Rinnai®

Troubleshooting

Tankless Water Heater Diagnostic Codes

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Models

This manual lists the diagnostic codes for the Rinnai Tankless Water Heater models shown below. Tankless water heater models are grouped by series name: Non-SENSEI™ and SENSEI™ Series. Each section in the manual includes a description of the diagnostic code, the applicable tankless water heater series, and troubleshooting steps to diagnose the error.

Non-SENSEI™ Series

Commercial	
C199i	REU-KBD3237FFUDC-US
C199e	REU-KB3237WDC-US
HTT (Hybrid Tank-Tankless)	
RH180	REU-VA1320WF-US
KA	
RC80i	REU-KA2530FFUD-US
RC80e	REU-KA2530WD-US
RC98i	REU-KA3237FFUD-US
RC98e	REU-KA3237WD-US
KB	
RU80i	REU-KB2530FFUD-US
RU80e	REU-KB2530WD-US
RU90e	REU-KBD2934WD-US
RU98i	REU-KB3237FFUD-US
RU98e	REU-KB3237WD-US
KBD	
RUC80i	REU-KBD2530FFUD-US
RUC90i	REU-KBD2934FFUD-US
RUC98i	REU-KBD3237FFUD-US
KBP	
RUR98i	REU-KBP3237FFUD-US
RUR98e	REU-KBP3237WD-US
KCM	
RUCS65i	REU-KCM2025FFU-US
RUCS75i	REU-KCM2528FFU-US
RUS65e	REU-KCM2025W-US
RUS75e	REU-KCM2528W-US
RE	
RE140i	REU-VE1720FFD-US
RE140e	REU-VE1720WD-US
RE160i	REU-VE2125FFD-US
RE160e	REU-VE2125WD-US
RE180i	REU-VE2432FFD-US
RE180e	REU-VE2432WD-US
RE199i	REU-VE2737FFD-US
RE199e	REU-VE2737WD-US
RE with Pump	
REP160i	REU-VEP2125FFD-US
REP160e	REU-VEP2125WD-US
REP199i	REU-VEP2730FFD-US
REP199e	REU-VEP2730WD-US

VA	
R50LSi	REU-VA2019FFUD
R63LSe2	REU-VA2024WD(A)-UC
R75LSi	REU-VA2528FFUD(A)
R75LSe	REU-VA2528WD(A)-UC
R94LSi	REU-VA2535FFUD
R94LSe	REU-VA2535WD-UC
R98LSi	REU-VA3237FFU
R98LSe	REU-VA3237W-US
R98LSi-ASME	REU-VA3237FFU-ASME
R98LSe-ASME	REU-VA3237W-ASME
VB	
RL75i	REU-VB2528FFUD-US
RL75e	REU-VB2528WD-US
RL94i	REU-VB2735FFUD-US
RL94e	REU-VB2735WD-US
R98LSi	REU-VA3237FFU-US
R98LSe	REU-VA3237W-US
R98LSi-ASME	REU-VA3237FFU-ASME
R98LSe-ASME	REU-VA3237W-ASME
VC (Value)	
V53e	REU-VAM1620W-US
V53De	REU-AM1620WD-US
V65i	REU-VC2025FFU-US
V65e	REU-VC2025W-US
V75i	REU-VC2528FFU-US
V75e	REU-VC2528W-US
V94i	REU-VC2837FFU-US
V94Xi	REU-VC2737FFU-US
V94e	REU-VC2837W-US
VC (Luxury)	
RL75i	REU-VC2528FFUD-US
RL75i(A)	REU-VC2528FFUD-US(A)
RL75e	REU-VC2528WD-US
RL75e(A)	REU-VC2528WD-US(A)
RL94i	REU-VC2837FFUD-US
RLX94i	REU-VC2737FFUD-US
RL94e	REU-VC2837WD-US

SENSEI™ Series

SENSEI™ Residential	
RU199i	REU-N3237FF-US
RU180i	REU-N2934FF-US
RU160i	REU-N2530FF-US
RU130i	REU-N2024FF-US
RU199e	REU-N3237W-US
RU180e	REU-N2934W-US
RU160e	REU-N2530W-US
RU130e	REU-N2024W-US
SENSEI™ Residential with Pump	
RUR Model Series:	
RUR199i	REU-NP3237FF-US
RUR160i	REU-NP2530FF-US
RUR199e	REU-NP3237W-US
RUR160e	REU-NP2530W-US
RSC Model Series:	
RSC199i	REU-NP3237FF-US(A)
RSC160i	REU-NP2530FF-US(A)
RSC199e	REU-NP3237W-US(A)
RSC160e	REU-NP2530W-US(A)
SENSEI™ Commercial	
CU199i	REU-N3237FFC-US
CU160i	REU-N2530FFC-US
CU199e	REU-N3237WC-US
CU160e	REU-N2530WC-US

SENSEI™ RX/CX Series

SENSEI™ RX Residential	
RX199i	REU-NB3237FF-US
RX180i	REU-NB2934FF-US
RX160i	REU-NB2530FF-US
RX130i	REU-NB2024FF-US
SENSEI™ RX Residential with Pump	
RXP199i	REU-NBP3237FF-US
RXP160i	REU-NBP2530FF-US
SENSEI™ CX Commercial	
CX199i	REU-NB3237FFC-US
CX160i	REU-NB2530FFC-US
SENSEI™ CX Commercial with Pump	
CXP199i	REU-NBP3237FFC-US
CXP160i	REU-NBP2530FFC-US

Safety

Safety Symbols

This manual contains the following important safety symbols. Always read and obey all safety messages.

⚠ DANGER	Indicates an imminently hazardous situation which, if not avoided, will result in personal injury or death.
⚠ WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in personal injury or death.
⚠ CAUTION	Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It may also be used to alert against unsafe practices.

Safety Precautions

Read and follow all safety precautions in this section, as well as a complete list in the Rinnai Tankless Water Heater Installation and Operation Manual. A copy of the manual was supplied with the Tankless Water Heater and is also located online at www.rinnai.us.

⚠ WARNING

- Only trained and qualified professionals are permitted to follow the instructions in this document.
- If the information in these instructions is not followed exactly, a fire or explosion may result causing property damage, personal injury, or death.
- Before operating, smell all around the water heater area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor. WHAT TO DO IF YOU SMELL GAS:
  - Do not try to light any water heater.
  - Do not touch any electrical switch; do not use any phone in your building.
  - Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
  - If you cannot reach your gas supplier, call the fire department.
- Before diagnosing and servicing the tankless water heater, turn off the electrical power supply, gas and incoming water supply.
- Before checking resistance readings, unplug the water heater and then isolate each item to be checked from the circuit.
- DO NOT adjust the internal gas valve. The design is such that adjustment is not required. Warranty will be voided if the internal gas valve is adjusted.
- Keep the area around the water heater clear and free from combustible materials, gasoline, and other flammable vapors and liquids. Flammable liquids such as cleaning solvents, aerosols, paint thinners, adhesives, gasoline and propane must be handled and stored with extreme care. These flammable liquids emit flammable vapors and when exposed to an ignition source can result in a fire hazard or explosion. Flammable liquids should not be used or stored in the vicinity of this or any other gas water heater.
- There are numerous live tests required when troubleshooting tankless water heaters. Use extreme care to avoid contact with energized components inside the tankless water heater.
- Label all wires prior to disconnection when servicing controls. Wiring errors may cause improper and dangerous operation.
- Do not use this water heater if any part has been under water.
- Do not use substitute materials. Use only parts certified for the water heater.
- Do not use an extension cord or adapter plug with this water heater.
- Any alteration to the water heater or its controls can be dangerous and will void the warranty.
- DO NOT operate the water heater without the front panel installed. The front panel should only be removed for service/maintenance or replacing internal components.
- BURN HAZARD. Hot exhaust and vent may cause serious burns. Keep away from the water heater. Keep small children and animals away from the water heater.
- Hot water outlet pipes leaving the water heater can be hot to touch.

Bluetooth Low Energy (BLE) and App Instructions

SENSEI™ RX/CX Series Only:

Instructions on this page are correct at the time of publishing; however, these instructions may be updated without notice. To make sure you have the most current instructions, please visit rinnai.us/wifi (for United States installations) or rinnai.ca/wifi (for Canadian installations).

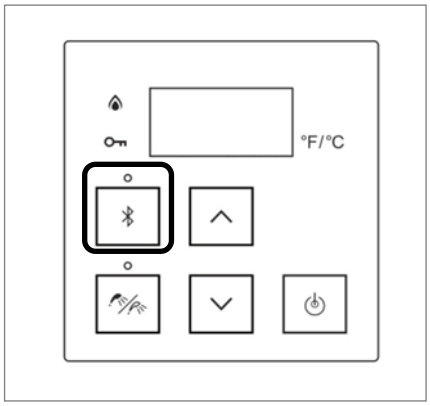
To download the Rinnai Central app:

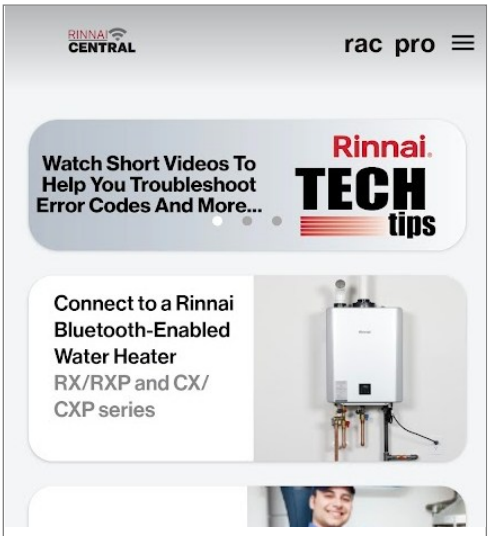
1. Scan the QR code shown to the right.
2. Download the Rinnai Central app from the App store or the Google Play.

To configure your tankless water heater using the Rinnai Central app:

Note: To use the Rinnai Central app BLE feature with your tankless water heater, your connecting device (smartphone, tablet, computer, etc) must support Bluetooth 4.0 or newer. Contact your connecting device manufacturer if you are not sure if your device supports Bluetooth 4.0 or newer.

1. Press and release the Bluetooth button on the controller. The Bluetooth LED on the controller turns solid blue.
2. Log into the Rinnai Central app with a professional account and connect to a Rinnai Bluetooth-enabled water heater.
3. Follow the Rinnai Central app through setting up your tankless water heater.





Sample Screen

Code SEt

SENSEI™ RX/CX Series Only:

This tankless water heater is set up for natural gas and indoor installations as default. When power is connected for the first time, you need to confirm the settings or change them properly.

⚠ WARNING	If proper settings are not selected before you use the tankless water heater, it will cause a hazardous situation which results in personal injury or property damage.

Only a trained and qualified professional should make initial settings. Confirm/change initial settings of the tankless water heater by choosing one of the two options below:

- Option 1 (recommended): Confirm/change settings from a smart device using Bluetooth Low Energy (BLE).
- Option 2: Confirm/change settings from the tankless water heater controller.

Refer to “Initial Settings” on an installation manual (100000839) or (100000840) for additional information.

Code 02

No Burner Operation During Freeze Protection

Applies To:

- Non-SENSEI™ Series

1. Verify all gas valves are open and feeding the proper gas pressure to water heater.
2. Verify all air was properly purged from gas lines after installation.
3. Verify proper inlet gas pressure is being fed to the water heater (check water heater's rating plate for proper pressures, which is located on side of water heater). The minimum listed inlet pressure MUST be maintained with all gas water heaters at the location firing on high fire. If water heater is a condensing water heater, the front panel must be installed before testing inlet pressures.
4. Verify proper gas type (ensure gas supply at location matches gas supply listed on water heater).
5. Verify gas type DIP switch on PC Board is set to proper gas type position.

⚠ WARNING Turn off gas valve feeding water heater before proceeding with the next step.

6. Verify igniter is working. Unplug igniter wire. Hold the igniter wire with an insulated pair of pliers about a 1/4 in. from a metal item on the water heater. Cycle the water heater (initiate hot water flow to initiate ignition cycle) to ensure you see a spark between the tip of the igniter wire and metal item on the water heater. If a spark is not observed, check ignition system for loose connections, damaged components or disconnected plugs back to PC Board. Also, check the ignition board to verify it is getting the proper voltage from the PC Board (refer to Technical Data Sheet on inside of water heater front cover for proper voltage and connector numbers). **Note:** There will be no voltage present unless the water heater is going through the ignition cycle.
7. Confirm the ceramic sparker electrode and flame rod(s) are tight in the mounting bracket. You should not be able to move the flame rod(s) or electrode with your finger if gasket is intact. If loose, remove and clean the electrode and flame rod(s). Then, reinstall using new electrode/flame rod gasket. Ensure the components are tight when gasket has been replaced. Loose flame rod(s) or electrodes can lead to a code 11 or 12.
8. Verify the proper flame rod wire is plugged into the proper flame rod. Some water heaters have multiple flame rods. A quick check to verify correct wiring is to look at the stamped letter on the bracket at flame rod (Y=Yellow, R=Red, B=Blue).
9. Look into view window on water heater. Do you see a flame in the burner box while the water heater is going through the ignition cycle? If you do see a flame, then there is an issue in the flame rectification circuit. This could be a buildup of carbon or a white substance on flame rod, bad connection at flame rod, loose or damaged flame rod, bad PC Board, gas valve, or low inlet gas pressures. Before replacing the PC Board or gas valve, continue following the steps below.

⚠ WARNING Turn off electrical, gas and water supply before performing this inspection.

10. Remove the igniter and flame rod assemblies and inspect for carbon or white substance build-up. **Note:** The electrode packing must be replaced if damaged. Have a new electrode packing available before removal of the flame rod assembly. Clean the igniter and flame rod and then re-install them.

⚠ WARNING Turn off electrical, gas and water supply to the water heater before proceeding with the step below.

11. Remove burner manifold and inspect orifices on back side of manifold for clogged or blocked orifices. Remove burner assembly and inspect chamber for insects or other debris. Clean out all debris found in burner and air chambers. Inspect copper fins in heat exchanger for a build-up between fins. Build-up or blockage between heat exchanger fins causes air flow restrictions, which will lead to a code 10. If build-up is present, you need an air compressor capable of delivering 120 psi of compressed air to blow out burner and heat exchanger fins. If unable to clean the heat exchanger with compressed air, replace heat exchanger.

⚠ CAUTION Always wear safety glasses and a mask when blowing out the burner.

12. If you note improper inlet gas pressures, check if the gas system was properly sized. If sized properly, you should see no more than a 0.3 in. pressure drop on natural gas with all gas water heaters in the building firing on high fire. The allowable pressure drop for Propane is 0.5 in. of water column. This pressure drop is based on the International Plumbing Code when operating on gas pressures up to 14 in. W.C. with black iron piping. There are numerous gas piping systems approved in the market. Make sure you refer to the manufacturer or International Plumbing Code manual for pressure drops on gas piping and pressures you are using for proper pressure drops allowed. If pressure drop exceeds that mentioned above for black iron gas systems, your system could be undersized (please recheck sizing). The issue could be in any of the following items: gas system, gas piping, regulator, tank, utility supply, dirt or debris in gas system components, etc. Have the gas system checked by a professional gas technician or master plumber that specializes in gas system sizing. Refer to the International Plumbing Code manual for proper gas system sizing for gas type, piping and pressures being used at this location.
13. Inspect vent system for loose joints, improper fittings, or failure to meet clearances around vent terminal outside building (see venting instructions for clearance specifications). Failure to meet vent terminal clearances can lead to recirculation of combustion gases on all water heaters (with exception of the RH-180 tankless water heater), causing incomplete combustion (which leads to carbon build-up on the flame rod). Ensure vent length is within specifications and DIP switches for vent lengths have been properly set.
14. Verify proper venting materials were used in this installation (refer to Tankless Water Heater Installation and Operation Manual or venting instructions for the proper type venting materials that should be used with your water heater).
15. Verify proper altitude settings (refer to high altitude gas pressure setting procedure for DIP switches and manifold gas pressure settings found in Tankless Water Heater Installation and Operation Manual or Technical Data Sheet on inside of water heater front cover for proper altitude settings).
16. On internal water heaters, inspect the plastic tube running from the bottom of the combustion chamber to the gas valve. If you find moisture in the tube, replace the gas valve. Inspect the vent system to detect where the condensate/moisture is coming from. Inspect the burner and heat exchanger fins for excessive corrosion. Signs of moisture could be a result of improper venting or a leak inside the heat exchanger.
17. Verify the condensate drain trap was used as recommended by Rinnai on non-condensing water heaters at the vent terminal connection at the top of the water heaters (with exception to the RH-180). If the condensate drain line is not connected, please install one per Rinnai venting instructions. If a condensate line is in use, inspect the vent connector on top of water heater to ensure it is not clogged up. In addition, check the condensate drain trap and line for blockage. If stopped up, remove vent pipe from water heater and clean out all debris and/or build-up from the trap or line.

18. Check that any two stage regulator used on the inlet gas feed is installed at least six feet away from water heater. Ensure when water heater shuts off, the pressure from the two stage regulator does not exceed the maximum inlet pressure of the water heater (no bleed-though being allowed). To verify, connect a manometer up to the test port on the bottom of the water heater. The inlet gas pressures should never exceed 10 in. water column for natural gas or 13.5 in. on propane; if the inlet gas pressures exceed these numbers, then the regulator may be defective.

⚠ WARNING Disconnect power supply to water heater before performing the following step.

19. Inspect all wiring harnesses throughout water heater for water or moisture in electrical connections. If any connections appear damp or wet, then dry them out and find out the cause.
20. If using an MSA or MSB system, isolate the water heater displaying the diagnostic code from the system during troubleshooting. If water heater operates when isolated, the issue may be in the electronic staging system (MSA or MSB). The MSA or MSB system does not apply to the RH-180.

⚠ WARNING For VE, VA, VB, VC, KA, RH-180 and KCM Water Heaters: Turn off electrical, gas and water supply to the water heater before proceeding with the step below.

21. Other suggestions to try
    - Verify spark electrode is installed in the correct position.
    - Verify all burner cassettes are in place in burner rack. If a water heater is dropped, the burners may shift and dislodge; if dislodged, loosen the burner bracket and reseat the burners.
    - Remove the four burners located under the flame rod and move them over to the high fire side of the burner tray. Move the four burners from the high fire side over under the flame rod. Sometimes condensate or debris can be inside the burners and cause turbulence inside the burner.
    - Condensate, debris or a malfunctioning mechanical component inside the gas valve may prevent the valve from opening correctly. Replace gas valve.
    - Voltage output to gas valve from PC Board could be incorrect or intermittent due to a defective component on PC Board. Replace PC Board.

