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# A/C COMPRESSOR OIL CHECKING

## Article Text

1993 Mazda RX7

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Sunday, August 19, 2001 06:59PM

### ARTICLE BEGINNING

1993 GENERAL SERVICING  
Compressor Refrigerant Oil Checking

#### \* PLEASE READ THIS FIRST \*

NOTE: For compressor applications, see COMPRESSOR APPLICATIONS TABLE below. DO NOT exceed A/C system refrigerant oil capacity, when servicing system. See REFRIGERANT OIL & REFRIGERANT SPECIFICATIONS TABLE.

### COMPRESSOR APPLICATION

NOTE: Due to late changes, always refer to underhood A/C specification label in engine compartment or A/C compressor label while servicing A/C system. If A/C Specification label and specifications in this article differ, always use label specifications.

#### COMPRESSOR APPLICATION TABLE

AA

Application	Compressor
Acura	Nippondenso 10-Cyl.
Audi	
90	Zexel 6-Cyl.
100	Zexel 6-Cyl.
BMW	Nippondenso Or Seiko-Seiki
Chrysler Motors/Eagle	
Colt & Summit	Sanden FX105V Scroll
Colt Vista & Summit Wagon	Nippondenso 10PA15 10-Cyl.
Stealth	Sanden FX105VS Scroll
Ram-50	Sanden FX80 Scroll
Ford Motor Co.	
Capri	Nippondenso 10-Cyl.
Festiva	Nippondenso 6-Cyl.
General Motors & Geo	
LeMans	Harrison V5 5-Cyl.
Metro & Tracker	Nippondenso 10-Cyl.
Prizm	Nippondenso 10PA15 10-Cyl.
Storm	Diesel Kiki KC-50 Rotary Vane
Honda	
Accord	Nippondenso 10-Cyl. Or Hadsys RC-17S 7-Cyl.
Civic	Sanden Scroll
Civic Del Sol	Sanden Scroll
Prelude	Sanden Scroll
Hyundai	
Elantra	Sanden TRF-090 Scroll

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Excel	.....	Sanden SD-709	7-Cyl.
Scoupe	.....	Nippondenso 10PA15C	10-Cyl.
Sonata	.....	Ford FX-15	10-Cyl.
Infiniti			
G20	.....	Atsugi NVR 140S	Rotary Vane
J30	.....	Calsonic V6	6-Cyl.
Q45	.....	Calsonic V5	5-Cyl.
Isuzu (R-12)			
Amigo	.....	Diesel Kiki DKS-13CH	6-Cyl.
Pickup			
4-Cylinder	.....	Diesel Kiki DKS-13CH	6-Cyl.
V6	.....	Harrison R4	4-Cyl. Radial
Stylus	.....	Diesel Kiki DKV-14D	Rotary Vane
Rodeo			
4-Cylinder	.....	Diesel Kiki DKS-17CH	6-Cyl.
V6	.....	Diesel Kiki DKV-14D	Rotary Vane
Trooper	.....	Diesel Kiki DKV-14D	Rotary Vane
Isuzu (R-134a Option) (1)			
Amigo, Pickup, Rodeo & Trooper			
2.3L & 2.6L Engine	.....	Zexel R-134a	6-Cyl.
3.1L Engine	.....	Harrison R-134a R-4	4-Cyl. Radial
3.2L Engine	.....	Zexel R-134a	Rotary Vane
Jaguar			
XJS	.....	Sanden SD-709	7-Cyl.
XJ6	.....	Sanden SD-7H15	7-Cyl.
Lexus	.....	Nippondenso 10PA20	10-Cyl.
Mazda			
B2200 & B2600i	.....	Sanden	5-Cyl.
Miata	.....	Nippondenso TV12	Rotary Vane
MPV	.....	Nippondenso	10-Cyl.
MX-6 & 626	.....	Panasonic	Rotary Vane
Navajo	.....	Ford FX-15	10-Cyl.
MX-3, Protege & 323	.....	Panasonic	Rotary Vane
929	.....	Panasonic	Rotary Vane
RX7	.....	Nippondenso TV12	Rotary Vane
Mercedes-Benz			
190E	.....	Nippondenso 10PA15	10-Cyl.
300D/E, 400E & 500E	.....	Nippondenso 10PA17	10-Cyl.
300SE/SD, 400SE & 500SEL	.....	Nippondenso 10PA20	10-Cyl.
Mitsubishi			
Diamante			
R-12	.....	Sanden FX105VS	Scroll
R-134a	.....	Sanden MSC105	
Diamante Wagon	.....	Nippondenso 10PA17C	10-Cyl.
Galant & Mirage	.....	Sanden FX105V	Scroll
Eclipse	.....	Nippondenso 10PA17	10-Cyl.
Expo/Expo LRV	.....	Nippondenso 10PA17C	10-Cyl.
Pickup	.....	Sanden FX80	Scroll
Montero	.....	Nippondenso 10PA15	10-Cyl.
Precis	.....	Sanden SD-709	7-Cyl.
3000GT			
R-12	.....	Sanden FX105VS	Scroll



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### REFRIGERANT OIL & REFRIGERANT CAPACITY

#### REFRIGERANT OIL & REFRIGERANT CAPACITY (ACURA THROUGH INFINITI)

Application	(1) Oil Ounces	Refrigerant Ounces
<b>Acura</b>		
Integra .....	(2) 2.0-3.4 .....	32-34
Legend		
Sedan .....	(2) (3) 4.7 .....	(4) 24.7-26.5
Coupe .....	(3) 4.7 .....	24.7-26.5
Vigor .....	(2) 4.7-4.9 .....	26.5-28.0
<b>Audi</b>		
90 .....	7.8-9.2 .....	(5) 23.0-24.8
100 .....	7.8-9.2 .....	(5) 21.0-22.8
<b>BMW</b>		
318 & 325 Series .....	3.4-4.8 .....	(6) 35-36
525i & 535i .....	4.7-6.1 .....	(6) 53.0-55.5
740i & 740iL .....	4.7-6.1 .....	(6) 53.0-55.5
<b>Chrysler Motors/Eagle</b>		
Colt & Summit .....	(2) 4.4-5.1 .....	26-30
Colt Vista & Summit		
Wagon .....	(2) 2.0-3.4 .....	30
Ram-50 .....	(2) 4.4-5.1 .....	30
Stealth .....	(2) 4.6-6.0 .....	29
<b>Ford Motor Co.</b>		
Capri .....	2.4-3.0 .....	23-27
Festiva .....	10 .....	25
<b>General Motors &amp; Geo</b>		
LeMans .....	8.0 .....	35
Metro .....	2.7 .....	18
Prizm & Prizm LSi .....	6.0 .....	25
Storm .....	5.1 .....	21
Tracker .....	2.7 .....	21
<b>Honda</b>		
Accord		
Nippondenso .....	3.0-4.1 .....	28-30
Hadsys .....	4.1-4.3 .....	28-30
Civic .....	4.0-4.7 .....	21-23
Civic Del Sol .....	4.0-4.7 .....	21-23
Prelude .....	(7) 4.3-5.0 .....	21-23
<b>Hyundai</b>		
Excel .....	8.1 .....	30-32
Scoupe .....	2-3 .....	28-32
Elantra .....	4.0 .....	32
Sonata .....	6.9-7.7 .....	30-32
<b>Infiniti</b>		
G20 .....	6.8 .....	24-29
J30 .....	8.5 .....	(8) 24-26
Q45 .....	9.7 .....	38-42

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- (1) - Total system capacity, unless otherwise noted.
- (2) - Compressor refrigerant oil capacity.
- (3) - Capacity revised by manufacturer in Acura Service News bulletin number ASN 0793-02.
- (4) - Use R-134a refrigerant and ND-Oil 8 (Part No. 38899-PR7-003).
- (5) - Use R-134a refrigerant and Polyalkylene Glycol (PAG) oil.
- (6) - Use R-134a and Polyalkylene Glycol Oil (Part No. 81-22-9-407-724).
- (7) - Use R-134a refrigerant and PAG Refrigerant Oil (Part No. 38899-P13-003).
- (8) - Use R-134a refrigerant and Type "S" Oil (Part No. KLH00-PAGS0).

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REFRIGERANT OIL & REFRIGERANT CAPACITY (ISUZU THROUGH MERCEDES)

AA

Application	(1) Oil Ounces	Refrigerant Ounces
<b>Isuzu (R-12)</b>		
Amigo .....	5.0	26
Pickup		
2.3L & 2.6L Engine .....	5.0	26
3.1L Engine .....	6.0	26
Rodeo		
2.6L Engine .....	5.0	26
3.2L Engine .....	5.0	26
Stylus .....	5.0	21
Trooper .....	5.0	30
<b>Isuzu (R-134a Option) (3)</b>		
Amigo & Pickup		
2.3L & 2.6L Engine .....	5.0	23
3.1L Engine .....	7.5-8.5	23
Rodeo .....	5.0	23
Trooper .....	5.0	26
<b>Jaguar</b>		
XJS .....	(2) 4.6	40
XJ6 .....	(2) 4.5	(4) 40
<b>Lexus</b>		
ES300 .....	(2) 3.5	32-35
GS300 .....	(2) 4.0	(5) 28-32
LS400 .....	(2) 2.8-3.5	(5) 32
SC300 & SC400 .....	(2) 4.0	32-35
<b>Mazda</b>		
B2200 & B2600i .....	(2) 4.5	28
Miata .....	(2) 2.7-3.3	28
MPV		
Dual Unit .....	(2) 2.7-3.3	51
Single Unit .....	(2) 2.7-3.3	37
MX-3 .....	(2) 5.0	28

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MX-6 & 626	(2)	4.3	26
Protege & 323	(2)	3.9-4.6	28
Navajo		7.0	28-29
929		3.6	28
RX7		3.4-4.7	21
Mercedes-Benz			
190E	(2)	4.0	36
300D/E, 400E & 500E	(2)	5.4	(6) 36
300SE/SD, 400SE & 500SEL	(2)	5.4	(7) 43

- (1) - Total system capacity, unless otherwise noted.
- (2) - Compressor refrigerant oil capacity.
- (3) - Standard equipment on some models built after 5/1/93.  
Use R-134a Swash Plate Compressor Oil (Part No. 2-90188-300-0) on 2.3L and 2.6L engine. Use R-134a R-4 Compressor Oil (Part No. 2-90222-320-0) on 3.1L engine. Use R-134a Rotary Vane Compressor Oil (Part No. 2-90188-301-0) on 3.2L engine.
- (4) - Use R-134a refrigerant and PAG SP20 refrigerant oil.
- (5) - Use R-134a refrigerant and ND-Oil 8 (Part No. 38899-PR7-003).
- (6) - Use R-134a refrigerant and Densooil 8 (Part No. A 001 989 08 03).
- (7) - Use R-134a refrigerant and Densooil 8 (Part No. A 001 989 08 03). Use 50 ounces if equipped with rear passenger compartment A/C-heater system.

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### REFRIGERANT OIL & REFRIGERANT CAPACITY (MITSUBISHI THRU SUBARU)

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Application	(1) Oil Ounces	Refrigerant Ounces
Mitsubishi		
Diamante		
R-12	5.4-6.0	34-38
R-134a	(3) 5.7-6.4	26-28
Diamante Wagon	5.4	28
Eclipse	(2) 2.0-3.4	33
Expo/Expo LRV		
1.8L	(2) 3.4-4.0	30
2.4L	(2) 2.0-3.4	30
Galant	(2) 5.0-5.7	33
Mirage	(2) 4.4-5.1	26-30
Pickup	(2) 4.4-5.1	30
Montero	(2) 2.0-3.4	28
Precis	8.1	30-32
3000GT		
R-12	4.7-6.0	29
R-134a	(3) 4.7-6.0	26-28
Nissan		





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Previa			
Without Rear A/C	3.4-4.7		32-35
With Rear A/C	3.4-4.7		41-44
Supra	(2) 4.1	(3)	23-27
Tercel	3.4-4.1		25-28
T100	3.4-4.1	(3)	21-25
4Runner	3.4-4.1		27-30
Volkswagen			
Cabriolet	4.6		30.0-31.8
Corrado SLC	3.9-4.4		35.0-36.8
EuroVan			
Without Rear A/C	4.6	(4)	34-35
With Rear A/C	8.2	(4)	48-49
Fox	5.7		41-42
Golf, GTI & Jetta	3.9	(4)	28-30
Passat	3.9-4.4	(4)	41.0-42.8
Volvo			
240	7.4	(5)	26
850			
Cold Climates	7.0	(5)	29
Hot Climates	7.0	(5)	26
940 & 960			
Sanden SD-510	4.8	(6)	32-34
Sanden SD-709	8.5	(6)	32-34
Seiko-Seiki	7.8	(6)	32-34

- (1) - Total system capacity, unless otherwise noted.
- (2) - Compressor refrigerant oil capacity.
- (3) - Use R-134a refrigerant and ND-Oil 8 (Part No. 38899-PR7-003).
- (4) - Use R-134a refrigerant and SP-10 PAG Oil (Part No. G 052 154 A2).
- (5) - Use R-134a refrigerant and ZXL 100 PG Oil (Part No. 8708581-7).
- (6) - Use R-134a refrigerant and PAG Oil (Part No. 8708581-9).

AA

### REFRIGERANT OIL

Only NEW, moisture-free refrigerant oil should be used in the air conditioning system. This oil is highly refined and dehydrated so moisture content is less than 10 parts per million. The oil container must be tightly closed at all times when not in use, or moisture from the air will be absorbed into the refrigerant oil.

### SERVICING PRECAUTIONS

#### DISCHARGING SYSTEM

Discharge A/C system using approved refrigerant recovery/recycling equipment. Always follow recovery/recycling equipment manufacturer's instructions. After refrigerant recovery

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process is completed, the amount of compressor oil removed must be measured and the same amount added to A/C system.

### **DISCONNECTING LINES & FITTINGS**

After system is discharged, carefully clean area around all fittings to be opened. Always use 2 wrenches when tightening or loosening fittings. Some refrigerant lines are connected with a coupling. Special tools may be required to disconnect lines. Cap or plug all openings as soon as lines are removed. DO NOT remove caps until connections of lines and fittings are completed.

### **CONNECTING LINES & FITTINGS**

**NOTE:** All R-134a based systems use 1/2-16 ACME threaded fittings. Ensure all replacement parts match the connections of the system being worked on.

Always use a new gasket or "O" ring when connecting lines or fittings. Coat "O" ring with refrigerant oil and ensure it is not twisted during installation. Always use 2 wrenches to prevent damage to lines and fittings.

### **PLACING SYSTEM IN OPERATION**

After component service or replacement has been completed and all connections have been made, evacuate system thoroughly with a vacuum pump. Charge system with proper amount of refrigerant and perform leak test. See REFRIGERANT OIL & REFRIGERANT SPECIFICATIONS article in GENERAL SERVICING for system capacities. Check all fittings that have been opened. After system has been leak tested, check system performance.

**NOTE:** Most compressors are pre-charged with a fixed amount of refrigerant (shipping) oil. Drain compressor oil from new compressor and add refrigerant oil to new compressor according to amount removed from old compressor. Always refer to underhood A/C specification label or A/C compressor label while servicing A/C system.

### **ATSUGI**

#### **ROTARY VANE**

1) Before checking and adjusting oil level, operate engine at 1200 RPM. Set controls at maximum cooling and high blower motor speed for 10 minutes to return oil to compressor.

2) Stop engine. Discharge refrigerant and remove compressor from vehicle. See SERVICING PRECAUTIONS. Drain compressor oil through compressor discharge port and measure oil amount.

3) If amount drained is less than 3 ounces, conduct leak tests at system connections. Repair or replace faulty parts as



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Component	Ounces
Condenser .....	1.0-1.7
Evaporator .....	1.5-2.5
Receiver-Drier .....	0.5-0.8
Refrigerant Lines (1) .....	1.0-1.7

(1) - Add only if a refrigerant oil leak is indicated.

AA

COMPONENT REFRIGERANT OIL CAPACITIES (CALSONIC V6)

AA

Component	Ounces
Condenser .....	2.5
Evaporator .....	2.5
Receiver-Drier .....	0.2
Refrigerant Lines (1) .....	1.0

(1) - Add only if a refrigerant oil leak is indicated.

AA

Subaru

1) Before checking and adjusting oil level, operate engine at 1000-1500 RPM. Set controls at maximum cooling and high blower motor speed for 20 minutes to return oil to compressor.

2) Stop engine. Discharge refrigerant and remove compressor from vehicle. See SERVICING PRECAUTIONS. Drain compressor oil from compressor drain plug and measure oil amount.

3) Fill compressor with total amount drained, using new oil. If any major components of the system were also replaced, determine the amount of additional oil needed. See appropriate SUBARU COMPONENT REFRIGERANT OIL CAPACITIES table for specified amount.

SUBARU COMPONENT REFRIGERANT OIL CAPACITIES (LEGACY)

AA

Component	Ounces
Compressor .....	2.4
Condenser .....	1.7
Evaporator .....	2.4
Refrigerant Lines (1) .....	1.7

(1) - Add only if a refrigerant oil leak is indicated.

AA

SUBARU COMPONENT REFRIGERANT OIL CAPACITIES (SVX)

AA

Component	Ounces
Compressor .....	2.4
Condenser .....	1.7

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Evaporator .....	2.4
Refrigerant Lines (1) .....	1.7

(1) - Add only if a refrigerant oil leak is indicated.

AA

### DIESEL KIKI

#### ROTARY VANE

1) Before checking and adjusting oil level, operate engine at 800-1000 RPM. Set controls at maximum cooling and high blower motor speed for 20 minutes to return oil to compressor.

2) Stop engine. Discharge refrigerant and remove compressor from vehicle. See SERVICING PRECAUTIONS. Remove oil drain plug and measure amount of oil drained.

3) If amount drained is less than 3 ounces (1.7 ounces on Geo Storm), conduct leak tests at system connections. Repair or replace faulty parts as necessary.

4) If amount drained is more 3 ounces (1.7 ounces on Geo Storm), oil level is okay. Fill compressor with same amount drained, using new oil. If amount drained is less than 3 ounces (1.7 ounces on Geo Storm), pour in 3 (1.7) ounces of new refrigerant oil.

5) When replacing other A/C system components, add the following amount(s) of refrigerant oil. See COMPONENT REFRIGERANT OIL CAPACITIES (DIESEL KIKI ROTARY VANE) table.

#### COMPONENT REFRIGERANT OIL CAPACITIES (DIESEL KIKI ROTARY VANE)

AA

Component	Ounces
-----------	--------

Condenser .....	1.7
-----------------	-----

Evaporator .....	1.0
------------------	-----

Receiver-Drier .....	1.0
----------------------	-----

Refrigerant Lines .....	0.3
-------------------------	-----

AA

### 5 & 6-CYLINDER

1) Before checking and adjusting oil level, operate engine at 800-1000 RPM. Set controls at maximum cooling and high blower motor speed for 20 minutes to return oil to compressor.

2) Stop engine. Discharge refrigerant and remove compressor from vehicle. See SERVICING PRECAUTIONS. Remove oil drain plug and measure amount of oil drained.

3) If amount drained is less than 3 ounces, conduct leak tests at system connections. Repair or replace faulty parts as necessary.

4) If amount drained is more 3 ounces, oil level is okay. Fill compressor with same amount drained, using new oil.

5) When replacing other A/C system components, add the following amount(s) of refrigerant oil. See COMPONENT REFRIGERANT OIL

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CAPACITIES (DIESEL KIKI 5 & 6-CYLINDER) table.

### COMPONENT REFRIGERANT OIL CAPACITIES (DIESEL KIKI 5 & 6-CYLINDER)

AA

Component Ounces

Condenser ..... 1.0

Evaporator ..... 1.7

Receiver-Drier ..... 1.0

Refrigerant Lines ..... 0.3

AA

## FORD

### FX-15 10-CYLINDER

1) Slowly discharge system. See SERVICING PRECAUTIONS. Remove A/C compressor. Drain compressor oil from suction and discharge ports. Measure amount drained and discard oil.

2) If amount drained from removed (old) compressor is between 3 and 5 ounces, add drained amount of new refrigerant oil into the NEW compressor through suction port.

3) If amount drained is less than 3 ounces, add 3 ounces to the NEW compressor. If amount drained is more than 5 ounces, add 5 ounces. Use new "O" rings on refrigerant lines. Install A/C compressor. Evacuate and recharge system. Perform leak test.

4) When replacing other A/C system components, add the following amount(s) of refrigerant oil. See COMPONENT REFRIGERANT OIL CAPACITIES (FX-15 10-CYLINDER) table.

### COMPONENT REFRIGERANT OIL CAPACITIES (FX-15 10-CYLINDER)

AA

Component Ounces

Condenser ..... 1.0

Evaporator ..... 3.0

Receiver-Drier ..... (1) 2.0

Refrigerant Lines ..... (2) 1.0

(1) - On Hyundai Sonata and Mazda Navajo, drain oil from old receiver-drier. Add amount drained to amount specified.

(2) - Add only if a large oil leak is indicated.

AA

## HADSYS

### 7-CYLINDER

Honda (Accord)

1) Discharge system. See SERVICING PRECAUTIONS. Remove compressor from vehicle. Drain all oil from NEW compressor and fill compressor with 4 ounces of clean refrigerant oil.

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2) Add one ounce of refrigerant oil when replacing evaporator. Add 1/2 ounce when replacing condenser. When replacing receiver-drier or hoses, add 1/3 ounce per component replaced.

### HARRISON

#### R4 4-CYLINDER

1) Before checking and adjusting oil level, operate engine at 800-1000 RPM. Set controls at maximum cooling and high blower motor speed for 20 minutes to return oil to compressor.

2) Stop engine. Discharge refrigerant and remove compressor from vehicle. See SERVICING PRECAUTIONS. Remove oil drain plug and measure amount of oil drained.

3) If amount drained is less than one ounce, conduct leak tests at system connections. Repair or replace faulty parts as necessary. Fill compressor with 2 ounces, using new refrigerant oil.

4) If amount drained is more one ounce, oil level is okay. Fill compressor with same amount drained, using new oil.

5) When replacing other A/C system components, add the following amount(s) of refrigerant oil. See COMPONENT REFRIGERANT OIL CAPACITIES (HARRISON R4 4-CYLINDER) table.

#### COMPONENT REFRIGERANT OIL CAPACITIES (HARRISON R4 4-CYLINDER)

Component	Ounces
Condenser .....	1.0
Evaporator .....	1.7
Receiver-Drier .....	1.0
Refrigerant Lines .....	0.3

#### V5 5-CYLINDER

1) If system is operable, run A/C system for several minutes to stabilize system. Turn off engine. Discharge system and remove compressor. See SERVICING PRECAUTIONS. Remove drain plug and measure oil.

2) If one ounce or more is drained, add same amount. If less than one ounce is drained, add 2 ounces of new refrigerant oil to compressor.

3) If condenser is replaced, add one ounce. Add 3.5 ounces if accumulator is replaced. If evaporator is replaced or if a large refrigerant leak occurred, add 3 ounces of new refrigerant oil.

### HITACHI

#### 6-CYLINDER

1) Before checking and adjusting oil level, operate compressor at 1000-1500 engine RPM, and set controls at maximum

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cooling and high blower motor speed for about 10 minutes to return oil to compressor.

2) Stop engine. Discharge refrigerant and remove compressor from vehicle. See SERVICING PRECAUTIONS. Drain oil from compressor through suction port. Measure amount of oil drained.

3) If amount drained is 2.4 ounces or more, fill with same amount using new oil. If amount drained is less than 2.4 ounces, fill with 2.4 ounces. Install compressor and recharge.

4) If A/C components are replaced, add refrigerant oil to system. Add 1.7 ounces if condenser is replaced. Add 2.4 ounces if evaporator is replaced. Oil does not need to be added if receiver-drier is replaced. Add 1.7 ounces of refrigerant oil only if a refrigerant oil leak is indicated.

## MATSUSHITA

### ROTARY VANE

Geo (Prizm)

1) If system is operable, run A/C system for several minutes to stabilize system. Turn off engine. Discharge system and remove compressor. See SERVICING PRECAUTIONS. Remove drain plug and measure oil.

2) If one ounce or more is drained, add same amount. If less than one ounce is drained, add 2 ounces of new refrigerant oil to compressor.

3) If condenser is replaced, add one ounce. Add 3.5 ounces if receiver-drier is replaced. If evaporator is replaced or if a large refrigerant leak occurred, add 3 ounces of new refrigerant oil.

Toyota

Discharge system. See SERVICING PRECAUTIONS. Remove compressor from vehicle. Drain oil from compressor through inlet and outlet ports. Fill compressor with 3.4-4.1 ounces of oil through suction port. Add 0.7 ounces if receiver-drier was replaced. When replacing condenser or evaporator, add 1.4-1.7 ounces of refrigerant oil.

## NIPPONDENSO

### ROTARY VANE

1) Before checking and adjusting oil level, operate compressor at engine idle speed, and set controls at maximum cooling and high blower motor speed for 20-30 minutes to return oil to compressor.

2) Stop engine. Discharge refrigerant and remove compressor from vehicle. See SERVICING PRECAUTIONS. Drain compressor oil through compressor intake and discharge ports. Measure amount drained.

3) Fill compressor with same amount as drained, plus one ounce. When replacing condenser, add one ounce. When replacing evaporator, add 1 1/2 ounces. When replacing receiver-drier, add 1/3



## A/C COMPRESSOR OIL CHECKING

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ounce of new refrigerant oil.

### 6 & 10-CYLINDER

NOTE: Porsche and Suzuki compressor oil checking procedures are not available from manufacturer.

#### Acura & Honda

1) Discharge system. See SERVICING PRECAUTIONS. Remove compressor from vehicle. Drain all oil from NEW compressor and fill compressor with 3-4 ounces of clean refrigerant oil.

2) On Accord, add 5/6 ounce of refrigerant oil when replacing evaporator. Add 1/3 ounce when replacing condenser. When replacing receiver-drier or hoses, add 1/3 ounce per component replaced.

3) On Legend, add 2 ounces of refrigerant oil when replacing evaporator. Add one ounce when replacing condenser. When replacing receiver-drier or hoses, add 1/3 ounce per component replaced.

4) On Integra, add one ounce of refrigerant oil when replacing evaporator. When replacing condenser, receiver-drier or hoses, add 1/3 ounce per component replaced.

5) On Vigor, add 1/2 ounce of refrigerant oil when replacing evaporator. Add 2/3 ounce when replacing condenser. When replacing receiver-drier or hoses, add 1/3 ounce per component replaced.

#### Chrysler Corp. (Colt Vista/Summit Wagon)

Add 2 ounces of refrigerant oil when replacing evaporator. Add one ounce when replacing condenser. When replacing receiver-drier or hoses, add 1/3 ounce per component replaced.

#### Ford Motor Co.

On Capri, add 2-3 ounces when replacing compressor. Add one ounce of refrigerant oil when replacing condenser or evaporator. When replacing receiver-drier, add 1/2 ounce. On Festiva, drain and measure oil from receiver-drier. Add the amount drained plus one ounce. Add one ounce when replacing condenser. Add 3 ounces of refrigerant oil when replacing evaporator.

#### Geo, Hyundai & Mazda

Add one ounce of refrigerant oil when replacing condenser. Add 1-1 1/2 ounce when replacing evaporator. When replacing receiver-drier or hoses, add 1/3 ounce per component replaced.

#### Lexus & Toyota

The use of refrigerant recovery/recycling is recommended by manufacturer. After refrigerant recovery process is completed, the amount of compressor oil removed must be measured and the same amount added to A/C system. Add 1 1/2 ounces of refrigerant oil when replacing condenser. Add 1 1/2 ounces when replacing evaporator. When replacing receiver-drier or hoses, add 1/2 ounce per component replaced.

#### Mercedes-Benz

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Add 2/3 ounce of refrigerant oil when replacing condenser. Add 1 1/3 ounces when replacing evaporator. When replacing receiver-drier or hoses, add 1/3 ounce per component replaced. If A/C system line has broken (sudden discharge), add 1 1/3 ounces of refrigerant oil.

**NOTE:** On Mercedes-Benz vehicles with rear A/C, add 2/3 ounce of refrigerant oil when replacing rear condenser. When replacing rear A/C lines, add 1/3 ounce per line replaced.

#### **Mitsubishi**

1) On Eclipse, add 2/3 ounce of refrigerant oil when replacing condenser. Add one ounce when replacing evaporator. When replacing receiver-drier or hoses, add 1/3 ounce per component replaced.

2) On Expo/Expo LRV and Montero, add one ounce of refrigerant oil when replacing condenser. Add 2 ounces when replacing evaporator. When replacing receiver-drier or hoses, add 1/3 ounce per component replaced.

#### **Volkswagen (Fox)**

1) The use of refrigerant recovery/recycling is recommended by manufacturer. After refrigerant recovery process is completed, the amount of compressor oil removed must be measured and the same amount added to A/C system.

