

Maintenance sheet

540P
5M2054-1

A. Troubleshooting

If the error code is displayed on the built-in controller and/or the remote controller, refer to Section B.

<< It takes a long time to get hot water at the fixtures >>

- Check to see if a recirculation timer is active. If not, it will take time for the hot water to get from the heater to the fixture.
- Check the recirculation pump for proper flow.
- The inlet filters on the return and inlet connections may need to be cleaned.

<< The water is not hot enough or turns cold and stays cold >>

- Compare the flow and temperature. Refer to "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 the gas supply pressure is within specified limits. Refer to "Gas supply and gas pipe sizing" in the Installation manual.
- Check the set temperature on the built-in controller/remote controller. If necessary, change the set temperature with the controller or the DIP switch setting. Refer to Section E.
- Refer to "Water circuit" in this section.
- Is the Easy-Link System set up correctly?

<<The water is too hot>>

- Check the set temperature and lower it, if necessary.

<<The hot water is not available when a fixture is opened>>

- Refer to "Power supply circuit" and "Water circuit" in this section.
- Is the Easy-Link System set up correctly?

<<Fluctuation in hot water temperature>>

- Check the filters on the cold water inlet and return connection to see if they are clogged. (Part #406)
- Check to see if the gas valve is fully open, that the gas line is sized properly, and that the supply gas pressure is within specified limits.
- Check for a cross connection between cold water lines and hot water lines.
- Refer to "Water circuit" in this section.
- Is the Easy-Link System set up correctly?

B. Error codes

Error codes 341, 751, and 941 apply to Indoor model only.

031: Incorrect DIP switch setting

- Check the DIP switch settings on the PCB. Refer to Section E.

101: Warning for the "991" error code

- Check the gas type on the rating plate of the water heater.
- Check to see if there is any blockage in the intake air and/or exhaust. Refer to "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 "Vent termination clearances" in the Installation manual.
- Check the total vent length. Refer to "Venting instructions" in the Installation manual.
- Check the altitude/elevation of the area where the water heater is installed. Refer to "High-altitude installation" in Section E. Change the DIP switch settings.
- Check to see if there is grease and/or dirt in the burner (Part #101) and fan motor (Part #103), especially if the water heater has been installed in a contaminated area.
- Check for dust and lint in the heat exchanger.
- Check the manifold pressure of the water heater. Refer to the rating plate of the water heater.

111: Ignition failure

- Check the gas supply and inlet gas pressure.
- Check to see if the Hi-limit switch (Part #412) is properly functioning.
- Check for disconnections/breakage of wires (Part #413, 708, 709, 711), and/or soot on the flame rod (Part #108). If the O.H.C.F (Part #413) has a breakage, **consult the manufacturer**.
- Check for a buzzing spark ignition sound coming from the burner (Part #101) when the water heater prepares for combustion.
- Listen for the double "clunk" sound coming from the gas valve assembly (Part #102) when the water heater goes into combustion.
- (Only if sparking and/or clunk sound) Check the voltage on each wire to the gas valve assembly (Part #102) and/or the igniter assembly (Part #711). Refer to "Appendix A" in Section C.
 - *No sparking sound >>>> Refer to #1 in "Appendix A," Section C.
 - *No clunking sound >>>> Refer to #2 in "Appendix A," Section C.
- Check for leaks from the heat exchanger (Part #401).
- Check for dust and lint in the nozzles of the manifold (Part #102).
- Check the current of the flame rod (Part #108). Refer to #3 in "Appendix A," Section C.

121: Loss of flame

- Check the gas supply and inlet gas pressure.
- Check to see if the Hi-limit switch (Part #412) is properly functioning.
- Check for disconnections/breakage of wires (Part #413, 708, 709, 711), burn marks on the PCB (Part #701), and/or soot on the flame rod (Part #108). If the O.H.C.F (Part #413) has a breakage, **Consult the manufacturer**.
- Check for leaks from the heat exchanger (Part #401).
- Check for dust and lint in the nozzles of the manifold (Part #102).
- Check the current of the flame rod (Part #108). Refer to #3 in "Appendix A," Section C.

311,321,331,341,351: Disconnected/short-circuited thermistor

- Check for disconnections/breakage of wires and/or debris on the thermistors (Part #407, 408, 411, 718, 731).
- Check the thermistor resistance. Refer to "Appendix D" in Section C.

391: Air-fuel ratio rod failure

- Check for disconnections/breakage of wires (Part #709) and/or soot on the flame rod (Part #108).

