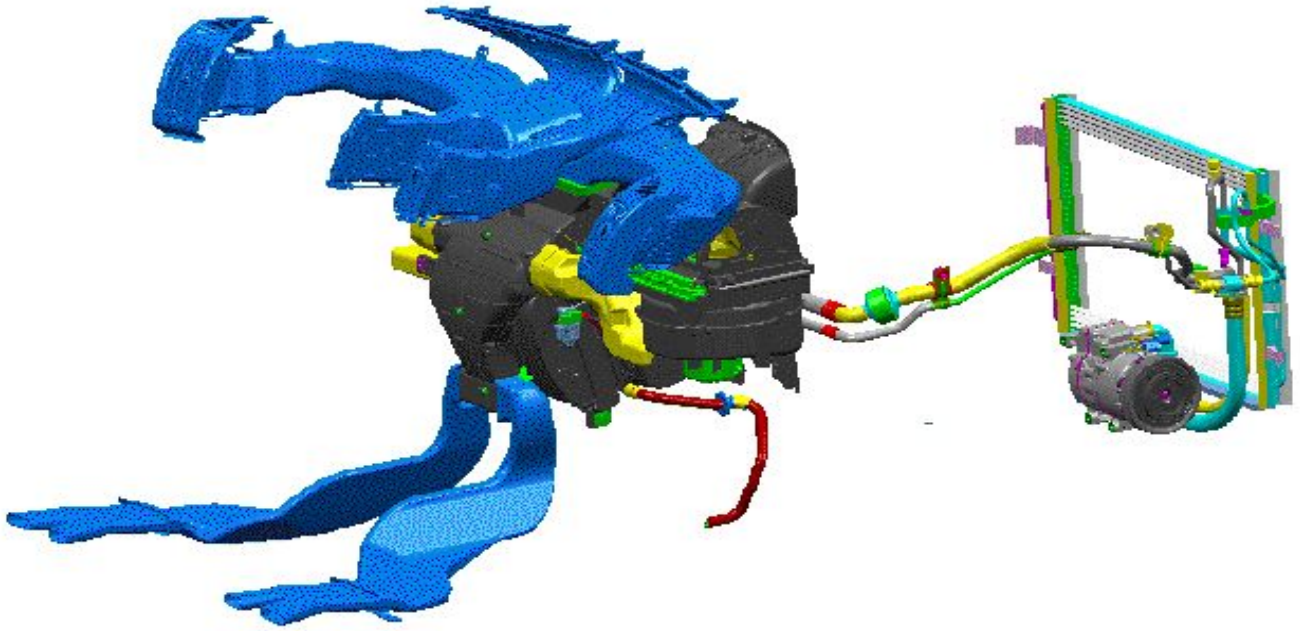
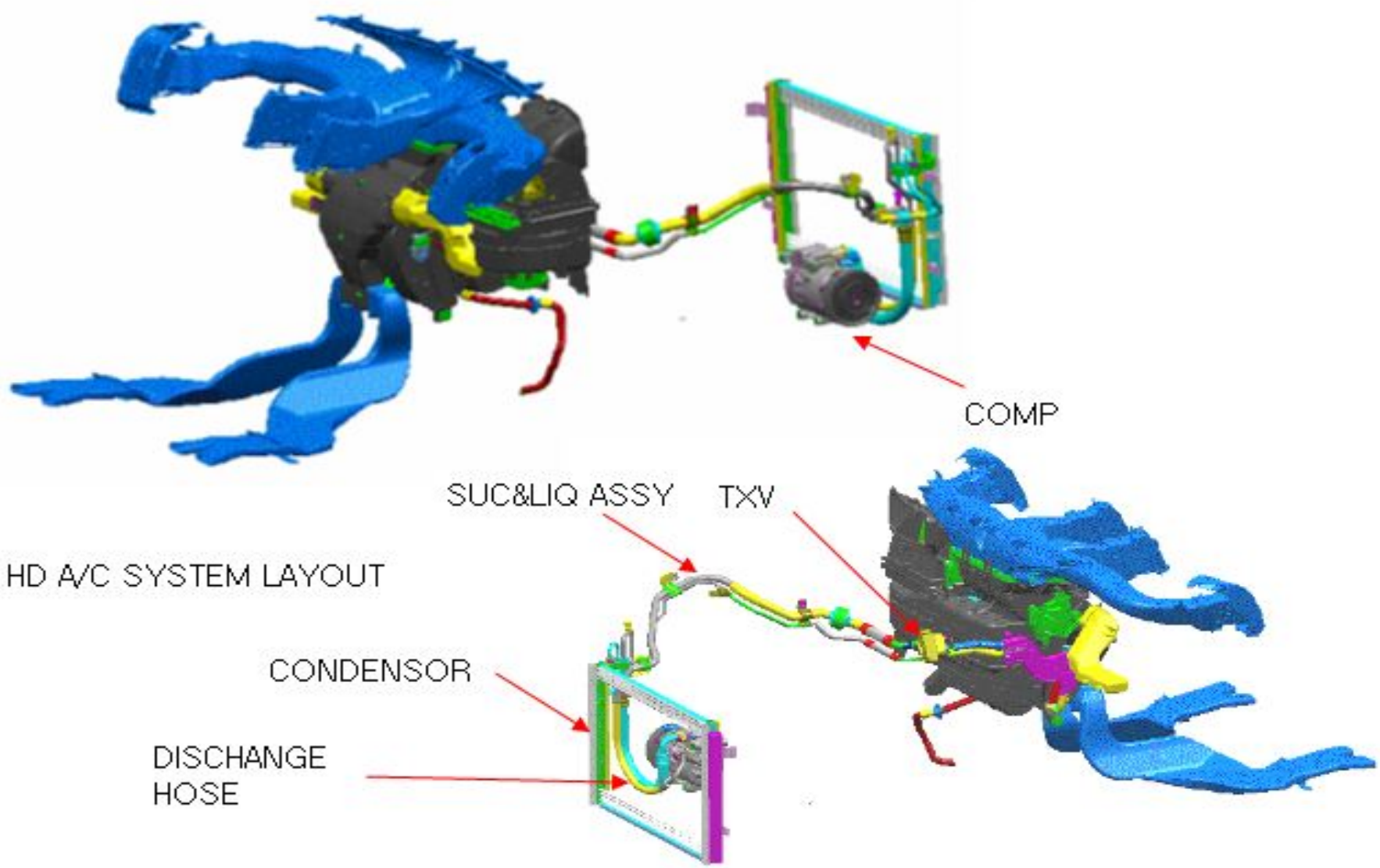
AIR CONDITIONING SYSTEM (HD)



System General

Items	HD
Compressor	VS16M
Refrigerant / Oil quantity	500 / 150 g
Condenser	Sub cool type (Condenser, receiver drier integrated)
Pressure detecting	APT (Automotive Pressure Transducer)
Cooling fan	Single fan type
Blower speed control	MOS-FET
Diagnosis	Controller or Hi-scan

Layout


COMP
SUC&LIQ ASSY
TXV
HD A/C SYSTEM LAYOUT
CONDENSOR
DISCHANGE
HOSE

controller

FATC

Manual

Function of Controller

Front controller (Manual)

1. Temp. switch
   : Cool ⇔ Warm
2. Blower switch
   : Speed 1st ⇔ 4th
3. Mode switch*
4. Intake switch (FRE/REC)
5. A/C switch
6. Rear defog switch

* Mode switch
: MAX A/C ⇔ VENT ⇔ B/L ⇔ FLOOR ⇔ MIX ⇔ DEF

Function of Controller

Controller (Auto)

* Mode switch

: VENT □ B/L □ FLOOR □ MIX □ VENT

1. DEF. switch
2. Rear Defog switch
3. A/C switch : REC fixed
4. Recirculation switch
5. Temp. switch
   : 63℉(17.5 ℃)~89℉(31.5 ℃),
   up/down by 1℉(0.5℃)
6. Auto switch
   : Temp.,blower,mode,
   A/C,Intake control
7. Off switch
   : Blower off, A/C off

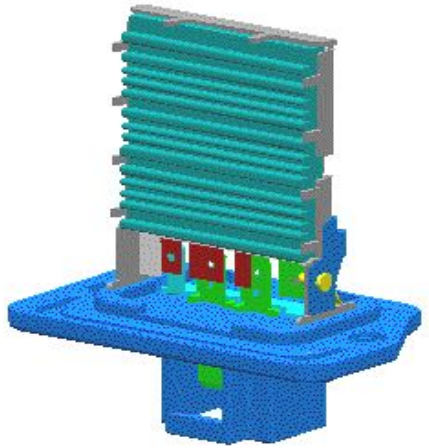
(MODE, AQS, REC available)

8. Mode switch*
9. AQS switch : FRE/REC changed by air status
10. Blower switch : 8 step control

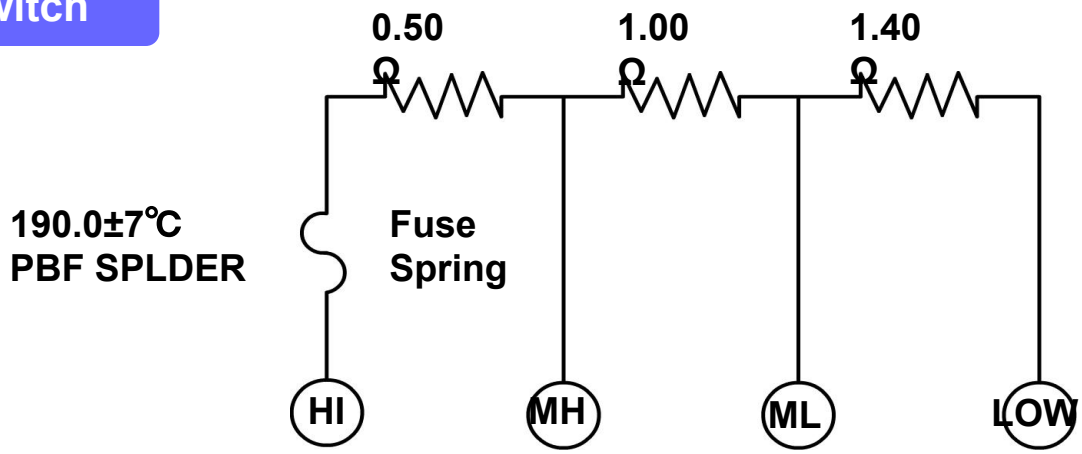
Function Of Buttons (Manual)

Blower switch

- Speed control : by resistor



Blower switch



CIRCUIT OF DIAGRAM

Function Of Buttons (Manual)

Mode switch

1. Mode operation

- MAX A/C : VENT, REC, A/C ON
- VENT mode : VENT
- B/L mode : B/L
- FLOOR mode : FLOOR, FRE
- MIX mode : MIX, FRE, A/C ON
- DEF mode : DEF, FRE, A/C ON

2. Feedback voltage of mode actuator

Position	F/B (V)
MAX A/C	0.3
VENT	0.3
B/L	1.4
FLOOR	2.5
MIX	3.6
DEF	4.7

Function Of Buttons (Manual)

FRE/REC switch

- REC switch ON : REC mode
- REC switch OFF : FRE mode
- Intake door actuator control

Position	F/B (V)
FRE	0.3
REC	4.7

Function Of Buttons (Manual)

A/C and Temp switch

- **Temp. actuator control : 16 steps**

Position	F/B (V)
Cool	0.3
Warm	4.7

- A/C output is controlled by evaporator sensor

Control Logic (Manual)

1. Mix/DEF logic

- MIX/DEF mode select □ A/C ON, FRE

- A/C ON/OFF and FRE/REC selection available

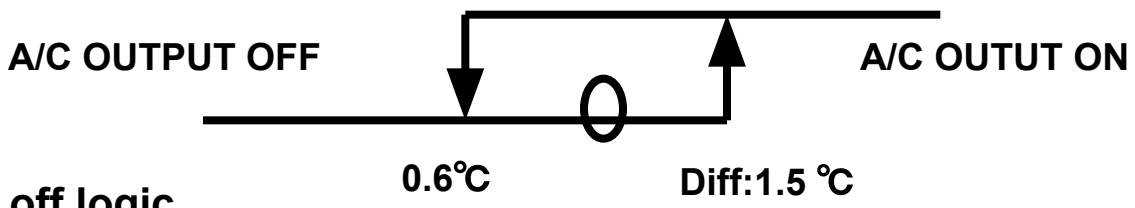
2. MAX A/C logic

- MAX A/C mode select □ VENT, A/C ON, REC

- A/C OFF and FRE selection is not available

3. EVAP logic

-During A/C ON, A/C ON/OFF output is controlled by EVAP. Sensor



4. Actuator cut off logic

- When an actuator can not go to target position actuator is cut off for protection.

