CHAPTER 17 - MAINTENANCE SCHEDULES

17.1. Service Technician

At least on an **annual** basis the following maintenance should be performed by a qualified service technician:

General

- Attend to any reported problems.
- Inspect the interior of the boiler jacket area; clean and vacuum if necessary.
- Clean the condensate drain assembly and fill with fresh water.
- Check boiler fluid pH on systems.
- Flush and clean dirt separator.
- Check for leaks, both inside and outside the unit: water, gas, flue and condensate.
- Verify vent piping and air inlet piping are in good condition, sealed tight and properly supported.
- Check boiler water pressure, piping and expansion tank.
- Check control settings.
- Check ignition electrode (sand off any white oxide; clean and reposition).
- Check ignition wiring and ground wiring.
- Check all control wiring and connections.
- Check burner flame pattern (stable and uniform).
- Check carbon monoxide detectors.

Additional items if combustion or performance is poor:

- Clean heat exchanger and flue ways.
- Remove burner assembly and clean burner head using compressed air only.

Once the maintenance items are completed, review the service with the owner.

17.2. Owner Maintenance

Periodically:

- Check the area around the unit.
- Check and remove any blockage from the combustion air inlet and ventilation openings.
- Check the temperature and pressure gauges.

Monthly:

- Check vent piping.
- Check combustion air inlet piping.
- Check the pressure relief valve.
- Check the condensate drain system.

Every 6 months:

- Check boiler piping and gas supply piping for corrosion or potential signs of leakage.
- Operate the pressure relief valve.
- Check carbon monoxide detectors.

⚠ WARNING

Follow the maintenance procedures given throughout this manual. Failure to perform the service and maintenance or follow the directions in this manual can result in damage to the HeatMaster TC or system components, resulting in substantial property damage, serious injury, or death.

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18.1. Service Technician Maintenance Procedures

⚠ WARNING

The HeatMaster TC must be inspected and serviced annually, preferably at the start of the heating season, by a qualified service technician. In addition, the owner maintenance and care of the unit as outlined in *Chapter 17 on page 73* and further explained in the HeatMaster User's Information manual, should be performed to assure maximum efficiency and reliability of the unit. Failure to service and maintain the HeatMaster TC and the system components can result in equipment failure, resulting in substantial property damage, serious injury, or death.

NOTICE

The following information provides detailed instructions for completing the service technician maintenance items outline in the maintenance schedule of Chapter 17 on page 73.

18.2. Reported Problems

Any problems reported by the owner should be checked, verified and corrected before proceeding with any maintenance procedures.

18.3. Check Surrounding Area

- Verify that the area surrounding the HeatMaster TC is free of combustible / flammable materials or flammable vapors or liquids. Remove immediately if found.
- Verify that combustion air inlet area is free of any contaminates. Refer to the materials listed in ***Section 2.1 on page 3*** of this manual. If any of these products are in the area from which the unit takes its combustion air, they must be removed immediately or the combustion air intake must be relocated to another area.

18.4. Inspect Burner Area

- Remove the boiler front jacket panel and venturi inlet elbow.
- Vacuum any dirt or debris from the burner/blower components.
- Check the burner plate mounting nuts for tightness, see ***Section 18.26 on page 80*** for torque specification.
- Check burner plate gasket for discoloration or damage.
- Check for flue gas leakage where the condensate pan connects to the heat exchanger and at the top and bottom of the internal vent pipe.
- Re-install venturi inlet elbow and front jacket panel when completed.

⚠ WARNING

Do not use solvents to clean any of the burner components. The components could be damaged, resulting in unreliable or unsafe operation. Failure to comply with this instruction can result in substantial property damage, serious injury, or death.

18.5. Check System Piping

- Inspect all water and gas piping for leaks and verify that the piping is properly supported.
- Inspect the fittings and components on the unit and verify they are leak free.

⚠ WARNING

Eliminate all system water leaks. Continual fresh make-up water will reduce the heat exchanger life causing boiler failure. Leaking water may also cause severe property damage to the surrounding area. Inspect the gas supply piping using the procedure outlined in Section *12.3.4 on page 62*. Failure to comply with this instruction can result in substantial property damage, serious injury, or death.

