Refrigerated Solutions Group

LogiTemp® & LogiTemp® Plus Electronic Controller Systems

Installation & Operations Manual

A Microprocessor-Based
Electric Expansion Valve Refrigeration Control System
With TCP/IP Internet Monitoring Feature

888-88889/171527
REV. 5-26-23

IMPORTANT NOTICES

- **Read this manual before installing or servicing your LogiTemp® system. Keep the manual and refer to it before doingany service on the equipment. Failure to do so may result in personal injury or waive warranty of damaged equipment.**

- Modifications to existing equipment are subject to approval by Refrigerated Solutions Group and must be explicitly written. There are no implied flexibilities designed into this product.

- The following points apply unless overwritten and approved by the Refrigerated Solutions Group engineering department:

  - Maximum distance of wires between the evaporator and the LogiTemp controller MUST not exceed 40 ft.
  - The LogiTemp controller MUST be mounted around the vestibule entrance door for below -40°F extra low temp freezer.
  - All sensor wires MUST be in separate metal conduit from powerwiring and control wiring for below -40°F extra low temp freezer.

- Due to continuous product enhancements, *Refrigerated Solutions Group reserves the right to make engineering changes and change specifications for product improvement without notice.*

INTRODUCTION

Thank you for purchasing a Refrigerated Solutions Group LogiTemp® electronic controller system. This manual contains important instructions for installing, using, and servicing the system as well as a parts list. Read this manual carefully before installing or servicing your equipment.

DANGER

Improper or faulty hook-up of electrical components of the refrigeration units can result in severe injuryor death.

All electrical wiring hook-ups must be done in accordance with all applicable local, regional or national standards.

NOTICE

Installation and service of the refrigeration and electrical components must be performed by a refrigeration mechanic and/or a licensed electrician.

The portions of this manual covering refrigeration and electrical components contain technical instructions intended only for persons qualified to perform refrigeration and electrical work.

This manual cannot cover every installation, use or service situation. If you need additional information, call or write us:

Customer Service Department
891 County Road U
Hudson, WI 54016
Phone:800-684-8988
Fax: 866-882-7629
Email: rsgservice@refsg.com

WARNING LABELS AND SAFETY INSTRUCTIONS

This is the safety-alert symbol. When you see this symbol, be alert to the potential for personal injury or damage to your equipment. Be sure you understand all safety messagesand always follow recommended precautions and safe operating practices.

NOTICE TO EMPLOYERS

You must make sure that everyone who installs, uses, or services your refrigeration is thoroughly familiar with all safety information and procedures.

Important safety information is presented in this section and throughout the manual. The following signal words are used in the warnings and safety messages:

DANGER: Severe injury or death will occur if you ignore themessage.

WARNING: Severe injury or death can occur if you ignore the message.

CAUTION: Minor injury or damage to your refrigeration system can occur if you ignore the message.

NOTICE: This is important installation, operation or service information. If you ignore the message, you may damage your refrigeration system.

The warning and safety labels shown throughout this manual are placed on your Refrigerated Solutions Group refrigerationsystem at the factory. Follow all warning label instructions. If any warning or safety labels become lost or damaged, call our customer service department at 800-684-8988 for replacements.

This label is on the housing of the LogiTemp typically located on an evaporator coil.

APPLICATIONS

LogiTemp® Electronic Controller Systems are designed to control Refrigerated Solutions Group brand condensing units and evaporators for freezer and cooler applications. Each system contains a condensing unit, evaporator(s) with LogiTemp board(s), electric expansion valve(s), pressure transducers, temperature sensors, reverse cycle valve (where applicable) and operational controls.

LogiTemp is the OEM version of the Master Controller 3.0 and its predecessors. It is typically mounted inside an evaporator left or right end compartment with a three-digit display mounted in front cover.

Images below show how the OEM controller is mounted on the evaporator

The LogiTemp interface is easy to use and is mounted on the outside of the evaporator coil.

The LogiTemp control board is factory installed inside the evaporator coil. The coil features a removable side panel for access to the control board.

LOGITEMP®

Description

LogiTemp is an OEM version of the custom-designed microprocessor-based electronic controller for Refrigerated Solutions Group refrigeration products to control an electric expansion valve in response to evaporator superheat and return air temperature. The hardware and input/output descriptions and connections of a LogiTemp controller are shown below.

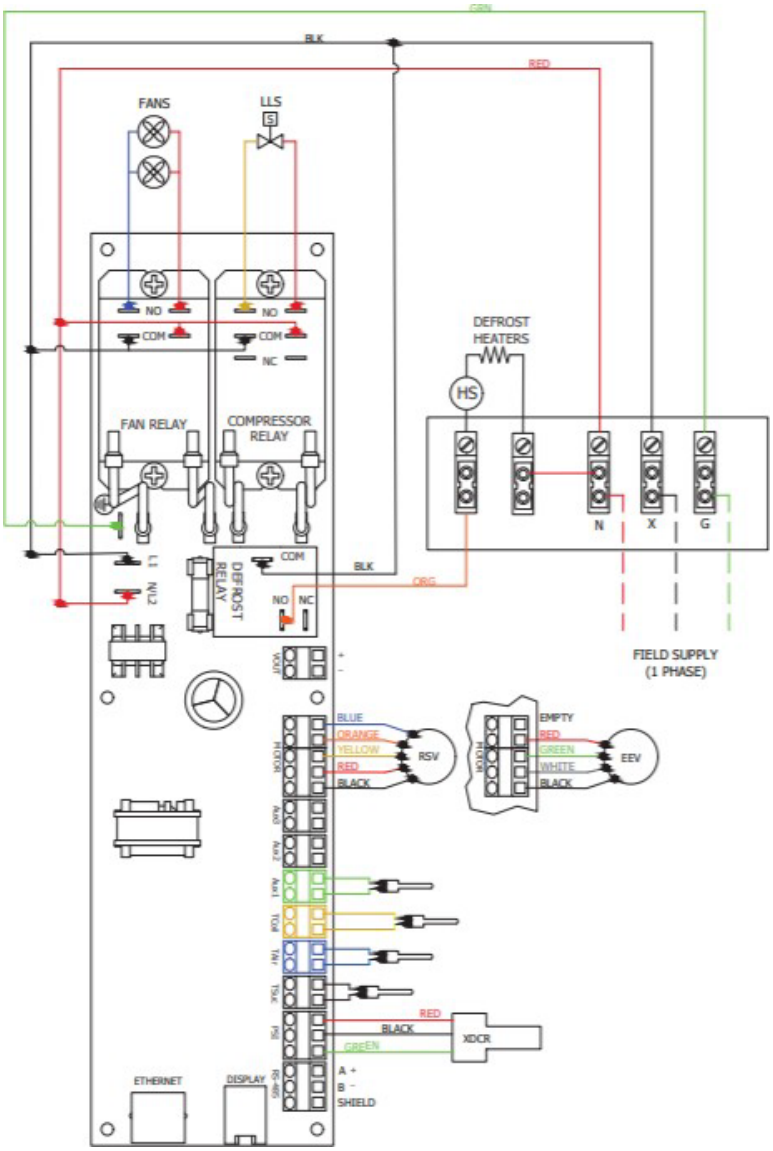


Figure 1. LogiTemp Controller Board Layout.

- **RSV or SER Terminals**. KE2THERM **RSV** or Sporlan **SER** type electric expansion valves are currently used for all applications. **RSV** has 500 nominal steps for entire valve stroke and **SER** has 1596 nominal steps for entire valve stroke. The default is **RSV** valve.

- **Pressure Transducer XDCR** is mounted at the evaporator suction header to measure saturated suction pressure inabsolute value but displayed in gauge pressure in PSIG as “PrS”. The suction pressure is converted to saturation temperature displayed as “tSt”. The difference between outlet temperature and evaporating temperature is the true superheat displayed as “SUP”.

- **Suction Outlet/Fan Cut-In Temperature Sensor TSuc** is mounted on the suction line about 6” to 10” away from the evaporator to measure outlet temperature during cooling cycle and to serve as evaporator fan cut-in temperaturesensor. The sensor is at a 2 or 10 o’clock position on the suction line. The default value of the fan cut-in temperature is pre-set at 20^{O}F for commercial refrigeration application. It is displayed as “tSC”.

- **Room Temperature Sensor TAir** is typically mounted with a plastic tie at the drain pan on the side of the evaporator return air. It is located around the middle of the evaporator to allow even air flow across it. If necessary, it can be relocated to a spot with better representation of the cold room temperature. It is displayed as “rtP”.

- **Defrost Termination Temperature Sensor TCoil** is mounted downstream of the distributor tube after the valve andclose enough to the evaporator coil to measure defrost termination temperature during defrost cycle. Figure 2 on the previous page shows the sensor locations of the evaporator and the controller. It is displayed as “tCL”.

- **One 30 Amp NO/ 3A NC 277 VAC Relay** is used for the compressor contactor or liquid line solenoid.

- **One 30 Amp NO 277 VAC Relay** is used to switch evaporator fans ON and OFF. A fan contactor will be used if the fan motor is larger than 30 amps or three phase or the voltage is different from control voltage.

- **One 30 Amp NO 277 VAC Relay** is used for a defrost heater when the heater load is less than 30 amp. It will be wired to defrost heater contactor when heater load is over 30 amp or three phase heaters. For a reverse cycle defrost system, it is wired to a 40VA transformer that provides 24VAC power to the reversing valve solenoid coil. Or it provides direct 230V control power to a reversing valve solenoid coil if rated 230V.

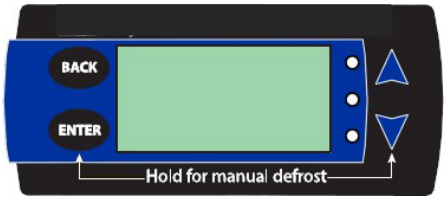
- **0-10VDC Output** is reserved to drive future external alarm relay.

- **One RJ-45, TCP/IP Ethernet Port** is used for Peer-to-Peer system or an alternating system communication requiring Ethernet connection. It is also used to communicate with a Laptop, internal network, or Internet.

- **Display Connection** is connected to a 3-Digit remote display and keypad.

