



Heatcraft Smart Controller

H-IM-80F

July 2017

Part No. 25000601

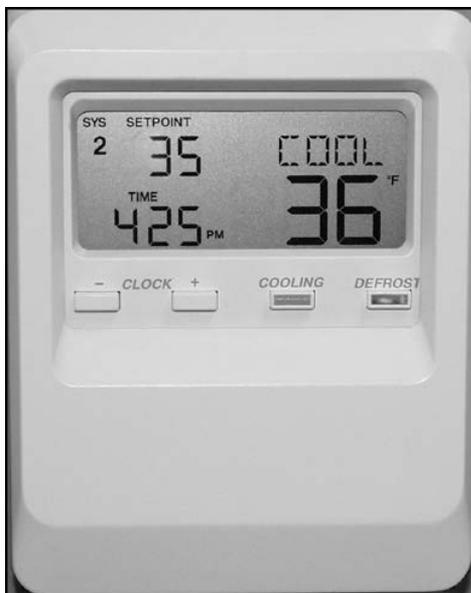
Replaces H-IM-80E (06-17)

Installation and Operation Manual

Table of Contents

Features	2-3
Installation Tips	4
Wiring	5
Power Supply	6
Initialization of Smart Controller	7
Button Functions	7
Programming Smart Controller	8
Monitoring Smart Controller	9
Locking Smart Controller	10
Error Codes	10
Wiring Error	11
Alarm Codes	11
Alarm Buzzer	12
Data Logging	12
Smart Defrost	13
System Defaults	14
Back Compatibility	15
Wiring Diagrams	16-23





The Smart Controller performs all the standard Beacon II and QRC functions with the additional benefit of:

- a) Remote mounting for easy access
- b) Remote monitoring and programming
- c) Controlling a maximum of four completely separate systems
- d) Logging data
- e) Smart Defrost
- f) Access via remote Gateway
- g) Has buzzer to signal alarms
- h) Locking keypad

Smart Controller allows complete monitoring and programming of the system.

The Controller display has the following buttons: COOLING, DEFROST, PROG REVIEW, MONITOR, ENTER, CLEAR, SETPOINT AND TIME.

The normal LCD display will show the programmed box set-point temperature, actual box temperature, the current time of day and the mode (i.e. COOL, DEFROST or OFF). When multiple systems are being controlled, the system number (i.e. SYS 1, SYS 2, SYS 3, SYS 4) will also be displayed on the LCD.

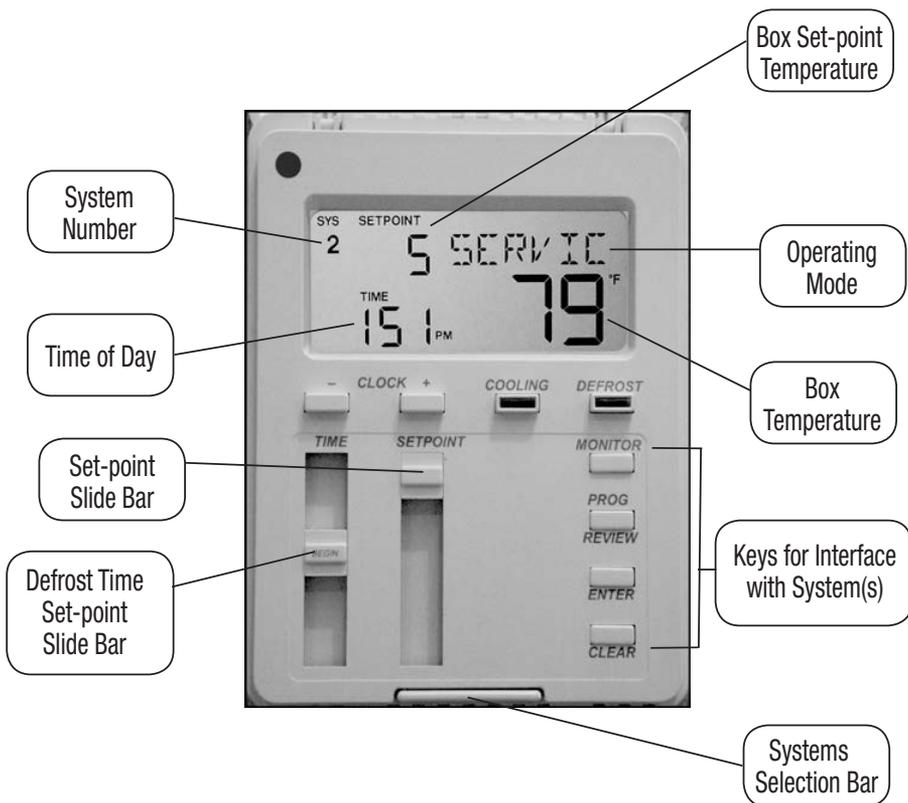
Operational Limits

Voltage Range	18 VAC to 30 VAC
Surrounding Ambient Temp. Range	40°F to 100°F
Relative Humidity	60% to Maximum
Controlling Box Temperature Range	-30°F to 70°F
Box Temperature Differential	2°F

Do not mount the Smart Controller where it will experience heavy vibration, such as near a Walk-in Box door.

Features of the Smart Controller

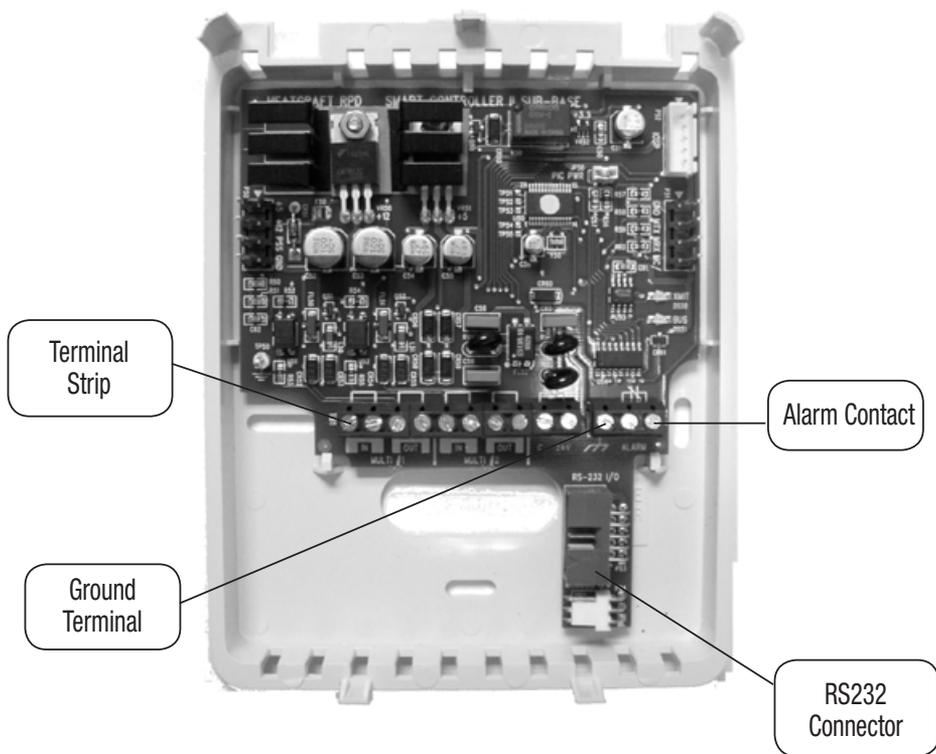
- Monitoring of the complete refrigeration system.
- Programming of a variety of parameters for the optimum control of the refrigeration system.
- The Smart Controller has a Liquid Crystal Display (LCD) which shows: current time, actual box temperature, box temperature set-point and if there is an alarm or fault condition.
- Data Logging.
- Smart Defrost to save energy on defrost.
- Sounds a buzzer to indicate an Alarm condition.
- Can be mounted up to 1000 ft. away from the system being controlled.
- Each Smart Controller can control four independent systems with up to 4 evaporators on each system or 2 systems with 8 evaporator boards.
- An RS232 port is provided which allows connection to system via RRC Gateway. (See H-IM-RRC at www.heatcraftpd.com)
- A Backup battery will maintain the clock settings for 10 years.
- Double E PROM Chip will maintain program settings indefinitely.
- Locking feature to prevent unauthorized access to program settings.



