Maintenance sheet

510U
1W1010-1

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 >>
- 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 more quickly, 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 open fully, the gas line is sized properly, and the gas supply pressure is within specified limits. Refer to the "Gas supply and gas pipe sizing" in the Installation manual.
- Check the set temperature on the built-in controller (the remote controller, if it is installed*) or the DIP switch setting. Refer to Section D.
- Refer to **"Water circuit"** in this section.
- Is the Easy-Link or Multi-Unit System set up correctly?

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

<<The hot water is not available when a fixture is opened>>
- Refer to **"Power supply circuit"** and **"Water circuit"** in this section.
- Check if the gas supply valve is open fully, the gas line is sized properly, and the gas supply pressure is within specified limits.
- Is the Easy-Link or Multi-Unit System set up correctly?

<<Fluctuation of hot water temperature>>
- Check if the filter on the cold water inlet is clogged (Part #406).
- Check if the gas line is sized properly and the supply gas pressure is within specified limits.
- Check for cross connection between cold water lines and hot water lines.
- Refer to **"Water circuit"** in this section.
- Is the Easy-Link or Multi-Unit System set up correctly?

<<Unit does not ignite when water goes through the water heater>>
- Refer to **"Power supply circuit"** and **"Water circuit"** in this section.
- Check if the inlet water temperature is too high. If it is too close to the set temperature, the water heater won't activate.
- Is the gas supply turned on?

<<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 heater is caused by insufficient air supply or incorrect installation. The water heater needs more combustion air. Refer to the "101" error code in the section B.

<<Power supply circuit>>
- Check the power supply, and make sure that the water heater has 120 VAC.
- Is the power switch inside water heater turned on? (Part #706)
- Press the "ON/OFF" button of the built-in controller (the remote controller, if it is installed*) and make sure that the STAND BY LED on the controller is lit. Run the water.
- Check if the green LED on the PCB (Part #701) of the water heater is lit. If so, the power supply circuit of the water heater is under normal condition. Next, refer to **"Water circuit"** in this section.
- Check the fuse on the surge box (Part #703), and if it has a brown spot, need to replace it.
- If the green LED on the PCB (Part #701) isn't lit, some electrical parts may be broken. **Consult the manufacturer.**

<<Water circuit>>
- Turn on the power button on the built-in controller (the remote controller if it is installed*), and then check if the STAND BY LED will light up.
- 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.
- Check for reverse connection and cross connection.
- Check to see if the filter on the cold water inlet is clogged or if there is sediment buildup in the filter. (Part #406)
- Check if water ways in the water heater are frozen. If so, thaw them. Refer to the Installation manual to protect your water heater from freezing.
- Check if the inlet water pressure is higher than 40 psi. If it's lower than 40 psi, increase the pressure.
- Check for connections and breakage of wires (Part #402).
- 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.

***If a remote controller is installed, it will take priority over the built-in controller.**

B. Error codes

031: Incorrect DIP switch setting
- Check the DIP switch settings on the PCB. Refer to Section D.

101: Warning for the "991" error code
- Check the gas type of the house (and/or the building). This model comes from the factory set for natural gas. This model can be converted to propane by a qualified agent with the **LP Conversion Kit (100270585)** that comes with the heater.
- Check for and remove any blockage in the venting system. Refer to "Venting instructions" in the Installation manual.
- Check for proper distance between the intake air and exhaust terminals and other exhaust gas terminals. Refer to "Venting instructions" in the Installation manual.
- Verify that the vent length is within max. limit. Refer to "Venting instructions" in the Installation manual. Make sure the DIP switches are set for the correct vent length and installation. Refer to section D.
- Check the altitude/elevation where the water heater is installed. Refer to the "High-altitude function" in Section D for correct DIP switch settings.
- Check for any 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 the rating plate or LP Conversion label.

