*Turbo air Speeds Up the Pace of Innovation*

REFRIGERATOR MANUFACTURER
Turbo air

SMART 7

**Part No. KUCST1307**
**CAREL CONTROLLER**

# Refrigeration System
# Installation & Operation Manual

***Please read this manual completely before attempting to install or operate this equipment !***

## Package Unit ( TOP MOUNT )

# CONTENTS

## Safety Information

Be sure all power sources are turned off before checking the electric wiring or appliances to avoid electric shock.

Do not run fan if cover or case is removed. This is to avoid electric shock.

Keep finger away from moving parts.

Avoid touching refrigerant lines. Some parts are very hot and can cause burns.

Avoid contacting sharp edges or coil surface that are a potential injury hazard.

Avoid touching the units or electric box in wet hands to prevent electric shock.

Please call the specialized installation company or trained personnel when you installing, moving, operating of the unit.

Field wiring must confirm to the requirements of units' electric specification.

## Inspection

A person at the job site to receive material holds responsibility. Each shipment should be carefully inspected against the bill of lading. The shipping receipt should not be signed before careful inspection. Check carefully for concealed damage. Any shortage or damages should be reported to the delivering carrier. If damaged material becomes the delivering carrier's responsibility and it should not be returned to Turbo air unless prior approval is given to do so. Check the serial tag information with invoice. Report any discrepancies to Turbo air sales representatives.

**Table 1. INDOOR UNIT - Medium Temperature (Air Defrost System)**

| Model | Ambient 95˚F | | Voltage | MCA | MOPD | Refrigerant. | | Plug Supplied | Matching NEMA Receptacle | NET Weight (Lbs) | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Capacity BTUH | | | | | Ref. | Wt oz | | | | |
| | 35˚F | 38˚F | | | | | | | | | |
| STI030MR404A1 | 3183 | 3380 | 115/1/60 | 7.1 | 15 | R404A | 18 | YES | 5-20R | 130 | A |
| STI050MR404A1 | 5026 | 5356 | 115/1/60 | 11.3 | 20 | R404A | 28 | YES | 5-20R | 195 | B |
| STI050MR404A2 | 5026 | 5356 | 208~230/1/60 | 4.7 | 15 | R404A | 28 | YES | 6-15R | 195 | B |
| STI068MR404A2 | 7743 | 8213 | 208~230/1/60 | 8.9 | 15 | R404A | 42 | YES | 6-15R | 216 | B |
| STI075MR404A2 | 8059 | 8675 | 208~230/1/60 | 9.2 | 15 | R404A | 42 | YES | 6-15R | 226 | B |
| STI100MR404A2 | 11652 | 12556 | 208~230/1/60 | 14.0 | 20 | R404A | 53 | YES | 6-20R | 311 | C |
| STI100MR404A3 | 11652 | 12556 | 208~230/3/60 | 10.1 | 15 | R404A | 53 | NO | - | 318 | C |
| STI130MR404A2 | 15092 | 16376 | 208~230/1/60 | 14 | 20 | R404A | 60 | NO | - | 320 | C |
| STI130MR404A3 | 15092 | 16376 | 208~230/3/60 | 9.9 | 15 | R404A | 60 | NO | - | 317 | C |

**Table 2. INDOOR UNIT – Low Temperature (Electric Defrost System)**

| Model | Ambient 95˚F | | | Voltage | MCA | MOPD | Refrigerant. | | Plug Supplied | Matching NEMA Receptacle | NET Weight (Lbs) | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Capacity BTUH | | | | | | Ref. | Wt oz | | | | |
| | 0˚F | −10˚F | −20˚F | | | | | | | | | |
| STI022LR404A2 | 2849 | 2423 | 1643 | 208~230/1/60 | 8.0 | 15 | R404A | 24 | YES | 6-15R | 195 | B |
| STI045LR404A2 | 5957 | 4603 | 3514 | 208~230/1/60 | 16.4 | 25 | R404A | 28 | YES | 6-15R | 226 | D |
| STI055LR404A2 | 7395 | 5406 | 4002 | 208~230/1/60 | 19.5 | 30 | R404A | 46 | YES | 6-20R | 311 | C |
| STI055LR404A3 | 7395 | 5406 | 4002 | 208~230/3/60 | 13.3 | 20 | R404A | 46 | NO | - | 318 | C |
| STI070LR404A2 | 9139 | 7520 | 5439 | 208~230/1/60 | 19.8 | 30 | R404A | 46 | NO | - | 320 | C |
| STI070LR404A3 | 9139 | 7520 | 5439 | 208~230/3/60 | 13.9 | 20 | R404A | 46 | NO | - | 317 | C |

**Table 3. OUTDOOR UNIT - Medium Temperature (Air Defrost System)**

| Model | Ambient 95˚F | | Voltage | MCA | MOPD | Refrigerant. | | Plug Supplied | Matching NEMA Receptacle | NET Weight (Lbs) | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Capacity BTUH | | | | | Ref. | Wt oz | | | | |
| | 35˚F | 38˚F | | | | | | | | | |
| STI050MR404A2 | 5026 | 5356 | 208~230/1/60 | 4.7 | 15 | R404A | 28 | NO | - | 205 | D |
| STI068MR404A2 | 7743 | 8213 | 208~230/1/60 | 8.9 | 15 | R404A | 42 | NO | - | 225 | D |
| STI075MR404A2 | 8059 | 8675 | 208~230/1/60 | 9.2 | 15 | R404A | 42 | NO | - | 236 | D |
| STI100MR404A2 | 11652 | 12556 | 208~230/1/60 | 14.0 | 20 | R404A | 53 | NO | - | 319 | E |
| STI100MR404A3 | 11652 | 12556 | 208~230/3/60 | 10.1 | 15 | R404A | 53 | NO | - | 327 | E |
| STI130MR404A2 | 15092 | 16376 | 208~230/1/60 | 14 | 20 | R404A | 60 | NO | - | 329 | E |
| STI130MR404A3 | 15092 | 16376 | 208~230/3/60 | 9.9 | 15 | R404A | 60 | NO | - | 325 | E |

**Table 4. OUTDOOR UNIT – Low Temperature (Electric Defrost System)**

| Model | Ambient 95˚F | | | Voltage | MCA | MOPD | Refrigerant. | | Plug Supplied | Matching NEMA Receptacle | NET Weight (Lbs) | Fig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Capacity BTUH | | | | | | Ref. | Wt oz | | | | |
| | 0˚F | −10˚F | −20˚F | | | | | | | | | |
| STX022LR404A2 | 2849 | 2423 | 1643 | 208~230/1/60 | 8.0 | 15 | R404A | 28 | NO | - | 213 | D |
| STX045LR404A2 | 5957 | 4603 | 3514 | 208~230/1/60 | 16.4 | 25 | R404A | 42 | NO | - | 248 | D |
| STX055LR404A2 | 7395 | 5406 | 4002 | 208~230/1/60 | 19.5 | 30 | R404A | 53 | NO | - | 320 | E |
| STX055LR404A3 | 7395 | 5406 | 4002 | 208~230/3/60 | 13.3 | 20 | R404A | 53 | NO | - | 317 | E |
| STX070LR404A2 | 9139 | 7520 | 5439 | 208~230/1/60 | 19.8 | 30 | R404A | 60 | NO | - | 328 | E |
| STX070LR404A3 | 9139 | 7520 | 5439 | 208~230/3/60 | 13.9 | 20 | R404A | 60 | NO | - | 324 | E |

**Figure A. INDOOR UNIT – Small Cabinet (Opening Size : 14.5 inch x 20.8 inch)**

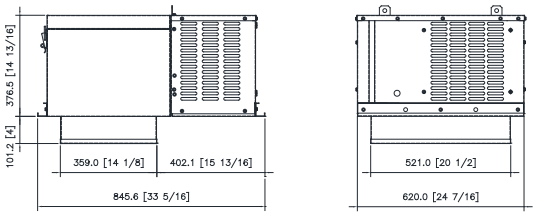



**Figure B. INDOOR UNIT – Medium Cabinet (Opening Size : 25 inch x 25 inch)**

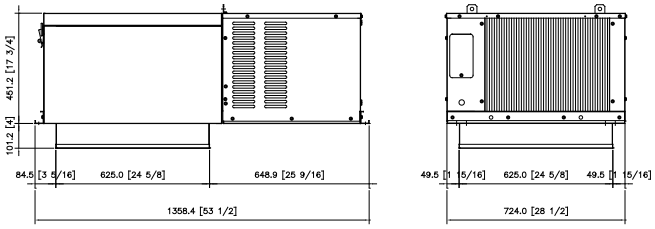



**Figure C. INDOOR UNIT – Large Cabinet (Opening Size : 25 inch x 38.5 inch)**

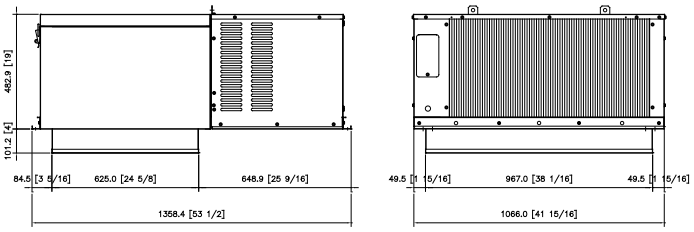



**Figure D. OUTDOOR UNIT – Medium Cabinet (Opening Size : 25 inch x 25 inch)**

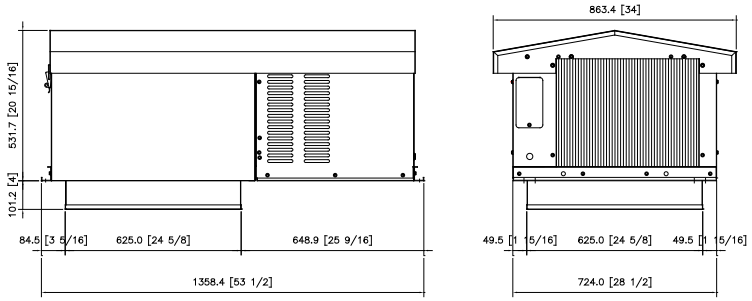
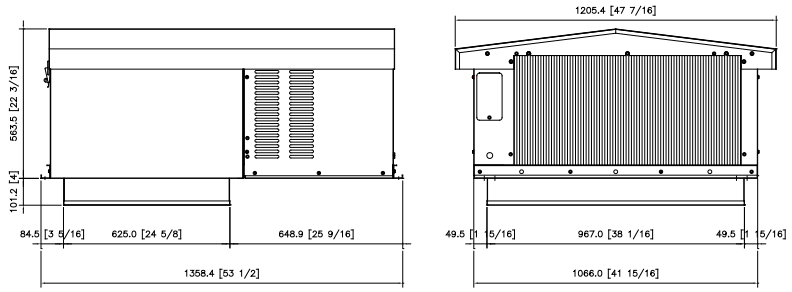