441: Flow sensor failure

- Check for disconnections/breakage of wires and/or debris on the flow sensor impeller (Part #402).
- Check the filter on the return connection to see if it is clogged. (Part #406)
- Check to see if the water in the pump pipe system has frozen.

510,551: Abnormal main gas solenoid valve and gas solenoid valve

- Check for connection/breakage of wires (Part #708) and/or burn marks on the computer board (Part #701).
- Reset the 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.

<<Unit does not ignite when water goes through the water heater>>

- Refer to "Power supply circuit" and "Water circuit" in this section.
- Check to see if the filters on the cold water inlet and return connection are clogged. (Part #406)
- Check to see if the inlet temperature is too high.

<<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 so that it can re-ignite quickly, as well as to purge all of the exhaust gas out of the flue.

<<Abnormal sounds from water heater>>

- Abnormal sounds from the water heater are caused by limited air supply or an incorrect installation. 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. Is the power switch inside the water heater turned on? (Part #706)
3. Press the "ON/OFF" button on the built-in/remote controller, and make sure that the STAND BY LED is lit. Run the water heater.
4. Check to see if the green LED on the PCB (Part #701) is lit. If so, the power supply circuit for the water heater is under normal condition; refer to "Water circuit" in this section.
5. Check the fuse on the surge box (Part #703), and if it has a brown spot, replace it.
6. If the green LED on the PCB (Part #701) is not lit, some electrical parts may be broken. **Consult the manufacturer**.

<<Water circuit>>

1. Press the "ON/OFF" button of the built-in/remote controller, and make sure that the STAND BY LED is lit.
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 connections and cross connections.
4. Check to see if the filters on the cold water inlet and return connection are clogged or if there is sediment built up in the filters. (Part #406)
5. Check for debris or obstructions in the fixtures.
6. Check to see if the water ways in the water heater are frozen. If so, thaw them. Refer to the installation manual to protect your water heater from freezing.
7. Make sure that the inlet water pressure is higher than 40 psi. If it is lower than 40 psi, increase the pressure.
8. Check the wiring connections and for breakage of wires (Part #402).
9. Check to see if the motor drive of the flow adjustment valve (Part #402) is locked due to scale buildup. Also check for water leakage. If these symptoms are present, **consult the manufacturer**.

611: Fan motor fault

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

631: Pump fault

- Check for disconnections/breakage of wires in the pump (Part #726).
- Check to see if the water in the pump has frozen (Part #726).

651: Flow adjustment valve fault (Only Easy-Link System)

- Inspect the flow adjustment valve (Part #402) for disconnected or broken wires. Also check for a locked motor drive due to scale buildup, and/or water leakage.
- Check the voltage between the black and red wires. Refer to "Appendix F" in Section C.

661: Bypass valve fault

- Inspect the bypass valve (Part #403) for disconnected or broken wires. Also check for a locked motor drive due to scale buildup, and/or water leakage.
- Check the voltage between the brown and red wires. Refer to "Appendix F" in Section C.

701: PCB fault

- Check for disconnections/breakage of wires (Part #714), and check the resistance between the white and red wires. Refer to "Appendix A" in Section C.
- Check the outlet thermistor (Part #408) for proper readings as it may need to be cleaned.

711: Gas solenoid valve drive circuit failure

- Refer to the "111" and "121" error codes in this section.

721: False flame detection

- Clean the flame rod (Part #108).
- Check for leaks from the heat exchanger (Part #401).

741: Miscommunication between water heater and remote controller

- Check the model type of the remote controller. Model No. 100276687 (TM-RE43) is the correct one.
 - Inspect the connections between the water heater and remote controller. Refer to "TEMPERATURE REMOTE CONTROLLER" in the Installation manual.
 - Check the power supply of the water heater.
 - If this error code appears only on the green LED on the PCB (Part #701), check the voltage on the remote controller terminal on the PCB. Refer to "Appendix E" in Section C.
 - If this error code appears only on the remote controller, replace the PCB (Part #701).
 - 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 built-in controller
- Check the power supply of the water heater.
 - If this error code appears only on the green LED in the PCB (Part #701), check the voltage on the built-in controller terminal on the PCB. Refer to "Appendix E" in Section C.
 - If this error code appears only on the built-in controller, replace the PCB (Part #701).
 - If this error code appears on both the PCB (Part #701) and the built-in controller, replace the temperature controller.

