Maintenance sheet

ATH3M
88A166-1

A. Troubleshooting

If the error code is indicated on the green LED (Refer to Section **C**) on the PCB (Part #701) of the water heater (and/or the remote controller), refer to Section **B**.

<< It takes long time to get hot water at the fixtures >>
- The time it takes to deliver hot water from the water heater to your fixtures depends on the length of piping between the two. The longer the distance or the bigger the pipes, the longer it will take to get hot water.
- If you would like to receive hot water to your fixtures quicker, you may want to consider a hot water recirculation system.

<< The water is not hot enough or turns cold and stays cold >>
- Compare the flow and temperature. Refer to the "Output temperature chart" in the Installation manual.
- Check cross plumbing between cold water lines and hot water lines.
- Check if the gas supply valve is fully open, the gas line is sized properly, and for sufficient gas supply pressure at the heater. Refer to the "Gas supply and gas pipe sizing" in the Installation manual.
- Check the set temperature. Adjust the set temperature with the remote controller or the DIPswitch setting. Refer to Section **D**.
- Refer to the **"Water circuit"** in this section.

<<The water is too hot>>
- Check the set temperature, lower the set temperature.

<<The hot water is not available when a fixture is opened>>
- Refer to the **"Power supply circuit"** and **"Water circuit"** in this section.

<<Fluctuation in hot water temperature>>
- Check if the filter on the cold water inlet is clean (Part #406).
- Check if the gas line is sized properly and the supply gas pressure is sufficient.
- Check for cross connection between cold water lines and hot water lines.
- Refer to the **"Water circuit"** in this section.

<<Unit does not ignite when water goes through the water heater>>
- Refer to the **"Power supply circuit"** and **"Water circuit"** in this section.
- If you use the remote controller, turn the power button on and then check if the STAND BY LED will light up.
- Check if the filter on the cold water inlet is clean (Part #406).
- Refer to the **"Water circuit"** in this section.

<<The fan motor is still spinning after operation has stopped>>
- This is normal. After operation has stopped, the fan motor keeps running for 15 to 70 seconds in order to re-ignite quickly, as well as purge all the exhaust gas out of the flue.

<<Abnormal sound from water heater>>
- An abnormal sound from the water heaters is caused by not enough air supply or wrong installations. The water heater needs more combustion air. Refer to the **"101" error code** in the section **B**.

<<Power supply circuit>>
1. Check the power supply, and make sure that the water heater has 120 VAC.
2. If the remote controller is installed, press the "ON/OFF" button of the remote controller, and make sure that the STAND BY LED next to the "ON/OFF" button of the remote controller is lit. Restart the water heater.
3. Check for the lighting of the green LED on the PCB (Part # 701) to indicate normal supply of power circuit.
   If the green LED on the PCB (Part #701) isn't lit, some electrical parts can be broken. **Consult the manufacturer.**
   If the green LED is lit, proceed to "**"Water circuit"** in this section.C
4. Check the fuse on the surge box (Part #703), and if it has a brown spot, need to replace it.

<<Water circuit>>
1. If you use the remote controller, turn the power button on and then check if the STAND BY LED will light up.
2. Open all hot water faucets, and make sure that there is enough water flow. This water heater needs at least 0.5 GPM water flow (at the default set temperature) to operate.
3. Check for reverse connection and cross connection.
4. Check if the filter on the cold water inlet is clean (Part #406).
5. Check if there is no debris or obstruction on the fixtures.
6. Check if water ways in the water heater are frozen. If so, unfreeze them and refer to the Installation manual to protect your water heater from freezing.
7. Check if the inlet water pressure is higher than 40 psi. And if it's lower than 40 psi, need to increase the pressure.
8. Check for connections and breakage of wires (Part #402).
9. Check if the motor drive of the flow adjustment valve (Part #402) is locked due to scale buildup, and/or water leakage. If so, **Consult the manufacturer**.

B. Error codes

*The 341, 751 and 941 error codes are applied to the 140 (T-H3M) Indoor model only.

031: Incorrect DIPswitch setting
- Check the DIPswitch settings on the PCB (Part #701). Refer to Section **D**.