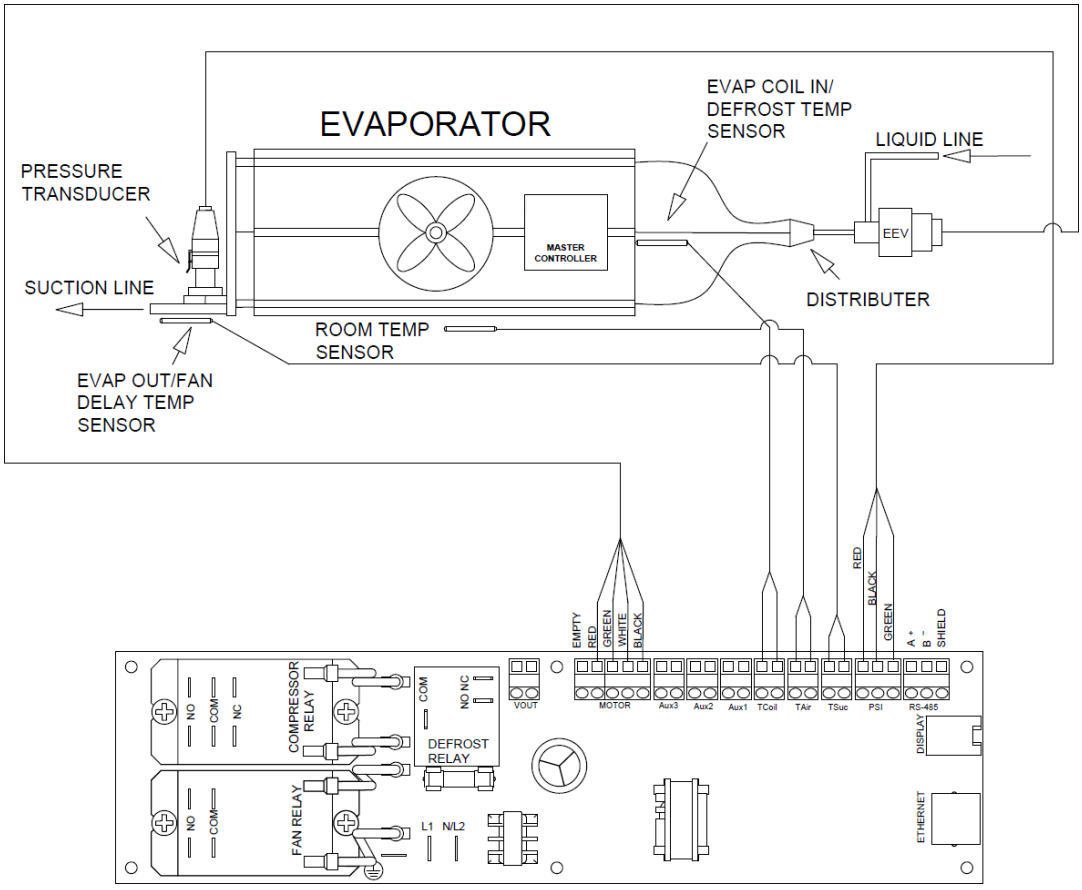
- **RS485 (A+, B-, Shield) Terminals** are used to communicate with auxiliary boards for extended applications.

□ **Power Input 120 to 208/240 VAC.**



- **Green, Yellow and Red LED Status Indicators.** The green LED will be on when the compressor relay is energized.The green LED will blink when the air temperature is satisfied, but the compressor minimum run timer or minimum off timer has not yet timed out. The red LED indicates a critical alarm has occurred (Low Pressure alarm). The yellow LED indicates all other alarms.

- **Four Push Buttons on the remote display** are used to display set points and status as well as to reset operational parameters like room temperature, defrost mode, number of defrosts, etc. Their functions can be also performed by using the TCP/IP interface.



LogiTemp® System
Figure 2.

Factory-Mounted Parts

- A controller board, an electric expansion valve, a pressure transducer, and three temperature sensors for single evaporator system (standalone or alternating) or peer (multiple evaporator system) evaporator are pre-mounted at the factory. For reverse cycle defrost, a 24 VAC 40VA transformer is mounted at standalone or master evaporator to provide power 24 VAC to the four-way reversing valve mounted in thecondensing unit. The control circuit and power supply are pre-wired to the terminal board of the evaporator. The board is molded in epoxy to avoid excessive moisture in cold room.
- A 4-way reversing valve, operating at 24 VAC, is installed in a reverse cycle defrost equipped unit. A transformer is also installed in one of the evaporators to supply 24VAC to the 4-way reversing valve.
- Peer-to-Peer controls can be connected directly to each other, using a CAT-5E cable, if there are only 2 controllers. The controllers must be connected through an Ethernet switch or router if 3 or morecontrollers are on the system. The controllers must be bonded together. A technician should install the CAT-5E cable from the controllers to the Ethernet switch or router and bond the controllers. All components are factory tested. A technician should check all the wiring and settings for proper operation after installation.

Features

- One of the most energy-saving features of the LogiTemp®System is free floating head pressure. A head pressure control valve is not installed on LogiTemp systems. With floating head pressure, the compressors work at the highest efficiency at the lowestpossible condensing pressure rather than at the limited pressure level typically found in conventional systems using a head pressure control valve for low ambient environments.
- The electric expansion valve replaces a thermal expansion valve. The refrigerant flow of the electric expansion valve is modulated by the true superheat, or the difference of evaporator outlet and evaporating temperatures.
- The room temperature sensor replaces the conventional temperature control. The temperature is set with the pushbuttons on the LogiTemp remote display or through the web page. The default temperature must be checked during the first startup of the machine against actual application temperature. Default must be re-set to actual application temperature if there is a discrepancy.
- The on-board timer is used for runtime control and scheduling defrosts. No mechanical defrost timer is necessary for this system. Once the power is turned on, the timer starts counting.
- LogiTemp has the capability to perform scheduled defrost or demand defrost.
    - When the scheduled defrost scheme is chosen, the on-board timer is used for scheduleddefrosts. The system works in the same fashion as a regular conventional system with mechanical defrost timer.
    - When the demand defrost is chosen, the controller will not initiate a defrost unless it is needed. The low temperature system is pre-set with demand defrost.
- The demand defrost scheme is a pioneer design by Refrigerated Solutions Group for freezer applications. Extensive lab tests indicate that many unnecessary defrosts are eliminated and energy consumption reduced when using demand defrost compared to using a conventional refrigeration system equipped with a mechanicaldefrost timer.
- The operational status of modes, room temperature and alarms are displayed on the three-digit remote display.
- Manual defrost is available on standalone and Peer-to-Peer systems.
- All components are factory-mounted, pre-wired and tested to save on-site installation labor and reduce chance of installation errors.
- The superheat set point has a wide adjustability range 5° to 20 ^{O}F. This range allows the controller tomeet different customers' needs and require less refrigerant charge for winter operation than conventional refrigeration unit when no head pressure valve is installed in the condensing unit.
- The controller can be used in low, medium, and high temperature applications. The internal programming will recognize the input of room temperature set point (***tS***) and automatically select appropriate segments of the program for the application.
- The patented reverse cycle defrost control **(**United States Patent 7,073,344**)** reduces defrost energyusage by up to 80% and decreases defrost time from 20-45 minutes (freezer equipped with electric heaters) to 3-5 minutes in a freezer or $1^{1}/_{2}$ – 2 minutes in a cooler with a completely clean defrost.
- Maximum operating suction pressure can be controlled by the electric expansion valve eliminating the crankcase pressure regulator for some applications.
- Minimum operating suction pressure provides additional compressor protection.

Sequences of Operation

START UP

When power is applied to the board, the controller closes the valve. The controller will display “bLt” for 3 seconds then will show ‘StU’ on its three- digit remote display for 3 seconds. It will then display ‘CFn’ on the three-digit display for 9 seconds. The evaporator fans will be on for the first 9 seconds allowing a service technician time to check them. The controller will then turn the fans off and check each sensor. The controller will check the pressure transducer for a short or open. It will display ‘CPr’ on the three-digit display for three seconds. If the sensor fails, the controller will display an alarm ‘PSA’ and go to safety mode for a failed sensor. If the sensor passes, it will display ‘oPr’ on the three-digit display for three seconds. The controller will check the sensor connected to ‘T_{SUC}’ for a short or an open. It will display ‘Ct1’ on the three-digit display for three seconds. If the sensor fails, the controller will display the alarm ‘SSA’ on the three-digit display and go to safety mode for a failed suction sensor. If the sensor passes, it will display ‘ot1’ on the three-digit display for three seconds. The controller will check the sensor connected to ‘T_{AIR}’ for a short or an open. It will display ‘Ct2’ on the three-digit display for three seconds. If the sensor fails, the controller will display the alarm ‘ASA’ on the three-digit display and go to safety mode for a failed air sensor. If the sensor passes, it will display ‘ot2’ on the three-digit display for three seconds. The controller will check the sensor connected to ‘T_{COIL}’ for a short or an open. It will display ‘Ct3’ on the three-digit display for three seconds. If the sensor fails, it will display the alarm ‘CSA’ on the three-digit display and go to safety mode for a failed coil temperature sensor. If the sensor passes, it will display ‘ot3’ on the three-digit display for three seconds. If all sensors pass, the controller will display ‘CFH’ on the three-digit display for six seconds.

The controller will not go into defrost during the preceding start up procedure. It will check the number of defrosts per day (DFPD) and time_of_day (HOUR, MIN). If it is time for the controller to be in defrost, it will startin DEFROST mode. If not, the controller will start in COOL(rEF) mode after fan delay.

The set points are stored in EEPROM (Electrically Erasable Programmable Read Only Memory). Batteries are not required to store the new set points. If power is lost, the set points which were in the controller at that timewill be used when power is restored.

OFF MODE (OFF)

The controller starts in OFF mode by fully closing the valve. The controller will keep the valve closed for theminimum OFF Time (Cot) to keep the compressor in pumpdown or off for a minimum amount of time. When room temperature reaches the cut-in set point (room temperature set point “tS” plus the temperature difference set point “Atd”), the controller goes to COOL mode (rEF).

If a scheduled defrost scheme is selected, while the controller is in OFF mode, it is constantly checking the number of defrosts per day and the time_of_day and calculating the time for defrost. When the time_of_day is right for a defrost, it will immediately go into DEFROST mode right after the current OFF mode.

If the demand defrost scheme is selected, defrost will be checked and initiated only during the COOL mode. After the Minimum OFF Time is timed out and the room temperature reaches the Cut-In temperature, thecontroller will go into COOL mode(rEF).

While in OFF MODE, the three-digit display on Master will show ‘OFF’ for three seconds, ‘rtP’ for twoseconds, and the numerical display of the room temperature for four seconds.

