INTRODUCTION

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DESIGNATIONS, LABELS/PLATES/DECALS, CODES AND DIMENSIONS/WEIGHTS

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VEHICLE DESIGNATIONS

The Vehicle Code chart lists description and code for Ram Truck and Sport Utility vehicles. The codes are used to identify vehicle types in charts, captions and in service procedures. The vehicle codes are different than the Vehicle Identification Number (VIN) or the wheelbase/model code.

VEHICLE SAFETY CERTIFICATION LABEL

A certification label is attached to the left side B-pillar. The label certifies that the vehicle conforms to Federal Motor Vehicle Safety Standards (FMVSS). The label also lists the:

- Month and year of vehicle manufacture
- Gross Vehicle Weight Rating (GVWR). The gross front and rear axle weight ratings (GAWR's) are based on a minimum rim size and maximum cold tire inflation pressure
- Vehicle Identification Number (VIN)
- Type of vehicle
- Type of rear wheels (single or dual)
- Bar code
- Month, Day and Hour (MDH) of final assembly

VEHICLE IDENTIFICATION NUMBER (VIN) PLATE

The Vehicle Identification Number (VIN) plate is attached to the top left side of the instrument panel. The VIN contains 17 characters that provide data concerning the vehicle. Refer to the decoding chart to determine the identification of a vehicle.

VEHICLE CODE DESIGNATIONS

VEHICLE CODE = AD (DODGE RAM PICKUP & CHASSIS CAB)		
VEHICLE FAMILY LINE		DESCRIPTION
AD1 AD2 AD3	D150 D250 D350	PICKUP 4 x 2
AD5 AD6 AD7	W150 W250 W350	PICKUP 4 x 4
AD2 AD3	D250 D350	CHASSIS CAB 4 x 2
AD6 AD7	W250 W350	CHASSIS CAB 4 x 4
AD4 AD4	AD100 AD150	SPORT UTILITY 4 x 2
AD8 AD8	AD100 AD150	SPORT UTILITY 4 x 4

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MEASUREMENT AND TORQUE SPECIFICATIONS

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SPECIFICATION NOTATIONS

WARNING: THE USE OF INCORRECT ATTACHING HARDWARE CAN RESULT IN COMPONENT DAMAGE AND/OR PERSONAL INJURY.

It is important to retain the original attaching hardware for assembly of the components. If the attaching hardware is not reusable, hardware with equivalent specifications must be used.

METRIC AND ENGLISH/SAE CONVERSION

The following chart will assist in converting metric units to equivalent English and SAE units, or vise versa.

TORQUE SPECIFICATIONS

TORQUE CHARTS

A torque chart for fasteners is provided at the end of each group (of service information). Refer to the Standard Torque Specifications chart to determine torque values not listed in the group (Figs. 1 and 2).

It is important to be aware that the torque values listed in the chart are based on clean and dry bolt threads. Reduce the torque value by 10 percent when the bolt threads are lubricated and by 20 percent if new.

BOLT THREAD AND GRADE/CLASS IDENTIFICATION

THREAD IDENTIFICATION

SAE and metric bolt/nut threads are not the same. The difference is described in the Thread Notation chart.

GRADE/CLASS IDENTIFICATION

The SAE bolt strength grades range from grade 2 to grade 8. The higher the grade number, the greater the bolt strength. Identification is determined by the line marks on the top of each bolt head (Fig. 1). The actual bolt strength grade corresponds to the number of line marks plus 2.

- A grade 2 bolt has no line marks on top of the bolt head
- A grade 5 bolt has 3 line marks on top of the bolt head
- A grade 7 bolt has 5 line marks on top of the bolt head

CONVERSION FORMULAS AND EQUIVALENT VALUES

Multiply	By	To Get	Multiply	By	To Get
in-lbs	x 0.11298	= Newton-Meters (N•m)	N•m	x 8.851	= in-lbs
ft-lbs	x 1.3558	= Newton-Meters (N•m)	N•m	x 0.7376	= ft-lbs
Inches Hg (60°F)	x 3.377	= Kilopascals (kPa)	kPa	x 0.2961	= Inches Hg
psi	x 6.895	= Kilopascals (kPa)	kPa	x 0.145	= psi
Inches	x 25.4	= Millimeters (mm)	mm	x 0.03937	= Inches
Feet	x 0.3048	= Meters (M)	M	x 3.281	= Feet
Yards	x 0.9144	= Meters (M)	M	x 1.0936	= Yards
Miles	x 1.6093	= Kilometers (Km)	Km	x 0.6214	= Miles
mph	x 1.6093	= Kilometers/Hr. (Km/h)	Km/h	x 0.6214	= mph
Feet/Sec.	x 0.3048	= Meters/Sec. (M/S)	M/S	x 3.281	= Feet/Sec.
Kilometers/Hr.	x 0.27778	= Meters/Sec. (M/S)	M/S	x 3.600	= Kilometers/Hr.
mph	x 0.4470	= Meters/Sec. (M/S)	M/S	x 2.237	= mph

COMMON METRIC EQUIVALENTS

1 Inch	= 25 Millimeters	1 Cubic Inch	= 16 Cubic Centimeters
1 Foot	= 0.3 Meter	1 Cubic Foot	= 0.03 Cubic Meter
1 Yard	= 0.9 Meter	1 Cubic Yard	= 0.8 Cubic Meter
1 Mile	= 1.6 Kilometers		

(10) Install bearing on hub with Installer D-156 and Handle C-4171 (Fig. 82).

(11) Install new axle shaft oil seal in differential housing with Installer D-112-44. Apply lubricant to lip of seal.

(12) Match each bearing cup with bearing (original). Install the cups on the bearings.

(13) Position Spreader W-129-A with the tool dowel pins seated in the locating holes (Fig. 83). Install the holddown clamps and tighten the tool turnbuckle finger-tight.

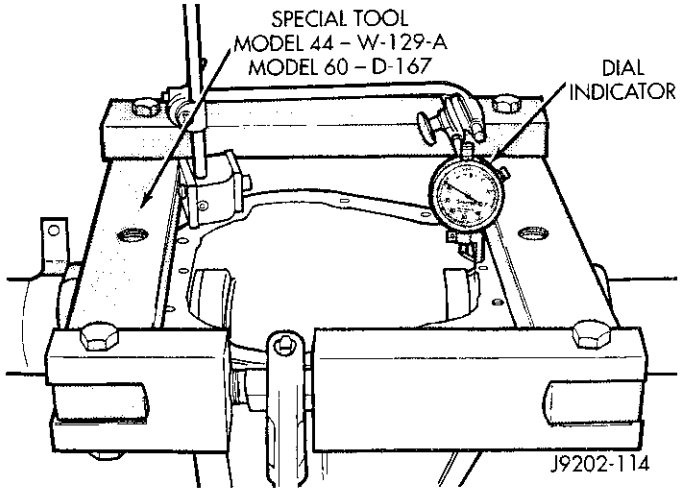

Fig. 83 Differential Housing Separation

(14) Install a pilot stud at the left side of the differential housing. Attach Dial Indicator to housing pilot stud. Load the indicator plunger against the opposite side of the housing (Fig. 83) and zero the indicator.

CAUTION: Do not spread over the specified distance. If the housing is over-separated, it could be distorted or damaged.

(15) Separate the housing enough to install the case in the housing. **Separate housing a maximum distance of 0.38 mm (0.015 in) with the spreader tool.** Measure the distance with the dial indicator (Fig. 83).

(16) Remove the dial indicator.

(17) Install case in the housing. Ensure the differential bearings are fully seated. Remove the spreader.

(18) Observe the assembly reference marks and position the bearing caps at their original locations (Fig. 84). Tighten the bearing cap bolts to 95-122 N•m (70-90 ft. lbs.) torque.

(19) Rotate assembly several revolutions to seat bearings. Measure backlash at three equally spaced locations with a dial indicator (Fig. 85).

