



COMMERCIAL REFRIGERATION GENERAL CONTROL GUIDE

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Introduction

Types of Temperature Controls 3

Models Not Covered in This Book..... 4

Appliance Information

Nomenclature..... 6

Holding Temperatures..... 7

Component Locations 8

Operation & Diagnostic Information

Appliance Sequence of Operation..... 30

Electronic Control (Without Display) 33



Electronic Control (With Display*)..... 59

*Display may be remote. You can interact with electronic control displays; otherwise, it is a thermometer



Mechanical Control..... 114



Defrost Timer..... 130



Introduction

Introduction

What is a temperature control or thermostat?

A temperature control or thermostat is a device that is interposed in a cooling system by which the appliance temperature is automatically maintained between certain levels.

Temperature controls are factory-set to give refrigerators an approximate temperature of 35°F (1.6°C) and freezers an approximate temperature of -10°F (-23.3°C). Let the unit function for several hours (completely cooling the appliance) before changing the control setting.

Excessive tampering with the control can lead to service difficulties. Should you ever need to replace the temperature control, be sure the control is ordered from your True dealer or a recommended service agent.

Types of Temperature Controls

There are two types of temperature controls:

- Mechanical Temperature Control: Cycles the compressor by sensing either the air temperature or the evaporator coil temperature.



- Electronic Temperature Control: Cycles the compressor by sensing the air temperature.



Introduction

Models Not Covered in This Book

The temperature control information for the following models is NOT covered in this book. Please see *Commercial Refrigeration Model-Specific Control Guide* on our website at <https://www.truemfg.com/support/manuals/#panel4>.

- GDM-HST
- GDM-HST02 / TGO-POP01
- GDM/T-CHROMO
- GDM/T-SCI
- TRM
- TSCI-TSL01
- TSCI



Appliance Information



Appliance Information

Nomenclature

Nomenclature

AC	Air Curtain
ADA	Americans With Disabilities Act Compliant
AL	Angled Lid
BLK	Black
C	Convenience Store Cooler
CD	Cold Deli
CHROMO	Chromatography
CLEVER	Cantilever Shelves
CT	Club Top
CVM	Contemporary Visual Merchandiser
D	Drawer
DG	Dry Goods
DS	Dual Sided
DT	Dual Temperature
F	Freezer
FC	Floral Case
FG	Glass Door Freezer
FGD01	Framed Glass Door, Version 01
FL	Flat Lid
FLM	Full Length Merchandiser
FLX	Flex; Convertible Freezer/Refrigerator
FR	Food Rated
FS	Full Width Cantilever Shelf w/out LED
FSL	Full Width Cantilever Shelf w/ LED
FZ	Zero Degree Freezer
G	Glass Door
GAL	Galvanized Top
GC	Glass/Plate Chiller
GDIM	Glass Door Ice Merchandiser
GDM	Glass Door Merchandiser
GE	Glass End
GEM	Glass End Merchandiser
GS	Glass Sided
G4SM	Four-Sided Glass
HS	Half Width Cantilever Shelf w/out LED
HSL	Half Width Cantilever Shelf w/LED
HST	Health Safety Timer
L	Low-Height
LD	LED Lighting
LP	Low Profile
LTF	Low Temperature Freezer
MB/MC	Mega Top
ME	Mirrored End
NSG	No Sign or Grill
NT	No Tank (Ice Merchandisers)
POP	Point of Purchase
PT	Pass-Through
RF	Radius Front

RGS	Rotating Glass Shelf
RI	Roll-In
RL	Rear Load
RT	Roll-Through
S	Stainless Steel
SCI	Scientific
SD	Slide Door
SE	Solid End
SI	Sign
SL	Slim Line
SPEC1	Undercounter/Worktop Spec Series 1
SS	Stainless Steel Interior
SSL	Super Slim Line
ST	Split Top
STR/STA/STG	Spec Series® Models
T	TRUE®
TAC	Vertical Air Curtain
TBB	Back Bar
TBR	True Bar Refrigerator
TCGG	Curved Glass Gravity Coil Deli Case
TD	Deep Well Horizontal Bottle Cooler
TDB	Back Bar/Direct Draw
TDBD	Double Duty Deli
TDC	Dipping Cabinet
TDD	Direct Draw
TDM	Display Merchandiser
TDR	True Draft Refrigerator
TFM	Frozen Merchandiser
TFP	Food Prep Table
TFT	True Flat Top
THAC	Horizontal Air Curtain
TMC	Milk Cooler
TOAM	Open Air Merchandiser
TPP	Pizza Prep Table
TRCB	Chef Base
TRM	True Retail Merchandiser
TS	Stainless Steel Exterior & Interior Reach-In
TSCI	Scientific Series
TSD	Slide Door
TSID	Single Duty Deli
TSL01	TRUE Standard Look, Version 01
TSSU	Sandwich/Salad Unit
T-SERIES	Upright Reach-In
TUC	Undercounter
TVM	Visual Merchandiser
TWT	Work Top
USM	US Made
W	Wine Merchandiser

Holding Temperatures

Holding Temperatures

- **CVM™ (Contemporary Visual Merchandiser) Refrigerator**
Holds 33°F to 38°F (0.5°C to 3.3°C)
- **FLM™ (Full Length Merchandiser) Freezer**
Holds -10°F (-23.3°C)
- **FLM™ (Full Length Merchandiser) Refrigerator**
Holds 33°F to 38°F (0.5°C to 3.3°C)
- **GDIM (Glass Door Ice Merchandiser)**
Holds 20°F to 25°F (-6.7°C to -3.9°C)
- **GDM® (Glass Door Merchandiser) Freezer**
Holds -10°F (-23.3°C)
- **GDM® (Glass Door Merchandiser) Refrigerator**
Holds 33°F to 38°F (0.5°C to 3.3°C)
- **GDM®-LTF (Glass Door Merchandiser Low Temp) Freezer**
Holds -20°F to 4°F (-28.9°C to -15.5°C)
- **STR, STA, STG (Spec Series) Freezer**
Holds -10°F (-23.3°C)
- **STR, STA, STG (Spec Series) Heated**
Holds 140°F to 180°F (60°C to 82.2°C)
- **STR, STA, STG (Spec Series) Refrigerator**
Holds 33°F to 38°F (0.5°C to 3.3°C)
- **T-Series® Freezer**
Holds -10°F (-23.3°C)
- **T-Series® Refrigerator**
Holds 33°F to 38°F (0.5°C to 3.3°C)
- **TAC® (Vertical Air Curtain) Refrigerator**
Holds 33°F to 38°F (0.5°C to 3.3°C)
- **TBB® (Back Bar) Refrigerator**
Holds 33°F to 38°F (0.5°C to 3.3°C)
- **TBR™ (Back Bar) Refrigerator**
Holds 33°F to 38°F (0.5°C to 3.3°C)
- **TCGG™ (Curved Glass Deli Case) Refrigerator**
Holds 38°F to 40°F (3.3°C to 4.5°C)
- **TCGR (Curved Glass Display Case) Refrigerated Bakery**
Holds 38°F to 40°F (3.3°C to 4.5°C)
- **TCGR-CD (Curved Glass Display Case) Cold Deli**
Holds 36°F to 38°F (0.5°C to 3.3°C)
- **TD™ (Horizontal Bottle Coolers) Refrigerator**
Holds 33°F to 38°F (0.5°C to 3.3°C)
- **TD™-LT (Horizontal Bottle Coolers / Low Temp Models)**
Holds 20°F (-6.7°C)
- **TDB (Back Bar / Direct Draw Beer Dispenser) Refrigerator**
Holds 33°F to 38°F (0.5°C to 3.3°C)
- **TDBD (Double Duty Deli Cases) Refrigerator**
Holds 38°F to 40°F (3.3°C to 4.5°C)
- **TDC (Dipping Cabinet) Freezer**
Holds -10°F to 8°F (-23.3°C to -13.3°C)
- **TDD™ (Direct Draw Beer Dispensers) Refrigerator**
Holds 33°F to 38°F (0.5°C to 3.3°C)
- **TDM™ (True Display Merchandiser) Refrigerator**
Holds 33°F to 41°F (0.5°C to 5°C),
Optionally 42°F to 65°F (5.5°C to 18.3°C)
- **TDR™ (Direct Draw Beer Dispensers) Refrigerator**
Holds 33°F to 38°F (0.5°C to 3.3°C)
- **TFM (Horizontal Freezers)**
Holds -10°F (-23.3°C)
- **TFP™ (Food Prep) Refrigerator**
Holds 33°F to 41°F (0.5°C to 5°C)
- **TFT (Flat Top) Refrigerator**
Holds 33°F to 41°F (0.5°C to 5°C)
- **T-GC™ (Glass & Plate Chillers / Frosters)**
Holds 0°F and below
- **TH Series (Heated Cabinet)**
Holds 80°F to 200°F (26.6°C to 93.3°C)
- **THAC™ (Horizontal Air Curtain) Refrigerator**
Holds 35°F to 40°F (1.6°C to 4.4°C)
- **THDC (Horizontal Dipping Cabinet) Freezer**
Holds -10°F to 8°F (-23.3°C to -13.3°C)
- **TMC™ (Milk Coolers) Refrigerator**
Holds 33°F to 38°F (0.5°C to 3.3°C)
- **TOAM™ (Open Air Merchandiser) Refrigerator**
Holds 33°F to 40°F (0.5°C to 4.4°C)
- **TPP® (Pizza Prep Table) Refrigerator**
Holds 33°F to 41°F (0.5°C to 5°C)
- **TR, TA, TG (Spec Series) Freezer**
Holds -10°F (-23.3°C)
- **TR, TA, TG (Spec Series) Refrigerator**
Holds 33°F to 38°F (0.5°C to 3.3°C)
- **TR, TA, TG (Spec Series) Heated Cabinets**
Holds 80°F to 180°F (26.6°C to 82.2°C)
- **TRCB™ (Chef Bases) Refrigerator**
Holds 33°F to 38°F (0.5°C to 3.3°C)
- **TS (Stainless Steel) Freezer**
Holds -10°F (-23.3°C)
- **TS (Stainless Steel) Refrigerator**
Holds 33°F to 38°F (0.5°C to 3.3°C)
- **TSCI (Scientific Series) Refrigerator**
Holds 35.6°F to 46.4°F (2°C to 8°C)
- **TSD (Slide Door) Refrigerator**
Holds 33°F to 38°F (0.5°C to 3.3°C)
- **TSID (Single Duty Deli Cases) Refrigerator**
Holds 38°F to 40°F (3.3°C to 4.5°C)
- **TSSU® (Sandwich / Salad) Refrigerator**
Holds 33°F to 41°F (0.5°C to 5°C)
- **TUC® (Undercounter) Freezer**
Holds -10°F (-23.3°C)
- **TUC® (Undercounter) Refrigerator**
Holds 33°F to 38°F (0.5°C to 3.3°C)
- **TVM® (True Visual Merchandiser) Refrigerator**
Holds 33°F to 38°F (0.5°C to 3.3°C)
- **TWT™ (Worktop) Freezer**
Holds -10°F (-23.3°C)
- **TWT™ (Worktop) Refrigerator**
Holds 33°F to 38°F (0.5°C to 3.3°C)

Component Locations

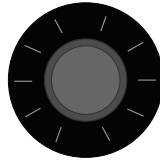
Component Locations

Control Legend

Images are not to scale. The generic images represent the controls displayed below them.

You will see the generic images in "Component Locations" (starting on pg. 10) to represent control locations.

Controls Without Displays



Generic Control Knob



Controls With Displays




Generic Control Display



Component Locations (cont.)

Light Operation

Appliances with glass doors or an open-air design may have a manual switch to turn the lights on and off. Solid-door appliances with interior lights may not have a light switch, as the lights typically activate when the solid door opens.

A light switch is installed near the light symbol , which indicates the light switch's approximate location.

If a light switch is not available, the lights may be activated by an LAE electronic control. See control (and light switch) locations in "Component Locations" starting on pg. 10.

Light Switch Operation (Manual Switch)

Turn the lights on and off by toggling the light switch.



Light Switch Operation (Electronic Control with Display)

See "Operate Light Switch" for LAE AR2/BIT25/BR1 displays (pg. 104) or LAE BR+/CD25/TM displays (pg. 109).



AR2/BIT25/BR1



BR+/CD25/TM

Component Locations (cont.)

Component Locations

Model(s): CVM

A light symbol  show the approximate location of the light switch. 

Light Switch on Glass Door Models

Inside top ceiling.



Control with Display
On the front of the grill.



Control with Display
Behind the rear grill.



NOTICE >

Control version and location may vary upon model of cabinet. Light switch availability and location may vary upon model of cabinet.

Component Locations (cont.)

Component Locations (cont.)

Model(s): FLM

**Light Switch on
Glass Door Models**
Inside top ceiling.



Control with Display
Behind the front bottom grill.

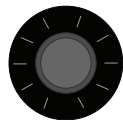


NOTICE >

Control version and location may vary upon model of cabinet. Light switch availability and location may vary upon model of cabinet.

Model(s): GDIM

Control without Display
Inside top ceiling.



**Light Switch on
Glass Door Models**
Inside top ceiling.



Control with Display
Behind the front bottom louvered grill.



NOTICE >

Control version and location may vary upon model of cabinet. Light switch availability and location may vary upon model of cabinet.

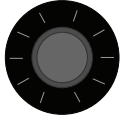
Component Locations (cont.)

Component Locations (cont.)

Model(s): GDM

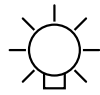
Control without Display

Inside top ceiling.



Light Switch on Glass Door Models

Inside top ceiling.



Control with Display

Behind or mounted to the front bottom louvered grill.



NOTICE >

Control version and location may vary upon model of cabinet. Light switch availability and location may vary upon model of cabinet.

Model(s): STM

Control with Display

On the front of top panel.



NOTICE >

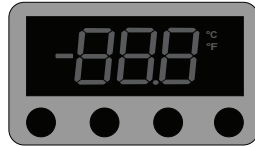
Control version and location may vary upon model of cabinet. Light switch availability and location may vary upon model of cabinet.

Component Locations (cont.)

Component Locations (cont.)

Model(s): STR | STA | STG Heated

Control with Display
On the front of top panel.



NOTICE >

Control version and location may vary upon model of cabinet. Light switch availability and location may vary upon model of cabinet.

Model(s): STR | STA | STG Reach-In and Reach-Thru

Control with Display
On the front of top panel.



Light Switch
Inside top ceiling.



NOTICE >

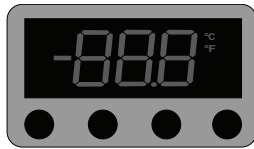
Control version and location may vary upon model of cabinet. Light switch availability and location may vary upon model of cabinet.

Component Locations (cont.)

Component Locations (cont.)

Model(s): STR | STA | STG Roll-In and Roll-Thru

Control with Display
On the front of top panel.



Light Switch
Inside top ceiling.



NOTICE >

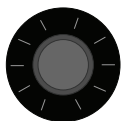
Control version and location may vary upon model of cabinet. Light switch availability and location may vary upon model of cabinet.

Model(s): T-23DT

Control with Display
On the front of top panel.



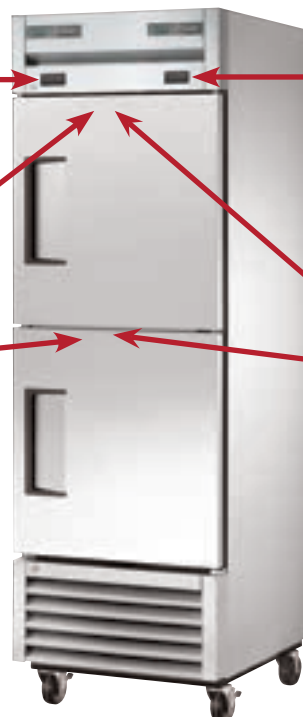
Control without Display
Inside top ceilings.



Control with Display
On the front of top panel.



Light Switch on Glass Door Models
Inside top ceiling.



NOTICE >

Control version and location may vary upon model of cabinet. Light switch availability and location may vary upon model of cabinet.

Component Locations (cont.)

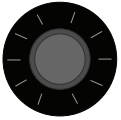
Component Locations (cont.)

Model(s): T-Series

Light Switch on Glass Door Models
Inside top ceiling.



Control without Display
Inside top ceiling.



Control with Display

On the front of top panel or behind or mounted to the front bottom louvered grill.



NOTICE >

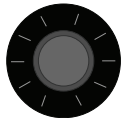
Control version and location may vary upon model of cabinet. Light switch availability and location may vary upon model of cabinet.

Model(s): TAC

Light Switch
Behind top airflow honeycomb.



Control without Display
Inside back wall, lower left.



Control with Display
Behind or mounted to the front bottom louvered grill.



NOTICE >

Control version and location may vary upon model of cabinet. Light switch availability and location may vary upon model of cabinet.

Component Locations (cont.)

Component Locations (cont.)

Model(s): TBR | TDR

Light Switch on Glass Door Models

Inside top ceiling.



Control with Display

On front of grill.



NOTICE >

Control version and location may vary upon model of cabinet. Light switch availability and location may vary upon model of cabinet.

Model(s): TCGG

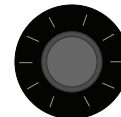
Light Switch on Glass Door Models

Inside top right ceiling.



Control without Display

Inside top right ceiling.



Control with Display

Behind the rear louvered grill.



NOTICE >

Control version and location may vary upon model of cabinet. Light switch availability and location may vary upon model of cabinet.

Component Locations (cont.)

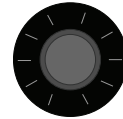
Component Locations (cont.)

Model(s): TCGR | TCGD | TCGDZ



Control without Display

Alongside rear bottom grill.



(TCGD model will not have a control)

Light Switch on Glass Door Models

Alongside rear bottom grill.



NOTICE >

Control version and location may vary upon model of cabinet. Light switch availability and location may vary upon model of cabinet.

Model(s): TCM

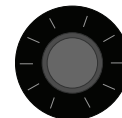
Light Switch on Glass Door Models

Above evaporator housing.



Control without Display

Behind rear bottom grill.



NOTICE >

Control version and location may vary upon model of cabinet. Light switch availability and location may vary upon model of cabinet.

Component Locations (cont.)

Component Locations (cont.)

Model(s): TBB | TBD | TDD | TD | T-GC

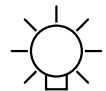
Control without Display

Inside back corner or behind the grill.



Light Switch

Inside back corner.



Light Switch on Glass Door Models

Inside left wall or top ceiling above lights.



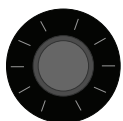
Control without Display

Inside right wall or back wall.



Control with or without Display

Behind the front louvered grill.



NOTICE >

Control version and location may vary upon model of cabinet. Light switch availability and location may vary upon model of cabinet.

Component Locations (cont.)

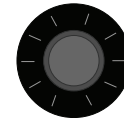
Component Locations (cont.)

Model(s) TBB | TBD | TDD | TD | T-GC (cont.)

Light Switch
Inside top ceiling.



Control with or without Display
On unit rear.



NOTICE >

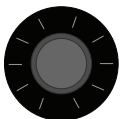
Control version and location may vary upon model of cabinet. Light switch availability and location may vary upon model of cabinet.

Model(s): TDBD | TSID

Light Switch on Glass Door Models
TSID: Inside top ceiling.
TDBD: Outside back countertop.



Control without Display
Inside top left ceiling.



NOTICE >

Control version and location may vary upon model of cabinet. Light switch availability and location may vary upon model of cabinet.

Component Locations (cont.)

Component Locations (cont.)

Model(s): TDC | THDC

Light Switch

On top of canopy.



Control without Display

Alongside the back louvered grill.



(TDC model will not have a control knob)

NOTICE >

Control version and location may vary upon model of cabinet. Light switch availability and location may vary upon model of cabinet.

Model(s): TDM | TGM



Light Switch

Behind clear cover on back of unit.



Control with Display

Behind clear cover on back of unit.



NOTICE >

Control version and location may vary upon model of cabinet. Light switch availability and location may vary upon model of cabinet.

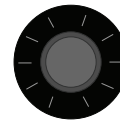
Component Locations (cont.)

Component Locations (cont.)

Model(s): TFM



Control without Display
Behind side bottom grill.



NOTICE >

Control version and location may vary upon model of cabinet. Light switch availability and location may vary upon model of cabinet.

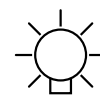
Model(s): TGN



Control with Display
On the front of top panel.



Light Switch on Glass Door Models
Top right ceiling.



NOTICE >

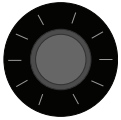
Control version and location may vary upon model of cabinet. Light switch availability and location may vary upon model of cabinet.

Component Locations (cont.)

Component Locations (cont.)

Model(s): TGU

Control without Display
Inside right wall.



Control with Display
On front side panel.



NOTICE >

Control version and location may vary upon model of cabinet. Light switch availability and location may vary upon model of cabinet.

Model(s): TH-Series

Light Switch
on Glass Door Models
On the front of the top panel



Control without Display
On the front of the top panel.



NOTICE >

Control version and location may vary upon model of cabinet. Light switch availability and location may vary upon model of cabinet.

Component Locations (cont.)

Component Locations (cont.)

Model(s): THAC

Light Switch

Behind the top airflow honeycomb.



Control with Display

Behind the front bottom louvered grill.



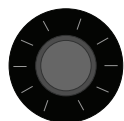
NOTICE >

Control version and location may vary upon model of cabinet. Light switch availability and location may vary upon model of cabinet.

Model(s): TMC

Control without Display

Inside top ceiling.



Control with Display

On the front of bottom panel.



NOTICE >

Control version and location may vary upon model of cabinet. Light switch availability and location may vary upon model of cabinet.

Component Locations (cont.)

Component Locations (cont.)

Model(s): TMW

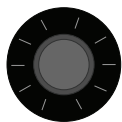
Control with Display

On the front panel.



Control without Display

Inside front right corner.



NOTICE >

Control version and location may vary upon model of cabinet. Light switch availability and location may vary upon model of cabinet.

Model(s): TOAM

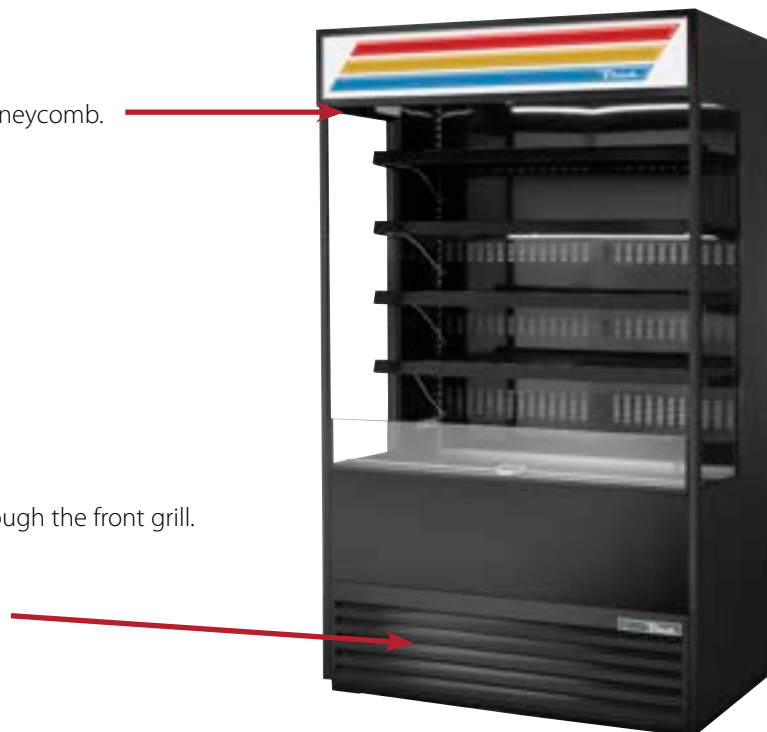
Light Switch

In front of the top airflow honeycomb.



Control with Display

Behind the front grill OR through the front grill.



NOTICE >

Control version and location may vary upon model of cabinet. Light switch availability and location may vary upon model of cabinet.

Component Locations (cont.)

Component Locations (cont.)

Model(s): TPP | TUC | TWT (Deep Undercounter or Worktop Models)

Control without Display

Inside right wall or
behind the front grill.



Control with Display

On the front of the grill.



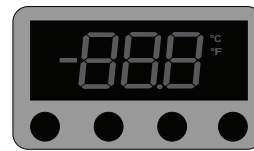
NOTICE >

Control version and location may vary upon model of cabinet. Light switch availability and location may vary upon model of cabinet.

Model(s): TR | TA | TG Reach-In and Reach-Thru

Control with Display

On the front of top panel.



Light Switch on Glass Door Models

Inside top ceiling.



Control without Display

Inside top ceiling.



NOTICE >

Control version and location may vary upon model of cabinet. Light switch availability and location may vary upon model of cabinet.

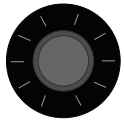
Component Locations (cont.)

Component Locations (cont.)

Model(s): TRCB

Control without Display

Inside top ceiling or right wall.



Control with Display

On the front of the grill.



NOTICE >

Control version and location may vary upon model of cabinet. Light switch availability and location may vary upon model of cabinet.

Model(s): TSSU | TFP | TUC | TWT (Does not include Deep Undercounter or Worktop models)

Control with Display

On the front countertop.



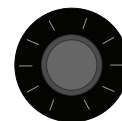
Light Switch on Glass Door Models

Top horizontal door opening.



Control without Display

Inside back corner or behind cap on back panel.



NOTICE >

Control version and location may vary upon model of cabinet. Light switch availability and location may vary upon model of cabinet.

Component Locations (cont.)

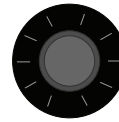
Component Locations (cont.)

Model(s): TVM



Control without Display

Inside the top ceiling.



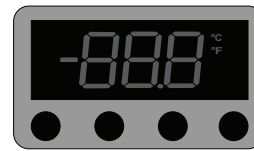
Light Switch on Glass Door Models

Inside the top ceiling.



Control with Display

Behind the front bottom louvered grill



NOTICE >

Control version and location may vary upon model of cabinet. Light switch availability and location may vary upon model of cabinet.

[illegible]

Operation & Diagnostic Information



Operation & Diagnostic Information

Appliance Sequence of Operation

Appliance Sequence of Operation

Refrigerators & Freezers

When the appliance is plugged in...

1. The interior lights illuminate on glass door models (if not, see "Component Locations" (starting on pg. 10).
2. The electronic temperature control display illuminates (if installed).

When the appliance is in refrigeration mode...

