (4.5 qts.)
Without Filter ..... 3.8 L (4.0 qts.)
5.0L (VIN H)
With Filter ..... 4.8 L (5.0 qts.)
Without Filter ..... 3.8 L (4.0 qts.)
5.7L (VIN K)**
With Filter ..... 4.8 L (5.0 qts.)
Without Filter ..... 3.8 L (4.0 qts.)
6.5L (VIN F, P, and S)*
With Filter ..... 6.5 L (7.0 qts.)
7.4L (VIN N)**
With Filter ..... 6.5 L (7.0 qts.)
Without Filter ..... 5.7 L (6.0 qts.)

* Oil filter should be changed at every oil change.
** Add one additional quart for C3500 H.D. models

Fuel Tank

Short Bed Models ..... 98.0 L (26 Gallons)
Long Bed Models ..... 128.0 L (34 Gallons)
Four-Door Models (Standard) ..... 128.0 L (34 Gallons)
Chassis-Cab Models
Standard (Side Tank) ..... 87.0 L (23 Gallons)

Optional (Rear Tank)	117.0 L (31 Gallons)
3500 HD Models	
Standard (Side Tank)	87.0 L (23 Gallons)
Optional (Rear Tank)	117.0 L (31 Gallons)
Transmission	
4L60-E Automatic—Drain and Refill	4.7 L (5 qts.)
After Complete Overhaul	10.6 L (11 qts.)
4L80-E Automatic—Drain and Refill	4.7 L (5 qts.)
After Complete Overhaul	10.9 L (11.5 qts.)
New Venture Gear 4500 Manual	3.78 L (4 qts.)
New Venture Gear 3500 (5LM60) Manual	2.0 L (2.2 qts.)

ADJUSTABLE BELT TENSION SPECIFICATIONS

Belt tension is maintained by a spring tensioned idler pulley. No adjustment of the serpentine belt is necessary.

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NOTES

SECTION 0C

VIBRATION DIAGNOSIS

NOTICE: When fasteners are removed, always reinstall them at the same location from which they were removed. If a fastener needs to be replaced, use the correct part number fastener for that application. If the correct part number fastener is not available, a fastener of equal size and strength (or stronger) may be used. Fasteners that are not reused, and those requiring thread locking compound will be called out. The correct torque value must be used when installing fasteners that require it. If the above conditions are not followed, parts or system damage could result.

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GENERAL DESCRIPTION

VIBRATION DIAGNOSIS

Vibration is a back and forth oscillation that can be seen, heard, or felt. Imbalance or misalignment of the vehicle is usually the cause of a vibration.

PATH, SOURCE, AND RESPONDER

In many cases the vibration that is being seen, heard, or felt is not the source but the responder (figure 1). Many times the severity of the vibration will depend on how it is transmitted through the vehicle.

VIBRATION CLASSES

Vibration problems can be classified into four sensitivity categories. Many problems fit into more than one of the categories. These categories can usually be combined into one of the following "classes" of categories:

A. Engine Speed Sensitive Only
B. Vehicle Speed Sensitive Only
C. Torque Sensitive and Vehicle Speed Sensitive
D. Torque Sensitive and Engine Speed Sensitive
E. Torque Sensitive, Vehicle Speed Sensitive, and Jounce Sensitive.

The first step in correcting a vibration problem is to determine which of the above best describe the problem. The second step is to determine the vehicle speed and rpm at which the vibration occurs or is most intense.

ORDERS OF VIBRATION

Some components vibrate more than others at a given speed. These multiple vibrations are referred to as the order of vibration. The order of a vibration is defined as the number of disturbances created by one rotation of a component. For example, a tire with one heavy spot will produce one disturbance each rotation - a first order vibration. An oval shaped tire will produce two disturbances each rotation - a second order vibration (figure 2).

VIBRATION CATEGORIES

There are several excitation sources and many responding systems which may cause a vibration complaint. Most vibrations are caused by wheel and tire disturbances or driveline imbalances. Each of these categories has a specific vibration associated with it. By systematically classifying the vibration into one of the following categories you can eliminate many components as the source.

VEHICLE SPEED SENSITIVE

Most vibration complaints will be found to be vehicle speed sensitive. The frequency of the vibration depends only on the speed of the vehicle.

Vehicle speed sensitivity can be determined as follows:

1. Drive the vehicle in high gear and locate the vibration problem. Record the vehicle speed and the rpm at which the problem occurs.
2. Shift the vehicle into a lower gear and again locate the vibration problem. Record the vehicle speed and the rpm at which the problem occurs.
3. If the problem occurs at the same vehicle speed as when the vehicle was in high gear, the vibration is vehicle speed sensitive.
4. Place the transmission in neutral or park position and slowly increase engine rpm to determine and engine-speed related vibration. Record the rpm at which the vibration occurs.

ENGINE SPEED SENSITIVE

Another group of vibration complaints will be found to be engine speed sensitive. The frequency of the vibration depends only on the speed of the engine, independent of the speed of the vehicle.

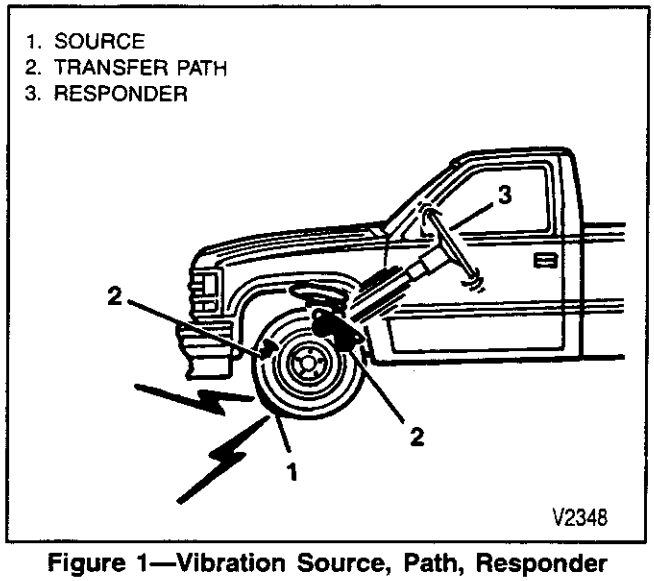

Figure 1—Vibration Source, Path, Responder

Engine speed sensitivity can be determined as follows:

1. Drive the vehicle in high gear and locate the vibration problem. Record the vehicle speed and the rpm at which the problem occurs.
2. Shift the vehicle into a lower gear and again locate the vibration problem. Record the vehicle speed and the rpm at which the problem occurs.
3. If the problem occurs at the same rpm as when the vehicle was in high gear, the vibration is engine speed sensitive.

PAYLOAD OR JOUNCE SENSITIVE

A payload or jounce sensitive problem is one which varies in intensity as the height of the vehicle changes with respect to the surface of the road. The intensity varies as the springs are extended or compressed.

Payload or jounce sensitivity can be determined as follows:

1. Drive the vehicle and observe the disturbance with varying payload.
2. Drive the vehicle over a road that dips in such a way that it causes the rear of the vehicle to move up and down relative to the surface of the road. Keeping a constant throttle, notice when the disturbance occurs.
3. If the disturbance occurs when the vehicle height is changed due to the payload, or it occurs on roads that cause the vehicle to dip, this can be determined as payload or jounce sensitive.

TORQUE SENSITIVE

A torque sensitive problem is one which increases in intensity as the torque (power) output of the engine increases. The intensity of the vibration increases as the throttle opening is increased.

Torque sensitivity can be determined as follows:

1. Drive the vehicle in high gear and locate the vibration. Record the vehicle speed and rpm at which the problem occurs.
2. Note the vibration while varying the throttle position. Drive the vehicle with steady throttle, slowly increasing to heavy throttle by going up hill. Or apply the brakes while increasing the throttle opening then slowly decrease to minimum throttle and coast during the vibration.
3. If the vibration becomes more severe as the throttle opening is increased, the vibration is torque sensitive. This typically changes the pinion angle.

ROAD TESTING

To help diagnose and isolate the source of a vibration, it is important to road test the vehicle and use a systematic approach in narrowing down the possible causes of a vibration.

1. When did the vibration start?
2. Did the vibration start after a repair procedure in any of the following areas?
   - Exhaust System
   - Undercoating
   - Tire Repair or Replacement
   - Wheel Alignment
   - Engine Repair

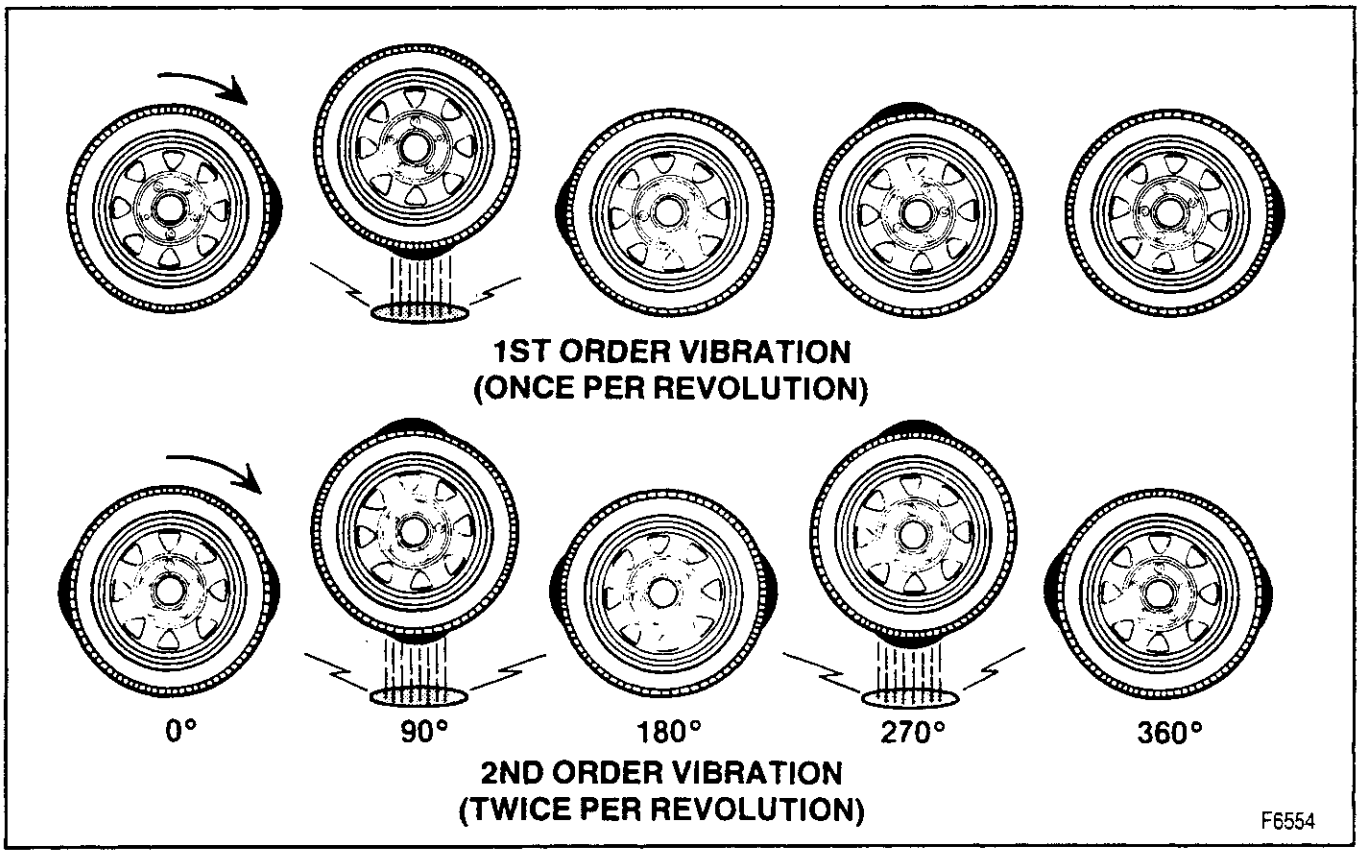

Figure 2—Order of Vibration

These questions will give you a basic outline and will enable you to eliminate many components and focus attention on only those items that can be responsible for the conditions encountered.

Four major component groups are usually the cause of or are related to vibration. When road testing a vehicle for vibration, remember these groups:

- Engine and mounts.
- Tires, wheels, and brake drums.
- Propeller shaft and universal joints.
- Transmission or transfer case mounts.

Before road testing a vehicle, check the following:

1. In-or-out of phase propeller shaft.
2. All fasteners for tightness at universal joints, wheel lugs, engine mounts, transmission, or transfer case mounts.
3. Tire air pressure.
4. Payload conditions.

ROAD TEST

Road test the vehicle to diagnose the complaint. Refer to "Reed Tachometer" or "Electronic Vibration Analyzer (EVA)." Record the speed and rpm at which the greatest vibration occurs. The vibration is likely to be felt in the steering wheel or in the seat bottom. The road test can be helpful in locating the vibration source either forward or aft.

COAST TEST

Drive the vehicle past the vibration speed, shift into neutral, and coast back through the vibration speed. In this test two kinds of vibrations normally occur; a shaking or a buzzing. A shaking vibration is usually caused by tires or a wheel and brake assembly problem. A buzzing vibration is usually caused by a driveline problem.

SPECIAL TOOL DESCRIPTION (VIBRATION DIAGNOSIS)

Special tools can be used to identify the frequency of a rotational component with a repetitive vibration. These tools consist of a reed tachometer or an electronic vibration analyzer (EVA).

REED TACHOMETER

The Biddle Frahm reed tachometer (or equivalent) measures vibration in cycles per minute (CPM) (figure 3). It consists of two rows of reeds. Each row is designed to vibrate at a particular frequency.

If you can match the rotational speed of a particular component with the frequency reading of the reed tachometer, you will know in which area to concentrate your efforts for repairs.

These frequency relationships exist for all vibrations that occur in a vehicle and understanding these relationships can often solve difficult vibration problems.

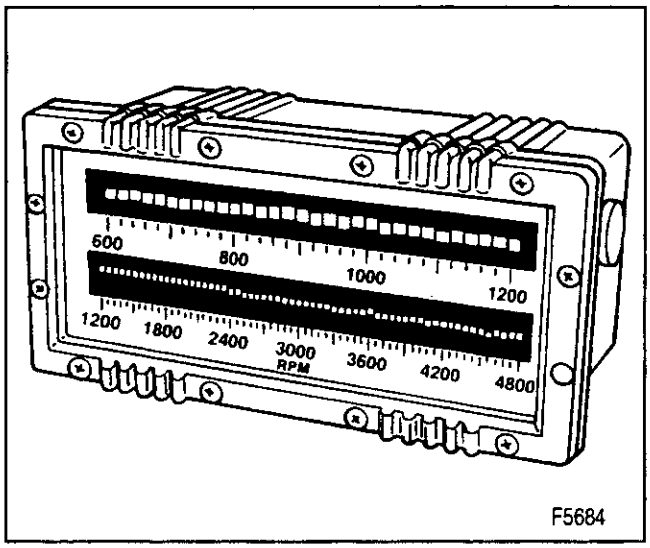

Figure 3—Reed Tachometer

REED TACHOMETER USAGE

The best place to put the reed tachometer in a truck is on top of the instrument panel. This is an effective location for picking up vibration and providing ease of viewing.

