Scotsman® Eclipse Technical Training

- CME686
- CME810
- CP686
- CP886
- CP1086

Scotsman®

In This Presentation

- What Eclipse is
- Components and their functions
- Installation
- Operation
- Maintenance
- Service Diagnosis

The Eclipse System

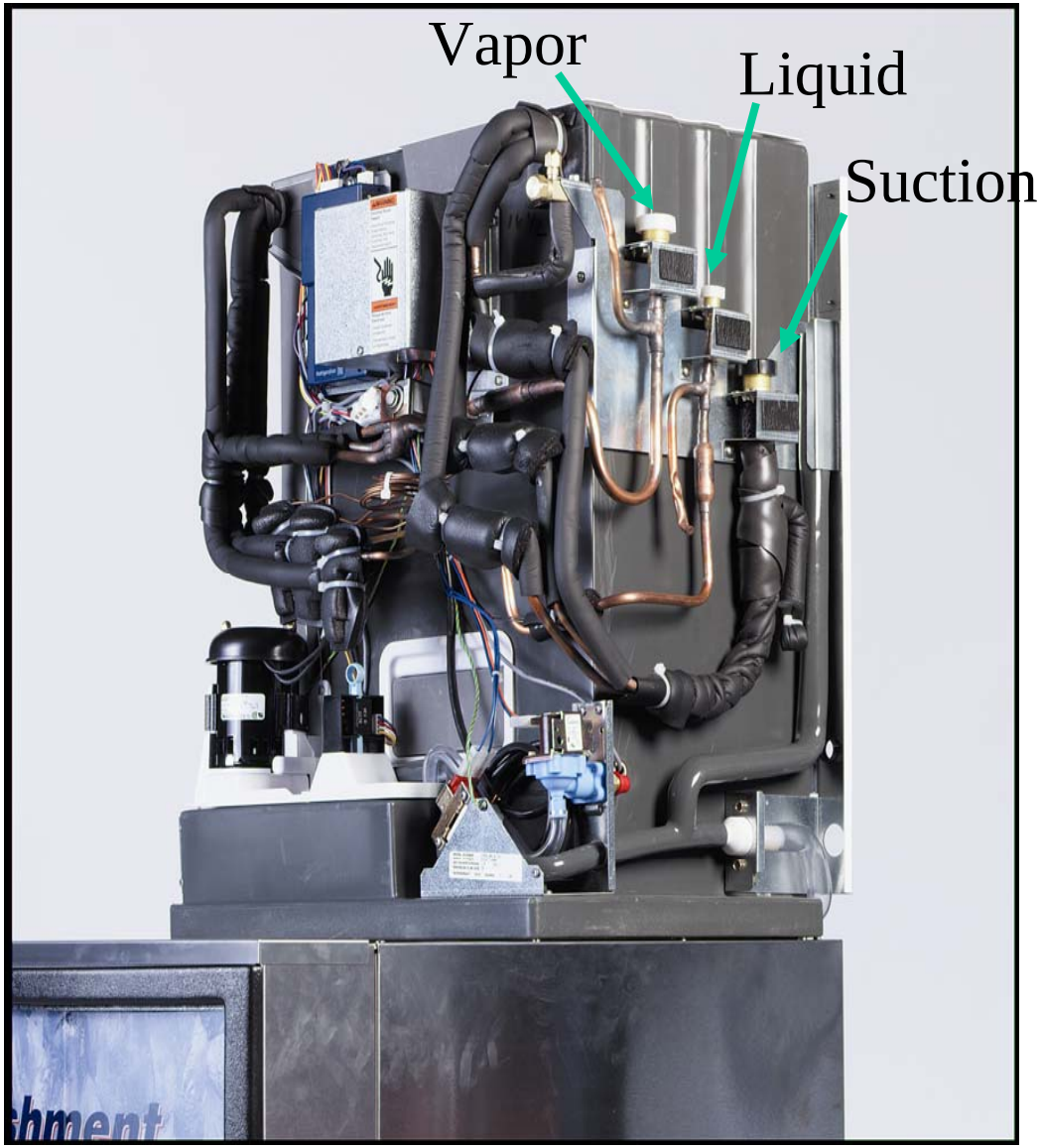
- The remote system is made up of three parts:
  - Ice Making Section or Head Unit - 115 volt
  - Compressor Package - 208-230 volt
  - Condenser - 208-230 volt
- Flexible Modular System
  - One condenser fits two compressor packages
  - One ice making head fits two compressor packages
  - All are R-404A systems

Ice Making Section

- CME686 or CME810
  - Remote Low Side
- 22” wide by 16.5” deep
  - Three evaporators
  - Three TXVs
  - Three check valves
  - CM³ technology
    - Water and Control Systems
    - Rotomolded freezing compartment

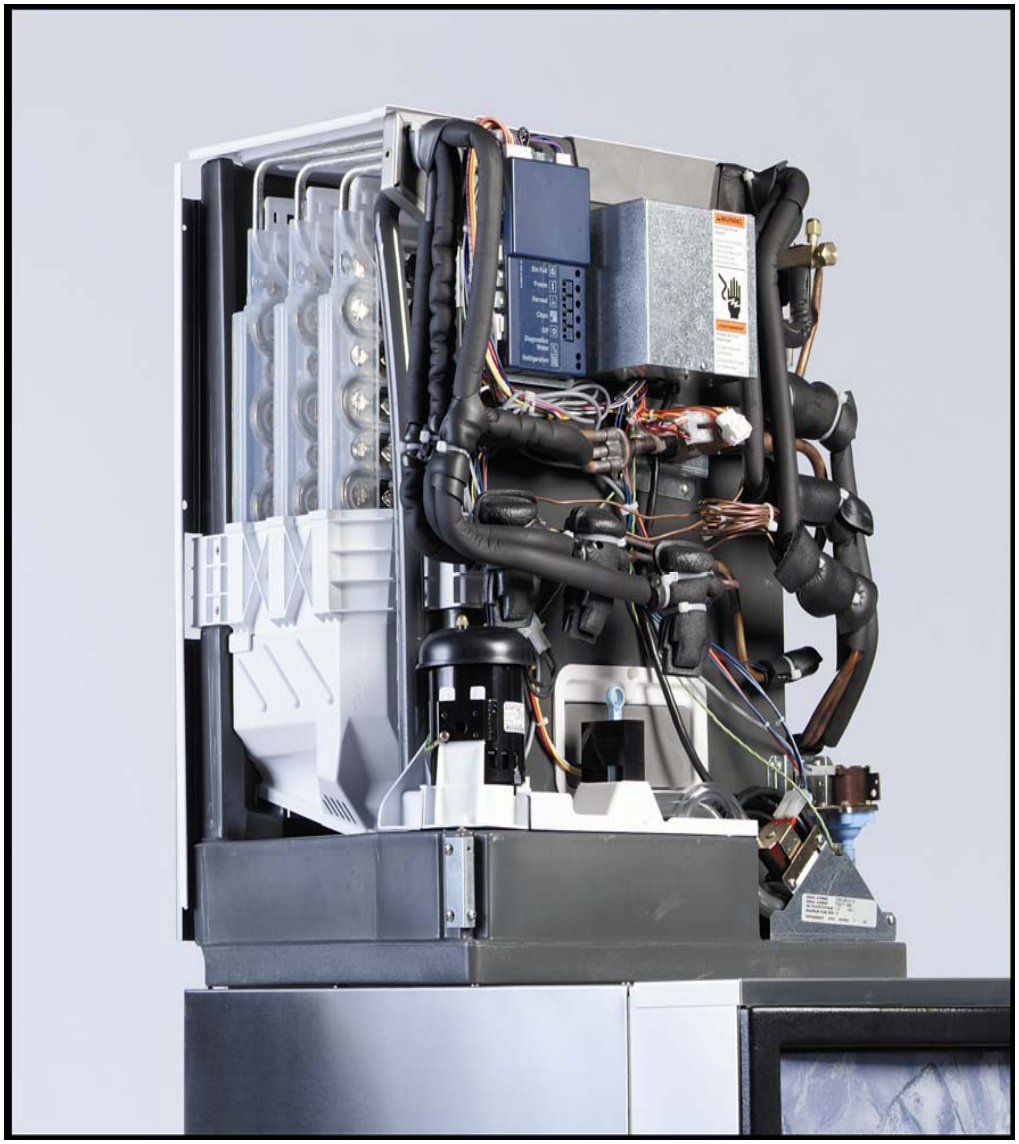
Ice Making Section

- Refrigerant Line Connections
  - Vapor
  - Liquid
  - Suction
- All on right side
  - Designed for Drive-Up Window Applications



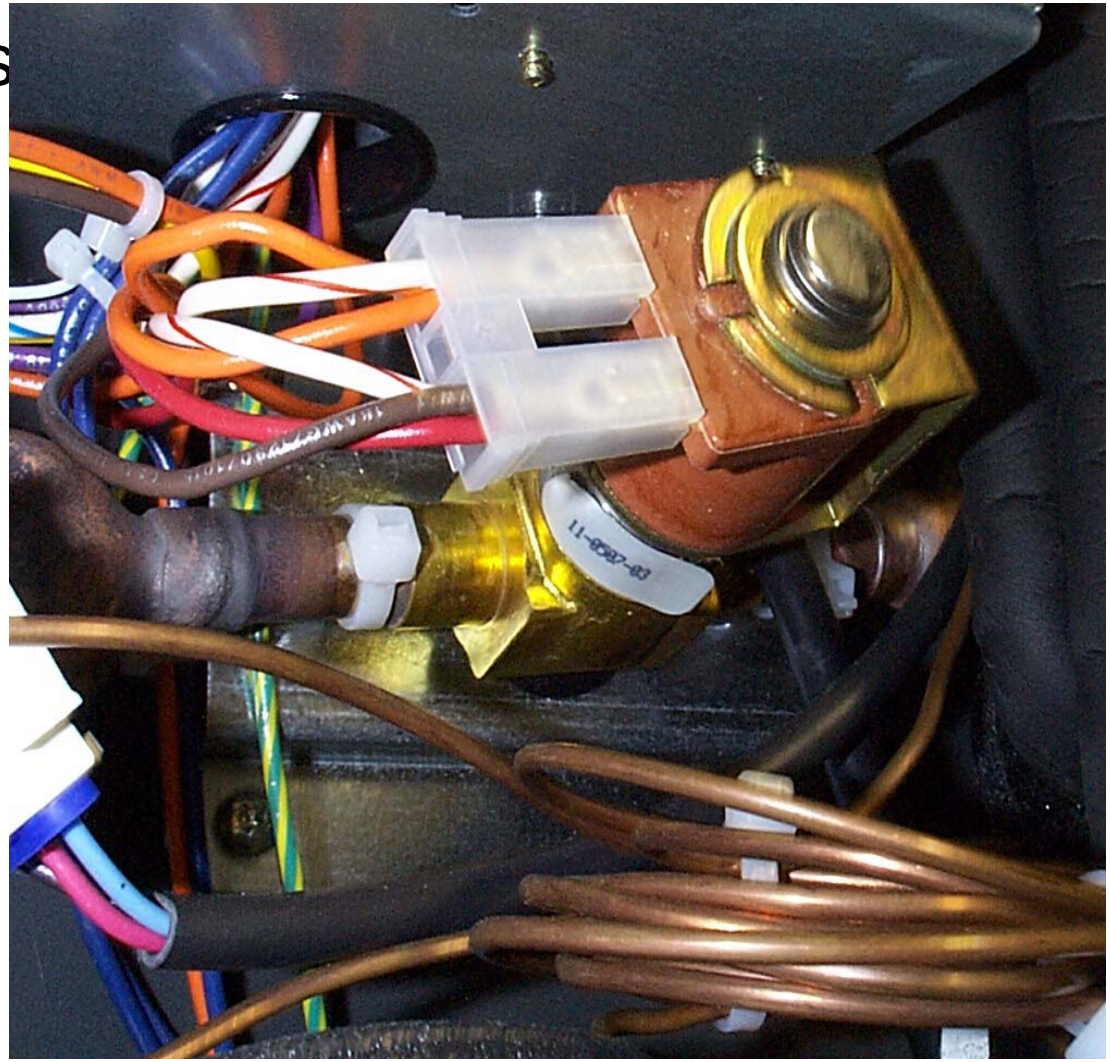
Ice Making Section

- Ice making compartment
- Three evaporators
  - Circuited in parallel
  - No braze joints in freezing compartment
  - Access from the left side or top



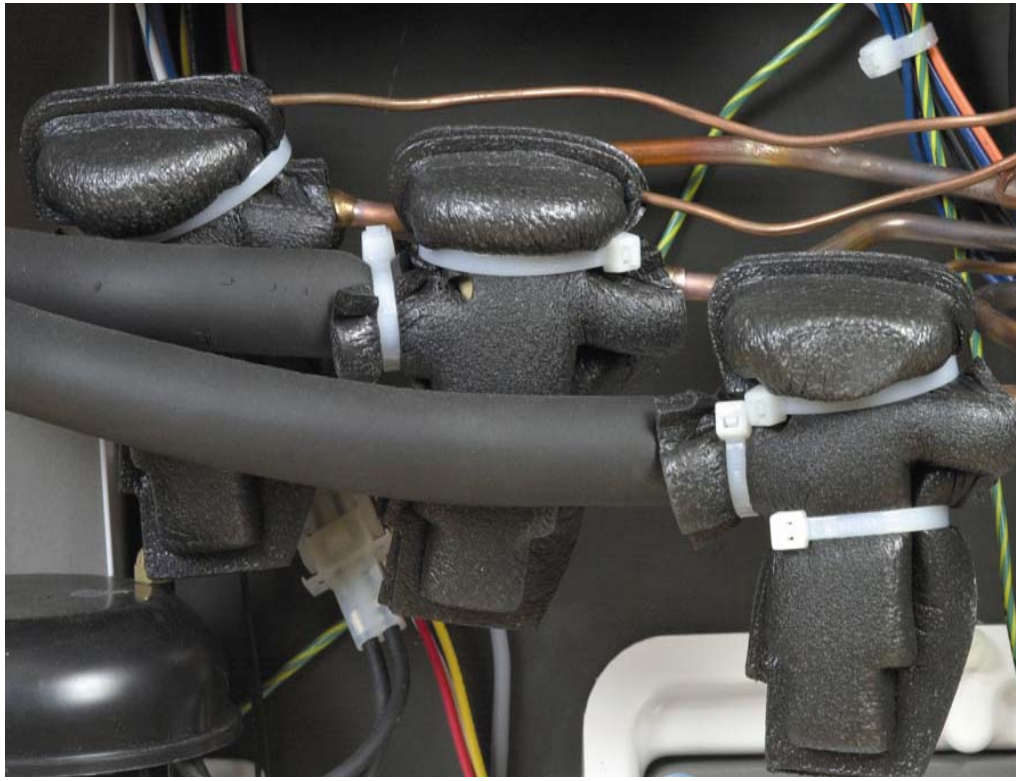
Vapor Inlet Valve

- Purpose: Opens during harvest to allow vapor to enter the evaporators
- 24 volt coil
- Different port size between CME686 and CME810



