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DYNATROL INSTRUCTIONS (Blue Version – 4.2)
includes Dynamic Zone Control

Congratulations! You have just purchased one of the new DynaTrol automatic temperature controls with "Dynamic Zone Control". This is an easy to use control which should give you many years of service.

Suggestions? Firing Tips? Corrections? Please phone, fax or email us with your suggestions, firing tips, unique uses, applications, or corrections. These instructions are a work in progress. We intend to create a place on our web site for continual updating of this kind of information. The DynaTrol is a truly great control. However, we want to keep improving both the control and the instructions. Please help us and our other customers.

What Control this manual applies to: This manual is for all DynaTrols made after 4/1/2003. They have a distinctive BLUE face (instead of the Green face of the previous versions. The major changes include reconfiguring the face buttons, having the thermocouple and cone offsets preprogrammed for our ceramic protection tubes, and allowing you to link a Vary-Fire program to an Easy-Fire program for slow cool down. The thermocouple protection tubes were improved as of October 1, 2004 which allowed us to reduce the thermocouple offset from +50°F to +18°F and eliminate most cone offsets.

TYPE CONVENTIONS USED IN THIS MANUAL

BUTTON = This type font equals a button that you hit on the face of the control
`DISPLAY` = This type font equals what the display shows

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CONTROL PRECAUTIONS

- The controller is used to control temperature, it is not a safety device.

- Do not <u>operate</u> the controller in temperatures above 125°F or below 32°F (NOTE: The board components are rated for 50°C below zero so the control (and kiln) can be stored outside in a covered area).

- Never leave your kiln unattended at the end of a firing. (The Delay feature gives you control over this).

- The controller contains electronic components which are sensitive to static electricity. Before handling the controller dissipate any static charge you may have by touching metal or a screw on the controller panel, the electrical box, the kiln lid, or some other grounded object. Pack in anti-static treated material or paper. Do not pack in plastic bag or untreated material.

- Be sure that the kiln has been set up properly. For Easy-Fire kilns see the specific Easy-Fire Assembly Instructions. For Davinci and Jupiter kilns: the kiln sections are numbered with a small sticker on the end of each section's powercord. The top section on any L&L kiln is section #1. The #2 section is always the section directly under the #1 section on any sectional L&L kiln. On three section kilns section #3 is the bottom section. On kilns with more than three sections, sections are numbered 1 through 4 or 1 through 5, top to bottom. Likewise, the top thermocouple is labled #1 and should be in the top section of the kiln. The #2 thermocouple is the bottom thermocouple in a two section kiln. The #2 thermocouple is the middle thermocouple on three or more section kilns. The #3 thermocouple is always in the bottom section of the kiln. It is imperative that your kiln is set up like this. Be sure to double-check this even if you set up the kiln yourself.

- When hooking up the thermocouple wires to the thermocouples on the kiln the RED wire goes to the NEGATIVE side (right) of the thermocouple connection block and the YELLOW wire goes to the POSITIVE side (left) of the thermocouple connection block. Always check the position of the thermocouple probe on the inside of the kiln before starting a firing. The current temperature displayed on the controller is measured at the end of the thermocouple. NOTE: If the thermocouple tip (where the temperature is measured) is back inside the brick insulation of the kiln (even a little bit) it will make the control think that the kiln is not as hot as it really is. That could lead to an overfiring! The thermocouple tips should be 1" to 1-1/2" in the kiln (as measured from the inside of the kiln side kiln wall. Some of L&L's thermocouples have plastic connection blocks on their cold ends. Inserting the thermocouple more than 1-1/2 inches into the kiln could put that plastic connection block too close to the stainless steel outside of the kiln, causing it to melt.

- Always review the current program before firing to ensure the correct profile is programmed.

- We recommend having your kiln shut off by a manual fused disconnect switch located near the kiln. That way you can turn off all electricity to the kiln when you are not using it. This would prevent any sort of accidental turning on of the kiln by an electrical surge.

- Follow the other precautions listed in your Kiln Instructionsand in the Troubleshooting Guide.

SETTING UP THE SECTIONS

Be sure to set up the sections, thermocouples and plugs in the proper way or the kiln will not work properly.

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DYNATROL SPECIFICATIONS

Thermocouple Input: Type K (Note: we do have Type S available by special order)
Accuracy: +/- 10°F
Cold Junction Compensation: Electronic
Power Input: 24 Volt Center Tap Transformer / 50 Hz or 60 Hz
Outputs 1 & 3: 150mA at 12 VDC, one 12 volt relay with 80 ohm coil per output
Output 2: 600mA at 12 VDC, one to three 12 volt relays with 80 ohm coil per output
Output 4: 150mA at 12 VDC, one optional 12 VDC relay with 80 ohm coil per output
Operating Temperature Range: 32°F to 125°F, 0°C to 52°C (See the notes in the Frequently Asked
Questions Section concerning "What Ambient Temperature Conditions do I need for control?")

GETTING STARTED (FIRST FIRING)

TEST FIRING TO CONE 5

Once a certified electrician, kiln expert, or yourself has set up the kiln properly and connected it to the
proper power supply, and once ALL of the safety precautions for fire hazards and kiln safety have been
thoroughly accounted for, you are ready for the test firing. The test firing must be done with nothing in the
kiln except the furniture kit, (if you ordered one) stacked how you would do so normally, and a cone 5 self-
supporting cone or cone pack in each zone of the kiln; top, middle, and bottom. The test firing will take
approximately 17 to 19 hours to complete. Be sure to monitor the kiln from time to time. Especially watch
it in the first few hundred degrees to be sure that the kiln was set up properly and then at the end of the
firing to be sure the location you have chosen is safe and that everything is working properly. Follow these
steps to program and run the test firing:

Power to the kiln is **ON** (kiln is plugged in), turn the toggle switch **ON**, display reads **ErrP**.
Press **1** and wait until you see **IdLE**, **tC2**, and the current temperature cycling over and over again.
Press **SLOW BISQUE** and see **S-bc**.
Press **ENTER** and see **ConE**, and a one, two or three digit number flashing back and forth.
Press **5,** and see only the number **5** in the display.
Press **ENTER** and see **HLd**, **00.00** flashing back and forth.
Press **ENTER** and see **CPL** for about three seconds, then see **IdLE**, **tC2**, and the current temperature cycling over and over.
Press **Preheat** See **HLd**.
Press **300** so the display reads **03.00**.
Press **ENTER** and see **CPL.**
Press **START/STOP** to begin the test firing.

Basically, this is a "Slow Bisque" program to cone 5 with no hold at the final temperature and a three hour
preheat. While this test firing is running use this time to familiarize yourself with the rest of the features
and options on this kiln.

If you plan on using the kiln for ceramics or for any application where you want it to heat up to a particular
CONE NUMBER, read in particular, the PROGRAMMING instructions for the EASY FIRE programs.

If you plan on using the kiln in a situation where specific TEMPERATURES must be reached at specific
rates, read in particular, the PROGRAMMING instructions for the VARY FIRE programming.

OVERVIEW: HOW THE DYNATROL WORKS

When electrical power is connected to the Dynatrol, the display will be lit , and either **ErrP** or **StOP** will be displayed. Pressing 1 now will show first, how long the last firing took, and then, **IdLE**, **tC2**, and the current temperature will be cycling over and over in the display. This cycling **IdLE** message means that the Dynatrol is on, ready to be programmed, but the kiln is not running yet. The current temperature is measured at the tip of the three thermocouples (**tC1, tC2, tC3**). If the thermocouple wires are connected to the thermocouples and if the tips of the thermocouples are inserted inside the kiln, the current temperature displayed is the temperature inside the kiln. The default thermocouple reading is **tC2**. In other words unless you specifically ask the control to show you the temperature at **tC1** or **tC3** then it will only show you the temperature at **TC2**. This is done by simply pressing the #1 button to see the temperature at **tC1**, or the #3 button to see the temperature at **tC3**.

When the **START/STOP** button is pressed once either a "Easy Fire" or "Vary Fire" profile has been selected, the Dynatrol starts to increase the temperature in the kiln towards the first set temperature at the programmed rate of rise. The kiln will be cycling (clicking) on and off to accomplish the exact rate of temperature rise. When the displayed temperature reaches the first set temperature in the first segment, the first hold phase can begin. If there is a hold time programmed in this segment, the Dynatrol will hold at the first set temperature for the programmed amount of hold time until the ending of the first segment of the firing. The second segment ramp stage then begins with the temperature increasing toward the second set temperature at the second ramp rate. Once it reaches the second set temperature it will hold there if there is a hold time programmed for the second segment (if there is no hold time then it simply goes on to the next segment). The control keeps going through this sequence until the end of the firing profile.

With the Vary Fire mode you may program six different programs with up to eight segments in each program. Each segment has a ramp rate (set in degrees Fahrenheit or Centigrade, heating or cooling, per hour), a set point temperature (the temperature that ramp rate will heat or cool to) and an optional hold time at that temperature for up to 99 hours and 99 minutes.   In the "Easy Fire" mode, the number of segments and the firing profile are preset according to the Easy Fire Temperature Profiles shown in Appendix A. The ramp portion of a segment need not always be increasing in temperature. You can program a decrease in temperature at a specific rate also. The Dynatrol actually accomplishes the temperature rise by establishing what's called a "traveling set point".

WHEN YOU HAVE LESS THAN THREE THERMOCOUPLES

If your kiln has only two thermocouples you will not be able to find **tC3** as there is no third thermocouple. The Dynatrol comes pre-programmed from the factory for your kiln's particular specifications.

If your kiln only has one thermocouple many of the features in the Dynatrol are not even needed. Rather than seeing **IdLE** and a **tC1**, **tC2**, or **tC3**, you will only see **IdLE** and a temperature flashing on and off. Likewise any menu choice which controls relationships between the different "zones" in the kiln will either not even appear in the menu or if in the menu or will not affect the Dynatrol's operation using only one thermocouple.

PROGRAMMING
4.1 EASY FIRE

The "Easy Fire" mode allows you to fire to a CONE NUMBER at one of four different speeds and then hold at that final temperature if you desire. These are the four preset "Easy Fire" programs that have been designed to do most typical ceramic firing cycles. They are "**Fast Bisque**", "**Slow Bisque**"," **Fast Glaze**" and "**Slow Glaze**". These preset programs have specific ramps and speeds built into them. You can enter any cone number up to cone 10*(see note below) as a final temperature, a hold time at that final temperature, a delay time and even a preheat time can be added as as options. This allows for some degree of customization while still keeping the programming simple and easy.

The "Easy Fire" mode uses the Orton Foundation's patented method to achieve the correct heat work making these programs ideal for firing ceramics. The advantage of using the "Easy Fire" method is that a very complicated firing profile may be chosen with just a few key strokes (see Appendix F for these firing profiles). These program's final temperature set points are based on a 108°F temperature rise per hour for a large Orton self-supporting cone (rather than the small Orton cones or regular large Orton cones).

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TIP
* NOTE: Some L&L Kilns are not designed to go to cone 10 or 2350°F. Consult your kiln's control panel label for the maximum operating temperature.

4.1.1 To use EASY FIRE:

Make sure **IdLE**, **tC2**, and the temperature are flashing. Pressing the **1** key will clear the display of **ErrP** or **Stop** messages.
Press one of the four easy firing profile buttons: **SLOW BISQUE** or **FAST BISQUE** or **SLOW GLAZE** or **FAST GLAZE**.
Press **ENTER.** You will see **S-bC**, **F-bC**, **S-GL** or **F-GL**
Type the cone number you want to fire to (for instance **05**).
If you type a wrong number, press **000** until all zeros appear in the display, press **ENTER,** then type the correct cone number.
Press **ENTER.**
Type the hold time or leave at **0**. Numbers to the left of the decimal are hours, to the right are minutes.
Press **ENTER CPL** will be displayed briefly, then **IdLE**, **tC2** and the current temperature will be flashing in the display.
Press **START/STOP** to begin firing.

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TIP
NOTE: PREHEAT OPTION. With any of the "Easy Fire" modes, a preheat stage is available.
During the preheat stage the temperature is automatically increased at a rate of 60°F per hour until 200°F is reached; the 200° temperature is then held for the programmed amount of time. Preheat is automatically set to zero during "Easy Fire" programming and at the end of each firing, so if a preheat stage is wanted, it must be reprogrammed for each "Easy Fire" firing.

To preheat the kiln for a specific amount of time you must first program an EASY FIRE program. Once this is done you can add the preheat option to it:
Press **PREHEAT** and see **HLd,00.00** cycling over and over.
Press the number keys to enter the amount of Preheat time desired. . Numbers to the LEFT of the decimal in the display are hours, i.e. 3 hours of preheat time would look like **03.00**. Numbers to the RIGHT of the decimal in the display are minutes, i.e. 75 minutes of preheat time would look like **00.75**.
Press **ENTER** and see **CPL** meaning that programming the preheat option is complete.

NOTE: DELAY OPTION With any Easy Fire or Vary Fire program an optional Delay for the start time of the program is available. This feature makes it easy for you to be present at the end of a firing. Appendix F has the estimated times that the Easy Fire Programs take for selected cone numbers. Use this appendix, and add however many hours you need, up to 99 hours and 99 minutes, to the delay timer to ensure your presence at the end of the firing.

To program a delay time you need not have programmed any firing profile yet. When the display cycles **IdLE**, **tC2,** current temperature over and over:

Press **DELAY** and see **dELA, 00.00** cycling over and over.
Press the number keys to enter the amount of delay time desired. Numbers to the RIGHT of the decimal in the display are minutes, i.e. 75 minutes of delay time would look like **00.75**. Numbers to the Left of the decimal in the display are hours, i.e. 14 hours 30 minutes of delay time would look like **14.30**.
Press **ENTER** and see **CPL**, meaning programming the delay option is complete.

Now once you program any Easy Fire or Vary Fire program this delay will appear in the display like a timer counting down when you press **START/STOP** to begin firing. The firing will begin once the timer reaches zero. It will remain set as is until you change it.

NOTE: If you make a mistake while programming (like entering the wrong hold time) and you have already pressed **ENTER,** you must continue to enter the rest of the program as you would have. Once you see **CPL** (meaning programming is complete) you must then go back and re-enter the entire program over again, making sure that you fix your mistake then.

4.1.2 EASY FIRE Example 1

Slow Bisque Firing Profile to Cone 04, **Pre-heat of 1 hour, 10 minute Hold** - Use the following steps for a bisque firing to cone 04, a 10 minute temperature hold at the peak temperature, and a preheat stage with 1 hour hold time. You can change the firing profile, cone number, hold time, or preheat time to fit your specific needs.

To begin programming the display must be reading **IdLE, tC2,** and the current temperature.

Press	Display	Comment
SLOW BISQUE	**S-bC**	If you press the wrong button, before pressing **ENTER**, simply press the correct button.
ENTER	Alternately flashing: **ConE & #**	The Slow Bisque profile is now selected. The word **ConE** and the last entered cone number will alternately flash on the display. Now enter the cone number - **04**.
04	Alternately flashing: **ConE** & **04**	The word **ConE** and the entered cone number will alternately flash on the display. If you type a wrong number, press **000**, then type the correct number.
ENTER	Alternately flashing: **HLd** & **00.00**	The cone number has been accepted. Now enter the 10 minute hold time.
0010	**00.10**	Numbers to left of decimal point are hours, to the right of decimal point are minutes. If you type a wrong number, press **0000**, then type the correct number.
ENTER	**CPL** flashes, then the current temperature	The 10 minute hold time is accepted. **CPL** indicates the firing profile has been completed.
PREHEAT	Alternating flashing: **HLd** & **00.00**	Preheat has been selected and the hold time is to be entered now.
100	**01.00**	Numbers to left of decimal point are hours, to the right of decimal point are minutes. NOTE: For a 1 hour hold time you could also enter **60** for 60 minutes; the display would show **00.60**. If you type a wrong number, press **0000**, then type the correct number.
ENTER	**CPL** flashes, then current temperature	Accepts a hold time of 1 hour, then **CPL** indicates the preheat stage has been completed.
START STOP	**-ON-**	After **-On-** is displayed for several seconds, the heating elements of the kiln will cycle on and the current temperature in the kiln will be displayed. If a time is displayed instead of the current temperature, then a delay start is in effect. If you do not want to delay the start. Press **START/STOP** button, then **DELAY,** then **0000,** then **ENTER**. When the current temperature and **IdLE** are again flashing in the display, press **START/STOP** to re-start the program.

4.1.3 EASY FIRE Example 2

Fast Glaze Firing Profile to Cone 06, 10 minute Hold, Delay start of 2 hours. Use the following steps for a glaze firing to cone 06, a 10 minute temperature hold at the peak temperature, and a 2 hour delay before the start of the firing. You may change the firing profile, cone number, hold time, delay time, or even add a preheat to this program to fit your special needs.

