EB400G Field Assist Troubleshooting Guide

Welcome to the Campo **"Field Assist Troubleshooting Guides".**
These guides were developed to assist the working technicians in the field. We've supplied issues and solutions to the most common problems encountered in the field. If you need assistance while troubleshooting on the job, they are easy to store in your smart phone, tablet or computer.

Getting Started is easy! Just click on 'Page #' for the problem you are encountering

Burner control is locked-out on reset ⟷ Burner control is NOT locked-out on reset

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- Contact Us…Page 31
- Register to receive updates and technical bulletins…Page 32
- Quick set-up and technical information…Page 33

- **NOTE:** If the red status light is flashing rapidly (three time per second) the control is locked out on reset. To reset, push and release the reset button.

- Warning! Continuous resetting of the burner control may cause an accumulation of gas in the heatexchanger, and this could lead to an Implosion of the heatexchanger or personal harm.

- You Reset the Burner Control, and It Goes Through The purge, But Does Not ignite… Page 3
- The Burner motor Did Not Start and the Burner Control Locks-out on Reset…Page 11
- The reset light is solid red during the pre-purge… Page 14
- The burner fires up, but the flame goes out after 5 to 10 seconds… Page15

You reset the burner control but it does not ignite…

1. Install your manometer in the outlet port of the gas valve
2. Reset the burner control.
3. After the 60 second purge, check to see if gas pressure is coming through the valve.
4. Keep a close eye on the manometer, as the pressure will only register for 1 or 2 seconds after the 60 second purge.

- If gas pressure is present… Page 4
- If gas pressure is NOT present…Page 7

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If gas pressure is present...

- ✓Defective igniter

- ✓Defective ignition cable

- ✓Broken electrode

- ✓Defective burner control

➢ Test the components... Page 5

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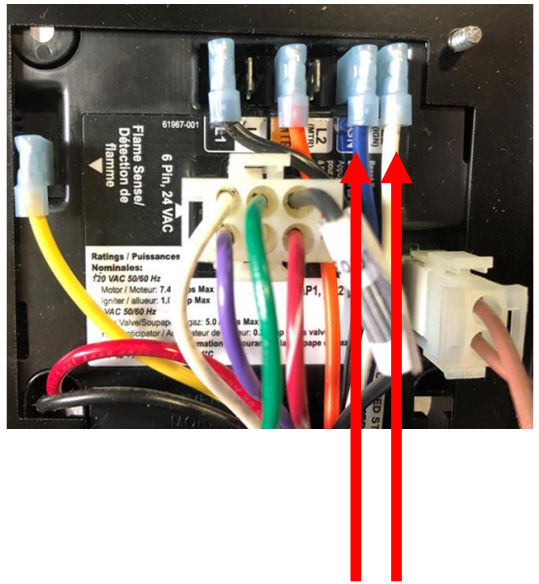
If gas pressure is present...



- ✓ Defective burner control
- ✓ Defective igniter
- ✓ Defective electrode cable
- ✓ Broken or cracked electrode porcelain

- First reset the control check for 120 volts on terminal igniter (Blue wire) and L2 after the 60 second purge. Keep a close eye on the electrode tip the spark will only appear for 1 or 2 seconds.
  - If 120 volts is not present, the control is defective.
  - If 120 volts is present... Page 6

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Testing the Igniter…

Ignition Cable

Electrode (Gap 1/8")

SHUT OFF the gas supply to the burner before testing!

1. Inspect the ignition electrode for cracks.
2. Inspect the ignition cable for cracks.
3. Inspect the electrode gap, ensuring the gap is 1/8".

- With the gun still outside the burner casing, re-connect the ignition cable to the igniter.
- Ensure the gas gun is WELL GROUNDED to the burner housing when testing for spark.
- Reset the burner control and check for spark after the pre-purge.
- Keep a close eye on the electrode as the spark will only appear for 1 second AFTER the 60 second pre-purge.

Problem solved

✓ No spark indicates a defective igniter.

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If gas is not present...

- Make sure the switch is in the on position.

✓Defective 24volt Transformer

✓Defective Burner Control

✓Defective gas valve

➢ Test the components... PAGE 8

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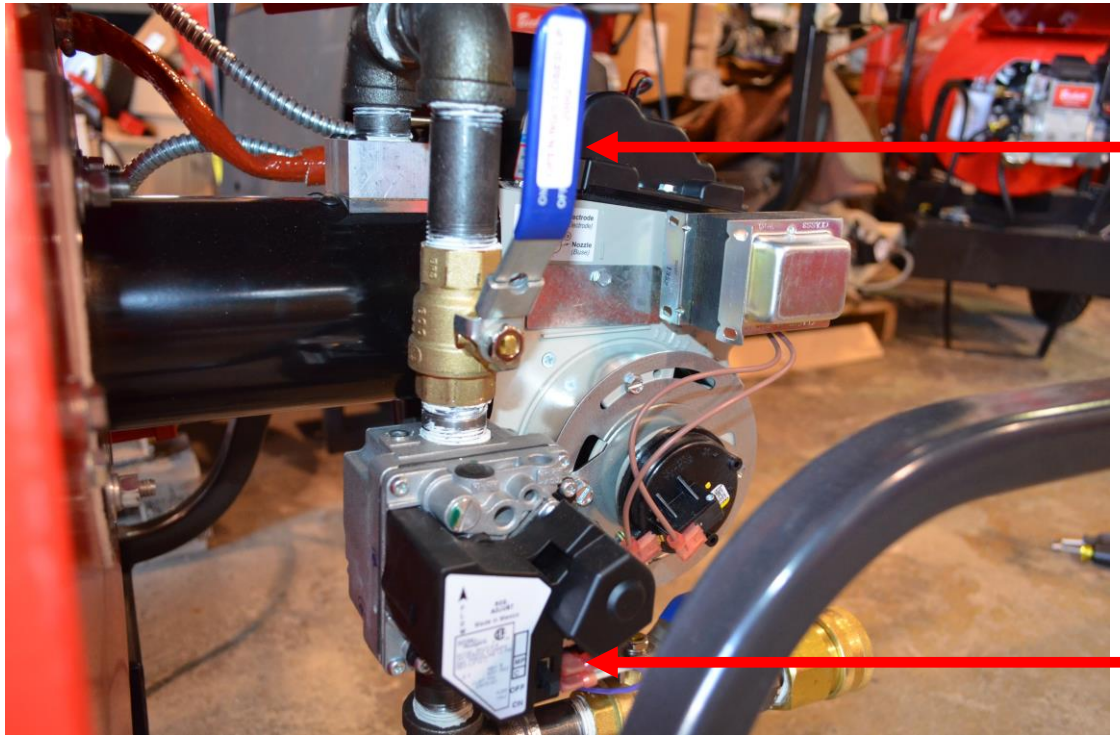
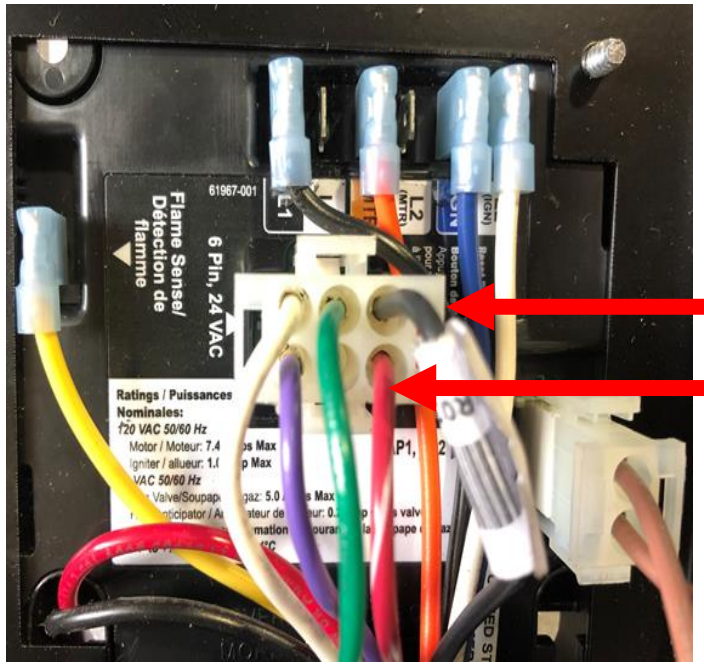


Ensure the 'switchover valve' is in the proper position for LP OR NG

On/Off Switch Location

➢ Continue to… Page 9

Checking the 24- volt transformer…



- Check for 24 volts between the black and 'red stripe' wires on the 6 prong plug of the burner control
- Note: sometimes it is 2 red wires on plug.

✓ If 24 volts is NOT present, the transformer is defective.

- If 24 volts is present, continue to… Page 10

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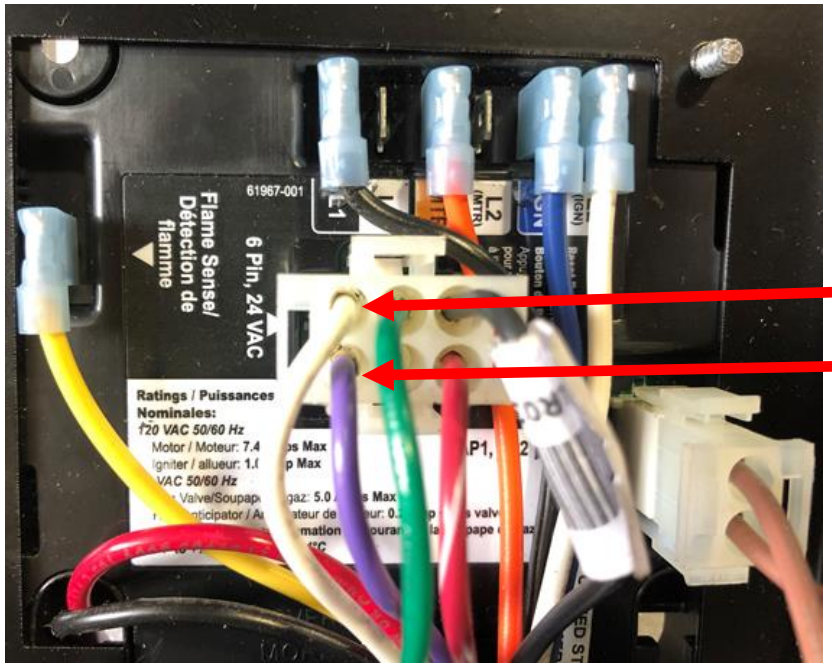
Checking the burner control and gas valve…



- Reset the Burner Control. After the 60 second purge, check for 24 volts on the 6 –prong plug between the white and violet wires.