However, if the vibration frequency cannot be read with the reed tachometer on the instrument panel, it can be placed in other locations that may be responding to the source of the vibration. To reduce the effect of road surface, vehicles should be test driven on a smooth road (preferably asphalt).

An important thing to be aware of when using the reed tachometer for the first time is that the reeds are very sensitive and will pick up many low amplitude vibrations (figure 4). These will appear as slight movements of many reeds, and do not correspond to any particular component. Reed movement that corresponds to a vibrating component will be greater in amplitude, traveling the full range of the viewing area.

The following examples illustrate two typical applications of a reed tachometer. The electronic vibration analyzer (EVA) can be substituted for the reed tachometer. Refer to "Electronic Vibration Analyzer."

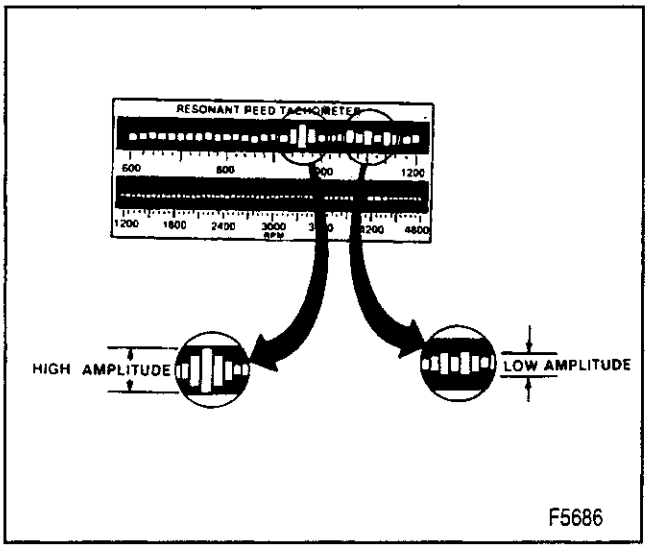

Figure 4—Amplitude

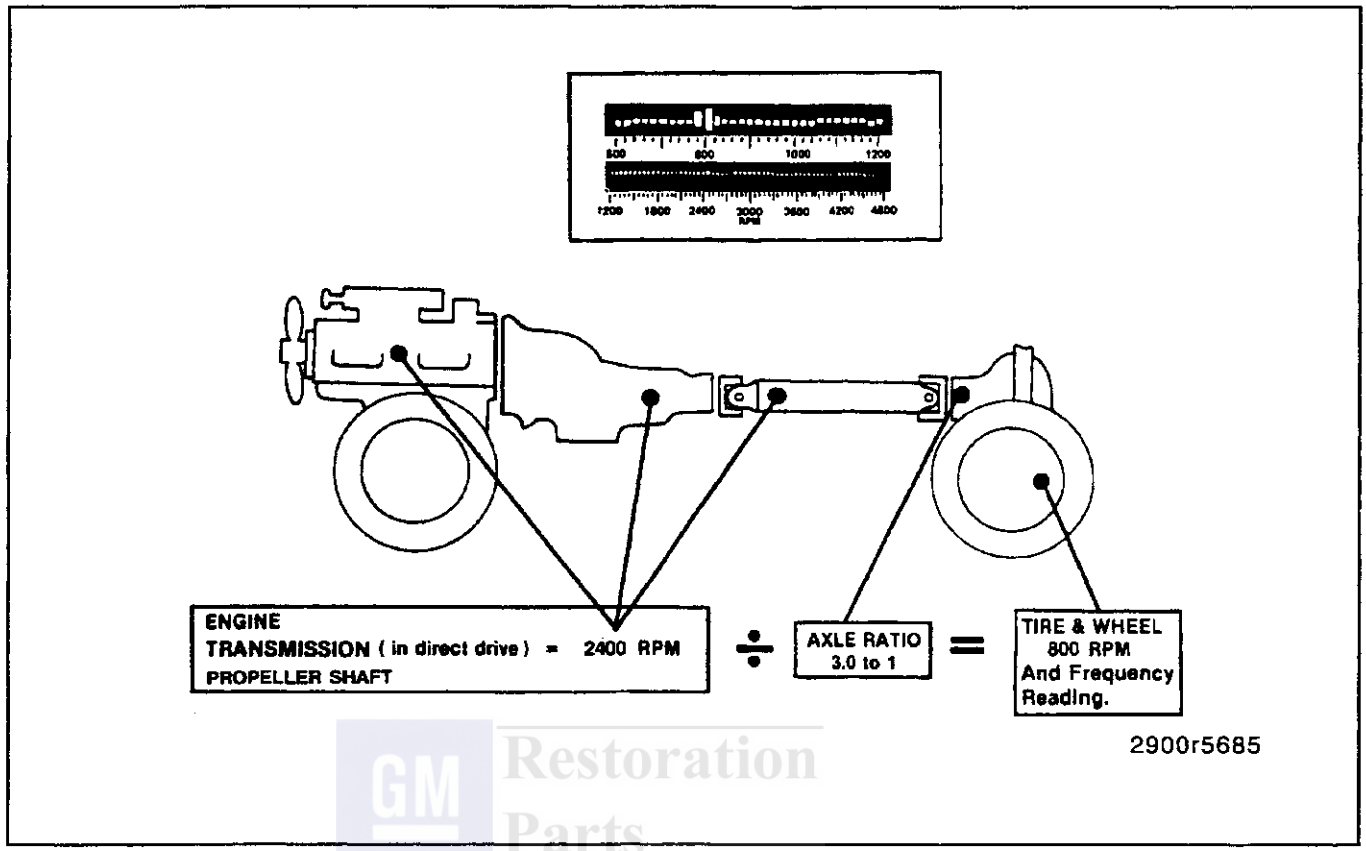

Figure 5—Reed Tachometer 1st Order Vibration

Example 1

Road test reveals low frequency (shake) vibration at 2400 rpm with the transmission in direct drive.

Known facts - Reed tachometer frequency reads at 800 cycles per minute (figure 5).

Vibration is vehicle speed sensitive.

Rear end ratio 3.0 to 1.

Calculations - First order of tire and rear end: 2400 rpm and 3.0 to 1 rear axle ratio = 800 rpm.

First order of propshaft: 2400.

Conclusion - The vibration frequency (800) is related to the first order rotation of the tire/wheel assembly. Given this relationship, you can correct the tire/wheel assembly for a first order disturbance.

Example 2

Road test reveals high frequency vibration at 2400 rpm with the transmission in direct drive.

Known facts - Reed tachometer frequency reads at 1600 cycles per minute (figure 6).

Vibration is vehicle speed dependent.

Rear end ratio 3.0 to 1.

Calculations - First order of tire and rear end: 2400 rpm and 3.0 to 1 rear axle ratio = 800 RPM.

First order of tire and wheel: 800.

Second order of tire and wheel: 800 x 2 = 1600.

Conclusion - The vibration frequency 1600 is related to the second order rotation of the tire and wheel.

TIRE SPEED CHART

Tire Size	Tread	Revs/Sec at 5 mph
P235/75R15	ALS OOR	1.00 0.99
P275/60HR15	AL3	1.03
31X10.5R15/B	OOR	0.95
LT225/75R16	ALS OOR	0.99 0.98
LT245/75R16	ALS OOR	0.95 0.94
LT265/75R16	OOR	0.90
LT215/85R16	HWY OOR	0.95 0.94
LT235/85R16	HWY OOR	0.91 0.90
7.50R16	HWY OOR	0.90 0.90
8.75R16.5	HWY	0.98
225/70R19.5	HWY	0.89

AL3=Performance (GT+4)
ALS=All Season
HWY=Highway
OOR-On/Off Road

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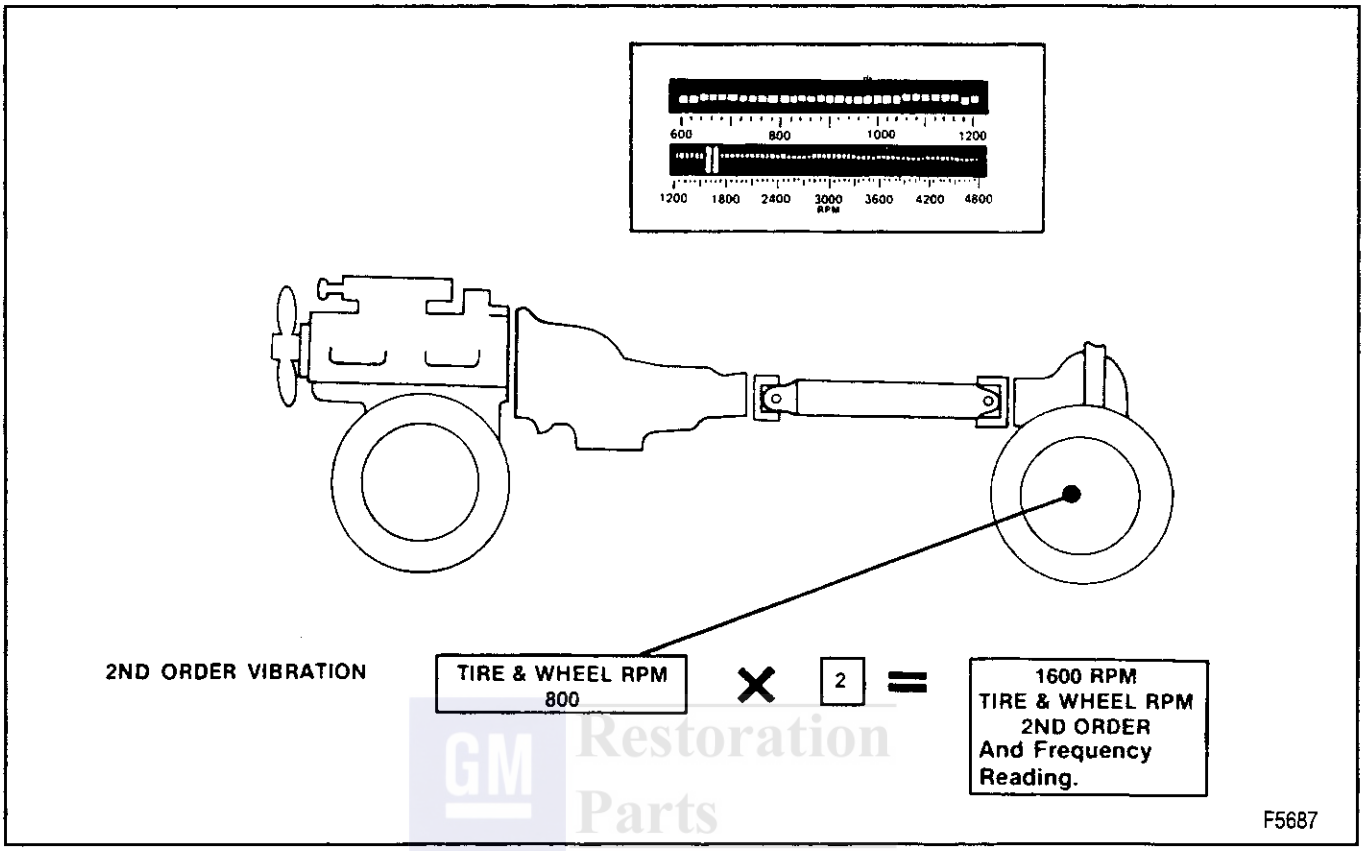


Figure 6—Reed Tachometer 2nd Order Vibration

ELECTRONIC VIBRATION ANALYZER (EVA)

The Electronic Vibration Analyzer (EVA) J 38792 speeds up the diagnosis of vibrations by displaying the three most predominant frequencies and their amplitudes. These frequencies are displayed in bar graph form. The strongest vibration is displayed first, the next strongest second, and the weakest displayed last (figure 7).

The EVA is equipped with a vibration sensor that can be plugged into either input A or input B on the front of the EVA. The vibration sensor can be mounted almost anywhere on the vehicle by using a magnet or adhesive putty. There is a trigger wire on the front of the EVA that a strobe light pickup can be attached to for driveshaft balancing (figure 8).

Important

- The vibration sensor is marked with the word "UP" on one side. For the sensor to accurately and consistently pickup vibrations, it must be mounted as close as possible to the source of the vibration in the horizontal position with the "UP" indentification facing up. Refer to the instruction manual accompanying the EVA for sensor calibration.

SPECIAL TOOL DESCRIPTION

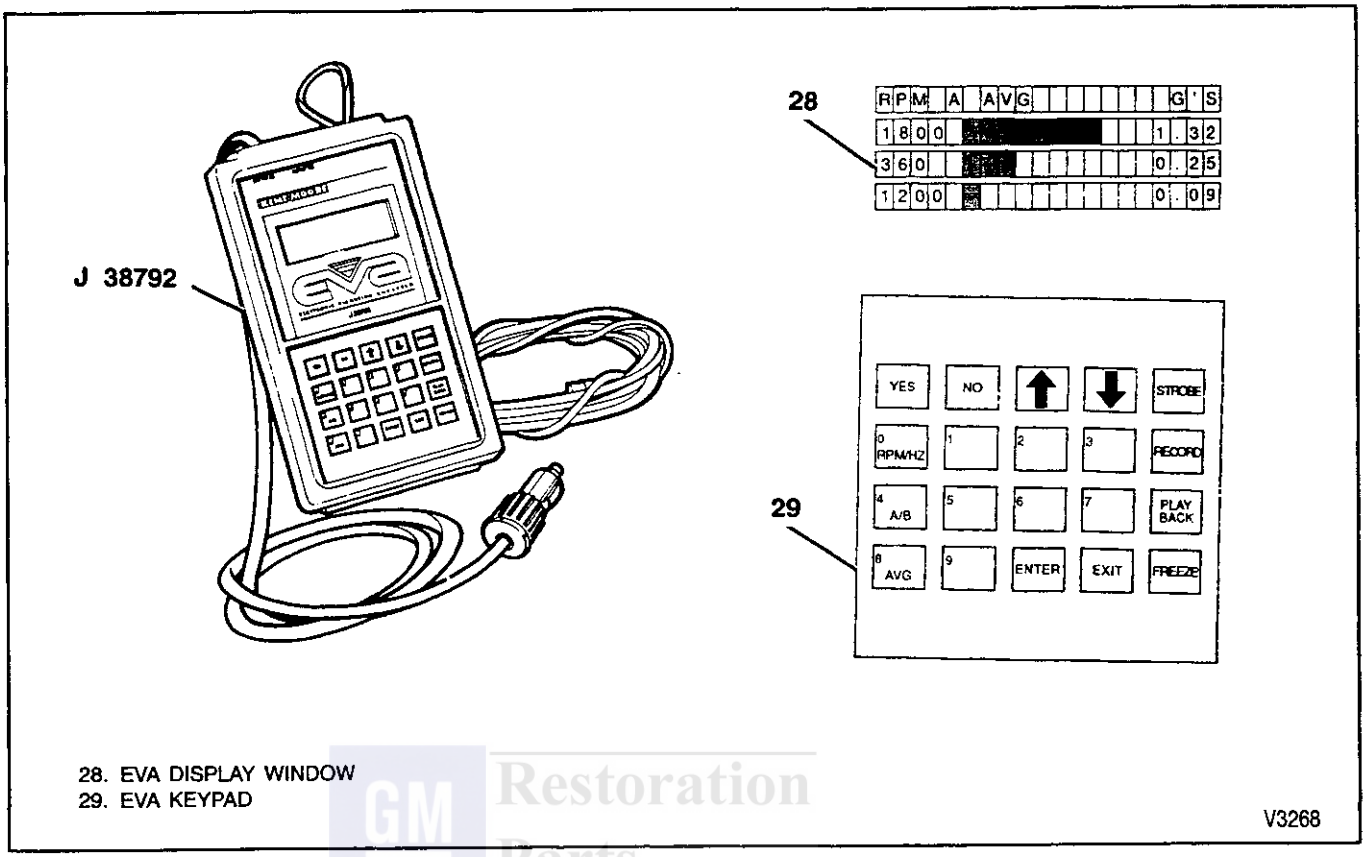
COMPANION FLANGE RUNOUT GAGE

A good place to start when diagnosing a vibration problem, is to consider pinion flange runout. Pinion flange runout affects the rear of the propshaft by moving it off its center rotating point. A pinion flange with excessive runout will have the same effect on the vehicle as a propshaft with excessive runout.

