



## 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

- The blower fan is running, but the control is locked –out on reset... [Page 2](#)
- The blower fan is running, and the burner control is NOT locked-out on reset... [Page 7](#)
- The blower fan won’t start... [Page 9](#)
- The blower fan won’t stop automatically... [Page 11](#)
- The burner doesn’t modulate... [Page 14](#)
- Technical information and more... [Page 19](#)

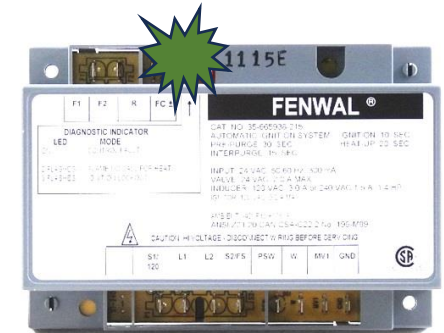
# Burner control is locked-out on reset...



The **Beckett** controller is flashing 1 LED light ( **green** ). This indicates the control is in ‘**Lockout**’  
To reset the control shut power off to the control for 10 seconds, and then turn it back on.



The **Fenwal** controller is flashing 1 LED light ( **green** ). This indicates the control is in ‘**Lockout**’  
To reset the control shut power off to the control for 10 seconds, and then turn it back on.



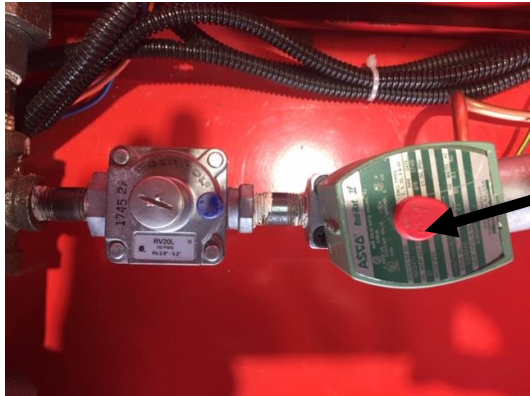
You reset the control and the pilot burner doesn't fire up...[Page 3](#)

You reset the control and the pilot burner fires up but the main burner doesn't fire up...[Page 5](#)

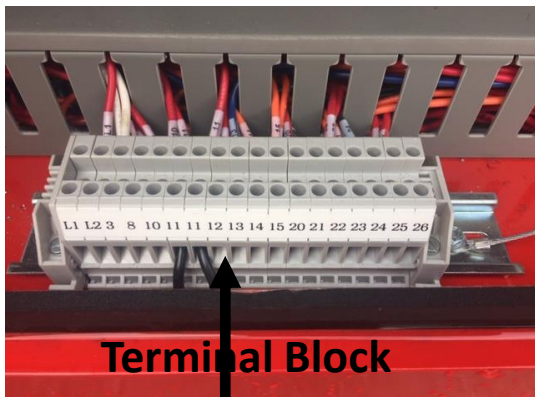
# Burner control is locked-out on reset...



Reset the control, check for **24 volts** to the pilot valve on terminal block wire # **12**



- ✓ If there is **0 volts** to the pilot valve, the control is defective.
- ✓ If **24 volts** is present, to the pilot gas valve,
- ✓ The valve is defective.
- ✓ The pilot assembly is out of alignment.
- ✓ The igniter is defective which is part of the control



Terminal Block

➤ Testing the components... [Page 4](#)

# 12



Install your manometer fitting into the test port of the pilot valve, Reset the control and check to see if gas is present to the pilot burner.

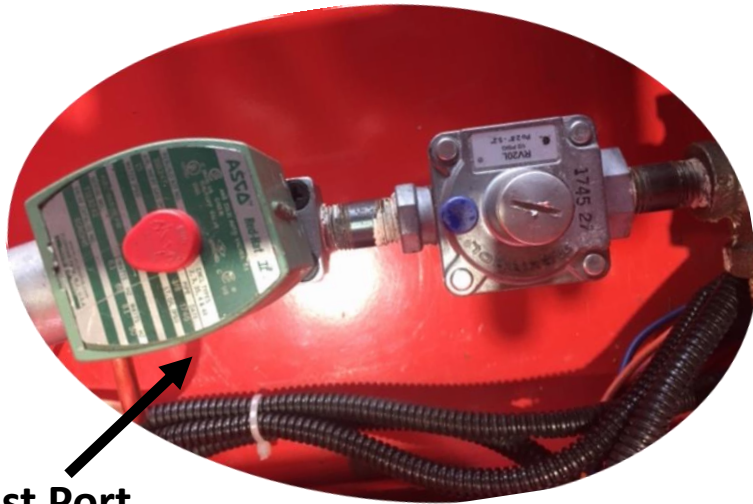
✓ If gas is **Not** present, defective gas valve.

• If gas **is** present, check for spark from igniter (“control”).

✓ If no spark, defective control.

• If spark **is** present, check alignment of electrode to pilot burner.

➤ **Problem solved**



Test Port

alignment



# The main burner doesn't fire up...

“Field Assist Troubleshooting Guide”



Reset the control, check for **24 volts** to main burner gas valves on terminal block wire **#14**



✓ If **24 volts** is **not** present, defective control.



• If **24 volts** is present...

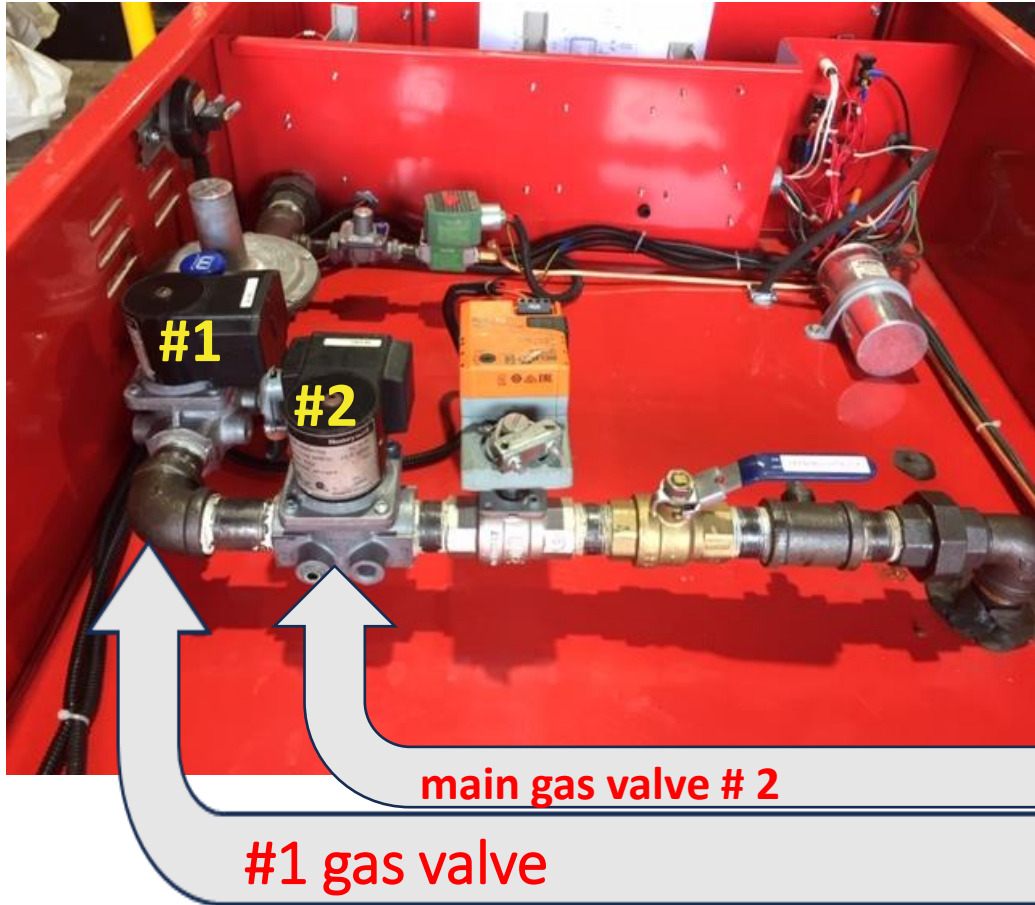
✓ One of the 2 gas valves is defective.