✓ If 24 volts is present after the 60 second purge, gas valve is defective.

✓ If 24 volts is NOT present after the purge, the burner control is defective.

Problem solved

HOME

The burner motor does not start...

"Field Assist Troubleshooting Guide"

Light Flashing reset control

- ✓ Defective burner motor.

- ✓ Defective Burner Control

- ✓ Defective Motor Relay

➢ Test the components...Page 12

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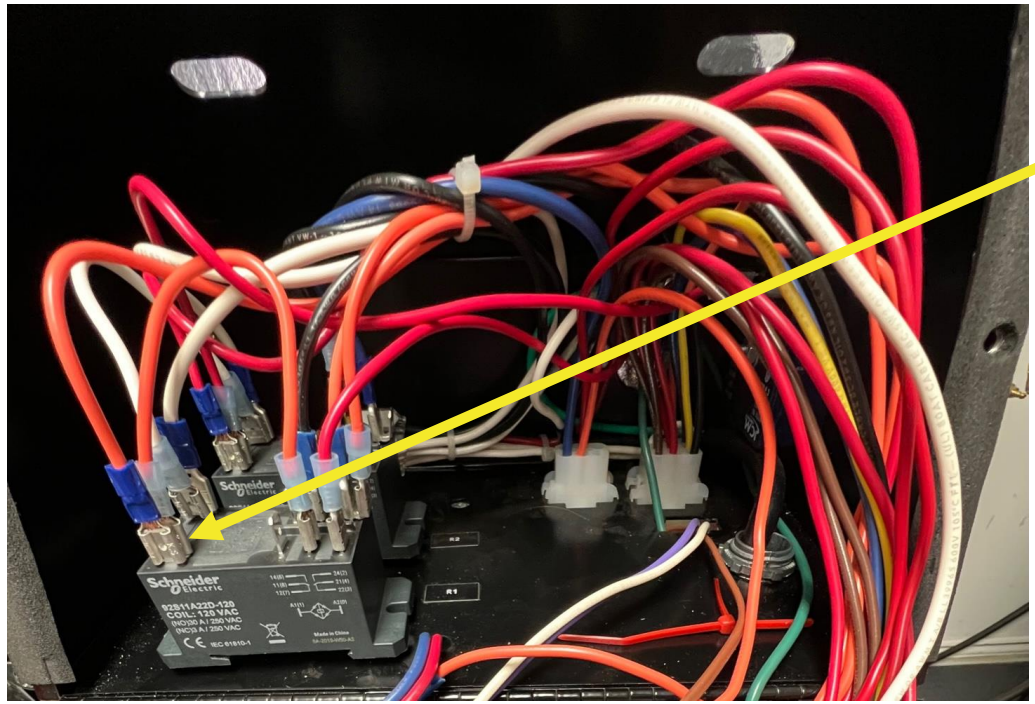
Checking burner motor, motor relay and burner control



Reset burner control, then check for 120 volts on burner motor relay coil.

- ✓ If 120 volts is NOT present, defective burner control

- ✓ If 120 volts is present, defective burner motor relay OR burner motor

- ➢ Checking burner motor and motor relay…Page 13

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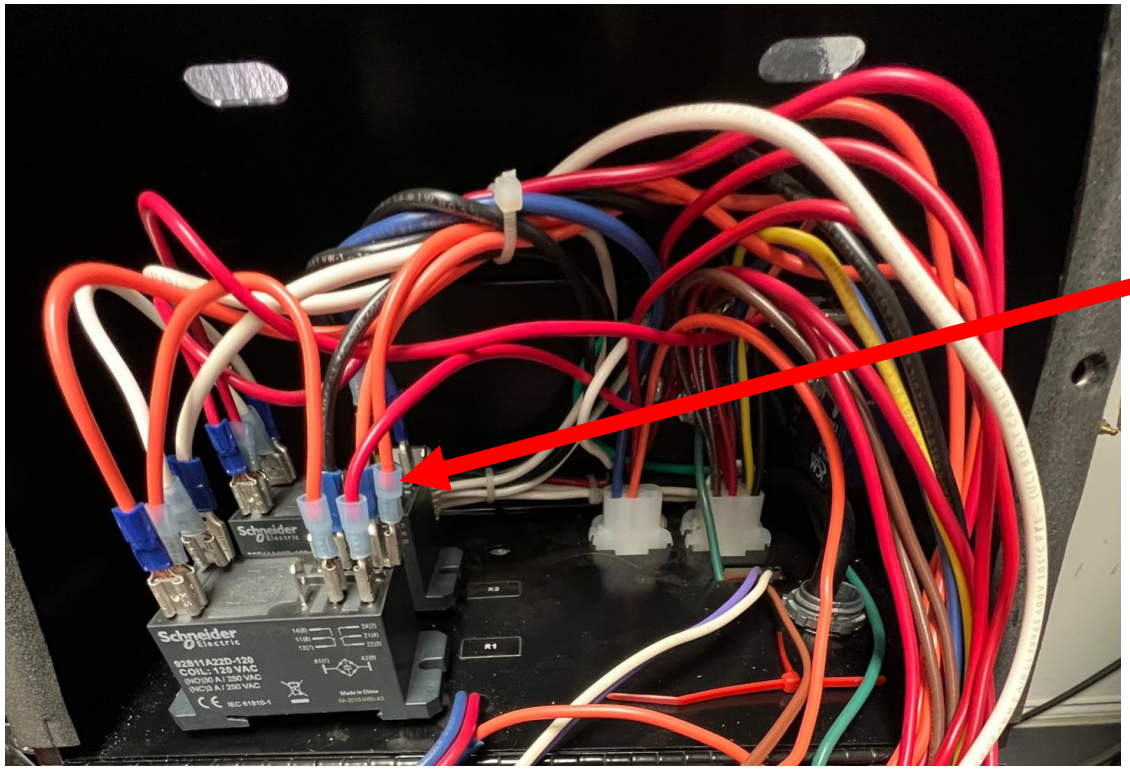
Checking burner motor and motor relay…



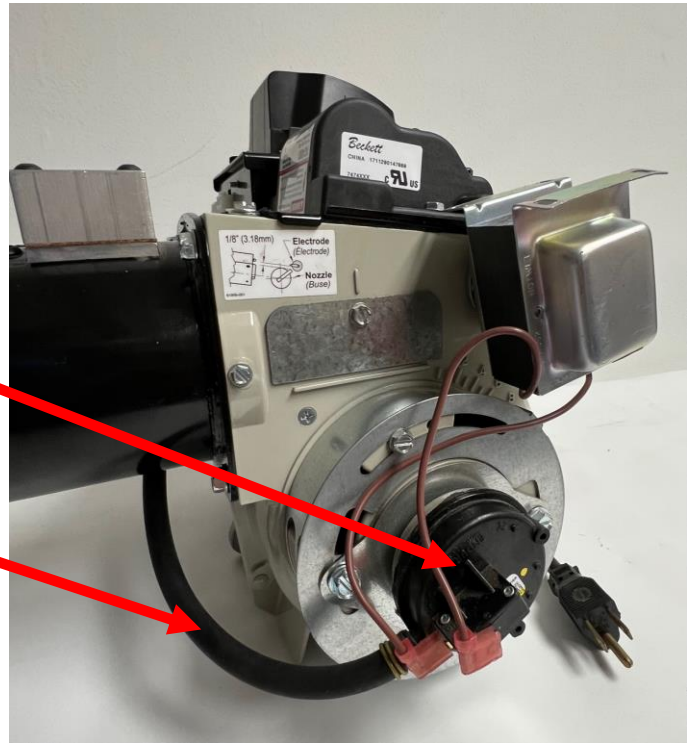
Reset the burner control and check for 120 volts going to the burner motor.

- ✓ If 120 volts is present, defective burner motor
- ✓ If 120 volts is NOT present, defective burner motor relay

Problem solved

The reset light is solid red during the purge…

- ✓ The air proving switch is defective
- ✓ The air hose is cracked or busted



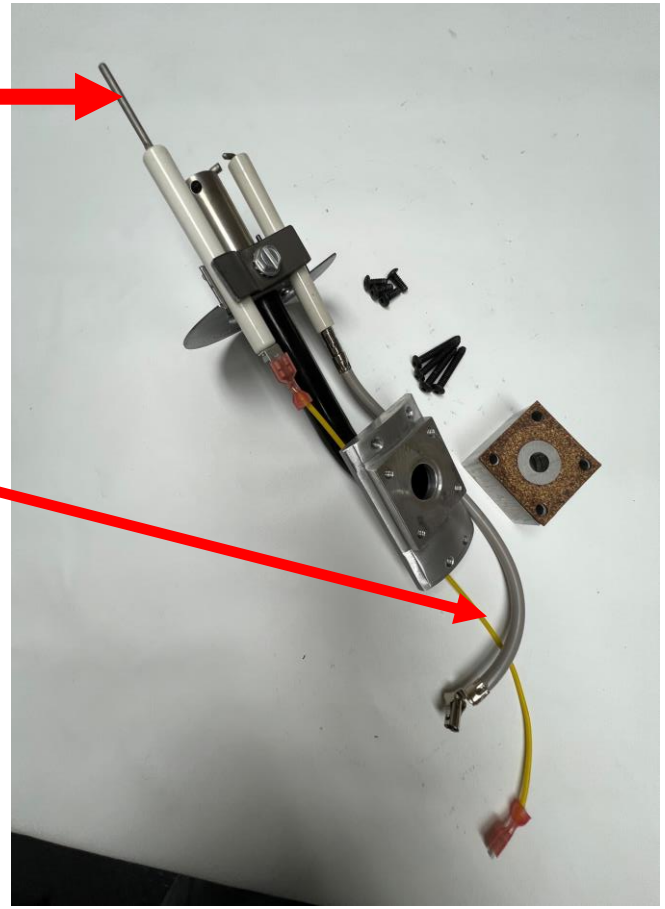
- ➢ Note: The air proven switch contact must be open to start and close after the burner motor starts.