Control Logic (Manual)

Logic cancel & selection

① Select DEF mode

② Push REC button 5 times for 3 seconds

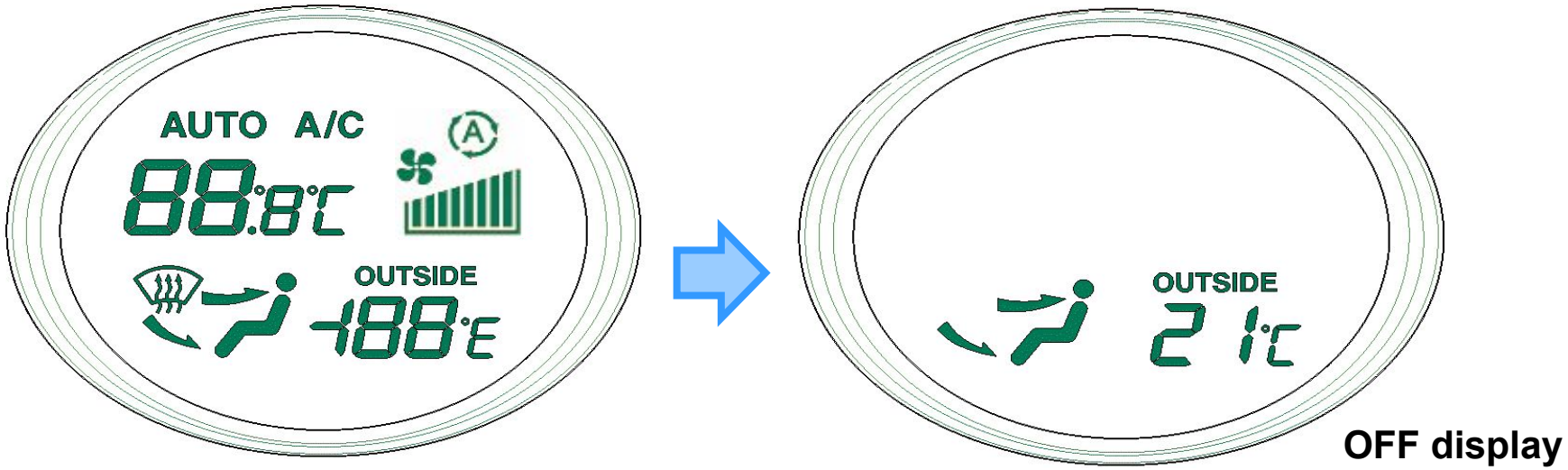
③ See REC indicator flashes 3 times with 2Hz.

④ Logic cancel & selection

- Logic cancel : initialized by A/C OFF, FRE
- Logic re-selected (at DEF mode) : initialized by A/C ON (indicator ON), FRE

Function Of Buttons (Auto)

1. Mode and ambient temperature display



OFF display

Function : When off switch is pushed ambient temperature and mode appear.

Function Of Buttons (Auto)

2. DEF mode control

DEF mode operation

- mode door : DEF position
- intake door : FRE position (REC selectable)
- A/C : on
- prior to MAX COOL/HOT function

3. OFF switch

System operation

- blower speed : off
- temp door : move to cool position after 20 sec delayed
- A/C : off
- intake door : FRE
- AQS function : off

Function Of Buttons (Auto)

4. AQS control

System operation

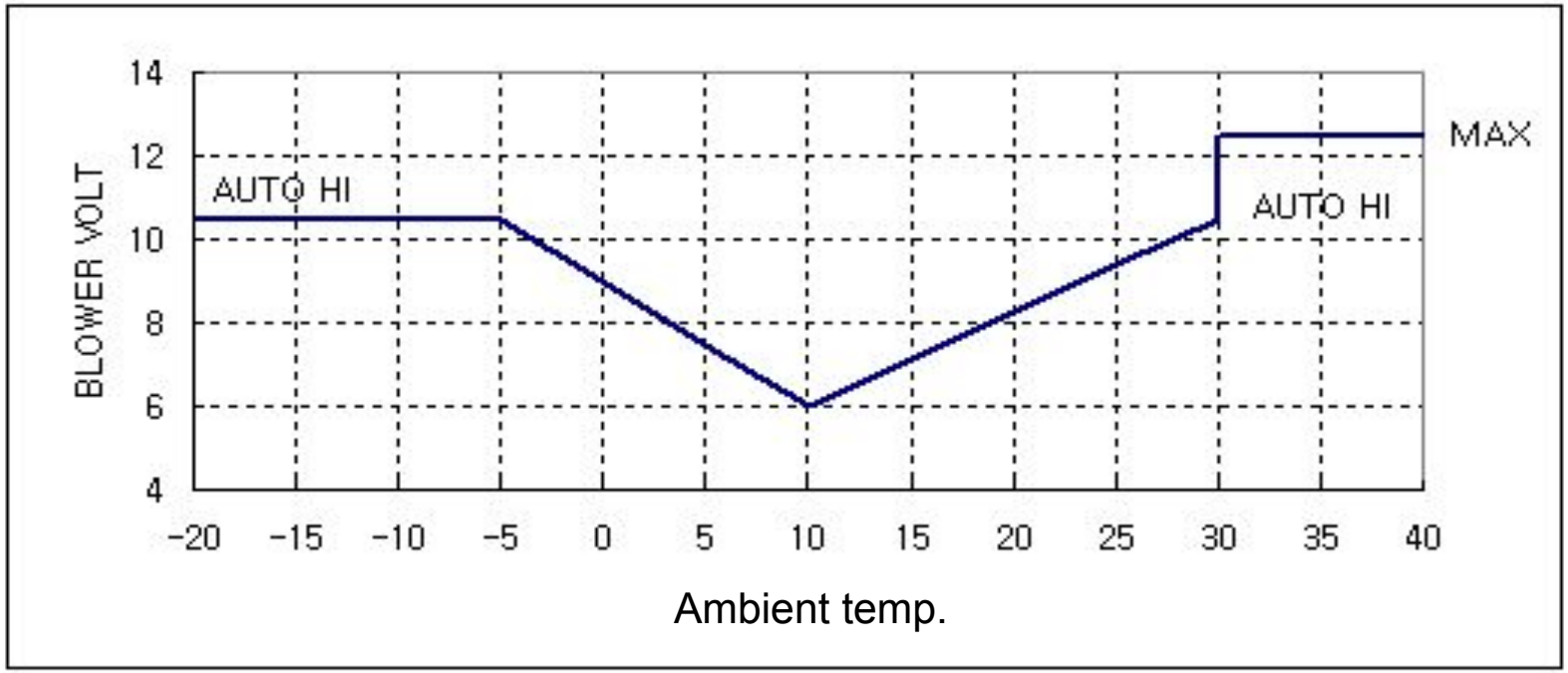
- Select the DEF during AQS ON : DEF is prior to AQS
- MAX cool/hot is prior to AQS
- When a preheating AQS : FRE position

5. Blower speed control

Speed	Manual speed voltage	AUTO speed voltage
1st	3.8	AUTO LO (4.5)
2nd	4.9	4.6 ~ 5.5
3rd	6.1	5.6 ~ 6.7
4th	7.2	6.8 ~ 7.7
5th	8.3	7.8 ~ 8.9
6th	9.5	9.0 ~ 10.1
7th	10.6	10.2 ~ AUTO HI (10.6)
8th	B+	

[Blower speed & motor voltage table]

5. Blower speed control



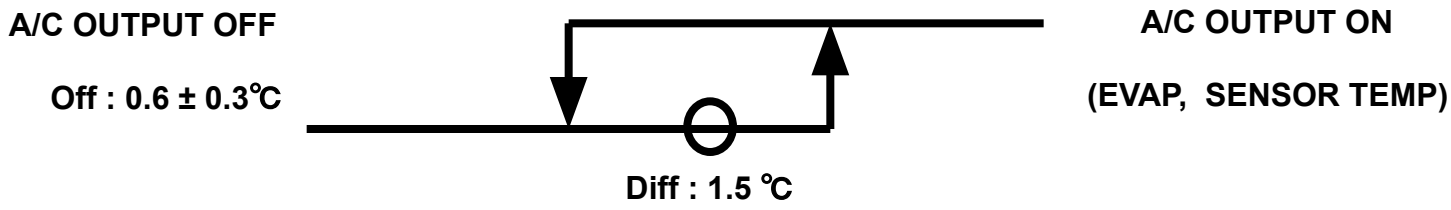
MIX/DEFOG logic

1. Operation

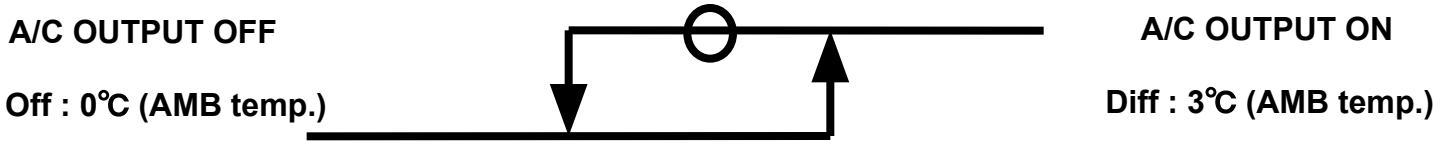
- Mode door : MIX or DEFOG
- Intake door : FRE (REC is selectable)
- Prior to MAX HOT/COOL function

2. A/C cut off

- By evaporator sensor operation
- Ambient temperature below 0℃ (A/C select indicator & compressor off)

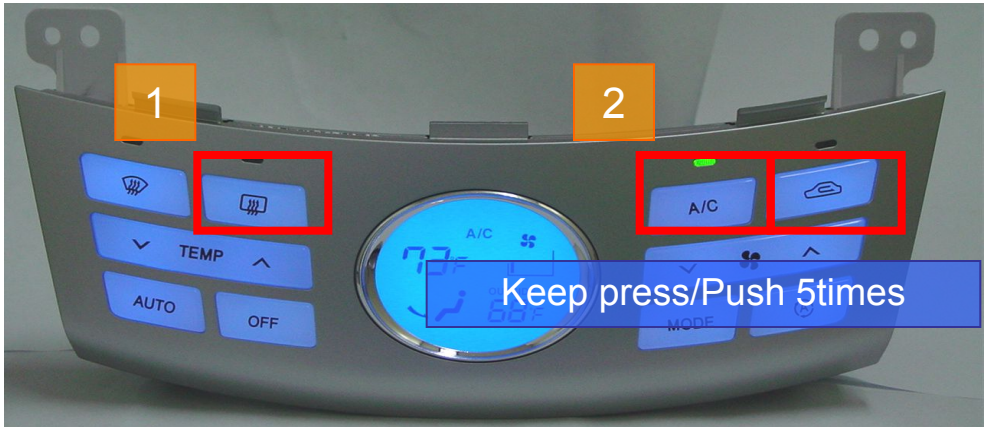


[By evaporator A/C ON/OFF]



[By ambient sensor A/C ON/OFF]

Logic cancel & selection



① Select DEF mode

② Keep pressing A/C button and push REC button 5 times for 3 seconds

③ See REC indicator flashes 3 times with 2Hz.