111: Ignition failure*
- Check the gas supply and inlet gas pressure.
- Check if the Hi-limit switch (Part #412) is properly functioning.
- Check for connection/breakage of wires (Part #008, 413, 708, 709), and/or soot on the flame rod (Part #107). And then if the O.H.C.F (Part #008, or 413) has a breakage, consult the manufacturer.
- Check if there is a buzzing spark ignition sound coming from the burner (Part #101) when water heater prepares for combustion.
- Listen for the double "clunk" sound coming from the gas valve assembly (Part #102) when water heater goes into combustion.
- (Only if no sparking and/or clunk sound) Check the voltage on each wire to 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 of "Appendix A" in Section C.
  *No clunk sound >>>>> Refer to #2 of "Appendix A" in Section C.
- Check if there is water leaking from the heat exchanger (Part #401).
- Check if there is dust and lint in the nozzles of the manifold (Part #102).
- Check the current on the flame rod (Part #107). Refer to #3 of "Appendix A" in Section C.

121: Loss of flame*
- Check the gas supply and inlet gas pressure.
- Check if the Hi-limit switch (Part #412) is properly functioning.
- Check for connection/breakage of wires (Part #008, 413, 708, 709), burn marks on the computer board (Part #701), and/or soot on the flame rod (Part #107). And then if the O.H.C.F (Part #008 or 413) has a breakage, consult the manufacturer.
- Check if there is water leaking from the heat exchanger (Part #401).
- Check if there is dust and lint in the nozzles of the manifold (Part #102).
- Check the current on the flame rod (Part #107). Refer to #3 of "Appendix A" in Section C.

311,321,331: Disconnected/short-circuited thermistor*
- Check for connection/breakage of wires and/or debris on the thermistors (Part #407, 408, 411, 713).
- Check the thermistor resistance. Refer to "Appendix D" in Section C.

391: Air-fuel ratio rod failure*
- Check for connection/breakage of wires (Part #709) and/or soot on the flame rod (Part #107).

441: Flow sensor failure (Only in Easy-Link & Multi-Unit Systems)
- Check for connection/breakage of wires and/or debris or blockage in the flow sensor impeller (Part #402).

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 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 to see if the fan motor connectors are frozen or corroded (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.

651: Flow adjustment valve fault (Only in Easy-Link & Multi-Unit Systems)
- Inspect the flow adjustment valve (Part #402), for connection/breakage of wires, locked motor drive due to scale buildup, and/or water leakage.
- Check the voltage between the black wire and red wire. Refer to "Appendix F" in Section C.

661: Bypass valve fault*
- Inspect the bypass valve (Part #403), for connection/breakage of wires, locked motor drive due to scale buildup, and/or water leakage.
- Check the voltage between the brown wire and red wire. Refer to "Appendix F" in Section C.

701: Computer board fault*
- Check for connection/breakage of wires (Part #714), and check the resistance between the white wire and red wire. Refer to #2 in Appendix A of 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 #107).
- Check if a vertical condensation drain is installed on the vent collar of the water heater, if there is more than 5 ft. (1.5 m) of straight pipe.
- Check if there is water leaking from the heat exchanger (Part #401).

741: Miscommunication between water heater and remote controller
- This error code will appear if the remote controller is disconnected from the PCB while power is still on.
- Check the model type of the remote controller. Model No. 100209924 (TM-RE42)
- Inspect the connections between the water heater and remote controller. Refer to the "Remote controller Installation" in the Installation manual.
- Check the power supply to 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 on the PCB (Part #701), check the voltage on the buit-in controller terminal on the PCB. Refer to "Appendix E" in Section C.
- If this error code appears only on the buit-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 built-in controller.

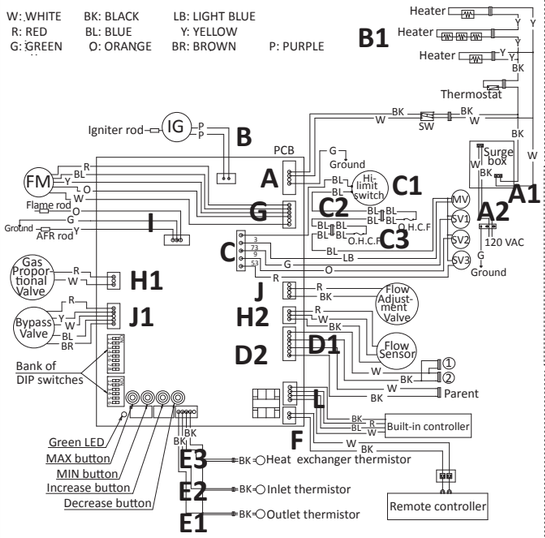
761: Miscommunication between Parent Unit/100112691(TM-MC02) and Child Units in Linked System
- Check the wire connections between the parent and child units in an Easy-Link System.
- Check the wire connections between 100112691 (TM-MC02) and heaters in a Multi-Unit System.
- Refer to heater installation manual or 100112691 (TM-MC02) manual for correct wire connections.

