Service Manual

Models: 500 - 2000

Up To 4:1 Turndown

⚠ WARNING This manual must only be used by a qualified heating installer / service technician. Read all instructions, including this manual and the VF Series 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.

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

⚠ WARNING

Installer – Read all instructions, including this manual and the VF Series Installation and Operation Manual, before installing. Perform steps in the order given.

User – This manual is for use only by a qualified heating installer/service technician. Refer to the VF Series Installation and Operation Manual for your reference.

Have this appliance 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 appliance – Please have the appliance model and serial number from the appliance's rating plate.

Consider piping and installation when determining appliance location (see the VF Series Installation and Operation Manual).

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

When servicing appliance –

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

Appliance operation –

- Do not block flow of combustion or ventilation air to the appliance.
- 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 appliance 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.

Appliance water –

- Thoroughly flush the system (without appliance connected) to remove sediment. The high-efficiency heat exchanger can be damaged by build-up or corrosion due to sediment.
- Do not use petroleum-based cleaning or sealing compounds in the appliance system. Gaskets and seals in the system may be damaged. This can result in substantial property damage.
- Do not use "homemade cures" or "appliance patent medicines". Serious damage to the appliance, personnel, and/or property may result.

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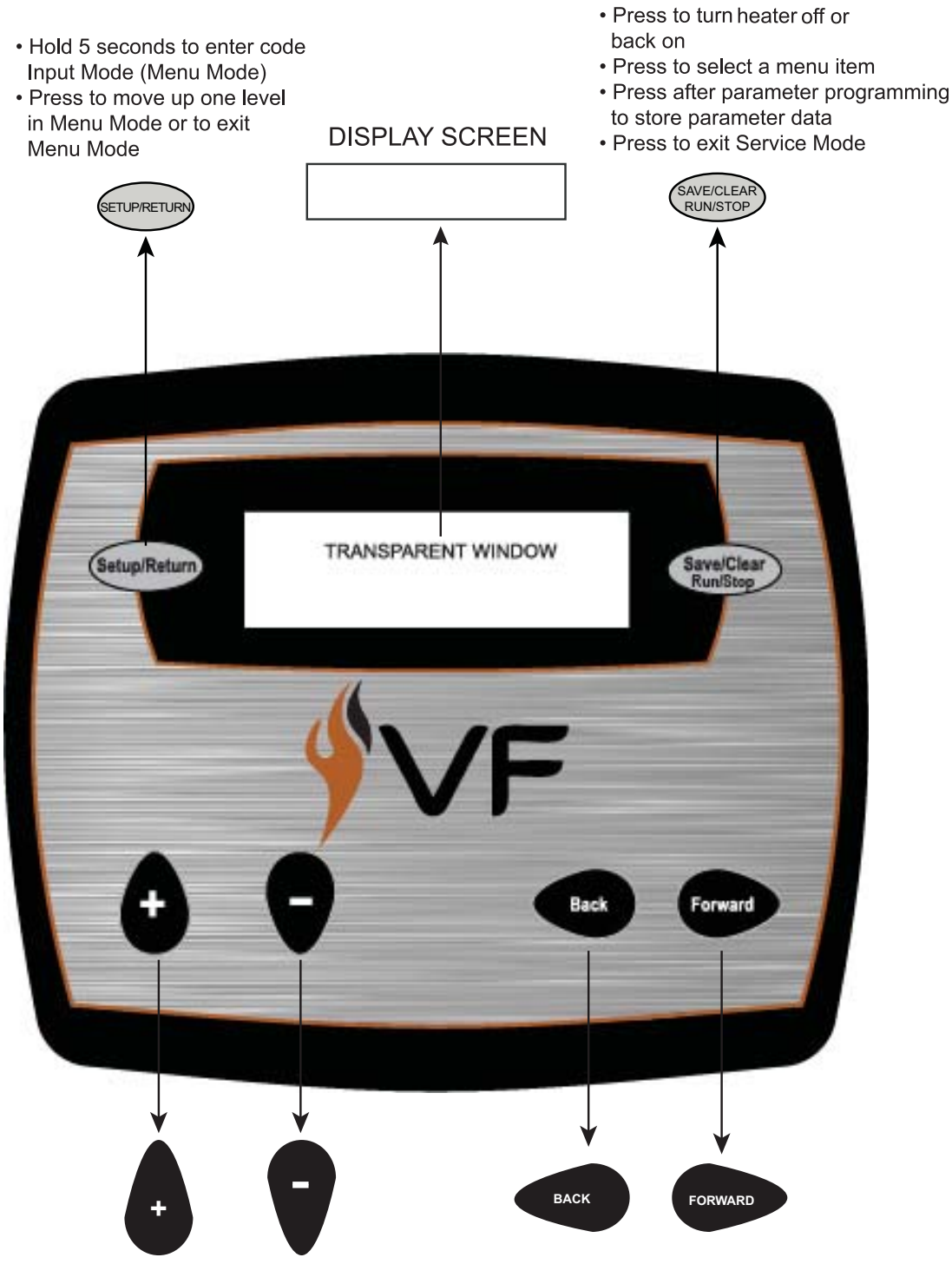
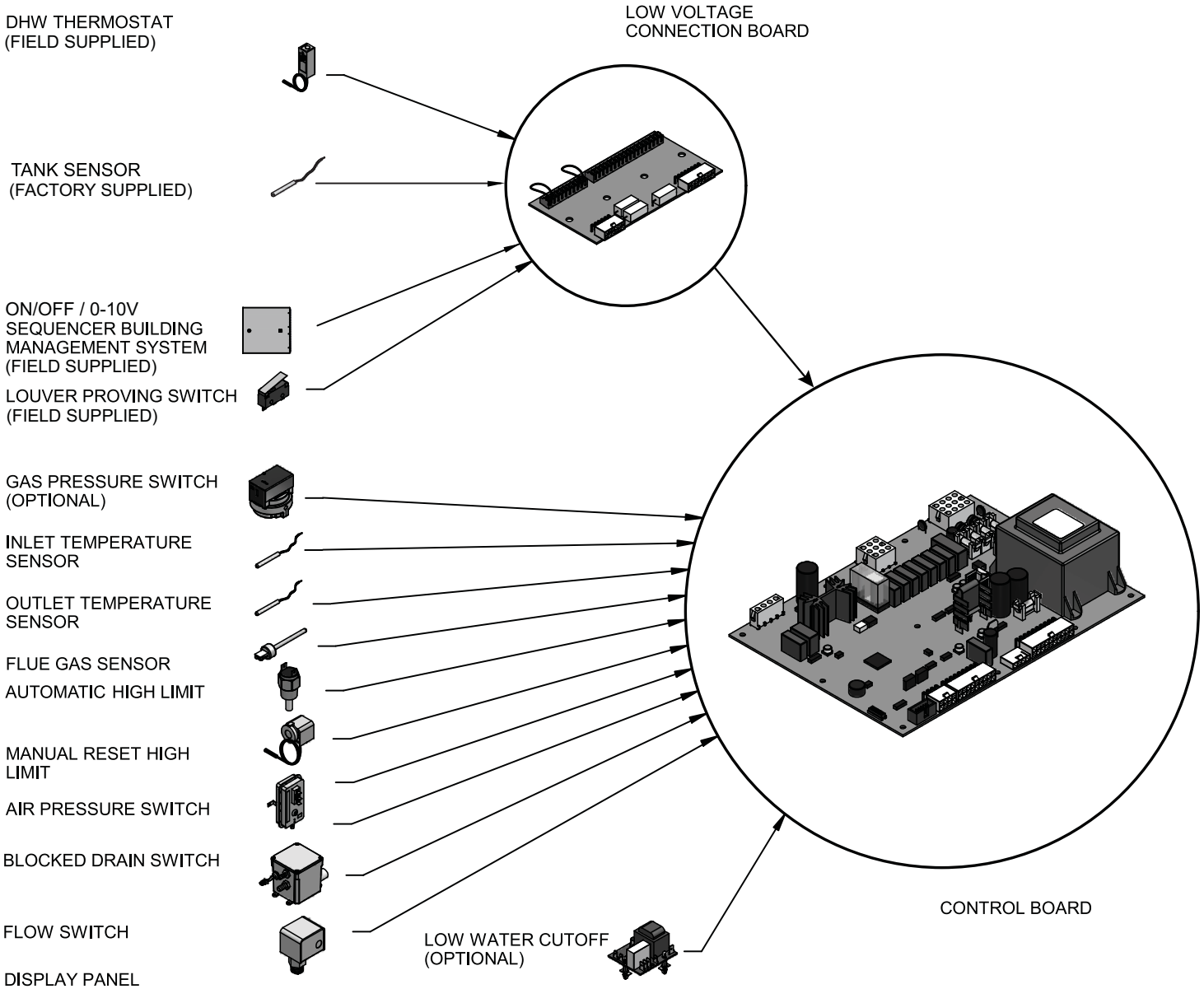
1 Service

