

HEATEC TEC-NOTE

Publication 1-10-218

MAINTENANCE Firestorm™ water heaters

CONTENTS

Safety.....	1
Scope.....	1
Intended users.....	2
Calcium clean-out.....	2
Cleaning strainers.....	4
Freeze protection.....	4
Checking water level switches.....	5
Checking the flame scanner.....	7
Checking pilot gas pressure regulator.....	7
Checking high fuel gas pressure switch.....	7
Checking low fuel gas pressure switch.....	8
Checking high flue gas stack temperature switch.....	8
Checking auxiliary contacts for water pump motor.....	9
Checking auxiliary contacts for combustion air motor.....	9
Checking low combustion air switch.....	10
Maintenance schedule.....	12

SAFETY

Carefully following safety instructions in this document will help you avoid serious injury or death. Read instructions for each topic in their entirety before actually doing the work. Pay special attention to hazard warnings that appear herein and on the heater. These warnings identify known hazards, their severity and how you can avoid them.

Warnings also appear at appropriate places in the instructions.

Please be aware that if you deviate from the instructions, you could create unforeseen safety hazards. You should perform step-by-step instructions in the order given.



Figure 1. Heatec Firestorm heater.

SCOPE

This document provides instructions for maintaining Firestorm water heaters (**Fig. 1**). It also provides instructions on how to check various devices in case you need to make sure they are working properly.

Failure to heed certain recommendations may result in damage to the heater and/or shorten its life. The components covered are mainly those that can cause heater malfunctions when they go bad, need cleaning, or get out of adjustment.

Because of differences in heaters, some instructions may not apply to your heater.

INTENDED USERS

Instructions in this document are intended for use by qualified operators and maintenance personnel. Some procedures require setting and testing parts inside the heater electrical control panel while it is open and electrical power is turned on.

Qualified persons are those who fully understand electrical shock hazards and how to avoid them. They also know how to take necessary precautions against being burned when working around hot surfaces and water heated to temperatures close to its boiling point.

CALCIUM CLEAN-OUT

Build up of calcium inside the heater can be a matter of serious concern. Excessive buildup can lead to heater malfunctions and heater damage. The rate of calcium buildup varies widely depending on the amount of calcium in the water supply and operating conditions.

Frequency of checks and down-time

The heater should be checked at least once a month while in regular use to make sure calcium buildup has not reached a point that affects operation of the heater. If no adverse signs are found, the checks can be made less frequently. However, if the heater is moved to a new location or if the water supply is changed, revert back to monthly checks.

When excessive calcium buildup is found you need to plan down-time for clean-out. You may need to allow a full day for clean-out. Do not delay any longer than absolutely necessary.

Symptoms of excessive build-up

In due time you should be able to judge when it's time for a clean-out by the appearance of calcium buildup on the packing in the heater.

In order to inspect the packing, shutdown the heater and allow it to cool. Then open the lower access door and pull out several pieces of packing (**Fig. 2**) from the center of the heater. You will need to remove packing until you are near the bottom center of the packing column. Calcium will build up here first.

As you continue to check packing at regular intervals you should also watch for other symptoms of calcium buildup.

One symptom is the *inability* to heat the water to the desired temperature as you have in the past. Another symptom is an abnormally high stack temperature and excessive vapor from the stack. Another symptom is discoloration of the outside of the heater shell.

We strongly recommend that you do not wait until these symptoms appear. Instead you should develop your ability to judge buildup by inspecting the packing as indicated earlier.



