

NEW FEATURES ON THE DYNATROL 700

IMPROVED HARDWARE FEATURES

1. **FOURTEEN SEGMENT DISPLAYS** – Improvement from the seven-segment displays on the DynaTrol 600. All letters can be represented on these displays; some messages will change from the DynaTrol 600 to DynaTrol 700 design.
2. **SELECTABLE THERMOCOUPLE TYPE** – Improved accuracy and increased resolution of the analog-to-digital converter allows one board to accept multiple thermocouples. The DynaTrol 700 software requires both a keypad setting and a jumper change on the rear of the circuit board to change the thermocouple type. The jumper selection is a precaution to prevent a software change of thermocouple type without accessing the back of the controller to also change the extension wire and thermocouple.
3. **ADDED FILTERING** – Filtering on the power inputs, control outputs, thermocouple inputs, and keypad inputs will decrease the susceptibility of the DynaTrol to damage or erratic operation due to static electricity, RF interference, and power line spikes.
4. **FIVE OUTPUTS** – This is an increase of one over the number of outputs on the DynaTrol 600 board. The outputs include the three zone outputs for temperature control with high current transistors, a safety output to power a safety relay and a programmable output for controlling a fan, an alarm, floor elements or lid elements. The safety output and the three switching outputs are still controlled by a capacitor-coupled control signal to prevent a stopped microprocessor from latching an output in the on condition.
5. **VOLTAGE AND CURRENT MEASUREMENT** – The output voltage of the transformer is used to calculate the line voltage. Each board must be calibrated when it is installed on the kiln (usually at the factory). The amperage reading requires a current sensor that clips around one of the power cord's hot wires. The default range for the calibrated sensor is 50A. For larger kilns the controller can be adjusted for a higher range sensor.
6. **MICROPROCESSOR WITH FLASH MEMORY AND ON-CHIP ANALOG-TO-DIGITAL CONVERTER** - Motorola's 68hc908gp32 microprocessor's phase-locked-loop clock system decreases the chance of reset due to outside electrical noise. It has increased memory to allow added software functions as well as added inputs to take advantage of features such as current sensing.
7. **RS485 COMMUNICATION TO ALLOW CONNECTION TO A PERSONAL COMPUTER** – The optional KISS software can be used to graphically track a firing, program the DYNATROL, or monitor the kiln remotely.
8. **LARGER EEPROM MEMORY TO ALLOW STORAGE OF PRESET VARY-FIRE PROGRAMS** – The controller has six preset Vary-Fire programs stored in EEPROM that can be recalled at any time.
 - a. User 1 is a glass slumping program
 - b. User 2 is a glass tack fuse program
 - c. User 3 is a glass full fuse program
 - d. User 4 is a glass bead-annealing program
 - e. User 5 is a lost-wax burnout program
 - f. User 6 is a slow cooling cycle that can be added to the end of a cone 6 firing with the 16-segment option.

