

1999 GENERAL SERVICING**Compressor Servicing****CALSONIC**

NOTE: Due to the variety of clutch and shaft seal configurations, obtain appropriate A/C compressor service tools for compressor being serviced.

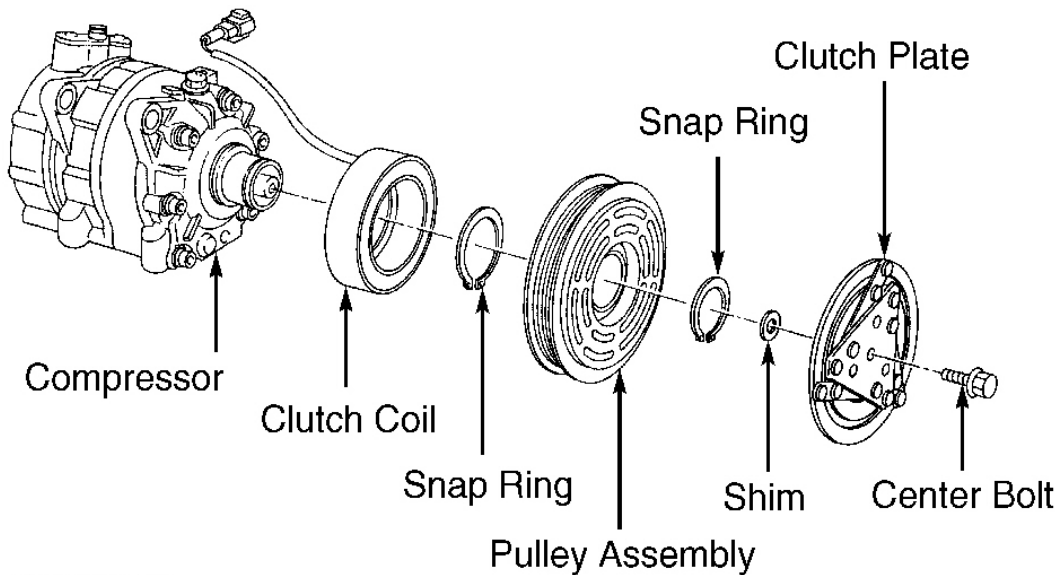
NOTE: Subaru recommends replacing compressor as an assembly if there is a clutch or compressor shaft seal failure.

CLUTCH COIL**Removal**

1. Using Clutch Disc Wrench (J-41260), remove clutch plate bolt. Using Clutch Disc Puller (J-38874), remove clutch plate. Insert clutch disc puller pins into clutch disc holes. Rotate holder clockwise to lock it into clutch disc. Tighten clutch disc puller center bolt and remove clutch disc plate and shims. Remove pulley assembly snap ring. See **Fig. 1**.
2. Using a 2-jaw puller, remove pulley assembly. Position puller jaws onto edge of pulley to prevent pulley groove from being deformed. Remove clutch coil harness clip, clutch coil snap ring, and clutch coil.

Installation

1. Ensure clutch disc and pulley contact surfaces are clean and free of excessive grooving and/or excessive heat damage. Check clutch coil for loose connection or cracked insulation. Replace components as necessary. Replace clutch disc and pulley assembly as a set.
2. Align clutch coil pin with hole in front head of compressor. Install clutch coil harness clip and clutch coil snap ring. Using hand press and Pulley Installer (J-41261), install pulley assembly. Install pulley assembly snap ring. Install original shim(s) and clutch disc. Using Clutch Disc Wrench (J-41260), install and tighten center bolt to 10 ft. lbs. (14 N.m). Ensure pulley turns smoothly.
3. Using a feeler gauge check clutch plate and pulley assembly air gap. Air gap should be 0.012-0.024" (0.30-0.60 mm). If air gap is incorrect, add or remove shims as necessary.
4. Install compressor and any other components. Evacuate and charge A/C system. Operate A/C system and engage and disengage A/C compressor clutch about 30 times to break in replacement clutch disc and pulley assembly.



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Fig. 1: Exploded View Of Compressor (Calsonic V6)

Courtesy of NISSAN MOTOR CO.

FORD FS-10 & HALLA FX-15

CLUTCH COIL

Removal

1. Hold clutch plate stationary and remove clutch plate center bolt. Remove clutch plate. If clutch plate cannot be removed by hand, use an 8 x 1.25-mm bolt threaded into clutch plate to remove clutch plate and shim(s). See [Fig. 2](#) . Mark position of clutch coil electrical connector.
2. Remove pulley snap ring and pulley assembly. Position appropriate shaft protector over compressor nose opening. Position jaws of a 2-jaw puller behind back edge of clutch coil. Position puller forcing screw on center of shaft protector and remove clutch coil from compressor.

Installation

1. Ensure clutch coil mounting surface is clean. Place clutch coil over compressor nose opening with clutch coil electrical connector correctly positioned. Position appropriate clutch coil installing adapter over compressor nose opening and inner radius of clutch coil.
2. Position forcing screw of puller on center of installing adapter. Position jaws of puller on rear side of compressor front mounts and tighten forcing screw. Ensure clutch coil bottoms against front head of compressor all around clutch coil outer diameter.
3. Install pulley assembly. Install snap ring with bevel side of snap ring facing out. Install shim(s) and clutch

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plate. Install a new clutch plate bolt and tighten to 97-123 INCH lbs. (11-14 N.m).

4. On Nissan Quest, install dial indicator at clutch plate and set to zero. Energize clutch coil and measure air gap between clutch plate and pulley. Air gap should be 0.020-0.033" (0.45-0.85 mm).
5. On Hyundai and Mazda, use a feeler gauge to check air gap between clutch plate and pulley at 3 places around pulley. On Hyundai, air gap should be 0.016-0.024" (0.41-0.61 mm).
6. On Mazda, air gap should be 0.014-0.033" (0.35-0.84 mm). On all models, if air gap is incorrect, add or remove shims as necessary.

SHAFT SEAL

Removal

1. Hold clutch plate stationary and remove clutch plate center bolt. Remove clutch plate. If clutch plate cannot be removed by hand, use an 8 x 1.25-mm bolt threaded into clutch plate to remove clutch plate and shim(s). See [Fig. 2](#).
2. Remove shaft seal felt from nose of compressor. Thoroughly clean seal area of compressor using low-pressure compressed air and a lint-free cloth. Remove compressor shaft seal internal snap ring. Position shaft seal remover over compressor shaft.
3. Push shaft seal remover downward against seal. Ensure end of shaft seal remover is engaged with inside of seal. Hold hex part of seal remover and rotate shaft seal remover handle clockwise to expand remover tip inside seal. Pull shaft seal from compressor.

Installation

1. Lubricate shaft seal protector and shaft seal with refrigerant oil. Install shaft seal on shaft seal protector so lip seal is toward compressor (large end of shaft seal protector).
2. Install shaft seal protector on compressor shaft. Using shaft seal installer, push shaft seal down seal protector until seal is seated.
3. Remove shaft seal installer and protector. Install a new shaft seal snap ring and shaft seal felt. Install shim(s) and clutch plate. Install a new clutch plate bolt and tighten to 97-123 INCH lbs. (11-14 N.m).
4. Use a feeler gauge to check air gap between clutch plate and pulley at 3 places around pulley. On Hyundai Accent, air gap should be 0.016-0.024" (0.41-0.61 mm).
5. On all other models, air gap should be 0.014-0.033" (0.35-0.84 mm). If air gap is incorrect, add or remove shims as necessary.

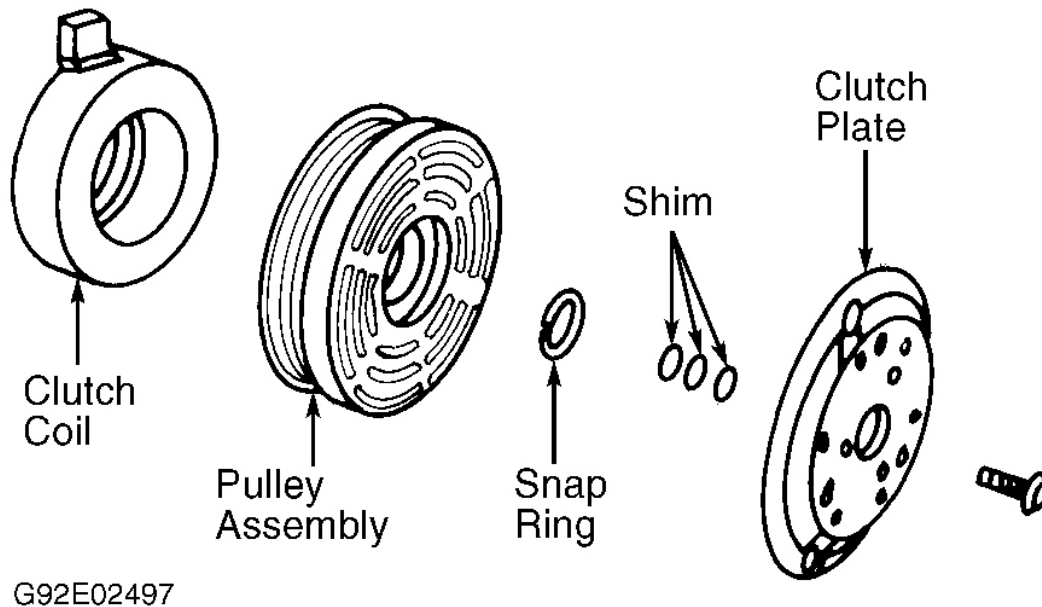


Fig. 2: Exploded View Of Compressor Clutch (Ford FS-10 Shown; Halla FX-15 Is Similar)
 Courtesy of MAZDA MOTORS CORP.

HARRISON HD6/HT6 6-CYLINDER

CLUTCH COIL & BEARING ASSEMBLY

CAUTION: DO NOT hammer on compressor shaft or clutch hub to remove clutch plate. Internal compressor damage will result.

Removal

1. Remove compressor from vehicle. Place compressor in Holding Fixture (J-33026). Using Clutch Plate/Hub Remover/Installer (J-33013-B), remove compressor clutch plate and hub. See **Fig. 3**.
2. Position remover/installer center screw forcing tip flat against compressor shaft and thread remover/installer into hub. End of shaft will be damaged if forcing tip is not flat. Hold remover/installer body and turn center screw into remover/installer body and remove clutch plate and hub. Remove shaft key from compressor shaft.
3. Remove snap ring. Install Pulley/Bearing Puller Guide (J-33023-A) on front head. Position Pulley/Bearing Puller (J-41552) into inner circle of slots on pulley. Turn puller clockwise until engaged in pulley slots. Tighten puller screw against puller guide until pulley is removed.
4. Disconnect clutch coil connector. Scribe match marks on compressor and clutch coil connector for installation reference. Install Puller Pilot Adapter (J-33023-A) on front head of compressor. Install Puller Crossbar (J-8433-1), Puller Legs (J-33025), and Forcing Screw (J-8433-3). Tighten puller forcing screw

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against pilot adapter and remove clutch coil. See **Fig. 3** .

