

# MCI Tempatrol Instructions

MCI®

## TEMPATROL® INSTRUCTION

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## POWER UP

The Delfield 6000 series and Spec Line Refrigerators and Freezers with the MCI Tempatrol (microprocessing unit) will operate immediately upon start-up without any programming. The freezer temperature is preset from the factory to 0° F and the refrigerator is preset to 37°F.

When the unit is started, the digital display will flash. This is a signal that the unit has been Powered up or that there has been a loss of power. Every time the unit is started or restarted, the time of day must be set.

Pressing the RESET button clears the flashing characters and will display the box temperature. The temperature will remain flashing if the box is over the set temperature. Flashing will stop when the over-temp condition is gone.

Instructions for setting the time and other programming follow a description of the Display Functions.

## DISPLAY FUNCTIONS

Normal Display is the box temperature in degrees Fahrenheit. Pressing the RESET button will always bring up the box temperature display. By pressing TEMP, you can read the set point of the box. The display will automatically return to the box temperature after one minute of displaying alternate information.

It is not unusual for the box temperature to rise rapidly when doors are opened. The temperature displayed is usually the warmest temperature inside the box. This is done purposely to make sure that the entire storage area is always represented by the display and assures that the refrigeration system is activated quickly to return the storage area to its correct temperature.

Remember the temperature displayed represents a precision measurement of the actual air temperature, not the average temperature. When a door is opened the cold air literally falls out and warm air rushes in. What the display shows is real and will provide more accurate control.

Flashing Temperature Display can be caused by four situations and is the first signal of a possible problem.

1. Unit has lost power or been started or the unit has not reached the set temperature
2. The box is over temperature. This occurs when a freezer reaches 32°F or a refrigerator reaches 65°F. This condition will stop when the temperature falls below 32°F (freezer) or 65°F (refrigerator).
3. Long duty cycle. The unit has been running for one continuous hour without the doors being opened. This condition will stop if RESET is pressed, the door is opened or the compressor shuts off.
4. The door has been ajar for one minute. This condition will stop if the door is closed.

Door Ajar Light will come on when the door is open. After one minute the temperature display will flash. After three minutes a loud beep every three seconds is emitted. The display and beeper will stop when RESET is pressed. If the door is not closed when RESET is pressed the same cycle will repeat.

Clean Condenser. This maintenance reminder comes on every 90 days and will go off when RESET is pressed.

Defrost. This indicator light comes on during defrost. Defrost can be terminated if RESET is pressed. Warmer box temperatures are expected during and after defrost.

Check System indicates a significant malfunction, such as an incomplete defrost, continuous compressor operation with continuous over-temp condition or sensor failure. After 2½ hours in this condition a loud beep is emitted every second. The beeper will stop if RESET is pressed.

Time of Day. The correct time is not essential to operation, but is necessary for correct defrost timing when not in Automatic (A) mode. The time will have to be reset whenever power is interrupted for correct defrost timing.

Custom Defrost – Freezers Only An automatic defrost cycle is preset at the factory, however, a custom defrost cycle can be set. The last defrost program is always kept in memory even in power is lost. Correct time of day is essential if a custom defrost cycle is set.

When programming the custom defrost cycle, the display will offer a choice of “A” or 1, 2, 3, 4, or 6.

To set the custom defrost cycle you first determine when defrosts are desired or not desired and estimate the number of defrosts required.

- 1 a day = Very light duty, basic storage (door is opened briefly a few times daily.)
- 2 a day = Light duty (10 door openings per day)
- 3 a day = Normal duty (1 door opening per hour)
- 4 a day = High usage (3 door openings per hour)
- 6 a day = Very high usage (4 or more door openings per hour)

Defrosts will occur at regular intervals, according to settings:

- 1 = One defrost a day, at time selected
- 2 = One defrost ever 12 hours
- 3 = One defrost every 8 hours
- 6 = One defrost every 4 hours

Based on your selection enter a time for the first defrost so that it and all subsequent defrosts occur at suitable times. Also, more defrosts should be added in a high humidity environment.

