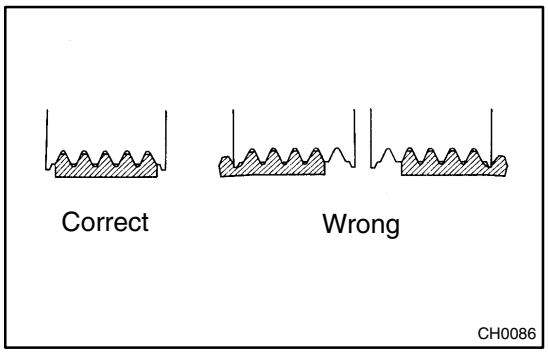
AIR CONDITIONING

DRIVE BELT (1CD–FTV) AC–1
MANIFOLD GAUGE SET (1CD–FTV) AC–4
REFRIGERANT LINE AC–6
COMBUSTION TYPE POWER HEATER AC–9
ELECTRICAL TYPE POWER HEATER AC–23
COMPRESSOR AND MAGNETIC CLUTCH (1CD–FTV) AC–25
RELAY (1CD–FTV) AC–29
CONDENSER FAN (1CD–FTV) AC–30
WATER TEMPERATURE SWITCH (1CD–FTV) AC–36

REFER TO AVENSIS/CORONA REPAIR MANUAL FOR CHASSIS AND BODY (Pub. No. RM599E)

NOTE: The above pages contain only the points which differ from the above listed manual.



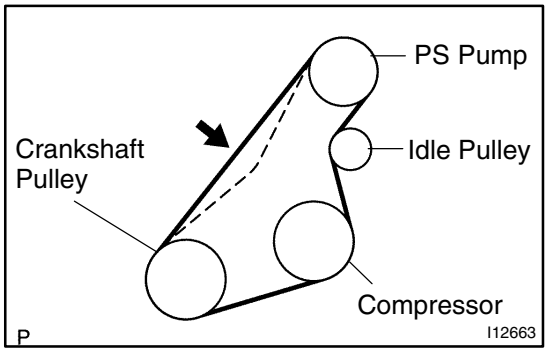
DRIVE BELT (1CD–FTV)

AC2A4–01

ON–VEHICLE INSPECTION

1. INSPECT DRIVE BELT INSTALLATION CONDITION

Check that the drive belt fits properly in the ribbed grooves.



2. INSPECT DRIVE BELT DEFLECTION

Using a belt tension gauge, apply load of 98 N (10 kgf, 22 lbf) and measure drive belt deflection.

Drive belt deflection:
New belt: 11 – 13 mm (0.47 – 0.51 in.)
Used belt: 15 – 18 mm (0.59 – 0.71 in.)

HINT:

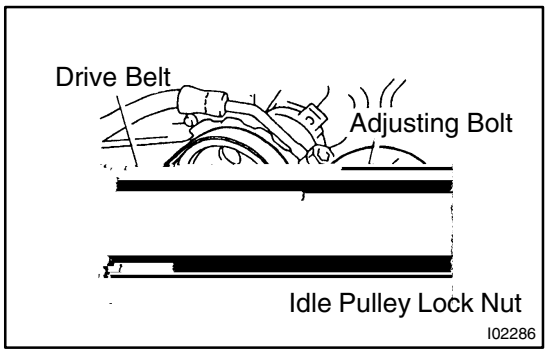
- ”New belt” refers to a belt which has been used less than 5 minutes on the running engine.
- ”Used belt” refer to a belt which has been on a running engine for 5 minutes or more.
- After installing the drive belt, check that it fits properly in the ribbed grooves.

3. INSPECT DRIVE BELT TENSION

Using a belt tension gauge, check the drive belt tension.

Drive belt tension:
New belt: 520 – 755 N (53 – 77 kgf)
Used belt: 196 – 392 N (20 – 40 kgf)

AC2A5–01



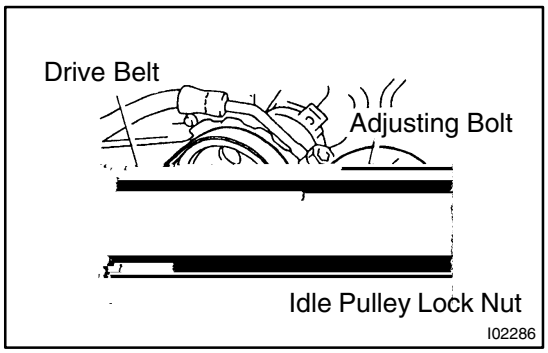
REMOVAL

REMOVE DRIVE BELT

(a) Loosen the idle pulley lock nut.

(b) Loosen the drive belt tension by adjusting bolt and remove the drive belt.

AC2A6–01



INSTALLATION

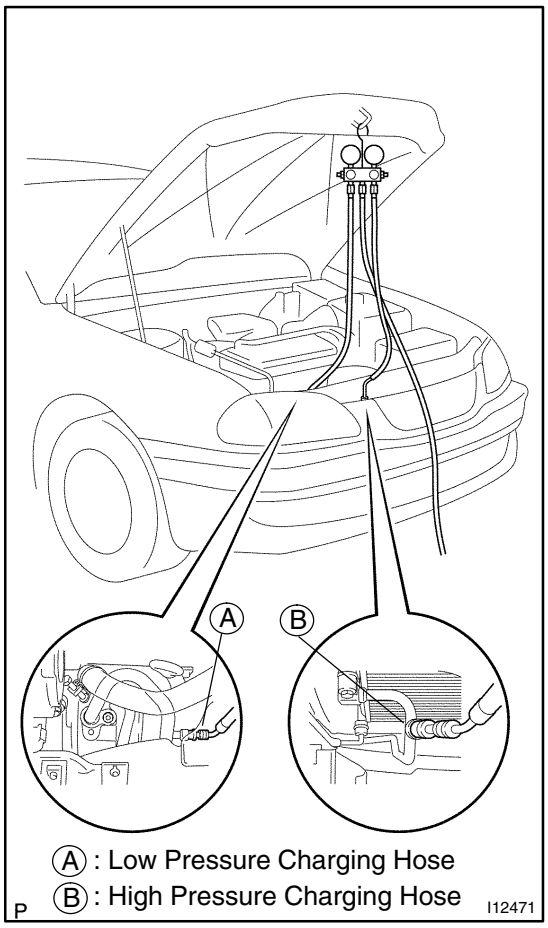
INSTALL DRIVE BELT

(a) Tighten the idle pulley lock nut temporarily.
Torque: 2.5 N·m (25 kgf·cm, 22 in.·lbf)

(b) Install the drive belt.

(c) Using a adjusting bolt, adjust drive belt tension.
Drive belt tension:
New belt: 520 – 755 N (53 – 77 kgf)
Used belt: 196 – 392 N (20 – 40 kgf)

(d) Tighten the idle pulley lock nut at regular torque.
Torque: 39 N·m (390 kgf·cm, 29 ft·lbf)



MANIFOLD GAUGE SET (1CD–FTV)

AC2A7–02

SET ON

1. CONNECT CHARGE HOSE TO MANIFOLD GAUGE SET

Tighten the nuts by hand.

CAUTION:

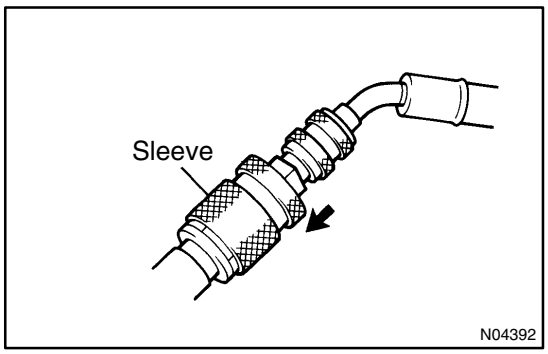
Do not connect the wrong hoses.

2. CONNECT QUICK DISCONNECT ADAPTERS TO CHARGING HOSES

Tighten the nuts by hand.

3. CLOSE BOTH HAND VALVES OF MANIFOLD GAUGE SET

4. REMOVE CAPS FROM SERVICE VALVE ON REFRIGERANT LINE

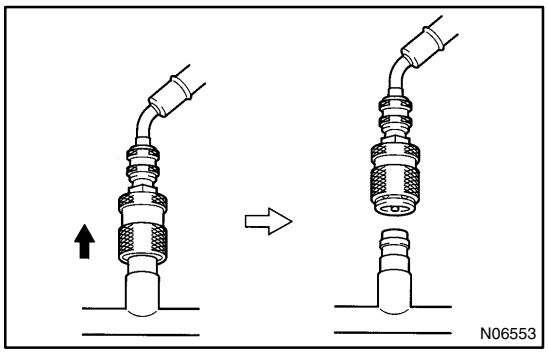


5. CONNECT QUICK DISCONNECT ADAPTER TO SERVICE VALVES

HINT:

Push the quick disconnect adapter onto the service valve, slide, then slide the sleeve of the quick disconnect adapter downward to lock it.

AC2A8–01



SET OFF

1. **CLOSE BOTH HAND VALVES OF MANIFOLD GAUGE SET**
2. **DISCONNECT QUICK DISCONNECT ADAPTERS FROM SERVICE VALVES ON REFRIGERANT LINE**

HINT:

Slide the sleeve of the quick disconnect adapter upward to unlock the adapter and remove it from the service valve.