Installation

1. Align clutch reference marks made during removal. Position Clutch Coil Installer (J-33024) over internal opening of clutch coil housing and align with front head of compressor. Position Puller Crossbar (J-8433-1) and Through-Bolts (J-33026) so Forcing Screw (J-8433-3) is centered in clutch coil installer center hole. Ensure through-bolts are fully threaded into holding fixture.
2. Tighten forcing screw against installer to press clutch coil onto compressor front head. Ensure clutch coil and installer stay aligned during installation. When clutch coil is fully seated on front head, stake front head and clutch coil. Using a 1/8" (3.2 mm) punch, stake clutch coil inner ring in 3 places, 120 degrees apart. Stake size should be 1/2 the area of punch tip and 0.010-0.015" (0.28-0.38 mm) deep.
3. Position Pulley/Bearing Installer (J-33017) and Pulley/Bearing Puller Guide (J-33023-A) over inner race of pulley bearing. Position Puller Crossbar (J-8433-1) and Through-Bolts (J-33026) so Forcing Screw (J-8433-3) is centered over puller guide. Ensure through-bolts are fully threaded into holding fixture.
4. Tighten forcing screw against puller guide to press pulley and bearing assembly onto front head of compressor. Ensure puller guide and front head of compressor stay aligned during installation. Install snap ring.
5. Install shaft key into clutch plate and hub. Ensure shaft key protrudes about 1/8" (3.2 mm) out of keyway. Ensure friction surfaces of clutch plate and pulley are clean. Ensure shaft key and keyway in hub are aligned and position clutch plate and hub onto compressor shaft.
6. Install Clutch Plate/Hub Remover/Installer (J-33013-B) with forcing screw in installation position. Body of remover/installer should be backed off from hub enough to allow forcing screw to be threaded onto compressor shaft.
7. Hold forcing screw and tighten installer body to press hub onto compressor shaft. Before pressing clutch plate and hub to final position, remove installer and ensure shaft key is still in keyway. Continue pressing clutch plate and hub until air gap between friction surfaces is 0.020-0.030" (0.51-0.76 mm).

CAUTION: When installing clutch plate and hub, if forcing screw is fully threaded onto end of compressor shaft or installer body is held and forcing screw is rotated, the shaft key will bind and break the clutch hub.

SHAFT SEAL

NOTE: It is not necessary to replace compressor shaft seal because of small amounts of refrigerant oil seepage. Replace compressor shaft seal when a refrigerant leak is detected.

Removal

1. Discharge A/C system, using approved refrigerant recovery/recycling equipment. Loosen and reposition compressor in mounting bracket. Remove clutch plate and hub assembly. See **CLUTCH COIL & BEARING ASSEMBLY** . See **Fig. 3** .
2. Remove shaft seal snap ring. Thoroughly clean all surfaces around seal including inside of compressor neck and exposed parts of seal, snap ring groove, and compressor shaft. Insert shaft Seal

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Remover/Installer (J-23128-A) into shaft seal. Hand-tighten seal remover/installer handle clockwise to seat inside seal. Remove shaft seal by turning and pulling seal remover/installer.

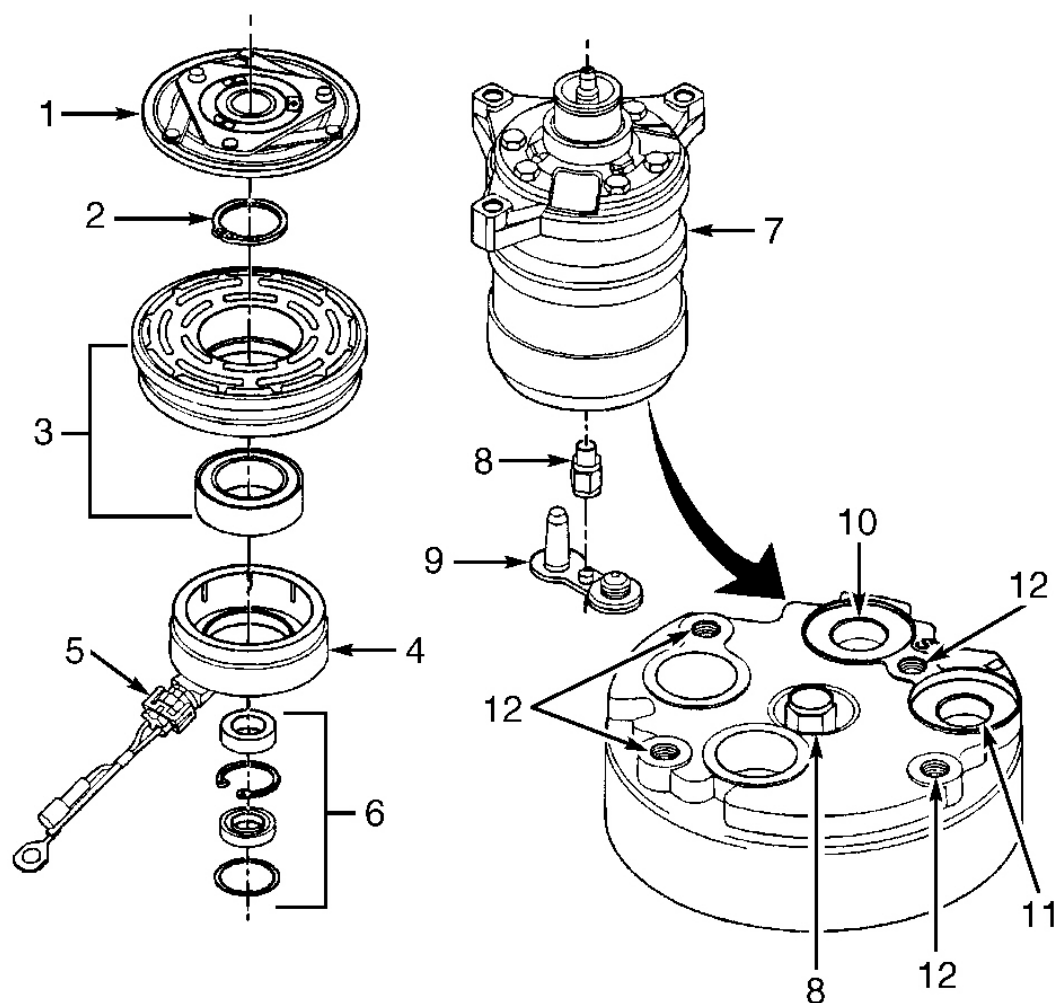
3. Using "O" Ring Remover (J-9553-01), remove "O" ring. Ensure shaft and inside of compressor neck are clean and free of foreign material. Thoroughly clean "O" ring groove in front head.

Installation

1. Lubricate new "O" ring with refrigerant oil and install using "O" Ring Installer (J-33011). Expand seal using shaft "O" ring installer. Insert installer into compressor until it bottoms. Move slide on installer downward until "O" ring is released into lower groove. Rotate installer to seat "O" ring and remove installer.
2. Lubricate shaft seal with refrigerant oil. Install shaft seal onto Seal Remover/Installer (J-23128-A). Install shaft seal so flared side of lip seal is installed toward compressor. Install Seal Protector (J-34614) into shaft seal lip and position seal protector over compressor shaft.
3. Push shaft seal into compressor using a rotary motion until seal bottoms. Use care to not move "O" ring. Remove installer. Install new snap ring with flat side against seal. Using seal remover/installer, push snap ring into snap ring groove. Clean excess refrigerant oil from compressor shaft and neck. Install clutch plate and hub assembly onto compressor shaft. See **CLUTCH COIL & BEARING ASSEMBLY** .

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- 1. Clutch Plate & Hub
- 2. Snap Ring
- 3. Pulley & Bearing Assembly
- 4. Clutch Coil Assembly
- 5. Clutch Coil Connector
- 6. Shaft Seal Components

- 7. Compressor
- 8. High-Pressure Relief Valve
- 9. Shipping Cap
- 10. Suction Port
- 11. Discharge Port
- 12. Mounting Boss

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Fig. 3: Exploded View Of Compressor (Harrison HD6/HT6 6-Cyl.)
Courtesy of ISUZU MOTOR CO.

HARRISON V7 7-CYLINDER

CLUTCH COIL & BEARING ASSEMBLY

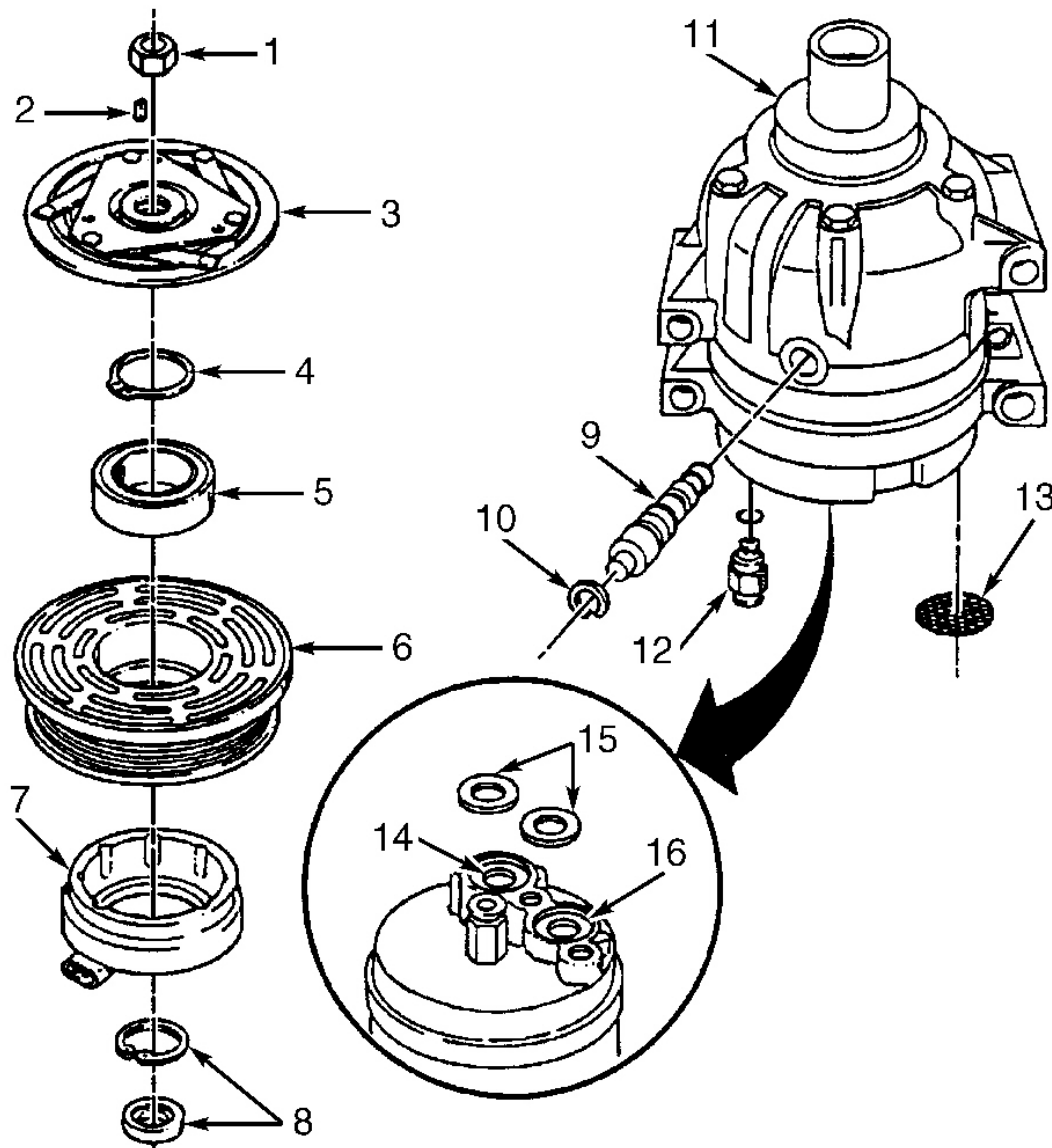
CAUTION: DO NOT hammer on compressor shaft or clutch hub to remove clutch plate. Internal compressor damage will result.

