Buzzer Troubleshooting Guide

What to do if you suspect a significant gas leak

- Do not attempt to find the cause yourself or allow untrained employees to do so.
- Do not try to light any gas furnace, pilot, or burner system.
- Do not touch any electrical switch.
- Do not use any phone in the building.
- Remind employees not to touch switches or phones, then evacuate the building.
- Leave windows and doors open for ventilation.
- GO TO A NEIGHBORING BUSINESS and CALL YOUR GAS SUPPLIER OR QUALIFIED SERVICE AGENCY IMMEDIATELY. Follow the gas supplier's or agency's instructions.
- If you cannot reach your gas supplier, CALL THE FIRE DEPARTMENT.
- Do not return to your building or allow employees to return to the building until the service call has been completed, the leak corrected, and a qualified agency has determined that the area is safe.

version 1.0

607 Albany Ave
P.O. Box 518
North Amityville, NY 11701-0518

Since Buzzer 1911

Tel: 631.842.8886
Fax: 631.842.9300
E-mail: GoBuzzer@aol.com

Your Questions Welcome: Safety First!

Please do not hesitate to contact us with any questions you, your customer, or local gas company may have - even "foolish" questions. We want you to be satisfied with your equipment from Charles A. Hones, and we welcome the opportunity to help you manage and understand your system better so you can enjoy better system performance.

If you have any questions about operation or installation of equipment described herein - STOP. Call your local *Buzzer* sales representative or distributor, or Charles A. Hones, Inc. directly. Pilot burners and flame safeties are critical components of any combustion system and should be handled only by individuals with a thorough understanding of their operation in relation to other components of the combustion system.

Troubleshooting **Quick Reference**

Further information available quickly via FAX - see page 14

If you would like to receive a copy of any of the publications referenced herein for further information, please call, write, or use the FAX-Back form at the end of this guide to receive information during office hours M-F 9-4:30 EST. For information from the general catalog, please specify which pages or topics you are interested in.

General Problems

Gas odor detected

IMPORTANT SAFETY NOTICE: This section addresses ways to remedy possible causes of FAINT gas odor. If the odor is strong, all gas must be shut off, the building ventilated and evacuated. If the leak of gas is major (for instance if you can hear it over the hum of machinery) the danger of fire, explosion, or personal injury is very real. <u>Please refer to procedures described on the cover of this manual for any gas leak of significant volume</u>.

~ NEVER use an open flame to locate a gas leak! ~

Probable causes: Gas may be leaking from the supply line (unions, nipples, elbows) from a valve (shutoff valve, gas cock, control valve, pressure gauge) or from the burner itself (missing mounting screw or crack in the casting). The smell of unburned gas can also be the result of poor venting, yellow flames, lack of air, or the orifice or gas pressure being severely over-rated for the burner.

Possible corrections: A) Check for minor leaks with soapy water solution. If the leak is from a pipe fitting (nipple, tee, elbow), remove the fitting, put pipe dope/sealer (with Teflon) on the male threads and tighten it back up. For leaks coming from a gas cock, pilot line, compression/flare fitting, or solenoid valve - even minor leaks - the item needs to be replaced. Note: check the arrow on your valve and make sure it is installed in the correct position. The arrow indicates the direction of gas flow. Also check the gas rating on the valve - many valves are only rated for 1/2 PSI. This is about 14" w/c, so if you were running gas at 48" w/c or pounds of pressure (1 PSI +), you would be exceeding the valve's rating. Please contact Charles A. Hones for a conversion chart showing approximate gas pressure in pounds, inches, ounces, and mbar. B) Check the following: Are flames waffling under your tank? Is the unit venting? (Perform a smoke test to verify.) Is there sufficient room air, secondary air, make-up air and primary air to efficiently support combustion? C) Odor is usually caused by leaking gas, poor venting or poor design of the appliance, in which insufficient space is allotted for combustion chamber, head space, make-up air, or venting. Request our "Basic Venturi Burner Needs" flyer for additional information on these aspects of design.

A word about other offensive odors: If you cannot find any leaks after thorough testing, it may be that what you are smelling is not actually the odor of unburned gas. Another strong, unpleasant odor may sometimes be mistaken for unburned gas. On a rare occasion the offending odor is from the process itself (such as cutting oil or grease being burned out of the burner), or the work being processed. In addition, aldehydes, which are produced by incomplete combustion or quenching of the gas flame on a cold surface, may be causing the offending odor. Aldehydes have a sharp, penetrating odor (worse than rotten eggs) which can be mistaken for the odor of unburned gas; often aldehydes also cause burning and tearing of the eyes. Aldehyde production is evidence of a severe and potentially very dangerous venting or appliance design problem **which is must be corrected immediately**. Further information about venting can be found in this guide on page 7 ("Venting" section) and page 13 ("Flame Roll-Out" section) and in our "Basic Venturi Burner Needs" flyer. You may also want to contact a gas professional to help you assess the situation. Charles A. Hones, Inc. welcomes any questions you have (even if we did not make the oven, forge, cooker, etc.) and will treat even the simplest with the seriousness, respect and honesty it deserves. **However, our recommendation is that you contact a local plumber for gas leaks or a local heating, ventilation, and air conditioning (HVAC) professional for venting (air out take) or fresh air (air intake) problems, as a professional on-site is generally best equipped to assess and correct problems.**

Trouble with installation / hardware / connections

Probable causes: ***Why*** won’t the parts you purchased just get together?! Unfortunately, the gas industry has many different types of threaded connections, various numbers of threads-per-inch, and many diameters. Connections between two different types or sizes of threads will require some kind of connector or adapter.

Possible corrections: First you must determine the type and size of connections you have; then you can figure out what kind of connector you need to get them together!