**Figure E. OUTDOOR UNIT – Large Cabinet (Opening Size : 25 inch x 38.5 inch)**



# Locating SMART 7 Package Unit

## Unit Installation Requirements

1. You must ensure before unit placement on the roof of box that the structural strength of the box can withstand the weight of SMART7 equipment
2. The unit should be installed away from noise sensitive site and must have proper support for noise and vibration not to be transmitted into the building.
3. Unit must be located away from steam, hot air or heat generator and placement should be selected in consideration of ventilation.
4. Indoor units are designed for indoor use only with ambient between 50°F~100°F and have no system control following ambient variation.
5. Evaporator section must not be located over doors.
6. Air circulation must cover completely inner space.
7. Installation, service and maintenance must be carried out by licensed contractor in conformity with the local standard construction code.

Ignoring above requirement will result in system fault, shorten life span and void the warranty,

## Unit Transport Requirements.

1. Do not remove shipping skid until ready to move it upon box rooftop.
2. Always watch out not to contact sharp edges and coil surfaces to avoid potential injury. Wear safety gears always during installation.
3. Use spreader bar to lift the unit upon roof of box not to damage on the cabinet.
4. Do not remove compartment cover of the compressor section, hood for outdoor unit.

## Unit Installation location.

1. Space between wall and air in/outlet must be secured at least 2inch.(refer to Fig. 1)
2. There must be 2 feet space secured at least above unit for service and removal of top case.(Refer to Fig. 1)
3. Single unit installation must be carried out following Fig. 2.
4. More than dual units installation must be carried out following Fig. 3.

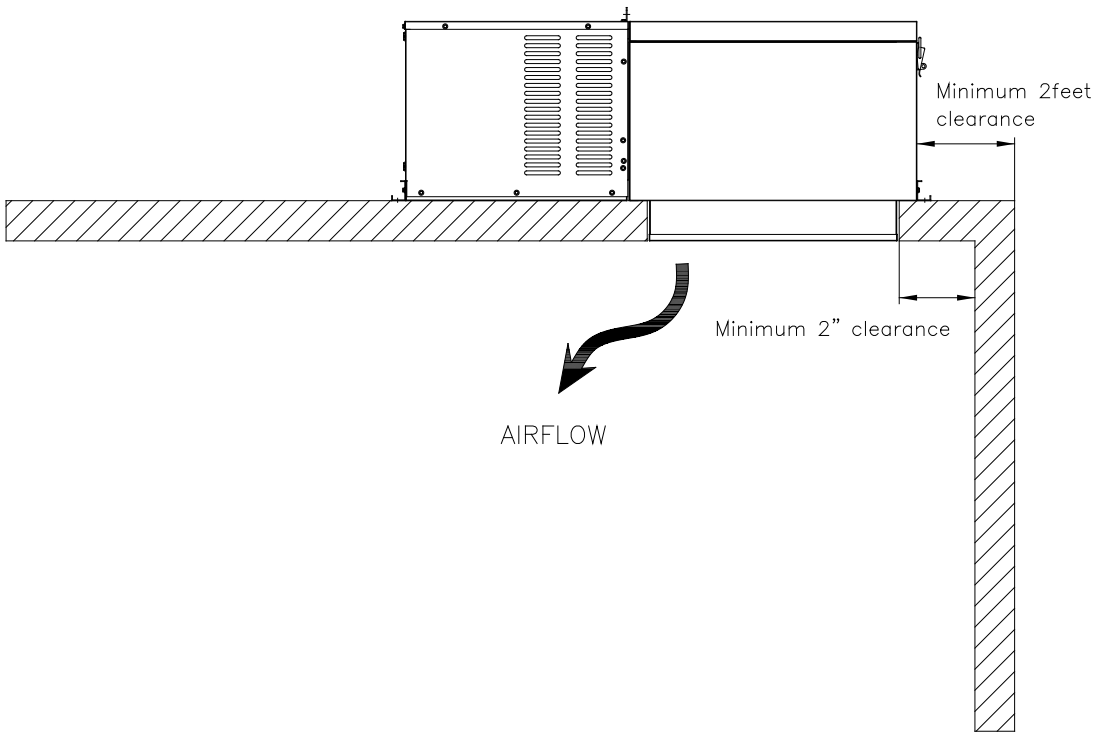



**Figure 1. Minimum Clearance at Installation of Unit.**

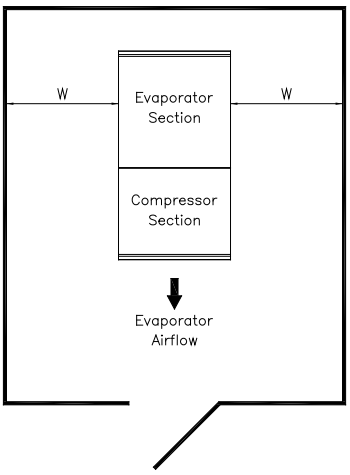



**Figure 2. One Unit**

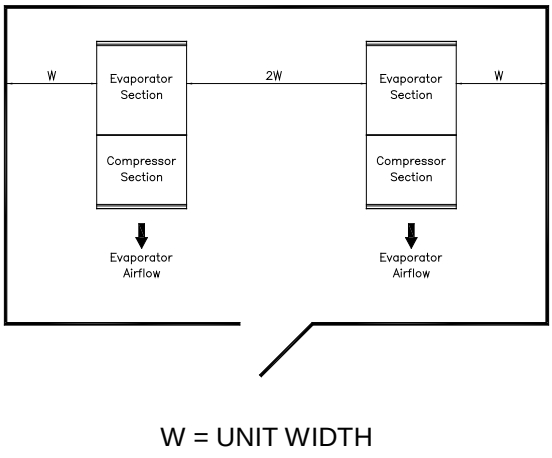



**Figure 3. Two or more Unit**

# Installation procedure

## Indoor use only ( STI Model )

1. Carefully check package for damages during transportation and unit after opening the package.
2. Requirements must be followed for installing location on the page of 6~7.
3. Ensure weights of units on the page of 4~5 and that structural strength of the box can withstand of the weight of the unit.
4. Clean the roof surface of box for close adhesion of unit gasket to the surface.
5. Consult to box manufacturer for any processes necessary to ensure the integrity of the exposed form in the panels is not compromised.
6. Check mounting surface as level of surface should be within 1/8inch per a feet.
7. Place carefully unit into the provided opening with the evaporator air flow directly forward the door and ensure the grill not to damage during installation.
8. Secure that the condenser airflow is not obstructed.
9. Drain is not needed as condensate is vaporized by hot gas lines in the drain panel from the compressor discharge.
10. Install trim pieces around the open on the ceiling of box.

## Outdoor use only ( STX Model )

Installation is the same as indoor models except as follows :

1. Units must be curb mounted ( Figure 4 ~ 5 ). Cabinet size refer to dimension size on page 5.
2. The condensate drain outlet pipe is located on the side of the unit. Field piping may be connected to the outlet provided it is adequately sloped and heated for freezing weather conditions.
3. After connecting electrical power, reinstall compressor compartment cover and weather hood.

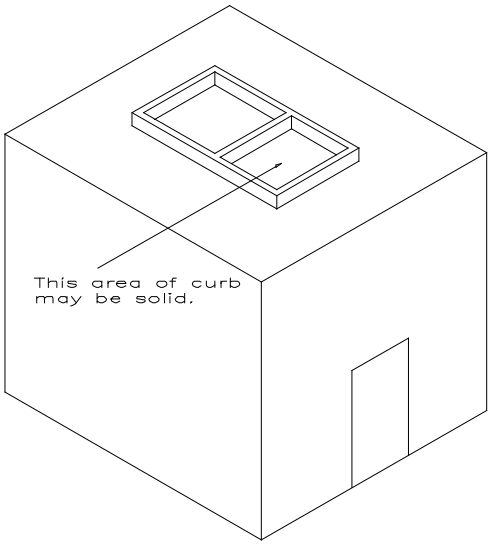



**Figure 4. Curb placed on roof of box.**

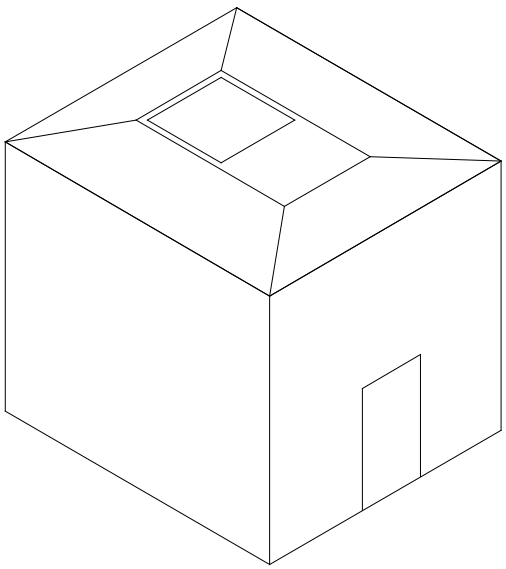


**Figure 5. Roof membrane placed over curb.**

## Check before Unit Start-up.

1. Check all electrical and refrigerant connections.
2. Observe all applicable building and electrical codes when wiring.
3. Make sure power supply has correct voltage and phase for unit and is fused properly.
4. If unit is connected with a power cord, use the cord with plug to connect to power supply.
   If unit is not connected with a power cord, use hard wire to connect to power supply.
   IMPORTANT
   Do not use extension cords to connect unit to power.
   Plug-in to grounded three prong outlet.
   Do not remove grounding prong.
   Do not use a power adapter.
5. All medium and low Temperature Models are preset to factory default settings at table 5.

