REGENT

COMMERCIAL TANKLESS WATER HEATER

Service Manual

Models: 500-1000

2000832456_000

⚠ WARNING This manual must only be used by a qualified heating installer / service technician. Read all instructions, including this manual and the Regent Installation and Operation Manual, before installing. Perform steps in the order given. Failure to comply could result in severe personal injury, death, or substantial property damage.

Save this manual for future reference.

Lochinvar®

HIGH EFFICIENCY BOILERS & WATER HEATERS

Contents

Hazard definitions

The following defined terms are used throughout this manual to bring attention to the presence of hazards of various risk levels or to important information concerning the life of the product.

⚠ DANGER DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION CAUTION used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

NOTICE NOTICE indicates special instructions on installation, operation, or maintenance that are important but not related to personal injury or property damage.

Please read before proceeding

Handling ceramic fiber materials

REMOVAL OF COMBUSTION CHAMBER LINING

⚠ WARNING The combustion chamber insulation in this appliance contains ceramic fiber material. Ceramic fibers can be converted to cristobalite in very high temperature applications. The International Agency for Research on Cancer (IARC) has concluded, "Crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (Group 1)". Normal operating temperatures in this appliance are below the level to convert ceramic fibers to cristobalite. Abnormal operating conditions would have to be created to convert the ceramic fibers in this appliance to cristobalite.

The ceramic fiber material used in this appliance is an irritant; when handling or replacing the ceramic materials it is advisable that the installer follow these safety guidelines.

- Avoid breathing dust and contact with skin and eyes.
  - Use NIOSH certified dust respirator (N95). This type of respirator is based on the OSHA requirements for cristobalite at the time this document was written. Other types of respirators may be needed depending on the job site conditions. Current NIOSH recommendations can be found on the NIOSH website at http://www.cdc.gov/niosh/homepage.html. NIOSH approved respirators, manufacturers, and phone numbers are also listed on this website.
  - Wear long-sleeved, loose fitting clothing, gloves, and eye protection.
- Apply enough water to the combustion chamber lining to prevent airborne dust.
- Remove the combustion chamber lining from the water heater and place it in a plastic bag for disposal.
- Wash potentially contaminated clothes separately from other clothing. Rinse clothes washer thoroughly.

NIOSH stated First Aid.

- Eye: Irrigate immediately.
- Breathing: Fresh air.

Please read before proceeding

⚠ WARNING **Installer –** Read all instructions, including this manual and the Regent Water Heater Installation and Operation Manual, before installing. Perform steps in the order given.

Have this water heater serviced/inspected by a qualified service technician, at least annually.

Failure to comply with the above could result in severe personal injury, death, or substantial property damage.

NOTICE When calling or writing about the water heater – Please have the water heater model and serial number from the water heater rating plate.

Consider piping and installation when determining water heater location.

Any claims for damage or shortage in shipment must be filed immediately against the transportation company by the consignee.

Factory warranty (shipped with unit) does not apply to units improperly installed or improperly operated.

⚠ WARNING Failure to adhere to the guidelines on this page can result in severe personal injury, death, or substantial property damage.

⚠ WARNING If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury, or loss of life.

-- This water heater MUST NOT be installed in any location where gasoline or flammable vapors are likely to be present.

-- WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electric switch; do not use any phone in your building.
- Immediately call your gas supplier from a nearby phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.
- Installation and service must be performed by a qualified installer, service agency, or the gas supplier.

⚠ WARNING DO NOT install units in rooms or environments that contain corrosive contaminants (see Table 1A). Failure to comply could result in severe personal injury, death, or substantial property damage.

⚠ WARNING The California Safe Drinking Water and Toxic Enforcement Act requires the Governor of California to publish a list of substances known to the State of California to cause cancer, birth defects, or other reproductive harm, and requires businesses to warn of potential exposure to such substances.

This product contains a chemical known to the State of California to cause cancer, birth defects, or other reproductive harm. This water heater can cause low level exposure to some of the substances listed in the Act.

DO NOT install the water heater in a location likely to freeze.

⚠ DANGER Freezing Conditions: If this appliance may have been exposed to freezing conditions, you MUST prevent from firing. Shut off power and gas to the appliance immediately and contact the factory for further instructions. Allowing the appliance to fire when the heat exchanger or near water heater piping is frozen will result in death or serious injury, and significant property damage.

When servicing the water heater –

- To avoid electric shock, disconnect electrical supply before performing maintenance.
- To avoid severe burns, allow the water heater to cool before performing maintenance.

Water heater operation –

- Do not block flow of combustion or ventilation air to the water heater.
- Should overheating occur or gas supply fail to shut off, do not turn off or disconnect electrical supply to circulator. Instead, shut off the gas supply at a location external to the appliance.
- Do not use this water heater if any part has been under water. The possible damage to a flooded appliance can be extensive and present numerous safety hazards. Any appliance that has been under water must be replaced.
- The installer must verify that at least one carbon monoxide alarm has been installed within a residential living space or home following the alarm manufacturer's instructions and applicable local codes before putting the appliance into operation.

What is in this manual?

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• Display panel readout, buttons and their functions

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• Control module inputs and options

Control module outputs
• Control module outputs and options

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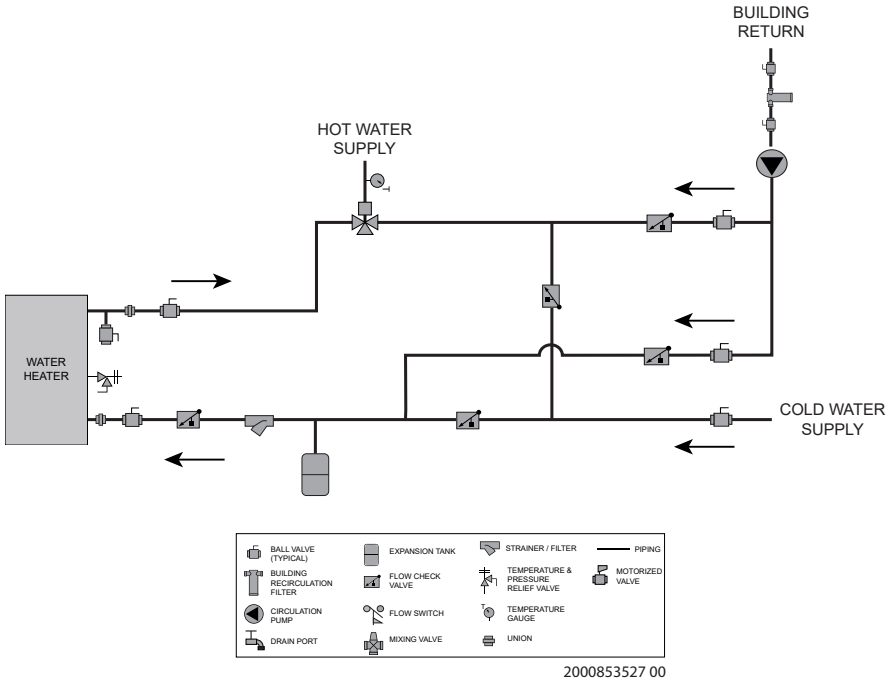
1 Service

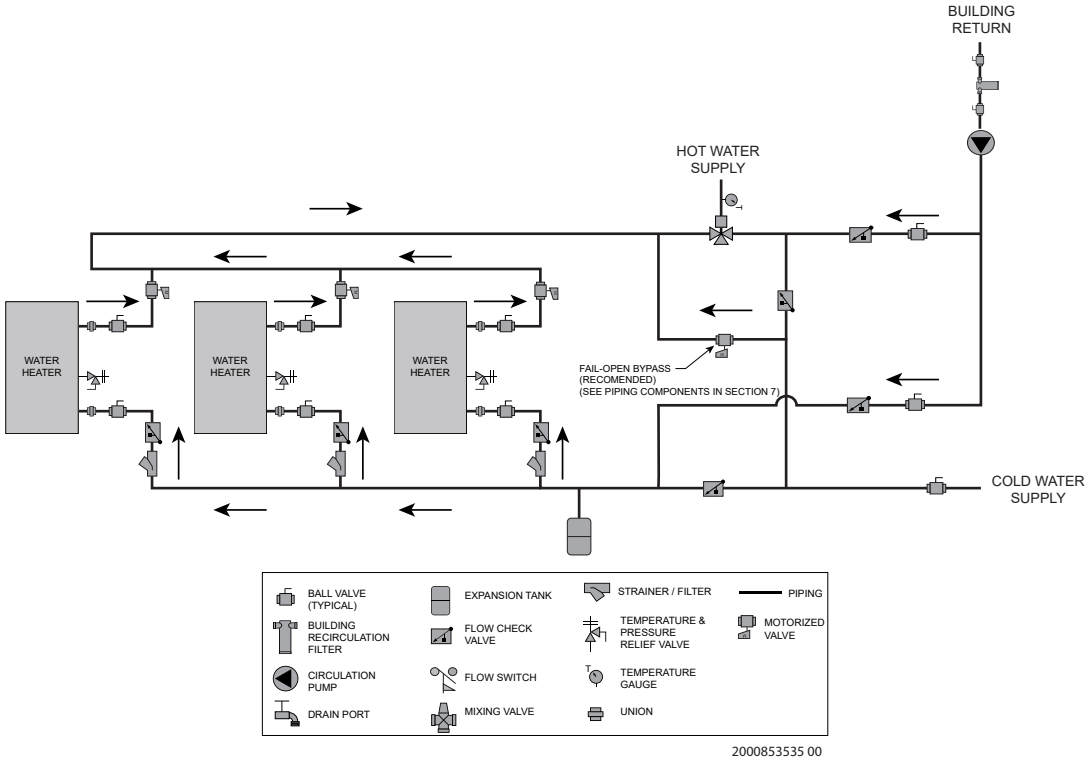
Water heater piping

This piping reference is included to specify the *Water heater Piping* specific to the Regent water heater. This piping scheme is important for the best temperature control and system performance. See the Regent Installation and Operation Manual for more detailed piping diagrams.

Single Heater - Single Temperature - DHW Recirculation



Triple Heater in Cascade - Single Temperature DHW Recirculation

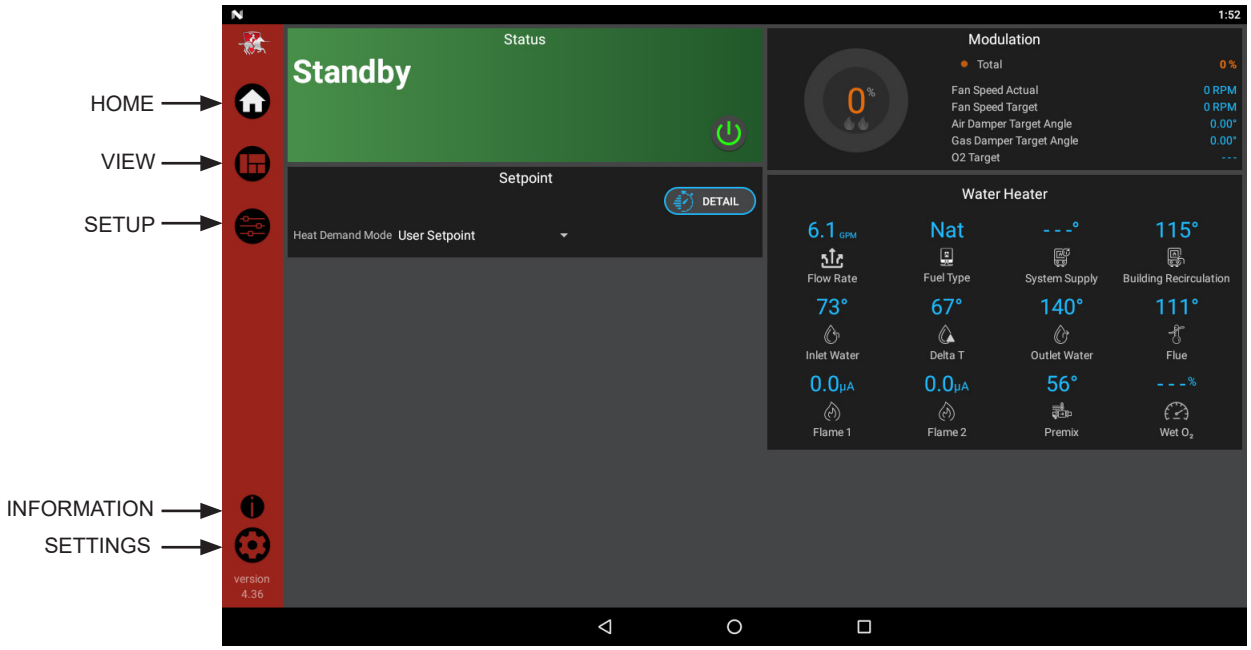


1 Service *(continued)*

SMART TOUCH™

The Home Screen displays basic information on how the unit is running. It is divided into the following sections: Status, Demand, Modulation, Sensors, and Navigation.

***Figure 1-1** Home Screen*



- The **Status** Section is located on the top left of the screen and displays how the unit is currently running (i.e. Off, Stand-by, Blocking, and Lockout) including: current driving demand, the reason for any blocking or lockout, and a power button.
- The **Demand** Section is located on the bottom left of the screen and displays information about the targets and limits of the current demand being serviced.
- The **Modulation** Section is located on the top right of the screen and displays the target modulation of the unit. This section also includes target and actual fan speeds.
- The **Sensor** Section is located on the bottom right of the screen and displays both factory installed and field installed sensor including: Inlet Water Temperature, Delta T Water Temperature, Outlet Water Temperature, Flue Temperature, and Inlet Water Flow Rate.
- The **Navigation** Section is located down the left side of the screen. There are five (5) sections located below the Lochinvar icon: Home, View, Setup, Information (About), and Settings. The Home Section is the screen shown above. The View Section provides more detailed information including subsections for: History, Cascade, Graphing, and a complete list of current Sensor Values. The Setup Section has several screens to aid in setting up the appliance. The Setup Section includes screens for adjusting: Set Points, Cascade, and BMS. The Information Section provides information about the hardware and software including the current software version of the interface and the version of the appliance control. The Setting Section enables several interface setup features including: Time Setup, Temperature Unit Select, System Update, and Wi-Fi Setup.

