Welcome!

2003 GSI Service School
Fan & Heater Section

Presented by

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Most Frequent Fan Service Calls

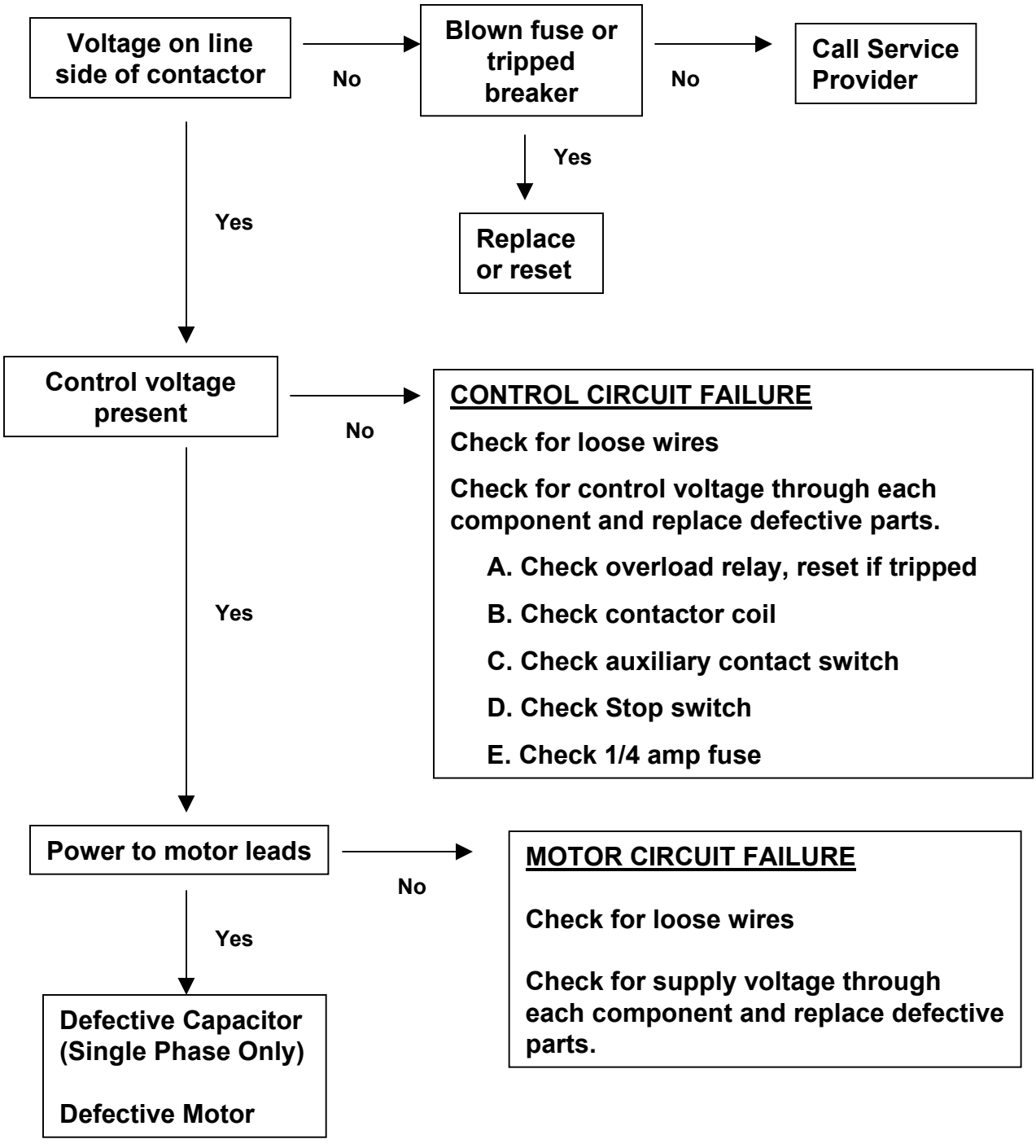
- This fan won't run.
- This fan runs awhile and stops.
- This fan runs but never gets to speed.
- This fan motor starts but is making a lot of noise.
- This fan is vibrating like crazy.
- This fan makes a ticking noise.
- This fan's motor is really hot to the touch.
- This fan is pulling too many amps.
- This fan won't shut off.
- This fan's overload sometimes trips when it is hot outside.

Safety Check

Remember that fans utilize high voltage power. All necessary safety procedures should be observed when servicing equipment.

Mechanical service of fans should be done with power disconnected and locked out to prevent injury.

Fan Troubleshooting Flow Chart



Fan runs for a short time and shuts off.