101: Warning for the "991" error code
- Check for the proper supply gas type.
- Check if there is any blockage in the intake air and/or exhaust. Refer to the "Venting instructions" in the Installation manual.
- If the water heater is installed as a direct-vent system, check whether there is enough distance between the intake air terminal and the exhaust terminal. Refer to the "Vent termination clearances" in the Installation manual.
- Check the total vent length. Refer to the "Venting instructions" in the Installation manual.
- Check the altitude/elevation of area of where the water heater is installed. Refer to the **"High-altitude function"** of Section **D** and change the DIPswitch settings.
- Check if there is grease and/or dirt in the burner (Part #101) and the fan motor (Part #103), especially if the water heater has been installed in a contaminated area.
- Check if there is dust and lint in the heat exchanger.
- Check the manifold pressure of the water heater. Refer to "SPECIFICATIONS" in the Installation manual of the water heater.

111: Ignition failure
1. Check for proper gas supply pressure at the heater inlet.
2. Check if the Hi-limit switch (Part #411) is properly functioning.
3. Check for connection/breakage of wires (Part #412, 707, 708, 709, 710), and/or soot on the flame rod (Part #108). Check if the O.H.C.F (Part #412) has a breakage, **Consult the manufacturer**.
4. Check if there is a buzzing spark ignition sound coming from the burner (Part #101) when water heater prepares for combustion.
5. Listen for the double "clunk" sound coming from the gas valve assembly (Part #102) when water heater goes into combustion.
6. (Only if sparking and/or kick sound) Check the voltage on each wire to gas valve assembly (Part #102) and/or the igniter assembly (Part #709). Refer to **"Appendix A"** in Section **C**.
   *No sparking sound >>>>> Refer to #1 at **"Appendix A"** in Section **C**.
   *No kick sound >>>>> Refer to #2 at **"Appendix A"** in Section **C**.
7. Check if there is leaking from the heat exchanger (Part #401).
8. Check if there is dust and lint in nozzles of the manifold (Part #102).
9. Check the current on the flame rod (Part #108). Refer to #3 at **"Appendix A"** in Section **C**.

121: Loss of flame
1. Check for proper gas supply pressure at the heater inlet.
2. Check if the Hi-limit switch (Part #411) is properly functioning.
3. Check for connection/breakage of wires (Part #412, 707, 708, 710), burn marks on the computer board (Part #701), and/or soot on the flame rod (Part #108). Check if the O.H.C.F (Part #412) has a breakage, **Consult the manufacturer**.
4. Check if there is leaking from the heat exchanger (Part #401).
5. Check if there is dust and lint in nozzles of the manifold (Part #102).
6. Check the current on the flame rod (Part #108). Refer to #3 at **"Appendix A"** in Section **C**.

311,321,341*: Disconnected/short-circuited thermistor
- Check for connection/breakage of wires and/or debris on the thermistor (Part #407, 408, 715).
- Check the thermistor resistance. Refer to **"Appendix D"** in Section **C**.

391: Air-fuel ratio rod failure
- Check for connection/breakage of wires (Part #708) and/or soot on the flame rod (Part #108).

510,551: Abnormal main gas solenoid valve and gas solenoid valve
- Check for connection/breakage of wires (Part #707) and/or burn marks on the computer board (Part #701).
- Reset power supply of the water heater.
- Check the voltage of each valve on the gas valve assembly (Part #102). Refer to **"Appendix C"** in Section **C**.

611: Fan motor fault
- Check for connection/breakage of wires, dust buildup in the fan motor (Part #103) and/or burn marks on the computer board (Part #701).
- Check for frozen/corrosion of connectors of the fan motor (Part #103).
- Check the voltage between blue wire and each wire of the fan motor (Part #103). Refer to **"Appendix B"** in Section **C**.

701: Computer board fault
- Check for connection/breakage of wires (Part #711), and check the resistance between white wire and red wire. Refer to **"Appendix A"** in Section **C**.

711: Gas solenoid valve drive circuit failure
- Refer to the **"111" and "121" error codes** in this section.

721: False flame detection
1. Clean the flame rod (Part #108).
2. For indoor models, check if a condensate drain is installed on the vent collar of the water heater.
3. Check if there is leaking from the heat exchanger (Part #401).

741: Miscommunication between water heater and remote controller
1. Check the model type of the remote controller. Model No. 9009069005 (TM-RE42) is the correct one.
2. Inspect the connections between the water heater and remote controller. Refer to the "Remote controller connections" of the Installation manual.
3. Check the power supply of the water heater.
4. If this error code appears only on the green LED in the PCB (Part #701), check the voltage on the remote controller terminal on the PCB. Refer to **"Appendix E"** in Section **C**.
5. If this error code appears only on the remote controller, replace the PCB (Part #701).
6. If this error code appears on both the PCB (Part #701) and the remote controller, replace the remote controller.