Code 03

Power Interruption During Bath Fill

Applies To:

- SENSEI™ Series
- SENSEI™ RX/CX Series
- Non-SENSEI™ Series

1. Turn off all hot water fixtures.
2. Press ON/OFF button on controller twice; this resets the diagnostic code.
3. If the code reappears after resetting the water heater three times, replace the PC Board.

Code 05

Bypass Flow Control Device

Applies To:

- SENSEI™ Series
- Non-SENSEI™ Series
- RH180 (Hybrid Tank-Tankless Non-SENSEI™ Series Water Heater)

SENSEI™ Series:

1. Measure resistance values of Bypass Flow Control Device at connector on PC Board (refer to "Electric Circuit Table" in Tech Sheet and Wiring Diagram for further clarification).
   - Connector "D" red wire pin #15 and pink wire pin #13 – 44 ~ 52Ω.
   - Connector "D" white wire pin #17 and blue wire pin #19 – 44 ~ 52Ω.
2. Replace bypass flow control device.

Non-SENSEI™ Series (Excluding RH180 Models):

1. Turn off power supply to water heater and then reapply power.
2. Turn on a hot water fixture and let water heater activate. If Code 05 reappears, replace the bypass valve.

RH180 Models:

1. Clean air filter.
2. Ensure proper vent system and components were installed per Rinnai's recommended installation instructions (located in Tankless Water Heater Installation and Operation Manual). Approved vent material is 4 in. B-Vent.
3. Inspect vent system for obstructions.
4. Verify proper clearance is maintained around vent termination.

⚠ CAUTION Turn off power supply to water heater before performing the next step.

5. Remove fan motor and inspect fan wheel and housing for any type of restriction. Re-install fan. Turn on power to water heater and test for proper operation.

⚠ WARNING Turn off electrical, gas and water supply before performing the next step.

6. Remove burner manifold and inspect orifices on back side of manifold for clogged or blocked orifices.
7. Remove burner assembly and inspect chamber for insects or other debris. Clean out all debris found in burner and air chambers.
8. Inspect copper fins in heat exchanger for a build-up between the fins. Build-up or blockage between heat exchanger fins will cause air flow restrictions, which will lead to code 05 or 10. If build-up is present, blow out burner and heat exchanger fins with an air compressor capable of delivering 120 PSI of compressed air. If unable to clean heat exchanger with compressed air, replace heat exchanger.

   ⚠ CAUTION Wear safety glasses and a mask when blowing out burner.

9. If the above steps do not clear Code 05, proceed to Code 10 troubleshooting steps.

Code 07

Circulation Flow Rate Below 2.1 GPM

Applies To:

- RH180 (Hybrid Tank-Tankless Non-SENSEI™ Series Water Heater)

1. Verify water heater has power.
2. Verify water supply is turned on and the supply pressure is at least 30 PSI.
3. Check to see if pump is operational.
4. Check pump wiring harness for loose, damaged or broken connections.
5. Drain tank. Clean inlet water filter.
6. Flush heat exchanger to ensure it is not clogged with scale build-up. Follow the flushing procedure as outlined in the Rinnai Tankless Water Heater Installation and Operation Manual.

Code 10

Air Supply, Exhaust Blockage or Condensate Trap is Full

Applies To:

- SENSEI™ Series
- SENSEI™ RX/CX Series
- Non-SENSEI™ Series

Condensate Trap applies to SENSEI™ Water Heaters and SENSEI™ RX/CX Water Heaters only

SENSEI™ Series and SENSEI™ RX/CX Series :

1. Check to ensure the condensate line is properly draining. If the condensate drain line becomes clogged or freezes up, it will back up into the condensate trap inside the water heater, shutting the water heater off to prevent spillage and setting off a code 10. If the condensate line is properly draining, proceed to the next step.
2. Clean inlet air filter under front cover in top right of water heater cabinet.
3. Inspect the entire intake and exhaust piping system inside/outside the installation site. Check for clearance issues, ensure the proper venting materials were used and all vent component sections are properly seated and cut to vent supplier's recommendations.

   Note: Rinnai offers numerous types of venting materials. You must ensure the proper vent materials are used on the water heater. Refer to the owner's manual of the product being serviced for the approved venting materials allowed for your specific water heater.

WARNING Never leave a water heater operating with the vent system (intake or exhaust) piping disconnected. The following procedure is only a test. Reconnect the vent system immediately after performing this test.

4. The following test can be performed only if the water heater is coding out while onsite. Remove the exhaust section of the vent system from the top of the water heater. Turn on a hot water fixture to see if the water heater will activate without coding out. If so, this indicates a restriction in the vent system's intake or exhaust piping.
5. If the water heater codes out during the above test, proceed as follows: Disassemble each section of vent pipe to inspect it for proper installation and vent component insertion depth. To confirm proper installation, mark each vent component with a marker before disassembling it. By marking the sections, you can now determine the depth of each joint after you pull it apart. Make sure to use a lubricant supplied by vent supplier when assembling the vent sections.

WARNING Failure to use the vent supplier's lubricant may result in cross contamination during combustion. Bad connections may cause noise during combustion, exhaust gas leakage and a code 10.

6. Verify the vent system being used is within the allowable equivalent vent length. See the Tankless Water Heater Installation and Operation Manual or vent system installation manual to determine the proper equivalent vent lengths and number of elbows allowed. For example, a vent system using Rinnai's concentric venting materials with two ninety-degree elbows, two forty-five degree elbows, and ten feet of straight pipe would be calculated out to 28 equivalent feet. When using Rinnai's concentric venting, the 90-degree elbow counts as six feet of vent pipe and each 45 degree counts as three feet of vent pipe.
7. If installer sprayed a foam sealant around the vent pipe penetration through the wall, check to ensure this material did not collapse the vent pipe penetration. Look down the vent pipe with a flashlight or camera to verify the piping has not collapsed. If you cannot see that section of venting material, remove it from the wall to inspect it.

8. Check for debris in vent system. Disconnect joints looking for water, condensation, insects or other items.
9. Verify all vent terminations meet Rinnai's recommendation from another vent termination on the same wall or roof. If multiple Rinnai Tankless Water Heaters are installed at the location, see the Tankless Water Heater Installation and Operation Manual or venting instructions for details regarding the vent materials being used for the proper clearances between vent terminations.
10. Verify vent terminals are installed with the proper clearance from overhangs, grades, obstructions, walls, porches, etc. See Venting instructions for proper clearance requirements.

⚠ CAUTION Use caution when following the next step.

11. Turn off power supply to the water heater. Remove fan motor and inspect fan wheel, housing, and air duct for any type of restriction. Verify the built-in check valve behind the fan housing is not stuck. Re-install fan. Then, re-apply power to the water heater and test for proper operation.
12. Verify the proper high altitude parameter was selected for your installation site. See the Rinnai Tankless Water Heater Installation and Operation Manual for instructions on how to verify this setting.

⚠ WARNING Disconnect electrical supply and turn off gas supply to the water heater before replacing any of the items listed in the next step.

13. Other items that may cause a code 10:
    - Defective fan motor
    - Defective wiring harness to fan motor from PC Board
    - Defective PC Board

⚠ WARNING Turn off electrical, gas and water supply to water heater before performing the following steps.

14. Remove the heat exchanger assembly from the water heater. Separate the burner assembly from the heat exchanger assembly and inspect the burner chamber for insects or other debris. Clean out all debris found in the burner and air chamber cavity. Pull the burner completely out of the housing to inspect the back side of it for blockage. **DO NOT** blow burner out with compressed air, as it could damage the burner.
15. While the heat exchanger is out of the water heater, inspect fins around the water flow passage tubes inside the primary and secondary heat exchangers for debris build-up and/or blockage. If build-up is present, blow heat exchanger out with 120 psi of compressed air to clear any air restrictions. If unable to clean out debris, replace the heat exchangers.

Non-SENSEI™ Series:

1. Inspect the entire vent system inside/outside the installation site. Check for clearance issues, ensure proper venting materials were used, ensure all sections are properly seated, joints are sealed and cannot be pulled apart, etc.

   Note: Rinnai offers numerous types of venting materials. You must ensure the proper vent materials are used on the water heater. Refer to the owner's manual of the product being serviced for the approved venting materials allowed for your specific water heater.

   > **⚠ WARNING**
   >
   > Never leave a water heater operating with the vent system (intake or exhaust) piping disconnected. The following procedure is only a test. Reconnect the vent system immediately after performing this test.

   - Using concentric or common vent materials may require disassembling each section of venting to inspect for proper installation and depth. Mark each concentric or common vent joint with a marker before disassembling. This will allow you to determine the proper depth when the vent sections are disassembled. Make sure to use the lubricant supplied by Rinnai when assembling the concentric or common vent sections.

     > **⚠ WARNING** Failure to use the lubricant may result in improperly sealed joints, which will lead to a code 10 or exhaust gas leakage.

   - Rinnai/Ubbink concentric venting with an aluminum inner pipe and white PVC outer shell for the intake air is approved for use with all Rinnai Non-condensing tankless water heaters with exception to the RH-180 (see below for approved venting for the RH-180 water heaters).
   - Rinnai/Ubbink concentric venting with a Polypropylene (PP) inner pipe and common vent pipe are approved for use with all Rinnai Condensing water heaters. The exhaust portion of the system is a special material made from Polypropylene (PP) piping.
   - PVC/CPVC solid core piping can be used to vent Rinnai Condensing tankless water heaters. Ensure all joints were properly glued and seated. Inspect system for damage, cracked or melted sections.
   - Only 4 in. B-Vent venting materials are approved for the RH-180 tank/tankless water heater. Follow vent manufacturer's instructions to ensure proper installation of the vent system.

2. Perform this test only if the water heater is coding out while onsite. Remove the vent system from the top of the water heater. Activate the water heater and see if it will operate without the vent system connected. If so, this is an indication the issue is in the vent system and not the water heater.
3. Verify DIP switches for vent lengths were set to the proper position. First, determine total vent length. See the Rinnai Tankless Water Heater Installation and Operation Manual to determine the length of any 90-degree elbows or 45-degree elbows being used in the vent system. For example, a vent system using concentric venting materials with two ninety-degree elbows, one forty-five degree elbow, and ten feet of straight pipe would be calculated as twenty-five feet of total vent length. In concentric venting, a 90-degree elbow counts as six feet. A 45-degree elbow is three feet.
4. If installer sprayed a foam sealant around the vent pipe penetration through the wall, check to ensure this material did not collapse the vent pipe penetration. Look down vent pipe with a flash light. If you cannot see that section of venting material, remove it from the wall and inspect it.

5. Check for debris in vent system. Disconnect joints and look for water, condensation, insects or other items.
6. Verify all vent terminations meet Rinnai's recommendation from another vent termination on the same wall or roof. If multiple Rinnai Tankless Water Heaters are installed at the location, see the Tankless Water Heater Installation and Operation Manual or venting instructions for details regarding the vent materials being used for the proper clearances between vent terminations. In addition, verify vent terminals are installed with the proper clearance from overhangs, grades, obstructions, walls, porches, etc. See Venting instructions for proper clearance requirements.
7. Remove fan motor and inspect fan wheel, housing, and air duct for any type restriction. Re-install fan. Then, reapply power to water heater and test for proper operation.

⚠ WARNING For VE, VA, VB, VC, KA, RH-180 and KCM Water Heaters: Turn off electrical, gas and water supply to the water heater before proceeding with the step below.

8. Remove the burner manifold and inspect the orifices on the back side of the manifold for clogged or blocked orifices. Remove the burner assembly and inspect the chamber for insects or other debris. Clean out all debris found in the burner and air chambers. Inspect the copper fins in heat exchanger for a build-up between fins. Build-up or blockage between the heat exchanger fins causes air flow restrictions, which will lead to a code 10. If build-up is present, you will need an air compressor capable of delivering 120 psi of compressed air to blow out the burner and heat exchanger fins. If unable to clean the heat exchanger with compressed air, replace the heat exchanger.

⚠ CAUTION Always wear safety glasses and a mask when blowing out the burner.

⚠ WARNING You must be qualified to service gas systems before proceeding with the following steps. See data sheet on the rear of front panel or owner's manual for information on gas pressures, DIP switch settings, and burner sensor resistance readings mention below.

9. Verify that low and high fire manifold gas pressures are set correctly. Some water heaters have a burner sensor and if the manifold pressures are not properly set, the temperature range for the senor may be too low causing a code 10.
10. Verify the manifold gas pressures and DIP switches were properly set for your altitude.

⚠ WARNING Disconnect the electrical supply and turn off the gas supply to the water heater before replacing items listed below.

11. Other items that may cause a code 10:
    - Defective fan motor bearing
    - Defective wiring harness to fan motor from PC Board
    - Defective PC Board
    - Improper DIP switch settings

Code 11

No Ignition

Applies To:

- SENSEI™ Series
- SENSEI™ RX/CX Series
- Non-SENSEI™ Series

SENSEI™ Series and SENSEI™ RX/CX Series:

1. Verify all gas valves on the system are open.
2. If the system is propane gas, make sure you have gas in the tank and the tank was properly sized for the application.
3. Verify all air was purged from gas lines after installation.
4. Verify proper inlet gas pressure is being fed to the water heater (check water heater's rating plate for proper pressures, which is located on side of water heater). The minimum listed inlet pressure MUST be maintained with all gas water heaters at the location firing on high fire.
5. Verify proper gas type (ensure gas supply at location matches gas supply listed on water heater).
6. Verify the gas type at Parameter 10 was properly selected:
   - Parameter 10 selection A = Natural Gas
   - Parameter 10 selection B = Propane Gas

   SENSEI™ RX/CX Series Only: Parameter 10 (Gas Type) can be changed only within 20 minutes after resetting power.

⚠ WARNING Turn off gas valve feeding water heater before proceeding with the next step.

7. Verify igniter is working. Unplug igniter wire. Hold the igniter wire with an insulated pair of pliers about a 1/4 in. from a metal item on the water heater. Cycle the water heater (initiate hot water flow to initiate ignition cycle) to ensure you see a spark between the tip of the igniter wire and metal item on the water heater. If a spark is not observed, check ignition system for loose connections, damaged components or disconnected plugs back to PC Board. Also, check the ignition board to verify it is getting the proper voltage from the PC Board (refer to Technical Data Sheet on inside of water heater front cover for proper voltage and connector numbers).

   Measure resistance or voltage of spark electrode on the PC Board:

   - **SENSEI™ Series:** Connector "D" Black wire pin #21 and Red wire pin #12 = 11 ~ 13 VDC during ignition cycle
   - **SENSEI™ RX/CX Series:** Connector "CN9" Black wire pin #12 and White wire pin #10 = 11 ~ 14 VDC during ignition cycle
   - Verify spark electrode gap is 0.138 in. or 3.5 mm
8. Make sure the ceramic sparker electrode and flame rod are tight in the mounting bracket. You should not be able to move either component with your finger if gasket is intact. If loose, remove and clean the electrode/flame rod. Reinstall using new electrode/flame rod gasket.
9. Visually inspect the burner flame through the view glass. If you see a flame in the burner box while the water heater is cycling, the water heater should continue to operate. If the flame goes out, there is an issue with the flame rectification circuit or gas system. The issue could be a buildup of carbon or a white substance on flame rod, bad connection at flame rod, loose or damaged flame rod, bad PC Board, defective gas valve or low inlet gas pressures. Before replacing the PC Board or gas valve, continue troubleshooting the steps below.

⚠ WARNING Turn off electrical, gas and water supply before performing the next step.

10. Remove the igniter and flame rod assemblies and inspect them for carbon or a white substance build-up. Make sure you have a replacement igniter/flame rod gasket before removing these components. The gasket **MUST** be replaced if the seal is broken.
11. Check to ensure the inlet gas pressure is within specifications with all gas water heaters at the location firing on high fire. If the inlet pressure drops below the allowable inlet pressure, the issue may be caused by one of the following: gas system, gas piping, regulator, or tank was not properly sized or is defective. You may have dirt or debris in gas system or components causing issues with the gas supply feed, etc. Have the gas system checked by a professional gas technician that specializes in gas system sizing and troubleshooting. If sizing is questionable, refer to the International Plumbing Code Book for proper gas system sizing for gas type, piping and pressures being used at this location.
12. Inspect vent system for loose connections or joints, improper fittings, failure to meet clearances around vent terminal outside building, etc. See venting instructions for clearance specifications for the vent system being used. Failure to meet vent terminal clearances will lead to recirculation of combustion gases causing incomplete combustion.
13. Ensure the equivalent vent length is within manufacturer's specifications.
14. Verify that proper venting materials were used with this installation (see the Rinnai Tankless Water Heater Installation and Operation Manual or venting instructions for details on the proper type venting materials to use with your water heater)
15. Verify the High Altitude Parameter 02 was properly selected:
    - Parameter 02 selection A = 0 – 2,000 ft. (0 – 610 M)
    - Parameter 02 selection B = 2,001 – 5.400 ft. (610 – 1,646 M)
    - Parameter 02 selection C = 5,401 – 7,700 ft. (1,646 – 2,347 M)
    - Parameter 02 selection D = 7,701 – 10,200 ft. (2,347 – 3,109 M)
16. Check for leaks, a common indicator that the heat exchanger is leaking (if liquid is coming out of the condensate drain and the water heater is not operating).
17. Ensure the two stage regulator used on the inlet gas supply is at least six feet from the inlet gas supply to the water heater. Make sure when water heater shuts off, the pressure from the two stage regulator does not exceed the maximum inlet pressure of the water heater and that you have no bleed-though. To verify this, connect a manometer up to the test port on the bottom of the water heater. The inlet gas pressure should never exceed 10 inches water column for natural gas or 13.5 inches for propane. If it does, the regulator may be defective.

⚠ WARNING Disconnect power supply to the water heater before performing the next step.

18. Inspect all wiring harnesses throughout the water heater for water or moisture in electrical connections. If any connections appear to be damp or wet, dry them out and troubleshoot the cause.
19. If using an MSA or MSB system, isolate the water heater displaying the diagnostic code from the system during troubleshooting. If the water heater operates when isolated, the issue may be in the electronic staging system (MSA or MSB).

⚠ WARNING Turn off electrical, gas and water supply before performing the next step.

