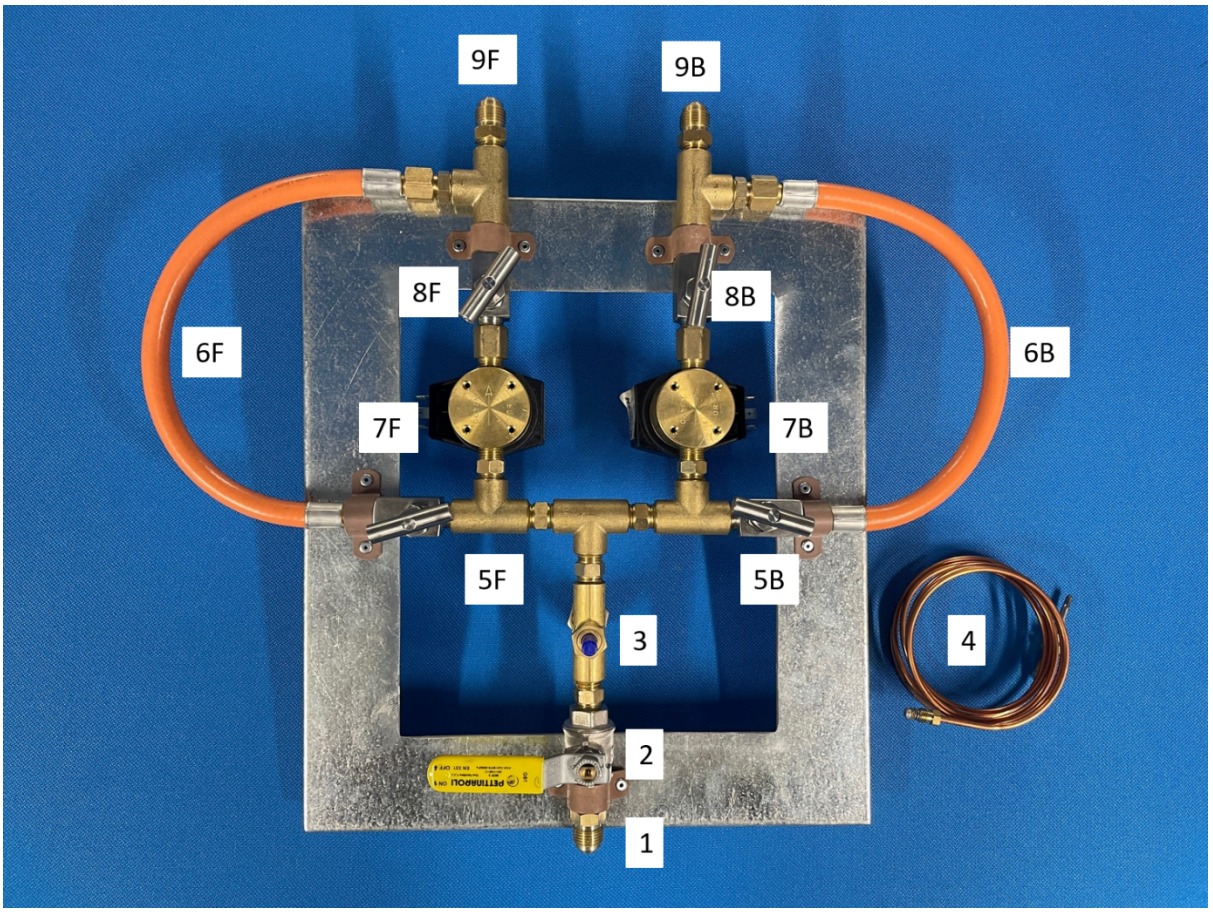
DOUBLE BURNER PID FORGE INSTRUCTIONS V1.1

The following is a basic installation instruction for the Gameco Artisan Supplies forge controller kit. The forge controller kit can be fitted to many types of forge designs to give accurate measurement and heat control. These components to do not constitute compliance however Gameco has made every effort to ensure our product selection complies with the requirements of AS 3814 (Australian Standard for Industrial and Commercial Gas Fired Appliances) it remains the responsibility of the forge builder and their authorized type B appliance installer to ensure they comply with all appropriate regulations and standards.