1. There may be a short delay before the compressor and/or evaporator fan(s) start. This delay may be determined by time or by temperature. This delay may also be the result of an initial defrost event that will be a minimum of six (6) min.
2. The temperature control/thermostat may cycle the compressor and evaporator fan(s) on and off together.
EXCEPTION: Models TSID, TDBD, TCGG, and TMW do not have evaporator fan(s).
3. The temperature control cycles the compressor by sensing either an evaporator coil temperature or air temperature, not a product temperature.

a. Mechanical Temperature Control or Electronic Temperature Control with a Knob

- i. The temperature control cycles the compressor on and off as determined by the cut-in and cut-out temperatures.

1. #9 is the coldest position
2. #1 is the warmest position
3. #0 or Off is the compressor off position

b. Electronic Temperature Control with a Display

- i. The temperature control cycles the compressor on and off as determined by the set point and differential temperatures.

1. The set point is the adjustable preprogrammed temperature designed to be either the cut-out temperature or it will match the average appliance holding temperature (only when used with a high and low differential).
2. The differential temperature(s) is the non-adjustable preprogrammed temperature used to determine when the compressor turns on and off (only when the set point is the average holding temperature).
4. An analog thermometer, a digital thermometer, or an electronic control display may reflect the refrigeration cycle swings of up and down temperatures, not a product temperature. **The most accurate method to determine an appliance's operation is to verify the product temperature.**
5. There may be times during refrigeration mode or defrost mode that the condenser fan motor will reverse to blow dirt off the condenser coil.

Appliance Sequence of Operation (cont.)

Refrigerators & Freezers (cont.)

When the appliance is in defrost mode...

1. Every appliance requires a defrost event to ensure the evaporator coil remains clear of frost and ice buildup.
2. Defrost is initiated either by the temperature control or a defrost timer.
EXCEPTION: Models TDC, TFM, THDC, and TMW require a manual defrost. The frequency of this manual defrost depends on the appliance's usage and ambient conditions.

a. Mechanical Temperature Control

- i. The temperature control cycles the compressor on and off as determined by the cut-in and cut-out temperatures.
1. During this time, only the evaporator fan runs.
EXCEPTION: Models TCGG, TDBD, and TSID do not have an evaporator fan(s).
 - ii. A freezer with a mechanical temperature control will defrost by time initiation as determined by a defrost timer
1. During this time, only the defrost coil heater and drain tube heater are energized.
 2. Defrost terminates when a specific evaporator coil temperature is reached or by a time duration.
- iii. Models with an analog or digital thermometer may show higher-than-normal temperatures during defrost.

b. Electronic Temperature Control

- i. The temperature control is preprogrammed to initiate defrost by a time interval but may also be initiated by temperature demand.
1. During defrost, a refrigerator turns off the compressor to use the evaporator fans to clear the evaporator coil.
 2. During defrost, a freezer turns off the compressor and evaporator fan to use electric heater to clear the evaporator coil.
- ii. The temperature with a digital display (if installed) shows dEF during defrost.
 - iii. Models with an analog or digital thermometer may show higher than normal temperatures during defrost.
 - iv. After defrost, there is a display delay until temperature is shown.
NOTICE > The display may have a short delay before showing a temperature after defrost has expired and may show dEF during a refrigeration cycle.

When the appliance sounds an audible and visual alarm...

1. Please reference the appliance's specific temperature control information in *Commercial Refrigeration General Control Guide* for any alarm codes.

Appliance Sequence of Operation (cont.)

Heated Appliances

When the appliance is plugged in...

1. The interior lights illuminate on glass door models (if not, see "Component Locations" (starting on pg. 10).
2. The electronic temperature control display illuminates (if installed).

When the appliance is in heat mode...

1. There may be a short delay before the heater(s) start. This delay may be determined by time or by temperature.
2. The temperature control cycles the heater(s) by sensing air temperature, not a product temperature.

a. Mechanical Temperature Control

- i. The temperature control cycles the compressor on and off as determined by the cut-in and cut-out temperatures.

1. The dial temperature represents the average appliance temperature.

b. Electronic Temperature Control with a Display

- i. The temperature control cycles the heater(s) on and off as determined by the set point and differential temperatures.

1. The set point is the adjustable preprogrammed temperature designed to be either the cut-out temperature or it will match the average appliance holding temperature (only when used with a high and low differential).
2. The differential temperature(s) is the non-adjustable preprogrammed temperature used to determine when the compressor turns on and off (only when the set point is the average holding temperature).
3. An analog thermometer, a digital thermometer, or an electronic control display may reflect the heating cycle swings of up and down temperatures, not a product temperature. **The most accurate method to determine an appliance's operation is to verify the product temperature.**

Electronic Control (without Display)

Electronic Control (without Display)

Pre-Diagnosis Checks.....	35
Is the product at the correct temperature?	35
Is the issue related to the appliance's operating conditions?	35
Is the evaporator coil frozen?	35
Is there proper airflow outside the appliance?	35
Is there proper airflow inside the appliance around the product?	36
Is the condenser coil dirty?	36
Is the appliance level and supported correctly?	36
Food prep models: Are the food pans being used correctly?	36
Do the appliance components operate correctly?	37
Are doors/drawers self closing (if applicable) and sealing properly?	37
Do the fan motors run correctly?	37
Does the appliance experience a defrost event?	37
Proceed to diagnostic flow chart	37
Diagnostic Flow Chart.....	38
Danfoss	40
Model Identification	40
EETa	40
ETC	40
EETa	41
Operation.....	41
Initiate Manual Defrost (Freezer models only)	42
Probe Identification & Resistances.....	42
Troubleshooting	43
ETC.....	44
Operation.....	44
Initiate Manual Defrost.....	45
Probe Identification & Resistances.....	45

Electronic Control (without Display) (cont.)

Sollatek.....	46
Model Identification.....	46
FCA22.....	46
FCA23.....	46
FCA22.....	47
Operation.....	47
Probe Identification & Resistances.....	48
Troubleshooting.....	50
FCA23.....	51
Operation.....	51
Probe Identification & Resistances.....	52
Troubleshooting.....	54
True.....	55
Model Identification.....	55
TEC22.....	56
Operation.....	56
Probe Identification & Resistances.....	57
Troubleshooting.....	58

Electronic Control (without Display) (cont.)

Pre-Diagnosis Checks

Before diagnosing the control, verify the control is the source of the problem. See the following pre-diagnosis checks.

Is the product at the correct temperature?

- If the product is at the correct temperature, the appliance is operating correctly.
- If the product is too warm or too cold, proceed with pre-diagnosis checks

Is the issue related to the appliance's application or operating conditions?

Is the evaporator coil frozen?

A frozen evaporator coil restricts airflow inside the appliance and prevents the appliance from reaching temperature.

Symptoms of the evaporator coil being frozen include...

- The entire coil may be frozen
- The coil may have an uneven frost pattern (front, back, left, right, top, bottom, drain pan, drain hose, etc.)

Causes of a frozen evaporator coil include...

- Doors/drawers not self-closing and sealing properly (see appropriate appliance component operation check)
- Dirty condenser coil (see appropriate pre-diagnosis check)
- The appliance not following its sequence of operation (see "Appliance Sequence of Operation" starting on pg. 30)
- The unit is not level/supported correctly (see appropriate pre-diagnosis check)

Is there proper airflow outside the appliance?

For correct operation, heat inside the appliance is absorbed by the refrigeration system; that heat is then released outside the appliance.

Symptoms of improper airflow outside the unit include...

- Product temperature is too warm
- Product temperature is too cold

Causes of improper airflow outside the unit include...

- Ambient temperature is too high
- Improper clearance around unit (see installation manual)
- Lack of preventative maintenance (see installation manual)

Electronic Control (without Display) (cont.)

- Improper fan operation (see appropriate appliance component operation check)

Is there proper airflow inside the appliance around the product?

For correct operation, heat inside the appliance is absorbed by the refrigeration system; that heat is then released outside the appliance. Air must be able to move throughout the appliance's inside to remove the heat and cool the product.

Symptoms of improper airflow inside the unit include...

- Inconsistent product temperatures throughout the unit
 - Some product may be too warm
 - Some product may be too cold

Causes of improper airflow inside the unit include...

- Product touching the inside walls (sides, back, door)
- Improper clearance around the evaporator fan motor

Is the condenser coil dirty?

A dirty condenser coil restricts airflow and prevents the refrigeration system from operating efficiently.

Causes of a dirty condenser coil include...

- Lack of preventative maintenance (see installation manual)

Symptoms of a dirty condenser coil include...

- A frozen evaporator coil (see appropriate pre-diagnosis check)
- Refrigeration system failure

Is the appliance level and supported correctly?

If the appliance is level, the doors/drawers close and seal properly and the water drains from inside the evaporator drain pan.

Causes of improper level or support include...

- The appliance is not level (see installation manual)
- The appliance is not supported (see installation manual)

Symptoms of improper level or support include...

- A frozen evaporator coil (see appropriate pre-diagnosis check)
- Doors/Drawers not self-closing (if applicable) and sealing correctly (see appropriate pre-diagnosis check)

Food prep models: Are the food pans being used correctly?

Symptoms of incorrect food pan use include...

- Evaporator coil is frozen from excessive air infiltration (see appropriate pre-diagnosis check)
- Product is too cold due to extended run time or metal pans
- Product is too warm due to infiltration of warm air or double-panning

Electronic Control (without Display) (cont.)

Food prep models: Are the food pans being used correctly? (cont.)

Causes of incorrect food pan use include...

- All food pans are not always in their positions or sitting flat/flush in pan openings
- Product is stored in stacked pans (double-panning) which can make product too warm
- Use of non-OEM food pans (mixing and matching with plastic or metal pans)
- Pans are metal
 - Metal pans may not seal against the pan dividers (such as at the pan corners)
 - Metal food pans are more conductive to temperature and can freeze product

Do the appliance components operate correctly?

Are doors/drawers self-closing (if applicable) and sealing properly?

Door and drawer gaskets must seal properly against the appliance for correct operation.

If self-closing, doors/drawers should close when opened 2-3" (51-76 mm).

Causes of doors/drawers not sealing properly include...

- Torn or defective gasket
- Defective door self-closing mechanism (spring, cord, retractor, etc.)
- Unit is not level/supported properly
- Unit is overstocked

Do the fan motors run correctly?

- Does the condenser fan motor run when the compressor runs?
- Does the condenser fan motor pull air into the condensing coil?
- Does the evaporator fan motor run when the compressor runs?
 - **IMPORTANT:** Evaporator fans may cycle with the compressor and/or door operation.
 - **IMPORTANT:** An electronic control that cycles the evaporator fan will not cause defrost issues or product temperatures to be out of range.

Does the appliance experience a defrost event?

Defrost events prevent the evaporator coil from freezing (see "Appliance Sequence of Operation" starting on pg. 30)

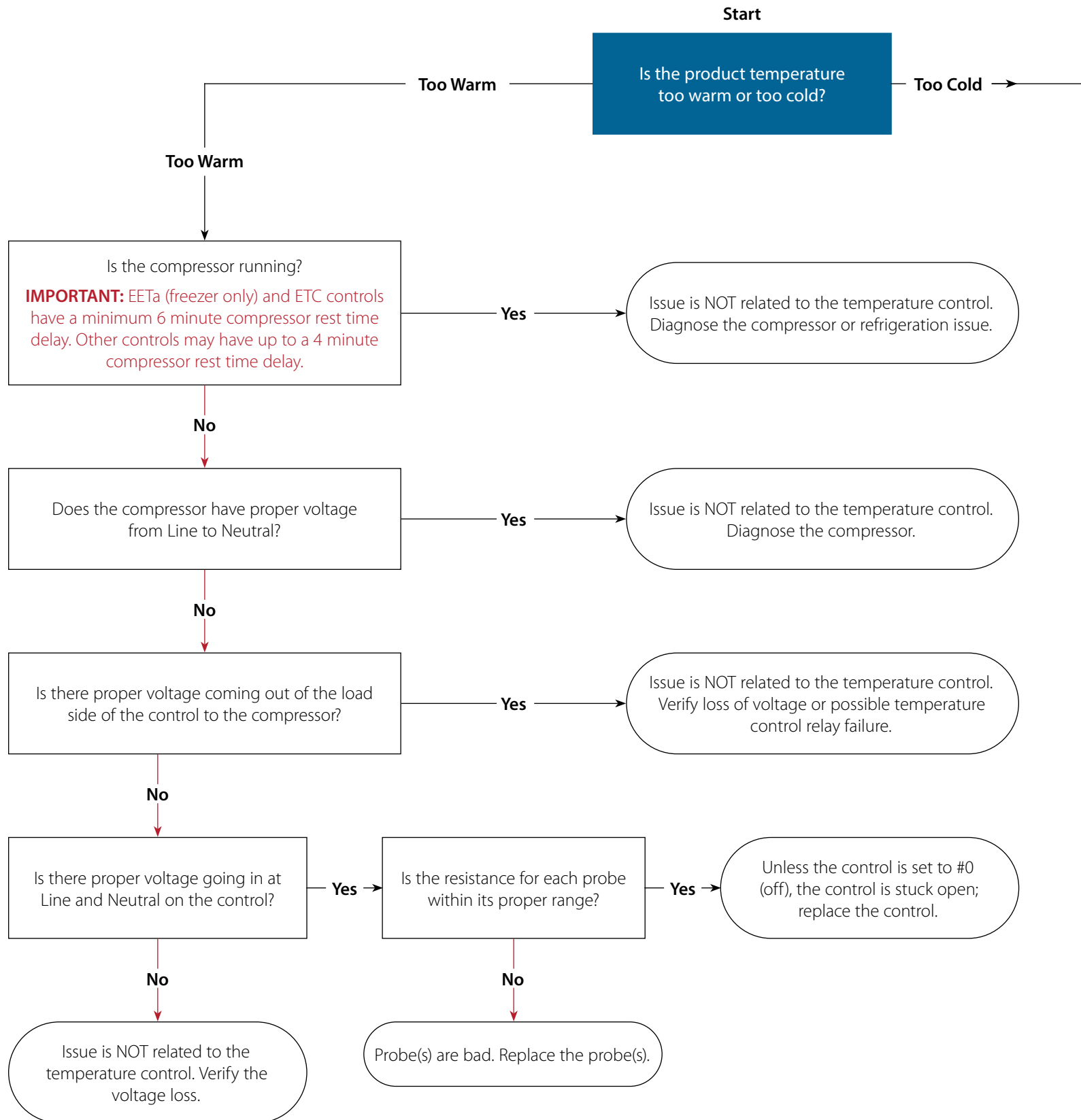
- Refrigerators have an off-cycle defrost with no defrost heaters energized.
- Freezers energize evaporator coil heaters and drain tube heaters.

Proceed to diagnostic flow chart.

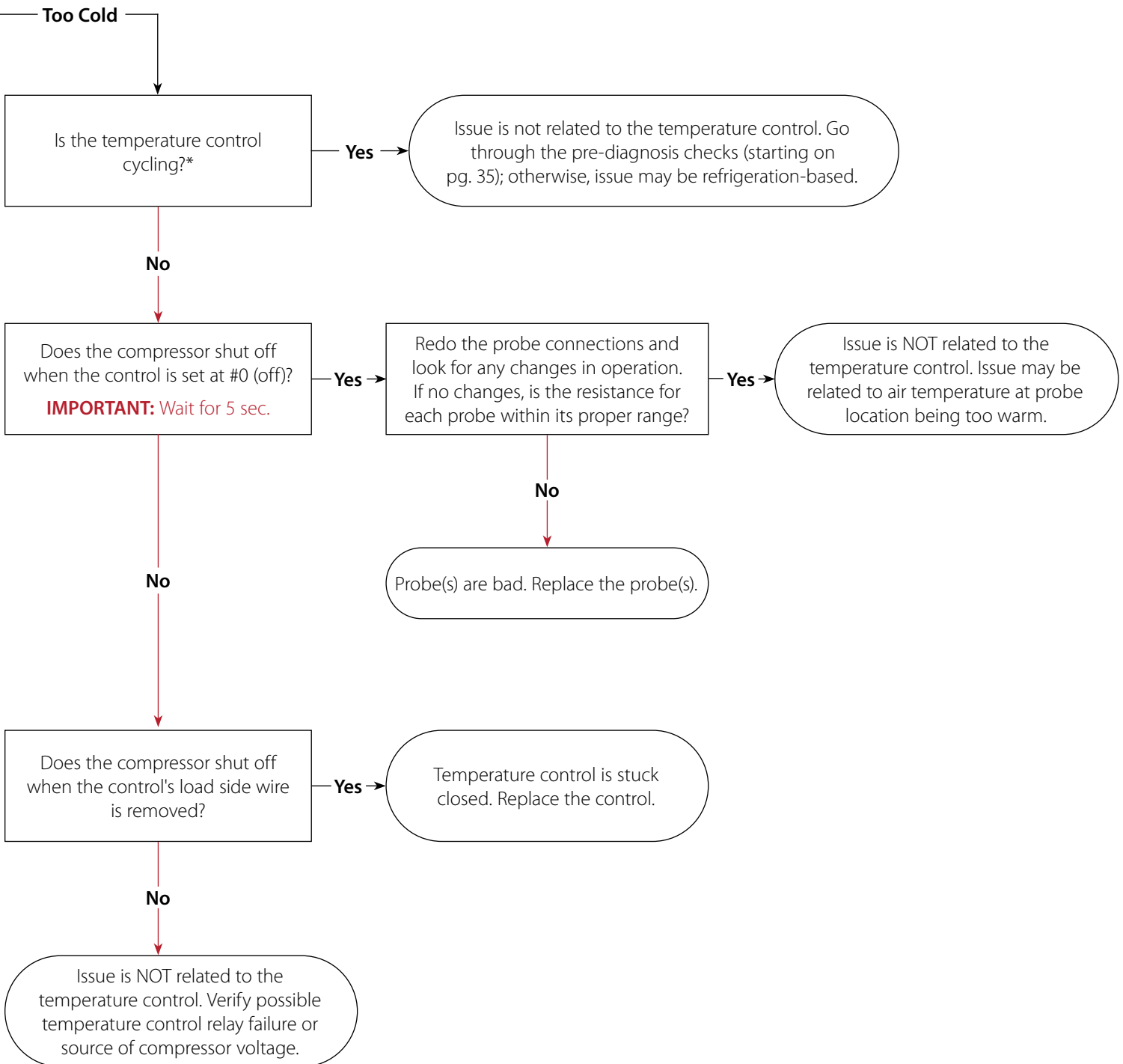
If the product temperature is too warm or too cold, the cause of the issue is not related to the application or operating conditions, and the components (excluding control) operate correctly, the problem is likely a control issue. Proceed to diagnostic flowchart.

Electronic Control (without Display) (cont.)

Diagnostic Flow Chart



Electronic Control (without Display) (cont.)



*To verify control operation, you must take the temperature in the same exact location as the control's sensing probe. This probe reads an air temperature.

Electronic Control (without Display) (cont.)

Danfoss

Danfoss

Model Identification

EETa



ETC



Electronic Control (without Display) (cont.)

Danfoss

EETa

Operation

The electronic temperature control...

- Cycles the compressor on and off based on the return air temperature. See operation table.
- Automatically defrosts every four (4) hours of compressor run time.
- Initiates an additional defrost if the evaporator coil temperature drops to the temperature specified in the operation table.
- Defrosts between 4 minute minimum and 60 minute maximum, or until the evaporator coil measures the temperature specified in the operation table.

Operation Table

Application	Program Part Number	#9 Cut-out °F (°C)	#5 Cut-out °F (°C)	#1 Cut-out °F (°C)	Differential °F (°C)	Average Product Temp °F (°C)	Defrost Termination °F (°C)	Defrost Initiation °F (°C)
Freezer	852465	-13 (-25)	-4.99 (-20.55)	3.02 (-16.01)	6 (3.3)	-1.99 (-18.9)	41 (5)	-29.92 (-34.4)
Freezer 2	852466	-0.04 (-17.8)	7.97 (13.35)	15.98 (-8.9)	6 (3.3)	10.97 (-11.7)	41 (5)	-29.92 (-34.4)
Freezer 3	853303	-4 (-20)	0.05 (-17.75)	4.1 (-15.5)	6 (3.3)	3.05 (-16.1)	41 (5)	-29.92 (-34.4)
Glass Chiller (T-GC)	852341	-11.02 (-23.9)	1.04 (-17.2)	13.1 (-10.5)	6 (3.3)	4.04 (-15.5)	41 (5)	-29.92 (-34.4)
Food Prep (TFP, TPP, TSSU)	853300	30.38 (-0.9)	32.45 (0.25)	34.52 (1.4)	3 (1.7)	33.95 (1.1)	39.92 (4.4)	5 (-15)
Refrigerator	853302	28.94 (-1.7)	32.99 (0.55)	37.04 (2.8)	6 (3.3)	35.99 (2.2)	39.92 (4.4)	8.96 (-12.8)
Wine/Chocolate	853301	35.96 (2.2)	51.98 (11.12)	68 (20)	6 (3.3)	54.98 (12.75)	39.92 (4.4)	8.96 (-12.8)

Electronic Control (without Display) (cont.)

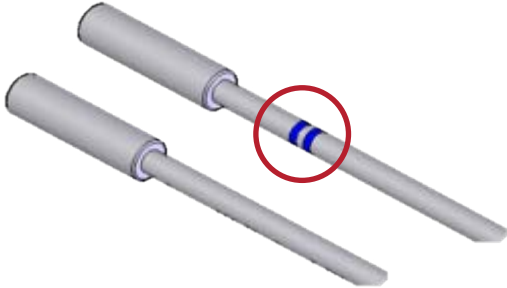
Danfoss

EETa (cont.)

Initiate Manual Defrost (Freezer models only)

To initiate a manual defrost, power cycle the unit. Either unplug the unit and plug it back in, or turn the circuit breaker off and then back on.

Probe Identification & Resistances



White: Thermostat (return air)

White with Blue Stripes: Defrost (coil)

When checking the probe resistance...

- Verify the probe resistance is accurate at the probe location.
- Use a calibrated thermometer to check the probe location temperature (coil or air temperature).
- Disconnect the probe from the controller. The probe cannot be plugged into the controller when measuring resistance.
- Use a calibrated Ohm meter to measure the resistance of the probe
- The resistance of the probe should match the associated temperature from the temperature to resistance chart.
- Fill a cup full of ice water (use a lot of ice). Put the probe into the ice bath, stir for 1 minute, then measure the resistance with a calibrated Ohm meter. Make sure to keep the probe in the center of the cup.
- The resistance of the probe should match the associated temperature at 32°F (0°C) as shown in the temperature to resistance chart.

Temperature to Resistance Chart*

Temperature °F (°C)	Resistance K-ohm	Temperature °F (°C)	Resistance K-ohm
-40 (-40)	338.25	77 (25)	10.00
-31 (-35)	243.55	86 (30)	8.06
-22 (-30)	177.50	95 (35)	6.53
-13 (-25)	130.64	104 (40)	5.33
-4 (-20)	97.21	113 (45)	4.37
5 (-15)	72.00	122 (50)	3.61
14 (-10)	55.35	131 (55)	2.99
23 (-5)	42.33	140 (60)	2.49
32 (0)	32.65	149 (65)	2.09
41 (5)	25.39	158 (70)	1.76
50 (10)	19.90	167 (75)	1.49
59 (15)	15.71	176 (80)	1.26
68 (20)	12.49		

***Subject to Change.** Information is provided to verify cut-in/cut-out range for diagnostic purposes only.

Electronic Control (without Display) (cont.)

Danfoss

Troubleshooting

Alarm Blocks

Meaning	No. of flashes (Block 1)	No. of flashes (Block 2)
Low and High temperature alarm	1	1
Line voltage alarm	1	2
Condenser alarm	1	3
Sensor error	2	1
Potentiometer error	2	2
Leakage alarm	3	1

NOTICE >

1. LED blinking every one second indicates power ON status and **no alarm** conditions.
2. Alarms to be interpreted as per block 1 and block 2 blinking pattern as given in the table. After block 1 and block 2 blinking there is about 2.5 second gap.
3. If there are multiple alarms, LED blinking pattern shows the alarm raised first, next active alarm will be displayed only when the first raised alarm is fixed.

Electronic Control (without Display) (cont.)

Danfoss

ETC

Operation

The electronic temperature control...

- Cycles the compressor on and off based on the return air temperature. See operation table.
- Automatically defrosts every four (4) hours of compressor run time.
- Initiates an additional defrost if the evaporator coil temperature drops to the temperature specified in the operation table.
- Defrosts between 4 minute minimum and 60 minute maximum, or until the evaporator coil measures the temperature specified in the operation table.

Operation Table

Application	Program Part Number	#9 Cut-out °F (°C)	#5 Cut-out °F (°C)	#1 Cut-out °F (°C)	Differential °F (°C)	Average Product Temp °F (°C)	Defrost Termination °F (°C)	Defrost Initiation °F (°C)
Freezer	809492 844189 994937 999492	-13 (-25)	-4.99 (-20.55)	3.02 (-16.01)	6 (3.3)	-1.99 (-18.9)	41 (5)	-29.92 (-34.4)
Freezer 2	994938	-0.4 (-18)	7.7 (-13.5)	15.8 (-9)	6 (3.3)	10.7 (-11.85)	41 (5)	-29.92 (-34.4)
Freezer 3	803410	-4.18 (-20.1)	-0.4 (-17.7)	4.46 (-15.3)	6 (3.3)	3.14 (-16.05)	41 (5)	-29.92 (-34.4)
Glass Chiller (T-GC)	225810	-10.84 (-23.08)	2.12 (-16.6)	15.08 (-9.4)	6 (3.3)	5.12 (-14.95)	41 (5)	-29.92 (-34.4)
Food Prep (TFP, TPP, TSSU)	200806 224502 994943	30.02 (-1.1)	32.99 (0.55)	35.96 (2.2)	3 (1.7)	34.49 (1.4)	41 (5)	-15 (-24.4)
Refrigerator	204880 211824 224501 844190 989767 994939 994940 994944 994946 999491	30.02 (-1.1)	33.98 (1.1)	37.94 (3.3)	6 (3.3)	36.98 (2.75)	41 (5)	10.4 (-12)
Wine/Chocolate	210683	42.08 (5.6)	54.05 (12.25)	66.02 (18.9)	6 (3.3)	57.05 (13.9)	41 (5)	10.4 (-12)

Electronic Control (without Display) (cont.)

