# Maintenance sheet

510C Series 110
1W5010-3

## 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 the "**Water circuit**" in this section.
- Is the 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 the "**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 Multi-Unit System set up correctly?

**<<Fluctuation in 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 the "**Water circuit**" in this section.
- Is the Multi-Unit System set up correctly?

**<<Unit does not ignite when water goes through the water heater>>**
- Refer to the "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 from 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.
- 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.
- Is the power switch inside water heater turned on? (Part #706)
- 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 contoroller 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 (1.9 L/m) 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. And 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, the built-in controller is in an inoperable condition without the display function.**

## 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 (100281154) that comes with the heater.
- Check for and remove any blockage in the concentric venting system. Refer to the "Venting instructions" in the Installation manual.
- Check for proper distance between the concentric terminal and other exhaust gas terminals. Refer to the "Venting instructions" in the Installation manual.
- Verify that the vent length is within max. limit. Refer to the "Venting instructions" in the Installation manual. Make sure the DIP switches are set for the correct vent length. Refer to section D.
- Check the altitude/elevation where the water heater is installed. Refer to the "High-altitude function" of 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 functioning properly.
- Check for connection/breakage of wires (Part #413, 708, 709), and/or soot on the flame rod (Part #108). And then if the O.H.C.F (Part #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 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 leaking from the heat exchanger (Part #401).
- Check if there is dust and lint in nozzles of the manifold (Part #102).
- Check the current on the flame rod (Part #108). Refer to #3 of "Appendix A" of Section C.

**121: Loss of flame***
- Check the gas supply and inlet gas pressure.
- Check if the Hi-limit switch (Part #412) is functioning properly.
- Check for connection/breakage of wires (Part #413, 708, 709), burn marks on the computer board (Part #701), and/or soot on the flame rod (Part #108). And then if the O.H.C.F (Part #413) has a breakage, consult the manufacturer.
- Check if there is leaking from the heat exchanger (Part #401).
- Check if there is dust and lint in nozzles of the manifold (Part #102).
- Check the current on the flame rod (Part #108). Refer to #3 at "Appendix A" in Section C.

**311,321,331: Disconnected/short-circuited thermistor***
- Check for connection/breakage of wires and/or debris on the thermistor (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 #108).

**441: Flow sensor failure (Only Easy-Link & Multi-Unit System)**
- 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 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.

**651: Flow adjustment valve fault (Only Easy-Link & Multi-Unit System)**
- 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 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 brown wire and red wire. Refer to "Appendix F" in Section C.

**701: Computer board fault***
- Check for connection/breakage of wires (Part #713), and check the resistance between white wire and black 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***
- Clean the flame rod (Part #108).
- Check if a condensate collector and trap (100266140 & 100266139) are 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 leaking from the heat exchanger (Part #401).

**741: Miscommunication between water heater and remote controller**
- 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 "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 in 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 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 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.

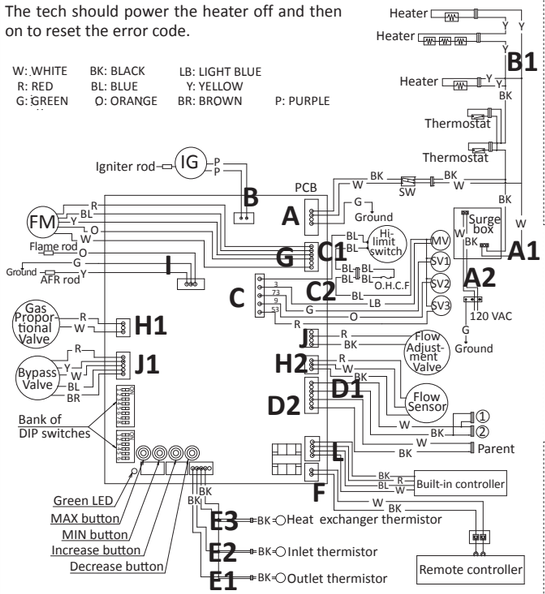
**761: Miscommunication between Parent unit and Child units for Easy-Link System**
- Check if the connections between the parent unit and the child units are correct. Refer to the "Easy-Link system" section in the Installation manual.