2) Add 1 1/2 ounce of refrigerant oil when replacing evaporator. When replacing condenser, add 1 1/3 ounce of refrigerant oil. Add one ounce of refrigerant oil when replacing receiver-drier (1 1/2 ounces if relief valve on receiver-drier has burst).

## **PANASONIC**

### **ROTARY VANE**

#### **Mazda**

Add 1 1/3 ounce of refrigerant oil when replacing condenser (1/2 ounce on MX-6 and 626). Add 2 ounces when replacing evaporator. When replacing receiver-drier or hoses, add 1/3 ounce of refrigerant oil.

## **SANDEN**

### **SCROLL**

#### **Chrysler/Mitsubishi**

1) On Colt, Galant, Mirage, Pickup, Ram-50 and Summit, add 1/2 ounce of refrigerant oil when replacing condenser. Add 1 1/2 ounces when replacing evaporator. When replacing receiver-drier or hoses, add 1/3 ounce per component replaced.

2) On Stealth and 3000GT, add 1/2 ounce of refrigerant oil when replacing condenser. Add 2 ounces when replacing evaporator. When replacing receiver-drier or low-pressure hose, add 1/3 ounce per

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component replaced.

### Honda

1) Discharge system. See SERVICING PRECAUTIONS. Remove compressor from vehicle. Drain all oil from NEW compressor and fill compressor with 4 ounces of clean refrigerant oil.

2) On Civic and Civic Del Sol, add 1 1/2 ounce of refrigerant oil when replacing evaporator. Add 2/3 ounce when replacing condenser. When replacing receiver-drier or hoses, add 1/3 ounce per component replaced.

3) On Prelude, add one ounce of refrigerant oil when replacing evaporator. When replacing other A/C components, add 1/3 ounce per component replaced (including hoses).

### Hyundai

Add 1 1/2 ounces of refrigerant oil when replacing evaporator. Add one ounce when replacing condenser. When replacing receiver-drier, add 1/3 ounce of refrigerant oil.

## 5-CYLINDER

### Mazda

Add one ounce of refrigerant oil when replacing condenser. Add 1 2/3 ounce when replacing evaporator. When replacing receiver-drier, add 1/2 ounce of refrigerant oil.

NOTE: Saab and Volvo (Sanden 5 or 7-cylinder) compressor oil checking procedures are not available from manufacturer.

## 7-CYLINDER

### Hyundai & Mitsubishi (Excel & Precis)

1) Before checking and adjusting oil level, operate compressor at engine idle speed, and set controls at maximum cooling and high blower motor speed for 20-30 minutes to return oil to compressor.

2) Stop engine. Discharge refrigerant and remove compressor from vehicle. See SERVICING PRECAUTIONS. Remove oil drain plug and drain oil. Measure amount of oil drained. Install drain plug with new "O" ring.

3) If amount drained is 2.3 ounces or more, fill compressor with same amount using new oil. If amount drained is less than 2.3 ounces, fill with 2.3 ounces. Install filler plug. Install compressor and recharge system.

### COMPONENT REFRIGERANT OIL CAPACITIES (SANDEN 7-CYLINDER)

AA

Component	Ounces
Condenser .....	1.0
Evaporator .....	3
Receiver-Drier .....	1

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AA

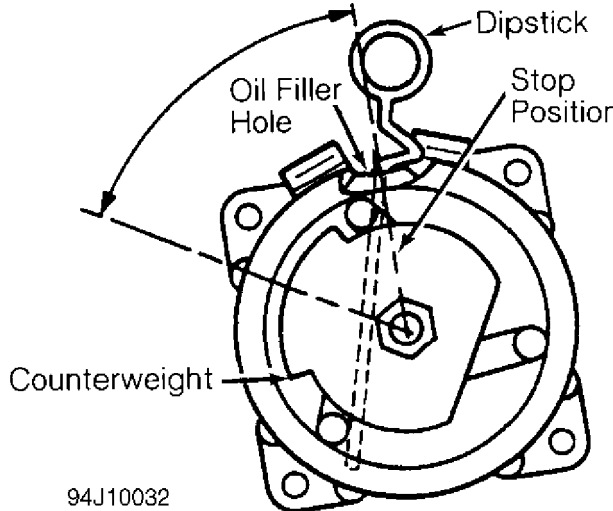
Jaguar (XJS)

1) Operate engine at idle speed for 10 minutes, to return refrigerant oil to compressor. Stop engine. Discharge refrigerant. See SERVICING PRECAUTIONS. Clean area around compressor filler plug and remove plug slowly.

2) Determine angle at which compressor is mounted. Insert compressor dipstick diagonally until stop on dipstick contacts filler plug surface. See Fig. 1. Remove dipstick and note oil fill level. Each increment on dipstick represents one ounce of oil.

3) Determine amount of oil needed according to mounting angle. See COMPRESSOR OIL CAPACITIES (JAGUAR XJS) table for specified amount.

4) If necessary, correct compressor oil level. Install compressor oil plug, and tighten it to 72-108 INCH lbs. (8-12 N.m). Evacuate and recharge A/C system. Perform leak test.



94J10032

Fig. 1: Checking Jaguar XJS Compressor Oil Level (Sanden 7-Cylinder)  
Courtesy of Jaguar Cars, Inc.

**COMPRESSOR OIL CAPACITIES (JAGUAR XJS)**

AA

Mounting Angle (In Degrees)	Oil Level In Increments
0 .....	3-5
10 .....	4-6
20 .....	5-7
30 .....	6-8
40 .....	7-9
50 .....	8-10
60 .....	9-11
90 .....	10-12

AA

Volkswagen

1) The use of refrigerant recovery/recycling is recommended

# A/C COMPRESSOR OIL CHECKING

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by manufacturer. After refrigerant recovery process is completed, the amount of compressor oil removed must be measured and the same amount added to A/C system.

2) On Cabriolet, add 2/3 ounce of refrigerant oil when replacing evaporator. When replacing condenser or receiver-drier, add 1/3 ounce of refrigerant oil per component replaced.

3) On Corrado SLC, Golf, GTI, Jetta and Passat, add 2/3 ounce of refrigerant oil when replacing evaporator. When replacing condenser or receiver-drier, add 1/3 ounce of refrigerant oil per component replaced.

4) On EuroVan, add one ounce of refrigerant oil when replacing evaporator. Add 1/2 ounce when replacing condenser (2/3 ounce on vehicles with rear A/C). When replacing receiver-drier, add 1/3 ounce (2/3 ounce on vehicles with rear A/C).

### SEIKO-SEIKI

#### ROTARY VANE

Saab (9000)

The A/C system is filled with 6.6 ounces of compressor oil. The compressor must be topped off with the specified amount. See COMPONENT REFRIGERANT OIL CAPACITIES (SEIKO-SEIKI ROTARY VANE) table. Topping off should be carried out on the high pressure side of the compressor.

#### COMPONENT REFRIGERANT OIL CAPACITIES (SEIKO-SEIKI ROTARY VANE)

AA

Component	Ounces
Compressor .....	(1) 2.3
Condenser .....	1.3
Expansion Valve .....	0.6
Evaporator .....	1.3
Receiver-Drier .....	1.3
Refrigerant Lines .....	0.6

(1) - To avoid an excessive amount of oil in the A/C system, oil must be drained from the compressor before it is installed.

AA

### ZEXEL

NOTE: Isuzu and Subaru compressor oil checking procedures are not available from manufacturer.

#### ROTARY VANE

Nissan

1) Before checking and adjusting oil level, operate engine at 1200 RPM. Set controls at maximum cooling and high blower motor speed for 10 minutes to return oil to compressor.

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2) Stop engine. Discharge refrigerant. See SERVICING PRECAUTIONS. Measure the amount of oil drained/discharged into refrigerant recovery/recycling equipment.

3) Remove compressor from vehicle. Drain compressor oil from compressor drain plug and measure oil amount. Add this amount to amount drained in step 2), to obtain total amount drained.

4) Fill compressor with total amount drained, using new oil. If any major components of the system were also replaced, determine the amount of additional oil needed. See COMPONENT REFRIGERANT OIL CAPACITIES (ZEXEL ROTARY VANE & 6-CYLINDER) table for specified amount.

#### COMPONENT REFRIGERANT OIL CAPACITIES (ZEXEL ROTARY VANE & 6-CYLINDER)

~~~~~

| Component                        | Ounces  |
|----------------------------------|---------|
| Condenser                        |         |
| Altima & Maxima .....            | 2.5     |
| NX, Pickup, Sentra & 300ZX ..... | 1.0-1.7 |
| Evaporator                       |         |
| Altima & Maxima .....            | 2.5     |
| NX, Pickup, Sentra & 300ZX ..... | 1.5-2.5 |
| Receiver-Drier                   |         |
| Altima & Maxima .....            | 0.2     |
| NX, Pickup, Sentra & 300ZX ..... | 0.5-0.8 |
| Refrigerant Lines (1) .....      | 1.0     |

(1) - Add only if a refrigerant oil leak is indicated.

~~~~~

#### 6-CYLINDER

##### Audi

1) The use of refrigerant recovery/recycling is recommended by manufacturer. After refrigerant recovery process is completed, the amount of compressor oil removed must be measured and the same amount added to A/C system.

2) Add one ounce of refrigerant oil when replacing accumulator. When replacing condenser, add amount drained from condenser plus 1/3 ounce of refrigerant oil. When replacing evaporator, add amount drained from evaporator plus 2/3 ounce of refrigerant oil.

##### Nissan

1) Before checking and adjusting oil level, operate engine at 1200 RPM. Set controls at maximum cooling and high blower motor speed for 10 minutes to return oil to compressor.

2) Stop engine. Discharge refrigerant. See SERVICING PRECAUTIONS. Measure the amount of oil drained/discharged into refrigerant recovery/recycling equipment.

3) Remove compressor from vehicle. Drain compressor oil from compressor drain plug and measure oil amount. Add this amount to

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amount drained in step 2), to obtain total amount drained.

4) Fill compressor with total amount drained, using new oil.

If any major components of the system were also replaced, determine the amount of additional oil needed. See COMPONENT REFRIGERANT OIL CAPACITIES (ZEXEL ROTARY VANE & 6-CYLINDER) table for specified amount.

Volvo (850)

1) Discharge refrigerant. See SERVICING PRECAUTIONS. Remove compressor from vehicle. Drain compressor oil from compressor drain plug and measure oil amount. Add the same amount of oil as was drained from the old compressor.

2) Add 1 2/3 ounce of refrigerant oil when replacing evaporator. When replacing condenser or hoses, add 2/3 ounce of refrigerant oil per component replaced. Add 3 ounce of refrigerant oil when replacing receiver-drier.

**END OF ARTICLE**

# A/C COMPRESSOR SERVICING

## Article Text

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### ARTICLE BEGINNING

1993 AIR CONDITIONING & HEAT  
Compressor Servicing

### READ THIS FIRST

NOTE: The purpose of this article is to provide GENERAL servicing overview. For more specific information, refer to the AUTO A/C-HEAT SYSTEM, MANUAL A/C-HEAT SYSTEM, or HEATER SYSTEM articles in this section.

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

### ATSUGI ROTARY VANE CLUTCH COIL R & I

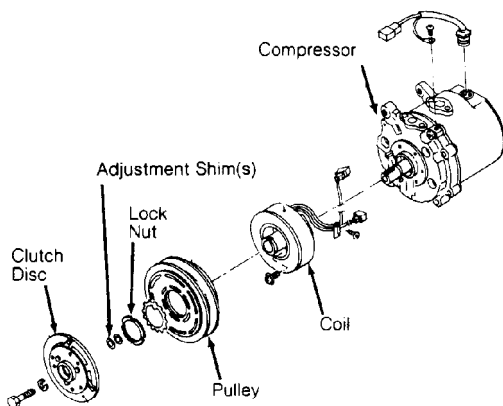
#### Removal

When replacing compressor clutch, be careful not to scratch shaft or bend pulley. When removing center bolt, hold clutch disc with Clutch Holder (KV99231010). Using Hub Puller (KV998VR001), remove clutch disc. When removing pulley, remove lock nut with Hub Socket (KV99235160).

#### Installation

1) Tighten center bolt to 81-104 INCH lbs. (9.1-11.8 N.m). Tighten lock nut to 21-29 ft. lbs. (29-39 N.m). Using feeler gauge, ensure clearance between clutch disc and pulley is .012-.024" (.30-.60 mm).

2) If clearance is not correct, replace adjustment shim(s). See Fig. 1. Break-in clutch by engaging and disengaging clutch about 30 times.



103223

Fig. 1: Exploded View Of Compressor (Atsugi Rotary Vane)  
Courtesy of Nissan Motor Co., U.S.A.



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### BOSCH 6-CYLINDER CLUTCH COIL R & I

#### Removal

1) Hold clutch plate and remove shaft nut. Using Clutch Plate Remover (64 5 00), remove clutch plate. Using snap ring pliers, remove circlip and remove pulley assembly.

2) If pulley bearing is being replaced, remove circlip at rear of pulley. Press bearing and spacer from pulley. Press in new bearing with spacer and replace circlip.

#### Installation

1) Clean all surfaces. Install pulley assembly on compressor and install circlip. Ensure clutch plate shim is in place on shaft. Install clutch plate and nut. Tighten nut to 13-15 ft. lbs. (18-20 N. m).

2) Using a feeler gauge, check clutch plate-to-pulley clearance. Clearance should be .028-.051" (.7-1.3 mm). If clearance is not correct, remove clutch plate and replace clutch plate shim. See Fig. 2.

### BOSCH 6-CYLINDER SHAFT SEAL R & I

#### Removal

Remove clutch plate. Remove shaft key and circlip. Using Seal Seat Remover/Installer (64 5 030), remove seal seat. Using Seal Remover/Installer (64 5 040), turn seal slightly clockwise to disengage tangs and pull out shaft seal. Remove "O" ring seal.

#### Installation

1) Coat new "O" ring seal with refrigerant oil and install. Coat new shaft seal with refrigerant oil and install seal on Seal Remover/Installer (64 5 040). Ensure shaft seal and shaft machine surfaces align. Insert shaft seal and turn slightly counterclockwise to secure on shaft.

2) Using sleeve from Seal Seat Remover/Installer (64 5 030), push seal seat into compressor and install circlip. Install shaft key and clutch plate. Check compressor oil level before charging system.

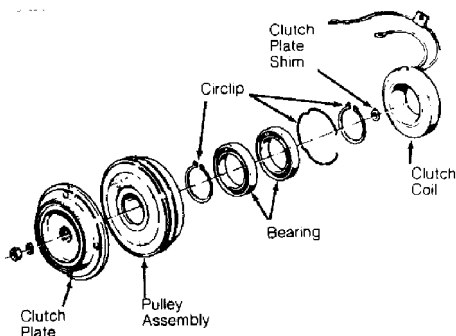


Fig. 2: Exploded View Of Compressor Clutch (Bosch 6-Cylinder)  
Courtesy of BMW of North America, Inc.

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### CALSONIC V5 & V6 CLUTCH COIL R & I

**NOTE:** Calsonic V6 compressor servicing procedure is not available from manufacturer.

#### Removal

1) Remove shaft nut while holding clutch plate with Clutch Disc Wrench (J-39072). Install clutch disc Puller Set (J-39073-4, J-33013-1, J-33013-3) and remove clutch plate.

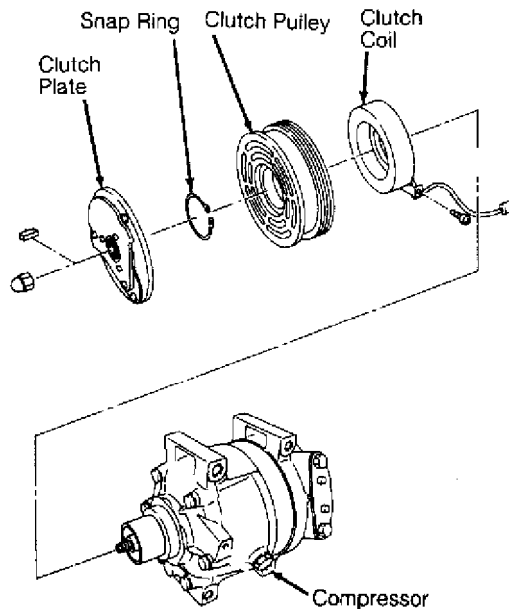
2) Remove snap ring. Use a universal gear puller to remove clutch pulley. See Fig. 3. Remove screw from clutch coil lead. Use puller to remove clutch coil.

#### Installation

1) To install clutch coil, reverse removal procedure. Ensure coil lead is installed in original position. Using puller set and Coil Jig (J-39073-1), carefully press clutch coil into place.

2) Install a new clutch pulley snap ring, being careful not to damage shaft seal. Press clutch plate into place. Install shaft nut and torque to 89-106 INCH lbs. (10-12 N.m).

3) Use a feeler gauge to check clutch plate-to-pulley clearance. Clearance should be .012-.024" (.30-.60 mm). If clearance is too large, remove shaft nut and again press in clutch plate. If clearance is too small, increase gap by pulling up clutch plate. DO NOT remove shaft nut.



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Fig. 3: Exploded View Of Compressor Clutch (Calsonic V5)  
Courtesy of Nissan Motor Co., U.S.A.

### DIESEL KIKI ROTARY VANE CLUTCH COIL R & I

#### Removal

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1) Hold clutch disc using Clutch Holder (J-33939) and remove center bolt. Using Puller (J-33944-A) and Forcing Bolt (J-33944-4), remove clutch disc. Remove adjustment shim(s) and snap ring.

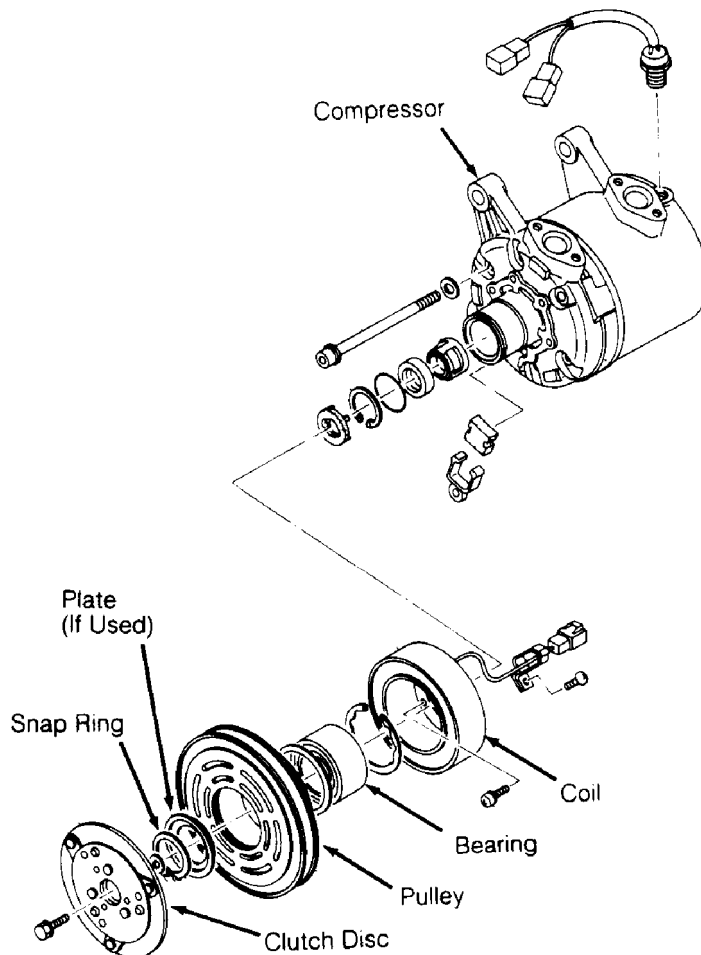
2) Remove pulley using Pilot (J-38424) and universal puller. Remove coil lead screw, clutch coil screws and coil. Remove snap ring and bearing if necessary.

#### Installation

1) Ensure coil lead is installed in original position.

Install and tighten coil screws to 35-53 INCH lbs. (4-6 N.m). Press pulley onto compressor using Pulley Installer (J-33940). Install snap ring and adjustment shim(s).

2) Install clutch disc and tighten center bolt to 106-133 INCH lbs. (12-15 N.m). Using feeler gauge, ensure clearance between clutch disc and pulley is .012-.024" (.30-.60 mm). If clearance is incorrect, add or remove shim(s) as necessary. Break-in clutch by engaging and disengaging clutch 30 times.



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Fig. 4: Exploded View Of Compressor (Diesel Kiki Rotary Vane)  
Courtesy of Nissan Motor Co., U.S.A.

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### **DIESEL KIKI 6-CYLINDER CLUTCH COIL R & I**

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

#### Removal & Installation

1) Using Clutch Holder (J-33939) to prevent clutch disc from rotating, remove shaft bolt. Using Clutch Disc Puller (J-33944-A) and Forcing Bolt (J-33944-4), remove clutch disc. Remove shim(s) from compressor drive shaft or clutch disc. See Fig. 5.

2) Remove snap ring, cover and pulley. With Puller Guide (J-33943-A) in center of pulley, attach Crossbar (J-8433) to outside diameter of pulley. Tighten crossbar bolt against puller guide to remove pulley. Remove coil lead, screws, and coil.

3) To install, reverse removal procedure. Install cover snap ring with beveled side facing out. Install clutch disc and tighten center bolt to 133 INCH lbs. (15 N.m).

4) Using feeler gauge, ensure clearance between clutch disc and pulley is .012-.024" (.30-.60 mm). If clearance is incorrect, add or remove shim(s) as necessary.

### **DIESEL KIKI SHAFT SEAL R & I**

#### Removal & Installation

1) Remove clutch coil. Remove and discard felt. Using Shaft Seal Cover Remover/Installer (J-33942), push down and turn remover clockwise to engage tangs to cover. Slowly remove seal cover from bore.

2) Remove shaft seal snap ring. Use Shaft Seal Remover (J-33942-B) to remove seal. Remove compressor through bolts, front head and "O" ring. If necessary, replace front and rear valve plates, reed valves, and "O" rings.

3) To install, reverse removal procedure. Coat "O" ring, shaft seal and seal seat with refrigerant oil. Place Shaft Seal Guide (J-34614) over end of compressor shaft. Ensure chamfered portion of shaft seal retainer aligns with chamfered portion on compressor shaft.

4) Install front head and tighten compressor through bolts, in a crisscross pattern, to 16 ft. lbs. (22 N.m). Install shaft seal cover and felt. See Fig. 5. Rotate compressor drive shaft 2-3 times to ensure compressor operates smoothly.

## A/C COMPRESSOR SERVICING

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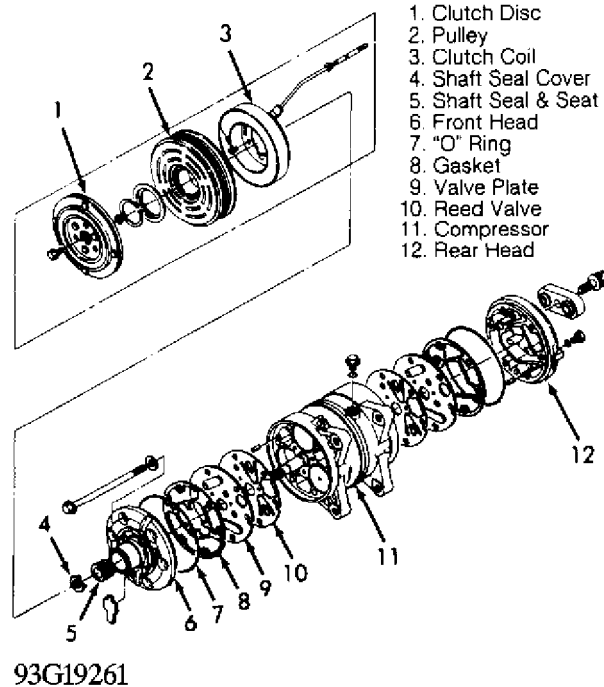


Fig. 5: Exploded View Of Compressor (Diesel Kiki 6-Cylinder)  
Courtesy of Isuzu Motor Co.

### FORD FX-15 CLUTCH COIL R & I

#### Removal

1) Using Clutch Holder (000 41 0812 05), remove clutch plate bolt. Using an 8-mm bolt threaded into clutch plate, remove clutch plate and shim(s). See Fig. 6.

2) Remove snap ring and pulley assembly. Install Shaft Protector (49 UN01 047) over shaft seal opening. Use a 2-jaw puller to remove clutch coil from compressor.

#### Installation

1) Ensure clutch coil mounting surface is clean. Use Coil Installer (49 UN01 046) and 2-jaw puller engaged to rear side of compressor front mounts to press coil into place.

2) Install pulley assembly. Install pulley assembly snap ring with bevel side of snap ring facing out. Install shim(s) and clutch plate. Install a new clutch plate bolt and tighten to 97-115 INCH lbs. (11-13 N.m).

3) Use a feeler gauge to check clearance between clutch plate and pulley assembly. Clearance should be .018-.033" (.46-.84 mm). If clearance is incorrect, add or remove shims as necessary.

### FORD FX-15 SHAFT SEAL R & I

## A/C COMPRESSOR SERVICING

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#### Removal

1) Using Clutch Holder (000 41 0812 05), remove clutch plate bolt. Using an 8-mm bolt threaded into clutch plate, remove clutch plate and shim(s). See Fig. 6.

2) Remove shaft felt seal. Thoroughly clean seal area of compressor. Remove shaft seal snap ring. Position Shaft Seal Remover (49 UN01 044) over compressor shaft.

3) Push shaft seal remover downward against seal. Ensure end of shaft seal remover is engaged with inside of seal. Rotate shaft seal remover 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 (49 UN01 043), push shaft seal down seal protector until seal is seated.

3) Remove shaft seal installer and protector. Install a new shaft seal retaining snap ring and shaft seal felt. Install shim(s) and clutch plate. Install a new clutch plate retaining bolt and tighten to 97-115 INCH lbs. (11-13 N.m).

4) Use a feeler gauge to check clearance between clutch plate and pulley assembly. Clearance should be .018-.033" (.46-.84 mm). If clearance is incorrect, add or remove shims as necessary.

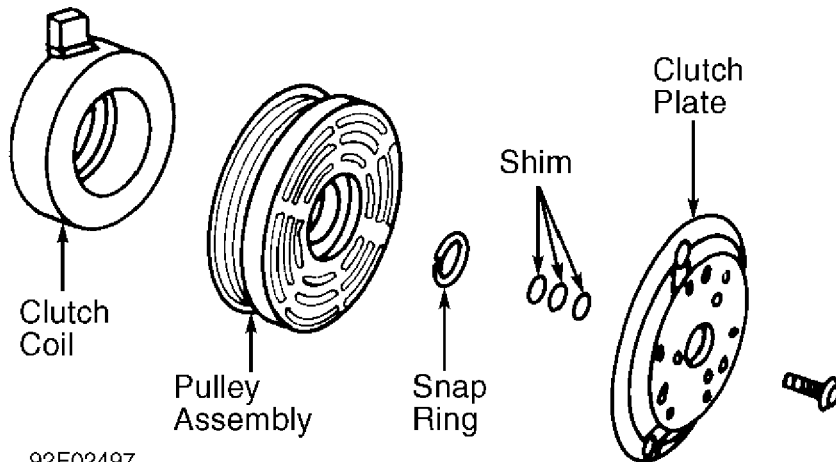


Fig. 6: Exploded View Of Compressor Clutch (Ford FX-15)  
Courtesy of Mazda Motors Corp.

## HADSYS 7-CYLINDER CLUTCH COIL R & I

#### Removal

Using Clutch Holder (J-37872), hold pressure plate and remove shaft bolt. Remove pressure plate and adjustment shim(s). See Fig. 7. Remove snap ring. Using universal puller, remove compressor pulley. Remove clutch coil.

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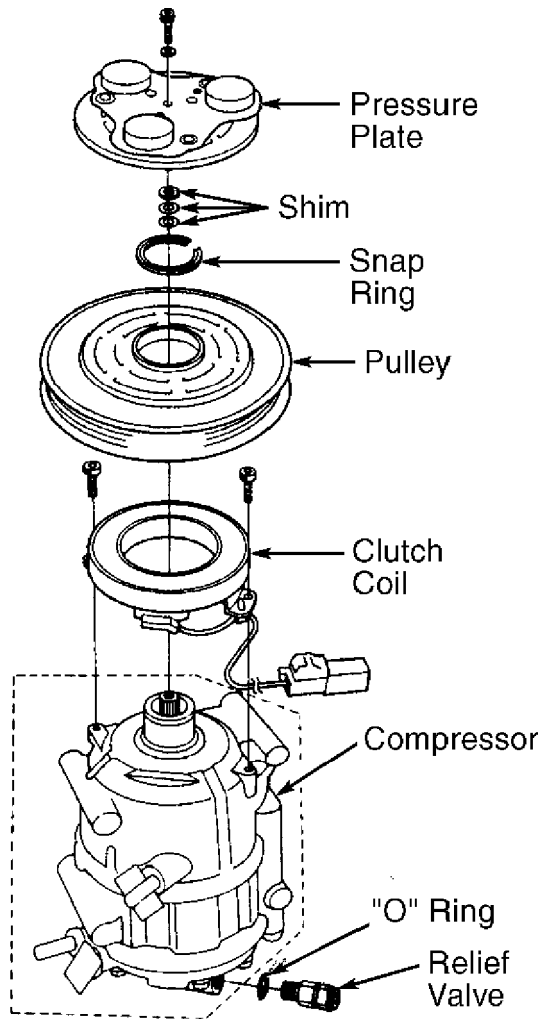
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#### Installation

Install clutch coil in reverse order of removal. Ensure snap ring is properly seated. Apply locking compound to shaft bolt and tighten it to 62 INCH lbs. (7 N.m). Ensure clearance between pressure plate and pulley is 0.012-0.024" (.30-.60 mm). If clearance is incorrect, add or remove shim(s) as necessary.