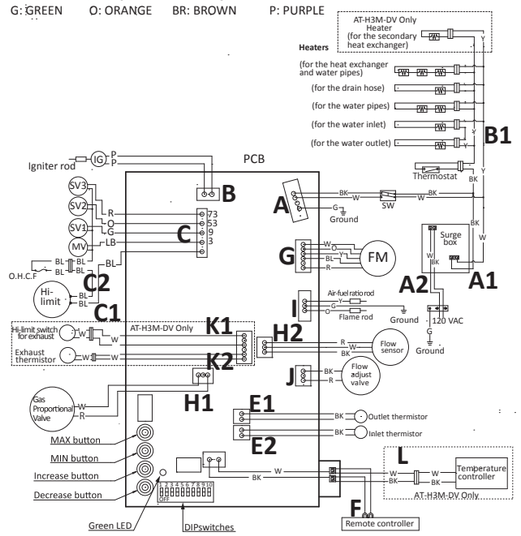
751*: Miscommunication between water heater and temperature controller
1. Check the power supply of the water heater.
2. If this error code appears only on the green LED in the PCB (Part #701), check the voltage on the remote controller terminal on the PCB. Refer to **"Appendix E"** in Section **C**.
3. If this error code appears only on the temperature controller (Part #721), replace the PCB (Part #701).
4. If this error code appears on both the PCB (Part #701) and the temperature controller, replace the temperature controller (Part #721).

941*: Abnormal exhaust temperature (Only 140 (T-H3M) Indoor model)
- Check for connection/breakage of wires, dust buildup in the fan motor (Part #103) and/or burn marks on the PCB (Part #701).
- Check the exhaust thermistor (Part #715) resistance. Refer to **"Appendix D"** in Section C.

991: Imperfect combustion
- Refer to the **"101" error code** in this section.

C. Wiring diagram and check point of the water heater

W: WHITE BK: BLACK LB: LIGHT BLUE
R: RED BL: BLUE Y: YELLOW
G: GREEN O: ORANGE BR: BROWN P: PURPLE



Appendix A (For error code 111)

Check the following points during ignition stage.

1. Refer to check point **"B"** on the wiring diagram above.
Check the voltage between purple wires during ignition process.
(Normal: 108 to 132 VAC)
This check point is normal?
Yes >> Replace the igniter assembly (Part #709).
No >> Go to Next.

2. Refer to check points **"C" and "H1"** on the wiring diagram above.
Check the voltages and resistance below during ignition process:
C: Between blue wire and light blue wire (Wire No.3).
(Normal: 93 to 120 VDC/1.35 to 1.65 kΩ)
C: Between blue wire and orange wire (Wire No.53).
(Normal: 93 to 120 VDC/1.35 to 1.65 kΩ)
H1: Check the voltage and resistance between white wire and red wire.
(Normal: 1 to 15 VDC/20 to 40 Ω)
These check points are normal?
Yes >> Replace the gas valve assembly (Part #102).
No >> Replace the PCB (Part #701).

3. Check the current through the yellow flame rod wire (Part #708).
(Normal: more than 5 μA)
This check point is normal during operation?
Yes >> Replace the PCB (Part #701).
No >> Replace the flame rod (Part #108).

Appendix B (For error code 611)

Refer to check point **"G"** in the diagram to the left and the following.
- Check the voltage between red wire and blue wire.
  (Normal: 132 to 192 VDC)
- Check the voltage between yellow wire and blue wire.
  (Normal: 13 to 17 VDC)
- Check the voltage between orange wire and blue wire.
  (Normal: 2.0 to 6.5 VDC)

All check points are normal?
Yes >> Replace the fan motor (Part #103).
No >> Replace the PCB (Part #701).

Appendix C (For error code 510 and 551)

Refer to check point **"C"** in the diagram to the left and the following.
Check the voltage and resistance on each valve on the gas valve assembly.
- Between blue wire and light blue wire (Wire No.3)
- Between blue wire and green wire (Wire No.9)
- Between blue wire and orange wire (Wire No.53)
  (Normal: 93 to 120 VDC/1.35 to 1.65 kΩ)
- Between blue wire and red wire (WIre No.73)
  (Normal: 93 to 120 VDC/2.07 to 2.53 kΩ)

All check points are normal?
Yes >> Replace the gas valve assembly (Part #102).
No >> Replace the PCB (Part #701).