To measure pinion flange runout use J 35819 Companion Flange Runout Gage. When working with larger pinion flanges, use the runout gage adapter sleeves J 35819-100. A dial indicator with a magnetic base or a clamp base will also be needed.

INCLINOMETER

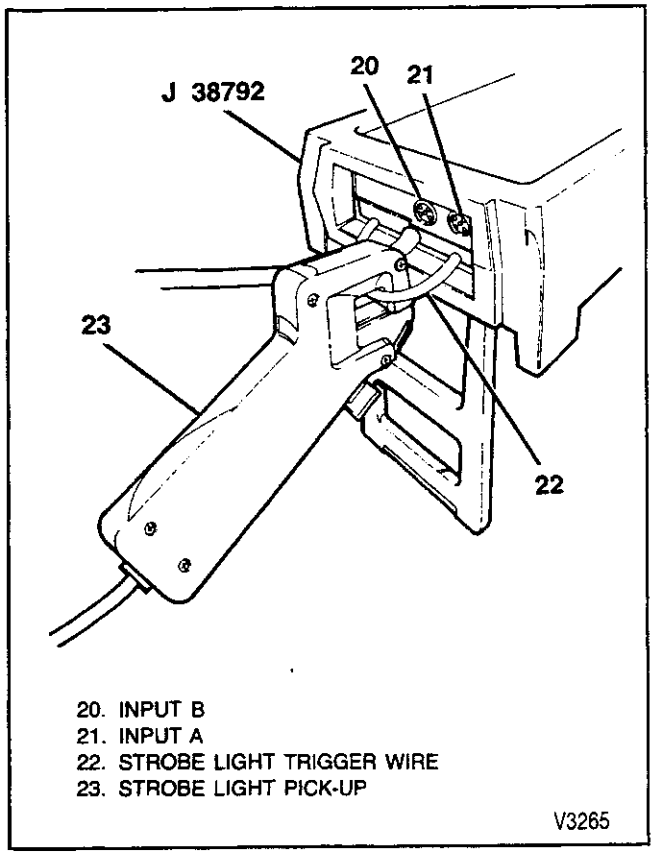
Drive line angles do not refer to the angle of the propshaft alone, but to the angle where the propshaft meets the front yoke or rear yoke on vehicles with a one-piece propshaft, and where the propshafts intersect on vehicles with a two-piece propshaft. The front and rear yokes must be included when measuring a two-piece propshaft system. The special tool used for checking driveline angles is J 23498-A, an inclinometer.



28. EVA DISPLAY WINDOW
29. EVA KEYPAD

V3268

Figure 7—Electronic Vibration Analyzer (EVA)



20. INPUT B
21. INPUT A
22. STROBE LIGHT TRIGGER WIRE
23. STROBE LIGHT PICK-UP

V3265

Figure 8—EVA Inputs and Connections

ON-VEHICLE SERVICE—TIRE AND WHEEL VIBRATIONS

BALANCING TIRES AND WHEELS

There are two types of tire and wheel balancing; static and dynamic. Static balance is the equal distribution of weight around the wheel. Wheels that are statically unbalanced cause a bouncing action called wheel tramp (figure 9). This condition will eventually cause uneven tire wear.

Dynamic balance is the equal distribution of weight on each side of the centerline so that when the wheel spins there is no tendency for it to move from side to side (figure 10). Wheels that are dynamically unbalanced may cause wheel shimmy.

GENERAL BALANCE PRECAUTIONS

Deposits of foreign material must be cleaned from the inside of the wheel. Remove stones from the tread to avoid operator injury during spin balancing and to obtain a good balance. The tire should be inspected for any damage, then balanced according to the equipment manufacturer's recommendations.

Whenever a heavier, solid locking wheel nut is used to replace a standard nut, it should be installed nearest the valve stem, and a 14 gram (1/2 ounce) balance weight should be added 180 degrees opposite the locking nut on the wheel's inboard side.

When rotating tires, always install the locking nut nearest the tire valve stem so that it remains opposite the balance weight. This procedure will improve the wheel balance by compensating for the heavy locking wheel nut.

OFF-VEHICLE BALANCING

Most electronic off-vehicle balancers are more accurate than the on-vehicle spin balancers. They are easy to use and give a dynamic (two-plane) balance. Although they do not correct for drum or rotor unbalance, like on-vehicle spin balancing, they are more accurate. When balancing off-vehicle, the wheel should locate on the balancer with a cone through the back side of the center pilot hole not by the wheel stud holes.

ON-VEHICLE BALANCING

On-vehicle balancing will help correct vibrations due to brake drum, rotor, and wheel cover imbalance.

When balancing on-vehicle, remove the balance weights from the off-vehicle dynamic balance. If more than 28 grams (one ounce) of additional weight is required, it should be split between the inner and outer rim flange.

Important

- The driven tire and wheel assemblies should be spun using the engine. Limit speed as stated in the following Caution.

CAUTION: Do not spin the drive wheels faster than 35 mph (55 km/h) as indicated by the speedometer. This limit is necessary because the speedometer indicates only one-half of the actual wheel speed when one drive wheel is spinning and the other drive wheel is stopped. Personal injury and damage may result from high speed spinning.

CAUTION: On vehicles equipped with limited slip rear axles, do not attempt to balance a tire on a drive wheel with the other drive wheel on the ground. The vehicle may drive through this wheel and cause the vehicle to move unexpectedly, resulting in personal injury and property damage.

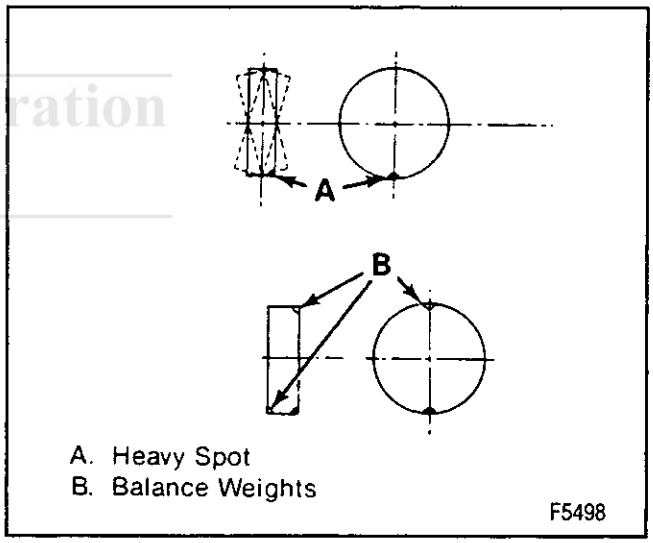


Figure 9—Static Unbalance

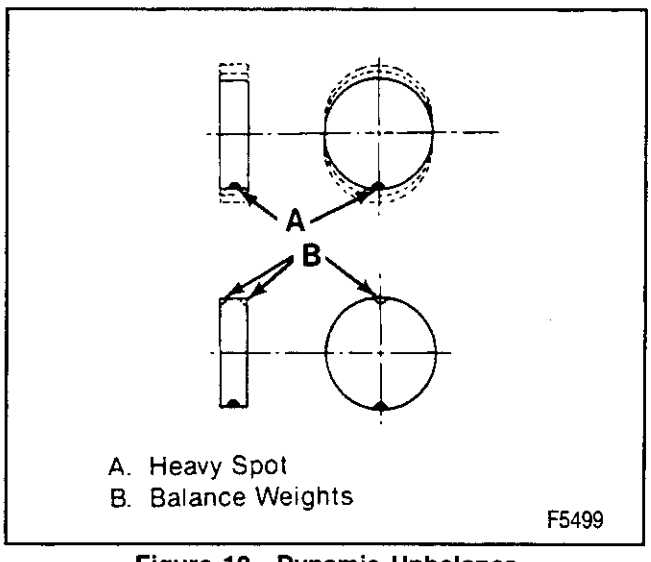


Figure 10—Dynamic Unbalance

To distinguish between a standard rear axle and a limited slip rear axle, check for Positraction (G80) on the Service Parts Identification label.

WHEEL WEIGHTS

If more than 85 grams (3 ounces) are needed, the wheel weights should be split as equally as possible between the inboard and outboard flanges.

Balancing of assemblies with factory aluminum wheels requires the use of special clip-on type wheel weights. These weights are designed to fit over the thicker rim flange of the aluminum wheel.

Adhesive wheel weights are also available. Use the manufacturer's procedures to install adhesive wheel weights.

WHEEL RUNOUT

Measure wheel runout with an accurate dial indicator. Take measurements with the wheel installed on the vehicle or off the vehicle using an accurate mounting surface such as on a wheel balancer. Measurements may be taken with or without the tire mounted on the wheel.

Radial runout and lateral runout should be measured on both the inboard and outboard rim flanges (figure 11). With the dial indicator firmly in position, slowly rotate the wheel one revolution and record the total indicator reading. If any measurement exceeds specifications, and there is vibration that wheel balancing will not correct, the wheel should be replaced. Disregard any indicator readings due to welds, paint runs, scratches, etc.

- STEEL WHEELS:
  - Radial runout.....1 mm (0.040 inch)
  - Lateral runout.....1.2 mm (0.045 inch)
- ALUMINUM WHEELS:
  - Radial runout.....0.8 mm (0.030 inch)
  - Lateral runout.....0.8 mm (0.030 inch)

TIRE/WHEEL ASSEMBLY RUNOUT

Before measuring the runout of a tire/wheel assembly, the vehicle should be driven long enough to warm up the tires. Do this before any measurements are taken, then do the following:

1. Lift the vehicle and support with suitable safety stands.
2. Mark the location of each tire/wheel assembly in relation to the wheel studs and to their position on the vehicle.
3. Install tire/wheel assembly on wheel balancer.
4. Using a dial indicator with a magnetic base and a roller tip, position it on the balancer so the different runout checks can be done (figure 12).
5. DO NOT start the wheel balancer with the dial indicator in place, These checks should be done by spinning the tire BY HAND ONLY on the tire balancer.
6. Slowly rotate the assembly one complete turn and "zero" the dial indicator on the low spot.
7. Rotate the assembly one more complete turn and note the amount of runout.

The maximum allowable radial and lateral runout is 1.3 mm (0.050 inch) when measuring off the vehicle, and 1.5 mm (0.060 inch) when measuring on the vehicle.

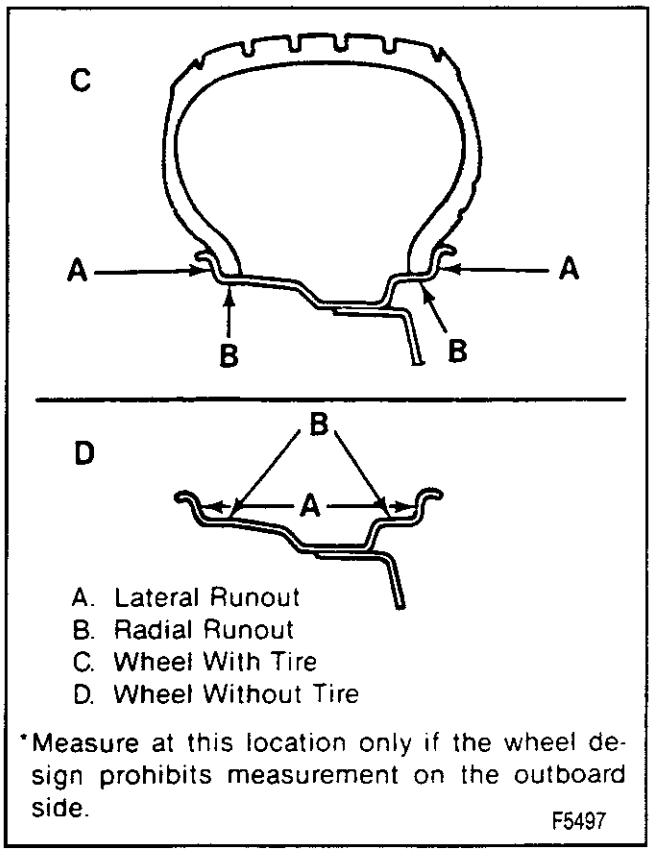


Figure 11—Wheel Runout

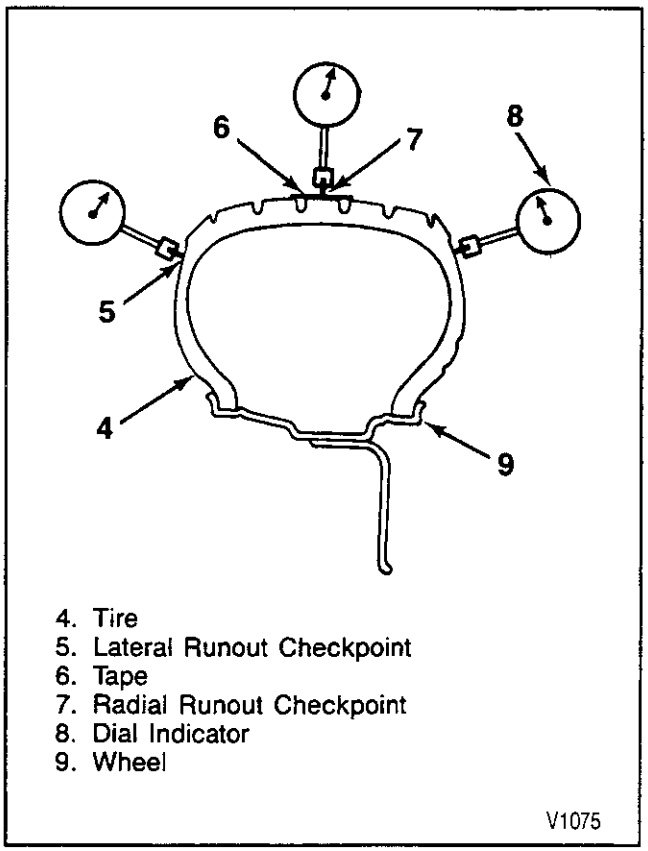


Figure 12—Measuring Radial and Lateral Runout

CORRECTING NON-UNIFORM TIRES

There are two ways to correct tires that cause a vibration even though they are properly balanced. One method uses an automatic machine which loads the tire and buffs small amounts of rubber from high spots on the outer two tread rows. Correction by this method is usually permanent and does not significantly affect the tire tread life.