1 Service

General Operation

How the water heater operates

The Regent uses an advanced stainless steel heat exchanger with and electronic control module that allows fully condensing operation. The blower pulls in air and pushes flue products out of the water heater through the heat exchanger and flue piping. The control module regulates the firing rate of the water heater by adjusting blower speeds and valve position to maintain the proper air fuel ratios.

How the control modules operate

The Regent water heater is equipped with a SMART TOUCH Display Interface. The control module receives inputs from water heater sensors and external devices. The control module activates and controls the blowers and gas valves to regulate heat input, and switches the water heater on and off as needed. The user programs the control module to meet system needs by adjusting control parameters through the SMART TOUCH Display Interface. These parameters set operating temperatures and water heater operating modes.

Sequence of operation

Table 1A (page 11) shows control module normal sequences of operation.

Access modes

User

The USER can set the set point, turn the unit OFF and ON, and set up WiFi.

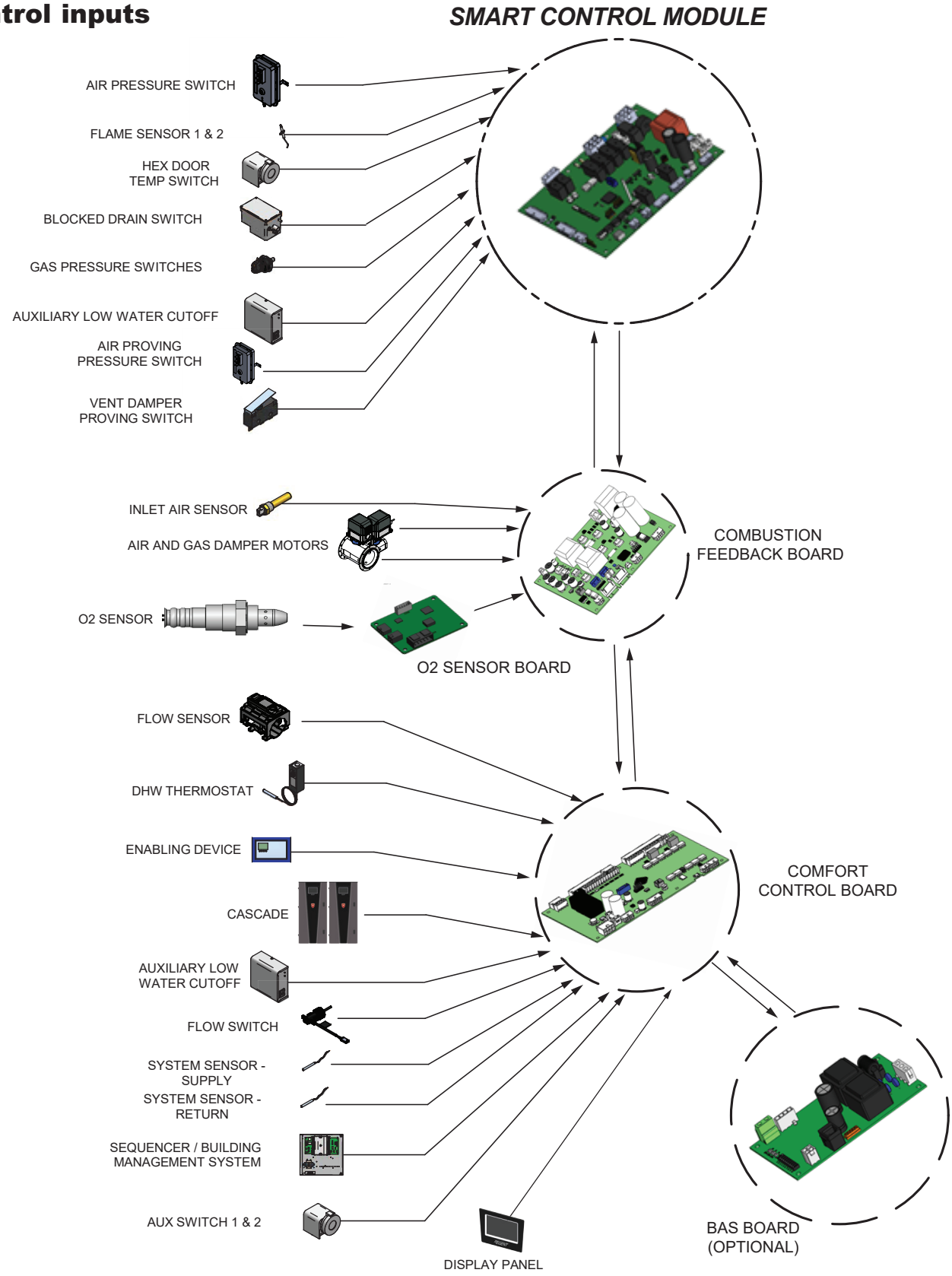
Installer

Most parameters are available only to the INSTALLER, accessible only by entering the installer password (5309) when selecting the Setup Section.

Note: The password will time out after an hour from entry.

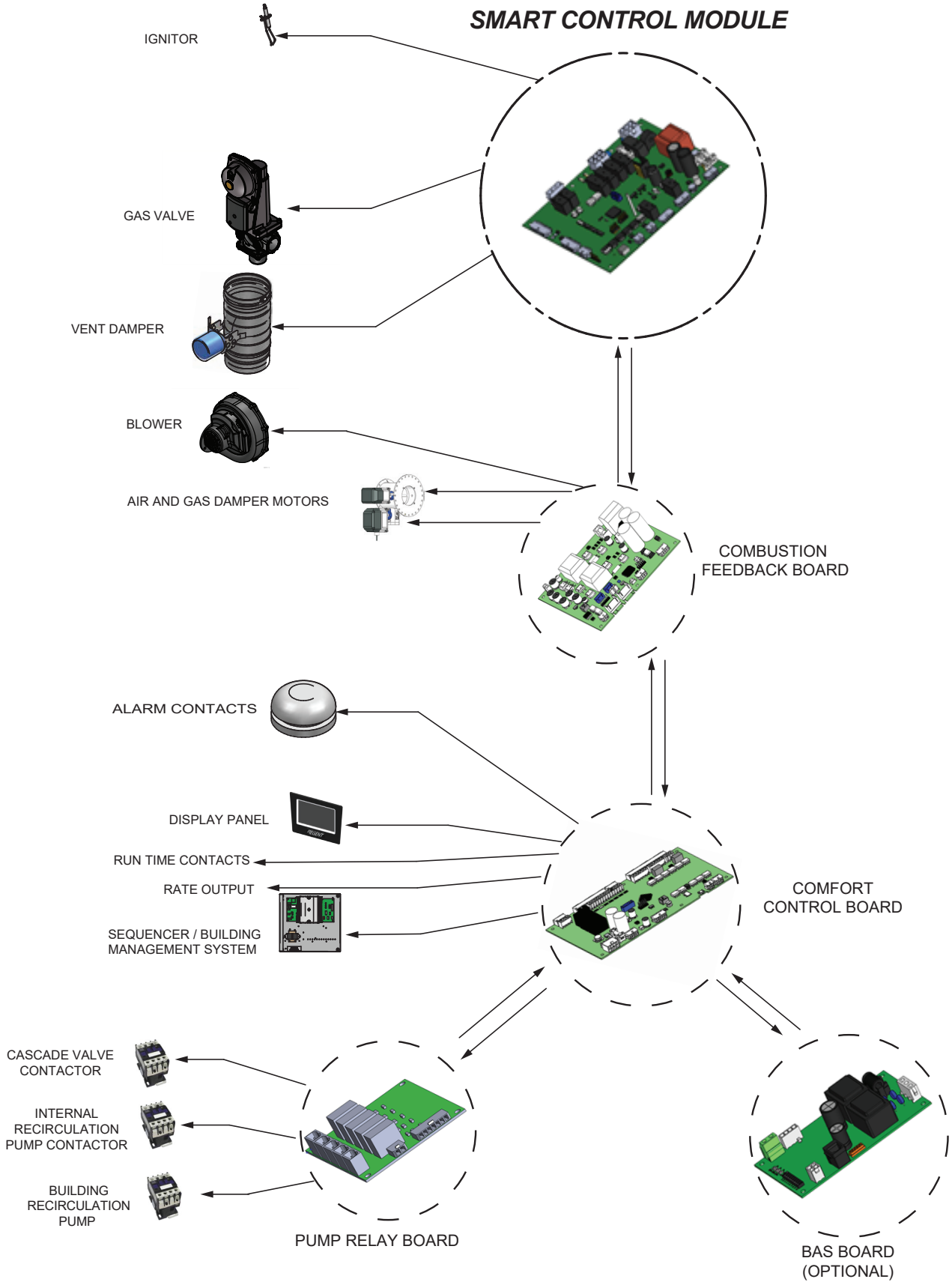
1 Service *(continued)*

Control inputs



1 Service

Control outputs



1 Service *(continued)*

***Table 1A** Sequence of Operation*

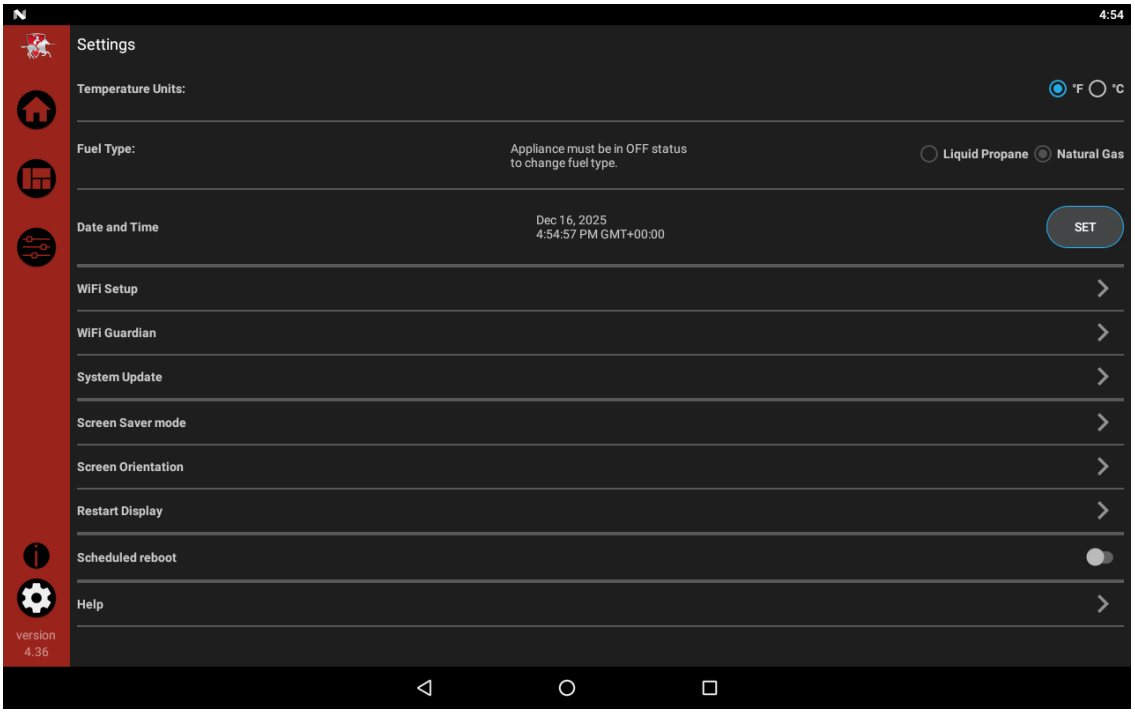
Sequence of operation

1.	Upon a call for heat, the water heater control initiates a pre-purge and confirms that all safeties are in their correct state. During the initial sequence of pre-purge, the air damper is open to its purge position, and the blower is forced to its purge speed. The air damper APS is checked to be open, the flow switch contacts are checked to be closed, and the proof of closure input is checked to be closed during this time.
2.	Once the air damper APS and proof of closure switches are confirmed, the safeties are checked in the correct state. The water heater control will then progress to the second part of pre-purge. During this phase the dampers and fan are forced into the ignition state. Once in the ignition state, the air damper APS must become closed.
3.	The water heater control then proceeds to trial for ignition. First, the control initiates sparking, then opens the gas valve. After sparking is completed, the control checks for the presence of flame. If the flame is not detected, the control will recycle or lockout on an Ignition Flame Failure. If the flame is present, the control proceeds to the flame stabilization period. During the flame stabilization period, the signal must not drop below the detection threshold and further must raise to a sufficiently high level for a stable flame. If the flame does not reach the higher threshold during flame stabilization, the unit will recycle or lockout on Flame Loss While Running. During the flame stabilization period and any running state thereafter, the controls will check that the proof of closure input is open.
4.	Upon successful completion of the flame stabilization period, the control will proceed to the running state and attempt to operate at the required modulation point. During operation, the damper positions and fan speeds MUST always remain within tolerance. Further, if an O2 sensor is present and functioning properly, the unit must operate within an expected range of O2 (see Section 11 of the Regent Installation and Operation Manual).
5.	The water heater control will modulate as needed to reach the desired setpoint.
6.	Once the DHW call for heat has been satisfied, the control will turn OFF the gas valve and begin the post-purge cycle. The free air calibration of the O2 sensor is completed.
7.	At the end of the post-purge cycle, the control will allow the fan speed to fall. Once at 3000 rpm, the air damper will be closed. The controls will check that the blower stops running and the dampers are in their expected positions. The control will check that the air damper APS reaches the open state.
8.	After one minute in standby, the O2 sensor will go into a standby state. The internal pump will continuously operate, even in standby state.