Possible Cause	Solution
Undersize wiring	Check power supply wires for proper sizing according to applicable codes
Low Line Voltage. Power Failure	Call service provider after checking for proper wire size
Magnetic contactor malfuctioning	Replace defective part
Defective stop switch	Replace defective part
Wrong heater strip / incorrect overload setting	Use correct heater strip or adjust overload setting

Fan Vibrates

Possible Cause	Solution
Fan may not be securely mounted	Securely Mount fan
Fan may not be level or housing is in a “bind”	Adjust leveling legs
Motor mounting bolts may be loose	Check and tighten motor mounting bolts
Fan may have dirt deposits on blade	Inspect and clean blade
Blade may not be mounted correctly	Check and adjust blade on bushing if necessary. Tighten bushing bolts to proper torque.
Blade may be out of balance	Replace or have blade rebalanced Check for water in blades
Fan blade may be hitting housing (ticking noise)	Check running clearance of blade and cone. Check for hub or housing bolt interference.
Fan may be in a stall	Reduce static pressure
Mechanical problem with motor (bent shaft, bad bearing, internal component loose)	Service or replace motor

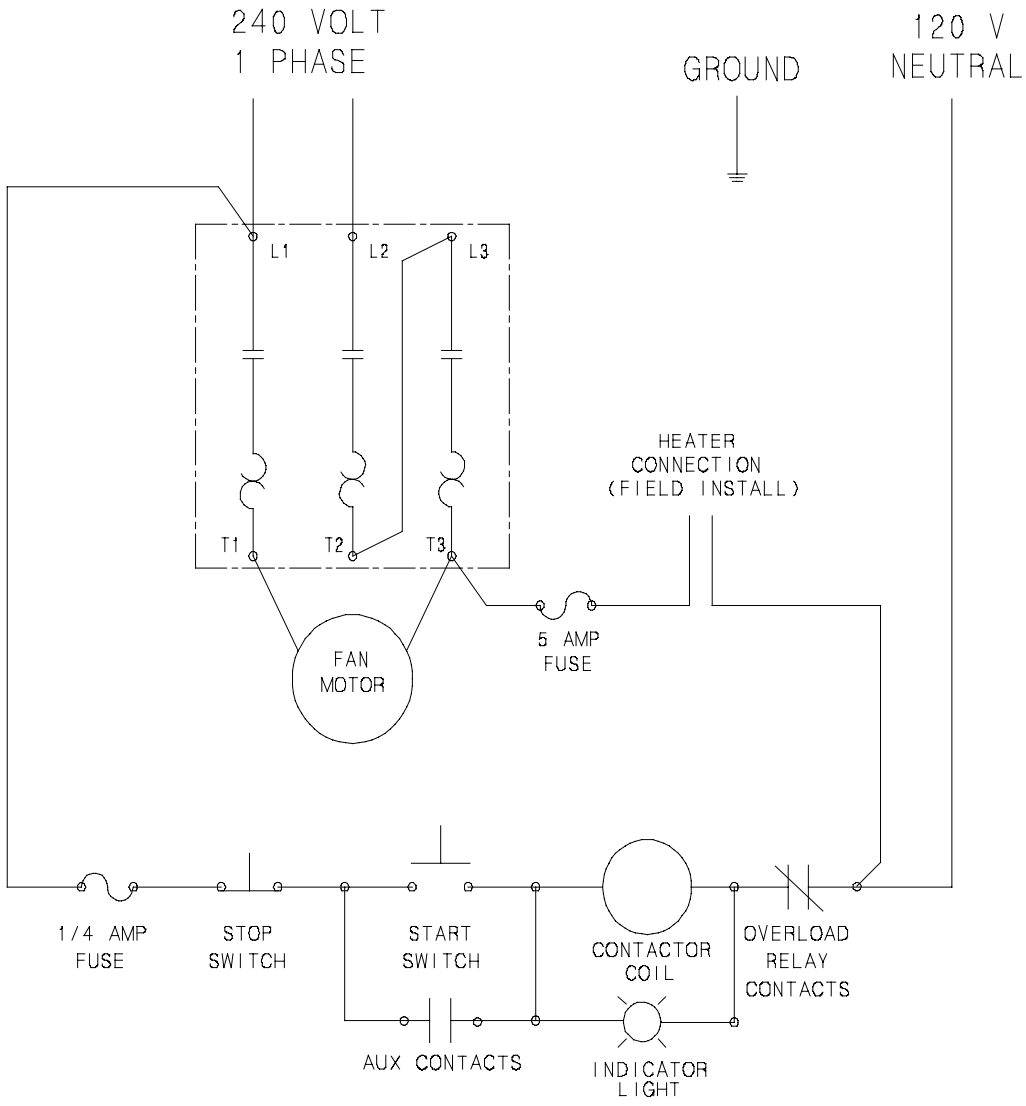
Fan motor runs hot

A normally operating motor's surface temperature will be about 90°F (50°C surface rise) to 126°F (70°C surface rise) above room temperature. If the room temperature is 62°F, then the normal motor operating surface temperature will be between 152°F to 188°F: this is hot enough to burn skin, but yet the motor is operating normally.