Another method is to dismount the tire and rotate it 180 degrees on the rim. It is important that this be done on tire and wheel assemblies which are known to be causing a vibration as it is just as likely to cause good assemblies to vibrate.

HUB AND AXLE SHAFT STUD RUNOUT

When wheel and tire runout occurs on the vehicle and does not occur in off-vehicle testing, the hub and axle shaft should be checked (figure 13).

MEASURING ROTOR OR AXLE SHAFT RUNOUT

Install or Connect

The dial indicator on the machined surface outside the bolts on the rotor or axle flange (figure 13).

Measure

- Runout.
  1. Turn the rotor or axle flange to locate the low spot.
  2. Zero the dial indicator.
  3. Turn the rotor or axle flange to check the total lateral runout.
     - 0.130 mm (0.005 inch) is the acceptable lateral runout.

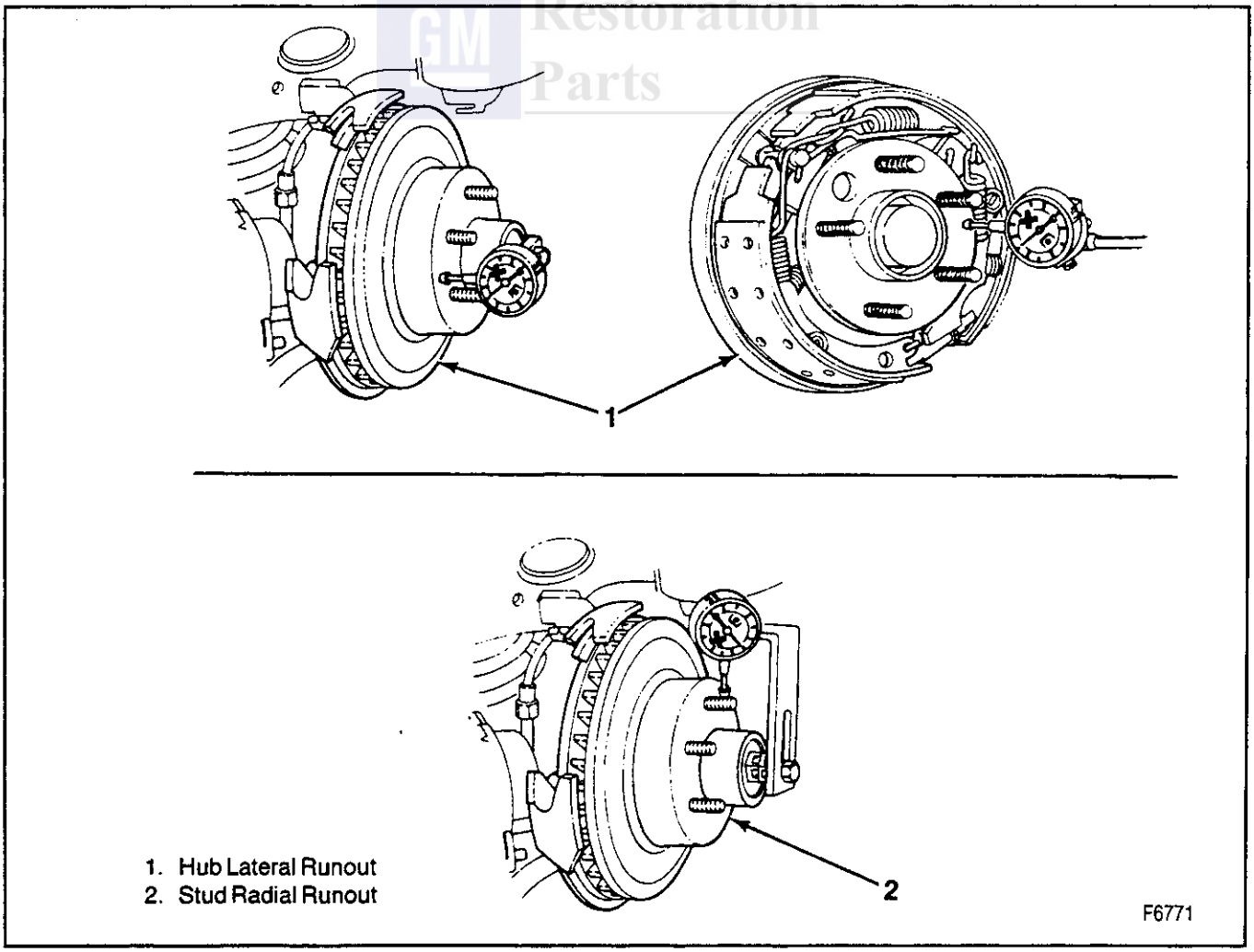
MEASURING AXLE SHAFT STUD RUNOUT

Install or Connect

The dial indicator to contact the wheel mounting studs (figure 13).

Measure

- Runout.
  1. Turn the hub to register on each of the studs.
  2. Zero the dial indicator on the lowest stud.
  3. Check the total runout on the remaining studs.
     - 0.8 mm (0.030 inch) is the acceptable radial runout.



1. Hub Lateral Runout
2. Stud Radial Runout

Figure 13—Hub and Axle Shaft Stud Runout

ON-VEHICLE SERVICE—DRIVELINE VIBRATIONS

Driveline vibrations will generally produce a high speed vibration, a "buzz" or "shudder." With tire and wheel speeds in the 45-50 mph range, the average tire and wheel speeds are 600 rpm. A driveline will turn at a higher rpm because of the gear ratios. Most driveline vibrations occur in the 45-55 mph range, and most usually become strongest on either acceleration or deceleration. Driveline vibrations come from four general areas:

1. Shaft Balance
2. Shaft Runout
3. Pinion Flange Runout
4. Companion Flange Runout
5. Joint Phasing
6. Driveline Angles

Most driveline vibrations that are associated with a "buzz" or "shudder" type vibration will also have a high frequency reading on the reed tachometer or the EVA. Refer to "Reed Tachometer" or to" Electronic Vibration Analyzer."

PROPELLER SHAFT RUNOUT CHECK

Noise vibration at high speed could be caused by a bent propeller shaft. The propeller shaft could have been damaged by rough handling or a collision. Check for propeller shaft straightness.

1. Raise the vehicle on a twin post hoist so the wheels can spin.
2. Attach a dial indicator having a magnetic base to a smooth place on the vehicle underbody.
3. Take dial indicator readings at the propeller shaft check points (figure 14).

Important

- Do not attach the dial indicator base at a weld.

4. With the transmission in neutral, hand rotate the axle pinion flange or the transmission yoke and take the necessary dial indicator readings on the propeller shaft. Record the readings. If the runout is over specification at one or more check points, rotate the propeller shaft 180 degrees at the pinion flange or companion flange. Reinstall and check the runout. If the runout is still over specification check the pinion or companion flange runout. Use a dial indicator and J 35819 Companion Flange Runout Gage before replacing the propeller shaft. Refer to figure 15. For models having a two-piece driveline, measure the rear propeller shaft runout first (figure 14). Reference mark the position of the rear propeller shaft yoke to the pinion flange or companion flange, then remove the rear propeller shaft. Measure the front propeller shaft runout on the tube and at the splined shaft end. If the runout exceeds the specifications found in figure 14, replace the shaft.
   - The runout of splined shaft end will affect the runout of the front measurement on the rear shaft.
5. Check the runout on the replacement propeller shaft. If the new propeller shaft runout is over specification, double-check the pinion flange runout (figure 15).

Important

- The splined end of the front propeller shaft is critical to the smooth operation of a two-piece driveline. Be sure the dial indicator readings are accurate.

PROPELLER SHAFT BALANCE CHECK

Remove or Disconnect

- Raise the vehicle on a twin post hoist so the wheels can spin.

1. Tire and wheel assemblies and the brake drums.

CAUTION: Do not apply the brake with the drums removed or personal injury and vehicle damage may occur.

Inspect

- Propeller shaft, universal joints, and attachments for mud, undercoating, or loose fasteners.

Clean

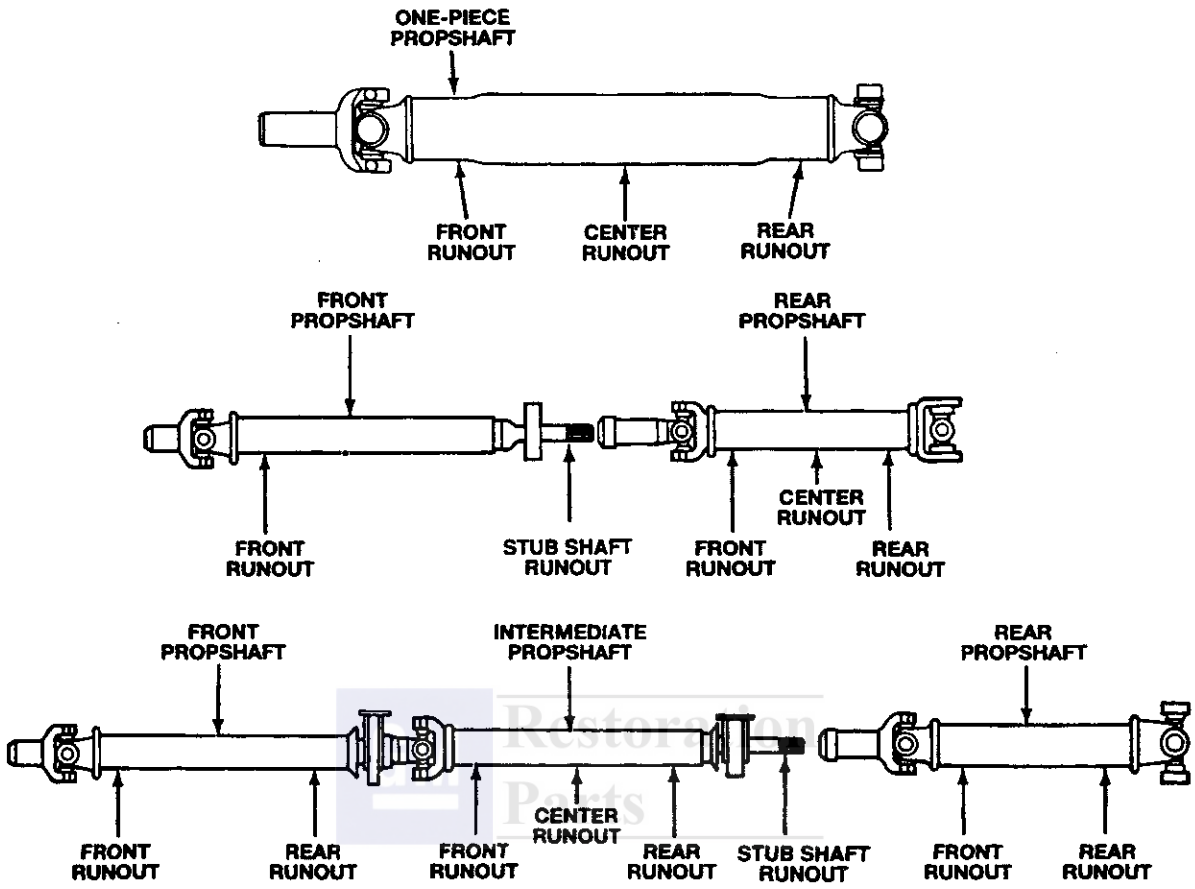
- Propeller shaft, universal joints, and attachments.

Tighten

- Any loose attachments or fasteners.

Important

- Run the vehicle in gear at the speed where the vibration peaks; observe the intensity of the vibration as indicated by the reed tachometer. The greater the disturbance, the greater the amount of amplitude that will be seen on the reed tachometer or the EVA. When using the reed tachometer or EVA to check propeller shaft balance, hold the reed tachometer or fasten the EVA sensor on a stationary component as close to the vibration as possible when reading the amplitude. Refer to "Reed Tachometer" or "Electronic Vibration Analyzer."
- Stop the engine.



PROPSHAFT RUNOUT SPECIFICATIONS				
PROPSHAFT	FRONT RUNOUT	CENTER RUNOUT	REAR RUNOUT	STUB SHAFT RUNOUT
ONE-PIECE	0.040"	0.050"	0.055"	—
ALUMINUM GRAPHITE	0.040"	—	0.040"	—
TWO-PIECE FRONT SLIP YOKE	0.020"	—	—	0.003"[1]
TWO-PIECE FRONT FIXED YOKE	0.040"	—	—	0.004"[1]
TWO-PIECE REAR	0.030"[2]	0.030"	0.035"	—
THREE-PIECE	0.025"	0.040"	0.040"	0.004"[1]

[1]Take measurement on splines, 1/2-inch from the end.
[2]Measured with rear shaft disconnected from front shaft. Front shaft must be within runout tolerances.

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Figure 14—Checking Propeller Shaft Runout

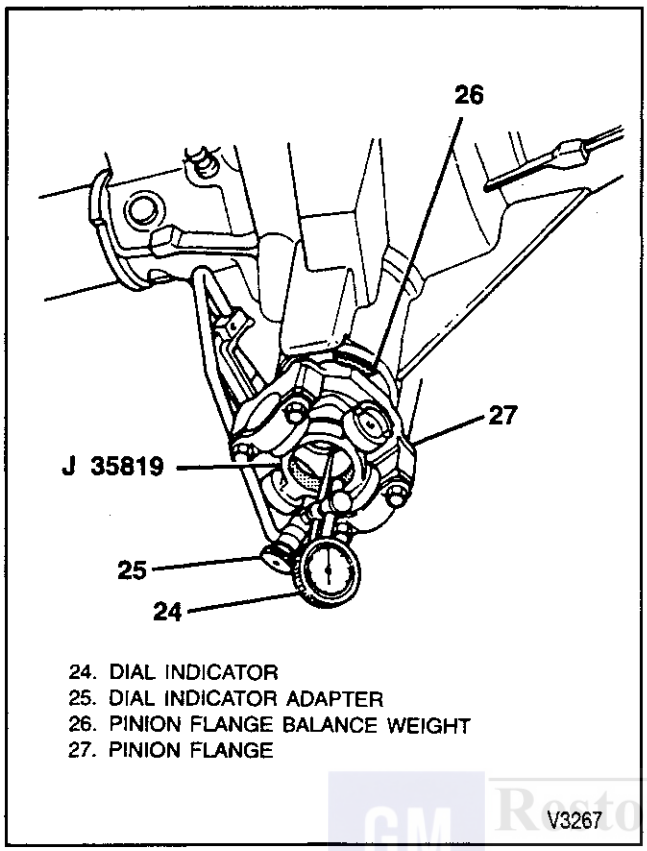


Figure 15—Pinion Flange Runout

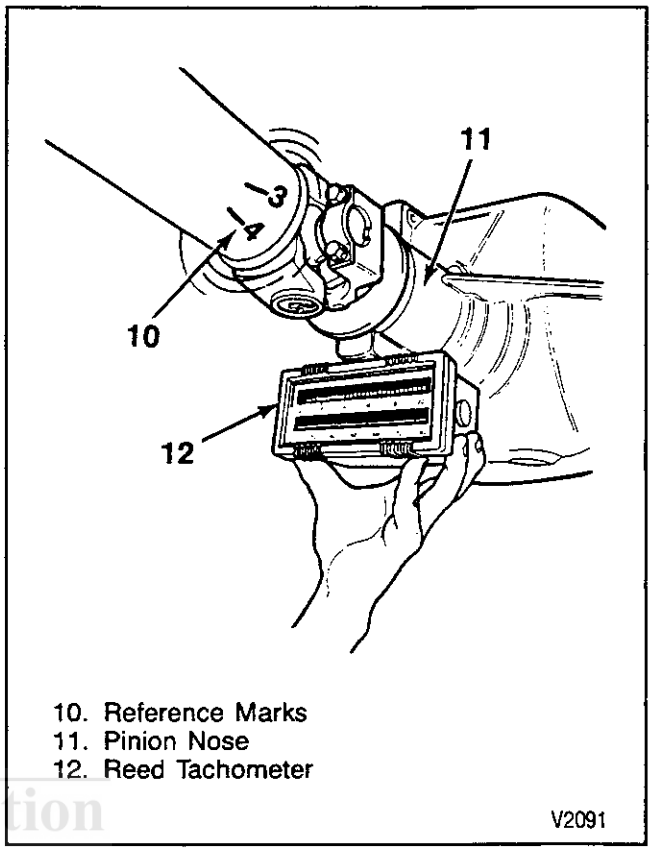


Figure 16—Propeller Shaft Reference Marks and Reed Tachometer Position

2. Propeller shaft.

NOTICE: A screwdriver or bar should not be used in the universal joint/spider location, to rotate the propshaft because seal damage may result. Use a chain or strap wrench wrapped around the pinion flange to rotate propshaft.