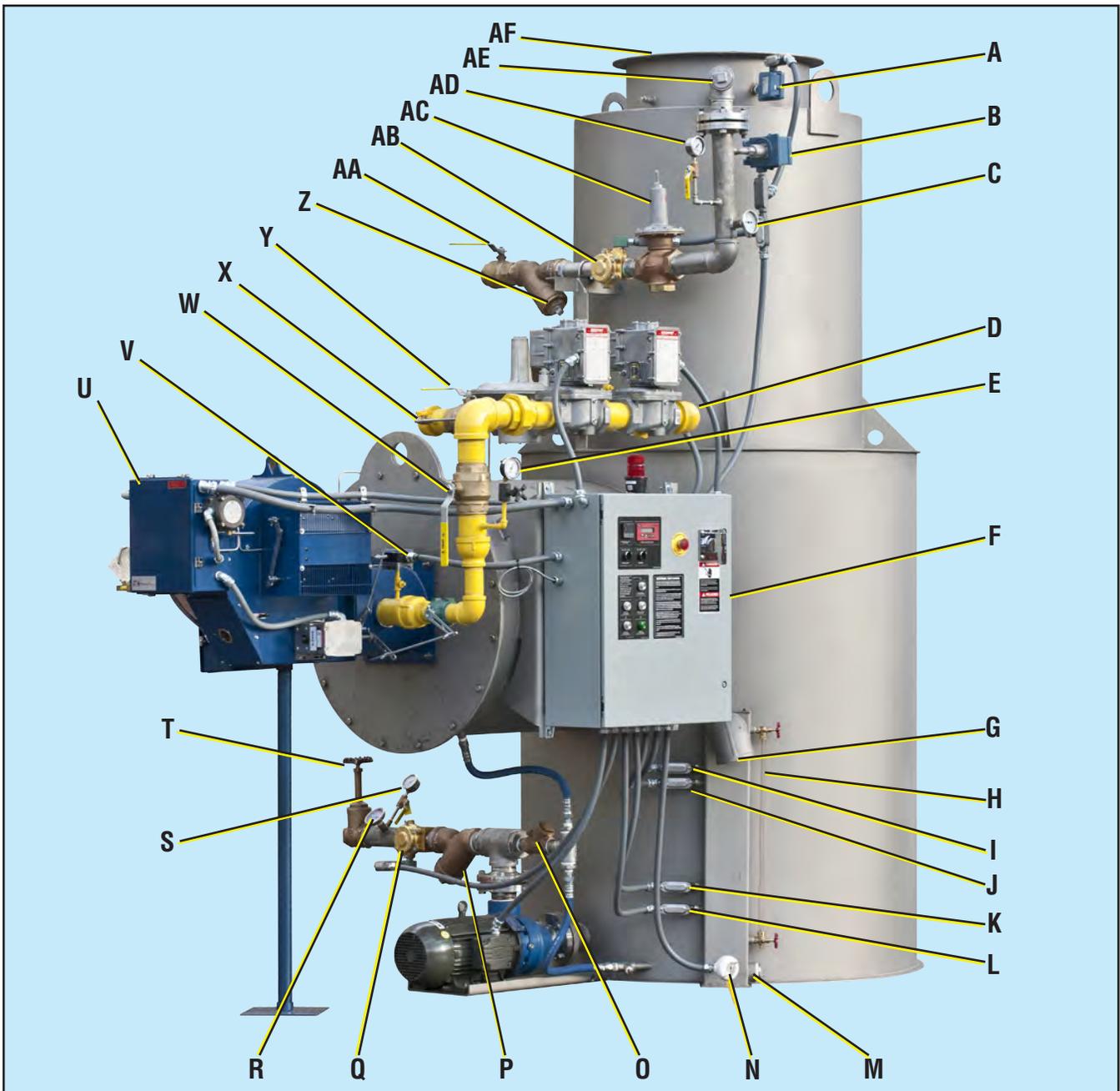
Figure 2. Checking packing for calcium buildup.

Cleaning methods

There are two methods for cleaning calcium from your heater. The first method requires shutting it down and removing all the packing. The packing must be soaked in a chemical intended for dissolving calcium. Once the calcium has been removed from the packing, rinse it and put it back in the heater.

The second method is to clean the inside of the heater and packing simultaneously. This is done by introducing a chemical cleaner into the top of the heater. Do this while circulating water from the reservoir through the heater with the burner off. This may take several hours, depending on the amount of calcium buildup.

To circulate its water, first fill the reservoir. Then temporarily install a pipe or hose from the water outlet valve to the secondary water connection



- | | | |
|--|--|---|
| A. Stack temperature switch | K. Low water level switch | V. High gas pressure switch |
| B. Inlet water pressure switch | L. Low-low water level switch | W. Manual gas leak test valve |
| C. Inlet water temperature gauge | M. Drain connection | X. Pilot gas valve |
| D. Low gas pressure switch (not visible in photo) | N. Thermocouple | Y. Manual gas shut off valve |
| E. Gas pressure gauge | O. Check valve | Z. Inlet water Y-strainer |
| F. Control panel | P. Outlet water Y-strainer | AA. Manual inlet water valve |
| G. Overflow connection | Q. Automatic outlet water valve | AB. Automatic inlet water valve |
| H. Water level indicator | R. Outlet water temperature gauge | AC. Inlet water pressure regulator |
| I. High-high water level switch | S. Outlet water pressure gauge | AD. Inlet water pressure gauge |
| J. High water level switch | T. Manual outlet water valve | AE. Secondary water connection |
| | U. Burner | AF. Exhaust stack connection |

Figure 3. Location of components on Firestorm heater.

