General Commercial Service

Scotsman
Ice Systems

Segments

- Cubers –
  - Prior (CM, CM^3) and Prodigy
  - Undercounter cuber
- Flakers –
  - Prior and Prodigy
  - Undercounter flaker
  - Ice maker-dispenser
- Nugget ice dispensing
- Hotel dispenser
- Eclipse

Scotsman Ice Systems

Recipe for Ice

- Mix proper amounts of
  - Water
  - Refrigeration
  - Electricity
- Too much or too little of any ingredient:

  – NO ICE!!!

Scotsman Ice Systems

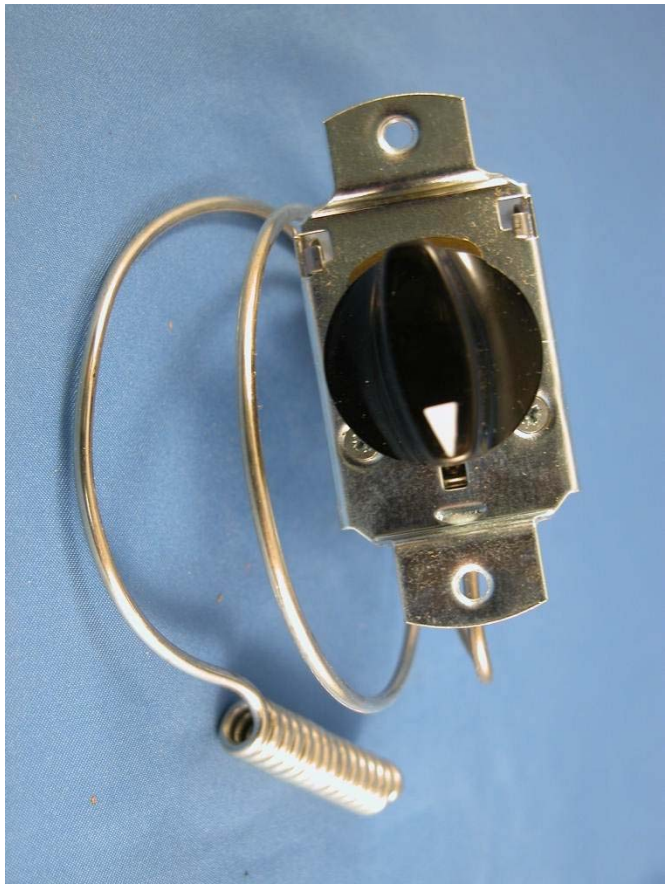
Cuber Control Type Review

- **All** must terminate freeze, start and finish harvest.
  - **Four** freeze cycle termination **methods**:
    - Suction line temperature plus timer
    - Suction line temperature only
    - Reservoir water level
    - Direct sensing of water over ice bridge
  - **Four** harvest cycle termination **methods**:
    - Timed
    - Infrared light sensing ice
    - Suction line temperature only
    - Curtain switch

Scotsman Ice Systems

Suction Line Temperature Method

- **Cube Size Thermostat** – Normally Open, closes on temperature fall. Sensing suction line temperature. Contacts close at preset temperature to start a timer (mechanical or electronic) to finish the cycle
  - Many prior models, including CM, SCE170
  - Exception: CU0515 senses evaporator temperature – its closed contacts immediately trigger Harvest.



Scotsman Ice Systems

Suction Line Temperature Method

- **Thermistor**, attached to suction line
  - Resistance changes with temperature
  - Attainment of preset resistance starts electronic timer to finish the cycle
    - Applies to CU50

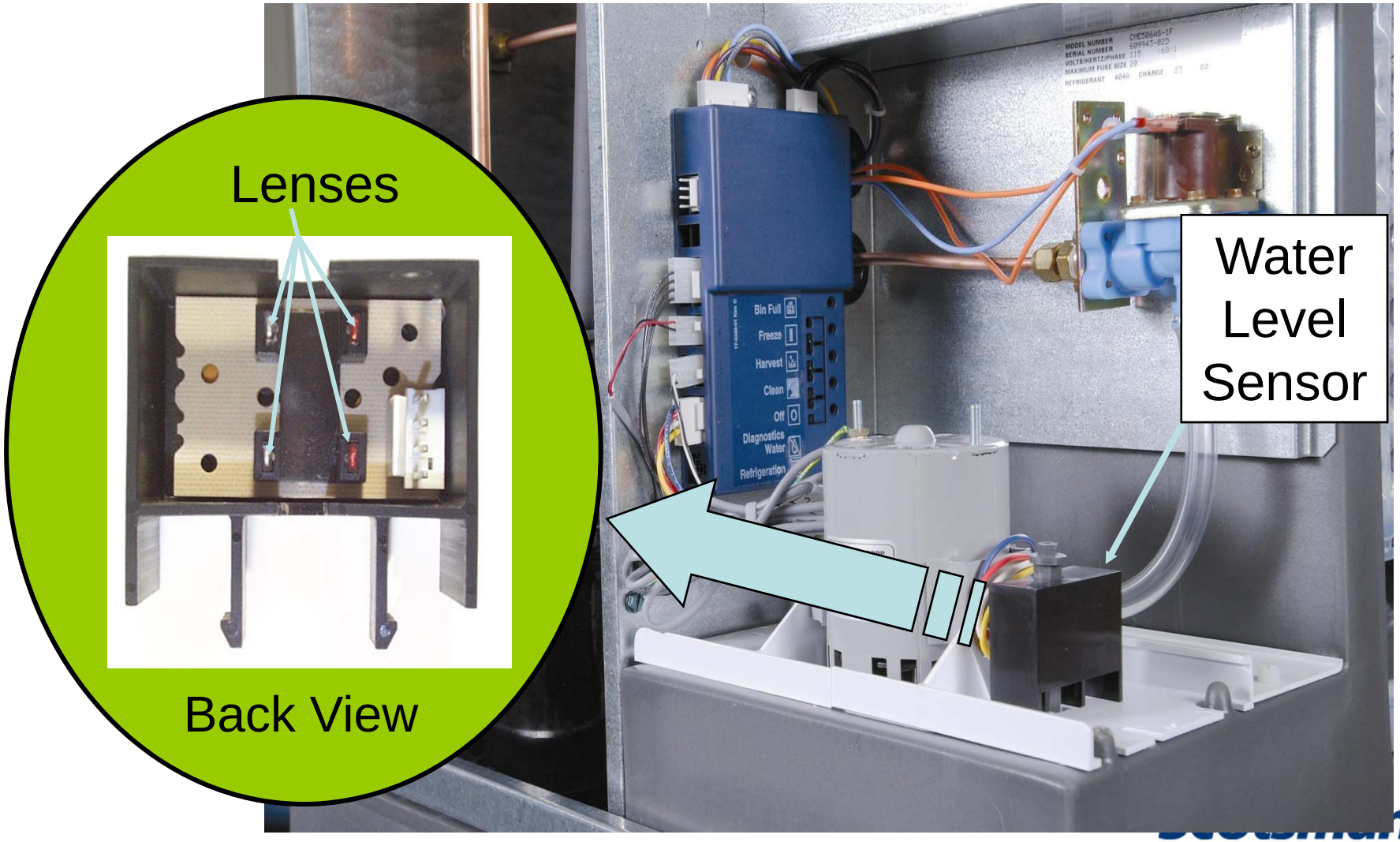
Scotsman Ice Systems

Water Level Method – CM^3

- Reservoir water level determines end of freeze
- Sensed by float, stick and infrared sensor
- As ice is made
  - Reservoir water level drops
  - Slot in the stick falls past the upper sensor
  - Triggers either
    - Refill or,
    - If all refills are complete, starts harvest.

Scotsman Ice Systems

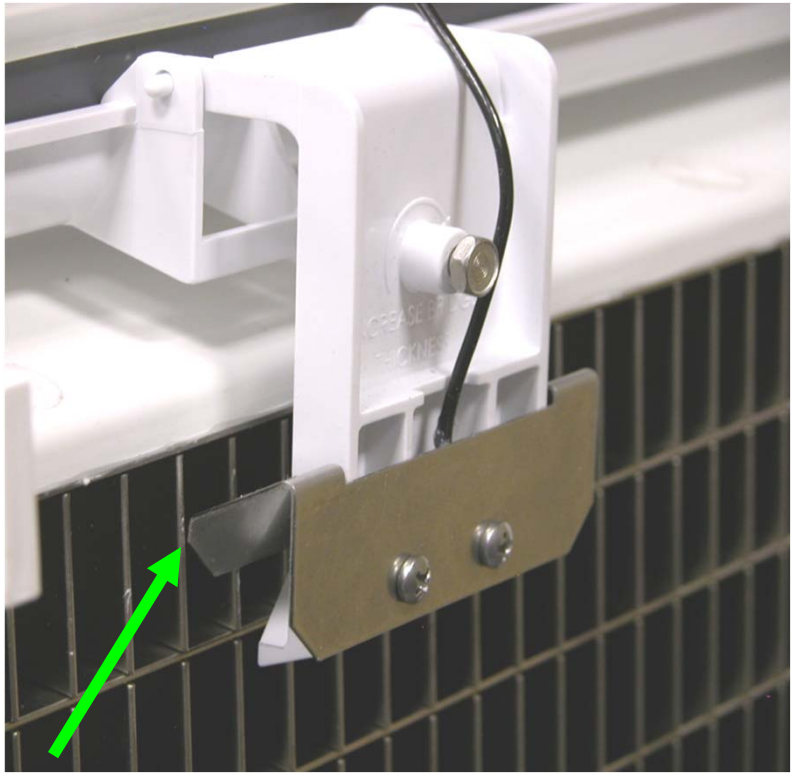
Water Level Sensor – Photo Eyes



Ice Systems

Direct Sensing Method – Prodigy Cuber

- Freeze continues until ice has increased in size to cause the water flowing over it to contact a sensor.
- That contact triggers the controller to begin the harvest mode.



Ice Thickness Sensor

Contact with water makes circuit from controller to cabinet, terminating freeze

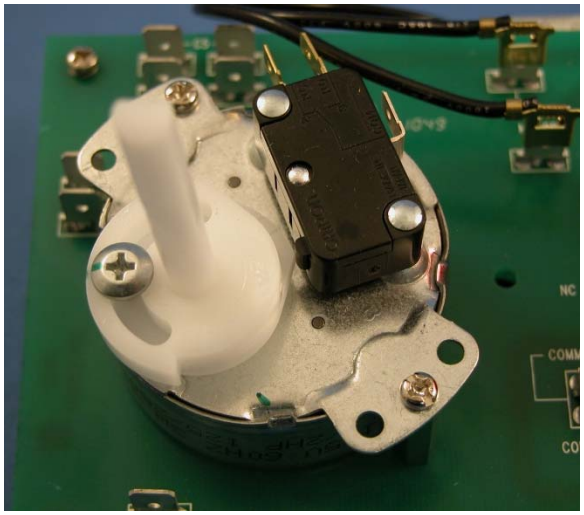
Scotsman Ice Systems

Harvest Complete

- **Time only** – timer advances a cam, microswitch on cam stops harvest.
  - CU50 and SCE170 have electronic timers in controller
- **Infrared sensors** – harvesting ice falls between infrared emitter and detector, when no longer detected controller sets next cycle harvest time.
- **Evaporator temperature** – CU0515. When the evaporator warms up to preset point, harvest stops.
- **Curtain switch** – when ice pushes curtain away from switch, it triggers the controller to stop harvest.

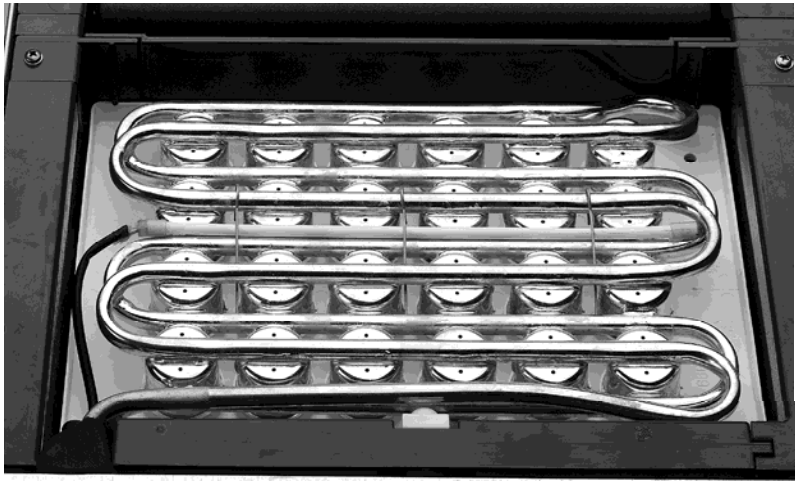
Scotsman Ice Systems

Freeze Termination Devices



Timer

Curtain Switch



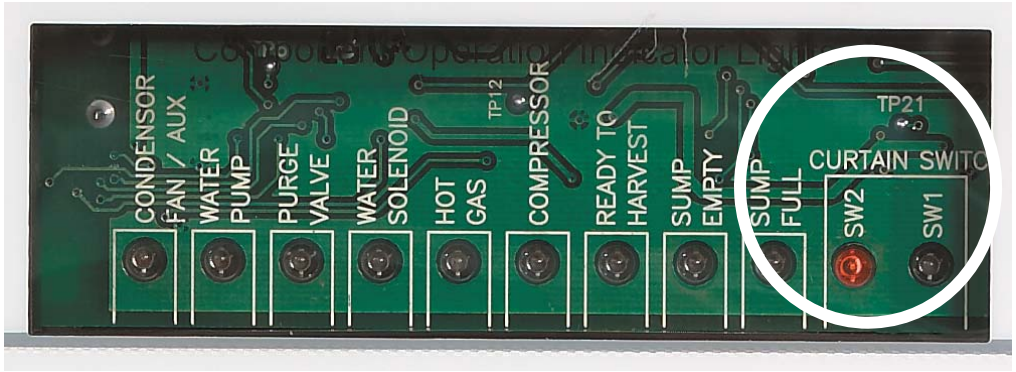
CU0515 Evaporator Thermostat

Photo Eyes

Scotsman Ice Systems

Curtain Switch - Prodigy

- Switch is Open when curtain is Open
  - Open contacts trigger end of freeze
- Indicator light is ON when switch is Open
  - Unused switch light is always on



Scotsman Ice Systems

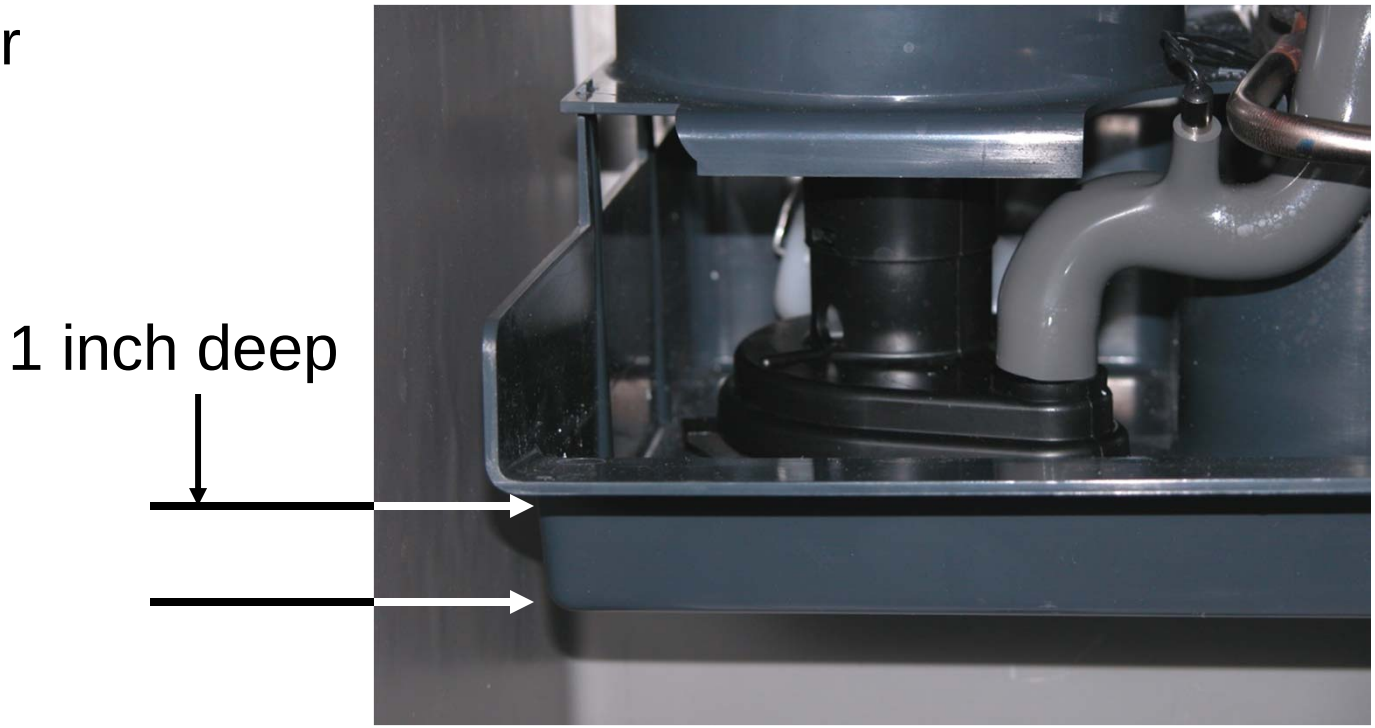
Prodigy Cuber Sequence of Operation

- Batch reservoir fill system on modular cubers
  - One fill per cycle
  - Fills until water sensor satisfied
- Freezes until ice thickness sensor triggered by water contact
- Harvests until curtain switch opens
- Drains water and refills during part of harvest cycle

Scotsman Ice Systems

CU1526/2026/3030 Water Level

- Full reservoir system, controlled by float valve
- Normal water level is 1” deep at left end of reservoir



Scotsman Ice Systems

Prior Cuber Sequence of Operation

- **CM³ type**
  - Batch reservoir fill system
    - Fills reservoir until water sensor satisfied + overflow time
    - Some models refill during freeze
      - CME456
      - CME810
      - CME1056
      - CME1356/1656
      - SCE275 – refills twice
  - Freezes until water drops enough to trigger harvest
  - Harvests until cube sensing quits – uses feedback from prior cycle

Scotsman Ice Systems

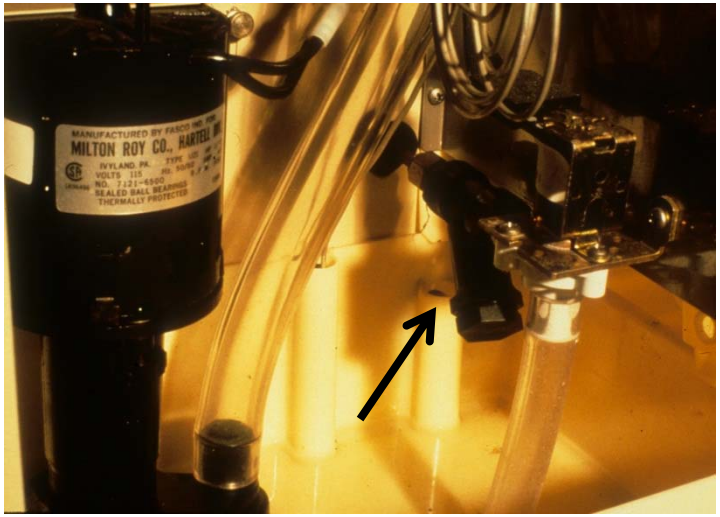
Prior Cuber Sequence of Operation

- **SCE170 type**
  - Full reservoir system – uses float valve
  - Freezes until cube size thermostat closes, starting electronic timer in the controller to finish freeze cycle
  - Harvests until curtain opens
  - Drains during harvest

Scotsman Ice Systems

Prior Cuber Sequence of Operation

- **CM / DCE type**
  - Batch reservoir fill system with inlet water solenoid valve
  - Fills reservoir continuously during harvest
  - Freezes until cube size control closes, starting timer
  - Timer finishes freeze and switches to harvest
  - Harvests until timer stops



Scotsman Ice Systems

Cuber Diagnostics – No Ice

- **Unit off, nothing operating**
  - Bin control keeping machine off (false bin full)
    - Thermostat
    - Curtain switch
    - Photo eyes
    - Ultrasonic
  - High pressure control open
  - Controller safety has stopped unit
    - Freeze or harvest cycle length – too short or too long
    - High or low discharge temperature
    - Lack of or too much water
  - Transformer failure

Scotsman Ice Systems

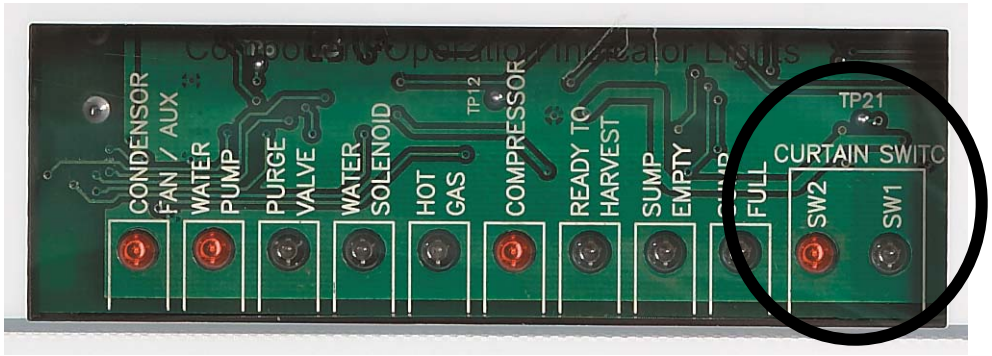
Cuber False Bin Full

- Bin Thermostat – cold control
  - Used on CU50, CM and some CM^3
  - CU or CM – **opens** on temperature fall
  - CM^3 – **closes** on temperature fall
  - CM^3 – connects to controller at #7
    - Standard on CME1056 and larger, optional on others
  - React to stop ice making at about 35^{o}F.

Scotsman Ice Systems

Cuber False Bin Full

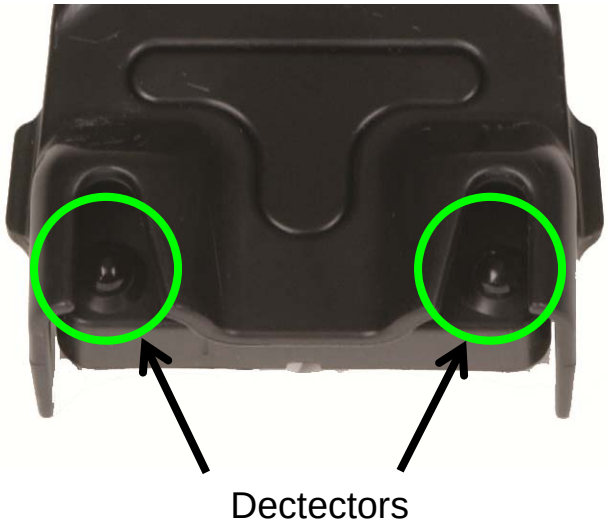
- Curtain Switch
  - Used on SCE170 and all Prodigy Cubers
  - Open switch shuts machine down
    - Curtain stays open
      - Stuck open
      - Magnet lost
    - Switch failure
  - Controller has indicator lights



Scotsman Ice Systems

Cuber False Bin Full

- Photo Eyes
  - Used in all CM^3 including SCE275
  - Photo eyes are infrared emitter and detector set
  - Scale on eyes will block light and cause Bin Full light to be ON all the time
  - Failed emitter or detector will also cause Bin Full light to be ON all the time
  - Controller unlikely to be the cause
  - No firm test available



Scotsman Ice Systems

Cuber False Bin Full

- Ultrasonic
  - Sound wave timing measures ice level
  - Originally used on certain prior 1990s CMs
  - New design in 2007
    - Standard on EH222
    - Optional thru Prodigy KVS kit

- If adjusted too low, will stop ice making
- If sensor socket is blocked, will stop ice making
  - Note – open curtain switch also triggers Bin Full light

Scotsman Ice Systems

Cuber Diagnostics – No ice

- Unit shut off on a safety
    1. High discharge pressure
    2. High discharge line temperature
    3. High by pass line temperature
    4. Long freeze time
    5. Long harvest time
    6. Short freeze time
    7. Lack of refrigeration
    8. Slow water fill

Scotsman Ice Systems

1. High Discharge Pressure

- All Remotes and Water Cooled Models
- Some Air Cooled
  - Sensed by high pressure cut out switch
  - Cut out pressure varies: 400, 450 or 500 PSIG
  - Automatic reset
  - Does not power off controller
- Causes
  - Hot ambient, poor ventilation
  - Fan motor failure, pressure switch failure
  - Water supply failure

Scotsman Ice Systems

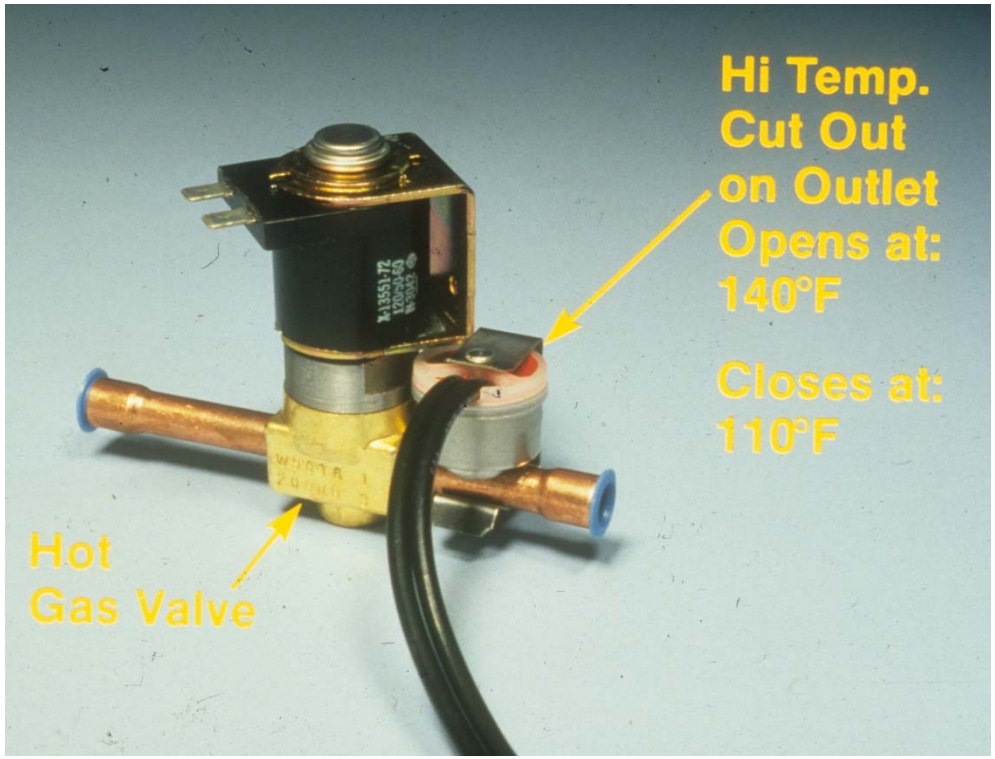
2. High Discharge Temperature

- CM^3 and Prodigy
  - Sensed by thermistor on discharge line
  - Shuts unit off at 250^{o}F.
- Causes
  - High superheat at compressor
    - TXV starving plate
    - Low charge
    - High ambient
  - Thermistor out of calibration

