2001-03 AUTOMATIC TRANSMISSIONS

MHTA CVT Overhaul

APPLICATION

CAUTION: Flush oil cooler and oil cooler lines prior to transaxle installation. Oil cooling system contamination may cause premature transaxle failure. For additional information, see appropriate SERVICING article.

TRANSAXLE APPLICATION

Application	Transaxle Model
Insight	MHTA

WARNING: The Insight charging system is part of the Integrated Motor Assisted (IMA) system which uses 144-volt circuits. Do not attempt to service system, as it requires special tools and training.

NOTE: Only overhaul information for transaxle is provided in this article. Electric motor diagnosis and repair should be accomplished by a certified Honda technician, due to possible personal injury from high voltage.

WARNING: When performing any inspection or service procedure on this vehicle, ensure the following service precautions are followed to prevent personal injury or death due to the extremely high voltage.

The following service precautions must be followed:

- Ensure ignition is off and ignition key is removed from ignition before performing any inspection or service procedure in engine compartment, as engine may automatically start and shut off when ignition is on.
- Read all service and warning labels in engine compartment before performing any procedures in engine compartment.
- All high-voltage wire harness connectors contain Orange connectors. DO NOT touch any wiring harness that contains Orange connectors.
- High-voltage battery and other high-voltage components may be identified by HIGH VOLTAGE caution labels. DO NOT touch these components.
- If necessary to inspect or service high-voltage system, ensure ignition is off. Remove trunk floor mat. Remove battery module cover from Intelligent Power Unit (IPU) lid. Remove locking cover from battery module switch. Turn battery module switch off and install locking cover on switch. Wait at least 5 minutes to allow condensers to discharge before touching any high-voltage wiring harness, connectors or components. Remove undercover, mid-frame cover clips and IPU lid. Using a DVOM, measure voltage at junction board terminals. If voltage reading is 0.1 volt or less, high-voltage system has been properly deactivated and high-voltage cables can be disconnected safely. If voltage is present, DO NOT attempt to

disconnect high-voltage cables due to a malfunction in high-voltage system.

- If necessary to touch any high-voltage wiring harness, connectors or components, use insulated gloves. Ensure insulated gloves are dry and in good condition and that no holes exist in insulated gloves by applying air pressure to insulated glove before touching any high-voltage wiring harness, connectors or components.
- DO NOT wear any metal objects while working on vehicle which may accidently drop and cause a short circuit.
- If any high-voltage wiring harness connector is disconnected, ensure terminal on wiring harness connector is wrapped with tape to prevent wiring harness connector from contacting any surface.
- If servicing high-voltage system, place sign on roof of vehicle to indicate to other technicians that high-voltage system is being serviced.

IDENTIFICATION

TRANSAXLE

Transaxle model and serial number are stamped on transaxle. See **Fig. 1** . Model and serial number may be required when ordering replacement components.

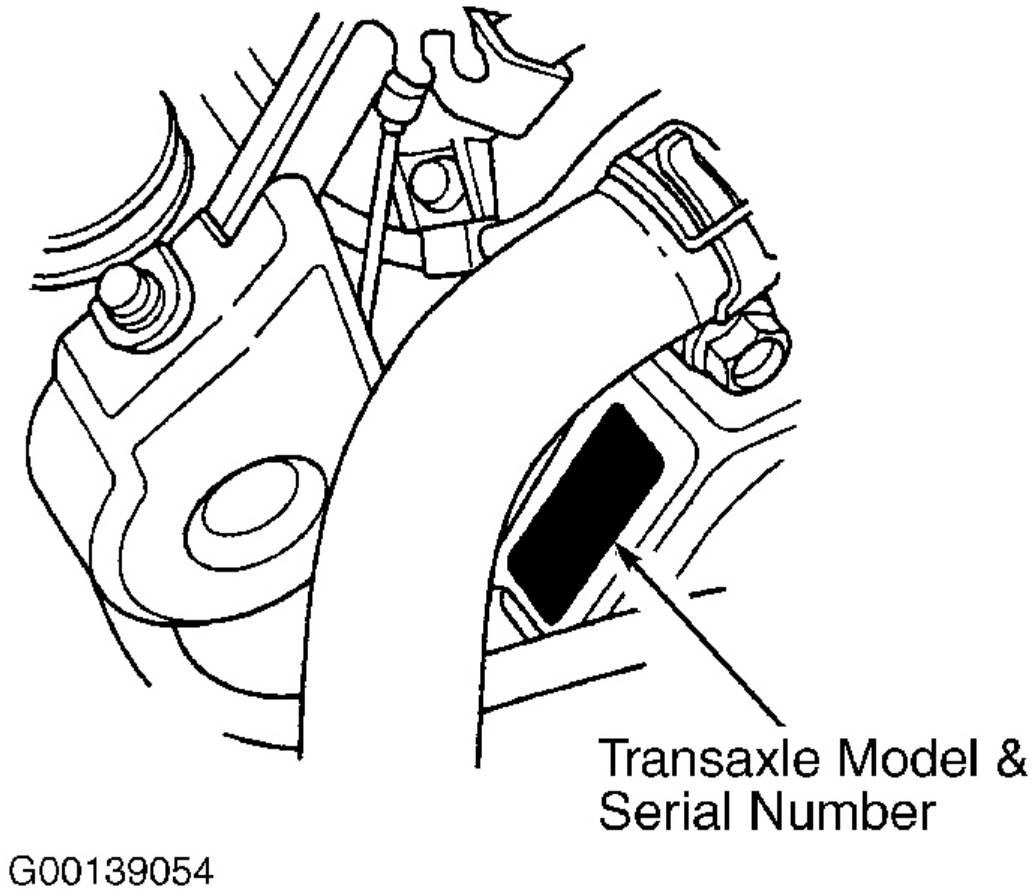

Fig. 1: Identifying Transaxle Model & Serial Number Location
Courtesy of AMERICAN HONDA MOTOR CO., INC.

DESCRIPTION & OPERATION

INTRODUCTION

The Continuously Variable Transaxle (CVT) is an electronically controlled automatic transaxle with drive and driven pulleys, and steel belt. CVT provides non-stage speeds forward and one reverse. CVT uses an idle stop (engine shuts down) feature at Red lights or when idling in traffic. Engine automatically restarts when driver releases brake pedal.

Around the outside of the flywheel is a ring gear which meshes with the starter pinion when the engine is being started. Transaxle has 4 parallel shafts: input shaft, drive pulley shaft, driven pulley shaft, and secondary gear shaft. See **Fig. 2** . Input shaft is connected to the flywheel, which is connected to the motor rotor. Motor rotor is connected to the end of the engine crankshaft. Drive pulley shaft and driven pulley shaft consists of movable

and fixed face pulleys. Both pulleys are linked by the steel belt.

Input shaft includes the sun gear and planetary gears with carrier. Drive pulley shaft includes the drive pulley and forward clutch. Driven pulley shaft includes the driven pulley, start clutch, and the secondary drive gear, which is integral with the park gear. Secondary gear shaft is positioned between the secondary drive gear and final driven gear. Secondary gear shaft includes the secondary driven gear and final drive gear, which serves to change the rotation direction, because the drive pulley shaft and driven pulley shaft rotate in the same direction. When certain conditions of the planetary gears in transaxle are engaged by the forward clutch and reverse brake, power is transmitted from the drive pulley shaft to the driven pulley shaft to provide "L", "D" and "R" gear positions.

Electronic control system consists of the Transmission Control Module (TCM), sensors, control valves and solenoid valves. Shifting is electronically controlled for comfortable driving under all conditions. TCM is located below the dashboard, behind the kick panel on the passenger's side.

Lower valve body assembly includes main valve body, secondary valve body, CVT pulley pressure control valve, CVT speed change control valve, CVT start clutch pressure control valve, and inhibitor solenoid valve. These valve bodies are positioned on the lower portion of transaxle housing. Manual valve body is bolted on the intermediate housing. Main valve body contains start clutch shift valve, shift inhibitor valve, and lubrication valve. Secondary valve body contains Pressure High (PH) regulator valve, Pressure High Control (PHC) shift valve "B", start clutch back-up valve, clutch reducing valve, and start clutch accumulator. CVT pulley pressure control valve contains pulley control valve "A" and driven pulley control valve with solenoid. CVT speed change control valve contains pulley control valve "B" and drive pulley control valve with solenoid. CVT start clutch pressure control valve consists of start clutch pressure control valve and solenoid. These solenoids are controlled by the TCM. Manual valve body contains manual valve and reverse inhibitor valve. Oil pump is located on the transaxle housing, and is linked with input shaft by sprockets and sprocket chain. Pulleys, forward clutch, and start clutch receive fluid from their respective feed pipes. Reverse brake receives fluid from internal hydraulic circuit.

TCM controls shift pulley ratio through the solenoids, while receiving input signals from various sensors and switches located throughout vehicle. TCM actuates pulley control solenoids to control pulley control valves "A" and "B". Drive pulley pressure is regulated at pulley control valve "B" and is applied to drive pulley. Driven pulley pressure is regulated at pulley control valve "A" and is applied to driven pulley, and pulley ratio is changed to their directed ratio.

CVT uses hydraulic-actuated clutches and brake to engage and disengage transaxle gears. When hydraulic pressure is introduced into clutch drum and reverse brake piston cavity, clutch piston and reverse brake piston move. This presses the friction discs and steel plate together, locking them so they don't slip. Power is then transmitted through the engaged clutch pack to its hub-mounted gear, and through the engaged ring gear to pinion gears. When hydraulic pressure is bled from clutch pack and reverse brake piston cavity, piston releases friction discs and steel plates, and components are free to slide past each other. This allows the gear to spin independently on its shaft, transmitting no power.

Start clutch engages and disengages secondary drive gear, and is located at end of driven pulley shaft. Start clutch is supplied hydraulic pressure by its oil feed pipe within driven pulley shaft. Forward clutch engages and disengages sun gear, and is located at end of drive pulley shaft. Forward clutch is supplied hydraulic pressure by its oil feed pipe within drive pulley shaft. Reverse brake locks the planetary carrier in "R" position, and is located inside intermediate housing around planetary carrier. Reverse brake discs are mounted to planetary

carrier, and reverse brake plates are mounted on intermediate housing. Reverse brake is supplied hydraulic pressure by a circuit connected to internal hydraulic circuit.

Planetary gear consists of sun gear, planetary pinion gears, and ring gear. Sun gear is connected to input shaft with splines. Pinion gears are mounted on planetary carrier. Planetary carrier is located on end of input shaft, over sun gear. Ring gear is located in planetary carrier, and connected to forward clutch drum. Sun gear inputs engine power via input shaft to planetary gears, and carrier outputs engine power. Planetary gear mechanism is only used for switching rotation direction of pulley shafts. In "D" and "L" positions (forward range), pinion gears do not rotate and revolve around sun gear, so carrier rotates. In "R" position (reverse range), reverse brake locks planetary carrier, and sun gear drives pinion gears to rotate. Pinion gears rotate, but don't revolve around sun gear. Pinion gears drive ring gear in opposite direction from rotation direction of sun gear.

Each pulley consists of a movable face and a fixed face, and effective pulley ratio changes with engine speed. Drive pulley and driven pulley are linked by the steel belt. To achieve a low pulley ratio, high hydraulic pressure works on movable face of driven pulley and reduces effective diameter of drive pulley, and a lower hydraulic pressure works on movable face of driven pulley to eliminate the steel belt slippage. To achieve a high pulley ratio, high hydraulic pressure works on movable face of drive pulley and reduces effective diameter of driven pulley, and low hydraulic pressure works on movable face of driven pulley to eliminate the steel belt slippage.

Transaxle is equipped with shift and key interlock systems. Shift interlock system prevents gearshift lever from being moved from Park unless brake pedal is depressed and accelerator pedal is in idle position. In case of a malfunction, gearshift lever can be released by placing ignition key in key release slot near gearshift lever. Key interlock system prevents ignition key from being removed from ignition lock assembly unless gearshift lever is in Park. For diagnosis of interlock systems, see appropriate HONDA SHIFT INTERLOCK SYSTEMS article.

The A/T gear position indicator on instrument panel contains lights to indicate which position A/T gear position switch on gearshift lever is in.

When transaxle gear combinations are engaged by clutches and brake, power is transmitted to provide appropriate gears. Gearshift lever positions operate as follows:

- **"P" (Park)**

  Front wheels lock as park pawl engages with park gear on secondary drive gear. All clutches are released. Neutral safety switch, incorporated in transmission range switch, allows engine starting in this position. All hydraulic pressure is blocked at manual valve.

- **"R" (Reverse)**

  Reverse brake is engaged. Back-up light switch, incorporated in transmission range switch, allows back-up lights to operate. Hydraulic pressure is directed to reverse brake.

- **"N" (Neutral)**

  All clutches are released. Neutral safety switch, incorporated in transmission range switch, allows engine starting in this position. All hydraulic pressure is blocked at manual valve.

- **"D" (Drive)**

  "D" position has 2 modes: Drive ("D") mode allows transaxle to automatically adjust gear ratio to keep engine at most efficient speed for current driving conditions. Second ("S") mode allows transaxle to shift into a lower gear for better acceleration and increased engine braking. Used for rapid acceleration at highway speeds. Modes are selected by pressing mode switch, located on steering wheel. Hydraulic pressure is directed to forward clutch in both modes.

- **"L" (Low)**

  Transaxle shifts into lowest gear for increased power on hills and for engine braking. Hydraulic pressure is directed to forward clutch.

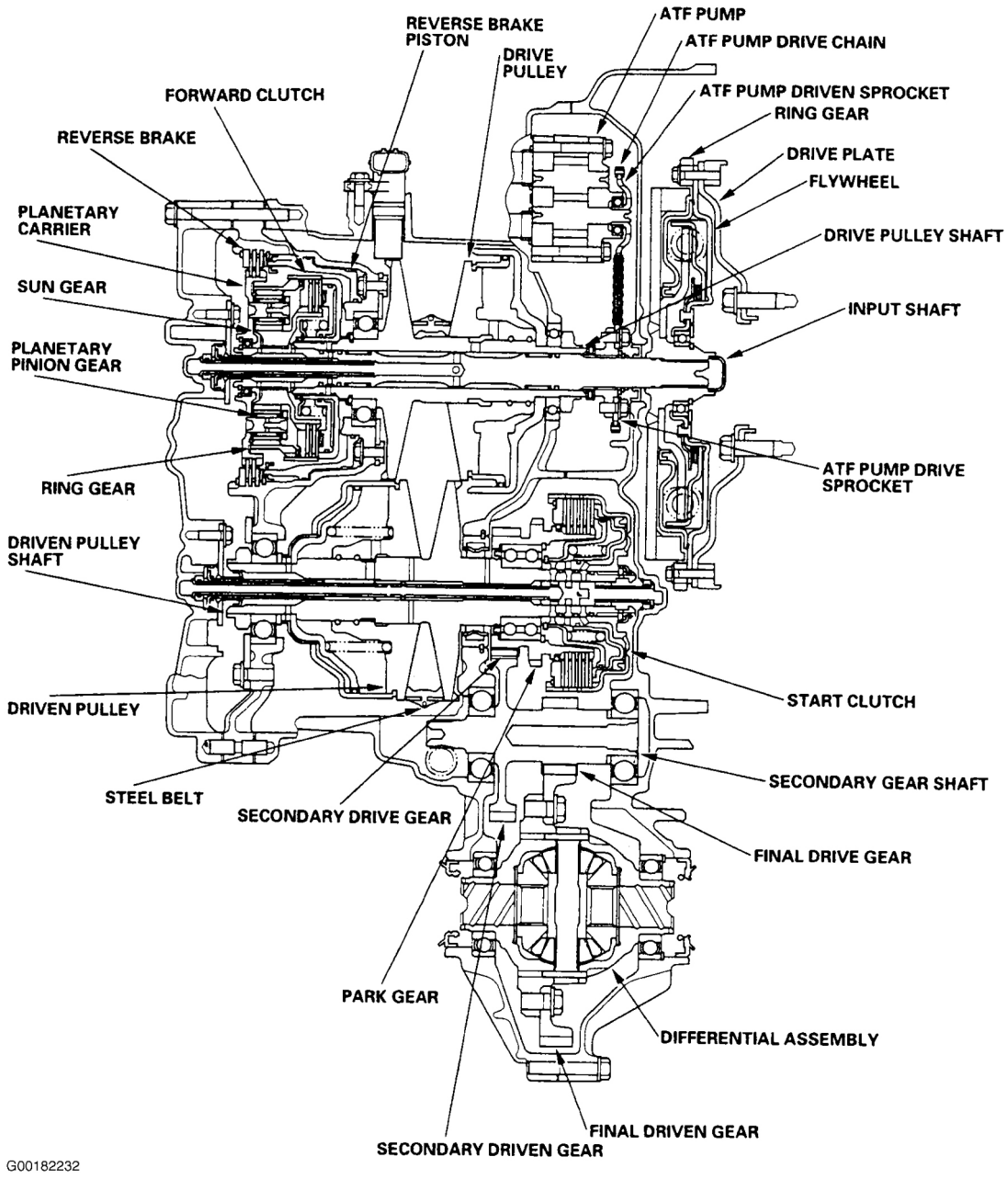

Fig. 2: Identifying Transaxle Component Locations
Courtesy of AMERICAN HONDA MOTOR CO., INC.

START CLUTCH CALIBRATION PROCEDURE

NOTE: **When TCM, transaxle assembly, battery, lower valve body assembly, fuse No. 18 (7.5-amp) or engine assembly are replaced, TCM must memorize feedback signal for start clutch control. Perform following procedure to calibrate start clutch.**

Calibration Procedure Using Scan Tool

Connect Honda PGM Tester to Data Link Connector (DLC), located under instrument panel to right of steering column. Follow tester's prompts in start clutch calibration procedures using Honda PGM Tester operator's manual.

Calibration Procedure With SCS Mode

1. Apply parking brake, and block all 4 wheels securely.
2. Warm engine to normal operating temperature (the radiator fan comes on).
3. Ensure that the MIL does not come on and the "D" indicator light does not blink.
4. If the MIL comes on or the "D" indicator light blinks, check the PGM-FI control system or the transaxle control system. Turn ignition off.
5. Connect the Honda PGM tester to the Data Link Connector (DLC), located under instrument panel to right of steering column, and follow the screen prompts to short circuit the SCS signal terminal using the tester menu.
6. Press the brake pedal, and continue pressing the pedal until completion of calibration procedure.
7. Start the engine, and shift to "N" position. Shift to "L" position and return to "N" position. Repeat this shift sequence 3 times within 20 seconds after the engine is started.
8. Ensure "D" indicator light comes on for one minute when the gearshift lever is in "N" position, then the "D" indicator light goes off.
9. If the "D" indicator light blinks, or the "D" indicator light comes on and stays on (it does not go off after one minute), turn ignition off and restart the calibration procedures at step 5 .
10. Shift to "D" position, and ensure the "D" indicator light comes on for 2 minutes, then goes off.
11. If the "D" indicator light blinks, or the "D" indicator light comes on and stays on (it does not go off after one minute), turn ignition off and restart the calibration procedures at step 5 .
12. Turn the ignition off to complete calibration procedure. Test drive the vehicle to verify that a problem does not occur on the start clutch control system.

LUBRICATION

NOTE: See appropriate SERVICING article.

TROUBLE SHOOTING

Transaxle malfunctions may be caused by poor engine performance, improper adjustments, fluid condition or failure of hydraulic, mechanical or electronic components. Ensure all concerns have been properly checked prior to transaxle overhaul. See appropriate DIAGNOSIS article.

TRANSAXLE DISASSEMBLY

NOTE: Refer to exploded views as needed during the following procedures. See Fig. 4 and Fig. 7 .

NOTE: Letters in parenthesis in the following steps are identified in illustration.

1. Remove 19 bolts and flywheel housing. Remove differential assembly. Remove snap ring and thrust shim on oil pump drive sprocket, then remove bolts securing oil pump drive sprocket. Remove oil pump drive chain. Remove oil pump drive sprocket, sprocket hub, thrust washers and thrust needle bearing from input shaft. See **Fig. 4** .
2. Expand snap ring under oil pump driven sprocket with snap ring pliers, then remove oil pump driven sprocket from oil pump. See **Fig. 3** . Remove oil pump body from transmission housing. See **Fig. 46** .

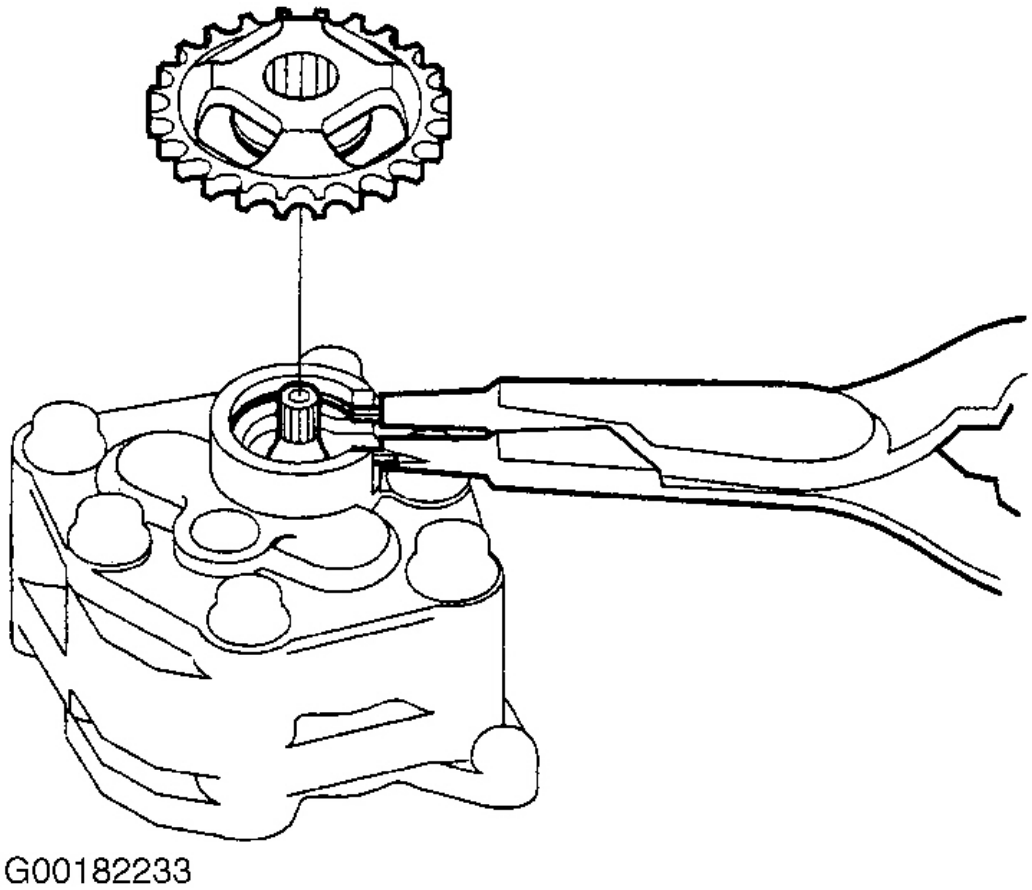

Fig. 3: Expanding Snap Ring Under Oil Pump Driven Sprocket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Remove park pawl shaft, park pawl spring and park pawl. See **Fig. 5** . Remove snap ring securing start clutch. Remove cotter retainer and cotters. See **Fig. 4** .
4. Set Start Clutch Remover (07TAE-P4V0120) on start clutch. Attach jaws of remover to park gear. See **Fig. 6** . Remove start clutch and secondary drive gear assembly.