- Rotate the propeller shaft 180 degrees from the original position.

Install or Connect

1. Propeller shaft.
   - Determine the position which gives the lowest amplitude reading on the reed tachometer or EVA.
2. Rear drums, wheels, and tire assemblies.
   - Determine the position which gives the best driveline response by road testing the vehicle for a final check of the propeller shaft balance.
   - For unacceptable balance, refer to "Propeller Shaft Balancing."

PROPELLER SHAFT BALANCING

HOSE CLAMP METHOD (Figures 16, 17, and 18)

1. Place the vehicle on a twin-post hoist so that the rear of the vehicle is supported on the rear axle housing and the rear wheels are free to rotate. Remove both rear wheel assemblies and reinstall the wheel lug nuts with flat sides next to the drums.
2. Mark and number propeller shaft at four points 90 degrees apart at the rear of the propeller shaft just forward of the balance weights (figure 16).
3. Install two hose clamps on the rear of the propeller shaft and slide them rearward until the clamps stop at the nearest balance weight welded to the tube. Align both clamps at any one of the four marks made on the shaft in step 2 and tighten.
4. Run the vehicle through the speed range to 50-55 mph (81-89 km/h). Note the amount of imbalance felt at the front of axle housing or as indicated by a reed tachometer or the EVA sensor. Refer to figures 16 and 17.

CAUTION: Never run vehicle higher than 55 mph (89 km/h). All persons should stay clear of universal joints and balance weight areas to avoid possible injury. Do not run the vehicle on the hoist for extended periods due to the danger of overheating the transmission or engine.

5. Loosen clamps and rotate clamp heads 90 degrees to the next mark on the propeller shaft. Tighten clamps and repeat step 4.
6. Repeat step 5 until vehicle has been run with clamp heads located at all four marks on shaft.

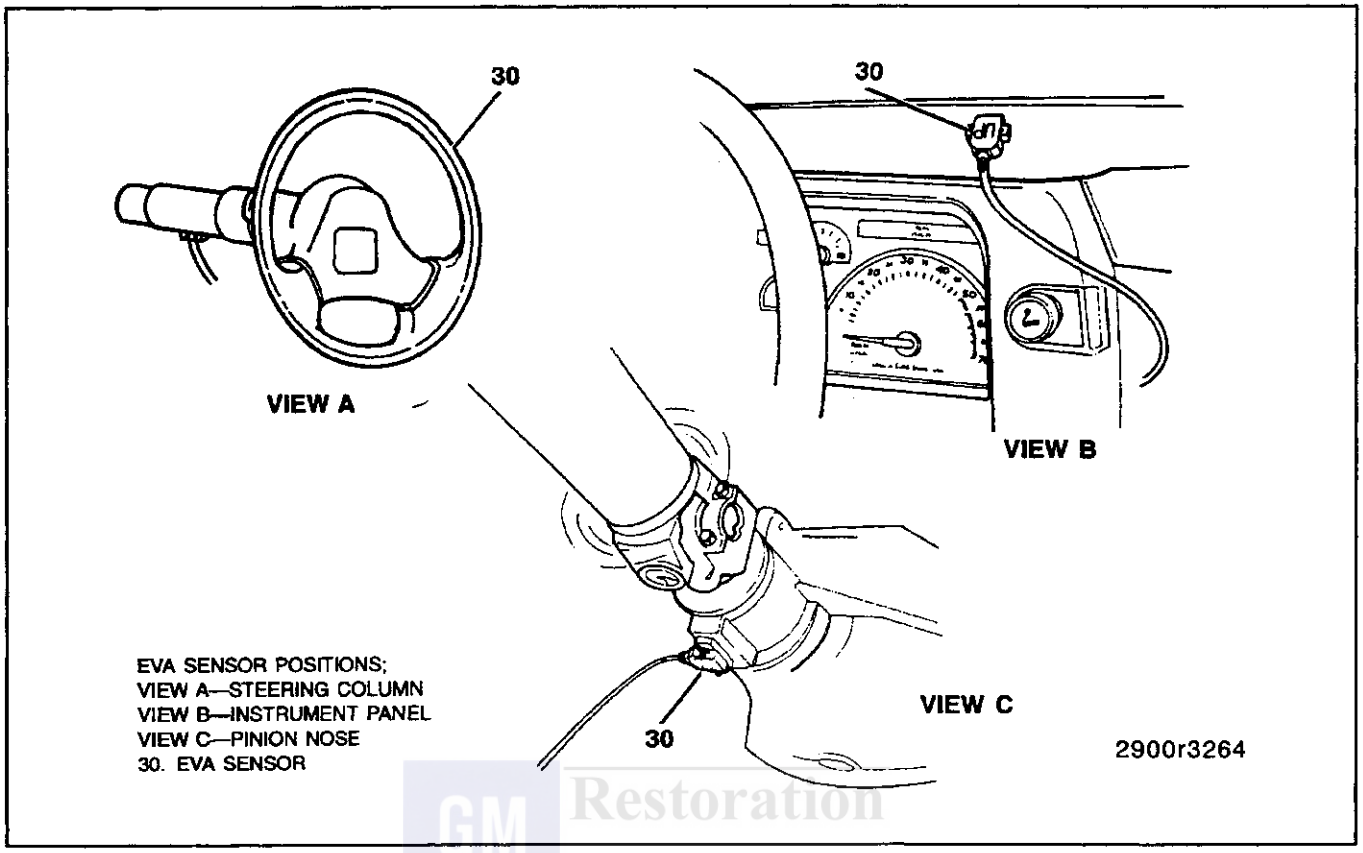


Figure 17—EVA Sensor Positions

7. Position clamps at point of least imbalance. Rotate the clamp heads away from each other 45 degrees (one on each side of the position) (figure 18). Run the vehicle and note if balance has improved. In some cases it may be necessary to use one clamp or possibly three clamps in order to obtain a good balance. Replace the propeller shaft if three hose clamps do not improve the balance.
8. Continue to rotate the clamps apart in smaller angular increments until the balance of the propeller shaft is achieved.

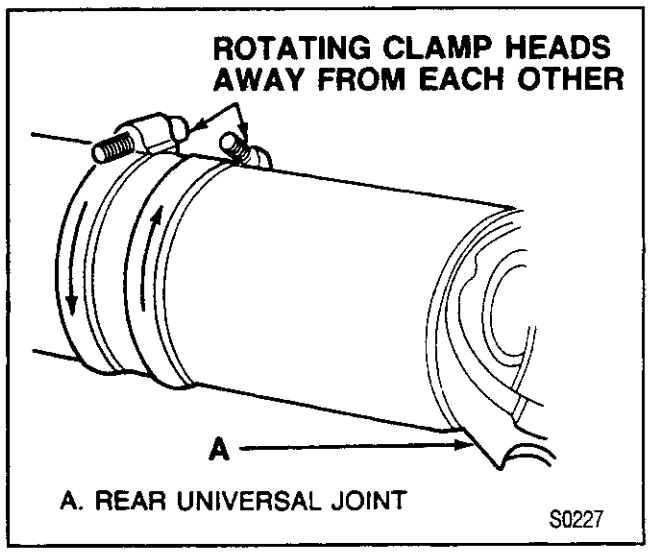


Figure 18—Rotating Hose Clamps

9. Reinstall wheel assemblies and road test the vehicle for final check of balance. A minimal vibration felt in the vehicle on the hoist may not show up during a road test.

STROBE LIGHT METHOD (Figures 8, 19, and 20)

Either a strobe light wheel balancer or an EVA can be used to balance a propeller shaft. The balance pickup unit should be placed directly under the nose of the axle carrier and as far forward as possible. When using the EVA for propshaft balancing, connect the strobe light to the trigger wire on the front of the EVA. By pushing the strobe button on the EVA's keypad, the EVA will go into the strobe mode, allowing the strobe light to flash.

1. Place the vehicle on a twin post hoist so the rear of the vehicle is supported on the rear axle housing and the rear wheels are free to rotate. Lower the hoist and allow the axle to rest on jackstands. Leaving the axle in the hoist fixture can destroy the sensitivity of the operation. Remove both rear wheel assemblies and reinstall wheel lug nuts with flat sides next to the drums.
2. Mark and number the propeller shaft at four points 90 degrees apart at the rear of the propeller shaft just forward of the balance weights, as shown in figure 16.
3. Place the strobe light wheel balancer pickup or the EVA sensor under the nose of the carrier (figures 17 and 19).

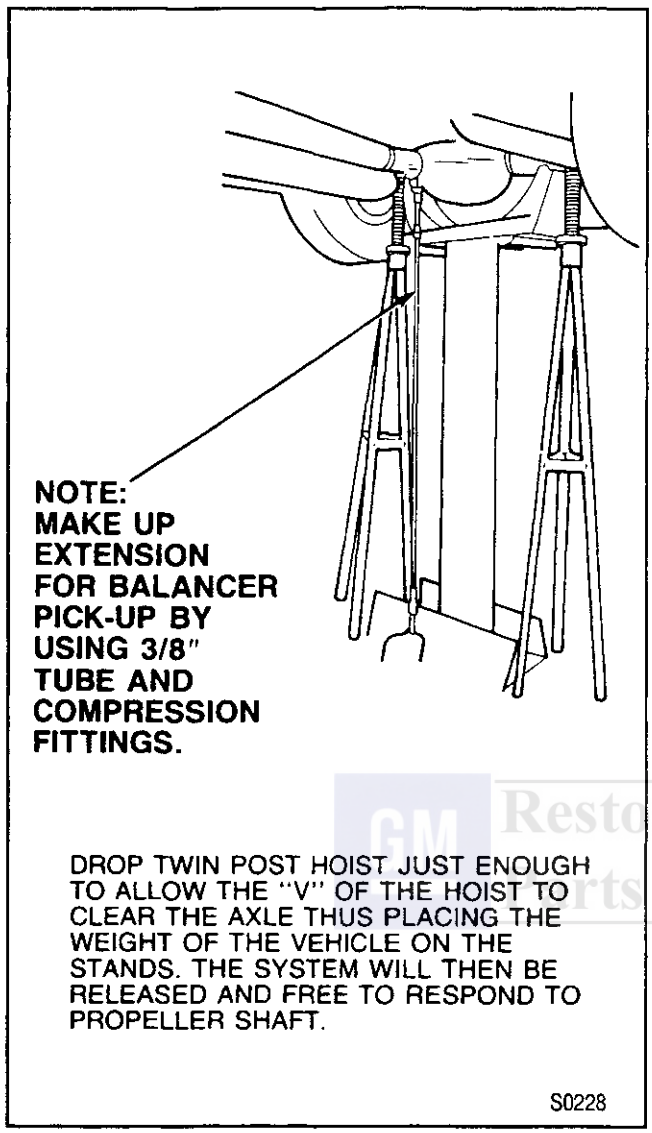


Figure 19—Pickup Unit Replacement

4. Run the vehicle in gear at the speed where the disturbance is at its peak, as indicated by driver input and by use of a reed tachometer or EVA holding at a constant speed. Point the strobe light up at the spinning propeller shaft and note the position of one of the reference numbers. Shut the engine off and position the propeller shaft so the reference numbers will be in the same position as was noted while the shaft was rotating. When the strobe light flashed, the heaviest point of the propeller shaft was at the bottom (6 o'clock). To balance the propeller shaft, it is necessary to apply the balancing weights (hose clamps) 180 degrees away from the heaviest point or at the top of the propeller shaft (12 o'clock).
5. Install two screw-type hose clamps on the propeller shaft as close to the balance weight and rear of the propeller shaft as possible. Position both clamp heads 180 degrees from the heaviest point on the propeller shaft as indicated by the strobe light. Tighten clamps.
6. Run the vehicle through the speed range. If disturbance is gone, nothing further need be done on the hoist. If the disturbance is not gone, and the strobe light shows the clamp heads at the bottom (6 o'clock) of the propeller shaft, go to step 7. If the strobe light shows the two clamp heads at the top of the propeller shaft, add one more hose clamp and recheck. If the strobe light shows the three clamp heads at the top of the propeller shaft, remove the propeller shaft and re-index it 180 degrees on the rear axle pinion flange. Recheck without clamps. Repeat balance starting with step 5. If the propeller shaft still needs more than three hose clamps at the same clock position, replace it.

Important

- Before replacing the propeller shaft double-check the pinion flange runout (figure 15).