761: Miscommunication between Parent unit and Child units in Easy-Link System

- Make sure that the connections between the parent unit and the child units are correct. Refer to the "Easy-Link System" section in the Installation manual.

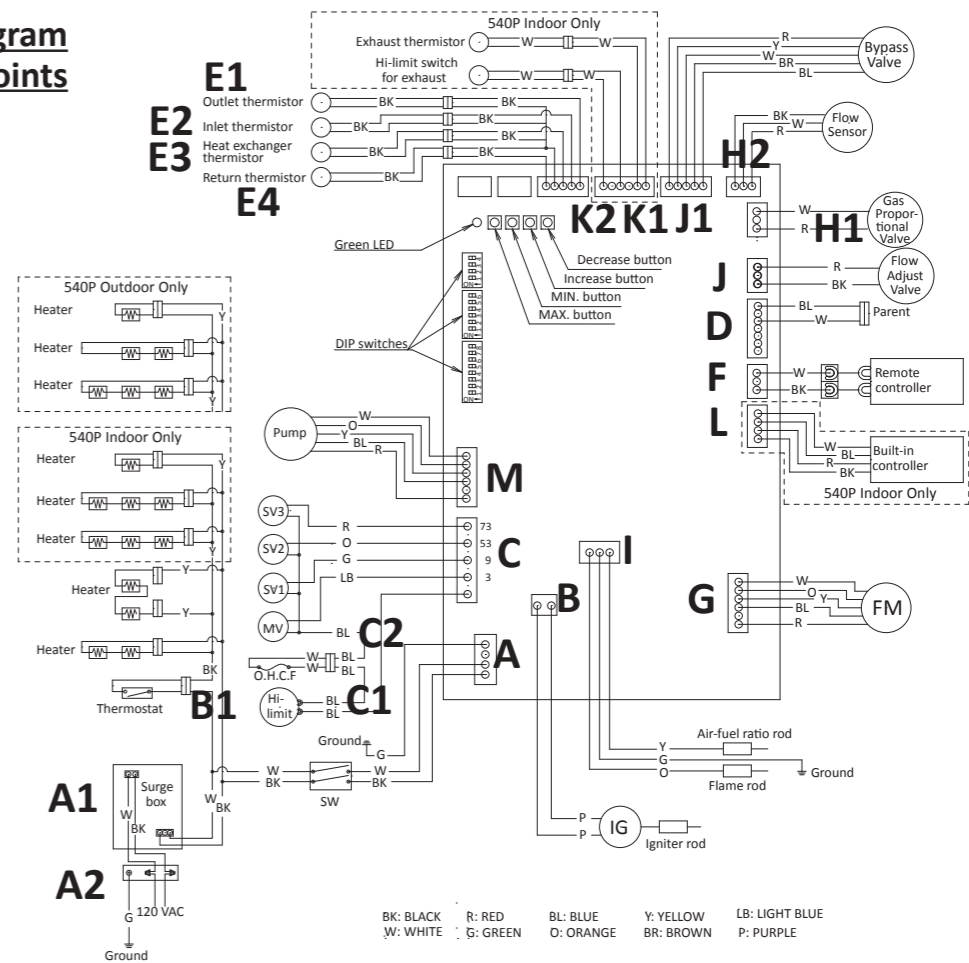
941: Abnormal exhaust temperature (Indoor model)

- Check for disconnections/breakage of wires, dust buildup in the fan motor (Part #103) and/or burn marks on the PCB (Part #701).
- Check the resistance of the exhaust thermistor. Refer to "Appendix D" in Section C.
- Check to see if the inlet and return water temperature is higher than 140°F (60°C) in the recirculation system.

991: Imperfect combustion

- Refer to the "101" error code in this section.

C. Wiring diagram and checkpoints



Appendix A (Error code 111)

Check the following points during ignition stage.

- #1. Refer to checkpoint "B" on the wiring diagram above. Check the voltage between purple wires. (Normal: 108 to 132 VAC)
Is the voltage within normal range?
Yes >>Replace the igniter assembly (Part #711).
No >>Go to Error code in Section B.

- #2. Refer to checkpoints "C" and "H1" on the wiring diagram above. Check the voltages below:
C: Between the blue and light blue wires (#3). (Normal: 93 to 120 VDC)
C: Between the blue and orange wires (#53). (Normal: 93 to 120 VDC)
H1: Between the white and red wires. (Normal: 1 to 15 VDC)

- Are these voltage within normal range?**
Yes >>Replace the gas valve assembly (Part #102).
No >>Replace the PCB (Part #701).

