

Operation  
Instructions  
for

# Laars Logic System LLS-1

LCD Boiler  
Controller

To be used in conjunction with appropriate product “Installation and Operation” manual shipped with product.

## **⚠ WARNING**

Improper adjustment, alteration, service or maintenance can cause injury or property damage. Refer to this manual. For assistance or additional information, consult a qualified installer, service agency, gas supplier, or call factory Applications Engineer.

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## SECTION 1.

### General Information

#### 1.1 Introduction

The Laars Logic System (LLS) is a solid state, commercial control capable of interfacing with your boiler or water heater to intelligently provide heat energy, diagnose problems and display boiler status via a liquid crystal display (LCD).

The LLS-1 allows you to customize your boiler's operation to best suit the needs of your application, while providing you with useful information to increase efficiency and simplify servicing.

The control reads information from multiple inputs and controls multiple outputs with a total of seventeen display readings. All sensors are monitored in parallel for increased safety.

The control features a simple user interface that allows programming of many functions and parameters. All boiler / domestic water settings are accessible through this interface as well as alarm settings and gas valve staging. Pump options (such as freeze protection and pump exercise) can also be turned on or off. If the draft fan or power venter option is used, they too can be controlled through simple display windows.

#### 1.2 Standard Operating Features

- All safety devices and sensors are checked to be working properly prior to starting boiler
- Proven hot surface or spark ignition, pilot & main gas valves, flame proving, vent dampers, power venting equipment, and combustion air intake equipment
- Optional outdoor air temperature reset for boiler operating temperature
- Alarm contacts for fault conditions
- Domestic Hot Water (DHW) set-point with adjustable differential (when Laars sensor is used)
- Control primary boiler pump
- Control DHW circulator (when Laars sensor is used)
- Display supply water temperature
- Display return water temperature and set point
- Display outdoor air temperature (OAT sensor optional)
- Display DHW storage tank temperature & set-point
- Adjustable pump time delay
- Adjustable manual reset outlet water temperature
- Control boiler staging
- 2 amp fused relays for low voltage devices
- 30 amp fused relays for high voltage devices
- Removable relay terminals for easy wiring
- Easy to access, easy to read control box locations

- Back-lighting for all LCD's to make programming easier in dark locations
- Modes for set-up, normal operation, programming & trouble-shooting
- Components such as power venters, combustion air intake systems, outdoor air sensors are field configurable
- Continuous display of basic operating conditions with easy to read symbols
- Adjustable fan setting for pre and post purge timing
- LCD will display and diagnose boiler performance down to the component level
- Redundant processors constantly monitor all safety devices and control operation

#### 1.3 Inputs

1. Tank Temperature Sensor (optional Laars sensor for DHW)
2. Inlet Water Temperature Sensor
3. Outlet Water Temperature Sensor
4. Flame Sensor
5. Low Water Cut Off (Water Level)
6. Blocked Vent Switch
7. Water Flow Sensor (Flow Switch)
8. High Gas Pressure Sensor (may be optional)
9. Low Gas Pressure Sensor (may be optional)
10. Venturi Differential Pressure Switch (MightyMax)
11. Burner Temperature Switch (Mighty Max)
12. Fusible Links (when boiler/heater is equipped)
13. Vent Damper Open (when boiler/heater is equipped)
14. Draft Inducer Pressure Switch (when used)
15. Auxilliary Devices

#### 1.4 Outputs

1. Boiler Pump
2. Igniter or Pilot Igniter Control
3. Pilot Gas Valve Control
4. Gas Valve Control
5. DHW Circulator (when used with Laars sensor)
6. Vent Damper (when used)
7. Alarm
8. Draft Inducer (when used)

#### 1.5 Indications / Displays

- Inlet Water Temperature
- Outlet Water Temperature
- Temperature Set Points for inlet water and DHW
- Ignition Process Indicators
- Low Water Cut Off Status (Water Level)
- Vent Damper Status
- Water Flow Status
- Supply Gas Pressure Status (when ordered with gas train)
- Lockout Indication and Alarm
- Main Gas Valve On/Off

- Main Gas Flame Status (if main burner flame sensor is present)
- Pump / Circulator Status for Boiler and DHW Pumps
- Fan Status
- Boiler Staging Status
- “Service Required” Indicators

## SECTION 2. Operation

### 2.1 Sequence of Operation

1. The main power switch is “ON”.
2. Space heating or domestic hot water “call for heat” signal is initiated.
3. The status of the water temperature at the boiler inlet is verified.
4. The status of the water temperature at the boiler outlet is verified.
5. Auxiliary terminals are checked to make sure the circuit is closed.
6. Boiler pump is energized (if controlled by the LLS).
7. Vent damper is opened (if installed)
8. Vent damper proving switch is verified.
9. Venting fans are energized (if installed).
10. Controller verifies that power venter proving switch has been made.
11. Controller verifies that the high gas pressure switch has not tripped if unit is equipped with switch.
12. Proper minimum gas pressure is verified if the unit has low gas pressure switch.
13. If used on the unit, rollout switch, blocked vent switch and fusible links are checked.
14. Differential pressure switches to verify proper air flow through units are checked (if the unit has such devices).
15. Flow switch is checked.
16. Adequate water level is verified through Laars Low water cutoff (if equipped).
17. Controller performs a pre-flame sense check.
18. Ignition system is energized.
19. Controller performs a post flame sense check.
20. The main gas valve assembly is activated as prescribed.
21. The main burner is ignited.
22. Call for heat is satisfied.
23. Main gas valve assembly is deactivated.
24. The pump is allowed to operate for a preset time, after which it stops (if pump delay is activated).
25. Venting fan is allowed to post purge, after which it stops (if programmed).
26. Vent damper stays open if post purge is activated, after which time it closes.

## SECTION 3. Field Installed Connections

Connections that are made to the LLS controller are described in this section. Sensors, field-supplied switches, power venters, aquastats, etc. can be connected directly to the LLS control. This section describes the method of connection, as well as any important information regarding connections (see Figure 1). Many connections will require programming/setup of the controller.

The LLS-1 has several operating parameters that can be changed to ensure that the boiler operation best meets the needs for your application.

### **Laars controls boiler water temperature at inlet.**

See Sections 5 and 6 for specifics about programming options.

### **Field Interlock - T1**

The field interlock connection is commonly referred to as a T-T connection. This is for tank aquastats and heating thermostats / end switches. The boiler will not fire unless this connection is made.

#### **⚠ WARNING**

The Field Interlock connection is NOT for safety switches that are used to prevent the boiler from firing. For field-supplied safety switches, connect directly through the boiler wiring or through the auxiliary switch connection on the LLS (J32). When components are wired through the Field Interlock, voltage to the main gas valves can be energized by the DHW (domestic hot water) sensor, if used. Contact the factory if you have any questions about how to connect safety switches to the boiler or the LLS.

#### **Important Note About Tank Aquastats:**

Standard tank aquastats must be connected to the Field Interlock (T1), not the DHW Tank Temp (T3). The aquastat will call for heat when the tank temperature drops, as in a standard water heater setup. DHW Tank Temp connection is for the Laars DHW Sensor only. Do not enable or program parameters for domestic water on the LLS when using a standard tank aquastat, or the controller will “look for” the Laars DHW Sensor.

### **Outside Air Temp - T2**

Laars’ OAT (outside air temperature) Sensor is connected here when outdoor reset is used in a heating system. To ensure proper operation, only the Laars OAT sensor should be used with the LLS.