Removal

1. Remove compressor from vehicle. Place compressor in Holding Fixture (J-41790). Use Clutch Plate Spanner (J-33027) to hold clutch plate. Remove compressor shaft nut.
2. Use Clutch Plate Remover/Installer (J-33013-B) to remove compressor clutch plate and hub. See **Fig. 4** . Hold remover body and turn center screw into remover body to remove clutch plate and hub. Ensure forcing tip on remover/installer center screw is flat or end of shaft/axial plate will be damaged. Remove key from compressor shaft.
3. Remove snap ring. Install Puller Pilot/Guide (J-33023-A) on front head. Position Pulley and Bearing Puller (J-41552) into inner circle of slots on pulley. Turn puller clockwise in slots to engage puller tangs with pulley. Tighten puller forcing screw against puller pilot/guide and remove pulley.
4. Disconnect clutch coil lead. Scribe marks on compressor and clutch coil for installation reference. Install Puller Pilot/Guide (J-33023-A) on front head. Remove clutch coil using puller pilot/guide and 2-jaw puller. Position puller jaws under edge of clutch coil.

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- 1. Nut
- 2. Key
- 3. Clutch Plate
- 4. Snap Ring
- 5. Pulley Assembly Bearing
- 6. Pulley Assembly
- 7. Clutch Coil
- 8. Snap Ring Shaft Seal

- 9. Compressor Control Valve
- 10. Snap Ring
- 11. Compressor
- 12. High-Pressure Relief Valve
- 13. Suction Port Filter Screen
- 14. Suction Port
- 15. Seal Washer
- 16. Discharge Port

Fig. 4: Exploded View Of Compressor (Harrison V7 7-Cyl.)
Courtesy of GENERAL MOTORS CORP.

Installation

1. Align reference marks made during removal. Using Puller Adapter (J-33024) and 2-jaw puller, press clutch coil onto compressor. Position puller jaws under compressor mounting bosses. Ensure clutch coil and installer stay lined up during installation.
2. Position pulley on compressor. Place Bearing Installer (J-33017) and Clutch Plate Remover/Installer (J-33013-B) over inner race of bearing. Place Adapter (J-42126) onto remover/installer and reposition center forcing screw into the opposite end of the remover/installer.
3. Back body of remover/installer off enough to allow center forcing screw to be threaded onto end of compressor shaft several turns. Hold center forcing screw while turning hex portion of remover/installer several turns. **DO NOT** allow center forcing screw to turn. Continue turning remover/installer until pulley bearing is pressed onto compressor enough to clear snap ring groove. Install snap ring with chamfer side facing up. Install key in clutch plate, allowing key to protrude about 1/8" (3.2 mm) from rear of clutch plate.
4. Install clutch plate on compressor shaft. Hold center forcing screw and turn hex portion of remover/installer several turns to press clutch plate onto compressor. Remove remover/installer and ensure key is still in keyway. Reinstall remover/installer and check air gap before installing clutch plate to its final position. Air gap between friction surfaces should be 0.015" (0.38 mm). Using spanner, install compressor shaft nut. Tighten shaft nut to 13 ft. lbs. (18 N.m). Check components for proper rotation.

SHAFT SEAL

Removal

1. Discharge A/C system, using approved refrigerant recovery/recycling equipment. Remove compressor from vehicle. Remove clutch plate and hub assembly. See **CLUTCH COIL & BEARING ASSEMBLY** . See **Fig. 4** .
2. Remove shaft seal snap ring. Ensure all surfaces around seal are clean. Insert Shaft Seal Remover/Installer (J-42136) into shaft seal. Rotate handle clockwise to seat seal remover/installer in seal. Remove shaft seal. Ensure shaft and inside of compressor neck are clean and free of foreign material. Thoroughly clean "O" ring groove in front head.

Installation

1. Install Shaft Seal Protector (J-34614) over compressor shaft. With shaft seal protector in place, lubricate shaft seal with refrigerant oil and install on to Shaft Seal Remover/Installer (J-34614).
2. Push shaft seal into compressor using a rotary motion until seal bottoms. Install new snap ring with flat side against seal. Install clutch plate and hub assembly onto compressor shaft. See **CLUTCH COIL & BEARING ASSEMBLY** .

KEIHIN SCROLL

NOTE: **If compressor shaft seal leaks, replace compressor.**

CLUTCH COIL

Removal

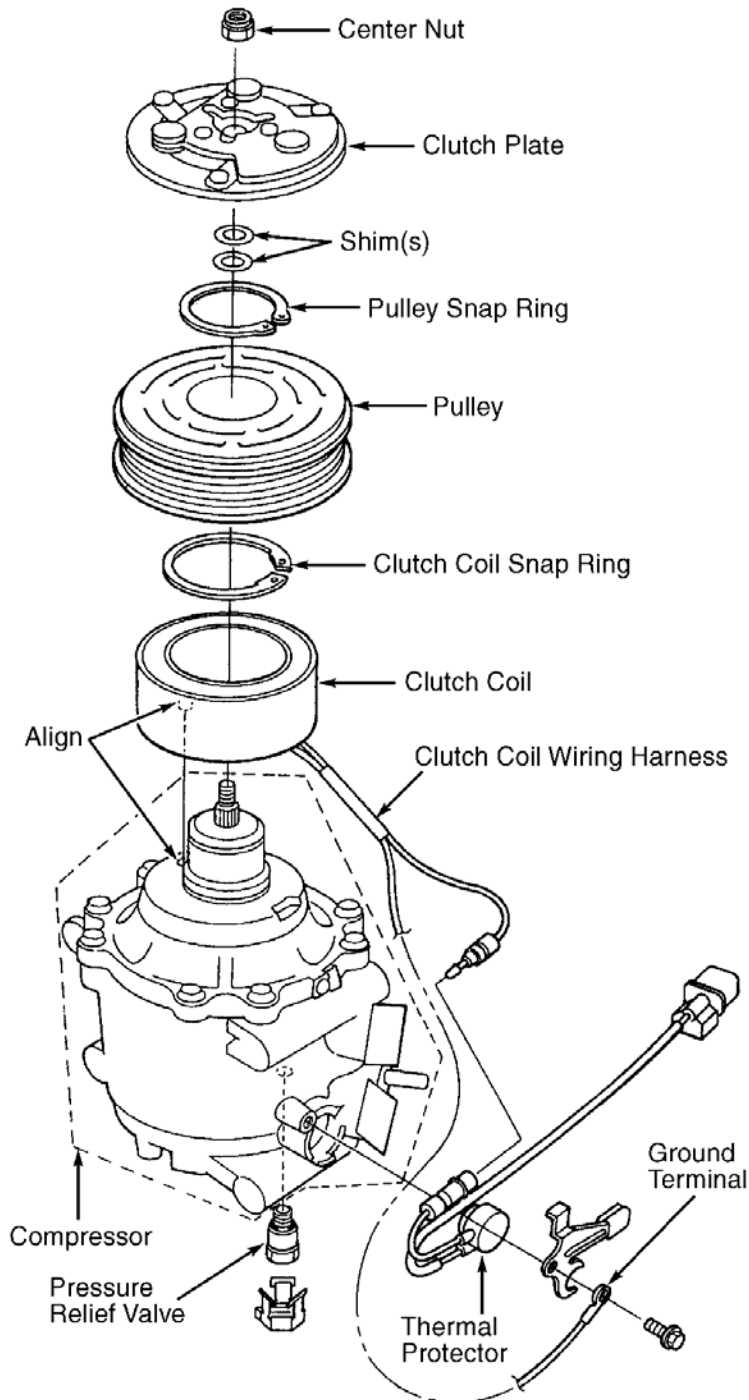
Hold clutch plate and remove shaft bolt. Remove clutch plate and adjustment shim(s). See **Fig. 5** . Remove pulley snap ring and discard. Position universal 2-jaw puller to back of pulley and Driver Adapter (07947-6340300) to center of pulley. If puller jaws are located on belt area, pulley will be damaged. Remove pulley. Remove clutch coil snap ring and discard. Disconnect clutch coil wiring harness and remove clutch coil.

Installation

1. Install clutch coil in reverse order of removal. Ensure wire side is facing down and pin on clutch coil boss is aligned with hole in compressor housing. Ensure snap ring is properly seated. Properly route and connect clutch coil wiring harness.
2. Install shims the same thickness as originally removed. Position pulley over clutch coil. Using Hub Guide (07965-6920500), press pulley onto compressor boss. Maximum press load is 5690 psi (400 kg/cm²) or 882 lbs. (400 kg). If pulley does not press on straight, remove pulley and inspect pulley and compressor boss for damage or burrs.
3. Hold clutch plate and tighten shaft nut to 13 ft. lbs. (18 N.m). Ensure air gap between clutch plate and pulley is 0.014-0.026" (0.35-0.65 mm). If air gap is incorrect, add or remove shim(s) as necessary.

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Fig. 5: Exploded View Of Compressor (Keihin Scroll)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

NIPPONDENSO

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NOTE: Due to the variety of clutch and shaft seal configurations, obtain appropriate A/C compressor service tools for compressor being serviced. Land Rover and Jaguar compressor servicing procedures are not available from manufacturer.

CLUTCH COIL

Removal (Acura, BMW, Honda & Isuzu)

On Acura and Honda, using Clutch Plate Holder (J-37872), hold clutch plate stationary and remove compressor shaft bolt. On BMW, using Clutch Plate Holder (64-5-090), hold clutch plate stationary and remove compressor shaft bolt. On all models, remove clutch plate and shims. Remove snap ring and pulley. Remove clutch coil wiring harness from compressor. Remove snap ring and clutch coil. See **Fig. 6** , **Fig. 7** or **Fig. 8** .

Installation

1. To install, reverse removal procedure. Use NEW snap rings. Ensure snap rings are installed with beveled side facing out and fully seated in snap ring groove. Install clutch coil with wire facing downward. Apply thread lock to compressor shaft bolt. Tighten shaft bolt to 117 INCH lbs. (13 N.m).
2. On Acura and Honda, ensure air gap between clutch plate and pulley is 0.014-0.026" (0.36-0.66 mm). On BMW, ensure air gap between clutch plate and pulley is 0.020-0.031" (0.50-0.80 mm). If air gap is incorrect, add or remove shim(s) as necessary.

Removal (Mazda Miata)

1. Hold clutch plate using Clutch Holder (00007-10331) and remove shaft bolt. Install Clutch Disc Remover (4992-02-020) and remove clutch plate and shim(s). See **Fig. 6** , **Fig. 7** or **Fig. 8** .
2. Remove pulley snap ring and tap pulley (with bearing) off of compressor. Remove screw for clutch coil lead. Mark position of clutch coil. Remove clutch coil snap ring and clutch coil.

Installation

To install, reverse removal procedure. Tighten shaft bolt to 97-142 INCH lbs. (11-16 N.m). Ensure pulley-to-clutch plate clearance is 0.014-0.025" (0.35-0.64 mm). If clearance is incorrect, add or remove shim(s) as necessary.

Removal (Mercedes-Benz & Mitsubishi)

1. Hold clutch plate stationary. Remove clutch plate center bolt and clutch plate. If clutch plate cannot be removed by hand, tighten an 8-mm or 10-mm bolt into clutch plate center bolt hole to remove clutch plate.
2. Remove shim(s) and pulley snap ring from compressor shaft. Tap pulley using a plastic hammer and remove pulley from compressor shaft. See **Fig. 6** , **Fig. 7** or **Fig. 8** . Remove retaining screw for clutch coil lead. Remove clutch coil snap ring and clutch coil.

Installation

1. To install, reverse removal procedure. Ensure clutch coil pin is aligned with hole in compressor housing.

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Ensure clutch coil lead is positioned properly. Ensure snap rings are installed with beveled side facing out. Tighten shaft bolt to 10-13 ft. lbs. (14-17 N.m).