- #3. Check the current through the orange flame rod wire (Part #709). (Normal: more than 5 µA)
Is the current normal when there is a flame?
Yes >>Replace the PCB (Part #701).
No >>Replace the flame rod (Part #108).

Appendix B (Error code 611)

Refer to checkpoint "G" in the diagram above and check the voltage

- Between the red and blue wires. (Normal: 132 to 192 VDC)
- Between the yellow and blue wires. (Normal: 13 to 17 VDC)
- Between the orange and blue wires. (Normal: 2.0 to 6.5 VDC)

- Are all of the voltages within normal range?**
Yes >>Replace the fan motor (Part #103).
No >>Replace the PCB (Part #701).

Appendix C (Error code 510 and 551)

Refer to checkpoint "C" in the diagram above and check the voltage on each valve on the gas valve assembly.

- Between the blue and light blue wires (#3). (Normal: 93 to 120 VDC)
- Between the blue and green wires (#9). (Normal: 93 to 120 VDC)
- Between the blue and orange wires (#53). (Normal: 93 to 120 VDC)
- Between the blue and red wires (#73). (Normal: 93 to 120 VDC)

- Are all of the voltages within normal range?**
Yes >>Replace the gas valve assembly (Part #102).
No >>Replace the PCB (Part #701).

Appendix D (Error code 311, 321, 331, 341, 351 and 941)

Check the resistance between the black wires.

- Outlet thermistor "E1" (Find the marking of No. 113 on the connector.)
- Inlet thermistor "E2" (Find the marking of No. 42 on the connector.)
- Heat exchanger thermistor "E3" (Find the marking of No. 12 on the connector.)
- Return thermistor "E4" (Find the marking of No. 14 on the connector.)

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

Appendix D (Error code 311, 321, 331, 341, 351 and 941)

Check the resistance between the white wires.

- Exhaust thermistor "K1"

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

- Are all of the checkpoints normal?**
Yes >> Replace the PCB. (Part #701)
No >> Replace the defective thermistor. (Part #407/408/411/718/731)

Appendix E (Error code 741 and 751)

Error code 741: Refer to checkpoint "F" on the wiring diagram.

Error code 751: Refer to checkpoint "L" on the wiring diagram.

Check the voltage between the black and white wires. (Normal: 11 to 25 VDC)

Is the voltage within normal range?

- Yes >>Replace the built-in/remote controller. (Part #722/724)**
No >>Replace the PCB. (Part #701)

Appendix F (Error code 651 and 661)

Error code 651: Refer to checkpoint "J" on the wiring diagram.

Check the voltage between the black and red wires. (Normal: 7 to 16 VDC)

Is the voltage within normal range?

- Yes >>Error code 651: Replace the flow adjustment valve. (Part #402).**
>>Error code 661: Replace the bypass valve (Part #403).
No >> Replace the PCB (Part #701).

Is the voltage within normal range?

- Yes >>Error code 651: Replace the flow adjustment valve. (Part #402).**
>>Error code 661: Replace the bypass valve (Part #403).
No >> Replace the PCB (Part #701).

Appendix G (Error code 631)

Refer to checkpoint "M" in the diagram above and check the voltage below.

- Between the blue and red wires. (Normal: 140 to 200 VDC)
- Between the blue and yellow wires. (Normal: 14 to 16 VDC)
- Between the blue and orange wires. (Normal: 1 to 6.5 VDC)

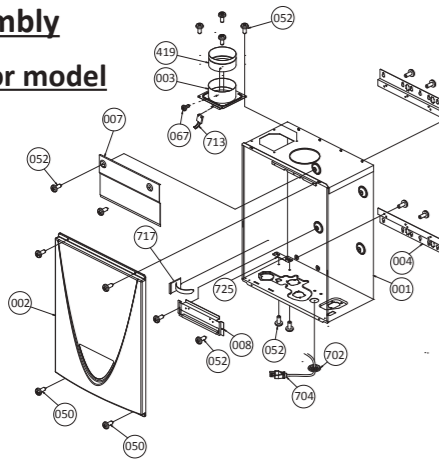
Are all of the voltages within normal range?

- Yes >>Replace the pump assembly (Part #726).**
No >>Replace the PCB (Part #701).