CAUTION: DO NOT place jaws of remover on start clutch guide. If jaws of remover contacts start clutch guide, start clutch guide may be damaged.

5. Remove secondary gear shaft. Remove secondary drive gear from start clutch. Remove sealing ring (A) from secondary drive gear (B), and clean it for reinstallation on NEW drive gear during reassembly. See **Fig. 41** .
6. Remove 60 mm (1) and 72 mm (13) end cover bolts and remove cover. Remove manual valve body lines. Remove planetary carrier/input shaft assembly and ring gear.
7. Remove snap ring securing reverse brake discs and plates. Remove reverse brake end plate, discs, plates and spring. See **Fig. 7** .
8. Remove snap ring securing forward clutch end plate, then remove forward clutch end plate, discs and plates.
9. Remove snap ring securing forward clutch to drive pulley shaft, then remove forward clutch.

CAUTION: If spring retainer tab is on reverse brake piston, spring retainer may be damaged. Ensure spring retainer tab is not on piston. See Fig. 8 .

10. Install Reverse Brake Spring Compressor (07TAE-P4V0110) on reverse brake to remove snap ring securing reverse brake return spring retainer. Compress reverse brake return spring and remove snap ring. See **Fig. 9** .
11. Remove spring compressor and remove spring retainer/return spring assembly (A). Apply air pressure to reverse brake pressure circuit hole (B) to remove reverse brake piston (C). See **Fig. 10** .
12. Remove snap ring retainer from drive pulley shaft. Remove drive pulley speed sensor. Remove bolt and detent spring. Remove 4 bolts and remove manual valve body and separator plate. Remove roller and push control shaft assembly toward outside of transmission housing if transmission range switch is removed. Remove intermediate housing. See **Fig. 7** . Remove ATF feed pipes from transmission housing.

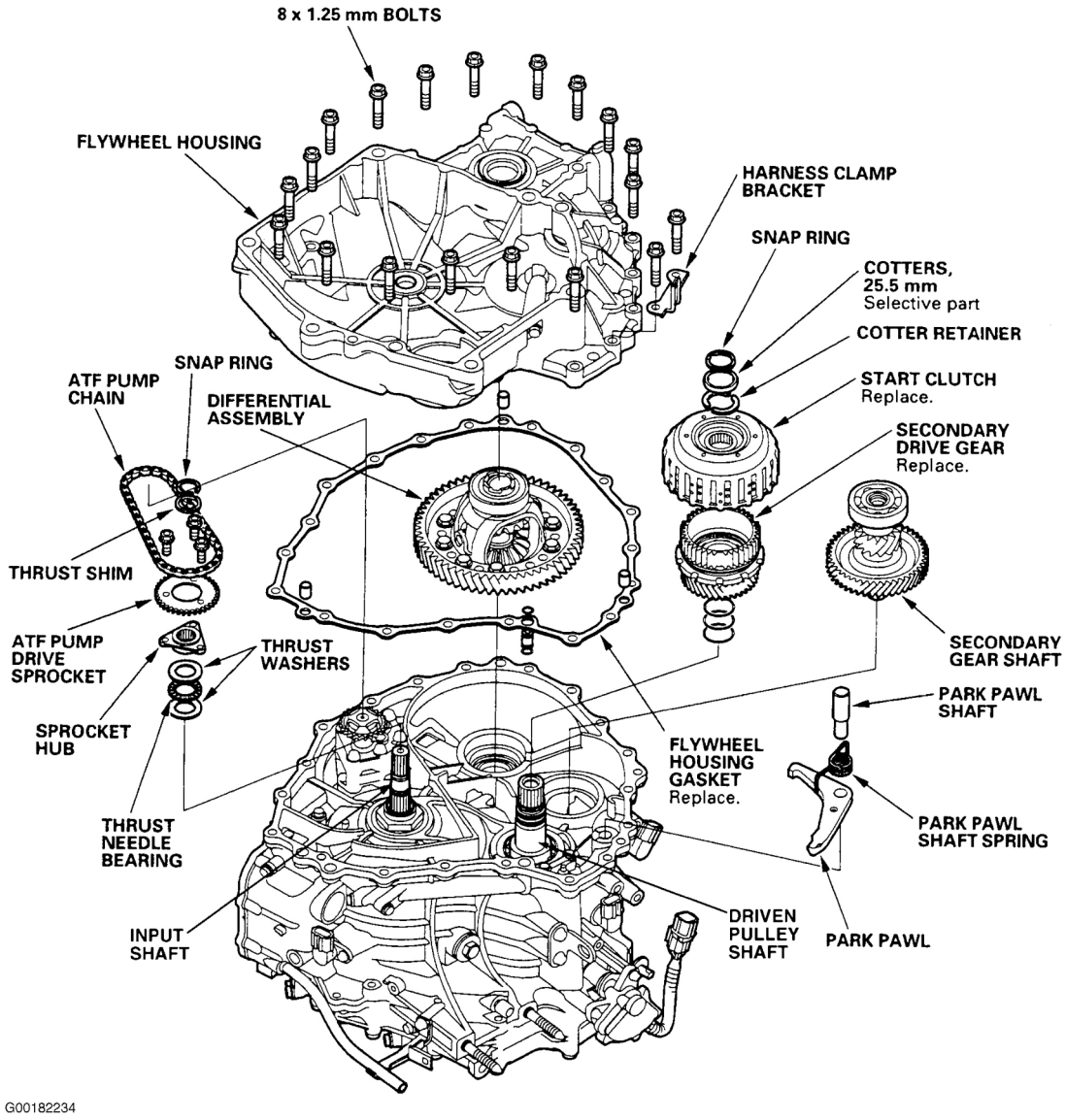

Fig. 4: Exploded View Of Flywheel & Transmission Housing Components
Courtesy of AMERICAN HONDA MOTOR CO., INC.

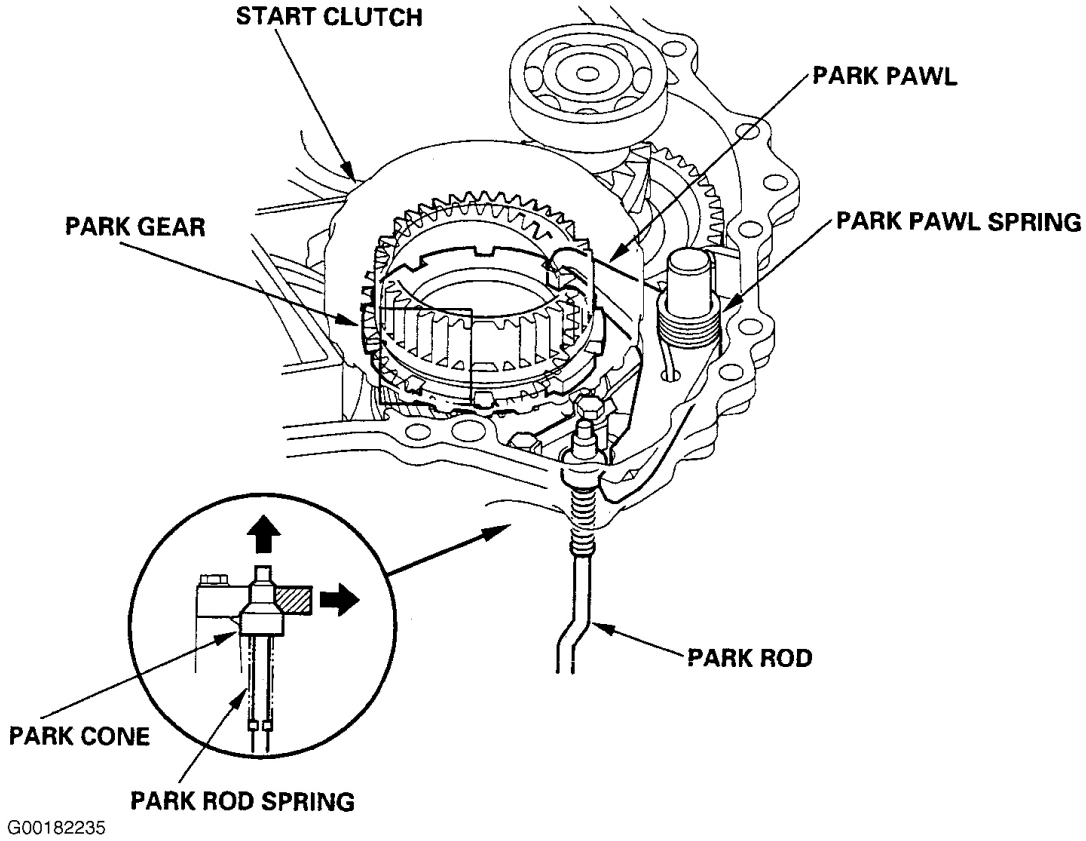

Fig. 5: Identifying Park Pawl Components
Courtesy of AMERICAN HONDA MOTOR CO., INC.

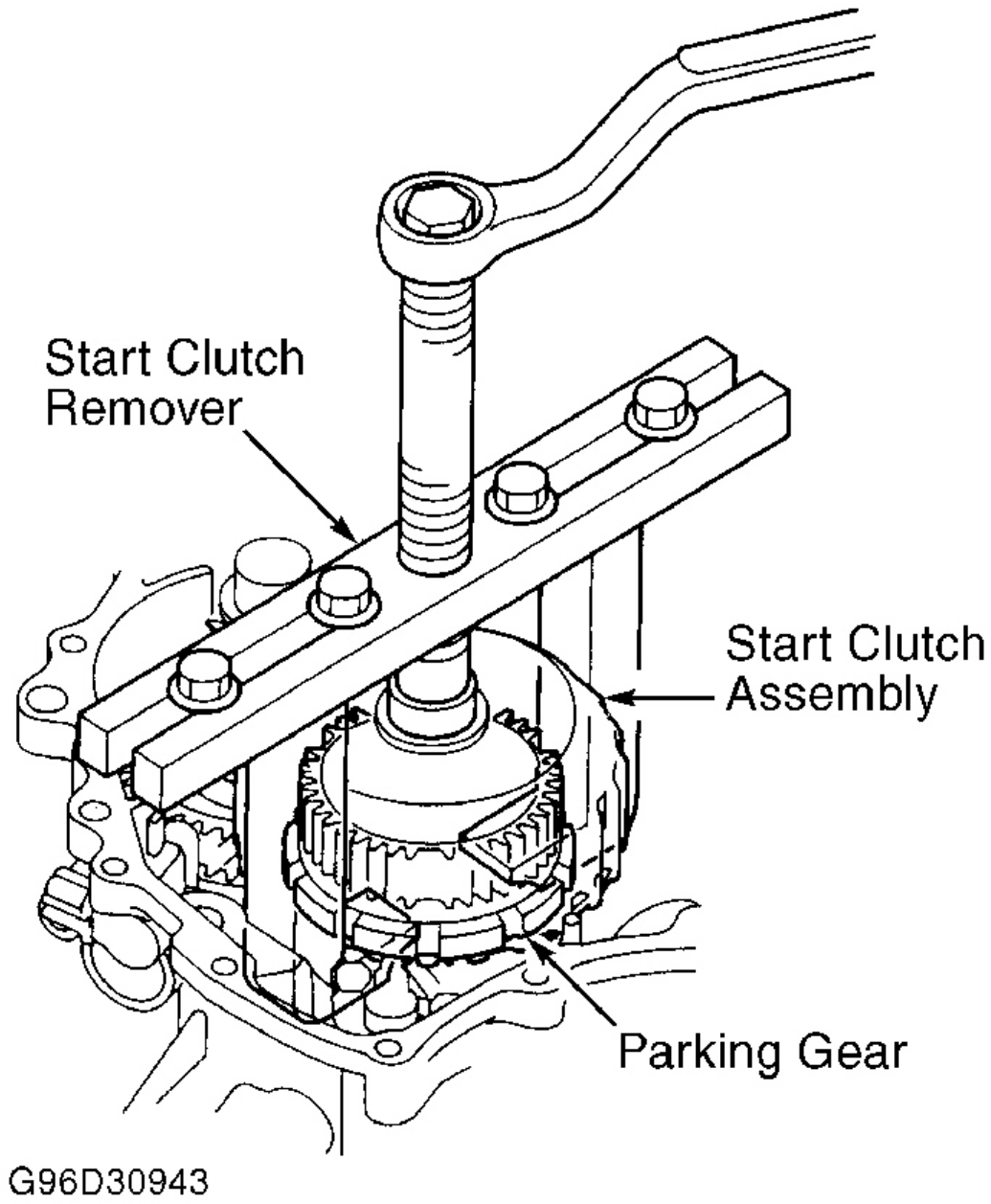

Fig. 6: Removing Start Clutch & Secondary Drive Gear Assembly
Courtesy of AMERICAN HONDA MOTOR CO., INC.

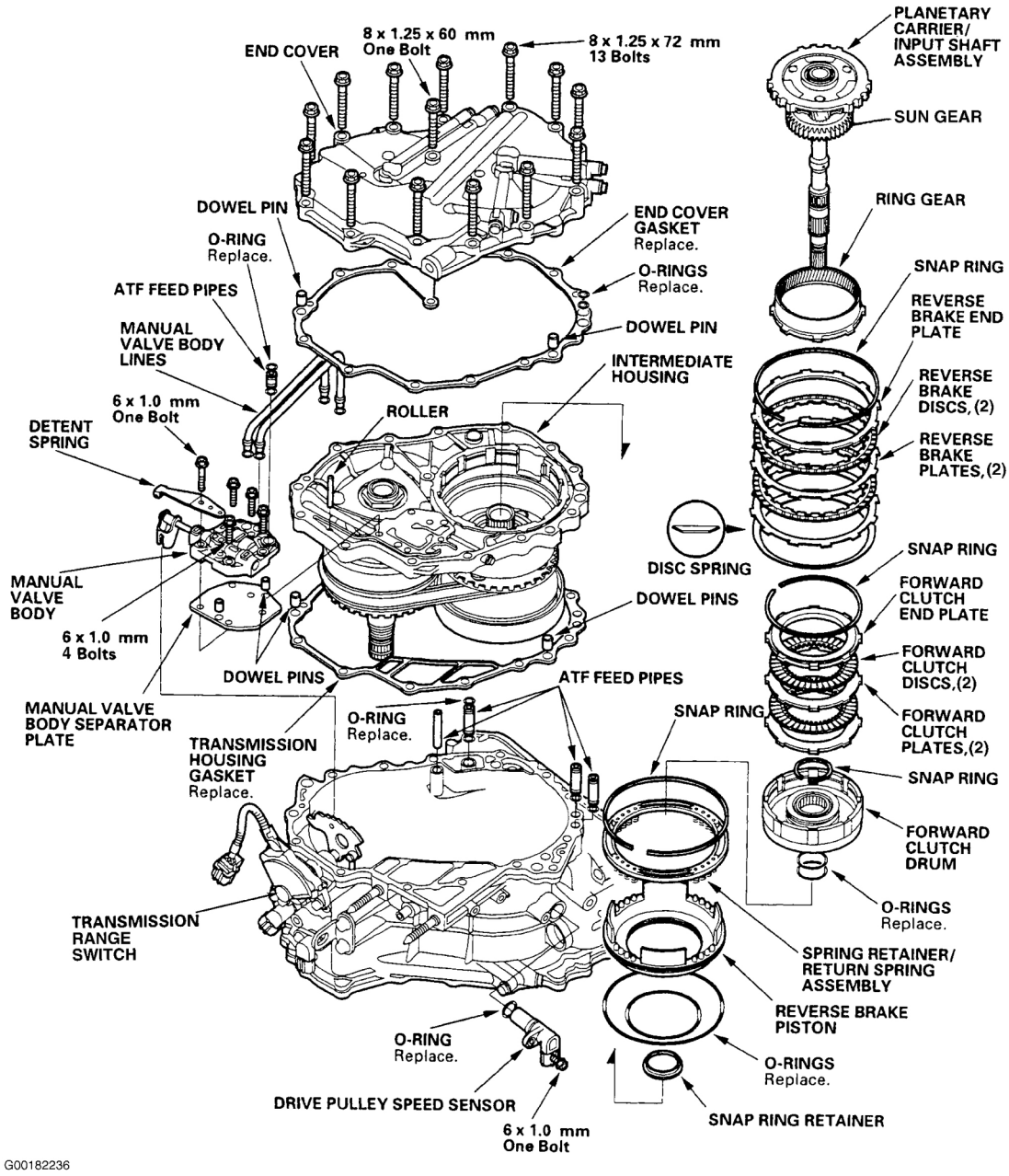

Fig. 7: Exploded View Of End Cover & Intermediate Housing Components
Courtesy of AMERICAN HONDA MOTOR CO., INC.

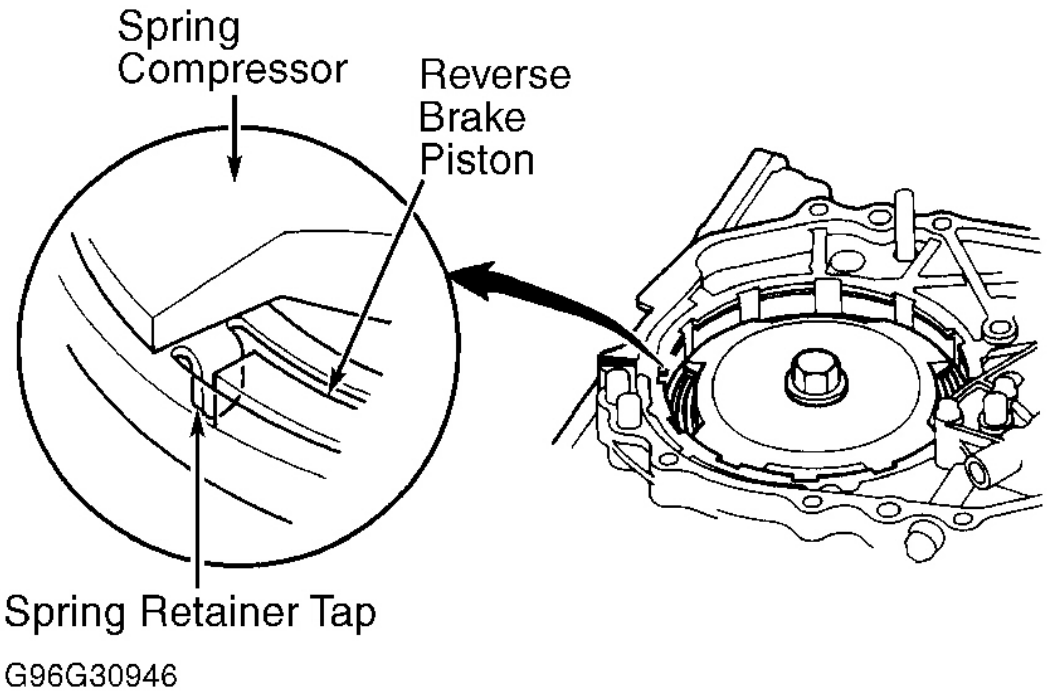

Fig. 8: Positioning Spring Retainer On Reverse Brake Piston
Courtesy of AMERICAN HONDA MOTOR CO., INC.

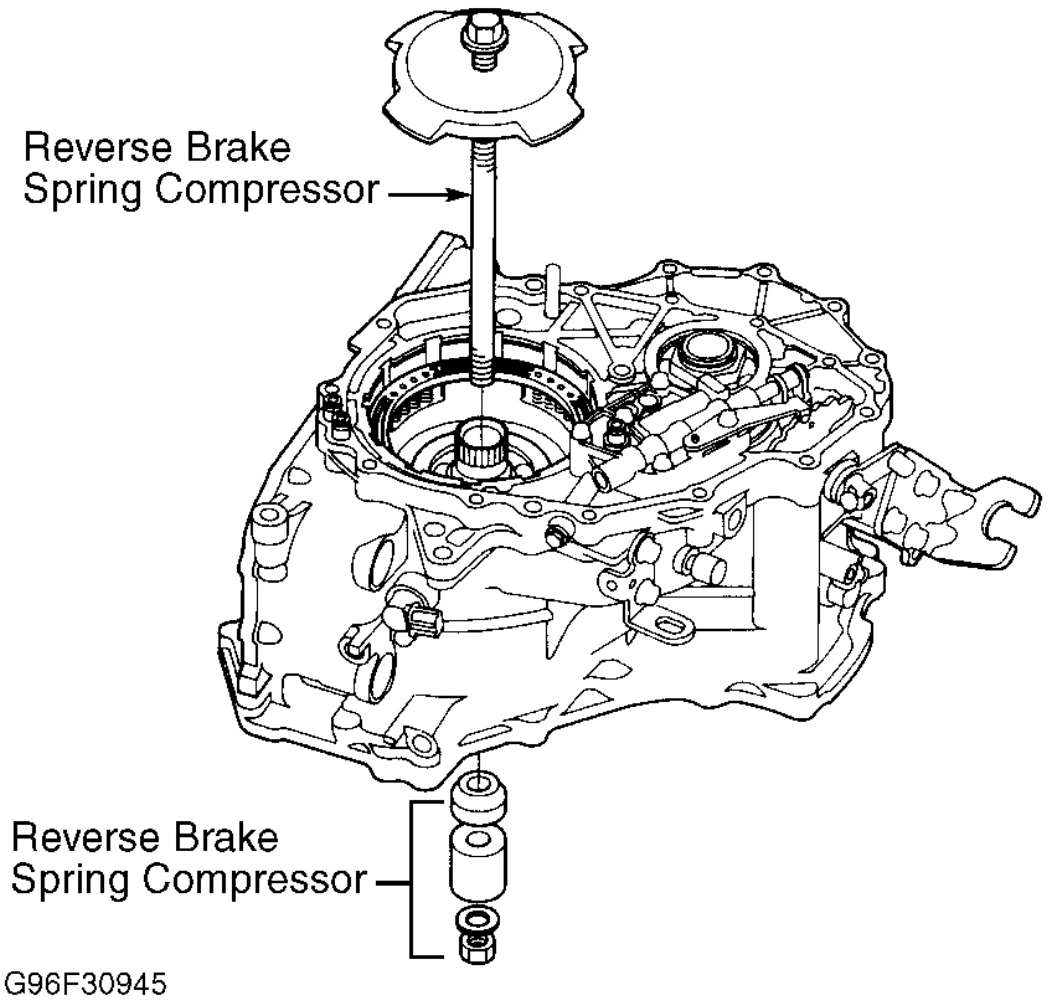

Fig. 9: Installing Reverse Brake Spring Compressor
Courtesy of AMERICAN HONDA MOTOR CO., INC.