The VF Series display



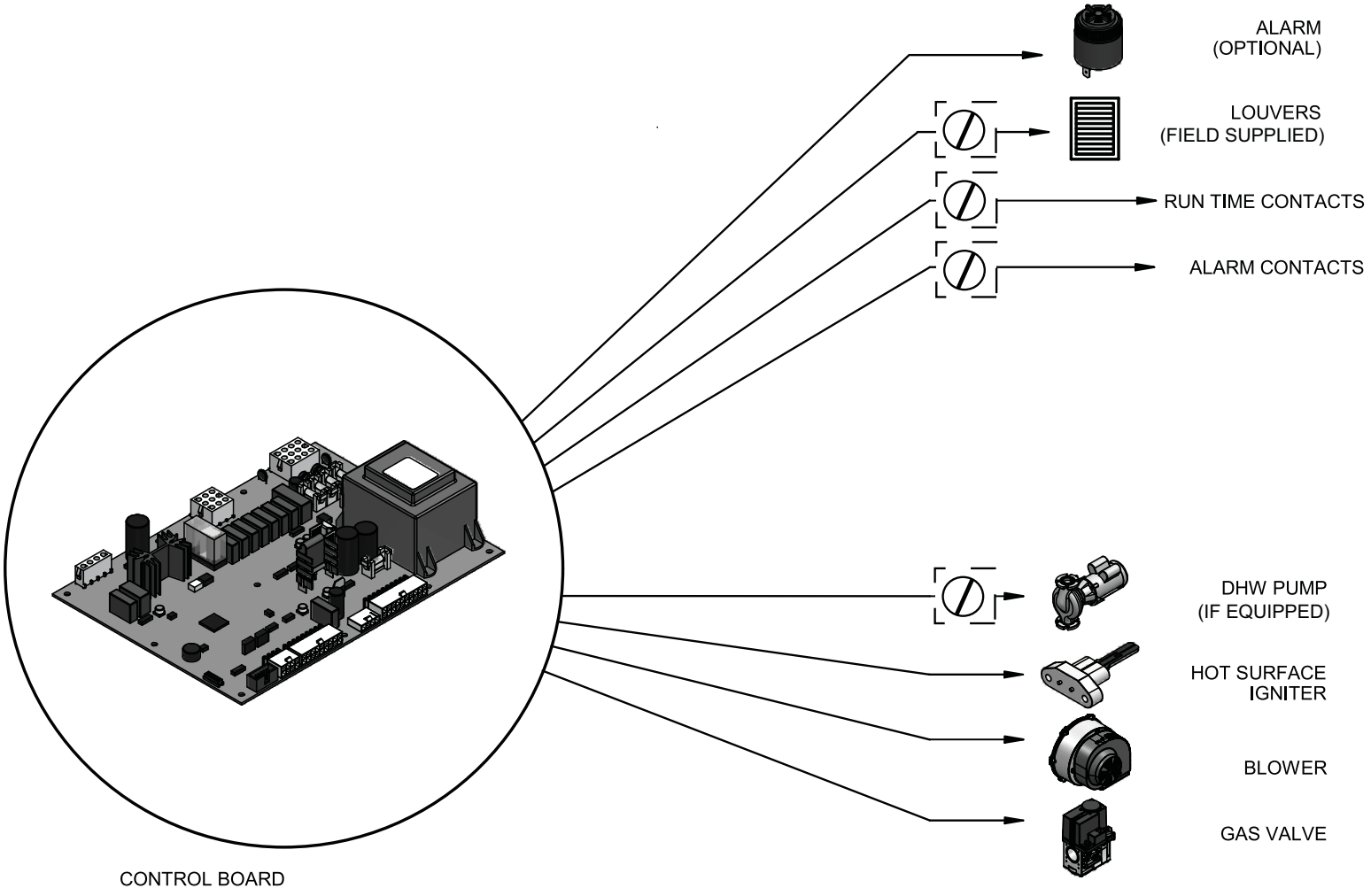
1 Service

Control inputs



1 Service *(continued)*

Control outputs



Indicates connections made to the line voltage terminal strip located on the rear of the unit.

1 Service

General Operation

How the appliance operates

The water heater uses a copper-finned tube heat exchanger to transfer heat from the flue products to the water. An electronic control module monitors various inputs to initiate a call for heat. The blower provides both primary and secondary air to the burner and forces the flue products out of the combustion chamber and into the vent system. The control module regulates the blower speed to control the firing rate of the appliance. The modulating gas valve monitors the amount of combustion air being pulled into the blower and regulates the amount of gas supplied, which then mixes with the combustion air and is supplied to the burner.

How the control module operates

The VF Series control module receives input from appliance sensors. The control module activates and controls the blower and gas valve to regulate heat input and switches the DHW pump on and off as needed. The user/installer programs the module to meet system needs by adjusting control parameters. These parameters set operating temperatures and heater operating modes. Appliance operation can be based on heater return water temperature, tank temperature, tank temperature thermostat, and/or remote enable switch.

Sequence of operation

Table 1A shows control module normal sequences of operation for DHW operation.

Access modes

User

The user can adjust the tank setpoint using the (+) and (-) buttons at any time during normal operation. By entering the USER code (0101), the user can also change temperature units, time and date, and night setback settings. In user mode, the following parameters can be viewed but not changed: heater model number; software version; total operating hours, total cycles and last 10 faults.

Installer

Most parameters are available only to the installer, accessible only by entering the installer access code (2525).

Saving parameters

To save parameters and exit programming:

Press the SAVE/CLEAR button, then the SETUP/RETURN button 3 times.

To keep parameter settings only for a current operating cycle:

Press the SETUP/RETURN button 3 times after making all desired parameter changes.

To enter a parameter and continue programming:

Press the SETUP/RETURN button 1 time to return to the parameter listings; press again to return to the menu listings. Remember to press the SAVE/CLEAR button when finished programming in order to save the changes made.

1 Service *(continued)*

Sequence of operation

***Table 1A**_Sequence of Operation - Space Heating and DHW*

OPERATION	DISPLAY
1. The manual reset high limit must be closed before any action will take place.	**HTR: Standby** **OUT: 123.8F(129)**
2. Upon a call for heat the control turns on the DHW pump. The flow switch and low water cutoff (if equipped) must close.	**HTR: Standby** **OUT: 123.8F(129)**
3. • The gas pressure switch(es) (if equipped) must close. • The contacts for the louvers close. The louver proving, blocked drain switch, and auto reset high limit inputs must close. • If the air pressure switch is open, the prepurge cycle then begins by starting the combustion blower. Once started, the air pressure switch must close.	**HTR: Standby** **OUT: 123.8F(129)**
4. After prepurge, the blower slows down and the hot surface igniter (HSI) is energized.	**HTR: PREPURGE** **OUT: 123.9F(129)**
5. Once the HSI is hot, the trial for ignition begins with the opening of the gas valve.	**HTR: IGNITION** **OUT: 123.9F(129)**
6. If the control does not sense flame, it will lock out.	**HTR: POSTPURGE, LOCKOUT** **OUT: 123.9F(129)**
7. If the control senses flame, it will fire the burner to maintain the setpoint. The firing rate will modulate as required to hold the tank temperature at the setpoint.	**HTR: DHW 20% RATE** **OUT: 124.8F(129)**
8. Once the call for heat is satisfied, the control will turn off the burner. The blower will remain on for the postpurge cycle. The DHW pump will continue to run for its pump delay time, then turn off.	**HTR: POSTPURGE** **OUT: 127.4F(129)**
9. Pump off.	**HTR: Standby** **OUT: 124.7F(129)**

1 Service

Display panel menu access

***Table 1B**_Use this procedure to access menus from the display panel*

BUTTON		OPERATION	DISPLAY	COMMENTS
●	SAVE/ CLEAR	Press 1 time in normal operation	HTR:OFF OUT:123.0F	*Heater turns off (this ensures uninterrupted programming)*
■	SETUP/ RETURN	Hold for 5 seconds -- display will change	Enter Menu Code: 0000	*Digit shown underlined at left will flash*
▲	(+)	Press 2 times to change the first flashing digit in the readout to “2”	Enter Menu Code: 2000	*Digit shown underlined at left will flash*
►	FORWARD	Press 1 time to move to the second digit	Enter Menu Code: 2000	*Digit shown underlined at left will flash*
▲	(+)	Press 5 times to change second digit in the readout to “5”	Enter Menu Code: 2500	*Digit shown underlined at left will flash*
►	FORWARD	Press 1 time to move to the third digit	Enter Menu Code: 2500	*Digit shown underlined at left will flash*
▲	(+)	Press 2 times to change the third digit to “2”	Enter Menu Code: 2520	*Digit shown underlined at left will flash*
►	FORWARD	Press 1 time to change to the last digit	Enter Menu Code: 2520	*Digit shown underlined at left will flash*
▲	(+)	Press 5 times to change last digit in readout to “5”	Enter Menu Code: 2525	*Digit shown underlined at left will flash*
		If you enter a digit incorrectly, you can move to the digit by using the FORWARD and BACK buttons as needed until the digit you want is flashing. Then use (+) and/or (-) buttons to change the value.		
●	SAVE/ CLEAR	Press to enter the code	Enter Menu Code: INSTALLER CODE	*The words, "INSTALLER CODE" will flash while displayed*
	⌛	After 2 seconds, display shows menus (press SAVE/CLEAR to select a menu)	>A General B Data Logging	*The caret symbol, ">" highlights the selectable line*
		If the code is entered incorrectly, the display will return to its previous mode. You will have to start over at step 1 to enter the code.		
▼	(-)	Press 1 time to highlight second listing	A General >B Data Logging	*The caret symbol, ">" highlights the selectable line*
▼	(-)	Press 1 time to toggle menu listing	>C Functions D DHW Settings	*The menu toggles to the next two menu options*
▼	(-)	Press 2 times to toggle menu listing	>E Control Modes F BMS	*The menu toggles to the next two menu options*
▼	(-)	Press 2 times to toggle menu listing	>G Circulation Pump H Service Notification	*The menu toggles to the next two menu options*
		To select a highlighted menu, press the SAVE/CLEAR button one time. The display will change to the first parameter under that menu, with the first characters flashing.		

