# **Maintenance sheet**

## A. Troubleshooting

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

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

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

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

- Compare the flow and temperature. Refer to the "Output temperature chart" in the Installation manual.
- · Check cross plumbing between cold water lines and hot water lines.
- Check if the gas supply valve is fully open, the gas line is sized properly, and for sufficient gas supply pressure at the heater. Refer to the "Gas supply and gas pipe sizing" in the Installation manual.
- · Check the set temperature. Adjust the set temperature with the remote controller or the DIPswitch setting. Refer to Section **D**.
- · Refer to the "Water circuit" in this section.

## <<The water is too hot>>

Check the set temperature, lower the set temperature

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

Refer to the "Power supply circuit" and "Water circuit" in this section.

#### <<Fluctuation in hot water temperature>>

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

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

- Refer to the "Power supply circuit" and "Water circuit" in this section.
- If you use the remote controller, turn the power button on and then check if the STAND BY LED will light up.
- Check if the filter on the cold water inlet is clean (Part #406).
- · Refer to the "Water circuit" in this section.

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

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

#### <<Abnormal sound from water heater>>

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

## << Power supply circuit>>

- 1. Check the power supply, and make sure that the water heater has 120 VAC.
- 2. If the remote controller is installed, press the "ON/OFF" button of the remote controller, and make sure that the STAND BY LED next to the "ON/OFF" button of the remote controller is lit.
- 3. Check for the lighting of the green LED on the PCB (Part # 701) to indicate normal supply of nower circuit.
- If the green LED on the PCB (Part #701) isn't lit, some electrical parts can be broken. Consult

If the green LED is lit, proceed to ""Water circuit" in this section.C

4. Check the fuse on the surge box (Part #703), and if it has a brown spot, need to replace it.

#### <<Water circuit>>

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

## B. Error codes

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

## 031: Incorrect DIPswitch setting

• Check the DIPswitch settings on the PCB (Part #701). Refer to Section D

## 101: Warning for the "991" error code

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

#### 111: Ignition failure

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

## 121: Loss of flame

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

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

- · Check for connection/breakage of wires and/or debris on the thermistor (Part #407, 408, 715).
- Check the thermistor resistance. Refer to "Appendix D" in Section C.

## 391: Air-fuel ratio rod failure

Check for connection/breakage of wires (Part #708) and/or soot on the flame rod (Part #108).

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

- · Check for connection/breakage of wires (Part #707) and/or burn marks on the computer
- · Reset power supply of the water heater.
- Check the voltage of each valve on the gas valve assembly (Part #102). Refer to "Appendix C" in Section C.

## 611: Fan motor fault

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

## 701: Computer board fault

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

#### 711: Gas solenoid valve drive circuit failure

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

## 721: False flame detection

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

## 741: Miscommunication between water heater and remote controller

- 1. Check the model type of the remote controller. Model No. 9008172005 (TM-RE40) is the correct one.
- 2. Inspect the connections between the water heater and remote controller. Refer to the "Remote controller connections" of the Installation manual.
- 3. Check the power supply of the water heater.
- 4. If this error code appears only on the green LED in the PCB (Part #701), check the voltage on the remote controller terminal on the PCB. Refer to "Appendix E" in Section C.
- 5. If this error code appears only on the remote controller, replace the PCB (Part #701). 6. If this error code appears on both the PCB (Part #701) and the remote controller, replace the remote controller.

## 751\*: Miscommunication between water heater and temperature controller

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

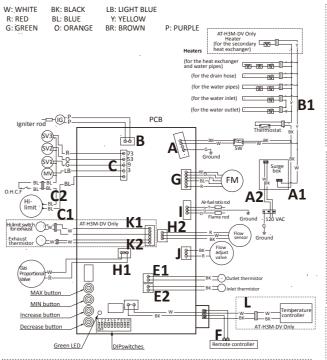
## 941\*: Abnormal exhaust temperature (Only 140 (T-H3M) Indoor model)

- · Check for connection/breakage of wires, dust buildup in the fan motor (Part #103) and/or burn marks on the PCB (Part #701).
- · Check the exhaust thermistor (Part #715) resistance. Refer to "Appendix D" in Section C.