20. Other suggestions:
    - Verify spark electrode is installed in the correct position and the gap is set to 3.5 mm across the probes.
    - Condensate, debris or a malfunctioning mechanical component inside the gas valve may be preventing the gas valve from occasionally opening. Replace gas valve.
    - Measure resistance or voltage of the **Gas Valve Solenoid on PC Board:**
      - **SENSEI™ Series:** Connector "D" on PC Board black wire pin #27 and yellow wire pin #29 = 18 ~ 22 ohms or 11 ~ 13 VDC
      - **SENSEI™ RX/CX Series:** Connector "CN9" on PC Board black wire pin #3 and yellow wire pin #4 = 11 ~ 13 VDC
    - **SENSEI™ Series:** Verify proper gas orifice is installed in gas valve: Red orifice = Propane (L.P.)
      Blue orifice = Natural gas

Non-SENSEI™ Series:

1. Verify all gas valves on gas system are open feeding the proper gas pressure to the water heater.
2. Verify all air was properly purged from gas lines after installation.
3. Verify proper inlet gas pressure is being fed to the water heater (check water heater's rating plate for proper pressures, which is located on side of water heater). The minimum listed inlet pressure MUST be maintained with all gas water heaters at the location firing on high fire. If the product is a condensing water heater, the front panel must be installed before testing inlet pressures.
4. Verify proper gas type (ensure the gas supply at this location matches that listed on water heater).
5. Verify gas type DIP switch on PC Board is switched to proper gas type position.

⚠ WARNING Turn off gas valve feeding water heater before proceeding with the next step.

6. Verify igniter is working. Unplug igniter wire. Hold the igniter wire with an insulated pair of pliers about a 1/4 in. from a metal item on the water heater. Cycle the water heater (initiate hot water flow to initiate ignition cycle) to ensure you see a spark between the tip of the igniter wire and metal item on the water heater. If a spark is not observed, check ignition system for loose connections, damaged components or disconnected plugs back to PC Board. Also, check the ignition board to verify it is getting the proper voltage from the PC Board (refer to Technical Data Sheet on inside of water heater front cover for proper voltage and connector numbers). **Note:** there will be no voltage present unless the water heater is going through the ignition cycle.
7. Make sure the ceramic sparker electrode is tight in its mounting bracket. You should not be able to move it with your finger if gasket is intact. If loose, remove and clean the electrode and flame rod. Reinstall using new electrode/flame rod gasket and ensure it is tight when the installation is finished. If the electrode is loose, the tip can drop down and touch the burners creating a short or no spark. A loose flame rod is called a floating flame rod and will result in a code 11 or 12.
8. Verify the proper flame rod wire is plugged into the proper flame rod. Some water heaters have multiple flame rods. A quick check to verify correct wiring is to look at the stamped letter on the bracket at flame rod (Y = yellow, R = red and B = blue).
9. Verify the flame rod is tight in its mounting bracket. You should not be able to move it with your finger if gasket is intact. If loose, remove it and clean flame rod and igniter. Inspect flame rod for cracks before re-installing it. Re-install using new gasket and ensure it is tight when installation is finished. A loose flame rod is called a floating flame rod and will result in a code 11.
10. Look into view window on water heater to see if you ever see a flame in the burner box while the water heater is going through the ignition cycle. If you do, this indicates an issue in the flame rectification circuit. This could be a buildup of carbon or a white substance on flame rod, bad connection at flame rod, loose or damaged flame rod, bad PC Board, gas valve or low inlet gas pressures. Before replacing the PC Board or gas valve, continue troubleshooting the steps below.

⚠ WARNING Turn off electrical, gas and water supply before performing the next step.

11. Remove the igniter and flame rod assemblies and inspect them for carbon or a white substance build-up. Clean both components before re-installing them. If you removed just the igniter and flame rod assemblies, make sure you have a new flame rod/igniter gasket before removing these components. This gasket MUST be replaced if the seal is broken.

⚠ WARNING For VE, VA, VB, VC, KA, RH-180 and KCM Water Heaters: Turn off electrical, gas and water supply to the water heater before proceeding with the step below.

12. Remove the burner manifold and inspect the orifices on the back side of manifold for clogged or blocked orifices. Remove the burner assembly and inspect the chamber for insects or other debris. Clean out all debris found in the burner and air chambers. Inspect the copper fins in heat exchanger for a build-up between the fins. Build-up or blockage between the heat exchanger fins will cause air flow restrictions, which will lead to a code 10. If build-up is present, you need an air compressor capable of delivering 120 psi of compressed air to blow out the burner and heat exchanger fins. If unable to clean the heat exchanger with compressed air, replace the heat exchanger.

⚠ CAUTION Always wear safety glasses and a mask when blowing out the burner.

13. If you note improper inlet gas pressures, check to see if the gas system was properly sized. If sized properly you should see no more than a 0.3 inch pressure drop on natural gas with all gas water heaters in the building firing on high fire. The allowable pressure drop for propane is 0.5 inches of water column. This pressure drop is based on the International Plumbing Code when operating on gas pressures up to 14" inches W.C. with black iron piping. There are a number of approved gas piping systems in the market. Make sure you refer to the manufacture or International Plumbing Code book for pressure drops on gas piping and pressures you are using for proper pressure drops allowed. If pressure drop excesses that mentioned above for black iron gas systems, your system could be undersized; please recheck sizing. The issue could be in any of the following items; gas system, gas piping, regulator, tank size, utility supply, dirt or debris in gas system components, etc. Have the gas system checked by a professional gas technician or master plumber that deals with gas system sizing. Refer to the International Plumbing Code Book for proper gas system sizing for gas type, piping and pressures being used at this location.
14. Inspect vent system for loose joints, improper fittings, failure to meet clearances around vent terminal outside building. See venting instructions for clearance specifications. Failure to meet vent terminal clearances can lead to recirculation of combustion gases on all water heaters (with exception to the RH-180) causing incomplete combustion which will lead to carbon build-up on flame rod. In addition, ensure vent length is within specifications and DIP switch for vent lengths has been properly set.
15. Verify that proper venting materials were used in this installation. See owner's manual or venting instructions for details on the proper type venting materials that should be used with your water heater.
16. Verify proper altitude settings. See high altitude gas pressure setting procedure for DIP switch and manifold gas pressure settings in the owner's manual or technical data sheets behind water heater's front cover.
17. On internal water heaters, inspect the plastic tube running from the bottom of the combustion chamber to the gas valve. If you find moisture in that tube, replace the gas valve. Also, inspect the vent system to determine where the condensate/moisture is coming from. The burner and heat exchanger fins should be inspected for excessive corrosion. Signs of moisture could be a result of improper venting or a leak inside the heat exchanger.
18. Verify the condensate drain trap was used as recommended by Rinnai on non-condensing water heaters at the vent terminal connection at the top of the water heater (with exception to the RH-180). If the condensate drain line is not connected, please install one per Rinnai venting instructions. If a condensate line is in use, inspect the vent connector on top of water heater to ensure it is not clogged. In addition, check the condensate drain trap and line for blockage. If stopped up, remove vent pipe from water heater and clean out all debris and/or build-up from the trap or line.
19. Ensure any two stage regulators used on the inlet gas feed are at least six feet from the inlet gas feed to the water heater. Ensure when water heater shuts off, the pressure from the two stage regulator does not exceed the maximum inlet pressure of the water heater (no bleed-though being allowed). To verify this, connect a manometer to the test port on the bottom of the water heater. The inlet gas pressures should not exceed 10 inches water column for natural gas or 13.5 inches for propane. If it does, the regulator may be defective.

⚠ WARNING Disconnect power supply to water heater before performing the next step.

20. Inspect all wiring harnesses throughout water heater for water or moisture in electrical connections. If any connections appear to be damp or wet, dry them out and troubleshoot the cause.
21. If using an MSA or MSB system, isolate the water heater displaying the diagnostic code from the system during troubleshooting. If water heater operates when isolated, the issue may be in the electronic staging system (MSA or MSB). The MSA and MSB's do not work with the RH-180 water heater.

⚠ WARNING For VE, VA, VB, VC, KA, RH-180 and KCM Water Heaters: Turn off electrical, gas and water supply to the water heater before proceeding with the step below.

22. Other suggestions:
    - Verify spark electrode is installed in the correct position.
    - Verify all burner cassettes are in place in burner rack. Sometimes when contractors drop a water heater the burners can shift and become dislodged. If you find the burners dislodged, loosen the burner bracket and reseat them.
    - Remove the four burners located under the flame rod and move them over to the high fire side of the burner tray. Move the four burners from the high fire side over under the flame rod. Sometimes condensate or debris can get down in the burners and cause turbulence inside the burner.
    - Condensate, debris or a malfunctioning mechanical component inside the gas valve may be preventing the valve from opening correctly once in a while. Replace gas valve.
    - Voltage output to gas valve from PC Board could be incorrect or intermittent due to a bad component on PC Board, replace PC Board.
    - Verify proper conversion of product. Remove the orifice plate and inspect the orifice and O-ring to ensure the proper components were used and the O-ring is installed per Rinnai's conversion instructions.

Code 12

Flame Failure

Applies To:

- SENSEI™ Series
- SENSEI™ RX/CX Series
- Non-SENSEI™ Series

⚠ WARNING You must be qualified to service gas systems before proceeding with the following items listed below.

Verify proper inlet gas pressure is being fed to water heater. Check water heater rating plate for proper inlet pressure. This plate or label is located on the side of each water heater. The minimum listed inlet pressure MUST be maintained with all gas water heaters at the location firing on high fire.

1. Ensure the gas is turned on at the water heater, gas meter or propane tank.
2. If system is on propane gas, ensure tank has gas in it.
3. Make sure the ceramic sparker electrode and flame rod are tight in the mounting bracket. You should not be able to move either component with your finger if gasket is intact. If loose, remove and clean the electrode/flame rod. Reinstall using new electrode/flame rod gasket.
4. If the inlet gas pressure is below the recommended pressure, the gas system may be undersized. If sized properly, you should see no more than a 0.3 inch pressure drop on natural gas with all gas water heaters in the building firing on high fire. The allowable pressure drop for propane is 0.5 inches of water column. This pressure drop is based on the National Fuel Gas Code / ANSI Z223.1, NFPA 54 when operating on gas pressures up to 14 inches W.C. with black iron piping. Refer to the Rinnai Tankless Water Heater Installation and Operation Manual or National Fuel Gas Code / ANSI Z223.1, NFPA 54 for pressure drops on gas piping and pressures you are using for proper pressure drops allowed. If pressure drop exceeds that mentioned above for black iron gas systems, your system could be undersized. Please recheck sizing. The issue could be in any of the following items: the gas system, gas piping, regulator, tank, utility supply, dirt or debris in gas system components, etc. Have the gas system checked by a professional gas technical or master plumber that deals with gas system sizing. Refer to the National Fuel Gas Code for proper gas system sizing for gas type, piping and pressures being used at this location.
5. Inspect the vent system for loose joints, improper fittings, or failure to meet proper clearances around vent terminal outside building. See venting instructions for clearance specifications. Failure to meet vent terminal clearances can lead to recirculation of combustion gases, which may cause incomplete combustion and a code 12.
6. Ensure the equivalent vent length is within Rinnai's or the vent manufacturer' specifications.
7. Ensure the proper venting materials were used on the water heater. See the vent manufacturer's instructions for detailed information on the vent system used.
8. If using Rinnai's concentric vent or common vent system, verify each vent component is fully engaged into top of water heater and at each joint. You may need to separate each connection to check for proper depth and connection. Mark each vent connection with a marker before pulling it apart to check depth once separated. Failure to have these joints fully engaged could result in code 12's due to recirculation of combustion gases.

9. Make sure the ceramic sparker electrode and flame rod are tight in the mounting bracket. You should not be able to move either component with your finger if gasket is intact. If loose, remove and replace the electrode/flame rod assembly and gasket. Ensure electrode gap is 0.138 in. (3.5 mm).
10. Inspect flame rod wiring for loose or damaged wires or connectors at the flame rod and PC Board.
11. Inspect flame rod silicone protective sleeve for cracks or heat damage. If cracked or damaged, the spark could possibly seek a grounding source outside the combustion chamber, leading to a code 12. Replace the silicone sleeve if damaged.
12. A properly grounded circuit is critical. Check to ensure all ground connections are intact, free of corrosion, tight at each joint or connection and the polarity of the circuit is correct. If unsure, contact a Licensed Electrician to inspect and/or correct any issue with the circuit.
13. Inspect fan blower wheel for debris and/or insects. If insects or debris are found in the fan housing or burner assembly, inspect the entire intake air chamber to include the vent system.

> **⚠ WARNING** Turn off power to water heater before unplugging fan motor or plugging it back up. Failure to do so could short out fan motor.

14. Check to ensure any two stage regulators used on the inlet gas feed are installed at least six feet away from water heater. Make sure when water heater shuts off, the pressure from the two stage regulator does not exceed the maximum inlet pressure of the water heater. To verify that, connect a manometer to the test port on the bottom of the water heater. The inlet gas pressures should never exceed 10 in. water column for natural gas or 13.5 in. on propane. If it does, the regulator may be defective.
15. Inspect all wiring harnesses throughout the water heater for moisture in electrical connections. If any of the connections appear to be damp or wet, dry them out and try to find out what is causing this moisture. This can cause a short circuit which could lead to code 12.
16. If MSA's or MSB's are being used on multiple water heater installations, isolate the water heater having issues from the system. Then try to fire that water heater up. If it operates without additional code 12's, the electronic board for your MSA or MSB may be defective.
17. See below for other suggestions:

- Condensate, debris or a malfunctioning mechanical component inside the gas valve, may be preventing the gas valve from operating. Replace gas valve.

For SENSEI™ Series and SENSEI™ RX/CX Series, continue with next two bullets:

- Measure resistance or voltage of the **Main Gas Valve Solenoid on PC Board:**
  - **SENSEI™ Series:** Connector "D" on PC Board black wire pin #27 and yellow wire pin #29 = 18 ~ 22 ohms or 11 ~ 13 VDC
  - **SENSEI™ RX/CX Series:** Connector "CN9" on PC Board black wire pin #3 and yellow wire pin #4 = 11 ~ 13 VDC
- **SENSEI™ Series:** Verify proper gas orifice is installed in gas valve. Red orifice = Propane (L.P.) Blue orifice = Natural gas
- **SENSEI™ RX/CX Series:** Verify proper gas parameter is selected: 10A = Natural gas, 10b = Propane

SENSEI™ Series and SENSEI™ RX/CX Series:

Immediate code 12 or 19 (No flame visible in burner box)

If a code 12 appears immediately after water flow begins, you have an electrical short in one of the water heater's components. The short could be in a wiring harness, water flow control or bypass valve or any other component within the DC circuit. One way to track this down is to unplug one component at a time and try to cycle the water heater on. If you unplug any component and the water heater cycles three times after unplugging it, the short is in that device.

Code 13

Combustion

Applies To:

- RH180 (Hybrid Tank-Tankless Non-SENSEI™ Series Water Heater)

1. Verify 4 in. B-Vent venting materials are used and installed per manufacturer's requirements.
2. Inspect entire vent system inside and outside installation site. Check for clearance issues. Ensure proper venting materials are used. Ensure all sections are properly seated. Ensure joints are sealed and cannot be pulled apart.
3. Verify space water heater is installed and has proper amount of combustion air for all gas water heaters installed in that space. Leave a door open and see if water heater will operate. If so, you may have to recalculate combustion air requirements based on installation site.
4. Verify DIP switches are properly set for altitude (refer to Tankless Water Heater Installation and Operation Manual or Technical Data Sheet on inside of water heater front cover for proper altitude settings).

Altitude	DIP switch 2	DIP switch 3
0 - 2,000 Ft (0 - 610 m)	OFF	OFF
2,001 - 5,400 Ft (610 - 1,646 m)	OFF	On

WARNING You must be qualified to service gas systems to perform following steps.

5. Verify inlet gas supply is within ranges shown in table below for all gas water heaters at site firing on high fire.
6. Verify water heater's forced low and forced high pressures are within ranges shown in table below.

Gas Inlet		Forced Low		Forced High	
Natural Gas	Liquid Propane	Natural Gas	Liquid Propane	Natural Gas	Liquid Propane
Minimum: 4 in. w.c. Maximum: 10.5 in. w.c.	Minimum: 8 in. w.c. Maximum: 13.5 in. w.c.	1.10 in. w.c.	1.23 in. w.c.	2.8 in. w.c.	3.0 in. w.c.

CAUTION Turn off power supply to water heater before performing the next step.

7. Remove fan motor and inspect fan wheel and housing for any type of restriction. Re-install fan. Turn on power to water heater and see if diagnostic reappears.

WARNING Turn off electrical, gas and water supply before performing the next step.

8. Remove burner manifold and inspect orifices on back side of manifold for clogged or blocked orifices. Remove burner assembly and inspect chamber for insects or other debris. Clean out all debris found in burner and air chambers. Inspect copper fins in heat exchanger for build-up.

Code 14

Thermal Fuse or Overheat Sensor (ODS)

Applies To:

- SENSEI™ Series
- SENSEI™ RX/CX Series
- Non-SENSEI™ Series

SENSEI™ Series and SENSEI™ RX/CX Series :

Note: Code 14 is activated by the over heat sensor mounted on the right hand side of the heat exchanger. A code 14 is an indication of overheating and should be taken seriously. This switch will automatically reset after the heat exchanger cools down. If the root cause of the fault is not corrected, the bi-metal switch will continue to trip.

1. Verify the ONLY DIP switch on the PC Board is set to the "OFF" position. If in the "ON" position, the water heater will indicate a code 71. In the "ON" position, this DIP switch electrically shut off the main gas solenoid valve preventing gas flow through the gas valve assembly.
2. Verify the water heater is connected to the proper gas type. See rating plate for gas type of water heater.
3. Verify proper clearances were maintained around water heater and vent terminals.
4. Inspect the over heat sensor wiring harness for loose connectors, damage or broken wires.
5. Ohm out safety circuit to determine if the bi- switch is open.
    - Measure resistance and/or voltage of the Overheat Switch on PC Board at Connector H:
        - **SENSEI™ Series:** Place one lead on connector "H" pin #14 black wire and connector "D" pin #28 black wire at PC Board
        - **SENSEI™ RX/CX Series:** Place one lead on connector "CN9" pin #1 black wire and pin #11 black wire at PC Board
    - Resistance reading should = Less than 1 ohm or voltage reading would be 11 ~ 13 VDC
6. Verify proper gas venturi was installed in gas valve.
    - Red orifice = Propane (L.P.)
    - Blue orifice = Natural gas
7. Verify the gas type at Parameter 10 was properly selected.
    - Parameter 10 selection A = Natural Gas
    - Parameter 10 selection B = Propane Gas

    NOTE: SENSEI™ RX/CX Series Only: Parameter 10 (Gas Type) can be changed only within 20 minutes after resetting power.