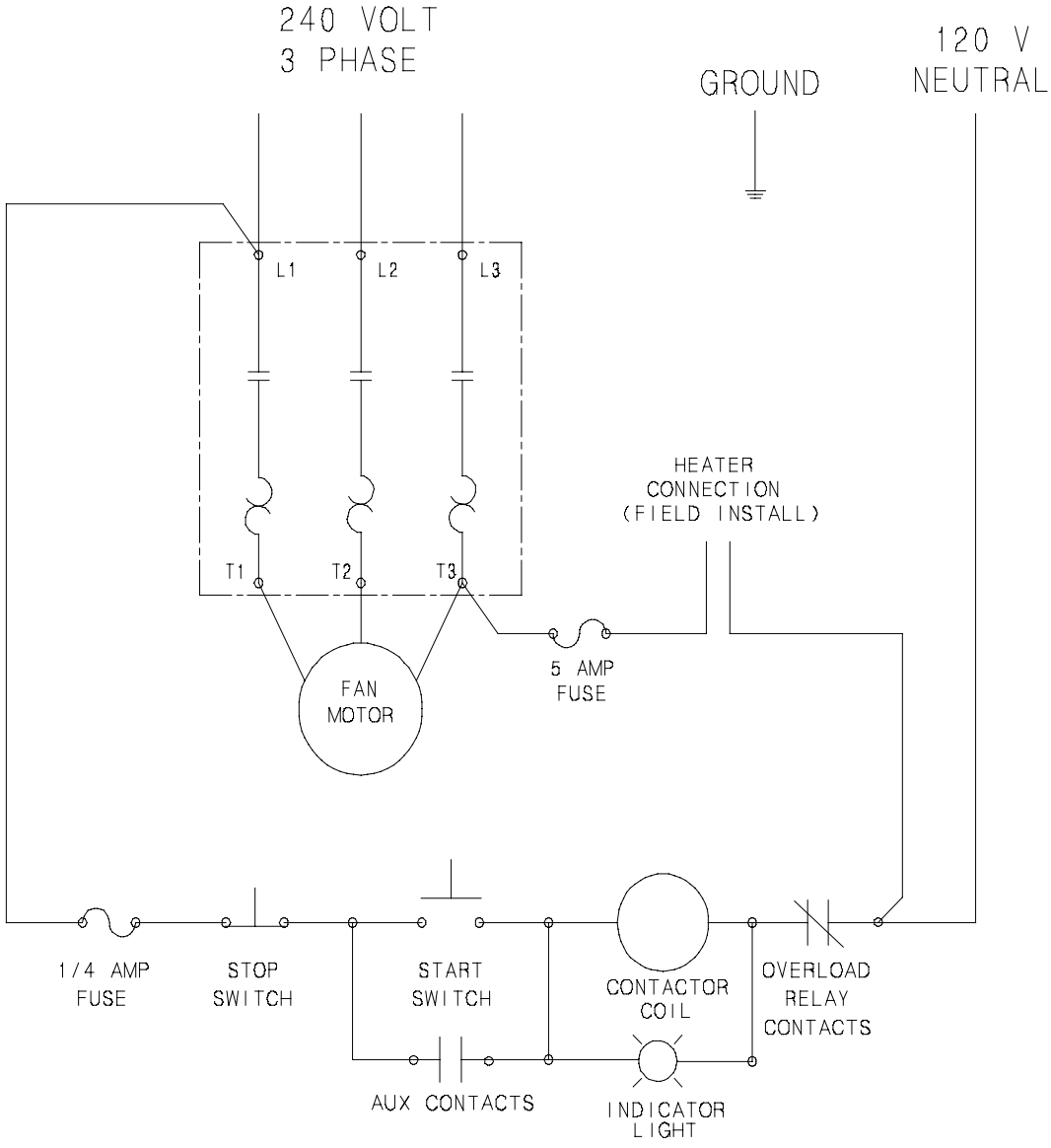
Pre-Season Maintenance

- Inspect fan housing for damage
- Inspect motor unit for damage
- Inspect fan blade for damage and debris buildup
- Inspect wiring for loose or damaged wiring
- Inspect control enclosure for damage and debris buildup
- Check for obstructions in fan inlet and discharge
- Check to see that blade will rotate freely
- Make sure all safety guards are in place and not damaged
- Run motor 30 minutes each month
- Lubricate motor bearings to motor manufacturers specifications
- Replace any faded or damaged safety decals
- Operate fan and correct any operational defects