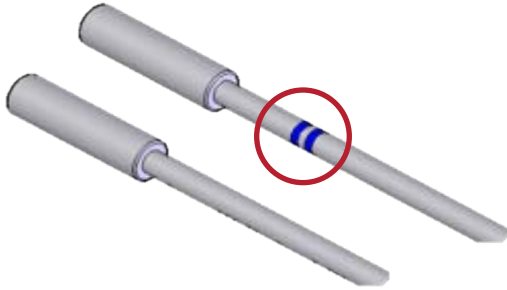
Danfoss

ETC (cont.)

Initiate Manual Defrost

To initiate a manual defrost, power cycle the unit. Either unplug the unit and plug it back in, or turn the circuit breaker off and then back on.

Probe Identification & Resistances



White: Thermostat (return air)

White with Blue Stripes: Defrost (coil)

When checking the probe resistance...

- Verify the probe resistance is accurate at the probe location.
 - Use a calibrated thermometer to check the probe location temperature (coil or air temperature).
 - Disconnect the probe from the controller. The probe cannot be plugged into the controller when measuring resistance.
 - Use a calibrated Ohm meter to measure the resistance of the probe
 - The resistance of the probe should match the associated temperature from the temperature to resistance chart.
- Fill a cup full of ice water (use a lot of ice). Put the probe into the ice bath, stir for 1 minute, then measure the resistance with a calibrated Ohm meter. Make sure to keep the probe in the center of the cup.
 - The resistance of the probe should match the associated temperature at 32°F (0°C) as shown in the temperature to resistance chart.

Temperature to Resistance Chart*

Temperature °F (°C)	Resistance K-ohm	Temperature °F (°C)	Resistance K-ohm
-67 (-55)	487.89	23 (-5)	21.17
-58 (-50)	338.25	32 (0)	16.33
-49 (-45)	237.69	41 (5)	12.70
-40 (-40)	169.16	50 (10)	9.95
-31 (-35)	121.80	59 (15)	7.86
-22 (-30)	88.77	68 (20)	6.25
-13 (-25)	65.34	77 (25)	5.00
-4 (-20)	48.61	86 (30)	4.03
5 (-15)	36.50	95 (35)	3.27
14 (-10)	27.68	104 (40)	2.67

***Subject to Change.** Information is provided to verify cut-in/cut-out range for diagnostic purposes only.

Electronic Control (without Display) (cont.)

Sollatek

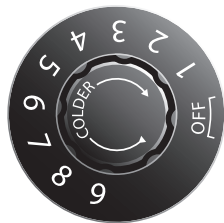
Sollatek

Model Identification

FCA22



FCA23



Electronic Control (without Display) (cont.)

Sollatek

FCA22

Operation

The electronic temperature control...

- Cycles the compressor on and off determined by the return air temperature (see tables).
- Automatically defrosts every four (4) hours of compressor run time.
- Initiates an additional defrost if the evaporator coil temperature drops to 12°F (11.1°C).
- Defrosts last either between 4 minute minimum and 40 minute maximum or until the evaporator coil measures 40°F (4.4°C).

Universal Control Settings

Control Setting	Cut-In °F (°C)	Cut-Out °F (°C)	Average Temperature °F (°C)	Defrost Initiation Temperature °F (°C)	Defrost Termination Temperature °F (°C)
#1	44 (6.7)	38 (3.3)	41 (5.0)	12 (11.1)	40 (4.4)
#2	43 (6.1)	37 (2.8)	40 (4.4)	12 (11.1)	40 (4.4)
#3	42 (5.6)	36 (2.2)	39 (3.9)	12 (11.1)	40 (4.4)
#4	41 (5.0)	35 (1.7)	38 (3.3)	12 (11.1)	40 (4.4)
#5	40 (4.4)	34 (1.1)	37 (2.8)	12 (11.1)	40 (4.4)
#6	39 (3.9)	33 (0.6)	36 (2.2)	12 (11.1)	40 (4.4)
#7	38 (3.3)	32 (0.0)	35 (1.7)	12 (11.1)	40 (4.4)
#8	37 (2.8)	31 (-0.6)	34 (1.1)	12 (11.1)	40 (4.4)
#9	36 (2.2)	30 (-1.1)	33 (0.6)	12 (11.1)	40 (4.4)

Wine/Chocolate Control Settings

Control Setting	Cut-In °F (°C)	Cut-Out °F (°C)	Avg. Product Temp. °F (°C)	Defrost Initiation Temperature °F (°C)	Defrost Termination Temperature °F (°C)
#1	74 (23.3)	68 (20.0)	71 (21.7)	12 (11.1)	40 (4.4)
#2	70 (21.1)	64 (17.8)	67 (19.5)	12 (11.1)	40 (4.4)
#3	66 (18.9)	60 (15.6)	63 (17.3)	12 (11.1)	40 (4.4)
#4	62 (16.6)	56 (13.3)	59 (15.0)	12 (11.1)	40 (4.4)
#5	58 (14.4)	52 (11.1)	55 (12.8)	12 (11.1)	40 (4.4)
#6	54 (12.2)	48 (8.9)	51 (10.6)	12 (11.1)	40 (4.4)
#7	50 (10.0)	44 (6.7)	47 (8.4)	12 (11.1)	40 (4.4)
#8	46 (7.7)	40 (4.7)	43 (6.2)	12 (11.1)	40 (4.4)
#9	42 (5.5)	36 (2.2)	39 (3.9)	12 (11.1)	40 (4.4)

Electronic Control (without Display) (cont.)

Sollatek

FCA22 (cont.)

Probe Identification & Resistances



Black: Thermostat (return air)

White: Defrost (coil)

When checking the probe resistance...

- Verify the probe resistance is accurate at the probe location.
 - Use a calibrated thermometer to check the probe location temperature (coil or air temperature).
 - Disconnect the probe from the controller. The probe cannot be plugged into the controller when measuring resistance.
 - Use a calibrated Ohm meter to measure the resistance of the probe
 - The resistance of the probe should match the associated temperature from the temperature to resistance chart.
- Fill a cup full of ice water (use a lot of ice). Put the probe into the ice bath, stir for 1 minute, then measure the resistance with a calibrated Ohm meter. Make sure to keep the probe in the center of the cup.
 - The resistance of the probe should match the associated temperature at 32°F (0°C) as shown in the temperature to resistance chart.

Electronic Control (without Display) (cont.)

Sollatek

FCA22 (cont.)

Temperature to Resistance Chart*

Temperature °F (°C)	Resistance K-ohm	Temperature °F (°C)	Resistance K-ohm
14 (-10)	548.267	73.4 (23)	109.283
15.8 (-9)	519.821	75.2 (24)	104.526
17.6 (-8)	492.994	77 (25)	100
19.4 (-7)	467.688	78.8 (26)	95.692
21.2 (-6)	443.81	80.6 (27)	91.592
23 (-5)	421.271	82.4 (28)	87.687
24.8 (-4)	399.992	84.2 (29)	83.969
26.6 (-3)	379.896	86 (30)	80.427
28.4 (-2)	360.911	87.8 (31)	77.051
30.2 (-1)	342.971	89.6 (32)	73.835
32 (0)	326.015	91.4 (33)	70.768
33.8 (1)	309.982	93.2 (34)	67.844
35.6 (2)	294.819	95 (35)	65.055
37.4 (3)	280.475	96.8 (36)	62.395
39.2 (4)	266.902	98.6 (37)	59.857
41 (5)	254.054	100.4 (38)	57.434
42.8 (6)	241.89	102.2 (39)	55.122
44.6 (7)	230.369	104 (40)	52.914
46.4 (8)	219.456	105.8 (41)	50.805
48.2 (9)	209.115	107.6 (42)	48.79
50 (10)	199.314	109.4 (43)	46.866
51.8 (11)	190.021	111.2 (44)	45.026
53.6 (12)	181.209	113 (45)	43.268
55.4 (13)	172.849	114.8 (46)	41.587
57.2 (14)	164.918	116.6 (47)	39.98
59 (15)	157.391	118.4 (48)	38.443
60.8 (16)	150.245	120.2 (49)	36.972
62.6 (17)	143.459	122 (50)	35.564
64.4 (18)	137.014	140 (60)	24.386
66.2 (19)	130.891	158 (70)	17.035
68 (20)	125.073	176 (80)	12.11
69.8 (21)	119.542	194 (90)	8.75
71.6 (22)	114.283	212 (100)	6.419

*Subject to Change. Information is provided to verify cut-in/cut-out range for diagnostic purposes only.

Electronic Control (without Display) (cont.)

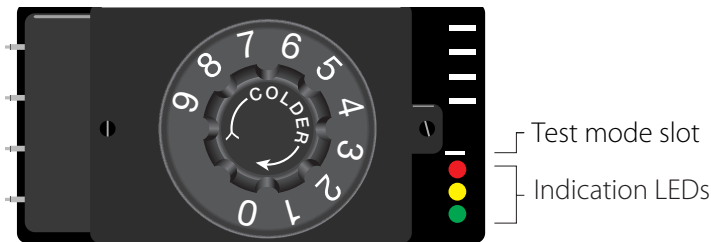
Sollatek

FCA22 (cont.)

Troubleshooting

In addition to reading the control indicator light codes (see table), note the potential solutions below:

- Check the terminal connections:
 - If the power wires (Live in and Comp) are reversed, the control indicator lights will not light and the compressor will not start.
 - If the probe wires are reversed, the control will not cycle correctly.
- Check if the black probe is touching metal. If so, it is reading surface temperature, not return air temperature.



Indicator Light Codes			
RED LED	YELLOW LED	GREEN LED	MEANING
OFF	OFF	ON	Voltage is good; compressor is ON; there is cooling demand.
ON	OFF	OFF	Voltage is bad; compressor is OFF; there is cooling demand.
Flashing	OFF	OFF	Voltage is bad; compressor is OFF; no cooling demand.
OFF	ON	OFF	In wait mode; compressor is OFF waiting for the time delay; there is cooling demand.
OFF	Flashing	OFF	In wait mode; compressor is OFF waiting for the time delay; no cooling demand.
OFF	OFF	Flashing	Time delay is over; compressor is OFF; no cooling demand.
Cycling	OFF	Cycling	In pre-defrost mode; all outputs are OFF.
ON	OFF	ON	In defrost mode; compressor is OFF.
Flashing	OFF	Flashing	In drip down mode; compressor is OFF.
Flashing	ON	Flashing	In drip down mode AND wait mode; waiting for coil probe to reach 35.6°F (2°C).
Flashing	Flashing	OFF	Voltage frequency is bad; compressor is OFF.
OFF	Flashing	Flashing	Probe #1 is faulty.
OFF	Cycling	Cycling	Probe #2 is faulty.
Cycling	Cycling	Cycling	Knob is in OFF position.
Flashing	Flashing	Flashing	In test mode; forces the compressor ON for 10 seconds. Insert a small screwdriver or any metallic object into the test mode slot to initiate test

Electronic Control (without Display) (cont.)

Sollatek

FCA23

Operation

The electronic temperature control...

- Cycles the compressor on and off determined by the return air temperature (see table).
- Automatically defrosts every four (4) hours of compressor run time.
- Initiates an additional defrost if the evaporator coil temperature drops to 9°F (12.8°C).
- Defrosts last either between 4 minute minimum and 40 minute maximum or until the evaporator coil measures 38°F (3.4°C).

Universal Control Settings

Control Setting	Cut-In °F (°C)	Cut-Out °F (°C)	Average Temperature °F (°C)	Defrost Initiation Temperature °F (°C)	Defrost Termination Temperature °F (°C)
#1	43 (6.1)	37 (2.7)	40 (4.4)	9 (12.8)	38 (3.4)
#2	42 (5.5)	36 (2.2)	39 (3.9)	9 (12.8)	38 (3.4)
#3	41 (5.0)	35 (1.6)	38 (3.3)	9 (12.8)	38 (3.4)
#4	40 (4.4)	34 (1.1)	37 (2.8)	9 (12.8)	38 (3.4)
#5	39 (3.9)	33 (0.6)	36 (2.2)	9 (12.8)	38 (3.4)
#6	38 (3.3)	32 (0.0)	35 (1.7)	9 (12.8)	38 (3.4)
#7	37 (2.8)	31 (-0.6)	34 (1.1)	9 (12.8)	38 (3.4)
#8	36 (2.2)	30 (-1.1)	33 (0.6)	9 (12.8)	38 (3.4)
#9	35 (1.6)	29 (-1.7)	32 (0.0)	9 (12.8)	38 (3.4)

Wine/Chocolate Control Settings

Control Setting	Cut-In °F (°C)	Cut-Out °F (°C)	Avg. Product Temp. °F (°C)	Defrost Initiation Temperature °F (°C)	Defrost Termination Temperature °F (°C)
#1	74 (23.3)	68 (20.0)	71 (21.7)	9 (12.8)	38 (3.4)
#2	70 (21.1)	64 (17.8)	67 (19.5)	9 (12.8)	38 (3.4)
#3	66 (18.9)	60 (15.6)	63 (17.3)	9 (12.8)	38 (3.4)
#4	62 (16.6)	56 (13.3)	59 (15.0)	9 (12.8)	38 (3.4)
#5	58 (14.4)	52 (11.1)	55 (12.8)	9 (12.8)	38 (3.4)
#6	54 (12.2)	48 (8.9)	51 (10.6)	9 (12.8)	38 (3.4)
#7	50 (10.0)	44 (6.7)	47 (8.4)	9 (12.8)	38 (3.4)
#8	46 (7.7)	40 (4.7)	43 (6.2)	9 (12.8)	38 (3.4)
#9	42 (5.5)	36 (2.2)	39 (3.9)	9 (12.8)	38 (3.4)

Electronic Control (without Display) (cont.)

Sollatek

FCA23 (cont.)

Probe Identification & Resistances



Black: Thermostat (return air)

White: Defrost (coil)

When checking the probe resistance...

- Verify the probe resistance is accurate at the probe location.
 - Use a calibrated thermometer to check the probe location temperature (coil or air temperature).
 - Disconnect the probe from the controller. The probe cannot be plugged into the controller when measuring resistance.
 - Use a calibrated Ohm meter to measure the resistance of the probe
 - The resistance of the probe should match the associated temperature from the temperature to resistance chart.
- Fill a cup full of ice water (use a lot of ice). Put the probe into the ice bath, stir for 1 minute, then measure the resistance with a calibrated Ohm meter. Make sure to keep the probe in the center of the cup.
 - The resistance of the probe should match the associated temperature at 32°F (0°C) as shown in the temperature to resistance chart.

Electronic Control (without Display) (cont.)

Sollatek

FCA23 (cont.)

Temperature to Resistance Chart*

Temperature °F (°C)	Resistance K-ohm	Temperature °F (°C)	Resistance K-ohm
14 (-10)	548.267	73.4 (23)	109.283
15.8 (-9)	519.821	75.2 (24)	104.526
17.6 (-8)	492.994	77 (25)	100
19.4 (-7)	467.688	78.8 (26)	95.692
21.2 (-6)	443.81	80.6 (27)	91.592
23 (-5)	421.271	82.4 (28)	87.687
24.8 (-4)	399.992	84.2 (29)	83.969
26.6 (-3)	379.896	86 (30)	80.427
28.4 (-2)	360.911	87.8 (31)	77.051
30.2 (-1)	342.971	89.6 (32)	73.835
32 (0)	326.015	91.4 (33)	70.768
33.8 (1)	309.982	93.2 (34)	67.844
35.6 (2)	294.819	95 (35)	65.055
37.4 (3)	280.475	96.8 (36)	62.395
39.2 (4)	266.902	98.6 (37)	59.857
41 (5)	254.054	100.4 (38)	57.434
42.8 (6)	241.89	102.2 (39)	55.122
44.6 (7)	230.369	104 (40)	52.914
46.4 (8)	219.456	105.8 (41)	50.805
48.2 (9)	209.115	107.6 (42)	48.79
50 (10)	199.314	109.4 (43)	46.866
51.8 (11)	190.021	111.2 (44)	45.026
53.6 (12)	181.209	113 (45)	43.268
55.4 (13)	172.849	114.8 (46)	41.587
57.2 (14)	164.918	116.6 (47)	39.98
59 (15)	157.391	118.4 (48)	38.443
60.8 (16)	150.245	120.2 (49)	36.972
62.6 (17)	143.459	122 (50)	35.564
64.4 (18)	137.014	140 (60)	24.386
66.2 (19)	130.891	158 (70)	17.035
68 (20)	125.073	176 (80)	12.11
69.8 (21)	119.542	194 (90)	8.75
71.6 (22)	114.283	212 (100)	6.419

*Subject to Change. Information is provided to verify cut-in/cut-out range for diagnostic purposes only.

Electronic Control (without Display) (cont.)

Sollatek

FCA23 (cont.)

Troubleshooting

In addition to reading the control indicator light codes (see table), note the potential solutions below:

- Check the terminal connections:
 - If the power wires (Live in and Comp) are reversed, the control indicator lights will not light and the compressor will not start.
 - If the probe wires are reversed, the control will not cycle correctly.
- Check if the black probe is touching metal. If so, it is reading surface temperature, not return air temperature.



Indicator Light Codes			
RED LED	YELLOW LED	GREEN LED	MEANING
ON	OFF	ON	Defrost mode
Flashing	ON	Flashing	Mini-defrost mode
Cycling	OFF	Cycling	Pre-defrost mode
Flashing	OFF	Flashing	Drip down mode
OFF	ON	ON	Post-defrost recovery mode
OFF ¹	One (1) Blink ²	OFF	Probe #1 faulty; good voltage
OFF ¹	Two (2) Blinks ²	OFF	Probe #2 faulty; good voltage
ON	One (1) Blink ²	OFF	Probe #1 faulty; bad voltage
ON	Two (2) Blinks ²	OFF	Probe #2 faulty; bad voltage
Cycling	Cycling	Cycling	Knob set to #0 (off position)
OFF ¹	OFF	ON	On mode
OFF ¹	Flashing	ON	On mode, but compressor is off due to door switch operation
ON	OFF	OFF	Bad voltage; cooling demand
Flashing	OFF	OFF	Bad voltage; temperature satisfied
OFF	ON	OFF	Wait mode; cooling demand
OFF	Flashing	OFF	Wait mode; temperature satisfied, protection delay not over
OFF	OFF	Flashing	Wait mode; temperature satisfied, protection delay over
Flashing	Flashing	Flashing	Test mode
Cycling ³	Cycling ³	OFF	Bad frequency detection
Flashing ⁴	Flashing ⁴	Flashing ⁴	Internal power supply failure

NOTICE > All cycling and flashing is for one (1) second duration unless otherwise specified.

1: LED comes on momentarily during under voltage and over voltage blind time.

2: Every two (2) seconds

3: Every half (0.5) seconds

4: Five (5) times a second

Electronic Control (without Display) (cont.)

True

True

Model Identification

TEC22



Electronic Control (without Display) (cont.)

True

TEC22

Operation

The electronic temperature control...

- Cycles the compressor on and off determined by the return air temperature (see table).
- Automatically defrosts every four (4) hours of compressor run time.
- Initiates an additional defrost if the evaporator coil temperature drops to 9°F (12.8°C).
- Defrosts last either between 4 minute minimum and 40 minute maximum or until the evaporator coil measures 38°F (3.4°C).

Universal Control Settings

Control Setting	Cut-In °F (°C)	Cut-Out °F (°C)	Average Temperature °F (°C)	Defrost Initiation Temperature °F (°C)	Defrost Termination Temperature °F (°C)
#1	43 (6.1)	37 (2.7)	40 (4.4)	9 (12.8)	38 (3.4)
#2	42 (5.5)	36 (2.2)	39 (3.9)	9 (12.8)	38 (3.4)
#3	41 (5.0)	35 (1.6)	38 (3.3)	9 (12.8)	38 (3.4)
#4	40 (4.4)	34 (1.1)	37 (2.8)	9 (12.8)	38 (3.4)
#5	39 (3.8)	33 (0.5)	36 (2.2)	9 (12.8)	38 (3.4)
#6	38 (3.3)	32 (0.0)	35 (1.7)	9 (12.8)	38 (3.4)
#7	37 (2.7)	31 (-0.6)	34 (1.1)	9 (12.8)	38 (3.4)
#8	36 (2.2)	30 (-1.2)	33 (0.5)	9 (12.8)	38 (3.4)
#9	35 (1.6)	29 (-1.7)	32 (0.0)	9 (12.8)	38 (3.4)

Wine/Chocolate Control Settings

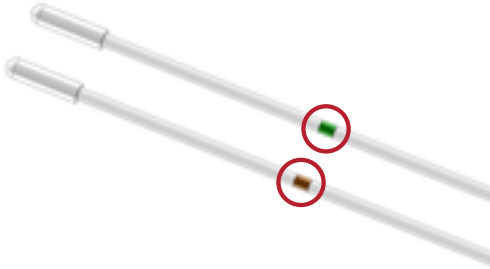
Control Setting	Cut-In °F (°C)	Cut-Out °F (°C)	Avg. Product Temp. °F (°C)	Defrost Initiation Temperature °F (°C)	Defrost Termination Temperature °F (°C)
#1	74 (23.3)	68 (20.0)	71 (21.7)	9 (12.8)	38 (3.4)
#2	70 (21.1)	64 (17.8)	67 (19.5)	9 (12.8)	38 (3.4)
#3	66 (18.9)	60 (15.6)	63 (17.3)	9 (12.8)	38 (3.4)
#4	62 (16.6)	56 (13.3)	59 (15.0)	9 (12.8)	38 (3.4)
#5	58 (14.4)	52 (11.1)	55 (12.8)	9 (12.8)	38 (3.4)
#6	54 (12.2)	48 (8.9)	51 (10.6)	9 (12.8)	38 (3.4)
#7	50 (10.0)	44 (6.7)	47 (8.4)	9 (12.8)	38 (3.4)
#8	46 (7.7)	40 (4.7)	43 (6.2)	9 (12.8)	38 (3.4)
#9	42 (5.5)	36 (2.2)	39 (3.9)	9 (12.8)	38 (3.4)

Electronic Control (without Display) (cont.)

True

TEC22 (cont.)

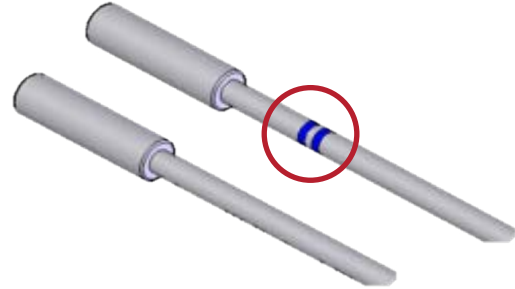
Probe Identification & Resistances



Previous Probes:

White with Green Stripe: Thermostat (return air)

White with Brown Stripe: Defrost (coil)



Current Probes:

White: Thermostat (return air)

White with Blue Stripes: Defrost (coil)

When checking the probe resistance...

- Verify the probe resistance is accurate at the probe location.
 - Use a calibrated thermometer to check the probe location temperature (coil or air temperature).
 - Disconnect the probe from the controller. The probe cannot be plugged into the controller when measuring resistance.
 - Use a calibrated Ohm meter to measure the resistance of the probe
 - The resistance of the probe should match the associated temperature from the temperature to resistance chart.
- Fill a cup full of ice water (use a lot of ice). Put the probe into the ice bath, stir for 1 minute, then measure the resistance with a calibrated Ohm meter. Make sure to keep the probe in the center of the cup.
 - The resistance of the probe should match the associated temperature at 32°F (0°C) as shown in the temperature to resistance chart.

Temperature to Resistance Chart*

Temperature °F (°C)	Resistance K-ohm	Temperature °F (°C)	Resistance K-ohm
-40 (-40)	338.20	41 (5)	25.40
-31 (-35)	243.60	50 (10)	19.90
-22 (-30)	177.50	59 (15)	15.70
-13 (-25)	130.60	68 (20)	12.50
-4 (-20)	97.20	77 (25)	10.00
5 (-15)	72.99	86 (30)	8.10
14 (-10)	55.35	95 (35)	6.50
23 (-5)	42.32	104 (40)	5.30
32 (0)	32.70	113 (45)	4.40

***Subject to Change.** Information is provided to verify cut-in/cut-out range for diagnostic purposes only.

Electronic Control (without Display) (cont.)

True

TEC22 (cont.)

Troubleshooting

In addition to reading the control indicator light codes (see table), note the potential solutions below:

- Check the terminal connections:
 - If the power wires (Live in and Comp) are reversed, the control indicator lights will not light and the compressor will not start.
 - If the probe wires are reversed, the control will not cycle correctly.
- Check if the black probe is touching metal. If so, it is reading surface temperature, not return air temperature.



Indicator Light Codes

REPEATING PATTERN												MEANING
ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	Standby (Knob = Off)
ON	OFF	OFF	OFF	ON	OFF	OFF	OFF	ON	OFF	OFF	OFF	Air probe error
ON	ON	OFF	OFF	ON	ON	OFF	OFF	ON	ON	OFF	OFF	Coil probe error
ON	ON	ON	ON	OFF	OFF	ON	ON	ON	ON	OFF	OFF	Max cold (Knob =9)
ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	Normal operation

Electronic Control (with Display)

Electronic Control (with Display*)

*Display may be remote. You can interact with a display, otherwise it is a thermometer.

Pre-Diagnosis Checks.....	63
Is the product at the correct temperature?	63
Is the issue related to the appliance's operating conditions?	63
Is the evaporator coil frozen?	63
Is there proper airflow outside the appliance?	63
Is there proper airflow inside the appliance around the product?	64
Is the condenser coil dirty?	64
Is the appliance level and supported correctly?	64
Food prep models: Are the food pans being used correctly?	64
Do the appliance components operate correctly?	65
Are doors/drawers self closing (if applicable) and sealing properly?	65
Do the fan motors run correctly?	65
Does the appliance experience a defrost event?	65
Proceed to diagnostic flow chart	65
Diagnostic Flow Chart.....	66
Carel.....	69
Model Identification.....	69
PQ	69
PQ	70
Unlock the control.....	70
Turn off the control	70
Turn on the control	70
Change the set point	71
Initiate manual defrost	71
Change unit of measure	72
Display probe temperature	72
Display Code Definitions.....	74
Probe Identification & Resistances	75

[Continued >](#)

Electronic Control (with Display) (cont.)

Danfoss	76
Model Identification.....	76
ERC.....	76
ETC	76
ERC	77
Unlock the control.....	77
Turn off the control	77
Turn on the control	78
Change the set point	78
Initiate manual defrost	79
Change unit of measure	79
Display probe temperature	80
ETC (Previous Display).....	82
Turn off the control	82
Turn on the control	82
Change the set point	82
Initiate manual defrost	83
Change unit of measure	83
ETC (Current Display).....	84
Differences between Danfoss & LAE displays.....	84
Turn off the control	85
Turn on the control	85
Change the set point	85
Initiate manual defrost	86
Change unit of measure	86
Display Code Definitions.....	87
ERC.....	87
ETC	87
Probe Identifications & Resistances.....	88

Electronic Control (with Display) (cont.)