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

*These error codes will be cleared when water flow stops in a single unit installation.

C. Wiring diagram and check points on the water heater

The tech should power the heater off and then on to reset the error code.



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 the ignition process.
(Normal: 108 to 132 VAC)
Is the voltage within normal range?
Yes >> Replace the igniter assembly (Part #711).
No >> Go back to error code.

2. Refer to check points **"C" and "H1"** on the wiring diagram above.
Check the voltages below during the ignition process:
C: Between blue wire and light blue wire (#3).
(Normal: 93 to 120 VDC)
C: Between blue wire and orange wire (#9).
(Normal: 93 to 120 VDC)
H1: Check the voltage between white wire and red wire.
(Normal: 1 to 15 VDC)
Are these voltages 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 when there is a flame.)
Is the current normal when there is a flame?
Yes >> Replace the PCB (Part #701).
No >> Replace the flame rod (Part #107).

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)

Are all of the voltages within normal range?
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 on the each valve on the gas valve assembly.
- Between blue wire and light blue wire (#3) (Normal: 93 to 120 VDC).
- Between blue wire and green wire (#73) (Normal: 93 to 120 VDC).
- Between blue wire and orange wire (#9) (Normal: 93 to 120 VDC).
- Between blue wire and red wire (#53) (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 (For error code 311, 321 and 331)

- Outlet thermistor (Find the connector with No.113 stamped on it.)
Check point **"E1"** on the wiring diagram.
- Inlet thermistor (Find the connector with No.42 stamped on it.)
Check point **"E2"**on the wiring diagram.
- Heat exchanger thermistor (Find the connector with No.12 stamped on it.)
Check point **"E3"**on the wiring diagram.

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

Are all of the check points normal?
Yes >> Replace the PCB (Part #701).
No >> Replace the thermistor (Part #407, 408, 411).

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 built-in controller on the PCB. • Between black wire and white wire. (Normal: 11 to 25 VDC)

Is the voltage within normal range?
Yes >> Replace the remote controller and/or built-in controller.
No >> Replace the PCB (Part #701).

Appendix F (For error code 651 and 661)

Refer to check point **"J"** or **"J1"** on the wiring diagram above.
J: Check the voltage between black wire and red wire. (Normal: 7 to 16 VDC)
J1: Check the voltage between brown wire and red wire. (Normal: 3 to 11 VDC)

Is the voltage within normal range?
Yes >> J: Replace the Flow adjustment valve (Part #402).
J1: Replace the Bypass valve (Part #403).
No >> Replace the PCB (Part #701).

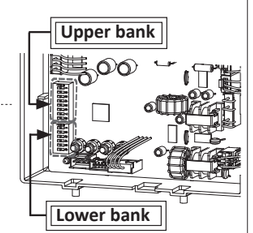
D. DIP switch settings on the computer board of the water heater

Locate the two banks of DIP switches at the bottom left of the computer board of the unit. Change the DIP switch settings when the power supply is turned off. The dark squares indicate the correct DIP switch position. DEFAULT is the factory setting.

<Upper bank of DIP switches>

Vent Length and Installation

Gas type	Vent length	Two pipe direct vent installation	Vent length	Single pipe with room air intake	Outdoor installation
Natural (DEFAULT)	0 to 20 ft (0 to 6.1 m)		0 to 60 ft (0 to 18.3 m)		
Propane	21 to 40 ft (DEFAULT) (6.2 to 12.2 m)		Vent length	Vent kit 100187154	
	41 to 60 ft (12.3 to 18.3 m)		0 to 55 ft (12.3 to 16.8 m)		