3. **INSTALL CAPS TO SERVICE VALVES ON REFRIGERANT LINE**

REFRIGERANT LINE

AC1A5–02

ON–VEHICLE INSPECTION (1CD–FTV Engine Models)

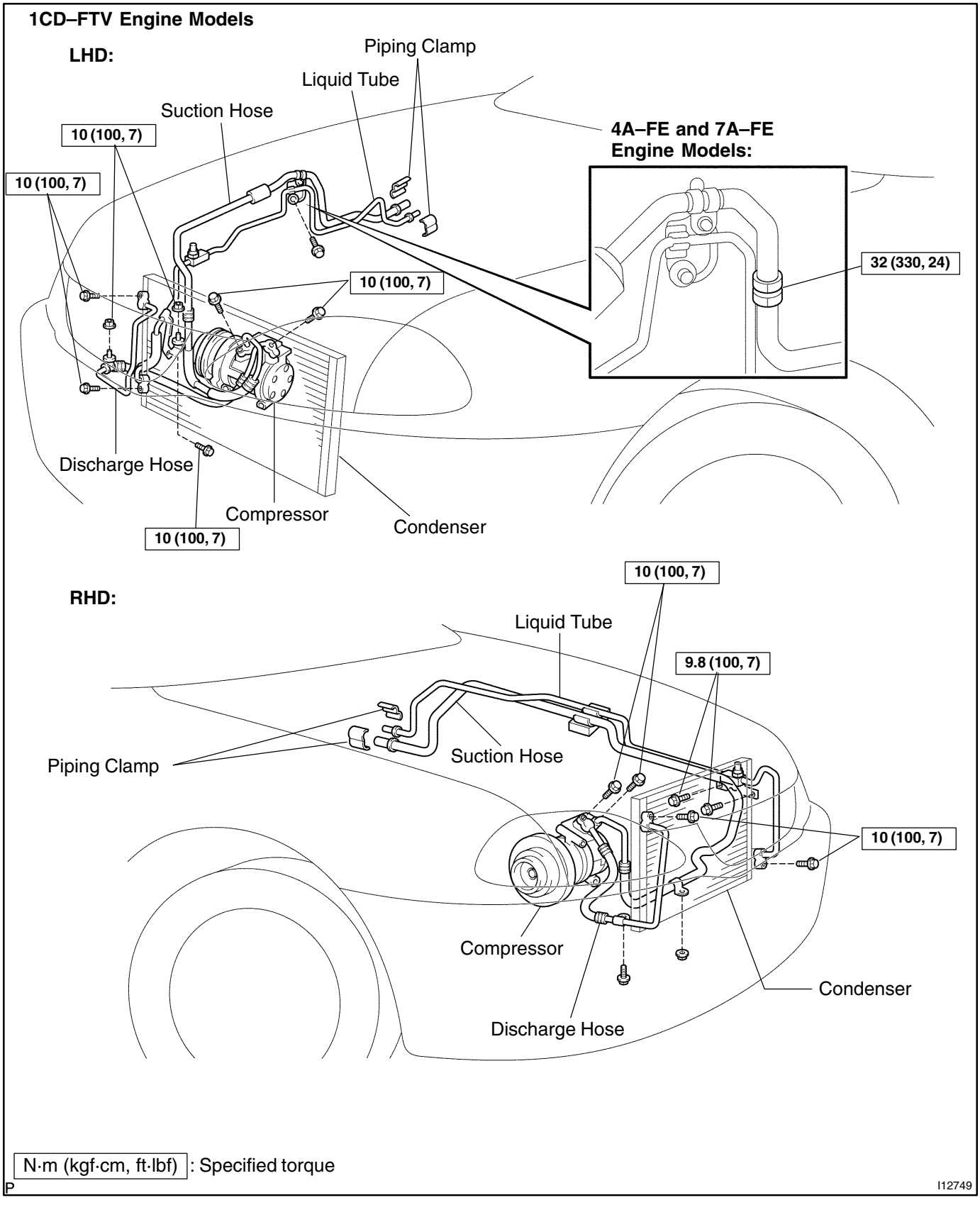
1. INSPECTION HOSE AND TUBE CONNECTIONS FOR LOOSENESS

2. INSPECT HOSES AND TUBES FOR LEAKAGE

Using a gas leak detector, check for leakage of refrigerant.

AC1A6–03

COMPONENTS



AC1A7–01

REPLACEMENT

1. DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM

2. REPLACE FAULTY TUBE OR HOSE

NOTICE:

Cap the open fittings immediately to keep moisture or dirt out of the system.

3. TIGHTEN JOINT OF BOLT OR NUT AT SPECIFIED TORQUE

NOTICE:

Connections should not be torqued tighter than the specified torque.

Part tightened	N·m	kgf·cm	ft·lbf
Compressor x Discharge hose	10	100	7
Compressor x Suction hose	10	100	7
Condenser x Discharge hose	10	100	7
Condenser x Liquid tube	10	100	7
Liquid line (Block joint)	10	100	7
Suction line (Piping joint)	32	330	24

4. EVACUATE AIR FROM REFRIGERATION SYSTEM AND CHARGE SYSTEM WITH REFRIGERANT

Specified amount: 450 ± 50 g (15.87 ± 1.76 oz.)

5. INSPECT FOR LEAKAGE OF REFRIGERANT

Using a gas leak detector, check for leakage of refrigerant.

6. INSPECT AIR CONDITIONING OPERATION

COMBUSTION TYPE POWER HEATER

AC29V–02

ON–VEHICLE INSPECTION

NOTICE:

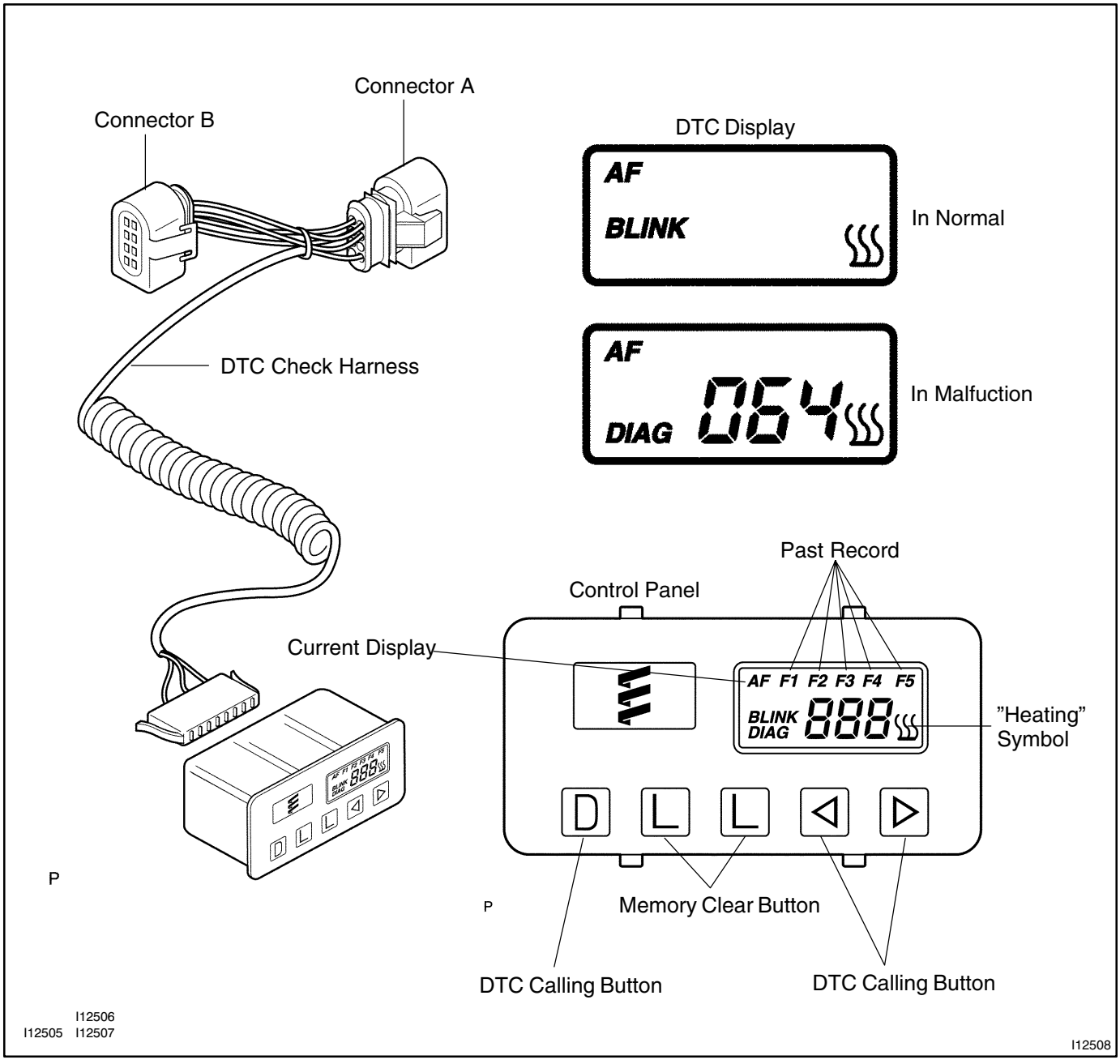
- **If the glow plug breaks, the ECU detects the breakage and stops the automatic operation, so the burner heater does not activate. (For other failures, similarly activated.)**
- **The cause of failures (such as voltage malfunction, overheating malfunction, short–circuit or breakage of functional componects, etc.) and how to remedy are shown by connecting the DTC tester and reading the DTC.**

1. OPERATION

(a) Connect the DTC tester between the connector A (Vehicle harness) of DTC check harness and connector B (Power heater harness).

(b) Start the engine.

(c) Pressing the DTC calling button displays a 3–digit number DTC.