COOL MODE (rEF)

The controller starts COOL mode by opening the valve. The condensing unit will start by a suction line low pressure control cut-in. The electric expansion valve is modulated by the controller so that a preprogrammed superheat set point is maintained during the refrigeration process. Actual superheat is the temperature difference of the evaporator outlet (T_{SUC})and the evaporating temperature (T_{SAT}) converted from the reading of the pressure transducer, or T_{SUC}-T_{SAT}**.** The controller will keep modulating the valve so the superheat will equal the superheat set point. Meanwhile, the controller also reads the room air temperature T_{AIR}. When the room temperature is below the room temperature set point (pre-set to -10 °F for low temp), it goes back to OFF mode. All the time that

the controller is in COOL mode, it is constantly checking the criteria to determine if a defrost should be initiated. It will immediately go into DEFROST mode (dEF) when defrost criteria are met.

If the suction pressure is above the maximum operating pressure set point (HoP), the valve will modulate to control the pressure at or below the maximum operating pressure set point (HoP). When the operating suction pressure is lower than HoP, it will go back to superheat control. Suction pressure is used to calculate saturated temperature (T_{SAT}).

If the suction pressure is below the Minimum pressure set point (LoP), the valve will close and the control signal to the external relay will be turned off. It will resume normal operation when the pressure is above the Minimum pressure set point.

While in COOL MODE, the three-digit display on Master will show ‘rEF’ for three seconds, ‘rtP’ for two seconds, and the numerical display of the room temperature for four seconds.

DEFROST MODE (dEF)

There are two methods to determine if a defrost will be initiated for LogiTemp: scheduled defrost and demand defrost. If the number of defrosts per day ‘dPd’ is set to ‘0’, the controller will do the demand defrost by default. If the number of defrosts per day ‘dPd’ is set from ‘1’ to ‘8’, the controller will do the scheduled defrost.

Scheduled Defrost

The following is the description of the scheduled defrost.

The time of day is really an elapsed counter that counts the number of minutes that have passed. An elapsed count of ‘0’ is 12:00 AM. The count goes up to 1439 which corresponds to 11:59 PM. The counter then resets to ‘0’.

The time of day will be kept if input power is connected. If input power is turned off, then back on,the time of day will be reset to ‘0’ which corresponds to 12:00 AM.

The first defrost start time is an elapsed time of 0 (12:00 AM). The subsequent defrost start times are determined by adding the number of minutes between each defrost to the previous start time until there is a defrost start time for each defrost per day. The number of minutes between each defrost is determined by taking1440 / number of defrosts per day as set up by the ‘dPd’ set point.

When starting an electric defrost, FAN relay is de-energized to turn off the fans. The controller waits for five seconds, then the DEFROST relay is energized to start a defrost.

When starting a reverse cycle defrost, the FAN relay is de-energized to turn off the fans while, at the same time, COMPRESSOR relay is de-energized to turn off the compressor. There is a 10 second delay before the DEFROST relay is energized to switch the four-way reverse valve. Then there is a 30 second waiting period for pressure equalizing. Afterward, COMPRESSOR relay is energized to turn the compressor. Hot gas will be reversed to flow to the evaporator while the electric expansion valve is modulated to start a defrost.

The controllers use the coil sensor ‘TCOIL’ as the defrost termination sensor. When this temperature gets above the preprogrammed Defrost Termination Set Point (dtP) before the preprogrammed Maximum Defrost Time (dtL), the defrost will terminate. Otherwise, it will be terminated when the Maximum Defrost Time (dtL) times out. While in DEFROST MODE, the three-digit display will be ‘dEF’ for three seconds, ‘dtt’ for two seconds, andthe numerical display of the temperature reading from sensor TCOIL for four seconds.

Demand Defrost

When ‘dPd’ is set to ‘0’, the controller will initiate a demand defrost. The controller will not go to ‘DEFROST MODE’ until a heavy frost accumulation is in the evaporator coil. When frost is built up in the evaporator, it will block the air flowing through the evaporator coil and reduce the heat transfer area. It will also decrease the evaporating temperature, which, in turn, increases probability of frosting. A demand defrost scheme to detect the frost build-up and the criteria to start defrost are programmed in LogiTemp. Unlike scheduled defrost,LogiTemp

with demand defrost is really an energy saver. If no selection is made, the controller will automatically select demand defrost when the power is applied to the controller. The defrost procedure is the same as described for the scheduled defrost.

After selecting the demand defrost, if the elapsed time since the last defrost has been a selectable time (Int) from 8 hours (480) to 72 hours (4320), LogiTemp® will go into defrost to ensure a proper oil return.

Manual Defrost

The controller allows manually-initiated defrost when needed. The manual defrost will be disabled if the evaporator inlet sensor detects the temperature higher than the defrost termination temperature. Operation of themanual defrost will be discussed in a later section.

COIL DRAIN MODE (Drn)

The controller automatically goes into COIL DRAIN whenever a defrost is terminated. The controller stays in this mode for the preprogrammed 'DRIP TIME'. When this time is completed the controller opens the expansion valve and goes into FAN DELAY mode (FdL).

While in COIL DRAIN MODE, the three-digit display on the controller will show 'Drn' for three seconds,'rtP' for two seconds, and the numerical display of the room temperature for four seconds.

FAN DELAY MODE (FdL)

The controller will pull down the temperature of the evaporator without the fans on until one of the following occurs: The FAN DELAY TIME of five minutes times out or the fan cut-in sensor's temperature (Fdt) T_{SUC} goes below the FAN DELAY TEMPERATURE of 30 Deg F. The controller will then go into COOL mode.

While in FAN DELAY MODE, the three-digit display will be 'FdL' for three seconds, 'Fdt' for twoseconds, and the numerical display of the temperature reading from sensor T_{SUC} for four seconds.

SAFETY MODE

When an alarm occurs, such as a sensor failure or a communication alarm, the controller will go into 'SAFETY MODE'. SAFETY MODE provides minimum refrigeration to the refrigerated room before the corrective action is taken and the alarm is cleared. The system will do the following in SAFETY MODE:

- Pressure transducer alarm (PSA)
  - Cool mode
    - Valve open for the minimum compressor run time
    - Valve closed for the minimum compressor off time
    - Keep doing above cycle until alarm goes away
    - Ignores maximum pressure control mode
- Outlet sensor alarm (SSA)
  - Cool mode
    - Valve open for the minimum compressor runtime
    - Close valve for the minimum compressor offtime
    - Keep doing above cycle until alarm goes away.
  - Fan delay mode
    - Lets fan delay time out (five minutes)
  - Defrost Mode
    - If this alarm and defrost term temp sensor alarm, reverse cycle defrost will last only threeminutes with valve open;
    - If this alarm and defrost term temp sensor alarm, electric defrost will last only tenminutes with valve closed.
- Room temp sensor alarm (ASA)
  - Cool Mode
    - Run on superheat control for the minimum compressor run time
    - Close valve for the minimum compressor off time
    - Keep doing above cycle until alarm goes away.

- Low superheat alarm (LSH)
  - Close valve and wait for alarm to go away.
- High Room Temperature Alarm (HtA)

  The 'high room temperature alarm' occurs when the room temperature is above the preprogrammed 'HIGH TEMPERATURE ALARM' for a preprogrammed number of minutes. The alarm is cleared whenthe room temperature is less than the 'HIGH TEMPERATURE ALARM' set point.
- Low Room Temperature Alarm (LtA)

  The 'low room temperature alarm' occurs when the room temperature is below the preprogrammed 'LOW TEMPERATURE ALARM' for a preprogrammed number of minutes. The alarm is cleared whenthe room temperature is above the 'LOW TEMPERATURE ALARM' set point.
- Defrost term temp sensor alarm (CSA)
  - Defrost mode
    - Open valve until alarm goes away or defrost terminates.
    - If this alarm and outlet temp sensor alarm, defrost will last only three minutes.
    - Use outlet sensor for defrost temperature termination

- Communication alarm (COA)
  - For Alternating mode (ALt), go to standalone mode.
  - For Synchronous mode (SYC)
    - Cool mode
      - Run on superheat control for the minimum compressor run time
      - Close valve for the minimum compressor off time
      - Keep doing above cycle until alarm goes away.
    - Pumpdown Mode
      - Wait until pump down time times out.
    - Drip Mode
      - Wait until Drip time times out.
    - Defrost Mode
      - Valve will close when defrost termination temperature meets its set point if reverse cycle defrost. Valve will close at all time if electric defrost. It will then wait the full defrost time for other evaporators to defrost.
      - If in demand defrost mode, defaults to three defrosts per day.

Multiple Evaporator Configuration

LogiTemp® can be configured with 0 to 7 other controllers. Each controller is appointed a static I/P address at the factory for communication and sequence of operation. The evaporators are piped together to onecondensing unit. All evaporators have a pressure transducer, outlet sensor and coil sensor. All controllers will communicate with each other to share the room temperature reading and the coil temperature reading. All controllers will modulate its electric expansion valve independently.

- The communication cable is a CAT/5E cable, up to 330 feet.
- Communication for peer-to-peer controls are connected to the RJ-45 connector.

BOND CONTROLLERS FROM FRONT PANEL

- Connect to Ethernet switch or router only the controllers that you want to bond.
- On any controller, Press and hold 'ENTER' until a set point is displayed.
- Press 'UP' until display shows 'BND'
- Press and hold 'ENTER' display changes. After about 5 seconds, all controllers will reset. They are then bonded.

PEER-TO-PEER MODE

When power is turned on, that controller will initialize itself by closing the valve. A 'ROOM TEMPERATURE ALARM' is set only if none of the controllers have a good air temperature sensor connected. If it does not have a

room temperature sensor connected, it will put itself in ‘COOL’ mode and wait to get the room temperature from another controller. If it does not receive any command within a minute, it will set the ‘communication alarm’and then run in ‘SAFETY MODE’ as described previously. The ‘communication alarm’ clears when it receives any command from that controller.
The controllers switch between ‘COOL’ mode and ‘OFF’ mode based on the warmest temperaturereading from all controllers that have a room temperature sensor.

If any controller decides to go in defrost, all controllers will then go into defrost.

If any controller decides to go in drain mode, all controllers will then go into drain mode.

If any controller decides to go in fan delay mode, all controllers will then go into fan delay mode

If there is a communication alarm at any controller, then the controller will go into defrost as a scheduleddefrost that will terminate on time only.