2. Check air gap between clutch plate and pulley. Position dial indicator on clutch plate. Energize clutch coil and zero dial indicator. De-energize clutch coil and measure air gap (clutch plate movement). Ensure air gap between clutch plate and pulley is 0.014-0.026" (0.35-0.65 mm). If air gap is incorrect, add or remove shim(s) as necessary. Ensure pulley rotates freely.

Removal (All Others)

1. Hold clutch plate stationary, and remove clutch plate center nut or bolt. On Lexus and Toyota, remove clutch plate using Clutch Plate Remover (07112-66040). On other models, remove clutch plate using a 2-jaw or 3-jaw puller.
2. On all models, remove shim(s) and pulley snap ring. See **Fig. 6** , **Fig. 7** , or **Fig. 8** . Tap pulley off compressor shaft using a plastic hammer. If pulley cannot be removed, use a 2-jaw or 3-jaw puller. Position puller jaws onto edge of pulley to prevent pulley groove from being deformed. Disconnect clutch coil lead. Remove clutch coil snap ring and clutch coil.

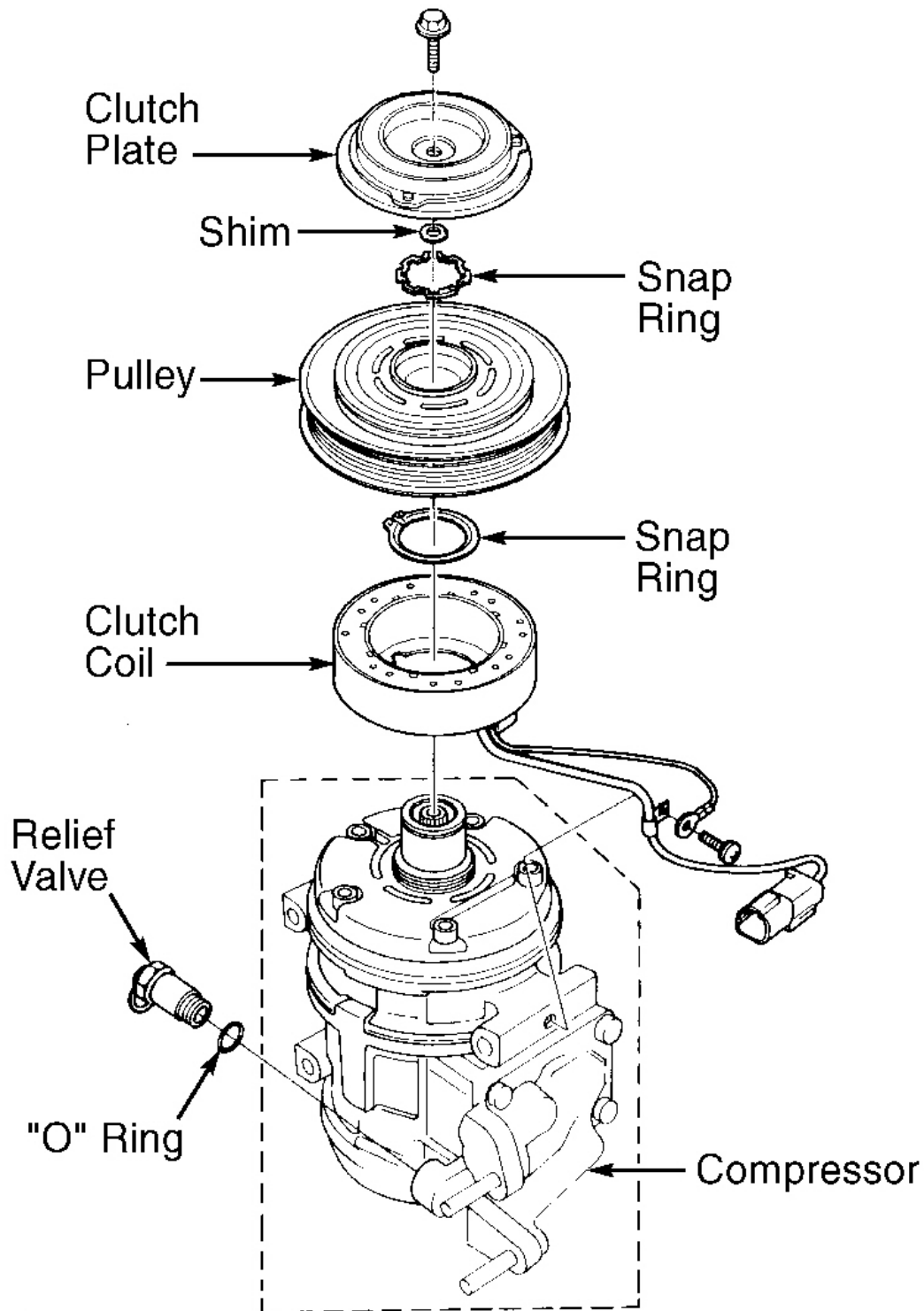
Installation

1. To install, reverse removal procedure. Ensure clutch coil is positioned correctly. Ensure new snap rings are installed with beveled side facing out. On Lexus and Toyota, tighten clutch plate center bolt to 115 INCH lbs. (13 N.m). On all other models, tighten shaft bolt (or nut) to 11-15 ft. lbs. (15-20 N.m).
2. On Lexus and Toyota, ensure air gap between clutch plate and pulley is 0.014-0.026" (0.35-0.65 mm). On all other models, ensure air gap between clutch plate and pulley is 0.016-0.024" (0.41-0.61 mm). On all models, if air gap is incorrect, add or remove shim(s) as necessary.

NOTE: **On some compressors, it is necessary to use a dial indicator on clutch plate to check air gap. Energize clutch coil and zero dial indicator. De-energize clutch coil and measure air gap. Ensure air gap is as specified.**

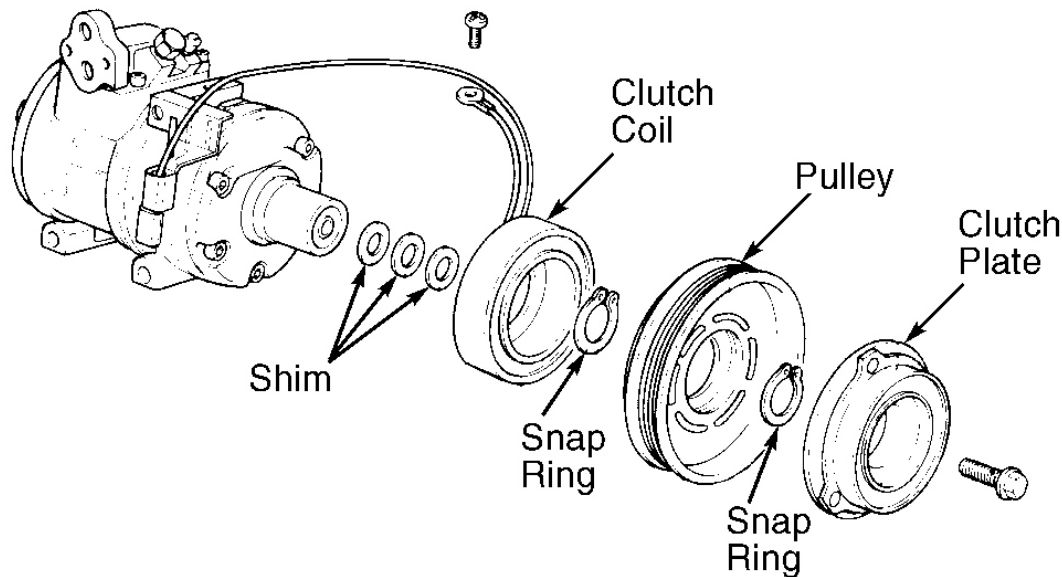
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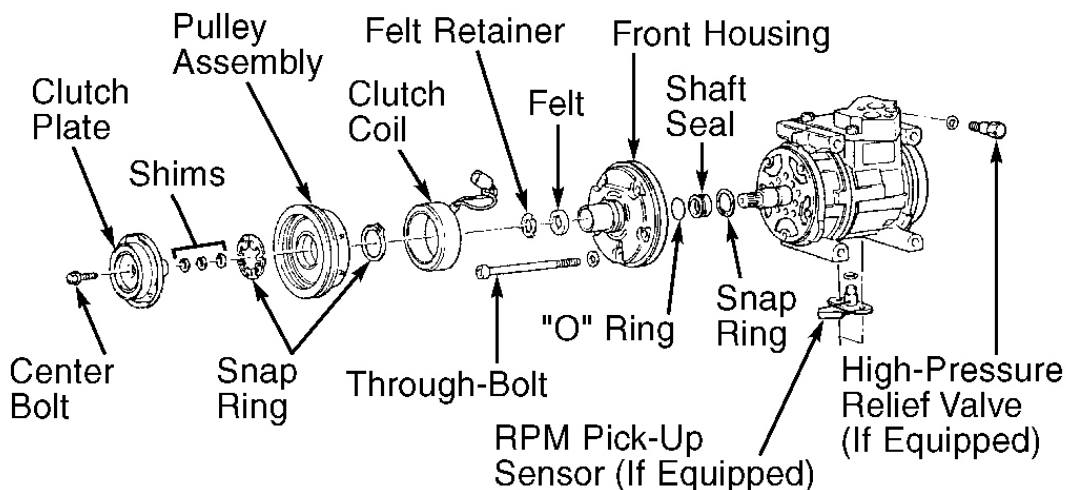
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Fig. 6: Exploded View Of Compressor (Nippondenso 10-Cyl. - Honda Shown; Others Are Similar)
 Courtesy of AMERICAN HONDA MOTOR CO., INC.



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Fig. 7: Exploded View Of Compressor (Nippondenso 10PA17C 10-Cyl.)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



G98C04103

Fig. 8: Exploded View Of Compressor (Nippondenso 10PA17C 10-Cyl. Shown; 10PA15 & 10PA20 Are

Similar)

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

SHAFT SEAL

NOTE: Most manufacturers does not provide compressor shaft seal replacement procedure. If shaft seal oil leak is excessive and/or refrigerant is leaking, compressor must be replaced. A small amount of refrigerant oil leakage from compressor shaft seal is normal.

CAUTION: On Mitsubishi, secure rear housing to compressor body using a vise before removing front housing through-bolts. Compressor rear housing may separate from compressor body, spilling refrigerant oil.

Removal (Mitsubishi)

1. Remove clutch coil. See **CLUTCH COIL** . See **Fig. 8** . Position compressor in a vise so compressor rear housing is secured to compressor body. Remove front housing through-bolts and front housing.
2. Using a flat-blade screwdriver, remove felt retainer and felt from front housing. Remove shaft seal snap ring. Using a flat-blade screwdriver, remove shaft seal and "O" ring. See **Fig. 8** .

Installation

1. Inspect compressor shaft and front housing bore for damage and/or excessive wear. Ensure "O" ring and shaft seal seat are clean. Apply refrigerant oil to compressor side of front housing bore. Lubricate "O" ring and shaft seal with refrigerant oil. Using a 21-mm socket, install shaft seal with "O" ring side facing away from compressor. Install shaft seal snap ring. See **Fig. 8** .
2. Install felt into felt retainer. Using a 14-mm deep socket, install felt and felt retainer. Lubricate compressor shaft. Install front housing using care not damage shaft seal lip. See **Fig. 8** .
3. Alternately tighten front housing through-bolts to 19 ft. lbs. (26 N.m). Install clutch plate center bolt. Using an INCH-lb. torque wrench, ensure compressor breakaway torque is 43 INCH lbs. (4.9 N.m) or less. To complete installation, reverse removal procedure. Ensure air gap between clutch plate and pulley is correct. See **CLUTCH COIL** .

