Application Number Guide

Cook-&-Hold Ovens
- Application 1 . . . . . . . Automatic Cook-&-Hold Oven with Meat Probe Option
- Application 2 . . . . . . . Automatic Cook-&-Hold Oven with Meat Probe Option
- Application 3 . . . . . . . Automatic Cook-&-Hold Oven
- Application 4 . . . . . . . Automatic Cook-&-Hold Oven
- Application 5 . . . . . . . Manual Cook-&-Hold Oven with Meat Probe Option
- Application 6 . . . . . . . Manual Cook-&-Hold Oven

Convection Ovens
- Application 7 . . . . . . . Automatic Convection Oven
- Application 8 . . . . . . . Automatic Convection Oven
- Application 9 . . . . . . . Manual Convection Oven

Deepfat Fryers
- Application 10 . . . . . . . Automatic Deepfat Fryer with Autolift Control
- Application 11 . . . . . . . Automatic Deepfat Fryer with Autolift Control
- Application 12 . . . . . . . Manual Deepfat Fryer with Autolift Control
- Application 13 . . . . . . . Pressurized Automatic Deepfat Fryer
- Application 14 . . . . . . . Pressurized Automatic Deepfat Fryer
- Application 15 . . . . . . . Pressurized Manual Deepfat Fryer
- Application 16 . . . . . . . Automatic Deepfat Fryer
- Application 17 . . . . . . . Automatic Deepfat Fryer
- Application 18 . . . . . . . Automatic Deepfat Fryer
- Application 19 . . . . . . . Manual Deepfat Fryer

Griddles
- Application 20 . . . . . . . Automatic Clam Shell Griddle
- Application 22 . . . . . . . Automatic One-Sided Griddle
- Application 23 . . . . . . . Manual One-Sided Griddle

Timers
- Application 24 . . . . . . . Automatic Timer
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Shelf Timer
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Rotisserie Ovens
- Application 27 . . . . . . . Manual and Automatic Rotisserie Oven with Meat Probe Option
- Application 28 . . . . . . . Manual Rotisserie Oven with Meat Probe Option
Introduction

Welcome to the MiniChef 2000™

The MiniChef 2000 is a configurable, time/temperature and machine function controller that is preprogrammed for dozens of cooking applications. Its compact size and optional horizontal/vertical orientation facilitates streamlined equipment design. It withstands rigorous application environment conditions, with an 80ºC ambient rating and superior EMI/RFI immunity. It is also backed by Watlow's exclusive three-year warranty.

Each unit is equipped to offer:
- two temperature sensor inputs
- two event inputs (for machine control)
- two heat control outputs
- two event outputs (for machine control)
- one audible alarm output

(See diagram below.)

Depending on the application software you select, some or all of the inputs or outputs are used. See the Application Selection Table that follows.

Figure 3 — Inputs and outputs.
MINICHEF™ 2000 Application Software Selection Table

To select the application software that best suits your equipment and purpose, first locate the type of equipment in the left column, then check the other columns for features and options you need. The application number is on the right (Appl#). Make a note of the application number. You will be using this number later when programming your controller. The guide for each application contains specific configuration and programming parameters, and operating instructions. Note that the use of the software below is not limited to the equipment types listed in the first column.

<table>
<thead>
<tr>
<th>Intended Equipment Type (May also apply to other apps)</th>
<th>Operation Mode</th>
<th>No. of Menus</th>
<th>Heat Output Channels</th>
<th>Timed Zones</th>
<th>Meat Probe</th>
<th>Fan Speeds</th>
<th>Steps</th>
<th>Appl #</th>
<th>Notes</th>
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<tbody>
<tr>
<td>COOK &amp; HOLD OVENS</td>
<td>Auto</td>
<td>6</td>
<td>Single</td>
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<td>Yes</td>
<td>1 or 2</td>
<td>2</td>
<td>1</td>
<td></td>
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<tr>
<td></td>
<td>Auto</td>
<td>17</td>
<td>Single</td>
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<td>Yes</td>
<td>1 or 2</td>
<td>2</td>
<td>2</td>
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<td></td>
<td>Auto</td>
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<td>4</td>
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<td>1 or 2</td>
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<td>No</td>
<td>1 or 2</td>
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<td>CONVECTION OVENS</td>
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<td>No</td>
<td>1 or 2</td>
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<td>Single</td>
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<td>No</td>
<td>1 or 2</td>
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<td>No</td>
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<td>Pressurized</td>
<td>Auto</td>
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<td>No</td>
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<td>No</td>
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<td>Single</td>
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<td>No</td>
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<td>Auto</td>
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<td>Single</td>
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<td>No</td>
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<td>17</td>
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<td>No</td>
<td>No</td>
<td>1</td>
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<td>No</td>
<td>No</td>
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<td>GRIDDLES</td>
<td>Clam Shell</td>
<td>Auto</td>
<td>6</td>
<td>Dual</td>
<td>1</td>
<td>No</td>
<td>No</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Clam Shell</td>
<td>Manual</td>
<td>N/A</td>
<td>Dual</td>
<td>1</td>
<td>No</td>
<td>No</td>
<td>1</td>
<td>21</td>
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<tr>
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<td>Single</td>
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<td>No</td>
<td>No</td>
<td>1</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>One-sided</td>
<td>Manual</td>
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<td>Single</td>
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<td>No</td>
<td>No</td>
<td>1</td>
<td>23</td>
</tr>
<tr>
<td>TIMERS</td>
<td>No temp. control</td>
<td>Auto</td>
<td>6</td>
<td>N/A</td>
<td>6</td>
<td>No</td>
<td>No</td>
<td>1</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>No temp. control</td>
<td>Manual</td>
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<td>N/A</td>
<td>1</td>
<td>No</td>
<td>No</td>
<td>1</td>
<td>25</td>
</tr>
<tr>
<td>SHELF TIMER</td>
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<td>No</td>
<td>1</td>
<td>26</td>
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<tr>
<td>ROTISSERIE OVENS</td>
<td>Manual &amp; Auto</td>
<td>30</td>
<td>Single</td>
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<td>Yes (1)</td>
<td>1 or 2</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td></td>
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<td>N/A</td>
<td>Single</td>
<td>1</td>
<td>Yes</td>
<td>Yes (1)</td>
<td>1 or 2</td>
<td>28</td>
<td></td>
</tr>
</tbody>
</table>

Table 4 — Application selection table.
Overview of Key Steps, from Installation through Operation:

1. **Install the controller**
   - Use the panel knock-out pattern guidelines in this guide.

2. **Wire the controller**
   - Use the connector/wiring information in this guide.

3. **Configure the controller**
   - After applying power, use the Configuration Mode to enter the equipment Application Number (from the MINICHEF 2000 Software Selection table), set up the controller and access the thermal optimization functions.
   - Use the space provided to record your values for future reference.
   - Set the Application Number Security Lock, if necessary, to prohibit end users from changing Application Number.
   - To speed configuration, you may want to use the Prototyping/Training Overlay (available separately, see Ordering Information in this guide).

Note: Always select and enter the application number first. The parameters that follow are based on it. See instructions in this Hardware & Software Setup Guide.

4. **Program the menus (automatic menu applications only)**
   - Use the Program Mode to program automatic menus for the chosen application. See instructions in this guide.
   - Use the space provided to record your values for future reference.
   - To ease menu programming, you may want to use the Prototyping/Training Overlay (available separately, see Ordering Information in this guide).

5. **Set menu security (automatic menu applications only)**
   - Set up menu security, if necessary, to prohibit end users from changing values. (Because the controller defaults to no security, the end user may be able to access the Program Mode to change parameter values based on menu.) See instructions in this guide.

6. **Set Real-time Clock**
   This applies only to controllers purchased with the Real-time Clock option. It allows you to see the time of day instead of “idle” on the display.

7. **Design faceplate overlay**
   - Use the Overlay Design Guidelines in this guide to design, manufacture and apply a membrane overlay for the controller faceplate. This custom-designed overlay becomes the end-user interface.
   - For overlay designs to suit specific applications, see the suggestions in each application guide.

8. **Operate the MINICHEF 2000**
   - Use the Operation Mode to run the installed controller. This is the default mode. Operation instructions are included in each application guide.
General Description

Getting to know your MiniChef™ 2000

Front view

Back view
Shown with mating connector terminals installed. Mating connectors and terminals are purchased separately.

Figure 6a — Front and back view.

Figure 6b — Mounting collar.

Dimensions:
Overall width x height x depth (Includes MiniChef 2000 with mounting collar and space required for mating connectors. Does not include wire bundle space requirements):
4.13 in x 3.25 in x 2.00 in (with collar mounted in horizontal position)
3.25 in x 4.13 in x 2.00 in (with collar mounted in vertical position)
Mating Connectors (purchased as an accessory — not included):

See Accessories ordering information about the following mating connectors:
Sensor Input Mating Connector: RIA Electronic Inc. RIACON #31007106, 6-position, quick-connect terminal, screw connection for 28-14 AWG wires, tighten to 7 in/lb.
Power Supply and Input/Output Mating Connector Kit: Kit includes: one AMP #1-640523-0 quick-connect terminal and fifteen AMP #641300-1 crimp pins.

Figure 7a — Mating connectors.

Note: Position mating connector with beveled edges at the top. They are not visible from the front.

Label Information:

Main Label

Part number
Date Code
Serial number
Pin designations

Agency marks

Sensor input label
If RTD sensors are specified: If thermocouples are specified:

INPUT 1 INPUT 2

1 2 3 4 5 6

INPUT 1 INPUT 2

TC+ TC− TC+ TC−

12 34 5 6

Figure 7b — Labels.
Step 1 Install the Controller

- Select sheet metal (16-, 18-, 20- or 22- gauge panel).
- For panel knock-out patterns, see subsequent pages of this guide.
- Use #6-32 mounting studs x 0.50” length minimum, either pressed or welded.
- Install the unit with either a horizontal or vertical mounting collar position.
- Install mating connectors to unit.

Note: This device should be used in systems that incorporate a separate high limit device for safety.

Figure 8 — Mounting the MINICHEF 2000.
Step 1 Install the Controller

Panel Knock-out Pattern for a Mounting Collar in a Horizontal Position

Figure 9a — Pattern for horizontal panel 16- or 18-gauge thick.

Figure 9b — Pattern for horizontal panel 20- or 22-gauge thick.
Panel Knock-out Pattern for a Mounting Collar in a Vertical Position

Figure 10 — Pattern for vertical panel 16- or 18-gauge thick.
Step 1 Install the Controller

Figure 11 — Pattern for vertical panel 20- or 22-gauge thick.

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Step 2 Wire the Controller

Position the connector with the beveled edges at the top.

Not all software applications use or require wiring to all inputs and outputs. For specific information consult the guide for the application you are using.

Note: The following illustration is a view of the back of the controller, not of the mating connector.

Power Wiring

Figure 12a — 24V~ (ac) Low Voltage.

WARNING: To avoid potential electric shock, use National Electric Code (NEC) safety practices when wiring and connecting this unit to a power source and to electrical sensors of peripheral devices. Failure to do so could result in injury or death.

Sensor Inputs 1 and 2

Note: The following illustrations are views of the back of the mating connector, not of the controller.

Figure 12b — Dual Thermocouple Option.

F 2-- 1-- - - - - (Type J, K, or E).
**Dual RTD Option (platinum)**

- F 2__ - 2__ - 2__ - 2__ (100Ω RTD, curve selectable)
- F 2__ - 3__ - 3__ - 3__ (500Ω RTD, curve selectable)
- F 2__ - 4__ - 4__ - 4__ (1000Ω RTD, curve selectable)

**Figure 13a — 2-wire RTD.**

- F 2__ - 2__ - 2__ - 2__

**Figure 13b — 3-wire RTD: (will function as a 2-wire RTD).**

**Note:** If your chosen software application does not require two sensor inputs, it is not necessary to wire Input 2. For specific information, consult the application guide for the application you are using.

**Event Inputs 1 and 2**

**Note:** The following illustration is a view of the back of the controller, not of the mating connector.

**Figure 13c — Switched DC (two per unit, non-isolated).**

**Note:** Not all software applications require event inputs 1 and 2. For specific information consult the application guide for the application you are using.
Output 1

Note: The following illustrations are views of the back of the controller, not of the mating connector.

Figure 14a — Switched DC Option (5V nominal, 30mA, non-isolated).

