# 1. General Description

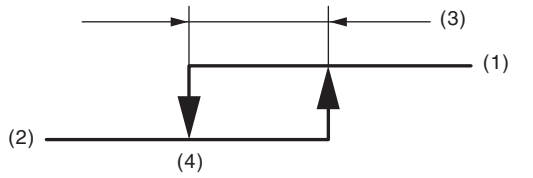
## A: SPECIFICATION

### 1. HEATER SYSTEM

| Item | | Specifications | Condition |
|---|---|---|---|
| Heating capacity | | 5.0 kW (4,299 kcal/h, 17,059 BTU/h) or more | • Air flow control dial or switch: FOOT<br>• Temperature control dial: HI (MAX HOT)<br>• Temperature difference between hot water and inlet air: 65°C (149°F)<br>• Hot water flow rate: 360 L (95.1 US gal, 79.2 Imp gal)/h |
| Air flow rate | | 290 $m^3$ (10,243 cu ft)/h | FOOT mode (FRESH), MAX HOT at 12.5 V |
| Max air flow rate | | 480 $m^3$ (16,954 cu ft)/h | • Temperature control dial: LO (MAX COOL)<br>• Fan dial: HI (MAX)<br>Auto A/C model: 7th position<br>Manual A/C model: 4th position<br>• FRESH/RECIRC switch: RECIRC |
| Heater core | Dimensions (W × H × T) | 257.5 × 118.5 × 27 mm (10.1 × 4.67 × 1.06 in) | — |
| Blower motor | Type | Magnet motor 300 W or less | 12 V |
| | Fan type and size (diameter × width) | Sirocco fan type 150 × 75 mm (5.91 × 2.95 in) | — |

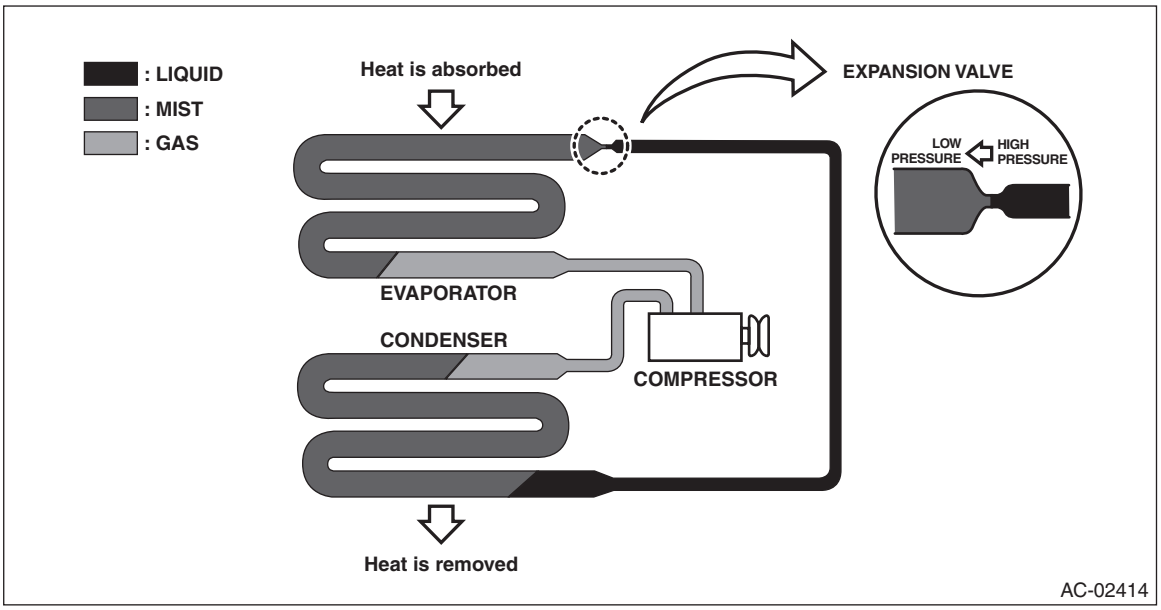
### 2. A/C SYSTEM

| Item | | Specifications |
|---|---|---|
| Type of air conditioner | | Reheat air-mix type |
| Cooling capacity | | 5.0 kW (4,299 kcal/h, 17,059 BTU/h) |
| Refrigerant | | HFC-134a ($CH_2FCF_3$) [0.475±0.025 kg (1.05±0.06 lb)] |
| Compressor | Type | Rotary fixed capacity (DKV-10Z) |
| | Discharge | 105 cc (6.41 cu in)/rev |
| | Max. permissible speed | 7,700 r/min |
| Magnet clutch | Type | Dry, single-disc type |
| | Power consumption | 45 W |
| | Type of belt | Gasoline engine model: V-belt 6 PK<br>HEV model: V-belt 7 PK |
| | Pulley dia. (effective dia.) | 110 mm (4.33 in) |
| | Pulley ratio | 1.3 |
| Condenser | Type | Sub cool type |
| | Core face area | 0.188 $m^2$ (2.002 sq ft) |
| | Core thickness | 16 mm (0.63 in) |
| | Radiation area | 4.5 $m^2$ (48.44 sq ft) |
| Expansion valve | Type | Block |
| Evaporator | Type | Dual-tank |
| | Dimensions (W × H × T) | 290.1 × 172 × 39 mm (11.42 × 6.77 × 1.54 in) |
| Blower fan | Fan type | Sirocco fan |
| | Outer diameter × Width | 150 × 75 mm (5.91 × 2.95 in) |
| | Power consumption | 280 W |
| Condenser fan (sub fan) | Motor type | Magnet |
| | Power consumption | 120 W |
| | Fan outer diameter | 318.5 mm (12.5 in) |

| Item | | | Specifications |
|---|---|---|---|
| Radiator fan (main fan) | | Motor type | Magnet |
| | | Power consumption | 120 W |
| | | Fan outer diameter | 318.5 mm (12.5 in) |
| Idle speed | | No load | 650±100 r/min |
| | | A/C ON | 800 — 900±50 r/min |
| Triple switch (Pressure switch) | Low-pressure switch operating pressure | ON → OFF | 196±25 kPa (2.00±0.25 kgf/cm$^2$, 28.4±3.6 psi) |
| | | OFF → ON | 225±30 kPa (2.29±0.31 kgf/cm$^2$, 32.6±4.3 psi) |
| | High-pressure switch operating pressure | ON → OFF | 2,940±200 kPa (29.98±2.04 kgf/cm$^2$, 426.3±29 psi) |
| | | OFF → ON | 2,350±200 kPa (24.00±2.04 kgf/cm$^2$, 340.7±29.0 psi) |
| | Middle-pressure switch operating pressure | ON → OFF | 1,470±120 kPa (14.99±1.22 kgf/cm$^2$, 213.15±17.4 psi) |
| | | OFF → ON | 1,770±100 kPa (18.05±1.02 kgf/cm$^2$, 256.65±14.5 psi) |
| Thermo-control amplifier working temperature | | |  AC-00601<br>(1) ON<br>(2) OFF<br>(3) 1.5±0.3°C (34.7±0.5°F)<br>(4) 1.0±0.5°C (33.8±0.9°F) |

## 3. BASIC OPERATION

The cooling system cools down the compartment by using the pipes connecting parts and cycling the evaporable liquid (refrigerant) within the sealed system in a repeated process of “vaporization — liquefaction — re-vaporization”.

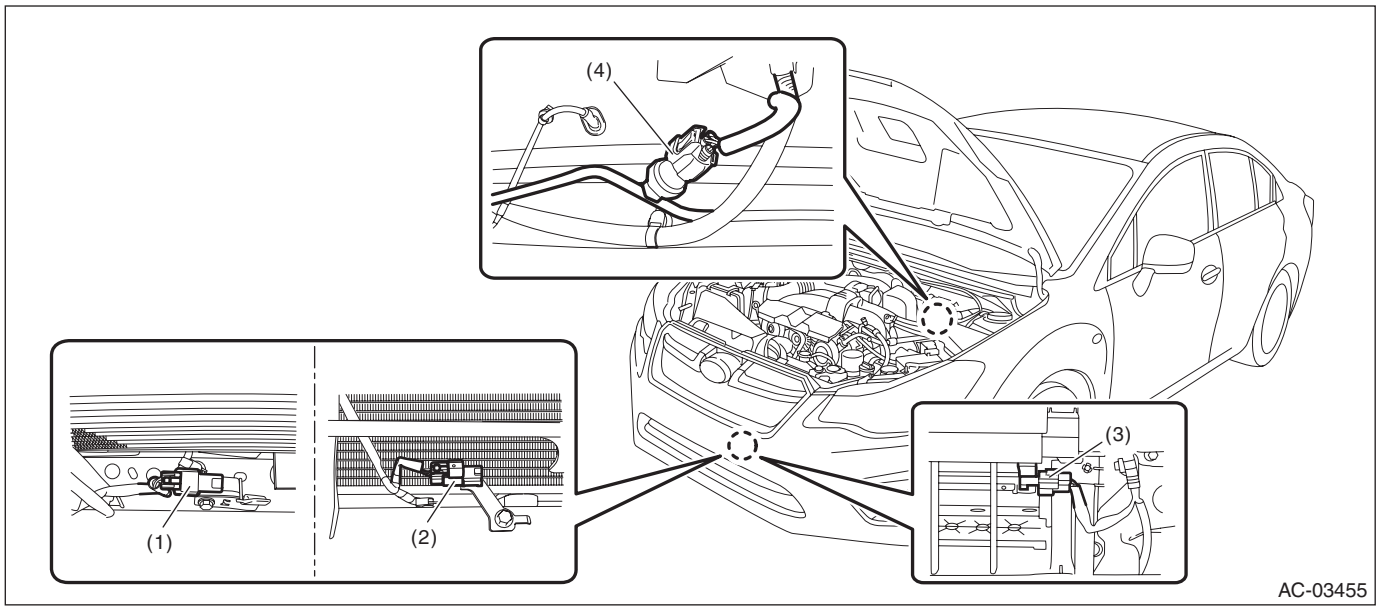



| Item | Operation |
|---|---|
| Compressor | Sucks and pressurizes the low temperature, low pressure refrigerant gas that was vaporized at the evaporator by absorbing heat from the compartment, and sends the high temperature, high pressure refrigerant gas to the condenser. |
| Condenser | Cools the high temperature, high pressure refrigerant gas sent from the compressor for condense and liquefaction. |
| Expansion valve | • Sprays the high temperature, high pressure liquid refrigerant from the small hole in order to let the refrigerant expand rapidly to turn it into low temperature, low pressure mist.<br>• The refrigerant amount is adjusted according to the refrigerant vaporization condition in the evaporator. |
| Evaporator | The evaporator turns into a low temperature condition when the mist refrigerant that was turned into a low temperature, low pressure condition at the expansion valve is vaporized in large quantity in the evaporator. Passing air flow through the low temperature evaporator emits cold air. |