④ Logic cancel & selection

FUNCTION		DEF/MIX	OFF
LOGIC	A/C	ON	OFF
	INTAKE	FRE	FRE
LOGIC CANCEL	A/C	PREVIOUS	OFF
	INTAKE	PREVIOUS	PREVIOUS

Temperature Unit Change

Temp unit change: ℃ ⇔ ℉

* Setting unit: ℃ (Battery disconnection)

* How to operate

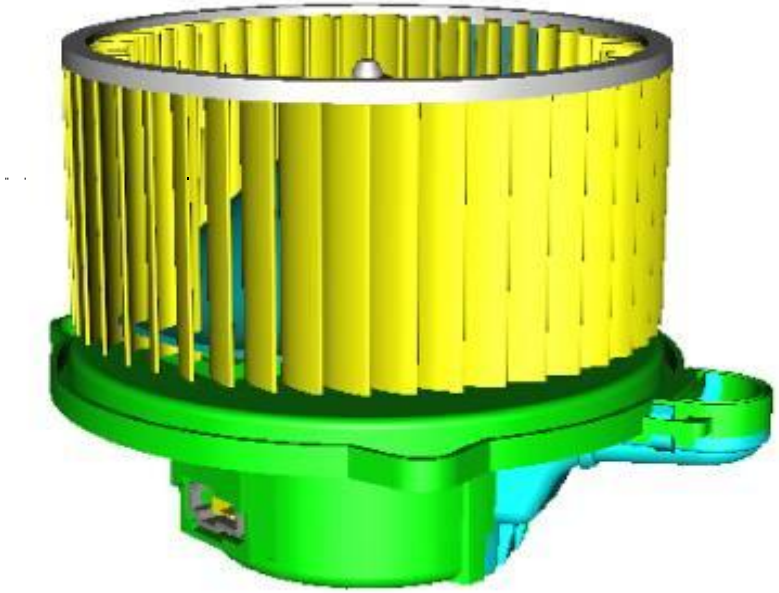
Press for 3 seconds or more

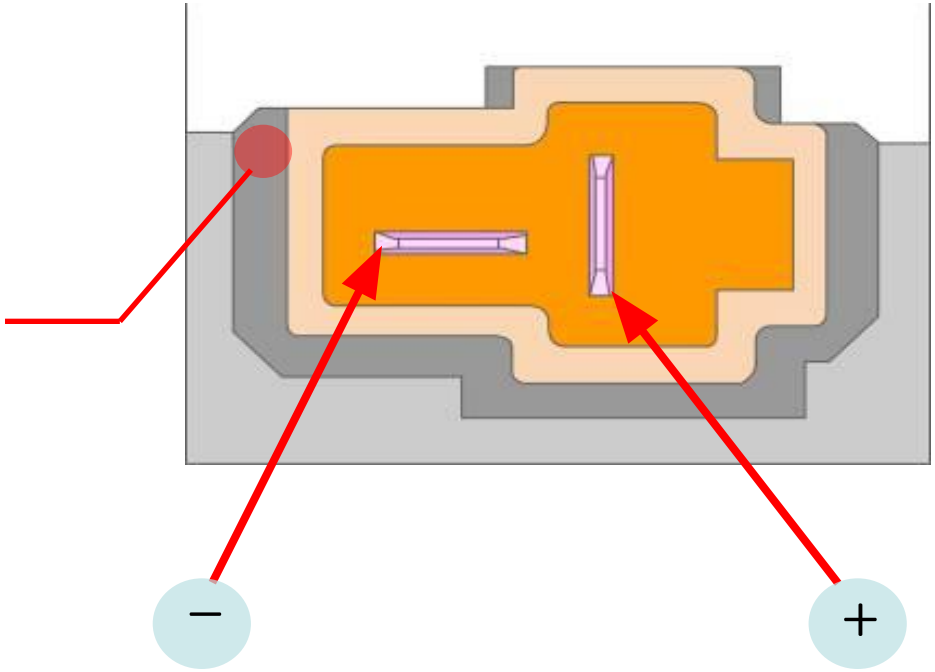
Keep pressing

Blower motor

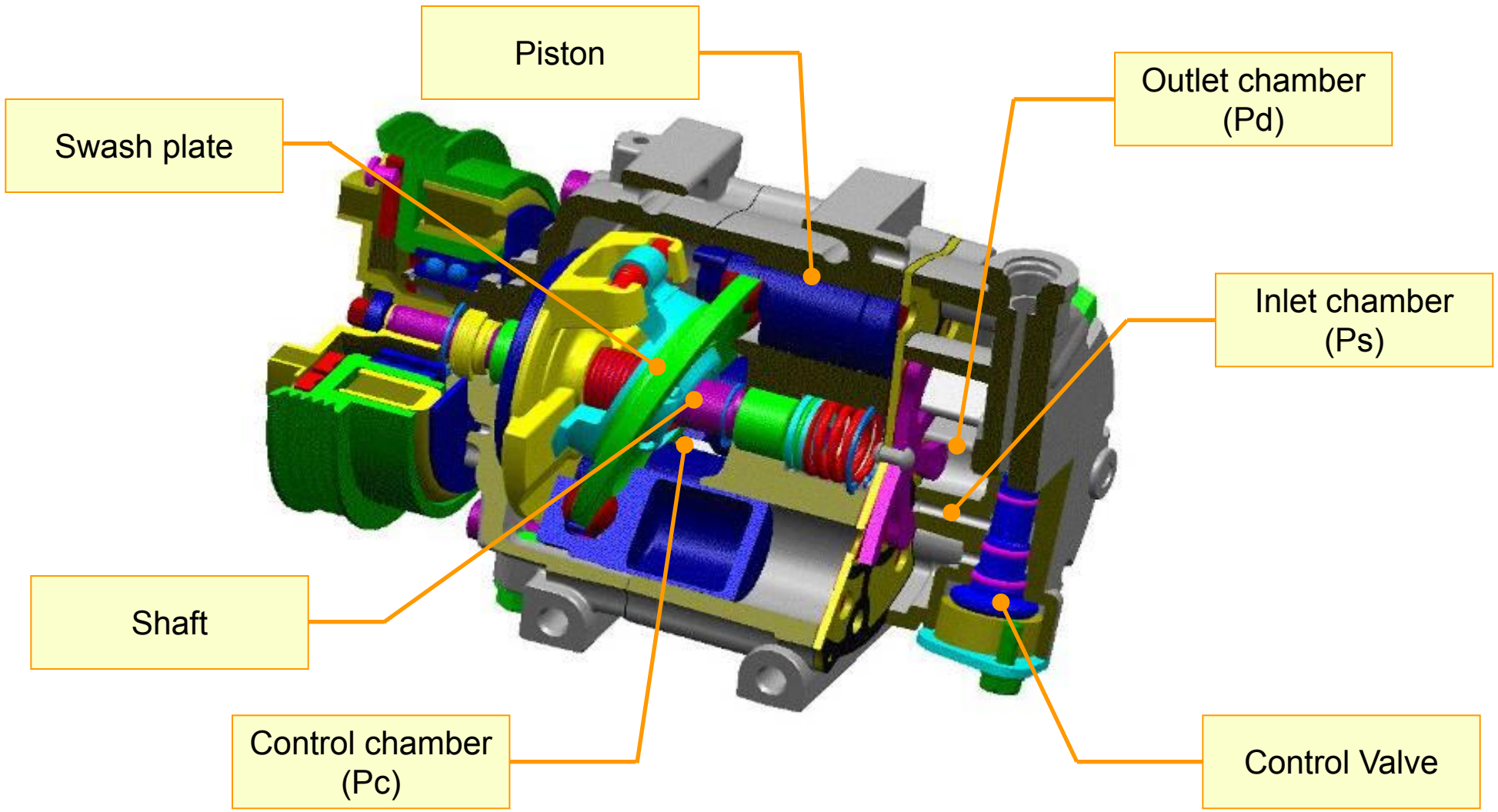
1. Front blower motor

- Capacity : 220W
- Wheel size : Ø147 X 75H
- Rotational direction : CCW

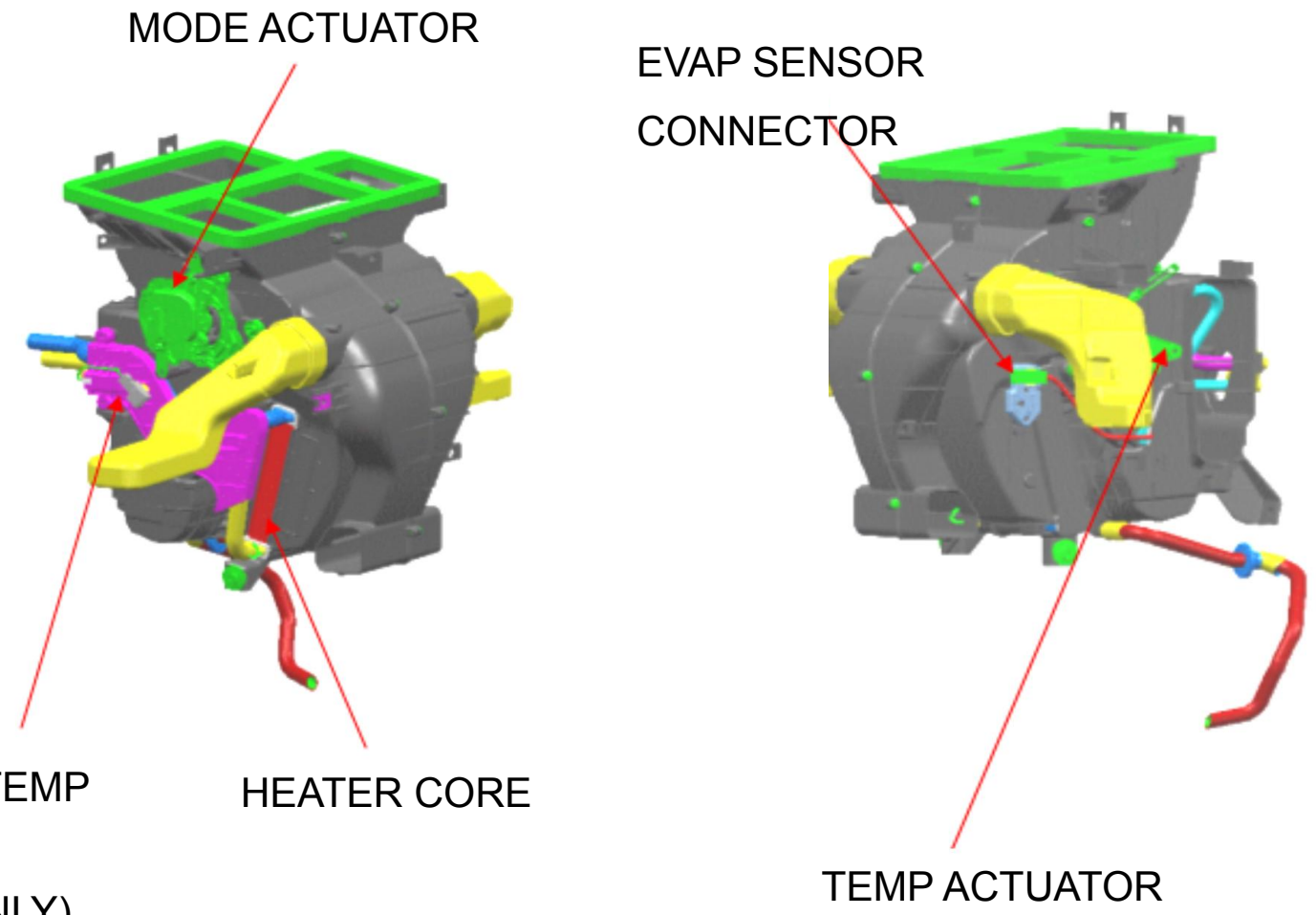




Compressor (Variable Swash Plate)