Scotsman Ice Systems

3. High By Pass Temperature

- Prior CM models
  - Sensed by thermo disc temperature sensor by hot gas valve outlet
  - Sensor opens circuit at 140ºF. Automatic reset
  - Cause:
    - Hot gas valve leaks thru during freeze



Scotsman
Ice Systems

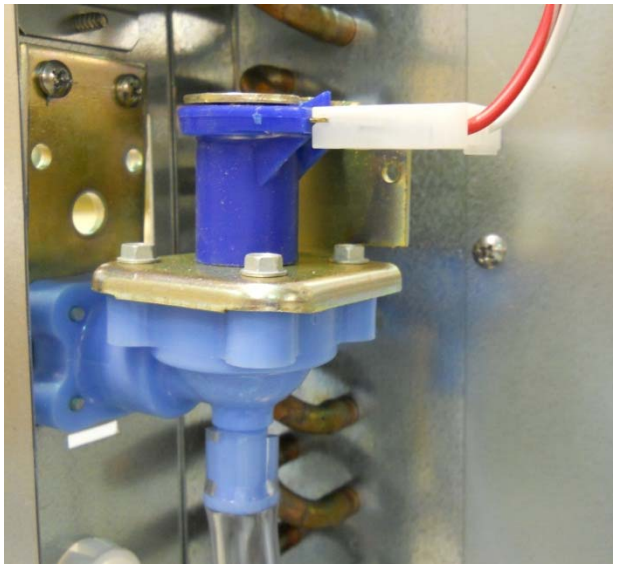
4. Long Freeze Cycle

- Applies to CM^3 and Prodigy
- Maximum times vary by product and model
  - CM^3 – 31 to 50 minutes
  - Prodigy – 45 minutes for all but CU1526 (84)
- Causes
  - Inlet water valve leaks thru during freeze
  - Purge valve leaks water down the drain
  - TXV superheat to high or too low
  - No refrigeration – any cause
  - Water pump failure
  - End of freeze not sensed by control system
  - Fans cycle (CM^3) in warm ambient

Scotsman Ice Systems

Long Freeze - Water Supply – Part of the Recipe

- **Too Much Water**
  - Inlet water valve leak by symptoms:
    - Long freeze time – any model
    - Thick ice on CM^3 models
  - Purge valve leak by
    - Thick ice on bottom of slab on Prodigy
      - Purge valve leak causes a refill
    - No ice at top row on CU1526/2026/3030
      - Causes float valve to open more as water drains out



Scotsman Ice Systems

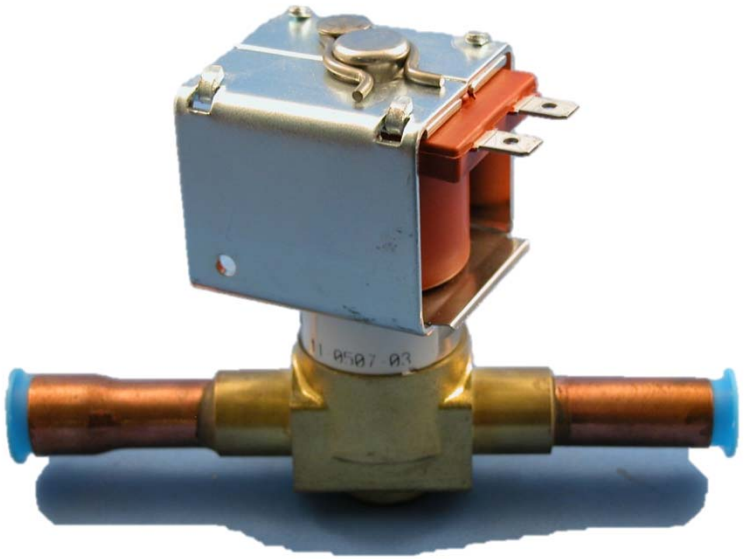
Long Freeze – No Refrigeration

- Lost charge
- Compressor off
- Compressor will not pull down
- Hot gas valve leaks by
- TXV
- Water supply off – water cooled
- Headmaster bypassing or not used – remote

Scotsman Ice Systems

Long Freeze: Hot Gas Valve Leaks By

- Applies to all cubers.
- Check temperature of valve during freeze cycle
  - Should NOT be hot
  - If HOT, replace or rebuild



Scotsman Ice Systems

Long Freeze: TXV Superheat

- Too low
  - High suction pressure during freeze
  - Floods evaporator and compressor
- Too high
  - Low suction pressure during freeze
  - Starves evaporator
  - Compressor overheats
- Bulb connection
  - Must be strapped tightly to suction line
  - Must be insulated
  - Bulb at 8:00 or 4:00 position

Scotsman Ice Systems

Remotes

- Must operate between -25 and +125 degrees F. air temp at condenser
- Receiver and head pressure control valve (headmaster) work together to maintain minimum discharge pressure in the freeze cycle
    - Bypasses condenser when discharge pressure is low
    - Keeps receiver pressurized, moves refrigerant to condenser until pressure increases

Scotsman Ice Systems

Remotes – Long Freeze

- No ice, low suction pressure
  - Low refrigerant charge
    - May be temperature related at first
  - Headmaster stuck in bypass mode
    - Fills receiver with discharge gas, no liquid returns
    - Receiver very hot, compressor overheats
  - Missing headmaster – non Scotsman condenser
    - Condenser fills with liquid, empties receiver
  - Liquid line valve not opening all the way
    - Starves expansion valve

Scotsman Ice Systems

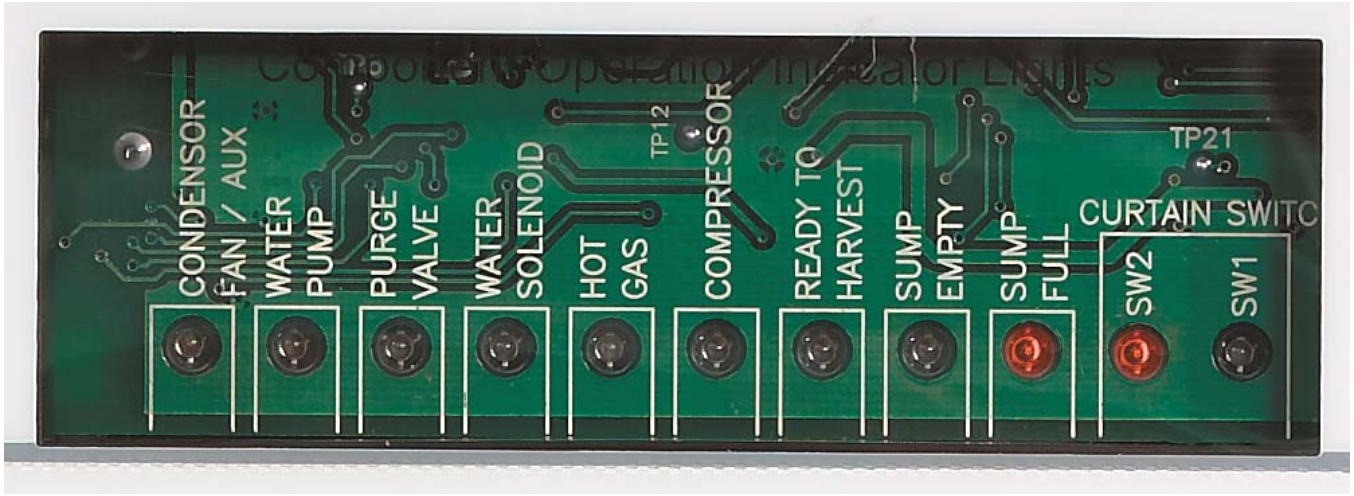
Long Freeze – End of Cycle Not Sensed

- CM^3
  - Water level
    - Not dropping
    - Not sensed by water level sensor and float stem/stick
- Prodigy
  - Water contact
    - No water over plate
    - Ice thickness sensor not making circuit when wet

Scotsman Ice Systems

Long Freeze Cycle - Prodigy

- No water due to False Sump Full signal
  - Sump Full light is on, but water level is low
  - Cause is a shorted water level sensor
  - Remedy: Clean sensor probe housing

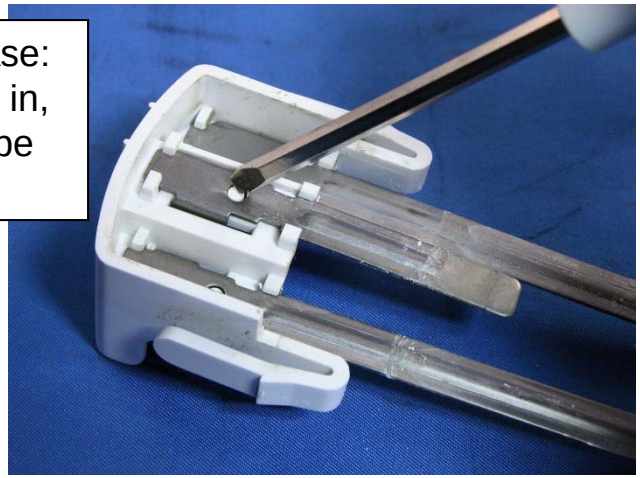


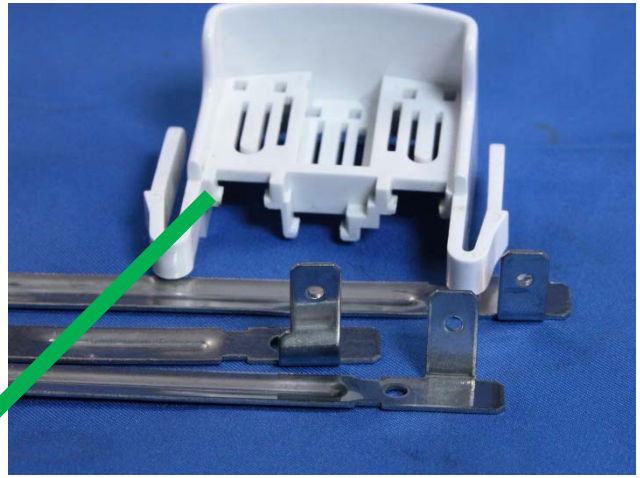
Scotsman Ice Systems

Diagnostic – Water Level Sensor

- Sump Full light ON, but no water in reservoir - Code 2 displayed.
- Cause: dirty sensor
  - Solution: clean sensor
    - Release probes from housing
    - Clean housing thoroughly
      - Housing is the insulator

To Release: Push pin in, pull probe down





Key Area to Clean

Scotsman Ice Systems

Update: New Water Level Sensor Guard

- Water level sensor probes shielded from water splash and separated from air upflow
  - Guard surrounds probes
  - Reduces false sump full signal
    - Reduces code 1 and 2 shut downs
- Applied to all Prodigy modular cubers
- Kits available:
  - Include sensor, harness, guard and sump cover

Scotsman Ice Systems

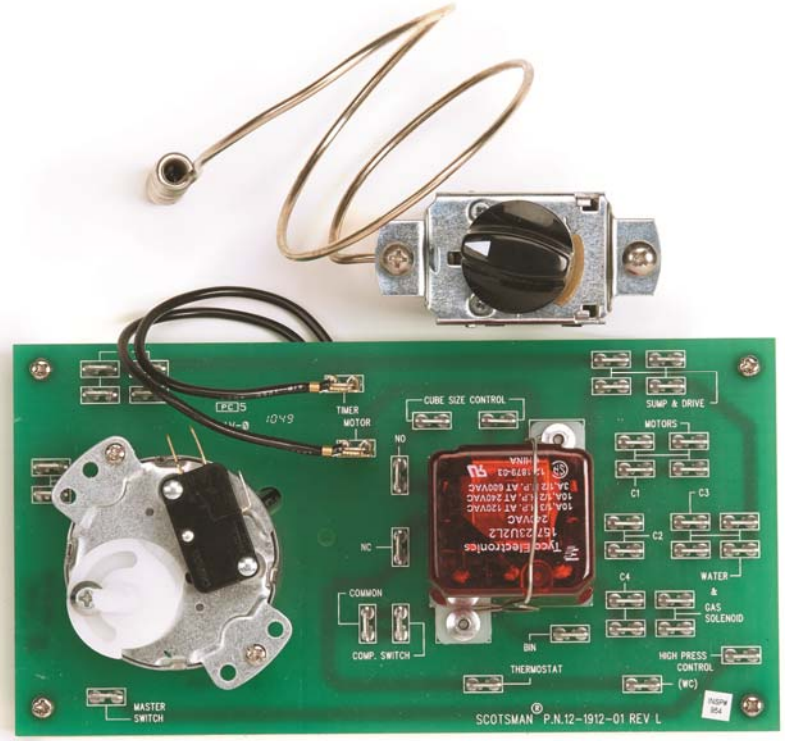
Long Freeze – End of Cycle Not Sensed

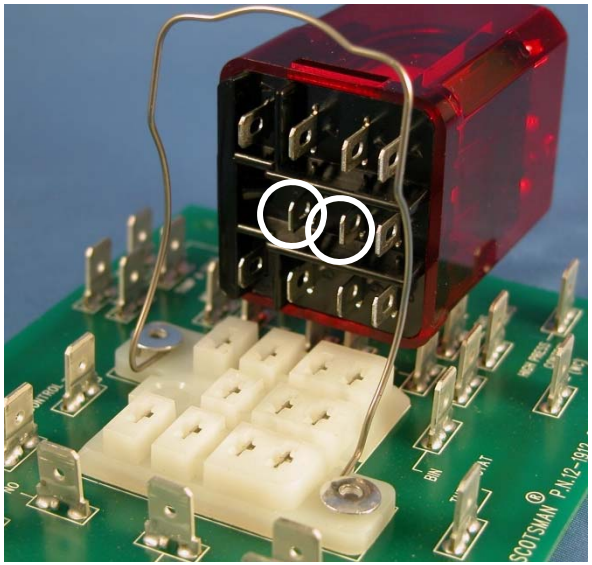
- SCE170 and/or prior CM or other old cuber
  - Cube size control does not close, causes:
    - Defective thermostat
    - Mis-adjusted
      - CCW adjusts warmer
    - Ice small / high superheat – suction line temp must drop to preset temp to connect power to timer
      - » Plus 8 deg. F. typical cut in
      - Refrigerant leak
      - Hot gas valve leaking by
      - Too much water

Scotsman Ice Systems

Long Freeze – End of Cycle Not Sensed

- Prior CM
  - Timer does not advance – **other reasons**
    - Open timer motor
    - Open relay contacts (8 to 5) when relay is energized





Scotsman Ice Systems

5. Long Harvest

- CM^3
  - Ice sensors/bin eyes not “seeing” the ice during harvest
  - First cycle always long to cover cold temperature operation
  - Ice not releasing
- SCE170
  - Curtain switch not sensing curtain opening
  - Ice not releasing
- Prodigy
  - Curtain switch not sensing curtain opening
  - Ice not releasing

Scotsman Ice Systems

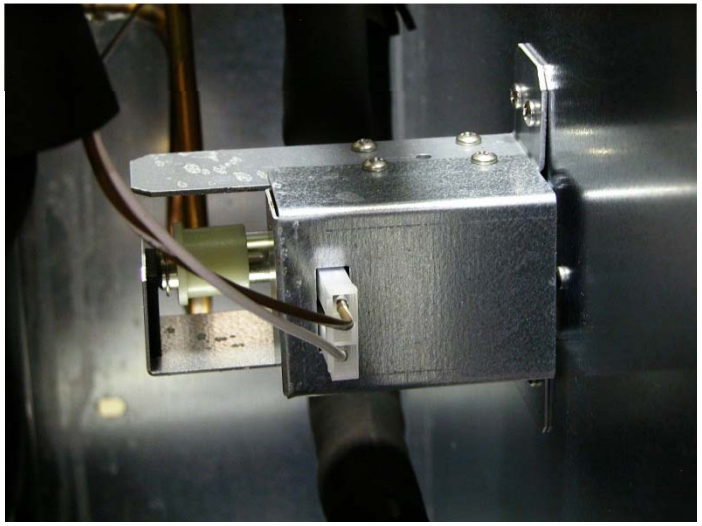
Bin Eyes not sensing

- CM^3 models used photo-electric eyes to sense ice cubes during harvest
- Infrared emitter (red & black wires) and detector in discharge chute
- Bin full light is the indicator of sensing
  - Blinks ON when sensed a group of cubes
- Mineral scale on lenses affects ability to sense
- Can be blinded by light

Scotsman Ice Systems

Ice Not Releasing – Any Model

- Lack of heat
  - Hot gas or vapor valve not opening or opens partially
- Dirty machine
- Oversized cube
- Undersized or partial cube
- Very cold conditions
- Harvest assist failure – Prodigy
- Damaged plate



Scotsman Ice Systems

Excessive Fan Cycling – CM³

- Air cooled CM³ models test discharge temperature 3 minutes after Freeze starts
  - If below the limit, fans cycle on and off for that entire freeze cycle to maintain discharge pressure
  - Fans might cycle if:
    - Unit is in a cold ambient
    - It is the first cycle after a restart – condenser is cold
    - The discharge temperature is lower than expected due to low charge or low superheat
    - Thermistor out of calibration or probe not connected to discharge tubing
- Cycling fans can result in very high discharge pressure – over 400 PSIG

Scotsman Ice Systems

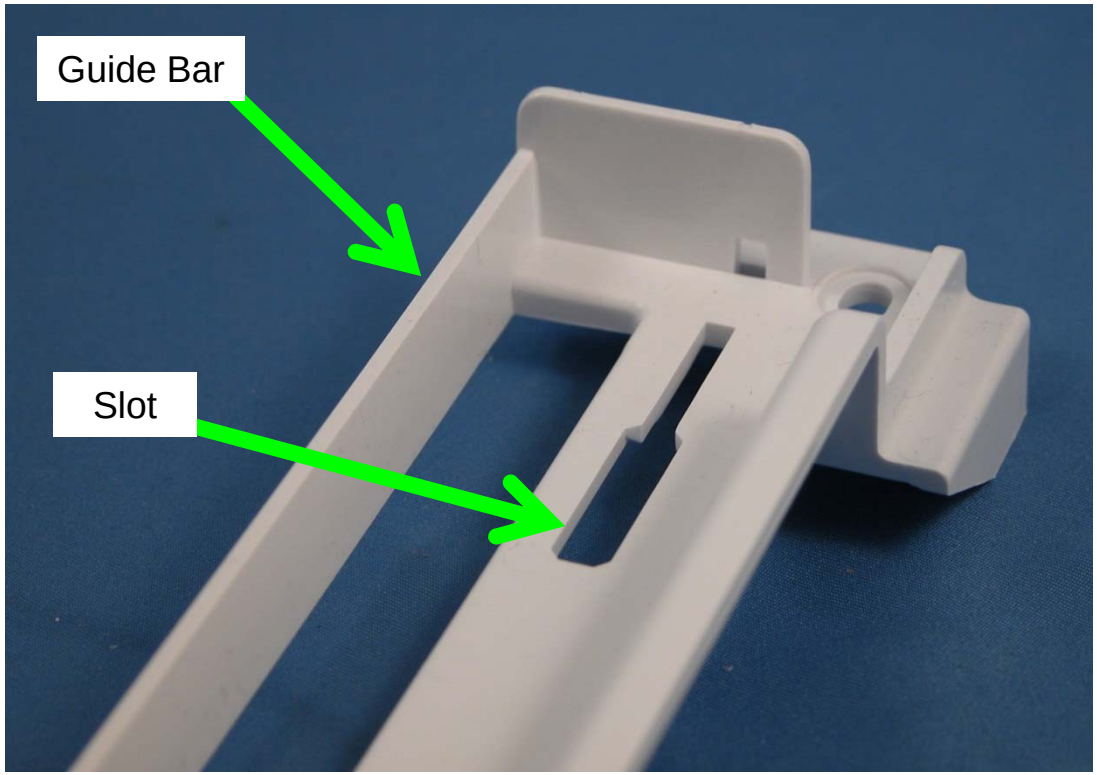
6. Short Freeze Time

- Prodigy Only – Code 8
  - Primary cause is erratic water flow from spillway
    - Spillway surface needs scrubbing
    - Sagging bracket (02-4205-01) needs replacing – plastic from bracket sags into water path
  - Secondary cause is ice bridge too thin, ice harvests bottom half, top half stays on plate
  - Another cause is scale on the Ice Thickness Sensor and wire

Scotsman Ice Systems

Update

- Mounting bracket change
  - Shortened slot, eliminates sag
  - Added guide bar
    - For distributor



Scotsman Ice Systems

Code 8 – Water Flow Correction

- Lightly sand or scrub the spillway across the flow of water
  - Evens out water flow
  - Reduces splash onto ice thickness sensor probe

Scotsman Ice Systems

7. Lack of Refrigeration

- CM^3: water and discharge thermistors confirm refrigeration operation
  - If at start up reservoir water stays warm and discharge line cool, **unit cuts off early in freeze** with a Refrigeration light on continuously.
    - Cause example: Compressor not starting
- CM^3 and Prodigy have maximum freeze cycle times
  - CM^3 – Refrigeration light on continuously at end of cycle
  - Prodigy – Code 1
    - Cause example: Low refrigerant charge

Scotsman Ice Systems

8. Slow Water Fill

- CM^3
  - Water fill time measured by controller
    - Powers relay to open inlet water solenoid valve
    - Starts internal time clock
  - Must fill within 130 seconds (up to 2 plates) or 250 seconds (3 plates or more)
    - Fill sensed by the Water Level Sensor
  - Slow fill causes 2 Blink Water Diagnostic Light Code
  - Automatic retry

Scotsman
Ice Systems

Slow Water Fill

- Prodigy
  - Water fill time measured by controller
    - Powers relay to open inlet water solenoid valve
    - Starts time internal clock
  - Must fill within 5 minutes
    - Fill sensed by Water Level Sensor
  - If slow triggers code 3
  - Automatic retry

Scotsman Ice Systems

Slow Water Fill Diagnostics

- CM^3 or Prodigy
  - Water supply restricted
  - Water solenoid failure
  - Controller relay failure
  - Purge valve leaking
- CM^3
  - Restricted/failed water supply – filter/valve
  - Sensor failure
  - Unit not level
  - Standpipe wrong height
  - Float stick hang up

Scotsman Ice Systems

CM^3 Sensor Diagnostics

- Water fills and overflows (in drain or in bin) until shut down on 2 blink water diagnostic
  - Float stick must rise and block lower photo eye of sensor
  - Causes of not triggering water fill:
    - Binds when rising – worn, replace stick and sensor
    - Wrong stick used – replace stick
    - CME810 – light blue color fades, replace stick
    - Overflow models – standpipe height too low – 2 and 5/8”
    - Water level sensor and/or harness failure

Scotsman Ice Systems

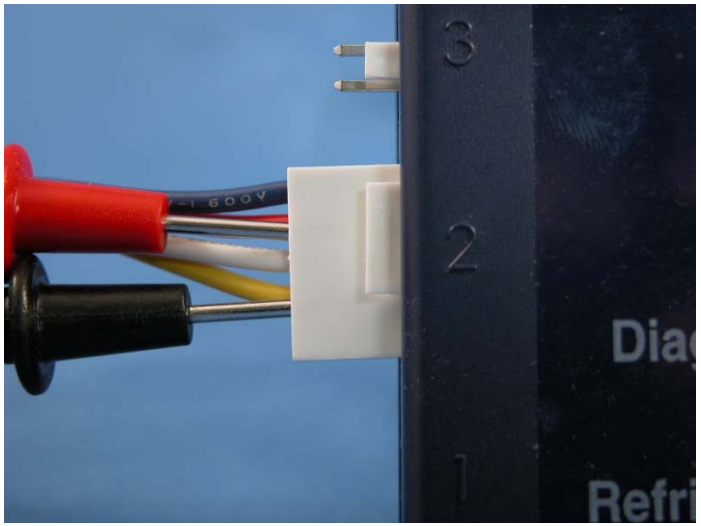
CM^3 – Test Mode

- Available only on Rev 9 controllers (2005 and up)
  - Forces operation
  - Allows testing of water level sensor function
- Hold OFF button in until unit shuts off.
- Hold OFF button in until green lights switch ON
- Hold CLEAN button in until bin full light blinks
  - Unit will test all functions in sequence, stops when done
  - Test water level sensor at end
    - Green lights indicate float level: 4, 3, 2 or 1.

Scotsman Ice Systems

CM³ Water Level Sensor Diagnostic

- Sensor must detect blocked light when float rises to full position
  - Must be no corrosion on pins – clean first
  - Check voltage at controller connector 2 with DC voltmeter
    - Negative on bottom pin – yellow wire
    - Positive on second pin from top – red wire
    - Move stick up and down, voltage change will be small, but MUST change



~ 5.01 VDC = Water Full

Scotsman Ice Systems

Flaked and Nugget
Modular
and Ice Maker Dispensers

Current and Prior

Scotsman
Ice Systems

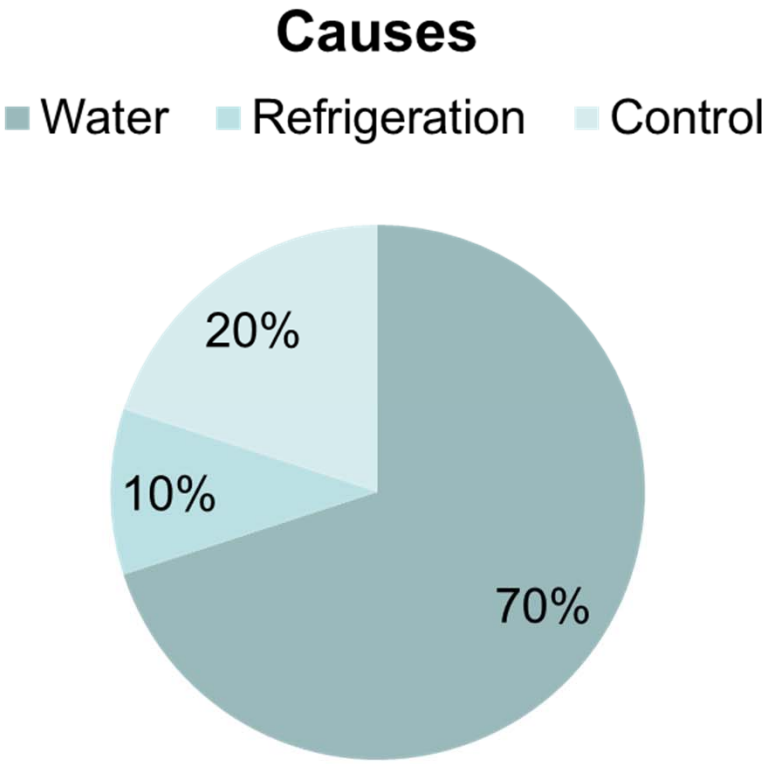
Quick Review: What is a flaker?