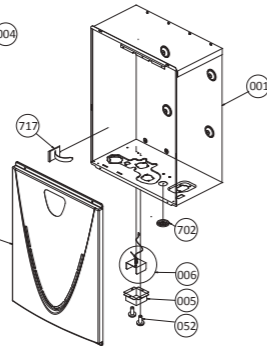
D. Components diagram / Parts list

Case assembly

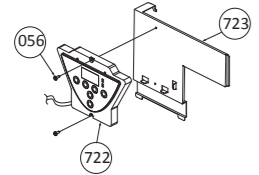
Indoor model



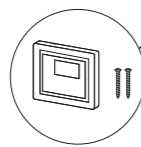
Outdoor model



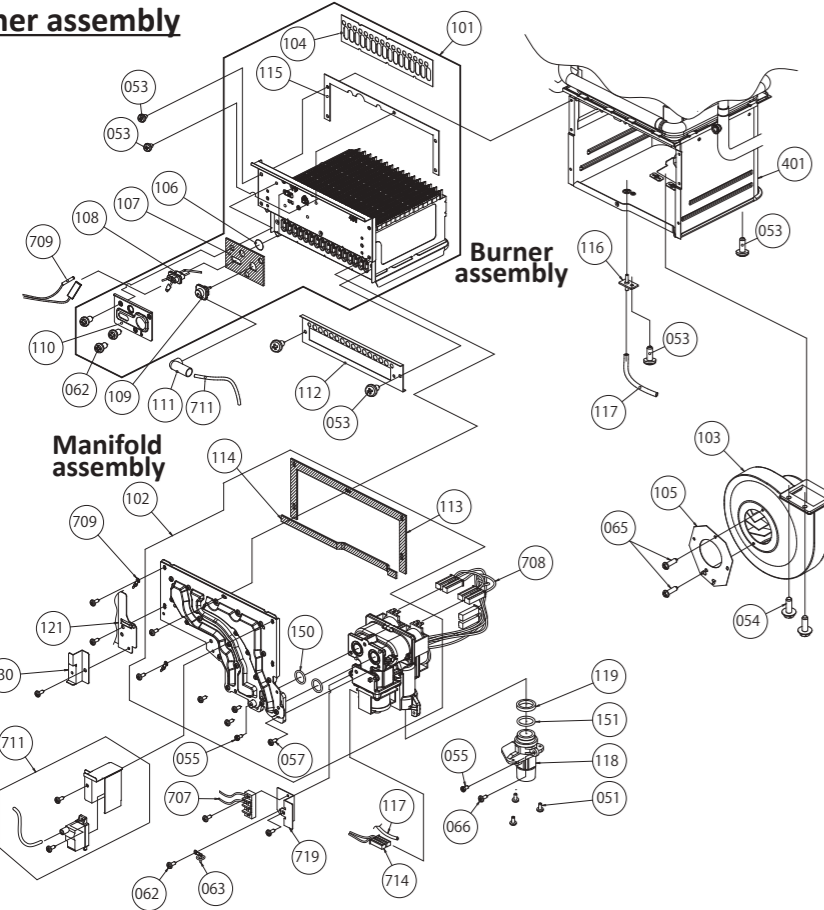
Built-in controller Indoor model



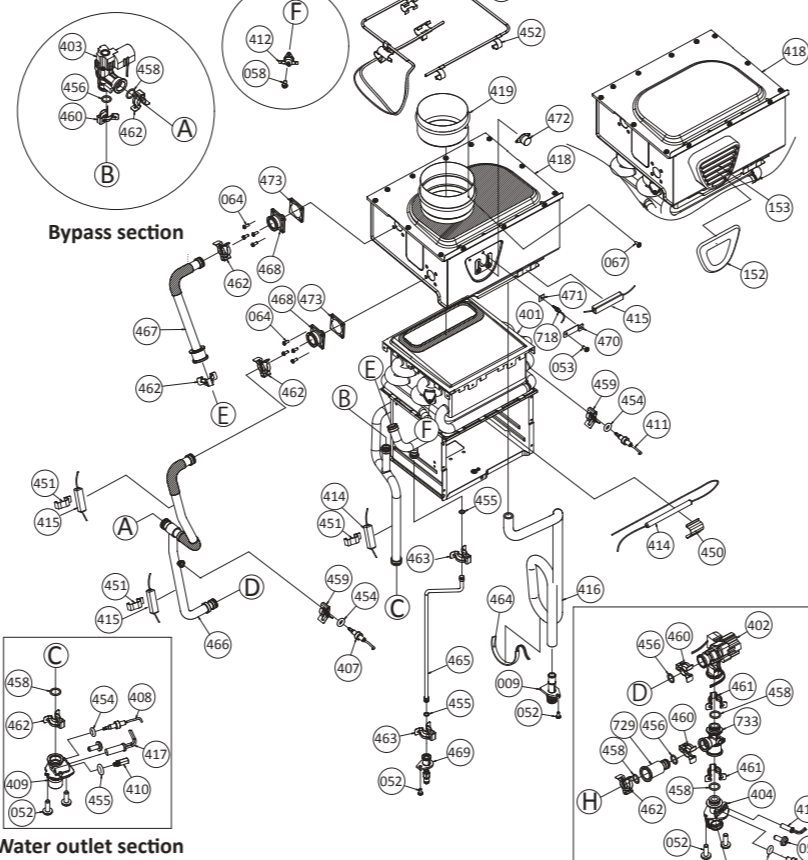
Temperature remote controller



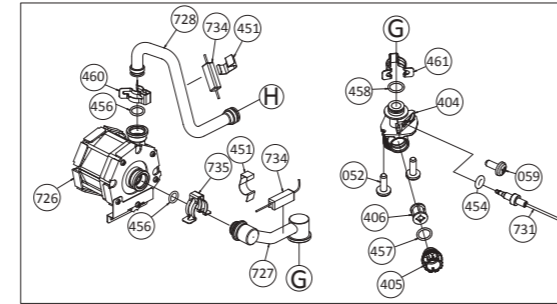
Burner assembly



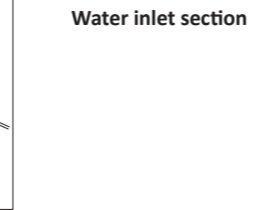
Water way assembly



