4. SERVICING

4.1 General description of servicing

(1) Test run

(a) Kinds of test run (Definition of terms)

Terms	Starting method	Ending method	Operation mode after test run	Complement
1. Water pump test run ・Operation of the water pump only ・Operation for purging air in the water circuit	At Run or Pause, start test run with one of following procedures ① Start operation from [Water pump test run] function of the R/C ② Switch ON the DIP switch SW5-2 on the PCB of the heat pump water heater	① Switch OFF the DIP switch SW5-2 on the PCB of the heat pump water heater ② Pause operation by pushing the Run/Pause switch of R/C	Return to the status (Run or Pause) before starting test run	<Action at water pump test run> Water pump: Operated at 3000min^{-1} Flow regulator (CWDV1): Fully open
2. Primary setting of operation ・Corresponding to the case that the installation was done without observing installation limitation. ・Judging the stability of the supply hot water temperature by operating the compressor and water pump at a certain speed. ・Above operation ends after 30 minutes have elapsed at the minimum, but if the stability of the supply hot water temperature cannot be judged, it operates for 120 minutes at the maximum. ・After the end of operation, correct the opening of flow regulator.	Despite Run or Pause, start operation with one of following methods ① Start operation from [Primary setting of operation] function of R/C ② Switch ON the DIP switch SW5-1 on the PCB of the heat pump water heater			Despite the "primary setting of operation" does not end (In case of ending condition ① − ④), it moves to normal operation * If the supply hot water temperature is not stable, It is possible to correct the opening of flow regulator by implementing [Primary setting of operation] again * It is possible to start [Primary setting of operation] from operating status.
		① Switch OFF the DIP SW5-1 on the PCB of the heat pump water heater	Pause	
		② Pause operation by pushing the Run/Pause switch of R/C	Pause	
		③ Send pause operation command by the external input	Pause	
		④ After 120 minutes have elapsed. (Forcible stop by time-up)	Pause	
		⑤ End operation normally	Pause	Move to normal operation
	③ Start operation to top up, to warm up or to fill up without the primary setting of operation	⑥ After the end of test run, start normal operation without pausing	Operation to top up or to fill up	It is possible to check that [Primary setting of operation] is unfinished, interrupted or completed with Mente PC
3. Normal operation (Test run) ・Collect the operation data by operating normal operation.	① Start operation by pushing [Manual operation to fill up] switch on R/C	① Pause operation by pushing the Run/Pause switch of R/C	Pause	Even if the operation starts by pushing Run/Pause switch, when the hot water amount in the cylinder is more than the target hot water amount, it cannot be operated.(the message of "It is in operation by standby" is displayed) In this case, collect the operation data by pushing [Manual operation to fill up] switch.
		② Hot water amount reaches the target hot water amount	Standby	
		③ End operation to fill up	Standby	

Note 1) [Water pump test run] and [Primary setting of operation] can be started with the R/C or the PCB of the heat pump water heater, and can be end with both the R/C and the PCB of the heat pump water heater (Ex. To start with the R/C and to end with the PCB of heat pump water heater is also available.)
Note 2) [Water pump test run] and [Primary setting of operation] can be set from the master heat pump water heater only.
Note 3) If the [Primary setting of operation] is not completed, it can not go to [Normal operation]
Note 4) During the [Primary setting of operation], no adjustment of the valve opening is done.
Note 5) [Normal operation (fill up)] is forcibly stopped by time up after 10 hours have elapsed.

(b) Test run procedure

a. After completion of installation work, check water can be supplied to the hot water supply system and turn the power ON.
After setting the [Date] and the [Time] , the following TOP screen (Screen 1-1) is displayed on the R/C.
∗ At this time, The mode of operation is [Pause]

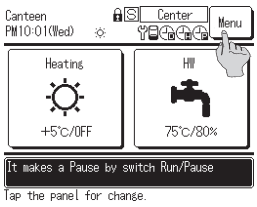
Caution 1

After servicing , according to this test run procedure, implement [Water pump test run] and [Primary setting of operation] as well.
Furthermore, check no error is existing on the R/C setting of [Date] and/or [Time]
If wrong setting of [Date] and/or [Time] is done, it may cause to charge higher tariff than anticipated by the customer because the night tariff is not applied.

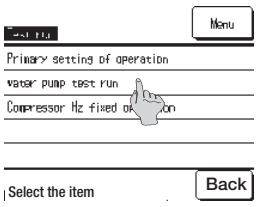
b. Implement water pump test run
Check the heat pump unit is in Pause mode and **switch ON the SW5-2 on the PCB of the heat pump unit.**
∗ Please check the message of "It makes a pause by switch Run/Pause" displayed on the display section of the TOP screen of R/C (Screen 1-1)

Water pump test run can also be done with R/C. Implement [Water pump test run] according to the following procedure.
Check the message [In Pause mode] (screen 1-1) ⇒ [Menu] ⇒ [Installation setting] ⇒ [Input service password (9999)] ⇒ [Test run] (screen 1-2) ⇒ Water pump test run] (screen 1-3)

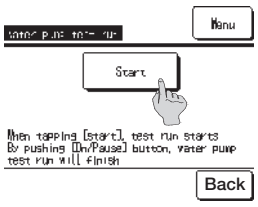
Screen 1-1



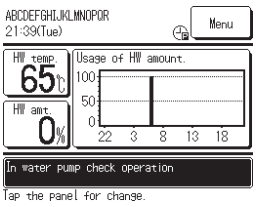
Screen 1-2



Screen 1-3

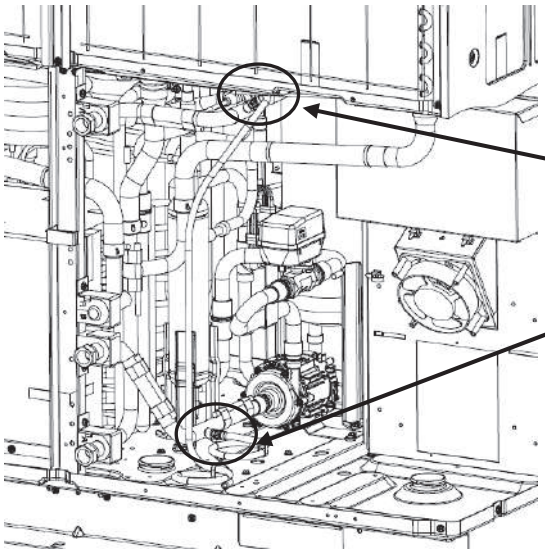


Screen 2-1



During pause, the message "It makes a pause by switch Run/Pause" is displayed on the TOP screen.

c. When starting water pump test run, the message of " In water pump check operation" is displayed on the TOP screen (Screen 2-1)
At this time, purge air by operating the water pump.
• Air purge valve of heat pump unit (refer to the Figure 1 mentioned below.)
• Open the relief valve and drain valves of cylinder and secondary side of hot water supply system, and **check the water drawn off continuously**. (If gurgling sound can be heard, purging air is not completed.)



Air purge valve
∗ At water pump test run, only this valve should be opened.

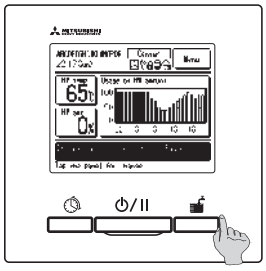
Drain valve
∗ When draining the heat pump unit, open this valve together with air purge valve.

Figure 1. Figure removed rear panel and right side panel of the heat pump water heater

d. After the end of water pump test run, **switch OFF the SW5-2 on the PCB of the heat pump water heater** and stop operation of water pump test run.

If stopping this operation with R/C, push Run/Pause switch at the TOP screen (Screen 3-1).

Screen 3-1



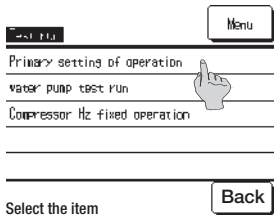
e. Please start [Primary setting of operation]

[Primary setting of operation] can be done by **switching ON the SW5-1 on the PCB of the heat pump water heater.**

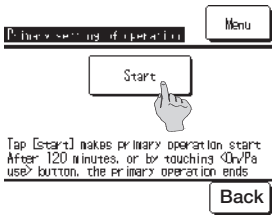
If starting this operation with R/C, it can be done according to the following procedure.

[Menu] ⇒ [Installation setting] ⇒ [Input service password (9999)] ⇒ [Test run] (Screen 4-1) ⇒ [Primary setting of operation] (Screen 4-2)

Screen 4-1



Screen 4-2

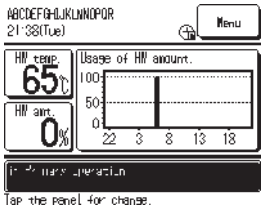


f. When the heat pump water heater starts operation of [Primary setting of operation], the message of "In Primary operation" is displayed on the TOP screen (Screen 5-1).

When the operation is completed, the heat pump water heater pauses and the message to "In Primary operation" is disappeared.

After ending [Primary setting of operation], please **switch OFF the SW5-1 on the PCB of the heat pump water heater.**

Screen 5-1



Caution 2

After the end of operation, even if the current hot water amount is less than the set hot water amount, the operation to top up can not start, because the heat pump water heater is in "Pause mode".

However, **the water pump may start operation for preventing the water in the water pipe from freezing.**

Caution 3

If [Primary setting of operation] is not done, **the anti-freezing operation cannot start during "Pause".**
(for preventing from breakdown of water pump due to a shortage of water)
If it is in danger of freezing water in the water pipe or when keep the system for long period without any operation, be sure to drawn off the water from the hot water supply system and turn the power OFF.

Caution 4

After completion of [Primary setting of operation], "2" is displayed at [Primary setting operation status] of Mente PC data

If this operation is not executed, "0" is displayed. If this operation is interrupted, "1" is displayed.

	Primary setting of operation		2	

∗ They are displayed on the [RAMDATA INDOOR] sheet

Note : The operation status of [Primary setting of operation] can also be checked with 7-segement display P30 as follows.

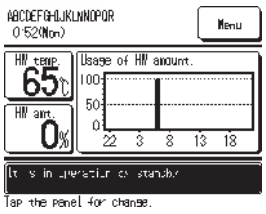
Not executed: P30-00
Interrupted: P30-01
Completed: P30-02

g. After completion of [Primary setting of operation], **make setting of the operation pattern with R/C according to the hot water supply load to meet customer's requirement** and start operation with Run/Pause switch (Screen 3-1).

Caution 5

If the hot water amount in the cylinder is more than the target hot water amount, the unit does not start operation.
In this case, **the message of " It is in operation by standby" is displayed on the TOP screen of R/C** (Screen 6-1)

Screen 6-1

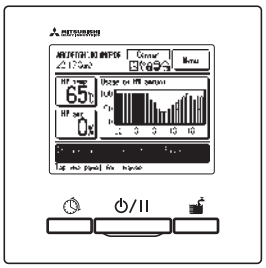


When the massage of " It is in operation by standby", please start operation to fill up by pushing [Manual operation to fill up] switch. (Screen 6-2)
When the heat pump water heater starts operation, the message of " In operation to fill up" is displayed (Screen 6-3).

Caution 6

If the hot water amount is 100%, the operation to fill up does not start operation.
Please ask the customer to use hot water to be at most 90% of hot water amount with mutual consent.
Fill up operation is forcibly stopped by time up after 10 hours have elapsed.

Screen 6-2



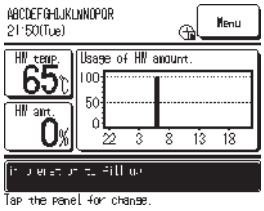
h. Check the operation status of the heat pump water heater with Mente PC and check each function is working properly.

Caution 7

Check following 2 points
- Protection control of compressor is activated or not.
- Check the controllability of hot water temperature by changing the setting temperature of hot water to 2 kinds of set points (ex. 65°C and 80°C) with R/C.

Furthermore, please check no problem such as leak and etc on the hot water supply system according to the inspection report of CO_2 heat pump water heater.

Screen 6-3



Caution 8

If implementing the manual operation to fill up, please stop the operation by pushing Run/Pause switch.
Furthermore check the message of " It is in operation by standby" is displayed on the TOP screen of R/C.
If the message of " It makes a Pause by switch Run/Pause" is displayed, the operation to fill up does not be implemented. Please be careful.
(In such case, please start operation by pushing Run/Pause switch.)

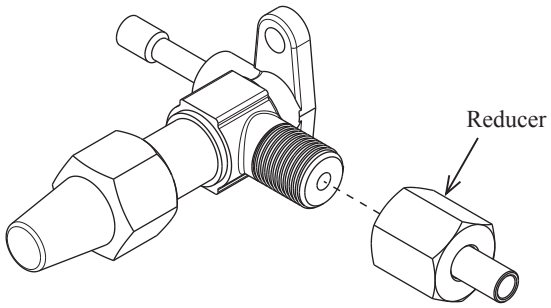
i. After end of the test run, **please clean up the strainers in the hot water supply system**.
After cleaning the strainers, **please implement [Water pump test run] and purge air again according to the item a-c of working procedure mentioned above, and check no leak.**

(c) Standard operation data

	Air temperature		Water temperature		Operating state								<Reference>	
	DB	WB	Inlet temperature	Outlet temperature	Compressor speed	HP	MP	LP	EEVG opening	EEVH opening	Tho-D	Tho-S	Water pump	CWFV1 opening
	℃	℃	℃	℃	rps	MPa	MPa	MPa	Pulse	Pulse	℃	℃	min^{-1}	%
Operation to top up in summer	25	21	24	65	83	10.35	5.81	4.45	260	310	86	17	2400	65
Operation to top up in intermediary season	16	12	17	65	80	9.89	5.37	4.16	190	380	85	12	2300	65
Operation to top up in winter	7	6	9	90	88	11.65	4.60	3.46	170	230	114	6	2500	35
Operation to top up at frosting	2	1	5	90	104	11.44	4.05	3.04	130	170	125	-2	2300	35
Operation to top up in winter at cold region	-7	-8	5	90	104	10.68	3.59	2.28	130	120	125	-12	2800	60
Operation to top up in winter at cold region ①	-15	-	5	90	104	9.95	3.37	1.83	150	90	121	-19	2500	30
Operation to top up in winter at cold region ②	-25	-	5	90	100	9.66	2.73	1.35	160	80	121	-28	3800	25
Operation to top up at overload	43	26	29	90	96	11.47	5.22	4.04	340	280	103	11	2400	35

(2) Method to purge CO_2 refrigerant

(a) Turn the power ON at the state that SW5-7 on the PCB of the heat pump water heater is switched ON.
With this procedure, operation is prohibited and EEVG1, EEVH1 and EEVH2 become fully opened.
(b) Turn the power OFF for safety.
(c) A joint (Reducer) to install on the service valve is included in the accessories. When performing the airtight test or vacuuming, finish the connection form of the joint according to purposes.



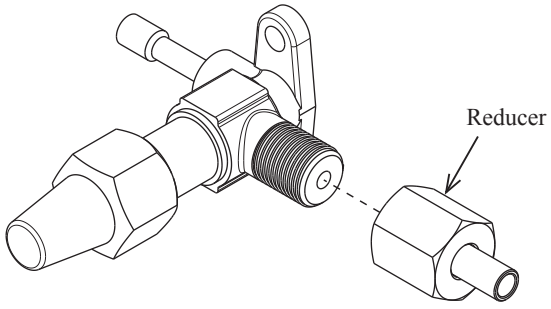
(d) Open the service valve little by little and purge the CO_2 refrigerant
(Note) If purging CO_2 refrigerant instantly, a lot of refrigerant oil may be purged together with the CO_2 refrigerant like dry ice. Accordingly be sure to purge it little by little.
And then, since CO_2 is 1.5 times as heavy as the air, do not purge it at a place such as manhole where CO_2 may stay.
(e) After purging almost of all amount of refrigerant charged in the heat pump water heater, attach a gauge manifold and purge the residual refrigerant merged into the refrigerant oil by using evacuation pump.
(f) After completion of purging work, switch OFF the SW5-7 on the PCB of the heat pump water heater.

(3) Method of air tightness test

(a) Please use nitrogen (N_2) gas for air tightness test with preparing new N_2 gas bomb.
(Note) There are 2 kinds of N_2 gas bombs. One of them has 19MPa inner pressure and the other has 15MPa inner pressure. Please use 2 bombs of 15MPa inner pressure one, which is containing $7m^3$ N_2 gas, for this air tightness test.
(b) Turn the power ON at the state that SW5-7 on the PCB of the heat pump water heater is switched ON.
With this procedure, operation is prohibited and EEVG1, EEVH1 and EEVH2 becomes fully opened.
(c) Switch ON the SW5-8 on the PCB of the heat pump water heater.
With this procedure, **only the EEVG1 becomes fully closed.** (It makes the high pressure side separated from the low pressure side)
(d) Turn the power OFF for safety.
(e) Connect the new N_2 gas bomb to the service valves of both high pressure side and low pressure side with charging hoses through a gauge manifold.
(f) Firstly implement air tightness test for only the high pressure side. Increase to 8.5MPa slowly and keep for 10 minutes. And then increase to 14MPa more slowly and keep for 10 minute and check no pressure drop.
(g) After that implement air tightness test for the low pressure side with keeping high pressure side as it is.
Increase to 8.5MPa slowly and keep 10 minutes and check no pressure drop.
(h) Purge N_2 gas by opening the gauge manifold little by little.
(i) After completion of purging work, switch OFF the SW5-7 and SW5-8 on the PCB of the heat pump water heater.

(4) Method of charging refrigerant

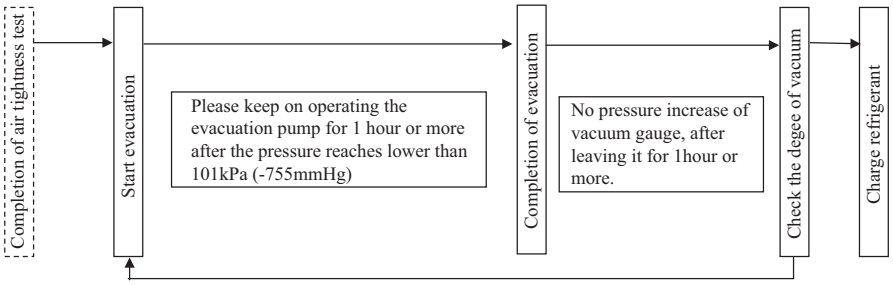
(a) Turn the power ON at the state that SW5-7 on the PCB of the heat pump water heater is switched ON.
With this procedure, operation is prohibited and EEVG1, EEVH1 and EEVH2 becomes fully opened.
(b) Turn the power OFF for safety.
(c) A joint (Reducer) to install on the service valve is included in the accessories. When performing the airtight test or vacuuming, finish the connection form of the joint according to purposes.



[Caution] The cautionary note for evacuation is same as that for R410A.

[Evacuation] Implement evacuation sufficiently for removing moisture in the refrigeration circuit.
* If the content percentage of moisture is high, it may cause clogging of EEVs and/or capillary tubes
* Turn the power ON after switching ON the SW5-7 and open EEVs fully.

<Work flow>



If the vacuum gauge shows pressure increase, it could have any moisture remaining or leaks in the refrigerant circuit. Please find leak point and after rectification, evacuate again.

(d) Charge refrigerant through the service valve of high pressure side. (Charging amount is 8.5kg. Normally it takes several minutes to complete charging
[Caution] Be sure to use the CO_2 refrigerant with 99.99% of purity and to use the siphon type bomb.
[Reason] Because of charging refrigerant at liquid stage, the siphon type bomb shall be used.
And then it shall be charged through the service valve of high pressure side in order to avoid liquid flooding.
(Do not heat the refrigerant bomb higher than 40℃ .)
(e) After charging refrigerant, shut the service valve and disconnect the gauge manifold.
[Caution] For your safety, remove the gauge manifold and check the pressure with Mente PC at the test run after charging refrigerant.
(f) Tighten the cap of service valve securely.
[Caution] Tightening torque of cap is 13N•m. On the other hand the service valve should be opened/closed manually.
(g) After completion of charging work, switch OFF the SW5-7 on the PCB of the heat pump water heater.

(5) Draining

(a) Turn the power OFF.
(b) Close the gate valve for the heat pump water heater. (Gate valve shall be equipped on site)
(c) Open the service panel of heat pump water heater and open the drain valve (lower side) and air purge valve (upper side) located in the heat pump water heater.
(d) After draining off, close the drain valve and air purge valve.

(6) Charging water to the unvented cylinder

(a) Check the power turned OFF.
(b) Check the drain valve and air purge valve closed.
(c) Open the gate valve for the heat pump water heater. (Water flow into the heat pump water heater)
(d) Open the air purge valve located in the heat pump water heater and check water comes out continuously.
(e) For the purpose of cleaning the cylinder, before the [Water pump test run], please drain off the water from the cylinder by opening the drain valve at the bottom of the cylinder and charge water to the cylinder again.
(f) After turning the power ON, implement the [Water pump test run]
(g) Open the drain valve again and check water is drawn off continuously.
(Note) In case of unvented cylinder, please check air purge twice, due to the feature of unvented cylinder.
(h) After completion of air purge, stop the [Water pump test run]

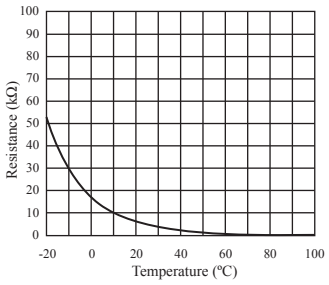
4.2 Error code list

Remote control Error code	LED on heat pump water heater		7-segment display	Contents of inspection
	Green	Red		
No display	Keep flashing	Stay off	Normal	Power line anomaly
				No display
E1	Keep flashing	Stay off	Normal	Communication error between remote control and heat pump water heater
E10	Keep flashing	Stay off	Normal	Excessive connected number of heat pump water heaters to the remote control
E31	Keep flashing	1-time flash	E31	Duplicated address No. of heat pump water heater Address setting error of heat pump water heater
E32	Keep flashing	1-time flash	E32	Open phase on power source Reverse phase on power source
E36	Keep flashing	1-time flash	E36-1	Discharge pipe temperature anomaly (Tho-D1)
E37	Keep flashing	1-time flash	E37-1	Heat exchanger temperature sensor 1 fault (Tho-R1)
		2-time flash	E37-2	Heat exchanger temperature sensor 2 fault (Tho-R2)
		3-time flash	E37-3	Heat exchanger temperature sensor 3 fault (Tho-R3)
		4-time flash	E37-4	Heat exchanger temperature sensor 4 fault (Tho-R4)
		5-time flash	E37-5	Fault of inlet water temperature sensor 1 on gas cooler (Tho-W1)
		6-time flash	E37-6	Fault of outlet water temperature sensor 2 on gas cooler (Tho-W2)
		Keep flashing	E37-7	Fault of inlet gas temperature sensor 1 on gas cooler (Tho-G1)
			E37-9	Fault of outlet gas temperature sensor 3 on gas cooler (Tho-G3)
E38	Keep flashing	1-time flash	E38	Outdoor air temperature sensor fault (Tho-A)
E39	Keep flashing	1-time flash	E39-1	Discharge pipe temperature sensor fault (Tho-D1)
		3-time flash	E39-3	Fault of inlet temperature sensor 1 on intermediate receiver (Tho-M1)
E40	Keep flashing	1-time flash	E40	High pressure anomaly (HP switch 63H1-1 activated)
E41	Keep flashing	1-time flash	E41-1	Power transistor overheat (for CM1) (5 times within 60 minutes)
E42	Keep flashing	1-time flash	E42-1	Current cut (for CM1)
E45	Keep flashing	1-time flash	E45-1	Communication error between inverter PCB and control PCB (CM1) High pressure anomaly (HP switch 63H1-1 activated)
E48	Keep flashing	1-time flash	E48-1	Outdoor fan motor 1 anomaly (FMo1)
		2-time flash	E48-2	Outdoor fan motor 2 anomaly (FMo2)
E49	Keep flashing	1-time flash	E49-1	Low pressure anomaly (LP sensor PSL1 activated)
E50	Keep flashing	1-time flash	E50	Flow volume anomaly in heating operation
E51	Keep flashing	1-time flash	E51-1	Power transistor 1 overheat (for CM1) (15 minutes continuously)
E52	Keep flashing	1-time flash	E52-1	Fault of hot water temperature sensor 1 on unvented cylinder (Tht-1)
		2-time flash	E52-2	Fault of hot water temperature sensor 2 on unvented cylinder (Tht-2)
		3-time flash	E52-3	Fault of hot water temperature sensor 3 on unvented cylinder (Tht-3)
		4-time flash	E52-4	Fault of hot water temperature sensor 4 on unvented cylinder (Tht-4)
		5-time flash	E52-5	Fault of hot water temperature sensor 5 on unvented cylinder (Tht-5)
		6-time flash	E52-6	Fault of hot water temperature sensor 6 on unvented cylinder (Tht-6)
		Keep flashing	E52-7	Fault of hot water temperature sensor 7 on unvented cylinder (Tht-7)
			E52-8	Fault of hot water temperature sensor 8 on unvented cylinder (Tht-8)
			E52-9	Fault of hot water temperature sensor 9 on unvented cylinder (Tht-9)
E53	Keep flashing	1-time flash	E53-1	Suction pipe temperature sensor 1 fault (Tho-S1)
		3-time flash	E53-3	Injection inlet temperature sensor 1 fault (Tho-inj1)
E54	Keep flashing	1-time flash	E54-1	Disconnection of low pressure sensor 1(PSL) Anomalous output of low pressure sensor 1
		2-time flash	E54-2	Disconnection of high pressure sensor 1(PSH) Anomalous output of high pressure sensor 1
		3-time flash	E54-3	Disconnection of intermediate pressure sensor 1(PSM) Anomalous output of intermediate pressure sensor 1
E55	Keep flashing	1-time flash	E55-1	Under-dome temperature sensor 1 fault (Tho-C1)
E56	Keep flashing	1-time flash	E56-1	Power transistor temperature sensor 1 fault (Tho-P1)
E58	Keep flashing	1-time flash	E58-1	Compressor anomaly by loss of synchronism (CM1)
E59	Keep flashing	1-time flash	E59-1	Compressor start-up failure (CM1)

Remote control Error code	LED on heat source water heater		7-segment display	Content of inspection
	Green	Red		
E60	Keep flashing	1-time flash	E60-1	Rotor position detection failure (CM1)
E61	Keep flashing	1-time flash	E61-1	Communications error between the master unit and slave unit 1
		2-time flash	E61-2	Communications error between the master unit and slave unit 2
		3-time flash	E61-3	Communications error between the master unit and slave unit 3
E63	Keep flashing	1-time flash	E63	Emergency stop , AF anomaly (set at adding active filter)
E64	Keep flashing	1-time flash	E64	Water pump anomaly (no operation)
				Water pump anomaly (excessive operation)
E89	Keep flashing	1-time flash	E89	Communication error between control PCB and CPU
No hot water comes out (1)	Keep flashing	Stay off	Normally	See troubleshooting (Page 192)
No hot water comes out (2)	Keep flashing	Stay off	Normally	See troubleshooting (Page 193)
No hot water comes out (3)	Keep flashing	Stay off	Normally	See troubleshooting (Page 194)
Anomalous sound and vibration (1)	Keep flashing	Stay off	Normally	See troubleshooting (Page 195)
Anomalous sound and vibration (2)	Keep flashing	Stay off	Normally	See troubleshooting (Page 196)

Maintenance code

Maintenance code is the signal to prompt service and maintenance, not to show anomaly.

7-segment display	Remote control display	Item	Remark
No.	No.		
Compressor operation hours			
oPE-1	M1	<In case that SW6-8 is OFF> When the cumulative operation hours of compressor has elapsed 5,000hr since the last maintenance, and it is between 4,900hr and 5,100hr. <In case that SW6-8 is ON> When the cumulative operation hours of compressor has elapsed 2,000hr since the last maintenance, and it is between 1,900hr and 2,100hr.	Synchronizing with the timing of alarming malfunction by the simple remote monitoring equipment
oPE-2	M2	<In case that SW6-8 is OFF> When the cumulative operation hours of compressor has elapsed 10,000hr since the last maintenance. <In case that SW6-8 is ON> When the cumulative operation hours of compressor has elapsed 5,000hr since the last maintenance	
oPE-3	M3	When the cumulative operation hours of compressor has elapsed 30,000hr since the last maintenance.	
Water pump operation hours			
oPE-11	M11	When the cumulative operation hours of water pump has elapsed 5,000hr since the last maintenance, and it is between 4,900hr and 5,100hr.	Synchronizing with the timing of alarming malfunction by the simple remote monitoring equipment
oPE-12	M12	When the cumulative operation hours of water pump has elapsed 10,000hr since the last maintenance.	
oPE-13	M13	When the cumulative operation hours of water pump has elapsed 20,000hr since the last maintenance.	
Setting error			
oPE-20	M20	Setting error for type of cylinder	Check setting of SW3-3 is OFF for sealed cylinder
oPE-21	M21	Setting error of heat pump water heater model	Kept SW4-1, -2, -3, -4 "OFF" (Factory default)
Error information			
oPE-30	M30	Detection of AF error	But E63 is not displayed
oPE-32	M32	Detection of drying up water	It is always displayed at test run
oPE-33	M33	Detection of disconnection of cylinder water temperature sensor	
oPE-34	M34	Detection of suspension of water supply	
oPE-35	M35	Detection of water pump error	
oPE-36	M36	Detection of excessive water flow during heating mode	Check the local equipment and adjust the water flow rate.
oPE-40	M40	・Message of [disconnection of cylinder temperature sensor] Hot water temperature sensor on the cylinder (Tht-1 to Tht-9) may be disconnected. Characteristics of HW temperature sensor  	・Check the connection and the charcteristics of all hot water temperature sensors on the cylinder and if there is a problem, connect it securely or replace it. ・If no problem on sensors, replace control PCB.