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Fig. 7: Exploded View Of Compressor (Hadsys 7-Cylinder)  
Courtesy of American Honda Motor Co., Inc.

### HARRISON R4 4-CYLINDER CLUTCH COIL AND BEARING R & I

#### Removal

1) Clamp Holding Fixture (J-25008-A) in vise. Attach compressor to holding fixture. Use Clutch Hub Holder (J-33027) to hold clutch and remove shaft nut.

2) Thread Hub and Drive Plate Assembly Remover/Installer (J-37707) into hub. Hold body of remover with wrench and turn center bolt

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into remover body to remove clutch plate and hub assembly. Remove shaft key and save for installation.

3) Remove snap ring. Place Puller Guide (J-25031-1) in center of pulley housing. Engage universal puller to outer diameter of pulley (clutch rotor). See Fig. 8. Hold puller and tighten screw to remove pulley.

4) Invert pulley and place on work bench. Press out rotor bearing using handle and Bearing Remover (J-9398-A). Attach universal puller to outside diameter of clutch coil. Tighten bolt against puller guide to remove clutch coil.

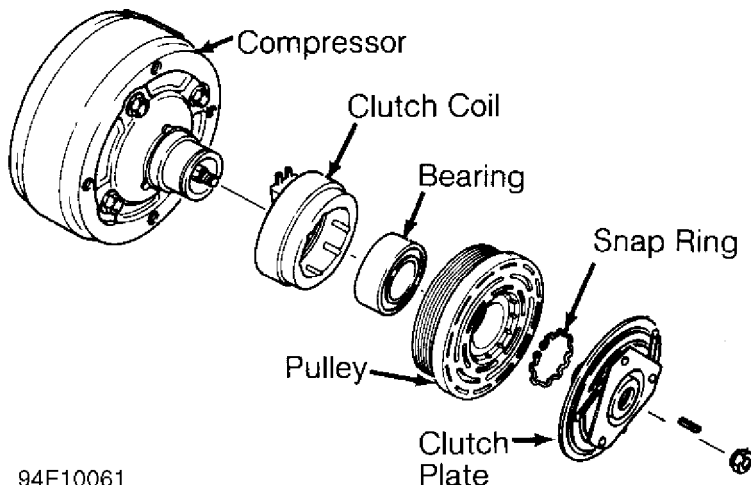
**CAUTION:** DO NOT drive or pound on clutch hub or shaft.

#### Installation

1) Ensure clutch coil is installed in original position. Press pulley onto compressor using Installer (J-9481-A) and handle. Install shaft key into hub key groove. Allow key to project approximately 3/16" (4.8 mm) out of keyway.

2) Ensure frictional surface of clutch plate and clutch rotor are clean before installing clutch plate and hub assembly. Align shaft key with shaft keyway and place clutch plate and hub assembly onto compressor shaft.

3) Hold hub and drive plate remover/installer with wrench and tighten nut to press hub into shaft until there is a .020-.040" (.5-1.0 mm) air gap between plate and clutch rotor. Install a new shaft nut and tighten to 10 ft. lbs. (14 N.m). Ensure rotor is not rubbing on clutch plate.



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Fig. 8: Exploded View Of Compressor (Harrison R4 4-Cylinder)  
Courtesy of Isuzu Motor Co.

### HARRISON V5 5-CYLINDER CLUTCH COIL AND BEARING R & I

#### Removal

1) Clamp Holding Fixture (J-34992) in vise. Attach compressor to holding fixture. Use Clutch Hub Holder (J-33027-A) to hold clutch. Remove shaft nut using Socket (J-33022). See Fig. 9.



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2) Thread Clutch Plate and Hub Assembly Remover (J-33013-B) into hub. Hold body of remover with wrench and turn center bolt to remove clutch plate and hub assembly. Remove snap ring. Remove shaft key and save for installation.

3) Place Puller Guide (J-33023-A) in center of pulley housing. Engage Rotor/Bearing Puller (J-33020) to inner circle of slots in pulley (rotor). Hold rotor/bearing puller in place and tighten screw to remove pulley.

4) Remove screw from rotor/bearing puller. Invert assembly and place on work bench with rotor/bearing puller still engaged. Remove hub bearing using handle and Bearing Remover (J-9398-A).

5) With puller guide in place, attach Crossbar (J-8433-1) and Puller (J-33025) to outside diameter of clutch coil. Tighten crossbar Bolt (J-8433-3) against puller guide to remove clutch coil.

#### Installation

1) Ensure clutch coil is installed in original position. Press coil into position using crossbar, clutch Coil Installer (J-33024) and Through Bolts (J-34992-2). Stake compressor housing 120 degrees apart to secure coil.

2) Position Rotor/Bearing Installer (J-33017) and puller guide over inner race of bearing. Using through bolts, assemble crossbar over puller pilot and tighten through bolts onto holding fixture. Tighten crossbar bolt to press pulley/bearing assembly onto compressor.

3) Install shaft key into hub key groove. Allow key to project approximately 1/8" (3.2 mm) out of keyway. Align shaft key with shaft keyway and place clutch plate and hub assembly onto compressor shaft.

**CAUTION:** Do not drive or pound on clutch hub or compressor shaft, as compressor could be damaged internally.

4) Hold hex portion of Hub Installer (J-33013) with a wrench. Tighten center screw to press hub into shaft until there is .020-.030" (.50-.76 mm) air gap between frictional plate and clutch rotor.

5) Install new shaft nut with small diameter boss of nut against crankshaft shoulder. Use Socket (J-33022) and Clutch Hub Holder (J-33027-A). Tighten shaft nut to 12 ft. lbs. (16 N.m). Ensure pulley does not rub on clutch plate. See Fig. 9.

## **HARRISON V5 5-CYLINDER SHAFT SEAL R & I**

#### Removal

Remove clutch plate and hub assembly. Remove shaft seal snap ring. Thoroughly clean inside of compressor neck area around shaft and seal. Engage tangs of Seal Remover/Installer (J-23128-A) into recessed portion of seal and remove seal. Remove and discard "O" ring from compressor neck. Thoroughly clean inside of compressor neck and "O" ring groove.

#### Installation

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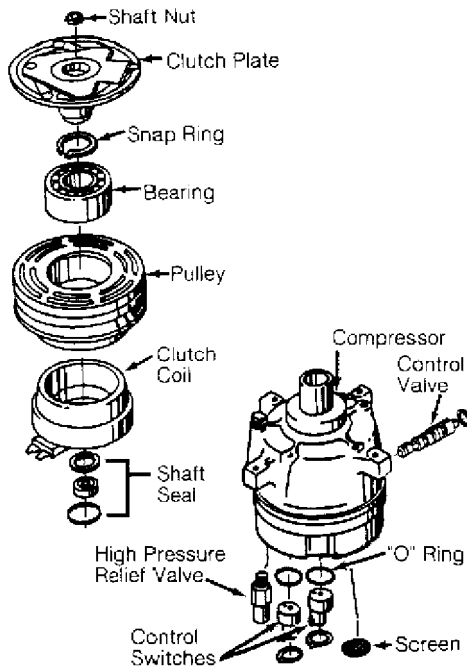
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1) Coat new "O" ring with refrigerant oil and install on "O" Ring Installer (J-33011). Install "O" ring into groove in compressor neck. Attach new seal to seal remover/installer. Dip shaft seal in clean refrigerant oil.

2) Place Seal Protector (J-34614) over compressor shaft. Push new seal over shaft protector. Install new seal snap ring with flat side against seal. Install clutch plate assembly.



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Fig. 9: Exploded View Of Compressor (Harrison V5 5-Cylinder)  
Courtesy of General Motors Corp.

### HITACHI 6-CYLINDER CLUTCH COIL AND SEAL R & I

#### Removal

1) Hold clutch hub with Clutch Tightener (925770000). Remove shaft nut from shaft. Using Clutch Hub Remover (926130000), remove clutch hub. Use snap ring pliers to remove inner snap ring.

2) Remove pulley and bearing assembly. Remove screws securing clutch coil lead. Remove inner snap ring from clutch coil. Remove clutch coil from front cover.

3) Remove shaft key. Use snap ring pliers to remove shaft seal snap ring. Wrap a rag around compressor shaft. Using Injector Needle (92619000) and refrigerant can, slowly pressurize compressor at low pressure (suction) service port. See Fig. 10. Catch shaft seal seat in rag.

4) Insert Shaft Seal Remover/Installer (926120000) through

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open end of front cover. Slowly pull out remover/installer to remove shaft seal.

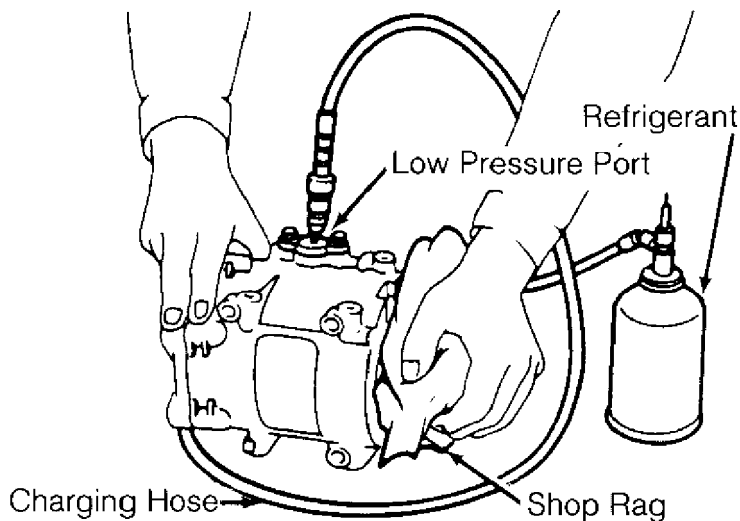
#### Installation

1) Ensure shaft seal contact surface is free of dirt.

Lubricate with refrigerant oil. Using shaft seal remover/installer, insert shaft seal.

2) To install clutch coil and hub, reverse removal procedure.

Tighten shaft nut to 14-15 ft. lbs. (19-21 N.m). Ensure clearance between pressure plate and pulley is 0.020-0.031" (.50-.80 mm).



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Fig. 10: Removing Compressor Shaft Seal Seat (Hitachi 6-Cylinder)  
Courtesy of Subaru of America, Inc.

## MATSUSHITA ROTARY VANE CLUTCH COIL R & I

#### Removal & Installation

1) Using Pressure Plate Holder (J-7624) and socket, remove center bolt. Thread Puller (J-34878) onto pressure plate. Hold pressure plate with pressure plate holder and tighten puller to remove pressure plate.

2) Remove shim(s) from shaft. Remove snap ring and, using a plastic hammer, tap pulley off. Remove screw for clutch coil lead. Remove snap ring and clutch coil. See Fig. 11.

3) To install, reverse removal procedure. Tighten shaft bolt to 10 ft. lbs (14 N.m). Using feeler gauge, ensure clearance between pressure plate and pulley is .014-.026" (.35-.65 mm). If clearance is incorrect, add or remove shim(s) as necessary.

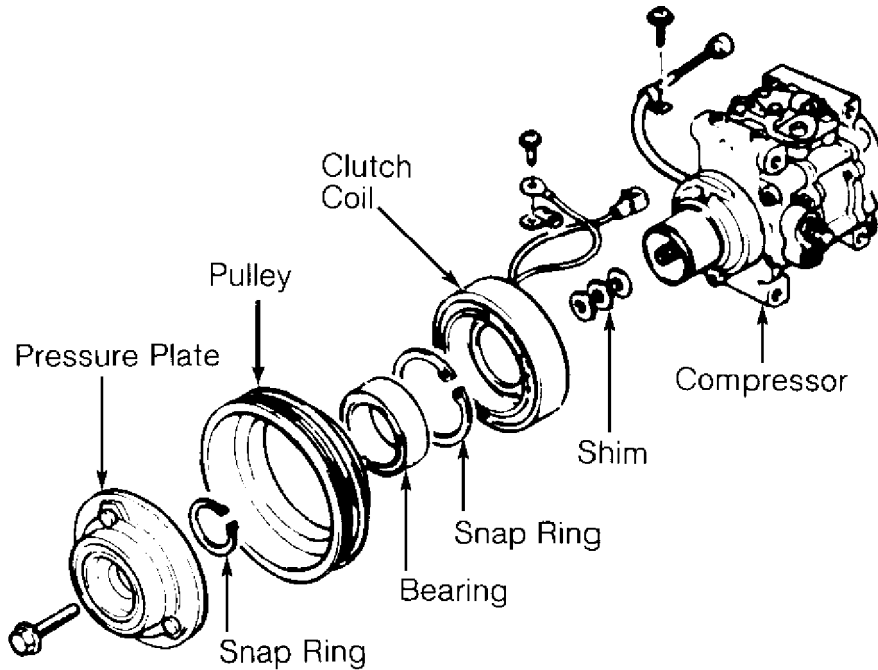
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Fig. 11: Exploded View Of Compressor (Matsushita Rotary Vane)  
Courtesy of Toyota Motor Sales, U.S.A., Inc.

### NIPPONDENSO TV12 ROTARY VANE CLUTCH COIL R & I

#### Removal

1) Hold clutch disc with Clutch Holder (00007-10331) and remove shaft nut. Install Clutch Disc Remover (4992-02-020) and remove clutch disc and shims. See Fig. 12.

2) Remove pulley snap ring and tap pulley (with bearing) off of compressor with plastic hammer. Remove screw for clutch coil lead. Remove snap ring and clutch coil.

#### Installation

To install, reverse removal procedure. Ensure pulley-to-clutch disc clearance is .016-.024" (.40-.60 mm). If clearance is incorrect, add or remove shim(s) as necessary.

### NIPPONDENSO TV12 DISCHARGE VALVE & SHAFT SEAL R & I

#### Removal

1) Drain and measure compressor oil in compressor. Remove discharge valve body through bolts. Remove discharge valve body bolts and body. Remove discharge valve plate and discharge valve.

2) Remove compressor through bolts and front and rear housing (oil separator case). Remove pins and gaskets. Remove shaft seal from shaft. Press shaft seal plate off of front housing (head cover).

#### Installation

To install components, reverse removal procedure. Tighten

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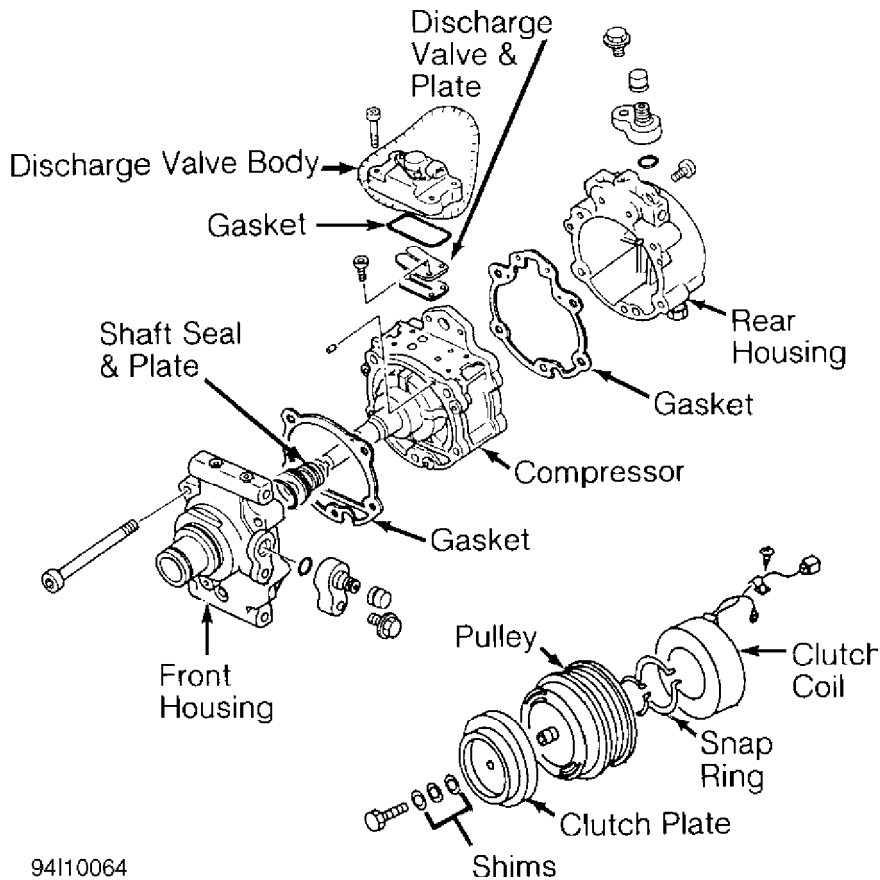
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compressor through bolts to 19 ft. lbs. (26 N.m). Tighten discharge valve bolts to 41 INCH lbs. (4.6 N.m). Tighten discharge valve body and body through bolts to 96 INCH lbs. (10.8 N.m).



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Fig. 12: Exploded View Of Compressor (Nippondenso TV12 Rotary Vane)  
Courtesy of Mazda Motors Corp.

### NIPPONDENSO 6 & 10-CYLINDER CLUTCH COIL AND BEARING R & I

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

#### Removal

1) Hold clutch plate stationary and remove shaft bolt (or nut). Remove clutch plate using puller. Remove shim(s) from shaft and snap ring. Tap pulley off shaft with plastic hammer. If pulley cannot be removed by hand, use commercially available puller.

2) Remove snap ring, bearing, and seal (if equipped) from pulley. See Fig. 13. Remove screw for clutch coil lead. Remove snap ring and clutch coil.

#### Installation

To install, reverse removal procedure. Ensure snap rings are installed with beveled side facing out. Tighten shaft bolt (or nut) to

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13-14 ft. lbs. (17-19 N.m) on Fox, MR2 and Scoupe; 10-13 ft. lbs. (14-17 N.m) on all others. Ensure air gap between clutch plate and pulley is .024-.040" (.60-1.00 mm) on Fox and MR2; .014-.026" (.36-.66 mm) on all others. If air gap is incorrect, add or remove shim(s) as necessary.

**NOTE:** To check air gap, place a dial indicator on clutch plate. Apply voltage to clutch coil. Check air gap between clutch plate and drive pulley. Ensure air gap is as specified.

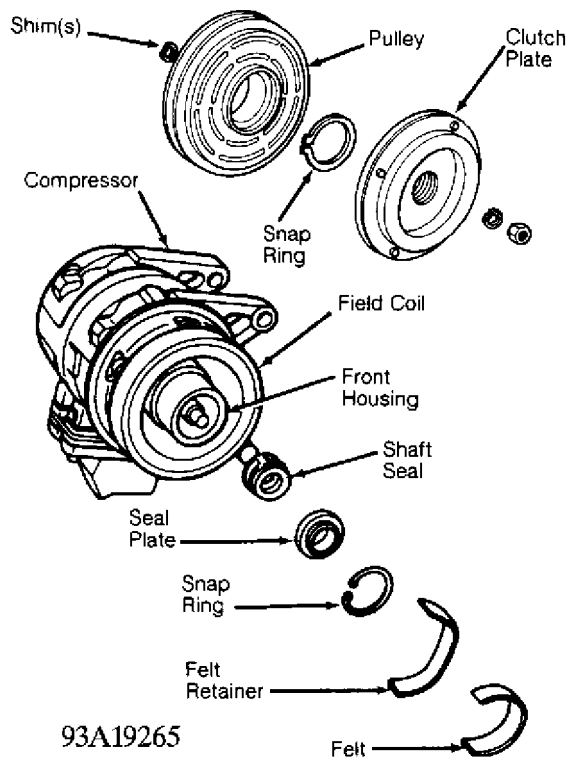


Fig. 13: Exploded View Of Compressor (Nippondenso 10-Cylinder)  
Courtesy of Ford Motor Co.

### NIPPONDENSO 6 & 10-CYLINDER SHAFT SEAL R & I

**NOTE:** On Chrysler and Mitsubishi, remove compressor through bolts and front housing to remove shaft seal. See Fig. 14. Alternately tighten through bolts to 18-21 ft. lbs. (24-28 N.m).

#### Removal

1) Remove clutch plate and pulley. Remove shim(s) from shaft. Remove clutch coil if necessary. Remove felt and felt retainer (if equipped). Place shaft key remover on shaft and turn to remove key.

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2) Remove seal plate snap ring. Engage plate remover on seal plate and pull up to remove seal plate. Engage shaft seal remover/installer to shaft seal and pull up to remove shaft seal from front housing.

#### Installation

1) Apply clean refrigerant oil to compressor housing bore. Lubricate shaft seal with refrigerant oil and install in front housing. Lubricate seal plate and install in front housing.

2) Install shaft key, snap ring, felt retainer and felt. With clutch plate installed, ensure air gap between clutch plate and pulley is .024-.040" (.60-1.00 mm) on Fox and MR2; .014-.026" (.36-.66 mm) on all others. If air gap is incorrect, add or remove shim(s) as necessary.

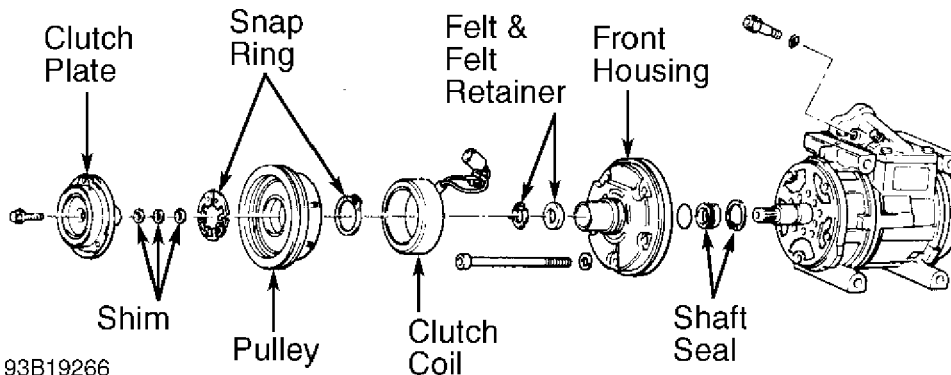


Fig. 14: Exploded View Of Compressor (Nippondenso 10PA15 10-Cylinder)  
Courtesy of Chrysler Corp.

### PANASONIC ROTARY VANE CLUTCH COIL R & I

#### Removal

Hold clutch disc stationary and remove shaft bolt. Remove clutch disc and shim(s) from shaft. Remove snap ring. Using a puller, remove pulley. Remove screw from clutch coil lead. Remove screws and field coil.

#### Installation

To install, reverse removal procedure. Tighten field coil screws to 30-57 INCH lbs. (3.4-6.4 N.m). Ensure pulley-to-armature gap is .016-.020" (.40-.50 mm). If air gap is incorrect, add or remove shim(s) as necessary. Tighten shaft bolt to 97-115 INCH lbs. (11-13 N.m).

### PANASONIC ROTARY VANE DISCHARGE VALVE R & I

#### Removal & Installation

Remove compressor head cover. Remove discharge valve stopper and discharge valve. See Fig. 15. Install replacement discharge valve and stopper, reversing removal procedure. Tighten discharge valve bolts to 27-34 INCH lbs. (3.0-3.8 N.m). Tighten compressor head cover

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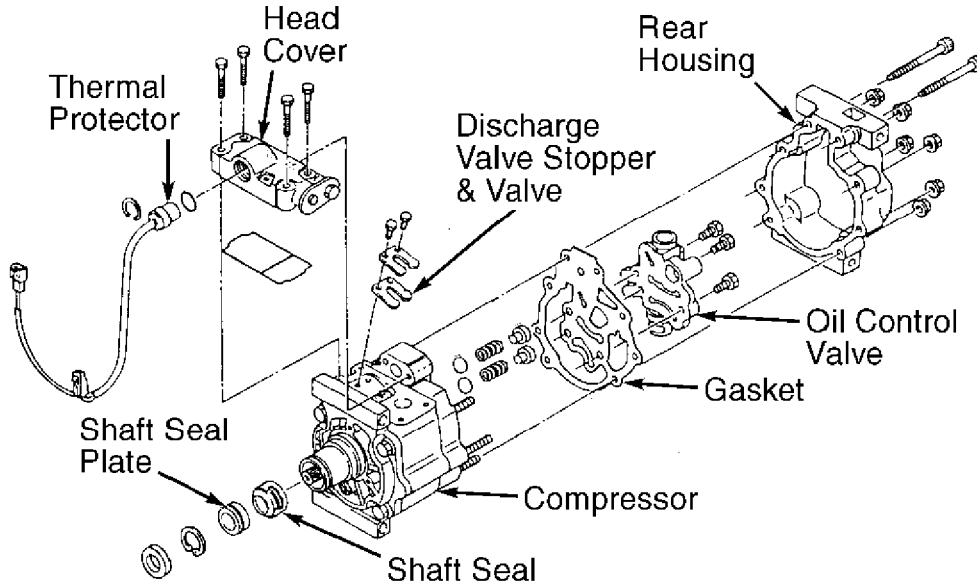
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bolts to 89 INCH lbs. (10 N.m).



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Fig. 15: Exploded View Of Compressor (Panasonic Rotary Vane)  
Courtesy of Mazda Motors Corp.

### PANASONIC ROTARY VANE OIL CONTROL VALVE R & I

#### Removal & Installation

Remove compressor rear cover. Remove oil control valve. Remove springs, valve, and rear cover seal. To install components, reverse removal procedure. Tighten oil control valve bolts to 89 INCH lbs. (10 N.m). Tighten rear cover nuts to 21 ft. lbs. (29 N.m) and bolts to 89 INCH lbs. (10 N.m).

### PANASONIC ROTARY VANE SHAFT SEAL R & I

#### Removal & Installation

Remove clutch disc and shim(s). Remove felt seal and snap ring. Using Seal Plate Remover (49 B061 005), engage and remove shaft seal plate. Remove shaft seal with Seal Remover/Installer (49 B061 006). To install, reverse removal procedure. Coat new seal plate and seal with clean refrigerant oil. DO NOT touch seal surfaces with fingers.

### SANDEN SCROLL CLUTCH COIL AND SHAFT SEAL R & I

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

Removal (Chrysler & Mitsubishi Except Galant & Mirage)

1) Remove drive belt pulley (if equipped). Hold clutch plate



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using Pliers (MB991367) and Bolts (MB991386). Use a ratchet and socket to remove clutch hub nut.

2) Remove clutch plate. Remove snap ring with internal snap ring pliers. Remove 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.

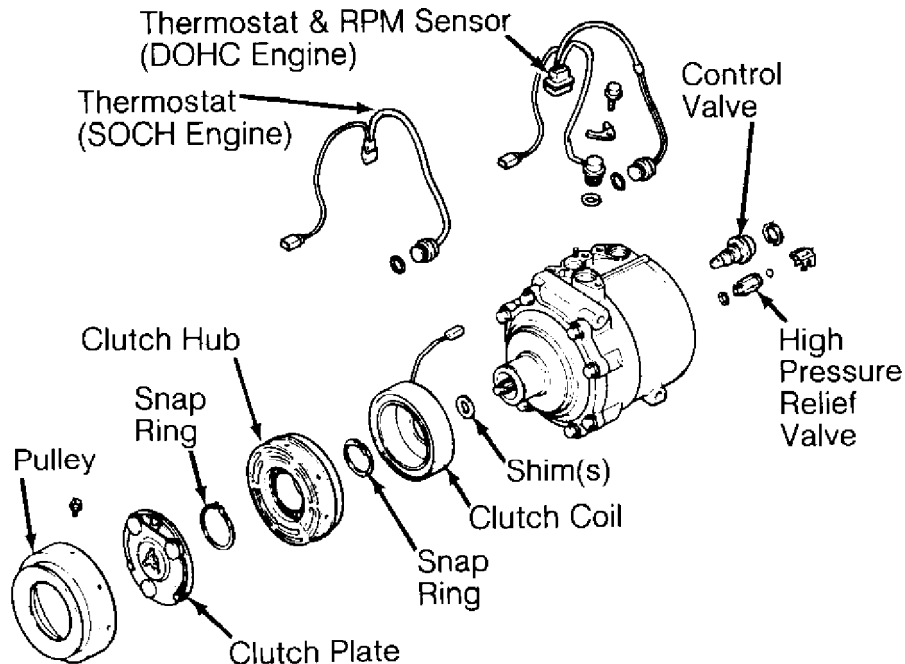
4) Tighten bearing remover bolt to withdraw bearing from compressor. Engage grooves of Shaft Seal Remover/Installer (MB991458) and pull straight up on shaft seal.