Problem solved

HOME

After the pre-purge, the burner fires up, but the flame goes out after 5 or 10 seconds.

- ✓ The flame rod is defective or dirty
- ✓ Flame rod lead wire is defective
  - ➢ NOTE: do not use sandpaper to clean flame rod. A cloth will be sufficient.
- ✓ Clean or replace flame rod or wire.

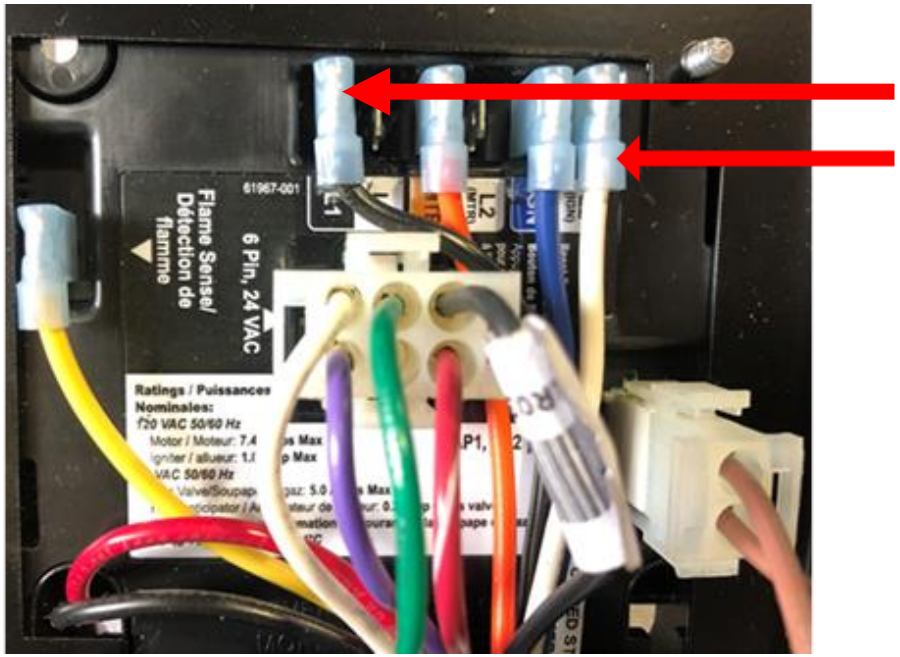


Problem solved

The Burner is NOT locked out on reset…

Choose the issue you are encountering and click on the Page #

If the Burner Control is NOT locked out on Reset…



- Check for 120 volts between Terminal (L1) and Common (L2) on the burner control.
  - If 120 volts is present… Page 18
  - If 120 volts is NOT present…Page 20

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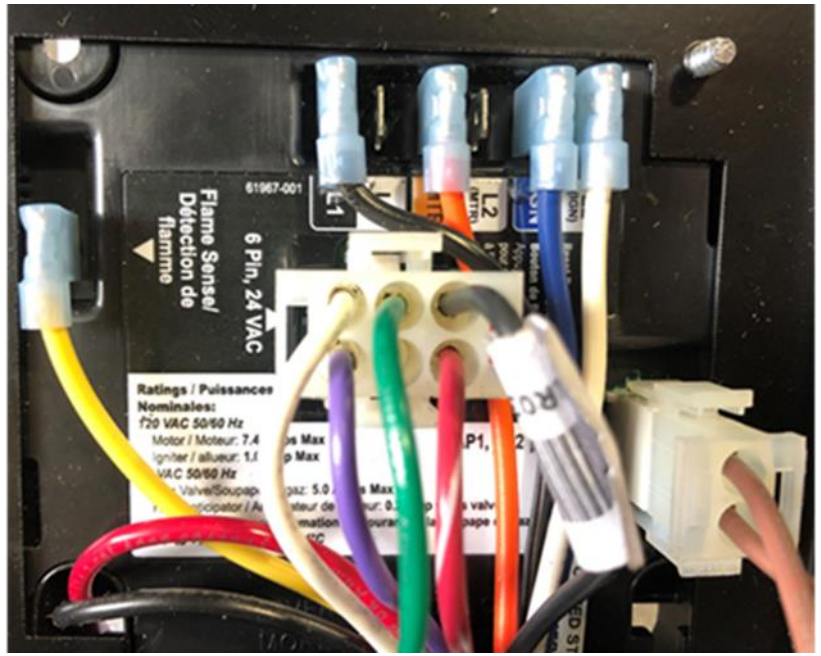
If 120 volts is PRESENT on burner control…



- ✓ Defective Bypass Switch

- ✓ Defective Burner Control

- ➢ Test the components… Page 19

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Testing the bypass switch and burner control...

Terminals TR-TW

To check the bypass switch, place a jumper wire on terminals TR-TW

- ✓ If the burner starts, the bypass switch is defective.
- ✓ If the burner does not start, the burner control is defective.

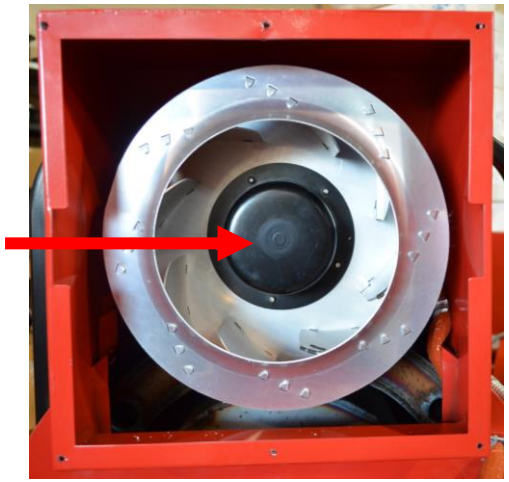
Problem solved

HOME

If 120 volts is NOT present on burner control between L1 and (L2)…

- ✓ Defective Thermal Limit Disc 150°F
- ✓ Defective Thermocouple
- ✓ Defective Temperature Controller
- ✓ Defective Fan Motor Thermostat Switch

Thermostat Switch Sealed Inside Fan Motor Not field serviceable



➢ Test the temperature controller… Page 21

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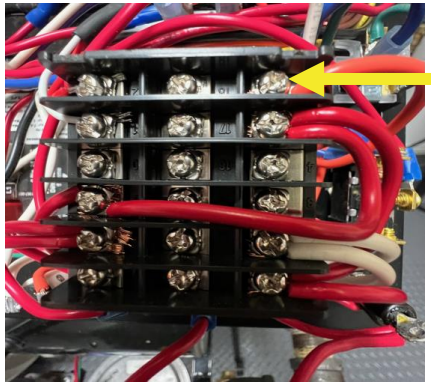
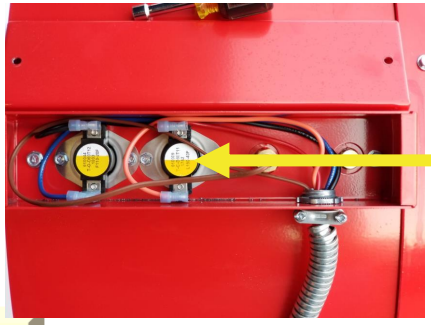
Testing the temperature controller…





➢ NOTE: If the display on the temperature controller is reading 000 (or other false reading), it is defective.

Check for 120 volts on the orange wire terminal #6 on the temperature controller.

✓ If 120 volts is NOT present, the temperature controller is defective.

✓ If 120 volts is present, the 150F thermal limit disc is defective or the heat thermostat in the fan motor is defective continue… Page 22