4.3 Troubleshooting

Error code	LED	Green	Red	Content
Remote control: No error code	Heat pump water heater	Keep flashing	Stay off	Power source anomaly (Power source to remote control)

1.Applicable model

All models

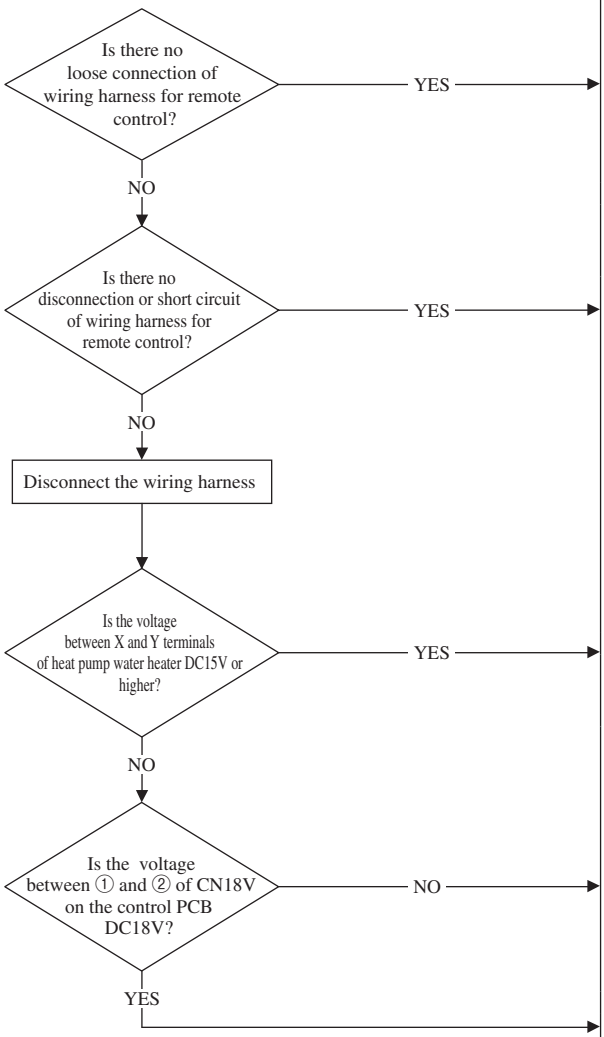
2.Error detection method

3. Condition of error displayed

4.Presumable cause

- Disconnection or short circuit of remote control wiring harness
- Remote control anomaly
- Malfunction by noise
- Power PCB anomaly
- Disconnection of wiring harness
- Control PCB anomaly

5.Troubleshooting



Note:

Error code	LED	Green	Red	Content
Remote control: No display	Heat pump water heater	Keep flashing	Stay off	No display on the remote control

1. Applicable model

All models

(In case of no display on the remote control)

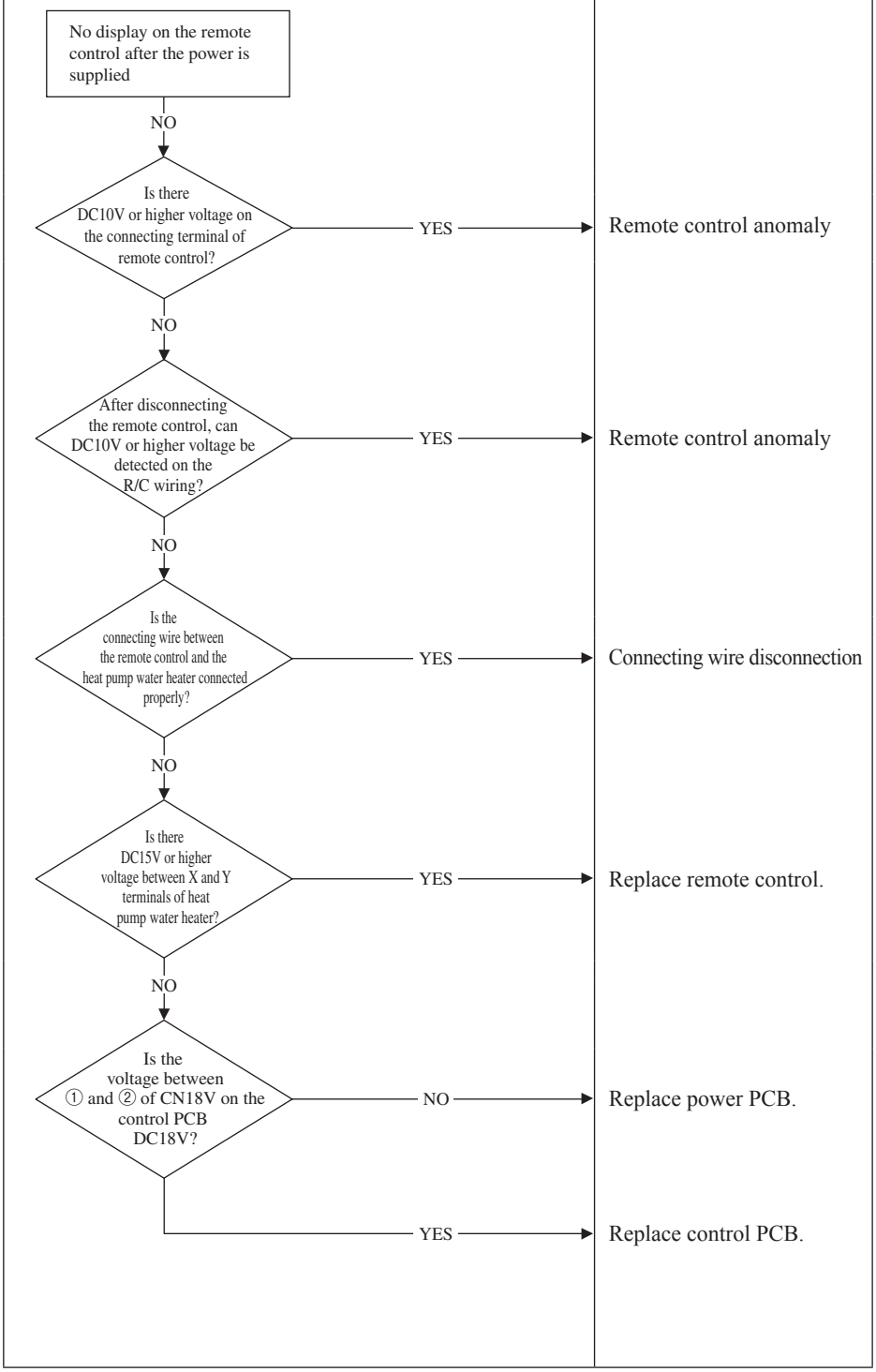
2. Error detection method

3. Condition of error displayed

4. Presumable cause

- Blown fuse
- Noise filter PCB anomaly
- Disconnection of wire between PCBs
- Power PCB anomaly
- Remote control anomaly
- Disconnection of remote control wire
- Heat pump unit control PCB anomaly

5. Troubleshooting



Note:

Error code	LED	Green	Red	Content
Remote control: E1 7-segment display: No display	Heat pump water heater	Keep flashing	Stay off	Communication error between remote control and heat pump water heater

1.Applicable model

All models

2.Error detection method

If the communication between remote control and heat pump unit cannot be established normally for 2 minutes or more during operation.
(It can be detected only by remote control.)

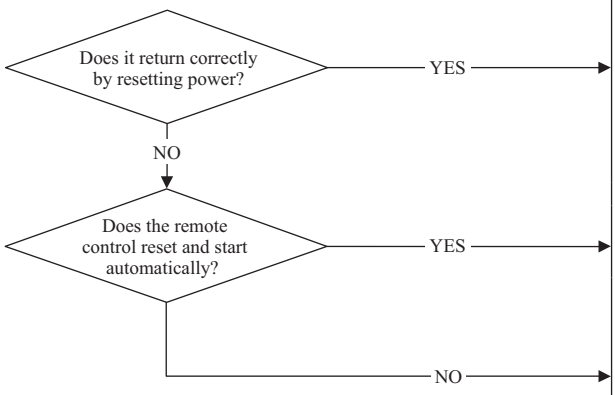
3. Condition of error displayed

Same as above

4.Presumable cause

- Anomaly of communication circuit between remote control and heat pump water heater
- Noise

5.Troubleshooting



* Check whether the message of "It is in operation by standby" is still displayed on the remote control, after 3 minutes or more have elapsed.

Note: If the heat pump water heater cannot communicate with remote control normally for 180 seconds, the PCB of the heat pump water heater automatically resets and starts

Error code	LED	Green	Red	Content
Remote control: E10	Heat pump water heater	Keep flashing	Stay off	Excessive No. of heat pump water heaters connected to one remote control

1.Applicable model

All models

2.Error detection method

When more than 17 sets of heat pump unit connected to one remote control are detected.

3. Condition of error displayed

Same as above

4.Presumable cause

- Excessive No. of units are connected
- Remote control anomaly

5.Troubleshooting

Diagnosis	Countermeasure
Are more than 17 sets of heat pump water heaters connected to one remote control? → NO	Remote control anomaly →Replace remote control.
Are more than 17 sets of heat pump water heaters connected to one remote control? → YES	Reduce connecting No. of units to 16 sets or less.

Note:

Error code	LED	Green	Red	Content
Remote control: E31 7-segment display: E31	Heat pump water heater	Keep flashing	1- time flash	Duplicated address No. of heat pump water heater Address setting error of heat pump water heater

1.Applicable model

All models

2.Error detection method

The microcomputer recognizes the address No. set on each heat pump water heater and checks whether any duplicated address is exsisting in the same system.

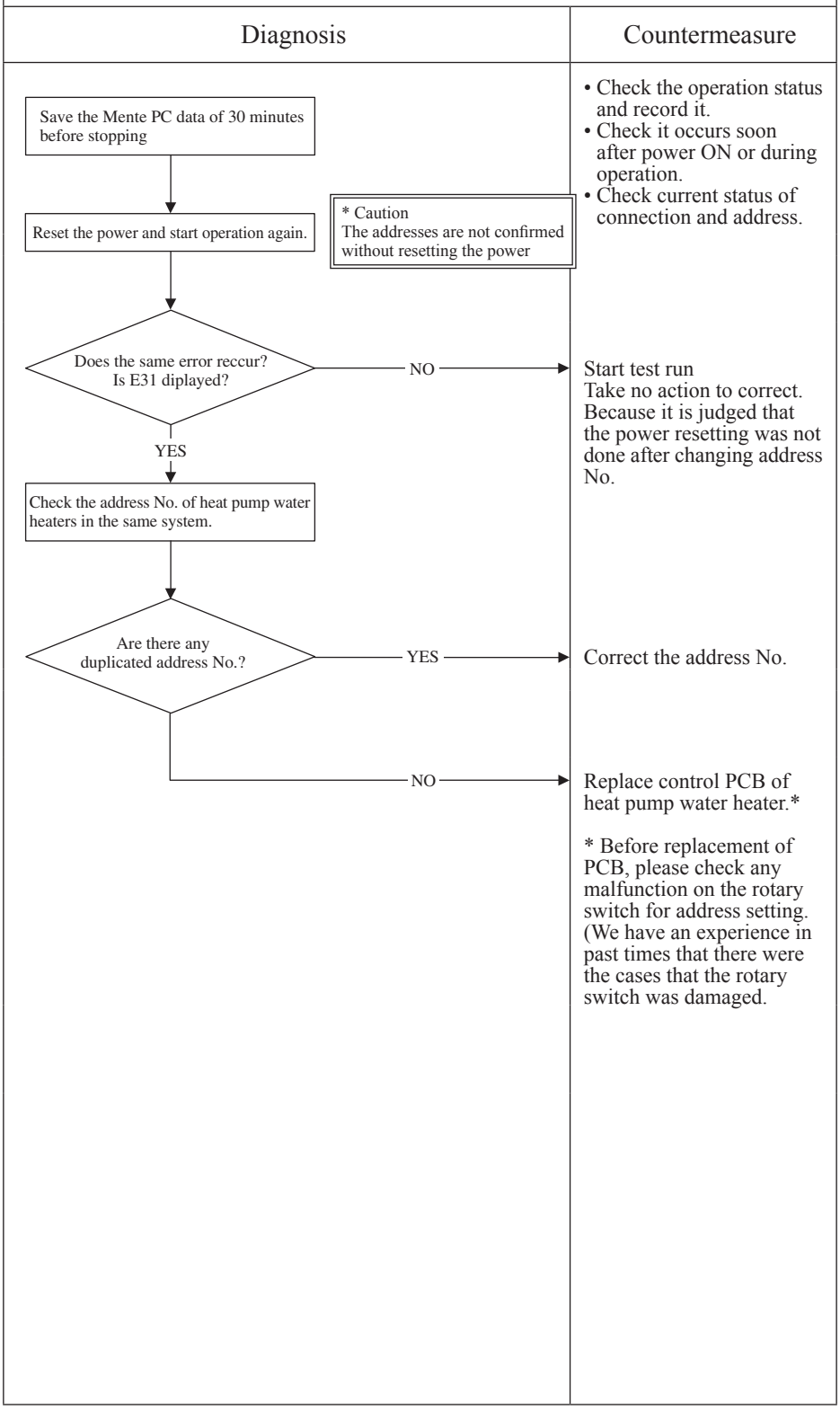
3. Condition of error displayed

When the duplicated address No. is detected in the same system

4.Presumable cause

- Mistake of setting address on heat pump water heater
- More than 17 units of heat pump water heater are connected.

5.Troubleshooting



Note: After correction, reset the power and check no error is displayed.
Addresses are not confirmed without resetting the power.

Error code	LED	Green	Red	Content
Remote control: E32 7-segment display: E32	Heat pump water heater	Keep flashing	1-time flash	Open phase of power line

1.Applicable model

All models

2. Error detection method

Check the power source voltage of inlet side of control PCB. (Check only L3-phase)

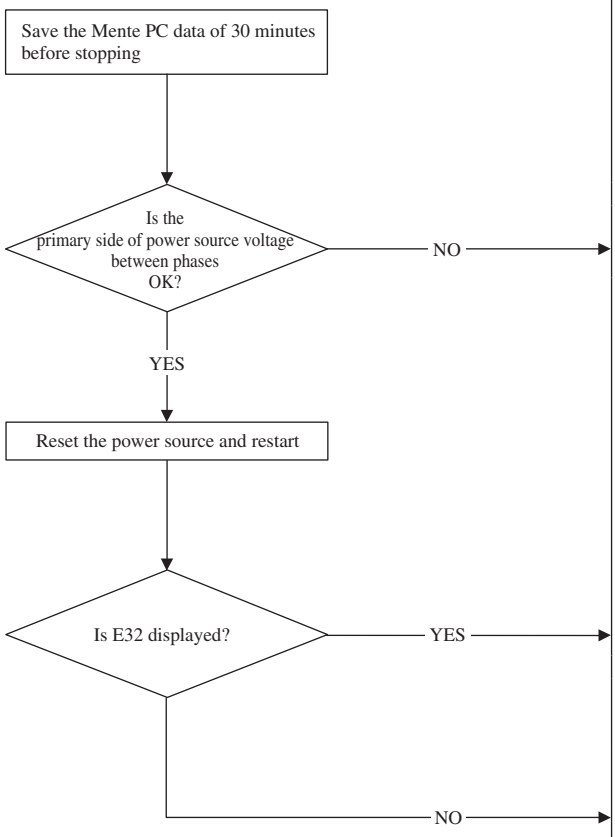
3. Condition of error displayed

If the power voltage between L3 and L1 phases or L3 and L2 phases becomes 0V.

4.Presumable cause

- Power source voltage failure on primary side
- Control PCB anomaly

5.Troubleshooting



Diagnosis	Countermeasure
Save the Mente PC data of 30 minutes before stopping	• Check the operation status and record it. • Check it occurs soon after power ON or during operation or during stopping. (When asking the customer to make rectification, it is much easier to explain the situation with these data.)
Is the primary side of power source voltage between phases OK? — NO	Ask the customer to make rectification
YES	
Reset the power source and restart	Check it under the operating conditions 30 minutes before error occurred as possible as you can.
Is E32 displayed? — YES	Replace control PCB.
NO	Check operation without any rectifications.

Note:

Error code	LED	Green	Red	Content
Remote control: E36 7-segment display: E36	Heat pump water heater	Keep flashing	1-time flash	Discharge pipe temperature anomaly

1.Applicable model

All models

2. Error detection method

If discharge pipe temperature sensor detects anomalous high temperature

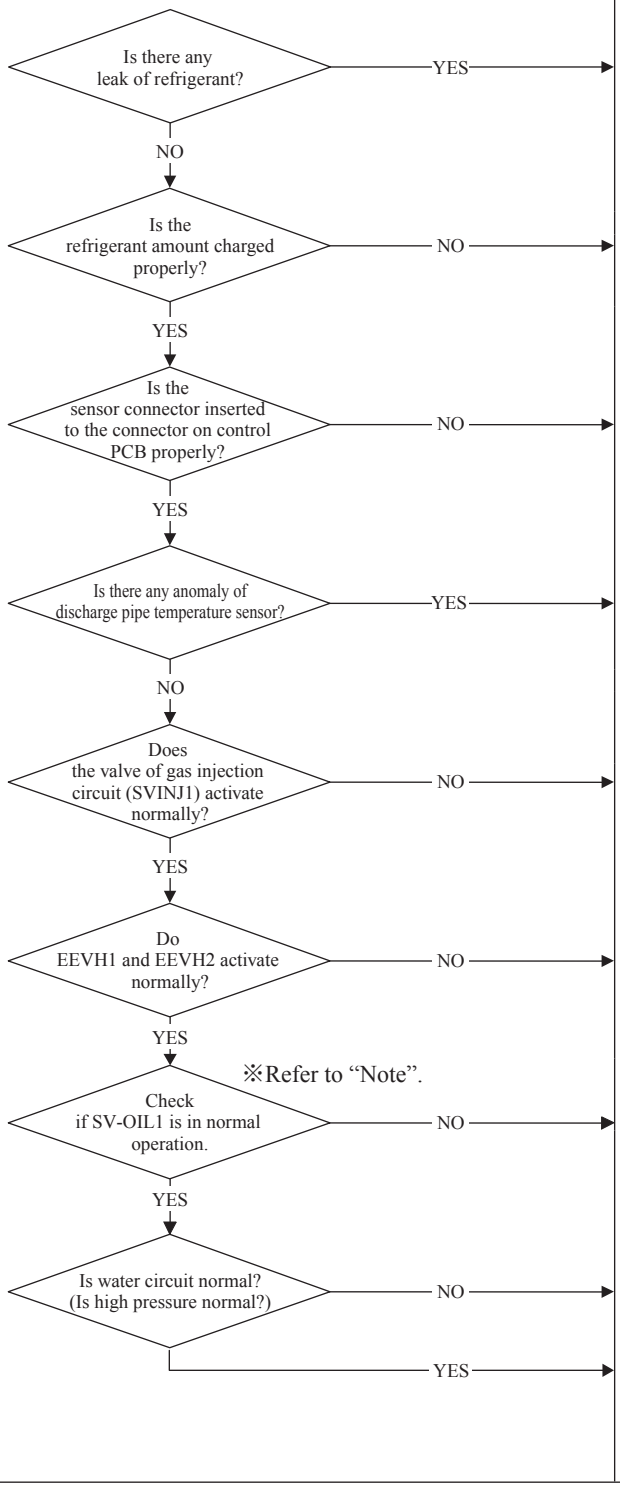
3. Condition of error displayed

If discharge pipe temperature sensor detects 135°C or higher for 2 seconds or compressor stops 3 times within 100 minutes

4. Presumable cause

- Discharge pipe temperature sensor anomaly
- Control PCB anomaly
- Leakage of refrigerant
- Lack of air flow volume
- Injection circuit malfunction
- Excessive suction superheat due to malfunction of EEV operation.
- Oil return line malfunction

5.Troubleshooting



Note: ※Winding wire resistance 1250Ω±10% (20℃)

Error code	LED	Green	Red	Content
Remote control: E37 *1 7-segment display: E37-1 to -9	Heat pump water heater	Keep flashing	*2	Outdoor heat exchanger sensor (Tho-R1, 2, 3, 4) anomaly Gas cooler temperature sensor (Tho-G1, 3, Tho-W1, 2) anomaly

*1 E37-1 to -4: Tho-R1 to -R4, E37-5, -6: Tho-W1, -W2, E37-7, -9: Tho-G1, -G3
*2 According to the kinds of sensors, from 1 to 6-time flash or keep flashing

1. Applicable model

All models

2. Error detection method

Detection of the anomalously low temperature (resistance value) of heat exchanger temperature sensors and gas cooler temperature sensors

3. Condition of error displayed

If the sensor detects anomalously low temperature for 20 seconds continuously after power ON.
Or if the sensor detects anomalously low temperature for 20 seconds continuously during normal operation after 2 minutes has elapsed since compressor ON.

4. Presumable cause

- Broken sensor harness or the internal wire of sensing section (Check the molded section as well.)
- Disconnection of sensor harness connection (connector)
- Control PCB anomaly

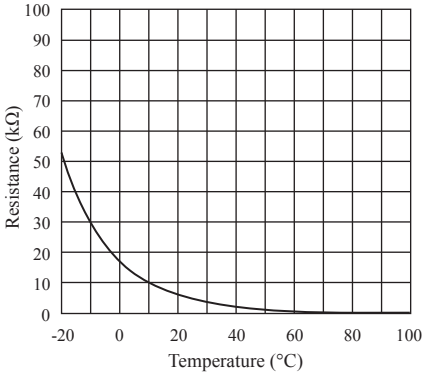
5. Troubleshooting

Diagnosis	Countermeasure
Save the Mente PC data of 30 minutes before stopping	• Check the operation status and record it. • Check it occurs soon after power ON or during operation or during stopping. • Check sensing value • Compare the temperature shown in Mente PC data to the acutal temperature measured with thermometer.
Is the connector of the anomalous sensor connected properly? — NO	Insert the connector securely
YES	
Are the characteristics of sensor OK? *3 — NO	Replace the temperature sensor.
YES	Replace the control PCB of heat pump water heater.

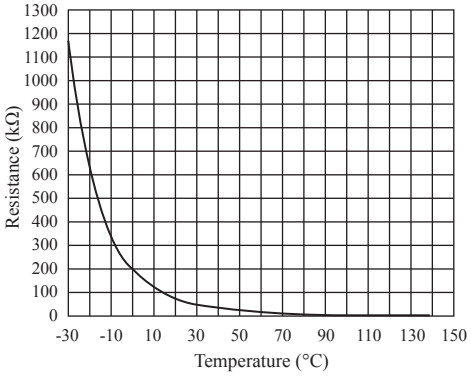
*3 Check several times to prove any poor connection

[Temperature-resistance characteristics]

Air heat exchanger temperature sensor (Tho-R1 to -R4)
Gas cooler temperature sensor (Tho-G3 and Tho-W1)



Gas cooler temperature sensor (Tho-G1 and Tho-W2)



Note:

Error code	LED	Green	Red	Content
Remote control: E38 7-segment display: E38	Heat pump water heater	Keep flashing	1-time flash	Outdoor air temperature sensor (Tho-A) anomaly

1. Applicable model

All models

2. Error detection method

Detection of anomalously low temperature (resistance) of outdoor air temperature sensor (Tho-A)

3. Condition of error displayed

If the sensor detects anomalously low temp for 20 seconds continuously after power ON.
Or if the sensor detects anomalously low temp for 20 seconds continuously during normal operation after 2 minutes has elapsed since compressor ON.

4. Presumable cause

- Broken sensor harness or the internal wire of sensing section (Check the molded section as well.)
- Disconnection of sensor harness connection (connector)
- Control PCB anomaly

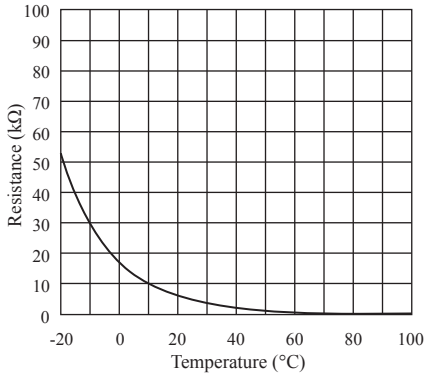
5. Troubleshooting

Diagnosis	Countermeasure
Save the data 30 minutes before stopping into the Mente PC	• Check the operation status and record it. • Check it occurs soon after power ON or during operation or during stopping. • Check sensing value • Compare the temperature shown in Mente PC data to the acutal temperature measured with thermometer.
Is the connector of the anomalous sensor connected properly? — NO	Insert the connector securely.
YES	
Are the characteristics of sensor OK? *1 — NO	Replace the temperature sensor (Tho-A).
YES	Replace the control PCB of heat pump water heater.

*1 Check several times to prove any poor connection

[Temperature-resistance characteristics]

Outdoor air temperature sensor (Tho-A)



Note:

Error code	LED	Green	Red	Content
Remote control: E39 *1 7-segment display: E39-1, 3	Heat pump water heater	Keep flashing	*2	Discharge pipe temperature sensor (Tho-D1) anomaly Intermediate receiver inlet temperature sensor (Tho-M1) anomaly

*1 E39-1: Tho-D1, E39-3: Tho-M1
*2 E39-1: 1-time flash, E39-3: 3-time flash

1. Applicable model

All models

2. Error detection method

Detection of anomalously low temperature (resistance) of Tho-D1 and/or Tho-M1

3. Condition of error displayed

If the sensor detects anomalously low temperature for 20 seconds continuously after power ON.
Or if the sensor detects anomalously low temperature for 20 seconds continuously during normal operation after 2 minutes has elapsed since compressor ON.

4. Presumable cause

- Broken sensor harness or the internal wire of sensing section (Check the molded section as well.)
- Disconnection of sensor harness connection (connector)
- Control PCB anomaly

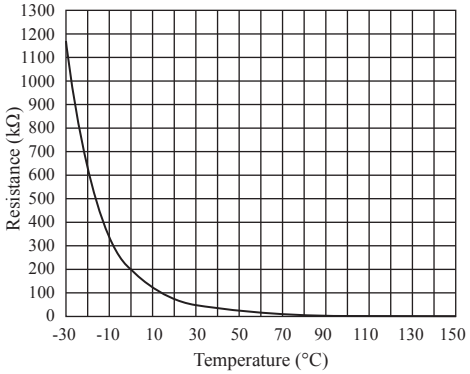
5. Troubleshooting

Diagnosis	Countermeasure
Save the Mente PC data of 30 minutes before stopping	• Check the operation status and record it. • Check it occurs soon after power ON or during operation or during stopping. • Check sensing value • Compare the temperature shown in Mente PC data to the acutal temperature measured with thermometer.
Is the connector of the anomalous sensor connected properly? — NO	Insert the connector securely.
YES	
Are the characteristics of sensor OK? *3 — NO	Replace the temperature sensor (Tho-D1 and/or Tho-M1).
YES	Replace the control PCB of heat pump water heater.

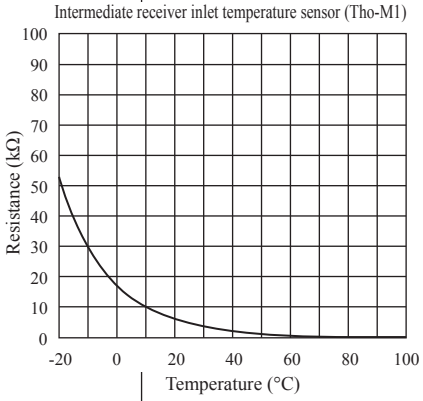
*3 Check several times to prove any poor connection

[Temperature-resistance characteristics]

Discharge pipe temperature sensor (Tho-D1)



Intermediate receiver inlet temperature sensor (Tho-M1)



Note:

Error code	LED	Green	Red	Content
Remote control: E40 7-segment display: E40	Heat pump water heater	Keep flashing	1-time flash	High pressure anomaly (63H1-1 activated)

1.Applicable model

All models

2.Error detection method

When high pressure switch 63H1-1 is activated

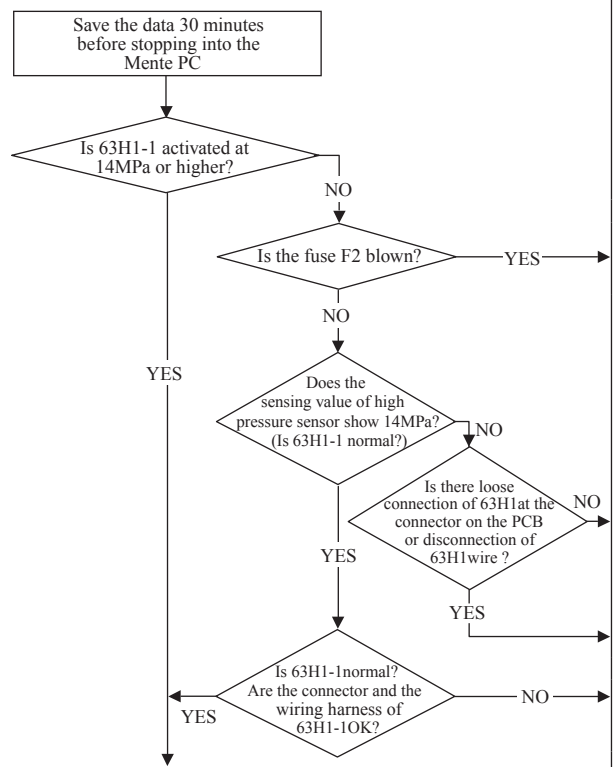
3. Condition of error displayed

- High pressure increases to 14MPa or higher.
- 63H1-1 is activated 5 times within 60 minutes.
- 63H1-1 is activated for 60minutes continuously.

4.Presumable cause

- Short-circuit of air flow at air heat exchanger/Disturbance of air flow/Clogging filter/Fan motor anomaly
- Control PCB anomaly
- Disconnection of high pressure switch connector
- Breakage of high pressure switch harness/Disconnection of connector
- Closed service valves
- High pressure sensor anomaly
- Oil return line malfunction

5.Troubleshooting



Note: If the same error does not reappear, continue to get data with Mente PC.
※Winding wire resistance 1250Ω±10% (20℃)

Error code	LED	Green	Red	Content
Remote control: E41 (E51) 7-segment display: E41 (E51) -1	Heat pump water heater	Keep flashing	1-time flash	Power transistor overheat

1.Applicable model

All models

2.Error detection method

When anomalously high temperature is detected

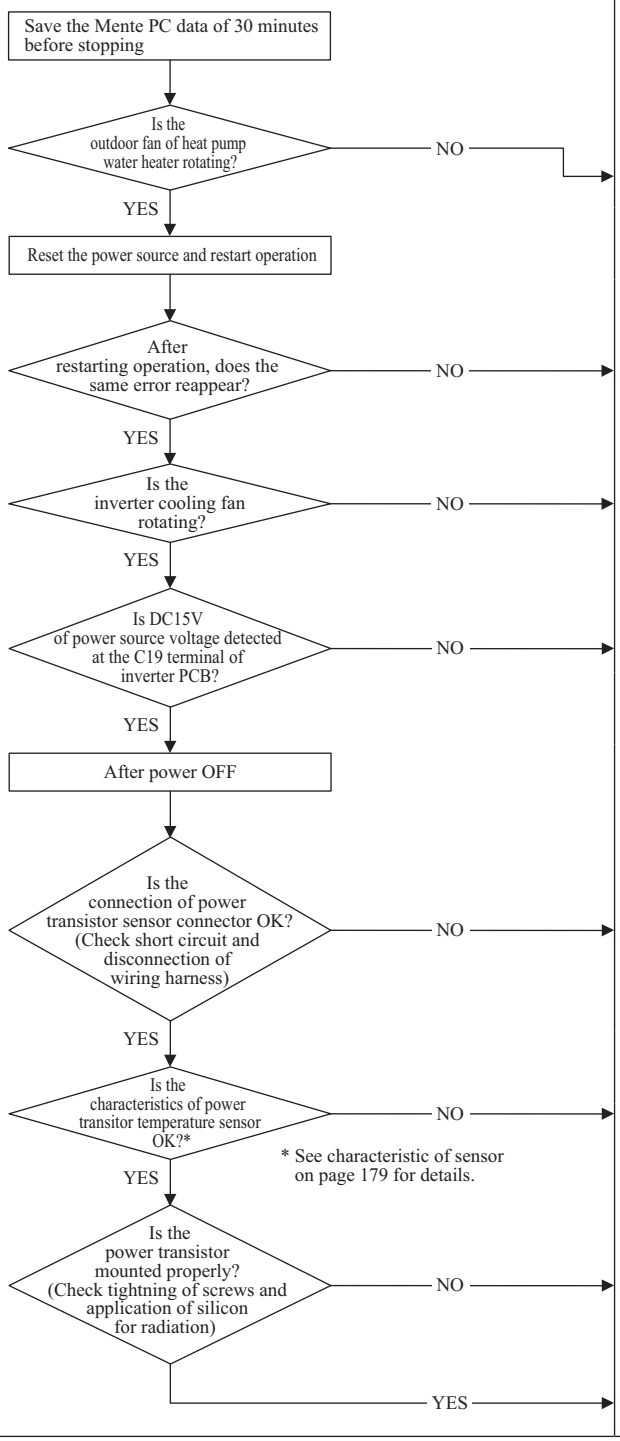
3. Condition of error displayed

Error signal from power transistor is detected 5 times within 60minutes. (E41)
Or error signal from power transistor is detected for 15 minutes continuously (E51)

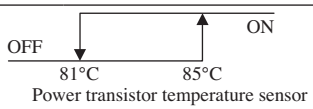
4.Presumable cause

- Power transistor anomaly
- Power transistor temperature sensor anomaly
- Anomalous power source to inverter PCB

5.Troubleshooting



Note: Inverter cooling fan is operated under the condition mentioned at right.
If the same error does not reappear, continue to get data with Mente PC.



Error code	LED	Green	Red	Content
Remote control:E42 7-segment display:E42	Heat pump water heater	Keep flashing	1-time flash	Current cut

1.Applicable model

All models

2.Error detection method

Detect the anomalous output current of inverter with the sensor built in the power transistor

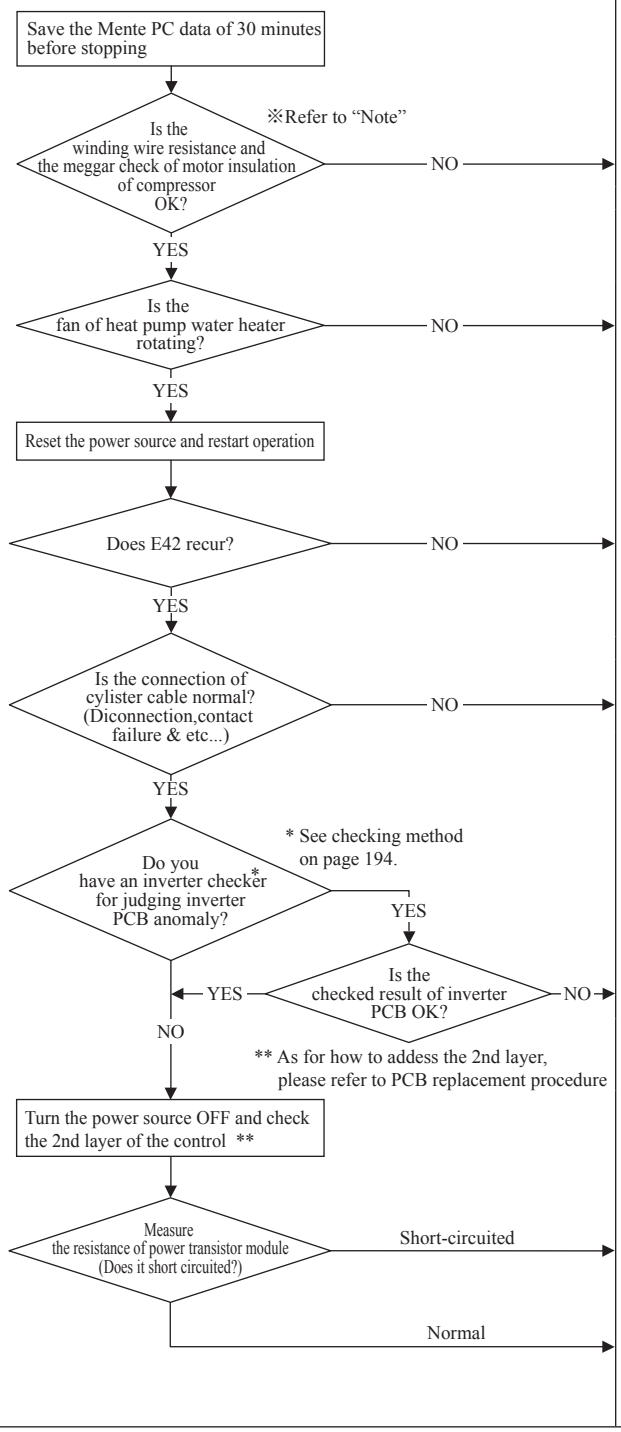
3. Condition of error displayed

If the error signal (47A or higher output current of inverter) is detected 4 times within 15 minutes.