(AE, Fig. 3). Then operate the water pump to circulate the water containing the cleaning chemical.

The cleaning chemical will probably work better soon after the heater has been shut down, while it is still warm.

The chamber that contains the floats for water level switches (I, J, K, L, Fig. 3) should be cleaned separately.

Chemicals

A variety of chemicals are available for removing calcium deposits. Some contain sulfamic acid. Others contain citric acid. You may wish to use stronger chemicals on the packing while it is out of the heater and milder chemicals inside the heater. Keep in mind that chemicals circulating through the heater will contact non-stainless steel parts, such as circulating pump, bronze valves, seals, etc. We suggest that you contact a chemical supplier to find out what they recommend.

Packing (removal & replacement)

Dissolving calcium from the packing may take several hours after it is removed from the heater. Consequently your heater will be out of service for an extended period unless you could simply exchange the original packing with extra packing already cleaned. That would shorten heater downtime and allow you to clean the coated packing as long as necessary.

To do that you would need extra packing. **It is absolutely essential for the extra packing to be identical to the original packing. Otherwise the heater will not perform properly!** Please contact Heatec for information about your packing.

If you plan to use extra packing be sure to scribe the wall of the heater to indicate the level of the original packing. When re-filling the heater with packing, increase its level about one inch higher than your scribe mark to allow for settling.

CLEANING STRAINERS

All Firestorm heaters have an inlet water Y-strainer (Z, Fig. 3). Some also have an outlet water Y-strainer (P, Fig. 3). Clogged strainers can cause

the heater to malfunction. Symptoms of a clogged strainer include tripping the inlet water pressure switch and/or abnormally high flue gas temperature. You should routinely check the strainers to make sure they are not clogged.

Cleaning inlet water Y-strainer

Manually shut off the inlet water valve (AA, Fig. 3). Remove the plug from the inlet water Y-strainer (Z, Fig. 3). Allow the water to drain.

Only a small amount of water will drain from the strainer, so a bucket is all you need to catch the water. Remove the strainer basket and clean it if it is clogged. Replace the strainer basket and the plug.

Cleaning outlet water Y-strainer

Allow the heater and water it contains to cool down enough to avoid being burned from contact with the shell and the water inside.

On heaters that have an outlet water strainer (P, Fig. 3), open the drain valve that you installed in the drain connection at the bottom of the heater. Or remove the plug from the drain connection (M, Fig. 3).