Figure 14b — Solid-state Relay Option.

Note: Not all software applications require Output 1. For specific information consult the application guide for the application you are using.
Output 2

Note: The following illustrations are views of the back of the controller, not of the mating connector.

**Figure 15a** — Switched DC Option (5V nominal, 30mA, non-isolated).

**Figure 15b** — Solid-state Relay Option.

**Note:** Not all software applications require Output 2. For specific information consult the application guide for the application you are using.
Event Output 1 and Event Output 2

Note: The following illustrations are views of the back of the controller, not of the mating connector.

![Diagram of Event Output 1 and Event Output 2]

\[
\begin{align*}
&\text{F 2\_\_\_\_\_\_\_\_\_1\_\_\_\_\_} \\
&\text{(switched dc, 5V nominal, 30mA, non-isolated outputs)}
\end{align*}
\]

Figure 16a — Event Outputs.

⚠️ Warning: If event outputs 1 & 2 are used to cause or initiate machine motion, appropriate reasonable care should be taken to prevent personal injury or machine damage as a result of machine motion.

Note: Not all software applications require event outputs 1 & 2. For specific information consult the application guide for the application you are using.

Output 5: Audible Alarm Output Signal Option

Note: The following illustrations are views of the back of the controller, not of the mating connector.

![Diagram of Output 5: Audible Alarm Output Signal Option]

\[
\begin{align*}
&\text{Alarm signal available at connector, 5V nominal, 30ma, non-isolated.} \\
&\text{F 2\_\_\_\_\_\_\_\_\_0\_\_\_\_\_} \\
&\text{(unit without internal audible alarm)}
\end{align*}
\]

Figure 16c — Switched DC.

Note: Pin 5 is shared with event output 2 wiring.
Step 3 Configure the Controller

Overview of Configuration

- Get to know the keys and how they function in different modes.
- Review configuration and programming procedures in this guide.
- Choose applications, functions, parameters and values (see Application Software Selection Table in this guide).
- Review the operating instructions (in each application guide).
- Get a complete idea of how the application works.

Controller Front Panel Layout

During configuration and programming, this is how the keys work:

Note: To order this helpful Prototyping/Training Overlay, see Ordering Information in this guide.

Note: In the Operation Mode, the keys will function differently, depending on the chosen application number. For more information, see individual application guides.
Software Structure

The MINICHEF 2000 software uses three modes — Configuration Mode, Programming Mode and Operation Mode — and each mode contains up to three levels of functions, parameters and values. The Operation Mode is the default mode.

Figure 18 — Navigating in Configuration Mode.
Figure 19 — Navigating in Menu Programming Mode.
## Configuration Mode Quick Reference

This is a list of all functions, parameters and values that are available through the Configuration Mode. (They are not all available for every application.) For a detailed explanation of parameters see the Appendix in this guide.

<table>
<thead>
<tr>
<th>Function</th>
<th>Parameter</th>
<th>Value</th>
<th>Your Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong> Equipment</td>
<td><strong>appl</strong> Application Number</td>
<td>1 - 28</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>appl</strong> Application Number</td>
<td>Yes, No</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>loc</strong> Security Lock</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>sound</strong> Audible Alarm Sound</td>
<td>0 - 5</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>btim</strong> Basket Travel Time</td>
<td>0 - 30 sec</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>ptim</strong> Pressure Release Time</td>
<td>1 - 120 sec (from end of menu)</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>preh</strong> Preheat Temperature</td>
<td>temp range low - range high</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>idte1</strong> Idle Temp Number 1</td>
<td>temp range low - range high</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>idte2</strong> Idle Temp Number 2</td>
<td>temp range low - range high</td>
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<td></td>
<td><strong>out</strong> Timer output 4</td>
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<tr>
<td></td>
<td><strong>steps</strong> Number of cooking steps</td>
<td>1 or 2</td>
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</tr>
<tr>
<td></td>
<td><strong>melt</strong> Oil Melt Cycle</td>
<td>On, Off</td>
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</tr>
<tr>
<td></td>
<td><strong>fan</strong> Fan Speed</td>
<td>1-speed, 2-speed</td>
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</tr>
<tr>
<td></td>
<td><strong>del</strong> Fan Delay Time</td>
<td>0 - 120 minutes</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>setp</strong> Temperature Set Point</td>
<td>temp range low - temp range high</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>prob</strong> Meat/Food Temperature Probe</td>
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<td></td>
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<td><strong>Setup</strong> Setup</td>
<td><strong>temp</strong> Temperature Display Format</td>
<td>ºC or ºF</td>
<td></td>
</tr>
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<td></td>
<td><strong>time</strong> Time Display Format</td>
<td>MMM:SS, HH:MM, H:MM:SS</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>chirp</strong> Key Chirp</td>
<td>On, Off</td>
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<td><strong>loc</strong> Menu Security Lock</td>
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<td><strong>tc</strong> Thermocouple Type</td>
<td>J, K (shown as H), E</td>
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</tr>
<tr>
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<td>DIN, JIS</td>
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<td></td>
<td><strong>tconp</strong> WatCurve™Temperature Compensation</td>
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<td><strong>offset1</strong> Temp Offset, Channel 1</td>
<td>-99 to 99°F (-55 to 55°C)</td>
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</tr>
<tr>
<td></td>
<td><strong>offset2</strong> Temp Offset, Channel 2</td>
<td>-99 to 99°F (-55 to 55°C)</td>
<td></td>
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<tr>
<td></td>
<td><strong>trlo</strong> Temperature Range Low</td>
<td>0°F (-18°C) for rtd inputs, 32°F (0°C) for tc inputs to temp range high</td>
<td></td>
</tr>
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<td></td>
<td><strong>trhi</strong> Temperature Range High</td>
<td>temp range low to 1200°F (649°C)</td>
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<td><strong>ready</strong> Ready/Preheat Feature</td>
<td>Yes, No</td>
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<td></td>
<td><strong>rbnd</strong> Ready Band</td>
<td>1 to 1200°F (649°C)</td>
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</tr>
<tr>
<td></td>
<td><strong>loss</strong> Power Loss Menu Resume</td>
<td>Yes, No</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>alar1</strong> Alarm, Channel 1</td>
<td>None, Dev, Proc, Both</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>alar1</strong> Absolute Process Alarm, Channel 1</td>
<td>100 to 1200°F (38 to 649°C)</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>alar1</strong> Low Deviation Alarm, Channel 1</td>
<td>-999 to 0°F (-555 to 0°C)</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>alar1</strong> High Deviation Alarm, Channel 1</td>
<td>0 to 999°F (0 to 555°C)</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>alar2</strong> Alarm, Channel 2</td>
<td>None, Dev, Proc, Both</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>alar2</strong> Absolute Process Alarm, Channel 2</td>
<td>100 to 1200°F (38 to 649°C)</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>alar2</strong> Low Deviation Alarm, Channel 2</td>
<td>-999 to 0°F (-555 to 0°C)</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>alar2</strong> High Deviation Alarm, Channel 2</td>
<td>0 to 999°F (0 to 555°C)</td>
<td></td>
</tr>
</tbody>
</table>
Step 3 Configure the Controller

**Function**
- **Thermal**

**Parameter**
- **Type**
  - Temperature Control Type
- **Hyst1**
  - Hysteresis 1
- **Hyst2**
  - Hysteresis 2
- **Pid**
  - PID Units
- **Auto1**
  - Auto-tuning, Channel 1
- **Auto2**
  - Auto-tuning, Channel 2
- **Prop1**
  - Proportional Band 1
- **Res1**
  - Reset (integral) Gain 1
- **Int1**
  - Integral Gain 1
- **Rate1**
  - Rate (derivative) Gain 1
- **Der1**
  - Derivative Gain 1
- **Cyc1**
  - PID Cycle Time 1
- **Prop2**
  - Proportional Band 2
- **Res2**
  - Reset (integral) Gain 2
- **Int2**
  - Integral Gain 2
- **Rate2**
  - Rate (derivative) Gain 2
- **Der2**
  - Derivative Gain 2
- **Cyc2**
  - PID Cycle Time 2

**Value**
- **Your Setting**
  - PID, On-Off
  - 1 to 999°F (1 to 55°C)
  - 1 to 999°F (1 to 55°C)
  - 1 to 999°F (1 to 55°C)
  - 1 to 999°F (1 to 55°C)
  - 1 to 999°F (1 to 55°C)
  - 1 to 999°F (1 to 55°C)
  - 1 to 999°F (1 to 55°C)
  - 1 to 999°F (1 to 55°C)
  - 1 to 999°F (1 to 55°C)
  - 1 to 999°F (1 to 55°C)
  - 1 to 999°F (1 to 55°C)
  - 1 to 999°F (1 to 55°C)
  - 1 to 999°F (1 to 55°C)
  - 1 to 999°F (1 to 55°C)
  - 1 to 999°F (1 to 55°C)

**Diagnostics**
- **WatHelp**
  - Date-of-Manufacture Code YYDDD
  - Serial Number XXXXXX
  - Part Number-first F2XX-XXXX-XXXX
  - Part Number-middle F2XX-XXXX
  - Part Number-last F2XX-XXXX-XXXX
  - Software Revision Number XX
  - Key Function Identification Yes, no
  - Current Application Number XX
  - Display Test All spot LEDs and all main-display LEDs will light up
  - Output Test 0=All outputs are normal
  - 1=Output 1 is on. All others are off.
  - 2=Output 2 is on. All others are off.
  - 3=Event Output 1 is on. All others are off.
  - 4=Event Output 2 is on. All others are off.
  - 5=Output 5 is on. All others are off.
  - 6=All outputs are on.
  - Event Input Test 0=Both Event Inputs are off.
  - 1=Event Input 1 is on.
  - 2=Event Input 2 is on.
  - 3=Both Event Inputs are on.
  - Actual Temperature Channel 1 (w/out offset) XXXX °F/°C
  - Actual Temperature Channel 2 (w/out offset) XXXX °F/°C
**On/off Temperature control**

On/off control switches the heat outputs either full on or full off, depending on the temperature sensor input, set point and hysteresis values. The hysteresis value creates a buffer zone that increases the time interval that the output is off or on. With hysteresis set to 1º the process value would stay closer to the set point, but the output would switch on and off more frequently.

**PID Temperature control (Proportional, Integral, Derivative)**

**Proportional control:** Some processes need to maintain a temperature or process value closer to the set point than On/off control can provide. Proportional control provides closer control by adjusting the output when the temperature or process value is within a proportional band. When the value is in the band, the controller adjusts the output based on how close the process value is to the set point: the closer to set point the lower the output. This is similar to backing off on the gas pedal of a car as you approach the speed limit. It keeps the temperature or process value from swinging as widely as it would with simple On/off control. However, when a system stabilizes, the temperature or process value tends to “droop” short of the set point.

**Proportional plus Integral:** The droop caused by proportional control can be corrected by adding integral (reset) control to the system. When the system has settled down, the integral (reset) value is tuned to bring the temperature or process value closer to the set point. However, this increases the overshoot that occurs at startup or when the set point is changed.

**Proportional, Integral, Derivative control (PID):** Use derivative (rate) control to minimize the overshoot in a Proportional-Integral controlled system. Derivative (rate) adjusts the output based on the rate of change in the temperature or process value.

**Auto-tuning**

Auto-tuning is a feature that simplifies the determination of PID values (an otherwise tedious, time-consuming system tuning process.) Auto-tuning allows the controller to automatically explore the responsiveness of the complete system to determine an effective set of parameters for PID control. To do this it crosses an auto-tune set point three times, then controls at the normal set point using the new parameters. Once the auto-tuning cycle is complete, the optimized PID values are stored in the controller memory automatically.
Configuration Procedure

Power up the control (24V~ (ac) source required).

1. Access the Configuration Mode by pressing the Up-arrow and Down-arrow keys simultaneously for two seconds.
   - ["m"] for automatic applications will appear on the display. ["-----"] will appear in manual applications.
   
   Then press the Home key and the Escape key simultaneously for two seconds.
   - ["etype"] will appear on the display. It is the first in a list of functions. You are now in the Configuration Mode.

2. To move down the list of functions press the Down-arrow key. To move up, press the Up-arrow key.

3. To access the parameter list: with the appropriate function on the display, press the Edit key. The first in a list of parameters will appear on the display, which will alternate between the parameter and its value.