## Standard Maintenance Guideline.

After first year of operation and under normal usage, maintenance should cover the following items at least once every six months.

1. Check all electrical and refrigerant connections.
2. Check all wiring and insulators.
3. Check contactors for proper operation and for state of contact points.
4. Check all fan motor. Tighten motor mount bolts, nuts and fan set screws.
5. Clean the heatexchanger (evaporator and condenser) coil surface.
6. Check the operation of the control system. Make sure all safety controls are operating properly.
7. Check the defrost control system. Make sure all defrost controls are operating properly.
8. Check the drain pan and drain line. If necessary, clean the drain pan and drain line.
9. Check the all heaters. Make sure the crankcase and drain line heaters are operating properly.

After installation of unit, it must be checked at least once for proper defrosting. The amount and pattern of frosting can vary considerably. It is dependent on the temperature of the room, the type of product being stored, how often new product is brought into the room and how often door is opened. Therefore, it may be necessary to periodically change the number of defrost cycles or adjust the duration of defrost.

# Sequence of Operation.

## Operation of Refrigeration.

1. When switch is turned on, power is provided to the temperature control, compressor, condenser and evaporator fan motor. And they will run until the box temperature setting is reached.
2. When the box temperature reaches a setting, the compressor and condenser fan motors shut off while evaporator fan motor is working.
3. When the box temperature rises above the set point and minimum off-time has elapsed, the compressor contactor will be re-energized and re-operated.

## Operation of Defrost.

1. Under normal electric defrost operation, the temperature/defrost control will de-energize the compressor contactor, evaporator fans and energize the defrost heaters. But under normal air defrost operation, the control will de-energize the compressor contactor and keep an evaporator fan motor working.
2. When the coil has defrosted completely and reached the preset coil sensor temperature, defrost heater cuts off and fan delay / drip sequences begin.
3. The control energizes the compressor and condenser fan motor and they restart.
4. When the coil temperature reaches 65°F or fan delay time has elapsed, the evaporator fans will be energized and started.

# Controller Setting.

## Carel PJEZC Electronic Controller.

The most complete solution for low temperature ventilated units, with three relays for complete control of the compressor, fan and defrost functions. The three relays are included in the very compact case in the versions with 230 V or 115 V power transformer, without compromising the performance or reliability of the product.

## Panel installation using 2 rear brackets

• insert the instrument in the opening (phase 1);
• secure the instrument by sliding the brackets in the guides on the instrument until compressing them against the panel (phase 2);

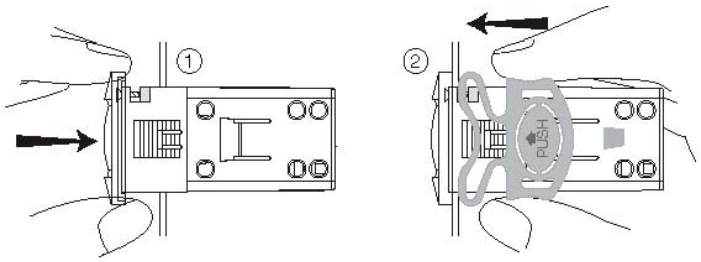



**Figure 6. Controller installed method**

## Electrical Connections

**WARNINGS:**

**• the electrical connections must only be completed by a qualified electrician;**
**• a power supply other than the type specified may seriously damage the system;**
**• separate as much as possible the probes and digital input signal cables from the cables carrying inductive loads and power cables to avoid possible electromagnetic disturbance. Never lay power cables(including the electrical cables) and probe signal cables in the same conduits. Do not install the probe cables in the immediate vicinity of power devices (contactors, circuit breakers or similar);**
**• reduce the path of the probe and sensor cables as much as possible, and avoid spiral paths that enclose power devices. The probes must be connected using shielded cables (minimum cross-section of each wire: 0.5 $mm^2$);**
**• avoid direct contact with internal electronic components;**
**• connection errors (and connections other than those indicated in this manual) may involve danger to the safety of the users and cause faults on the instruments and the components connected;**
**• fit the unit with all the electromechanical safety devices required to guarantee correct operation and the complete safety of the user.**

## The buttons;

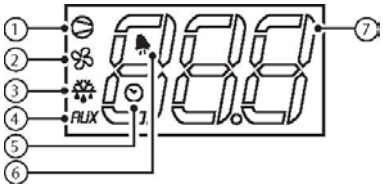



**Figure 7. Display**

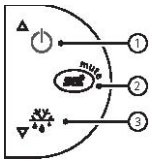



**Figure 6. Keypads**

## Display

| BUT. NO | FUNCTION | NORMAL OPERATION | | | START UP |
|---|---|---|---|---|---|
| | | ON | OFF | FLASH | |
| 1 | COMPRESSOR | ON | OFF | CALL | ON |
| 2 | FAN | ON | OFF | CALL | ON |
| 3 | DEFROST | ON | OFF | CALL | ON |
| 4 | Auxiliary output (AUX) | Output active | Output not active | - | ON |
| 5 | Clock (RTC) | RTC available, enabled (tEN=1) and at least one time band has been set | RTC not available or not enabled (tEN=0) or no time band set | | ON (if the clock is fitted) |
| 6 | alarm | alarm in progress | no alarm in progress | | on |
| 7 | digits | three digits with decimal point and range -199 to 999. See parameters /4, /5, /6 for the type of probe displayed, values in °C/°F and decimal point | | | |

## Keypads

| BUT NO. | NORMAL OPERATION | | START UP | |
|---|---|---|---|---|
| | pressing the button alone | pressing with other buttons | | |
| 1 | more than 3 s: switch ON/OFF | pressed together with 3 activates / deactivates the continuous cycle | | |
| 2 | - 1 s: displays/sets the set point<br>- more than 3 s: accesses the parameter setting menu (enter password 22)<br>- mutes the audible alarm (buzzer) | | for 1 s RESET current EZY set | Pressed together (2 and 3) activate parameter reset procedure |
| 3 | more than 3 s: activates / deactivates the defrost | pressed together with 1 activates / deactivates the continuous cycle | for 1 s displays firmware version | |

## Preliminary configurations

Once the electrical connections have been completed, simply power-up the controller to make it operative.

Turbo air recommends to check that the display does not show any alarm signals (see par. Table 7), and finally set the parameters as desired (see par. Table 5,6).

The main parameters are as follows:

| Control parameters | | Defrost parameters | | Alarm parameters | |
|---|---|---|---|---|---|
| st | set point | d0 | type of defrost | Ad | temperature alarm delay |
| rd | set point differential | dI | interval between two defrosts | AL | low temperature alarm threshold/deviation |
| | | dt | end defrost temperature | AH | high temperature alarm threshold/deviation |
| | | dP | maximum defrost duration | | |

# Functions available from the keypad.

## On and off

**Switching the instrument ON** : press UP for more than 3 s (when pressing the button, the display shows ON).

**Switching the instrument OFF** : press UP for more than 3 s. The display shows the message “OFF”, alternating with the temperature measured by the set probe.

In OFF status, the following functions are disabled (if featured by the model):

• compressor control / duty setting / continuous cycle;

• defrost;

• fan control;

• alarms : ‘LO’, ‘HI’, ‘IA’, ‘cht’, ‘CHT’;

• door switch: A4=7/8

• buzzer (when available).

While the following are enabled:

• temperature display, alternating with the message “OFF”;

• parameter display and setting;

• alarms: “E0”, “E1”, “E2”;

• the internal timer relating to parameter ‘dI’ is updated. If ‘dI’ expires in OFF status, a defrost is performed when restarting;

• auxiliary relay management, only in the following configurations:

– H1= = 1/2 (“E0” alarm only);

– H1= 3, A4= 6;

 **WARNINGS:**

**• when first connected, easy is already on and ready to be used;**

**• the instrument can be switched on from a supervisor PC and via an external contact (setting A4= 5). The latter has priority over the other modes.**

## Set point setting (desired temperature value)

The easy, easy compact devices control the desired temperature (set point) inside the cabinet or cold room directly and dynamically.

To view and modify the set point:

- press SET for 1 s, the set value will start fl ashing;
- increase or decrease the value using UP or DOWN;
- press SET to confirm the new value.

## Manual defrost

Press DOWN for more than 3 s (activated only if the temperature conditions are right).

## Continuous cycle

Press UP+DOWN for more than 3 s (activated only if the temperature conditions are right and for easy split only when H6=0).

The continuous cycle is used to maintain refrigeration active in the cabinet or cold room, regardless of the temperature inside the unit. This may be useful for rapidly bringing the temperature below the set point value.

## Rapid display of the temperature read by the other probes

Press the DOWN button to scroll the temperatures read by the probes. Each time the DOWN button is pressed, the display will show the name of the probe Pr1, Pr2 or Pr3 (only on the models with 3 inputs and with multifunction input configured as a probe) and after 1 s the temperature measured by the selected probe will be displayed.

To display the other probes, press DOWN again.

To return to the normal display, wait 3 s without pressing any buttons (exit by timeout).

# Device setup.

## Rapid parameter set selection (EZY)

The easy controllers feature the EZY parameter which is used to quickly choose a list of parameters, with corresponding values, for the control of the refrigeration system.