For example, in Maxfield's Café defrost cycles were not wanted during peak times of 7:00 a.m., noon, and 5:00 p.m. The freezer is used heavily during these periods but the rest of the day is normal duty; the humidity in the café is also high. Therefore, we estimate that four defrosts are required per day and they will occur every six hours.

To avoid 7:00 a.m. rush we set the first defrost at 8:00 a.m. Subsequent defrosts occur at 2:00 p.m., 8:00 p.m. and 2:00 a.m. neatly missing the defined rush periods.

We recommend that the first defrost be set to follow heaviest usage.

Automatic or Demand Defrost. If the Automatic (A) defrost is selected the MC1 will monitor usage and efficiency of the unit, and will defrost automatically only when needed. This setting is highly recommended for right duty and basic storage applications. It is also recommended for all applications when the time of the defrost is not important. In the Automatic mode it is possible for the unit to operate for several days without defrosting.

By eliminating unnecessary defrosting significant energy savings can be realized. Fewer defrosts also lead to a more constant temperature control and longer product life.

Manual Defrost. A defrost can be initiated at any time by pressing DEFROST and TIME simultaneously. The defrost can be terminated by pressing RESET.

## MCI PROGRAMMING

### Setting Time of Day

1. Press RESET to clear flashing display; this must be done before the rest of the key pad will be functional.
2. Press TIME to show current time (12:00 am is time at power-up)

3. Press UP or DOWN to set correct time. Note: AM and PM indicators at left of display.
4. Press TIME or RESET to return to box temperature display.

Setting Defrost Cycles (Freezer Only) A defrost cycle is pre-programmed at the factory and no adjustment is necessary to use the unit. A custom defrost cycle or automatic/on demand cycle can be programmed if desired. To change defrost cycle or set new cycle:

1. Press DEFROST "A, 1, 2, 3, 4, or 6" will be displayed . A = Automatic/demand defrost. 1, 2, 3, 4, or 6 = number of defrosts per a 24 hour period.
2. Press UP or DOWN to desire selection.
3. Press DEFROST again: If you selected A it will return to temperature display, if you selected 1, 2, 3, 4, or 6 time of first defrost is displayed.
4. Press UP or DOWN to set hour of first defrost. Other defrosts will be spaced evenly over the following 24 hour period. See Basic Operation section on how to select specific defrost times.
5. Press DEFROST or RESET to return display to box temperature.

Setting box temperature. Box temperatures are programmed at the factory at 0°F for the freezer and 37° for the refrigerator. The recommended storage temperature range is -5° to 0°F for the freezer and 35° to 40° F for the refrigerator. If other ranges are selected they must be suitable for all products being stored.

1. Press RESET to display box temperature.
2. Press TEMP to display current set point.
3. Press UP and DOWN to select desired set point. The refrigerator can be set from 25° to 60°F (35° to 40° F recommended) and the freezer can be set from -10° to 20°F (-5° to 0°F recommended).
4. Press RESET or TEMP to return to box temperature display.

DIAGNOSTICS - STAGE 1 (BASIC)

INDICATION	CAUSE	WHAT TO DO	THINGS TO CHECK
Flashing Display - all indicators	Power Up	Press RESET - set time of day	How long was power off? Has there been any product spoilage
Flashing temp display above 32° on freezer above 65° on refrigerator	Over Temp	Keep doors closed Let unit pull down Watch and wait	Was unit just turned on? Is box overloaded with warm product? Is evaporator coil clear? Is there, or has there been a CHECK SYSTEM indication? Did unit just defrost?