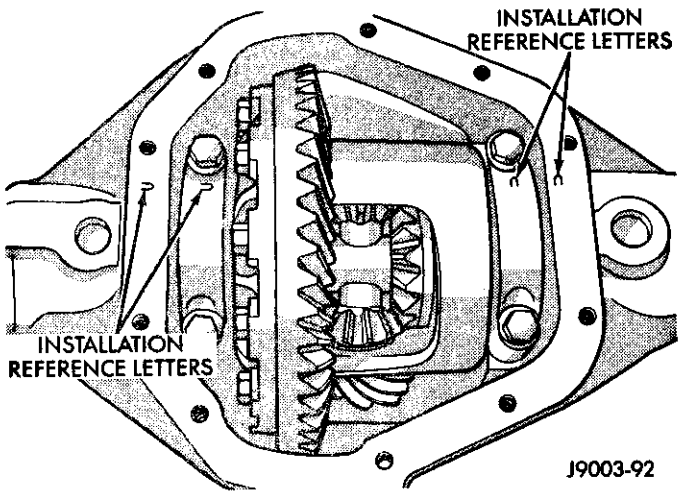

Fig. 84 Differential Bearing Cap Reference Letters

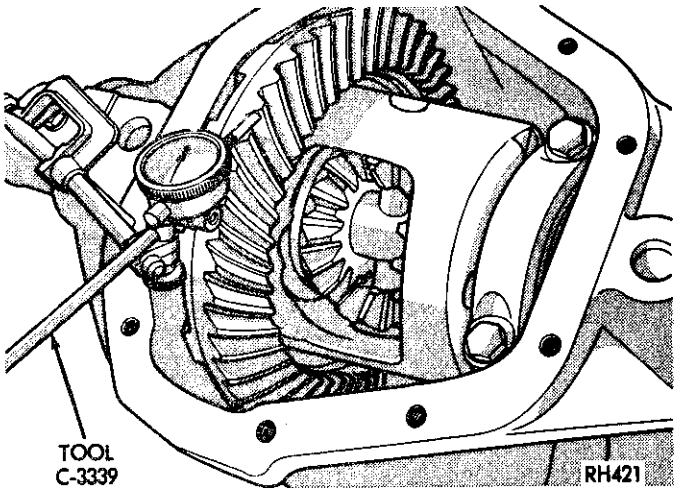

Fig. 85 Ring Gear Backlash Measurement

The ring gear backlash must be within 0.004 - 0.009 inch (0.10 - 0.23 mm). It cannot vary more than 0.002 inch (0.05 mm) between the points checked.

(20) Excessive backlash is corrected by moving the ring gear teeth closer to the pinion gear teeth. Insufficient backlash is corrected by moving the ring gear away from the pinion gear. Backlash correction is accomplished by transferring shims from one side to the other.

If the mesh and backlash steps have been followed in the procedures above, good gear teeth contact patterns should exist.

RING GEAR TEETH CONTACT PATTERN ANALYSIS

The ring gear teeth contact patterns will show if the pinion gear depth shim(s) have the correct thickness. It will also show if the ring gear backlash has been adjusted correctly. The backlash must be maintained within the specified limits until the correct teeth contact patterns are obtained.

(7) Inspect the pinion bearing preload shims (Fig. 1) for cracks, damage and distortion. Install replacement shims (if necessary) for the preload torque adjustment.

(8) Inspect the RWAL brake exciter ring for damage and missing teeth. If not removed, ensure the ring is firmly pressed onto the differential case. Replace the ring if loose or damaged.

DIFFERENTIAL ASSEMBLY

ASSEMBLY

(1) Align the exciter ring tab with the slot in differential case (Fig. 20).

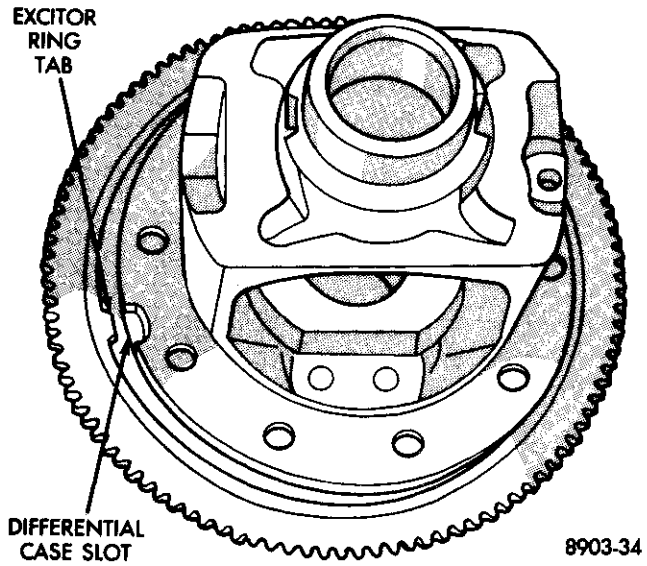

Fig. 20 Exciter Ring Alignment

(2) Invert the differential case and start two ring gear bolts. This will provide case-to-ring gear bolt hole alignment (Fig. 21).

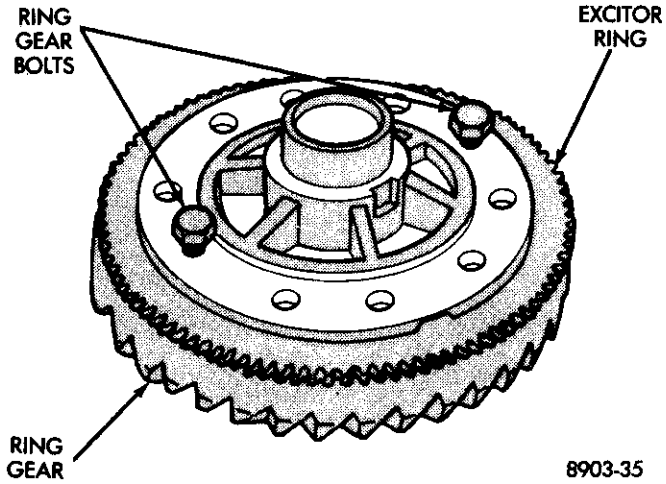

Fig. 21 Ring Gear Bolt Hole Alignment

(3) Press the exciter ring onto the differential case using the ring gear as a pilot (Fig. 22).

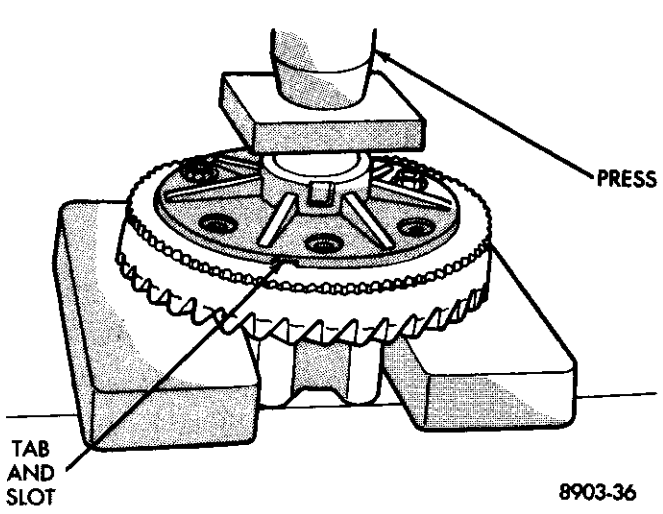

Fig. 22 Ring Gear Bolt Hole Alignment

(4) Install new ring gear bolts and alternately tighten to;

- Grade 8 bolts to 136-163 N•m (100-120 ft. lbs.) torque
- Grade 9 bolts (7 radial lines) to 169-183 N•m (125-135 ft. lbs.) torque

(5) Lubricate all differential components with hypoid gear lubricant.

(6) Install the following components in the differential case (Fig. 23).

- Differential side gears and thrust washers
- Pinion gears and thrust washers
- Pinion gear mate shaft (align holes in shaft and case)

(7) Install and seat the lock pin in the differential case and mate shaft with a punch and hammer (Fig. 23). Peen metal part of case over pin in two places.

If replacement gears and thrust washers were installed, it is not necessary to measure the gear backlash. Correct fit is due to close machining tolerances during manufacture.

(8) Place Master Differential Bearing D-343 (D-117) on the case hubs (Fig. 24).

(9) Install a pilot stud at the right side of housing. Attach Dial Indicator C-3339 to the pilot stud. Load indicator plunger against the back of the ring gear (Fig. 25).