➤ Testing the main flame gas valves... [Page 6](#)



# Checking the 2 main burner gas valves...

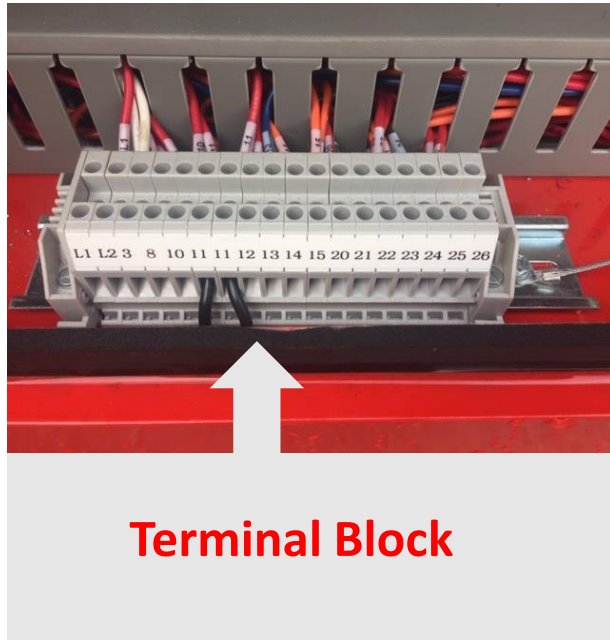


Install your manometer fitting into the test port of the main gas valve # 2, connect your manometer to the fitting. Reset the control and check to see if gas is present to the main burner.

- ✓ If gas is present, #2 gas valve is defective
- ✓ If no gas is present #1 gas valve is defective.

➤ Problem solved

# Burner control is NOT locked-out on reset...

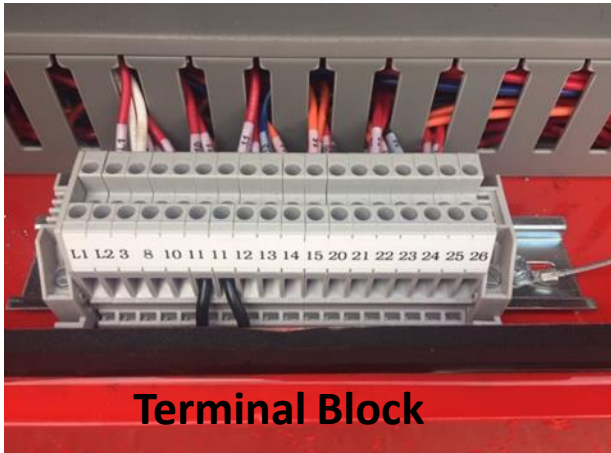


- Check for **120 volts** on wire **#28**
- ✓ If **120 volts** is not present, defective burner on switch.
- If there is **120 volts**, check for **120 volts** on terminal **#25**
- ✓ If **120 volts** is not present the blower motor thermostat is defective.
- **Note:** The thermostat switch is sealed inside the blower motor It is **not field Serviceable**.
- If **120 volts** is present, check for **120 volts** on terminal **#26**
- ✓ If **120 volts** is **not** present, defective tilt switch
- If **120 volts** is present...[Page 8](#)



# Checking the DFC+

## “Field Assist Troubleshooting Guide”



- If **120 volts** was present, check for **120 volts** on terminal **#10**
- ✓ If **120 volts** is **not** present, defective High limit disc.
- **Note:** newer models have a manual reset hi limit disc. if it does, reset high limit disc.
- If **120 volts** is present, check for **120 volts** on terminal **#11**
- ✓ If **120 volts** is **not** present, defective air proven switch.
- If **120 volts** is present on terminal **#11**
- Place a jumper between **#11** and **#12** on the terminal block.
- ✓ If the burner starts, the DFC+ is defective.
- ✓ If the display is giving a false reading or error, the discharge air sensor is defective.



**Problem solved**



# The blower fan won't start...



Turn the fan manual override switch to on.

- If the blower fan starts...
  - ✓ Defective burner on /off switch
  - ✓ Defective DFC+ control
- Test the components... [Page 10](#)



- If the fan blower doesn't start with the manual switch... [Page 13](#)



Fan relay





- With the Heat ON/Off switch is in the ON position and the Fan manual override switch in the off position...
- Check for 120 volts on wire #27 on the terminal #5 on DFC+
- ✓ If 120 volts is not present, defective DFC+



- If 120 volts is present, check for 120 volts on the terminal block wire #8
- ✓ If 120 volts is not present, defective toggle switch.

➤ Problem solved

# The blower fan won't stop.

“Field Assist Troubleshooting Guide”



The call for heat is satisfied and the fan blower doesn't stop and blows cold air...[Page 12](#)

There is no call for heat and the fan blower doesn't stop and blows cold air...[Page 15](#)

The blower fan is controlled by the DFC+, Fan Limit disc, Fan manual override switch, Heat on/off switch, and the Fan Relay. If the fan blower continues to run and won't stop.



Defective DFC+

?



Defective fan manual override

?



Defective fan limit disc.

?



Defective Heat on/off switch

?

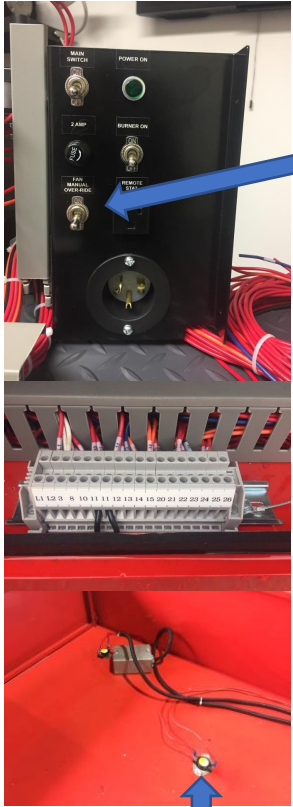


Defective relay

?