# B: LOCATION

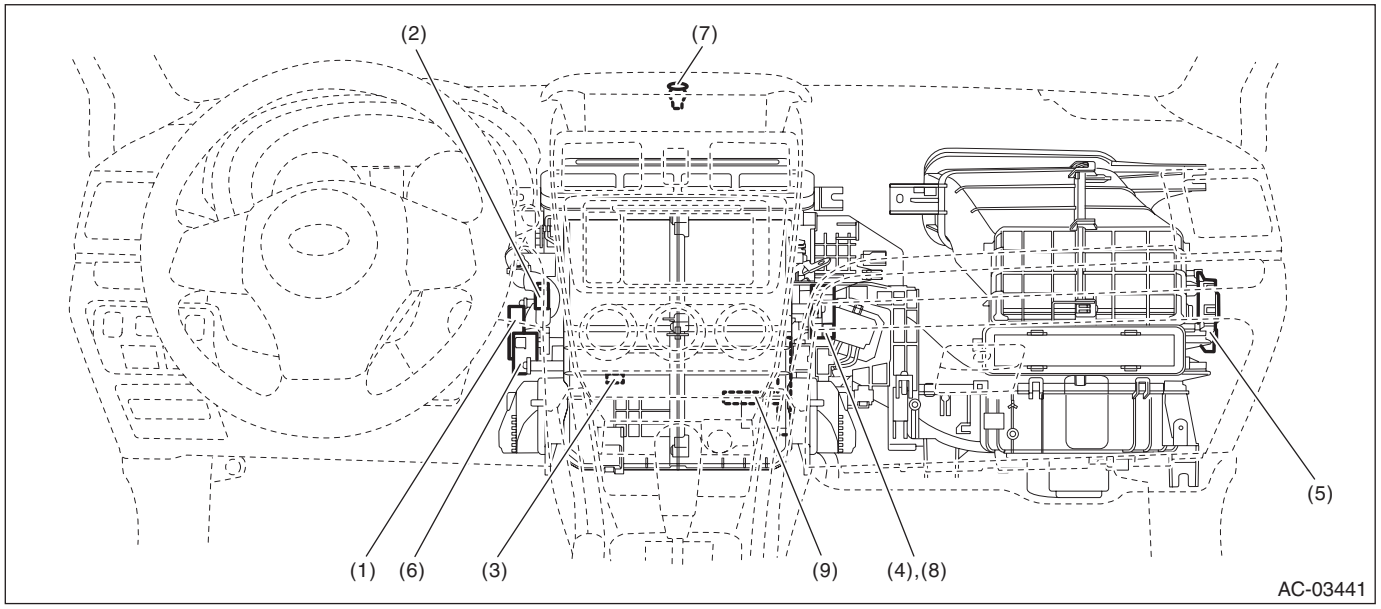
## 1. ELECTRICAL COMPONENT (ACTUATORS AND SENSORS)

- Engine compartment




(1) Ambient sensor (gasoline engine, except for XV model)
(2) Ambient sensor (gasoline engine, XV model)
(3) Ambient sensor (HEV model)
(4) Pressure switch

- Compartment

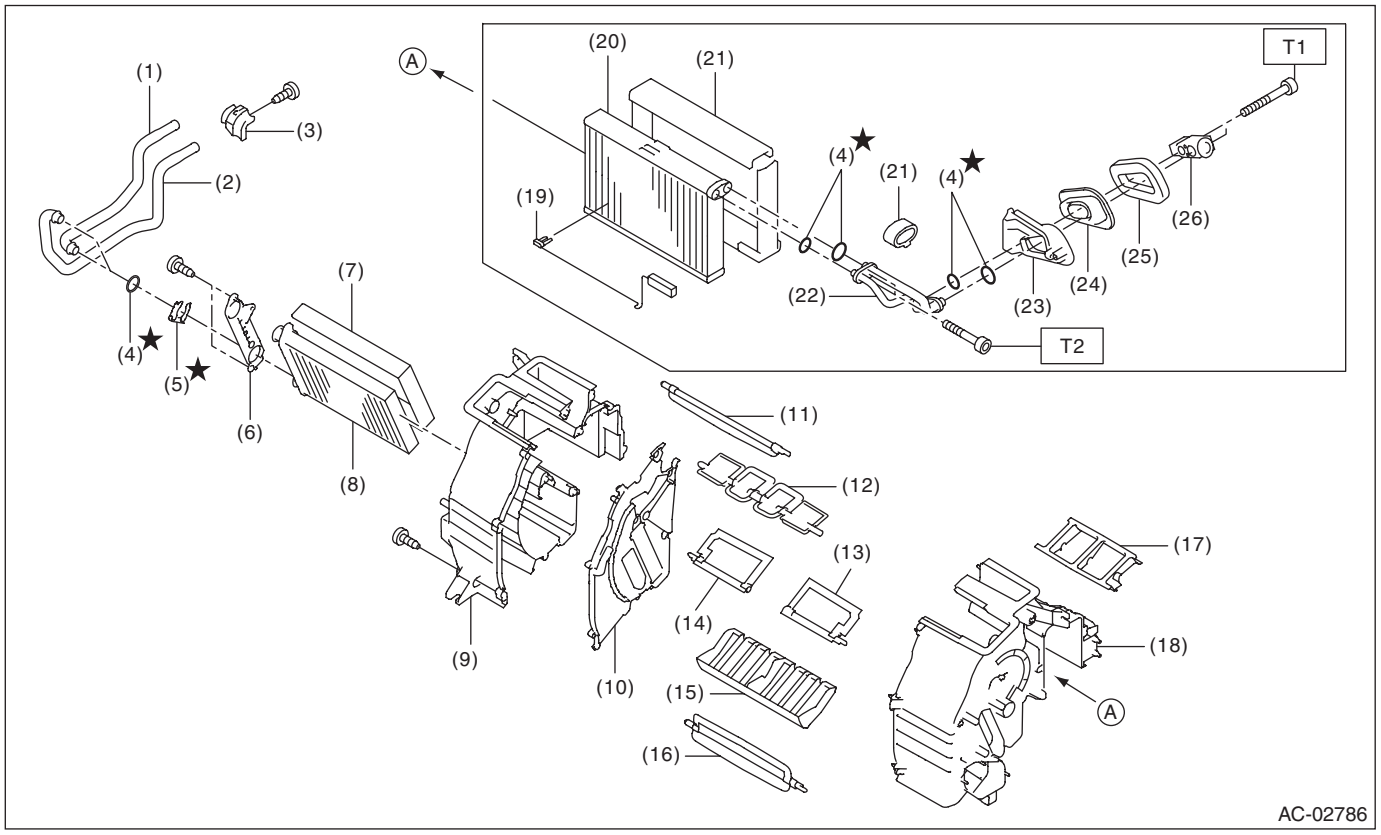



(1) Dual A/C air mix door actuator LH
(2) In-vehicle sensor
(3) Evaporator sensor
(4) Dual A/C air mix door actuator RH
(5) Intake door actuator
(6) Mode door actuator
(7) Sunload sensor
(8) Single A/C air mix door actuator
(9) Heater core sensor (HEV model)