Installation

The Smart Controller should be installed in a location where the large Liquid Crystal Display (LCD) can be viewed easily, yet is secure and vibration free. Because of the LCD screen, the Smart Controller should not be mounted where it will experience temperatures below 40°F or above 100°F.

A terminal strip for wiring connections is located on the base of the Smart Controller. To access this terminal strip, pull both halves of the Smart Controller housing apart, while holding top near LCD display. Mounting holes are located in the plastic base.



Wiring

All 24 volt wiring must be run separate from the line voltage wiring.

All low voltage wiring must be 18 gauge minimum and must be run separate from high voltage wiring. The maximum distance from the Smart Controller to the master evaporator is 1000 ft.

The terminal strip in the Smart Controller is labeled similarly to that of the Beacon II boards. Connect the corresponding terminals to those on the Beacon II board.

For Single Refrigeration System:

Connect **MULTI OUT 1** from the Smart Controller to the **MULTI IN** on the Beacon II or QRC board on the Evaporator. Then connect **MULTI IN 1** from the Smart Controller to the **MULTI OUT** on the Beacon board on the evaporator. See typical wiring diagram at the back of these instructions.

On systems with multiple evaporators, the Smart Controller must be wired to the master evaporator first.

DO NOT disconnect the room sensor from any of the evaporators.

For MULTIPLE Independent Refrigeration Systems:

For the first system, connect **MULTI OUT 1** from the Smart Controller to the **MULTI IN** on the board on the evaporator in this first system. Then connect **MULTI IN 1** from the Smart Controller to the **MULTI OUT** on the Beacon II or QRC board on the evaporator on this first system.

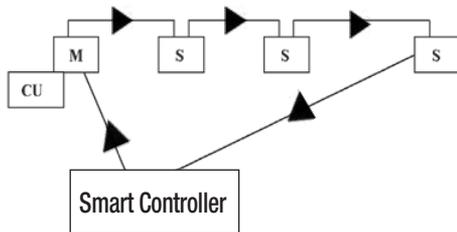
DO NOT disconnect the room sensor from any of the evaporators.

See typical wiring diagram at the back of these instructions.

For the second system, connect **MULTI OUT 2** from the Smart Controller to the **MULTI IN** on the Beacon II or QRC board on the evaporator in this second system. Then connect **MULTI IN 2** from the Smart Controller to the **MULTI OUT** on the Beacon II or QRC board on the evaporator on this second system. See typical wiring diagram at the back of these instructions.

On systems with multiple evaporators the Smart Controller must be wired to the master evaporator first. **DO NOT disconnect the Room sensor from any of the evaporators.**

SINGLE SYSTEM CONNECTION



M = Master Evaporator S = Slave Evaporator CU = Condensing unit

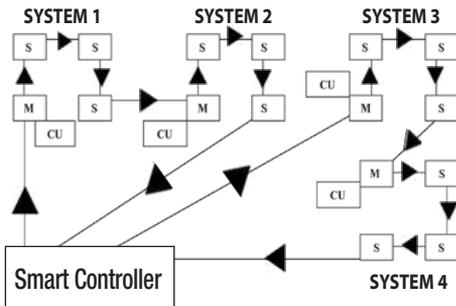
DO NOT CONNECT 24V & C BETWEEN EVAPORATORS.

The Smart Controller and the evaporators are then connected in a daisy-chain fashion.

(See the wiring diagrams in the back of this manual)

A minimum 18 gauge wire should be used. All low voltage wiring must be run separate from high voltage wiring.

MULTIPLE SYSTEM CONNECTION



M = Master Evaporator S = Slave Evaporator CU = Condensing unit

Power Supply

The Smart Controller 24 V power should come from one of two sources:

- 1) When the RS-232 port on the Smart Controller is NOT used:
 - Power typically comes from one evaporator in the Beacon II or QRC system. 24V and COM connections should be wired to the Beacon II or QRC board.
 - The evaporator power supply should be floating (not grounded). The Beacon II or QRC evaporator board is grounded through its mounting screws.
 - The grounding terminal on the Smart Controller should be connected to a good ground - typically in the evaporator electrical panel.
- 2) When the RS-232 port on the Smart Controller IS connected to a device:
 - A dedicated 24V power supply must be used, separate from the Beacon II or QRC board(s) power supply. 24V and COM connections should be wired to this power supply. Typical power supply would be a 24VAC universal Plug-in Power Source with a minimum current rating of 300mA.
 - The power supply should be floating (not grounded).
 - The grounding terminal on the Smart Controller should be connected to a good ground - typically in the evaporator electrical panel.

If the Smart Controller LCD displays all "88888," this indicates that the power supply is below 18VAC. When this occurs, the connected Beacon II or QRC components will power down and shut off. When the power supply is corrected to 24VAC, the system will restart after a 4 minute hold-off period and resume normal operation. The Smart Controller display will then be normal.

If a power interruption occurs to the Smart Controller, the LCD screen will go blank. The connected Beacon II or QRC systems will continue to operate and maintain box temperature provided their power supply is not interrupted.

Initialization of Smart Controller

When power is first applied to the Smart Controller, it checks the configuration of the system to which it is connected and stores this in its memory. Smart Controller checks how many condensing units there are and how many evaporators are connected to each condensing unit. The order in which the units are wired from the multi-out of the Smart Controller determines the unit ID (UNI-4) assigned by the Smart Controller. This is called initialization. Whenever a system is added, removed or modified (changing the number of evaporators on a condensing unit), while connected to the Smart Controller, it must be re-initialized.

Place all systems in the service mode before initializing the Smart Controller. Make sure all wiring changes to the system and the Smart Controller are complete and accurate before initializing the Smart Controller. Each SLAVE Evaporator must also be programmed as a SLAVE BEFORE the system is initialized. The "SLA" setpoint must be set from the board programming. It cannot be done from the Smart Controller.

To Initialize the Smart Controller

- Press and Hold both the **ENTER** and **CLEAR** buttons until the LCD displays "ERROR"
- Release the **ENTER** and **CLEAR** buttons quickly, then press the **ENTER** button
- The LCD will display "WAIT"
- If unsuccessful "NO CHG" will be displayed

It may take up to 2 minutes to complete the initialization of the system after which the normal LCD screen will appear.

Button Functions

- **SYSTEM SELECTION BAR:** If two or more systems are being controlled from the Smart Controller, this bar allows switching between systems. The display will show the SYS number and all parameters related to that system. The cover plate of Smart Controller when pushed will also change the display between systems.
- **CLOCK (+ -):** This is used to set the time of day on the display.
 - Depress the "+" button to move the clock forward
 - Depress the "-" button to move the clock backward
 - When in PROG Mode, these are used to step through values for setting superheat etc. for each evaporator of the system(s) attached to the Smart Controller and for different defrost start time periods.

- **COOLING:** Depressing this button will start the system in the cooling cycle immediately (The 4 minutes "Hold Off" is bypassed). This button will illuminate to indicate that the Cooling function is "ON". System operation will be as described under REFRIGERATION MODE in the Beacon II or QRC installation manual.

Pressing the COOLING button while the system is cooling, and the button illuminated, will pumpdown the system and turn it off.

- **DEFROST:** Depressing this button will force the system into defrost immediately (The "Hold Off/Hold On" times are bypassed). This button will illuminate to indicate that the Defrost function is "ON". When in Defrost, pressing this button a second time will end defrost.
- **MONITOR:** Depressing the MONITOR button will display the current operating conditions.

If one Smart Controller is controlling two or more independent systems, you must press the SELECTION BAR to display formation on the system you want to monitor. If multiple evaporators are connected to the system displayed, you must press the "+" or "-" buttons to display information on the evaporator you want to monitor.

- **PROG REVIEW:** This button allows stepping through each of the setpoints for initial setup and to make changes.

If one Smart Controller is controlling two or more independent systems, you must press the SELECTION BAR to display information on the system you want to make program changes. If multiple evaporators are connected to the system displayed, you must press the "+" or "-" buttons to display information on the evaporator you want to monitor.