Determining pipe size: If you are working with $\frac{1}{2}$” to 10” diameter sch 40 steel pipe, it is possible to size the pipe pretty accurately by simply measuring and comparing your measurement to values on the chart below to determine the Pipe Size for connection purposes. For instance, if your pipe appears to be $1\frac{9}{16}$”on the inside diameter, you can assume the Pipe Size is $1\frac{1}{2}$” diameter. If you find pipe sizing awkward, you’re not alone; even experienced maintenance persons are sometimes confused by pipe sizing! The following charts should make pipe sizing a little simpler.

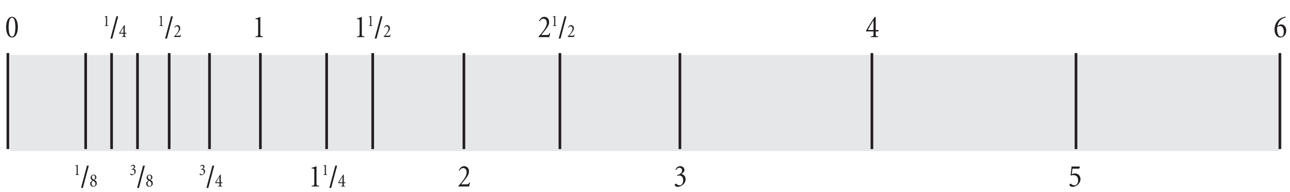
Pipe Sizing for Sch 40 Steel Pipe ONLY (ASTM A53-68 standard pipe)

Pipe Size	Inside diam.	Outside diam.	Pipe Size	Inside diam.	Outside diam.
$\frac{1}{8}$”	.269”	.405”	2”	2.067”	2.375”
$\frac{1}{4}$”	.364”	.540”	$2\frac{1}{2}$”	2.469”	2.875”
$\frac{3}{8}$”	.493”	.675”	3”	3.068”	3.500”
$\frac{1}{2}$”	.622”	.840”	4”	4.026”	4.500”
$\frac{3}{4}$”	.824”	1.050”	5”	5.047”	5.563”
1”	1.049”	1.315”	6”	6.065”	6.625”
$1\frac{1}{4}$”	1.380”	1.660”	8”	8.071”	8.625”
$1\frac{1}{2}$”	1.610”	1.900”	10”	10.020”	10.750”

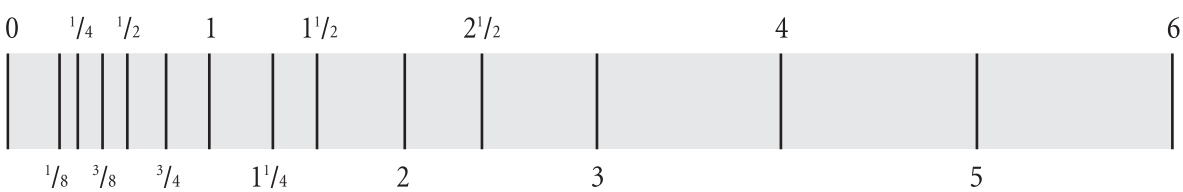
Sizing Pipe, Fittings, or Valves

You can use the guidelines below to size an item you have in your hand. Simply follow the directions for alignment, depending on whether the item has external or internal threads.

External-Threaded Pipe or Fittings: Place left outside edge of pipe precisely on the line marked “0” below. Right outside edge of pipe falls on line indicating size of pipe.



Internal-Threaded Pipe Fittings or Valves: Taking care to measure across the **center** of the inside threads, line the left inside edge of threads up with line marked “0” below. Right inside edge of threads falls on line indicating size of fitting.



Determining type of threads: Some threads have a taper to minimize leaking, while others are straight. NPT (National Pipe Thread) threads are tapered. NPS threads are straight and are used only for mechanical joining; you will not normally find them on pilot fittings . However, we have run across an occasional European valve with 1/8" R.P. threads, which are straight. These require a gasket for the seal and an R.P. to NPT fitting in order to hook up your pilot.

Determining threads per inch: Threads per inch can be determined by simply counting the number of individual threads in a one inch section of thread. If you have only 1/2" of thread, double the count to equal threads per inch. For 1/4", quadruple the count.

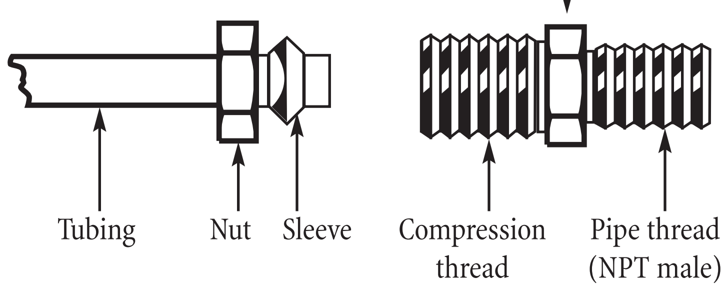
Pilot tubing connections: A.) 9 times out of 10, the compression or flare fitting we supply with our pilots are 1/8" NPT to 1/4" tubing. If you are replacing your pilot tubing and you bring ONLY IT to the hardware store, you may come home with a 1/4" fitting which cannot be connected to your valve or pilot burner; you'll have to go back for a fitting which is 1/8" NPT to 1/4" tubing. B.) Compression or flare fittings are connected to the aluminum or copper pilot tubing as illustrated below:

Assembly of Compression and Flare Fittings

Compression Fitting

(for use with aluminum or copper tubing only)