4. To move down the list of parameters press the Down-arrow key. To move up, press the Up-arrow key.

5. To access a parameter (in order to change its value): with the parameter on the display, press the Edit key. The first in a list of values will appear on the display.
Note: When you are configuring your controller, always edit **E-type** and set the application number first (for example, **APPL** 20). The parameters that follow are based on it. In general, parameters that appear earlier on the list can influence the parameters and values that follow.

6. To change a value: press the Down-arrow key or the Up-arrow key.

7. To save the new value, which is on the display, press the Enter key. You will return to the parameter list and the new value will flash to confirm that it has been accepted.
   
   If you do not want to enter the new value, press the Escape key. You will return to the parameter list without making the change.

8. Repeat 4 through 7 until all values for this application have been programmed.

9. To leave the parameter list, press the Enter key. You will move to the function list.

10. Repeat 2 through 9 until the Equipment-Type, Setup and Thermal functions have all been programmed. (The Diagnostics function is used for troubleshooting and is read-only. No programming required.)

11. To leave the function list and exit the Configuration Mode, press the Enter key twice.

Note: You can also exit the Program Mode from the parameter list or function list by pressing the Home key for two seconds or by pressing the Enter key repeatedly.
Step 4 Program the Menus

Program Mode Quick Reference

These are the functions, parameters and values that may be included in the Program Mode. Not all parameters will appear. Different parameters are relevant in different application numbers. For a detailed explanation, see the Appendix in this guide.

<table>
<thead>
<tr>
<th>Function</th>
<th>Parameter</th>
<th>Value/Description</th>
<th>Your Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Menu Numbers XX</td>
<td>Set point 1</td>
<td>Temperature of set point 1.</td>
<td>Temp range low - temp range high</td>
</tr>
<tr>
<td></td>
<td>Time 1</td>
<td>Run time of set point 1.</td>
<td>Format varies based on configuration.</td>
</tr>
<tr>
<td></td>
<td>Fan 1 Speed</td>
<td>Speed of fan 1 during time 1</td>
<td>Single Speed:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Two Speed:</td>
</tr>
<tr>
<td>Set point 2</td>
<td>Temperature of set point 2.</td>
<td>Temp range low - temp range high</td>
<td></td>
</tr>
<tr>
<td>Time 2</td>
<td>Run time of set point 2.</td>
<td>Format varies based on configuration.</td>
<td></td>
</tr>
<tr>
<td>Fan 2</td>
<td>Speed of fan during time 2</td>
<td>Single Speed:</td>
<td>on</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Two Speed:</td>
<td>OFF</td>
</tr>
<tr>
<td>Probe</td>
<td>Activates probe function.</td>
<td>Temp range low - temp range high</td>
<td></td>
</tr>
<tr>
<td>Probe Temperature</td>
<td>Temperature at which probe will switch controller to hold condition.</td>
<td>Temp range low - temp range high</td>
<td></td>
</tr>
<tr>
<td>Set point 3</td>
<td>Temperature of set point 3.</td>
<td>Format varies based on configuration.</td>
<td></td>
</tr>
<tr>
<td>Time 3</td>
<td>Run time of set point 3.</td>
<td>Single Speed:</td>
<td>on</td>
</tr>
<tr>
<td>Fan 3 Speed</td>
<td>Speed of fan 3 during time 3</td>
<td>Two Speed:</td>
<td>OFF</td>
</tr>
<tr>
<td>Set point 4</td>
<td>Temperature of set point 4.</td>
<td>Temp range low - temp range high</td>
<td></td>
</tr>
<tr>
<td>Time 4</td>
<td>Run time of set point 4.</td>
<td>Format varies based on configuration.</td>
<td></td>
</tr>
<tr>
<td>Fan 4</td>
<td>Speed of fan during time 4</td>
<td>Single Speed:</td>
<td>on</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Two Speed:</td>
<td>OFF</td>
</tr>
</tbody>
</table>
Step 4 Program the Menus

**ALARM** Mid Menu Alarm

**Atme** Alarm Time
Time before end of menu

**Hsppt** Hold Set Point
Temperature at which the oven will operate during hold sequence

**Htme** Hold Time
Run time of hold sequence.

**Hfan** Hold Fan
Speed of fan during hold time

**none**, **Stir**, **Add**, **FLIP**, **Turn**, **ALERT**

0 - **time** (in seconds)

Temp range low to temp range high.

0 = infinite. A setting >0 = hold time. Format varies based on configuration

Single speed: **on**, **OFF**
Two Speed: **OFF**, **Lo**, **Hi**
Procedure to program the menus

This procedure applies only to automatic applications. Menus for manual applications are explained in the application guides.

1. To enter the Program Mode, press the Up-arrow and Down-arrow keys simultaneously for approximately two seconds.
   \[pg \text{[m''1]} \] will appear on the display. This is menu number 1, the first in a list of several. You are now in the Program Mode.

2. To move down the list of menus press the Down-arrow key. To move up, press the Up-arrow key.

3. To access the list of menu parameters, with the appropriate menu number on the display, press the Edit key.

   The first in a list of parameters will appear on the display. The display will alternate between the parameter and its value.

4. To move down the list of parameters press the Down-arrow key. To move up, press the Up-arrow key.
5. To edit a value: with the parameter on the display, press the Edit key. The first value in a list of values will appear on the display.

6. To change a value: press the Down-arrow key to move down, press the Up-arrow key to increment up.

7. To enter the new value: with the value on the display, press the Enter key. The value will be entered and you will return to the parameter list. If you do not want to enter the new value, press the Escape key. You will return to the parameter list without making the change. The parameter and its original value will alternate on the main display.

8. Repeat 2 through 7 until all values for the menu have been programmed.

9. To leave the parameter list, press the Enter key. You will move to the menu list.

10. Repeat 2 through 9 until all desired menus have been programmed. It is not required that all menus be programmed. (If any total menu time is set to zero, the menu key is disabled in the Operation Mode.)

11. To leave the menu list and exit the Program Mode, press the Enter key.

Note: A second way to immediately exit the Program Mode is to press the Home key for 2 seconds.

To Review Menu Values
Repeat 1 through 4 for each menu. Repeat 9 and 11 to exit.
Step 5 Set Controller Security

To Set Menu Security Lock
Return to the Configuration Mode, to the Setup Function, and program the Loc Parameter to adjust end-user access.

When Loc is set to YES the end user does not have access to the Menu Programming Mode and can only view parameter values.

When Loc is set to NO the end user has access to the Menu Programming Mode and can change parameter values.

To return to the Operation Mode, press the Enter key twice.

To Set Application Number Security Lock
Return to the Configuration Mode, to the TYPE Function, and the A_Loc Parameter to adjust end-user access.

When A_Loc is set to YES the user cannot change the Application Number. The application number is secure from inadvertent changes.

When A_Loc is set to NO the user can change the Application Number.

To return to the Operation Mode, press the Enter key twice.
Step 6 Set the Real-time Clock

These instructions are optional and apply only to controllers that are purchased with the Real-time clock (time of day) option. (Part number example: F2 _ _ - _ _ _ _ - 1 _ _ _)

To set the time of day

1. Press the Edit key and Home key simultaneously for approximately 3 seconds. You are now in the Real-time Clock Program Mode.

![Image of Edit Key and Home Key being pressed simultaneously]

2. To change the time press the Up-arrow or Down-arrow key. Note that \[ A^{''''} \] indicates a.m. and \[ P^{''''} \] indicates p.m..

![Image of Up-arrow and Down-arrow keys being pressed]

3. With the desired time on the display, press the Enter key. The new value will be saved and the unit will return to the Operation Mode.

![Image of Enter key being pressed]

Depending on how the controller was programmed in the Configuration Mode, one of the following will appear on the display:

- **Time of day** (if \[ SETUP / Clk \] is set to \[ YES \] in the Configuration Mode).

- **idle** (if \[ SETUP / Clk \] is set to \[ no \] in the Configuration Mode).
Step 7 Design Membrane Overlay

In Step 7, design the membrane overlay for the front controller panel. Follow the design guidelines here, but for suggestions about designs suitable for specific applications, see the Suggested Overlay Design in each application guide.

1. Design guidelines

![Membrane overlay diagram](image)

Figure 31 — Membrane guidelines for a horizontal unit.

Recommended material: .008" thick polyester with .002" thick 3M adhesive or equivalent. Other materials and thicknesses should be qualified by customer.

Watlow keys (6) (no adhesive in these areas)

Watlow keys (6) (ref) (4)

Mounting studs (ref) (4)

.125 in. (8) red transparent windows for indicator lights (no adhesive in these areas)

Mounting collar outline (shown in horizontal orientation)

.700 in. Ref.

Red transparent window (no adhesive in this area)

Watlow keys (6) (no adhesive in these areas)

Watlow keys (6) (ref) (4)

Mounting studs (ref) (4)

.125 in. (8) red transparent windows for indicator lights (no adhesive in these areas)

Mounting collar outline (shown in horizontal orientation)

.700 in. Ref.

Red transparent window (no adhesive in this area)
Step 7 Design Membrane Overlay

2. Recommended source of faceplate overlay supply:
Customers must supply their own faceplate membrane overlay. A recommended source of supply of contamination- and water-resistant overlays is Dura-Tech, Inc., La Crosse, Wis., Phone (608) 781-2570. FAX (608) 781-1730.

3. A Prototyping and Training faceplate overlay accessory you can order:
The prototyping and training membrane faceplate (adhesive backed, measuring 4.75 in x 4.75 in) is available as an Accessory (WATLOW PART NO. 0238-0679-0000).
## Minichef™ 2000 Troubleshooting Chart

<table>
<thead>
<tr>
<th>Symptom/Indication</th>
<th>Possible Causes</th>
<th>Possible Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main display is blank. No indicator lights.</td>
<td>• System power switch is off. • System fuse is blown. • System circuit breaker is tripped. • System high-limit device is latched. • System wiring has open circuitry. • Power supplied to controller does not meet specification.</td>
<td>• Check the controller mating connectors and system harness assemblies for proper installation. • Cycle the power to the controller: off-on. • Check power supply, fuses, switches, breakers, connectors, wiring for proper connection.</td>
</tr>
</tbody>
</table>

### Errors (Messages 1-14 alternate on display with normal display.)*

<table>
<thead>
<tr>
<th>Error Code</th>
<th>Display</th>
<th>Possible Causes</th>
<th>Possible Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Err 1</td>
<td>appears on the display</td>
<td>• Controller EPROM component malfunction (checksum error).</td>
<td>• Cycle the power to the controller: off-on. If Err 1 reappears on the display, return controller to factory.</td>
</tr>
<tr>
<td>Err 2</td>
<td>appears on the display</td>
<td>• Controller EEPROM component malfunction (checksum error).</td>
<td>• Cycle the power to the controller: off-on. If Err 2 reappears on the display, return controller to factory.</td>
</tr>
<tr>
<td>Err 3</td>
<td>appears on the display</td>
<td>• Controller RAM memory malfunction.</td>
<td>• Cycle the power to the controller: off-on. If Err 3 reappears on the display, return controller to factory.</td>
</tr>
<tr>
<td>Err 4</td>
<td>appears on the display</td>
<td>• Calibration Error. Controller is out of calibration.</td>
<td>• Return controller to factory.</td>
</tr>
<tr>
<td>Err 5</td>
<td>appears on the display</td>
<td>• A/D Underflow Error has occurred on channel 1. • Temperature sensor for channel 1 is incompatible with controller. • Temperature sensor lead wires for channel 1 are improperly terminated (lead wires are reversed). • Channel 1 measures a condition below the controller temperature range.</td>
<td>• Confirm temperature sensor compatibility. Compare controller part number and specification to the chosen sensor. • Refer to the controller part number on the sticker label, or view the controller part number by accessing the WatHelp Diagnostics Function. • For controllers requiring thermocouple sensors, confirm that the parameter is set to the proper thermocouple curve. • For controllers requiring RTD sensors, confirm that the parameter is set to the proper RTD curve. • Refer to sensor wiring instructions. • Refer to controller specifications.</td>
</tr>
</tbody>
</table>