- A continuous flow ice machine
  - Vertical, water filled, refrigerated cylinder
    - With internal CCW 11 RPM auger driven by a gear reducer
  - Constant water in and ice flow out
  - Soft ice crystals continuously form in the evaporator between the auger and freezer wall
    - Forced up by the auger
  - Makes flaked or nugget ice by a compression process
    - Flaked ice: Soft ice squeezed against barrier or thru slots to make it useable
    - Nugget ice: Soft ice extruded thru 16 holes, 9 on NU130

Scotsman Ice Systems

Recipe for Ice

- Same as a cuber
  - Water
  - Refrigeration
  - Control system



Scotsman Ice Systems

Flaked and Nugget Ice

- Several Systems
  - By gear reducer size:
    - 1/20 HP – NU130 only
    - 1/10 HP – brass evaporator, flaked ice only
      - Electro-mechanical or electronic controls (dispensers)
      - Two sizes
        - » SF75 type – AF1, AFE400, AFE424
        - » SF1 type – TDE470, MDT3 and MDT4
    - 1/10 HP – stainless steel evaporator, cubelet ice only
      - MDT2
    - ¼ HP – stainless steel evaporators – 2 sizes
      - Electronic controls
        - » Auto-sentry and prior
        - » Prodigy

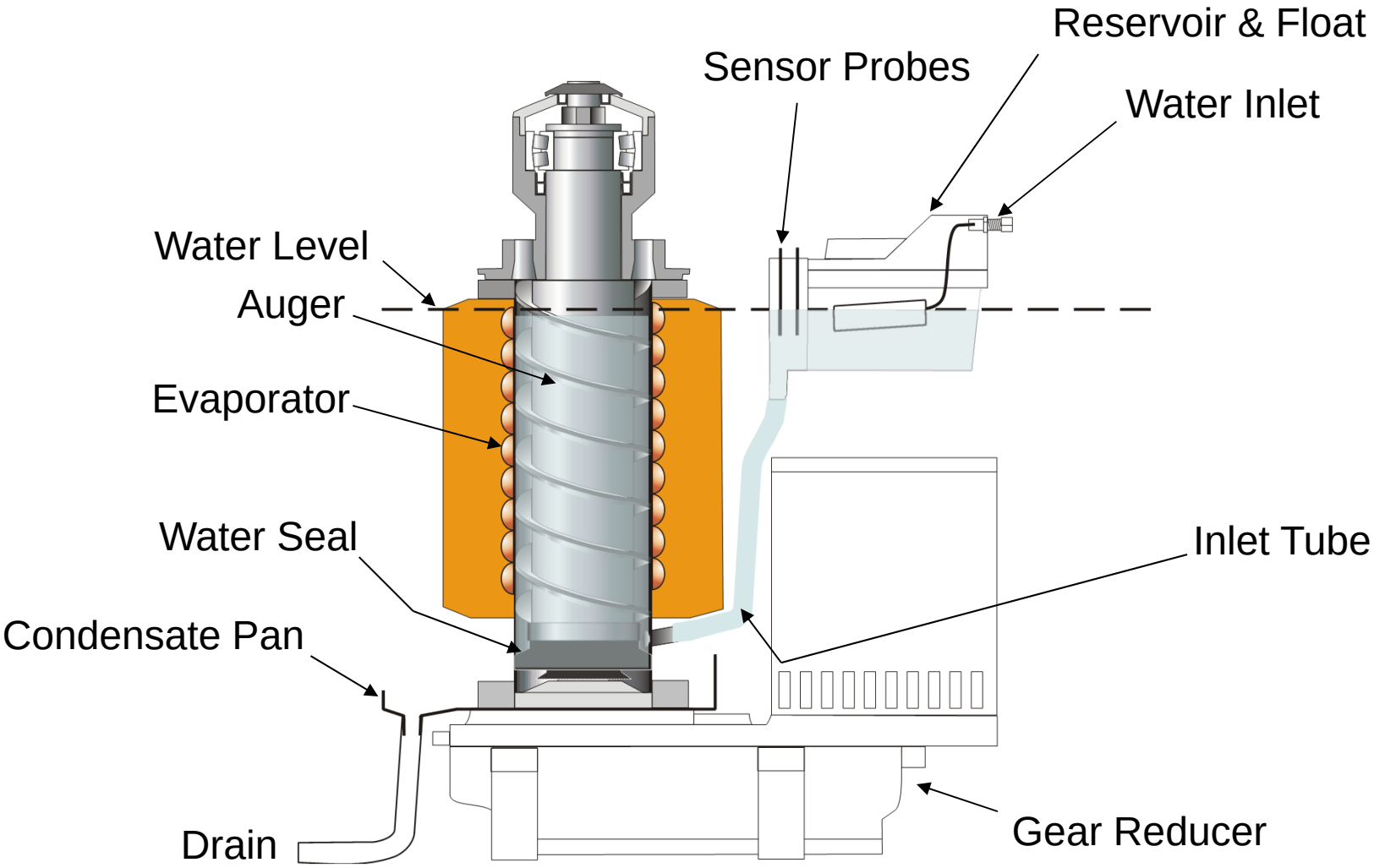
Scotsman Ice Systems

Flaked and Nugget – No Ice

- Continuous flow machines **must** have water
- All have water sensor to stop operation if water supply fails, methods include:
  - Water Pressure - AFE
  - Heated Thermistor – Prior NM/FM, MDT3 thru MDT6
  - Conductivity – Prodigy, NU130, MDT2 and AutoSentry
- All auto restart when water supply is restored

Scotsman Ice Systems

Water Schematic – Prodigy 2012



Scotsman Ice Systems

Flaked and Nugget – No Ice

- Bin control stopping operation
  - Thermostat machines – AF & AFE
    - Open bin stat
  - Electronic models – all others
    - Scale on photo eye set
    - Optional KVS set too low

Scotsman Ice Systems

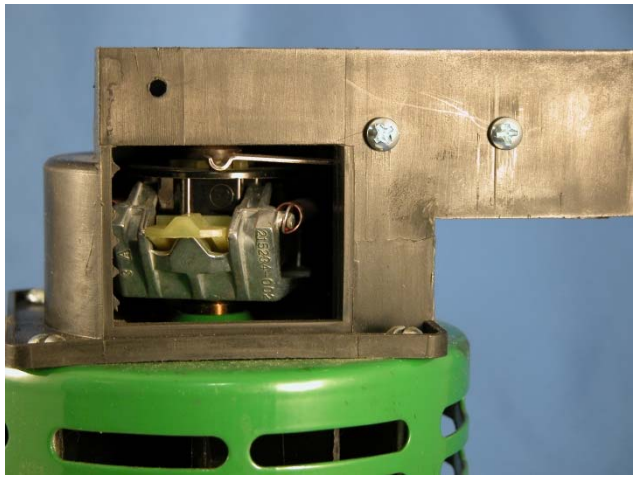
Flaked and Nugget – No Ice

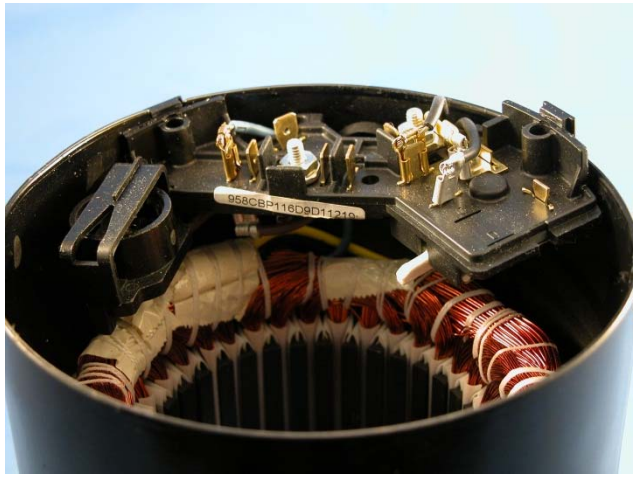
- Gear reducer motor overloaded
  - Stalled motor breaks circuit to compressor contactor with centrifugal switch
    - MDT3 thru MDT6
    - AF & AFE
    - Many prior
  - Over-amped motor triggers controller to shut system down
    - AutoSentry (NME/FME) cut out point
      - 5 amps with Emerson motor, 6 with GE or Marathon
    - Prodigy cut out point
      - 3 or 6 amps by voltage
    - NU130 – 1 amp
  - MDT2 – controller senses motor rotation

Scotsman Ice Systems

Centrifugal Switch

- In series with contactor coil or compressor, switches open when motor slows or stalls
- Two types
  - 1/10 HP motor, switch is on top of motor
  - ¼ HP motor, switch is inside motor





Scotsman Ice Systems

Gear Reducer Overloaded

- Causes:
  - Low water level
  - Scale on evaporator
  - Scale on auger
  - Worn bearings
  - Damaged gear reducer

Scotsman
Ice Systems

Flaked and Nugget – No Ice

- Refrigeration
  - Low charge
  - TXV or cap tube restricted
  - High or low pressure control open
  - Remote headmaster bypassing condenser
  - Remote liquid line valve not opening or leaks thru
  - Remote pump down switch open
  - Remote line set restricted
    - Quick connect did not fully pierce
  - Contactor failure
  - Compressor failure
    - Will not start
    - Does not pump, failed valves

Scotsman Ice Systems

Flaked and Nugget - Refrigeration

- Steady state operation
- Two refrigerants
  - R-134a
    - AFE424, MDT2, MDT3, MDT4, NU130
    - Most operate at 12-13 PSIG suction, NU130 excepted
  - R-404A – all others since 1995 changeover
    - Suction pressure varies by model, condenser and ambient, smaller machines have higher pressure
      - Overall 22 to 46 PSIG
    - Remote low side EPR is set per unit size
    - Superheat on TXV models:
      - 6-8 degrees up to Prodigy
      - 12 degrees for Prodigy

Scotsman Ice Systems

Flaked and Nugget - Refrigeration

- Low Pressure Cut Out Open (12 – 18 PSIG)
  - Many prior models cut out at 0 - 4
  - No refrigerant in system
  - Restriction
  - Auger not turning, compressor on
- High Pressure Cut Out Open (400 PSIG)
  - Fan motor failure
  - Water supply lost to water cooled model

Scotsman Ice Systems

Flaked and Nugget – Remote Refrigeration System

- Head pressure control valve (headmaster)
  - Maintains minimum discharge pressure
    - 180 PSIG prior
    - 220 PSIG current
  - Was in ice head, now part of condenser
- Liquid line solenoid
  - Powered by controller
- Receiver
- Pump down pressure switch
  - Operates compressor contactor

Scotsman Ice Systems

Prodigy Remote Flaker / Nugget

- Use condensers
  - ERC111 – N0622 and F0822
  - ERC311 – all others
- Head change only: re-use prior condenser
  - Must be same refrigerant
  - Add headmaster kit KPFHM

Scotsman Ice Systems

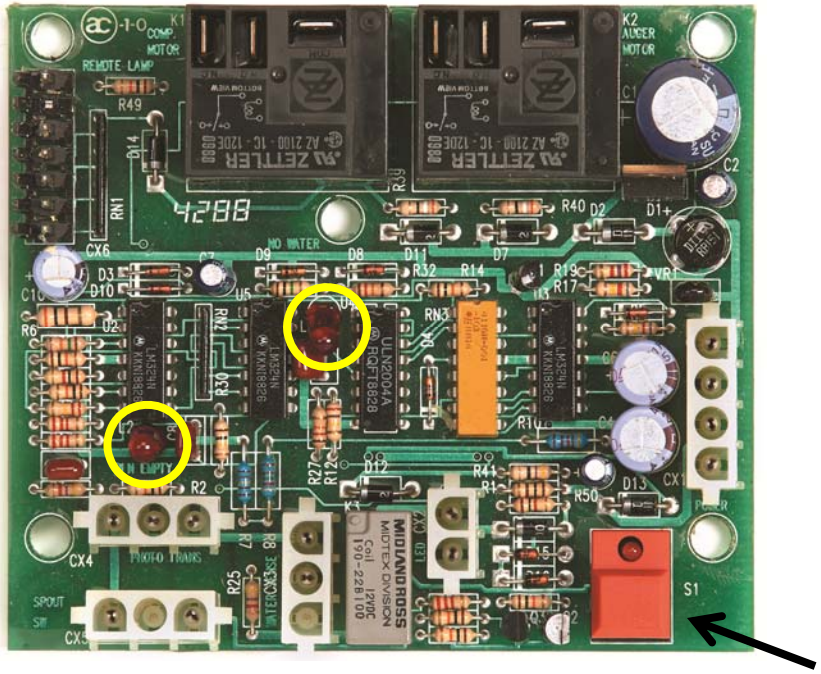
Flaked and Nugget - Controllers

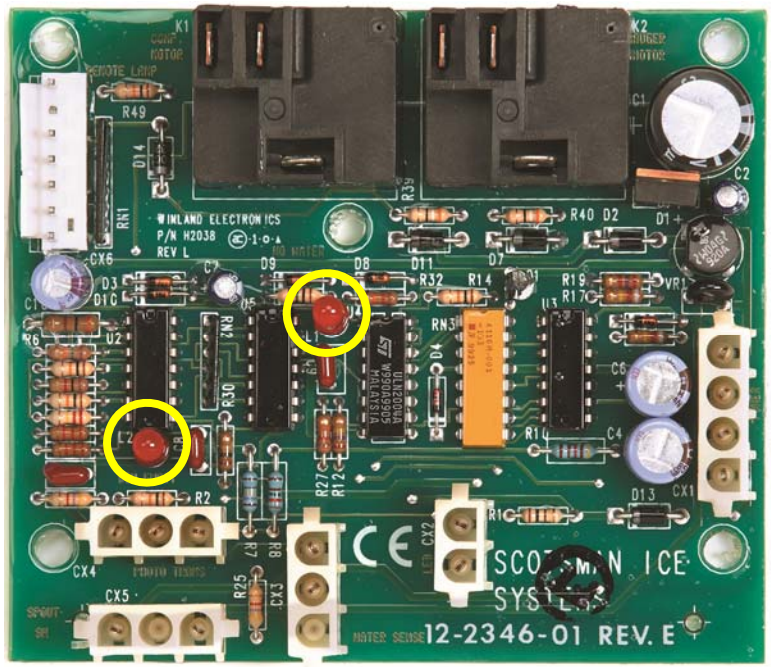
- Six types
  1. NM/FM/ND/NS and NME/FME/NDE/NSE – 1988 thru 2000
  2. NME/FME - AutoSentry – 2001 thru 2009
  3. Prodigy
  4. TDE or MDT3 thru MDT6
  5. MDT2
  6. NU130

Scotsman Ice Systems

NM/FM/ND NME/FME/NDE Controller

- Two Lights
  - No Water (L1)
  - Bin Empty (L2)
- With and Without Reset Switch

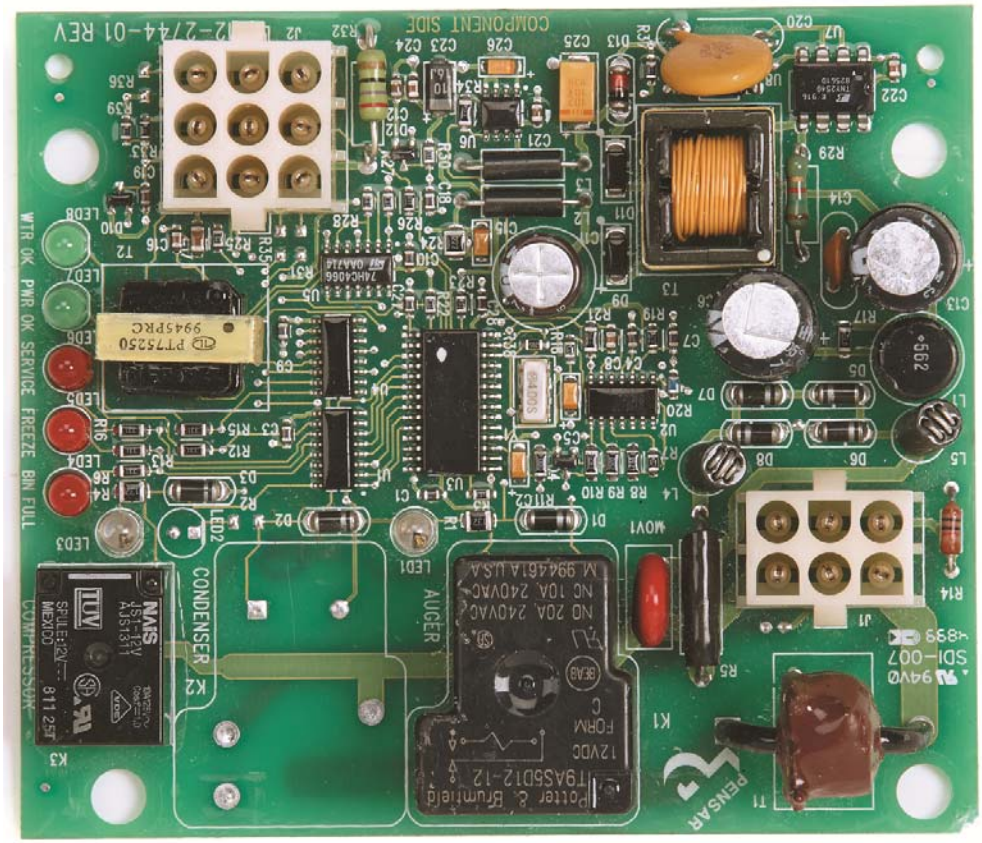




Scotsman
Ice Systems

AutoSentry Controller

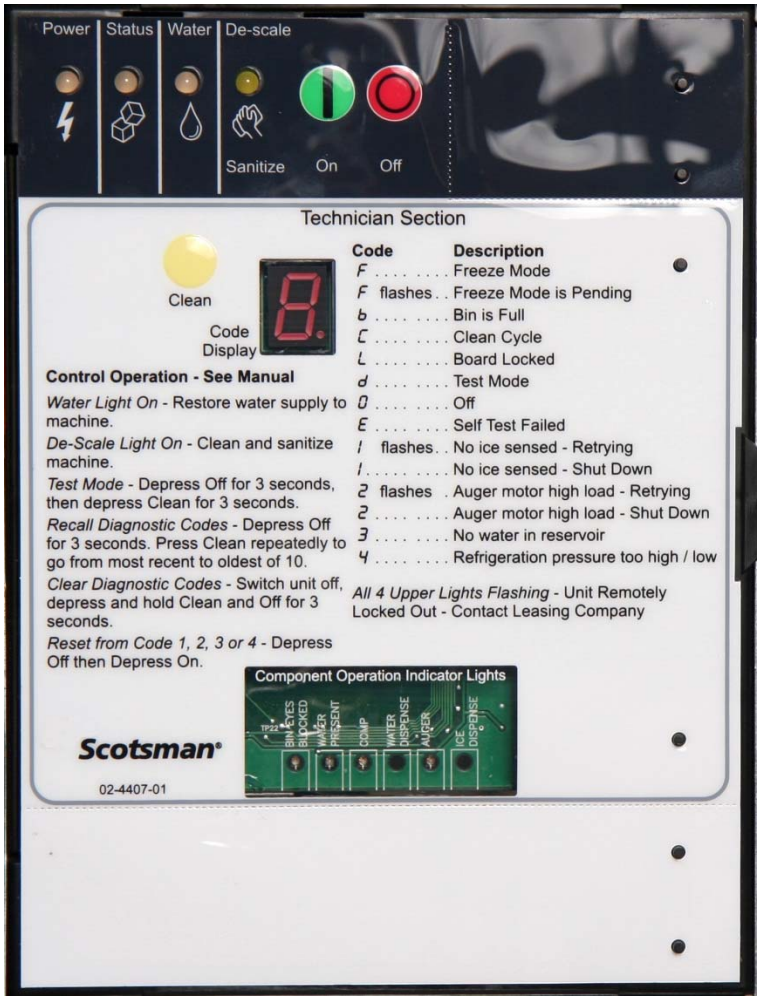
- Seven Lights
  - Water OK
  - Power OK
  - Service
  - Freeze
  - Bin Full
  - Compressor (LED3)
  - Gear Reducer (LED1)



Scotsman Ice Systems

Prodigy Controller

- Eight Lights
  - Power
  - Status
  - Water
  - De-scale / Sanitize
  - Bin Eyes Blocked
  - Water Present
  - Comp
  - Auger
- Code Display
- Three switches



Scotsman Ice Systems

Prodigy - Display Codes

- F = Freeze mode
- b = Bin full
- C = Clean cycle
- L = Locked
- d = test mode
- O = Off
- E = self test failed

A blinking code means a mode change – will restart or has restarted

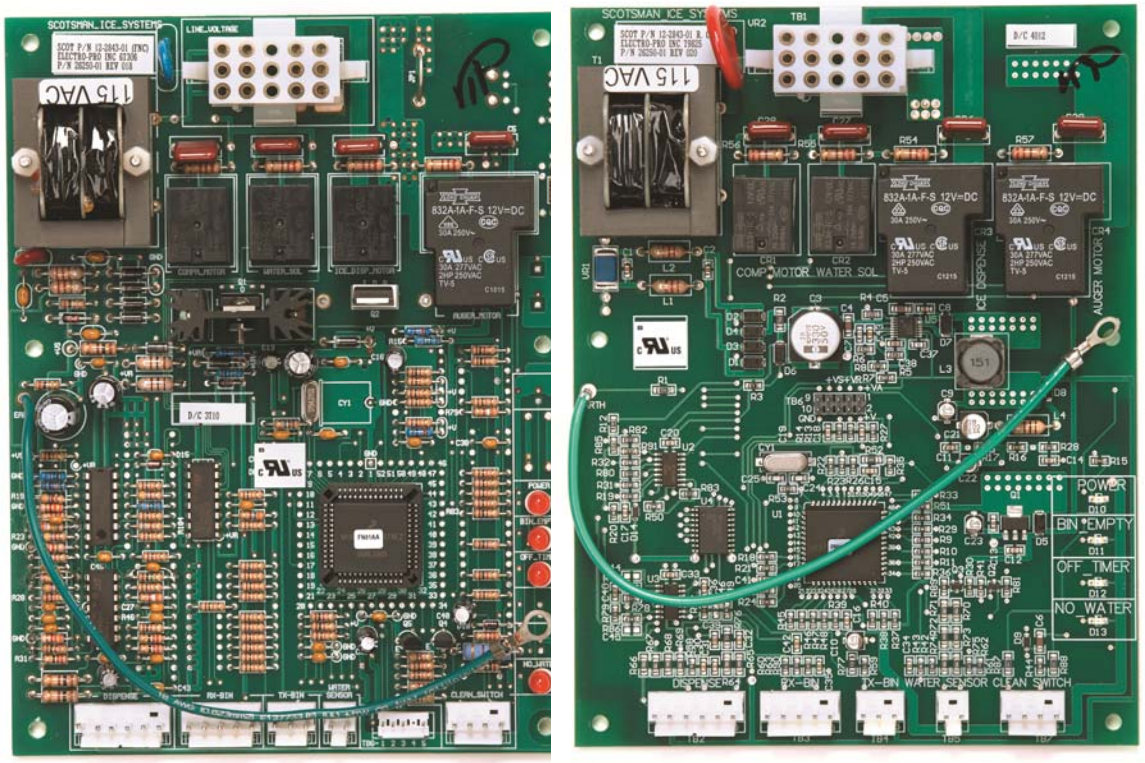
- 1 = No ice sensed
- 2 = Auger motor over amp
- 3 = No water sensed
- 4 = Refrigeration system pressure too high / low

- Manual codes:
- 0, 4, 6, 1 = time interval to Clean Light On settings

Scotsman Ice Systems

TDE & MDT3 thru MDT6 Controller

- Four Lights
  - Power
  - Bin Empty
  - Off Timer
  - No Water

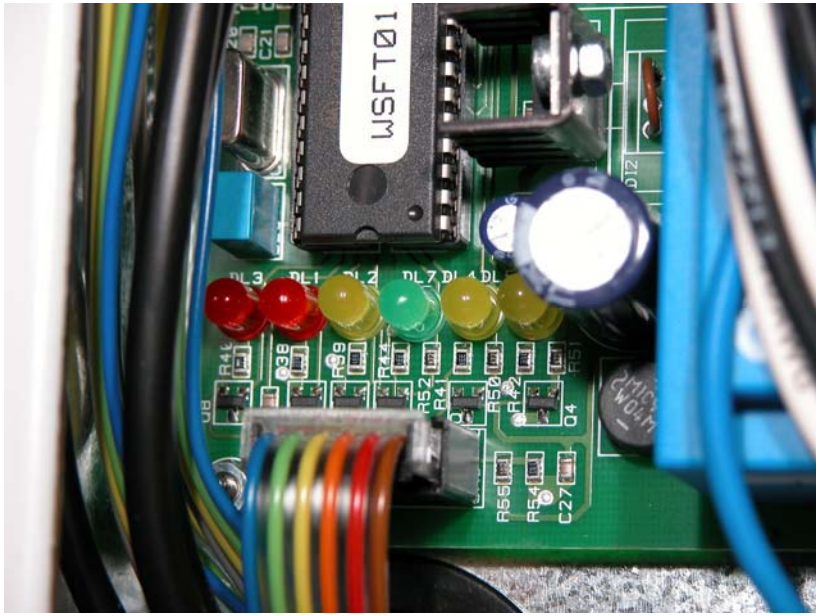


Current Controller

Scotsman Ice Systems

MDT2 Controller

- Six Lights (left to right)
  - Bin Empty
  - Hi condenser temp
    - If blinking, timing off mode
  - Auger Motor Rotation Failure
    - If blinking, hi evap temp
  - Power
  - No Water
  - Bin Full

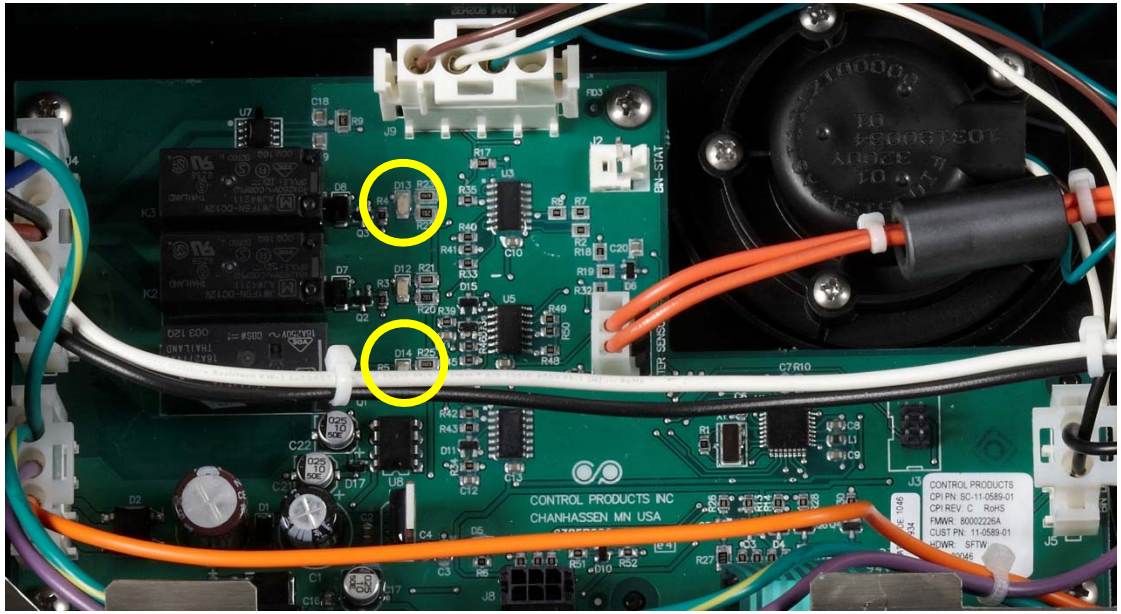


- Dispense board signals fault by blinking its lights

Scotsman Ice Systems

NU130 Controller

- Three cabinet lights
  - Ice Making
  - Check Water
  - Time to Clean
- Two relay lights
  - Compressor
  - Auger Motor