Dixell.....	89
Model Identification.....	89
XR.....	89
XW.....	89
XR/XW.....	90
Lock/unlock the control.....	90
Change the set point.....	91
Change displayed probe temperature.....	92
Initiate manual defrost.....	94
Download control parameters via hot key.....	95
Display Code Definitions.....	96
Probe Identifications & Resistances.....	97
LAE.....	99
Model Identifications.....	99
AR2/BR1/BIT25.....	99
BR+/CD25/TM.....	99
AR2/BR1/BIT25.....	100
Differences between Danfoss & LAE displays.....	100
Lock/unlock the control.....	101
Turn off the control.....	101
Turn on the control.....	101
Change the set point.....	102
Initiate manual defrost.....	102
Operate light switch.....	103
Change unit of measure.....	103
Display probe temperature.....	104

[Continued >](#)

Electronic Control (with Display) (cont.)

BR+/CD25/TM.....	106
Unlock the control.....	106
Turn off the control.....	106
Turn on the control.....	107
Change the set point.....	107
Initiate manual defrost.....	108
Operate light switch.....	108
Change unit of measure.....	109
Display probe temperature.....	109
Display Code Definitions.....	110
Probe Identification & Resistance.....	111

Electronic Control (with Display) (cont.)

Pre-Diagnosis Checks

Before diagnosing the control, verify the control is the source of the problem. See the following pre-diagnosis checks.

Is the product at the correct temperature?

- If the product is at the correct temperature, the appliance is operating correctly.
- If the product is too warm or too cold, proceed with pre-diagnosis checks

Is the issue related to the appliance's application or operating conditions?

Is the evaporator coil frozen?

A frozen evaporator coil restricts airflow inside the appliance and prevents the appliance from reaching temperature.

Symptoms of the evaporator coil being frozen include...

- The entire coil may be frozen
- The coil may have an uneven frost pattern (front, back, left, right, top, bottom, drain pan, drain hose, etc.)

Causes of a frozen evaporator coil include...

- Doors/drawers not self-closing and sealing properly (see appropriate appliance component operation check)
- Dirty condenser coil (see appropriate pre-diagnosis check)
- The appliance not following its sequence of operation (see "Appliance Sequence of Operation" starting on pg. 30)
- The unit is not level/supported correctly (see appropriate pre-diagnosis check)

Is there proper airflow outside the appliance?

For correct operation, heat inside the appliance is absorbed by the refrigeration system; that heat is then released outside the appliance.

Symptoms of improper airflow outside the unit include...

- Product temperature is too warm
- Product temperature is too cold

Causes of improper airflow outside the unit include...

- Ambient temperature is too high
- Improper clearance around unit (see installation manual)
- Lack of preventative maintenance (see installation manual)
- Improper fan operation (see appropriate appliance component operation check)

[Continued >](#)

Electronic Control (with Display) (cont.)

Is there proper airflow inside the appliance around the product?

For correct operation, heat inside the appliance is absorbed by the refrigeration system; that heat is then released outside the appliance. Air must be able to move throughout the appliance's inside to remove the heat and cool the product.

Symptoms of improper airflow inside the unit include...

- Inconsistent product temperatures throughout the unit
- Some product may be too warm
- Some product may be too cold

Causes of improper airflow inside the unit include...

- Product touching the inside walls (sides, back, door)
- Improper clearance around the evaporator fan motor

Is the condenser coil dirty?

A dirty condenser coil restricts airflow and prevents the refrigeration system from operating efficiently.

Causes of a dirty condenser coil include...

- Lack of preventative maintenance (see installation manual)

Symptoms of a dirty condenser coil include...

- A frozen evaporator coil (see appropriate pre-diagnosis check)
- Refrigeration system failure

Is the appliance level and supported correctly?

If the appliance is level, the doors/drawers close and seal properly and the water drains from inside the evaporator drain pan.

Causes of improper level or support include...

- The appliance is not level (see installation manual)
- The appliance is not supported (see installation manual)

Symptoms of improper level or support include...

- A frozen evaporator coil (see appropriate pre-diagnosis check)
- Doors/Drawers not self-closing (if applicable) and sealing correctly (see appropriate pre-diagnosis check)

Food prep models: Are the food pans being used correctly?

Symptoms of incorrect food pan use include...

- Evaporator coil is frozen from excessive air infiltration (see appropriate pre-diagnosis check)
- Product is too cold due to extended run time or metal pans
- Product is too warm due to infiltration of warm air or double-panning

Electronic Control (with Display) (cont.)

Food prep models: Are the food pans being used correctly? (cont.)

Causes of incorrect food pan use include...

- All food pans are not always in their positions or sitting flat/flush in pan openings
- Product is stored in stacked pans (double-panning) which can make product too warm
- Use of non-OEM food pans (mixing and matching with plastic or metal pans)
- Pans are metal
 - Metal pans may not seal against the pan dividers (such as at the pan corners)
 - Metal food pans are more conductive to temperature and can freeze product

Do the appliance components operate correctly?

Are doors/drawers self-closing (if applicable) and sealing properly?

Door and drawer gaskets must seal properly against the appliance for correct operation.

If self-closing, doors/drawers should close when opened 2-3" (51-76 mm).

Causes of doors/drawers not sealing properly include...

- Torn or defective gasket
- Defective door self-closing mechanism (spring, cord, retractor, etc.)
- Unit is not level/supported properly
- Unit is overstocked

Do the fan motors run correctly?

- Does the condenser fan motor run when the compressor runs?
- Does the condenser fan motor pull air into the condensing coil?
- Does the evaporator fan motor run when the compressor runs?
- **IMPORTANT:** Evaporator fans may cycle with the compressor and/or door operation.
- **IMPORTANT:** An electronic control that cycles the evaporator fan will not cause defrost issues or product temperatures to be out of range.

Does the appliance experience a defrost event?

Defrost events prevent the evaporator coil from freezing (see "Appliance Sequence of Operation" starting on pg. 30)

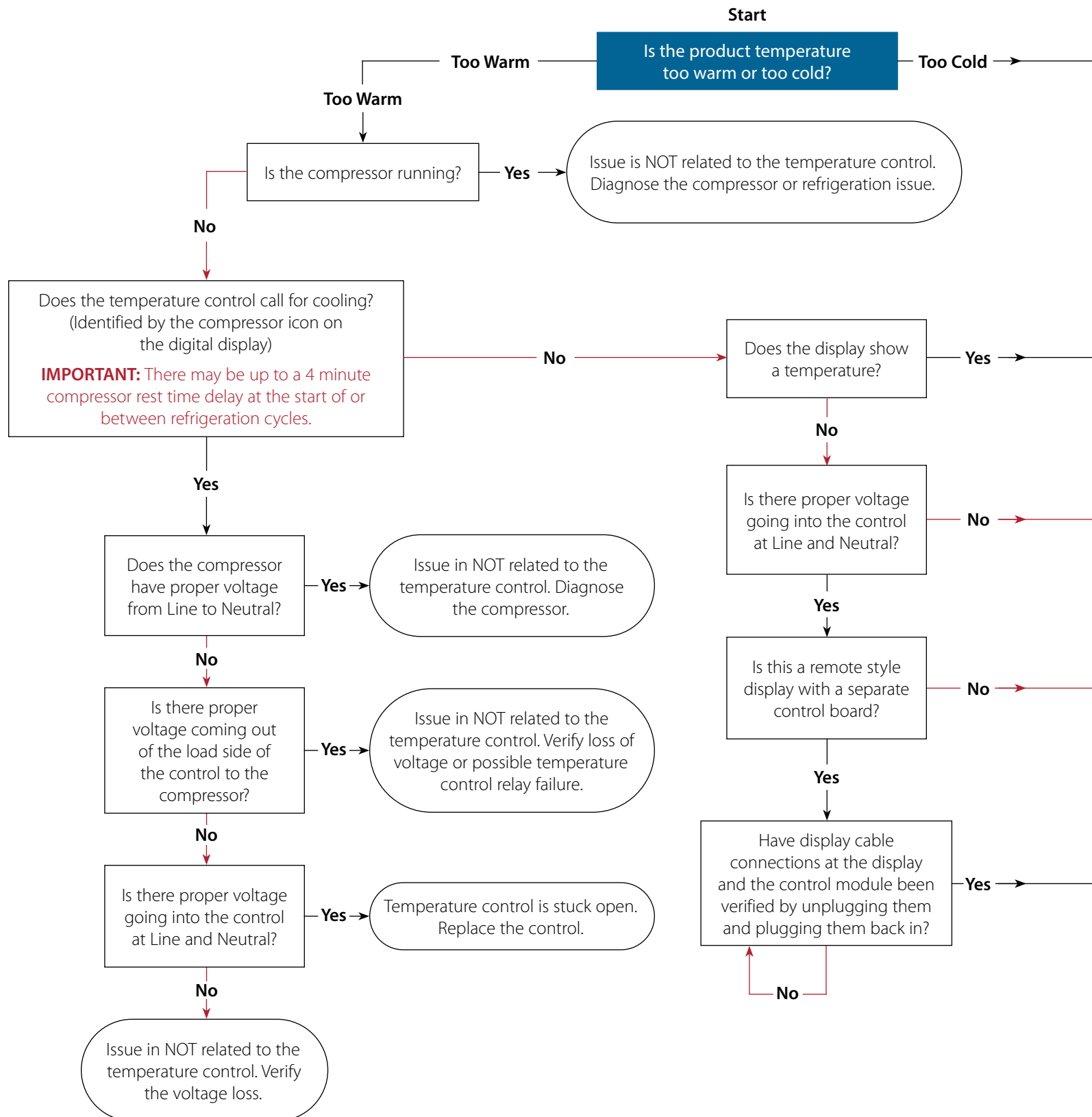
- Refrigerators have an off-cycle defrost with no defrost heaters energized.
- Freezers energize evaporator coil heaters and drain tube heaters.

Proceed to diagnostic flow chart.

If the product temperature is too warm or too cold, the cause of the issue is not related to the application or operating conditions, and the components (excluding control) operate correctly, the problem is likely a control issue. Proceed to diagnostic flowchart.

Electronic Control (with Display) (cont.)

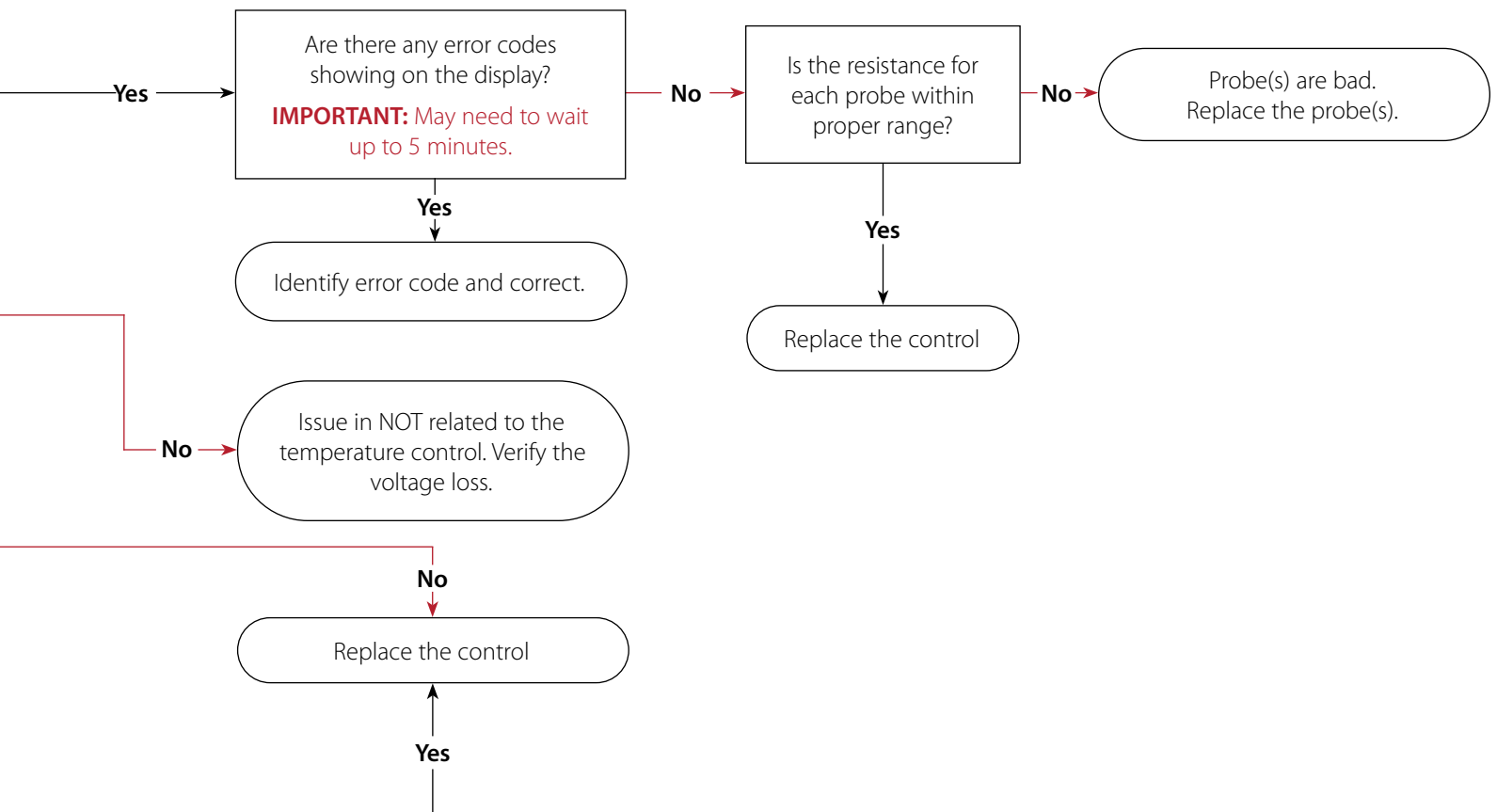
Diagnostic Flow Chart



Electronic Control (with Display) (cont.)

Too Cold

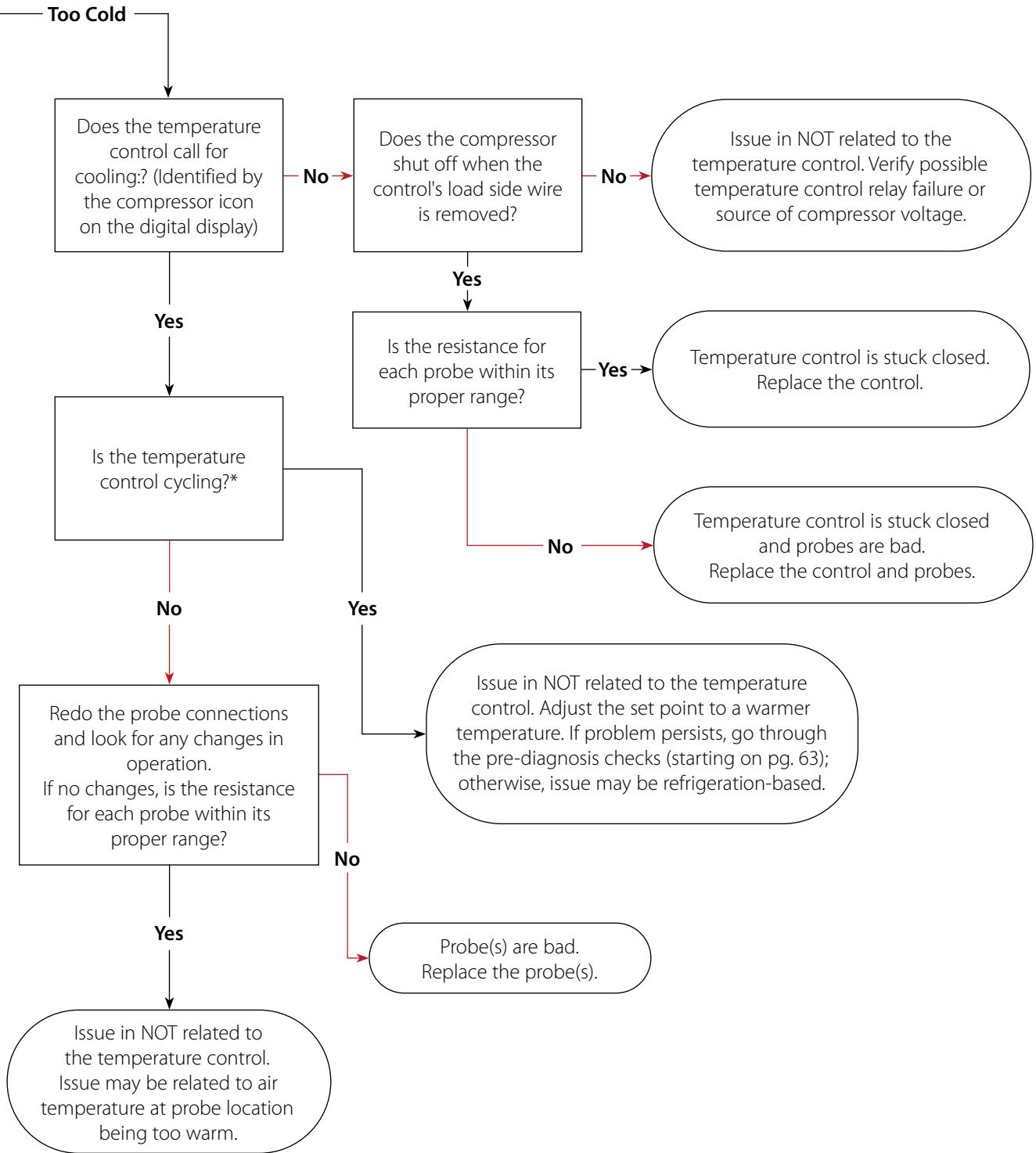
Continued >



Electronic Control (with Display) (cont.)

Diagnostic Flow Chart (cont.)

Continued >



*To verify control operation, you must take the temperature in the same exact location as the control's sensing probe. This probe reads an air temperature.

Electronic Control (with Display) (cont.)

Carel

Carel

Model Identification

PQ



Electronic Control (with Display) (cont.)

Carel

PQ

P Q CONTROL LEGEND



Up Arrow/Power



Set Point/Enter Programming/
Enter/Mute Audible Alarm



Down Arrow/Defrost



Compressor Running



Evaporator Fan Running



Defrost Heaters Energized



Activation of 2nd Parameter Set

Unlock the Control

NOTICE > The control will lock 60 seconds after powering up or staying inactive. You cannot manually lock the control.

1. Press and hold the up arrow . The display show **Loc.**
DO NOT RELEASE THE BUTTON!



2. While still holding the up arrow, press and hold the down arrow until the display shows **unL.**

NOTICE > The control will lock after 60 seconds of inactivity. You cannot manually lock the control



Turn Off the Control

⚠ DANGER!



Risk of electric shock or burn! Powering off an electronic does not remove power from all components. Unplug the appliance or disconnect power before installation or servicing.

1. Unlock the control.

NOTICE > The control will lock after 60 seconds of inactivity.

2. Press and hold the power button until the display shows **OFF.**



Turn On the Control

1. Press and hold the power button until the display shows three (3) dashes and then the current appliance temperature.



Electronic Control (with Display) (cont.)

Carel

PQ (cont.)

P Q CONTROL LEGEND



Up Arrow/Power

Set Point/Enter Programming/
Enter/Mute Audible Alarm

Down Arrow/Defrost



Compressor Running



Evaporator Fan Running



Defrost Heaters Energized




Activation of 2nd Parameter Set

Change the Set Point



Changing the set point adjusts the appliance operation to keep optimal product temperature.

1. Unlock the control. Once unlocked, the display shows **unL** before returning to the current appliance temperature.

NOTICE > The control will lock after 60 seconds of inactivity.

2. Press and hold set . The display shows **SEt** and then shows the current set point.



3. With the up  or down  arrow, adjust the set point to the desired setting.




4. Press and release set. The control saves the setting and shows the current appliance temperature.



Initiate Manual Defrost

A manual defrost clears accumulated frost and ice from the evaporator coil. The defrost will only terminate when a specific preset temperature or duration has been met.

1. Unlock the control.
NOTICE > The control will lock after 60 seconds of inactivity.

2. Press and hold the defrost button  until the display shows **dEF**.



Electronic Control (with Display) (cont.)

Carel

PQ (cont.)

P Q CONTROL LEGEND



Up Arrow/Power



Set Point/Enter Programming/
Enter/Mute Audible Alarm



Down Arrow/Defrost



Compressor Running



Evaporator Fan Running



Defrost Heaters Energized



Activation of 2nd Parameter Set

Change Unit of Measure

1. Unlock the control. Once unlocked, the display shows **unL** before returning to the current appliance temperature.

NOTICE > The control will lock after 60 seconds of inactivity.

2. Press and hold **set** until the display shows **/5**.

NOTICE > When holding **set**, the display will first show **SEt** and then show the current set point. Continue to hold **set** and the display will change to **/5**.



3. Press and release **set**. The display shows the current setting.



0 = Celsius



1 = Fahrenheit

4. With the up or down arrow, change the unit of measure to the desired setting.



5. Leave the control inactive. The control saves the adjusted setting and restarts.

Display Probe Temperature

The display shows temperature probe readings in different locations of the appliance.

1. Unlock the control. Once unlocked, the display shows **unL** before returning to the current appliance temperature.

NOTICE > The control will lock after 60 seconds of inactivity.

2. Press and hold **set** until the display shows **/5**.

NOTICE > When holding **set**, the display will first show **SEt** and then show the current set point. Continue to hold **set** and the display will change to **/5**.



3. Press and release up arrow until the display shows **d/**.



4. Press and release **set**. The display shows the current probe 1 (thermostat) temperature.



Electronic Control (with Display) (cont.)

Carel

PQ (cont.)

P Q CONTROL LEGEND



Up Arrow/Power



Compressor Running

Set Point/Enter Programming/
Enter/Mute Audible Alarm

Evaporator Fan Running



Defrost Heaters Energized



Down Arrow/Defrost



Activation of 2nd Parameter Set

Display Probe Temperature (cont.)

5. Press and release **set** to return to the previous list.



6. Press and release the up arrow. The display shows **d/1**.



7. Press and release **set**. The display shows the current probe 2 (defrost) temperature.



8. Press and release **set** to return to the previous list.



Display Probe Temperature (cont.)

9. Press and release the up arrow. The display shows **d/2**.



10. Press and release **set**. The display shows the current probe 3 (defrost) temperature.

NOTICE > If probe 3 is not active, the display shows **n/A**.



11. Exit the list. Leave the control inactive for 30 seconds.

Electronic Control (with Display) (cont.)

Carel

Display Code Definitions

Display Code Definitions	
dF	Defrost
dOr	Open door alarm
E0	Probe 1 error
E1	Probe 2 error
E2	Probe 3 error
Ed	Defrost ended by maximum defrost time
HI	High temperature alarm
LO	Low temperature alarm

Electronic Control (with Display) (cont.)

Carel

Probe Identification & Resistances



White: Thermostat (return air)

White with Blue Stripe: Defrost (coil)

When checking the probe resistance...

- Verify the probe resistance is accurate at the probe location.
 - Use a calibrated thermometer to check the probe location temperature (coil or air temperature).
 - Disconnect the probe from the controller. The probe cannot be plugged into the controller when measuring resistance.
 - Use a calibrated Ohm meter to measure the resistance of the probe
 - The resistance of the probe should match the associated temperature from the temperature to resistance chart.
- Fill a cup full of ice water (use a lot of ice). Put the probe into the ice bath, stir for 1 minute, then measure the resistance with a calibrated Ohm meter. Make sure to keep the probe in the center of the cup.
 - The resistance of the probe should match the associated temperature at 32°F (0°C) as shown in the temperature to resistance chart.

Temperature to Resistance Chart*

Temperature °F (°C)	Resistance K-ohm	Temperature °F (°C)	Resistance K-ohm
-40 (-40)	338.25	77 (25)	10.00
-31 (-35)	243.55	86 (30)	8.06
-22 (-30)	177.50	95 (35)	6.53
-13 (-25)	130.64	104 (40)	5.33
-4 (-20)	97.21	113 (45)	4.37
5 (-15)	72.00	122 (50)	3.61
14 (-10)	55.35	131 (55)	2.99
23 (-5)	42.33	140 (60)	2.49
32 (0)	32.65	149 (65)	2.09
41 (5)	25.39	158 (70)	1.76
50 (10)	19.90	167 (75)	1.49
59 (15)	15.71	176 (80)	1.26
68 (20)	12.49		

***Subject to Change.** Information is provided to verify cut-in/cut-out range for diagnostic purposes only.

Electronic Control (with Display) (cont.)