Important Warnings:
To be installed and commissioned by an authorized person in accordance with all codes and standards.
The solenoid coils will get hot during use. Very hot. This is normal and expected.
Do not exceed 1300C with this system fitted to your forge. It is possible to run at higher temperatures however there will be considerable expense in converting to higher temp thermocouples.
Do not operate at pressures over 500 kPa

COMPONENTS

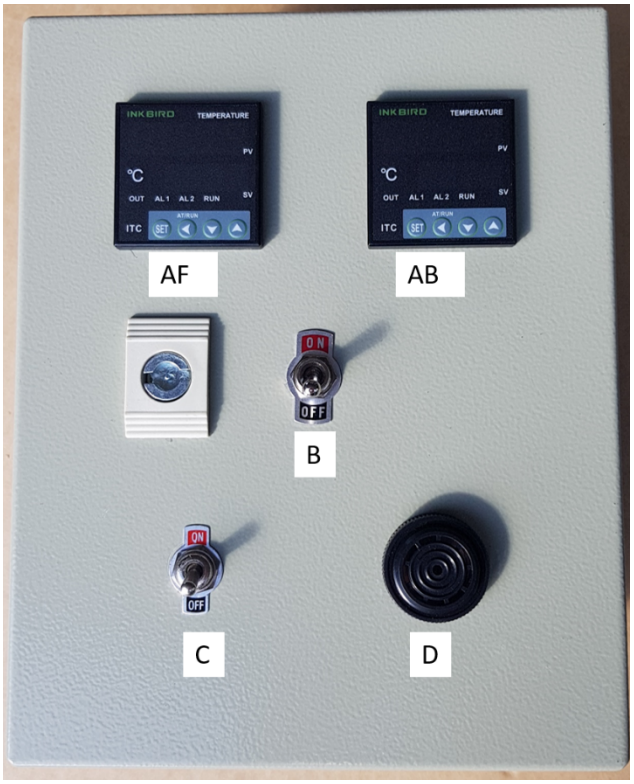
Gas Train

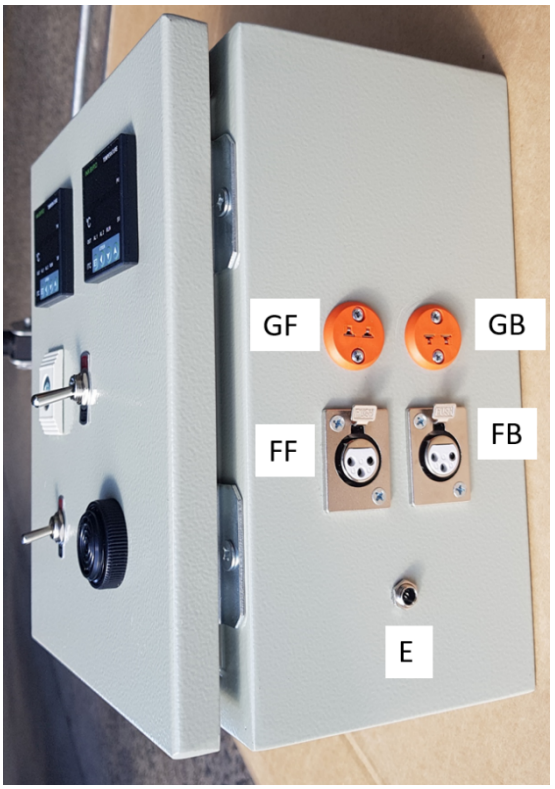


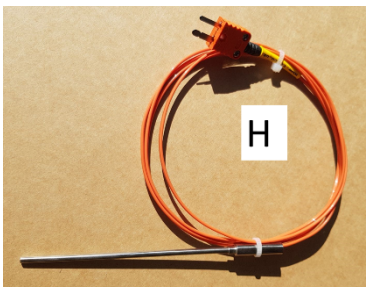
1) Inlet Connection (connection to gas supply up to 500 kPa LP Gas)
2) Main shut off valve

