

Maintenance sheet

60E101

A. Troubleshooting

If the error code is indicated on the 3-digit 7-Seg LED 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" of the installation manual.
- Check cross plumbing between cold water lines and hot water lines.
- Check if the gas supply valve fully open, the gas line sized properly and the gas supplies pressure enough. Refer to the "Gas supply and gas pipe sizing" of the installation manual.
- Check the set temperature, and change the dipswitch setting. Refer to Section D.
- Refer to "Water circuit" in this section.

<<The water is too hot>>

- Check the set temperature, lower setting 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 cleaned. (Part #409)
- Check if the gas line sized properly and the supply gas pressure sufficient.
- Check for cross connection between cold water lines and hot water lines.
- Refer to "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 the green LED will lit.
- Check if the filter on the cold water inlet cleaned. (Part #409)

<<The fan motor still spinning after operation has stopped>>

- This is normal. After operation has stopped, the fan motor keeps running for 35 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>>

- If the remote controller installed, press the "ON/OFF" button of the remote controller, and make sure that the green LED on the "ON/OFF" button of the remote controller is lit. Restart the water heater.
- Check if that the 3-digit 7-Seg 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 the "Water circuit" in this section.
- Check the fuse on the surge box (Part #715), and if it has a brown spot, need to replace it.
- Check the power supply, and make sure that the water heater has 120 VAC.
- If the 3-digit 7-Seg LED on the PCB (Part #701) isn't lit, some electrical parts can be broken. Consult the manufacturer.

<<Water circuit>>

- If you set the remote controller, turn the power button on and then the green LED will lit.
- 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 to operate.
- Check for reverse connection and cross connection.
- Check if the filter on the cold water inlet cleaned. (Part #409)
- Check if there is no debris or obstruction on the fixtures.
- Check if water ways in the water heater are frozen. If so, unfreeze them. And refer to installation manual to protect your water heater from freeze.
- Check if the inlet water pressure is higher than 40 psi. And if it's lower than 40 psi, need to increase the pressure.
- Check for connections and breakage of wires (Part #423, 429).
- Check if the motor drive of the water control valve (Part #423) is locked due to scale buildup, and/or water leakage, Consult the manufacturer.

441: Flow Sensor failure (Only Easy-Link system)

- Check for connection/breakage of wires and/or debris on impeller (Part #429, 708).

510,551: Abnormal Main and Gas Solenoid Valve

- Check for connection/breakage of wires (Part #705) and/or burn marks on the computer board (Part #701).
- Reset power supply of the water heater.
- Check voltage on the each valve on the gas valves assembly (Part #118). Refer to the "Appendix C" in Section C.

611,621*: Fan motor and Exhaust Fan motor fault

- Check for connection/breakage of wires, dust buildup in the fan motor/Exhaust fan motor (Part #114,124) and/or burn marks on the computer board (Part #701).
- Check for frozen/corrosion of connectors of the fan motor (Part #114,124).
- Check voltage between blue wire and each wire of the fan motor (Part #114,124) during operation. Refer to the "Appendix B" in Section C.

631: Abnormal External Pump

- Check whether the pump connected to PCB (Part #701) works properly.

651,661: Water control valve fault (Only Easy-Link system)

- Check the water control valve (Part #423), connection/breakage of wires (Part #423), motor drive locked due to scale buildup, and/or water leakage.
- Check voltage between black wire and red wire. Refer to the "Appendix F" in Section C.

701: Computer board fault

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

711: Hi-limit switch trip/ Gas solenoid valve drive circuit failure

- Check connection/breakage of wires (Part #705) and/or burn marks on the computer board (Part #701).

721: False flame detection

- Clean the flame rod (Part #106).
- For indoor models, check if condensate drain is installed on the vent collar of the water heater.
- Check if there is leaking from heat exchanger (Part #401 or 456).

741: Miscommunication between water heater and remote controller

- Check the model type of the remote controller. Model name 9007603005 is the correct one.
- Inspect for the connections between the water heater and remote controller. Refer to "Remote controller connections" section in the Installation manual.
- Check the power supply of the water heater.
- If this error code appears only the 3-digit 7-Seg LED on the PCB (Part #701), check the voltage on the remote controller terminal on the PCB. Refer to the "Appendix E" in Section C.
- If this error code appears only remote controller, replace the PCB (Part #701).
- If this error code appears both the PCB (Part #701) and the remote controller, replace the remote controller.

