#### Prodigy Elite and Prodigy Plus Cuber Technical Training



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# SERVICE SUPPORT

## **Technical Service 1-800-533-6006**



# Scotsman Service Support App





Check out the new mobile ready website







Service site

www.scotsman-ice.com/service

How to Video



https://youtu.be/AuW7YuC9etg

Scan the qr code above or go to <u>www.scotsman-ice.com/service</u> on your smart phone, the "add to home screen" and you are all set. For more info, got to <u>https://youtu.be/AuW7YuC9etg</u> or scan the qr code watch the how to video for iPhone and Android

Service Information Menu

Q

Search



## Technical Service Virtual Business Card



Scotsman<sup>°</sup>

#### **QR Code**

- Added to product in 2013
  - Scan with smart phone
  - Connects to Scotsman website warranty verification
  - Shows
    - Warranty dates
    - Recent warranty history
  - Links to
    - Parts list
    - Service manual





## What's New – Prodigy Elite

- Panels
- No more top and bottom trim strips



- Front panel features "hook & latch" system and quarter turn screws
- Controller
  - New way to interact with an ice machine
  - A simplified experience ensures intuitive operation
  - Bluetooth® based connectivity for easy "local" pairing without removing panels

## **Scotsman ICELINQ® Mobile App**



#### What's New – Prodigy Elite

#### **New sensors**

- ITS and WLS
- Both easier to clean
- ITS now has a disconnect directly behind the evaporator to streamline the cleaning process even further





#### What's New – Prodigy Elite

#### **Preservation Mode**

- Keeps the unit running even with a dirty ice thickness. If the ITS starts giving inconsistent readings the unit will ignore it and run a timed freeze
- Allows the machine to continue making ice for up to 6 months
- Fixed freeze times of 12 mins once in Preservation Mode
- During harvest in Preservation mode, the 16-segment display alternates between P and H, and the Clean LED flashes
- After 75 cycles it will try to fix itself by doing a flush/refill 3x
- During Preservation mode, the machine will operate using Flush Level 5



## **Configurations by Evaporator Plate**

- 3 single plate platforms
  - 6 inch (example C0330)
  - 12 inch (example C0530)
  - 18 inch (example C1030)
- •2 double plate platforms
  - 12 inch (EH330)
  - 18 inch (example C1448)



## Installation



#### Installation – All Models

- Set the machine in place
- Remove any packing
- Level the cabinet
- Connect drain (s)
- Connect water supply
- Remotes: Route and connect tubing to condenser
- Add any optional accessories
  - Smart Board, Vari Smart, Air Baffle, Front/Side Air In
- Connect power





- Potable water connects to 3/8 fitting on back of cabinet
  - Cuber fitting is 3/8" female pipe thread
    direct connection to inlet water
    solenoid valve
- Reservoir or condensate pan drain fitting is <sup>3</sup>/<sub>4</sub>" female pipe thread
  - Vent for proper draining
  - Minimum slope of ¼" fall per foot of horizontal run





## **Prodigy Installation – Remote Air Cooled**

- MUST use condensers with headmaster in them:
  - ERC111, 311 and 611
  - RTE line sets 10, 20, 40, or
    75 foot lengths
    - 3/8 liquid
    - 1/2 discharge
  - Power supplied by ice machine for fan motor







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#### **Remote Installation**

- Typical Installation
  - Condenser above ice machine
  - Precharged line set coiled within building
    - Use horizontal coil
    - NEVER leave excess coiled up on the roof!





**Cuber Operation** 

#### **Cuber Components**

- Electrical
  - PTCR for single phase compressor starting
  - Harvest assist
  - Fan motor air cooled and remote air cooled
  - Fan cycling pressure switch for self contained air cooled
- Control System
  - 12 volt transformer
  - Electronic controller
    - Operates all loads

#### Sensors

- Water level sensor
- Ice thickness sensor
- Curtain switch
- Water temperature sensor
- Discharge temperature sensor
- High pressure cut out on some models



#### **Prodigy Operation**

- Electrical Sequence
  - Power up, controller does self check
  - Power Light glows Green
  - Push and release the green ON button to start the unit







### Cuber Start Up – Air and Water Cooled

- Reservoir emptied and refilled
  - Purge valve opens, water pump starts
  - Hot gas and harvest assist solenoid activate
  - Inlet water valve opens, water fills the reservoir
  - Purge valve closes, pump shuts off
- •When the reservoir is full, the water stops and the compressor and pump start
  - Fan motor will start when discharge pressure increases to cut in point of fan cycle switch



#### Water Control – All Cuber Models

- Water Level Sensor
  - Conductivity Probe
  - Water fills when midlength probe is not touching water
  - Water stops filling when short probe touches water
    - Snaps out of reservoir cover for ease of maintenance







#### **Freeze Cycle**

- Hot gas valve closes and harvest assist pin retracts after 5 seconds of freeze.
  - Allows compressor to start with minimal discharge pressure
- Freeze continues until reservoir temp falls to preset point, then pump stops for 30 seconds.