Press	Display	Comment
Fast Glaze	**F-GL**	If you press the wrong button, before pressing **ENTER,** simply press the correct button.
ENTER	Alternately flashing: **ConE** & #	Fast Glaze is selected. The word **ConE** and the last entered cone number will alternately flash on the display.
06	Alternately flashing: **ConE** & **06**	The word **ConE** and the entered cone number will alternately flash on the display. If you type a wrong number, press **0000**, then type the correct number.
ENTER	Alternately flashing: **HLd** & **00.00**	The cone number has been accepted and the hold time is entered now.
10	**00.10**	The Hold time is displayed. Numbers to left of decimal point are hours, to the right of decimal point are minutes. If you type a wrong number, press zero 4 times, then type the correct number.
ENTER	**CPL** flashes, then the current temperature	Accepts a hold time of 10 minutes and then **CPL** indicates the firing profile has been completed.
Delay	Alternately flashing: **dELA** & **00.00** (or the last programmed delay time)	Either **00.00** or the last programmed delay time will flash alternately with **dELA**.
200	**02.00**	Numbers to left of decimal point are hours, to the right of decimal point are minutes. If you type a wrong number, press zero 4 times, then type the correct number.
ENTER	**CPL** flashes, then current temperature	The 2 hour delay time is accepted. **CPL** indicates the job is completed. After **CPL** flashes several times, the current temperature is displayed.
START/ STOP	**-On-** then **02.00**	Starts the countdown of the delay time toward zero, at which time the kiln will start to heat. The display will show the amount of time left until the firing is to start.

4.1.4 EASY OPTIONS SECTION
4.1.4.1 Delay Button
This button's function is used to delay the start of a firing.

NOTE: There is a separate button specifically for this function. If you program a delay start it will remain on and set for all programs (both "Vary Fire" and "Easy Fire" until you take it off by programming it to **00.00**. This means you can program the delay time before or after you enter (or recall) the program that you want to fire.

Example: Program a one hour delay to the start of a firing. You can change the one hour delay to as much as 99 hours and 99 minutes of delay time.

Remember: IdLE, tC2, and the current temperature must be cycling on the display before beginning to program.

Press	Display	Comment
Delay	Alternately flashing: **dELA** and **00.00**	The controller is ready to accept the delay time of 1 hour.
100	**01.00**	Displays the selected time. Numbers to left of decimal point are hours, to the right of decimal point are minutes. If you type a wrong number, press **0000**, then type the correct number.
ENTER	**CPL** flashes then the current temperature	**CPL** flashes several times indicating the 1 hour delay has been accepted. The current temperature then flashes in the display.

4.1.4.2 Preheat
PrHt - Preheat can be used with the "Easy Fire" mode only. When Preheat is in use, the temperature ramps up at 60°F/hour to 200°F and then holds at 200°F for the amount of time programmed. If you start at a room temperature of 70°F, then it will take about 1-1/2 hours to reach 200°F at which time the hold segment in the Preheat will start. Preheat is automatically set to zero during "Easy Fire" programming and at the end of each firing, so if a preheat stage is wanted, it must be reprogrammed for each cone firing.
Preheat Example: Set a preheat time of 2 hours. Remember: You must choose and program an Easy Fire profile first, before you set the preheat time. **IdLE, tC2** and the temperature must be flashing to start the programming.

Press	Display	Comment
Preheat	Alternately flashing: **HLd** and **00.00**	If you see **StOP** when you press Preheat then it means that you have a VARY-FIRE program entered. You can not use preheat with a VARY-FIRE program.
ENTER	Alternately flashing: **HLd** & **00.00**	Preheat has been selected; enter the time you want to hold the temperature at 200°F (in this example 2 hours)
200	**02.00**	Displays the selected time of 2 hours. Numbers to left of decimal point are hours, to the right of decimal point are minutes. If you type a wrong number, press **0000**, then type the correct number.
ENTER	**CPL** flashes then the current temperature	**CPL** flashes several times indicating the 2 hour preheat time has been accepted. **IdLE, tC2**, and the current temperature then cycles in the display.

4.1.4.3 Alarm Button
This button's function enables you to program an audible temperature alarm.

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TIP

NOTE: There is a separate button specifically for this function. This alarm must be set for each firing when an Easy Fire program is chosen. When a Vary Fire program is chosen the Dynatrol will automatically use the alarm setting that can be programmed with that chosen program when you entered that program into the Dynatrol originally.

The alarm may be set before or during a firing. When the alarm temperature is reached, a beeper will sound. Turn off the sound by pressing **ENTER**. This is very useful for alerting you to specific critical temperatures in a program - for instance just before the kiln is going to reach maturing temperatures or when to close the lid during natural venting.

Example: Before or during a firing, set the alarm temperature to go off at 200°F.

Press	Display	Comment
Alarm	Alternately flashing: **ALAr** and #	The word **ALAr** and the last entered alarm temperature will alternately flash on the display. The controller is ready to accept the alarm temperature. If no alarm is entered within 10 seconds, the display will flash **CPL** and then the flashing current temperature.
200	**0200**	Displays the selected temperature of 200°F. If you type a wrong number, press **0000**, then type the correct number.
ENTER	**CPL** flashes then the current temperature	**CPL** flashes several times indicating the alarm temperature has been accepted. The **IdLE**, **tC2**, and the current temperature then cycles in the display.

4.1.5 Downramping, or Controlled Cooling with Easy Fire

1) If your kiln is cooling too rapidly for good glaze results, or if the cooling is so rapid that cracking occurs on certain large pieces, it is recommended to cool under power. This is accomplished using the following instructions. A kiln with a light load or a large firing chamber will cool more quickly than a kiln with a heavy, dense load or a small firing chamber assuming the same thickness of the insulation. So you may want to test your kiln to see how quickly it cools at high temperatures and at low temperatures to see what type of cooling segment(s) you need.

2) The EASY-FIRE to VARY-FIRE feature allows you to fire an EASY-FIRE program and then automatically start a VARY-FIRE program at the end of the EASY-FIRE program.

3) Press the **ENTER PROG** button in the VARY-FIRE Section

4) Press **6** and then press **ENTER** to program User 6.

5) Program User 6 with desired cool down program. User 6 will start when your EASY-FIRE program reaches complete (**CPt**).

6) NOTE: Segment one of user 6 is utilized by the controller and cannot be used for the program. Therefore the number of segments will need to be one greater than the number used for programming. When the display asks for **ra1** press **ENTER**, **ENTER**, **ENTER** to begin programming the Ramp-Hold portion with segment 2. Treat a cooling segment the same as a heating segment when programming the Dynatrol. Then, when you input the **rA** number (rate of rise or fall in °F per hour), this number will be the number of degrees per hour that you want the kiln to COOL. Next in that segment, when you input the **°F** number (the segment's set point), this number will be the temperature to which the kiln will cool to, at the rate you have just programmed. You can then program a hold (if you need one here) at this temperature. The program can then end (this was your last segment if you made up a 2 segment program) or it can continue on cooling or go back to heating in the next segment (if you had more than 2 segments in the program). All that the Dynatrol knows, is that to be a cooling segment, the set point must be LOWER

than the previous segment's set point. It will treat the ramp rate the same for either heating or cooling, just moving the temperature along at the prescribed rate.

7) Press the desired EASY FIRE program button (i.e. **Slow Bisque, Fast Bisque, Slow Glaze or Fast Glaze**).

8) Enter desired EASY-FIRE program. This will program the EASY-FIRE portion for the program. Do this just as you would for any EASY-FIRE program.

9) Press the **OTHER** button until **16-S** appears in the display. Press **ENTER**.

10) Press the **1** key until the desired condition is displayed. **On** will allow EASY-FIRE program to flow into VARY-FIRE User 6 program and **OFF** will disable this option.

11) Press the **ENTER** button. Programming is now complete. If 16-segment is **On** then the controller will perform the EASY-FIRE program and upon finishing it will run the VARY-FIRE User 6 program.

12) NOTE: **16-S** will appear in in the Program Review when you press the **REVIEW PROG** button.

4.1.6 EASY FIRE Example 3 with a controlled cooldown
Slow Glaze Firing Profile to Cone 6, 5 minute Hold, Controlled Cooldown..

Press	Display	Comment
Enter Prog	Alternately flashing: **USEr** & **1** (or some other number 1-6)	This allows you to chose which program number to program. You FIRST have to program the cooldown program BEFORE you program the EASY-FIRE program. Otherwise the control thinks you are going to use VARY-FIRE program #6 as your main program.
6	**6**	You are going to program VARY-FIRE program No 6
ENTER	Alternately flashing: **SEG** & **2** (or some other number 1-8)	This is the number of segments you will need. In most cases you will want 2 segments. The first segment IS NOT USED and it doesn't matter what it says.
2	**2**	This tells the control you will be programming two segments
ENTER	Alternately flashing: **rA 1** & **0500** (or some other number)	This is the ramp of segment 1. It doesn't matter what the value is because it will be ignored.
ENTER	Alternately flashing: **oF 1** & **0200** (or some other number)	This is the temperature set point of segment 1. It doesn't matter what the value is because it will be ignored.
ENTER	Alternately flashing: **HLd1** & **0200** (or some other number)	This is hold value of segment 1. It doesn't matter what the value is because it will be ignored.
ENTER	Alternately flashing: **rA 2** & **0000** (or some other number)	This is asking you what ramp value to put in for segment 2. This will be our cooldown rate in degrees F (unless you are operating in deg C)
150	**0150**	This means we will cool at a rate of 150 deg per hour.

ENTER	Alternately flashing: **oF 2** & **0000** (or some other number)	This is asking you what temperature value to put in for segment 2. This will be our cooldown setpoint, i.e. the target temperature to cool down to. After we reach this temperature the kiln will stop firing and it will cool down without any power.
1500	**1500**	We will have a controlled cooldown to 1500 Deg F
ENTER	Alternately flashing: **HLd2** & **0000**	This is asking you for a hold time.
0000	**00.00**	Hold of zero
ENTER	Alternately flashing: **ALAr** & **9999**	This is asking you for an alarm temperature.
ENTER	**CPL**	You are not entering an alarm temperature and now you are complete.
Slow Glaze	**S-GL**	If you press the wrong button, before pressing **ENTER,** simply press the correct button.
ENTER	Alternately flashing: **ConE** & **#**	Fast Glaze is selected. The word **ConE** and the last entered cone number will alternately flash on the display.
6	Alternately flashing: **ConE** & **6**	The word **ConE** and the entered cone number will alternately flash on the display. If you type a wrong number, press **0000**, then type the correct number.
ENTER	Alternately flashing: **HLd** & **00.00**	The cone number has been accepted and the hold time is entered now.
5	**00.05**	The Hold time is displayed. Numbers to left of decimal point are hours, to the right of decimal point are minutes. If you type a wrong number, press zero 4 times, then type the correct number.
ENTER	**CPL** flashes, then the current temperature	Accepts a hold time of 10 minutes and then **CPL** indicates the firing profile has been completed.
Other (4x)	**16-S**	This means 16 segment.
ENTER	**OFF**	The 16 segment feature is turned off as the default setting.
1	**On**	Pressing 1 turns the 16 segment feature on. You can toggle between **OFF** and **On** by pressing **1** again.
ENTER	**CPL**	You have now activated the 16 segment hfeature which will start VARY-FIRE Program No 6 when the EASY-FIRE program finishes (reached CPL)
START/ STOP	**-On-**	Starts the program..
Review Prog		You will see 16-S at the end of the displays that scroll. This tells you that VARY_FIRE Program #6 will start when your EASY-FIRE program ends.

4.2 VARY-FIRE

The Vary Fire mode allows you to program exactly how you want the kiln to fire. It provides a very broad range of programming possibilities designed to allow for the many different ways these kilns can be used. The Dynatrol allows you to permanently store 6 separate, programs with up to 8 ramp/hold segments in each program. There is one cooling or heating ramp, a temperature setpoint, and an optional hold time at that setpoint, per segment. These programs are stored in a non-volatile memory bank, which means that they will stay in memory even when all power is turned off. The Dynatrol allows you to hold at a low temperature for a long time (i.e. you can have an automatic drying period similar to the Preheat option in the Easy Fire mode). Then it can automatically ramp up to your final temperature, switching to different heating or cooling rates along the way. You can ramp slowly through critical periods or soak at any temperature within, or at the end of a firing, for more consistent maturing of work. Your program can include a controlled cool down to avoid heat shock. Many of these options are permanently programmed into the Easy Fire programs to maximize their ability to properly fire your ceramics. However, with the "Vary Fire" programs you have complete control over nearly every aspect of the firing so you can adjust the kiln performance to your exact needs. This can allow the kiln to be used for non-ceramic applications such as glass slumping, annealing, enameling, growing crystals, jewelry, heat treating, testing, and other industrial uses.

In the Vary Fire mode your saved programs are called **USEr1**, **USEr2**,… **USEr6**. These are the names that will define your programs and make them easy to recall in order to use them to fire the kiln.

Vary Fire programs are best thought of in the terms of a chart. For example: a three segment program with a one hour hold time and a maximum set point temperature of 1575°F and a controlled cooldown. In segment 1, ramp rates are at first only 100°F per hour until the entire kiln's temperature reaches 200°F. Then, with no hold time in segment 1, the control automatically switches to segment 2, which will allow the kiln to rise at 500°F per hour until its maximum setpoint at 1575°F. Then it will hold for one hour at 1575°F. Then, in segment 3, it will cool from 1575°F to 1000°F at 143°F per our. Once the kiln temperature cools to 1000°F the firing is complete and the kiln heaters will turn off.

Segment	Rate °F/hour	Temperature	Hold
1	100°F/Hour	200°F	0
2	500°F/hour	1575°F	1 hour (01.00)
3	143°F/hour	1000°F	0

SAMPLE VARY-FIRE PROGRAM
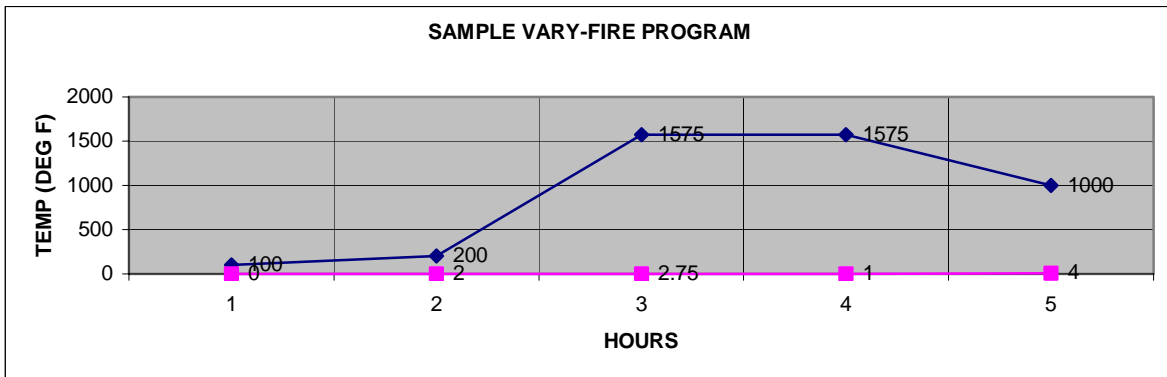
NOTE: Appendix K has a blank form for writing your firing programs. Photo-copy this form as needed.

NOTE: If you make a mistake while programming (like entering the wrong hold time) and you have already pressed **ENTER**, you must continue to enter the rest of the program as you would have. Once you see **CPL** (meaning programming is complete) you must then go back and re-enter the entire program over again, making sure that you fix your mistake then.

4.2.1 VARY-FIRE Example

The following steps are used to enter a program under **USEr1** for the firing profile in the below example.

? TIP **NOTE:** You can change the program's name (the USEr number), change the number of segments, and change the ramping rates, segment setpoints and hold times within each of the segments. You can even add a DELAY time to ensure that you will be around for the end of the firing, all to fit the program to your own specific needs.

Press	Display	Comment
ENTER PROG	Alternately flashing: **USEr** & **#**	The display alternates between **USEr** and the last selected firing profile number.
1	**1**	Selects user (**USEr**) profile number **1**. Only choose USEr 1 if you have not already entered a program there or if you wish to program over the program that is already there.
ENTER	Alternately flashing: **SEG** & **No.**	The displays flashes between **SEG** and the number of segments which were previously selected for this profile.
3	**3**	This is the number of segments needed for our example profile.
ENTER	Alternately flashing: **rA1** & **No.**	The display flashes between **rA1** and the heating rate per hour of the previously selected for this profile.
100	**0100**	Displays the selected rate/hour.
ENTER	Alternately flashing: **°F1** & **No.**	The display flashes between °**F1** & the temperature which was previously selected for this profile.
200	**0200**	Displays the selected temperature
ENTER	Alternately flashing: **HLd1** & **No.**	The display flashes between **HLd1** & the hours and minutes which were previously selected for this profile.
0	**00.00**	No hold time.
ENTER	Alternately flashing: **rA2** & **No.**	The display flashes between **rA2** & the heating rate previously selected for this profile.
500	**0500**	Displays the selected rate/hour.
ENTER	Alternately flashing: **°F2** & **No.**	The display flashes between °**F2** & the temperature which was previously selected for this profile
1575	**1575**	Displays the selected temperature.
ENTER	Alternately flashing: **HLd2** & **No.**	The displays flashes between **HLd2** & the previously selected hold time.
0100	**01.00**	One Hour hold time at 1575°F
ENTER	Alternately flashing: **rA3** & **No.**	The display flashes between **rA3** & the heating rate previously selected for this profile.
143	**0143**	Displays the selected rate/hour.
ENTER	Alternately flashing: °**F3** & **No.**	The display flashes between °**F3** & the temperature which was previously selected for this profile
1000	**1000**	Displays the selected temperature.