Scotsman
Ice Systems

Flaked and Nugget Cleaning

- All models, use Scotsman Clear 1 Ice Machine Scale Remover – it is nickel safe
  - Ratio: 8 ounces to 3 quarts of clean water
  - Shut water off
  - Drain and refill reservoir / evaporator
  - Soak with unit off, then operate unit, use all scale remover solution
    - Prodigy and NU130 have clean mode that includes soak time
  - Switch water back on
  - Repeat if needed, do NOT increase strength

Scotsman Ice Systems

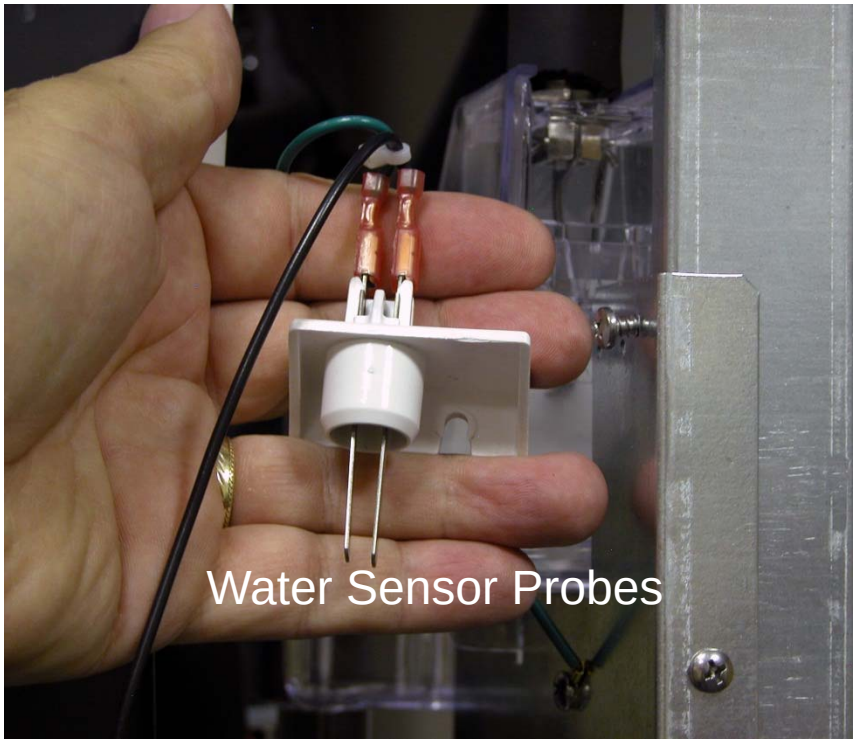
Maintenance – Scale Removal

- Clean mode
  - Push Clean button
  - Timed soak / auger in motion – 20 minutes
  - Timed run / ice making – 20 minutes keep reservoir full of solution
  - Resets clean light

Scotsman Ice Systems

Maintenance

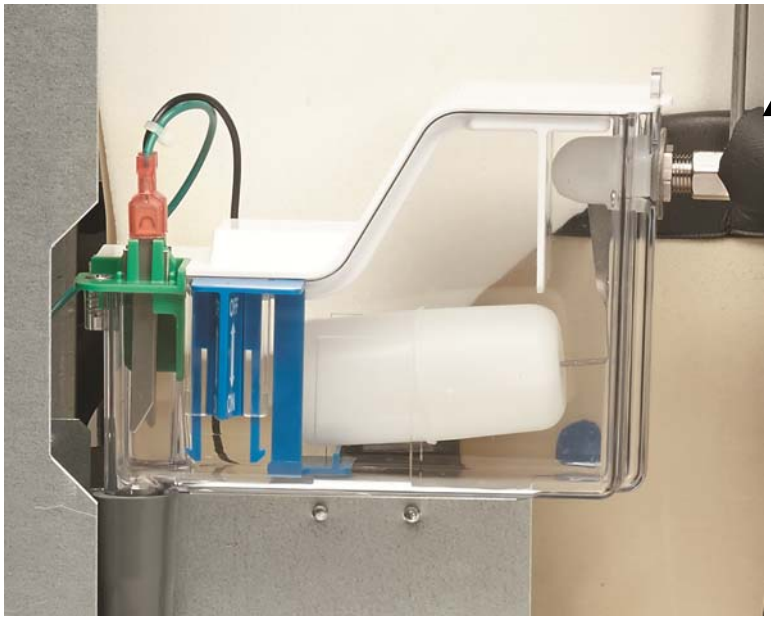
- Check mechanicals
  - Clean air filter
  - Clean Water Sensor
  - Ice Sensor
    - Clean eyes
  - Top bearing
    - Check / Repack
  - Water seal
    - Check condensate pan
  - Gear reducer bolts
    - Check torque
      - 275 inch pounds

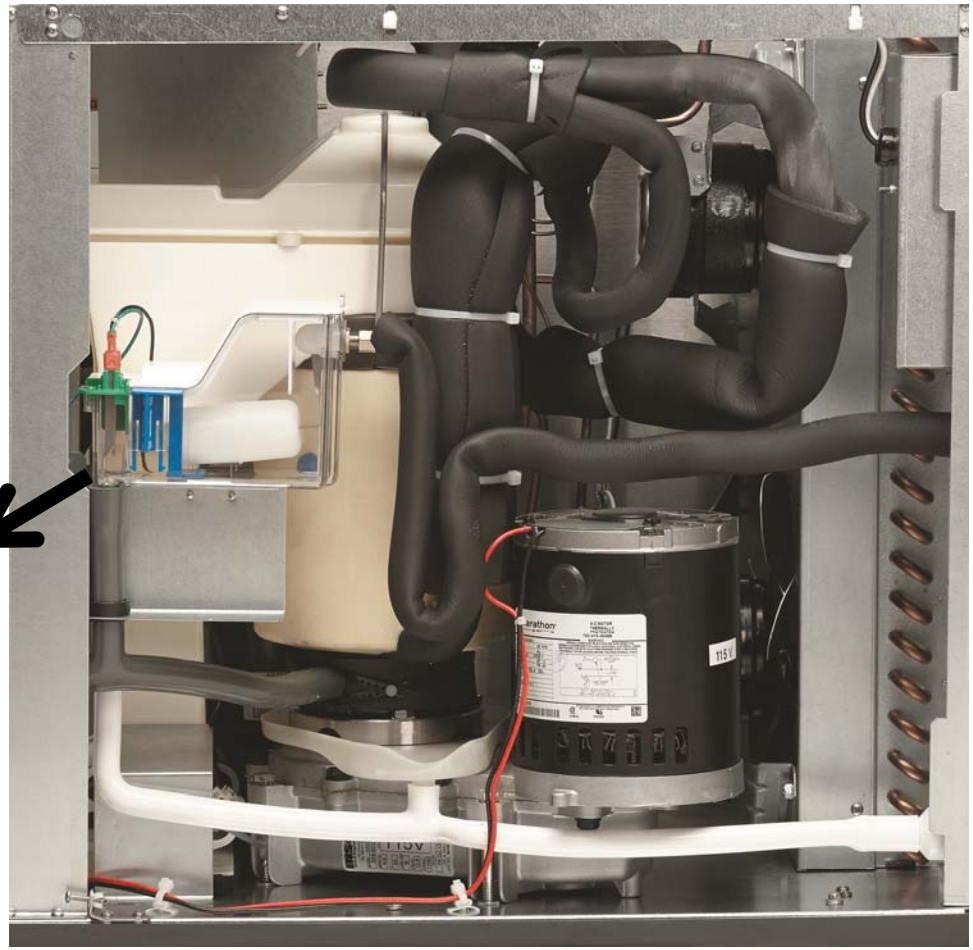


Scotsman Ice Systems

Update

- Changed Reservoir in 2012
  - Copper inlet tubing
  - New sensor position
  - Float bulb lever

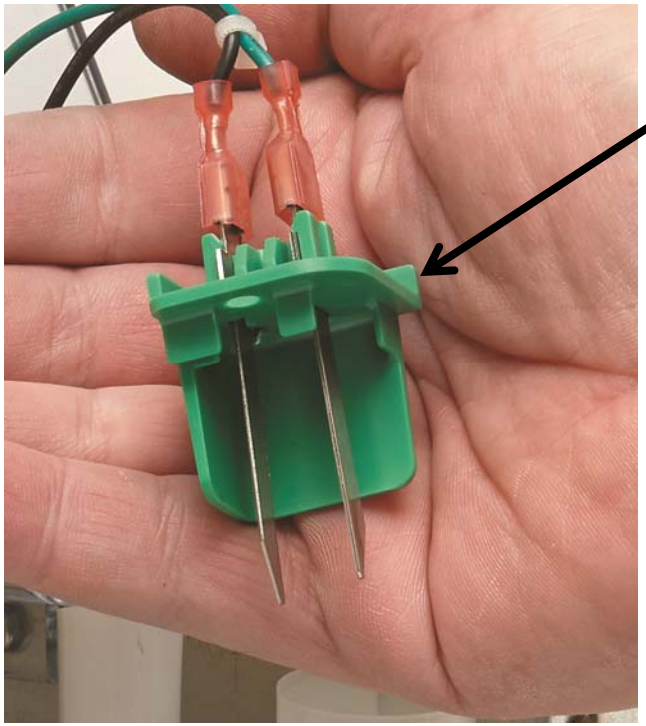




Scotsman Ice Systems

Maintenance – Current Version

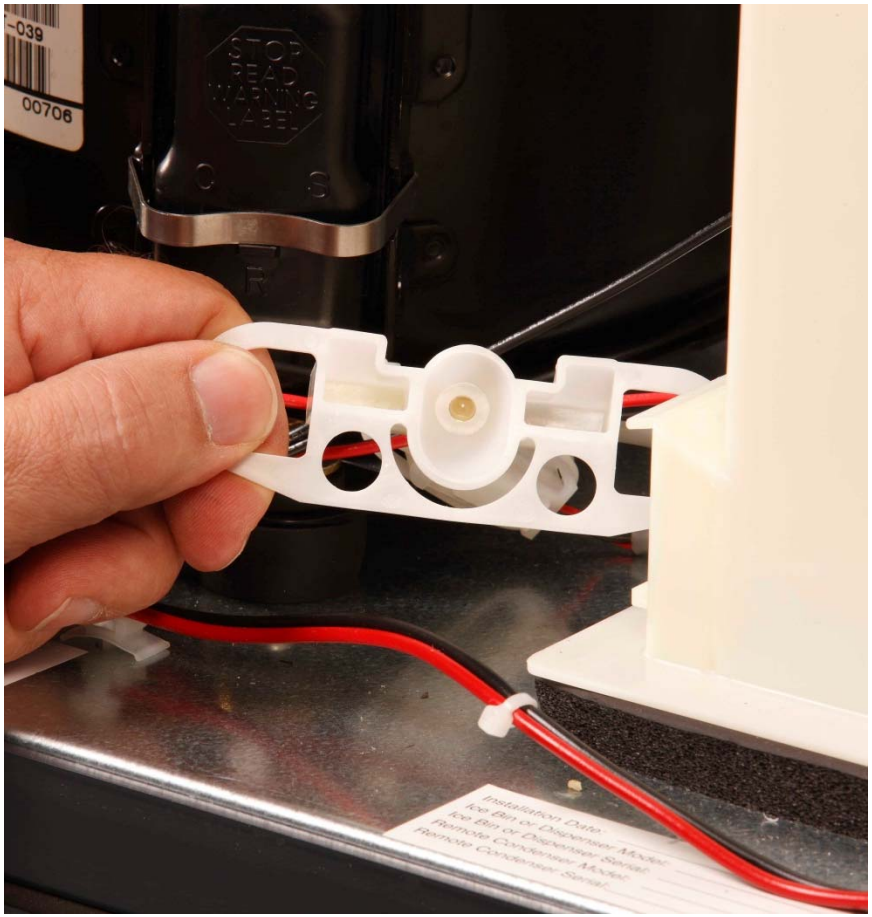
- Check water level sensor
  - Probes clean and not shorted



Scotsman Ice Systems

Maintenance

- Clean ice sensors
  - Photo eye set
  - Slide out to remove
  - Wipe with diluted ice machine scale remover



Scotsman
Ice Systems

Bearing Access

- Push bail clamp back
- Remove chute cover
- Remove ice sweep
- Remove breaker cover
  - Left hand threads

Scotsman Ice Systems

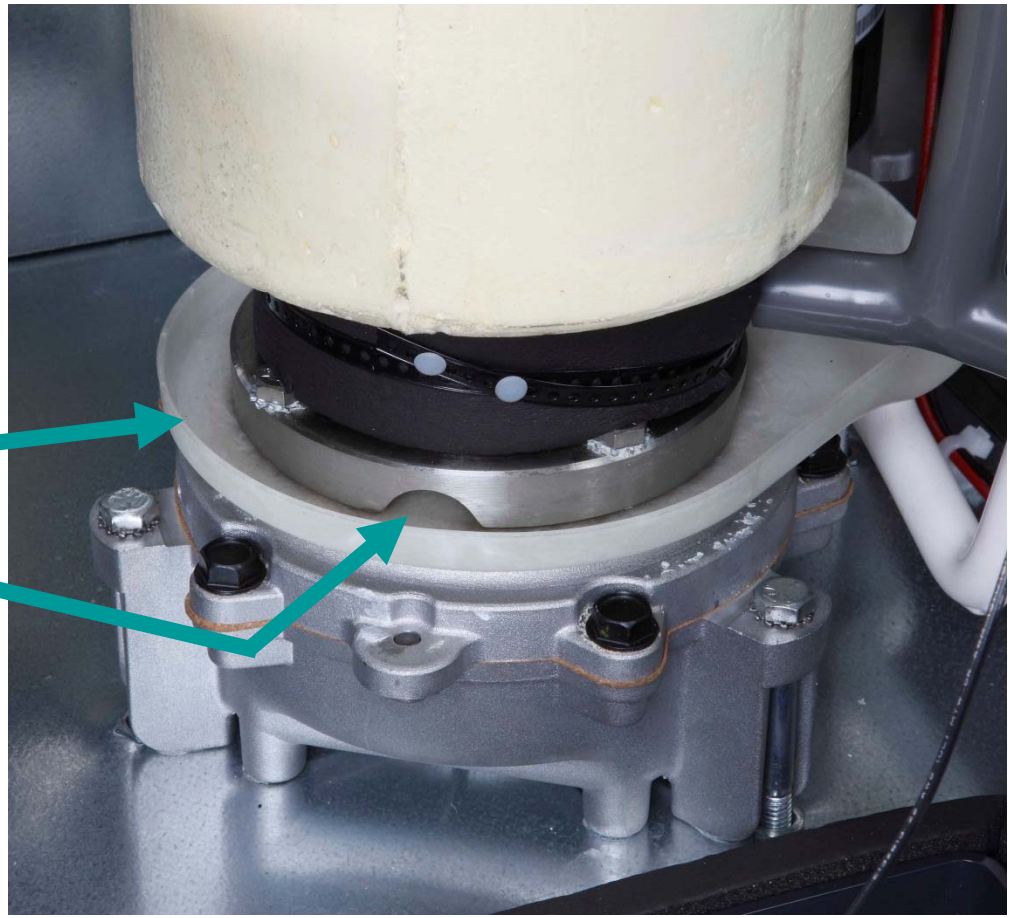
Maintenance

- Bearing service
  - Grease all white – OK
  - Grey streak – add grease to check
  - All grey - repack
    - Repack with grease needle
- Replacement
  - Use arbor press to remove and press in new bearing

Scotsman Ice Systems

Maintenance

- Water Seal
  - Check condensate pan
  - Water seal leak drains into pan



Scotsman Ice Systems

Service

- Remove the Auger
  - Shut off water
  - Drain reservoir & evaporator
  - Push bail clamp back
  - Remove cover
  - Remove ice sweep
  - Remove upper chute

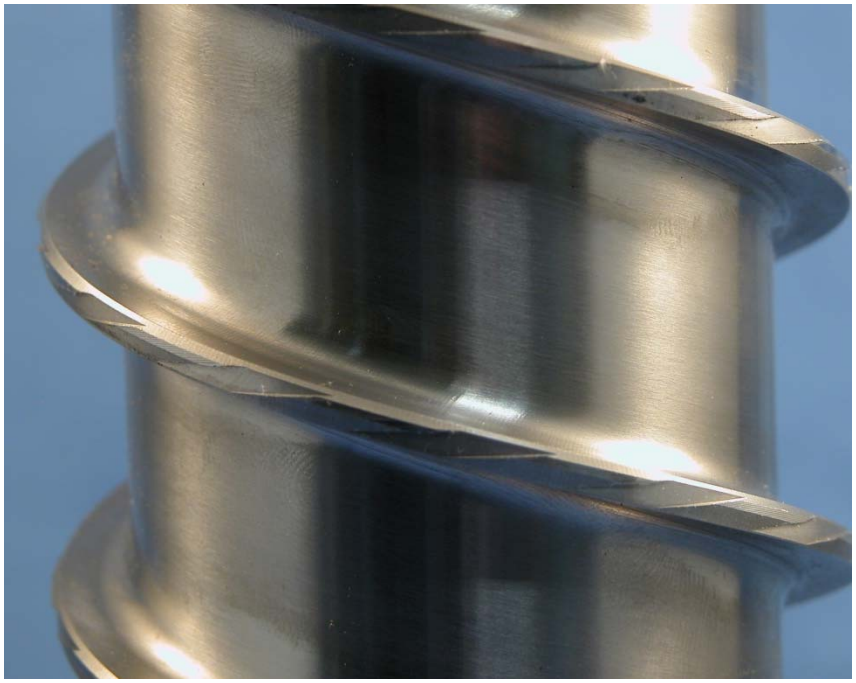
Scotsman Ice Systems

Service

- Loosen auger stud
- Remove 4 allen head bolts
- Lift Auger out, dry off
  - Works best clean & bright
  - Examine auger edges
    - Excessive bearing wear will cause auger damage
  - Check evaporator wall for scale
- Replace Water Seal

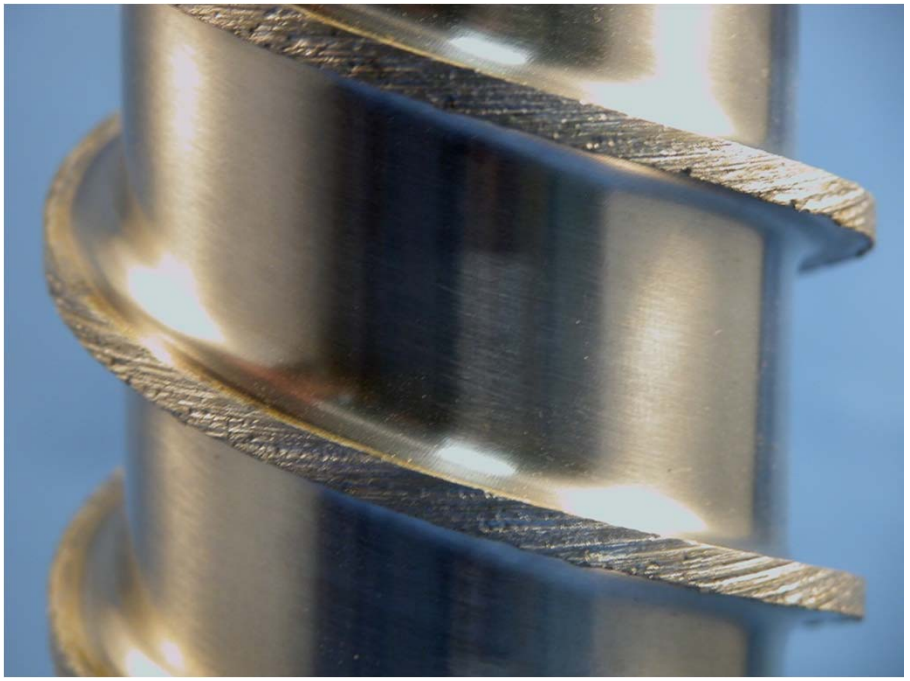
Scotsman Ice Systems

Auger



Auger as it should look,

clean and not damaged.



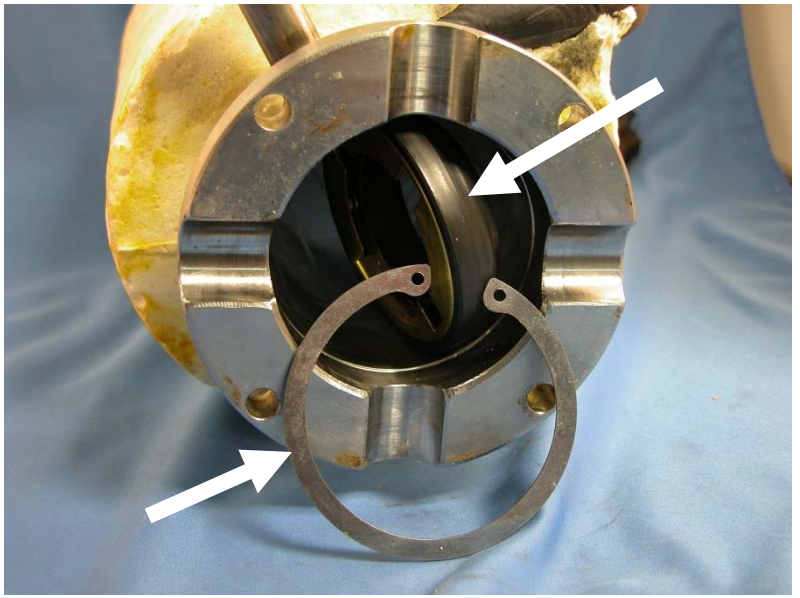
Damaged Auger –

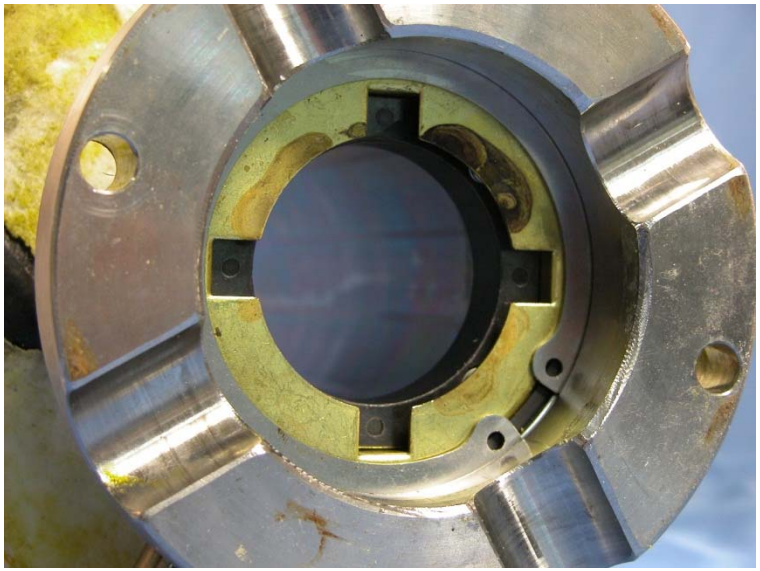
replace, do not use!

Scotsman Ice Systems

Water Seal Replacement

- Remove auger
- Separate from gear reducer
- Remove retainer and stationary half of seal



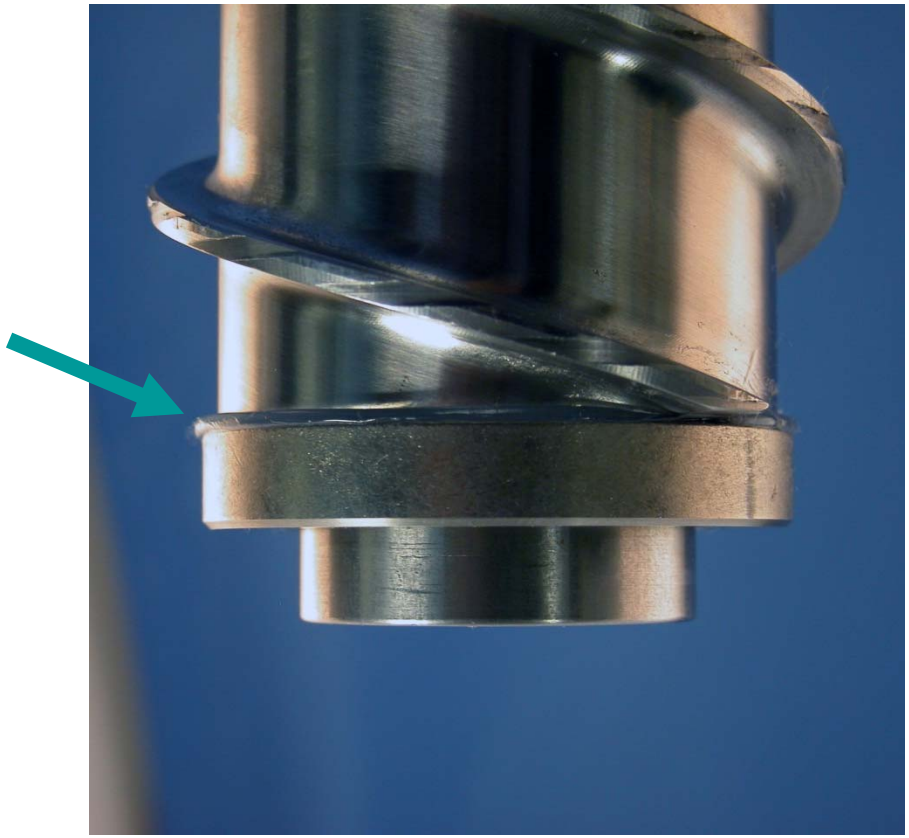


- Lubricate new seal half
- Insert seal into tube
- Install retainer
- Reposition seal onto retainer

Scotsman Ice Systems

Water Seal Replacement

- Rotating Half
  - Clean auger shoulder
  - Add bead of food grade sealant to shoulder
  - Lubricate rubber
  - Slide onto auger
  - Sealant fills gap



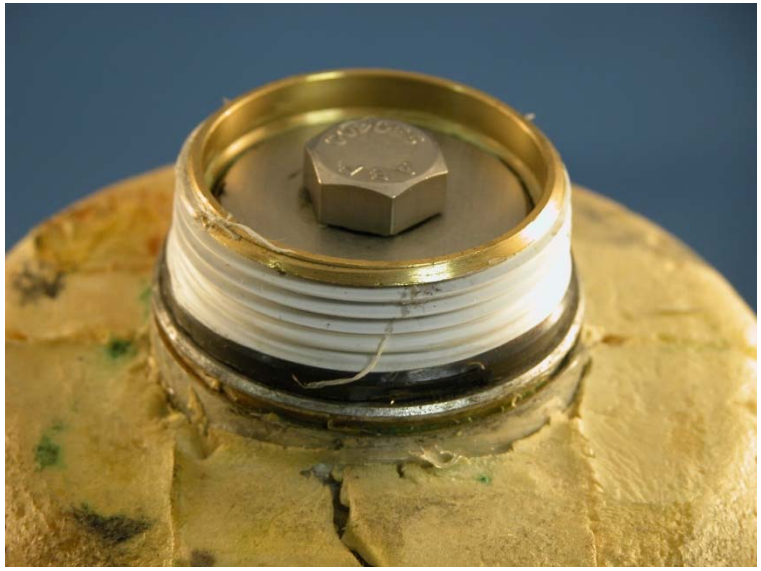
Scotsman Ice Systems

Service: Top Bearing

- Remove auger stud
- Separate breaker from auger, check bearing
  - Remove / Replace bearing using arbor press
  - Install new lip seals, cup side up
    - 2” PVC coupling install tool
    - Lube seals with food grade grease before installing bearing