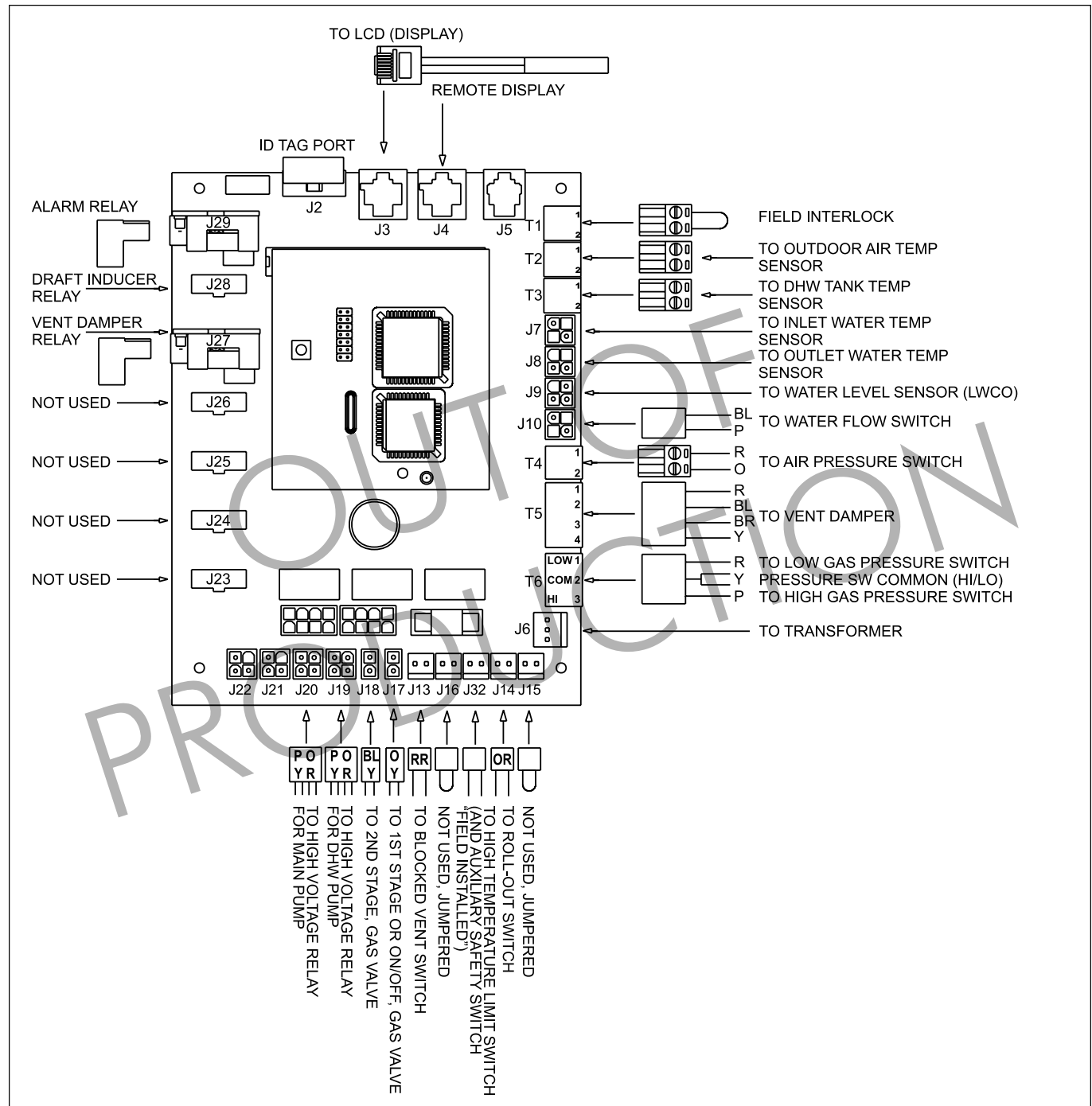


Figure 1. Laars Logic System Connections.

### DHW Tank Temp - T3

This connection is for a Laars DHW (domestic hot water) Sensor only. (Standard tank aquastats must be connected to T1, the Field Interlock connection on the controller.) The Laars DHW sensor is a thermistor, not a switch, and this connection reads resistance. Use of this sensor allows the user to program domestic water features that are not available when using a standard tank aquastat.

### ⚠ WARNING

If DHW sensor is used, additional components that are tied to the field interlock will NOT prevent the unit from firing when the DHW sensor calls for heat. For field-supplied safety switches that must keep the boiler from firing, connect directly through the boiler wiring or through the auxiliary switch connection on the LLS (J32).

### Water Level Sensor - J9

**This connection is for a Laars Low Water Cutoff only.** (Other low water cutoff devices must be connected to Aux SW - J32.) This connection is made at the factory on units that are ordered with the Low Water Cutoff option or other options that include a Low Water Cutoff and is made in the field when being added after the unit is on site.

### Draft Pressure Switch - T4

When a draft fan is installed, a draft pressure switch must be connected to ensure that the fan is operating before the boiler is allowed to fire. Some boilers and water heaters have built-in fans, and this connection will be made to the unit's internal draft switch. Remove factory-installed jumper when connecting draft pressure switch.

### Vent Damper Control - T5

Vent dampers for units that require them (Mighty Therm HH & PH, 175-250) are equipped with a harness that requires wiring to the LLS through the Vent Damper Control connection. See Figure 2. Remove factory installed jumper when connecting vent damper.

### High & Low Gas Pressure Switches - T6

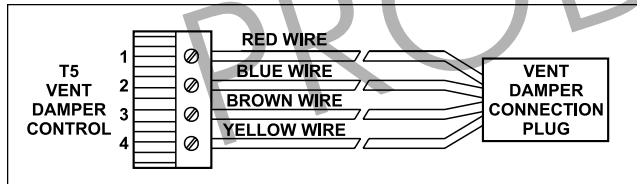


Figure 2. LLS Vent Damper Connection.

When a heater is built with high and low gas pressure switches, this connection is made at the factory. When adding gas pressure switches in the field, wire them per Figure 3. Remove factory-installed jumper when connecting gas pressure switches.

### Main Pump Control - J20

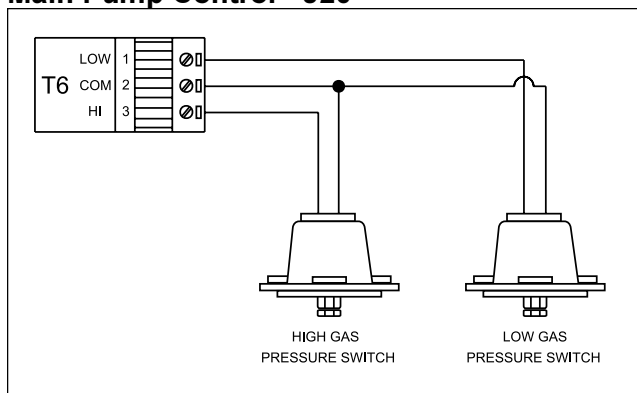


Figure 3. High and Low Gas Pressure Switch Connection.

On pump-mounted units, this connection is made at the factory. To interlock a pump to the LLS for non-pump-mounted units, with the addition of Laars' high voltage (110V) relay & wire harness, use this connection. One end of the wire harness connects to J20 and the other end connects to the relay. A separate 110V source is then connected through the relay to the pump. This connection will handle pumps as large as 1hP, 110V, single phase. The LLS can be programmed to post-purge the pump and monitor current draw through the relay.

### DHW Pump Control - J19

**This feature works with the Laars DHW sensor only.** To interlock a domestic water pump (the pump between the heater and the storage tank) to the LLS, with the addition of Laars' high voltage (110V) relay, wire harness, and DHW sensor, use this connection. One end of the wire harness connects to J19 and the other end connects to the relay. The Laars DHW sensor must be connected to T3. A separate 110V source is then connected through the relay to the pump. This connection will handle pumps as large as 1hP, 110V, single phase. The LLS can be programmed to post-purge the pump and monitor current draw through the relay.

### Aux Sw - J32

This connection is made at the factory if additional switches are ordered with the unit. If not, field-supplied safety switches can be connected here. Safety switches that must prevent the boiler from firing must be connected here, or in series with the boiler wiring, and NOT through the Field-Interlock connection.

### Alarm Relay - J29

This is a normally open 24VAC relay connection, and is not a dry contact. With this alarm relay, the user will have a 24VAC source for building automation system alarms, bells, buzzers, or any other alarm device, 8VA maximum.

### Draft Inducer Relay - J28

When a boiler or water heater has a built-in draft fan, this connection will be made at the factory. For field-supplied draft fans or power venters with the addition of Laars' relay, the user can make a connection here which, upon a call for heat, will call the fan to operate. The LLS can be programmed to pre-purge and/or post-purge the fan. Important note: When this connection is used, a draft pressure switch must be installed at connection T4 to prove the fan is operating before the unit fires.

### Vent Damper Relay - J27

Mighty Therm Boilers, models HH and PH, 175 and 250, require that vent dampers be installed. The vent damper relay (supplied with the controller) is plugged into this connection, but no other connections are made to the relay. The function of the relay is to close connections internal to the control board.

#### **ID Tag Port - J2**

ID tag must NEVER be removed. Do not tamper with this connection at any time.

#### **To LCD Panel - J4**

An additional LCD (controller display) can be connected here and remote mounted up to 500 feet away from the LLS. This is for display only. Changes cannot be made, and the control cannot be reset from the remote display.

## **SECTION 4.**

### **Factory Installed Connections**

The following connections are made at the factory, if required, and descriptions are provided here for informational purposes only. Some connection points are not functional on the LLS-1, and will not be used. Contact the factory before modifying any of these connections. The LLS-1 has several operating parameters that can be changed to ensure that the boiler operation best meets the needs for your application. See Section 5 and 6 for specifics about programming options.