ENTER	Alternately flashing: **HLd3** & **No.**	The displays flashes between **HLd2** & the previously selected hold time.
0	**00.00**	No hold time.
ENTER	Alternately flashing: **ALAr** & **No.**	The display alternates between **ALAr** & the previously used alarm setting.
9999	**9999**	Enters the temperature at which the alarm will sound. The alarm will be turned off with a setting of **9999**.
ENTER	**CPL** flashes then the current temperature	**CPL** flashes several times indicating the program has been completed. The current temperature then flashes in the display.

4.2.2 Downramping, or Controlled Cooling with Vary Fire

To have the kiln cool at a prescribed rate, slower than it's natural rate, within a program or at the end of a firing, first consider the following. A kiln with a light load or a large firing chamber will cool more quickly than a kiln with a heavy, dense load or a small firing chamber assuming the same thickness of the insulation. So you may want to test your kiln to see how quickly it cools at high temperatures and at low temperatures to see what type of cooling segment(s) you need.

Treat a cooling segment the same as a heating segment when programming the Dynatrol. You must initially add an extra segment. Then, when you input the **rA** number (rate of rise or fall in °F per hour), this number will be the number of degrees per hour that you want the kiln to COOL. Next in that segment, when you input the **°F** number (the segments set point), this number will be the temperature to which the kiln will cool to, at the rate you have just programmed. You can then program a hold (if you need one here) at this temperature. The program can then end (this was your last segment) or it can continue on cooling or go back to heating in the next segment.

All that the Dynatrol knows, is that to be a cooling segment, the set point must be LOWER than the previous segment's set point. It will treat the ramp rate the same for either heating or cooling, just moving the temperature along at the prescribed rate. (See the previous example for the Vary Fire).

NOTE: At least one heating segment must proceed a cooling segment as the kiln cannot cool from room temperature.

4.2.3 The RECALL PROGRAM Button

This button is used to call up one of your six previously programmed USEr firing profiles in order to use that program to fire the kiln.

Example: To recall USEr profile #4, do the following. First enter your program into User Profile #4, then:

Press	Display	Comment
RECALL PROGRAM	Alternately flashing: **USEr** & **1**	The controller is ready to accept the desired user number.
4	4	Indicates the user program selected.
ENTER	**CPL** flashes then the current temperature	**CPL** flashes several times indicating the program has been selected. The current temperature then flashes in the display.

4.2.4 Note about Preheating (Candling) with "Vary Fire"

There is no actual "Preheat" option in the Vary Fire mode. You must include another segment in your program in order to "Preheat". To candle in the "Vary Fire" mode you would make your first segment as follows:

`rA1  -60`

`°F1 - 200 -`

`HLD1` - (time you wish to candle for)

4.3 REVIEW AND SPECIAL OPTIONS SECTION
4.3.1 Other Button

- Reset feature `rSEt`

- Cone Lookup Table `ConE`

- Controller ID `Id`

- 16 step program `16-S` (only comes up if you have VARY-FIRE Program #5 in active memory or if you have an EASY-FIRE program in active memeory)

- Cone temperature offsets `CnoS`

- Temperature scales `°F` or `°C CHG°`

- Error codes ON or OFF `ErCd`

- Thermocouple offset `tCoS`

- Lag `LAG` (Only comes up if you have 2 or 3 thermocouples programmed into the control – which is normal for most L&L kilns)

- Autolag ON or OFF `AULG` (See this after entering the LAG)

- Board temperature `bd t`

This button contains a menu accessing the programmable settings for the rest of the Dynatrol's features.
There are several options in the "Other" menu. Pressing **Other** will continue to cycle through the options available, **rSEt** (Reset to default values) -**PrHt** (Preheat)) – **Id** (Identification) –**16-S** (16 Segment Program) - **CnoS** (Cone Offset) - **CHG°** (Change degrees) - **ErCd** (Error Codes) - **tCoS** (Thermocouple Offset) - **LAG** (lag between zones) – **Aulg** (AUTOLAG, actually located behind the LAG setting) – **bd t** (shows the temperature of the Dynatrol itself when the kiln is not firing.)

?
TIP
16-S will not appear in this menu unless Vary Fire Profile #5 has been programmed and recalled or if an EASY-FIRE program has been entered.
Aulg will not appear in this menu until **LAG** has been entered and a setting has been programmed.

TO EXIT this menu without changing anything, cycle through by pressing Other until Id appears, then press ENTER twice.

4.3.1.1 Reset
rSEt - Choosing this function will re-assign the default values to the thermocouple offsets, Lag, Autolag, and Error codes. Press **OTHER** until **rSEt** is displayed. Then press **ENTER**. **CPL** will be displayed indicating that the thermocouple offsets have been set to zero, the **LAG** to **25**, the Autolag to **off** and the Error Checking to **ON**.

4.3.1.2 Cone Lookup Table
This option allows you to type in a cone number and see what the Dynatrol's programmed temperature is for that cone number at a temperature climb of 108°F per hour. This function is provided as a handy reference table to use while you are programming. There is a more complete cone table in Appendix *. Remember however that there is no absolute equivalent between cones and temperature.

Cone Table Example:

Press	Display	Comment
OTHER **OTHER**	**ConE**	The word **ConE** will appear on the display
The desired cone number , example: **07**	Alternately flashing: **ConE** & desired cone number. This example: **ConE** & **07**	The word **ConE** and the entered cone number will alternately flash on the display.
ENTER	Cone Temperature (1787°F for cone 07) then **CPL**	The cone temperature is displayed for 2 seconds then **CPL** is displayed followed by the flashing current temperature

4.3.1.3 Identification
Id - Used by KISS (Kiln Interface Software System) to identify the kiln when hooked to a personal computer. This software is available from L&L.

4.3.1.4 Sixteen Segment Program
16-S - This option allows Vary-fire profiles #5 and #6 to be combined into one profile with up to 16 segments. It only shows up in the "**OTHER**" menu only when Vary-Fire #5 Profile has been programmed and recalled. First, program Vary-Fire Profile #5 and then Vary-Fire Profile #6. Note that the beginning segment of Profile #6 should be entered as if it was to start directly after the ending segment of Profile #5.

To take advantage of this feature do the following:

Press	Display	Comment
		First, program VARY-FIRE Profile #6 Then Vary-Fire Profile #5.
RECALL PROGRAM	USEr, 1	This is asking which program to recall, you can press 5.
5	5	USEr profile number 5 containing at least the first half of your program has been chosen, press **ENTER**.
ENTER	CPL	The program USEr 5 has been recalled
Other	16-S	Press **Other** until the **16-S** appears. Press **ENTER** to accept the option.
ENTER	OFF	This option is currently off. Use any number key to toggle between ON and OFF
1	On	This turns on the 16 segment programming – linking program #5 and program #6, press **ENTER**.
ENTER	CPL	This activates and confirms the programming
START		The controller will fire Vary-Fire Profile #5 until complete and then will fire Vary-Fire Profile #6 until complete

?
TIP

NOTE: If you just want **USEr5** to fire without automatically being followed by whatever is programmed in **USEr6** double-check that this option is set to **OFF** It will show up the Program Review.

4.3.1.5 Cone Offset

CnoS (Cone Offset) - Used to fine tune what the Dynatrol thinks the final cone temperature should be in Easy Fire programs. The final cone temperature can be raised or lowered a maximum of 99°F. When entering the offset temperature the following code is used: the left two digits designate whether to raise (**00**) or lower (**90**) the cone temperature, that is, "**00**" means plus (+) and "**90**" means minus (-). The right two digits are the number of degrees the cone temperature will be raised or lowered. This offset will remain programmed only for the specific cone number until you reprogram the cone offset differently

Examples:

Number	Meaning
0020	Raise the final cone temperature by 20°F
0040	Raise the final cone temperature by 40°F
0015	Raise the final cone temperature by 15°F
9030	Lower the final cone temperature by 30°F
9005	Lower the final cone temperature by 5°F
9045	Lower the final cone temperature by 45°F

NOTE: This option does not affect the "Vary Fire" (Ramp-Hold) mode but it will show up on the menu.

NOTE: The Cone Offsets come preprogramed. From cone 022 to cone 017 the cone offsets are set at 9020. All other cones are preset at 0000. (Note on Blue DynaTrols made before Oct 1 2004 the cone offset was 9030 for cones 022 to 017 and 9020 for other cones. The offsets were changed when we switched to a more responsive thermocouple protection tube). You can always change this. The RESET option in OTHER will NOT reset these settings. This is part of the compensation necessary for the mullite protection tubes.

Cone Offset Example: Adjust cone 07 to shut off the kiln at 20°F below Orton's prescribed cone temperature.

Press	Display	Comment
OTHER OTHER	**CnoS**	If **CnoS** does not show on the display, press the **OTHER** key until **CnoS** displays.
ENTER	Alternately flashing: **ConE** & #	Cone Offset has been selected; the word **ConE** and the last entered cone number will alternately flash on the display. Now enter the cone number which you want to adjust (in this example cone 07)
07	Alternately flashing: **ConE** & **07**	The word **ConE** and the entered cone number (**07**) will alternately flash on the display. If you type a wrong number, press zero 3 times, press ENTER, then type the correct number.
ENTER	Alternately flashing: **°F0S** & **9000**	**°F0S** and the previous offset setting alternately flash. Enter the new offset temperature using the rules above, in this example, **9020**"
9020	**9020**	The selected offset temperature is displayed. If you type a wrong number, press zero 4 times, then type the correct number.
ENTER	**CPL** flashes then the current temperature	**CPL** flashes several times indicating the offset temperature adjustment has been accepted. The current temperature then flashes in the display.

4.3.1.6 Change from Deg F to Deg C

CHG° - Used to select degrees Fahrenheit (°F) or degrees Celsius (°C).

Example: Change from °F to °C.

Press	Display	Comment
OTHER OTHER	**CHG°**	If **CHG°** does not show on the display, press the **Other** key until **CHG°** displays.
ENTER	**°F**	Indicates that the Fahrenheit (°F) scale is being used. You can toggle back and forth between °F and °C by pressing the **1** key.
1	**°C.**	Displays **°C** . The decimal point in the lower right corner means that the Celsius (centigrade) scale has been selected.
ENTER	**CPL** flashes then the current temperature	**CPL** flashes several times indicating the temperature scale has been changed. The current temperature in **°C** then flashes in the display. There will be a decimal point in the lower right-hand corner of the display.

4.3.1.7 Error Codes (On/Off)

ErCd - Used to turn ON or turn OFF the error codes. When you receive your Dynatrol the error codes are turned on. In most cases, you will want the error codes on. They can be turned off if you are doing special firings, such as jewelry or glass firing where the kiln is opened while hot. Turning the error codes off turns off the dynamic zone control feature that keeps the temperature in the kiln even top to bottom. It eliminates nuisance shut downs but side steps built in fail-safe measures.

The only Error codes that this can not turn off are **Err6**, **FAIL**, and **ErrP** in both the "Easy Fire" and "Vary Fire" modes. In addition **Err1** and **Err8** are not turned off in the last segment of an "Easy Fire" program. This is because the built in calculations would make no sense if the kiln were firing too slowly. (see Appendix * for a full translation of each error code)

Example: Turn the error codes off.

Press	Display	Comment
Other Other	**ErCd**	If **ErCd** does not show on the display, press the **OTHER** key until **ErCd** displays.
ENTER	**On**	Indicates that the error codes are turned on. You can toggle back and forth between on and off by pressing the **1** key.
1	**OFF**	Displays **OFF** indicating the error codes will be turned off.
ENTE	**CPL** flashes indicating that the error codes have been turned off.	**CPL** flashes several times indicating that programming is complete. **IdLE**, **tC2**, and the current temperature then cycle in the display.

4.3.1.8 Thermocouple Offsets

TCoS – This is used to raise or lower the temperature indicated by any of the thermocouples. The maximum offset is 99°F. A positive offset is entered with **00** preceding the amount of offset and a negative offset is preceded with **90**. This is similar to what is done for entering cone offsets. When **tCoS** is displayed, press **ENTER** and **TC1** will be displayed. Press **ENTER** and the current offset for the top thermocouple will be displayed. Press **ENTER** when the correct offset for the top thermocouples is

displayed and then **TC2** will be displayed. Repeat the process for **TC2** and **TC3** only inputting the offset on the thermocouples that need it.

Raising the indicated temperature LOWERS the actual temperature in the kiln and therefore the amount of heat work. Lowering the indicated temperature RAISES the actual temperature in the kiln and therefore the amount of heat work.

Thermocouple Offset Example

Entering this sequence of steps will make the TOP zone of the kiln fire cooler by 15°F than the rest of the kiln. To do this, the offset is performed on the top (#1) thermocouple only, however the rest of the thermocouples must be programmed as well. The other one or two thermocouples (depending on model of kiln) would be programmed for a zero offset.

Reminder: **IdLE**, **tC2**, and the current temperature must be cycling before you begin programming

Press	Display	Comment
OTHER OTHER	**tCOS**	Represents thermocouple offset, press **ENTER**
ENTER	**tC1**	Represents thermocouple #1. The top of the kiln contains **tC1** so this is the thermocouple that we want to offset. Press **ENTER**.
ENTER	**°FOS 0050**	The Dynatrol is asking how many degrees you wish to add to or take from that thermocouple's displayed reading. NOTE: If this number reads something other than **0000**, you already have an offset programmed here. Note that the control comes with a 0050 already preprogrammed in as a thermocouple offset to help compensate for the ceramic protection tube. Press **ENTER** if you wish to keep this offset, OR press **0000** and then press **ENTER** to have no offset on that thermocouple OR continue to follow this example and press **0065**.
0065	**0065**	You have now programmed the top thermocouple to read 65°F hotter, therefore making the top of the kiln 65°F cooler, provided of course, that you program no offsets for thermocouples 2 or 3. Press **ENTER**
ENTER	**tC2**	Press **ENTER**, you must now enter offsets for thermocouples 2 and 3. In this example we are keeping these offsets set for zero.
ENTER	**°FOS 0050**	Keep at **0050**. If this number reads something other than **0050**, you already have an changed the default offset programmed here. Press **ENTER** if you wish to keep this offset.
ENTER	**tC3**	Press **ENTER**
ENTER	**°FOS 0050**	Keep at **0050**. If this number reads something other than **0050**, you already have an changed the default offset programmed here. Press **ENTER** if you wish to keep this offset.
ENTER	**CPL** or **StOP**	Thermocouple offset programming is complete.

NOTE: The thermocouple offset will affect the final temperature in that zone only for all Easy Fire and Vary Fire profiles. It will remain programmed until you reprogram it.

NOTE: The Thermocouple Offset comes already programmed into the control at 0018 (+ 18 Deg F) when it leaves the factory. Note the the room temperature will show 18 Deg F higher than it actually is. The RESET option in OTHER will NOT reset these settings. IF YOU DO NOT USE THE THERMOCOUPLE PROTECTION TUBES THEN YOU NEED TO CHANGE THERMOCOUPLE OFFSET TO 0000. (Note that on controls sent out before Oct 1, 2004 the thermocouple offset was set for 0050)

4.3.1.9 Lag

LAG – The **LAG** setting is the number of degrees any zone can lag behind the travelling set point before ramping is suspended (the elements are turned off) in the other zones. Ramping will continue as soon as the slow zone catches up. **LAG** is programmable with a maximum setting of **99**. A lower **LAG** setting gives tighter uniformity but slows the ramp rate because the travelling set point will only advance as fast as the slowest zone. The lower the setting, the tighter the temperature difference is between zones. The higher the setting, the less the control is working to control temperature uniformity and the faster the kiln can heat up. Press **ENTER** when you see **LAG** to program this setting. Once **ENTER** is pressed the display will say **0025**. Either just press **ENTER** to keep the factory setting of 25°F or change this setting now and then press **ENTER**. You will now see **AULG** (explained below) and then an ON or OFF message. Read **AULG** to decide if it should be **ON** or **OFF** and follow the instructions there for programming it so.

4.3.1.10 Autolag

Aulg – used to turn the Autolag feature **ON** or **OFF**. Autolag is a standard feature that can automatically disable the **LAG** control until the end of the firing. Having Autolag turned **ON** speeds up the firing considerably. Most ceramics applications do not require exceptional uniformity until the end of the firing. However, for glass and other industrial applications turning the Autolag to **OFF** is probably recommended. Turning Autolag OFF will allow the LAG setting to act normally throughout the entire firing.

In order to turn Autolag **ON** or **OFF** you must first choose the **LAG** option and enter a **LAG** setting. As soon as you press **ENTER** after entering the **LAG** setting you will see **AULG** for approximately two seconds, and then see either **ON** or **OFF**. Press **1** to toggle between **ON** and **OFF**. Then press **ENTER**

4.3.1.11 Board Temperature

bd t - You may press **ENTER** here to see what the ambient temperature of the Dynatrol's electronics are. This temperature can also be seen while the kiln is firing by pressing **VIEW SEGMENT** three times. (see Control Precautions for acceptable ambient operating temperatures)

4.3.2 Review Program

This feature is useful to be sure that the program that you have just selected to fire the kiln, either one of the preprogrammed Easy Fire programs or one of your six USEr programs, is the one that you think it is.