# C: COMPONENT

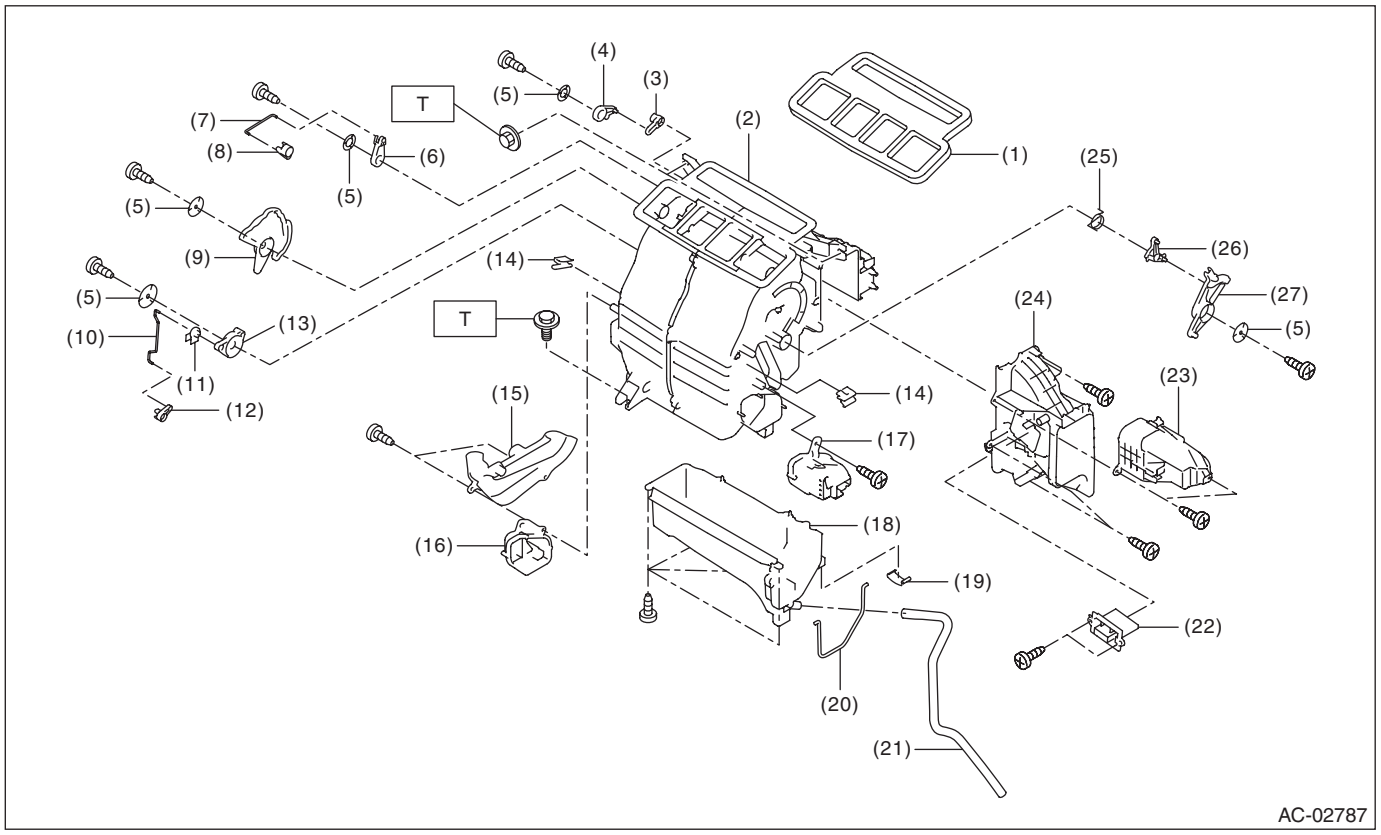
## 1. HEATER AND COOLING UNIT

- Manual A/C model




(1) Pipe - inlet
(2) Pipe - outlet
(3) Clamp - pipe
(4) Seal O-ring
(5) Clamp
(6) Plate - heater core
(7) Packing - heater core
(8) Heater core
(9) Case - heater unit UPR LH
(10) Plate CTR
(11) Shutter - defroster
(12) Shutter - vent
(13) Shutter - air mix RH
(14) Shutter - air mix LH
(15) Guide - heater unit
(16) Shutter - foot
(17) Case - vent duct
(18) Case - heater unit UPR RH
(19) Thermostat - cooling
(20) Evaporator ASSY - cooling
(21) Packing - evaporator core
(22) Pipe - evaporator core
(23) Case - expansion valve
(24) Seal - cooling
(25) Packing - heater unit
(26) Expansion valve - cooling

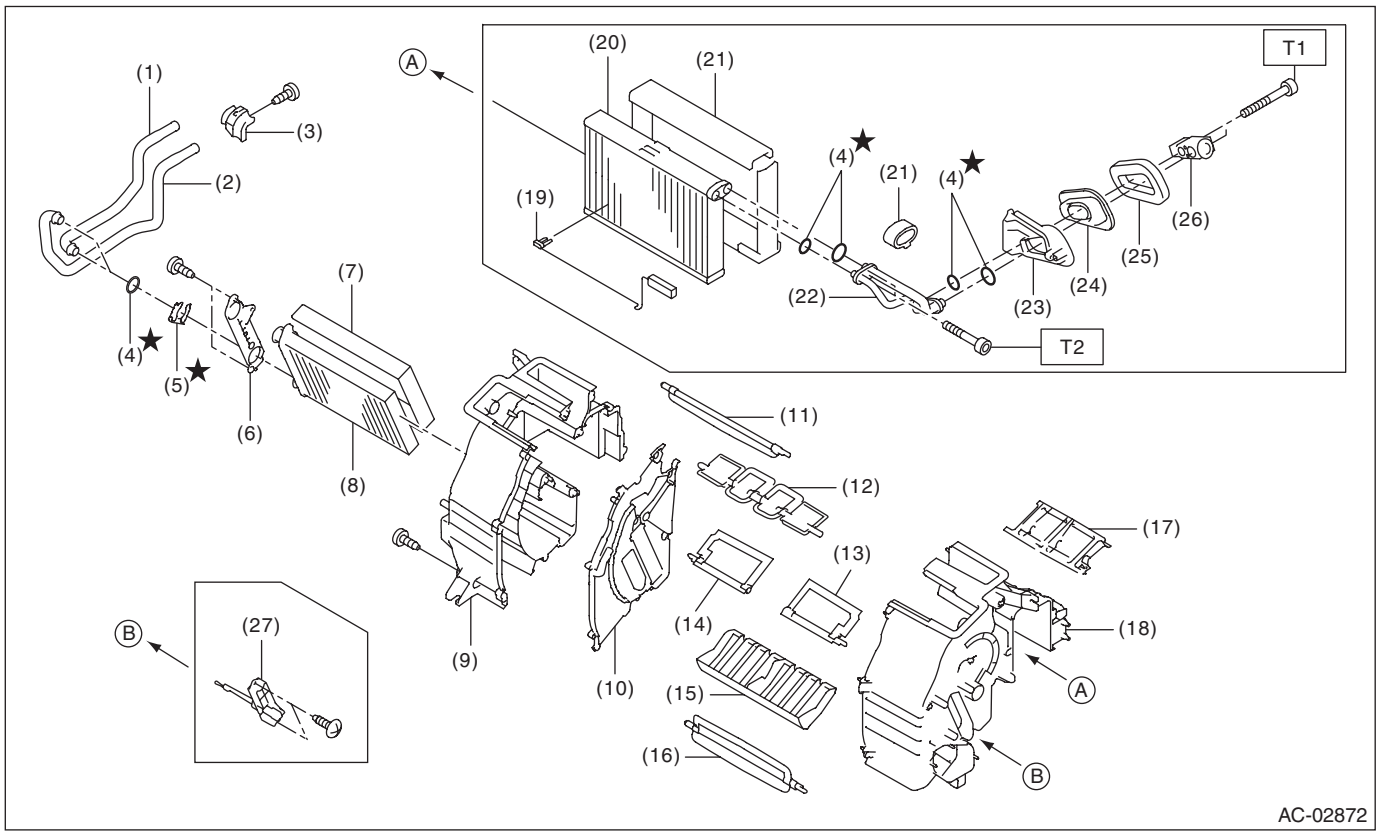
***Tightening torque: N·m (kgf-m, ft-lb)***
***T1: 5.0 (0.51, 3.7)***
***T2: 6.7 (0.68, 4.9)***




(1) Packing - heater unit
(2) Case - heater unit
(3) Lever - defroster
(4) Lever - defroster sub
(5) Washer - heater
(6) Lever - ventilator sub
(7) Rod - ventilator
(8) Lever - ventilator door
(9) Lever - mode
(10) Rod - foot
(11) Clip
(12) Lever - foot
(13) Lever - foot sub
(14) Clamp - cable
(15) Cover - heater pipe
(16) Duct - foot LH
(17) Duct - foot RH
(18) Case - heater LWR
(19) Clip - case
(20) Packing - evaporator cover
(21) Hose - drain
(22) Resistor
(23) Cover
(24) Cover - heater unit
(25) Spring - heater unit
(26) Lever A
(27) Lever B

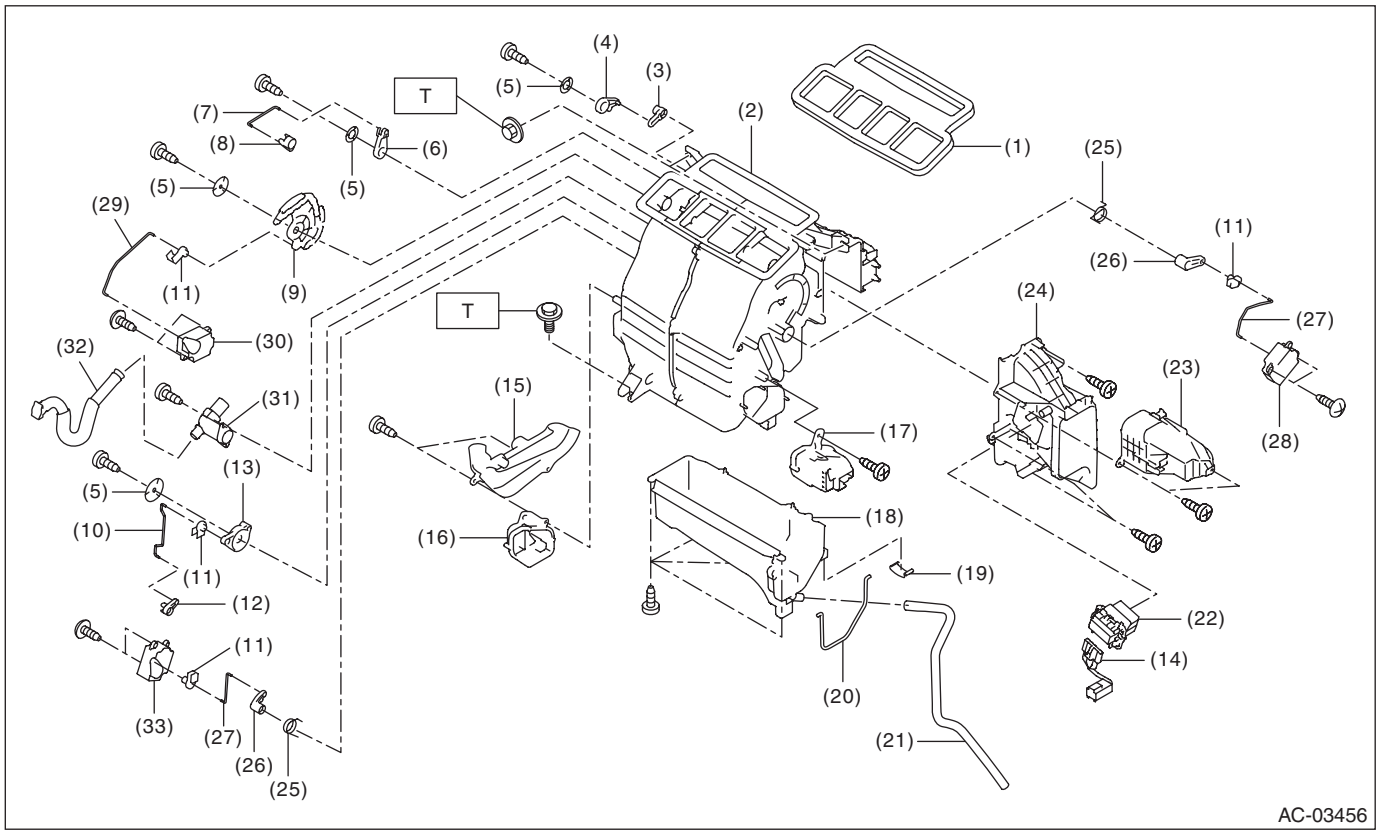
***Tightening torque: N·m (kgf-m, ft-lb)***
***T: 7.5 (0.76, 5.5)***