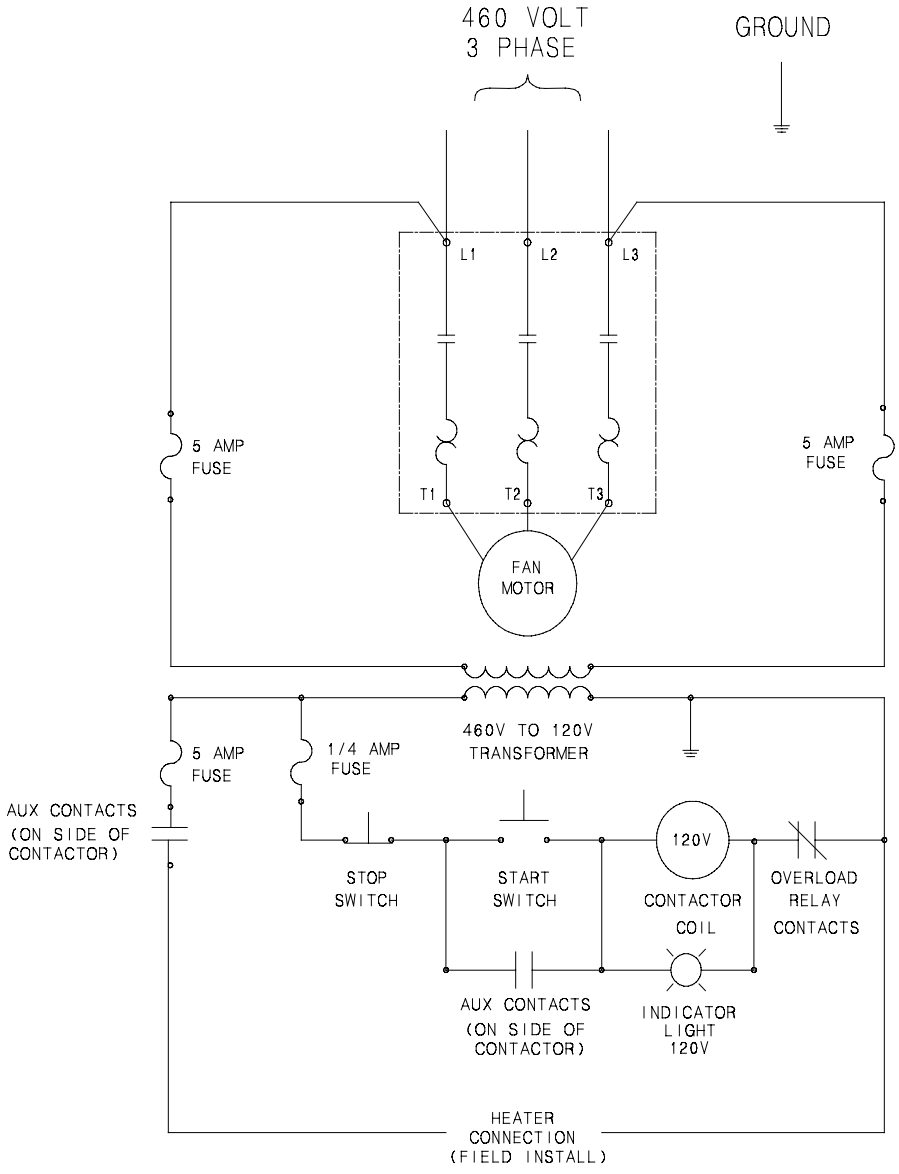
240 Volt 1 Phase Schematic



240 Volt 3 Phase Schematic



460 Volt 3 Phase Schematic



Torque Specifications

- Vane Axial Torque Specs
  - Taper Bushing
    - Crowley Blades (Composite)
      - H bushing — 8 ft lb
      - P bushing — 16 ft lb
    - Airfoil Impeller (Aluminum)
      - H bushing — 8 ft. lb
      - P bushing — 10 ft lb
  - Trantorque Bushing
      - 14” 1 hp — 50 ft. lb
      - 18” 1.5 hp — 63 ft. lb
      - 24” 7 hp to 28” 15 hp — 84 ft. lb

- Centrifugal Torque Specs
  - Taper Bushing
    - 3-15 hp 3500 rpm — 16 ft. lb
    - 20-50 hp 3500 rpm — 29 ft. lb
    - 3-50 hp 1750 rpm — 29 ft. lb
  - Trantorque Bushing
    - 3-7.5 hp 1750 rpm — 125 ft. lb
    - 10-20 hp 1750 rpm — 160 ft. lb
    - 30-50 hp 1750 rpm — 200 ft. lb