Example - If you have selected a Slow Bisque "Easy Fire" profile to cone 04 with a 20 minute hold, the following will be displayed, each for about 1/2 second when **REVIEW PROGRAM** is pressed:

Display	Comment
S-bC	Slow Bisque firing profile
PrHt	Indicates the next value will be the preheat hold time
00.00	No preheat hold time is selected
ConE	Next value will be the selected cone number
04	Selected cone number
°F	next number will be the cone temperature
1926	Dynatrol's temperature for cone 04
HLd	Next number will be the hold or soak time at the end of the firing
00.20	20 minutes hold selected
dELA	next number will be the delay time before the start of firing
00.00	No delay, firing will start when **START/STOP** is pressed
ALAr	Next number will be the high alarm limit setting
9999	This is as high as the alarm can be set and assures the alarm will be off
ErCd	Next message will indicate if the error codes are ON or OFF
ON	Error codes are **ON**
LAG	Next number is the **LAG** setting
25	**LAG** is set at 25
CPL	End of firing profile

4.3.3 View Segment

This feature is used while firing to see where the kiln is in the program, what the travelling set point is currently set for, and what the ambient temperature of the Dynatrol's electronics is.

Examples:

If you press View Segment, and the FIRST message that is displayed is…	It Means
Stop	No firing is in progress, the controller is currently idling (**IdLE**, **tC2**, temp.)
rA 4	Kiln firing, ramp stage in segment 4
rA 3	Kiln firing, ramp stage in segment 3
HLd2	Kiln firing, hold stage in segment 2
HLd6	Kiln firing, hold stage in segment 6
If you press View Segment, the SECOND message that is displayed is…	**It Means:**
The Travelling Set Point: in the form of a temperature number in whatever temperature scale you are using. i.e. **200**	This number is constantly changing based on how you have programmed the kiln. The Dynatrol looks at the entire program you have entered and then plots the course of the Travelling Set Point. Once the firing has started and the elements are heating, the thermocouples are registering the temperature in the kiln. These temperatures are constantly compared to the Travelling Set Point and their relationship is what determines whether or not the elements stay on or are turned off in each zone of the kiln.
If you press View Segment, the THIRD message that is displayed is…	**It Means:**
The ambient temperature of the Dynatrol's electronics in the control panel. I.e. 100	This temperature can tell you if you are operating the kiln in a detrimental and possibly unsafe environment. The recommended maximum ambient temperature is 125°F. If your temperature reads hotter than that you could damage the Dynatrol over time. Something else to consider is the fire hazard issue (see the general kiln instructions for precautions on this)

4.3.4 Skip Step (SStp)

The Skip Step function is performed using the **View Segment** button. The Skip Step feature is only available in a "Vary Fire" firing profile. It is used when enough heat work has been done at the current segment and you want to immediately go the next ramp rate. To skip to the next <u>ramp</u> stage, press View Segment, then within 2 seconds, press **ENTER**, and **ENTER** a second time. If you press **View Segment** and do not press **ENTER** within 2 seconds, the current segment (e. g., **rA1**) will continue to be displayed.

Simply wait until the temperature is again displayed and press View Segment, then **ENTER** within 2 seconds, and **ENTER** again. If you press **View Segment,** then **ENTER,** then decide not to skip to the next ramp stage, simply do not press any key; after about 10 seconds the display will return to the current temperature. If you are currently in the ramping part of the segment and you skip a step you will jump over any hold time in that segment and go directly to the ramp in the next segment. If you are currently in the hold part of a segment and you skip a step you will just go to the ramp in the next segment.

4.4 HIDDEN "OTHER" MENU & Programming the Powered Bottom

This menu contains the programmable settings for the rest of the features in the Dynatrol. To find this menu, first IdLE, tC2, and the current temperature must be cycling in the display.

Press **OTHER** once to see **rSEt** displayed
Press **4, 4, 3**, and see **notC** (this is the first option in the hidden "Other" menu)
Keep pressing **OTHER** to cycle through the menu options OR press **ENTER** on any one of the options.
To exit the menu press **ENTER** twice when you see **PCt**. You will then see **CPL**, and then **IdLE**, **tC2**, and the current temperature cycling in the display again.

WARNING: (OPTION A) DO NOT PRESS **ENTER** HERE. **OPA**, **OPB**, and **SAFt** are three options currently programmed to operate with different equiptment than our powered bottoms and are therefore not recommended as options for controlling them. While it is OK to press **ENTER** on **OPA**, **OPB**, or **SAFt** whether you have a powered bottom or not, it is imperative that if you do, you must then re-enter the hidden "Other" menu and press **ENTER, ENTER** (two times) on either **OPC** or **PCt** if you HAVE a powered bottom. If you do NOT HAVE a powered bottom you must press **ENTER** on **PCt**, set it for all zeros, and press **ENTER** again. **(OPTION B)** DO NOT PRESS **ENTER** HERE. See OP A.

4.4.1 Number of Thermocouples

When you press **OTHER, 4, 4, 3** The menu is displayed as follows:

notC (number of thermocouples) used to change the number of zones in your kiln (essentially, the number of thermocouples used). To run the kiln using only one thermocouple press **ENTER**, then **1,** then **ENTER** when **notC** is displayed. If you choose to do this you must use only thermocouple number 2 in the kiln and we recommend putting it in the middle zone's thermocouple hole. All the zones of the kiln will turn on and off simultaneously when you program the Dynatrol to use only one thermocouple. If you wish to run the kiln using only two thermocouples press **ENTER**, then **2,** then **ENTER** when **notC** is displayed. If you choose to do this you must have thermocouple #1 in the top zone of the kiln and thermocouple #2 in the middle zone or in the bottom zone. When you program the Dynatrol to run using only two thermocouples the bottom zone and the middle zone go on and off simultaneously. To run the kiln using three thermocouples press **ENTER**, then **3**, then **ENTER** when **notC** is displayed. If you choose to do this thermocouple #1 must be in the top zone, thermocouple #2 in the middle, and #3 in the bottom. All three zones will operate independently, tied to their respective thermocouples.

NOTE: G model glass kilns and D model doll kilns with only one thermocouple can be programmed to run with two or three thermocouples but as they physically only have one thermocouple the **FAIL** message will be displayed referencing the non-exhistant thermocouple. You must then re-program for just one thermocouple. Likewise, two section L&L kilns come with only two thermocouples. If you physically add a section to a two section kiln, you be able to add a third thermocouple. But if you program a two section kiln for three thermocouples you will receive the **FAIL** message referencing the non-exhistant thermocouple. You must then re-program for two thermocouples.

4.4.2 OP C (Option C)

When you press **ENTER** here all you will see is **CPL**. Now when you program in Vary Fire mode however, you will see an extra prompt in each segment called **FAN1**, **FAN2,...FAN8**. This will appear right before you see the **rA1**, **rA2**,...**rA8** prompt. **FAN**, in this application, is referring to the powered bottom. You can set the powered bottom to be either **ON** or **OFF** in each segment of programming in a Vary Fire program only. Toggle between **ON** and **OFF** using a number key.

4.4.3 PCt (Percent)

When you press **ENTER** here you can either exit the menu by pressing **ENTER** again (you are essentially setting the percent to remain the same by doing this). Or else you can program this setting to turn your powered bottom on a percent of the time that the bottom zone in the kiln is on. To set this percent from 0% to 150% press the percent you want. i.e. Entering `100` here would turn the powered bottom on whenever the bottom zone came on. Entering `50` here would turn the powered bottom on for about eight seconds, then off for about eight seconds if the bottom zone of the kiln was on all the time.

NOTE: Setting the `PCt` setting to `0000` will turn off all powered bottom options.

4.4.4 SAFt (Safety)

DO NOT PRESS **ENTER** HERE. See warning about `OP A`.

4.4.5 Pid (PID Setting)

This setting is not part of the powered bottom settings, It is always "on". Pressing **ENTER** here allows you set another percent setting that can help a slow, heavily loaded kiln fire faster. This setting comes pre-programmed at the factory for 85%. Basically you are determining how much help the middle zone of the kiln gives the bottom zone of the kiln when the bottom zone is lagging behind during heating. This function automatically activates to your pre-programmed setting when the bottom zone is on 100% of the time. Without this feature, heat from the bottom zone will rise up and help to heat the other zones so generally the bottom of the kiln is on more than the other zones to compensate for this. Sometimes the slow bottom zone will slow the whole kiln down. With this feature, the middle zone of the kiln will come on the programmed percent of the time that the TOP zone comes on, if the bottom zone is on all the time. What was found during tests was that if the bottom was on 100%of the time, the top zone was generally on 90% of the time, but the middle zone was on only about 40% of the time. By programming a higher percent you can greatly speed up your firings. (you will have to experiment, try the factory setting 85% then try maybe 125% and compare your results).

4.4.6 dIAG (Diagnostics)

This is handy to use when your kiln is first delivered and set up to make sure it was done properly. It can also be useful in seeing if an element has burned out. Press **ENTER** when you see `dIAG` and open the lid of your kiln. You will see each zone of the kiln turn on for one minute each, starting with zone #1, the top zone. If you have a powered bottom it will be on for the entire diagnostic test. CAREFUL it can get hot. This will tell you if the kiln sections are in the wrong order or if they are plugged in to the wrong receptacles on the control panel. If this is the case the zones will not turn on in the proper 1, 2, 3, order.

4.4.7 ShtO (Shut-Off)

This option is used to shut off the automatic feature in the Dynatrol that holds the hottest part of the kiln at each segment's set point until the average of the three (or two) thermocouples reaches that set point. Pressing **ENTER** here allows you to toggle, using a number key, between **ON** and **Off**. **ON** meaning that as soon as the hottest zone gets to the segment's set point the entire kiln switches to either the "hold time" or the next segment. **OFF** meaning that the Dynatrol will not let the hottest zone's temperature rise until the average temperature of the three zones reaches that segment's set point. Then the kiln can begin the "hold time" or the next segment. You may want to turn this setting to **ON** if you fire with the "Lag" set for say 15 and the "Autolag" OFF. It can also help to speed up a slow firing as well.

APPENDIX A
OVERVIEW OF FEATURES
A.1 Dynamic Zone Control

The DYNATROL features Dynamic Zone Control. It measures temperatures in the bottom, middle and top of the kiln and automatically adjusts the heat output of three separate heating zones even as the kiln is heating up and during the final approach to maturing temperatures. Kiln temperatures are automatically evened out to within 1/2 cone or better top to bottom! There is no manual intervention with input switches to even out temperatures. There are separate thermocouples (heat sensors) and contactors (power controls) for each of the three zones. Dynamic Zone Control suspends firing on one or more zones if the other zones are lagging behind the faster zone(s)..**tC1** (as displayed on the kiln) is the Top Zone, **TC2** is the Middle Zone, **tC3** is the Bottom Zone. **NOTE: It is absolutely necessary to match the proper section with the proper control box outlet and proper thermocouple** (Thermocouples, cords and receptacles are all marked for identification. If these are mismatched the kiln will not operate properly and you will get the **Errd** display showing that one of the zones is way off set point.

A.2 Programmable Number of Zones

The latest version of the DynaTrol allows you to program the number of zones. Typically there are three zones in a kiln. However, on our two section kilns the control will come programmed to operate as a two zone control. On GS1714 kilns we have the control programmed to be a single zone control. If you change the number of sections in a kiln (for instance, if you take one section off a three section kiln) you can reprogram the control to suit your needs. Another benefit of this new feature is that you can program the control to be a single zone control and avoid the complications of three zone control (i.e. LAG issues). When the control is programmed to be a single zone control outputs 1, 2 and 3 all work together. When programmed as a two zone control outputs 2 and 3 work together and output 1 is separate.

A.3 Four Easy Preset Programs

There are four preset "Easy Fire" programs that have been designed to do most typical ceramic firing cycles. They are **Fast Bisque, Slow Bisque**, **Fast Glaze** and **Slow Glaze**. These preset programs have specific ramps and speeds built into them (see Appendix A for details of what these ramps are). You can enter any cone number up to cone 10* as a final temperature, a hold time, a delay time and even a "candling" time as options. This allows a great deal of customization while still keeping the programming simple and easy. We recommend you start with these programs until you get some experience with the control and your kiln.

The "Easy Fire" mode uses Orton's patented method to achieve correct heat work so it is ideal for firing ceramics. The advantage of using the "Easy Fire" method is that a very complicated firing profile may be chosen with just a few key strokes. The "Easy Fire" method helps protect against over and under firing by carefully tracking and controlling the temperature at the end of the firing as the cone temperature is approached. The program is based on a 108°F temperature rise for a large self supporting cone (rather than the small Orton cones or regular large cones).

*Note: Some L&L Kilns are not designed to go to cone 10. Consult your kiln's label for the maximum operating temperature.

A.4 Six User Defined Programs

If your needs are more sophisticated or involved there is a separate "Vary-Fire" programmer mode. This allows you to have 6 separate, repeatable, storable programs with up to 8 segments. There is one cooling or heating ramp, a temperature setpoint and an optional hold time per segment. The programs are stored in non-volatile memory which means that they will stay in memory even when all power is turned off. The DYNATROL allows you to soak at a low temperature for a long time (i.e. you can have an automatic drying period) and then automatically ramp up to your high fire at different rates. You can ramp slowly through critical periods or soak at end point temperatures for more consistent maturing of work. It also allows a controlled cool down to avoid heat shock. Of course many of these valuable uses are available in the preset "Easy Fire" programs. However, with the "Vary Fire" programs you have complete control over ramp times and rates and so you can adjust the kiln performance to your exact needs. It also allows the

control to be used for non-ceramic applications such as glass, enameling, heat treating and other industrial uses.

Note: "Vary Fire" programs fire the kiln to your specifically programmed temperature. "Easy Fire" programs will fire the kiln to your specifically programmed cone number.

?
TIP

A.5 Linkable Programs
You can now link Vary-Fire Program #5 and #6 to get a 16 segment program. You can also use this system to link Vary-Fire Program #6 to the end of an Easy-Fire Program.

A.6 Delay Start
You can delay the start of the program by up to 99 hours, 99 minutes. This allows you to plan end of firing conveniently. This is also very useful for saving energy costs by firing kiln with night electric rates. If you want the kiln to mature at 2:00 PM the next day and you know your program will take 12 hours and you are starting your program at 4:00 PM today you would program in an 8 hour delay. NOTE: The delay start remains on or set for all programs (both "Vary Fire" and "Easy Fire") until you turn it off.

A.7 Preheat (Candling)
You can "candle" the kiln for up to 99 hours, 99 minutes to dry ware thoroughly. "Candling" is a specific hold at 200°F which boils off the water in the clay slowly so that your work does not explode as the water expands rapidly to steam. This is highly recommended to do for most ceramics. We recommend overnight or for at least several hours depending on how dry your work it. NOTE: This is available as an optional step in the "Easy Fire" mode only. You can do the same thing with an added first segment in the "Vary Fire" mode.

A.8 Soak
The control will soak at Final Set Point for up to 99 hours, 99 minutes, and can be programmed to hold a temperature as long as 66 days before needing to be reset. This is a very useful feature and one of the great advantages of an automatic control. Most ceramics achieve their characteristics not so much by what temperature they reach but by how much "heat-work" is put into them. A long soak at a lower cone can often develop the bisque or glaze better. In addition a soak period almost always will improve the uniformity of the firing throughout the kiln. A soak period gives the entire load of ware time to absorb the radiant heat that is projected from the elements. If you simply rise to a certain temperature and then shut the kiln off (as is typical of a manual kiln sitter operation) then the center or the bottom of the kiln may not have had a chance to absorb as much heat as the ware around the perimeter. You may have experienced the fact that an older kiln with slow firing elements may in fact have given you better results. This is because the entire kiln has had a chance to even itself out as it approached final cone. We suggest experimenting with this feature. Try a soak of 10 to 20 minutes. The Dynatrol will automatically adjust the final temperature to compensate for the programmed Hold Time in the Easy Fire mode only.

A.9 Audible Temperature Alarm
There is an easily settable audible temperature alarm. This can alert you at any point in program. For instance the control can alert you that the kiln is close to maturity so you can watch it reach final set point. You can use it to alert you when to close the lid if you are manually venting the kiln. You can disable this alarm by programming in **9999**. Press **ENTER** to turn off alarm when it is sounding.

A.10 Program Review
Press this button to see the entire program before or while running it. It will scroll through the programmed steps. We suggest hitting **REVIEW PROGRAM** at the beginning of your firing to see if the control is set up to do what you want it to. If the control shows error codes "OFF" when they should be "On" or no "Hold" where one should be, you must first stop the program that is running in order to change anything. Most settings cannot be changed while running a program.

A.11 Segment Review
Press **VIEW SEGMENT** once while you are firing to see which segment's ramp or hold you are currently in, what the current set point is, and what the actual temperature of the Dynatrol's electronics are.