Appendix D (For error code 311, 321, 341, and 941)

- Outlet thermistor
  Check point **"E1"**.
- Inlet thermistor
  Check point **"E2"**.

Check the resistance between black wire and black wire.

Temperature	°F	50	59	68	77	86	95
	°C	10	15	20	25	30	35
Resistance	kΩ	15.4	12.6	10.3	8.5	7.0	5.9

- Exhaust thermistor
  Check point **"K2"**.

Check the resistance between white wire and white wire.

Temperature	°F	50	59	68	77	86	95
	°C	10	15	20	25	30	35
Resistance	kΩ	19.5	15.9	13.0	10.7	8.9	7.4

All check points are normal?
Yes >> Replace the PCB (Part #701).
No >> Replace the thermistor (Part #407, 408, 715).

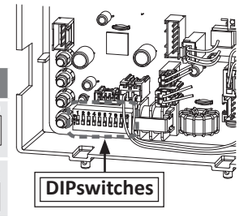
Appendix E (For error code 741 and 751)

Error code 741: Refer to check point **"F"** on the wiring diagram above.
Error code 751 : Refer to check point **"L"** on the wiring diagram above.
Check the voltage on the remote controller and/or temperature controller on the PCB. • Between black wire and white wire. (Normal: 11 to 25 VDC)

This check point is normal?
Yes >> Replace the remote controller and/or temperature controller.
No >> Replace the PCB (Part #701).

D. DIPswitch settings on the computer board of the water heater

Locate the bank of DIPswitches at the bottom left of the computer board of the unit.
Change the DIPswitch settings when the power supply is turned off.
The dark square is the direction the DIPswitch should be set to. DEFAULT is the factory setting.



Gas type*		Model type*		Temperature set	
Propane	ON / OFF 1 2 3 4 5 6 7 8 9 10	Indoor model**	ON / OFF 1 2 3 4 5 6 7 8 9 10	120°F (49°C) DEFAULT	ON / OFF 1 2 3 4 5 6 7 8 9 10
Natural Gas	ON / OFF 1 2 3 4 5 6 7 8 9 10	Outdoor model	ON / OFF 1 2 3 4 5 6 7 8 9 10	140°F (60°C)	ON / OFF 1 2 3 4 5 6 7 8 9 10

***Factory setting** ** For Indoor model: Refer to "Venting" section below for proper settings**

High-altitude function			
Indoor model		Outdoor model	
0 to 2,000 ft. DEFAULT	ON / OFF 1 2 3 4 5 6	0 to 2,000 ft. DEFAULT	ON / OFF 1 2 3 4 5 6
2,000 to 3,000 ft.	ON / OFF 1 2 3 4 5 6	2,000 to 4,000 ft.	ON / OFF 1 2 3 4 5 6
3,000 to 5,000 ft.	ON / OFF 1 2 3 4 5 6	4,000 to 6,000 ft.	ON / OFF 1 2 3 4 5 6
5,000 to 7,500 ft.	ON / OFF 1 2 3 4 5 6		
7,500 to 10,100 ft.	ON / OFF 1 2 3 4 5 6		

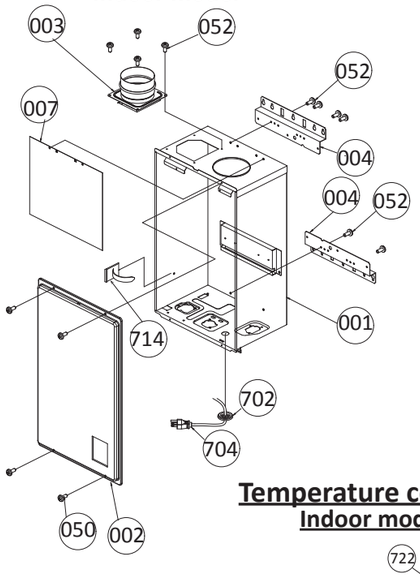
FM speed is increased automatically.