# The call for heat is satisfied and the fan blower doesn't stop... cold air...

"Field Assist Troubleshooting Guide"



Fan limit Disc.

- Make sure the fan manual switch is in the off position. Check for **120 volts** on wire **#8** on terminal block.
- ✓ If **120 volts** is **not** present, defective fan relay.
- If there is **120 volts** **is** present, check for **120 volts** on wire **#27** on DFC+ **#5**
- ✓ If **120 volts** is present, defective DFC+.
- If **120 volts** is **not** present, check for **120 volts** on fan limit disc on both terminals.
- ✓ If **120 volts** **is** present on both terminals, defective fan limit disc.
- ✓ If **120 volts** is **not** present on both terminals, defective fan manual override switch.



➤ Problem solved

# There is no call for heat and the fan blower doesn't stop...



Fan limit Disc.

- Make sure the fan manual switch is in the off position. Check for **120 volts** on wire **#8** on terminal block
- ✓ If there **is 0 volts** present, defective fan relay.
- If **120 volts is** present, check for **120 volts** on fan limit disc on both terminals.
- ✓ If **120 volts is** present on both terminals, defective fan limit disc.
- ✓ If **120 volts is not** present on both terminals, defective fan manual override switch.



➤ Problem solved



# The main burner doesn't modulate...



- If main burner doesn't modulate...
- ✓ Defective modulation motor.



- ✓ Defective discharge sensor



- ✓ Defective DFC+

➤ Testing the components... [Page 15](#)

# The burner doesn't modulate...

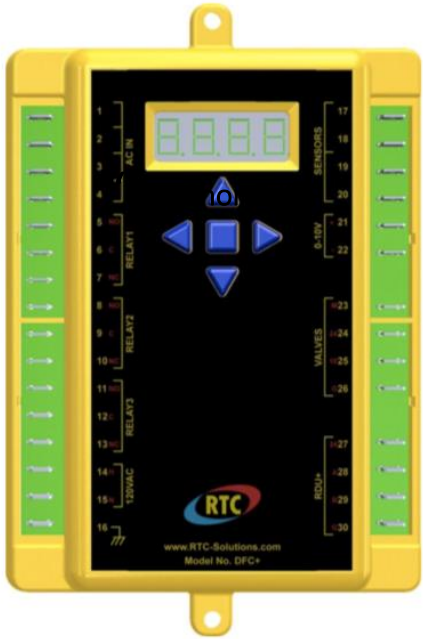


- **Note:** The burner only modulates when using the remote thermostat.
- **Note:** Voltage on these terminals are DC
  - Check for **24 volts DC** on terminal **#24** of DFC+ and **0-10 volts DC** on terminal **#25** of DFC+ to Valve Ground.

24	24VDC Valve Output
25	0-10VDC Valve Output
26	Valve Ground

- ✓ If these Voltages are Not present, defective DFC+
- If voltages are present, defective valve or valve damper is stuck.
- Remove the motor and operate the valve damper manually.
- ✓ If the damper moves freely, the motor is defective

➤ Check the discharge temperature sensor... [Page 16](#)



Error messages on the DFC+ will be scrolled across the display with a detailed message. “dFtS oPEn” – There is no Discharge Temperature Sensor connected to the DFC+. “dFtd oPEn” – The user has the Remote (“rE”) parameter on the RDU+ enabled, but no external control is found to take a reading. “dFts ShortEd” – There is a short in the connection of the Discharge Temperature Sensor. “dFtd ShortEd” – The user has the Remote (“rE”) parameter on the RDU+ enabled and there is a short in the connection.

- If there is a message displayed on the DFC+ screen, unplug the Heater and plug it back in.
- If the message goes away the heater should operate properly.
- If the message stays on the display, defective discharge sensor or lose wire.

➤ **Problem solved**



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1

The heater should be installed level and on solid ground or base. noncombustible (material).

2

The heater must be placed at least 10 feet from any LP or Gas container.

3

The heater should not be installed in an area where combustible gases are circulating.

4

The discharge air stream of this heater must not be directed toward any LP-Gas container within 20 Ft (6.1M).

5

The heater should have the proper size wiring for voltage and amperage demand...[Page 28](#)

6

All gas piping and wiring cables should be routed so they are protected from water or traffic.

7

Ensure all piping and fittings are free from gas leaks.

8

Ensure proper ducting of heater respecting limitations...[Page 31](#)

➤ Back technical information...[Page 19](#)



- 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 proper voltage is supplied to the heater.
- Make sure the proper size wiring is connected to the heater.

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 and gas supply is adequate.
- If there is more than 1 heater or appliance on the same piping all units should be running during testing for pressure drop.

➤ Back to main menu...[Page19](#)



On a call for heat (the heat switch is turned on) The circulating fan starts up and the air proving switch contacts close. The burner control energizes the pilot gas valve, and the spark igniter lights the pilot burner. Once flame has been proven the main flame gas valves open and the main burner flame comes on.

**Note:** The blower will start and purge the unit for a pre-set time (2-5 sec.) before the ignition sequence will begin.

Once the pilot flame has been established, the main flame will come on and will begin to adjust as needed to maintain the discharge air temperature at the pre-set temperature. The burner only modulates while using the remote thermostat,

➤ Back technical information...[Page 19](#)



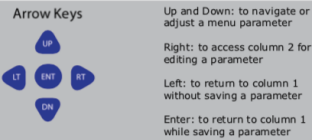
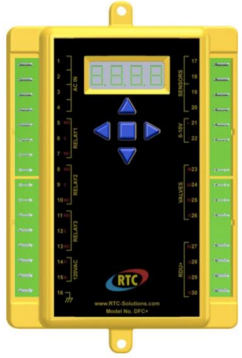
- Once the pilot flame has been established, the main flame will come on and will begin to modulate as needed to maintain the discharge air temperature at the pre-set temperature, Only if the remote thermostat is connected.
- Back to other technical information...[Page 19](#)





- The discharge air temp sensor is mounted in an air mixing tube, located near the discharge air side of the heater. Its function is to provide temperature information to the amplifier (DFC+). This information is used by the amplifier to control the “MAX” air temp portion of the amplifier.