A.12 Skip Segment
In the "Vary Fire" mode you can skip a segment to advance to a higher segment and speed the program along.

A.13 Set Point Indication
If you press **VIEW SEGMENT** twice while the kiln is firing, the control will show you what your current set point is during the program as it is changing. This is useful to confirm that the temperatures of the thermocouples are where they are supposed to be.

A.14 Change of Program During Firing
When firing you can alter the program anytime. You must press "Stop", then reprogram, then press "Start". The Dynatrol will automatically take the current temperature into consideration and start back up at that point in the program. If you attempt to do this right at the end of a firing, the amount of time it takes to reprogram is not accounted for by the Dynatrol. If more than a few minutes go by, the temperature displayed may not accurately represent the amount of heat work taking place in the kiln. Another reason to fire with witness cones.

A.15 Cone Offset
This is one tool you have to help you match the control to your real firing experience. It is important to fire the kiln with witness cones to find out what is really happening inside the kiln. Using these you can fine tune the overall performance of the kiln to match what is really happening to your ware. The cone offset is just one of the ways you have of making this adjustment. Keep in mind however that your firing speed and soak time will also have an effect on how the witness cones and ware perform. When you are making an adjustment try changing one variable at a time. For instance if you are firing to Cone 05 and your witness cones don't mature you could do a number of things. One is to use the cone offset to raise what the Dynatrol thinks is the temperature of cone 05 in an Easy Fire program. Another thing you could do is put in a soak/hold time at the end of the program in a Vary Fire program. Another thing would be to slow the kiln down towards the end of its firing cycle with a slower, longer final segment in a Vary Fire program. Try one thing at a time to find out what works best for you. The cone table that the Dynatrol uses are based on a 108°F temperature rise for a large self-supporting cone (not the small Orton cones or the regular large cones).

A.16 Thermocouple Offset
This allows you to individually change what the Dynatrol thinks the thermocouples are reading. Use this to adjust for thermocouple drift or kiln uniformity adjustments. It allows you to influence how the kiln "sees" the temperature in the kiln. For instance, if the center zone is consistently firing higher (as measured by witness cones) then you would change that thermocouple to read higher. This would trick the control into thinking that the center zone was hotter and it would keep the temperatures down. The difference between Cone Offset and Thermocouple Offset is that Cone Offset works in Easy Fire programs only and changes a specific cone's temperature for the whole kiln. Thermocouple Offset will affect temperatures in both Vary Fire programs and in Easy Fire programs. Basically it changes just that particular thermocouple's reading up or down to even out temperatures in an unevenly heating kiln no matter what cone number or temperature you are firing to.

NOTE: Thermocouples drift in their accuracy over time. The hotter you fire the quicker this will occur. This is another reason why it is important to check each firing with witness cones.

A.17 Last Temperature Reached Indication
When an Easy-Fire program is complete it will tell you what the last temperature reached was. You press **REVIEW PROGRAM** at the end of the cycle to see this temperature. This is useful for logging and comparing to what happened with your ware. Compare this temperature to witness cones and make adjustments in your firing cycle or cone offsets to adjust the performance of the kiln.

A.18 Cone/Temperature Equivalent Look Up Table
Convert cone numbers to temperatures in degrees. The look up table is based on a ramp rate of 108°F. This table is provided as a handy reference table to use while you are programming. There is a more complete table in the Appendix J.

A.19 Dust Sealed Keypad

The keypad is dust tight so you don't need to worry if you have dirty hands that might get dust into the electronics.

A.20 Easy to Follow Graphic Design

It is graphically designed to be user friendly. "Easy Fire", "Vary Fire", "Options" and "View" functions are grouped separately. The numeric keypad makes entering parameters like temperatures and cone numbers easy.

A.21 Error Checking Can Be Turned Off

There are various error codes in the control. These can be important diagnostic tools. They can also be somewhat confusing and alarming if you don't understand then. One of the most common ones is **Err1** which will stop the program if the kiln's temperature is rising too slowly. **ErrP** indicates a power outage to the control. **Errd** indicates that one zone is 100°F off set point. All these and more are explained in greater detail in Appendix G.

A.22 Reset Defaults Function

This function (available under "Options, Other" - see Section 4.3.3) resets most settings back to factory defaults. It does not affect the thermocouple or cone offsets. Turns Error Checking On, sets LAG to 25°F, and sets Autolag to "OFF".

A.23 Reads Control Board Temperature

This is a diagnostic tool. The control should not be operated when it is above 125°F (52°C) or below 32°F (0°C). This should not normally be a problem with the way L&L mounts these controls away from the heat. However, if you do get a reading that is higher than this temperature (for instance if you are operating in a particularly hot room) we recommend that you direct some cooling air at the control. This board temperature is displayed as follows: When you press the View Segment Button while firing, first the current segment is displayed, then the set point temperature and then the Dynatrol's board temperature. Ambient temperatures that are out of the suggested range can lead to either control failure or control inaccuracy.

A.24 Automatic Restart after Brief Power Interruption with Flashing Alert

This is the **ErrP** indication. If the power outage was brief the program will continue to fire and the **ErrP** message will flash with the temperature indication. By hitting the "1" button you can clear this alarm message. See Appendix G for all error code explanations

A.25 Adjustable Lag between Zones

The three zone Dynamic Zone Control works by shutting down zones that are rising too quickly ahead of the slowest zone. (In most kilns the slowest zone is the bottom zone). The more the upper zones are shut off, the slower the kiln will be. You can adjust the allowable lag between zones from 5°F to 99°F. The default setting is 25°F. This setting gives you control over the tradeoff between speed of firing and zone uniformity. If your kiln is firing too slowly try adjusting this lag setting to a higher value. With a higher lag the kiln may fire faster but you may not get quite the same temperature uniformity top to bottom. You may be able to compensate for this lack of uniformity by putting in a soak time at the end. Of course you should also look at the ultimate reasons one of the zones is firing too slowly to begin with. Check your element resistance. Check how you have loaded the kiln. Check to make sure everything is tight. Look in our Troubleshooting Guide for more suggestions.

The logic of the "**LAG**" system has been optimized to make kilns fire faster. The logic works like this: If one zone's temperature has fallen behind the rest of the kiln's temperature by more than the "**LAG**" amount (i.e. the "**LAG** setting) but than less than twice the "**LAG**" amount, the Dynatrol's travelling set point slows to 60°F per hour instead of the programmed rate, unless the programmed rate is less than 60°F. If a zone is behind by more than twice the "**LAG**" amount, the travelling set point will stop and wait until the lagging zone is less than twice the "**LAG**" amount.

A.26 Autolag

"**AUTOLAG**" is a new feature that automatically disables the "**LAG**" control until the end of the firing. Having "**AUTOLAG**" turned on speeds up the firing considerably. Most ceramics applications do not require exceptional uniformity until the end of the firing. However, for glass and other industrial applications turning **OFF** "**AUTOLAG**" is probably recommended. With "**AUTOLAG**" ON the "**LAG**" feature is disabled until the last 45°F of the firing when it comes back on to it's programmed setting. Basically this allows the faster sections to help pull the slower sections along.

A.27 PID Tuning Control

PID stands for Proportional - Integral - Derivative. It is a sophisticated calculus algorithm that minimizes temperature overshoot. The control is able to anticipate the temperature set point and start to cut back power before it reaches actual setpoint. In standard On/Off control the power does not turn off until the actual set point is reached. Because of the inertia of the kiln this could result in temperature overshoot without the PID control. The values for the PID are hard programmed into the control and can not be changed. They are optimized for ceramics. If you are using the control for another application and you find that the control gives you some overshoot try a step in your Vary Fire program that is a very slow ramp for the last few degrees of the program. For instance if you wanted to get to 1800°F without overshoot, have the program go to 1775°F and then take 15 minutes to ramp to 1800°F. NOTE: As of April 2000 a second set of PID settings was added for temperatures below 500°F. This will improve overshoot in the lower temperature range.

A.28 Contactor Cycle Time

There is an 8 second cycle time built into the control. This means that the fastest the contactors can turn on and off is every 8 seconds. This saves wear on contactors.

A.29 Thermocouple Burnout Protection

The kiln will shut down automatically if all thermocouples burn out. The kiln continues to fire if only one or two thermocouples burn out. This protects your firing in the event of failed thermocouples. Of course, if all three thermocouples fail then the control stops firing.

A.30 Digital Indication of Temperature in either Degrees F or C

You can switch between temperature readings in degrees Fahrenheit or degrees Centigrade.

A.31 See All the Zone Temperatures

You can scroll through all three thermocouple readings by pressing **1** to see **TC1** (top zone), **2** to see **TC2** (middle zone) and **3** to see **TC3** (bottom zone). The default view is of **TC2**. You must specifically hit **1** or **3** to see the top and bottom zone temperatures. The reading will stay on the thermocouple that you last pressed.

A.32 See Which Zones are Firing

Press Number Key **8** while the kiln is firing. This toggles the LED display to show you which zones are firing. See the section under **DESCRIPTION OF KEY FUNCTIONS AND DISPLAY,** Appendix C for details. This is a great diagnostic tool to allow you to see which zones are firing. For instance if one zone is firing constantly and the other zones are not then you know that the constantly firing zone is the slow zone.

A.33 Cold Junction Compensation

The control automatically compensates for varying ambient temperatures. It can operate in ambient temperatures of 32°F to 125°F (0°C to 50°C). The **View Segment** button lets you see ambient board temperature (press **View Segment** three times). This is an electronic compensation.

A.34 Matches Pyrometric Cone Performance in "Easy Fire" Mode

This feature is licensed from Orton. (Patent #4,461,616 and 4,730,101). This feature is not controlled by the user. Basically it adjusts how the firing takes place towards the end so that the control approximates how cones work. The control sees how fast the kiln is rising and adjusts the final end point temperature higher or lower to achieve the proper amount of "heat-work". For instance, to mature your ware at the same cone number, a the kiln rising at 100°F per hour will require a lower set point temperature than a kiln

rising at 200°F per hour. This feature is only used in the "Easy Fire" mode. Note: The control emulates the self supporting cones. (see Appendix J, Pyrometric Cones)

A.35 Computer Interface System

The new DynaTrol is capable of being hooked up to a computer using special KISS Software. See separate instructions for details on this feature. Up to 10 separate kilns can be hooked up to one computer. This is available from L&L.

APPENDIX B
DYNATROL FACEPLATE AND KEYPAD

START/STOP button for starting and stopping firings.

"Vary Fire" Programmer for setting and saving your own firing profiles.

REVIEW section to review the selected program, view the current segment, view the board temperature, view the program set point, or skip to the next firing segment.

OPTIONS button to look up cone temperatures, set the cone offset to adjust cone tem-peratures, set thermocouple offsets, set LAG, AUTOLAG On/Off, Identify Control, Turn On/Off 16 seg-ment program capability, Reset default values, or change the temperature scale (°F/°C).

LED DISPLAY - four digit display showing times and temp-eratures. Indicate Deg F or C

Number keys section for entering temperatures and times. Change which thermo-couple you are reading. Turn On/Off ability to see which zones are firing. Reprogram the number of zones of control.

EASY FIRE section for choosing one of four preset Easy Fire profiles.

EASY OPTIONS section for setting Delay Time, PreHeat Time, and Alarm Temperature.

APPENDIX C
DESCRIPTION OF KEY FUNCTIONS AND DISPLAY

The front panel of the controller has seven distinct parts:

- **START/STOP** Key
- **LED** Display
- **VARY-FIRE PROGRAMMER** Section
- **REVIEW AND SPECIAL OPTIONS** Section
- **NUMBER KEYS** Section
- **EASY FIRE** Section
- **EASY OPTIONS** Section

C.1 START/STOP Key

Starts the firing or, if there is a firing in progress, stops the firing.

NOTE: This key has no function during programming.

C.2 VARY-FIRE PROGRAMMING Section

Program your own firing profiles and recall them for use.

ENTER PROG - This button allows you to initiate programming. Up to 6 profiles (programs) may be programmed and saved.

RECALL PROG - Allows one step recall of one of the programmed profiles (programs).

C. 3 LED DISPLAY- Displays temperatures, times, and messages.

The LED (Light Emitting Diode) has room for four digits or letters in the display. Because each digit has seven (7) diodes to create each number or letter, some letters do not appear as you are used to seeing them in print, for example, t is displayed as ⌐. Also the messages are displayed using both capital and small letters, for example, cone displays as ⌐⌐⌐, stop as ⌐⌐⌐.

When the decimal point is displayed between the middle 2 digits, a time is being displayed.

If there is a decimal to the right of all the digits, the temperature is being displayed in degrees Celsius (Centigrade). By pressing #8 on the numerical Keypad while you are firing a profile you can turn on and off the ability to see which zones are firing. The little LED lights under the numerals in the display act as indicators of the zones firing. There are three of these little indicators and all three will blink on and off even if your kiln only has two or one heating zone

Zone 1   Zone 2   Zone 3   °C if on
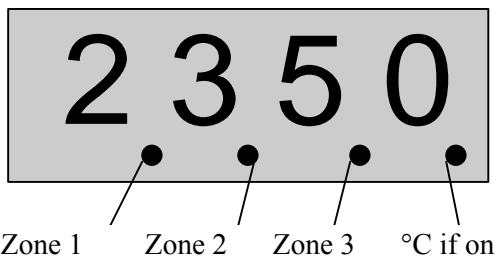
C.4 REVIEW & SPECIAL OPTIONS

Cone Offset, Thermocouple Offset, Identify Control for KISS software, Set 16 Segment Program, Set LAG, Set AUTOLAG, View Cone Table, and change between °F and °C.

REVIEW PROGRAM

REVIEW SEGMENT

OTHER (SPECIAL OPTIONS)
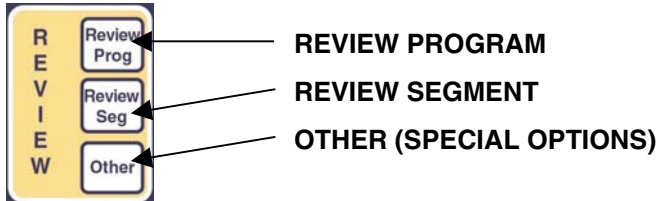
Review Program - The information displayed when Review Program is pressed varies depending on whether you are using "Easy Fire" or "Vary Fire". When Review Program is pressed, each of the steps in the current firing profile is displayed one after another.

In **EASY FIRE** Mode - The display will show the selected firing profile in the following order:

- preheat time
- cone #
- cone temperature
- hold time
- delay time
- alarm setting

When a firing is complete, Review Program is used to see the final temperature reached during the firing.

In **Vary Fire** Mode - The display will show in the following order:

- the user program #
- the number of segments
- 1st ramp rate
- 1st segment temperature
- 1st hold time
- (If there is more than 1 segment, then the ramp rate, segment temperature, and hold time of each of the other segments will be displayed in order.)
- delay time
- alarm setting

Review Segment - Available only during a "Vary Fire" (Ramp-Hold) Firing. It is used to view the current firing segment or to skip from the current segment to the next firing ramp1. When View Segment is pressed during a firing the current stage of the firing is displayed. If it is pressed in between firings, **StOP** will flash 3 times and then the current temperature will be displayed. When you press **REVIEW SEGMENT** twice you will see the program set point temperature. When you press it three times you will see the control board temperature.**Delay –** Used to delay the start of a program

Other - There are several "**Other**" options

`ConE –` Cone Lookup Table – Used to look up the temperature of various cone numbers. The temperature which is displayed is for self-supporting cones with a heating rate of 108°F/hr

`Id` – Identify control for KISS software

`16-S` – 16 Segment Program for Vary-Fire Programs On/Off. Comes up only if Profile #5 is programmed.

`CnoS` (Cone Offset) - Used to raise or lower the final cone temperature. This option is available only in the EASY FIRE (cone firing) mode.

`CHG °` - Used to select degrees Fahrenheit (°F) or degrees Celsius (°C).

`ErCd` - Used to turn on or turn off the error codes.

`rSEt` - Used to reset to default values.

`tCoS` - Used to change thermocouple offsets

`LAG` - used to change lag temperatures between zones. The default setting is 25. The range is 5 to 99.

`AuLg` – used to turn **AUTOLAG** On or Off. **AUTOLAG** is a feature that automatically disables the **LAG** control until the end of the firing. Having **AUTOLAG** turned on speeds up the firing considerably. Most ceramics applications do not require exceptional uniformity until the end of the firing. glass and other industrial applications turning **OFF AUTOLAG** is probably recommended.

C.5 NUMBER KEYS Section
Contains the ENTER key and the number keys.
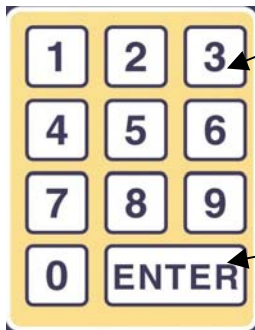
Numeric keys - Used for entering times, temperatures and other numbers. The number "1" is also used to acknowledge the `ErrP` error signal when you first turn the kiln on. Press "**1**", "**2**" or "**3**" while firing to change which thermocouple reading you see in the LED display. Press **8** while firing to turn On/Off the ability to see which zones are firing by the LED display dots.