## 991: Imperfect combustion

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

## C. Wiring diagram and check point of the water heater



## Appendix A (For error code 111)

## Check the following points during ignition stage.

# 1. Refer to check point "B" on the wiring diagram above. Check the voltage between purple wires during ignition process. (Normal: 108 to 132 VAC)

This check point is normal?

Yes >> Replace the igniter assembly (Part #709).

No >> Go to Next.

# 2. Refer to check points "C" and "H1" on the wiring diagram above Check the voltages and resistance below during ignition process:

- C: Between blue wire and light blue wire (Wire No.3).
- (Normal: 93 to 120 VDC/1.35 to 1.65 k $\Omega$ ) C: Between blue wire and orange wire (Wire No.53).
- (Normal: 93 to 120 VDC/1.35 to 1.65 k $\Omega$ ) H1: Check the voltage and resistance between white wire and red wire (Normal: 1 to 15 VDC/20 to 40 O)

These check points are normal?

Yes >> Replace the gas valve assembly (Part #102). No >> Replace the PCB (Part #701).

#3. Check the current through the yellow flame rod wire (Part #708). (Normal: more than 5 uA)

This check point is normal during operation? Yes >> Replace the PCB (Part #701). No >> Replace the flame rod (Part #108).

#### Appendix B (For error code 611)

Refer to check point "G" in the diagram to the left and the following.

- Check the voltage between red wire and blue wire.
- (Normal: 132 to 192 VDC)
- Check the voltage between vellow wire and blue wire. (Normal: 13 to 17 VDC)
- · Check the voltage between orange wire and blue wire. (Normal: 2.0 to 6.5 VDC)

All check points are normal?

Yes >> Replace the fan motor (Part #103).

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

## Appendix C (For error code 510 and 551)

Refer to check point "C" in the diagram to the left and the following. Check the voltage and resistance on each valve on the gas valve assembly

- Between blue wire and light blue wire (Wire No.3)
- · Between blue wire and green wire (Wire No.9)
- Between blue wire and orange wire (Wire No.53)
  - (Normal: 93 to 120 VDC/1.35 to 1.65 k $\Omega$ )

 Between blue wire and red wire (WIre No.73) (Normal: 93 to 120 VDC/2.07 to 2.53  $k\Omega$ )

All check points are normal?

Yes >> Replace the gas valve assembly (Part #102). No >> Replace the PCB (Part #701).

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

- Outlet thermistor
- Check point "E1".

 Inlet thermistor Check point "E2".

Check the resistance between black wire and black wire.

	Temperature	°F	50	59	68	77	86	95
		°C	10	15	20	25	30	35
	Resistance							5.9

· Exhaust thermistor Check point "K2"

Check the resistance between white wire and white wire.

All check points are normal?

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

°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

## No >> Replace the thermistor (Part #407, 408, 715). Appendix E (For error code 741 and 751)

Error code 741: Refer to check point "F" on the wiring diagram above. Error code 751: Refer to check point "L" on the wiring diagram above. Check the voltage on the remote controller and/or temperature controller

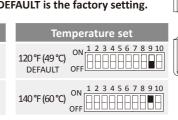
on the PCB. • Between black wire and white wire. (Normal: 11 to 25 VDC)

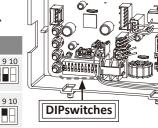
This check point is normal? Yes >> Replace the remote controller and/or temperature controller. No >> Replace the PCB (Part #701).