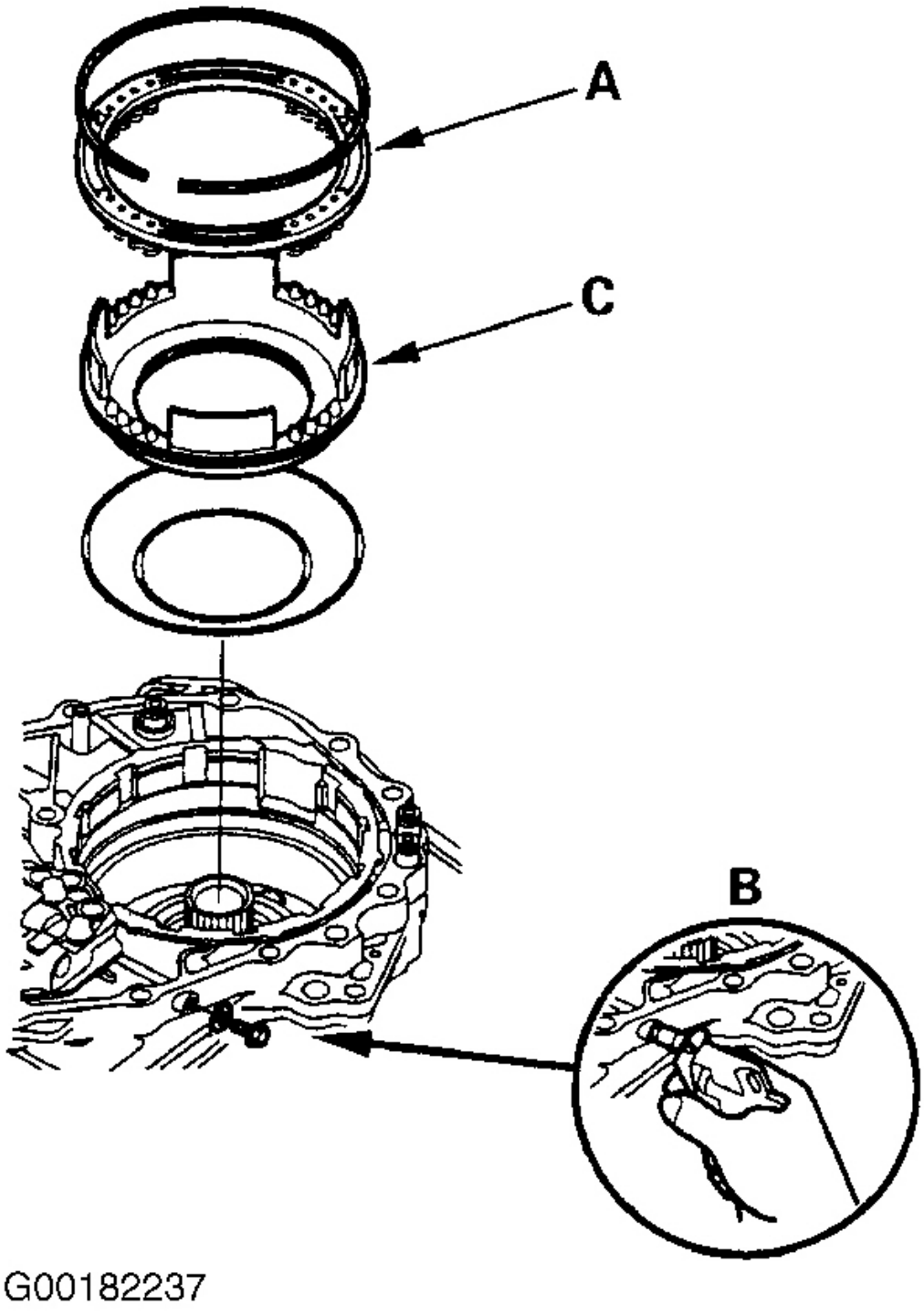

Fig. 10: Applying Air Pressure To Reverse Brake Circuit

Courtesy of AMERICAN HONDA MOTOR CO., INC.

COMPONENT DISASSEMBLY & REASSEMBLY

MANUAL VALVE BODY

Disassembly & Reassembly

Remove spring seat, spring and reverse inhibitor valve. Remove manual valve from valve body. Clean all parts in solvent and dry with compressed air. Blow out all passages. Inspect valve body for wear, scratches and scoring. See **Fig. 11** . To reassemble, reverse disassembly procedure. Lubricate all components with ATF during reassembly.

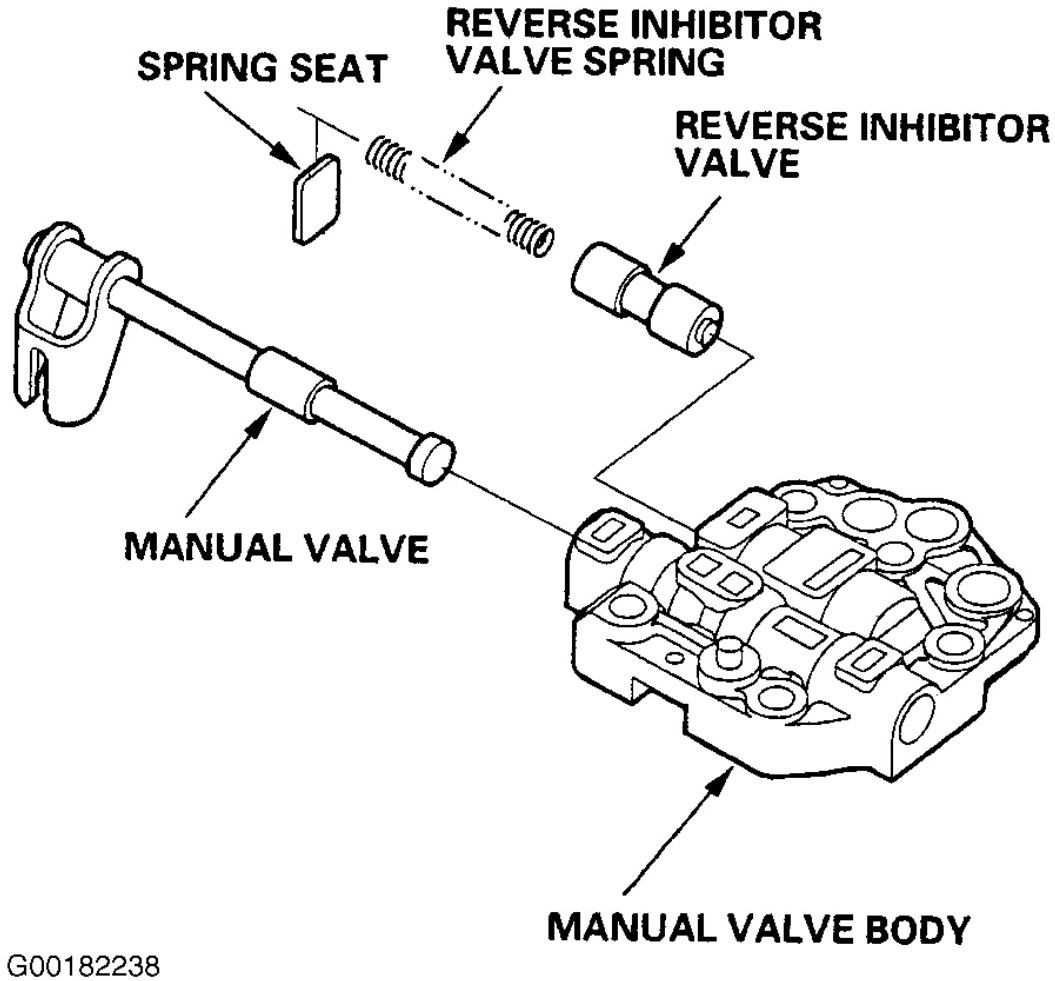

Fig. 11: Identifying Manual Valve Body Components
Courtesy of AMERICAN HONDA MOTOR CO., INC.

FORWARD CLUTCH

Disassembly

1. Remove snap ring. Remove clutch end plate, discs and plates. See **Fig. 12** . Remove disc spring. Install Clutch Spring Compressor Attachments (07LAE-PX40100 and 07HAE-PL50101) and Bolt Assembly (07GAE-PG40200) to forward clutch assembly. See **Fig. 13** .

CAUTION: If either end of compressor is set over an area of spring retainer which is not supported by return spring, retainer may be damaged. Ensure compressor is adjusted for full contact with spring retainer. See Fig. 13 .

2. Compress return spring. Remove snap ring, spring compressor components, spring retainer and return spring. See **Fig. 12** . Wrap shop towel around clutch drum. Apply compressed air to oil passage to remove piston. Place a finger tip on other end while applying air pressure. See **Fig. 14** .

Cleaning & Inspection

Clean all parts in solvent and dry with compressed air. Blow out all passages. Inspect check valve. If valve is loose, replace piston. See **Fig. 15** . Lubricate components with ATF prior to reassembly.

Reassembly

1. Install NEW "O" rings on clutch piston in correct direction. See **Fig. 16** . Install piston in clutch drum. Apply pressure and rotate to ensure proper seating. DO NOT pinch "O" ring by installing piston with too much force.
2. Install return spring and spring retainer. Position snap ring on retainer. Install clutch spring compressor on forward clutch. Compress return spring. Install snap ring and remove spring compressor.

CAUTION: If either end of compressor is set over an area of spring retainer which is not supported by return spring, retainer may be damaged. Ensure compressor is adjusted for full contact with spring retainer. See Fig. 13 .

3. Install disc spring with narrow side down. See **Fig. 12** . Soak clutch discs in ATF for a minimum of 30 minutes. Starting with clutch plate, alternately install plates and discs. Install clutch end plate with flat side toward disc.

NOTE: Prior to installing plates and discs, ensure inside of clutch drum is free of dirt or other foreign matter.

4. Install snap ring. Ensure snap ring end gap is .31" (7.9 mm). Using a dial indicator, measure clearance between clutch end plate and top disc. Zero dial indicator with clutch end plate lowered and lift plate up to snap ring. See **Fig. 17** .
5. Distance clutch end plate moves is clearance between clutch end plate and top disc. Measure clearance in

at least 3 places and use average as actual measurement. Clearance should be .024-.031"(.60-.80 mm).

6. If clearance is not within specification, select a NEW clutch end plate, then recheck. End plates are available in thickness range from .138" (3.50 mm) to .185" (4.70 mm), in increments of .004" (.10 mm). See **Fig. 18** . After replacing clutch end plate, ensure clearance is within specification.

NOTE: If thickest clutch end plate is installed, but clearance is still over specification, replace clutch discs and plates.

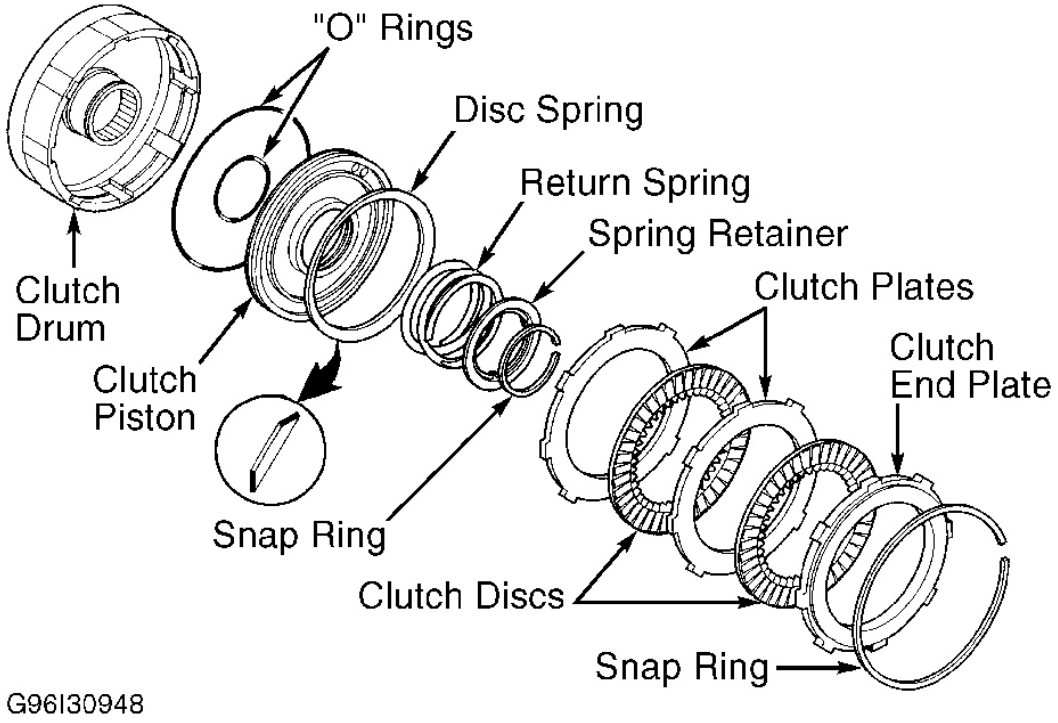

Fig. 12: Exploded View Of Forward Clutch Assembly
Courtesy of AMERICAN HONDA MOTOR CO., INC.

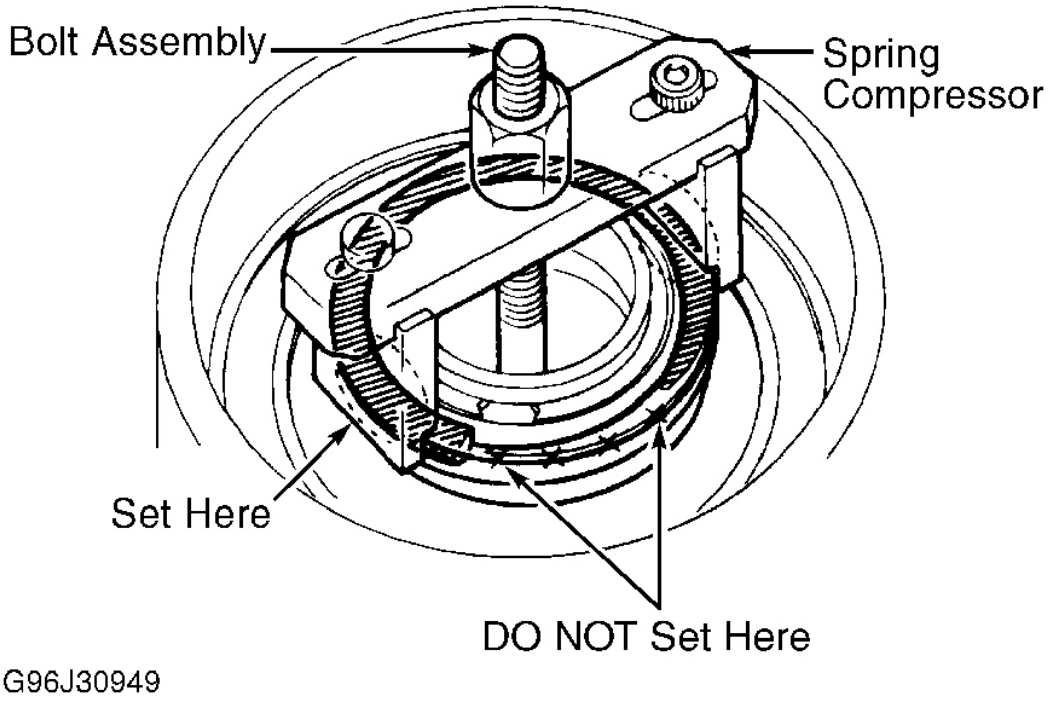

Fig. 13: Compressing Forward Clutch Return Spring
Courtesy of AMERICAN HONDA MOTOR CO., INC.

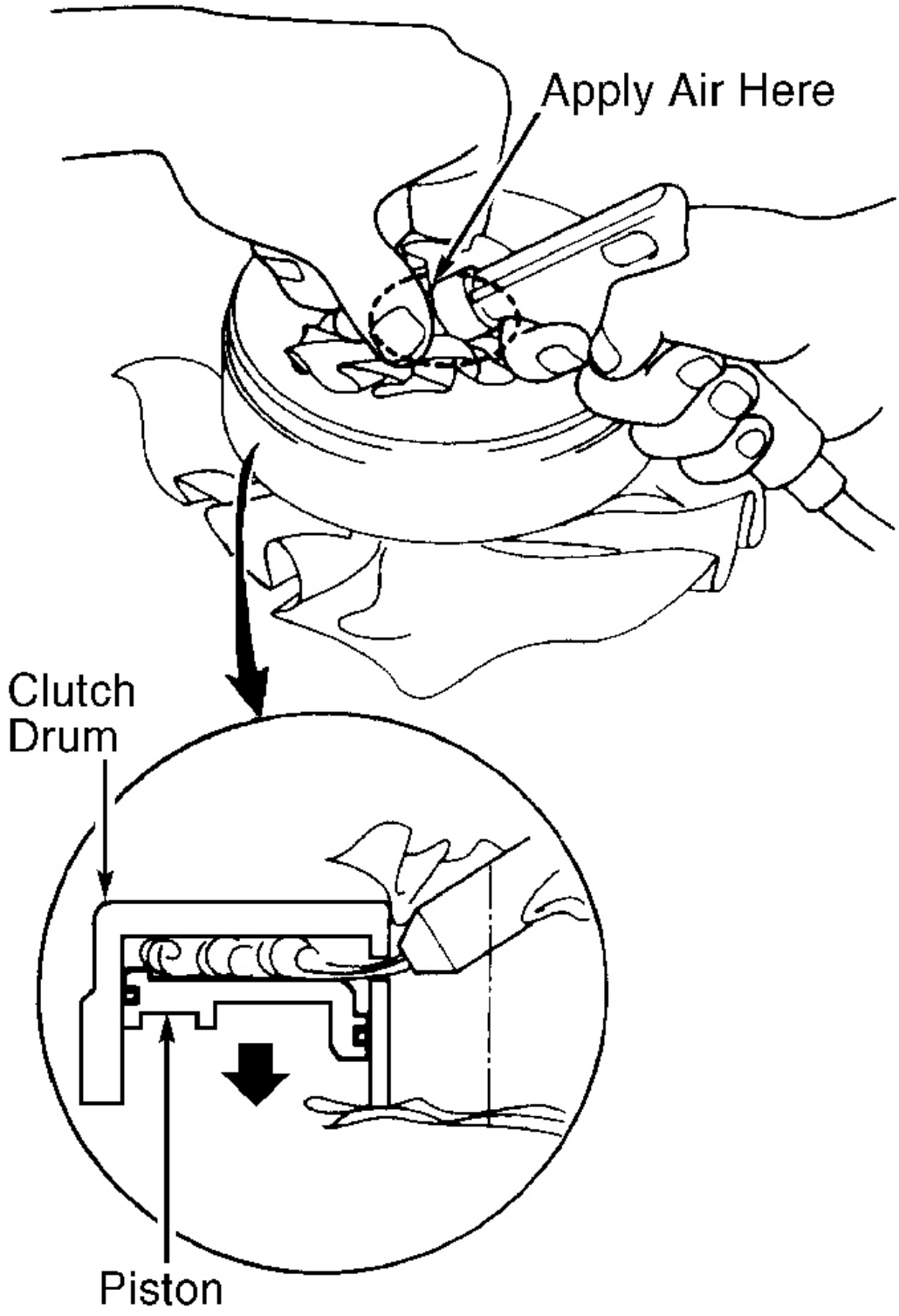

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Fig. 14: Removing Forward Clutch Piston
Courtesy of AMERICAN HONDA MOTOR CO., INC.

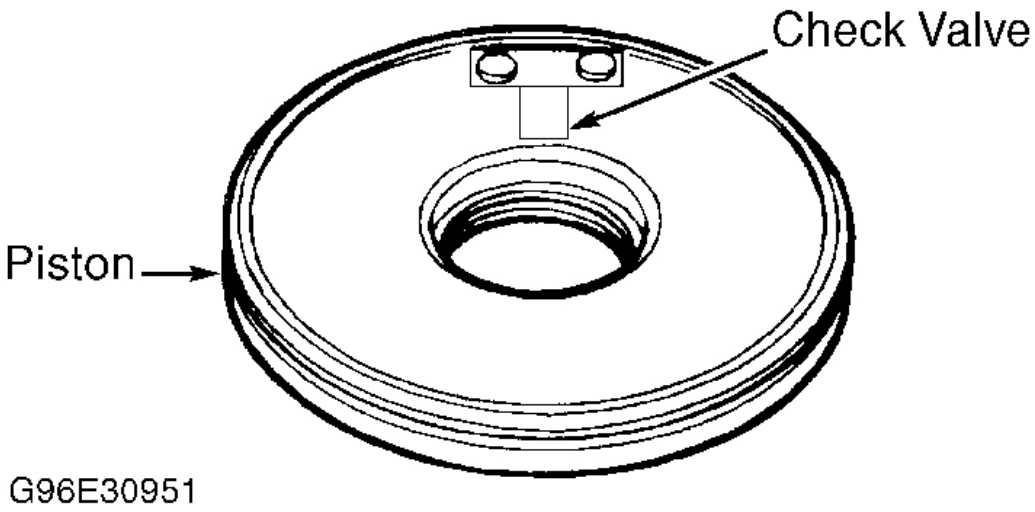

Fig. 15: Checking Forward Clutch Piston Check Valve
Courtesy of AMERICAN HONDA MOTOR CO., INC.

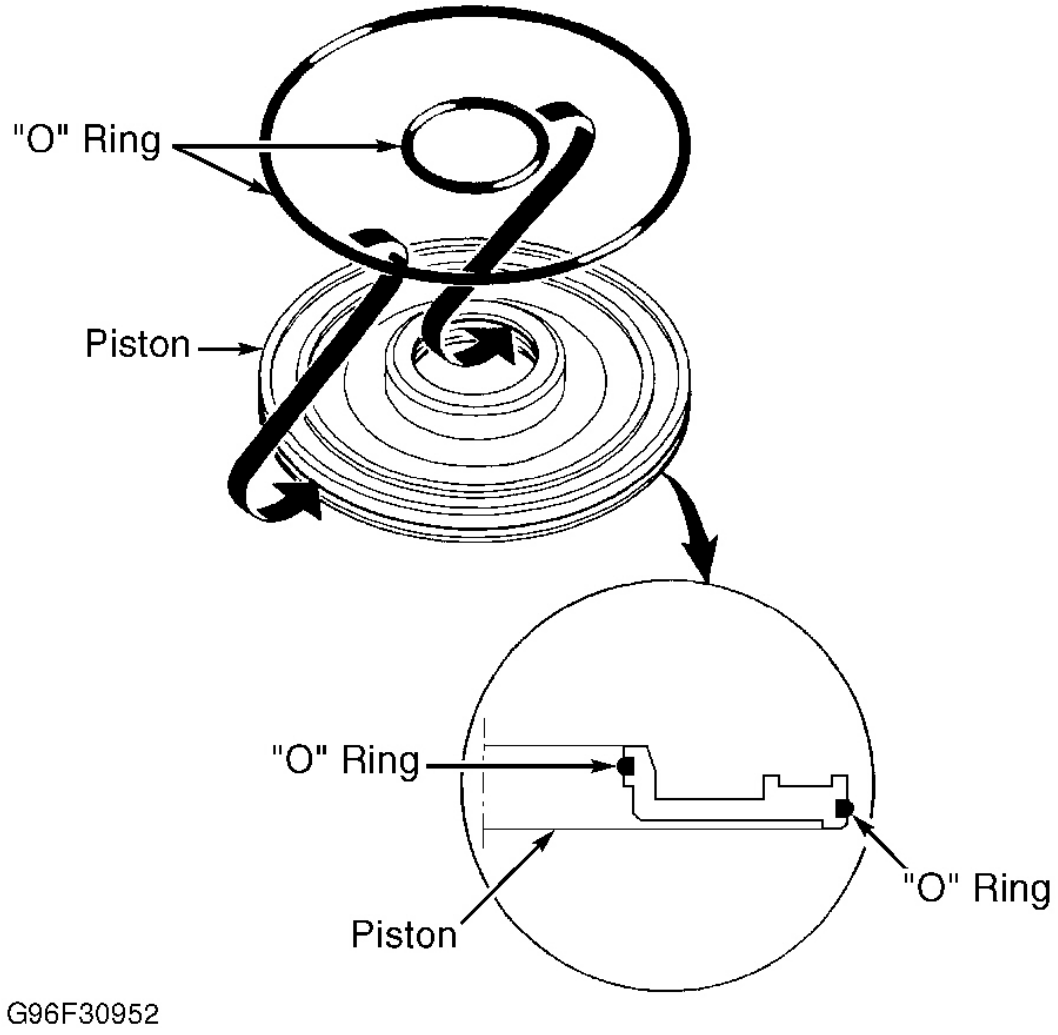

Fig. 16: Installing Forward Clutch Piston "O" Rings
Courtesy of AMERICAN HONDA MOTOR CO., INC.