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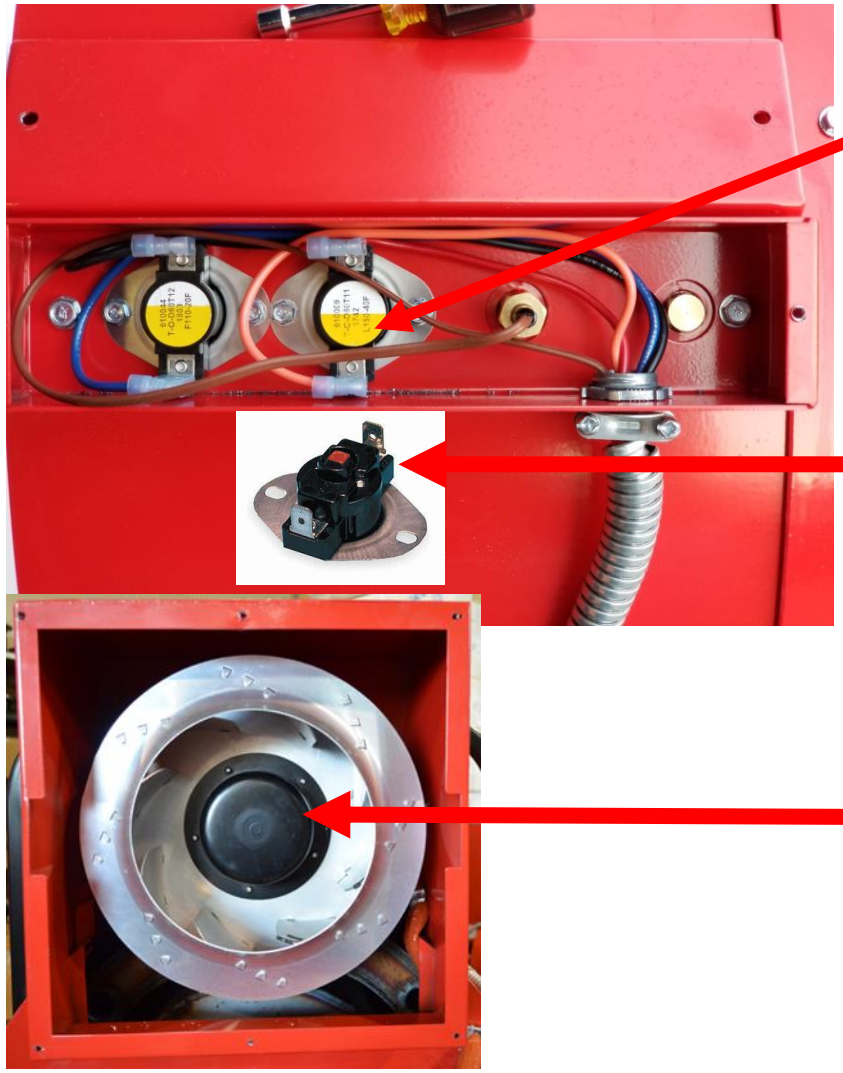
Test the high limit 150°F disc and motor thermostat



- Test for 120 volts on each terminal of the disc to ground.

✓ If 120 volts is NOT present on both sides disc the disc is defective.

➢ Note: newer models have a manual reset limit disc check to ensure it is not tripped off.

- If 120 volts is present on both terminals of the disc, the motor thermostat is defective.

➢ Note: the fan motor thermostat is located inside the motor and is not field serviceable.

➢ Test the motor thermostat… Page 23

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- NOTE: On late model, Blaze construction heaters, the circulating fan motors are equipped with a thermal heat thermostat that is not field serviceable.
- The motor thermostat is wired in series with the 120- volt temperature controller circuit.

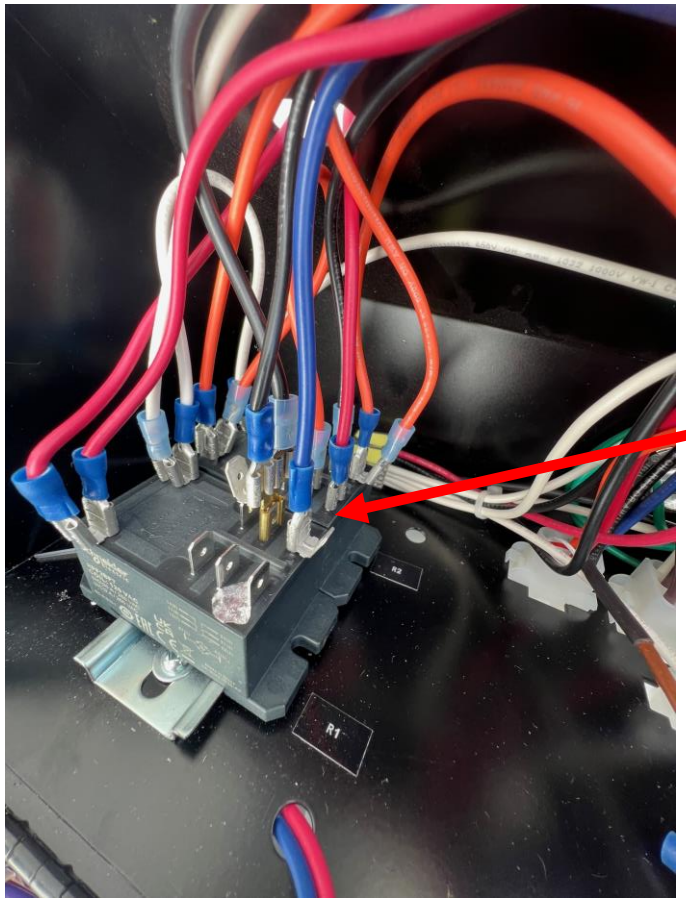
Check to ensure the thermal heat thermostat contact is closed by testing for continuity, using the 2 white or 2 grey wires leading to the circulating fan motor.

- If the contact is closed, the thermal heat switch is good.

✓ If the contact is open, the 'Circulating Fan Motor' is defective and needs to be replaced.

Problem solved

If the circulating fan fails to start...



With the Fan Override switch in the ON position, check for 120 volts on the fan relay (R1) on the fan motor terminal.
(Blue wire)

- ✓ If there is 120 volts is present, the Motor is defective.

- ✓ If 120 volts is NOT present, the relay is defective

Problem solved

If the fan is starting intermittently, erratically or inconsistently…

The EB400D is equipped with redundant controls to ensure positive starts for the circulating blower fan.

- ✓ If the temperature controller display reaches 90°F and the fan does not start, the controller is defective.

- ✓ If the fan does not start within 90 seconds of the burner starting, the fan timer is defective.

- ✓ If the temperature at the fan 110°F Disc is over 110°F and the fan does not start, the 110°F fan disc is defective.

Problem solved

- ➢ Note: It is very unlikely that all 3 components would be defective at the same time. If the circulating fan fails to start, likely it would be the circulating fan motor or the (R1) relay

Circulating fan does not shut off…

Fan 0veride Switch

- First, ensure that the ambient temperature at the 110°F fan disc is less than 80°F.

- ✓ The Fan Override switch is in the ON position. (Turn it to the OFF position)
- ✓ Defective 110°F fan disc 
- ✓ Defective fan relay 
- ✓ Defective temperature controller 

- Testing the components… Page 27

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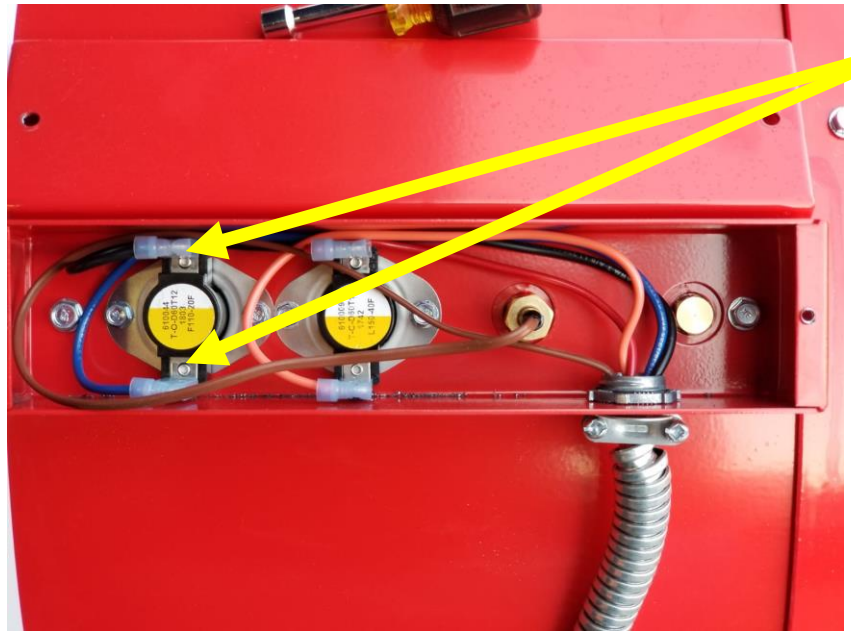
Circulating fan does not shut off
Checking – 110°F fan disc…

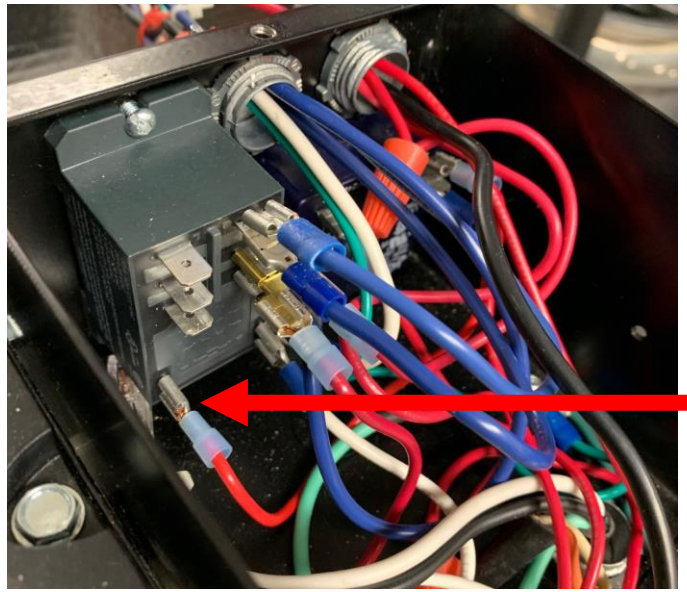


Check for 120 volts between ground and each terminal.

Note: If 120 volts is present on BOTH terminals, the disc is defective.

If 120 volts is present on ONE terminal only, the disc is GOOD Continue…Page 28

Circulating fan does not shut off
Checking - circulating fan relay…



- Check for 120 volts on the relay coil terminals.