Scotsman Ice Systems

AFE/MDT3 or 4 Top Bearing Access



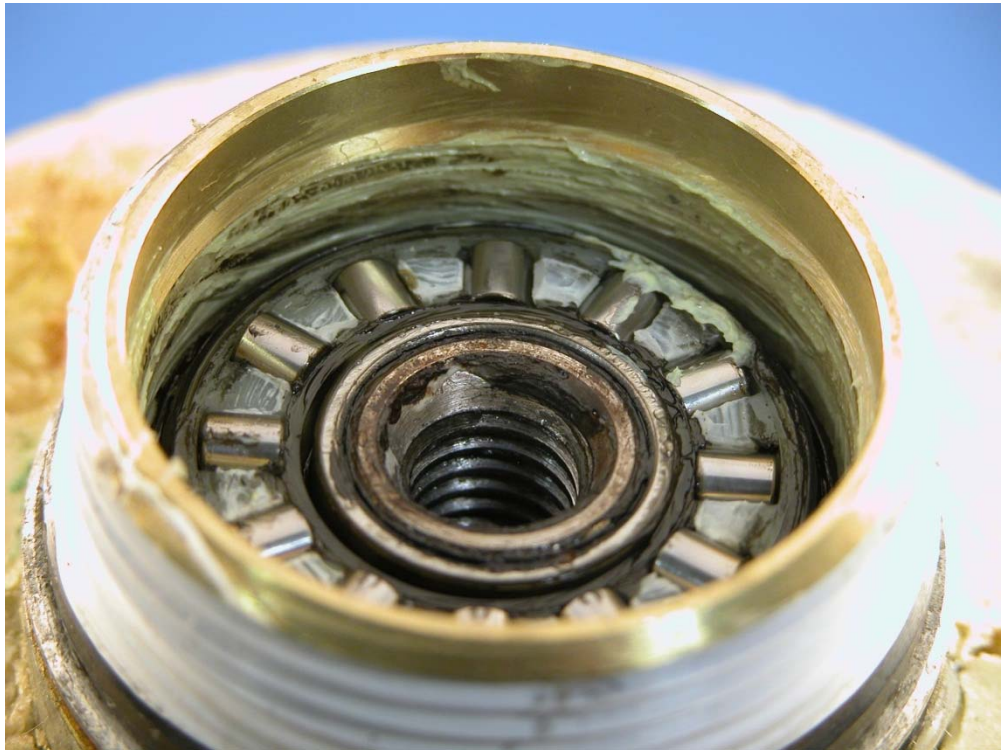
Remove Plastic Cap

Unscrew Bolt, Remove Thrust Washer

Scotsman Ice Systems

AFE/MDT3 or 4 Top Bearing Inspection

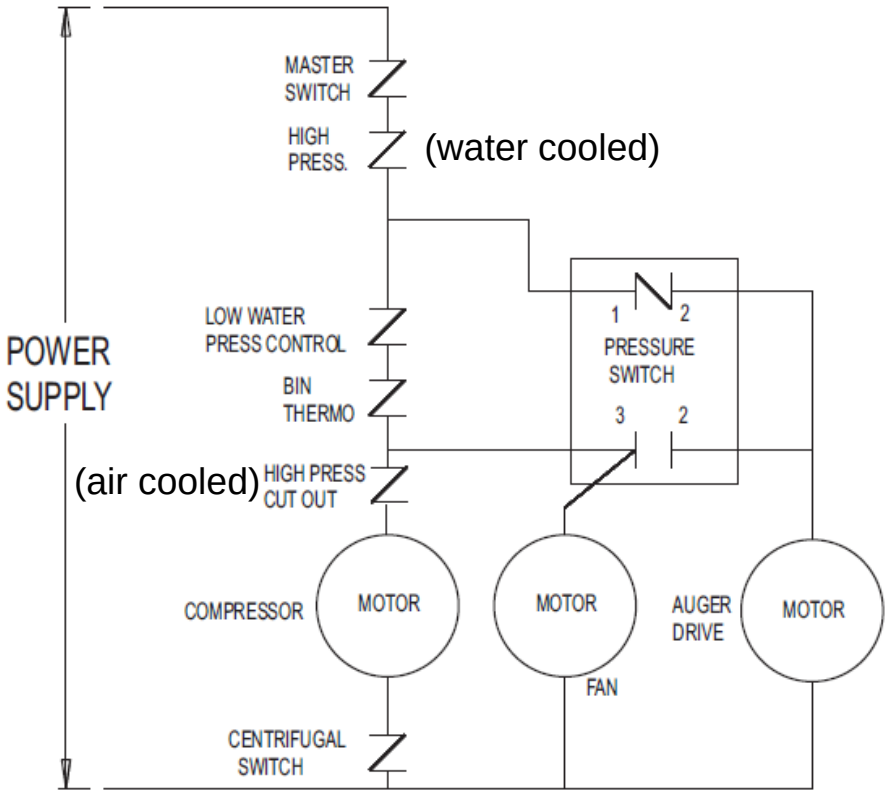
- Clean up and repack with small amount of grease
- Return thrust bearing to unit
- Put plastic cap back on, be sure it is on tight



Scotsman Ice Systems

AFE Service Diagnosis

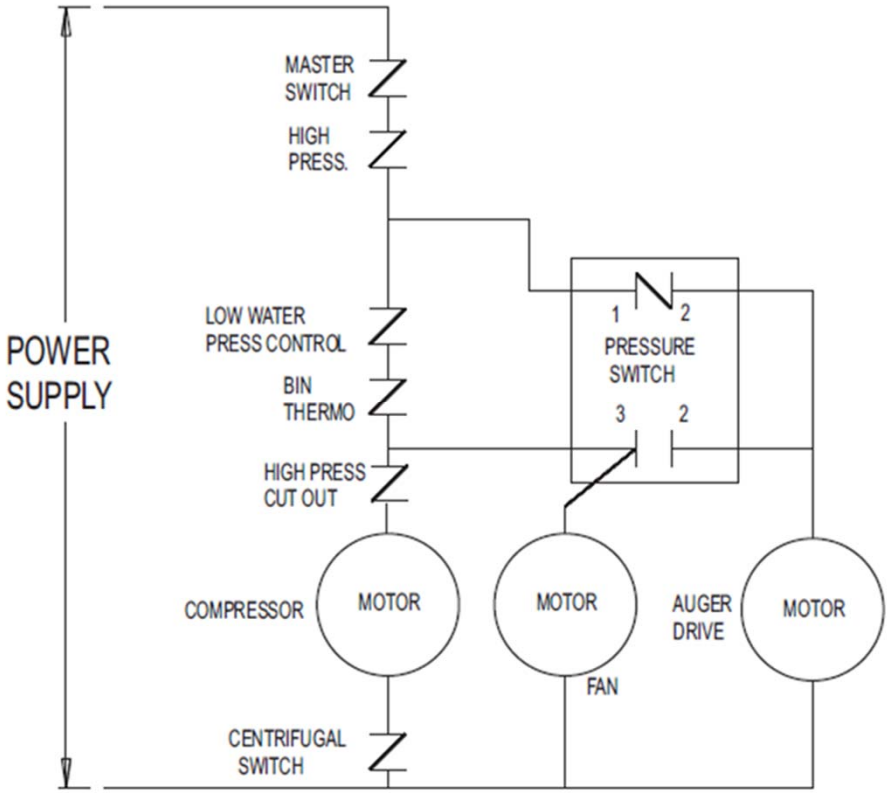
- Ice Maker Does Not Operate
- Check:
  - Bin Thermostat
  - Water Pressure Cut Out Switch
  - Hi Pressure Cut Out Switch



Scotsman Ice Systems

AFE Service Diagnosis

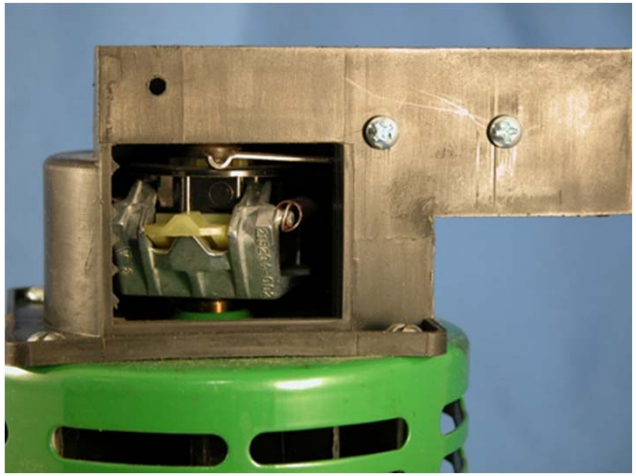
- Ice Maker Does Not Operate
- Check:
  - Auger Delay Contacts 3-2
  - Auger Drive Motor



Scotsman Ice Systems

AFE Service Diagnosis

- Compressor Does Not Operate
- Check:
  - Centrifugal Switch on Auger Motor
  - Compressor Relay, Capacitor
  - Compressor Motor



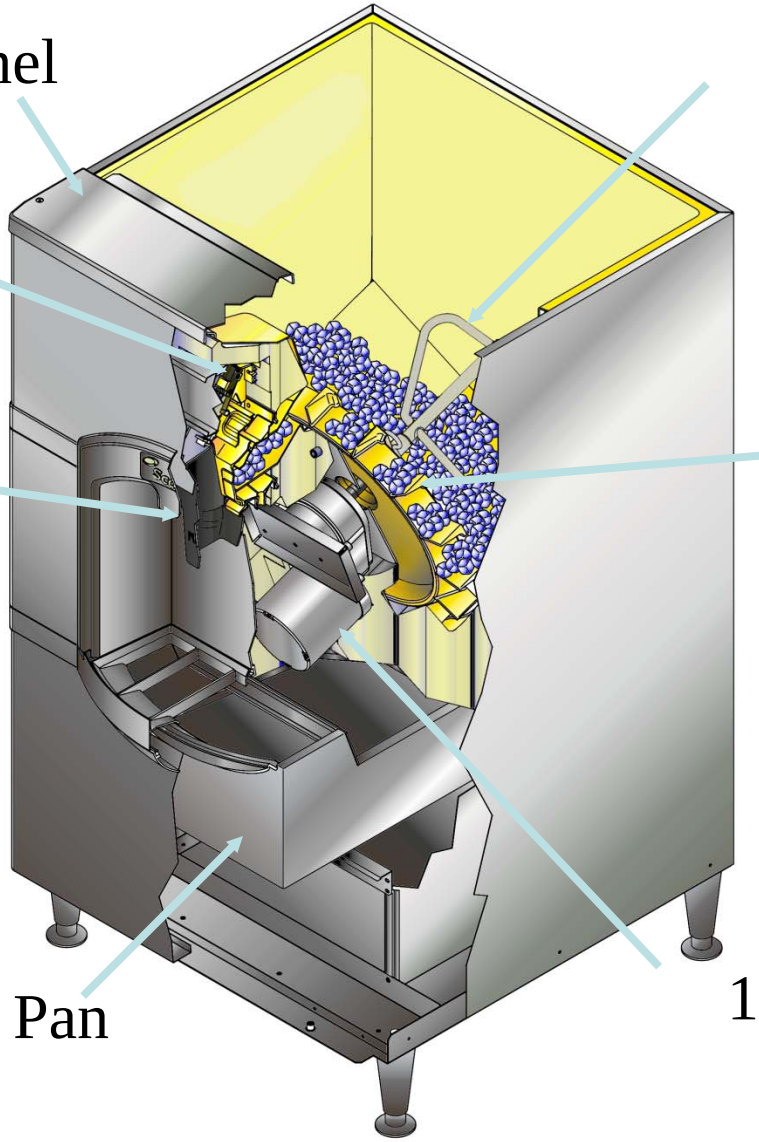
Scotsman Ice Systems

Hotel Dispensers

- HD22 and HD30
  - Primarily used with C0322 and C0330.

Scotsman
Ice Systems

HD22 & HD30



Removable Top Panel

Vend Switch

Ice Chute

Insulated Ice Catch Pan

Stainless Steel Sweep Arm

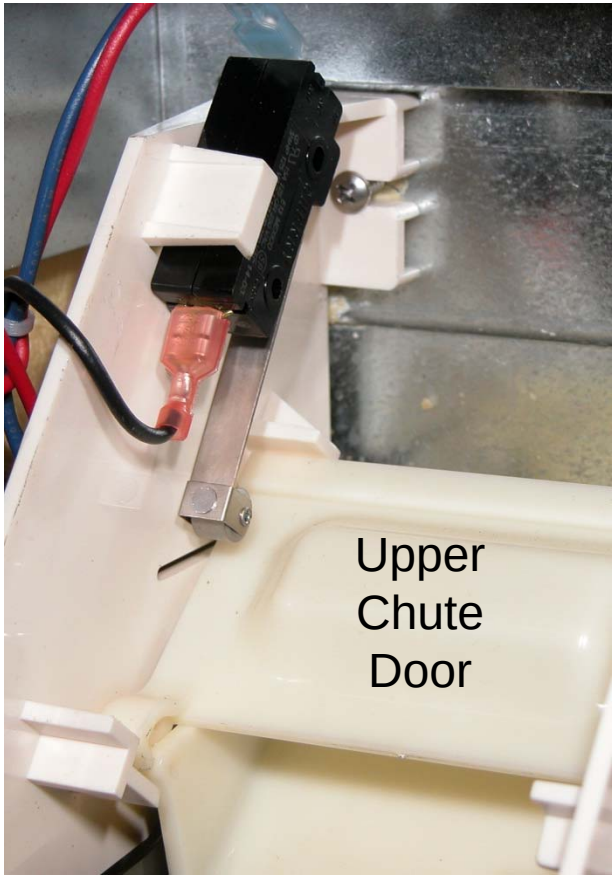
Dispense Rotor

1/4 HP Drive Motor

Scotsman Ice Systems

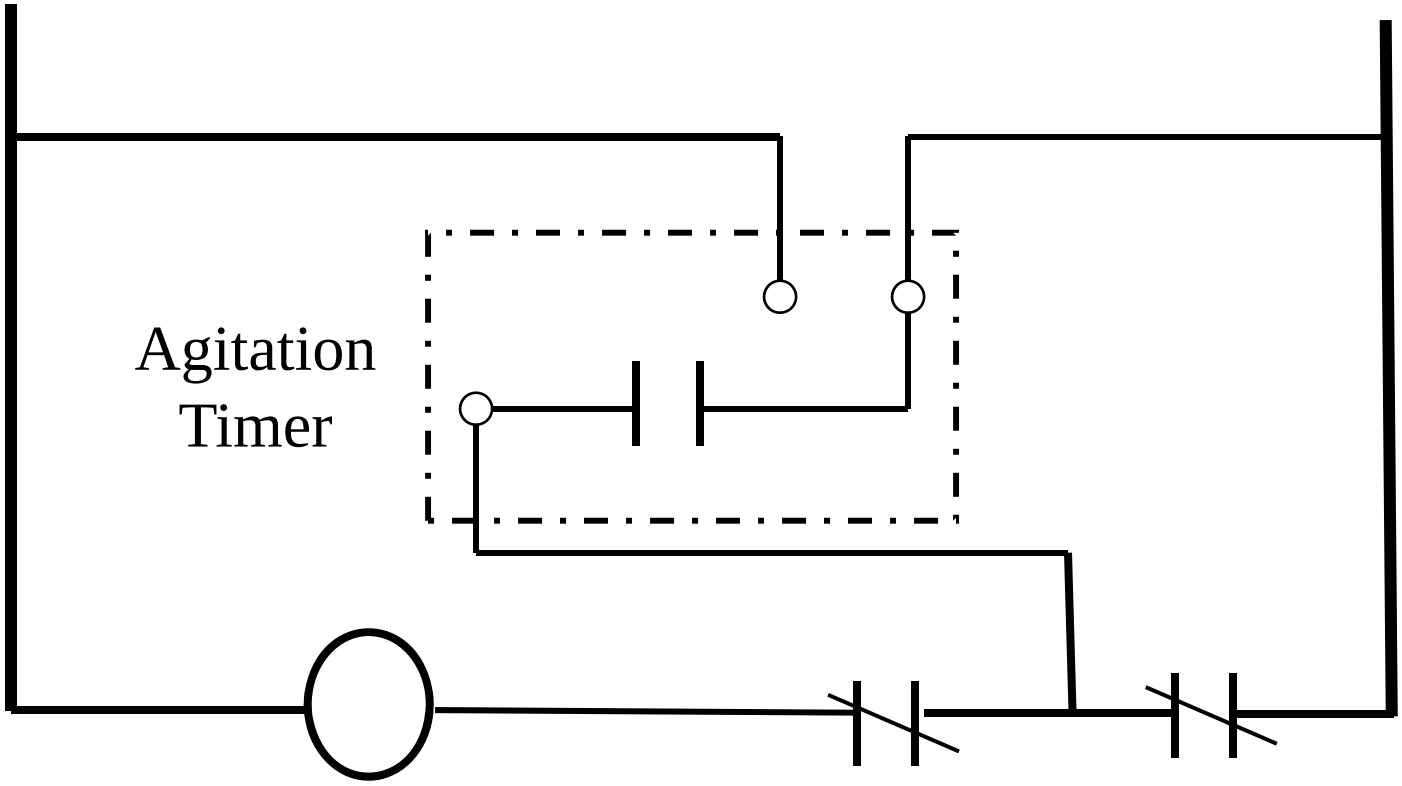
System Operation

- Push chute to dispense ice
- Upper chute door lifts up and moves vend switch closed
- Dispense drive motor starts, ice vends until chute is released
- Agitation timer cycles dispenser drive motor 3 seconds every 6 hours
  - Ice does not dispense during agitation



Scotsman Ice Systems

Schematic Diagram

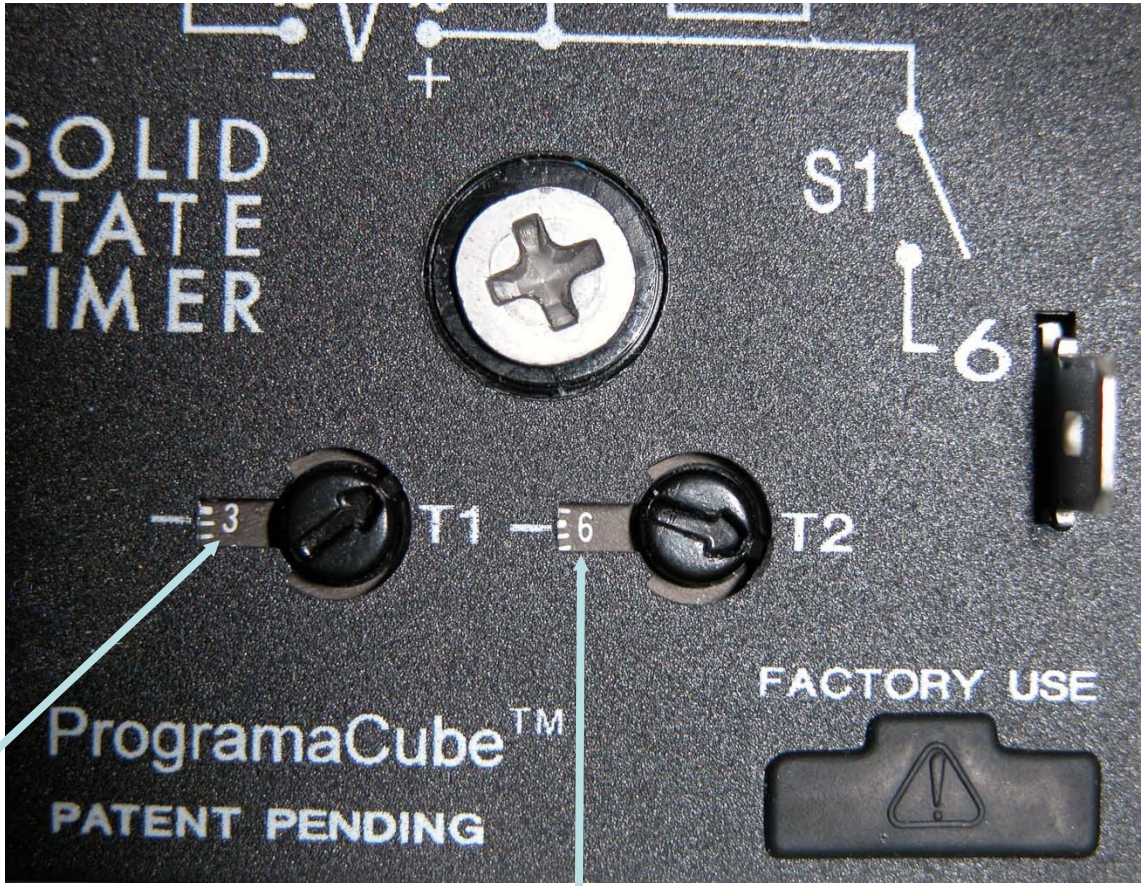


Shown in dispense mode

Scotsman Ice Systems

Agitation Timer

- Cycles at power up
- Cycles
  - 3 seconds on
  - Every 6 hours
  - Adjustable

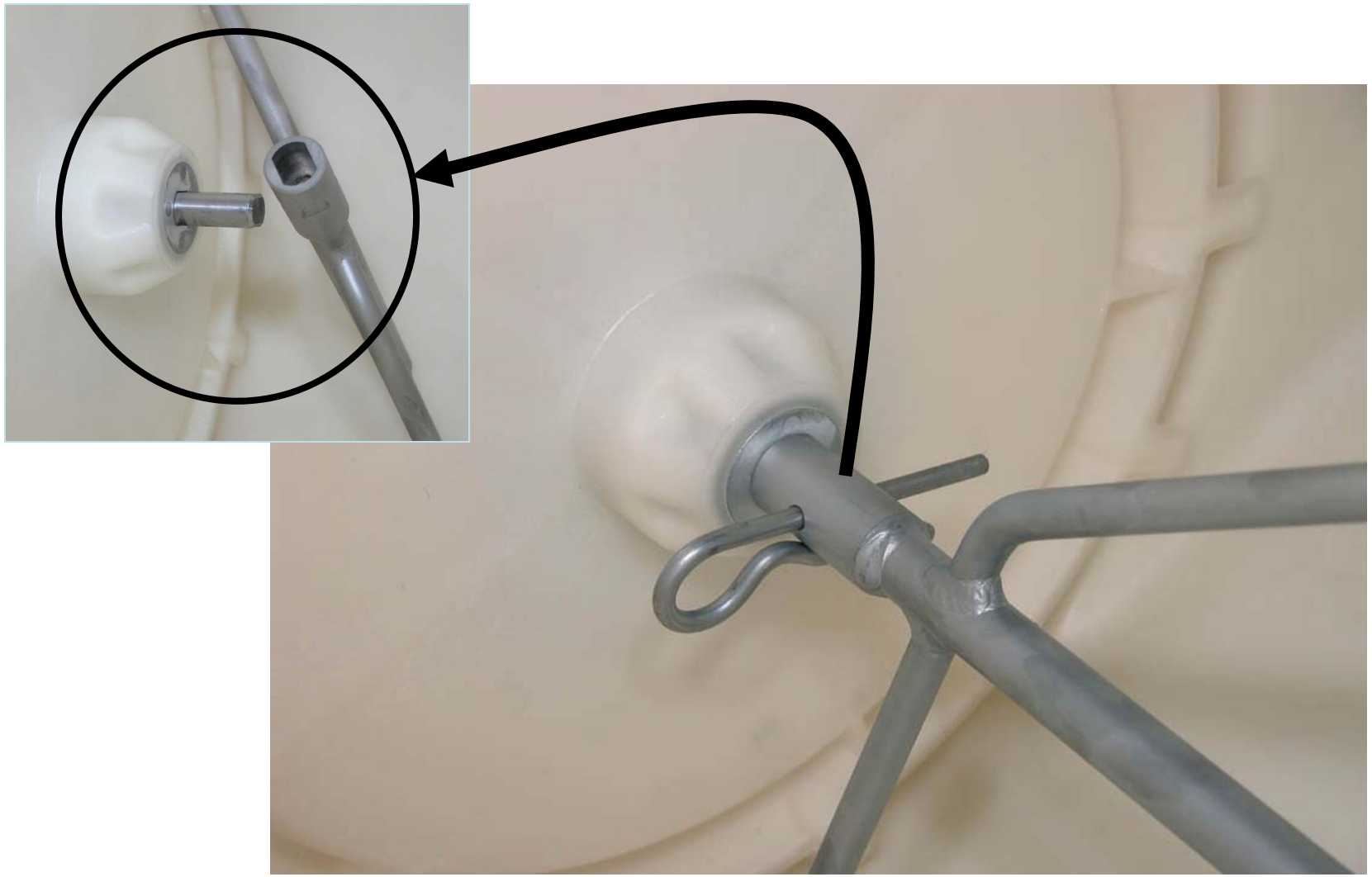


Seconds of On Time

Hours Between Cycles

Scotsman Ice Systems

Sweep Arm Drive



Scotsman
Ice Systems

Maintenance

- Ice catch pan is removable for easy clean out
- Can be pulled out partially without removing drain hose
- Drain hose easily disconnected when pan must be removed

Scotsman Ice Systems

Service Diagnosis

Symptom	Possible Cause	Probable Repair
No ice dispensed	No ice	Check machine
	Panel interlock switch open	Check top panel
	Vend switch does not close	Check vend switch
	Drive motor failure	Check drive motor windings
		Check capacitor

Scotsman Ice Systems

Nugget Ice Applications

for

Ice Beverage Dispensers

Nugget Ice Dispensing

- Manual Fill Dispenser Modifications
  - Must be set up for Nugget ice dispensing
    - Adapter
    - Kits
    - Adjustments

Scotsman Ice Systems

Scotsman or Cornelius Dispensers

- ID150
  - Add adapter and diverting plate
- ED150
  - Add adapter, diverting plate, change agitator, KVS to lower ice level
- ID200 or ID250
  - Add adapter (includes diverting plate) and KVS
- ED200 or ED250
  - Add adapter, ice slide, diverting plate addition, KVS
- All
  - Change agitation time to 2 seconds on every 3 hours

Scotsman Ice Systems

Cornelius Dispensers

- ED300
  - Add Cornelius adapter
  - Add Cornelius agitator kit
  - Add Scotsman bin control kit
- Flavor Fusion (IDC215/255)
  - Add Cornelius adapter
  - Add Scotsman KVS
  - Add diverting plate for Flavor Fusion

Scotsman Ice Systems

General Info

- N0422, N0622, N0922 or N1322
  - Scotsman
    - ID150
    - ID200, ID250
  - Cornelius
    - ED150, DF150
    - ED200, DF200
    - ED250, DF250
  - Lancer
    - Special 30” unit with N in the part number
      - Has special extended liner and different agitator
    - Sensation model – new product

Scotsman Ice Systems

Special Agitator

Standard 150 Agitator

Extra Tip

Special Agitator for ED150 & Nugget Ice

Scotsman Ice Systems

Flavor Fusion Type

- IDC215 or IDC255
  - Cornelius adapter
  - Cornelius diverting plate
  - Scotsman KVS