4.Presumable cause

- Compressor anomaly
- Leak of refrigerant
- Power transistor anomaly
- Anomalous power voltage to the inverter PCB
- Fan motor anomaly

5.Troubleshooting



Note: Despite the insulation failure of compressor, there is a case of compressor failure. If the same error recurs after replacement of electrical components, please replace compressor. If the same error does not reappear, continue to get data with Mente PC.
※ Winding wire resistance : 0.726Ω (20℃) Motor insulation resistance : Several tens MΩ

Error code	LED	Green	Red	Content
Remote control: E45 7-segment display: E45-1	Heat pump water heater	Keep flashing	1-time flash	Communication error between inverter PCB and control PCB High pressure anomaly (63H1-1 activated)

1. Applicable model

All models

2. Error detection method

When the communication between inverter PCB and control PCB of heat pump water heater is not established.

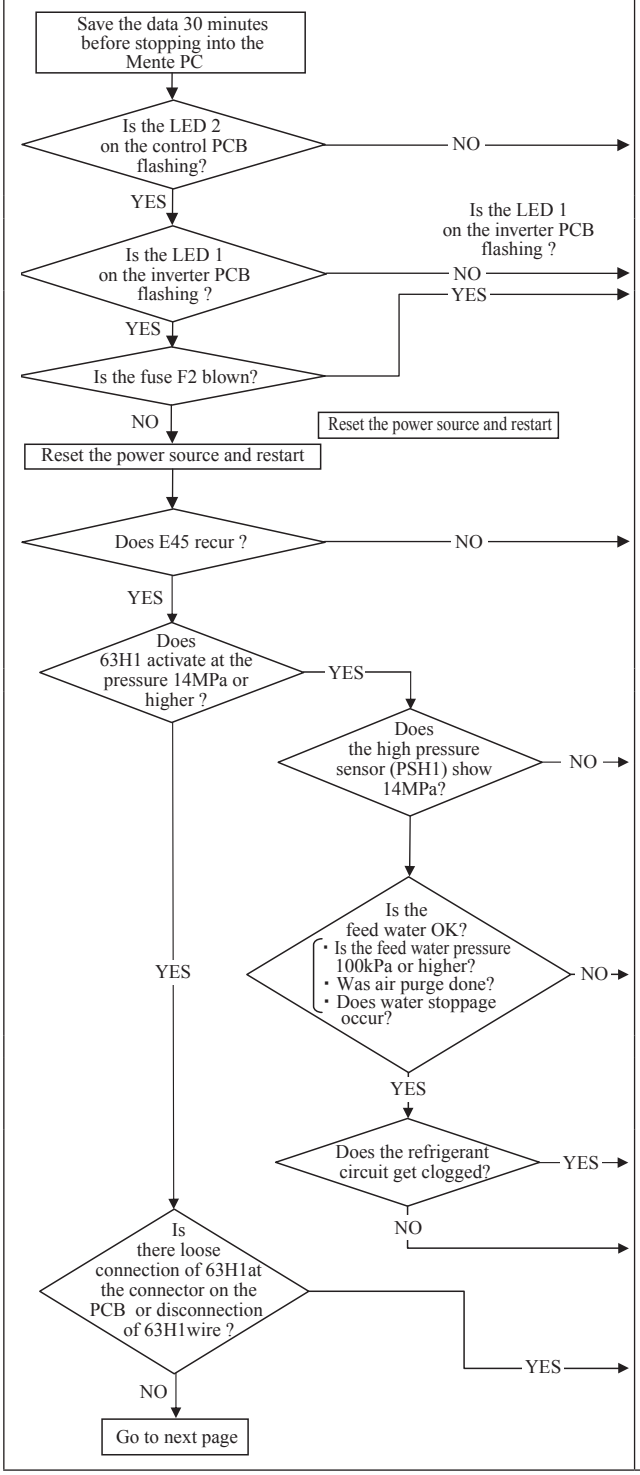
3. Condition of error displayed

Same as above

4. Presumable cause

- Disconnection of signal wiring harness
- Control PCB anomaly
- Inverter PCB anomaly
- Anonaly of inrush current suppression resistance

5. Troubleshooting



Note: If the same error does not reappear, continue to get data with Mente PC.

Error code	LED	Green	Red	Content
Remote control: E45 7-segment display: E45-1	Heat pump water heater	Keep flashing	1-time flash	Communication error between inverter PCB and control PCB High pressure anomaly (63H1-1 activated)

1. Applicable model

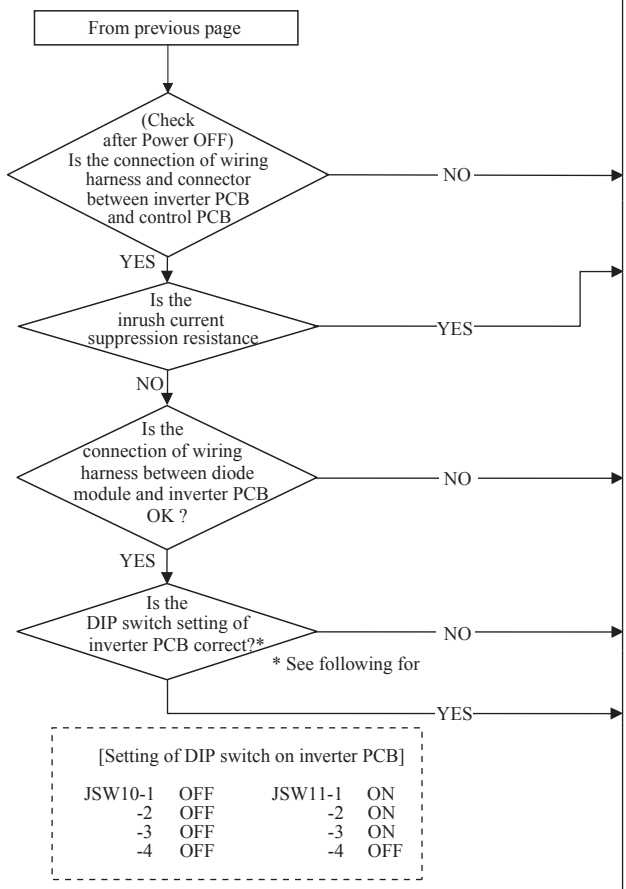
All models

2. Error detection method

3. Condition of error displayed

4. Presumable cause

5. Troubleshooting



Error code	LED	Green	Red	Content
Remote control: No display *1 7-segment display: E48-1, 2	Heat pump water heater	Keeps flashing	*1 1, 2 times	Heat pump water heater DC fan motor anomaly (1/2)

*1 E48-1: FMO1/ 1 time flashing, E48-2: FMO2/ 2 time flashing

1. Applicable model

All models

2. Error detection method

- When fan speed command is 400rpm or lower and over current status is detected 10 times continuously.
- When actual fan speed is 100rpm or lower for 30 seconds.

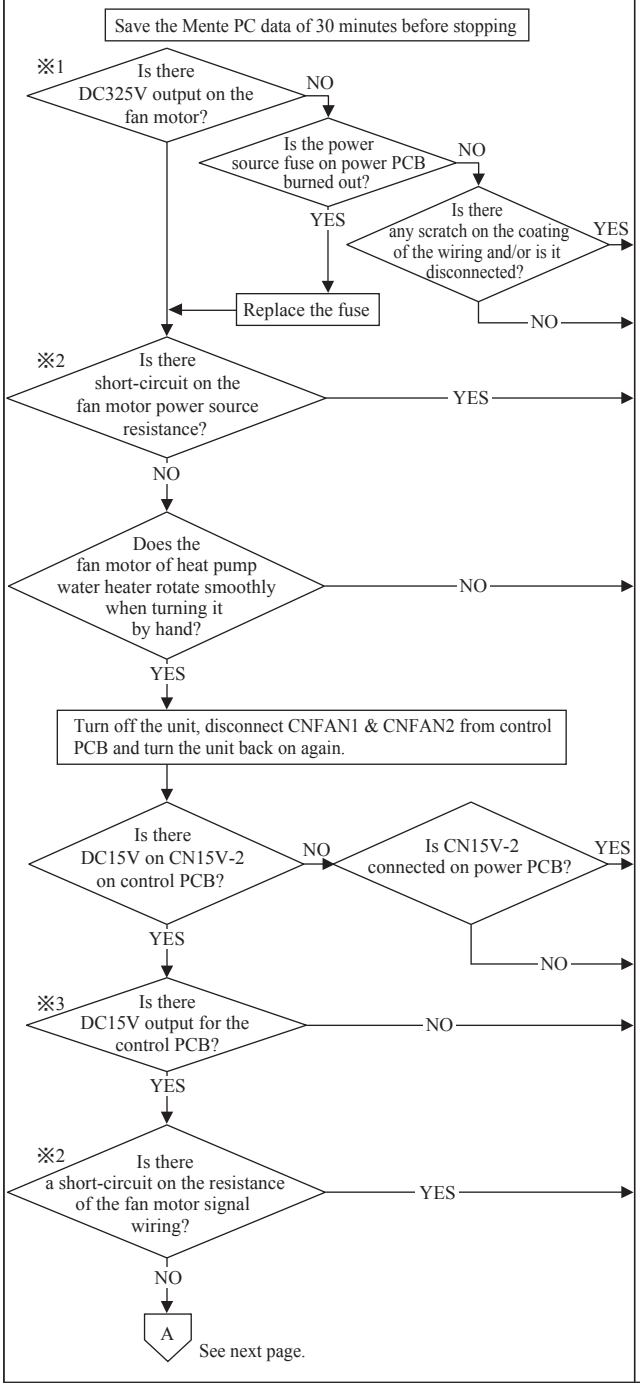
3. Condition of error displayed

- When fan speed command is 400rpm or lower and over current status is detected 10 times continuously.
- When actual fan speed is 100rpm or lower for 30 seconds. (Fan motor is locked)

4. Presumable cause

- Disconnection of wiring or loose connection of connector
- Fan motor anomaly
- Control PCB anomaly
- Power PCB anomaly

5. Troubleshooting and countermeasure (Both fan motors should be inspected regardless of E48-1 and E48-2.)



Note: ※1 Measurement item Connector of power source wiring for fan motors (RED-BLACK)
※2 Refer to resistance on another table. (Next page)
※3 Measurement item Between 1-6 pin of CNFAN connector for control PCB
If the same error does not reappear, continue to get data with Mente PC.

Error code	LED	Green	Red	Content
Remote control: No display *1 7-segment display: E48-1, 2	Heat pump water heater	Keeps flashing	*1 1, 2 times	Heat pump water heater DC fan motor anomaly (2/2)

*1 E48-1: FMO1/ 1 time flashing, E48-2: FMO2/ 2 time flashing

1. Applicable model

All models

2. Error detection method

- When fan speed command is 400rpm or lower and over current status is detected 10 times continuously.
- When actual fan speed is 100rpm or lower for 30 seconds.

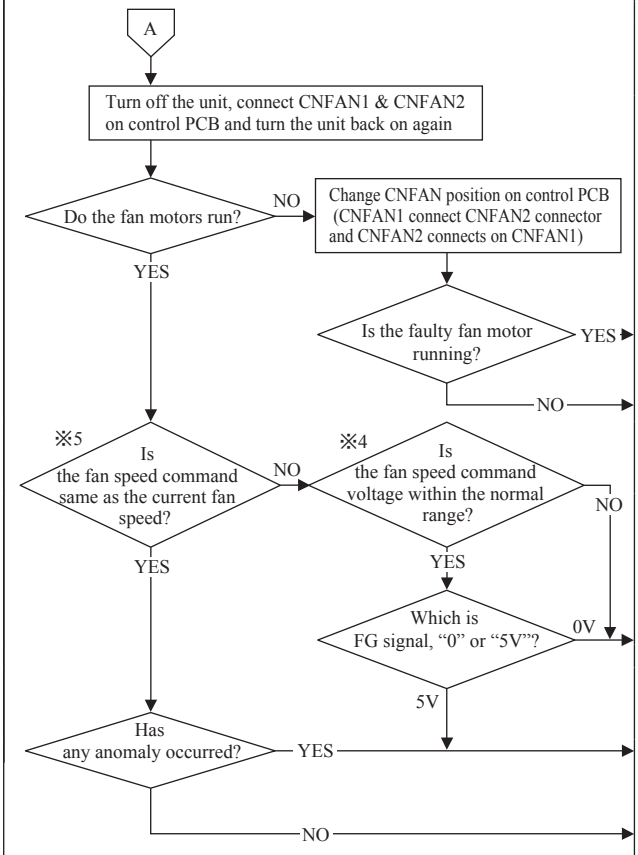
3. Condition of error displayed

Same as above

4. Presumable cause

- Disconnection of wiring or loose connection of connector
- Fan motor anomaly
- Control PCB anomaly
- Power PCB anomaly

5. Troubleshooting and countermeasure (Both fan motors should be inspected regardless of E48-1 and E48-2.)



Note: ※4 Speed command voltage 0-7.5 [V]
※5 Checking by Mente PC or 7-segment.
If the same error does not reappear, continue to get data with Mente PC.

Separate table: Fan motor resistance value (Reference value ※)

				Part number for fan motor
Terminal	Signal	Measurement point		SSA512T101 or SSA512T155
Electric source	VM	Between 1 pin and 2 pin of power source terminal (GND)	Red - Black	1MΩ and over
Control	Vcc	Between 1 pin and 2 pin of power source terminal (GND)	White - Black	7.7kΩ ± 20%
	REV	Between 2 pin and 2 pin of power source terminal (GND)	Orange -Black	1MΩ and over
	VSP	Between 3 pin and 2 pin of power source terminal (GND)	Yellow - Black	200kΩ ± 10%
	FG	Between 4 pin and 2 pin of power source terminal (GND)	Blue - Black	1MΩ and over
	OVERC	Between 5 pin and 2 pin of power source terminal (GND)	Green - Black	1MΩ and over
	GND	Between 6 pin and 2 pin of power source terminal (GND)	Pink - Black	1Ω and lower

※ Measurement value varies depending on measurement equipment used. This value is to inspect obvious anomaly e.g. short-circuit, etc., and then it's not the one to guarantee to judge right and wrong.

Error code	LED	Green	Red	Content
Remote control: E49 7-segment display: E49-1	Heat pump water heater	Keep flashing	1-time flash	Low pressure anomaly

1.Applicable model

All models

2.Error detection method

Detection of anomalously low pressure
- LP≦1.0MPa is detected for 30 seconds continuously
- LP≦0.003MPa is detected for 5 seconds continuously

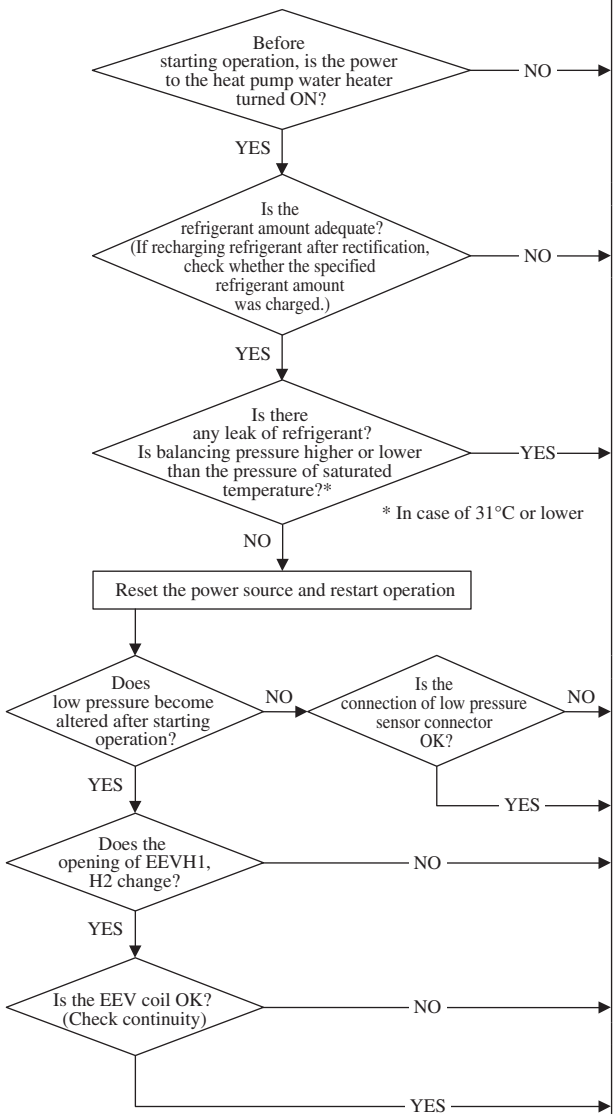
3. Condition of error displayed

If error signal is detected 5 times within 60 minutes

4.Presumable cause

- Leak of refrigerant
- EEV anomaly

5.Troubleshooting



Note:

Error code	LED	Green	Red	Content
Remote control: E52 * 1 7-segment display: E52-1 to -9	Heat pump water heater	Keep flashing	* 2	Anomaly of hot water temperature sensor for unvented cylinder (Tht-1 to -9)

* 1 E52-1 to -9: Tht-1 to -9,
* 2 E52-1 to -6: 1 to 6-time flash, E52-7 to -9: Keep flashing,

1. Applicable Model

All models

2. Error detection method

Detection of anomalously low temperature (resistance) of hot water temperature sensor for unvented cylinder

3. Condition of error displayed

If the sensor detects anomalously low temperature for 20 seconds continuously after power ON.
Or if the sensor detects anomalously low temperature for 20 seconds continuously during normal operation after 2 minutes has elapsed since compressor ON.

4. Presumable cause

- Broken sensor harness or the internal wire of sensing section (Check the molded section as well.)
- Disconnection of sensor harness connection (connector)
- Control PCB anomaly

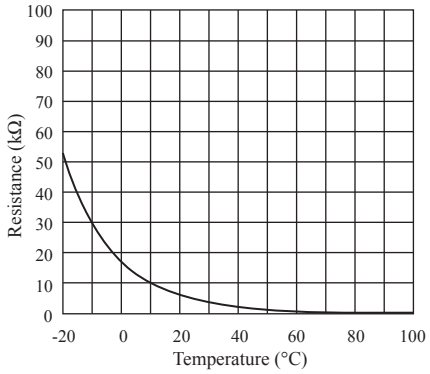
5. Troubleshooting

Diagnosis	Countermeasure
Save the Mente PC data of 30 minutes before stopping	• Check the operation status and record it. • Check it occurs soon after power ON or during operation or during stopping. • Chech sensing value. • Compare the temperature shown in mentePC data to the acutal temperature measured with thermometer.
Is the connector of the anomalous sensor connected properly? — NO	Insert the connector securely.
YES → Are the characteristics of sensor OK? *3 — NO	Replace the hot water temperature sensor for unvented cylinder (Tht-1 to -9).
YES	Replace the control PCB of heat pump water heater.

*3 Check several times to prove any poor connection.

[Temperature-resistance characteristics]

Hot water temperature sensor for unvented cylinder (Tht-1 to -9)



Note:

Error code	LED	Green	Red	Content
Remote control: E53 * 1 7-segment display: E53-1, -3	Heat pump water heater	Keep flashing	* 2	Suction pipe temperature sensor (Tho-S1) anomaly Injection inlet temperature sensor (Tho-INJ1) anomaly

* 1 E53-1: Tho-S1, E53-3: Tho-INJ1
* 2 E53-1: 1-time flash , E53-3: 3-time flash

1. Applicable Model

All models

2. Error detection method

Detection of anomalously low temperature (resistance) of temperature sensor (Tho-S1, Tho-INJ1)

3. Condition of error displayed

If the sensor detects -50°C or lower temperature for 5 seconds continuously

4. Presumable cause

- Broken sensor harness or the internal wire of sensing section (Check the molded section as well.)
- Disconnection of sensor harness connection (connector)
- Control PCB anomaly

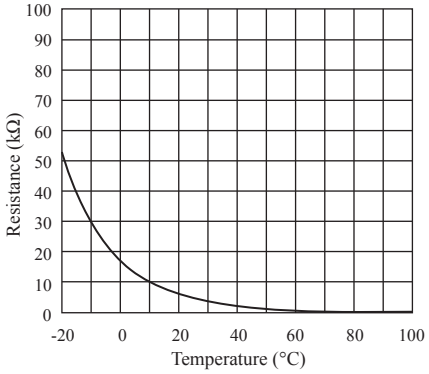
5. Troubleshooting

Diagnosis	Countermeasure
Save the Mente PC data of 30 minutes before stopping	• Check the operation status and record it. • Check it occurs soon after power ON or during operation or during stopping. • Check sensing value • Compare the temperature shown in mentePC data to the acutal temperature measured with thermometer.
Is the connector of the anomalous sensor connected properly? — NO	Insert the connector securely.
YES → Are the characteristics of sensor OK? *3 — NO	Replace temperature sensor (Tho-S1, Tho-INJ1).
YES	Replace the control PCB of heat pump water heater.

*3 Check several times to prove any poor connection.

[Temperature-resistance characteristics]

Suction pipe temperature sensor (Tho-S1)
Injection inlet temperature sensor (Tho-INJ1)



Note:

Error code	LED	Green	Red	Content
Remote control: E54 * 1 7-segment display: E54-1, -2, -3	Heat pump water heater	Keep flashing	* 2	High pressure/Intermediate pressure/ Low pressure sensor anomaly (PSH/PSM/PSL)

* 1 E54-1: Low pressure sensor, E54-2: High pressure sensor. E54-3: Intermediate pressure sensor
* 2 E54-1: 1-time flash, E54-2: 2-time flash. E54-3: 3-time flash

1. Applicable Model

All models

2. Error detection method

Detection of anomalous pressure (resistance) of PSL/PSM/PSH

High pressure	0 - 14MPa
Intermediate pressure	0 - 10MPa
Low pressure	0 - 10MPa

3. Condition of error displayed

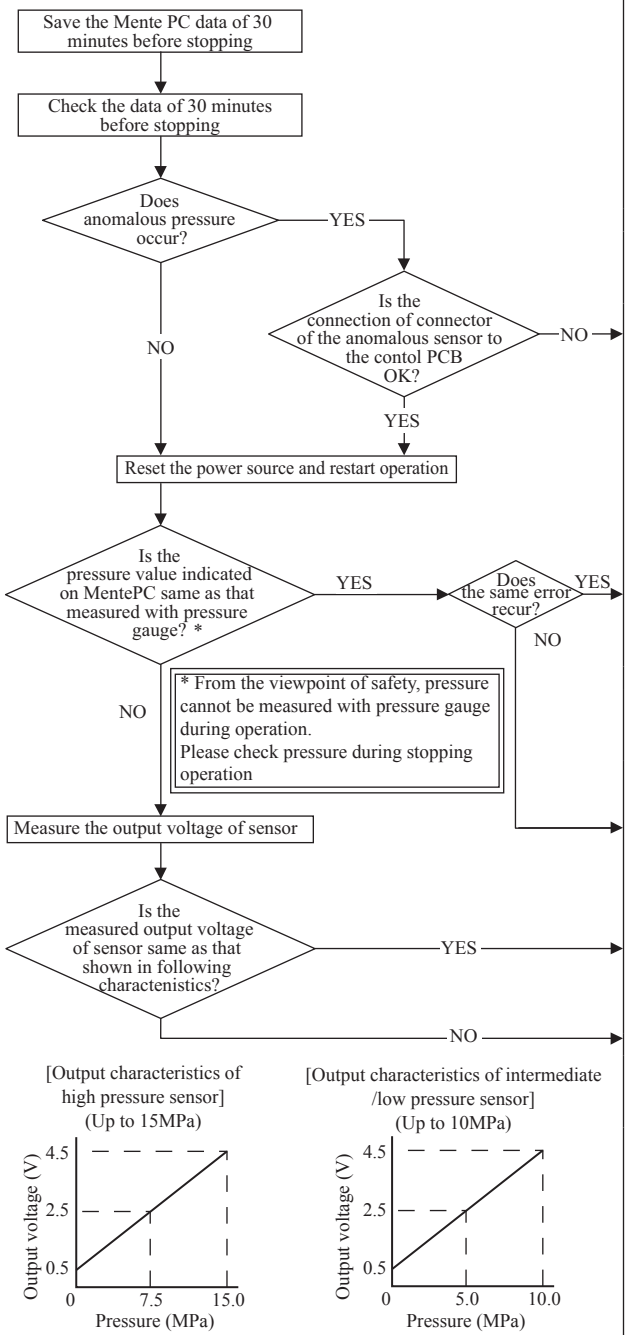
If the pressure sensor detects anomalous output voltage for 20 seconds continuously after turning power ON.
Or if the pressure sensor detects anomalous output voltage for 5 seconds continuously within 2 minutes to 2 minutes and 20 seconds after the compressor ON.

4. Presumable cause

- Broken sensor harness
- Disconnection of sensor harness connection (connector)
- Sensor anomaly
- Control PCB anomaly
- Bad installation condition
- Insufficient water volume
- Insufficient refrigerant amount

5. Troubleshooting

Diagnosis



[Output characteristics of high pressure sensor] (Up to 15MPa)

[Output characteristics of intermediate /low pressure sensor] (Up to 10MPa)

Pressure sensor output voltage : To measure beween Black-White

Countermeasure

- Check the operation status and record it.
- Check it occurs soon after power ON or during operation or during stopping.
- Check sensing value.

Insert the connector of sensor securely and restart operation.

No anomaly in presurre sensor & its control. Suspect other causes which can cause pressure anomaly.(I.E, Lack of supply water, lack of CO_2 gas and etc...).

Temporary malfunction by noise.
If noise source can be specified, take a measure.

Replace control PCB.

Replace sensor.

Note:

Error code	LED	Green	Red	Content
Remote control: E55 7-segment display: E55-1	Heat pump water heater	Keep flashing	1-time flash	Under-dome temperature sensor (Tho-C1) anomaly

1. Applicable Model

All models

2. Error detection method

Detection of anomalously low temperature (resistance) of temperature sensor. (Tho-C1)

3. Condition of error displayed

If the sensor detects -50°C or lower temperature for 5 seconds continuously

4. Presumable cause

- Broken sensor harness or the internal wire of sensing section(Check the molded section as well.)
- Disconnection of sensor harness connection (connector)
- Control PCB anomaly

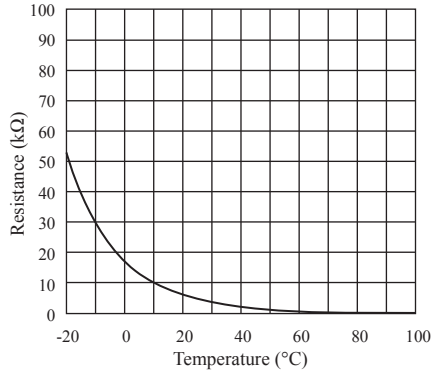
5. Troubleshooting

Diagnosis	Countermeasure
Save the Mente PC data of 30 minutes before stopping ↓ Is the connector of the anomalous sensor connected properly? NO → YES ↓ Are the characteristics of sensor OK? *1 NO → YES →	・Check the operation status and record it. ・Check it occurs soon after power ON or during operation or during stopping. ・Check sensing value ・Compare the temperature shown in mentePC data to the acutal temperature measured with thermometer. Insert the connector securely. Replace under-dome temperature sensor (Tho-C1). Replace the control PCB of heat pump water heater.

*1 Check several times to prove any poor connection.

[Temperature-resistance characteristics]

Under-dome temperature sensor (Tho-C1)



Note:

Error code	LED	Green	Red	Content
Remote control: E56 7-segment display: E56-1	Heat pump water heater	Keep flashing	1-time flash	Power transistor temperature sensor (Tho-P1) anomaly

1. Applicable Model

All models

2. Error detection method

Detection of anomalously low temperature (resistance) of power transistor temperature sensor.
(Tho-P1)

3. Condition of error displayed

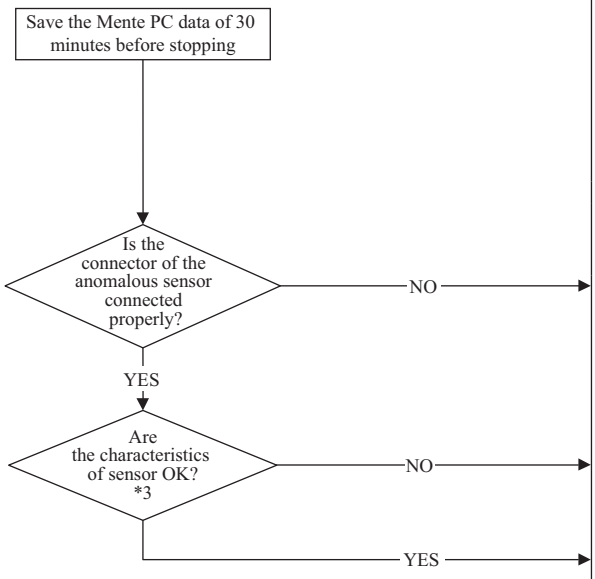
Under the condition of 0°C or higher of outdoor air temperature, if the sensor detects disconnection for 20 seconds continuously within 30 seconds after 10 minutes has elapsed since compressor ON, it makes the compressor stopped. After 3 minutes, compressor restarts automatically. And then if this error is detected 3 times within 40 minutes, it makes error stop.

4. Presumable cause

- Broken sensor harness or the internal wire of sensing section (Check the molded section as well.)
- Disconnection of sensor harness connection (connector)
- Control PCB anomaly

5. Troubleshooting

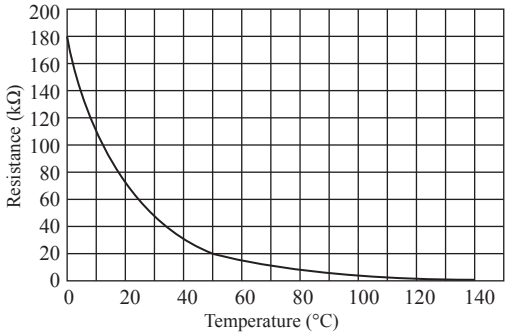
Diagnosis



*3 Check several times to prove any poor connection.

[Temperature-resistance characteristics]

Power transistor temperature sensor (Tho-P1)



Countermeasure

- Check the operation status and record it.
- Check it occurs soon after power ON or during operation or during stopping.
- Check sensing value
- Compare the temperature shown in mentePC data to the acutal temperature measured with thermometer.

Insert the connector securely.

Replace power transistor temperature sensor (Tho-P1).

Replace the control PCB of heat pump water heater.