1 Service *(continued)*

Display panel parameter access

***Table 1C**_This is a typical example of accessing a parameter, shown for pump delay parameter*

BUTTON		OPERATION	DISPLAY	COMMENTS
This example shows how to access the pump delay parameter. The first display shown is at the beginning of the menu listings, after entering the installer access code.				
	-	Beginning of menu listings.	>A General B Data Logging	*The caret symbol, ">" highlights the selectable line*
▼	(-)	Press 1 time to highlight second listing	A General >B Data Logging	*The caret symbol, ">" highlights the selectable line*
▼	(-)	Press 1 time to toggle menu listing	>C Functions D DHW Settings	*The menu toggles to the next two menu options*
▼	(-)	Press 2 times to toggle menu listing	>E Control Modes F BMS	*The menu toggles to the next two menu options*
▼	(-)	Press 2 times to toggle menu listing	>G Circ. Pump H Service Noti.	*The menu toggles to the next two menu options*
●	SAVE/ CLEAR	Press 1 time to list parameters	G1 DHW Pump Delay	*The DHW Pump Delay menu item is shown*
●	SAVE/ CLEAR	Press 1 time to select parameter	G1 DHW Pump Delay 30 sec	*The DHW Pump Delay setting is shown*
▲	(+) (or (-))	Press to increase (or decrease) value	G1 DHW Pump Delay 45 sec	*Parameter will increase or decrease, depending on button pressed*
●	SAVE/ CLEAR	Press 1 time to save (or press MENU/EXIT to continue)	G1 DHW Pump Delay	*The new setting is saved and the menu item is shown*
■	SETUP/ RETURN	Press 1 time to return to the main menu	> A General B Data Logging	
■	SETUP/ RETURN	Press 1 time to return to normal operation	HTR:Pre-Purge OUT:123.7˚F	*This display example assumes a DHW call for heat is present*

1 Service

Parameter table

***Table 1D**_This table lists control module parameters and where to access them*

	Menu	SUB ITEM	Description	See Page	User Access		Installer Access	
					Display	Modify	Display	Modify
GENERAL	A	1	Heater Model	13	Yes	No	Yes	No
		2	User Code	13	Yes	Yes	Yes	Yes
		3	Date and Time	13	Yes	Yes	Yes	Yes
		4	Software Version	13	Yes	No	Yes	No
		5	Temperature Units	13	Yes	Yes	Yes	Yes
		6	Night Setback Temperature	13	Yes	Yes	Yes	Yes
		7	Night Setback Times	13	Yes	Yes	Yes	Yes
DATA LOGGING	B	1	Hours Running DHW	13	Yes	No	Yes	No
		2	Ignition Attempts	13	Yes	No	Yes	No
		3	Show Last 10 Errors	13	Yes	No	Yes	No
FUNCTIONS	C	1	Reset Last 10 Errors	13	No	No	Yes	Yes
		2	Service Mode Delay	13	No	No	Yes	Yes
DHW SETTINGS	D	1	Tank Setpoint	14	Yes	Yes	Yes	Yes
		2	Tank Offset	14	No	No	Yes	Yes
		3	Tank Differential	14	No	No	Yes	Yes
CONTROL MODES	E	1	Enable Input	14	No	No	Yes	Yes
		2	0-10V Building Management Input	14	No	No	Yes	Yes
BMS	F	1	Voltage at Minimum	14	No	No	Yes	Yes
		2	Voltage at Maximum	14	No	No	Yes	Yes
		3	Minimum Power	14	No	No	Yes	Yes
		4	Maximum Power	14	No	No	Yes	Yes
CIRCULATION PUMPS	G	1	DHW Pump Delay	15	No	No	Yes	Yes
SERVICE NOTIFICATION	H	1	Service Notification in Months	15	No	No	Yes	Yes
		2	Service Notification Running Hours	15	No	No	Yes	Yes
		3	Service Notification Cycles	15	No	No	Yes	Yes
		4	Reset Service Notification Counter	15	No	No	Yes	Yes
		5	Accept PPlug	15	No	No	Yes	Yes

1 Service *(continued)*

Viewable and changeable control parameters

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

A: General

Heater model

The control will display "VWH500 - 2000" as the model number because the same control is used on several models. This will be displayed when parameter **A1** has been accessed. This parameter is not changeable.

User code

The User Code allows the user to access and change a limited number of control parameters. The access code can be changed by the user or the installer to a code of their choosing. To change the code, parameter **A2** must be accessed. The default code is 0101. The code can be changed one digit at a time by using the arrow keys on the display.

Date and time

The control uses an internal clock for the night setback feature and for logging of events. For these features to work correctly, the clock must be set when the unit is first installed or any time the unit has been powered off for more than 30 days. To set the clock, parameter **A3** must be accessed. The date and time are displayed as "YY:MM:DD W hh:mm". YY = year, MM = month, DD = date, W = day (1 = Monday, 2 = Tuesday, etc.), hh = hour (24 hour time; 2:00 PM = 14:00), mm = minutes.

NOTICE The internal clock does not adjust for Daylight Savings Time and therefore, will require a manual adjustment.

Software version

The software version allows the user to view the software version in use by the control. This software controls the operation of the unit. When a new software version becomes available, the existing control can be replaced with a new control to update the software.

Temperature units

The control can be configured to display temperature in either °C or °F. This parameter can be changed by the user or the installer by accessing parameter **A5**. The default is °F.

Night setback temperature

Once the internal clock has been set correctly, the night setback feature can be used to program a lower water temperature setpoint for the tank. This parameter can be changed by the user or the installer by accessing parameter **A6**. The temperature range for this parameter is 32°F (0°C) to 261°F (127°C). If set higher than the tank setpoint (parameter **D1**) the tank setpoint will be used. The feature is turned off with a setting of 32.0°F (0°C). The default value is 32.0°F (0°C).

Night setback times

If parameter A6 is set to anything other than 32.0°F (0°C), the night setback feature becomes active. This will require start and stop times to be programmed for the days that reduced temperatures are required. These times can be changed by the user or the installer by accessing parameter **A7**. Each day of the week (Monday through Sunday) will have an on and off time.

Example: Monday ON: 22:30, Tuesday OFF: 6:45. If you wish to skip a day and have no night setback, leave the on and off times the same. The default times for each day will be 08:00 (OFF) and 18:00 (ON).

B: Data logging

Hours running DHW

The hours running DHW parameter shows the total number of hours the unit has been in the DHW firing position. This parameter can be viewed by the user and the installer by accessing parameter **B1**.

Ignition attempts

The ignition attempts parameter shows the total number of times the unit has attempted to fire. This parameter can be viewed by the user and the installer by accessing parameter **B2**.

Show last 10 errors

The control will log the 10 most current errors with the date and time the error occurred. This parameter can be viewed by the user and the installer by accessing parameter **B3**.

C: Functions

Reset last 10 errors

The reset last 10 errors parameter allows the error counter to be reset to 0. This parameter can only be cleared by the installer by accessing parameter **C1**. Once accessed, press the SAVE/CLEAR button to clear the counter.

Service mode delay

By pressing the hidden button on the front of the display for five (5) seconds, the control will be placed in Service Mode. This will override all other heat demands. The Service Mode allows the installer to set the unit to any desired firing rate for the purpose of combustion analysis. The delay sets the length of time the unit will stay in the Service Mode if no keys have been pressed before going back to its original state. This parameter can only be changed by the installer by accessing parameter **C2**. The time range of this parameter is 0 to 40 minutes. The default value is 20 minutes.

1 Service

D: DHW settings

Tank setpoint

When a temperature sensor is installed in the tank, the tank setpoint sets the target temperature of the water in the tank. The user or installer can adjust this setpoint by accessing parameter **D1**. The temperature range of this parameter is 60°F (15°C) to 190°F (88°C). The default value is 120°F (49°C).

Tank offset

The tank offset is the number of degrees the tank temperature must go above the tank setpoint before the water heater will turn off. The installer can adjust this setpoint by accessing parameter **D2**. The temperature range of this parameter is 0° to 10°F (5°C). The default value is 4°F (2°C).

Tank differential

The tank differential is the number of degrees the tank temperature must go below the tank setpoint before the heater will start to heat the tank. The installer can adjust this setpoint by accessing parameter **D3** The temperature range of this parameter is 0° to 40°F (22°C). The default value is 6°F (3°C).

E: Control modes

Enable input

The tank thermostat input can be used in two different ways. When a tank aquastat is used, this input can start a heat demand when the aquastat closes. When a tank sensor is used, this input can be used to enable/disable the water heater using an external contact. This setting can be used by the installer by accessing parameter **E1**. To use this input with an aquastat, set this parameter to "Aquastat". To use this input with a remote enable contact, set this parameter to "Remote Enable". The default setting is "Aquastat".