761: Miscommunication between Parent unit and Child units for Easy-link system

- Check if connection between the parent unit and the child units are correct. Refer to "Easy-Link system" section in the Installation manual.

941*: Abnormal exhaust temperature (Only 520 Direct Vent Indoor)

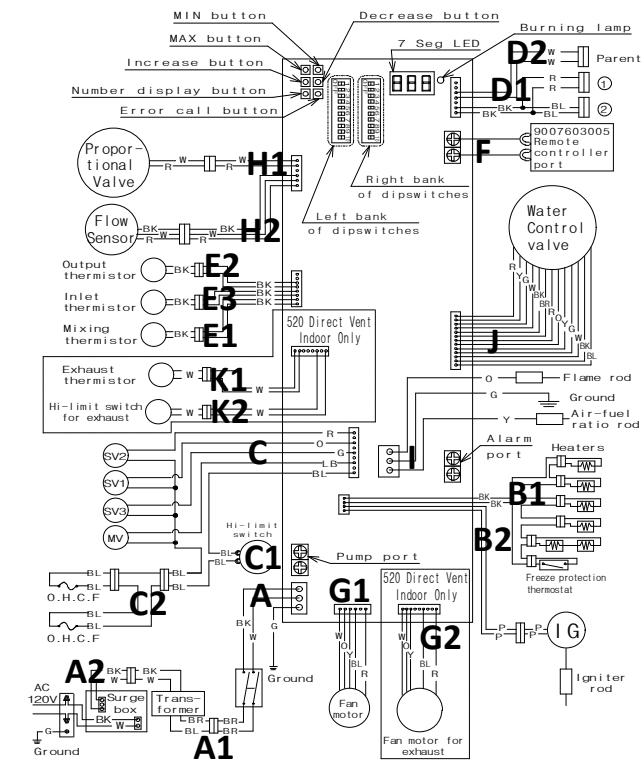
- Check if the set temperature is higher than 140°F (60°C) and the system is Recirculation.
- Check exhaust thermistor resistance. Refer to the "Appendix D" in Section C.

991: Imperfect combustion

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

C. Wiring Diagram and check point of the Water heater

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



Appendix A (For error code 111)

Check these points during ignition stage.

- Refer check point "B2" on the wiring diagram above.

Check voltage between purple wires.

(Normal: AC 90 to 110 V)

This Check point is normal?

Yes >> Replace the igniter (Part #123)

No >> Go to Next

- Refer check point "C" and "H1" on the wiring diagram above.

Check the voltage bellows.

C: Between blue wire and light blue wire (#3).

(Normal: DC78 to 100 V)

C: Between blue wire and orange wire (#53).

(Normal: DC78 to 100 V)

H1: Check the voltage between white wire and red wire.

(Normal: DC 1 to 15 V)

These check points are normal?

Yes >> Replace the gas valves assembly. (Part #118)

No >> Replace the PCB. (Part #701)

- Check current thought the orange flame rod wire (Part #710).

(Normal: more than 1μA)

This check point is normal during operation?

Yes >> Replace the PCB. (Part #701)

No >> Replace the flame rod. (Part #106)

Appendix B (For error code 611 & 621)

Refer check point "G1" & "G2" in the diagram to the left and followings.

- Check voltage between red wire and blue wire. (Normal: DC 110 to 160 V)
- Check voltage between yellow wire and blue wire. (Normal: DC 13 to 17 V)
- Check voltage between orange wire and blue wire. (Normal: DC 2.0 to 6.5 V)

All check points are normal?

Yes >> Replace the fan motor and Exhaust fan motor. (Part #114&124)

No >> Replace the PCB. (Part #701)

Appendix C (For error code: 510 & 551)

Refer check point "C" in the diagram to the left and followings.

Check voltage on the each valve on the gas valves assembly.