Installation (Chrysler & Mitsubishi Except Galant & Mirage)

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 clearance between pressure plate and pulley is .016-.024" (.40-0.60 mm). If clearance is incorrect, add or remove shim(s) as necessary.



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Fig. 16: Exploded View Of Compressor (Sanden Scroll)  
Courtesy of Chrysler Corp.

Removal (Chrysler & Mitsubishi Galant & Mirage)

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1) Hold clutch plate by securing 2 box-end wrenches with two 6-mm bolts, 1" (25 mm) or longer. Holding bow-end wrenches, use a ratchet and socket to remove clutch hub nut.

2) Remove clutch plate. See Fig. 17. Remove snap ring with internal snap ring pliers. Remove clutch hub. Remove snap ring and clutch coil.

3) Remove front housing bolts. Remove front housing and "O" ring from compressor. Remove shaft seal from shaft. Remove snap ring from back side of front housing. Remove seal plate. Use brass drift and hammer to lightly tap shaft bearing from front housing. Remove felt seal.

NOTE: DO NOT touch sealing surfaces of shaft seal carbon ring and shaft seal plate.

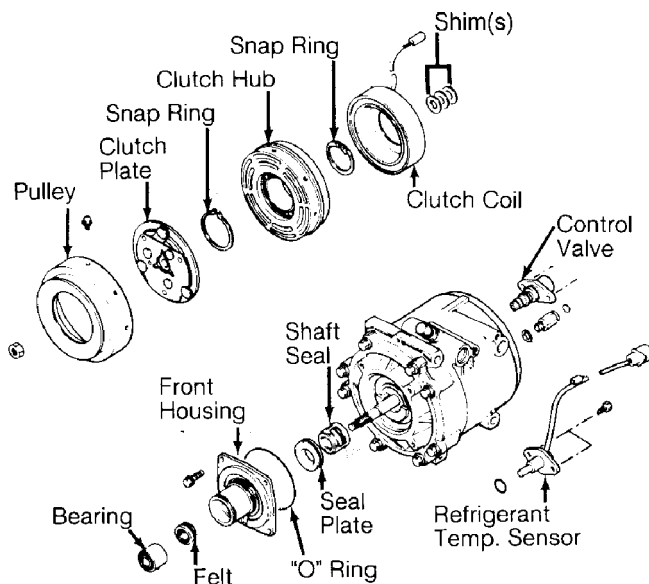
#### Installation (Chrysler & Mitsubishi Galant & Mirage)

1) Lubricate shaft seal with compressor oil. Align notches on shaft seal with notches on shaft. Install shaft seal plate on front housing. Install front seal housing to compressor.

2) Use Drift (MB991301) to install felt into front housing. Ensure metal ring on felt faces up. Use drift to press bearing into front housing.

3) Align and install clutch coil. Install snap ring so tapered surface faces outward. Install clutch hub. Install snap ring. Align clutch plate mark with shaft; where there are no splines on shaft.

4) Tighten clutch hub nut to 12 ft. lbs. (16 N.m). Using feeler gauge, measure clutch plate-to-clutch hub gap. If gap is not .012-.024" (.30-.60 mm), remove clutch assembly and add or remove shim(s).



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Fig. 17: Exploded View Of Compressor (Sanden FX105V Scroll)  
Courtesy of Chrysler Corp.

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#### Removal & Installation (Honda & Hyundai)

1) Remove shaft nut while holding clutch plate with Armature Holder (J-37872). Using Puller (07935-8050003), remove pressure plate and shim(s). See Fig. 16. Remove snap ring.

2) Place Seal Driver (07945-4150200) in center of pulley. Engage universal puller to outer diameter of 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.

3) To install clutch coil, reverse removal procedure. Align lug on clutch coil with hole in compressor. Install snap rings with chamfered side facing out. Tighten shaft nut to 12-14 ft. lbs. (16-19 N.m). Using feeler gauge, ensure clearance between pressure plate and pulley is .014-.026" (.35-.65 mm). If clearance is incorrect, add or remove shim(s) as necessary.

NOTE: Shaft seal removal and installation procedures not available from Honda or Hyundai.

### **SANDEN 5-CYLINDER CLUTCH COIL R & I**

#### Removal

1) Hold clutch plate, using Holder (0000-41-0809-01), and remove shaft nut. Remove clutch plate using Puller (0000-41-0809-02). Remove shaft key and shim(s). Remove external front housing snap ring and internal bearing snap ring (if used).

2) Install Clutch Pilot (0000-41-0810-77), Pulley/Clutch Remover (0000-41-0810-76), and Puller (0000-41-0804-51/57) to remove pulley assembly. Remove snap ring and drive bearing out of pulley. Remove screw for clutch coil lead. Remove snap ring and clutch coil.

#### Installation

1) Install new bearing, ensuring Bearing Installer (000-41-0804-43) contacts outer race of bearing. Install snap ring and ensure bearing turns freely.

2) Install clutch coil, ensuring lug on coil aligns with hole in front housing. Support compressor on rear mounting ears. Align rotor on front housing hub. Use bearing installer and Driver (0000-41-0810-59) to install pulley. With pulley seated, install snap ring(s). Install shim(s) and shaft key.

3) Place clutch plate over shaft and, using Shaft Protector (0000-41-0809-10), tap clutch plate into place. Install and tighten shaft nut to 25-32 ft. lbs. (34-44 N.m). Using feeler gauge, ensure clearance between clutch plate and pulley is .016-.032" (.40-.80 mm). If clearance is incorrect, add or remove shim(s) as necessary.

### **SANDEN 5-CYLINDER CYLINDER HEAD & VALVE PLATE R & I**

#### Removal & Installation

Remove compressor cylinder head (rear cover) bolts. Carefully pry cylinder head of compressor. Remove reed valve plate and gasket. To install components, reverse removal procedure. Tighten compressor

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cylinder head bolts, in a crisscross pattern, to 21-29 ft. lbs. (29-39 N.m).

### **SANDEN 5-CYLINDER SHAFT SEAL R & I**

#### Removal

Remove shaft nut and clutch plate. Remove shaft key and shim(s). Carefully remove felt ring. Remove shaft seal seat snap ring. Using Seal Seat Remover/Installer (0000-41-0810-73), carefully remove seal seat. Using Shaft Seal Remover/Installer (0000-41-0812-11), carefully remove shaft seal.

#### Installation

1) Install Seal Protector (0000-41-0812-13) over shaft. Place new seal on remover/installer. DO NOT touch carbon sealing surface with fingers. Dip seal in refrigerant oil and install. Remove seal installer by turning counterclockwise.

2) Coat seal seat with refrigerant oil. Install seal seat using remover/installer. Install seal seat snap ring (with flat side down). Install shim(s), felt ring and shaft key. Install shaft nut and clutch plate. Ensure clearance between clutch plate and pulley is .016-.032" (.40-.80 mm). If clearance is incorrect, add or remove shim(s) as necessary.

### **SANDEN 7-CYLINDER CLUTCH COIL AND BEARING R & I**

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

#### Removal

1) Install two 6-mm bolts, 1" (25 mm) or longer, in clutch plate holes. Using 2 box-end wrenches to hold bolts and to prevent clutch plate from turning, remove shaft nut.

2) Remove clutch plate using Clutch Plate Puller (09977-21100). Remove clutch shim(s) and bearing dust cover. Remove external front housing snap ring. See Fig. 18.

3) Remove pulley using universal puller. Detach clutch coil lead from compressor housing. Remove clutch coil snap ring and clutch coil. If necessary, remove snap ring and bearing.

#### Installation

1) Align clutch coil lug with hole in compressor housing, and install clutch coil. Install clutch coil snap ring. Install drive pulley using Drive Pulley Installer (09977-21811).

2) Install external bearing snap ring. Using Seal Installer (09977-21800), install bearing dust cover. After dust cover installation, ensure there is no contact between cover and front housing.

3) Install clutch shim(s) and clutch plate. Tighten shaft nut to 13-14 ft. lbs. (17-19 N.m). Using a dial indicator, check air gap between clutch plate and drive pulley. Apply voltage to clutch coil.

## A/C COMPRESSOR SERVICING

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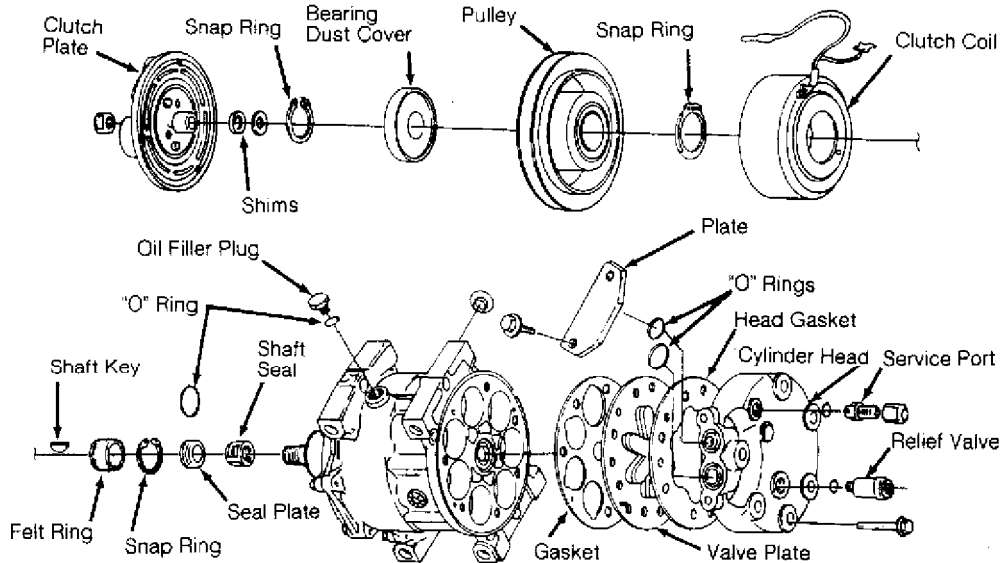
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Ensure air gap is .016-.032" (.40-.80 mm). If clearance is incorrect, add or remove shim(s) as necessary.

NOTE: If compressor valve plate is serviced, tighten compressor cylinder head bolts to 25-26 ft. lbs. (34-35 N.m).



93119263

Fig. 18: Exploded View Of Compressor (Sanden 7-Cylinder)

Courtesy of Hyundai Motor Co.

### SANDEN 7-CYLINDER SHAFT SEAL R & I

NOTE: Check compressor refrigerant oil level when replacing seals. See COMPRESSOR OIL CHECKING article in GENERAL SERVICING.

#### Removal

1) Remove clutch plate, shim(s) and bearing dust cover. Tap shaft key out of slot in compressor shaft. Remove seal retainer felt ring.

2) Remove shaft seal seat snap ring. Insert Seal Seat Remover/Installer (09977-21400) into front housing and turn to engage tangs on seat. Lift seal seat out.

3) Insert Seal Remover/Installer (09977-21510) into front housing and turn to engage tangs on seal. Carefully lift shaft seal out without scratching compressor shaft.

#### Installation

1) Install Shaft Seal Guide Sleeve (09977-21700) over compressor shaft. Dip seal in refrigerant oil and install seal on sleeve. Using seal remover/installer, rotate seal clockwise until seal is engaged. Remove seal remover/installer by turning it

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counterclockwise.

2) Coat seal seat with refrigerant oil and install seal with seal seat remover/installer. Remove shaft seal guide sleeve. Install snap ring with beveled edge facing out. Install seal retainer felt ring using seal seat remover/installer.

3) Install shaft key and clutch plate. Tighten shaft nut to 13-14 ft. lbs. (17-19 N.m). Using a dial indicator, check air gap between clutch plate and drive pulley. Apply voltage to clutch coil. Ensure air gap is .016-.032" (.40-.80 mm). If clearance is incorrect, add or remove shim(s) as necessary.

### **SEIKO-SEIKI ROTARY VANE**

NOTE: Volvo Seiko-Seiki compressor servicing procedure is not available from manufacturer.

### **ZEXEL ROTARY VANE CLUTCH COIL AND BEARING R & I**

#### Removal

1) Hold clutch disc using Clutch Disc Wrench (KV99231260) and remove center bolt. Using Clutch Disc Puller (KV99232340), remove drive plate and adjustment shim(s).

2) Remove snap ring. Remove pulley using Pilot (J-39023) and universal puller. Remove clutch coil. If necessary, remove snap ring and bearing. See Fig. 19.

#### Installation

1) Ensure coil lead is installed in original position. Install and tighten coil screws. Press pulley onto compressor using Pulley Installer (J-33940). Install snap ring and adjustment shim(s).

2) Install clutch disc and tighten center bolt to 11-13 ft. lbs. (15-18 N.m). Using feeler gauge, ensure clearance between clutch disc and pulley is .012-.024" (.30-.60 mm). If clearance is incorrect, add or remove shim(s) as necessary. Break-in clutch by engaging and disengaging clutch 30 times.

NOTE: Shaft seal assembly servicing procedure is not available from manufacturer. Use exploded view as a guide. See Fig. 19. Tighten thermal protector, if removed, to 11-13 ft.lbs. (15-18 N.m).

## A/C COMPRESSOR SERVICING

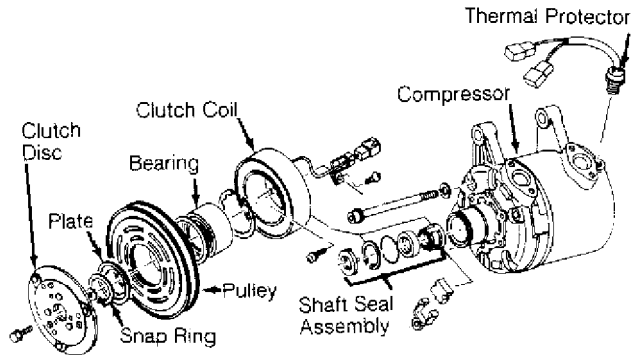
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94C10068

Fig. 19: Exploded View Of Compressor (Zexel Rotary Vane)  
Courtesy of Nissan Motor Co., U.S.A.

### ZEXEL 6-CYLINDER CLUTCH COIL AND BEARING R & I

NOTE: Volvo Zexel compressor servicing procedure is not available from manufacturer.

#### Removal (Audi)

1) Using Spanner Wrench (44-4), hold clutch hub stationary and remove shaft bolt. Remove clutch plate and shim(s) using Puller (VAG 1719) and Spanner Wrench (3212). See Fig. 20. Remove snap ring.

2) Place Spacer (VAG 1719/1) in center of pulley cavity. Attach Puller (US 1078) to outer diameter of pulley and remove pulley. Remove snap ring, bearing, and clutch coil as necessary.

#### Installation (Audi)

Ensure clutch coil lug fits into hole on compressor housing. Using Installer (VAG 1719/2), press on pulley and install snap ring. Install shim(s) and clutch plate. Tighten shaft bolt to 11 ft. lbs. (15 N.m). Using feeler gauge, ensure air gap between pulley and clutch disc is .012-.024" (.30-.60 mm). If clearance is incorrect, add or remove shim(s) as necessary.

## A/C COMPRESSOR SERVICING

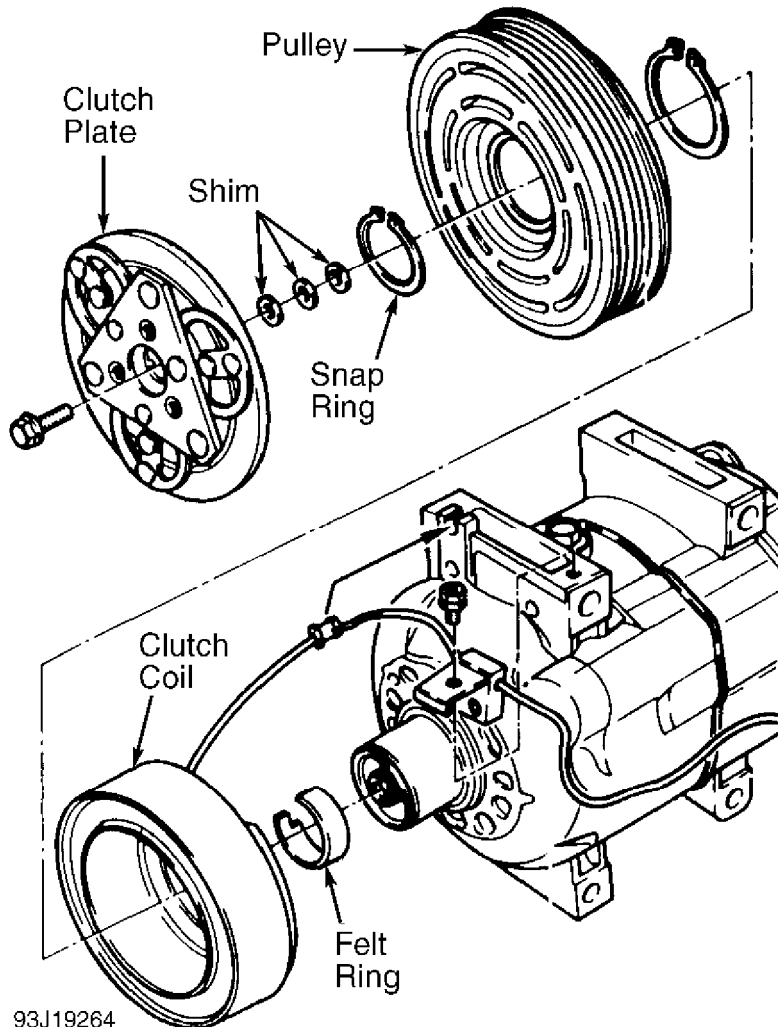
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93J19264

Fig. 20: Exploded View Of Compressor (Zexel 6-Cylinder)  
Courtesy of Audi of America, Inc.

### Removal (Nissan)

1) Using Clutch Disc Wrench (J-37877), hold clutch hub stationary and remove shaft nut. Remove adjustment shim(s) and clutch disc using Clutch Disc Puller (J-26571-A).

2) Bend lock washer away from lock nut. See Fig. 21. Remove lock nut with Wrench (J-37882). Remove pulley by hand or, if difficult to remove, use Pilot (J-26720-A) and universal puller. Remove snap ring, bearing, and clutch coil as necessary.

### Installation (Nissan)

1) Ensure key is installed in compressor shaft keyway. Install pulley, lock washer and pulley. Tighten lock nut to 25-29 ft. lbs. (34-39 N.m). Bend lock washer against lock nut.

2) Install clutch disc and tighten shaft nut to 10-12 ft. lbs (14-16 N.m). Using feeler gauge, ensure air gap between pulley and clutch disc is .012-.024" (.30-.60 mm). If clearance is incorrect, add or remove shim(s) as necessary. Break-in compressor clutch assembly by



# A/C COMPRESSOR SERVICING

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engaging and disengaging clutch 30 times.

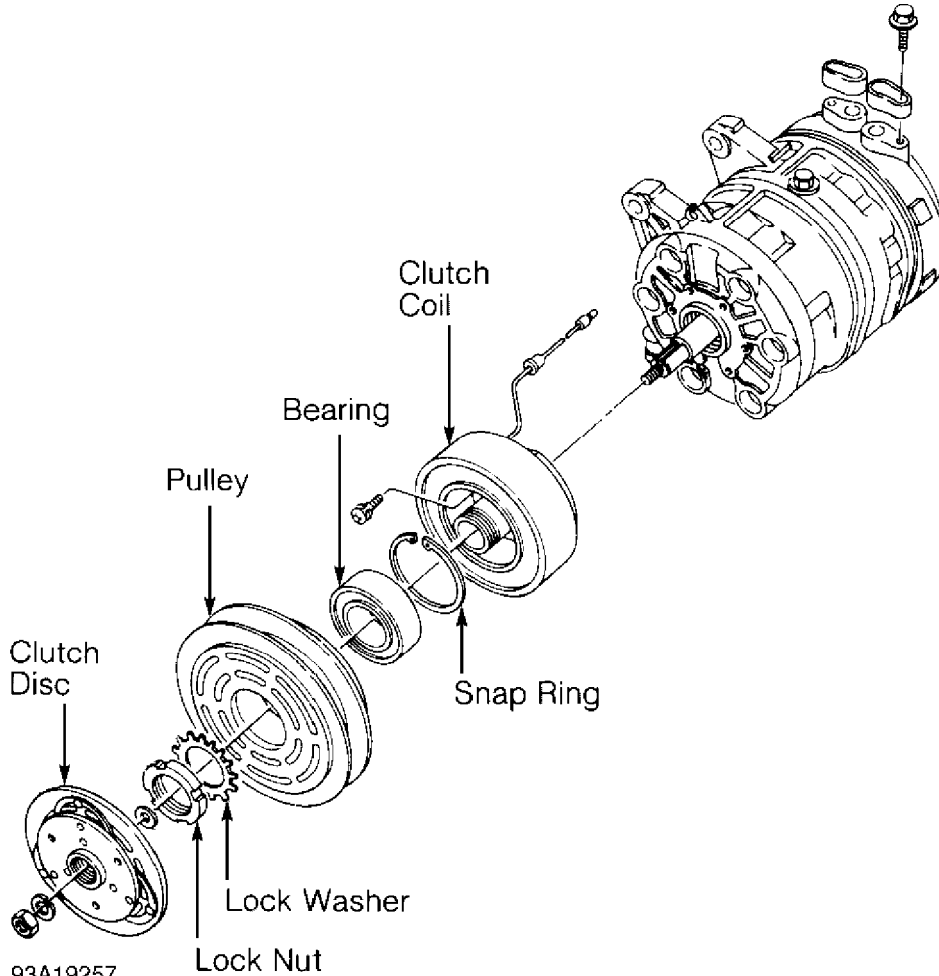


Fig. 21: Exploded View Of Compressor (Zexel DKS-16H 6-Cylinder)  
Courtesy of Nissan Motor Co., U.S.A.

**END OF ARTICLE**

# A/C SYSTEM GENERAL DIAGNOSTIC PROCEDURES

## Article Text

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### ARTICLE BEGINNING

1993 AIR CONDITIONING & HEAT  
A/C General Diagnostic Procedures

Diagnosis is an important first step in A/C system servicing. To save time and effort, systems should be carefully checked to identify the causes of poor performance. By using the following diagnostic charts, defective components or system problems can be quickly located. To identify problems that are specific to one system, refer to the repair section of this manual. The charts in this section apply to all systems.

#### PREPARATION FOR TESTING

- 1) Attach Low and High pressure gauges.
- 2) Start engine and allow to warm up.
- 3) Set system to COOL and blower to HIGH.
- 4) Open car doors and hood.
- 5) Run engine at fast idle for 2-3 minutes.

### AIR CONDITIONING SYSTEM PERFORMANCE CHECK

#### AIR CONDITIONING SYSTEM PERFORMANCE CHECK TABLE

AA

PERFORM TESTS: SHOULD BE: IF:

AA

Temperature Check Temperature Check Is:

- \* Switch to LOW blower.
- \* Close doors.
- \* Check outlet temperature. 35-45° F Too warm - Check control lever operation, heater water valve, cooling system and gauge readings.

AA

PERFORM TESTS: SHOULD BE: IF:

AA

Visual Check Visual Check Shows:

- \* Compressor Quiet with no leaks Noisy - Check belts, oil level, seals, gaskets, reed valves.
- \* Condenser Free of obstructions Blocked - Clean off. Plugged - Flush or replace.
- \* Receiver-Drier Dry and warm to touch Frosty - Check for restriction, replace desiccant.

# A/C SYSTEM GENERAL DIAGNOSTIC PROCEDURES

## Article Text (p. 2)

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- |                   |                       |  |
|-------------------|-----------------------|--|
| * Sight Glass     | Clear or few bubbles  | Bubbly, foamy or streaks - Check gauge readings.                 |
| * High Side Lines | Dry and warm to touch | Frosty or very hot - Check for restriction or overcharge.        |
| * Low Side Lines  | Dry and cool to touch | Frosty or warm - Check for restriction, low charge or bad valve. |
| * Expansion Valve | Dry                   | Frosty - Check for moisture or restriction. Check sensing bulb.  |
| * STV             | Dry and cool to touch | Frosty or warm - Check gauge readings for valve malfunction.     |
| * Evaporator      | Dry and cold to touch | Freezing or warm - Check expansion valve, STV or thermostwitch.  |

AA

PERFORM TESTS: SHOULD BE: IF:

AA

Gauge Readings Gauge Readings are:

- |                   |                    |  |
|-------------------|--------------------|--|
| * High Side Gauge | See Pressure Chart | Above or below normal - See A/C Diagnosis. |
|-------------------|--------------------|--|

- |                  |                    |                       |
|------------------|--------------------|-----------------------|
| * Low Side Gauge | See Pressure Chart | Above or below normal |
|------------------|--------------------|-----------------------|

AA

### AMBIENT TEMPERATURE/PRESSURE

# A/C SYSTEM GENERAL DIAGNOSTIC PROCEDURES

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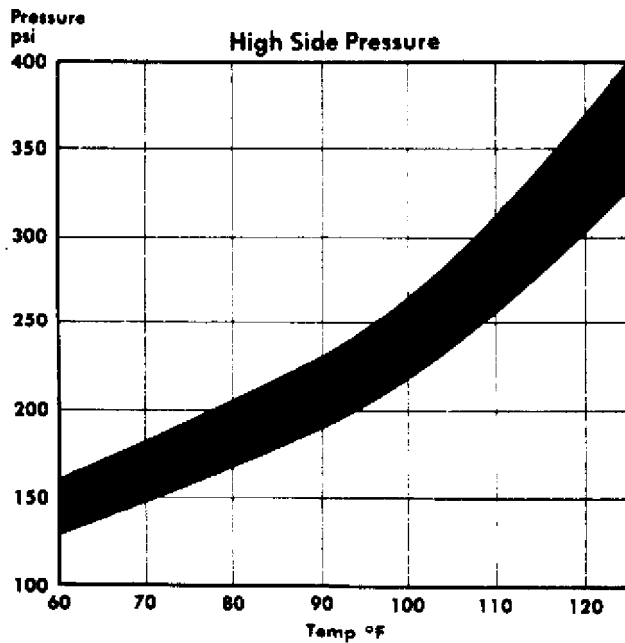


Fig. 1: Ambient Temperature/Pressure (R-12)

### EVAPORATOR TEMPERATURE/PRESSURE

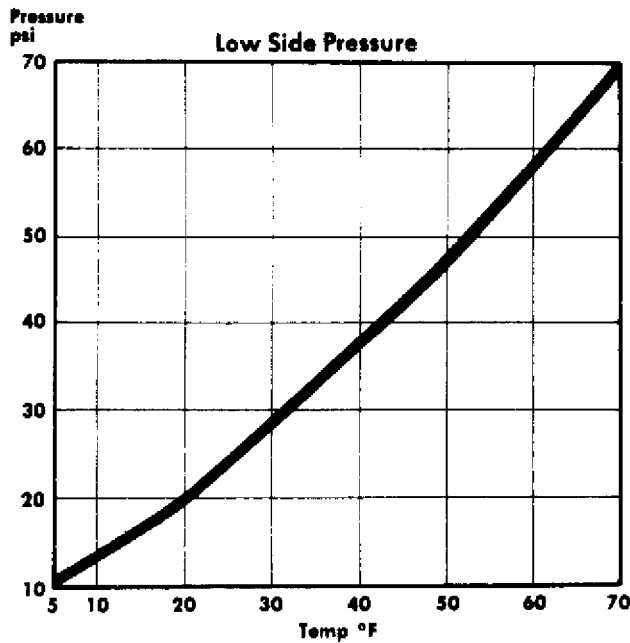


Fig. 2: Evaporator Temperature/Pressure (R-12)

### A/C DIAGNOSIS W/GAUGES FOR SYS. W/INSUFFICIENT OR NO COOLING

A/C DIAGNOSIS W/GAUGES FOR SYS. W/INSUFFICIENT OR NO COOLING TABLE

A/C SYSTEM GENERAL DIAGNOSTIC PROCEDURES

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Low Side Gauge	High Side Gauge	Other Symptoms (1)	Diagnosis
NORMAL	NORMAL	No or few bubbles in sight glass. High side gauge may go high. Low side gauge does not fluctuate with compressor on/off cycle.	Some Air & Moisture in System
NORMAL	NORMAL	Cools okay in morning but not during hot part of day. Bubbles in sight glass. Discharge air warm when low side gauge drops into vacuum.	Excessive Moisture in System
NORMAL	NORMAL	Thermostatic sw. sys. only- compressor cycles off & on too rapidly.	Defective Thermostatic Sw.
NORMAL to HIGH	NORMAL	Cycling clutch sys only - to compressor doesn't turn on soon enough. Discharge air becomes warm as low side pressure rises.	Misadjusted Thermostatic Sw. or Defective Pressure Sensing Switch
LOW	LOW	Bubbles in sight glass. Outlet air slightly cool.	Low R-12 Charge
LOW	LOW	Sight glass clear. Outlet air very warm.	Excessively Low R-12 Charge
LOW	LOW	Outlet air slightly cool. Sweating or frost at expansion valve.	Expansion Valve Stuck Closed Screen Plugged or Sensing Bulb Malfunction
LOW	LOW	Outlet air slightly cool. High side line cool to touch. Sweating or frost on high side.	Restriction on High Side
LOW	HIGH	Evaporator outlet pipe cold. Low side goes into vacuum when blower is disconnected.	STV Stuck Open
HIGH	LOW	Evaporator outlet pipe warm. Outlet air warm.	STV Stuck Closed
HIGH	LOW	Noise from compressor.	Compressor Malfunction

# A/C SYSTEM GENERAL DIAGNOSTIC PROCEDURES

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3 HIGH	3 HIGH	3 Outlet air warm.	3 Compressor	3
3	3	3 Liquid line very hot.	3 Malfunction	3
3	3	3 Bubbles in sight glass.	3 or	3
3	3	3	3 R-12 Overcharge	3
3 HIGH	3 HIGH	3 Outlet air slightly cool.	3 Large Amount of Air	3
3	3	3 Bubbles in sight glass.	3 of Air & Moisture	3
3	3	3	3 in System	3
3 HIGH	3 HIGH	3 Outlet air warm.	3 Expansion Valve	3
3	3	3 Evaporator outlet sweating	3 Stuck Open	3
3	3	3 and frost.	3	3
3(1)	3 - If equipped with a low refrigerant charge protection system,		3	3
3	3 compressor operation may have stopped.		3	3

### AIR CONDITIONING GENERAL TROUBLE SHOOTING

#### CONDITION & POSSIBLE CAUSE

##### Compressor Not Working

- \* Compressor clutch circuit open.
- \* Compressor clutch coil inoperative.
- \* Poor clutch ground connection.
- \* Fan belts loose.
- \* Thermostatic switch inoperative.
- \* Thermostatic switch not adjusted.
- \* Ambient temperature switch open.
- \* Superheat fuse blown.