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

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







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

High-altitude function				Venting					
Indoor model		Outdoor model		2 inch	3 inch		4 inch		
0 to 2,000 ft. DEFAULT	ON 1 2 3 4 5 6	0 to 2,000 ft. DEFAULT	ON 1 2 3 4 5 6	Single pipe	Two-pipe	Single pipe	Two-pipe & single pipe		
2,000 to 3,000 ft.	ON 1 2 3 4 5 6	2,000 to 4,000 ft.	ON 1 2 3 4 5 6	5 to 6.5 ft.	5 to 20 ft .(DEFAULT)  ON 12 3 4 5 6 7 8 9 10  OFF	5 to 45 ft .(DEFAULT)	5 to 50 ft .(DEFAULT)  ON 12345678910  OFF		
3,000 to 5,000 ft.	ON 1 2 3 4 5 6	4,000 to 6,000 ft.	OFF 1 2 3 4 5 6	t our	21 to 40 ft.  ON 12 34 5 6 7 8 910  OFF	46 to 70 ft.  ON 12 34 5 6 7 8 910  OFF	51 to 100 ft.  ON 12345678910  OFF		
5,000 to 7,500 ft.	ON 1 2 3 4 5 6	Over 6,000 ft.	Consult our						
7,500 to 10,100 ft.	ON 1 2 3 4 5 6	Over 6,000 It.	Technical Services	N/A	41 to 70 ft.	N/A	N/A		
FM speed is increased automatically.					OFF HHHHH				

#### E. Components diagram / Parts list Water way assembly **Computer board assembly** Outdoor model Case assembly Indoor model Indoor model **Outdoor model** 007 (706) 401 320273-556 (714)Water intlet section 402 319143-463 403 319143-018 404 319143-193 405 319143-197 406 319143-198 407 319143-214 408 319143-529 **Temperature contoller** 409 319143-466 Indoor model (050) 410 319143-199 411 319143-228 (722)Water outlet section 412 319143-067 (059)(416) (052)(453) 413 320273-364 320273-365 414 415 320273-366 416 319143-468 417 320273-553 320273-554 418 320273-367 419 N/A **Burner assembly** 450 N/A 319143-125 451 **Burner assembly** 452 N/A 319143-082 453 (104) (115) 454 319143-080 (053) <u>Temperature remote controller</u> 455 319143-100 Surge box 456 319143-091 (053) 457 319143-083 458 319143-105 319143-226 459 (106) 460 319143-205 Description 461 319143-535 (116) 462 320273-555 101 320273-353 EK458 Burner assembly 463 320273-368 102 320273-354 EK459 Manifold with gas valve assembly LP 464 319143-106 FK460 Manifold with gas valve assembly NA 320273-356 465 319143-111 103 319143-443 EK109 Fan motor for Indoor model 466 319143-104 319143-043 Fan motor for Outdoor model EKK25 N/A EK450 Case assembly for Indoor model 104 319143-031 EKK2X Burner gasket 467 319143-542 001 319143-558 N/A EK451 Case assembly for Outdoor model 105 320273-557 FK491 Fan damper for Indoor mode 468 319143-282 EM381 Fan damper for Outdoor model 701 320273-369 (709) EK452 Front cover for Indoor 002 N/A (112) (053) 106 319143-033 EKK2V Burner windov N/A EK453 Front cover for Outdoor 702 319143-426 Rod holder gasket 107 319143-034 FKK2W 703 320273-128 003 320273-350 EK454 Intake air port assembly 108 319143-517 EK193 Flame rod 102 319143-427 EK455 704 004 N/A Bracket Manifold 109 320273-357 EK461 Igniter rod 319143-546 319143-510 Junction box 005 EK190 assembly 319143-036 EKK32 Rod holder 705 319143-141 006 320273-352 EK456 Power supply cord assembly 111 320273-358 EK462 Rod cap 706 320273-376 007 N/A EK457 Back guard panel 112 320273-359 EK463 Burner damper Indoor 319143-473 050 319143-025 EW000 Screw M4×12 (W/Washer) 320273-360 FK464 Burner damper Outdoor 707 320273-379 051 319143-325 EW001 Screw M4×10 (W/Washer) 113 319143-044 Manifold gasket A EKK2Y 708 320273-380 052 319143-026 EW002 Screw M4×10 (Coated) 114 319143-045 EKK2K Manifold gasket B 709 320273-381 053 319143-060 Screw M4x10 EW003 319143-032 Burner holder gasket 710 319143-185 319143-326 Hex head screw M4×12 (W/Washer) 054 FW004 116 319143-042 EKK2D Pressure port 055 319143-063 EW005 Hex head screw M4x8 711 319143-481 319143-344 117 EX019 Combustion chamber tube 056 N/A EW018 Pan screw M4X20 712 N/A 320273-362 EK465 Gas inlet 319143-201 057 EKK31 Tap tight screw M4x12 FEZN 319143-191 713 319143-049 119 EKK2Z Gas inlet ring 058 319143-087 EW00A Screw M3x6 SUS 714 319143-500 Surge box plate 120 EK466 N/A 059 319143-328 Screw M4x6 FW009 715 319143-131 060 N/A EK191 Screw M3x6 150 319143-350 EZP18 O-ring P18 NBR (Black) 716 319143-501 319143-057 EK042 O-ring P20 NBR (Black) 319143-059 151 061 EW00D Pan screw M4x8 320273-684 721 152 319143-370 Silicon ring for Outdoor model 062 319143-048 EM167 Wire clamp 60 FK442 722 N/A 153 319143-121 EX13J Exhaust port for Outdoor model 320273-497 EW00P Screw M4x10 723 319143-485 154 319143-065 EKN50 Silicon ring 064 319143-330 EW00B Screw M3x6 SUS3 320273-512 724