Note:

Error code	LED	Green	Red	Content
Remote control: E58 7-segment display: E58-1	Heat pump water heater	Keep flashing	1-time flash	Compressor anomaly by loss of synchronism

1. Applicable Model

All models

2. Error detection method

When E58 is displayed on the 7-segment LED display

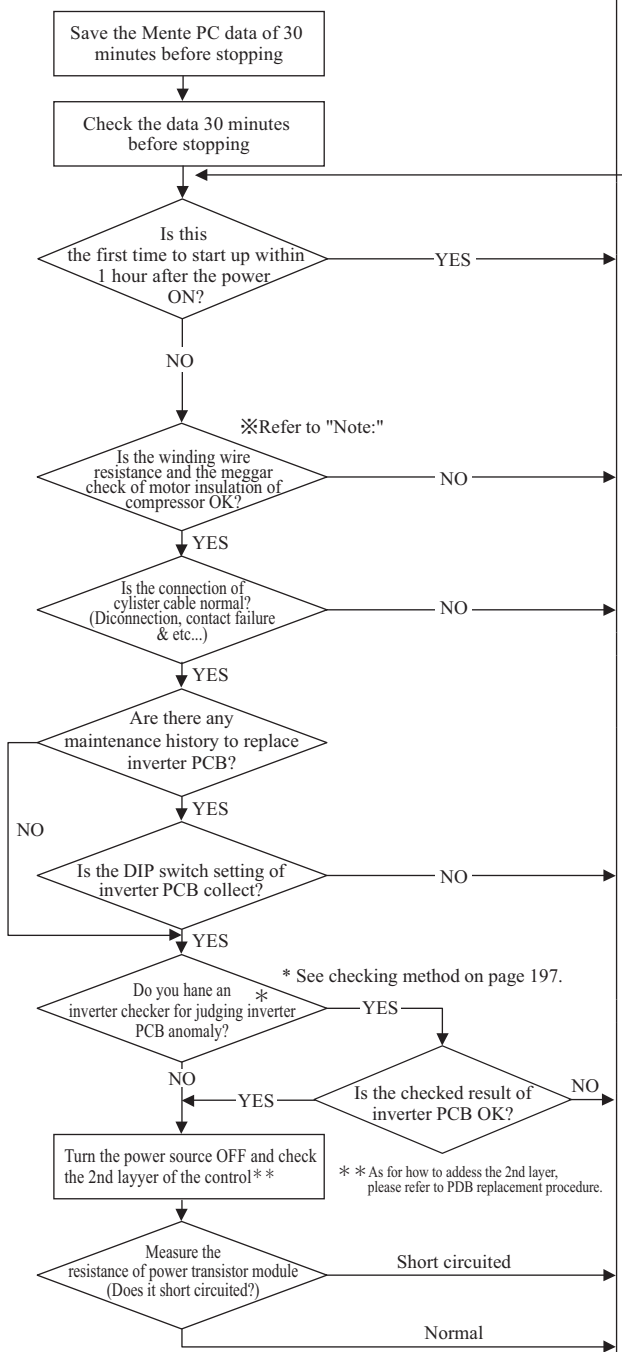
3. Condition of error displayed

If this anomaly is established 4 times within 15 minutes

4. Presumable cause

・Insufficient communication hours before start operation. (Start operation without power source to the crankcase heater in advance)
・Compressor anomaly

5. Troubleshooting



Note: If the same error does not reappear, continue to get data with Mente PC.
※ Winding wire resistance : 0.726Ω (20℃) Motor insulation resistance : Several tens MΩ

Error code	LED	Green	Red	Content
Remote control: E59 7-segment display: E59-1	Heat pump water heater	Keep flashing	1-time flash	Compressor startup failure

1. Applicable Model

All models

2. Error detection method

When it fails to change over to the operation for rotor position detection of compressor motor

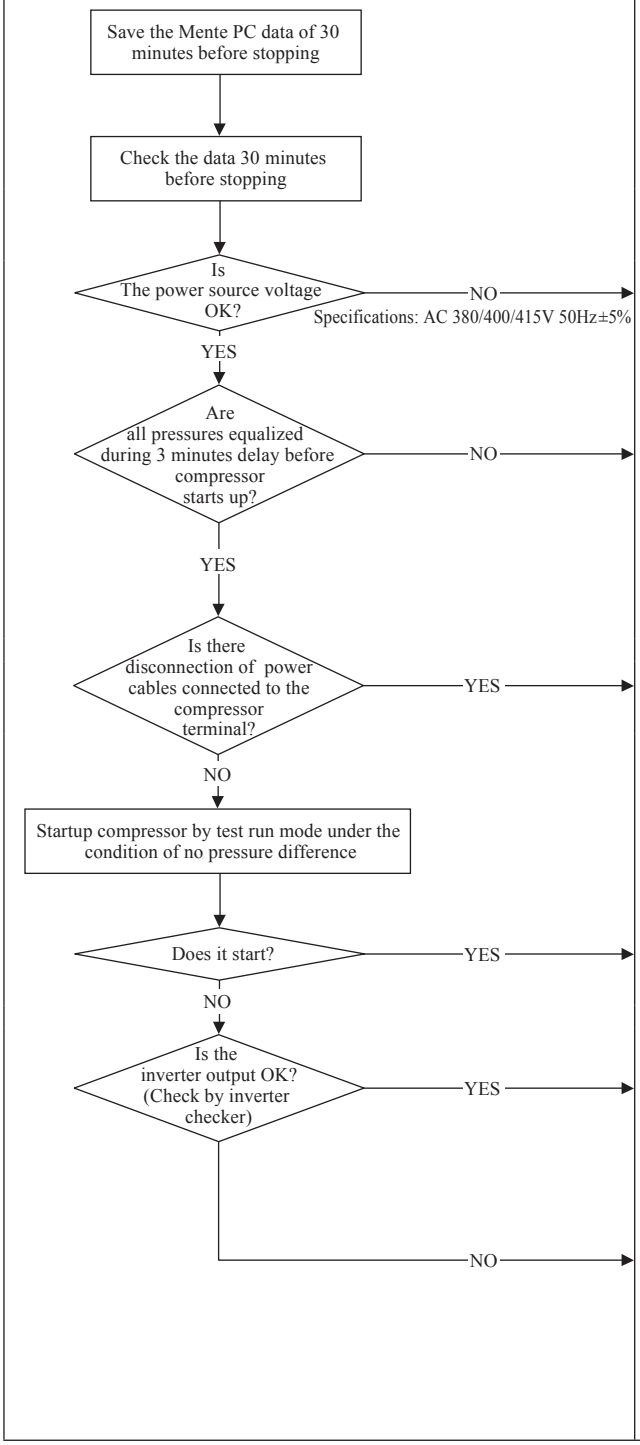
3. Condition of error displayed

If the compressor fails to startup 20 times (10 patterns × 2 times) continuously.

4. Presumable cause

- Anomalous power source voltage
- Faulty component for refrigerant circuit
- Inverter PCB anomaly
- Disconnection of power cable and/or poor connection of connector
- Compressor anomaly (Motor or bearing)
- Power transistor anomaly

5. Troubleshooting



Note: If the same error does not reappear, continue to get data with Mente PC.
※Winding wire resistance 1250Ω±10% (20℃)

Error code	LED	Green	Red	Content
Remote control: E60 7-segment display: E60-1	Heat pump water heater	Keep flashing	1-time flash	Rotor position detection failure

1. Applicable Model

All models

2. Error detection method

Detection of the compressor rotor position
After starting up, the rotor position can not be detected again.

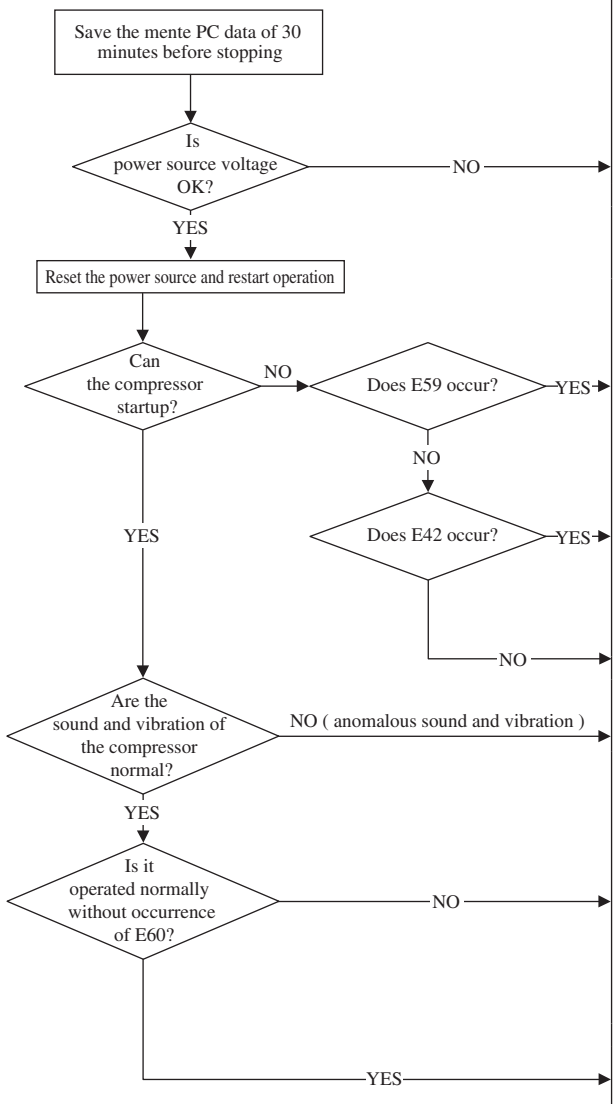
3. Condition of error displayed

If this anomaly occurs 4 times within 15 minutes

4. Presumable cause

- Compressor anomaly
- Inverter PCB anomaly
- Anomalous power source voltage
- Power transistor anomaly

5. Troubleshooting



Note: If the same error does not reappear, continue to get data with Mente PC.

Error code	LED	Green	Red	Content
Remote control: E61 7-segment display: E61-1, 2, 3 *1	Heat pump water heater	Keeps flashing	*1	Communications error between the master unit and slave units

*1 E61-1: Between master unit and slave unit 1 / 1-time flash E61-2: Between master unit and slave unit 2 / 2-time flash
E61-3: Between master unit and slave unit 3 / 3-time flash

1. Applicable model

All models

2. Error detection method

E61-1,2,3 is displayed on 7-segment LED.

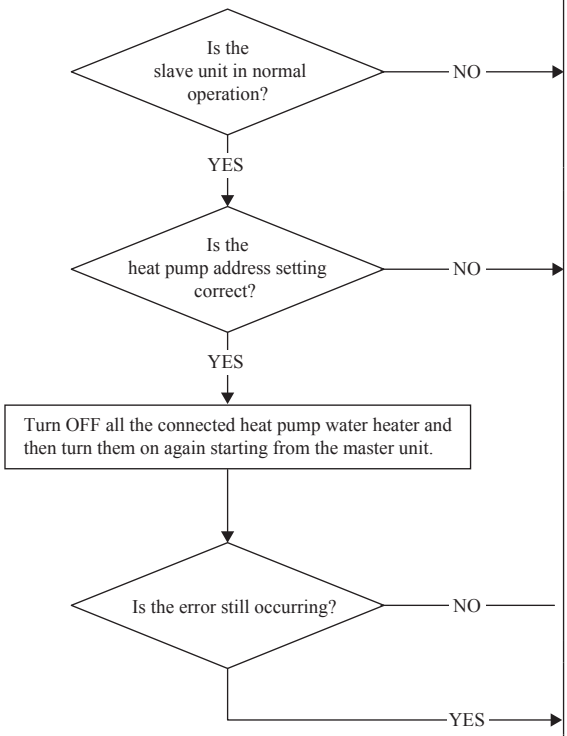
3. Condition of error displayed

When the communication between master unit and slave units of heat pump water heater is not established.

4. Presumable cause

- Communication wiring anomaly
- Control PCB anomaly

5. Troubleshooting and countermeasure



Note:

Error code	LED	Green	Red	Content
Remote control: E63 7-segment display: E63	Heat pump water heater	Keep flashing	1-time flash	Emergency stop

1.Applicable model

All models

2. Error detection method

When the contact signal input is input to CnT contact on the control PCB of heat pump water heater.

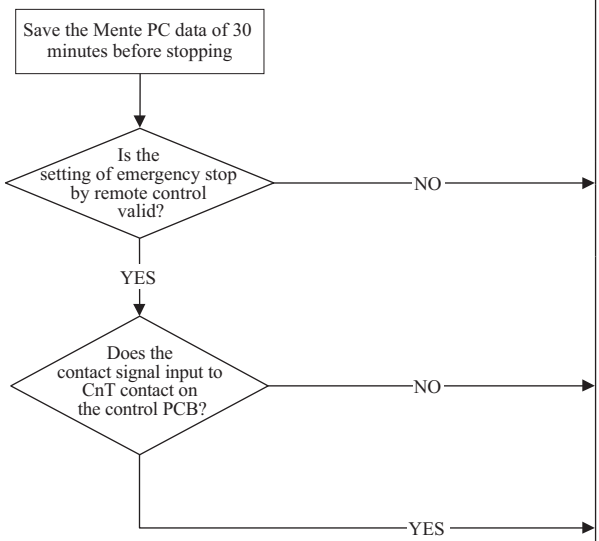
3.Condition of error displayed

Same as above

4. Presumable cause

・Occurrence of emergency stop factor

5.Troubleshooting



Diagnosis	Countermeasure
	・Check the operation status and record it. ・Check it occurs soon after power ON or during operation or during stopping.
Is the setting of emergency stop by remote control valid? NO	Replace control PCB.
Does the contact signal input to CnT contact on the control PCB? NO	Replace control PCB.
YES	Check the cause for occurring emergency stop. (It is better to have the data of 30 minutes before stopping for checking.)

Note: The heat pump water heater detected the emergency stop signal sends the command to make [All stop].

Error code	LED	Green	Red	Content
Remote control: E64 7-segment display: E64	Heat pump water heater	Keep flashing	1-time flash	Water pump anomaly (1) In case the motor does not rotate

1. Applicable Model

All models

2. Error detection method

When it detects anomalous difference between the rotation speed command and the actual rotation speed of water pump.
Or when it detects anoumalous acutal rotation speed.

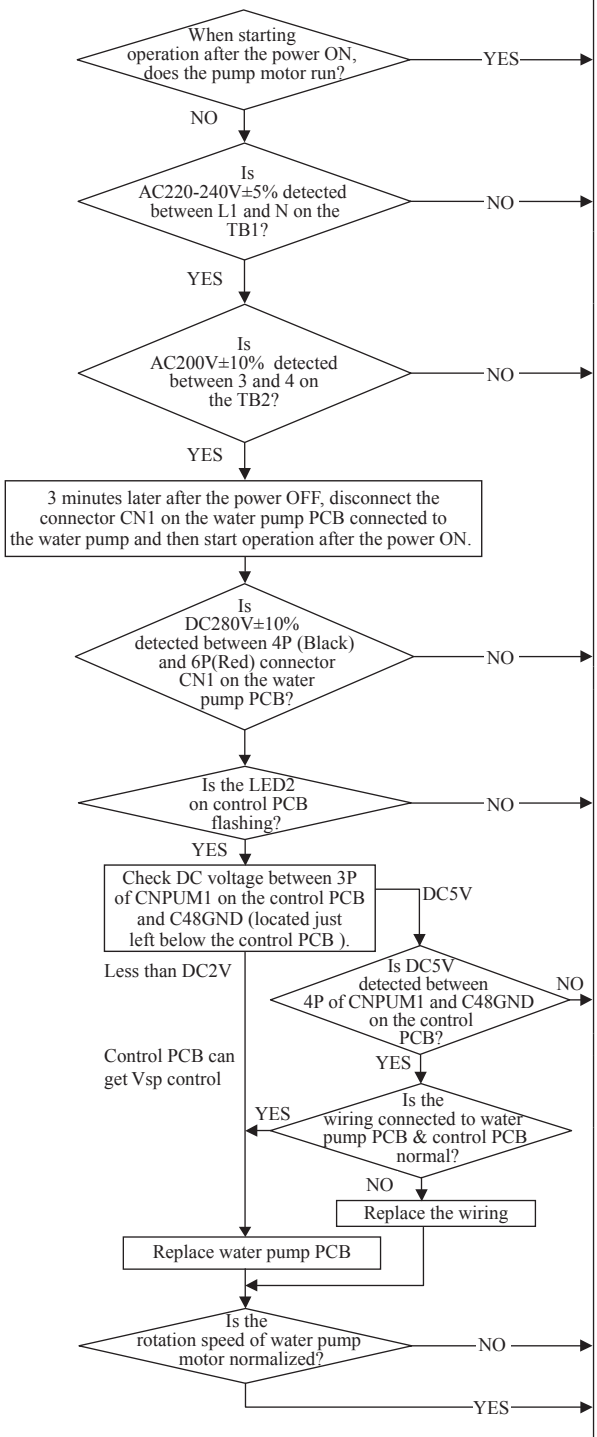
3. Condition of error displayed

- If the rotation speed difference is 500min^{-1} or more
- If anomalous actual rotation speed is detected for 1 minute continuously.

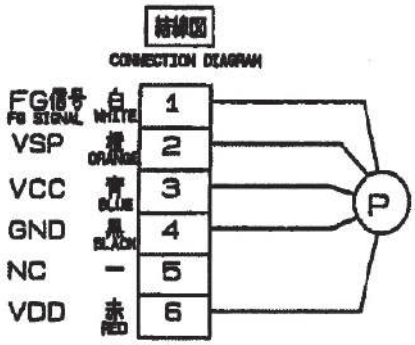
4. Presumable cause

- Water pump anomaly
- Control PCB anomaly
- Power source or power PCB anomaly
- Water pump PCB anomaly

5. Troubleshooting



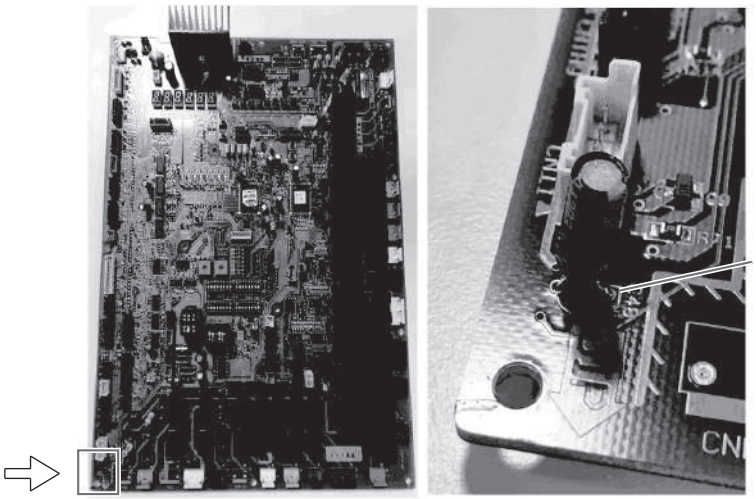
Note: Refer connection diagram,measurement point with resistance value for water pump to next page.
See detail location of C48GND at next page.



Measurement point		Measurement value (Reference value)
Tester +	Tester -	
VDD	GND	393.6kΩ
VCC	GND	24.9kΩ
VSP	GND	559.6kΩ
FG	GND	O.L

This value will change depending on the measurement device and ambient temperature, so please use this table for just a reference.

Detial location of C48GND



Error code	LED	Green	Red	Content
Remote control: E64 7-segment display: E64	Heat pump water heater	Keep flashing	1-time flash	Water pump anomaly (2) In case the motor rotates at anomously high speed (Disable to control rotation speed or rotate at max speed)

1. Applicable Model

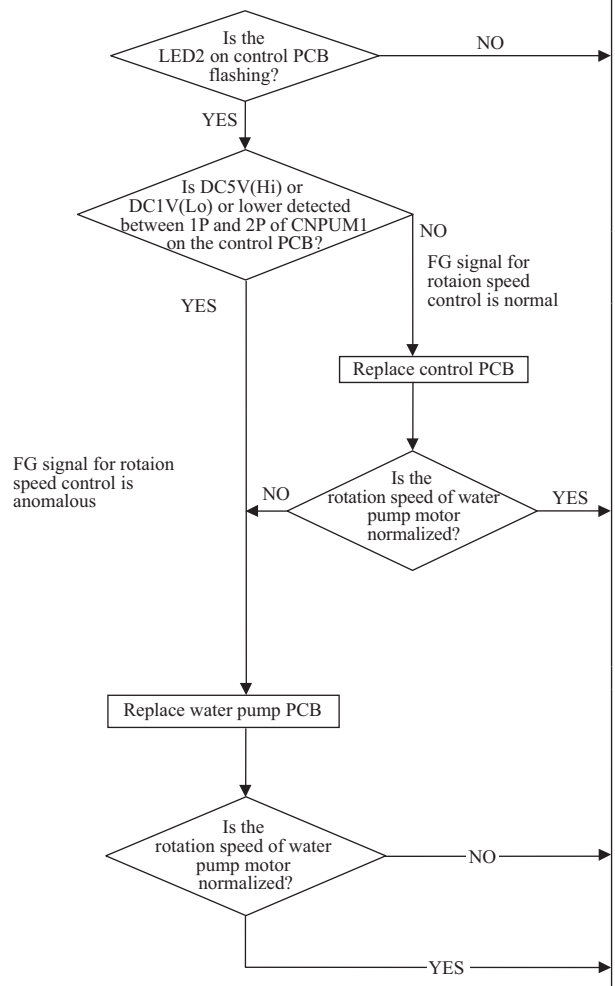
All models

2. Error detection method

3. Condition of error displayed

4. Presumable cause

5. Troubleshooting



Note:

Error code	LED	Green	Red	Content
Remote control: E89 7-segment display: E89	Heat pump water heater	Keep flashing	1-time flash	Communication error between CPU of control PCBs

1. Applicable Model

All models

2. Error detection method

When the communication between CPUs is interrupted for a certain period of time

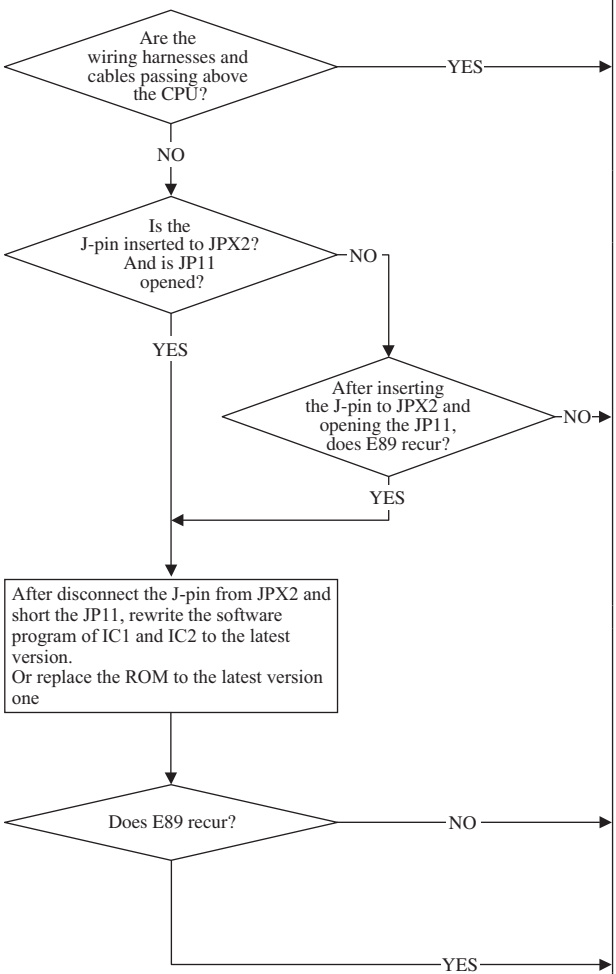
3. Condition of error displayed

If it occurs 4 times within 15 minutes

4. Presumable cause

・Noise
・Mixing of software versions
・Control PCB anomaly

5. Troubleshooting



Diagnosis	Countermeasure

Note:

Error code	LED	Green	Red	Content
Remote control: No display 7-segment display: No display	Heat pump water heater	Keep flashing	Stay OFF	It can operate but no hot water comes out (1)

1. Applicable Model

All models

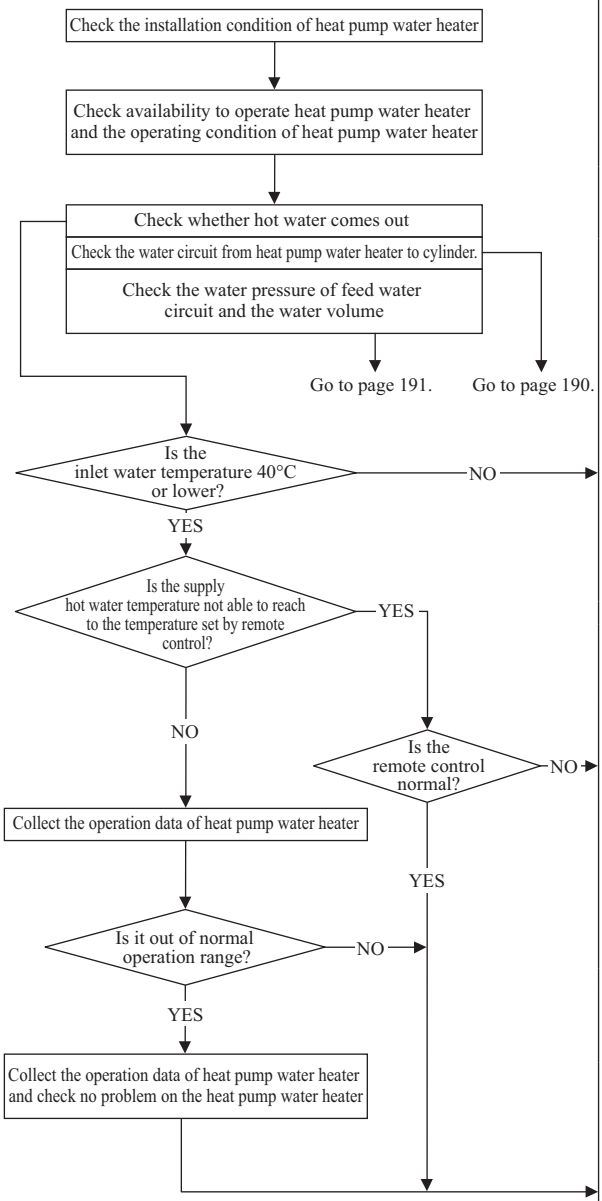
2. Error detection method

3. Condition of error displayed

4. Presumable cause

- Insufficient capacity of heat pump water heater
  Heating capacity of heat pump water heater is not meet to the actual heat load
  Bad installation of equipments
- Anomaly of heat pump water heater

5. Troubleshooting

Diagnosis	Countermeasure
	Insufficient capacity due to short circuit of air circulation. Check excessive heat load of hot water. Check whether the feed water is supplied or not. Check power source. (voltage, frequency) Collect the operation data by setting the conditions to operate the compressor with remote control. Check heat pump water heater. Check water circuit. If the inlet feed water temperature is 40°C or higher, there is a case not to obtain the required hot water amount. If using the water other than the clean water, be sure to suppress increase in temperature of inlet feed water. *When the hot water amount is almost 100%, the inlet feed water temp may increase temporarily. Replace remote control. Check insufficient capacity by protection control. Check the status of functional components temperature sensor, pressure sensor, compressor, EEV (body, coil) Check insufficient refrigerant and leak of refrigerant. Check water circuit Go to pages 190 and 191.

Note:

Error code	LED	Green	Red	Content
Remote control: No display 7-segment display: No display	Heat pump water heater	Keep flashing	Stay OFF	It can operate but no hot water comes out (2)

1. Applicable Model

All models

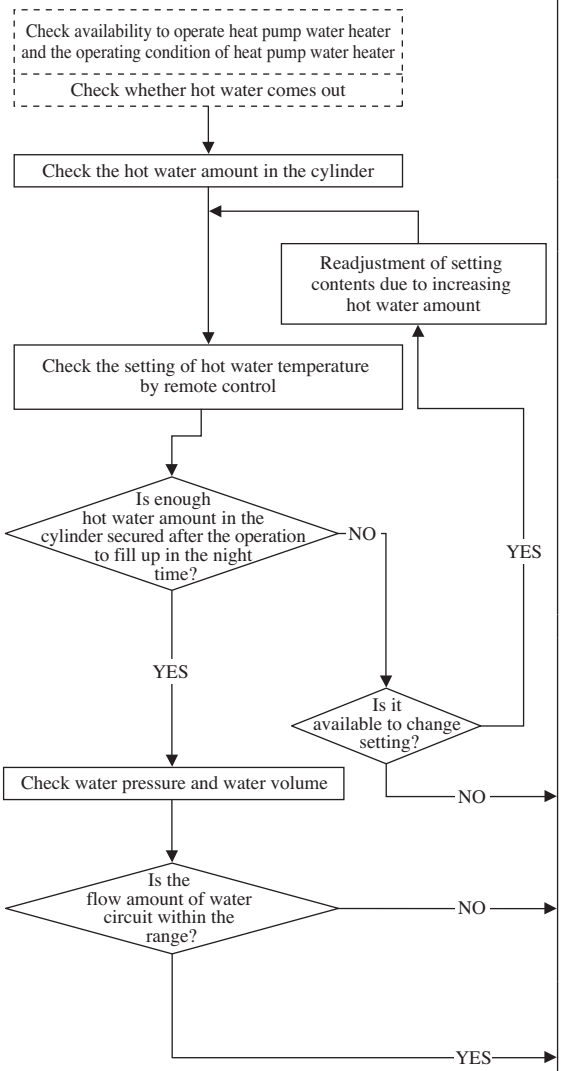
2. Error detection method

3. Condition of error displayed

4. Presumable cause

- Anomaly of water circuit between the heat pump water heater and HW storage unit.
- Piping failure in the HW storage unit

5. Troubleshooting



Diagnosis	Countermeasure
Is enough hot water amount in the cylinder secured after the operation to fill up in the night time? NO	Since the usage of ho water amount seems to be very much, the setting contents by remote control shall be readjusted. ① Start and/or end time ② Hot water amount and/or the amount to top up
Is it available to change setting? NO	Usage of hot water amount is too much
Is the flow amount of water circuit within the range? NO	Check water circuit Leak, Drain, by-pass, Clogging, operation of pump and actuation of valves.
YES	Check water circuit. Go to next page.

Note:

Error code	LED	Green	Red	Content
Remote control: No display 7-segment display: No display	Heat pump water heater	Keep flashing	Stay OFF	It can operate but no hot water comes out (3)

1. Applicable Model

All models

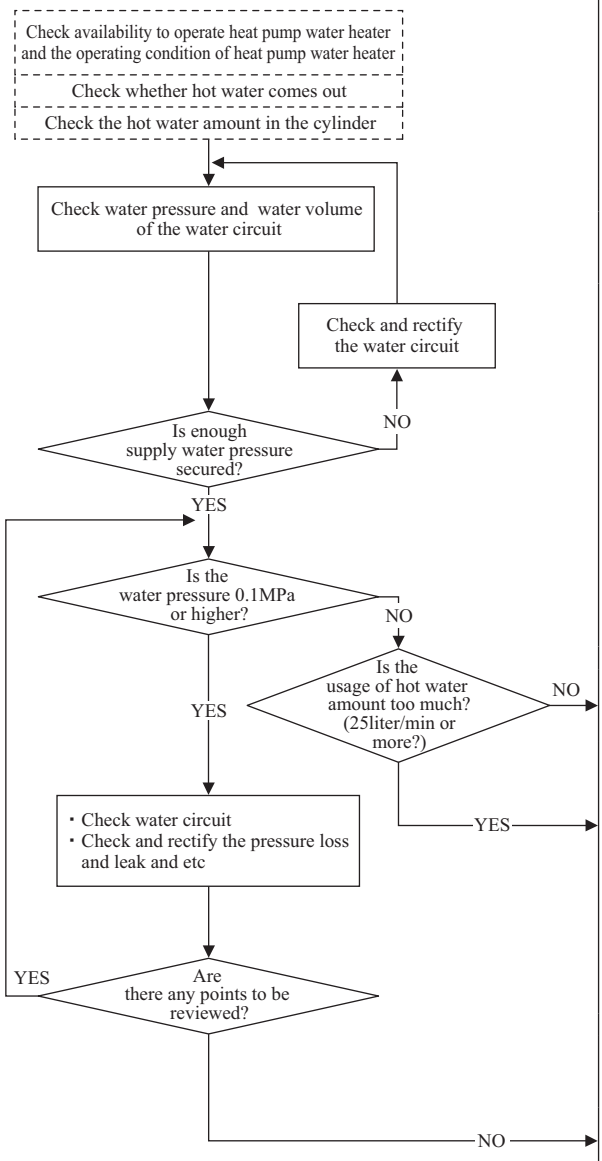
2. Error detection method

3. Condition of error displayed

4. Presumable cause

- Insufficient supply water pressure
- Too much pressure loss of water circuit

5. Troubleshooting



Diagnosis	Countermeasure
Check availability to operate heat pump water heater and the operating condition of heat pump water heater Check whether hot water comes out Check the hot water amount in the cylinder	
Check water pressure and water volume of the water circuit	
Check and rectify the water circuit	Check and secure the supply water pressure.
Is enough supply water pressure secured? NO	・Check the pressure loss in the water circuit and secure enough water pressure. ・Check height difference and piping length. ・Size up the piping.
Is the water pressure 0.1MPa or higher? NO	
Is the usage of hot water amount too much? (25liter/min or more?) NO	It is normal
・Check water circuit ・Check and rectify the pressure loss and leak and etc	Check water circuit Strainer (If it is clogged, clean it up) Opening of valves Mixing valve By-pass circuit Leak.
Are there any points to be reviewed? YES	
NO	Usage of hot water amount is too much.