Steps continued on next page.

8. Verify the High Altitude Parameter 02 was properly selected.
    - Parameter 02 selection A = 0 – 2,000 ft. (0 – 610m)
    - Parameter 02 selection B = 2,001 – 5.400 ft. (610 – 1,646m)
    - Parameter 02 selection C = 5,401 – 7,700 ft. (1,646 – 2,347m)
    - Parameter 02 selection D = 7,701 – 10,200 ft. (2,347 – 3,109m)
9. Verify the Model Parameter 13 was properly selected.
    - Parameter 13 selection A = 199K Btu's
    - Parameter 13 selection B = 180K Btu's
    - Parameter 13 selection C = 160K Btu's
    - Parameter 13 selection D = 130K Btu's
10. Verify the Exhaust Parameter 14 was properly selected.
    - Parameter 14 selection A = Indoor Water Heater
    - Parameter 14 selection B = Outdoor Water Heater
11. Inspect the front, sides and back of the heat exchanger surface for cracks, separations, discoloration or damage of any kind. If you find any of the above mentioned items, replace the heat exchanger.
12. Flush the water heater's heat exchanger. Refer to the flushing procedure provided in the Rinnai Tankless Water Heater Installation and Operation Manual.
13. If code 14 persists after performing the procedures, replace PC Board.
14. Remove the heat exchanger assembly from the water heater. Separate the burner and primary heat exchanger. Inspect the burner assembly and heat exchanger fins for debris build-up or blockage. If debris build-up is found, clean all debris from heat exchanger. If unable to clean, replace the heat exchanger and all gaskets.

Note: If removing the burner for service or replacement, purchase (101 Burner Gasket-Large). Burner gasket MUST NOT be reused after removal. Ensure burner and heat exchanger surface are cleaned and smooth before reinstalled burner.

Non-SENSEI™ Series:

Inspect the internal components inside the water heater's casing especially around the heat exchanger where the copper section meets the combustion box. Look for discoloration of the heat exchanger surface in that area; it will appear black.

Note: Code 14 is an indication of overheating and should be taken seriously. There are two components (bi-metal switches and thermo-fuses) within the product that will cause a code 14. The overheat bi-metal safety switch is mounted on the heat exchanger, either on the top right or left front of that component. The thermo-fuses are wrapped around the heat exchanger. The bi-metal switch, in most cases, will reset itself after cooling down once tripped. After the bi-metal switch resets, the water heater will operate again. If the fault that caused it to trip is not corrected, it will trip again after the temperature range for that switch is exceeded. The thermo-fuses, on the other hand, are a one shot device, meaning once blown, they must be replaced. This will require removing the heat exchanger, at which point you need to perform a detailed inspection of all items listed below.

1. Verify DIP switch #5 in the SW2 bank of DIP switches is in the "OFF" position. If in the "ON" position this will cause a code 14, as this switch is used to de-energize the gas valve circuit. This applies only to the VC, and KB models, it does not apply to V, VE, VA, VB or KA products.
2. Verify the water heater is connected to the proper gas type. See rating plate for gas type of water heater.

3. Check to see if this water heater has ever been converted from one gas type to another. If it was converted, verify conversion was performed per manufacturer's specifications. See conversion procedure for the model number water heater at your location.
4. Verify proper clearances were maintained around water heater and vent terminals.
5. Inspect the safety circuit wiring harness for loose connectors, damage or broken wires.
6. Ohm out safety circuit to determine if the bi- switch is open or if the issue is a blown thermo- fuse.
7. Verify all DIP switches are set per manufacturer' recommendations. Contact Rinnai for details on proper settings if you need assistance.

> **⚠ WARNING** You must be qualified to service gas systems before proceeding.

8. Use a manometer to verify force low and high fire manifold gas pressures. Procedure for checking these pressures can be found on the back side of the front cover. If you need assistance, contact Rinnai technical services 24/7 for details on now to check these pressures. You must have a manometer to check gas pressures.
9. Check system operation to see if the water heater is continuously short cycling. If so, heat from short cycling can transfer into the copper heat exchanger and trip the bi-metal switch. Investigate to see what is causing the short cycling, such as aqua-stats with a low delta T. Increase set point of aqua-stat by at least twenty degrees lower than the water heater's set point. This will normally stop the water heater from short cycling.

> **⚠ WARNING** Turn off the electrical, gas and water supply to the water heater before proceeding.

10. Inspect burner manifold, burner assembly and heat exchanger copper fins for debris build-up or blockage. If you find debris build-up inside the heat exchanger that has led to a code 14, replace the heat exchanger.
11. Inspect the front, sides and back of the heat exchanger surface for cracks, separations, discoloration or damage of any kind. If you find any of the above mentioned items, replace the heat exchanger.
12. Inspect all components inside the water heater cabinet for signs of excessive heat damage. Take note of the copper surface of the heater exchanger where the combustion box and copper meet for discoloration. If discoloration (black) surface is noted, replace heat exchanger. This indicates a blockage or debris build up between the copper fins inside the heat exchanger.
13. Verify venting is within vent clearance specifications and lengths per manufacturer's recommendation.
14. If code 14 still appears after performing the above inspections, replace PC Board.

Code 15

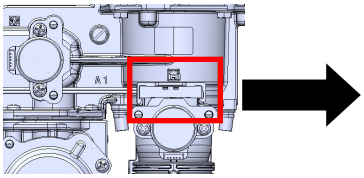
Venturi Control

Applies To:

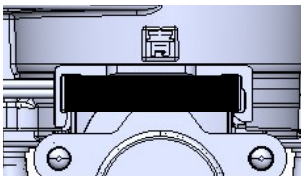
- SENSEI™ Series
- SENSEI™ RX/CX Series

1. Reset main power supply to water heater.
2. Check gas valve and solenoid wiring harnesses for loose, damage or broken connections.
3. **For SENSEI™ RX/CX Series:** Check if a black reed switch on back side of the gas valve is properly.

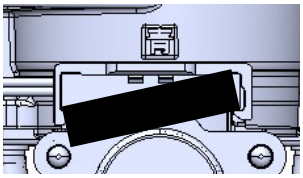
Back Side of Gas Valve



Properly Located



Example of not Properly Located



4. **For SENSEI™ Series:** Measure resistance and/or voltage of Venturi Control Device on PC Board at Connector D5 (refer to "Electric Circuit Table" in Tech Sheet and Wiring Diagram for further clarification):
    5. Connector "D" Red wire pin #12 and Black wire pin #30 at PC Board = 12 ~ 14 VDC when 120 VAC power cord is connected.
    6. Connector "D" Brown wire pin #25 and Black wire pin #30 at PC Board = Less than 1 VDC
    7. Connector "D" Grey wire pin #23 and Black wire pin #30 at PC Board = Less than 1 VDC
    8. Connector "D" Blue wire pin #5 and white wire pin #7 = 35 ~ 41 ohms
    9. Connector "D" Yellow wire pin #11 and Red wire pin #9 = 35 ~ 41 ohms
5. **For SENSEI™ RX/CX Series:** Measure resistance and/or voltage of Venturi Control Device on PC Board at Connector CN10 (refer to "Electric Circuit Table" in Tech Sheet and Wiring Diagram for further clarification):
    - Connector "CN10" Blue wire pin #3 and Black wire pin #2 at PC Board = 350 ~ 550 ohms
    - Connector "CN10" Blue wire pin #4 and Black wire pin #2 at PC Board = 350 ~ 550 ohms
    - Connector "CN10" Blue wire pin #5 and Black wire pin #2 at PC Board = 350 ~ 550 ohms
    - Connector "CN10" Blue wire pin #6 and Black wire pin #2 at PC Board = 350 ~ 550 ohms
    - Connector "CN10" Red wire pin #9 and Black wire pin #1 at PC Board = 350 ~ 550 ohms
    - Connector "CN10" Red wire pin #10 and Black wire pin #1 at PC Board = 350 ~ 550 ohms
    - Connector "CN10" Red wire pin #11 and Black wire pin #1 at PC Board = 350 ~ 550 ohms
    - Connector "CN10" Red wire pin #12 and Black wire pin #1 at PC Board = 350 ~ 550 ohms
    - Connector "CN10" Black wire pin #14 and Black wire pin #1 at PC Board = 4-6 VDC
6. Check fan motor for proper operation.
7. Ensure there is proper air flow through intake and exhaust ports of vent system.
8. Replace gas valve assembly.
9. Replace fan motor.

Code 16

High Outgoing Water Temperature

(Safety Shutdown – Outlet Water Temperature Exceeded 203°F / 95°C)

Applies To:

- SENSEI™ Series
- SENSEI™ RX/CX Series
- Non-SENSEI™ Series

1. Check for restrictions in air flow around vent terminal.
2. Check fan for proper operation.
3. Verify check valve behind fan motor in not stuck restricting air flow.
4. Check for foreign materials in combustion chamber and exhaust piping.
5. Check for blockage in heat exchanger.
6. Verify water heater is set to appropriate gas type (see rating plate on side of water heater for gas type).
   - **SENSEI™ Series and SENSEI™ RX/CX Series:** Verify gas type at Parameter 10 was properly selected (A=Natural Gas. B=Propane Gas).
     NOTE: SENSEI™ RX/CX Series Only: Parameter 10 (Gas Type) can be changed only within 20 minutes after resetting power.
7. Replace gas valve assembly.
8. Replace fan motor assembly.

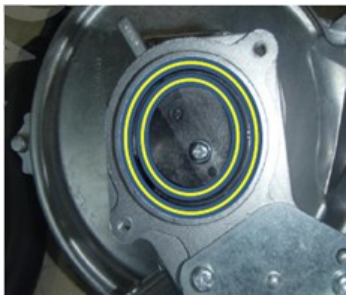
Code 17

Venturi Blockage

Applies To:

- SENSEI™ Series
- SENSEI™ RX/CX Series

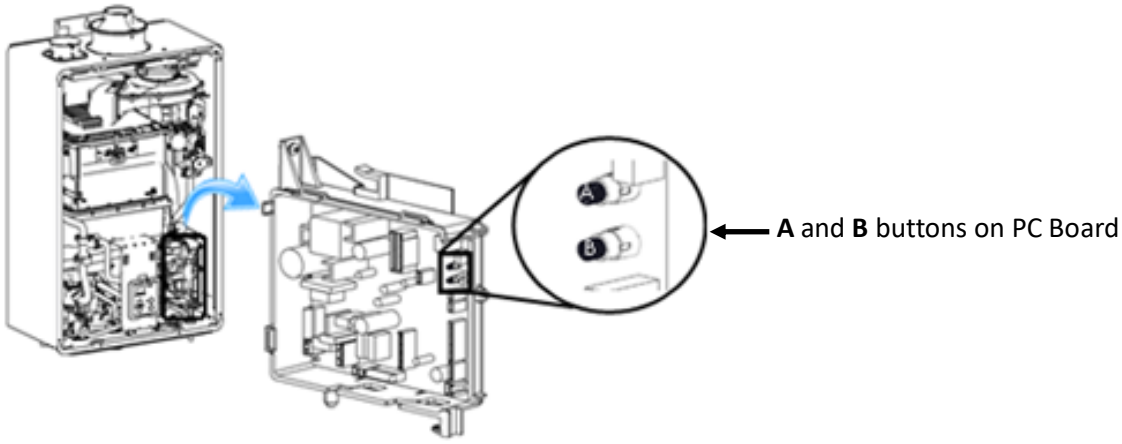
1. Verify condensate drain line is properly draining.
2. Inspect entire vent system intake air, exhaust chamber and vent termination for obstructions.
3. Inspect venturi for blockage or debris build-up. Remove gas valve and Venturi assembly from fan motor and inspect area shown below for debris.



4. Clean debris from Venturi assembly. Re-install assembly and follow reset procedure below, which will return water heater to normal operation.

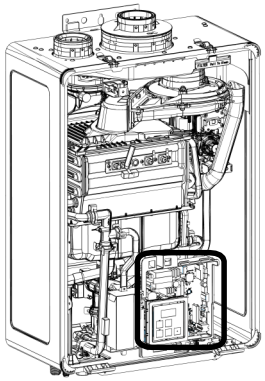
SENSEI™ Series :

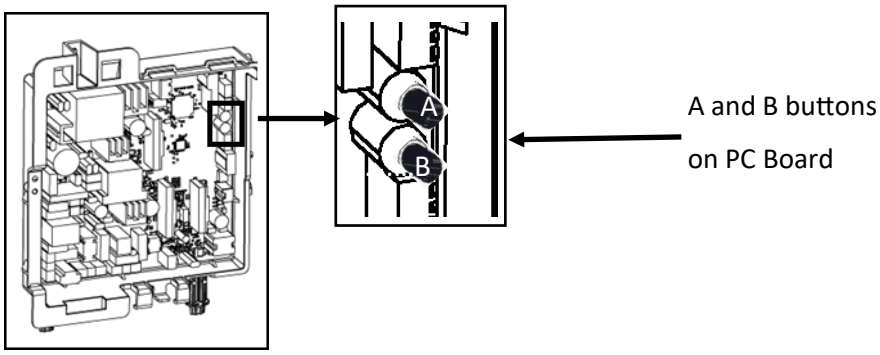
Step	Display on Temperature Controller
Initial Step	With Controller Off (Blank)
Press button **B** for 1 second	"t"
Press button **B** for 1 second	"F"
Press button **B** for 1 second	"S"
Press button **B** for 1 second	"E" (Only if code 17 or 52 is occurring)
Press buttons **A** and **B** for 10 seconds	"ECL" (Reset complete)
This reset procedure will return the water heater to normal operation.	



SENSEI™ RX/CX Series :

Step	Display on Temperature Controller
Initial Step	With Controller Off (Blank)
Press button **B** for 1 second	"dES"
Press button **B** for 1 second	"t"
Press button **B** for 1 second	"AdJ"
Press button **B** for 1 second	"F"
Press button **B** for 1 second	"A"
Press button **B** for 1 second	"E" (Only if code 17 or 52 is occurring)
Press buttons **A** and **B** for 10 seconds	"ECL" (Reset complete)
This reset procedure will return the water heater to normal operation.	





Code 18

Gas Valve Adjustment Limit

Applies To:

- SENSEI™ RX/CX Series

A Smart-Sense gas valve can adjust air/fuel ratio to gas rich or to gas lean. Error code 18 is shown when the gas valve reaches the gas rich limit or the gas lean limit. The Smart-Sense gas valve itself has a wide range of air/fuel ratio, but the range of air/fuel ratio is intentionally limited per gas type; natural gas and propane gas. For normal operation, the gas valve should not reach the gas rich limit or the gas lean limit. When you see this error code, a cause of the error should be supplied gas itself is not correct, gas type is not correct, entered gas valve parameters are not correct, or a flame rod wire is disconnected.

1. Verify appropriate gas (Natural gas or Propane gas) is supplied.
2. Verify Parameter 10 (Gas Type) is properly selected (A=Natural Gas. B=Propane Gas).
   NOTE: Parameter 10 (Gas Type) can be changed only within 20 minutes after resetting power.
3. Verify gas valve parameters are correct or enter gas valve parameters. Refer to “Enter Gas Valve Parameters” on Gas Valve Replacement Instructions (100000855) for finding and entering gas valve parameters.
4. Verify a flame rod wire is properly connected or the wire has no damage.

Code 19

Electrical Grounding

Applies To:

- SENSEI™ Series
- SENSEI™ RX/CX Series
- Non-SENSEI™ Series

Immediate code 12 or 19 (No flame visible in burner box)

If a code 19 appears immediately after water flow begins, you have an electrical short in one of the water heater's components. The short could be in a wiring harness, water flow control or bypass valve or any other component within the DC circuit. One way to track this down is to unplug one component at a time and try to cycle the water heater on. If you unplug any component and the water heater cycles three times after unplugging it, the short is in that device.

Code 21

Data Transfer Error

Applies To:

- SENSEI™ Series
- SENSEI™ RX/CX Series

SENSEI™ Series:

1. If the PC Board has been replaced, ensure the data transfer process is complete.
2. Ensure all parameters were properly programmed for the water heater model in use.
3. Ensure data transfer instructions were followed when installing new PC Board.
4. If data transfer procedure was unsuccessful, manually program all 14 parameters for your water heater according to the PC Board Replacement Instructions supplied with the new PC Board.

SENSEI™ RX/CX Series:

1. If the PC Board has been replaced, ensure the data transfer process is complete.
2. Ensure all parameters were properly programmed for the water heater model in use.
3. Ensure data transfer instructions were followed when installing new PC Board.
4. If data transfer procedure was unsuccessful, refer to “Gas Valve Replacement Instructions” (100000855) or “PCB replacement instructions” (100000854), enter gas valve parameters correctly.

Code 22

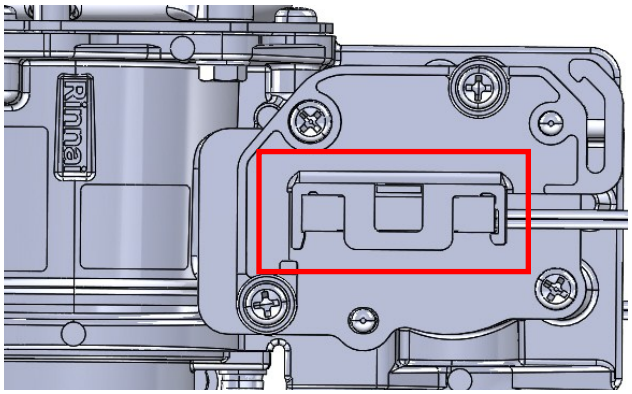
Gas Valve Adjustment

Applies To:

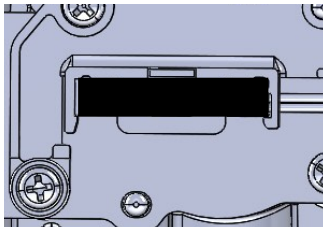
- SENSEI™ RX/CX Series

1. Verify a reed switch on front of gas valve is located properly.

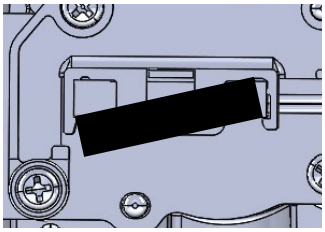
Front Side of Gas Valve



Properly Located:



Example of Not Properly Located:



2. Verify all gas valve parameters are correct. If not, refer to “Gas Valve Replacement Instructions” (100000855), enter gas valve parameters correctly.