Danfoss

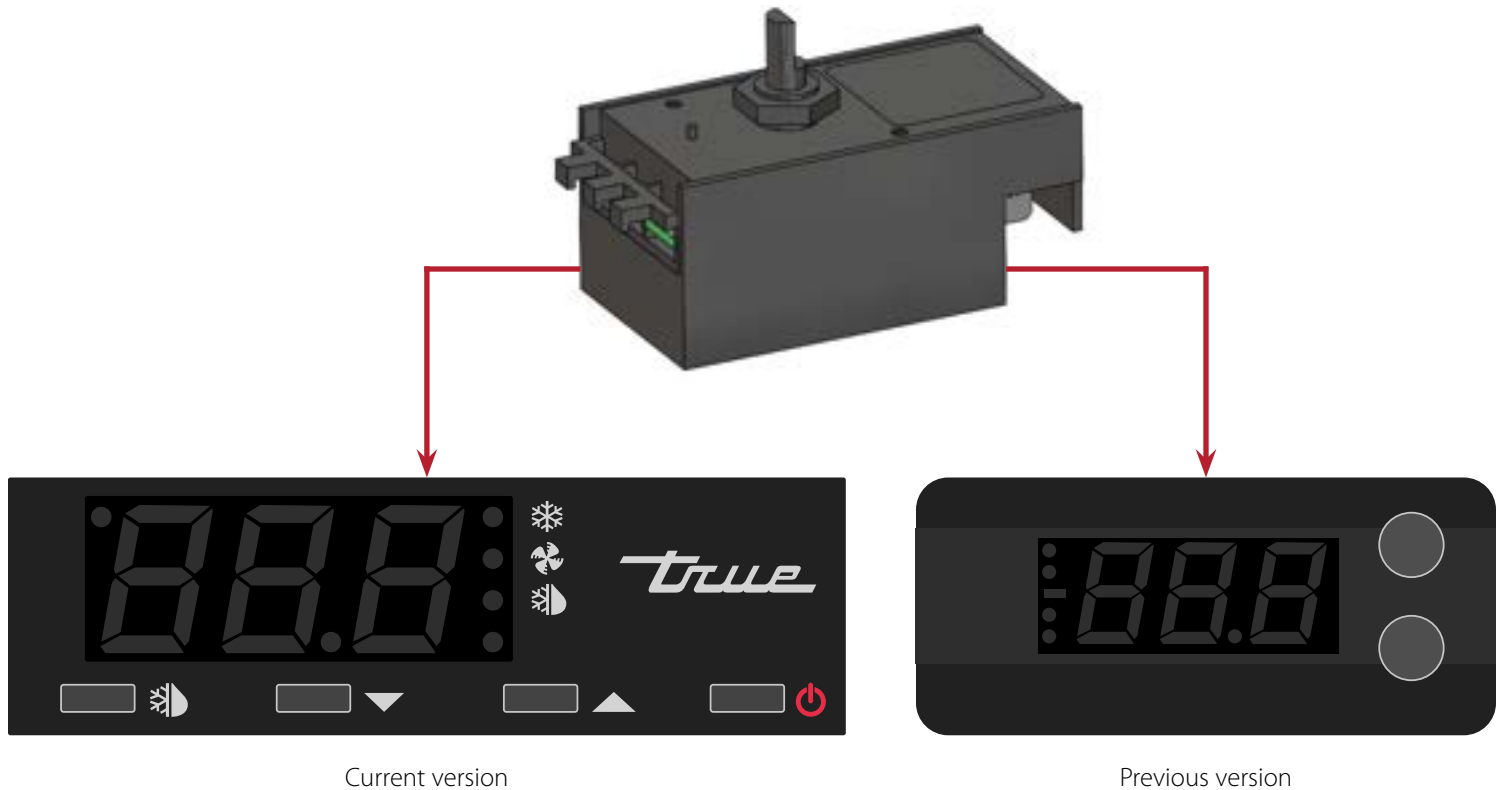
Danfoss

Model Identification

ERC



ETC



Current version

Previous version

Electronic Control (with Display) (cont.)

Danfoss

ERC

DANFOSS ERC CONTROL LEGEND

Defrost/ Back/
Show °F or °CPower/
OkaySet Point/
Up ArrowSet Point/
Down Arrow

Compressor Operation



Evaporator Fan Operation



Cabinet in Defrost



Alarm



Unlock the Control

The display will not lock unless it was originally locked.

NOTICE > The control will lock after 60 seconds of inactivity.

1. Press any button to display the current lock status.



2. If the display shows **unL**, the control is unlocked. If the display shows **Loc**, press and hold the back button  and the up arrow  until the display shows **unL**.




Turn Off the Control

⚠ DANGER!

Risk of electric shock or burn! Powering off an electronic does not remove power from all components. Unplug the appliance or disconnect power before installation or servicing.

NOTICE > May need to unlock the control.

Press and hold the power button  until the display shows **oFF**. The display will then turn blank with a decimal point.



Electronic Control (with Display) (cont.)

Danfoss

ERC (cont.)

DANFOSS ERC CONTROL LEGEND



Defrost/ Back/
Show °F or °C



Power/
Okay



Set Point/
Up Arrow



Set Point/
Down Arrow



Compressor Operation



Evaporator Fan Operation



Cabinet in Defrost



Alarm

Turn On the Control

NOTICE > May need to unlock the control.

Press and hold the power button until the display shows **on**. The display will then show the current appliance temperature.



Change the Set Point

NOTICE > May need to unlock the control.

Changing the set point adjusts the appliance temperature to keep optimal product temperature.

1. Press the up or down arrow to show the current setting.



2. Press the up or down arrow buttons to change the set point to the desired temperature.



3. Leave the display inactive until it shows the current appliance temperature.



Electronic Control (with Display) (cont.)

Danfoss

ERC (cont.)

DANFOSS ERC CONTROL LEGEND

Defrost/ Back/
Show °F or °CPower/
OkaySet Point/
Up ArrowSet Point/
Down Arrow

Compressor Operation



Evaporator Fan Operation



Cabinet in Defrost




Alarm

Initiate Manual Defrost

NOTICE > May need to unlock the control.

A manual defrost clears accumulated frost and ice from the evaporator coil. The defrost will only terminate when a specific preset temperature or duration has been met.


Press and hold the defrost button  until the display shows **dEF**.



Change Unit of Measure

NOTICE > May need to unlock the control.

The display can show the temperature in either Fahrenheit or Celsius.

Press the back button  to change the unit of measure.



Electronic Control (with Display) (cont.)

Danfoss

ERC (cont.)

DANFOSS ERC CONTROL LEGEND



Defrost/ Back/
Show °F or °C



Power/
Okay



Set Point/
Up Arrow



Set Point/
Down Arrow



Compressor Operation



Evaporator Fan Operation



Cabinet in Defrost



Alarm

Display Probe Temperature

The display shows temperature probe readings in different locations of the appliance.

1. Unlock the control. Once unlocked, the display shows **unL**.
NOTICE > The control will lock after 60 seconds of inactivity.



2. At the same time, press and hold both the up and down arrows until the display shows **PAS**.



3. Wait for the display to show **000**.



4. Press the down arrow until the display shows **989**.



Display Probe Temperature (cont.)

5. Press okay . The display shows **PS2**.

NOTICE > After three (3) consecutive incorrect entries, the control locks for 15 minutes.



6. Wait for the display to show **tHE**.



7. Press the up arrow. The display shows **SEr**.



8. Press okay. The display shows **Sdi**.



9. Press the up and down arrow as needed until the display shows **S1S**.



Electronic Control (with Display) (cont.)

Danfoss

ERC (cont.)

DANFOSS ERC CONTROL LEGEND

Defrost/ Back/
Show °F or °C

Power/
Okay



Set Point/
Up Arrow

Set Point/
Down Arrow



Compressor Operation



Evaporator Fan Operation



Cabinet in Defrost



Alarm

Display Probe Temperature (cont.)

10. Press okay to display the probe 1 (thermostat) temperature.



11. Press the back button to return to the previous list.



12. Press the down button. The display show S2S.



13. Press okay to show the current probe 2 (defrost) temperature.



14. Press the back button to return to the previous list.



Display Probe Temperature (cont.)

15. Press the down arrow. The display shows S3S.

NOTICE > If probe 3 is not activated, S3S will not appear.



16. Press okay to show the current probe 3 (defrost) temperature.



17. Press the back button to return to the previous list.



18. Press the down arrow until the display shows S4S.

NOTICE > If probe 4 is not active, S4S will not appear.



19. Press okay to show the current probe 4 (defrost) temperature.



20. Exit the list.

- Press the back button twice (x2).
- Leave the control inactive for 30 seconds.

Electronic Control (with Display) (cont.)

Danfoss

ETC - Previous Display

DANFOSS ETC (PREVIOUS DISPLAY) CONTROL LEGEND



Turn Off the Control

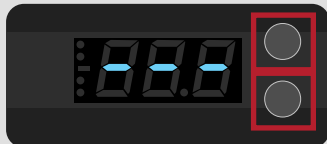
⚠ DANGER!



Risk of electric shock or burn! Powering off an electronic does not remove power from all components. Unplug the appliance or disconnect power before installation or servicing.

Turning off the control deactivates the refrigeration system and all electronic components connected to the control. The lights will remain powered.

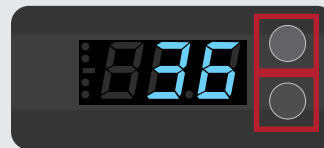
Press and hold the both buttons for six (6) seconds.



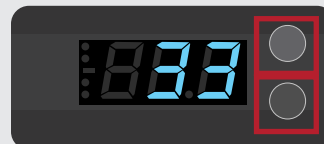
Change the Set Point

Changing the set point adjusts the appliance operation to keep optimal product temperature.

1. Press the top or bottom button for two (2) seconds and then release to display the current set point.

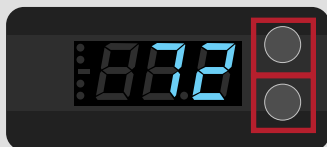


2. Press the top or bottom button until the display shows desired setting. Then release the button.



Turn On the Control

Press both buttons and release.



Electronic Control (with Display) (cont.)

Danfoss

ETC - Previous Display (cont.)

DANFOSS ETC (PREVIOUS DISPLAY) CONTROL LEGEND

**Initiate Manual Defrost**

A manual defrost clears accumulated frost and ice from the evaporator coil. The defrost will only terminate when a specific preset temperature or duration has been met.

Press and hold the bottom button for six (6) seconds. The display show **dEF**.

**Change Unit of Measure**

The display can show the temperature in either Fahrenheit or Celsius

Press and hold the top button for five (5) seconds.



Electronic Control (with Display) (cont.)

Danfoss

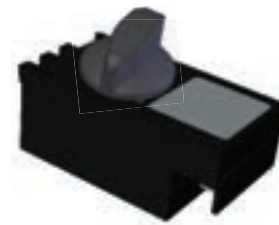
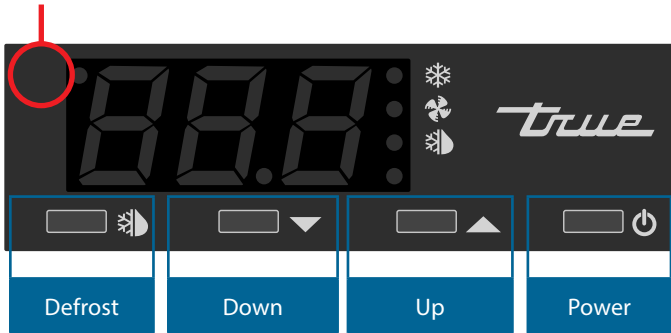
ETC - Current Display

Differences Between Danfoss & LAE Displays

The Danfoss ETC and LAE AR2/BR1/BIT25 controls use very similar displays. See the differences called out below. These displays are NOT interchangeable.

Danfoss Display

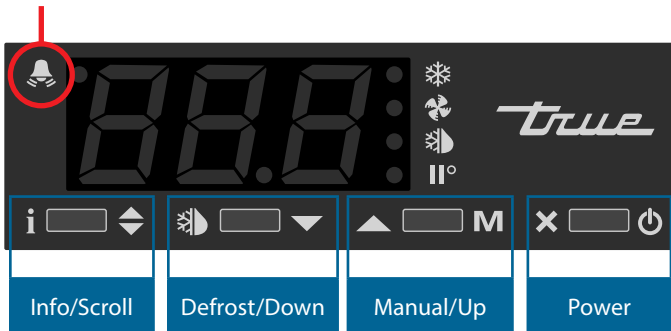
No Alarm Symbol



Danfoss electronic control board

LAE Display

Alarm Symbol



LAE electronic control board

Electronic Control (with Display) (cont.)

Danfoss

ETC - Current Display (cont.)

DANFOSS ETC (CURRENT DISPLAY) CONTROL LEGEND



	Compressor Operation		Manual Defrost		Up Arrow
	Evaporator Fan Operation		Down Arrow		Power
	Defrost Heater Operation				

Turn Off the Control

⚠ DANGER!



Risk of electric shock or burn! Powering off an electronic does not remove power from all components. Unplug the appliance or disconnect power before installation or servicing.

Turning off the control deactivates the refrigeration system and all electronic components connected to the control. The lights will remain powered.

Press and hold the button for five (5) seconds.



Change the Set Point

Changing the set point adjusts the appliance operation to keep optimal product temperature.

1. Press and hold the up arrow until the display shows the current setting.



2. Press the down arrow or up arrow to adjust the setting.



Turn On the Control

Press and hold the power button for five (5) seconds.



Electronic Control (with Display) (cont.)

Danfoss

ETC - Current Display (cont.)

DANFOSS ETC (CURRENT DISPLAY) CONTROL LEGEND



	Compressor Operation		Manual Defrost		Up Arrow
	Evaporator Fan Operation		Down Arrow		Power
	Defrost Heater Operation				

Initiate Manual Defrost

A manual defrost clears accumulated frost and ice from the evaporator coil. The defrost will only terminate when a specific preset temperature or duration has been met.

Press and hold manual defrost until the display show **def**.



Change Unit of Measure

The display can show the temperature in either Fahrenheit or Celsius

1. Press and hold the up arrow for ten (10) seconds. The display shows the current setting.



2. Press the down or up arrow to change the current setting.



Electronic Control (with Display) (cont.)

Danfoss

Display Code Definitions

ERC

Display Code Definitions	
Con	Condenser alarm
deF	Defrost
dor	Door open alarm
E01	S1 sensor failure
E02	S2 sensor failure
E03	S3 sensor failure
E04	S4 sensor failure
EoC	Communication error between control and display
Hi	High Temperature alarm
LEA	Refrigerant leakage alarm
Lo	Low Temperature alarm
non	Display sensor not configured correctly
SYn	Connected display not compatible with control
uHi	High voltage alarm
uLi or uLo	Low voltage alarm

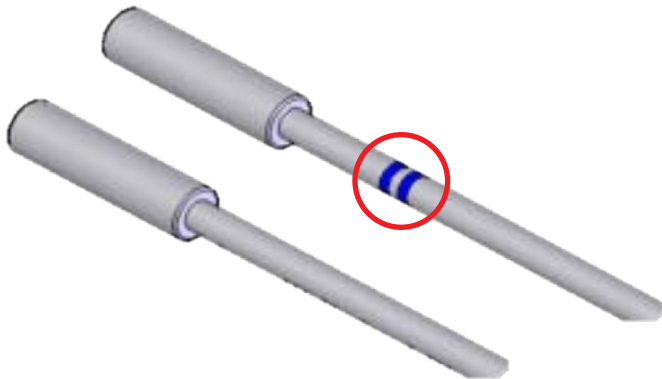
ETC

Display Code Definitions	
E1	Sensor 1 defect
E2	Sensor 2 defect
E4	Compressor fault
E5	Heater fault
E6	Pot fault
E13	Communication error
Hi	High temperature alarm
Lo	Low temperature alarm
Ulo	Low supply voltage
UHi	High supply voltage

Electronic Control (with Display) (cont.)

Danfoss

Probe Identification & Resistances



White: Thermostat (return air)

White with Blue Stripes: Defrost (coil)

When checking the probe resistance...

- Verify the probe resistance is accurate at the probe location.
 - Use a calibrated thermometer to check the probe location temperature (coil or air temperature).
 - Disconnect the probe from the controller. The probe cannot be plugged into the controller when measuring resistance.
 - Use a calibrated Ohm meter to measure the resistance of the probe
 - The resistance of the probe should match the associated temperature from the temperature to resistance chart.
- Fill a cup full of ice water (use a lot of ice). Put the probe into the ice bath, stir for 1 minute, then measure the resistance with a calibrated Ohm meter. Make sure to keep the probe in the center of the cup.
 - The resistance of the probe should match the associated temperature at 32°F (0°C) as shown in the temperature to resistance chart.

Temperature to Resistance Chart*

Temperature °F (°C)	Resistance K-ohm	Temperature °F (°C)	Resistance K-ohm
-67 (-55)	487.89	23 (-5)	21.17
-58 (-50)	338.25	32 (0)	16.33
-49 (-45)	237.69	41 (5)	12.70
-40 (-40)	169.16	50 (10)	9.95
-31 (-35)	121.80	59 (15)	7.86
-22 (-30)	88.77	68 (20)	6.25
-13 (-25)	65.34	77 (25)	5.00
-4 (-20)	48.61	86 (30)	4.03
5 (-15)	36.50	95 (35)	3.27
14 (-10)	27.68	104 (40)	2.67

***Subject to Change.** Information is provided to verify cut-in/cut-out range for diagnostic purposes only.

Electronic Control (with Display) (cont.)

Dixell

Dixell

Model Identification

XR



XW



Electronic Control (with Display) (cont.)

Dixell

XR/XW

DIXELL XR/XW CONTROL LEGEND



Up arrow



Down arrow



Manual defrost



Set point



Power/Stand-by



Compressor operation



Evaporator or condenser fan operation



Defrost operation and/or reversing condenser fan operation



Alarm



Programming mode



Drip time in progress



Lock/Unlock the Control

NOTICE > The control will remain locked/unlocked until manually changed.

1. Press and hold both the up arrow and down arrows for at least three (3) seconds. The display shows **PoF** (locked) or **Pon** (unlocked).



2. Press and hold both the up arrow and down arrows for at least three (3) seconds.



Electronic Control (with Display) (cont.)

Dixell

XR/XW (cont.)

DIXELL XR/XW CONTROL LEGEND



Up arrow



Down arrow



Manual defrost



Set point



Power/Stand-by



Compressor operation



Evaporator or condenser fan operation



Defrost operation and/or reversing condenser fan operation



Alarm



Programming mode





Drip time in progress





Change the Set Point

NOTICE > May need to unlock the control.

1. XR: Press and hold the set button  until the display shows the current setting. The snowflake indicator starts blinking.
XW: Press and immediately release the set button . The display shows the current setting. The snowflake indicator starts blinking.



2. Within ten (10) seconds press the up arrow  or down arrows  until the display shows the desired setting.



3. Press the set button or leave the control inactive for ten (10) seconds. The control saves the new setting.

Electronic Control (with Display) (cont.)

Dixell

XR/XW (cont.)

DIXELL XR/XW CONTROL LEGEND



Up arrow



Down arrow



Manual defrost



Set point



Power/Stand-by



Compressor operation



Evaporator or condenser fan operation



Defrost operation and/or reversing condenser fan operation



Alarm



Programming mode (flashing)



Drip time in progress (flashing)



Change Displayed Probe Temperature

NOTICE > May need to unlock the control.

1. Press and hold both the set button and down arrow until the display shows **HY** (7-10 seconds).



2. Release the buttons. Then press the down arrow until the display shows **Lod** or **Ld**.



3. Press the **set** button . The display shows the current display probe (**P1**, **P2**, or **P3**).



Continued >

Electronic Control (with Display) (cont.)

Dixell

XR/XW (cont.)

DIXELL XR/XW CONTROL LEGEND



Up arrow



Down arrow



Manual defrost



Set point



Power/Stand-by



Compressor operation



Evaporator or condenser fan operation



Defrost operation and/or reversing condenser fan operation



Alarm



Programming mode

(flashing)



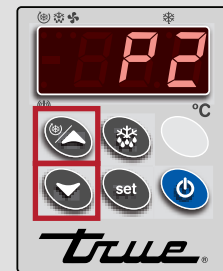
Drip time in progress

(flashing)



Change Displayed Probe Temperature (cont.)

4. Press the up or down arrows until the display shows the desired display probe.



5. Press **set** to save the new setting.



6. Leave the control inactive for ten (10) seconds. The display returns to the current appliance temperature.

Electronic Control (with Display) (cont.)

Dixell

XR/XW (cont.)

DIXELL XR/XW CONTROL LEGEND



Up arrow



Down arrow



Manual defrost



Set point



Power/Stand-by



Compressor operation



Evaporator or condenser fan operation



Defrost operation and/or reversing condenser fan operation



Alarm



Programming mode




Drip time in progress



Initiate Manual Defrost

NOTICE > May need to unlock the control.

Press and hold both the defrost button  until the display shows **deF**.

NOTICE > Defrost will only terminate once a specific preset temperature or a preset time duration is reached.



Electronic Control (with Display) (cont.)

Dixell

XR/XW (cont.)

DIXELL XR/XW CONTROL LEGEND



	Up arrow		Evaporator or condenser fan operation
	Down arrow		Defrost operation and/or reversing condenser fan operation
	Manual defrost		Alarm
	Set point		Programming mode (flashing)
	Power/Stand-by		Drip time in progress (flashing)
	Compressor operation		

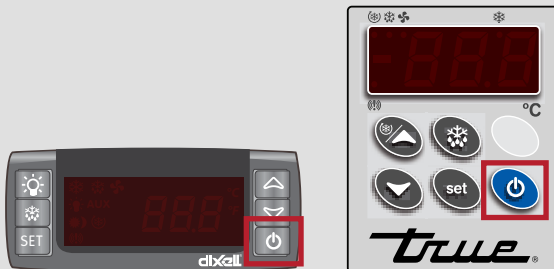


Download Control Parameters via Hot Key

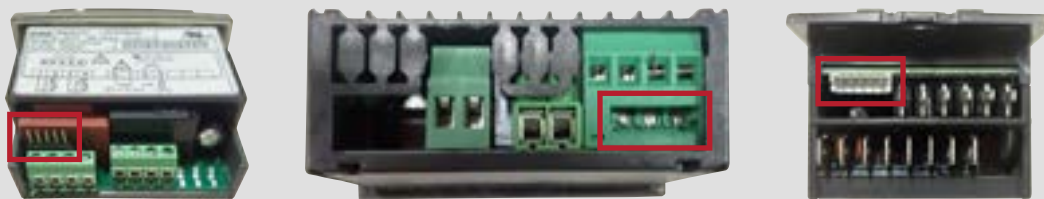
NOTICE > May need to unlock the control.

NOTICE > Parameters vary model to model.

1. Turn off the control or disconnect power.



2. Insert the hot key into the back of the control.



3. Restore power to the control.
4. The parameters automatically download from the hot key to the control. Once the download is complete, the display shows **End**. Remove the hot key.



Electronic Control (with Display) (cont.)

Dixell

Display Code Definitions

NOTICE > To silence an alarm, press any button on the keypad.

Display Code Definitions	
P1	Thermostat probe failure
P2	Evaporator probe failure
P3	Auxiliary probe failure
HA	Maximum temperature alarm
LA	Minimum temperature alarm
EE	Data or memory failure
dA	Door switch alarm
EAL	External alarm
BAL	Serious external alarm
PAL	Pressure switch alarm

Electronic Control (with Display) (cont.)

Dixell

Probe Identification & Resistances



p1: Thermostat (return air)

p2: Defrost (coil)

p3: Display

NOTICE > p3 probe is not installed and/or activated in all applications. If p3 is not installed and/or activated, the display probe is p1.

When checking the probe resistance...

- Verify the probe resistance is accurate at the probe location.
 - Use a calibrated thermometer to check the probe location temperature (coil or air temperature).
 - Disconnect the probe from the controller. The probe cannot be plugged into the controller when measuring resistance.
 - Use a calibrated Ohm meter to measure the resistance of the probe.
 - The resistance of the probe should match the associated temperature from the temperature to resistance chart.
- Fill a cup full of ice water (use a lot of ice). Put the probe into the ice bath, stir for 1 minute, then measure the resistance with a calibrated Ohm meter. Make sure to keep the probe in the center of the cup.
 - The resistance of the probe should match the associated temperature at 32°F (0°C) as shown in the temperature to resistance chart.

Electronic Control (with Display) (cont.)

Dixell

Temperature to Resistance Chart*

Temperature °F (°C)	Resistance K-ohm
-58 (-50)	329.50
-50 (-45)	247.70
-40 (-40)	188.50
-31 (-35)	144.10
-22 (-30)	111.30
-12.5 (-25)	86.43
-4 (-20)	66.77
5 (-15)	53.41
14 (-10)	42.47
23 (-5)	33.90
32 (0)	27.28
41 (5)	22.05
50 (10)	17.96
59 (15)	14.69
68 (20)	12.09
77 (25)	10.00
86 (30)	8.31
95 (35)	6.94
104 (40)	5.83
113 (45)	4.91
122 (50)	4.16
131 (55)	3.54
140 (60)	3.02
149 (65)	2.59
158 (70)	2.23
167 (75)	1.92
176 (80)	1.67
185 (85)	1.45
194 (90)	1.27
203 (95)	1.11
212 (100)	0.97
221 (105)	0.86
230 (110)	0.76
239 (115)	0.53

***Subject to Change.** Information is provided to verify cut-in/cut-out range for diagnostic purposes only.

Electronic Control (with Display) (cont.)

LAE

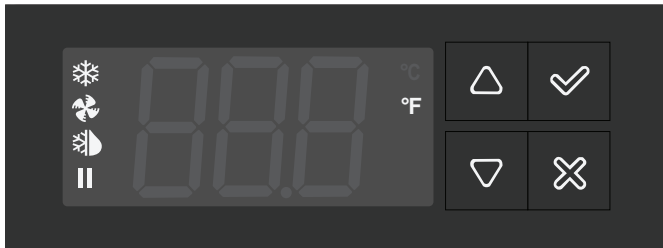
LAE

Model Identification

AR2/BR1/BIT25



BR+/CD25/TM



Electronic Control (with Display) (cont.)

LAE

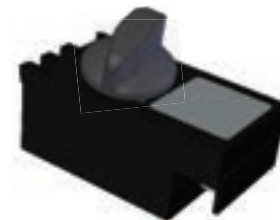
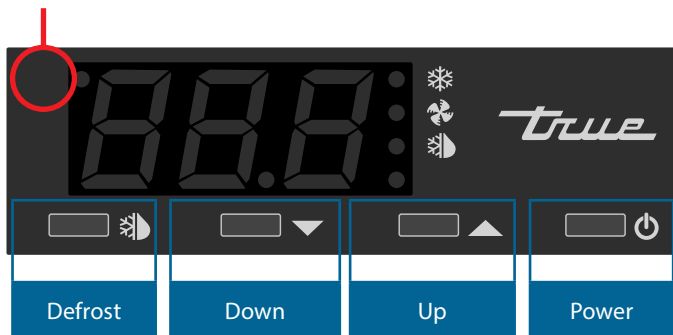
AR2/BR1/BIT25

Differences Between Danfoss & LAE Displays

The Danfoss ETC and LAE AR2/BR1/BIT25 controls use very similar displays. See the differences called out below. These displays are NOT interchangeable.

Danfoss Display

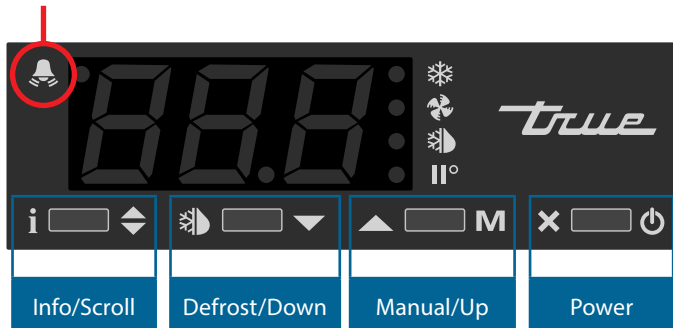
No Alarm Symbol



Danfoss electronic control board

LAE Display

Alarm Symbol



LAE electronic control board

Electronic Control (with Display) (cont.)