##### Excessive Noise or Vibration

- \* Missing or loose mounting bolts.
- \* Bad idler pulley bearings.
- \* Fan belts not tightened correctly.
- \* Compressor clutch contacting body.
- \* Excessive system pressure.
- \* Compressor oil level low.
- \* Damaged clutch bearings.
- \* Damaged reed valves.
- \* Damaged compressor.

##### Insufficient or No Cooling; Compressor Working

- \* Expansion valve inoperative.
- \* Heater control valve stuck open.
- \* Low system pressure.
- \* Blocked condenser fins.
- \* Blocked evaporator fins.
- \* Vacuum system leak.
- \* Vacuum motors inoperative.
- \* Control cables improperly adjusted.

## A/C SYSTEM GENERAL DIAGNOSTIC PROCEDURES

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- \* Restricted air inlet.
- \* Mode doors binding.
- \* Blower motor inoperative.
- \* Temperature above system capacity.

## HEATING GENERAL TROUBLE SHOOTING

### CONDITION & POSSIBLE CAUSE

Insufficient, Erratic, or No Heat

- \* Low coolant level.
- \* Incorrect thermostat.
- \* Restricted coolant flow through heater core.
- \* Heater hoses plugged.
- \* Misadjusted control cable.
- \* Sticking heater control valve.
- \* Vacuum hose leaking.
- \* Vacuum hose blocked.
- \* Vacuum motors inoperative.
- \* Blocked air inlet.
- \* Inoperative heater blower motor.
- \* Oil residue on heater core fins.
- \* Dirt on heater core fins.

Too Much Heat

- \* Improperly adjusted cables.
- \* Sticking heater control valve.
- \* No vacuum to heater control valve.
- \* Temperature door stuck open.

Airflow Changes During Acceleration

- \* Vacuum system leak.
- \* Bad check valve or reservoir.

Air From Defroster At All Times

- \* Vacuum system leak.
- \* Improperly adjusted control cables.
- \* Inoperative vacuum motor.

Blower Does Not Operate Correctly

- \* Blown fuse.
- \* Blower motor windings open.
- \* Resistors burned out.
- \* Motor ground connection loose.
- \* Wiring harness connections loose.
- \* Blower motor switch inoperative.
- \* Blower relay inoperative.
- \* Fan binding or foreign object in housing.
- \* Fan blades broken or bent.

END OF ARTICLE

# A/C COMPRESSOR SERVICING

## Article Text

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### ARTICLE BEGINNING

1993 AIR CONDITIONING & HEAT  
Compressor Servicing

### READ THIS FIRST

NOTE: The purpose of this article is to provide GENERAL servicing overview. For more specific information, refer to the AUTO A/C-HEAT SYSTEM, MANUAL A/C-HEAT SYSTEM, or HEATER SYSTEM articles in this section.

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

### ATSUGI ROTARY VANE CLUTCH COIL R & I

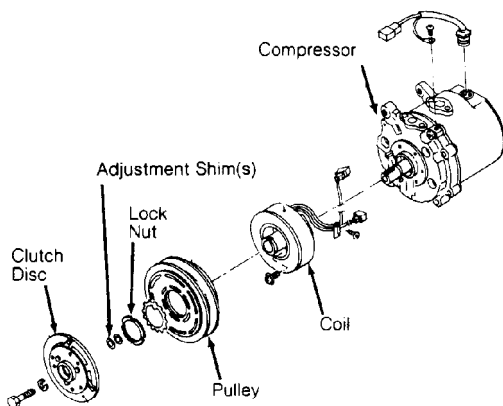
#### Removal

When replacing compressor clutch, be careful not to scratch shaft or bend pulley. When removing center bolt, hold clutch disc with Clutch Holder (KV99231010). Using Hub Puller (KV998VR001), remove clutch disc. When removing pulley, remove lock nut with Hub Socket (KV99235160).

#### Installation

1) Tighten center bolt to 81-104 INCH lbs. (9.1-11.8 N.m). Tighten lock nut to 21-29 ft. lbs. (29-39 N.m). Using feeler gauge, ensure clearance between clutch disc and pulley is .012-.024" (.30-.60 mm).

2) If clearance is not correct, replace adjustment shim(s). See Fig. 1. Break-in clutch by engaging and disengaging clutch about 30 times.



103223

Fig. 1: Exploded View Of Compressor (Atsugi Rotary Vane)  
Courtesy of Nissan Motor Co., U.S.A.



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### BOSCH 6-CYLINDER CLUTCH COIL R & I

#### Removal

1) Hold clutch plate and remove shaft nut. Using Clutch Plate Remover (64 5 00), remove clutch plate. Using snap ring pliers, remove circlip and remove pulley assembly.

2) If pulley bearing is being replaced, remove circlip at rear of pulley. Press bearing and spacer from pulley. Press in new bearing with spacer and replace circlip.

#### Installation

1) Clean all surfaces. Install pulley assembly on compressor and install circlip. Ensure clutch plate shim is in place on shaft. Install clutch plate and nut. Tighten nut to 13-15 ft. lbs. (18-20 N. m).

2) Using a feeler gauge, check clutch plate-to-pulley clearance. Clearance should be .028-.051" (.7-1.3 mm). If clearance is not correct, remove clutch plate and replace clutch plate shim. See Fig. 2.

### BOSCH 6-CYLINDER SHAFT SEAL R & I

#### Removal

Remove clutch plate. Remove shaft key and circlip. Using Seal Seat Remover/Installer (64 5 030), remove seal seat. Using Seal Remover/Installer (64 5 040), turn seal slightly clockwise to disengage tangs and pull out shaft seal. Remove "O" ring seal.

#### Installation

1) Coat new "O" ring seal with refrigerant oil and install. Coat new shaft seal with refrigerant oil and install seal on Seal Remover/Installer (64 5 040). Ensure shaft seal and shaft machine surfaces align. Insert shaft seal and turn slightly counterclockwise to secure on shaft.

2) Using sleeve from Seal Seat Remover/Installer (64 5 030), push seal seat into compressor and install circlip. Install shaft key and clutch plate. Check compressor oil level before charging system.

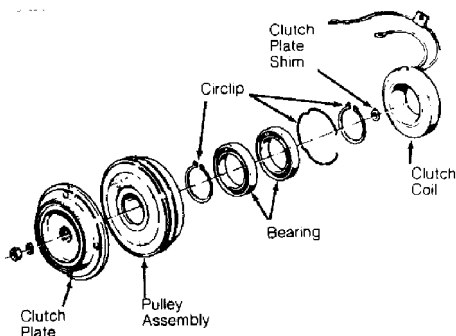


Fig. 2: Exploded View Of Compressor Clutch (Bosch 6-Cylinder)  
Courtesy of BMW of North America, Inc.

## A/C COMPRESSOR SERVICING

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### CALSONIC V5 & V6 CLUTCH COIL R & I

**NOTE:** Calsonic V6 compressor servicing procedure is not available from manufacturer.

#### Removal

1) Remove shaft nut while holding clutch plate with Clutch Disc Wrench (J-39072). Install clutch disc Puller Set (J-39073-4, J-33013-1, J-33013-3) and remove clutch plate.

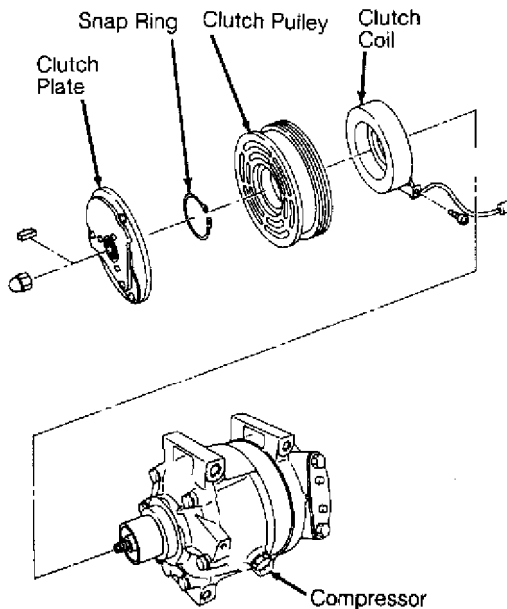
2) Remove snap ring. Use a universal gear puller to remove clutch pulley. See Fig. 3. Remove screw from clutch coil lead. Use puller to remove clutch coil.

#### Installation

1) To install clutch coil, reverse removal procedure. Ensure coil lead is installed in original position. Using puller set and Coil Jig (J-39073-1), carefully press clutch coil into place.

2) Install a new clutch pulley snap ring, being careful not to damage shaft seal. Press clutch plate into place. Install shaft nut and torque to 89-106 INCH lbs. (10-12 N.m).

3) Use a feeler gauge to check clutch plate-to-pulley clearance. Clearance should be .012-.024" (.30-.60 mm). If clearance is too large, remove shaft nut and again press in clutch plate. If clearance is too small, increase gap by pulling up clutch plate. DO NOT remove shaft nut.



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Fig. 3: Exploded View Of Compressor Clutch (Calsonic V5)  
Courtesy of Nissan Motor Co., U.S.A.

### DIESEL KIKI ROTARY VANE CLUTCH COIL R & I

#### Removal

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1) Hold clutch disc using Clutch Holder (J-33939) and remove center bolt. Using Puller (J-33944-A) and Forcing Bolt (J-33944-4), remove clutch disc. Remove adjustment shim(s) and snap ring.

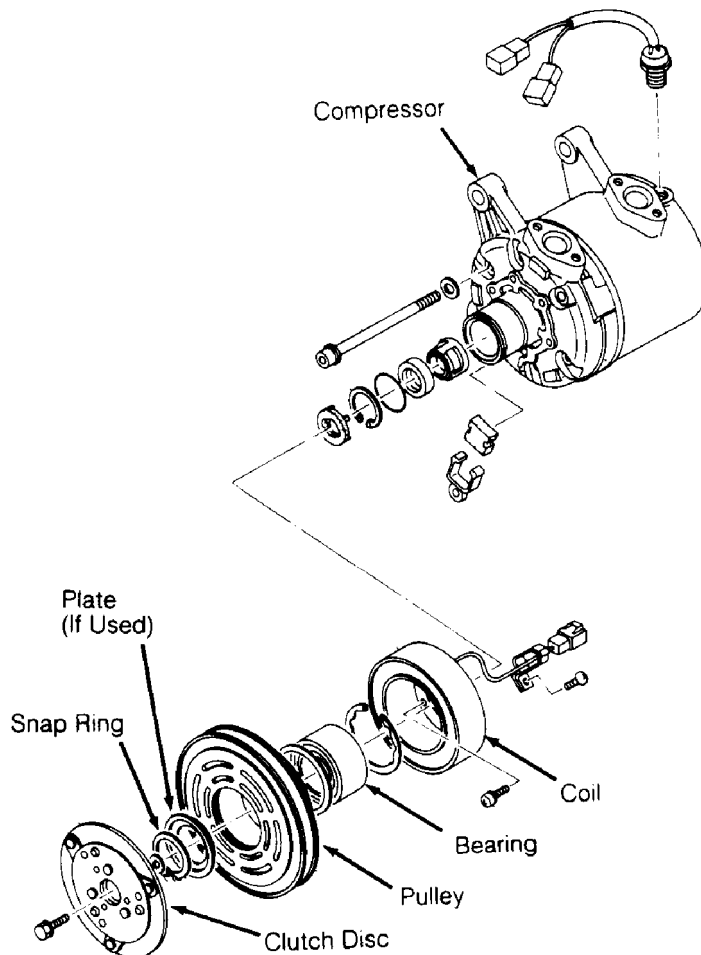
2) Remove pulley using Pilot (J-38424) and universal puller. Remove coil lead screw, clutch coil screws and coil. Remove snap ring and bearing if necessary.

#### Installation

1) Ensure coil lead is installed in original position.

Install and tighten coil screws to 35-53 INCH lbs. (4-6 N.m). Press pulley onto compressor using Pulley Installer (J-33940). Install snap ring and adjustment shim(s).

2) Install clutch disc and tighten center bolt to 106-133 INCH lbs. (12-15 N.m). Using feeler gauge, ensure clearance between clutch disc and pulley is .012-.024" (.30-.60 mm). If clearance is incorrect, add or remove shim(s) as necessary. Break-in clutch by engaging and disengaging clutch 30 times.



103225

Fig. 4: Exploded View Of Compressor (Diesel Kiki Rotary Vane)  
Courtesy of Nissan Motor Co., U.S.A.

## **A/C COMPRESSOR SERVICING**

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### **DIESEL KIKI 6-CYLINDER CLUTCH COIL R & I**

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

#### Removal & Installation

1) Using Clutch Holder (J-33939) to prevent clutch disc from rotating, remove shaft bolt. Using Clutch Disc Puller (J-33944-A) and Forcing Bolt (J-33944-4), remove clutch disc. Remove shim(s) from compressor drive shaft or clutch disc. See Fig. 5.

2) Remove snap ring, cover and pulley. With Puller Guide (J-33943-A) in center of pulley, attach Crossbar (J-8433) to outside diameter of pulley. Tighten crossbar bolt against puller guide to remove pulley. Remove coil lead, screws, and coil.

3) To install, reverse removal procedure. Install cover snap ring with beveled side facing out. Install clutch disc and tighten center bolt to 133 INCH lbs. (15 N.m).

4) Using feeler gauge, ensure clearance between clutch disc and pulley is .012-.024" (.30-.60 mm). If clearance is incorrect, add or remove shim(s) as necessary.

### **DIESEL KIKI SHAFT SEAL R & I**

#### Removal & Installation

1) Remove clutch coil. Remove and discard felt. Using Shaft Seal Cover Remover/Installer (J-33942), push down and turn remover clockwise to engage tangs to cover. Slowly remove seal cover from bore.

2) Remove shaft seal snap ring. Use Shaft Seal Remover (J-33942-B) to remove seal. Remove compressor through bolts, front head and "O" ring. If necessary, replace front and rear valve plates, reed valves, and "O" rings.

3) To install, reverse removal procedure. Coat "O" ring, shaft seal and seal seat with refrigerant oil. Place Shaft Seal Guide (J-34614) over end of compressor shaft. Ensure chamfered portion of shaft seal retainer aligns with chamfered portion on compressor shaft.

4) Install front head and tighten compressor through bolts, in a crisscross pattern, to 16 ft. lbs. (22 N.m). Install shaft seal cover and felt. See Fig. 5. Rotate compressor drive shaft 2-3 times to ensure compressor operates smoothly.

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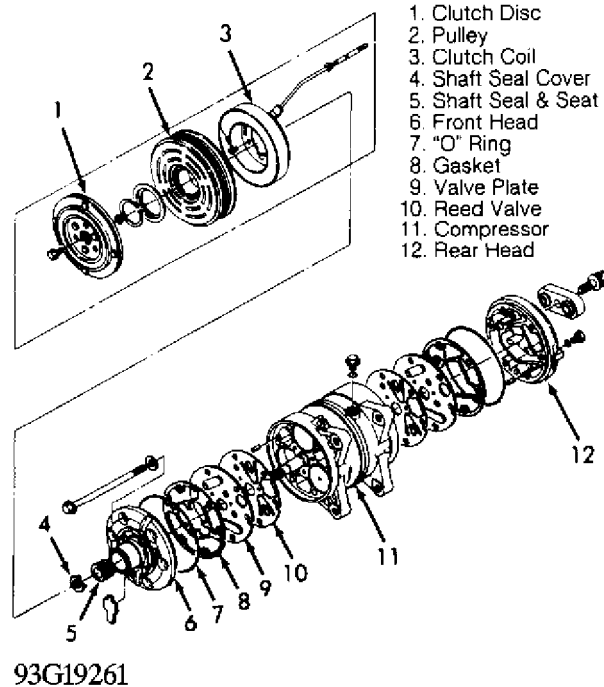


Fig. 5: Exploded View Of Compressor (Diesel Kiki 6-Cylinder)  
Courtesy of Isuzu Motor Co.

### FORD FX-15 CLUTCH COIL R & I

#### Removal

1) Using Clutch Holder (000 41 0812 05), remove clutch plate bolt. Using an 8-mm bolt threaded into clutch plate, remove clutch plate and shim(s). See Fig. 6.

2) Remove snap ring and pulley assembly. Install Shaft Protector (49 UN01 047) over shaft seal opening. Use a 2-jaw puller to remove clutch coil from compressor.

#### Installation

1) Ensure clutch coil mounting surface is clean. Use Coil Installer (49 UN01 046) and 2-jaw puller engaged to rear side of compressor front mounts to press coil into place.

2) Install pulley assembly. Install pulley assembly snap ring with bevel side of snap ring facing out. Install shim(s) and clutch plate. Install a new clutch plate bolt and tighten to 97-115 INCH lbs. (11-13 N.m).

3) Use a feeler gauge to check clearance between clutch plate and pulley assembly. Clearance should be .018-.033" (.46-.84 mm). If clearance is incorrect, add or remove shims as necessary.

### FORD FX-15 SHAFT SEAL R & I

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#### Removal

1) Using Clutch Holder (000 41 0812 05), remove clutch plate bolt. Using an 8-mm bolt threaded into clutch plate, remove clutch plate and shim(s). See Fig. 6.

2) Remove shaft felt seal. Thoroughly clean seal area of compressor. Remove shaft seal snap ring. Position Shaft Seal Remover (49 UN01 044) over compressor shaft.

3) Push shaft seal remover downward against seal. Ensure end of shaft seal remover is engaged with inside of seal. Rotate shaft seal remover clockwise to expand remover tip inside seal. Pull shaft seal from compressor.

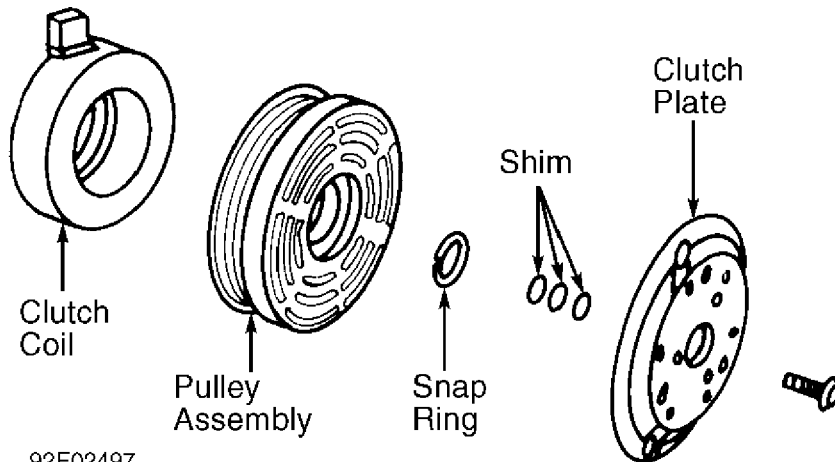
#### Installation

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 (49 UN01 043), push shaft seal down seal protector until seal is seated.

3) Remove shaft seal installer and protector. Install a new shaft seal retaining snap ring and shaft seal felt. Install shim(s) and clutch plate. Install a new clutch plate retaining bolt and tighten to 97-115 INCH lbs. (11-13 N.m).

4) Use a feeler gauge to check clearance between clutch plate and pulley assembly. Clearance should be .018-.033" (.46-.84 mm). If clearance is incorrect, add or remove shims as necessary.



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Fig. 6: Exploded View Of Compressor Clutch (Ford FX-15)  
Courtesy of Mazda Motors Corp.

## HADSYS 7-CYLINDER CLUTCH COIL R & I

#### Removal

Using Clutch Holder (J-37872), hold pressure plate and remove shaft bolt. Remove pressure plate and adjustment shim(s). See Fig. 7. Remove snap ring. Using universal puller, remove compressor pulley. Remove clutch coil.

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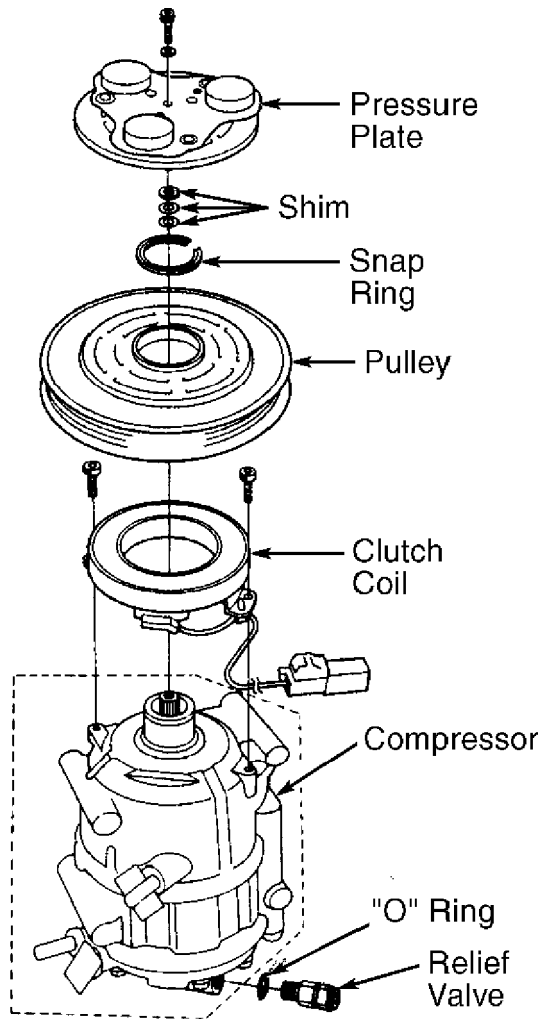
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#### Installation

Install clutch coil in reverse order of removal. Ensure snap ring is properly seated. Apply locking compound to shaft bolt and tighten it to 62 INCH lbs. (7 N.m). Ensure clearance between pressure plate and pulley is 0.012-0.024" (.30-.60 mm). If clearance is incorrect, add or remove shim(s) as necessary.



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Fig. 7: Exploded View Of Compressor (Hadsys 7-Cylinder)  
Courtesy of American Honda Motor Co., Inc.

#### HARRISON R4 4-CYLINDER CLUTCH COIL AND BEARING R & I

##### Removal

1) Clamp Holding Fixture (J-25008-A) in vise. Attach compressor to holding fixture. Use Clutch Hub Holder (J-33027) to hold clutch and remove shaft nut.

2) Thread Hub and Drive Plate Assembly Remover/Installer (J-37707) into hub. Hold body of remover with wrench and turn center bolt

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into remover body to remove clutch plate and hub assembly. Remove shaft key and save for installation.

3) Remove snap ring. Place Puller Guide (J-25031-1) in center of pulley housing. Engage universal puller to outer diameter of pulley (clutch rotor). See Fig. 8. Hold puller and tighten screw to remove pulley.

4) Invert pulley and place on work bench. Press out rotor bearing using handle and Bearing Remover (J-9398-A). Attach universal puller to outside diameter of clutch coil. Tighten bolt against puller guide to remove clutch coil.

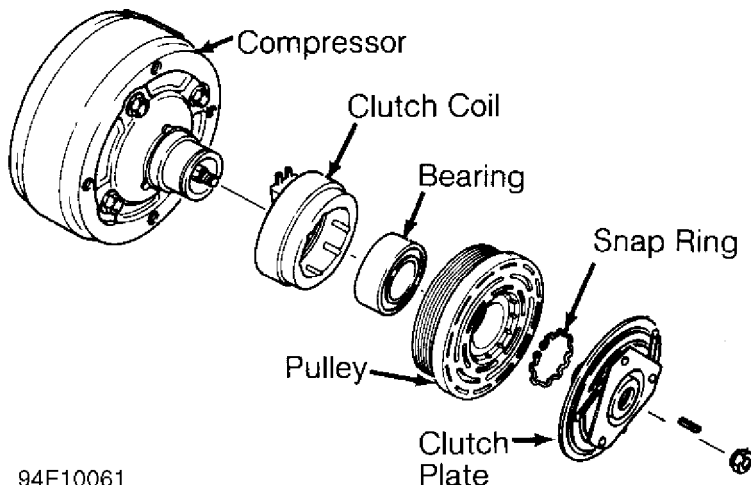
**CAUTION:** DO NOT drive or pound on clutch hub or shaft.

#### Installation

1) Ensure clutch coil is installed in original position. Press pulley onto compressor using Installer (J-9481-A) and handle. Install shaft key into hub key groove. Allow key to project approximately 3/16" (4.8 mm) out of keyway.

2) Ensure frictional surface of clutch plate and clutch rotor are clean before installing clutch plate and hub assembly. Align shaft key with shaft keyway and place clutch plate and hub assembly onto compressor shaft.

3) Hold hub and drive plate remover/installer with wrench and tighten nut to press hub into shaft until there is a .020-.040" (.5-1.0 mm) air gap between plate and clutch rotor. Install a new shaft nut and tighten to 10 ft. lbs. (14 N.m). Ensure rotor is not rubbing on clutch plate.



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Fig. 8: Exploded View Of Compressor (Harrison R4 4-Cylinder)  
Courtesy of Isuzu Motor Co.

### HARRISON V5 5-CYLINDER CLUTCH COIL AND BEARING R & I

#### Removal

1) Clamp Holding Fixture (J-34992) in vise. Attach compressor to holding fixture. Use Clutch Hub Holder (J-33027-A) to hold clutch. Remove shaft nut using Socket (J-33022). See Fig. 9.



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2) Thread Clutch Plate and Hub Assembly Remover (J-33013-B) into hub. Hold body of remover with wrench and turn center bolt to remove clutch plate and hub assembly. Remove snap ring. Remove shaft key and save for installation.

3) Place Puller Guide (J-33023-A) in center of pulley housing. Engage Rotor/Bearing Puller (J-33020) to inner circle of slots in pulley (rotor). Hold rotor/bearing puller in place and tighten screw to remove pulley.

4) Remove screw from rotor/bearing puller. Invert assembly and place on work bench with rotor/bearing puller still engaged. Remove hub bearing using handle and Bearing Remover (J-9398-A).

5) With puller guide in place, attach Crossbar (J-8433-1) and Puller (J-33025) to outside diameter of clutch coil. Tighten crossbar Bolt (J-8433-3) against puller guide to remove clutch coil.

#### Installation

1) Ensure clutch coil is installed in original position. Press coil into position using crossbar, clutch Coil Installer (J-33024) and Through Bolts (J-34992-2). Stake compressor housing 120 degrees apart to secure coil.

2) Position Rotor/Bearing Installer (J-33017) and puller guide over inner race of bearing. Using through bolts, assemble crossbar over puller pilot and tighten through bolts onto holding fixture. Tighten crossbar bolt to press pulley/bearing assembly onto compressor.

3) Install shaft key into hub key groove. Allow key to project approximately 1/8" (3.2 mm) out of keyway. Align shaft key with shaft keyway and place clutch plate and hub assembly onto compressor shaft.

**CAUTION:** Do not drive or pound on clutch hub or compressor shaft, as compressor could be damaged internally.

4) Hold hex portion of Hub Installer (J-33013) with a wrench. Tighten center screw to press hub into shaft until there is .020-.030" (.50-.76 mm) air gap between frictional plate and clutch rotor.