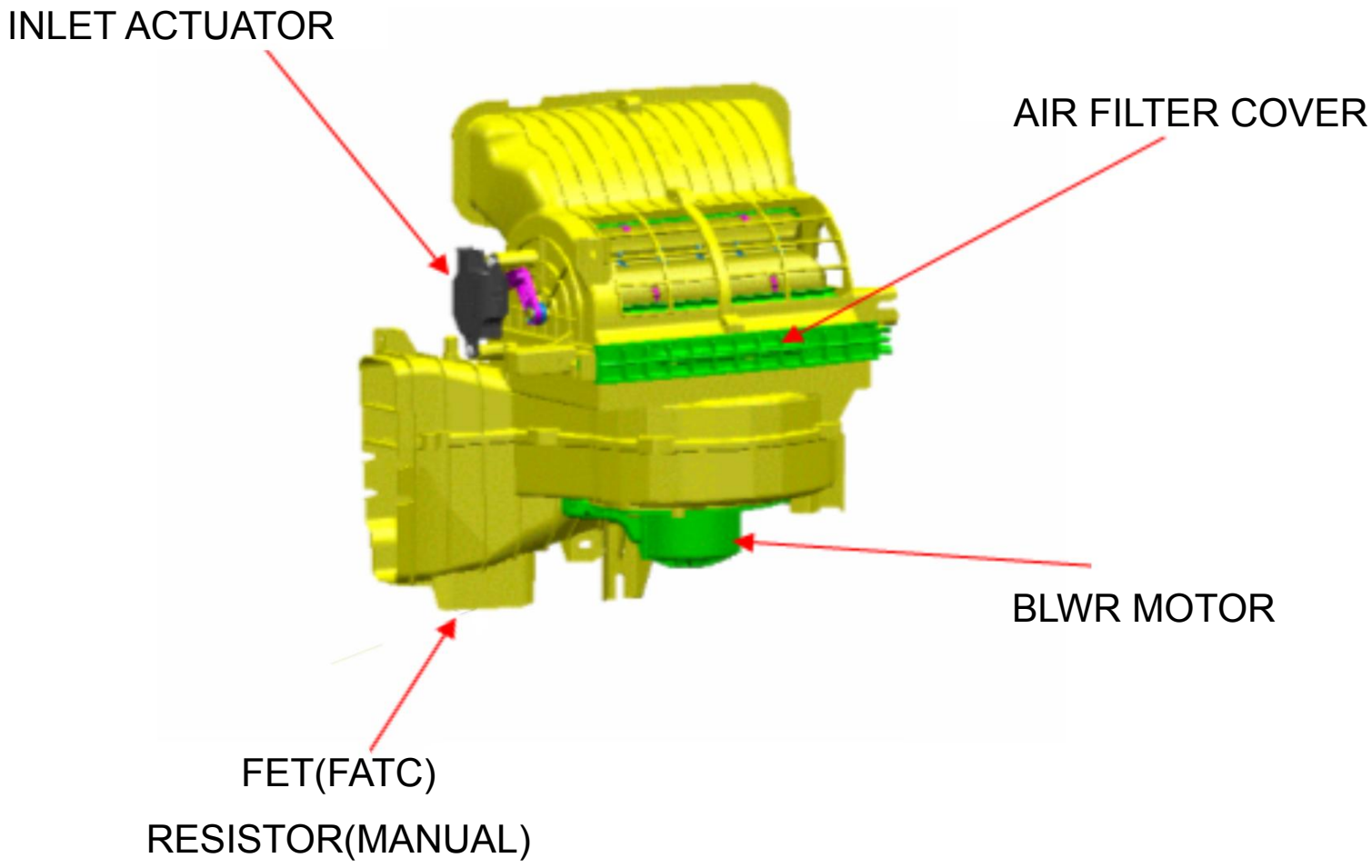


HVAC (Heating, Ventilation and Air Conditioning)



HVAC (Heating, Ventilation and Air Conditioning)

2. Blower unit

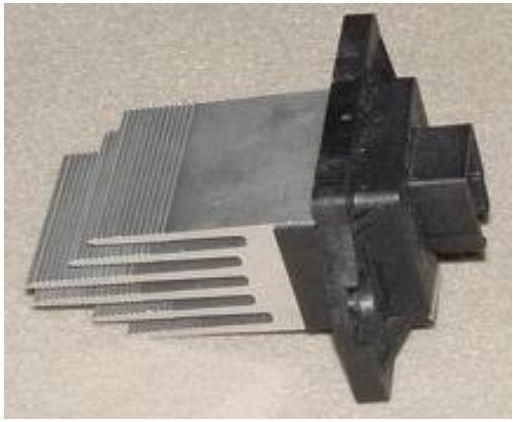


Cooling Fan

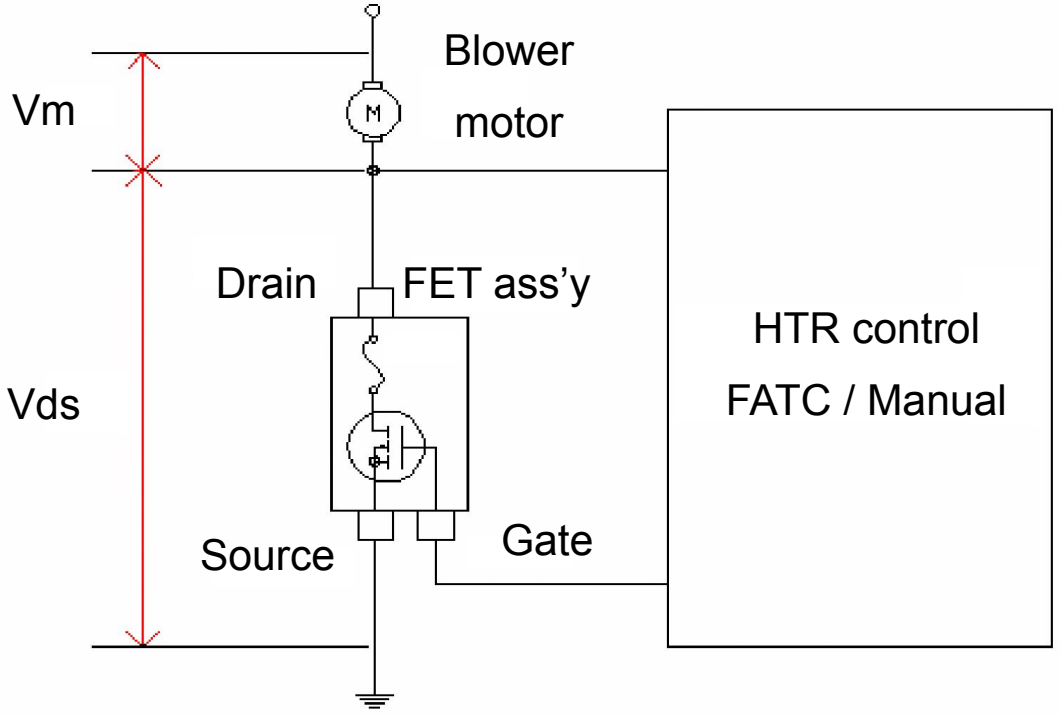
A/CON S/W	A/CON Pressure	Vehicle Speed {KPH}	Coolant Temperature [℃]						Remarks
			-30	A	85	100	105		
ON	P≥ 15.5kg f/㎠ G	ALL	OFF	HIGH					
	15.5kg f/㎠ G > P ≥ 12 kg f/㎠ G	V<45	OFF	LOW		HIGH			
		45≤V<80	OFF			LOW	HIGH		
		80<V	OFF					HIGH	
	12 kg f/㎠ G > P ≥ 6 kg f/㎠ G	V<45	OFF		LOW		HIGH		
		45≤V<80	OFF			LOW	HIGH		
		80<V	OFF					HIGH	
	6 kg f/㎠ G > P	ALL	OFF					HIGH	
OFF		V<45	OFF			LOW	HIGH		
		45≤V<80	OFF			LOW	HIGH		
		80<V	OFF					HIGH	

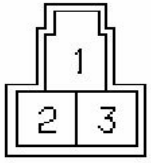
* Depending on the fuel type of the engine , Coolant temperature 'A' can be changed as follows.

MOS FET (Metal Oxide Semiconductor Field Effect Transistor)



Blower speed	Vm
1st	3.8 V
2nd	4.9 V
3rd	6.1 V
4th	7.2 V
5th	8.3 V
6th	9.5 V
7th	10.6 V
8th	Batt





Pin	Function
1	Drain
2	Source
3	Gate

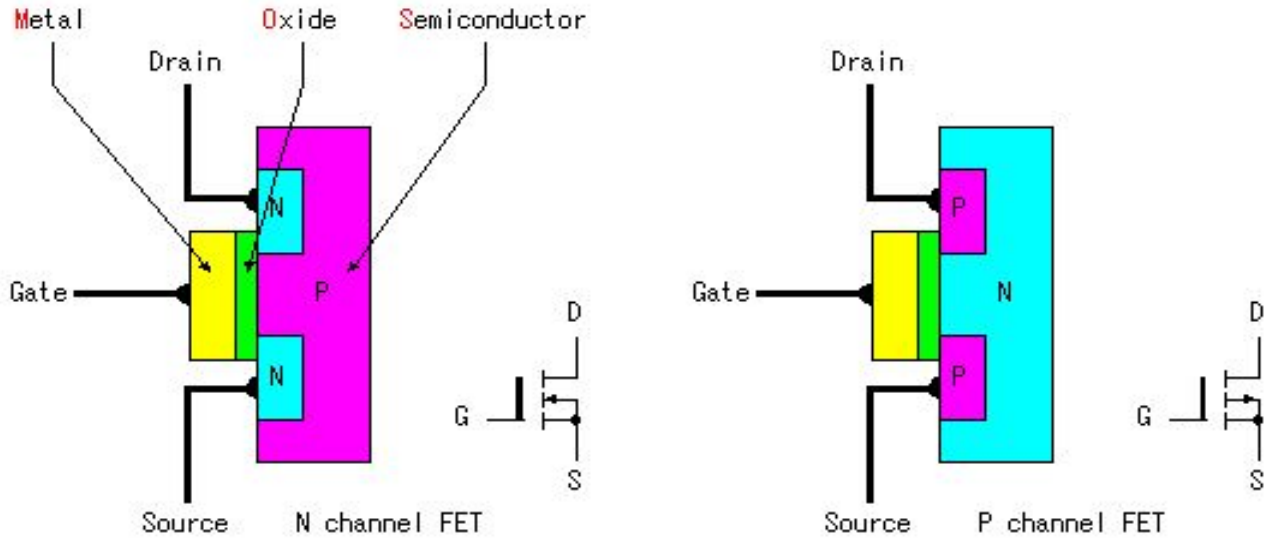
MOS FET (Metal Oxide Semiconductor Field Effect Transistor)

MOS FET (Metal Oxide Semiconductor Field Effect Transistor) is composed of Metal, Oxide and Semiconductor.

There are NPN type and PNP type as the semiconductor part. NPN type is called N-channel and PNP type is called P channel. An oxide film is put to the semiconductor of NPN or PNP and metal is put onto it as the gate.

Transistor controls an output current by the input current. However, **in case of FET, it controls an output current by input voltage.**

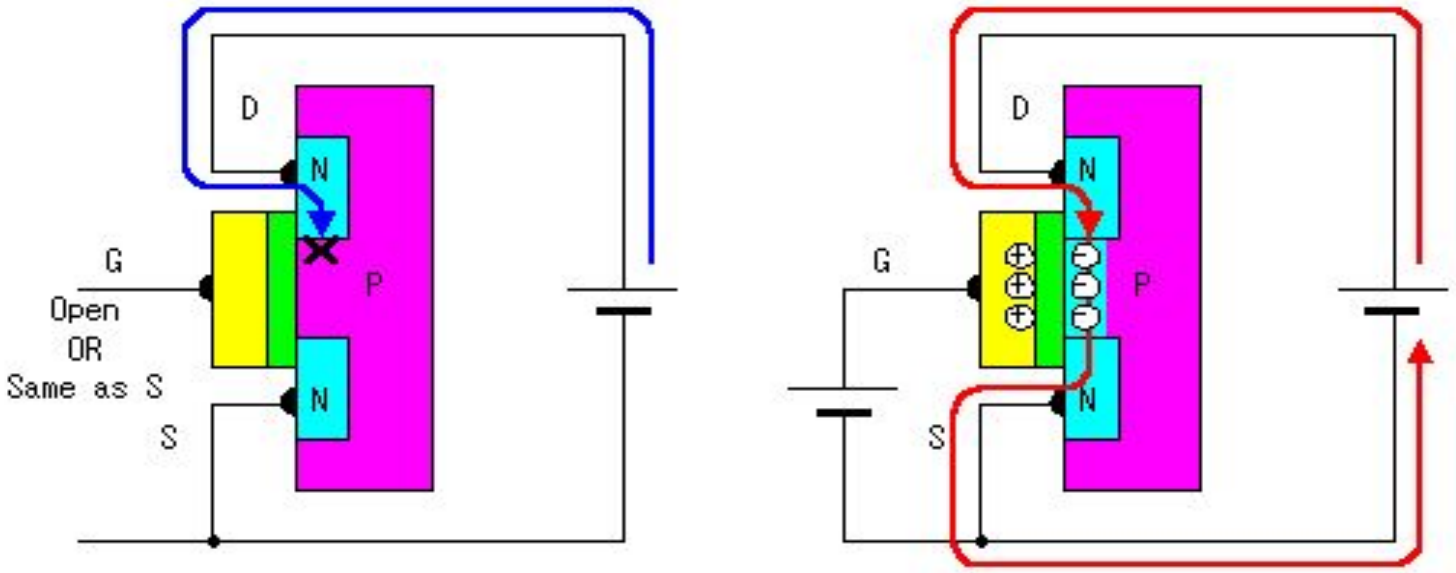
To handle an MOS FET, it needs an attention. Because **the oxidation insulation film is thin, this film is easy to destroy in the high voltage of the static electricity and so on.**