*Note: For definitions of errors, see pages 56 - 57.
<table>
<thead>
<tr>
<th>Symptom/Indication</th>
<th>Possible Causes</th>
<th>Possible Solutions</th>
</tr>
</thead>
</table>
| **Err 6** appears on the display | • A/D Overflow Error has occurred on channel 1.  
• Temperature sensor or circuit for channel 1 is open or damaged.  
• Temperature sensor for channel 1 is incompatible with controller.  
• Channel 1 measures a condition above the controller temperature range. | • Evaluate condition of channel 1 sensor and circuitry.  
• Confirm temperature sensor compatibility. Compare controller part number and specification to the chosen sensor.  
• Refer to the controller part number on the sticker label, or view the controller part number by accessing the WatHelp Diagnostics Function.  
• For controllers requiring thermocouple sensors, confirm that the $\text{tr}$ parameter is set to the proper thermocouple curve.  
• For controllers requiring RTD sensors, confirm that the $\text{rtd}$ parameter is set to the proper RTD curve.  
• Refer to sensor wiring instructions.  
• Refer to controller specifications. |
| **Err 7** appears on the display | • Under-range Error has occurred on channel 1.  
• Controller measures a temperature below the allowable operating range.  
• Temperature sensor lead wires for channel 1 are improperly terminated (lead wires are reversed).  
• Controller is misapplied. | • Refer to sensor wiring instructions.  
• Refer to controller specifications.  
• System may need to warm up. |
| **Err 8** appears on the display | • Over-range Error has occurred on channel 1.  
• Controller measures a temperature above the allowable operating range.  
• Temperature sensor lead wires for channel 1 are improperly terminated (lead wires are reversed).  
• Controller is misapplied. | • Refer to sensor wiring instructions.  
• Refer to controller specifications.  
• System may need to cool down.  
• Evaluate the system high-temperature limiting device. |
<table>
<thead>
<tr>
<th>Symptom/Indication</th>
<th>Possible Causes</th>
<th>Possible Solutions</th>
</tr>
</thead>
</table>
| **Err 9** appears on the display | • A/D Underflow Error has occurred on channel 2.  
• Temperature sensor for channel 2 is incompatible with controller.  
• Temperature sensor lead wires for channel 2 are improperly terminated (lead wires are reversed).  
• Channel 2 measures a condition below the controller temperature range. | • Confirm temperature sensor compatibility. Compare controller part number and specification to the chosen sensor.  
• Refer to the controller part number on the sticker label, or view the controller part number by accessing the WatHelp Diagnostics Function.  
• For controllers requiring thermocouple sensors, confirm that the \texttt{tc} parameter is set to the proper thermocouple curve.  
• For controllers requiring RTD sensors, confirm that the \texttt{rtd} parameter is set to the proper RTD curve.  
• Refer to sensor wiring instructions.  
• Refer to controller specifications. |
| **Err 10** appears on the display | • A/D Overflow Error has occurred on channel 2.  
• Temperature sensor or circuit for channel 2 is open or damaged.  
• Temperature sensor for channel 2 is incompatible with controller.  
• Channel 2 measures a condition above the controller temperature range. | • Evaluate condition of channel 2 sensor and circuitry.  
• Confirm temperature sensor compatibility. Compare controller part number and specification to the chosen sensor.  
• Refer to the controller part number on the sticker label, or view the controller part number by accessing the WatHelp Diagnostics Function.  
• For controllers requiring thermocouple sensors, confirm that the \texttt{tc} parameter is set to the proper thermocouple curve.  
• For controllers requiring RTD sensors, confirm that the \texttt{rtd} parameter is set to the proper RTD curve.  
• Refer to sensor wiring instructions.  
• Refer to controller specifications. |
| **Err 11** appears on the display | • Under-range Error has occurred on channel 2.  
• Controller measures a temperature below the allowable operating range.  
• Temperature sensor lead wires for channel 2 are improperly terminated (lead wires are reversed).  
• Controller is misapplied. | • Refer to sensor wiring instructions.  
• Refer to controller specifications.  
• System may need to warm up. |

Note: For definitions of errors, see pages 56 - 57.
<table>
<thead>
<tr>
<th>Symptom/Indication</th>
<th>Possible Causes</th>
<th>Possible Solutions</th>
</tr>
</thead>
</table>
| **Err 12** appears on the display | • Over-range Error has occurred on channel 2.  
   • Controller measures a temperature above the allowable operating range.  
   • Temperature sensor lead wires for channel 2 are improperly terminated (lead wires are reversed).  
   • Controller is misapplied. | • Refer to sensor wiring instructions.  
   • Refer to controller specifications.  
   • System may need to cool down.  
   • Evaluate the system high-temperature limiting device. |
| **Err 13** appears on the display | • Ambient temperature surrounding the controller is too high or too low. | • Adjust system or environment such that the ambient air surrounding the control is above 0°C and below 80°C.  
   • Refer to controller specifications. |
| **Err 14** briefly appears on the display when power is turned on. Time of day no longer appears on the display. The word "idLE" or some other word appears on the display. | • Real-time Clock Error prohibits the time of day to appear on the display. | • If the application does not require the Power Loss Menu Resume feature, then this error is a non-critical error. The controller will operate normally, with the exception of no longer displaying the time of day. To correct the error, return controller to the factory.  
   • If the application requires displaying time of day, or if the application requires the Power Loss Menu Resume feature, then this error is a critical error. Return controller to the factory. |
| Time of day does not appear on the display. The word "idLE" or some other word appears on the display when power is turned on. | • Controller is not equipped with the Real-time Clock option.  
   • Controller is equipped with the Real-time Clock option, but the controller is not programmed properly. | • Compare controller part number to the following part number format: F2HA-____-1____.  
   • If the controller part number does not have a “1” in the 9th position, it is not equipped for the Real-time Clock (time of day) feature. Refer to the controller part number on the sticker label, or view the controller part number by accessing the WatHelp Diagnostics Function.  
   • Confirm that the [Cloc] parameter is set to [YES]. |
### Alarms

**P1841** appears on the display.
System seems to be overheating.

**Possible Causes**
- Absolute Process Alarm for channel 1 has occurred.
  - Channel 1 temperature sensor measures a value that exceeds the maximum allowable temperature defined by the program.
  - System equipment failure.

**Possible Solutions**
- Determine if Absolute Process Alarm is required for channel 1. If not, access the \[AL'P1\] parameter and set the value to disable the process alarm, choosing `nonE` or `dEU`. Refer to programming guide.
  - If Process Alarm for channel 1 is required, confirm that the \[AL'P1\] parameter is set to the proper value for the application.
  - Evaluate the system high-temperature limiting device.
  - The Offset parameter can affect the alarm point. Confirm that the \[OFSt1\] parameter is set properly.
  - System may require service.

**P1842** appears on the display.
System seems to be overheating.

**Possible Causes**
- Absolute Process Alarm for channel 2 has occurred.
  - Channel 2 temperature sensor measures a value that exceeds the maximum allowable temperature defined by the program.
  - System equipment failure.

**Possible Solutions**
- Determine if Absolute Process Alarm is required for channel 2. If not, access the \[AL'P2\] parameter and set the value to disable the process alarm, choosing `nonE` or `dEU`. Refer to programming guide.
  - If Process Alarm for channel 2 is required, confirm that the \[AL'P2\] parameter is set to the proper value for the application.
  - Evaluate the system high-temperature limiting device.
  - The Offset parameter can affect the alarm point. Confirm that the \[OFSt2\] parameter is set properly.
  - System may require service.

\[Note: See definitions of temperature alarms on page 55.\]
<table>
<thead>
<tr>
<th>Symptom/Indication</th>
<th>Possible Causes</th>
<th>Possible Solutions</th>
</tr>
</thead>
</table>
| **H, 1** appears on the display. System seems to be overheating. | Deviation Alarm indicating a high temperature condition for channel 1.  
  - Channel 1 sensor measures a high temperature that exceeds the allowable deviation above the programmed setpoint. | • Determine if High or Low Deviation Alarms are required for channel 1.  
  If neither are required, access the \[AL''1\] parameter and set the value to disable the deviation alarms, choosing \[nonE\] or \[Proc\]. Refer to programming guide.  
  • If Deviation Alarms for channel 1 are required, confirm that the \[ALdH1\] parameter is set to the proper value for the application.  
  • The Offset parameter can affect the alarm point. Confirm that the \[OFSt1\] parameter is set properly.  
  • System may require service. |
| **H, 2** appears on the display. System seems to be overheating. | Deviation Alarm indicating a high temperature condition for channel 2.  
  - Channel 2 sensor measures a high temperature that exceeds the allowable deviation above the programmed setpoint. | • Determine if High or Low Deviation Alarms are required for channel 2.  
  If neither are required, access the \[AL''2\] parameter and set the value to disable the deviation alarms, choosing \[nonE\] or \[Proc\]. Refer to programming guide.  
  • If Deviation Alarms for channel 2 are required, confirm that the \[ALdH2\] parameter is set to the proper value for the application.  
  • The Offset parameter can affect the alarm point. Confirm that the \[OFSt2\] parameter is set properly.  
  • System may require service. |
| **LO, 1** appears on the display. System seems to be underheating. | Deviation Alarm indicating a low temperature condition for channel 1.  
  - Channel 1 sensor measures a low temperature that exceeds the allowable deviation below the programmed setpoint. | • Determine if High or Low Deviation Alarms are required for channel 1.  
  If neither are required, access the \[AL''1\] parameter and set the value to disable the deviation alarms, choosing \[nonE\] or \[Proc\]. Refer to programming guide.  
  • If Deviation Alarms for channel 1 are required, confirm that the \[ALdL1\] parameter is set to the proper value for the application.  
  • The Offset parameter can affect the alarm point. Confirm that the \[OFSt1\] parameter is set properly.  
  • System may require service. |
## Troubleshooting Chart

<table>
<thead>
<tr>
<th>Symptom/Indication</th>
<th>Possible Causes</th>
<th>Possible Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LO</strong> appears on the display. System seems to be underheating.</td>
<td>Deviation Alarm indicating a low temperature condition for channel 2. - Channel 2 sensor measures a low temperature that exceeds the allowable deviation below the programmed setpoint.</td>
<td>- Determine if High or Low Deviation Alarms are required for channel 2. If neither are required, access the <strong>ALdL2</strong> parameter and set the value to disable the deviation alarms, choosing <strong>nonE</strong> or <strong>Proc</strong>. Refer to programming guide. - If Deviation Alarms for channel 2 are required, confirm that the <strong>ALdL2</strong> parameter is set to the proper value for the application. - The Offset parameter can affect the alarm point. Confirm that the <strong>DEST</strong> parameter is set properly. - System may require service.</td>
</tr>
</tbody>
</table>

### Operations

- **Operator cannot access Menu Programming Mode.**
- **Operator cannot access Configuration Mode.**
- **Operator cannot set Real-time Clock time.**

<table>
<thead>
<tr>
<th>Possible Causes</th>
<th>Possible Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Controller is currently running a menu.</strong> - Operator error. - Controller does not have the Real-time Clock option.</td>
<td><strong>Access modes when controller is in an idle state. User can cancel an active menu in order to gain access to these modes.</strong> - <strong>Refer to programming guide for procedure to access the Menu Programming Mode, the Configuration Mode and for setting the Real-time Clock time.</strong></td>
</tr>
</tbody>
</table>

| Cannot stop an active menu. | Operator error. | Press Menu key or Start/Stop key for 2 seconds. |

| Alarm sound is on too long or runs continuously at the end of a Menu cycle. Different Alarm sound or duration is desired at the end of a Menu cycle. | **Operator error.** - **Sound** parameter is set to **s**. - **Controller requires reprogramming.** | **To silence the alarm, press the key indicated by the flashing light.** - **To select alternative Audible Alarm sounds and duration, change value of **Sound** parameter to meet the application requirements. See programming guide.** - **Consult factory.** |

| Scrambled display | **Temporary error.** - **Controller is defective.** | **Turn power off, then on to clear the temporary error.** - **If error persists, return to factory.** |

| Keys seem to function differently than expected. | **Controller programmed incorrectly for application.** - **Factory applied wrong faceplate overlay to system.** - **Operator error.** - **Defective key switch.** | **Verify the correct software Application Number is programmed. Access WatHelp Diagnostics and make note of **APPL** parameter value.** - **Refer to programming guide.** - **Consult factory.** |