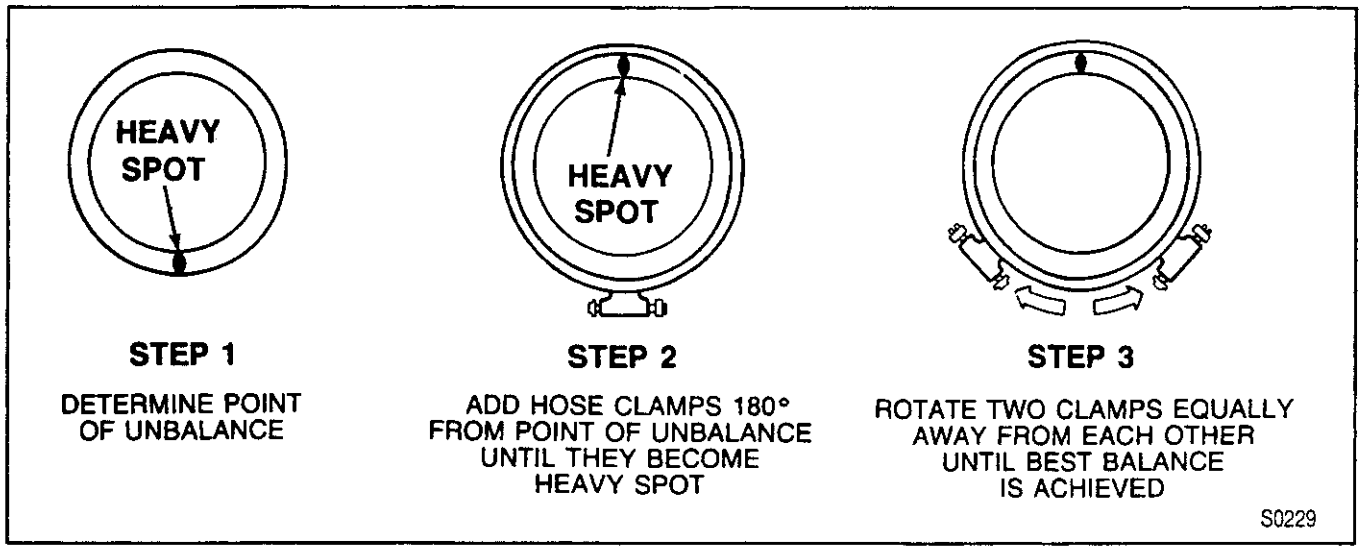
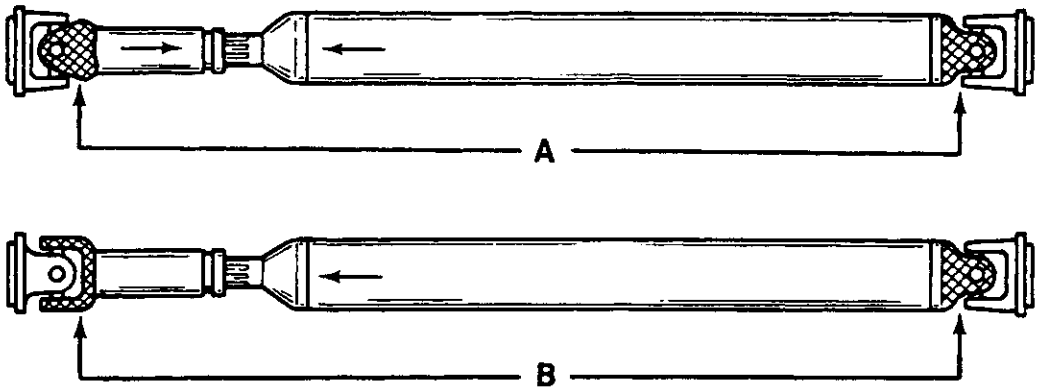


Figure 20—Positioning Hose Clamps to Achieve Best Balance



A. Correct Phasing - Yoke Lugs (Ears) and Alignment Marks Aligned
B. Incorrect Phasing - Yoke Lugs (Ears) and Alignment Marks not Aligned

B6716

Figure 21—Phasing

If the clamps are 180 degrees from their original position after the propeller shaft was reindexed, the axle pinion flange is out of balance and must be replaced. DO NOT use more than three hose clamps to balance the propeller shaft. If the strobe light shows the hose clamps at the bottom of the propeller shaft, but the disturbance still exists, go to step 7.

7. Rotate two of the hose clamps equal distances away from each other toward the top (one on each side of the position) in small increments until the best balance is achieved (figure 20). In some cases, it may be necessary to use one clamp or possibly three clamps in order to obtain a good balance. Replace the propeller shaft if three hose clamps do not correct the problem.
8. Install the wheels and road test the vehicle for a final check of balance. Vibration felt in the vehicle on the hoist may not show up during a road test.

PROPELLER SHAFT PHASING

The propeller shaft is designed and built with the yoke lugs (ears) in line with each other. This design produces the smoothest running shaft possible, and is called phasing (figure 21).

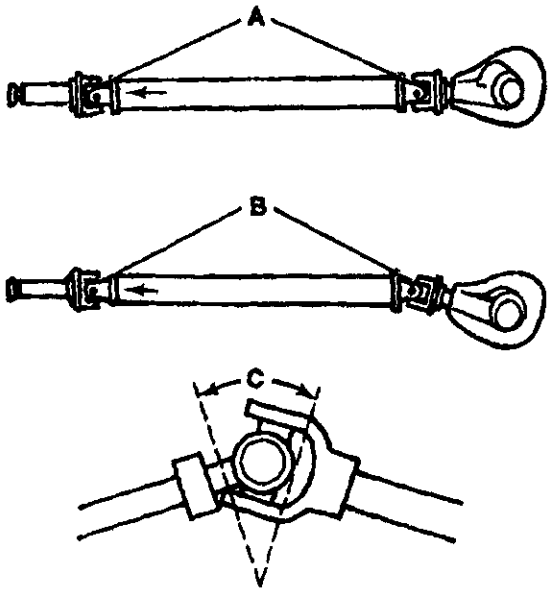
Vibration can be caused by an out-of-phase propeller shaft. The propeller shaft will absorb vibrations from speeding up and slowing down each time the universal joint goes around. A total cancellation of vibration produces a smooth flow of power in the driveline.

DRIVELINE ANGLES

When two shafts intersect at any common universal joint, the bend that is formed is called the working angle (figure 22). The larger the working angle, the greater the amount of acceleration and deceleration of the universal joint. For every revolution of the propeller shaft, there are two accelerations and decelerations of the universal joints. This speeding up and slowing down of the universal joint must be cancelled out to produce a smooth power flow. This is done through phasing and proper universal joint working angles.

MEASURING DRIVELINE ANGLES

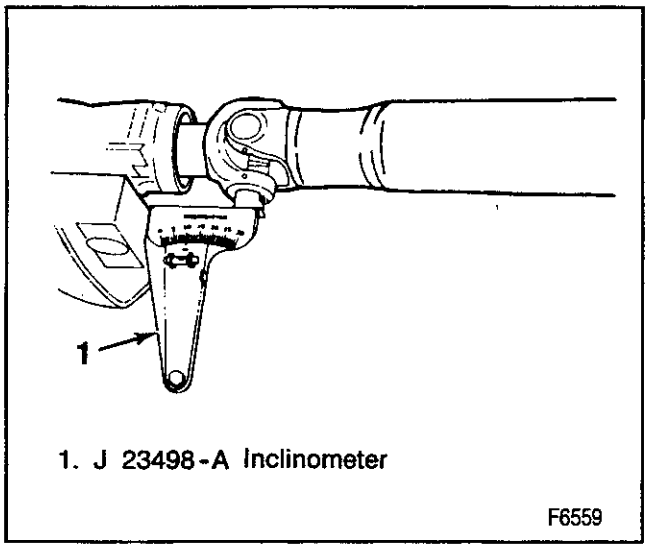
Driveline angles can be measured using an inclinometer. Support the vehicle at curb weight with a full tank of gasoline. Install the J 23498-A inclinometer on the propeller shaft bearing cap (figure 23).



A. WORKING ANGLES ARE EQUAL
B. WORKING ANGLES ARE NOT EQUAL
C. WORKING ANGLES NOT TO EXCEED 3 DEGREES

2900r6560

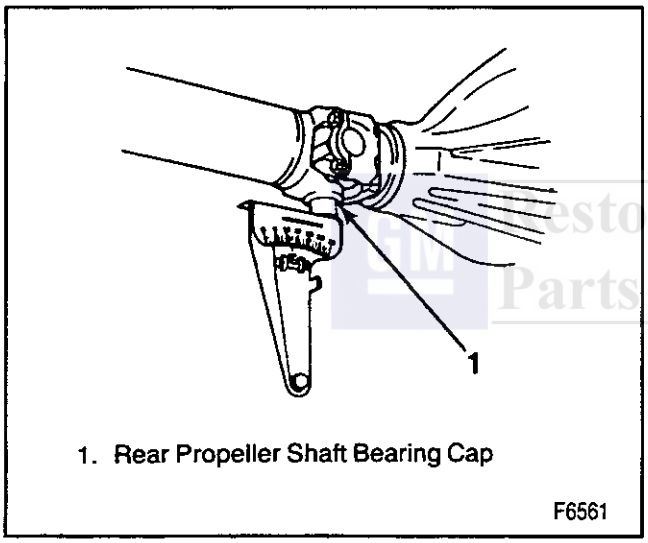
Figure 22—Working Angles



1. J 23498-A Inclinometer

F6559

Figure 23—Measuring Driveline Angles



1. Rear Propeller Shaft Bearing Cap

F6561

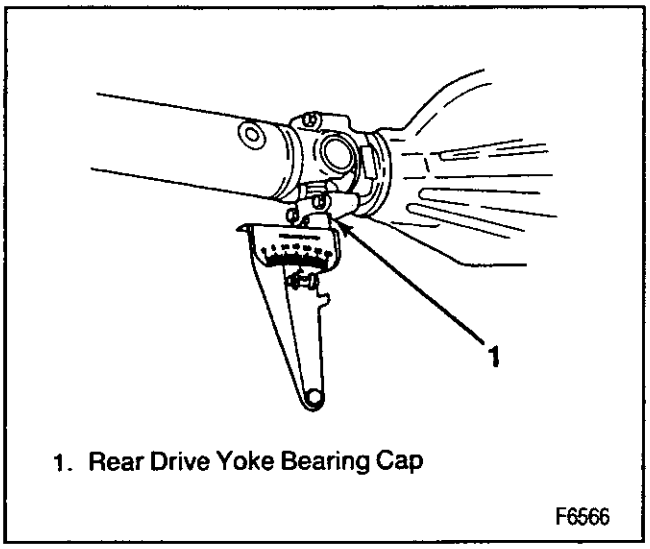
Figure 24—Measuring Rear U-Joint Working Angle

ANGLE AT REAR UNIVERSAL JOINT

1. Place inclinometer J 23498-A on rear propeller shaft bearing cap (figure 24). Center the bubble in the sight glass and record the measurement. The bearing cap must be straight up and down and free of dirt or other foreign material to obtain an accurate measurement.
2. Rotate the propeller shaft 90 degrees and place the inclinometer on the rear drive yoke bearing cap (figure 25). Center the bubble in the sight glass and record the measurement.
3. Subtract the small figure from the larger figure to obtain the rear universal joint angle.

ANGLE AT FRONT UNIVERSAL JOINT

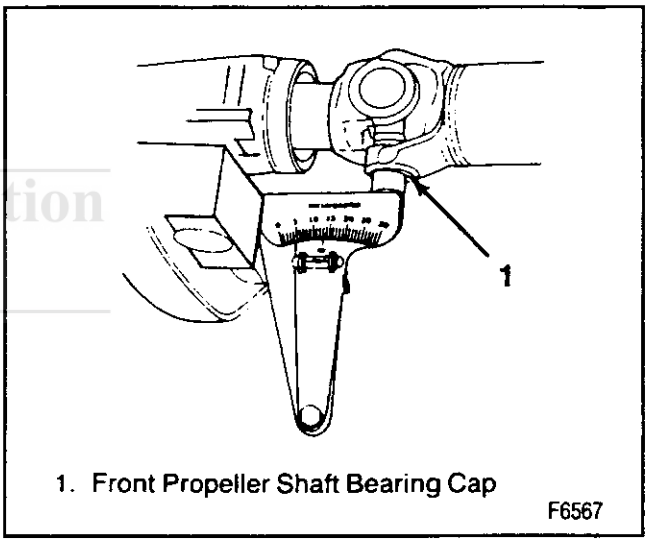
1. Place the inclinometer on front propeller shaft bearing cap (figure 26). Center the bubble in the sight and record measurement.
2. Rotate the propeller shaft 90 degrees and place the inclinometer on the front slip spline yoke bearing cap (figure 27). Center the bubble on the sight glass and record the measurement.
3. Subtract the smaller figure from the larger figure to obtain the front universal joint angle.



1. Rear Drive Yoke Bearing Cap

F6566

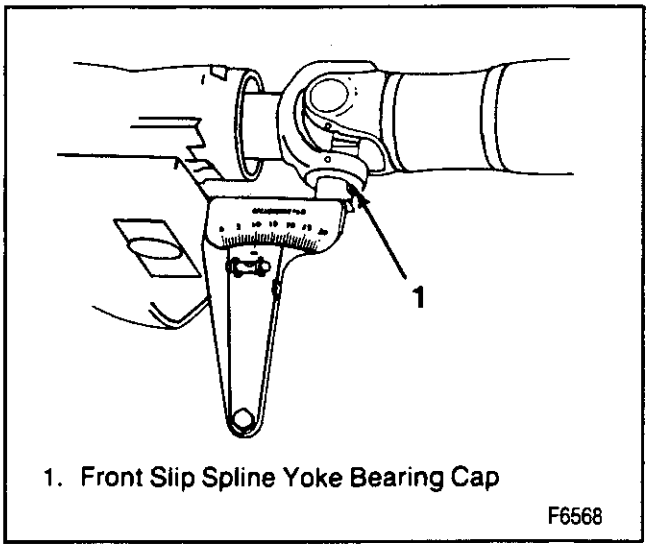
Figure 25—Measuring Rear U-Joint Working Angle



1. Front Propeller Shaft Bearing Cap

F6567

Figure 26—Measuring Front U-Joint Working Angle



1. Front Slip Spline Yoke Bearing Cap

F6568

Figure 27—Measuring Front U-Joint Working Angle

RULES FOR MEASURING DRIVELINE ANGLES

Rule Number 1 —The working angles of each pair of U-joints must be within one-half degree of being equal on shafts that turn at 3200 rpm or higher, or within one degree of being equal on shafts that turn at speeds below 3200 rpm.

Rule Number 2 —(Involves a two drive shaft, three U-joint system). With a three-joint system there is always an odd joint that cannot be paired with another joint. Since the U-joint between the transmission and the front shaft does not have a mate to cancel out its acceleration and deceleration, this front shaft should be within one-half degree of the transmission angle for high-speed shaft and within one degree for low-speed shafts. If the rear-end pinion angle is not equal to either the engine/transmission angle or front shaft angle, it should be at an angle between those two. There can be a one-half degree difference between the center and rear U-joint working angles, provided neither of the working angles exceed 3 degrees on high-speed shafts (turning at 3200 rpm or higher), or 5 degrees on low-speed shafts (turning below 3200 rpm).