- **CLEAR:** Used to clear incorrect entries while programming or to return to the System display when monitoring.
- **TIME:** Slide-bar is used to set the thermostat clock for Defrost times.
- **SETPOINT:** Slide-bar is used to change settings while programming.
- **ENTER:** To enter new settings into the program.

NOTE: Settings are recorded in memory even if power fails.

Programming Smart Controller

To make a change, press the **PROGRAM REVIEW** button until the setpoint item that needs to be changed is displayed. The **SETPOINT** Slide-bar is then used to change to the desired new setting. When the new desired setting is displayed, press the **"ENTER"** button. The new setting is now programmed into the Smart Controller memory.

Press the **PROGRAM REVIEW** button and follow the steps below (to back up one step during programming, while pressing the **"MONITOR"** button, press the **"PROGRAM REVIEW"** button):

- **DEF TYP** – ELE or AIR: Select for Electric Defrost or Air Defrost then press **"ENTER"**. This selection will automatically set the defaults for Air and Electric Defrost. Important: This will set the refrigerant type to R404A for Air and R404A for Electric. You must change to the refrigerant you are using in your application if these are incorrect.
- **REF TYP** – Selection for type of refrigerant R-22 (22), R-404A (404), R-507 (507).
*R-407A (47A), R-407C (47C), R-407F (47F), R448A (48A), R449A (49A) (*Only available on Smart Controller firmware 3.70 and later.)
- **BOX TMP** – Box Temp: -30° F to 70° F. Use **"SETPOINT"** slide-bar to get desired temperature, then press **"ENTER"**.
- **SUPRHT** – Superheat: 4 to 20° F. Use **"SETPOINT"** slide-bar to select desired superheat temperature, then press **"ENTER"**. If multiple evaporators are connected, use the "+" button to set other evaporators on this system.
- **SMT DFT** – Smart Defrost: On/Off. Use **"SETPOINT"** slide-bar to turn it ON or OFF, then press **"ENTER"** - When Smart Defrost is turned on, 8 defrost periods per day will automatically be programmed. These will be at 12:00 am, 3:00 am, 6:00 am, 9:00 am, 12:00 pm, 3:00 pm, 6:00 pm, and 9:00 pm. Also, the defrost fail safe time will be set to 60 minutes, and the defrost termination temperature will be set to 55°F. The user can change these as needed for the application. Smart Defrost is only available when Defrost Type (DFT TYP) is set to electric (ELE).
- **DM DFT*** – Demand Defrost: On/Off use **"SETPOINT"** slide-bar to turn it ON or OFF, then press **"ENTER"**. (The defrost fail-safe time is defaulted to 60 minutes, and the defrost termination temperature will be set to 55° F). Demand Defrost is only available when Defrost Type (DFT TYP) is set to electric (ELE).
*Only available on Smart Controller firmware 3.70 and later
- **DEF ST** – Defrost Start time: Up to 12 settings per day (For dF 1, use the **"TIME"** slide-bar to select first defrost time, then press **"ENTER"**. Use "+" button to scroll to next defrost period, dF 2, use **"TIME"** slide-bar to select second defrost time and press **"ENTER"**. Repeat steps for each required defrost period). If defrost times are not programmed the system will use the defaults: Electric Defrost - four per day at 4:00 am, 10:00 pm, 4:00 pm, 10:00 am. Air Defrost - two per day at 9:00 am, 9:00 pm. When Demand Defrost (DMD DFT) is 'ON', Defrost Start Time (DEF ST) is disabled and not displayed.
- **DEF SAF** – Defrost Fail Safe Time: 10 to 200 minutes. When this time has elapsed, the defrost cycle will end, even if the programmed Defrost Termination temperature was not achieved. Use **"SETPOINT"** slide-bar to select desired time, then press **"ENTER"**.
- **DEF TMP** – Defrost Termination Temperature: 40 to 100° F. Use **"SETPOINT"** slide-bar to select desired temperature, then press **"ENTER"**. If multiple evaporators are connected, use the "+" button to set other evaporators on this system.
- **ALR HI** – Alarm High Temperature. -40 to 90° F. Use **"SETPOINT"** slide-bar to select desired temperature, then press **"ENTER"**.
- **ALR LO** – Alarm Low Temperature -40 to 90° F. Use **"SETPOINT"** slide-bar to select desired temperature, then press **"ENTER"**.
- **ALR MIN** – Alarm Time, in minutes. Condition must exceed before alarm is indicated: 2 to 120 minutes. Use **"SETPOINT"** slide-bar to select desired time, then press **"ENTER"**.
- **F / C** – ° F or ° C. Use **"SETPOINT"** slide-bar to select then press **"ENTER"**.
- **12/24H** – Clock: 12H is for standard time. 24H is for international time. Use **"SETPOINT"** slide-bar to select, then press **"ENTER"**.
- **FNSTIR** – Evaporator fan stirring: On/Off. Use **"SETPOINT"** slide-bar to turn it On or Off, then press **"ENTER"**.
- **TEST** – OFF or ON: Puts all evaporators in **TEST** mode. Use with Caution. This will cycle each output at 10 second intervals. Use **"SETPOINT"** slide-bar to select, then press **"ENTER"**. Return to "OFF" and then press **"ENTER"** to end the test.

Programming Smart Controller cont'd.

- **SERVIC** – ON or OFF: When placed in the ON mode this will pump the system down and shut it off. The system will not restart until SERVIC is placed back in the OFF mode.

When multiple evaporators are connected as master/slave, depressing the "+" or "-" button will display information specific to each evaporator. Units in a master/slave connection are numbered 1 through 4. The first evaporator connected to the **SMART CONTROLLER MULTI-OUT** Terminals is Evaporator #1.

- **MODBUS** – ON or OFF: By default MODBUS OFF should show on the Smart Controller. Smart Controller has two ports: RS232 and RS485. While the hardware is available for MODBUS communication, the current software does not support MODBUS protocol.
- **DE ORG** - 4, 4 or 2, 8: Allows for the user to select between 4 systems with 4 evaporator boards and 2 systems with 8 evaporator boards.

Monitoring Smart Controller

The monitoring function can be used to monitor live system data. The information displayed, such as super-heat, is the actual superheat of the system as it is changing.

Press the **MONITOR** button and follow the steps below (to back up one step during monitoring, while pressing the "PROGRAM REVIEW" button, press the "MONITOR" button):

- **SUPRHT** – Superheat (use "+" button to check super-heat of other evaporators, if Master/slave)
- **EXVSET** – Expansion valve step setting (Stepper Motor setting 0 to 255 steps: use "+" button to check other evaporators if Master/slave)
- **SUCTMP** – Evaporator Suction temperature (Measured by the Suction Sensor): use "+" button to check other evaporators if Master/Slave
- **SSVTMP** – Saturated Suction temperature at the Evaporator (Determined by Suction Transducer): use "+" button to check other evaporators if Master/Slave
- **SUCPRE** – Evaporator Suction Pressure (Measured by Suction Transducer): use "+" button to check other evaporators if Master/Slave

- **ODTMP** – Actual outdoor ambient temperature (Measured at the Condensing Unit)
- **DEFTMP** – Evaporator coil temperature (Used to terminate defrost): use "+" button to check other evaporators if Master/Slave
- **DEFTIM** – Defrost Time: Length of last defrost
- **CMPCYC** – Comp Cycles: No of Compressor Cycles since 12:00 midnight. Compressor Cycles (CMPCYC) will not display accurate information when Smart Controller is connected to a QRC system.
- **CMPRUN** – Comp run time (Measured since 12:00 midnight) Compressor Run-time (CMPRUN) will not display accurate information when Smart Controller is connected to a QRC system.
- **SPRTMP** – Spare sensor temperature input
- **VERSION** – Software Version: For each Beacon II Controller (use "+" button to check other evaporators, if Master/slave)
- **VERSION** – Software Version: for Smart Controller

When multiple evaporators are connected as master/slave depressing the "+" or "-" button will display information specific to each evaporator. Units in a master/slave connection are numbered 1 through 4.

The first evaporator connected to the **SMART CONTROLLER MULTI-OUT** Terminals is Evaporator #1 and must be a "master" board.