- Between blue wire and light blue wire (#3). (Normal: DC 78 to 100 V)
- Between blue wire and green wire. (#9) (Normal: DC 78 to 100 V)
- Between blue wire and orange wire (#53). (Normal: DC 78 to 100 V)
- Between blue wire and red wire (#73). (Normal: DC 78 to 100 V)

All check points are normal?

Yes >> Replace the gas valves assembly. (Part #118)

No >> Replace the PCB. (Part #701)

Appendix D (For error code: 311, 321, 331, 341 and 941)

- Mixing thermistor (Find the marking of No.113 on the connector) Check point "E1"
 - Output thermistor (Find the marking of No.12 on the connector) Check point "E2"
 - Inlet thermistor (Find the marking of No.42 on the connector) Check point "E3"
- Check 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 (Find the marking of No.52 on the connector) Check point "K1"

Check 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 wrong thermistor. (Part #422, 433, 418, 706)

Appendix E (For error code 741)

Refer check point "F" on the wiring diagram above.

Check voltage on the remote controller terminal on the PCB. (Normal: DC 11 to 25 V)

This check point is normal?

Yes >> Replace the remote controller.

No >> Replace the PCB. (Part #701)

Appendix F (For error code 651 & 661)

Refer check point "J" on the wiring diagram above.

Check voltage between blue wire and brown wire. (Normal: DC 13 to 16 V)

This check point is normal?

Yes >> Replace the Water control valve. (Part #423)

No >> Replace the PCB. (Part #701)

B. Error codes

*The 341, 621 and 941 error codes are applied to the 520 Direct Vent Indoor model only.

031: Incorrect dipswitch setting

- Check the dipswitch settings on the PCB. Refer to Section D.

101: Warning for the "991" error code

- Check the gas type of the water heater. If it's wrong gas type model, replace the water heater to correct one.
- Check if there is any blockage (For example, Damper sticking, Vent Flaps installed on the terminator, Snow build up around terminator, Installed in a closet (No ventilation or lack of combustion air)) in the intake air and/or exhaust. Refer to the "Vent termination clearances" of the installation manual.
- If the water heater is installed as a direct-vent system, check whether there are enough distance between the intake air terminal and the exhaust terminal. Refer to the "Vent termination clearances" of the installation manual.
- Check if the total vent length doesn't exceed 50 ft and the # of elbows is less than 5Ea.
- Check the altitude/elevation of area of where the water heater installed. Refer to the "High-altitude function" of the 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 #114), especially if the water heater has been installed in a contaminated area.
- Check if there is dust and lint in heat exchanger.
- Check the manifold pressure of the water heater. Refer to installation manual.

111: Ignition failure

- Check gas supply and inlet gas pressure.
- Check if the Hi-limit switch (Part #432) is properly functioning.
- Check for connection/breakage of wires (Part #110, 404, 704, 705, 710, 719), burn marks on the computer board (Part #701), and/or soot on the flame rod (Part #106). And then if O.H.C.F (Part #008 and/or #404) is 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 valves assembly (Part #118) when water heater goes into combustion.
- (Only no sparking and/or kick sound) Check voltage on each wire to gas valves assembly (Part #118) and/or the igniter (Part #123). Refer to the "Appendix A" in Section C.
 - *No sparking sound >>>> Refer to the #1 at "Appendix A" in Section C.
 - *No kick sound >>>> Refer to the #2 at "Appendix A" in Section C.
- Check if there is leaking from heat exchanger (Part #401 or 456)
- Check if there is dust and lint in nozzles of the manifold (Part #118).
- Check current on the flame rod (Part #106). Refer to the #3 at "Appendix A" in Section C.

121: Loss of flame

- Check gas supply and inlet gas pressure.
- Check if the Hi-limit switch (Part #432) is properly functioning.
- Check for connection/breakage of wires (Part #110, 404, 704, 705, 710, 719), burn marks on the computer board (Part #701), and/or soot on the flame rod (Part #106). And then if O.H.C.F (Part #008 and/or #404) is breakage, Consult the manufacturer.
- Check if there is leakage from heat exchanger (Part #401 or 456).
- Check if there is dust and lint in nozzles of the manifold (Part #118).
- Check current on the flame rod (Part #106). Refer to the #3 at "Appendix A" in Section C.