2. DESCRIPTION OF DISPLAY AND BUTTONS

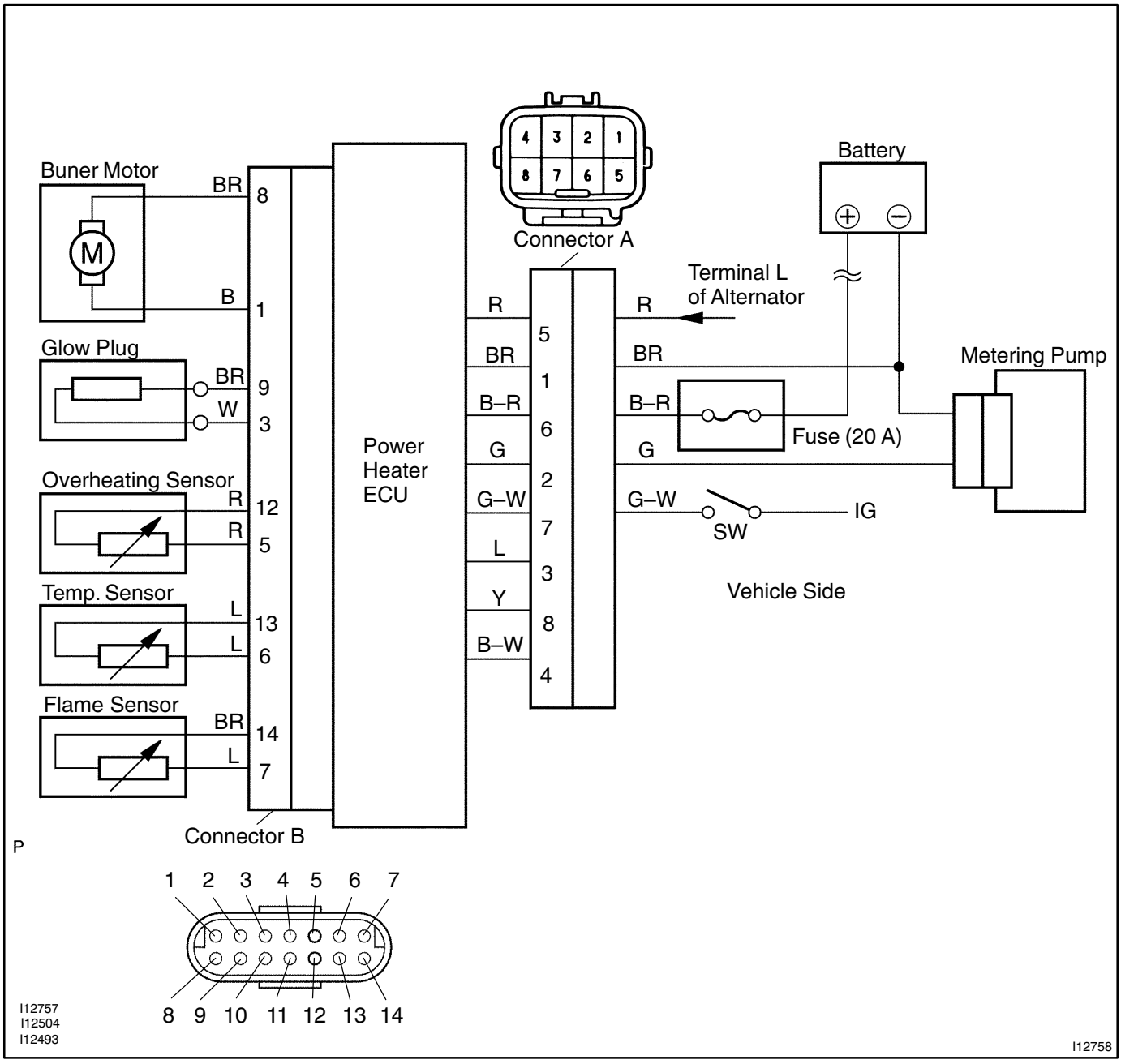
AF: Current Value Malfunction (Blinking at current failure)
Diag: DTC (Example: 064 Flame sensor break)
Mamory Clear button: Deletion of faulty memory (Press both buttons together for longer than 2 sec.)
> Button: Scroll up of faulty memory (The past 5 codes can be stored.)
< Button: Scroll down of faulty memory (The past 5 codes can be stored.)

3. FAULTY MEMORY

The ECU is able to store up to 5 pieces of faulty memory. If it is full, the new data is written over F5.

4. WIRING DIAGRAM

Wire colors are indicated by an alphabetical code.
B=Black W=White BR=Brown L=Blue R=Red G=Green Y=Yellow
The first letter insicates the basic wire color and the seconk letter indicates the color of the stripe.



5. ON–VEHICLE INSPECTION

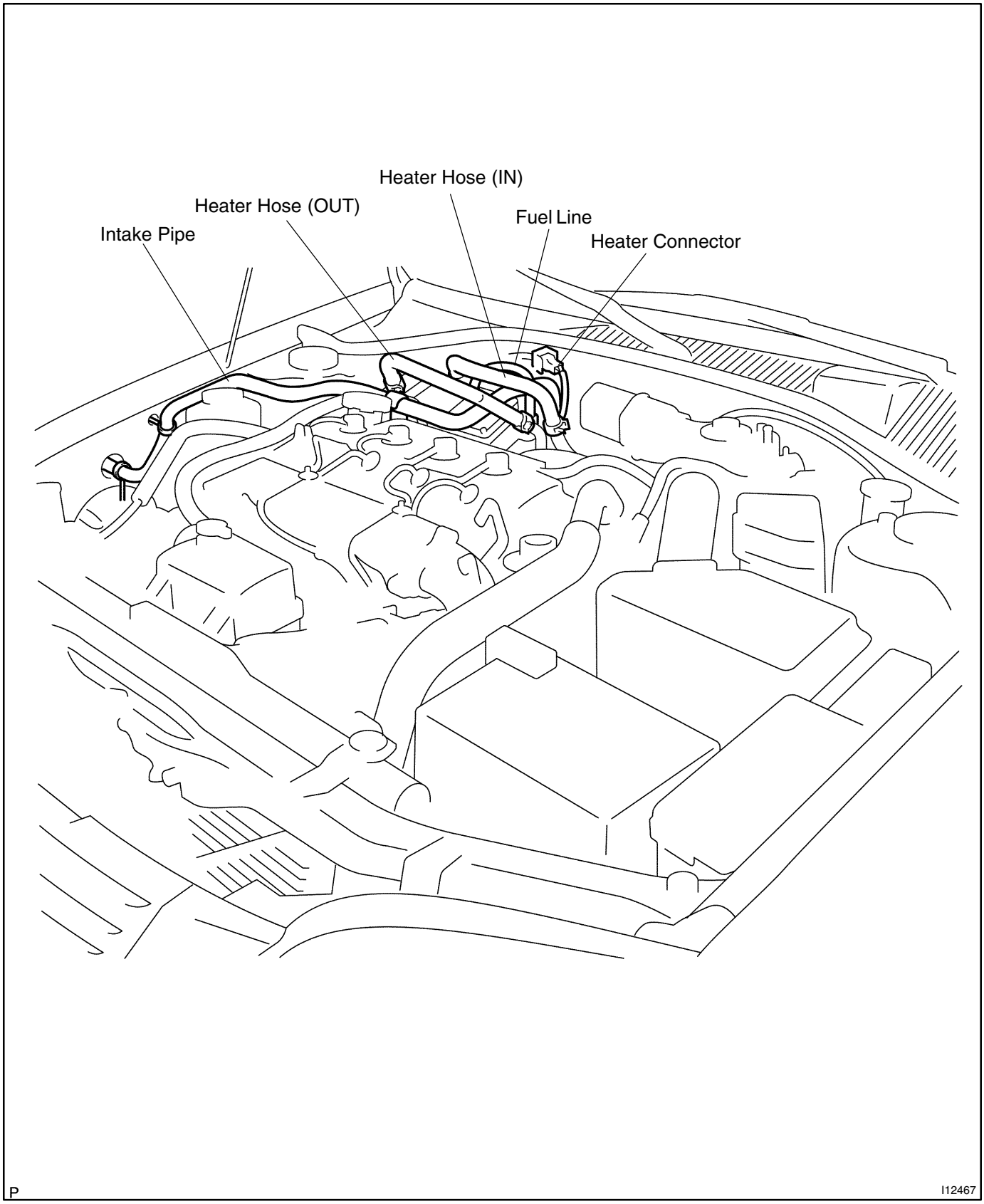
If a malfunction code is displayed during the DTC check, check the circuit listed for that code in the table below and proceed to the appropriate page.

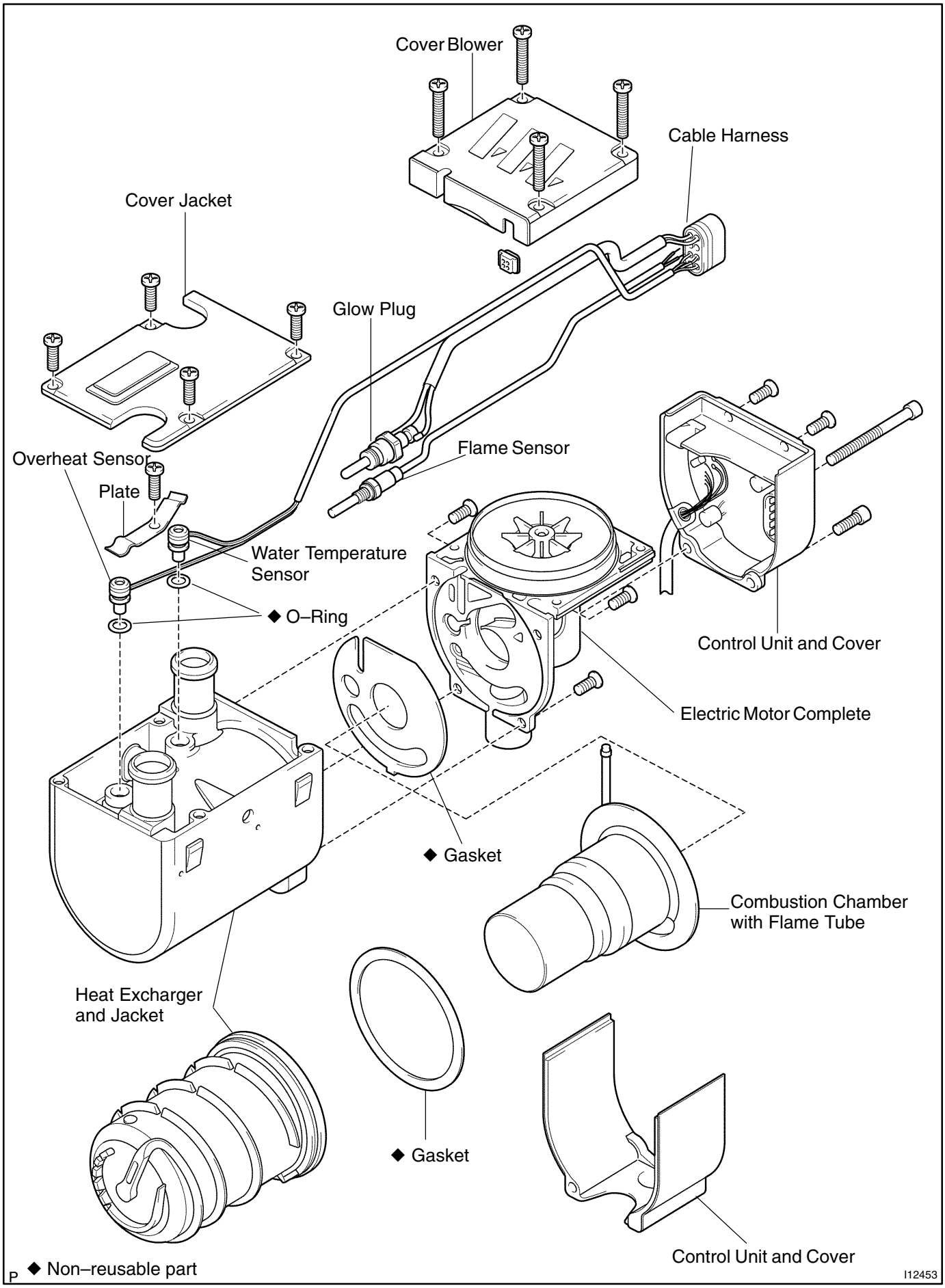
DTC No.	Description of fault	Comment / Remedy
000	No malfunction	–
010 011	Overvoltage shutoff Undervoltage shutoff	Voltage between 1 and 5 at connector A > 16 V Voltage between 1 and 5 at connector A < 10.2 V (Voltage values must be present > 20 seconds) Check battery, regulator and electrical leads.
012	Overheating	Check temperature at temperature or overheating sensor > 125˚C. Check water circuit.
014	Possible overheating detected (Hardware threshold value)	Difference of measured values at temperature sensor > 15˚C (min. 70˚C water temperature and metering pump in operation); Check temperature sensor and overheating sensor, replace if necessary.
017	Overheating delected (Hardware threshold value)	Temperature at temperature or overheating sensor > 130˚C, emergency OFF if DTC No. 012 or 014 not applicable; Check water circuit, check temperature sensor and overheating sensor, replace if necessary.
020	Glow plug break	Check glow plug, replace if necessary.
021	Glow plug output overload	Check glow plug, replace if necessary.
030	Combustion air blower motor EMF outside perm. range.	Blower impeller or burner motor fammed (frozen solid, dirty, etc.) Remedy jam, replace burner motor if necessary.
031	Combustion air blower motor break	Check lead to combustion air motor (burner motor) for continuity, replace if necessary.
032	Combustion air blower motor short–circuit	Check combustion air blower motor (burner motor), replace if necessary. Check supply lead (chafed, etc.).
047	Metering pump short–circuit	Check supply lead to metering pump for short–circuit, check metering pump, replace if necessary.
048	Metering pump break	Check supply lead to metering pump for continuity, remedy break, replace metering pump if necessary.
051	Cold blow time exceeded	At start, if flame sensor above 70˚C > 240 sec.; Check exhaust gas combustion air supply, check flame sensor, replace if necessary.
052	Safety time exceeded	When all perm. start attempts used up; Check fuel delivery and fuel supply. Check exhaust gas and combustion air ducts.
054	Flame cutout, HIGH setting	Check fuel delivery and fuel supply. Check exhaust gas and combustion air ducts. If combustion OK → Check flame sensor, replace if necessary.
056	Flame cutout, LOW setting	
060	Temperature sensor break	Check connecting leads. Resistance value between 6 and 13 at connector B > 2 MΩ If break)
061	Temperature sensor short–circuit	Check connecting leads. Resistance value between 6 and 13 at connector B < 2 MΩ (If short–circuit)