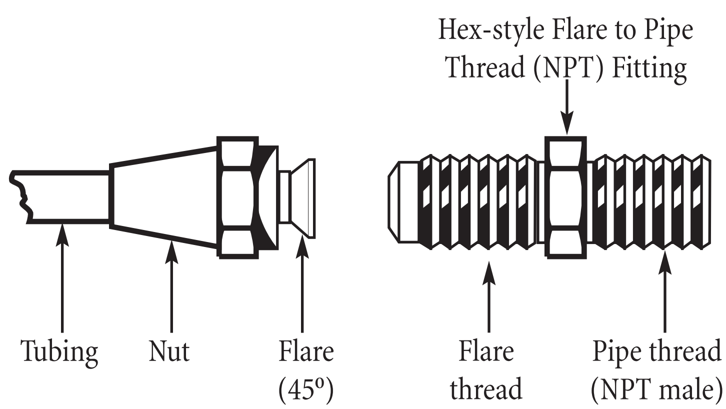
Place nut and sleeve onto tubing, then cut end of tubing to square. Insert tubing into compression fitting. Tighten nut onto compression fitting by hand, then with a wrench.



Flare Fitting

(for use with aluminum or copper tubing only)

Place nut onto tubing, then flare tubing with a flaring tool. Tighten nut onto flare fitting by hand, then with a wrench.



Problems connecting to propane: Propane connection difficulties are very common. A.) Often a regulator obtained locally cannot be connected to a burner purchased from another source because the 3/8" fitting on the regulator hose is usually a flare fitting, while the burner is likely to have a 3/8" fitting with NPT threads. The solution is to obtain an NPT to flare fitting from a local hardware store. B.) Occasionally one attempts to use a backyard-type water valve as a gas needle valve (they may LOOK alike!), but finds the threads don't match. This is because water valves have GHT (Garden Hose Thread) connections, which are incompatible with gas fittings. Good thing! Get yourself a real gas needle valve, and the problem is solved.

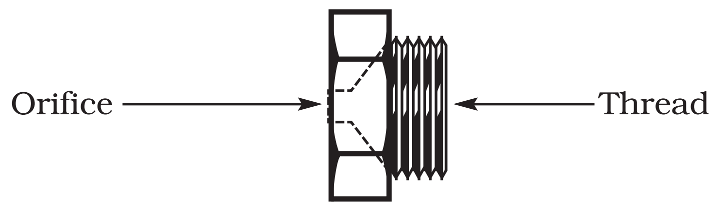
Trouble replacing orifice: Replacing one manufacturer's equipment with another's is difficult because different gas spud (orifice) and other internal fittings are available in every size under the sun. Leaks can occur when threads-per-inch do not match or one misjudges the size of orifice needed. Replacing an orifice with one by the original manufacturer of the equipment is always best. Below you will find information about parts available to replace an orifice in your ***Buzzer*** equipment. Please contact us if you would like information on how to perform this replacement.

Brass Spuds Available

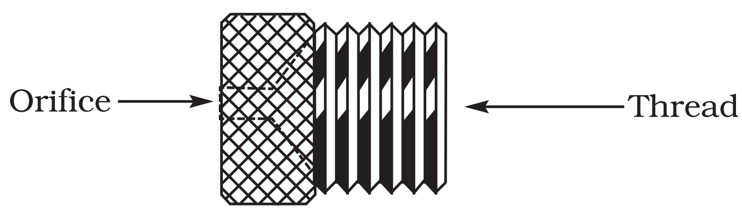
- to replace parts on Charles A. Hones ***Buzzer*** Equipment

[Number immediately before "(NPT)" indicates number of threads per inch]

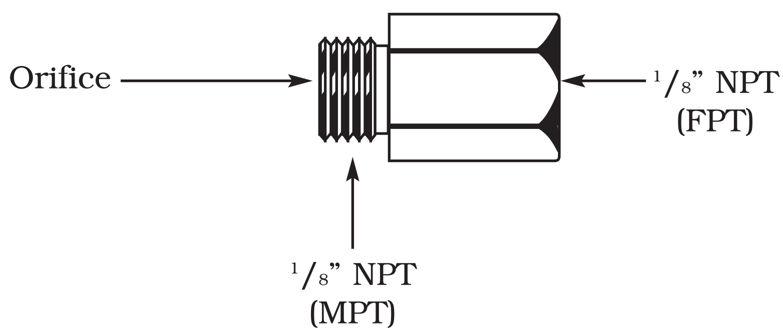
Hex-Head Brass Spuds
1/4 x 28 (this is more like 1/4" bolt/screw size)
16-36 (approx 1/16")
1/4" x 18 (NPT)
3/8" x 18 (NPT)
1/2" x 14 (NPT)



Round Brass Spuds
1/8" x 27 (NPT)
1/4" x 18 (NPT)
3/8" x 18 (NPT)
3/4" x 14 (NPT)
1" x 11.5 (NPT)
1 1/4" x 11.5 (NPT)

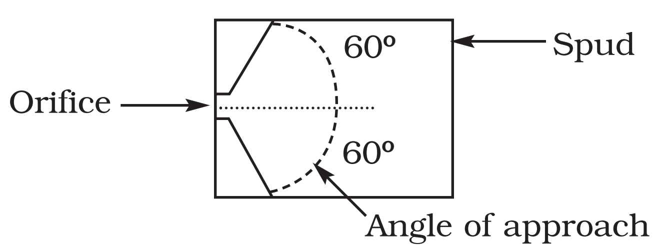


U.B. Brass Spuds
1/8" x 27 (NPT)



All orifices have a coefficient of .80.

Ordinary twist drill angle of approach is 60° or 120°, depending on your definition. (See diagram on right.)