**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 point of 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 this check point normal?**
**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 check points normal?**
**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 this check point 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)

**Are all of the check points 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 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 check points normal?**
**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 marking of No.113 on the connector)
  Check point **"E1"** on the wiring diagram.
- Inlet thermistor (Find the marking of No.42 on the connector)
  Check point **"E2"**on the wiring diagram.
- Heat exchanger thermistor (Find the marking of No.12 on the connector)
  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 this check point normal?**
**Yes >> Replace the remote controller and/or built-in controller.**
**No >> Replace the PCB (Part #701).**

### Appendix F (For error code 651 and 661)

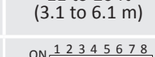
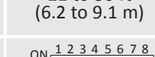
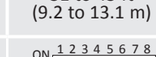
Refer to check point **"J"** or **"J1"** on the wiring diagram above.
J: Check the voltage between black wire and red wire. (Normal: 7 to 16 VDC)
J1: Check the voltage between brown wire and red wire. (Normal: 3 to 11 VDC)

**Is this check point normal?**
**Yes >> Replace the Flow adjustment valve (Part #402). or Replace the Bypass valve (Part #403).**
**No >> Replace the PCB (Part #701).**

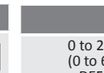
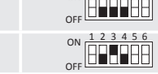
## D. DIP switch settings on the computer board of the water heater

**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 positions. DEFAULT is the factory setting.**

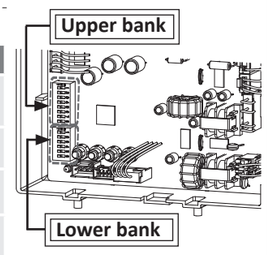
**<Upper bank of DIP switches>**

| Gas type | Vent length | | | |
|---|---|---|---|---|
| | 0 to 10 ft (0 to 3 m) DEFAULT | 11 to 20 ft (3.1 to 6.1 m) | 21 to 30 ft (6.2 to 9.1 m) | 31 to 43 ft (9.2 to 13.1 m) |
| Natural (DEFAULT) |  |  |  |  |
| Propane |  |  |  |  |

**<Lower bank of DIP switches>**

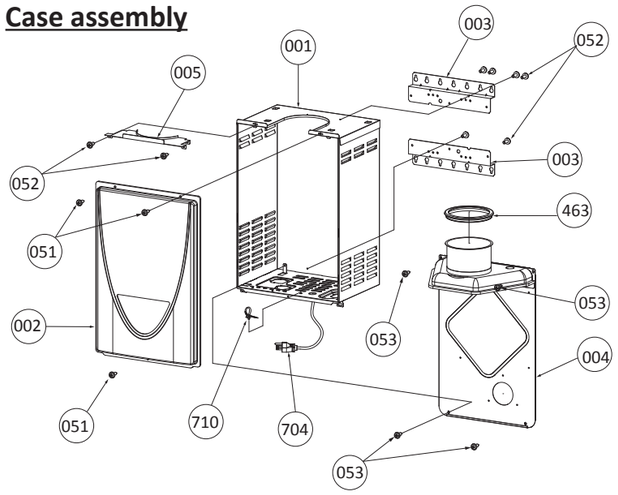
| Temperature set | Easy-Link System | High-altitude function | |
|---|---|---|---|
| 120 °F (50 °C) (DEFAULT)  | Parent Unit  | 0 to 2,000 ft (0 to 609 m) DEFAULT |  |
| 140 °F (60 °C)  | Child Unit* (DEFAULT)  | 2,001 to 3,000 ft (610 to 914 m) |  |
| | | 3,001 to 5,000 ft (915 to 1,524 m) |  |
| | | 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.