---

**Note:** See definitions of temperature alarms on page 55.
<table>
<thead>
<tr>
<th>Symptom/Indication</th>
<th>Possible Causes</th>
<th>Possible Solutions</th>
</tr>
</thead>
</table>
| Keys inoperative or hard to press. | • Misalignment of controller to metal faceplate.  
• Menu key is inactive due to programmed menu time set to zero.  
• Operator error.  
• Defective key switch. | • Ensure proper mounting of controller.  
• If Menu key is inoperative, verify that a time greater than zero is programmed into the Menu program for that key.  
• Refer to the programming guide.  
• Consult factory.  
• Return to factory. |
| Faceplate Overlay is damaged or cracked. Edges are lifting up. | • Faceplate overlay not designed or installed properly. | • Contact factory to replace faceplate overlay to avoid contamination of controller electronics. If overlay is damaged, take extreme care when cleaning area around controller. Do not wash, wipe, or spray damaged area with liquid cleansers.  
• Refer to Faceplate Overlay design guidelines. |
| Controller does not beep:  
• when keys are pressed.  
• at the end of Menu cycles. | • Specified system does not have an audible alarm output or the audible alarm is defective.  
• The Key Chirp feature is not activated.  
• The Sound parameter value is set to 0. | If controller part number format is F2XX-XXXX-X1XX (a “1” in the tenth character) and if the ChirP parameter is set to on:  
• If keys don’t beep, return controller to factory.  
If no audible alarm occurs at the end of a Menu cycle, and if Sound parameter is set to a number other than 0:  
• return the controller to the factory.  
If controller part number format is F2HA - ____-0 (a “0” in the tenth character), consult factory. |
| • Controller beeps every time a key is pressed. | • The Key Chirp feature is activated. | • Disable the Key Chirp feature by setting the ChirP parameter to OFF. |
| Menus cycles don’t resume (continue) after power returns to the controller.  
Power Loss Menu Resume feature doesn’t seem to work. | • Controller configuration does not have Battery/Real-time Clock feature.  
• The Power Loss Menu Resume feature is not activated.  
• Battery is low or needs replacement. | • Confirm that the controller configuration has the Battery/Real-time Clock feature. Part number format is F2HA - ____-1 (a “1” in the ninth character).  
• Reprogram the controller, setting the PLM parameter to YES.  
• If problem persists, return controller to factory. |
<table>
<thead>
<tr>
<th>Symptom/Indication</th>
<th>Possible Causes</th>
<th>Possible Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time of day is inaccurate</td>
<td>• Real-time Clock is not programmed properly.</td>
<td>• Refer to programming guide to reset the time of day.</td>
</tr>
<tr>
<td></td>
<td>• Battery is low.</td>
<td>• If problem persists, return to factory.</td>
</tr>
<tr>
<td>Programmed Menus are being changed or tampered with.</td>
<td>Menu Program Security has not been set.</td>
<td>To secure the Menu programs, set the <strong>Loc</strong> parameter to <strong>YES</strong>.</td>
</tr>
<tr>
<td>Software Application Numbers are being changed or tampered with.</td>
<td>Application Number Security has not been set.</td>
<td>To secure the Application Number, set the <strong>A_Loc</strong> parameter to <strong>YES</strong>.</td>
</tr>
<tr>
<td>Operator cannot reprogram Menus.</td>
<td>Menu Program Security has been set.</td>
<td>Set the <strong>Loc</strong> parameter to <strong>no</strong>.</td>
</tr>
<tr>
<td>Software Application Number cannot be changed.</td>
<td>Application Number Security has been set.</td>
<td>Set the <strong>A_Loc</strong> parameter to <strong>no</strong>.</td>
</tr>
<tr>
<td>Inaccurate temperatures</td>
<td>Malfunctioning temperature sensors.</td>
<td>• Refer to Troubleshooting section on Error Messages.</td>
</tr>
<tr>
<td></td>
<td>• <strong>[OFSt1]</strong> or <strong>[OFSt2]</strong> parameter may be set incorrectly.</td>
<td>• Confirm that compatible sensors are used in the system. Refer to controller specifications.</td>
</tr>
<tr>
<td></td>
<td>• System may have two grounded thermocouple sensors, causing ground loops.</td>
<td>• Check system wiring.</td>
</tr>
<tr>
<td></td>
<td>• Loose or improper connections.</td>
<td>• Check system sensors.</td>
</tr>
<tr>
<td></td>
<td>• Reversed sensor lead-wires.</td>
<td>• Confirm that a maximum of 1 grounded thermocouple is used in the system.</td>
</tr>
<tr>
<td></td>
<td>• Sensor not compatible with control.</td>
<td>• Confirm that compatible thermocouple wires/extension wires are used in the system.</td>
</tr>
<tr>
<td></td>
<td>• Control not programmed properly.</td>
<td>• Verify that the programmed thermocouple curve matches the sensor specification (see <strong>Fc</strong> parameter setting).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Verify that the programmed RTD curve matches the sensor specification (see <strong>rtd</strong> parameter setting).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Use WatHelp Diagnostics parameter <strong>[teNP1]</strong> and <strong>[teNP2]</strong> to confirm actual temperatures sensed on channel 1 and 2.</td>
</tr>
<tr>
<td>Operator cannot get out of Configuration Mode or Menu Programming Mode.</td>
<td>Operator error.</td>
<td>• Press the HOME key for 2 seconds.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Or, repeatedly press the ENTER key to exit and return to the normal operating mode.</td>
</tr>
<tr>
<td>Symptom/Indication</td>
<td>Possible Causes</td>
<td>Possible Solutions</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------------</td>
<td>-------------------------</td>
<td>-----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Cannot change the value of a parameter while in the Configuration Mode.</td>
<td>Operator error.</td>
<td>• View the parameter name on the display. Display should be flashing. Press the EDIT key first, before using the UP and DOWN keys.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• If attempting to set the software application number ([APPL]), the Application Number Security Lock may be set; set the [A_Loc] parameter to [no].</td>
</tr>
<tr>
<td>Cannot change the value of a Menu Parameter while in the Menu Programming Mode.</td>
<td>Operator error.</td>
<td>• View the parameter name on the display. Press the EDIT key first, before using the UP and DOWN keys.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Menu Program Security Lock may be set; set the [Loc] parameter to [no].</td>
</tr>
</tbody>
</table>
Definitions of Functions, Parameters and Values

Configuration Mode

**etype Equipment Type Function**
Configures control for application and sounds.

**APPl Application Number**
Selects the application software set for the controller.
Range: 1-20  Default: 20

**a_Loc Application Number Security Lock**
Choose between **yes** and **no** to lock the Application Number. When **a_Loc** is set to **yes**, the Application Number is not adjustable.
Range: **yes**, **no**  Default: **no**

**Ptine Pressure Release Time**
Sets the number of seconds before the completion of a menu when the pressure output is released.
Range: 1-120 sec.  Default: 60

**Sound Audible Alarm Sound**
Type of audible alarm that will sound at the completion of a menu cycle or at the end of a hold cycle.
Range: 0-5  Default: 0
0 = no alarm sound at the end of menu
1 = alarm sounded for 2 seconds
2 = alarm sound alternatives on/off every second for 20 seconds
3 = 3 short beeps followed by 1 second off, this cycle repeats itself for 20 seconds
4 = alarm sounds on/off every second continuously
5 = alarm is on solid, continuously

*Note: All alarms can be silenced by pressing the appropriate key once.*

**btine Basket Travel Time**
This is the number of seconds that the output for basket lift/drop will be on. This prompt is only visible on applications with automatic basket lift.
Range: 0 - 30 seconds  Default: 2 seconds

**preHT Preheat Temperature**
The temperature that the control will preheat to upon power-up. This prompt is only visible on some deep fat fryer applications.
Range: temp range low - range high  Default: temperature range low

**idLE1 Idle Temperature Number 1**
This is the effective setpoint when you press the idle one key. This idle setpoint can only be regulated to during the idle state.
Range: temp range low - range high  Default: temperature range low
**Idle**  
Idle Temperature Number 2  
This is the effective setpoint when you press the idle two key. This idle setpoint can only be regulated to during the idle state.  
**Range:** temp range low - range high  
**Default:** temperature range low

**Melt**  
Oil Melt Cycle  
Turns the melt feature on or off. This feature will allow the heaters to come on at only 10% power when the temperature is below 212°F. This is visible on all deepfat fryer applications.  
**Range:** on, off  
**Default:** off

**Fan**  
Fan Speed  
This selects the fan type, either 1 speed, on/off, or two speed, off/lo/hi. This prompt is visible on convection ovens with a fan.  
**Range:** 1-speed, 2-speed  
**Default:** 1-speed

**Delay**  
Fan Delay Time  
Selects the amount of time in minutes, after completion of a menu, that the fan will remain on for system cooling. This prompt is visible on convection ovens with a fan.  
**Range:** 0 - 120 minutes  
**Default:** 0 minutes

**Setpt**  
Set Point Temperature  
Set point that the control will regulate to at all times. Visible on applications that have one setpoint for all menus.  
**Range:** TrLo to TrHi  
**Default:** TrLo

**Out**  
Timer Output 4  
Selects if event output will turn on while time is running. Visible on manual applications with output 4 available  
**Range:** yes, no  
**Default:** no

**Steps**  
Number of Cooking Steps  
Selects number of steps in the menu. Visible on manual applications with two possible steps.  
**Range:** 1, 2  
**Default:** 1

**Probe**  
Probe  
Selects if application will use a meat/food temperature probe to measure temperature, initiated by a press of the probe key. Visible on rotisserie applications.  
**Range:** yes, no  
**Default:** no

**Setup**  
Setup Function  
Sets up control for hardware and operating parameters

**T.F.**  
Temperature Display Format  
Selects the units of temperature measurement, either Fahrenheit or Centigrade. This parameter appears only when the selected application software set uses at least one temperature input or output.  
**Range:** C, F  
**Default:** F
Setup Function, continued

**Time Display Format**
Selects the time display format in minutes/seconds, hours/minutes, or hours/minutes/seconds and will only appear when the selected application software set uses time for any of its operations.

Range: [HNNSS] [HNN] Default: [HNNSS]

**Key Chirp**
Turns the key chirp function on or off. The key chirp function makes a short audible sound whenever a valid keypress has been made.

Range: [on], [OFF] Default: [OFF]

**Menu Security Lock**
Choose between [Yes] and [no] to lock the menu parameters. When [Loc] is set to [Yes], the menu parameters are not adjustable. This parameter only appears when the selected application software set has pre-programmed or saved menus.

Range: [Yes], [no] Default: [no]

**Thermocouple Type**
Selects the type of thermocouple sensor used. Both thermocouple inputs must be of the same type when using two. This parameter appears only when the control has thermocouple type inputs and the selected application software set uses at least one temperature input.

Range: [J], [H], [E] Default: [J]

Note: [H] denotes type K thermocouple.

**RTD Curve**
Selects the RTD (resistance temperature detector) curve. When utilizing two RTD inputs, both must use the same curve. This parameter only appears when the control has RTD type inputs and the selected application software set uses at least one temperature input.

Range: [din], [J], [S] Default: [din]

**WatCurve Temperature Compensation**
Turns the WatCurve temperature compensation feature on or off. This parameter appears only when the selected application software set uses at least one temperature output in combination with a count down timer.

Range: [on], [OFF] Default: [OFF]

**Temperature Offset, Channel 1**
Adds a relative offset to the sensed temperature of input 1. This parameter appears only when the selected application software set uses temperature input 1.

Range: -99 to 99°F (-55 to 55°C) Default: 0

**Temperature Offset, Channel 2**
Adds a relative offset to the sensed temperature of input 2. This parameter appears only when the selected application software set uses temperature input 2.

Range: -99 to 99°F (-55 to 55°C) Default: 0
Definitions of Functions, Parameters and Values

*Temperature Range Low*
Sets an absolute lowest setable temperature set point. This parameter appears only when the selected application software set uses at least one temperature output.

**Range:** 0°F (-18°C) for rtd inputs, 32°F (0°C) for tc inputs to the value of *Temperature Range High*

**Default:** 32°F

*Temperature Range High*
Sets an absolute highest setable temperature set point. This parameter appears only when the selected application software set uses at least one temperature output.

**Range:** value of *Temperature Range Low* to 1200°F (649°C) **Default:** 500°F (260°C)

*Ready/Preheat Feature*
Turns the ready band feature on or off. Visible if application uses at least one temperature input. If this feature is activated, the controller displays temperature as the system pre-heats to the “ready” condition.