(10) Insert a small pry bar between the bearing cap and left side of differential case. Pry the case as far as possible to right side (Fig. 25). Zero the dial indicator pointer.

(11) Pry the case to left side and record the travel distance.

The measurement above is the shim thickness necessary for case zero end-play. The total thickness will be determined during the ring gear backlash adjustment.

(12) Remove indicator and pilot stud.

(11) Attach adjuster cable to adjuster lever. Be sure cable is properly routed.

(12) Adjust brakeshoes to drum with brake gauge.

BRAKE DRUM INSTALLATION

(1) Position drum on axle housing.

(2) Install bearing and inner nut. Adjust bearing as described in Group 3.

(3) Install locking washer and outer nut. Bend locking washer to secure it.

(4) Place new gasket on hub and install axle shaft, cones, lock washers and nuts.

(5) Install wheel and tire assembly.

(6) Remove support stands and lower vehicle.

BRAKE DRUM SERVICE

BRAKE DRUM REFINISHING

The brake drums can be resurfaced on a drum lathe when necessary. Initial machining cuts should be limited to 0.12 - 0.20 mm (0.005 - 0.008 in.) at a time as heavier feed rates can produce taper and surface variation. Final finish cuts of 0.025 to 0.38 mm (0.001 to 0.0015 in) are recommended and will generally provide the best surface finish.

Be sure the drum is securely mounted in the lathe before machining operations. A damper strap should always be used around the drum to reduce vibration and avoid chatter marks.

BRAKE DRUM REFINISH LIMITS

The maximum allowable diameter of the drum braking surface is stamped or cast into the drum outer edge (Fig. 9). Generally, a drum can be machined to a maximum of 1.5 mm (0.060 in.) oversize. Always replace the drum if machining would cause drum diameter to exceed indicated size limit.

BRAKE DRUM RUNOUT

Measure drum diameter and runout with an accurate gauge. The most accurate method of measurement involves mounting the drum in a brake lathe and checking variation and runout with a dial indicator.

Variations in drum diameter should not exceed 0.076 mm (0.003 in). Drum runout should not exceed 0.20 mm (0.008 in.) out of round. Refinish the drum if runout or variation exceed these values.

WHEEL CYLINDER REMOVAL

(1) Raise and support vehicle.

(2) Remove brake drum and brakeshoes as described in this section.

(3) Remove anchor bolt and nut and remove washer, spring, parking brake lever, adjuster cable, cam plate and anchor pin bushing.

(4) Loosen brakeline at wheel cylinder.

(5) Remove wheel cylinder bolts.

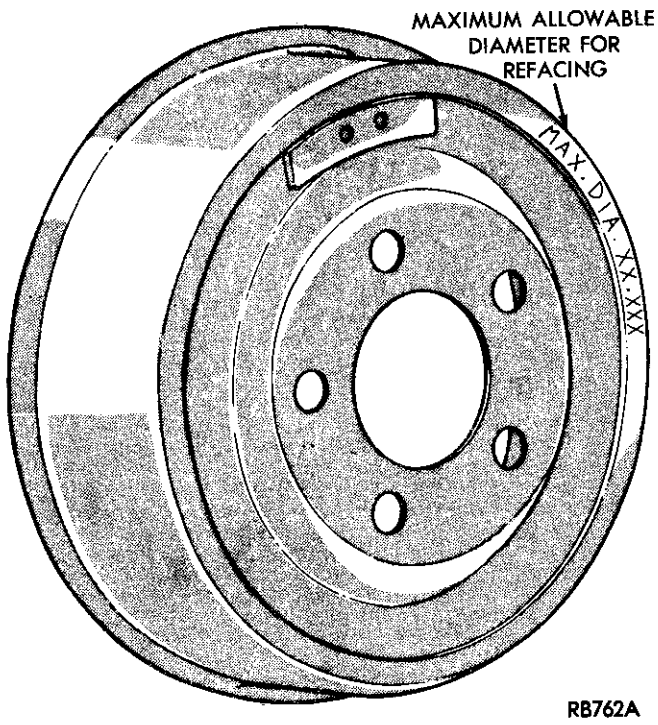

Fig. 9 Location Of Brake Drum Maximum Allowable Diameter

(6) Disconnect brakeline and remove wheel cylinder.

WHEEL CYLINDER OVERHAUL

WHEEL CYLINDER DISASSEMBLY

(1) Remove push rods and boots (Fig. 10).

(2) Press pistons, cups and spring and expander from cylinder bore.

(3) Remove bleed screw.

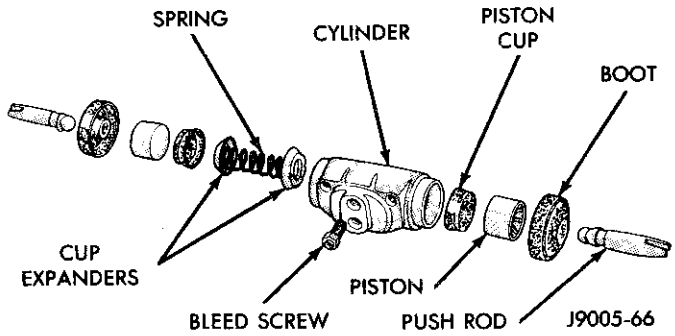

Fig. 10 Wheel Cylinder Components

CLEANING AND INSPECTION

Clean the cylinder and pistons with clean brake fluid or brake cleaner only. Do not use any other cleaning agents. Dry the cylinder and pistons with compressed air. Do not use rags or shop towels to dry the cylinder components. Lint from such materials can adhere to the cylinder bores and pistons.

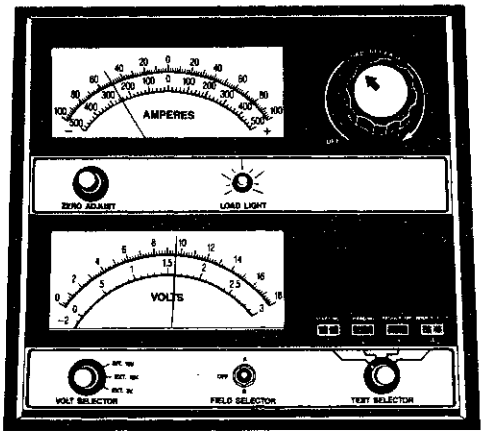

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Fig. 10 Load 50% Cold Crank Rating Note Voltage

LOAD TEST TEMPERATURE		
Minimum Voltage	Temperature	
	F°	C°
9.6	70 and above	21 and above
9.5	60	16
9.4	50	10
9.3	40	4
9.1	30	-1
8.9	20	-7
8.7	10	-12
8.5	0	-18

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BATTERY CHARGING

A battery is completely charged when it has:

- an open circuit voltage of 12.4 volts or more.
- has enough cranking capacity (minimum 9.6 volts when loaded for 15 seconds to 50% of cold cranking amperage rating at 21°C/70°F).

A green color, in the test indicator on the top of the battery, indicates the battery is charged enough for further testing. A black color indicates the battery voltage state of charge is below 75%. A yellow or bright color indicates the battery has excessively low electrolyte level. The battery cannot be refilled or charged, it must be replaced.

WARNING: DO NOT CHARGE A BATTERY THAT HAS EXCESSIVELY LOW ELECTROLYTE LEVEL. BATTERY MAY ARC INTERNALLY AND EXPLODE.

WARNING: EXPLOSIVE GASES FORM OVER BATTERY, DO NOT SMOKE, USE FLAME, OR CREATE SPARKS NEAR BATTERY.

WARNING: DO NOT ASSIST BOOST OR CHARGE A FROZEN BATTERY, CASING MAY FRACTURE.

WARNING: POISON, CAUSES SEVERE BURNS. BATTERY CONTAINS SULFURIC ACID, AVOID CONTACT WITH SKIN, EYES, OR CLOTHING. IN EVENT OF CONTACT, FLUSH WITH WATER AND CALL PHYSICIAN IMMEDIATELY. KEEP OUT OF REACH OF CHILDREN.

CAUTION: Disconnect the vehicle's battery negative cable before charging battery to avoid damage to electrical systems. Do not exceed 16.0 volts while charging battery.