5) Install new shaft nut with small diameter boss of nut against crankshaft shoulder. Use Socket (J-33022) and Clutch Hub Holder (J-33027-A). Tighten shaft nut to 12 ft. lbs. (16 N.m). Ensure pulley does not rub on clutch plate. See Fig. 9.

## **HARRISON V5 5-CYLINDER SHAFT SEAL R & I**

#### Removal

Remove clutch plate and hub assembly. Remove shaft seal snap ring. Thoroughly clean inside of compressor neck area around shaft and seal. Engage tangs of Seal Remover/Installer (J-23128-A) into recessed portion of seal and remove seal. Remove and discard "O" ring from compressor neck. Thoroughly clean inside of compressor neck and "O" ring groove.

#### Installation

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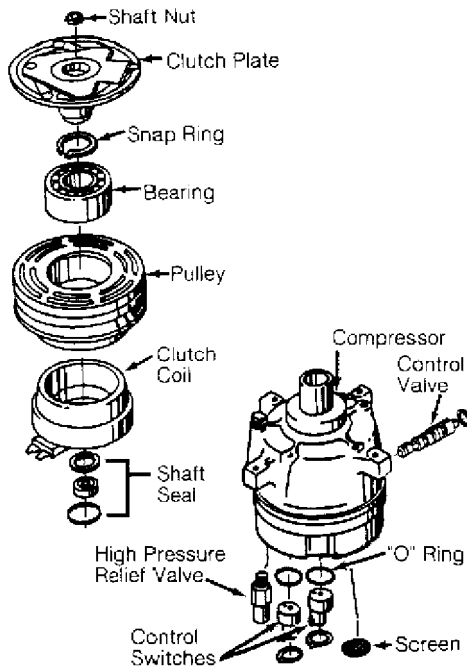
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1) Coat new "O" ring with refrigerant oil and install on "O" Ring Installer (J-33011). Install "O" ring into groove in compressor neck. Attach new seal to seal remover/installer. Dip shaft seal in clean refrigerant oil.

2) Place Seal Protector (J-34614) over compressor shaft. Push new seal over shaft protector. Install new seal snap ring with flat side against seal. Install clutch plate assembly.



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Fig. 9: Exploded View Of Compressor (Harrison V5 5-Cylinder)  
Courtesy of General Motors Corp.

### HITACHI 6-CYLINDER CLUTCH COIL AND SEAL R & I

#### Removal

1) Hold clutch hub with Clutch Tightener (925770000). Remove shaft nut from shaft. Using Clutch Hub Remover (926130000), remove clutch hub. Use snap ring pliers to remove inner snap ring.

2) Remove pulley and bearing assembly. Remove screws securing clutch coil lead. Remove inner snap ring from clutch coil. Remove clutch coil from front cover.

3) Remove shaft key. Use snap ring pliers to remove shaft seal snap ring. Wrap a rag around compressor shaft. Using Injector Needle (92619000) and refrigerant can, slowly pressurize compressor at low pressure (suction) service port. See Fig. 10. Catch shaft seal seat in rag.

4) Insert Shaft Seal Remover/Installer (926120000) through

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open end of front cover. Slowly pull out remover/installer to remove shaft seal.

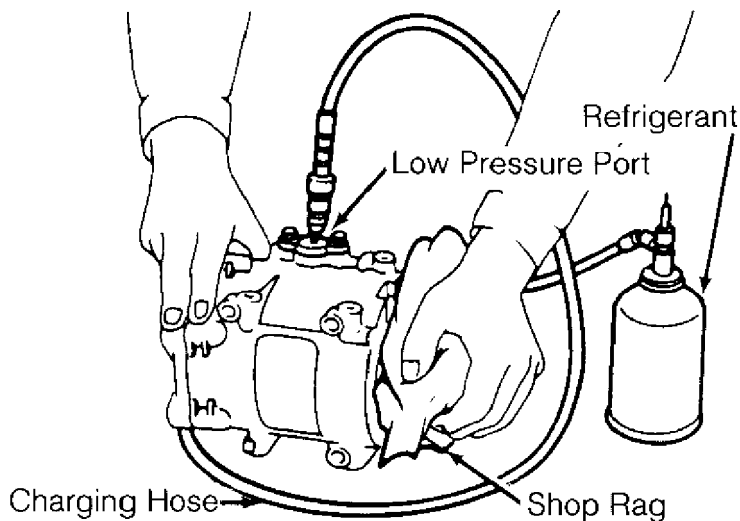
#### Installation

1) Ensure shaft seal contact surface is free of dirt.

Lubricate with refrigerant oil. Using shaft seal remover/installer, insert shaft seal.

2) To install clutch coil and hub, reverse removal procedure.

Tighten shaft nut to 14-15 ft. lbs. (19-21 N.m). Ensure clearance between pressure plate and pulley is 0.020-0.031" (.50-.80 mm).



94H10063

Fig. 10: Removing Compressor Shaft Seal Seat (Hitachi 6-Cylinder)  
Courtesy of Subaru of America, Inc.

## MATSUSHITA ROTARY VANE CLUTCH COIL R & I

#### Removal & Installation

1) Using Pressure Plate Holder (J-7624) and socket, remove center bolt. Thread Puller (J-34878) onto pressure plate. Hold pressure plate with pressure plate holder and tighten puller to remove pressure plate.

2) Remove shim(s) from shaft. Remove snap ring and, using a plastic hammer, tap pulley off. Remove screw for clutch coil lead. Remove snap ring and clutch coil. See Fig. 11.

3) To install, reverse removal procedure. Tighten shaft bolt to 10 ft. lbs (14 N.m). Using feeler gauge, ensure clearance between pressure plate and pulley is .014-.026" (.35-.65 mm). If clearance is incorrect, add or remove shim(s) as necessary.

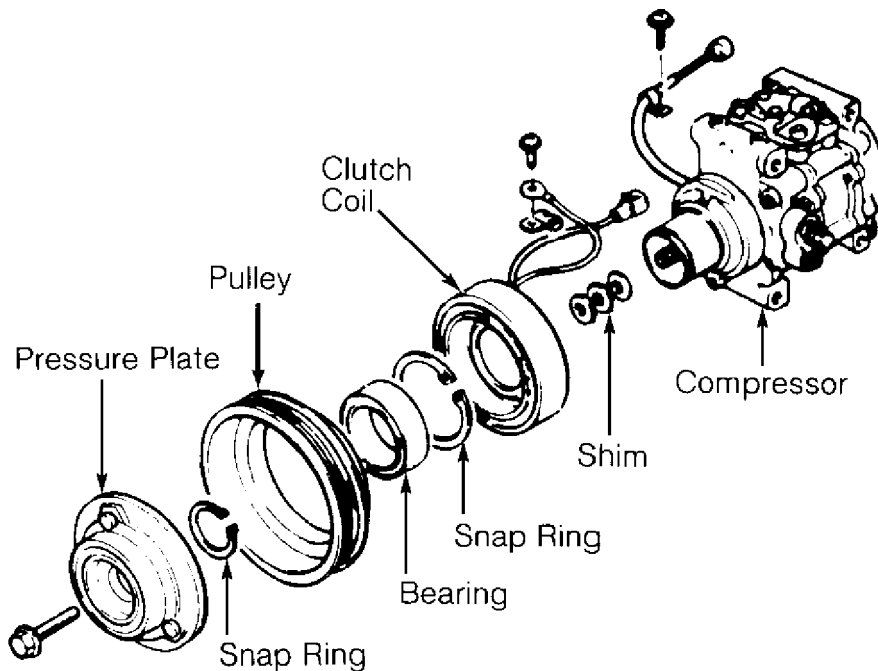
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93H19262  
Fig. 11: Exploded View Of Compressor (Matsushita Rotary Vane)  
Courtesy of Toyota Motor Sales, U.S.A., Inc.

### NIPPONDENSO TV12 ROTARY VANE CLUTCH COIL R & I

#### Removal

1) Hold clutch disc with Clutch Holder (00007-10331) and remove shaft nut. Install Clutch Disc Remover (4992-02-020) and remove clutch disc and shims. See Fig. 12.

2) Remove pulley snap ring and tap pulley (with bearing) off of compressor with plastic hammer. Remove screw for clutch coil lead. Remove snap ring and clutch coil.

#### Installation

To install, reverse removal procedure. Ensure pulley-to-clutch disc clearance is .016-.024" (.40-.60 mm). If clearance is incorrect, add or remove shim(s) as necessary.

### NIPPONDENSO TV12 DISCHARGE VALVE & SHAFT SEAL R & I

#### Removal

1) Drain and measure compressor oil in compressor. Remove discharge valve body through bolts. Remove discharge valve body bolts and body. Remove discharge valve plate and discharge valve.

2) Remove compressor through bolts and front and rear housing (oil separator case). Remove pins and gaskets. Remove shaft seal from shaft. Press shaft seal plate off of front housing (head cover).

#### Installation

To install components, reverse removal procedure. Tighten

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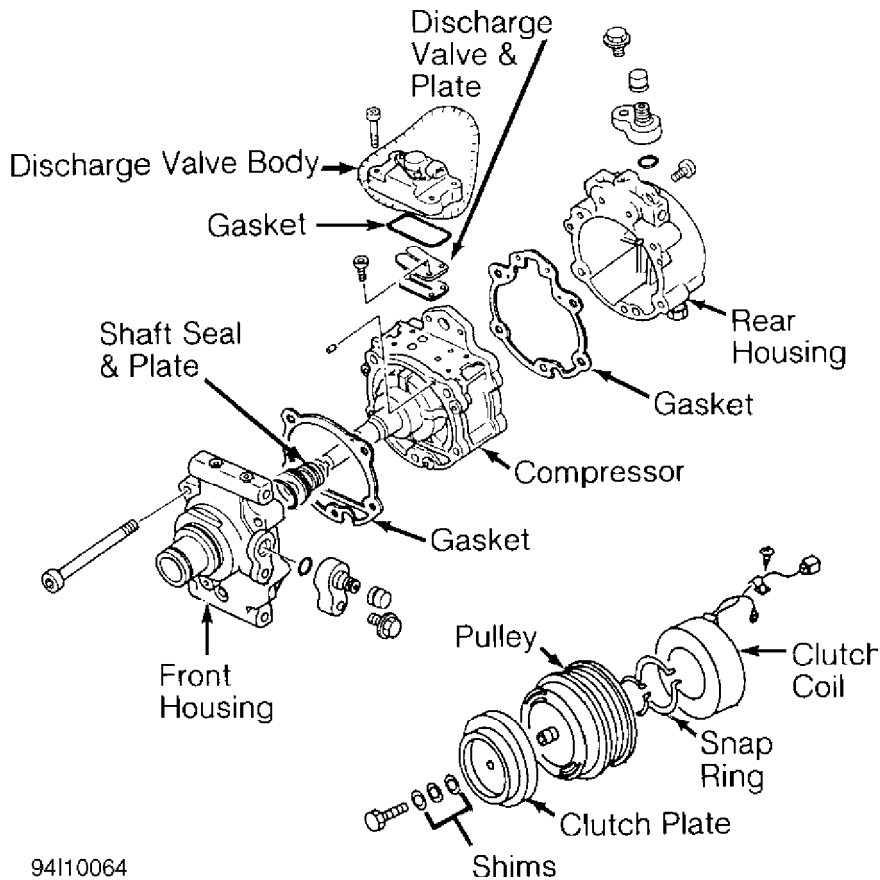
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compressor through bolts to 19 ft. lbs. (26 N.m). Tighten discharge valve bolts to 41 INCH lbs. (4.6 N.m). Tighten discharge valve body and body through bolts to 96 INCH lbs. (10.8 N.m).



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Fig. 12: Exploded View Of Compressor (Nippondenso TV12 Rotary Vane)  
Courtesy of Mazda Motors Corp.

### NIPPONDENSO 6 & 10-CYLINDER CLUTCH COIL AND BEARING R & I

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

#### Removal

1) Hold clutch plate stationary and remove shaft bolt (or nut). Remove clutch plate using puller. Remove shim(s) from shaft and snap ring. Tap pulley off shaft with plastic hammer. If pulley cannot be removed by hand, use commercially available puller.

2) Remove snap ring, bearing, and seal (if equipped) from pulley. See Fig. 13. Remove screw for clutch coil lead. Remove snap ring and clutch coil.

#### Installation

To install, reverse removal procedure. Ensure snap rings are installed with beveled side facing out. Tighten shaft bolt (or nut) to

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13-14 ft. lbs. (17-19 N.m) on Fox, MR2 and Scoupe; 10-13 ft. lbs. (14-17 N.m) on all others. Ensure air gap between clutch plate and pulley is .024-.040" (.60-1.00 mm) on Fox and MR2; .014-.026" (.36-.66 mm) on all others. If air gap is incorrect, add or remove shim(s) as necessary.

**NOTE:** To check air gap, place a dial indicator on clutch plate. Apply voltage to clutch coil. Check air gap between clutch plate and drive pulley. Ensure air gap is as specified.

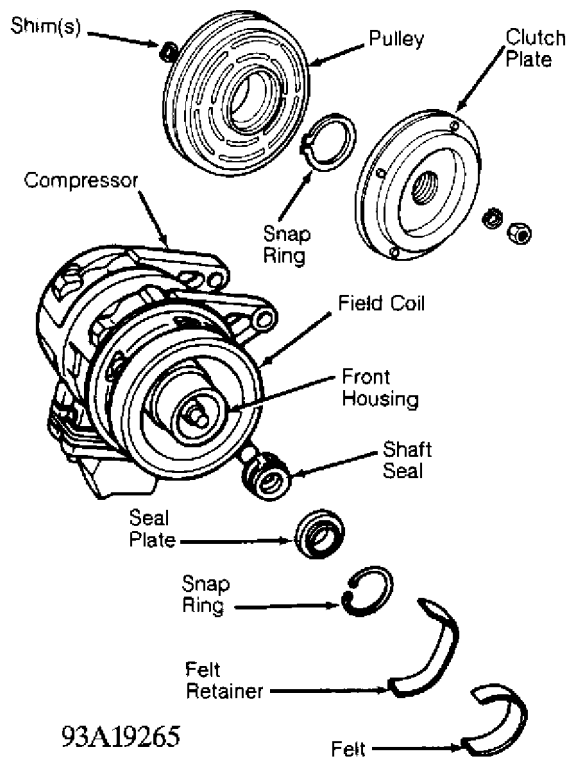


Fig. 13: Exploded View Of Compressor (Nippondenso 10-Cylinder)  
Courtesy of Ford Motor Co.

### NIPPONDENSO 6 & 10-CYLINDER SHAFT SEAL R & I

**NOTE:** On Chrysler and Mitsubishi, remove compressor through bolts and front housing to remove shaft seal. See Fig. 14. Alternately tighten through bolts to 18-21 ft. lbs. (24-28 N.m).

#### Removal

1) Remove clutch plate and pulley. Remove shim(s) from shaft. Remove clutch coil if necessary. Remove felt and felt retainer (if equipped). Place shaft key remover on shaft and turn to remove key.

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2) Remove seal plate snap ring. Engage plate remover on seal plate and pull up to remove seal plate. Engage shaft seal remover/installer to shaft seal and pull up to remove shaft seal from front housing.

#### Installation

1) Apply clean refrigerant oil to compressor housing bore. Lubricate shaft seal with refrigerant oil and install in front housing. Lubricate seal plate and install in front housing.

2) Install shaft key, snap ring, felt retainer and felt. With clutch plate installed, ensure air gap between clutch plate and pulley is .024-.040" (.60-1.00 mm) on Fox and MR2; .014-.026" (.36-.66 mm) on all others. If air gap is incorrect, add or remove shim(s) as necessary.

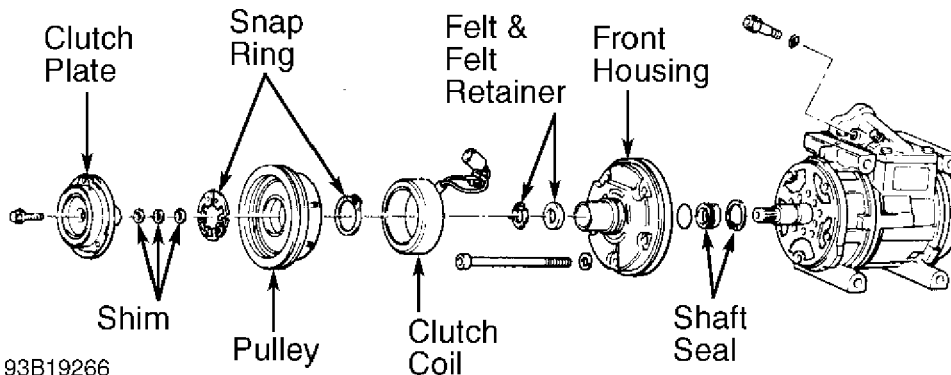


Fig. 14: Exploded View Of Compressor (Nippondenso 10PA15 10-Cylinder)  
Courtesy of Chrysler Corp.

### PANASONIC ROTARY VANE CLUTCH COIL R & I

#### Removal

Hold clutch disc stationary and remove shaft bolt. Remove clutch disc and shim(s) from shaft. Remove snap ring. Using a puller, remove pulley. Remove screw from clutch coil lead. Remove screws and field coil.

#### Installation

To install, reverse removal procedure. Tighten field coil screws to 30-57 INCH lbs. (3.4-6.4 N.m). Ensure pulley-to-armature gap is .016-.020" (.40-.50 mm). If air gap is incorrect, add or remove shim(s) as necessary. Tighten shaft bolt to 97-115 INCH lbs. (11-13 N.m).

### PANASONIC ROTARY VANE DISCHARGE VALVE R & I

#### Removal & Installation

Remove compressor head cover. Remove discharge valve stopper and discharge valve. See Fig. 15. Install replacement discharge valve and stopper, reversing removal procedure. Tighten discharge valve bolts to 27-34 INCH lbs. (3.0-3.8 N.m). Tighten compressor head cover

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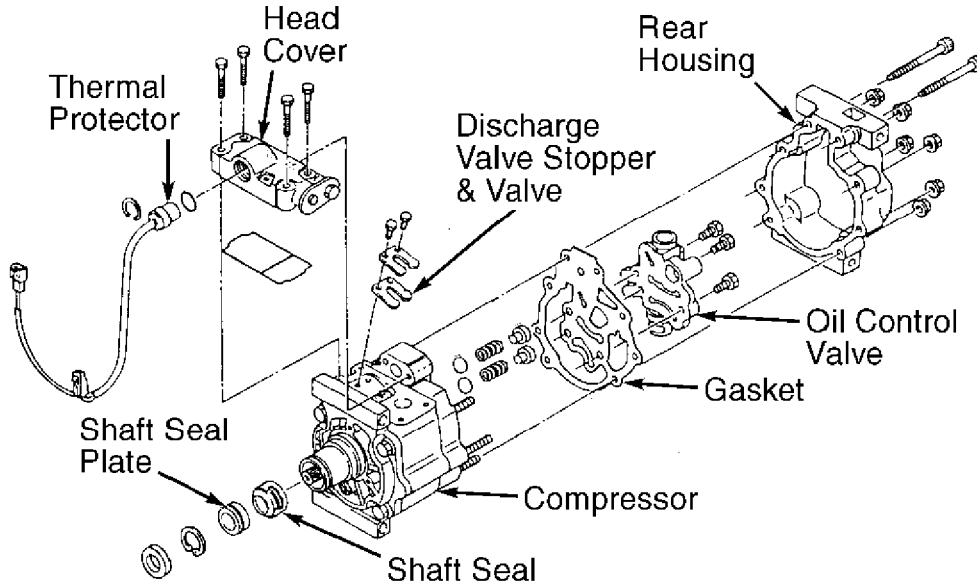
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bolts to 89 INCH lbs. (10 N.m).



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Fig. 15: Exploded View Of Compressor (Panasonic Rotary Vane)  
Courtesy of Mazda Motors Corp.

### PANASONIC ROTARY VANE OIL CONTROL VALVE R & I

#### Removal & Installation

Remove compressor rear cover. Remove oil control valve. Remove springs, valve, and rear cover seal. To install components, reverse removal procedure. Tighten oil control valve bolts to 89 INCH lbs. (10 N.m). Tighten rear cover nuts to 21 ft. lbs. (29 N.m) and bolts to 89 INCH lbs. (10 N.m).

### PANASONIC ROTARY VANE SHAFT SEAL R & I

#### Removal & Installation

Remove clutch disc and shim(s). Remove felt seal and snap ring. Using Seal Plate Remover (49 B061 005), engage and remove shaft seal plate. Remove shaft seal with Seal Remover/Installer (49 B061 006). To install, reverse removal procedure. Coat new seal plate and seal with clean refrigerant oil. DO NOT touch seal surfaces with fingers.

### SANDEN SCROLL CLUTCH COIL AND SHAFT SEAL R & I

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

Removal (Chrysler & Mitsubishi Except Galant & Mirage)

1) Remove drive belt pulley (if equipped). Hold clutch plate



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using Pliers (MB991367) and Bolts (MB991386). Use a ratchet and socket to remove clutch hub nut.

2) Remove clutch plate. Remove snap ring with internal snap ring pliers. Remove 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.

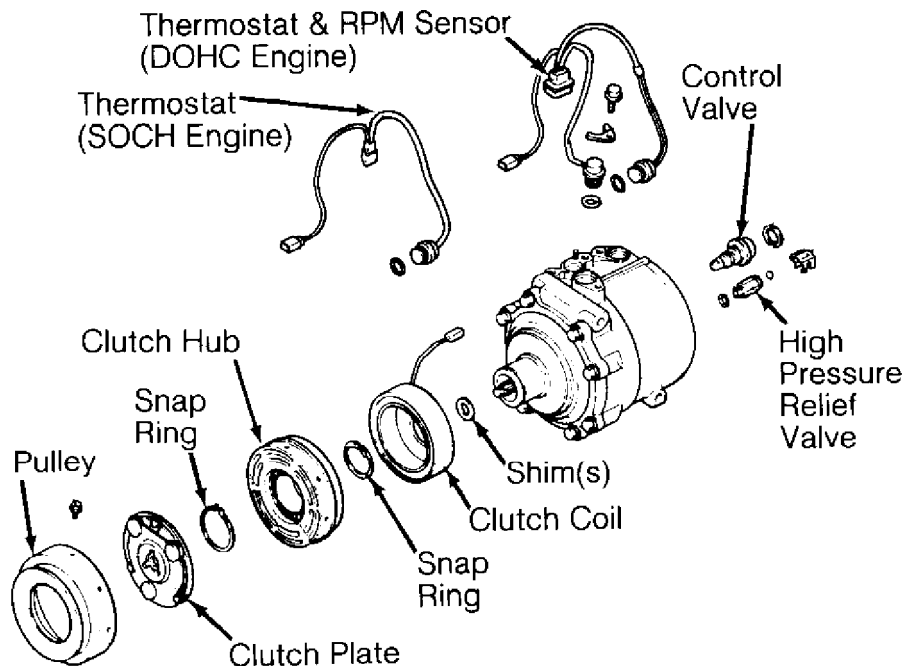
4) Tighten bearing remover bolt to withdraw bearing from compressor. Engage grooves of Shaft Seal Remover/Installer (MB991458) and pull straight up on shaft seal.

Installation (Chrysler & Mitsubishi Except Galant & Mirage)

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 clearance between pressure plate and pulley is .016-.024" (.40-0.60 mm). If clearance is incorrect, add or remove shim(s) as necessary.



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Fig. 16: Exploded View Of Compressor (Sanden Scroll)  
Courtesy of Chrysler Corp.

Removal (Chrysler & Mitsubishi Galant & Mirage)

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1) Hold clutch plate by securing 2 box-end wrenches with two 6-mm bolts, 1" (25 mm) or longer. Holding bow-end wrenches, use a ratchet and socket to remove clutch hub nut.

2) Remove clutch plate. See Fig. 17. Remove snap ring with internal snap ring pliers. Remove clutch hub. Remove snap ring and clutch coil.

3) Remove front housing bolts. Remove front housing and "O" ring from compressor. Remove shaft seal from shaft. Remove snap ring from back side of front housing. Remove seal plate. Use brass drift and hammer to lightly tap shaft bearing from front housing. Remove felt seal.

NOTE: DO NOT touch sealing surfaces of shaft seal carbon ring and shaft seal plate.

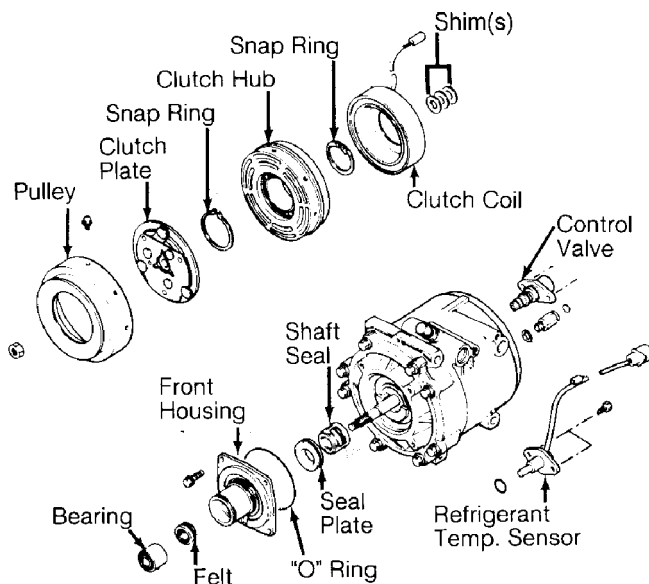
#### Installation (Chrysler & Mitsubishi Galant & Mirage)

1) Lubricate shaft seal with compressor oil. Align notches on shaft seal with notches on shaft. Install shaft seal plate on front housing. Install front seal housing to compressor.

2) Use Drift (MB991301) to install felt into front housing. Ensure metal ring on felt faces up. Use drift to press bearing into front housing.

3) Align and install clutch coil. Install snap ring so tapered surface faces outward. Install clutch hub. Install snap ring. Align clutch plate mark with shaft; where there are no splines on shaft.

4) Tighten clutch hub nut to 12 ft. lbs. (16 N.m). Using feeler gauge, measure clutch plate-to-clutch hub gap. If gap is not .012-.024" (.30-.60 mm), remove clutch assembly and add or remove shim(s).



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Fig. 17: Exploded View Of Compressor (Sanden FX105V Scroll)  
Courtesy of Chrysler Corp.

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#### Removal & Installation (Honda & Hyundai)

1) Remove shaft nut while holding clutch plate with Armature Holder (J-37872). Using Puller (07935-8050003), remove pressure plate and shim(s). See Fig. 16. Remove snap ring.

2) Place Seal Driver (07945-4150200) in center of pulley. Engage universal puller to outer diameter of 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.

3) To install clutch coil, reverse removal procedure. Align lug on clutch coil with hole in compressor. Install snap rings with chamfered side facing out. Tighten shaft nut to 12-14 ft. lbs. (16-19 N.m). Using feeler gauge, ensure clearance between pressure plate and pulley is .014-.026" (.35-.65 mm). If clearance is incorrect, add or remove shim(s) as necessary.

NOTE: Shaft seal removal and installation procedures not available from Honda or Hyundai.

### **SANDEN 5-CYLINDER CLUTCH COIL R & I**

#### Removal

1) Hold clutch plate, using Holder (0000-41-0809-01), and remove shaft nut. Remove clutch plate using Puller (0000-41-0809-02). Remove shaft key and shim(s). Remove external front housing snap ring and internal bearing snap ring (if used).

2) Install Clutch Pilot (0000-41-0810-77), Pulley/Clutch Remover (0000-41-0810-76), and Puller (0000-41-0804-51/57) to remove pulley assembly. Remove snap ring and drive bearing out of pulley. Remove screw for clutch coil lead. Remove snap ring and clutch coil.

#### Installation

1) Install new bearing, ensuring Bearing Installer (000-41-0804-43) contacts outer race of bearing. Install snap ring and ensure bearing turns freely.

2) Install clutch coil, ensuring lug on coil aligns with hole in front housing. Support compressor on rear mounting ears. Align rotor on front housing hub. Use bearing installer and Driver (0000-41-0810-59) to install pulley. With pulley seated, install snap ring(s). Install shim(s) and shaft key.

3) Place clutch plate over shaft and, using Shaft Protector (0000-41-0809-10), tap clutch plate into place. Install and tighten shaft nut to 25-32 ft. lbs. (34-44 N.m). Using feeler gauge, ensure clearance between clutch plate and pulley is .016-.032" (.40-.80 mm). If clearance is incorrect, add or remove shim(s) as necessary.

### **SANDEN 5-CYLINDER CYLINDER HEAD & VALVE PLATE R & I**

#### Removal & Installation

Remove compressor cylinder head (rear cover) bolts. Carefully pry cylinder head of compressor. Remove reed valve plate and gasket. To install components, reverse removal procedure. Tighten compressor

## **A/C COMPRESSOR SERVICING**

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cylinder head bolts, in a crisscross pattern, to 21-29 ft. lbs. (29-39 N.m).

