

265-1514
Kilnminder

MODEL 4E

MODEL 4.1E



MODEL 4.0E



KILNMINDER

CONTENTS:

SPECIFICATIONS.....	2
FEATURES.....	4
INSTALLATION.....	5
GETTING STARTED.....	10
LIST OF PRE-SET PROGRAMS.....	10
PROCEDURES FOR:	
• Running a kiln heating program.....	13
• Manual operation during a run.....	14
• Delayed start of a run.....	15
• Setting the security level.....	16
• Selecting a kiln heating program.....	17
• Creating or editing a heating program..	18
• Setting options and adjustments.....	20
FAULT CODES AND TROUBLESHOOTING.....	24

MODEL 4E SPECIFICATIONS:

LINE VOLTAGE: **4.0E: 90 TO 250 VAC**
 (SELF-ADJUSTING)
 4.1E: 120VAC, 240VAC,
 OR AS ORDERED.

MAXIMUM KILN AMPS: **4.0E: 20 AMPS**
 4.1E: 60 AMP

TEMPERATURE DISPLAY: DEG F OR C

TEMPERATURE SETTING RANGE:

100...2450 DEG F

38...1344 DEG C

THERMOCOUPLE: TYPE K OR TYPE N

TEMPERATURE CONTROL PRECISION:

+/- 8 DEG F

+/- 5 DEG C

TEMPERATURE READING PRECISION:

+/- 4 DEG F

+/- 2 DEG C

TEMPERATURE READING RANGE:

32...2500 DEG F

0...1370 DEG C

**ALLOWABLE ROOM TEMPERATURE DURING
KILN MINDER OPERATION:**

0...150 DEG F

-20...70 DEG C

PROGRAM STORAGE CAPACITY:

99 KILN HEATING

PROGRAMS, 20 STAGES

PER PROGRAM.

DELAYED START RANGE:

**0 TO 85 HOURS IN 20
MINUTE STEPS.**

RAMPING TIME RANGE PER STAGE:

**0 TO 42 HOURS IN 10
MINUTE STEPS.**

DWELL TIME RANGE PER STAGE:

**0 TO 42 HOURS IN 10
MINUTE STEPS.**

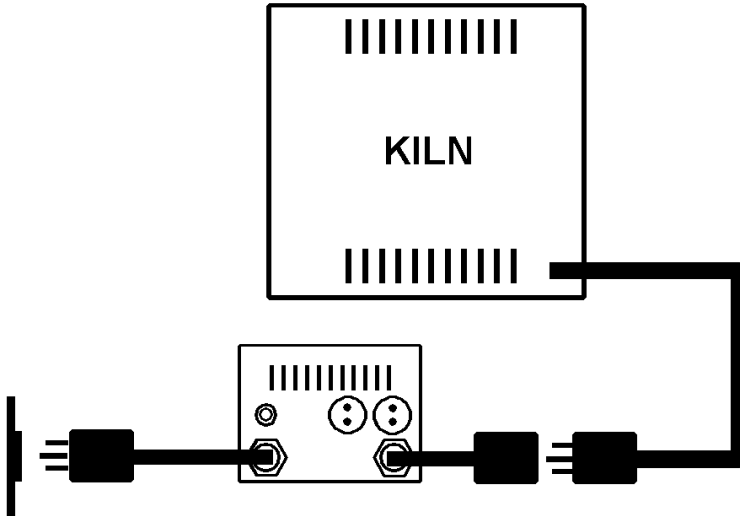
MODEL 4E FEATURES:

- **MODEL 4.0E SELF-ADJUSTS TO LINE VOLTAGE.**
- **REDUNDANT CONTROL-RELAY.**
- **REDUNDANT SELF-CORRECTING MEMORY.**
- **ADAPTIVE ZERO CURRENT CONTROL-RELAY SWITCHING.**
- **CONTROL-RELAY CONTACT BOUNCE SUPPRESSION.**
- **ADAPTIVE AUTO-TUNING WITH NON-VOLATILE MEMORY.**
- **SAFETY CUT-OUT RELAY SEPARATE FROM CONTROL RELAYS.**
- **BACK-UP THERMOCOUPLE INPUT.**
- **RECOVERY FROM POWER FAILURES.**

- **BUILT-IN PROTECTION FROM POWER LINE SURGES.**
- **WILL ACCEPT TYPE K OR TYPE N THERMOCOUPLE.**
- **SETTINGS CAN BE MANUALLY EXAMINED AND CHANGED DURING RUN.**
- **SECURITY LOCK FEATURE PREVENTS ACCIDENTAL PROGRAM CHANGES.**

INSTALLATION:

MODEL 4.0E POWER CONNECTION TO A TYPICAL KILN.

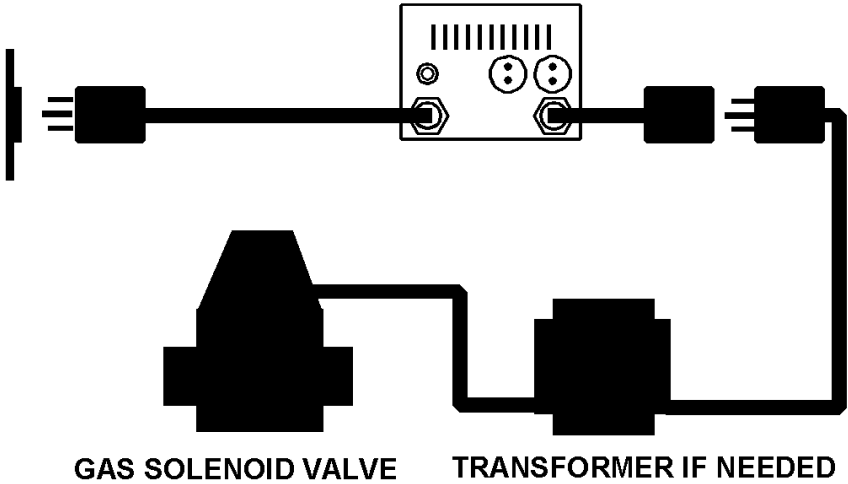


The standard cord ends on the model 4.0E are for a 115 VAC 15 Amp kiln, but the model 4.0E is designed to work with kilns up to 230 VAC 20 Amp. The cord ends can be removed and replaced with cord ends appropriate to the kiln. The kiln must have the same voltage rating as the wall outlet.

Set the kiln element control to maximum, full on.

The model 4.0E can be used to control a gas fired kiln equipped with an electric gas solenoid valve.

MODEL 4.0E CONNECTION TO A GAS SOLENOID VALVE.