Battery electrolyte will bubble inside of case while being charged properly. If the electrolyte boils violently or is discharged from the vent holes while charging, immediately reduce charging rate or turn off charger and evaluate battery condition.

Some battery chargers are equipped with polarity (+ to +/- to -) sensing devices to protect the charger or battery from being damaged if improperly connected. If the battery state of charge is too low for the polarity sensor to detect, the sensor must be bypassed for charger to operate. Refer to operating instructions provided with battery charger being used.

CAUTION: Charge battery until test indicator appears green. Do not overcharge.

It may be necessary to jostle the battery or vehicle to bring the green ball into view in the test indicator when the state-of-charge has reached 75%.

BATTERY CHARGING TIME TABLE

Charging Amperage	5 Amps	10 Amps	20 Amps
Open Circuit Voltage	Hours Charging at 21°C (70°F)		
12.25 to 12.39	6 Hrs.	3 Hrs.	1.5 Hr.
12.00 to 12.24	8 Hrs.	4 Hrs.	2 Hrs.
11.95 to 12.09	12 Hrs.	6 Hrs.	3 Hrs.
10.00 to 11.95	14 Hrs.	7 Hrs.	3.5 Hrs.
10.00 to 0	See Charging Completely Discharged Battery		

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After the battery has been charged, green indicator, perform a load test to determine cranking capacity. If the battery will endure a load test, return the battery to use. If battery will not endure a load test, it must be replaced. Clean and inspect battery hold downs, tray, terminals, posts, and top before completing service, see Group 8B - Battery/Starter/Generator Service.

CHARGING TIME REQUIRED

The time required to charge a battery will vary depending upon the following factors:

INTERMITTENT WINDSHIELD WIPER FUNCTION AND SWITCH TESTING PROCEDURES

INTERMITTENT WIPER FUNCTION TESTING PROCEDURES

The intermittent wipe and standard two speed motors are identical. Refer to previous sections for diagnosis of system problems which do not involve the DELAY function. If problem occurs only in the DELAY mode, the following tests are to be performed. These tests involve disconnecting the intermittent wipe control unit which can be found on the steering column support bracket (Fig. 2).

CONDITION

Excessive delay (more than 30 seconds) or inadequate variation in delay.

PROCEDURE

Variations in delay should be as follows:

(1) Minimum delay (delay control to extreme counterclockwise position before first detent) 1/2 to 2 seconds.

(2) Maximum delay (delay control to extreme clockwise position before off detent) 10 to 30 seconds.

(3) If there is excessive delay or no variations in delay proceed to intermittent wipe switch test.

CONDITION

In DELAY mode wipers run continually when wash is operated but do not provide an extra wipe when the wash control is released.

PROCEDURE

Replace the control unit.

CONDITION

Wipers start erratically during DELAY mode.

PROCEDURE

(1) Verify that the ground connection at the instrument panel is making good connection (free from paint) and is tight.

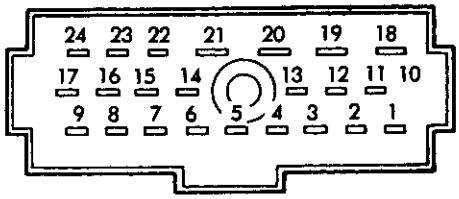
(2) Verify that the motor ground strap is making good contact and that the motor mounting bolts are tight.

(3) Verify that the wiring ground connections for the intermittent wipe control unit and the wiper switch are tight.

(4) If condition is not corrected, replace control unit.

MULTIFUNCTION (INTERMITTENT WIPER) SWITCH TESTING PROCEDURES

Refer to Multifunction (Two Speed Wiper) Switch Testing Procedures using the following continuity chart.



MULTIFUNCTION SWITCH PINS

SWITCH POSITION	CONTINUITY BETWEEN
OFF	PIN 6 AND PIN 7
DELAY	PIN 8 AND PIN 9 PIN 2 AND PIN 4 PIN 1 AND PIN 2 PIN 1 AND PIN 4
LOW	PIN 4 AND PIN 6
HIGH	PIN 4 AND PIN 5
WASH	PIN 3 AND PIN 4
*RESISTANCE AT MAXIMUM DELAY POSITION SHOULD BE BETWEEN 270,000 OHMS AND 330,000 OHMS. *RESISTANCE AT MINIMUM DELAY POSITION SHOULD BE ZERO WITH OHMMETER SET ON HIGH OHM SCALE.	

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Fig. 1 Intermittent Wipe Switch Continuity Chart

INTERMITTENT WIPE MODULE LOCATION

The intermittent wipe module is located to the right of the steering column on the back side of the instrument panel (Fig. 2).

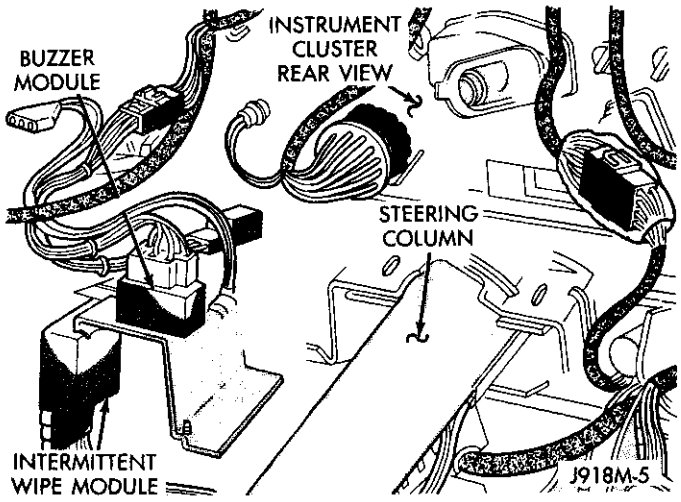
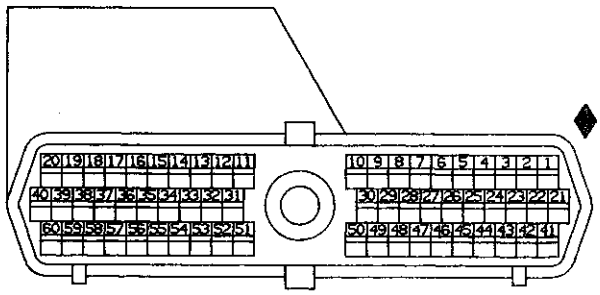


Fig. 2 Intermittent Wipe Module Location



VIEWED FROM WIRE END OF CONNECTOR

◆ AUTO TRANSMISSION ONLY

CAV	IGNITION SYSTEM CIRCUITS		SHEET
1	K32 20WT/BK	WATER IN FUEL SENSOR	25
◆ 2	K2 20TN/BK	ENGINE COOLANT TEMP SENSOR	25
3	A14 16RD	DIRECT BATTERY FEED	22
4	K4 18BK/LB	SENSOR RETURN	26
5	Z11 16BK/WT	SIGNAL GROUND	23
6	K6 20VT/WT	5 VOLT SUPPLY	26
7	K44 18TN/YL	8 VOLT INPUT	25
8	—	—	—
9	A21 14DB	IGNITION FEED	21
10	T6 20 OR/WT	TRANSMISSION OD CONTROL	14
11	Z12 18BK/TN	POWER GROUND	23
12	Z12 18BK/TN	POWER GROUND	23
13	—	—	—
14	—	—	—
15	S22 18OR/BK	HEATER #2 RELAY	21
16	S21 18YL/BK	HEATER #1 RELAY	21
17	—	—	—
18	—	—	—
19	—	—	—
20	K20 18DG	GENERATOR FIELD DRIVER	20
21	K21 18BK/RD	TRANSMISSION OD LOCKOUT SOLENOID	25
22	K22 18OR/DB	THROTTLE POSITION (SENSOR)	26
23	—	—	—
24	K24 18GY/BK	REFERENCE PICKUP	25
25	D21 20PK	DATA LINK TRANSMIT	23
26	—	—	—
27	C20 18BR	A/C COMPRESSOR CLUTCH INPUT	26
◆ 28	T25 20LG/RD	TRANSMISSION THERMO SWITCH	25
29	V40 18WT/PK	BRAKE SENSE	37
30	T41 18BR/YL	PARK/NEUTRAL POSITION SWITCH	21
31	—	—	—
32	G3 20BK/PK	MALFUNCTION INDICATOR LAMP	22
33	V36 20TN/RD	VEHICLE SPEED CONTROL VACUUM	37
34	C13 20DB/OR	W.O.T. CUTOUT RELAY	26
35	—	—	—
36	—	—	—
37	T61 20BK/OR	TRANSMISSION OD LAMP SIGNAL	14
38	—	—	—
39	—	—	—
40	—	—	—
41	—	—	—
42	—	—	—
43	G21 20GY/LB	TACHOMETER PROVISIONS	22
44	—	—	—
45	D20 20LG	DATA LINK RECEIVE	23
46	—	—	—
47	G7 20WT/OR	VEHICLE SPEED SENSOR PICKUP	25
48	V31 20BR/RD	VEHICLE SPEED CONTROL-SET	37
49	V32 20YL/RD	VEHICLE SPEED CONTROL-ON/OFF	37
50	V33 20WT/LG	VEHICLE SPEED CONTROL-RESUME	37
51	K51 20DB/YL	AUTOMATIC SHUT-DOWN RELAY	22
52	—	—	—
53	V35 20LG/RD	VEHICLE SPEED CONTROL-VENT	37
54	K31 20BK/PK	WATER-IN-FUEL LAMP	23
55	T60 20OR/LG	TRANSMISSION OD SOLENOID	14
56	E5 20DG/WT	WAIT-TO-START LAMP	23
57	A142 16DG/OR	A.S.D.-BATTERY SENSE	22
58	—	—	—
59	—	—	—
60	—	—	—