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

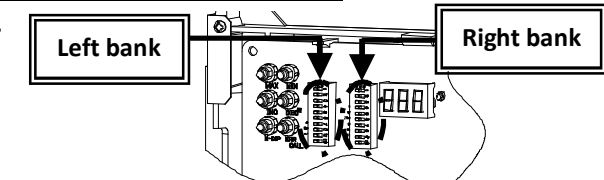
- Check for connection/breakage of wires and/or debris on thermistor (Part #422, 433, 418, 706, 707, 721).
- Check thermistor resistance. Refer to the "Appendix D" in Section C.

391: Air-fuel Ratio Rod failure

- Check for connection/breakage of wires (Part #710) and/or soot on the AFR rod. (Part #106).

D. Dipswitch Settings on the computer board of the water heater

Change the dipswitch settings when the power supply is turning off. The dark square is the direction the dipswitch should be set to. DEFAULT is the factory setting.



<Left bank of dipswitches>

The Gas Type and Model Type dipswitch should already be properly preset from the factory.

Gas type		Model type	
Propane	Natural Gas	520 Direct Vent Indoor	520 Outdoor

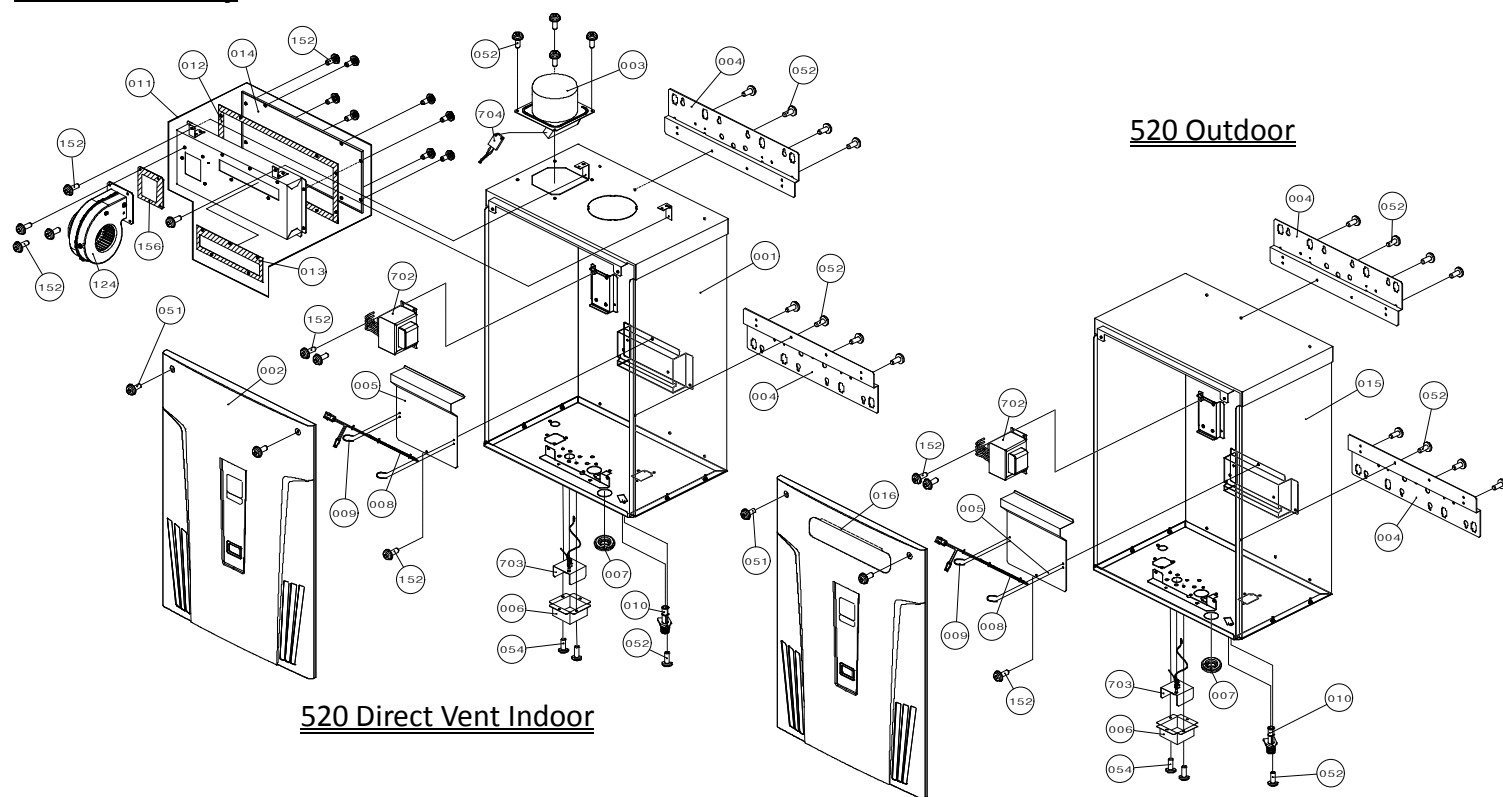
High-altitude function			
DEFAULT (0 to 2,500 ft)	FM+ (2,500 to 4,000 ft)	FM++ (4,000 to 5,000 ft)	Over 5,000 ft:
			Consult the manufacturer
FM speed is increased automatically.			