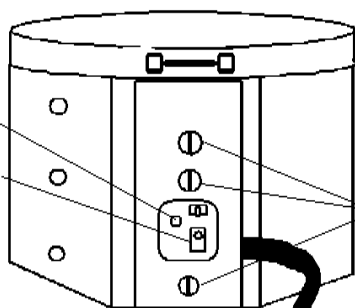
The transformer is needed only if the gas solenoid voltage requirement is different from the wall outlet voltage. A 24 VAC solenoid, for example, requires a transformer to work with a standard 115 VAC wall outlet.

If the kiln is gas-fired, set the kilnminder option number 1 to 1. See Procedures For Setting Kilnminder Options.

MODEL 4.1E POWER CONNECTION TO A TYPICAL KILN.

IF THE KILN HAS A KILN SITTER, SET THE TIMER CONTROL TO MAXIMUM, ALL THE WAY CLOCKWISE.

SET THE KILN SITTER. USE A CONE WELL ABOVE THE FIRING TEMPERATURE SO THE KILN REMAINS ON.



IF THE KILN HAS ELEMENT CONTROLS, SET THEM TO MAXIMUM, FULL ON.

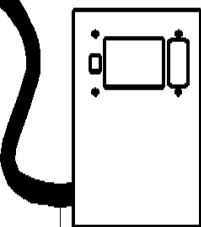


GREEN = GROUND.

3 PHASE:
BLACK, RED, WHITE
= PH1, PH2, PH3.

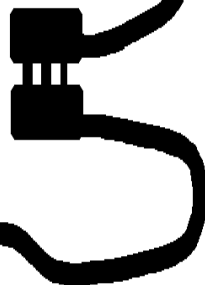
240 VAC SINGLE PH:
BLACK = HOT
WHITE = HOT.

120 VAC SINGLE PH:
BLACK = HOT
WHITE = NEUTRAL.



LINE

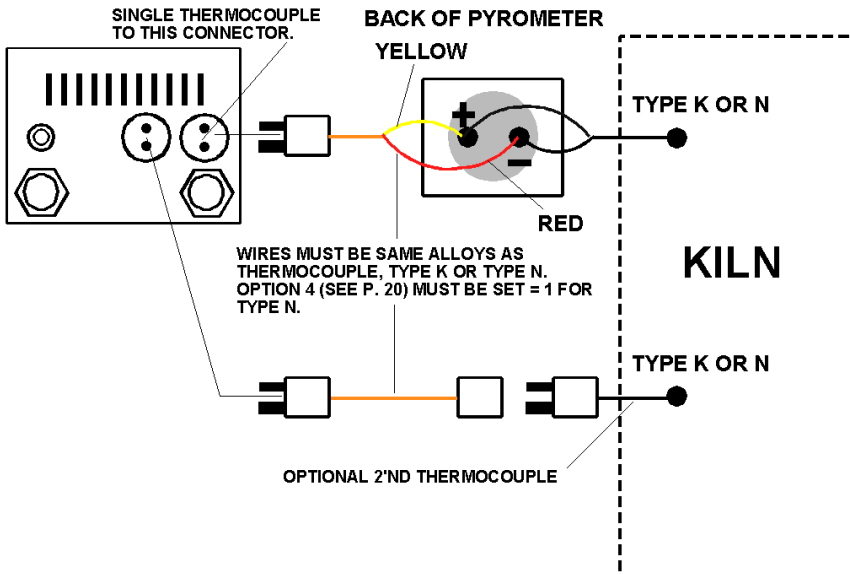
LOAD



Model 4.1E electrical installation may require the services of an electrician.

The kiln minder installation also requires connection to a thermocouple inside the kiln to measure kiln temperature. Most kilns are equipped with a type-K thermocouple connected to a pyrometer gauge. The kiln minder is shipped with a length of thermocouple wire and a connector. The thermocouple wire can be connected to a kiln's existing pyrometer gauge.

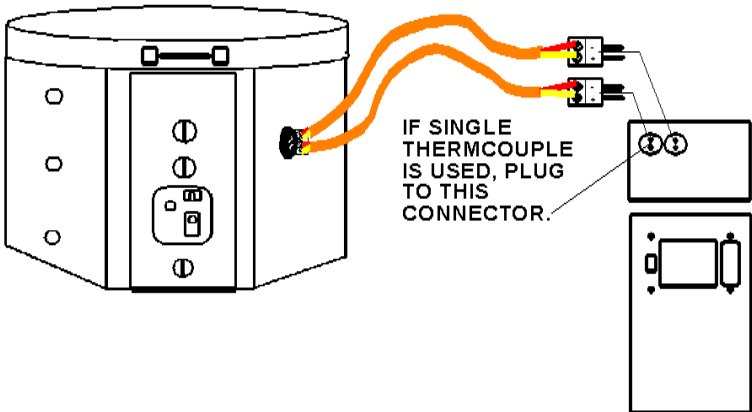
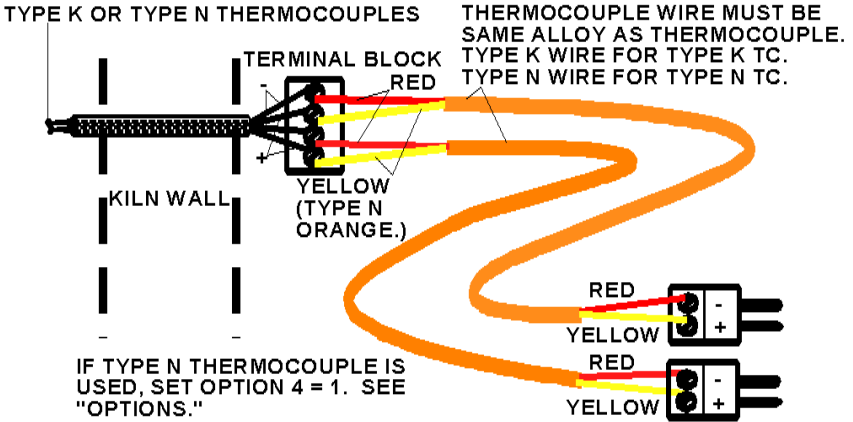
MODEL 4.0E THERMOCOUPLE WIRING TO KILN WITH PYROMETER GAUGE.