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IMPROVED SOFTWARE FEATURES

1. **PROGRAMMABLE COOL DOWN SEGMENT ADDED TO CONE FIRE PROGRAMMING** – Enabling the cool option in the hidden menu, allows an additional segment to be added to a cone profile. This satisfies the need of many cone 6 glazes to have a slow cool down after reaching the top temperature.
2. **CONE FIRE PROGRAM TRANSITIONS TO A RAMP HOLD PROFILE** – Using the 16-segment option in conjunction with a Cone-Fire profile gives the crystalline glaze artist seven segments after the top temperature to grow more crystals. It can also be used for a cooling program for cone 6 glazes.
3. **WRITE YOUR OWN CONE-FIRE PROFILE** – Use the Vary-Fire programs to write your own Cone-Fire profile by using the **OTHER** key to specify the top temperature for the profile and which segment the cone correlation function will be performed. Additional segments after the “cone segment” can be used but must have soak temperatures less lower than the cone temperature
4. **PREVIEW BUTTON STEPS BACKWARDS DURING RAMP HOLD FIRING** – If you make a mistake or want to review one of your previous entries in a Vary-Fire program, simply press the **REVIEW PROGRAM** key to back up to the previous entry.
5. **REVIEW SEGMENT STEPS BACKWARDS IN THE “OTHER” MENU** – Pressing the **REVIEW SEGMENT** key while navigating the “other” menu will act as a back key. The user may press this key to return to the previous menu option without the need to cycle all the way though the menu.
6. **TWO-KEY START** – The two-key start sequence is a option to prevent an accidental start of the kiln because of a stuck key or inadvertent key press. This option is enabled in the hidden menu. To start the kiln press **START/STOP** and ---- will be displayed. Press **ENTER** and the controller will start the firing.
7. **FULL POWER RAMP** – A full power ramp will be enabled if a ramp rate of 9999 degrees per hour is programmed. At the start of a full power up ramp the elements will continuously be on until the soak temperature is reached. At temperatures 50 degrees less than the programmed soak temperature the elements will begin to cycle to minimize overshoot. A full power ramp is the quickest way to reach a specified temperature.
8. **FIRING COUNTER** – The firing counter will help the user to keep track of the number of firings on their kiln and to help plan routine kiln maintenance. It is incremented five minutes into each firing. The number of firings can be viewed during a program review after the word **FIRE**.
9. **ADJUSTABLE CYCLE TIME** – The cycle time is the length of time between an element turning on two consecutive times. Using a short cycle time may improve temperature control while using a longer cycle time may improve relay life. Cycle time can be programmed anywhere in the range of 10 seconds to 60 seconds. For mechanical relays the default cycle time is fourteen seconds.
10. **TWO HUNDRED MILLISECOND CYCLE TIME** – Using both solid-state relays and very short cycle times can have beneficial effects on element life and temperature control. Programming a cycle time of zero will set up the controller to operate with a 200 millisecond cycle time. This feature will work only if the kiln is equipped with solid-state relays.

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11. **HOT KEYS DURING FIRING** – These keys can be pressed at anytime during the firing.
 - a. **REVIEW PROGRAM** will show the current program.
 - b. **VIEW SEGMENT** will show the current segment, traveling set point and circuit board temperature.
 - c. The **ALARM** key will allow the reprogramming of the alarm to either a low or high temperature alarm.
 - d. Pressing the **5** key will display the current rate of temperature rise in degrees/hour.
 - e. Pressing the **7** key will run the amperage diagnostic routine displaying the amperage rating for each section of the kiln. If the kiln is not equipped with the optional current sensor all amperage readings will be zero.
 - f. Pressing the **8** key will activate the 1000's, 100's and 10's decimal points to be pilot lights. The 1000's decimal point represents that output one is currently on, 100's output two, and 10's output three.
 - g. Pressing the **0** key will display the time that has elapsed since the start of the firing.

12. **IMPROVED LAG FUNCTION FOR ZONE CONTROL** – The ramp rate now determines the LAG. If one section lags behind the traveling set point by more than one LAG value then the rate of rise of the traveling set point is slowed as shown in the table. This allows the tightness of control to be balanced against speed by setting your ramp rate.
 - a. Rate of rise between 1°F/hour and 70°F/hour; LAG = 3
 - b. Rate of rise between 71°F/hour and 500°F/hour; LAG = 7
 - c. Rate of rise greater than 500°F/hour; LAG = 10

13. **FINAL RATE OF RISE OR ERROR CONDITION RATE OF RISE** – The V6-CF stores the final rate of rise for the last up ramp of the most recent firing. The final rate of rise is displayed during the ERTF routine in the hidden menu. If an error condition is triggered during a firing the final rate of rise will be over written with the rate of rise just before the error condition was triggered. This number can be used to help understand what was happening in the kiln immediately before an error occurred.

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PROGRAMMING EXAMPLES

EXAMPLE 1: CONE-FIRE TO VARY-FIRE – This feature allows you to use a Cone-Fire program then automatically transition to a Vary-Fire (Ramp-Hold) program. Here is a sample cooling program that can be added to a cone 6 glaze firing to enhance the glaze. The Vary-Fire program must be located in user 6.

Segment	Rate	° F	Hold	Remarks
1	9999	2232	0	Over written by controller
2	9999	1900	0	Fast down ramp to save elements
3	150	1500	0	Slow cooling to 1500 to enhance glaze

Only two cooling segments will be used but we must still program user 6 for 3 segments because the controller will ignore the first segment. The steps to program the controller are as follows

1. Press the **ENTER PROG** key.
2. Press **6** and then press **ENTER** to program User 6.
3. Program user 6 with desired program. User 6 will fire when the cone-fire program reaches complete.