1 Service

Initial Setup Screen

Figure 1-2 *Settings Screen*



Initial Setup

Date and Time

The control uses an internal clock for logging of events. For this feature to work correctly, the clock must be set when the water heater is first installed or anytime the water heater has been powered off for more than four (4) hours. This parameter must be accessed to set the clock. If the unit is connected to the internet, the time will adjust based on the time zone selected.

Temperature units (°C / °F)

The control can be configured to display temperature in either °C or °F.

Fuel Type

If the site requires a change in gas type, the control allows the user to switch from one gas to another. Reference Section 8- Gas Conversions of the Regent Installation and Operation Manual for more information. NOTE: The unit must be in the OFF status to change the fuel type. Otherwise, it will be unavailable.

1 Service *(continued)*

Viewable and changeable control parameters

CAUTION Before changing parameters, note the settings so that the unit can be returned to its original operating parameters.

Set Point Screens

Figure 1-3 *Set points*

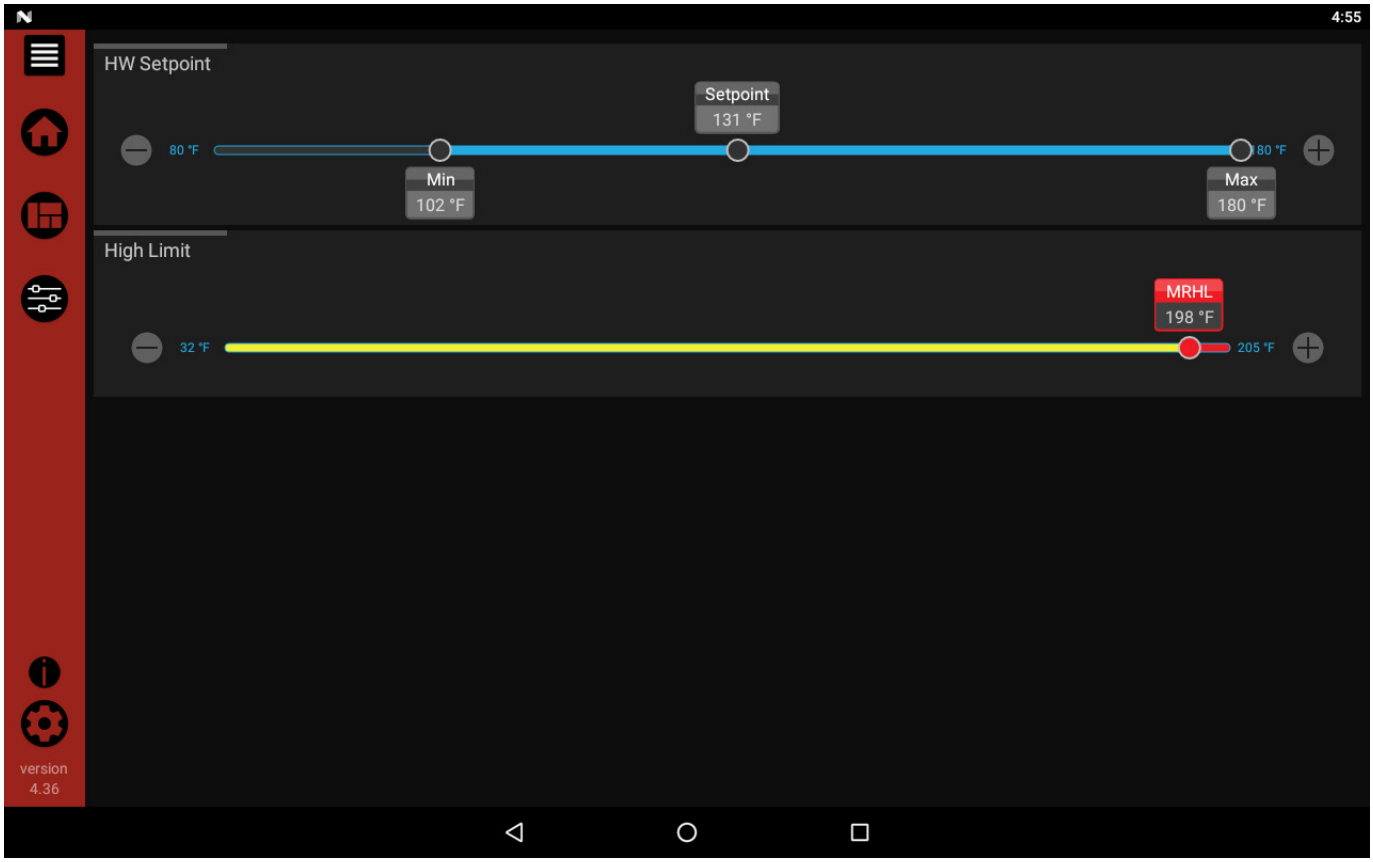


Table 1B *Set Points (This table lists control module parameters; use the sub-tab under the Setup tab to access them.*

Menu	Parameter Name (as shown on the LCD screen)	Min Value	Max Value	Default Value
SETPOINTS	High limit: MRHL	32	205	205
	DHW Setpoint: Setpoint	80	180	120
	DHW Setpoint: Min	80	178	80
	DHW Setpoint: Max	82	180	140

1 Service

Set Points

High Limit: MRHL

The SMART TOUCH control contains an integral Manual Reset High Limit (MRHL) on the outlet of the heat exchanger. Once the outlet temperature exceeds the MRHL set point, the water heater will shut down and lock out. Once the outlet temperature has dropped below this set point, the RESET button on the LCD display must be pressed to clear this lockout.

DHW Set Point: Set point

When a DHW call for heat becomes active, the control will use the DHW set point to determine the firing rate of the water heater based on the outlet water temperature.

DHW Set Point: Min

This setting controls the minimum user set point for the outlet temperature.

NOTICE

DHW Set Point: Min setting does not constitute a minimum possible temperature of the outlet water, but rather a minimum allowable value of the DHW Set Point that can be applied without the installer password.

DHW Set Point: Max

This setting controls the maximum user set point for the outlet temperature.

⚠ CAUTION

The DHW Set Point: Max setting does not constitute a maximum possible temperature of the outlet water. Proper scald protection is required regardless of the value of this setting.

1 Service *(continued)*

BMS Screens

Figure 1-4 *BMS_Screen A*

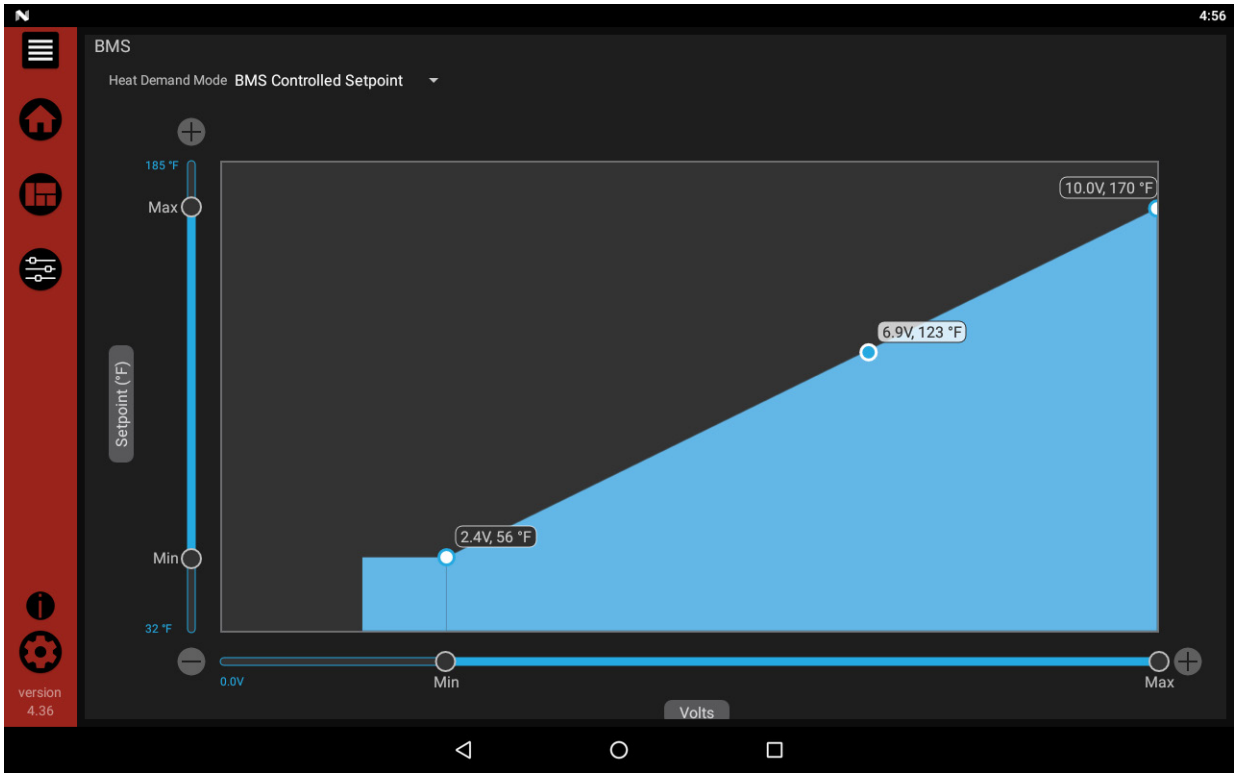
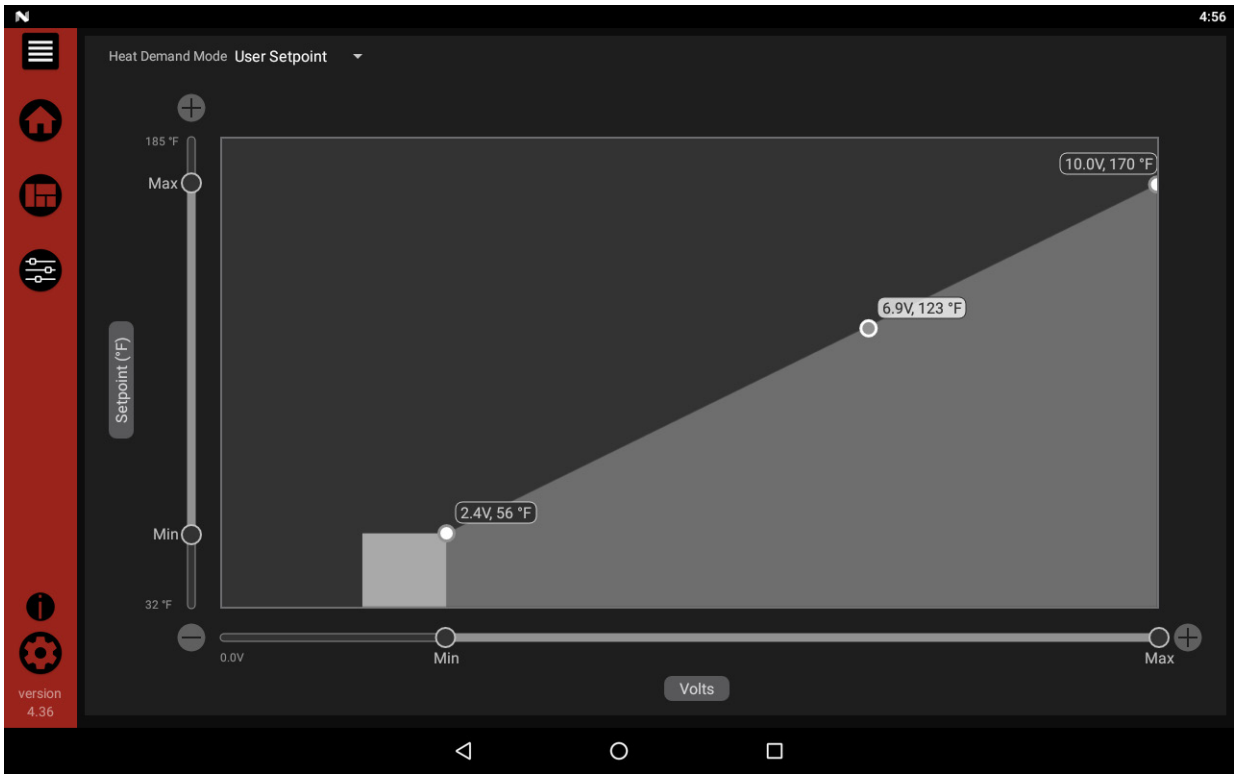


Figure 1-5 *BMS_Screen B*



1 Service

Table 1C BMS (This table lists control module parameters; use the sub-tab under the Setup tab to access them.)

Menu	Parameter Name (as shown on the LCD screen)	Min Value	Max Value	Default Value
BMS	Set point (F): Min	80	SET POINT MAX	115
	Set point (F): Max	SET POINT MIN	180	140
	Volts: Min	0	Volts Max	2
	Volts: Max	Volts min	10	10

BMS Mode (Set Point)

The set point of the water heater may be controlled through the 0-10V Building Management System (BMS) input. When set to SETPOINT, voltage determines the set point used by the water heater. If SETPOINT is not selected, BMS will not be available.

BMS Volts at Minimum (Set Point)

When BMS is set to SETPOINT, this parameter will determine the voltage on the 0 - 10V BMS input that represents the minimum modulation or set point. Any voltage less than this value will not change the modulation or set point used by the water heater.

BMS Volts at Maximum (Set Point)

When BMS is set to SETPOINT, this parameter will determine the voltage on the 0-10V BMS input that represents the maximum set point. Any voltage above this value will not changed the set point used by the water heater.