**Range:** ‘Yes’, ‘no’ **Default:** ‘Yes’

*Ready Band*
This feature is used along with the Ready/Preheat feature. Ready Band sets the ready band size. The ready band is the current set point +/- the relative temperature value of *Ready Band*. The use of ready band varies with the application software set. This parameter only appears when *Ready* is set to yes.

**Range:** 1 to 1200°F (649°C) **Default:** 100°F (56°C)

*Real-time Clock Display*
Turns the real time clock feature on or off. When on, the control will display the time of day when it is idle. This parameter only appears when the hardware and the selected application software set support real-time clock option.

**Range:** ‘Yes’, ‘no’ **Default:** ‘no’

*Power Loss Menu Resume*
Turns the power loss feature on or off. This parameter only appears when the hardware supports the real time clock and the selected application software set uses temperature input 1. If activated, menu countdown time resumes when power is returned to the system.

**Range:** ‘Yes’, ‘no’ **Default:** ‘no’

*Alarm, Channel 1*
Selects the type of temperature alarm associated with input 1. This parameter only appears when the selected application software set uses temperature input 1.

**Range:** ‘none’, ‘deU’, ‘Proc’, ‘both’ **Default:** ‘none’

*Absolute Process Alarm 1, Channel 1*
Sets an absolute process alarm temperature setting. A process alarm occurs when the input 1 temperature (including offset) is above this setting. This parameter only appears when the selected application software set uses temperature input 1 and *Alarm, Channel 1* is set to either ‘Proc’ or ‘both’.

**Range:** 100°F to 1200°F (38 to 649°C) **Default:** 1200°F (649°C)
### Definitions of Functions, Parameters and Values

**Setup Function, continued**

**[aldl1]** Low Deviation Alarm, Channel 1  
Sets a relative low deviation temperature alarm. A low deviation alarm occurs when the input 1 temperature (including offset) is below set point minus this setting. This parameter only appears when the selected application software set uses temperature input 1 and **[al''1]** is set to either **deu** or **both**.  
*Range:* -999 to 0°F (-555 to 0°C)  
*Default:* -999°F (-555°C)

**[aldH1]** High Deviation Alarm, Channel 1  
Sets a relative high deviation temperature alarm setting. A high deviation alarm occurs when the input 1 temperature (including offset) is above setpoint plus this setting. This parameter only appears when the selected application software set uses temperature input 1 and **[al''1]** is set to either **deu** or **both**.  
*Range:* 0 to 999°F (0 to 555°C)  
*Default:* 999°F (555°C)

**[al''2]** Alarm, Channel 2  
Selects the type of temperature alarm associated with input 2. This parameter only appears when the selected application software set uses temperature input 2.  
*Range:* **none**, **deu**, **Proc**, **both**  
*Default:* **none**

**[alp2]** Absolute Process Alarm, Channel 2  
Sets an absolute process alarm temperature setting. A process alarm occurs when the input 2 temperature (including offset) is above this setting. This parameter only appears when the selected application software set uses temperature input 2 and **[al''2]** is set to either **Proc** or **both**.  
*Range:* 100 to 1200°F (38 to 649°C)  
*Default:* 1200°F (649°C)

**[aldl2]** Low Deviation Alarm, Channel 2  
Sets a relative low deviation temperature alarm setting. A low deviation alarm occurs when the input 2 temperature (including offset) is below set point minus this setting. This parameter only appears when the selected application software set uses temperature input 2 and **[al''2]** is set to either **deu** or **both**.  
*Range:* -999 to 0°F (-555 to 0°C)  
*Default:* -999°F (-555°C)

**[aldH2]** High Deviation Alarm, Channel 2  
Sets a relative high deviation temperature alarm setting. A high deviation alarm occurs when the input 2 temperature (including offset) is above set point plus this setting. This parameter only appears when the selected application software set uses temperature input 2 and **[al''2]** is set to either **deu** or **both**.  
*Range:* 0 to 999°F (0 to 555°C)  
*Default:* 999°F (555°C)

**[therl]** Thermal Function  
Configures control heat functions

**[type]** Temperature Control Type.  
Selects the heat control algorithm. On/Off control uses a hysteresis as a switching point.  
PID control uses a combination of proportion, integral and derivative values to determine percentage of output power. This parameter only appears when the selected application software set uses at least one temperature output.  
*Range:* **P id, onOFF**  
*Default:* **onOFF**
**HYSt1** Channel 1 Hysteresis
Sets the relative switching hysteresis size for output 1. This parameter only appears when the selected application software set uses a temperature output from channel 1 and \texttt{TYPE'} is set to \texttt{onOFF}.
*Range*: 1 to 99ºF / 1 to 55ºC  *Default*: 3ºF / 2ºC

**HYSt2** Channel 2 Hysteresis
Sets the relative switching hysteresis size for output 1. This parameter only appears when the selected application software set uses a temperature output from channel 1 and \texttt{TYPE'} is set to \texttt{onOFF}.
*Range*: 1 to 99ºF (1 to 55ºC)  *Default*: 3ºF (2ºC)

**P'id** Units
Selects the PID in US or SI (System International or metric) units.
*Range*: \texttt{SI}, \texttt{US}  *Default*: \texttt{US}

**tune1** Channel 1 Auto-tune
Initiates the auto-tuning feature for output 1. This parameter only appears when the selected application software set uses a temperature output from channel 1 and \texttt{TYPE'} is set to \texttt{Pid}.
*Range*: \texttt{On}, \texttt{Off}  *Default*: \texttt{Off}

**tune2** Channel 2 Auto-tune
Initiates the auto-tuning feature for output 2. This parameter only appears when the selected application software set uses a temperature output from channel 2 and \texttt{TYPE'} is set to \texttt{Pid}.
*Range*: \texttt{On}, \texttt{Off}  *Default*: \texttt{Off}

**Prop1** Channel 1 Proportional Band
Sets the proportional band for output 1. This parameter only appears when the selected application software set uses a temperature output from channel 1 and \texttt{TYPE'} is set to \texttt{Pid}.
*Range*: 1 to 999ºF (1 to 555ºC)  *Default*: 25ºF (14ºC)

**rSet1** Channel 1 Reset
Sets the reset (integral) gain for output 1. A value of 0.00 shuts reset off. This parameter only appears when the selected application software set uses a temperature output from channel 1 and \texttt{TYPE'} is set to \texttt{Pid} and \texttt{P'id} is set to \texttt{US}.
*Range*: 0.00 to 9.99 repeats / minute  *Default*: 0.00 repeats / minute

**int'1** Channel 1 Integer
Sets the integral gain for output 1. A value of 0.00 shuts the integral off. This parameter only appears when the selected application software set uses a temperature output from channel 1 and \texttt{TYPE'} is set to \texttt{Pid} and \texttt{P'id} is set to \texttt{SI}.
*Range*: 0.00 to 99.99 minutes / repeat  *Default*: 0.00 minutes / repeat

**rate1** Channel 1 Rate
Sets the rate (derivative) gain for output 1. A value of 0.00 shuts the rate off. This parameter only appears when the selected application software set uses a temperature output from channel 1 and \texttt{TYPE'} is set to \texttt{Pid} and \texttt{P'id} is set to \texttt{US}.
*Range*: 0.00 to 9.99 minutes  *Default*: 0.00 minutes
Definitions of Functions, Parameters and Values

Thermal Function, continued

**Channel 1 Derivative**
Sets the derivative gain for output 1. A value of 0.00 shuts the derivative off. This parameter
appears when the selected application software set uses temperature output 1 and
**type** is set to **P_i_d** and **P_i_d U** is set to **S_i**.
Range: 0.00 to 9.99 minutes  Default: 0.00 minutes

**Channel 1 Cycle Time**
Sets the PID cycle time for output 1. This parameter only appears when the selected
application software set uses temperature output 1 and **type** is set to **P_i_d**.
Range: 1 to 60 seconds  Default: 5 seconds

**Channel 2 Proportional Band**
Sets the relative proportional band for output 2. This parameter only appears when the
selected application software set uses temperature output 2 and **type** is set to **P_i_d**.
Range: 1 to 999°F (1 to 555°C)  Default: 25°F (14°C)

**Channel 2 Reset**
Sets the reset (integral) gain for output 2. A value of 0.00 shuts reset off. This parameter
only appears when the selected application software set uses a temperature output
from channel 2 and **type** is set to **P_i_d** and **P_i_d U** is set to **US**.
Range: 0.00 to 9.99 repeats / minute  Default: 0.00 repeats / minute

**Channel 2 Integer**
Sets the integral gain for output 2. A value of 0.00 shuts the integral off. This parameter
only appears when the selected application software set uses a temperature output
from channel 2 and **type** is set to **P_i_d** and **P_i_d U** is set to **S_i**.
Range: 0.00 to 99.99 minutes / repeat  Default: 0.00 minutes / repeat

**Channel 2 Rate**
Sets the rate (derivative) gain for output 2. A value of 0.00 shuts the rate off. This parameter
only appears when the selected application software set uses temperature output
2 and **type** is set to **P_i_d** and **P_i_d U** is set to **US**.
Range: 0.00 to 9.99 minutes  Default: 0.00 minutes

**Channel 2 Derivative**
Sets the derivative gain for output 2. A value of 0.00 shuts the derivative off. This parameter
appears when the selected application software set uses temperature output
2 and **type** is set to **P_i_d** and **P_i_d U** is set to **S_i**.
Range: 0.00 to 9.99 minutes  Default: 0.00 minutes

**Channel 2 Cycle Time**
Sets the PID cycle time for output 2. This parameter only appears when the selected
application software set uses temperature output 2 and **type** is set to **P_i_d**.
Range: 1 to 60 seconds  Default: 5 seconds
WatHelp Diagnostics Function

Allows the viewing of information that is useful when servicing or troubleshooting the system.

*`#AG`* Date-of-Manufacture Code
Shows the manufactured date code of the controller.
Cannot be changed.

*`#SN`* Serial Number
Shows the serial number of the controller.
Cannot be changed.

*`#PN1`* Part Number 1
Shows the first four characters of the controller part number.
Cannot be changed.

*`#PN2`* Part Number 2
Shows the second four characters of the controller part number.
Cannot be changed.

*`#PN3`* Part Number 3
Shows the third four characters of the controller part number.
Cannot be changed.

*`#SR`* Software Revision Number
Displays the software revision number for the controller.
Cannot be changed.

*`#AP`* Application
Displays the application software set for the control.
*
*Range:* 1-28  *Default:* 20

*`#ID`* Key Function Identification
Setting to "YES" will activate a review of the function of the keys. The key indicators will light and the corresponding key function will appear in the display.
*
*Range:* Yes, no

*`#DS`* Display Test
Lights up all display and individual LED’s for verification that they work properly.
Visual test only. Cannot be changed.

*`#OT`* Output Test
To assist in system troubleshooting, forces on each output for verification that all outputs work. Outputs return to normal when the *Output* parameter is set to 0 or the user exits the test.