PANASONIC ROTARY VANE**CLUTCH COIL****Removal (Mazda)**

Hold clutch disc stationary and remove shaft bolt. See **Fig. 9** . Remove clutch disc and shim(s) from shaft. Remove pulley snap ring and remove pulley using a puller if necessary. Remove screw from clutch coil lead. Remove screws and clutch coil.

Installation

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To install, reverse removal procedure. Tighten shaft bolt to 11 ft. lbs. (15 N.m). Ensure air gap is 0.016-0.023" (0.41-0.58 mm). If air gap is incorrect, add or remove shim(s) as necessary.

THERMAL PROTECTOR

Removal (Mazda)

Remove 2 compressor head cover rear bolts and then 4 upper head cover bolts. Remove thermal protector snap ring and push thermal protector out from its back side. DO NOT pull on wiring harness. See **Fig. 9**.

Installation

1. Ensure thermal protector "O" ring groove in compressor head cover is free of foreign material. Apply refrigerant oil to "O" ring and install into "O" ring groove. Install thermal protector with wiring harness leads horizontal to head cover. Install thermal protector snap ring with chamfered edge facing thermal protector.
2. Apply refrigerant oil to head cover lower "O" ring and install with top side faces upward. Apply clean refrigerant oil to rear "O" ring and install in head cover. Carefully install head cover onto compressor. Tighten 2 rear head cover bolts to 115-159 INCH lbs. (13-18 N.m). Tighten 4 lower head cover bolts to 80-106 INCH lbs. (9-12 N.m) in a diagonal pattern.

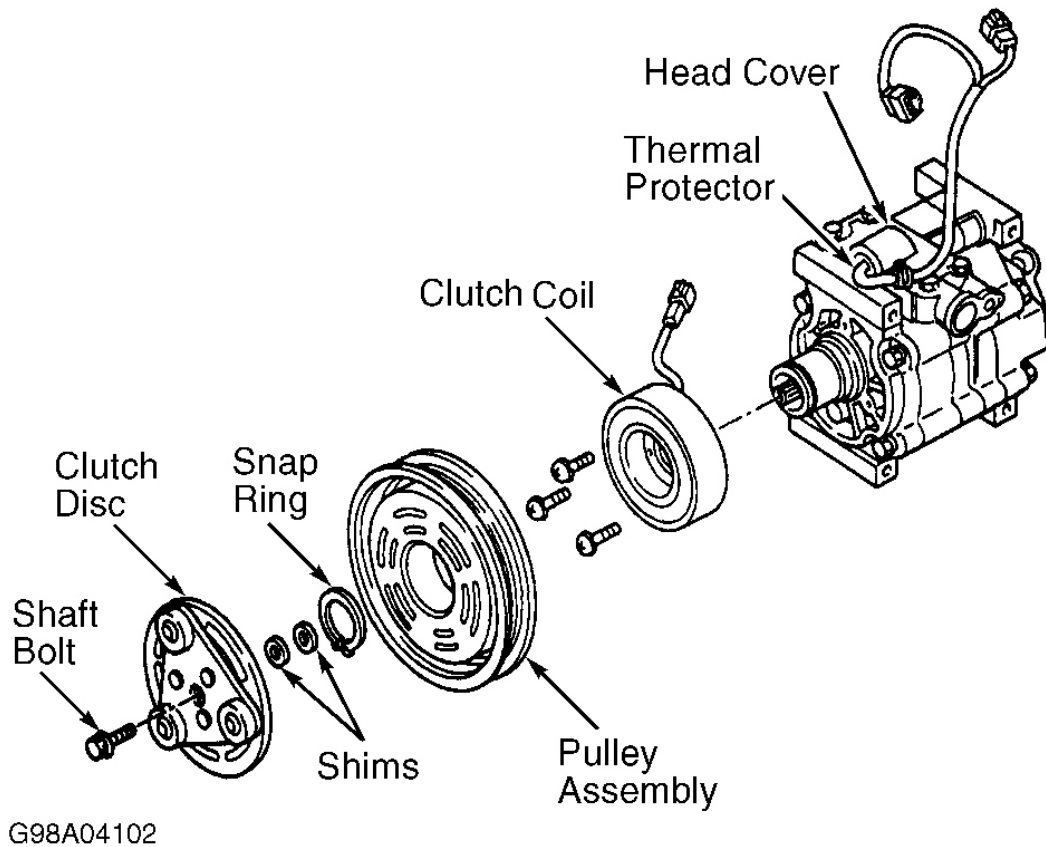


Fig. 9: Exploded View Of Compressor (Panasonic)
Courtesy of MAZDA MOTORS CORP.

SANDEN SCROLL

NOTE: Range Rover Sanden compressor servicing procedures are not available from manufacturer.

CLUTCH COIL & SHAFT SEAL

NOTE: Due to the variety of clutch and shaft seal configurations, obtain appropriate A/C compressor service tools for compressor being serviced.

Removal (Mitsubishi)

1. Remove drive belt pulley (if equipped). Hold clutch plate using Pliers (MB991367) and Bolts (MB991386). Use a ratchet and socket to remove clutch hub nut.
2. Remove clutch plate. See **Fig. 11** or **Fig. 12**. Remove snap ring with internal snap ring pliers. Remove

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clutch hub (rotor). Remove snap ring and clutch coil.

3. Using an awl, remove bearing cover and retainer. Using Bearing Remover (MB991456), engage bearing grooves. Place base of bearing remover over remover arms and tighten nut.
4. Tighten bearing remover bolt to withdraw bearing from compressor. Engage grooves of Shaft Seal Remover/Installer (MB991458) and pull straight up on shaft seal.

Installation

1. To install shaft seal, ensure front housing is free of foreign objects. Lubricate Shaft Seal Protector (MB991459) and place over compressor shaft. Lubricate shaft seal and install using shaft seal remover/installer. Remove shaft seal protector.
2. Using a 21-mm socket or Drift (MB991301), carefully press bearing onto compressor shaft. Install clutch coil so that alignment pin is engaged. Install clutch coil snap ring with tapered side facing out.
3. Align armature plate with crankshaft spline. Tighten shaft nut to 12 ft. lbs. (16 N.m). Using feeler gauge, ensure air gap between pressure plate and pulley is 0.02-0.03" (0.5-0.8 mm) on Diamante and 0.016-0.024" (0.4-0.6 mm) on all other models. If air gap is incorrect, add or remove shim(s) as necessary.

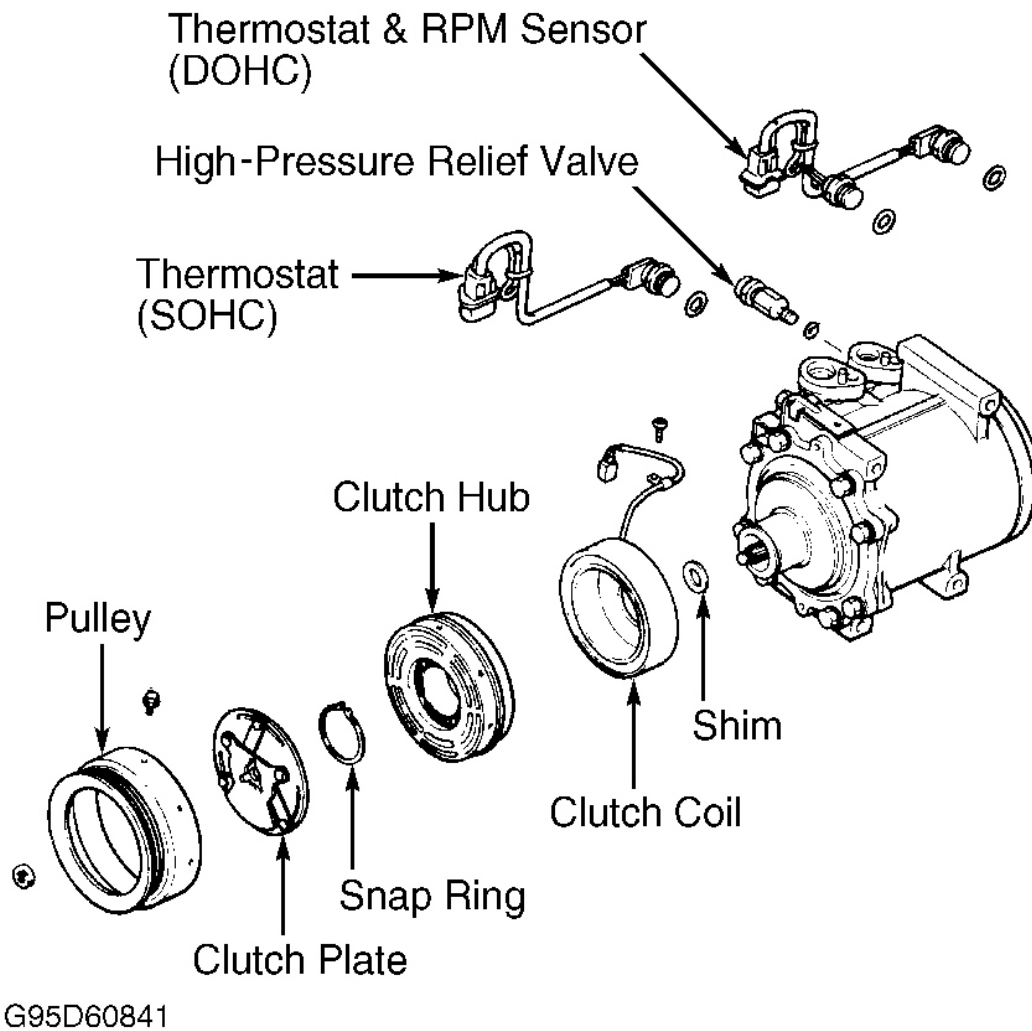


Fig. 10: Exploded View Of Compressor (Sanden MSC105 Scroll Shown; MSC90C Is Similar)
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

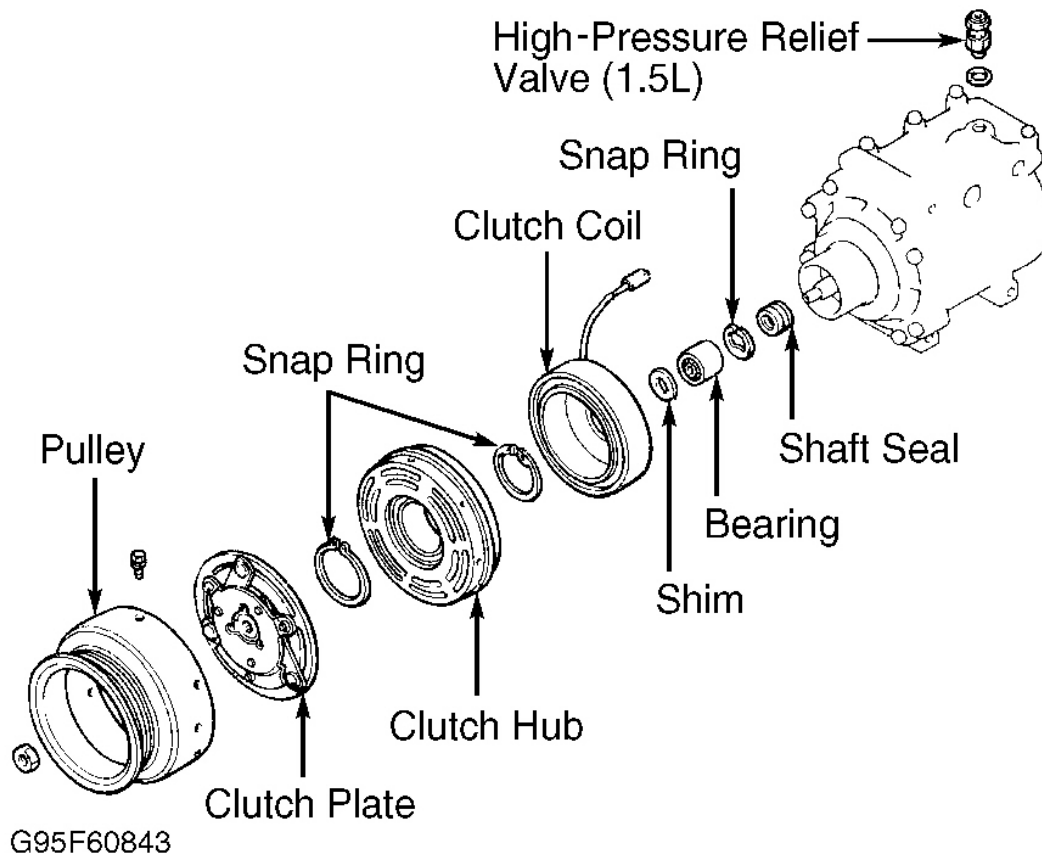


Fig. 11: Exploded View Of Compressor (Sanden Scroll)
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

Removal (Honda)

1. Remove shaft nut while holding clutch plate with Clutch Holder (J-37872). Remove pressure plate and shim(s). Remove snap ring.
2. Using universal puller attached to outer diameter of pulley, and Driver (07947-6340300) in center of pulley, remove pulley. DO NOT engage puller on belt area. Hold puller in place and tighten screw to remove pulley. Remove screw for clutch coil lead. Remove snap ring and clutch coil.