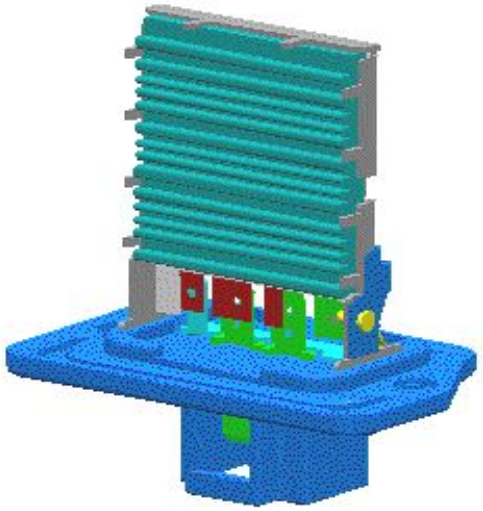
MOS FET (Metal Oxide Semiconductor Field Effect Transistor)

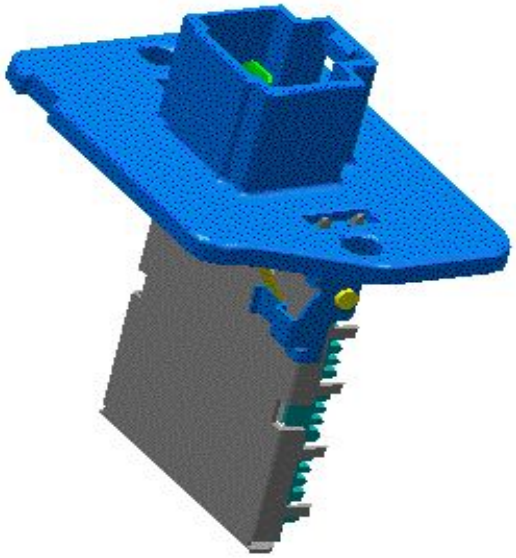
[N-channel MOS FET]

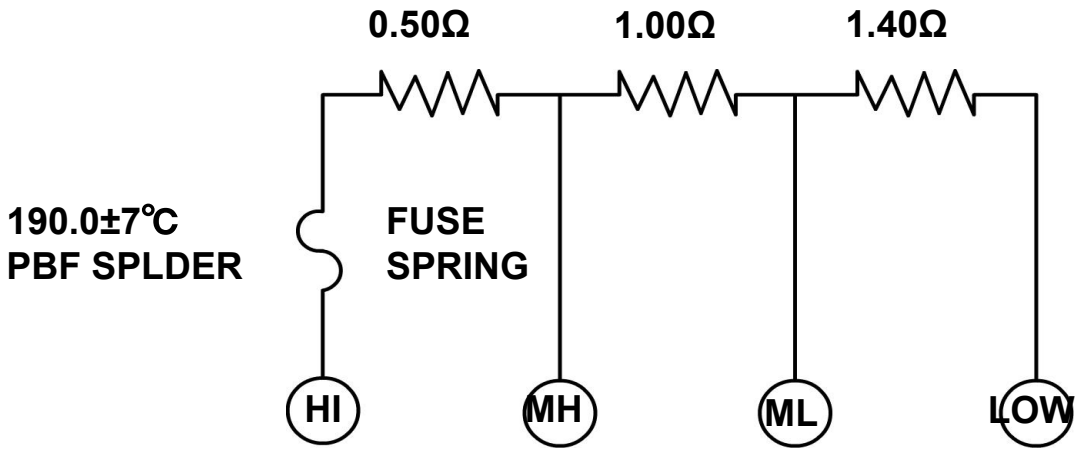
When positive voltage is applied to the gate of the N-channel MOS FET, the electrons of N-channel of source and drain are attracted to the gate and go into the P-channel semiconductor among both. With the move of these electrons, it becomes the condition like spans a bridge for electrons between drain and source. The size of this bridge is controlled by the voltage to apply to the gate.



Resistor







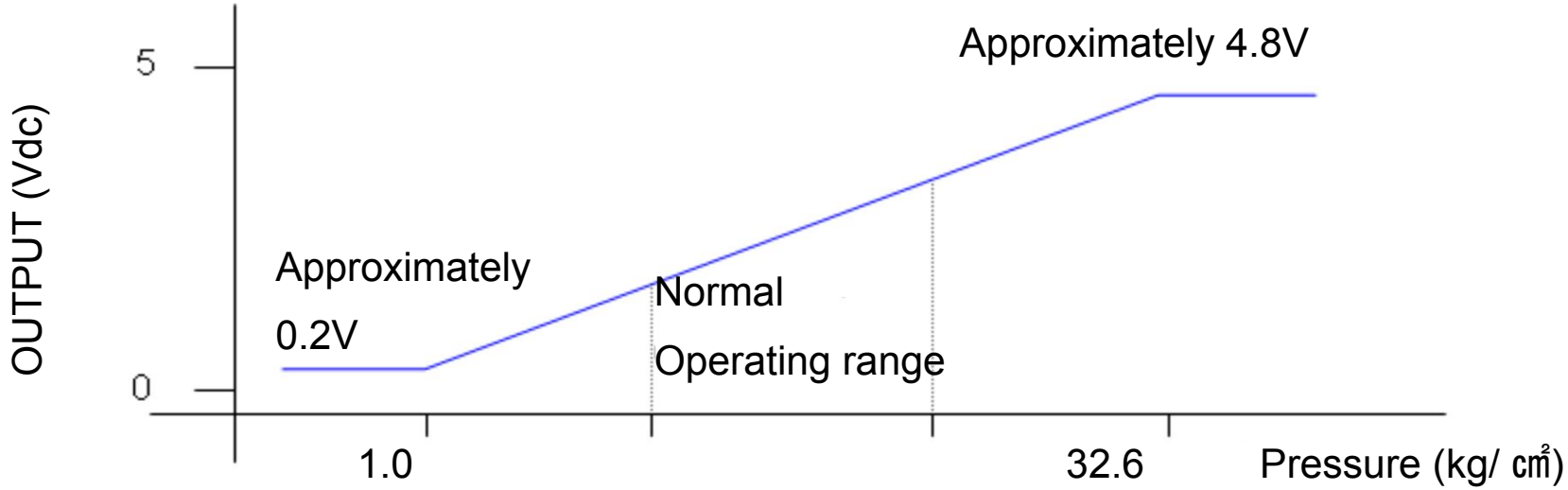
CIRCUIT OF DIAGRAM

APT (Automotive Pressure Transducer)

1. Specification

- Supply voltage : 5.0V
- Operating temp. : -40℃ ~ 135℃
- Pressure range : 0 ~ 32 Kgf/㎠

2. Characteristics



Components (Auto)

Ambient sensor & AQS

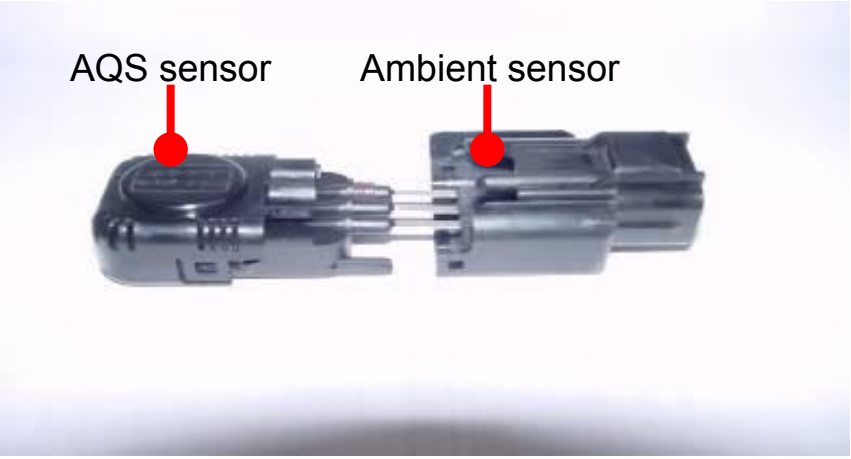
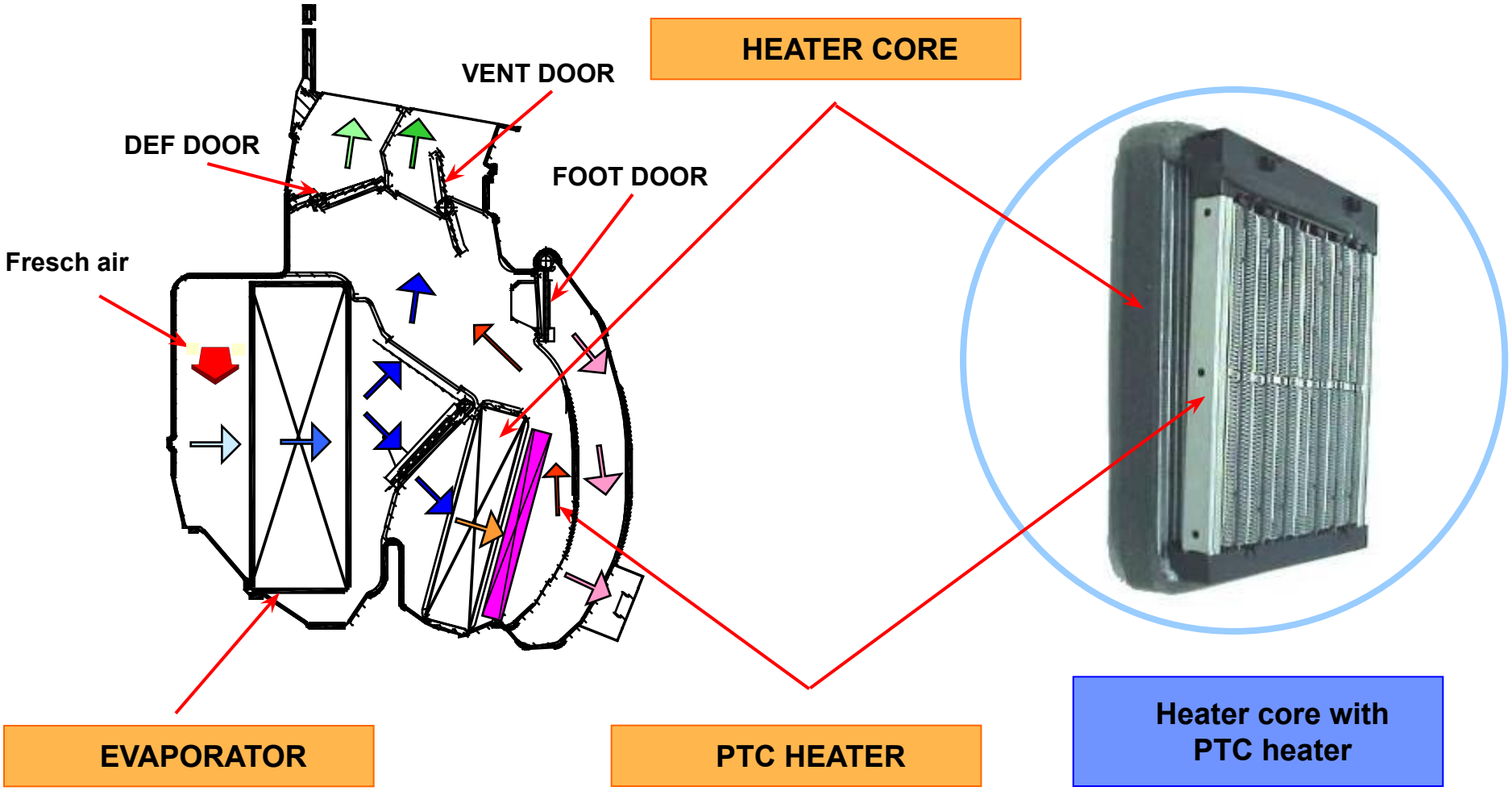