3) Flame Supervision Valve
4) Flame Supervision Thermocouple
5) "F" Front Burner Bypass needle valve ("Colder" valve)
   "B" Back Burner Bypass needle valve ("Colder" valve)
6) "F" Front Burner Bypass
   "B" Back Burner Bypass
7) "F" Front Burner High Pressure 12V solenoid valve
   "B" Back Burner High Pressure 12V solenoid valve
8) "F" Front Burner Main Flame needle valve ("Hotter" Valve)
   "B" Back Burner Main Flame needle valve ("Hotter" Valve)
9) "F" Front Burner Gastrain Outlet to burner
   "B" Back Burner Gastrain Outlet to burner

Control Box and Associated Equipment





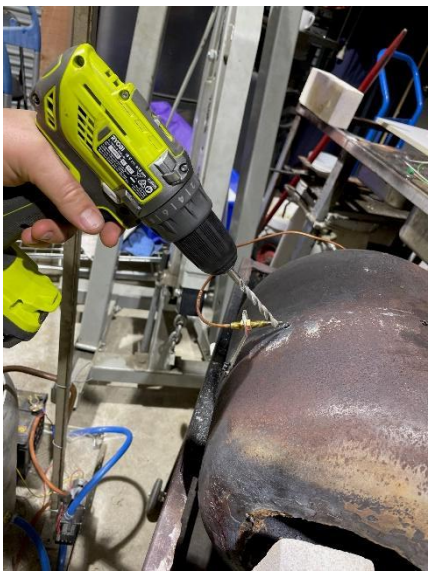


A) Front and Back Burner Programmable Controller

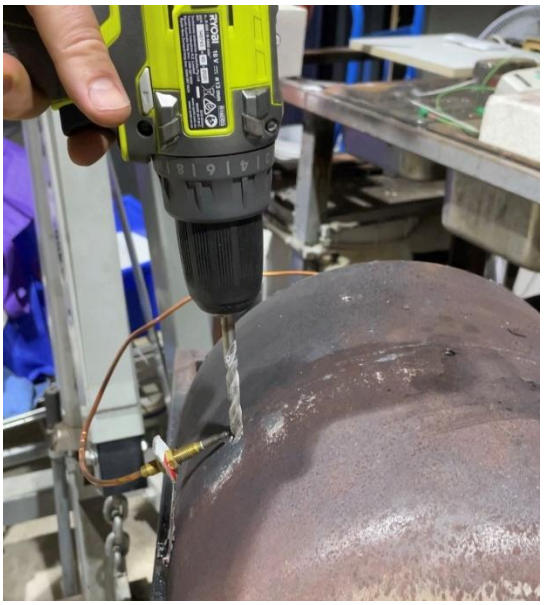
B) Main Power Switch
C) Alarm Power Switch
D) Alarm
E) 12V Dc power in
F) Front and Back Solenoid power out
G) Front and back Control Thermocouple outlet
H) 2 x Type N Control Thermocouple
I) 12 Volt Power Supply
J) 2 x Solenoid Power Cable