Additionally, a second thermocouple can be installed to act as a back-up thermocouple in the event that the primary thermocouple fails. The kiln minder is designed to detect thermocouple faults. When the kiln minder detects a thermocouple fault, whether it is open circuited (even with the gauge on the circuit) or short circuited, the kiln minder will switch to the second thermocouple if it is present and doesn't have a fault. Otherwise, the kiln minder will display a fault code and stop the kiln heating program. The second thermocouple

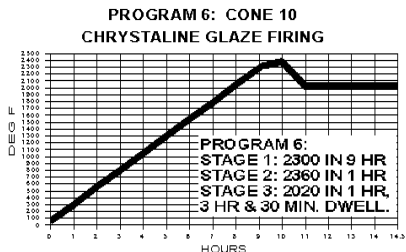
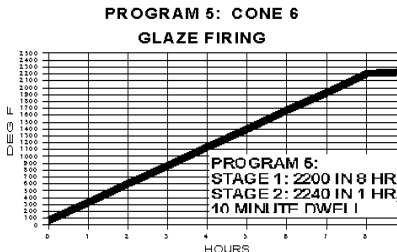
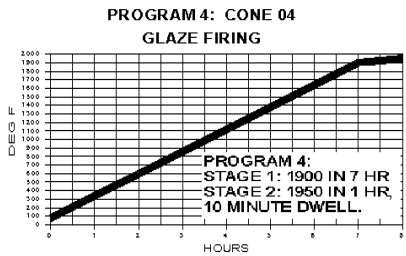
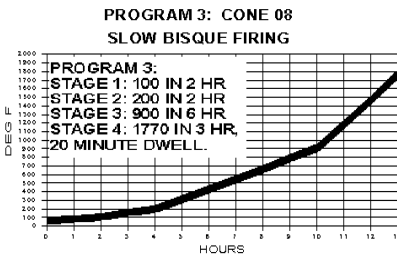
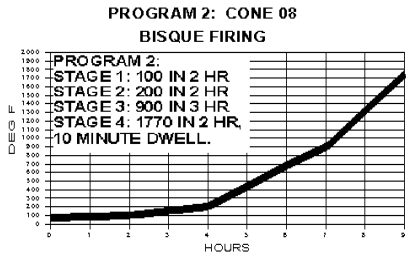
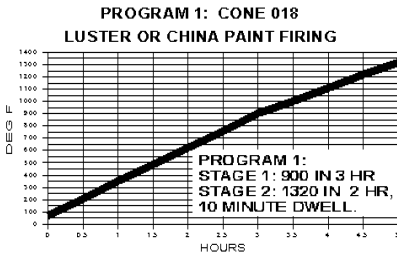
is optional. The kilninder will operate normally with a single thermocouple connected to it.

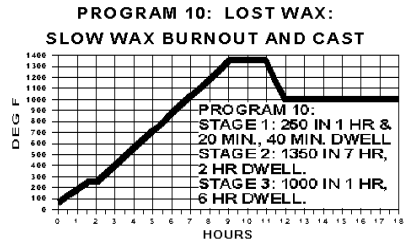
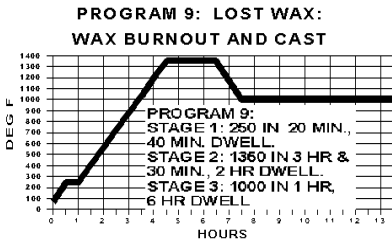
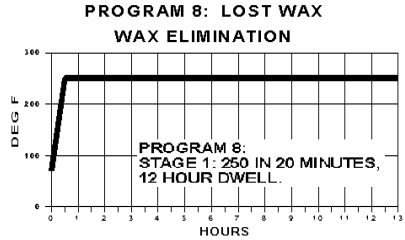
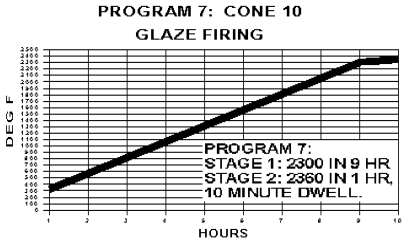
MODEL 4.1E THERMOCOUPLE WIRING



GETTING STARTED:

The kilnminder is designed to control kiln temperature versus time according to a kiln heating program. The kilnminder holds 99 kiln heating programs and these are stored in the kilnminder even when no power is connected. No battery is required. The kilnminder is shipped with ten kiln heating programs already programmed. These can be altered as needed, and other kiln heating programs can be created by the user.





**PROGRAM 11 THROUGH 99:
LEFT FOR USER TO PROGRAM.**

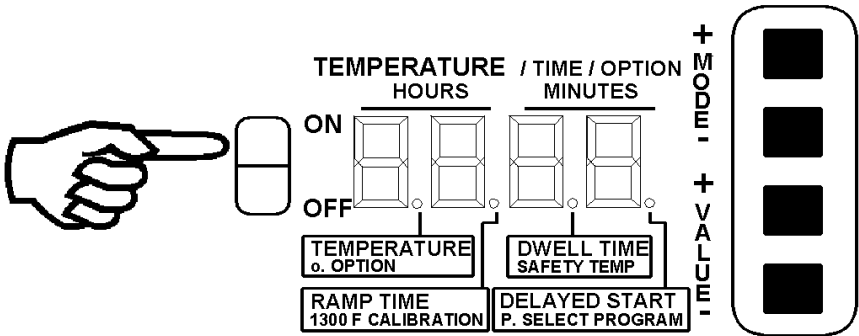
These kiln heating programs can be created and altered at the kilnminder or at a personal computer if the kilnminder is shipped with the serial communications option.

A kiln heating program consists of 1 to 20 stages. Each stage has a kiln temperature, a ramp time, and a dwell time. The kilnminder will gradually bring the kiln temperature to the setting temperature over the ramp time and then maintain that temperature for the dwell time. At

the end of the dwell time, the kilnminder will advance to the next stage. If the next stage has been programmed to

be the end stage, the kiln heating program will end and the kiln will stop heating.

The kilnminder front panel has an ON/OFF switch, four LED function indicators, a TEMPERATURE/TIME display, and four push buttons.



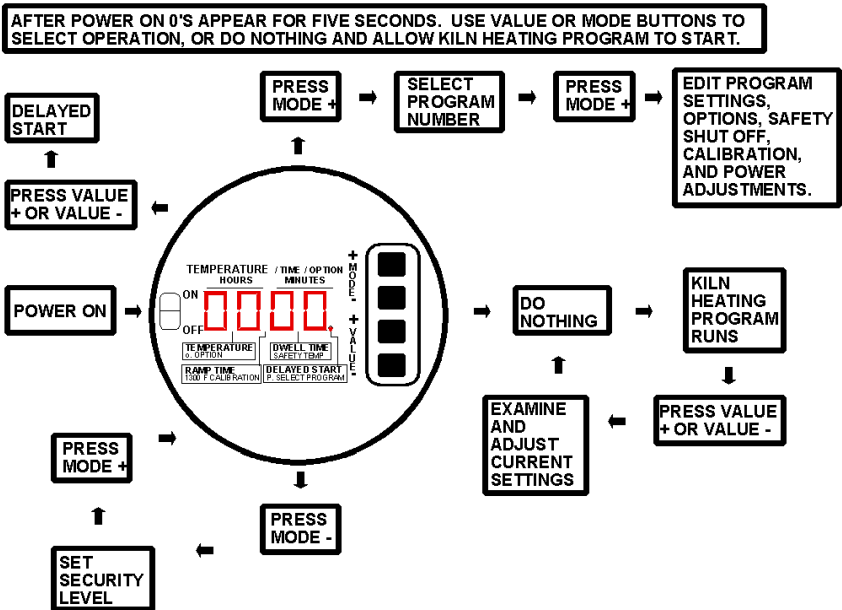
After the kilnminder is turned on, the LED indicators will blink momentarily as the kilnminder initializes itself and then the display will show all 0's for five seconds.