Installation

1. To install, reverse removal procedure. Align lug on clutch coil with hole in compressor. Install snap ring with chamfered side facing out. Position pulley squarely over coil. Using Hub Guide (07945-6920500), press pulley onto compressor boss. Maximum press load is 5690 psi (400 kg/cm²) or 882 lbs. (400 kg).
2. Tighten shaft nut to 13 ft. lbs. (18 N.m). Using feeler gauge, ensure air gap between pressure plate and pulley is 0.014-0.026" (0.35-0.65 mm). If air gap is incorrect, add or remove shim(s) as necessary.

1999 Toyota RAV4

1999 GENERAL SERVICING Compressor Servicing

NOTE: If shaft seal leaks, replace compressor.

Removal (Mazda)

1. Remove compressor shaft nut while holding clutch plate with Clutch Holder (49-B061-010). Remove clutch pressure plate and shim(s). If clutch pressure plate cannot be removed by hand, use Pressure Plate Remover (49-B061-013).
2. Remove pulley assembly snap ring. Install a 2-jaw puller to outer diameter of pulley and a 1.0" (25 mm) socket to compressor boss, and remove pulley. DO NOT engage puller on belt area. Hold puller in place and tighten screw to remove pulley. Remove clutch coil snap ring and clutch coil.

Installation

1. To install, reverse removal procedure. Align lug on clutch coil with hole in compressor. Install snap ring with chamfered side facing out. Position pulley squarely over coil. Ensure compressor boss and inside area of pulley bearing are clean and free of foreign material. Using Pulley Installer (49-G032-311), press pulley onto compressor boss.
2. Tighten compressor shaft nut to 14 ft. lbs. (19 N.m). Using feeler gauge, ensure air gap between clutch pressure plate and pulley is 0.014-0.025" (0.35-0.65 mm). If air gap is incorrect, add or remove shim(s) as necessary.

SANDEN 7-CYLINDER

CLUTCH COIL & BEARING

Removal (Jaguar)

1. Using 3 bolts, attach Puller (JD166-1) to clutch plate. While holding clutch plate with puller, remove shaft nut. Install puller bolt in center of puller, and tighten bolt to remove clutch plate.
2. Remove adjustment shim(s) and Woodruff key. Remove pulley snap ring. Install threaded Adapter (JD166-5), onto compressor shaft. Engage Collets (JD166-5) to inner diameter of pulley and attach Puller (JD166-1) to collets.
3. Install puller bolt in center of puller, and tighten bolt to remove pulley. Press bearing out of drive belt pulley. Remove screw for clutch coil lead. Remove snap ring and clutch coil.

Installation

To install clutch coil and bearing, reverse removal procedure. Tighten shaft nut. Ensure air gap is 0.016-0.031" (0.40-0.80 mm). If air gap is incorrect, add or remove shim(s) as necessary.

Removal (Volkswagen)

1. Remove compressor shaft nut while holding clutch plate with two 1/4" (6 mm) bolts and Spanner Wrench (Mastercool 90901). Remove clutch plate using two 1/4" (6 mm) bolts and Puller (Mastercool 90902). Remove pulley assembly lock ring. See **Fig. 12** . Using a 2-jaw puller, remove pulley assembly. Position puller jaws onto edge of pulley to prevent pulley groove from being deformed.

2. If replacing pulley bearing, remove bearing snap ring. Using Thrust Plates (VW401 and VW402), Thrust Bushing (VW412) and Thrust Tube (VW455), press bearing out of pulley. Mark position of clutch coil. Remove clutch coil snap ring and clutch coil.

Installation

1. To install, reverse removal procedure. Ensure clutch coil is positioned correctly and install snap ring. Using Thrust Plates (VW401 and VW402) and Thrust Bushings (VW412 and VW473), press bearing into pulley until fully seated. Install bearing snap ring.
2. Using Thrust Plates (VW401 and VW402) and Thrust Bushings (VW412 and VW441), press pulley assembly onto compressor shaft. Install pulley assembly lock ring. Install clutch plate and compressor shaft nut. Tighten compressor shaft nut until the air gap is 0.028" (0.71 mm).
3. To check air gap, position a depth gauge on edge of pulley and measure distance to clutch plate. Using a fused jumper wire, energize clutch coil and measure distance from edge of pulley to clutch plate again. Air gap is the difference between first and second measurement. Ensure air gap is 0.028" (0.71 mm). To adjust air gap, tighten or loosen compressor shaft nut.

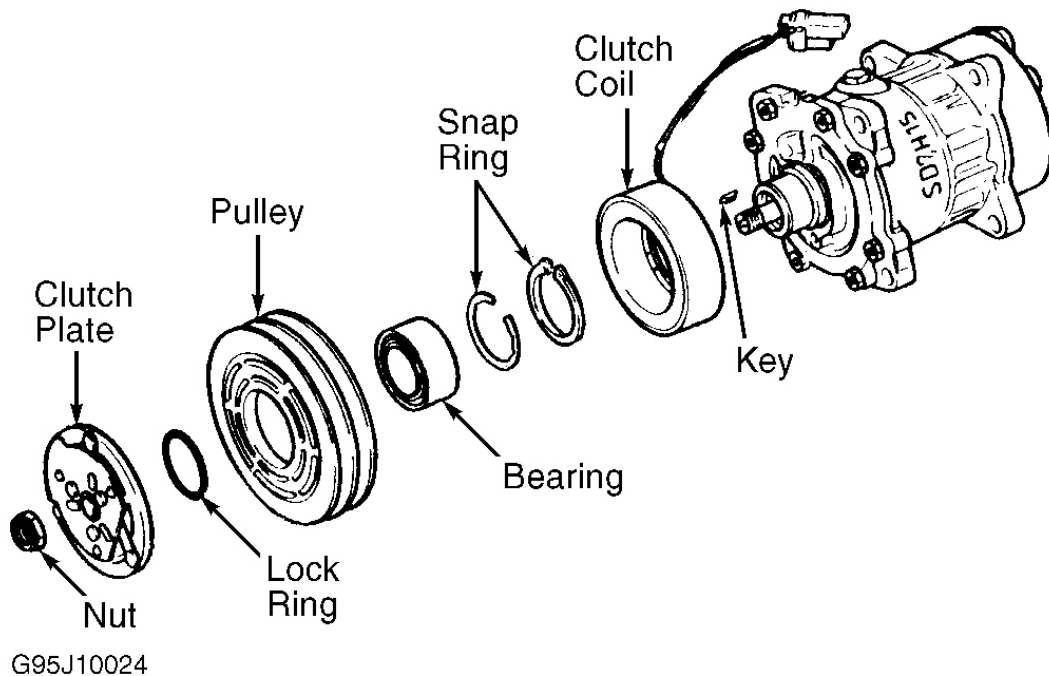


Fig. 12: Exploded View Of Compressor (Sanden 7-Cyl.)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

SHAFT SEAL**Removal (Jaguar)**

1999 Toyota RAV4

1999 GENERAL SERVICING Compressor Servicing

1. Using 3 bolts, attach Puller (JD166-1) to clutch plate. While holding clutch plate with puller, remove shaft nut. Install puller bolt in center of puller, and tighten bolt to remove clutch plate.
2. Remove Woodruff key, felt seal, and seal seat snap ring. Engage Seal Seat Remover/Installer (JD167) to seal seat, and remove seal seat. Engage Seal Remover/Installer (JD168) to shaft seal, and remove shaft seal.

Installation

Lubricate shaft seal protector and shaft seal with refrigerant oil. Using seal remover/installer, install shaft seal. Lubricate seal seat "O" ring with refrigerant oil, and install seal seat. To complete installation, reverse removal procedure.

NOTE: On Volkswagen, shaft seal removal and installation procedure is not available from manufacturer.

CLUTCH COIL

Removal (Suzuki)

1. Remove compressor shaft nut and discard, while holding clutch plate with Clutch Holder (09920-55810). Remove clutch plate using Clutch Plate Remover (09930-35210). Remove shaft key and shim(s). See **Fig. 13**.
2. Remove pulley snap ring. Install a 2-jaw puller to outer diameter of pulley and Shaft Protector (09951-65510) to compressor boss, and remove pulley. DO NOT engage puller on belt area. Hold puller in place and tighten screw to remove pulley. Disconnect clutch coil lead from compressor housing. Remove clutch coil snap ring and clutch coil.

Installation

1. To install, reverse removal procedure. Align lug on clutch coil with hole in front housing of compressor. Install snap ring with chamfered side facing out. Position pulley squarely over coil. Ensure compressor boss and inside area of pulley bearing are clean and free of foreign material. Using Pulley Installer (09951-15510), press pulley onto compressor boss. Install pulley snap ring.
2. Install shim(s) and shaft key. Install clutch plate using a plastic hammer and a tube with an inside diameter more than 0.34" (8.5 mm) and an outside diameter less than 0.75" (19 mm). Using feeler gauge, ensure air gap between clutch plate and pulley is 0.014-0.025" (0.35-0.65 mm). If air gap is incorrect, add or remove shim(s) as necessary. Connect clutch coil lead to compressor housing. Hold clutch plate and tighten compressor shaft nut to 13 ft. lbs. (18 N.m).

SHAFT SEAL

Removal (Suzuki)

Remove clutch plate, pulley and clutch coil. See **CLUTCH COIL**. Remove felt ring, shaft key and shaft seal snap ring. See **Fig. 13**. Insert Seal Remover/Installer (09990-48230) into seal seat and twist remover to engage seal. Pull up on remover/installer and remove seal.

Installation

1. Using refrigerant oil, lubricate Shaft Seal Protector (09990-58240) and install over compressor shaft. Using refrigerant oil, lubricate shaft seal lips and outer "O" ring. Install shaft seal over protector with "O" ring toward compressor. Ensure lips of shaft seal point toward compressor.
2. Using Seal Remover/Installer (09990-48230) and hand pressure, slowly install shaft seal until upper face of seal is lower than snap ring groove. Install snap ring with chamfered side facing compressor. Install shaft key and felt ring. To complete installation, reverse removal procedure.

