MAR1400 and
MAR2000

Technical Training

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MAR1400 and MAR2000

Shown without chute

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General Description

- RL (Remote Low Side) System ONLY
- R-404A
- Slowly rotating evaporator drum in a water bath and with water spraying on it
- Evaporator temperature is -11 deg. F.
- Refrigerant flows in and out of the evaporator from one end
- Thin ice skin contacts scraping blade and chips off

ICE PRODUCTION

	70/50	90/70
• MAR1400	1430 lb	1260 lb
• MAR2000	1980 lb	1700 lb

MAR Cabinet

Front View

Back View

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APPLICATION GUIDELINES

Indoors Only!

Ambient Temperature: 5-39ºC (40-100ºF)

Water Temperature: 5-35ºC (40-95ºF)

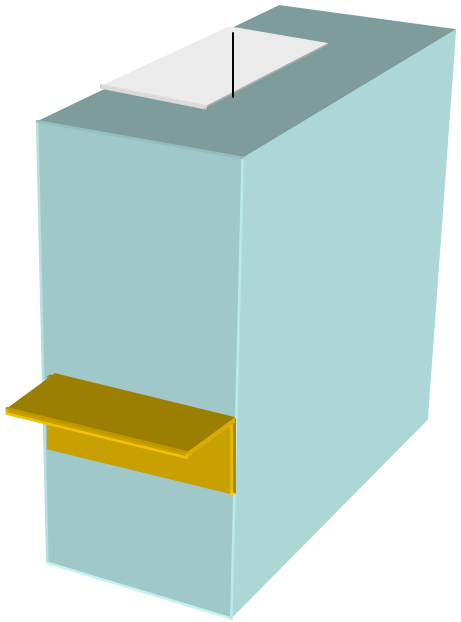
Water pressure: 1-5 bar (14-75 psi)

Electr.Voltage Fluctuation: ±10%

COOLING CAPACITY REQ.

MODEL	EVAPORATING TEMPERATURE	COOLING REQUIREMENT
	°C (°F)	Kcal/hr. (BTUH)
MAR1400	-24 (-11)	5000 (19,000)
MAR2000	-24 (-11)	6500 (26,000)

Assembly: ICE CHUTE



- Provided with machine
- Must be assembled to cabinet when machine is installed
- Bin thermostat bulb attaches to inside bottom side

Electrical & Refrigeration

- Supply Power:
  - 208-230 volts, 60 Hz
  - Single Phase power to the terminal strip in the electrical box
  - No connection to condensing unit
    - It operates on its low pressure control
- Refrigeration
  - Connect to rack or dedicated condensing unit