Locking The Heatcraft Smart Controller Board

SMART CONTROLLER is lockable to prevent programmed settings changes by unauthorized personnel. When the Smart Controller is Locked, all buttons except for the **MONITOR**, **PROGRAM REVIEW**, and **CLEAR** buttons are disabled. The slides and selector bar are also still active.

To LOCK the settings, do the following:

- Press “**PROGRAM REVIEW**” button.
- Press and hold “**MONITOR**” button.
- While holding “**MONITOR**” button, press “**ENTER**” button.
- The LED will display *L o c*.

This will prevent unauthorized persons from changing any settings for system displayed. To **UNLOCK** the Controller, repeat these steps. LCD will display “*U N L O C K .*”

Note: Each system must be locked or unlocked separately.

Error Codes

- **R*SEN* - Room temperature sensor shorted, open or not installed
- **DFSEN* - Defrost temperature sensor shorted, open or not installed
- **STSEN* - Suction Temperature sensor shorted, open or not installed
- **SPSEN* - Suction pressure transducer shorted, open or not installed
- **ODSEN* - Outdoor temperature sensor shorted
- **SUPLO* - Superheat too low
- **SHTDN* - Compressor shutdown
(High or low refrigerant pressure or low oil pressure)
Compressor Shutdown error code does not apply to QRC systems.

The error code will flash alternately with the normal display information. When the error condition is corrected, the error code will no longer be displayed and only the normal information will be displayed.

*All errors for all units connected to the Smart Controller will be displayed with an appropriate indicator for the system and unit experiencing the error. The individual boards will also display the errors.

Wiring Error

If the Smart Controller LCD displays “+COMM+,” this indicates that there is an error in the communication wiring or that the wiring is broken or disconnected. Occurrence of this error on the connected unit will indicate which wires are faulty.

The communication wiring is the **MULTI IN** and **MULTI OUT** connections. Check to make sure the **OUT** is connected to **IN**. Never connect **OUT** to **OUT** or **IN** to **IN**.

Alarm Codes

- ***BOXHI**: Box temperature too high
- ***BOXLO**: Box temperature too low
- ***STRUP**: System Start-up failure (Compressor pumps down and tries to restart after 4 minutes.) System Start-up Failure Alarm does not apply to QRC systems.
- ***INFLT**: Input fault (Box Temp., Suction Temp., Pressure Transducer open or not installed)
- Power failure

When an **ALARM** condition occurs, the Smart Controller will display “**CALL FOR SERVICE**”, the **ALARM** code, the **SYSTEM** Number and will sound an internal buzzer along with the closure of alarm contacts on controller.

Alarm Circuit - The onboard alarm is a dry set of NC contacts which close to indicate an alarm or a power loss. The type and wiring for the alarm is customer specified and supplied. Note that the alarm circuit does not distinguish or indicate what caused the alarm. These contacts can handle up to 125VAC and a 1 Amp load.

The alarm code will flash alternately with the normal display information. When the alarm condition is corrected, the alarm code will no longer be displayed and only the normal information will be displayed.

The system will pumpdown and cycle off and will not restart until the fault is cleared for the following conditions:

- Suction sensor shorted, open or not installed
- Room temperature sensor shorted, open or not installed on master
- Pressure Transducer open or not installed

The system will pumpdown, cycle off and try to restart for three consecutive times. Each try will be after the 4 minutes “**Hold Off**” period, for the following fault conditions:

- Oil pressure (Does not apply to QRC systems)
- High pressure or low pressure cutout (or any other compressor safeties) (Does not apply to QRC systems)

After the fourth try, the alarm contacts will be closed and an alarm message displayed on the LCD screen. To clear this condition, the system should be cycled through the “**SERVICE**” mode after correction is complete.

On Multiple systems the alarm contacts on each of the Master Evaporators will also announce alarms for that system. Alarms on slave evaporators will only occur for input fault and power failure.

Alarm Buzzer

The **ALARM** buzzer will sound when an alarm condition occurs. This buzzer will turn off when the alarm condition is cleared. The buzzer can also be silenced at any time by pressing the "**CLEAR**" button.

Data Logging

On multiple evaporator systems, the data recorded is from the master evaporator only. This data is available via remote connection through the Smart Controller's RS232 serial port.

The data can be viewed using RRC Gateway.

(See H-IM-RRC at www.heatcraftprd.com under Literature > I&O manuals).

Smart Defrost

The Smart Controller continuously monitors the system performance to determine the need for defrost. It uses a variety of data such as the outdoor ambient and box temperature in its decision making process. Smart Defrost is available for electric defrost systems only.

Activating Smart Defrost

After your system has been running for a week or two with normal defrost operation and the system has operated normally with no problems, you may consider activating Smart Defrost.

You must program multiple defrost times into the Smart Controller to provide flexibility for the system to defrost the coil properly. Smart Defrost will only allow the system to defrost at a programmed defrost time. The system will not defrost in between programmed defrost times. Hence, we recommend that a minimum of 8 defrost periods be programmed when Smart Defrost is turned on. The system will have the potential to defrost eight times per day to keep the coil clear and to allow the system to operate at optimum condition.

To activate Smart Defrost, press the **"PROGRAM REVIEW"** button until **"S M T D F T"** is displayed. (Also, it is recommended that the defrost fail-safe time be increased to 60 minutes).

Move the **"SETPOINT"** slide-bar to **"ON"** then press **"ENTER"**. Press **"CLEAR"** to return to the main screen.

When Smart Defrost is turned on, 8 defrost periods per day will automatically be programmed. These will be at 12:00 am, 3:00 am, 6:00 am, 9:00 am, 12:00 pm, 3:00 pm, 6:00 pm, and 9:00 pm. Also, the defrost fail safe time will be set to 60 minutes, and the defrost termination temperature will be set to 55°F. The user can change these as needed for the application.

Deactivating Smart Defrost

To turn Smart Defrost off, move the **"SETPOINT"** slide bar to **"OFF"** then press **"ENTER"**. Press **"CLEAR"** to return to the main screen.

Demand Defrost

Demand defrost is available for electric defrost systems only. To activate Demand defrost, press the **"PROGRAM REVIEW"** button until **"D M D D F T"** is displayed. Move the **"SETPOINT"** slide-bar to **"ON"** then press **"ENTER"**/ Press **"CLEAR"** to return to the Main Screen.

When Demand defrost is turned on, the Smart Controller will monitor system performance and will only call for a Defrost when necessary. Demand defrost does not utilize defrost periods, so all defrost period times will be cleared with the selection of **"D M D D F T"**.

System Defaults

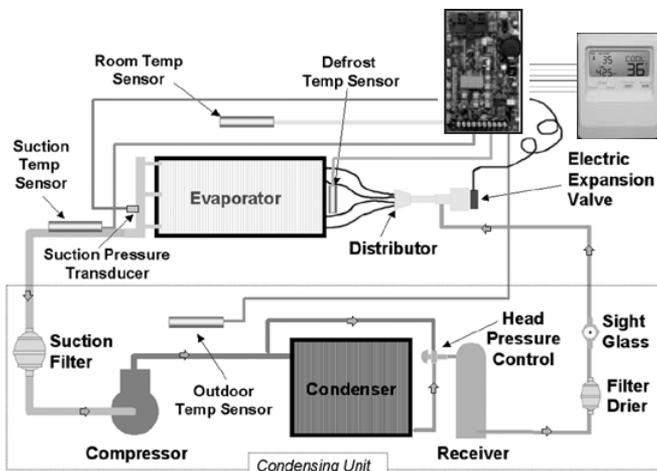
The following are factory defaults for the parameters for the Smart Controller. If the user does not select a setting for any of the following parameters, the default will be used.

It is important the user set ALL parameters based on their needs.