– The dry freeze is an anti-slush process



#### **End of Freeze Cycle**

- Freeze continues until ice thickness sensor is contacted by water for a few seconds, that triggers harvest
- Air cooled fan may shut down a few seconds before harvest to build up heat



#### Ice Thickness Sensor

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





#### **Operation - Harvest**

- Compressor:
- Water pump:
- Fan motor:
- Purge valve:
- Inlet water solenoid:
- Harvest assist:
- Hot Gas Valve:

ON – will switch Off OFF

ON

ON

ON

- ON will switch Off
- ON will switch Off



#### **Harvest Assist Mechanism**

 Harvest continues until the evaporator heats up enough to release the ice, the harvest assist pin will extend fully and the ice will release as a unit, forcing the curtain open





#### **Curtain Switch**

- The curtain switch opening terminates harvest.
  - Stays open = shuts off. If it closes again, a new freeze cycle begins.
  - Switch is the magnetic reed type





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#### **Ice Bridge**







#### **Total Cycle Times**

Minutes







#### Harvest Cycle Times (seconds)

Seconds





### **Bin Full**

- The curtain switch is the bin full detector
  - A full bin keeps the curtain from closing
  - When open during harvest for more than **30 seconds** shuts the unit off
  - 2 plate models must have both curtain switches open to end harvest, and at least one to stay open for more than 30 seconds to stop ice making.
- KVS / Vari Smart control can also shut the machine off
  - Based on ice level and setting of the control



#### **F**

## **Bin Full Display**

- Lower case b
- Remote models
  - Liquid line valve closes, everything off except compressor
  - Compressor off after 30 seconds
- Short restart delay when curtain switch re-closes

Technician Section	
de blay	Code <i>F</i> <i>F</i> flashes <i>b</i> <i>C</i>
Manual	d
water supply to	0
n and sanitize	E ! flashes









#### **AutoAlert Light Panel**



#### Prodigy Plus Lower Light and Switch Panel



#### **Prodigy Cuber Controller**



#### **F**

#### **Code Display**

- Letter codes show operational status
- •Number codes show shut down causes



Techni	cian Section	
	Code	Description
	F	Freeze Cycle
	F flashes	Freeze Cycle is Pending
	Н	Harvest Cycle
	H flashes	Manual Harvest
	Б	Bin is Full
1.4	Ε	Clean Cycle
	L	Board Locked
	d	Test Mode
	<i>G</i>	Off
	Ε	Self Test Failed
	/ flashes	Max Freeze - Retrying
	1	Max Freeze Time Shut Down
	2 flashes	Max Harvest - Retrying
	2	Max Harvest Time Shut Down
	3	Slow Water Fill
	4	High Discharge Temp
	5	Sump Temp Sensor Failure
	7	Discharge Temp Sensor Failure
	8 flashes	Short Freeze - Retrying
	8	Short Freeze - Thin ice
	All 4 Upper Ligh	ts Flashing - Unit Remotely
	Locked Out - Co	ontact Leasing Company



## **5 Controller Shut Down Causes**

• Exceeds limit on maximum freeze time

```
- 45 minutes (Code 1)
```

• Exceeds limit on maximum harvest time

- 3.5 minutes (Code 2)

- End of freeze triggered too soon
  - Before 6 minutes into the freeze cycle (Code 8)
- Discharge temperature too high
  - Exceeds 250 degrees F. (Code 4)
- Exceeds limit on water fill time
  - 5 minutes (Code 3)



#### **Controller Reaction**

- Maximum freeze time (Code 1)
  - Completes harvest, tries another cycle
- Maximum harvest time (Code 2)
  - Shuts down, restarts after 50 minutes
- Minimum freeze (Code 8)
  - Completes timed harvest, tries another cycle
- Discharge temp exceeds 250 degrees F. (Code 4)
  - Immediate shut down
- Maximum limit on water fill time (Code 3)
  - Shuts down, attempts refill every 20 minutes
#### **Cuber Controller Auto Restart**

- From diagnostic 1,2,8 causes
  - Retries 2 times, if fails again 3rd time, machine must be manually reset
- From water interruption
  - Will continuously restart every 20 minutes
- From power failure
  - Goes thru a timed harvest (3 minutes)