#### **Inlet Temp Sensor - J7**

This connection is made at the factory for the temperature sensor on the boiler/heater inlet.

#### **Outlet Temp Sensor - J8**

This is the factory connection for the temperature sensor on the boiler/heater outlet.

#### **Water Level Sensor - J9**

This connection is made at the factory on units that are ordered with the Low Water Cutoff option, or other options that include a Low Water Cutoff.

#### **Water Flow Sensor - J10**

This connection is made at the factory, for the water flow sensor (flow switch).

#### **Tran Sec - J6**

This is the factory connection for the unit's transformer.

#### **Gas V-5 H-Volt - J22**

Not used on LLS-1

#### **Gas V-6 H-Volt - J21**

Not used on LLS-1

#### **Valve Gas 2 - J18**

This connection is made at the factory to control safety gas valve or stage.

#### **Valve Gas 1 - J17**

This connection is made at the factory to control safety gas valve or stage.

#### **Blocked Vent Sw - J13**

This is the factory connection for a unit that is equipped with a blocked vent switch.

#### **Venturi Sw - J16**

This is the factory connection for a unit that is equipped with a venturi pressure switch.

#### **Roll Out Sw - J14**

This connection is made at the factory on units that are equipped with roll-out switches.

#### **Fuse Link - J15**

This is the factory connection for a unit that is built with a fusible link.

#### **Gas Valve 3 Relay - J26**

Not used on LLS-1

#### **Gas Valve 4 Relay - J25**

Not used on LLS-1

#### **Gas Valve 5 Relay - J24**

Not used on LLS-1

#### **Gas Valve 6 Relay - J23**

Not used on LLS-1

#### **ID Tag Port - J2**

ID tag must NEVER be removed. Do not tamper with this connection at any time.

#### **To LCD + Keyboard - J3**

This connection is made at the factory, for the LLS display and keypad. Additional remote LCD panel must be connected to J4.

## **SECTION 5.**

### **Programmable Parameters**

### **See Section 6 For Programming Instructions**

The LLS-1 has several operating parameters that can be changed to ensure that the boiler operation best meets the needs for your application. The following is a list of the programmable parameters, minimum and maximum values, and defaults. **NOTE: Laars controls boiler water temperature at inlet.**

**Boiler Settings****Inlet Water Temperature**

- 110°F min
- 220°F max
- 140°F default models HH/PH
- 110°F default models VW/PW

**Operating Differential**

- 2°F min
- 30°F max
- 15°F default models HH/PH
- 5°F default models VW/PW

**Outlet Water Temperature**

- 110°F min
- 240°F max
- 200°F default models HH/PH
- 180°F default models VW/PW

**Low Return Water Temperature (for alarm)**

- 40°F min
- 240°F max
- 80° default

**Boiler Pump Settings****Boiler Pump Installed**

- “yes” or “no”
- “yes” default for PH/PW
- “no” default for HH/VW

**Run Constant, Auto**

- “auto” default
- “constant” optional

**Pump Extended Run Cycle (pump delay time)**

- 0 minute min
- 10 minute max
- 5 minute default

**Pump Exercise**

- “no” default
- “yes” optional

**Pump Exercise Frequency**

- 1 day min
- 9 days max
- 7 days default

**Freeze Protection**

- “on” default
- “off” optional

**Freeze Protection to operate at**

- 33°F min
- 50°F max
- 35°F default

**Domestic Hot Water (DHW) Settings**

**IMPORTANT NOTE:** The DHW connection on the LLS is only for the Laars DHW sensor. Standard tank aquastats must be connected to the LLS field interlock. These Domestic Hot Water settings are only used if the Laars DHW sensor is controlling tank temperature.

**DHW Operation**

- “off” default
- “on” optional

**DHW Setpoint Temperature**

- 110°F min
- 190°F max
- 110°F default

**Operating Differential**

- 2°F min
- 30°F max
- 5°F default

**Outdoor Reset Settings**

(Not applicable to models VW & PW)

**NOTE:** Outdoor Reset is accomplished with Laars Outdoor Reset sensor. Other sensors may not be compatible with the LLS control logic.

**Outdoor Air Temperature Sensor Installed**

- “no” default
- “yes” optional

**Outdoor Reset**

- “off” default
- “on” optional

**Outdoor Reset Ratio (Boiler inlet temp set point governs high end of curve)**

- min
- 5 max
- default

**Maximum permissible water temperature (will override reset curve)**

- 150°F min
- 220°F max
- 190°F default

**Minimum permissible water temperature (will override reset curve)**

- 110°F min
- 150°F max
- 130°F default

**Warm Weather Shutdown**

- “on” default
- “off” optional

**Warm Weather Shutdown Temp**

- 40°F min
- 120°F max
- 60°F default

**Alarm Settings****External Alarm**

- “on” default
- “off” optional

**Internal Alarm**

- “on” default
- “off” optional



## Power Venter Option

Power Venter Installed

- “no” default
- “yes” optional

Pre-Purge Time

- 0 minute min
- 10 minute max
- 0 (no purge) default

Post-Purge Time

- 0 minute min
- 10 minute max
- 0 (no purge) default

## Vent Damper Option

Vent Damper Installed

- “no” default
- “yes” optional

Post-Purge Time

- 0 minute min
- 10 minute max
- 0 (no purge) default

## Gas Valve Staging

(For two-stage units only)

## Differential Between Stage 1 & 2

- 2°F min
- 50°F max
- 10°F default

# SECTION 6. Programming

The LLS-1 has program menus that allow you to obtain boiler operation information and allow you to change many of the operating parameters if you wish to do so.

The up and down arrow keys (the two rightmost

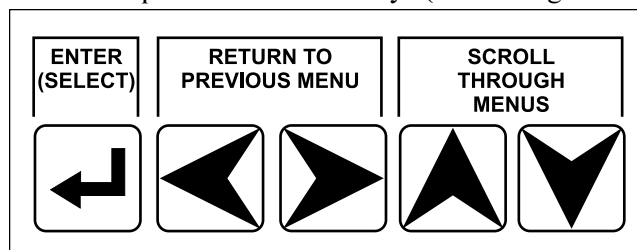


Figure 4. LLS Menu Buttons.

keys) scroll through the menu. The right and left arrow keys move back to previous menus. The enter key (on the left) is pushed to select, or enter a menu or to change displayed information (see Figure 4).

There are fifteen (15) separate Display Groups, they are as follows:

## Display #1 - Default

During periods of inactivity the LLS-1 readout will display:  
LAARS LOGIC SYSTEM. In order to access one of the twelve menus hit the enter key.

## Display #2 - Main Menu Selection

Use the arrow keys to scroll through the information, to select a menu hit the enter key while it is displayed. The readout will go back to Display #1 if left inactive on any display for longer than thirty (30) seconds. The list appears in the following order:

BOILER INFORMATION  
BOILER SETTINGS  
BOILER PUMP  
DHW SETTINGS  
OUTDOOR RESET  
ALARM SETTINGS  
POWER VENTER OPTION  
VENT DAMPER OPTION  
GAS VALVE STAGING  
PERFORM SYSTEM CHECK  
SENSOR VALUES  
OPERATING SUMMARY

## Display #3 - Boiler Information

If this menu is selected the following display will appear:

BOILER INFORMATION

This is data for how the boiler was built and how the LLS was programmed. This data is entered into the LLS-1 at the factory and cannot be changed. It displays the model & serial number, the LLS program number, the date the unit was manufactured and the fuel type. The readout will go back to Display #1 if left inactive on any display for longer than thirty (30) seconds.

Use the arrow keys to scroll through the information, it will appear as follows:

MODEL # \_\_\_\_\_  
SERIAL # \_\_\_\_\_  
LLS VER. \_\_\_\_\_  
MFR DATE mm/dd/yyyy  
FUEL TYPE \_\_\_\_\_

## Display #4 - Boiler Settings

If this menu is selected the following display will appear:

## BOILER SETTINGS

Use the arrow keys to scroll through the information, it will appear as follows:

**INLET SETPOINT**

This is the desired boiler inlet water temperature.

**OPER DIFFERNTL \_\_\_F**

This sets the desired operating temperature differential.

**MAN RESET TEMP \_\_\_F**

Displays unit's outlet water temperature.

**LOW TEMP WARN \_\_\_F**

With this setting, you will tell the controller to alarm when the boiler's inlet temperature goes below the temperature selected.