### **SANDEN 5-CYLINDER SHAFT SEAL R & I**

#### Removal

Remove shaft nut and clutch plate. Remove shaft key and shim(s). Carefully remove felt ring. Remove shaft seal seat snap ring. Using Seal Seat Remover/Installer (0000-41-0810-73), carefully remove seal seat. Using Shaft Seal Remover/Installer (0000-41-0812-11), carefully remove shaft seal.

#### Installation

1) Install Seal Protector (0000-41-0812-13) over shaft. Place new seal on remover/installer. DO NOT touch carbon sealing surface with fingers. Dip seal in refrigerant oil and install. Remove seal installer by turning counterclockwise.

2) Coat seal seat with refrigerant oil. Install seal seat using remover/installer. Install seal seat snap ring (with flat side down). Install shim(s), felt ring and shaft key. Install shaft nut and clutch plate. Ensure clearance between clutch plate and pulley is .016-.032" (.40-.80 mm). If clearance is incorrect, add or remove shim(s) as necessary.

### **SANDEN 7-CYLINDER CLUTCH COIL AND BEARING R & I**

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

#### Removal

1) Install two 6-mm bolts, 1" (25 mm) or longer, in clutch plate holes. Using 2 box-end wrenches to hold bolts and to prevent clutch plate from turning, remove shaft nut.

2) Remove clutch plate using Clutch Plate Puller (09977-21100). Remove clutch shim(s) and bearing dust cover. Remove external front housing snap ring. See Fig. 18.

3) Remove pulley using universal puller. Detach clutch coil lead from compressor housing. Remove clutch coil snap ring and clutch coil. If necessary, remove snap ring and bearing.

#### Installation

1) Align clutch coil lug with hole in compressor housing, and install clutch coil. Install clutch coil snap ring. Install drive pulley using Drive Pulley Installer (09977-21811).

2) Install external bearing snap ring. Using Seal Installer (09977-21800), install bearing dust cover. After dust cover installation, ensure there is no contact between cover and front housing.

3) Install clutch shim(s) and clutch plate. Tighten shaft nut to 13-14 ft. lbs. (17-19 N.m). Using a dial indicator, check air gap between clutch plate and drive pulley. Apply voltage to clutch coil.

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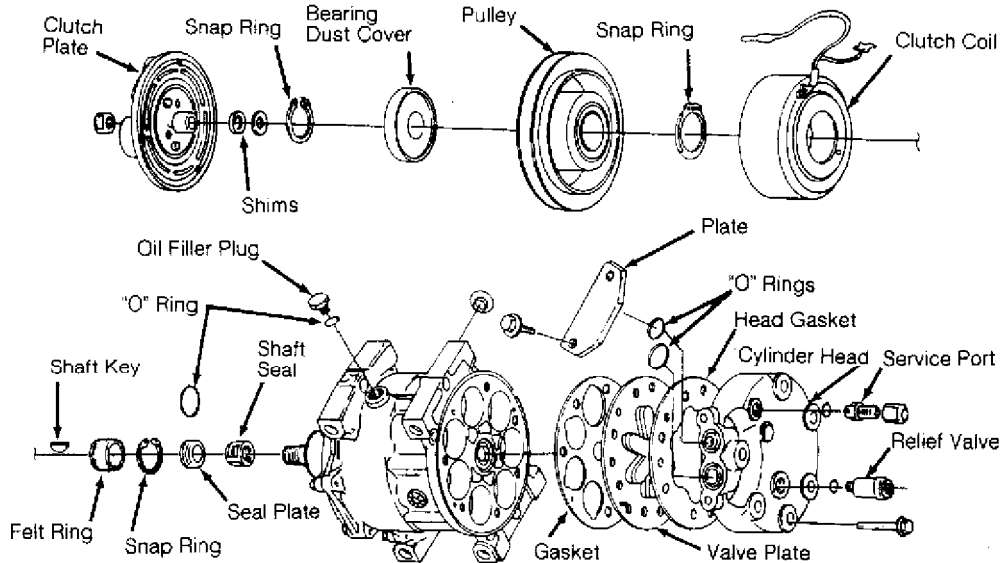
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Ensure air gap is .016-.032" (.40-.80 mm). If clearance is incorrect, add or remove shim(s) as necessary.

NOTE: If compressor valve plate is serviced, tighten compressor cylinder head bolts to 25-26 ft. lbs. (34-35 N.m).



93119263

Fig. 18: Exploded View Of Compressor (Sanden 7-Cylinder)

Courtesy of Hyundai Motor Co.

### SANDEN 7-CYLINDER SHAFT SEAL R & I

NOTE: Check compressor refrigerant oil level when replacing seals. See COMPRESSOR OIL CHECKING article in GENERAL SERVICING.

#### Removal

1) Remove clutch plate, shim(s) and bearing dust cover. Tap shaft key out of slot in compressor shaft. Remove seal retainer felt ring.

2) Remove shaft seal seat snap ring. Insert Seal Seat Remover/Installer (09977-21400) into front housing and turn to engage tangs on seat. Lift seal seat out.

3) Insert Seal Remover/Installer (09977-21510) into front housing and turn to engage tangs on seal. Carefully lift shaft seal out without scratching compressor shaft.

#### Installation

1) Install Shaft Seal Guide Sleeve (09977-21700) over compressor shaft. Dip seal in refrigerant oil and install seal on sleeve. Using seal remover/installer, rotate seal clockwise until seal is engaged. Remove seal remover/installer by turning it

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counterclockwise.

2) Coat seal seat with refrigerant oil and install seal with seal seat remover/installer. Remove shaft seal guide sleeve. Install snap ring with beveled edge facing out. Install seal retainer felt ring using seal seat remover/installer.

3) Install shaft key and clutch plate. Tighten shaft nut to 13-14 ft. lbs. (17-19 N.m). Using a dial indicator, check air gap between clutch plate and drive pulley. Apply voltage to clutch coil. Ensure air gap is .016-.032" (.40-.80 mm). If clearance is incorrect, add or remove shim(s) as necessary.

### **SEIKO-SEIKI ROTARY VANE**

NOTE: Volvo Seiko-Seiki compressor servicing procedure is not available from manufacturer.

### **ZEXEL ROTARY VANE CLUTCH COIL AND BEARING R & I**

#### Removal

1) Hold clutch disc using Clutch Disc Wrench (KV99231260) and remove center bolt. Using Clutch Disc Puller (KV99232340), remove drive plate and adjustment shim(s).

2) Remove snap ring. Remove pulley using Pilot (J-39023) and universal puller. Remove clutch coil. If necessary, remove snap ring and bearing. See Fig. 19.

#### Installation

1) Ensure coil lead is installed in original position. Install and tighten coil screws. Press pulley onto compressor using Pulley Installer (J-33940). Install snap ring and adjustment shim(s).

2) Install clutch disc and tighten center bolt to 11-13 ft. lbs. (15-18 N.m). Using feeler gauge, ensure clearance between clutch disc and pulley is .012-.024" (.30-.60 mm). If clearance is incorrect, add or remove shim(s) as necessary. Break-in clutch by engaging and disengaging clutch 30 times.

NOTE: Shaft seal assembly servicing procedure is not available from manufacturer. Use exploded view as a guide. See Fig. 19. Tighten thermal protector, if removed, to 11-13 ft.lbs. (15-18 N.m).

## A/C COMPRESSOR SERVICING

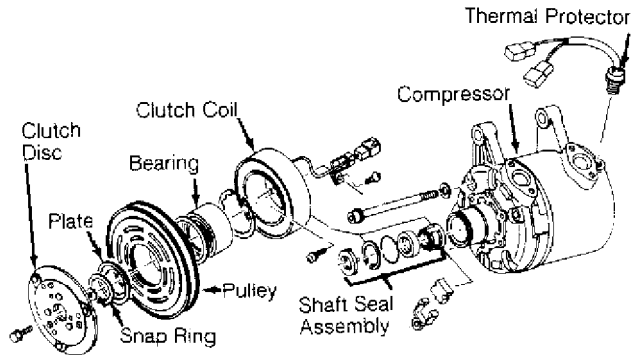
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94C10068

Fig. 19: Exploded View Of Compressor (Zexel Rotary Vane)  
Courtesy of Nissan Motor Co., U.S.A.

### ZEXEL 6-CYLINDER CLUTCH COIL AND BEARING R & I

NOTE: Volvo Zexel compressor servicing procedure is not available from manufacturer.

#### Removal (Audi)

1) Using Spanner Wrench (44-4), hold clutch hub stationary and remove shaft bolt. Remove clutch plate and shim(s) using Puller (VAG 1719) and Spanner Wrench (3212). See Fig. 20. Remove snap ring.

2) Place Spacer (VAG 1719/1) in center of pulley cavity. Attach Puller (US 1078) to outer diameter of pulley and remove pulley. Remove snap ring, bearing, and clutch coil as necessary.

#### Installation (Audi)

Ensure clutch coil lug fits into hole on compressor housing. Using Installer (VAG 1719/2), press on pulley and install snap ring. Install shim(s) and clutch plate. Tighten shaft bolt to 11 ft. lbs. (15 N.m). Using feeler gauge, ensure air gap between pulley and clutch disc is .012-.024" (.30-.60 mm). If clearance is incorrect, add or remove shim(s) as necessary.

## A/C COMPRESSOR SERVICING

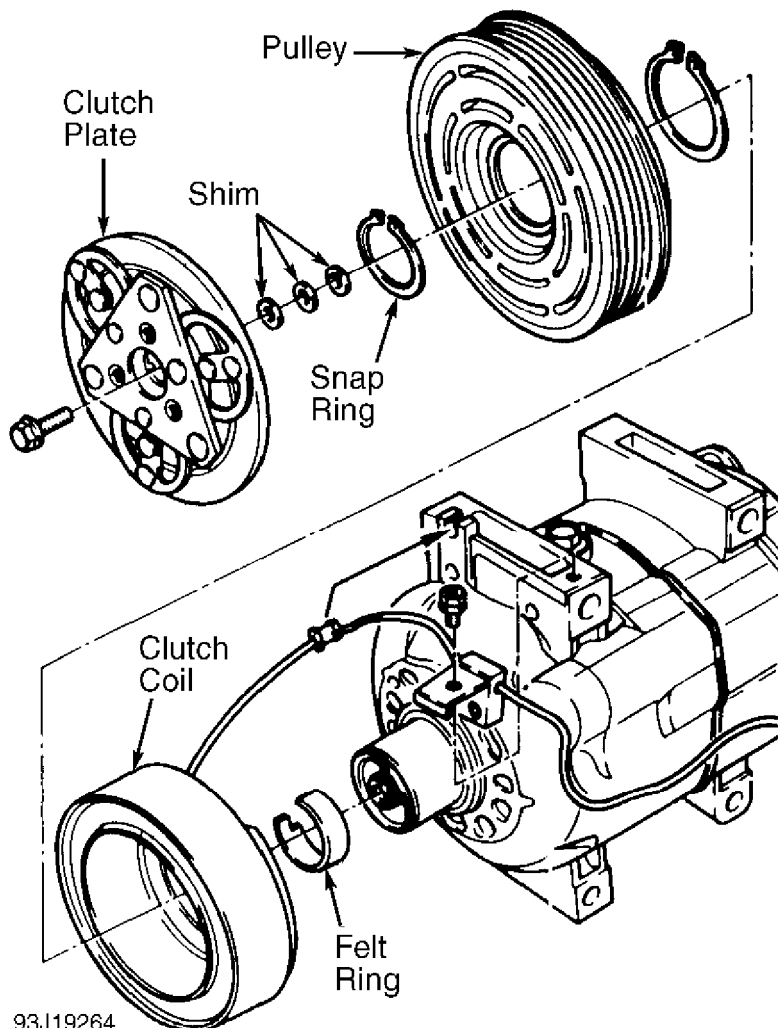
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Fig. 20: Exploded View Of Compressor (Zexel 6-Cylinder)  
Courtesy of Audi of America, Inc.

### Removal (Nissan)

1) Using Clutch Disc Wrench (J-37877), hold clutch hub stationary and remove shaft nut. Remove adjustment shim(s) and clutch disc using Clutch Disc Puller (J-26571-A).

2) Bend lock washer away from lock nut. See Fig. 21. Remove lock nut with Wrench (J-37882). Remove pulley by hand or, if difficult to remove, use Pilot (J-26720-A) and universal puller. Remove snap ring, bearing, and clutch coil as necessary.

### Installation (Nissan)

1) Ensure key is installed in compressor shaft keyway. Install pulley, lock washer and pulley. Tighten lock nut to 25-29 ft. lbs. (34-39 N.m). Bend lock washer against lock nut.

2) Install clutch disc and tighten shaft nut to 10-12 ft. lbs (14-16 N.m). Using feeler gauge, ensure air gap between pulley and clutch disc is .012-.024" (.30-.60 mm). If clearance is incorrect, add or remove shim(s) as necessary. Break-in compressor clutch assembly by



# A/C COMPRESSOR SERVICING

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engaging and disengaging clutch 30 times.

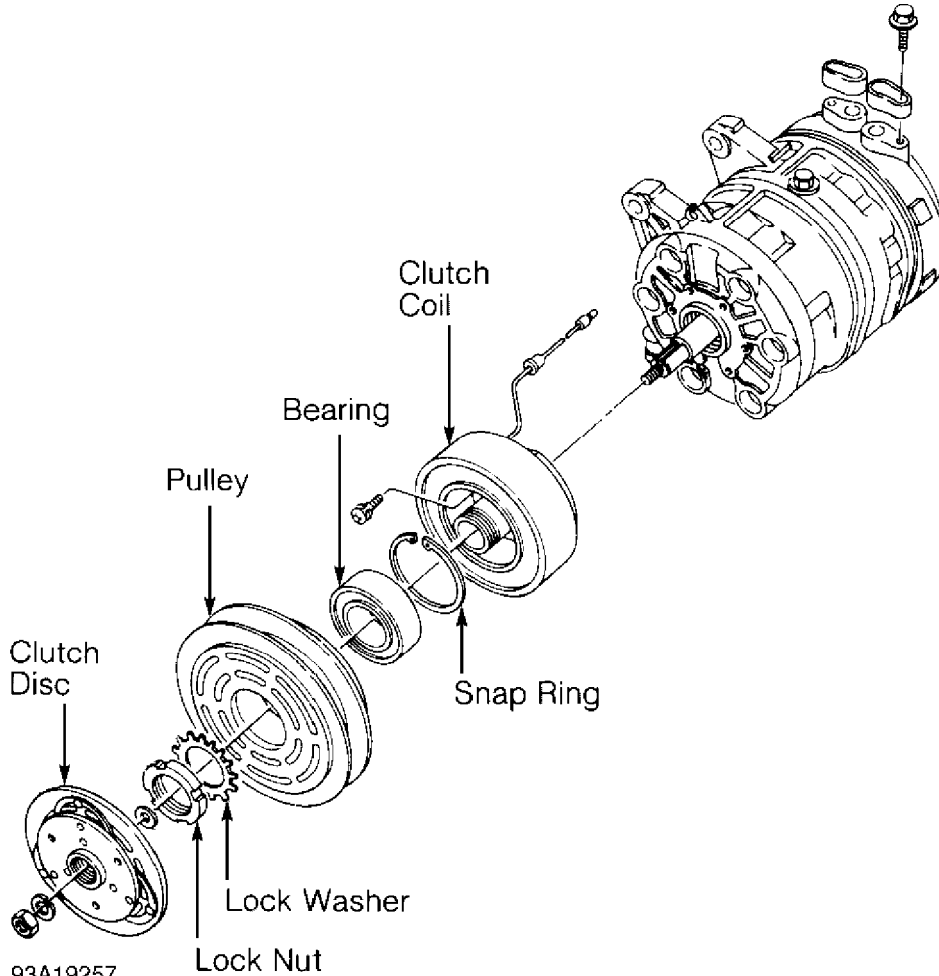


Fig. 21: Exploded View Of Compressor (Zexel DKS-16H 6-Cylinder)  
Courtesy of Nissan Motor Co., U.S.A.

**END OF ARTICLE**

# A/C-HEATER SYSTEM - MANUAL

## Article Text

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### ARTICLE BEGINNING

1993 MANUAL A/C-HEATER SYSTEMS  
Mazda Motors Corp.

RX7

#### \* PLEASE READ THIS FIRST \*

**WARNING:** To avoid injury from accidental air bag deployment, read and carefully follow all SERVICE PRECAUTIONS and DISABLING & ACTIVATING AIR BAG SYSTEM procedures in AIR BAG RESTRAINT SYSTEM article in ACCESSORIES & ELECTRICAL section.

**CAUTION:** When battery is disconnected, radio will go into anti-theft protection mode. Obtain radio anti-theft protection code from owner prior to servicing vehicle.

### SPECIFICATIONS

#### SPECIFICATIONS TABLE

Application Specification

Compressor Type	.....	Panasonic Rotary Vane
Compressor Belt Deflection (1)		
New	.....	9/64-11/64" (3.5-4.5 mm)
Used	.....	11/64-13/64" (4.5-5.0 mm)
System Oil Capacity	.....	3.4-4.7 ozs.
Refrigerant (R-12) Capacity	.....	21 ozs.
System Operating Pressures (2)		
High Side	.....	142-192 psi (10-13.5 kg/cm <sup>2</sup> )
Low Side	.....	15-27 psi (1.1-1.9 kg/cm <sup>2</sup> )

- (1) - Measure with 22 lb. (10 kg) pressure applied to center of belt.
- (2) - Specification is with ambient temperature at about 68°F (20°C).

### DESCRIPTION

Blower case, mounted under right end of instrument panel, contains blower motor and intake (fresh/recirculated) air door. See Fig. 1. Evaporator case, to left of blower case, contains evaporator and evaporator thermostats. Heater case, located next to evaporator case, contains heater core, airflow mode door and air-mix (temperature blend) door.

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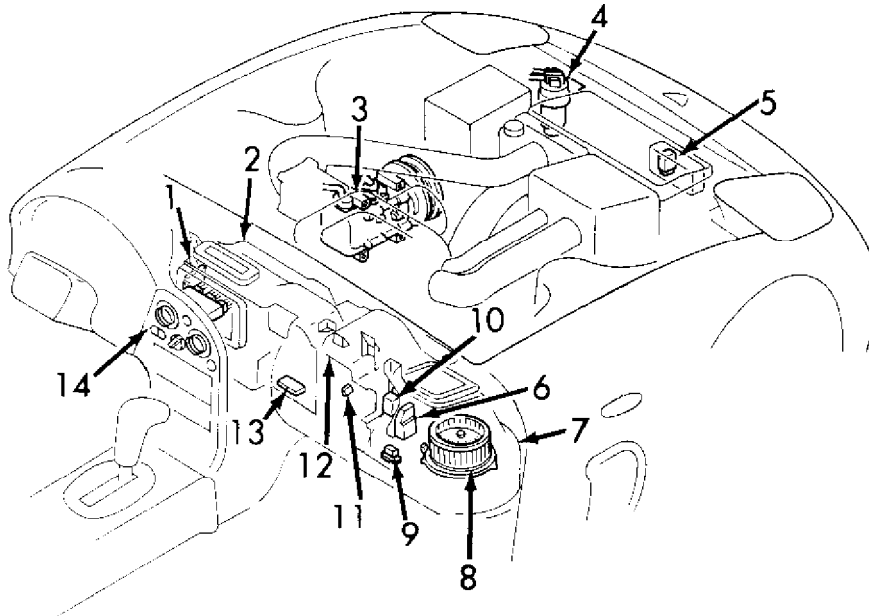
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- |                               |                              |
|-------------------------------|------------------------------|
| 1. Airflow Mode Door Actuator | 8. Blower Motor              |
| 2. Heater Case                | 9. Blower Motor Resistor     |
| 3. A/C Compressor             | 10. Blower Motor Relay       |
| 4. Receiver-Drier             | 11. Evaporator Thermostwitch |
| 5. A/C Relay                  | 12. Evaporator Case          |
| 6. Intake Air Door Actuator   | 13. Air-Mix Door Actuator    |
| 7. Blower Case                | 14. A/C-Heater Control Unit  |

94B10240

Fig. 1: Identifying Manual A/C-Heater System Components  
Courtesy of Mazda Motors Corp.

## OPERATION

### A/C-HEATER CONTROL UNIT

#### Blower Motor Control Knob

Blower speed is controlled by a 4-speed setting knob. See Fig. 2. Blower must be on for A/C system to operate.

#### Temperature Control Knob

Temperature control knob operates air-mix door in evaporator case to achieve desired temperature. System will provide cooled air when A/C switch is on and blower switch is in any position other than off. Rotate knob counterclockwise for cooler air. Temperature control knob should be in maximum cool setting for maximum A/C performance.

#### A/C Switch

Push switch to engage A/C compressor. Compressor will not engage with ambient temperature less than 38°F (3°C).

#### Airflow Mode Control Knob

Control knob selects distribution of incoming air. Going

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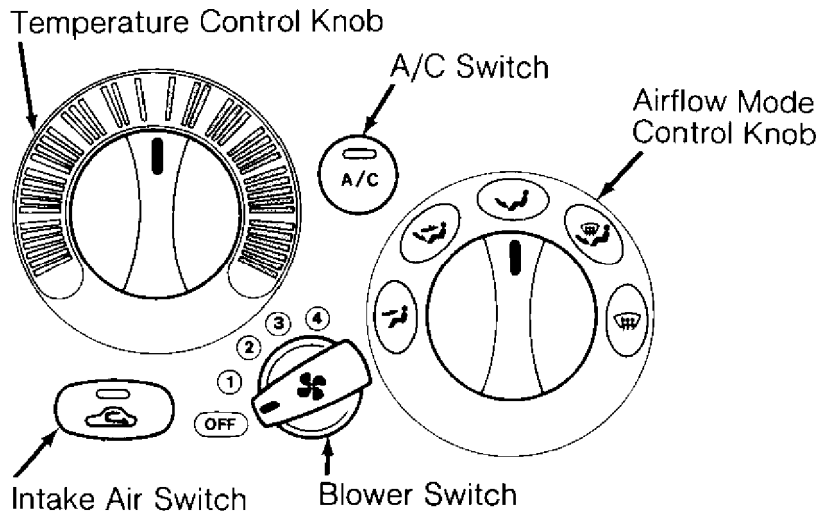
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clockwise from 9 o'clock position , air distribution positions of control knob are as follows: vent, floor and vent, floor, floor and defrost, defrost.

#### Intake (Fresh/Recirculated) Air Switch

Use this switch when maximum cooling is required. To recirculate air inside vehicle, press intake air button. Indicator light will come on, and outside air will be shut off.



94H10246

Fig. 2: Identifying A/C-Heater System Controls  
Courtesy of Mazda Motors Corp.

## PRESSURE SWITCH

The pressure switch, located in the refrigerant line near receiver-drier, is wired in series with magnetic (compressor) clutch. Whenever system pressures drop below or increase above the control point of the switch, power supplied to compressor will be cut and compressor activity will cease until pressures are back to within operating ranges.

## TROUBLE SHOOTING

NOTE: Components listed indicate most likely cause(s) of trouble. Possible causes are not listed in any order of probability.

### BLOWER MOTOR DOES NOT OPERATE AT ANY BLOWER SETTING

Check components listed, and repair or replace as necessary: A/C blower fuse; rear wiper fuse; blower motor relay; wiring harness; blower motor; blower switch.

### BLOWER MOTOR DOES NOT OPERATE AT SPECIFIC SETTING

Check components listed, and repair or replace as necessary:

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blower motor resistor; blower switch; wiring harness.

#### **AIRFLOW MODE DOES NOT CHANGE**

Check components listed, and repair or replace as necessary:  
airflow mode door motor; A/C-heater control unit; wiring harness.

#### **INTAKE AIR DOES NOT CHANGE**

Check components listed, and repair or replace as necessary:  
A/C-heater control unit; intake air door motor; wiring harness.

#### **TEMPERATURE CONTROL DOOR MOTOR DOES NOT OPERATE**

Check components listed, and repair or replace as necessary:  
A/C-heater control unit; temperature control door motor; wiring harness.

#### **A/C CLUTCH DOES NOT OPERATE**

Check components listed, and repair or replace as necessary:  
A/C clutch; refrigerant pressure switch; A/C relay; A/C fuse; cigar fuse; wiring harness.

#### **A/C CLUTCH & ELECTRIC COOLING FAN DO NOT OPERATE**

Check components listed, and repair or replace as necessary:  
A/C-heater control unit; thermoswitch; blower switch; wiring harness; refrigerant charge.

### **TESTING**

**\* PLEASE READ THIS FIRST \***

**WARNING:** To avoid injury from accidental air bag deployment, read and carefully follow all SERVICE PRECAUTIONS and DISABLING & ACTIVATING AIR BAG SYSTEM procedures in AIR BAG RESTRAINT SYSTEM article in ACCESSORIES & ELECTRICAL section.

#### **A/C SYSTEM PERFORMANCE**

1) Park vehicle out of direct sunlight. Install A/C manifold gauge set. Start and run engine at 2000 RPM. Set A/C controls to recirculate air, panel (vent) mode, full cold, and A/C button on.

2) Set blower/fan on high speed and close doors and windows. Insert thermometer in center vent. Operate system for 20 minutes to allow system to stabilize. Measure temperature. Temperature should be 37-42°F (3-6°C) at center vent, with high side and low side pressures within specification. See SPECIFICATIONS table at beginning of article.

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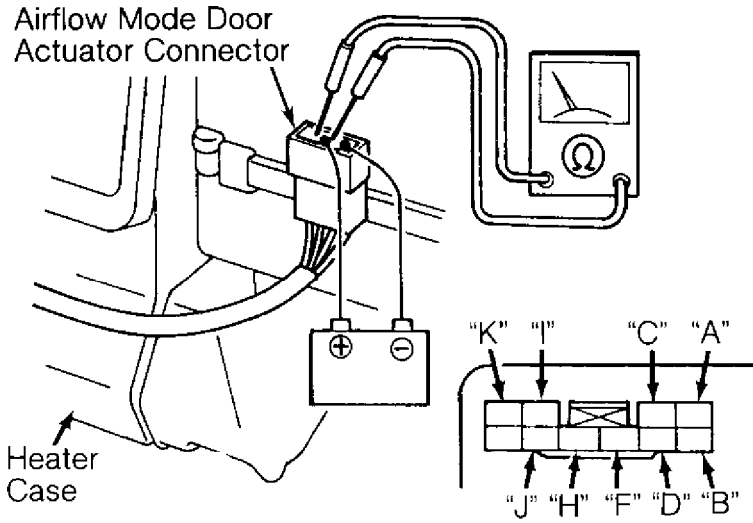
### AIRFLOW MODE DOOR MOTOR

1) Disconnect airflow mode door motor connector. Apply battery voltage to terminal "J" and ground terminal "K". See Fig. 3. Ensure motor operates.

2) Check continuity between specified terminals. See AIRFLOW MODE SPECIFICATIONS table. If continuity does not exist, replace motor.

#### AIRFLOW MODE SPECIFICATIONS TABLE

Switch Setting	Terminals
Vent	"C", "D", "F", "H" & "I"
Floor & Vent	"A" & "B"; "D", "F", "H" & "I"
Floor	"A", "B" & "C"; "F", "H" & "I"
Floor & Defrost	"A", "B", "C" & "D"; "H" & "I"
Defrost	"A", "B", "C", "D" & "F"



94J10248  
 Fig. 3: Testing Airflow Mode Door Motor  
 Courtesy of Mazda Motors Corp.

### AIRFLOW MODE DOOR CIRCUIT

1) If airflow mode door motor tested okay in AIRFLOW MODE DOOR MOTOR test, disconnect A/C-heater control unit connector and airflow mode door motor connector. See Figs. 3 and 7.

2) Check continuity on all wires at airflow mode door motor connector. If continuity does not exist on any wire, repair wire as necessary between A/C-heater control unit connector and airflow door motor connector. If continuity exists on all wires, replace A/C-heater control unit.

### AIR-MIX DOOR MOTOR

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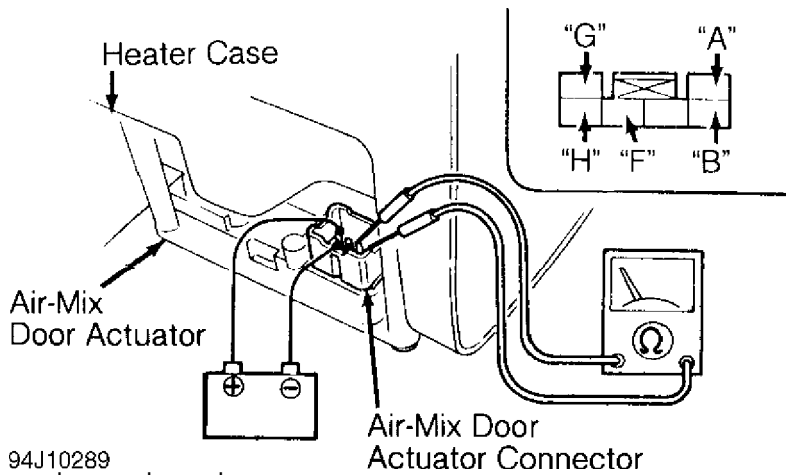
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1) Disconnect air-mix door motor connector. See Fig. 4. Apply battery voltage to terminal "G" and ground terminal "H". Verify motor operation. Check resistance between terminals "F" and "B". Resistance should increase from 1000 ohms to 5500 ohms as temperature control knob is moved from hot to cold setting.