**Table 5. SET 1 (EZY=1) – Low temperature (SET POINT : -10℉) Electric defrost**

| Parameter | Description | Min | Max | Default |
|---|---|---|---|---|
| St | Set point | -30 | 30 | -10 |
| r1 | Minimum set point value | -50 | 30 | -30 |
| r2 | Maximum set point value | -30 | 150 | 30 |
| c2 | Minimum compressor off time | 0 | 100 | 4 |
| do | Type of defrost | 0 | 4 | 0 |
| dl | Interval between defrost | 0 | 199 | 6 |
| dt | End defrost temperature set point | -50 | 127 | 65 |
| dP | Maximum defrost duration | 1 | 199 | 60 |
| d4 | Defrost on power-up | 0 | 1 | 1 |
| dd | Dripping time | 0 | 15 | 2 |
| F0 | Enable evaporator fan control | 0 | 1 | 0 |
| F2 | Stop evaporator fan if compressor stop | 0 | 1 | 0 |
| F3 | Evaporator fan status during defrost | 0 | 1 | 1 |
| Fd | Post-dripping time | 0 | 15 | 2 |

**Table 6. SET 2 (EZY=3) – Medium temperature (SET POINT : 38℉) Air defrost**

| Parameter | Description | Min | Max | Default |
|---|---|---|---|---|
| St | Set point | 0 | 50 | 38 |
| r1 | Minimum set point value | -50 | 50 | 0 |
| r2 | Maximum set point value | 0 | 150 | 50 |
| c2 | Minimum compressor off time | 0 | 100 | 4 |
| do | Type of defrost | 0 | 4 | 2 |
| dl | Interval between defrost | 0 | 199 | 6 |
| dt | End defrost temperature set point | -50 | 127 | 40 |
| dP | Maximum defrost duration | 1 | 199 | 40 |
| d4 | Defrost on power-up | 0 | 1 | 0 |
| dd | Dripping time | 0 | 15 | 0 |
| F0 | Enable evaporator fan control | 0 | 1 | 0 |
| F2 | Stop evaporator fan if compressor stop | 0 | 1 | 0 |
| F3 | Evaporator fan status during defrost | 0 | 1 | 0 |
| Fd | Post-dripping time | 0 | 15 | 0 |

## Table of alarms and signals.

When an alarm is activated, the display shows the corresponding message that flashes alternating with the temperature; if fi tted and enabled, the buzzer and the alarm relay are also activated.

All the alarms have automatic reset (that is, they stop when the causes are no longer present), except for alarm ‘CHt’ which has manual reset (instrument on/off using the UP button or by disconnecting the power supply).

Pressing the SET button mutes the buzzer, while the code displayed and the alarm relay only go off when the causes of the alarm have been resolved.

The alarm codes are shown in the table below:

**Table 7. Alarm codes table.**

| alarm code | buzzer and alarm relay | LED | alarm description | reset | enable alarm parameters involved |
|---|---|---|---|---|---|
| E0 | active | on | probe 1 error = control | automatic | |
| E1 | not active | on | probe 1 error = defrost | automatic | d0=0/1/4, F0=1 |
| E2 | not active | on | probe 1 error = condenser/product | automatic | A4=10 |
| IA | active | on | external alarm | automatic | A4=1, +A7 |
| dOr | active | on | open door alarm | automatic | A4=7/8, +A7 |
| LO | active | on | low temperature alarm | automatic | AL, Ad |
| HI | active | on | high temperature alarm | automatic | AH, Ad |
| EE | not active | on | unit parameter error | not possible | |
| EF | not active | on | operating parameter error | manual | |
| Ed | not active | on | defrost running | on first defrost ended correctly | dP, dt, d4, A8 |
| dF | not active | off | defrost running | automatic | d6=0 |
| cht | not active | on | dirty condenser pre-alarm | automatic | A4=10 |
| CHT | active | on | dirty condenser alarm | manual | A4=10 |
| EtC | not active | on | clock alarm | by setting the time | if bands active |

# Description of the main signals and alarms.

### LED flashing

The activation of the corresponding function is delayed by a timer, awaiting an external signal or disabled by another procedure that is already in progress. e.g. if is a continuous cycle in progress and a defrost is called, the latter will remain pending until the end of the continuous
cycle, and the corresponding LED (defrost) will flash.

### E0 steady or flashing

control probe error:

• probe not working : the probe signal is interrupted or short-circuited;

• probe not compatible with the instrument;

The alarm signal E0 is steady if it is the only active alarm (the temperature value is not displayed), while it flashes if other alarms are active or the second probe is displayed.

### E1 flashing

evaporator probe or food conservation probe error:

• probe not working, the probe signal is interrupted or short-circuited;

• probe not compatible with the instrument;

### E2 flashing

condenser probe or food conservation probe error:

• probe not working, the probe signal is interrupted or short-circuited;

• probe not compatible with the instrument;

### IA flashing

immediate or delayed alarm from multifunction digital input:

• check the multifunction input and parameters A4 and A7.

### dOr flashing

open door alarm:

• check the multifunction input and parameters A4 and A7.

### LO flashing

low temperature alarm. The probe has measured a temperature lower than the set point by a value that exceeds parameter AL:

• check parameters AL, Ad and A0.

The alarm is automatically reset when the temperature returns within the set limits (see parameter AL).

**HI flashing**

high temperature alarm. The probe has measured a temperature higher than the set point by a value that exceeds parameter AH.

• check parameters AH, Ad and A0.

The alarm is automatically reset when the temperature returns within the set limits (see parameter AH).

**EE displayed during operation or on power-up**

unit parameter reading error. See Data errors.

**EF displayed during operation or on power-up**

operating parameter reading error. See Data errors.

**Ed flashing**

The last defrost ended after exceeding the maximum duration rather than when reaching the end defrost set point.

• check parameters dt, dP and d4;

• check the effi ciency of the defrost.

The message disappears when the next defrost ends correctly.

**dF flashing**

defrost running:

• this is not an alarm signal, but rather a message that the instrument is running a defrost. Only shown if d6= 0.

**cht flashing**

dirty condenser pre-alarm:

• check parameters A4, Ac, AE and Acd.

**CHt flashing**

dirty condenser alarm:

• check parameters A4, Ac, AE and Acd.

**EtC flashing**

internal clock error.

## Data error

In certain operating conditions, the instrument may detect errors in the data saved. These errors may compromise the correct operation of the instrument. If the microprocessor detects a data saving error, the display shows the message “EE”.

If the fault persists, the controller needs to be replaced. If, on the other hand, the message disappears, it can continue to be used. When “EE” error occurs frequently and/or remains for some time, the controller should be checked, as the original precision may not be guaranteed.

# Modifying the parameters.

## Parameter navigation

The operating parameters, modifiable using the keypad, are divided into two types: frequent (type F) and confi guration (type C). Access to the latter is protected by password (default= 22) to prevent accidental or unauthorised modifications.

**Accessing the type F parameters:**

- press the SET button for more than 3 s (if there are active alarms, mute the buzzer). The display shows the parameter code ‘PS’ (password);
- use the UP and DOWN buttons to scroll the parameters. The LED corresponding to the category of parameters will be on (see Table 8);
- press SET to display the value associated with the parameter
- increase or decrease the value using the UP or DOWN button respectively;
- press SET to temporarily save the new value and display the parameter again;
- repeat the procedure for any other parameters that need to be modified;
- press the SET button for more than 3 s to permanently save the parameters and exit the parameter setting procedure.

**Accessing the type C parameters:**

- press the SET button for more than 3 s (if there are active alarms, mute the buzzer), the display shows the parameter code “PS” (password);
- press the SET button to access the password setting;
- use the UP and DOWN buttons to scroll the numbers until displaying “22” (password to access the parameters);
- press the SET button to confi rm the password;
- use the UP and DOWN buttons to scroll the parameters. The LED corresponding to the category of parameters will be on (see Table 8);
- press SET to display the value associated with the parameter;
- increase or decrease the value using the UP or DOWN button respectively;
- press SET to temporarily save the new value and display the parameter again;
- repeat the procedure for any other parameters that need to be modified;
- press the SET button for more than 3 s to permanently save the parameters and exit the parameter setting procedure.

**WARNINGS:**

**If no button is pressed for 60 s, all the changes made to the parameters, temporarily saved in the RAM, will be cancelled and the previous settings restored.**

**The dAY, hr, Min parameters are not restored, as these are saved instantly when entered.**

**If power is disconnected from the instrument before saving the settings (pressing the SET button for 3 s), all the changes made to the parameters and temporarily saved will be lost.**

**Table 8. Category of parameters.**

| Category | Initial | Icon | Category | Initial | Icon |
|---|---|---|---|---|---|
| Probe parameters | / | - | Alarm parameters | A | |
| Control parameters | r | - | Fan parameters | F | |
| Compressor parameters | c | | AUX output configuration parameters | H1 | AUX |
| Defrost parameters | d | | RTC parameters | - | |

## Setting the default parameters.

**WARNINGS:**

**running this procedure overwrites any custom parameter settings**.

To reset the default parameters:

• disconnect power from the instrument;

• reconnect power while holding the SET and DOWN buttons;

• the display will show the message “CF”;

• after a few seconds the instrument starts operating with the default configuration. Any different parameter settings will need to be updated.

## Controller Troubleshooting.

The following table shows a number of anomalous situations that may occur on the various models.