BMS Set Point at Minimum Volts

This parameter is visible only when the BMS Mode is set to SETPOINT. The value of this parameter determines the set point when the voltage on the 0 - 10V BMS input is equal to or less than the BMS Volts at Minimum parameter value.

BMS Set Point at Maximum Volts

This parameter is visible only when BMS Mode is set to SETPOINT. The value of this parameter determines the set point when the voltage on the 0 - 10V BMS input is equal to or more than the BMS Volts at Maximum parameter value.

1 Service *(continued)*

Cascade Screens

Figure 1-6 *Cascade Setup*

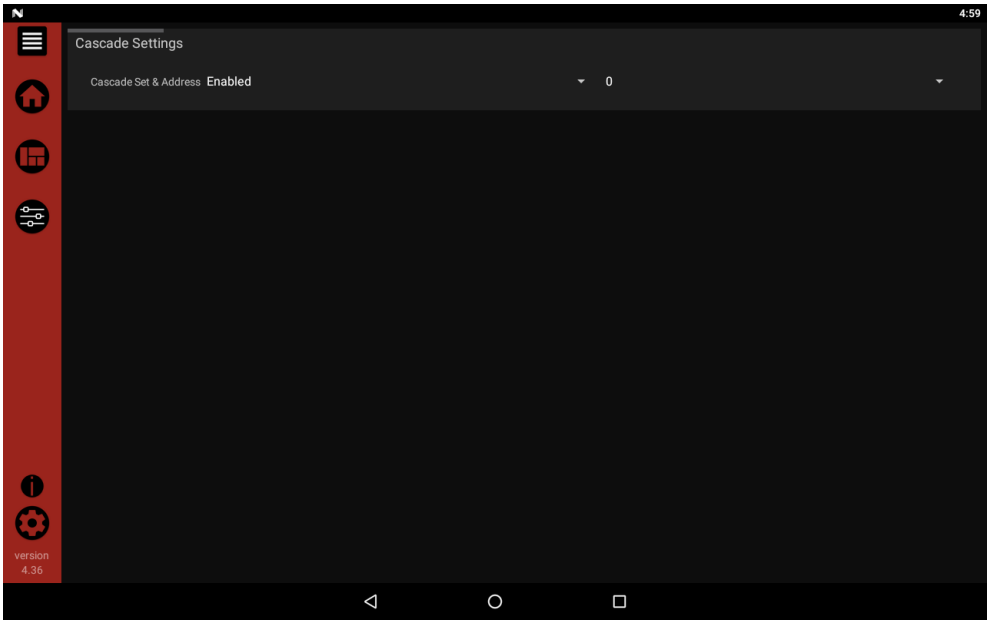


Table 1D *Cascade (This table lists control module parameters; use the sub-tab under the Setup tab to access them.)*

Menu	Parameter Name (as shown on the LCD screen)	Min Value	Max Value	Default Value
CASCADE	Cascade Address	0	7	1
	Cascade Status	ENABLE	DISABLE	DISABLE

Cascade Requirements

Cascade units have certain requirements to maintain functionality. See section 12 in the Regent Installation and Operation manual for more information.

Cascade Parameters

Cascade Status

The water heater is part of a group of units sequenced together. The leader determines the total DHW load based on the set point and flow rate. It directs members to open and close their cascade valve to meet the DHW load. Each member heater will modulate and deliver hot water at the set point temperature. When Cascade is active, each water heater in the group requires a unique address.

Cascade Address

The water heater designated as the Leader needs to be programmed with address 0. All the Member water heaters require addresses from 1-7, and the addresses must be different for each Member. The addresses can be in any order, regardless of the order in which the units are wired together. The system supply sensor should be connected to the leader water heater, but this is not required.

Cascade Functions

Struggling Member

When a unit is running at a higher modulation point, but the demand calculation wants it to run at a lower modulation point, after 2 minutes if there is no change in modulation, the unit will then be replaced in operation and moved to the end of the priority order. The "Struggling Member" status will clear after a 24-hour rotation, or after the demand requires a new member to be added.

Blocked Member

When a unit has a demand and is not in a Running/Ignition/ Pre-Purge State, the blocked member counter will begin. After a continuous 20 seconds, if the unit is still not in that state, it will be replaced in active cascade operation and moved down the priority list. After 24 hours, the "Blocked Member" status will clear, and the unit will return to the priority list.

Lockout / Open Enable / Shutdown Mode Removal

When a member is in Lockout, the DHW call for heat is unsatisfactory, or is in Shutdown Mode, that unit will close the cascade valve and be replaced by another Member while the cascade function is still enabled. After the lockout is cleared with a reset on the display, that unit will return to its normal spot in the priority order.

1 Service
Service Screens

Figure 1-7 *Service Maintenance*

The Service Screen allows the integrated control to override all other heat demands and operates the combustion system manually through the complete modulation range. To place the water heater into Service Mode, press the START button. All safeties remain active during Service Mode. If no buttons are pressed, the integrated control will automatically revert back to its original status after the "Remaining time in Service" counter expires.

Once the water heater has been placed into Service Mode it will light and modulate to low fire. At any time after that point use the touch screen to adjust the firing rate. To adjust the firing rate, manually adjust the Target Power percentage using the slider at the bottom of the "Firing Rate Setting" section. When Service Mode is no longer needed press the STOP button to return to normal operation.

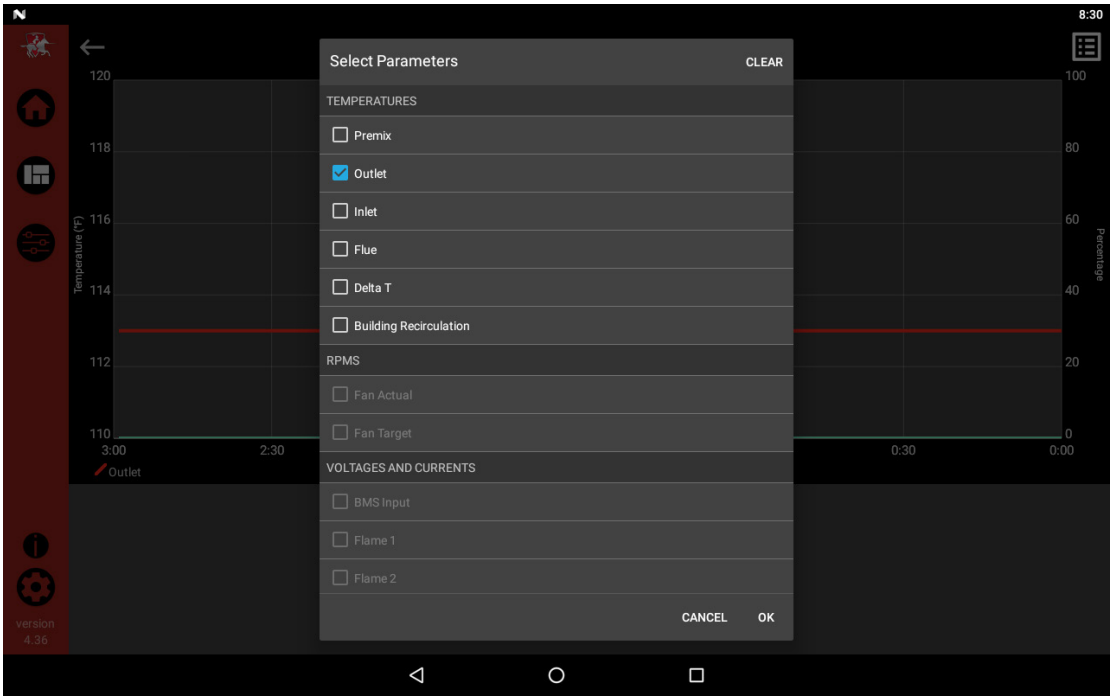
⚠ WARNING The hot water Setpoint will be ignored during Service Mode. Ensure adequate scald protective devices are in place prior to using Service Mode.

1 Service *(continued)*

Graph Screens

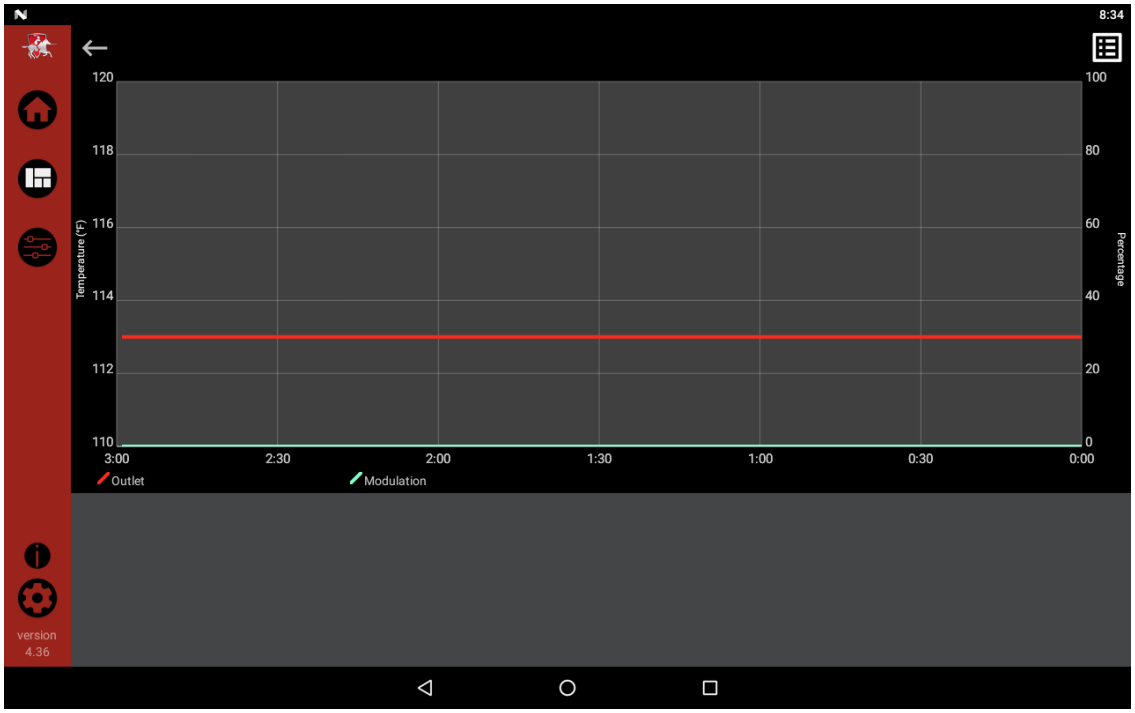
The Graph screen consists of a Short Term Data Screen (three minutes in one second intervals). If a parameter is selected by mistake, it can be deselected by reselecting the parameter. A maximum of six (6) items can be graphed at one time.

Figure 1-8 *Graph Select*



Once the items to be graphed are selected, press the OK button to view the graph. Each item graphed will have a different color line to represent it. The items selected will be shown below the graph along with their corresponding color.

Figure 1-9 *Graph Screen*



1 Service

History Screen

The History Screen shows the status of various counters and faults. Within the History Screen there are two separate sections, the “Lockout Blocking Fault” and “Runtime History”.

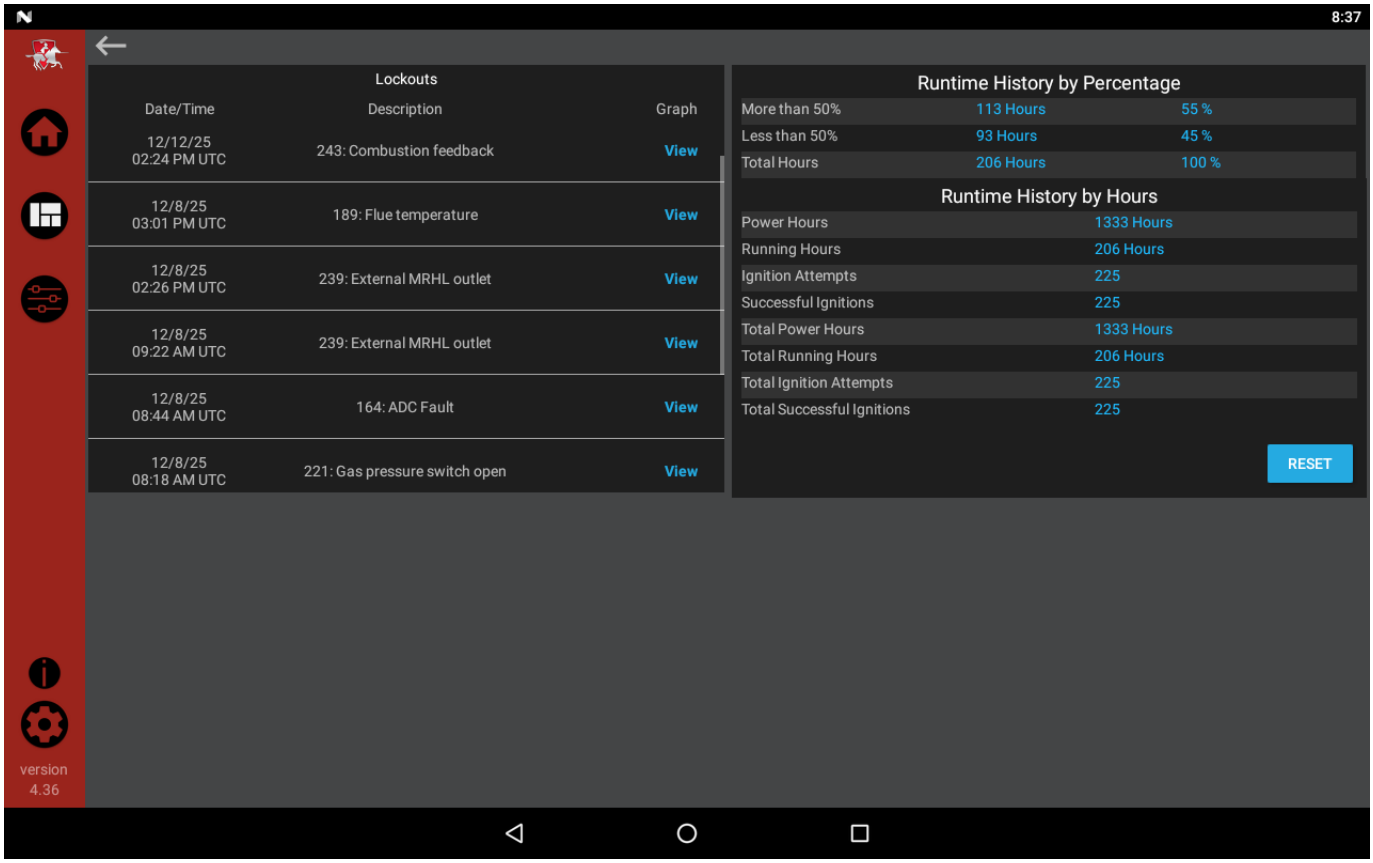
The left side of the screen reflects the "Lockout blocking Fault" section which allows you to view the last 10 lockout faults. Succeeded by each fault is the date and time of when the fault occurred. A three (3) minute graph of sensor data before the fault can be viewed by selecting the VIEW button.