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 ra 1 press **ENTER, ENTER, ENTER** to begin programming the Vary-Fire portion with segment 2.

4. Press the desired **CONE FIRE** speed button.
5. Enter desired Cone-Fire program. This will program the Cone-Fire portion of the program.
6. Press the **OTHER** button until the message “16-S” is displayed. Press **ENTER** key.
7. Press the **1** key until the desired option is displayed. “On” will allow Cone-Fire to transition into Vary-Fire User 6 and “Off” will disable this option.
8. Press the **ENTER** key. Programming is now complete. If the 16-segment option is on then the controller will perform the Cone-Fire program, when finished with the Cone-Fire the controller will transition to the program stored in Ramp-Hold user 6.

NOTE: 16-S will appear in review if the **REVIEW PROGRAM** key is pressed.

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EXAMPLE 2: WRITE-YOUR-OWN CONE FIRE PROGRAM - This feature gives the user the heat work calculation of a Cone-Fire program and the versatility of a Vary-Fire program. It is useful for very fast or very slow cone firings, crystalline glaze firings or other specialty glaze firing.

The following program will duplicate the cone 6 firing with a slow cool down but will **not** require enabling the 16-s option each time the kiln fired.

Segment	Rate	°F	Hold	Remarks
1	100	200	00.15	15 minute hold for drying ware
2	300	1000	0	Faster ramp after ware is dry
3	100	1100	0	Slow down for dunting stage and carbon burnout
4	200	2000	0	Speed up until the last 2 hours of the firing
5	108	Cone 6	0	Controller will calculate the top temperature based on firing speed.
6	9999	1900	0	Fast ramp to save elements
7	150	1500	0	Slow ramp to enhance glaze

Programming is the same as for any other Vary-Fire program until you get to °F 5. Instead of typing in the temperature for cone 6, press the **OTHER** key, press **6**, and press **ENTER** and you will be at the hold 5 stage of programming. Finish the programming as you normally would. Now, when you fire this user program, you will get a cone 6 firing with a cool down stage.

To erase a cone correlation stage, press **REVIEW PROGRAM** to step backward to the rate before the cone entry and then proceed as a normal Vary-Fire. All temperatures after the cone correlation stage must be less than the cone temperature.

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HIDDEN MENU ADDENDUM

These features have been added to the hidden menu of the DynaTrol kiln controller. A short description of each feature and how to use the feature follows.

1. **CYCL (CYCLE TIME)** – Sets the output cycle time. The cycle time is the length of time between an output coming on two consecutive times. If the cycle time is set for 14 seconds the output will come on every 14 seconds as needed. Cycle time can be set from 10 seconds to 60 seconds. A cycle time of zero can also be programmed; this option will use a cycle time of 200 milliseconds and can only be used if the kiln uses solid-state relays.
2. **MAX (MAXIMUM KILN TEMPERATURE)** – Sets the maximum temperature that can be programmed into a Vary-Fire or Cone-Fire program. The maximum temperature cannot be set above 2400 degrees Fahrenheit (1315 degrees Celsius).
3. **TYPE (THERMOCOUPLE TYPE)** – Allows changing of the thermocouple type. The DynaTrol supports both type K and type S thermocouples. To change from type K to type S requires changing this software setting to type S as well as placing a jumper on the circuit board. To change from type S to type K requires changing this software setting to type K and removing a jumper from the circuit board.

NOTE: MAKE SURE THE SOFTWARE AND JUMPER SETTING MATCHES THE TYPE OF THERMOCOUPLE YOU ARE USING. IF THESE TWO SETTINGS DO NOT MATCH AN ERROR WILL OCCUR AND THE CONTROLLER WILL DISPLAY THE MESSAGE ERR9.