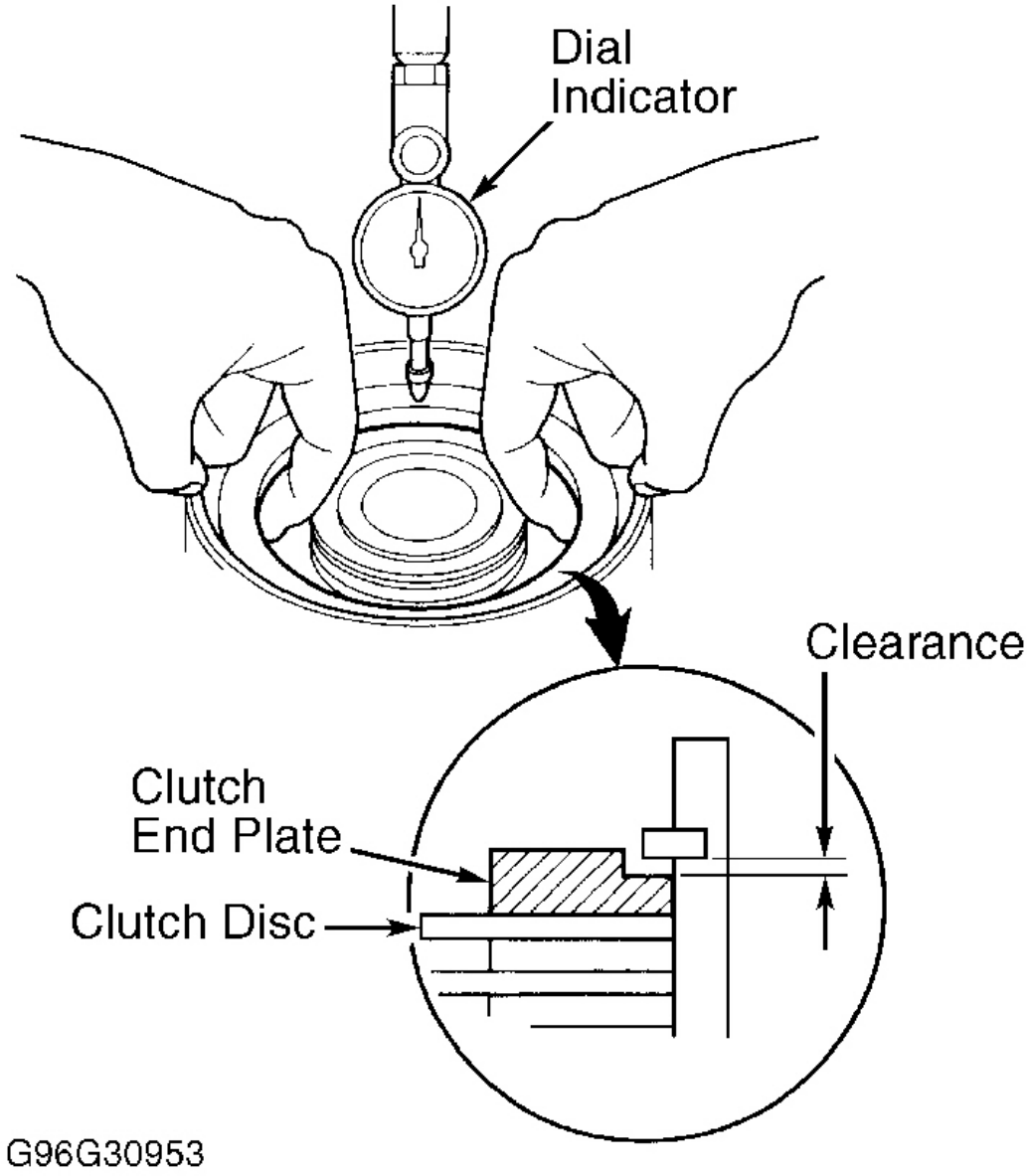

Fig. 17: Measuring Forward Clutch Clearance
Courtesy of AMERICAN HONDA MOTOR CO., INC.

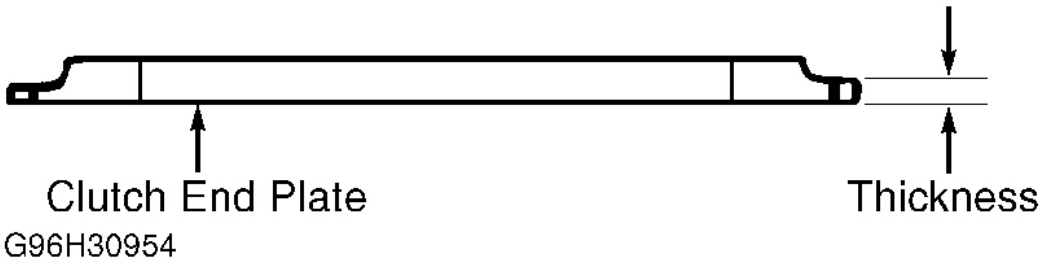

Fig. 18: Measuring Forward Clutch End Plate Thickness
Courtesy of AMERICAN HONDA MOTOR CO., INC.

DIFFERENTIAL ASSEMBLY

Disassembly

1. Prior to disassembly, place differential assembly on "V" blocks and install both axles. Using dial indicator, measure pinion gear backlash. See **Fig. 19** . Backlash should be .002-.006" (.05-.15 mm). If backlash is not as specified, replace differential carrier.
2. Remove final driven gear from differential carrier. Final driven gear bolts have left-hand threads. Using appropriate bearing puller, remove differential carrier bearings (if necessary). See **Fig. 20** .

Cleaning & Inspection

Check bearings for wear and rough rotation. Inspect final driven gear teeth for damage. Replace components as necessary.

Reassembly

To reassemble, reverse disassembly procedure. Install NEW bearings using appropriate driver and press. Install final driven gear on differential carrier with chamfered side of gear on inner bore, facing differential carrier. Tighten bolts to 72 ft. lbs. (98 N.m).

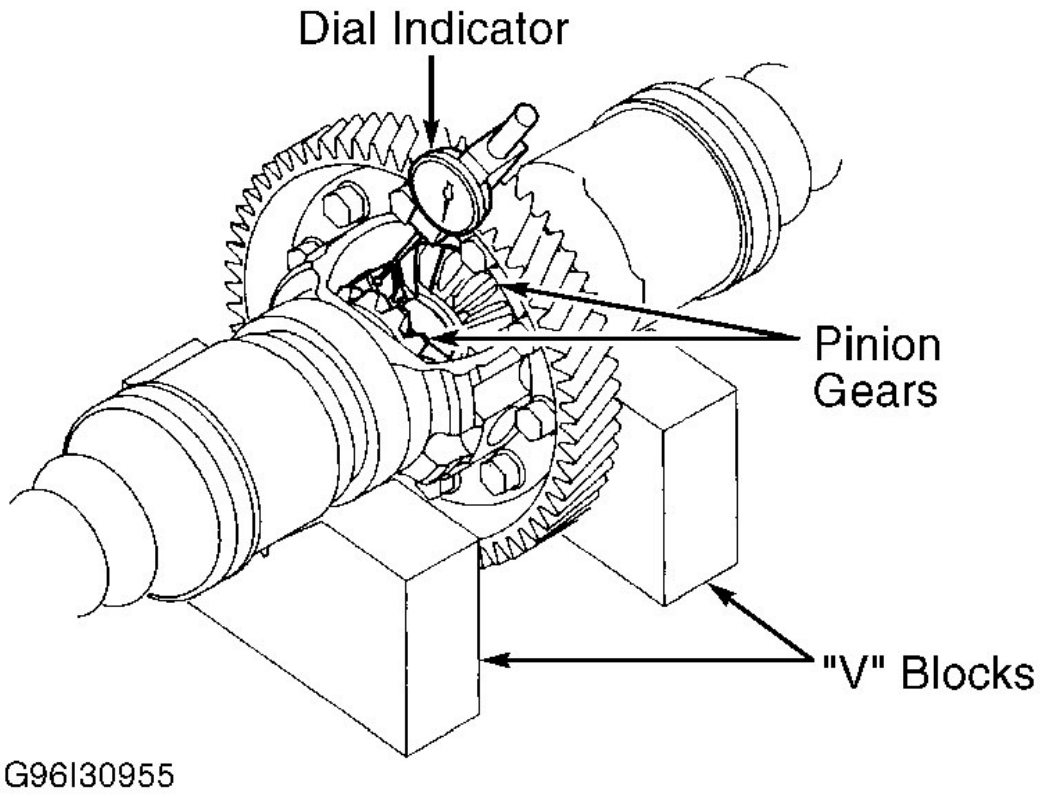

Fig. 19: Measuring Pinion Gear Backlash
Courtesy of AMERICAN HONDA MOTOR CO., INC.

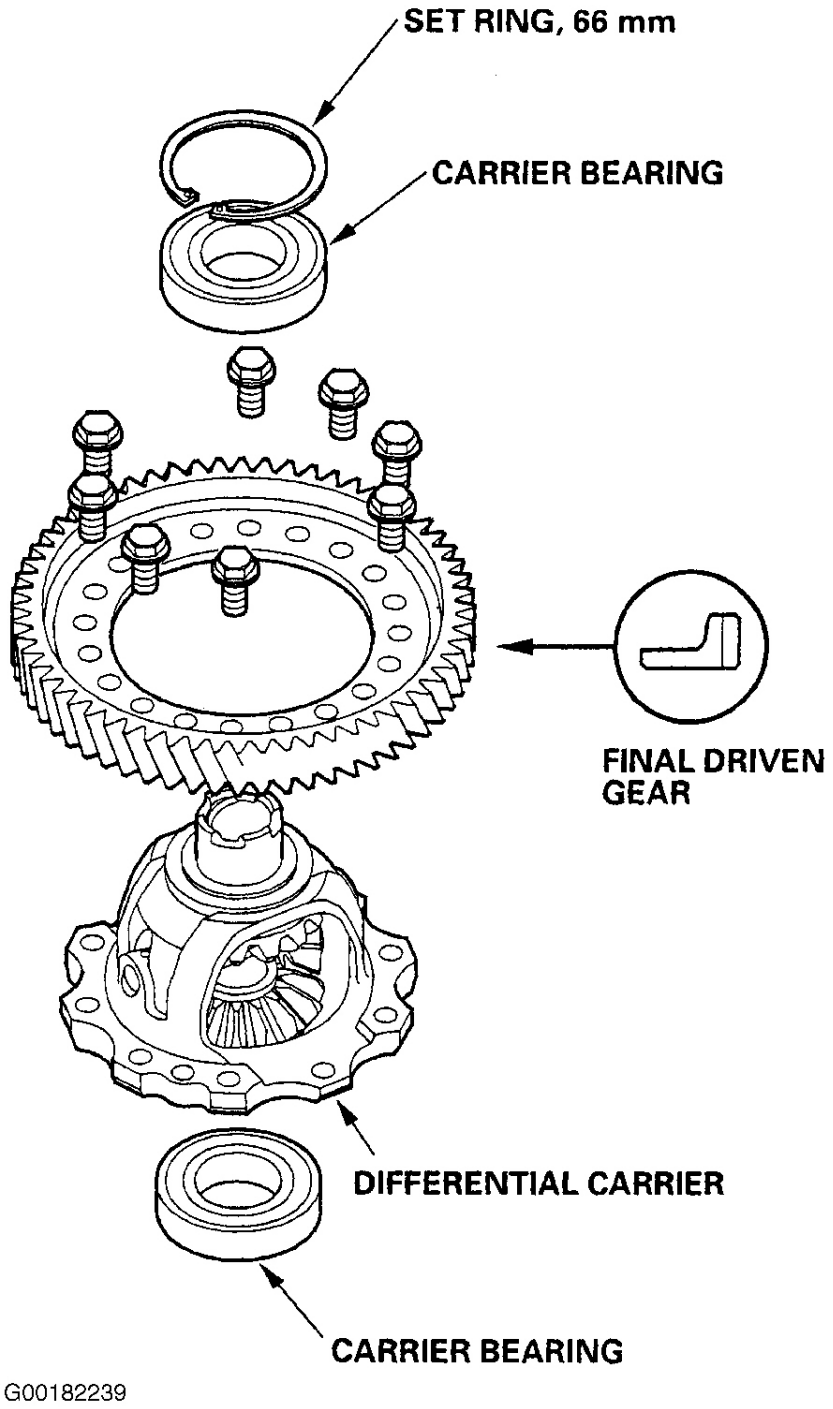

Fig. 20: Identifying Differential Assembly Components
Courtesy of AMERICAN HONDA MOTOR CO., INC.

TRANSMISSION & FLYWHEEL HOUSING OIL SEALS

Disassembly & Reassembly

1. Remove oil seal from transmission housing and flywheel housing using pin punch and hammer. Install differential assembly into transmission housing. Use appropriate driver to seat differential assembly into housing.
2. Install flywheel housing with dowel pins, harness clamp bracket and gasket onto transmission housing, and tighten bolts to 19 ft. lbs. (26 N.m). Install a 66 mm set ring into flywheel housing. See **Fig. 21** . DO NOT install oil seal. Using feeler gauge, measure clearance between 66 mm set ring and outer race of bearing in flywheel housing. See **Fig. 22** . Clearance should be 0-.006" (0-.15 mm).
3. If clearance is not as specified, remove set ring and measure it's thickness. Select and install NEW set ring, recheck clearance, then go to next step. Set ring is available in thickness range from .098" (2.50 mm) to .118" (3.00 mm) in increments of .004" (.10 mm).
4. Remove flywheel housing. Install correct thickness set ring. Install oil seal in transmission housing and flywheel housing using appropriate driver, pilot, adapter and hammer. Ensure oil seal in flywheel housing is installed to correct depth. See **Fig. 23** .

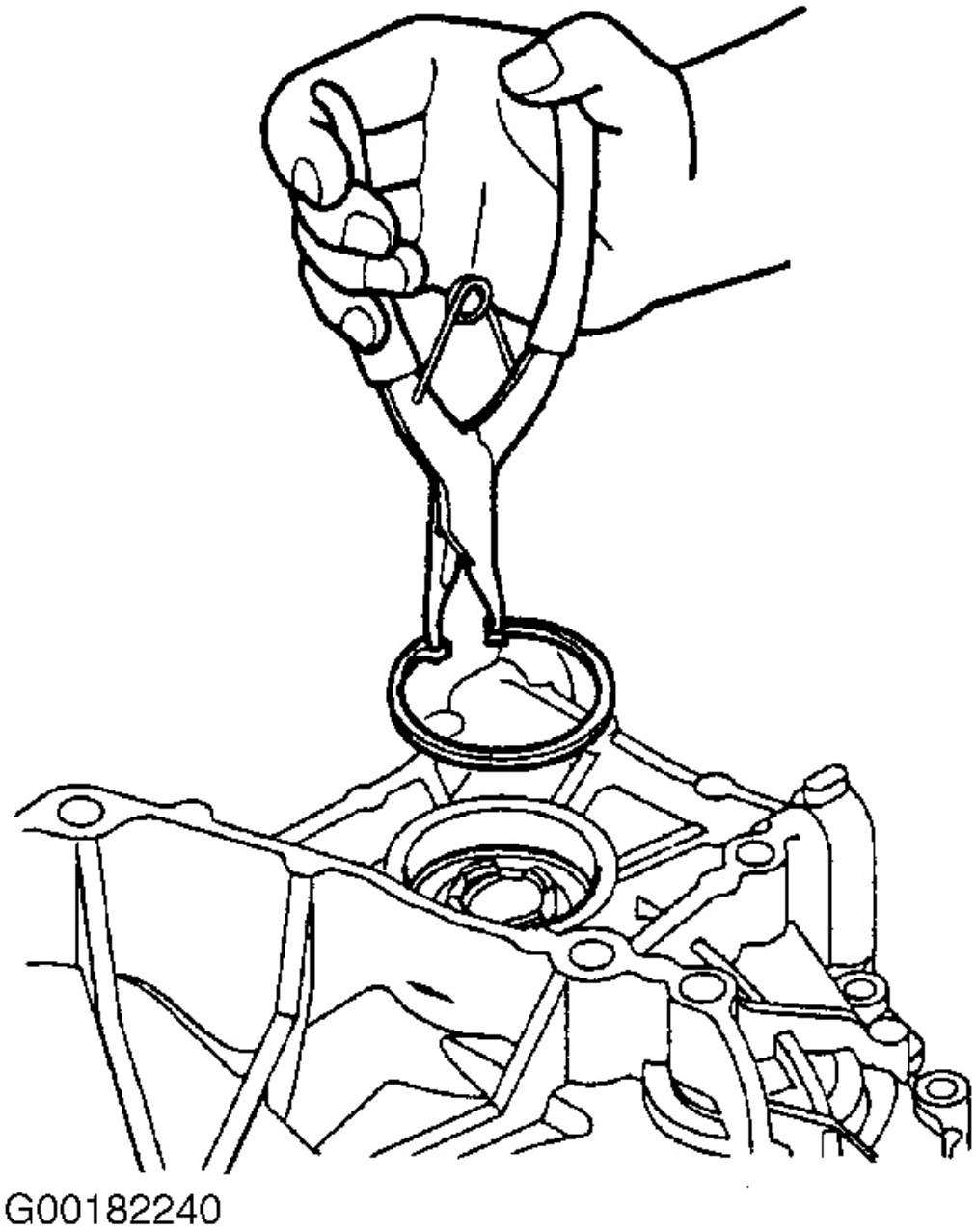

Fig. 21: Installing Set Ring Into Flywheel Housing
Courtesy of AMERICAN HONDA MOTOR CO., INC.

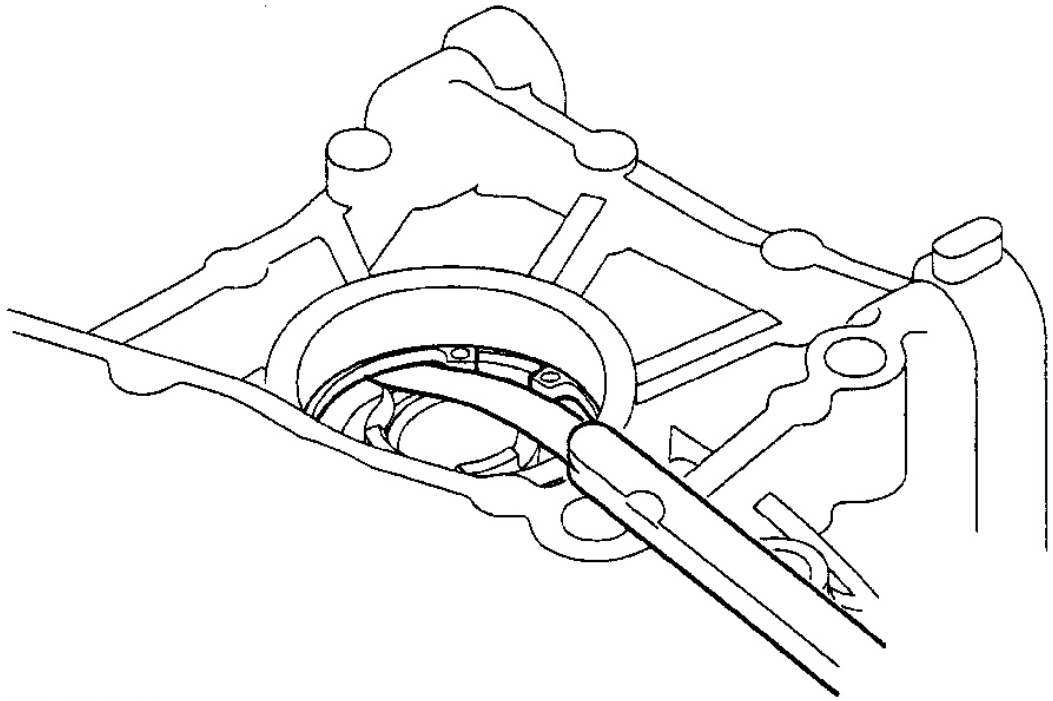

Fig. 22: Measuring Set Ring Clearance
Courtesy of AMERICAN HONDA MOTOR CO., INC.

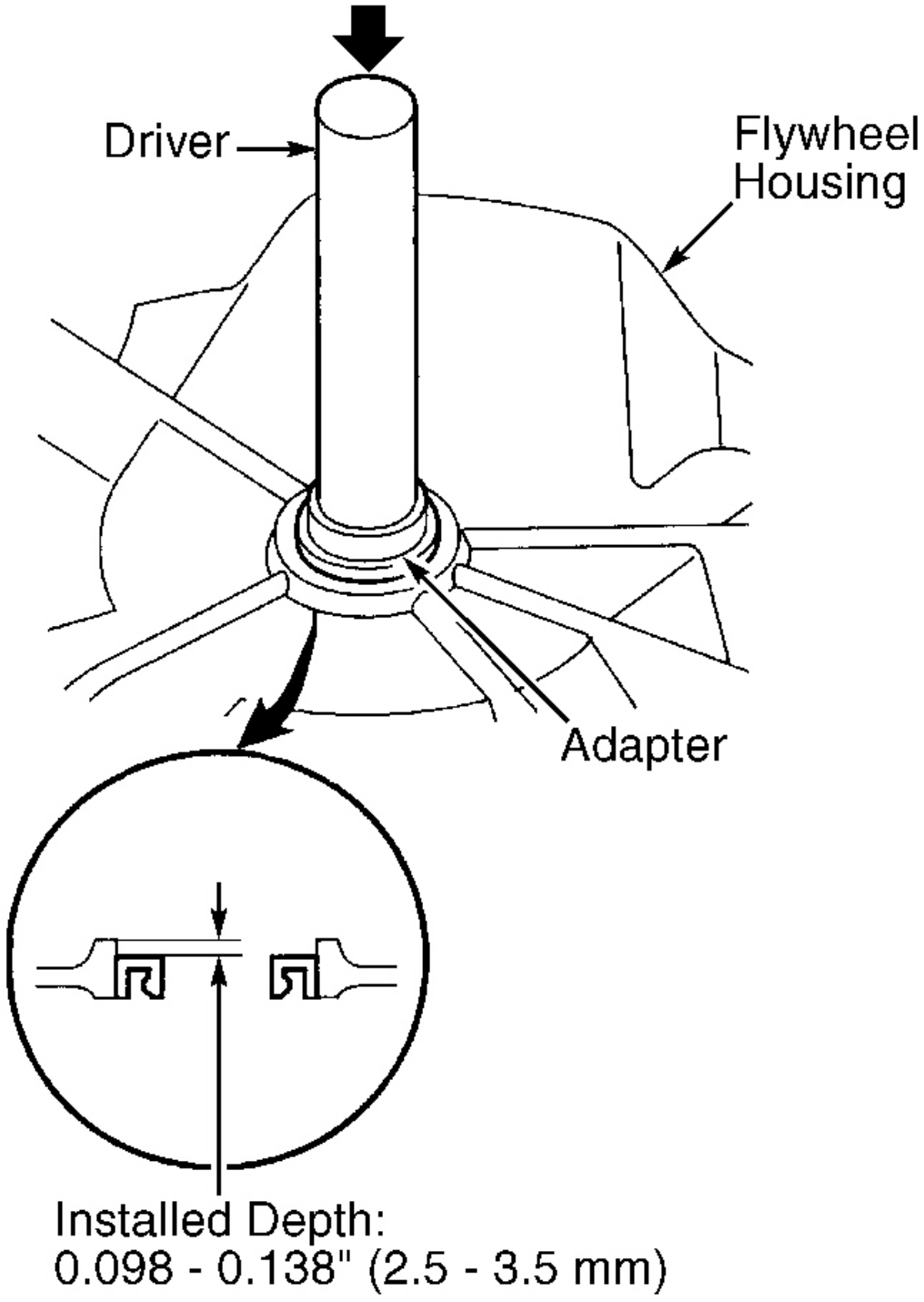

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Fig. 23: Installing Flywheel Housing Oil Seal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

DRIVEN PULLEY SHAFT BEARING

Disassembly & Reassembly

1. Expand snap ring with snap ring pliers, then push bearing out using driver, adapter and press. See **Fig. 24** . DO NOT remove snap ring unless it is necessary to clean groove in housing. Lubricate parts with ATF. Expand snap ring with pliers. Insert NEW bearing part way into housing using driver and adapter. Install bearing with groove facing outside housing.
2. Release pliers, then push bearing down into housing until ring snaps in place around bearing. After installing bearing, ensure snap ring is seated in bearing and housing grooves. See **Fig. 25** . Ensure bearing operates properly and snap ring end gap is 0-.35" (0-9 mm).