Flashing temp display below 32° on freezer below 65° on refrigerator	Long Duty Cycle	Press RESET Let unit pull down Watch and wait	Was box recently loaded with warm product? Is room temperature high? Does display flash again after one hour?
Flashing display returns after one hour	Continuous compressor operation	Press RESET Let unit pull down Watch and wait	Is set point too low? Is condenser clean? Is box heavily loaded? Is evaporator clear? Is room temperature high?
Door ajar	Door Open	Close door	Is something blocking the door?
Door ajar with flashing temp display, and three second beep	Door open after 1minute Door open after 3 minutes	Press RESET for temporary clear if door is being kept open intentionally	Is door being held open longer than needed?
Clean condenser	90 day timer	Clean condenser Press RESET	Have all maintenance procedures been performed on unit?
Defrost	In defrost		
Check system with flashing temp display	Over temp for 1 hour with doors kept closed	Check diagnostic code number (see Stage 2 diagnostics)	Is box overloaded with warm product? Is the evaporator clear? Is the condenser clean?
Check system without flashing temp display	Incomplete defrost or some other problem detected by the control	Check diagnostic code number (see Stage 2 diagnostics)	Call a qualified service agent.
Check system with flashing temp and alarm	Over temp for 2½ hours with doors kept closed	Check diagnostic code number (see Stage 2 diagnostics)	Call a qualified service agent.
Check system with alarm and 33 degree display	Sensor failure	Try pressing RESET Call for service if alarm cannot be cleared	Check sensor wiring for broken or loose wire.

Note: Repeated problem of flashing display indicates very high compressor activity, make sure routine maintenance procedures are performed regularly.

Note: Whenever a check system indication appears, a potentially serious problem has occurred. Appropriate action should be taken immediately to insure proper product temperature.

Note: A check system and all warnings can be temporarily cleared by pressing RESET, however pressing reset will not normally correct a system problem

### SIMPLE SYSTEM CHECKS

ITEM	METHOD OF CHECKING	NORMAL INDICATION
Time of day	Press TIME	Correct time of day.
Defrost settings (freezers only)	Press DEFROST Press DEFROST twice	A or 3 or 4 (may also be a 1 or 2 or 6) Time of first defrost cycle (if in A mode, should return to temperature display.
Set point (temperature setting)	Press TEMP	Refrigerator - 35° to 40° F Freezer - 5° to 0°F (may be 25° to 60° on refrigerator, 10° to 20° on freezer)
Present box temp	Press RESET	Within 2 degrees of set point
Evaporator temp	Press RESET then DOWN (during normal operation compressor running)	Freezer = -20° to 0°F (up to 55° during defrost) Refrigerator = 10° to 40°F
Evaporator temp #2 (freezers only)	Press RESET then UP (during normal operation) compressor running	Freezer = -20° to 0°F Refrigerator = -33°F (no sensor)

## DIAGNOSTICS – STAGE 2

System checks in case of CHECK SYSTEM indication

### A. Enter Diagnostic Mode

1. Press DOWN and TIME together, then press TEMP
2. Diagnostic Code Numbers and Check System indicator should appear.
3. Code numbers indicate problem area to check:

000 = no problem
001 = check refrigerant
002 = check evaporator and/or air flow
003 = check compressor
004 = check entire system
005 = check defrost

006 = check box sensor –33
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007 = check control system (memory failure)
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1. Designed to aid service technician
2. Refer to trouble shooting chart for additional help.

#### B. Leave Diagnostics

1. Press RESET.
2. CHECK SYSTEM indicator will go off unless box sensor problem.
3. CHECK SYSTEM will re-appear in one hour if an over temp condition still exists.

## DIAGNOSTICS – STAGE 3

Relay operation check and factory programming codes

#### A. Enter Diagnostic Mode (Stage 2)

1. Press DOWN and TIME together, then press TEMP
2. Diagnostic code number should appear.

#### B. Enter Diagnostics

1. Press DEFROST.
2. Service check code number of 1 to 8 should appear.
3. Press UP/DOWN to obtain desired service check function:

001 = check fan relay for one minute
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002 = check compressor relay for one minute
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003 = check light relay for one minute
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004 = check defrost relay for one minute
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005 = factory programming code
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006 = factory programming code
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007 = factory programming code
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008 = clear error codes
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1. Press TIME to initiate the checking action
2. Energized relay will stay on for one minute or until next service check is initiated
3. Press RESET at any time to exit diagnostic mode