Delayed ignition or difficulty lighting

Probable causes: Pilot flame may be improperly located or being obstructed. The problem may also be caused by excessively distant port spacing, especially on a pipe burner. Lastly, the gas velocity or mixture may simply be more than the burner design can accommodate.

Possible corrections: A.) Check the pilot; it should be positioned so that the flame easily reaches the main burner and fires across the burner, rather than aiming into the ports. (Be sure to examine the relative positions of pilot and main burner when the unit is both cold and hot, as natural draft increases with temperature.) Check mounting brackets and holders to be certain they are holding the pilot securely in its proper position. B.) The pilot should not be obstructed. Check to make sure that firebrick, insulation, or other material has not fallen in front of the pilot. Check to make sure that there is no foreign material, such as spider webs or debris, inside the pilot. Foreign material in or around the pilot is a surprisingly common cause of ignition problems, which shouldn't be overlooked. Where this stuff comes from, what it is, and how the heck it gets there may be a mystery, but often the solution is as simple as removing some puzzling junk! C.) The port spacing on pipe burners should generally be 1/4" - 5/16" on center. If ports are further apart than that, they may have difficulty tracking down the pipe. If spacing cannot be shortened, then a baffle can be positioned above the ports which momentarily contains the mixture under the plate and allows for quicker tracking down the length of the pipe. The baffle plate (see p. 53 of our ***Buzzer*** Burner Catalog 1600BR) also reduces the likelihood of the flames making direct contact with the item being heated. D.) The primary air shutter should be closed down to create a softer, richer (reducing) flame. A flame which is softer is easier to ignite and tracks better. E.) Try reducing the gas pressure or orifice size to decrease the velocity or volume or both. If your main flame is pushing past the pilot or pushing the pilot out of its path, the pilot will have difficulty igniting the main flame (delayed ignition). F.) Install a larger pilot. Perhaps your pilot is too small for the application, in which case installing a larger pilot will ignite the burners in a more reliable, secure manner. G.) You could try a new style solenoid valve with a slow-opening actuator (coil). The slow-opening feature allows for smoother ignition. (For more information about pilot types, options, and extensions offered by Charles A. Hones, Inc., ask for a copy of *Buzzer, the Latest* issue 10: "Pilot Roll-Call".)

Equipment operates too hot or too cold

Probable causes: There are many reasons equipment may not operate at the desired temperature, including improper size burner or gas pressure, poor design, venting problems, insulation problems, inadvertent adjustments to controls or valves, and damage or obstruction somewhere in your system.

Possible corrections: Begin with a thorough visual inspection of the system, from the gas line in all the way through the venting system out. You are looking for any damage, debris, loose connections, shifting of components from proper placement, or incorrect settings on valves or controls. (If you find problems with your controls, please refer to the section "Program-controlled operation unsatisfactory" immediately below.) If visual inspection does not yield an obvious culprit, consider the following possibilities:

Existing system which has operated satisfactorily in the past suddenly does not operate at the desired temperature: The most likely cause is anything that has recently changed in your system. Often a significant change in the system is overlooked because one considers it an improvement to the system. (For instance, new insulation could be the culprit if that insulation is not the proper type for your equipment or process; there are many types of insulation, and not every "good quality" insulation is appropriate for every application. Furthermore, even insulation that is exactly right for the equipment and process will not work well if it is not properly installed. Read more about insulation under "insulation problems" below.) If something has changed recently in your system, do not assume that this change could not be causing your problem. It is worth your while to consult with someone knowledgeable about industrial gas equipment; such a person has the benefit of far more experience troubleshooting and may be able to explain how a seemingly insignificant change to your system could indeed be preventing it from achieving the desired temperature. If you cannot pinpoint what may have changed in your system, browse through "specific problems" below.

New system does not operate at desired temperature: On a new installation, the problem is often using the wrong size burner. For instance, a 30,000 BTUH burner would be inadequate for a 3' x 4' BBQ with 25lbs. of lava rock; however, it would provide far too much heat and flame for a standard (12" x 18") backyard BBQ. Because of the many factors involved (type of process, insulation, gas pressure, etc.), sizing a burner for an application can be complex. We at Charles A. Hones, Inc., together with our representatives and distributors, are eager to assist you in sizing a burner for your application; this reduces the likelihood of error. While a significantly undersized burner must be replaced, a slightly oversized burner can often be made to operate quite satisfactorily by fitting it with a thermostat or temperature control. Such an addition to your system will automatically cycle the burner on and off to maintain the desired set point without the need to throttle the burner manually. In addition, a new system might not operate at the desired temperature for any of the following reasons:

Specific problems:

Venting problems: A system needs appropriate ventilation in order to achieve optimal temperature. Generally speaking, there should be one square inch of flue area per 6,500 BTUH for natural draft with no stack or chimney. The more stack or chimney you have, the more draft is created and the smaller your flue hole needs to be. If your system is not achieving desired temperature, calculate how much flue area you have and compare that to your BTUH. If flue area is well above or below the guidelines above, you will need to make corrections, as either too much or too little flue space will prevent equipment from reaching top temperature. A.) With excessive flue space, there is excessive temperature loss: the heat is literally sucked out of the process. Excessive flue area can sometimes be corrected in the field by using a damper to reduce flue area, allowing correct temperature to be achieved. B.) On the other hand, inadequate flue space will also limit temperature by making it difficult to achieve complete combustion. If the flue is small enough that the main burner flames are hazy, lazy or yellow, combustion is not efficient and temperature will be limited. Insufficient flue area can sometimes be corrected by adding a small amount of flue pipe (12" or so), which will draw more volume from the appliance, allowing it to breathe and develop well-shaped blue flames. This increase in efficiency will often lead to an increase in temperature. (For more detailed information on venting, we recommend the "Venting" section of our four-page "Basic Venturi Burner Needs" sheet.)