Note:

Error code	LED	Green	Red	Content
Remote control: No display 7-segment display: No display	Heat pump water heater	Keep flashing	Stay OFF	Anomalous sound and vibration (1)

1. Applicable Model

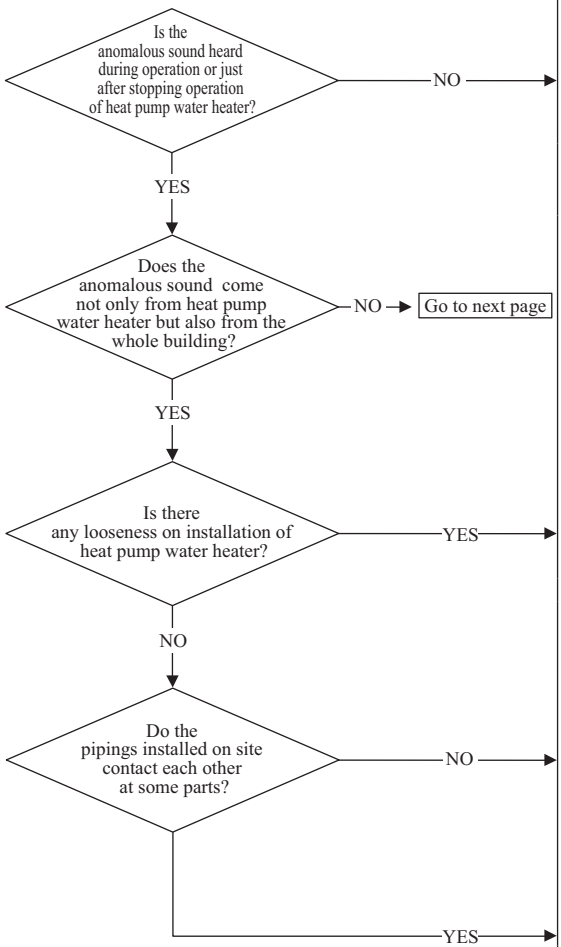
All models

2. Error detection method

3. Condition of error displayed

4. Presumable cause

5. Troubleshooting



Note:

Error code	LED	Green	Red	Content
Remote control: No display 7-segment display: No display	Heat pump water heater	Keep flashing	Stay OFF	Anomalous sound and vibration (2)

1. Applicable Model

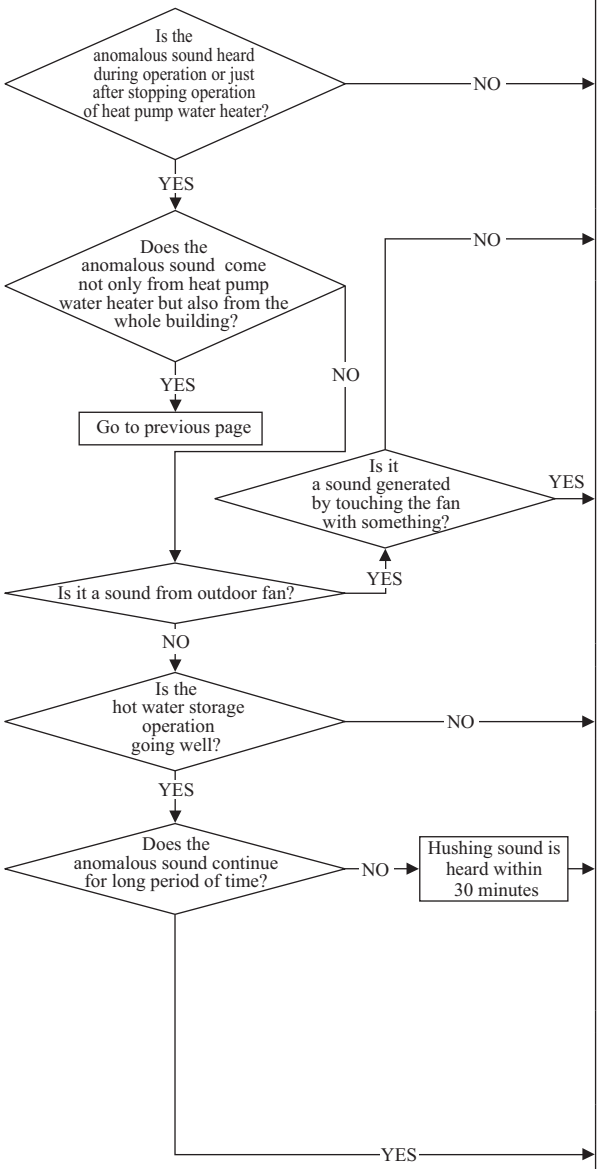
All models

2. Error detection method

3. Condition of error displayed

4. Presumable cause

5. Troubleshooting



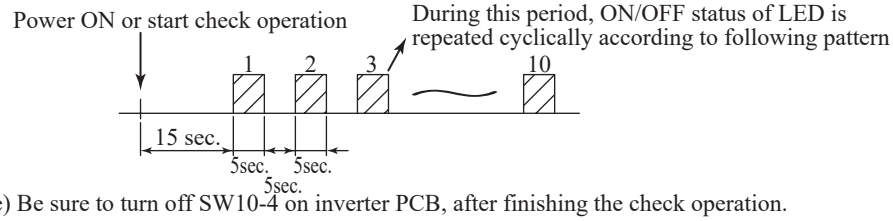
Note:

(1) Checking procedure of inverter PCB

1) Setup procedure of checker.
 a) Power OFF (Turn off the breaker).
 b) Remove the terminal cover of compressor and disconnect the wires (U, V, W) from compressor.
 c) Connect the wires U (Red) , V (White) and W (Black) of checker to the terminal of disconnected wires (U, V, W) from compressor respectively.

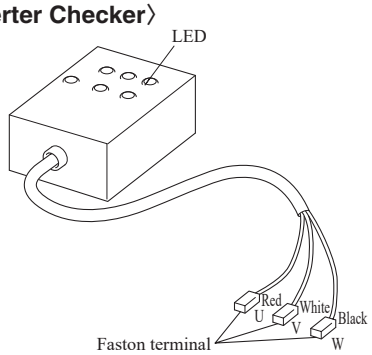
2) Operation for judgment.
 a) Power ON after SW10-4 on inverter PCB was turned ON.
 b) After 15 seconds since the test operation has started, LED start ON/OFF for 5 seconds cyclically and it repeats 10 times.
 c) Check ON/OFF status of 6 LED's on the checker.
 d) Judge the PCB by ON/OFF status of 6 LED's on the checker.

ON/OFF status of LED	If all of LED are ON/OFF according to following pattern	If all of LED stay OFF or some of LED are ON/OFF
Inverter PCB	Normal	Anomalous



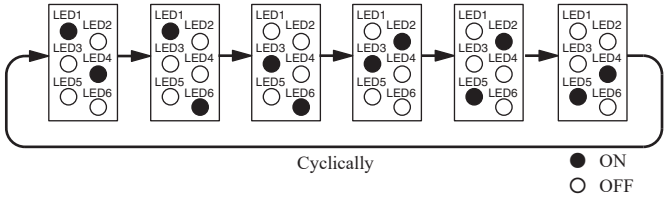
e) Be sure to turn off SW10-4 on inverter PCB, after finishing the check operation.

〈Inverter Checker〉



Connect to the terminal of the wires which are disconnected from compressor.

LED ON/OFF pattern



(2) Power transistor module terminal short circuit check procedure

Disconnect the compressor wiring, then conduct a short circuit check.
P-U, P-V, P-W
N-U, N-V, N-W
Check between the P-N terminals.
Bring the tester probes in contact with the following places on each terminal.
P: Power transistor P terminal,
N: Power transistor N terminal,
U: End of red harness to compressor
V: End of white harness to compressor
W: End of black or blue harness to compressor

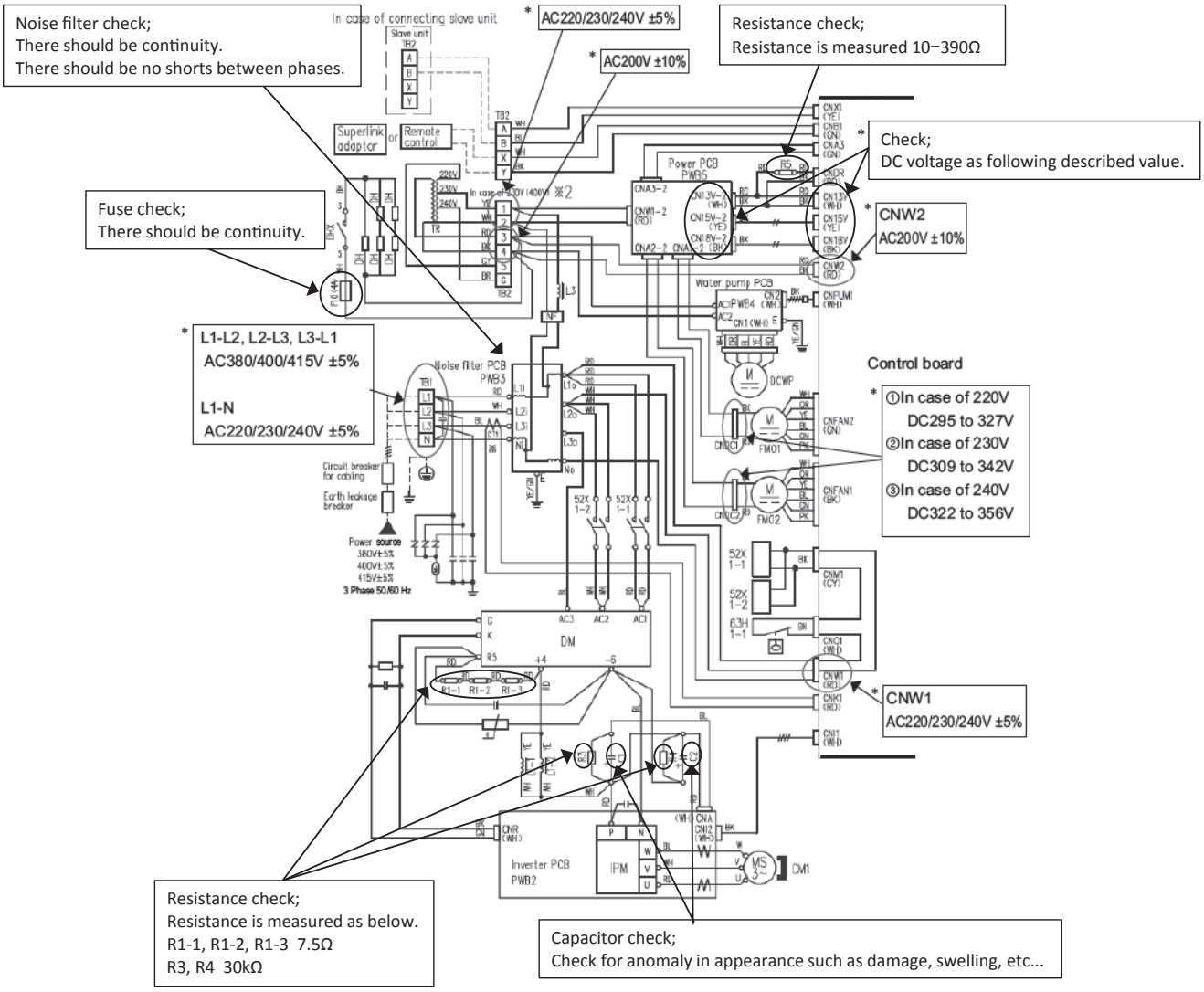
Check for a power transistor short circuit.
- When you do not have a diagnostic checker for judging if the inverter is defective, measure between the terminals of the power transistor parts, judge whether the power transistor is defective or not.
- Disconnect the compressor, then measure with the control incorporated.

Tester		Normal value (Ω)
Terminal (+)	Terminal (-)	ESA30EH2
P	N	Scores of M
N	P	A few of M
P	U	Scores of M
P	V	Scores of M
P	W	Scores of M
N	U	Hundreds of K
N	V	Hundreds of K
N	W	Hundreds of K
U	P	Hundreds of K
V	P	Hundreds of K
W	P	Hundreds of K
U	N	Scores of M
V	N	Scores of M
W	N	Scores of M

If the measured values range from 0 - several kΩ, there is a possibility that the elements are damaged, so replace the power transistor parts.

(3) Outdoor unit check points

Check items with the *mark when the power is ON.
Do not start the unit during checking for your safe.



4.4 Component replacement as a guide

For maintenance, check and preventive maintenance, please note implemetation to replace components
We would like to ask all customers owning this product to have a periodical maintenance and to replace components by our authorized service man in order to maintain the safety of product and to keep its function in good condition.
In this table, the contents of periodical checking on the product under the general usage condition and its maintenance cycle and the estimated time to replacement of each components are shown.
Especially regarding the estimated time for replacement of components, it is decided depending on the water and air quality and setting time of hot water operation and etc.
Regarding the concrete maintenance and inspection, please consult with out distributor.

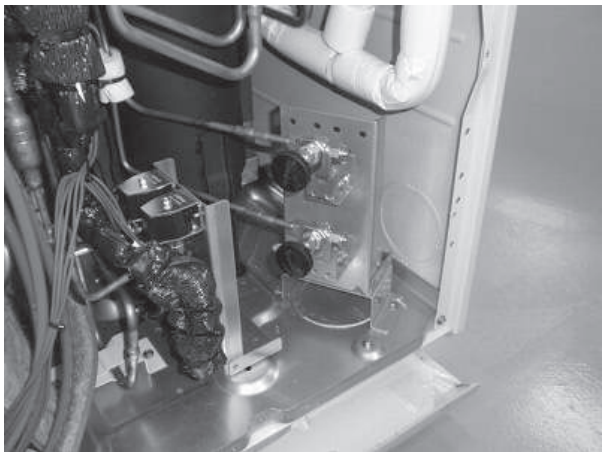
Component		Check point	Inspection cycle (Time/Year)**	Estimated time for replacement
Components of refrigeration circuit	Compressor	High pressure, intermediate pressure, low pressure, vibration, sound, insulation resistance, loose connection of terminal	1	40,000 hours
	Heat exchanger (Evaporator)	High pressure, intermediate pressure, low pressure, cleanness of fin	1	10 years
	Gas cooler (water heat exchanger)	High pressure, intermediate pressure, low pressure, pressure loss of water, discharge pipe temperature	1*	10 years
	Solenoid valve	Behavior, leak, clogging	1	10 years
	EEV (Electronic expansion valve)	Behavior, leak, clogging	1	10 years
	Strainer	Temperature difference between inlet and outlet ports of strainer	1	At heavy service
	Capillary tube	Contact wear, vibration	1	10 years
	Refrigerant pipe	Contact wear, vibration	1	10 years
Components of electrical circuit	Relay	Behavior, contact resistance at contact point, insulation resistance	1	10 years
	Coil and body of solenoid Valve & EEV	Insulation resistance	1	25,000 hours
	Crankcase heater	Insulation resistance	1	20,000 hours
	Anti-freezing heater (Drain pan, Water piping)	Insulation resistance, fallen leaves and dirts on the drain pan	1	20,000 hours
	Fuse	Apparent condition	1	5 years
	PCB (for Control, Inverter and Water pump)	Apparent condition	1	10 years
	High pressure switch (63H1) Pressure sensors	Contact resistance at contact point Is any rubbing on the capillary tube found?	1	10 years
	Terminal block	Loose connection of terminal	1	10 years
	Wiring and connector	Disconnection, looseness, deterioration, rubbing	1	10 years
	Capacitor	Leakage of electrolysis solution, deformation	1	25,000 hours
	Cooling fan	Insulation resistance, anomalous sound	1	10 years
	Magnet contactor (52C)	Contact resistance at contact point, behavior	1	25,000 hours
Outdoor fan	Fan propeller	Balance, crack	1	10 years
	Fan motor	Insulation resistance, anomalous sound, vibration	1	20,000 hours
Components of water circuit	Water pump	Behavior, vibration, anomalous sound, insulation resistance, water leakage	1*	5 years
	Flow regulator (CWFV1)	Behavior, vibration, anomalous sound, insulation resistance, water leakage	1*	5 years
	Motor valve (CWFV2 to CWFV5)	Behavior, vibration, anomalous sound, insulation resistance, water leakage	1*	5 years
	Pressure reducing valve	Behavior, anomalous sound, water pressure, water leakage	1*	5 years
	Check valve	Behavior, anomalous sound, water pressure, water leakage	1*	5 years
	Strainer	Clogging, water leakage	1*	Cleaning 2times/year

* Inspection period and replacement period are received much influence from the clean water quality to use for this hot water supply system.
Please ask our distributor for details.
** It is recommendable to inspect at least one time / year.

4.5 Disassemble and reassemble method

(1) Compressor replacement procedure

(a) Purge CO_2 refrigerant.



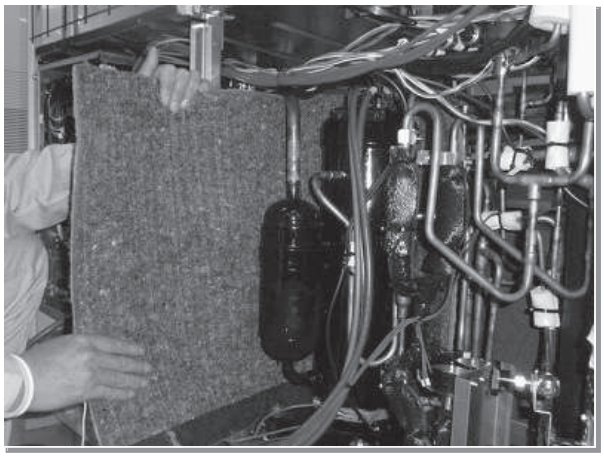
Connect the charge hoses to the service valves and purge CO_2 refrigerant.
(It is available to purge CO_2 in the air)

Note 1) If purging refrigerant rapidly, the refrigerant may become frozen inside of service valve and cannot be purged.
In addition, refrigerant oil may also be purged.
Therefore, be sure to purge the refrigerant through a proper adjustment.

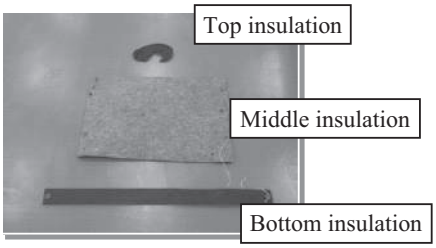
Note 2) Be sure to check EEV fully opened.
*Check procedure: Power Off ⇒ On ⇒ Off

(b) Before dismounting compressor

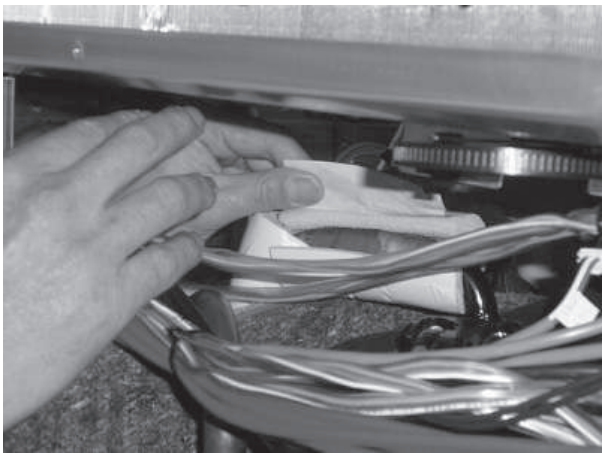
1) Remove insulation jacket from compressor.



Remove the middle and bottom insulation from left side of compressor.
Remove top insulation first and bottom insulation and then middle insulation sequentially

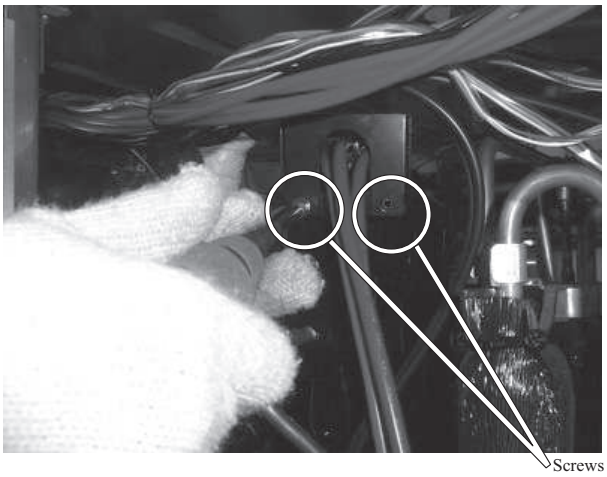


2) Remove the insulation of discharge piping.

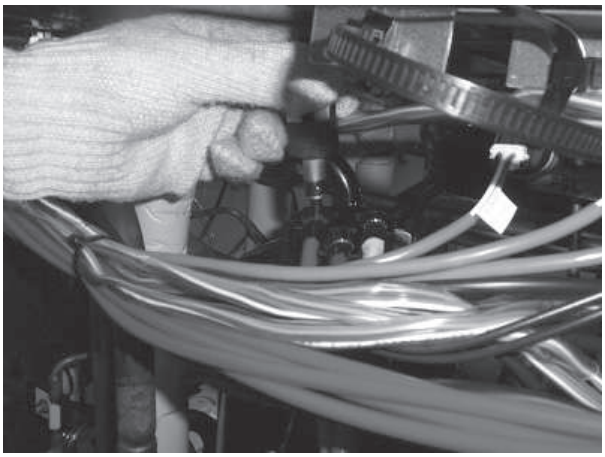


Be sure to remove the insulation neatly with consideration for reuse.
And remove it up to the position not to be burnt by brazing work.

3) Remove the power cables from compressor.

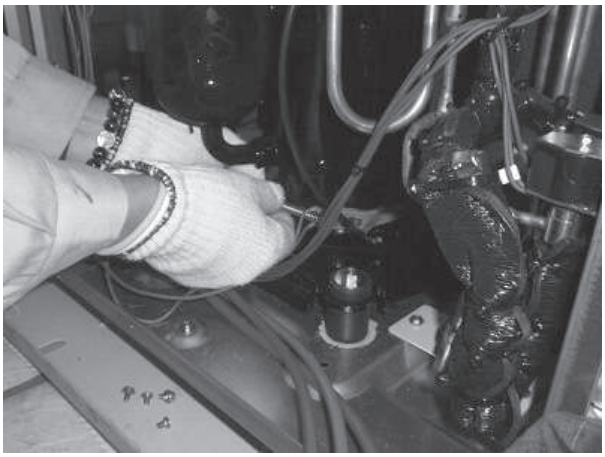


Loosen 2 screws and remove the terminal cover.

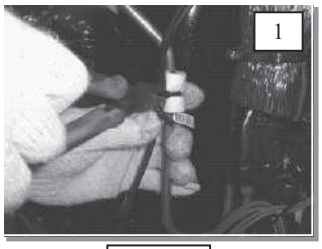


Loosen 3 screws and disconnect the power cables.
Note) Since the terminals are facing upward, it had better to use a stabilizing type screwdriver.

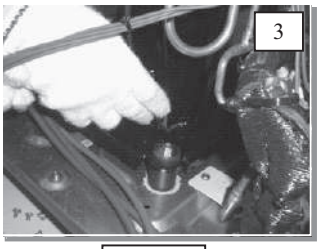
4) Remove the crankcase heater.



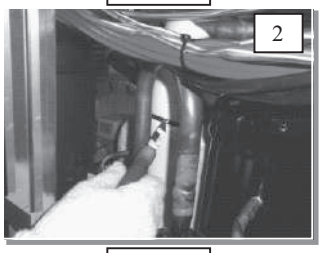
5) Remove temperature sensors.



Tho-INJ1



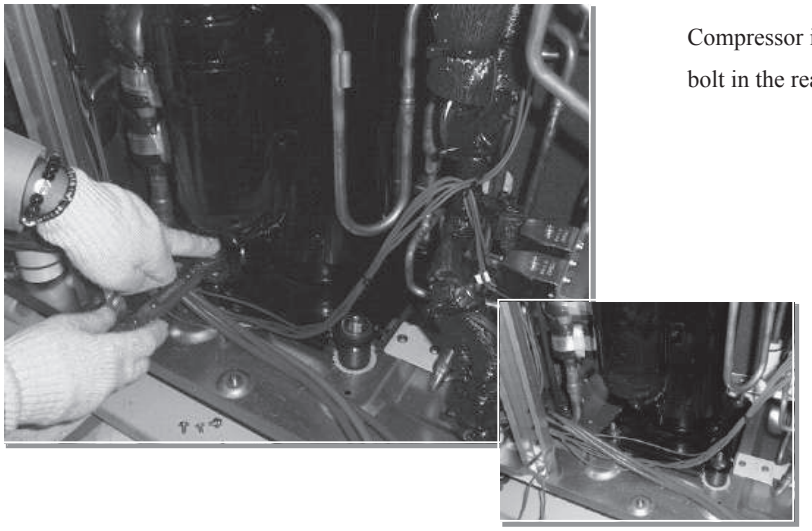
Tho-C1



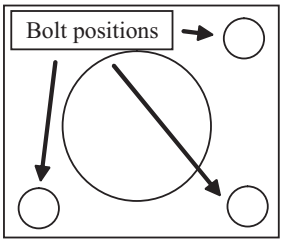
Tho-D1

Remove 3 temperature sensors after removing insulations
1. Tho-INJ1 (Injection temperature sensor)
2. Tho-D1 (Discharge temperature sensor)
3. Tho-C1 (Under-dome temperature sensor)

6) Loosen 3 nuts of compressor mounting bolts.



Compressor is fixed with 2 bolts in front and 1 bolt in the rear.



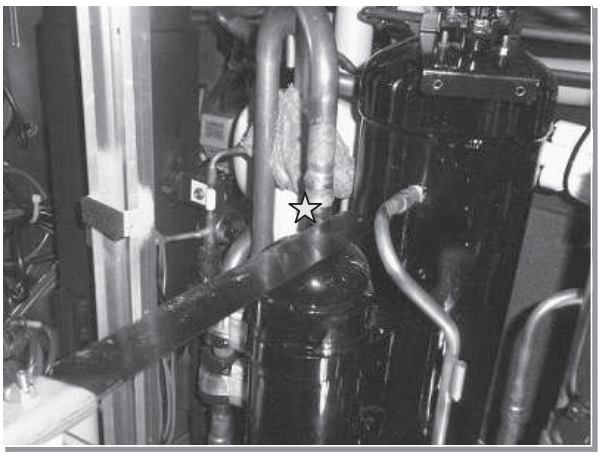
7) Bind up wires and cables for compressor.

Bind up wires and cables in order not to get in the way of brazing work and replacing work of compressor.

(c) Dismounting compressor

1) Disconnect pipes by cutting.

① Suction pipe



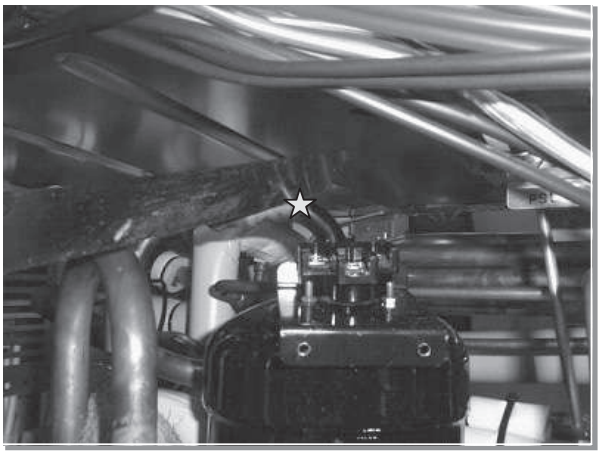
Before disconnection work, be sure to check the residual pressure in the unit is 0MPa.
(It is very dangerous to brazing pipe too hastily.)

It is better to disconnect the pipe by cutting, because the pipe is thicker and the insertion depth of pipe is deeper.
If research is required, cut the pipe as nearer as the brazing point in order to leave longer pipe on compressor side.

☆ Cutting position

Extract the remaining pipe from cutting point to brazing point by brazing.

② Discharge pipe

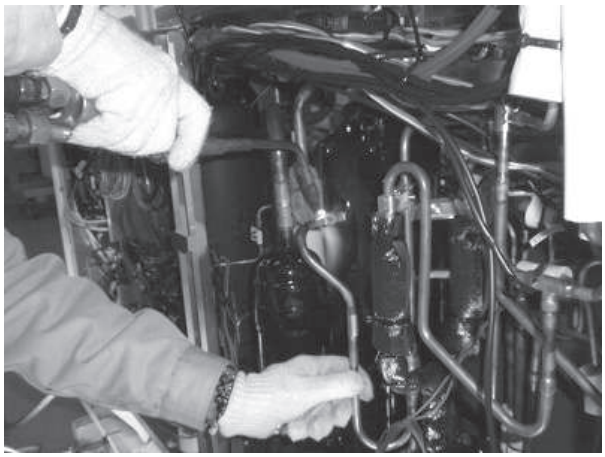


Cut the pipe in the same procedure as that for suction pipe.

☆ Cutting position

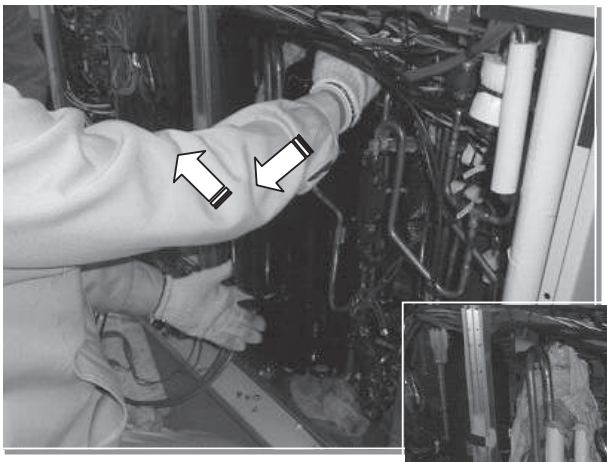
2) Disconnect a pipe by brazing.

③ Gas injection pipe



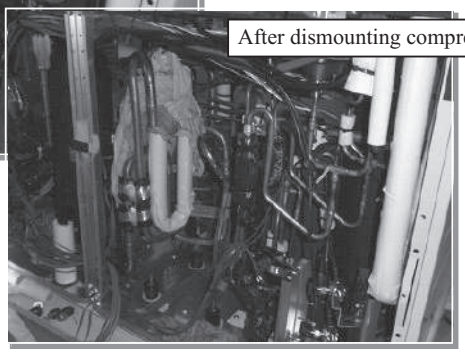
Gas injection pipe can be disconnected first by brazing, because this pipe is thin. However it is easier to disconnect it after cutting suction and discharge pipes.

3) Dismount the compressor.



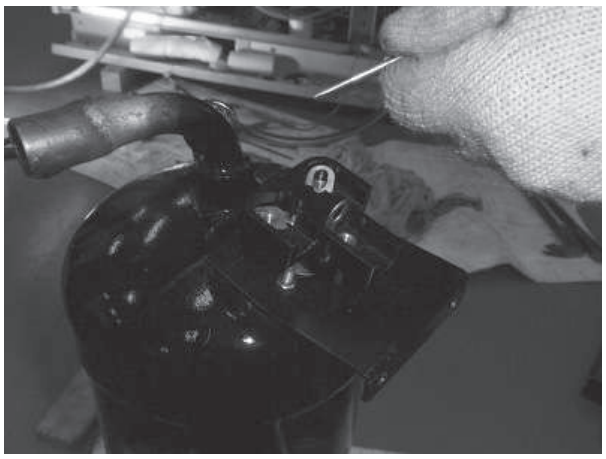
Incline the top of compressor to foreside and take it out obliquely upward.

Note) When taking out compressor, be careful not to hit it against the suction pipe located at the rear lower left side of compressor.



After dismounting compressor

4) Dismount the terminal block from compressor.



Dismount the terminal block from the compressor in order to reuse it, because new compressor as spare part does not have it.

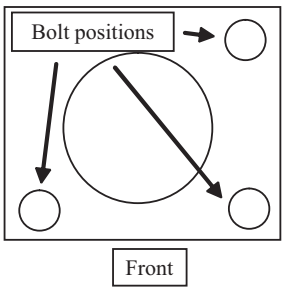
(d) Mounting new compressor

1) Mounting new compressor

Place the new compressor on to the mounting base without hitting the suction pipe located at the rear lower left side of compressor.