<Lower bank of DIP switches>

High Altitude Function

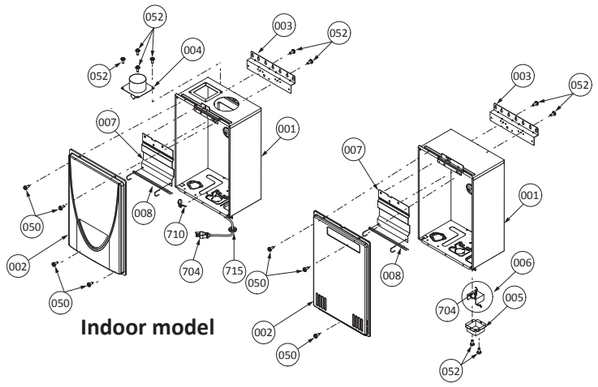
Easy-Link System	Indoor model		Outdoor model	
Parent Unit	0 to 2,000 ft (0 to 610 m) DEFAULT		0 to 2,000 ft (0 to 610 m) DEFAULT	
Child Unit* (DEFAULT)	2,001 to 3,000 ft (611 to 914 m)		2,001 to 4,000 ft (611 to 1,219 m)	
	3,001 to 5,000 ft (915 to 1,524 m)		4,001 to 6,000 ft (1,220 to 1,829 m)	
	5,001 to 7,500 ft (1,525 to 2,286 m)			
	7,501 to 10,100 ft (2,287 to 3,078 m)			

*Single unit is the same as the child unit.

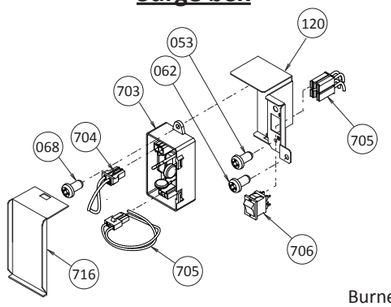
Temperature set	
120 °F (50 °C) (DEFAULT)	
140 °F (60 °C)	