- Auto A/C model




(1) Pipe - inlet
(2) Pipe - outlet
(3) Clamp - pipe
(4) Seal O-ring
(5) Clamp
(6) Plate - heater core
(7) Packing - heater core
(8) Heater core
(9) Case - heater unit UPR LH
(10) Plate CTR
(11) Shutter - defroster
(12) Shutter - vent
(13) Shutter - air mix RH
(14) Shutter - air mix LH
(15) Guide - heater unit
(16) Shutter - foot
(17) Case - vent duct
(18) Case - heater unit UPR RH
(19) Thermostat - cooling
(20) Evaporator ASSY - cooling
(21) Packing - evaporator core
(22) Pipe - evaporator core
(23) Case - expansion valve
(24) Seal - cooling
(25) Packing - heater unit
(26) Expansion valve - cooling
(27) Heater core sensor (HEV model)

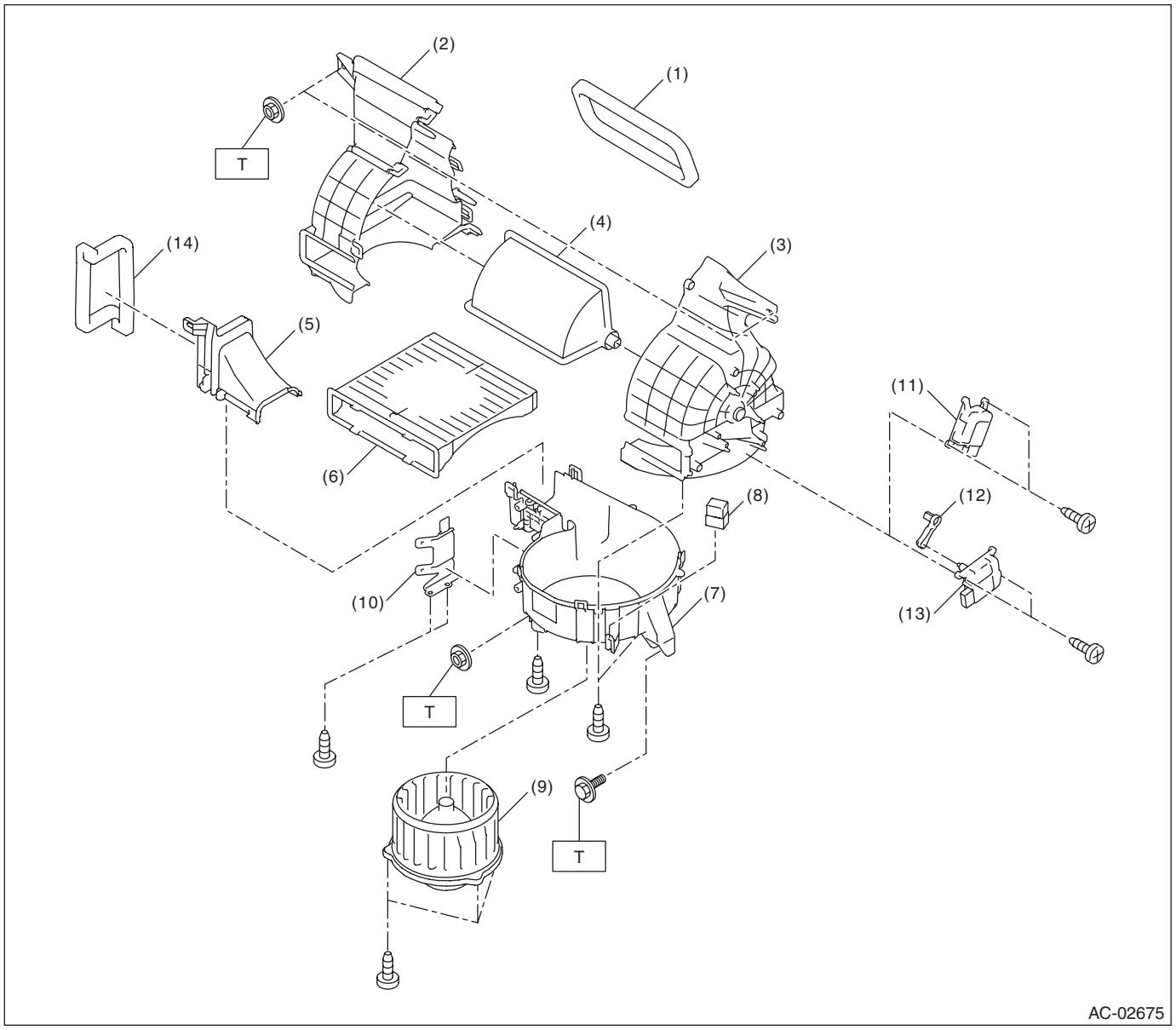
***Tightening torque: N·m (kgf-m, ft-lb)***
***T1: 5.0 (0.51, 3.7)***
***T2: 6.7 (0.68, 4.9)***




(1) Packing - heater unit
(2) Case - heater unit
(3) Lever - defroster
(4) Lever - defroster sub
(5) Washer - heater
(6) Lever - ventilator sub
(7) Rod - ventilator
(8) Lever - ventilator door
(9) Lever - mode
(10) Rod - foot
(11) Clip
(12) Lever - foot
(13) Lever - foot sub
(14) Harness - heater unit
(15) Cover - heater pipe
(16) Duct - foot LH
(17) Duct - foot RH
(18) Case - heater LWR
(19) Clip - case
(20) Packing - evaporator cover
(21) Hose - drain
(22) Power transistor
(23) Cover
(24) Cover - heater unit
(25) Spring - heater unit
(26) Lever - air mix
(27) Rod - air mix
(28) Motor - actuator mix RH
(29) Rod - mode
(30) Motor - actuator mode
(31) Aspirator - heater unit
(32) Aspirator hose
(33) Motor - actuator mix LH (dual A/C model)

***Tightening torque: N·m (kgf-m, ft-lb)***
***T: 7.5 (0.76, 5.5)***

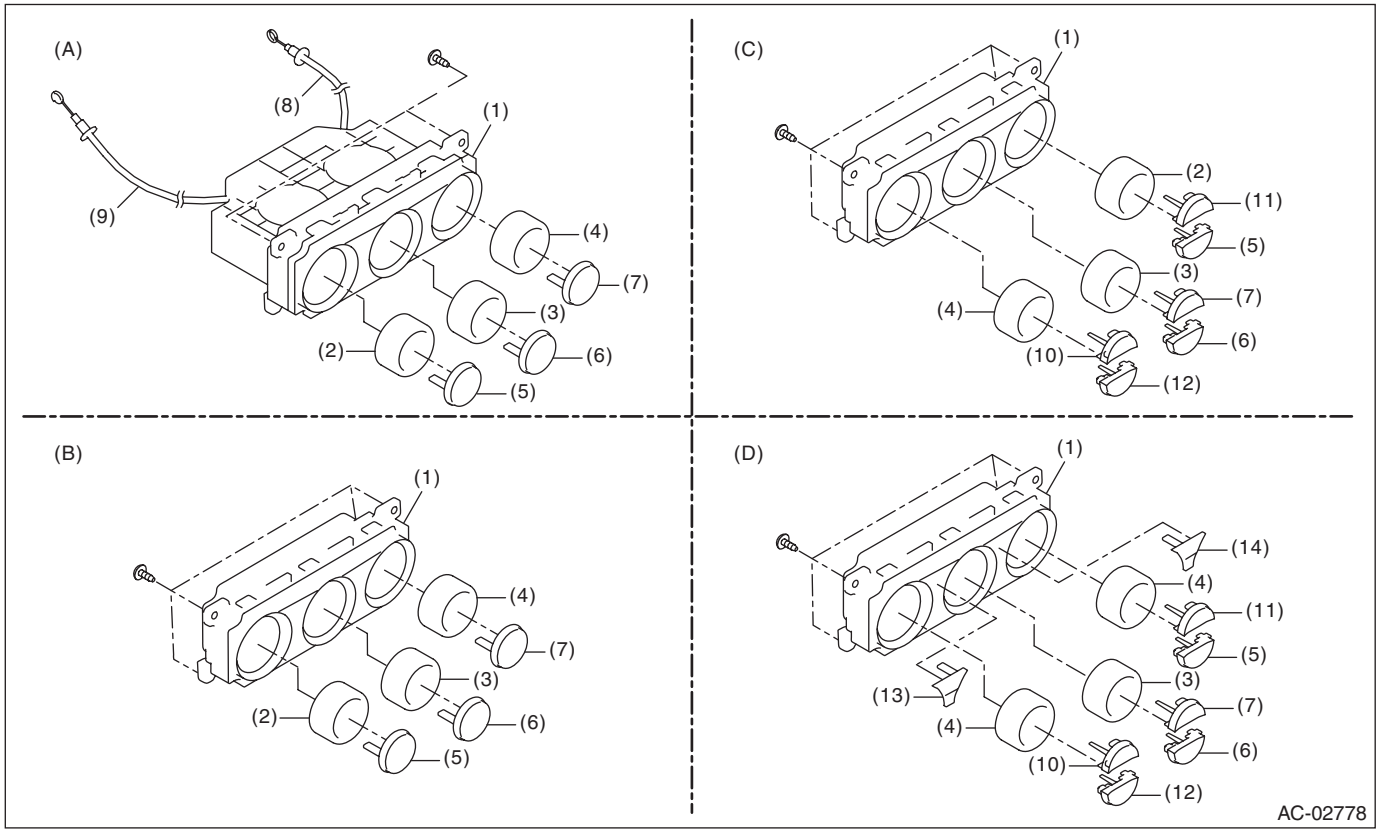
## 2. BLOWER MOTOR UNIT




(1) Packing - blower
(2) Case - blower intake LH
(3) Case - blower intake RH
(4) Shutter - blower
(5) Case upper - blower
(6) Filter kit
(7) Case lower - blower
(8) Blower motor relay
(9) Blower - motor
(10) Bracket
(11) Motor - actuator blower (auto A/C model)
(12) Lever
(13) Motor - actuator blower (manual A/C model)
(14) Packing