While the display is showing all 0's, select from these possibilities:

- Do nothing and the currently selected heating program will run through to completion.
- Press MODE + to select a different heating program. Then use VALUE +/- to select a heating program number within 1 and 99. Press MODE - to allow the selected heating program to begin, or Press MODE + to edit the settings of the selected heating program.

- Press **VALUE +** for a delayed start. Then use **VALUE +/-** to set the delayed start up to 99 hours and 20 minutes in steps of 20 minutes.
- Press **MODE -** to change the kilnminder security level.

See Procedures for more details on these functions.



PROCEDURES:

- Running a kiln heating program.
- Manual operation during a run.
- Delayed start of a run.
- Setting the security level.
- Selecting a kiln heating program.
- Creating or editing a heating program.

- **Setting options and adjustments.**

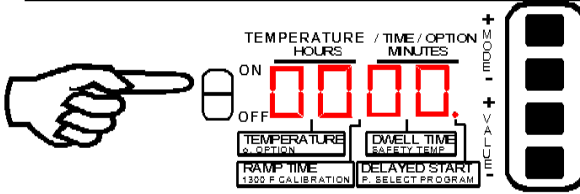
Running a kiln heating program:

To run a kiln heating program, turn on the kilnminder and allow it to run. It will run one of the 99 kiln

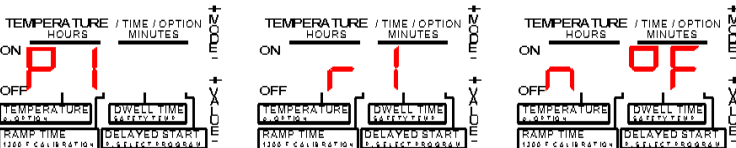
heating programs in the kilnminder memory. See Procedures / Selecting a kiln heating program to change which of the 99 programs the kilnminder will run. At the end of the heating program, the kilnminder turns off the kiln and shows “done” in the display.

Manual operation during a run:

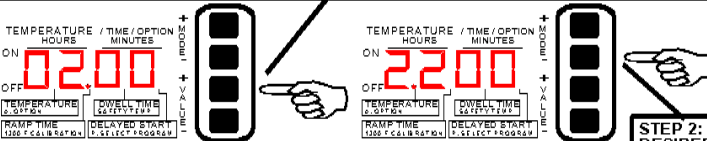
AFTER POWER UP, THE DISPLAY SHOWS 0'S FOR FIVE SECONDS.



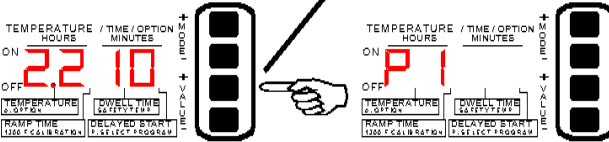
AFTER THE FIVE SECOND WAIT, THE KILN HEATING PROGRAM STARTS.



STEP 1: PRESS VALUE + OR - THE DISPLAY SHOWS THE TIME REMAINING IN THE RAMP SEGMENT, OR, IF THE RAMP SEGMENT IS FINISHED, THE TIME REMAINING IN THE DWELL (SOAK) SEGMENT. THE RAMP OR DWELL INDICATOR SHOWS WHICH IS BEING DISPLAYED. AFTER 20 SECONDS, DISPLAY REVERTS TO ABOVE. BEFORE 20 SECONDS ELAPSE, USE VALUE +/- TO CHANGE THE TIME. SECURITY LEVEL MUST = 0 OR 1 TO CHANGE A SETTING.



STEP 3: THE DISPLAY AND INDICATORS SHOW THE VALUE SELECTED. USE VALUE +/- TO CHANGE THE SELECTED VALUE IF DESIRED. SECURITY LEVEL MUST = 0 OR 1 TO CHANGE VALUE. CHANGES ARE NOT STORED INTO PERMANENT MEMORY. CHANGES ARE LOST WHENEVER THE STAGE NUMBER CHANGES.



STEP 2: IF DESIRED, USE MODE +/- TO SELECT TEMPERATURE, RAMP TIME, OR DWELL TIME. MAKE SELECTION BEFORE 20 SECONDS ELAPSE.

20 SECONDS AFTER NO MODE OR VALUE BUTTON PRESSED, THE DISPLAY REVERTS BACK TO ABOVE. MODE BUTTONS REVERT TO BEING USED TO CHANGE STAGE NUMBER IF OPTION 7 = 1.

Once the kiln heating program has started, the TEMPERATURE display will momentarily show kiln temperature, the degrees symbol, the kiln heating program number, and the stage number. Press a VALUE button once to display the time remaining in the ramp time or dwell time if the ramp time has finished. Press a VALUE button again to change the time. VALUE + will increase

the time 10 minutes. VALUE – will decrease the time 10 minutes. Press MODE +/- to examine or change ramp time, dwell time, or temperature settings of the current stage. Setting changes made while the kiln heating program is running are temporary. The changes are lost when the kiln heating program advances to the next stage. If the security level is set to 2, the settings can be examined but not changed. See Procedures / Setting the security level.

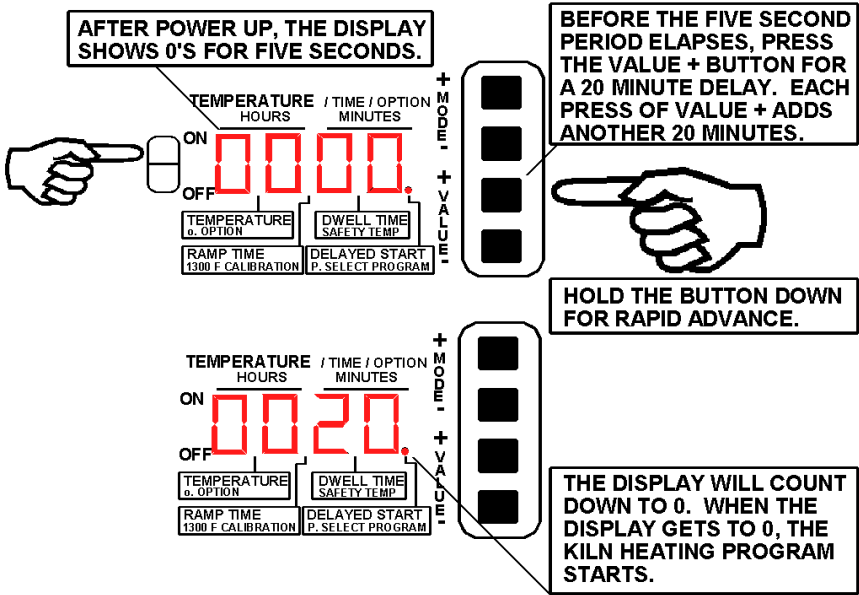
Note that the MODE buttons function in two different ways while the kiln heating program is running. Normally, the MODE buttons will advance or retreat the stage number. After a VALUE button is pressed, however, the MODE buttons temporarily function to select the ramp time, dwell time, or temperature setting of the stage. Whenever an indicator light is on, whether RAMP TIME, DWELL TIME, or TEMPERATURE, the MODE buttons function to select the ramp time, dwell time, or temperature of the stage. Then, after 20 seconds with no VALUE button pressed, the MODE buttons revert back to controlling the kiln heating program stage number.