The most frequent causes and corresponding checks are described:

| Problem | Cause | Checks |
|---|---|---|
| the compressor does not start (signalled by the compressor LED flashing) | • compressor delay set<br>• defrost post dripping in progress | parameters c0, c1 and c2 and dd |
| the temperature is over the set limits but there is no alarm message and the buzzer, if fitted, does not sound | alarm delay set | parameters Ad, c6, d8 |
| alarm IA is signalled (multifunction input) without actually being active | the multifunction input generates an alarm when the contact opens | connection of the input and whether this is closed in normal operation |
| the alarm connected to the multifunction input is not detected | alarm delay set or parameter programming error | 1. if A4=1<br>2. the status of digital input A7 |
| the defrost is not activated | • defrost duration too short (dP)<br>• interval between defrosts dI=0: in this case the defrost is not activated | parameters dP and dI |
| | the end defrost temperature is too low or the evaporator temperature is too high | parameters dt and d/ (defrost probe) |
| the manual defrost is not activated and the defrost LED flashes | compressor protection times set | parameter d9 (select d9=1) |
| the high temperature alarm is shown after a defrost | the alarm delay after defrost is too short or the alarm threshold is too low | parameters d8 and AH |
| the display remains frozen even after the defrost | the ambient temperature has not yet reached the set point or alternatively the time d8 has not elapsed | wait or reduce d8 |
| after modifying a parameter the controller continues working with the old values | the instrument has not updated the old value or alternatively the parameter setting procedure has not been ended correctly by pressing the SET button for 3 s | turn the instrument off and on again or alternatively reprogram the parameters correctly |
| the evaporator fan does not start | 1. a compressor and fan start delay has been set<br>2. if F0=1 (fan managed by fan controller)<br>• the evaporator is “hot”: the evaporator temperature can be read by selecting parameter /d;<br>• dripping in progress;<br>• F1 (evaporator fan control set point) too low.<br>• post-dripping delay set<br>3. if F0=0<br>• F2=1 and the compressor is off<br>• dripping in progress<br>• post-dripping in progress | 1. parameter c0<br>2. parameters F0, F1, Fd, dd and d/<br>3. parameters F0, F2, dd and Fd |

# Listing of Controller Parameters and Settings.

| Codes | Description | Type | Min | Max | UOM | Defaults | |
|---|---|---|---|---|---|---|---|
| | | | | | | Low temp. | Med temp. |
| PS | password | F | 00 | +199 | - | 22 | 22 |
| / | **PROBE PARAMETERS** | | | | | | |
| /2 | probe measurement stability | C | 1 | 15 | - | 4 | 4 |
| /4 | select probe displayed | F | 1 | 3 | | 1 | 1 |
| /5 | select ℃/°F (0=℃, 1=°F) | C | 0 | 1 | flag | 1 | 1 |
| /6 | disable decimal point | C | 0 | 1 | flag | 0 | 0 |
| /7 | enable probe 2 alarm (model M only) | C | 0 | 1 | 0 | 0 | 0 |
| /C1 | probe 1 calibration | F | -50 | +50 | °F | 0 | 0 |
| /C2 | probe 2 calibration | F | -50 | +50 | °F | 0 | 0 |
| /C3 | probe 3 calibration | F | -50 | +50 | °F | 0 | 0 |
| r | **CONTROL PARAMETERS** | | | | | | |
| St | control temperature set point | S | r1 | r2 | °F | -10 | 38 |
| r1 | minimum set point value | C | -50 | r2 | °F | -30 | 35 |
| r2 | maximum set point value | C | r1 | 150 | °F | +30 | 50 |
| r3 | select operating mode ( 0=direct+defrost , 1=direct , 2=reverse ) | C | 0 | 2 | flag | 0 | 0 |
| r4 | automatic night-time set point variation | C | -50 | +50 | °F | 0 | 0 |
| rd | control differential | F | 0 | 19 | °F | 2 | 2 |
| c | **COMPRESSOR PARAMETERS** | | | | | | |
| c0 | compressor and fan start delay on power-up | C | 0 | 100 | min | 0 | 0 |
| c1 | minimum time between consecutive compressor starts | C | 0 | 100 | min | 0 | 0 |
| c2 | minimum compressor off time | C | 0 | 100 | min | 4 | 4 |
| c3 | minimum compressor on time | C | 0 | 100 | min | 0 | 0 |
| c4 | compressor on time with duty setting | C | 0 | 100 | min | 0 | 0 |
| cc | continuous cycle duration | C | 0 | 15 | hours | 4 | 4 |
| c6 | temperature alarm bypass after continuous cycle | C | 0 | 15 | hours | 2 | 2 |
| d | **DEFROST PARAMETERS** | | | | | | |
| d0 | type of defrost ( 0 = heater by probe, 1 = hot gas by probe, 2 = heater by time, 3 = hot gas by time, 4 = heater by time with temp. control ) | C | 0 | 4 | flag | 0 | 2 |
| dI | interval between defrosts | F | 0 | 199 | hours | 6 | 6 |
| dt | end defrost temperature set point | F | -50 | +130 | °F | 65 | 40 |
| dP | maximum defrost duration | F | 1 | 199 | min | 60 | 40 |
| d4 | defrost when the instrument is switched on (0=no, 1=yes) | C | 0 | 1 | flag | 1 | 0 |
| d5 | defrost delay on power-up or when enabled by digital input | C | 0 | 199 | min | 0 | 0 |
| d6 | disable temperature display during defrost (0=no, 1=yes) | C | 0 | 1 | flag | 1 | 1 |
| dd | dripping time | F | 0 | 15 | min | 2 | 0 |
| d8 | alarm bypass time after defrost | F | 0 | 15 | hours | 1 | 1 |
| d9 | defrost priority over compressor protectors (0=no, 1=yes) | C | 0 | 1 | flag | 0 | 0 |
| d/ | display defrost probe temperature | F | | | °F | - | - |
| dC | time base ( for defrost only : 0 = hr/min , 1 = min/s ) | C | 0 | 1 | flag | 0 | 0 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **A** | **ALARM PARAMETERS** | | | | | | |
| A0 | alarm and fan temperature diff erential | C | -20 | +20 | °F | 2 | 2 |
| AL | low temperature alarm threshold/deviation ( AL= 0 : alarm disabled ) | F | -50 | +250 | °F | 0 | 0 |
| AH | high temperature alarm threshold/deviation ( AH= 0 : alarm disabled ) | F | -50 | +250 | °F | 0 | 0 |
| Ad | low and high temperature alarm delay | C | 0 | 199 | min | 0 | 0 |
| A4 | digital input configuration<br>0 : input not active<br>1 : exter. alarm, instant (A7=0) or delayed (A7>0)<br>2 : enable defrost (open=disabled)<br>3 : start defrost on closing<br>4 : curtain switch or night-time operation (open=normal set point)<br>5 : remote ON/OFF (open=OFF)<br>6 : AUX output control [H1=3] (open=AUX de-energised)<br>7 : AUX output [H1=3]+FAN OFF control (closed)(open=AUX energised)<br>8 : AUX output [H1=3]+FAN OFF control (closed) + COMP. OFF control (closed) (open=AUX energised)<br>9 : select direct/reverse operation<br>r3=0 → open=direct + defrost, closed=reverse<br>r3=1/2 → open=direct, closed=reverse<br>10 : condenser probe<br>11 : product probe | C | 0 | 11 | - | 0 | 0 |
| A7 | external alarm detection delay | C | 0 | 199 | Min | 0 | 0 |
| A8 | enable alarm "Ed" : end defrost by timeout (1 = enabled) | C | 0 | 1 | - | 0 | 0 |
| Ac | high condenser temperature alarm | C | -50 | +250 | °F | 150 | 150 |
| AE | high condenser temperature alarm differential | C | 0.1 | 20.0 | °F | 10 | 10 |
| Acd | high condenser temperature alarm delay | C | 0 | 250 | min | 0 | 0 |
| **F** | **FAN PARAMETERS** | | | | | | |
| F0 | fan management (0 = fans on, 1 = controlled based on parameter F1) | C | 0 | 1 | - | 0 | 0 |
| F1 | evaporator fan control set point | F | -50 | +130 | °C/°F | +5 | +5 |
| F2 | fans OFF when compressor OFF ( 0=ON , 1=OFF ) | C | 0 | 1 | - | 0 | 0 |
| F3 | evaporator fan status during defrost (0: FAN ON, 1: FAN OFF) | C | 0 | 1 | - | 1 | 0 |
| Fd | post-dripping time | F | 0 | +15 | min | 2 | 0 |
| **H** | **OTHER SETTING** | | | | | | |
| H0 | serial address | C | 0 | 199 | - | 1 | 1 |
| H1 | AUX output confi guration<br>0 : no function associated with the output<br>1 : alarm output usually energized<br>2 : alarm output usually de-energized<br>3 : auxiliary output driven by digital input [A4=6/7/8]<br>digital input OPEN = AUX de-energised<br>digital input CLOSED = AUX energised | C | 0 | 1 | flag | 1 | 1 |
| H2 | enable keypad (0=disabled, 1=enabled, 2=enabled except for ON/OFF) | C | 0 | 2 | flag | 1 | 1 |
| H4 | disable buzzer (0=enabled, 1=disabled) | C | 0 | 1 | - | 0 | 0 |
| H5 | key ID code from supervisor | F | -99 | +99 | - | 22 | 22 |
| EZY | select Easy Set according to the model | C | 0 | 4 | - | 1 | 3 |

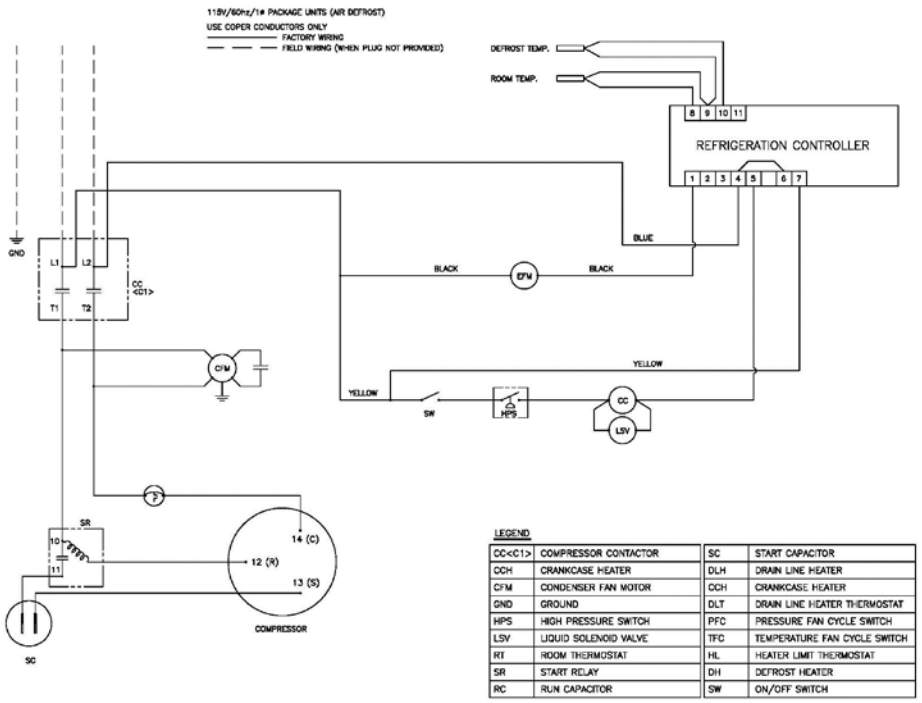
## System troubleshooting.