0-10V building management input (BMS)

When the building management input is enabled, the control modulates the unit based on the voltage on the 0-10V input on the connection board. The 0-10V input controls the modulation of the unit(s). This setting is adjustable by the installer by accessing parameter **E2**. The default value is Inactive. See menu *Section F* to adjust the parameters that control the BMS operation.

F: Building Management System (BMS)

Voltage at minimum

This setting determines the voltage at which the external signal begins to increase either the modulation or the setpoint. Below this voltage, the modulation or setpoint will be at their minimum values. This parameter can be adjusted by the installer by accessing parameter **F1**. The range for this parameter is 0V - (**F2** - 0.1V). The default value is 2V.

Voltage at maximum

This setting determines the voltage at which the external signal forces the modulation to its maximum value. This parameter, along with the previous parameter, determines how much the modulation changes as the BMS input voltage changes. The modulation will change in proportion to the change in voltage between the minimum and maximum voltage settings. This parameter may be adjusted by the installer by accessing parameter **F2**. The range for this parameter is (**F1** + 0.1V) - 10V. The default setting is 10V.

Minimum power

This setting determines the modulation of the unit when the BMS input voltage is at or below the Voltage at Minimum setting. This parameter is active only when the BMS type is set to Power. This parameter can be as low as 25%. This parameter may be adjusted by the installer by accessing parameter **F3**. The range for this parameter is 0 - 100%. The default value is 20%.

Maximum power

This setting determines the modulation of the unit when the BMS input voltage is at or above the Voltage at Maximum setting. This parameter is only active when the BMS type is set to Power. This parameter can be adjusted by the installer by accessing parameter **F4**. The range for this parameter is 0 - 100%. The default value is 100%.

1 Service *(continued)*

G: Circulation pumps

DHW pump delay

The DHW pump delay parameter sets the length of time the DHW pump (if connected) will run after a DHW demand has been satisfied. This parameter is adjustable by the installer by accessing parameter **G1**. The time range for this parameter is 1 second to 40 minutes. The default time is 30 seconds.

H: Service Notification

Service notification in months

When the control determines that a scheduled service is due based on days of installation, the display will alternate the standard display text with the message SERVICE DUE every 5 seconds. This parameter is adjustable by the installer by accessing parameter **H1**. The time range for this parameter is 0 months to 36 months. The default time is 12 months.

Service notification running hours

When the control determines that a scheduled service is due based on the hours of actual operation, the display will alternate the standard display text with the message SERVICE DUE every 5 seconds. This parameter is adjustable by the installer by accessing parameter **H2**. The time range for this parameter is 0 hours to 100,000 hours. The default time is 10,000 hours.

Service notification cycles

When the control determines that a scheduled service is due based on the number of cycles, the display will alternate the standard display text with the message SERVICE DUE every 5 seconds. This parameter is adjustable by the installer by accessing parameter **H3**. The range for this parameter is 0 cycles to 100,000 cycles. The default is 10,000 cycles.

Reset service notification counter

Once servicing has been completed, the service notification counter should be reset. This parameter can be reset by the installer by accessing parameter **H4**. Once accessed, press the SAVE/CLEAR button to reset the service notification counter.

Accept PPlug

After replacing a control board, the new control will require the installer to verify the model in which it is installed. As soon as the power is turned on, the screen will display “Wrong ID Plg”. Look behind the control panel at the connector plugged into X5 on the control board. Note the number written on the connector. Access parameter **H5**. That number should appear after the word “Setting:” on the bottom line. If this number matches the number on the connector, press the SAVE/CLEAR button.

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; • Inspect condensate system and flush with fresh water • Check for leaks (water, gas, flue, condensate) • Examine venting system • Check system water pressure/system piping/expansion tank • Check control settings • Check igniter • Check wiring and connections • Check flue gas passageways • Flame inspection (stable, uniform) • Inspect and clean the burner • Check manifold gas pressure • Perform start-up checkout and performance verification per Section 7 in the VF Series Installation and Operation Manual. **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 appliance area • Check pressure/temperature gauge
Monthly	• Check vent piping • Check air piping • Check relief valve • Check condensate drain system
Every 6 months	• Test low water cutoff (if used) • Reset button (low water cutoff) • Check appliance piping (gas and water) for leaks • Operate relief valve

2 Maintenance *(continued)*

⚠ WARNING Follow the service and maintenance procedures given throughout this manual and in component literature shipped with the appliance. Failure to perform the service and maintenance could result in damage to the appliance 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 appliance should be inspected annually only by a qualified service technician. In addition, the maintenance and care of the appliance designated in Table 2A and explained on the following pages must be performed to assure maximum appliance efficiency and reliability. Failure to service and maintain the appliance and system could result in equipment failure.

⚠ WARNING Electrical shock hazard – Turn off power to the appliance before any service operation on the appliance 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 appliance area

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

Inspect appliance interior

1. Remove the outer access panels and inspect the interior of the appliance.
2. Vacuum any sediment from inside the appliance and components. Remove any obstructions.

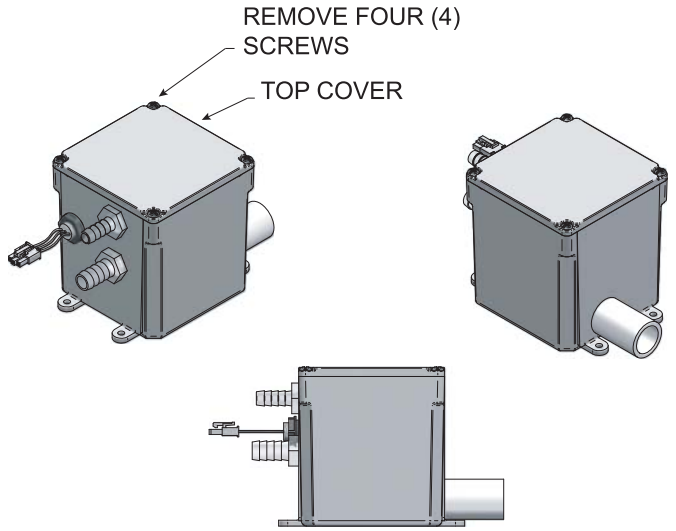
Clean condensate system

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

Flush condensate trap with water

1. Remove the four (4) screws securing the top cover to the condensate trap and remove the cover (reference FIG. 2-1).
2. Locate the plastic ball inside the float tube. Verify there is nothing under the ball causing it to not seat properly.
3. If necessary, flush with fresh water until the water begins to pour out of the drain.
4. Replace the top cover on the condensate trap.
5. Replace the four (4) screws removed in Step 1.

***Figure 2-1**_Condensate Trap*



Check all piping for leaks

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 3 - Gas Connections* of the VF Series Installation and Operation Manual.

2 Maintenance

Flue vent system and air piping

1. Check for gastight seal at every connection, seam of air piping, and vent piping periodically inspected by a qualified service agency.

⚠ WARNING Venting system must be sealed gastight to prevent flue gas spillage and carbon monoxide emissions, which will result in severe personal injury or death.

Check water system

1. Verify all system components are correctly installed and operational.

2. Watch the system pressure as the unit heats up (during testing) to ensure pressure does not rise too high. Excessive pressure rise indicates expansion tank sizing or performance problem.

3. Inspect automatic air vents and air separators. Remove air vent caps and briefly press 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, diaphragm or bladder type. See *Section 4 - Water Connections* of the VF Series Installation and Operation Manual for suggested best location of expansion tanks and air eliminators.

Check relief valve

1. Inspect the relief valve and lift the lever to verify flow. Before operating any relief valve, ensure that it is piped with its discharge in a safe area to avoid severe scald potential. Read *Section 4 - Water Connections* of the VF Series 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 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 appliance 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.

2 Maintenance *(continued)*

Inspect/replace hot surface igniter

1. Turn off main electrical power to the appliance.
2. Turn off main manual gas shutoff to the appliance.
3. Carefully pull back the insulation flaps to expose the burner mounting flange.
4. Locate the hot surface igniter. Disconnect the two power leads to the hot surface igniter.
5. Loosen and remove the two wing nuts that mount the igniter.
6. Lift the igniter vertically out of the burner mounting flange. Use care, do not hit or break the silicon carbide igniter. Do not contaminate the igniter by handling with oily or dirty hands.
7. Check the replacement igniter for cracks or damage before installing.
8. Ensure that the fiber gasket used to seal the base of the igniter to the burner flange is reinstalled to seal the base of the replacement igniter.
9. Carefully insert the igniter into the mounting point on the burner flange and position on the mounting studs.
10. Reinstall the two wing nuts and tighten by hand only. Over tightening the wing nuts may break the ceramic mounting flange.
11. Ensure that the igniter gasket is properly installed and seals the point of contact between the igniter and burner mounting flange.
12. Reconnect the power leads to the igniter.
13. Replace the insulation blanket flaps.
14. Turn on main gas supply and main power.
15. Test fire the appliance to ensure proper operation.

Check all wiring

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

Check control settings

1. Set the control module display to Parameter Mode and check all settings. See Section 1 of this manual. Adjust settings if necessary. See Section 1 of this manual for adjustment procedures.
2. Check settings of external limit controls (if any) and adjust if necessary.