DTC No.	Description of fault	Comment / Remedy
064	Flame sensor break	Check connecting leads. Resistance value between 7 and 14 at connector B > 3,040 Ω (If break)
065	Flame sensor short–circuit	Check connecting leads. Resistance value between 7 and 14 at connector B > 780 Ω (If short–circuit)
071	Overheating sensor break	Check connecting leads. Resistance value between 5 and 12 at connector B > 2MΩ (If break)
072	Overheating sensor short–circuit	Check connecting leads. Resistance value between 5 and 12 at connector B < 50 Ω (If short–circuit)
090 092 093	Control unit detectice (Intermal fault / Reset) Control unit detective (ROM error) Control unit detective (RAM error)	Control unit malfunction due to interference voltage from vehicle electrical system; Possible causes low batteries, chargers, other sources of interlerence; eliminale interference voltages. Internal faults detected in microprocessor / memory detected. Replace control unit.
097	Internal control unit faults	Other faults which cannot lead to DTC No.90, 92 and 93, replace control unit.

AC29W–02

COMPONENTS



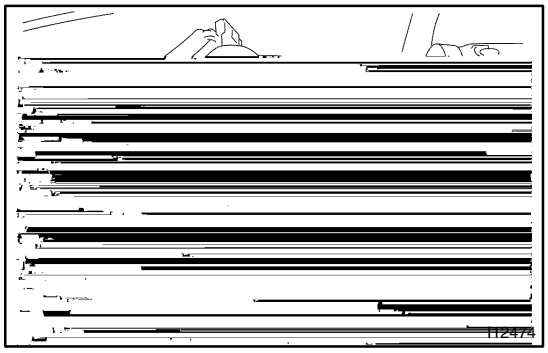

Cover Blower
Cable Harness
Cover Jacket
Glow Plug
Flame Sensor
Overheat Sensor
Plate
Water Temperature Sensor
◆ O–Ring
Control Unit and Cover
Electric Motor Complete
◆ Gasket
Combustion Chamber with Flame Tube
Heat Excharger and Jacket
◆ Gasket
Control Unit and Cover
P ◆ Non–reusable part
I12453

AC29X–01

REMOVAL

1. REMOVE RH UNDER COVER

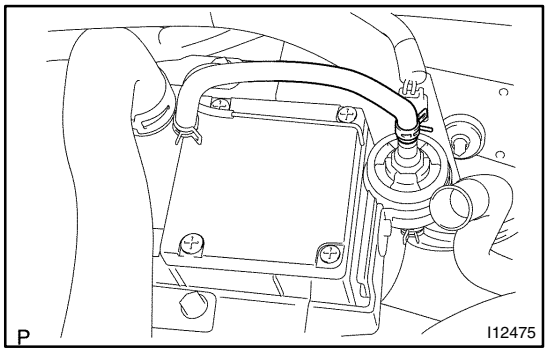
2. DRAIN ENGINE COOLANT



3. DISCONNECT HEATER HOSES

(a) Disconnect the inlet heater hose.

(b) Disconnect the outlet heater hose.

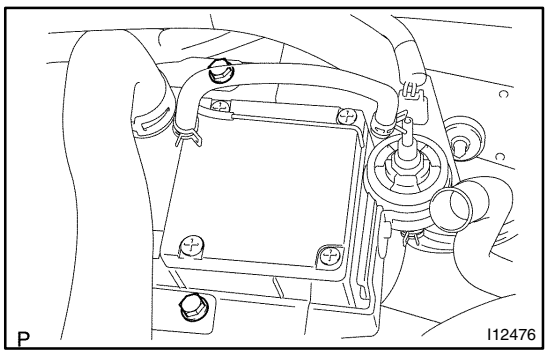


4. DISCONNECT FUEL LINE

Disconnect the fuel line from the fuel pump.

5. DISCONNECT FUEL PUMP CONNECTOR

6. DISCONNECT COMBUSTION TYPE POWER HEATER CONNECTOR

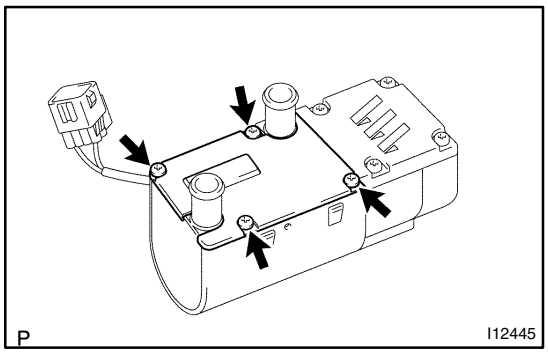


7. REMOVE COMBUSTION TYPE POWER HEATER

Remove the 2 bolts holding the combustion type power heater to the 2 brackets.

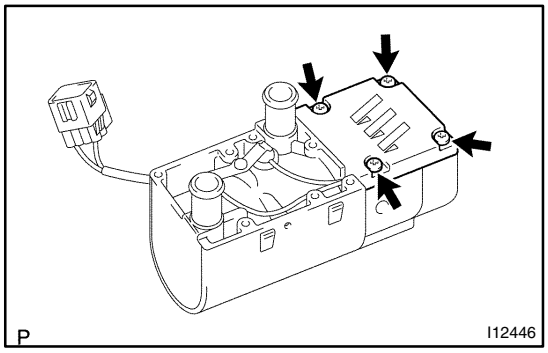
AC29Y–01

DISASSEMBLY



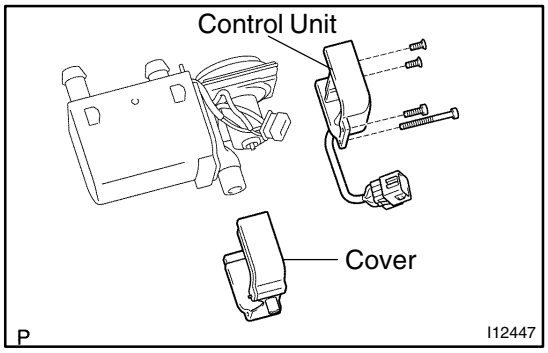
1. REMOVE JACKET COVER

Remove the 4 screws and jacket cover.



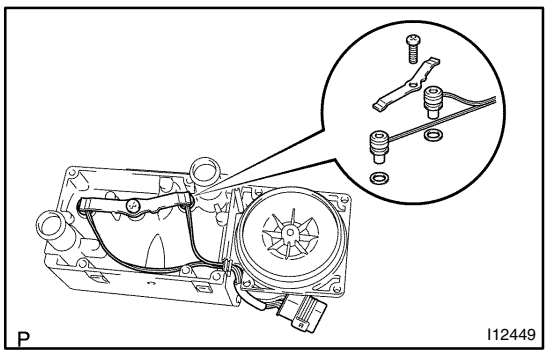
2. REMOVE BLOWER COVER

Remove the 4 screws and blower cover.



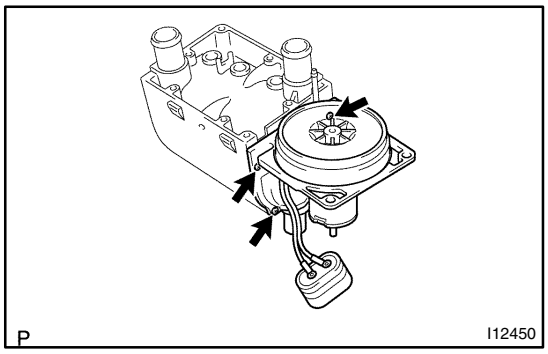
3. REMOVE CONTROL UNIT AND COVER

(a) Remove the 2 screws.
(b) Remove the 2 hexagon screws.
(c) Remove the control unit and cover.