#### **Controller Button Processes**

•Reset

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Push and release
 Off, push and
 release On





#### **Cuber Control Button Use**

- Recall diagnostic code
  - Push and hold Off to shut the machine 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





#### **Cuber Controller Button Use**

- 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





#### **Cuber Controller Button Use**

- View/Change water purge
  - Push and hold Off to shut the machine down
  - Push and hold Off again until the display code changes – code displayed is the current purge setting
  - Press and release the On button to cycle to another setting – 1 to 5 or A for Automatic
  - Push Off to lock it in





#### WaterSense Automatic Purge

- Checks conductivity of reservoir water at start up
  - Must be not less than 10 microSiemens/cm
- Adjusts purge water amount based on water's TDS
  - Display shows an A if set to Automatic (factory default)
- Purge can also be manually set
  - 1 is minimum
  - 5 is maximum



#### **Other Controller Button Processes**

- Empty reservoir
  - Push and hold Off to shut the machine down
  - Push and hold Clean button until the display shows a dash, pump will drain the reservoir for 30 seconds, repeat as needed





# **Cuber Diagnostics**

#### **Most Common Service Call**

- •No Ice
  - Why?
  - Dirty ice machine sensors and water distributor fouled, purge ineffective
  - Lack of water filter plugged
  - Lack of air filter plugged, condenser dirty



## Second Most Common Service Call

- Poor performance not keeping up
  - Why?
  - Machine is too hot, cycle time long
    - Dirty
    - Installed too close to other equipment
    - In a corner, in a closet
    - Not enough HVAC
    - Bad installation





- Freeze plus harvest time equals total cycle
- •Example: C1030 air cooled at 70/50 = 9-10 minutes cycle time.
- Hot environment, air, water or both, adds heat load and makes the machine have longer cycles
- <u>Sometimes it isn't broken</u>. Measure cycle time, if normal and the bridge thickness is also correct, the machine is making all it can.



#### **Diagnostic Process**

- Check diagnostic code
  - Use codes as a guide to the root cause
  - Codes listed on the controller overlay
- Remember the Recipe for Ice a malfunction will be in one of these areas:
  - Water
  - Refrigeration
  - Electrical



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#### **Diagnostics**

- Max freeze time diagnostic Code 1
  - See Code in display
  - Shows why unit shut off
  - Use Code as a tool to guide to root cause





#### **Diagnostic Aids**

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







#### **Example: Freeze Cycle**







#### **Example: Harvest Cycle**





#### **Diagnostic – Line Voltage Outputs**

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#### **Diagnostics**

- Max freeze time diagnostic Code 1
  - Limit is 45 minutes
  - Typical cycle is much shorter
    - 15 to 20 minutes
  - Long freeze cycle causes:
    - Lack of water
    - Lack of refrigeration effect
    - Not sensing ice formation





#### **Diagnostics – Code 1**

- Lack of water flow potential causes:
  - False Sump Full signal from Water Level
    Sensor dirt buildup
    - Water will not be added if Sensor is shorted and signaling Sump Full
  - Water pump failure potential scale caused
  - Leaking Purge Valve potential scale caused





#### **Diagnostics Code 1**

## •Lack of refrigeration may be caused by:

- Dirty air filters
- Fan motor or fan pressure control failure
- Water supply to water cooled condenser failure
- Low charge
- TXV superheat not correct
- Compressor contactor failure
- Compressor overheated or off







#### **Diagnostic – Water Pump**

- Check pump for operation
  during freeze
  - When diagnostic light is ON pump should be operating









#### **Diagnostic – WLS**

- Water Level Sensor
  - Continuity probe
  - Must be OFF if nothing touches the probes







#### **Diagnostic – Water Level Sensor**

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



Key Area to Clean





To Release: Push pin in, pull probe down



## **Diagnostic – Fan Motor**

- Two controls controller and fan pressure switch
  - Controller light ON when fan should be ON
  - Pressure switch then controls power to fan motor
    - 22 & 30 CI: 240, CO: 190
    - 48 CI: 280, CO: 220
    - Jump pressure switch wires together, then power up unit and check fan motor operation







#### **Diagnostics - Sensors**

- Ice thickness sensor
  - It is a continuity probe
  - Check by grounding metal tip to cabinet and observing Ready To Harvest light









## Diagnostics

- Max harvest time Code 2
  - Limit is 3 ½ minutes
  - Normal time is between one and two minutes



- Long harvest cycle possibly caused by:
  - No ice due to no water after max freeze
  - Harvest assist not functioning correctly
    - Not extending or retracting
  - Hot gas valve not opening
  - Curtain switch not sensing when curtain opens
  - Poor or No ice formation
  - Low refrigerant charge



#### **Diagnostic – Harvest Assist**

- Operates when the Hot Gas valve is energized
  - Check during harvest, if voltage is present, pin should extend when ice releases





Note: Harvest assist solenoid coil cannot be checked with an ohmmeter. Check voltage instead.