Photo sensor

In-car & Humidity sensor

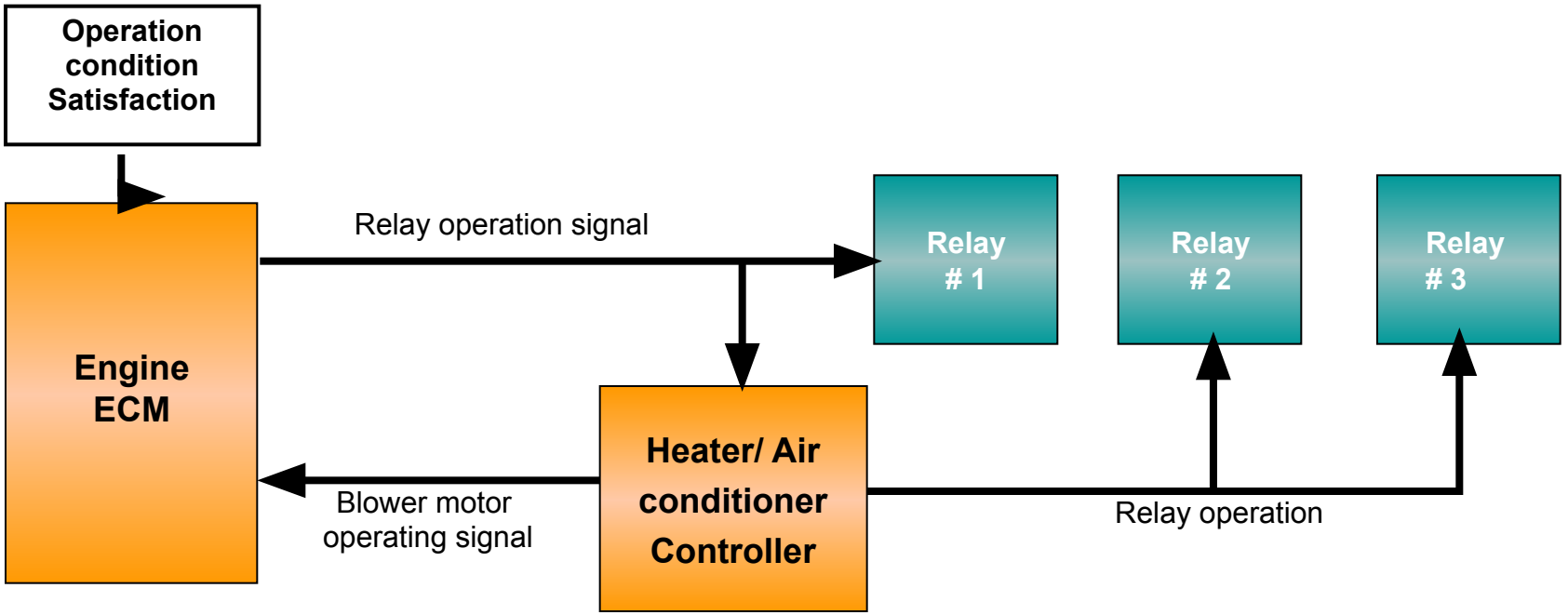
Water temperature sensor

PTC Heater


HEATER CORE
VENT DOOR
DEF DOOR
FOOT DOOR
Fresch air
EVAPORATOR
PTC HEATER
Heater core with
PTC heater

PTC Heater

Block diagram



* PTC 1(15 seconds) ⇒ PTC 1 + 2(15 seconds) ⇒
PTC 1 + 2 + **3*(15 seconds)**

3* : PTC relay 3 will be off if battery power is 11.5V or less

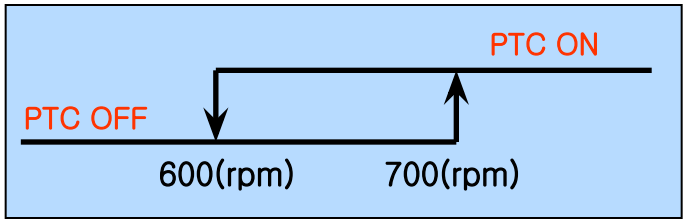
PTC Heater

PTC Heater operation condition

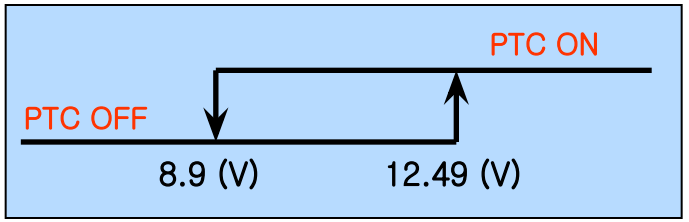
* Engine rpm: Over 700 RPM
* Ambient temperature : Below 5℃
* Battery voltage : 8.9V -OFF, 12.5V –ON
* Engine coolant temperature : Below 70℃
* Blower motor: ON
* Operating time: 6o minutes

PTC Heater operation pattern

* Engine rpm:



* Battery voltage



PTC Heater operation check

1.Method

- Mode: Vent, Bi-level or Floor
- Temperature: Full warm (HI)
- Blower motor: Off (Press OFF button)
- Air intake switch: Press the intake switch for 5 seconds.

2. Control

- LCD display blinks 30seconds per 0.5seconds.
- Blower switch: Press the blower switch.
- PTC Heater relay 2 and 3 operates for 30seconds.

3. Operation release

- Press A/C or Intake switch, or ignition switch off.
- After PTC Heater operation for 30 seconds, it will turns off automatically.
- It will go to initial condition (A/C off, Fresh mode), when PTC Heater operation checks release.

Failsafe (Manual)

Failsafe mode

NO	ITEM	FAILURE CONDITION	FAILSAFE
1	Evaporator sensor	Less than 0.1V or Higher than 4.9V	Compressor OFF
2	Temp. door potentiometer		Fix at the position
3	Mode door potentiometer		
4	Intake door potentiometer		

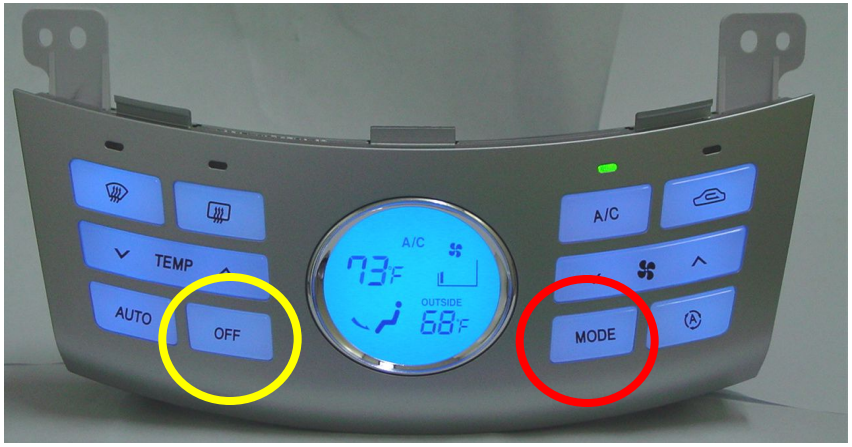
Failsafe (FATC)

A/C sensor failsafe mode

NO	ITEM	FAILURE	FAILSAFE
1	In-car sensor	Short to battery or open	Replaced by 25℃
2	Ambient sensor		Replaced by 20℃
3	Evaporator sensor		Replaced by -2℃
4	Water temperature sensor		Replaced by -2℃
5	Temp. door potentiometer		※ 17℃ ~ 24.5℃ : fix to MAX COOL ※ 25.0℃ ~ 32℃ : fix to MAX HOT
6	Mode door potentiometer		※ At Vent mode : fix to Vent mode ※ At other mode : fix to DEF mode
7	Intake door potentiometer		※ Fix to FRE / REC mode
8	Photo sensor		Correction control inhibited
9	AQS		Control inhibited
10	Humidity sensor		Replaced by humidity 10%

Failsafe (FATC)

DTC reading procedure



Keep pressing

Press mode 4 times

Ignition switch : **OFF→ON**

Press the **MODE** switch more than 4 times within 2 seconds during pressing the **OFF** switch.

After graphic symbol display blinks 3times, start self-diagnosis

Self-diagnosis (Continuous operation)

Press AUTO

Press AUTO

Self-diagnosis (Step operation by A/C SW)

Press OFF

Press OFF

Return to original condition

Failsafe (FATC)

DTC list (Binary code displayed on the controller)

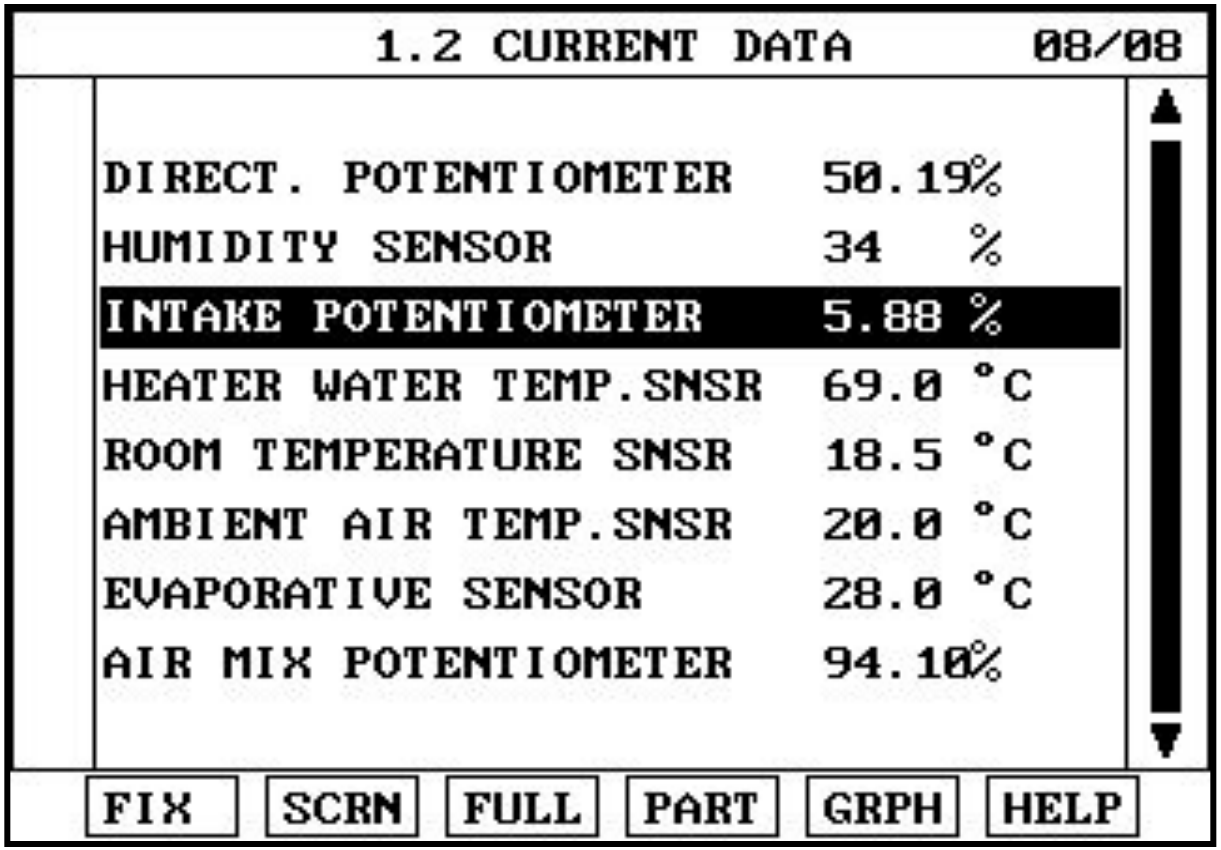
DTC	DESCRIPTION
00	NORMAL
11	INCAR SENSOR OPEN
12	INCAR SENSOR SHORT
13	AMBIENT SENSOR OPEN
14	AMBIENT SENSOR SHORT
15	WATER TEMP SENSOR OPEN
16	WATER TEMP SENSOR SHORT
17	EVAP SENSOR OPEN
18	EVAP SENSOR SHORT
19	TEMP DOOR POTENTIOMETER OPEN/SHORT(DRIVER SIDE)
20	DEFECTIVE TEMP DOOR POTENTIOMETER
21	MODE DOOR POTENTIOMETER OPEN/SHORT(DRIVER SIDE)
22	DEFECTIVE MODE DOOR POTENTIOMETER
23	HUMIDITY SENSOR OPEN
24	HUMIDITY SENSOR SHORT

Failsafe (FATC)