18.6. Clean Condensate Drain Assembly

- Loosen the retaining nut from the condensate drain assembly and disconnect the assembly from the boiler.
- Empty any water from the trap and flush with fresh water as necessary to clean.
- Remove plastic ball and clean with fresh water.
- Check the drain piping from the condensate drain assembly to the drain. Flush to clean as necessary.
- Install the plastic ball into the condensate drain assembly and reassemble onto the boiler by tightening the retaining nut with rubber seal onto the boiler. Hand tight only.
- Remove the fill plug on the condensate drain assembly and fill with water. See ***Fig. 14 on page 28***.
- Replace the fill plug on drain assembly.

18.7. Check Ventilation Air Openings

- Verify that all ventilation openings to the mechanical room or building are open and unobstructed. Check the operation and wiring of any automatic ventilation dampers.
- Check and verify the vent termination and the combustion air intake are free of debris and obstructions.

18.8. Inspect Vent and Combustion Air Piping

- Visually inspect the venting system and combustion air piping for blockage, deterioration of gaskets or leakage. Repair any deficiencies.
- Verify that the combustion air inlet and vent piping is connected, sealed and properly supported.

⚠ DANGER

Failure to inspect the vent system and combustion air inlet piping and to have any conditions repaired, will result in serious injury, or death.

18.9. Check Boiler System

- Verify all system components are correctly installed and operating properly.
- Check the cold fill pressure for the system. Typical cold water fill pressure is 12 psig.
- Verify the system pressure, as the unit operates at high temperature, does not exceed 25 psig. Excessive pressure indicates expansion tank sizing is incorrect or system performance problems.
- Inspect air vent and air separators in the system. Ensure vents do not leak, replace any leaking vents.
- Verify boiler fluid pH level is between 6.6 and 8.5.
- Check and verify inhibitor /antifreeze concentration within the boiler water meets inhibitor/antifreeze manufacturer's specifications.
- If necessary contact a boiler water treatment company for a chemical analysis.
- Flush and clean dirt separator. Refer to dirt separator manufacturer' s instructions for details.

18.10. Check Expansion Tank

Refer to *Chapter 5 on page 19* for recommended location of the expansion tank and air eliminators.

Diaphragm Tank:

- Ensure the system contains a minimum of one automatic air vent. Recommended location of the air vent should be atop an air eliminator.
- Remove the tank from the system and check the charge pressure. For residential applications, the charge pressure is typically 12 psig. If tank does not hold pressure, then the membrane is damaged and the tank should be replaced.

18.11. Check Boiler Relief Valve

Inspect the relief valve and lift the lever to verify flow at least annually or as recommended on the warning tag of the valve.

⚠ WARNING

Before manually operating the pressure relief valve, ensure the discharge piping is directed to a suitable place of disposal to avoid a potential scald hazard. The discharge piping must be full size without restriction and installed to permit complete drainage of both the valve and line. Failure to comply with this instruction can result in substantial property damage, serious injury, or death.

If after closing the valve, the valve fails to seat properly or continually weeps, replace the relief valve. Ensure the cause of the relief valve to weep is the valve itself, not due to system over-pressurization caused by an expansion tank that is waterlogged or undersized.

18.12. Check Water Heater T&P Relief Valve

⚠ WARNING

Before operating T&P relief valve, make sure no one is in front of or around T&P relief valve discharge piping. Hot discharge water can cause substantial property damage, serious injury, or death.

- Move operating lever to open position for a few seconds and then move it back, allowing it to snap closed. After T&P relief valve is operated, if it continues to release water, close cold water inlet to water heater immediately. Follow draining instructions, and replace T&P relief valve. If T&P relief valve weeps periodically, it may be due to thermal expansion see *Section 4.8 on page 15*. Do not plug T&P relief valve or discharge piping.

⚠ WARNING

Plugging T&P relief valve or discharge piping can cause excessive pressure in water heater, resulting in substantial property damage, serious injury, or death.

18.13. Inspection of Ignitor

- Remove the ignitor from the burner mounting plate.
- Remove any white oxides accumulated on the ignitor using fine grit sandpaper or steel wool. If the ignitor does not clean to a satisfactory condition, replace the ignitor.
- When installing the ignitor, ensure the gasket is in good condition and correctly positioned. Replace the gasket if necessary. Tighten ignitor screws in multiple steps, alternating between the screws to ensure proper alignment. See *Section 18.26 on page 80* for torque specifications.