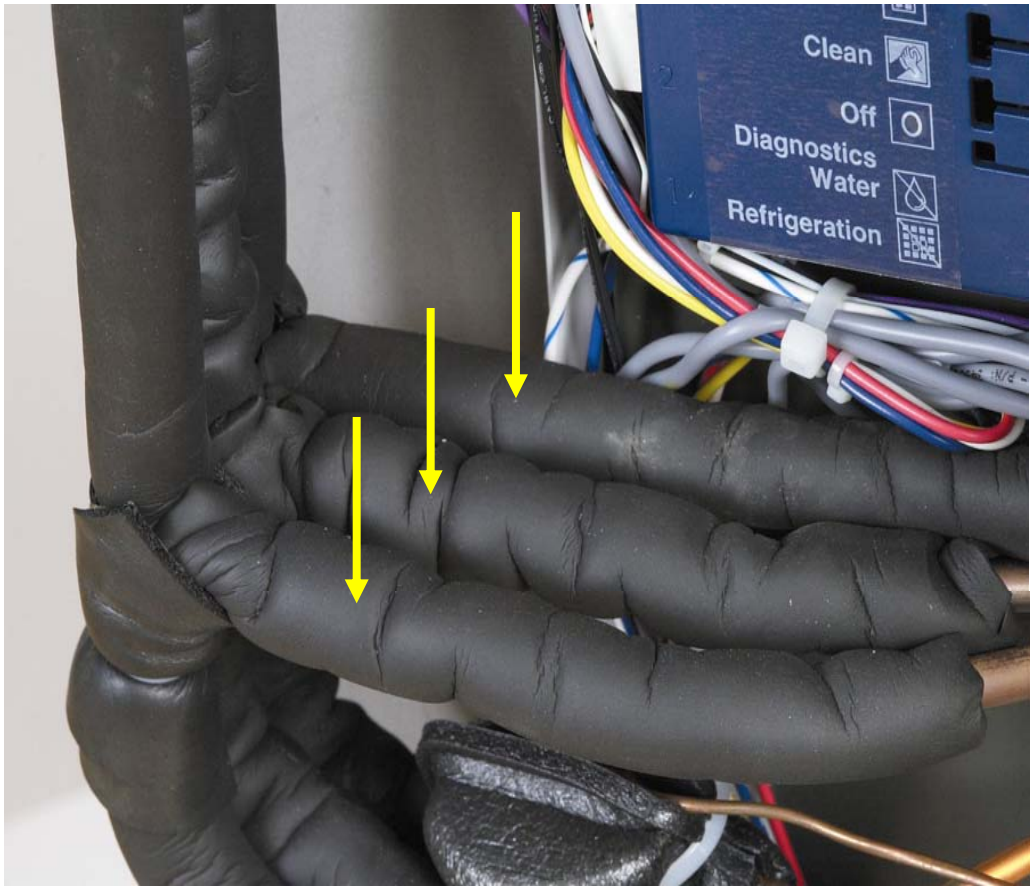
Three TXVs

- Three internally equalized valves
- Purpose: Control individual evaporator superheats
  - One valve per plate
  - Promotes even plate-to-plate ice distribution



Three Check Valves

- Check valves keep each TXV's refrigeration flow directed to a single evaporator
  - Eliminates cross-flow during freeze cycle
  - Each TXV outlet must flow to one evaporator



Water Pump

- 115 volt pump
- Same for both CME686 and CME810
- Pedestal type
- Pump motor separated from reservoir
  - Keeps motor drier
  - Motor cap keeps condensation off motor

Scotsman® Controller

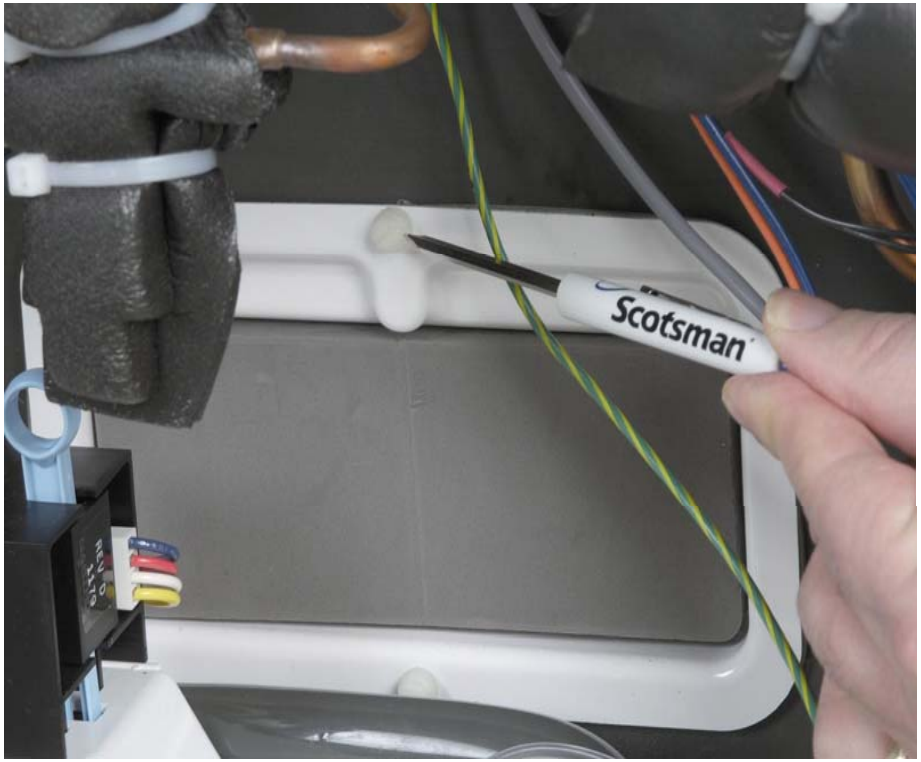
- AutoIQ™plus
- Uses sensors for
  - ice harvest,
  - bin full indications
  - water reservoir temperature
  - water level
- Controls freeze and harvest cycles

CME Electrical Box

- Transformer 115 to 24, 85 VA
- Purge valve timer
- Control wire connection nearby
  - Wire routes to compressor package
  - Controls contactor and solenoid valves

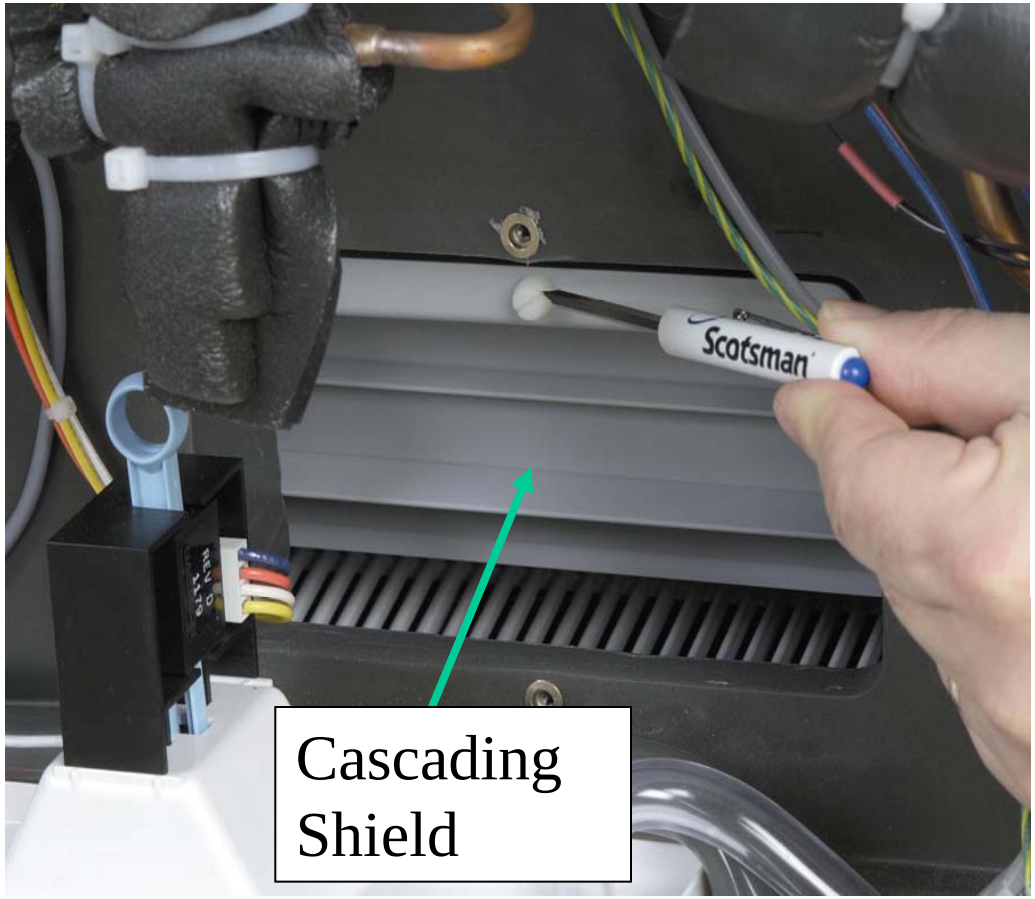
Inspection Cover

- Provides access when left and right side access is limited
- Access to:
  - cascading shield
  - water trough
  - ice sensors
- Also covers cascading shield fastener



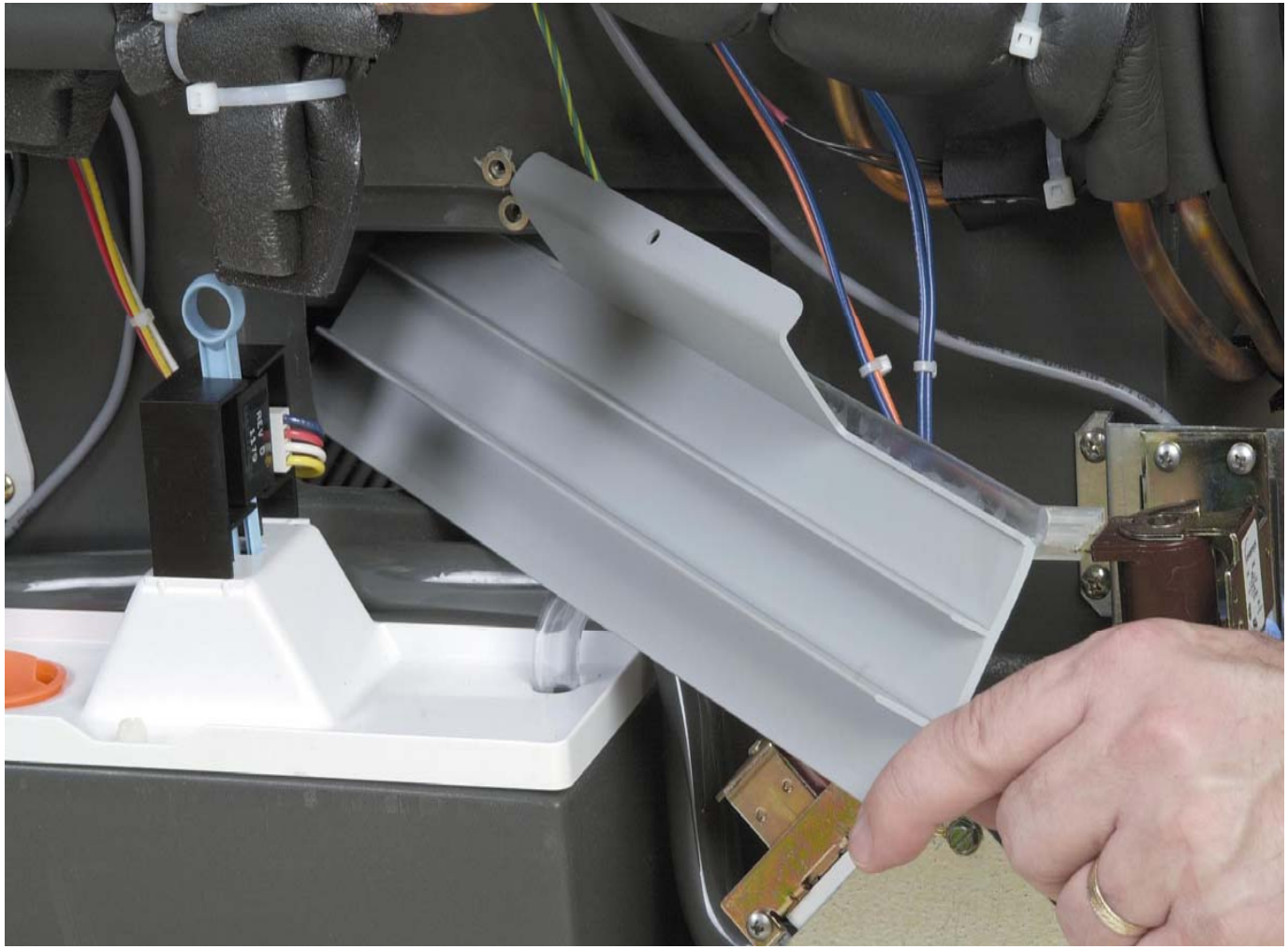
Cascading Shield

- Removal begins with removal of the inspection cover
- Then remove the one retaining screw