PARAMETERS	CODE	AIR	ELECTRIC
Refrigerant	REF TYP	R-404A	R-404A
Box Temperature	BOX TMP	35°F	-10°F
Superheat	SUPR HT	7°F	7°F
Smart Defrost	SMT DEF	N/A	Off**
Demand Defrost	DM DEF	N/A	Off
Defrost Start Times	DEF ST	9 am/ 9pm	4am, 10am, 4pm, 10pm
Defrost Fail-Safe Times	DEF SAF	40 min.	30 min. (60 min. when Smart Defrost or Demand Defrost is On)
Defrost End Temperature	DEF TMP	45°F	60°F (55°F. when Smart Defrost or Demand Defrost is On)
Alarm High Temperature	ALR HI	50°F	5°F
Alarm Low Temperature	ALR LO	30°F	-15°F
Alarm Time	ALR MIN	60 min.	60 min.
Temperature Units	F-C	°F	°F
Clock Setting	12/24H	12 H	12 H
Fan Chilling	FNSTIR	Off	Off
Test Mode	TEST	Off	Off
Service Mode	SERVIC	Off	Off

**When Smart Defrost is turned on, 8 defrost periods per day will automatically be programmed. These will be at 12:00 am, 3:00 am, 6:00 am, 9:00 am, 12:00 pm, 3:00 pm, 6:00 pm, and 9:00 pm.

Also, the defrost fail safe time will be set to 60 minutes, and the defrost termination temperature will be set to 55° F. The user can change these as needed for the application.



In order to accommodate updates in technology and in industry, new Beacon II, QRC, and Smart Controller part numbers were created to handle a number of enhancements.

The "NEW" part numbers listed below will serve as service parts for any "OLD" part numbers in the event a replacement part is needed. The Table and notes below highlight key differences between the OLD and NEW parts.

	Supported Parameters:					
	OLD			NEW		
Part Numbers:	28910101	28910102	89704301	28910103	28910104	89704304
Part Description:	Beacon II (Green)	QRC (White)	Smart Controller	Beacon II (Blue)	QRC (White)	Smart Controller
R22	✓	✓	✓	✓	✓	✓
R404A	✓	✓	✓	✓	✓	✓
R507	✓	✓	✓	✓	✓	✓
R407A	-	-	-	✓	✓	✓
R407C	-	-	-	✓	✓	✓
R407F	-	-	-	✓	✓	✓
R448A	-	-	-	✓	✓	✓
R449A	-	-	-	✓	✓	✓
Demand Defrost*	-	✓	-	✓	✓	✓
Evap Fan Cycling	-	✓	-	✓	✓	✓

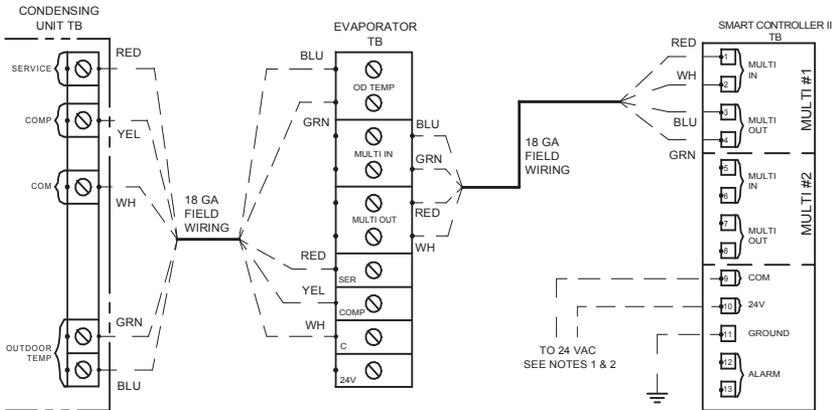
* Demand Defrost is implicit on all Smart Controller Versions (Can be activated by engaging Smart Defrost and clearing all defrost times), but the explicit DMDDFT parameter is only ever displayed on 89704304

NOTES:

1. When using a new Smart Controller 89704304 with multiple systems, the Smart Controller will poll each individual system and only display parameters if they are available for ALL boards in that system.
2. When using an old Smart Controller 89704301 with multiple systems, the Smart Controller will only display the old parameters, even if the Beacon II or QRC boards that are connected support additional parameters.
3. A new Beacon II/QRC board that is connected to old Beacon II/QRC boards or an old Smart Controller will only display parameters supported on the old versions.

24 VOLT CONNECTION WIRING W/ SINGLE SYSTEM

CONNECTION DIAGRAM FOR SMART CONTROLLER II
(WITH ONE EVAPORATOR)



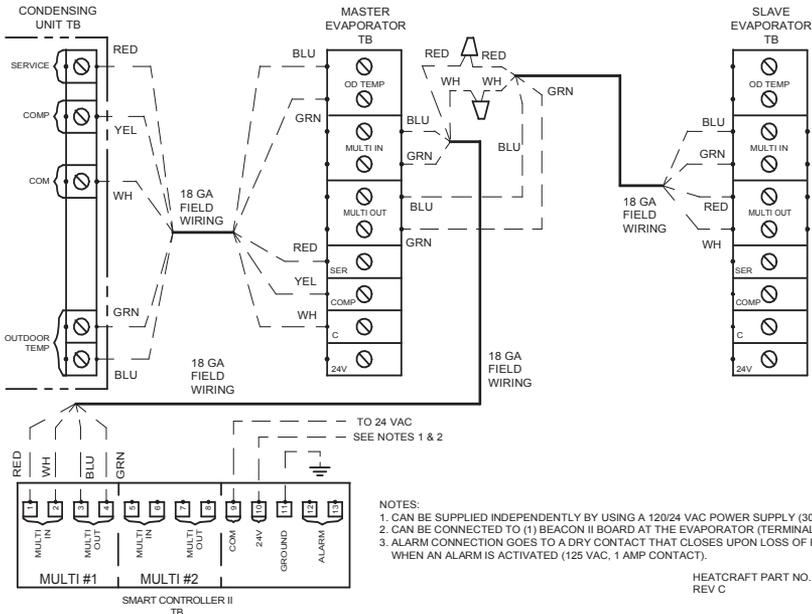
NOTES:

1. CAN BE SUPPLIED INDEPENDENTLY BY USING A 120/24 VAC POWER SUPPLY (300mA).
2. CAN BE CONNECTED TO (1) BEACON II BOARD AT THE EVAPORATOR (TERMINALS 24V & C).
3. ALARM CONNECTION GOES TO A DRY CONTACT THAT CLOSES UPON LOSS OF POWER OR WHEN AN ALARM IS ACTIVATED (125 VAC, 1 AMP CONTACT).

HEATCRAFT PART NO. 29661601

24 VOLT CONNECTION WIRING W/ SINGLE SYSTEM

CONNECTION DIAGRAM FOR SMART CONTROLLER II
(WITH TWO EVAPORATORS)



NOTES:

1. CAN BE SUPPLIED INDEPENDENTLY BY USING A 120/24 VAC POWER SUPPLY (300mA).
2. CAN BE CONNECTED TO (1) BEACON II BOARD AT THE EVAPORATOR (TERMINALS 24V & C).
3. ALARM CONNECTION GOES TO A DRY CONTACT THAT CLOSES UPON LOSS OF POWER OR WHEN AN ALARM IS ACTIVATED (125 VAC, 1 AMP CONTACT).

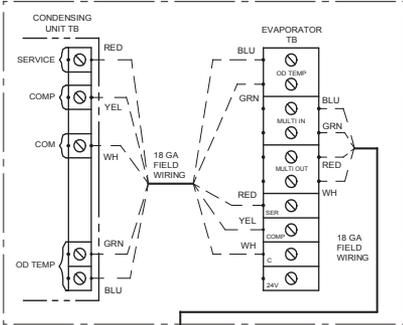
HEATCRAFT PART NO. 29661701
REV C

Beacon II Wiring Diagrams

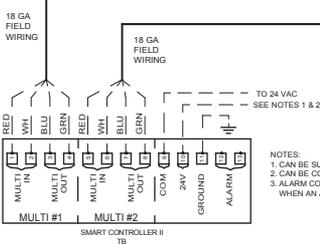
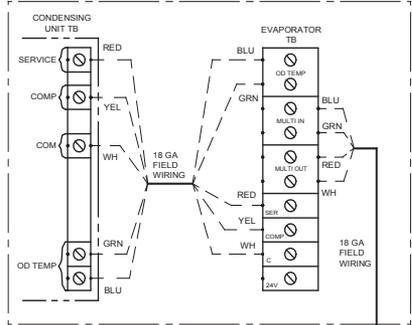
24 VOLT CONNECTION WIRING W/ 2 SYSTEMS

CONNECTION DIAGRAM FOR SMART CONTROLLER II
(TWO SEPARATE SYSTEMS / (1) EVAPORATOR ON EACH SYSTEM)

SYSTEM 1



SYSTEM 2



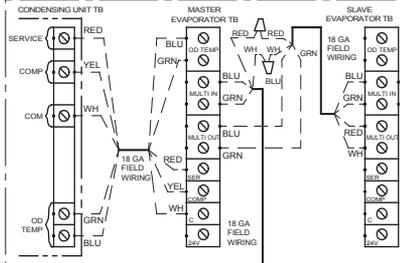
- NOTES:
1. CAN BE SUPPLIED INDEPENDENTLY BY USING A 120/24 VAC POWER SUPPLY (300mA).
 2. CAN BE CONNECTED TO (1) BEACON II BOARD AT THE EVAPORATOR (TERMINALS 24V & C).
 3. ALARM CONNECTION GOES TO A DRY CONTACT THAT CLOSSES UPON LOSS OF POWER OR WHEN AN ALARM IS ACTIVATED (125 VAC, 1 AMP CONTACT).