***Tightening torque: N·m (kgf-m, ft-lb)***
***T: 7.5 (0.76, 5.5)***

## 3. CONTROL PANEL




(A) Manual A/C model

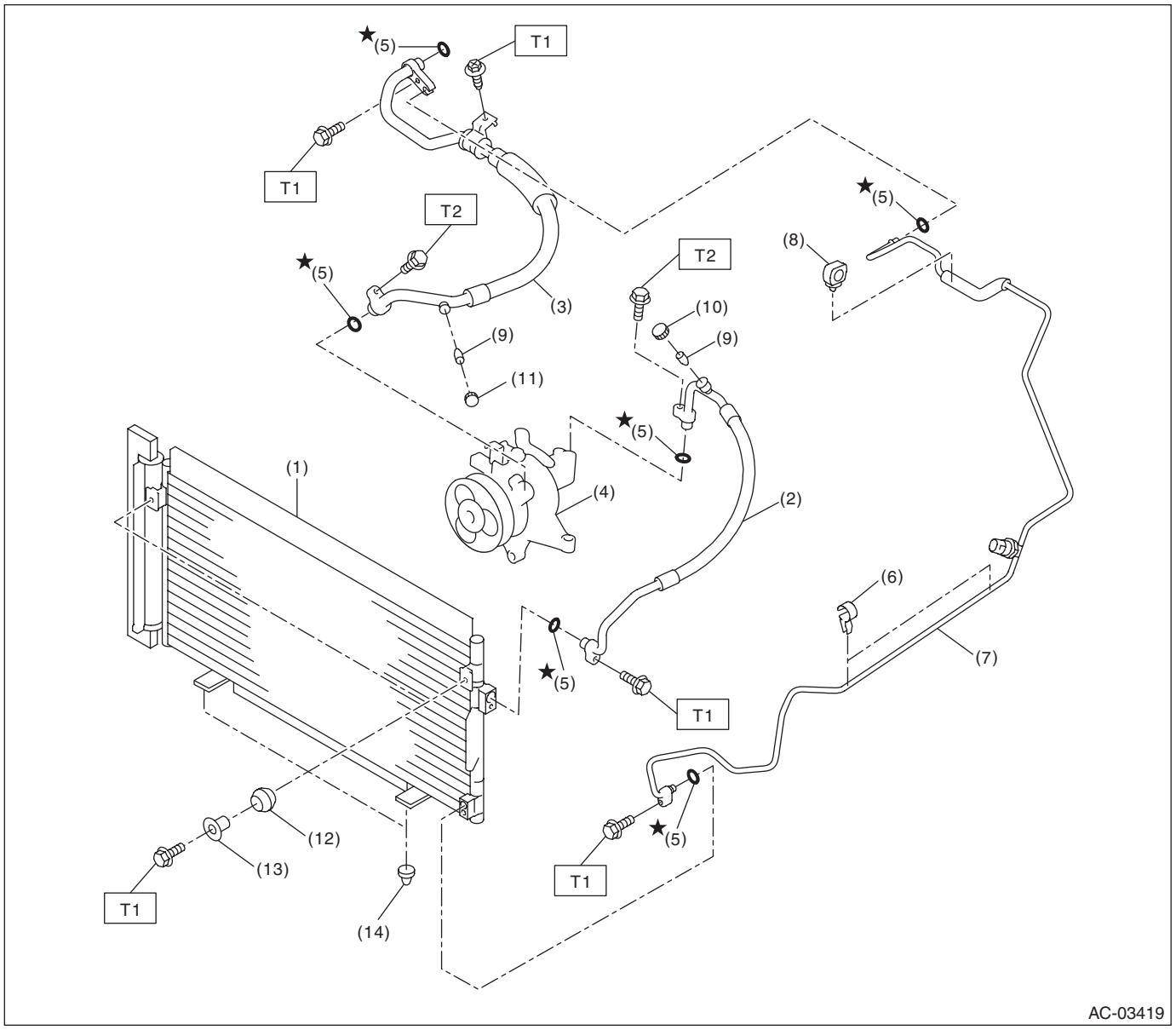
(B) Single auto A/C model (with standard MFD)

(C) Single auto A/C model (with high grade MFD)

(D) Dual auto A/C model

(1) Control case
(2) Air flow control dial
(3) Fan dial
(4) Temperature adjustment dial
(5) Rear window defogger switch
(6) FRESH/RECIRC switch
(7) A/C switch
(8) Temperature control cable
(9) Air flow control cable
(10) AUTO switch
(11) Defroster switch
(12) OFF switch
(13) Air flow control switch
(14) Dual switch

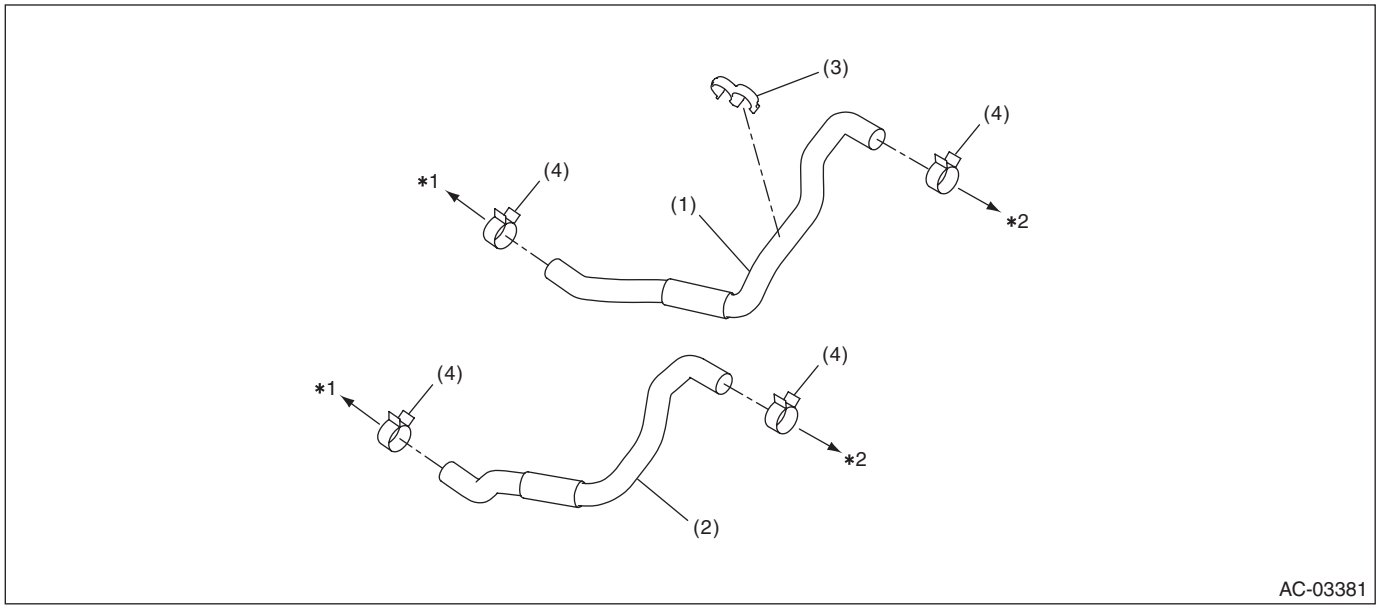
## 4. AIR CONDITIONING UNIT




(1) Condenser ASSY - air conditioner
(2) Hose - pressure discharge
(3) Hose - pressure suction
(4) Compressor ASSY
(5) Seal O-ring
(6) Clip - pipe
(7) Pipe - evaporator cooling
(8) Clip
(9) Valve - hose pressure
(10) Cap - hose pressure discharge
(11) Cap - hose pressure suction
(12) Grommet
(13) Spacer
(14) Bushing - condenser