Fan Service Review

1. What control voltage is used on today's fans?

_____

2. What should you check if you do not have line voltage on the "L" side of the contactor?

_____

3. A separate 110 volt neutral must be run to the fan. True or False?

_____

4. Name two things GSI recommends you do when servicing a fan?

_____

5. A defective stop switch will cause what problem?

_____

6. An improperly tightened bushing typically is a cause of this problem.

_____

7. How long should a fan motor be run during the off season?

_____

8. This is the most frequent cause of control voltage loss and can be found using the wiggle test.

_____

Most Frequent Heater Service Calls

- This heater will not light.
- This heater lights and then goes out.
- This heater lights and shuts down with flame out even though flame is there.
- This heater flame pulses and the gas gauge jumps around.
- This heater shuts down in the middle of the night and everything looks ok.
- This heater is running ok but the temperature spread is uneven under the bin.
- This heater flames out when the heater cycles (usually LP).
- This heater will not reset.
- This heater's gas pressure must be set very high to light.
- This heater's gas pressure is very low or gauge reads zero.

Heater will not light

- **Burner will not fire. No gas pressure and no ignition spark**
  - No main power.
    - Fan not running, fan contactor must be engaged for heater to run.
    - Check fuse, on/off switch, & high limit switches

- **Burner will not fire. No gas pressure and ignition spark is constant.**
  - No gas supply.
    - Open all shutoff valves and check tank to see if empty.

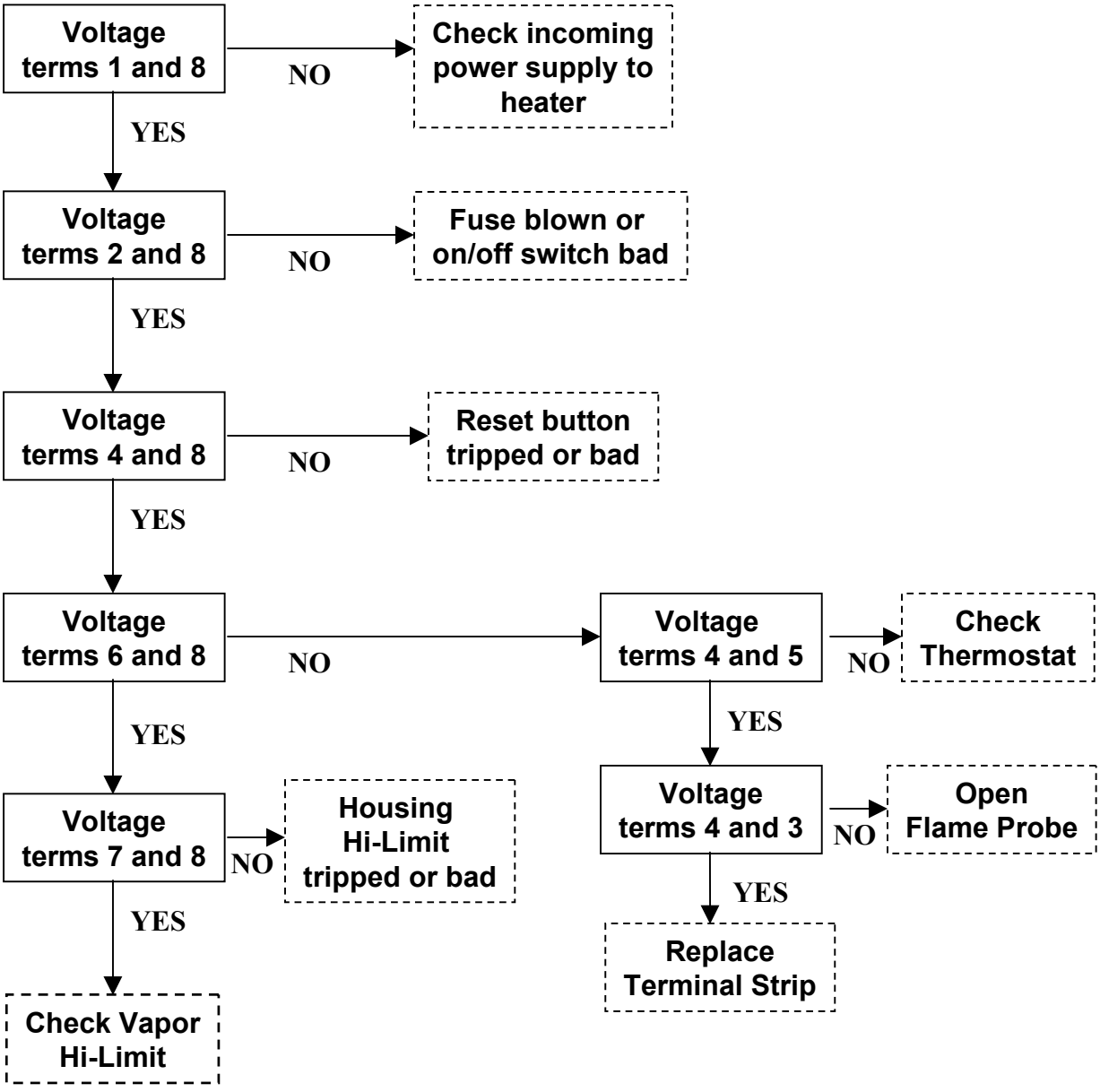
- **Burner will not fire. Gas pressure constant and no ignition spark**
  - No power to transformer or transformer is bad.
  - Gas pressure set too low.
  - Spark Plug/Ignitor problem
    - Check gap and set to 1/16”.
    - Check wiring.