HEATCRAFT PART NO. 29661901
REV C

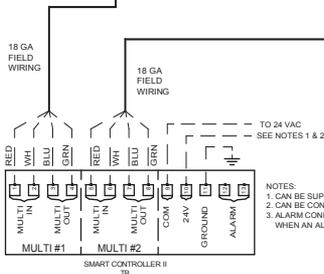
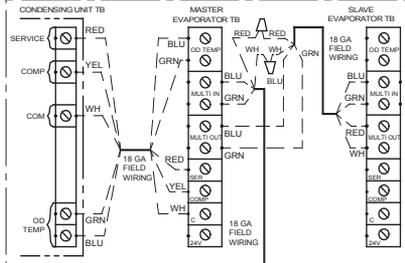
24 VOLT CONNECTION WIRING W/ 2 SYSTEMS

CONNECTION DIAGRAM FOR SMART CONTROLLER II
(TWO SEPARATE SYSTEMS / (2) EVAPORATOR ON EACH SYSTEM)

SYSTEM 1



SYSTEM 2



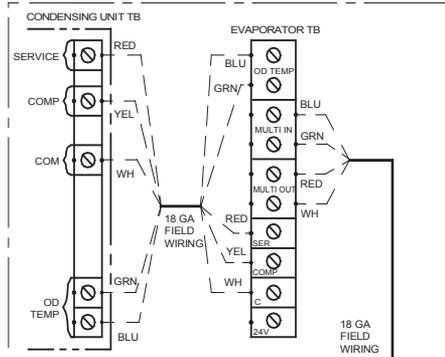
- NOTES:
1. CAN BE SUPPLIED INDEPENDENTLY BY USING A 120/24 VAC POWER SUPPLY (300mA).
 2. CAN BE CONNECTED TO (1) BEACON II BOARD AT THE EVAPORATOR (TERMINALS 24V & C).
 3. ALARM CONNECTION GOES TO A DRY CONTACT THAT CLOSSES UPON LOSS OF POWER OR WHEN AN ALARM IS ACTIVATED (125 VAC, 1 AMP CONTACT).

HEATCRAFT PART NO. 29661801
REV C

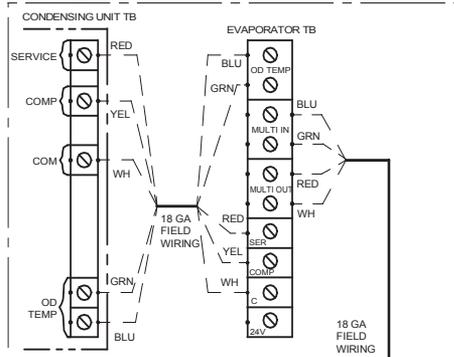
24 VOLT CONNECTION WIRING W/ 4 SYSTEMS

CONNECTION DIAGRAM FOR SMART CONTROLLER II
(FOUR SEPARATE SYSTEMS / (1) EVAPORATOR ON EACH SYSTEM)

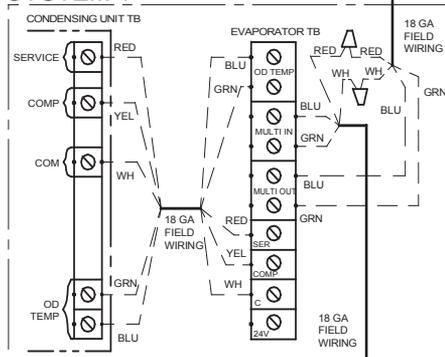
SYSTEM 2



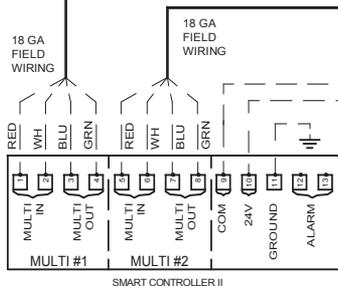
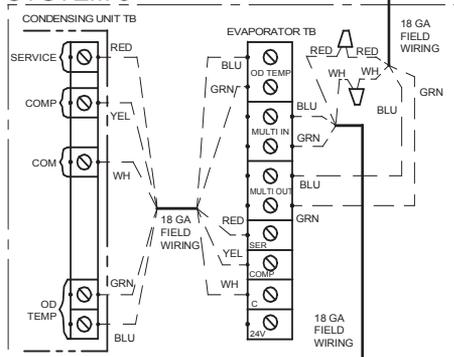
SYSTEM 4



SYSTEM 1



SYSTEM 3



TO 24 VAC
SEE NOTES 1 & 2

NOTES:

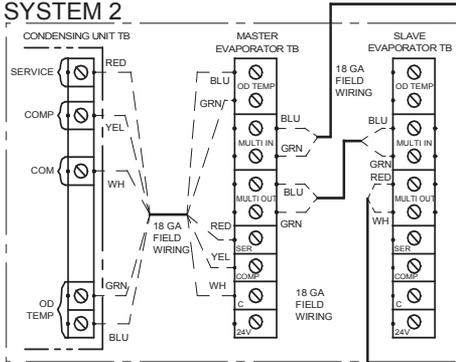
1. CAN BE SUPPLIED INDEPENDENTLY BY USING A 120/24 VAC POWER SUPPLY (300mA).
2. CAN BE CONNECTED TO (1) BEACON II BOARD AT THE EVAPORATOR (TERMINALS 24V & C).
3. ALARM CONNECTION GOES TO A DRY CONTACT THAT CLOSSES UPON LOSS OF POWER OR WHEN AN ALARM IS ACTIVATED (125 VAC, 1 AMP CONTACT).

HEATCRAFT PART NO. 29682101
REV B

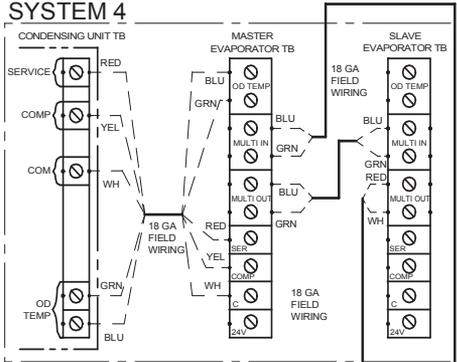
24 VOLT CONNECTION WIRING W/ 4 SYSTEMS

CONNECTION DIAGRAM FOR SMART CONTROLLER II
(FOUR SEPARATE SYSTEMS / (2) EVAPORATOR ON EACH SYSTEM)