Note: option # 7 must be set = 1 for the MODE buttons to control the stage number during a run. See Procedures / Setting options and adjustments.

Delayed start of a run:

When the kilnminder is turned on, the display will show 0s for five seconds. During the five second wait period the user can press the VALUE+ button for a delayed start. Each press of VALUE+ adds another 20-minute delay up to 99 hours 20 minutes. The display will show hours in the first two digits and minutes in the third and fourth digits. The display will count down the minutes until it

reaches 0 and then the currently selected kiln heating program will start.

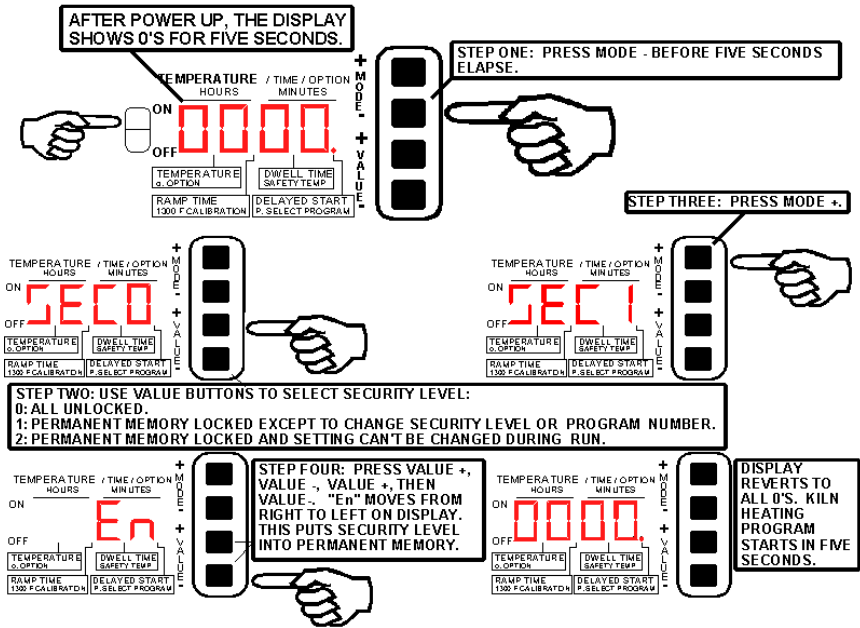


Setting the security level:

The security level feature can be used to prevent accidental changes to settings. The security level can be set to 0, 1, or 2:

- **0: All unlocked.** Kiln heating program settings and the kilnminder adjustments can be changed. Settings can be temporarily changed during a run.
- **1: Settings can be temporarily changed during a run, but access to kiln heating program settings and kilnminder adjustments is blocked.**

- **2: Settings can't be changed during a run and access to kiln heating program settings and kilnminder adjustments is blocked.**

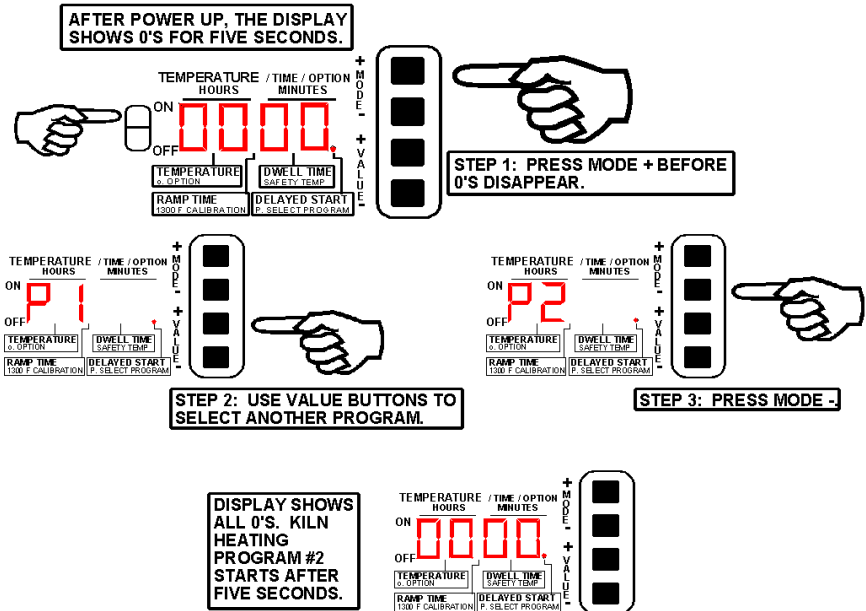


Selecting a kiln heating program:

The kilnminder stores 99 kiln heating programs in its memory. One of the kiln heating programs is the currently active program. To select which of the 99 kiln

heating programs is the currently active one, turn on the kilnminder. The display will show 0s for five seconds. Before the 0s go away, press **MODE +**. Use the **VALUE +/-** buttons to select a program number from 1..99. Press **MODE -** to run the selected program, or press **MODE +** to create or edit the selected program. See **Procedures / Creating or editing a heating program**. Once a program

number has been selected, it will be retained even after the kilnminder has been turned off.



Creating or editing a heating program:

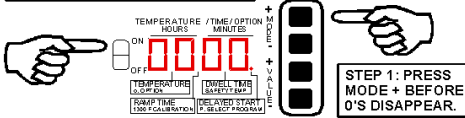
A kiln heating program consists of 1 to 20 stages. A stage has a kiln temperature setting, a ramp time setting, and a dwell time (soak time) setting. When the heating program is run, the kilnminder will cause the kiln to heat

up to or to cool down to the temperature setting within the ramp time. The greater the ramp time, the more gradually the kiln temperature will be brought to the temperature setting. Then, the kilnminder will hold that temperature for the dwell time. After the dwell time is up, the kilnminder will then go to the next stage of the heating

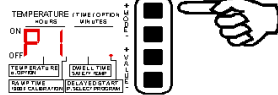
program. At the end of the heating program, the kilnminder turns off the kiln and shows “done” in the display.