Scotsman®

Cascading Shield

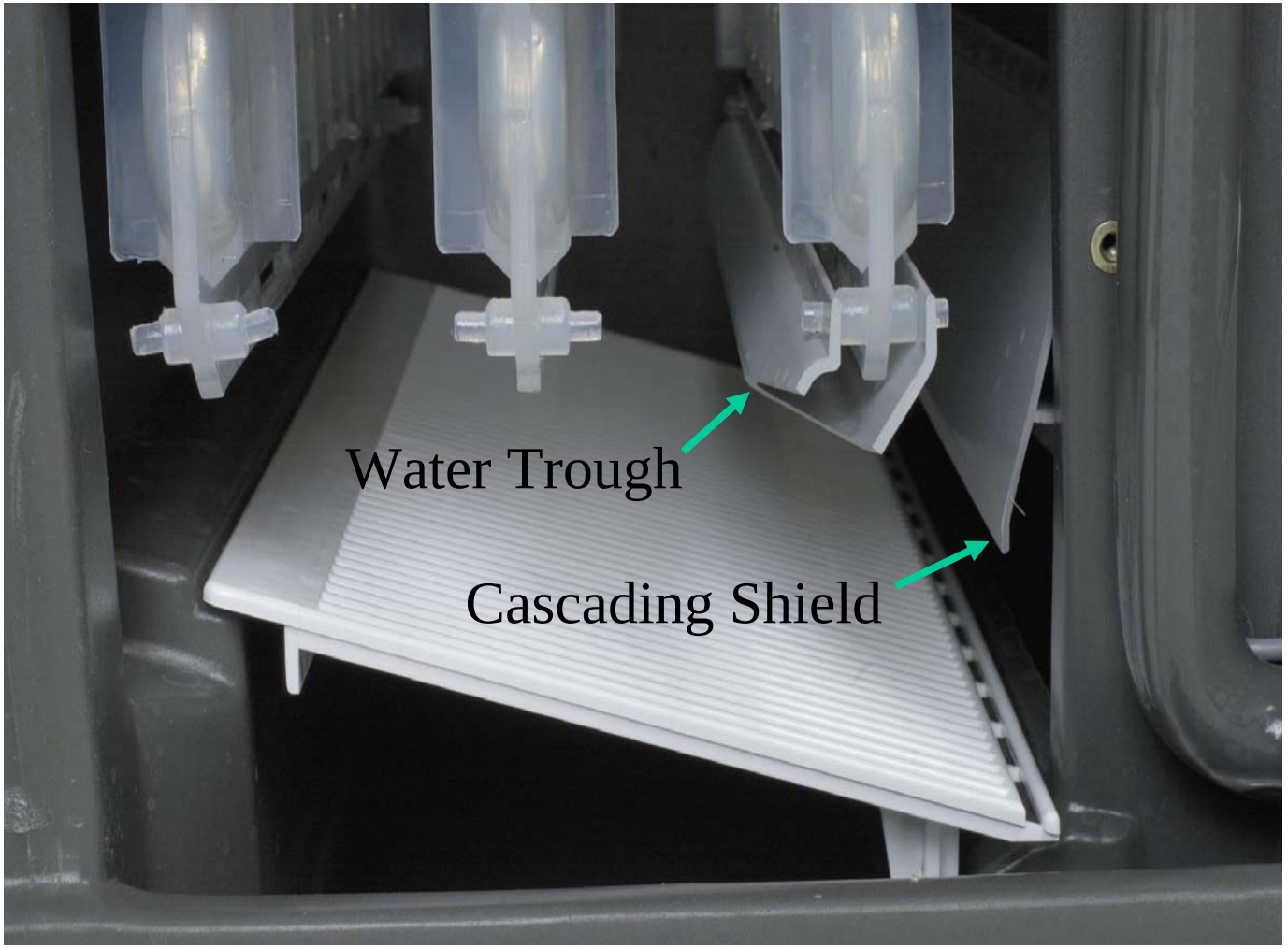


Scotsman®

Evaporator Covers

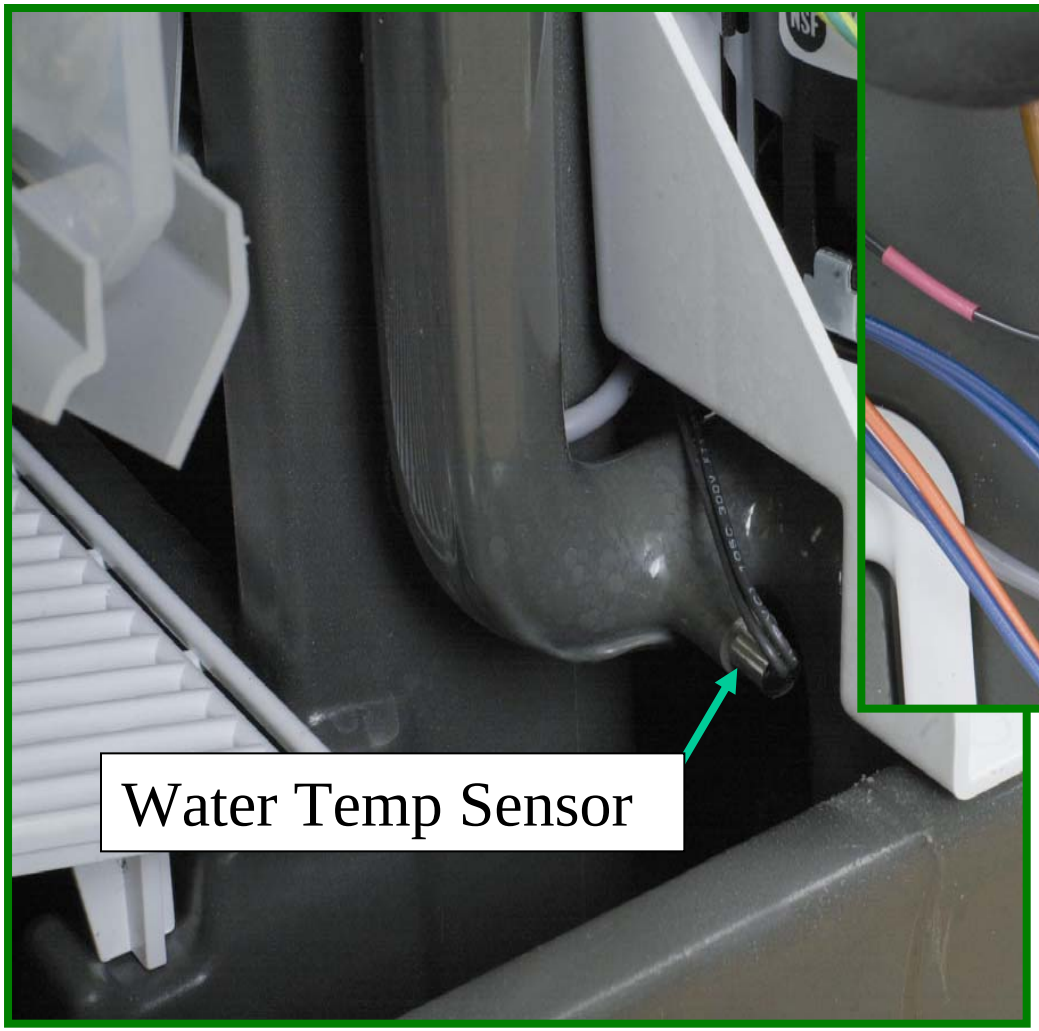
Scotsman®

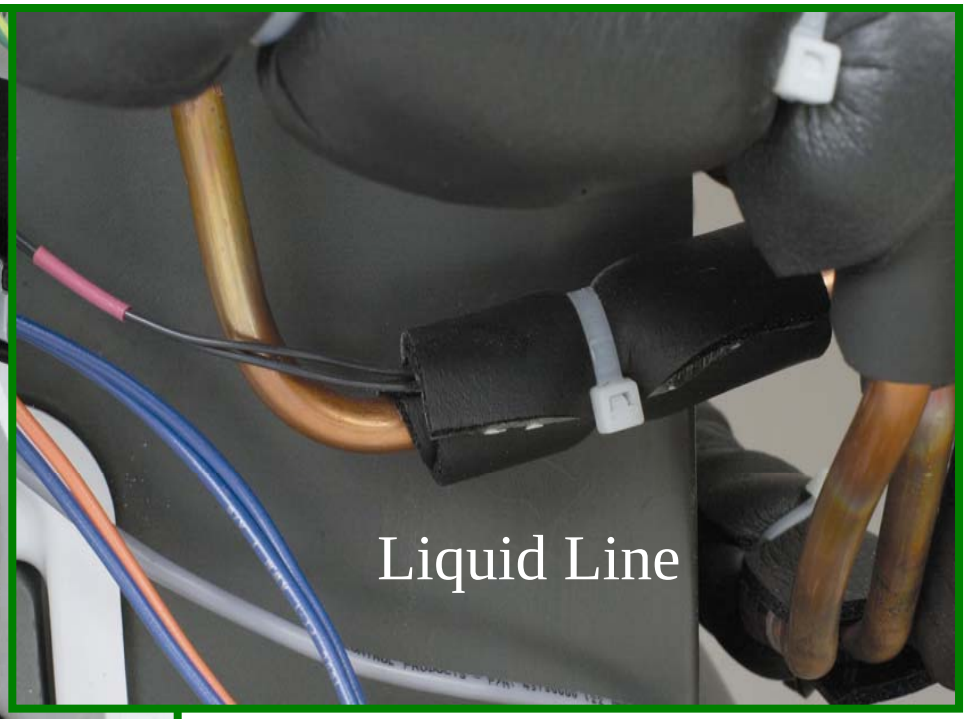
Freezing Compartment



Scotsman®

Temperature Sensors



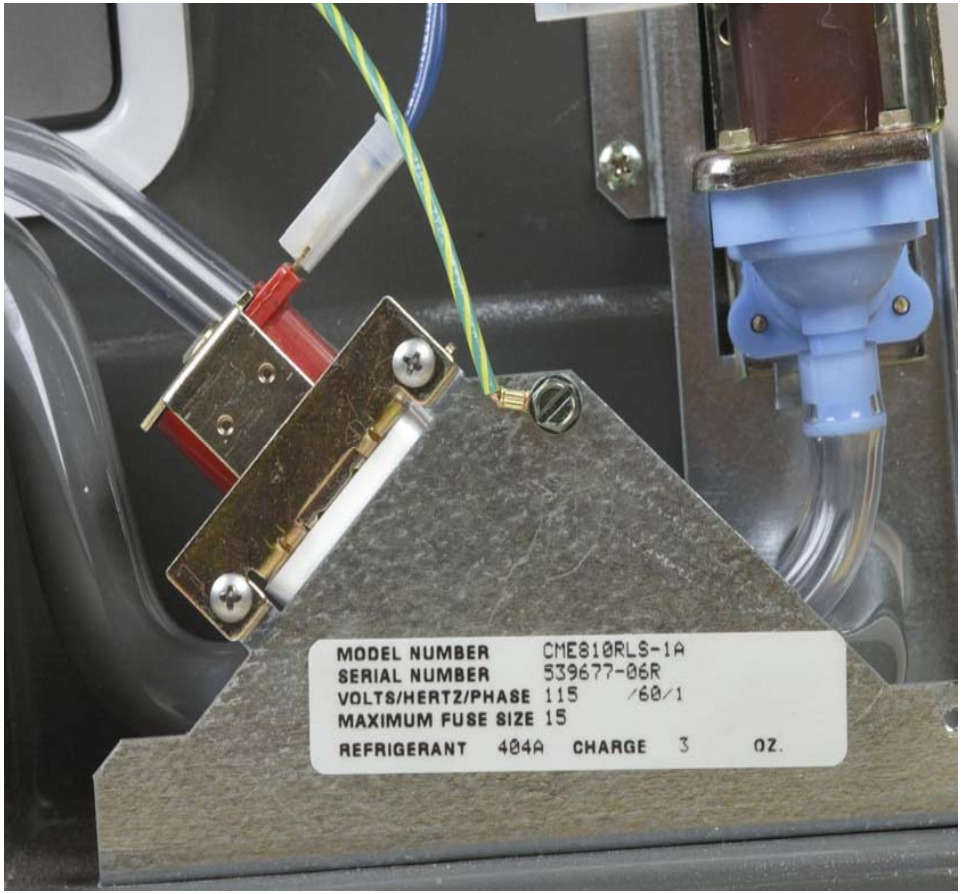


Inlet Water Valve

- Located in right front corner of unit
- 1.25 GPM valve
  - Same one as on CME256, CME506 and many others
- Opens to add water and fill reservoir
  - Adds water during harvest
  - Fills at beginning of freeze
  - Refills once more during freeze

Purge Valve

- Located in the front of the unit
- 115 volt coil
- Opens to drain the reservoir during harvest
- Controlled by purge valve timer



Ice Sensors

- Sensing position 3” below base
- Control position designed for dispenser applications
  - Also works well on bins
- Maximizes fill without overfilling

Compressor Package

- Three models
  - CP686
  - CP886
  - CP1086

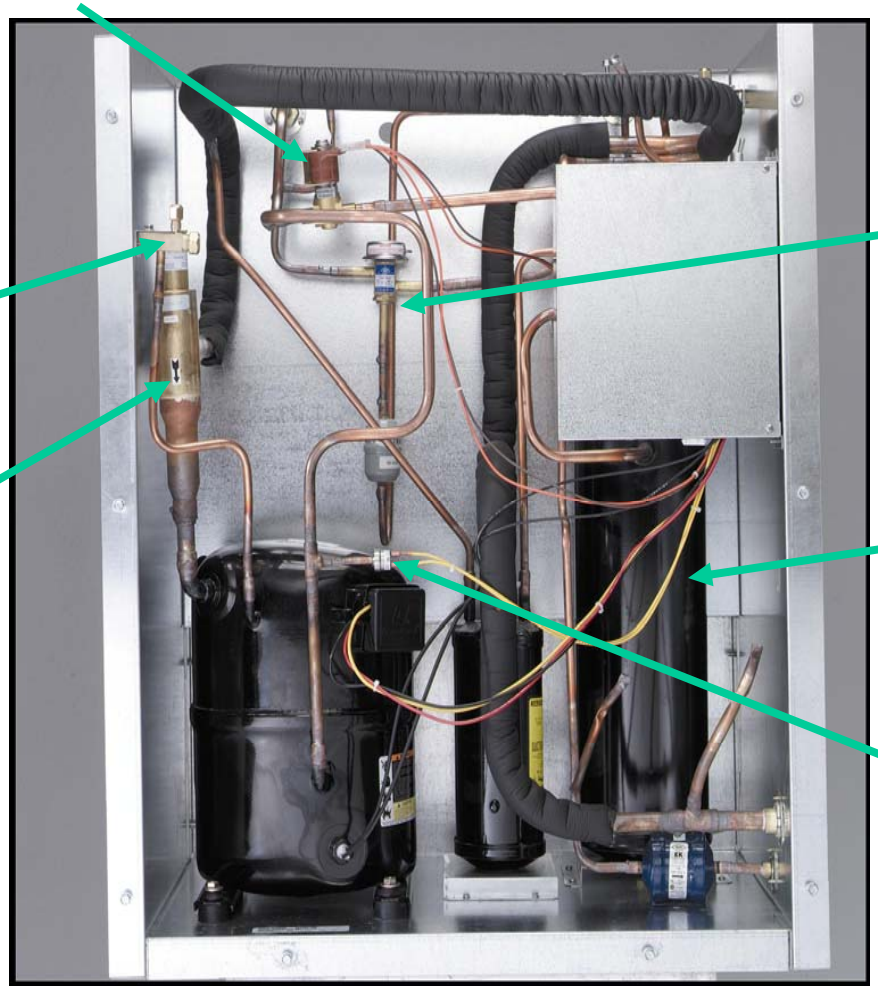
Scotsman®

CP Unit

Condenser Bypass Valve

Low Side Access Valve

CPR Valve



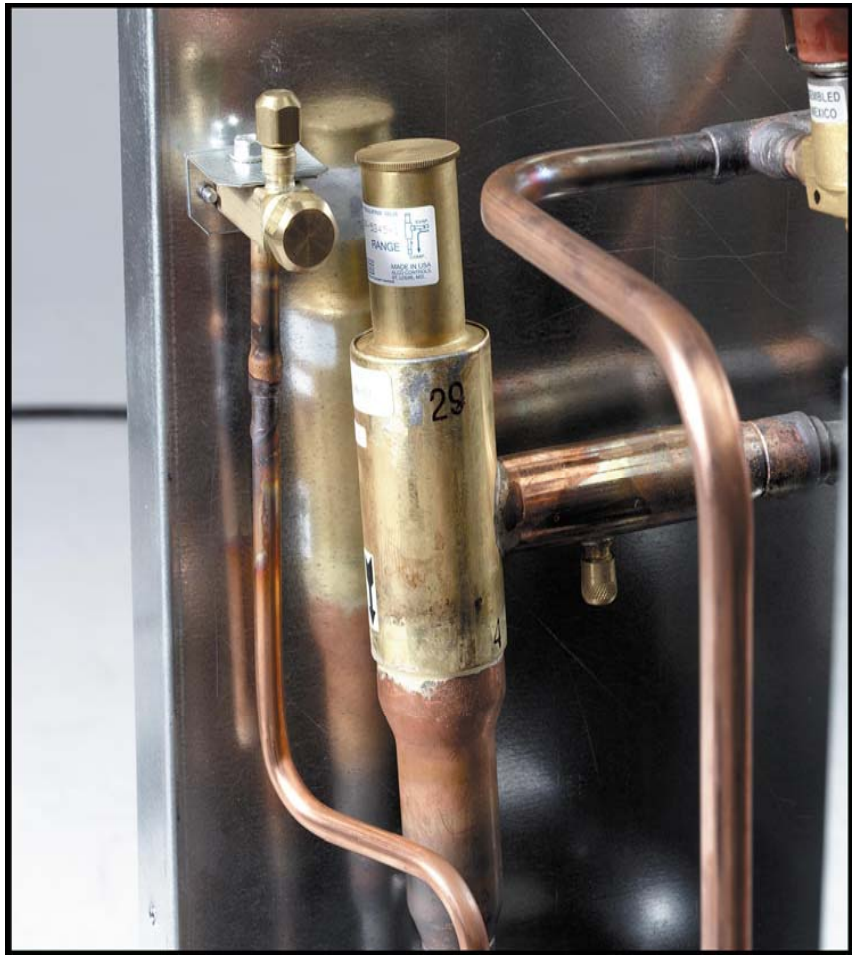
Headmaster

Receiver

High Pressure Cut Out - Auto Reset

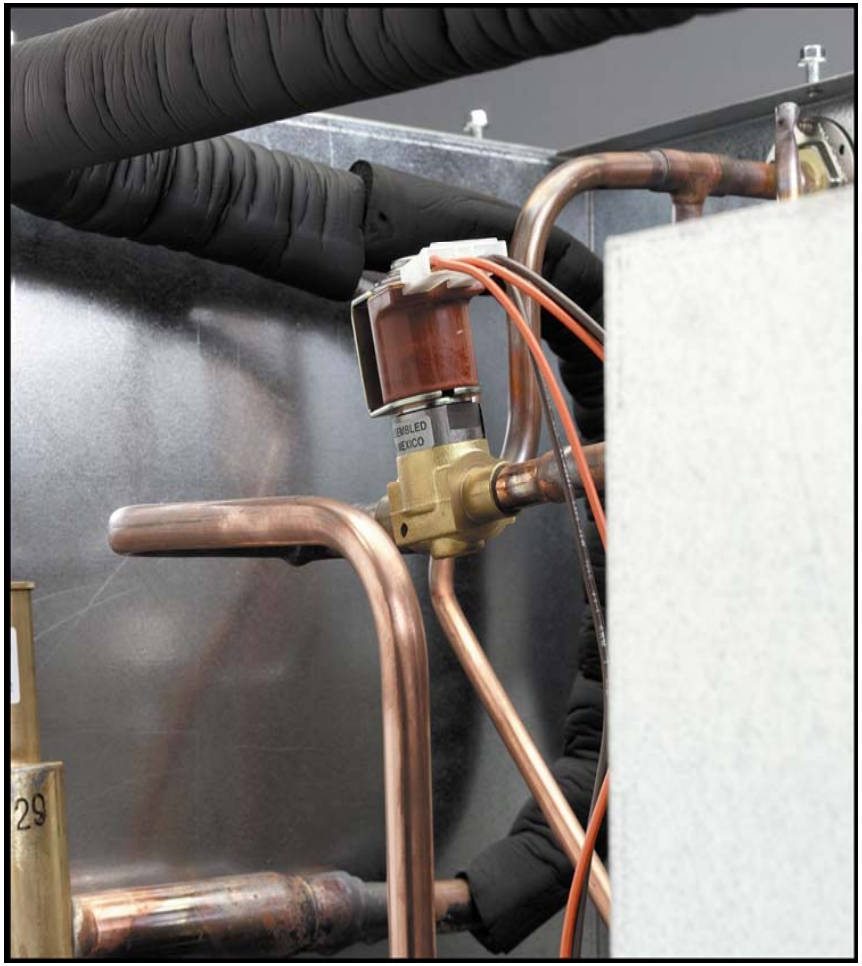
Scotsman® Crankcase Pressure Regulator

- CPR valve restricts compressor dome pressure during harvest
  - 55 to 60 PSIG
  - Pre-set - don't adjust it!
- Low Side Access valve has evaporator pressure during freeze, but not during harvest