POWERTRAIN CONTROL MODULE II
(PCM II) CONNECTOR (5.9L DIESEL ENGINE) J938W-11

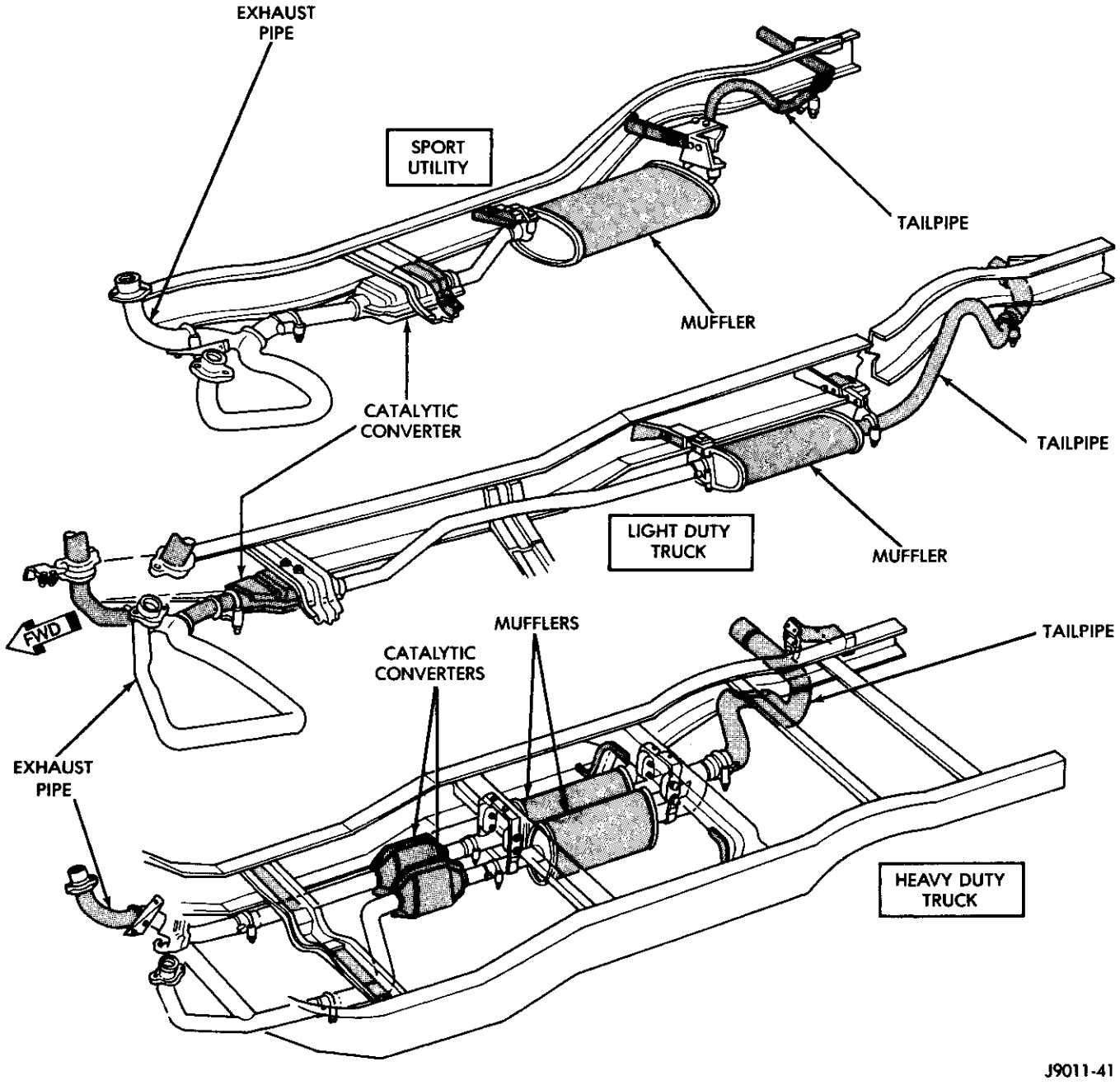


Fig. 1 Exhaust System—Gasoline Engines (Typical)

the turbine wheel and shaft. At the other end of the shaft is the compressor wheel. The compressor wheel draws air in and forces it into the engine cylinders through the intake manifold.

Supplying increased air flow to the engine provides:

- Improved engine performance
- Lower exhaust smoke density
- Improved operating economy
- Altitude compensation
- Noise reduction.

MULTI-PORT FUEL INJECTION (MPI)—COMPONENT DESCRIPTION/SYSTEM OPERATION—EXCEPT DIESEL

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GENERAL INFORMATION

All gas powered engines are equipped with sequential Multi-Port Fuel Injection (MPI). The MPI system (Fig. 1) provides precise air/fuel ratios for all driving conditions.

The Powertrain Control Module (PCM) operates the fuel system. The PCM was formerly referred to as the SBEC or engine controller. The PCM is a preprogrammed, dual microprocessor digital computer. It regulates ignition timing, air-fuel ratio, emission control devices, charging system, speed control, air conditioning compressor clutch engagement and idle speed. The PCM can adapt its programming to meet changing operating conditions.

Powertrain Control Module (PCM) Inputs represent the instantaneous engine operating conditions. Air-fuel mixture and ignition timing calibrations for various driving and atmospheric conditions are preprogrammed into the PCM. The PCM monitors and analyzes various inputs. It then computes engine fuel and ignition timing requirements based on these inputs. Fuel delivery control and ignition timing will then be adjusted accordingly.

Other inputs to the PCM are provided by the brake light switch, air conditioning select switch and the speed control switches. All inputs to the PCM are converted into signals.

Electrically operated fuel injectors spray fuel in precise metered amounts into the intake port directly above the intake valve. The injectors are fired in a specific sequence by the PCM. The PCM maintains an air/fuel ratio of 14.7 to 1 by constantly adjusting injector pulse width. Injector pulse width is the length of time that the injector opens and sprays fuel into the chamber. The PCM adjusts injector pulse width by opening and closing the ground path to the injector.

Manifold absolute pressure (air density) and engine rpm (speed) are the primary inputs that determine fuel injector pulse width. The PCM also monitors other inputs when adjusting air-fuel ratio.

Inputs That Effect Fuel Injector Pulse Width:

- Exhaust gas oxygen content
- Coolant temperature
- Manifold absolute pressure (MAP)
- Engine speed
- Throttle position
- Battery voltage
- Air conditioning selection
- Transmission gear selection (auto. trans.)
- Speed control

The powertrain control module (PCM) adjusts ignition timing by controlling ignition coil operation. The ignition coil receives battery voltage when the ignition key is in the run or starter (crank) position. The PCM provides a ground for the ignition coil. The coil discharges when the PCM supplies a ground. By switching the ground path on and off, the PCM regulates ignition timing.