The “Runtime History” section includes the following information:

- Power hours – Shows the number of hours the control has been powered on since the last reset.
- Running hours – Shows the number of hours that the water heater has been firing since the last reset.
- Ignition attempts – Shows the number of times the control has attempted to ignite since the last reset.
- Successful Ignition attempts - Shows the number of times the control has successfully ignited since the last reset.
- Total Power hours – Show the total number of hours the control has been powered.
- Total Running hours – Show the total number of hours that the water heater has been firing.
- Total ignition attempts – Show the total number of times the control has attempted to ignite.
- Total Successful ignition attempts – Show the total number of times the control has successfully ignited.

The top right of this screen details the running hours based on 4 different running positions.

Figure 1-10 *History Screen / Runtime History*



2 Maintenance

Maintenance and annual startup

Table 2A *Service and Maintenance Schedules*

Service technician (see the following pages for instructions)	
ANNUAL START-UP	**General:** • Address reported problems • Inspect interior; clean and vacuum if necessary; • Clean condensate trap and fill with fresh water • Check for leaks (water, gas, flue, condensate) • Verify flue and air lines in good condition and sealed tight • Check system water pressure/system piping/expansion tank • Check control settings • Check ignition and flame sense electrodes (sand off any deposits; clean and reposition) • Check wiring and connections • Perform combustion start-up checkout and performance verification per Section 11 of the Regent Installation and Operation manual. • Flame inspection (stable, uniform) • Flame signal (at least 10 microamps at high fire) • Clean the heat exchanger if flue temperature is more than 54°F above return water temperature. **If combustion or performance indicate need:** • Clean heat exchanger • Remove and clean burner using compressed air only • Clean the blower wheel

Owner maintenance	
Daily	• Check water heater area
Monthly	• Check vent piping • Check air piping • Check air and vent termination screens • Check relief valve • Check condensate drain system • Check automatic air vents • Remove debris from Y-strainer per manufacturer's instructions • Check building recirculation filter (if filter required) • Check for and clean any debris or obstruction from bird screens (if equipped)
Every 6 months	• Check water heater piping (gas and water) for leaks • Operate relief valve • Check water chemistry

2 Maintenance

⚠ WARNING Follow the service and maintenance procedures given throughout this manual and in component literature shipped with the water heater. Failure to perform the service and maintenance could result in damage to the water heater or system. Failure to follow the directions in this manual and component literature could result in severe personal injury, death, or substantial property damage.

⚠ WARNING The water heater should be inspected annually only by a qualified service technician. In addition, the maintenance and care of the water heater designated in Table 2A and explained on the following pages must be performed to assure maximum water heater efficiency and reliability. Failure to service and maintain the water heater and system could result in equipment failure.

⚠ WARNING Electrical shock hazard – Turn off power to the water heater before any service operation on the water heater except as noted otherwise in this instruction manual. Failure to turn off electrical power could result in electrical shock, causing severe personal injury or death.

Address reported problems

1. Inspect any problems reported by the owner and correct before proceeding.

Inspect water heater area

1. Verify that water heater area is free of any combustible materials, gasoline and other flammable vapors and liquids.

2. Verify that air intake area is free of any of the contaminants listed in Section 1 - Determine Water Heater Location of the Regent Installation and Operation manual. If any of these are present in the water heater intake air vicinity, they must be removed. If they cannot be removed, reinstall the air and vent lines per this manual and the Regent Installation and Operation manual.

Inspect water heater interior

1. Open the front door and inspect the interior of the water heater.

2. Vacuum any sediment from inside the water heater and components. Remove any obstructions.

Clean condensate trap

1. Inspect the condensate drain line, condensate PVC fittings, and condensate trap.

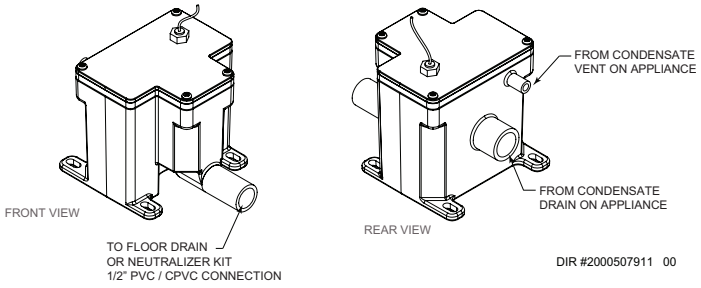
Monthly inspection:

1. The condensate trap should be inspected monthly to ensure the trap is properly installed and connected to the condensate pipe under the appliance, see FIG. 2-1.
2. The condensate line should be inspected monthly for obstructions, making sure it allows free flow for condensate to drain.
3. Inspect the neutralizing kit (if installed) monthly to ensure the condensate is draining properly, and there is still an adequate amount of neutralizing agent available.

Annual cleaning:

1. The condensate trap should be cleaned at least once annually, or at the end of each heating season, by removing the bottom cap and cleaning out any sediment that exists.
2. The provided condensate trap is equipped with a ball that acts as a seal against harmful flue gases escaping in case there is no condensate in the trap. If this ball is not present, flue gases may be able to pass through the trap when there is no condensate present, resulting in an unsafe environment. It is important to check and make sure the ball is still located in the trap, acting as a seal against flue gases at least once annually and after every cleaning.
3. After the condensate trap is cleaned or serviced, it must be checked to ensure that it is installed and draining properly. Reference Section 10 - Condensate Disposal in the Regent Installation and Operation manual for installation instructions.

Figure 2-1 *Condensate Trap*



⚠ WARNING The condensate trap must be filled with water during all times of water heater operation to avoid flue gas emission from the condensate drain line. Failure to fill the trap could result in severe personal injury or death.

2 Maintenance *(continued)*

Check all piping for leaks

⚠ WARNING Eliminate all system or water heater leaks. Leaking water may cause severe property damage.

1. Inspect all water and gas piping and verify to be leak free.
2. Look for signs of leaking lines and correct any problems found.
3. Check gas line using the procedure found in Section 8 - Gas Connections in the Regent Installation and Operation manual.

Flue vent system and air piping

1. Visually inspect the entire flue gas venting system and air piping for blockage, deterioration or leakage. Repair any joints that show signs of leakage. Verify that air inlet pipe is connected and properly sealed.
2. Verify that water heater vent discharge and air intake are clean and free of obstructions.
3. Verify that bird screens are clean and free of debris or obstruction.

⚠ WARNING Failure to inspect for the above conditions and have them repaired can result in severe personal injury or death.

Check water system

1. Verify all system components are correctly installed and operational.
2. Check the cold fill pressure for the system. Verify it is correct (must be a minimum of 30 PSI).
3. Watch the system pressure as the water heater heats up (during testing) to ensure pressure does not rise too high. Excessive pressure rise indicates expansion tank sizing or performance problem.
4. Inspect automatic air vents and air separators. Remove air vent caps and briefly push valve to flush vent. Replace caps. Make sure vents do not leak. Replace any leaking vents.

Check expansion tank

1. Expansion tanks provide space for water to move in and out as the heating system water expands due to temperature increase or contracts as the water cools. Tanks may be open, closed or diaphragm or bladder type. See Section 7 - System Piping of the Regent Installation and Operation manual for suggested best location of expansion tanks and air eliminators.

Check water heater relief valve

1. Before operating any relief valve, ensure that it is piped with its discharge in a safe area to avoid severe scald potential. Inspect the relief valve and lift the lever to verify flow. Read Section 7 - System Piping of the Regent Installation and Operation manual before proceeding further.

⚠ WARNING Safety relief valves should be re-inspected AT LEAST ONCE EVERY THREE YEARS, by a licensed plumbing contractor or authorized inspection agency, to ensure that the product has not been affected by corrosive water conditions and to ensure that the valve and discharge line have not been altered or tampered with illegally. Certain naturally occurring conditions may corrode the valve or its components over time, rendering the valve inoperative. Such conditions are not detectable unless the valve and its components are physically removed and inspected. This inspection must only be conducted by a plumbing contractor or authorized inspection agency – not by the owner. Failure to re-inspect the water heater relief valve as directed could result in unsafe pressure buildup, which can result in severe personal injury, death, or substantial property damage.

⚠ WARNING Following installation, the valve lever must be operated AT LEAST ONCE A YEAR to ensure that waterways are clear. Certain naturally occurring mineral deposits may adhere to the valve, rendering it inoperative. When manually operating the lever, water will discharge and precautions must be taken to avoid contact with hot water and to avoid water damage. Before operating lever, check to see that a discharge line is connected to this valve directing the flow of hot water from the valve to a proper place of disposal. Otherwise severe personal injury may result. If no water flows, valve is inoperative. Shut down the water heater until a new relief valve has been installed.

2. After following the above warning directions, if the relief valve weeps or will not seat properly, replace the relief valve. Ensure that the reason for relief valve weeping is the valve and not over-pressurization of the system due to expansion tank waterlogging or undersizing.

Inspect ignition and flame sense electrodes

1. Remove the ignition and flame sense electrodes from the water heater heat exchanger access cover.
2. Remove any deposits accumulated on the ignition/flame sense electrode using sandpaper. If the electrodes cannot be cleaned satisfactorily, replace with new ones.
3. Replace ignition/flame sense electrode, making sure gasket is in good condition and correctly positioned.

2 Maintenance

Check ignition ground wiring

1. Inspect water heater ground wire from the heat exchanger access cover to ground terminal strip.
2. Verify all wiring is in good condition and securely attached.
3. Check ground continuity of wiring using continuity meter.
4. Replace ground wires if ground continuity is not satisfactory.

Check all water heater wiring

1. Inspect all water heater wiring, making sure wires are in good condition and securely attached.

Check control settings

1. Set the SMART TOUCH control module display to Parameter Mode and check all settings. See Section 1 of the Regent Service Manual. Adjust settings if necessary.
2. Check settings of external limit controls (if any) and adjust if necessary.

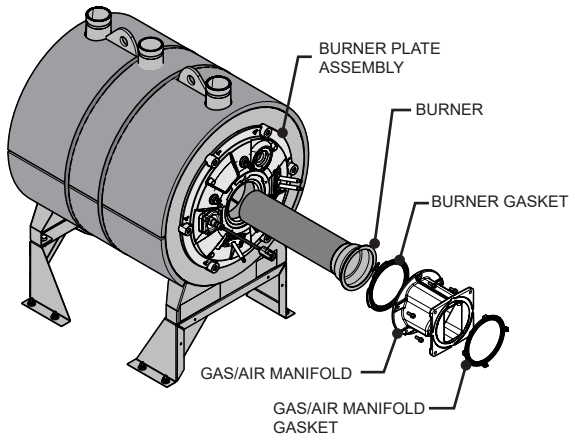
Perform start-up and checks

1. Start water heater and perform checks and tests specified in Section 11 - Start-up of the Regent Installation and Operation manual.
2. Verify cold fill pressure is correct and that operating pressure does not go too high.

Check burner flame

1. Inspect flame through observation window.
2. If the flame is unsatisfactory at either high fire or low fire, turn off water heater and allow water heater to cool down. Remove the burner and clean it thoroughly using a vacuum cleaner or compressed air. Do not use compressed air to clean burner if performed inside a building.
3. Remove the burner, reference FIG. 2-2.
4. When replacing the burner, ensure gasket is in good condition and positioned correctly (FIG. 2-2).

***Figure 2-2** Burner Assembly*



Check flame signal

1. The Regent water heater is equipped with two flame sense electrodes. At high fire, the flame signal shown on the display, labeled “Flame 2”, should be at least 10 microamps. As the water heater modulation decreases to low fire, the value shown on the display, labeled “Flame 1”, should increase.
2. A lower flame signal may indicate a fouled or damaged flame sense electrode. If cleaning the flame sense electrode does not improve, ground wiring is in good condition, and ground continuity is satisfactory, replace the flame sense electrode.
3. See Section 3 - Troubleshooting in this manual for other procedures to deal with low flame signal.

Check O2 sensor

1. A self-diagnosis feature is programmed into the O2 sensor control. If there is a problem with the O2 sensor, the appropriate error will be displayed. The unit will continue to operate on the last known combustion curve. Contact a qualified service technician to inspect and replace the O2 sensor as needed.

Review with owner

1. Emphasize the need to perform the maintenance schedule specified in this manual.
2. Remind the owner of the need to call a licensed contractor should the water heater or system exhibit any unusual behavior.
3. Remind the owner to follow the proper shutdown procedure and to schedule an annual start-up.

Cleaning heat exchanger

For recommended materials; including brush, appropriate extension(s), refractory cover, and detailed instructions see Table 2B-Heat Exchanger Cleaning Kits.