| Symptoms | Possible causes | Solution |
|---|---|---|
| Compressor not running | Main switch open | Close switch |
| | Blown fuse | Check electrical circuits and motor winding for shorts or grounds. Replace fuse after fault is corrected. |
| | Loose wiring | Check all wire junctions. Tighten all terminal screws. |
| | System cable shut down | Replace shutdown cable. |
| | Thermal overload tripped | Overloads are automatically reset. Check unit when unit come back on line. |
| | Defective contactor or contactor coil | Replace or repair |
| | System shut down by safety devices. | Check cause of shut down |
| | No cooling required. | Wait until calls for cooling |
| | Motor electrical trouble. | Check motor for open windings, short circuit or burn out. |
| Noisy Compressor | Flooding of liquid refrigerant into crankcase | Check expansion valve setting |
| | Worn compressor. | Replace compressor |
| High discharge pressure. | Non-condensable in system. | Remove non-condensable. |
| | Too much refrigerant | Remove excess refrigerant |
| | Fan not running | Check electrical circuit and fuse. |
| | Dirty condenser coil | Clean condenser coil |
| | Liquid line solenoid not open | Repair or replace coil |
| Low discharge pressure. | Insufficient refrigerant | Check leaks. Add charge. |
| | Low suction pressure | See corrective steps for low suction pressure. |
| High suction pressure | Excessive loads | Reduce load. |
| | Expansion valve overfeeding. | Check bulb location and clamping. Adjust superheat.. |
| Low suction pressure. | Expansion valve malfunctioning. | Check and reset for proper superheat. |
| | Lack of refrigerant. | Check for leaks. Add charge. |
| | Evaporator dirty or iced. | Clean. Check defrost parameters and modify as required. |
| Compressor thermal protector switch open. | Evaporator dirty or iced | Clean and defrost. |
| | Condenser coil dirty. | Clean coil |
| | Too much refrigerant | Remove excess refrigerant |
| | Clogged liquid line filter drier. | Replace filter drier. |
| | Operating beyond design conditions | Add facilities so that conditions are within allowable limits. |
| Fan(s) will not operate | Main swich open. | Close switch. |
| | Blown fuses. | Replace fuses. Check for short circuits or overload conditions. |
| | Defective motor | Replace motor. |
| | Coil does not get cold enough to reset thermostat. | Adjust fan delay setting of control. |
| | Controller or sensor defective. | Replace defective component. |
| | Unit in defrost cycle. | Wait for completion of cycle. |
| Room temperature too high. | Controller temperature set too high. | Adjust control |
| | Superheat too high. | Check and reset for proper superheat |
| | Insufficient refrigerant | Check leaks. Add charge |
| | Evaporator coil iced | Manually defrost coil. Check defrost controls for malfunction. |
| Ice accumulating on ceiling around grill. | Defrost duration is too long. | Adjust defrost termination temperature. |
| | Fan delay not delaying fans after defrost period. | Adjust fan delay setting or replace sensor. |
| | Defective defrost control or sensor. | Replace defective component. |
| | Too many defrost. | Adjust number of defrosts. |
| Coil not clearing of frost during defrost cycle. | Coil temperature not getting above freezing point during defrost. | Check heater operation. |
| | Not enough defrost cycles per day. | Adjust control for more defrost cycles. |
| | Defrost cycle too short. | Adjust defrost control, defrost duration setting. |
| | Defective defrost control or sensor. | Replace defective component. |
| Ice accumulating in drain pan. | Defective heaters. | Replace heater. |
| | Unit not installed properly (out of level) | Check and adjust if necessary. |
| | Drain line plugged. | Clean drain line. |
| | Defective control. | Replace defective component. |

# Electrical Wiring Diagram.

**Diagram 1. Wiring diagram for SMART 7, Air Defrost 115V / 1Ph / 60Hz.**

**Model : STI030MR404A1**

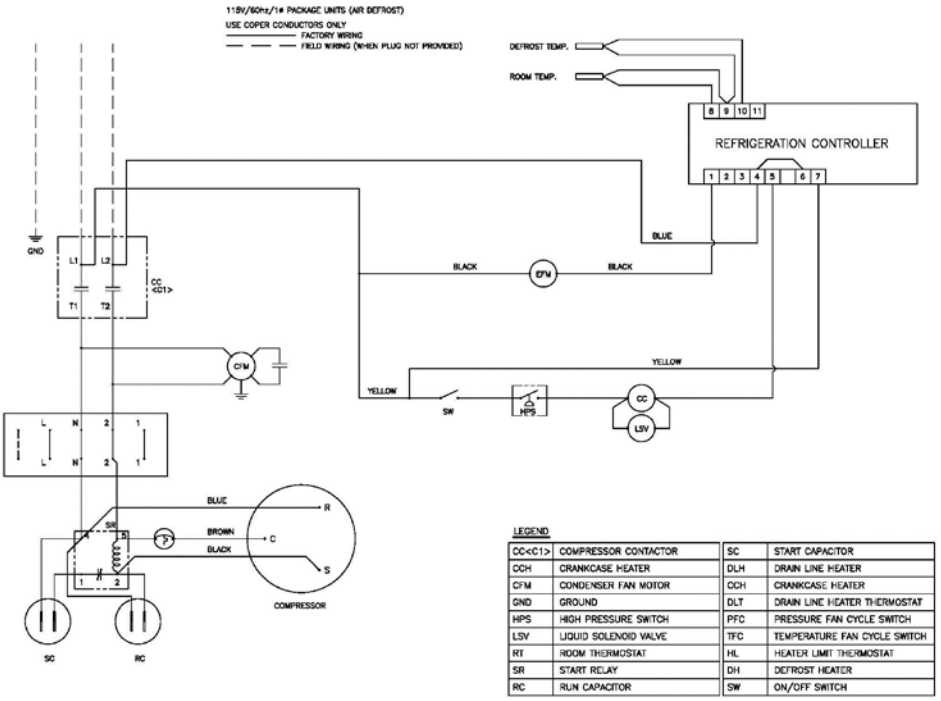



LEGEND

| | | | |
|---|---|---|---|
| CC<C1> | COMPRESSOR CONTACTOR | SC | START CAPACITOR |
| CCH | CRANKCASE HEATER | DLH | DRAIN LINE HEATER |
| CFM | CONDENSER FAN MOTOR | CCH | CRANKCASE HEATER |
| GND | GROUND | DLT | DRAIN LINE HEATER THERMOSTAT |
| HPS | HIGH PRESSURE SWITCH | PFC | PRESSURE FAN CYCLE SWITCH |
| LSV | LIQUID SOLENOID VALVE | TFC | TEMPERATURE FAN CYCLE SWITCH |
| RT | ROOM THERMOSTAT | HL | HEATER LIMIT THERMOSTAT |
| SR | START RELAY | DH | DEFROST HEATER |
| RC | RUN CAPACITOR | SW | ON/OFF SWITCH |

**Diagram 2. Wiring diagram for SMART 7, Air Defrost 115V / 1Ph / 60Hz.**

**Model : STI050MR404A1**




LEGEND

| | | | |
|---|---|---|---|
| CC<C1> | COMPRESSOR CONTACTOR | SC | START CAPACITOR |
| CCH | CRANKCASE HEATER | DLH | DRAIN LINE HEATER |
| CFM | CONDENSER FAN MOTOR | CCH | CRANKCASE HEATER |
| GND | GROUND | DLT | DRAIN LINE HEATER THERMOSTAT |
| HPS | HIGH PRESSURE SWITCH | PFC | PRESSURE FAN CYCLE SWITCH |
| LSV | LIQUID SOLENOID VALVE | TFC | TEMPERATURE FAN CYCLE SWITCH |
| RT | ROOM THERMOSTAT | HL | HEATER LIMIT THERMOSTAT |
| SR | START RELAY | DH | DEFROST HEATER |
| RC | RUN CAPACITOR | SW | ON/OFF SWITCH |