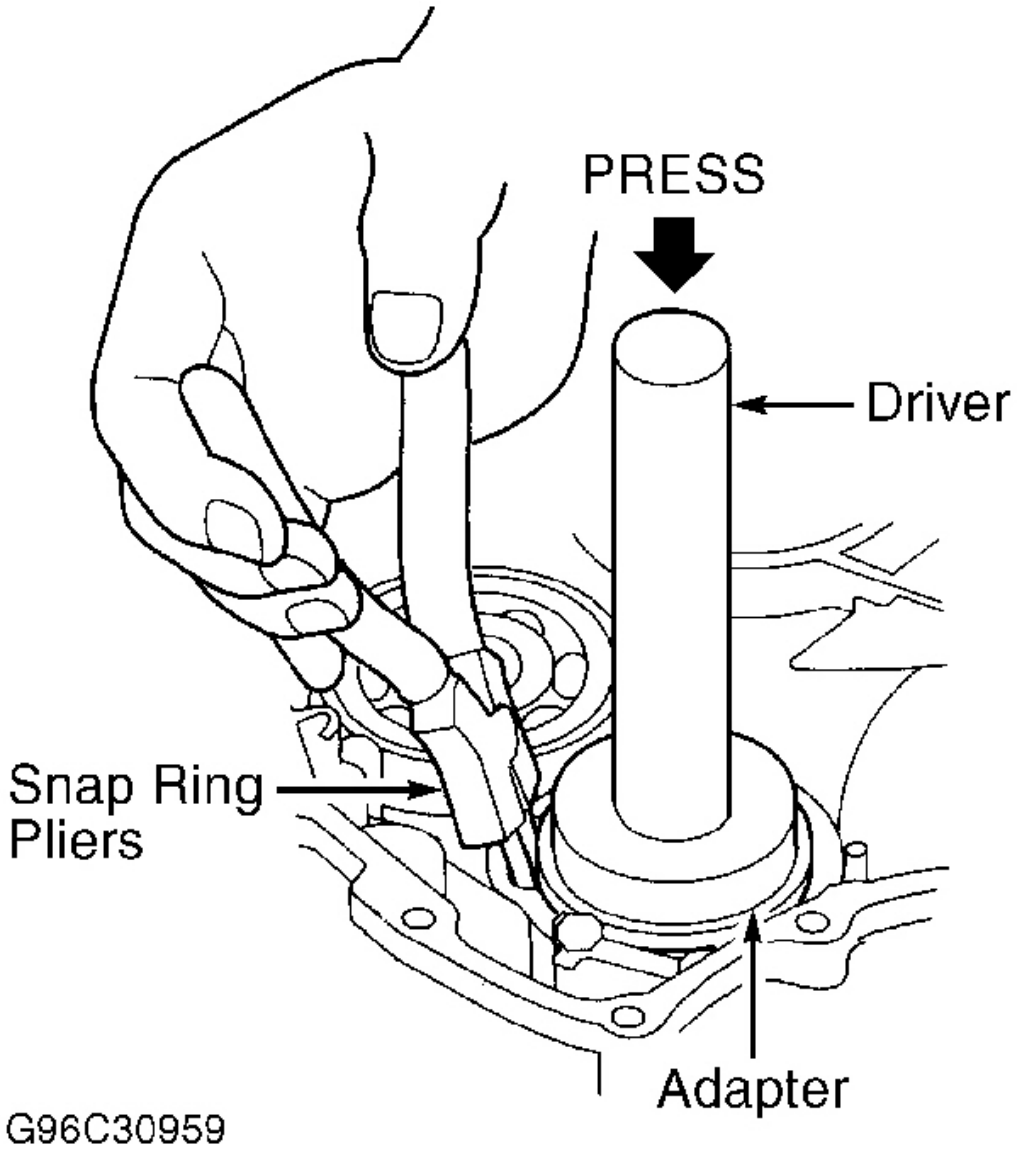

Fig. 24: Removing Driven Pulley Shaft Bearing
Courtesy of AMERICAN HONDA MOTOR CO., INC.

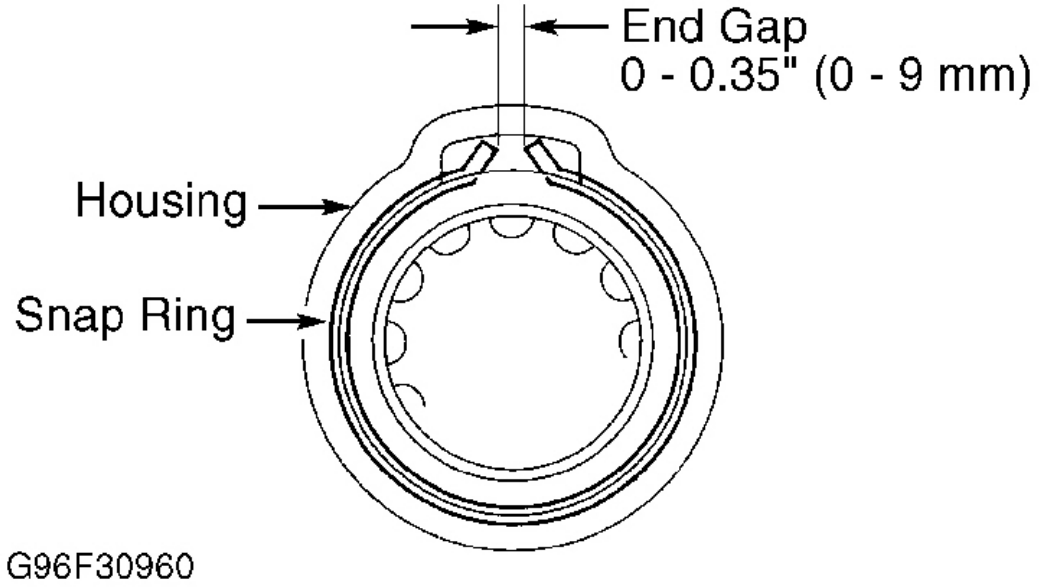

Fig. 25: Measuring Snap Ring End Gap
Courtesy of AMERICAN HONDA MOTOR CO., INC.

SECONDARY GEAR SHAFT BEARING

Disassembly & Reassembly

NOTE: Letters in parenthesis in the following steps are identified in illustration.

1. Remove bearings (A) from secondary gear shaft (B) using a universal 2-jaw (or 3-jaw) puller (C). Place a shaft protector (D) between secondary gear shaft and puller to prevent shaft damage. See **Fig. 26** .
2. Using adapter, driver and press, install NEW secondary gear shaft bearing on transmission housing side of gear shaft. Select 25 x 35 mm thrust shim. See **SECONDARY GEAR SHAFT 25 X 35 THRUST SHIM SELECTION** under ADJUSTMENTS. Install selected thrust shim, then install NEW bearing on secondary gear shaft on flywheel housing side of gear shaft using adapter, driver and press.

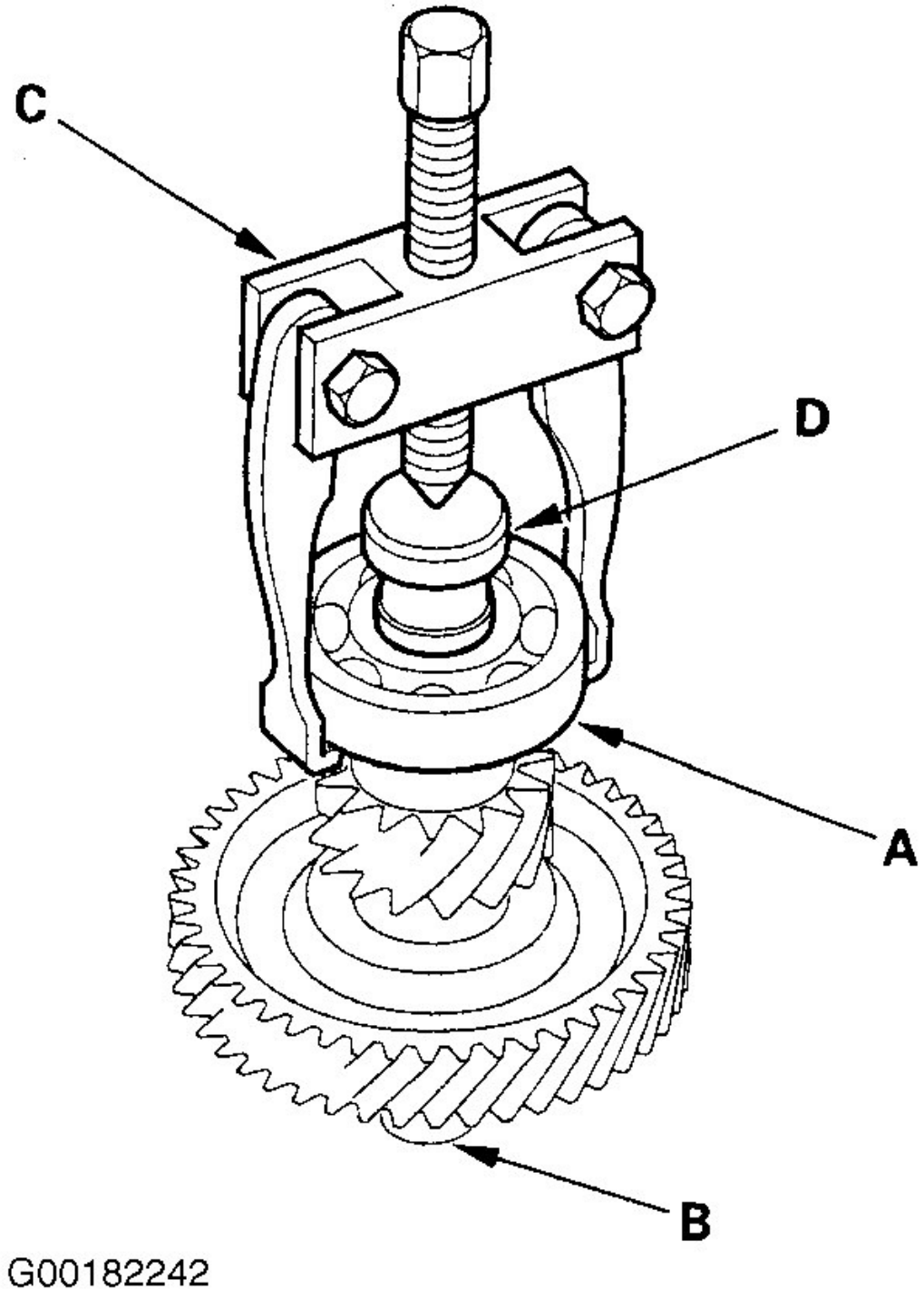

Fig. 26: Removing Secondary Gear Shaft Bearings

Courtesy of AMERICAN HONDA MOTOR CO., INC.

PLANETARY CARRIER BEARING

Disassembly & Reassembly

Remove snap ring securing planetary carrier bearing. See **Fig. 27** . Using a pin punch, remove planetary carrier bearing. See **Fig. 28** . Install NEW bearing using an adapter and driver. Install snap ring to secure bearing on planetary carrier.

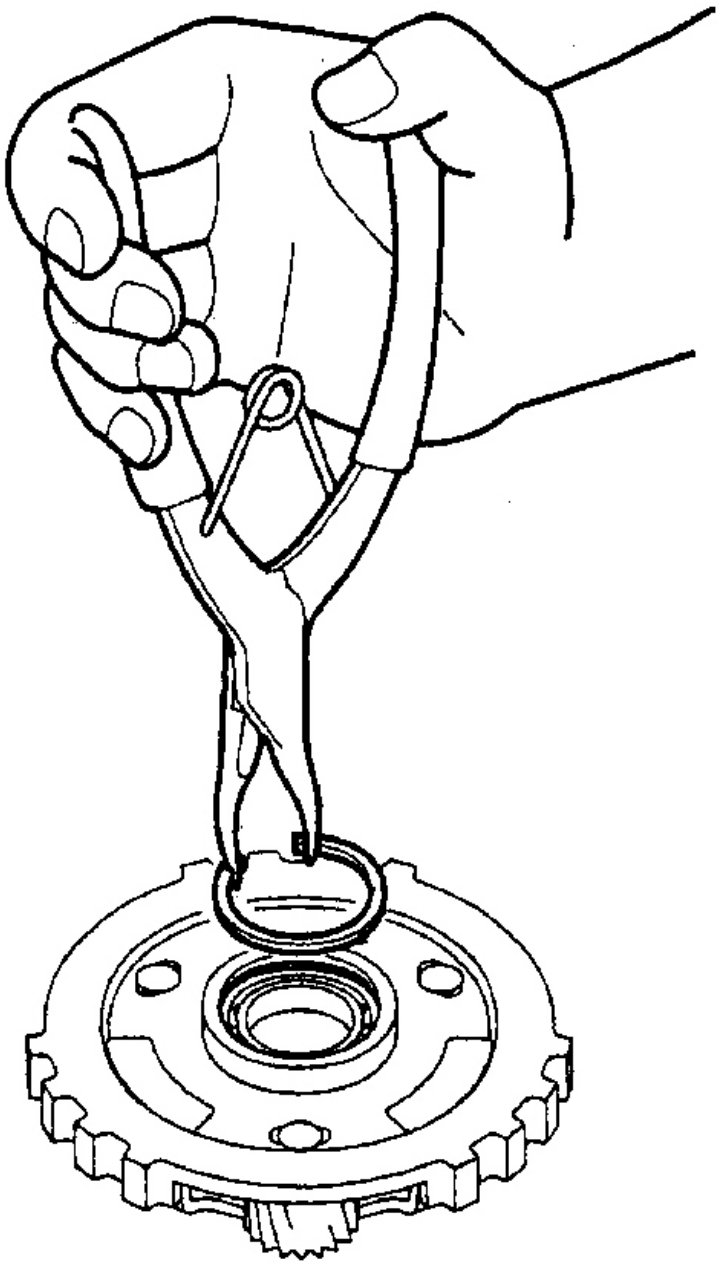

Fig. 27: Removing Snap Ring Securing Bearing
Courtesy of AMERICAN HONDA MOTOR CO., INC.

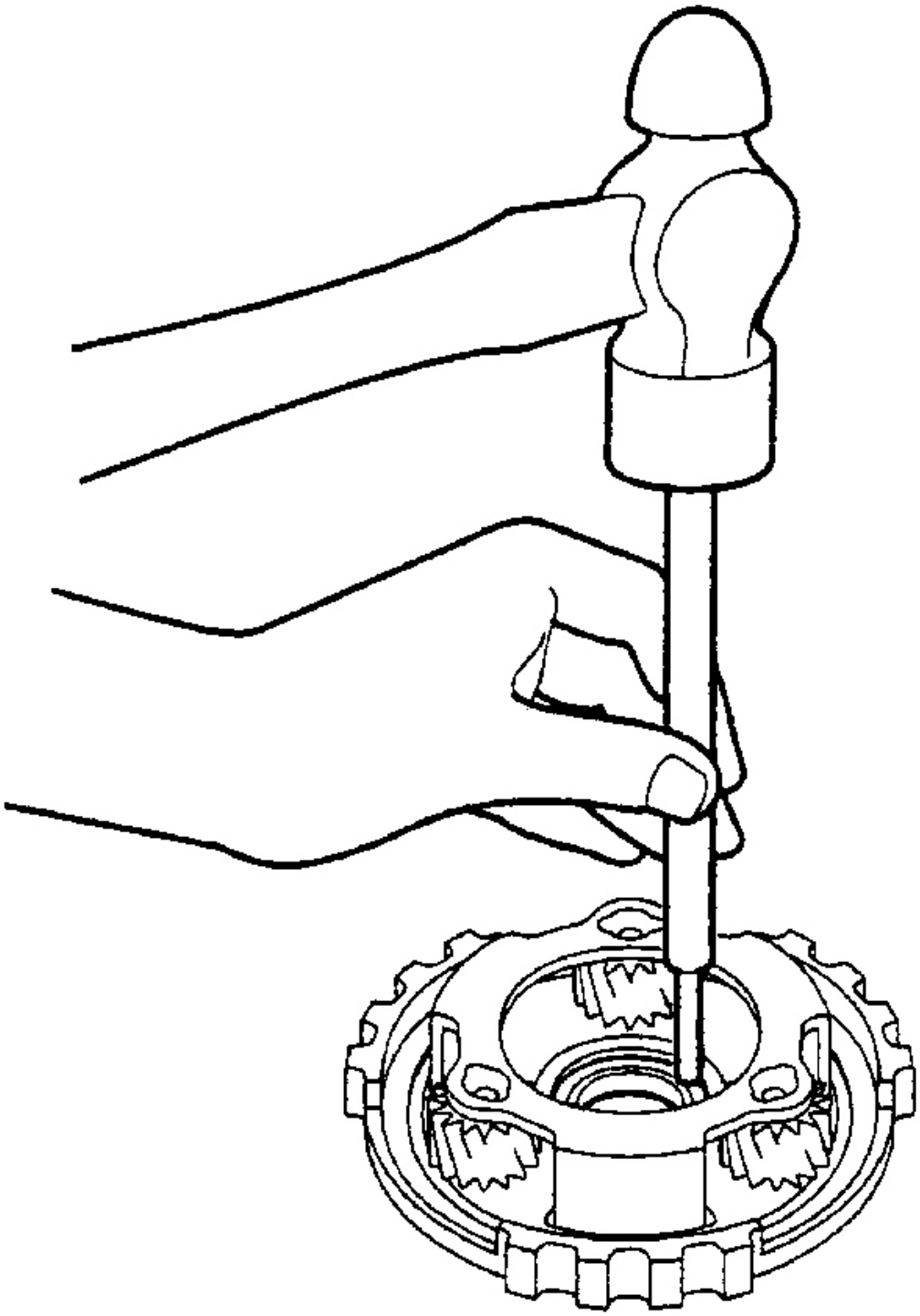

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Fig. 28: Removing Planetary Carrier Bearing
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CONTROL SHAFT ASSEMBLY

Disassembly & Reassembly

NOTE: Letters in parenthesis in the following steps are identified in illustration.

1. Remove transmission range switch from control shaft. Remove bolt (A) and lock washer (B). Remove control lever (C) from control shaft (D). Remove control shaft assembly from transmission housing (E). Inspect oil seal (F) and replace as necessary. See **Fig. 29** . Inspect control shaft tips end gap. If end of control shaft is squeezed together, worn or damaged, replace control shaft assembly.
2. Install control shaft assembly into transmission housing. Install control lever to control shaft. Install and tighten bolt with NEW lock washer to specification, then bend lock tab on washer over bolt head. Do not install transmission range switch at this time. Install switch after installing end cover.

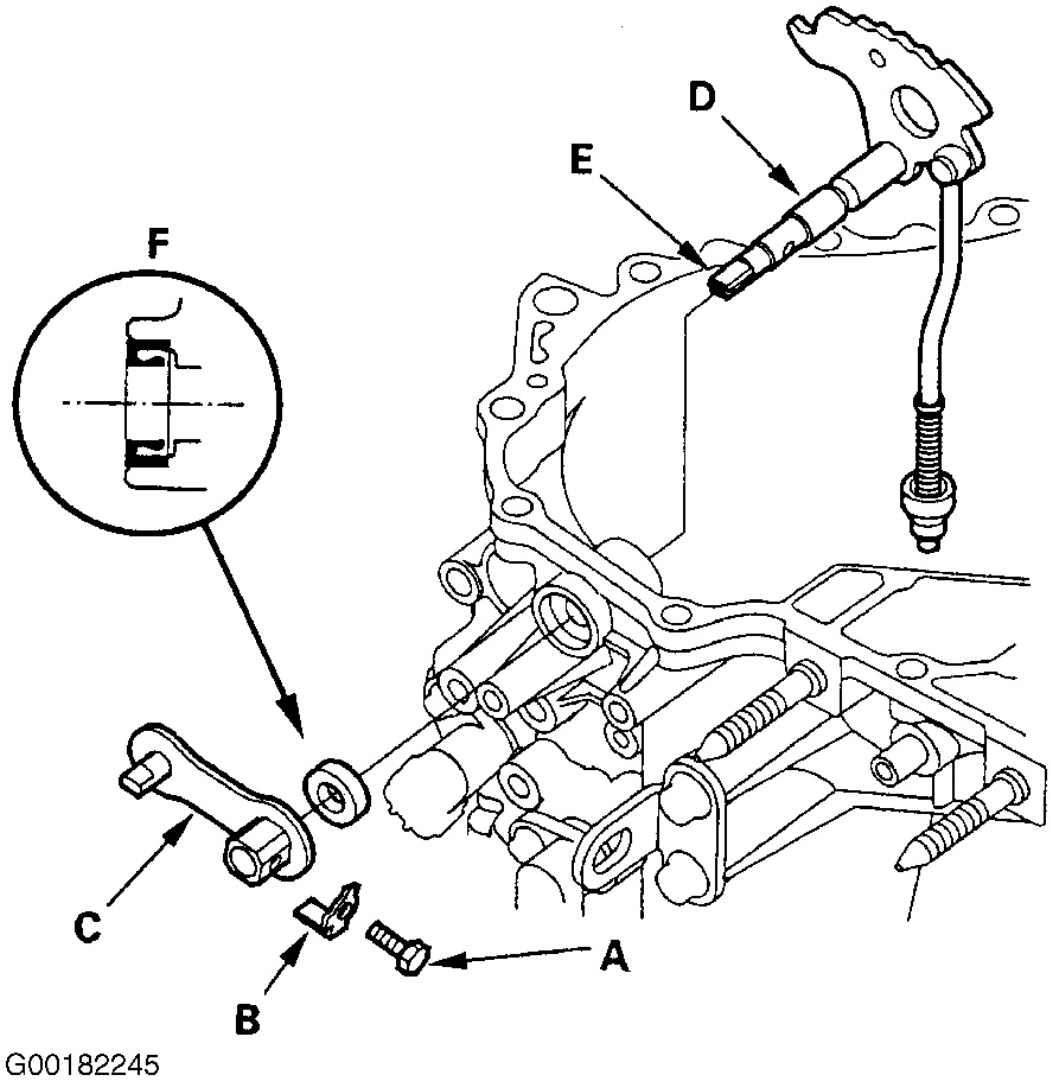

Fig. 29: Removing & Installing Control Shaft Assembly
Courtesy of AMERICAN HONDA MOTOR CO., INC.