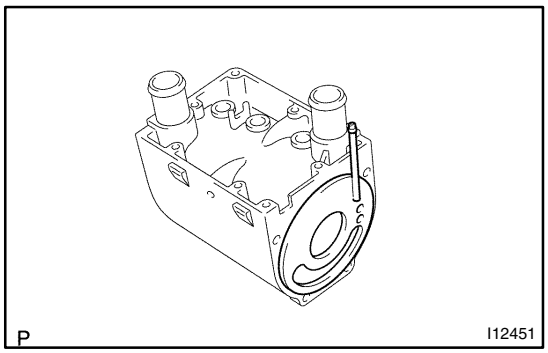
4. REMOVE CABLE HARNESS

(a) Remove the screw and plate.
(b) Remove the water temperature sensor and overheat sensor.



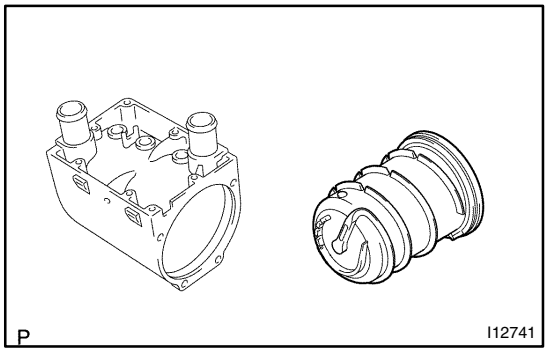
5. REMOVE ELECTRIC MOTER

(a) Remove the 3 screws and the electric moter.
(b) Remove the gasket.



6. REMOVE COMBUSTION CHAMBER WITH FLAME TUBE

Remove the combustion chamber and gasket.



7. REMOVE HEAT EXCHAMBER

AC29Z–01

INSPECTION

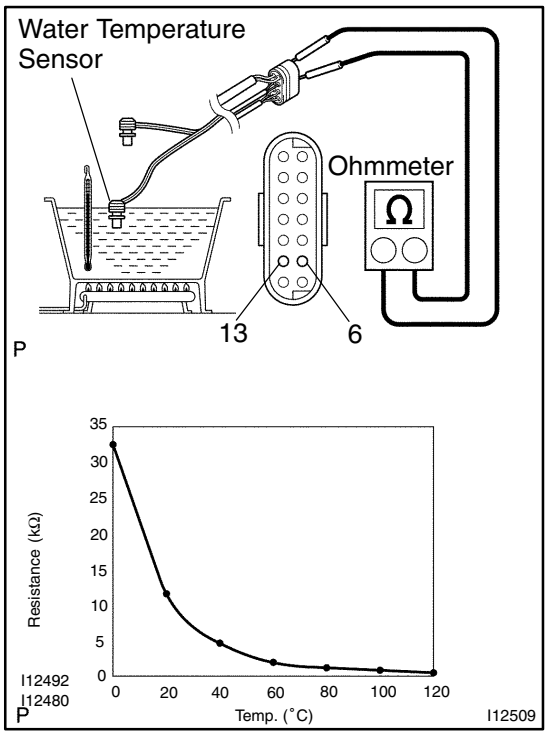
1. INSPECT WATER TEMPERATURE SENSOR

Measure the resistance between the terminals 6, 13.

Using an ohmmeter, measure the resistance between the terminals.

Resistance: Refer to the graph

If the resistance is not as speaified, replace the water temperature sensor.



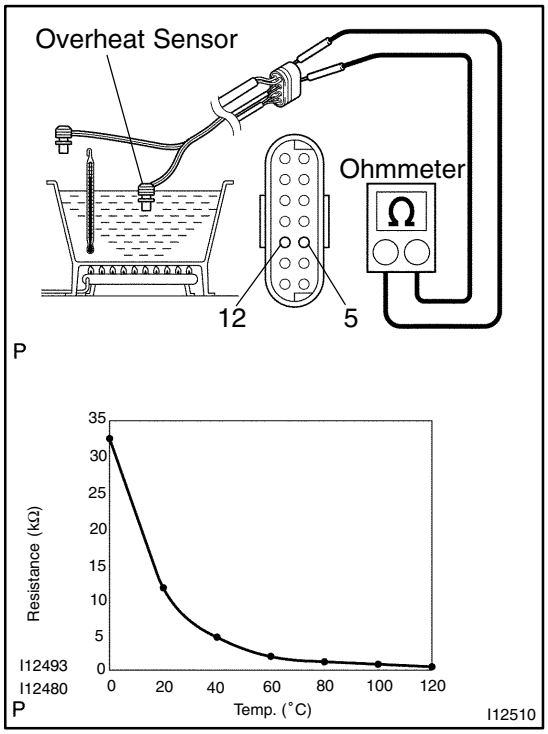
2. INSPECT OVERHEAT SENSOR

Measur the resistance between the terminal 5, 12.

Using an ohmmeter, measure the resistance between the terminals.

Resistance: Refer to the graph

If the resistance is not as speaified, replace the over heat sensor.

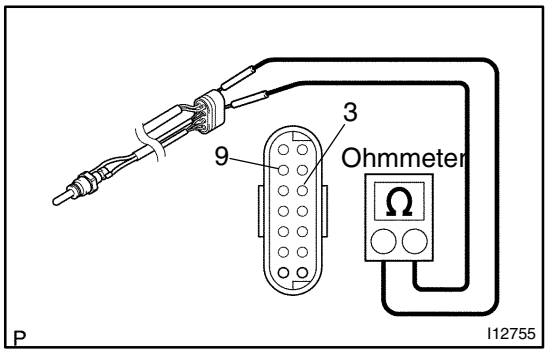


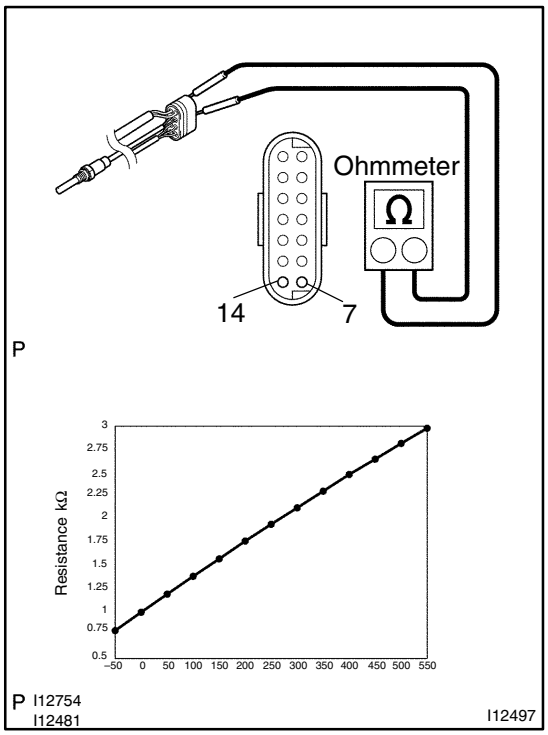
3. INSPECT GLOW PLUG

Using an ohmmeter, check that there is continuity, between the glow plug terminal 3, 9.

Standard resistance: about 0.5 Ω (20°C, reference valve)

If resistance is over 1Ω, replace the glow plug.



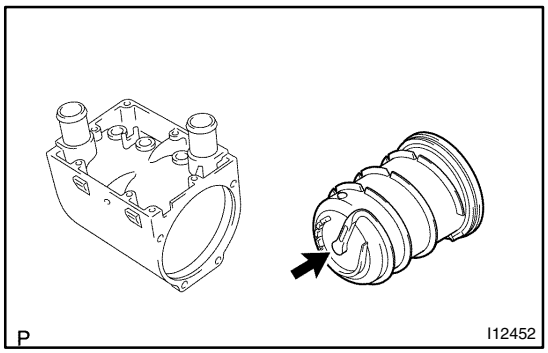


4. INSPECT FLAME SENSOR

Measur the resistance between the terminal 7, 14.

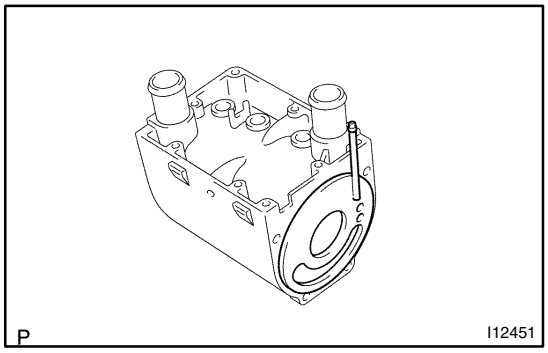
AC2A0–01

REASSEMBLY



1. INSTALL HEAT EXCHAMBER

Align slot on heat exchanger (arrow) with lug in jacket.

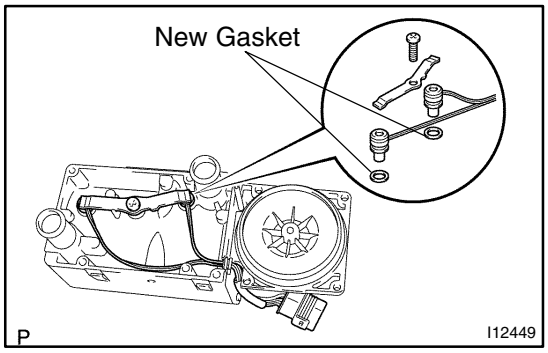


2. INSTALL COMBUSTION CHAMBER WITH FLAME TUBE

Install a new gasket and the combustion chamber.

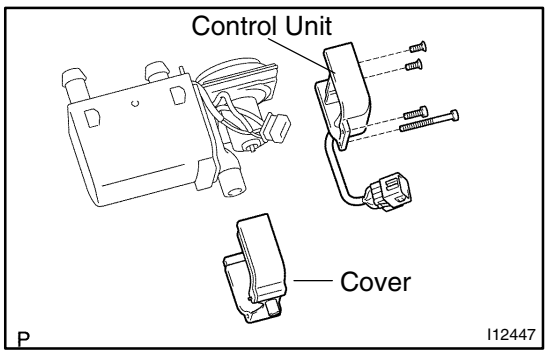
3. INSTALL ELECTRIC MOTOR

(a) Install a new gasket.
(b) Install the electric motor with the 3 screws.