***Tightening torque: N·m (kgf-m, ft-lb)***
***T1: 7.5 (0.76, 5.5)***
***T2: 10 (1.02, 7.4)***

## 5. HEATER HOSE

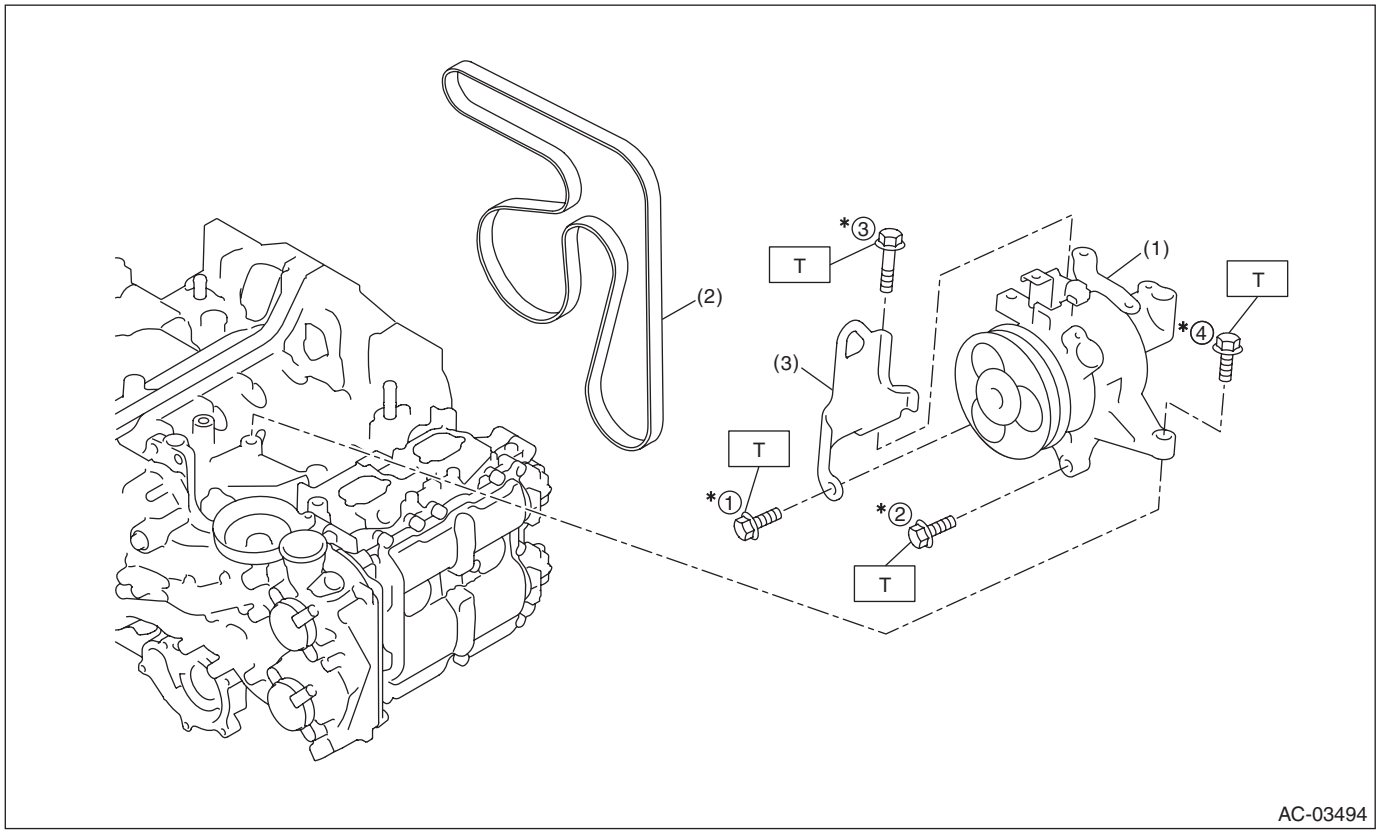



(1) Hose - heater outlet
(2) Hose - heater inlet
(3) Clip
(4) Clamp

*1: Engine side
*2: Heater core side

## 6. COMPRESSOR

- Gasoline engine model

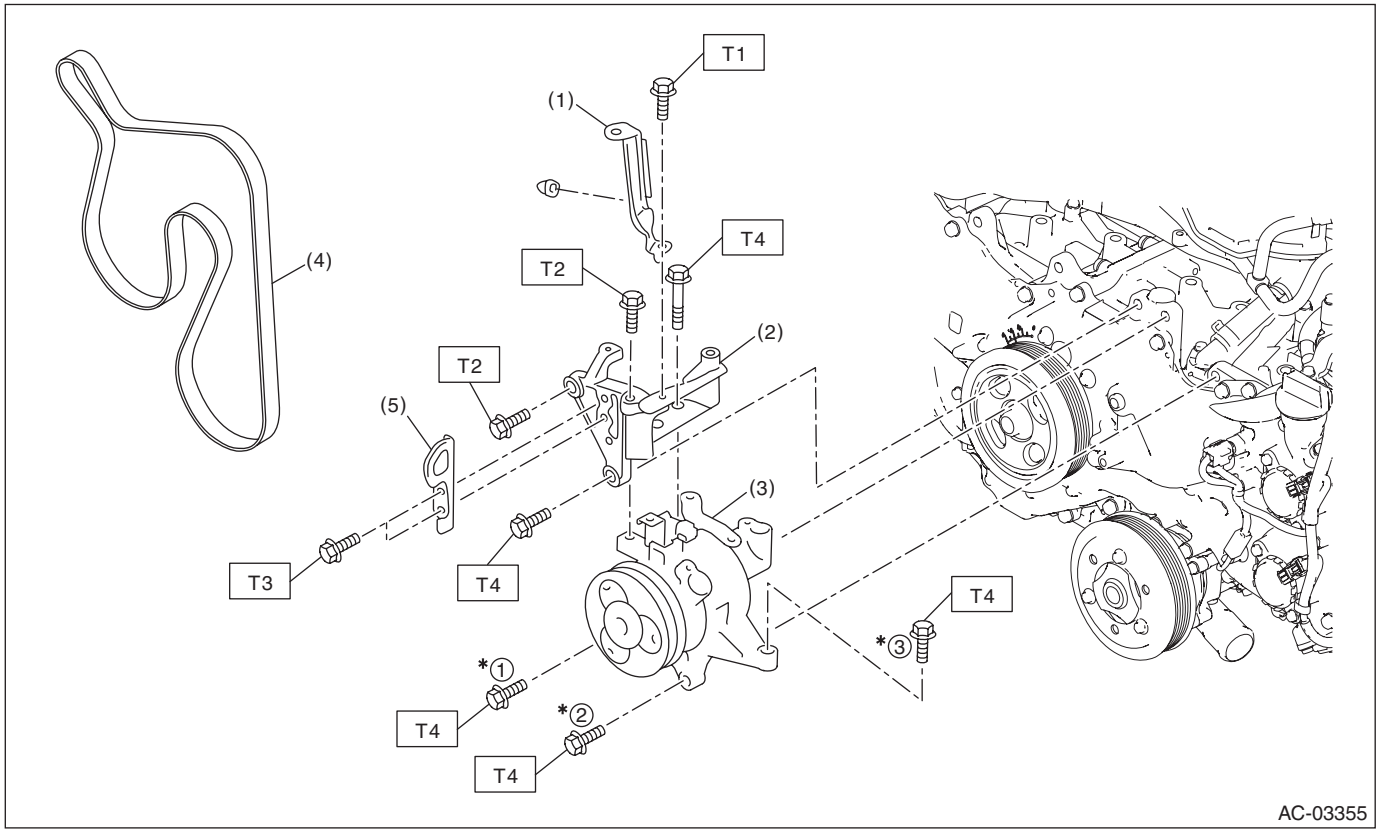



(1) Compressor ASSY
(2) V-belt (6 PK)
(3) Hanger - engine front

***Tightening torque: N·m (kgf-m, ft-lb)***
***T: 36 (3.67, 26.6)***

*: Tighten the compressor in the numerical order as shown in the figure.

- HEV model

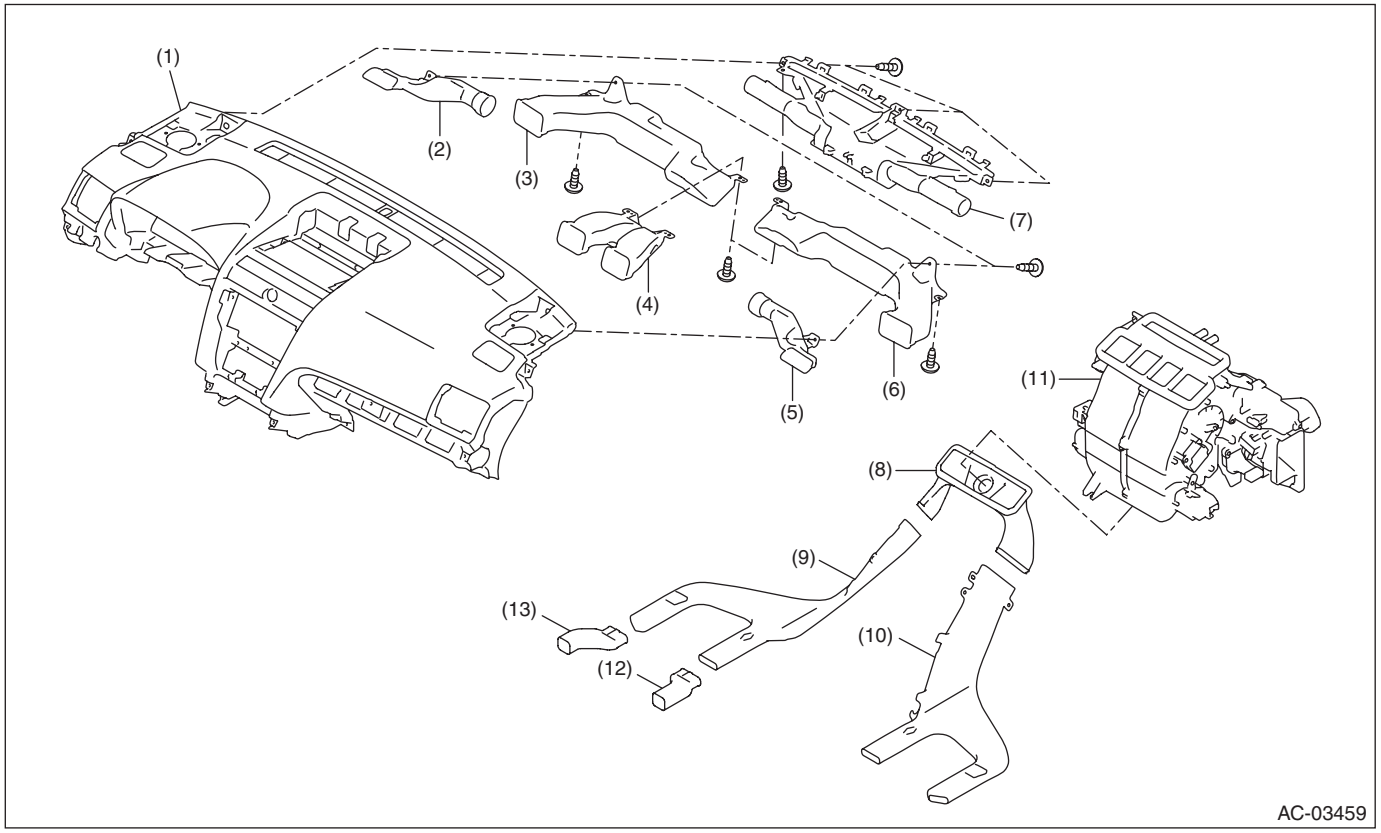



(1) Bracket - vacuum pump connector
(2) Bracket COMPL - vacuum pump
(3) Compressor ASSY
(4) V-belt (7 PK)
(5) Hanger - engine front

***Tightening torque: N·m (kgf-m, ft-lb)***
***T1: 6.4 (0.65, 4.7)***
***T2: 18 (1.84, 13.3)***
***T3: 19 (1.94, 14)***
***T4: 36 (3.67, 26.6)***

*: Tighten the compressor in the numerical order as shown in the figure.