<Right bank of dipswitches>

Easy-Link system	
Parent Unit	Child Unit
Single unit is the same as the child unit.	

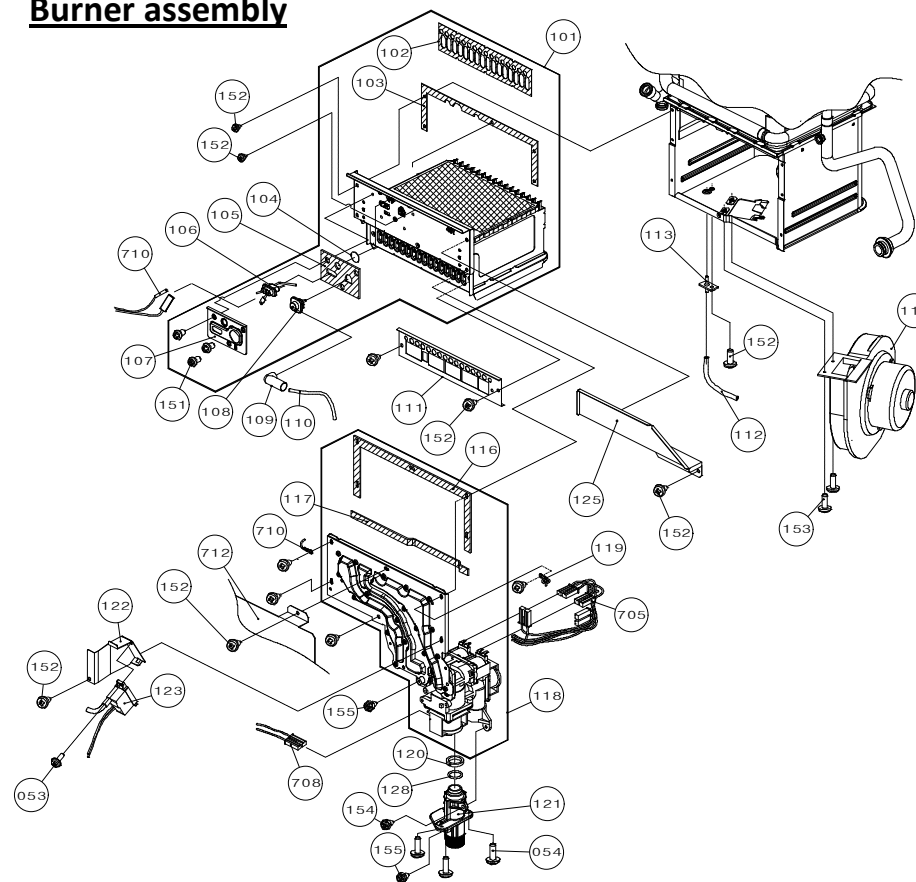
E. Components Diagram / Parts List

Case assembly



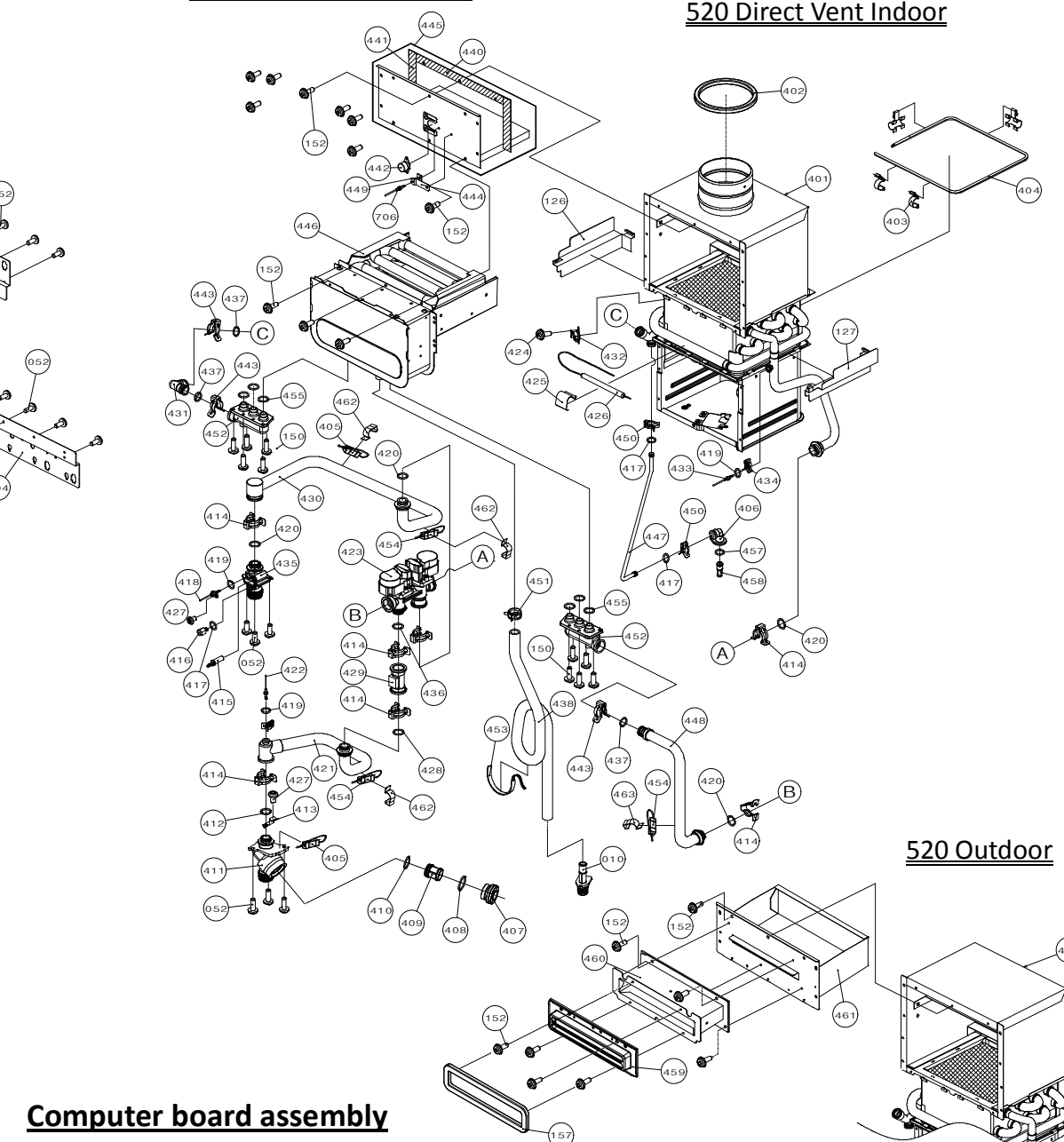
Item#	Part#	Description	Item#	Part#	Description
001	319143-009	Case assembly for 520 Indoor	009	319143-017	Fastener
002	319143-010	Front cover for 520 Indoor	010	319143-018	Condensate drain port
003	319143-011	Intake air port assembly	011	319143-019	Duct
004	319143-012	Brackets	012	319143-020	Duct gasket A
005	319143-013	Back guard panel	013	319143-021	Duct gasket B
006	319143-014	Junction box	014	319143-022	Duct cover plate
007	319143-015	Rubber bush	015	319143-023	Case assembly for 520 Outdoor
008	319143-016	O.H.C.F for combustion chamber	016	319143-024	Front cover for 520 Outdoor