LOWER VALVE BODY ASSEMBLY

NOTE: For valve descriptions for control valve assemblies, see INTRODUCTION under DESCRIPTION & OPERATION.

Manufacturer does not supply exploded views, disassembly procedures or specifications for lower valve body assembly. When disassembling valve bodies, note location of all components for reassembly reference. See **Fig. 30** -**Fig. 32** . Clean components with solvent and dry with compressed air. Inspect components for damage. Replace components as necessary. Coat all components with ATF prior to reassembly. Ensure all components

are installed in correct locations. For solenoid testing, see appropriate DIAGNOSIS article.

Removal & Installation

1. Raise and support vehicle. Remove transaxle drain plug. Disconnect transaxle cooler hoses at cooler lines. Remove bolt securing ATF cooler inlet line. Remove transaxle oil pan bolts. Remove oil pan. Remove 2 bolts and remove the oil strainer. See **Fig. 33** .
2. Remove 8 bolts and remove the lower valve body assembly. Remove the bolt securing the solenoid harness connector while holding the lower valve body assembly, and remove the connector and valve body assembly. Remove the oil cooler lines.
3. Clean the inlet opening of the oil strainer thoroughly with compressed air. See **Fig. 34** . Check that the oil strainer is in good condition, and that the inlet opening is not clogged. Test the oil strainer by pouring clean ATF through the inlet opening, and replace oil strainer if it is clogged or damaged.
4. To install, reverse removal procedure. Tighten fasteners to specification. See **TORQUE SPECIFICATIONS** . Perform **START CLUTCH CALIBRATION PROCEDURE** under DESCRIPTION & OPERATION.

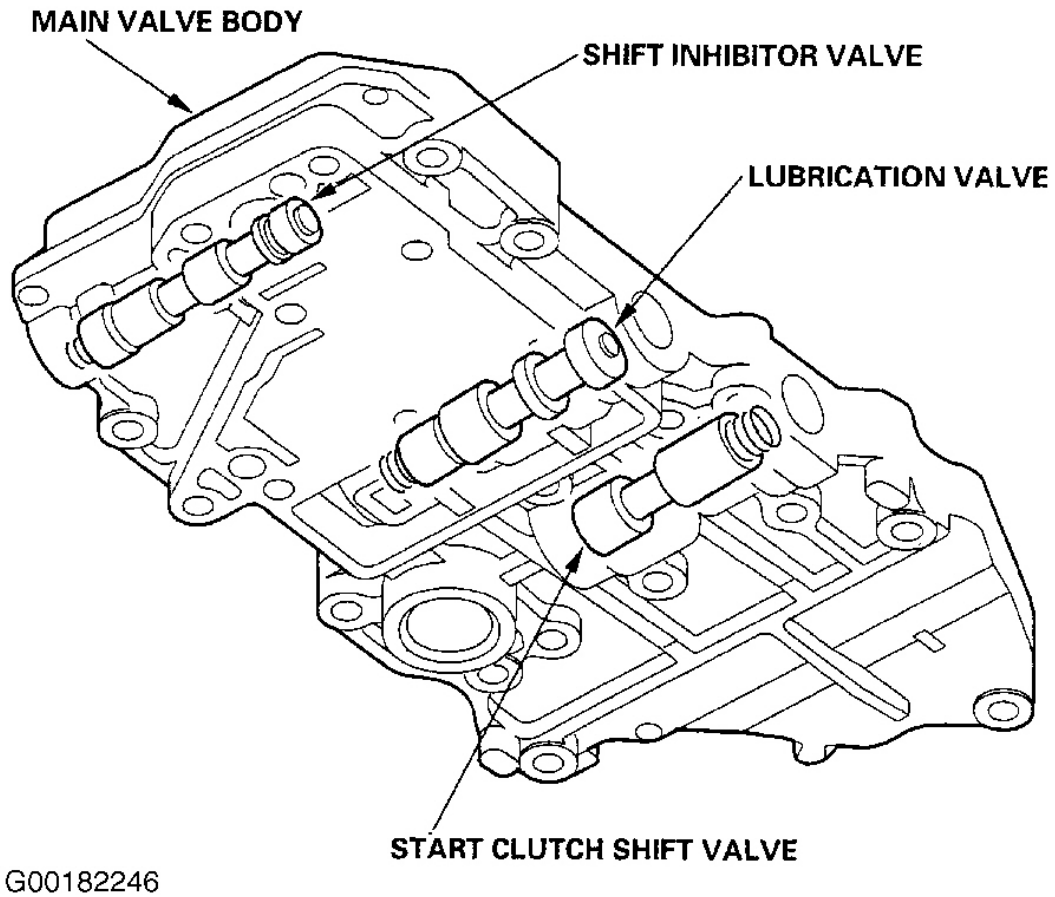

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Fig. 30: Identifying Main Valve Body Valves
Courtesy of AMERICAN HONDA MOTOR CO., INC.

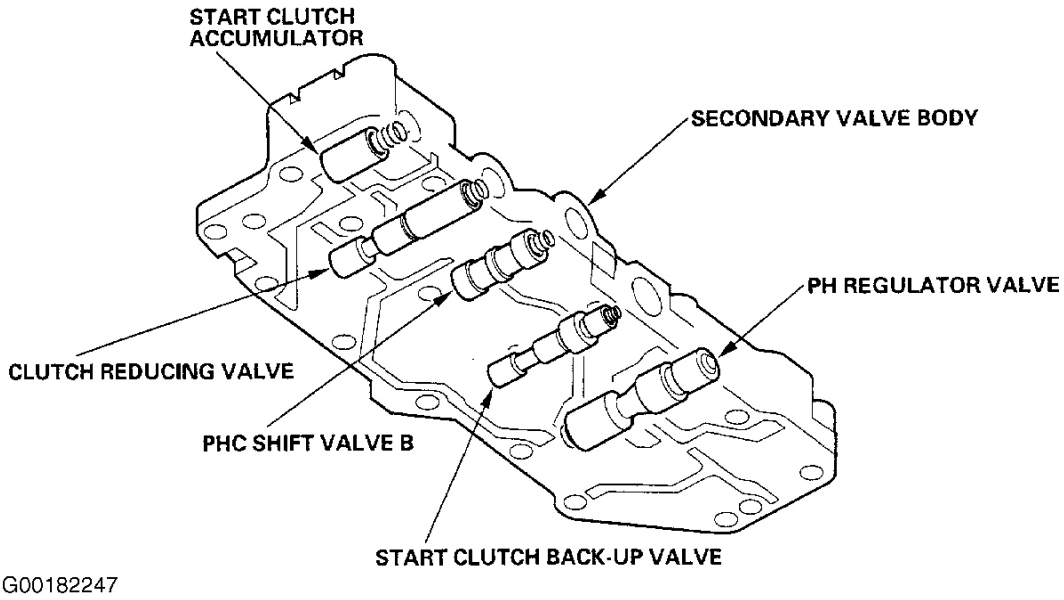


Fig. 31: Identifying Secondary Valve Body Valves
Courtesy of AMERICAN HONDA MOTOR CO., INC.

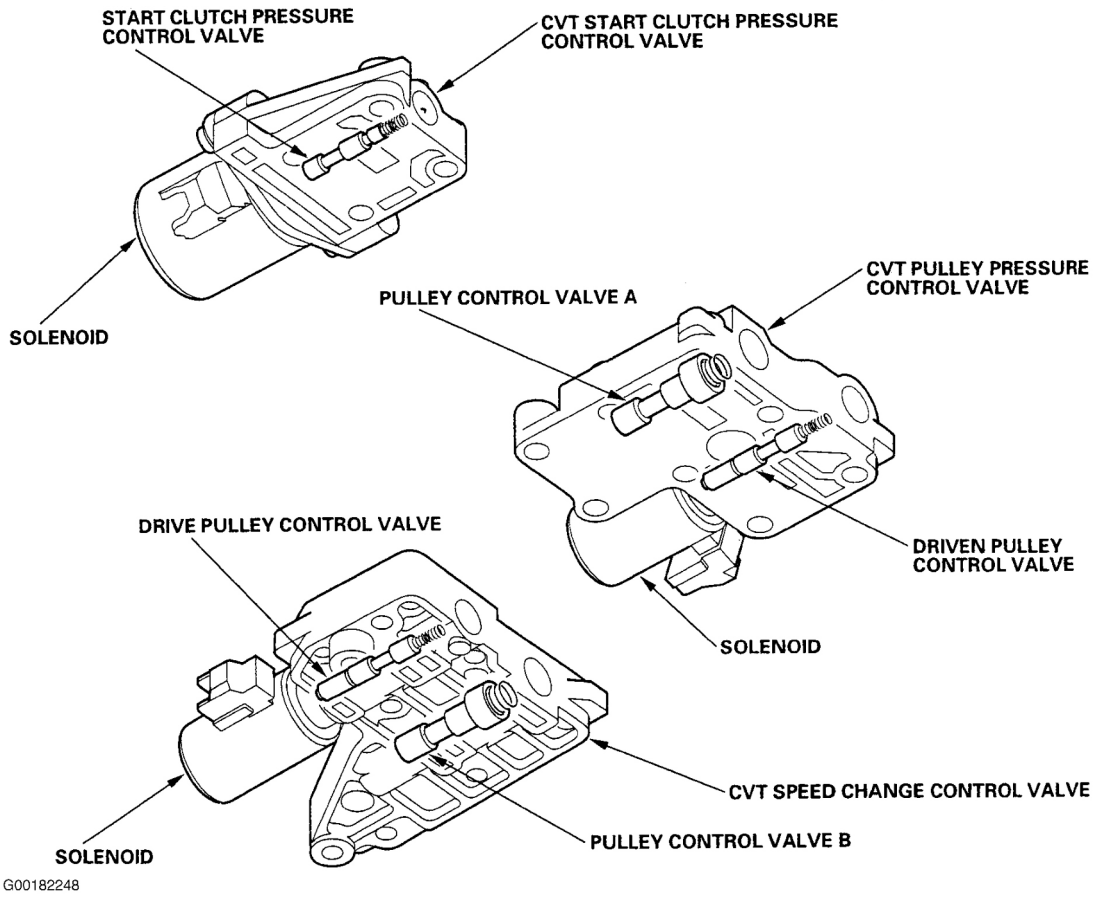


Fig. 32: Identifying Speed Change, Start Clutch Pressure & Pulley Pressure Control Valve Assemblies Valves
Courtesy of AMERICAN HONDA MOTOR CO., INC.

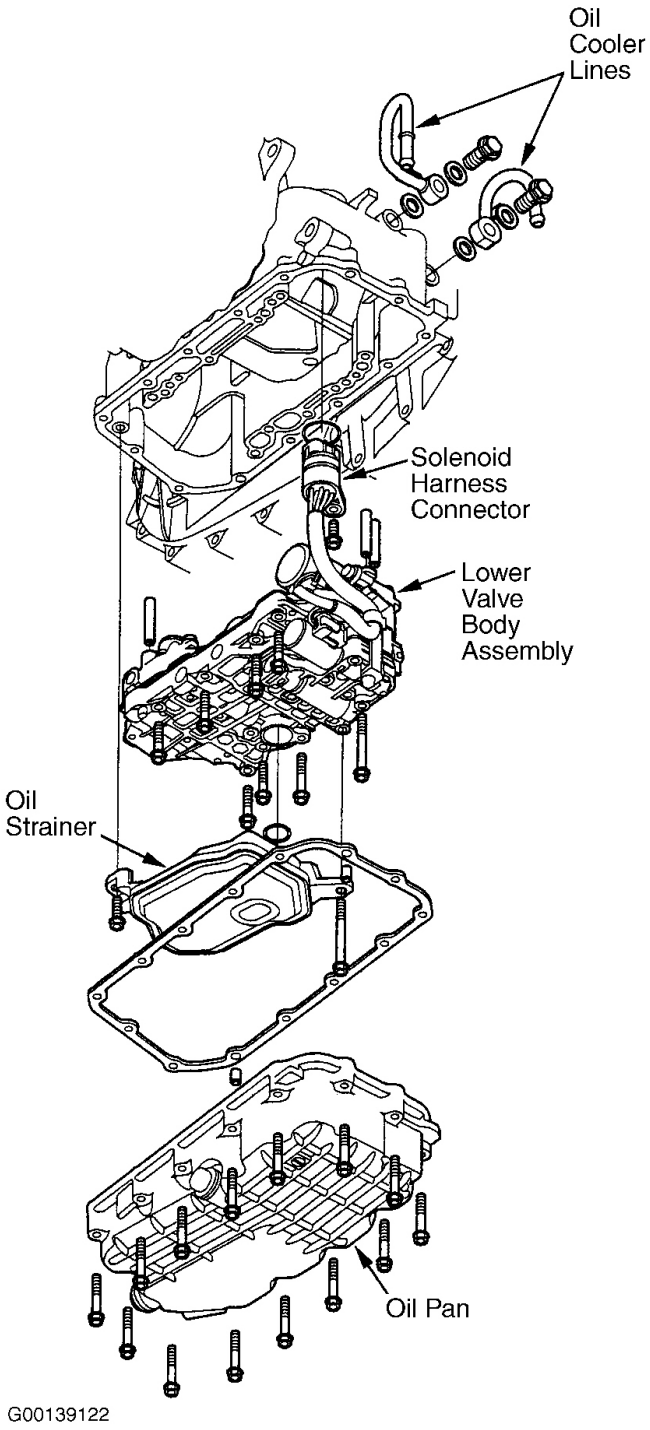


Fig. 33: Removing Oil Pan, Oil Strainer & Lower Valve Body Assembly
Courtesy of AMERICAN HONDA MOTOR CO., INC.

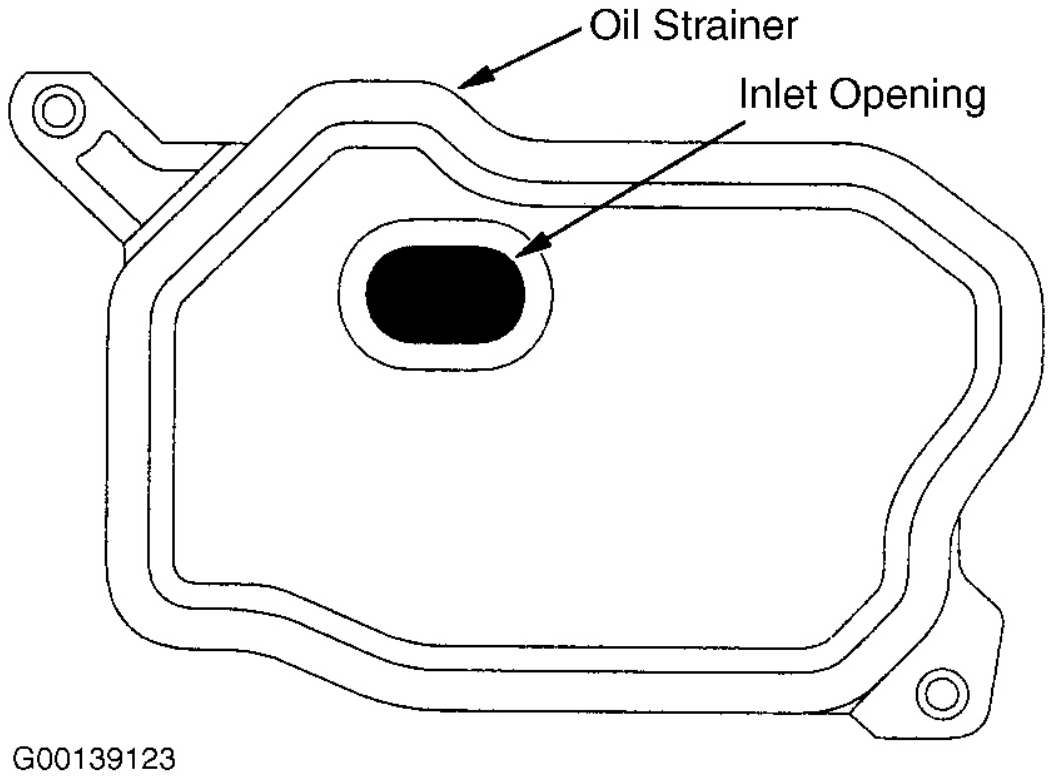


Fig. 34: Locating Inlet Opening On Oil Strainer
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CONTROL VALVE ASSEMBLY REPLACEMENT

Removal & Installation

NOTE: Letters in parenthesis in the following steps are identified in illustration.

1. Remove lower valve body assembly. See **REMOVAL & INSTALLATION** under LOWER CONTROL VALVE ASSEMBLY. Disconnect speed change control valve assembly connector (A) and start clutch pressure control valve assembly connector (B).
2. Remove solenoid harness clamp (C). Remove 7 bolts, and remove speed change control valve assembly (D). Remove 4 bolts, and remove start clutch pressure control valve assembly (E). See **Fig. 35** . To install, reverse removal procedure. Tighten bolts to specification. See **TORQUE SPECIFICATIONS** .

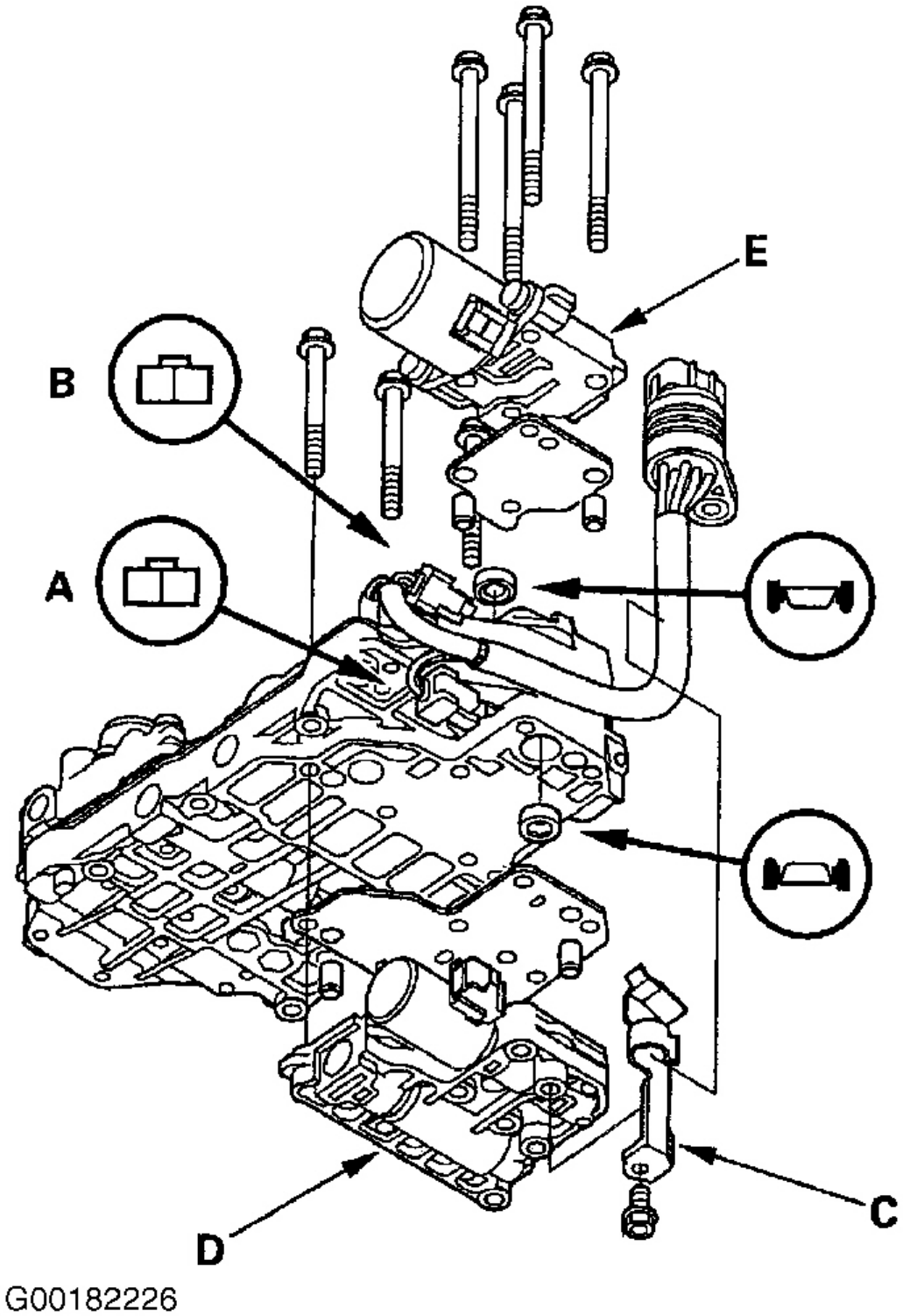


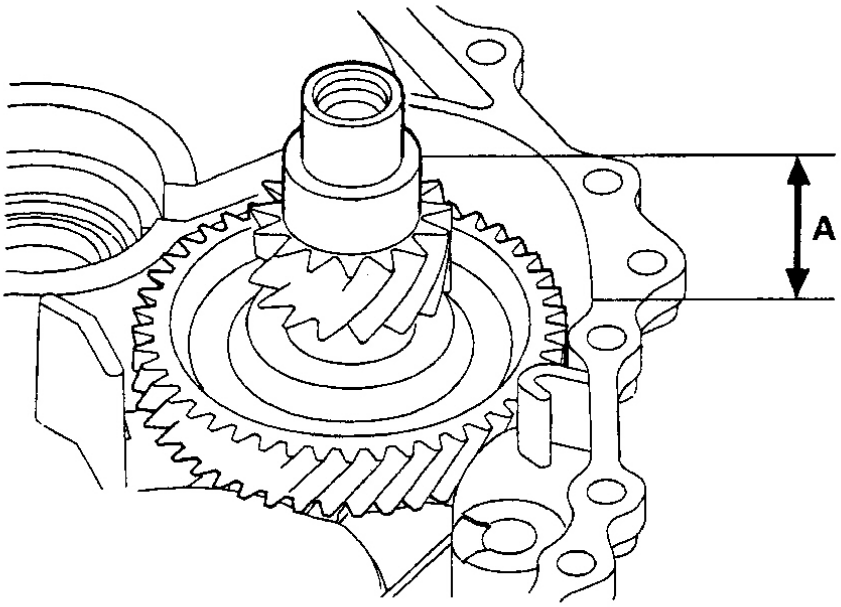
Fig. 35: Replacing Control Valve Assemblies
Courtesy of AMERICAN HONDA MOTOR CO., INC.

ADJUSTMENTS

SECONDARY GEAR SHAFT 25 X 35 THRUST SHIM SELECTION

NOTE: Perform this procedure prior to transaxle reassembly. If secondary gear shaft bearings or secondary gear shaft is replaced, perform this procedure.