✓ If 120 volts is not present, defective relay

✓ If 120 volts is present on the relay coil… Page 29

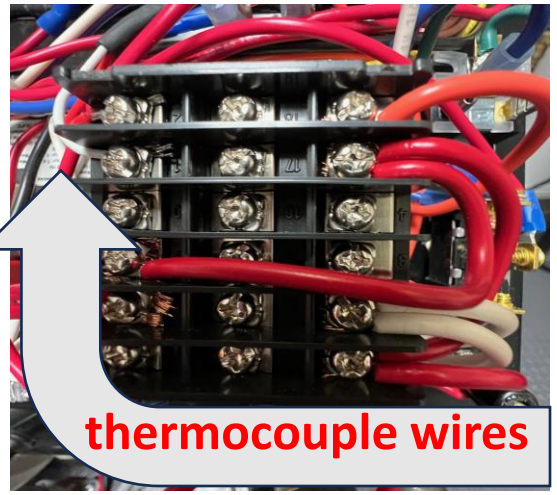
Circulating fan does not shut off…

If the circulating fan 110°F disc is good AND there is 120 volts on the circulating fan relay (R1) coil.

- ✓ Defective temperature controller
- ✓ Defective Thermocouple

➢ Testing the components… Page 30

Circulating fan does not shut off…



Testing the thermocouple…

- Remove the (small) red and white thermocouple wires from the back of the temperature controller
- Install a jumper wire between the two terminals

✓ If the fan stops running, the thermocouple is defective

✓ If the fan continues to run, the temperature controller is defective

➢ Caution… do not remove the wrong red and white wires

Problem solved

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Set up and technical information Guides…

Choose the information you require and click on the Page

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Start-up procedure gas fired units…

- All heaters should be set up by a qualified gas technician.
- Make sure all piping and fittings are tight and free from gas leaks.
- Purge all air from gas lines connected to the regulator.
- Soap test all gas lines and fittings including gas train for leaks.

➢ Caution: If the heater is going to be fed with power from a generator, always have the heater unplugged until the generator is running stable. Ensure the generator is sized to accommodate the heater voltage demand.

➢ Start-up continued…Page 35

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What you need to commission the heater!

Combustion Analyzer

Voltmeter

Manometer

➢Continue to set-up…Page 36

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Start-up procedure gas continued…

Have a qualified gas fitter determine the correct regulators to use and the correct diameter hose to feed the unit with fuel according to pressure in the supply line and length of lines. Gas fitters have charts to help them determine this information.

Switch over valve

- Determine if unit will run on Natural gas or Propane.
- Make sure that NG/LP switchover valve is in the right position.
- Make sure the incoming gas pressure is between 7" and 14" WC.
- Make sure the venting is properly installed.
- Make sure the proper voltage is supplied to the heater.
- Make sure the proper size wiring is connected to the heater.

➢ Start-up continued…Page 37

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Start-up procedure gas continued…

With the switch for the burner in the off position, plug in the heater, turn the fan manual override switch to ON position and ensure voltage remains steady. Return fan manual override switch to OFF position.

- Place the toggle switch in bypass position to start the burner.
  Once the burner is running make sure that incoming pressure is between 7" and 14" of WC .

✓ If the pressure drops out when running, it means that there is not enough volume of gas or not enough pressure.

- If the gas pressure drops, make sure the gas regulators and piping are correct.

➢ Adjusting the burner for proper combustion….Page 38

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Adjusting the burner for clean and reliable combustion

Clean & Reliable Combustion

Getting the most reliable performance out of an oil burner comes down to ensuring that it is properly set up. This can require some fine tuning, but the following steps should help you achieve the reliable combustion you are looking for…Page

- **No installation** is complete until the combustion of the heater has been performed.

Using a combustion analyzer… Page 42

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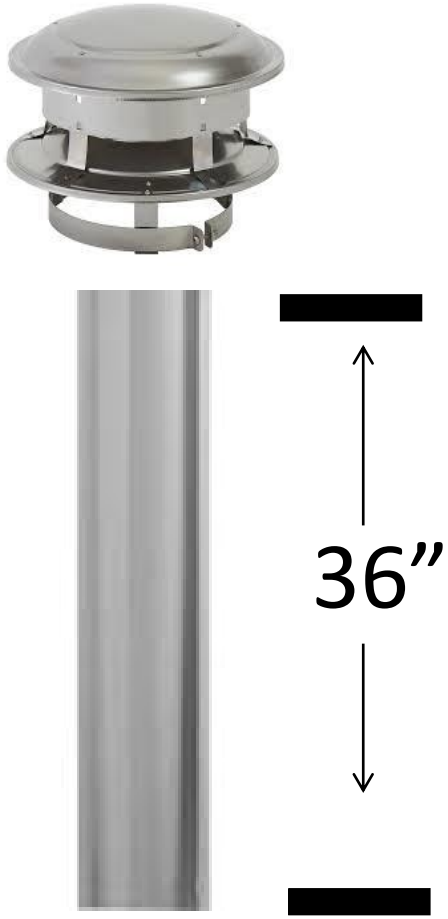
Venting outside a building…



- Make sure to install a stack minimum 36" on the flue.
- Make sure to install a rain cap on the flue pipe.
- Make sure that flue gases are not being circulated into by the cooling fan and pushed into the space you are heating.

WARNING: The appropriate measures must be taken to ensure there will be no positive pressures on the exhaust flue of the heater.

➢ Venting from inside a building…Page 40

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Best practices for venting when heater is located inside a building

- Avoid using as many 90-degree elbows as possible
- Venting runs should be as short as possible
- Vertical rise minimum 3 feet, 5 feet is better outside the building.
- Always install a rain cap.

- Never decrease diameter of flue piping.
- Horizontal runs ¼” per foot rise.
- Make sure all piping is properly secured.
- Make sure there is no negative pressure inside the building where the heater is placed.

➢ Note: where the vent pipe passes through a combustible wall a fireproof thimble must be used.

➢ Back to other technical information…Page 33

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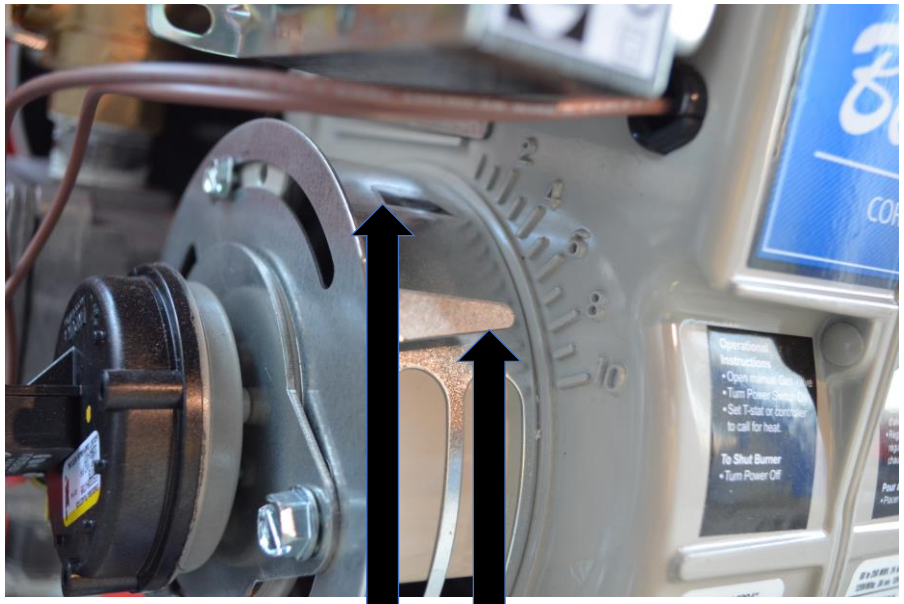
Proper air adjustments must be preformed for reliable combustion



- Recommended air settings are indicated in manufactures instructions as:
  Example: 10/0 the first number being the shutter and the second number being the band.

➢ Note: recommend air settings are approximate and will change with altitude and fuel oil temperature.

➢ The Use of a combustion analyzer will ensure clean burning and maximum efficiency.

➢ EB400G Air setting 10/0, Gas pressure LP 4" WC NG 3.5" WC, Head setting to # 10.1

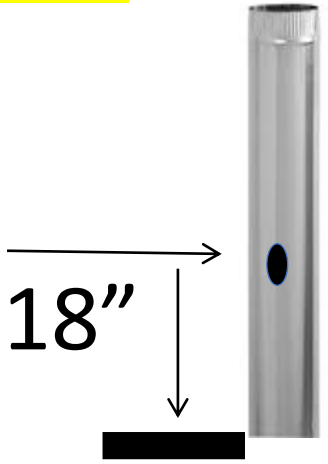
➢ Back to other technical information…Page 33

- **While the flue-stack is still cold pre-drill ¼" hole in the flue-stack 18" above the flue collar.**

Set the air settings to manufacture's recommendations. Once you've done that, start the burner and let it operate for 10 minutes. Next, draw an Oxygen (O2) sample from the flue pipe. Adjust the air settings to achieve between 3% & 4% (O2)
Check the CO (Carbon Monoxide) level it should not be higher than 50 PPM.