1. Shut down water heater:
   - Follow the “To Turn Off Gas to Appliance” instructions for the water heater in Section 11 - Startup of the Regent Installation and Operation manual.
   - Do not drain the water heater unless it will be exposed to freezing temperatures.
2. Allow time for the water heater to cool to room temperature if it has been firing.
3. Open the front door access and remove the blower/gas train assembly.
4. Remove the nuts securing the heat exchanger access cover to the heat exchanger and set aside.

2 Maintenance *(continued)*

⚠ WARNING The water heater contains ceramic fiber materials. Use care when handling these materials per instructions in this manual. Failure to comply with could result in severe personal injury.

5. Remove the necessary components to gain the needed access for heat exchanger cleaning, see FIG 2-2.

6. Use a vacuum cleaner to remove any accumulation on the water heater heating surfaces. Do not use any solvent.

7. Brush the heat exchanger while dry using a nylon bristle brush. Caution: DO NOT use a metal brush. Re-vacuum the heat exchanger.

8. Finish cleaning using a clean cloth dampened with warm water. Rinse out debris with a low pressure water supply.

9. Allow the heat exchanger to thoroughly dry.

10. Remove the field supplied rear refractory cover from the back of the combustion chamber of the heat exchanger and reassemble.

11. Close isolation valves on piping to isolate water heater from system. Attach a hose to the water heater drain and flush the water heater thoroughly with clean water by using purging valves to allow water to flow through the water makeup line to the water heater.

12. Perform start-up and check-out procedures in the Check Flame and Combustion- Section 11- Start-up of the Regent Installation and Operation Manual.

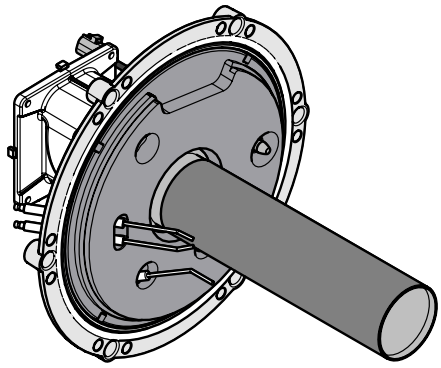
13. Replace the access cover and restore water heater to operation

***Table 2B** Heat Exchanger Cleaning Kit*

Model	Kit Number	Part Number	Component Description
500 - 1000	100157628	100333410	Rear Refractory Cover, 10.75" Diameter
		100208804	Rear Refractory Cover, 7.25" Diameter
		100208309*	Nylon 4" Wheel Brush*
		100208310	1/4" x 12" Drill Extension
		100208311	1/4" x 24" Drill Extension

⚠ CAUTION * Do NOT use a metal brush. Only use the kit provided brush or an equivalent replacement nylon brush.

***Figure 2-3** Rope Gasket - Heat Exchanger Door*



NOTICE Rope gasket is intended for sealing combustion (see FIG. 2-3). If gasket is damaged DO NOT reuse, the rope gasket must be replaced. See the Regent Replacement Parts List for replacement rope gasket.

Oil bearing circulators

1. Check other circulators in the system. Oil any circulators requiring oil, following the circulator manufacturer's instructions. Over-oiling will damage the circulator.

Air filter

1. Shut down water heater and ensure purge function has been completed.
2. Once purge has been completed, open the front door and locate the air box at the bottom of the water heater cabinet.
3. From there, remove the thumb screws on the front of the airbox, and then remove the sheet metal panel to access the air filter.
4. Remove the air filter and inspect for any blockages or if the filter needs to be replaced (monthly).
5. Replace the air filter if necessary.
6. Install the filter after inspection, ensuring that the arrow indicating flow path is in the correct position.
7. Place the sheet metal cap back onto the air box and screw on the thumb screws to seal.
8. Close the door and allow water heater to restart operation.

2 Maintenance

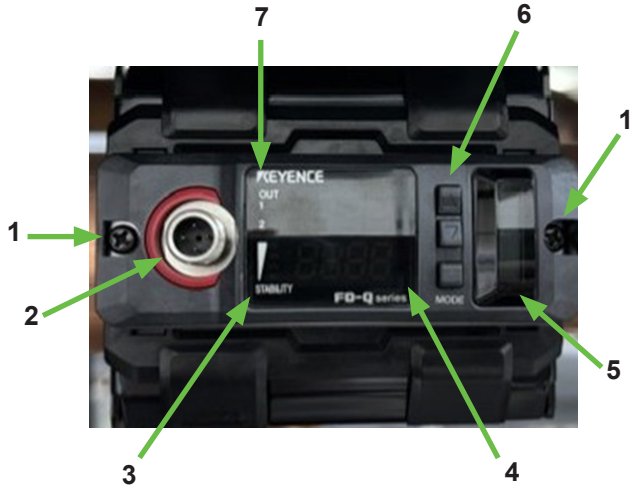
Internal pump

1. The Regent water heater internal pump does not require oil.
2. To clean volute of the pump, the motor head must be removed, and the heat exchanger drained.
3. To remove the motor head, after the water has been shut off and the heat exchanger drained, remove the four bolts attaching the motor head to the volute.
4. Once the motor head is removed, inspect the volute for any corrosion.
5. If problems persist, review the troubleshooting section of this manual, or contact the manufacturer.

Flow sensor

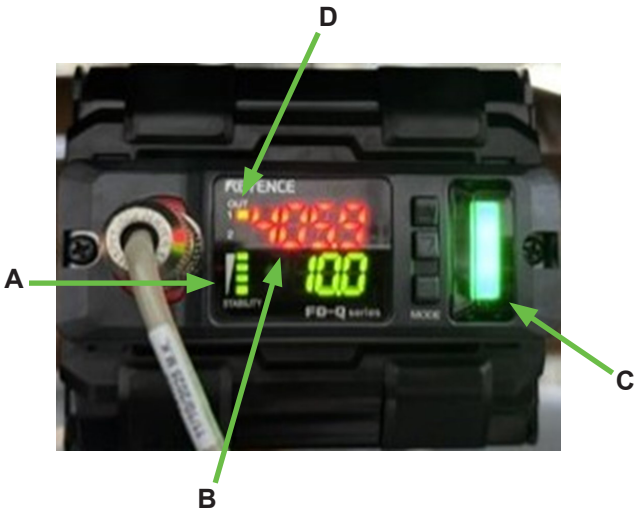
The Regent water heater features an ultrasonic flow sensor that measures and displays the water flow rate into the water heater through the inlet pipe. See FIG. 2-4 and 2-5 for more information about the flow sensor and values displayed on flow sensor screen.

Figure 2-4 *Flow sensor DISPLAY OFF*



1. M4 mounting screws for flow sensor display onto bracket
2. Flow sensor cable connection (M12-4 pin connector)
3. Flow sensor stability indicator detects flow sensor stability on piping. 1 to 4 light indications=stability level display.
4. Flow sensor display screen: the current flow value will be on the top line of the display.
5. Status indicator. Will light up according to the flowing status of fluid.
6. Setting buttons (DO NOT TOUCH)
7. Output Indicators

Figure 2-5 *Flow sensor DISPLAY ON*



A. Stability indicator - 1-4 bars on display WILL read flow, with 1 bar being the least stable

B. Flow indicator (ACTUAL) - Flow indicator will read 10x the actual GPM on the SMART TOUCH display. For example, 405.9=40.59 GPM.

C. Status indicator - Will light up according to the flowing status of fluid.

D. Output Indicator

For troubleshooting steps, please see table 2C.

2 Maintenance

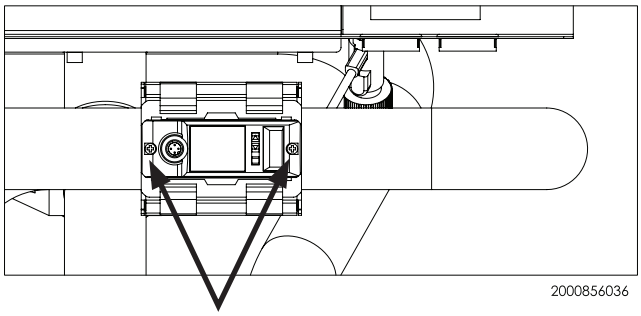
Table 2C *Flow sensor trouble shooting*

IMAGE	CAUSE	STEPS
Sensor is not powered. OR Sensor has power, but no flow displayed on flow sensor screen.	Flow sensor wired incorrectly	1. If there is flow indicated on SMART TOUCH display, but the display on flow sensor does not show flow, check the harness connection to the comfort control board (X1-9= BL, X1-10=BK). 2. Check the harness into the flow sensor (see Figure 2-4). 3. Replace the flow sensor.
Display on Sensor Reads: "---" OR Stability bars less than 4	Flow sensor display mount not stable	1. The two mounting screws on the front of the bracket are not screwed to the proper torque (1 N-m). Check to make sure mounting screws are properly installed. See Figure 2-6 for location of the Mounting screws. 2. Ensure flow sensor harness is connected to flow sensor. 3. Bleed the piping line of air bubbles. Air trapped could cause a non-ideal flow distribution. 4. Replace the flow sensor.
"FFFF" is displayed	Flow has exceeded display range	1. Limit water flow into unit pipes until the FFFF is cleared, and flow range is not exceeded. 2. NOTE: The SMART TOUCH display on the water heater will still display a flow, however the flow sensor functionality has just been exceeded.

Replacing the flow sensor

To replace the flow sensor, simply remove the flow sensor cable connection (M12-4 pin connector), and unscrew the two M4 mounting screws on the right- and left-hand side of the flow sensor display. See Figure 2-6 for more information.

Figure 2-6 *Removal of mounting screws*



3 Troubleshooting

Water Chemistry

1. The Regent water heater can operate at certain hardness levels. See Section 7- System piping in the Regent Installation and Operation manual for more details.
2. If the system is at a hardness level ABOVE the requirement listed in the Regent Installation and Operation manual, the water quality will need to be checked to ensure proper operation.
3. If filters are installed in the system to assist with water quality, check those components to ensure proper flow into the water heater.

⚠WARNING Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Always disconnect power to the water heater before servicing. Failure to comply could result in severe personal injury, death, or substantial property damage.

⚠WARNING Never jumper (bypass) any device except for momentary testing as outlined in the Troubleshooting chart. Severe personal injury, death, or substantial property damage can result.

Before troubleshooting:

1. Have the following items:
   a. Voltmeter that can check 120 vac, 24 vac, and 12 vdc.
   b. Continuity checker.
   c. Contact thermometer.
2. Check for 120 vac (minimum 102 vac to maximum 132 vac) to water heater.
3. Make sure thermostat is calling for heat and contacts are closed. Check for 24 vac between enable input and ground.
4. Make sure all external limit controls are installed and operating.

Check the following:

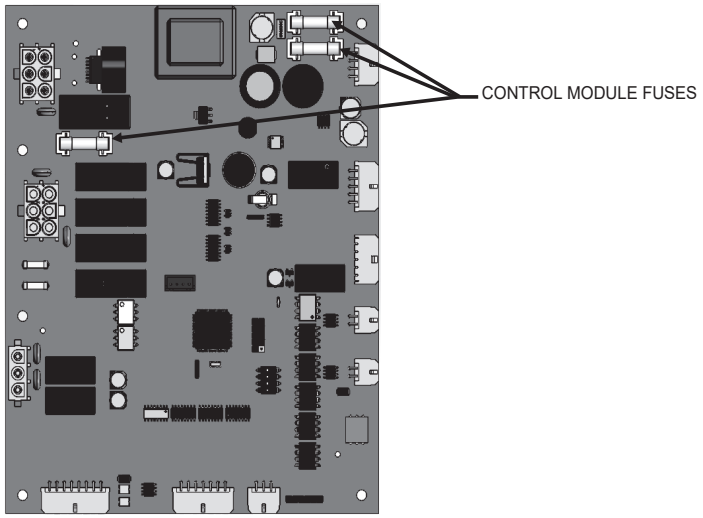
1. Wire connectors to control module are securely plugged in at the module and originating control.
2. Gas pressures:
   - Maximum: 14 inches w.c. (3.5 kPa) (natural and LP) with no flow (lockup) or with water heater on
   - Minimum: 2.5 inches w.c. (0.62 kPa) (NATURAL) or 8 inches w.c. (1.99 kPa) (PROPANE) with gas flowing (verify during water heater startup)

Check control module fuses

NOTICE ALWAYS check control module fuses before replacing control module or any major components (blower, etc.). If one of these fuses is blown, it can prevent the control module or other components from operating.

1. Turn OFF the power to the water heater at the external line switch.
2. Open the front door.
3. Remove the control panel cover.
4. Inspect fuses (reference FIG. 3-1).

Figure 3-1 *Control Module Fuses*



5. The water heater is shipped with replacement fuses in a plastic bag located inside the control panel.
6. If necessary, select the correct replacement fuse and replace any blown fuse(s).

⚠WARNING Do not jumper fuse or replace with any fuse except as specified. Failure to comply could result in severe personal injury, death, or substantial property damage.

7. Re-install the control panel cover using the four (4) screws removed in Step 3. Close the front door.
8. Restore power to the water heater at the external line switch and verify water heater operation (Section 9 - Start-up in the Regent Installation and Operation Manual) after completing water heater service.

3 Troubleshooting *(continued)*

Table 3A *Troubleshooting Chart - No Display*

FAULT	CAUSE	CORRECTIVE ACTION
No Display	- No power supplied to the unit. OR - No LED's illuminated on the Display Interface control board.	• Check position of ON/OFF switch. Turn switch to the ON position. • Check wiring harness connection between display board and main control board. Connect harness at both points. • Check 120 VAC through the ON/OFF switch. • Check external line switch, fuse, or breaker.
No Burner Operation	- Unit locked out on fault.	• Consult display for specific fault. Refer to fault descriptions in this manual for corrective actions.
	- Main control board temperature set point satisfied.	• Review temperature setting.
Unit does not modulate up to 100%	- Flue temperature is not changing.	• Check the status of Active Power Limitations Alterations on the modulation detail screen. • Check to ensure flue sensor is mounted.