Perform start-up and checks

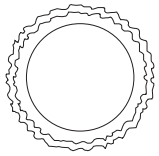
1. Start appliance and perform checks and tests specified in *Section 7 - Start-up* of the VF Series Installation and Operation Manual.
2. Verify cold fill pressure is correct and that operating pressure does not go too high.

Check burner flame

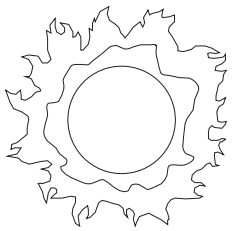
Visually check main burner flames at each start-up after long shutdown periods or at least every six months. A burner viewport is located on the burner mounting flange.

⚠ WARNING The area around the burner viewport is hot and direct contact could result in burns.

***Figure 2-2**_Flame Pattern Illustration*



NORMAL BURNER FLAME



ABNORMAL BURNER FLAME

Normal Flame: A normal flame at 100% of burner input is blue, with slight yellow tips, a well defined flame and no flame lifting.

Yellow Tip: Yellow tipping can be caused by blockage or partial obstruction of air flow to the burner.

Yellow Flames: Yellow flames can be caused by blockage of primary air flow to the burner or excessive gas input. This condition MUST be corrected immediately.

Lifting Flames: Lifting flames can be caused by over firing the burner, excessive primary air or high draft.

If improper flame is observed, examine the venting system, ensure proper gas supply and adequate supply of combustion and ventilation air.

2 Maintenance

Check flue gas passageways

Any sign of soot around the inner jacket, outer jacket, flue pipe connections, burner or in the areas between the fins on the copper heat exchanger indicates a need for cleaning. The following cleaning procedure must only be performed by a qualified serviceman or installer. Proper service is required to maintain safe operation. Properly installed and adjusted units seldom need flue cleaning.

CAUTION All gaskets/sealants on disassembled components or jacket panels must be replaced with new gaskets/sealants on reassembly. Gasket and sealant kits are available from your distributor.

⚠ CAUTION When a Category IV vent system is disconnected for any reason, the flue must be reassembled and resealed according to the vent manufacturer's instructions.

Inspect and clean burner

The burner should be removed for inspection and cleaned on an annual basis. An appliance installed in a dust or dirt contaminated environment may require cleaning of the burner on a 3 to 6 month schedule or more often, based on severity of the contamination. The fan assisted combustion process may force airborne dust and dirt contaminants, contained in the combustion air, into the burner. With sustained operation, non-combustible contaminants may reduce burner port area, reduce burner input or cause non-warrantable damage to the burner.

Use extreme care when operating an appliance for temporary heat during new construction. Airborne contaminants such as dust, dirt, concrete dust or drywall dust can be drawn into the burner with the combustion air and block the burner port area. An external combustion air filter is provided with the appliance. This filter helps ensure clean air is used for the combustion process. Check this filter every month and replace when it becomes dirty. The burner of an appliance used for temporary heat without a combustion air filter installed will probably require a thorough cleaning before the unit is placed into normal service.

Access to the burner will require the following steps:

1. Turn off main electrical power to the appliance.
2. Turn off main manual gas shutoff to the appliance.
3. Remove the front outer control panel covers. Slide out the inner control panel to increase service clearances and carefully remove the multi-pin wiring connectors on the back of the control panel. Remove the screws along the front and rear edge of the top outer jacket panel to remove top. Remove the control panel to allow access to the components in the top of the appliance.
4. Remove the sensing tubes from the low air pressure switch to the combustion air blower.
5. Disconnect the wiring connections on the top of the combustion air blower.
6. Remove the six (6) hex head bolts attaching the gas/air venturi to the inlet of the combustion air blower.
7. Remove the four (4) nuts holding the combustion air blower to the top of the burner and remove the combustion air blower assembly.
8. Use care when removing the combustion air blower assembly to prevent damage to the venturi and burner gaskets.
9. Disconnect the power wires to the hot surface igniter.
10. Remove the hot surface igniter. The hot surface igniter is fragile. Use care to prevent impact damage to the silicone carbide igniter surface when removing the igniter.
11. Remove the eight (8) nuts holding the burner to the heat exchanger.
12. The burner can now be lifted vertically out of the heat exchanger chamber.
13. Use care when removing the burner to prevent damage to the woven burner port surface or gaskets on removal.
14. Remove any visible dust or dirt blockage from the surface of the burner with a vacuum. Compressed air may also be blown across the burner surface to clean the "pores" of the woven burner port material.
15. Reassemble in reverse order.

2 Maintenance *(continued)*

Checking manifold gas pressure

The gas manifold pressure tap is located on the venturi connection of the gas manifold assembly (FIG. 2-3). The manifold gas pressure tap can be accessed by removing the upper left access panel on the front of the appliance.

Follow the steps below when checking manifold gas pressure:

1. Turn the appliance power switch to the "OFF" position.
2. Turn the latch counterclockwise and open the upper door.
3. Remove the screws along the front and rear edge of the top outer jacket panel. Disconnect the ventilation fan's 2-pin connector hanging from the top panel cover inside the unit. Remove the top outer jacket panel.
4. Loosen the set screw on the venturi connection of the gas manifold assembly one full turn from inside the pressure tap to read manifold gas pressure. Place the tubing of the manometer over the tap once the set screw is loosened.
5. Turn the appliance power switch to the "ON" position.
6. Place the appliance into the active position by pressing the SAVE/CLEAR button on the display board (see page 5) until **HTR:Standby** appears in the display window.
7. Locate the pinhole button below the SAVE/CLEAR button (see page 5). Press the button once and hold for five (5) seconds to place the appliance into Service Mode. In Service Mode the appliance will fire and operate at 100% of rate.
8. As the appliance comes on and fires, record the inches of water column of displacement on both sides of the manometer. The sum of these two readings will be the gas manifold pressure. Reference Table 2B - Gas Manifold Pressure Chart for the proper measurement.
9. This is a reference pressure only and is not field adjustable. An appliance supplied with the required minimum gas supply pressure will operate at the correct manifold gas pressure.

***Figure 2-3**_Gas Train Assembly*

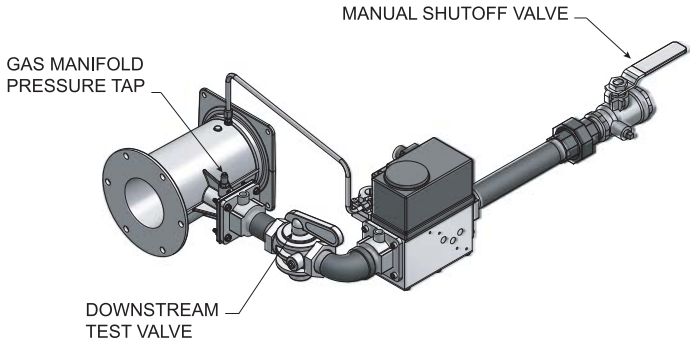


***Table 2B**_Gas Manifold Pressure Chart*

Model No.	Natural Gas Water Column (w.c.)	LP Gas Water Column (w.c.)
500	-6.7 to -7.2	-7.9 to -8.4
750	-3.0 to -3.5	-4.0 to -4.5
1000	- 6.1 to -6.6	-8.4 to 8.9
1500	-3.9 to -4.6	-2.1 to -2.6
2000	-3.9 to -4.6	-2.1 to -2.6

10. Once the gas manifold pressure has been checked, press the SAVE/CLEAR button on the display board to take the appliance out of Service Mode. The appliance will go to shutdown and the display will show **HTR:OFF**.
11. Turn the appliance power switch to the "OFF" position.
12. Remove the manometer and related fitting(s) from the connection tap and replace the 1/8" hex plug (on F9 models only).
13. Replace the top jacket panel and reconnect the ventilation fan's 2-pin connector hanging from the top panel cover.
14. Replace the upper left access panel.
15. Turn the appliance power switch to the "ON" position.
16. Press the SAVE/CLEAR button on the display board until **HTR:Standby** appears in the display window.

2 Maintenance

Combustion analysis procedure

1. Turn the appliance power switch to the "OFF" position.
2. Remove the flue temperature sensor from the flue pipe. **Note:** Combustion measurements will be made at this point.
3. Turn the appliance power switch to the "ON" position.
4. Place the appliance into the active position by pressing the SAVE/CLEAR button on the display board (see page 5) until **HTR:Standby** appears in the display window.
5. Locate the pinhole button below the SAVE/CLEAR button. Press the button once and hold for 5 seconds to place the appliance into Service Mode. In Service Mode the appliance will fire and operate at 100% of rate.
6. Insert the probe from a combustion analyzer into the hole left by the removal of the flue temperature sensor.
7. Compare the combustion measurement to the values listed in Table 2C.

***Table 2C**_Combustion Measurements*

Model No.	Natural Gas CO_2 (%)	LP Gas CO_2 (%)
500 - 1300	8.2 to 8.7	9.0 to 9.5
1500	8.6 to 9.1	9.6 to 10.1
2000	7.6 to 8.2	8.6 to 9.2

8. If the combustion is not within the specified range, reference the Troubleshooting Chart below for possible causes and corrective actions.