This heater lights and then goes out.

- **Burner goes out. Gas pressure and Ignition spark are constant.**
  - Vapor high limit.
  - Flame sensor not sensing flame or illegal flame sense.
  - Gas pressure set too low.
  - Airswitch (if supplied).
  - Thermostat is at set point.
  - HiLo heater cycling, but valve is closed.

Standard Heater Troubleshooting Guide

This chart should be used step by step to troubleshoot heater if heater does not start immediately after turning on switch. This troubleshooting flow chart requires use of a voltmeter to check for 110 volts on designated terminals on terminal strip in heater. **Always use voltmeter to check between terminals that are designated not between terminals and ground.**



Component Troubleshooting

- **Transition / Housing Hi-Limit**
  - Mechanical reset.
  - If tripped, push button to reset.
  - If not tripped, use voltmeter to check for continuity in switch.
  - Replace if switch cannot be reset.

- **Flame Probe**
  - Should be closed when cold
  - Use voltmeter to check for continuity in switch.
  - Replace when open in cold condition

- **Reset Switch**
  - If reset button pops out again 30-60 seconds after reset, check flame probe to see that it is getting hot. If probe is getting hot, troubleshoot flame probe.
  - If switch will not reset after 60 seconds, replace it.

- **Terminal Strip**
  - Turn power off to heater
  - Connect Flame Probe wires together
  - Check for power on terminals 6 and 8
  - If no power is present, check for power on terminals 4 and 3
  - If power is present, replace terminal strip.

Component Troubleshooting

- **Ignitor/Spark Plug**
  - Turn gas off to heater.
  - Check gap on ignitor or plug.
  - Check porcelain for any sign of cracks.
  - Remove plug wire from spark plug/ignitor.
  - Carefully holding plug wire by insulation, try to get an arc between end of wire and heater housing (or other wire if using a 2 pole transformer)

- **Ignition Transformer/Plug Wire**
  - Turn off gas to heater.
  - If no spark is present after checking ignitor, remove spark plug wire from ignition transformer.
  - Check for spark at ignition transformer with and insulated screwdriver.
  - Spark should jump a minimum 1/4” gap.
  - Replace transformer if no spark is established.
  - If spark is established, replace wire set.

- **Solenoid Coil**
  - Remove coil from valve body.
  - Insert screwdriver into coil. When heater calls for valve to open, screwdriver should be drawn to magnetic coil. If not, check power to coil and replace if necessary.

- **Plugged Orifice**
  - Check for gas at the burner.
  - If no gas, remove pipetrain and check orifice and burner or burner ring for blockages.

Test Firing Deluxe Heater

- Turn on power and fuel to the fan and heater. Set the controlling thermostat to call for heat.

- Start fan and move heater switch to the "ON" position.
  - The "FAN ON" indicator light on the board should now be lit.
  - If light is not on, confirm 120V at terminals 19 & 20. If no power exists, check for power at the fuse in the fan control box and all safety hi-limit switches. Make the needed repairs to restore power to the terminals 19 & 20.
  - If power exists at terminals 19 & 20, be sure the circuit between 17 & 18 for the airswitch is closed.

- With the "FAN ON" indicator lit, the troubleshooting lights 1 through 5 should be on at the end of a 20 second purge cycle. The "IGNITOR ON" indicator will now light.