## 7. HEATER DUCT



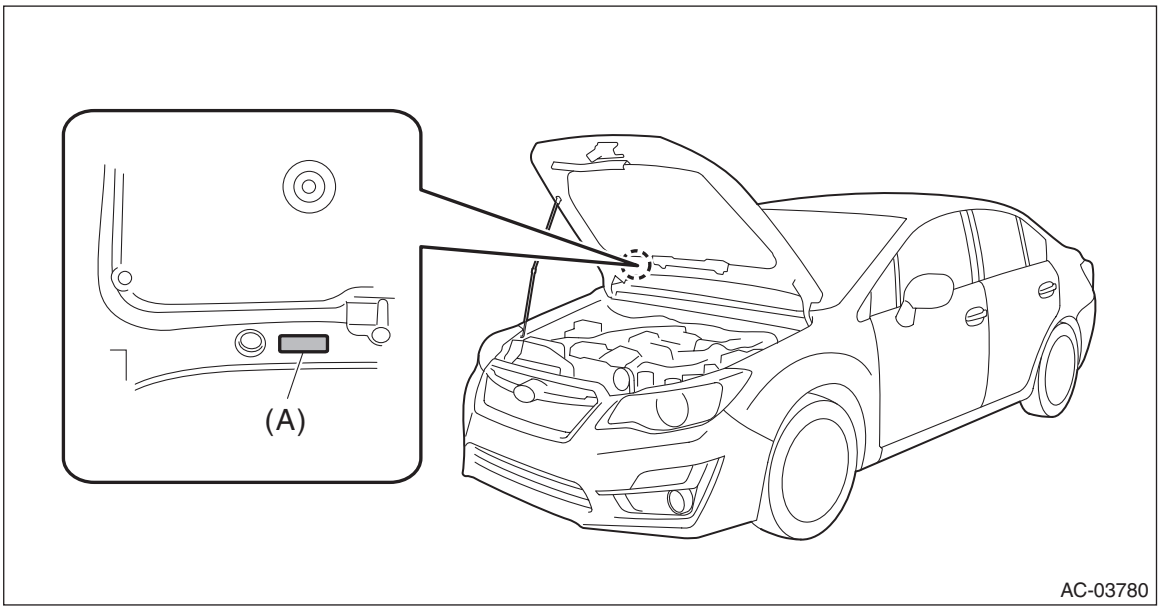

(1) Panel COMPL - instrument
(2) Duct - side defroster LH
(3) Duct - side ventilation LH
(4) Duct - center vent
(5) Duct - side defroster RH
(6) Duct - side ventilation RH
(7) Nozzle - front defroster
(8) Duct - rear heater CTR
(9) Duct - rear heater LH
(10) Duct - rear heater RH
(11) Heater and cooling unit ASSY
(12) Duct - extension LH (HEV model)
(13) Duct - extension RH (HEV model)

## D: CAUTION

• Before disassembling or reassembling parts, always disconnect the battery ground cable from battery. When replacing the radio, control module, and other parts provided with memory functions, record the memory contents before disconnecting the battery ground cable. Otherwise, the memory is cleared.
• Reassemble the parts in the reverse order of disassembly procedure unless otherwise indicated.
• Connect the connectors securely during reassembly.
• After reassembly, make sure that each component operates normally.

### 1. HFC-134A A/C SYSTEM

• The cooling system components for the HFC-134a system such as the refrigerant and compressor oil are different from the conventional CFC-12 system components and they are incompatible with each other.
• Vehicles with the HFC-134a system can be identified by the label (A) attached to the vehicle.
Before maintenance, check A/C system which is installed to the vehicle.




### 2. COMPRESSOR OIL

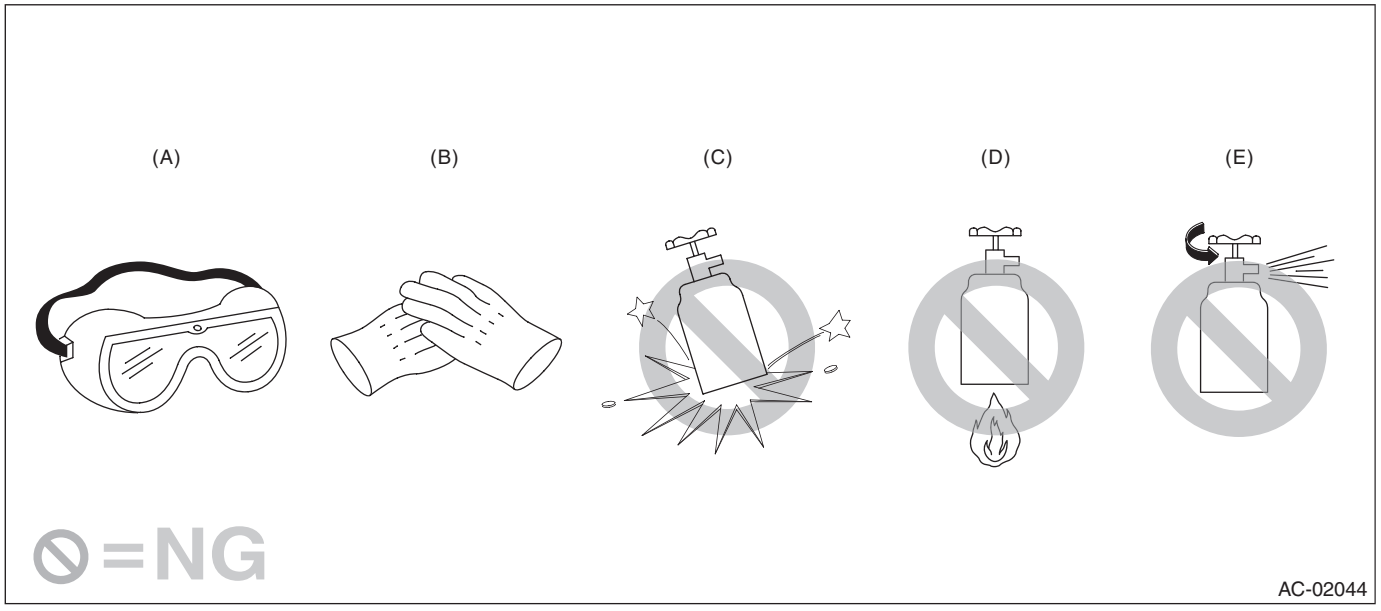
• HFC-134a compressor oil has no compatibility with that of CFC-12 system.
• Use only the manufacturer-authorized compressor oil for the HFC-134a system; only use DH-PR (ZXL200PG).
• Do not mix multiple compressor oils.
If CFC-12 compressor oil is used in the HFC-134a A/C system, the compressor may become stuck due to poor lubrication, or the refrigerant may leak due to swelling of rubber parts.
On the other hand, if HFC-134a compressor oil is used in a CFC-12 A/C system, the durability of the A/C system will be lowered.
• HFC-134a compressor oil is very hygroscopic. When replacing or installing/removing A/C parts, immediately isolate the oil from atmosphere using a plug or tape. In order to avoid moisture, store the oil in a container with its cap tightly closed.

### 3. REFRIGERANT

• CFC-12 refrigerant cannot be used in a HFC-134a A/C system. HFC-134a refrigerant, also cannot be used in a CFC-12 A/C system.
• If an incorrect or no refrigerant is used, it will result in poor lubrication and the compressor itself may be damaged.

## 4. HANDLING OF REFRIGERANT

• The refrigerant boils at approx. –30°C (–22°F). When handling it, be sure to wear protective goggles and protective gloves. Direct contact of the refrigerant with skin may cause frostbite.
If the refrigerant gets into your eye, avoid rubbing your eyes with your hands. Wash your eye with plenty of water, and receive medical treatment from an eye doctor.
• Do not heat a service can. If a service can is directly heated, or put into boiling water, the inside pressure will become extremely high. This may cause the can to explode. If a service can must be warmed up, use warm water of 40°C (104°F) or less.
• Do not drop or impact a service can. (Observe the precautions and operation procedure described on the refrigerant can.)
• When the engine is running, do not open the high-pressure valve of manifold gauge. The high-pressure gas will back-flow resulting in an explosion of the can.
• Provide good ventilation and do not work in a closed area.
• In order to prevent global warming, avoid releasing HFC-134a into the atmosphere. Using a refrigerant recovery system, discharge and recycle the gas.

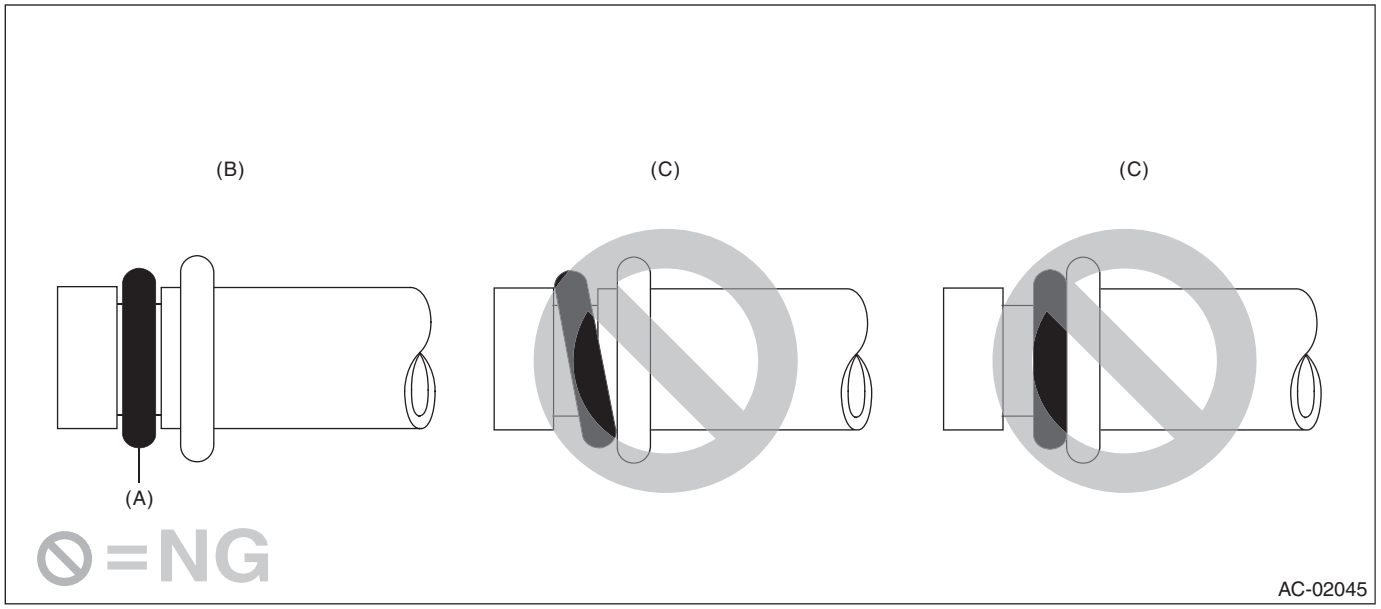



(A) Goggles
(B) Gloves
(C) Do not apply impact.
(D) No direct heat on container
(E) Do not discharge

## 5. O-RING CONNECTIONS

• Always use a new O-ring.
• In order to keep the O-rings free of lint which will cause a refrigerant gas leak, perform work without using gloves or waste cloths.
• Apply compressor oil to O-rings to avoid sticking, before installation.
• Use a torque wrench to tighten the O-ring fittings. Over-tightening will result in damage of the O-ring and deformation of the pipe end.
• If the work is interrupted before completing pipe connections, recap the pipes, components and fittings with a plug or tape to prevent foreign matter from entering.
• Visually check the surfaces and mating surfaces of O-rings, threads and connecting points. If a failure is found, replace the applicable parts.