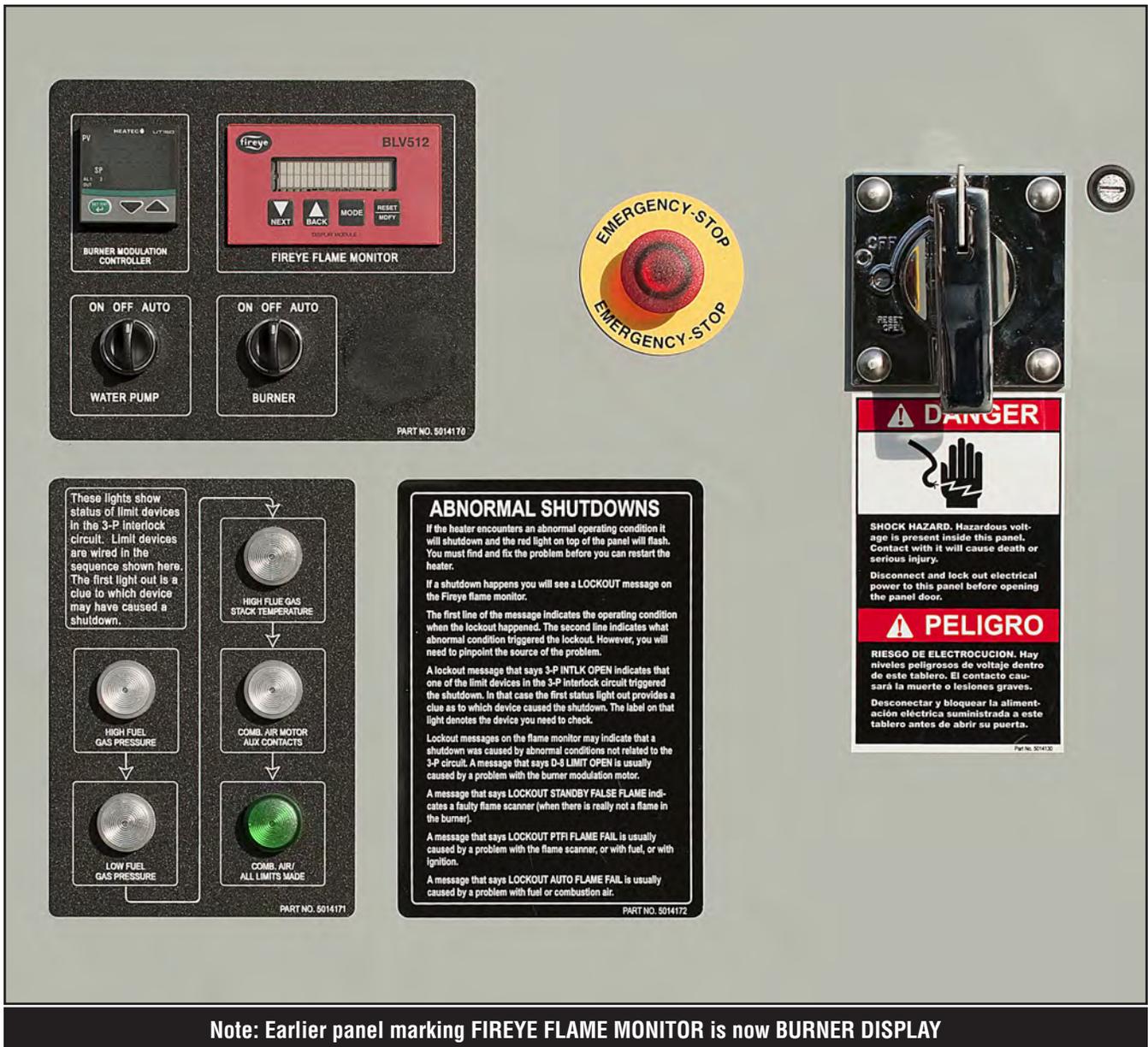
Drain several gallons of water until the level shown on the water level indicator is slightly lower than the outlet Y-strainer. So you may want to connect a hose to the drain valve so the water can be directed to a suitable area away from the heater.

Remove the plug from the outlet water Y-strainer. Allow the water to drain. Only a small amount of water will drain from the strainer, so a bucket is all you need to catch the water. Remove the strainer basket and clean it if it is clogged. Replace the strainer basket and plug.

Close the drain valve at the bottom of the heater or replace the plug in the drain connection.

FREEZE PROTECTION

Be sure to protect your heater from freezing if it is located where temperatures remain below freezing for several hours while not running. Otherwise water in the heater could freeze and cause extensive damage to heater components.



Note: Earlier panel marking FIREYE FLAME MONITOR is now BURNER DISPLAY

Figure 4. Components outside the control panel.

One way to protect it from freezing is to drain all water from the heater shell, float chamber, piping, pump and strainer. All of these have drain plugs except for piping, which may require loosening connections to allow drainage where water is trapped.

As an alternative to draining water from the piping you may want to install heat tracing around the piping.