**Diagram 3. Wiring diagram for SMART 7, Air Defrost 208~230V / 1Ph / 60Hz.**

**Model : STI050MR404A2, STX050MR404A2**

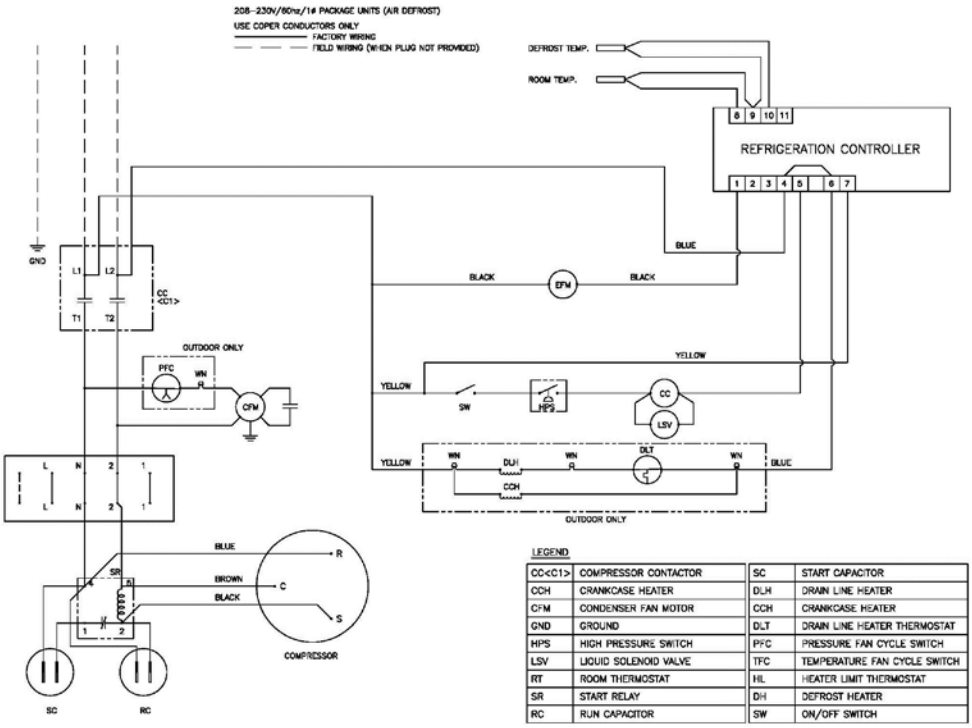



**Diagram4. Wiring diagram for SMART 7, Air Defrost 208~230V / 1Ph / 60Hz.**

**Model : STI068MR404A2 , STI075MR404A2 , STX068MR404A2 , STX075MR404A2**

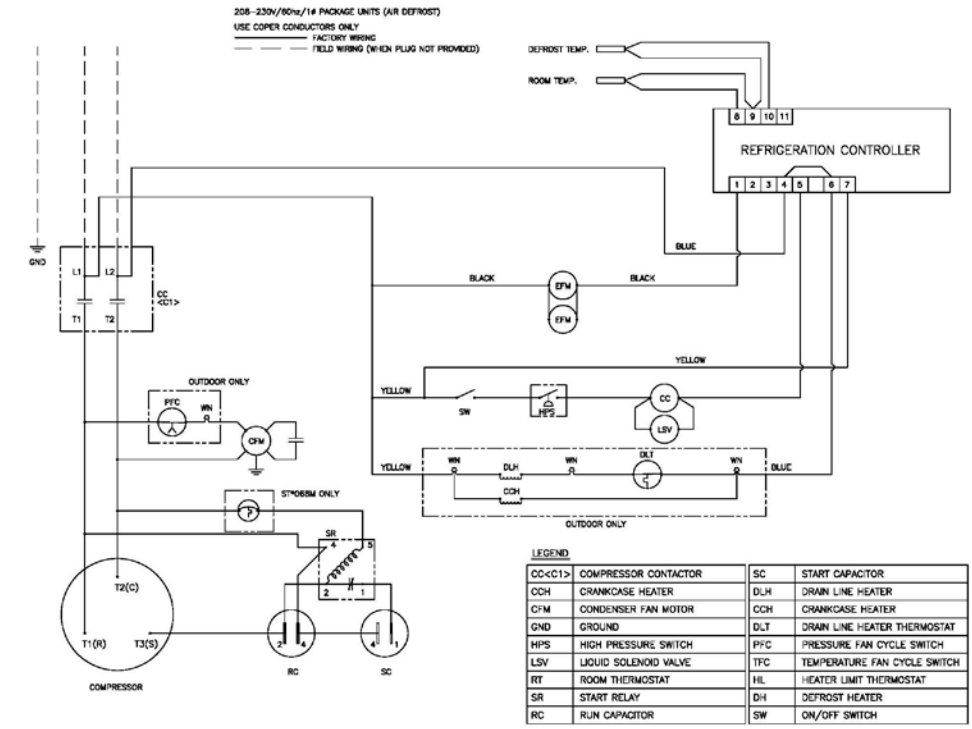
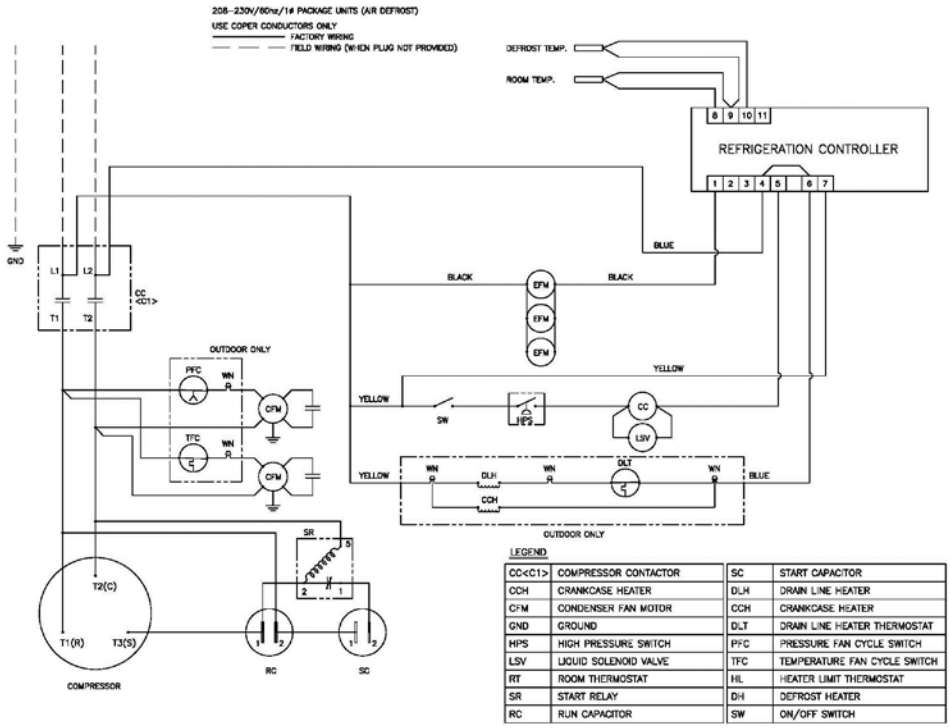


**Diagram5. Wiring diagram for SMART 7, Air Defrost 208~230V / 1Ph / 60Hz.**

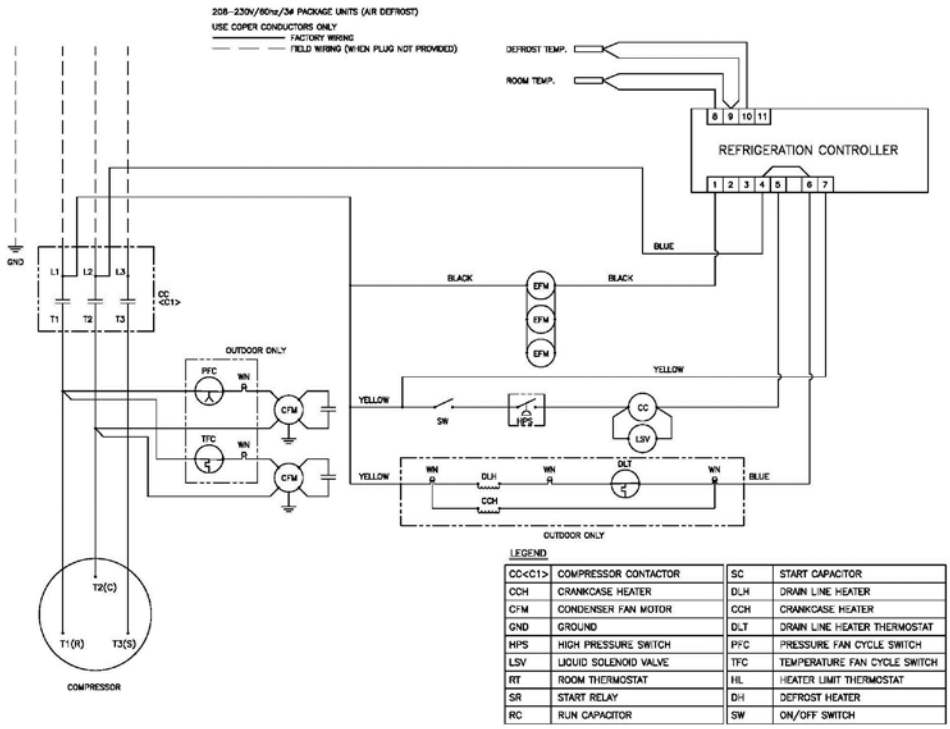
**Model : STI100MR404A2 , STI130MR404A2 , STX100MR404A2 , STX130MR404A2**




| | | | |
|---|---|---|---|
| CC<C1> | COMPRESSOR CONTACTOR | SC | START CAPACITOR |
| CCH | CRANKCASE HEATER | DLH | DRAIN LINE HEATER |
| CFM | CONDENSER FAN MOTOR | CCH | CRANKCASE HEATER |
| GND | GROUND | DLT | DRAIN LINE HEATER THERMOSTAT |
| HPS | HIGH PRESSURE SWITCH | PFC | PRESSURE FAN CYCLE SWITCH |
| LSV | LIQUID SOLENOID VALVE | TFC | TEMPERATURE FAN CYCLE SWITCH |
| RT | ROOM THERMOSTAT | HL | HEATER LIMIT THERMOSTAT |
| SR | START RELAY | DH | DEFROST HEATER |
| RC | RUN CAPACITOR | SW | ON/OFF SWITCH |

**Diagram6. Wiring diagram for SMART 7, Air Defrost 208~230V / 3Ph / 60Hz.**

**Model : STI100MR404A3, STI130MR404A3, STX100MR404A3, STX130MR404A3**




| | | | |
|---|---|---|---|
| CC<C1> | COMPRESSOR CONTACTOR | SC | START CAPACITOR |
| CCH | CRANKCASE HEATER | DLH | DRAIN LINE HEATER |
| CFM | CONDENSER FAN MOTOR | CCH | CRANKCASE HEATER |
| GND | GROUND | DLT | DRAIN LINE HEATER THERMOSTAT |
| HPS | HIGH PRESSURE SWITCH | PFC | PRESSURE FAN CYCLE SWITCH |
| LSV | LIQUID SOLENOID VALVE | TFC | TEMPERATURE FAN CYCLE SWITCH |
| RT | ROOM THERMOSTAT | HL | HEATER LIMIT THERMOSTAT |
| SR | START RELAY | DH | DEFROST HEATER |
| RC | RUN CAPACITOR | SW | ON/OFF SWITCH |