4. **2KEY (TWO KEY START)** – Makes starting the kiln a two-key sequence. The first key is the **START/STOP** key. The second key is the **ENTER** key. The kiln will not start unless these two keys are pressed in the correct order.
5. **E-BD (ERROR BOARD TEMPERATURE)** – Sets the maximum allowable temperature of the circuit board. The default value is 200 degrees Fahrenheit (93 degrees Celsius). This feature is aimed at people that use their kilns in a small, enclosed space and who need to make sure the kiln room does not exceed a given temperature. If the circuit board temperature exceeds the error board temperature the DynaTrol will terminate the firing.
6. **REST (RESTORE DEFAULT USER PROGRAMS)** – The DynaTrol is preloaded with six Vary-Fire user programs. The restore default user programs feature will overwrite all six Vary-Fire profiles. The six profiles that will be restored to the Vary-Fire profiles are:
 - a. Glass slumping program
 - b. Glass tack fuse program
 - c. Glass full fuse program
 - d. Glass bead annealing program
 - e. Lost-wax burnout program
 - f. Slow cooling cycle to be added to the end of a cone 6 firing with the 16-segment option. To use this feature program a cone 6 firing and set the 16-segment option to on.

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7. **ERTF (ERROR TEMPERATURE, ERROR TIME, AND FINAL RATE OF RISE)** – If an error occurs while firing, the DYNATROL saves the temperature of the kiln, the firing time and current rate of rise when the error occurred. During each firing the final rate of rise is saved and can be viewed by using this menu option. The final rate of rise is the number immediately after the message ROR.
8. **COOL (Cone Fire Cooling Segment)** – Allows the user to toggle on or off an optional cooling segment after any Cone-Fire program. When COOL is set to on, the DynaTrol will prompt the user to enter a cooling segment while programming a Cone-Fire profile. The user is able to set a cooling ramp rate, a soak temperature and a hold time just like in a Vary-Fire program. If a rate of zero is programmed the cooling segment will be ignored during a firing. This is only a cooling segment; therefore the soak temperature must be less than the final cone temperature.
9. **VOLT (VOLTAGE MEASUREMENT)** – Allows the user to test the voltage where the kiln is set up. This option helps to diagnose firing problems when the kiln is not able to reach a programmed temperature. Press **ENTER** and the display will flash NOLd to indicate the next number displayed is the no load voltage. Press **ENTER** again and FLLd will be displayed to indicate the next number displayed is the full load voltage. The elements will come on momentarily while the DYNATROL is displaying full load voltage. After four seconds the kiln will return to IDLE.
10. **DTCT (CURRENT DETECTOR SETTINGS)** – Allows the user to change the current detector rating. This option will only be used if your DynaTrol came with the optional current sensor.

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OUTPUT DIAGNOSTICS ROUTINE

The DynaTrol 700 kiln controller is able to turn on each output consecutively for diagnostic purposes.

1. Press **OTHER** key one time. The message “RSET” will be displayed.
2. Type in key sequence **4, 4, 3**
3. ”NOTC” will be displayed. Press **OTHER** until “DIAG” is displayed.
4. Press **ENTER** key.
5. “OUTS” will be displayed. To run the output diagnostic routine press the **ENTER** key.
6. “OUT1” will be displayed and output one will come on. Press **ENTER** key to go to next step. After ten seconds the DynaTrol will automatically switch to the next step even if a key is not pressed
7. “OUT2” will be displayed and output two will come on. Press **ENTER** key to go to next step. After ten seconds the DynaTrol will automatically switch to the next step even if a key is not pressed.
8. “OUT3” will be displayed and output three will come on. Press **ENTER** key to go to next step. After ten seconds the DynaTrol will automatically switch to the next step even if a key is not pressed.
9. “OUT4” will be displayed and output four will come on. Press **ENTER** key to return to idle. After ten seconds the DynaTrol will automatically return to idle even if a key is not pressed.

CURRENT SENSOR INSTALLATION

The DynaTrol 700 kiln controller is able to measure amperage draw for each section of a kiln. To take advantage of this feature an optional current sensor must be installed. Installing the current sensor requires access to the back of the circuit board.

The current sensor has two wires that need to be connected to the circuit board. One wire is black. One wire is white. On the top left corner of the circuit board is a terminal with inputs marked black and white. See DynaTrol 700 layout.

1. Insert the white wire in the terminal that has been marked white.
2. Insert the black wire in the terminal that has been marked black.
3. Use a screwdriver to tighten the two screws on the terminals so that the wires will not come lose.
4. The circuit sensor clips around one of the power cord’s hot wires.

The DynaTrol 700 is now able to measure the amperage draw using the controller’s diagnostic routines.

AMPERAGE DIAGNOSTICS ROUTINE

To display the kiln's current draw the optional current sensor must be installed. If the sensor is not installed or it is not installed correctly the controller will display zero amps for all sections of the kiln.