Scotsman Ice Systems

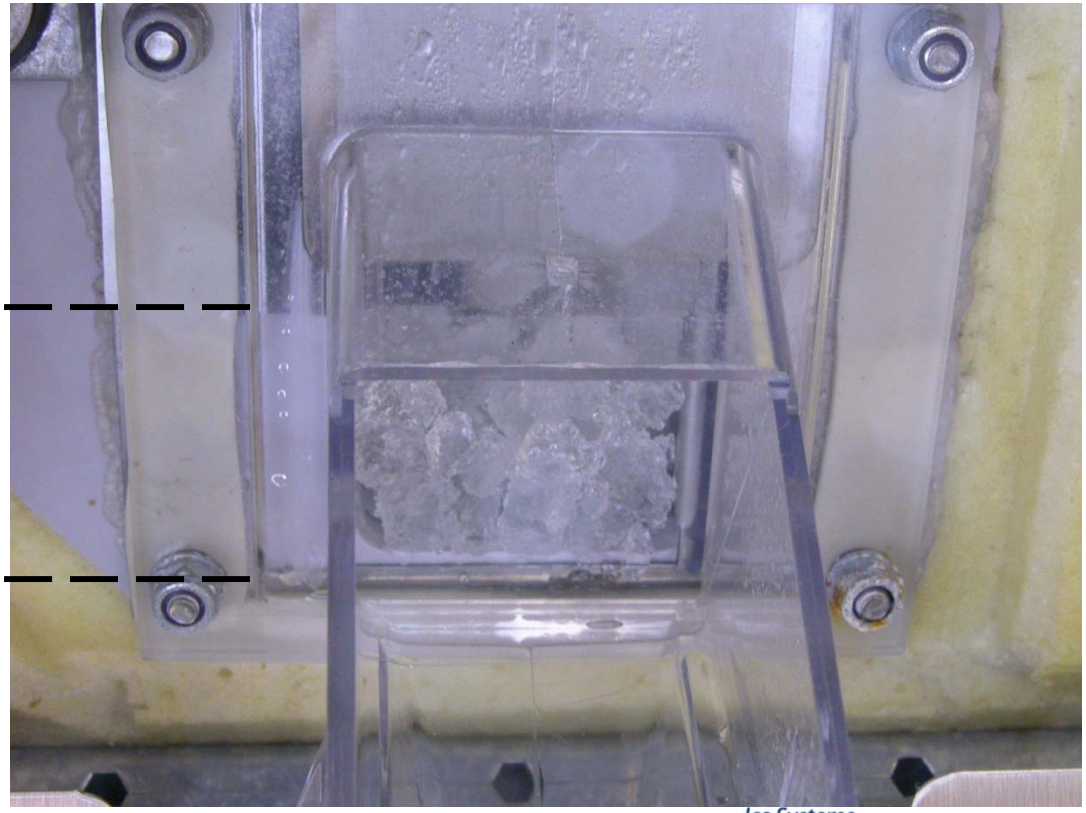
Diverter

- Required for Scotsman and Cornelius dispensers – will not dispense Nugget ice without it
- Installs in chute of dispenser
- Guides or diverts the ice into the chute as it is pushed past

Restrictor Plate

- Cornelius or Scotsman
  - Removal allows very rapid dispensing
  - Recommended: remove or keep and set opening to 1.5”

Restrictor Plate Mounting Holes are Slotted



All Brands and Models

- Agitation must be minimized when dispensing Nugget Ice
  - Scotsman has adjustment features for on time and interval
  - Cornelius has adjustments on their controller
  - Lancer has dip switches
  - SerVend can’t be adjusted but disconnecting the yellow wire to the agitation relay stops agitation

Scotsman Ice Systems

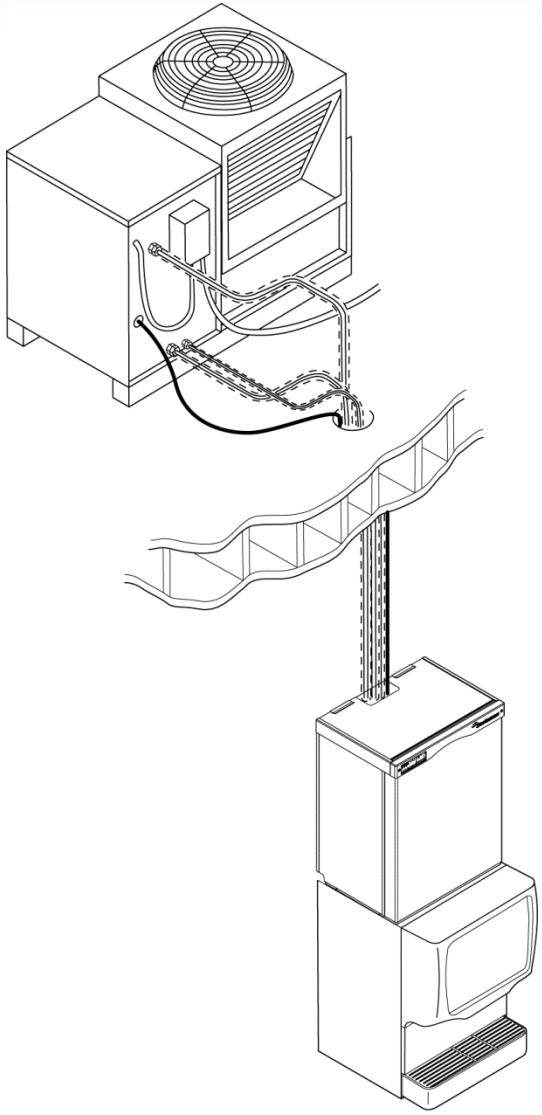
Ice Slide

- Slide is part of KDIL-PN-200 or 250 kits
- Inserts from above into slot bottom of dispenser hopper
- Distributes ice evenly over the cold plate

Scotsman Ice Systems

Eclipse

- Remote low side cuber, common models:
  - CME810 – prior
    - CM³ control system
    - Individual cubes
  - EH222 – current
    - Prodigy control system
  - EH330 and EH430 - current
    - Larger capacity Prodigy models
    - Two evaporator plates



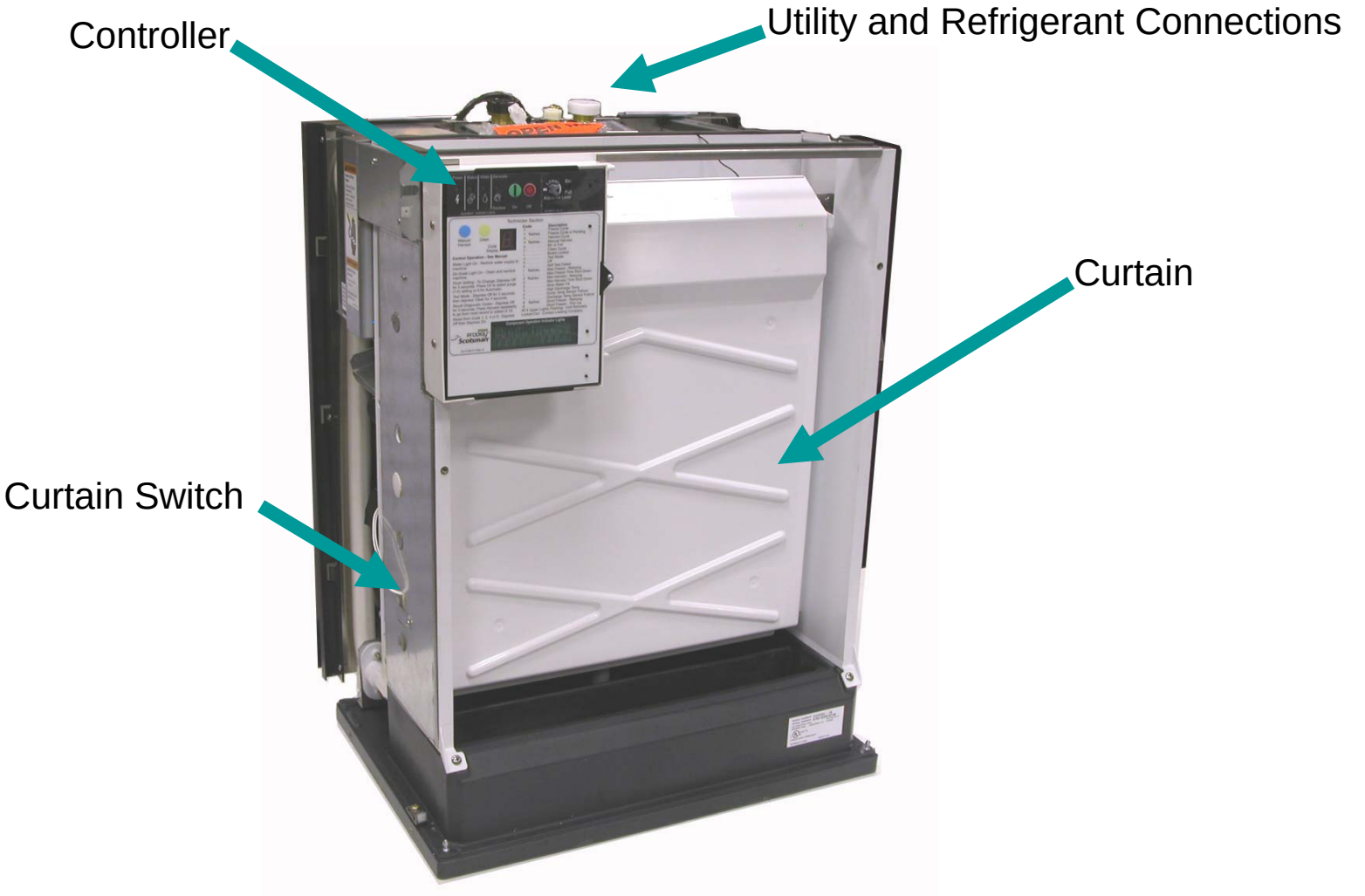
Scotsman Ice Systems

EH222 Head

- Ice making compartment
  - One evaporator – faces front
  - Controller in front of curtain

Scotsman Ice Systems

EH222 Freezing Compartment



Scotsman
Ice Systems

Curtain Switch

- EH222 – located to the left of the curtain
- When curtain is open, switch is open.
  - Curtain switch indicator light on controller will be ON when open.
    - EH130 and EH222 will always have one curtain switch light on.

Scotsman Ice Systems

Vari-Smart or KVS

- Adjustable ice level
  - Standard on EH222
  - Optional on all others

Adjustment Knob

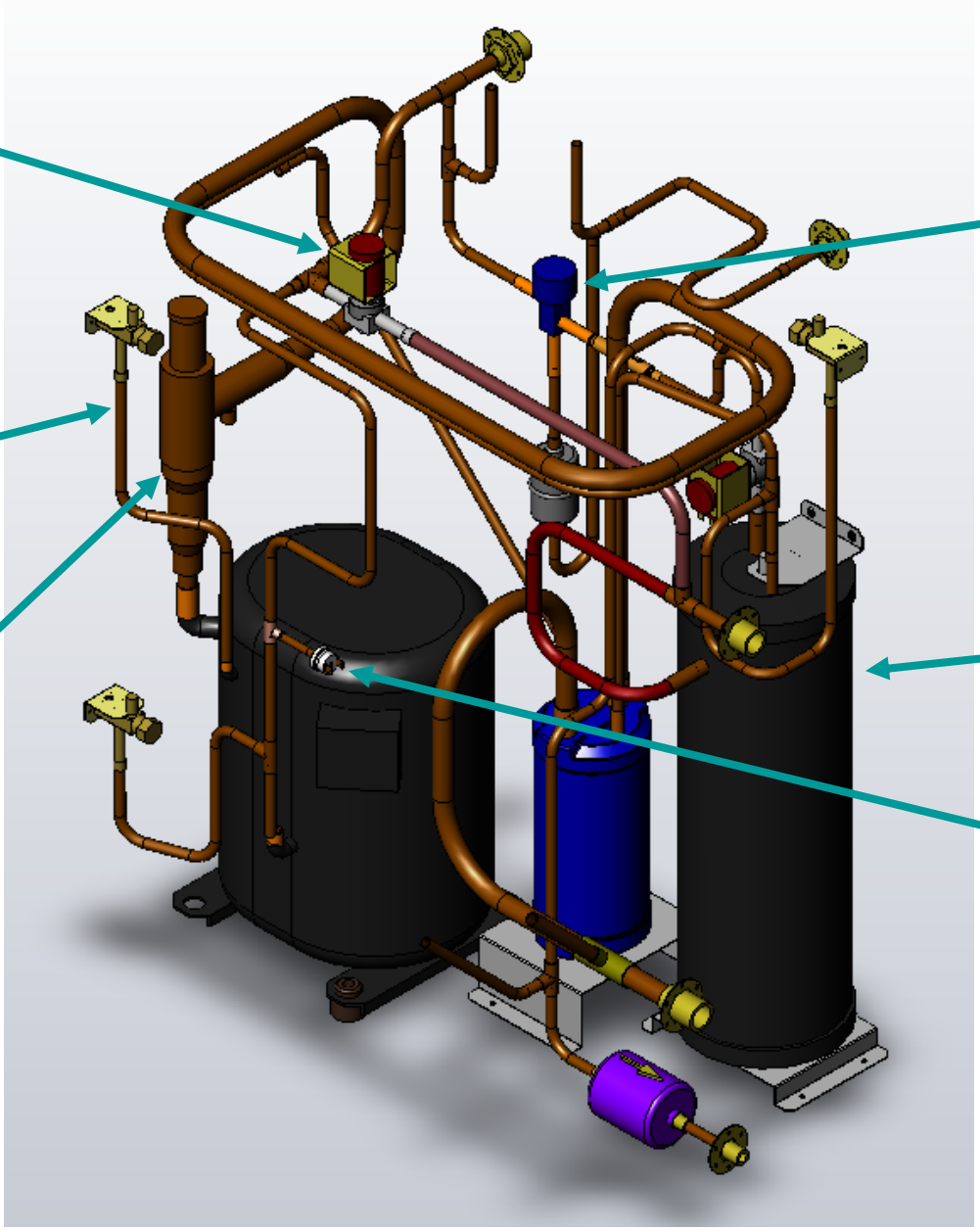
Scotsman Ice Systems

Compressor Packages (CP Unit)

- Several models
  - For EH222
    - C0800CP
    - C1410CP
  - For EH430
    - C1410CP
    - C1800CP
    - C2000CP
  - For EH330
    - C1200CP

Scotsman
Ice Systems

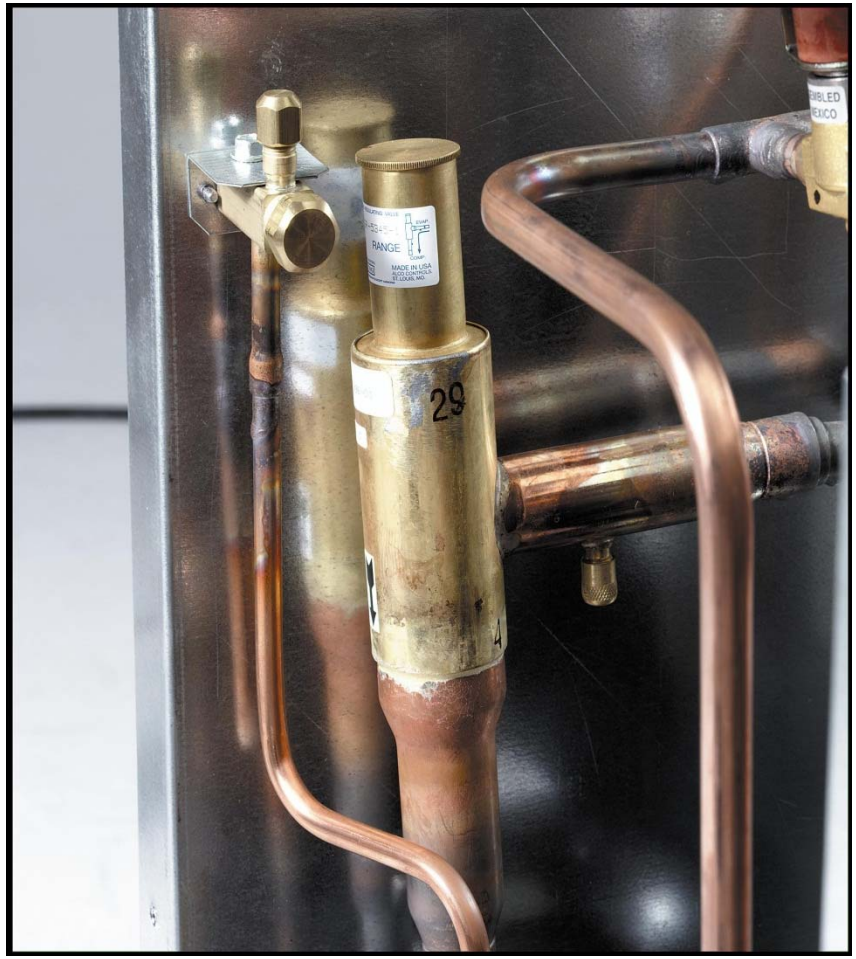
CP Unit



Scotsman Ice Systems

Crankcase Pressure Regulator

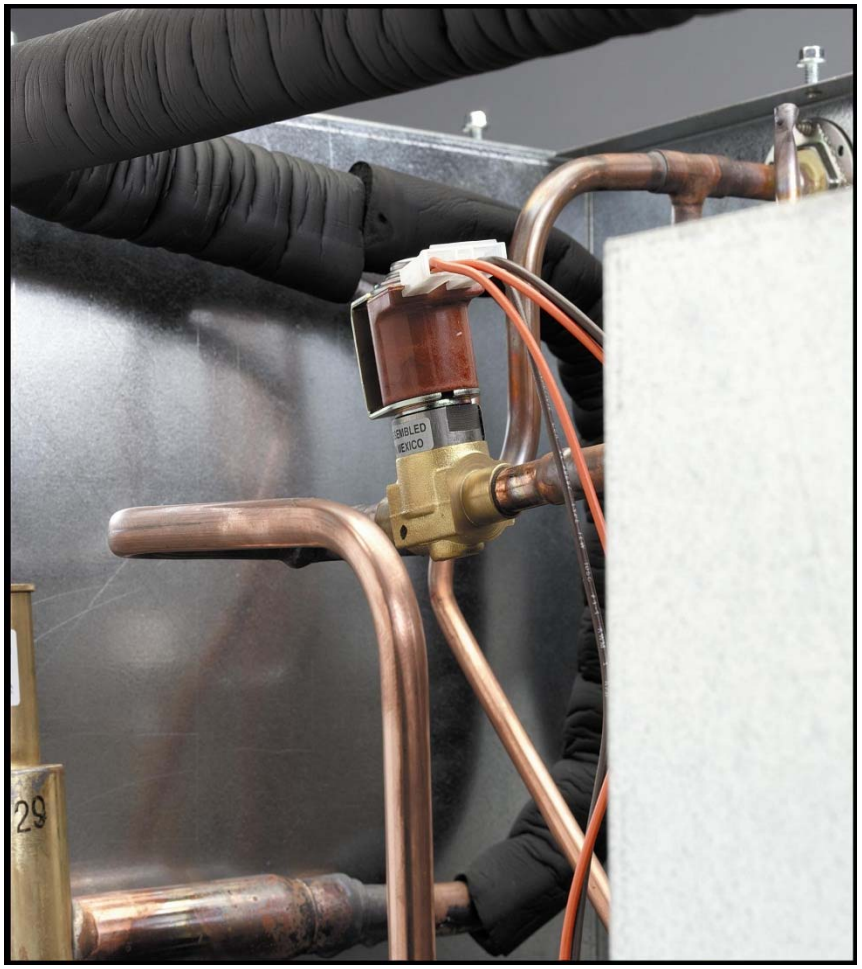
- CPR valve restricts compressor dome pressure during harvest
  - 55 to 60 PSIG
  - Pre-set - don't adjust it!
- Low Side Access valve connected to compressor dome, reads evaporator pressure during freeze, but not during harvest – use quick connect for evap press



Scotsman Ice Systems

Condenser Bypass Valve

- Normally Closed, opens during harvest
- Bypasses condenser coil and directs discharge gas to vapor line



Scotsman Ice Systems

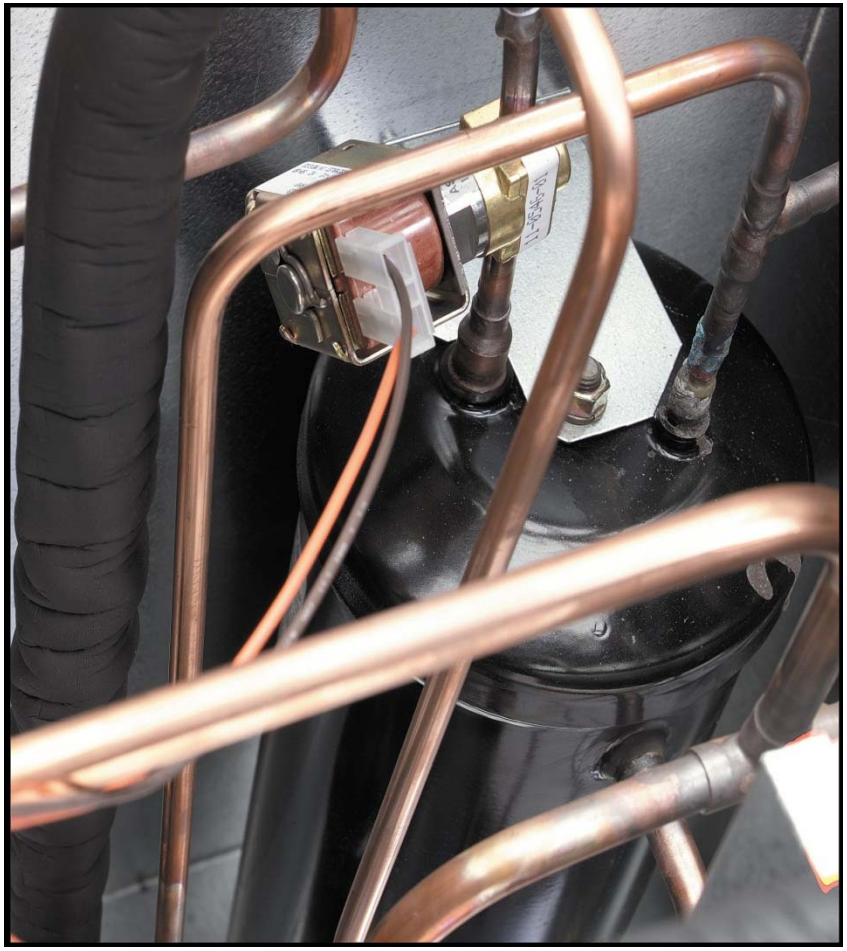
Headmaster

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

Scotsman Ice Systems

Liquid Inlet Valve

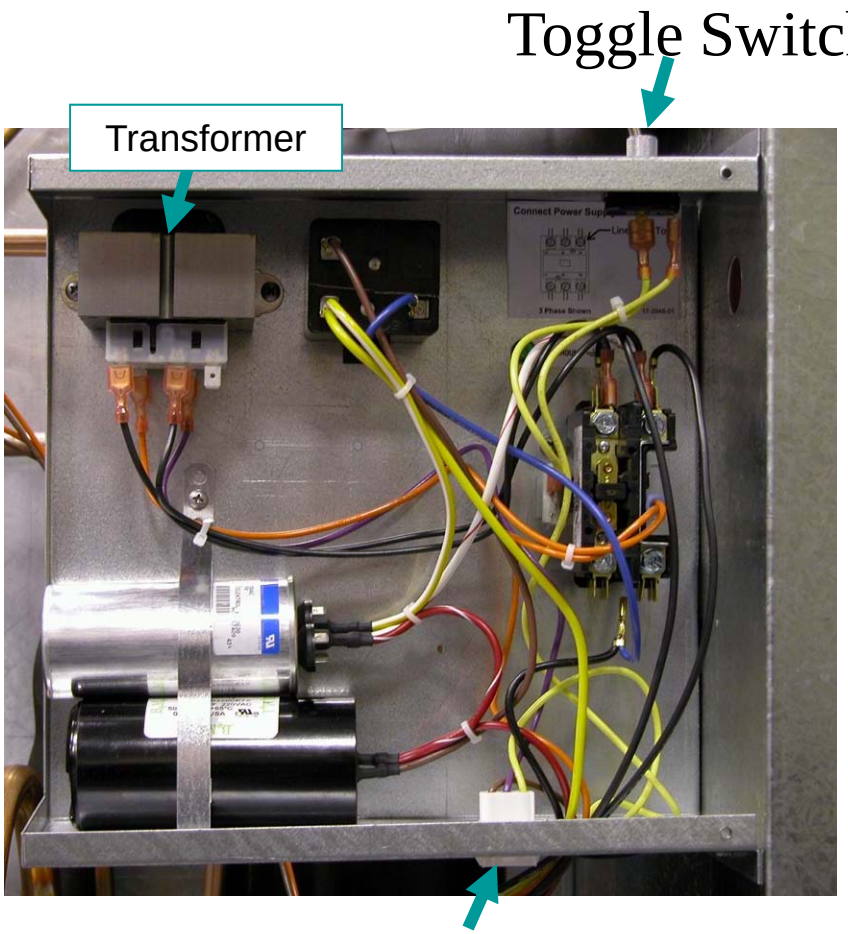
- Normally Open, closes during harvest
- Controls liquid flow into receiver
- Isolates refrigerant in condenser during harvest
- Improves cycle time



Scotsman Ice Systems

Electrical Box

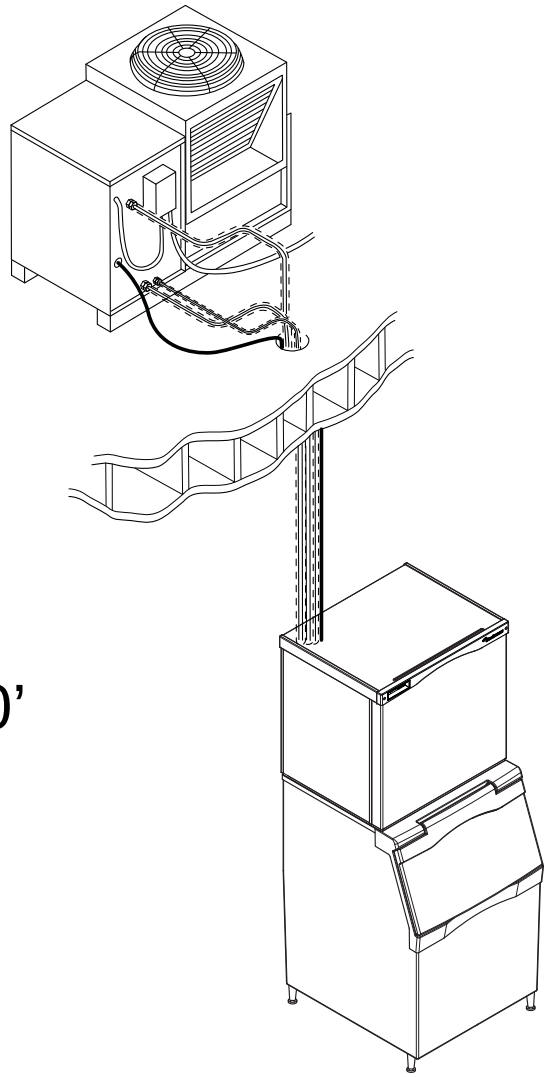
- Transformer to power EH relays
- Toggle switch controls condensing unit
- Control Wire connection from EH to control the system
- Electrical power connected at contactor
- Remote condenser fan connects at contactor