ALTERNATING MODE

The controller can be configured as an alternating system for dual single-evaporator refrigeration units to provide redundancy of a refrigerated cold room. Once the network is set up, a CAT/5E cable can be connected between the 2 controllers, connected to the RJ-45 connector.

When the alternating mode is selected, the dual refrigeration units will start pulling down box temperature to the cut-out set point then both go into OFF MODE(OFF). When the box temperature rises to cut-in temperature, one of the units will come on while the other stays off. The other evaporator will perform the refrigeration in the next cooling cycle.

IMPORTANT NOTE:

In the controller, the parameter of “dtY” must be set for proper method of defrost. “dtY = ELE” is for regular electric defrost; “dtY = rCd” is for regular reverse cycle defrost.

Definition of On-Board Symbols

STATUS, DEFAULT AND READING DISPLAY

When the on-board green light is on, the compressor relay is energized. When the green light is blinking, theroom temperature sensor is satisfied, but waiting for the minimum off timer or minimum run timer to time out.When the red light is on, there is a critical alarm. When the yellow light is on, there is a non-critical alarm.

The status and the digital data are displayed on the onboard three-digit LED display. Below is a list of parameters of the operational status.

Display	Description
bLt	Refrigerated Solutions Group LogiTemp
StU	Indicates the status of Start-Up Mode
CFn	Check fan working status
CPr	Check pressure transducer
OPr	Indicates the pressure transducer is working as it should
Ct1	Check sensor T_{SUC}, the suction temperature sensor
ot1	Indicates the T_{SUC} is working as it should
Ct2	Check sensor T_{AIR}, the room temperature sensor
ot2	Indicates the T_{AIR} is working
Ct3	Check sensor T_{COIL}, the coil temperature sensor
ot3	Indicates the T_{COIL} is working
CFH	Indicates all sensors are OK
FdL	Indicates FAN DELAY MODE
Fdt	Actual T_{SUC} value in FAN DELAY

rEF	Indicates REFR (COOL) MODE
OFF	Indicates OFF MODE
Pdt	Indicates PUMPDOWN MODE before an electric defrost
dEF	Indicates DEFROST MODE
Drn	Indicates COIL DRAIN MODE
dtt	Inlet sensor T_{COIL} value in DEFROST MODE

A list of the parameters that can be displayed and/or changed is shown below when access to the default settings isneeded. This access is usually done by a trained technician.

The Following display are for viewing the status of the refrigeration system and cannot be changed.

Control Board Output	
rtP	Room or air temp connected to blue connector labeled 'TAIR'(-60ºF to 150ºF)
SUP	Actual Superheat in rEF (COOL) MODE
PrS	Suction Pressure connected to gray connector labeled G B R for green, black, red leads(-14 psi to 140 psig)
tSC	Suction Outlet Temperature Sensor connected to 2 pin black connector labeled 'TSUC'
tSt	Saturated Suction Temperature calculated from Suction Pressure PrS
tCL	Coil/defrost Temperature connected to yellow connector labeled 'TCOIL'
oPn	Percentage the EEV is open (0-99%)
StA	Status of the controller: rEF for cool mode, OFF for off mode, dEF for defrost mode, Drn for drain mode, FdL for fan delay mode
rCo	Compressor relay status: On if relay is energized, OFF if relay is de-energized
rdF	Defrost relay status: On if relay is energized, OFF if relay is de-energized
rFn	Fan relay status: On if relay is energized, OFF if relay is de-energized
AU1	Aux input 1's status (see below for more details) connected to green connector labeled 'AUX1'
AU2	Aux input 2's status (see below for more details) connected to black connector labeled 'AUX2'
AU3	Aux input 3's status (see below for more details) connected to black connector labeled 'AUX3'
iP1	first octet of ip address
iP2	second octet of ip address
iP3	third octet of ip address
iP4	fourth octet of ip address
Fir	firmware version

The Following list indicates manual modes of the controller and may be changed for diagnostic purposes.

Control Board Output	
UCt	Manually change the control mode of the controller: Go from cool or off mode to defrost mode, from defrost mode to
UOE	Manually open the EEV a percentage (0-99%)
CLA	Manually clear the alarms
bnd	When controller needs to communicate with other controllers, this mode will 'bond' the controllers to communicate with each other

The Following list indicates parameter values of the controller and may be changed to customize the refrigeration system.

Control Board Output	
rFG	Refrigerant Type (If rFG = 449, then R-449A refrigerant, If rFG = 404, then R-404A refrigerant)
SSP	Superheat Set Point seen at the evaporator (5ºF to 20ºF)
tS	Room Temperature Set Point or "cut-out" (-40ºF to 75ºF range)
Atd	Cut-in Temperature Differential (0ºF to 25ºF)
COt	Minimum Time the EEV is closed, or minimum off time (0 to 15 minutes)
Crt	Minimum Time the EEV is open, or minimum run time (0 to 15 minutes)
LoP	Minimum Suction Pressure Set Point (-14.6 psi to 100.0 psig)
HoP	Maximum Suction Pressure Set Point (10.0 to 150 psig)
dPd	Number of Defrost/Day. When dPd=0, demand defrost, when dPd = 1 to 8, scheduled defrost
dtY	Defrost Mode (If dtY = ELE, then electric or air, If dtY = rCd, then reverse cycle
Int	Only applicable when in the demand defrost scheme and tS <=35ºF, this Set Point designates the time between a safety defrost. Example; if Int = 480, then a defrost will occur every 8 hrs (480/60).
Pdt	Pump Down Timeout duration (0-90 minutes). Only applicable to elec. and air defrost schemes
dtP	Defrost Termination Temperature (35ºF to 90ºF)
dtL	Maximum Defrost Duration (0 to 90 minutes)
drn	Drip Time Duration (0 to 15 minutes)
bnt	Multiple Evaporator Mode, ALt = Alternating mode, SYC = Peer-to-Peer synchronous Mode
Ato	If in alternating mode, this value indicates the number of degrees above the cut-in Set Point (tS + Atd + Ato) at which both controllers are overridden and both go into COOL MODE.
HAo	High Temperature Alarm Offset (0ºF to 99.0ºF)
LAd	Temperature Alarm Delay (0 to 120 minutes)
LAo	Low Temperature Alarm Offset (0ºF to 20ºF)

ALARM DISPLAY

Any alarm will cause analog output voltage (across CN1) to switch. 10 VDC output corresponds to no alarms. 0 VDC corresponds to any alarm set. The 10VDC can be wired to power an external alarm relay.

All alarms have a distinct display shown on the three-digit display on the controller. The red LED will be on for a pressure or suction temperature sensor alarm and the amber LED will on for all other alarms. Multiple alarms can exist. Below is the list of the alarm acronyms.

Remote 3 Digit Display	**Description**
PSA	Pressure sensor alarm
SSA	Suction Temp sensor alarm
ASA	Air Temp sensor alarm
CSA	coil sensor alarm
LSH	low superheat alarm
HtA	high air temperature alarm
LtA	low air temperature alarm
LPA	low suction pressure alarm
Dor	Door open alarm
COA	Comm alarm with other controllers
EA1	External Alarm 1
EA2	External Alarm 2
EA3	External Alarm 3
EFL	Email failure alarm (email not sent)
A1A	Aux Input 1 Temp sensor alarm
A2A	Aux Input 2 Temp sensor alarm
A3A	Aux Input 3 Temp sensor alarm
FrA	flash memory read/write failure
CCA	Comm alarm with comp sequencer

Setting Parameters by On-Board Pushbuttons

There are two levels for programming the controllers with the three-digit display and four pushbuttons. The first level (User's Level) will enable the USER to set the room temperature set point 'tS ', the refrigerant set point'rFG', and the defrost type set point 'dtY'; the second level (Technician's Level) allows access to the other parameters as described above.

USER'S LEVEL Press and hold the 'ENTER' button until the display reads 'tS ' (about 3 seconds). Use the 'up arrow' and 'down arrow' buttons to scroll between room temperature set point 'tS ', refrigerant set point 'rFG', defrost type set point 'dtY', and password 'PAS' to enter the 'TECHNICIAN LEVEL'. Press 'enter button' to view the value of the selected set point. If you want to change the value, use the up and down buttons to increment or decrement the value. Press the 'enter button' to change the digit that is blinking. When the value that is wanted is displayed, press and hold the 'ENTER' button until the name of the set point is displayed (about 3 seconds). At any time, pressing the 'BACK' button will escape to the step before.

TECHNICIAN'S LEVEL Press and hold the 'ENTER' button until the display reads 'tS ' (about 3 seconds). Use the 'up arrow' and 'down arrow' buttons to scroll to 'PAS'. Press the 'enter button' and '000' is displayed with the one's digit blinking. Press the 'up arrow button' until the display reads '002'. Press and hold the 'ENTER' button (about 3 seconds) until a set point is displayed. Use the up and down buttons to get to the set point that is wanted. Press 'enter button' to view the value of the selected set point.

If you want to change the value, use the up and down buttons to increment or decrement the value. Press the'enter button' to change the digit that is blinking. When the value that is wanted is displayed, press and hold the 'ENTER' button until the name of the set point is displayed (about 3 seconds). At any time, pressing the 'BACK' button will escape to thestep before.

MANUAL VALVE Press and hold the 'down arrow button' until the display reads a number. This is the valve open percentage. The tenth's digit will be blinking. Press the 'enter button' to change the digit that is blinking. Use the up and down buttons to increment or decrement the percentage open. At any time, pressing the 'BACK' button will escape manual valve mode and go back to auto mode. If no buttons are pressed for1 hour, the controller will go back to auto mode.

CLEAR ALARM Press and hold the 'ENTER' button until the display reads 'tS ' (about 3 seconds). Use the 'up arrow' and 'down arrow' buttons to scroll to 'PAS'. Press the 'enter button' and '000' is displayed with the one's digit blinking. Press the 'up arrow button' until the display reads '002'. Press and hold the 'ENTER' button (about 3 seconds) until a set point is displayed. Use the 'up arrow button' or 'down arrow button' until display reads 'CLA'. Press and hold the 'enter button' until the red led flashes (about 3 secs)

MANUAL DEFROST Press and hold the 'enter button' and the 'down arrow button' until the display flashes (about 3 seconds). If the controller was in 'rEF' or 'OFF', it will go to 'DEF'. If the controller was in 'DEF', it will go to 'drn'. If the controller was in 'drn', it will go to 'Fnd'. If the controller was in 'Fnd', it will go to 'rEF'.