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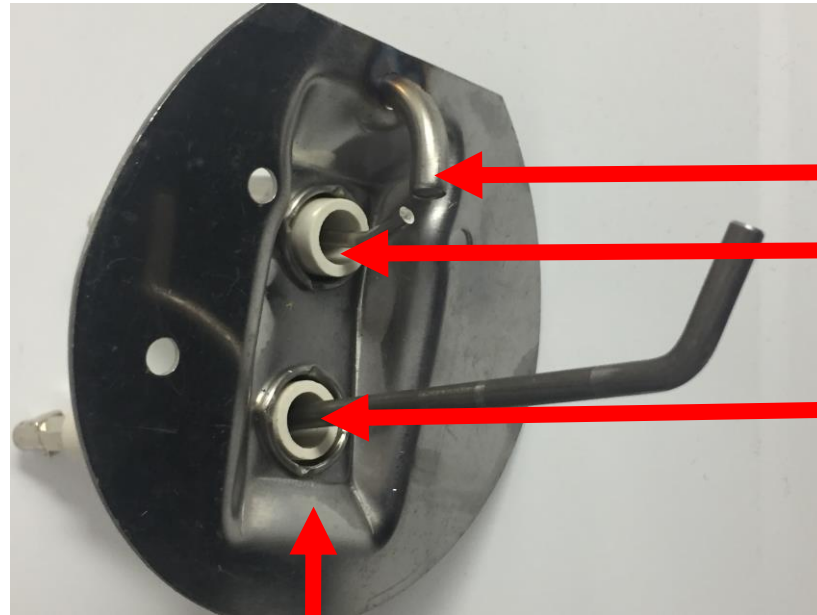
- The DFC+ will always display the current discharge air temperature. Press any arrow key to change the discharge setpoint temperature. Once an arrow key is pressed, the LED will display the text for the current setpoint temperature. Use the down or up key to set a new discharge temperature, then press the middle key to save the changes made. If a key is not pressed for 10 seconds, the DFC+ will exit without saving. When adjusting the set point range, the set point cannot surpass the set Low and High values. That is **120°F** to **250°F**.
- **Example:** if the Low set point is set to **150°F** the heater will start up and will reach **250°F**. then turn down to **150°F** degrees and maintain the discharge air at **150°F** until the unit is shut down or the discharge air temperature is changed. If the Low setting is not changed the heater will continue to operate at the set range weather, it is shut down or not.

➤ Newer Heaters set points...[Page 30](#)



**Main Gas Burner**

**Location Of Pilot Burner Assembly**



**Pilot Gas Burner**

**Spark Electrode**

**Flame Rod**

**Pilot Burner Assembly**

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# Control Panel and operation switches...

“Field Assist Troubleshooting Guide”



Main Power On  
Switch

2 Amp Fuse

Fan Manual Override  
Switch



Power On Light

Heat ON/Off Switch

Remote thermostat

Power Supply

➤ Back to other technical information...[Page 19](#)



- **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.

- Back to other technical information...[Page 19](#)







➤ **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.

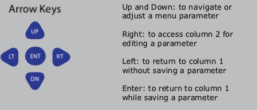
All gas piping should be free from rust and dirt inside the piping. When the heater is not connected to gas piping, ensure all connections are capped to prevent dirt entering the gas train.

➤ **Example** of gas and regulator sizing...[Page 41](#)

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- The DFC+ will always display the current discharge air temperature. Press any arrow key to change the discharge setpoint temperature. Once an arrow key is pressed, the LED will display the text for the current setpoint temperature. Use the down or up key to set a new discharge temperature, then press the middle key to save the changes made. If a key is not pressed for 10 seconds, the DFC+ will exit without saving. When adjusting the set point range, the set point cannot surpass the set Low and High values. That is 90°F to 250°F.
- **Example:** if the Low set point is set to 150°F the heater will start up and will reach 250°F. then turn down to 150°F degrees and maintain the discharge air at 150°F until the unit is shut down or the discharge air temperature is changed. If the Low setting is not changed the heater will continue to operate at the set range weather, it is shut down or not.



[back to other technical information...Page 19](#)



### DUCTWORK

This heater is designed for use with or without ductwork. Only ductwork supplied by the manufacturer shall be used with this heater. Slide duct onto the tapered discharge transition of the heater until fit is tight. Support duct as required. All attached duct should be configured to ensure static pressure at the heater discharge does not exceed .15” WC (.037 kPa).

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# DF650 Gas Train Components and test ports...

“Field Assist Troubleshooting Guide”



Main burner gas  
Pressure regulator

2 Main burner gas  
valves

Switchover valve  
Natural gas/propane

Test port for gas valves



Gas pressure regulator  
For pilot flame

Pilot Gas Valve

Variable Gas Valve

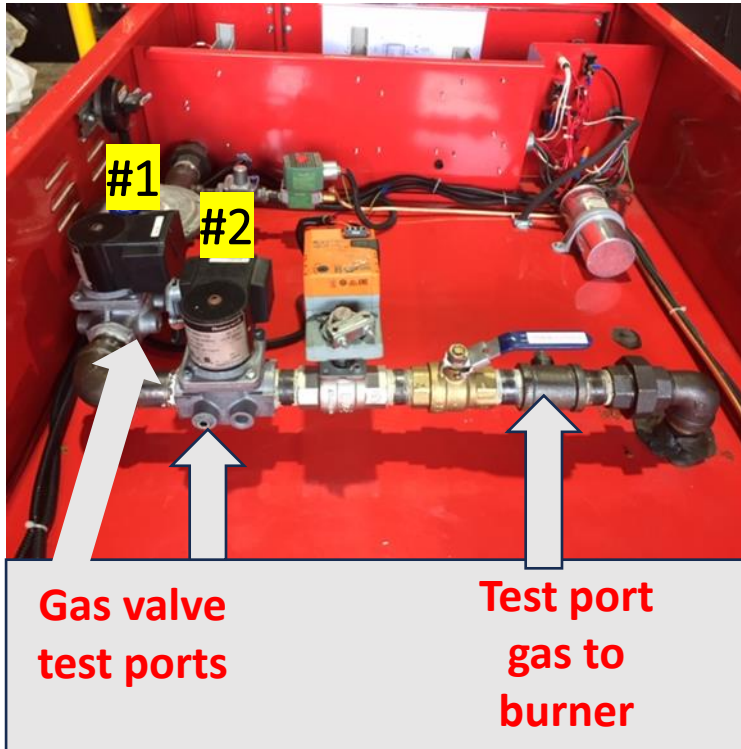
Test port for gas to main  
burner on switch over  
valve or black pipe Tee

➤ Back to other technical information...[Page 19](#)



## Natural Gas and Propane Heater Maintenance

➤ <b>Most important to</b> Check main gas solenoid valves to ensure one of them is not stuck open... <a href="#">Page 34</a>	Check
Inspect ignition cable for cracks or current leakage	✓ done
Check air switch hose for cracks	✓ done
Clean flame rod and ignition electrode	✓ done
Check wiring terminals inside control panel, tighten if lose	✓ done
Clean blower wheel (remove dust)	✓ done
Clean heater casing and check for dents <b>Note:</b> large dents effect heater performance	✓ done
Start heater and check below items...	✓ done
Gas train fittings for leaks	✓ done
Operation of thermostat /bypass	✓ done
Check and adjust gas pressure if needed	✓ done
Check control safety lock-out	✓ done
<a href="#">Back to menu...Page 19</a>	



➤ **Danger:** It is most important to check the gas valves every year to ensure one or both valves are not **stuck open**. Failure to check this can cause a dangerous situation.