2) Tighten the nuts of compressor mounting bolts.

Place the new compressor in right position on the mounting bolts and tighten the nuts.



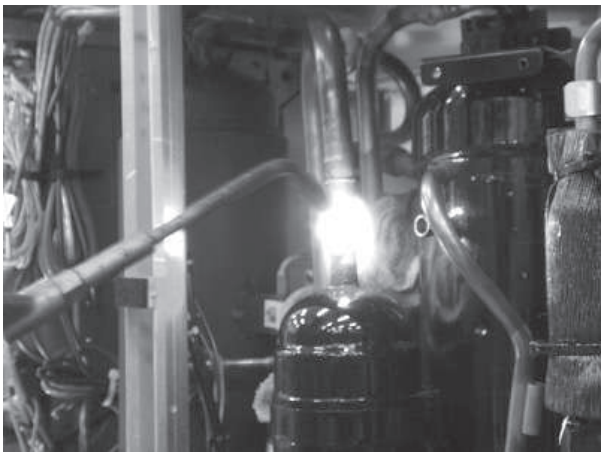
3) Brazing

① **Discharge pipe**

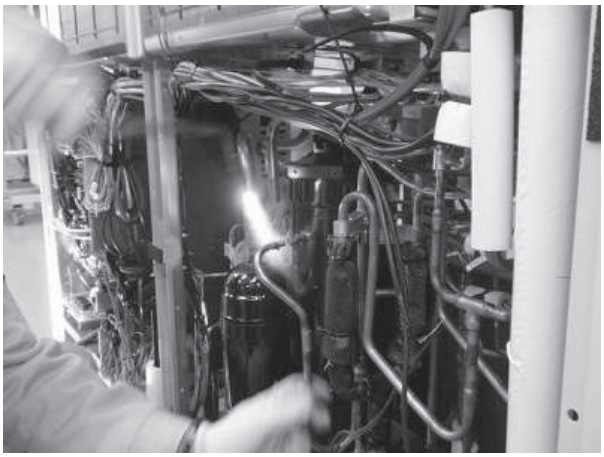
Be sure to do masking around the brazing place.
(The places not only around discharge pipe but also around suction pipe and gas injection pipe)

Note) Be careful to braze pipes without any gas leak later on, because the pipe is thicker and pipe insertion depth is deeper and then upper space is rather tight for brazing work.

② **Suction pipe**

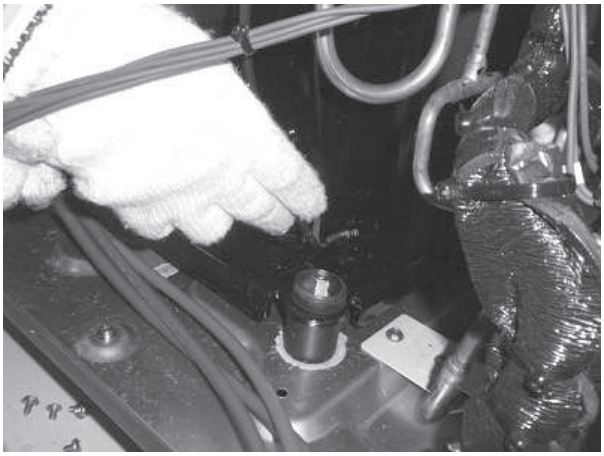


③ **Gas injection pipe**



(e) After mounting new compressor

1) Attach crank case heater and under-dome temperature sensor.



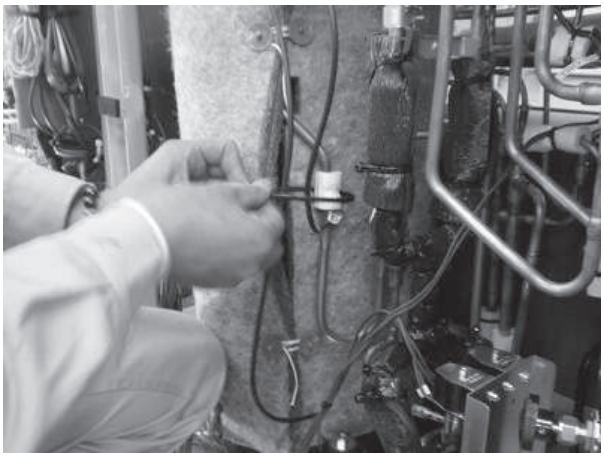
Be sure to attach them before wrapping the insulation jacket around the compressor.

2) Wrap the insulation jacket around the compressor.

Insert the insulation jacket from left side of compressor and wrap it around compressor.
And then band it in front of the compressor.

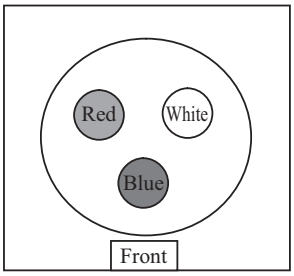
Note) Do not forget to put top insulation cover on the compressor.

3) Attach discharge pipe temperature sensor and gas injection temperature sensor.

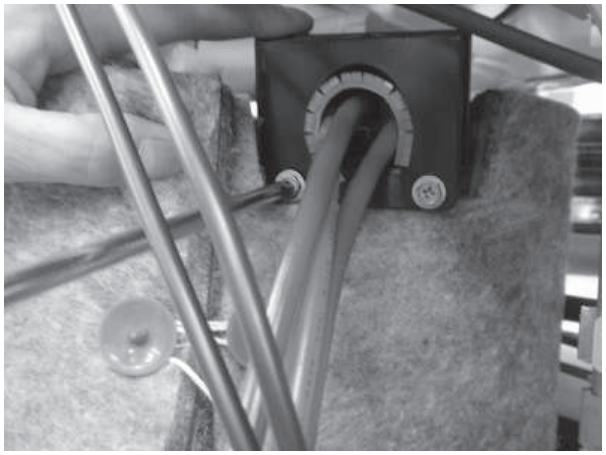


Put them back the way they were.

4) Connect the power cable to the compressor.



5) Attach terminal cover and bundling the wires.



Hook the back of terminal cover to the latch and tighten 2 screws.

The unbound wires shall be put back the way they were.

(f) Charge refrigerant.

1) Air tightness test should be done with N_2 gas by pressurizing up to 14MPa
2) Evacuate the refrigerant pipes
3) Charge CO_2 refrigerant * About 2 sets of $7m^3$ bomb are required.

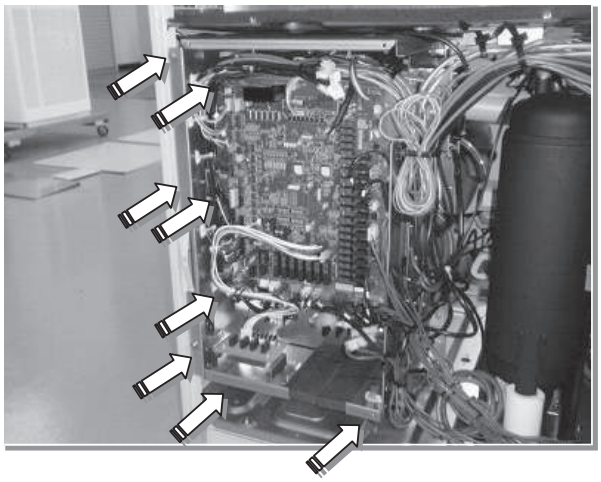
(g) Test run

1) Check whether the controls and sensors are normal.

(2) Inverter PCB replacement procedure

(a) Replacement work of inverter PCB (on the third layer)

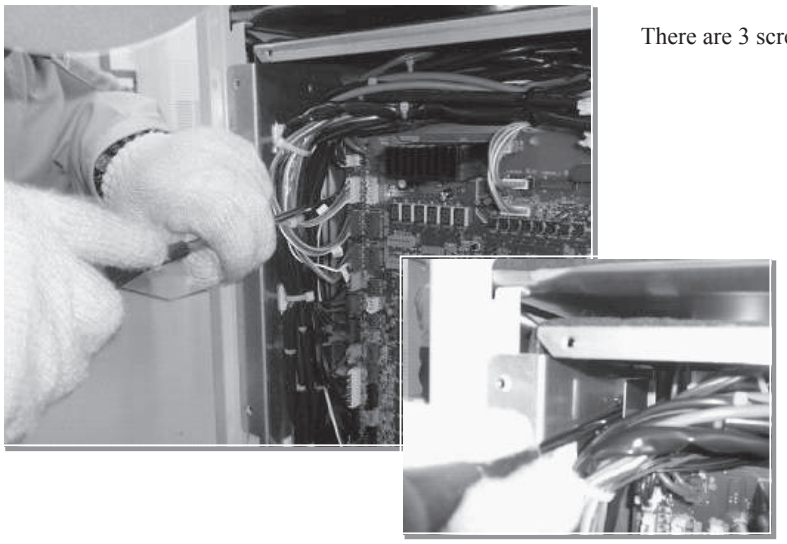
1) Loosen screws.



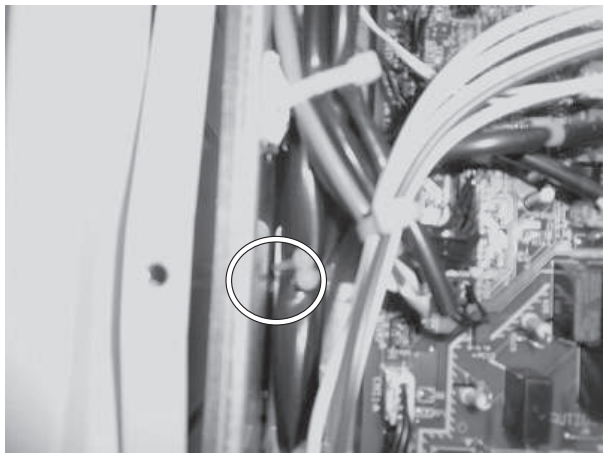
The mounting board of the first layer (on the front) the second layer (on the back) can be removed like as opening door.

Loosen 8 screws (shown with white arrow)
Left side of control box : 3 screws
Inner left side of control box : 3 screws
Bottom side of control box : 2 screws

① Inside of control box

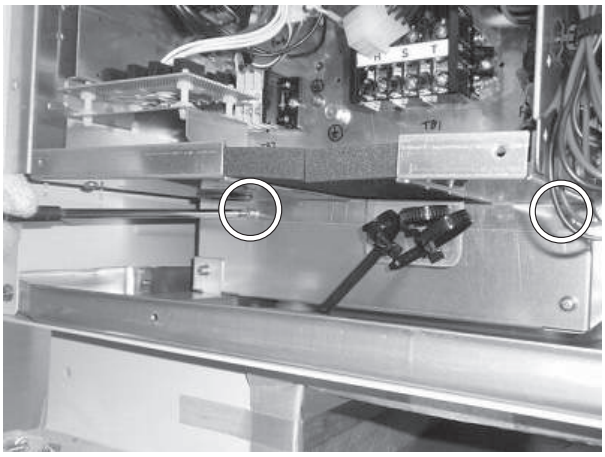


There are 3 screws at inner left side of control box.



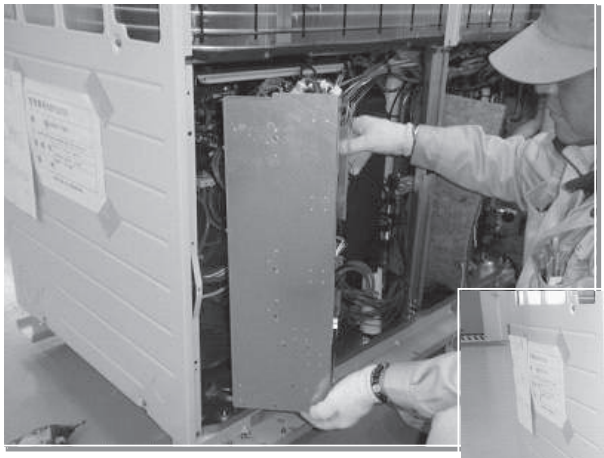
Be careful not to forget to loosen a center screw which is hidden by wiring.

② **At the bottom of control box**



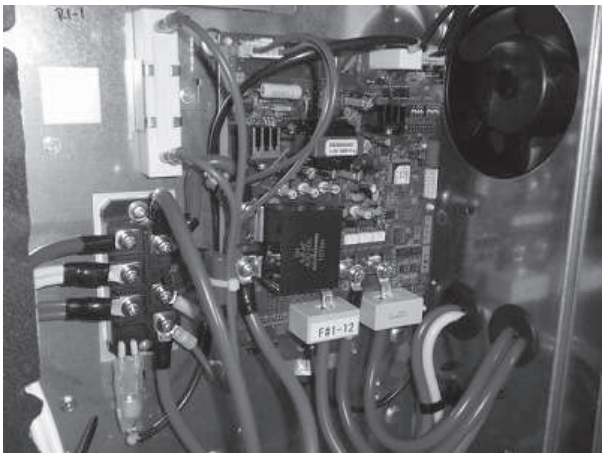
There are 2 screws at the bottom of the control box.

③ **Open the mounting board of first and second layer.**



This mounting board supported at right edge as supporting point can be opened from left side.

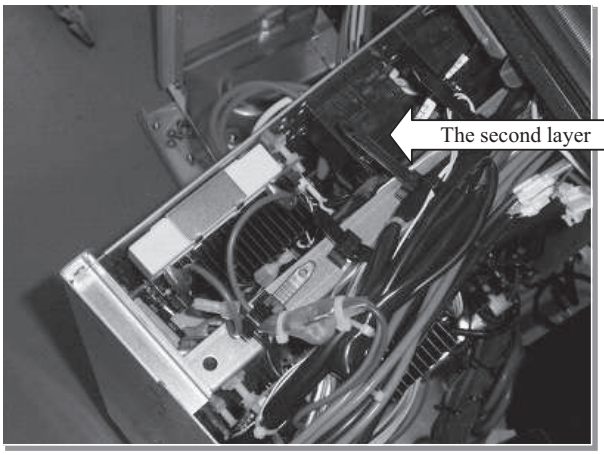
2) Inverter PCB



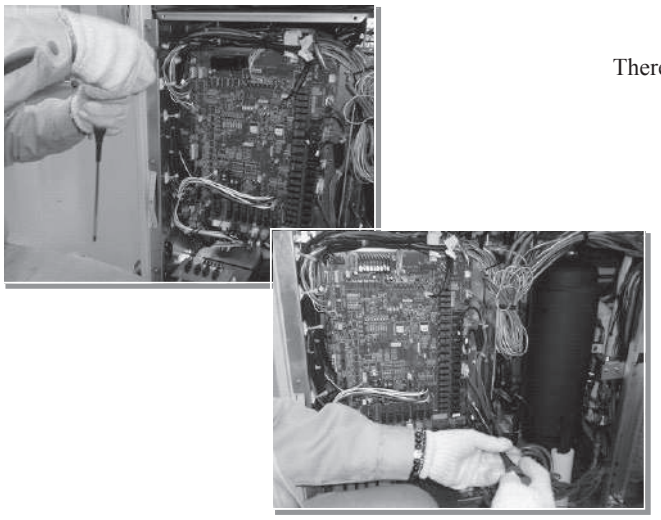
Following the process ① to ③ enables easy access to the inverter PCB without disconnecting wires.

(3) Replacement procedure of power PCB and water pump PCB

(a) Replacement work of power PCB (on the second layer)

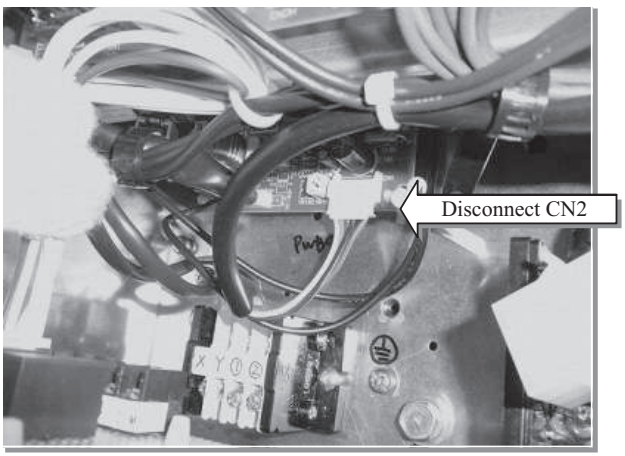


① Loosen 4 screws.



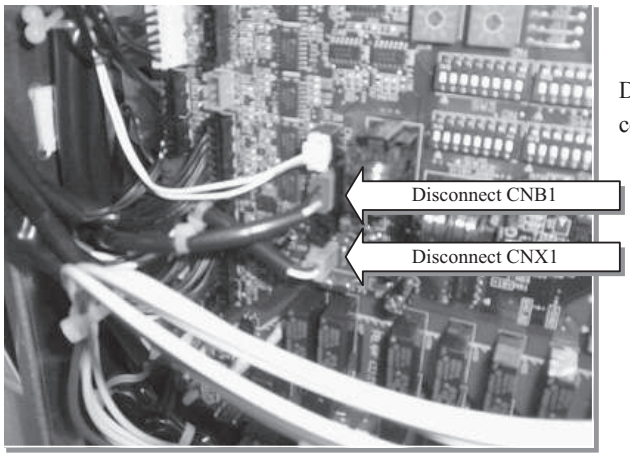
There are 4 screws at all corners of the first layer.

② Disconnect the wire going to the water pump PCB.



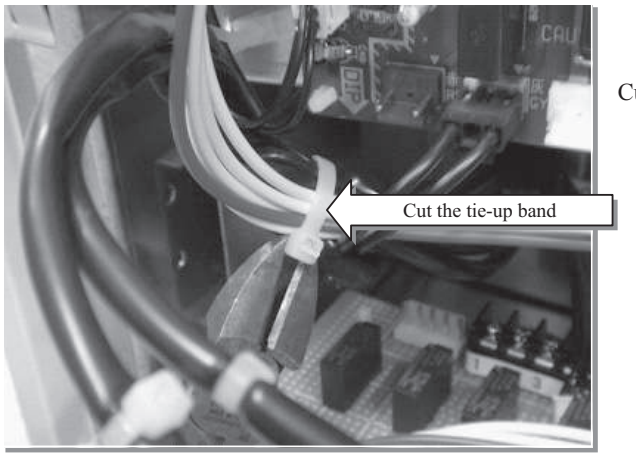
Disconnect CN2 connector on the water pump PCB.

③ **Disconnect the wires going to control PCB.**



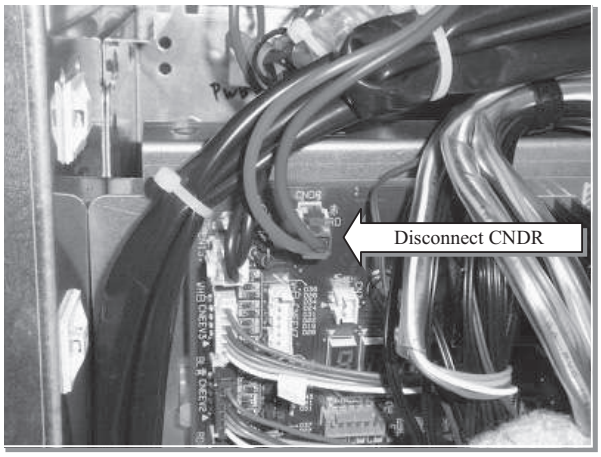
Disconnect CNB1 connector (Green) and CNX1 connector (Yellow) on the control PCB.

④ **Cut the tie-up band.**



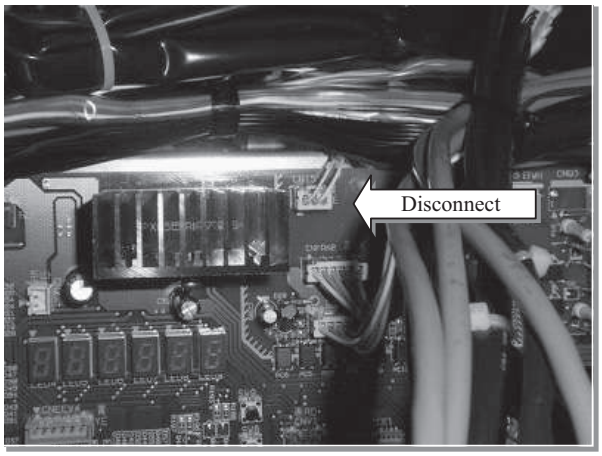
Cut the tie-up band

⑤ **Disconnect the wire going to control PCB.**



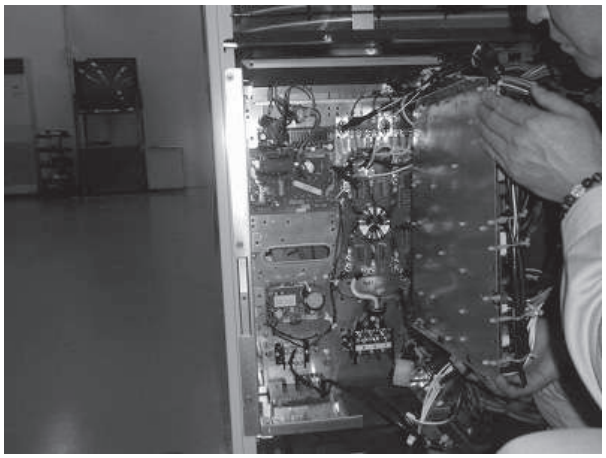
Disconnect CNDR connector (Red) at the upper left part of control PCB

⑦ Disconnect the wire going to control PCB.



Disconnect CN13V connector (White), CN15V connector (Yellow) and CN18V connector (Black) at the upper center part of control PCB. (Check the detailed position of connector with the wiring diagram or control PCB drawing)

⑧ Remove the first layer.



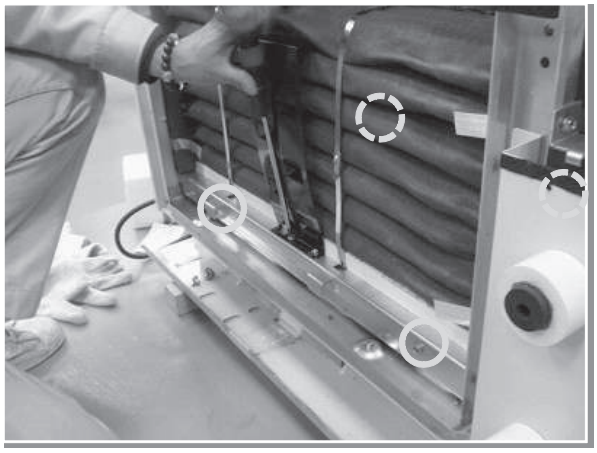
Following the process from ① to ⑦ enables to remove the first layer and to access power PCB.

(4) Dismounting water heat exchanger

(a) Remove the insulation.

The insulation will be reused.

(b) Detach 4 screws(front side x 2 , back side x 2) from the base.

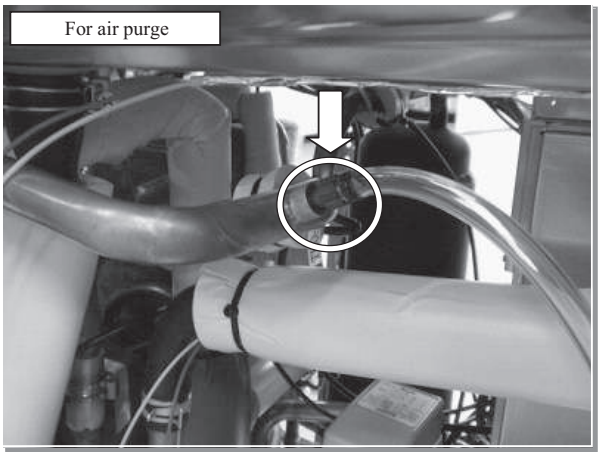


※It's no need to detach the insulation from the gas cooler.

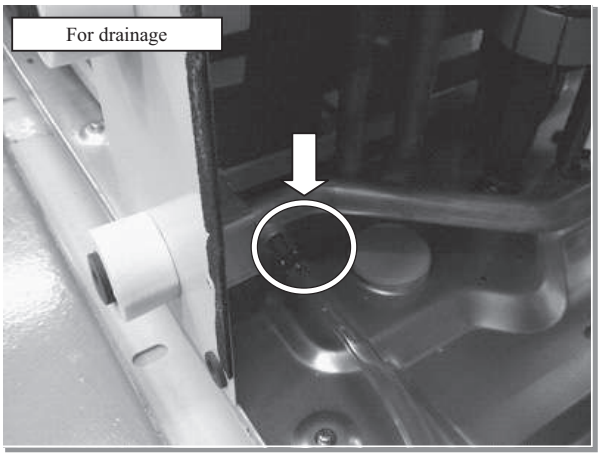
(5) Replacement procedure of water heat exchanger (Gas cooler)

(a) Removal of residual water in the water heat exchanger

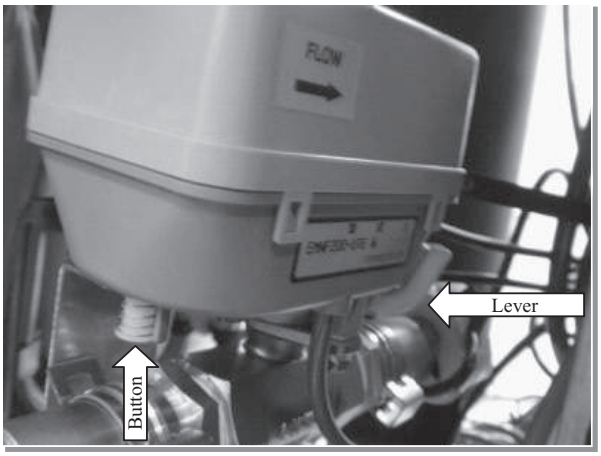
1) Remove residual water in the water heat exchanger (from 2 ports).



Turn the air purge valve and drain valve to open fully and discharge residual water.



2) Turn the lever to open the flow regulator manually.

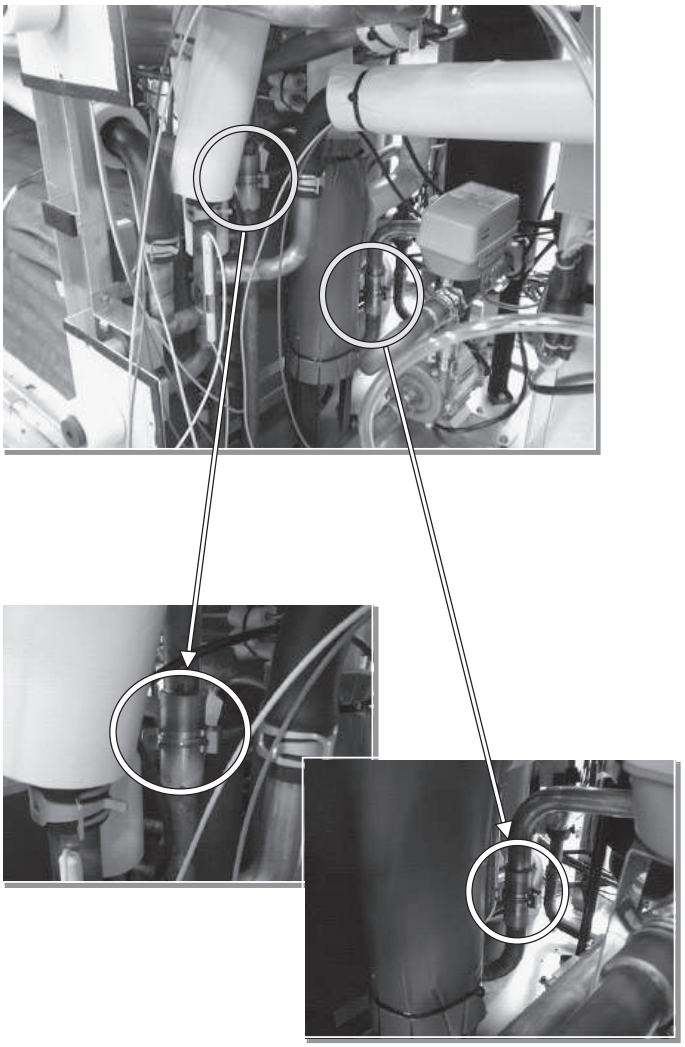


While pressing the button for switching to manual operation located at the bottom of the flow regulator, turn the lever to open ("O") side.

The flow regulator shall be open, when discharging residual water.

3) Disconnect the water pipes and ThoG1 sensor (at 2 positions).

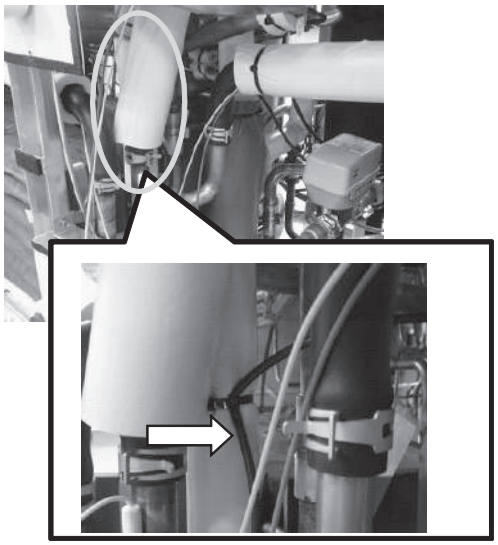
① The positions to disconnect



② Disconnect the water pipes.

Extract the quick fastener (female side)

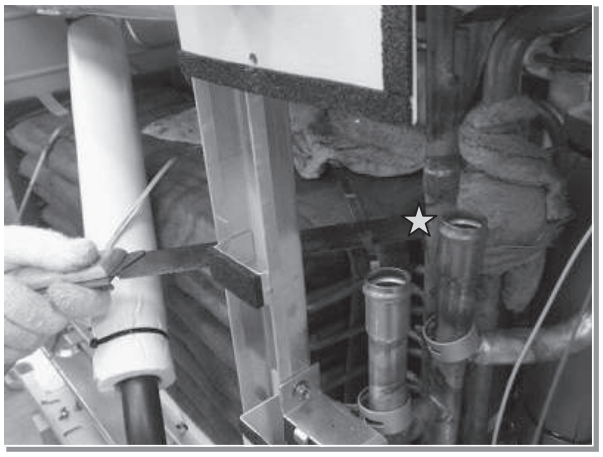
4) Disconnect ThoG1 sensor.



Detach the tie wrap band and insulation, and disconnect the ThoG1 sensor.
When disconnecting the sensor, be careful not to damage it.

5) Cut the refrigerant pipe of water heat exchanger.

① Inlet side of refrigerant pipe



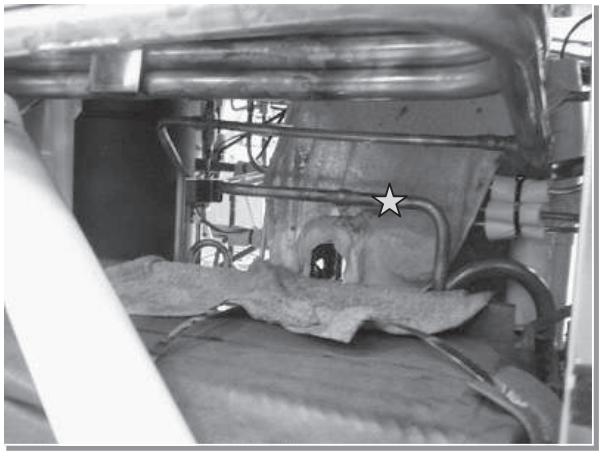
Before cutting the refrigerant pipe, remove the drain hose.
Before cutting the refrigerant pipe, be sure to check residual pressure in the water heat exchanger is 0MPa. (It is very dangerous to brazing pipe too hastily.)

It is better to disconnect the pipe by cutting, because the pipe is thicker and the insertion depth of pipe is deeper. If research of dismounted water heat exchanger is required, cut the pipe as nearer as the brazing point in order to leave longer pipe on water heat exchanger side.

☆ Cutting position

Extract the remaining pipe from cutting point to brazing point by brazing.

② Outlet side of refrigerant pipe



Cut the pipe in the same procedure as that for inlet side of refrigeration pipe.

☆ Cutting position

6) Dismount the water heat exchanger.

