30 Inch Wide Eclipse Modular Cubers

Technical Training
• Ice Making Head
  – CME1386
  – CME1686

• Compressor Package
  – CP1316
  – CP2086

• Condenser
  – ERC1086
  – ERC2086
• The remote system is made up of three parts:
  – Ice Making Section or Head Unit - 115 volt
  – Compressor Package - 208-230 volt
  – AC Condenser - 208-230 volt

• Flexible Modular System
  – CME1386 or CME1686 can connect to CP1316
  – ERC1086 can be used on 1000, 1300 or 1600 systems
  – All are R-404A systems
• 30” Wide Head Units
• CME1386 or CME1686 or CME2086
  – Remote Low Side
  – CM³ technology
    • Water and Control Systems
    • Rotomolded freezing compartment
Ice Making Section

- Refrigerant Line Connections
  - Vapor
  - Liquid
  - Suction
- Ice making compartment
- Five or Six evaporators
  - CME1386 has 5
  - CME1686 and CME2086 have 6
Vapor Inlet Valve

- Purpose: Opens during harvest to allow vapor to enter the evaporators
- 24 volt coil
• Single externally equalized valve
  – Meters refrigerant through a distributor
• 115 volt pump
• Same for all three
• Pedestal type
• Pump motor separated from reservoir
  – Keeps motor drier
  – Motor cap keeps condensation off motor
• **AutolQplus**
• 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

Box purposely mounted at an angle
Two sensors
  - Water
    • In pump discharge hose
    • Used to check water temp for anti-slush and refrigeration system operation
  - Liquid
    • Used to determine which pre-set time for first harvest cycle
      – Lower temperatures = longer first harvest cycle
• Opens to add water and fill reservoir
  – Adds water during harvest
  – Fills at beginning of freeze
  – Refills once more during freeze
• Opens to drain the reservoir during harvest
• Controlled by purge valve timer
• Infrared sensors
  – Located at the ice outlet port
  – Create a light curtain
  – Harvesting ice triggers the sensor
- CME1386, CME1686 and CME2086 are all equipped with a bin thermostat.
- Thermostat routes through hole in base.
Bin Thermostat

- Thermostat bulb must be mounted to the bracket
- The bracket mounts to the bottom of the ice machine
• Two models
  – CP1316
    • Reciprocating compressor
  – CP2086
    • Scroll compressor
Low Side: Compressor Suction
High Side: Compressor Discharge
Receiver Liquid Outlet
• CPR valve restricts compressor dome pressure during harvest
  – 55 to 60 PSIG
  – Pre-set - don’t adjust it!
• Normally Closed, opens during harvest
• Bypasses condenser coil and directs discharge gas to vapor line
• Maintains discharge pressure during freeze
• Active at any temp below 70°F.
  – Rated at 217 PSIG, freeze cycle pressure may be between 220 and 250 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
• Shipped with system charge
• Three ports
  – Liquid inlet
  – Liquid outlet
  – Vapor outlet
• 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
• Scroll compressor
• Three Phase
  – Supply wiring can make it start backwards
  – To fix, switch two power leads
• Single Phase
  – Always starts with the correct rotation
  – Can reverse after power interruption
  – Time delay relay in circuit to prevent reversal
• Compressor protection circuit
  – 24 volt transformer
  – 24 volt relay
  – Time Delay Relay
• Power interruption of as little as 15 milliseconds causes relay to shut compressor off for 30 seconds
• Compressor then restarts
• Oil sight glass and oil drain / fill port
• Don’t add oil!
  – Oil level will change during each cycle
  – Ranges between 1/3 & 1/2 full
• Two models - ONLY for Eclipse
  – ERC1086 - used with CP1386 and CP1686
  – ERC2086 - only used with CP2086
• No headmaster in condenser
  – Headmaster is in CP unit
• Swivel nut connections for CP unit
  – Don’t connect these condensers to a regular remote!
• Three systems, single and three phase for each
  – 1300
  – 1600
  – 2000

• Must match components to create system
• 1300 -
  – CME1386, CP1316, ERC1086
• 1600 -
  – CME1686, CP1316, ERC1086
• 2000 -
  – CME2086, CP2086, ERC2086
• CP units may also be connected to approved central condenser coil using tubing kit RTE10
  – Coil must NOT have headmaster
• 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
Other Configurations