Venting			
2 inch	3 inch		4 inch
Single pipe	Two-pipe	Single pipe	Two-pipe & single pipe
5 to 6.5 ft. ON / OFF 1 2 3 4 5 6 7 8 9 10	5 to 20 ft. (DEFAULT) ON / OFF 1 2 3 4 5 6 7 8 9 10	5 to 45 ft. (DEFAULT) ON / OFF 1 2 3 4 5 6 7 8 9 10	5 to 50 ft. (DEFAULT) ON / OFF 1 2 3 4 5 6 7 8 9 10
N/A	21 to 40 ft. ON / OFF 1 2 3 4 5 6 7 8 9 10	46 to 70 ft. ON / OFF 1 2 3 4 5 6 7 8 9 10	51 to 100 ft. ON / OFF 1 2 3 4 5 6 7 8 9 10
N/A	41 to 70 ft. ON / OFF 1 2 3 4 5 6 7 8 9 10	N/A	N/A

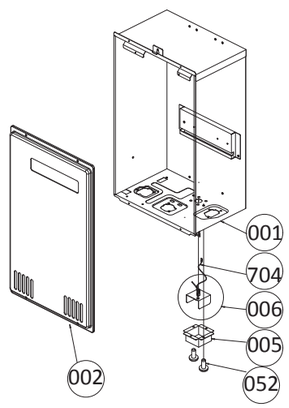
E. Components diagram / Parts list

Case assembly

Indoor model

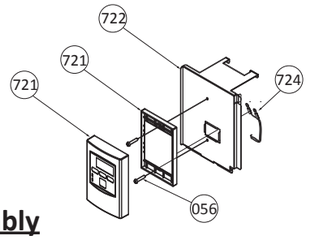


Outdoor model



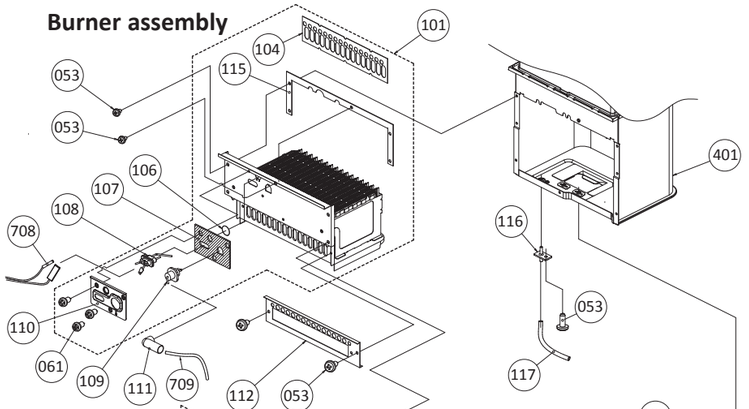
Temperature contoller

Indoor model

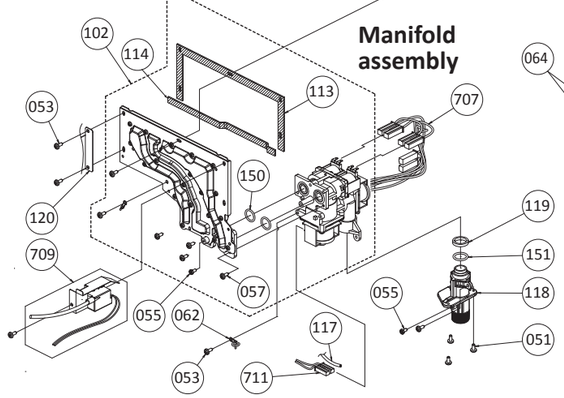


Burner assembly

Burner assembly

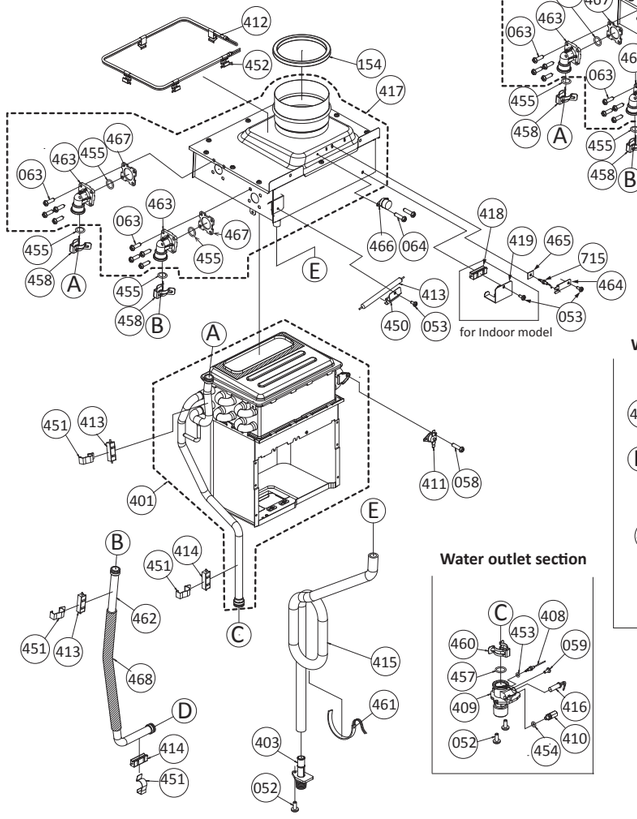


Manifold assembly

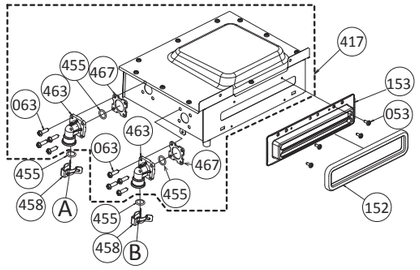


Water way assembly

Indoor model

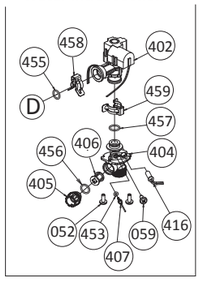


Outdoor model

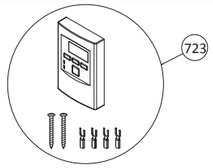


Water outlet section