18.14. Check Ignition Cable and Ground Wiring

- Inspect the ignition cable from the ignitor to the ACVMax control module.
- Inspect the ground wire from the ignitor to the ACVMax control module.
- Ensure wiring is in good condition and securely connected.
- Check ground continuity using a continuity meter.
- Replace ground wire if ground continuity is not satisfactory.

18.15. Check Control Wiring

Inspect all control wiring. Ensure wiring is in good condition and properly connected.

18.16. Check Control Settings

- Review all boiler settings in the Heating & DHW EZ Setup menus. Adjust settings as necessary, see *Section 10.7 on page 46 and Section 10.8 on page 48*
- Check any external limit control settings (if used). Adjust settings as necessary.

18.17. Perform Start-up and Checkout Procedures

- Start the unit and perform the start-up procedures as listed in *Chapter 12 on page 61*.
- Verify the cold water fill pressure is correct and the operating pressure of the boiler is within normal operating range.
- Complete the checkout procedures as outlined in *Chapter 15 on page 69*.

18.18. Check Burner Flame

- Inspect the flame pattern through the observation port of the heat exchanger.
- If flame pattern is not fully blue and covers the entire burner surface during high fire, shut the unit down and allow it to cool thoroughly before disassembly.
- Close the external manual gas valve on the gas supply line and disconnect the gas piping and gas valve wire harness connector.
- Disconnect the wiring harness connectors from the blower and remove the blower retaining screws. Remove the blower from the unit.
- Remove the mounting nuts securing the burner plate to the heat exchanger and set aside.
- Carefully remove the burner plate assembly from the heat exchanger. Ensure that the combustion chamber 2-in-1 insulation is not damaged during removal of burner mounting plate assembly.
- Remove the burner head mounting screws and remove the burner head. Inspect the burner head for deterioration. Use compressed air or a vacuum to clean the burner head.
- Remove the venturi and gas valve assembly from the blower.
- Use a vacuum cleaner or compressed air to clean the interior of the blower assembly. Inspect the blower blades to ensure they are clean and not damaged.
- Re-assemble the venturi and gas valve onto the blower. Ensure the venturi gasket or o-ring is in good condition and positioned correctly. Replace gasket or o-ring if necessary.
- Re-assemble the burner head onto the burner mounting plate. Ensure the burner head gasket is in good condition and positioned correctly. Replace gasket if necessary.
- Re-assemble the burner plate assembly onto the heat exchanger. Ensure the combustion chamber 2-in-1 insulation is in place and positioned correctly. Replace if necessary.
- Re-assemble the blower onto the burner plate and reconnect the wiring harness connectors.
- Re-assemble the gas supply connection and wire harness to the gas valve. Open the external manual gas valve. Check gas piping for any leaks as outlined in ***Section 11.5 on page 57*** and repair if necessary.
- Torque all screws, bolts, and nuts in accordance with specifications in ***Section 18.26 on page 80***.
- Place the unit back into service.

18.19. Check Flame Signal

- The flame signal can be read from the Boiler Information screen. It should be a min. 2-3 µA at low fire.
- Check the ignitor condition if flame signal is low.
- Check ground wire for continuity if flame signal is low. Replace ignitor if conditions are satisfactory.

18.20. Check Combustion Levels

Refer to ***Section 12.3.5 on page 62*** for measuring combustion levels and burner adjustments.

18.21. Check Flue Gas Temperature

- Manually place the boiler into high fire. See ***Section 12.3.5 on page 62*** for procedure.
- Navigate to the Boiler Information Menu to observe the flue gas temperature. See ***Section 10.12 on page 50*** .
- If the flue gas temperature is more than 54°F [30°C] above the supply water temperature, shut the boiler down and follow the heat exchanger cleaning procedure below.

18.22. Clean Heat Exchanger

Shut down the boiler:

- Follow the instructions on Page 60 "To Turn Off Gas to Appliance"
- Do not drain the boiler unless the boiler will be subject to freezing conditions.
- Do not drain the boiler if antifreeze is used in the system.

- Allow the boiler to cool down to room temperature before servicing.
- Close the external manual gas valve on the gas supply line and disconnect the gas piping and gas valve wire harness connector.
- Disconnect the wiring harness connectors from the blower and remove the blower retaining screws. Remove the blower from the unit.
- Remove the mounting nuts securing the burner plate to the heat exchanger and set aside.
- Carefully remove the burner plate assembly from the heat exchanger. Ensure that the combustion chamber 2-in-1 insulation is not damaged during removal of burner mounting plate assembly.