LAE

AR2/BR1/BIT25 (cont.)

LAE AR2 / BR1 / BIT25 CONTROL LEGEND



	Compressor Operation		Info/Set Point		Manual Activation/Up Arrow
	Evaporator Fan Operation		Manual Defrost/Down Arrow		Stand-By/Cancel
	Defrost Heater Operation				
	Activation of 2nd Parameter Set				
	Alarm				

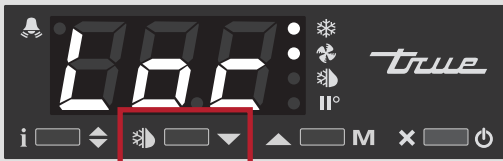
Lock / Unlock the Control

NOTICE > The control will remain locked/unlocked until manually changed.

1. Press info to show **t1**.



2. Press the down arrow to show **Loc**.



3. Press and hold info to show the current lock status.
DO NOT RELEASE THE BUTTON!



YES = Locked



no = Unlocked

4. Press the arrows to change the lock setting.



5. Release all buttons and wait for the control to display the appliance temperature.

Turn Off the Control

⚠ DANGER!



Risk of electric shock or burn! Powering off an electronic does not remove power from all components. Unplug the appliance or disconnect power before installation or servicing.

Turning off the control deactivates the refrigeration system and all electronic components connected to the control. The lights will remain powered.

NOTICE > May need to unlock the control.

Press and hold cancel until the display shows **off**.



Turn On the Control

NOTICE > May need to unlock the control.

Press and hold cancel until the display shows **on**.



Electronic Control (with Display) (cont.)

LAE

AR2/BR1/BIT25 (cont.)

LAE AR2/BR1/BIT25 CONTROL LEGEND



	Compressor Running		Info/Set Point		Manual Activation/Up Arrow
	Evaporator Fan Operation		Manual Defrost/Down Arrow		Stand-By/Cancel
	Appliance in Defrost				
	Activation of 2nd Parameter Set				
	Alarm				

Change the Set Point

NOTICE > May need to unlock the control.

Changing the set point adjusts the appliance temperature to keep optimal product temperature.

1. Press and hold info until the display shows the current setting.

DO NOT RELEASE THE BUTTON!



2. While holding info, press the up or down arrows to adjust the setting.



3. Release all buttons and wait for the control to display the current appliance temperature.

Initiate Manual Defrost

NOTICE > May need to unlock the control.

A manual defrost clears accumulated frost and ice from the evaporator coil. The defrost will only terminate when a specific preset temperature or duration has been met.

Press manual defrost until the display show **deF**.



Electronic Control (with Display) (cont.)

LAE

AR2/BR1/BIT25 (cont.)

LAE AR2 / BR1 / BIT25 CONTROL LEGEND



	Compressor Operation		Info/Set Point		Manual Activation/Up Arrow
	Evaporator Fan Operation		Manual Defrost/Down Arrow		Stand-By/Cancel
	Defrost Heater Operation				
	Activation of 2nd Parameter Set				
	Alarm				

Operate Light Switch

NOTICE > May need to unlock the control.

1. Press and hold the up arrow until the lights turn on or off.



2. Release the button.

Change Unit of Measure

NOTICE > May need to unlock the control.

The display can show the temperature in either Fahrenheit or Celsius.

1. Press and hold both info and cancel until the display shows **MdL** or **SPL**.



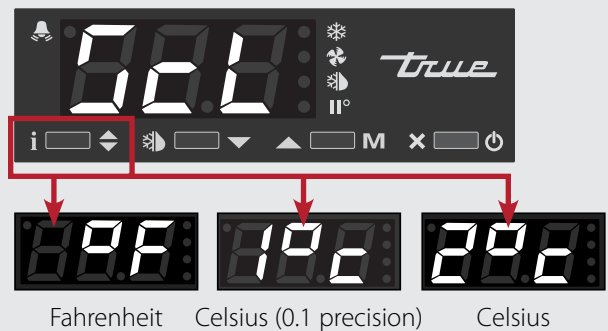
2. Press the down arrow until the display shows **Scl**.



3. Press and hold info until the display shows the current unit of measure.

DO NOT RELEASE THE BUTTON!

- °F: Fahrenheit (no decimal)
- 1°C: Celsius (0.1 precision)
- 2°C: Celsius (no decimal)



Continued >

Electronic Control (with Display) (cont.)

LAE

AR2/BR1/BIT25 (cont.)

LAE AR2/BR1/BIT25 CONTROL LEGEND



	Compressor Running		
	Evaporator Fan Operation		
	Appliance in Defrost		
	Activation of 2nd Parameter Set		
	Alarm		

Change Unit of Measure (cont.)

- While holding info, press the up or down arrow to change the unit of measure.
- Release all buttons and wait for the control to display the current appliance temperature.

Display Probe Temperature

The display shows the temperature probe readings in different locations of the appliance.

- Press info to show **t1**.



- Press and hold info to show the current **t1** probe temperature.



- Release info to show **t2**.



- Press and hold info to show the current **t1** probe temperature.


[Continued >](#)

Electronic Control (with Display) (cont.)

LAE

AR2/BR1/BIT25 (cont.)

LAE AR2 / BR1 / BIT25 CONTROL LEGEND



	Compressor Operation		Info/Set Point		Manual Activation/Up Arrow
	Evaporator Fan Operation		Manual Defrost/Down Arrow		Stand-By/Cancel
	Defrost Heater Operation				
	Activation of 2nd Parameter Set				
	Alarm				

Display Probe Temperature (cont.)

5. Release info to show **t3**.

NOTICE > If the T3 probe is not active, t3 will not appear.



6. Press and hold info to show the current **t1** probe temperature.



7. Release all buttons and wait for the control to display the current appliance temperature.

Electronic Control (with Display) (cont.)

LAE

BR+/CD25/TM

LAE BR+ / CD25 / TM CONTROL LEGEND



Set Point/
Up Arrow



Confirm/ Lights/
Info Menu



Set Point/
Down Arrow



Cancel/ Back/
Power



Compressor Operation



Evaporator Operation



Defrost Heater Operation



Activation of 2nd
Parameter Set

Unlock the Control

1. Press and hold confirm for 5 seconds. The display will flash **inF** and then show **Loc**.



2. Press confirm to show the current lock status.



YES = Locked



no = Unlocked

3. If **YES**, press the down arrow to change the setting to **no**.



4. Press confirm .



5. The control saves the setting and proceeds to the next item in the info menu.

NOTICE > The control will lock after 60 seconds of inactivity.

Turn Off the Control

⚠ DANGER!



Risk of electric shock or burn! Powering off an electronic does not remove power from all components. Unplug the appliance or disconnect power before installation or servicing.

Turning off the control deactivates the refrigeration system and all electronic components connected to the control. The lights will remain powered.

1. Unlock the control. Once unlocked, the display shows **ScL**.



2. Press cancel . The display shows the current appliance temperature.



3. Press and hold cancel until the display shows **oFF**.

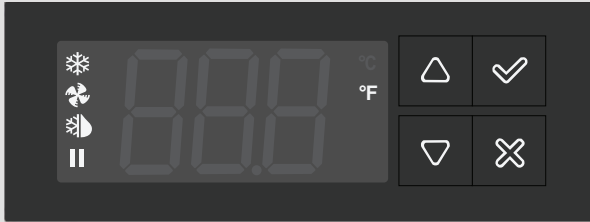


Electronic Control (with Display) (cont.)

LAE

BR+/CD25/TM (cont.)

LAE BR+/CD25/TM CONTROL LEGEND

Set Point/
Up ArrowConfirm/ Lights/
Info MenuSet Point/
Down ArrowCancel/ Back/
Power

Compressor Operation



Evaporator Operation



Defrost Heater Operation

Activation of 2nd
Parameter Set

Turn On the Control

1. Unlock the control. Once unlocked, the display shows **Scl**.



2. Press cancel [X]. The display shows **oFF**.



3. Press and hold cancel until the display shows the current appliance temperature.



Change the Set Point

Changing the set point adjusts the appliance operation to keep optimal product temperature.

1. Unlock the control. Once unlocked, the display shows **Scl**.



2. Press cancel [X]. The display shows the current appliance temperature.



3. Press and hold the up [Up Arrow] or down [Down Arrow] arrow until the display shows **SP**.



4. With the up or down arrow, adjust the set point to the desired setting.



5. Press confirm [Confirm]. The control saves the setting and the display returns to the current appliance temperature.



Electronic Control (with Display) (cont.)

LAE

BR+/CD25/TM (cont.)

LAE BR+ / CD25 / TM CONTROL LEGEND



△ Set Point/
Up Arrow

✓ Confirm/ Lights/
Info Menu

❄ Compressor Operation

🌀 Evaporator Operation

☀ Defrost Heater Operation

|| Activation of 2nd
Parameter Set

▽ Set Point/
Down Arrow

✕ Cancel/ Back/
Power

Initiate Manual Defrost

A manual defrost clears accumulated frost and ice from the evaporator coil. The defrost will only terminate when a specific preset temperature or duration has been met.

1. Unlock the control. Once unlocked, the display shows **ScL**.



2. Press cancel ✕. The display shows the current appliance temperature.



3. Press and hold the up △ and down ▽ arrow until the display shows **dEF**.



Operate Light Switch

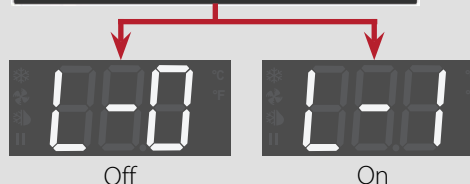
1. Unlock the control. Once unlocked, the display shows **ScL**.



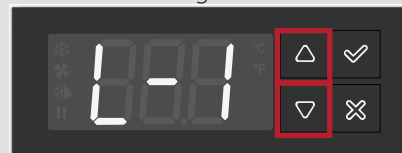
2. Press cancel ✕. The display shows the current appliance temperature.



3. Press and hold confirm ✓ until the display shows the current light setting.



4. Press the up △ or down ▽ arrow until the display shows the desired setting.



5. Press confirm. The display shows the current appliance temperature.

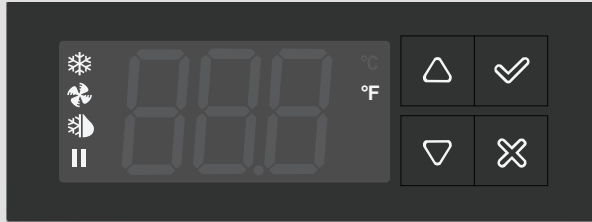


Electronic Control (with Display) (cont.)

LAE

BR+/CD25/TM (cont.)

LAE BR+/CD25/TM CONTROL LEGEND



△ Set Point/
Up Arrow

✓ Confirm/ Lights/
Info Menu



Compressor Operation



Evaporator Operation



Defrost Heater Operation



Activation of 2nd
Parameter Set

▽ Set Point/
Down Arrow

✕ Cancel/ Back/
Power

Change Unit of Measure

1. Unlock the control. Once unlocked, the display shows **Scl**.



2. Press confirm ✓ to show the current unit of measure.



Fahrenheit



Celsius

3. Press the up △ or down ▽ arrows to change the system of measure.



4. With the display showing the desired setting, press confirm ✓.



5. The control saves the setting and proceeds to the next item in the info menu.

Display Probe Temperatures

1. Press and hold confirm ✓ for 5 seconds. The display will flash **inF** and then show **Loc**.



2. Press the up △ or down ▽ arrow until the display shows **t1**. This is the thermostat probe.



3. Press confirm. The display shows the current **t1** reading.



4. Press confirm. The display shows **t2**. This is the defrost probe.



5. Press confirm. The display shows the current **t2** reading.



6. Press cancel ✕ twice (x2). The display shows the current appliance temperature.



Electronic Control (with Display) (cont.)

LAE

Display Code Definitions

Display Code Definitions	
dEF	Defrost in progress
oFF	Controller in stand-by
do	Door open alarm
t1	Instant Probe 1 temperature
t2	Instant Probe 2 temperature
t3	Instant Probe 3 temperature
hi	High temperature alarm
Lo	Low temperature alarm
E1	Probe T1 failure
E2	Probe T2 failure
E3	Probe T3 failure
thi	Maximum Probe 1 temperature recorded
tLo	Minimum Probe 1 temperature recorded
Loc	Keypad state lock

Electronic Control (with Display) (cont.)

LAE

Probe Identification & Resistances



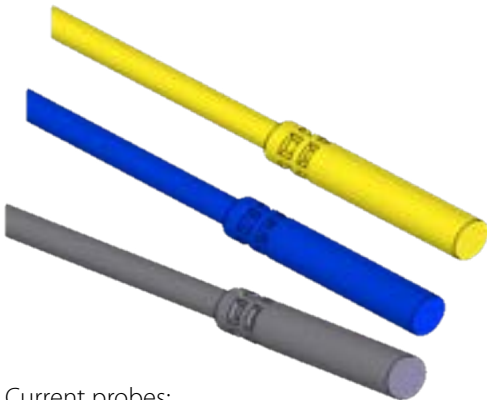
Previous probes:

t1: Thermostat (return air)

t2: Defrost (coil)

t3: Display

NOTICE > t3 probe is not installed and/or activated in all applications. If t3 is not installed and/or activated, the display probe is t1.



Current probes:

t1 (gray): Thermostat (return air)

t2 (blue): Defrost (coil)

t3 (yellow): Multifunction

NOTICE > t3 probe is not installed and/or activated in all applications. If t3 is not installed and/or activated, the display probe is t1.

When checking the probe resistance...

- Verify the probe resistance is accurate at the probe location.
 - Use a calibrated thermometer to check the probe location temperature (coil or air temperature).
 - Disconnect the probe from the controller. The probe cannot be plugged into the controller when measuring resistance.
 - Use a calibrated Ohm meter to measure the resistance of the probe
 - The resistance of the probe should match the associated temperature from the temperature to resistance chart.
- Fill a cup full of ice water (use a lot of ice). Put the probe into the ice bath, stir for 1 minute, then measure the resistance with a calibrated Ohm meter. Make sure to keep the probe in the center of the cup.
 - The resistance of the probe should match the associated temperature at 32°F (0°C) as shown in the temperature to resistance chart.

Electronic Control (with Display) (cont.)

LAE

Probe Identification & Resistances (cont.)

Temperature to Resistance Chart*

Temperature °F (°C)	Resistance K-ohm	Temperature °F (°C)	Resistance K-ohm
-40 (-40)	195.65	113 (45)	4.92
-31 (-35)	148.17	122 (50)	4.16
-22 (-30)	113.35	131 (55)	3.54
-13 (-25)	87.56	140 (60)	3.01
-4 (-20)	68.24	149 (65)	2.59
5 (-15)	53.65	158 (70)	2.23
14 (-10)	42.51	167 (75)	1.93
23 (-5)	33.89	176 (80)	1.67
32 (0)	27.22	185 (85)	1.45
41 (5)	22.02	194 (90)	1.27
50 (10)	17.93	203 (95)	1.15
59 (15)	14.67	212 (100)	0.97
68 (20)	12.08	221 (105)	0.86
77 (25)	10.00	230 (110)	0.76
86 (30)	8.32	239 (115)	0.67
95 (35)	6.95	248 (120)	0.60
104 (40)	5.83	257 (125)	0.53

***Subject to Change.** Information is provided to verify cut-in/cut-out range for diagnostic purposes only.

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

Mechanical Control

Mechanical Control

Types of Controls.....	116
Coil sensing.....	116
Air sensing.....	116
Pre-Diagnosis Checks.....	117
Is the product at the correct temperature?	117
Is the issue related to the appliance's operating conditions?	117
Is the evaporator coil frozen?	117
Is there proper airflow outside the appliance?	117
Is there proper airflow inside the appliance around the product?	118
Is the condenser coil dirty?	118
Is the appliance level and supported correctly?	118
Food prep models: Are the food pans being used correctly?	118
Do the appliance components operate correctly?	119
Are door/drawers self-closing (if applicable) and sealing properly?	119
Do the fan motors run correctly?	119
Does the appliance experience a defrost event?	119
Proceed to diagnostic flow chart	119
Diagnostic Flow Chart.....	120
Temperature Ranges by Control Part Number	122
Danfoss	124
Model Identification.....	124
Danfoss.....	124
High Altitude Adjustment	124
Required tools.....	125
Procedure	125

Mechanical Control (cont.)

GE	126
Model Identification.....	126
GE.....	126
High Altitude Adjustment.....	126
Required tools.....	127
Procedure	127
Ranco/Cutter Hammer	128
Model Identification.....	128
Ranco/Cutler Hammer	128
High Altitude Adjustment.....	128
Required tools.....	129
Procedure	129

Mechanical Control (cont.)

Types of Controls

There are two types of mechanical controls: Coil sensing and Air sensing.

Coil Sensing

An evaporator coil sensing temperature control (see fig. 1) ensures the evaporator coil remains clear of frost and ice by not letting the compressor restart until the coil temperature is above freezing [32°F (0°C)]. This is called an off cycle defrost.

NOTICE > Some deli appliances with gravity coil systems use a regular defrost cycle without heaters to assist in clearing the coil.

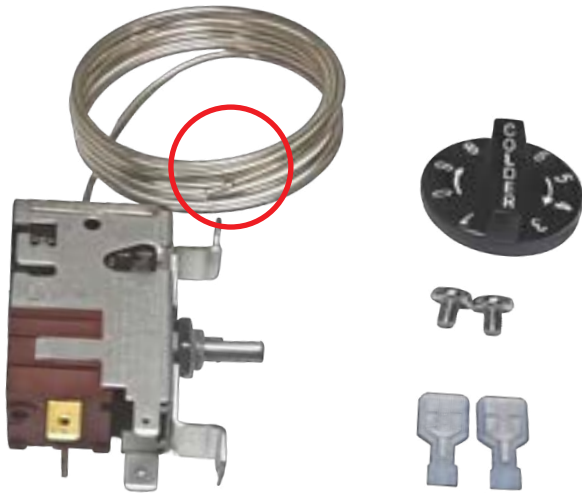


Fig. 1. Coil sensing control. The end of the sensor is straight.

Air Sensing

An air sensing temperature control (see fig. 2) used in a freezer application requires a defrost cycle with heaters to ensure that the evaporator coil is kept clear of frost and ice.

EXCEPTION > Air sensing controls used in wine/chocolate applications do not utilize a defrost cycle because evaporator coil temperatures are above freezing.

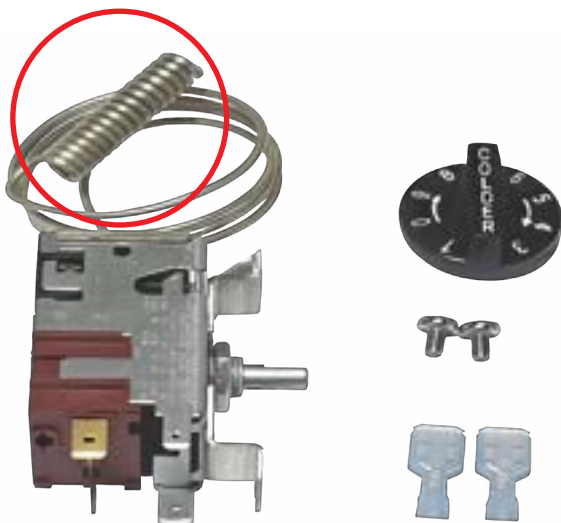


Fig. 2. Air sensing control. The end of the sensor is coiled (pigtailed).

Mechanical Control (cont.)

Pre-Diagnosis Checks

Before diagnosing the control, verify the control is the source of the problem. See the following pre-diagnosis checks.

Is the product at the correct temperature?

- If the product is at the correct temperature, the appliance is operating correctly.
- If the product is too warm or too cold, proceed with pre-diagnosis checks

Is the issue related to the appliance's application or operating conditions?

Is the evaporator coil frozen?

A frozen evaporator coil restricts airflow inside the appliance and prevents the appliance from reaching temperature.

Symptoms of the evaporator coil being frozen include...

- The entire coil may be frozen
- The coil may have an uneven frost pattern (front, back, left, right, top, bottom, drain pan, drain hose, etc.)

Causes of a frozen evaporator coil include...

- Doors/drawers not self-closing and sealing properly (see appropriate appliance component operation check)
- Dirty condenser coil (see appropriate pre-diagnosis check)
- The appliance not following its sequence of operation (see "Appliance Sequence of Operation" starting on pg. 30)
- The unit is not level/supported correctly (see appropriate pre-diagnosis check)

Is there proper airflow outside the appliance?

For correct operation, heat inside the appliance is absorbed by the refrigeration system; that heat is then released outside the appliance.

Symptoms of improper airflow outside the unit include...

- Product temperature is too warm
- Product temperature is too cold

Causes of improper airflow outside the unit include...

- Ambient temperature is too high
- Improper clearance around unit (see installation manual)
- Lack of preventative maintenance (see installation manual)
- Improper fan operation (see appropriate appliance component operation check)

[Continued >](#)

Mechanical Control (cont.)

Is there proper airflow inside the appliance around the product?

For correct operation, heat inside the appliance is absorbed by the refrigeration system; that heat is then released outside the appliance. Air must be able to move throughout the appliance's inside to remove the heat and cool the product.

Symptoms of improper airflow inside the unit include...

- Inconsistent product temperatures throughout the unit
- Some product may be too warm
- Some product may be too cold

Causes of improper airflow inside the unit include...

- Product touching the inside walls (sides, back, door)
- Improper clearance around the evaporator fan motor

Is the condenser coil dirty?

A dirty condenser coil restricts airflow and prevents the refrigeration system from operating efficiently.

Causes of a dirty condenser coil include...

- Lack of preventative maintenance (see installation manual)

Symptoms of a dirty condenser coil include...

- A frozen evaporator coil (see appropriate pre-diagnosis check)
- Refrigeration system failure

Is the appliance level and supported correctly?

If the appliance is level, the doors/drawers close and seal properly and the water drains from inside the evaporator drain pan.

Causes of improper level or support include...

- The appliance is not level (see installation manual)
- The appliance is not supported (see installation manual)

Symptoms of improper level or support include...

- A frozen evaporator coil (see appropriate pre-diagnosis check)
- Doors/Drawers not self-closing (if applicable) and sealing correctly (see appropriate pre-diagnosis check)

Food prep models: Are the food pans being used correctly?

Symptoms of incorrect food pan use include...

- Evaporator coil is frozen from excessive air infiltration (see appropriate pre-diagnosis check)
- Product is too cold due to extended run time or metal pans
- Product is too warm due to infiltration of warm air or double-panning

Mechanical Control (cont.)

Food prep models: Are the food pans being used correctly? (cont.)

Causes of incorrect food pan use include...

- All food pans are not always in their positions or sitting flat/flush in pan openings
- Product is stored in stacked pans (double-panning) which can make product too warm
- Use of non-OEM food pans (mixing and matching with plastic or metal pans)
- Pans are metal
 - Metal pans may not seal against the pan dividers (such as at the pan corners)
 - Metal food pans are more conductive to temperature and can freeze product

Do the appliance components operate correctly?

Are doors/drawers self-closing (if applicable) and sealing properly?

Door and drawer gaskets must seal properly against the appliance for correct operation.

If self-closing, doors/drawers should close when opened 2-3" (51-76 mm).

Causes of doors/drawers not sealing properly include...

- Torn or defective gasket
- Defective door self-closing mechanism (spring, cord, retractor, etc.)
- Unit is not level/supported properly
- Unit is overstocked

Do the fan motors run correctly?

- Does the condenser fan motor run when the compressor runs?
- Does the condenser fan motor pull air into the condensing coil?
- Does the evaporator fan motor run when the compressor runs?
 - **IMPORTANT:** Evaporator fans may cycle with the compressor and/or door operation.
 - **IMPORTANT:** An electronic control that cycles the evaporator fan will not cause defrost issues or product temperatures to be out of range.

Does the appliance experience a defrost event?

Defrost events prevent the evaporator coil from freezing (see "Appliance Sequence of Operation" starting on pg. 30)

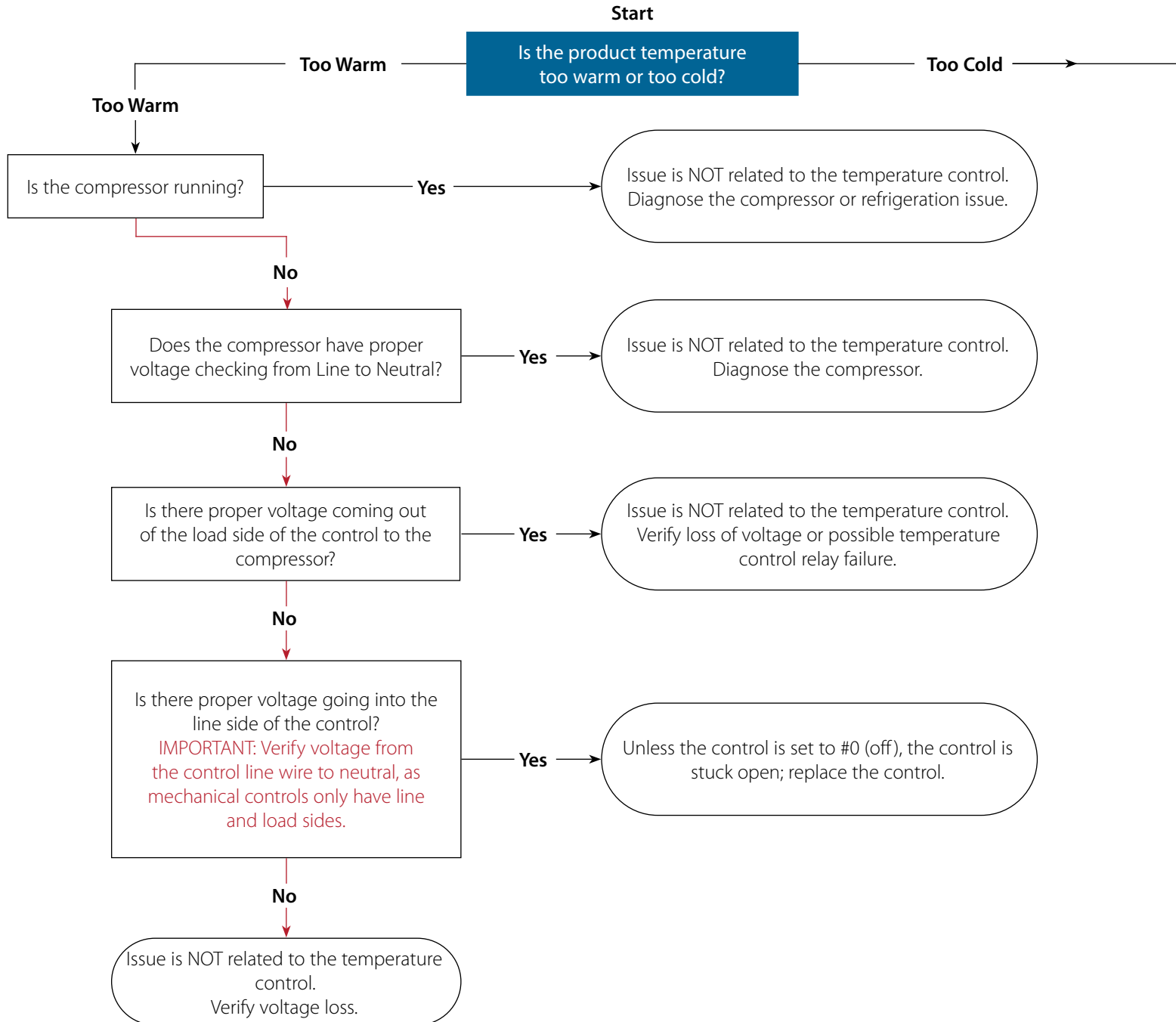
- Refrigerators have an off-cycle defrost with no defrost heaters energized.
- Freezers energize evaporator coil heaters and drain tube heaters.