Gas pressure problems: Excessive or inadequate gas pressure can result in a system failing to maintain desired temperature. Increasing gas pressure will increase BTUH output, while decreasing pressure will decrease BTUH output. (For details about how increasing gas pressure increases the BTUH output of a given orifice, refer to the chart on page 22 of our Burner Catalog 1600BR.) In order to determine whether incorrect gas pressure is an issue, you must first determine how the BTUH rating of your equipment is related to gas pressure, and then determine what the gas pressure is going into your system. A burner or furnace may be capable of achieving a range of BTUH outputs depending upon several factors including gas pressure. If, for example, a burner is rated at 120,000 BTUH at 6" w/c, it will produce 120,000 BTUH at 6"w/c, but significantly less at 4"w/c, and significantly more at 8" w/c. Using gas pressure that is significantly higher or lower than the range a particular component was designed to handle will not produce satisfactory results and can be dangerous, so it is vital to know what pressure your equipment was meant to run on. Some burners and other components are specifically designed only for low pressure, or only for high pressure, gas, and cannot be safely operated otherwise. Once you have determined the rating on your equipment, you should measure the actual gas pressure on your line at the point where your system operates. In our experience there is sometimes a significant difference between the pressure a utility company states is being supplied to the building and the actual pressure available on the line at the point where the system operates. Pressure is lost for many reasons, including being divided and regulated among multiple pieces of equipment. Pressure can be lost due to the number of elbows and turns and the diameter and length of the gas pipe. The only way to know what is actually available for your combustion process is to measure gas pressure on the line just before it enters your valve train/system with a pressure gauge designed to measure pressure in the range you have entering the building. Please contact Charles A. Hones for a conversion chart showing approximate gas pressure in pounds, inches, ounces, and mbar.

Insulation problems: Insulation must be rated for the temperature at which you intend to work, of an appropriate type for the application, properly installed and in good repair for your equipment to reach full temperature. A.) Begin with a thorough visual inspection of your insulation. You are looking for wear, damage, shifting, or gapping. These kinds of flaws suggest that insulation may need to be repaired or replaced in order for your equipment to reach temperature. B.) If insulation is properly installed and in good repair, determine the temperature it is rated for. Confirm that the rating is adequate - it should exceed your highest working temperature by a comfortable margin or 200ºF. C.) Finally, consider whether the insulation you are using is appropriate to your application: do you need a lightweight insulation with a low thermal storage value that heats and cools quickly, or a heavyweight insulation with a high thermal storage value that heats and cools slowly? Using the wrong kind of insulation can make it very difficult for your equipment to reach full temperature. If you are uncertain what type of insulation you have or need, consult a professional. For a list of insulating material available through Charles A. Hones, please request our "Refractory Guide".

Trouble with digital controls

Probable causes: Often when a program-controlled process is unsatisfactory, it is because the digital control is not programmed properly or functioning properly. It is wise to rule out controls as the source of your problem whenever possible.

Possible corrections: Control may need re-wiring, re-programming, re-setting or the addition of a separate relay for adequate operation. In addition, sometimes a control is simply not designed to operate in the manner needed for a particular process, in which case it must be replaced or have additional equipment added to perform as needed. Sometimes setting a control to auto-tune corrects unsatisfactory performance. For instance, it is often helpful when control is overshooting or undershooting set point temperatures. The auto-tune function will automatically set the cycle time, and proportional band parameter, as well as a host of other settings. However, we have found that on rare occasions the control selects a cycle time that is too low (3 or 4 seconds), which will need to be manually re-adjusted. (For more on overshooting and undershooting, see details below.)

Control appears to be operating, but does not execute the expected program: A.) Review the program carefully, step by step, to be sure that each part has been entered correctly. (You may need to consult the manual or even the manufacturer to be certain you understand how the program should be entered.) The program you find may look little like what you thought was in there - sometimes, quite unexpectedly, digital controls will revert to default settings. This is a most unwelcome but all too common occurrence. If your control is not programmed exactly as it should be or has reverted to default settings, you will need to re-enter your program into the control. B.) Make sure that your control is designed to do what you need it to. Most controls will ramp up from a cold start to a set point, but not all of these can then go on to hold that set point and then advance automatically to a second set point; if you need complex ramping capability, you will need a ramping control. C.) If your ramping control does not operate on a schedule properly, check to be sure that a 24 hour x 7 day timer is installed in the control panel, programmed properly, and wired properly. For a Watlow 982 control, check the programming carefully, and confirm that the event input prompt (in the global menu) is set for File 1, File 2, etc. Look over the wiring for loose or incorrect connections. Though it is not very clear in the instruction booklet, you need to install a jumper between terminals 21 and 22.

Control cycles on/off, on/off, on/off in rapid succession: With Watlow 93,982, and 988 digital controls, you can adjust the cycle time in your PID menu. Default settings on many controls range from 1 to 5 seconds. I generally recommend a cycle time setting of 15 to 30 seconds.

Control read-out obviously in error: A.) Control may need to be re-programmed. Review the program carefully, step by step, to be sure that each part has been entered correctly. (You may need to consult the manual or even the manufacturer to be certain you understand how the program should be entered.) B.) If your furnace is operating correctly, but readings are running in reverse - even into negative numbers - or displaying an error code, it is almost always a wiring problem on the sensor. It often happens when the thermocouple is replaced and wires get hooked up backwards. On very rare occasions, the thermocouple itself is at fault, being labeled incorrectly or assembled incorrectly. For a type "k" thermocouple, the yellow wire goes to the positive (+) and the red wire goes to the negative (-). If this connection looks right, confirm that the thermocouple itself is not backwards; the negative leg is magnetic, while the positive leg is not. If this doesn't solve the problem, check the point where the wires connect to the control. Again, yellow wire to the positive (+) terminal, red wire to the negative (-).

