Geil Kilns Company

Automated Geil Kiln

Controller Operation and Reference Document

This document describes the use and operation of the

Fuji Controllers

Used to control the Fully Automated Geil Kiln

Quick Start Information:

There is no quick start.

Do NOT attempt to operate your kiln
without *completely* reading this document;

Your warranty is void if you
use your kiln without reading this manual first.

For those who hate reading manuals…

This is not a manual. Imagine that you are a pilot.

This document describes how to fly your plane.

You are flying children.

Crashing is not an option.

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Introduction

Congratulations on your purchase of the finest downdraft gas kiln made anywhere in the world. The Geil Fully Automated kiln allows you to precisely program a firing to achieve specific temperature and atmosphere conditions that can be repeated firing after firing. Thus once you have determined a firing profile that achieves the ceramic goals you like, the fully automated features of the Geil Kiln allow you to remove the uncertainty and disappointment that can come from firing most manual gas kilns.

Instead of squinting at half-invisible cones at temperatures over 2300°F or examining the amount of carbon and the length of the flame coming out the top spy in order to determine if your firing is proceeding properly (you can still do these things and you are strongly encouraged to continue doing this even when the computers are operating the kiln), you will be able to look at the control panel (a photograph is presented in Figure 1) and, if you are using it, a remotely attached computer operating the TKC software, and know that your firing is working properly. A separate manual describes the operation of the TKC software.

Please do not hesitate to mark this introduction and reference document with questions, notes and observations. Please send any suggestions for improving the clarity, readability, or usability of this document to Geil Kilns Company.

Remember: you will not be able to operate your kiln until you have read and understood this document. Your warranty will not apply if you attempt to operate the kiln without reading this document. If you are unsure of any operation described in this document, contact Geil Kiln Company before operating your kiln.

Automated Firing

Automated firing of the kiln uses the same basic firing principles and procedures that you would use in manually firing the kiln. To increase the temperature of the kiln, you would generally increase the gas pressure and/or open the gas valve some known amount. To increase the reduction, i.e., to reduce the amount of oxygen in the kiln, you would move in the damper. Most potters may have used or seen a thermocouple which can be

used to measure temperature, often with digital readouts. Some potters may have access to oxyprobes, which also give a reading that describes the amount of oxygen in the kiln. As reduction increases, the amount of oxygen decreases. (There is always *some* oxygen in the kiln even at high reduction levels. It is not much, perhaps only a few millionths of a percentage. Regular air has about 21% oxygen, for reference.)

The automated kiln does these same tasks in the same way. To increase the temperature, the temperature controller opens a gas valve. This valve is not a simple "open" or "closed" valve, but a proportional valve. Thus the controller will adjust the valve open just a hair, or a lot, depending on what the firing profile calls for. (All temperatures used for the Geil Kiln controllers must be in Farenheit degrees; thus all degrees shown in this manual are in °F.) To increase the reduction, the atmosphere, or "auto-damper" controller, moves the damper in using a precision motor connected to the damper blade.

Both controllers get information they need from two sources: first, you, by supplying the firing profile, and second, the probes on the kiln, which gives each controller, respectively, a temperature reading and an oxygen reading. The controllers, which are computers, then adjust both the proportional gas valve (to change the temperature) as well as the damper motor (which changes the damper and thus the atmosphere, or oxygen level, inside the kiln.)

To operate the kiln successfully and safely, you need to know what a firing profile is, how to enter it into the controllers, how to start, monitor, and stop a firing, and also how to operate the kiln manually, with some, or no, help from the controllers. This manual will explain each of these procedures carefully. Once you are comfortable with your kiln, you may also want to try some more advanced operations, also described in this manual.

Figure 1: The Control Panel for the Automated Kiln

Figure 1 shows the control panel for the kiln. By the time you have finished this manual, you will be familiar with every button, dial and light

on this panel. For now, let's walk through the photograph, starting in the upper left corner. The black display panel in the upper left has a label called the "Process Temperature Controller"; from now on we'll use the term 'temperature controller'. This panel is actually the front face of a Fuji PYX controller; this controller—actually a programmable computer—controls the temperature inside the kiln.

In the upper right of the photograph is the "Auto-Damper Controller"; this Fuji Controller controls the damper and thus the atmosphere, or oxygen level, inside the kiln. From now on we'll call this the "atmosphere controller".

In the center left of the panel is the "Hi Limit Override Controller"; this controller is connected to a separate temperature probe than the temperature controller; it is included here as a backup safety shutoff system in case anything goes wrong with the temperature controller. More on its operation later.

Along the bottom of the control panel are 4 switches. They are described below, left to right.

The first (left most) switch is a toggle switch and controls the power to the panel and thus the kiln. Turning on and off the kiln with this switch triggers a complex series of operations in the kiln. Power to the kiln via this switch is different than simply plugging or unplugging the power cable into the wall socket. **Never turn off the kiln by unplugging the power cable.**

The next switch is a spring-loaded push button switch, which is used to turn on the Hi Limit Override Controller.

The next switch is also a spring-loaded push button switch, which is used to light the pilots.

The final, right most switch, is again a spring-loaded push button switch, which turns on the main gas valve.

The single green and two orange lights above these switches are indicators and will be fully explained, along with the buttons, in the section of the manual which deals with starting up and firing the kiln.

Overview

The Temperature and Atmosphere Controllers work together to operate the kiln. They are not connected to each other, however. Each operates independently even though the actions of one controller will affect the other, just as would happen if you were operating this or any kiln completely manually. You push in the damper and the temperature goes up. If the temperature climbs too fast, you compensate by turning down the gas. Later, you turn up the gas to keep the temperature climbing, but this might create too much reduction, so you pull out the damper. This lowers the reduction but also lowers the rate of temperature climb, so you have to go back and forth with these two actions to keep the firing going the way you want. The controllers do exactly the same thing but the difference is that they never get bored or tired, and they can make tiny adjustments to both the damper and the gas valve that a normal human would never be able or willing to make.

Each controller has two modes of operation. The first, or default, mode is the "operation" mode, in which the controller is either waiting patiently for some instructions or is actually running a firing. The second mode is the "program" mode in which you enter in parameters that will control the firing, including the command to start the firing.

The photograph in Figure 1 shows the control panel in the 'operation' mode. This is the default mode. (If you enter the program mode and don't make some change within 2 minutes, the controller automatically goes back to the 'operation' mode.)

It is strongly recommended that you plug the power cable from the controller panel into an uninterrupted power supply (UPS). If for any reason the local power company's power is interrupted during a firing, the kiln will shut off, the program will of course be interrupted, the damper will be left wherever it was when the power went off and consequently your firing may well be compromised. If the power comes back on even in a minute, you will likely scramble to recover the momentum of the firing, which will involve not only the full startup procedure (described below) but also determining where in the firing profile you were at the time of the power loss and reprogramming the controllers to start at that point in the cycle. You will also have to compensate for the loss of temperature in the kiln during the power outage in your programming, or simply go forward manually. This would be a major scramble—all of these efforts can be avoided with the proper installation of a UPS.

Before we get into the details of how to program the controllers, we need to know what kind of firing is desired.