- Use compressed air or water to remove any accumulation from the heat exchanger flue ways.
- Re-assemble the burner plate assembly onto the heat exchanger. Ensure the combustion chamber 2-in-1 insulation is in place and positioned correctly. Replace if necessary.
- Re-assemble the blower onto the burner plate and reconnect the wiring harness connectors.
- Reconnect the gas piping and wire harness to the gas valve. Open the external manual gas valve. Check gas piping for any leaks as outlined in *Section 11.5 on page 57* and repair if necessary.
- Torque all screws, bolts, and nuts in accordance with specifications in *Section 18.26 on page 80*.
- Close isolation valves on the boiler water piping to isolate the boiler from the heating system.
- Attach a hose to the boiler drain valve and flush the boiler thoroughly with fresh water by using the purge valves to allow water to enter through the make-up water line to the boiler.
- Once the boiler has been completely flushed, return the boiler back into operation.
- Perform the required startup and checkout procedures as outlined in *Chapter 11 on page 55 and Chapter 15 on page 69*.

18.23. Check Carbon Monoxide Detectors

Verify that at least two (2) carbon monoxide detectors are installed and operating properly. One must be installed in the mechanical room where the HeatMaster TC is located and another installed in the living area outside the bedroom(s).

18.24. Review With Owner

Ensure the owner understands the importance of performing the maintenance schedule specified in this manual.

18.25. Draining Procedure

Drain water heater if it will be shut off and exposed to freezing temperatures. Freezing water will expand and damage water heater.

- If boiler water contains sufficient antifreeze, then only the domestic water needs to be drained.

⚠ WARNING

Close boiler water isolation valves and relieve system pressure to below 15 psig in outer tank before draining inner tank to prevent damage to inner tank. Failure to comply with this instruction can result in substantial property damage.

- If boiler water does not contain sufficient antifreeze, then the boiler water and domestic water must be drained.

If antifreeze is used in boiler water, check concentration. Boiler water (including additives) must be practically non-toxic, having toxicity rating or class of 1, as listed in Clinical Toxicology of Commercial Products. A maximum 50/50 mixture of inhibited propylene glycol is recommended. Follow antifreeze manufacturer's instruction.

⚠ WARNING

- **Do not use automotive, ethylene glycol or petroleum-based antifreeze. Do not use any undiluted antifreeze. This can cause substantial property damage, serious injury, or death.**
- **Water from opened drain valves, unions and other connections may be extremely hot. To avoid substantial property damage, serious injury, or death:**
  - **Tighten all drain hose connections.**
  - **Direct hot water away from all persons.**

18.25.1 Draining Boiler Tank

1. Disconnect power supply to HeatMaster TC
2. Close boiler water isolation valves between boiler and heating system.
3. Connect hose to boiler water drain valve at bottom of unit. Open and drain water to a safe place.
4. To speed draining procedure, loosen air vent on top of unit.
5. When draining is complete, close drain valve and retighten air vent.

18.25.2 Draining Domestic Tank

See *Fig. 6 on page 15.*

1. Disconnect power supply to HeatMaster TC.
   - If boiler outer tank pressure is greater than 15 psig, close isolation valves and relieve boiler pressure before proceeding.
2. Close cold water isolation valve.
3. Connect a hose to domestic water drain valve at cold water inlet. Hose should extend to drain at floor level to allow siphoning of domestic water tank.
4. Open hot water faucet at highest point above heater.
5. Open domestic water drain valve to begin draining.
6. When draining is complete, close hot water faucet and domestic water drain valve.