3 Troubleshooting

Checking temperature sensors

The Regent temperature sensors (inlet water, outlet water, and flue) are all resistance type devices. The following tables show the correct values for the sensors at various temperatures. Use an ohmmeter to read the resistance of the sensor at a known temperature. If the resistance of the sensor does not closely match its corresponding table, replace the sensor.

It is important to note that the flue and outlet water sensors each have two temperature sensing devices in one housing. These devices are designated as S1/S9 - outlet sensor and S3/S10 - flue sensor. Please reference the wiring diagram in the Regent Installation and Operation Manual for correct terminal location.

Table 3B - *Inlet Water/System Sensor Resistance vs. Temperature*

Temperature (°C/°F)	Resistance	Temperature (°C/°F)	Resistance
10/50	19553	60/140	2786
20/68	12690	70/158	2004
30/86	8406	80/176	1464
40/104	5715	90/194	1084
50/122	3958	100/212	816

Table 3C - *Outlet Water & Pre-Mix Air Sensor Resistance vs. Temperature*

Outlet	S1	R/Y		Outlet	S9	RW/Y	
Pre-Mix Air	S11	GY/Y					
Temperature (°C/°F)	Resistance	Temperature (°C/°F)	Resistance	Temperature (°C/°F)	Resistance	Temperature (°C/°F)	Resistance
10/50	19,553	70/158	2,004	10/50	40,030	70/158	3,478
20/68	12,690	80/176	1,464	20/68	25,030	80/176	2,492
30/86	8,406	90/194	1,084	30/86	16,090	90/194	1,816
40/104	5,715	100/212	816	40/104	10,610	100/212	1,344
50/122	3,958			50/122	7,166		
60/140	2,786			60/140	4,943		

Table 3D - *Flue Sensor Resistance vs. Temperature*

Flue	S3	GY/Y		Flue	S10	W/Y	
Temperature	Resistance	Temperature	Resistance	Temperature	Resistance	Temperature	Resistance
10/50	40,030	70/158	3,478	10/50	258,500	70/158	16,870
20/68	25,030	80/176	2,492	20/68	125,500	80/176	12,000
30/86	16,090	90/194	1,816	30/86	80,220	90/194	8,674
40/104	10,610	100/212	1,344	40/104	52,590	100/212	6,369
50/122	7,166			50/122	35,270		
60/140	4,943			60/140	24,160		

3 Troubleshooting *(continued)*

***Table 3E** Troubleshooting Chart - Noisy System*

FAULT	CAUSE	CORRECTIVE ACTION
Noisy Operation	- Supply gas flow insufficient or is exceeding the limit.	1. Check incoming supply gas pressure. Nat gas supply range: 2.5 inches w.c. (0.62kPa) to 14 inches w.c. (3.5kPa) Propane gas supply range: 8 inches w.c. (1.99kPa) to 14 inches w.c. (3.5kPa). 2. Refer to Section 8 in the Regent Installation and Operation manual.
	- Gas/air mixture problem.	1. Refer to the Gas Valve Adjustment Procedure in Section 3 of this manual. 2. Check venting lengths do not exceed the maximum listed in Section 3 of the Regent Installation and Operation manual.
	- Air in the piping system.	1. Properly purge all air from the piping system.
	- Dirt or debris caught in the air intake that may be blocking inlet air flow.	1. Check or replace the filter. 2. Check the intake termination.
No Pump Operation - Internal Recirculation Pump or System Pump	- Blown fuse.	1. Check fuses on the control board. If one is blown, replace that fuse.
	- Faulty pump.	1. Replace pump.
	- Internal fault on control board.	1. Replace main control board.
	- Faulty pump relay.	1. Replace relay.
No Blower Operation	- Internal fault on control board.	1. Replace control board.
	- Faulty blower.	1. Replace blower.
	- Faulty blower relay.	1. Replace relay.
Relief Valve Opening	- System pressure exceeds relief valve setting.	1. Lower the system pressure below the rating of the supplied relief valve. Maximum operational pressure of the heat exchanger is160 psi (40 kPa). 2. Check expansion tank sizing.

3 Troubleshooting

***Table 3F** Troubleshooting Chart - Fault Messages Displayed on Water heater Interface*

FAULT	DESCRIPTION	CORRECTIVE ACTION
Gas Pressure Switch Open (will require a manual reset once the condition has been corrected. Press the RESET button on the SMART TOUCH display to reset.)	High Gas Pressure Switch open OR Low Gas Pressure Switch Open OR High and Low Gas Pressure Switch open	1. Check Gas pressure switch wiring connections. 2. Check incoming supply gas pressure. Nat gas supply range: 2.5 inches w.c. (0.62kPa) to 14 inches w.c. (3.5kPa) Propane gas supply range: 8 inches w.c. (1.99kPa) to 14 inches w.c. (3.5kPa). 3. Refer to Section 8 of Regent Installation and Operation Manual for more information on gas supply. 4. Correct gas supply pressure if necessary.
Gas Pressure Switch (will require a manual reset once the condition has been corrected. Press the RESET button on the SMART TOUCH display to reset.)	High Gas Pressure Switch open while running OR Low Gas Pressure Switch open while running OR High and Low gas pressure switch open while running	1. Check Gas pressure switch wiring connections. 2. Check incoming supply gas pressure. Nat gas supply range: 2.5 inches w.c. (0.62kPa) to 14 inches w.c. (3.5kPa) Propane gas supply range: 8 inches w.c. (1.99kPa) to 14 inches w.c. (3.5kPa). 3. Refer to Section 8 of Regent Installation and Operation Manual for more information on gas supply. 4. Correct gas supply pressure if necessary.
Flow Switch (will require a manual reset once condition has been corrected. Press the RESET button on the SMART TOUCH display to reset.)	Flow switch/LWCO open for too long OR Flow switch/LWCO open for too long while running	1. Check for loose wiring connections on CC and Main control board. 2. Check signal to flow switch. 3. Check pump operation, ensure there is power. 4. Check the system for water flow and verify all air has been purged from the system. 5. Reset the Flow Switch/LWCO from the “reset” button on the display control panel.
	Blown fuse.	1. Replace fuse F2 on the main control board.
Blocked Drain Open (will require a manual reset once condition has been corrected. Press the RESET button on the SMART TOUCH display to reset.)	Blocked drain opened.	1. Check condensate tube from unit to floor drain for proper installation and obstructions. 2. Inspect condensate trap for blockage. Clean if necessary. 3. Check for loose wiring connection at wire harness plug. 4. Faulty blocked drain switch. Replace switch.
Blocked Drain Switch (will require a manual reset once condition has been corrected. Press the RESET button on the SMART TOUCH display to reset.)	Blocked drain open in run.	1. Check condensate tube from unit to floor drain for proper installation and obstructions. 2. Inspect condensate trap for blockage. Clean if necessary. 3. Check for loose wiring connection at wire harness plug. 4. Faulty blocked drain switch. Replace switch.

3 Troubleshooting *(continued)*

***Table 3F** (continued from previous page) Troubleshooting Chart - Fault Messages Displayed on Water heater Interface*

FAULT	DESCRIPTION	CORRECTIVE ACTION
Blocked Vent Recycle OR Blocked Vent (will require a manual reset once the condition has been corrected. Press the RESET button on the SMART TOUCH display to reset.)	Blocked Vent APS open	1. Check for obstruction or blockage in the vent/ air intake pipes or terminations. 2. Check filter. Replace if necessary. 3. Check reference hose and tubing connections to the pressure switches for blockage/ obstruction. 4. Check the wiring connections to the switch. See Regent Installation and Operation manual for more details. 5. Inspect the burner. Reference this manual for cleaning procedures. 6. Inspect the heat exchanger. Reference this manual for cleaning procedures. 7. Vent/air intake lengths exceed the maximum allowed lengths. Refer to Section 3 of the Regent Installation and Operation manual.
Flame Fail Ignition (will require a manual reset once the condition has been corrected. Press the RESET button on the SMART TOUCH display to reset.)	The unit has failed to prove main burner ignition.	1. Visually check for presence of a spark from the view of the port. 2. Inspect spark electrode and associated wiring for damage/proper connection. Reference this manual for cleaning procedure. Replace if necessary. 3. Inspect flame sensors and associated wiring. Reference this manual for cleaning procedure. Replace if necessary. 4. Check/Replace Air filter. 5. Check incoming supply gas pressure. Nat gas supply range: 2.5 inches w.c. (0.62kPa) to 14 inches w.c. (3.5kPa) Propane gas supply range: 8 inches w.c. (1.99kPa) to 14 inches w.c. (3.5kPa). 6. Check for proper electrical grounding of the unit. 7. If 120 VAC is present, check the outlet of the valve to ensure the valve is flowing gas. There should be a negative pressure present on the outlet of the gas valve. 8. Verify that the vent/air intake pipes are correctly installed and there are no obstructions. 9. Inspect the burner. Reference this manual for cleaning procedures. Replace if necessary.

3 Troubleshooting

***Table 3F** (continued from previous page) Troubleshooting Chart - Fault Messages Displayed on Water heater Interface*

FAULT	DESCRIPTION	CORRECTIVE ACTION
Flame Fail Running (will require a manual reset once the condition has been corrected. Press the RESET button on the SMART TOUCH display to reset.)	The flame failed while running.	1. Inspect Flame rods and associated wiring for damage and connection. Reference this manual for cleaning procedures. Replace if necessary. 2. Check incoming supply gas pressure. Nat gas supply range: 2.5 inches w.c. (0.62kPa) to 14 inches w.c. (3.5kPa) Propane gas supply range: 8 inches w.c. (1.99kPa) to 14 inches w.c. (3.5kPa). 3. Check/Replace Air filter. 4. Verify that the vent/air intake pipes are installed correctly and there are no obstructions. 5. Check for proper electrical grounding of the unit. 6. Check combustion. 7. Inspect the burner. Reference this manual for cleaning procedures. Replace if necessary.
Gas Valve 1 (will require a manual reset once the condition has been corrected. Press the RESET button on the SMART TOUCH display to reset.)	Low gas valve 1 relays feedback OR High gas valve 1 relays feedback	1. Check wiring harness connection at the gas valve and the main control board 2. Check during ignition sequence that the LED light on the front of the gas valve is on. If LED is not energized, replace the gas valve.

3 Troubleshooting *(continued)*

***Table 3F** (continued from previous page) Troubleshooting Chart - Fault Messages Displayed on Water heater Interface*

FAULT	DESCRIPTION	CORRECTIVE ACTION
Manual Reset High Limit (MRHL) Outlet Temp (will require a manual reset once the condition has been corrected. Press the RESET button on the SMART TOUCH display to reset.)	Max MRHL limit exceeded.	1. If the high limit has tripped, check the setting of the MRHL set point 2. Check the voltage to the internal recirculation pump motor. If voltage is not present, check wiring back to the main control board. 3. Replace the pump relay if necessary. 4. Verify the water heater is piped properly into the heating system. Refer to section 7 of the Regent Installation and Operation manual for the proper piping methods. 5. If 120 VAC is present on a call for heat and the internal recirculation pump is not operating, replace the pump.
Fan Speed Low (will require a manual reset once the condition has been corrected. Press the RESET button on the SMART TOUCH display to reset.)	The actual fan RPM is 30% lower than what is being called for.	1. Vent/air intake lengths exceed the maximum allowed lengths. Refer to Section 3 of the Regent Installation and Operation Manual for more details. 2. Check for obstruction or blockage in the vent air intake pipes or at terminations. 3. Check the wiring connections at the fan and at the main control board. 4. Replace the blower.
	Blown fuse.	1. Replace fuse F2 on the control board.

3 Troubleshooting

***Table 3F** (continued from previous page) Troubleshooting Chart - Fault Messages Displayed on Water heater Interface*

FAULT	DESCRIPTION	CORRECTIVE ACTION
Fan Speed High (will require a manual reset once the condition has been corrected. Press the RESET button on the SMART TOUCH display to reset.)	The actual fan RPM is 30% higher than what is being called for.	1. Vent/air intake lengths exceed the maximum allowed lengths. Refer to Section 3 of the Regent Installation and Operation Manual for proper lengths. 2. Check for obstruction or blockage in the vent/ air intake pipes or at terminations. 3. Check the wiring connections at the fan and at the main control board. 4. Replace the fan.
Flue Temperature	The flue sensor detected a temperature at max limit.	1. Inspect the flue sensor and associated wiring. Measure the resistance of the flue sensor and compare to Table 3E of this manual. Replace the sensor if necessary. 2. Check for obstruction or blockage in the vent/ air intake pipes or at terminations. 3. Inspect the heat exchanger. Reference this manual for the procedure on how to clean the flue side of the heat exchanger.
Outlet Temperature	Outlet water temperature has exceeded the maximum outlet water temperature.	1. Inspect the outlet sensor and associated wiring. Measure the resistance and compare to the tables in section 3 of this manual. 2. Verify the system is full of water and that all air has been properly purged from the system. 3. Check for 120 VAC to the internal recirculation pump motor. If voltage is not present, check wiring back to the main control board. If 120 VAC is present, and pump is still not operational, replace pump motor ONLY. 4. Verify the water heater is piped properly into the heating system. Refer to section 7 of the Regent Installation and Operation Manual for more details.
EEPROM programmed (will require a manual reset once the condition has been corrected. Press the RESET button on the SMART TOUCH display to reset.)	Parameter programming completed.	1. After downloading parameters from a laptop, the main control board must be reset 2. Press the RESET button on the SMART TOUCH display panel.