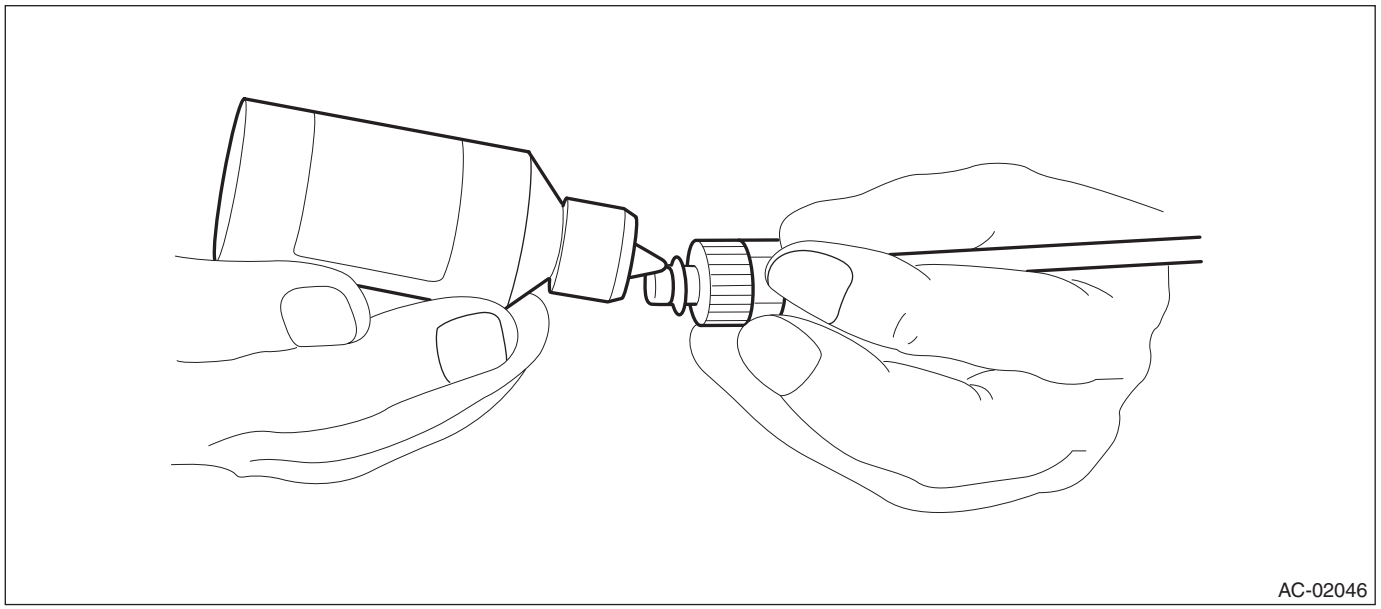
- Install the O-rings straight against the pipe groove.




(A) O-ring (B) OK (C) NG

- Use compressor oil specified in the service manual to lubricate the O-rings.

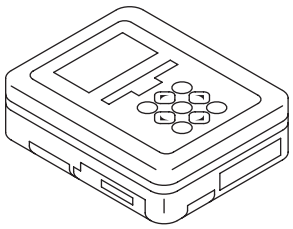
Apply oil to the top and sides of O-rings before installation.
Apply compressor oil to the pipe grooves.




- After tightening, use a clean cloth to remove excess compressor oil from the connections and any oil which may have run on the vehicle body or other parts.
- If any leakage is suspected after tightening, do not tighten the connections further, but disconnect the connections, remove the O-rings, and check the O-rings, threads, and connections.

# E: PREPARATION TOOL

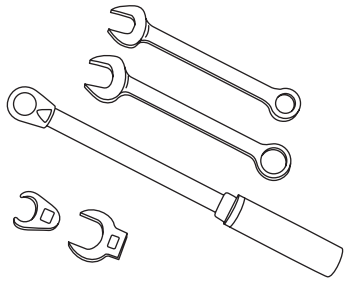
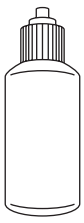
## 1. SPECIAL TOOL

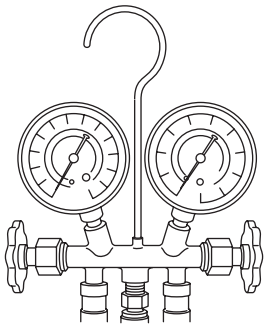
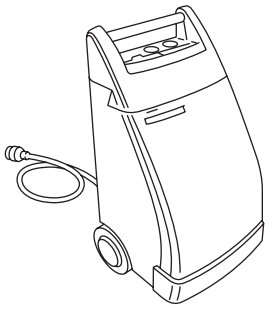
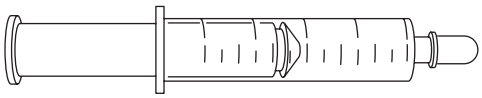
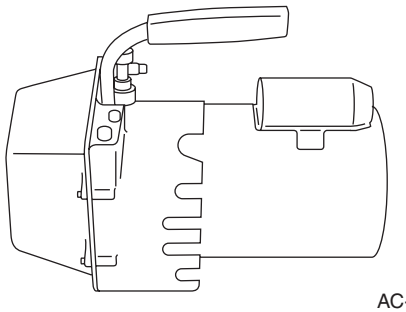
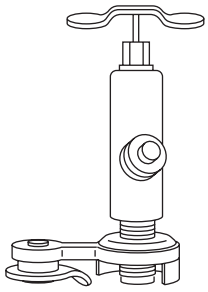
| ILLUSTRATION | TOOL NUMBER | DESCRIPTION | REMARKS |
|---|---|---|---|
|  ST1B022XU0 | 1B022XU0 | SUBARU SELECT MONITOR III KIT | Used for setting of each function and trouble-shooting for electrical system.<br>NOTE:<br>For detailed operation procedures of SUBARU SELECT MONITOR III, refer to “PC application help for Subaru Select Monitor”. |

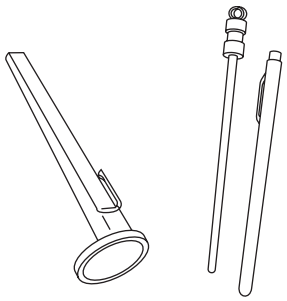
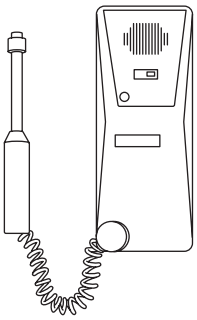
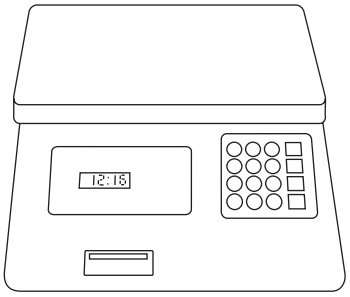
## 2. GENERAL TOOL

**CAUTION:**
**When working on vehicles with a HFC-134a system, only use HFC-134a specified tools and parts. Do not mix CFC-12 tools and parts. If HFC-134a and CFC-12 refrigerant or compressor oil is mixed, it will result in poor lubrication and the compressor itself may be damaged.**
**In order to prevent the mixture of HFC-134a and CFC-12 parts and liquid, the type of tool and screw, and the replacement valves used are different. The gas leak detectors for the HFC-134a and CFC-12 systems must also not be interchanged.**

| | HFC-134a | CFC-12 |
|---|---|---|
| Tool & screw type | Millimeter size | Inch size |
| Valve type | Quick joint type | Screw-in type |

| Illustration | Tools and Equipment |
|---|---|
|  AC-00213 | Wrench<br>Various **WRENCHES** will be required to service any A/C system. 7 — 40 N·m (0.7 to 4.1 kgf-m, 5 to 30 ft-lb) torque wrench and various crow-foot wrenches will be needed. Open end or flare nut wrenches will be needed to affix the pipe and hose fittings. |
|  AC-00012 | Applicator bottle<br>A small **APPLICATOR BOTTLE** is recommended to apply compressor oil to the various parts. It can be available at a hardware store. |

| Illustration | Tools and Equipment |
|---|---|
|  AC-00013 | Manifold gauge set<br>A **MANIFOLD GAUGE SET** (with hoses) is available at either a refrigerant supplier or an automotive equipment supplier. |
|  AC-00014 | Refrigerant recovery system<br>A **REFRIGERANT RECOVERY SYSTEM** is used for the recovery and recycling of A/C system refrigerant after contaminants and moisture have been removed from the refrigerant. |
|  AC-00015 | Syringe<br>A graduated plastic **SYRINGE** will be needed to add oil into the system again. A syringe can be available at a pharmacy or drug store. |
|  AC-00016 | Vacuum pump<br>A **VACUUM PUMP** is necessary (for a good working condition), and may be available at either a refrigerant supplier or an automotive equipment supplier. |
|  AC-00017 | Can tap<br>A **CAN TAP** for the 397 g (14 oz.) can is available at an automotive equipment supplier. |

| Illustration | Tools and Equipment |
|---|---|
|  AC-00018 | Thermometer<br>A Pocket **THERMOMETER** is available at either a industrial hardware store or a refrigerant supplier. |
|  AC-00019 | Electronic leak detector<br>An **ELECTRONIC LEAK DETECTOR** can be available at either a specialty tool supplier or an A/C equipment supplier. |
|  AC-00020 | Weight scale<br>A **WEIGHT SCALE** such as an electronic charging scale or a bathroom scale with digital display will be needed, if a 13.6 kg (30 lb) refrigerant container is used. |