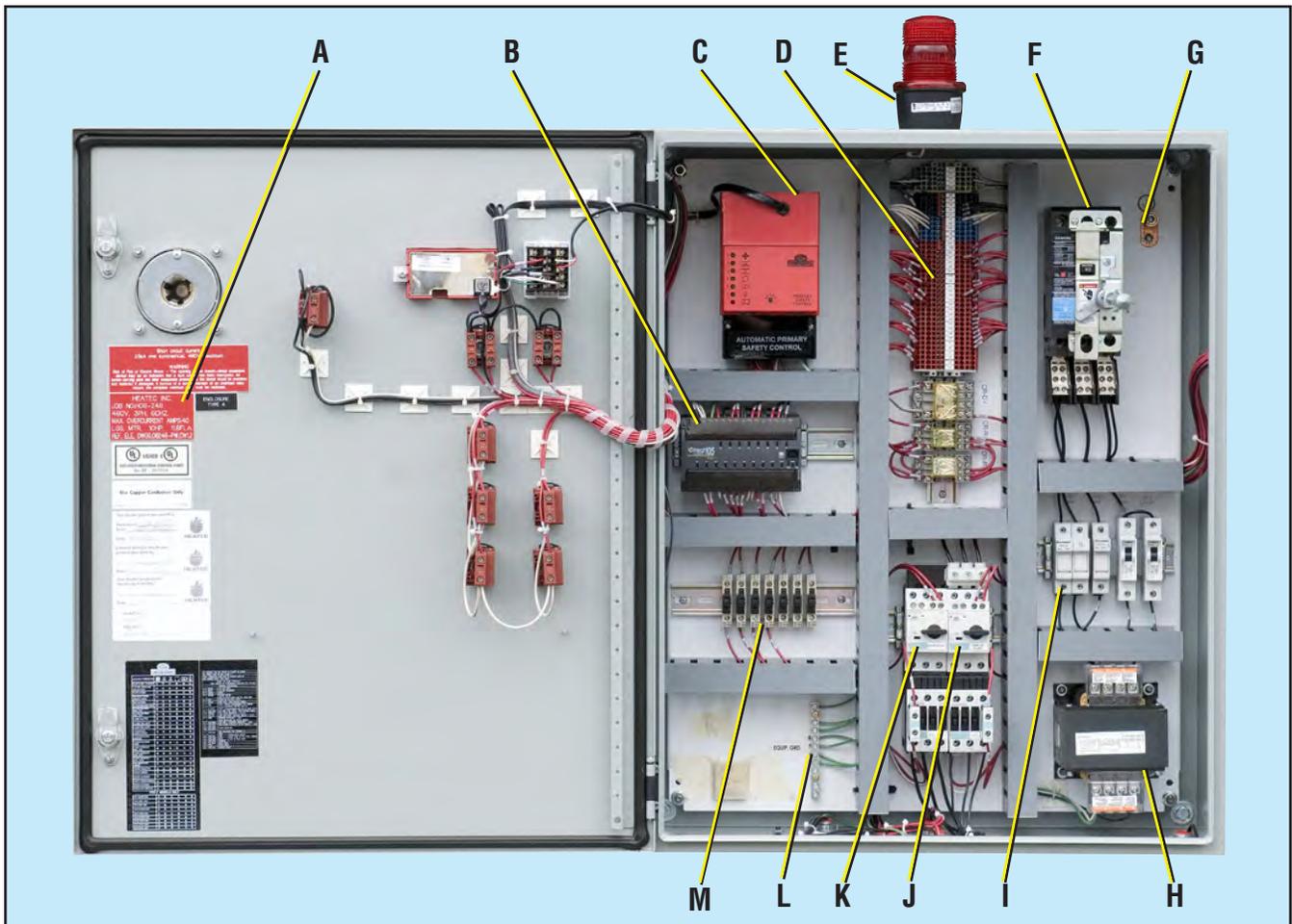
CHECKING WATER LEVEL SWITCHES

Check water level switches (I, J, K, L, Fig. 3) if you encounter any of the following symptoms:

- Pump won't run
- Tank overflows
- Outlet water valve is inoperative
- Pump cycles on/off

To check the switches proceed as follows:

1. Obtain a scrap piece of stiff wire (or a coat hanger) about 3 feet long. Bend one end of the wire to form a small hook.
2. Open the control panel so you can observe the lights on the PLC (B, Fig. 5).
3. Turn on the electrical power using the main disconnect breaker (F, Fig. 5) inside the panel.



- | | |
|---|--|
| <p>A. Voltage label</p> <p>B. PLC (Programmable Logic Controller)</p> <p>C. Fireye burner management control YB110</p> <p>D. Terminals and relays</p> <p>E. Alarm strobe light</p> <p>F. Main disconnect breaker</p> <p>G. Grounding lug</p> | <p>H. Control transformer</p> <p>I. Circuit breakers and fuse blocks</p> <p>J. Blower motor controller</p> <p>K. Water pump motor controller</p> <p>L. Equipment grounding strip</p> <p>M. Fused terminals</p> |
|---|--|

Figure 5. Components inside the control panel.

4. Open the top of the chamber where the switches are installed.
5. Insert the hooked end of the wire into the channel and grab onto the float of a switch.
6. Move the float up and down while observing the light on the PLC. The light should go on and off in response to float movement.
7. Repeat steps 5 and 6 for each of the remaining switches.



Figure 6. Flame scanner.

CHECKING THE FLAME SCANNER

1. Make sure that the **BURNER** switch (**Fig. 4**) is set to **OFF**.
2. Turn on power to the control panel while the front panel is open.
3. With no flame present, check for approximately 560 Vac between terminals S1 and S2 using an ac voltmeter.
4. Remove the flame scanner (**Fig. 6**).
5. Create a flame using a cigarette lighter, a torch or a match. Hold the flame in front of the scanner eye. The voltage should drop to about 340 Vac and the Fireye burner display should show the message **FALSE FLAME** and should indicate a signal number. Otherwise, either the flame scanner or its amplifier is defective.