#### **Diagnostic – Harvest Assist**

- Spring retracts pin when power is off
  - If pin does not retract, check for binding in evaporator bushing





Harvest Assist Pin







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## Motor actuated Harvest Assist Mechanism, used on some models (Beginning March 2013)





- 115V 12-3060-21, Replacing both 12-3035-21 and 12-3036-21
- 230V 12-3060-22, Replacing both 12-3035-22 and 12-3036-22



#### **Important Safety Recall**

Harvest Assist Solenoids			
Evaps		Voltage	Reca
P/N			
•6" & 12"	115	A39788-	701
•6" & 12"	230	A39788-	702
•18"	115	A39788-	801
•18"	230	A39788-	802





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#### **Diagnostic - Sensors**

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









## **Diagnostic – Hot Gas Valve**

- Opens at start up and during harvest
- One per evaporator
- Line voltage coil



Check power to coil when hot gas indicator light is on



#### Diagnostic – Water Level Sensor Code 2

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

Key Area to Clean







#### Diagnostic – Water Level Sensor Key Area to Clean

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## **Diagnostics**

- Slow or no water fill Code 3
  - Limit on fill time is 5 minutes
  - Longer fill times possibly caused by:
    - Water supply shut off
    - Water filters plugged up
    - Inlet water solenoid valve failure
    - Controller not opening inlet water solenoid valve
    - Purge valve leak





#### **Purge valve**

- Opens every cycle to drain some water;
  dilutes mineral buildup
  - Must drain freely gravity drain
    - External tubing can be a restriction check for venting and kinks
  - Must open
  - Must not leak by
    - Reservoir will refill if Sump Empty detected
  - Purge can be mis-adjusted by controller setting



#### **Inlet Water Solenoid Valve**

- **Quick test**: In Freeze, pull Water Level Sensor out of reservoir Sump Empty light will switch ON and Inlet Water Solenoid Valve should open to fill the reservoir.
  - Note: If Sump Full light is ON water valve will not open







# **Diagnostics**

- High discharge temperature Code 4
  - Immediate and complete shut off if discharge temperature reaches 250°F.
  - Possible causes of high discharge temperature
    - Fan motor failure
    - Extreme high ambient
    - Hot gas valve leak thru
    - Too much superheat







# **Diagnostic - Sensors**

- Display codes 5 or 7 indicate a sensor failure
  - Check by measuring resistance of thermistor and comparing to the table at that temperature
    - Table of resistances in manual or handbook, same as for CM3
- Operation can continue without thermistor use, diagnostic code 5 will be displayed when they are disconnected







#### **Short Freeze Time**

- Short freeze cycle 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





# Water Distributor Mounting Bracket

- Applies to all Prodigy cubers
- Effective November 2012



 Change made bottom of bracket stronger to eliminate sagging into water path





#### **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





# **Diagnostics - Sensors**

- Ice thickness sensor
- Short freeze may be caused by
  - mis-adjusted ice thickness sensor
    ~ gap 3/16 7/32
  - Scale on the bridge thickness control







# **Service Notes: Refrigerant Charge**

- Ice machines are critically charged
- Refrigerant leak symptoms are progressive – they change as the amount of refrigerant lost increases
  - Thinner ice at evaporator area near tube outlet
  - Longer cycle times, both freeze and harvest





# **Diagnostics**

- No ice complaint
  - Machine is not making ice
  - Bin is <u>not full</u>
  - Status light is on
  - <u>Code b</u> is displayed
  - Possible causes:
    - Curtain is open or off the unit
    - Curtain switch is open
    - Vari-smart is installed and set too low



# **Diagnostics – Curtain Switch**

- Light is ON when switch is Open
  - Unused switch light is always on
- Move the curtain
  - Check if the light cycles with the curtain's movement or
  - Use ohmmeter on switch leads
    - Good is less than 5 ohms when closed







# **Diagnostic – Test Mode**

• Test Mode:

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- Hold Off button in for 3 seconds. Release.
- Hold Clean button in for 3 seconds.