Temperature control is too cold ("undershooting the set point"): Undershooting is often the fault of the proportional band parameter on a digital control. On a Watlow control, this is found in the PID menu. A.) If the temperature begins cycling way before the set point is reached and after 15 minutes of cycling in the neighborhood of the set point (without actually achieving the set point), I would suggest adjusting the PB setting. If the PB is set for 25 (a standard default setting on Watlow control instruments), adjust it down to 15. The control will now keep the burner on 'til it hits a temperature closer to the set point. The temperature will then continue to drift up after the burner shuts off and hopefully it will hit the set point without overshooting by a great margin! B.) If this slight adjustment to the PB does not achieve the desired result, you can lower the cycle time. Cycle time is the length of time the control sits idle from when it shuts off until it calls for heat again. If your current cycle time is set for 30 seconds, try adjusting it to 15 seconds. [NOTE: generally on burners equipped with on/off solenoid valves, we don't adjust the cycle time under 10 seconds Excessive rapid cycling of the burner will quickly wear out your solenoid valve and result in excessive extinction pop. A solenoid valve equipped with a low-fire bypass will work better on rapid cycles and have smoother characteristics switching from high flame to low flame.] C.) Burners equipped with intermittent pilots (in which both the burner and the pilot are off when the control is not calling for heat) will sometimes have trouble reaching temperature. Many spark ignition controls with intermittent pilots have a pre-purge time (1 to 25 seconds) in which the control calls for heat, but is delayed by the purge cycle before the ignition control cycles the burner on. In severe cases, you may have to set your PB to 0 (zero). This turns your control into an on/off control in which the burner remains on until the temperature reaches the set point.

Temperature control is too hot ("overshooting the set point"): Overshooting is often the fault of the proportional band parameter on a digital control. On a Watlow control, this is found in the PID menu. A.) If your temperature is going way past the set point indicated on your control, you can try adjusting the PB to a higher number, for instance from 25 to 35. The control will cycle off sooner and drift to a lesser extent, and hopefully not overshoot the temperature as drastically. B.) You can also adjust the cycle time and increase the delay between turning off and coming back on. We have had customers with melting furnaces or salt baths successfully adjust this setting up to two minutes!

Control doesn't seem to work properly with complex valve train: New digital controls have a solid state output, which puts out power of about .5amps. While this is enough to power one solenoid valve, it is insufficient to power multiple solenoids, ignition controls, mercury contactor switches, electrical elements and the like. For a complex system, output from the control needs to be wired to a separate relay, and from that relay it can be wired to other components. Pre-packaged controls from Hones are available with additional relays pre-wired within the enclosure.

Extinction Pop

Extinction pop occurs when the burner turns off and may be followed by burning at the orifice for a few seconds. In some cases the "pop" is delayed for a couple of seconds.

Probable causes: Generally extinction pop is caused by that last small amount of gas passing through the orifice with little pressure or velocity behind it. Extinction pop is generally not a problem and will not damage your equipment or burners. However, in the rare case where extinction pop is severe enough to blow out your pilot, the problem needs immediate correction (reduction).

Possible corrections: A) Close down the primary air shutter (see p. 4 of ***Buzzer*** Burner Catalog 1600BR or attached sheet) which will reduce the volume of the gas/ air mixture and should reduce the "pop". B) Try increasing the velocity of your mixture by increasing the gas pressure. Increased pressure will make it harder for the gas flame to get sucked back into the nozzle at extinction. C) Reduce the orifice size this serves to both increase velocity slightly while at the same time reducing the volume of the gas/ air mixture. D) Try moving the shut off valves closer to the orifice so that when the valve closes less gas will be trapped between it and the orifice. This generally help reduce extinction pop which is followed by a small amount of gas burning at the orifice or delayed extinction pop. E) If the above steps do not tame the extinction pop enough to keep pilots lit you will need to replace your pilot with a larger model or arrange it in a different location. (For more information about pilot types, options, and extensions offered by Charles A. Hones, Inc., ask for a copy of ***Buzzer****, the Latest* issue 10: "Pilot Roll-Call".)

Flame Color Problems

"Candle" yellow flames or flames that are blue with "candle" yellow tips

Probable cause: Lack of primary air - the air that mixes with the gas stream within your ***Buzzer*** Venturi (see four-page "Basic Venturi Burner Needs" sheet). Adequate primary air is required for complete and proper combustion.

Possible corrections: A) Open your primary air shutter (see p. 4 of ***Buzzer*** Burner Catalog 1600BR or attached sheet) to allow more air into the Venturi mixer. B) Check the drilling of the orifice to make sure that the orifice hole is located within the center of the brass spud. An orifice which is out of alignment will not entrain sufficient air, resulting in yellow flames. C) Check the throat of your Venturi for obstructions such as spider webs (found in BBQ equipment, pottery kilns, outdoor equipment, or anything not used for a couple of weeks), nests (commercial / seasonal cooking equipment), water (outdoor / hose down areas), or debris (floor sweepings, soot, dirt, paper or material from processing). D) Check the size of your orifice. If your orifice is to large, it may pass more gas then the Venturi can handle. This often happens if a burner set up for natural gas is used on propane. If the orifice is only slightly oversized (yellow tips), the addition of extra mixing space should remove yellow from the flame. A second option would be to remove a 90 degree elbow from between the Venturi and nozzle. This would slightly increase flow velocity through the burner, allowing more primary air to be entrained into the Venturi. E) Check your gas pressure. If your gas pressure is higher then required (i.e. you only need 5 to 6" w/c but your gauge is reading 15" w/c) your orifice may be passing far more gas then the Venturi or burner can handle. Most ***Buzzer*** **"low pressure"** Venturi burners are set up for 5 to 6" w/c Natural Gas or 10-11" w/c Propane Gas.