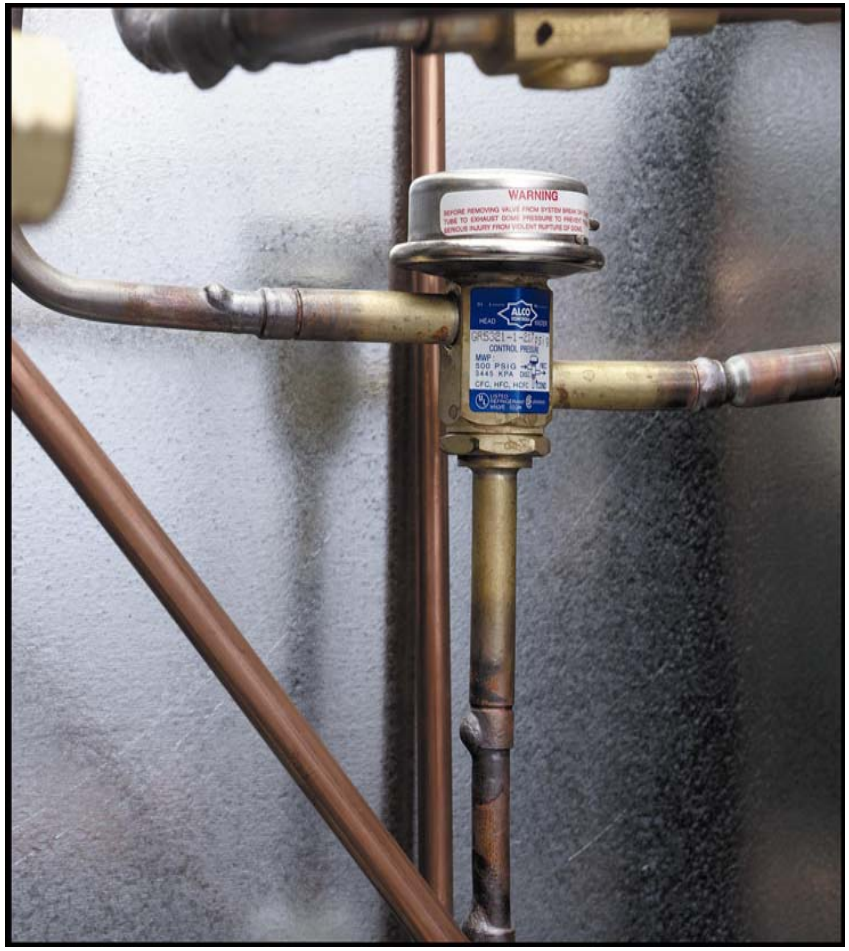
Scotsman® Condenser Bypass Valve

- Normally Closed, opens during harvest
- Bypasses condenser coil and directs discharge gas to vapor line
- Ported valve - same one as CME2006



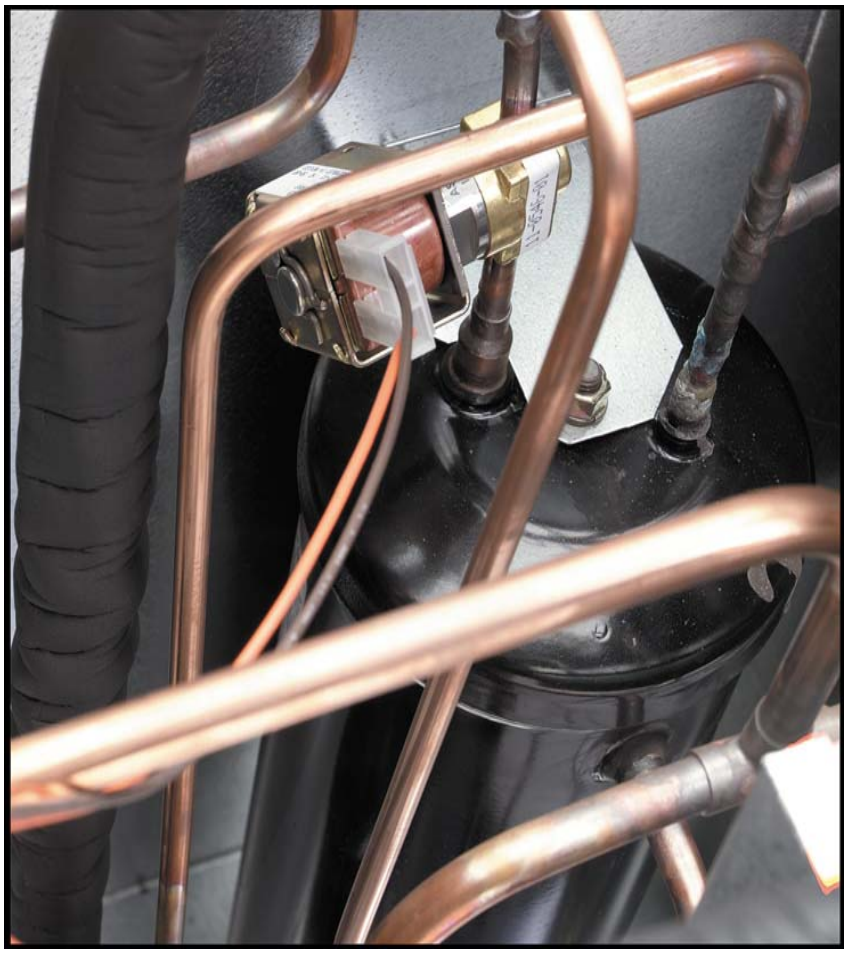
Headmaster

- Maintains discharge pressure during freeze
- Active at any temp below 70°F.
  - Rated at 217 PSIG, freeze cycle pressure may be between 220 and 230 during cold ambient operation



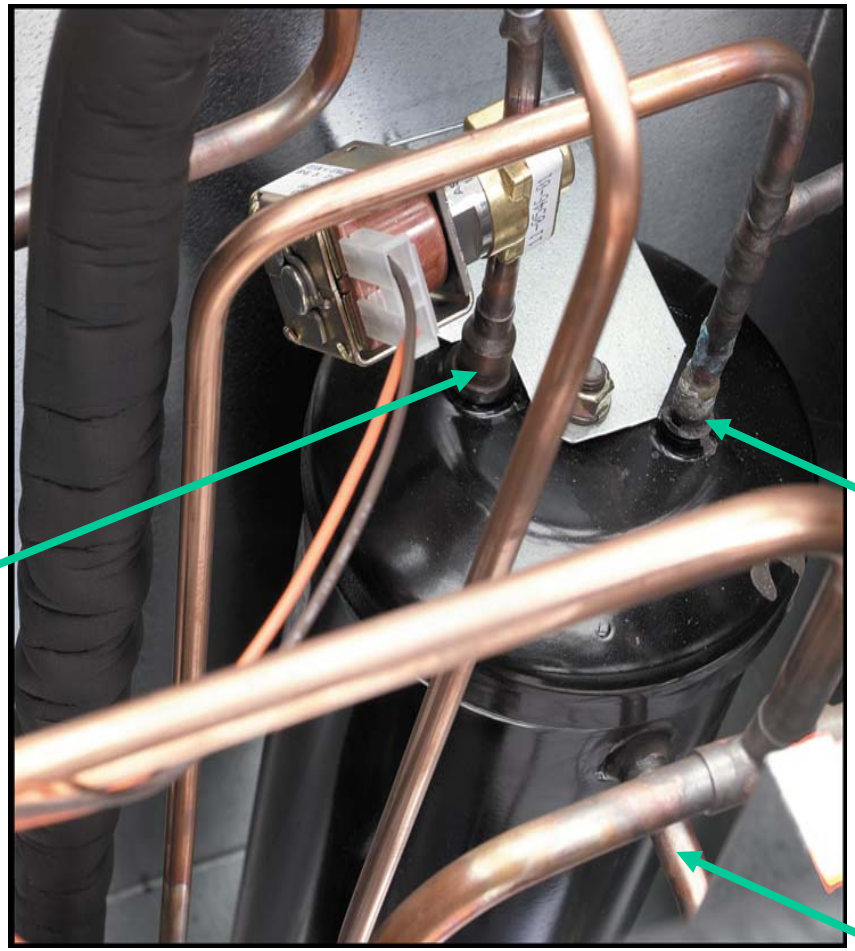
Liquid Inlet Valve

- Normally Open, closes during harvest
- Controls liquid flow into receiver
- Isolates refrigerant in condenser during harvest
- Improves cycle time



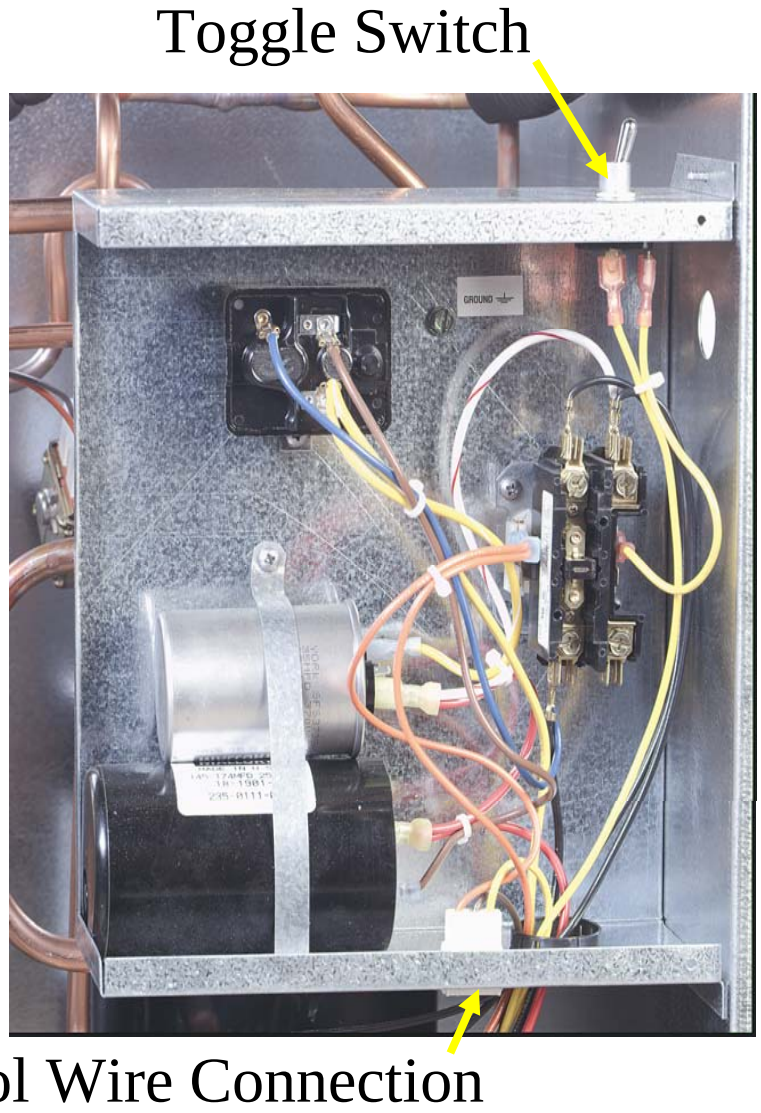
Receiver

- Shipped with system charge
- Three ports
  - Liquid inlet
  - Liquid outlet
  - Vapor outlet



Electrical Box

- Toggle switch controls condensing unit
- Control Wire connection from Ice Making Section to control the system
- Electrical power connected at contactor
- Remote condenser fan connects at contactor



Condensers

- Three models - ONLY for Eclipse
  - ERC680 - used with CP686 and CP886
  - ERC1086 - only used with CP1086
  - and a two circuit model, ERC6810
    - can be used with any CP unit
- No headmaster in condenser
  - Headmaster is in CP unit
- Swivel nut connections for CP unit
  - Don’t connect these condensers to a regular remote!

System Installation

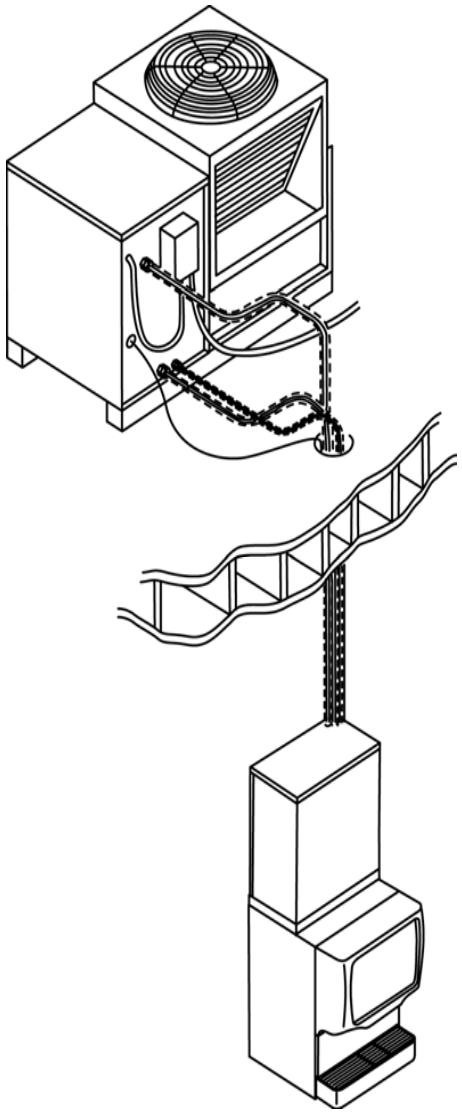
- Three systems, single and three phase for each
  - 600
  - 800
  - 1000
- Must match components to create system

System Installation

- 600 -
  - CME686, CP686, ERC680
- 800 -
  - CME810, CP886, ERC680
- 1000 -
  - CME810, CP1086, ERC1086
- CP units may also be connected to approved central condenser coil using tubing kit RTE10
  - Coil must NOT have headmaster

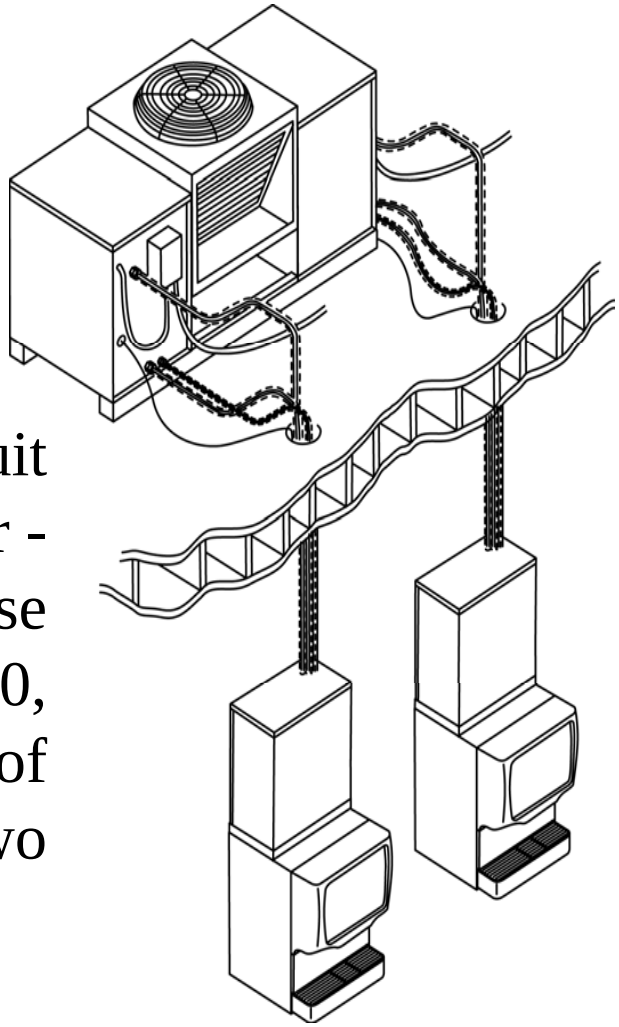
Equipment Location

- CME can be above or below condensing unit
  - If above, limit is 15 feet
- Pre-charged lines are used
  - 3 tubes per set
  - 20, 50 and 75 foot only
  - No extra refrigerant charge required
  - S trap required when condensing unit is over 20’ above ice making head
- Must have bin or dispenser adapter for the CME