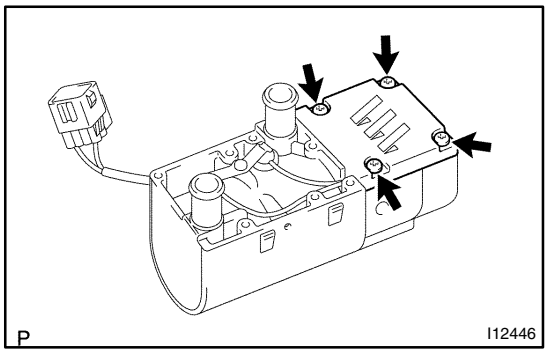
4. INSTALL CABLE HARNESS

(a) Install the water temperature sensor and over heat sensor.
(b) Install the plate with the screw.



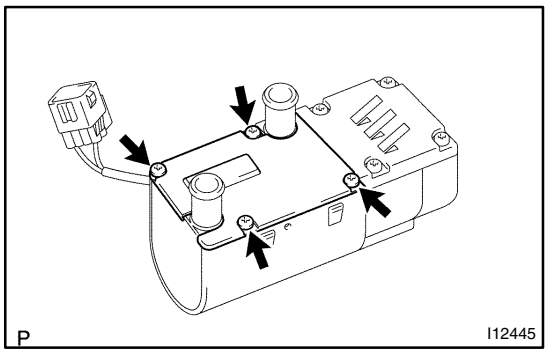
5. INSTALL COVER AND CONTROL UNIT

(a) Install the cover and control unit.
(b) Install the 2 hexagon screws.
(c) Install the 2 screws.



6. INSTALL BLOWER COVER

Install the blower cover with the 4 screws.

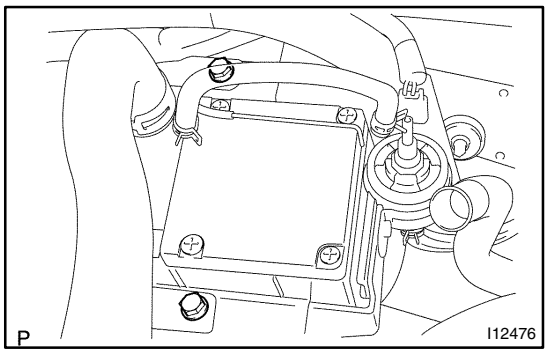


7. INSTALL JACKET COVER

Install the jacket cover with the 4 screws.

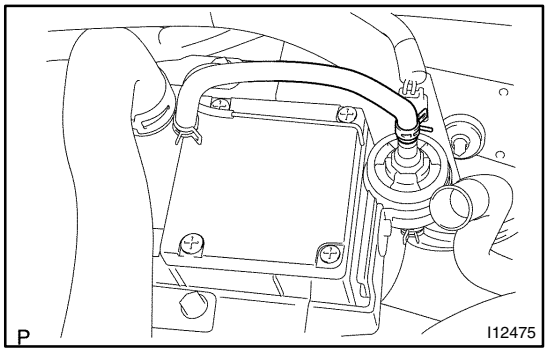
AC2A1–01

INSTALLATION



1. INSTALL COMBUSTION TYPE POWER HEATER

Install the combustion type power heater with the 2 bolts.

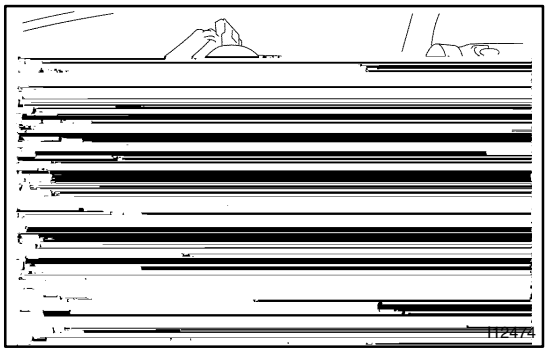


2. CONNECT COMBUSTION TYPE POWER HEATER CONNECTOR

3. CONNECT FUEL PUMP CONNECTOR

4. CONNECT FUEL LINE

Connect the fuel line to the fuel pump.



5. CONNECT HEATER HOSES

(a) Connect the inlet heater hose.

(b) Connect the outlet heater hose.

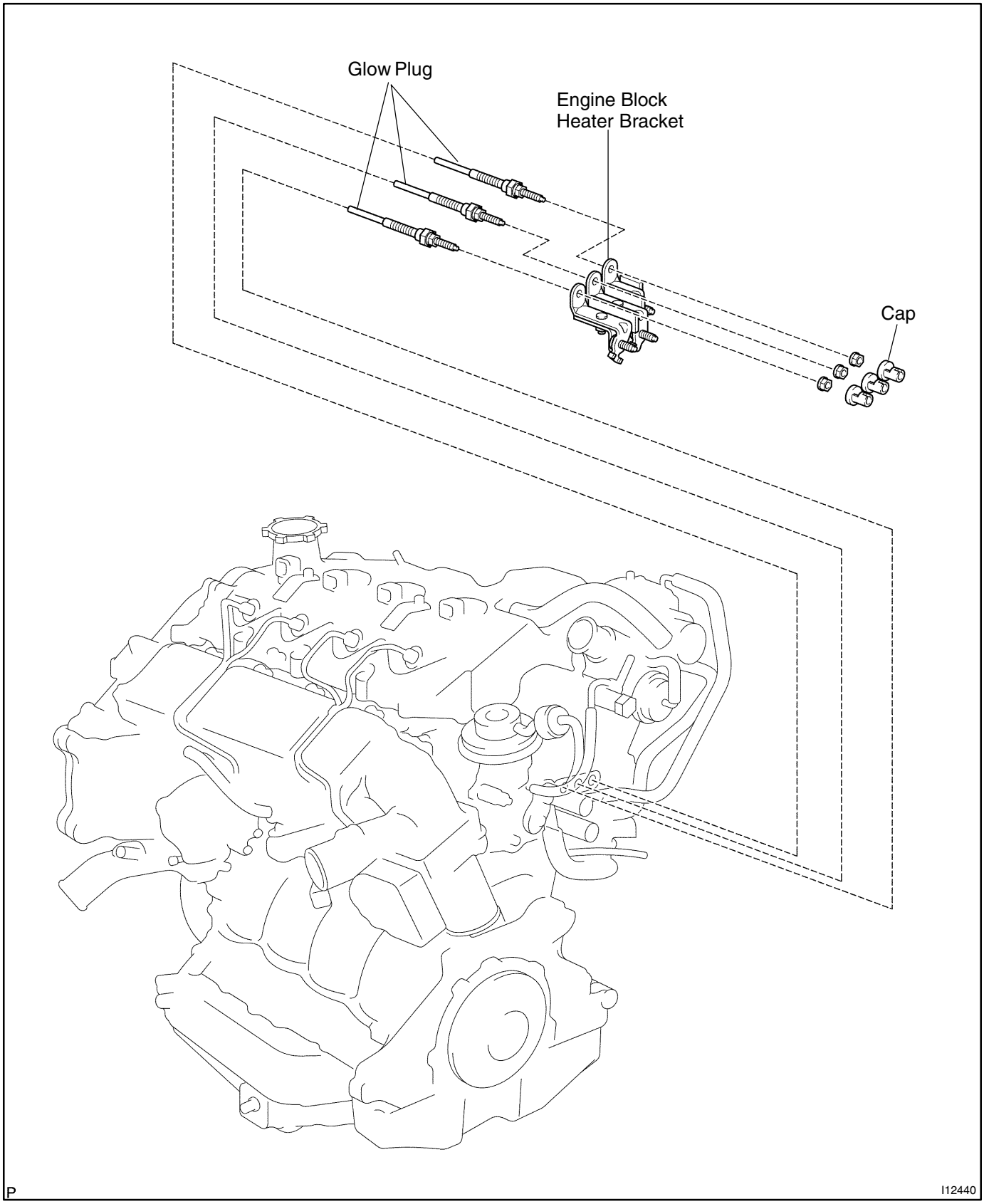
6. FILL ENGINE COOLANT

7. INSTALL RH UNDER COVER

ELECTRICAL TYPE POWER HEATER

COMPONENTS

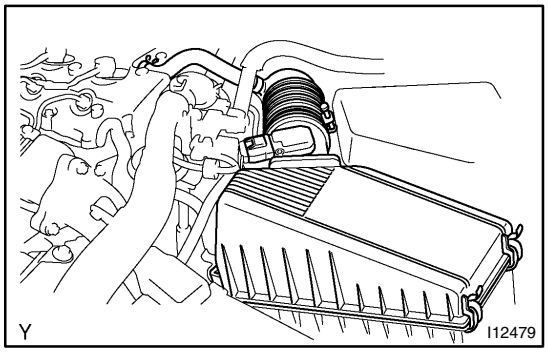
AC29T–01



AC29U–01

INSPECTION

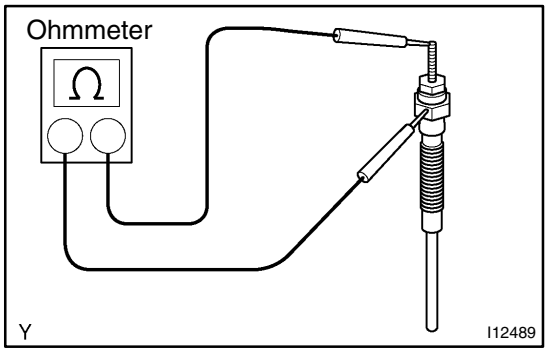
1. DRAIN ENGINE COOLANT



2. REMOVE AIR CLEANER ASSEMBLY

3. REMOVE GLOW PLUGS

(a) Remove the glow plug cap.
(b) Remove the 3 bolts.
(c) Remove the glow plug plate.
(d) Remove the glow plug stay.
(e) Remove the 3 glow plugs.



4. INSPECT GLOW PLUGS

Using an ohmmeter, check that there is continuity between the glow plug terminal and ground.

Standard resistance at 20˚C (68˚F):
Approx. 0.22 Ω

If there is continuity, replace the glow plug.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

5. REINSTALL GLOW PLUGS

(a) Install the 3 glow plugs.
(b) Install the glow plug stay.
(c) Install the glow plug plate.
(d) Install the 3 bolts.
(e) Install the glow plug cap.