Code 25

Condensate pump error or drain is clogged (accessory pump)

Applies To:

- SENSEI™ Series
- SENSEI™ RX/CX Series
- Non-SENSEI™ Series

Code 25 only appears when the condensate safety switch contacts are made (contact between the two wires). This occurs when condensate backs up and causes the float switch (safety switch) to trip. Code 25 may also occur if the condensate pump stops working.

1. Confirm power is supplied to pump.
2. Check pump for proper operation (external, third party pump).
3. Ensure drain line is not clogged or frozen.
4. Check all wiring for loose, damaged or broken connections from pump back to PC Board and/or condensate trap back to PC Board.
5. Ensure drain line has an air gap in it.
6. Inspect condensate trap for restrictions.

Code 30

Flammable Vapor Sensor

Applies To:

- RH180 (Hybrid Tank-Tankless Non-SENSEI™ Series Water Heater)

⚠ WARNING

- Leave the space or room the water heater is installed in until safety personal have identified the area as safe and all flammable vapors are removed and eliminated.
- You MUST be qualified to service gas water heaters before proceeding with the following steps.

1. Disconnect power supply to water heater.
2. Remove water heater front panel. Inspect Flammable Vapor Sensor and wiring harness for loose, damaged or broken wires or connectors. Inspect from sensor back to PC Board.
3. Verify Flammable Vapor Sensor is properly mounted and not damaged.
4. When you are certain no flammable vapors are present, turn power and gas back on to water heater. Open a tap and allow water heater to fire up and check the following voltage outputs listed in chart below. If the 30 code reappears and you are certain no flammable vapors are present, replace the Flammable Vapor Sensor.

PCB Connector	Part Name	Wire Color	Pin #	Voltage (DC)
D1	Flammable Vapor Sensor	Red—Black	(D) 1 - 6	1.9 to 2.1 VDC
		White—Yellow	(D) 4 - 3	25.5 to 39.5 mVDC

5. Replace PC Board.

Code 31

Burner Thermocouple

Applies To:

- RH180 (Hybrid Tank-Tankless Non-SENSEI™ Series Water Heater)
- Non-SENSEI™ Series

1. Check low/high fire manifold pressures for proper settings (refer to Tankless Water Heater Service Manual or Technical Data Sheet on inside of water heater front cover for gas pressure setting procedure). Set manifold pressures per instructions for your altitude.
2. Verify all DIP switches are set to proper position on PC Board (refer to Technical Data Sheet on inside of water heater front cover for proper altitude settings).
3. Measure milli-volt (mV) reading of burner thermocouple.
    - Thermocouple milli-volt range should be between 20 to 27 mV under normal combustion.
    - If reading exceeds 30 milli-volts, or is less than 8 milli volts, the water heater will go into a code 31.
    - A thermocouple reading above 30 mV during combustion indicates water heater may be over fired. Verify high fire manifold pressures. If gas pressures are within specifications, remove burner manifold and burners. Check for blockage between heat exchanger fins. If clogged, clean all debris from fins or replace heat exchanger.
    - A thermocouple reading below 8 mV during combustion indicates low gas pressure or low Btu gas content (thermocouple is not detecting a high enough temperature inside combustion chamber due to pressures or gas issues). Verify forced low fire gas pressure. If pressure is within specifications, contact Rinnai Technical Support for assistance.
4. Replace thermocouple.

Code 32

Outgoing Water Temperature Thermistor Fault

Applies To:

- SENSEI™ Series
- SENSEI™ RX/CX Series
- Non-SENSEI™ Series

1. Check thermistor wiring harness for loose, broken or damaged connections from thermistor back to PC Board.

⚠ CAUTION Turn off water supply to water heater and drain system down before proceeding with next steps.

2. With no water remaining in hot water supply lines, remove thermistor and check for scale build-up on thermistor. Clean off any substance found on thermistor.
3. With water supply still isolated and thermistor removed from water heater, check resistance readings of thermistor using a volt/ohm meter capable of reading 20K ohms.
   - Set meter to proper setting for checking 20K ohms and insert meter leads into each end of thermistor plug.
   - Apply heat to thermistor bulb. The thermistor resistance value starts to decrease when heat is applied (a simple way to apply heat is to place the thermistor bulb between your thumb and another finger and apply pressure. The heat from your body causes the resistance reading to decrease). The thermistor reading decreasing when heat is applied is an indicator the thermistor is functioning properly. The resistance reading will increase if ice is placed against the thermistor bulb.
   - Typical resistance values are:
     - 11.4 – 14K ohms at 59°F
     - 6.4 – 7.8K ohms at 86°F
     - 3.6 – 4.5K ohms at 113°F
     - 2.2 – 2.7K ohms at 140°F
     - 0.6 – 0.8K ohms at 221°F
4. If thermistor readings are correct, re-install thermistor ensuring small O-ring is still intact in thermistor before installation (place a small amount of grease or lubricant on O-ring to prevent damage during installation).
5. Turn on water supply and check for leaks around thermistor.
6. Re-fire the water heater. If code 32 still appears, replace the thermistor.
7. **RUR199 AND RUR160 MODELS ONLY**—If Crossover Mode Recirculation is being used, isolate unit from plumbing and drain unit. Replace Bypass Filter with Bypass Plug, if available. If this corrects the problem, inspect the check valve located between the Internal Circulation Pipe Assembly and Circular Joint Connection. If open, reseat or replace. Refer to the Technical Data Sheet supplied with the water heater, or contact Technical Support for assistance.

Code 33

Heat Exchanger Thermistor

Applies To:

- SENSEI™ Series
- SENSEI™ RX/CX Series
- Non-SENSEI™ Series

1. Check thermistor wiring harness for loose, broken or damaged connections from thermistor back to PC Board.

⚠ CAUTION Turn off water supply to water heater and drain system down before proceeding with next steps.

2. With no water remaining in hot water supply lines, remove thermistor and check for scale build-up on thermistor. Clean off any substance found on thermistor.
3. With water supply still isolated and thermistor removed from water heater, check resistance readings of thermistor using a volt/ohm meter capable of reading 20K ohms.
   - Set meter to proper setting for checking 20K ohms and insert meter leads into each end of thermistor plug.
   - Apply heat to thermistor bulb. The thermistor resistance value starts to decrease when heat is applied (a simple way to apply heat is to place the thermistor bulb between your thumb and another finger and apply pressure. The heat from your body causes the resistance reading to decrease). The thermistor reading decreasing when heat is applied is an indicator the thermistor is functioning properly. The resistance reading will increase if ice is placed against the thermistor bulb.
   - Typical resistance values are:
     - 11.4 – 14K ohms at 59°F
     - 6.4 – 7.8K ohms at 86°F
     - 3.6 – 4.5K ohms at 113°F
     - 2.2 – 2.7K ohms at 140°F
     - 0.6 – 0.8K ohms at 221°F
4. If thermistor readings are correct, re-install thermistor ensuring small O-ring is still intact in thermistor before installation (place a small amount of grease or lubricant on O-ring to prevent damage during installation).
5. Turn on water supply and check for leaks around thermistor.
6. Re-fire the water heater. If code 33 still appears, replace the thermistor.

Code 34

Combustion Air Temperature Thermistor for Non-SENSEI™ Series
Lime Detecting Thermistor for SENSEI™ RX/CX Series

Applies To:

- Non-SENSEI™ Series
- SENSEI™ RX/CX Series

Non-SENSEI™ Series:

1. Check thermistor wiring harness for loose, broken or damaged connections from thermistor back to PC Board.
2. Remove thermistor from fan motor housing.
3. Check resistance readings of thermistor using a volt/ohm meter capable of reading 20K ohms.
   - Set meter to proper setting for checking 20K ohms and insert meter leads into each end of thermistor plug.
   - Apply heat to thermistor bulb. The thermistor resistance value starts to decrease when heat is applied (a simple way to apply heat is to place the thermistor bulb between your thumb and another finger and apply pressure. The heat from your body causes the resistance reading to decrease). The thermistor reading decreasing when heat is applied is an indicator the thermistor is functioning properly. The resistance reading will increase if ice is placed against the thermistor bulb.
   - Typical resistance values are:
     - 11.4 – 14K ohms at 59°F
     - 6.4 – 7.8K ohms at 86°F
     - 3.6 – 4.5K ohms at 113°F
     - 2.2 – 2.7K ohms at 140°F
     - 0.6 – 0.8K ohms at 221°F
4. Verify water heater is connected to proper gas type (see rating plate for water heater gas type).
5. Has the water heater ever been converted to a different gas type (for example, converting from Natural Gas to Propane)? If so, verify the specific conversion procedure for the model was performed per the Tankless Water Heater Gas Conversion manual.
6. Verify proper clearances are maintained around water heater and vent terminals.
7. Verify DIP switches are set correctly per the Water Heater Gas Conversion manual or Installation and Operation Manual. Contact Rinnai for details on proper settings if you need assistance.

⚠ WARNING You must be qualified to service gas systems before proceeding with next steps.

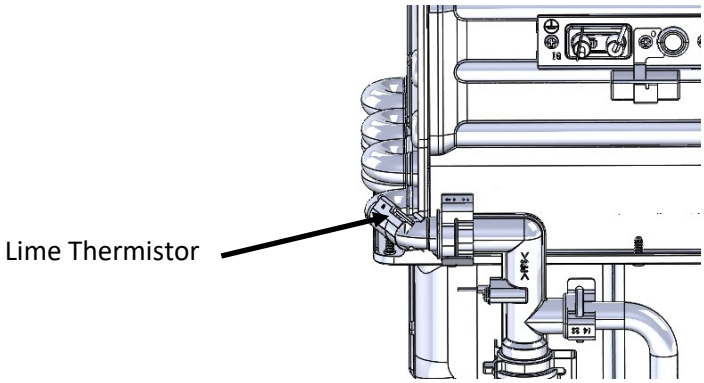
8. Using a manometer, verify force low and high fire manifold gas pressures (refer to Technical Data Sheet on inside of water heater front cover for instructions). A manometer must be used to check operating gas pressures.

⚠ WARNING Turn off gas and water supply to the water heater before proceeding with next steps.

9. Inspect burner manifold, burner assembly and heat exchanger copper fins for debris build-up or blockage.
10. Verify venting is within clearance specifications and lengths per manufacture's recommendation.
11. If code 34 still appears after performing above steps, replace thermistor.

SENSEI™ RX/CX Series:

1. Check lime thermistor wiring harness (see image below) for loose, broken or damaged connections from the thermistor back to PC Board.



2. Remove the thermistor from hot water pipe.
3. Check resistance readings of the thermistor using a volt/ohm meter capable of reading 100K ohms.
   - Set meter to proper setting for checking 100K ohms and insert meter leads into each end of thermistor plug.
   - Apply heat to thermistor bulb. The thermistor resistance value starts to decrease when heat is applied (a simple way to apply heat is to place the thermistor bulb between your thumb and another finger and apply pressure. The heat from your body causes the resistance reading to decrease). The thermistor reading decreasing when heat is applied is an indicator the thermistor is functioning properly. The resistance reading will increase if ice is placed against the thermistor bulb.
   - Typical resistance values are:
     - 70.6 – 85.0K ohms at 59°F
     - 36.5 – 42.8K ohms at 86°F
     - 20.0 – 22.8K ohms at 113°F
     - 11.5 – 12.8K ohms at 140°F
     - 2.7 – 3.0K ohms at 221°F
4. Clean the thermistor to remove any foreign objects from the thermistor.
5. Install the thermistor on hot water pipe.
6. If code 34 still appears after performing above steps, replace thermistor.

Code 35

Tank Temperature Sensor

Applies To:

- RH180 (Hybrid Tank-Tankless Non-SENSEI™ Series Water Heater)

1. Check tank temperature sensor wiring harness for loose, broken or damaged connections from thermistor back to PC Board.

⚠ CAUTION Turn off water supply to water heater and drain system before proceeding with next steps.

2. With water supply isolated, remove thermistor from the water heater.
3. Check resistance readings of thermistor using a volt/ohm meter capable of reading 20K ohms.
   - Set meter to proper setting for checking 20K ohms and insert meter leads into each end of thermistor plug.
   - Apply heat to thermistor bulb. The thermistor resistance value starts to decrease when heat is applied (a simple way to apply heat is to place the thermistor bulb between your thumb and another finger and apply pressure. The heat from your body causes the resistance reading to decrease). The thermistor reading decreasing when heat is applied is an indicator the thermistor is functioning properly. The resistance reading will increase if ice is placed against the thermistor bulb.
   - Typical resistance values are:
     - 11.4 – 14K ohms at 59°F
     - 6.4 – 7.8K ohms at 86°F
     - 3.6 – 4.5K ohms at 113°F
     - 2.2 – 2.7K ohms at 140°F
     - 0.6 – 0.8K ohms at 221°F
4. If thermistor readings are correct, re-install thermistor ensuring small O-ring is still intact in thermistor before installation (place a small amount of grease or lubricant on O-ring to prevent damage during installation).
5. Turn on water supply and check for leaks around thermistor.
6. Re-fire the water heater. If code 33 still appears, replace the thermistor.

Code 38

Exhaust Gas Temperature Sensor

Applies To:

- SENSEI™ Series
- SENSEI™ RX/CX Series
- Non-SENSEI™ Series

1. Check “Exhaust Gas Temperature Sensor” wiring harness for loose, broken or damaged connections at the sensor and PC Board.
2. Remove sensor. Check resistance readings of thermistor using a volt/ohm meter capable of reading 20K ohms.
   - Set meter to proper setting for checking 20K ohms and insert meter leads into each end of thermistor plug behind the wires.
   - Apply heat to thermistor bulb. The thermistor resistance value starts to decrease when heat is applied (a simple way to apply heat is to place the thermistor bulb between your thumb and another finger and apply pressure. The heat from your body causes the resistance reading to decrease). The thermistor reading decreasing when heat is applied is an indicator the thermistor is functioning properly. The resistance reading will increase if ice is placed against the thermistor bulb.
   - Typical resistance values are:
     - 11.4 – 14K ohms at 59°F
     - 6.4 – 7.8K ohms at 86°F
     - 3.6 – 4.5K ohms at 113°F
     - 2.2 – 2.7K ohms at 140°F
     - 0.6 – 0.8K ohms at 221°F
3. If sensor readings are correct, re-install sensor into exhaust port.
4. Initiate water flow to activate the water heater. If code 38 still continues to appear, proceed to the next step.
5. Verify water heater is connected to proper gas type (see rating plate for water heater gas type).
6. Has the water heater ever been converted to a different gas type (for example, converting from Natural Gas to Propane)? If so, verify the specific conversion procedure for the model was performed per the Tankless Water Heater Gas Conversion manual.
7. Verify proper clearances are maintained around water heater and vent terminals.
8. Ensure parameter settings / dip switches are appropriately set for the specific installation location. Contact Rinnai for details on proper settings if you need assistance.

⚠ WARNING You must be qualified to service gas systems before proceeding with next steps.

9. Using a manometer, verify force low and high fire manifold gas pressures (refer to Technical Data Sheet on inside of water heater front cover for instructions). A manometer must be used to check operating gas pressures.

⚠ WARNING Turn off gas and water supply to water heater before proceeding with next steps.

10. Inspect burner manifold, burner assembly and heat exchanger copper fins for debris build-up or blockage.
11. Verify venting is within clearance specifications and lengths per manufacture’s recommendation.
12. If code 38 still appears, replace sensor.

RH180 Models (CO Sensor)

1. Verify 4 in. B-Vent venting materials were used and installed per manufacturer's requirements.
2. Inspect entire vent system inside and outside installation site. Check for clearance issues, ensure proper venting materials were used, ensure all sections are properly seated, joints are sealed and cannot be pulled apart, etc.
3. Verify space surrounding water heater has proper amount of combustion air for all gas water heaters installed in that space. Leave a door open and see if water heater will operate. If so, you may need to recalculate combustion air requirements based on installation site.
4. Verify DIP switches are properly set for altitude (refer to Technical Data Sheet on inside of water heater front cover for more information).

Altitude	DIP switch 2	DIP switch 3
0 - 2,000 Ft (0 - 610 m)	OFF	OFF
2,001 - 5,400 Ft (610 - 1,646 m)	OFF	ON

WARNING You must be qualified to service gas systems before proceeding with next steps.

5. Verify inlet gas supply is within ranges shown in table below for all gas water heaters at site firing on high fire.
6. Verify water heater's force low and forced high fire pressures are within ranges shown in table below.

Gas Inlet		Forced Low		Forced High	
Natural Gas	**Liquid Propane**	**Natural Gas**	**Liquid Propane**	**Natural Gas**	**Liquid Propane**
Minimum: 4 in. w.c. Maximum: 10.5 in. w.c.	Minimum: 8 in. w.c. Maximum: 13.5 in. w.c.	1.10 in. w.c.	1.23 in. w.c.	2.8 in. w.c.	3.0 in. w.c.

CAUTION Turn off power supply to water heater before proceeding with next steps.

7. Remove fan motor and inspect fan wheel, housing, and air duct for any type restriction. Reinstall fan. Reapply power to water heater and test for proper operation.

WARNING Turn off electrical, gas and water supply to the water heater before proceeding with next steps.

8. Remove burner manifold and inspect orifices on back side of manifold for clogged or blocked orifices. Remove burner assembly and inspect chamber for insects or other debris. Clean out all debris found in burner and air chambers. Inspect copper fins in heat exchanger for build-up between fins. Build-up or blockage between heat exchanger fins causes air flow restrictions. If build-up is present, you need an air compressor capable of delivering 120 psi of compressed air to blow out burner and heat exchanger fins. If unable to clean heat exchanger with compressed air, replace heat exchanger.

CAUTION Wear safety glasses and a mask when blowing out burner.

9. Review troubleshooting steps in Code 05 regarding the RH-180 water heater.
10. Review troubleshooting steps in Code 10 regarding the RH-180 water heater.
11. Check voltage to CO sensor based on chart below.

PCB Connector	Part Name	Wire Color	Pin #	Status	Voltage (DC)
C1	CO Sensor	Red—Black	1—5	Normal	1.9 - 2.1 VDC
				During Combustion	2.5 - 3 VDC

12. Before replacing CO sensor, ventilate room and allow fresh air into space. Turn off power supply to the water heater, and then turn back on. Wait 30 minutes and try firing the water heater again.
13. If above steps do not resolve the code, replace CO sensor and PC Board.

Code 41

Freeze Protection Sensor (External Water Heaters for SENSEI and Non-SENSEI Series, All Water Heaters for SENSEI RX/CX Series)

Applies To:

- SENSEI™ Series
- SENSEI™ RX/CX Series
- Non-SENSEI™ Series

NOTE: If the KB water heater's freeze protection sensor/thermistor is unplugged/cut/shorted, it will not allow the water heater to fire up and will show a code 41.