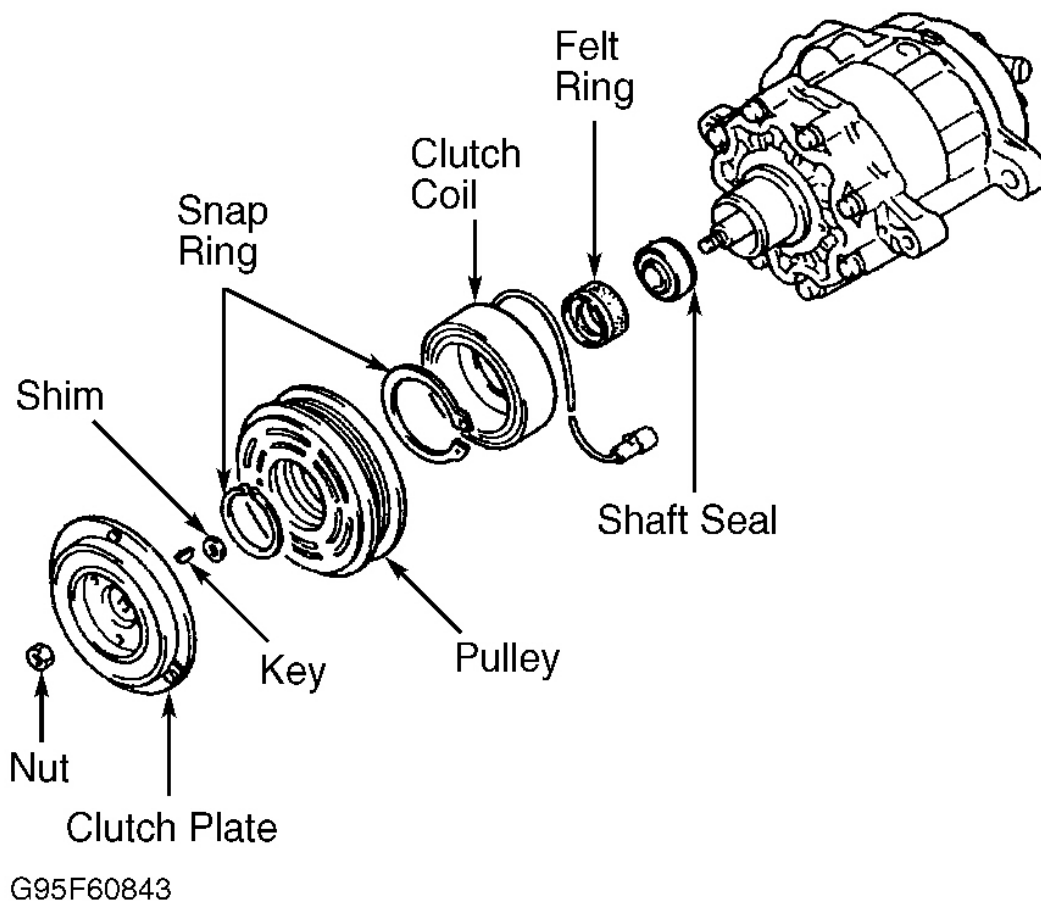


Fig. 13: Exploded View Of Compressor (Sanden SD7B10 7-Cyl.)
Courtesy of SUZUKI OF AMERICA, CORP.

SEIKO-SEIKI ROTARY VANE**CLUTCH COIL****Removal (BMW)**

1999 Toyota RAV4

1999 GENERAL SERVICING Compressor Servicing

Using Clutch Plate Holder (64-5-020), hold clutch plate stationary and remove compressor shaft bolt. Remove clutch plate and shims. Remove pulley snap ring. Using a 3-jaw puller attached between clutch coil and pulley, remove pulley. Disconnect clutch coil wiring harness. Remove snap ring and clutch coil.

Installation

Install clutch coil with wire facing downward. Use new snap ring. Ensure snap ring is installed with beveled side facing out and fully seated in snap ring groove. Install pulley using Pulley Driver (33-1-020) and plastic hammer. Install shims and clutch plate and shaft bolt. Ensure air gap between clutch plate and pulley is 0.020-0.031" (0.50-0.80 mm). If air gap is incorrect, add or remove shim(s) as necessary.

Removal (Suzuki)

1. Remove compressor shaft bolt and washer, while holding clutch plate with Clutch Holder (09991-06020). Remove clutch plate using Clutch Plate Remover (09991-06030). Remove shim(s) and felt ring. See **Fig. 14**.
2. Remove pulley snap ring. Install a 2-jaw puller to outer diameter of pulley and remove pulley. DO NOT engage puller on belt area. Hold puller in place and tighten screw to remove pulley. Disconnect clutch coil lead from compressor housing. Remove clutch coil snap ring and clutch coil.

Installation

1. To install, reverse removal procedure. Align lug on clutch coil with hole in front housing of compressor. Install snap ring with chamfered side facing out. Connect clutch coil lead to compressor housing. Install felt ring and shim(s). See **Fig. 14**.
2. Position pulley squarely over coil. Ensure compressor boss and inside area of pulley bearing are clean and free of foreign material. Using Pulley Installer (09991-06010), press pulley onto compressor boss. Install pulley snap ring.
3. Install clutch plate. Using feeler gauge, ensure air gap between clutch plate and pulley is 0.012-0.020" (0.30-0.50 mm). If air gap is incorrect, add or remove shim(s) as necessary. Hold clutch plate and tighten NEW compressor shaft bolt to 10 ft. lbs. (13 N.m).

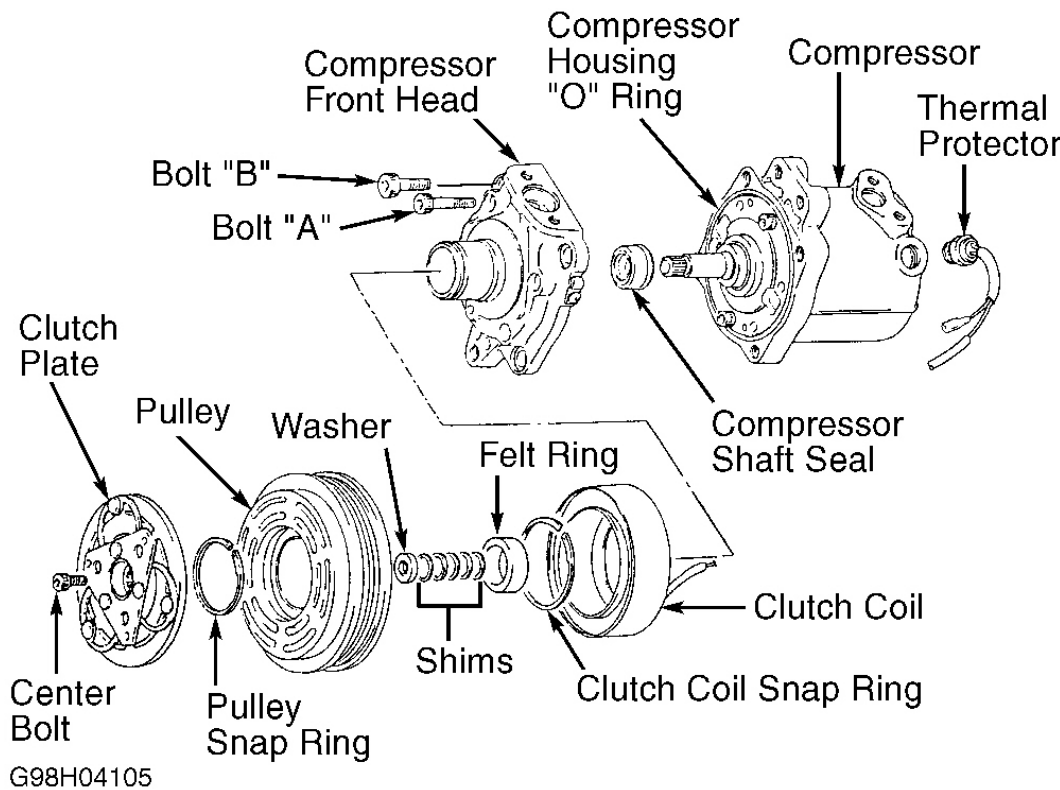


Fig. 14: Exploded View Of Compressor (Seiko-Seiki Rotary Vane)
 Courtesy of SUZUKI OF AMERICA, CORP.

SHAFT SEAL

NOTE: BMW does not provide compressor shaft seal replacement procedure. If shaft seal oil leak is excessive and/or refrigerant is leaking, compressor must be replaced. A small amount of refrigerant oil leakage from compressor shaft seal is normal.

Removal (Suzuki)

Remove clutch plate, pulley and clutch coil. See **CLUTCH COIL** . Remove 8 compressor front head bolts. Push on compressor shaft while pulling on front head, using care not to remove cylinder from compressor housing. Remove compressor shaft seal from front head. See **Fig. 14** .

Installation

1. Using refrigerant oil, lubricate shaft seal lips and outer "O" ring. Using Seal Remover/Installer (09991-06050) and hand pressure, install shaft seal into front head with shaft seal "O" ring toward compressor. Using refrigerant oil, lubricate Shaft Seal Protector (09991-06040) and install over compressor shaft.

2. Install compressor housing "O" ring to compressor housing. Align compressor front head with compressor housing and install. Tighten front head bolts "A" first and then front head bolts "B" in a crisscross pattern. See **Fig. 14** . Tighten bolts "A" to 10 ft. lbs. (13 N.m) and bolts "B" to 17 ft. lbs. (23 N.m). Remove shaft seal protector. To complete installation, reverse removal procedure.

ZEXEL ROTARY VANE

NOTE: **Subaru recommends replacing compressor as an assembly if there is a clutch or compressor shaft seal failure.**

CLUTCH COIL & BEARING

Removal (Honda, Isuzu & Kia)

1. Using clutch disc/plate holder, remove clutch disc/plate bolt. Using puller and forcing screw, remove clutch disc/plate. See **Fig. 15** or **Fig. 16** .
2. Remove shim(s) and snap ring. On DKV-14D compressor, use pulley puller pilot to protect compressor shaft. On all models, use a puller to remove pulley. Remove screw for clutch coil lead. Remove 3 clutch coil screws and clutch coil.

Installation

1. To install, reverse removal procedure. Align clutch coil pin with hole in front head of compressor and install clutch coil. Tighten clutch coil screws to 44 INCH lbs. (5 N.m). Using pulley installer and drive handle, tap pulley onto compressor. On all models, install new snap ring.
2. On DKV-14D compressor, tighten clutch plate bolt to 113 INCH lbs. (13 N.m) Using feeler gauge, ensure air gap between clutch plate and pulley is 0.012-0.024" (0.30-0.60 mm). If air gap is incorrect, add or remove shim(s) as necessary.

NOTE: **On Kia, shaft seal servicing procedure is not available from manufacturer.**

Removal (Nissan)

1. Hold clutch disc using clutch disc holder and remove center bolt. Using Clutch Disc Puller (J-38874), remove clutch disc and adjustment shim(s).
2. Remove snap ring. Remove pulley using Pilot (J-39023) and universal 2-jaw puller. Position puller jaws onto edge of pulley to prevent pulley groove from being deformed. Remove clutch coil lead, 3 clutch coil retaining screws, and clutch coil. See **Fig. 15** or **Fig. 16** .

Installation

1. Ensure clutch disc and pulley contact surfaces are clean and free of excessive grooving and/or excessive heat damage. Check clutch coil for loose connection or cracked insulation. Replace components as necessary. Replace clutch disc and pulley assembly as a set.
2. Align pin in clutch coil with hole in front head of compressor. Ensure coil lead is installed in original

position. Install and tighten coil screws. Press pulley onto compressor using Pulley Installer (J-39024) and a hand press. Install pulley snap ring and adjustment shim(s).