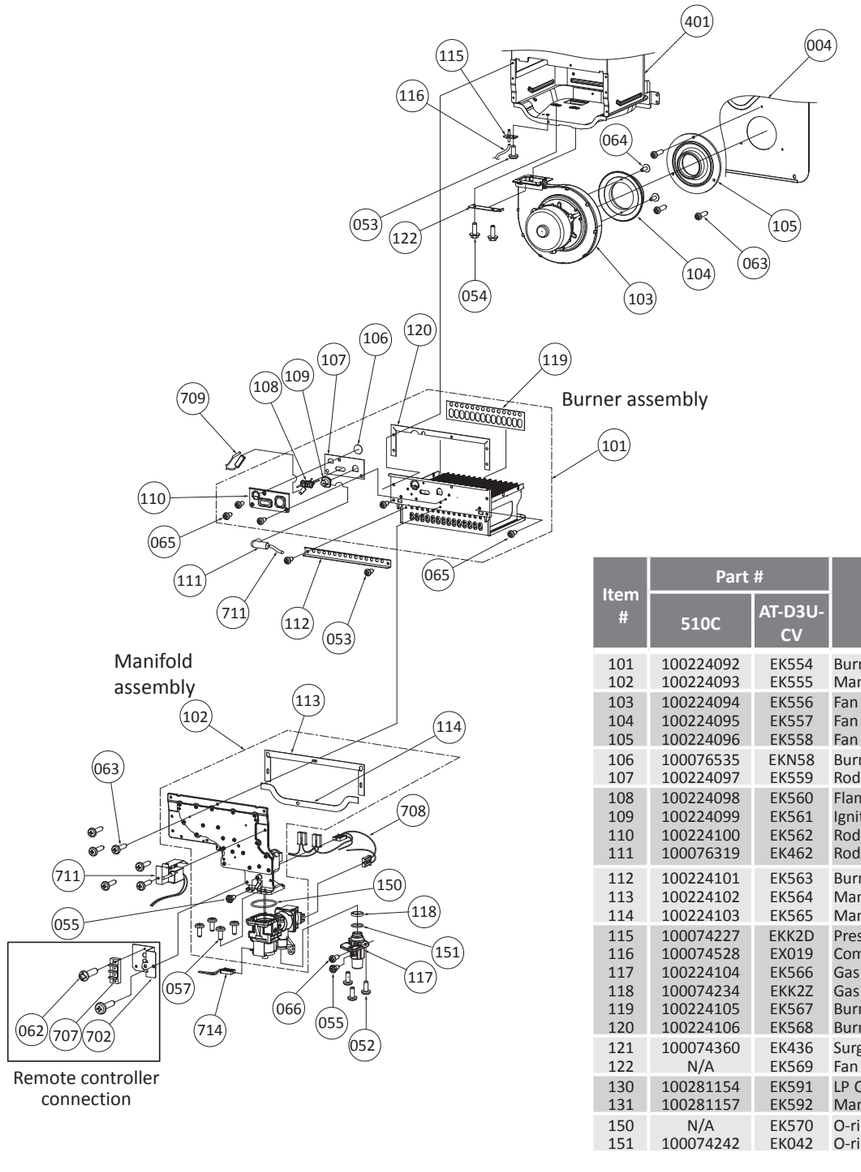
# E. Components diagram / Parts list

## Case assembly

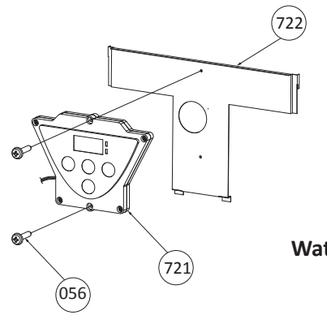



| Item # | Part # 510C | Part # AT-D3U-CV | Description |
|---|---|---|---|
| 001 | N/A | EK550 | Case assembly |
| 002 | N/A | EK551 | Front cover |
| 003 | N/A | EK455 | Bracket |
| 004 | N/A | EK552 | Duct unit |
| 005 | N/A | EK553 | Duct unit cover |
| 051 | 100074210 | EW000 | Truss Screw M4×12 (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 | 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 | N/A | EW02A | Truss Screw M4x8 SUS3 |
| 061 | N/A | EW016 | Screw M3x6 BSNI Binding head |
| 062 | 100074515 | EW00X | Screw M3x12 BSNI Raised counter sunk head |
| 063 | 100076450 | EW00E | Tapping Screw M4x14 SUS410 Truss head |
| 064 | N/A | EW02C | Pan Screw M3x10 SEMS MFZN |
| 065 | 100074244 | EW00D | Pan Screw M4x8 MFZN |
| 066 | 100074247 | EW006 | Pan Screw M4x10 FEZN |