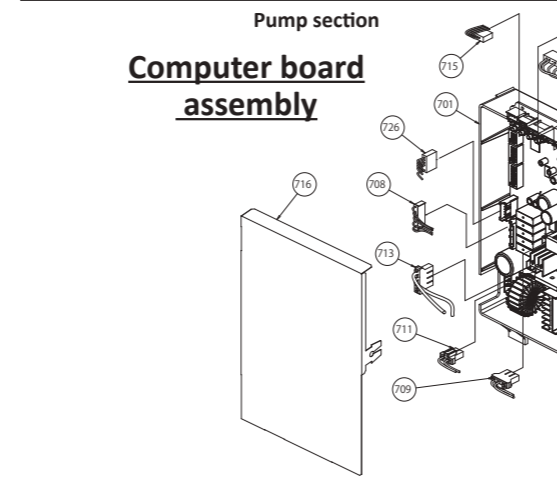
Water outlet section



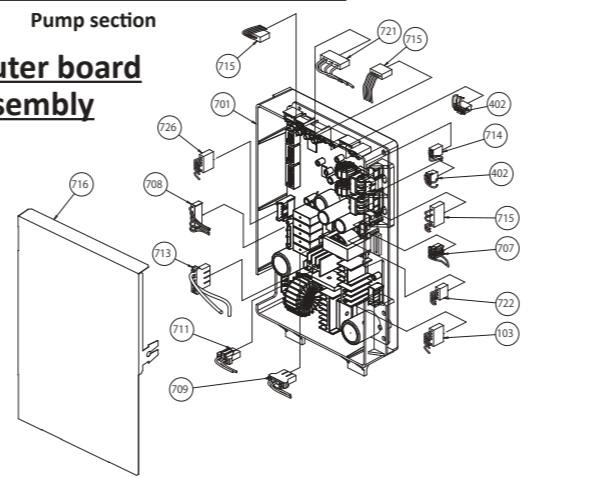
Water inlet section



Pump section



Computer board assembly



E. DIP switch settings on the computer board



WARNING

- Turn off the power supply to the water heater before changing the DIP switch settings.
- The dark squares indicate the correct DIP switch positions.
- Failure to observe these warnings could lead to carbon monoxide poisoning, severe personal injury, or death.