6. REINSTALL AIR CLEANER ASSEMBLY

7. FILL ENGINE COOLANT

COMPRESSOR AND MAGNETIC CLUTCH (1CD–FTV)

AC2A9–01

ON–VEHICLE INSPECTION

1. MAKE THESE VISUAL CHECKS:

(a) Leakage of grease from the clutch bearing

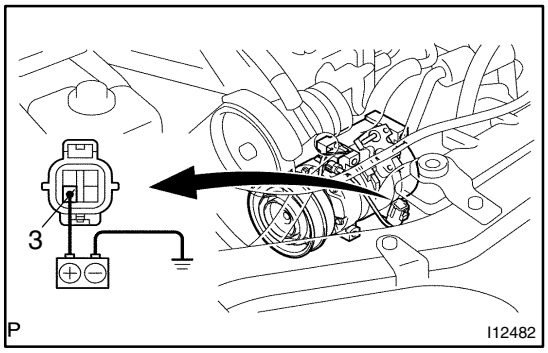
(b) Signs of oil on the pressure plate or rotor

2. INSPECT MAGNETIC CLUTCH BEARING FOR NOISE

(a) Start the engine.

(b) Check for abnormal noise from the compressor when the A/C switch is OFF.

If abnormal noise is being emitted, replace the magnetic clutch.



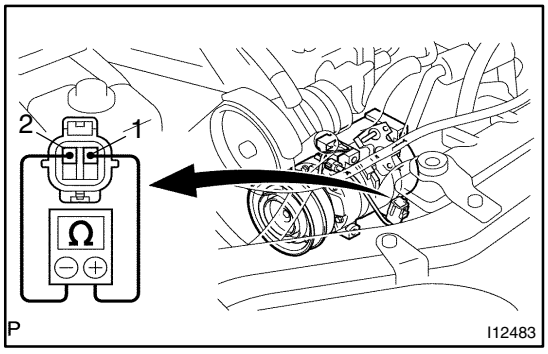
3. INSPECT MAGNETIC CLUTCH OPERATION

(a) Disconnect the connector.

(b) Connect the positive (+) lead from the battery to the terminal 3 on the magnetic clutch connector and the negative (–) lead to the body ground.

(c) Check that the magnetic clutch is energized.

If operation is not as specified, replace the magnetic clutch.



4. INSPECT COMPRESSOR LOCK SENSOR RESISTANCE

(a) Disconnect the connector.

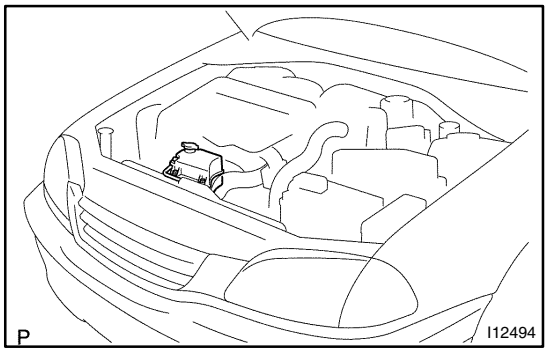
(b) Measure resistance between terminals 1 and 2.

Standard resistance: 65 – 125 Ω at 20˚C (68˚F)

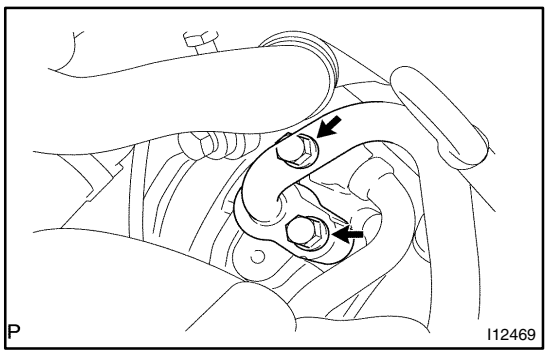
AC2AB–01

REMOVAL

1. RUN ENGINE AT IDLE SPEED WITH A/C ON FOR APPROX. 10 MINUTES WITH A/C ON
2. STOP ENGINE
3. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY
4. DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM
5. REMOVE ENGINE UNDER COVER RH
6. REMOVE DRIVE BELT
(See page AC–2)
7. DRAIN ENGINE COOLANT



8. REMOVE RESERVOIR TANK
(a) Remove the upper hose.
(b) Disconnect the lower hose.
(c) Disconnect the 2 bolts and reservoir tank.



9. DISCONNECT DISCHARGE AND SUCTION HOSES
Remove the 2 bolts and disconnect the both hoses.
NOTICE:
Cap the open fittings immediately to keep moisture or dirt out of the system.
10. REMOVE COMPRESSOR
(a) Disconnect the connector.
(b) Remove the 3 bolts and compressor.

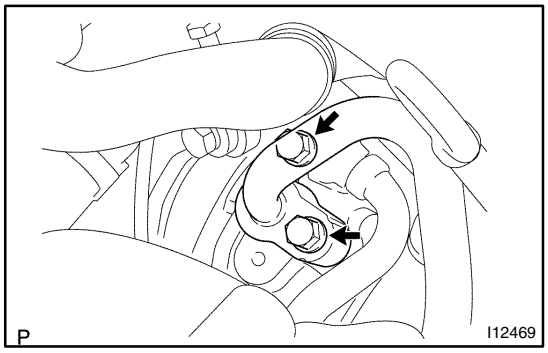
AC2AC–01

INSTALLATION

1. INSTALL COMPRESSOR

(a) Install the compressor with the 3 bolts.
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

(b) Connect the connector.

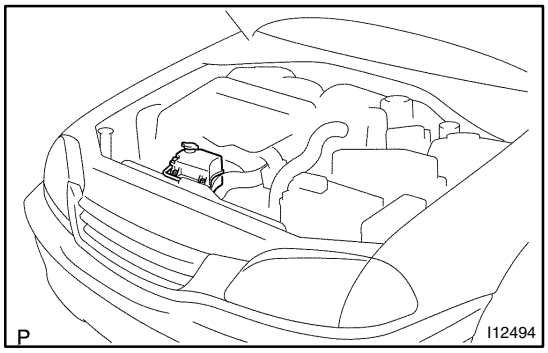


2. CONNECT DISCHARGE AND SUCTION HOSES

Connect the both hoses with the 2 bolts.
Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)

CAUTION:
Hoses should be connected immediately after the caps have removed.

HINT:
Lubricate 2 new O–rings with compressor oil and install the hoses.



3. INSTALL RESERVOIR TANK

(a) Connect the reservoir tank with the 2 bolts.
(b) Connect the lower hose.
(c) Install the upper hose.

4. REFILL ENGINE COOLANT

5. INSTALL AND CHECK DRIVE BELT
(See page AC–3)

6. INSTALL ENGINE UNDER COVER RH

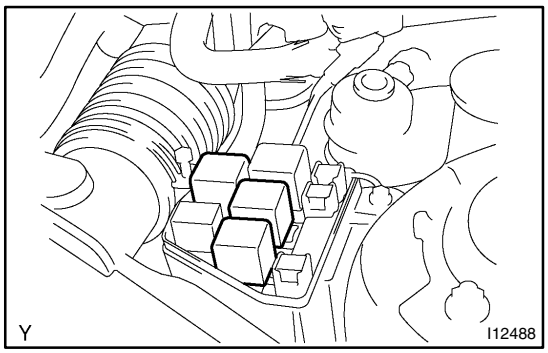
7. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

8. EVACUATE AIR IN REFRIGERATION SYSTEM AND CHARGE WITH REFRIGERANT
Specified amount: 450 ± 50 g (15.87 ± 1.76 oz.)

9. INSPECT FOR LEAKAGE OF REFRIGERANT

Using a gas leak detector, check the tightening torque at the joints.

10. INSPECT A/C OPERATION



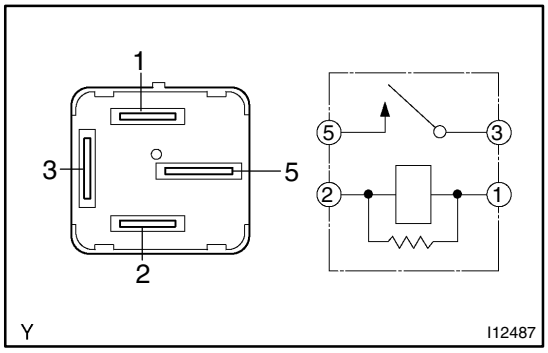
RELAY (1CD–FTV)

AC2AD–01

INSPECTION

ELECTRICAL TYPE POWER HEATER

(a) Remove magnetic clutch relay (marking: HTR sub1, sub2, sub3) from engine room relay block.



(b) Inspect magnetic clutch relay (marking: HTR sub1, sub2, sub3) continuity.

Condition	Tester connection	Specified condition
Constant	1 – 2	Continuity
Apply B+ between terminals 1 and 2.	3 – 5	Continuity

If continuity is not as specified, replace the relay.

(c) Reinstall relay to engine room relay block.

CONDENSER FAN (1CD–FTV)

AC2AE–01

ON–VEHICLE INSPECTION

1. INSPECT CONDENSER FAN OPERATION

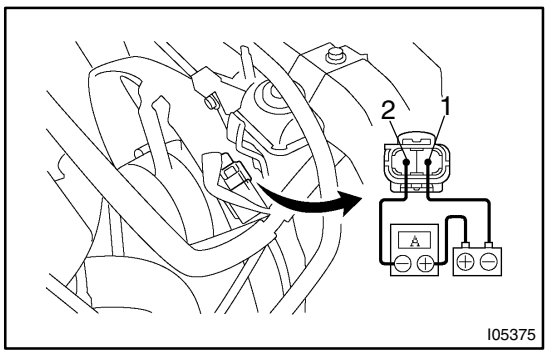
Inspect the fan operation, as shown in the chart below.

Test conditions:

- Ignition switch ON
- Blower speed control dial at ”HI” position
- Temperature control dial at ”COOL” position
- Set on manifold gauge set
- A/C switch ON

Condition	Fan operation (Fan speed)
Engine coolant temperature 91˚C (196˚F) or below	Not rotate
Engine coolant temperature 100˚C (212˚F) or above	Rotate
Refrigerant pressure is less than 1,520 kPa (15.5 kgf/cm^2, 220 psi)	Rotate (Low speed)
Refrigerant pressure is 1,520 kPa (15.5 kgf/cm^2, 220 psi) or above	Rotate (High speed)

If operation is not as specified, proceed to the next inspection.



2. INSPECT CONDENSER FAN MOTOR OPERATION

(a) Disconnect the connector.