1. Press **OTHER** key one time the message "RSET" will be displayed.
2. Type in key sequence **4, 4, 3**.
3. "NOTC" will be displayed. Press **OTHER** until the message "DIAG" is displayed.
4. Press **ENTER** key.
5. "OUTS" will be displayed. Press **ONE** key.
6. "AMPS" will be displayed. Press **ENTER** key.
7. The message "AMP1" will now be displayed and the elements should turn on. The number shown after this message is the amperage for section one of the kiln.
8. The message "AMP2" will now be displayed. The number shown after this message is the amperage for section two of the kiln.
9. The message "AMP3" will now be displayed. The number shown after this message is the amperage for section three of the kiln.

The amperage diagnostics routine is now complete. The controller will return to idle.

VOLTAGE CALIBRATION

To display voltage using the DynaTrol kiln controller a calibration must be done. Before calibration make sure the relays and elements are connected.

1. Press **OTHER** key one time. The message "RSET" will be displayed.
2. Type in key sequence **4, 4, 3**
3. "NOTC" will be displayed. Press **OTHER** until "VOLT" is displayed.
4. Press **ENTER** key. "NOLD" for no load will be displayed for two seconds. After "NOLD", a number will be displayed until either **ENTER** is pressed or the **443** calibration code is entered. This number is the no load voltage. However, until after calibration this number is meaningless.
5. Type in key sequence **4, 4, 3**.
6. "CAL1" will be displayed. Measure the line voltage and enter this number now using the keypad. This number will be used to calculate no load voltage
7. Press **ENTER** key.
8. "CAL2" will be displayed. Measure the line voltage and enter this number now using the keypad. This number will be used to calculate full load voltage.
9. Press **ENTER** key.
10. The voltage calibration routine is now complete. The controller will return to idle.

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DISPLAY NO LOAD AND FULL LOAD VOLTAGE

To display no load and full load voltage the elements must be connected. If the elements are not connected these values will be incorrect.

1. Press **OTHER** key one time. The message “RSET” will be displayed.
2. Type in key sequence **4, 4, 3**
3. “NOTC” will be displayed. Press **OTHER** until “VOLT” is displayed.
4. Press **ENTER** key. “NOLD” for no load will be displayed for two seconds. The number displayed after this message will be the no load voltage.
5. Press **ENTER** key. “FLLD” for full load will be displayed for two seconds. The number displayed after this message will be the full load voltage.

The controller will return to idle. After calibration the temperature will take a few seconds to adjust.

RESTORE DEFAULT USER PROGRAMS

The following profiles will overwrite the six Vary-Fire profiles if the restore default user programs feature is used. This feature can be found in the hidden menu under the heading “REST”.

USER 1 – MEDIUM SPEED GLASS SLUMPING PROFILE

Segment	Rate	°F	Hold
1	500	250	00:12
2	500	500	00:12
3	500	750	00:12
4	600	1100	00:05
5	600	1220	00:05
6	9999	1000	01:00
7	90	970	01:00
8	120	750	00:01

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USER 2 – MEDIUM SPEED GLASS TACK FUSE PROFILE

Segment	Rate	°F	Hold
1	500	250	00:12
2	500	500	00:12
3	500	750	00:12
4	600	1250	00:20
5	600	1350	00:10
6	9999	1000	01:00
7	90	970	01:00
8	120	750	00:01

USER 3 – MEDIUM SPEED FULL FUSE PROFILE

Segment	Rate	°F	Hold
1	500	250	00:12
2	500	500	00:12
3	500	750	00:12
4	600	1250	00:20
5	600	1480	00:15
6	9999	1000	01:00
7	90	970	01:00
8	120	750	00:01

USER 4 – GLASS BEAD ANNEALING PROFILE

Segment	Rate	°F	Hold
1	9999	960	08:00
2	9999	960	00:40

USER 5 – LOST WAX BURNOUT PROFILE

Segment	Rate	°F	Hold
1	9999	300	01:00
2	100	350	00:30
3	350	1350	01:30
4	300	900	99:99

USER 6 – SLOW COOLING CYCLE FOR CONE 6 GLAZES

Segment	Rate	°F	Hold
1	9999	2232	00:00
2	9999	1900	00:00
3	150	1500	00:00