VIBRATION DIAGNOSIS CHARTS

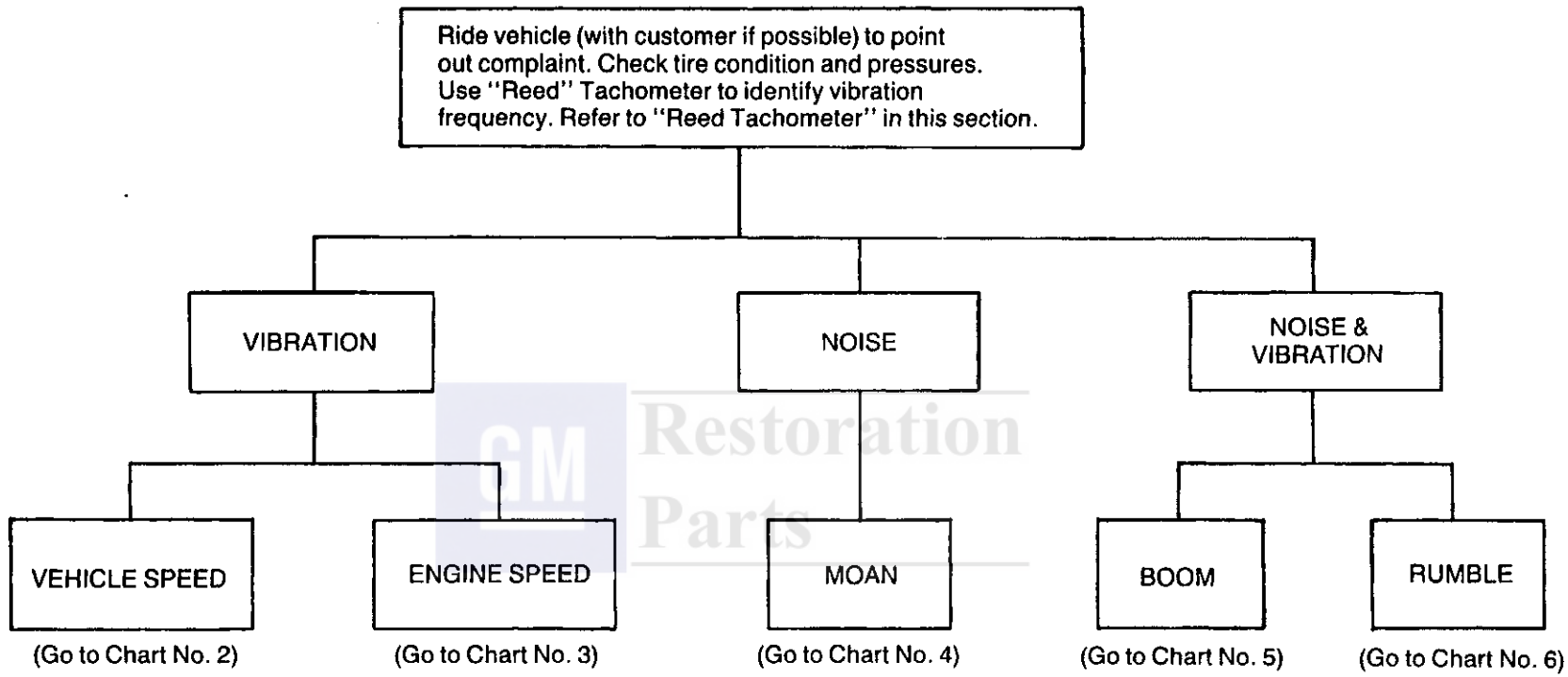
Refer to figures 28 through 35.

TECHNICIAN VIBRATION DIAGNOSIS FORM

The following form is for the technician to use when diagnosing a vibration problem. Copies of this form should be made for future use.

The form used for diagnosing a vibration problem is found after the vibration diagnosis charts. Copies of this form should be made for future use.

NOISE AND VIBRATION INDEX CHART



VEHICLE SPEED — Speedometer (vehicle speed) related.

ENGINE SPEED — Tachometer (engine speed) related.

MOAN — A low frequency noise which sounds like exhaust noise, is engine rpm and/or engine torque sensitive. Most customers will complain of noise — maybe a vibration or buzz in floor.

BOOM — A drum sound which occurs on impact with hole or seams in the road then dies out, could have a vibration along with the drumming sound.

RUMBLE* A steady drumming sound and vibration which is vehicle speed sensitive and continues as long as the vehicle speed is maintained, regardless of engine speed.

*NOTE: "Load sensitive rumble" — may only be noted with certain vehicle loads and speed conditions.

"Height (jounce) sensitive rumble" — Noise and vibration will vary in intensity and degree as vehicle height change takes place with road terrain change.

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Figure 28—Vibration Diagnosis Chart #1