3. Install clutch disc and tighten center bolt to 9-11 ft. lbs. (11-15 N.m). Ensure pulley rotates freely. Using a feeler gauge, ensure air gap between clutch disc and pulley is 0.012-0.024" (0.30-0.61 mm). If air gap is not as specified, add or remove shim(s) as necessary.
4. Install compressor and any other components. Evacuate and charge A/C system. Operate A/C system and break-in clutch disc and pulley assembly by engaging and disengaging clutch 30 times during engine operation.

NOTE: Compressor shaft seal servicing procedure is not available from manufacturer. If removed, tighten thermal protector to 11-13 ft. lbs. (15-18 N.m).

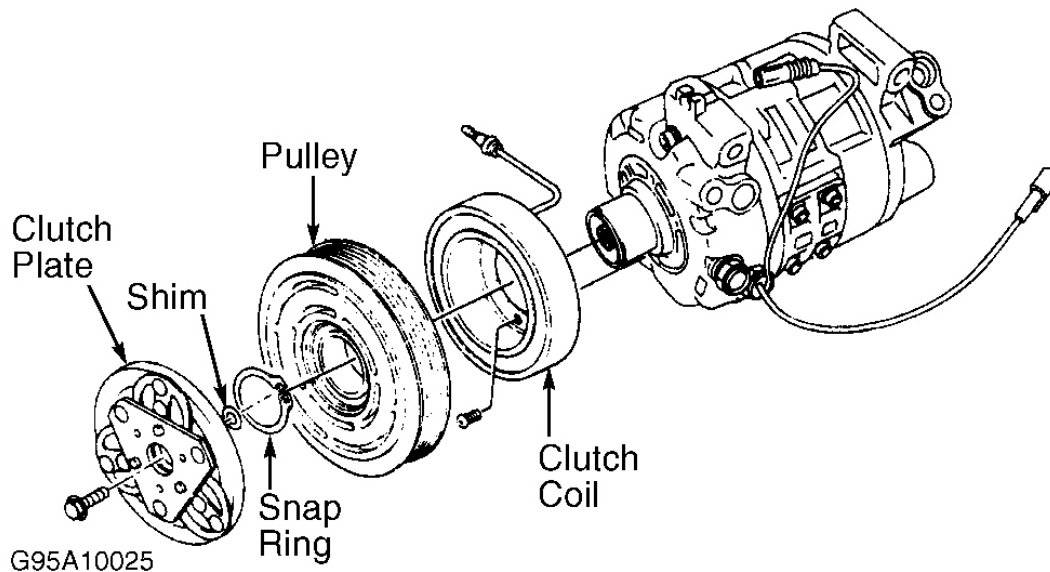


Fig. 15: Exploded View Of Compressor (Zexel DKV-14D Rotary Vane)
Courtesy of ISUZU MOTOR CO.

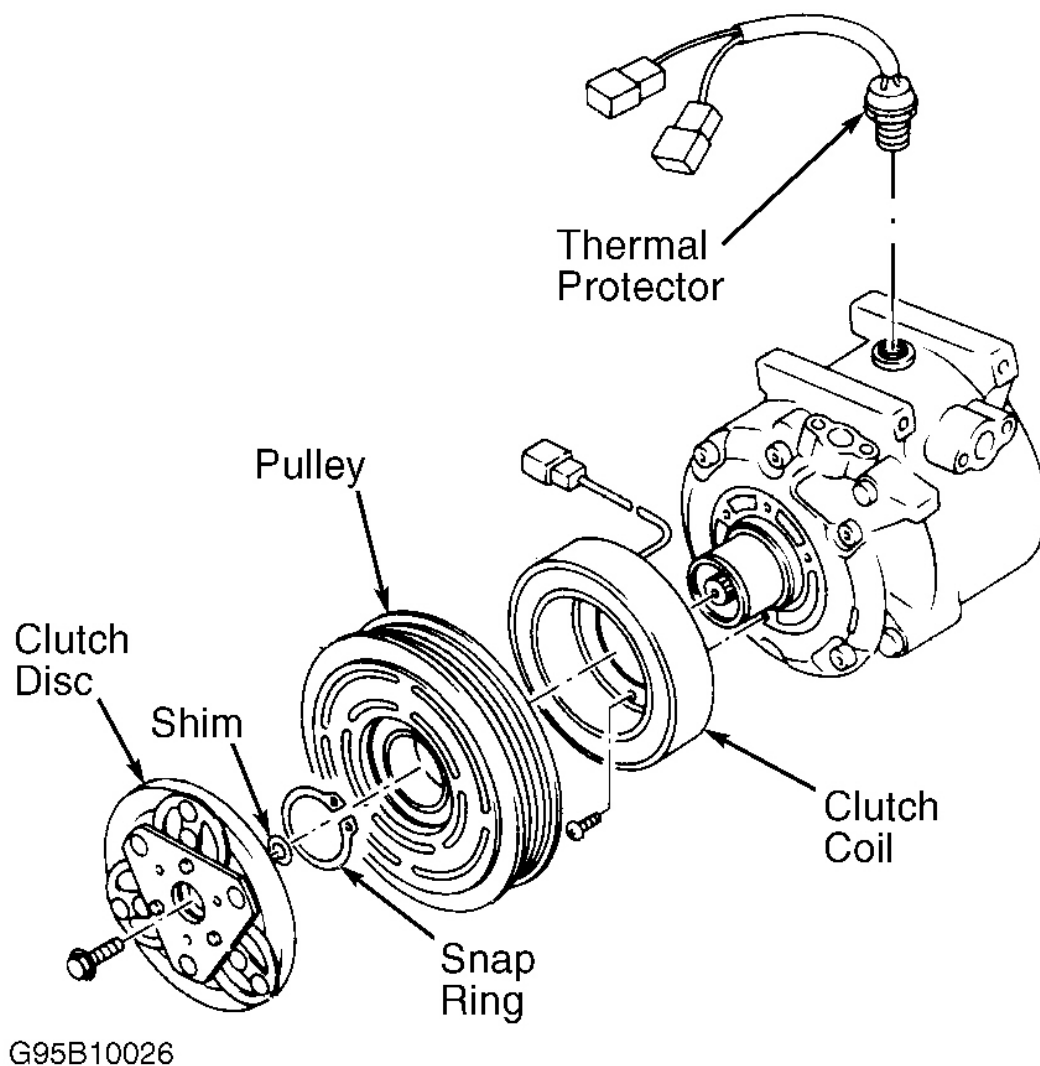


Fig. 16: Exploded View Of Compressor (Zexel DKV-14C Rotary Vane)

Courtesy of NISSAN MOTOR CO., U.S.A.

ZEXEL 6-CYLINDER

NOTE: Subaru recommends replacing compressor as an assembly if there is a clutch coil, pulley bearing or compressor shaft seal failure.

CLUTCH COIL & BEARING

Removal (Volvo)

1999 Toyota RAV4

1999 GENERAL SERVICING Compressor Servicing

1. Using Clutch Plate Holder (999-5596-5), hold clutch plate stationary and remove compressor shaft nut. Remove clutch plate and shim(s) using Puller (999-5597-3). Keep shims in the order in which they were removed. See **Fig. 17** .
2. Remove pulley snap ring. Using Puller (999-5598-1) and Adapter (999-5599-3 or 999-5618-7), remove pulley. Mark position of clutch coil for installation. Disconnect electrical lead. Remove clutch coil snap ring and clutch coil, as necessary.

Installation

1. Install clutch coil and snap ring. Ensure clutch coil electrical lead is properly positioned on compressor housing. Position pulley on compressor. Using Puller (999-5598-1) and Adapter (999-5519-5 or 999-5600-5), press pulley onto compressor and install snap ring.
2. Install shims in reverse order of removal and clutch plate. Hold clutch plate stationary and tighten compressor shaft nut to 11 ft. lbs. (15 N.m). Using a feeler gauge, ensure air gap between pulley and clutch plate is 0.012-0.020" (0.30-0.50 mm). If air gap is incorrect, add or remove shims as necessary.

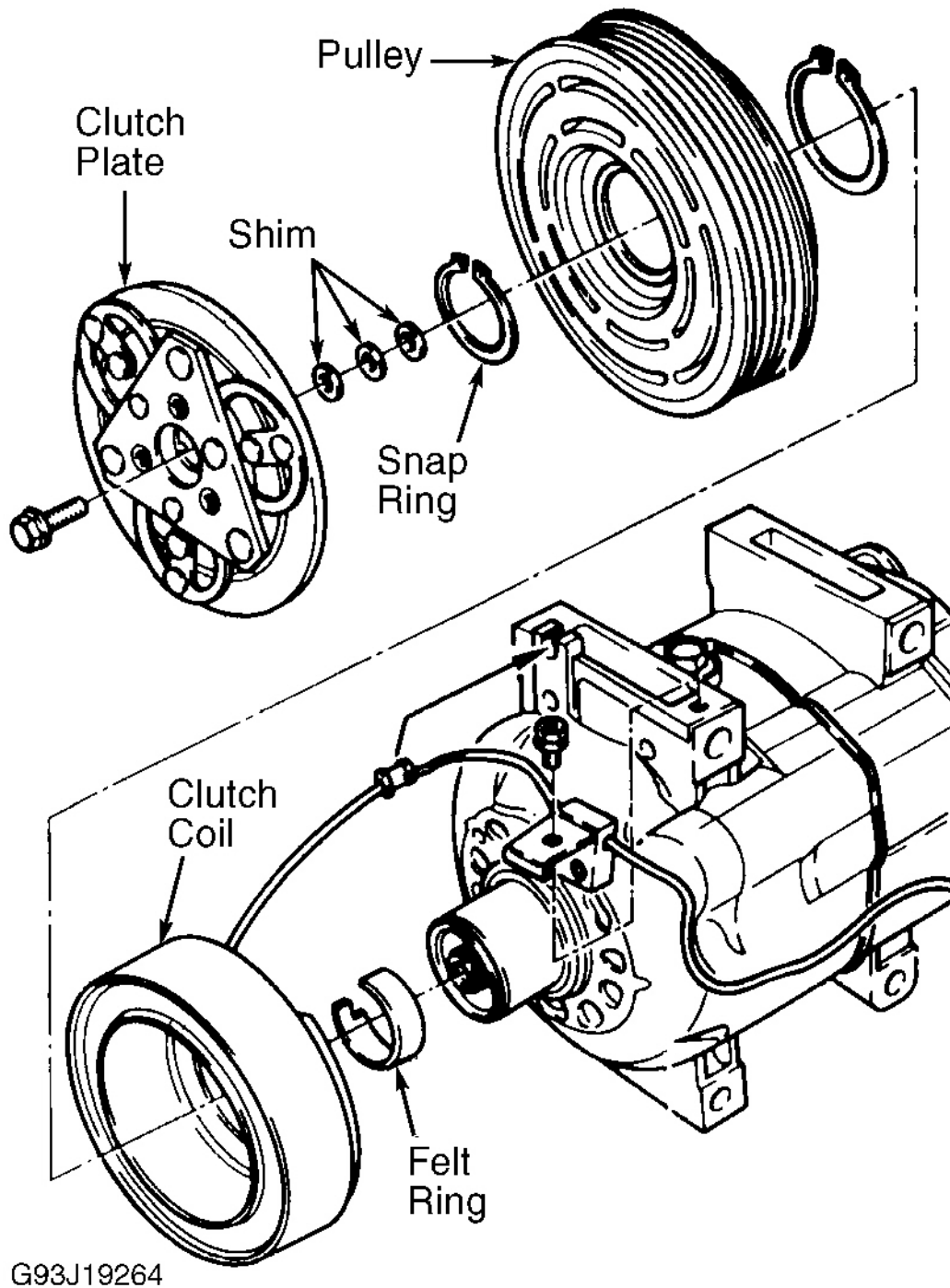


Fig. 17: Exploded View Of Compressor (Zexel 6-Cylinder)
Courtesy of AUDI OF AMERICA, INC.