To create or edit a kiln heating program, the security level must be set to 0 or the kilnminder will not enter into the program editing mode. See Procedures / Setting the security level.

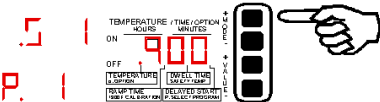
AFTER POWER UP, THE DISPLAY SHOWS 0'S FOR FIVE SECONDS.



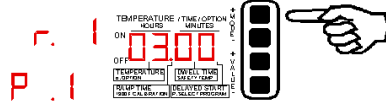
STEP 2: USE VALUE BUTTONS TO SELECT PROGRAM - THEN PRESS MODE+ TO EDIT THE SETTINGS FOR THAT PROGRAM. (SECURITY LEVEL MUST BE SET TO 0.)



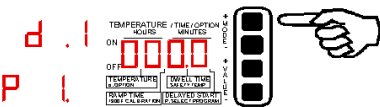
STEP 3: THE TEMPERATURE INDICATOR LIGHTS. THE DISPLAY MOMENTARILY SHOWS STAGE NUMBER, THEN PROGRAM NUMBER, AND THEN TEMPERATURE SETTING FOR THAT STAGE. USE VALUE BUTTONS TO ADJUST TEMPERATURE. THEN, PRESS MODE+.



STEP 4: THE RAMP TIME INDICATOR LIGHTS. THE DISPLAY SHOWS “r” (RAMP) WITH STAGE NUMBER, THEN PROGRAM NUMBER, AND THEN RAMP TIME FOR THAT STAGE. USE VALUE BUTTONS TO ADJUST RAMP TIME. THEN, PRESS MODE+.



STEP 5: THE DWELL TIME INDICATOR LIGHTS. THE DISPLAY SHOWS “d” (DWELL) WITH STAGE NUMBER, THEN PROGRAM NUMBER, AND THEN DWELL TIME FOR THAT STAGE. USE VALUE BUTTONS TO ADJUST DWELL TIME. THEN, PRESS MODE+.



STEP 6: THE TEMPERATURE INDICATOR LIGHTS. THE DISPLAY SHOWS PROGRAM NUMBER, THEN STAGE NUMBER, AND THEN TEMPERATURE SETTING FOR THAT STAGE. REPEAT STEPS 3, 4, AND 5 TO ADJUST SETTINGS FOR ALL THE STAGES. THEN, PRESS MODE+.



Repeat steps 3, 4, and 5 for each stage of the heating program. The MODE – button can be used to back up and review previous settings. Follow these steps to create a new program or to change the settings of an existing program.

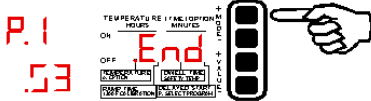
The heating program typically requires only two or three stages, though 20 are available. If fewer than 20 stages are needed, at step 6 above, hold the VALUE + or VALUE – button down until the display shows “End”. Then, turn off the kilnminder, or press MODE + to adjust

kilnminder options. To run the program just created, simply turn on the kilnminder.

Setting options and adjustments:

Follow the procedures under Procedures / Creating or editing a heating program, but instead of then turning off the kilnminder, press MODE +.

STEP 7: ALL 20 STAGES CAN BE PROGRAMMED, BUT MOST PROGRAMS DO NOT NEED 20 STAGES. IF FEWER THAN 20 STAGES ARE NEEDED, PROGRAM THE DWELL TIME OF THE LAST NEEDED STAGE, THEN PRESS MODE +. THE TEMPERATURE INDICATOR LIGHTS. PRESS VALUE - UNTIL THE DISPLAY SHOWS "End". TO CONTINUE ON TO SETTING KILNMINDER OPTIONS, PRESS MODE +. IF OPTIONS DO NOT REQUIRE ADJUSTMENTS, TURN OFF THE KILNMINDER AND THEN TURN IT ON TO RUN THE SELECTED KILN HEATING PROGRAM.



- OPTION 2:** 0: ELECTRIC KILN. FIBER OR FOR CERAMICS. RELAY CONTROL PERIOD = 9.4 SECONDS.
1: ELECTRIC KILN. BRICK FOR LOST WAX. RELAY CONTROL PERIOD = 4.7 SECONDS.

- OPTION 3:** 0: TEMPERATURE IN DEGREES FAHRENHEIT.
1: DEGREES CENTIGRADE.

- OPTION 4:** 0: TYPE K THERMOCOUPLE
1: TYPE N THERMOCOUPLE
(LARGE ERROR IN TEMPERATURE READING IF THIS OPTION IS NOT SET CORRECTLY.)

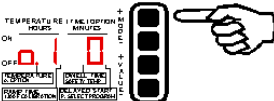
- OPTION 5:** 0: NORMAL KILN POWER.
1: FULL POWER TO KILN IF KILN TEMPERATURE DROPS MORE THAN 70 DEG. F. FROM SET POINT.

- OPTION 6:** 0: SHORTED THERMOCOUPLE (FAIL 06) CHECKER DISABLED.
1: SHORTED THERMOCOUPLE CHECKER ENABLED.

- OPTION 7:** 0: MODE BUTTON DISABLED WHILE KILN HEATING PROGRAM RUNNING.
1: MODE BUTTON ENABLED.

- OPTION 8:** 0: AUTO-TUNING DISABLED.
1: AUTO-TUNING ENABLED.

STEP 8: THE OPTION INDICATOR (ALSO THE TEMPERATURE INDICATOR) LIGHTS. SET THE 8 OPTIONS AS NEEDED. THE 8 OPTION SETTINGS APPLY TO ALL PROGRAMS. USE THE VALUE BUTTONS TO SET AN OPTION TO 1 OR 0. REFER TO THE CHART BELOW. USE THE MODE + BUTTON TO ADVANCE FROM ONE OPTION TO ANOTHER.



- OPTION 1:** 0: ELECTRIC KILN. RELAY CONTROL PERIOD = 9.4 OR 4.7 SECONDS.
1: GAS KILN. RELAY CONTROL PERIOD = 75 SECONDS.

The options and adjustments apply to all of the kiln heating programs.

Note on option # 4: Insure that the kiln thermocouple is either type K or type N (the vast majority are type K) and that this option is set correctly. Otherwise, the kilnminder temperature reading will be inaccurate.

Note on option # 6: Normally, option # 6 is set to 1 to enable the shorted thermocouple checker. Under some

unusual circumstances, though, the shorted thermocouple detector can show a fault, fail code # 6, where there is none, in which case it can be turned off. If the kilnminder shows a fail code # 6, set option # 5 = 1 and use the power control adjustments to increase the kiln power. Then and only then, if fail code # 6 continually appears and the user is certain that the kiln thermocouple and wiring to the kilnminder is not faulty, turn off option # 6.