***Table 2D**_Combustion Troubleshooting Chart*

Possible Cause	Corrective Action
Vent / Air Intake Length or Obstruction	- Refer to Section 2 - *Venting* in the VF Series Installation and Operation Manual for the proper venting and air intake methods. - Check for obstructions in the vent / air intake terminals.
Gas Supply Pressure	- Refer to Section 3 - *Gas Connections* in the VF Series Installation and Operation Manual for the proper gas supply for the VF Series.
Dirty / Damaged Burner	- Refer to page 20 of this manual for burner removal and cleaning procedures. - Replace burner if necessary.
Gas Valve Adjustment	- Refer to page 23 of this manual for the gas valve adjustment procedure.

9. Once the combustion analysis is complete, press the SAVE/CLEAR button on the display board to take the appliance out of Service Mode. The appliance will go to shutdown and the display will show **HTR:OFF**.
10. Turn the appliance power switch to the "OFF" position.
11. Replace the flue temperature sensor into the flue pipe.
12. Turn the appliance power switch to the "ON" position.
13. Press the SAVE/CLEAR button on the display board until **HTR:Standby** appears in the display window.

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

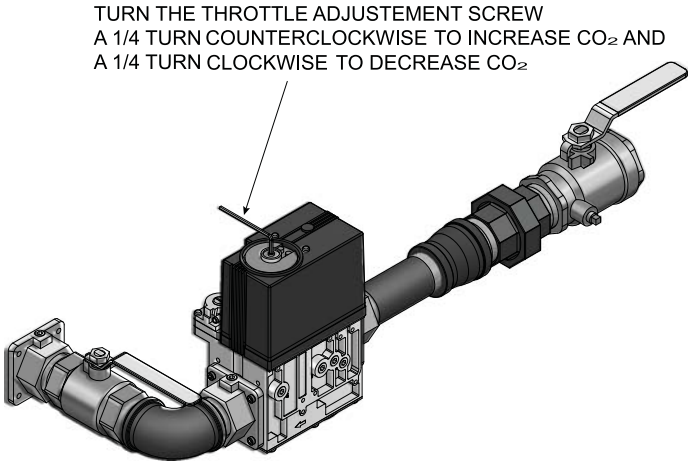
2 Maintenance *(continued)*

Gas valve adjustment procedure

1. Turn the appliance power switch to the "OFF" position.
2. Remove the screws along the front and rear edge of the top outer jacket panel. Disconnect the ventilation fan's 2-pin connector hanging from the top panel cover inside the unit. Remove the top outer jacket panel.
3. Follow the Combustion Analysis Procedure on page 22 of this manual to measure combustion.
4. With the appliance operating in the Service Mode, locate the throttle adjustment screw on the gas valve (see FIG. 2-4) . Using an Allen wrench turn the throttle adjustment screw a 1/4 turn counterclockwise to increase CO_2 levels and a 1/4 turn clockwise to decrease CO_2 levels.
5. After one adjustment of the valve, measure the combustion.
6. If the combustion is still not within the specified range, repeat the procedure. This procedure SHOULD NOT be performed more than four (4) times. If after four (4) adjustments the combustion is still not within the specified range, revisit the possible causes in Table 2D on page 22 of this manual.
7. Once the combustion analysis is complete, press the SAVE/CLEAR button on the display board to take the appliance out of Service Mode. The appliance will go to shutdown and the display will show **HTR:OFF**.
8. Turn the appliance power switch to the "OFF" position.
9. Replace the flue temperature sensor into the flue pipe.
10. Replace the top jacket panel and reconnect the 2-pin connector hanging from the top panel cover.
11. Replace the upper left access panel.
12. Turn the appliance power switch to the "ON" position.
13. Press the SAVE/CLEAR button on the display board until **HTR:Standby** appears in the display window.

⚠ WARNING Overfire and underfire hazards! Possible fire, explosion, overheating, and component failure. Do not attempt to adjust firing rate of the water heater. The firing rate must be adjusted only by factory trained personnel.

***Figure 2-4**_Throttle Adjustment Screw*



2 Maintenance

Inspect and clean the heat exchanger

1. Turn off all power to the appliance.
2. Turn off main gas to appliance.
3. Remove the front outer jacket panel.
4. Remove the inner jacket panel (see FIG. 2-5).
5. Check the heat exchanger surface for soot. If soot is present, the heat exchanger must be cleaned and the problem corrected.
6. Remove the burner as described in the *Inspect and Clean Burner* section of this manual.
7. Check the "V" baffles on the heat exchanger. Remove and clean if necessary.
8. Remove soot from the heat exchanger with a stiff bristle brush. Use a vacuum to remove loose soot from surfaces and inner chamber.
9. The heat exchanger can be removed by disconnecting all water piping to the heat exchanger, removing the screws holding the heat exchanger to the top of the inner jacket and sliding the heat exchanger towards the front of the appliance. Once the heat exchanger is removed, a garden hose can be used to wash the tubes to ensure that all soot is removed from the heat exchanger surfaces. *Note: Do not wet the insulation blankets on the inside of the outer jacket panels.*
10. Ensure that any soot present on the burner is removed. See *Inspect and Clean Burner* section.
11. Carefully reinstall the heat exchanger and "V" baffles if removed from the appliance.
12. Reinstall the inner jacket panel, burner, manifolds, wires, and hoses. Use new gasket material to ensure a proper air seal.
13. Reassemble all gas and water piping. Test for gas leaks.

CAUTION Upon completion of any testing on the gas system, leak test all gas connections with a soap and water solution while main burners are operating. Do not spray soap and water solution on the control module housing. The use of an excessive amount of soap and water solution can damage the control. Immediately repair any leak found in the gas train or related components. Do not operate an appliance with a leak in the gas train, valves, or related piping.

14. Reassemble outer jacket panels.
15. Cycle unit and check for proper operation.

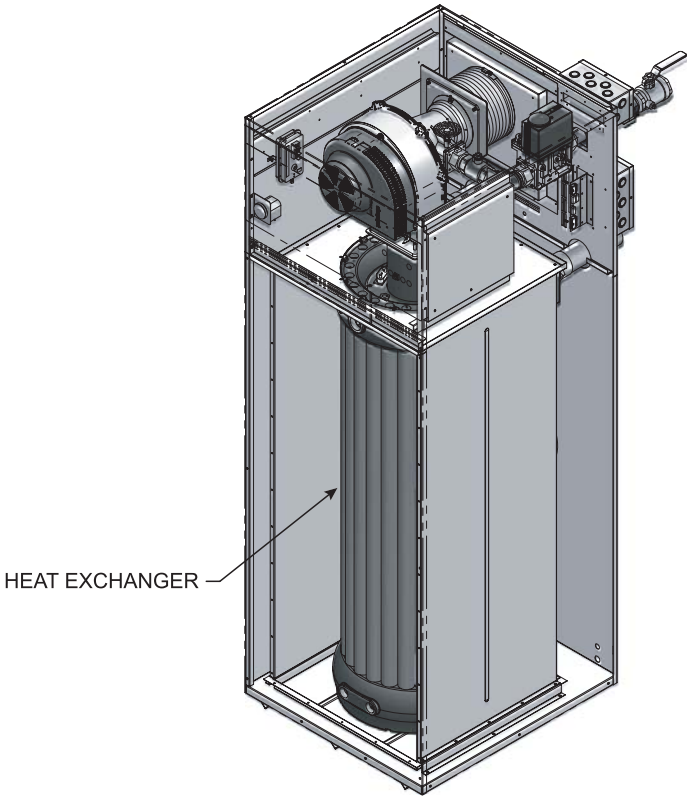


***Figure 2-5**_Location of the Heat Exchanger Inside Jacket*

Review with owner

1. Review the VF Series Installation and Operation Manual with the owner.
2. Emphasize the need to perform the maintenance schedule specified in this manual.
3. Remind the owner of the need to call a licensed contractor should the appliance or system exhibit any unusual behavior.
4. Remind the owner to follow the proper shutdown procedure and to schedule an annual start-up at the beginning of the next heating season.

Oiled bearing circulators

Inspect the pump every six (6) months and oil as necessary. Use SAE 30 non-detergent oil or lubricant specified by the pump manufacturer.

3 Troubleshooting

⚠ WARNING Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Always disconnect power to the appliance 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 appliance.
3. Make sure either the tank thermostat or tank sensor is calling for heat. If the enable input is set to remote enable (see page 14), the tank thermostat input must be closed and the tank temperature sensor must be below the DHW setpoint minus the tank differential. Check for 24 VAC between the tank thermostat connections 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:

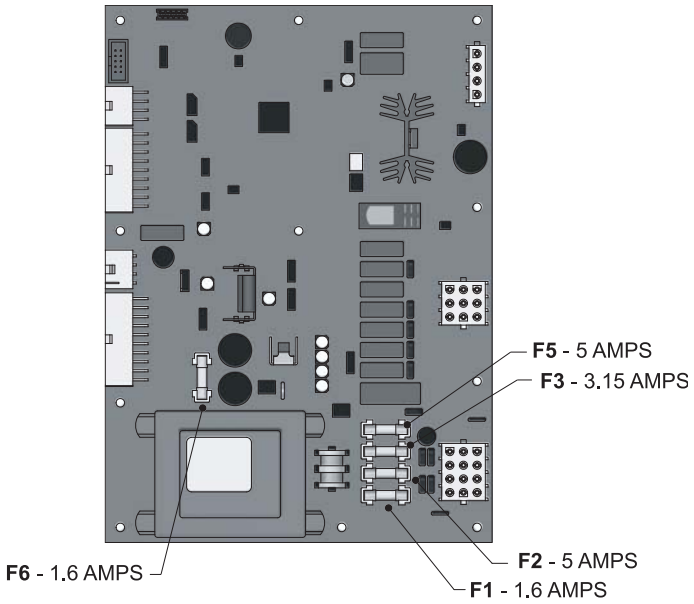
   Refer to Section 3 - Gas Connections of the VF Series Installation and Operation Manual for detailed information concerning the gas supply.