To change a value, select it by hitting the enter key while the value is displayed. The value will start to flash. Use the arrow keys to change the value. When the value you desire is shown, press the enter key. The value will stop flashing, indicating that the value has been set. The readout will go back to Display #1 if left inactive on any display for longer than thirty (30) seconds.

**Display #5 - Boiler Pump**

If this menu is selected the following display will appear.

**BOILER PUMP**

This is to indicate to the controller whether a pump has or has not been connected, and how the user wants the pump controlled.

Use the arrow keys to scroll through the information, it will appear as follows:

**PUMP INSTALLED = YES/NO**

This indicates whether or not a pump will be controlled by the LLS.

**RUN CONT/AUTO = AUTO/CONT**

When put in constant mode, the pump will run continuously, regardless of whether or not there is a call for heat. When put in auto mode, the pump will start when there is a call for heat, stop when the call for heat is ended, and extended run time ends, and will run whenever the outlet temperature sensed is within 5°F of the outlet water temperature setting, to avoid nuisance high limit trips.

**EXTENDED RUN \_\_\_MIN**

Extended run is the pump time delay. After a call for heat is satisfied, if the unit is in auto pump mode, the pump will keep running for the length of time entered by the user.

**EXERCISE PUMP = NO/YES**

If this function is turned on, during long periods with no boiler/heater use (such as a hydronic boiler system in the summer), the LLS will run the pump to minimize the possibility of the pumps seizing up.

**EXERCISE FREQ \_ DAYS**

This tells the controller how often you want the pump run, if the exercise feature is enabled.

**FREEZE PROTECT = \_\_\_**

If the freeze protection feature is enabled, the unit's pump will be energized when the controller detects inlet water temperature below what the user has entered. This will keep the water moving through the boiler to minimize the possibility of freezing. Note that this will not protect the boiler if there is a loss of electrical power to the unit, or if a prolonged period of freezing temperatures occurs.

**FREEZE PROTECT @ \_\_\_F**

This is the temperature at which the user wants the freeze protection option to turn on.

To change a value select it by hitting the enter key, the value will start to flash. Use the arrow keys to change the value, when finished hit the enter key, the value will stop flashing. The readout will go back to Display #1 if left inactive on any display for longer than thirty (30) seconds.

**Display #6 - DHW Settings**

If this menu is selected the following display will appear.

**DHW SETTINGS**

**IMPORTANT NOTE: The DHW (Domestic Hot Water) connection on the LLS is only for the Laars DHW sensor. Standard tank aquastats must be connected to the LLS field interlock. These Domestic Hot Water settings are only used if the Laars DHW sensor is controlling tank temperature.**

Use the arrow keys to scroll through the information, it will appear as follows:

**DHW OPERATION ON \_ OFF \_**

This tells the LLS controller that the Laars DHW sensor is being used

**DHW SETPOINT \_\_\_F**

This sets the domestic water temperature, and is measured at the DHW sensor.

**OPER DIFFERENTIAL \_\_\_F**

This sets the desired differential of the domestic hot water temperature setting.

To change a value select it by hitting the enter key, the value will start to flash. Use the arrow keys to change the value, when finished hit the enter key, the value will stop flashing. The readout will go back to Display #1 if left inactive on any display for longer than thirty (30) seconds.

**Display #7 - Outdoor Reset**

If this menu is selected the following display will appear.

**OUTDOOR RESET**

**NOTE: Outdoor Reset and Warm Weather Shutdown are accomplished with Laars Outdoor Reset sensor. Other sensors may not be compatible with the LLS control logic.**

Use the arrow keys to scroll through the information, it will appear as follows:

**USE OAT SENSOR = YES/NO**

This tells the controller that the Laars OAT (Outside Air Temperature) sensor has been installed.

**OUTDOOR RESET ON \_ OFF \_**

This turns the outdoor reset function on or off.

**RESET RATIO \_ \_**

This setting is the outdoor reset ratio.

**MAX RESET SETPT \_\_\_F**

This is the temperature at which the boiler will override the reset ratio calculation, to ensure that the boiler has the desired maximum temperature at the boiler inlet (to prevent nuisance high limit trips and higher-than-desired boiler temperature).

**MIN RESET SETPT \_\_\_F**

This is the temperature at which the boiler will override the reset ratio calculation, to ensure that the boiler has the desired minimum temperature at its inlet (to minimize the possibility of condensation).

**WARM OAT SHTDN = ON/OFF**

Warm weather shutdown (WWSD) can be activated. In this mode, the boiler and pump will be deactivated when the outdoor temperature reaches the WWSD setpoint. In this mode, the pump will be exercised if that option is chosen.

**WARM OAT SHTDN @ \_\_\_ F**

This sets the temperature at which the user would like the Warm Weather Shutdown to activate.

To change a value select it by hitting the enter key, the value will start to flash. Use the arrow keys to change the value, when finished hit the enter key, the value will stop flashing. The readout will go back to Display #1 if left inactive on any display for longer than thirty (30) seconds.

**Display #8 - Alarm Settings**

If this menu is selected the following display will appear.

**ALARM SETTINGS**

Use the arrow keys to scroll through the information, it will appear as follows:

**EXTERNAL ALARM = ON \_ OFF \_**

If an external alarm is connected, this will activate it.

**INTERNAL ALARM = ON \_ OFF \_**

The controller has an internal alarm, which beeps under an alarm condition. This will activate the internal alarm sound, if desired. Alarms will appear in the form of icons and in the text display, regardless of whether this is activated or not.

To change a value select it by hitting the enter key, the value will start to flash. Use the arrow keys to change the value, when finished hit the enter key, the value will stop flashing. The readout will go back to Display #1 if left inactive on any display for longer than thirty (30) seconds.

**Display #9 - Power Venter Option**

If this menu is selected the following display will appear.

**POWER VENTER OPTION**

Use the arrow keys to scroll through the information, it will appear as follows:

**VENTER OPTION = NO/YES**

If a field-supplied power venter (or other draft fan) has been installed, this will tell the controller to activate the fan and check for the fan proving switch.

**PREPURGE \_\_\_ MIN**

If desired, set a pre-purge cycle time, which will run the fan for that amount of time before boiler ignition takes place.

**POSTPURGE \_\_\_ MIN**

If desired, set a post-purge cycle time, which will keep the fan running after the call for heat has been satisfied.

To change a value select it by hitting the enter key, the value will start to flash. Use the arrow keys to change the value, when finished hit the enter key, the value will stop flashing. The readout will go back to Display #1 if left inactive on any display for longer than thirty (30) seconds.

### Display #10 - Vent Damper Option

If this menu is selected the following display will appear.

#### VENT DAMPER OPTION

Use the arrow keys to scroll through the information, it will appear as follows:

#### VENT DAMPER OPT = YES/NO

If a vent damper is installed, this will tell the controller to open it, check its proving switch and close it.

#### POSTPURGE \_\_ MIN

If a venter fan has been installed and programmed with a post-purge, this will keep the vent damper open while the fan post-purges. If no fan post-purge has been set, this will post-purge the damper.

To change a value select it by hitting the enter key, the value will start to flash. Use the arrow keys to change the value, when finished hit the enter key, the value will stop flashing. The readout will go back to Display #1 if left inactive on any display for longer than thirty (30) seconds.

### Display #11 - Gas Valve Staging

If this menu is selected the following display will appear.

#### GAS VALVE STAGING

This option is for stage-fired units only.

Use the arrow keys to scroll through the information, it will appear as follows:

#### DIFFERENTIAL \_\_ F

To set the temperature differential between the first and second stages, enter a time here.

To change a value select it by hitting the enter key, the value will start to flash. Use the arrow keys to change the value, when finished hit the enter key, the value will stop flashing. The readout will go back to Display #1 if left inactive on any display for longer than thirty (30) seconds.

### Display #12 - Perform System Check

If this menu is selected the following display will appear.

#### PERFORM SYSTEM CHECK

Use the arrow keys to scroll to the following question:

#### PRESS UP = DO CHECK

#### PERFORM SYSTEM CHECK? \_

Use arrow keys to switch between Y and N. Select by pressing the enter key. If N is selected the readout will return to Display #1. If Y is selected the following display will flash for 10 seconds while the system is being checked:

#### PERFORMING CHECK .....

Once the check is complete one of the following two message will be displayed:

#### SYSTEM OK or ERROR AT \_\_\_\_\_

The readout will go back to Display #1 if left inactive on any display for longer than thirty (30) seconds.

### Display #13 - Sensor Values

If this menu is selected the following display will appear.

#### SENSOR VALUES

Use the arrow keys to scroll through the information, it will appear as follows:

#### LWCO \_\_

This will display voltage at the low water cutoff (if a Laars low water cutoff is installed).