*Range:* 0-6  *Default:* 0

0 = all outputs are in a normal state
1 = only Output 1 is on
2 = only Output 2 is on
3 = only Event Output 1 is on
4 = only Event Output 2 is on
5 = only Output 5 is on
6 = all outputs are on
Definitions of Functions, Parameters and Values

Diagnostics Function, continued

**Input Event Input Test**
To assist in system troubleshooting, shows the on/off state of the event inputs. A number alternately appears on the display.
- If number = 0, both inputs are open
- If number = 1, input 1 is closed, input 2 is open
- If number = 2, input 1 is open and input 2 is closed
- If number = 3, both inputs are closed

**Channel 1 Input**
Shows the input 1 temperature, with no offset added.

**Channel 2 Input**
Shows the input 2 temperature, with no offset added.
**Program Mode**

**Menu Number**
The number of the menu to program.
*Range:* 1 - x (The total number of menus depends on the application.)  
*Default:* 1

**Set Point 1**
This is the first cook set point temperature.
*Range:* Minimum and maximum temperatures programmed in the Configuration Mode  
*Default:* range low

**Time**
This is the first cook time.
*Range:* depends upon time format, other time settings, and end application  
*Default:* 0

**Fan 1**
This is the first fan setting.
*Range:* On, OFF, Lo, Hi  
*Default:* OFF

**Set Point 2**
This is the second cook set point temperature.
*Range:* range low to range high  
*Default:* range low

**Time 2**
This is the second cook time.
*Range:* depends upon time format, other time settings, and end application  
*Default:* 0

**Fan 2**
This is the second fan setting.
*Range:* On, OFF, Lo, Hi  
*Default:* OFF

**Probe**
This turns the meat/food probe on or off for the current menu.
*Range:* On or OFF  
*Default:* OFF

**Probe Temperature**
This is the probe temperature setting.
*Range:* range low to range high  
*Default:* range low

**Hold Set Point**
This is the hold setpoint temperature.
*Range:* range low to range high  
*Default:* range low

**Hold Time**
This is the hold time.
*Range:* depends upon time format, other time settings, and end application  
*Default:* 0

**Hold Fan**
This is the hold fan setting.
*Range:* On, OFF, Lo, Hi  
*Default:* OFF
Definitions of Functions, Parameters and Values

Program Mode, continued

**Set Point 3**
This is the third cook set point temperature.
*Range*: range low to range high  *Default*: range low

**Time 3**
This is the third cook time.
*Range*: depends upon time format, other time settings, and end application  *Default*: 0

**Fan 3**
This is the third fan setting.
*Range*: On, OFF, Lo, Hi  *Default*: OFF

**Set Point 4**
This is the fourth cook set point temperature.
*Range*: range low to range high  *Default*: range low

**Time 4**
This is the fourth cook time.
*Range*: depends upon time format, other time settings, and end application  *Default*: 0

**Fan 4**
This is the fourth fan setting.
*Range*: On, OFF, Lo, Hi  *Default*: OFF

**Mid Menu Alarm**
Mid Menu Alarms are advisory alarms only and do not affect the controllability of the system. This parameter offers a choice of words that appears on the display during the Mid Menu Alarm Condition. These alarms silence automatically after a few seconds.
*Range*: none, stir, add, flip, turn, alert  *Default*: none

**Mid Menu Alarm Time**
As a menu is activated and time is counting down to zero, the Mid Menu Alarm Time is the amount of time remaining in the countdown sequence at which time the Mid Menu Alarms sound and display.
*Range*: 0 - tine1  *Default*: 0
Definitions of Temperature Alarms

If there is a problem during operation, an alarm message will appear on the main display. Alarm messages are self clearing. They will go away when the condition causing the alarm goes away.

Only one alarm will be displayed at a time. The alarm with the highest priority will be the one displayed. The priority is as follows starting with the highest: channel 1 process, channel 1 high deviation, channel 1 low deviation, channel 2 process, channel 2 high deviation, channel 2 low deviation.

When displaying alarms, an alarm message will alternate with the normal display. Alarms will only be displayed in the operational mode. The outputs of the control will not be affected in any way by an alarm.

Process alarm \textit{PrOC1} (channel 1), \textit{PrOC2} (channel 2)

A process alarm occurs when the measured temperature of a channel exceeds the process alarm parameter value. The measured temperature includes any offsets programmed in the control parameters.

Low deviation alarm \textit{LO} 1 (channel 1), \textit{LO} 2 (channel 2)

A low deviation alarm occurs when the measured temperature of a channel drops below the current setpoint minus the low deviation parameter value. The measured temperature includes any offsets programmed in the control parameters.

High deviation alarm \textit{Hi} 1 (channel 1), \textit{Hi} 2 (channel 2)

A high deviation alarm occurs when the measured temperature of a channel rises above the current setpoint plus the high deviation parameter value. The measured temperature includes any offsets programmed in the control parameters.

Note: See the Troubleshooting Chart in this Appendix for probable causes and possible solutions to alarm situations.
Definitions of Errors

This control has the ability to detect different error conditions. The outputs of the control will be shut off when any error condition occurs. If a menu is running, it will be canceled upon any error condition.

Only one error will be displayed at a time. The error with the highest priority will be the one displayed. When displaying errors, an error message will alternate with the normal display. Errors will only be displayed in the operational mode.

Errors $Err'1$, $Err'2$ and $Err'3$ are latching, meaning that once they occur, the only way to clear them is to cycle power. The remaining errors are self-clearing, meaning when the error condition goes away, the error will disappear.

**EPROM checksum error $Err'1$**
An EPROM checksum error occurs on power up when the bytes in the EPROM do not add up to 0. The EPROM is programmed at time of manufacture in such a way that all valid bytes should add up to 0.

**EEPROM checksum error $Err'2$**
An EEPROM checksum error occurs on power up when the bytes in the EEPROM do not add up to 0.

**RAM error $Err'3$**
A RAM error occurs on power up when a RAM test is executed and fails. The RAM test writes certain values to the RAM memory locations and then reads them back. If the value read is equal to the value written in all cases the RAM test passes, otherwise it fails.

**Calibration Error $Err'4$**
A Calibration Error occurs when stored calibration values have been corrupted and may make the controller temperature readings inaccurate.

**A/D underflow error $Err'9$ (channel 1), $Err'9$ (channel 2)**
An A/D underflow error occurs when the electrical signal from the sensor is outside of the measurable range of the A/D circuit. This can be caused by incorrect sensor type, reversed sensor leads, or measuring temperatures outside the sensor range.

**A/D overflow error $Err'6$ (channel 1), $Err'10$ (channel 2)**
An A/D overflow error occurs when the electrical signal from the sensor is either missing or outside the measurable range of the A/D circuit. This can be caused by an open sensor or measuring temperatures outside the sensor range.

**Under range error $Err'7$ (channel 1), $Err'11$ (channel 2)**
The under range error occurs when the control is unable to accurately calculate the temperature even though the A/D is able to measure the signal. This is caused by measuring temperature below the temperature range of the control.
Definitions of Errors

Over range error 8 (channel 1), 12 (channel 2)
The over range error occurs when the control is unable to accurately calculate the temperature even though the A/D is able to measure the signal. This is caused by measuring temperature above the temperature range of the control.

Ambient out of range error 13
An ambient out of range error occurs when the ambient sensor produces a signal that is either above or below the range of temperatures that can be calculated for ambient. This range of temperatures is larger than the operational range of the control itself.

Real-time Clock error 14
A Real-time Clock error occurs when timekeeping components fail. This error message will appear in the display only at power up. When this error occurs, the controller disables the Real-time Clock functions and the Power Loss Menu Resume function. The part number in Wathelp diagnostics will change from F2HA - _ _ _ - 1 _ _ to F2HA - _ _ _ - 0 _ _.

Order of Priority
The order of priority is as follows starting with the highest:
- EPROM checksum error
- EEPROM checksum error
- RAM error
- Calibration error
- Channel 1 A/D underflow error
- Channel 1 A/D overflow error
- Channel 1 under range error
- Channel 1 over range error
- Channel 2 A/D underflow error
- Channel 2 A/D overflow error
- Channel 2 under range error
- Channel 2 over range error
- Ambient out of range
- Real-time clock error

Note: See the Troubleshooting Chart in this Appendix for probable causes and possible solutions to alarm situations.
Glossary of Terms

**Application** Any of the 28 (or more) equipment-specific purposes for which the MINICHEF 2000 includes software programs. Each application has a number.

**Automatic control** One-touch cooking, which requires configuration of the preprogrammed menus.

**Auto-tuning** A time-saving feature, auto-tuning allows the controller to explore the responsiveness of the system in order to determine an effective set of parameters for PID control. To do this it crosses an auto-tune set point three times, then controls at the normal set point using the new parameters.

**Configuration Mode** The level of programming in which equipment type features and parameters are specified.

**Convection Oven** An oven that uses a fan to circulate heat and minimize cooking times.

**Cook and Hold Oven** An oven that cycles between a cook cycle and a hold cycle in order to maintain food at a servable temperature or maximize meat tenderness.

**Deepfat Fryer** A fryer that cooks food in large amounts of hot oil. Efficiency depends on the fryer’s power input, production rate, and the longevity of the cooking oil.

**Derivative** The rate of change in a process variable. Also known as rate. See PID.

**DIN** Deutsche Industrial Norms (DIN). A set of technical, scientific and dimensional standards developed in Germany. Many DIN standards have worldwide recognition.

**Griddle** Good for crisping, browning and flavor development, griddles can be one-sided or two-sided. Two-sided griddles (also called Clam Shell griddles) reduce cooking times by cooking both sides of the food simultaneously.

**Hysteresis** A change in the process variable required to re-energize the control or alarm output. Sometimes called switching differential.

**Integral** Control action that automatically eliminates offset, or droop, between set point and actual process temperature. Inverse of Reset.

**JIS** Joint Industrial Standards, also Japanese Industrial Standards Committee (JISC). Establishes standards on equipment and components.

**Keys:**

- **Down-arrow key (F)** On the Protoyping/Training Overlay, the right key in the bottom row, which allows user to move down the lists.
- **Edit key (A)** On the Protoyping/Training Overlay, the left key in the top row, which allows user to access the next level of parameters or values.
- **Enter key (B)** On the Protoyping/Training Overlay, the center key in the top row, which allows user to enter a chosen value and return to the previous level.
- **Escape key (E)** On the Protoyping/Training Overlay, the center key in the bottom row, which allows user to return to the original value, when editing a value.
- **Home key (D)** On the Protoyping/Training Overlay, the left key in the bottom row, which allows user to move directly to Operation Mode with a 2-second key press.
- **Up-arrow key (C)** On the Protoyping/Training Overlay, the right key in the top row, which allows user to move up the lists.
**Manual control** A way of operating foodservice equipment that requires end-users to select and use manual setting keys.

**Manual Setting keys** Keys that allow end-users to manually set time, temperature, etc., individually.

**Menu** Set of cooking instructions that can be programmed into the MINICHEF for end-user convenience. A menu can include times, temperatures, fan speeds, etc.

**Menu Select key** A key that allows end-users to access and select from a list of pre-programmed menus.

**On/off control** On/off control switches the output either full on or full off, depending on the input, set point and hysteresis values. The hysteresis value creates a buffer zone that increases the time interval that the output is off or on. With hysteresis set to 1º the process value would stay closer to the set point, but the output would switch on and off more frequently, causing “chattering.”

**Operation Mode** The end-user mode that occurs after power-up. It allows end-users to cook foods using pre-set keys and menus. Operation Mode is the MINICHEF 2000 default mode.

**PID** Uses derivative (rate) control to minimize the overshoot in a Proportional-Integral controlled system. Derivate (rate) adjusts the output based on the rate of change in the temperature or process value.

**Program Mode** The level of programming in which the automatic menus are set.

**Programmed menu keys** Keys programmed to allow users to choose pre-set cooking instructions.

**Proportional control** Some processes need to maintain a temperature or process value closer to the set point than on/off control can provide. Proportional control provides closer control by adjusting the output when the temperature or process value is within a proportional band. When the value is in the band, the controller adjusts the output based on how close the process value is to the set point: the closer to set point the lower the output. This is similar to backing off on the gas pedal of a car as you approach the speed limit. It keeps the temperature or process value from swinging as widely as it would with simple on/off control. However, when a system stabilizes, the temperature or process value tends to “droop” short of the set point.

**Rate** Anticipatory action that is based on the rate of temperature change, and compensates to minimize overshoot and undershoot. See derivative.

**Reset** Control action that automatically eliminates offset, or droop, between set point and actual process temperature. Inverse of Integral.

**Rotisserie Oven** An oven that slowly cooks meat on a rotating spit, and allows cooking of single or staggered batches of food.

**Shelf Timing Oven** An oven with one temperature setting and a timer that permits individual cooking times to be set for different shelves.

**Timer** Can accompany any type of food equipment to help time food cooking cycles and alert users to perform related tasks.
Specifications (1032)

Control Mode

- Single and dual heat channels, PID or on/off.¹
- Microprocessor-based, programmable, reverse-acting control outputs.
- User-selectable embedded application software defines operation of display, keys, inputs, outputs, timing action.
- One-step auto-tuning, WatHelp diagnostics, WatCurve temperature compensation.

Agency

- CE approved:
  - EN 50081-1: Emissions
  - EN 50082-1: Immunity
  - EN 60730-1 and EN 60730-2-9: Safety
- NSF Listed, Criteria 2.⁵
- AGA: UL tested to AGA standard Z21.23, UL File #E43684.
- UL and C-UL recognized, UL 197, 873, 991 and CSA standard C22.2-24, File # E43684.

Operator Interface

- Membrane overlay, contamination and water resistant, (supplied by customer).
- LED display, 5-digit, 0.56 in high, red.
- Displays times, temperatures, user prompts and diagnostic codes.
- User-selectable time and temperature display formats.
- Temperature display formats—˚F or ˚C.
- Time display formats—H:MM:SS, HH:MM, or MMM:SS.
- 8 discrete indicator LEDs, red.
- 6 tactile feedback keys.
- Menu-driven operation and manual modes available.
- WatHelp diagnostics.
- Real-time clock option displays time of day.