Water intlet section



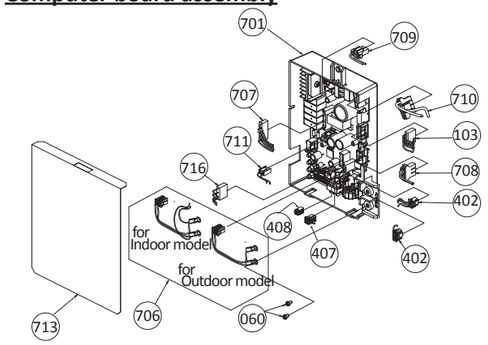
Temperature remote controller



Item #	Part #		Description
	140 model	T-H3M model	
001	N/A N/A	EK450 EK451	Case assembly for Indoor model Case assembly for Outdoor model
002	N/A N/A	EK452 EK453	Front cover for Indoor Front cover for Outdoor
003	320273-350	EK454	Intake air port assembly
004	N/A	EK455	Bracket
005	319143-510	EK190	Junction box
006	320273-352	EK456	Power supply cord assembly
007	N/A	EK457	Back guard panel
050	319143-025	EW000	Screw M4×12 (W/Washer)
051	319143-325	EW001	Screw M4×10 (W/Washer)
052	319143-026	EW002	Screw M4×10 (Coated)
053	319143-060	EW003	Screw M4x10
054	319143-326	EW004	Hex head screw M4×12 (W/Washer)
055	319143-063	EW005	Hex head screw M4x8
056	N/A	EW018	Pan screw M4X20
057	319143-201	EKK31	Tap tight screw M4x12 FEZN
058	319143-087	EW00A	Screw M3x6 SUS
059	319143-328	EW009	Screw M4x6
060	N/A	EK191	Screw M3x6
061	319143-059	EW00D	Pan screw M4x8
062	319143-048	EM167	Wire clamp 60
063	320273-497	EW00P	Screw M4x10
064	319143-330	EW00B	Screw M3x6 SUS3