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 appliance at the external line switch.
2. Remove front access cover.
3. Inspect fuses F1, F2, F3, F5, and F6, see FIG. 3-1 below.

Figure 3-1_*Control Module Fuses*



4. The appliance is shipped with three (3) spare fuses in a plastic bag attached to the control panel.
5. If necessary, replace open fuse (F1 and F6 are 1.6 amps, F3 is 3.15 amps, F2 and F5 are 5 amps).

Note: Fuses F1 - F6 are all slow blow fuses.

⚠ 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.

6. Install front access cover after fuse inspection.
7. Restore power to the appliance at the external line switch and verify water heater operation (*Section 7 - Start-up* in the VF Series Installation and Operation Manual) after completing water heater service.

3 Troubleshooting

Table 3A *Troubleshooting Chart - No Display*

FAULT	CAUSE	CORRECTIVE ACTION
No Display	- No 120 VAC supplied to unit.	• Check external line switch, fuse, or breaker. • Check position of ON/OFF switch. Turn switch to the ON position. • Check 120 VAC through the ON/OFF switch. No voltage through switch, replace switch.
	- Bad wiring connection.	• Check wiring harness connection between the display board and the main control board. Connect the harness at both points.
	- Blown fuse.	• Replace fuse F6 on the main control board, see FIG. 3-1 on page 25 of this manual.
	- Bad display board.	• Replace board.
	- Bad main control board.	• Replace main control board.
No Burner Operation	- Main control board temperature setpoint satisfied.	• Review temperature setting.
	- Remote enable switch open.	• Review tank thermostat setting.
	- Unit locked out on fault.	• Consult display for specific fault. Refer to fault descriptions on pages 29 - 35 of this manual for corrective actions.
Unit Does Not Modulate Above 50%	- Controlled by BMS.	• Check BMS parameter settings.

3 Troubleshooting *(continued)*

Checking temperature sensors

The appliance temperature sensors (inlet water, outlet water, system water, tank water, flue, and outdoor air) 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.

Table 3B *Inlet/Outlet Resistance vs. Temperature*

Temperature (°F)	Resistance	Temperature (°F)	Resistance
50	18,780	158	1,990
68	12,263	176	1,458
86	8,194	194	1,084
104	5,592	212	817
122	3,893		
140	2,760		

Table 3C *Flue Temperature Sensor Resistance vs. Temperature*

Temperature (°F)	Resistance	Temperature (°F)	Resistance
68	125,500	158	16,870
77	100,000	176	12,000
86	80,220	194	8,674
104	52,590	212	6,369
122	35,270	230	4,744
140	24,160	248	3,581

Table 3D *Tank Sensor Resistance vs. Temperature*

Temperature (°F)	Resistance	Temperature (°F)	Resistance
32	32,650	158	1,752
50	19,900	176	1,258
68	12,490	194	918
86	8,057	212	680
104	5,327		
122	3,603		
140	2,488		

3 Troubleshooting

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

FAULT	CAUSE	CORRECTIVE ACTION
Noisy Operation	- Gas supply problem.	• Refer to *Section 3 - Gas Connections* of the VF Series Installation and Operation Manual for detailed information concerning the gas supply.
	- Gas/air mixture problem.	• Refer to the *Checking Manifold Gas Pressure* and *Combustion Analysis Procedure* on pages 21 and 22 of this manual for the proper settings. Verify that the vent/air intake lengths do not exceed the maximum listed in the *Venting* section of the VF Series Installation and Operation Manual.
	- Dirty/damaged burner.	• Refer to page 20 in this manual for the burner removal and inspection procedure. Clean or replace the burner as necessary.
	- Low water flow through the heat exchanger.	• Refer to *Section 4 - Water Connections* of the VF Series Installation and Operation Manual for minimum flow rates. Verify that the appliance is piped in a primary/secondary fashion and that the appliance and system pump are running on a call for heat.
	- Air in the piping system.	• Properly purge all air from the piping system.
	- Low system water pressure.	• Verify system pressure is a minimum of 12 PSI.
No Pump Operation	- Faulty pump.	• Replace pump.
	- Internal fault on control board.	• Replace main control board. **Note:** Make sure the pump horse power (hp) does not exceed 1 hp.
Relief Valve Opening	- System pressure exceeds relief valve setting.	• Lower the system pressure below the rating of the supplied relief valve.
	- Improperly sized expansion tank.	• Install properly sized expansion tank.
	- Outlet water temperature in excess of 210°.	• Check setpoint of temperature control. • Check temperature rise across heat exchanger. Refer to the temperature rise chart in *Section 4 - Water Connections* of the VF Series Installation and Operation Manual.

3 Troubleshooting *(continued)*

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

FAULT	DESCRIPTION	CORRECTIVE ACTION
Gas Pressure SW (Will require a manual reset once the condition has been corrected.)	Either the optional manual reset low gas pressure switch or the optional manual reset high gas pressure switch tripped.	• Reset the pressure switches. • Measure the supply gas pressure to determine cause of failure. Refer to *Section 3 - Gas Connections* of the VF Series Installation and Operation Manual for detailed information concerning the gas supply. • Correct the supply gas pressure if necessary.
Flow Switch/ LWCO (Lockout will reset automatically after 5 minutes or may be reset immediately once condition has been corrected. Press the SAVE/CLEAR button on the display to reset.)	Either the flow switch or the optional low water cutoff is not making.	• Check pump operation on a call for heat. • Check for closed valves or obstructions in the water piping. • Verify system is full of water and all air has been purged from the system.
Blocked Drain SW (Lockout will reset automatically after 5 minutes or may be reset immediately once condition has been corrected. Press the SAVE/CLEAR button on the display to reset)	The blocked drain switch has detected excessive condensate build up inside the unit.	• Check condensate tube from unit to floor drain for proper installation and obstructions. • Inspect condensate trap for blockage. Clean if necessary. • Check for loose wiring connection at wire harness plug. • Bad blocked drain switch. Replace switch.
Flame Sequence (Will require a manual reset once the condition has been corrected. Press the SAVE/CLEAR button on the display to reset.)	The flame detector circuit is seeing a flame signal while no flame is present.	• Check supply voltage for proper polarity. • Check external wiring for voltage feedback. • Check the internal wiring for bad connections. • Replace main control board.

3 Troubleshooting

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

FAULT	DESCRIPTION	CORRECTIVE ACTION
No Flame Ign (Will require a manual reset. Press the SAVE/ CLEAR button on the display to reset.)	The unit has failed to prove main burner flame upon ignition.	• Inspect igniter and associated wiring for damage and connection. Reference page 20 of this manual for removal and cleaning procedure. Replace if necessary. • Check for proper electrical grounding of unit. • Check incoming supply gas pressure. Refer to *Section 3 - Gas Connections* in the VF Series Installation and Operation Manual for detailed information concerning the gas supply. • Verify that the tube from the gas valve to the air inlet is connected and is not damaged. • Verify that the vent/air intake pipes are correctly installed and that there are no obstructions. • Inspect the burner. Reference page 20 of this manual for removal and cleaning procedures. Replace if necessary. • Refer to the *Checking Manifold Gas Pressure* and *Combustion Analysis Procedure* on pages 21 and 22 of this manual for the proper settings. • Check for 120 VAC to the gas valve during the ignition attempt. If no voltage is present, check the wiring between the gas valve and the main control board. • Replace the wiring or the main control board as necessary.
HSI Current Low (Will require a manual reset once the condition has been corrected. Press the SAVE/CLEAR button on the display to reset.)	Amp draw of the hot surface igniter did not meet the minimum requirement of 2.6 amps.	• Measure the amp draw of the hot surface igniter during the trial for ignition stage. If less than 2.6 amps replace the hot surface igniter. • If more than 2.6 amps replace the control module.
Flame CKT Error	The main control board has detected an internal fault.	• Replace the main control board.

3 Troubleshooting *(continued)*

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

FAULT	DESCRIPTION	CORRECTIVE ACTION
No Flame Running (Will require a manual reset once the condition has been corrected. Press the SAVE/CLEAR button on the display to reset.)	The unit was running and lost the flame signal.	• Inspect igniter and associated wiring for damage and connection. Reference page 20 of this manual for removal and cleaning procedure. Replace if necessary. • Check for proper electrical grounding of unit. • Check incoming supply gas pressure. Refer to *Section 3 - Gas Connections* of the VF Series Installation and Operation Manual for detailed information concerning the gas supply. • Verify that the tube from the gas valve to the air inlet is connected and is not damaged. • Verify that the vent/air intake pipes are installed correctly and there are no obstructions. • Refer to the *Checking Manifold Gas Pressure* and *Combustion Analysis Procedure* on pages 21 and 22 of this manual for the proper settings. • Inspect the burner. Reference page 20 of this manual for removal and cleaning procedures. Replace if necessary. • Replace the main control board.
Auto Reset High Limit	The outlet water temperature has exceeded the fixed setting of the automatic reset high limit.	• Verify that the system is full of water and that all air has been properly purged from the system. • Verify that the appliance is piped properly into the heating system. Refer to *Section 4 - Water Connections* of the VF Series Installation and Operation Manual for the proper piping methods for the VF Series. • Check 120 VAC to DHW pump motor on a call for heat. If voltage is not present, check wiring back to the main control board. Replace the main control board if necessary. • If 120 VAC is present on a call for heat and the pump is not operating, replace the pump. • If the system pump is a variable speed pump, ensure that the system flow is not less than the flow. • Check temperature setting of the main control board. • Check resistance of water sensors and compare to Table 3B on page 27 of this manual. Replace sensor if necessary. • Replace high limit.