#### FLAME SENSOR \_\_

This will display voltage at the flame sensor.

#### BOILER PUMP \_\_ A

This will display the Amperage of the pump motor, if controlled by the LLS.

#### DHW PUMP \_\_ A

This will display the Amperage of the domestic water pump motor, if controlled by the LLS.

#### 24V REF \_\_

This will display the voltage from the transformer, to compare control voltage to what is coming out of the unit's transformer.

The sensor value information cannot be changed. The readout will go back to Display #1 if left inactive on any display for longer than thirty (30) seconds.

**TEST VOLTAGE \_\_ V**

For factory information only.

**Display #14 - Operating Summary**

If this menu is selected the following display will appear.

**OPERATING SUMMARY**

Use the arrow keys to scroll through the information, it will appear as follows:

**INSTALLED HRS \_\_\_\_**

This displays the total number of hours the units has been installed.

**OPERATING \_\_\_\_**

This displays the total number of hours the unit has fired.

**TOTAL CYCLES \_\_\_\_**

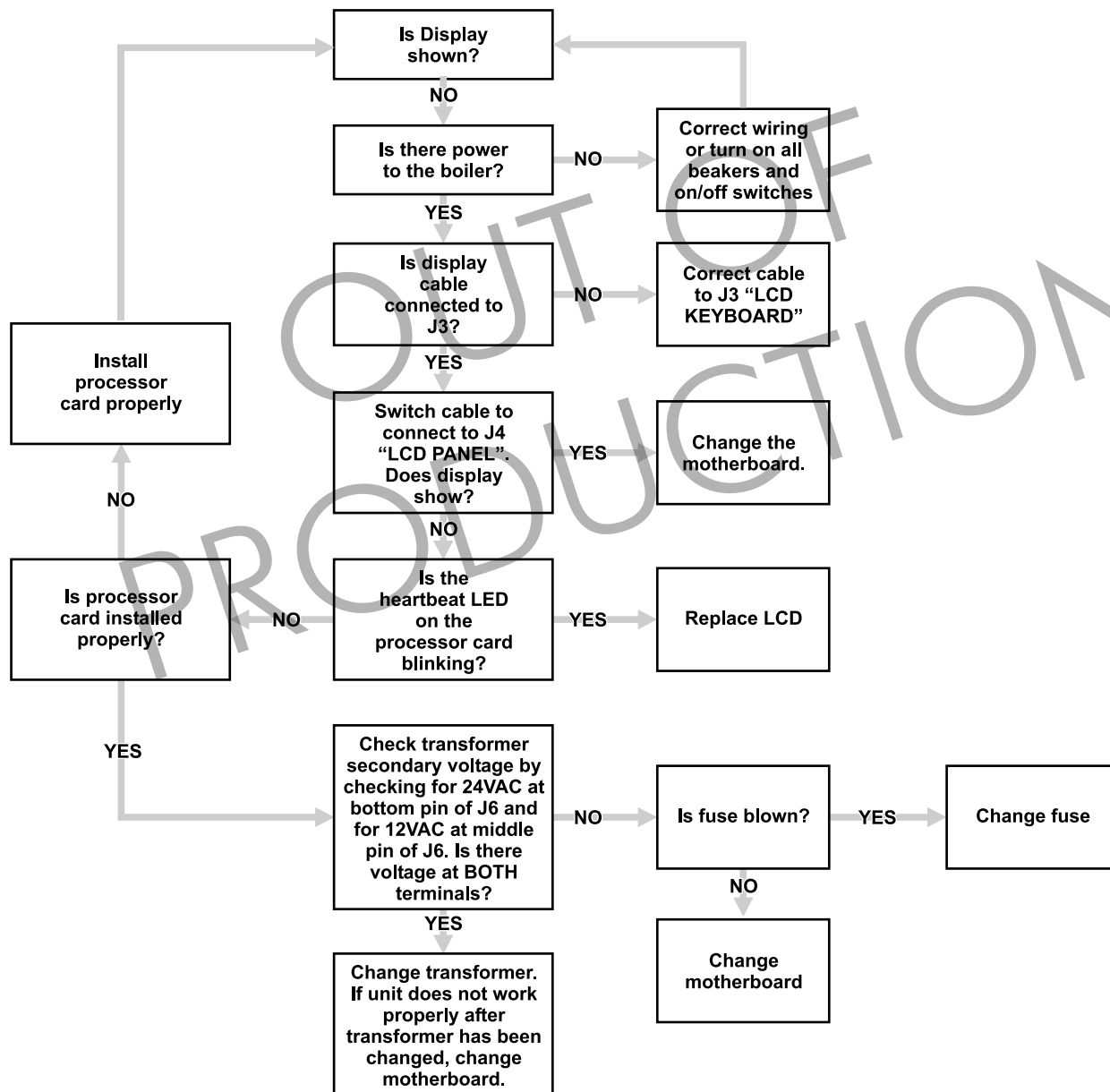
The displays the total number of times the unit has cycled on/off since it was first installed

This information cannot be changed. The readout will go back to Display #1 if left inactive on any display for longer than thirty (30) seconds.

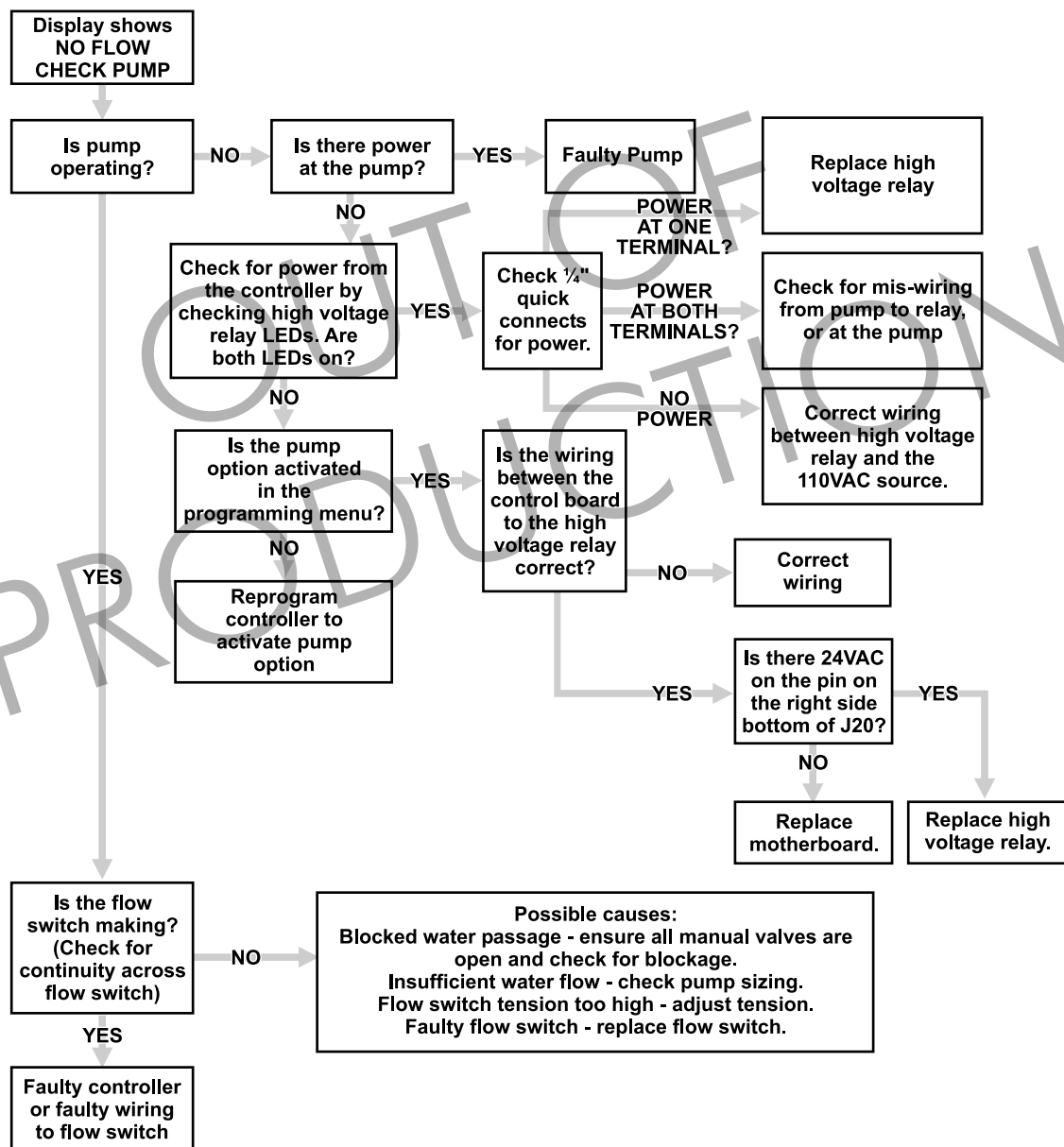
**SECTION 7.****Troubleshooting**

The LLS controller, itself, cannot be troubleshot. If the fault guides, which follow, lead you to a faulty controller, replace the controller.