Air Adjustments

Combustion Analyzer



Test Hole

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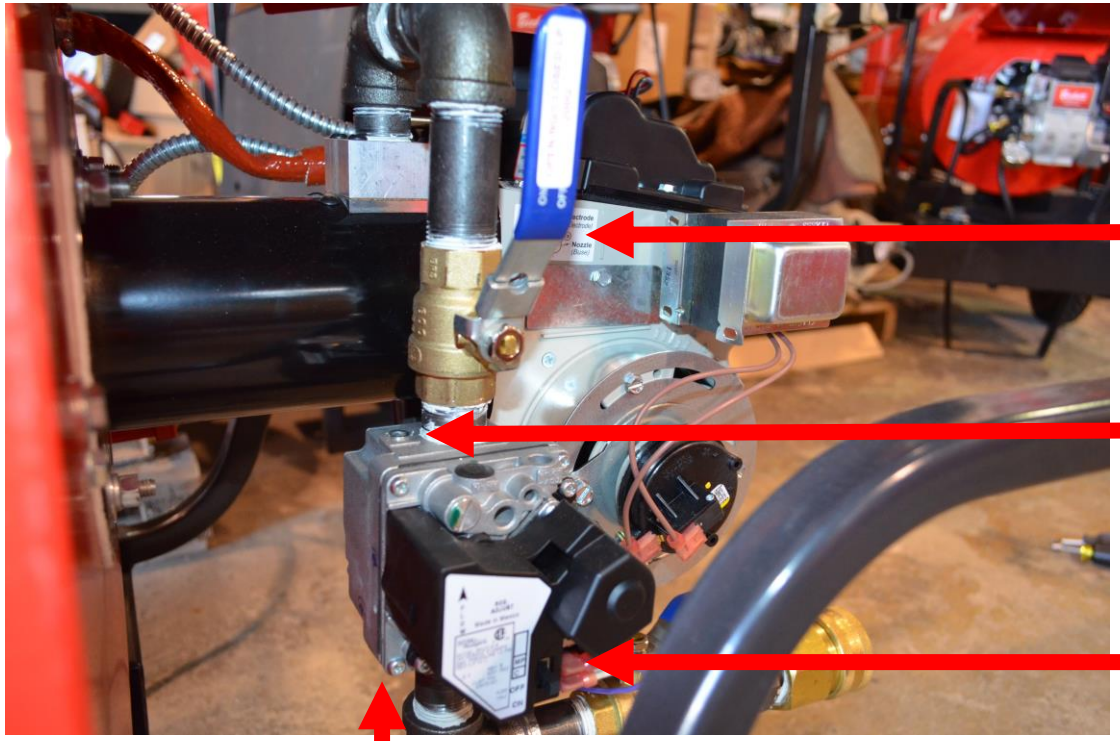
Gas Train EB200G…



Switchover valve for LP OR NG

Test outlet port

Gas valve On/Off Switch

Test Inlet port

➢ Back to other technical information…Page 33

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Electrical hook-up…

- Only extension cords that are CSA / UL approved should be used.

Extension cords should be no less than # 12 gauge up to 50 feet
Over and up to 100 feet, no less than #10 gauge should be used.
Do not plug multiple extensions together.
Make sure extension cords are placed so as not to obstruct walkways and protected against traffic.

- WARNING: If the heater is going to be fed with power from a generator, always have the heater unplugged until the generator is running stable. Ensure the generator is sized to accommodate the heater voltage demand.

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Natural Gas and Propane Burner	
Preform and Record combustion results:	**Check**
O2 PERCENTAGE (oxygen)	✓ done
CO parts per million (ppm carbon monoxide)	✓ done
Remove gas gun assembly adjust electrodes check for cracks and clean	✓ done
Lubricate o ring on gun assembly	✓ done
Clean flame rod	✓ done
Check ignition cable	✓ done
Start burner and check control safety lock-out	✓ done
Check and adjust gas pressure Hi fire and Low fire	✓ done
Clean blower wheel (remove dust)	✓ done
Check air switch hose for cracks	✓ done
Check gas train fittings for leaks	✓ done
Start heater and check operation of thermostat /bypass	✓ done
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Heater controls	Check
Test temperature controller. Fan on at 90F / Fan off at 80°F Burner off 5° F above set high limit / Burner back on at high set temp	✓ Done
Check circulating fan,(Fan timer, Fan relay, 110°F disk)	✓ Done
Check wiring terminals inside control panel, tighten if lose	✓ Done
Clean heater casing and check for dents	✓ Done

➢ Note: Pre-season annual maintenance will save you time, money and service calls every time you rent the unit.

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Gas piping, and regulator sizing…

➢ **Note**: All gas piping should be calculated and installed by a qualified Gas fitter.

Gas fitters have charts for sizing gas pipes and proper regulators for different pressures and installations.

It is important to use the right sizing piping charts for your area. Code regulations vary from different States and Provinces.

➢ Pipe and regulator sizing example…Page 48

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Natural Gas and Propane Regulator Examples…

1. Obtain the specifications included with the operational instructions for gas heaters.
2. Size the gas regulator according to the gas inlet pressure available to the heater.
3. Read the outlet pressure required for the heater on the heater specification sheet.
4. Size the regulator according to both the inlet and outlet gas pipe diameter of the gas train.

Size the gas regulator and piping according to the gas Outlet pressure available

Outlet diameter → **Gas Train 1 ¼"**

Outlet pressure

Size the gas regulator according to the gas inlet pressure required for the heater →

7" to 14"

➢ Note: The supplied pressure regulator with the heater on the gas train is used only to adjust the burner operating pressure. The only time a secondary regulator is not used is when the gas supplied on site from the meter is less than 14" WC.

Pipe sizing example…Page 49

Pipe sizing the job site…

➢ **WHAT YOU NEED TO KNOW**

Where the heater will be placed

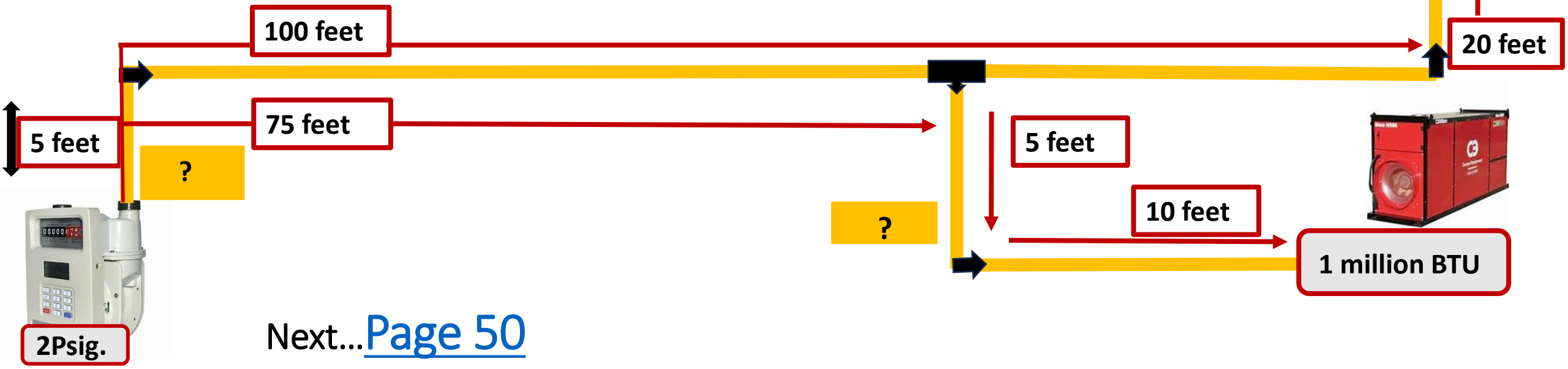
What Pressure is available 2 Psig

Gas type Natural Gas

Total BTUs of all units connected to gas piping 3 million

Length of longest run. 125 feet

➢ Steve's Job site requiring 1 heater - 1 million BTUs and 1 - heater 2 million BTUs.



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Pipe sizing…

Find size of pipe to the first branch using your 2 Psig chart for NG. and 125-foot run.

Natural Gas

GAS: NATURAL														
INLET PRESSURE: LESS THAN 2 psi														
PRESSURE DROP: 0.5 in. w.c.														
SPECIFIC GRAVITY: 0.60														
	PIPE SIZE (inch)													
NOMINAL:	½	¾	1	1¼	1½	2	2½	3	4	5	6	8	10	12
ACTUAL ID:	0.622	0.824	1.049	1.380	1.610	2.067	2.469	3.068	4.026	5.047	6.065	7.981	10.020	11.938
LENGTH (feet)	CAPACITY IN CUBIC FEET OF GAS PER HOUR													
10	172	360	678	1390	2090	4020	6400	11 300	23 100	41 800	67 600	139 000	252 000	399 000
20	118	247	466	957	1430	2760	4400	7780	15 900	28 700	46 500	95 500	173 000	275 000
30	95	199	374	768	1150	2220	3530	6250	12 700	23 000	37 300	76 700	139 000	220 000
40	81	170	320	657	985	1900	3020	5350	10 900	19 700	31 900	65 600	119 000	189 000
50	72	151	284	583	873	1680	2680	4740	9660	17 500	28 300	58 200	106 000	167 000
60	65	137	257	528	791	1520	2430	4290	8760	15 800	25 600	52 700	95 700	152 000
70	60	126	237	486	728	1400	2230	3950	8050	14 600	23 600	48 500	88 100	139 000
80	56	117	220	452	677	1300	2080	3670	7490	13 600	22 000	45 100	81 900	130 000
90	52	110	207	424	635	1220	1950	3450	7030	12 700	20 600	42 300	76 900	122 000
100	50	104	195	400	600	1160	1840	3260	6640	12 000	19 500	40 000	72 600	115 000
125	44	92	173	355	532	1020	1630	2890	5890	10 600	17 200	35 400	64 300	102 000
150	40	83	157	322	482	928	1480	2610	5330	9650	15 600	32 100	58 300	92 300
175	37	77	144	296	443	854	1360	2410	4910	8880	14 400	29 500	53 600	84 900
200	34	71	134	275	412	794	1270	2240	4560	8260	13 400	27 500	49 900	79 000
250	30	63	119	244	366	704	1120	1980	4050	7320	11 900	24 300	44 200	70 000
300	27	57	108	221	331	638	1020	1800	3670	6630	10 700	22 100	40 100	63 400

2 million BTU

?

20 feet

100 feet

75 feet

5 feet

?

5 feet

?

1 million BTU

10 feet

Next Consult Chart

2Psig.