Time (seconds)	On
0	WIV - 30 seconds
30	WP - 10 seconds
40	WP, PV, HGV - 10 seconds
50	HGV, Comp - 5 seconds
55	Comp - 15 seconds
70	None - 5 seconds
75	HGV - 10 seconds
85	Fan - 10 seconds
95	None





#### **Diagnostic - Power**

- Continuous power supply is critical
- Remember: Auto restarts from power interruption
  - Poor electrical connection can cause frequent to continuous auto restarts
  - If cord connected, try another outlet as a diagnostic
    - Outlets wear out, can be defective and have poor connections



Maintenance and Cleaning

#### Maintenance

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- Mineral scale
  - Water sensors and distributor become coated with scale
  - Use Scotsman Clear 1 scale remover to dissolve scale
  - Pay special attention to:
    - Water distributor
    - Ice thickness sensor
    - Water level sensor





# NEW FROM SCOTSMAN ICE SYSTEMS® STERA SHEEN® GREEN LABEL MACHINE SANITIZER.





# **Scale Removal and Sanitizing**

- Begin by removing the ice from the bin or dispenser.
- Sanitize the bin or dispenser at the end of the ice machine cleaning process.
- •You will need:
  - Nickel safe ice machine cleaner
  - Sanitizer
  - Bucket, spray bottle, cloths, soft brush, gloves



# **Two Cuber Cleaning Methods**

- 1. All models <u>up to Prodigy Plus</u> (D)
  - 1. Multi-step, manual process
- 2. Prodigy Plus D
  - 1. Single step, timed process



# **Two Step Cuber Clean Cycle**

- Harvest ice / stop machine
- Push clean button
  - When Purge Valve Light goes OUT, add scale remover per machine volume
  - Circulate scale remover as long as you like
- Push Clean button again
  - Drains and refills
  - Operate this way for 20 minutes or more
- Push Off to stop
  - Resets the Cleaning Indicator Light



# **Single Step Prodigy Plus**

- Push and release Clean
  - Starts timed harvest 3 minutes
  - Drains reservoir
  - Code blinks A d 1 add scale remover at this point
  - Fills reservoir
  - Circulates scale remover for about 11 minutes
  - Drains and refills for 20 minutes
  - Shuts off when complete
  - Approximately 35 minutes total







### **Clear 1 Scale Remover by Model**

- C0322 or C0330 8 ounces
- C0522, C0530 or C0630 10 ounces
- C0830, C1030 12 ounces
- •C1448, C1848, C2148, C2648 24 ounces
- •EH222 12 ounces
- •EH330 20 ounces
- EH430 24 ounces



# **Cleaning Tip – Water Not Filling**

- At start of Clean Mode water reservoir must pump out and cause Sump Empty or no water will be added
- Temporarily lift sensor so it rests on snaps
- Retry Clean Mode
- Corrected on D models





#### **Water Distributor**

- Release catches, pull and lift off mounting track
- Pull cover off, rinse out







# **Restricted Water Distributor**

- Mineral build up clogs outlet holes
- Causes
  - Code 8 short freeze
    because of poor water
    flow
  - Code 1 long freeze if totally plugged stopping all water





# **Ice Thickness Sensor**

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• Wipe inside surface clean with scale remover





Clean this surface



#### Water Level Sensor

- Release snaps and pull out
- Wipe metal probes clean with scale remover
  - Include base of plastic housing
  - White housing must be clean





# Diagnostic – Water Level Sensor Code 2

- Sump Full light ON, but 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



#### **F**

# **Additional Item to Clean**

- Curtain remove
- Right side liner remove
- Sump cover remove
- Pump remove from bracket
- Pump bracket remove
- Hose remove
- •Wash curtain, liner, sump cover, pump bracket and hose in sink



#### **Air Filter**

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- Slide out, wash off, return.
  - One filter up to600 lb.
  - Two filters from800 to 1000 lb.
  - Four filters 1400 lb and higher





Cuber Service and Updates

# **Service Notes: New Service Controller**

- New controller use on any
  - Prodigy Plus: connect lower switch panel harness
  - Prior models: Nothing to connect
- All
  - Discharge static electricity by touching metal cabinet before touching controller
  - Rotate selector switch to correct position for model
    - Will NOT operate as shipped, must be set





#### Warranty

# What is covered:

• Material and Workmanship defects.

Not covered: Issues related to lack of maintenance, abuse, improper installation and/or environmental.

The importance of getting your claims in on time

We are consistently looking for ways to improve upon our products.
 Claims must be in within 30 days.

All warranty information can be found at the warranty tab on the service website.



# **Key Items to Remember**

- Most common service is for a dirty machine
- Includes too short or too long freeze cycles
- Cleaning the machine with the Clean Mode resets the clean light and resets the auto purge





# Are there any questions?