CHECKING PILOT GAS PRESSURE REGULATOR



Figure 8. Manometer connected to tee at pilot gas line.

1. Connect a manometer to the tee of the pilot gas line where it enters the burner.
2. Open the control panel and gain access to the Fireye burner control (**C, Fig. 5**).
3. Turn on power to the control panel (**F, Fig. 5**) while the front panel is open.
4. Set **BURNER** switch (**Fig. 4**) to **ON** and let the heater start through its purge cycle.

5. Wait for the burner display (**Fig. 4**) to show the words **IGNITION TIMING**. Quickly place the switch marked **CHECK/RUN** on bottom of Fireye burner control (**C, Fig. 5**) to the position marked **CHECK**. This will hold the timing sequence while you check/adjust the regulator.
6. Check that the manometer indicates approximately 3 inches of W.C. or as specified for your burner in the burner manual. If not, adjust screw on the regulator to attain the recommended setting.
7. Place switch marked **CHECK/RUN** on bottom of Fireye burner control back to **RUN**. The timing sequence should continue and operation should be normal.

CHECKING HIGH FUEL GAS PRESSURE SWITCH

With the burner operating, remove the cover from the high fuel gas pressure switch (**Fig. 9**). **Be careful not to touch the live terminals.** Adjust the switch to a lower setting that causes the switch to open.



Figure 9. High fuel gas pressure switch.

The following reactions should occur, indicating that the pressure switch is operating properly:

- The burner should shut down.
- The **HIGH FUEL GAS PRESSURE** light (**Fig. 4**) on the control panel should go *out*. (All other indicator lights on the panel will also go *out*.)

- Fireeye burner display should read **LOCKOUT 3-P INTLK OPEN.**

Re-adjust the high pressure switch to its previous position and reset its manual reset button. Reinstall its cover.

CHECKING LOW FUEL GAS PRESSURE SWITCH



Figure 10. Low fuel gas pressure switch.

Shut off the main gas manual shutoff valve (**Y, Fig. 3**) and set **BURNER** switch (**Fig. 4**) to **ON**. Remove the plug from the tee fitting below the pressure switch allowing gas to escape. The following reactions should occur, indicating that the switch is operating properly:

- **LOW FUEL GAS PRESSURE** light on control panel (**Fig. 4**) should be the first light to go *out*. (Subsequent indicator lights on the panel will also go out.)
- Fireeye burner display (**Fig. 4**) should read **LOCKOUT 3-P INTLK OPEN.**

Reinstall plug in tee fitting. Slowly re-open the main gas manual shutoff valve.

Reset the low fuel gas pressure switch (**Fig. 10**) using its manual reset button. Reset the Fireeye control.

CHECKING HIGH FLUE GAS STACK TEMPERATURE SWITCH

WARNING

Do not touch the exposed terminals (**Fig. 12**) inside the stack temperature switch. Touching the terminals could cause electrical shock causing serious injury or death.



Figure 11. High flue gas temperature switch.

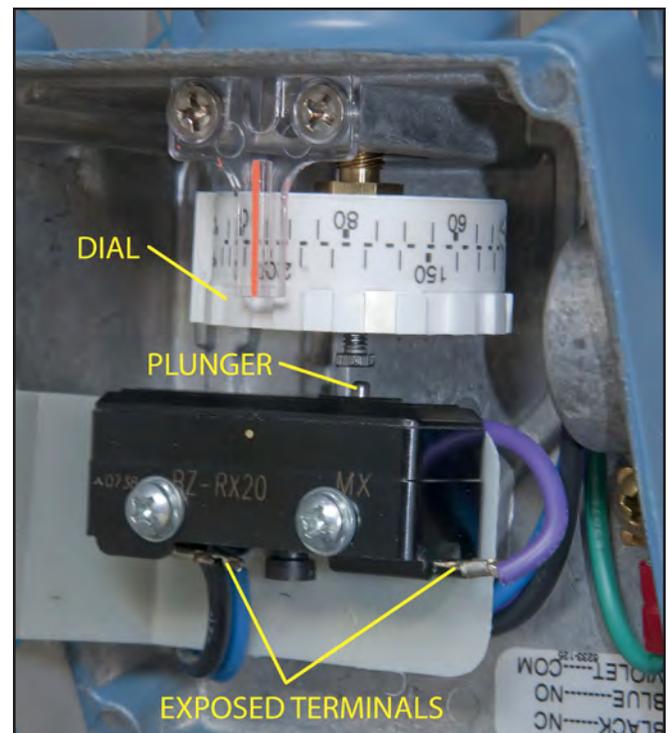


Figure 12. Inside of high flue gas temperature switch.