To test the valves, **unplug** the heater and leave the heater off for the duration of the tests. Connect the heater to gas piping. Turn the gas off. Install your manometer into the test port on valve **#2**. Turn the gas valve on and check if there is pressure. If you have pressure valve **#1** is stuck open, defective. If you have no pressure valve **#1** is good. To test valve **#2**, Shut of the gas and install a hose between valve test port **#1**, and valve test port **#2**. Install your manometer on the test port after the switchover valve and turn the gas back on. If you now have pressure gas valve **#2** is stuck open, defective. If you no pressure both valves are good.

**Note:** Gas valve test ports are incoming pressure so there is gas pressure always in valve **#1** test port if gas is turned on and the heater turned off or unplugged.

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Propane main burner pressure **2.2"** WC

Propane Pilot burner pressure **2"** WC

Natural gas main burner **6"** WC

Natural gas pilot burner **2"** WC

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# Piping charts gas 0.6 specific gravity... “Field Assist Troubleshooting Guide”



1

.05 PSIG. Or less... [Page 37](#)



2

1 PSIG. With less than 10 % pressure drop... [Page 38](#)



3

2 PSIG. With less than 10 % pressure drop... [Page 39](#)



4

5 PSIG. With less than 10 % pressure drop... [Page 40](#)

➤ **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.

➤ Back to other technical information... [Page 19](#) ➤ How to use piping charts... [Page 41](#)

**Pipe sizing Table for 0.5 (14" WC) pounds Pressure with a 10% Pressure drop and a gas of...  
0.6 Specific Gravity**

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
3	3.068	8,500	5,900	4,700	4,100	3,600	3,250	3,000	2,800	2,600	2,500	2,200	2,000	1,850	1,700
4	4.026	17,500	12,000	9,700	8,300	7,400	6,800	6,200	5,800	5,400	5,100	4,500	4,100	3,800	3,500

**Pipe sizing Table for 1 Psig. Pressure with a 10% Pressure drop and a gas of...  
0.6 Specific Gravity**

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
<a href="#">HOME</a> 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
10.00	10.020	266718	183314	147207	125990	111663	101175	86592	76745	52747	42357	36252
12.00	11.938	422248	290209	233048	199459	176777	160172	137087	121498	83505	67057	57392

**Pipe sizing Table for 2 Psig. Pressure with a 10% 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

**Pipe sizing Table for 5 Psig. Pressure with a 10% Pressure drop and a gas of...  
0.6 Specific Gravity**

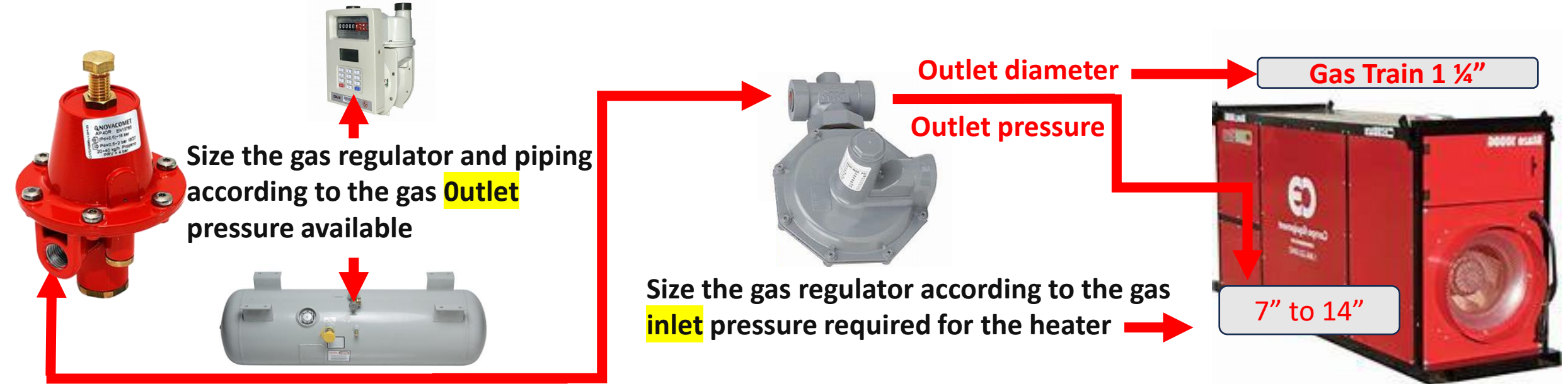
Pipe Size of Schedule 40 Standard Pipe (Inches)	Internal Diameter (Inches)	Total Equivalent Length of Pipe in Feet										
		50	100	150	200	250	300	400	500	1000	1500	2000
1.00	1.049	1989	1367	1098	940	833	755	646	572	393	316	270
1.25	1.380	4084	2807	2254	1929	1710	1549	1326	1175	808	649	555
1.50	1.610	6120	4206	3378	2891	2562	2321	1987	1761	1210	972	832
2.00	2.067	11786	8104	6505	5567	4934	4471	3827	3391	2331	1872	1602
2.50	2.469	18785	12914	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



# 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.



➤ **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.

Job sizing example... [Page 42](#)

# Pipe sizing the job site...

## "Field Assist Troubleshooting Guide"



### ➤ WHAT YOU NEED TO KNOW

Where the heater will be placed

What Pressure is available **2 Psig**

Gas type **Natural Gas**

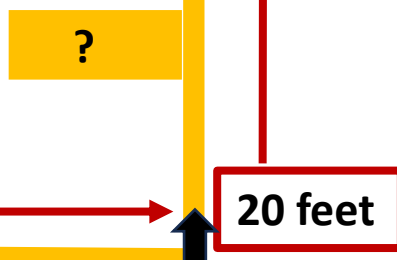
Total BTUs of all units connected to gas piping **3 million**

Length of longest run. **125 feet**

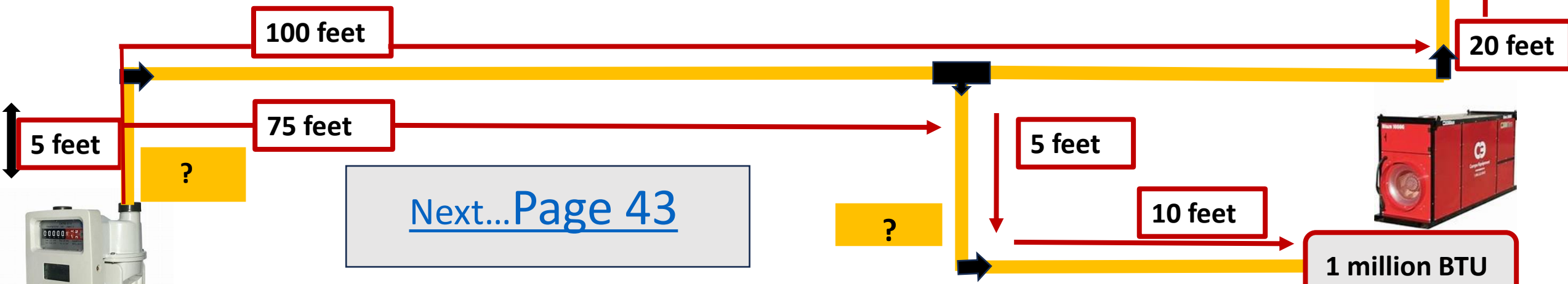
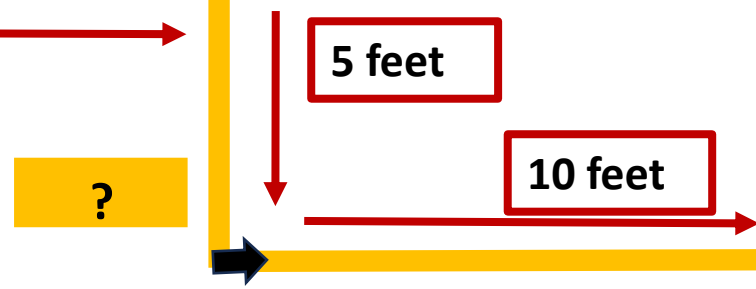
➤ Steve's Job site requiring 1 heater - **1 million BTUs** and 1 - heater **2 million BTUs**.