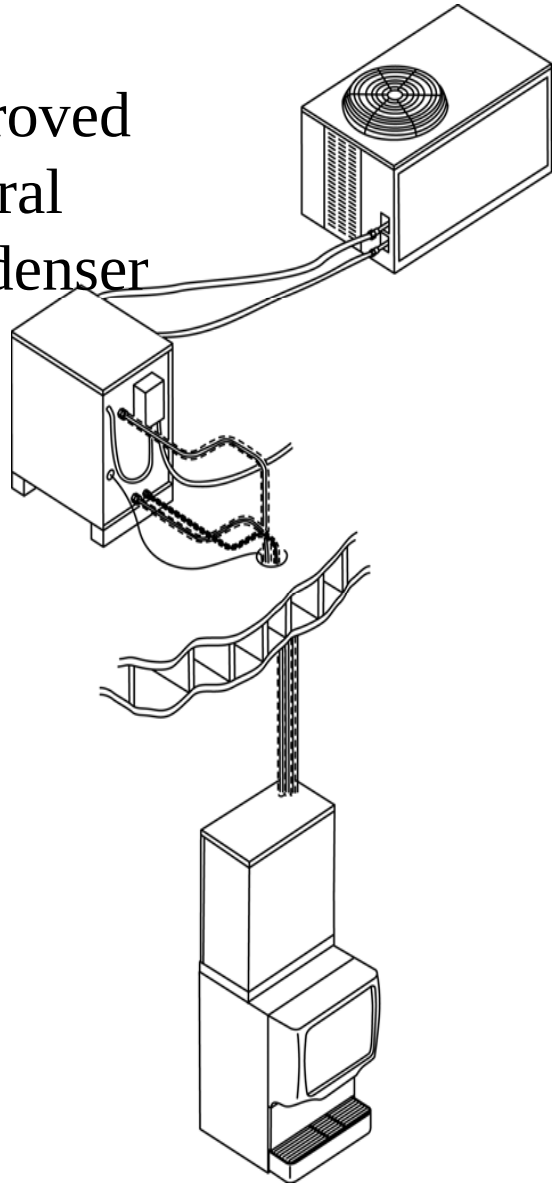


Other Configurations

Two Circuit Condenser - ER2C6810, use with 600, 800, 1000 or a mix of any two



Approved Central Condenser

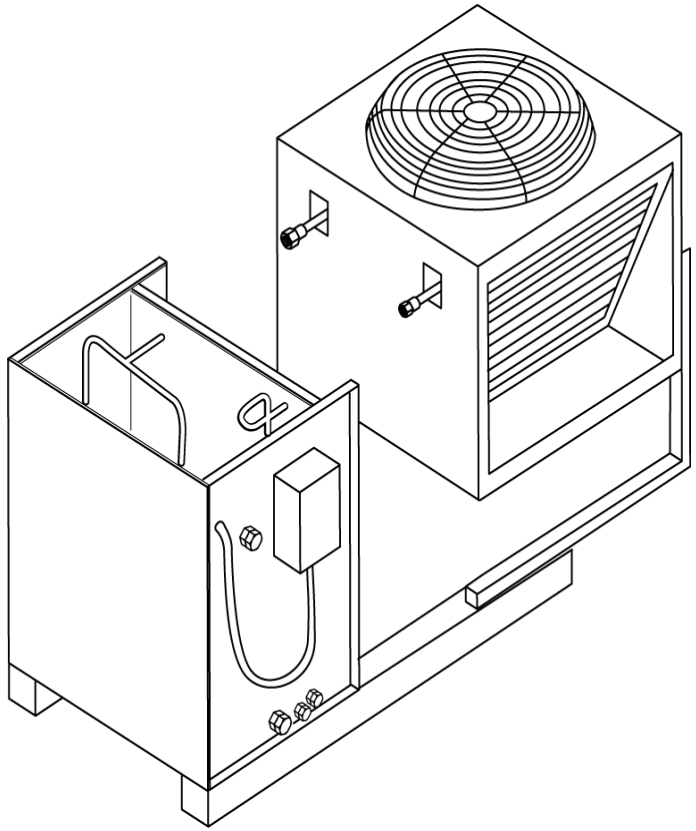


Condensing Unit

- Modular system - connect CP to ERC
- Assemble on roof or ground
- ERC has back legs and two braces
  - Assemble legs and braces to condenser
- Connect wires to junction box
- Place ERC on back of CP - lip on CP holds ERC up

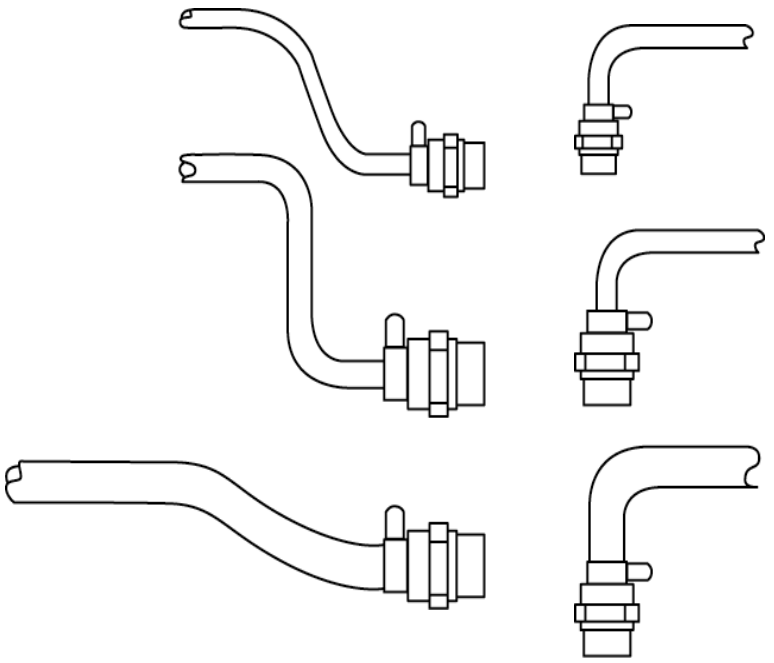
Condensing Unit

- Fasten CP to ERC
- Connect liquid and discharge line connections
- Route wire to CP control box and connect to contactor



Line Set

- Three tubes
- Reversible
- CME routing determines which end goes to CME
  - Out the top - use double-bend ends at CME
  - Out the back - use single 90 degree ends at CME



Ends for out the CME top

Ends for out the CME back

Line Set Installation

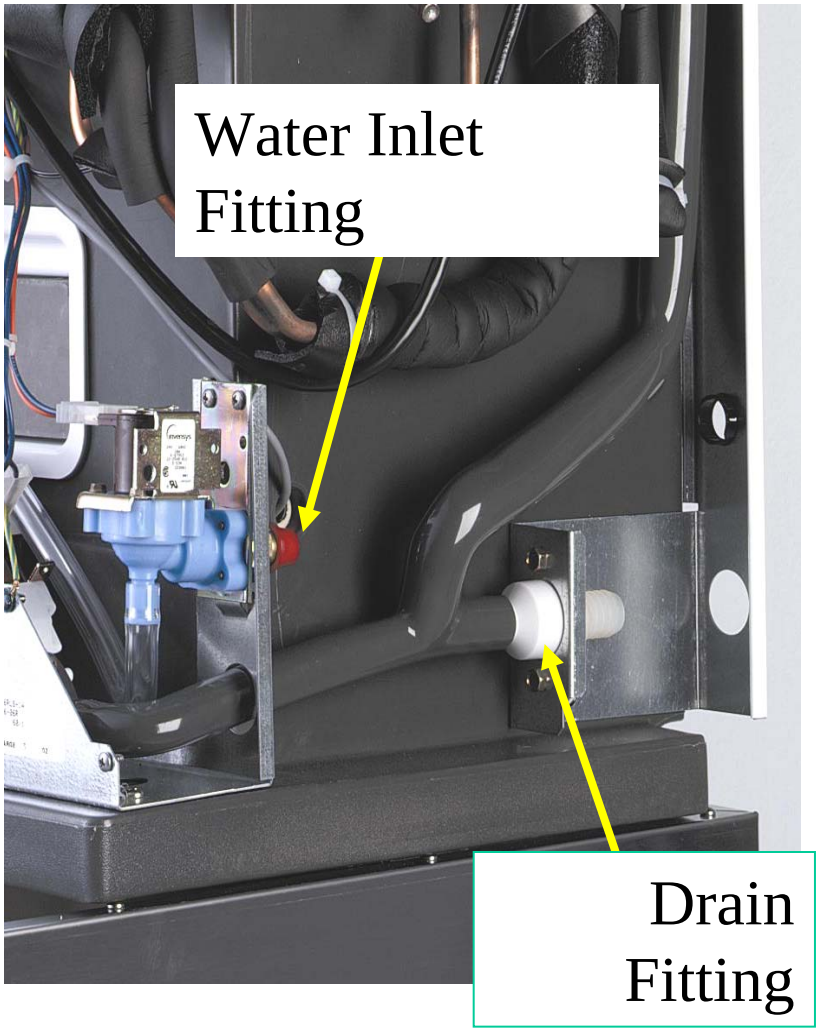
- Route lines in two groups
  - Liquid and Vapor
  - Suction separately for ease of routing
    - 3/4” tube requires careful handling
  - Check for holding charge before installation
  - Route control wire with line set
  - Only shorten if necessary
    - Do before connections are made!
    - Purge with nitrogen while brazing
      - Schraders at both ends for purging
    - Evacuate to 300 microns or less
    - Add holding charge if connecting later

Scotsman® Two Circuit Condenser Installs

- Mark Lines, Wires and CP Units
- Example:
  - Mark one unit “A”
  - Mark line set “A” and control wire “A”
  - Unit A’s pre-charged lines route to Unit A
  - Unit A’s control wire connects to Unit A
  - Confirm before connecting
- Start one unit at a time to confirm proper operation and control wire routing

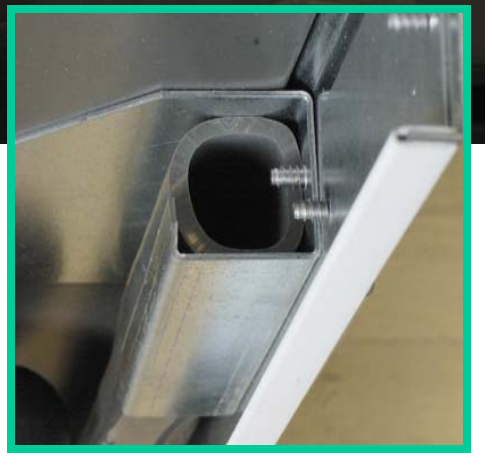
Install CME

- Flush against wall capability
- Drains left, right or back
- Water inlet and power inlet from the top or back
- Refrigerant line connections back or top
- 115 volt unit, cord provided



Flush Installations

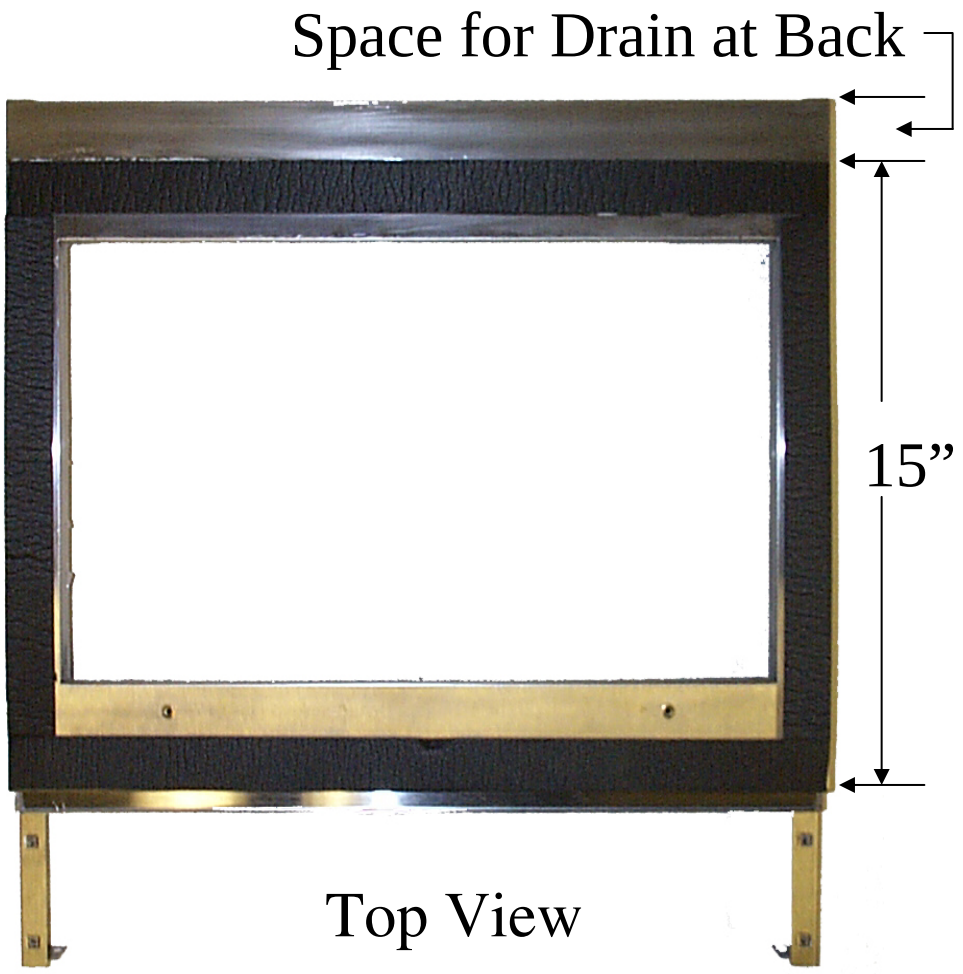
- Attach water inlet
- Attach drain - 3/4”
  - Unit ships with left drain hose installed,
    - Right drain hose in plastic bag
  - No vent required, vent is internal
  - Secure drain with tape for ease of mounting