If the VC water heater's freeze protection sensor/thermistor is unplugged/cut/shorted, it will allow the water heater to fire up. At which point it will flash a code 41 alternating between the code 41 and the set point temperature.

1. Check sensor wiring harness for loose, broken or damaged connections from sensor back to PC Board.
2. Ensure sensor is open to outside air and not covered with insulation.
3. Check the resistance readings of this component using a volt/ohm meter capable of reading 20K ohms. Set meter to proper setting for checking 20K ohms and insert meter leads into each end of the sensor plug. Then apply heat to the sensor bulb. You will notice the sensor resistance reading start to drop when heat is applied. A simple way to apply heat is to place the sensor bulb between your thumb and another finger and apply pressure. The heat from your body will cause the resistance reading to decrease. If the sensor reading starts to decrease with heat applied normally, that indicates the component is functioning properly. The resistance reading will increase if ice is placed against the bulb.

   Typical resistance values are:

   - 11.4 – 14K ohms at 59°F
   - 6.4 – 7.8K ohms at 86°F
   - 3.6 – 4.5K ohms at 113°F
   - 2.2 – 2.7K at 140°F
   - 0.6 – 0.8K at 221°F

   If the outside air temperature thermistor (on outdoor models only for SENSEI and Non-SENSEI Series, and all models for SENSEI RX/CX Series) is open or disconnected, the water heater will continue to operate and flash a code 41. The display will alternate between the set point temperature and the code 41. Since the thermistor is used to activate the freeze protection, there is no need for it not to allow the water heater to operate. After the issue causing the code is cleared, the error code will disappear.

   Refer to the tankless water heater installation and operation manual for the proper connection point of the temperature controller.

   - If you find the temperature controller connected to any point or wires other than what is shown in the manual, disconnect it immediately.
   - Connect the controller as shown in the installation and operation manual.

Code 51

Inlet Water Temperature Thermistor

Applies To:

- SENSEI™ Series
- SENSEI™ RX/CX Series
- Non-SENSEI™ Series

1. Check sensor wiring harness for loose, broken or damaged connections from sensor back to PC Board.

> **⚠ CAUTION** Turn off water supply to water heater and drain system down before proceeding with next steps.

2. With no water left in hot water supply lines remove the sensor and check it for scale build-up. Clean off any substance found on this component.
3. With water supply still isolated and sensor removed from the water heater, check the resistance readings of this component using a volt/ohm meter capable of reading 20K ohms. Set meter to proper setting for checking 20K ohms and insert meter leads into each end of the sensor plug. Apply heat to the sensor bulb. You will notice the sensor resistance reading start to drop when heat is applied. A simple way to apply heat is to place the sensor bulb between your thumb and another finger and apply pressure. The heat from your body will cause the resistance reading to decrease. If the sensor reading starts to decrease with heat applied normally, that indicates the component is functioning properly. The resistance reading will increase if ice is placed against the bulb.

   Typical resistance values are:

   - 11.4 – 14K ohms at 59°F
   - 6.4 – 7.8K ohms at 86°F
   - 3.6 – 4.5K ohms at 113°F
   - 2.2 – 2.7K at 140°F
   - 0.6 – 0.8K at 221°F

   If sensor readings are correct, re-install this component ensuring the small O-ring is still intact in sensor well before installation. Place a small amount of grease or lubricant on the O-ring to prevent damaging it during installation. Turn water supply back on and check for leaks around this component. Re-fire the water heater to see if you still get a code 51. If so, replace the sensor.

   Note: If the inlet water temperature thermistor is open or disconnected, the water heater will continue to operate and flash a code 51. The display will alternate between the set point temperature and code 51. Once the issue causing the code is cleared the error code will disappear.

Code 52

Gas Valve

Applies To:

- SENSEI™ Series
- SENSEI™ RX/CX Series
- Non-SENSEI™ Series

SENSEI™ Series and SENSEI™ RX/CX Series :

⚠ WARNING Disconnect power and gas supply before proceeding.

1. Check flame rod and wiring for loose, broken or damaged components or connections.
2. Check gas solenoid wiring harness for loose or damaged terminals.
3. Measure resistance and/or voltage of the **Gas Valve Solenoid on PC Board**:

   SENSEI™ Series: Check black wire at pin #27 and yellow wire pin #29 on connector D for 18 ~ 22 ohms or 11 ~ 13 VDC

   SENSEI™ RX/CX Series: Check black wire at pin #3 and yellow wire pin #4 on connector CN9 for 11 ~ 13 VDC.

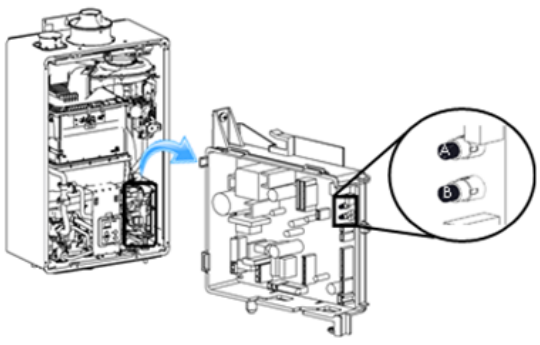
   Reapply power and check voltage to the gas valve while water heater is trying to fire.
4. Replace gas valve and venturi assembly. If code 52 appears after replacing the gas valve/venturi assembly, follow the reset procedure below.

SENSEI™ Series :

Method of Operation	Display on Temperature Controller
(Initial)	With Controller Off (Blank)
Press button B for 1 second	"t"
Press button B for 1 second	"F"
Press button B for 1 second	"S"
Press button B for 1 second	"E" (Only if code 17 or 52 is occurring)
Press buttons A and B for 10 seconds	"ECL" (Reset complete)
This reset procedure will return the water heater to normal operation.	

Following image shows location of buttons on PC Board.

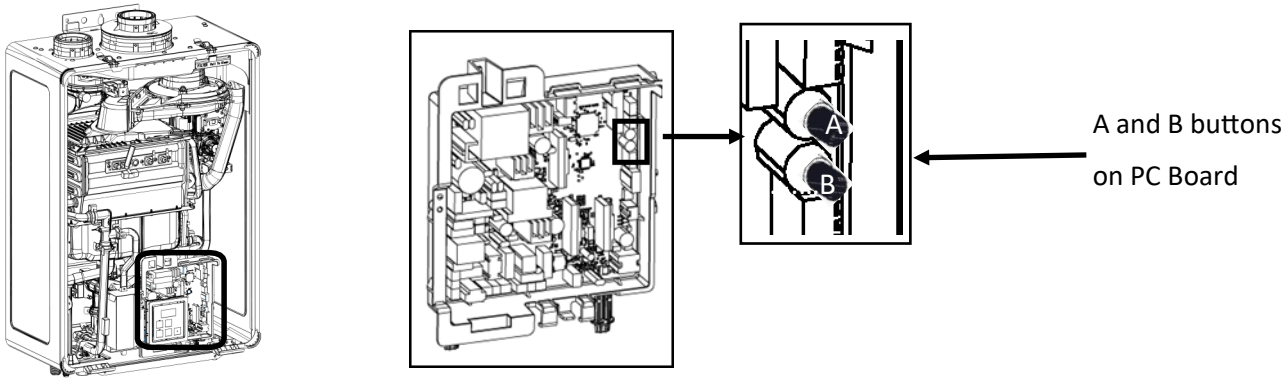
Example



SENSEI™ RX/CX Series :

Step	Display on Temperature Controller
Initial Step	With Controller Off (Blank)
Press button **B** for 1 second	"dES"
Press button **B** for 1 second	"t"
Press button **B** for 1 second	"AdJ"
Press button **B** for 1 second	"F"
Press button **B** for 1 second	"A"
Press button **B** for 1 second	"E" (Only if code 17 or 52 is occurring)
Press buttons **A** and **B** for 10 seconds	"ECL" (Reset complete)
This reset procedure will return the water heater to normal operation.	

Picture below shows location of buttons on PC Board.



5. If code 52 does not reset after following the procedure above, contact Rinnai technical support for assistance.

Non-SENSEI™ Series:

Modulating Solenoid Valve Signal Abnormal (POV)

> **⚠ WARNING** Disconnect power and gas supply before proceeding.

1. Check wiring harness for loose, broken or damaged connections from POV valve back to PC Board.
2. Unplug POV valve, using a volt/ohm meter and check resistance readings across the POV coil on the gas valve. The proper resistance reading for this coil can be found in the Tech Data Sheet found on the back side of the water heater's front panel or in the Rinnai Water Heater Service Manual for that model water heater. If you find the coil to be open, replace the gas valve. If resistance reading is found to be within specification, proceed to item #3 below.

   Note: Resistance readings can vary from meter to meter based on the meter's accuracy range and battery life. A weak battery can affect readings; replace your battery if in doubt before performing service. In addition, make sure you have your meter set to the correct resistance (ohm) setting and the component being checked is isolated from the water heater's circuit and power supply.
3. Check voltage to the POV valve while water heater is trying to fire. If you have the proper voltage but keep getting an error code, proceed to the next item.

> **⚠ WARNING** Disconnect power supply to the water heater before proceeding with this task.

4. If code 52 still appears after performing the above inspection replace the PC Board.

Code 54

High Exhaust Gas Temperature

Applies To:

- SENSEI™ Series
- SENSEI™ RX/CX Series
- Non-SENSEI™ Series

Error code 54 — "High Exhaust Gas Temperature" If the exhaust temperature exceeds 163°F, the water heater will reduce its input Btu firing rate. If after 120 seconds the exhaust gas temperature remains above 163°F, the water heater will shut down and flash a code 54.

1. Check around vent termination to ensure clearances were met.
2. Check for restrictions in vent system intake and exhaust ports.
3. Verify venting is within vent clearance specifications and lengths per Rinnai's instructions.
4. Ensure the water heater was installed on gas type that matches rating plate gas type.
5. Ensure inlet water temperature does not exceed 160°F.

> **⚠ WARNING** Turn off the electrical, gas, and water supply to the water heater before proceeding.

6. Check heat exchanger surface for hot spots. If hot spots are found, this indicates blockage inside the heat exchanger due to scale build up. Flush heat exchanger with four gallons of vinegar per flushing instructions found in owner's manual. If heat exchanger shows signs of damage from poor maintenance of the water heater, replace the heat exchanger. If scale build-up caused code 54, treat water supply to prevent future issues.
7. Inspect exhaust gas temperature sensor, wiring and connections back to PC Board. Measure resistance of circuit. Typical resistance values:
   - 11.4 – 14K ohms at 59°F
   - 6.4 – 7.8K ohms at 86°F
   - 3.6 – 4.5K ohms at 113°F
   - 2.2 – 2.7K at 140°F
   - 0.6 – 0.8K at 221°F
8. Check for fan air leakage (leakage between air intake and combustion chamber).
9. **SENSEI™ models and SENSEI™ RX/CX models:** Remove heat exchanger from water heater. Separate burner from primary heat exchanger and inspect fins inside heat exchanger for blockage. If debris is found, clean heat exchanger fins with 120 psi compressed air.

   Note: If removing the burner for service or replacement, purchase (101 Burner Gasket-Large). Burner gasket MUST NOT be reused after removal. Ensure burner plate and heat exchanger surface is change and smooth before reinstalling burner.
10. **Non-SENSEI™ models:** Remove manifold, sight plate and burner assembly to inspect heat exchanger fins for restrictions. If debris is found, clean heat exchanger fins with 120 psi compressed air. Replace gaskets if damaged.
11. If code 54 still appears after performing the above inspections, replace the PC Board.

Code 57

Burner Overheat Bi-Metal Switch

Applies To:

- Non-SENSEI™ Series

A code 57 will appear when one of the two bi-metals opens on the rear of the burner assembly. Code 57 will appear regardless of whether or not the water heater is in operation. To reset this code, you must correct the problem with the bi-metal switch first. Then, turn the power off to the water heater and then back on. This is called a hard re-set.

1. Check burner overheat bi-metal switch wiring harness for loose, broken or damaged connections from sensor back to PC Board.
2. Verify water heater is connected to the proper type gas. For example, a natural gas water heater should be connected to natural gas.

> **⚠ WARNING** You must be qualified to service gas systems before proceeding.

3. Verify low/high fire manifold pressures are set properly. See gas pressure setting procedures for pressure setting at your elevation.
4. If water heater was ever converted from one gas type to another, verify the conversion process was performed per the manufacturer's instructions and all pressures and DIP switches were properly set to match the gas type water heater was converted too.

> **⚠ WARNING** Disconnect power supply to water heater before proceeding with this task.

5. Replace sensor.

NOTE: For KB Series Condensing Tankless Water Heaters, reference Technical Bulletin 107 ("Troubleshooting Code 14 and Code 57 on KB Series Condensing Tankless Water Heaters").

Code 58

Secondary Heat Exchanger Sensor

Applies To:

- Non-SENSEI™ Series

A code 58 will appear when one of the two bi-metal switches on the secondary heat exchanger opens. These bi-metal switches are located on the rear of the secondary heat exchanger where the air box connects to the heat exchanger. The code 58 will appear regardless of whether or not the water heater is in operation. To reset this code you must correct the problem with the bi-metal switch first. Then, turn the power off to the water heater and then back on. This is called a hard reset.

1. Check sensor wiring harness for loose, broken or damaged connections from sensor back to PC Board.
2. Measure resistance value of circuit from PC Board connectors. Resistance should be less than 1 ohm.
3. This code indicates a scale build-up inside the secondary heat exchanger and it needs to be flushed to prevent damage. Refer to flushing instructions in the owner manual. Hard water must be treated to prevent scale build-up or damage to the heat exchanger will occur.

Code 61

Combustion Fan Motor

Applies To:

- SENSEI™ Series
- SENSEI™ RX/CX Series
- Non-SENSEI™ Series

⚠ WARNING Before servicing fan motor, turn off power and gas supply to the water heater. Never attempt to plug or unplug motor while power is supplied to the water heater. Failure to follow this procedure could lead to damaged components including the fan motor.

1. Check wiring harness for loose, broken or damaged connections from fan motor back to PC Board.
2. Remove fan motor with power and gas supply turned off. Inspect blower wheel to ensure it turns freely.
3. Check fan housing for debris that could prevent the fan wheel from turning.
4. **SENSEI™ Series Models and SENSEI™ RX/CX Series Models:** Ensure check valve behind the fan motor is not sticking in the closed position.
5. Measure fan motor winding resistance. See Technical Data Sheet behind front cover of the water heater or in service manual for proper resistance readings. If windings are open, replace motor.
6. **SENSEI™ RX/CX Series Models:** Measure voltage of Combustion Fan on PC Board at Connector CN7 (refer to "Electric Circuit Table" in Tech Sheet and Wiring Diagram for further clarification) while unit is in operation:
   - Connector "CN7" Red wire pin #1 and Black wire pin #2 at PC Board = 7-48VDC
   - Connector "CN7" White wire pin #4 and Black wire pin #2 at PC Board = 2-14VDC
   - Connector "CN7" Yellow wire pin #3 and Black wire pin #2 at PC Board = 11-13VDC
7. If motor windings and voltage of combustion fan are within specifications and fan motor turns freely, replace PC Board.

Code 63

Recirculation Low Flow

Applies To:

- SENSEI™ Series
- SENSEI™ RX/CX Series
- Non-SENSEI™ Series

1. ***Non-SENSEI™ Models Only:*** Verify DIP switches were set to the proper position for the type of recirculation system in use, crossover or dedicated recirculation. See owner's manual for details.
2. Ensure bypass plug is removed and bypass filter is installed in the crossover valve mode (COV).

> **⚠ WARNING** Turn off the water supply, drain the water heater before removing the inlet water and/or bypass filters.

3. Clear filters of all debris, reinstall and bleed plumbing system of all air.
4. Ensure cold water inlet and hot water outlet valves are open.
5. Purge air from recirculation line, allow water flow until no air can be heard at the fixtures.
6. Open bleeder valve installed below water heater and allow all air out of plumbing system.

> **⚠ CAUTION** System is pressurized. Place bucket under valve to catch water being released. Be prepared to shut off the inlet cold water feed, in case this fitting is screwed out to far.

7. Ensure recirculation pump it getting the proper supply voltage at the pump wiring harness. It should be 120 VAC.
8. If installed on a dedicated return, ensure line does not exceed maximum length allowed for your piping size and the parameter for Economy or Comfort mode is properly set. See manual for details.
9. Turn off the water supply. In the dedicated mode ensure the plug was installed in the filter housing on the recirculation side of the water heater.
10. ***SENSEI™ Models and SENSEI™ RX/CX Models:*** Verify the Recirculation Setting Parameter 04 was properly selected.
    - Parameter 04 selection A = No Recirculation
    - Parameter 04 selection B = Recirculation (Dedicated)
    - Parameter 04 selection C = Crossover Mode Long Loop for SENSEI™ Models, and Crossover Mode for SENSEI™ RX/CX Models
    - Parameter 04 selection D = Crossover Mode Short Loop for SENSEI™ Models, and N/A for SENSEI™ RX/CX Models

11. ***SENSEI™ Models and SENSEI™ RX/CX Models:*** Verify the Recirculation Setting Parameter 04 was properly selected.
    - Parameter 05 selection A = Economy Mode
    - Parameter 05 selection B = Comfort Mode
12. Isolate the plumbing system with the valve kit hot/cold water feed line. Connect a 50 ft. to 100 ft. hose to the water heater valve kit. Place one end of the hose on the cold water connection threads and the other end to the hot water connection threads. You will need an adapter sold at your local hardware store to adapt the male end of the hose to a female thread. The hose being connected to the water heater is creating an independent circulation loop, which isolates the home's loop. Next, open the valve on the valve kit, allowing water to flow into the hose. Bleed all air from the hose with the pump drain or pressure relief valve. Be sure to have a bucket to catch all water being released. Now power the system up and allow the pump to cycle on. If this system operates without throwing a code 63, you have air or a leak in your home's plumbing system. Close the valve kit drain valve and disconnect your hose. Open the cold and hot water feed lines back up and proceed to the test below or properly bleed to plumbing system on the structure.
13. If you continue to get a code 63, check the plumbing system for leaks. First, ensure all fixtures in the building are not in use. Next, place a pressure gauge on a hose connection outside the structure. Open that fixture to pressurize the gauge. Check to ensure you have no leaks at the gauge. Go to the water meter or well and shut off the main water feed to the building. Go back to the gauge on the hose connection and ensure the building is holding pressure. If the pressure bleeds down, this indicates you have a leak in your plumbing system. The reason for the code 63 is, when the circulation pump comes on, it is drawing a higher flow rate than the leak, which in turn sucks air into the system.
14. ***SENSEI™ RX/CX Models Only:*** If recirculation water temperature is not adequate, confirm pump speed is set to Max (Parameter 16A). Recirculation flow rate must be greater than 0.4 GPM (1.5 L/min).
15. Ensure recirculation loop equivalent length does not exceed 400 ft (122m) with 3/4 in. pipe or 100 ft (30m) with 1/2 in. pipe.
16. ***SENSEI™ Models and SENSEI™ RX/CX Models:*** If the water heater does not have a circulation pump connected to it, ensure parameter 04 is set to A, meaning the pump logic is deactivated. If parameter 04 is programmed to setting B with no pump connected, it will code out with error code 63.