HOME

Pipe sizing Table for 2 pounds Pressure with a 10% Pressure drop and a gas of…

0.6 Specific Gravity

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NO 125-foot then always use next highest ➘

Pipe Size of Schedule 40 Standard Pipe (Inches)	Internal Diameter (Inches)	Total Equivalent Length of Pipe in Feet										
		50	100	150	200	250	300	400	500	1000	1500	2000
1.00	1.049	1112	764	614								
1.25	1.380	2283	1569	1260								
1.50	1.610	3421	2351	1888								
2.00	2.067	6589	4528	3636								
2.50	2.469	10501	7217	5796								
3.00	3.068	18564	12759	10246								
3.50	3.548	27181	18681	15002								
4.00	4.026	37865	26025	20899								
5.00	5.047	68504	47082	37809								
6.00	6.065	110924	76237	61221								
8.00	7.981	227906	156638	125786								
10.00	10.020	413937	284497	228461								
12.00	11.938	655315	450394	361682	309553	274351	248582	212751	188560	129596	104070	89071

➢ **WHAT YOU NEED TO KNOW**

What Pressure is available **2 Psig**

Gas type, **Natural Gas**

Total BTUs of all units connected to gas piping **3 million**

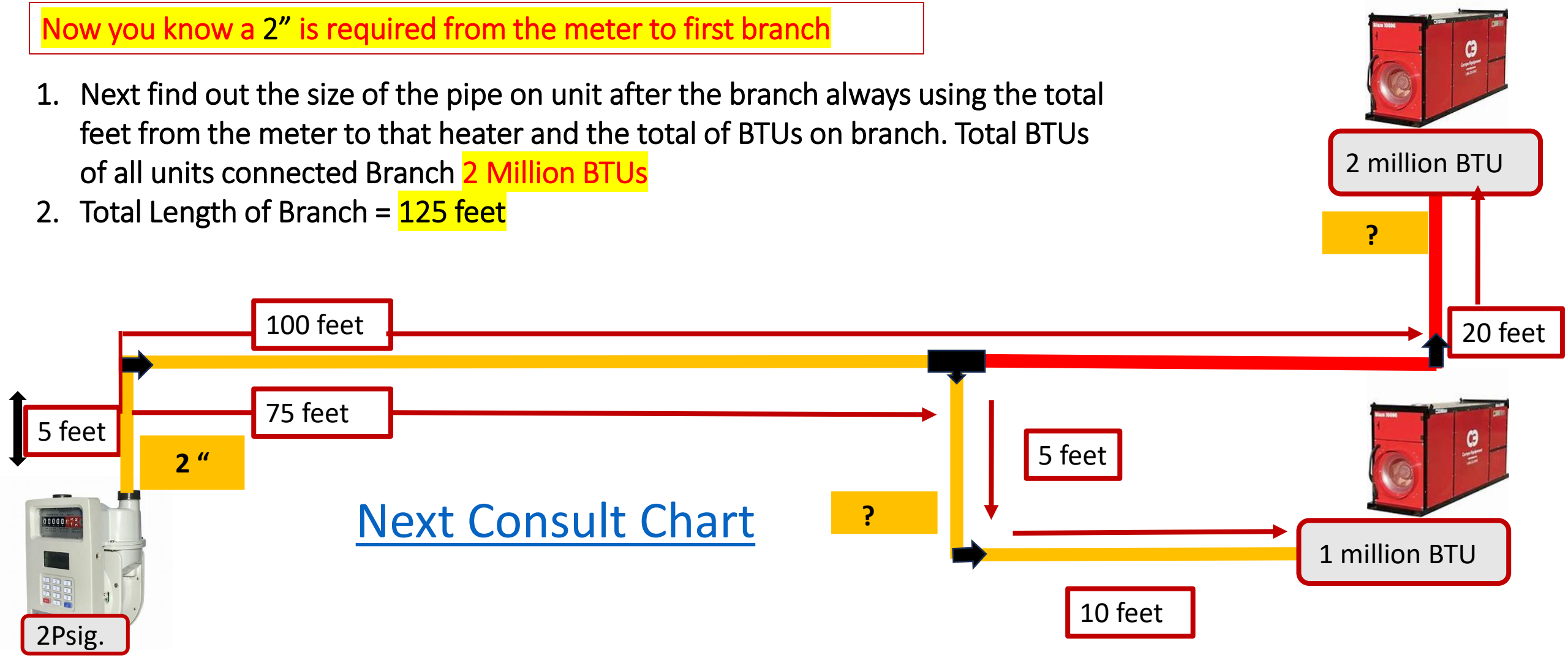
Length of longest run. **125 feet**

150 feet-3636 million BTU's = 2" pipe.

Pipe sizing…

Now you know a 2" is required from the meter to first branch

1. Next find out the size of the pipe on unit after the branch always using the total feet from the meter to that heater and the total of BTUs on branch. Total BTUs of all units connected Branch 2 Million BTUs
2. Total Length of Branch = 125 feet



Next Consult Chart

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Pipe sizing Table for 2 pounds Pressure with a 10% Pressure drop and a gas of…

0.6 Specific Gravity

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Pipe Size of Schedule 40 Standard Pipe (Inches)	Internal Diameter (Inches)	Total Equivalent Length of Pipe in Feet										
		50	100	150	200	250	300	400	500	1000	1500	2000
1.00	1.049	1112	764	614	525	466	422	361	320	220	177	151
1.25	1.380	2283	1569	1260	1079							
1.50	1.610	3421	2351	1888	1616							
2.00	2.067	6589	4528	3636	3112							
2.50	2.469	10501	7217	5796	4961							
3.00	3.068	18564	12759	10246	8769							
3.50	3.548	27181	18681	15002	12840							
4.00	4.026	37865	26025	20899	17887							
5.00	5.047	68504	47082	37809	32359							
6.00	6.065	110924	76237	61221	52397							
8.00	7.981	227906	156638	125786	107657							
10.00	10.020	413937	284497	228461	195533							
12.00	11.938	655315	450394	361682	309553	274351	248582	212754	188560	129596	104070	89071

Total BTUs on branch = 2000,000

Total length of run = 125 feet

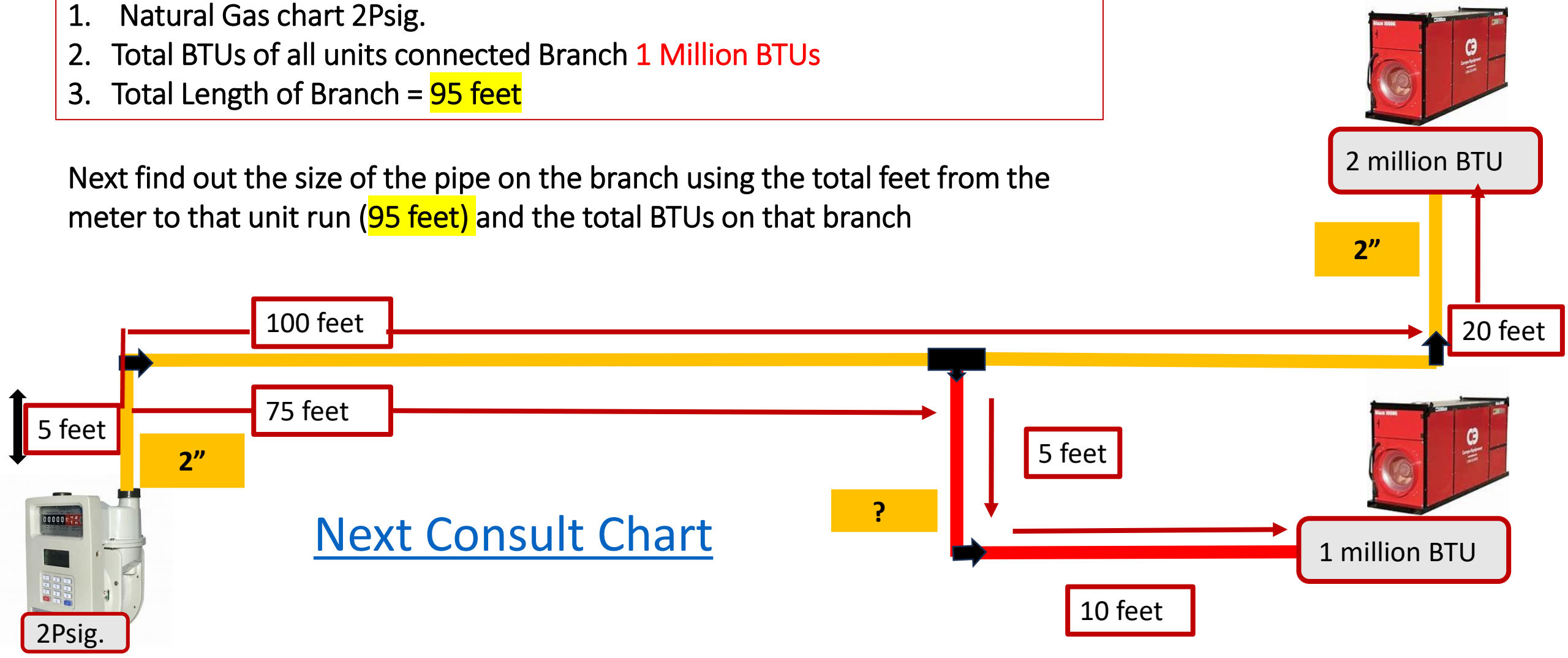
150 feet-3636 million BTU's = 2" pipe.

No 125 foot on chart must use next highest footage.

Pipe sizing…

1. Natural Gas chart 2Psig.
2. Total BTUs of all units connected Branch 1 Million BTUs
3. Total Length of Branch = 95 feet

Next find out the size of the pipe on the branch using the total feet from the meter to that unit run (95 feet) and the total BTUs on that branch



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Pipe sizing Table for 2 pounds Pressure with a 10% Pressure drop and a gas of…
0.6 Specific Gravity.