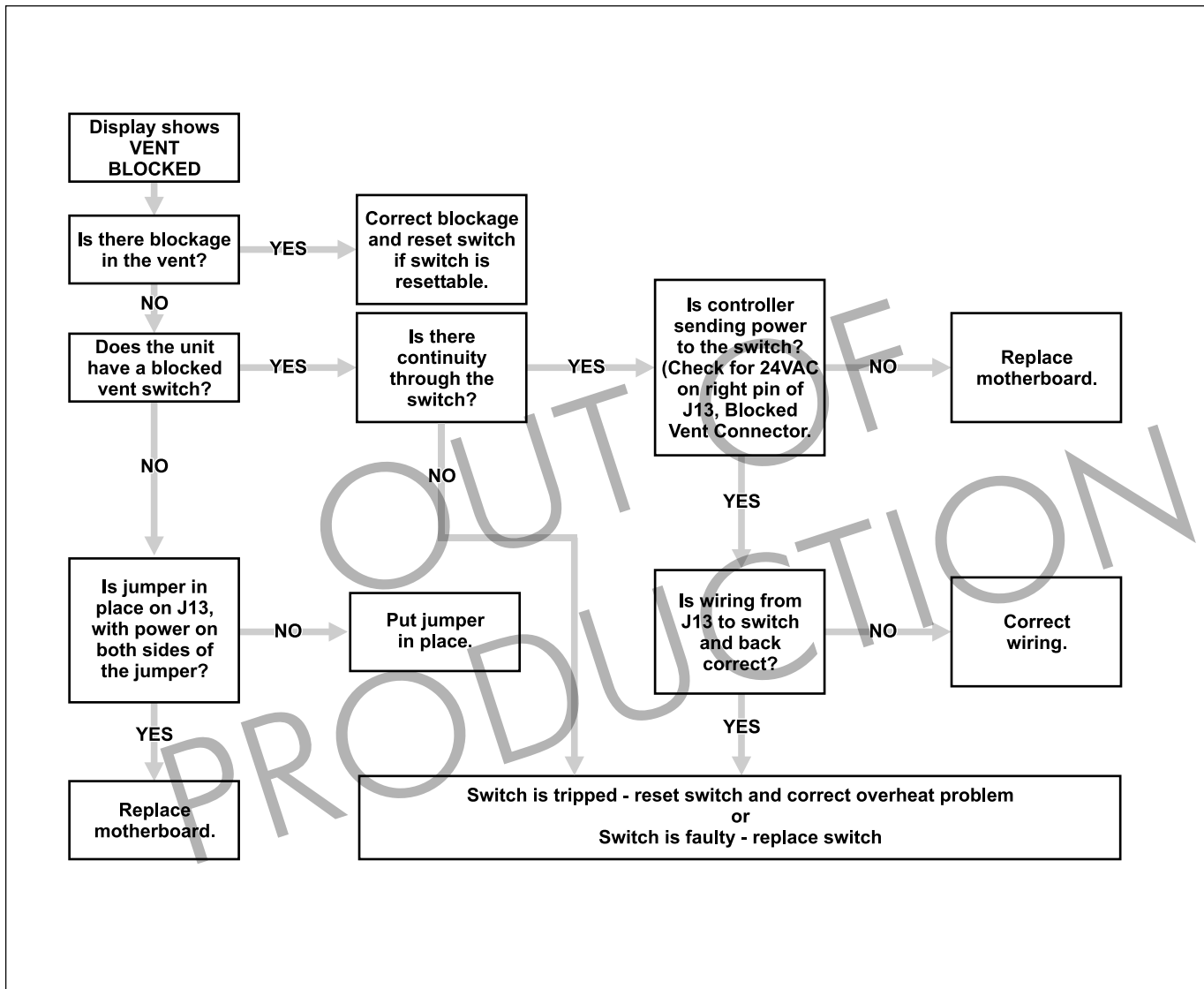
## 7.1 Display Fault Guide



## 7.2 Flow Fault Guide

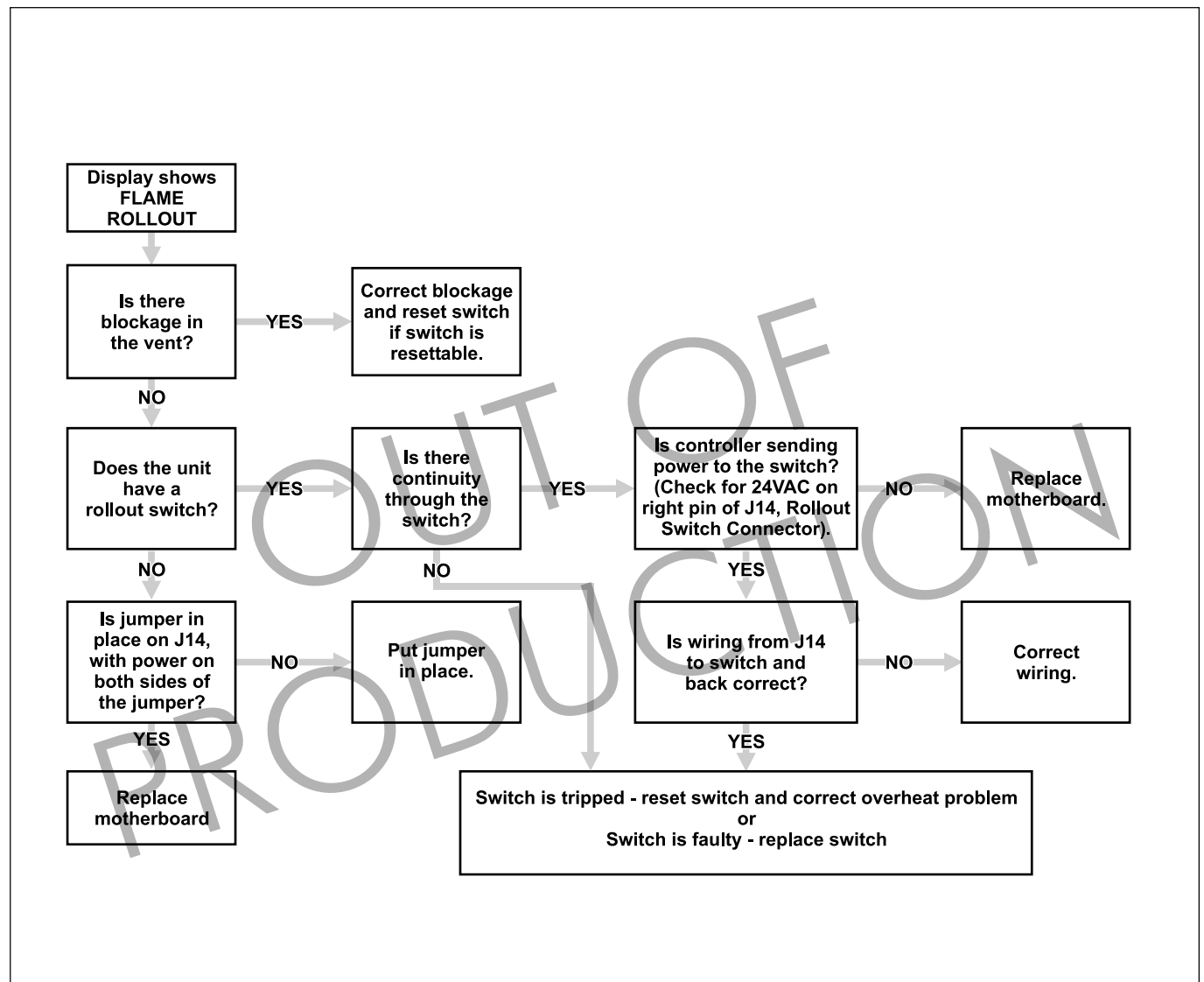


### 7.3 Blocked Vent Fault Guide

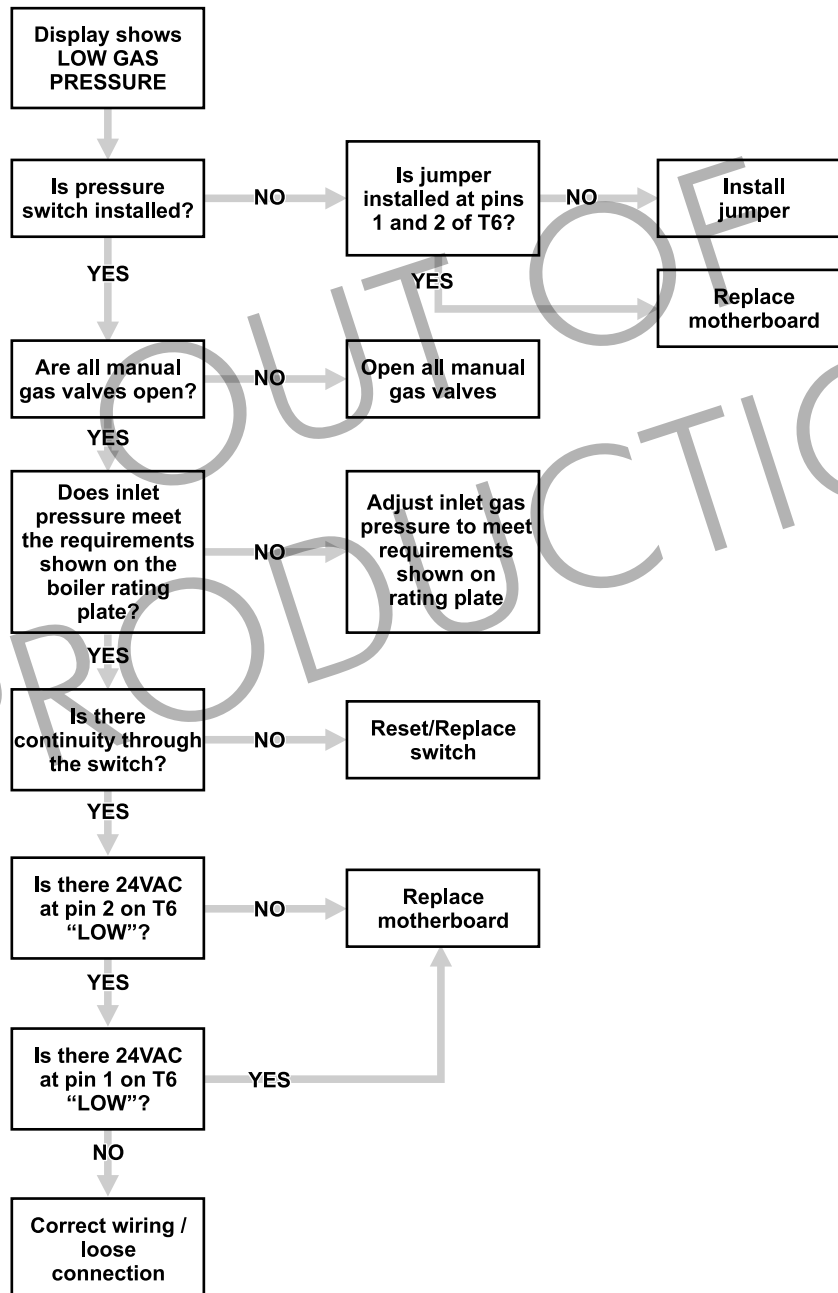




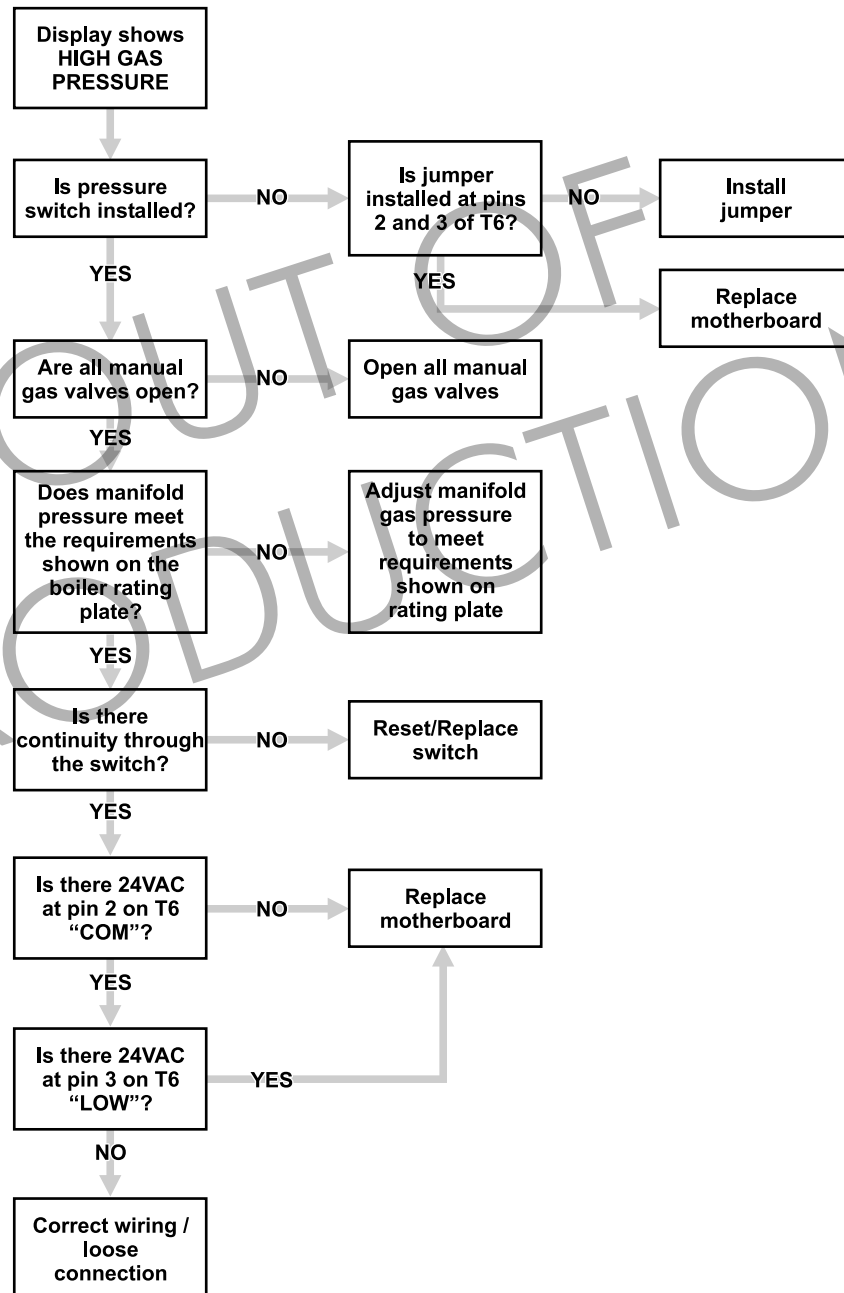
## 7.4 Flame Rollout Fault Guide



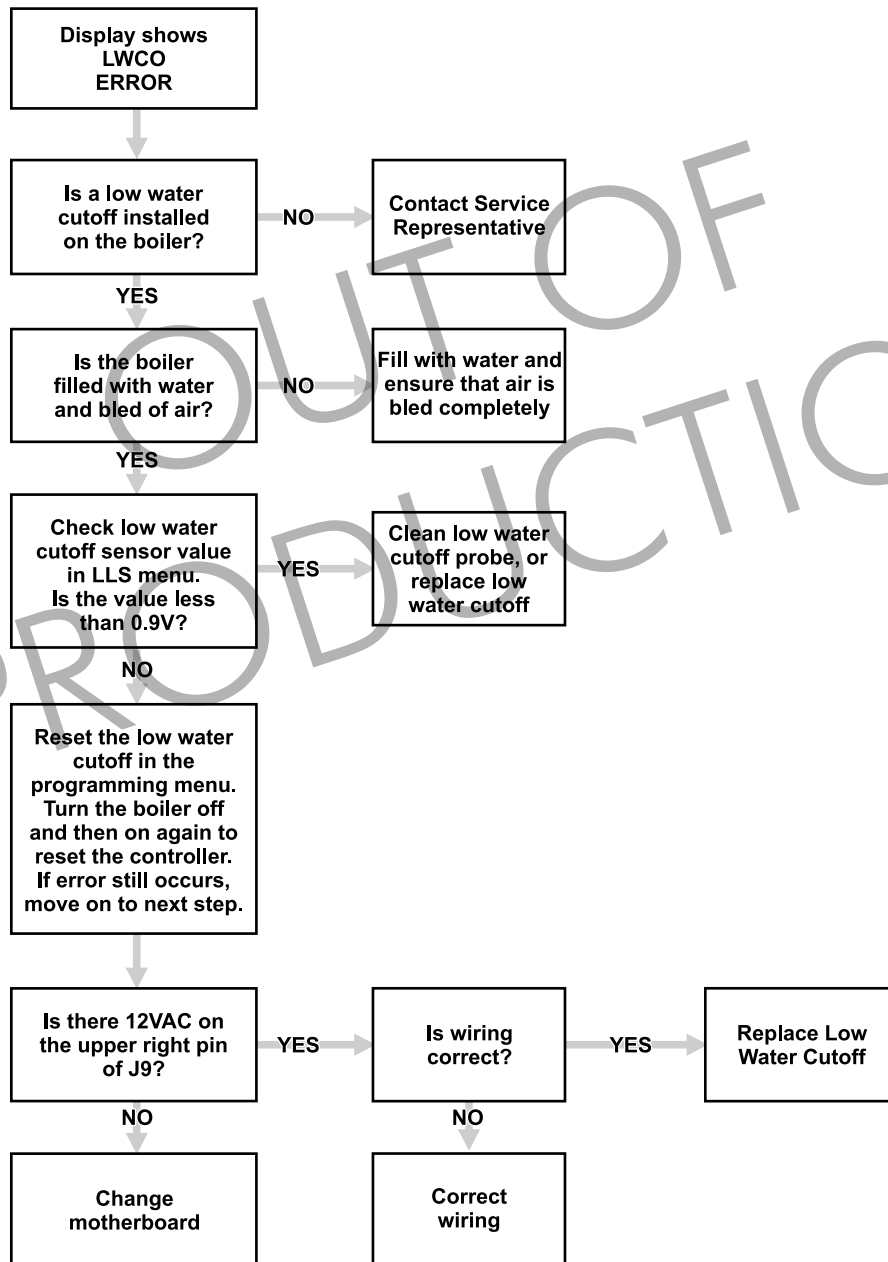
## 7.5 Low Gas Pressure Fault Guide



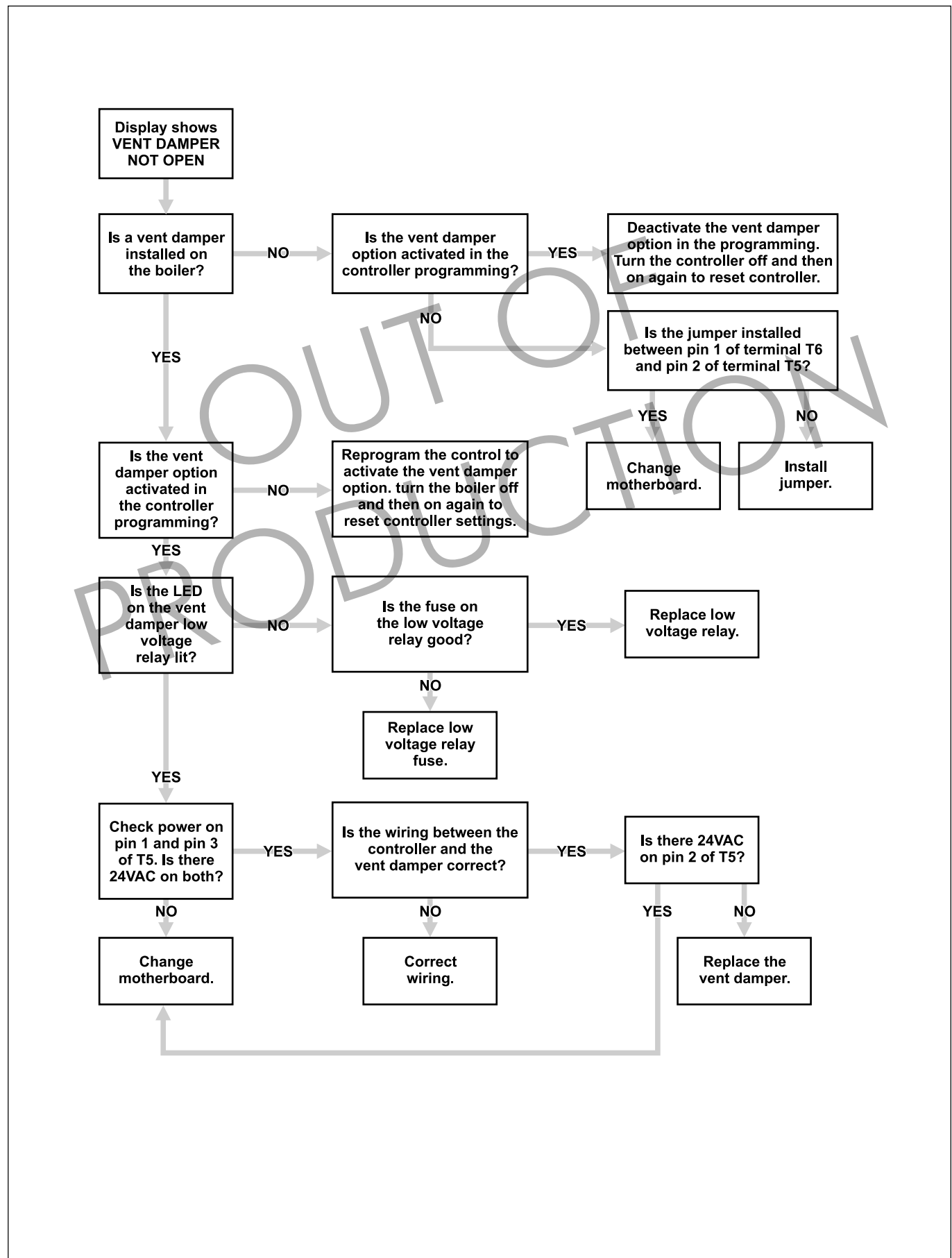
## 7.6 High Gas Pressure Fault Guide



## 7.7 Low Water Cut Off Fault Guide



## 7.8 Vent Damper Fault Guide



## SECTION 8.

### Replacement Parts

#### 8.1 Ordering Information

To order or purchase parts, contact your nearest Laars dealer or distributor. If they cannot supply you with what you need, contact:

Laars Customer Service, 6000 Condor Drive,  
Moorpark, California, 93021,  
Telephone (800) 900-9276.

In Canada, contact 480 S. Service Rd., Oakville,  
Ontario, Canada L6K 2H4, Telephone (905) 844-8233.