Orange flames mixed with shades of blue and red

and / or

Glitter or sparkle visible in the flame

Probable cause: Generally caused by particles of dust or dirt mixing with the primary air and gas within the Venturi mixer. It often occurs with new equipment and lasts for a couple of hours until dust within the Venturi, burner, and new piping is consumed. Orange flames are also often present in areas where welding is done or material is cut or machined, causing smoke or fine particles which can be entrained into the Venturi. This temporarily creates orange or glittery flames.

Possible corrections: This is generally a short lived problem, and unless orange or glittery flames are very severe and prolonged, they will not effect burner performance. In severe cases, (where residue builds up inside the Venturi) the burner can be removed and cleaned out with a bottle brush. Larger items such as nozzles can be cleaned out the same way, while smaller items such as burner heads can be blown out with compressed air.

Flame Stability Problems

Fluctuating flames (flames alternately bigger and smaller)

Probable cause: Fluctuating flames are generally caused by your gas pressure fluctuating higher and lower. If other equipment is sharing the same gas line as it cycles on and off it will cause the pressure in the line to rise and fall.

Possible corrections: A) To correct fluctuating flames start with the pressure regulator. In most cases the regulator will hold pressure to the equipment steady even as the line pressure fluctuates. B) If there is a regulator on the line and the gas pressure is fluctuating the regulator may be defective. Most gas pressure regulators have a internal rubber membrane (diaphragm) inside which can become worn and fail. This is often associated with frequent venting on regulators which include a vent. **Do not attempt to repair the diaphragm - the regulator should be replaced**. C) Fluctuating gas pressure is occasionally associated with single stage regulators used on propane tanks which are nearly empty. *Note: When placing a new pressure regulator into service you will need to know what the gas pressure in the line is, what gas pressure is required for your equipment, the BTUH rating of your equipment and the size of your gas line. Pressure regulators come in three basic models 1) Pounds pressure to pounds pressure. 2) Pounds pressure to inches pressure. 3) Inches pressure to inches pressure.*   For a list of regulators available through Charles A. Hones, including sizes, capacities, and types, please request our "Regulator Information". D) On occasion fluctuating flames can be caused by a partial blockage in the Venturi or orifice. This blockage can be caused by problems such as rust in your gas pipes, spider webs, or paper sucked up into the Venturi. Any blockage needs to be corrected.

Wavering flames (flames waving from side to side)

Probable cause: Wavering flames are generally the fault of air blowing down the vent (flue) and into the combustion chamber. Air can also blow in through secondary air ports causing main flames or pilot flames to waver.

Possible corrections: A) Wavering flames caused by air blowing down your vent can be corrected by installing a downdraft diverter on your stack. A downdraft diverter directs the wind coming down your flue pipes into the shop rather then into your combustion chamber. Rotary diverters which install outdoors on the roof also prevent air currents from blowing down the stack and assist to increase draft away from the equipment on windy days. B) Wavering flames can also be caused by air currents entering into the combustion chamber through secondary or primary air openings. Such openings can be protected from fans, blowers, or wind with sheet metal shields and expanded metal coverings.

Coughing or pulsating flames (flames have "on again - off again" look)

Probable causes: Excessive port area results in flames getting sucked in, then clearing out, only to get sucked in again. Occasionally a coughing or pulsating flame is the result of inadequate air/gas mixing space.

Possible corrections: A.) Increase the size of the orifice to balance out the excessive port area. The larger orifice will admit more gas thus increasing the volume of the gas/air mixture. B.) Increase the gas pressure which will also increase the flow through the orifice. If you can increase the gas pressure from 10" w/c to 14" w/c propane, the effect will be the same as increasing the orifice size you've just increased your BTUH output. C.) Reduce your port area. If you have fabricated your own pipe burner, you can weld shut the ports (holes) closest to the mixer, which also serves to increase your mixing space. D.) Coughing can also result from a lack of mixing space most likely the result of borderline fuel/air mixture to support combustion. If this is the case, the addition of a nipple and coupling to extend the outlet length of the Venturi will help. You can also add a 90 degree ell between the Venturi and burner, which provides some extra mixing space as well as slowing down the velocity of the mixture, allowing it more time to mix before it reaches the first port.

Flame Location Problems

Lifting flames (well-shaped blue flames lift or blow off burner)

Flames are lifting or blowing off the tops of burner ports or blowing off the end of the nozzle. Flames may intermittently "dance" above the burner, or continuously burn above the burner, or blow off the burner completely. Lifting flames are generally all blue, have good shape, and may be somewhat noisy, in contrast to the softer hazy, waffling effect of floating flames (see entry immediately below for more on floating flames).

Probable causes: The volume of fuel and air are exceeding the port area of the burner causing the flames to lift. On occasion too much velocity (gas pressure) will push the flame off the nozzle or port.

Possible corrections: A.) Reduce primary air shutter in order to reduce amount of air entrained into the Venturi. This decrease in volume may settle the flames on the burner. B.) Reduce the size of the orifice. If the orifice is too large, the volume of gas passing through may exceed the port area of your burner, causing flames to lift off. C.) Reduce the gas pressure to the burner. For instance, reducing the pressure from 5" w/c natural gas to 3 1/2" w/c natural gas would have the same effect as decreasing the orifice size. D.) If the amount of BTUH required cannot be reduced, then the port area of the burner can be increased slightly, which will also reduce the flow velocity. E.) If you have a new style solenoid valve with flow adjustment installed on your gas line, you could reduce the gas flow to the burner until the flames stop lifting off the burner. This can also be done with a conventional limiting orifice valve.