SET UP

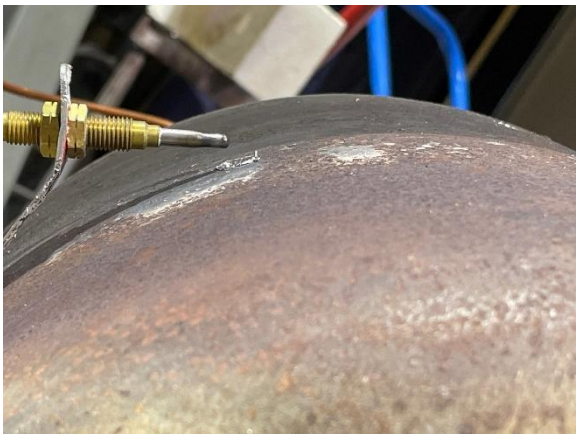
1) The control box and valve train should be mounted in an appropriate location where it will not be subject to heat in excess of 50°C or mechanical damage, yet is easy to operate and see and protected from mechanical/hot metal damage. It should be rigidly fixed and we recommend 3/8" 10mm copper tube and flare fittings to connect the valve train and main burner. Two hoses are provided for burner connection for testing purposes and could be used for permanent connection if deemed appropriate on your appliance by the installer. The mounting bracket can be drilled as appropriate for mounting in your situation.
2) Select a suitable location for the power supply (I), where under no circumstances can it come into contact with hot metal. This is the only 240volt component.
3) If you have a Gameco Artisan Supplies forge kit (any of the double burner variants), disconnect your hoses at the unions where they connects to your existing burner assemblies. The valves currently on the burners can be left in place. This connection (the 3/8" FSAE swivel connection on the hose) is screwed together without tape or sealant.
4) If you have large Gameco Burner (1") we recommend removing the jets from the inspirator of the burners, check that the hole size is between 1 and 1.2mm.
5) Connect the existing supply hose from the cylinder to the inlet of the valve train (1)
6) Connect the valve train outlets (9) to your burners using the connection hoses provided if appropriate or copper pipe. Ensure the front is connected to the front burner and the back burner to the back burner.
7) Connect the copper thermocouple (4) to the bottom of the flame supervision valve (3). Do this connection up without tape or sealant hand tight + ¼ turn with wrench
8) Mount the tip of this thermocouple such that it will get hot when the front burner is on. Ideally it should be mounted in a location where it will sit at around 600C. If it does not get hot enough the valve will not work. Or will take too long to hold on (In excess of 60 seconds) or shut off (In excess of 45 seconds). If it gets too hot it will burn out prematurely.
9) We have a suggested method that suits our preferred forge design:
    a. On the opposite side to the front burner mark the midway point between the side and the top of the forge and drill a 7mm dia straight through the forge at an angle of approximately 45 degrees as shown in the pictures.



b. Insert the drill TIP ONLY into this hole and raise the drill to vertical to elongate the upper edge of the hole. This prevents hot gasses rising when the forge is turned off from keeping the thermocouple heated.



c. Make a bracket from sheet material as shown in the pictures below and mount the thermocouple so that just the tip is located towards the bottom of the hole with an air gap approximately 5mm. ensure plenty or room for adjustment during setup phase.



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C) Make a bracket from sheet material as shown in the pictures below and mount the thermocouple so that just the tip is located towards the bottom of the hole with an air gap approximately 5mm. ensure plenty or room for adjustment during setup phase.


10) Drill two holes in the forge body approximately 4mm dimeter through the insulation, at a location near where you will be heat treating your blades, and install the type N control thermocouples into these hole. This hole should never be in direct flame contact. We recommend under the burners in a cylinder forge. The thermocouples should protrude 20-25mm into the forge.


11) Plug the solenoid Power cables (J) and control thermocouple (H) into the control box sockets (F) and (G). ensure that the front burner control thermocouple goes into the front burner socket and likewise the solenoids are also plugged into the correct sockets
12) Turn on gas and valves 2, 5F, 5B and 8F, 8B and while depressing the blue button on the flame supervision valve 3, check all fittings and connections for leaks using soapy water. If the burners are fitted with a shut off valves at the burners, have them closed at this time, only open to test the final connections. If the burner is not fitted with a shut off valve the

forge will fill with gas during this time. Perform test in a well ventilated space, away from sources of ignition and allow at least 5 minutes for gas to disperse before proceeding.