Visit our website at [www.laars.com](http://www.laars.com) for Service Center listings.

#### 8.2 Parts List

KE2300200 main control board  
KE2302600 processor card  
KE2302300 immersion well  
KE2300500 keypad/overlay  
KE2300000 LCD (display)  
KE2301400 transformer, 50VA  
KE2301300 transformer, 100VA  
KE2304000 ignition control, spark ignition  
KE2304500 terminal, jumper

#### Sensors

KE2301100 outdoor air sensor  
K20602200 outdoor air sensor housing  
KE2301200 inlet water sensor  
KE2303700 outlet water sensor  
KE2300900 water level sensor (LWCO)  
KE2304300 DHW sensor

#### Relays

KE2301800 high voltage relay  
KE2301700 low voltage relay

#### Wires & Wire Harnesses

KE2302001 wire harness, water flow switch  
KE2302002 wire, adaptor (COMMON) to  
ignition control (GND)  
KE2302003 wire, adaptor (24V OUT) to  
ignition control (THS)  
KE2302004 wire harness, gas valve, on/off or  
first stage  
KE2302005 wire, adaptor (24V IN) to ignition  
control (MV)  
KE2302006 wire, ignition control to ground  
KE2302007 wire, gas valve (PV/MV) to  
ignition control (GND)  
KE2302008 wire, ignition control/pilot high  
tension lead  
KE2302009 wire, gas valve (PV) to ignition  
control (PV)  
KE2302010 wire harness, roll-out switch/  
fusible link  
KE2302011 wire harness, high voltage relay to  
main board  
KE2302012 wire, pump to 110V common  
KE2302013 wire, high voltage relay to 110V hot  
KE2302014 wire, pump to high voltage relay  
KE2302015 wire harness, blocked vent switch  
KE2302016 wire harness, vent damper  
KE2302017 wire harness, gas valve, second stage  
KE2303800 adapter voltage, ignition  
KE2302100 cable, LCD

**NOTE:** The LLS I.D. chip must be programmed for the exact model and serial number of the boiler. Contact the factory with the model and serial number for information on replacing I.D. chips. An I.D. chip does not have to be changed when processor card is changed.

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