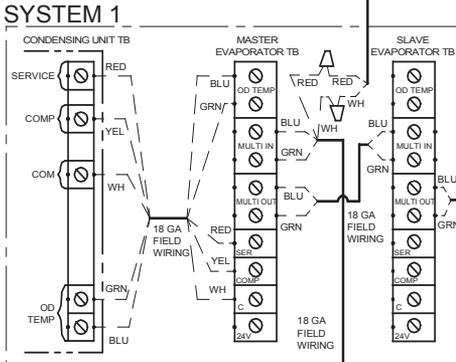
SYSTEM 2



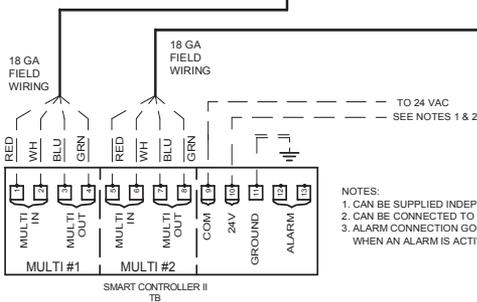
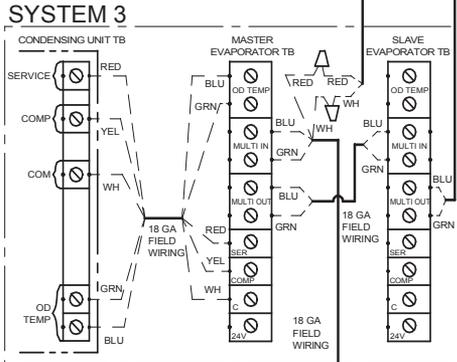
SYSTEM 4



SYSTEM 1



SYSTEM 3



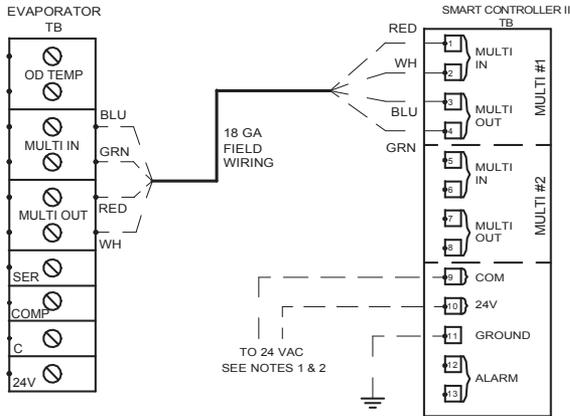
NOTES:

1. CAN BE SUPPLIED INDEPENDENTLY BY USING A 120/24 VAC POWER SUPPLY (300mA).
2. CAN BE CONNECTED TO (1) BEACON II BOARD AT THE EVAPORATOR (TERMINALS 24V & C).
3. ALARM CONNECTION GOES TO A DRY CONTACT THAT CLOSES UPON LOSS OF POWER OR WHEN AN ALARM IS ACTIVATED (125 VAC, 1 AMP CONTACT).

HEATCRAFT PART NO. 29664201
REV C

24 VOLT CONNECTION WIRING W/ SINGLE SYSTEM

CONNECTION DIAGRAM FOR SMART CONTROLLER II
(WITH ONE EVAPORATOR)

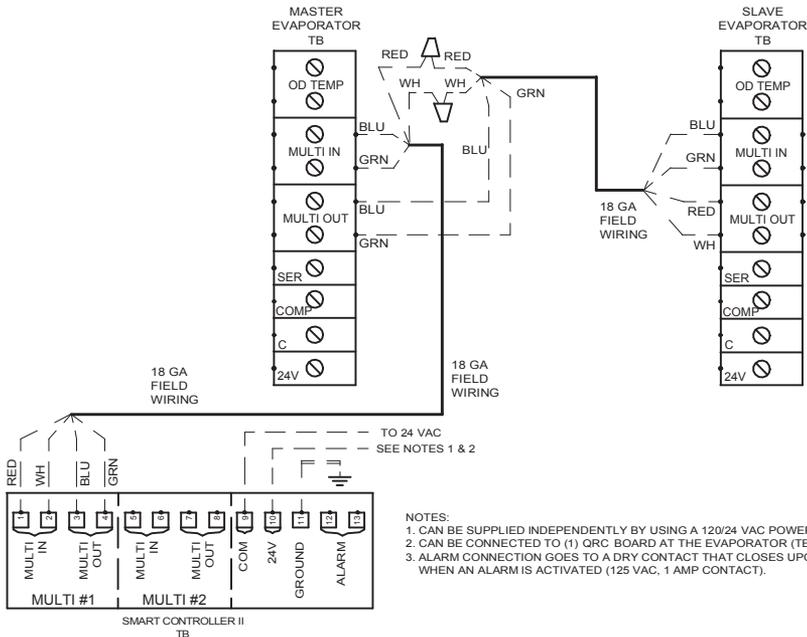


NOTES:

1. CAN BE SUPPLIED INDEPENDENTLY BY USING A 120/24 VAC POWER SUPPLY (300mA).
2. CAN BE CONNECTED TO (1) QRC BOARD AT THE EVAPORATOR (TERMINALS 24V & C).
3. ALARM CONNECTION GOES TO A DRY CONTACT THAT CLOSSES UPON LOSS OF POWER OR WHEN AN ALARM IS ACTIVATED (125 VAC, 1 AMP CONTACT).

24 VOLT CONNECTION WIRING W/ SINGLE SYSTEM

CONNECTION DIAGRAM FOR SMART CONTROLLER II
(WITH TWO EVAPORATORS)



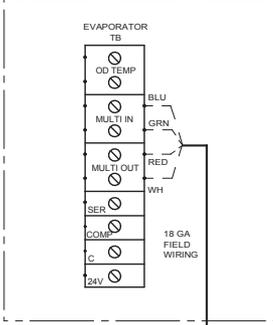
NOTES:

1. CAN BE SUPPLIED INDEPENDENTLY BY USING A 120/24 VAC POWER SUPPLY (300mA).
2. CAN BE CONNECTED TO (1) QRC BOARD AT THE EVAPORATOR (TERMINALS 24V & C).
3. ALARM CONNECTION GOES TO A DRY CONTACT THAT CLOSSES UPON LOSS OF POWER OR WHEN AN ALARM IS ACTIVATED (125 VAC, 1 AMP CONTACT).

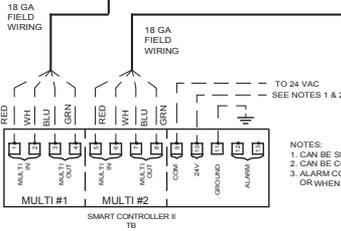
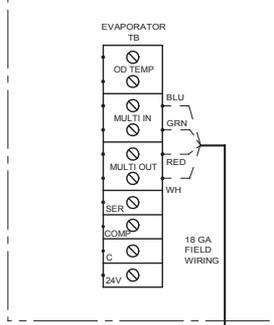
24 VOLT CONNECTION WIRING W/ 2 SYSTEMS

CONNECTION DIAGRAM FOR SMART CONTROLLER II
(TWO SEPARATE SYSTEMS / (1) EVAPORATOR ON EACH SYSTEM)

SYSTEM 1



SYSTEM 2

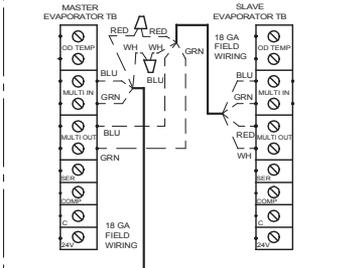


- NOTES:
1. CAN BE SUPPLIED INDEPENDENTLY BY USING A 120/24 VAC POWER SUPPLY (3000VA).
 2. CAN BE CONNECTED TO (1) ORC BOARD AT THE EVAPORATOR (TERMINALS 24V & C).
 3. ALARM CONNECTION GOES TO A DRY CONTACT THAT CLOSSES UPON LOSS OF POWER OR WHEN AN ALARM IS ACTIVATED (125 VAC, 1 AMP CONTACT).