The sensors and switches that provide inputs to the powertrain control module (PCM) comprise the En-

will prevent the undercoating from causing an unbalanced condition and vibration.

CAUTION: Use exact replacement hardware for attaching the propeller shafts. Exact replacement will ensure safe operation. The specified torque must always be applied when tightening the fasteners.

UNIVERSAL JOINTS

The front prop shaft uses the 7260 series universal joint. The rear prop shaft uses the 7290 series universal joint on all but the Dana 70 axle. The 1410 series is used with the Dana 70 axle.

Two different types of universal joints systems are used:

- Single cardan universal joint (Fig. 2)
- Double cardan universal joint (Fig. 3)

LUBRICATION

The slip yoke on the front shaft is equipped with a zerk type lubrication fitting. Use a multi-purpose NLGI Grade 2 EP lubricant. Refer to Group 0, Lubrication and Maintenance for additional information. The factory installed U-joints are lubricated for the life of the vehicle and do not need re-lubrication. All U-joints should be inspected for leakage and damage each time the vehicle is serviced. If seal leakage or damage exists, the U-joint should be replaced.

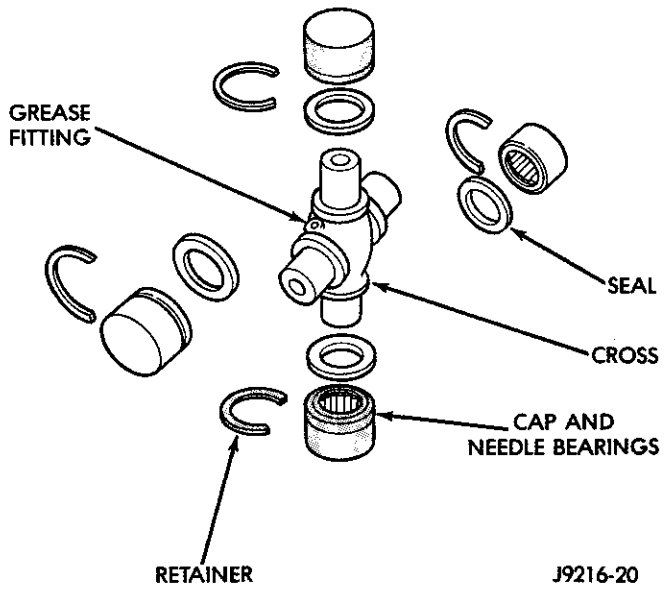
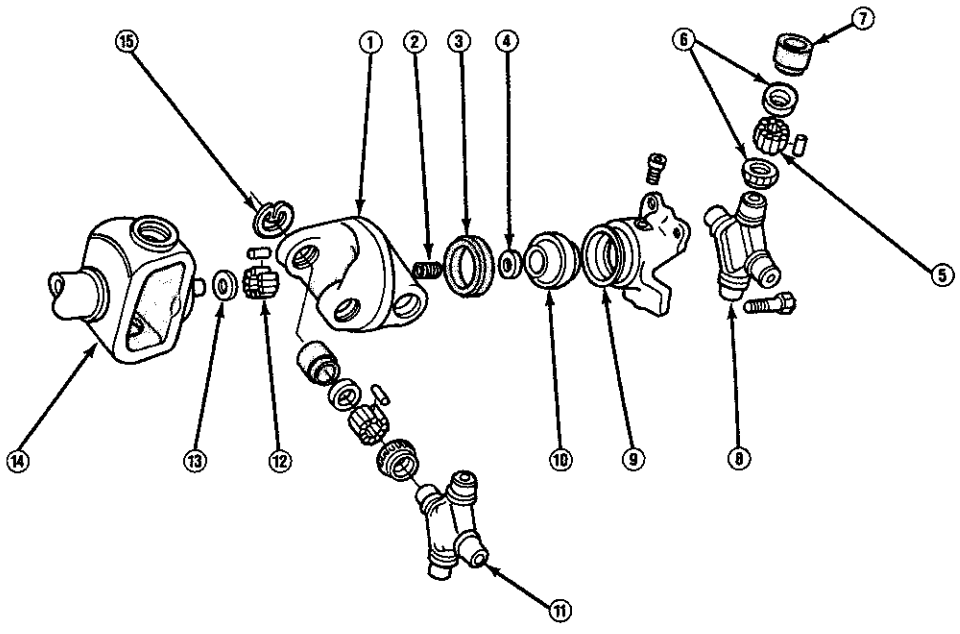


Fig. 2 Single Cardan Universal Joint (Typical)



1. LINK YOKE
2. SOCKET SPRING
3. SOCKET BALL RETAINER
4. THRUST WASHER
5. NEEDLE BEARINGS
6. SEAL
7. BEARING CAP
8. REAR SPIDER
9. SOCKET YOKE
10. SOCKET BALL
11. FRONT SPIDER
12. NEEDLE BEARINGS
13. THRUST WASHER
14. DRIVE SHAFT YOKE
15. RETAINING CLIP

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Fig. 3 Double Cardan (CV) Universal Joint

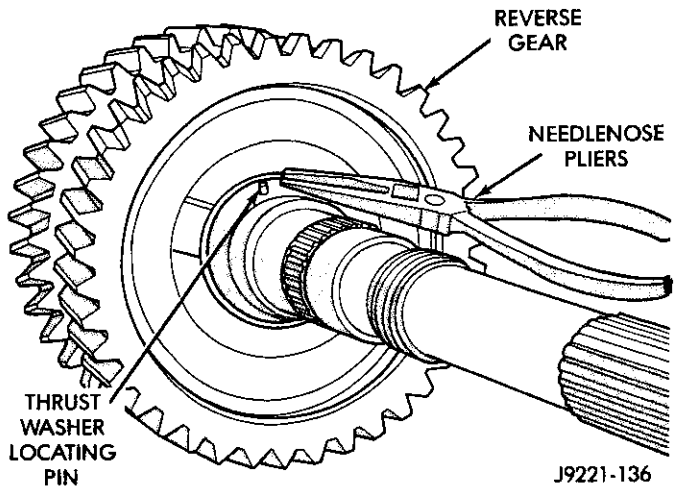

Fig. 69 Removing Thrust Washer Locating Pin

(28) Remove reverse gear synchro stop ring and clutch gear (Fig. 70).

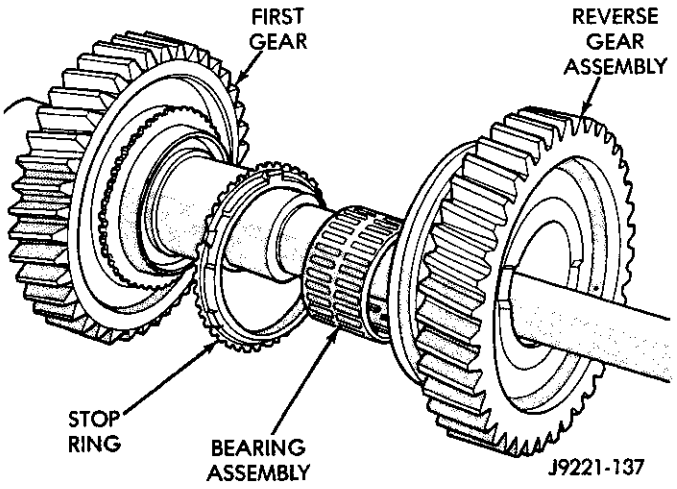

Fig. 70 Reverse Gear, Bearing And Stop Ring Removal

(29) Remove reverse gear bearing spacer from mainshaft (Fig. 71).

(30) Remove first gear snap ring (Fig. 71). Tension of this snap ring is considerable. Heavy duty snap ring pliers will be required to spread the ring far enough to remove it.

(31) Remove reverse clutch gear (Fig. 72).

(32) Remove first gear from bearing and mainshaft (Fig. 73).

(33) Remove first gear bearing from mainshaft (Fig. 74).

TRANSMISSION CLEANING AND INSPECTION

Clean the gears, bearings shafts, extension/adapter housing and gear case with solvent. Dry all parts except the bearings with compressed air. Allow the bearings to either air dry or wipe them dry with clean shop towels.