Burner assembly

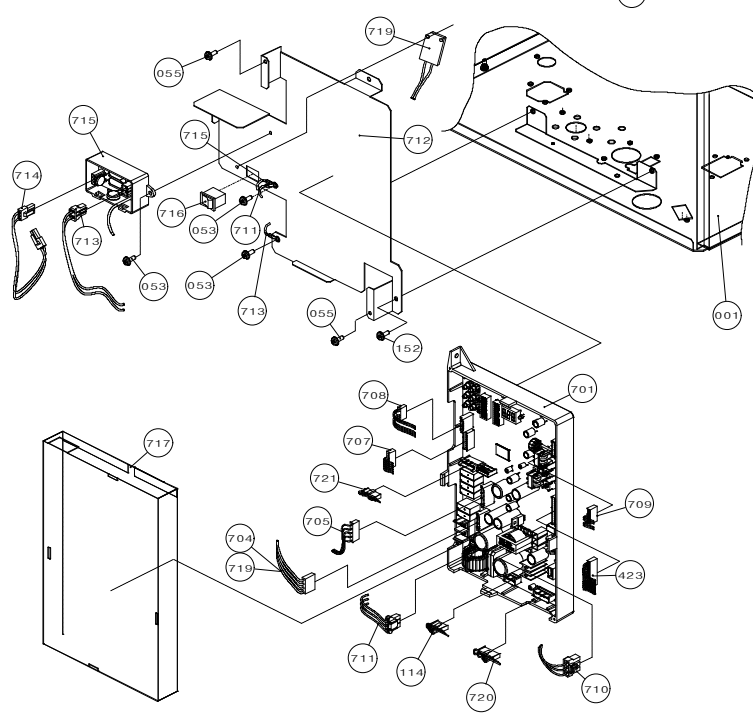


Item#	Part#	Description	Item#	Part#	Description
051	319143-025	Screw M4x12 (W/Washer)	101	319143-030	Burner assembly
052	319143-026	Screw M4x10 (Coated)	102	319143-031	Burner gasket
053	319143-027	Pan screw M4x10	103	319143-032	Burner holder gasket
054	319143-028	Screw M4x10	104	319143-033	Burner window
055	319143-029	Pan screw M3x10	105	319143-034	Rod holder gasket
106	319143-035	Flame rod	107	319143-036	Rod holder
108	319143-037	Igniter rod	109	319143-038	Rod cap
110	319143-039	High voltage igniter cable	111	319143-040	Damper
112	319143-041	Urethane tube	118	319143-046	Manifold assembly with gas valve assembly LP
113	319143-042	Pressure port	119	319143-048	Manifold assembly with gas valve assembly NA
114	319143-043	Fan motor	120	319143-049	Wire clamp 60
116	319143-044	Manifold gasket A	121	319143-050	Gas inlet ring
117	319143-045	Manifold gasket B	122	319143-051	Gas inlet
123	319143-052	Igniter plate	123	319143-052	Igniter
124	319143-053	Fan motor for exhaust	124	319143-053	Fan motor for exhaust
125	319143-054	HX protection plate (Front)	125	319143-054	HX protection plate (Front)
126	319143-055	HX protection plate (Right)	126	319143-055	HX protection plate (Right)
127	319143-056	HX protection plate (Left)	127	319143-056	HX protection plate (Left)
128	319143-057	O-ring P20 NBR	128	319143-057	O-ring P20 NBR
150	319143-058	Screw M4x8	150	319143-058	Screw M4x8
151	319143-059	Pan screw M4x8	151	319143-059	Pan screw M4x8
152	319143-060	Screw M4x10	152	319143-060	Screw M4x10
153	319143-061	Pan Screw M4x12 (W/Washer)	153	319143-061	Pan Screw M4x12 (W/Washer)
154	319143-062	Pan screw M4x10	154	319143-062	Pan screw M4x10
155	319143-063	Hex head screw M4x8	155	319143-063	Hex head screw M4x8
156	319143-329	Flange gasket for fan motor	156	319143-329	Flange gasket for fan motor
157	319143-206	Silicon ring	157	319143-206	Silicon ring