Enter Key – Used to enter or acknowledge numbers and programs

C.6 EASY-FIRE Section
Choose the EASY FIRE mode you want to use.
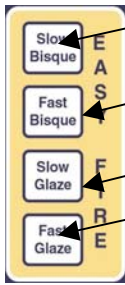
Slow Bisque - Used for setting a slow bisque firing profile.
** 13 hours to fire to cone 04.**
Fast Bisque - Used for setting a fast bisque firing profile.
** 10 hours to fire to cone 04.**
Slow Glaze - Used for setting a slow glaze firing profile.
** 7 hours to fire to cone 04.**
Fast Glaze - Used for setting a fast glaze firing profile.
** 4 hours to fire to cone 04.**

C.7 EASY-OPTIONS Section
Choose the EASY options (Delay Time, Preheat Time, Alarm)
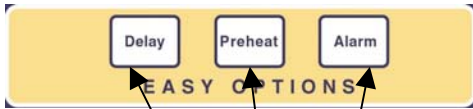
Alarm – Used to sound an audible alarm at a temperature that you specify

Preheat – Used to put in a preheat time to allow the ceramic work to dry out completely.

Delay – Used to delay firing until you want the program to start

APPENDIX D
TERMS AND ABBREVIATIONS

Celsius - a temperature scale in which 0° is the freezing point and 100° the boiling point of water. Also called centigrade.

centigrade - a temperature scale in which 0° is the freezing point and 100° the boiling point of water. Also called Celsius.

cone - a pyramid shaped ceramic composite which bends and melts in the kiln to indicate the amount of heat work which has taken place in the kiln.

default – (or default settings) These are the settings that the Dynatrol comes programmed with from the factory. Using the Reset feature will return the Dynatrol to it's default settings.

final set point – in an all heating program with no cooling segments this would be the maximum temperature the kiln was programmed to reach. If there are programmed cooling or holding segments then the last segment's programmed set point is the final set point.

profile - A series of segments which define how the kiln temperature is to proceed through the firing. This is sometimes referred to as a program.

ramp-hold - A firing profile in which the temperature is programmed to increase to a specific temperature, hold for a period of time then repeat this sequence until a final temperature is reached.

segment - One unit of programming. Each segment on this control has a ramp (Deg per hour), a final set point temperature and a hold time.

set point – the target temperature within a programmed segment.

T/C or **t/c** - Abbreviation for thermocouple.

thermocouple (abbreviated **T/C** or **t/c**) - Temperature measurement sensor made of two dissimilar metals which are joined at one end; the end where they are joined is the temperature measuring end. The RED wire is always the negative lead in a thermocouple.

witness cone - a ceramic cone which bends to indicate the heat work which has been done.

APPENDIX E
DISPLAY MESSAGES (in alphabetical order)

ALAr - **Alarm**. When **ALAr** flashes in the display, an alarm temperature between 0° and 9999° may be entered. When the alarm is set to 9999°, it is turned off.

AULG – **AUTOLAG.** In Options, Other button, behind the Lag setting: You can turn Autolag feature on or off.

bd t - **Board Temperature**. Indicates the temperature of the Dynatrol's electronics (see Control Precautions).

°C1, °C1, °C1, through **°C 8**, Degrees Celsius temperature. In the "Vary Fire" Mode with the Celsius temperature scale selected, the controller is waiting for an end temperature to be entered for the segment. The numbers stand for the segment which is being programmed.

CHG° - **Change degrees -** When **CHG°** is displayed, press **ENTER** to select the temperature scale you would like to use, either Fahrenheit (°F) or Celsius (°C). The **1** key will toggle between °F and °C. When the scale you want to use is displayed, press **ENTER**.

CnoS - **Cone offset**. Press **ENTER** to adjust an individual cone shut off temperature plus or minus 50°F.

ConE - **Cone number**. When **ConE** is displayed, a cone number between 022 and 10 must be entered. This will be found in the Cone Table or the "Easy Fire" Mode.

CO S – **Degrees Centigrade offset** – seen when a Cone Offset or a Thermocouple offset is being programmed.

CPL - **Complete**. Indicates programming or some programming function is complete.

CPLt - **Complete**. Indicates a firing has been completed.

Decimal Point displayed in lower right-hand corner of display   The temperature is displayed in degrees Celsius (°C).

Decimal Point displayed in center of display between 10's and 100's. A time in hours and minutes is being displayed.

dELA - **Delay**. Indicates the time in hours and minutes before the start of firing.

DIAG - **Diagnostics**. Located in the Hidden "Other" Menu. Pressing ENTER here turns zone 1's elements on for one minute followed by zone 2's elements, then zone 3's elements. A powered bottom will stay on during all three zone's test. If the kiln is improperly put together it will become apparent now.

ErCd. **Error Codes**. When **ErCd** is displayed, press enter to turn the Error Code function on or off. This function is located by pressing **OTHER** in the OPTIONS Section.

Err- **Error**. Indicates a software error has occurred. The error codes are listed in **APPENDIX F.**

ErrE. Software Error. Indicates a software error has occurred. Contact L&L Service. The error codes are listed in **APPENDIX F.**

Err0, Err1, Err2 through **Err8** **Error**. An error has occurred; the error codes are listed in **APPENDIX F.**

ErrP - Power Outage Error. This is displayed during a firing if power to the kiln has been interrupted for more than a couple minutes, depending how far along in the firing you are. The error codes are listed in **APPENDIX F.**

°F1, **°F2, °F3** through **°F8** In the "Vary Fire" Mode with the Fahrenheit temperature scale selected, the controller is waiting for an end temperature to be entered for the segment. The numbers stand for the segment which is being programmed.

°FO S – **Degrees Fahrenheit Offset** – seen when a Cone Offset or a Thermocouple offset is being programmed.

FAIL - **Thermocouple Failure**. The thermocouple is not connected to the controller or there may be a break in one of the thermocouple lead wires. If the thermocouple wire is broken, it must be replaced. When connecting the thermocouple, connect the RED wire to the connector with RED dot and connect the YELLOW wire to the connector with the YELLOW dot. On all thermocouples, the RED wire is always negative; the yellow wire in this case is the positive.

FAN1, FAN2, FAN3, through **FAN8.** This message will appear during programming in the Vary Fire mode only after OP C (option C in the hidden "other" menu) has been chosen. "FAN" refers to your powered bottom (if you have one), and the number is the number of the segment you are currently programming. The powered bottom (FAN) can be programmed to be **ON** or **OFF** in each segment of the Vary Fire program.

F-bC **Fast Bisque**, One of the Easy-Fire programs

F-GL **Fast Glaze**, One of the Easy-Fire programs

HLd - **Hold**. Indicates the holding time in hours and minutes at the end of a "Easy Fire" program. OR it may mean that you have just pressed **ENTER** after seeing **PrHt** and now the Dynatrol is asking how much hold time in the preheat setting you want to have.

Hld1, Hld2, Hld3 through **Hld8** In the "Vary Fire" Mode the controller is waiting for a soak or hold time in hours and minutes to be entered for the segment. The numbers stand for the segment which is being programmed.

Id – **Identification.** Allows you to identify a particular control for use with KISS computer software.

IdLE and Temperature – Flashing The kiln is off, and the current temperature in the kiln is displayed. The Dynatrol is programmed to run using only one thermocouple.

IdLE, tC2, and the current temperature flashing- The kiln is off, and the current temperature in the kiln at thermocouple #2 is displayed. The Dynatrol is programmed to run using either two or three thermocouples.

LAG - **LAG** is the number of degrees any zone can lag the local set point before ramping is suspended to the other sections. Ramping in those sections will continue as soon as the slow zone catches up. **LAG** is programmable with a maximum setting of 99 and a minimum setting of 5.

notC - **Number of thermocouples.** Located in the Hidden "Other" Menu. Pressing **ENTER** here allows you to choose how many thermocouples (essentially how many zones) are in the kiln.

OFF. Press **ENTER** when displayed to turn the Error Codes, the Autolag, a Powered Bottom, or the "shut off" feature Off. Pressing the **1** key toggles between **On** and **OFF**.

On (no dashes). Press **ENTER** when displayed to turn the function you are programming on. Pressing the **1** key toggles between **On** and **OFF**.

-On- On displayed with dashes. Displayed for about 10 to 15 seconds when the **START/STOP** button is pressed to begin a firing. The heating elements of the kiln will not begin heating until **-On-** disappears and the current kiln temperature is displayed. NOTE: Pressing any key besides **START/STOP** while **-On-** is displayed, will stop the firing. Pressing **START/STOP** after –**ON**- goes away will stop the firing.

OPA. **Option A**. DO NOT PRESS ENTER HERE. This option is not used with L&L's kiln systems.

OPB. **Option B**. DO NOT PRESS ENTER HERE. This option is not used with L&L's kiln systems.

OPC. **Option C**. Located in the Hidden "Other" Menu. Allows you to turn the powered bottom on or off in each segment of the Vary Fire mode.

PCt. **Percent**. Located in the Hidden "Other" Menu. You can set how often your powered bottom comes on based on a percent of when the bottom zone comes on.

PF. **Power Failure**. **PF** indicates the power to the kiln has been interrupted for a long enough time to effect the current firing. The kiln has shut down and the firing must be restarted.

PId. Located in the Hidden "Other" Menu. Pressing **ENTER** when you see this allows you to program a setting to help a heavily or unevenly loaded kiln fire faster.

PrHt. **Preheat stage.** When **PrHt** is displayed, press **ENTER** to select the preheat stage holding time. Found in the "Other" menu in the OPTIONS section.

rA1, rA2, rA3 through **rA8** In the "Vary Fire" Mode the controller is waiting for an ramp temperature rise per hour to be entered for the segment. The numbers stand for the segment which is being programmed. The temperature is in °F/hr or °C/hr whichever has been selected. If °C has been selected, there will be a decimal point in the lower right-hand corner of the display.

rSEt **Reset**. Press **OTHER** until **rSEt** is displayed. Then press **ENTER**. **CPL** will be displayed indicating that the thermocouple offsets have been set to zero, **LAG** to 25, Autolag to OFF, and the Error Checking to **ON**. These are the Default settings.

16-S. **Sixteen step program option.** Vary Fire profile #5 must have been chosen, and now the Dynatrol must be told whether to automatically fire Vary Fire profile #6 immediately after the ending of #5 (16-S set to ON) or not (16-S set to OFF).

SAFt. **Saftey option.** DO NOT PRESS ENTER HERE. This option is not used with L&L's kiln systems

S-bC **Slow Bisque**. One of the Easy-Fire programs

S-GL **Slow Glaze**, One of the Easy-Fire programs

SEG. **Segment**. When **SEG** is displayed, the number of desired segments for a "Vary Fire" program should be entered.

ShtO. Located In the Hidden "Other" Menu. Set to either ON or OFF. Lets you choose between firing styles where: **ON** means that as soon as the hottest zone gets to the segment's set point the entire kiln switches to either the "hold time" or the next segment. **OFF** means that the Dynatrol will not let the hottest zone's temperature rise until the average temperature of the three zones reaches that segment's set point. Then the kiln can begin the "hold time" or the next segment.

StOP - **Stop**. Indicates firing has been stopped. Also may be displayed when the controller is first turned on. Also used like **CPL** with some functions.

USEr. When **USEr** is displayed, one of the 6 user programs may be selected or programmed.

SStP. **Skip Step**. Press **VIEW SEGMENT, ENTER, ENTER** to skip to the next ramp segment in a "Vary Fire" program. Skip Step is not available with a "Easy Fire" program.

tCoS **Thermocouple offsets**. This is used to raise or lower the temperature indicated by any of the thermocouples. The maximum offset is 50°F. A positive offset is entered with 00 preceding the amount of offset and a negative offset is preceded with 90. This is the same as is done for entering cone offsets. When **tCoS** is displayed, press **ENTER** and **tC1** will be displayed. Press enter and the current offset for the top thermocouple will be displayed. Press **ENTER** when the correct offset for the top thermocouples is displayed and then **TC2** will be displayed. Repeat the process for **TC2** and **TC3**.

Temperature - Continuously displayed The kiln is on (in either a "Vary Fire" or a "Easy Fire" program), and the current temperature in the kiln is displayed. The Dynatrol is programmed to run using only one thermocouple.

tC2 and the current temperature flashing- The kiln is on (in either a "Vary Fire" or a "Easy Fire" program), and the current temperature in the kiln at thermocouple #2 is displayed. The Dynatrol is programmed to run using either two or three thermocouples.

Time - Decreasing A delay start is in effect for a "Vary Fire" or a "Easy Fire" program. The time remaining before the kiln starts to heat is displayed.

Time - Temperature alternately flashing. The kiln is in either a hold phase of a "Vary Fire" segment or a hold phase at the end of an "Easy Fire" Profile. The numbers displayed are the remaining time and the current kiln temperature.

APPENDIX F
Easy Fire Temperature Profiles

These charts tell what the Easy Fire programs do to your kiln when you choose one of them. These charts will also be good reference points for writing your own programs in the Vary Fire mode. These charts are for cones 07 through 04 and cones 5, 6, 7, and 10. Other cone numbers will work as well in your own programs.

⚠ ? TIP **NOTE:** No delays, preheats. or final soaks are shown. When these programs are fired the actual final temperatures may vary slightly as the Dynatrol adjusts itself based on how quickly it is climbing to that final temperature. This would not be the case for "Vary Fire" programs that you develop and input yourself. Also note that all these programs end on segment 7 rather than start on segment 1. This is due to the way the Orton feature works in the "Easy Fire" mode and is not relevant to your own programming in the "Vary Fire" mode. (Segment #7 in the "Easy Fire" mode is a special segment that incorporates the Orton software and so it must be the last segment of every "Easy Fire" profile). Start your "Vary Fire" profiles on segment 1.

CONE 07

Slow Bisque Firing Profile for cone			**07**	**1787°F**		Slow Glaze Firing Profile			
Segment	Rate°F /hr	Temperature °F	Hold	Time in Hours	Segment	Rate°F /hr	Temperature °F	Hold	Time Hours
3	80	250		2.25	5	150	250		1.20
4	200	1000		3.75	6	400	1537		3.22
5	100	1100		1	7	120	1787		2.08
6	180	1537		2.43					
7	80	1787	0	3.13				0	
			Total	12.55				Total	6.50

Fast Bisque Firing Profile						Fast Glaze Firing Profile			
Segment	Rate°F /hr	Temperature °F	Hold	Time in Hours	Segment	Rate°F /hr	Temperature °F	Hold	Time Hours
3	120	250		1.50	6	570	1537		2.57
4	300	1000		2.50	7	200	1787		1.25
5	150	1100		0.67					
6	180	1537		2.43					
7	108	1787	0	2.31				0	
			Total	9.41				Total	3.82

NOTE: All the programs shown are written to accommodate the fastest possible empty kilns. THE NUMBERS DO NOT REPRESENT TYPICAL KILN FIRING TIMES WITH A LOAD. Most kilns will take considerably longer (as much as 4 times) to fire than the times shown here.

CONE 06

Slow Bisque Firing Profile for cone			06	1819°F		Slow Glaze Firing Profile			
Segment	Rate°F /hr	Temperature °F	Hold	Time in Hours	Segment	Rate°F /hr	Temperature °F	Hold	Time Hours
3	80	250		2.25	5	150	250		1.20
4	200	1000		3.75	6	400	1569		3.30
5	100	1100		1	7	120	1819		2.08
6	180	1569		2.61					
7	80	1819	0	3.13				0	
			Total	12.73				Total	6.58

Fast Bisque Firing Profile						Fast Glaze Firing Profile			
Segment	Rate°F /hr	Temperature °F	Hold	Time in Hours	Segment	Rate°F /hr	Temperature °F	Hold	Time Hours
3	120	250		1.50	6	570	1569		2.63
4	300	1000		2.50	7	200	1819		1.25
5	150	1100		0.67					
6	180	1569		2.61					
7	108	1819	0	2.31				0	
			Total	9.59				Total	3.88

CONE 05

Slow Bisque Firing Profile for cone			05	1891°F		Slow Glaze Firing Profile			
Segment	Rate°F /hr	Temperature °F	Hold	Time in Hours	Segment	Rate°F /hr	Temperature °F	Hold	Time Hours
3	80	250		2.25	5	150	250		1.20
4	200	1000		3.75	6	400	1641		3.48
5	100	1100		1	7	120	1891		2.08
6	180	1641		3.01					
7	80	1891	0	3.13				0	
			Total	13.13				Total	6.76

Fast Bisque Firing Profile						Fast Glaze Firing Profile			
Segment	Rate°F /hr	Temperature °F	Hold	Time in Hours	Segment	Rate°F /hr	Temperature °F	Hold	Time Hours
3	120	250		1.50	6	570	1641		2.75
4	300	1000		2.50	7	200	1891		1.25
5	150	1100		0.67					
6	180	1641		3.01					
7	108	1891	0	3.13				0	
			Total	10.81				Total	4

NOTE: All the programs shown are written to accommodate the fastest possible empty kilns. THE NUMBERS DO NOT REPRESENT TYPICAL KILN FIRING TIMES WITH A LOAD. Most kilns will take considerably longer (as much as 4 times) to fire than the times shown here.