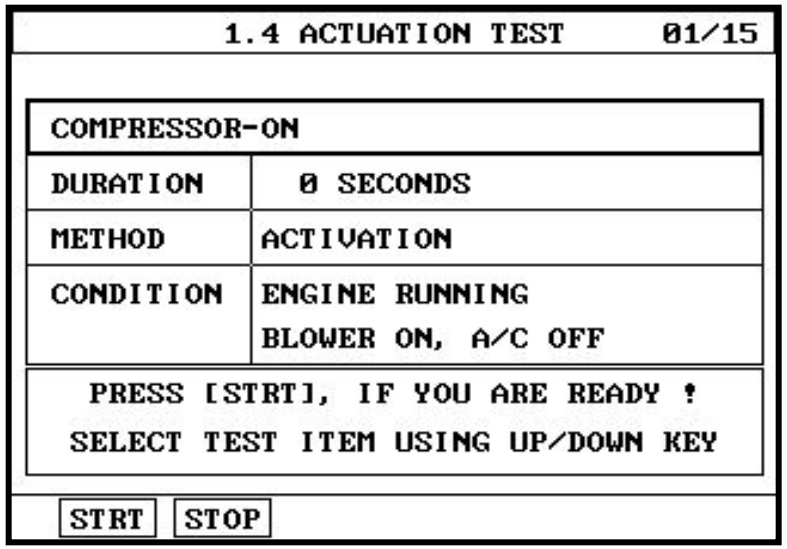
DTC list (Binary code displayed on the controller)

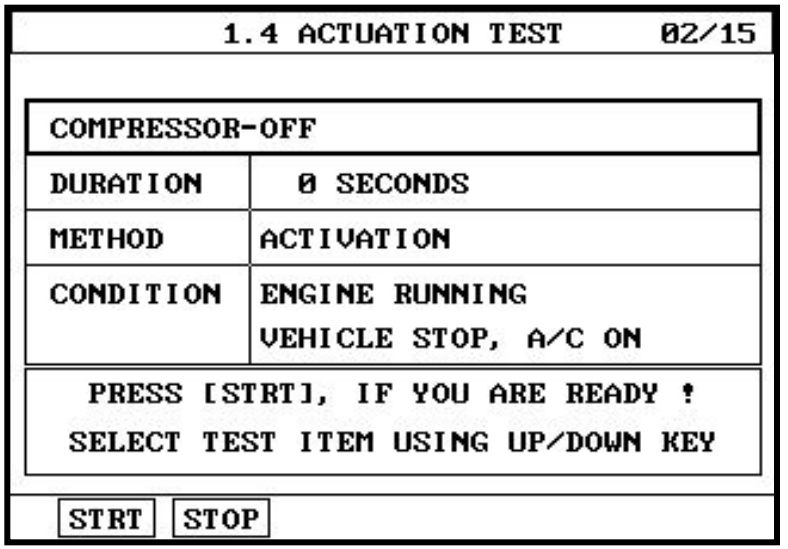
DTC	DESCRIPTION
25	INTAKE DOOR POTENTIOMETER OPEN/SHORT
26	DEFECTIVE INTAKE DOOR POTENTIOMETER
27	AQS SENSOR OPEN
28	AQS SENSOR SHORT
31	DEFECTIVE AQS SENSOR

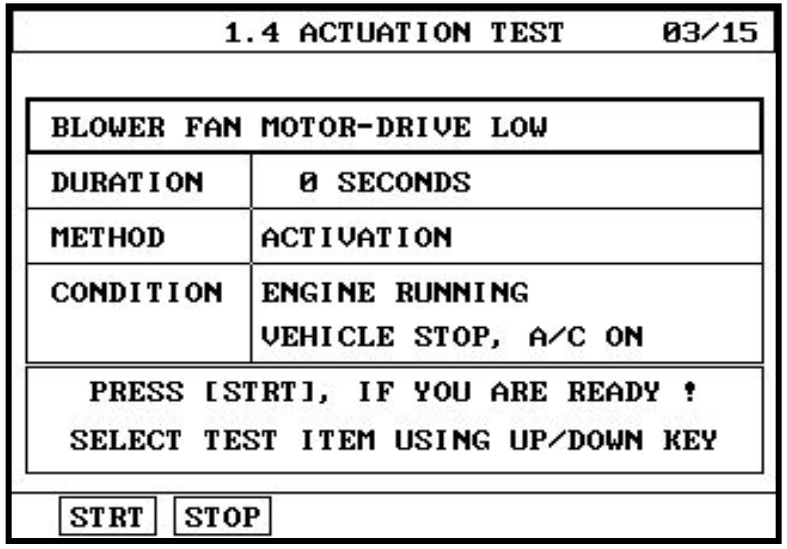
Hi-scan (current data) – 8 items

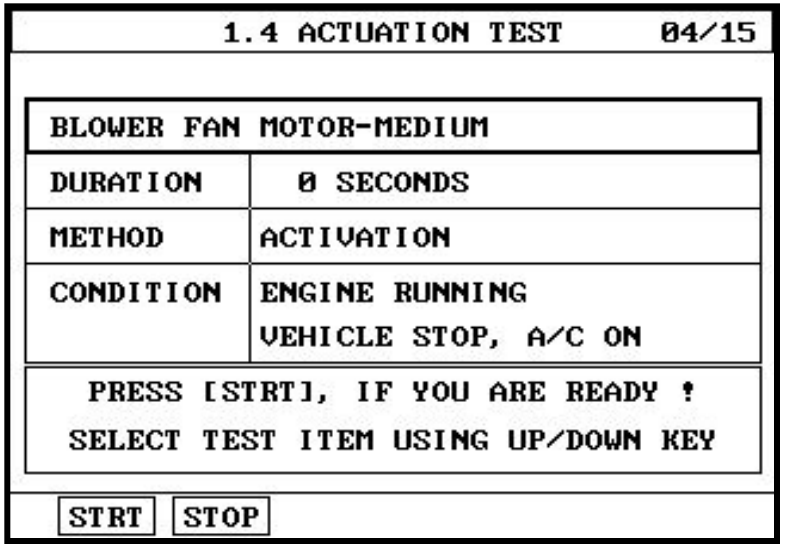


Hi-scan (Actuator test)

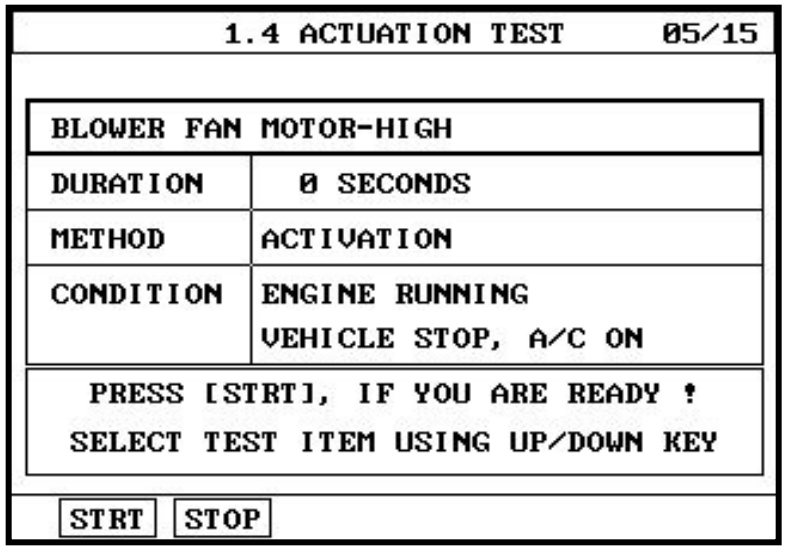


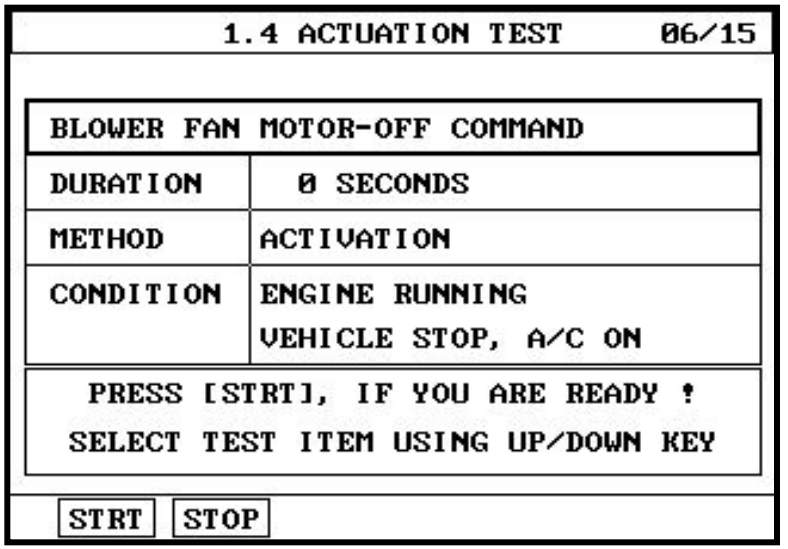


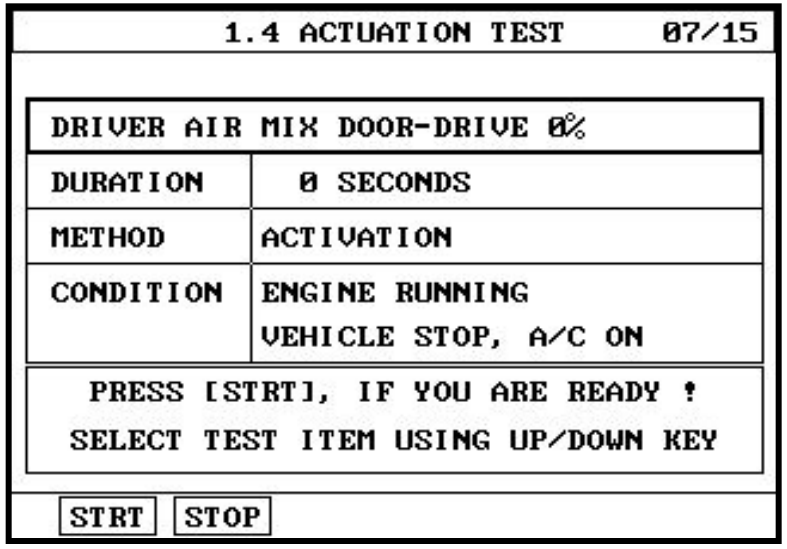


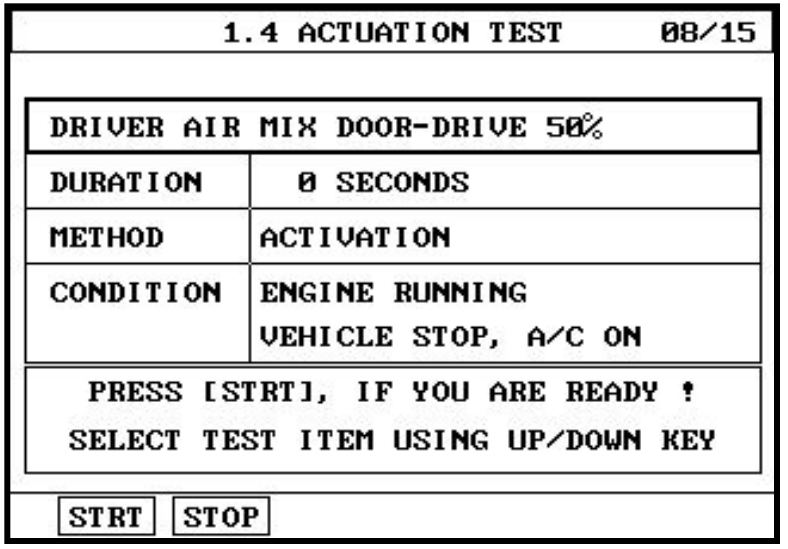


Hi-scan (Actuator test)









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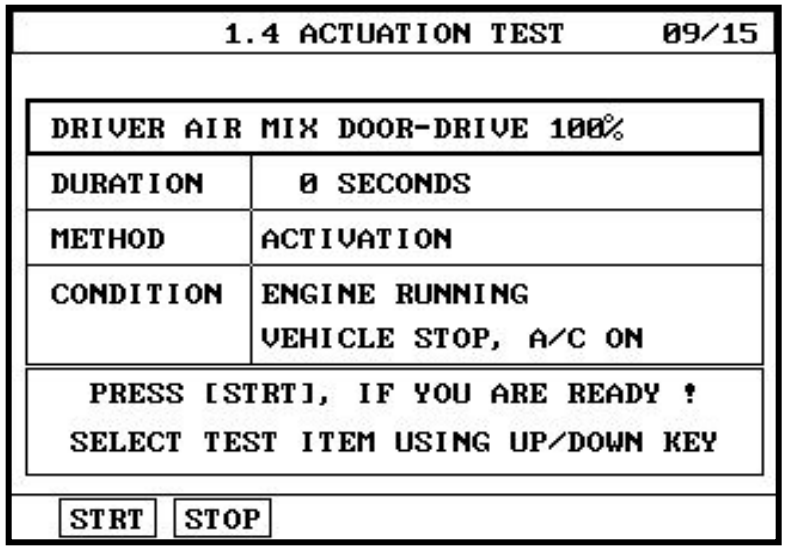