(b) Connect the battery and ammeter to fan connector, as shown in the illustration.

(c) Check that the fan rotates smoothly and then check that the reading on the ammeter.

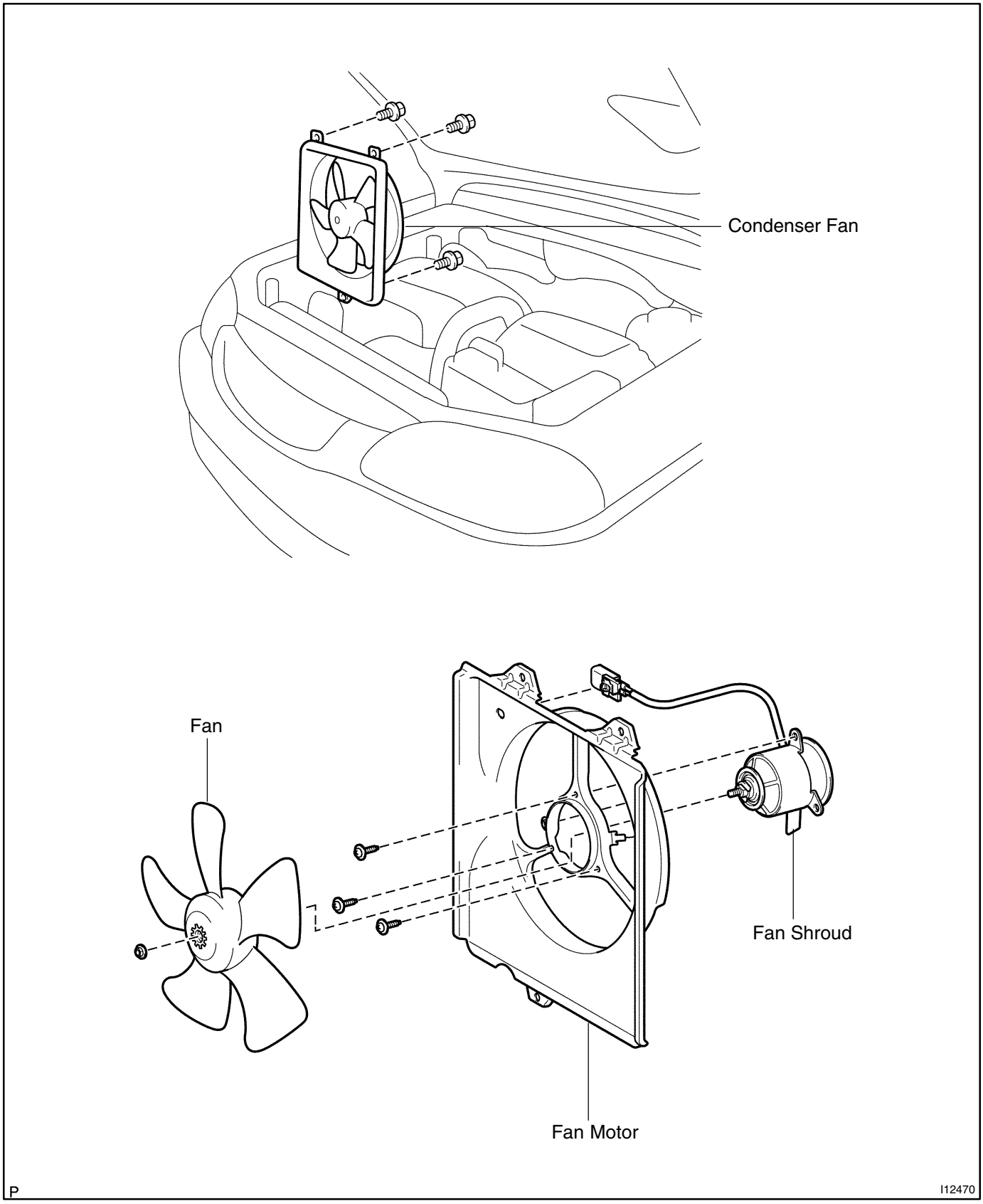
Specified amperage:

9.5 ± 1.5 A at 20˚C (68˚F)

- If operation is not as specified, replace the fan motor.
- If operation is as specified, check the pressure switch, cooling fan relays and water temp. switch.

AC2AF–01

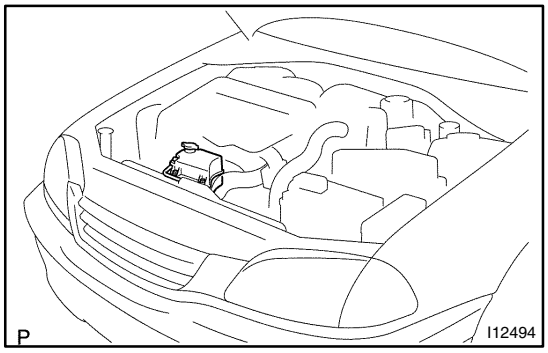
COMPONENTS



AC2AG–01

REMOVAL

1. DRAIN ENGINE COOLANT



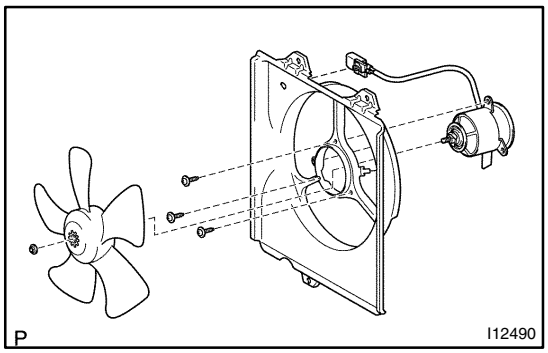
2. REMOVE RESERVOIR TANK

(a) Disconnect the upper hose.
(b) Disconnect the lower hose.
(c) Remove the 2 bolts and reservoir tank.

3. REMOVE CONDENSER FAN

(a) Disconnect the connector.
(b) Remove the 3 bolts and condenser fan.

AC2AH–01

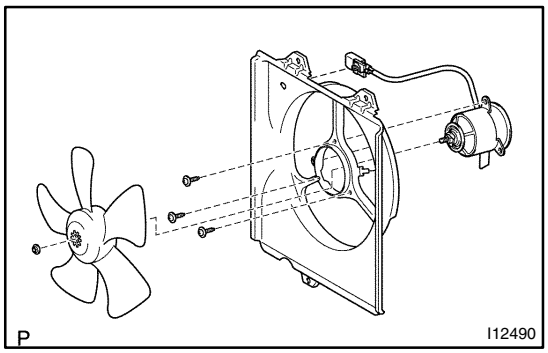


DISASSEMBLY

REMOVE FAN

(a) Remove the nut and fan.
(b) Remove the fan motor.
    (1) Disconnect the 3 wire harness clamps.
    (2) Remove the 3 screws and fan motor.

AC2AI–01



REASSEMBLY

INSTALL FAN

(a) Install the fan motor.
  (1) Install the fan with the 3 screws.
  (2) Connect the wire harness clamps.
(b) Install the fan with the nut.

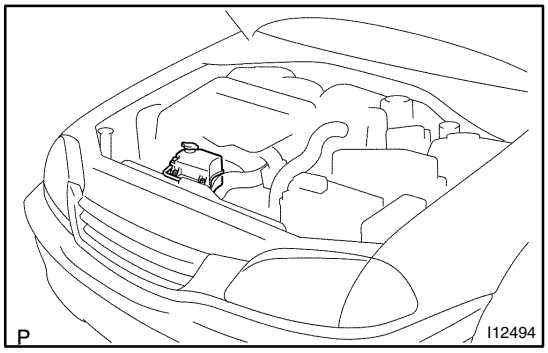
AC2AJ–01

INSTALLATION

1. INSTALL CONDENSER FAN

(a) Install the fan with the 3 bolts.

(b) Connect the fan connector.



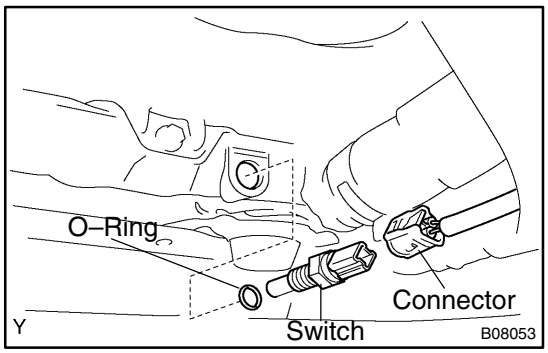
2. INSTALL RESERVOIR TANK

(a) Install the reservoir tank with the 2 bolts.

(b) Install the lower hose.

(c) Install the upper hose.

3. FILL ENGINE COOLANT



WATER TEMPERATURE SWITCH (1CD–FTV)

AC2AK–01

INSPECTION

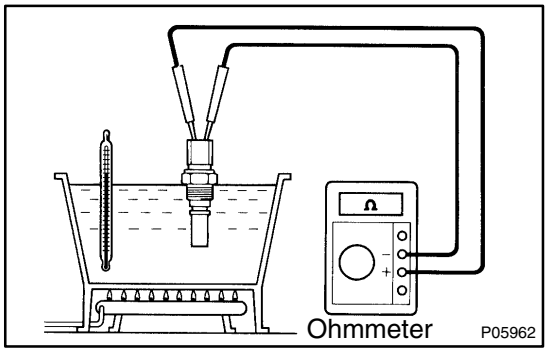
1. REMOVE ENGINE UNDER COVER

2. DRAIN ENGINE COOLANT

3. REMOVE WATER TEMPERATURE SWITCH

(a) Disconnect the connector.

(b) Remove the water temperature switch and O–ring.



4. INSPECT WATER TEMPERATURE SWITCH OPERATION

(a) Using an ohmmeter, check that the no continuity exists between terminals when the coolant temperature is above 93°C (199°F).

If continuity exists, replace the switch.

(b) Using an ohmmeter, check that there is no continuity exists between the terminals when the coolant temperature is below 83°C (181°F).

If no continuity exists, replace the switch.

5. REINSTALL WATER TEMPERATURE SWITCH

(a) Install a new O–ring to the water temperature switch.

(b) Install the water temperature switch.

(c) Connect the connector.

6. REINSTALL ENGINE UNDER COVER

7. FILL WITH ENGINE COOLANT

8. START ENGINE AND CHECK FOR COOLANT LEAK