**2 million BTU**



**1 million BTU**



Always use total length of feet from meter to end of the branch.  
Starting with the longest run and then the lengths to the end of the remaining other branches.



**2Psig.**

# Pipe sizing...

## "Field Assist Troubleshooting Guide"



### ➤ 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**

		GAS: NATURAL													
		INLET PRESSURE: LESS THAN 2 psi													
		PRESSURE DROP: 0.5 in. w.c.													
		SPECIFIC GRAVITY: 0.60													
		PIPE SIZE (inch)													
		1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4	5	6	8	10	12
NORMAL	ACTUAL I.D.	0.822	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
CAPACITY IN CUBIC FEET OF GAS PER HOUR															
LENGTH (feet)	10	172	360	678	1190	2090	4020	6400	11300	23100	41800	67600	139000	252000	399000
	20	118	247	466	957	1430	2760	4400	7780	15900	28700	46500	95500	173000	275000
	30	95	199	374	768	1150	2220	3530	6250	12700	23000	37300	76700	139000	220000
	40	81	170	320	657	985	1900	3020	5350	10900	19700	31900	65600	119000	189000
	50	72	151	284	583	873	1680	2680	4740	9660	17500	28300	58200	106000	167000
	60	65	137	257	528	791	1520	2430	4290	8360	15800	25600	52700	97700	152000
	70	60	126	237	486	728	1400	2230	3950	8050	14600	23600	48500	88100	139000
	80	56	117	220	452	677	1300	2080	3670	7490	13600	22000	45100	81900	130000
	90	52	110	207	424	635	1220	1950	3450	7030	12700	20600	42300	76900	122000
	100	50	104	195	400	600	1160	1840	3260	6640	12000	19500	40000	72600	115000
	125	44	92	173	355	532	1020	1630	2890	5890	10600	17200	35400	64300	102000
	150	40	83	157	322	482	928	1480	2610	5330	9650	15600	32100	58300	92300
	175	37	77	144	296	443	854	1360	2410	4910	8880	14400	29500	53600	84900
	200	34	71	134	275	412	794	1270	2240	4560	8260	13400	27500	49900	79000
	250	30	63	119	244	366	704	1120	1980	4050	7320	11900	24300	44200	70000
	300	27	57	108	221	331	638	1020	1800	3670	6630	10700	22100	40100	63400

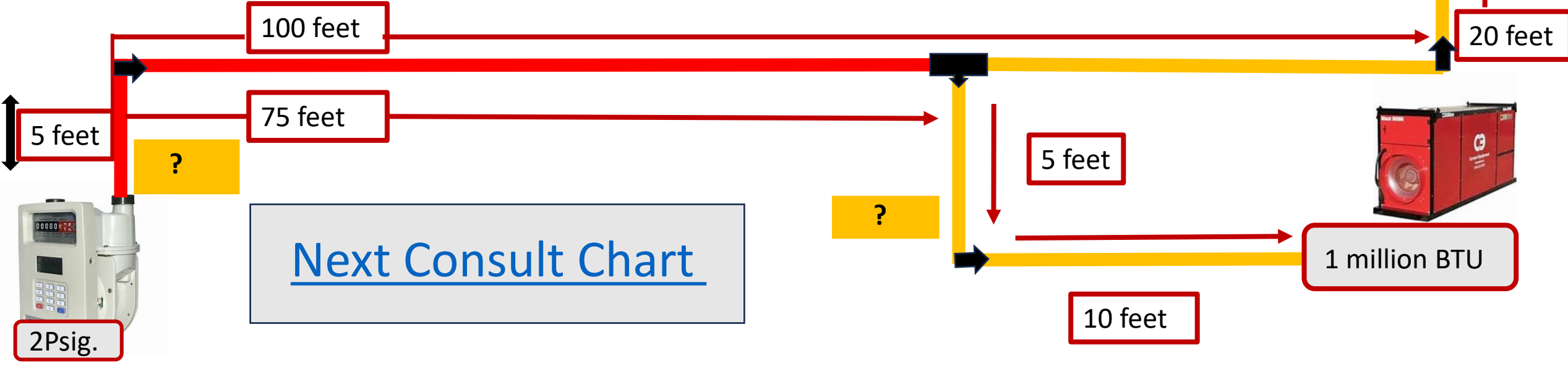


**2 million BTU**

?

**20 feet**

Find size of pipe to the first branch using your 2 Psig chart for NG.