2) Apply battery voltage to terminal "H" and ground terminal "G". Verify motor operation. Check resistance between terminals "F" and "A". Resistance should decrease from 5500 ohms to 1000 ohms as temperature control knob is moved from cold to hot setting. Replace motor if it does not test as specified.



94J10289  
Fig. 4: Testing Air-Mix Door Motor  
Courtesy of Mazda Motors Corp.

**AIR-MIX DOOR MOTOR CIRCUIT**

1) If air-mix door motor tested okay in AIR-MIX DOOR MOTOR test, disconnect A/C-heater control unit connector and air-mix door motor connector. See Figs. 4 and 7.

2) Check continuity on all wires at air-mix door motor connector. If continuity does not exist on any wire, repair wire as necessary between A/C-heater control unit connector and air-mix door motor connector. If continuity exists on all wires, replace A/C-heater control unit.

**BLOWER MOTOR CIRCUIT**

1) Check blower motor fuse and rear wiper fuse. See Fig. 5. If either fuse is blown, repair short circuit in wiring harness. Replace fuse. If fuses are okay, go to next step.

2) Turn ignition switch to ON position. Check voltage at specified blower motor relay harness connector terminals and take appropriate action. See BLOWER MOTOR RELAY VOLTAGE TEST table.

**BLOWER MOTOR RELAY VOLTAGE TEST TABLE**

Terminal	Volts	Action
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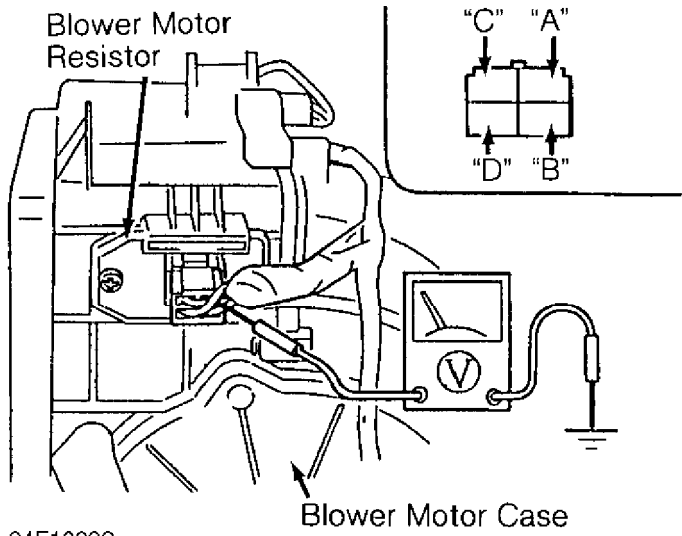
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Terminal	Volts	Action
"A" .....	12 .....	Check Voltage At Next Terminal
	0 .....	Replace Resistor
"B" .....	12 .....	Check Voltage At Next Terminal
	0 .....	Replace Resistor
"C" .....	12 .....	Check Voltage At Next Terminal
	0 .....	Replace Resistor
"D" .....	12 .....	Go To Step 2)
	0 .....	Replace Resistor

AA



94F10293  
 Fig. 8: Testing Blower Motor Resistor  
 Courtesy of Mazda Motors Corp.

2) Turn ignition switch to ON position. Ensure blower switch and A/C switch are in OFF position. Check voltage at specified blower switch connector terminal and take appropriate action. See BLOWER SWITCH VOLTAGE TEST table. See Fig. 7.

BLOWER SWITCH VOLTAGE TEST TABLE  
 AAA

Terminal	Volts	Action
Blue/White .....	12 .....	Check Voltage At Next Wire
	0 .....	Repair Wiring Harness Between Resistor & Blower Switch
Blue/Red .....	12 .....	Check Voltage At Next Wire
	0 .....	Repair Wiring Harness Between Resistor & Blower Switch
Blue .....	12 .....	Check Voltage At Next Wire
	0 .....	Repair Wiring Harness Between Resistor & Blower Switch
Blue/Yellow .....	12 ...	Replace A/C-Heater Control Unit
	0 .....	Repair Wiring Harness Between Resistor & Blower Switch

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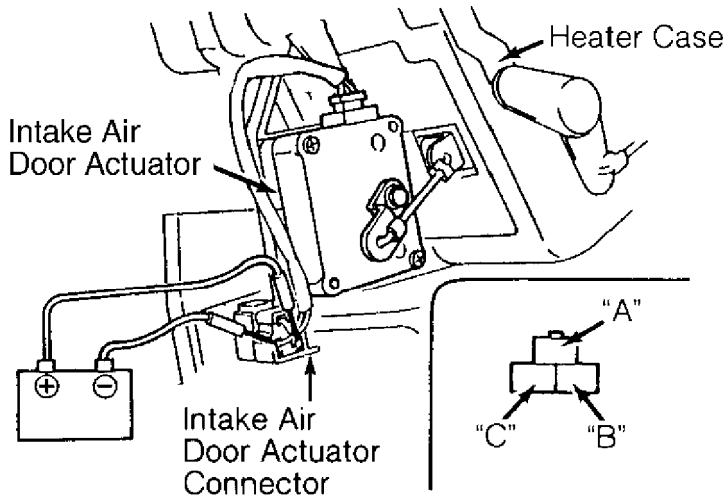
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### INTAKE AIR DOOR MOTOR

Disconnect intake air door motor connector. See Fig. 9. Apply battery voltage to terminal "A". Ground terminal "B" and then ground terminal "C". Replace motor if it does not operate.



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Fig. 9: Testing Intake Air Door Motor  
Courtesy of Mazda Motors Corp.

### INTAKE AIR DOOR MOTOR CIRCUIT

1) If intake air door motor tested okay in INTAKE AIR DOOR MOTOR test, disconnect A/C-heater control unit connector and intake air door motor connector. See Figs. 7 and 9.

2) Check continuity on all wires at intake air door motor connector. If continuity does not exist on any wire, repair wire as necessary between A/C-heater control unit connector and intake air door motor connector. If continuity exists on all wires, replace A/C-heater control unit.

### MAGNETIC (COMPRESSOR) CLUTCH CIRCUIT

1) Check A/C fuse and CIGAR fuse. See Fig. 10. If either fuse is blown, repair short circuit in wiring harness. Replace fuse. If fuses are okay, go to next step.

2) Remove A/C relay. See Figs. 1 and 11. Turn ignition switch to ON position. Check voltage at specified A/C relay harness connector terminals and take appropriate action. See A/C RELAY VOLTAGE TEST table.

### A/C RELAY VOLTAGE TEST TABLE

AA

Terminal	Volts	Action
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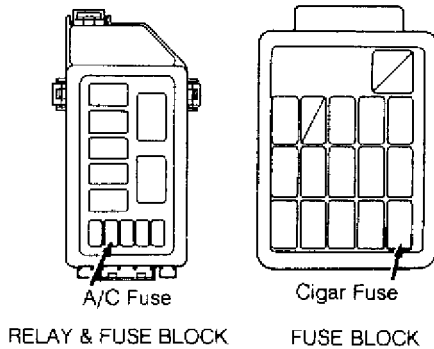
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"A"	.....	12	....	Check Voltage On Next Terminal
		0	.....	Repair Blue/Black Wire
"B"	.....	12	.....	Go To Step 3)
		0	.....	Repair Yellow Wire

AA

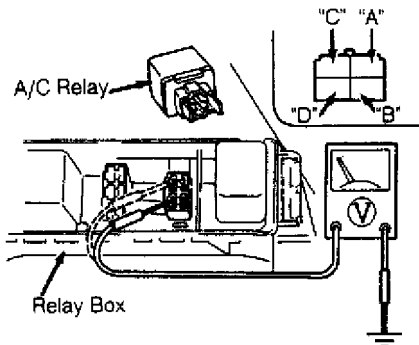


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Fig. 10: Identifying A/C & Cigar Fuses  
Courtesy of Mazda Motors Corp.

3) Apply battery voltage to A/C relay terminal "A" and ground terminal "B". See Fig. 12. Check continuity between terminals "C" and "D". If continuity does not exist, replace relay. If continuity exists, go to next step.

4) Ensure ignition switch is in OFF position. Connect a jumper wire between A/C relay connector terminals "A" and "B". See Fig. 11. Start engine. Turn blower and A/C switches to ON position. If magnetic clutch engages, repair wiring harness between A/C relay connector and Electronic Control Unit (ECU). If magnetic clutch does not engage, remove jumper wire and go to next step.



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Fig. 11: Testing A/C Relay Connector  
Courtesy of Mazda Motors Corp.

5) Turn ignition switch to OFF position. Disconnect pressure switch connector. See Fig. 13. Connect jumper wire across pressure switch harness connector terminals. Start engine. Turn blower and A/C

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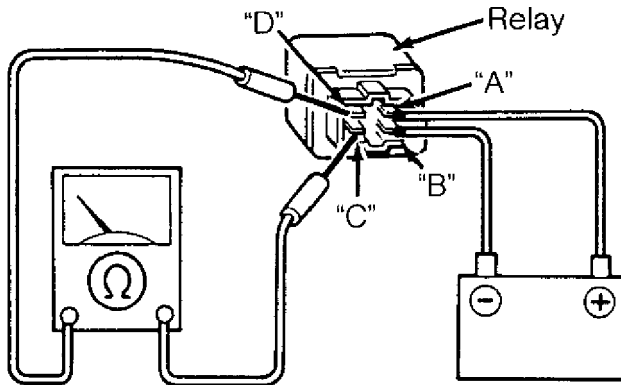
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switches to ON position. If magnetic clutch engages, go to next step. If magnetic clutch does not engage, remove jumper wire. Reconnect pressure switch. Go to step 7).

6) Install A/C manifold gauge set. Start and run engine at 2000 RPM. If high side pressure reading is 30-299 psi (2.1-21 kg/cm<sup>2</sup>), replace pressure switch. If reading is not within specification, check A/C system for leaks.

7) Check voltage on pressure switch harness connector Black/Blue wire. If battery voltage exists, go to next step. If battery voltage does not exist, repair wiring harness between A/C relay and pressure switch.

8) Check voltage on magnetic clutch harness connector Black/Red wire. If battery voltage exists, replace magnetic clutch. If battery voltage does not exist, repair wiring harness between magnetic clutch and pressure switch.

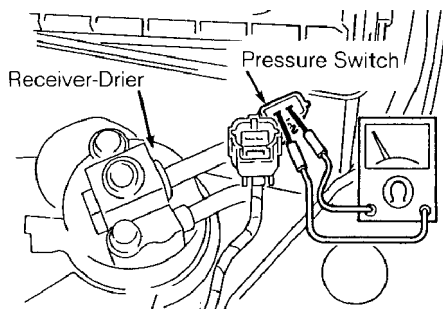


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Fig. 12: Identifying Relay Terminals  
Courtesy of Mazda Motors Corp.

## PRESSURE SWITCH

Turn engine off. Connect A/C manifold gauge set. Ensure system pressure reads 30-299 psi (2.1-21 kg/cm<sup>2</sup>). Disconnect pressure switch connector. See Fig. 13. Check continuity across connector terminals. If continuity does not exist, replace pressure switch.



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Fig. 13: Testing Pressure Switch  
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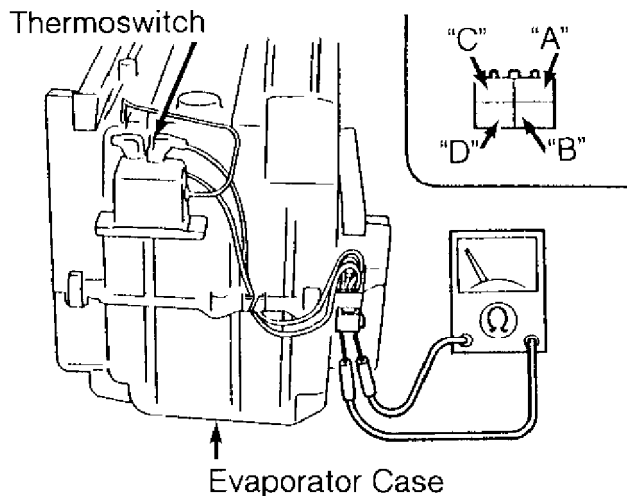
## RELAYS

1) Remove relay to be tested. See Fig. 1. Using an ohmmeter, ensure continuity exists between terminals "A" and "B" and does not exist between terminals "C" and "D". See Fig. 12.

2) Apply battery voltage to terminal "A" and ground terminal "B". Ensure continuity exists between terminals "C" and "D". If continuity is not as specified, replace relay.

## THERMOSWITCH

Ensure ignition switch is in OFF position. Disconnect thermoswitch connector. See Fig. 14. Check continuity between specified thermo-switch connector terminals. Continuity should exist between terminals "A" and "B", and terminals "C" and "D". If continuity is not as specified, replace thermoswitch.



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Fig. 14: Locating Thermoswitch Connector  
Courtesy of Mazda Motors Corp.

## THERMOSWITCH CIRCUIT

1) Ensure thermoswitch is okay. See THERMOSWITCH. Disconnect blower switch connector and thermoswitch connector. See Figs. 7 and 14. Check continuity on Blue/Yellow wire between connectors. If continuity does not exist, repair Blue/Yellow wire. If continuity exists, go to next step.

2) Reconnect blower switch connector. Disconnect A/C-heater control unit connectors. See Fig. 7. Check for continuity of Violet/Pink wire and White wire between A/C-heater control unit connector and thermoswitch connector. If continuity does not exist, repair appropriate wire. If continuity exists, go to next step.

3) Turn A/C switch to ON position. Check continuity between A/C-heater control unit terminals "1I" and "1G". See Fig. 15. If continuity does not exist, replace A/C-heater control unit. If continuity exists, check wiring harness between A/C-heater control unit and Electronic Control Unit (ECU).

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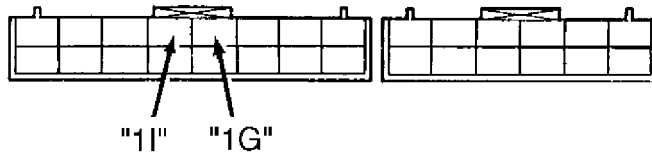
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Fig. 15: Testing A/C-Heater Control Unit  
Courtesy of Mazda Motors Corp.

## REMOVAL & INSTALLATION

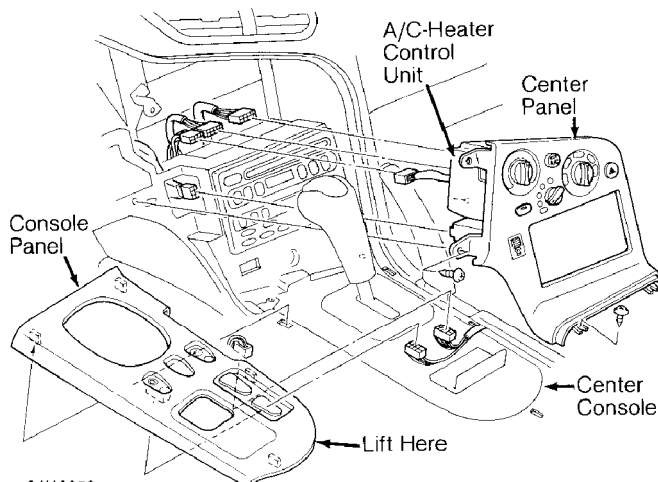
\* PLEASE READ THIS FIRST \*

**WARNING:** To avoid injury from accidental air bag deployment, read and carefully follow all SERVICE PRECAUTIONS and DISABLING & ACTIVATING AIR BAG SYSTEM procedures in AIR BAG RESTRAINT SYSTEM article in ACCESSORIES & ELECTRICAL section.

## A/C-HEATER CONTROL UNIT

### Removal & Installation

- 1) Obtain radio anti-theft protection code from owner prior to servicing vehicle. Disconnect negative battery cable. Remove ashtray.
- 2) Using a protected screwdriver, lift center console panel at location indicated. See Fig. 16. Pull console panel upward to disengage clips from center console.
- 3) Remove center panel screws and center panel. Disconnect electrical connectors from A/C-heater control unit. Remove A/C-heater control unit screws and control unit. To install, reverse removal procedure.



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Fig. 16: Removing A/C-Heater Control Unit  
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### BLOWER MOTOR

#### Removal & Installation

Remove instrument panel. See INSTRUMENT PANEL. Remove evaporator case. See EVAPORATOR CASE. Remove blower case mounting nuts and blower case. Disassemble blower case to remove blower motor. To install, reverse removal procedure.

### COMPRESSOR

#### Removal & Installation

Discharge A/C system using approved refrigerant recovery/recycling equipment. Disconnect battery. Remove battery and battery box. Disconnect magnetic clutch connector. Disconnect refrigerant lines from compressor. Remove drive belt. Remove compressor mounting bolts and compressor. To install, reverse removal procedure.

### CONDENSER

#### Removal & Installation

Discharge A/C system using approved refrigerant recovery/recycling equipment. Remove engine compartment undercover. Disconnect refrigerant lines from condenser. Remove condenser mounting bolts and condenser. To install, reverse removal procedure.

### EVAPORATOR

#### Removal & Installation

1) Disconnect negative battery cable. Discharge A/C system using approved refrigerant recovery/recycling equipment. Disconnect refrigerant lines from evaporator tubes at engine compartment firewall.

2) Remove glove box and right undercover. Loosen left seal plate between heater case and evaporator case. Loosen right seal plate between evaporator case and blower case.

3) Remove evaporator case nuts. Disconnect drain hose and remove evaporator case. Disassemble evaporator case to remove evaporator and thermoswitch. See Fig. 17. To install, reverse removal procedure. Evacuate and charge system.



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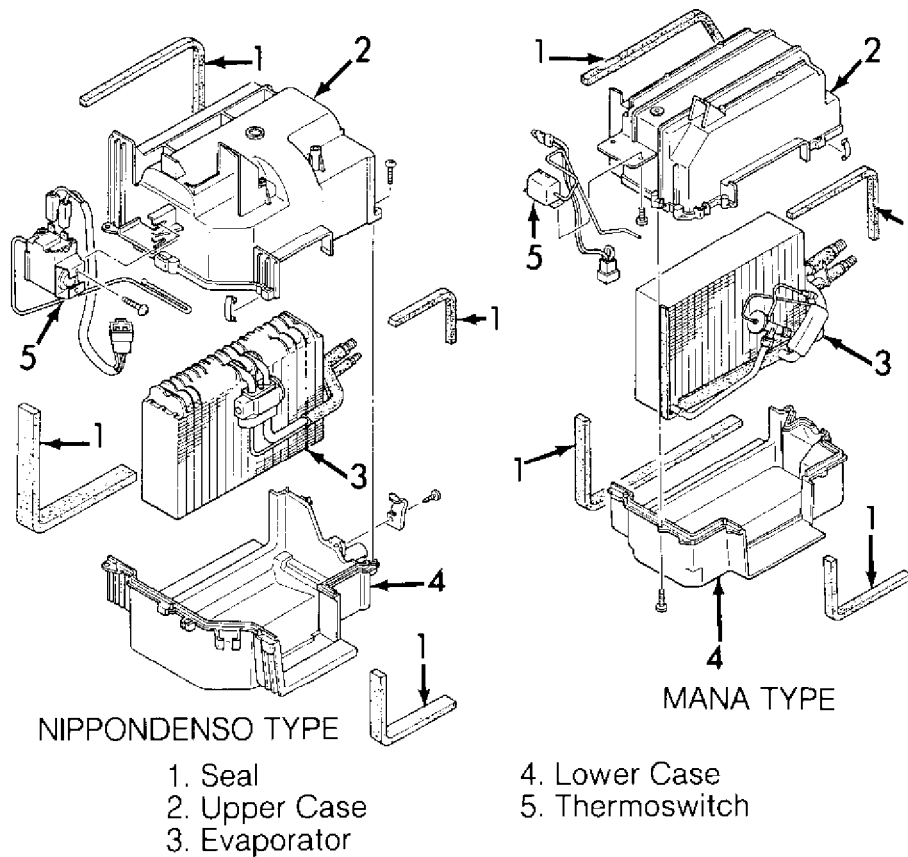
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Fig. 17: Exploded View Of Evaporator Case  
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## HEATER CORE

### Removal & Installation

Drain coolant. Disconnect negative battery cable. Disconnect heater hoses at engine compartment firewall and remove grommets. Remove instrument panel. See INSTRUMENT PANEL. Remove heater case. Disassemble heater case to remove heater core. To install, reverse removal procedure. Fill cooling system.

## INSTRUMENT PANEL

### Removal & Installation

Disconnect negative battery cable. Remove all components in order listed in illustration. See Fig. 18. To install, reverse removal procedure.

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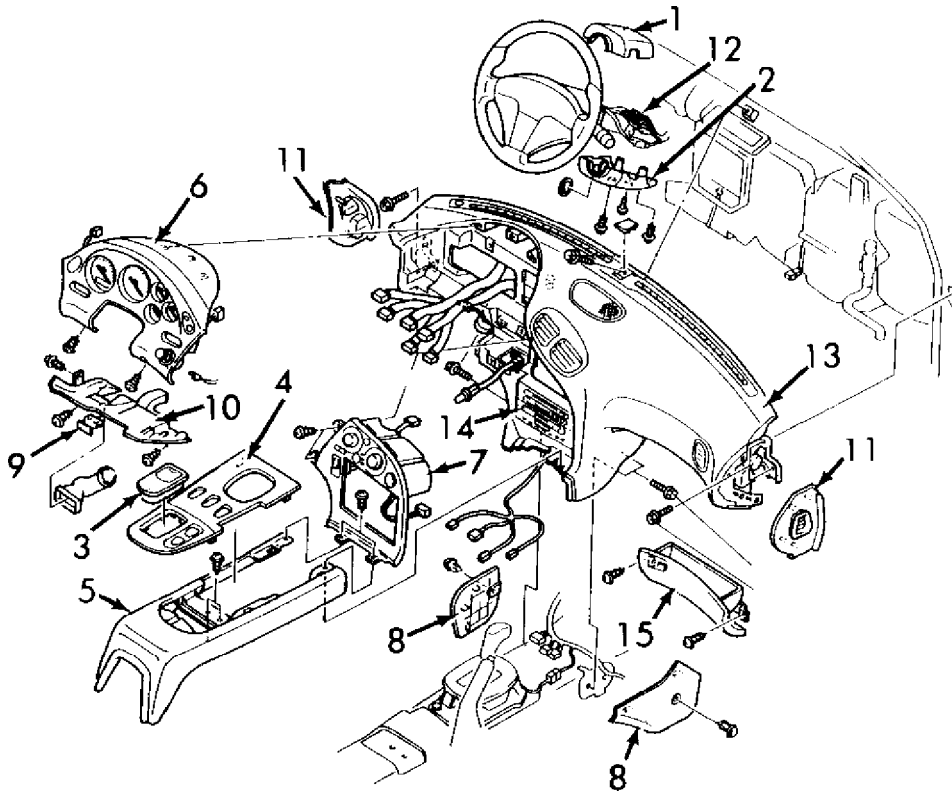
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- |                                |                                  |
|--------------------------------|----------------------------------|
| 1. Upper Column Cover          | 9. Hood Release Knob             |
| 2. Lower Column Cover          | 10. Lower Panel                  |
| 3. Ashtray                     | 11. Side Panel<br>(Left & Right) |
| 4. Console Panel               | 12. Steering Column              |
| 5. Center Console              | 13. Dash Board                   |
| 6. Instrument Cluster          | 14. Radio                        |
| 7. Center Panel                | 15. Glove Box                    |
| 8. Side Wall<br>(Left & Right) |                                  |

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Fig. 18: Exploded View Of Instrument Panel  
Courtesy of Mazda Motors Corp.

### RECEIVER-DRIER

#### Removal & Installation

Disconnect negative battery cable. Discharge A/C system using approved refrigerant recovery/recycling equipment. Disconnect refrigerant lines from receiver-drier. Remove receiver-drier. To install, reverse removal procedure. Evacuate and charge system.

### TORQUE SPECIFICATIONS

#### TORQUE SPECIFICATIONS TABLE

AA

Application

Ft. Lbs. (N.m)

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A/C Compressor Bolts .....	14-19	(19-26)
A/C Compressor Lines .....	15-21	(20-29)
A/C Condenser Lines		
Inlet .....	11-18	(15-24)
Outlet .....		(1)

INCH Lbs. (N.m)

Evaporator Hoses .....	108-120	(12.2-13.6)
Receiver-Drier Hoses .....	40-56	(4.5-6.3)

(1) - Specification is 84-168 INCH lbs. (9.5-19 N.m).

AA

**WIRING DIAGRAM**

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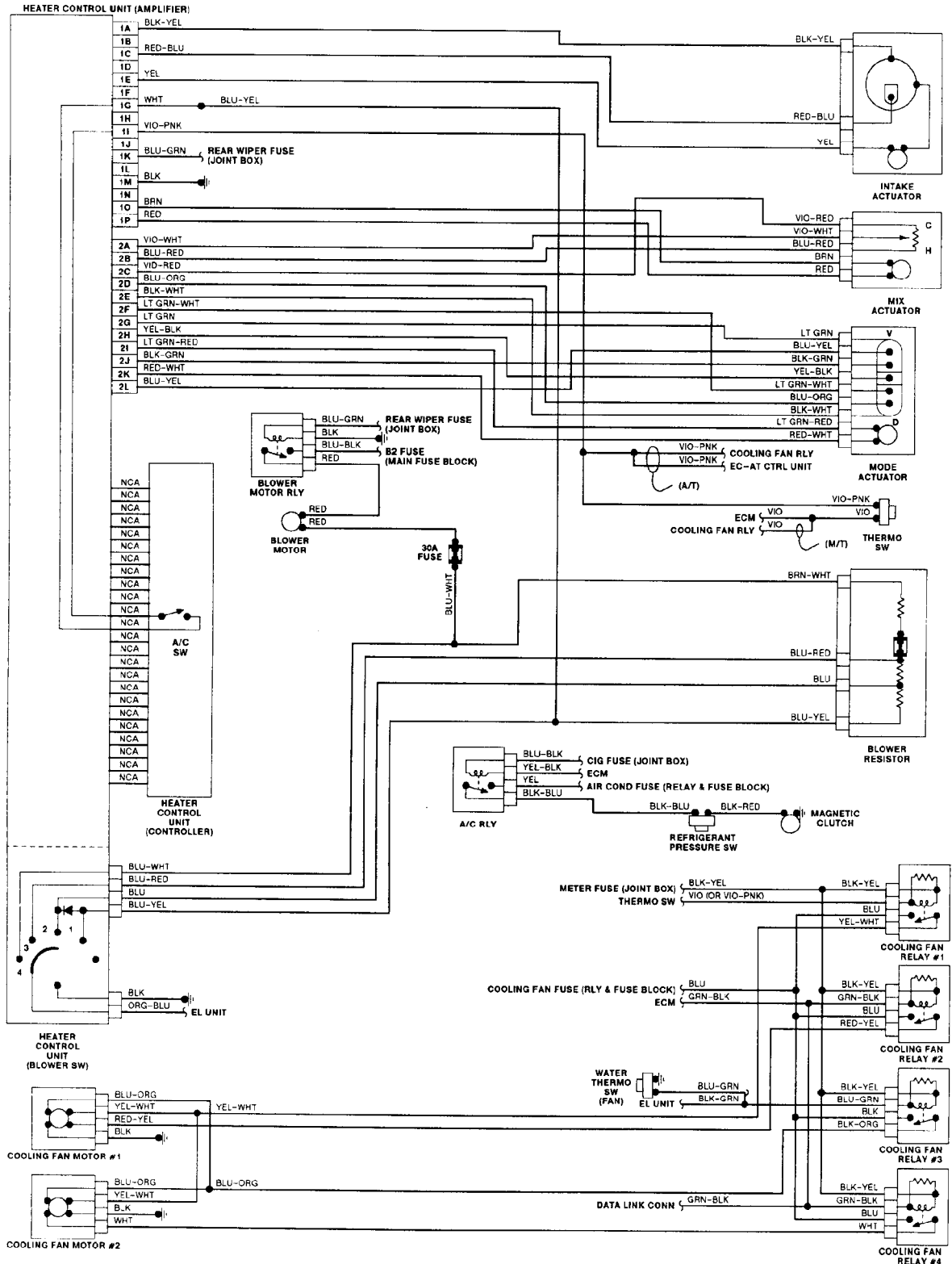
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Fig. 19: Manual A/C-Heater System Wiring Diagram

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