Upper bank of DIP switches		Pump operation for freeze protection
Active	Inactive (DEFAULT)	

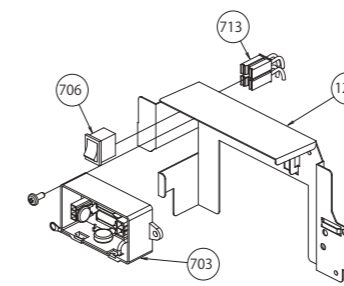
Middle bank of DIP switches

Easy-Link System	Single unit installation	High altitude installation (Indoor)				High altitude installation (Outdoor)			Setting temperature	
		0 to 2,000 ft (0 to 610 m) (DEFAULT)	2,000 to 3,000 ft (611 to 914 m)	3,000 to 5,000 ft (915 to 1,524 m)	5,000 to 7,500 ft (1,525 to 2,286 m)	7,500 to 10,100 ft (2,287 to 3,078 m)	0 to 2,000 ft (0 to 610 m) (DEFAULT)	2,000 to 4,000 ft (611 to 1,219 m)	4,000 to 6,000 ft (1,220 to 1,829 m)	120 °F (50 °C) (DEFAULT)

Lower bank of DIP switches

Gas (Factory setting)	Vent length and vent type installation						Manual pump operation			
	LP	Natural	3" venting		4" venting		Common venting	ON	OFF (DEFAULT)	
			Two-pipe, Direct vent installations	Single vent pipe installations						
			5 to 20 ft (1.5 to 6.1 m) (DEFAULT)	21 to 40 ft (6.2 to 12.2 m)	41 to 70 ft (12.3 to 21.3 m)	5 to 45 ft (1.5 to 13.7 m) (DEFAULT)	46 to 70 ft (13.8 to 21.3 m)	5 to 50 ft (1.5 to 15.2 m) (DEFAULT)	51 to 100 ft (15.3 to 30.5 m)	

Surge box



Item #	Part #		Description
	540P	T-H3P	
454	100076303	EZM04	O-ring P4 FKM
455	100076305	EZM06	O-ring P6 FKM
456	100076306	EZM14	O-ring P14 FKM
457	100076307	EZM15	O-ring P15 FKM
458	100076308	EZM16	O-ring P16 FKM
459	100074282	EKH30	Fastener "4-11"
460	100074290	EKK24	Fastener "14-22"
461	100074410	EM192	Fastener "16A"
462	100074389	EKK39	Fastener "16-25A"
463	100074297	EX12K	Fastener "6-15"
464	100074686	EK217	Flat heater
465	100276674	EK625	Drain tube
466	100276640	EK624	Cold pipe
467	100074690	EK222	Stainless heat exchanger out pipe
468	100074691	EK226	Header connection
469	100074692	EK228	Drain port
470	100074291	EX13H	Thermistor fixing plate
471	100074296	EK13L	Exhaust thermistor gasket
472	100074289	EKH6G	Hi-limit switch for exhaust
473	100074693	EK229	Gasket
701	100276677	EK628	Computer board
702	100076470	EX00B	Rubber grommet
703	100076100	EK280	Surge box
704	100074601	EK146	120 VAC wire for Indoor model
706	100074326	EKK4V	120 VAC Power ON-OFF switch
707	100074650	EK165	Remote controller wire
708	N/A	EK633	Gas valve wire
709	N/A	EK634	Flame rod wire
711	100276678	EK630	Igniter assembly
713	N/A	EK631	Switch wire with thermostat for Indoor
	N/A	EK636	for Outdoor
714	100074657	EK167	Proportional gas valve wire
715	N/A	EK632	24V cables for Indoor model
	N/A	EK638	for Outdoor model
716	100074375	EKK1M	Computer board cover
717	N/A	EX13C	Cable clamp
718	100074316	EKH6E	Exhaust thermistor for Indoor model
719	100074644	EK152	Remote fixing plate
721	100074659	EK180	Exhaust Hi-limit switch wire
722	100276680	EK639	Temperature controller for Indoor model
723	N/A	EK629	Fixing plate
724	100276687	TM-RE43	Temperature remote controller
725	N/A	EK619	Pump fixing plate
726	100276636	EK620	Recirculation pump assembly
727	100276638	EK622	Pump inlet pipe
728	100276639	EK623	Pump outlet pipe
729	100276676	EK626	Pump connection
730	N/A	EK627	PCB fixing plate
731	100276681	EK640	Return thermistor
732	100276683	EK642	Closing plug
733	100276686	EK643	Three way connection
734	100076326	EK469	Heater
735	100076400	EM190	Fastner "12.7"