RH180 Models:

Circulation Flow Rate below 1.3 GPM

1. Next, using the temperature controller see if water heater is producing flow. To display the recovery flow rate in gallons per minute through the water heater, press the "UP" button for 3 seconds, followed by the "ON/OFF" button. The display will display a number, that number is your flow rate. Example 5 = 0.5 GPM, 21 – 2.1 GPM. If the flow rate is below 1.3 GPM perform the following checks;
    - Bleed all air from the system tank and pump.
    - Clean the inlet water filter.
    - Verify you have the proper water supply to the water heater at a flow rate of six gallons plus.
    - Verify you have 30 to 50 psi of inlet water pressure to the water heater.
    - If application is using a crossover valve inspect and clean pump filter on water heater.
    - If installed on a dedicated circulation return line, inspect return line to ensure check valves are functional and you have no restrictions in this line.

Code 65

Water Flow Control Device

Applies To:

- SENSEI™ Series
- SENSEI™ RX/CX Series
- Non-SENSEI™ Series

1. Check wiring harness to the water flow servo for loose, broken or damaged connections from the servo valve back to PC Board.
2. Turn off, and then turn on power to the water heater. See if code resets.
3. The water flow servo valve has failed to close during the bath fill function. Immediately turn off the water flow and discontinue the bath fill controller.

> **⚠ WARNING** Turn off the electrical, gas and water supply to the water heater before proceeding.

4. Replace water flow control servo.
5. **SENSEI™ Series Models Only:** Measure voltage of **Water Flow Control Device on PC Board at Connector (Plug D4)**:
   - Connector "D" red wire pin #18 and pink wire pin #20 = 44 - 52Ω.
   - Connector “D” white wire pin #16 and blue wire pin #14 = 44 ~ 52Ω.
   - Connector “D” grey wire (turns black before getting to board) pin #30 and orange wire pin #12 = 12 ~ 14 VDC.
6. **SENSEI™ RX/CX Series Models Only:** Measure voltage and/or resistance of **Water Flow Control Device on PC Board at Connector (Plug CN9)**:
   - Connector “CN9” red wire pin #16 and pink wire pin #17 = 40-60 Ω.
   - Connector “CN9” white wire pin #15 and blue wire pin #14 = 40-60 Ω.
   - Connector “CN9” grey wire pin #5 and orange wire pin #9 = 11-13 VDC.
   - Connector “CN9” grey wire pin #5 and brown wire pin #13 = less than 1 VDC when limiter is on or 4-6 VDC when limiter is off.

Code 66

Bypass Flow Servo

Applies To:

- SENSEI™ RX/CX Series

1. Verify the harness and connector are not wet.
2. Measure resistance values of Bypass Flow Control Device at connector on PC Board (refer to “Electric Circuit Table” in Tech Sheet and Wiring Diagram for further clarification).
   - Connector “CN10” red wire pin #17 and pink wire pin #18: 40 - 60Ω.
   - Connector “CN10” blue wire pin #15 and white wire pin #16: 40 - 60Ω.
3. If one of these resistance values is out of the range, replace the PC board, and otherwise replace the bypass flow control device.

Code 70

PC Board Fault

Applies To:

- SENSEI™ Series
- SENSEI™ RX/CX Series
- Non-SENSEI™ Series

1. Check to ensure all water heater parameters were properly set.
2. Check all wiring harnesses at the connection to the PC Board to ensure they are not loose, broken or damaged.
3. Replace PC Board.
4. **SENSEI™ Series Models Only:** After replacing PC Board, you will have to transfer data from old board to new board using data transfer cable that comes with the new PC Board. If the data transfer is not possible, you can manually program all parameters with the step by step instructions included with the new board. Refer to "PCB Replacement Instructions" (100000553), program all parameters correctly.
5. **SENSEI™ RX/CX Series Models Only:** After replacing PC Board, you will have to transfer data from old board to new board using data transfer cable that comes with the new PC Board. If the data transfer is not possible, you can manually program all parameters with the step by step instructions included with the new board. Refer to "PCB Replacement Instructions" (100000854), program all parameters correctly.

Code 71

Gas Solenoid Valve

Applies To:

- SENSEI™ Series
- SENSEI™ RX/CX Series
- Non-SENSEI™ Series

SENSEI™ Series and SENSEI™ RX/CX Series:

1. Ensure single DIP switch on PC Board is in the “OFF” position.
2. Check wiring harnesses for the gas solenoid valve for loose, broken or damaged connections from gas valve solenoids back to PC Board.

> **⚠ WARNING** Turn off the electrical, gas and water supply to the water heater before proceeding.

3. Measure resistance and/or voltage of the **Gas Solenoid Valve on PC Board:**
   - **SENSEI™ Series:** Connector “D” on PC Board black wire pin #27 and yellow wire pin #29 = 18 ~ 22 ohms or 11 ~ 13 VDC
   - **SENSEI™ RX/CX Series:** Connector “CN9” on PC Board black wire pin #3 and yellow wire pin #4 = 11 ~ 13 VDC
4. Ensure heater circuit is not grounded.
5. Replace gas valve.
6. **SENSEI™ Series Models Only:** Replace PC Board. After replacing PC Board, transfer data from old board to the new board using data transfer cable provided with the new PC board. If the data transfer is not possible, you can manually program all parameters with the step by step instructions included with the new board. Refer to “PCB Replacement Instructions” (100000553), program all parameters correctly.
7. **SENSEI™ RX/CX Series Models Only:** Replace PC Board. After replacing PC Board, transfer data from old board to new board using data transfer cable that comes with the new PC Board. If the data transfer is not possible, you can manually program all parameters with the step by step instructions included with the new board. Refer to “PCB Replacement Instructions” (100000854), program all parameters correctly.

Non-SENSEI™ Series:

SV0, SV1, SV2 or SV3 Solenoid Valve Fault

> **⚠ WARNING** Turn off the electrical, gas and water supply to the water heater before proceeding.

1. Check wiring harnesses to SV0, SV1, SV2, SV3 and SV4 for loose, broken or damaged connections from gas valve solenoids back to PC Board.
2. Check for moisture in plastic tubing on internal water heaters from bottom of combustion box back to gas valve. If moisture is found in this tube, replace gas valve. Remove burner manifold and burner assembly to determine what is causing the moisture. Look for a leaking heat exchanger or condensation coming from the vent system.

   If the heat exchanger is leaking, replace it and any other components damaged due to that leak.

   If the moisture is caused by condensation running back into the water heater from the vent system, make provisions to stop this by installing a condensate drain line at the top of the water heater.
3. Check voltage to SVO and SV1 while water heater is trying to fire. If you have proper voltage but keep getting an error code, proceed to item 4 below.
4. Measure the resistance of SV0, SV1, SV2, SV3 and SV4. If any of the solenoid valves are found to be open, meaning they have no resistance, replace the gas valve and burner manifold with the new solenoids. Proper resistance values can be found in the technical data sheet under the water heater's front cover.
5. If you are still getting a code 71, replace the gas control valve. It is possible to have good resistance values, however a mechanical obstruction inside the valve may limit functionality.
6. Replace PC Board.

Code 72

Flame Rod Fault

Applies To:

- SENSEI™ Series
- SENSEI™ RX/CX Series
- Non-SENSEI™ Series

1. Check wiring harnesses to flame rods for broken or damaged connections from flame rod back to PC Board.
2. Ensure flame rod is touching flame when water heater fires.
3. Remove flame rod and check for carbon build-up. Replace the flame rod and gasket if necessary.
4. Measure micro amp output from flame rod. It should maintain a minimum of 1 micro amp.
5. Replace flame rod and flame rod gasket.
6. Verify heat exchanger is not leaking. Replace if needed.
7. Replace the PC Board.
8. **SENSEI™ Series Models Only:** After replacing PC Board, transfer the data from old board to new board using data transfer cable provided with the new PC Board. If the data transfer is not possible, you can manually program all parameters with the step by step instructions included with the new board. Refer to "PCB Replacement Instructions" (100000553), program all parameters correctly.
9. **SENSEI™ RX/CX Series Models Only:** After replacing PC Board, you will have to transfer data from old board to new board using data transfer cable that comes with the new PC Board. If the data transfer is not possible, you can manually program all parameters with the step by step instructions included with the new board. Refer to "PCB Replacement Instructions" (100000854), program all parameters correctly.

Code 73

Burner Thermocouple Fault

Applies To:

- Non-SENSEI™ Series

1. Check wiring harness at burner thermocouple back to PC Board for loose, broken or damaged wiring or connections.
2. Verify all DIP settings are set to the proper altitude per the tech sheet, found under the front panel of your water heater. This information can also be found in the product's service manual.

   ⚠ WARNING You must be qualified to service gas systems before proceeding.

3. Confirm low/high fire manifold gas pressures are set to factory specification per the altitude the water heater is installed at. Manifold gas pressure settings and directions can be found on the tech sheet under front panel of the water heater or in the service manual.
4. Replace burner thermocouple. If code reappears after replacing this component, replace PC Board.

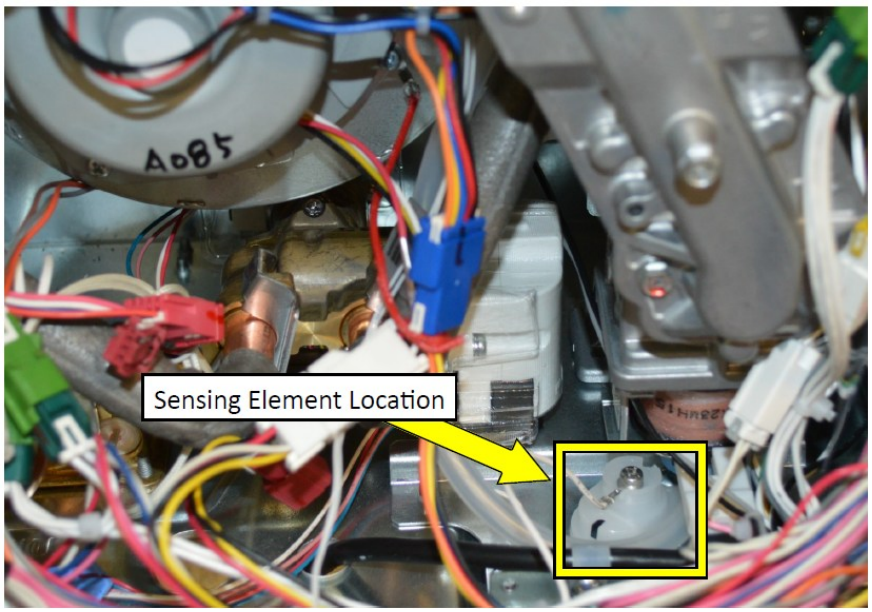
Code 79

Water Leakage Detected

Applies To:

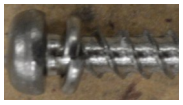
- Non-SENSEI™ Series

1. Check wiring harness at leak detector for loose, broken or damaged wiring or connections.
2. Check the heat exchanger and all piping inside the water heater for leaks.
3. If no leaks are found, inspect inside of cabinet for signs of water pooling on bottom pan of water heater. Wipe or blow out any water found in cabinet. Dry off leak sensor and restart water heater to observe if Code 79 reappears.
   - If Code 79 clears, you may stop troubleshooting.
   - If Code 79 persists, continue to the next step.
4. If no water is found in cabinet, unplug leak sensor and restart water heater to observe if Code 79 reappears.
   - If Code 79 clears, continue to the next step.
   - If Code 79 persists, check if the leak sensor's connector on the PCB has a short circuit.
5. If water heater operates with leak sensor unplugged (see images below).
   - Remove leak sensor screw.
   - Manually shorten the screw: Using a tool (such as wire strippers, hacksaw, bolt cutter, etc.), cut the screw by the length of three turns (threads).
   - Optional: After cutting, smooth the end of the screw with sandpaper to remove any sharp edges.
   - Replace leak sensor screw.



Original Screw

Shortened Screw



Code FE

Flammable Vapors Detected

Applies To:

- RH180 (Hybrid Tank-Tankless Non-SENSEI™ Series Water Heater)

⚠ WARNING

- Leave the space or room the water heater is installed in until safety personal have identified the area as safe and all flammable vapors are removed and eliminated.
- You MUST be qualified to service gas water heaters before proceeding with the following steps.

1. Disconnect power supply to water heater.
2. Remove water heater front panel. Inspect Flammable Vapor Sensor and wiring harness for loose, damaged or broken wires or connectors. Inspect from sensor back to PC Board.
3. Verify Flammable Vapor Sensor is properly mounted and not damaged.
4. When you are certain no flammable vapors are present, turn power and gas back on to water heater. Open a tap and allow water heater to fire up and check the following voltage outputs listed in chart below. If the FE code reappears and you are certain no flammable vapors are present, replace the Flammable Vapor Sensor.

PCB Connector	Part Name	Wire Color	Pin #	Voltage (DC)
D1	Flammable Vapor Sensor	Red—Black	(D) 1 - 6	1.9 to 2.1 VDC
		White—Yellow	(D) 4 - 3	25.5 to 39.5 VDC

5. Replace PC Board.

Code FF

Maintenance Has Been Performed

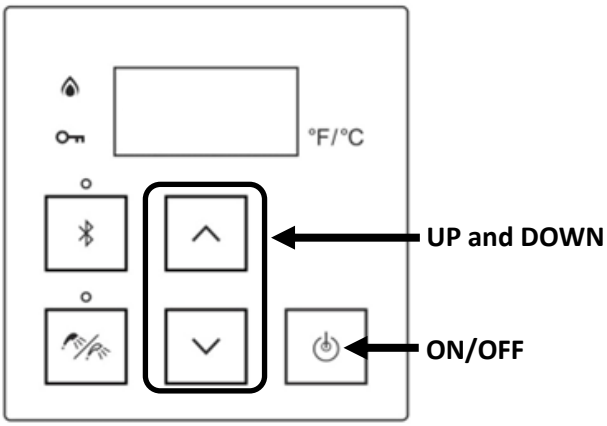
Applies To:

- SENSEI™ Series
- SENSEI™ RX/CX Series
- Non-SENSEI™ Series

FF is a placeholder code in the diagnostic code history indicating that maintenance or service was performed by a service provider.

After maintenance or service is performed, enter code **FF** by following the instructions below:

1. Press the **UP** button and hold for at least 0.5 seconds.
2. While holding the **UP** button, press the **DOWN** button (hold both buttons simultaneously for at least 0.5 seconds).
3. While holding both **UP** and **DOWN** buttons, press the **ON/OFF** button.
4. The display then shows **FF**.



Code SE

Cascade Diagnostic Display

Applies To:

- SENSEI™ Series
- SENSEI™ RX/CX Series

Appears in SENSEI™ Commercial water heaters and SENSEI™ CX Series only.

With cascade connections on commercial water heaters, the primary water heater's display will flash between "SE" and the selected set temperature when an error code is displayed on any secondary water heater.

Code SS (SS)

Service Soon (SS) Alert (Appears as SS)

Applies To:

- SENSEI™ Series
- SENSEI™ RX/CX Series

SENSEI™ Series:

SS is a time-based service indicator set during installation. See section “4.12 Parameter Settings” in owner’s manual for additional details on setting or changing the **SS** indicator. **SS** indicates that it is time for service. The heat exchanger should be flushed to prevent damage (refer to section “6.3 Flushing the Heat Exchanger” in owner’s manual for more information). **Hard water must be treated to prevent scale build-up or damage to the heat exchanger.**

To reset the SS code, push the **On/Off** button on the temperature controller five times in five seconds.

Verify the Service Soon Alert (SS) Parameter 03 was set to your selection.

- Parameter 03 selection A = Not Active
- Parameter 03 selection B = 0.5 yrs.
- Parameter 03 selection C = 1 yr.
- Parameter 03 selection D = 2 yrs.

SENSEI™ RX/CX Series:

SS is a time-based service indicator set during installation. See section “4.13 Configure Parameter Settings” in owner’s manual for additional details on setting or changing the **SS** indicator. **SS** indicates that it is time for service. The heat exchanger should be flushed to prevent damage (refer to section “6.3 Flushing the Heat Exchanger” in owner’s manual for more information). **Hard water must be treated to prevent scale build-up or damage to the heat exchanger.**

To reset the SS code:

1. Push the “B” button five times until SS appears in the controller display.
2. Push and hold the “A” button for 10 seconds until “SCL” appears. (After a few seconds, “SCL” will automatically disappear). The SS code is reset, and the controller now displays the set temperature.

Verify the Service Soon Alert (SS) Parameter 03 was set to your selection.

- Parameter 03 selection A = Not Active
- Parameter 03 selection B = 0.5 yrs.
- Parameter 03 selection C = 1 yr.
- Parameter 03 selection D = 2 yrs.

Code 00, LC, LC0-LC9

Applies To:

- SENSEI™ RX/CX Series
- Non-SENSEI™ Series

SENSEI™ RX/CX Series:

Scale build-up in Heat Exchanger (when checking maintenance code history. “00” is substituted for “LC”)

1. Flush heat exchanger per recommended flushing procedure found in water heater’s owner’s manual. Refer to section “6.3 Flushing the Heat Exchanger” in owner’s manual for more information.
2. There is a shutdown feature built into the product to prevent damage caused by the water heater scaling up. See reset function for these water heaters below:
   - LC, 00, or LC0 – LC9 indicates that there is a scale build-up in the heat exchanger and that it needs to be flushed to prevent damage. Refer to the flushing instructions in the owner’s manual. Hard water must be treated to prevent scale build-up or damage to the heat exchanger. **The above codes will lock the water heater out, requiring a reset function. See below how to reset.**
   - To operate the water heater **temporarily** until the heat exchanger can be flushed, push the on/off button on temperature controller five times within five seconds. **(Water heater will operate for 70hrs and lock out with another LC code) Example: LC2 indicates**
     water heater has been reset for 3 - 70hr periods without flush and hard reset.