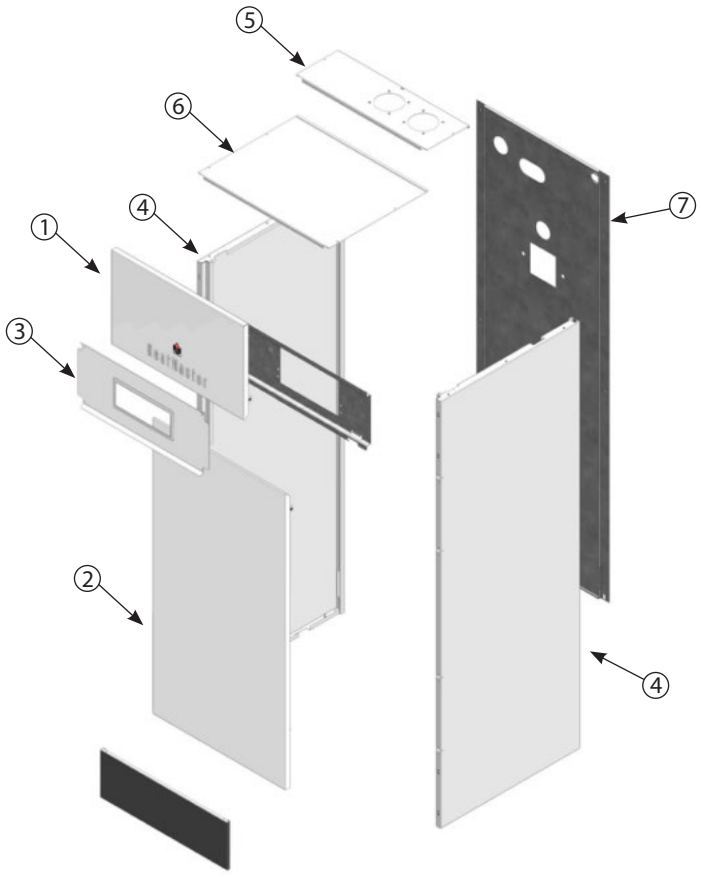
18.26. Torque Specifications Table

	Torque Req'd (in-lbs)	
Item	***Min.***	***Max.***
Burner Plate Nuts	*44*	*53*
Burner Head Bolts	*26.5*	*31*
Fan Clamp Screw	*62*	*71*
Gas Valve Screws	*31*	*35*
Venturi Screws	*31*	*35*
Ignitor Screws	*26.5*	*31*

⚠ WARNING

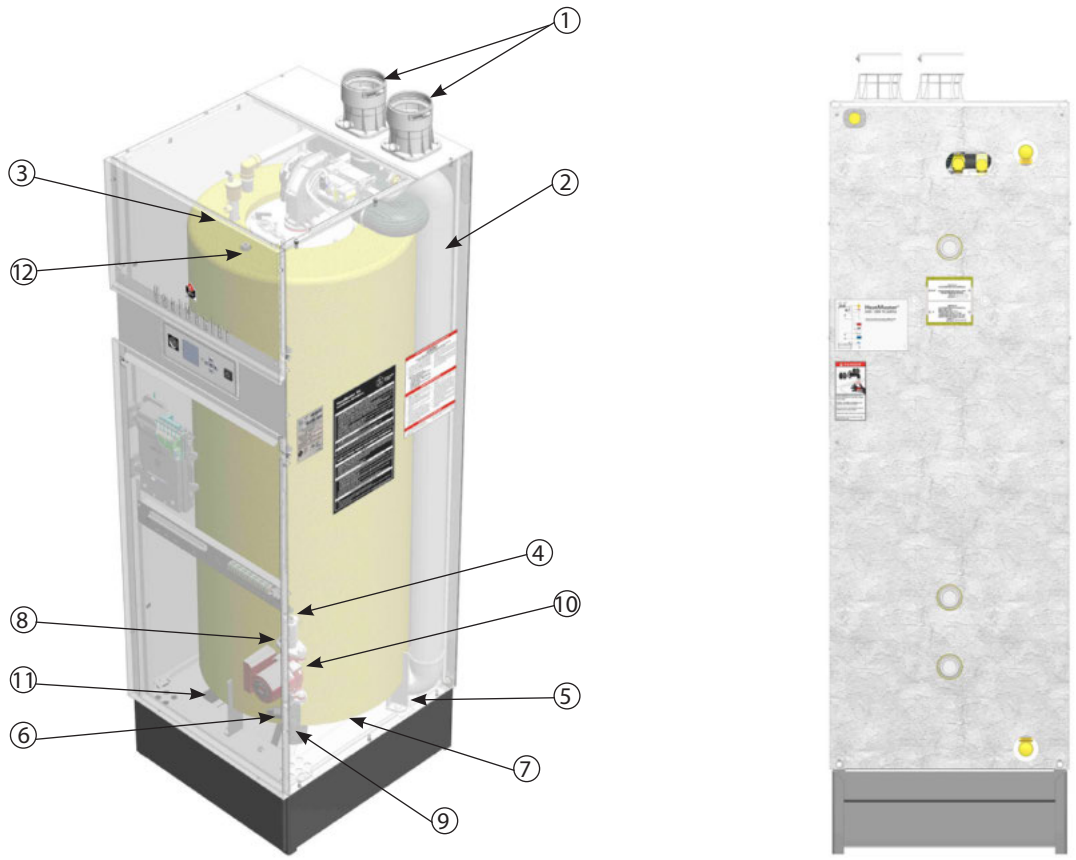
- **Replacement parts must be purchased through a local Triangle Tube distributor. When ordering a part, please provide the model number and description and/or part number of replacement part.**
- **Use only genuine Triangle Tube replacement parts to ensure warranty coverage and to avoid improper operation or damage to appliance.**
- **Contact Triangle Tube at 856-228-8881 or www.triangletube.com for a list of distributors near you.**