Item #	Part #		Description
	540P	T-H3P	
001	N/A	EK617	Case assembly for Indoor model
	N/A	EK635	for Outdoor model
002	100074665	EK158	Front cover for 540P Indoor (AT-H3P-DV)
	100074666	EK174	for 540P Outdoor (AT-H3P-OS)
003	100074667	EK170	Intake air port assembly
004	N/A	EK162	Bracket
005	100074668	EK190	Junction box
006	100276679	EK637	Power supply cord assembly
007	N/A	EK161	Back guard panel
008	N/A	EK160	Chamber fixing plate
009	100074203	EKH23	Condensate drain port
050	100074210	EW000	Truss screw M4x12 (W/Washer) SUS410
051	100074509	EW001	Truss screw M4x10 (W/Washer) SUS410
052	100074211	EW002	Truss screw M4x10 (Coated) SUS3

Item #	Part #		Description
	540P	T-H3P	
053	100074245	EW003	Truss screw M4x10 SUS
054	100074510	EW004	Hex head screw M4x12 (W/Washer) SUS3
055	100074248	EW005	Hex head screw M4x8 FEZN
056	N/A	EW018	Pan screw M4x20 SUS410
057	100074385	EKK31	Tap tight screw M4x12 FEZN
058	100074272	EW00A	Tapping screw M3x6 SUS3 Pan head
059	100074512	EW009	Tapping screw M4x6 SUS3 Truss head
060	100076269	EKK37	Tap tight screw M4x12
061	N/A	EK191	Plus bind Screw M3x6 FEZN
062	100074244	EW00D	Pan screw M4x8 MFZN
063	100074233	EM167	Wire clamp 60
064	N/A	EK230	Screw M4x10
065	100074514	EW00B	Screw M3x6 SUS3 Binding head
066	100074247	EW006	Pan screw M4x10
067	N/A	EK739	Pan screw M4x10 for 3" adapter

Item #	Part #		Description
	540P	T-H3P	
101	100074670	EK192	Burner assembly
102	100074671	EK181	Manifold with gas valve assembly LP
	100074672	EK182	Manifold with gas valve assembly NA
103	100074606	EK109	Fan motor for Indoor model
	100074228	EKK25	Fan motor for Outdoor model
104	100074216	EKK2X	Burner gasket
105	100074466	EM381	Burner damper for Indoor model
106	100074218	EKK2V	Burner window
107	100074219	EKK2W	Rod holder gasket
108	100074673	EK193	Flame rod
109	100074222	EKK0F	Igniter rod
110	100074221	EKK32	Rod holder
111	100074223	EKN61	Rod cap
112	100074674	EK183	Burner damper LP
	100074675	EK169	Burner damper NA
113	100074229	EKK2Y	Manifold gasket A

Item #	Part #		Description
	540P	T-H3P	
114	100074230	EKK2K	Manifold gasket B
115	100074217	EKK0G	Burner holder gasket
116	100074227	EKK2D	Pressure port
117	100074528	EX019	Combustion chamber tube
118	100074616	EK117	Gas inlet
119	100074526	EX00D	Gas inlet ring
121	N/A	EK618	Surge box plate
150	100074533	EZP18	O-ring P18 NBR (Black)
151	100074242	EK042	O-ring P20 NBR (Black)
152	100074678	EK157	Silicon ring for Outdoor model
153	100074679	EK177	Exhaust port for Outdoor model
401	100276637	EK621	Primary heat exchanger assembly
402	100074624	EK129	Flow adjustment valve / Flow sensor
403	100074625	EKD58	Bypass valve
404	100074377	EKK1U	Water inlet
405	100074381	EKK2B	Inlet drain plug
406	100074382	EKK2C	Inlet water filter
407	100276682	EK641	Inlet thermistor
408	100074374	EKK1A	Outlet thermistor
409	100074681	EK208	Water outlet
410	100074383	EKK2E	Outlet drain plug
411	100074281	EKK2T	Heat exchanger thermistor
412	100074280	EKN34	Hi-Limit switch
413	100074334	EK333	Overheat-cut-off fuse
414	100074682	EK209	Pipe heater
415	100074683	EK210	Inlet heater for Indoor model
	100074684	EK211	Inlet heater for Outdoor model
416	100074685	EK231	Drain tube
417	100074629	EK105	Inlet heater
418	100074700	EK251	Secondary heat exchanger for Indoor model
	100074701	EK256	Secondary heat exchanger for Outdoor model
419	100310706	EK737	3" PVC adapter
450	100074273	EKK27	Pipe heater fixing plate
451	100074310	EK031	Heater fixing plate 16
452	100074251	EKK26	Fuse fixing plate 18
453	100074331	EK029	Fuse fixing plate 14