Proceed to diagnostic flow chart.

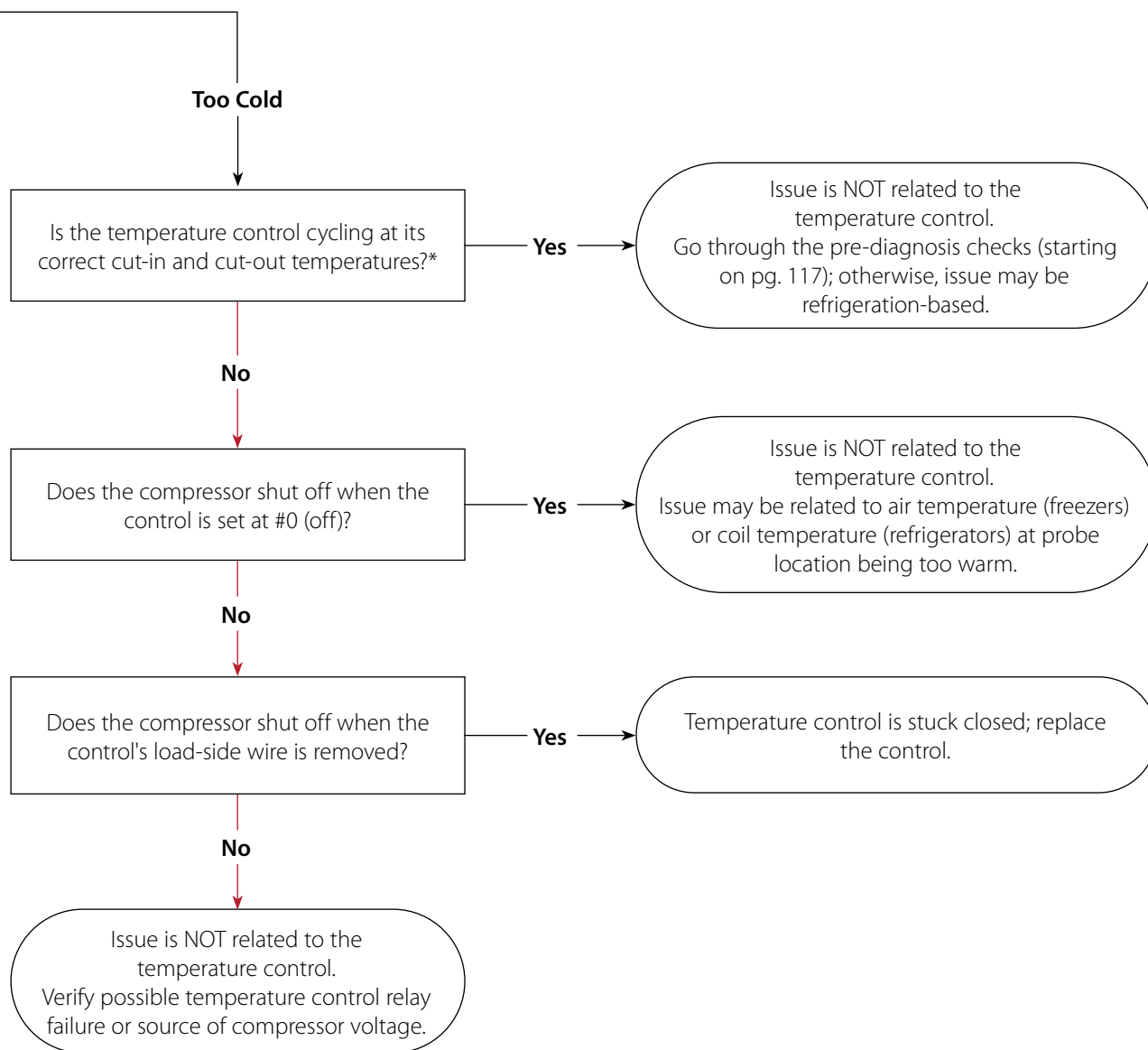
If the product temperature is too warm or too cold, the cause of the issue is not related to the application or operating conditions, and the components (excluding control) operate correctly, the problem is likely a control issue. Proceed to diagnostic flowchart.

Mechanical Control (cont.)

Diagnostic Flow Chart



Mechanical Control (cont.)



*To verify control operation, you must take the temperature in the same exact location as the control's sensor. This location may be in the evaporator coil (refrigerator) or air temperature (freezer).

Mechanical Control (cont.)

Temperature Ranges by Control Part Number

NOTICE!



Some appliances with 1/2 horsepower compressor may use a temperature control relay that may need to be diagnosed.

The control operates within the cut-in and cut-out temperatures described in the temperature range by control part number table.

Cut-in: The temperature the control turns on at

Cut-out: The temperature the control turns off at

See figs. 1 and 2 for guidance on where to check the temperature while diagnosing a control.

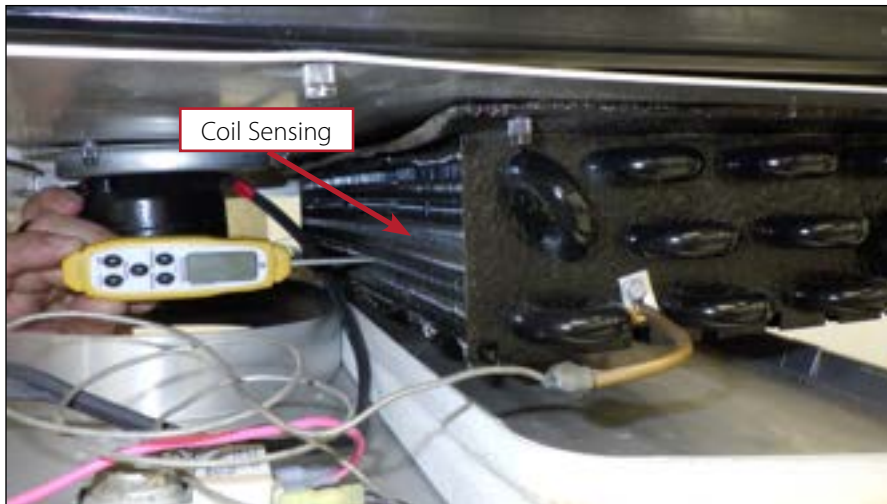


Fig. 1. For coil sensing controls, check the coil temperature as close as possible to the sensor inside the evaporator coil.

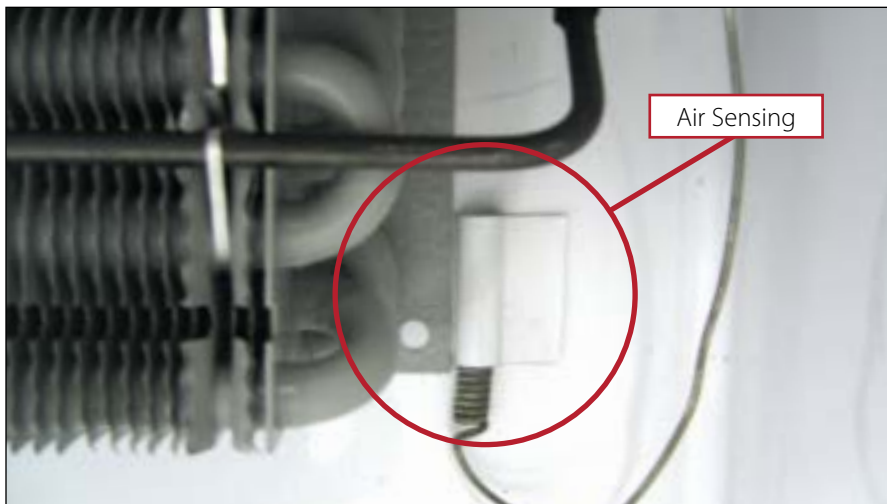


Fig. 2. For air sensing controls, check the air temperature as close as possible to the coiled end (pigtail) of the sensor.

Mechanical Control (cont.)

Temperature Range by Part Number*

True P/N	True P/N (Kit)	MFG P/N	Application	Cut-In °F (°C)	Cut-Out °F (°C)
800303		9531N376		35.0 (1.7)	14.5 (-9.7)
800304		9530N1490		-8.5 (-22.5)	-14.5 (-25.8)
800306		9531N251		40.0 (4.4)	19.0 (-7.2)
800312		9530N1284		8.5 (-22.5)	-14.5 (-25.8)
800313		9531N335		36.5 (2.5)	16.0 (-8.9)
800320		9530N1185		32.5 (0.3)	26.5 (-3.1)
800325		9530N1318	Red Wine, Chocolate	62.0 (16.7)	55.0 (12.8)
800335		9530N1376		38.0 (3.3)	20.0 (-6.7)
800340		9530N1155		26.1 (-3.3)	10.9 (-11.7)
800345	988271	077B1264		-2.6 (-19.2)	-15.5 (-26.6)
800357		9530266		-3.0 (-19.4)	-8.0 (-22.2)
800358		077B1214		-8.5 (-22.7)	-14.4 (-26.0)
800363		9530C311		-2.6 (-19.2)	-12.5 (-24.7)
800366	988282	077B6806		37 (2.8)	16.5 (-8.7)
800368	988285	077B6857		39.6 (4.3)	26.2 (-3.2)
800369	988266	077B1212		-2.6 (-19.4)	-12.3 (-24.8)
800370	988267	077B1216		-4.0 (-20.2)	-15.3 (-26.5)
800371	988286	077B6863	High Altitude	41.9 (5.5)	23.7 (-4.6)
800382	988284	077B6856		37.2 (2.9)	18.1 (-7.8)
800383	988268	077B1227		0.3 (-17.8)	-5.6 (-21.1)
800384	988270	077B1229		24.8 (-4.0)	18.7 (-7.4)
800385	988269	077B1228	White Wine	44.2 (6.8)	34.7 (1.5)
800386	988287	077B6871		43.2 (6.3)	20.1 (-6.7)
800387	988288	077B6887	Flower Cooler	39.2 (4.0)	21.2 (-6.0)
800390		9530N1329	Super Nova	13.1 (-10.5)	8.1 (-13.3)
800393	988283	077B6827		41.7 (5.4)	20.5 (-6.4)
800395		931N370	High Altitude	40.0 (4.4)	22.8 (-5.1)
800399		9530C304		0.4 (-17.6)	-5.4 (-20.8)
822212	988291	CAP-075-174R	Heated	165.0 (73.9)	174.0 (78.9)
822213	988289	077B6894		37.0 (2.8)	21.6 (-5.8)
822214	988273	077B1309		32.0 (0.0)	17.9 (-7.9)
822223	988274	077B1331		25.7 (-3.5)	8.6 (-13.0)
831931	988272	077B1277		-2.0 (-19.0)	-9.0 (-23.0)
831932		3ART56VAA4		40.0 (4.4)	18.0 (-7.8)
831987	988265	077B0995	Red Wine, Chocolate	57.2 (14.1)	49.6 (9.9)
908854	988290	077B6926		36.3 (2.4)	10.4 (-12.1)
908975	988275	077B1352		-12.1 (-24.7)	-25.1 (-32.0)
911427	988276	077B1354		37.6 (3.1)	26.2 (-3.2)
913382	988277	077B1367		-11.0 (-24.1)	-22.5 (-30.5)
917838	988278	077B1369		0.3 (-17.8)	-14.1 (-25.8)
930794	988279	091X9775		41.5 (5.3)	24.9 (-3.9)
933190	988280	077B3264		41.7 (5.4)	19.4 (-7.1)
942659	988281	077B3315		39.6 (4.3)	26.2 (-3.2)
952478		077B3347		43.2 (6.3)	20.1 (-6.7)
954800		077B3531		41.9 (5.5)	23.7 (-4.6)
958745		3ART55VAA4		39.2 (4.0)	17.6 (-8.0)
958747	988264	077B3548		37.2 (2.9)	18.1 (-7.8)
958857		3ART5VAA198		8.0 (-13.3)	-6.0 (-21.1)
959268	988294	3ART55VAA3		39.6 (4.2)	26.2 (-3.2)
960640	988296	3ART55VAA5		43.1 (6.2)	20.2 (-6.6)
962728		3ART55VAA6		41.8 (5.4)	20.4 (-6.4)
963056		3ART55VAA2		39.2 (4.0)	15.8 (-9.0)

*Subject to Change. All temperatures are at midpoint setting #5. All temperatures have a +/- 2° variance. True recommends replacing the OEM control with the same part number.

Mechanical Control (cont.)

Danfoss

Danfoss

Model Identification

Danfoss



High Altitude Adjustment

⚠ DANGER!



Risk of electric shock or burn!

Setting temperature controls to the 0 (off) position DOES NOT remove power from all components. Unplug the appliance or disconnect power before installation or servicing.

⚠ WARNING!



Sharp edges!

Take care when moving, installing, cleaning, servicing, and maintaining the appliance to avoid cuts. Be sure to take care when reaching under the appliance or handling metal components.

! USER ACTION!



Only make control adjustments for high altitude locations. Appliances ordered with high altitude temperature controls are pre-calibrated and **do not require adjustment**. See the Temperature Range by Part Number table (pg. 123) to determine if your control is pre-calibrated.



Mechanical Control (cont.)

Danfoss

High Altitude Adjustment (cont.)

Mechanical temperature controls are affected by the lower pressure of high altitude applications. The control cuts in and out at colder temperatures than a control in an application closer to sea level. **Adjust the cut-in and cut-out settings to warmer temperatures** per the instructions.

Required Tools

Required tools include (but may not be limited to) the following:

- 5/64" Allen Wrench
- T-7 Torx Bit

Procedure

1. Unplug the appliance or disconnect power.
2. Carefully access the temperature control body.
NOTICE > If removed, be sure to note which wire goes to which spade terminal.
3. Determine the desired adjustment. Each 1/4 turn of the adjustment screws is equal to approximately 2°F (1.1°C).
4. Turn the cut-in and cut-out adjustment screws (see fig. 1) the desired amount clockwise.
NOTICE > DO NOT turn the adjustment screws more than one (1) full turn.
NOTICE > After making adjustment, measure temperature during three cycles before adjusting again.
5. Reinstall removed/moved parts.
6. Restore power and verify operation.

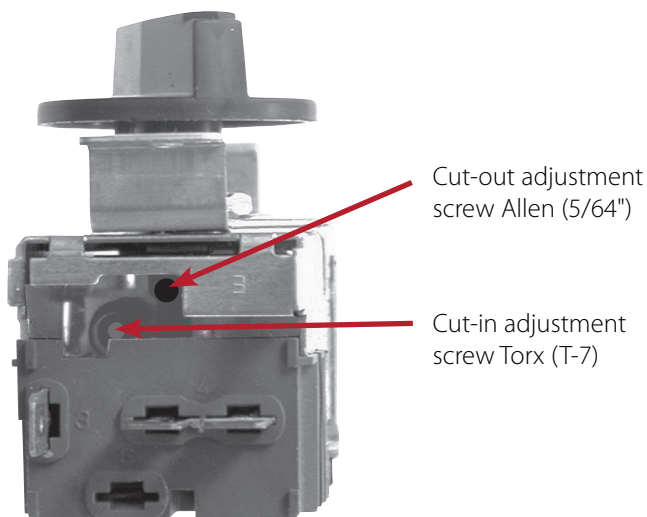


Fig. 1. Cut-in and cut-out adjustment screw locations on the control's bottom.

Mechanical Control (cont.)

GE

GE

Model Identification

GE



High Altitude Adjustment

⚠ DANGER!



Risk of electric shock or burn!

Setting temperature controls to the 0 (off) position DOES NOT remove power from all components. Unplug the appliance or disconnect power before installation or servicing.

⚠ WARNING!



Sharp edges!

Take care when moving, installing, cleaning, servicing, and maintaining the appliance to avoid cuts. Be sure to take care when reaching under the appliance or handling metal components.

! USER ACTION!



Only make control adjustments for high altitude locations. Appliances ordered with high altitude temperature controls are pre-calibrated and **do not require adjustment**. See the Temperature Range by Part Number table (pg. 123) to determine if your control is pre-calibrated.



Mechanical Control (cont.)

GE

High Altitude Adjustment (cont.)

Mechanical temperature controls are affected by the lower pressure of high altitude applications. The control cuts in and out at colder temperatures than a control in an application closer to sea level. **Adjust the cut-in and cut-out settings to warmer temperatures** per the instructions.

Required Tools

Required tools include (but may not be limited to) the following:

- Small flat blade screwdriver

Procedure

1. Unplug the appliance or disconnect power.
2. Carefully access the temperature control body.
NOTICE > If removed, be sure to note which wire goes to which spade terminal.
3. Remove the control knob.
4. Consult the Clockwise Turn by Elevation table. Then, turn the calibration screw (see fig. 1) the advised amount clockwise.
NOTICE > Only adjust the calibration screw on the face of the control (next to the cam) behind the knob; this calibration screw adjusts both cut-in and cut-out temperature.
NOTICE > Each 1/4 turn (15/60) of the calibration screw is equal to approximately 2°F (1.1°C). **DO NOT** adjust more than a 3/4 (40/60) turn total.
5. Reinstall removed/moved parts.
6. Restore power and verify operation.

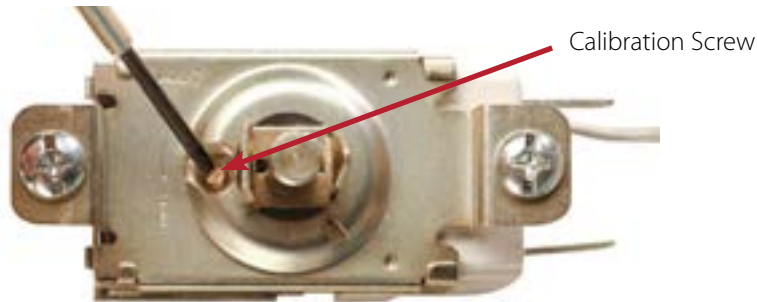
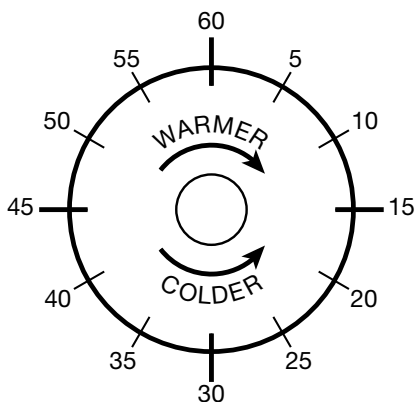


Fig. 1. Calibration screw location on the control face behind the knob.



Guide for measuring rotation required for altitude correction.

Clockwise Turn by Elevation

Elevation	Clockwise Turn* (60 = full turn)
2000' (609.6 m)	7/60
3000' (914.4 m)	11/60
4000' (1219.2 m)	15/60
5000' (1524 m)	19/60
6000' (1828.2 m)	23/60
7000' (2133.6 m)	27/60
8000' (2438.4 m)	30/60
9000' (2743.2 m)	34/60
10,000' (3048 m)	37/60
* DO NOT adjust more than a 3/4 (40/60) turn total.	

Mechanical Control (cont.)

Ranco/Cutler Hammer

Ranco/Cutler Hammer

Model Identification

Ranco/Cutler Hammer



High Altitude Adjustment

⚠ DANGER!



Risk of electric shock or burn!

Setting temperature controls to the 0 (off) position DOES NOT remove power from all components. Unplug the appliance or disconnect power before installation or servicing.

⚠ WARNING!



Sharp edges!

Take care when moving, installing, cleaning, servicing, and maintaining the appliance to avoid cuts. Be sure to take care when reaching under the appliance or handling metal components.

! USER ACTION!



Only make control adjustments for high altitude locations. Appliances ordered with high altitude temperature controls are pre-calibrated and **do not require adjustment**. See the Temperature Range by Part Number table (pg. 123) to determine if your control is pre-calibrated.



Mechanical Control (cont.)

Ranco/Cutler Hammer

High Altitude Adjustment (cont.)

Mechanical temperature controls are affected by the lower pressure of high altitude applications. The control cuts in and out at colder temperatures than a control in an application closer to sea level. **Adjust the cut-in and cut-out settings to warmer temperatures** per the instructions.

Required Tools

Required tools include (but may not be limited to) the following:

- 5/64" Allen wrench
- T-7 Torx Bit

Procedure

1. Unplug the appliance or disconnect power.
2. Adjust the temperature control to the #9 position.
3. Carefully access the temperature control body (see fig. 1).

NOTICE > If removed, be sure to note which wire goes to which spade terminal.
4. Consult the Counterclockwise Turn by Elevation table. Then, turn the cut-in and cut-out adjustment screws (see fig. 2) the advised amount counterclockwise.

NOTICE > After making adjustment, measure temperature during three cycles before adjusting again.
5. Reinstall removed/moved parts.
6. Restore power and verify operation.

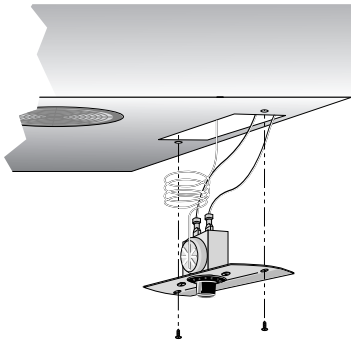


Fig. 1. Access the control body.

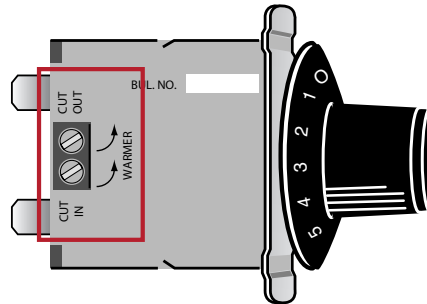
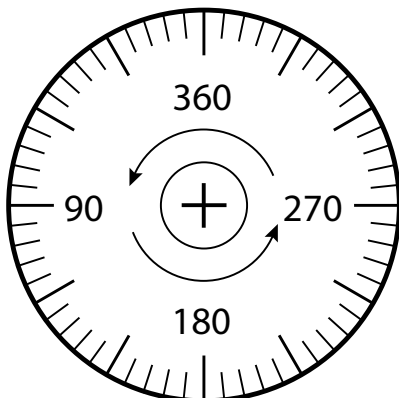


Fig. 2. Cut-in and cut-out adjustment screw location.



Guide for measuring degrees of rotation for altitude correction. The arrows indicate direction of screw rotation.

Counterclockwise Turn by Elevation

Elevation	Counterclockwise Turn (360° per full turn)
2000' (609.6 m)	42°
3000' (914.4 m)	78°
4000' (1219.2 m)	114°
5000' (1524 m)	150°
6000' (1828.2 m)	186°
7000' (2133.6 m)	222°
8000' (2438.4 m)	258°
9000' (2743.2 m)	294°
10,000' (3048 m)	330°

Defrost Timers

Defrost Timers

Paragon.....	132
Model Identification.....	132
Paragon.....	132
Freezer Models.....	132
Location.....	132
Adjust time of day.....	133
Adjust timer settings.....	133
Grasslin.....	134
Model Identification.....	134
Grasslin.....	134
Freezer Models*.....	134
Location.....	134
Adjust time of day.....	135
Adjust timer settings.....	135
TCGG/TDBD/TSID.....	136
Location.....	136
Adjust time of day.....	136
Adjust timer settings.....	137
T-19F/19FZ/23F.....	138
Location.....	138
Adjust time of day.....	138
Adjust timer settings.....	139

* Excludes T-19F/19FZ/23F.

Defrost Timers (cont.)

- Mallory..... 140
 - Model Identification..... 140
 - Mallory..... 140
 - T-GC & TUC/TWT-27F/48F/60F/72F 140
 - Location 141
 - Adjust defrost cycle start time 141
 - Wiring..... 142
- Paragon & Grasslin Conversion..... 143
 - Paragon Wiring 143
 - Grasslin Wiring 143

Defrost Timers (cont.)

Paragon

Paragon

Model Identification

Paragon



Freezer Models

(time initiated; temperature terminated)

- Time initiated: The defrost cycle begins at a specific time.
- Temperature terminated: The defrost cycle ends when the temperature probe reaches a preset temperature. Due to a time termination backup, defrost cycle cannot exceed 20 min.

All refrigeration equipment operating below 30°F (-1.11°C) accumulates frost on the evaporator coil and require routine defrost.

True has factory-set your defrost timer to a recommended time, duration, and quantity of defrost cycles. Your True appliance has been set for three (3) defrost cycles spread throughout the day (6am, 2pm, and 10pm). If you decide to change the defrost time settings, please see "Adjust Timer Settings."

During defrost...

- Temperature sensors disconnect heaters to keep the appliance from overheating.
- Temperature sensors delay the fan motors once the defrost cycle has been completed to prevent the circulation of warm air inside the appliance.

Location

The defrost timers are located behind the front louver grill.