## Burner assembly

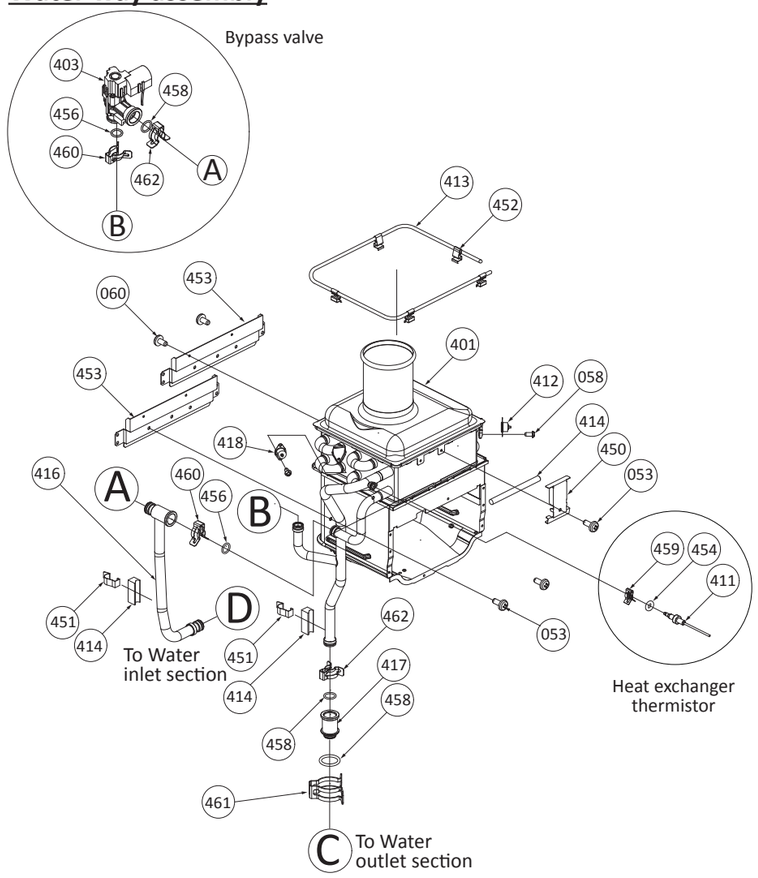



## Built-in temperature controller




| Item # | Part # 510C | Part # AT-D3U-CV | Description |
|---|---|---|---|
| 101 | 100224092 | EK554 | Burner and mixing chamber assembly |
| 102 | 100224093 | EK555 | Manifold with gas valve assembly NA |
| 103 | 100224094 | EK556 | Fan motor assembly |
| 104 | 100224095 | EK557 | Fan motor gasket |
| 105 | 100224096 | EK558 | Fan motor plate |
| 106 | 100076535 | EKN58 | Burner window |
| 107 | 100224097 | EK559 | Rod holder gasket |
| 108 | 100224098 | EK560 | Flame rod with AFR function |
| 109 | 100224099 | EK561 | Igniter rod |
| 110 | 100224100 | EK562 | Rod holder |
| 111 | 100076319 | EK462 | Rod cap |
| 112 | 100224101 | EK563 | Burner damper |
| 113 | 100224102 | EK564 | Manifold gasket A |
| 114 | 100224103 | EK565 | Manifold gasket B |
| 115 | 100074227 | EKK2D | Pressure port |
| 116 | 100074528 | EX019 | Combustion chamber tube |
| 117 | 100224104 | EK566 | Gas inlet |
| 118 | 100074234 | EKK2Z | Gas inlet ring |
| 119 | 100224105 | EK567 | Burner gasket |
| 120 | 100224106 | EK568 | Burner holder gasket |
| 121 | 100074360 | EK436 | Surge box plate |
| 122 | N/A | EK569 | Fan motor plate |
| 130 | 100281154 | EK591 | LP Conversion Kit |
| 131 | 100281157 | EK592 | Manifold Gasket |
| 150 | N/A | EK570 | O-ring (Manifold) |
| 151 | 100074242 | EK042 | O-ring P20 NBR (Black) |