**Diagram7. Wiring diagram for SMART 7, Electric Defrost 208~230V / 1Ph / 60Hz.**

**Model : STI022LR404A2, STX022LR404A2**

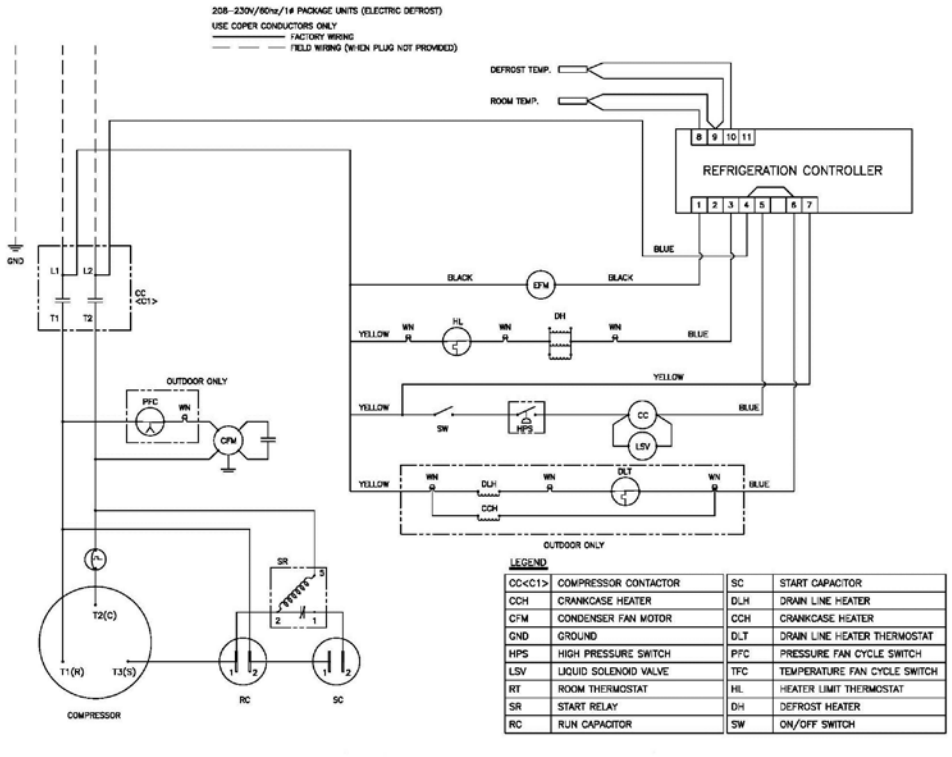



**Diagram8. Wiring diagram for SMART 7, Electric Defrost 208~230V / 1Ph / 60Hz.**

**Model : STI045LR404A2 , STX045LR404A2**

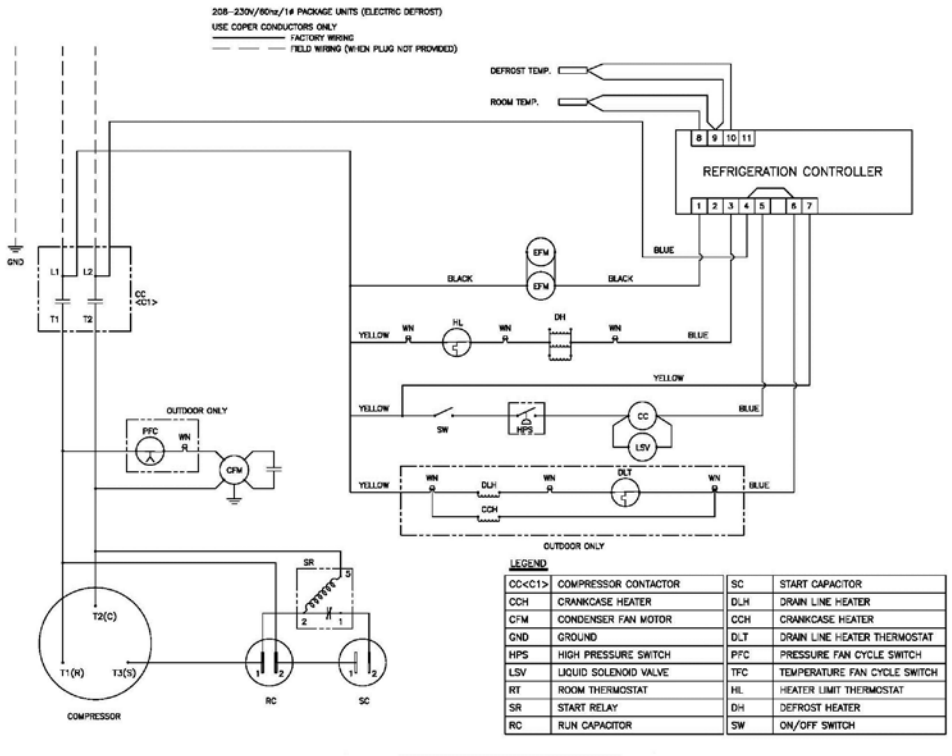


**Diagram9. Wiring diagram for SMART 7, Electric Defrost 208~230V / 1Ph / 60Hz.**

**Model : STI055LR404A2 , STI070LR404A2 , STX055LR404A2 , STX070LR404A2**

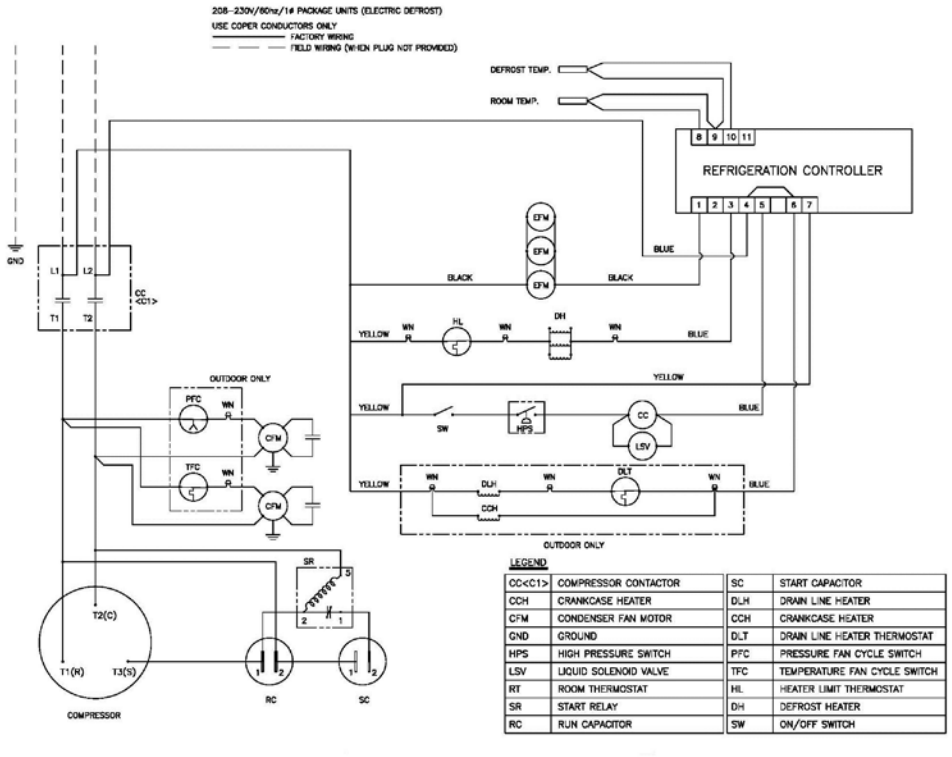
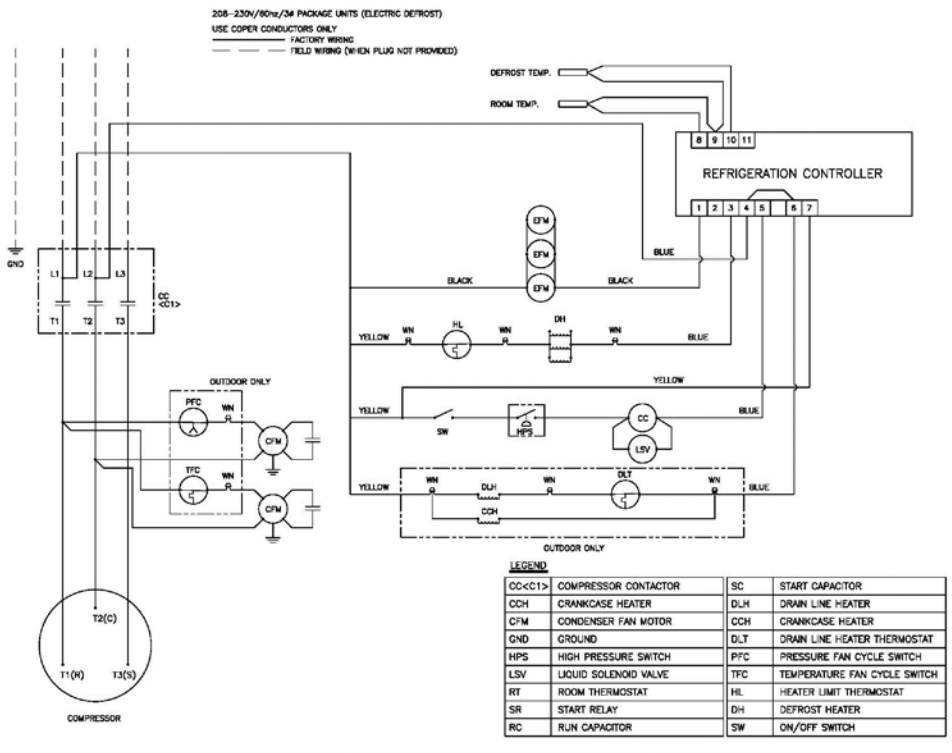



**Diagram10. Wiring diagram for SMART 7, Electric Defrost 208~230V / 3Ph / 60Hz.**

**Model : STI055LR404A3 , STI070LR404A3 , STX055LR404A3 , STX070LR404A3**



REFRIGERATOR MANUFACTURER
Turbo air

1250 Victoria street

CARSON, CA 90746

FAX : 310-900-1008

Toll Free : 888-900-1002

(U.S.A & Canada)

http://www.turboairinc.net