Fig. 25 - HeatMaster 240 - 399 TC Jacket Components



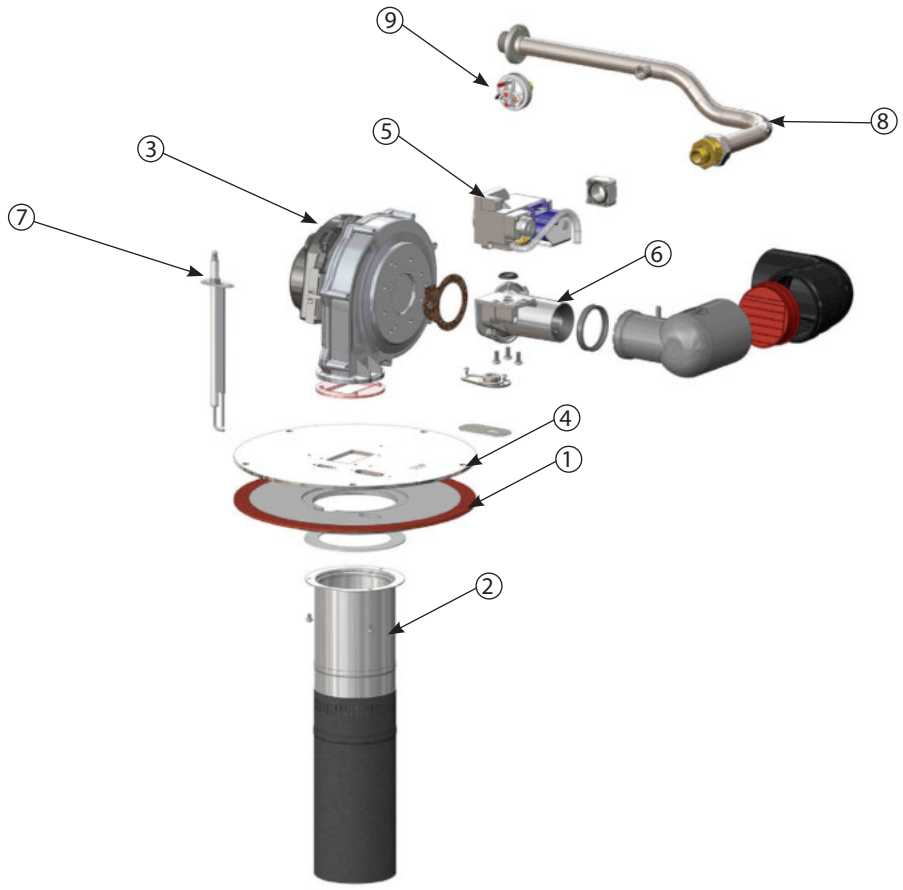
Item	Part #	Description
1	TCJKT02	Front Jacket Panel, Upper
2	TCJKT04	Front Jacket Panel, Lower
3	TCJKT01	Front Jacket Panel, Middle
4	TCJKT03	Left/Right Jacket Panel
5	TCJKT06	Top Panel, Back
6	TCJKT05	Top Panel, Front
7	TCJKT07	Back Jacket Panel