EK467

FK129

EKH23

EKK2B

FKK2C

EKK4J

EK207

EK104

EKK2E

EM212

EX02A

EK468

FK469

EK470

EK105

EK471

EK472

EK473

EK474

EK475

EK031

FK476

EZF04

EZF06

EZF14

EZF15

EZF16

FKK24

EM192

EKK39

EK217

EK477

EK478

EX13H

FX13I

EKH6G

EK229

EK479

EK480

EX148

EK280

EK146

EK143

EKK4V

EK481

EK138

FK/182

FK483

EK484

EKJ59

EK112

EX004

FKK1M

EX13C

EKH6E

EK180

EK487

EK490

TM-RE40

EK489

Heat exchanger assembly

Condensate drain port

Water inlet

Inlet drain plug

Inlet water filter

Inlet thermistor

Water outlet

Hi-Limit switch

Pipe heater

Inlet heater

Drain tube

Inlet heater

Heater fixing plate

Fuse fixing plate

O-ring P4 FKM

O-ring P6 FKM

O-ring P14 FKM

O-ring P15 FKM

O-ring P16 FKM

Fastener "14-22"

Fastener "16-25A"

Header connection

Inlet pipe packing

Computer board

Rubber grommet

Gas valve wire

Flame rod wire

Igniter assembly

Nvlon clamp FC6

Fixing plate

Computer board cover

Surge box

Cold pipe for 140 model

Thermistor fixing plate

Exhaust thermistor gasket

Hi-limit switch for exhaust

120 VAC wire for Indoor model

120 VAC wire for Outdoor model

Remote controller wire for Indoor model

Remote controller wire for Outdoor model

120 VAC Power ON-OFF switch

Freeze protection thermostat

Cable clamp for Indoor model

Exhaust Hi-limit switch wire

Temperature remote controller

Remote controller connection wire

Exhaust thermistor for Indoor model

Temperature controller for Indoor model

Proportional gas valve wire

Fastener "16A"

Flat heater

Gasket

Pipe heater fixing plate

Heater fixing plate 16

Outlet thermistor

Outlet drain plug

Overheat-cut-off fuse

for 140 Inddor and Outdoor

Flow adjustment valve / Flow sensor

Secondary heat exchanger for Indoormodel

Secondary heat exchanger for Outdoor model

Secondary heat exchanger heater