CONE 04

Slow Bisque Firing Profile for cone			04	1926°F		Slow Glaze Firing Profile			
Segment	Rate°F /hr	Temperature °F	Hold	Time in Hours	Segment	Rate°F /hr	Temperature °F	Hold	Time Hours
3	80	250		2	5	150	250		1
4	200	1000		4	6	400	1676		4
5	100	1100		1	7	120	1926		2
6	180	1676		3					
7	80	1926	0	3				0	
			Total	13				Total	7

Fast Bisque Firing Profile						Fast Glaze Firing Profile			
Segment	Rate°F /hr	Temperature °F	Hold	Time in Hours	Segment	Rate°F /hr	Temperature °F	Hold	Time Hours
3	120	250		2	6	570	1676		3
4	300	1000		3	7	200	1926		1
5	150	1100		1					
6	180	1676		3					
7	108	1926	0	2				0	
			Total	11				Total	4

CONE 5

Slow Bisque Firing Profile for cone			5	2165°F		Slow Glaze Firing Profile			
Segment	Rate°F /hr	Temperature °F	Hold	Time in Hours	Segment	Rate°F /hr	Temperature °F	Hold	Time Hours
3	80	250		2.25	5	150	250		1.20
4	200	1000		3.75	6	400	1915		4.16
5	100	1100		1	7	120	2165		2.08
6	180	1915		4.43					
7	80	2165	0	3.13				0	
			Total	14.66				Total	7.44

Fast Bisque Firing Profile						Fast Glaze Firing Profile			
Segment	Rate°F /hr	Temperature °F	Hold	Time in Hours	Segment	Rate°F /hr	Temperature °F	Hold	Time Hours
3	120	250		1.50	6	570	1915		3.24
4	300	1000		2.50	7	200	2165		1.25
5	150	1100		0.67					
6	180	1915		4.53					
7	108	2165	0	2.31				0	
			Total	11.51				Total	4.49

NOTE: All the programs shown are written to accommodate the fastest possible empty kilns. THE NUMBERS DO NOT REPRESENT TYPICAL KILN FIRING TIMES WITH A LOAD. Most kilns will take considerably longer (as much as 4 times) to fire than the times shown here.

CONE 6

Slow Bisque Firing Profile for cone	6	2199°F				Slow Glaze Firing Profile			
Segment	Rate°F /hr	Temperature °F	Hold	Time in Hours	Segment	Rate°F /hr	Temperature °F	Hold	Time Hours
3	80	250		2.25	5	150	250		1.20
4	200	1000		3.75	6	400	1949		4.25
5	100	1100		1	7	120	2199		2.08
6	180	1949		4.72					
7	80	2199	0	3.13				0	
			Total	14.85				Total	7.53

Fast Bisque Firing Profile						Fast Glaze Firing Profile			
Segment	Rate°F /hr	Temperature °F	Hold	Time in Hours	Segment	Rate°F /hr	Temperature °F	Hold	Time Hours
3	120	250		1.50	6	570	1949		3.30
4	300	1000		2.50	7	200	2199		1.25
5	150	1100		0.67					
6	180	1949		4.72					
7	108	2199	0	2.31				0	
			Total	11.70				Total	4.55

CONE 7

Slow Bisque Firing Profile for cone	7	2228°F				Slow Glaze Firing Profile			
Segment	Rate°F /hr	Temperature °F	Hold	Time in Hours	Segment	Rate°F /hr	Temperature °F	Hold	Time Hours
3	80	250		2.25	5	150	250		1.20
4	200	1000		3.75	6	400	1978		4.32
5	100	1100		1	7	120	2228		2.08
6	180	1978		4.88					
7	80	2228	0	3.13				0	
			Total	15				Total	7.60

Fast Bisque Firing Profile						Fast Glaze Firing Profile			
Segment	Rate°F /hr	Temperature °F	Hold	Time in Hours	Segment	Rate°F /hr	Temperature °F	Hold	Time Hours
3	120	250		1.50	6	570	1978		3.35
4	300	1000		2.50	7	200	2228		1.25
5	150	1100		0.67					
6	180	1978		4.88					
7	108	2228	0	2.31				0	
			Total	11.86				Total	4.60

NOTE: All the programs shown are written to accommodate the fastest possible empty kilns. THE NUMBERS DO NOT REPRESENT TYPICAL KILN FIRING TIMES WITH A LOAD. Most kilns will take considerably longer (as much as 4 times) to fire than the times shown here.

CONE 10

Slow Bisque Firing Profile for cone			**10**	**2345°F**	Slow Glaze Firing Profile				
Segment	Rate°F /hr	Temperature °F	Hold	Time in Hours	Segment	Rate°F /hr	Temperature °F	Hold	Time Hours
3	80	250		2	5	150	250		1
4	200	1000		4	6	400	2095		5
5	100	1100		1	7	120	2345		2
6	180	2095		6					
7	80	2345	0	3				0	
			Total	16				Total	8

Fast Bisque Firing Profile					Fast Glaze Firing Profile				
Segment	Rate°F /hr	Temperature °F	Hold	Time in Hours	Segment	Rate°F /hr	Temperature °F	Hold	Time Hours
3	120	250		2	6	570	2095		4
4	300	1000		3	7	200	2345		1
5	150	1100		1					
6	180	2095		6					
7	108	2345	0	2				0	
			Total	13				Total	5

NOTE: All the programs shown are written to accommodate the fastest possible empty kilns. THE NUMBERS DO NOT REPRESENT TYPICAL KILN FIRING TIMES WITH A LOAD. Most kilns will take considerably longer (as much as 4 times) to fire than the times shown here.

APPENDIX G
ERROR CODES

Error Code	Description	Quick View NOTE: ">" means greater than, "<" means less than
Err0 **rPCn**	Software Error. Recheck the selected program, and reprogram if necessary. You may have to contact the L&L for new software.	
Err1	The temperature is increasing less than 12 degrees per hour during a ramp segment, where the temperature is programmed to increase. This slow rate must persist for 22.5 minutes before the error is displayed. This can be caused by low power to the kiln, aged elements, etc. See the kiln Troubleshooting Guide to check for all the things that could cause slow heat up. It is one of the most common error codes. Try running the kiln with the error codes turned off. Note that Err1 is only a possibility during a ramp.	Ramp segment Temp. increase < 12°F/hr Persists > 22.5 min.
Err2	During a hold segment the temperature rises to greater than 50 degrees above the hold temperature which was set. The temperature must stay 50 degrees above this set temperature for 18 seconds before the error is displayed.	Hold segment 50°F above set temp. Persists > 18 sec.
Err3	During a hold segment the temperature is more than 50 degrees below the hold temperature which was set. The temperature must stay 50 degrees below this set temperature for 18 seconds before the error is displayed.	Hold segment 50°F below set temp. Persists > 18 sec.
Err4	The temperature is more than 50 degrees above the previous hold temperature during a ramp segment where the temperature is programmed to decrease. The temperature must stay 50 degrees above this set temperature for 18 seconds before the error is displayed.	Decreasing Ramp segment 50°F above last hold temp. Persists > 18 sec.
Err5	The temperature is more than 50 degrees below the local setpoint temperature during a ramp segment where the temperature is programmed to decrease. The temperature must stay 50 degrees below this set temperature for 18 seconds before the error is displayed.	Decreasing Ramp segment 50°F below local setpoint temp. Persists > 18 sec.
Err6	A Negative temperature is displayed. This generally indicates the thermocouple is connected incorrectly. To correct this situation, ensure the red and yellow wires are connected correctly to the controller and at all junctions. You can identify the red lead on an unmarked thermocouple with a magnet because a magnet will be attracted to the red lead.	(-) displayed
Err7	The temperature is more than 50 degrees above the local setpoint temperature during a ramp segment where the temperature is programmed to increase. The temperature must stay 50 degrees above this set temperature for 18 seconds before the error is displayed.	Increasing Ramp segment 50°F above local setpoint temp. Persists > 18 sec.
Err8	When using the Easy Fire Mode, the temperature is decreasing during the last ramp segment. This could indicate that (if provided on your kiln) that a kiln sitter has turned the kiln off or that the lid was up or the peepholes open or some other physical thing is causing the kiln to decrease in temperature.	Cone fire mode only Temp. decreasing during last ramp segment
ErrP	Continuous **ErrP** in display. Indicates a long term power outage. The kiln has been shut down. Press **1** to clear the display.	

ErrP	**ErrP** and the current temperature are alternately flashing. To clear the display, press the **1** key. If a firing was in progress, the kiln will continue to fire even though this message is flashing. This error can also happen as a result of RF noise that resets the microprocessor. If this is suspected, the control panel should be returned to L&L for testing and possible modification.	
Err-	The Err with a dash indicates there was a power loss to the controller while writing a program to the non-volatile memory chip. Recheck the selected program, and reprogram if necessary.	
Errd	This is "Error Difference." **Errd** indicates that a difference of more than a 100 degrees has been detected between any of the thermocouples and the set point. When **Errd** is displayed the firing will be terminated. **Errd** will not be detected if the error codes (**ErCd**) have been turned off. The reason for having **Errd** is to insure against a case where, for instance, the top (**tC1**) and bottom (**tC3**) thermocouples have been inadvertently switched. In such a case the top thermocouple (**tC1**), while placed in the bottom section, could be calling for heat and the heat will be delivered to the bottom of the kiln causing a grossly uneven firing. The first thing to test, if you have this error code, is that the thermocouples are placed in the proper sections. To do this take each thermocouple out (while the kiln is cold) and heat it with a match while pressing the 1, 2, or 3 button on the control to read the appropriate thermocouple. Top should be #1, Middle should be #2 and Bottom should be #3. Another potential cause of this error code could be the sections stacked in the wrong order, or plugged into the control's receptacles in the wrong order. If not this, a bad element in one of the sections. Check to see if the elements are firing. Check resistance on the elements (see the troubleshooting guide or the general kiln instructions or contact L&L for information on this). Another possibility is a bad contactor or bad receptacle or loose wire. Using a digital multi-meter that allows you to test voltage in an outlet and resistance in a circuit (available from any good electronics or hardware store) you, your electrician, or your local kiln distributor can see whether a circuit is actually delivering power to the receptacles on the control box, and exactly what the resistance of your elements are.	
ErrE	A hardware error has been detected by the controller software. The controller must be returned for service.	Hardware error

APPENDIX H
How Three Zone Control is Used

HOW THREE ZONE CONTROL IS USED ON A TWO, FOUR AND FIVE SECTION KILN AND WITH A POWERED BOTTOM

On kilns with four heating sections the center two heating sections are tied together as one center zone. On kilns with five heating sections the center three heating sections are tied together as one center zone. Each section still has its own separate contactor, but the center zone control output controls one contactor on a three section kiln, two contactors on a four section kiln and three contactors on a five section kiln. We suggest placing the center zone thermocouple (`tC2`) in either of the two middle sections on a four section kiln and in the center section on a five section kiln. You can of course experiment to achieve optimal results.

Kilns with two zones typically use inputs (thermocouples) and outputs (receptacles) 1 and 2 even though we usually have a third unused circuit on the control. If you add a section you may want to enable the three zone control (see the section on programming) and possibly add a thermocouple. On kilns with powered bottoms the powered bottom is controlled off the bottom zone control output. This would be the case of a kiln with three or more sections. In the case of a two section kiln with a powered bottom the powered bottom is controlled off the center zone control (`tC2`). This acts as a two zone kiln.

APPENDIX I
Frequently Asked Questions

I.1 During programming of a firing, I typed a wrong number. How do I correct this?

Before pressing **ENTER,** enter zero until all zeros are displayed, then enter the correct number. If you have already pressed **ENTER,** you must continue to enter the rest of the program as you would have, then you must start over again to program properly, fixing your mistake this time around..

I.2 How do I clear the `ErrP` from the display?

Press the **"1"** key. After several seconds the current temperature will be displayed. The amount of time the last firing took or **StOP** may be displayed before the current temperature. If the **ErrP** message is flashing with the alternate display being the temperature then it means that the kiln is still firing after a brief power interruption.

I.3 I am getting the `Errd` message. What is wrong?

More than likely the kiln was set up improperly. NOTE: It is absolutely necessary to match the proper ring with the proper control box outlet and proper thermocouple. If these are mismatched the kiln will not operate properly and you will get the **Errd** display showing that one of the zones is way off set point. Thermocouples, cords and receptacles are all marked for identification. The top zone ring, outlet and thermocouple are all marked #1. In three ring kilns the middle zone is #2 and the bottom is #3. In four ring kilns the middle zone is #2 and #3; the bottom is #4. In five ring kilns the middle is #2, #3 and #4 and the bottom is #5. You can easily test to make sure the thermocouples are properly located by putting a match to one at a time and checking the temperature rise on the control for that thermocouple.

I.4 I am getting the `Err1` message. What is wrong?

This is the most common error message. It means the kiln is rising in temperature too slowly and can be caused by a variety of things. In older kilns it is probably a result of elements being aged or one or more elements not firing for some reason. The first thing to check is element resistance and continuity. See our troubleshooting guide for details. If this happens in a newer kiln it is still a good idea to check the elements. One problem we have found is that the thermocouple lead wire was pinched and was creating a short circuit (meaning that the controls was reading whatever temperature was at the pinched point and so, as far as the control was concerned, the kiln wasn't heating up. The way to test for such a condition is first of all to observe that the control is showing a temperature that is greatly different than what you can tell is in the kiln. The other better way is to disconnect the thermocouple and see if the display says **FAIL** . If it

does then it means there is no short circuit in the thermocouple circuit. This could also happen with a burned thermocouple connection wire (say if the yellow wire touched the kiln case and the wire insulation burned off). Note that Err1 is only a possibility during a ramp. A common problem is that one of the sections is lagging. Try a **LAG** of 50 or even 75. Try to find out which section is lagging. If it is the bottom (fairly typical) you could try a 2" layer of calcium silicate under the kiln bottom (this is very inexpensive insulation that is quite hard and non-compressible) or even another brick bottom. If you are using a vent try turning it off towards the high end of the firing cycle. (NOTE: This is OK to do on an L&L Vent-Torr but with some bottom mounted vents you are not supposed to do this or you will burn up the motor). Make sure your peepholes are closed at high fire. Make sure **AUTOLAG** is on. Make sure kiln is loaded evenly, more in the bottom of the kiln than the top will make it fire very slowly also. One last thing to consider is the voltage available to the kiln when it is on and running. Get an electrician to check this at the kiln and be sure it comes pretty close to the kiln's label. Low voltage can cause slow heat ups and voltage lower than 208VAC can also cause problems with the microprocessor in the Dynatrol as well.

I.5 My kiln takes longer to fire than I think it should.

Make sure you have the **AUTOLAG** feature turned on. . See suggestions above in **Err1** troubleshooting.

I.6 My program takes longer to complete than I expected. What is happening?

The controller actually accomplishes the temperature rise by establishing what's called a traveling set point. The traveling set point is set by the controller at the initial kiln temperature, and it is increased (or decreased) at a rate equal to the ramp rate you have chosen. Anytime the kiln temperature is below this traveling set point the heating elements of the kiln are turned on. If the temperature is above the traveling set point the heating elements are turned off. When both the traveling set point and the average of the measured temperatures reach the first soak temperature, the hold phase begins or the next ramp rate begins. (That is called a guaranteed soak). It means that a program might take longer than the theoretical time you have programmed into it.

I.7 My kiln seems to be much hotter than the thermocouples indicate. Or the kiln seems to be going to slow (by the readings on the controller).

This could be serious. Check to see that the thermocouples are inserted at least 1 to 1-1/2" into the kiln. If the tips of the thermocouples are buried in the kiln wall insulation they will obviously read at a lower temperature than the inside of the kiln. **THIS COULD LEAD TO AN OVERFIRING OF THE KILN!** Another possibility is that there is a short circuit in the thermocouple lead wire. See the above **Err1** question to check the thermocouple circuit.

I.8 Is there a guaranteed soak?

Yes. This means that if the kiln does not reach temperature in the time you assign in a ramp it will not start the hold portion of that segment until the kiln reaches the set point temperature. This also means that the actual time to fire may take longer than you have programmed into the kiln (if it takes longer to get to a particular temperature than you think it ought to take).

I.9 I turned on the controller and FAIL is displayed. What does this mean?

One or more of the thermocouples are not connected to the controller. When connecting the thermocouple, connect the RED wire to the connector with the negative (minus) sign under it. Connect the YELLOW wire to the connector with the positive (plus) sign under it. . On all thermocouples, the RED wire is always negative; the yellow wire in this case is the positive. Also there may be a break in one of the thermocouple lead wires, if so, the thermocouple lead wire must be replaced. Make sure all thermocouple connections are very secure and tight and that there is a direct touching of the thermocouple lead wire with the actual wire inside the thermocouple. (See I.21)

I.10 I keep burning out thermocouples. What is wrong?

Thermocouples, like elements are a consumable item. They will burn out over time. If you are firing to high temperatures (Cone 5 and above) you should consider either an 8 gauge thermocouple or one of the new 2300MI Industrial thermocouples. A reduction atmosphere (the lack of enough oxygen in the kiln to thoroughly burn off all impurities) attacks elements and thermocouples. Speedy firings especially as the kiln climbs to 1100°F, will not give enough time to burn out these impurities. This is made worse if there

is no ventilation to the kiln. An open peephole or three may be enough, or a downdraft venting system like L&L's Vent Torr system may be what you need for a good, clean, oxidizing atmosphere.