NO 95-foot then always use next highest

Pipe Size of Schedule 40 Standard Pipe (Inches)	Internal Diameter (Inches)	Total Equivalent Length of Pipe in Feet										
		50	100	150	200	250	300	400	500	1000	1500	2000
1.25	1.049	1112	764	614								
	1.380	2283	1569	1260								
1.50	1.610	3421	2351	1888								
2.00	2.067	6589	4528	3636								
2.50	2.469	10501	7217	5796								
3.00	3.068	18564	12759	10246								
3.50	3.548	27181	18681	15002								
4.00	4.026	37865	26025	20899								
5.00	5.047	68504	47082	37809	32359	28680	25986	22240	19711	13547	10879	9311
6.00	6.065	110924	76237	61221	52397	46439	42077	36012	31917	21936	17616	15077
8.00	7.981	227906	156638	125786	107657	95414	86452	73992	65578	45071	36194	30977
			4497	228461	195533	173297	157020	134389	119106	81861	65737	56263
			0394	361682	309553	274351	248582	212754	188560	129596	104070	89071

1. Natural Gas chart 2Psig.
2. Total BTUs of all units connected Branch 1 Million BTUs
3. Total Length of Branch from meter = 95 feet

100 feet-1569 BTU's = 1 ¼"

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Pipe sizing…

Piping for job complete

2 million BTU

2"

20 feet

100 feet

75 feet

5 feet

2"

5 feet

Multiple units on a header

1 ¼"

1 million BTU

10 feet

2Psig.

HOME

Pipe sizing multiple heaters one header…

"Field Assist Troubleshooting Guide"

Note: any other appliances operating off the same meter would have to be calculated in to piping.

400,000 BTU

20 feet

1" PIPE

30 feet

650,000 BTU

20 feet

1" PIPE

50 feet

2 million BTU

20 feet

2" PIPE

100 feet

2 1/2" PIPE

2 feet

2Psig.

40 feet

10 feet

1 1/4" PIPE

2 million BTU

Available pressure 2Psig.
Total BTU = 5.050 million
Longest length 122 feet

Next example

HOME

Pipe sizing multiple heaters one Main Line and multiple drops…

"Field Assist Troubleshooting Guide"

Available pressure 2Psig.

Total BTU = 4250,000

Longest length 165 feet

Note: any other appliances operating off the same meter would have to be calculated in to piping.

400,000 BTU

20 feet

1"

30 feet

30 feet

650,000 BTU

20 feet

1"

50 feet

2 million BTU

20 feet

2"

Branch A - 135 feet

3 feet

2 feet

2 ½"

2Psig.

Menu

50 feet

1 ½"

1 million BTU

20 feet

1 ¼"

50 feet

50 feet

10 feet

200,000 BTU

1"

Branch B

165 feet

HOME

Piping charts gas 0.6 specific gravity… "Field Assist Troubleshooting Guide"

1	2	3	4
.05 PSIG. Or less… Page 60	1 PSIG. With less than 10 % pressure drop… Page 61	2 PSIG. With less than 10 % pressure drop… Page 62	5 PSIG. With less than 10 % pressure drop… Page 63

➢ **Note**: All gas piping should be calculated and installed by a qualified Gas fitter. Gas fitters have charts for sizing gas pipes and proper regulators for different pressures and installations.

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Maximum Capacity of Pipe in Cubic Feet of Gas per Hour for Gas Pressures of 0.5 Psig or Less and a Pressure Drop of 0.3 Inch Water Column

(Based on a 0.60 Specific Gravity Gas)

Nominal Iron Pipe Size, Inches	Internal Diameter, Inches	Length of Pipe, Feet													
		10	20	30	40	50	60	70	80	90	100	125	150	175	200
¼	.364	32	22	18	15	14	12	11	11	10	9	8	8	7	6
⅜	.493	72	49	40	34	30	27	25	23	22	21	18	17	15	14
½	.622	132	92	73	63	56	50	46	43	40	38	34	31	28	26
¾	.824	278	190	152	130	115	105	96	90	84	79	72	64	59	55
1	1.049	520	350	285	245	215	195	180	170	160	150	130	120	110	100
1¼	1.380	1,050	730	590	500	440	400	370	350	320	305	275	250	225	210
1½	1.610	1,600	1,100	890	760	670	610	560	530	490	460	410	380	350	320
2	2.067	3,050	2,100	1,650	1,450	1,270	1,150	1,050	990	930	870	780	710	650	610
2½	2.469	4,800	3,300	2,700	2,300	2,000	1,850	1,700	1,600	1,500	1,400	1,250	1,130	1,050	980

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Pipe Sizing Table for 1 Pound Pressure
Capacity of Pipes of Different Diameters and Lengths in Cubic Feet per Hour for an Initial Pressure of 1.0 Psig With a 10 Percent Pressure Drop and a Gas of 0.6 Specific Gravity

Pipe Size of Schedule 40 Standard Pipe (Inches)	Internal Diameter (Inches)	Total Equivalent Length of Pipe in Feet										
		50	100	150	200	250	300	400	500	1000	1500	2000
1.00	1.049	717	493	396	338	300	272	233	206	142	114	97
1.25	1.380	1471	1011	812	695	616	558	478	423	291	234	200
1.50	1.610	2204	1515	1217	1041	923	836	716	634	436	350	300
2.00	2.067	4245	2918	2343	2005	1777	1610	1378	1222	840	674	577
2.50	2.469	6766	4651	3735	3196	2833	2567	2197	1947	1338	1075	920
3.00	3.068	11962	8221	6602	5650	5008	4538	3884	3442	2366	1900	1626
3.50	3.548	17514	12037	9666	8273	7332	6644	5686	5039	3464	2781	2381
4.00	4.026	24398	16769	13466	11525	10214	9255	7921	7020	4825	3875	3316
5.00	5.047	44140	30337	24362	20851	18479	16744	14330	12701	8729	7010	6000
6.00	6.065	71473	49123	39447	33762	29923	27112	23204	20566	14135	11351	9715
8.00	7.981	146849	100929	81049	69368	61479	55705	47676	42254	29041	23321	19960

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Pipe Sizing Table for 2 Pounds Pressure Capacity of Pipes of Different Diameters and Lengths in Cubic Feet per Hour for an Initial Pressure of 2.0 Psig With a 10 Percent Pressure Drop and a Gas of 0.6 Specific Gravity

Pipe Size of Schedule 40 Standard Pipe (Inches)	Internal Diameter (Inches)	Total Equivalent Length of Pipe in Feet										
		50	100	150	200	250	300	400	500	1000	1500	2000
1.00	1.049	1112	764	614	525	466	422	361	320	220	177	151
1.25	1.380	2283	1569	1260	1079	956	866	741	657	452	363	310
1.50	1.610	3421	2351	1888	1616	1432	1298	1111	984	677	543	465
2.00	2.067	6589	4528	3636	3112	2758	2499	2139	1896	1303	1046	896
2.50	2.469	10501	7217	5796	4961	4396	3983	3409	3022	2077	1668	1427
3.00	3.068	18564	12759	10246	8769	7772	7042	6027	5342	3671	2948	2523
3.50	3.548	27181	18681	15002	12840	11379	10311	8825	7821	5375	4317	3694
4.00	4.026	37865	26025	20899	17887	15853	14364	12293	10895	7488	6013	5147
5.00	5.047	68504	47082	37809	32359	28680	25986	22240	19711	13547	10879	9311
6.00	6.065	110924	76237	61221	52397	46439	42077	36012	31917	21936	17616	15077
8.00	7.981	227906	156638	125786	107657	95414	86452	73992	65578	45071	36194	30977

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Pipe Sizing Table for 5 Pounds Pressure
Capacity of Pipes of Different Diameters and Lengths in Cubic Feet per Hour for an Initial Pressure of 5.0 Psig With a 10 Percent Pressure Drop and a Gas of 0.6 Specific Gravity

Pipe Size of Schedule 40 Standard Pipe (Inches)	Internal Diameter (Inches)	Total Equivalent Length of Pipe in Feet										
		50	100	150	200	250	300	400	500	1000	1500	2000
1.00	1.049	1989	1367	1098	940	833	755	646	572	393	316	270
1.25	1.380	4084	2807	2254	1929	1710	1549	1326	1175	808	649	555
1.50	1.610	6120	4206	3378	2891	2562	2321	1987	1761	1210	972	832
2.00	2.067	11786	8101	6505	5567	4934	4471	3827	3391	2331	1872	1602
2.50	2.469	18785	12911	10368	8874	7865	7126	6099	5405	3715	2983	2553
3.00	3.068	33209	22824	18329	15687	13903	12597	10782	9556	6568	5274	4514
3.50	3.548	48623	33418	26836	22968	20356	18444	15786	13991	9616	7722	6609
4.00	4.026	67736	46555	37385	31997	28358	25694	21991	19490	13396	10757	9207
5.00	5.047	122544	84224	67635	57887	51304	46485	39785	35261	24235	19461	16656
6.00	6.065	198427	136378	109516	93732	83073	75270	64421	57095	39241	31512	26970
8.00	7.981	407692	280204	225014	192583	170683	154651	132361	117309	80626	64745	55414

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The EB400G can be used in most applications with ductwork.
The maximum outlet (supply air) is 400 feet. The maximum inlet (return air) is 50 feet.
Total ducting, Outlet plus Inlet not to exceed 400 feet.

➢ Best practices…

✓ Never exceed the 400 feet of total ducting and 50 feet of air inlet ducting.
✓ If flexible ducting is used, there should be no kinks in ductwork.
✓ Weather flexible or solid ducting is used, try to avoid sharp 90º turns.
✓ If ducting is split into 2 locations, use a TY not a T. and a maximum of 200 feet total ducting.
✓ If ducting is split into 2 locations, ensure the volume of air passing through is equal to or greater than the single outlet of the heater.
✓ Ensure all ducting is properly protected from water, traffic, and other obstructions.

➢ Note: Improper ducting will cause overheating and short cycling which will damage the heater.

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