**Pipe sizing Table for 2 pounds Pressure with a 10% 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

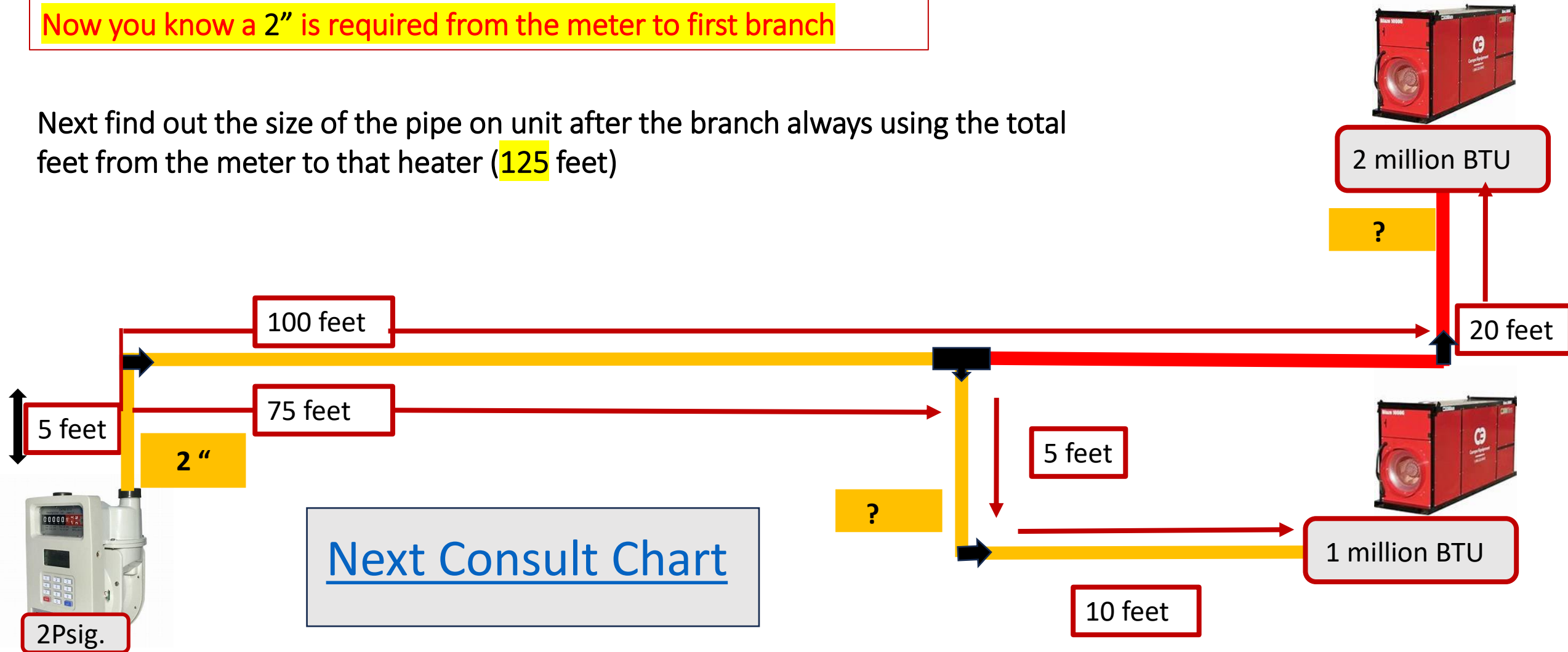
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# Pipe sizing...



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

Next find out the size of the pipe on unit after the branch always using the total feet from the meter to that heater (125 feet)



**Pipe sizing Table for 2 pounds Pressure with a 10% 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

[Next](#)

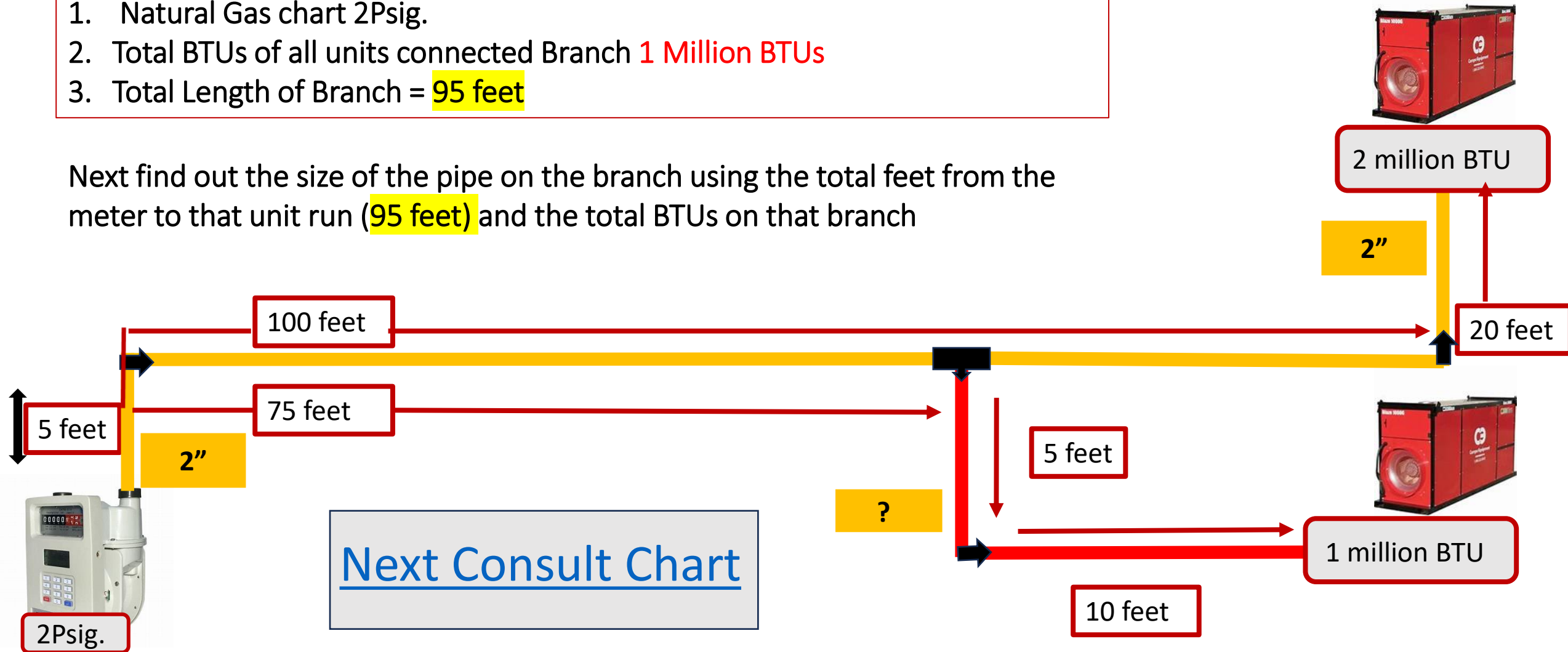


# Pipe sizing...



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



**Pipe sizing Table for 2 pounds Pressure with a 10% 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
10.00	10.020	413937	284497	228461	195533	173297	157020	134389	119106	81861	65737	56263

[Next](#)



### Piping for job complete

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



2 million BTU

2"

20 feet



1 million BTU

5 feet

1 1/4"

10 feet

100 feet

75 feet

Multiple units on a header

2"