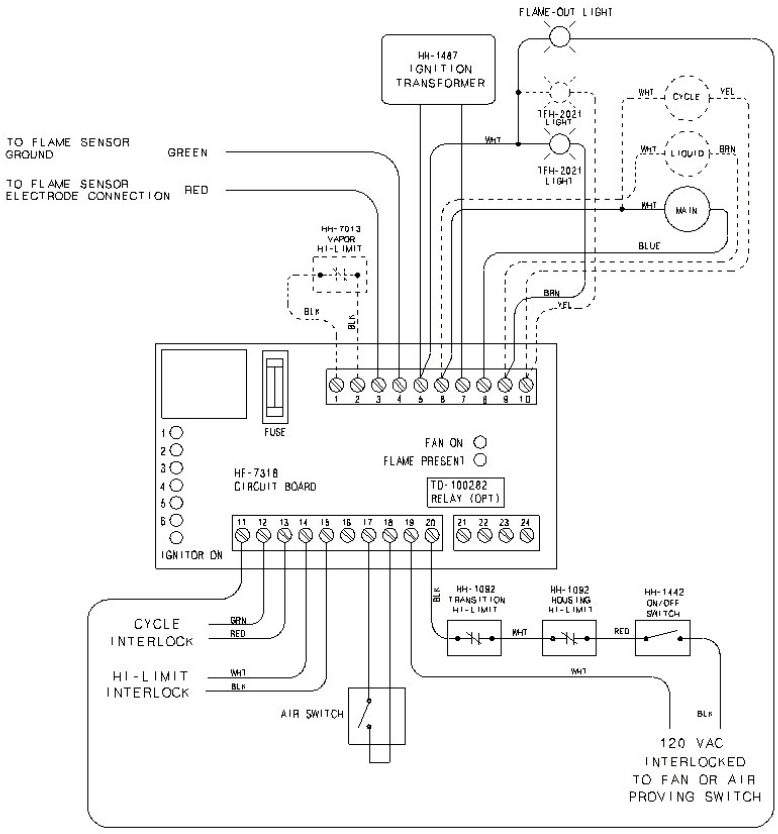
- Heater should ignite, and "FLAME PRESENT" indicator should be lit. If flame is present and light not on. Adjust sensor into flame until light is on when flame is burning. It may be necessary to adjust sensor after changing gas pressure settings.

- If heater does not light, follow the troubleshooting lights on the wiring schematic decal and correct faults. Be aware that light #1 relates to the fuse on the board, and not the fuse in the fan control box. If the fuse in the fan box is blown, no lights on the board will be on.

- Cycle the controlling thermostat to insure the heater responds to the call for heat. If the unit is HI-LO fire, the #6 light will indicate during high fire.

- Heater is now ready for normal operation. Set the desired temperature on the thermostat and check fuel pressure settings.

DELUXE HEATER WIRING DIAGRAM



● INDICATES LIGHT ON ○ INDICATES LIGHT OFF

INDICATION	POSSIBLE CAUSE	POSSIBLE SOLUTION
○ ○ ○ ○ ○ ○ 1 2 3 4 5 6	Bad On/Off Switch	Replace Switch
	Heater Housing Hi-Limit	Reset Or Replace Hi-Limit
	Transition Hi-Limit	Reset Or Replace Hi-Limit
	No Power To Heater	Check Heater
● ○ ○ ○ ○ ○ 1 2 3 4 5 6	Blown Fuse	Replace Fuse
● ● ○ ○ ○ ○ 1 2 3 4 5 6	Flame Sensor (if flame present light on)	Clean Or Replace Flame Sensor
	Control Board	Replace Control Board
	Air Switch (if fan on light not on)	Check Air Switch
● ● ● ○ ○ ○ 1 2 3 4 5 6	Vaporizor Hi-Limit	Adjust Vaporizor Coil Replace Vapor Hi-Limit
● ● ● ● ○ ○ 1 2 3 4 5 6	Humidistat/Thermostat	Temperature Reached Replace Thermostat Or Humidistat
● ● ● ● ● ○ 1 2 3 4 5 6	Spark Plug	Clean Or Replace Spark Plug
	No Fuel To Burner	Check Fuel Supply
	Bad Solenoid	Replace Solenoid

● ● ● ● ● ○ 1 2 3 4 5 6 WAIT FOR 20 SECOND PURGE DELAY TO TROUBLESHOOT!
INDICATING LIGHTS SHOWN ON LEFT SHOULD BE LIT
WHEN UNIT IS OPERATING PROPERLY

DC-1161

Pre-Season Maintenance

- Inspect heater housing for damage
- Inspect fuel supply line for damage
- Make sure all safety guards are in place and not damaged
- Replace any faded or damaged safety decals
- Disconnect and lockout power to fan and heater. Open control box lid and inspect all components for moisture, vibration, or rodent damage.
- Inspect and tighten all loose wiring. Replace any that may be damaged.
- Remove burner orifice tube and inspect for foreign material. Clean if necessary.
- Inspect burner holes for corrosion or plugging with dirt or rust. Clean if necessary.
- Be sure primary air inlet is intact and free of obstructions.
- Inspect Flame Probe and Ignition Wires. Replace if damaged.
- Inspect Flame Probe and Ignitor. Adjust or replace if necessary.
- Test fire burner to verify proper operation of components.