     After temporary reset, controller will cycle between set temperature and LC#.

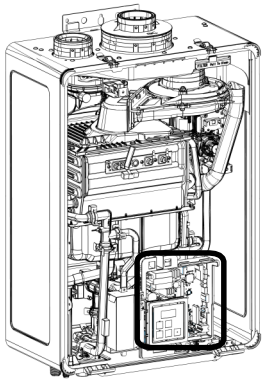
After flushing water heater, the procedure to reset LC codes:

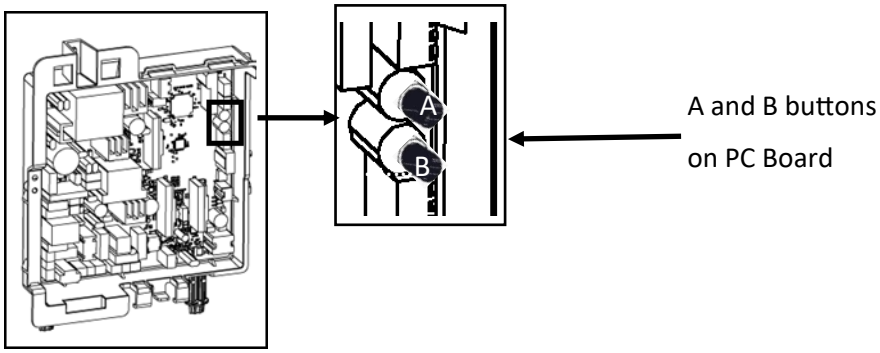
- If flushing water heater completes properly, LC codes is reset automatically.
- If not, push the two switches (A and B) on PC Board at the same time for five seconds.
- Water heater will return to normal operation and LC# count returns to 0.

This hard reset procedure is not in owners/installation manual or tech sheet.

With Rinnai Central app, you can see Flushing History.

Picture below shows location of buttons on PC Board.





Non-SENSEI™ Series:

Scale build-up in Heat Exchanger (when checking maintenance code history. “00” is substituted for “LC”)

1. Flush heat exchanger per recommended flushing procedure found in water heater’s owner’s manual.
2. **NOTE:** The LC, LC0 – LC9 codes are the only codes that will allow a water heater to continue to operate. The display will alternate between the LC codes and the temperature setting. The controller will continue to beep.
3. On older products, you can reset the LC code by turning off the power and then turning it back on.
4. On newer products, there is a shutdown feature built into the product to prevent damage caused by the water heater scaling up. See reset function for these water heaters below:
    - LC, 00, or LC0 – LC9 indicates that there is a scale build-up in the heat exchanger and that it needs to be flushed to prevent damage. Refer to the flushing instructions in the owner’s manual. Hard water must be treated to prevent scale build-up or damage to the heat exchanger. **The above codes will lock the water heater out, requiring a reset function. See below how to reset.**

    - To operate the water heater **temporarily** until the heat exchanger can be flushed, push the on/off button on temperature controller five times. **(Water heater will operate for 70hrs and lock out with another LC code) Example: LC2 indicates water heater has been reset for 3 - 70hr periods without flush and hard reset.**

      After temporarily reset, controller will cycle between set temperature and LC#.

After flushing water heater, the procedure to reset LC codes:

- Push the two switches (A and B) on PC Board at the same time for five seconds.
- Water heater will return to normal operation and LC# count returns to 0.

This hard reset procedure is not in owners/installation manual or tech sheet.

Troubleshooting: No Code

Applies To:

- SENSEI™ Series
- SENSEI™ RX/CX Series
- Non-SENSEI™ Series

No Code Related to Water Flow Issues:

1. On temperature controller, access performance data (see section “View Performance Data” in this document for steps). Check values for water flow rate (01) and water temperature sensors (02, 08, and 11).
2. Ensure that minimum activation water flow rate is achieved. If not, isolate unit from plumbing and test again.
3. Check/clean inlet water supply filter.
4. Ensure hot and cold water lines are not reversed/cross connected.
5. Ensure there is not a crossover/cross connection somewhere in the building plumbing or a plumbing fixture.
6. Check to ensure the water flow turbine spins freely.
7. Measure the resistance of the water flow sensor. See technical data sheet behind front cover of water heater for proper readings.
    - **SENSEI™ RX/CX Series:** Connector “CN9” on PC Board red wire pin #8 and black wire pin #7 = 11 ~ 14VDC
    - **SENSEI™ RX/CX Series:** Connector “CN9” on PC Board yellow wire pin #6 and black wire pin #7 = 4 ~ 7 VDC while more than 0.26 gpm (1.0 L/m) water is running
8. If unit is registering flow, check temperature sensor values. Note: if unit is not firing, all values should register approximate ground water temperature. Inspect thermistor and wiring back to PC Board connections.
9. If the display is blank and clicking is heard from water heater, disconnect water flow servo motor and/or bypass valve. If display comes on and clicking stops, replace water flow servo valve and/or bypass valve.

No Code Related to Water Heater Tripping Ground Fault Receptacle or Breaker (RUR Models Only)

Inspect pump housing around aluminum casing for signs of water strains or water weeping from casing. If you find the above situation, that is an indication the O-ring on the pump shaft is allowing water to seep into the motor winding. Solution is to replace the pump/motor assembly.

No Code Related to Cold Water Sandwich Caused by Low Flow

Applies To:

- SENSEI™ Series
- SENSEI™ RX/CX Series
- Non-SENSEI™ Series

1. Open fixture and record flow rate using the water heater's temperature control pad.
2. Shut off hot/cold water feed lines to the water heater, remove inlet water filter and check for debris. Clean if necessary. Re-install filter and turn on water supply. Open the same tap again and recheck your flow rate to see if it increased. If the flow rate is less than (1) gpm, remove the restrictor and clean the strainer in that fixture. You should have at least (1) gpm of flow at all fixtures. Otherwise, pressure drops in the plumbing system, due to improperly sized plumbing, can cause the flow rate to drop below the minimum flow rate requirement of the water heater. This will cause the water heater to cycle on/off causing a cold water sandwich.

Cold water sandwiches can be caused by numerous items such as:

- Improperly installed, faulty, or flapping check valves. Swing check vales should be installed with the hex cap horizontal, facing upwards.
- Debris in fan motor blower wheel which may cause the water heater to ramp up/down in Btu's due to cycling.
- Clogged inlet water filter which may cause restricted water flow. Always clean filter on all service calls.
- Inlet gas pressure changing due to under sized meters, regulators, gas lines, tanks, etc. Must ensure gas system is sized properly. Check inlet gas pressure while the water heater is operating looking for inlet gas pressures surging up and down. This would indicate an issue with the gas supply.
- Inlet water pressure fluctuating which may cause the water heater to cycle on/off on low flows. Can be caused by fluctuating water supplies due to improperly sized plumbing systems, well system problems, and utility water systems fluctuating.
- MSA and/or MSB system causing the system to cycle, especially if water heater #1 has a clogged filter or restricted flow. If water heater #1 is creating the issue, you may have to install a PVA valve to resolve the cycling issue.
- A faulty valve diaphragm or check valve in the plumbing system can cause cold water to bleed into the hot side of the plumbing system resulting in temperature fluctuations at the fixture. Check the entire plumbing system, both upstream and down stream, of the fixture for possible bleed over of cold water into the hot side of the plumbing system.
- Standard use of water in a plumbing system without recirculation. When a consumer cycles hot water use (on/off in short period of time) it is possible to introduce some cold water into the hot plumbing system. This segment of cold water is introduced during the ignition sequence after the water heater recognizes the subsequent use hot water and may result in a temporary fluctuation in temperature at the hot water fixture.
- Demand systems – each time a demand system calls for hot water the water heater cycles on. If the consumer does not leave the tap open, the water heater cycles off. When the water is turned back on within a few minutes of the demand system cycling, a cold water sandwich is created.
- Loose or bad electrical connection inside the water heater or power supply to product. Power supply could be dropping out momentarily due to a component heating up, loose wiring connections, etc.
- Low flow shower heads, especially in area with high ground water temperatures. Remove the flow restrictor, if possible, to increase the flow rate. If not possible, the fixture may have to be replaced.

No Code Related to Cold Water Sandwich Caused by Faulty Fixture

Applies To:

- SENSEI™ Series
- SENSEI™ RX/CX Series
- Non-SENSEI™ Series

1. Have customer explain an issue.
2. Turn off hot water ball valve on the Rinnai valve kit at the water heater. This should shut off the water flow to all hot water fixtures at the location. Turn on a hot water fixture to check and see if any water continues to flow at that fixture. After roughly two minutes, all residual water in the system should bleed down to no flow at your fixtures. If water continues to flow at any flow rate, you have a faulty fixture, check valve, or a cross over in the plumbing system. Locate faulty fixture and correct the bleed over.
3. Ask the customer if the location has a circulating system. If so, isolate to circulation loop from the plumbing system by means of a shut off valve in the return loop. We are trying to ensure water is not bypassing the water heater through a faulty check valve in the return loop. After shutting off the ball valve in the circulating loop, all water flow should stop. If not, you may still have a faulty fixture.
4. Proceed to all fixtures with single handle levers and shut off the cold water ball valve at each fixture, one at a time. Check flow after shutting off the cold water line at each fixture. If water flow stops during this process, go back to the last fixture turned off and open the cold water ball valve. If flow starts back, that fixture has a bad diaphragm in it. You can either replace the faulty fixture insert or install a check valve in the hot water feed to prevent cold water from back feeding.
5. If location has a mixing valve, isolate mixing valve and turn off the cold water feed to that device. If the water temperature reaches temperature and continues to maintain temperature with the mixing valve isolated, the problem is in the mixing valve.

Troubleshooting: View Diagnostic Information

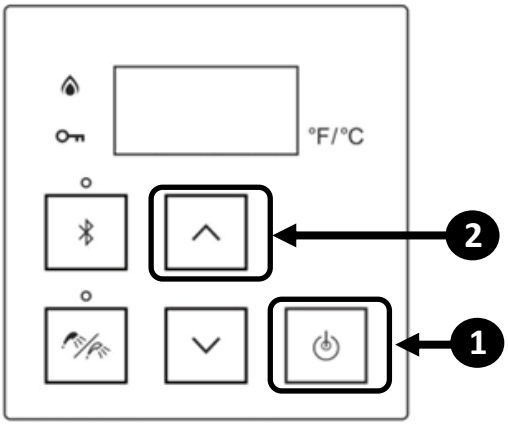
Applies To:

- SENSEI™ Series
- SENSEI™ RX/CX Series
- Non-SENSEI™ Series

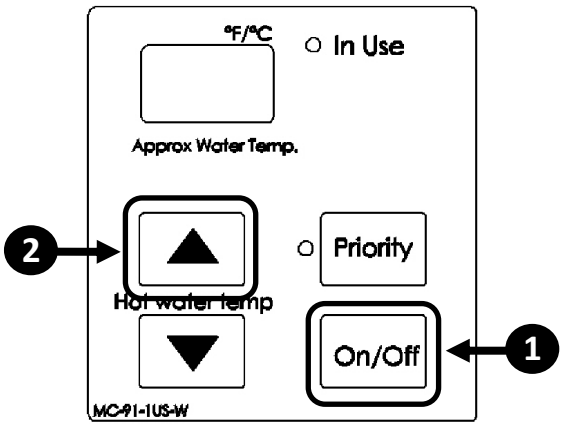
To display diagnostic codes:

1. Turn off the water heater by pressing the “On/Off” button.
2. Press and hold the “On/Off” for 2 seconds and then the ▲ (Up) button simultaneously.
3. The last 9 maintenance codes display and flash one after the other.
4. To exit diagnostic codes and return the water heater to normal operation, press and hold the “On/Off” button for 2 seconds and then the ▲ (Up) button simultaneously.
5. Turn on the water heater by pressing the “On/Off” button.

Controller for RX/CX Models:

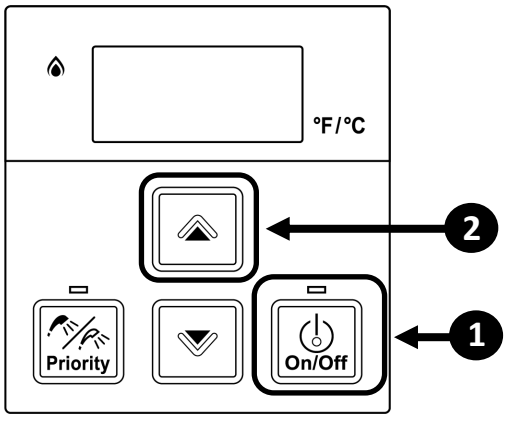


Controller for all Models Except RE/REP Models or RX/CX Models



- Part #: MC-91-2 (Residential Applications)
- Part #: MCC-91-2 (Commercial Applications)

Controller for RE/REP Models:

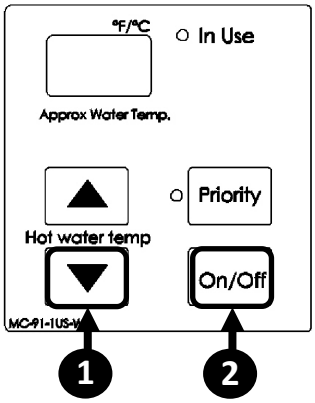
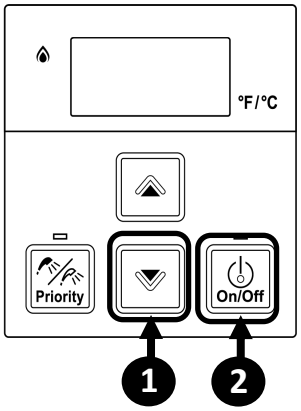
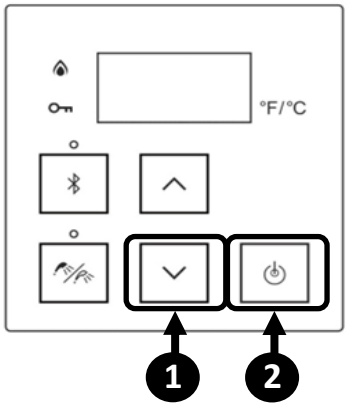


- Part #: MC-601 (Residential Applications)
- Part #: MCC-601 (Commercial Applications)

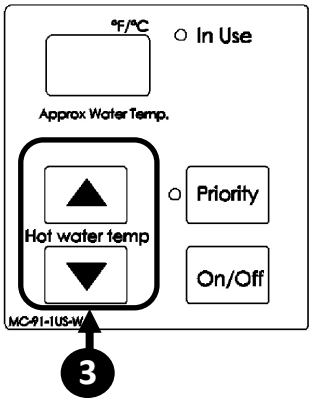
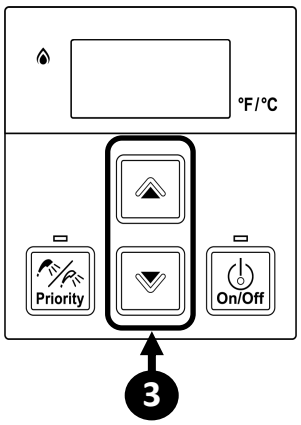
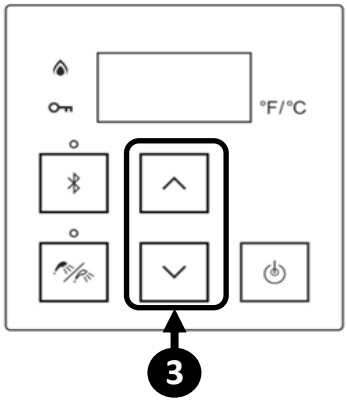
View Performance Data

To View Performance Data:

1. Press and hold the ▼(Down) button.
2. While holding the ▼(Down) button for 2 seconds, press and hold the “On/Off” button (hold both buttons simultaneously).

Controller for all Models Except RE/REP Models and RX/CX Models[1]	Controller for RE/REP Models[2]	Controller for RX/CX Models
		

3. Use the ▲ (Up) and ▼ (Down) buttons to scroll to the desired performance information described below.

Controller for all Models Except RE/REP Models and RX/CX Models[1]	Controller for RE/REP Models[2]	Controller for RX/CX Models
		

[1]
- Part #: MC-91-2 (Residential Applications)
- Part #: MCC-91-2 (Commercial Applications)

[2]
- Part #: MC-601 (Residential Applications)
- Part #: MCC-601 (Commercial Applications)

Note: The Performance data table for your specific water heater may differ for that of the following table. Refer to the Tech Sheet or Installation and Operation manual specific to the water heater for available performance data options.

Performance Data Table

#	DATA	UNIT
01	Water Flow Rate	x0.1 gal/min
02	Outgoing Temperature	°F
03	Combustion Hours	x100 Hours
04	Combustion Cycles	See Table 1 on next page.
05	Fan Frequency	Hz
06	Additional Controllers Connected	1 = Connected 2 = Not Connected
07	Water Flow Control Position	0=mid, 1=Open, 2=Closed
08	Inlet Temperature	°F
09	Fan Current	x10 mA
10	Total Bath Fill Amount	gallons
11	HEX Outlet Temperature	°F
12	By-Pass Flow Control Position	Degrees of opening
15	Freeze Protection Temperature *(Indoor Unit Only)*	Water Temperature in °F
17	Freeze Protection Temperature *(Outdoor Unit Only and RX/CX Series)*	Water Temperature In °F
19	Pump Hours	x100 Hours
20	Pump Cycles	See Table 1 on next page.
21	Exhaust Temperature	°F
22	Pump Frequency (*RX/CX Series Only*)	Hz
23	Lime Detecting Temperature *(RX/CX Series Only)*	°F
24	Descaling Cycles *(RX/CX Series Only)*	
30	Upper Tank Thermistor Temperature (CX Series Only)	°F
31	Lower Tank Thermistor Temperature (CX Series Only)	°F
A0	Accumulated Amount of Hot Water (First 3 Digits)	Gal
A1	Accumulated Amount of Hot Water (Middle 3 Digits)	X 1,000 Gal
A2	Accumulated Amount of Hot Water (Top 3 Digits)	X 1,000,000 Gal
C0	Accumulated Amount of Gas Input (First 3 Digits)	X 100 kcal
C1	Accumulated Amount of Gas Input (Middle 3 Digits)	X 100,000 kcal
C2	Accumulated Amount of Gas Input (Top 3 Digits)	X 100,000,000 kcal

Table 1

04 (Combustion Cycles) and 20 (Pump Cycles)		
Cycle Count	Low Number	High Number
0-999	0	999
1,000-9,999	10-	99-
10,000-65,535	1- -	6- -

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