Note on option # 8: Normally, option # 8 is set to 1 to enable the kilnminder to automatically adjust the kiln power settings. Under some unusual circumstances, though, the auto-tuning algorithm may not optimally self-adjust the kiln power adjustments in which case the kiln temperature continually overshoots or fails to reach a temperature setting. Normally, the kilnminder performance may not be optimal when it is first used with a given kiln, but its performance in terms of absence of temperature over-shoots and undershoots should improve with each run as the kilnminder self-adjusts to the kiln. If it never becomes optimal, however, the autotuning option # 8 can be turned off and the kiln power adjustments can be adjusted manually. See below for details on how to adjust the kiln power adjustments.

Once the eight options have been adjusted using the MODE and VALUE buttons, turn off the kilnminder, or press MODE + to continue on to adjusting the safety cutoff temperature setting, the kilnminder temperature calibration, or the kilnminder power adjustments.

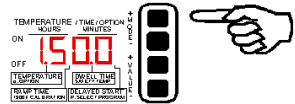
The safety cutoff temperature is the kiln temperature above which the kilnminder safety will cut power to the kiln. The safety will also cut power to the

kiln if it detects any system failure within the kilnminder or a thermocouple fault. The safety cutout is independent from the kiln temperature control. Set the safety cutoff

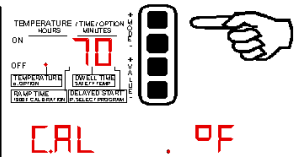
temperature well above the highest temperature setting of the currently selected kiln heating program.

Once the safety cutoff temperature has been adjusted, turn off the kilnminder, or press MODE + to continue on to adjusting the kilnminder temperature calibration or the kiln power adjustments.

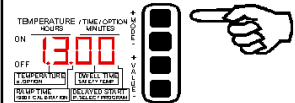
STEP 9: FROM OPTION #8 PRESS MODE + TO CONTINUE ON TO ADJUSTING THE SAFETY SHUT OFF TEMPERATURE. THE TEMPERATURE INDICATOR AND THE SAFETY TEMP INDICATOR LIGHT. USE THE VALUE BUTTONS TO ADJUST THE SAFETY SHUT OFF TEMPERATURE. THE SAFETY SHUT OFF TEMPERATURE APPLIES TO ALL KILN HEATING PROGRAMS. IF THE KILN TEMPERATURE EXCEEDS THIS SETTING, THE SAFETY RELAY (INDEPENDENT OF THE KILN TEMPERATURE CONTROL RELAY) WILL DISENGAGE AND SHUT OFF THE KILN. THE KILNMINDER WILL SHOW FAIL CODE 11. SET THE SAFETY SHUT OFF TEMPERATURE WELL ABOVE THE HIGHEST TEMPERATURE OF THE KILN HEATING PROGRAM TO BE RUN. THEN, IF A TEMPERATURE CALIBRATION OR POWER ADJUSTMENT IS NEEDED, PRESS MODE +, OR TURN OFF THE KILNMINDER IF NO CALIBRATION IS NEEDED.



STEP 10: THE TEMPERATURE INDICATOR LIGHTS. THE DISPLAY SHOWS KILN TEMPERATURE. EVERY FIVE SECONDS THE DISPLAY MOMENTARILY SHOWS "CAL" AND WHETHER THE TEMPERATURE READING IS DEGREES F OR DEGREES C (SEE OPTION 3 OF STEP 8). IF NEEDED, USE THE VALUE BUTTONS TO ADJUST THIS READING TO WHAT THE KILNMINDER SHOWED TO AGREE WITH THE ACTUAL KILN TEMPERATURE WHEN THE KILN IS COOL. THE KILNMINDER IS CALIBRATED AT THE FACTORY SO THIS ADJUSTMENT SHOULD NOT BE NECESSARY. THEN, IF A HIGH TEMPERATURE CALIBRATION OR POWER ADJUSTMENT IS NEEDED, PRESS MODE +, OR TURN OFF THE KILNMINDER IF NO CALIBRATION IS NEEDED.



STEP 11: THE TEMPERATURE INDICATOR AND THE 1300 F CALIBRATION INDICATOR LIGHT. THE DISPLAY SHOWS 1300 IF OPTION 3 (FAHRENHEIT / CENTIGRADE) IS 0 OR 704 IF OPTION 3 IS 1. IF NEEDED, USE THE VALUE BUTTONS TO ADJUST THIS READING TO WHAT THE KILNMINDER SHOWED THE KILN TEMPERATURE TO BE WHEN THE ACTUAL KILN TEMPERATURE WAS 1300 DEGREES F OR 704 DEGREES C. THE KILNMINDER IS CALIBRATED AT THE FACTORY SO THIS ADJUSTMENT SHOULD NOT BE NECESSARY. THEN, PRESS MODE +. AN ADJUSTMENT MADE IN THIS STEP ISN'T STORED INTO MEMORY UNTIL AFTER STEP 12.



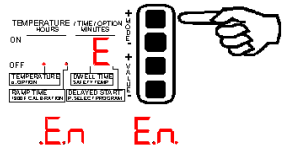
The kilnminder is temperature calibrated at the time of manufacture so may never require user calibration. The temperature calibration feature is available should a user wish to make the kilnminder temperature reading agree with another temperature gauge or standard.

Before using the calibration feature, insure that the kiln thermocouple is either type K or type N and that option # 4 (see above) is set correctly.

The kilnminder temperature calibration consists of two parts, a low temperature (room temperature)

adjustment, step 10 above, and a 1300 deg F (704 deg C) adjustment, steps 11 and 12.

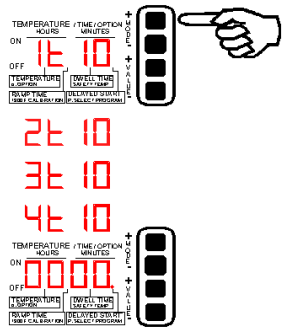
STEP 12: THE TEMPERATURE INDICATOR AND THE 1300 F CALIBRATION INDICATOR LIGHT. TO STORE INTO MEMORY THE ADJUSTMENT MADE IN STEP 11, PRESS VALUE +, THEN VALUE -, THEN VALUE +, THEN VALUE -. "En" WILL MOVE ACROSS THE DISPLAY AS THE VALUE BUTTONS ARE PRESSED IN THE CORRECT SEQUENCE. TO SKIP THIS STEP AND CONTINUE ON TO POWER ADJUSTMENTS, PRESS MODE +, OR TURN OFF THE KILNMINDER IF NO POWER ADJUSTMENT IS NEEDED.