Approved Central Condenser Coil

CP Unit

RTE10 Line Set

3RTE Line Set

Ice Making Head
• 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
• Fasten CP to ERC
• Connect liquid and discharge line connections
• Route wire to CP control box and connect to contactor
Partial Assembly, One Thread Showing

Status: Not Ready, diaphragms partially pierced
Partial Assembly, Threads are Flush

Status: Not Ready, diaphragms pierced but connection not leak proof.
Completed Assembly

Status: Ready, diaphragms fully pierced and joint is leak proof
• Three tubes
• Reversible
• CME routing determines which end goes to CME
  – Out the back - use double-bend ends at CME
  – Out the top - use single 90 degree ends at CME

Ends for out the CME top
Ends for out the CME back
• 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
Install CME

- Flush against wall capability
- Drains left or back
- Route refrigeration tubes out the top for flush installations
- 115 volt unit, cord provided
• Attach water inlet
• Attach drain - 3/4”
• Connect refrigerant tubing. Add foam tape/cork tape to suction line nut
• Secure unit at sides or back with provided strap-clip
• 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
• 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
• **CM³** control system
  – Water level sensor for
    • Reservoir water fill
    • Freeze cycle termination
  – Ice sensors to sense
    • Ice harvest
  – 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 thermostat to determine bin full
• 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
• Similar to conventional remote ice cubers
  – Condensing unit forces liquid refrigerant to the ice making section
    • TXV meters refrigerant all evaporators
  – 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
• 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
• 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
• 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

\[
\text{Measured Cube Release Time} + \text{Calculated Extra Time} = \text{Harvest Time}
\]
• Freeze Cycle Time (90/70):
  – 1300 - 16 to 17 minutes
  – 1600 - 17 to 18 minutes
  – 2000 - 12 to 13 minutes

• Harvest Cycle Time (90/70)
  – 1300 - 2 minutes
  – 1600 - 1 1/2 to 2 minutes
  – 2000 - 2 1/2 minutes
• **Freeze Cycle**
  – Rapid Pull Down to between 50 and 40 PSIG
  – Gradual Pull Down to
    • 1300 30 to 34 PSIG
    • 1600 35 to 37 PSIG
    • 2000 23 to 25 PSIG just before Harvest
  – Pressures at CP unit or CME will be the same during Freeze

2000 lb model, end of freeze
• Harvest Cycle
  – At the ice making section, low side pressure rapidly increases to 90 - 95 PSIG or higher in hot ambient conditions
  – At the CP unit compressor access valve, dome pressure is limited by the CPR valve to 55 - 60 PSIG during harvest
• CP Unit
  – Discharge during low ambient freeze will be about 240 PSIG
  – Discharge during harvest will be about 100 PSIG
  – High Pressure Cut Out opens at 450, closes at 350 PSIG
• De-lime with Scotsman Ice Machine Cleaner
  – Push & release clean button
  – Pour in 24 ounces of ice machine cleaner
  – Clean for 10 minutes, then push and release clean button again, wait 20 minutes and shut unit off

• Check distributors for scale build up
• 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
• What happens if?
• Control wire becomes unplugged
  – CP unit does not operate
  – Exceeds maximum freeze time
  • Controller shows continuous refrigeration diagnostic light
• 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
- 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
• What happens if?
• Headmaster is stuck in bypass
  – Very little liquid flow to TXVs
  – Long freeze cycle
  – Controller shows continuous refrigeration diagnostic light
• 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
• 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
• What happens if?
• The purge valve leaks through
  – May result in small cubes
  – Short freeze cycle
  – May have long harvest cycle
• 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
• 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
• 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
• 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
• What happened if?
• The controller is showing a continuous refrigeration diagnostic light
  – Maximum freeze time exceeded
  – Dirty condenser coil
  – Fan motor inoperative
• 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
• 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.
• Eclipse is a three part ice making system
  – Ice making head
  – Compressor Package
  – Condenser
• There are 6 systems
  – 600
  – 800
  – 1000
  – 1300
  – 1600
  – 2000