I.11 How can I find out the final temperature which was reached during a cone firing?

At the end of an Easy Fire firing, the current kiln temperature and **CPLt** will be alternately flashing in the display. Press **ENTER** or **START/STOP**. Then press "**Review Program**", the final temperature will display. This final temperature will be retained until the next firing or until the controller is reprogrammed. In a Vary Fire program the Dynatrol will fire to the temperature programmed.

I.12 My kiln underfires, turns off before the DynaTrol reaches its set point .

If you have a Dawson Kiln Sitter as a back up safety device be sure that the cone in it is at least two to three cones higher than your final set point temperature. Remember that, when using the DynaTrol control, the optional kiln sitter is only safety back up controls. You do not want it to actually actuate. If you have a Dawson Kiln Sitter/Timer, be sure the time is set higher than the expected length of your program. See above answer about the kiln sitter safetey control . Also you may need to adjust the cone settings with the cone offset. Note that it is common for thermocouples to "drift" in their readings. As this happens the cone offset or the thermocouple offset can compensate for this. Always fire with witness cones so you can compare what the control did to the actual performance of cones.

I.13 Why use a soak time or make the kiln go slow?

Most ceramics achieves its characteristics not so much by what temperature it reaches but by how much "heat-work" is put into it. A long soak at a lower cone can often develop the bisque or glaze better. In addition a soak period almost always will improve the uniformity of the firing throughout the kiln. A soak period gives the entire load of ware time to absorb the radiant heat that is projected from the elements. If you simply rise to a certain temperature and then shut the kiln off (as is typical of a manual kiln sitter operation) then the center of the kiln may not have had a chance to absorb as much heat as the ware around the perimeter. The same would be true for a thick piece of pottery if it was just heated to a temperature and then cooled. The middle of the piece would never get to the same temperature as the outside of the piece, and in extreme situations, if it was heated very quickly, could cause the piece to explode. You may have experienced the fact that an older kiln, with slow firing elements may in fact have given you better results. This is because the entire kiln has had a chance to even itself out as it approached final cone. A slow heat up will result in "cleaner" bisque. It will give the kiln time to burn out impurities like sulfur and carbon out of the clay. These impurities can cause pitting and other problems when you subsequently glaze the ware if they have not been given sufficient time to burn off during the bisque.

I.14 Can you change a program segment while running a program?

No. You must first Stop the program by hitting **START/STOP**. Then change the program. Then re-start the program. The control will automatically start from where you were previously. For instance if the kiln temperature is at 1200°F and this is segment No 2 it will restart from that point in the program. You can advance to the next segment (in a "Vary Fire" Program). See the directions in under Skip Step in the View Section.

I.15 When the control flashes **TC2** alternating with a temperature does it read that until you toggle to a different thermocouple?

The control is continually reading the temperatures in all three zones. However it only displays one temperature at a time. It does not scroll automatically. To manually scroll to the different thermocouples hit either 1, 2 or 3. The default display is thermocouple #2.

I.16 Is there a lead zone?

No. Each zone is controlled independently with a separate input (each thermocouple), and a separate output (the signal from the Dynatrol to one of the contactors to send or not to send power to the elements. The output of the zones can be quite different. For instance the top zone (#1) may be calling for 75% output while the middle zone (#2) is calling for 35% output while the bottom zone (#3) is calling for 90% output. This percentage is the percent of time that a zone is on, out of the total time elapsed. This is a time proportioning control.

I.17 Is this a time proportioning control?

Yes. The control determines what the percent of output (0-100%) is required to properly heat the kiln. It then converts this into amount of time or and time off that the contactor should be firing. This is different than current proportioning which would send a proportional current to adjust an continually adjustable SCR power control for instance.

I.18 What happens when I turn off the Error Codes?

It is O.K. to do this. However, you will not get certain operator protections which might prevent you from getting a poorly fired kiln. They can be turned off if you are doing special firings, such as jewelry or glass firing where the kiln is left open. This will also turn off the Dynamic Zone Control, **LAG**, and the **Errd** function when the Error Codes are turned off. This turns off most error functions so that kiln is not affected by these built in checks. It eliminates nuisance shut downs but side steps built in "idiot proofing". The only Error codes that this does not turn off are **Err6, FAIL,** and **ErrP** in both the "Easy Fire" and "Vary Fire" modes. In addition **Err1** (indicating slow temperature rise) and **Err8** (temperature falling) is not turned off in the last segment of an "Easy Fire" program. This is because the built in calculations would make no sense if the kiln were firing too slowly.

I.19 What happens when a thermocouple fails?

If the top (**tC1**) thermocouple fails then the top (**tC1**) and middle (**tC2**) work together from the **tC2** thermocouple. If the bottom (**tC3**) fails then the bottom (**tC3**) and middle (**tC2**) work together from the **tC2** thermocouple. If the middle (**tC2**) fails then the top (**tC1**) and middle (**tC2**) work together from the **tC1** thermocouple.

I.20 One or more of the thermocouples reads FAIL. What is wrong?

One or more of the thermocouple circuits has failed. Chances are this is a bad thermocouple. Even if the thermocouple looks OK there might be a microscopic crack that could fail intermittently. A simple test to see if the problem is in the thermocouple itself or in the thermocouple wire is to do the following: Disconnect the thermocouple from the yellow lead/extension wire that attaches at the cold end of the thermocouple. Touch together the red and yellow leads coming out of the yellow lead/extension wire (note: this is very low milli-voltage and is not dangerous). This will complete the thermocouple circuit and eliminate the actual thermocouple from consideration. Now press the #1 button, If the **FAIL** message goes away then you know it is a bad thermocouple. If the **FAIL** message does not go away then the next thing to check is make sure that the thermocouple is properly attached to the connection board on the control. If this looks OK then the yellow extension wire should be replaced or the Dynatrol might have a problem. (See I.9)

I.21 What is PID and can the PID settings be changed?

PID stands for "Proportional, Integral, Derivative" This is a mathematical calculus function built into the control that proportions the amount of power going to the output device (contactor) as the kiln approaches set point temperature. It is used to prevent overshoot which you would get if the control did not turn off until it reached the set point. The values are fixed and based on average kiln conditions. Because most kiln conditions are fairly similar and the ramps are very slow by most industrial standards not much flexibility needs to be built into the PID constants. There is no "adaptive tuning." The values for the PID are hard programmed into the control and can not be changed. They are optimized for ceramics. If you are using the control for another application and you find that the control gives you some overshoot try a step in your program that is a very slow ramp for the last few degrees of the program. For instance if you wanted to get to 1800°F without overshoot have the program go to 1775°F and then take 15 minutes to ramp to 1800°F .

I.22 Is there any way to know what the set point actually is?

Yes. Press View Segment twice while the kiln is firing and the set point will appear.

I.23 What happens if there is a power outage?

If the power outage lasts for less than ½ hour the control should pick up where it left off unless the kiln temperature has dropped more than 250°F or, if it is within 100°F of the end of the firing then only a 100°F drop off is allowed. If the program automatically aborts based on the above logic then it must be

manually restarted. If you restart the program, the control will find out where the temperature is and will start from there. If you get a power outage you will see an **ErrP** error code. This must be reset by hitting any button on the key pad.

I.24 The display is jumpy. What about Thermocouple noise?

The negative lead of the thermocouples are automatically grounded to the safety ground. This typically is able to remove thermocouple noise from the system. Thermocouple noise is typically caused by stray electrical currents induced into the low voltage thermocouple circuits by the kiln elements. It shows up as "jumpy" temperature readings on the control. A little of this is OK but if the readings are very jumpy it can confuse the control. If you see this sort of "jumpiness" check all ground connections involved for tightness and continuity. If the ground is OK and the thermocouples are in the factory provided holes, in your kiln about one and one half inches, then contact L&L or a certified repairman for assistance. NOTE: thermocouples in homemade holes that may be positioned too close to the elements, could receive more of the inductive current generated by the elements, therefore receive more noise (NOTE: In extreme cases L&L can retrofit your control box with a noise suppresser and even wire the box so that the control voltage is feed through a separate 120 volt cord).

I.25 Do thermocouples need to be grounded or ungrounded?

They must be ungrounded thermocouples. Grounded thermocouples will cause problems with this control. The negative leads of the thermocouples are connected to the kiln ground. (See above). Be sure there is only one ground to your kiln. This is normally through the plug or main power connection all the way to the "earth ground". The control is grounded and RF noise generated in the thermocouples (from the elements and other sources) is drawn into the sheath ground and into the negative lead of the thermocouple and then ultimately out to earth ground.

I.26 Can I overide the end of a firing to gain temperature?

Lets say you just fired a load and you can see through your peephole (looking at a witness cone) that your load did not fire to full maturity. Restart the program with a higher cone value and then manually shut off kiln when the witness cone starts to mature. Use the cone offset feature next time to eliminate this problem before it happens again.

I.27 I hear the contactors clicking on and off when the kiln is at a low temperature and even though my set point is way above the temperature readings. Why?

The control only allows power for about 1/3 of the time when the kiln temperature is below 500°F. This is because kilns are generally overpowered for these low temperatures and the control would constantly be overshooting any lower temperature set points without this feature.

I.28 What does it mean when the display flashes?

The Dynatrol is trying to give more information than can fit on just one displayed message. Either the message cycles over and over again, like "**IdLE**, **tC2**, current temperature, or the messages continue to flash by quickly, as in the case of what happens when you press the Review Program button.

I.29 What does CPL mean?

"**CPL**" means that programming an option or a sequence of steps has been completed.

I.30 How do you turn off the audible alarm?

The alarm is an audible signal. You can turn it off (after it turns on) by pressing **ENTER**. Set it for **9999** to disable it.

I.31 How do I get information about my firing?

When the program has completed it will flash **CPLt** and the time it took to get to temperature. After pressing **STOP** you can press **REVIEW PROGRAM** to get more information about the firing. The display will scroll through the following: the Cone you set it at, the actual temperature that the kiln achieved, what speed you had it set for, and hold time. This only works in the Easy-Fire mode. In the Vary-Fire mode, if you press **REVIEW PROGRAM** you see what you programmed only. This information will be retained in memory until the control is reprogrammed.

I.32 What ambient temperature conditions do I need for the control?

Do not operate the controller in temperatures above 125°F or below 32°F. Actually a little hotter or colder will still be within tolerance of the components. The real component rating is near 160°F and 0°F. If you are using the Celsius temperature scale 0°C is the lowest operating temperature possible as the Dynatrol thinks a negative temperature displayed is because of a thermocouple installed backwards, not because it could be cold outside. and . (NOTE: The board components are rated for 50°C below zero so the control (and kiln) can be stored outside in a covered area).

I.33 The kiln did not begin soaking when it should have.

The fact that the kiln did not start to soak when its seems like it should could be due to the fact that an average of all the process variables (TC readings) and the traveling set point have to reach set point temperature before the hold begins.

I. 34 The thermocouples seem to be off according to the cones.

If you had an **ErrP** message while firing, and the kiln temperature went down briefly, the cones may have misrepresented actual temperature for the following reason: If the temperature decreases in the kiln temporarily after the cone begins to form a glass (starts to mature even though it may not be visible) the decrease in temperature could "freeze" the cone and prevent it from operating properly. Cone temperatures also vary according to how quickly the kiln climbs in temperature. Thermocouples do age, sometimes rapidly, and may not read like they used to. Try a cone offset to raise or lower the entire kiln's final temperature for the cone you have programmed. Or try a thermocouple offset if it is just one or two zones that are consistently hotter or cooler than they should be.

I.35 How do I ramp down?

You must use the Vary-Fire Mode. The control will change the path of the firing profile in the direction of the next segment's set point. In other words if the current segment has a set point of 500°F and the following segment has a set point of 1000°F then the control will ramp the set point in the "up" direction. Conversely if the current segment has a set point of 1000°F and the next segment has a setpoint of 500°F then the control will ramp the set point in the "down" direction. See the specific instructions in the Programming section under Vary Fire.

I.36 Does the control work on 50 HZ?

Yes. The control will work on either 50 Hz or 60 Hz. The electrical cycle does not affect any timing circuits in the control.

I.37 TEMPERATURE READINGS VS CONES

Automatic controls are great tools. *They are not complete tools, however.* They base what they do on electrical signals generated by the thermocouples that get interpreted by the electronic control as specific temperatures. There are four inherent problems with this. First, the thermocouples are only measuring temperature at the very tip of the thermocouple. Typically this is placed an inch or two in from the inside surface of the kiln. The thermocouple is usually not measuring the temperature in the middle of the kiln. Second, there is an inherent error in the thermocouple of a few degrees either way. Third, thermocouples drift in their accuracy over time. Fourth, and perhaps most important, thermocouples only measure temperature. For ceramics you are really interested in "heat-work" or the amount of heat that is absorbed by your ware over time. It is like baking a cake. Absolute temperature is only one factor in the successful baking. For all these reasons we highly recommend the use of witness cones in every firing. These will tell you what really happened in the kiln. We suggest using a set of three witness cones in each zone for the kiln. At the absolute minimum use one witness cone per firing to check basic performance of the kiln and control. Then using this accurate information you can use the many features of the DynaTrol to conform the performance of the control to your exact needs. You may want to try firing the kiln with all the preset programs with witness cones to see just how the type of program affects the cones you will be using. Keep good records and get to know your kiln, the Dynatrol and how the combination of these two things with the kind of ware that you fire all work together. **There is no substitute for experimentation and personal individualized documentation.**

APPENDIX J
PYROMETRIC CONES

Pyrometric cones are made of clay and other minerals and are precisely formulated to soften when fired in a kiln. They will bend over when they have absorbed a certain amount of heat. The amount of heat is related to both time and temperature. They mirror fairly accurately what goes on in ceramic body and so can be a more reliable guide to firing than a thermocouple instrument. Differing materials in the cones result in different firing temperatures. The cones you are likely to use in an L&L kiln are numbered from Cone 022 to Cone 10 (coldest to hottest). The number is imprinted on the cone. Usually clay and glaze comes with a recommended cone to fire to. Be careful not to drop or expose to moisture your cones. There are two sizes, large and small. The small cones (1-1/8" tall) are used in a Dawson Kiln Sitter. The large cones (2-5/8" tall) are generally used in the kiln as a visual check of what is going on. When locating the large cones be sure they are placed so that their normal 8° angle is maintained. Typically you will place another cone of the next higher number next to the main cone. This cone should not quite bend over while the main cone should be bent totally over. Keep the cones a few inches away from the peephole site so it is not affected by cold drafts. Wear protective glasses when viewing inside the kiln.

The Cone Look Up Table in the DynaTrol is based on a 108°F temperature rise for a large self supporting cone (not the small cones or the large regular cones). This is also what the Easy-Fire mode uses as its reference for changing the final set point temperature. Orton has available excellent information on how to use witness cones. See the section in these instructions on Temperature Reading Vs Cones for ideas on how to use witness cones to maximize the accuracy and performance on your control.

TEMPERATURE EQUIVALENTS OF ORTON PYROMETRIC CONES

NOTE: the rate of temperature rise is during the last several hundred degrees of firing. Table is courtesy of The Edward Orton, Jr. Ceramic Foundation. Note that the kilns tend to slow down considerably in the higher temperature ranges to perhaps 50°F to 100°F per hour.

Cone Number	Large Cone Deg F Equival at 108°F per hour temp rise	Large Cone Deg F Equival at 270°F per hour temp rise	Type of Ware
022	1069°F	1086°F	
021	1116°F	1137°F	
020	1157°F	1175°F	
019	1234°F	1261°F	Overglaze Colors,
018	1285°F	1323°F	Enamels and Gold
017	1341°F	1377°F	
016	1407°F	1458°F	
015	1454°F	1479°F	
014	1533°F	1540°F	
013	1596°F	1566°F	
012	1591°F	1623°F	
011	1627°F	1641°F	
010	1629°F	1641°F	
09	1679°F	1693°F	
08	1733°F	1751°F	
07	1783°F	1803°F	Low Fire Fritted Glazes
06	1816°F	1830°F	Lead Glazes and
05	1888°F	1915°F	Low Fire Earthenware
04	1922°F	1940°F	
03	1987°F	2014°F	
02	2014°F	2048°F	
01	2043°F	2079°F	
1	2077°F	2109°F	
2	2088°F	2124°F	Semi-Vitreous Ware
3	2106°F	2134°F	
4	2134°F	2167°F	
5	2151°F	2185°F	
6	2194°F	2232°F	
7	2219°F	2264°F	China Bodies, Stoneware
8	2257°F	2305°F	and Porcelain
9	2300°F	2336°F	
10	2345°F	2381°F	

APPENDIX K
Firing Program Blank

Firing Program Number: _____

Segment	Rate	Temperature	Hold
1			
2			
3			
4			
5			
6			
7			
8			

Firing Program Number: _____

Segment	Rate	Temperature	Hold
1			
2			
3			
4			
5			
6			
7			
8			