Water way assembly



Computer board assembly



520 Direct Vent Indoor

Item#	Part#	Description
701	319143-126	Computer board
702	319143-127	Transformer
703	319143-128	Junction box inner plate
704	319143-129	Freeze protection and EH-IG wire for 520 Indoor
705	319143-130	Gas valve wire
706	319143-131	Exhaust thermistor assembly
707	319143-132	Thermistors wire
708	319143-133	Proportional gas valve wire
709	319143-134	Pump and multi-cable
710	319143-135	Flame rod wire
711	319143-136	Switch wire
712	319143-137	PCB fixing plate
713	319143-138	AC120V wire
714	319143-139	AC120V Transformer connecting wire
715	319143-140	Surge box
716	319143-141	AC120V power ON-OFF switch
717	319143-142	PCB cover
718	319143-143	Nylon clamp
719	319143-144	Freeze protection and EH-IG wire for 520 Outdoor
720	319143-145	Exhaust fan motor wire
721	319143-415	Exhaust thermistor wire

Item#	Part#	Description
401	319143-064	Heat exchanger assembly for 520 Indoor
402	319143-065	Silicon ring
403	319143-066	Fuse fixing plate 18
404	319143-067	Overheat-cut-off fuse
405	319143-068	Heater 101
406	319143-069	Drain port
407	319143-070	Filter plug
408	319143-071	O-ring P25 FKM
409	319143-072	Water inlet filter
410	319143-073	O-ring JASO# 1021 FKM
411	319143-074	Water inlet
412	319143-075	O-ring JASO# 1016 FKM
413	319143-076	Heater plate
414	319143-077	Fastener "16AG"
415	319143-078	Outlet heater
416	319143-079	Outlet drain plug
417	319143-080	O-ring P6 FKM
418	319143-081	Mixing thermistor
419	319143-082	O-ring P4 FKM
420	319143-083	O-ring P16 FKM
421	319143-084	Cold pipe
422	319143-085	Inlet thermistor
423	319143-086	Water control valve
424	319143-087	Screw M3x6
425	319143-088	Pipe heater fixing plate
426	319143-089	Pipe heater 120
427	319143-090	Pan screw M4x6 (W/Washer)
428	319143-091	O-ring P15 FKM
429	319143-092	Flow sensor
430	319143-093	Hot pipe
431	319143-094	Joint elbow
432	319143-095	Hi-limit switch
433	319143-096	Output thermistor
434	319143-097	Fastener "4-11"
435	319143-098	Water outlet
436	319143-099	O-ring JASO# 1017 FKM
437	319143-100	O-ring P14 FKM
438	319143-101	Drain tube
440	319143-102	Secondary heat exchanger plate gasket A
441	319143-103	Secondary heat exchanger plate gasket B
442	319143-104	Hi-limit switch for exhaust
443	319143-105	Fastener "14-22"
444	319143-106	Thermistor fixing plate
445	319143-107	Secondary heat exchanger plate
446	319143-108	Secondary heat exchanger
447	319143-109	Drain pipe
448	319143-110	Secondary heat exchanger out plate
449	319143-111	Exhaust thermistor gasket
450	319143-112	Fastener "6-15"
451	319143-113	Band B
452	319143-114	Header
453	319143-115	Flat heater
454	319143-116	3 array heater
455	319143-117	O-ring P12 FKM
456	319143-118	Heat exchanger assembly for 520 Outdoor
457	319143-119	O-ring P3 EPDM
458	319143-120	Secondary heat exchanger drain plug
459	319143-121	Exhaust port
460	319143-122	Exhaust chamber assembly
461	319143-123	Secondary heat exchanger plate
462	319143-124	Heater fixing plate 20
463	319143-125	Heater fixing plate 16