#### C. Leave Diagnostics

1. Press RESET
2. CHECK SYSTEM indicator should go off
3. Normal box temperature display should return

Service Check Code	005	006	007
Defrost Function	Termination time limit	Termination time limit	Fan delay cut-in temp
Function Code Number	Degrees F	Minutes	Degrees F
0:01	NONE	NONE	NONE
0:02	40	15	10
0:03	45	30	20
0:04	50	40	25
0:05	55	45	30
0:06	60	50	35
0:07	65	60	40
0:08	70	90	50

#### A. ENTER DIAGNOSTIC MODE – STAGE 3

1. Press DOWN and TIME together, then TEMP (Diagnostic Entry)
2. Press DEFROST (Enter stage 3)
3. Press UP/DOWN until correct service code appears (See chart above)
4. Press TIME and HOLD
  - a. Factory function code number appears (normally 0:05)
  - b. Press UP/DOWN to change code (see chart)
5. Each service code (005, 006, and 007) is normally set for 0:05
6. Each service code may be set with a different function code number

#### EXAMPLE:

Factory defrost settings are:

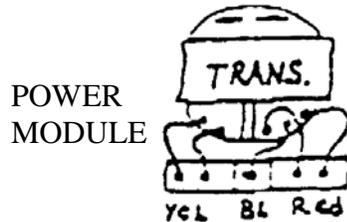
1.
  - a. Termination temp (Service Code 005) = 55°F (Function code No. 0:05)
  - b. Time limit (Service Code 006) = 45 minutes (Function code No. 0:05)
  - c. Fan cut-in (Service Code 007) = 30° (Function code No. 0:05)

Want Defrost Settings:

- A. Termination temp (Service Code 005) = 70°F (Function code No. 0:05)
- B. Time limit (Service Code 006) = 45 minutes (Function code No. 0:03)
- C. Fan cut-in (Service Code 007) = 30° (Function code No. 0:05)

#### D. Leave Diagnostics

1. Press RESET
2. Normal box temperature display should return.



#### Voltage Readings

- 9 and 10 – 2.8 VAC for heating up vacuum florescent yellow to yellow from transformer
- 7 and 1 – 35 VDC for compressor relay
- 7 and 2 – 35 VDC for fan relay
- 7 and 4 – 35 VDC for light relay

#### Transformer readings

Yellow to yellow 2.8 VAC

Red to red 25 VAC

Red to blue 13 VAC

#### CONTROL MODULE

##### Sensor

Pin connection on control module

9 and 10

Goes to jamb switch (rocker switch). Jumping (closing the gate) these two pin terminal causes relay for light to become energized by causing a connection (gate to close) between pin terminals 7 and 4 on power module. It also causes relay for fans to become de-energized by breaking the connection (opening the gate) between pin terminals 7 and 3 on power modules.

7 and 8

No function.

5 and 6

Outlet sensor connection (white band). A change in resistance (measured in OHMS) causes display to

register a value corresponding to degree Fahrenheit. The resistance to temperature values are in the LCI manual. This temperature will be displayed while depressing the DOWN button on the control module.

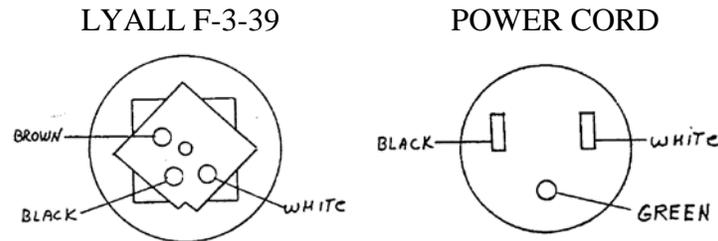
3 and 4

Inlet sensor connection (red band). A change in resistance (measured in OHMS) causes display to register a value corresponding to degree Fahrenheit. The resistance to temperature values are in the LCI manual. This temperature will be displayed while depressing the UP button on the control module.