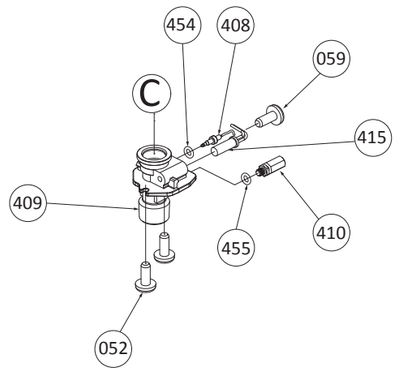
## Water way assembly



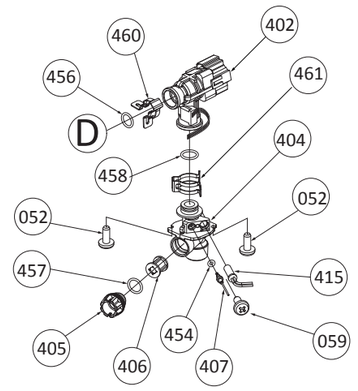

| Item # | Part # 510C | Part # AT-D3U-CV | Description |
|---|---|---|---|
| 401 | 100224108 | EK572 | Heat exchanger assembly for 510C |
| 402 | 100074624 | EK129 | Flow adjustment valve / Flow sensor |
| 403 | 100074625 | EKD58 | Bypass valve for 510C model |
| 404 | 100074377 | EKK1U | Water inlet |
| 405 | 100074381 | EKK2B | Inlet drain plug |
| 406 | 100074382 | EKK2C | Inlet water filter |
| 407 | 100224109 | EK573 | Inlet thermistor for 510C model |
| 408 | 100224110 | EK574 | Outlet thermistor for 510C model |
| 409 | 100074627 | EK104 | Water outlet |
| 410 | 100074264 | EK239 | Outlet drain plug |
| 411 | 100224111 | EK575 | Heat exchanger thermistor for 510C |
| 412 | 100074280 | EKN34 | Hi-Limit switch for 510C model |
| 413 | 100074252 | EX02A | Overheat-cut-off fuse |
| 414 | 100074682 | EK209 | Pipe heater |
| 415 | 100074629 | EK105 | Inlet heater |
| 416 | 100224112 | EK576 | Pipe inlet for 510C model |
| 417 | 100224113 | EK577 | Joint outlet for 510C model |
| 418 | N/A | EK589 | Thermo switch |
| 450 | N/A | EK578 | Pipe heater fixing plate |
| 451 | 100074310 | EK031 | Heater fixing plate 16 |
| 452 | N/A | EK476 | Fuse fixing plate 18 |
| 453 | N/A | EK579 | Combustion chamber fixing plate |
| 454 | 100076303 | EZF04 | O-ring P4 FKM |
| 455 | 100076305 | EZF06 | O-ring P6 FKM |
| 456 | 100076306 | EZF14 | O-ring P14 FKM |
| 457 | 100076307 | EZF15 | O-ring P15 FKM |
| 458 | 100076308 | EZF16 | O-ring P16 FKM |
| 459 | 100074282 | EKH30 | Fastener “4-11” for 510C model |
| 460 | 100074290 | EKK24 | Fastener “14-22” |
| 461 | 100074410 | EM192 | Fastener “16A” |
| 462 | 100074389 | EKK39 | Fastener “16-25A” for 510C model |
| 463 | N/A | EK580 | Silicon ring |
| 701 | 100224116 | EK583 | Computer board for 510C model |
| 702 | 100074644 | EK152 | Remote fixing plate for 510C |
| 703 | 100076100 | EK280 | Surge box |
| 704 | 100074601 | EK146 | 120 VAC wire |
| 705 | N/A | EK584 | Switch wire |
| 706 | N/A | EK590 | 120 VAC Power ON-OFF switch |
| 707 | 100074650 | EK165 | Remote controller wire for 510C model |
| 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 for 510C model |
| 714 | 100074642 | EK112 | Proportional gas valve wire |
| 721 | 100074660 | EK173 | Temperature controller |
| 722 | N/A | EK588 | Controller fixing plate |
| N/A* | 100076516 | EKK0J | Communication cable |

*Refer to p.9 on the Installation manual.

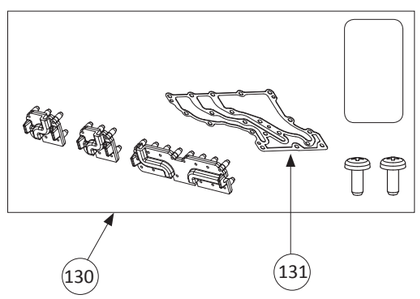
### Water outlet section



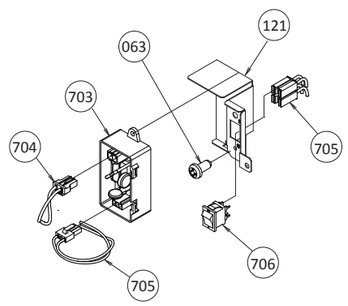

### Water inlet section




## LP Conversion Kit




## Surge box




## Computer board assembly