Item #	Part #		Description
	140 model	T-H3M model	
101	320273-353	EK458	Burner assembly
102	320273-354 320273-356	EK459 EK460	Manifold with gas valve assembly LP Manifold with gas valve assembly NA
103	319143-443 319143-043	EK109 EKK25	Fan motor for Indoor model Fan motor for Outdoor model
104	319143-031	EKK2X	Burner gasket
105	320273-557 319143-282	EK491 EM381	Fan damper for Indoor model Fan damper for Outdoor model
106	319143-033	EKK2V	Burner window
107	319143-034	EKK2W	Rod holder gasket
108	319143-517	EK193	Flame rod
109	320273-357	EK461	Igniter rod
110	319143-036	EKK32	Rod holder
111	320273-358	EK462	Rod cap
112	320273-359 320273-360	EK463 EK464	Burner damper Indoor Burner damper Outdoor
113	319143-044	EKK2Y	Manifold gasket A
114	319143-045	EKK2K	Manifold gasket B
115	319143-032	EKK0G	Burner holder gasket
116	319143-042	EKK2D	Pressure port
117	319143-344	EX019	Combustion chamber tube
118	320273-362	EK465	Gas inlet
119	319143-049	EKK2Z	Gas inlet ring
120	N/A	EK466	Surge box plate
150	319143-350	EZP18	O-ring P18 NBR (Black)
151	319143-057	EK042	O-ring P20 NBR (Black)
152	319143-370	EK442	Silicon ring for Outdoor model
153	319143-121	EX13J	Exhaust port for Outdoor model
154	319143-065	EKN50	Silicon ring

Computer board assembly



Item #	Part #		Description
	140 model	T-H3M model	
401	320273-556	EK467	Heat exchanger assembly for 140 Inddor and Outdoor
402	319143-463	EK129	Flow adjustment valve / Flow sensor
403	319143-018	EKH23	Condensate drain port
404	319143-193	EKK1U	Water inlet
405	319143-197	EKK2B	Inlet drain plug
406	319143-198	EKK2C	Inlet water filter
407	319143-214	EKK4J	Inlet thermistor
408	319143-529	EK207	Outlet thermistor
409	319143-466	EK104	Water outlet
410	319143-199	EKK2E	Outlet drain plug
411	319143-228	EM212	Hi-Limit switch
412	319143-067	EX02A	Overheat-cut-off fuse
413	320273-364	EK468	Pipe heater
414	320273-365	EK469	Inlet heater
415	320273-366	EK470	Drain tube
416	319143-468	EK105	Inlet heater
417	320273-553	EK471	Secondary heat exchanger for Indoormodel
	320273-554	EK472	Secondary heat exchanger for Outdoor model
418	320273-367	EK473	Secondary heat exchanger heater
419	N/A	EK474	Heater fixing plate
450	N/A	EK475	Pipe heater fixing plate
451	319143-125	EK031	Heater fixing plate 16
452	N/A	EK476	Fuse fixing plate
453	319143-082	EZF04	O-ring P4 FKM
454	319143-080	EZF06	O-ring P6 FKM
455	319143-100	EZF14	O-ring P14 FKM
456	319143-091	EZF15	O-ring P15 FKM
457	319143-083	EZF16	O-ring P16 FKM
458	319143-105	EKK24	Fastener “14-22”
459	319143-226	EM192	Fastener “16A”
460	319143-205	EKK39	Fastener “16-25A”
461	319143-535	EK217	Flat heater
462	320273-555	EK477	Cold pipe for 140 model
463	320273-368	EK478	Header connection
464	319143-106	EX13H	Thermistor fixing plate
465	319143-111	EX13L	Exhaust thermistor gasket
466	319143-104	EKH6G	Hi-limit switch for exhaust
467	319143-542	EK229	Gasket
468	319143-558	EK479	Inlet pipe packing
701	320273-369	EK480	Computer board
702	319143-426	EX148	Rubber grommet
703	320273-128	EK280	Surge box
704	319143-427	EK146	120 VAC wire for Indoor model
	319143-546	EK143	120 VAC wire for Outdoor model
705	319143-141	EKK4V	120 VAC Power ON-OFF switch
706	320273-376	EK481	Remote controller wire for Indoor model
	319143-473	EK138	Remote controller wire for Outdoor model
707	320273-379	EK482	Gas valve wire
708	320273-380	EK483	Flame rod wire
709	320273-381	EK484	Igniter assembly
710	319143-185	EKJ59	Freeze protection thermostat
711	319143-481	EK112	Proportional gas valve wire
712	N/A	EX004	Nylon clamp FC6
713	319143-191	EKK1M	Computer board cover
714	319143-500	EX13C	Cable clamp for Indoor model
715	319143-131	EKH6E	Exhaust thermistor for Indoor model
716	319143-501	EK180	Exhaust Hi-limit switch wire
721	320273-684	EK487	Temperature controller for Indoor model
722	N/A	EK490	Fixing plate
723	9009069005	TM-RE42	Temperature remote controller
724	320273-512	EK489	Remote controller connection wire