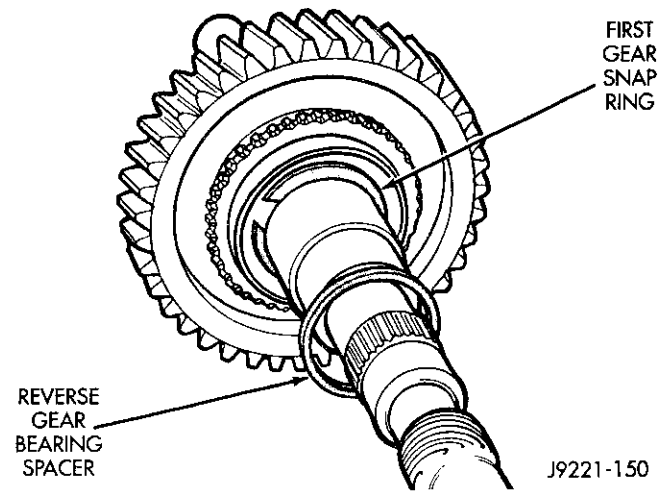

Fig. 71 Reverse Gear Bearing Spacer And First Gear Snap Ring Removal

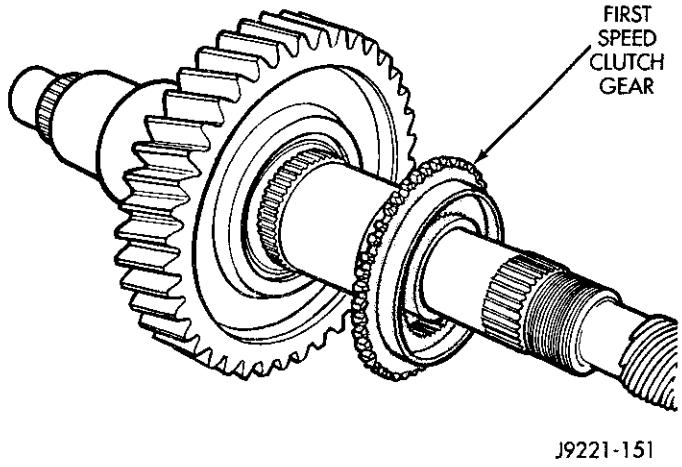

Fig. 72 Removing Reverse Clutch Gear

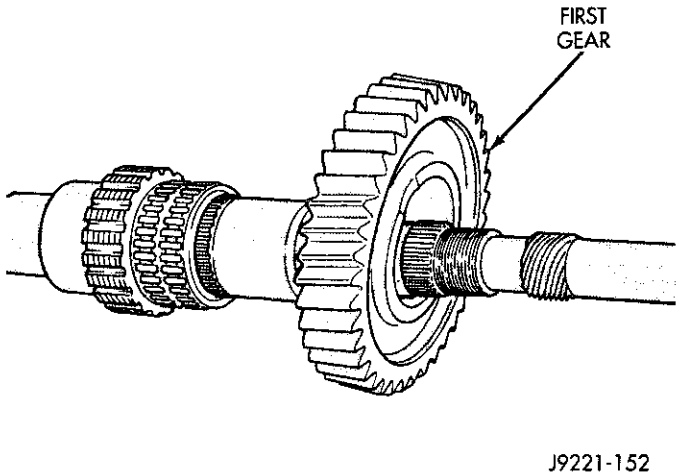

Fig. 73 Removing First Gear

Inspect the reverse idler gear, bearings, shaft and thrust washers (Fig. 75). Replace the bearings if the rollers are worn, chipped, cracked, flat-spotted, or

TRANSMISSION DIAGNOSIS

Condition	Possible Cause	Correction
MOVES IN 2ND OR 3RD GEAR, ABRUPTLY DOWNSHIFTS TO LOW	1. Governor valve sticking 2. Valve body malfunction	1. Remove, clean, and inspect; replace faulty parts 2. Remove, clean, and inspect; look for stuck 1-2 valve or governor plug
SLIPS IN LOW GEAR D ONLY, BUT NOT IN 1 POSITION	1. Overrunning clutch faulty, not holding	1. Replace overrunning clutch
SLIPS IN FORWARD DRIVE RANGES	1. Low fluid level 2. Air in fluid (fluid is foamy, full of bubbles), shifts are spongy, caused by air getting into pump suction passages 3. Gearshift or throttle linkage out of adjustment 4. Low hydraulic pressures due to worn pump, incorrect control pressure adjustments, valve body warpage or malfunction, sticking governor, leaking seal rings, clutch seals leaking, servo leaks, clogged filter, or cooler lines 5. Accumulator piston cracked, spring broken or seal worn 6. Clutch or servo malfunction, leaking seals or worn plates 7. Overrunning clutch worn, not holding (slips in 1 only)	1. Add fluid and check for leaks 2. Check for bad pump gasket or seals, dirt between pump halves, and loose pump bolts or defective O-ring at filler tube 3. Adjust linkage 4. Perform hydraulic and air pressure tests to determine cause 5. Inspect and repair as necessary 6. Air pressure check clutch-servo operation and repair as required 7. Replace clutch
SLIPS IN REVERSE ONLY	1. Low fluid level 2. Aerated fluid; see Slips in Forward Drive Ranges 3. Gearshift linkage out of adjustment 4. Rear band out of adjustment 5. Hydraulic pressure too low due to worn pump, worn seal rings, clutch or servo seal leakage 6. Worn front clutch, leaking rear servo, or worn rear band 7. Band-linkage binding	1. Add fluid and check for leaks 2. See Slips in Forward Drive Ranges 3. Adjust linkage 4. Adjust band 5. Perform hydraulic pressure tests to determine cause 6. Air pressure check clutch-servo operation and repair as required 7. Inspect and repair as required

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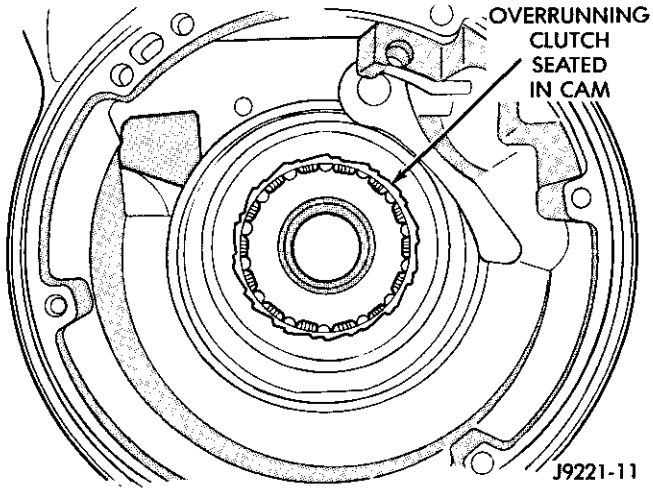

Fig. 58 Overrunning Clutch Seated In Cam—36RH/37RH

Checking Clutch Operation

(1) Temporarily install low-reverse drum to check overrunning clutch operation.

(2) Tilt drum slightly and carefully engage clutch race in clutch rollers.

(3) Raise drum to level position. Then rotate drum in clockwise direction until fully seated.

(4) Check clutch operation by turning low-reverse drum back and forth. Drum should rotate freely in clockwise direction but lock in counterclockwise direction.

(5) Remove low-reverse drum after checking clutch operation.

FRONT SERVO AND BAND OVERHAUL

SERVO AND BAND INSPECTION

Clean the servo piston components with solvent and dry them with compressed air. Wipe the band clean with lint free shop towels.

Replace the front band if distorted, lining is burned, flaking off, or worn to the point where the grooves in the lining material are no longer visible.

Inspect the servo components. Replace the springs if collapsed, distorted or broken. Replace the guide, rod and piston if cracked, bent, or worn. Discard the servo snap ring if distorted or warped.

Check the servo piston bore for wear. If the bore is severely scored, or damaged, it will be necessary to replace the case.

Replace any servo component if doubt exists about its condition. Do not reuse suspect parts.

FRONT SERVO PISTON OVERHAUL (FIG. 59)

(1) Remove seal ring from rod guide.