Floating flames (hazy, waffling flames appear to be reaching for air)

Floating flames which are all blue or blue with yellow on the tips. Hazy and waffling under the tank, they look like a sci-fi special effect. Flames appear to be reaching for air. Flames may come out of pilot ports and may even extinguish your pilot and shut down your system. (Not to be confused with lifting flames, which are well-defined, may be noisy, and lift or blow off burner entirely, as detailed immediately above.)

Probable causes: Incomplete combustion is taking place. This can have several different causes, many of which involve a lack of secondary air. There may simply be inadequate provision for access to secondary air, or inadequate head space for complete combustion to occur. Poor venting can also lead to a lack of secondary air; if products of combustion can't vent out, new, fresh air can't come in. Finally, incomplete combustion is sometimes caused by running more burner (BTUH) than your appliance is designed to handle.

Possible corrections: A) Check your venting to make sure products of combustion are exiting your system. Use a smoke test in order to find out if movement of air from the floor and out the vents is going in the proper direction. For improper venting, contact a local heating, ventilation and air conditioning (HVAC) professional. B) Check secondary air provisions. You should have about one square inch for each 7,000 BTUH. If you don't have enough secondary air space, or all the space is available only at one end, additional openings need to be created. C) Head space is the space between the top of your burner and the item being heated. For nozzle burners, it is the space from the end of the port to the target brick, bag wall, diverter brick, or any object the flame strikes. The space can be increased by raising the object further from the burner or lowering the burner further away from the object. We recommend that on pilot or new projects, the angle iron supports that hold the burner to the frame of your tank, oven, cooker, etc. be secured with nuts and bolts so the design can be easily modified. Avoid spot welding the whole assembly together, especially in areas where adjustments may need to be made. D) If floating flames occur briefly only when the burner first comes on, the use of a new style slow-opening solenoid would be recommended.

Flame roll-out (flames literally rolling out from under appliance)

The burner flames roll out from under your oven, kiln, cooker, tank, heat treat furnace, smokehouse, or appliance. This is a very extreme case of floating flames.

Probable causes: Either the flue is mostly blocked, or head space or provisions for secondary air are grossly inadequate. Can also be caused by way too much burner for the appliance or job.

Possible corrections: A) Check for flue blockage, fallen bricks, insulation, structural material, or broken baffles. Check the passageway from the combustion chamber to the flue. On older furnaces and processing equipment, check hearth supports and bracing for anything that may have "given out" and is now blocking the burners. On newer equipment, check design, secondary air, head space, venting, and BTUH rating of burners. B) Follow all correction procedures for section 8 "Floating flames" C) If flame roll out occurs briefly only when the unit first cycles on the use of a slow-opening solenoid would be recommended. D) If multiple pipe burners are being used within a confined space and are to close together the burner located in the middle may not receive adequate secondary air. In this case you can often see the middle burner floating within the combustion chamber looking for a air source. To correct the problem the middle burner orifice can be reduced so that less air would be required. If this does not correct the problem then the burners need to be positioned further apart. E) Homemade burners with three rows of ports may have the same problem in which the center row of holes do not receive enough air and burn hazy and float about looking for air. On occasion reducing the orifice will correct the floating flames without having to replace the burner.

Flashback (burner operates correctly for a period, then "flashes back" to burn at orifice)

Probable cause: Generally caused by excessive port area, resulting in such a low flow velocity that the flames get sucked into the burner and burn at the orifice.

Possible corrections: A.) Try reducing the amount of primary air for a softer, less turbulent flame. This will sometimes overcome ports which are too shallow, such as a pipe burner made of tubing or sch. 10 or 20 pipe. B.) Often the port area is too great for the size of the orifice, which can be resolved by increasing the orifice size or increasing the gas pressure. The extra volume will generally prevent the flame from getting sucked back into the Venturi. C.) On older burners or equipment that has seen heavy use, the nozzle or burner head may be distorted or burned out. Such a mushroomed nozzle or burned out port creates excessive port area and requires replacement. D.) If the nozzle or burner head are getting too hot or the pilot flame is positioned to fire into the main burner rather than across the main burner, the flame will occasionally get sucked into the burner. Try readjusting the pilot or reposition the main burner to reduce the amount of "red" heat it is subject to. E.) If flashback occurs when the flame is throttled into a low position, the low setting should be increased. F.) **If flashback occurs when the burner is in the off position and continues to burn at the orifice, this indicates a dangerous gas leak from a safety valve, solenoid valve, or shutoff valve which *must be replaced immediately*.**

Troubleshooting Guide FAX-Back Form

Charles A. Hones, Inc.

Manufacturers of ***Buzzer*** Industrial Gas Equipment
607 Albany Ave
North Amityville, NY 11701-0518 USA
Voice: 631.842.8886 **FAX**: **631.842.9300**

For troubleshooting information returned via FAX M-F 9-4:30 EST, please complete this form and fax to Charles A. Hones.

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- ☐ Please send "**Basic Venturi Burner Needs**" flyer
- ☐ Please send information from ***Buzzer*** **Burner Catalog 1600BR**
  (Indicate page # or topic:____)
- ☐ Please send a copy of ***Buzzer, the Latest*** **issue 10**: "**Pilot Roll-Call**"
- ☐ Please send gas pressure conversion chart (includes inches w/c; OSI; PSI; mbar)
- ☐ Please send orifice replacement instructions
- ☐ Please send Refractory Guide
- ☐ Please send Regulator Information
- ☐ Please send other information (Specify:____
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