Scotsman Ice Systems

Equipment Location

- Head can be above or below condensing unit
  - If above, limit is 15 feet
- Pre-charged lines are used
  - 3RTE20, 35, 50 or 75 - **EH**
  - No extra refrigerant charge required
  - S trap in suction tube required when condensing unit is over 20’ above ice making head
- Must have bin or dispenser adapter for the EH222 head



Scotsman Ice Systems

Install Head

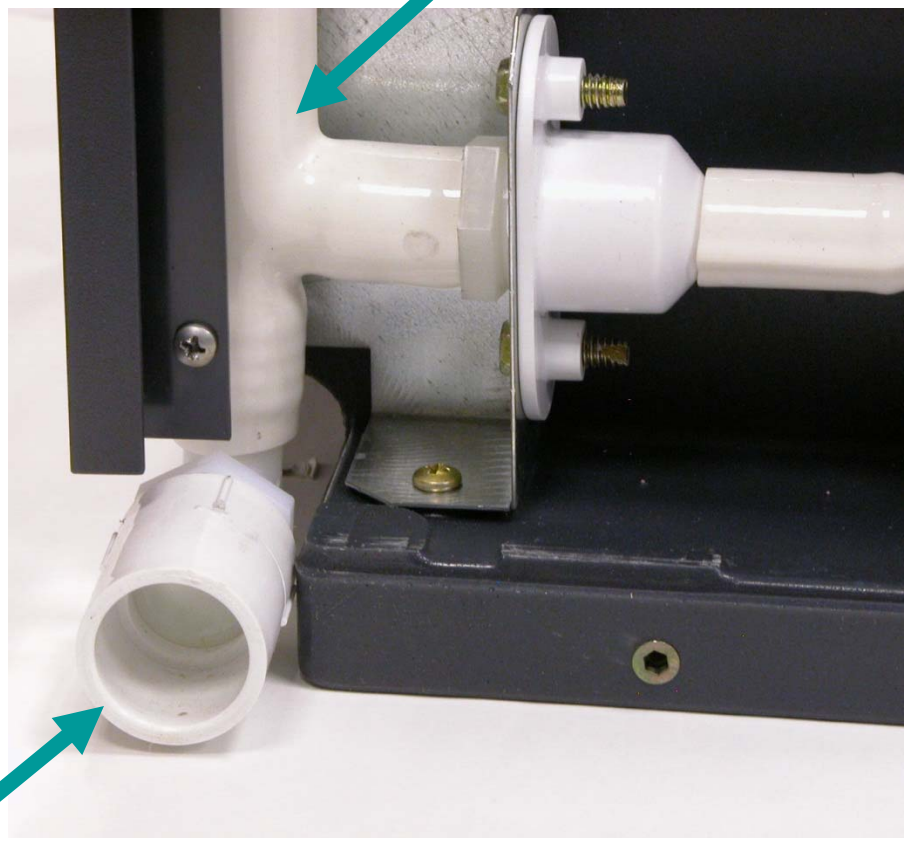
- Against wall capability
  - EH222 fully flush
  - EH330, EH430 limited by chase panel
- Drains left, right or back
- Water inlet and power inlet from the top or back
- Refrigerant line connections back or top
- 115 volt unit, cord provided

Scotsman Ice Systems

Flush Installations - EH222

- Attach water inlet
  - 3/8” union flare ships in hardware package
- Attach drain - 3/4”
  - EH222 ships with drain hose fitting attached
  - EH222 no vent required, vent is internal

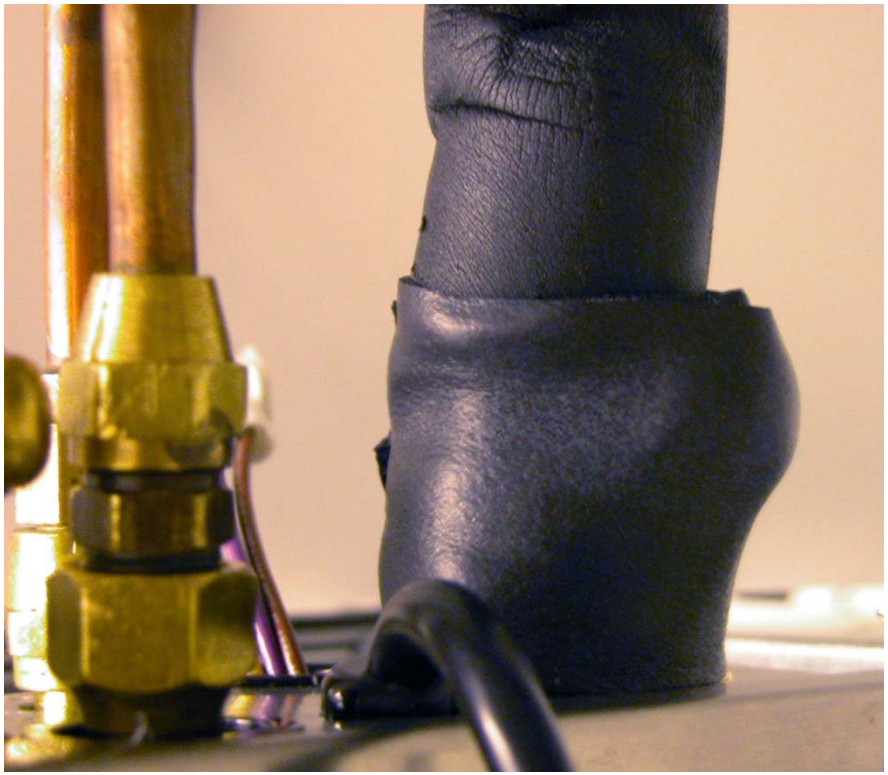
Drain Fitting Rotates to left, right or back.



Scotsman Ice Systems

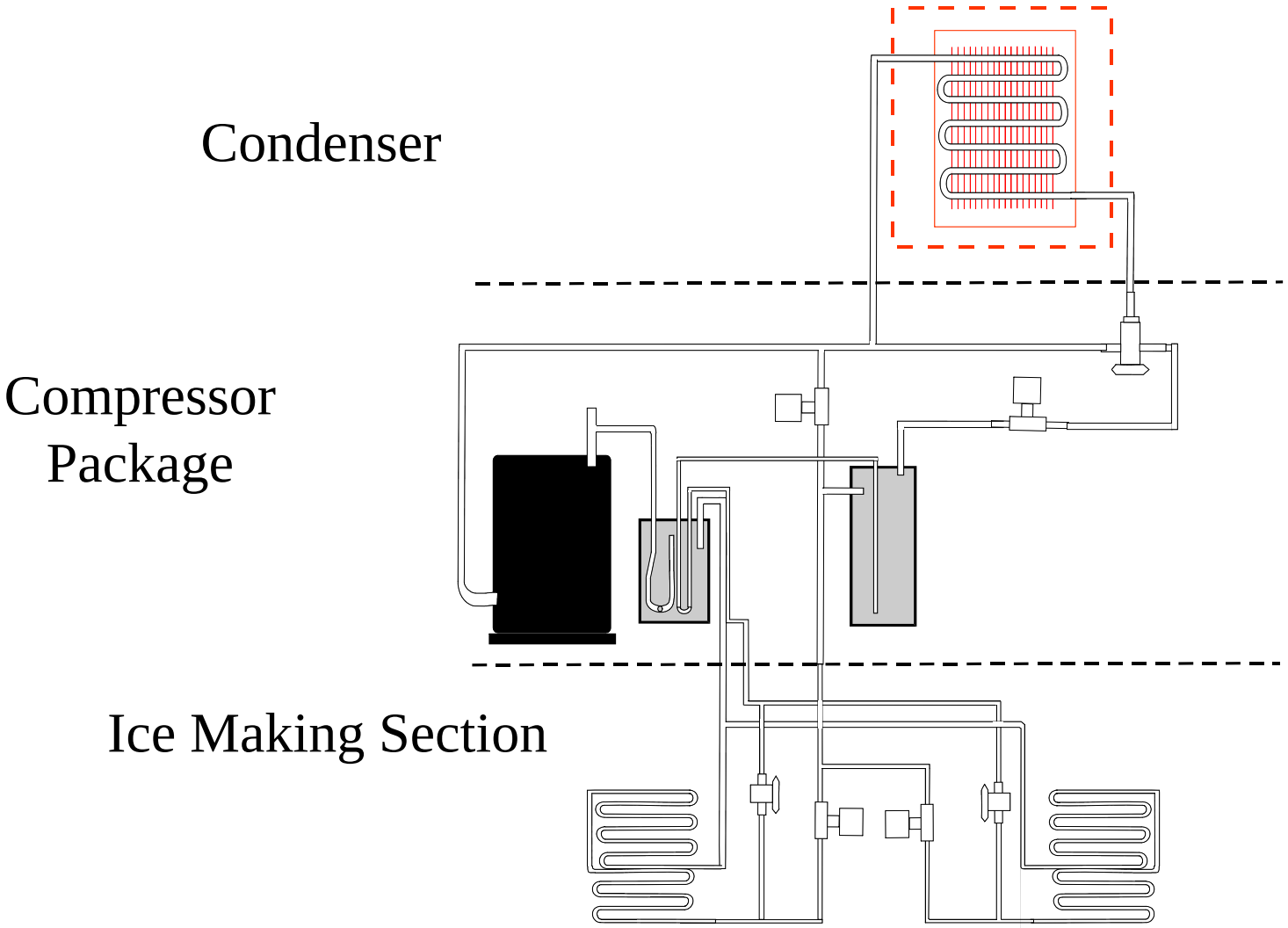
Connect Pre-Charged Lines

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



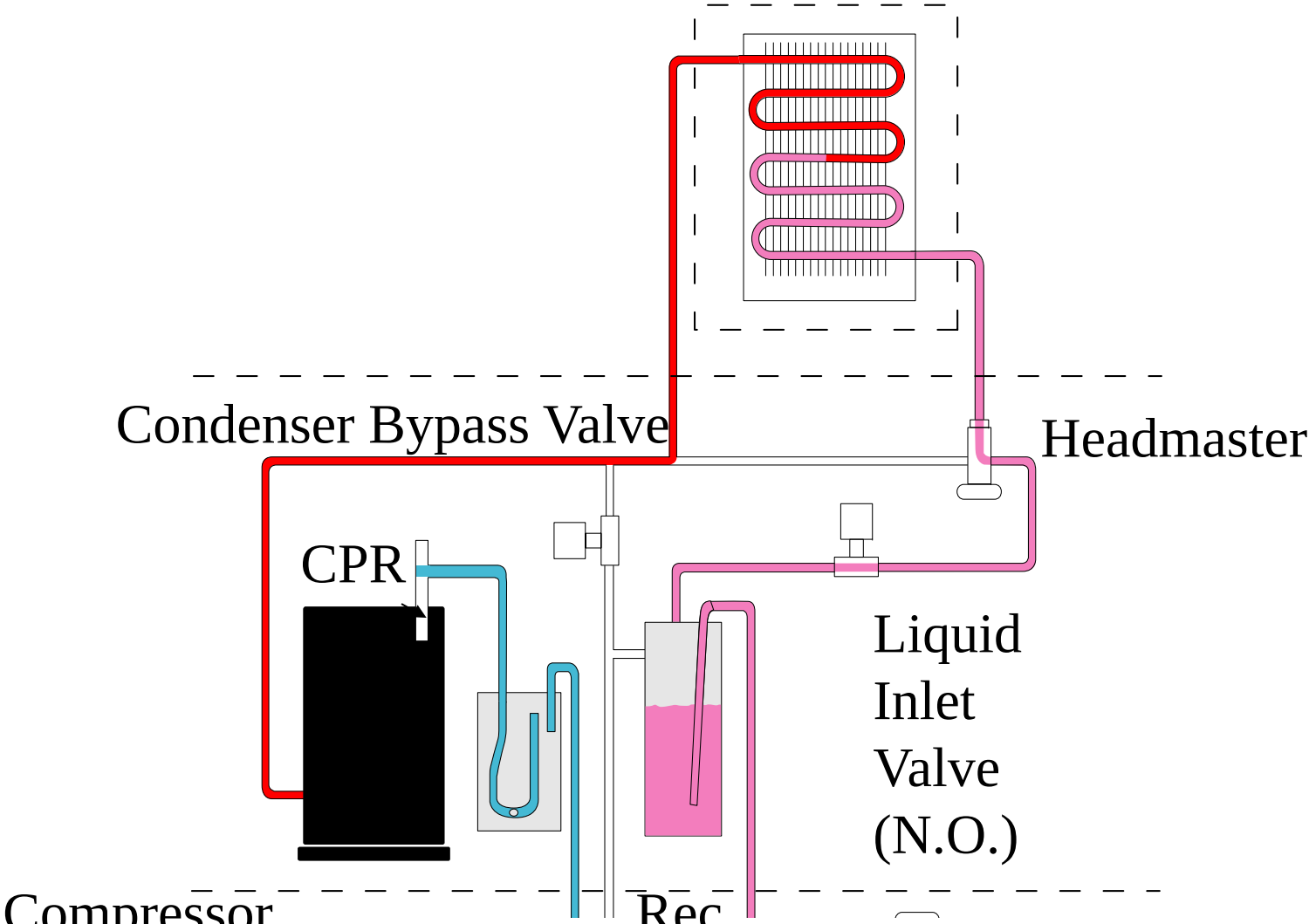
Scotsman Ice Systems

Eclipse Refrigeration Schematic



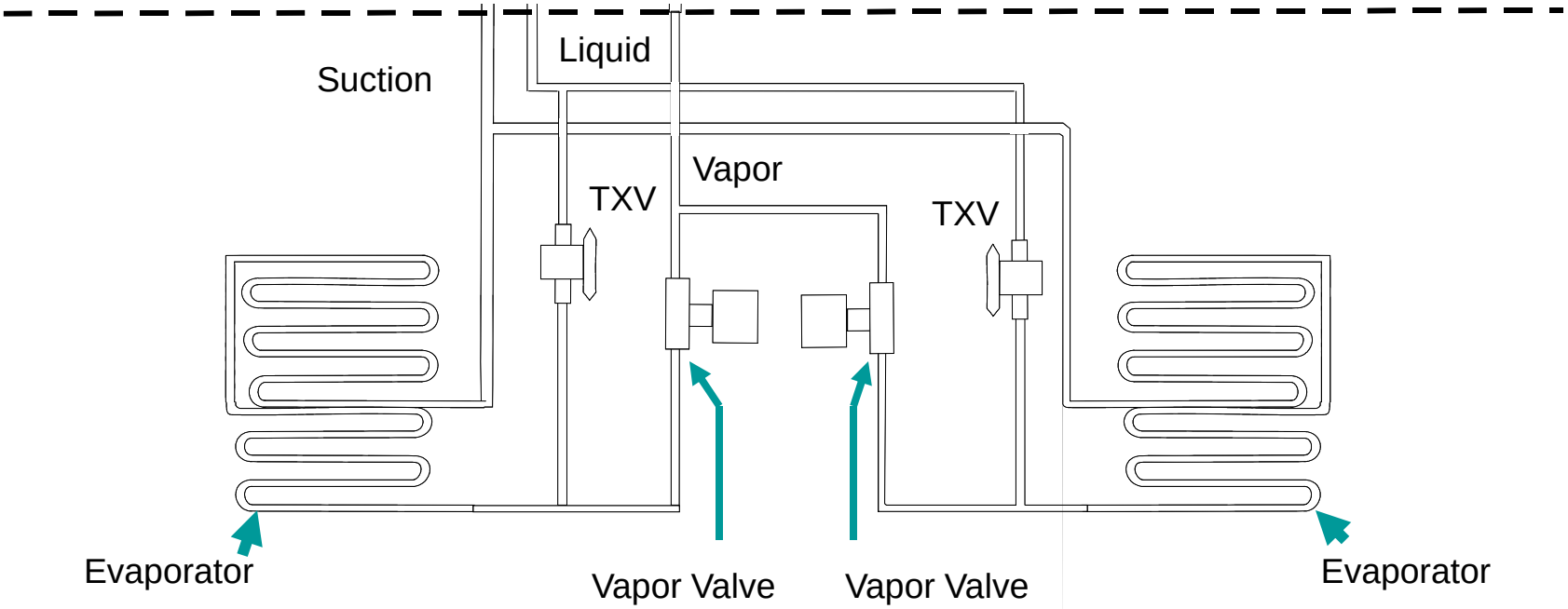
Scotsman Ice Systems

Eclipse Condensing Unit



Scotsman
Ice Systems

Ice Making Section – EH430 Example



Scotsman
Ice Systems

Eclipse Service Diagnosis

- What happens if?
- Vapor Inlet Valve Does Not Open
  - Vapor line hot
  - Discharge pressure increases
  - Low side pressure not as high as normal - 80
  - No or partial ice release
  - Code 2

Scotsman Ice Systems

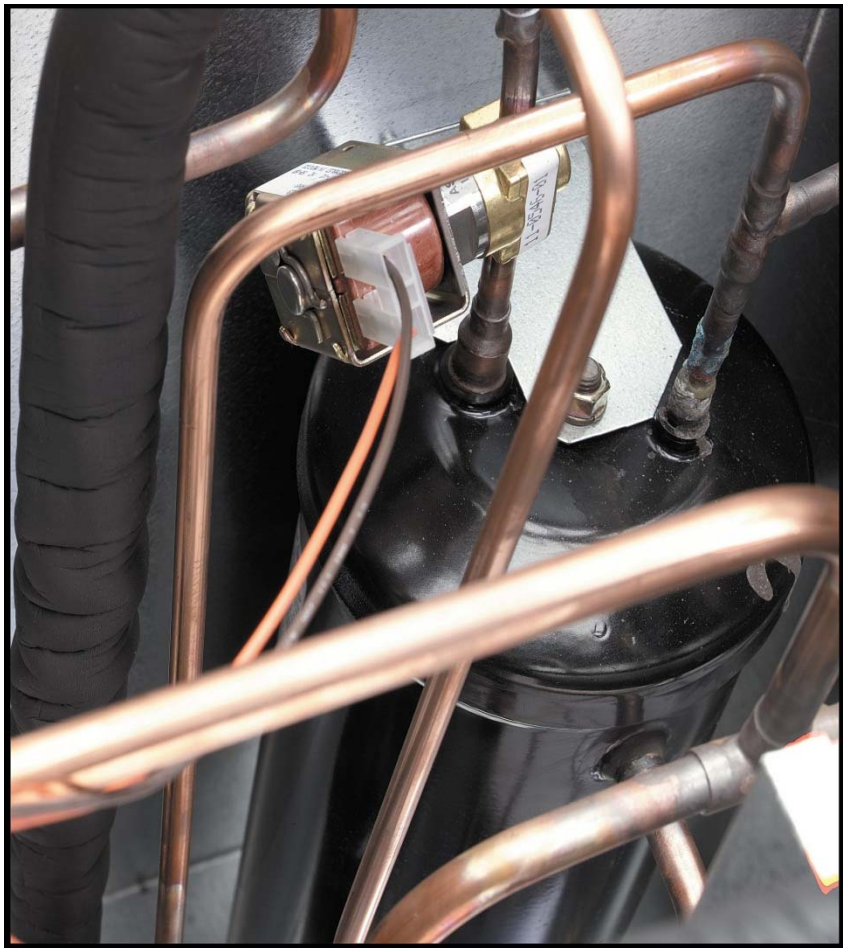
Eclipse Service Diagnosis

- What happens if?
- Condenser by pass valve does not open
  - High pressure cut out opens and closes
  - No ice release
  - Code 2

Scotsman Ice Systems

Eclipse Service Diagnosis

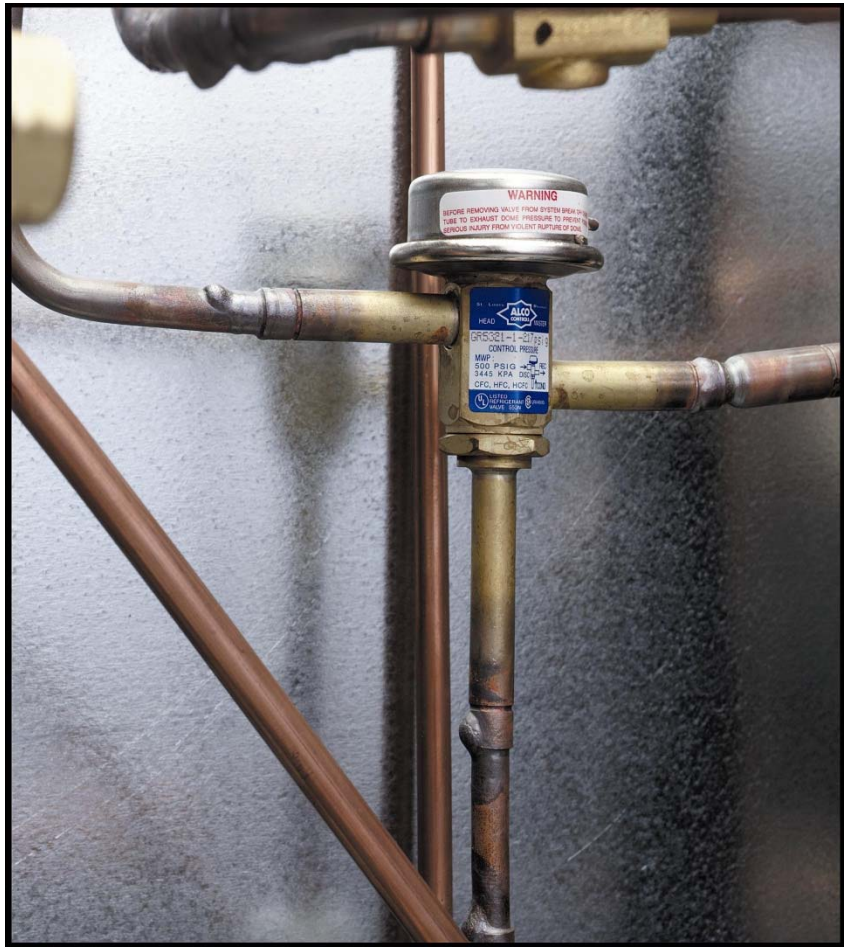
- What happens if?
- Receiver inlet valve does not close during harvest
  - Very little change
- If it sticks closed
  - Hi discharge pressure cut out opens
  - Code 1



Scotsman Ice Systems

Service Diagnosis

- What happens if?
- Headmaster is stuck in bypass
  - Very little liquid flow to TXVs
  - Long freeze cycle
  - Controller shows code 1



Scotsman Ice Systems

Service Diagnosis

- What happens if?
- There is a refrigerant leak
  - No change until receiver runs dry
    - Varies with condensing ambient
    - 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

Scotsman Ice Systems

Service Diagnosis

- What happens if?
  - TXV has high superheat?
    - Poor ice formation, ok at top of evaporator, thin in the middle
    - Similar to low refrigerant charge
  - TXV has low superheat?
    - Long freeze cycle

Scotsman Ice Systems

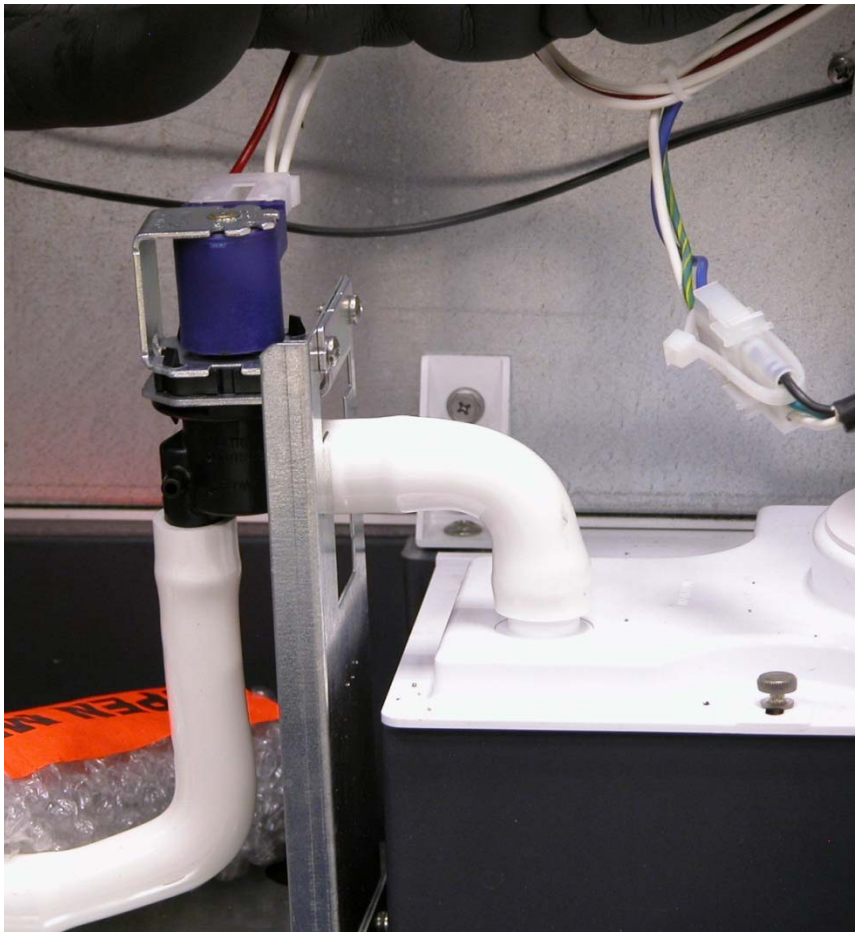
Service Diagnosis

- 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

Scotsman Ice Systems

Service Diagnosis

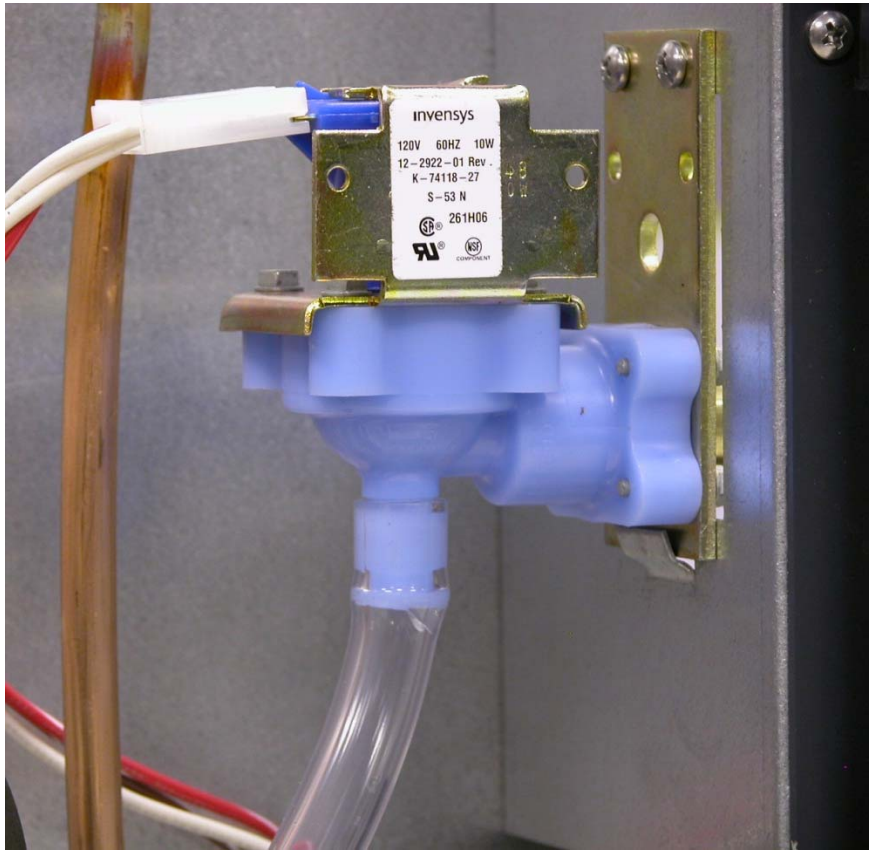
- What happens if?
- The purge valve leaks and drains the reservoir
  - Reservoir may refill during the freeze cycle
  - Thick ice at bottom of slab