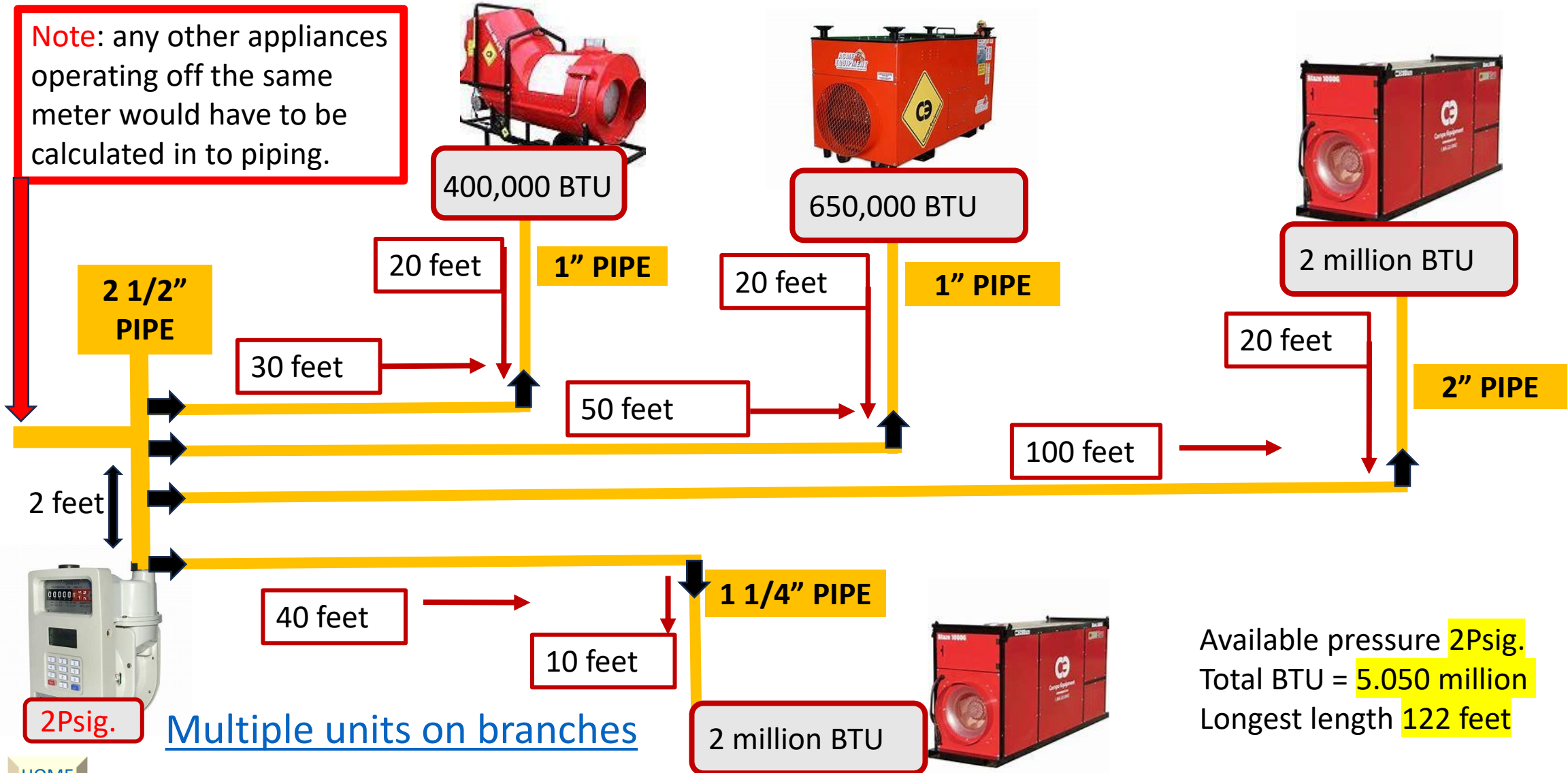
5 feet

2Psig.

# Pipe sizing multiple heaters one header...



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



# Pipe sizing multiple heaters one Main Line and multiple branches...

"Field Assist Troubleshooting Guide"

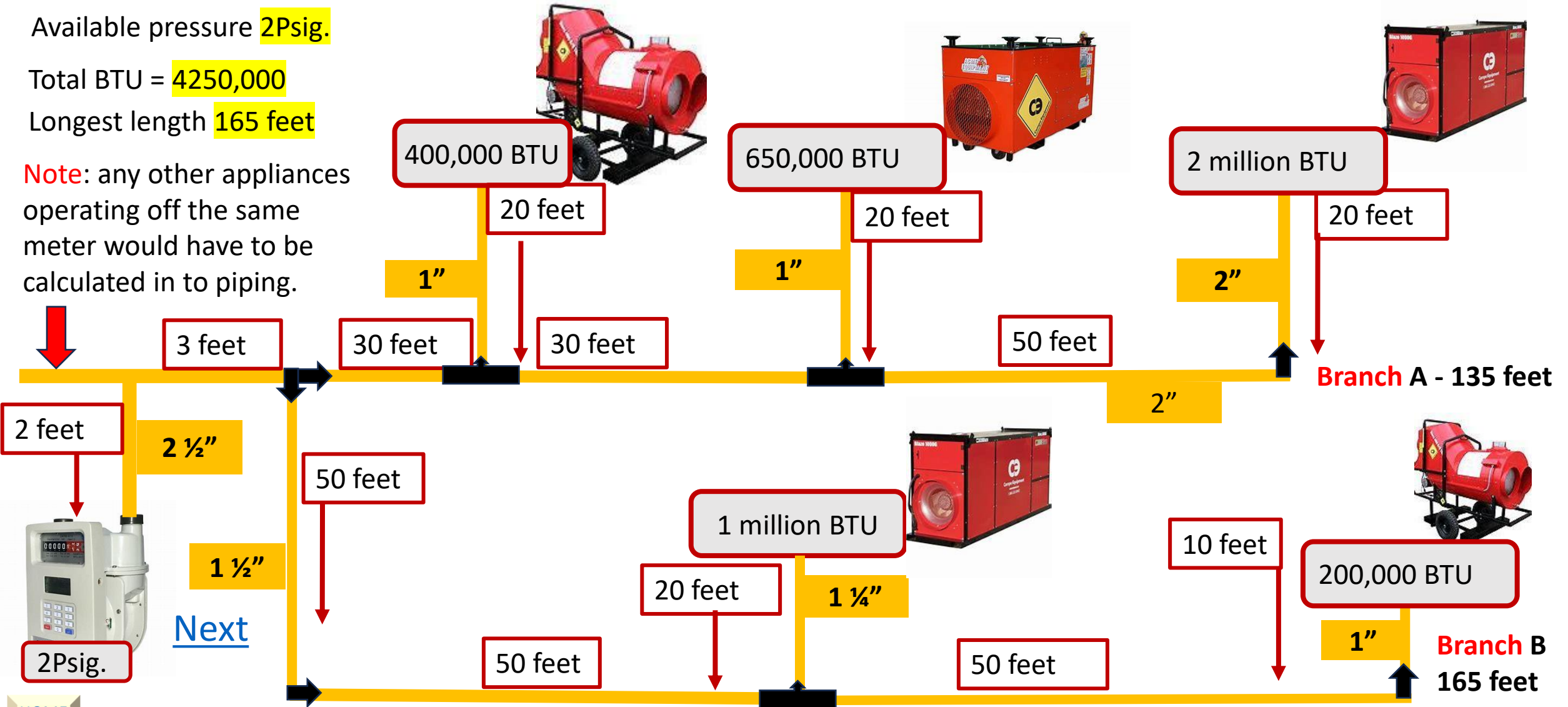


Available pressure 2Psig.

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.



# Gas pressure Comparisons...

## "Field Assist Troubleshooting Guide"



If you had Available pressure  
**0.5Psig. = (14" WC)**  
Total BTUs 3 million. Longest  
length = 125 feet  
**3" inch pipe needed**

- 1. Available pressure **2Psig.**
- 2. Total BTU = **3000,000**
- 3. Longest length = **125 feet**  
**2" inch pipe needed**

If you had Available  
pressure **5Psig.**  
Total BTU = **3000,000**  
Longest length = 125 feet  
**1 1/4" pipe needed**



2 million BTU

2"

20 feet



1 million BTU

5 feet

1 1/4"

10 feet

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