1 and 2

Cabinet sensor connection (green band). A change in resistance (measured in OHMS) causes display to register a value corresponding to degrees Fahrenheit. The resistance to temperature values are in the LCI manual. This temperature will be displayed normally.

## REFRIGERATOR



To check proper wire connections without voltage:

1. Use multi-tester set on lowest resistance scale.
2. Insert RED test lead into hole marked for BROWN wire of LYALL F-3-39. Touch the BLACK test lead to BROWN wire which goes to compressor. Needle on the meter should deflect to zero (far right end of scale).
3. Insert RED test lead into hole marked for BLACK wire of LYALL F-3-39. Touch the BLACK test lead to pin on power cord marked for BLACK wire. Needle on the meter should deflect to zero (far end of scale).
4. Insert RED test lead into hole marked for WHITE wire of LYALL F-3-39. Touch the BLACK test lead to pin on power cord marked for WHITE wire. Needle on the meter should deflect to zero (far end of scale).

To check the LYALL F-3-39 on a completely assembled package with voltage applied.

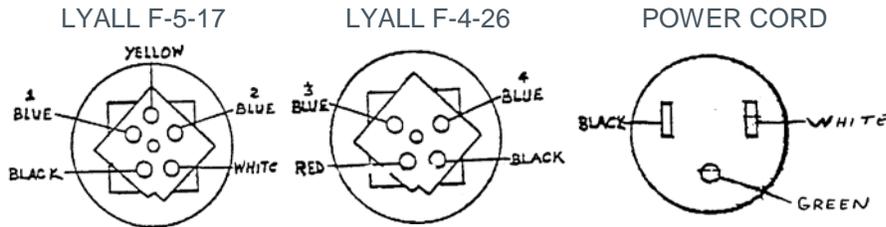
1. Use multi tester set on appropriate AC voltage scale.
2. Voltage readings should be as follows when test leads are inserted into pin connections of LYALL F-3-39.

BLACK and WHITE – Line Voltage

BLACK and BROWN – Line Voltage

BROWN and WHITE – Zero (far left of scale)

## FREEZER



To check proper wire connections without voltage.

1. Use multi-tester set on lowest resistance scale.
2. Insert RED test lead into hole marked for BLACK wire of LYALL F-5-17. Touch BLACK test lead to pin on power cord marked for BLACK wire. Needle on the meter should deflect to zero (far right end of scale.)
3. Insert RED test lead into hole marked for WHITE wire of LYALL F-5-17. Touch BLACK test lead to pin on power cord marked for WHITE wire. Needle on the meter should deflect to zero (far right end of scale.)
4. Insert RED test lead into hole marked for YELLOW wire of LYALL F-5-17. Touch BLACK test lead to YELLOW wire in the timer box and then to YELLOW in wire evaporator. Needle on the meter should deflect to zero (far right end of scale.)
5. Insert RED test lead into hole marked for BLUE wire of LYALL F-5-17. Touch BLACK test lead to BLUE wire in the timer box. Needle does not deflect. Touch BLACK test lead to BLUE wire or compressor. Needle on the meter should now deflect to zero.
6. Insert RED test lead into hole marked for BLUE wire of LYALL F-5-17. Touch BLACK test lead to the (2) BLUE wire at the timer box or the compressor, which ever does not cause the meter to deflect, when RED test lead was inserted into (1) BLUE, should not cause the meter to deflect to zero.
7. Insert RED test lead into hole marked for (3) BLUE wire of LYALL F-4-26. Touch BLACK test lead to BLUE wire for compressor. Needle on the meter should deflect to zero (far right end of scale).
8. Insert RED test lead into hole marked for (4) BLUE wire of LYALL F-4-26. Touch BLACK test lead to BLUE wire for evaporator fans. Needle on the meter should deflect to zero.
9. Insert RED test lead into hole marked for RED wire of LYALL F-4-26. Touch BLACK test lead to RED wire for light. Needle on the meter should deflect to zero.