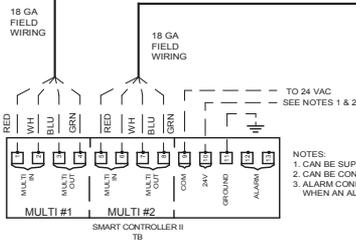
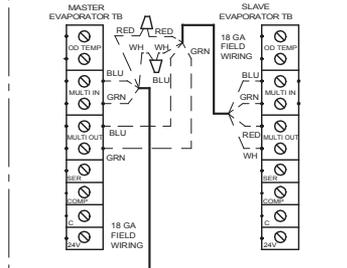
24 VOLT CONNECTION WIRING W/ 2 SYSTEMS

CONNECTION DIAGRAM FOR SMART CONTROLLER II
(TWO SEPARATE SYSTEMS / (2) EVAPORATOR ON EACH SYSTEM)

SYSTEM 1



SYSTEM 2

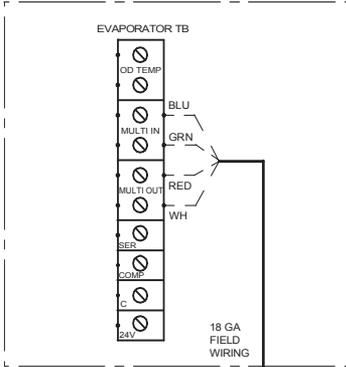


- NOTES:
1. CAN BE SUPPLIED INDEPENDENTLY BY USING A 120/24 VAC POWER SUPPLY (3000VA).
 2. CAN BE CONNECTED TO (1) ORC BOARD AT THE EVAPORATOR (TERMINALS 24V & C).
 3. ALARM CONNECTION GOES TO A DRY CONTACT THAT CLOSSES UPON LOSS OF POWER OR WHEN AN ALARM IS ACTIVATED (125 VAC, 1 AMP CONTACT).

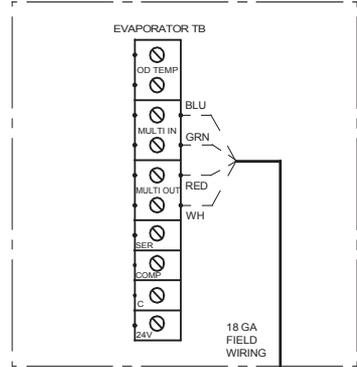
24 VOLT CONNECTION WIRING W/ 4 SYSTEMS

CONNECTION DIAGRAM FOR SMART CONTROLLER II
(FOUR SEPARATE SYSTEMS / (1) EVAPORATOR ON EACH SYSTEM)

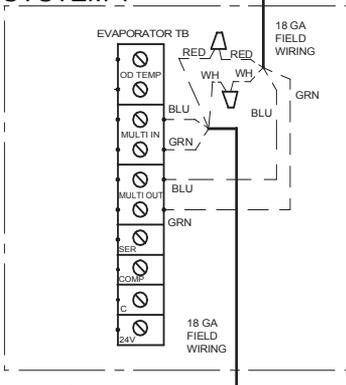
SYSTEM 2



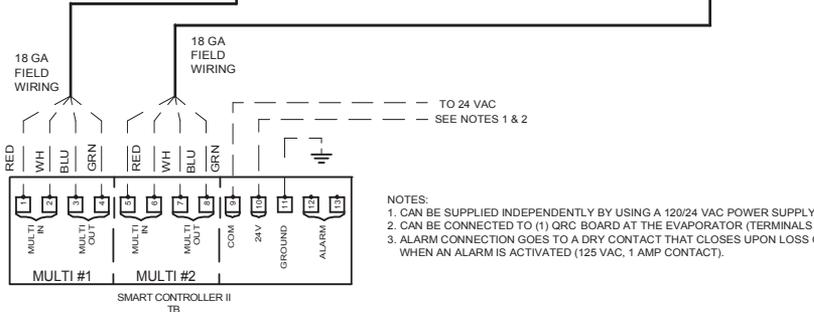
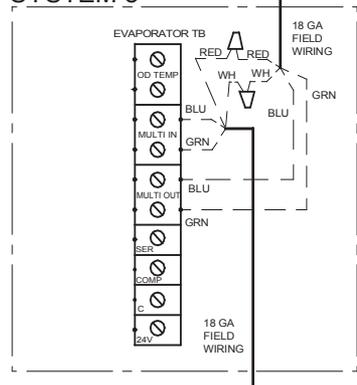
SYSTEM 4



SYSTEM 1



SYSTEM 3



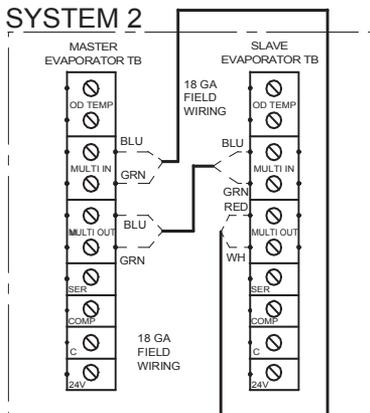
NOTES:

1. CAN BE SUPPLIED INDEPENDENTLY BY USING A 120/24 VAC POWER SUPPLY (300mA).
2. CAN BE CONNECTED TO (1) ORC BOARD AT THE EVAPORATOR (TERMINALS 24V & C).
3. ALARM CONNECTION GOES TO A DRY CONTACT THAT CLOSES UPON LOSS OF POWER OR WHEN AN ALARM IS ACTIVATED (125 VAC, 1 AMP CONTACT).

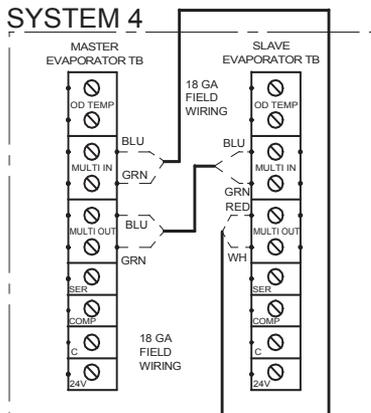
24 VOLT CONNECTION WIRING W/ 4 SYSTEMS

CONNECTION DIAGRAM FOR SMART CONTROLLER II
(FOUR SEPARATE SYSTEMS / (2) EVAPORATOR ON EACH SYSTEM)

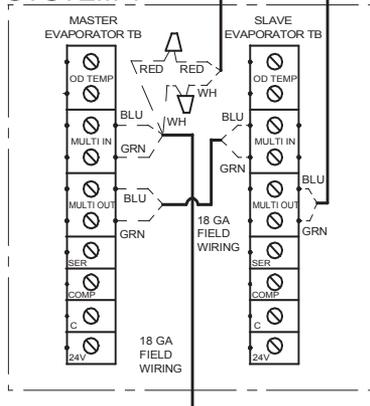
SYSTEM 2



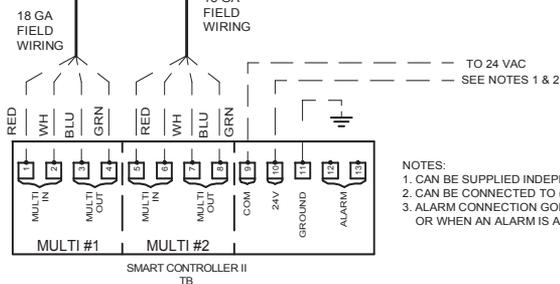
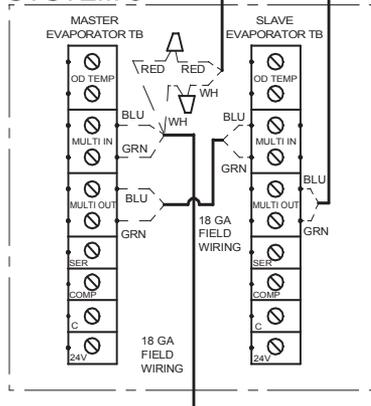
SYSTEM 4



SYSTEM 1



SYSTEM 3



NOTES:

1. CAN BE SUPPLIED INDEPENDENTLY BY USING A 120/24 VAC POWER SUPPLY (300mA).
2. CAN BE CONNECTED TO (1) QRC BOARD AT THE EVAPORATOR (TERMINALS 24V & C).
3. ALARM CONNECTION GOES TO A DRY CONTACT THAT CLOSES UPON LOSS OF POWER OR WHEN AN ALARM IS ACTIVATED (125 VAC, 1 AMP CONTACT).

Heatcraft Refrigeration Products, LLC
2175 West Park Place Blvd., Stone Mountain, GA 30087
www.heatcraftprd.com

Customer Service and Technical Support

Normal Business Hours – 8:00 AM – 8:00 PM EDT
(800) 321-1881

After Hours (after 5:00 PM EDT, weekends and holidays)
(855) 883-1036

Since product improvement is a continuing effort, we reserve the right to make changes in specifications without notice.

The name behind the brands you trust.™