BOND CNTRLRS Connect the controllers that need to communicate with each other using the RJ-45 connector of the controller to an ethernet switch or router. If there are just 2 controllers, you can connect them directly, without the ethernet switch or router. **Disconnect any other controller that is not going to communicate with this group of controllers.** On any of the controllers, press and hold the 'ENTER' button until the display reads 'tS' (about 3 seconds). Use the 'up arrow' and 'down arrow' buttons to scroll to 'PAS'.

Press the 'enter button' and '000' is displayed with the one's digit blinking. Press the 'up arrow button' until the display reads '002'. Press and hold the 'ENTER' button (about 3

seconds) until a set point is displayed. Use the up and down buttons to get to ‘bnd’ (bond controllers). Press and hold the ‘ENTER’ button until the display changes. After 3 to 5 seconds, all connected controllers will reset. The bonding process is complete. At any time, pressing the ‘BACK’ button will escape this mode back to the previous step.

Temperature Sensors

The application range of the temperature sensors used for this controller is -60ºF to +150ºF. If the sensor detects a temperature out of the range, an alarm will show on the controller display.

Three temperature sensors are used in a LogiTemp-equipped refrigeration system. They are the room temperature return air sensor, the evaporator defrost termination temperature surface sensor and the evaporatoroutlet (suction line) temperature surface sensor. All sensors are solid state devices with the same characteristics that change electrical resistance in response to a change intemperature.

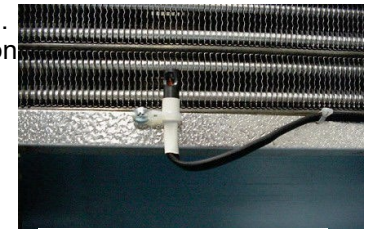


Figure 3

The room temperature sensor is factory-mounted on the lower back of the evaporator at the drain pan. This placement avoids heat from defrost heaters and lights and still allows a good air stream over the sensor. Figure 3 shows atypical mounting of the room temperature sensor.

The defrost termination sensor is mounted on one of the distributor tubes close the coil end plate. The outlet sensor is mounted on the suction line at the outlet of the evaporator as shown in Figure 4. These sensors are interchangeable.

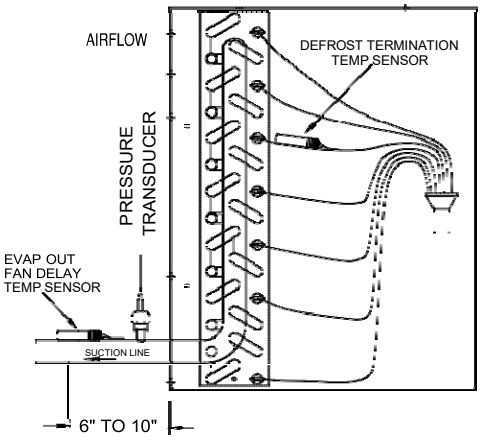


Figure 4

SENSOR SERVICE INSTRUCTIONS

Care must be taken when brazing the suction line at the evaporator. The outlet sensor must be taken out before brazing.After brazing, fasten the sensor with the metal strap provided. Make sure the sensor is tight and has good contact with the suction line.

The temperature sensor cannot be repaired. Using the measurements in Chart A below, you can determine if they arefunctioning correctly. If the sensors are found out of tolerance, they should be replaced.

As mentioned above, the temperature sensor changes electrical resistance in response to temperature changes. Disconnect the sensor from the controller, check the temperatureat the sensor location, then check and record the resistance through the temperature sensor.

Procedures to check temperature sensor tolerance with ice water:

1. Use a cup of water with well-stirred ice. The water temperature should be an even 32°F.
2. Submerge the room temperature sensor (T_{AIR}) into the water while the LogiTemp controller is normally operating. Check the display for the value. If the sensor shows 32°F, it is working properly.
3. Press the up or down buttons until the display shows the name of one of the variables. When the display shows tSC(T_{SUC}), which is the suction temperature, press the “*ENTER*” button to show the digit value. Submerge the sensor into the water. Check the display for the value. If the sensor shows32°F, it is working properly.
4. Press the down button until the display shows tCL, which is the coil temperature T_{COIL}, press the “*ENTER*” button to show the digit value. Submerge the sensor into the water. Check the display for the value. If the sensor shows 32°F, it is working properly.

Compare the temperature and resistance to Chart A.

Chart A. Temperature/Resistance Characteristics (-50 to 80 ºF)

Temp. ºF	Temp. ºC	ohms*1k		Temp. ºF	Temp. ºC	ohms*1k
-50	-45.6	43.45		15	-9.4	7.579
-40	-40.0	32.31		20	-6.7	6.731
-35	-37.2	27.96		25	-3.9	5.993
-30	-34.4	24.27		30	-1.1	5.349
-25	-31.7	21.13		32	0	5.123
-20	-28.9	18.43		35	1.7	4.781
-15	-26.1	16.12		40	4.4	4.281
-10	-23.3	14.13		50	10.0	3.454
-5	-20.6	12.42		60	15.6	2.805
0	-17.8	10.94		70	21.1	2.294
5	-15.0	9.651		80	26.7	1.888
10	-12.2	8.544				

NOTE: Use resistance at 32ºF for sensor checking.

Pressure Transducer

LogiTemp will be equipped with one of two types of pressure transducer (PT). The difference is in the color of sensor wires as noted below:

New PT (19-14226, 19-14223)	OLD PT (19-13955, 19-14092)	Description
RED (R)	BLACK	+VDC (+5)
BLACK (B)	GREEN	GROUND (5-)
GREEN (G)	WHITE	SIGNAL (sig)

The GROUND is connected to terminal ‘5-‘on the board. The SIGNAL lead is connected to terminal ‘sig’ on theboard. The +VDC lead is connected to terminal ‘5+’ on the board. Chart B shows the characteristics of the pressure transducer. **NOTE: The pressure transducer cannot be repaired but replaced only.**

Chart B. Pressure Sensor Simulation Values (0 to 150 PSIA)

Bar	PSIA	PSIG	V (Signal to Ground)
0	0	-14.6	0.509
0.69	10	-4.6	0.784
1.379	20	5.4	1.058
2.069	30	15.4	1.332
2.758	40	25.4	1.587
3.448	50	35.4	1.862
4.137	60	45.4	2.136
4.827	70	55.4	2.391
5.516	80	65.4	2.665
6.206	90	75.4	2.920
6.895	100	85.4	3.194
7.585	110	95.4	3.469
8.274	120	105.4	3.724

Charging the LogiTemp®-Equipped Refrigeration System

Note: If you are a first-time installer of a LogiTemp system,please call Refrigerated Solutions Group for on-phone training.

Since the system is designed with free floating head control, the head pressure control valve is not installed in this type of system. Therefore, the compressor operates at its highest EER value.

During initial pull down, after primary charge while the system is running, a large evaporator superheat is built up. The electric expansion valve is then open all the way. If the system is charged full sight glass during this period, the system is already overcharged.

Note: The liquid line size is determined by conventional piping practices for air and electric defrost. For reverse cycle defrost, the liquid line must be selected by choosing the liquid line one nominal step larger than the conventional approach.

For example:
For an evaporating temperature =-20ºF, refrigerant R-449A, and a capacity of 24,000 BTUH, the conventional tables will suggest a liquid line size of ½" OD. When utilizing the reverse cycle feature of LogiTemp Plus, the liquid line size should be 5/8" OD. When utilizing the electric or air defrost scheme, there is no need to make the line larger.

All suction lines may be chosen by conventional practices. Please note the"stubs" at both the evaporator and condensing unit do not necessarily mean that this is the correct size for your application.

Calculation of estimated amount of working refrigerant:
The amount of working refrigerant can be estimated by the following formula:

Tons of cooling capacity x 4.5 LBS/Ton + Full Liquid Line Charge between Evaporator and Condensing Unit.

For example, a system of 12,000 BTUH @ -20F suction, 50 ft 1/2" liquid line run, R449A, 100F Liquid,the working amount of refrigerant is: 1 x 4.5 + 6.5 x 50/100 = 7.75 LBS R449A. **The actual charge should be approximately this working amount of refrigerant.**

Weight of Refrigerant in LBS per 100 ft of Liquid Line:

Liquid Line Size, Inch	Refrigerant	Lbs of Refrigerant
3/8	R448A/R449A R404A	3.6 3.5
1 /2	R448A/R449A R404A	6.7 6.5
5/8	R448A/R449A R404A	10.8 10.5
7/8	R448A/R449A R404A	22.5 21.0

The recommended charging procedures are:

(1) Charge the system by weighing exact amount of refrigerant specified by Refrigerated Solutions Group for the unit. Or,

(2) Charge 50% of the liquid receiver (if provided) rated holding capacity. Let the system run through the pulldown period until room temperature is closely reached, then gradually add refrigerant until actual superheat "SUP" on board is approaching superheat setpoint "SSP". Bubbles may be seen in the sight glass. Slowly add refrigerant until the subcooling of the condenser to be around 1 to 5ºF.

(3) In a reverse cycle defrost system, there may not be a liquid receiver. Charge the system the working amount of refrigerant calculated above. Let the system run through the pull down period until room temperature is closely reached. Then gradually add refrigerant until actual

superheat “SUP” on board is approaching superheat setpoint “SSP”. Bubbles may be seen in the sight glass. Slowly add refrigerantuntil the subcooling of the condenser to be around 1 to 5°F.

How to diagnose an overcharged system:
An overcharged system will not operate properly.

- First, be sure that system is not leaking
- Compressor may be short cycling
- Frost building up on compressor suction section, suction filter or service valve
- Low superheat alarm appears on the controller display constantly
- Head pressure cut-out during defrost for a reverse cycle defrost system
-

Solution:
Taking some refrigerant out of the system until on-board actual superheat “SUP” is observed approachingsuperheat setpoint “SSP”.