1. Removing bearing on flywheel housing side of secondary gear shaft. See **SECONDARY GEAR SHAFT BEARING** under COMPONENT DISASSEMBLY & REASSEMBLY. Install secondary gear shaft into transmission housing.
2. Measure distance "A" between transmission housing surface and 25 x 35 mm thrust shim mounting surface on secondary gear shaft, and record measurement. See **Fig. 36** . Measure distance "B" between flywheel housing surface and bearing mounting surface in the housing, and record measurement. See **Fig. 37** .
3. Calculate 25 x 35 mm thrust shim thickness using following formula to ensure secondary gear shaft thrust clearance is 0-.006" (0-.15 mm): Distance "B" minus distance "A", minus bearing thickness of .067" (17 mm) plus flywheel housing gasket thickness of .020" (.50 mm). Shims are available in thickness range from .110" (2.80 mm) to .150" (3.80 mm) in increments of .004" (.10 mm).
4. Remove secondary gear shaft from transmission housing. Install selected 25 x 35 mm thrust shim on secondary gear shaft, then install bearing. See **SECONDARY GEAR SHAFT BEARING** under COMPONENT DISASSEMBLY & REASSEMBLY.



Sectional View

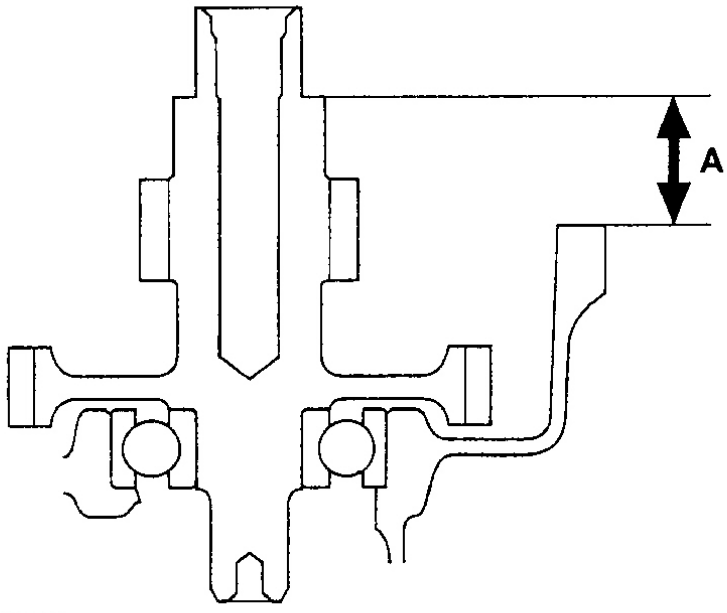
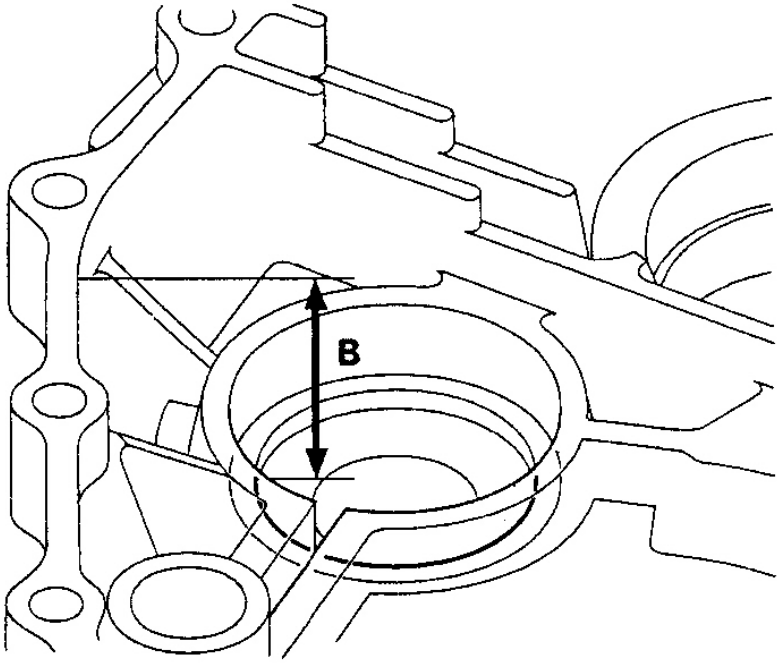


Fig. 36: Measuring Secondary Gear Shaft Distance "A"
Courtesy of AMERICAN HONDA MOTOR CO., INC.



Sectional View

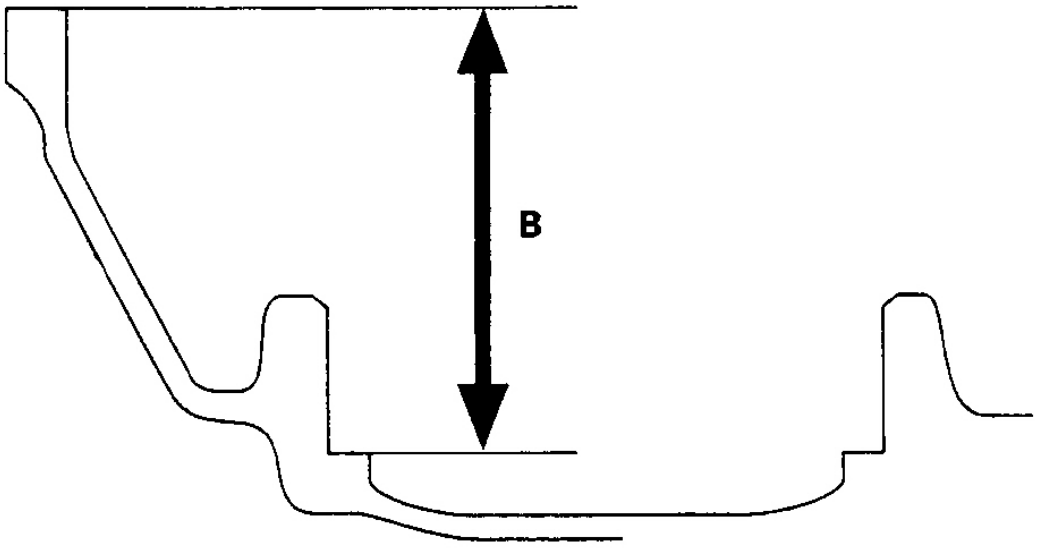
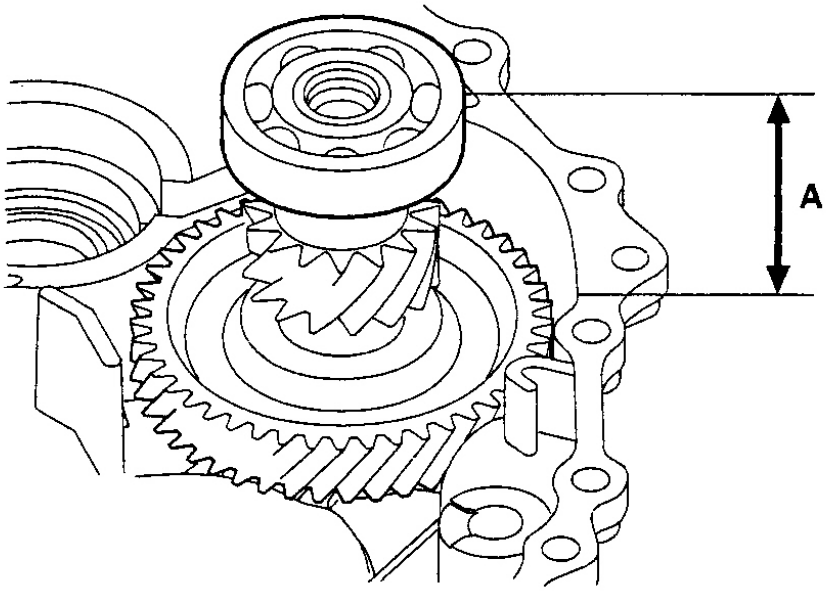


Fig. 37: Measuring Distance "B" Between Flywheel Housing Surface & Bearing Mounting Surface
Courtesy of AMERICAN HONDA MOTOR CO., INC.

SECONDARY GEAR SHAFT THRUST CLEARANCE

NOTE: Perform this procedure prior to transaxle reassembly. If transmission housing or flywheel housing was replaced, secondary gear shaft thrust clearance must be checked.

1. Install secondary gear shaft into transmission housing. Measure distance "A" between transmission housing surface and top of ball bearing, and record measurement. See **Fig. 38** . Measure distance "B" between the flywheel housing surface and ball bearing mounting surface in housing, and record measurement. See **Fig. 37** .
2. Calculate secondary gear shaft clearance using following formula to ensure secondary gear shaft thrust clearance is .020-.026" (.50-.65 mm): Measurement "A" minus measurement "B". Standard clearance includes using gasket thickness of .020" (.50 mm). If clearance is out of specification, adjust clearance by replacing 25 x 35 mm thrust shim. See **SECONDARY GEAR SHAFT 25 X 35 THRUST SHIM SELECTION** .



Sectional View

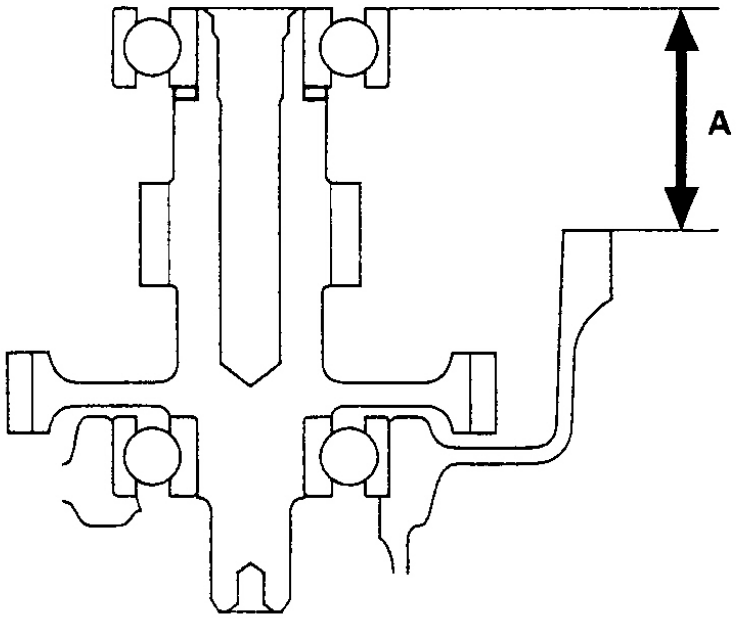


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Fig. 38: Measuring Secondary Gear Shaft Thrust Clearance Distance "A"
Courtesy of AMERICAN HONDA MOTOR CO., INC.

TRANSAXLE REASSEMBLY

NOTE: When PCM, transaxle assembly, start clutch assembly, lower valve body assembly or engine assembly are replaced, PCM must memorize feedback signal for start clutch control. Perform START CLUTCH CALIBRATION PROCEDURE under DESCRIPTION & OPERATION to calibrate start clutch after installing transaxle.

1. Install 8 x 50 mm ATF feed pipe in transmission housing. Install 10.9 x 39.6 mm AFT feed pipes (2) with NEW "O" rings in transmission housing. Install 2 dowel pins and NEW transmission housing gasket on transmission housing. See **Fig. 7** . Push control shaft assembly toward outside of transmission housing, then install intermediate housing.
2. Install manual valve body separator plate and 2 dowel pins on intermediate housing. Install manual valve body (4 bolts) with detent spring and bolt. Pull control shaft assembly back, then install roller on intermediate housing by aligning groove on control shaft. Install reverse brake piston with NEW "O" rings in intermediate housing.
3. Install spring retainer/return spring assembly (A) on reverse brake piston (C). See **Fig. 10** . Install return springs on spring guides of reverse brake piston. Install reverse brake spring compressor through the drive pulley shaft on reverse brake return spring. See **Fig. 9** .

CAUTION: If spring retainer tab is on reverse brake piston, spring retainer may be damaged. Ensure spring retainer tab is not on piston. See Fig. 8 .

4. Compress return springs, then install snap ring in intermediate housing above spring retainer. Ensure snap ring end gap is a minimum of .59" (15 mm). Soak reverse brake discs in ATF for a minimum of 30 minutes. Install disc spring on reverse brake piston in correct direction.
5. Starting with a reverse brake plate, alternately install reverse brake plate and discs. Install reverse brake end plate and snap ring in direction (A) shown. Ensure snap ring end gap is a minimum of .71" (18 mm), and inside diameter (B) of snap ring is 5.65" (143.5 mm). See **Fig. 39** .

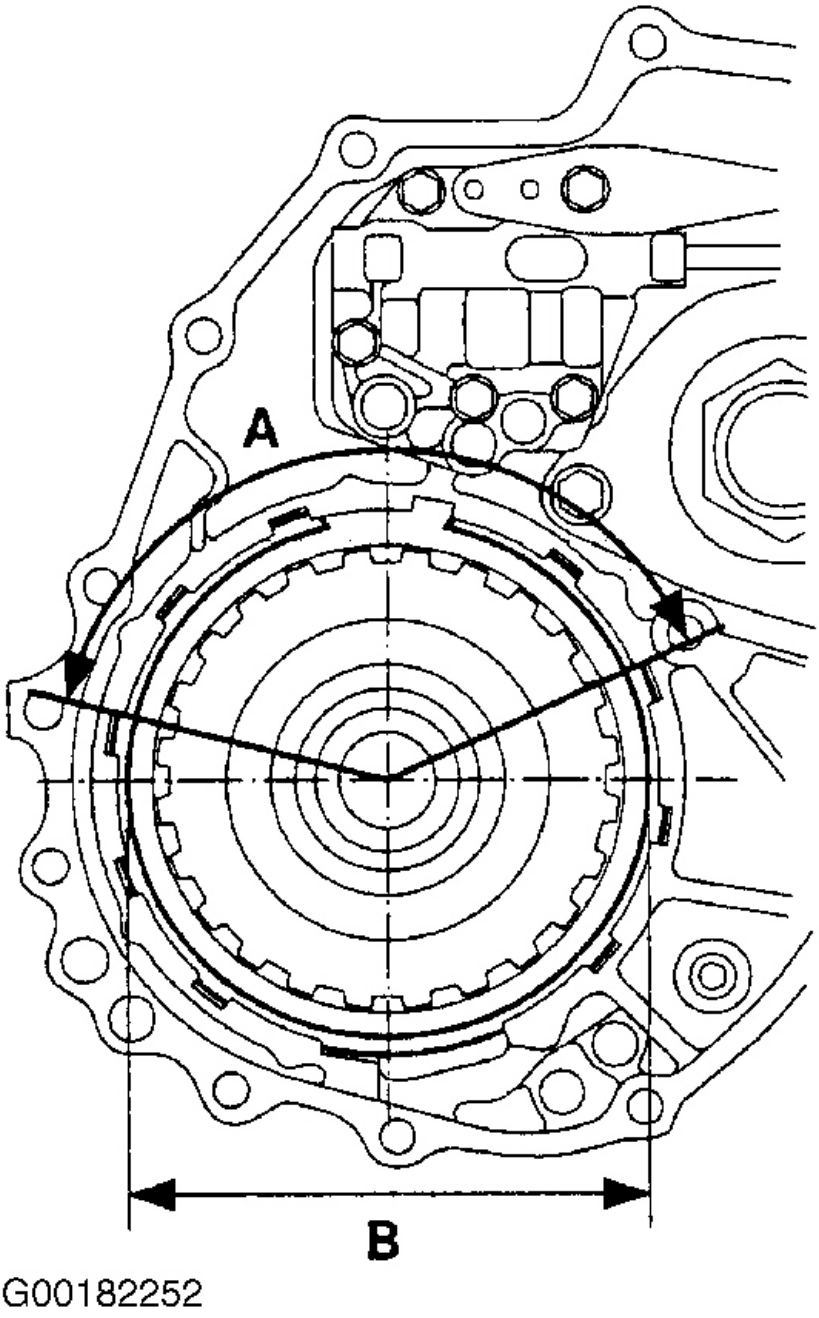

Fig. 39: Installing Reverse Brake Snap Ring
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Using a dial indicator, measure clearance between reverse brake end plate and top disc. See **Fig. 40** .
7. Zero dial indicator with reverse brake end plate lowered. Lift end plate up toward snap ring. Take

measurement in at least 3 places and use average as actual clearance. Clearance should be .022-.033" (.55-.85 mm).

8. If clearance is not as specified, remove reverse brake end plate and measure end plate thickness. Select and install NEW reverse brake end plate, then recheck clearance. End plate is available in thickness range from .142" (3.61 mm) to .200" (5.08 mm) in increments of .008" (.20 mm).

NOTE: If thickest reverse brake end plate is installed, but clearance is still over specification, replace reverse brake discs and plates.

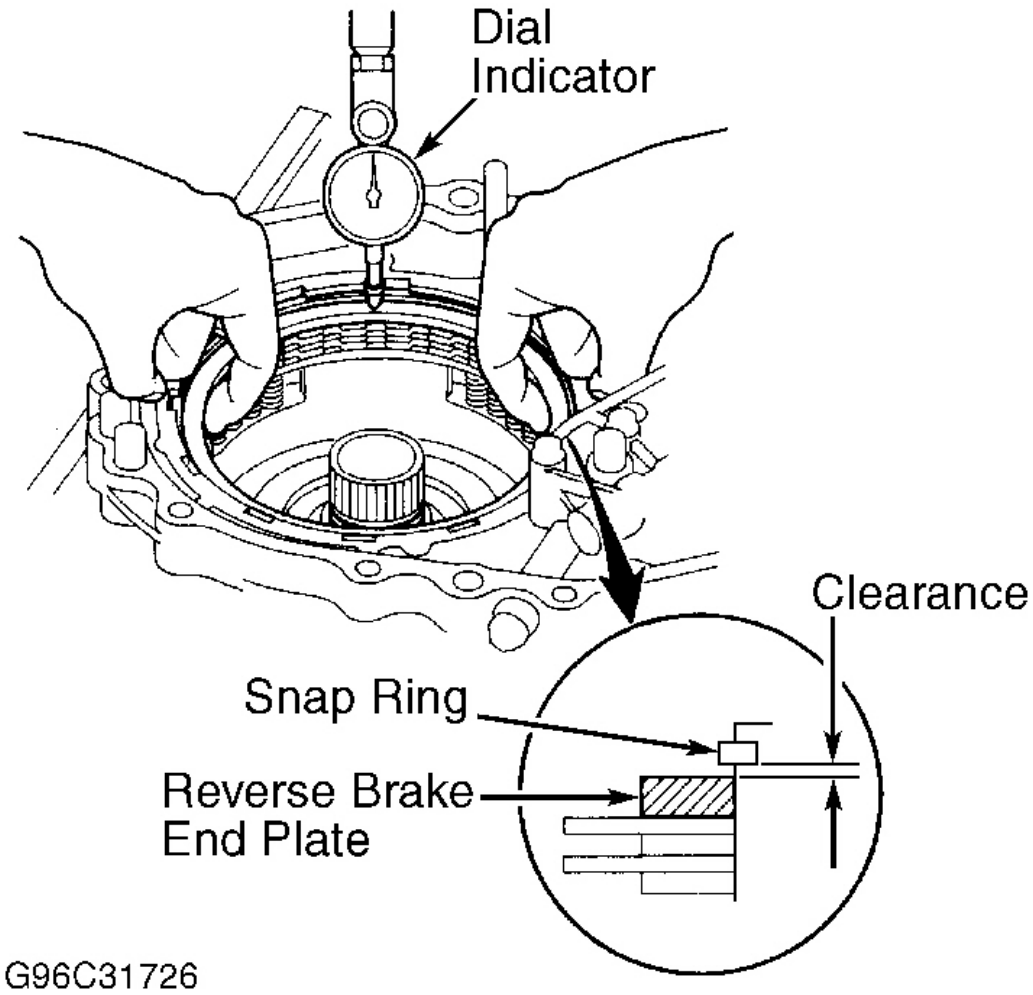

Fig. 40: Measuring Reverse Brake End Plate Clearance
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. After replacing reverse brake end plate, ensure clearance is within specification. Install snap ring retainer

on drive pulley shaft.

10. Wrap drive pulley shaft splines with tape to prevent damage to "O" rings. Install NEW "O" rings in drive pulley shaft grooves, then remove tape. Install forward clutch assembly on drive pulley shaft. Install snap ring. Ensure outside diameter of snap ring is 1.63" (41.4 mm) maximum. Install ring gear on forward clutch.
11. Install planetary carrier/input shaft assembly through drive pulley shaft while aligning sun gear to clutch discs and aligning planetary carrier to reverse brake discs. See **Fig. 7** .
12. Install manual valve body lines with NEW "O" rings on manual valve body and intermediate housing. Install ATF feed pipe with NEW "O" rings on manual valve body. Install 2 dowel pins and NEW end cover gasket on intermediate housing. See **Fig. 7** . Install NEW "O" rings on ATF feed pipes. Install end cover and bolts. Tighten bolts to specification. See **TORQUE SPECIFICATIONS** .
13. Install drive pulley speed sensor with NEW "O" ring. Install sealing ring (A) on NEW secondary drive gear (B). See **Fig. 41** . Install park pawl, pawl spring and pawl shaft on transmission housing. Move control lever to any gear position except "P" position.
14. Install secondary gear shaft with selected thrust shim into transmission housing. See **SECONDARY GEAR SHAFT 25 X 35 THRUST SHIM SELECTION** under ADJUSTMENTS. Wrap driven pulley shaft splines with tape to prevent damage to "O" rings. Install NEW "O" rings in shaft grooves, then remove tape. Assemble secondary drive gear assembly in start clutch assembly. See **Fig. 4** . Install both components on driven pulley shaft.
15. Pull handle of Start Clutch Installer (07TAE-P4V0130) up, then install tip of installer into driven pulley shaft hole. Set installer on start clutch. See **Fig. 42** . Push handle of installer, then tighten nut to seat secondary drive gear assembly on driven pulley shaft securely. See **Fig. 43** .
16. Pull handle of installer up and remove installer. Install 25.5 mm cotters to cotter groove on driven pulley shaft, then measure clearance between cotters and start clutch guide using a feeler gauge. See **Fig. 44** . Take measurement in at least 3 places and use average as actual clearance. Clearance should be 0-.005" (0-.13 mm).
17. If clearance is not as specified, remove cotters and measure their thickness. Select and install NEW cotters, then recheck clearance. Cotters are available in thickness range from .114" (2.90 mm) to .126" (3.20 mm) in increments of .004" (.10 mm). After replacing cotters, ensure clearance is within specification.