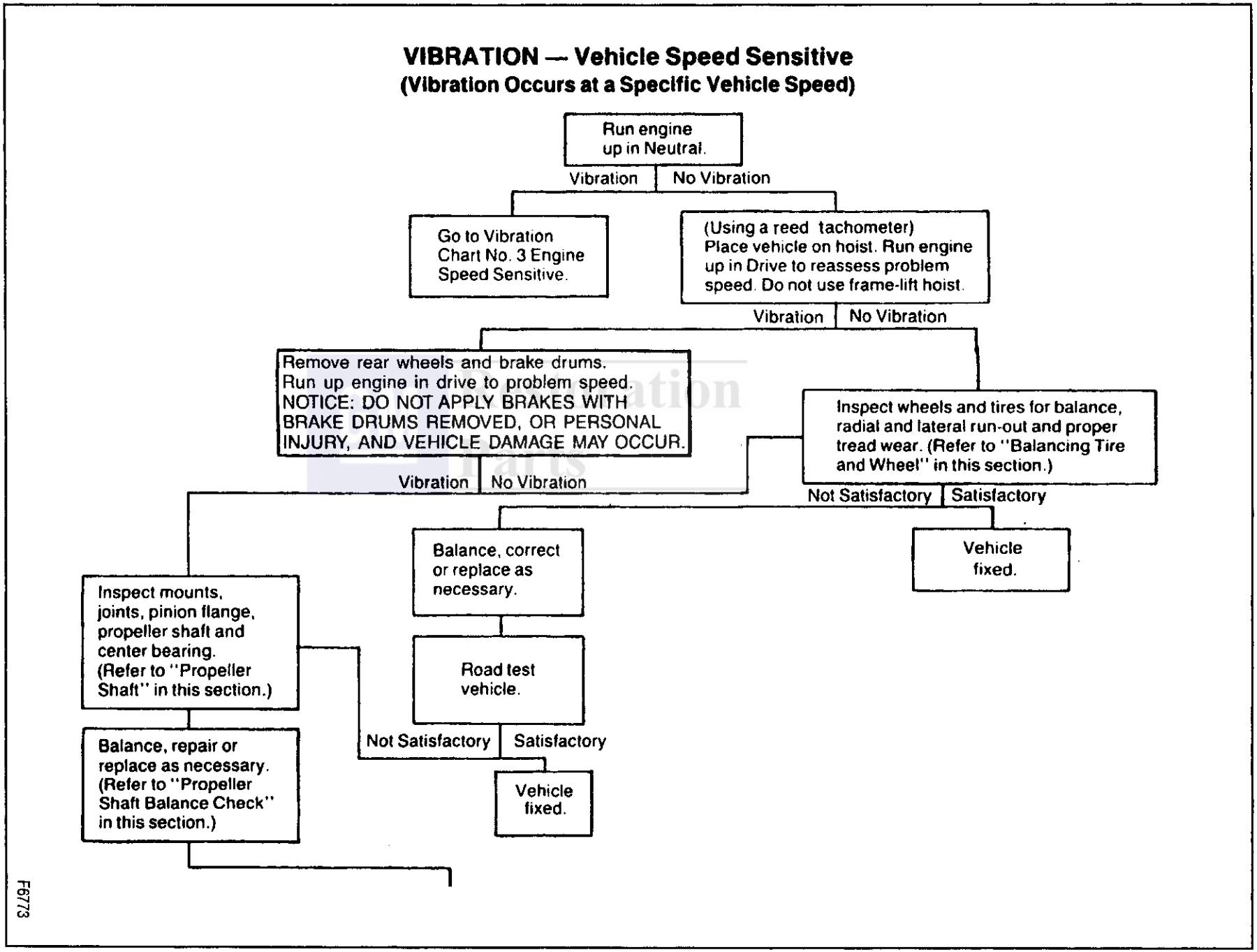


Figure 29—Vibration Diagnosis Chart #2

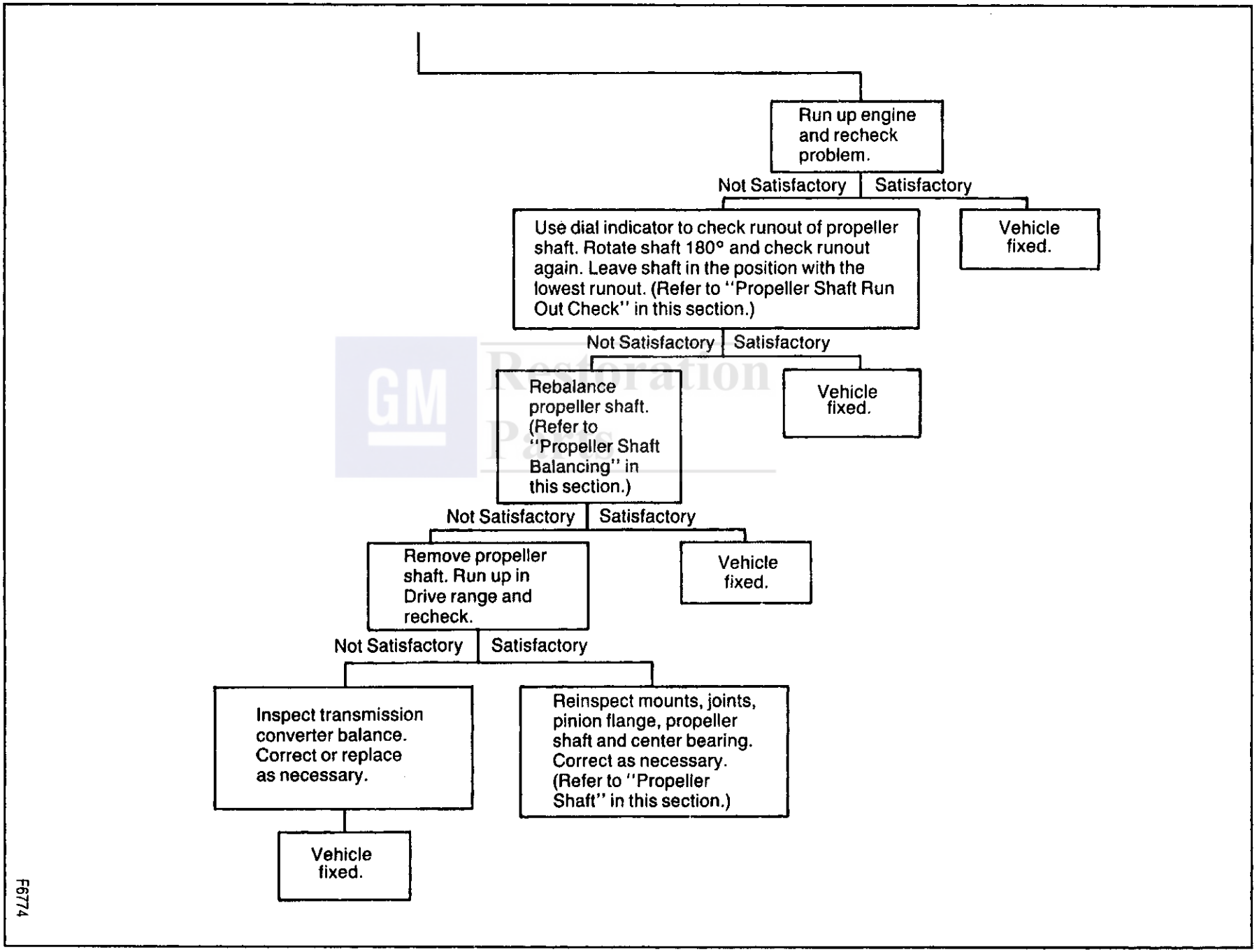


Figure 30—Vibration Diagnosis Chart #2 Continued

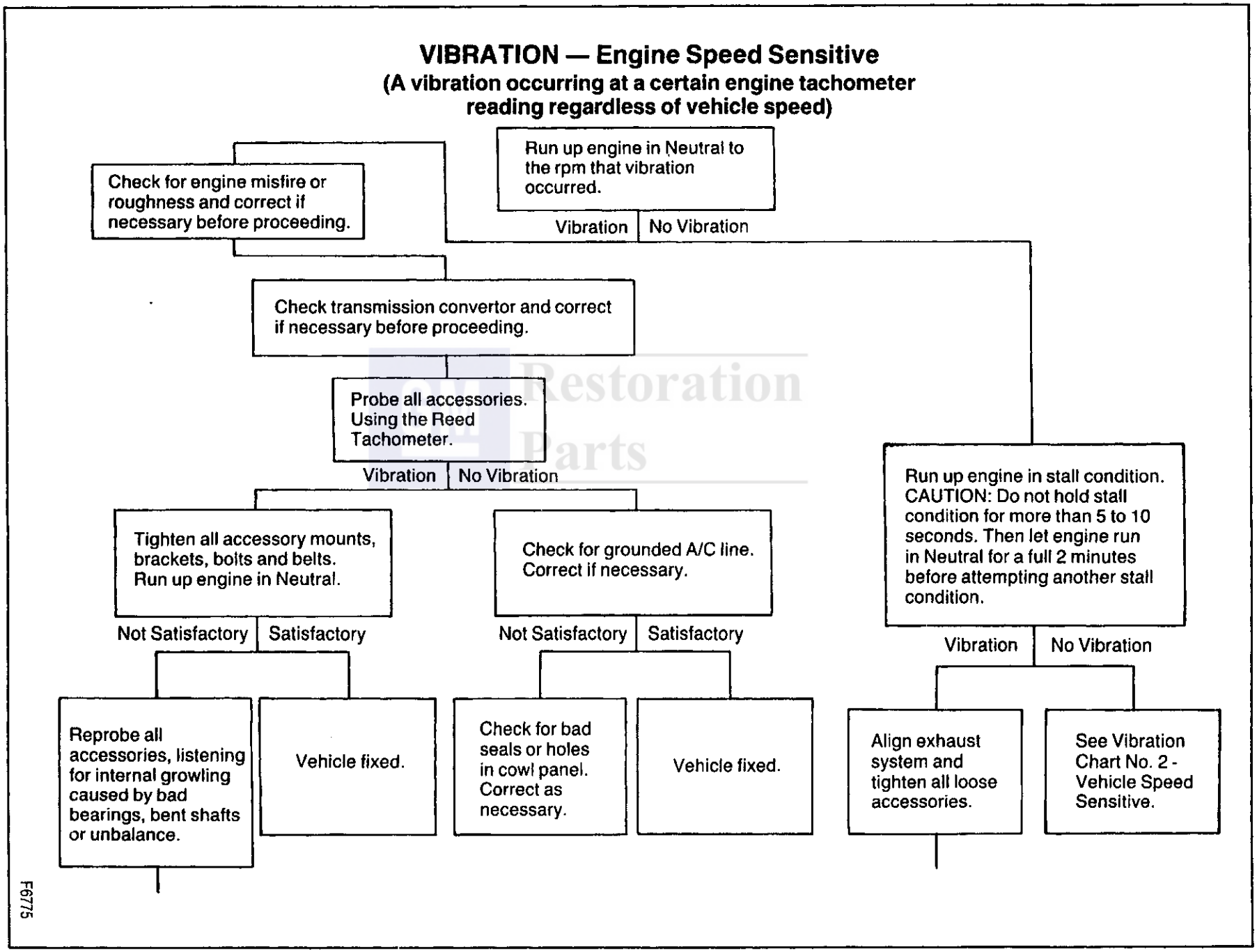


Figure 31—Vibration Diagnosis Chart #3

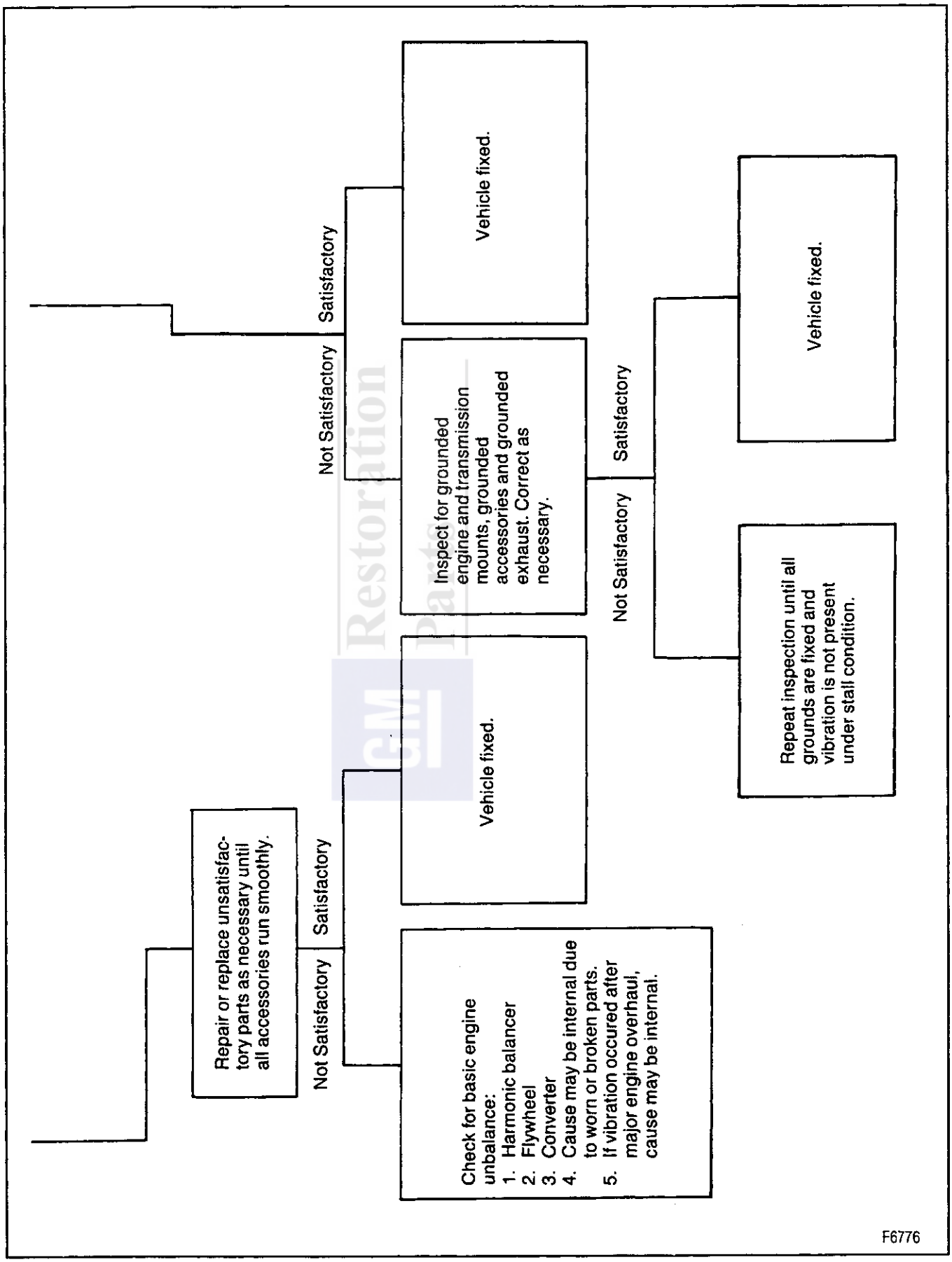


Figure 32—Vibration Diagnosis Chart #3 Continued

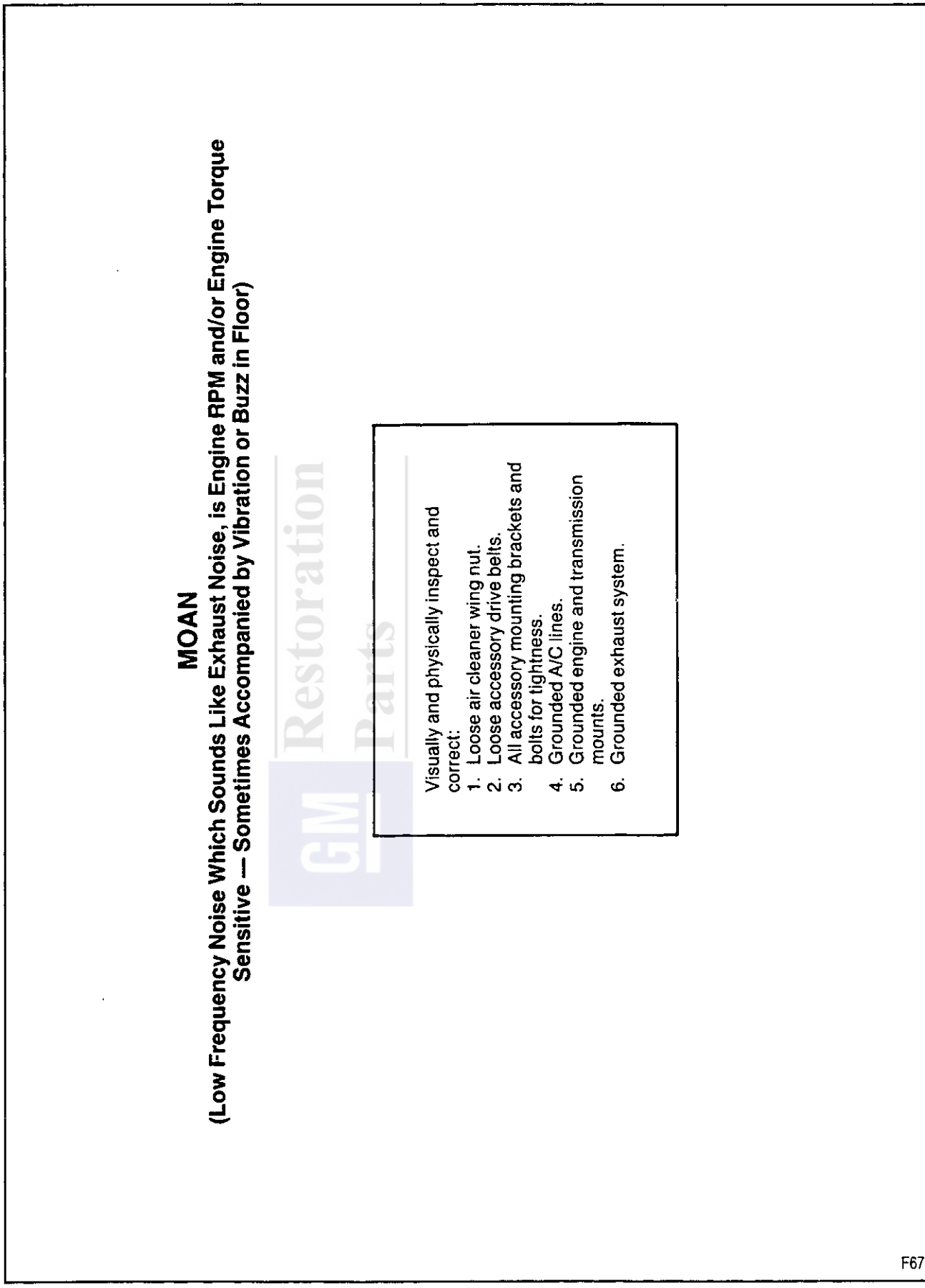


Figure 33—Vibration Diagnosis Chart #4

BOOM — Noise and Vibration
(A drum sound which occurs on impact with holes or seams in the road surface)

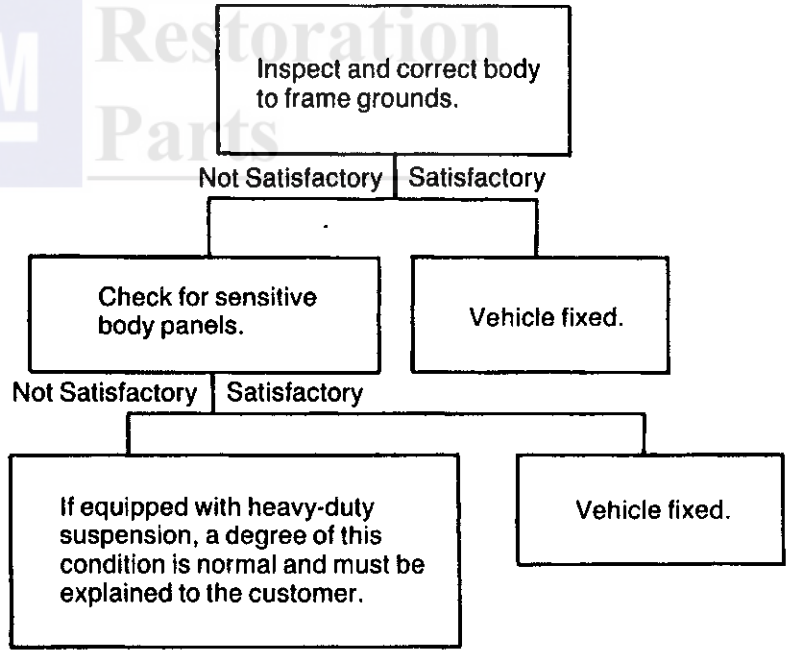
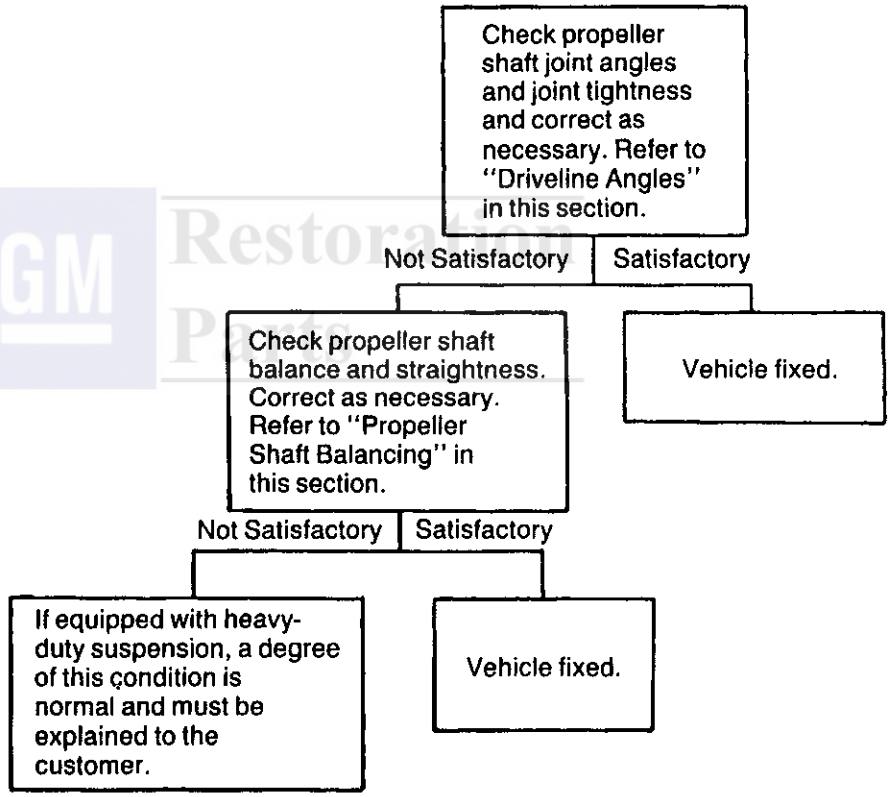


Figure 34—Vibration Diagnosis Chart #5

RUMBLE — Noise and Vibration

(A steady drumming sound which is vehicle speed sensitive and continues as long as vehicle speed is maintained)



NOTE: Rumble may be vehicle load sensitive or vehicle height sensitive.
Refer to "Vibration Categories" in this section.

Figure 35—Vibration Diagnosis Chart #6

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TIRE/WHEEL AND PROPSHAFT ROTATION
FRONT ENGINE—REAR DRIVE

Vehicle Information

Complaint Speed:_____ mph
Symptom:_____
Frequency:_____
Engine Speed:_____ rpm
Gear:_____

Year:_____ Model:_____
VIN:_____
Engine:_____ Trans:_____
Tire Size:_____ Axle Ratio:_____:_____
TPC Spec:_____

Tire/Wheel Speed

Vibration Occurs at:	[ ]	mph ÷ 5 (mph)		=	[ ]	increments of 5 mph
5 mph increments	[ ]	x	[ ] tire RPS* at 5 mph (from chart)	=	[ ]	**Tire/Wheel Speed, RPS (Hz)** 1st order
1st order	[ ]	x 2		=	[ ]	2nd order
1st order	[ ]	x 3		=	[ ]	3rd order

Propshaft Speed

						Propshaft Speed
1st order tire	[ ]	x	[ ] (axle ratio)	=	[ ]	1st order
1st order propshaft	[ ]	x 2		=	[ ]	2nd order

*RPS=revolutions per second; equates to cycles per second (Hz).

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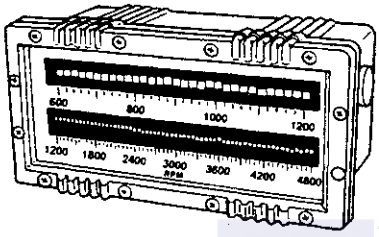
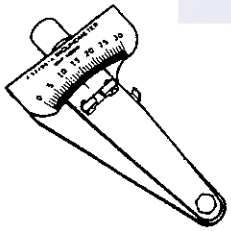
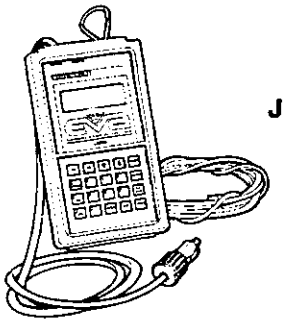
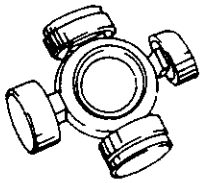
SPECIAL TOOLS

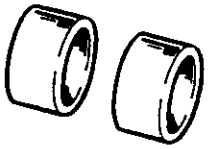
1. 

P/N 313510

2. 
J 23498-A

3. 
J 38792

4. 
J 35819

5. 
J 35819-100

1. BIDDLE FHRAM REED TACHOMETER
2. INCLINOMETER
3. ELECTRONIC VIBRATION ANALYZER (EVA)
4. COMPANION FLANGE RUNOUT GAGE
5. RUNOUT GAGE ADAPTER SLEEVES

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