Internal Vent

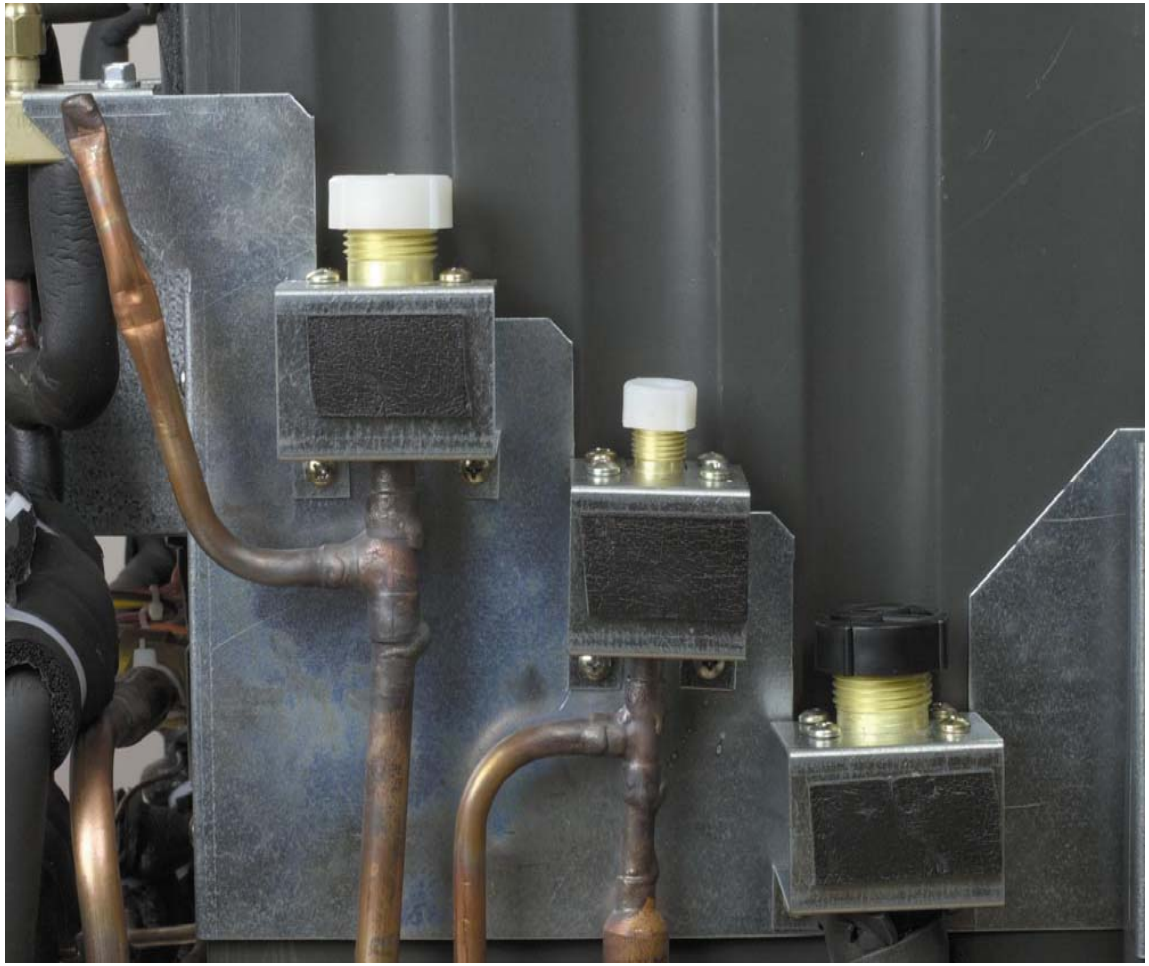
Place on Adapter

- Many different adapters
  - Use gasket tape at mounting area
  - Sealing area
    - 22” wide x 15” deep
- Remove all panels
- Place unit
- Connect control wire



Scotsman® Connect Pre-Charged Lines

- Add foam tape/cork tape to suction line nut
- Secure unit at sides or back with provided strap-clips

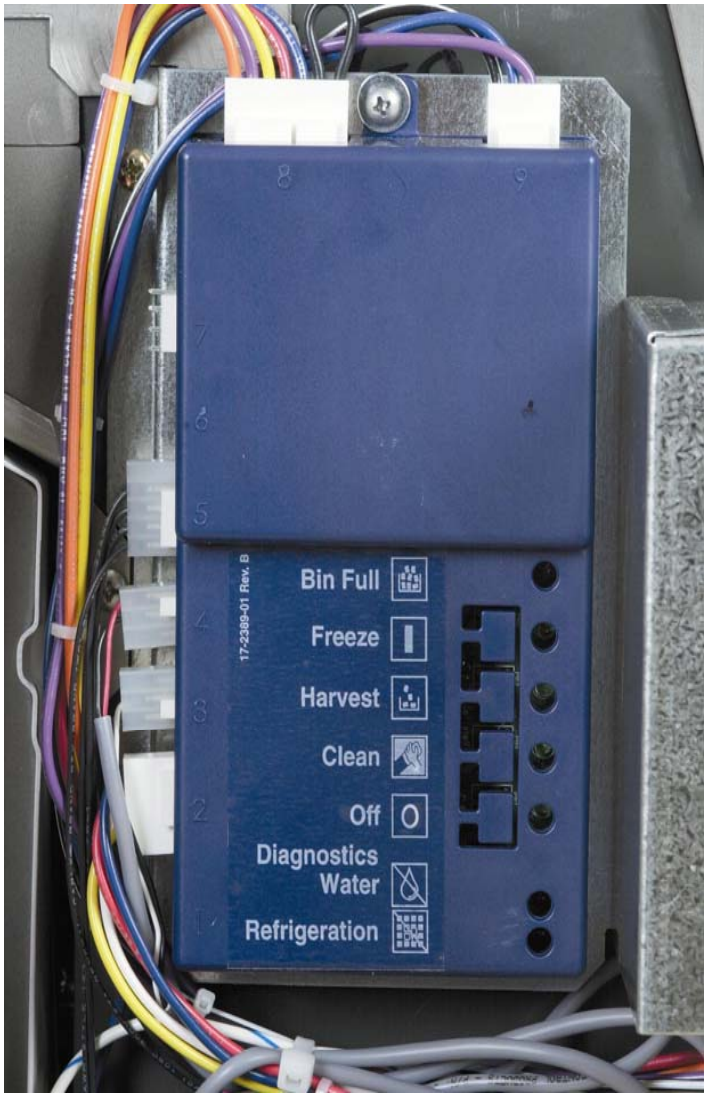


Condensing Unit

- Connect precharged lines
  - Use refrigerant oil
  - Use two wrenches to prevent quick-connect diaphragm damage from rotating tube
- Connect control wire
- Connect power, check voltage

Initial Start Up

- Check installation
  - Power
  - Water
  - Drain
  - Tube Routing
- No soak out needed
  - Plug in CME unit
  - Check EEPROM code
  - Push Freeze to start



Start Up

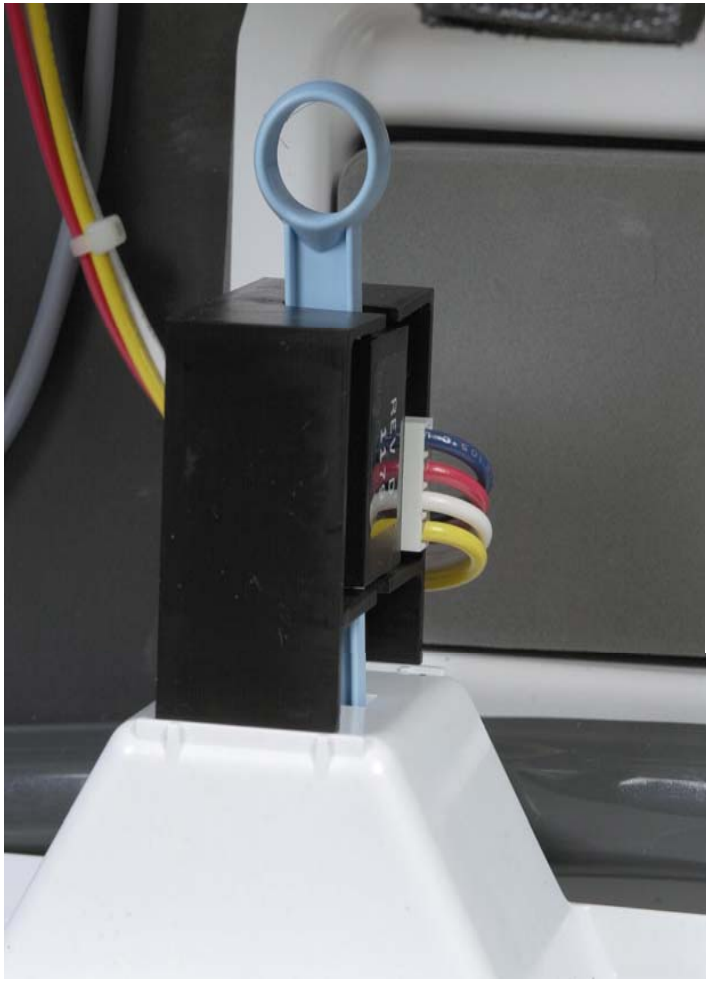
- CME unit
  - Opens & closes Purge Valve
  - Fills with water
  - Switches on Pump
  - Switches on Condensing Unit
    - Compressor and fan begin to operate
- Adjustments
  - Purge is adjustable

Scotsman® Operation - Control System

- CM^3 control system
  - Water level sensor for
    - Reservoir water fill
    - Freeze cycle termination
  - Ice sensors to sense
    - Ice harvest
    - Bin full
  - Controller determines cycles and operates components
    - Uses water level to determine freeze cycle length
    - Uses length of time for ice to fall to determine next harvest
    - Uses ice sensor signal blockage to determine bin full

Control Details

- Water level sensor
  - Two photo-electric eyes in housing
  - Top eye blocked tells controller water level is low
  - Bottom eye blocked tells controller water reservoir is full



Control Details

- Ice sensors - photo-eyes
  - Located at bottom of ice drop zone
  - One side is an emitter, the other a detector
  - Creates a light curtain that can sense groups of cubes falling during harvest

Operation - Freeze

- Similar to conventional remote ice cubers
  - Condensing unit forces liquid refrigerant to the ice making section
    - Each TXV meters refrigerant to its own evaporator
  - At a pre-determined water temperature, the pump stops for 30 seconds
  - As ice forms on the evaporators, the water level drops
  - About half way through the cycle the water reservoir re-fills
  - The next time the water level drops to the point where the top of the slot in the float stick blocks the eyes, the system goes into the harvest cycle

Operation - Harvest

- Eclipse features Cold Temperature Harvest
  - Condensing Unit may be located outside
    - Temperature Range between -20 and 120 F.
    - Receiver is with the condensing unit
    - Vapor line connects discharge gas and receiver vapor to vapor inlet line in ice making section
    - High vapor flow rates achieved with no compressor impact due to use of CPR valve
    - Vapor contains latent heat - even at sub-zero temperatures
    - Condensing vapor in the evaporators transfers the heat
    - Evaporators warm up and ice is released

Scotsman® Operation - Harvest Details

- Vapor inlet valve opens
- Condenser bypass valve opens
- Receiver inlet valve closes
- Purge valve opens
- Pump stops for a time then restarts to purge the reservoir of water
- Purge valve closes after 40 seconds
- Inlet water valve opens for a few seconds to add water to the reservoir for harvest assist
- Harvest continues until the controller stops it

Scotsman® Operation - Harvest Control

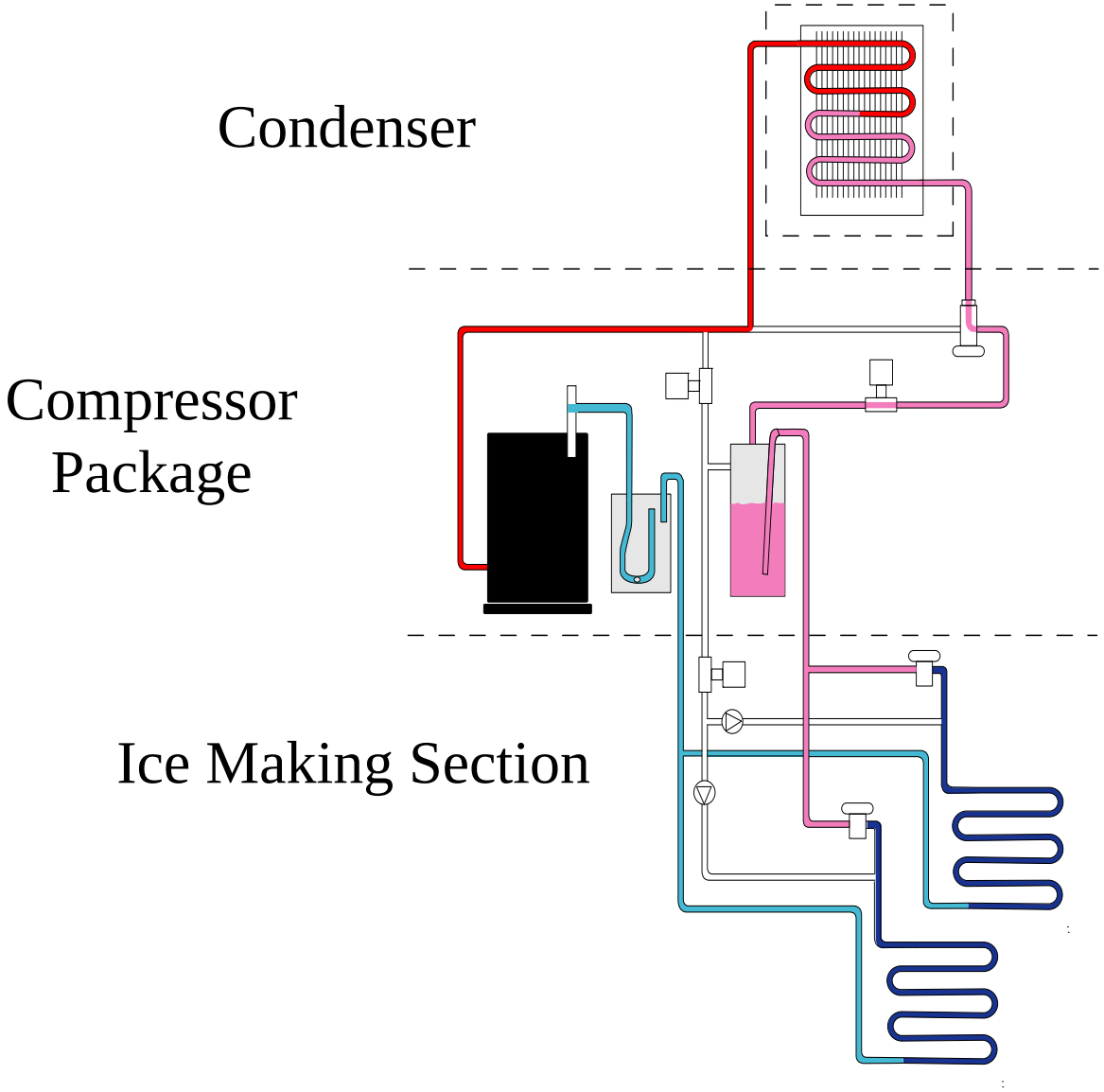
- Controller begins timing harvest
- Ice falling interrupts the signal from the ice sensor emitter to the receiver
  - The time of that interrupt is recorded by the controller
  - The last time the controller receives an interrupt signal is saved as the cube release time
  - Extra time is calculated from the actual cube release time

Measured Cube Release Time + Calculated Extra Time = Harvest Time

Operation

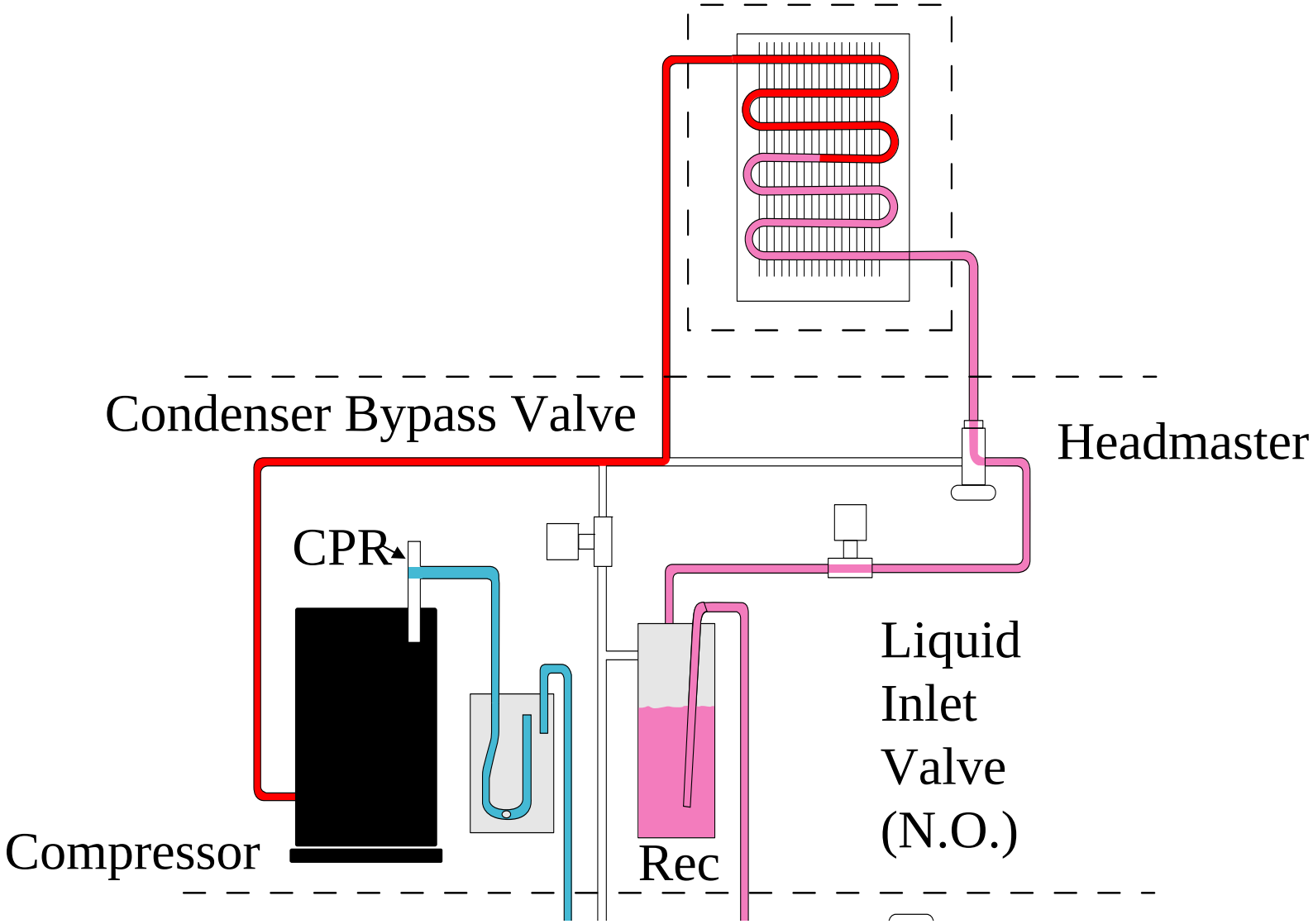
- Freeze Cycle Time:
  - 1000 - between 12 and 19 minutes
  - 800 - between 14 and 22 minutes
  - 600 - between 16 and 25 minutes
    - 600’s cycle is longer in very high ambient
- Harvest Cycle Time
  - 1000 - between 1 and 3 minutes
  - 800 - between 1 and 3 minutes
  - 600 - between 2 and 3 minutes
  - Extreme low temperatures - harvest lengthens
    - up to 6 minutes