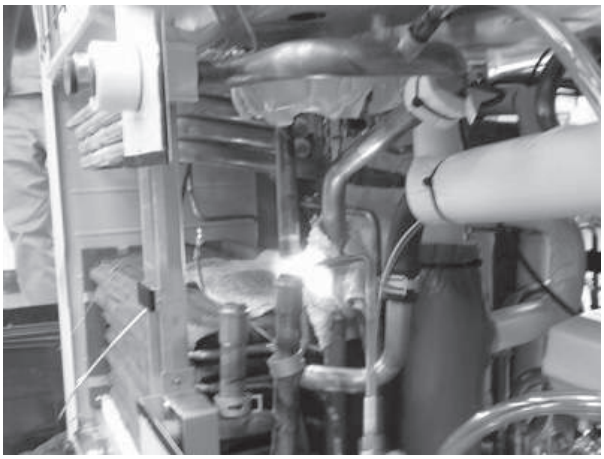
If the center pillar cannot be removed, pull out the water heat exchanger from left side by turning it anti-clockwise.

7) Clean the internal of new gas-cooler.

Before replacement, supply water (about 3L or more) to the internal of new gas cooler.
Tilt it several times to the left and right, and drainage.
If the water color is brown, repeat the above operation until the water will be clear.

8) Mount new water heat exchanger.

① Inlet side of refrigrant pipe

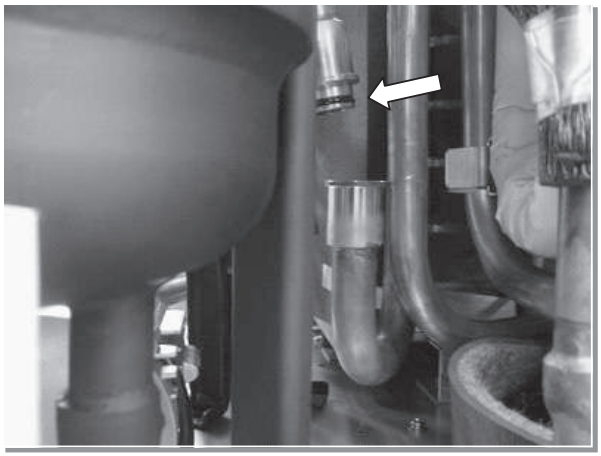


Be sure to do masking around the brazing place.
(The places not only around inlet side of refrigrant pipe but also around outlet side of refrigrant pipe.)

Note) Be careful to braze pipes without any gas leak later on, because the pipe is thicker and pipe insertion depth is deeper and then working space is rather tight for brazing work.

② Outlet side of refrigrant pipe

9) Connect the water pipe.



When connecting the water pipe, be sure to replace the O-ring to new one.

4.6 Cleaning procedure of CO_2 water heater gas cooler

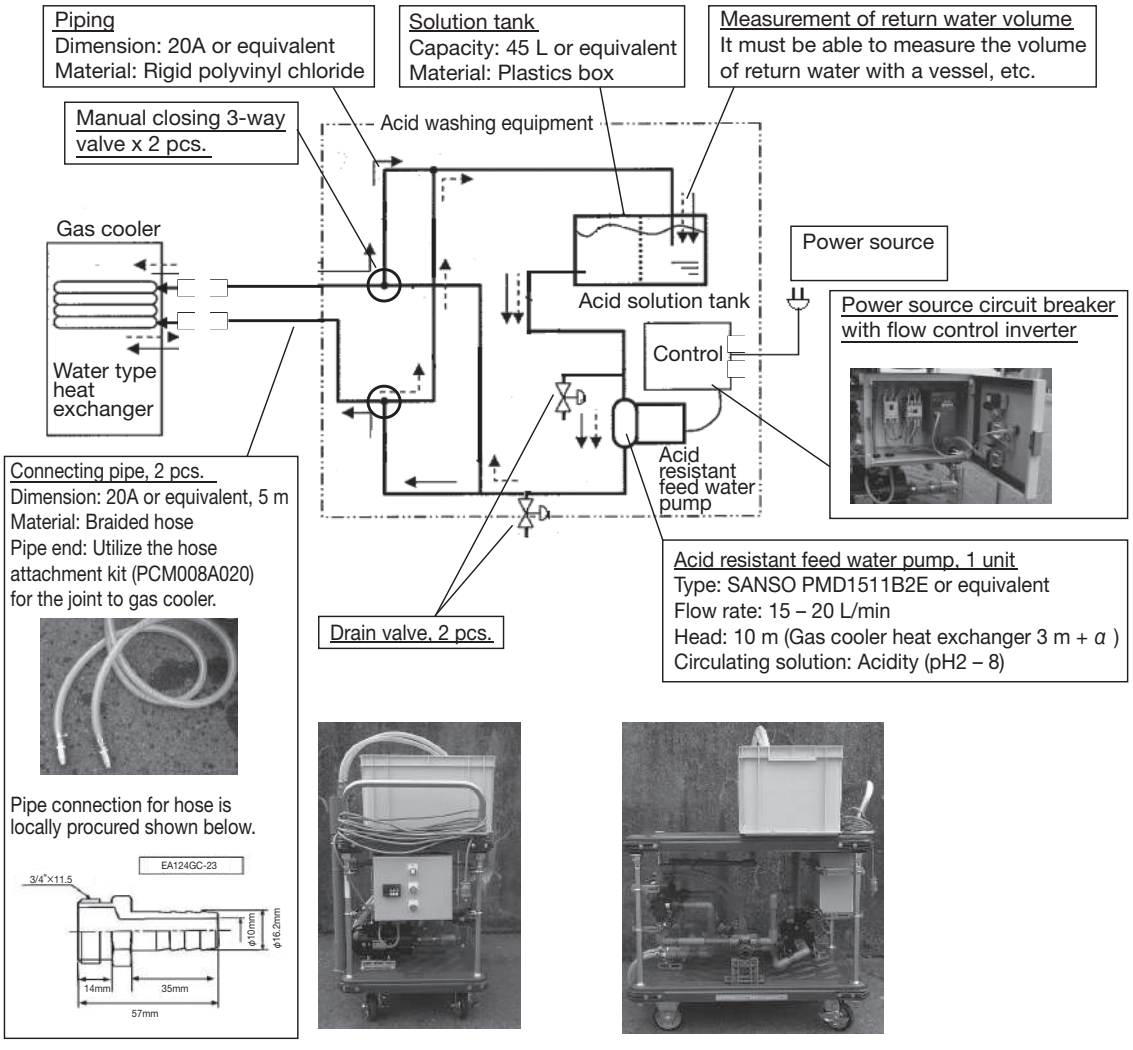
Foreign matter, and scaling could build up inside the gas cooler of the unit in which CO_2 and water exchange heat. The ancient depods depend on water quality. If it becomes too thick, it could effect flow rate and heating capacity. COP could drop or unstables control could also lead mismatch of hot water outlet temperature compared to the target temperature.
It is recommended to inspect operation data regularly, and wash the gas cooler as follows when dectercoraton of the mentioned performance due to scaling is detected.

(1) Necessary tools

1) Washing solution (Ex. Kuridine T-203, a product of Kurita Water Ind.)
   Features: Food additive-base. Lowly corrosive to aluminum, SUS and copper materials. Safe to human body.
2) Neutralizer (Ex. Kuridine N, a product of Kurita Water Ind.)
   Features: Powder in small bags for long term storage. Low toxicity.
3) Liquid waste vessel (Total recommendation: 100 L, 15 L × 6 times (Washing/neutralization)
4) pH meter or pH test paper
5) Protective equipment (Protective glasses, gloves, mask)
6) Measure (Circulation flow rate, solution concentration)
7) Hose attachment kit (PCM008A020) × 1 set
8) O ring (PCM925C002A) × 3 pcs., drain valve (PCM483D001) × 2 pcs.
9) Washing equipment (See following figure.)

Example of acid washing

• Outline of circuit and parts are as shown below.
• Materials resistant to chemicals (acid)



(2) Cleaning procedure

The following chart shows the flow the steps required from evaluation for need of washing to end of clean up procedure.

Operation preparation

Evaluation if clean up required.

① Judgment for need of washing

② Heat pump water heater power source OFF

③ Pipe connection

④ Check for 3-way valve position and closure of water drain valve on the washing equipment. Washing pump power source ON

⑤ Feed water into washing circuit. (15 L)

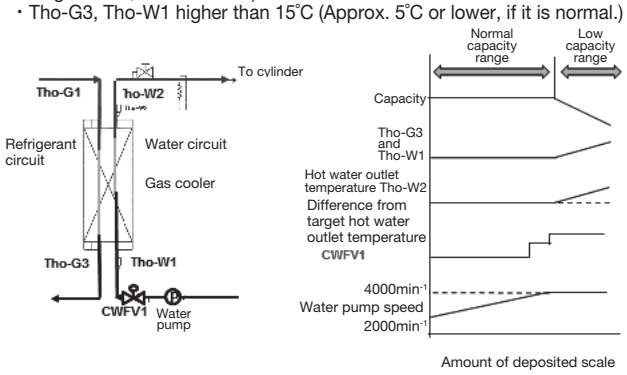
⑥ Connect the plug to the receptacle.

⑦ Adjust the circulation water flow rate at 15 – 20 L/min. Bleed air.

⑧ Washing pump OFF

<Symptom of accumulated scale>

- Water pump speed (Upper limit 4,000 min^{-1}), CWFV1 (Upper limit 100%) nearly at upper limit value
- Tho-W2 > Target hot water outlet temperature + 3˚C (Same as the target value, if it is normal.)
- Tho-G3, Tho-W1 higher than 15˚C (Approx. 5˚C or lower, if it is normal.)



Washing

⑨ Add washing agent.

⑩ Washing pump ON
Check initial pH. Wash for approx. 0.5 – 1 hour.
* Change the water flow direction regularly with the manual valve.

⑪ Check pH. Does it increase slowly? — N → ⑩ / Y →

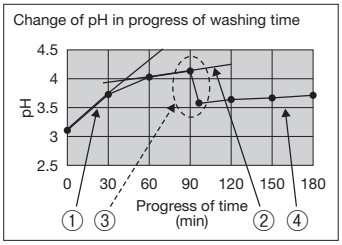
⑫ Add washing agent again. (pH drop to 0.5)

⑬ Washing operation (For approx. 30 min. to 1 hr.)

⑭ Check pH. It does not increase. — N → ⑬ / Y →

⑮ End of washing

<Preparation of solution>
Example: When using Kuridine T-203, prepare 20% solution.
Add approx. 3.8 L of KURIDINE to 15 L of water.
Formula: 3.8/(15 + 3.8) = 20%
<Check pH to see if scale has been removed.>



① pH does not increase slowly. … During washing (Scale being removed)
② pH increases slowly … Depleted efficiency of washing agent. Add more agent.
③ pH drops. … pH drops after adding the washing agent.
④ No increase in pH … End of scale removal

Neutralization/restoration

⑯ Add a neutralizer gradually into the circuit.

⑰ Operate continuously with pH6 – 8. (For approx. 30 min.) — N → ⑰ / Y →

⑱ Supply city water from one side.

⑲ Supply city water again, and circulate for 10 – 20 min. Repeat the steps ⑱ and ⑲ minimum 2 or 3 times till pH in the liquid waste stabilizes at 6 – 8. — N → ⑱ / Y →

⑳ Restore water circuit. Bleed air.

<Liquid waste disposal>

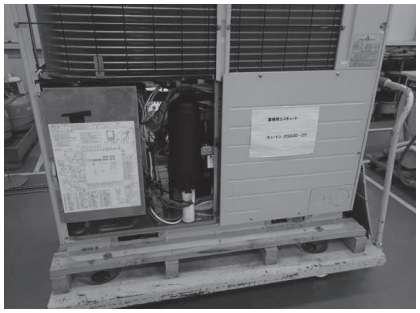
Note) Add the neutralizer carefully, not to overflow the solution owing to the surge of foaming by chemical reaction after a sudden addition of neutralizer.
Note) Liquid waste needs to be disposed by an authorized industrial waste disposal contractor.

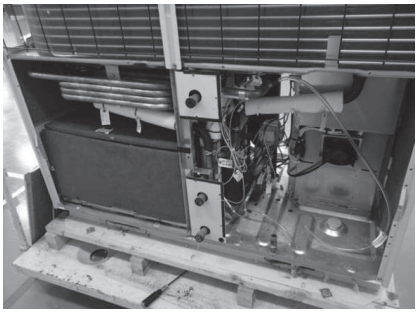
(3) Cleaning instructions

1) Turn OFF the power source to the heat pump water heater.

2) Connect pipes.

2-1) Remove the front panel (control BOX side) and the rear panels (2 pcs).

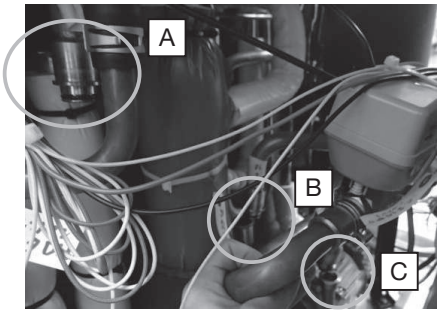


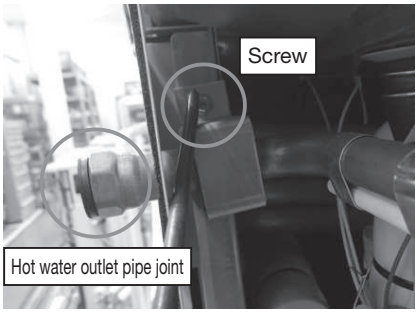


2-2) Remove the quick fasteners at A to C in the following figure.

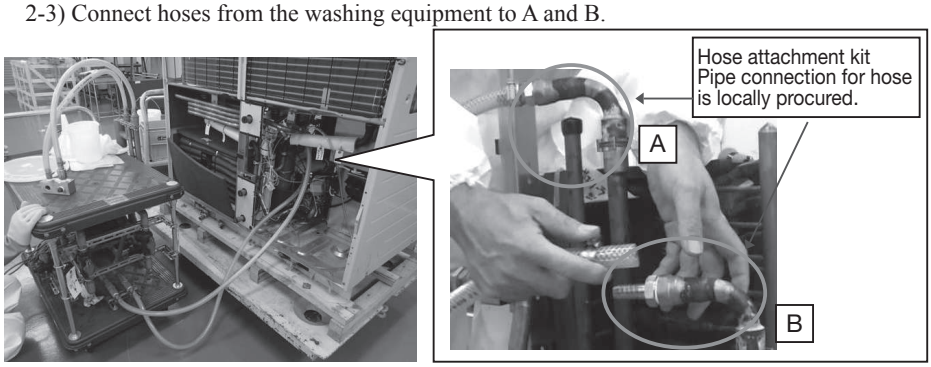
Note) If it is difficult to remove at A, remove the joint and screw from the hot water outlet pipe in the figure at right.

Note) Remove the fastener at C in order to remove the same at B.





2-3) Connect hoses from the washing equipment to A and B.



Utilize the hose attachment kit (PCM008A020) to connect to the heat pump water heater (Gas cooler water pipe inlet and outlet).

Note) Provide the hoses, pipe connection for hose and clamps locally.

3) Set the washing equipment (provided locally). (Valve direction adjustment, water drain valve closure, etc.)

4) Feed water to the washing equipment and devices. (15 – 20 L)

Note) Check for leak from the piping.

Note) Capacity in the gas cooler piping is approx. 9L. Adjust the feed water quantity according to the washing cylinder.

5) Turning on the power source of the washing equipment, start the washing pump. Bleed air also from the piping at this time.

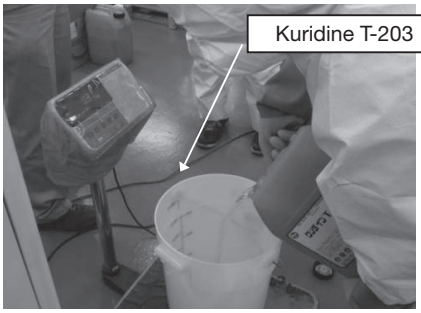
6) Adjust the circulation water volume at 15 – 20 L.

7) Turn OFF the washing pump.

8) Add the neutralizing agent.

Example: Prepare 20% solution of Kuridine T-203.
If the water is 15 L, add approx. 3.8 L of Kuridine T-203 (undiluted solution).

Note) Adjust the concentration of solution depending on the washing agent.



9) Check initial pH. Turn ON the washing pump, and operate it for 0.5 – 1.0 hr.

10) Check pH regularly during washing till the increase of pH slows down.

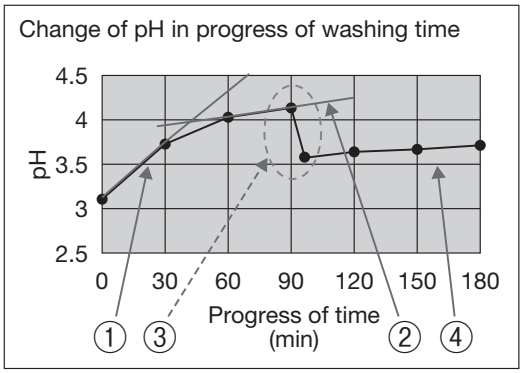
a) Does pH increases slowly? → Add more washing agent, and repeat the step (9).

Note) Change the manual valve regularly to invert the flow direction of washing agent. (Once/30 – 60 min.)

Note) Unless the flow direction can be inverted with the manual valve, drain washing agent before adding more agent, disconnect and reconnect outlet and inlet hoses, and return to the section (4).
Or, continue to wash longer than normal.

b) pH does not increase. → Go to the section (11).

Repeating the above, complete the washing when pH does not increase any more.



① pH does not increase slowly. … During washing (Scale being removed)

② pH increases slowly … Depleted efficiency of washing agent. Add more washing agent.

③ pH drops. … pH drops after adding the neutralizer.

④ No increase in pH … End of scale removal

11) Add the neutralizer gradually to neutralize the solution in the piping. (To pH 6 – 8)

Note) Add the neutralizer carefully, gradually paying attention to the foam created chemical reaction, during the especially adding suddenly neutralizer.

Note) Take care to avoid the air foam being trapped in the water pump.

Note) When the neutralized condition has continued for 30 minutes at least while operating the water pump, the neutralization can be completed.

12) After completing the neutralization (to pH6 – 8), feed water from one side to push out the liquid waste to a vessel. When the washing solution has been purged completely, turn off the washing pump.

Note) Check the pH of drained solution once more to see if it is neutralized sufficiently. (To avoid dispose of an acidle solution)

13) Feed city water to the washing equipment and the gas cooler, and turn on the washing pump again to circulate water. About 10 – 20 minutes later, repeat the step (12).

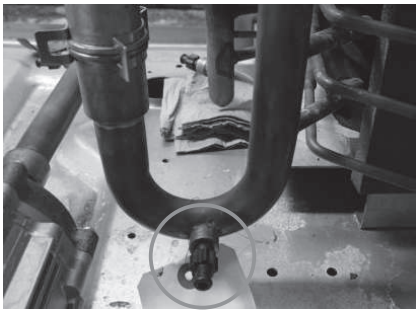
Repeat the above work at least 2 to 3 times. If the pH of liquid waste stabilizes at pH6 – 8, it can be judged that the washing solution has been removed from the circuit.

Note) Check again the pH of drained solution to see if it has been neutralized sufficiently.

14) Restore the water circuit as it was, and bleed air from the piping to complete the washing.

Be sure to have the liquid waste disposed by an authorized industrial waste disposal contractor, and obtain the certificate.

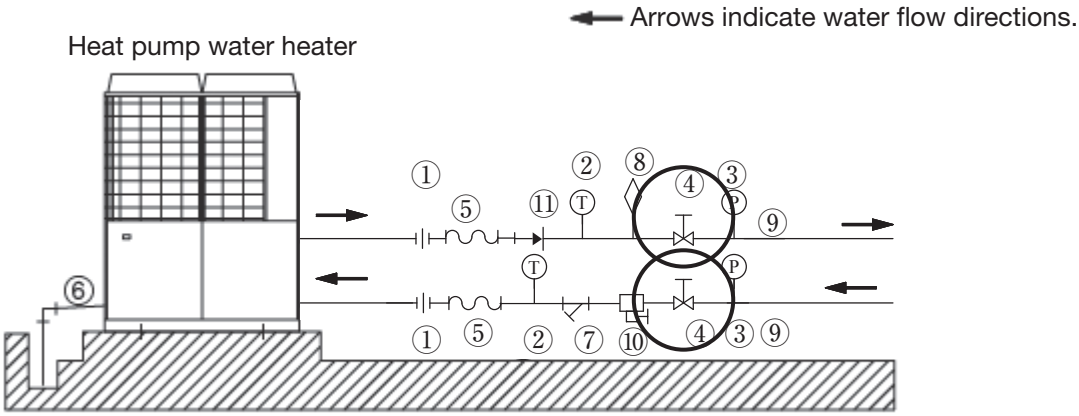
Note) After the washing, replace O rings (PCM925C002A, 3 pcs.) and the drain valves (PCM483D001, 2 pcs.).



4.7. Method of draining water from gas cooler

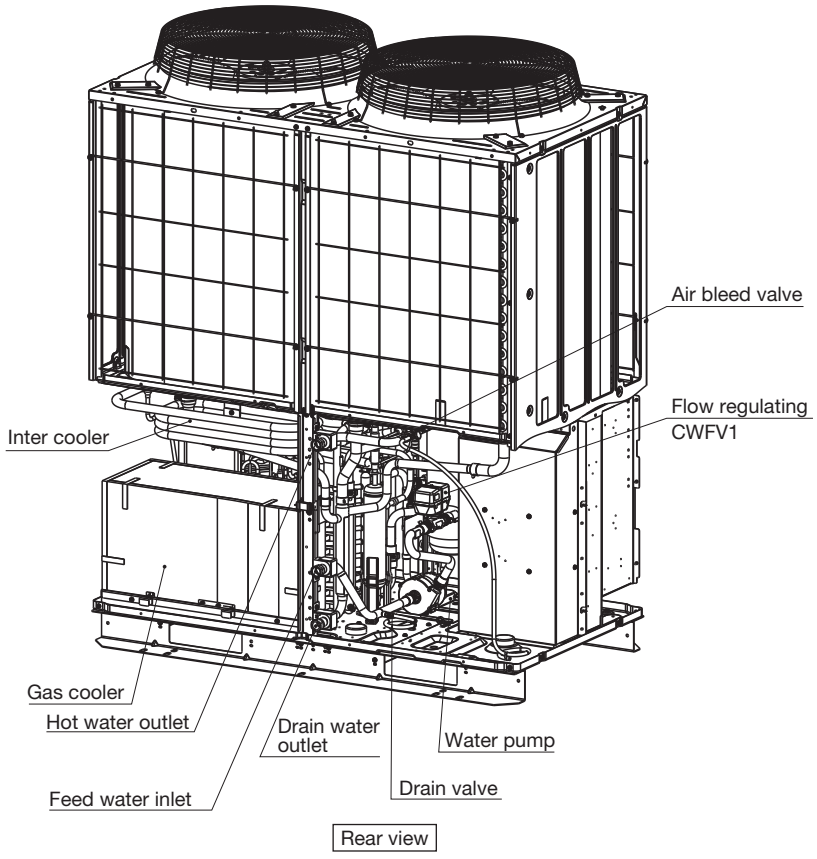
If the heat pump water heater is left without power source in winter, water in the gas cooler may freeze, damaging the heat exchanger or causing problems at restart of operation. Please drain water from the gas cooler as follows prior leaving the unit deemergesed for long time.

1) Close the valves at the hot water supply and the water supply pipe sides.



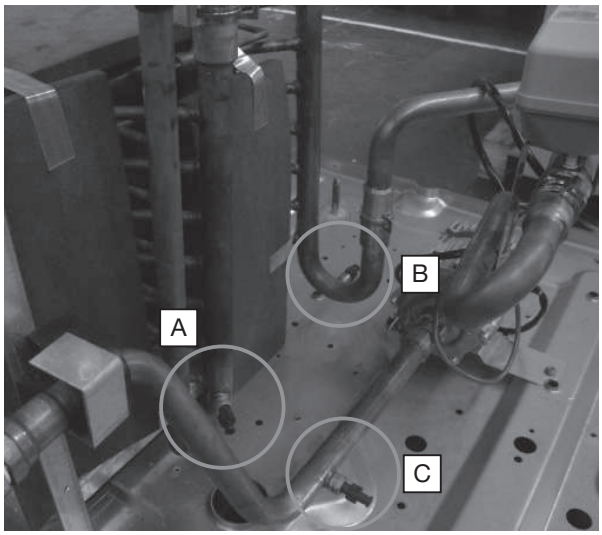
Configuration of water pipes

2) Remove the service panels both at the front and the rear.

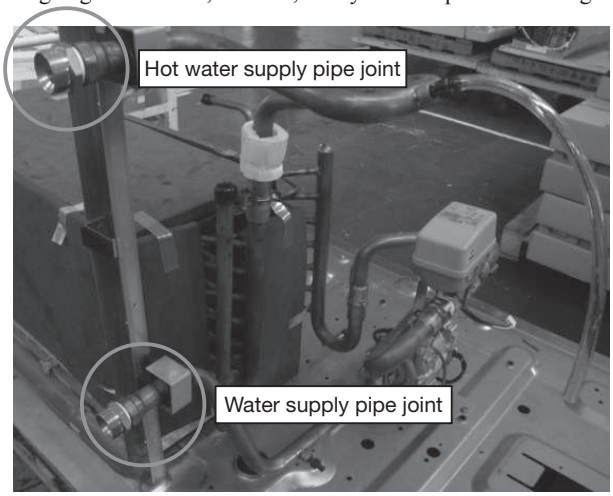


Following instructions are based on a test unit equipped with the water piping only, to show better the relative positions of pipes and drain valves.

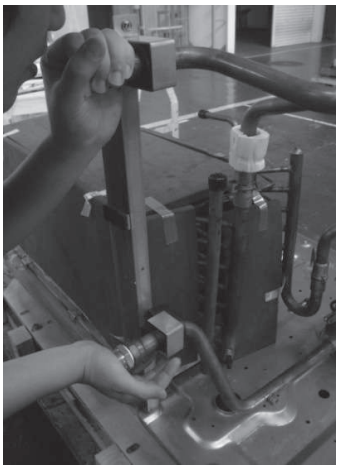
3) Open the drain valve C to drain water. Close the valve after draining.



4) Disconnect the joints from the hot water supply and the water return pipe sides. Blow air from the hot water supply pipe joint till no water is forced out from the water return pipe any more.
* When using a nitrogen gas container, or other, always set the pressure no higher than 0.4 MPa.



5) Blow air from the hot water supply pipe side after opening the valve A and closing the return side by a hand. When water has been drained completely, close the valve A.
Repeat the same also on the valves B and C.



This is all for the water draining work. Restore the pipe connection after the work.

(Caution)

When water is charged again later, test run the water pump to bleed air securely before operating the unit. Please note that it may take time before the unit operation stabilizes.

4.8 7-segment display and compressor stop factor

(1) 7-segment code (P) list

Following list shows the codes used for the setting of option functions and for the adjustment of parameters at site.

For the methods to change settings, refer to the 7-segment setting procedure on the page 103 (8.4)(b).

Code No.	Data display	Data display range	Minimum unit	Remark
<Setting by service personnel>				
P20	Air heat exchanger fan snow protection control	0: (Factory default) 0−1	–	0: Fan snow protection control invalid (Factory default) 1: Fan snow protection control setting 1 valid
P21	Air heat exchanger fan snow protection control ON time setting	30: (Factory default) 10, 30−600 (sec)	30	
P22	Demand rate change value	OFF: (Normally) 000、040、060、080	–	Setting value for 2-step demand input Ordinary demands are set with DIP switch.
P23	DC24V CNZ1 External output 1 function assignment	0: (Factory default) 0−20	1	0: Operation output 1: Error output 2: Compressor ON output 3: Fan ON output 4: Water shortage output 5: Water pump ON output 6: Anti-freezing circuit output 7: Defrost operation output 8: Hot water storage operation output 9: Heat retaining operation output 10: Anti-freezing operation output 11: Anti-freezing heater output 12: Water overflow output 13: Backup operation output 14: Remote control ON 15: Hot water amount output 16: Heating operation output (for space heating) 17~20: Spare
P24	DC24V CNZ2 External output 2 function assignment	1: (Factory default) 0−20	1	
P25	CNS1 function assignment	0: (Factory default) 0−20	1	0: Stop input (Master) 1: Demand input (Master) 2: Fan snow protection control input (Master/Slave independent) 3: Operation input (Operation/Normal) (Master) 4: Pause input (Pause/Normal) (Master) 5: 2-step demand input (Master) 6: Spare 7: Emergency stop (E63) 8: Start/Stop (Master) 9: Anti-legionella control input 10: Flow volume anomaly in heating operation 11−20: Spare
P26	CNS2 function assignment	1: (Factory default) 0−20	1	
P27	CNS3 function assignment	2: (Factory default) 0−20	1	
P28	CNG1 function assignment	3: (Factory default) 0−20	1	
P29	CNG2 function assignment	4: (Factory default) 0−20	1	
P30	Initial setting operation status	0: (Factory default) 0−2	1	0: Unfinished 1: Interruption 2: Completed
P31	CWFV1 aperture correction value	0: (Factory default) -10−+10	2.50%	Range of auto correction by the primary setting operation is from -5 to +5. This is not to allow to change by manual.