3 Troubleshooting *(continued)*

***Table 3F** (continued from previous page) Troubleshooting Chart - Fault Messages Displayed on Water heater Interface*

FAULT	DESCRIPTION	CORRECTIVE ACTION
Outlet Water Sensor (will require a manual reset once the condition has been corrected. Press the RESET button on the display to reset.)	Outlet water sensor opened OR Outlet water sensor shorted	1. Check the sensors and their associated wiring. Repair or replace the sensor or wiring if damaged. 2. Measure the resistance of the sensors and compare them to the tables in this manual. Replace if necessary.
Inlet Water Sensor (will require a manual reset once the condition has been corrected. Press the RESET button on the display to reset.)	Inlet water sensor opened OR Inlet water sensor shorted	1. Check the sensors and their associated wiring. Repair or replace the sensor or wiring if damaged. 2. Measure the resistance of the sensors and compare them to the tables in this manual. Replace if necessary.
Flue Sensor (will require a manual reset once the condition has been corrected. Press the RESET button on the display to reset.)	Flue Sensor Opened OR Flue Sensor Shorted	1. Check the sensors and their associated wiring. Repair or replace the sensor or wiring if damaged. 2. Measure the resistance of the sensors and compare them to the tables in this manual. Replace if necessary.
Too Many Resets	Too many manual resets have occurred.	1. Turn power off to unit, wait 30 seconds and then turn power back on. 2. Wait 15 minutes and try again. 3. If problem persists, consult the manufacturer.
EEPROM Write Error	The main control board has detected an internal fault.	1. Turn power off to unit, wait 30 seconds and then turn power back on. 2. If problem persists, replace the main control board.
Programming Error	EEPROM error during programming	1. Turn power off to unit, wait 30 seconds and then turn power back on. 2. If problem persists, replace the main control board.
CRC Error	The main control board has detected an internal fault.	1. Turn power off to unit, wait 30 seconds and then turn power back on. 2. If problem persists, replace the main control board.

3 Troubleshooting

***Table 3F** (continued from previous page) Troubleshooting Chart - Fault Messages Displayed on Water heater Interface*

FAULT	DESCRIPTION	CORRECTIVE ACTION
Flame Signal (will require a manual reset once the condition has been corrected. Press the RESET button on the display to reset.)	Flame sensor 1 senses a flame while the gas valve is turned off. OR Flame sensor 2 senses a flame while the gas valve is turned off	1. Inspect Flame sensor 1 and associated wiring for damage and connection. Reference this manual for cleaning procedures. 2. Inspect Flame sensor 2 and associated wiring for damage and connection. Reference this manual for cleaning procedures. 3. Replace if necessary.
Flue Damper	Flue damper feedback stuck closed OR Flue damper feedback stuck open	1. Check the flue damper connection on the rear of the water heater (3-pin). IF damper is not being used, check the jumper cable is installed properly. 2. Verify Damper is installed properly on the vent. 3. Check wiring connection between the flue damper and the control board. 4. Check for 24 VAC from the output of the BC/CC transformer to the flue damper. 5. Check for 120 VAC from the output of the flue damper to the BC/CC Transformer. 6. Check Fuses on the control board. Replace fuse if necessary. 7. Replace the Flue damper. 8. Replace the control board.
ADC Fault (will require a manual reset once the condition has been corrected. Press the RESET button on the display to reset.)	A problem was detected with measuring one or more temperature sensors: - Outlet Sensor S1 - Outlet Sensor S9 - Flue Sensor S3 - Flue Sensor S10 - Premix Sensor S11 - Premix Sensor S13 - 24V Fault - 5V Fault	1. Check all connections between the temperature sensors and the control board. Ensure no damage/loose connections. 2. Check the resistance of all sensors (see this manual) 3. If the problem persists, replace the control board.

3 Troubleshooting *(continued)*

***Table 3F** (continued from previous page) Troubleshooting Chart - Fault Messages Displayed on Water heater Interface*

FAULT	DESCRIPTION	CORRECTIVE ACTION
ADC Safety Sensor (will require a manual reset once the condition has been corrected. Press the RESET button on the display to reset.)	ADC Safety Sensor Fault	1. Check all connections between the safety sensors and the control board. Ensure no damage/loose connections. 2. If the problem persists, replace the control board.
Combustion Feedback (will require a manual reset once condition has been corrected. Press the RESET button on the SMART TOUCH display to reset.)	CF Tolerance at rest CF Tolerance during purge	1. Check screen CF context 2. If problem persists, contact your service technician
Air Damper closed/open (will require a manual reset once the condition has been corrected. Press the RESET button on the display to reset.)	Air damper feedback active open OR Air damper feedback active stuck open OR Air Damper APS Active Closed OR Air Damper APS Active Open	1. Check connection of damper to combustion feedback board. 2. Check APS connection (ensure no blockages within the pressure lines) 3. Check APS connection (ensure electrical wiring is correct—for more detail see Installation and Operation manual).
APS Recycle (will require a manual reset once condition has been corrected. Press the RESET button on the SMART TOUCH display to reset.)	APS Active Open	1. Check for obstruction or blockage in the vent/air intake pipes or terminations 2. Check filter. Replace if necessary 3. Check reference hose and tubing connections to the pressure switches for blockage/obstruction. 4. Check the wiring connections to the switch. See Regent Installation and Operation manual for more details. 5. Inspect the burner. Reference this manual for cleaning procedures 6. Inspect the heat exchanger. Reference this manual for cleaning procedures. 7. Vent/air intake lengths exceed the maximum allowed lengths. Refer to Section 3 of the Regent Installation and Operation manual.

3 Troubleshooting

***Table 3F** (continued from previous page) Troubleshooting Chart - Fault Messages Displayed on Water heater Interface*

FAULT	DESCRIPTION	CORRECTIVE ACTION
Air Damper Recycle (will require a manual reset once condition has been corrected. Press the RESET button on the SMART TOUCH display to reset.)	Air Damper Feedback active open	1. Check connection of damper to combustion feedback board.
Air Damper APS Recycle (will require a manual reset once condition has been corrected. Press the RESET button on the SMART TOUCH display to reset.)	Air Damper APS active open	1. Check connection of damper to combustion feedback board. 2. Check APS connection (ensure no blockages within the pressure lines) 3. Check APS connection (ensure electrical wiring is correct—for more detail see Installation and Operation manual).
Proof-of-Closure (will require a manual reset once the condition has been corrected. Press the RESET button on the display to reset.)	Proof-of-closure valve not opened OR Proof-of-closure valve not closed	1. Check Gas valve wiring connections. 2. Measure gas pressure. Nat gas supply range: 2.5 inches w.c. to 14 inches w.c. Propane gas supply range: 8 inches w.c. to 14 inches w.c. Refer to section 8 of Regent Installation and Operation Manual for more information on gas supply 3. Correct gas supply pressure if necessary 4. If gas supply pressure within operating range, and electrical connections to valve functional, replace gas valve regulator.
HEX Door Temp switch/MRHL (will require a manual reset once condition has been corrected. Press the RESET button on the SMART TOUCH display to reset.)	HEX Door Temp Switch made	1. Check burner access door over-temp switch for loose connections and continuity. 2. Inspect heat exchanger combustion chamber for any build-up or debris. 3. Inspect condensate trap for blockage. Clean if necessary. 4. If neither chamber or condensate drain illustrate blockage, replace switch if necessary.
Premix Temperature	Premix sensor maximum temperature	1. Inspect flue sensor and associated wiring. 2. Measure the resistance of the flue sensor and compare to table 3E in this manual. Replace the sensor if necessary. 3. Check for obstruction or blockage in the vent/air intake pipes or at terminations 4. Replace Premix Sensor.

3 Troubleshooting *(continued)*

***Table 3F** (continued from previous page) Troubleshooting Chart - Fault Messages Displayed on Water heater Interface*

FAULT	DESCRIPTION	CORRECTIVE ACTION
Premix Sensor	Premix sensor shorted OR Premix sensor opened	1. Inspect flue sensor and associated wiring. 2. Measure the resistance of the flue sensor and compare to table 3E in this manual. Replace the sensor if necessary.
Flue Damper Recycle	Flue Damper switch opened during run too many times	1. Check the flue damper connection on the rear of the water heater (3-pin). IF damper is not being used, check the jumper cable is installed properly. 2. Verify Damper is installed properly on the vent. 3. Check wiring connection between the flue damper and the control board. 4. Recycle power, allowing 30 seconds to reset switch count 5. Check flue damper. 6. Replace flue damper if necessary.
Soft Start (will require a manual reset once condition has been corrected. Press the RESET button on the SMART TOUCH display to reset.)	Contact your service technician	1. Contact your service technician

3 Troubleshooting

Combustion Analysis Procedure

1. Turn the main power off to the water heater by placing the "On/Off" switch in the OFF position.
2. Remove the fitting from the flue collector. **Note:** Combustion measurements will be made at this point.
3. Insert the probe from a combustion analyzer into the hole left by the removal of the fitting.
4. Turn the main power on to the water heater by placing the "On/Off" switch in the ON position.
5. Navigate to the Setup Screen from the Home Screen by pressing the SETUP button along the left side of the screen. Enter the installer password.
6. Select the Service Maintenance Screen. The tabs will scroll (up and down) to reveal more options.

   On the Service Maintenance Screen place heater into Service Mode by selecting the START button, then selecting the low fire modulation point (FIG. 3-2).
7. Once the water heater has modulated to rate, measure the combustion. The values should be near the target listed in Table 3H (this page). CO levels should be less than 200 ppm for a properly installed unit. If the combustion is not near the target, reference the Troubleshooting Chart for possible causes and corrective actions.
8. Once the heater analysis is complete, test the safety shutoff device by turning the manual shutoff valve to the OFF position and ensuring the heater shuts down and registers an alarm. Open the manual shutoff valve and reset the control.
9. Turn the main power off to the water heater and replace the fitting into the flue pipe connection.
10. Ensure the water heater is placed back into normal operation.

⚠ WARNING You must replace the fitting to prevent flue gas spillage into the room. Failure to comply could result in severe personal injury, death, or substantial property damage.

***Table 3G** Flue Products*

Natural Gas		
Units	***Co_2 (Flue Port)**	***O^2 (Sensor)**
ALL	8.0 - 9.5	3.9 - 6.5
Propane		
Units	***Co_2 (Flue Port)**	***O^2 (Sensor)**
ALL	8.6 - 10.5	3.9 - 6.5

*NOTE: The Regent Combustion System is designed to maintain constant combustion. CO_2 is the target combustion measured from the flue measurement port. O_2 is the target measurement of the active O_2 sensor in the combustion chamber. An O2 measurement from the flue will vary from the O_2 measured in the combustion chamber.

***Figure 3-2** Service Screen*

3 Troubleshooting *(continued)*

***Table 3H** Troubleshooting Chart - Combustion Levels*

POSSIBLE CAUSE	CORRECTIVE ACTION
Vent/Air Intake Length or Obstruction	1. Refer to Section 2 - General Venting of the Regent Installation and Operation Manual for the proper venting and air intake methods for the Regent water heater. 2. Check for obstructions at the vent/air intake terminals. 3. Check/replace filter.
Gas Supply Pressure	1. Refer to Section 6 - Gas Connections of the Regent Installation and Operation Manual for the proper gas supply for the Regent water heater.
Dirty/Damaged Burner	1. Refer to this manual for burner removal and cleaning procedures. 2. Replace burner if necessary.
Gas Valve Adjustment	1. Refer to this manual for the gas valve adjustment procedure.

Gas valve adjustment procedure

CAUTION Under normal operating conditions the gas valve should not need adjusting. Any adjustment should be done in conjunction with the commissioning sequence as detailed in the Start-up Section of the Regent Installation and Operation Manual.

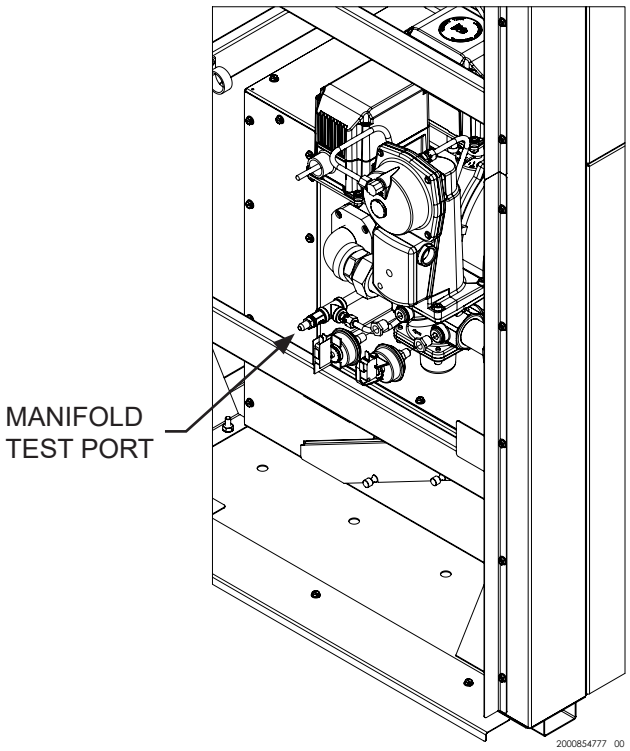
Adjusting the gas valve's regulator adjustment screw sets the manifold pressure used for the entire modulation range. The commissioning process allows each of the nine (9) control points to be adjusted individually. See FIG. 3-3 for location of the measurement point for manifold pressure.

Note: Turning the adjustment screw clockwise increases the CO_2 while decreasing the O2 levels.

Note: Turning the adjustment screw counterclockwise decreases CO_2 while increasing the O2 levels.

If combustion is still not within the specified range, repeat the procedure above. If after four (4) adjustments and the combustion is still not within the specified range, revisit the possible causes in Table 3H on page 40 or gas valve replacement may be required.

***Figure 3-3** Check Manifold Pressure*



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