E. Components diagram / Parts list

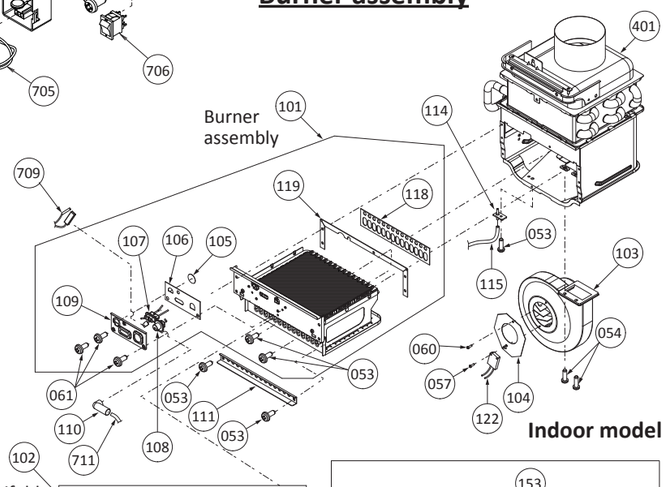
Case assembly

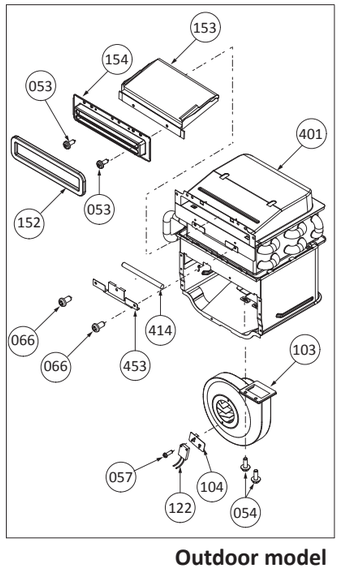


Surge box



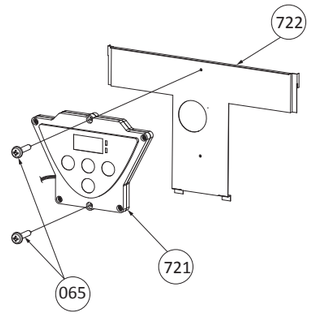
Burner assembly



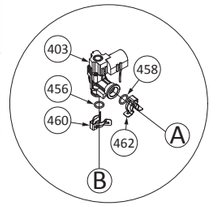


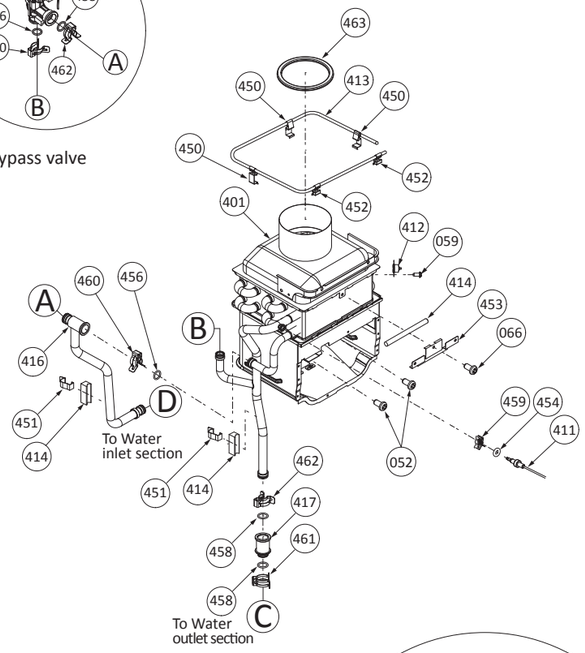
Item #	Part #		Description
	510 U	AT-D3U-IN/OS	
001	N/A	EK596	Case assembly Indoor model
	N/A	EK597	Outdoor model
002	N/A	EK598	Front cover Indoor model
	N/A	EK599	Outdoor model
003	N/A	EK455	Bracket
004	N/A	EK600	Intake air port assembly
005	100074668	EK190	Junction box
006	100074603	EKK4D	Power supply cord assembly
007	N/A	EK601	Back guard panel
008	100074201	EM484	Overheat-cut-off fuse for combustion chamber
050	100074210	EW000	Truss screw M4×12 (W/Washer) SUS410
051	100074509	EW001	Truss screw M4×10 (W/Washer) SUS410
052	100074211	EW002	Truss screw M4×10 (Coated) SUS3
053	100074245	EW003	Truss screw M4x10 SUS
054	100074510	EW004	Hex head screw M4×12 (W/Washer) SUS3
055	100074248	EW005	Hex head screw M4x8 FEZN
056	100074247	EW006	Pan screw M4x10 FEZN
057	100074511	EW008	Pan Screw M3x10 SUS
058	100074512	EW009	Tapping screw M4x6 SUS3 Truss head
059	100074272	EW00A	Tapping screw M3x6 SUS3 Pan head
060	100074514	EW00B	Screw M3x6 SUS3 Binding head
061	100074244	EW00D	Pan screw M4x8 MFZN
062	100076450	EW00E	Tapping screw M4x14 SUS410 Truss head
063	100074515	EW00X	Screw M3x12 BSNI Raised counter sunk head
064	N/A	EW016	Screw M3x6 BSNI Binding head
065	N/A	EW018	Pan screw M4x20 SUS410
066	N/A	EW02A	Truss screw M4x8 SUS3
067	100074385	EKK31	Tap tight screw M4x12 FEZN
068	N/A	EX014	Truss screw M4x10 MFZN3

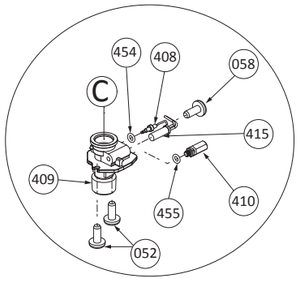
Built-in temperature controller (Indoor only)