Figure 13. Checking stack temperature at analyzer port.

With the burner operating, remove the cover from the high flue gas temperature switch (**Fig. 11**).

1. Remove the plug from the analyzer port at the base of the exhaust stack. Insert a thermometer in the port and note the temperature of the exhaust gas (**Fig. 13**).
2. Rotate the dial (**Fig. 12**) on the switch until its setting is a *lower* value than the temperature of the exhaust gas. Be careful not to slide the dial towards the switch while rotating it. Otherwise the dial may press on the small plunger in the switch and prematurely trip the switch.

The following reactions should occur, indicating that the switch is operating properly:

- The burner should shut down.
- The **HIGH FLUE GAS STACK TEMPERATURE** light (**Fig. 4**) on control panel should be the first light to go *out*.
- Burner display (**Fig. 4**) should read **LOCKOUT 3-P INTERLOCK OPEN**.

Rotate the dial to its previous setting, then reset the manual reset button on the switch. Replace the cover.

CHECKING AUXILIARY CONTACTS FOR WATER PUMP MOTOR

With the burner operating, trip the breaker disconnect for the water pump motor (**G, Fig. 15**).

This should cause its auxiliary contacts (**E, Fig. 15**) to open. The following reactions should occur, indicating that the contacts are operating properly:

1. The burner should shut down.
2. Fireeye burner display (**Fig. 4**) should show **STANDBY L1-3 OPEN**.

Reset the breaker disconnect for the water pump motor.

CHECKING AUXILIARY CONTACTS FOR COMBUSTION AIR BLOWER MOTOR

With the burner operating, trip the breaker disconnect for the combustion air blower motor (**B, Fig. 15**).

This should cause its auxiliary contacts (**D Fig. 15**) to open. The following reactions should occur, indicating that the contacts are operating properly:

1. The burner should shut down.
2. The **COMB. AIR MOTOR AUX. CONTACTS** light (**Fig. 4**) on control panel should be the first light *out*.
3. Fireeye burner display (**Fig. 4**) should read **LOCKOUT 3-P INTERLOCK OPEN**.

Reset the breaker disconnect for the combustion air blower motor.