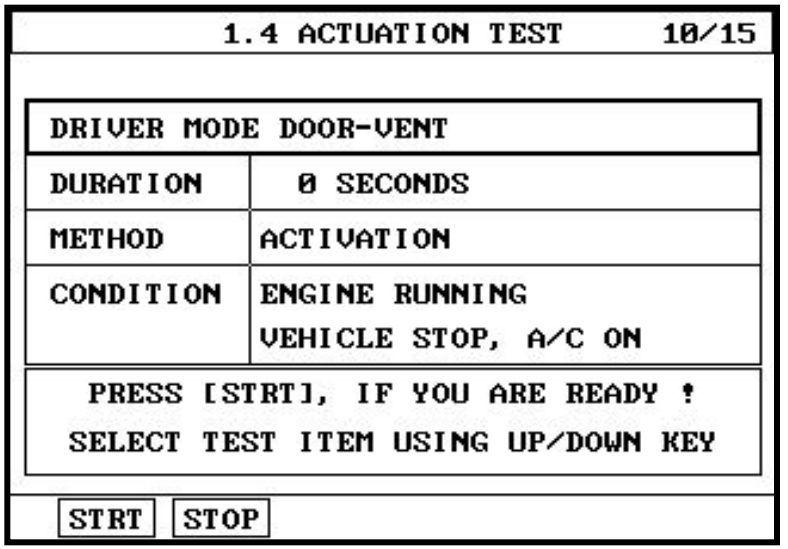

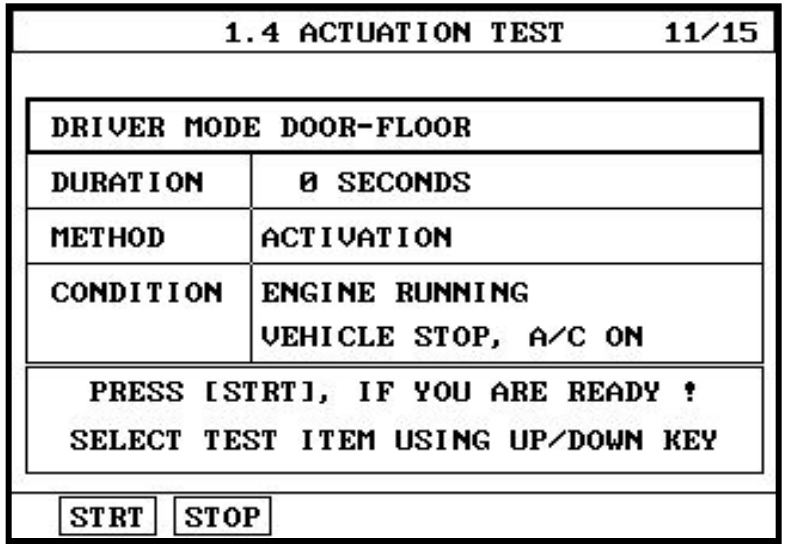

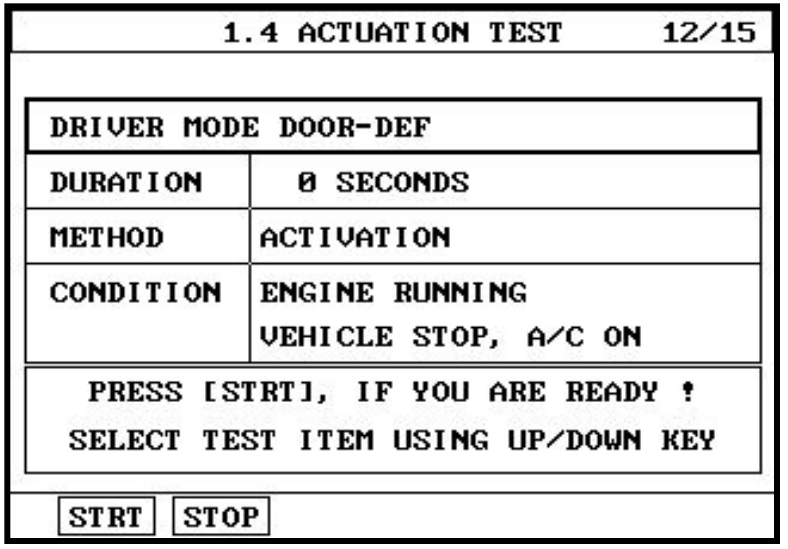

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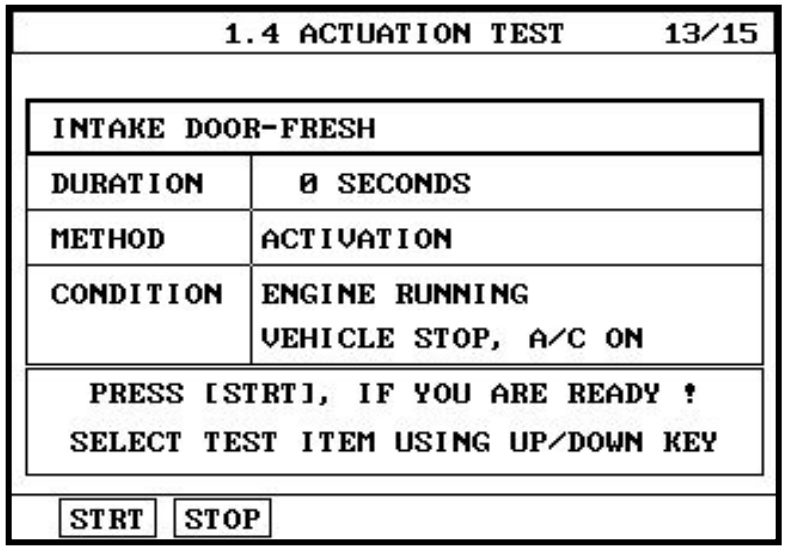
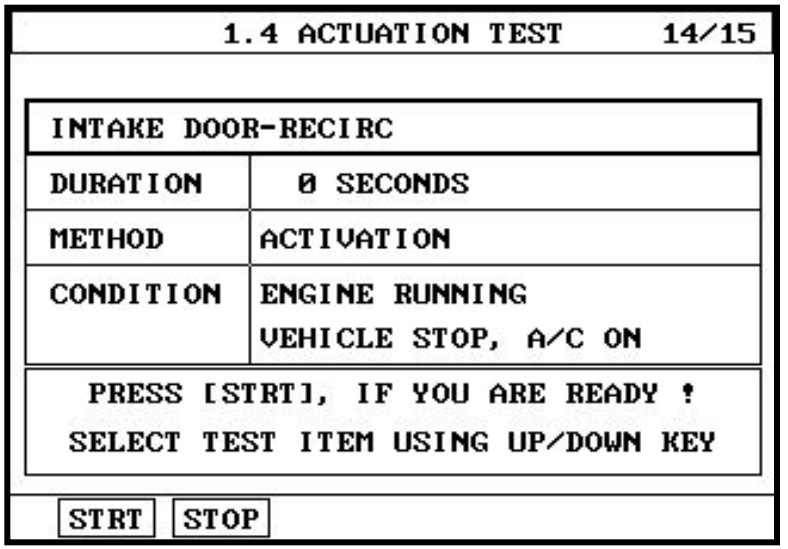
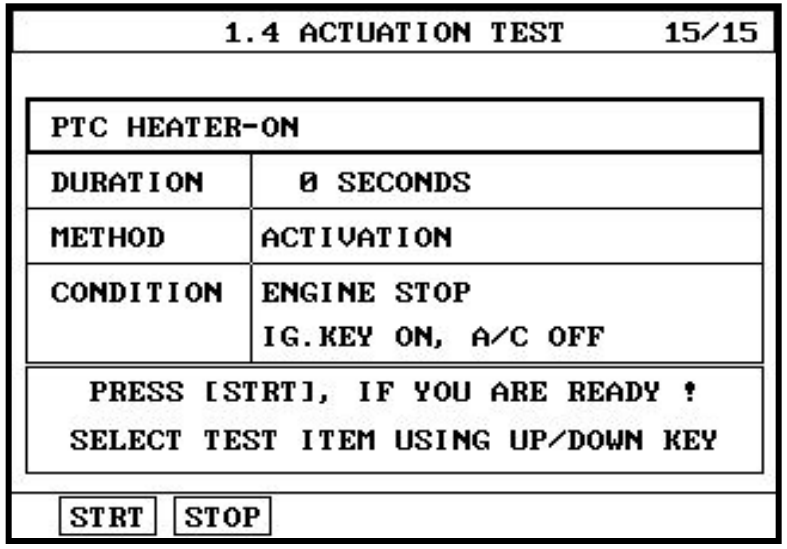
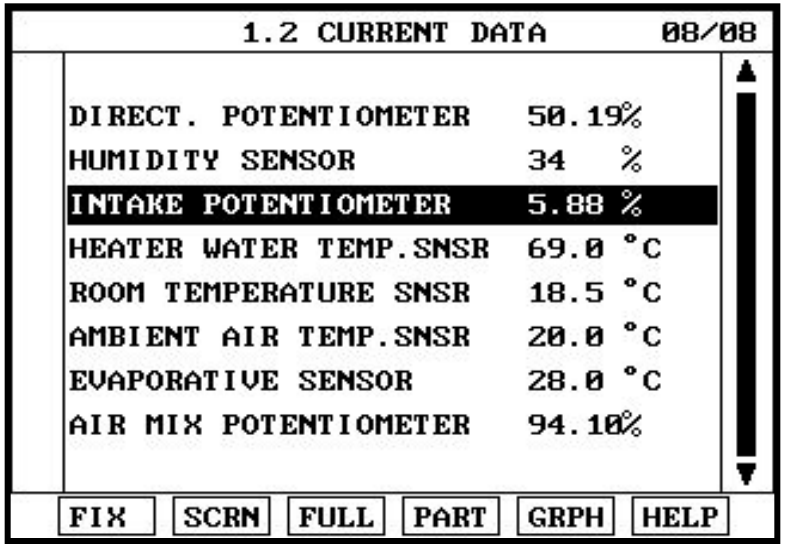
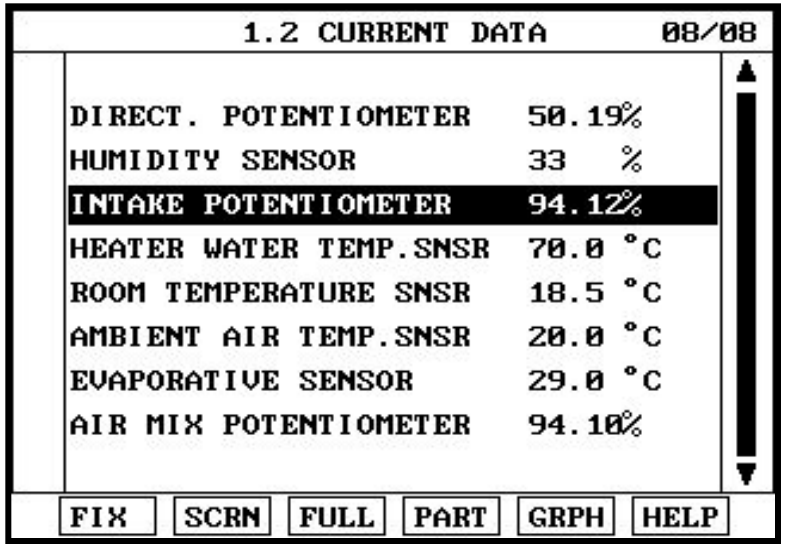






Intake door value change





Identification check

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        1.6 . IDENTIFICATION CHECK
   MODEL   : ELANTRA(HD)06-
   SYSTEM  : FULL AUTO AIR/CON.

    VEHICLE : HD

    PART NO : 97250-3K600

    PART NAME : CONTROL ASS'Y-FATCK
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