Code No.	Data display	Data display range	Minimum unit	Remark
P32	AC200V system external output 1 function assignment (CNH3)	0: (Factory default) 0−20	1	0: Operation output 1: Error output 2: Compressor ON output 3: Fan ON output 4: Water shortage output 5: Water pump ON output 6: Anti-freezing circuit output 7: Defrost operation output 8: Hot water storage operation output 9: Heat retaining operation output 10: Anti-freezing operation output 11: Anti-freezing heater output 12: Water overflow output 13: Backup operation output 14: Remote control ON 15: Hot water amount output 16: Heating operation output (for space heating) 17−20: Spare
P33	AC200V system external output 2 function assignment (CNN2)	1: (Factory default) 0−2	1	
P34	AC200V system external output 3 function assignment (CNN13)	2: (Factory default) 0−2	1	
P47	Return hot water 3-way valve switching temperature	40: (Factory default) 0−90	5	Changes the switching temperature setting of the 3-way valve.
P77	Hot water storage amount reach/un-reach judgment temperature initializing	0: (Factory default)	1	Switches between the once-through and the circulation controls by the movement of 0→1 or 1→0 depending on the state of SW5-4.
P78	Hot water storage amount correction for hot water storage operation starting condition	5: (Factory default) 0−100	5	Changes the start condition when it starts to store hot water after using up hot water stored in the cylinder.
P79	Hot water storage amount correction for hot water storage operation ending condition	5: (Factory default) 0−100	5	When the hot water storage ending condition is corrected. Used, for example, when it is necessary to end just at 60%.
<Spare setting>				
P80	Number of CPU resets	0−255	1	
P81	Number of SL communication errors	0−255	1	
P82	Number of reset commands from remote control	0−255	1	
P83	Number of SFR errors	0−255	1	
P84	Number of remote control transmission disability errors	0−255	1	
P85	Number of sequence errors	0−255	1	
P86	Number of power source ONs	0−255	1	
P87	Number of task start errors	0−255	1	

(2) 7-segment code (C) list

Code No.	Contents of display	Data display range	Minimum unit	Remark
<Sensor & actuator>				
C00	CM1 operating frequency	0－130	1rps	
C01	CM2 operating frequency	0－130	1rps	
C02	Tho-A Outdoor air temperature	L,-20－70	1℃	
C03	Tho-R1 Heat exchanger temperature1	L,-20－70	1℃	
C04	Tho-R2 Heat exchanger temperature2	L,-20－70	1℃	
C05	Tho-R3 Heat exchanger temperature3	L,-20－70	1℃	
C06	Tho-R4 Heat exchanger temperature4	L,-20－70	1℃	
C07	Tho-D1 Discharge pipe temperature (CM1)	L,-25－150	1℃	
C08	Tho-D2 Discharge pipe temperature (CM2)	L,-25－150	1℃	
C09	Tho-C1 Under-dome temperature (CM1)	L,-30－90	1℃	
C10	Tho-C2 Under-dome temperature (CM2)	L,-30－90	1℃	
C11	Tho-P1 Power transistor temperature (CM1)	L,10－140	1℃	
C12	Tho-P2 Power transistor temperature (CM2)	L,10－140	1℃	
C13	Tho-S1 Suction pipe temperature (CM1)	L,-40－75	1℃	
C14	Tho-S2 Suction pipe temperature (CM2)	L,-40－75	1℃	
C15	Tho-W1 Gas cooler water sensor (inlet)	L,-40－75	1℃	
C16	Tho-W2 Gas cooler water sensor (outlet)	L,-40－75	1℃	
C17	Tho-M1 Reciever inlet temperature sensor (CM1)	L,-40－75	1℃	
C18	Tho-M2 Reciever inlet temperature sensor (CM2)	L,-40－75	1℃	
C19	Tho-Inj1 Injection inlet temperature sensor (CM1)	L,-40－75	1℃	
C20	Tho-Inj2 Injection inlet temperature sensor (CM2)	L,-40－75	1℃	
C21	Tho-G1 Gas cooler inlet refrigerant temperature sensor (CM1)	L,-25－150	1℃	
C22	Tho-G2 Gas cooler inlet refrigerant temperature sensor (CM2)	L,-25－150	1℃	
C23	Tho-G3 Gas cooler inlet refrigerant temperature sensor (CM3)	L,-40－75	1℃	
C24	Tho-G4 Gas cooler inlet refrigerant temperature sensor (CM4)	L,-40－75	1℃	
C25	Tht-1 (Unvented cylinder)		1℃	
C26	Tht-2 (Unvented cylinder)		1℃	
C27	Tht-3 (Unvented cylinder)		1℃	
C28	Tht-4 (Unvented cylinder)		1℃	
C29	Tht-5 (Unvented cylinder)		1℃	
C30	Tht-6 (Unvented cylinder)		1℃	
C31	Tht-7 (Unvented cylinder)		1℃	
C32	Tht-8 (Unvented cylinder)		1℃	
C33	Tht-9 (Unvented cylinder)		1℃	
C34	Tht-Op1 (Vented cylinder)		1℃	
C35	Tht-Op2 (Vented cylinder)		1℃	
C36	Tht-Op3 (Vented cylinder)		1℃	
C37	WLS Water level sensor (Vented cylinder)	0－50	0.1kPa	
C38	CT1 Current (CM1)	0－50	1A	
C39	CT2 Current (CM2)	0－50	1A	
C40	Inverter secondary current1	0－50	1A	
C41	Inverter secondary current2	0－50	1A	
C42	High pressure sensor (CM1)	0－15	0.01MPa	
C43	High pressure sensor (CM2)	0－15	0.01MPa	
C44	Low pressure sensor (CM1)	0－8.5	0.01MPa	
C45	Low pressure sensor (CM2)	0－8.5	0.01MPa	
C46	Mid pressure sensor (CM1)	0－8.5	0.01MPa	
C47	Mid pressure sensor (CM2)	0－8.5	0.01MPa	
C48	Suction superheat (CM1)	0－50	0.1deg	
C49	Suction superheat (CM2)	0－50	0.1deg	
C50	FM01 Revolution speed	0－2550	$10min^{-1}$	
C51	FM02 Revolution speed	0－2550	$10min^{-1}$	
C52	EEVH1 Heating expansion valve opening pulse	0－500	1pulse	
C53	EEVH2 Heating expansion valve opening pulse	0－500	1pulse	
C54	EEVG1 Gas cooler expansion valve opening pulse	0－500	1pulse	
C55	EEVG2 Gas cooler expansion valve opening pulse	0－500	1pulse	
C56	Water pump revolution speed command	0－500	$10min^{-1}$	
C57	Water pump revolution speed	0－500	$10min^{-1}$	
C58	CWFV1 opening	0－100	1%	
C59	CWFV opening	0 , 1 (0; Close, 1; Open)	—	Order of 100: CWFV2 Order of 10 : CWFV3 Order of 1 : CWFV4

Code No.	Contents of display	Data display range	Minimum unit	Remark
C60	CWFV opening	0, 1 (0：Close, 1：Open)	—	Order of 100：CWFV5
				Order of 10 ：CWFV6
				Order of 1 ：Spare
C61	"Pressure switch External input"	0, 1 (0：Open circuit 1：Short circuit)	—	Order of 100：63H1-1
				Order of 10 ：63H1-2
				Order of 1 ：CNS1
C62	External input	0, 1 (0：Open circuit 1：Short circuit)	—	Order of 100：CNS2
				Order of 10 ：CNS3
				Order of 1 ：CNG1
C63	External input External output	0, 1 (0：Open circuit 1：Short circuit)	—	Order of 100：CNG2
				Order of 10 ：Operation output (CNH)
				Order of 1 ：Error output (CNY)
C64	External output	0, 1 (0：Open circuit 1：Short circuit)	—	Order of 100：External output (CNZ1)
				Order of 10 ：External output (CNZ2)
				Order of 1 ：Spare
C65	Relay output (Heater)	0, 1 (0：Open circuit 1：Short circuit)	—	Order of 100：CH1
				Order of 10 ：CH2
				Order of 1 ：DH
C66	Relay output (Heater)	0, 1 (0：Open circuit 1：Short circuit)	—	Order of 100：H1
				Order of 10 ：H2
				Order of 1 ：Spare
C67	Relay output (Cooling fan for control)	0, 1 (0：Open circuit 1：Short circuit)	—	Order of 100：Coolig fan1, 2
				Order of 10 ：Ventilating fan
				Order of 1 ：AC water pump
C68	Relay output (52X-1, 2)	0, 1 (0：Open circuit 1：Short circuit)	—	Order of 100：52X1-1, 2
				Order of 10 ：52X2-1, 2
				Order of 1 ：Spare
C69	Relay output (Solenoid valve)	0, 1 (0：Open circuit 1：Short circuit)	—	Order of 100：SV-inj1
				Order of 10 ：SV-inj2
				Order of 1 ：SVHG1
C70	Relay output (Solenoid valve)	0, 1 (0：Open circuit 1：Short circuit)	—	Order of 100：SVHG2
				Order of 10 ：SV-oil1
				Order of 1 ：SV-oil2
C71	Number of connected unit	1–4	1unit	
C72	Capacity of connected unit	0–999	1kW	
C73	Accumulated compressor operating time (CM1)	0–655	100h	
C74	Accumulated compressor operating time (CM2)	0–655	100h	
C75	Accumulated water pump operating time	0–655	100h	
C76	Accumulated compressor operating time from the maintenance last time (CM1)	0–655	100h	
C77	Accumulated compressor operating time from the maintenance last time (CM2)	0–655	100h	
C78	Accumulated water pump operating time from the maintenance last time	0–655	100h	
C79	Operation mode	0–10	—	See next page.
C80	Target temperature to top up	0–99	1℃	
C81	Target hot water temperature	0–99	1℃	
C82	Target hot water amount	0–99	1℃	
C83	Rate of effective demand	0–100	1%	
C84	Hot water amount	0–127	1%	
C85	Spare	—	—	
<Control status>				
C86	Control status	0–127	1	
C87	Protection control status	0–127	1	
C88	Compressor stop factor	0–127	1	
C89	Compressor stop factor lapsed time	0–255	1	
C90	Protection control factor1	0–127	1	
C91	Protection control factor2	0–127	1	
C92	Protection control factor3	0–127	1	
C93	Compressor anomaly detection factor1	0–127	1	
C94	Compressor anomaly detection factor2	0–127	1	
C95	Compressor anomaly detection factor3	0–127	1	
<Others>				
C96	Data reset			
C97	Program・sub-version	0–991	—	
C98	Program・POL-version	0.00–9.99	0.01	
C99	Auto feed display	—	—	

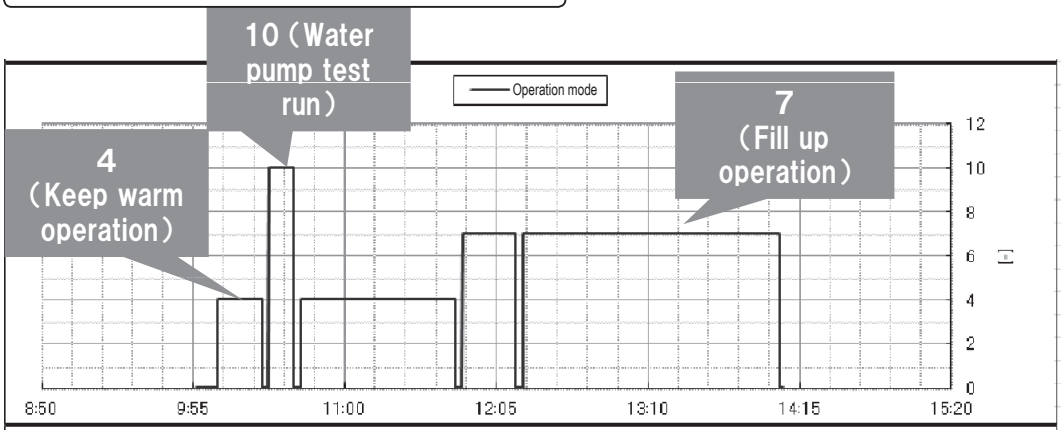
• Operation mode can be confirmed from Mente PC or 7-segment display (C79)

No.	Operation mode	Cylinder type		In case of day off setting
0	Stop	Vented	Available	Available
		Unvented		
1	Top up operation	Vented	Available	Unavailable
		Unvented		
4	Keep warm operation (Vented cylinder only)	Vented	Available	Available
		Unvented	Unavailable	
5	Anti-freezing operation (Water pump work only)	Vented	Available	Available (*1)
		Unvented		
7	Fill up operation	Vented	Available	Available
		Unvented		
8	Defrost operation (*2)	Vented		
		Unvented		
9	Primary setting operation	Vented		
		Unvented		
10	Water pump test run	Vented		
		Unvented		

(*1) After primary setting operation is done, this operation is available.

(*2) If ambient temperature is less than 3 degree, defrost operation will be started after finishing top up operation in night-time.

[Example of operation mode in Mente PC data]



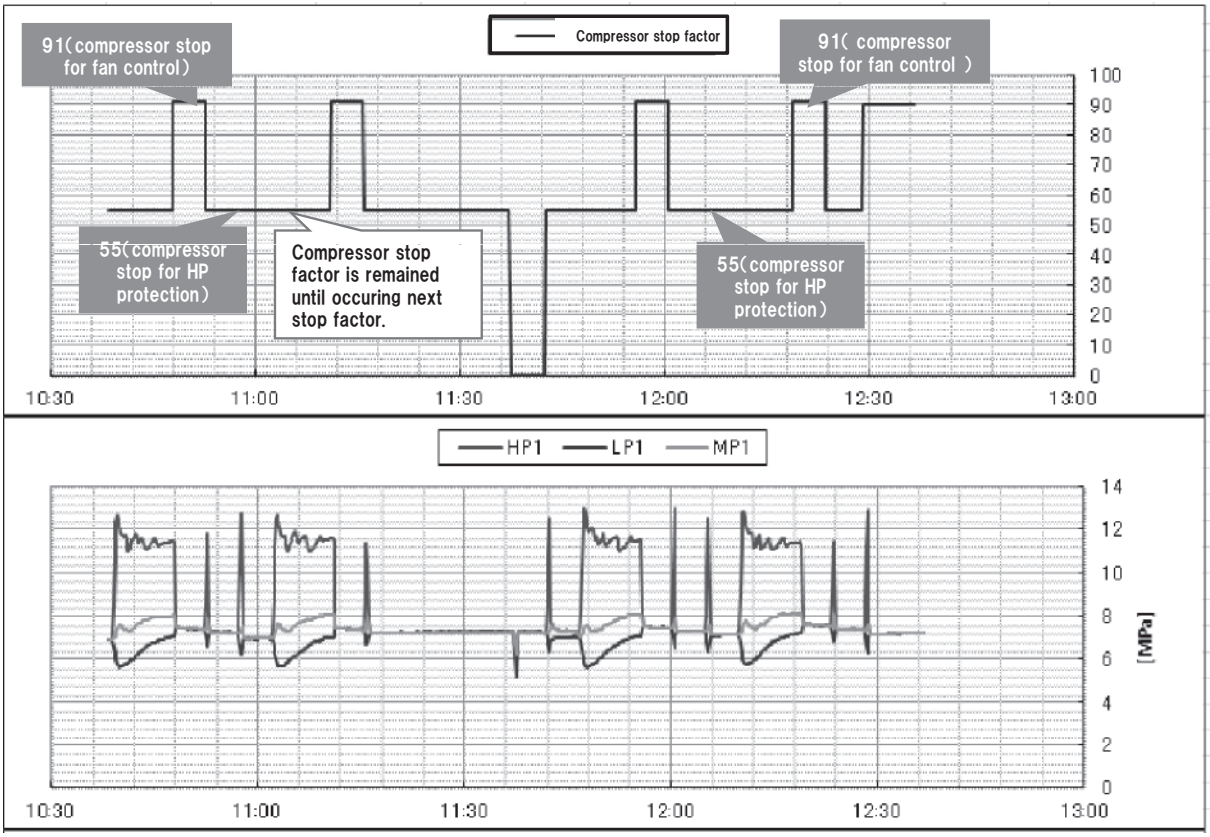
(3) Compressor stop factor

It can be confirmed the number of compressor stop factor from Mente PC or 7-segment display (C88).
Compressor stop factor is remained until occuring next stop factor.

[Example]

(i) Compressor stop factor (55) is caused by HP protection control. This control is caused by lack of supply water due to pipe clogging.

(ii) Compressor stop factor (91) is caused by outdoor fan control . (2 fan → 1fan)
This control can be seemed in hot season.



Compressor stop factor		Number
【Outdoor unit】 Disconnection / Short circuit (sensor, EEV)	When power ON	0
	Ambient temperature sensor	1
	Heat exchanger temperature sensor 1 (Tho-R1)	2
	Heat exchanger temperature sensor 2 (Tho-R2)	3
	Heat exchanger temperature sensor 3 (Tho-R3)	4
	Heat exchanger temperature sensor 4 (Tho-R4)	5
	Discharge pipe temperature sensor 1 (Tho-D1)	6
	Discharge pipe temperature sensor 2 (Tho-D2)	7
	Suction pipe temperature sensor 1 (Tho-S1)	8
	Suction pipe temperature sensor 2 (Tho-S2)	9
	Under-dome temperature sensor 1 (Tho-C1)	10
	Under-dome temperature sensor 1 (Tho-C2)	11
	Heat radiation fin temperature sensor1 /Power transistor temperature sensor1(Tho-P1)	12
	Heat radiation fin temperature sensor2 /Power transistor temperature sensor2(Tho-P2)	13
	High pressure sensor 1	14
	Low pressure sensor 1	15
	Intermidiate pressure sensor 1	16
	High pressure sensor 2	17
	Low pressure sensor 2	18
	Intermidiate pressure sensor 2	19
【Outdoor unit】 Disconnection / Short circuit (sensor, EEV)	Gas cooler water temperature sensor 1	20
	Gas cooler water temperature sensor 2	21
	Gas cooler temperature sensor 1	22
	Gas cooler temperature sensor 3	24
	Temp. sensor at inlet injection port	26
	Temp. sensor at inlet port of intermediate pressure receiver	28
	Disconnection of EEVH1	30
	Disconnection of EEVH2	31
	Disconnection of EEVG1	32
【Unvented Cylinder】 Disconnection / Short circuit (sensor, EEV)	Tht1 for unvented cylinder	40
	Tht2 for unvented cylinder	41
	Tht3 for unvented cylinder	42
	Tht4 for unvented cylinder	43
	Tht5 for unvented cylinder	44
	Tht6 for unvented cylinder	45
	Tht7 for unvented cylinder	46
	Tht8 for unvented cylinder	47
	Tht9 for unvented cylinder	48
	Water level sensor for unvented cylinder	49
	Water temperature sensor for unvented cylinder	50

Compressor stop factor		Number
【System anomaly】	HP1 Anomaly ※ 63H1 activation, HP ≧ 14MPa	55
	LP1 Anomaly ※ LP ≦ 1.0MPa	57
	Td1 Anomaly ※ Td ≧ 135℃	59
	Open phase on power source, Reverse phase on power source	61
	CPU communication error	62
【System anomaly】	FMo1 anomaly	65
	FMo2 anomaly	66
	INV1 current cut	67
	INV1 power transistor overheat	69
	INV1 start-up failure	71
	INV1 communication error	73
	INV1 loss of synchronism	75
	Communication error between outdoor unit	77
	Active filter anomaly	78
【Water circuit anomaly】	Water pump anomaly Ex. Rotation of water pump ＜ 500 min^{-1}	80
	Inlet water temperature anomaly Ex1. Inlet water temperature ＞ 63℃ Ex2. In case, there Is a temperature difference(⊿ 10℃) in 10 minutes.	81
	Outlet water temperature anomaly Ex1. Outlet water temperature ≧ 98℃	82
	Overflow anomaly	83
	Anomaly of cut off the water supply Ex1. Gas cooler outlet refrigerant temperature ≧ 80℃	84
	Flow volume anomaly	85
【Control】	Normal stop （Operation is stopped without anomaly.）	90
	Stop for changing control Ex1. fan control(2fan → 1fan)	91
	Stop for changing water circuit Ex. Normal operation → Keep warm operation(Vented cylinder only)	92

4.9 How to reset the accumulated water pump and compressor operating time

【Timing to be displayed about periodical check 1, 2 & oPE-1 – 3,11 – 13】

- Q-ton announce the maintenance code and periodic check by the cumulative operating time of the water pump and compressor. This announcement to the user can remind the maintenance check.
- The table shows the timing of maintenance code and periodic check. And also, it shows how to reset the cumulative operating time after periodic check

	7-segment display of accumulated operation time (*1)	Maintenance code		Display of remote control(*2)		How to reset
		oPE Code	Timing to be displayed	Display content	Timing to be displayed	
Water pump	C78 (Accumulated water pump operating time from last periodical check)	oPE-11(M11)	5,000h	Periodical check 1	20,000h	1. Set 7-segment display to parameter C78. 2. Change SW3-7 to ON (oPE counter resets) 3. Change SW3-7 to OFF (factory default)
		oPE-12(M12)	10,000h			
		oPE-13(M13)	20,000h			
Compressor	C76 (Accumulated compressor operating time from last periodical check(CM1))	oPE-1(M1)	5,000h	Periodical check 2	30,000h	1. Set 7-segment display to parameter C76. 2. Change SW3-7 to ON (oPE counter resets) 3. Change SW3-7 to OFF (factory default)
		oPE-2(M2)	10,000h			
		oPE-3(M3)	30,000h			

Note） *1： 100h units
*2： This function can be invalid by using SW6-4 to ON（from Main ROM ver.1.802）

【How to reset accumulated time of water pump and compressor after replacement 】

- Accumulated time of water pump and compressor is counted. This info will be useful when servicing.
- If it is replaced, make sure to reset its accumulated time for future service.

	7-segment display of accumulated operation time (*1)	How to reset
Water pump	C75 (Accumulated water pump operating time)	Set the 7-segment to C75. Reset operation time by pressing the SW7 for 3 seconds.
Compressor	C73 (Accumulated compressor operating time(CM1))	Set the 7-segment to C73. Reset operation time by pressing the SW7 for 3 seconds.

Note） *1： 100h units

〈Reference〉

C70	Relay output (Solenoid valve)	0 , 1 (0 ： Open circuit, 1 ： Short circuit)	—	Order of 100 ： SVHG2 Order of 10 ： SV-oil1 Order of 1 ： SV-oil2
C71	Number of connected unit	1 — 4	1unit	
C72	Capacity of connected unit	0 — 999	1kW	
C73	Accumulated compressor operating time (CM1)	0 — 655	100h	
C74	Accumulated compressor operating time (CM2)	0 — 655	100h	
C75	Accumulated water pump operating time	0 — 655	100h	
C76	Accumulated compressor operating time from the maintenance last time (CM1)	0 — 655	100h	
C77	Accumulated compressor operating time from the maintenance last time (CM2)	0 — 655	100h	
C78	Accumulated water pump operating time from the maintenance last time	0 — 655	100h	
C79	Operation mode	0 — 10	—	See next page.
C80	Target temperature. to top up	0 — 99	1℃	
C81	Target hot water temperature.	0 — 99	1℃	
C82	Target hot water amount	0 — 99	1℃	
C83	Rate of eff ective demand	0 — 100	1%	

4.10 Reference for control PCB replacement

When changing control PCB, make sure to save/transfer below data as following below procedure.

No.	Item	Content
1	Target HW temperature	60 － 90℃
2	Accumulated compressor operating time	0 － 255
3	Accumulated water pump operating time	0 － 255

<Procedure for data save>

Menu ⇒ Service & maintenance (enter the PW) ⇒ Save HP unit setting

⇒ Save setting

※ If the multiple units are connected, all of unit data can be recorded.

<Procedure for data transfer >

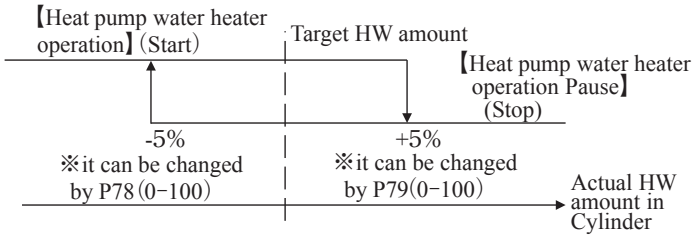
Menu ⇒ Service & maintenance (enter the PW) ⇒ Save HP unit setting

⇒ Transferred the saved data

※ If the multiple units are connected, please select the unit.

※ During operation, this procedure is not allowed.

4.11 Operation start/stop condition



＜Example＞
① After reached 100% HW amount, if unit become inching operation, P78 change from 5 to moreover may be effective.
② If the temperature sensor is not so many, there is a possible to make extra HW. If so, P79 change from 5 to 0 may be effective.

＜Starting condition of normal operation＞

Actual HW amount (= displayed in RC) + 5% ＜ Target HW amount

i.e.) If you want to start unit after run out of HW in cylinder, change the P78 value from 5 to 95.

＜Ending condition of normal operation＞

Actual HW amount （= displayed in RC) ≧ Target HW amount + 5%

Or

Actual HW amount （= displayed in RC) ≧ 100% HW amount level

i.e.) If you want to stop the unit at reached actual HW amount as same as target HW amount, P79 value should be changed from 5 to 0.

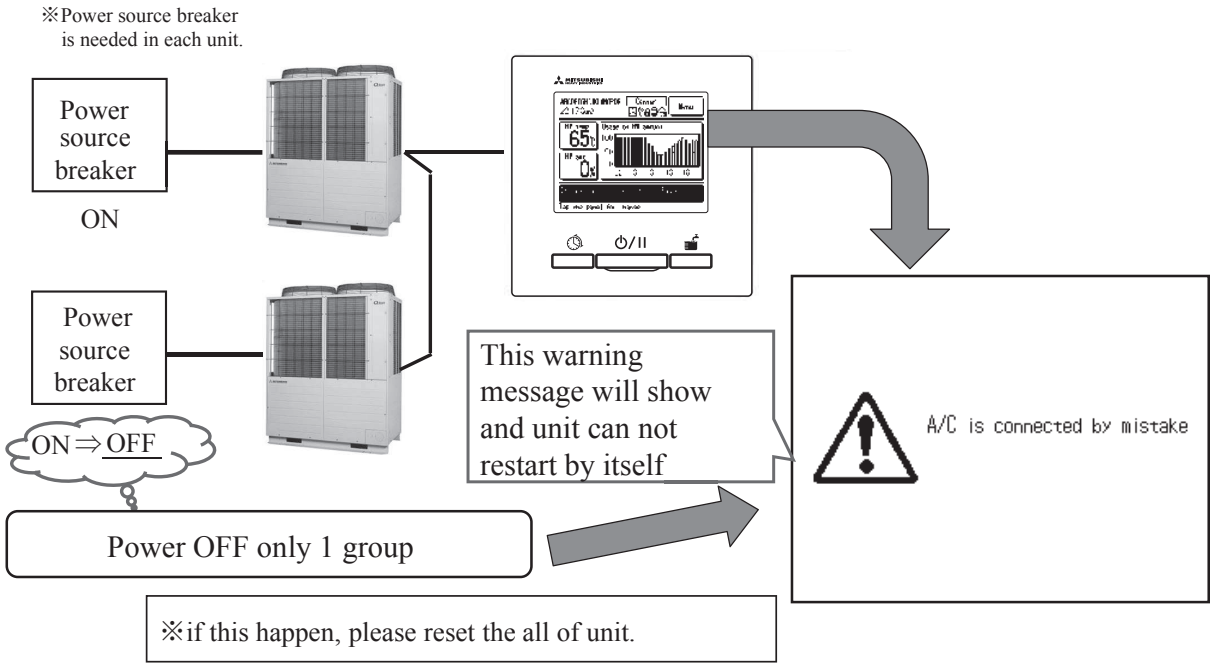
Note) When you change P78/P79 value, make sure to record in commissioning report or service report.
Be sure to set P78 ＜ target HW amount. If P78 ≧ target HW amount, heat pump will not start even if the actual HW amount reaches 0%.

4.12 When power off in multiple unit system

(1) In case of 1 remote control & multiple units

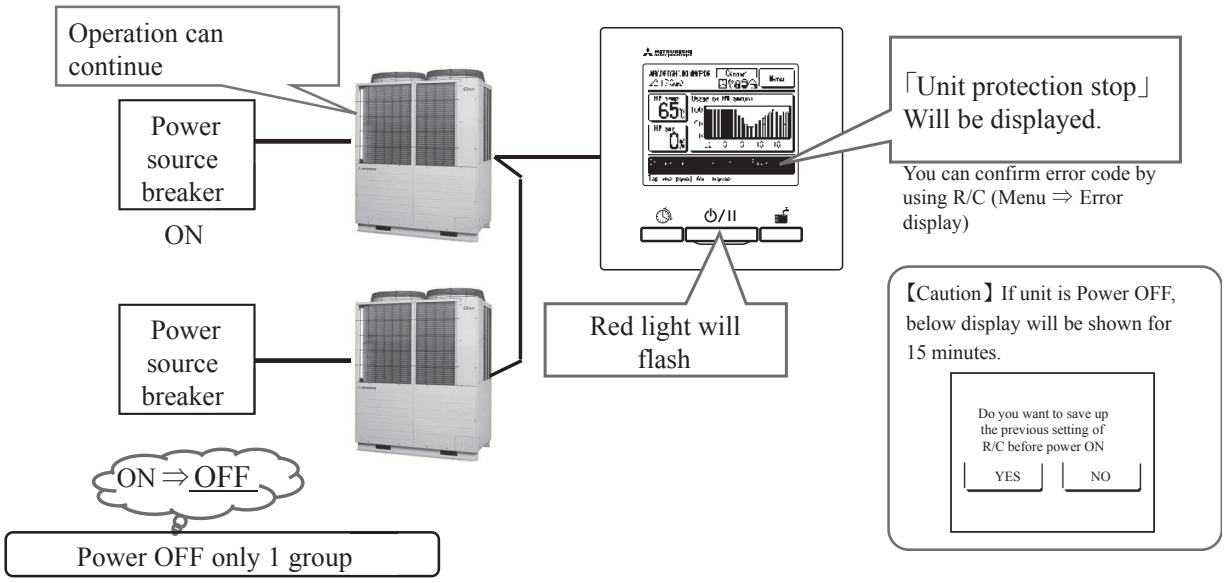
(a) Prior to W23R-2.1

If 1 group is OFF in combination system, all of unit can not restart by itself.



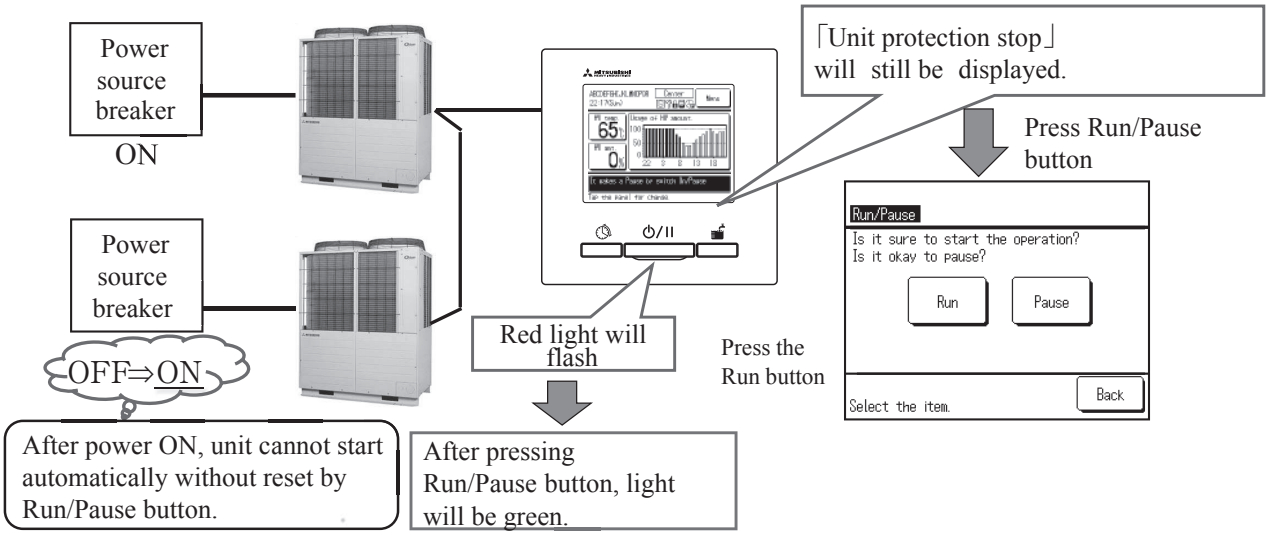
(b) W23R-2.2 or later

② At that time, E1 will be displayed and red light will flash because there is no communication with remote control and unit(Power OFF).



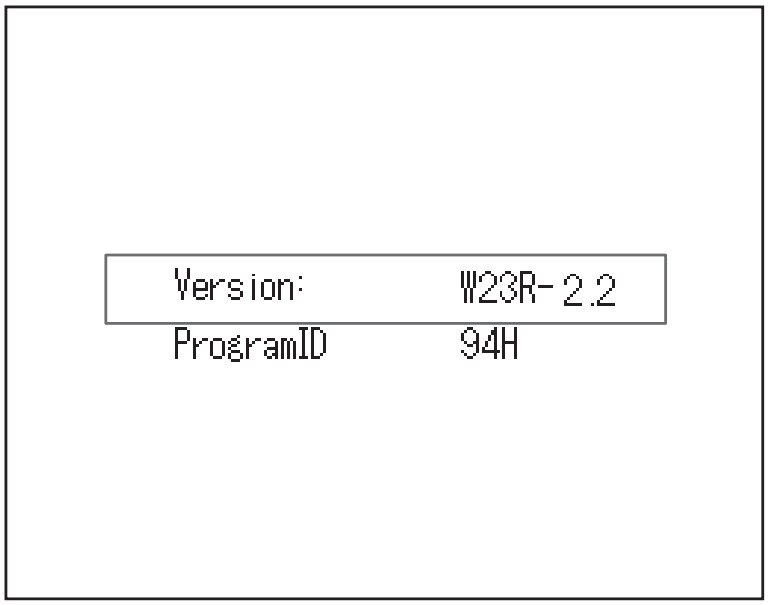
③ If the unit is power ON again, communication will re-start. But operation status will be stop.

④ Therefore please press Run/Pause button on R/C. At this time E1 will be reset.



(2) How to check R/C software version

※Below display will be shown after power ON
This issue will be solved from W23R-2.2 or later.



4.13 Additional information for tank temperature sensor connection

(1) Mounting method of temperature sensor

When attaching the temperature sensors on the hermetic type hot water cylinder, take the following cautions into consideration.

- ●Use aluminum adhesive tapes capable of withstanding temperatures higher than 90℃, with care to stick the sensors firmly to the surface of cylinder.
- ●Attach the sensors in the order of Tht-1, Tht-2 …, starting from the hot water supply outlet. Hot water amounts corresponding to respective temperature sensors vary depending on the number of sensors.

	TOTAL							
Sensor No.	2 pcs.	3 pcs.	4 pcs.	5 pcs.	6 pcs.	7 pcs.	8 pcs.	9 pcs.
Tht-1	20%	20%	20%	20%	10%	20%	10%	10%
Tht-2	100%	60%	50%	40%	30%	30%	20%	20%
Tht-3		100%	75%	60%	40%	40%	30%	30%
Tht-4			100%	80%	60%	50%	50%	40%
Tht-5				100%	70%	65%	60%	50%
Tht-6					100%	80%	70%	60%
Tht-7						100%	80%	70%
Tht-8							100%	80%
Tht-9								100%

- ●Attach the highest temperature sensor at about 100mm below the welding position of upper panel or connection for hot water returning from the heat pump water heater, whichever lower.
- ●Attach the lowest temperature sensor at about 100mm above the supply water inlet or connection of feed water pipe to the heat pump water heater, whichever higher.

  When the supply water inlet goes down in the hot water cylinder, take as the standard the end of supply water pipe or incoming water pipe connection, whichever higher.
- ●Between the highest and lowest sensors, attach temperature sensors keeping the same distance from one to the next sensor. Take care also to adjust the number of sensors such that 500 liters or more water will be reserved between a pair of sensors, in order to prevent the inching operation.