(2) Remove small snap ring from servo piston rod. Then remove piston rod, spring and washer from piston.

(3) Remove and discard servo component O-ring and seal rings.

(4) Lubricate new O-ring and seal rings with petroleum jelly and install them on piston, guide and rod.

(5) Install rod in piston. Install spring and washer on rod. Compress spring and install snap ring.

(6) Set servo components aside for installation during transmission reassembly.

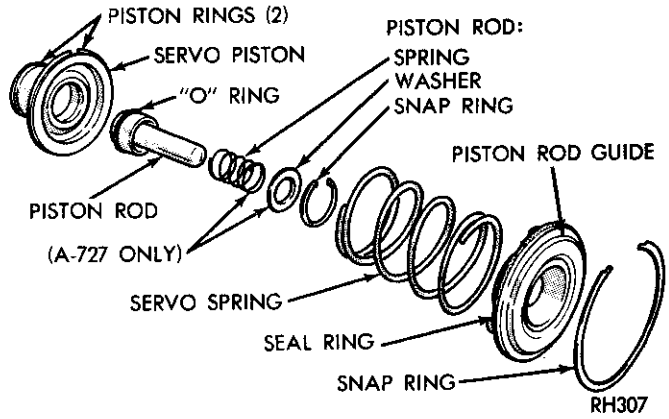

Fig. 59 Front Servo Components—36RH/37RH

REAR SERVO AND BAND OVERHAUL

SERVO AND BAND INSPECTION

Clean the servo components with solvent and dry them with compressed air.

Inspect the servo components. Replace the spring if collapsed, distorted or broken. Replace the plug and piston if cracked, bent, or worn. Discard the servo snap ring if distorted or warped.

Check rear band condition. Replace the band if distorted, the lining is burned or flaking off, or the lining is worn (grooves no longer visible at any point on the lining material).

If doubt exists about the condition of any servo component, replace it. Do not reuse suspect parts.

REAR SERVO PISTON OVERHAUL (FIG. 60)

(1) Remove small snap ring and remove plug and spring from servo piston.

(2) Remove and discard servo piston seal ring.

(3) Lubricate piston and guide seals with petroleum jelly. Lubricate other servo parts with transmission fluid.

(4) Install new seal ring on servo piston.

(5) Assemble piston, plug, spring and snap ring.

(6) Lubricate piston seal lip with petroleum jelly.

(7) Set servo components aside for assembly installation.

OVERDRIVE UNIT OVERHAUL—42RH/46RH

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OVERDRIVE UNIT DISASSEMBLY

(1) Remove overdrive piston thrust plate (Fig. 1). Retain thrust plate. It is a select fit part and can be reused.

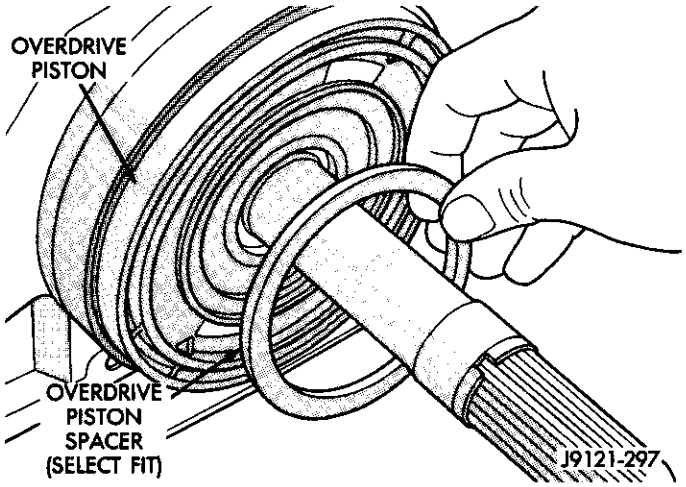

Fig. 1 Overdrive Piston Thrust Plate Removal/ Installation

(2) Remove intermediate shaft spacer (Fig. 2). Retain spacer. It is a select fit part and can be reused.

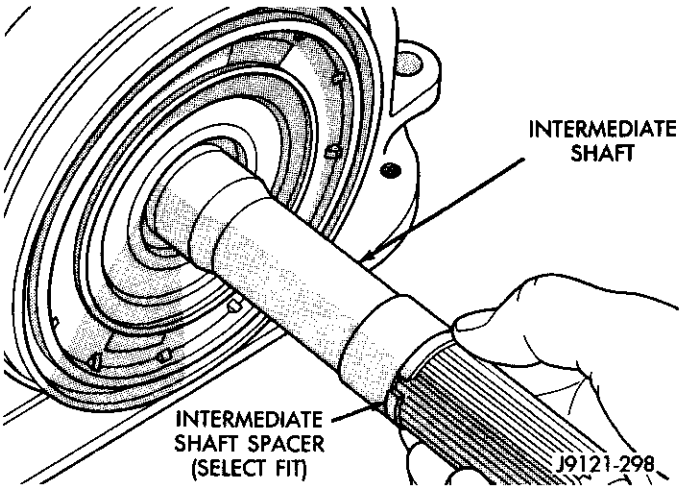

Fig. 2 Intermediate Shaft Spacer Location

(3) Remove overdrive piston from retainer (Fig. 3).

(4) Remove overdrive piston thrust bearing from direct clutch hub (Fig. 4).

(5) Remove overdrive clutch pack retaining ring (Fig. 5).

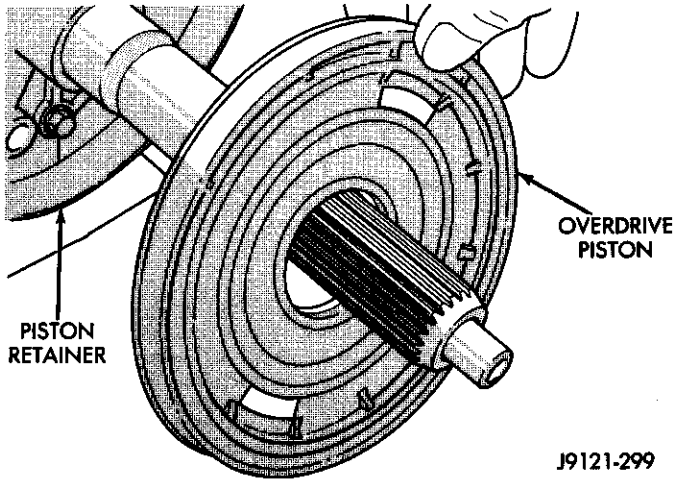

Fig. 3 Removing Overdrive Piston

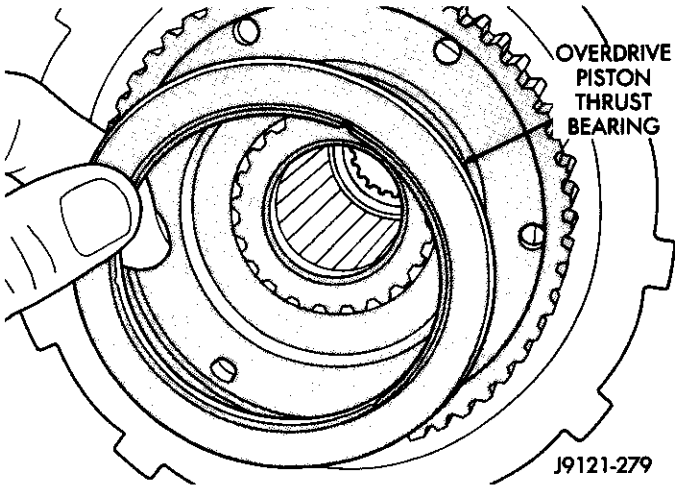

Fig. 4 Removing Overdrive Piston Thrust Bearing

(6) Remove overdrive clutch pack (Fig. 6). Note that thickest plate is positioned at rear of clutch pack.

(7) Remove overdrive clutch wave spring (Fig. 7).

(8) Remove overdrive clutch reaction snap ring (Fig. 8). Note that snap ring is located in same groove as wave spring.

(9) Remove access cover and gasket from case (Fig. 9). Cover provides access to output shaft front bearing locating ring.

(10) Expand output shaft bearing snap ring with snap ring pliers and push output shaft forward to release shaft front bearing from locating ring (Fig. 10).