CHECKING LOW COMBUSTION AIR SWITCH



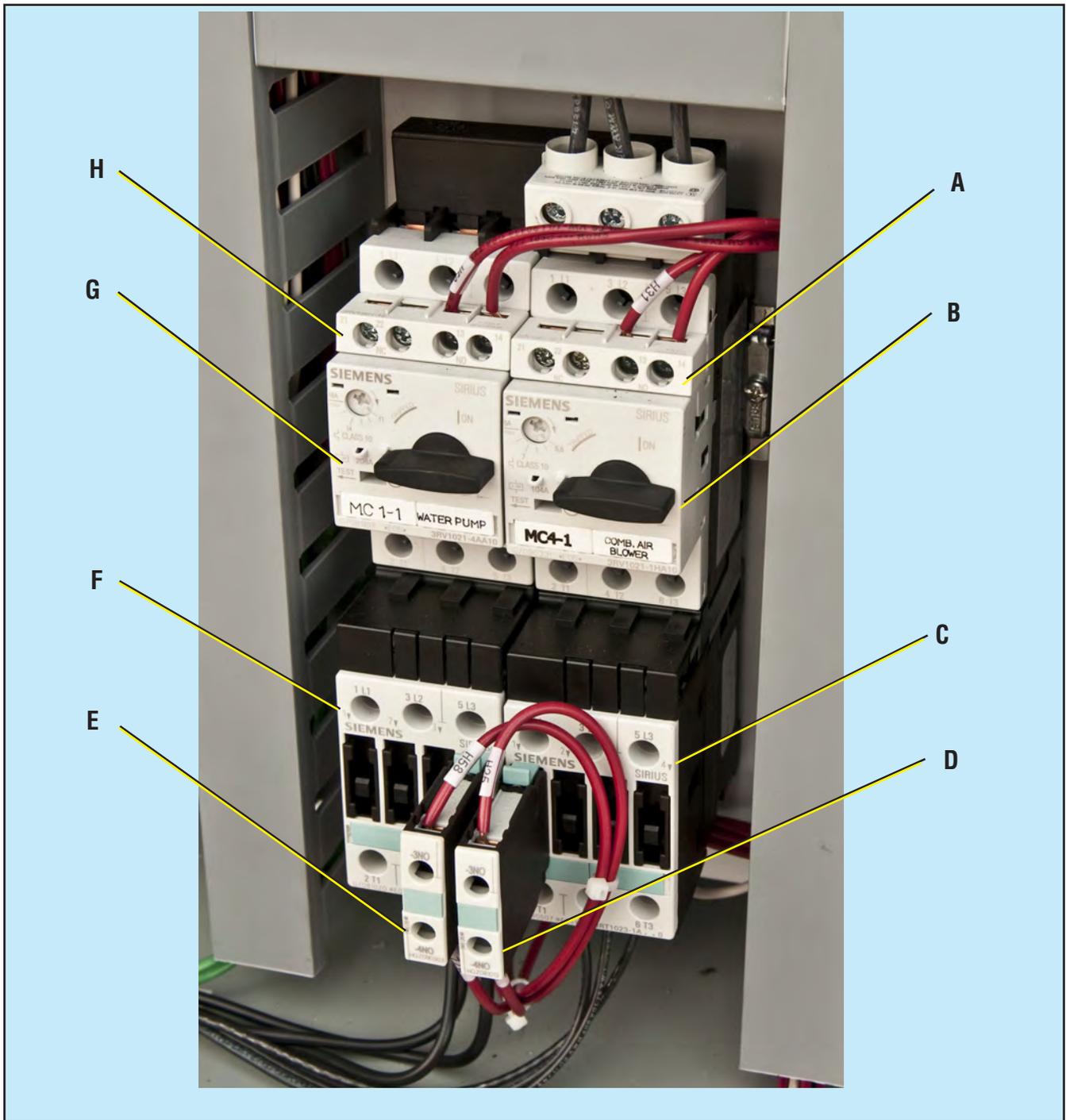
Figure 14. Low combustion air switch.

Make sure that the **BURNER** switch (**Fig. 4**) is set to **OFF**.

1. In the control panel unlatch the auxiliary contacts (**D**, **Fig. 15**) for the combustion air blower and physically remove it with wires attached.

2. Pull out the blue plunger on the module and hold it out to close its contacts.
3. Restart the burner. The **COMB. AIR/ ALL LIMITS MADE** light (**Fig. 4**) should come on almost immediately.
4. Trip the breaker disconnect for the combustion air blower. The **COMB. AIR/ ALL LIMITS MADE** light should go *out* within 4 to 5 seconds. If not, remove cover from combustion air switch (**Fig. 14**) and re-adjust it as follows: Turn the adjustment screw clockwise to shorten the cut-off response time. Turn it counterclockwise to lengthen the cut-off response time.

Re-insert the auxiliary contacts module into the breaker disconnect.



- A. Breaker auxiliary contacts for combustion air blower motor**
- B. Breaker disconnect for combustion air blower motor**
- C. Contactor for combustion air blower motor**
- D. Auxiliary contacts for combustion air blower motor**
- E. Auxiliary contacts for water pump motor**
- F. Contactor for water pump motor**
- G. Breaker disconnect for water pump motor**
- H. Breaker auxiliary contacts for water pump motor**

Figure 15. Components of motor controllers inside the control panel.

MAINTENANCE SCHEDULE

Firestorm™ water heaters

Heatec Firestorm water heaters should be checked periodically according to the requirements below. **Failure to properly maintain your heater could result in a fire or explosion.**

REQUIREMENT	WEEKLY	MONTHLY	QUARTERLY	YEARLY
Clean flame scanner.	X			
Check intake area of blower to make sure it is not blocked by foreign material and is free from buildup of dirt.	X			
During normal operation check all pressure gauges and thermometers on heater and record any changes from previous indications.	X			
Check all operating and limit controls and settings to make sure they are set properly and are working properly.	X			
Check heater and piping to ensure there are no leaks.	X			
Check heater to ensure there is no structural damage to heater or signs of over-heating.	X			
Check burner control linkage to make sure it is not binding or loose.	X			
Remove packing from inside heater and check to ensure that calcium buildup is not excessive.		X		
Check strainers to ensure they are not clogged.		X		
Have exhaust stack gases analyzed and have burner tuned by a specialist				X