Scotsman® Refrigeration Schematic



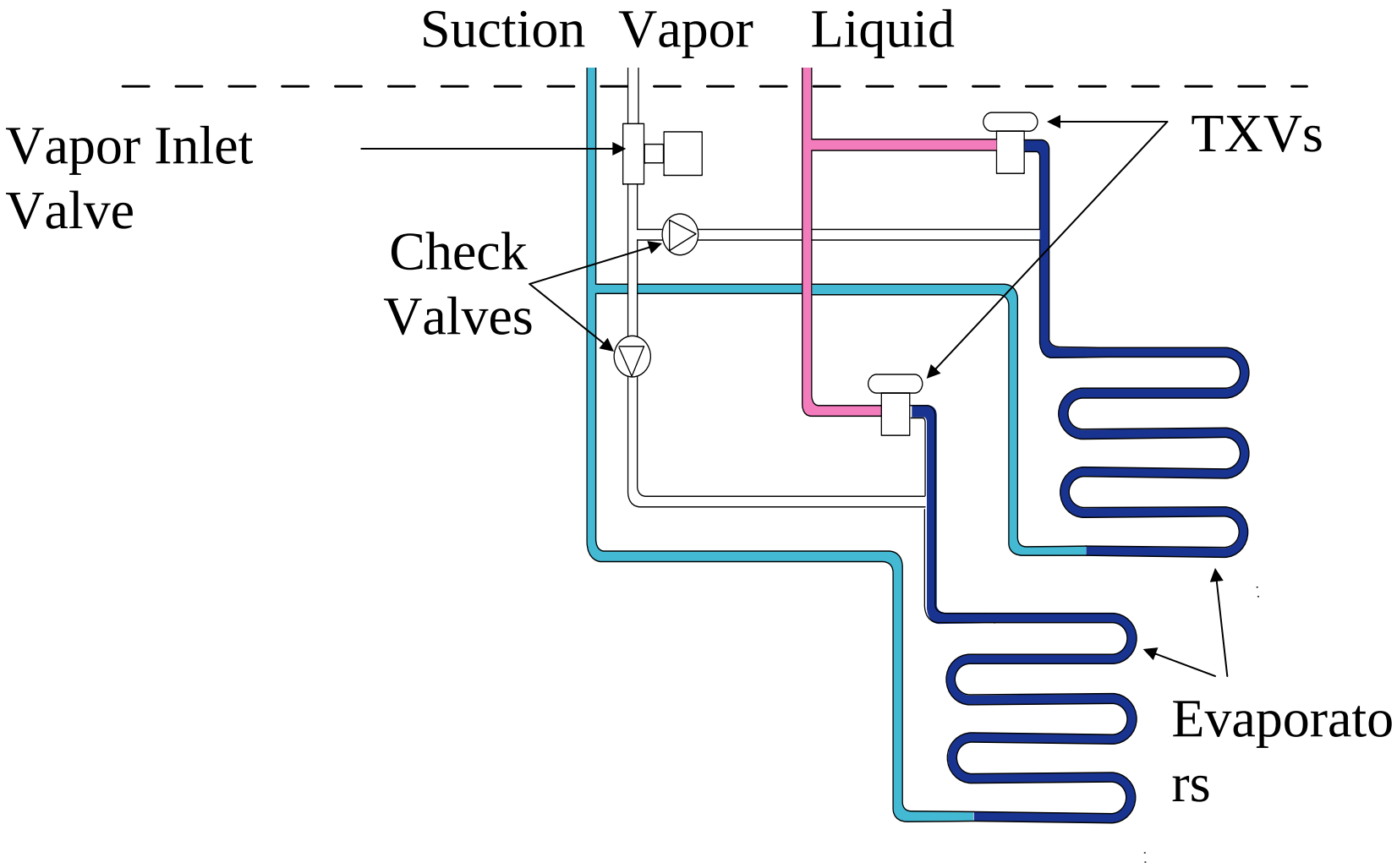
Scotsman®

Condensing Unit



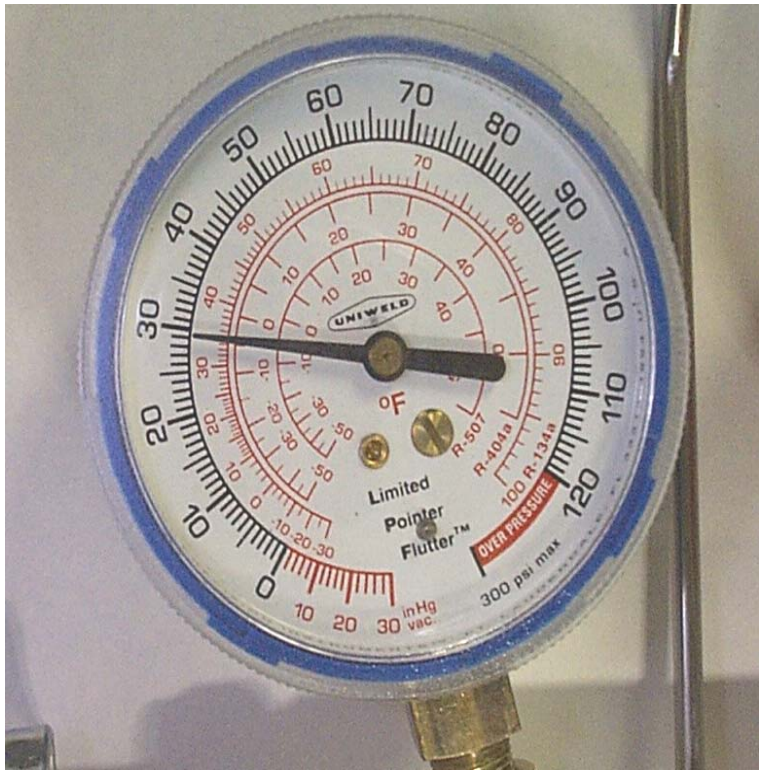
Scotsman®

Ice Making Section



System Pressures

- Freeze Cycle
  - Rapid Pull Down to between 80 and 60 PSIG
  - Gradual Pull Down to 28 - 30 PSIG just before Harvest
  - Pressures at CP unit or CME will be the same during Freeze

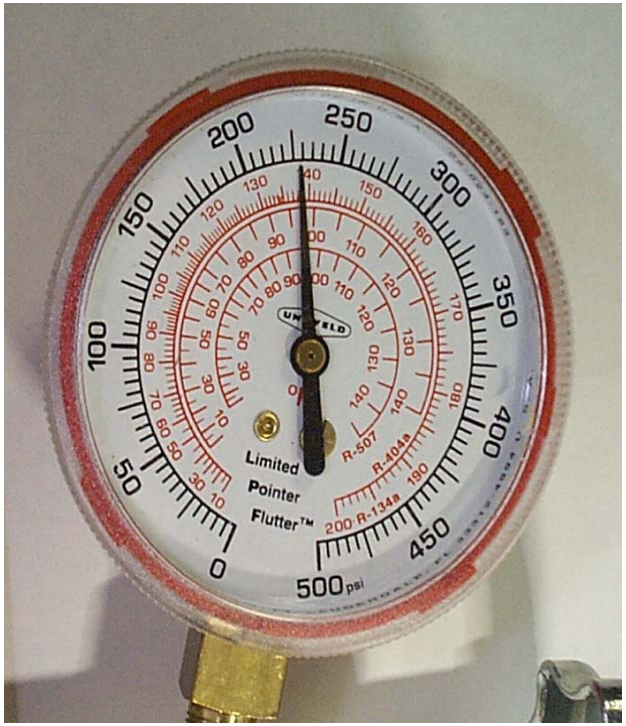


System Pressures

- Harvest Cycle
  - At the ice making section, low side pressure rapidly increases to 90 - 120 PSIG
  - At the CP unit compressor access valve, dome pressure is limited by the CPR valve to 55 - 60 PSIG during harvest

System Pressures

- CP Unit
  - Discharge during low ambient freeze will be about 225 PSIG
    - Headmaster rated for 217, there is some variation unit to unit
  - Discharge during harvest will be about 100 PSIG
  - High Pressure Cut Out opens at 450, closes at 350 PSIG

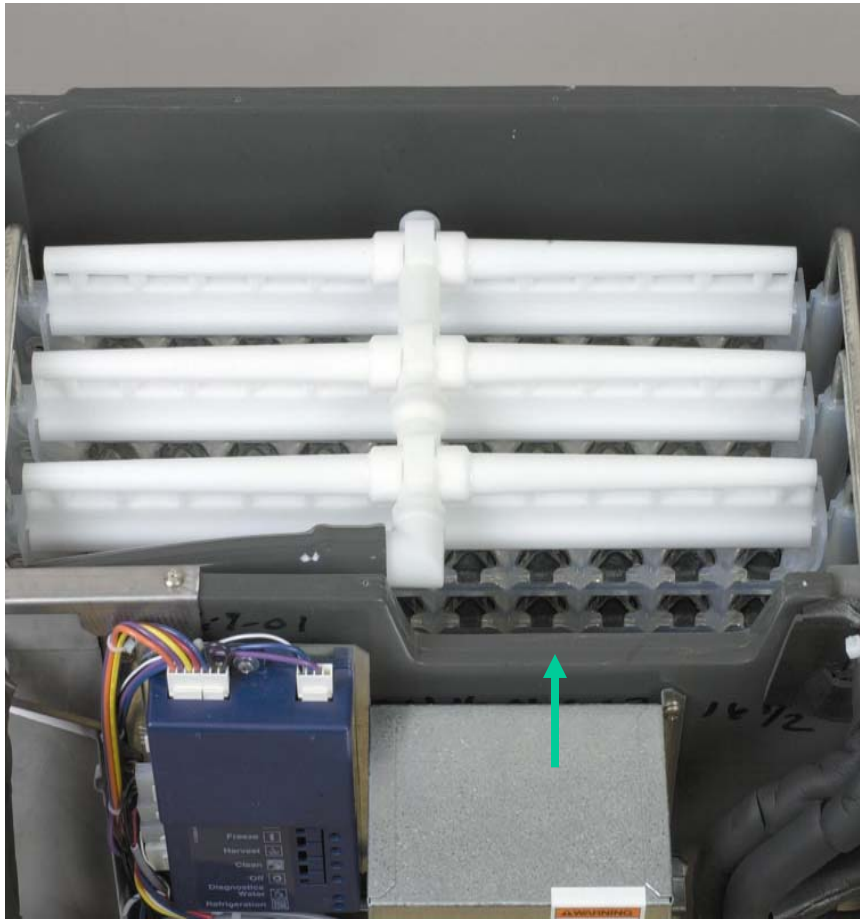


Maintenance

- De-lime with Scotsman Ice Machine Cleaner
  - Push & release clean button
  - Pour in 24 ounces of IM cleaner through handy fill-plug in sump cover
  - Clean for 10 minutes, then push and release clean button, wait 20 minutes and shut unit off
- Check distributors for scale build up

Maintenance

Top Cover Lifts Up



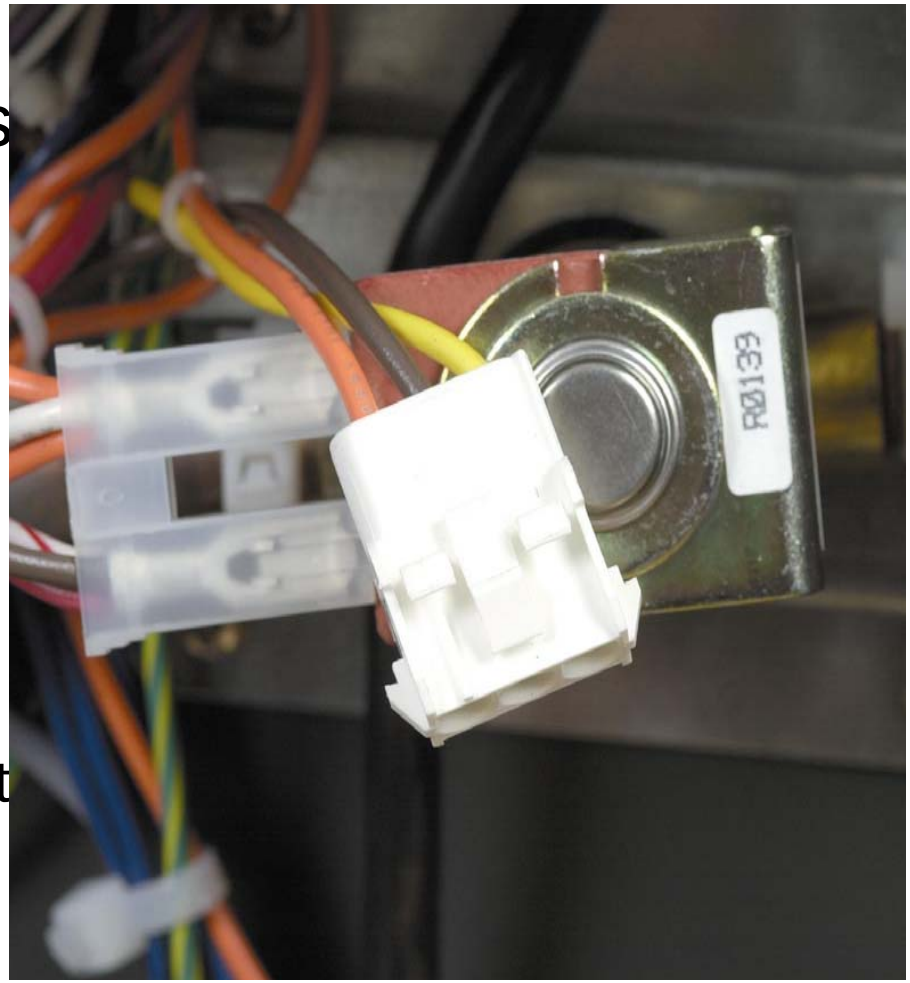
Notch in Wall for Front Access

Service Diagnosis

- What happens if?
- Vapor Inlet Valve Does Not Open
  - Vapor line hot
  - Discharge pressure increases
  - Low side pressure does not change
  - No ice release - large slabs of ice
  - 2 blink refrigeration light