Technical Notes

- An optional alarm relay (10VDC Coil) can be connected to terminals (+,-) of CN1. When the relay is energized, there’s no alarm. The alarm does not indicate what causes the alarm. To find out what has caused the alarm, check the onboard three-digit display for alarm codes and refer to the diagnosis chartfor corrective action.
- Defrost termination set point (dtP) can be also set up to 80°F. When setting the defrost termination temperature, make sure that the frost is free after each defrost. Also adjust the maximum defrost duration when necessary.
- The superheat of each application can be set by the customer. Superheat 8-12°F is recommended forwinter operation, superheat 5-10°F for summer.
- Always clear the “LSH”, “HtA” and “LtA” alarms after corrective action is taken. The sensor andcommunication alarms cannot be cleared unless they are corrected.
- Cat5/e communication cable should be rated 300 V 80°C or higher. If the wire is rated lower than 300 V,a separate conduit must be used for communication cables.
- Follow the instructions in the Refrigerated Solutions Group *Condensing Unit and Refrigeration System Installation & Operation Manual* to perform the final check-up before charging and starting up the system. Always referto this service manual, make sure all steps are understood. Don’t hesitate to call Refrigerated Solutions Group Customer Service Department at 800-684-8988 for technical assistance.

REVERSE CYCLE DEFROST

General Information

Refrigerated Solutions Group's patented (U.S. patent no. 7,073,344) reverse cycle defrost is a standard feature on LogiTemp Plus-equipped refrigeration systems. A reverse cycle valve is already **factory-installed** on the condensingunit. The valve's primary function is to reverse the direction of the refrigerant flow during defrost. When LogiTemp's demand defrost determines that a defrost is necessary, the reverse cycle valve is activated, and the high temperature refrigerant flow is reversed.

Under the normal refrigeration cycle, the refrigerant flow is the same as traditional refrigeration modes. During the defrost mode, the refrigerant flow is reversed back through the evaporator coil heating it from the inside-out along its entire length and eliminating frost buildup (see figure 5 below).

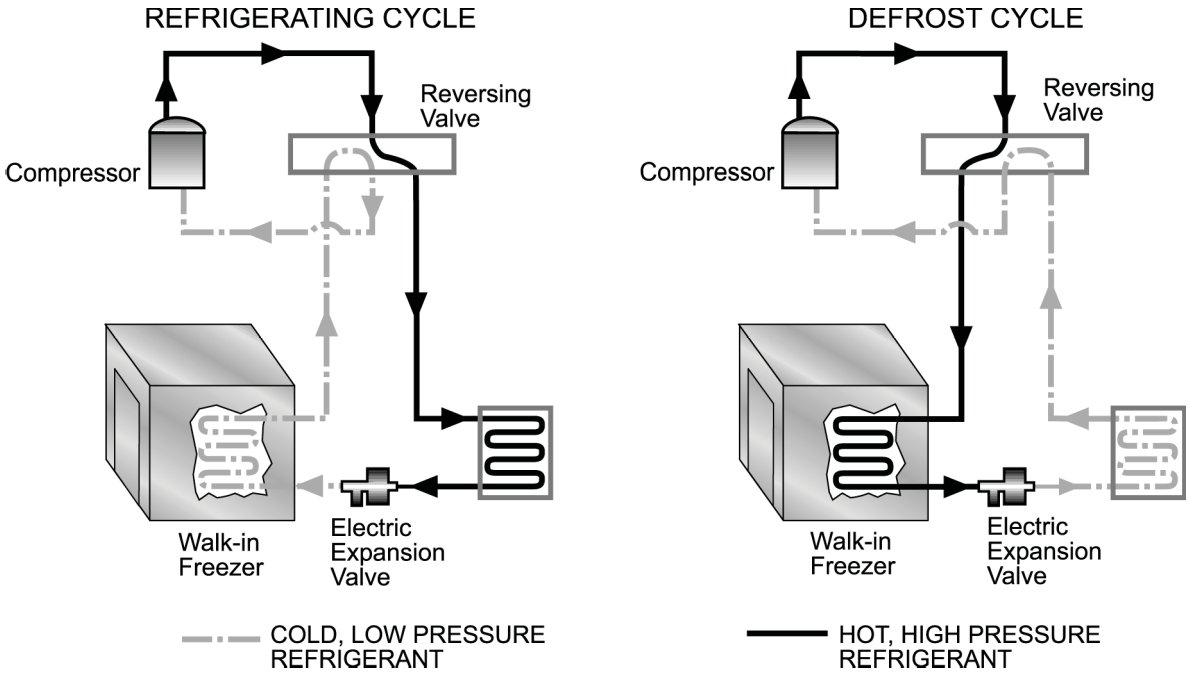


Figure 5

Advantages

Reverse cycle technology offers several significant advantages:

- **An up to 80% reduction in defrost energy usage.** This savings, coupled with that from the demand defrost feature, dramatically reduces energy consumption.
- Eliminates many mechanical parts
- Reduces cost of evaporator, installation and wiring
- Reduces defrost time
- No significant increase in freezer room temperature
- No noticeable increase in product temperature

Factory-Installed Parts

A 4-way reversing valve, operating at 24 VAC, is installed in a reverse cycle defrost unit. A transformer is also installed in the master evaporator to supply 24VAC to the 4-way reversing valve.

Eliminated Parts

The Refrigerated Solutions Group Reverse cycle's unique technology, coupled with the bi-flow electric expansion valve, eliminatesthe need for:

- Defrost coil heaters
- Head pressure control valves
- Check valves and expansion valves at the condenser that are normally necessary in traditional hot gas defrost systems
- By-pass valves
- Liquid line solenoid valves
- Receiver tanks (except in B-series condensing units 6 HP and up)
- Sight glass optional

Removing these components reduces the cost of the evaporator itself and saves on installation and wiring.

Defrost Time

Defrost time is greatly lessened with the reverse cycle option. The average time using electric defrost heaters is 20-30 minutes but reverse cycle performs a completely "clean" defrost typically in 3 – 5 minutes for freezers and $1^{1}/_{2}$ – 2 minutes for coolers.

Because the defrost is so rapid, there is no noticeable increase in freezer room temperature and the product temperature rise is also significantly less. Reverse cycle defrost, combined with demand defrost, assures the evaporator receives the number of complete defrosts needed at the necessary times to prevent iced evaporators while assuring the protection of the valued product being stored.

Charging a LogiTemp® Plus with Reverse Cycle Defrost System f

Note: If you are a first-time installer of a LogiTemp Plus system,please call Refrigerated Solutions Group for on-phone training.

Please refer to Page 21: Charging the LogiTemp-Equipped Refrigeration System

Due to the reversing of the refrigerant flow, it is recommended that the refrigeration liquid line piping also be insulated to prevent condensation drips between the condensing unit and the evaporator coil.

ELECTRIC WIRING

WARNING

Please make sure to turn all power off before servicing electrical equipment. Always use a qualified and trained technician. If you are the technician and a first-time installer of a LogiTemp system, call our service department at 800-684-8988 for free training and support.

The field wiring for a LogiTemp-equipped refrigeration system includes the power supply to the condensing unit, the evaporator (fans, heaters, and controller) and the communication cables between masterand slaves. Thermostat wiring may be used for four-way reversing valve power supply since it is 24 VAC.

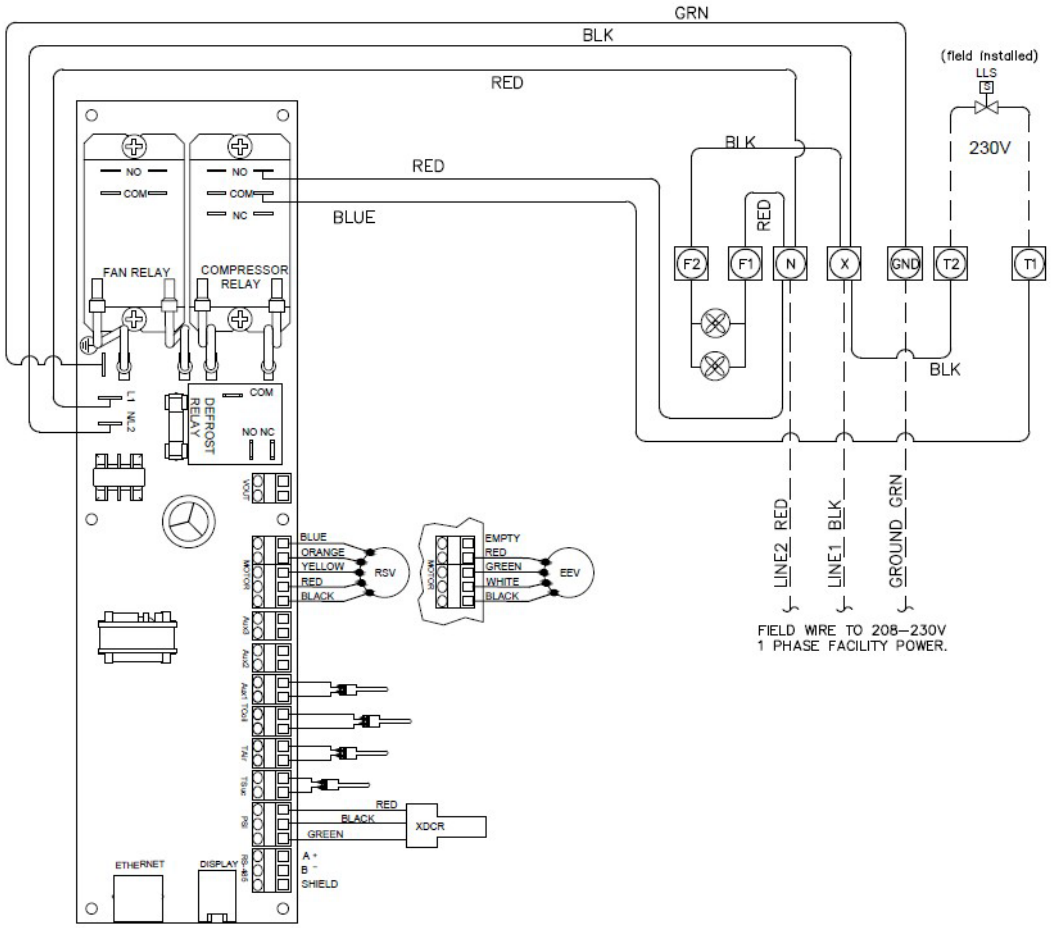
TYPICAL EVAPORATOR WIRING DIAGRAM (AIR DEFROST)