10. Insert RED test lead into hole marked for BLACK wire of LYALL F-4-26. Touch BLACK test lead to pin on power cord marked for BLACK wire. Needle on meter should deflect to zero.

To check the LYALL F-5-17 on a completely assembled package with voltage applied.

1. Use multi-tester set on appropriate AC voltage scale.
2. Voltage readings should be as follows, when test leads are inserted into pin connections of LYALL F-5-17.

BLACK and WHITE – Line Voltage

(2) BLUE and WHITE – Line Voltage or 0

(1) BLUE and (2) BLUE – Line Voltage

(1) BLUE and WHITE – Line Voltage or 0

YELLOW and WHITE – Zero

## DELFIELD POWER MODULE CONNECTOR CHECK OUT

Pins 9 and 10 supply the VFD with the necessary AC voltage for operation. The voltages across these two pins can be checked using an AC voltmeter set on the 20 volt range.

Connect one lead of the meter to pin 9 and the other lead to pin 10. A voltage reading of about 2.5V should be obtained.

Pin 8 is the high DC voltage for the VFD and relay coils. The voltage can be checked by using a DC voltmeter on the 200 volt range.

Connect the common or ground lead of the meter to pin 7. This is the ground signal between power and control modules. Connect the second lead to pin 8. A reading of 30 to 32 volts should be obtained. The actual voltage depends on the number of relays that are activated when the reading is taken.

Pin 6 provides a 60 hz. Signal for time keeping purposes. The voltages can be checked by using an AC voltmeter on the 20 volt range.

Connect one lead to pin 7 and connect the second lead to pin 6. A reading of about 12 volts AC should be obtained.

Pin 5 provides the low DC voltage for the regulator and the horn. It can be checked by using a DC voltmeter on the 20 volt range.

Connect the common or ground lead of the meter to pin 7. Connect the second lead to pin 5. A reading of 14 to 15 volts should be obtained. The actual voltage depends on the number of relays that are activated when the reading is taken.

Pins 1 through 4 are the power line for the relay coils. The voltage on these pins can best be checked by entering Stage 2 diagnostics and operating the relays individually.

To enter stage 2 diagnostics, press the TIME and DOWN buttons simultaneously, then within 3 seconds, press the TEMP button. This puts the unit into stage 1 diagnostics. Press the DEFROST button. A number one should be displayed on the VFD. This is stage 2 and all relays should be off at this time.

Using a DC voltmeter, the voltages on pins 1 through 4 cannot be checked. Connect the common or ground lead of the voltage is to be checked. The voltages for pins 1 through 4 are listed in a table. The voltages vary depending on which relay is turned on.

With the one showing on the VFD, press the TIME button. This activates the light relay. Check the voltages on each of the pins 1 through 4 and compare them to the table.

Continue this procedure for number 3, the compressor relay and number 4, the defrost relay. Pressing RESET will exit diagnostics and return to normal operating mode.

## VOLTAGE TABLE FOR PINS 1 THROUGH 4

	<b>FRZ</b>	<b>REF</b>	<b>FRZ</b>	<b>REF</b>	<b>FRZ</b>	<b>REF</b>	<b>FRZ</b>	<b>REF</b>
No relay on	31.3	N/A	31/5	31.5	31.5	N/A	31.5	31.5
Fans relay on 1	30.4	N/A	30.5	31.5	31.5	.8	12.2	31.5
Compressor relay on 2	12	N/A	.8	.8	30.3	N/A	30.5	30.5
Light relay on 3	30.4	N/A	30.5	30.5	11.8	N/A	.8	.8
Defrost relay on 4	.8	N/A	11.7	31.5	30.3	N/A	30.5	30.5

All values are DC volts

N/A = Not Applicable

REF = Refrigerator

FRZ = Freezer

The voltages given here are not exact. Line voltage fluctuations and the normal tolerances range of various components will cause the voltages to vary.

NOTE:Whenever the control module is to be disconnected, disconnect the AC power cord from the AC service.