3 Troubleshooting

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

FAULT	DESCRIPTION	CORRECTIVE ACTION
Manual Reset High Limit (Will require a manual reset once condition has been corrected. Press the SAVE/CLEAR button on the display to reset.)	The outlet water temperature has exceeded the setting of the adjustable high limit.	• Verify setting of adjustable high limit. • Verify that the system is full of water and that all air has been properly purged from the system. • Verify that the appliance is piped properly into the system. *Refer to Section 4 - Water Connections* of the VF Series Installation and Operation Manual for proper piping methods for the VF Series. • Check 120 VAC to the pump motor on a call for heat. If voltage is not present, check wiring leading to the main control board. Replace the main control board if necessary. • If 120 VAC is present on a call for heat and the pump is not operating, replace the pump. • If the system pump is a variable speed pump, ensure the system flow is not less than the flow. • Check temperature setting of the main control board. • Check resistance of water sensors and compare to the tables on page 27 of this manual. Replace the sensor if necessary. • Replace high limit.
Inlet Low	The inlet water temperature did not exceed 130° within 15 minutes of ignition.	• Raise temperature setpoint above 130°. • Install a 3-way valve per the piping diagram in *Section 4 - Water Connections* of the VF Series Installation and Operation Manual. • Replace the main control board.
Fan Low OR Fan Speed Low (Will require a manual reset once condition has been corrected. Press the SAVE/CLEAR button on the display to reset.)	The actual fan RPM is 30% lower than what is being called for.	• Vent/air intake lengths exceed the maximum allowed lengths. Refer to *Section 2 - Venting* of the VF Series Installation and Operation Manual for proper lengths. • Check for obstruction or blockage in the vent/air intake pipes or at terminations. • Check wiring connections at the fan and at the main control board. • Replace the fan. • Replace the main control board.
	Blown fuse.	• Replace fuse F3 on the main control board, see page 25 of this manual.

3 Troubleshooting *(continued)*

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

FAULT	DESCRIPTION	CORRECTIVE ACTION
Fan High OR Fan Speed High (Will require a manual reset once the condition has been corrected. Press the SAVE/CLEAR button on the display to reset.)	The actual fan RPM is 30% higher than what is being called for.	• Vent/air intake lengths exceed the maximum allowed lengths. Refer to *Section 2 - Venting* of the VF Series Installation and Operation Manual for proper lengths. • Check for obstruction or blockage in the vent/air intake pipes or at terminations. • Check wiring connections at the fan and at the main control board. • Replace the fan. • Replace the main control board.
Flue Open OR Flue Shorted	The flue sensor wiring has been disconnected, grounded, or the flue sensor has been removed from the flue.	• Check the sensor and associated wiring. Repair or replace sensor or wiring if damaged. • Reinstall sensor in flue outlet.
Sensor Open (Will require a manual reset once the condition has been corrected. Press the SAVE/CLEAR button on the display to reset.)	Either the inlet water or outlet water temperature sensor has been disconnected.	• Check the sensors and their associated wiring. Repair or replace the sensor or wiring if damaged. • Measure the resistance of the sensors and compare the resistance to the tables on page 27 of this manual. • Replace the sensor if necessary.
Sensor Shorted (Will require a manual reset once the condition has been corrected. Press the SAVE/CLEAR button on the display to reset.)	Either the inlet water or outlet water temperature sensor has been shorted.	• Check the sensors and their associated wiring. Repair or replace the sensor or wiring if damaged. • Measure the resistance of the sensors and compare the resistance to the tables on page 27 of this manual. • Replace the sensor if necessary.
Louver Proving (Lockout will reset automatically after 5 minutes or may be reset immediately once condition has been corrected. Press the SAVE/CLEAR button on the display to reset.)	An optional remote proving switch is not making.	• Check function of remote devices. • Check for loose or misplaced jumper if proving switch is not installed.
Tank Open	Tank sensor not connected.	• Repair or replace the sensor wiring if damaged. • Replace the sensor if necessary.
APS Open (Lockout will reset automatically after 5 minutes or may be reset immediately once condition has been corrected. Press the SAVE/CLEAR button on the display to reset.)	The air pressure switch did not make within 1 minute after the combustion air blower has been energized.	• Check air filter. Clean or replace as necessary. • Vent/air intake lengths exceed the maximum allowed lengths. • Check for blockage or obstruction in vent/air inlet pipe or at terminations. • Verify combustion air blower is operating. Replace if necessary.

3 Troubleshooting

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

FAULT	DESCRIPTION	CORRECTIVE ACTION
APS Closed (Lockout will reset automatically after 5 minutes or may be reset immediately once condition has been corrected. Press the SAVE/CLEAR button on the display to reset.)	The control sensed that the air pressure switch was closed before the combustion air blower was energized.	• Check for jumper on air pressure switch. • Check for an unusually high negative draft in the vent stack.
Wrong ID Plug	Control module ID plug does not match parameter H5.	• Verify that ID plug is connected properly to connector X5 on the control module. • Verify that the wiring in the ID plug is not cut or damaged and that the wiring connectors are seated properly in the plug. • Verify that the number on the ID plug matches the number in parameter L5. If not, replace the control module. • When replacing control modules, verify that the number in parameter L5 matches the number on the ID plug. If so, press the SAVE/CLEAR button on the display. If not, replace the control module.
Temp O/Shoot (Lockout will reset automatically after 5 minutes or may be reset immediately once condition has been corrected. Press the SAVE/CLEAR button on the display to reset.)	The stack temperature has exceeded the set parameters for the water heater.	• Inspect the heat exchanger. Reference page 20 of this manual for the procedure on how to clean the flue side of the heat exchanger. • Inspect the flue sensor and associated wiring. Measure the resistance of the flue sensor and compare to Table 3C on page 27 of this manual. Replace the sensor if necessary. • Verify that the vent/air intake pipes are properly installed and that there are no obstructions. • Replace the main control board.
	The temperature rise across the heat exchanger has exceeded the set parameters for the appliance.	• Verify that the system is full of water and that all air has been properly purged from the system. • Verify that the appliance is piped properly into the heating system. Refer to *Section 4 - Water Connections* of the VF Series Installation and Operation Manual for the proper piping methods. • Check for 120 VAC to the pump motor on a call for heat. If voltage is not present, check the wiring leading to the main control board. Replace the main control board if necessary. • If 120 VAC is present on a call for heat and the pump is not operating, replace the pump.

3 Troubleshooting *(continued)*

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

FAULT	DESCRIPTION	CORRECTIVE ACTION
Temp O/Shoot (continued) (Lockout will reset automatically after 5 minutes or may be reset immediately once condition has been corrected. Press the SAVE/CLEAR button on the display to reset.)	Outlet water temperature has exceeded the maximum outlet water temperature.	• Verify that the system is full of water and that all air has been properly purged from the system. • Verify that the appliance is piped properly into the system. Refer to *Section 4 - Water Connections* of the VF Series Installation and Operation Manual for the proper piping methods. • Check 120 VAC to the pump motor on a call for heat. If voltage is not present, check wiring leading to the main control board. Replace the main control board if necessary. • If 120 VAC is present on a call for heat and the pump is not operating, replace pump. • Replace the main control board.
Rem Ctrl Flt	External control is cycling too often.	• Check setpoint of the external control. • Check the wiring between the external control and the unit. • Replace the control.
Service Blk	While the unit is in Service Mode, the outlet temperature has exceeded 185°F (85°C).	• Establish a heating load to remove heat from the system. • Verify that the system is full of water and that all air has been properly purged from the system. • Verify that the appliance is piped properly into the system. Refer to *Section 4 - Water Connections* of the VF Series Installation and Operation Manual for the proper piping methods. • Check 120 VAC to the pump motor on a call for heat. If voltage is not present, check the wiring leading to the main control board. Replace the main control board if necessary. • If 120 VAC is present on a call for heat and the pump is not operating, replace the pump.
Low Voltage	120 VAC input to the main control board has dropped below 80 VAC.	• Check 120 VAC supply to the transformer. • Check wiring connections at the low voltage terminal strip. • Check the wire size/length to remote devices. • Replace the main control board.
Watch Dog Error	The main control board has detected an internal fault.	• Replace the main control board.
Write EEProm	The main control board has detected an internal fault.	• Replace the main control board.
Program EEProm	The main control board has detected an internal fault.	• Replace the main control board.
CRC Parameters	The main control board has detected an internal fault.	• Replace the main control board.
No Error Stored	The main control board has detected an internal fault.	• Replace the main control board.

Revision Notes: *Revision A (ECO C12846) initial release.*