EVAPORATOR, B–MA,
OEM CONTROLLER, AIR DEFROST

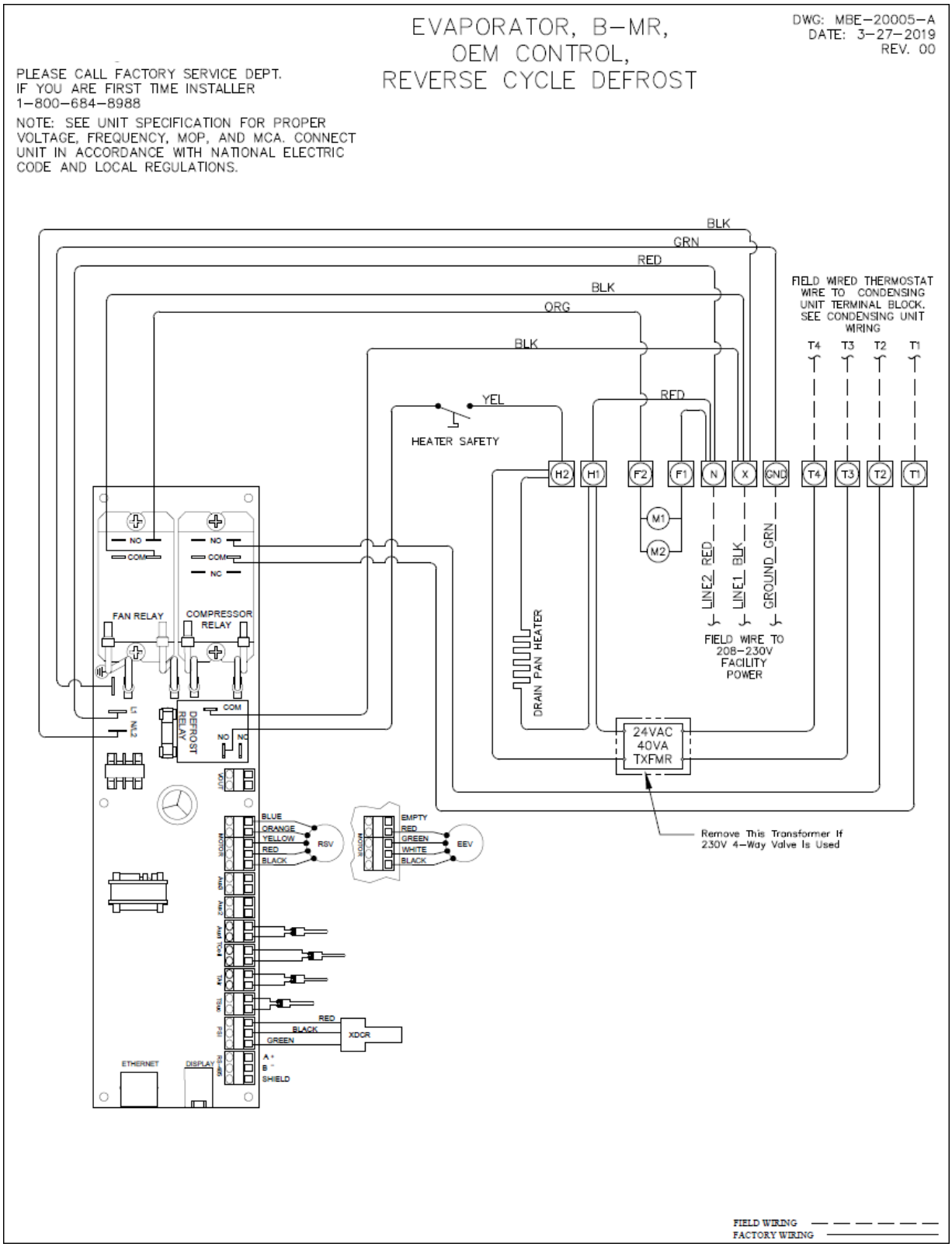
DWG: MBE–20007–A
DATE: 3–26–2019
REV. 0

PLEASE CALL FACTORY SERVICE DEPT.
IF YOU ARE FIRST TIME INSTALLER
1–800–684–8988

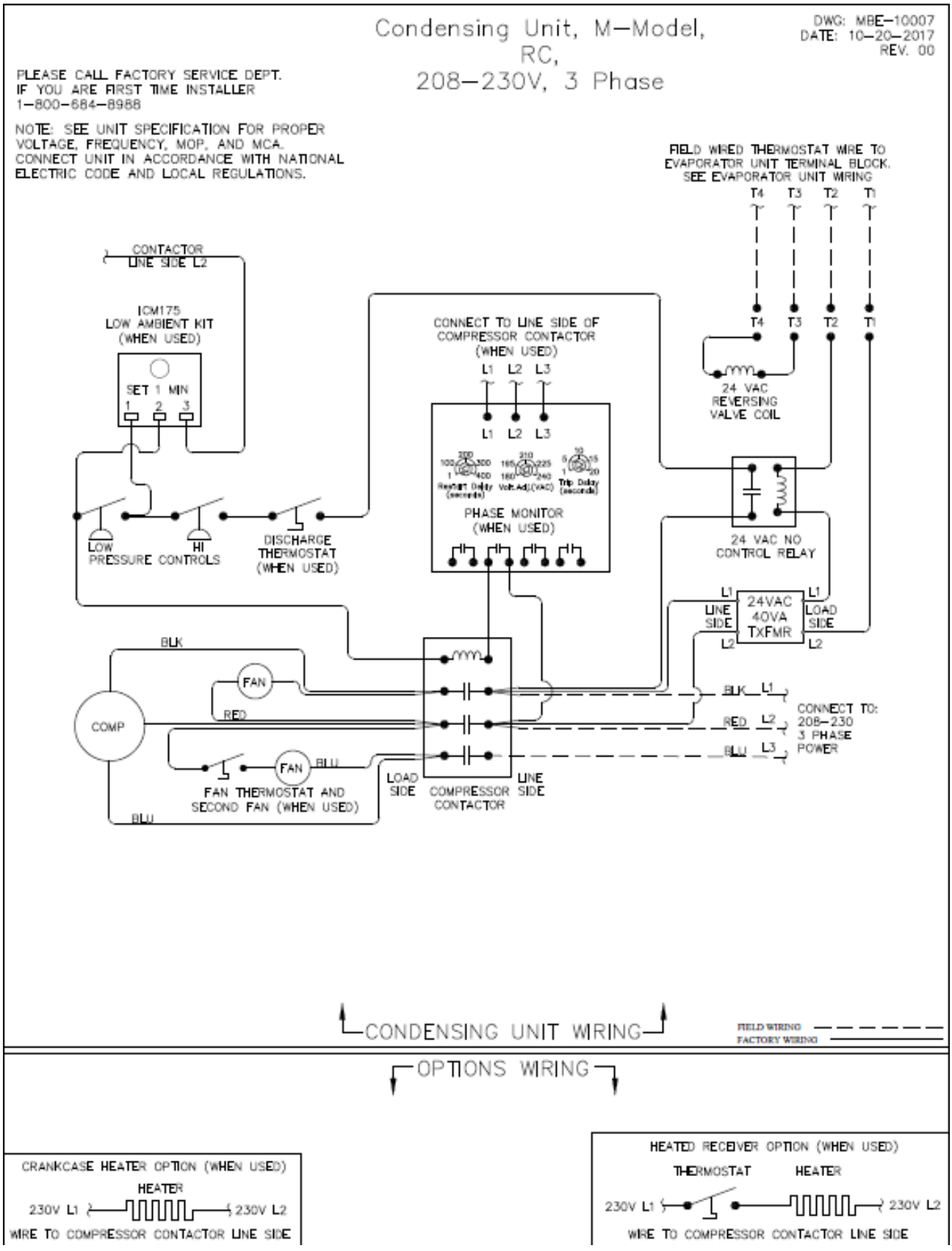
NOTE: SEE UNIT SPECIFICATION FOR PROPER VOLTAGE, FREQUENCY, MOP, AND MCA. CONNECT UNIT IN ACCORDANCE WITH NATIONAL ELECTRIC CODE AND LOCAL REGULATIONS.



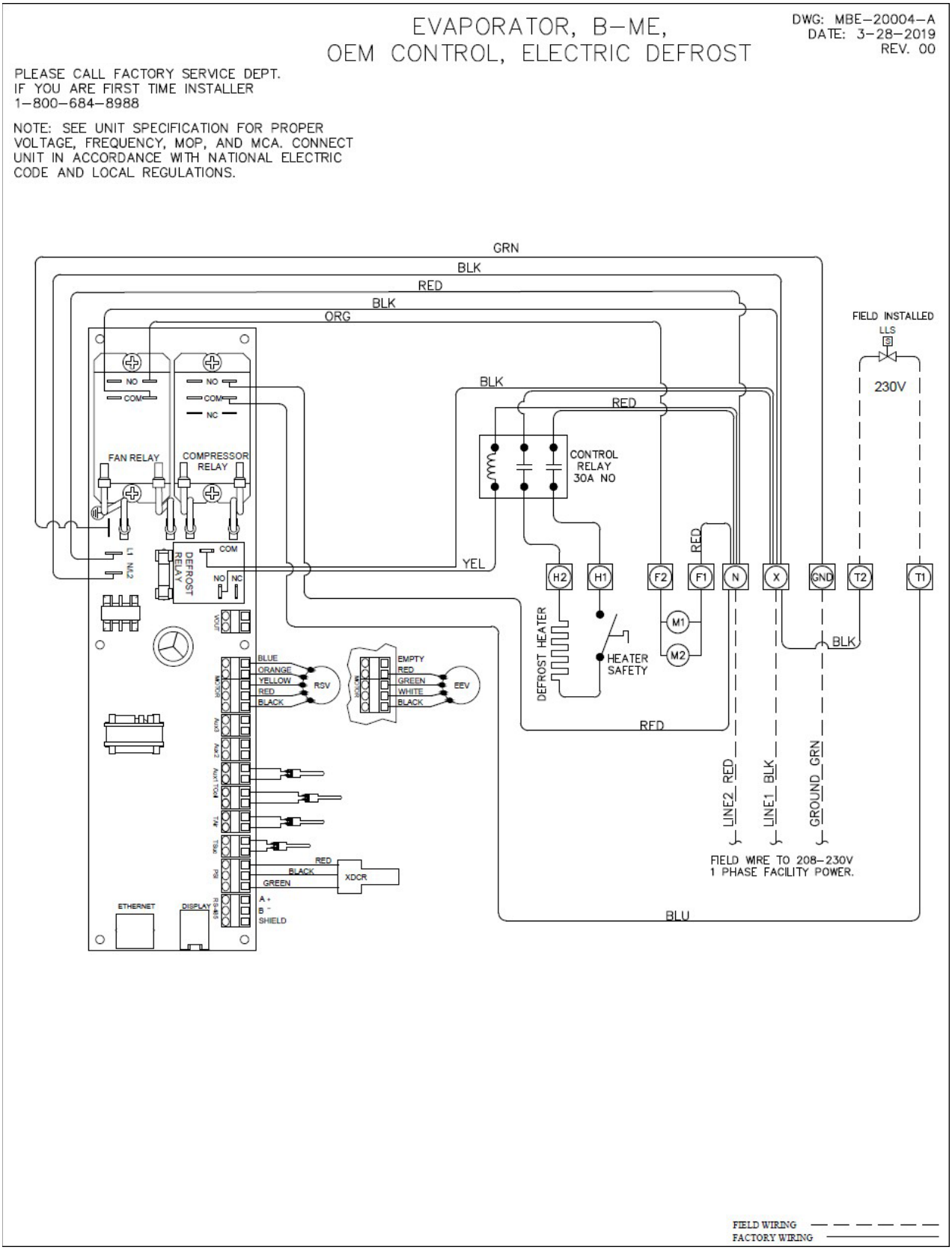
TYPICAL EVAPORATOR WIRING DIAGRAM (REVERSE CYCLE DEFROST)



TYPICAL CONDENSING UNIT WIRING DIAGRAM (REVERSE CYCLE DEFROST)



TYPICAL EVAPORATOR WIRING DIAGRAM (ELECTRIC DEFROST)



Note: For feature configuration, please refer to the wiring diagram in the actual system for installation.