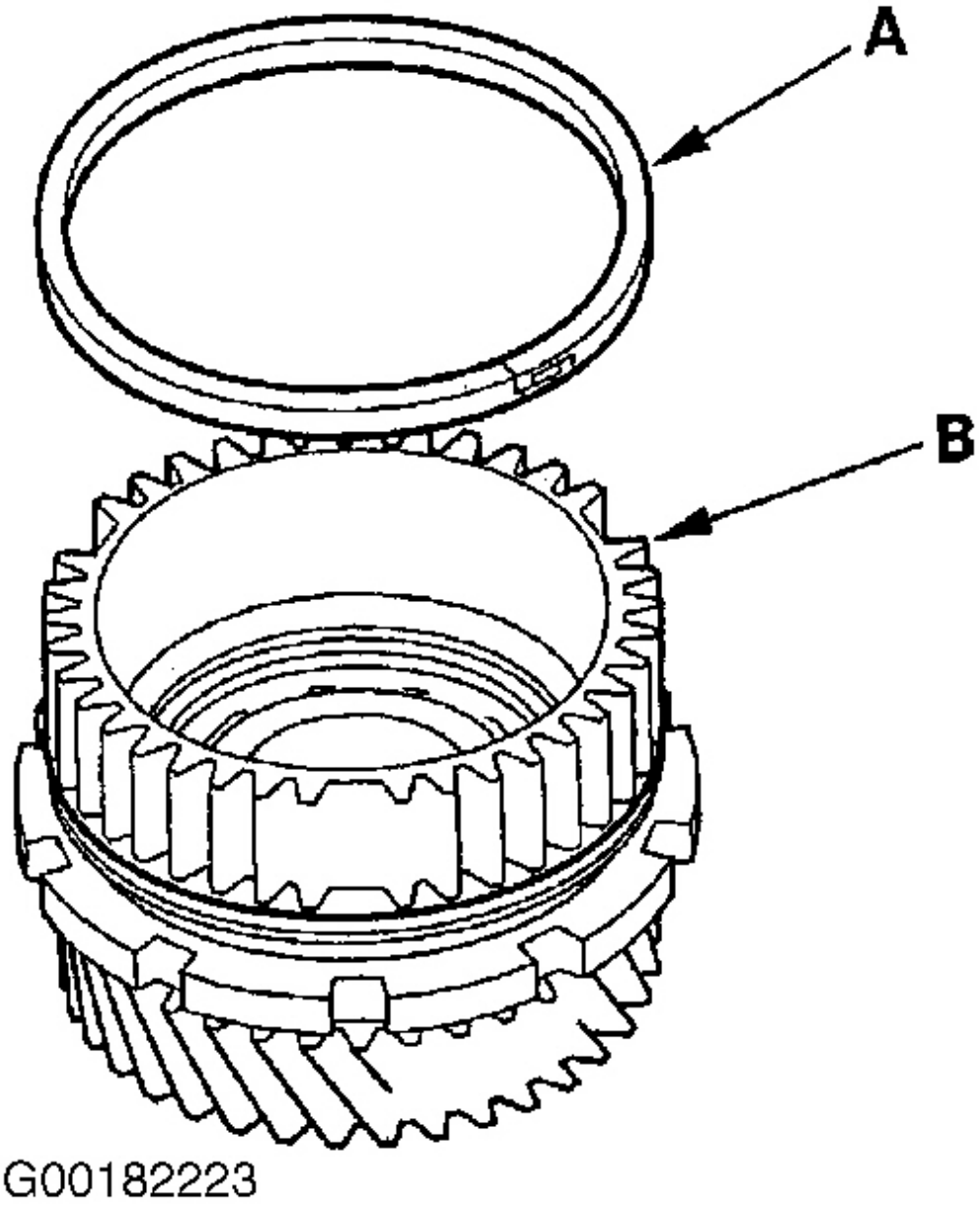

Fig. 41: Installing Sealing Ring On Secondary Drive Gear
Courtesy of AMERICAN HONDA MOTOR CO., INC.

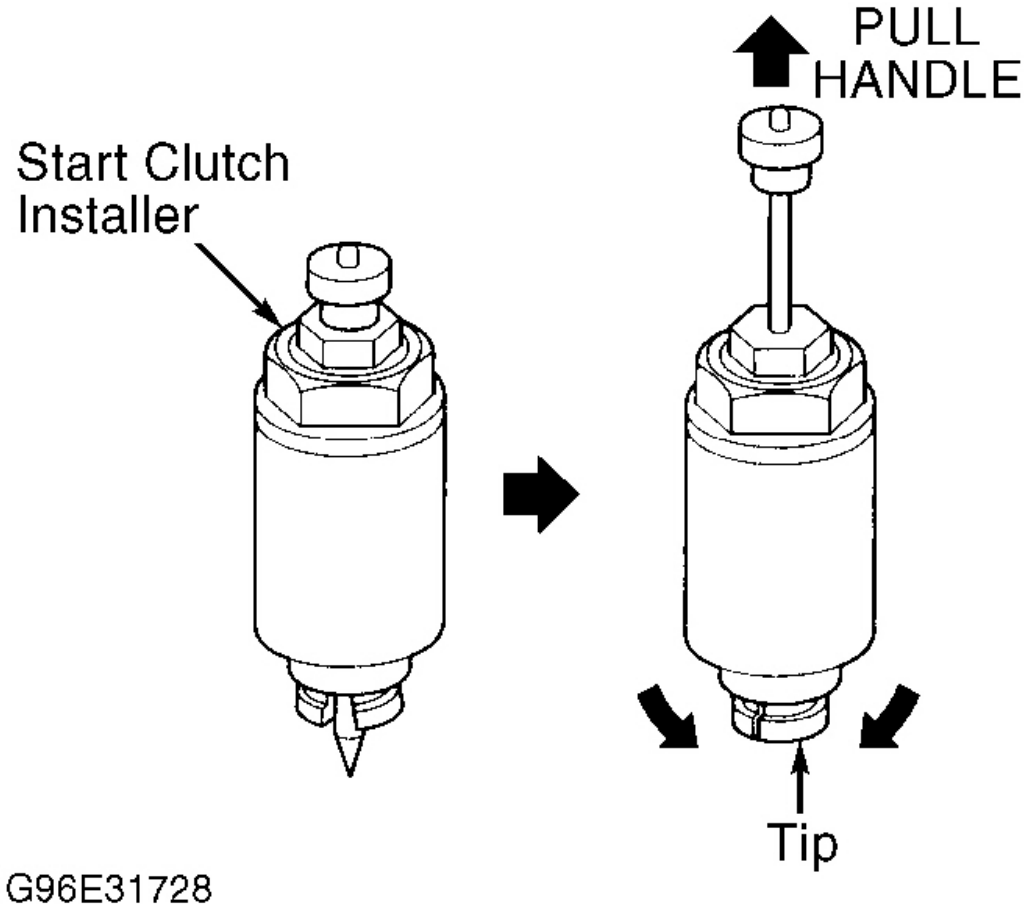

Fig. 42: Identifying Start Clutch Installer Components
Courtesy of AMERICAN HONDA MOTOR CO., INC.

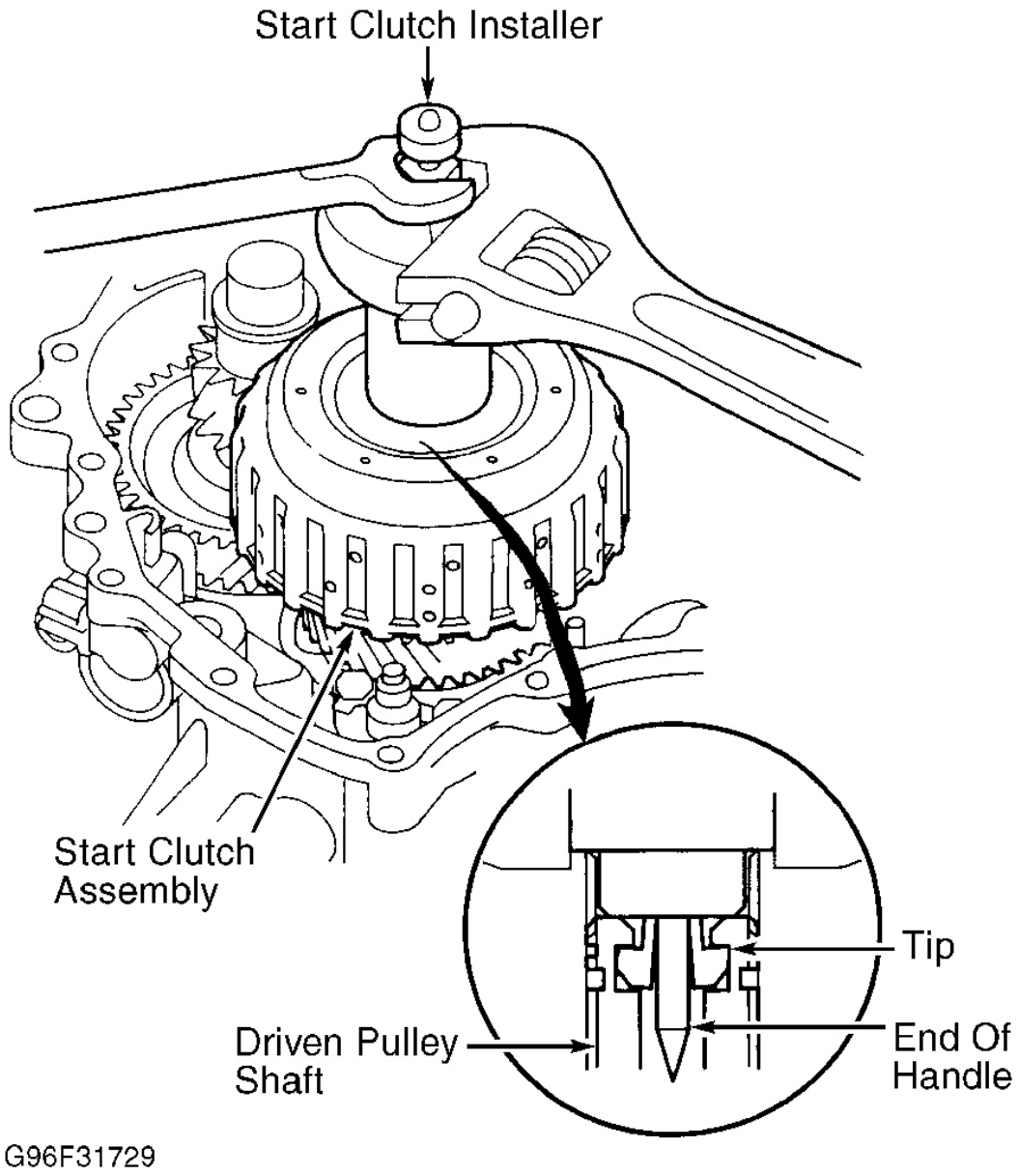

Fig. 43: Installing Start Clutch Assembly
Courtesy of AMERICAN HONDA MOTOR CO., INC.

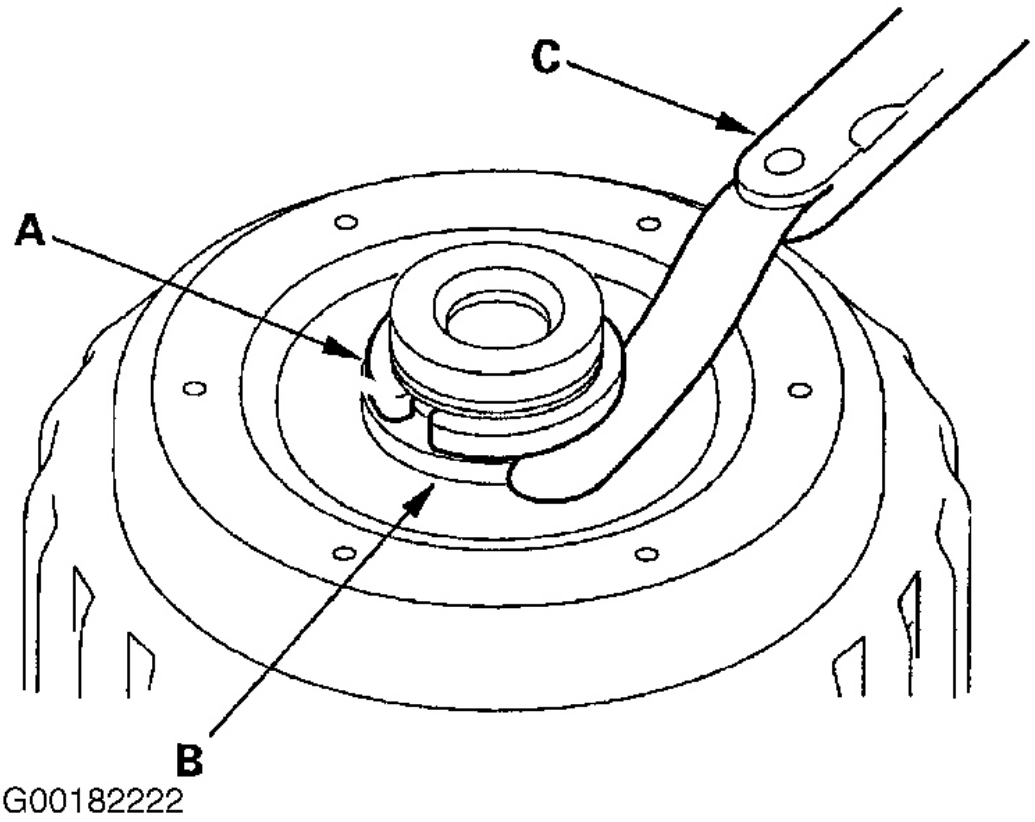

Fig. 44: Measuring Clearance Between Start Clutch Guide & Cotters
Courtesy of AMERICAN HONDA MOTOR CO., INC.

18. Install cotter retainer and snap ring. Ensure outside diameter of snap ring is 1.33" (33.9 mm) minimum. Install thrust washer, thrust needle bearing, thrust washer, oil pump drive sprocket hub and 22 x 28 mm thrust shim on input shaft. See **Fig. 4** . Install snap ring. Ensure outside diameter of snap ring is 1.04" (26.3 mm) maximum.
19. Measure clearance between 22 x 28 mm thrust shim and snap ring. See **Fig. 45** . Take measurement in at least 3 places and use average as actual clearance. Clearance should be .015-.026" (.37-.65 mm). If clearance is not as specified, remove thrust shim and measure shim thickness.

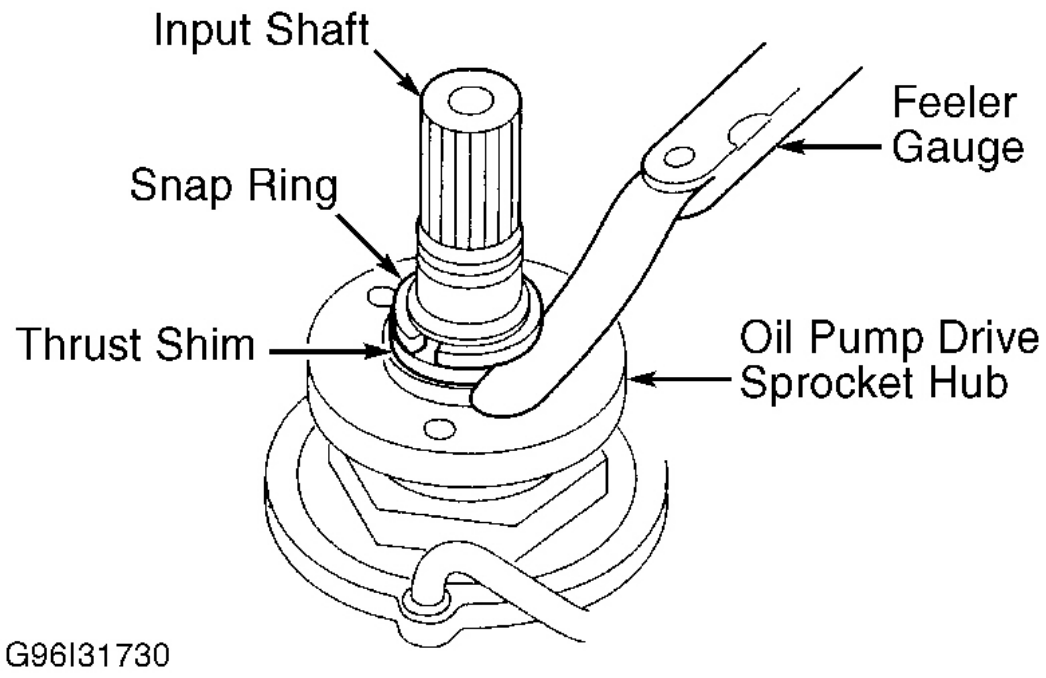

Fig. 45: Measuring Oil Pump Drive Sprocket Hub Thrust Shim-To-Snap Ring Clearance
Courtesy of AMERICAN HONDA MOTOR CO., INC.

20. Select and install NEW thrust shim, then recheck clearance. Thrust shims are available in thickness range from .045" (1.15 mm) to .095" (2.40 mm) in increments of .010" (.25 mm). After replacing thrust shims, ensure clearance is within specification and snap ring outside diameter is correct.
21. Install 22 x 10 mm ATF pipe (A) and 18 x 10 mm pipe (B) in transmission housing, then install NEW "O" rings (C) over ATF pipes. Install NEW oil pump body (D) with dowel pins (E). Do not pinch "O" rings. Install snap ring (F) in snap ring groove. See **Fig. 46** . Install oil pump drive sprocket on sprocket hub.

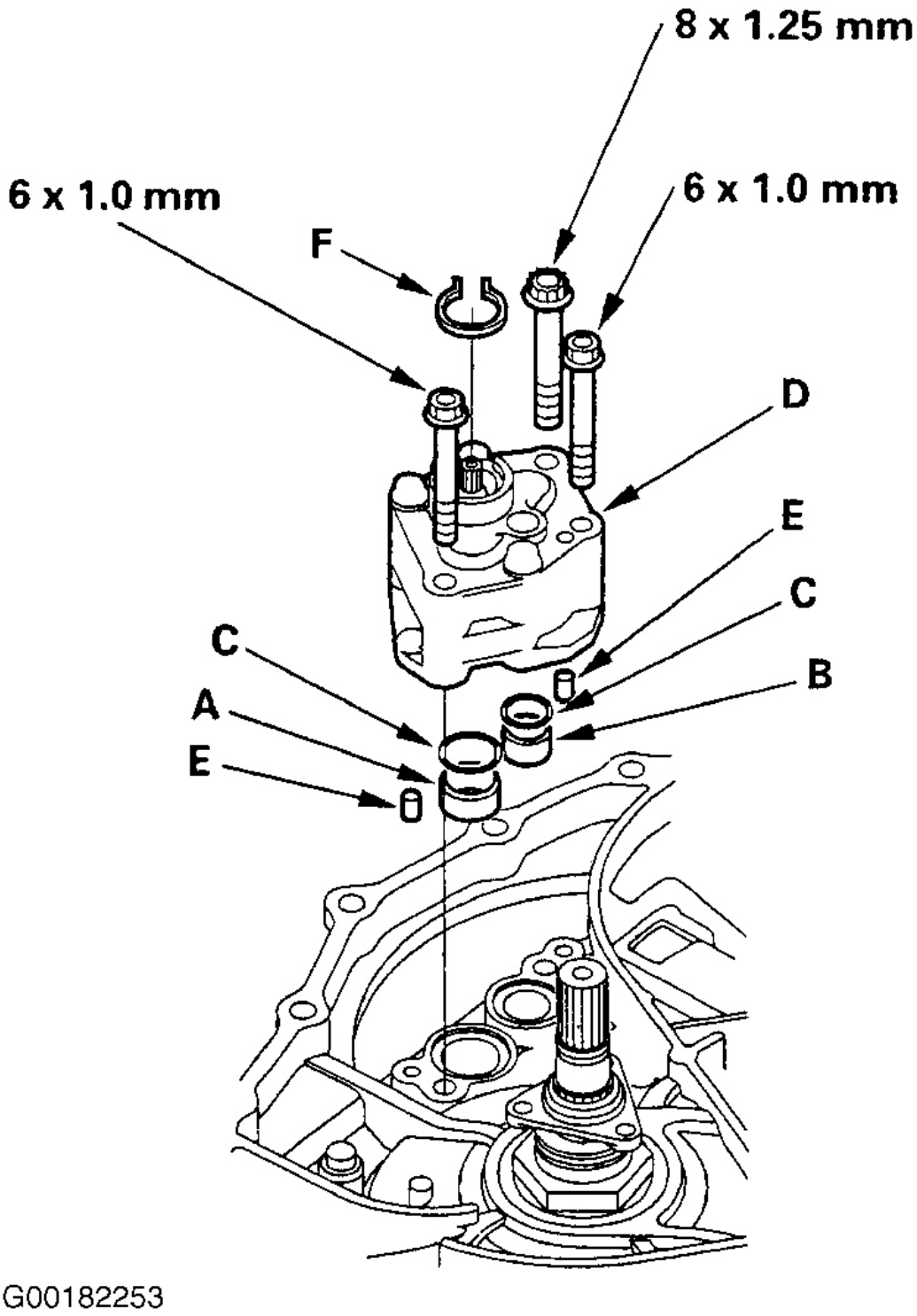

Fig. 46: Installing Oil Pump Body

Courtesy of AMERICAN HONDA MOTOR CO., INC.

22. Install oil pump drive chain on oil pump drive and driven sprockets. Install and tighten sprocket bolts to specification. See **TORQUE SPECIFICATIONS** . Install differential assembly. Install ATF feed pipe using NEW "O" rings into transmission housing. See **Fig. 4** .
23. Install 3 dowel pins and NEW flywheel housing gasket on transmission housing. Install NEW "O" ring over ATF feed pipe. Install flywheel housing and bolts. See **Fig. 4** . Tighten bolts to specification.
24. Install solenoid harness connector with NEW "O" ring. Install lower valve body assembly with oil feed pipes and 8 bolts. Install oil strainer with NEW "O" ring. Install oil pan with 2 dowel pins and NEW oil pan gasket. Install ATF cooler inlet line mounting bolt.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
End Cover Bolt	25 (34)
Flywheel Housing Bolt	19 (26)
Oil Pan Drain Plug	36 (49)
Oil Pump Assembly 8 mm Bolt	19 (26)
Pressure Plug	13 (18)
Ring Gear Bolt	72 (98)
	INCH Lbs. (N.m)
Control Lever Bolt	124 (14.0)
Detent Spring Bolt	106 (12.0)
Drive Pulley Speed Sensor Bolt	106 (12.0)
Flywheel-To-Drive Plate Bolt	106 (12.0)
Lower Valve Body Assembly Bolt	106 (12.0)
Lower Valve Body Assembly-To-Transmission Housing Bolt	106 (12.0)
Manual Valve Body Bolt	106 (12.0)
Oil Pan Bolt	106 (12.0)
Oil Pump Assembly 6 mm Bolt	106 (12.0)
Oil Pump Drive Sprocket Bolt	106 (12.0)
Oil Strainer Bolt	106 (12.0)
Solenoid Harness Bolt	106 (12.0)
Transmission Range Switch Bolt	106 (12.0)

TRANSAXLE SPECIFICATIONS

TRANSAXLE SPECIFICATIONS

Application	Specification - In. (mm)
Clearance	
Cotters-To-Start Clutch Guide	0-.005 (0-.13)

Flywheel Housing Set Ring-To-Outer Race	0-.006 (0-.15)
Forward Clutch	.024-.031 (.60-.80)
Oil Pump Drive Sprocket Hub	.015-.026 (.37-.65)
Reverse Brake	.022-.033 (.55-.85)
Secondary Gear Shaft Thrust	.020-.026 (.50-.65)
Secondary Gear Shaft Thrust Shim	0-.006 (0-.15)
Differential Pinion Gear Backlash	.002-.006 (.05-.15)
Snap Ring Diameter	
Cotter Retainer (Minimum)	1.33 (33.9)
Forward Clutch (Maximum)	1.63 (41.4)
Oil Pump Drive Sprocket Hub (Maximum)	1.04 (26.3)
Reverse Brake (Minimum)	5.65 (143.5)
Snap Ring End Gap	
Driven Pulley Shaft Bearing	0-.35 (0-9)
Forward Clutch	.31 (7.9)
Reverse Brake Clutch Drum (Minimum)	.71 (18)
Reverse Brake Piston (Minimum)	.59 (15)

CLUTCH DISC & PLATE QUANTITY

Component	Disc	Plate
Forward Clutch	2	2
Reverse Brake	2	2