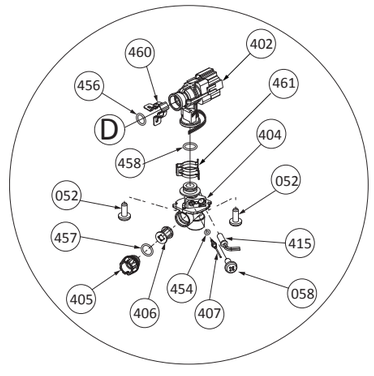


Water way assembly



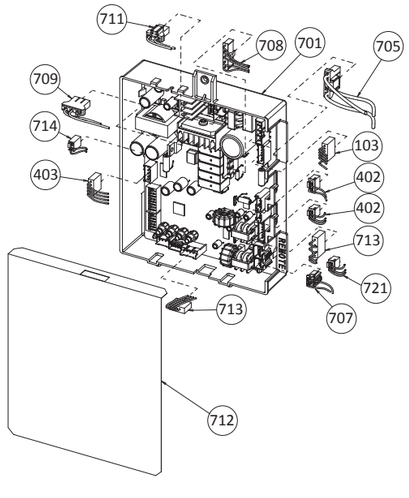






Item #	Part #		Description
	510 U	AT-D3U-IN/OS	
101	100224092	EK554	Burner assembly
102	100224093	EK555	Manifold with gas valve assembly NA
103	100074606	EK109	Fan motor for Indoor model
	100074228	EKK25	Fan motor for Outdoor model
104	100074466	EM381	Fan motor plate for Indoor model
	N/A	EK140	Fan motor plate for Outdoor model
105	100076535	EKN58	Burner window
106	100224097	EK559	Rod holder gasket
107	100224098	EK560	Flame rod with AFR function
108	100224099	EK561	Igniter rod
109	100224100	EK562	Rod holder
110	100076319	EK462	Rod cap
111	100270556	EK602	Burner damper
112	100224102	EK564	Manifold gasket A
113	100224103	EK565	Manifold gasket B
114	100074227	EKK2D	Pressure port
115	100074528	EX019	Combustion chamber tube
116	100074235	EKK1E	Gas inlet
117	100074234	EKK2Z	Gas inlet ring
118	100224105	EK567	Burner gasket
119	100224106	EK568	Burner holder gasket

Computer board assembly



Item #	Part #		Description
	510 U	AT-D3U-IN/OS	
120	100074360	EK436	Surge box plate
121	N/A	EK603	PCB fixing plate
122	100074369	EKJ59	Thermostat
130	100270585	EK604	LP Conversion kit
131	100281157	EK592	Manifold gasket
150	N/A	EK570	O-ring P18 NBR (Manifold)
151	100074242	EK042	O-ring P20 NBR (Black)
152	100074390	EKK3G	Silicon ring for Outdoor model
153	100074400	EKK53	Rain protection plate in Exhaust chamber for Outdoor model
154	100074403	EKK56	Exhaust port for Outdoor model
401	100270559	EK607	Heat exchanger assembly for Indoor
	100270560	EK608	for Outdoor
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	100224109	EK573	Inlet thermistor
408	100224110	EK574	Outlet thermistor
409	100074627	EK104	Water outlet
410	100074264	EK239	Outlet drain plug
411	100224111	EK575	Heat exchanger thermistor
412	100074280	EKN34	Hi-Limit switch
413	100074252	EX02A	Overheat-cut-off fuse for heat exchanger
414	100074682	EK209	Pipe heater
415	100074629	EK105	Inlet heater
416	100270581	EK609	Pipe inlet
417	100224113	EK577	Joint outlet
450	N/A	EK616	Fuse fixing plate 40
451	100074310	EK031	Heater fixing plate 16
452	N/A	EK476	Fuse fixing plate 18
453	N/A	EK610	Pipe heater fixing plate
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	100074250	EKN50	Silicon ring for Indoor model
701	100270584	EK613	Computer board for 510U
702	100074644	EK152	Remote fixing plate
703	100076100	EK280	Surge box
704	100074601	EK146	120 VAC wire for Indoor model
	100074323	EKK3C	for Outdoor model
705	N/A	EK614	Switch wire
706	N/A	EK590	120 VAC Power ON-OFF switch
707	100074650	EK165	Remote controller wire
708	N/A	EK585	Gas valve wire
709	N/A	EK586	Flame rod wire
710	N/A	EW022	Cable strap
711	100074640	EK153	Igniter assembly
712	100074458	EM329	Computer board cover
713	N/A	EK587	24V cables
714	100074642	EK112	Proportional gas valve wire
715	100074655	EK184	Rubber grommet for Indoor model
716	N/A	EK615	Surge box cover
721	100074660	EK173	Temperature controller
722	N/A	EK588	Controller fixing plate
N/A	100076516	EKK0J	Communication cable for linking*

*Refer to p.9 on the Installation manual.

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