Fig. 26 - HeatMaster 240 - 399 TC Internal Components



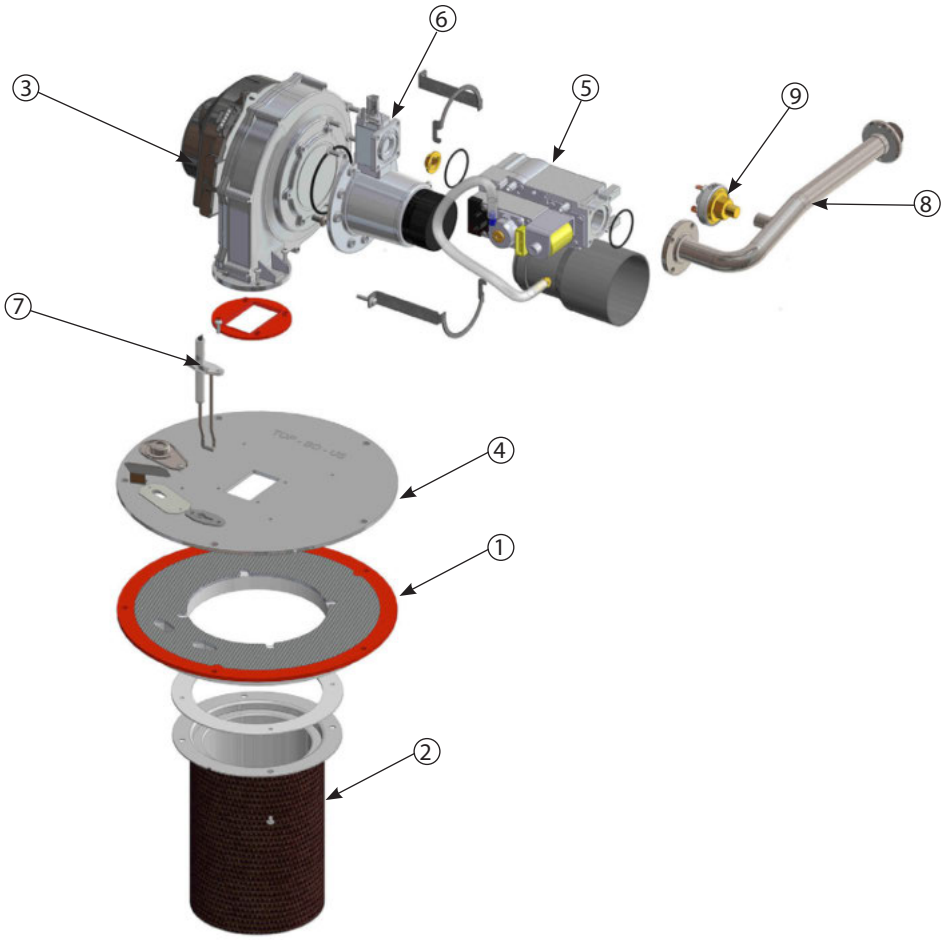
Item	Part #	Description
1	TCADPT01	Vent Outlet/Combustion Air Inlet Adapter
2	TCRKIT01	Polypropylene Vent Pipe
3	PTRKIT122	Supply Temperature Sensor
4	PTRKIT123	Return Temperature Sensor
5	PTRKIT123	Flue Temperature Sensor
6	PARKIT04	LWCO Pressure Sensor
7	PSRKIT05	Condensate Drain Assembly
8	TCRKIT02	Boiler Piping - Upper Recirculation
9	TCRKIT03	Boiler Piping - Lower Recirculation
10	TCRKIT04	Circulator
11	TCRKIT05	Polypropylene Condensate Pan
12	PSRKIT63	DHW Temperature Sensor