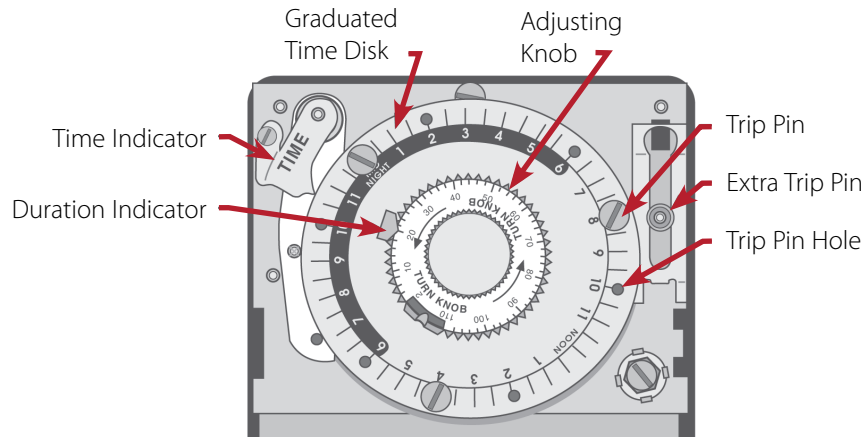
- Single door models: Lower right corner
- Two door models: Left of the centered ballast box
- Three door models: Left upright post

Defrost Timers (cont.)

Paragon

Adjust Time of Day

Turn the adjustment knob counterclockwise until the time indicator aligns with the current time day on the outer graduated time disk.



Adjust Timer Settings

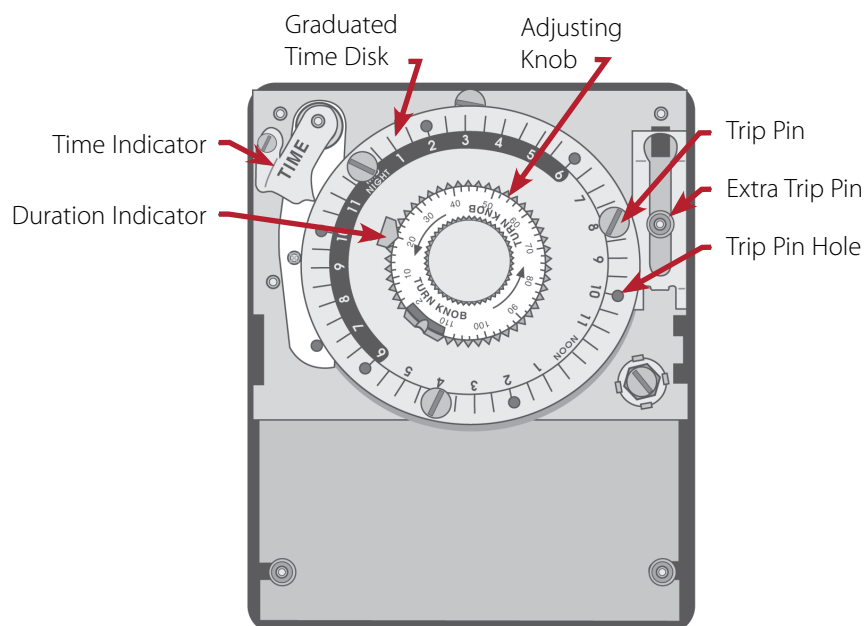
! NOTICE!



- Always follow the manufacturer's recommended settings when adjusting the quantity and duration of defrost cycles.
- If not set for the recommended minimum quantity of defrost cycles and duration, the coil may develop excessive frost. This may lead to system failure and produce loss, which is not covered by warranty.

True recommends three (3) defrost cycles per day, spread evenly throughout the day.
A defrost cycle should not exceed 30 min.

- To adjust when a defrost cycle begins, move a trip pin to a different trip pin hole in the outer graduated time disk.
- To add an additional defrost, use the extra trip pin.
- To adjust the duration, press down and slide the duration indicator. Do not exceed 30 min.



Defrost Timers (cont.)

Grasslin

Grasslin

Model Identification

Grasslin



Freezer Models*

***Excludes T-19F/19FZ/23F.** See other section (pg. 138).

(time initiated; temperature terminated)

- Time initiated: The defrost cycle begins at a specific time.
- Temperature terminated: The defrost cycle ends when the temperature probe reaches a preset temperature. Due to a time termination backup, defrost cycle cannot exceed 30 min.

All refrigeration equipment operating below 30°F (-1.11°C) accumulates frost on the evaporator coil and require routine defrost.

True has factory-set your defrost timer to a recommended time, duration, and quantity of defrost cycles. Your True appliance has been set for defrost cycles spread throughout the day (most freezer models: 6am, 2pm, and 10pm; GDM-72F & T-72FG: 2am, 8am, 2pm, 8pm). If you decide to change the defrost time settings, please see "Adjust Timer Settings."

During defrost...

- Temperature sensors disconnect heaters to keep the appliance from overheating.
- Temperature sensors delay the fan motors once the defrost cycle has been completed to prevent the circulation of warm air inside the appliance.

Location

Behind the front louvered grill inside the electrical box or in a separate gray timer box.

Defrost Timers (cont.)

Grasslin

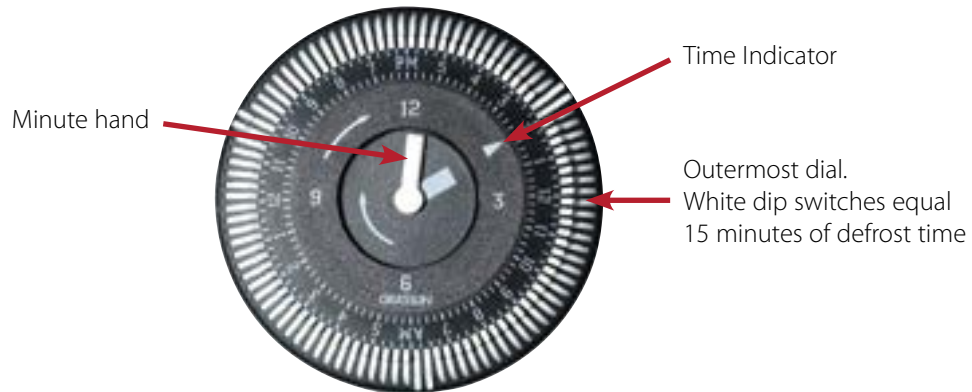
Freezer Models* (cont.)

***Excludes T-19F/19FZ/23F.** See other section (pg. 138).

Adjust Time of Day

1. Unplug the appliance or disconnect power.
2. Turn the innermost dial's minute hand clockwise until the time of day on the outer dial aligns with the time indicator (white triangle marker).

NOTICE > DO NOT adjust the time of day by rotating the outer dial.



Adjust Timer Settings

! NOTICE!

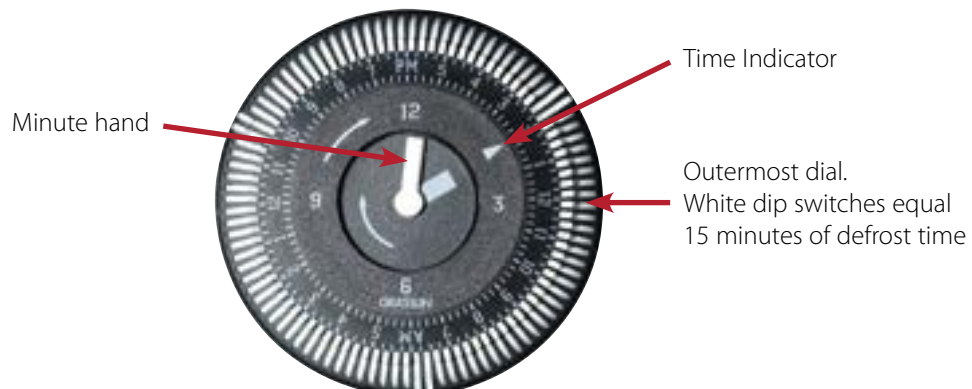


- Always follow the manufacturer's recommended settings when adjusting the quantity and duration of defrost cycles.
- If not set for the recommended minimum quantity of defrost cycles and duration, the coil may develop excessive frost. This may lead to system failure and produce loss, which is not covered by warranty.

- True recommends three (3) (or four (4) for GDM-72F & T-72FG) defrost cycles minimum per day, spread evenly throughout the day.
- High usage, high temperature, or high humidity applications may require four (4) defrost cycles spread evenly throughout the day.
- A defrost cycle should not exceed 30 minutes (two (2) dip switches).
- Each dip switch represents 15 minutes of defrost time.

1. Locate the desired defrost time on the outer dial.
2. Flip the corresponding dip switch outward.

NOTICE > To remove defrost time, flip the dip switch inward.



Defrost Timers (cont.)

Grasslin

TCGG/TDBD/TSID

(time initiated; temperature terminated)

- Time initiated: The defrost cycle begins at a specific time.
- Time terminated: The defrost cycle ends after a preset time duration.

All refrigeration equipment operating below 30°F (-1.11°C) accumulates frost on the evaporator coil and require routine defrost.

True has factory-set your defrost timer to a recommended time, duration, and quantity of defrost cycles. Your True appliance has been set for defrost cycles spread throughout the day (6am, 2pm, and 10pm). If you decide to change the defrost time settings, please see "Adjust Timer Settings."

During defrost...

- The appliance does not operate. The appliance goes through a natural defrost.

Location

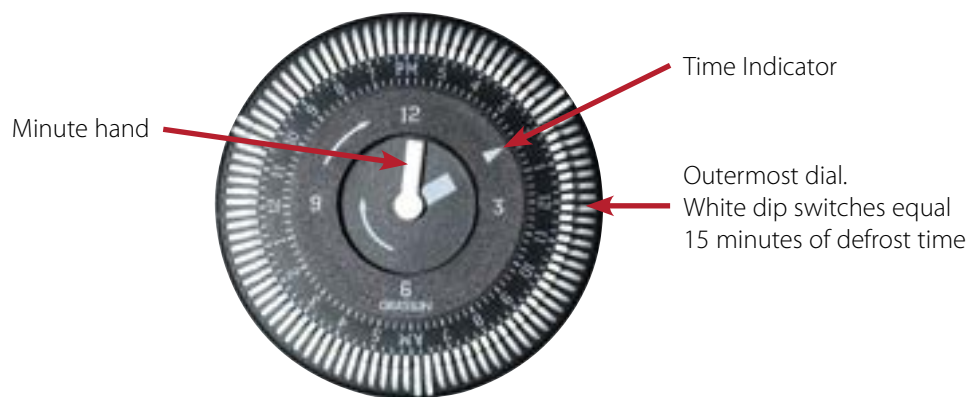
Behind the front louver grill on the...

- TDBD/TSID: Lower left.
- TCGG: Lower right.

Adjust Time of Day

1. Unplug the appliance or disconnect power.
2. Turn the innermost dial's minute hand clockwise until the time of day on the outer dial aligns with the time indicator (white triangle marker).

NOTICE > DO NOT adjust the time of day by rotating the outer dial.



Defrost Timers (cont.)

Grasslin

TCGG/TDBD/TSID (cont.)

Adjust Timer Settings

! NOTICE!



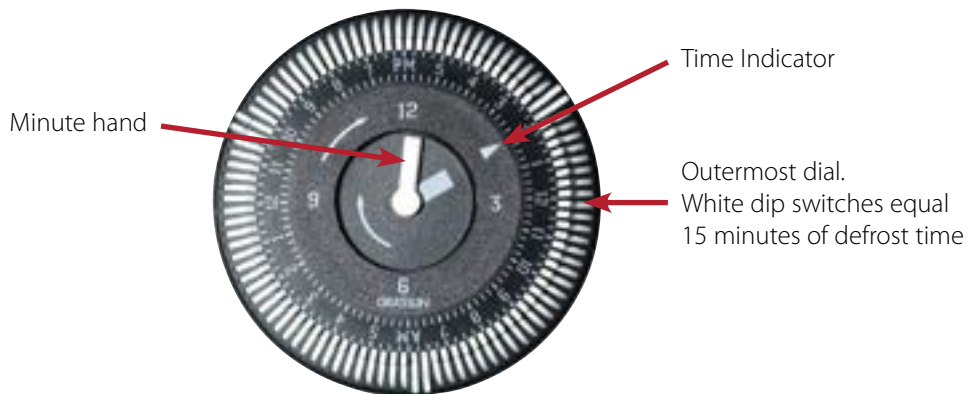
- Always follow the manufacturer's recommended settings when adjusting the quantity and duration of defrost cycles.
- If not set for the recommended minimum quantity of defrost cycles and duration, the coil may develop excessive frost. This may lead to system failure and produce loss, which is not covered by warranty.

- True recommends three (3) defrost cycles minimum per day, spread evenly throughout the day.
- High usage, high temperature, or high humidity applications may require four (4) defrost cycles spread evenly throughout the day.
- A defrost cycle should be 60 minutes (four (4) dip switches).
- Each dip switch represents 15 minutes of defrost time.

1. Locate the desired defrost time on the outer dial.

2. Flip the corresponding dip switch outward.

NOTICE > To remove defrost time, flip the dip switch inward.



Defrost Timers (cont.)

Grasslin

T-19F/19FZ/23F

(time initiated; temperature terminated)

- Time initiated: The defrost cycle begins at a specific time.
- Time terminated: The defrost cycle ends after a preset time duration.

All refrigeration equipment operating below 30°F (-1.11°C) accumulates frost on the evaporator coil and require routine defrost.

True has factory-set your defrost timer to a recommended time, duration, and quantity of defrost cycles. Your True appliance has been set for defrost cycles spread throughout the day (2am, 8am, 2pm, and 8pm). If you decide to change the defrost time settings, please see "Adjust Timer Settings."

During defrost...

- Temperature sensors disconnect heaters to keep the appliance from overheating.
- Temperature sensors delay the fan motor once the defrost cycle has been completed to prevent the circulation of warm air inside the appliance.

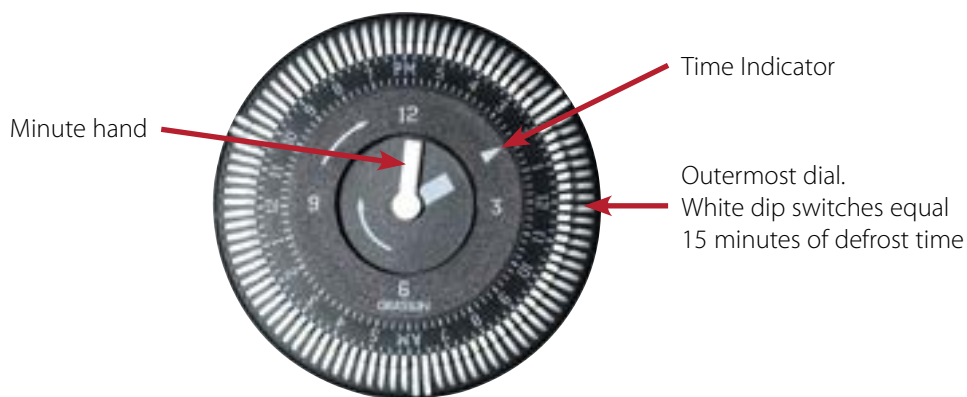
Location

Behind the front louver grill inside the electrical box or in a separate gray timer box.

Adjust Time of Day

1. Unplug the appliance or disconnect power.
2. Turn the innermost dial's minute hand clockwise until the time of day on the outer dial aligns with the time indicator (white triangle marker).

NOTICE > DO NOT adjust the time of day by rotating the outer dial.



Defrost Timers (cont.)

Grasslin

T-19F/19FZ/23F (cont.)

Adjust Timer Settings

! NOTICE!



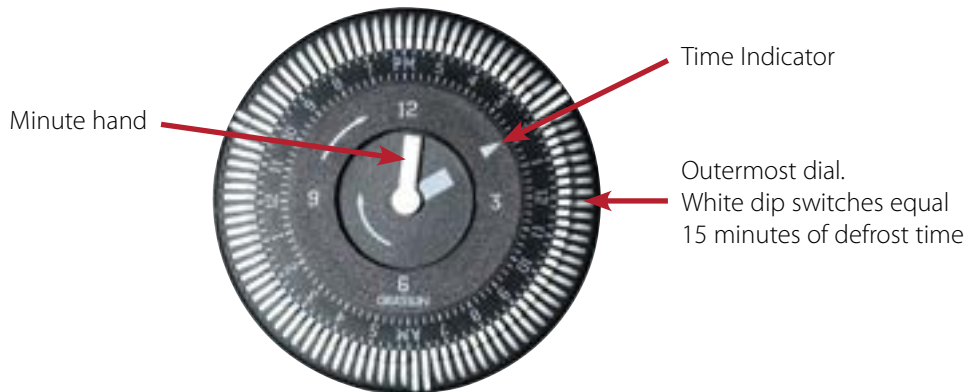
- Always follow the manufacturer's recommended settings when adjusting the quantity and duration of defrost cycles.
- If not set for the recommended minimum quantity of defrost cycles and duration, the coil may develop excessive frost. This may lead to system failure and produce loss, which is not covered by warranty.

- True recommends four (4) defrost cycles minimum per day, spread evenly throughout the day.
- High usage, high temperature, or high humidity applications may require six (6) defrost cycles spread evenly throughout the day.
- A defrost cycle not exceed 15 minutes (one (1) dip switches).
- Each dip switch represents 15 minutes of defrost time.

1. Locate the desired defrost time on the outer dial.

2. Flip the corresponding dip switch outward.

NOTICE > To remove defrost time, flip the dip switch inward.



Defrost Timers (cont.)

Mallory

Mallory

Model Identification

Mallory



T-GC & TUC/TWT-27F/48F/60F/72F

(time initiated; temperature terminated)

- Time initiated: The defrost cycle begins at a specific time.
- Temperature terminated: The defrost cycle ends after a preset time duration.

All refrigeration equipment operating below 30°F (-1.11°C) accumulates frost on the evaporator coil and require routine defrost.

The Mallory timer initiates a defrost cycle every 6-8 hours, depending on the model.

During defrost...

- Temperature sensors disconnect heaters to keep the appliance from overheating.
- Temperature sensors delay the fan motors once the defrost cycle has been completed to prevent the circulation of warm air inside the appliance.

Defrost Timers (cont.)

Mallory

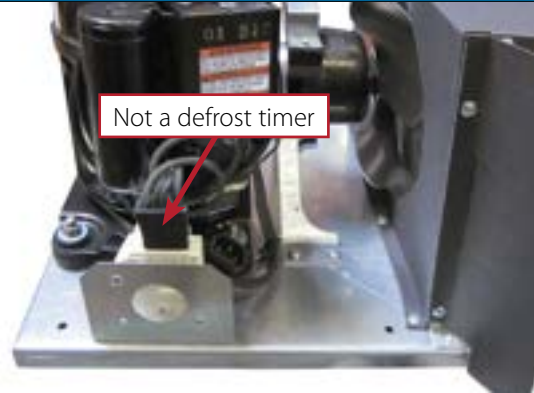
T-GC & TUC/TWT-27F/48F/60F/72F (cont.)

Location

! NOTICE!



Be advised! Mallory timer function varies by installation location. If the timer is installed in the condensing unit, it is a **fan motor timer**; the timer controls when the fan motor reverses rotation.



Find the defrost timer near the mechanical control. See fig. 1.



Fig. 1. Mallory timer beneath a mechanical control.

Defrost Timers (cont.)

Mallory

T-GC & TUC/TWT-27F/48F/60F/72F (cont.)

Adjust Defrost Cycle Start Time

1. Wait until the time of day you want defrost to initiate.
2. Turn the actuating gear (see fig. 2) clockwise until the contacts change position, activating a defrost.

NOTICE > The next defrost cycle will occur 6—8 hours later, depending on the model.

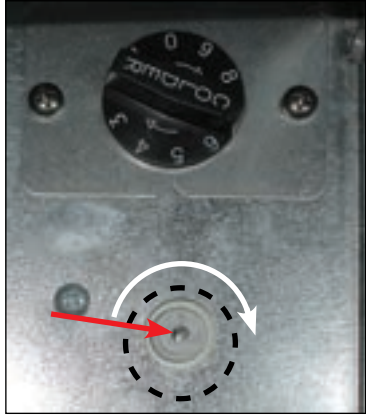
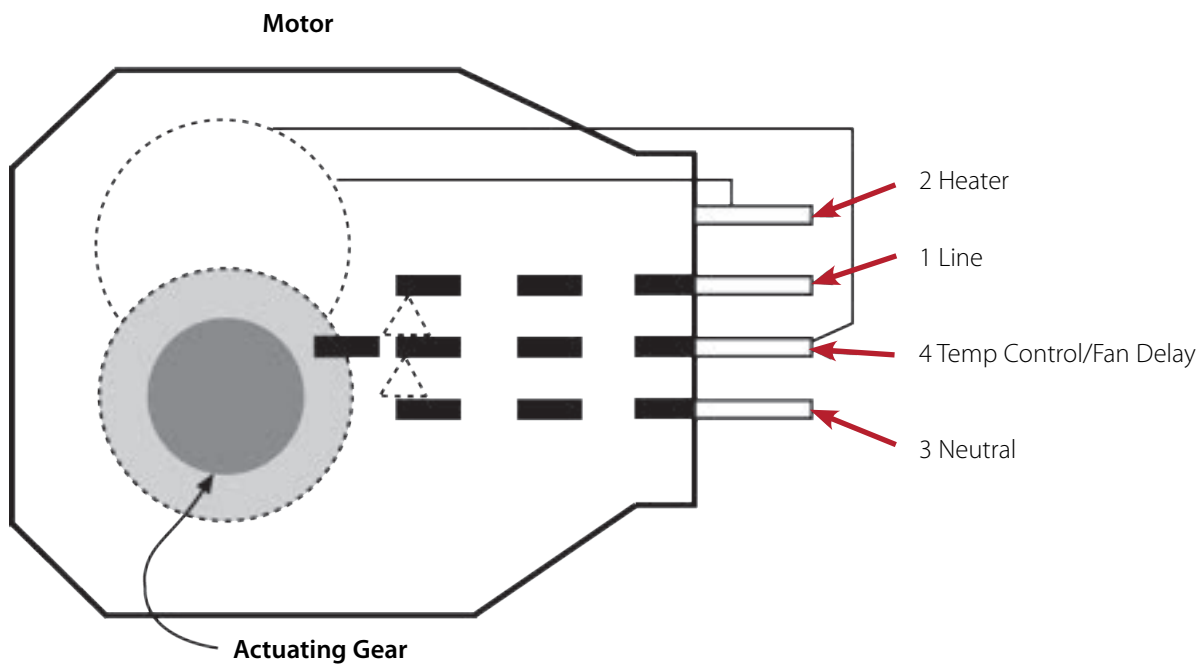


Fig. 2. Turn the actuating gear clockwise until the contacts click.

Wiring

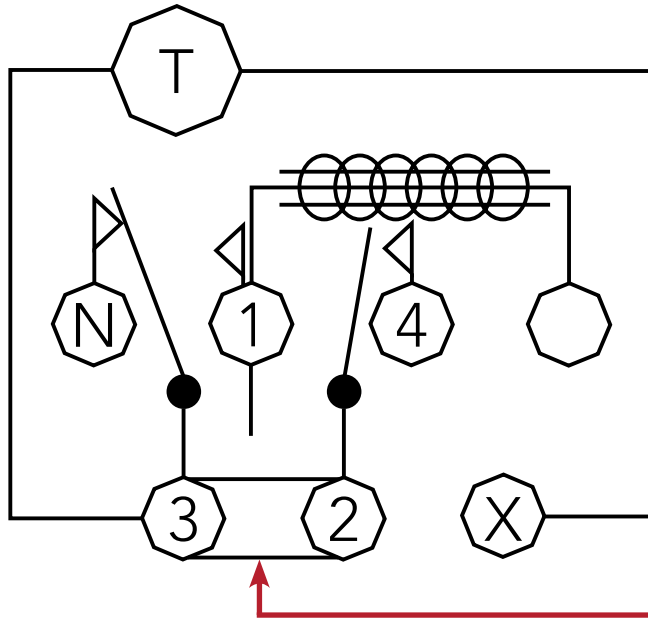


NOTICE > Previous timers had terminals #1 and #3 reversed.

Defrost Timers (cont.)

Paragon & Grasslin Conversion

Paragon Wiring



- N** RED - To temperature control (normally closed)
- 1** PINK - To defrost heaters (normally open)
- 4** BLACK or TAN - To evaporator fan motors (normally closed)
- 0** PURPLE - Defrost termination
- 3** BLACK - Line voltage
- 2** BLACK or TAN - From door switch
- X** WHITE - Neutral

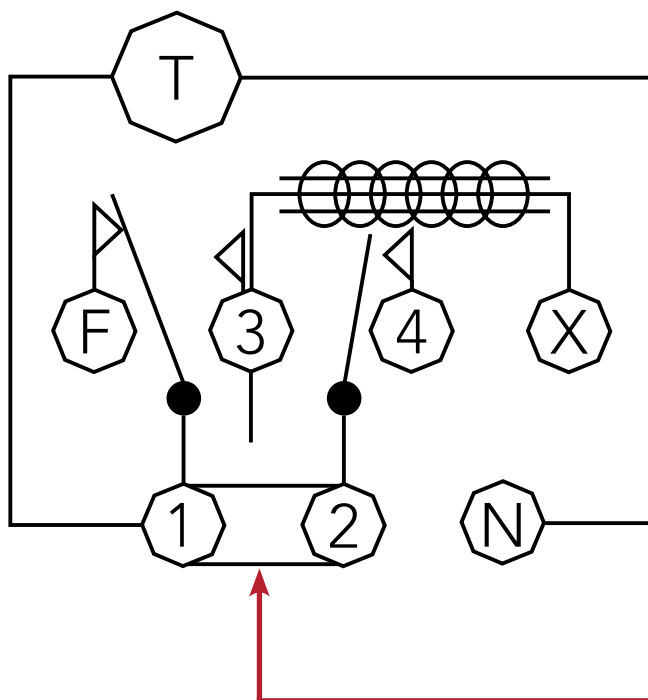
Disclaimer:

Not all wire terminals are used in all applications

Wire colors are subject to change

NOTICE > If there is jumper bar between #3 and #2 on the Paragon timer, you must put a jumper wire between #1 and #2 on the Grasslin timer

Grasslin Wiring



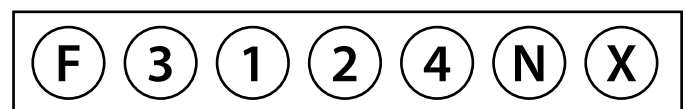
- F** RED - To temperature control (normally closed)
- 3** PINK - To defrost heaters (normally open)
- 4** BLACK or TAN - To evaporator fan motors (normally closed)
- X** PURPLE - Defrost termination
- 1** BLACK - Line voltage
- 2** BLACK or TAN - From door switch
- N** WHITE - Neutral

Disclaimer:

Not all wire terminals are used in all applications

Wire colors are subject to change

As shown on the Grasslin timer



NOTICE > If there is jumper bar between #3 and #2 on the Paragon timer, you must put a jumper wire between #1 and #2 on the Grasslin timer



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