TYPICAL SET POINTS FOR CONTROLLER

	Air/Electric Defrost		Reverse Cycle Defrost	
	Low Temp	High Temp	Low Temp	High Temp
tS	-10	35	-10	35
rFG	449	449	449	449
dty	ELE	ELE	rCd	rCd
Edt	rS	rS	rS	rS
SSP	10	10	10	10
HoP	55	80	55	80
LoP	2	2	2	2
LPP	20%	20%	20%	20%
HPP	75%	75%	75%	75%
Fot	30	50	30	50
Ctd	10	10	10	10
LLt	0	0	0	0
Ato	5	5	5	5
Crt	2	2	2	2
Cot	2	2	2	2
Cyr	PEr	PEr	PEr	PEr
din	dnd	dnd	dnd	dnd
dPd				
Int	720	1440	720	1440
dFS	oFF	on	oFF	oFF
dtP	75	45	60	60
dtL	35	35	20	20
drn	2	2	5	2
Cyd				
Fdt	30	45	30	45
Fnt	5	5	5	5
Pdt	2	2	0	0
bnt	SyC	SyC	SyC	SyC
HAo	10	10	10	10
LAo	5	5	5	5
LAd	60	60	60	60
drd	30	30	30	30
AU1	diS	diS	diS	diS
A1A	CLo	CLo	CLo	CLo
AU2	diS	diS	diS	diS
A2A	CLo	CLo	CLo	CLo
AU3	diS	diS	diS	diS
A3A	CLo	CLo	CLo	CLo
tS2	-5	40	-5	40
Atd	5	3	5	3
CLA				
bnd				
SA	EnA	EnA	EnA	EnA
dHC	diS	diS	diS	diS
HITA	25	15	25	15
HITD	59	59	59	59
LOTA	10	15	10	15

TROUBLESHOOTING GUIDE

Use the alarm display together with the chart below to check the causes of each error message.

Trouble, Alarm Codes	Causes	Corrective Actions
Pressure transducer alarm **PSA**	• Bad transducer • Out of range • Loose wire • Wrong hook-up	• Replace the pressure transducer • Turn off power for a few seconds, turn back on • Wire correctly
Suction temp sensor TSUC alarm **SSA**	• Mechanical damage • Connection wire loose • Overheated • Out of range	• Tighten the connection wires on the controllerterminal • When brazing suction line, take out the sensor • Install the sensor after brazing
Room sensor TAIR alarm **ASA**	• Mechanical damage • Connection wire loose • Overheated • Out of range	• Tighten the connection wires on the controllerterminal • The room sensor can be replaced by surfacesensor
Defrost termination sensor TCOIL fails **CSA**	• Mechanical damage • Loose connection wire • Overheated • Out of range	• Tighten the connection wires on the controllerterminal • Let the sensor cool down to applicationtemperature range: –50ºF to +103ºF • Replace failed sensor
Low superheat **LSH**	• Superheat setting too low • Wrong locations of TS2 • Sensors may be loose • Uneven feeding of coil circuits • Overcharge of refrigerant Defective electric expansion valve(EEV) • Compressor stops	• Change to correct set point • Make sure the distributor is feeding each circuitevenly • Insulate the sensors with foam tape • Use correct refrigerant charge • Check EEV wiring • Replace defective EEV • Check compressor
High room temperature **HtA**	• Insufficient refrigeration • Heat load too large • Compressor fails or high pressurecuts out • Evaporator fans may not run • Door open for too long • Coil iced-up	• Check system design to select a sufficientsystem • Replace failed compressor • Fix the evaporator fans • Keep the cold room door closed duringrefrigeration • Check possible air leak through the walls ofcold room
Low room temperature **LtA**	• Inproper low temp setpoint • Over designed system	• Change low temp set point • Re-select the system
Low pressure alarm **LPA**	• Refrigerant leak • Bad transducer	• Fix leak • Replace pressure transducer
Door open alarm **dor**	• Door open • Wiring loose • Digital input set-up incorrectly	• Close the door • Tighten the terminals. Correct wiring • Check the setting and correct it
Communication alarm **COA**	• Loose connection • Failed communication port	• Tighten the terminals and bonding set-up • Change a new controller board
External Alarm 1 **EA1**	• Loose connection • Incorrect set-up	• Tighten the terminals • Check the setting and correct it
External Alarm 2 **EA2**	• Loose connection • Incorrect set-up	• Tighten the terminals • Check the setting and correct it
External Alarm 3 **EA3**	• Loose connection • Incorrect set-up	• Tighten the terminals • Check the setting and correct it
Email failure alarm (email not sent) **EFL**	• Incorrect set-up	• Check the set-up and correct it

Troubleshooting the Electric Expansion Valve

If the valve stops moving, depending upon how far open it is, one or more alarms may be displayed. These alarms include a low superheat alarm, a low temperature alarm, and/or a high temperature alarm.
Use the following steps to troubleshoot the valve:

1) Disconnect the valve from the controller.
2) The resistance between the black and white leads should be 90 ohms. The resistance between the black and red leads should be an open.
3) The resistance between the red and green leads should be 90 ohms. The resistance between the white and green leads should be an open.
4) The resistance between each lead and the brass housing of the valve should be an open.
5) Read the AC, not DC, voltage across the black and white leads while the valve is moving. The AC voltage should be 11 to 13 VAC. The voltage will be close to 0 VAC when the valve is not moving.
6) Repeat step 5 across the red and green leads.

If any voltage is out of tolerance, replace the controller. If the above steps pass, inspect for contamination in the valve or nicks on the seat of the valve.

CAUTION: If the valve was taken apart and was left running while taken apart, the piston may have come too far out of the motor assembly. If you reassemble the valve with the piston in this position, the threads in the piston will be stripped when the piston is forced into the seat while tightening the lock nut. Make sure the piston is drawn up far enough into the motor assembly before reassembling.

REFRIGERATED SOLUTIONS GROUP PART NUMBERS

Use the chart below when ordering replacement parts for your Refrigerated Solutions Group LogiTemp refrigeration system.

Item Description	Part No.	Notes
LogiTemp OEM Board MT Cooler	19-14800	Please re-set for applications
LogiTemp OEM Board LT Freezer	19-14778	Please re-set for applications
MC 4.0 OEM Board 3-digit display	19-14717	Snap-in on evaporator end cover
MC 4.0 OEM Board Mounting Snaptrack 11.2"	19-14779	To hold OEM board in place
END COVERNEXGEN-LP, WITT# 08528350	19-14771	With a knock-out hole for display
CONTROLLER BRACKET, WITT# 08528349	19-14772	To mount the OEM board on
EEV KE2 P/N 21102 ,RSV-220 3/8 X 1/2 ODF, No Stator	19-14681	To be used with 19-14683
EEV KE2 P/N 21100 ,RSV-320 1/2 X 1/2 ODF, No Stator	19-14682	To be used with 19-14683
KE2 P/N 21104 , Replacement EEV Stator RSV-CS	19-14683	For 19-14681 and 19-14682
Master Controller 3.2 Board Med. Temp. Cooler	19-14285	Please re-set for applications
Master Controller 3.2 Board Low Temp. Freezer	19-14282	Please re-set for applications
Electric expansion valve SER-6, 1/2" ODF x 1/2"ODF 120" S	19-13772	Connections: SER-6-1/2”x1/2”
Electric expansion valve SER-6, 5/8" ODF x 5/8" ODF 120" S	19-13773	Connections: SER-6-5/8”x5/8”
Low Pressure Transducer	19-14223	Suction Pressure
4-Way Reversing Valve	09-09776	7/8” Connections, 24VAC Coil
4-Way Reversing Valve	09-09783	1 3/8” Connections, 24VAC Coil
Temperature Sensor	19-13967	30” Leads
Temperature Sensor	19-13968	10 ft Leads
24VAC Control RELAY	19-13986	For compressor control
24VAC, 40VA Transformer	39-01088	120/208/240 V Primary
Smart Gate Wireless Router, KE2# 20695	19-14294	
Fast MB Master-Controller, CommercialRange, 5 Port 10/100	19-14287	
Fast Ethernet Switch, 8 Port 10/100	19-14288	
Cable: 50 feet Ethernet Cat5e,	19-14290	With Ethernet Switch
Cable: 25 feet Ethernet Cat5e	19-14289	Use between AMCs
Cable: 100 feet Ethernet Cat5e	19-14291	With Ethernet Switch
Valve Test Kit	19-13786	Recommended for service
Fuse, BK/MDL-1/4, Time Delay, for AMC	19-14299	for AMC, Vendor: KE2Therm

For condensing unit installation and wiring, please consult the *Refrigerated Solutions Group Condensing Unit System Installation and Operation Manual*. If any discrepancy is found in this manual, please contact Refrigerated Solutions Group Technical Service Department immediately.

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800-477-5253 Norlake Scientific Sales
800-388-5253 Norlake Parts/Service
800-647-1284 Master-Bilt Sales
800-684-8988 Master-Bilt Parts/Service
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