Scotsman Ice Systems

Service Diagnosis

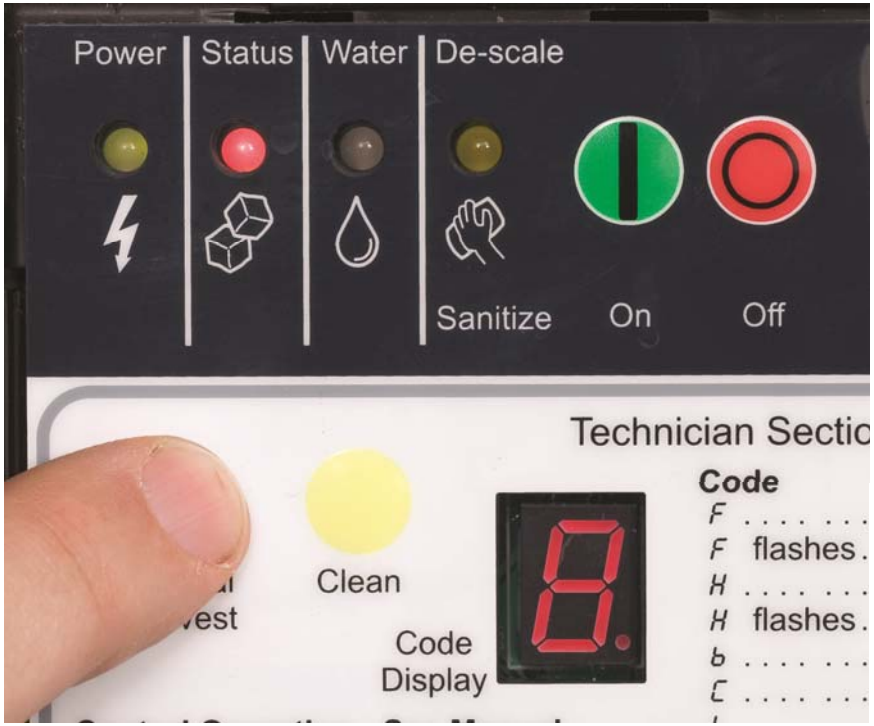
- What happens if?
- The inlet water valve leaks through
  - Keeps adding water (heat load) to reservoir
  - Result is a long freeze cycle – just like any other cuber



Scotsman Ice Systems

Control Button Processes

- Recall diagnostic code
  - Push and hold Off to shut down
  - Push and hold Off again until the display code changes
  - Push and release the Harvest button to cycle thru the last 10 diagnostic codes, from latest to oldest



Scotsman Ice Systems

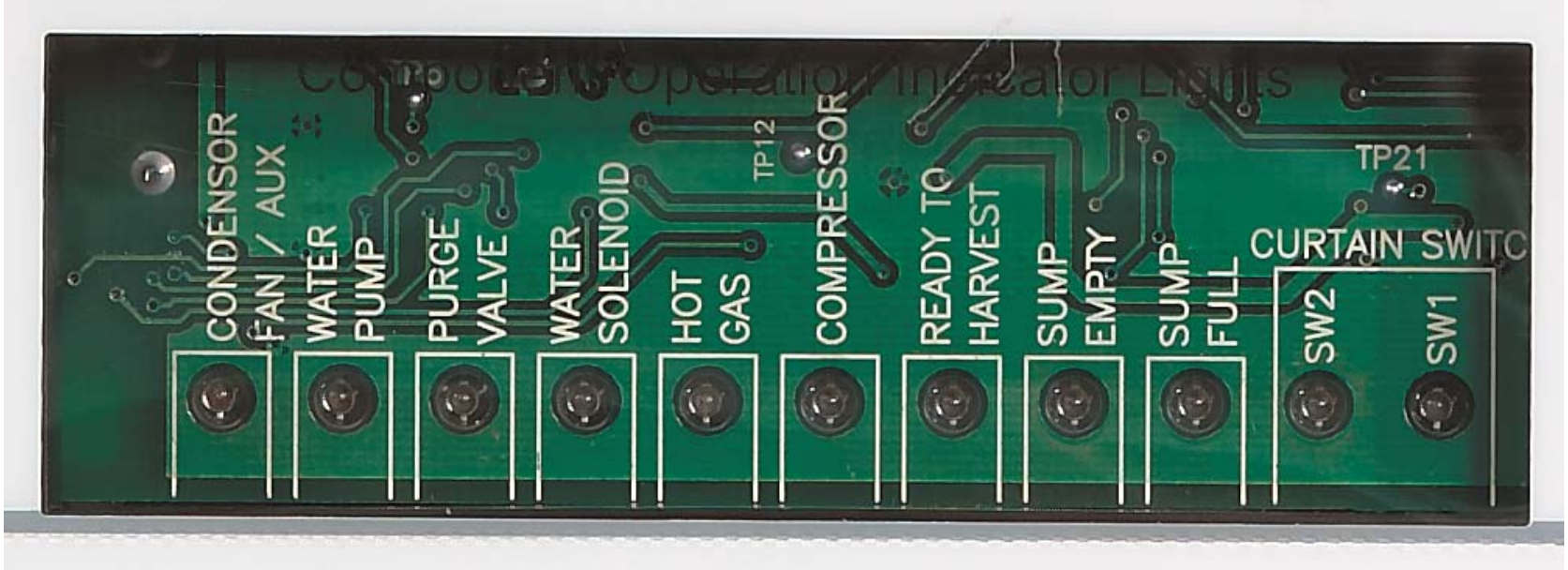
Controller Button Processes

- Clear all diagnostic codes
  - Push and hold Off to shut the machine down
  - Push and hold both the Clean and Harvest buttons for 3 seconds

Scotsman Ice Systems

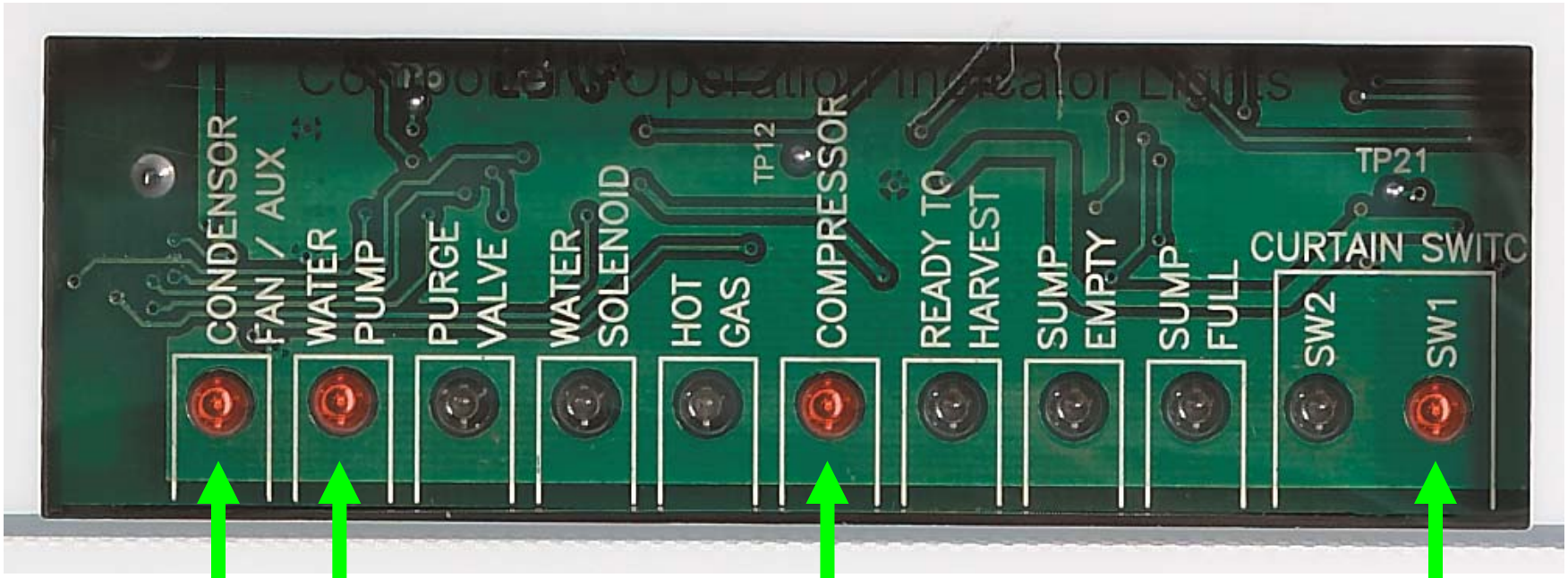
Prodigy Diagnosis

- Use the controller's component indicator lights to check if a component is operating when it should be.



Scotsman Ice Systems

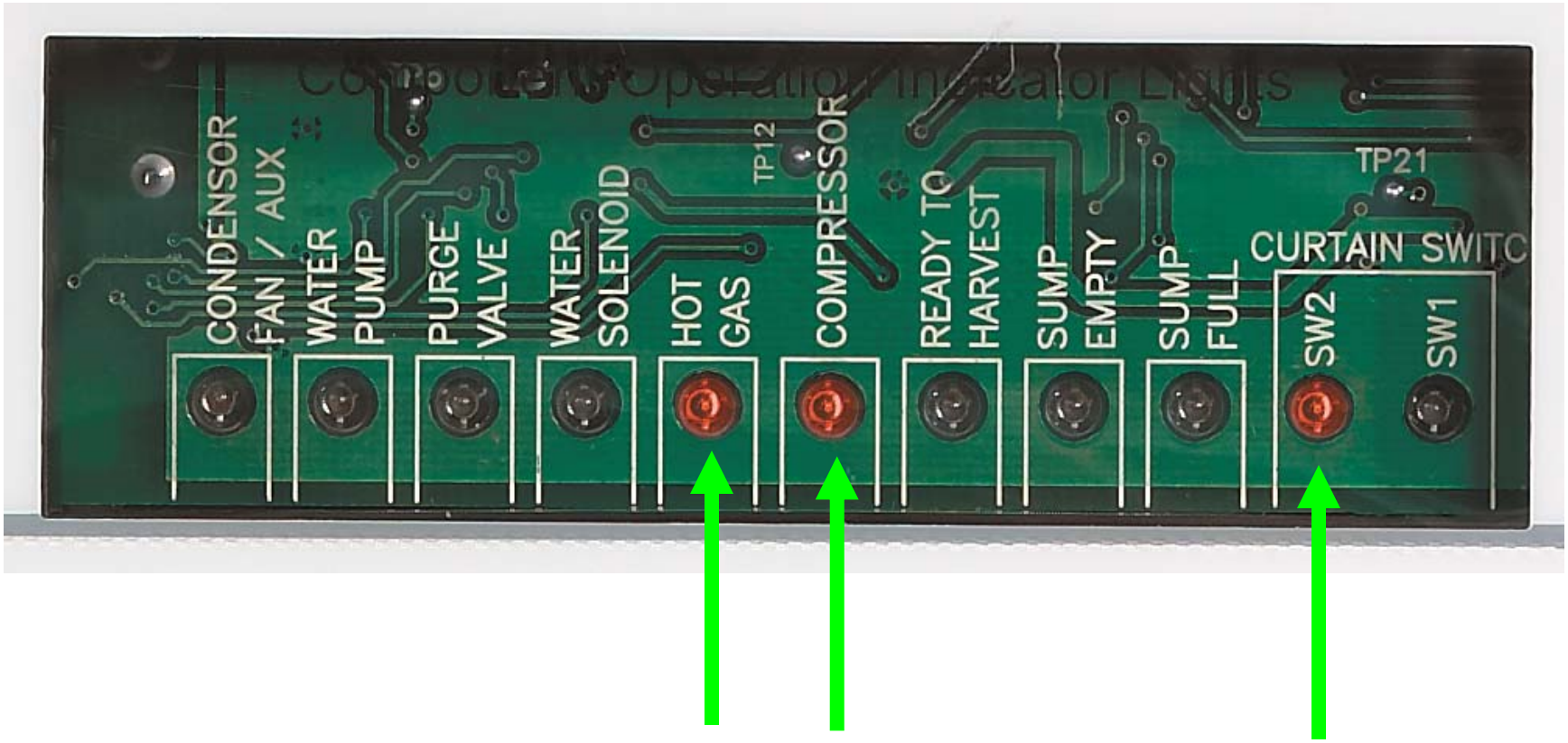
Example: Freeze Cycle



On but not used in Eclipse

Scotsman Ice Systems

Example: Harvest Cycle



Scotsman
Ice Systems

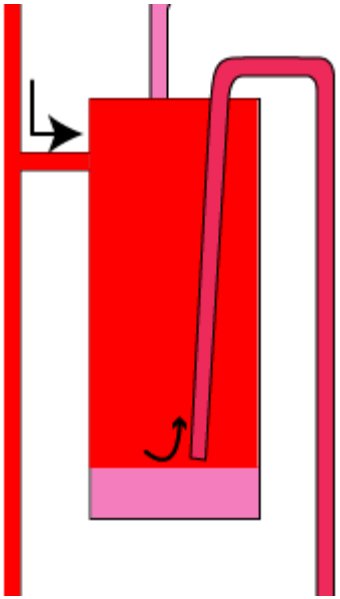
Eclipse Service Diagnosis

- What happens if?
- The condenser fan stops
  - CP unit's hi pressure cut out will open
  - Maximum freeze time will be exceeded
  - Head's controller will shut system off
  - Controller will display code 1

Scotsman Ice Systems

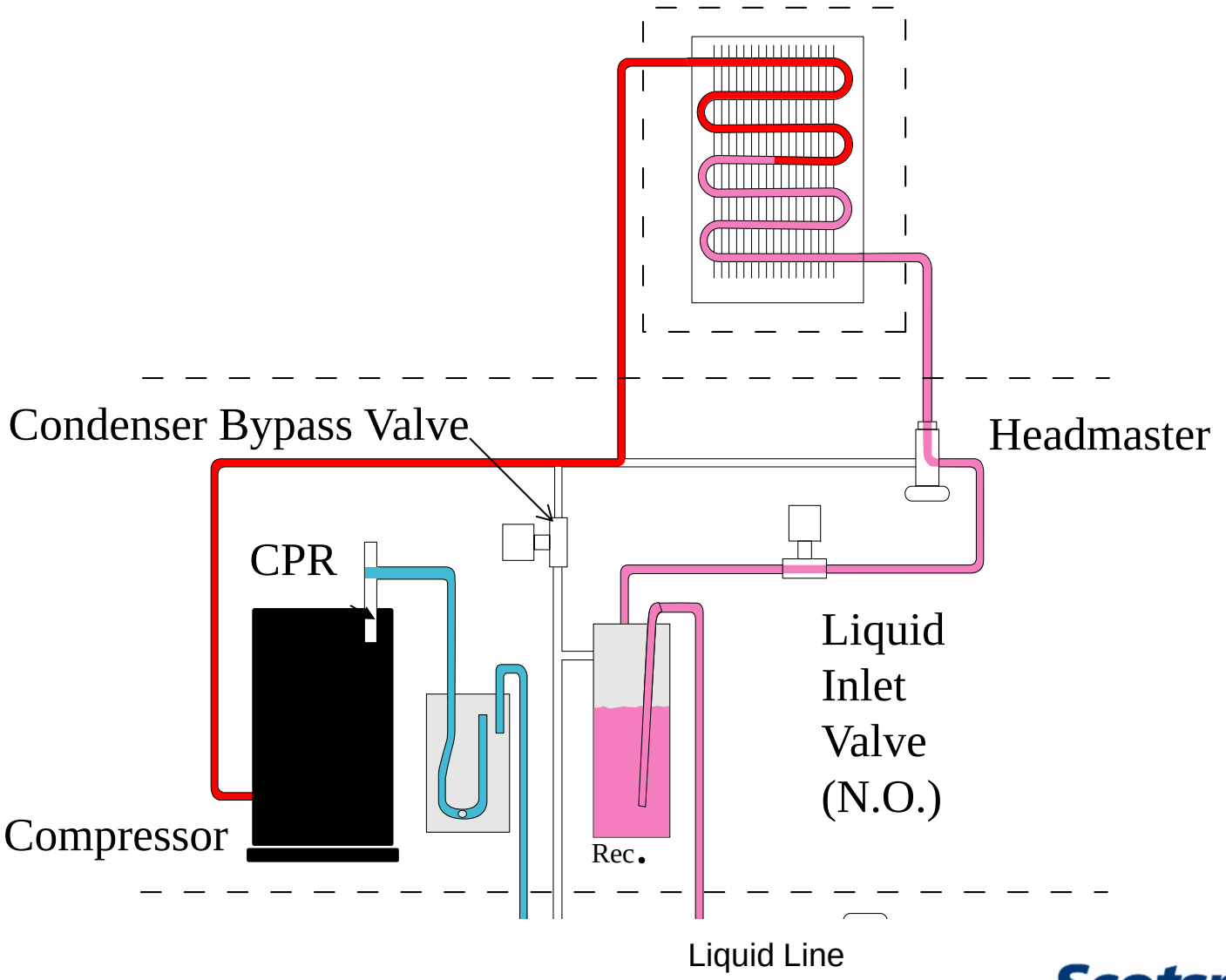
Eclipse Service Diagnosis

- What happens if?
- The condenser bypass valve leaks thru but head's vapor valve remains closed
  - Receiver fills with high pressure gas thru side port
  - High pressure gas in liquid line
  - Headmaster bypassing, also filling receiver
  - TXV bulb warm, valve open
  - High pressure in suction line – to compressor
  - Hot bypass valve
  - Long freeze cycle – code 1



Scotsman Ice Systems

Condensing Unit



Scotsman
Ice Systems

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

Scotsman Ice Systems

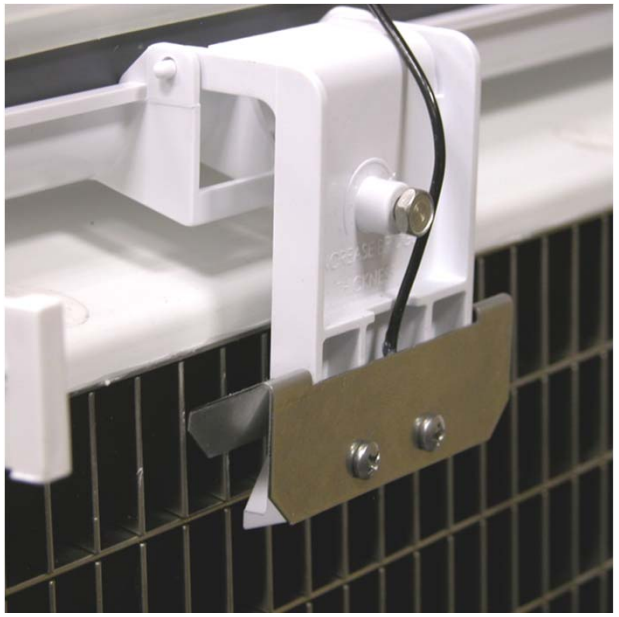
Service Diagnosis

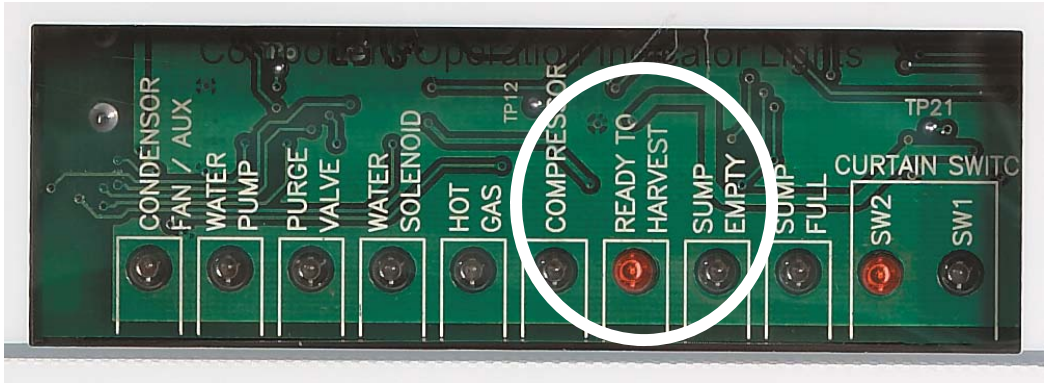
- What happened if?
- The controller displays code **1**
  - Maximum **freeze** time exceeded
    - Dirty condenser coil
    - Fan motor inoperative
      - Hi discharge pressure caused compressor to shut off
    - No water over evaporator, no ice made
    - Lack of refrigerant, no ice made

Scotsman Ice Systems

Diagnostics - Sensors

- Ice thickness sensor
  - Continuity probe
  - Check by grounding metal tip to cabinet and observing Ready To Harvest light





Scotsman Ice Systems

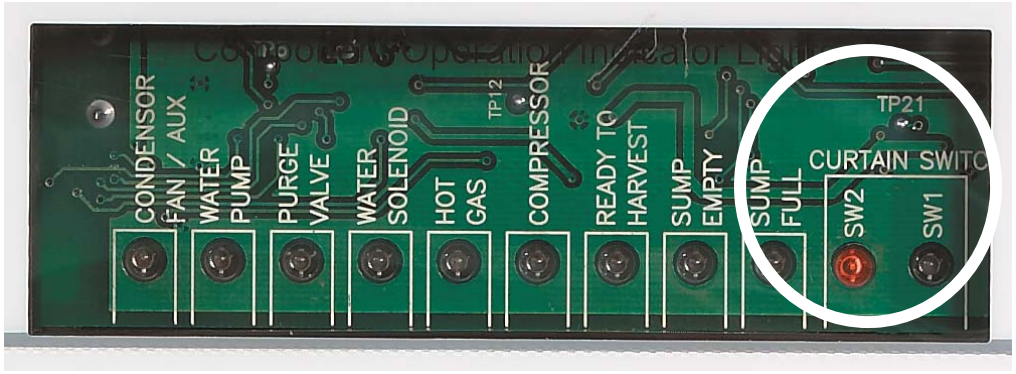
Service Diagnosis

- What happened if?
- The controller displays code **2**
  - Maximum **harvest** time exceeded
    - Vapor valves did not open
    - Curtain did not open
      - Ice too thin
      - Ice normal at top, thick on bottom

Scotsman Ice Systems

Diagnostic - Sensors

- Curtain Switch
  - Magnetic reed switch
    - Use indicator light or ohmmeter
  - When curtain is CLOSED, light is OFF
    - Single plate models have 1 light on all the time



Scotsman Ice Systems

Service Diagnosis

- What happened if?
- The controller displays code **3**
- Slow or **no water** fill
    - Possible clogged water filters
  - Low water level - leaks out
  - Water level sensor not working or harness connection poor

Scotsman Ice Systems

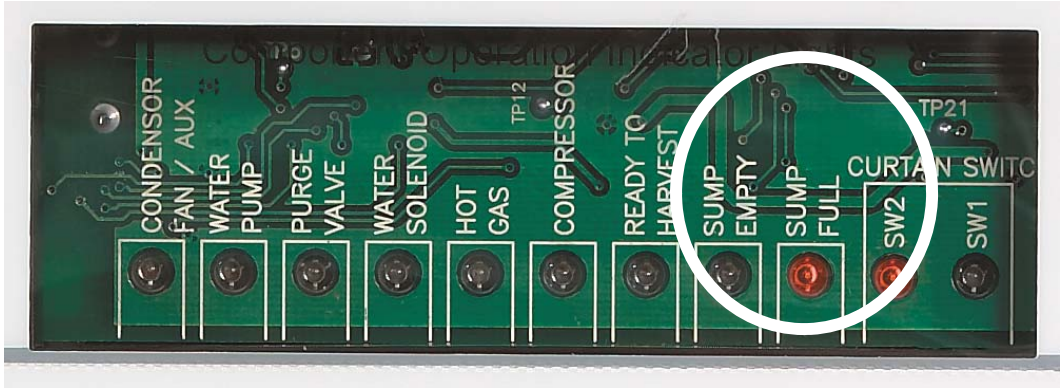
Service Diagnosis

- What happened if?
- The controller displays code **3**
- Slow or **no water** fill
    - Possible clogged water filters
  - Low water level - leaks out
  - Water level sensor not working or harness connection poor

Scotsman Ice Systems

Diagnostic - Sensors

- Water Level Sensor
  - Continuity probe
  - Check by connecting two short probes
  - Sump full light should be On



Scotsman Ice Systems

Service Diagnosis

- What happened if?
- The controller displays code 4, 5 or 7
  - 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

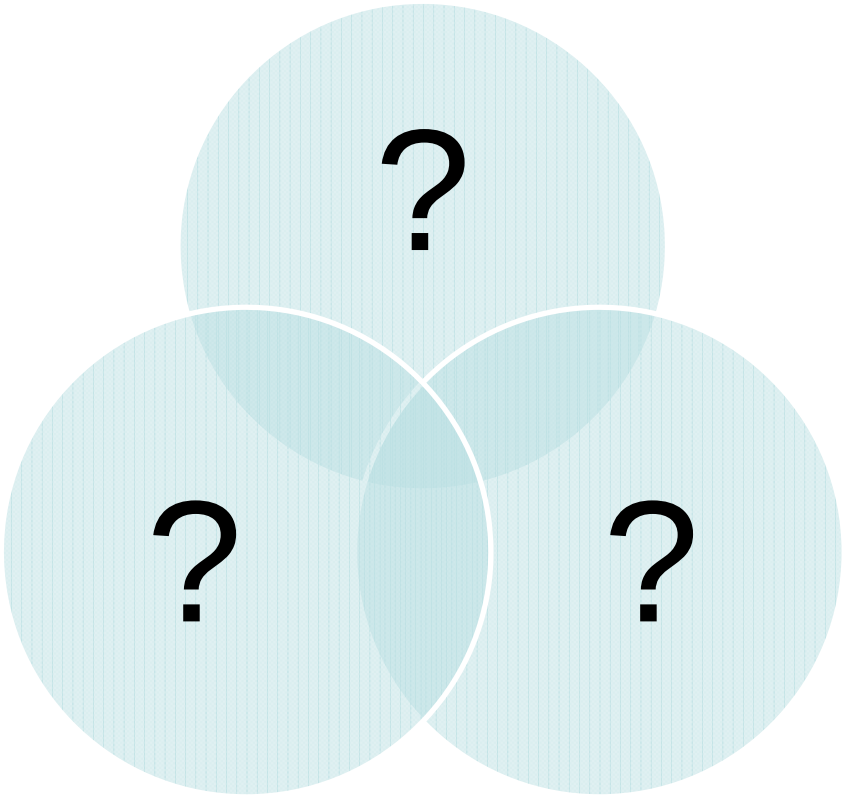
Scotsman Ice Systems

Service Diagnosis

- What happened if?
- The controller displays code **8**
  - Freeze cycle **too short** – less than 6 minutes
    - Excess water flowing near the ice thickness sensor
    - Incomplete harvest of previous cycle

Scotsman Ice Systems

Questions?



Scotsman
Ice Systems