Heater Service Review

1. Standard heater flame probes are normally in what condition?

_____

2. What is the recommended spark plug gap for the heater?

_____

3. On the HF-7318 circuit board, which light is lit when the circuit is completed between terminals 17 & 18?

_____

4. Which light only comes on when using a HI-LO Thermostat?

_____

5. When the flame probe on a standard heater remains closed for more than 30 seconds what happens?

_____

6. On a deluxe board, what event is represented by the "Flame Present" light?

_____

7. Name three items that will prevent power to terminals 19 & 20 on the deluxe board when the heater is turned on.

_____

8. Name two things that can make the flame go out after successful ignition.

_____

Resource Information

The GSI Group Website (link)
www.grainsystems.com/gsi/index.htm

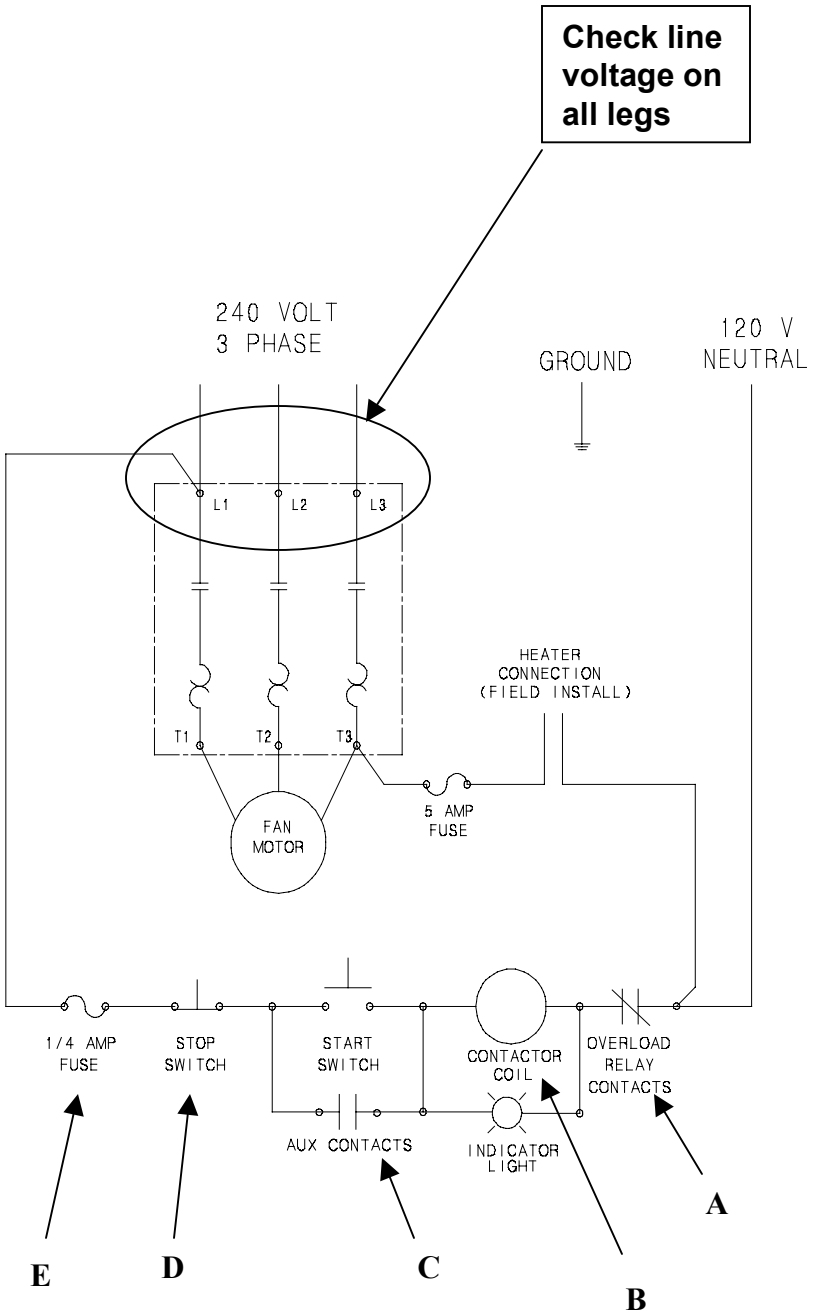
Baldor Motors Website (link)
www.baldor.com

Rego Regulator Website
www.regoproducts.com

Asco Gas Valve Website
www.ascovalve.com

Purdue University
https://engineering.purdue.edu/ABE/

Fan Control Schematic



- Capacitor Tester
  - TIF
    - *Model:* TIF660
  - Grainger
    - *Stock Number:* 3X983
    - *List Price:* $37.45

Prices at date of school

Always discharge capacitor before handling!

Standard Heater Schematic