Fig. 27 - HeatMaster 240 TC Burner Components



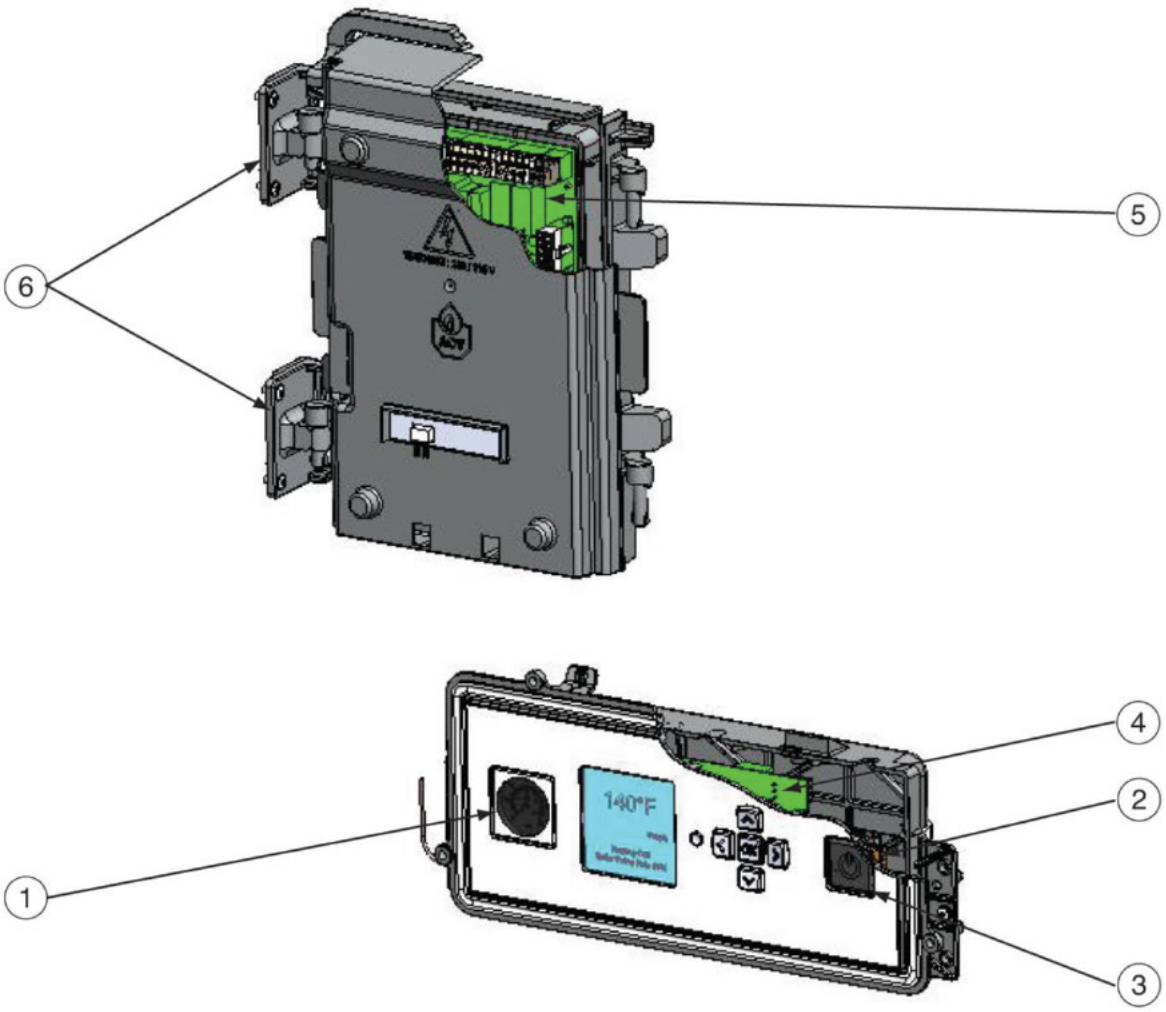
Item	Part #	Description
1	TCRKIT07	Combustion Chamber 2-in-1 Insulation
2	TCRKIT08	Burner Head Assembly (with Gasket)
3	PSRKIT13	Blower Assembly (with Gasket)
4	TCRKIT09	Burner Plate Assembly
5	PTRKIT111	Gas Valve
6	PARKIT40	Venturi - HeatMaster TC 240
7	TCRKIT10	Igniter Assembly
8	TCRKIT11	Gas Pipe
9	TCRKIT12	Gas Pressure Switch

Fig. 28 - HeatMaster 399 TC Burner Components



Item	Part #	Description
1	TCRKIT14	Combustion Chamber 2-in-1 Insulation
2	TCRKIT15	Burner Head Assembly (with Gasket)
3	TCRKIT16	Blower Assembly (with Gasket)
4	TCRKIT17	Burner Plate Assembly
5	TCRKIT18	Gas Valve
6	TCRKIT19	Venturi - HeatMaster TC 399
7	TCRKIT20	Igniter Assembly
8	TCRKIT21	Gas Pipe
9	TCRKIT12	Gas Pressure Switch

Fig. 29 - HeatMaster TC Control & Display Enclosures



Item	Part #	Description
1	PTRKIT109	Pressure Gauge
2	TCRKIT22	Power Switch
3	PTSWI02	Power Switch Cover
4	PARKIT101	Display Module
5	PARKIT100	Control Module (Universal when used with PARKIT101)
6	PAHNG01	Control Box Hinges