STEP 13: ADJUST THE FOUR KILN POWER SETTINGS AS NEEDED. PRESS MODE + TO ADVANCE FROM ONE POWER SETTING TO ANOTHER. USE THE VALUE BUTTONS TO ADJUST A POWER SETTING. WHEN OPTION NUMBER 8 (STEP 8) IS SET TO 1, THE KILNMINDER WILL AUTOMATICALLY ADJUST THESE SETTINGS ITSELF AS A KILN HEATING PROGRAM RUNS. TO MANUALLY TO ADJUST A POWER SETTING, IF THE KILNMINDER CAUSES THE KILN TO OVERSHOOT A TEMPERATURE SETTING, DECREASE THE POWER SETTING FOR THAT TEMPERATURE. IF THE KILNMINDER CAUSES THE KILN TO NOT REACH A TEMPERATURE SETTING, INCREASE THE POWER SETTING FOR THAT TEMPERATURE. THE FOUR KILN POWER SETTINGS DETERMINE HOW MUCH HEAT POWER TO APPLY TO THE KILN FOR EACH OF FOUR TEMPERATURE REGIONS:

- REGION 1: 100 TO 310 DEGREES F (37 TO 154 DEG C).
- REGION 2: 320 TO 630 DEGREES F (160 TO 332 DEG C).
- REGION 3: 640 TO 1270 DEGREES F (337 TO 687 DEG C).
- REGION 4: 1280 TO 2450 DEGREES F (693 TO 1343 DEG C).

THESE SETTINGS APPLY TO ALL KILN HEATING PROGRAMS. FROM POWER SETTING NUMBER FOUR, PRESS MODE + TO RETURN THE KILNMINDER BACK TO ITS INITIAL STATE SHOWN IN STEP 1 IN WHICH IT DISPLAYS ALL 0's, AND THE SELECTED KILN HEATING PROGRAM WILL START AFTER FIVE SECONDS.



Ordinarily, step 13 above isn't necessary. Normally, option # 8 is set to 1 to enable the kilnminder to automatically adjust the kiln power settings. Under some unusual circumstances, though, the auto-tuning algorithm may not optimally self-adjust the kiln power adjustments in which case the kiln temperature continually overshoots or fails to reach a temperature setting. Normally, the kilnminder performance may not be optimal when it is first used with a given kiln, but its performance in terms of absence of temperature over-shoots and undershoots should improve with each run as the kilnminder self-adjusts to the kiln. If it never becomes optimal, however, the autotuning option # 8 can be turned off and the kiln

power adjustments can be adjusted manually. If the kiln temperature undershoots the set point, that is, if it is very sluggish or never reaches the temperature setting of a stage, increase the power setting for that temperature setting. If the kiln temperature overshoots, that is, if it soars past the temperature setting of a stage, decrease the power setting for that temperature.

FAULT CODES AND TROUBLESHOOTING

MODEL 4 FAIL CODES.

EF 3 IF tF APPEARS IN THE DISPLAY DURING A RUN, IT MEANS THAT THE PRIMARY THERMOCOUPLE FAILED AND THE MODEL 4 HAS SWITCHED TO THE SECONDARY THERMOCOUPLE AND CONTINUED RUNNING. THE FAIL CODE OF THE PRIMARY THERMOCOUPLE IS TO THE RIGHT.

FR IL IF FAIL APPEARS IN THE DISPLAY, THE MODEL 4 CEASES KILN OPERATION. THE SAFETY RELAY IS DISABLED. THE DISPLAY SHOWS FAIL, THEN A FAIL CODE, AND THEN KILN TEMPERATURE .

IF 3 IF BOTH THERMOCOUPLES FAIL, THE DISPLAY SHOWS THE FAIL CODE OF THE PRIMARY THERMOCOUPLE AND THEN THE
2F 10 FAIL CODE OF THE SECONDARY THERMOCOUPLE.

FAIL CODES:

FAIL 0: MICROCONTROLLER OR PERMANENT MEMORIES HAVE LOST INFORMATION.

FAIL 1: ANALOG TO DIGITAL SIGNAL CONVERTER HAS FAILED.

FAIL 2: PERMANENT MEMORIES WON'T READ OR WRITE INFORMATION.

FAIL 3: THERMOCOUPLE OPEN CIRCUIT.

FAIL 5: THERMOCOUPLE SIGNAL CHANGED TOO FAST.

FAIL 6: THERMOCOUPLE SHORTED, OR THERMOCOUPLE OUT OF KILN, OR KILN FAILED TO HEAT.

FAIL 9: THERMOCOUPLE SIGNAL GREATER THAN ANALOG TO DIGITAL CONVERTER LIMIT.

FAIL 10: THERMOCOUPLE SIGNAL NEGATIVE.

FAIL 11: USER PROGRAMMED KILN TEMPERATURE LIMIT EXCEEDED.

FAIL 16: CONTROL BOX TOO HOT > 150 DEG F (65 DEG C).

SEE TROUBLESHOOTING GUIDE.

Troubleshooting Guide:

- **Fail 0: Send in for repair.**
- **Fail 1: Send in for repair.**
- **Fail 2: Replace Microchip 24LC256 parts.**
- **Fail 3: Open thermocouple. Check thermocouple wiring for loose connections or broken wires. If no wiring problem is found, replace the thermocouple. Insure that the replacement thermocouple is of the same type as the original. Most kilns use type K thermocouples, chromel/alumel. Note: A thermocouple that is failing typically develops a crack at the tip that is not visible. The thermocouple may work when the kiln is cool but then fails as the kiln heats.**
- **Fail 5: The kiln temperature reading changed in a way that indicates a fault in the thermocouple or thermocouple wiring. The thermocouple may have broken or a wire may have broken, or wires may have become short circuited, or some other device may have come into contact with the thermocouple wiring.**
- **Fail 6: The kiln temperature did not rise as expected. If the kiln is unusually massive and slow to respond to the kilnminder, this fault condition might be triggered falsely, in which case this fault detector can be turned off by setting option # 6 to 0. See Procedures for / setting options and adjustments. This fault condition can be triggered by the kiln failing to heat, due to the kiln heating element being broken or due to faulty wiring to the kiln or due to a failure within the kilnminder control relays. This fault condition can also be triggered by a short circuit in the thermocouple wiring or by a thermocouple falling out of the kiln.**
- **Fail 9: The thermocouple signal exceeds the limit of the kilnminder to measure it. This can be caused by the kiln heating uncontrollably or by a thermocouple wiring fault.**

- **Fail 10: The thermocouple signal is negative. This usually indicates that the thermocouple is wired backwards.**
- **Fail 11: The user entered temperature cut-off limit has been exceed in the kiln. Insure that the cut-off limit is set higher than all the temperature settings of the kiln heating program. See Procedures for / setting options and adjustments. If the cut-off limit is set high enough, this fault can indicate that the kilnminder control relays are faulty. This fault can also be triggered by faulty thermocouple wiring.**
- **Fail 16: The kilnminder itself has gotten too hot. Move it to a cooler location.**