Accuracy

- Calibration accuracy and sensor conformity²: ± 2.0°F for Type J thermocouple and RTD, ± 0.35% of span for Type K and E thermocouples, ±1 LSD, 77°F ± 5°F ambient and rated line voltage of ±10%.
- Accuracy span: 1000°F (540°C) minimum.
- Temperature stability: ± 0.15°F/˚F (0.15°C/˚C) change in ambient typical.

Sensors/Inputs

- Contact inputs, TTL compatible with internal pull-up resistor, two available.
- Thermocouple,³ software selectable Type J, K or E, 32 to 1200°F. (Dual-channel applications require at least one ungrounded thermocouple).
- RTD,³ 2- or 3-wire, platinum, 100, 500, 1000Ω, at 0°C, software selectable DIN or JIS curves, 0 to 1200°F (3-wire will function as 2-wire).
- Input A/D resolution: 15 bit.

Output Options

- Solid-state relay, 0.4A, with or without contact suppression.
- Switched dc signal, 4.5V to 5.25V, 30mA maximum output, minimum load resistance > 150Ω, non-isolated.

Audible Output Options

- Switched dc signal, 4.5V to 5.25V, 30mA maximum output, minimum load resistance > 150Ω, non-isolated.
- Internal audible alarm, 75dB at 10 cm.

Connectors

- Sensor Input Terminal Strip⁴: RIACON, 6-position, quick-connect.

Power/Line Voltage

- 20.4 to 26.4V~ (ac), 47 to 63Hz.
- 15VA maximum.
- For CE applications, input power must be limited to 15W external to the control.
- Program retention upon power failure via non-volatile memory.
- Battery/real-time clock option: 6-year lithium battery, provides power backup upon power failure, operation resumption after power recovery, ability to display time of day.

Operating Environment

- 32 to 176°F (0 to 80°C), 0 to 90% RH, non-condensing.

Storage Temperature

- -40 to 176°F (-40 to 80°C).

Mechanical

- Case: polycarbonate Lexan with adjustable mounting collar (vertical or horizontal orientation), designed for mounting on 16-, 18-, 20- and 22-gauge panels.
- Internal panel mounting requires a specified panel cutout and four #6-32 studs or equivalent.
- Overall width x height x depth: horizontal - 4.13 in x 3.25 in x 2.00 in; vertical - 3.25 in x 4.13 in x 2.00 in (Assumes mating connectors are attached. Does not include wire bundle space requirements.).
- Vibration: 2g, 10 to 150Hz, applied in any one of three axes.
- Weight: 6.50oz maximum.

Program Storage

- All non-embedded user and factory programs are stored in non-volatile memory. Can be changed by reprogramming.

Sample/Update Rates

- 1 input: 4Hz.
- 2 Inputs: 4Hz.
- PID: 1Hz.
- Control outputs: 100Hz.
- Display: 10Hz.

¹ The MINICHEF 2000 controller is to be used in systems with an external high temperature limiting device.
² Thermocouple lead resistance of 200Ω causes < 1°C error. RTD, 22 gauge wire will not contribute more than 0.086°F error/ft.
³ Dual channel applications require either two thermocouple sensors or two identical RTD sensor types.
⁴ Certified for thermometer accuracy (oven and hot food holding applications from 32°F to 60°F) when used with RTD or type J thermocouple probes.
Ordering Information

(1033)

MINICHEF™ 2000
Cooking controller with numerous food equipment application software sets, single and dual channel on/off or PID temperature regulation, timer and machine-function control, microprocessor-based, programmable, auto-tuning, WatCurve™, WatHelp diagnostics, 24V~ (ac) power input, agency approved, flush mounted (membrane faceplate supplied by customer).

Inputs
1 = Dual thermocouple, Type J, K or E
2 = Dual RTD, platinum, 100Ω, curve selectable
3 = Dual RTD, platinum, 500Ω, curve selectable
4 = Dual RTD, platinum, 1000Ω, curve selectable

Note: All models include two event inputs, switched dc logic signal, non-isolated.

Output Number 1
1 = Switched dc, 5V nominal, 30mA, non-isolated
2 = Solid-state relay, Form A, 0.4A, without RC suppression
3 = Solid-state relay, Form A, 0.4A, with RC suppression

Output Number 2
1 = Switched dc, 5V nominal, 30mA, non-isolated
2 = Solid-state relay, Form A, 0.4A, without RC suppression
3 = Solid-state relay, Form A, 0.4A, with RC suppression

Event Outputs 1 and 2
1 = 2 event outputs, switched dc, 5V nominal, 30mA, non-isolated

Battery and Real-time Clock
0 = None
1 = Includes battery and real-time clock

Audible Alarm
0 = Alarm signal available at connector, switched dc, 5V nominal, 30mA, non-isolated
1 = Internal alarm included

Software
AA = Standard Food Equipment Application Software Set
XX = Custom Set-up parameters or Made-To-Order custom software. Consult your local Watlow Sales Engineer. Code number assigned by factory.
Part Numbers & Accessories

**MINICHEF 2000 Accessories**

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</tr>
</thead>
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<tr>
<td>0836-0442-0000</td>
<td>Sensor Input Mating Connector, (RIACON #31007106), 6-position, quick-connect terminal, screw connection for 28-14 AWG wires, tighten to 7 in/lb</td>
</tr>
<tr>
<td>A001-0298-0000</td>
<td>Power Supply and I/O Mating Connector Kit. Includes:</td>
</tr>
<tr>
<td></td>
<td>– 1 AMP #1-640523-0, 15-position, quick-connect terminal</td>
</tr>
<tr>
<td></td>
<td>– 15 AMP #641300-1 crimp pins</td>
</tr>
<tr>
<td>0238-0679-0000</td>
<td>Prototyping &amp; Training Membrane Overlay, adhesive-backed, 4.75 in x 4.75 in</td>
</tr>
<tr>
<td>0830-0479-0000</td>
<td>Prototyping EPROM Extraction Tool, AMP #821980-1</td>
</tr>
<tr>
<td>A001-0249-0001</td>
<td>120V~/ to 24V~/ (ac), stepdown transformer, class 2, quick-connect terminals included</td>
</tr>
<tr>
<td>A001-0249-0002</td>
<td>208/240V~/ to 24 V~/ (ac), step-down transformer, class 2, quick-connect terminals included</td>
</tr>
</tbody>
</table>

**MINICHEF 2000 Documentation**

<table>
<thead>
<tr>
<th>Part Number</th>
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<tr>
<td>WMC2-XUGN-0000</td>
<td>The Complete MINICHEF 2000 User Guide</td>
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<tr>
<td>WMC2-XADN-0000</td>
<td>The Complete MINICHEF 2000 User Guide on CD</td>
</tr>
<tr>
<td>WMC2-XTDN-0000</td>
<td>MINICHEF 2000 Tutorial Disk</td>
</tr>
<tr>
<td>WMC2-XSGN-0000</td>
<td>Hardware &amp; Software Setup Guide</td>
</tr>
<tr>
<td>WMC2-XAGN-0001</td>
<td>Cook-&amp;-Hold Oven Application Guide</td>
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<tr>
<td>WMC2-XAGN-0002</td>
<td>Convection Oven Application Guide</td>
</tr>
<tr>
<td>WMC2-XAGN-0003</td>
<td>Deepfat Fryer Application Guide</td>
</tr>
<tr>
<td>WMC2-XAGN-0004</td>
<td>Griddle Application Guide</td>
</tr>
<tr>
<td>WMC2-XAGN-0005</td>
<td>Timer Application Guide</td>
</tr>
<tr>
<td>WMC2-XAGN-0006</td>
<td>Shelf Timer Application Guide</td>
</tr>
<tr>
<td>WMC2-XAGN-0007</td>
<td>Rotisserie Oven Application Guide</td>
</tr>
</tbody>
</table>

**Recommended Sources of Supply for Miscellaneous Items**

- **DURA-TECH, Inc.**
  LaCrosse, WI
  (608) 781-2570
  - Custom Membrane Faceplates

- **AMP, Inc.**
  Harrisburg, PA
  1-800-522-6752
  - Prototyping EPROM Extraction Tool Part No. 821980-1
  - Pin Crimping Hand Tools
    Part No. 90325-1 or 58514-1
  - Pin Extraction Hand Tool
    Part No. 455822-2

- **RIA Electronic, Inc.**
  Eatontown, NJ
  (908) 389-1300
  - RIACON Connectors
Watlow Controls

Watlow Controls is a division of Watlow Electric Mfg. Co., St. Louis, Missouri, a manufacturer of industrial electric heating products since 1922. Watlow begins with a full set of specifications and completes an industrial product that is manufactured totally in-house, in the U.S.A. Watlow products include electric heaters, sensors, controls and switching devices. The Winona operation has been designing solid state electronic control devices since 1962, and has earned the reputation as an excellent supplier to original equipment manufacturers. These OEMs depend upon Watlow Controls to provide compatibly engineered controls that they can incorporate into their products with confidence. Watlow Controls resides in a 100,000-square-foot marketing, engineering and manufacturing facility in Winona, Minnesota.

Technical Assistance

If you encounter a problem with your Watlow controller, refer to the Troubleshooting Chart in this guide. Also review all of your configuration information for each step of the setup to verify that your selections are consistent with your applications.

If the problem persists after checking all the steps, you can get technical assistance by calling Watlow Controls at (507) 454-5300, between 7 a.m. and 5 p.m. CST, and asking for an applications engineer. When you call have the following information on hand: the controller’s part number, date code, serial number, software revision number, and application number. Much of this information is available on the controller case. All of this information is also available via the MINICHEF 2000 main display by accessing the WatHelp Diagnostics Function under ‘\texttt{diag}’ in the Configuration Mode.

We Value Your Feedback

Your comments and suggestions on this manual are welcome. Please send them to, Technical Writer, Watlow Controls, 1241 Bundy Blvd., P.O. Box 5580, Winona, MN 55987-5580 or call (507) 454-5300 or fax (507) 452-4507.

Contact

• Phone: (507) 454-5300.
• Fax: (507) 452-4507.
• For technical support, ask for an Applications Engineer.
• To place an order, ask for Customer Service.
• To discuss a custom option, ask for the MINICHEF 2000 Product Manager.

Warranty

The MINICHEF 2000 is warranted to be free of defects in material and workmanship for 36 months after delivery to the first purchaser for use, providing that the unit has not been misapplied. Since Watlow has no control over its use, or misuse, we cannot guarantee against failure. Watlow’s obligations hereunder, at Watlow’s option, are limited to replacement or refund of purchase price of a unit which upon examination proves to be defective within the warranty period. This warranty does not apply to damage resulting from transportation, alteration, misuse, or abuse.

Returns

• Call or fax Customer Service for a Return Material Authorization (RMA) number before returning a control.
• Put the RMA number on the shipping label, and also on a description of the problem.
• 20% of net price restocking charge applies to all standard units returned to stock.

Note: All documentation of the MINICHEF 2000 is subject to change without notice.
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X, Y, Z
Declarations that the following product:  
  **Designation:** MINICHEF 2000  
  **Model Number(s):** F2 (H or U) or C(-1, 2, 3 or 4)(1, 2 or 3)(1, 2 or 3)  
  **Classification:** Electronic incorporated Class III temperature controller, Type 2C action, for use in light industrial  

**Rated Voltage:** 24 V~ (VAC)  
**Rated Frequency:** 50/60 Hz  
**Maximum Input Power:** 15 Watts  

Meets the essential requirements of the following European Union Directive(s) using the relevant section(s) of the normalized standards and related documents shown:

### EN 60730-2-9: 1995
Automatische elektrische Regelsysteme für den Haushalt und ähnlichen Einsatz, Teil 2: Spezifische Richtlinien  
**Number(s) of model(s):** F2 (H or U) or C(-1, 2, 3 or 4)(1, 2 or 3)(1, 2 or 3) 1-(0 or 1)(0 or 1)(Any two letters or numbers)

### EN 60730-1: 1993
Automatische elektrische Regelsysteme für den Haushalt und ähnlichen Einsatz, Teil 1: Allgemeine Richtlinien  
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Notes