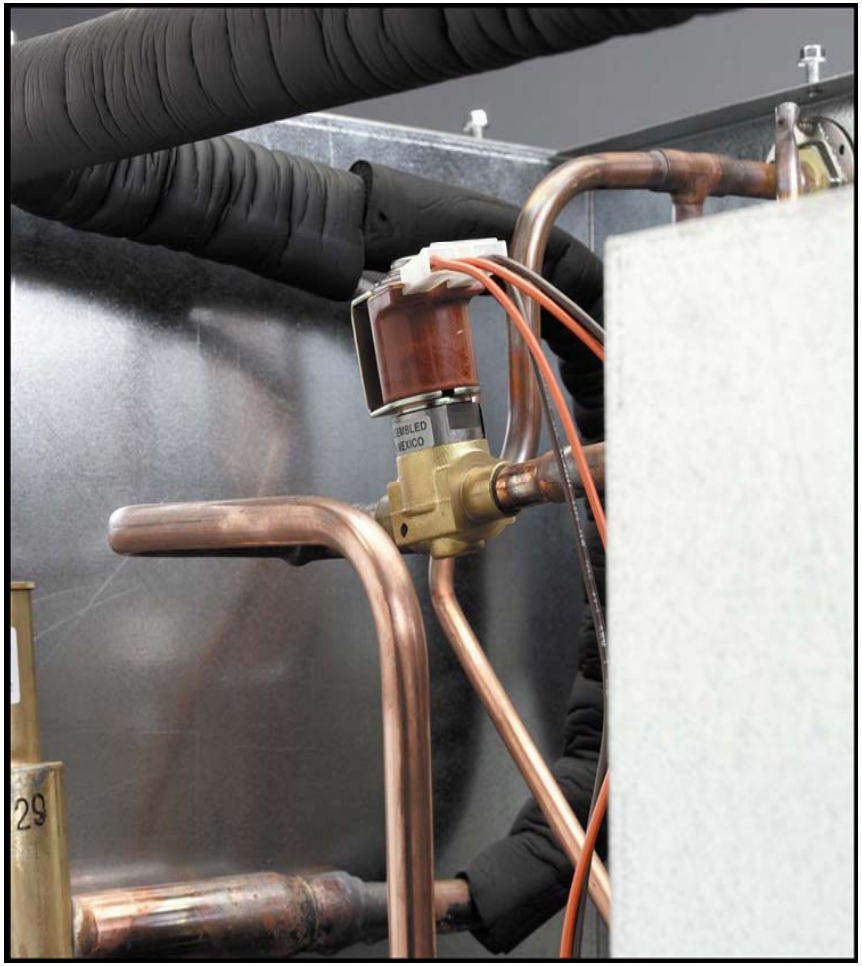
Service Diagnosis

- What happens if?
- Control wire becomes unplugged
  - CP unit does not operate
  - Exceeds maximum freeze time
    - Controller shows continuous refrigeration diagnost light



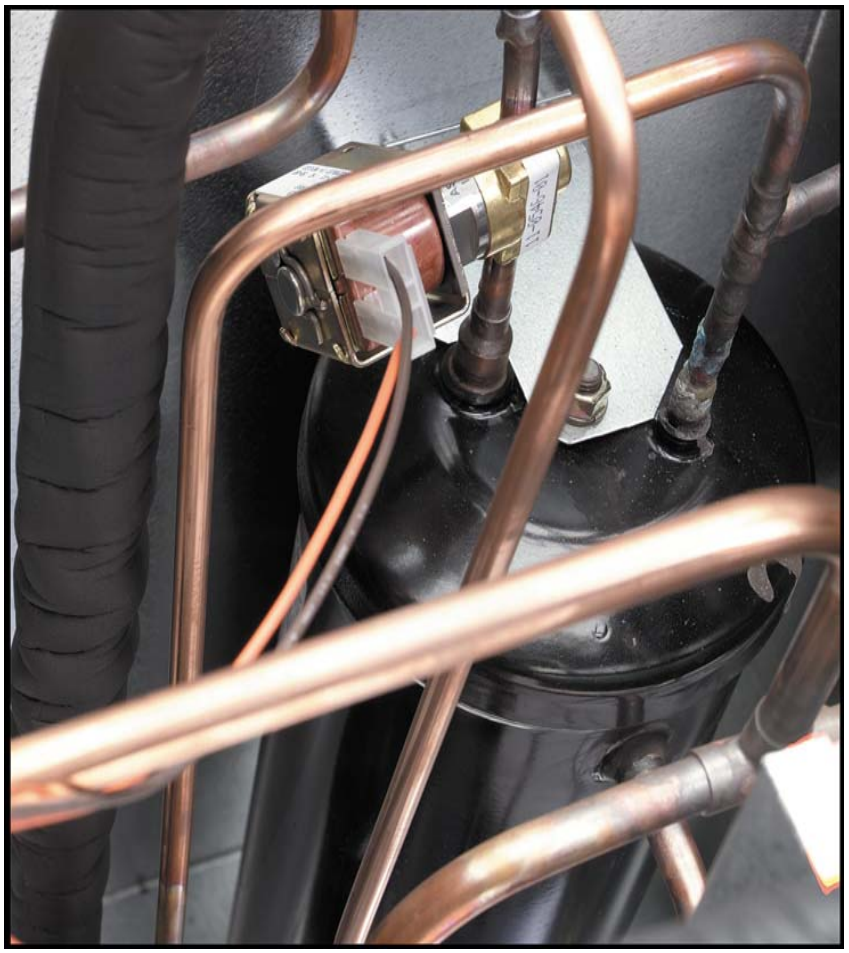
Service Diagnosis

- What happens if?
- Condenser by pass valve does not open
  - High pressure cut out opens
    - Note: High discharge pressure during harvest will not be present at liquid connection
  - Ice may release, but slowly



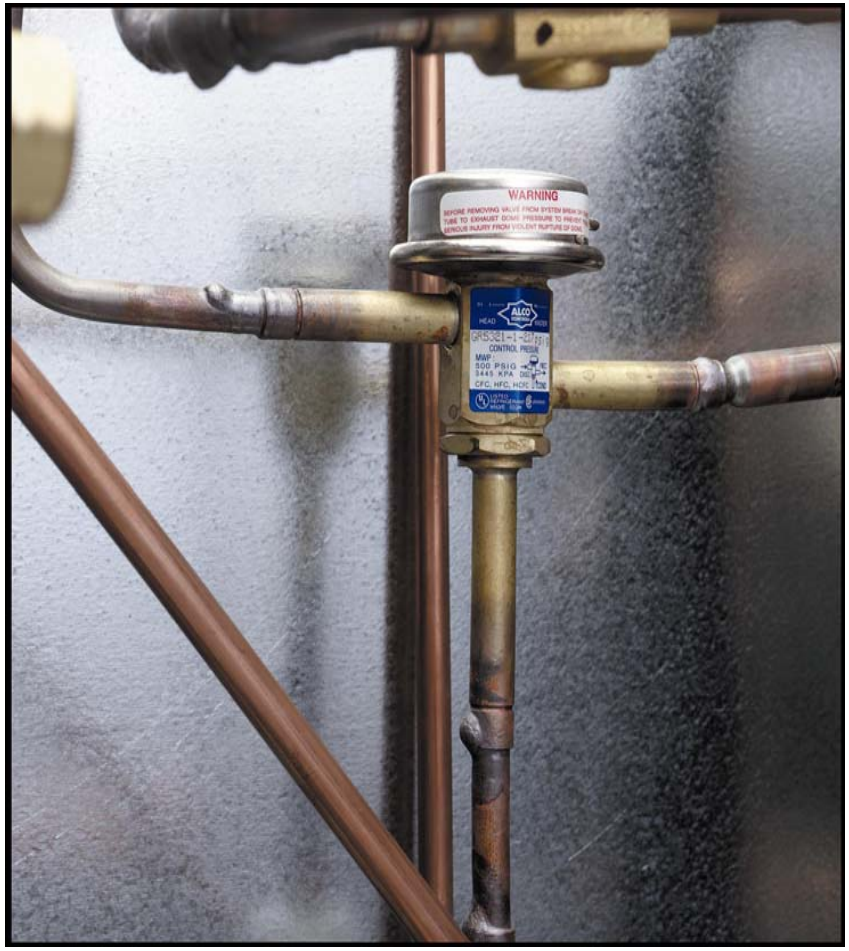
Service Diagnosis

- What happens if?
- Receiver inlet valve does not close during harvest
  - Very little change
- If it sticks closed
  - Hi discharge pressure cut out opens
  - Controller shows continuous diagnostic light



Service Diagnosis

- What happens if?
- Headmaster is stuck in bypass
  - Very little liquid flow to TXVs
  - Long freeze cycle
  - Controller shows continuous refrigeration diagnostic light



Service Diagnosis

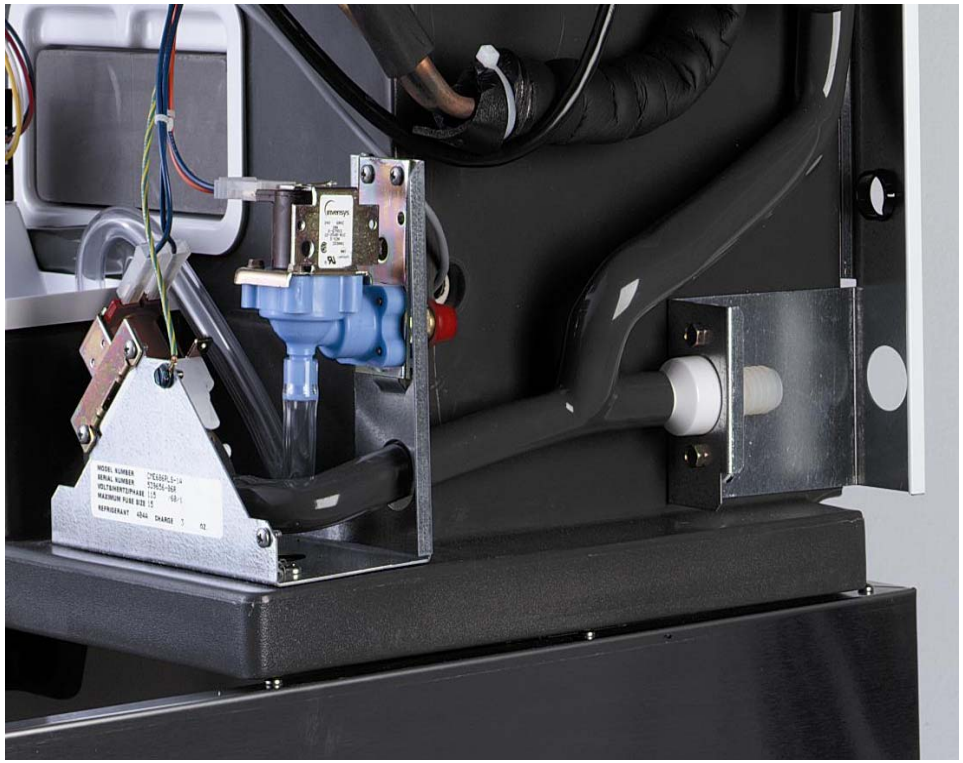
- What happens if?
- There is a refrigerant leak
  - No change until refrigerant level drops below the operational threshold for the ambient
    - Headmaster will try to maintain minimum discharge pressure - but will be hissing as gas flows through
    - Ice formation will be poor
    - Low capacity/long freeze cycle will result
  - Add charge to confirm, if ice making resumes with normal discharge pressure there is a leak

Service Diagnosis

- What happens if?
- There is no water to the ice making section
  - Water is part of the recipe for ice!
  - Controller will stop unit operation but retry filling every 20 minutes until water is restored

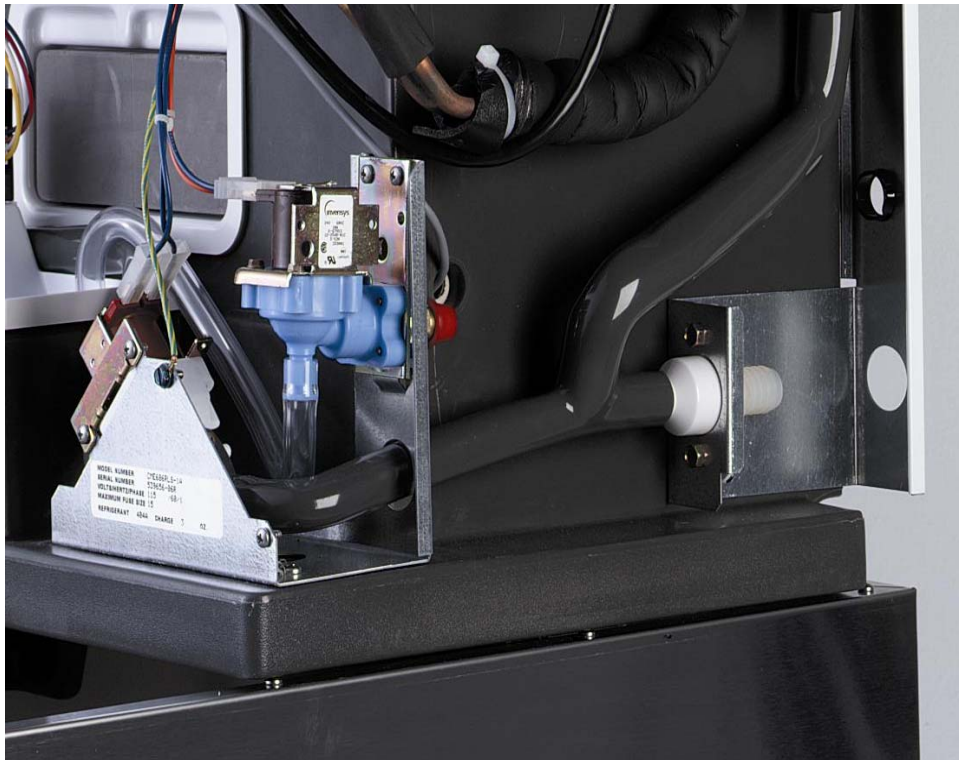
Service Diagnosis

- What happens if?
- The purge valve leaks through
  - May result in small cubes
  - Short freeze cycle
  - May have long harvest cycle



Service Diagnosis

- What happens if?
- The inlet water valve leaks through
  - Keeps adding water (heat load) to reservoir
  - Result is a long freeze cycle



Service Diagnosis

- What happens if?
- The condenser fan stops
  - CP unit's hi pressure cut out will open
  - Maximum freeze time will be exceeded
  - CME unit will shut system off
  - Controller will display continuous refrigeration diagnostic light

Service Diagnosis

- What happens if?
- Both the solenoid valves in the condensing unit do not work
  - Very, very unlikely, but
    - The discharge pressure during harvest will be about 150 PSIG
    - The low side pressure during harvest will be less than 90 PSIG
    - The ice will harvest slowly
    - The refrigerant flowing out of the receiver will make a whistling noise

Service Diagnosis

- What happens if?
- The CPR valve fails
  - Pressure during harvest will not be at the pre-set point
    - 55 to 60 PSIG
  - Will not hold an adjustment
  - No external symptom
- CPR setting should be checked if compressor is replaced

Service Diagnosis

- What happened if?
- The controller is showing a one blink refrigeration diagnostic light
  - This indicates that the ice harvest was very slow and the controller timed-out on maximum harvest time
  - Ice was sensed by the control system
  - Likely causes include
    - Beginning to freeze up

Service Diagnosis

- What happened if?
- The controller is showing a two blink refrigeration diagnostic light
  - This indicates that the ice harvest was very slow and the controller timed-out on maximum harvest time
  - Ice was NOT sensed by the control system
  - Likely causes include
    - Freeze up
    - Vapor inlet valve did not open
    - Ice sensor can’t “see” ice well

Service Diagnosis

- What happened if?
- The controller is showing a continuous refrigeration diagnostic light
  - Maximum freeze time exceeded
  - Dirty condenser coil
  - Fan motor inoperative

Service Diagnosis

- What happened if?
- The controller is showing a two blink water diagnostic light
  - Slow or no water fill
    - Possible clogged water filters
  - Low water level - leaks out
  - Water level sensor not working or harness connection poor

Service Diagnosis

- What happened if?
- The controller is showing both diagnostic lights on continuously
  - This indicates that the temperature sensors are not working or not plugged in. They need to be plugged back in or replaced.
  - The ice machine will operate without the thermistors working, but it is limited in its diagnostics that way

Summary

- Eclipse is a three part ice making system
- There are two ice making heads
  - Using CM³ Technology
- There are three compressor packages
- There are two single circuit condensers
- There is one two circuit condenser
- R-404A refrigerant