13) Fix any gas leaks.
14) Open valves 2, 5F and 8F and close valves 5B and 8B , depress the blue button and hold this button in while you light your front burner in the usual manner. Keep the button depressed for approximately 30 seconds and it should stay on when released. If it does not stay on the flame supervision thermocouple is too far away from the flame, move closer or increase the hole size to 8mm. If it stays on after just a few seconds the flame supervision thermocouple is likely getting too hot and will not last. 20-30 seconds is ideal. This test should be performed at the lowest anticipated burner flame setting.
15) Turn the front burner up to the maximum anticipated burner setting and run hot for several minutes. Turn off the gas at the main shut off valve (2) and hold your hand on the flame supervision valve (3) ensuring you feel an audible click as it shuts off within 45 seconds. If it takes longer to shut off than 45 seconds move the flame detection thermocouple away from the heat slightly and return to step 14. This will take some trial and error.

Operation

16) Starting with a cold forge, Open valves 2, 5F and 8F and close valves 5B and 8B, connect the control box to power and turn it on. Ensure the Alarm, the bottom switch (C) is in the OFF position.
17) Using the three arrow keys on the front and back controls set the digits on the display to the desired temperature in degrees Celsius.
18) Depress the blue button on the flame supervision valve (3) and light the forge in the usual manner. Keep the blue button depressed until the flame remains on.
19) Watch the front temperature controller on the forge and wait for it to nearly reach the desired temperature. When it is close to reaching temperature and before it does, turn OFF the needle valve 8 and adjust the bypass needle valve (5F) (The colder valve) until the temperature is no longer climbing and just starting to drop. Getting colder. Say 1 degree a second or less.
20) Ensuring that the solenoid is on indicated by the “out” light being illuminated on the controller, turn on the needle valve (8F) until the temperature JUST starts to rise. Again 1 degree a second or less.
21) With these two valves set in this manner, when the solenoid is off the temperature should fall slowly. When the solenoid is on it should rise slowly.
22) The control should now automatically hold temperature on the front burner within a few degrees by alternating between the two burner settings.
23) The rear burner control should be reading low, slightly open the bypass valve 5B and ensure the temperature does not rise under the rear burner if it does the valve is too far open. Then open the Hotter (main valve 8B) until the temperature under this burner starts to rise.
24) Some further adjustment on all valves may be necessary to balance the system. Remember when the solenoids are closed, temperature should be dropping, when solenoids open the temp should be increasing.
25) During adjustment if the burners flash back and you hear a noise as combustion occurs in the venturi, immediately shut off the burner, adjust the air mixture by closing the air shutter. This is also important if the burners start to “woof”.
26) If the controls appears to fluctuate a lot it is likely having difficulty with any time difference between when it makes a change and when the system registered the change. This indicates the PID settings are not ideal for your setup. To rectify, press and hold the set button until the control enters its menu system. Press the set button repeatedly until the control reads CtrL. Use the arrow keys to change this from 3 to 2. Wait for about 15 seconds and the

control should return to the main screen and be flashing AT and the set temperature or fire rate. Leave it alone and touch nothing until it stops flashing AT. This is the Auto tuning mode and will automatically set the PID settings to get optimum results. It will run through several cycles before changing the PID settings and accuracy should improve. Each control should be auto tuned one at a time.

27) The Alarm. To use the alarm, decide what temperatures deviation you want the alarm to go off at high and low. Press the set key to enter the menu system and change DHAL to the high alarm limit deviation and DLAL to the low alarm limit. Again using the arrow keys. If something goes wrong and the temperature increases or decreases the alarm will sound, but only if the alarm switch (the smaller toggle switch on the front panel) is switched to on.
    Example: Control is set and holding 800C. If DHAL is set to 15, the alarm will go off if the temperature reaches 815C and if DLAL is set to 15 the low alarm will go off if the temperature drops below 785C
    The front and back controllers control alarms separately so both will need to be set.
28) NOTE once the forge reaches temperature and has been sitting at temp for some time it will require less heat to stay at temperature and at this point you can re set the needle valves in the same manner as before. This will be the biggest reason it will over shoot.
29) Once you set the needle valves and everything is working ticketyboo you can use the yellow handled ball valve to turn off the forge and leave everything set ready to go for next time. If you want to heat treat at different settings (say stainless steel) you can re adjust the needle valves from step 14, often valve 8 can be left as set requiring only very minor adjustment.

If you have any issues please let Gameco know and please let us know all feedback also.