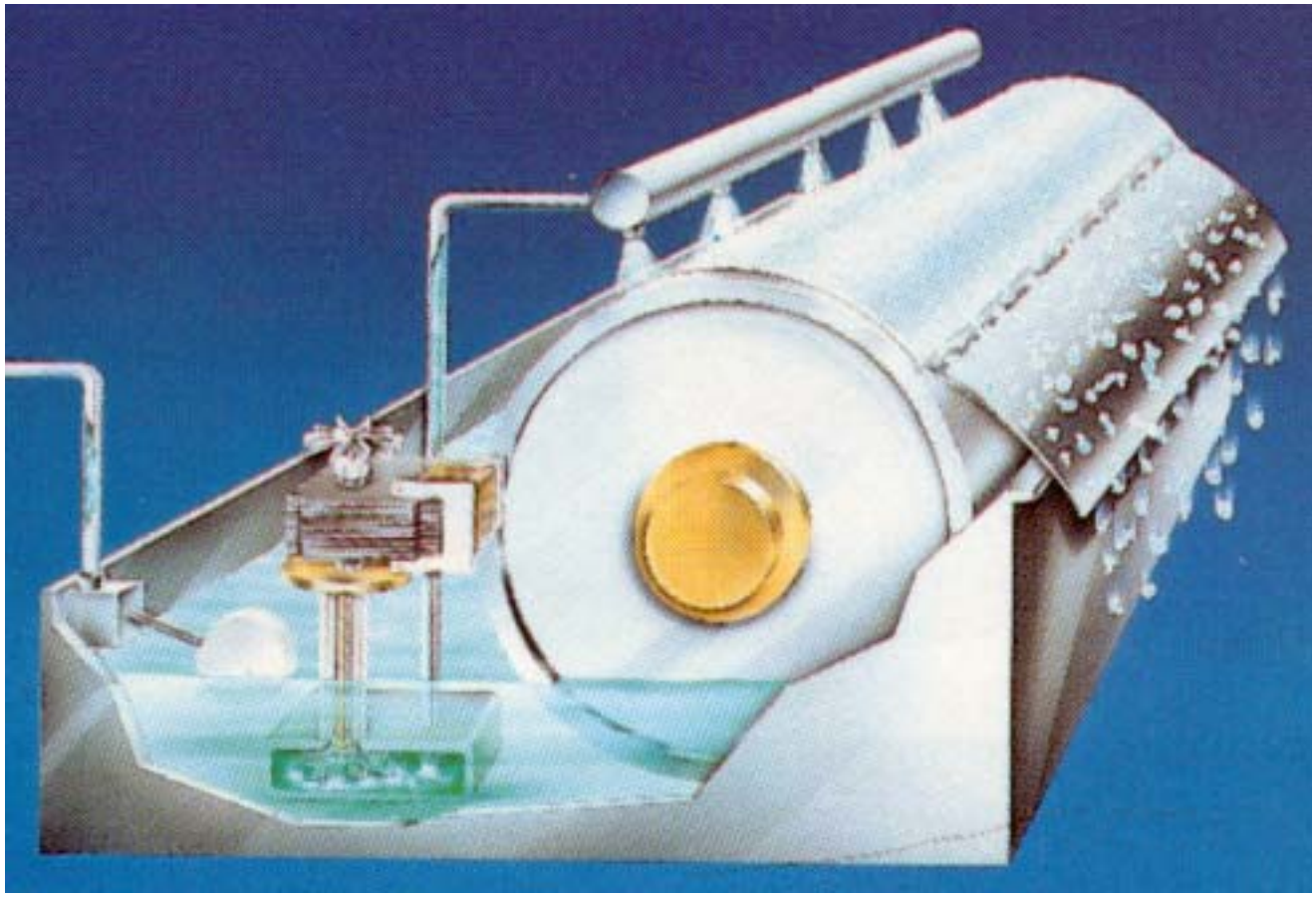
REFRIGERATION

- Confirm system capacity and refrigerant type
- Line runs less than 10 feet:
  - Use 3/8” liquid line and 5/8” suction line
- Line runs longer than 10 feet
  - Use 1/2” liquid line and 3/4” suction line
- Install isolation valves in both liquid and suction lines

WATER SUPPLY and DRAIN CONNECTIONS

- Provide separate water supplies, with hand shut-off valve on the ice making water supply line
- Evaporator supply water connection: 3/4” male hose coupling fitting (with water strainer) is standard, and a 3/8” male flare is adapter provided, shipped loose in cabinet
- Connect drain tube to drain fitting

General Operation



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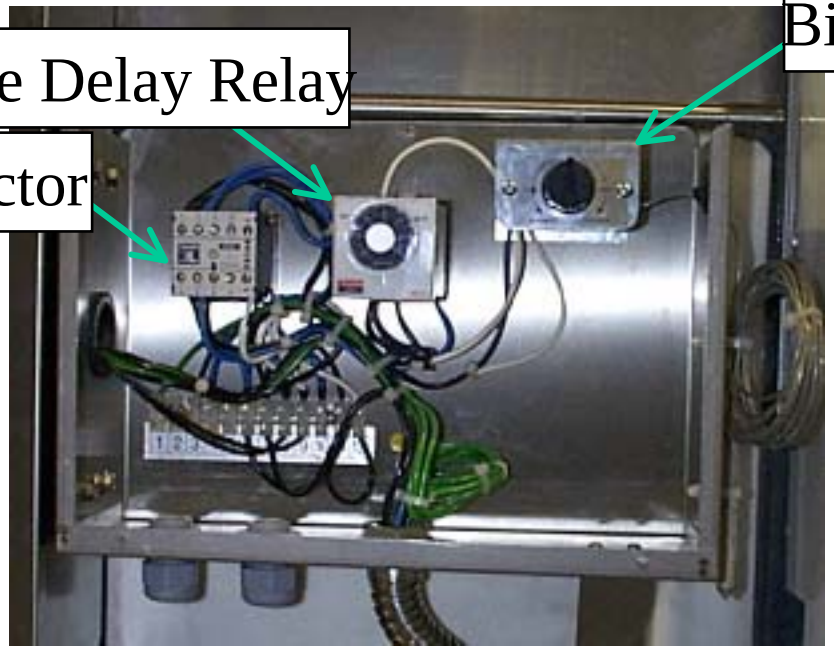
MAR Components



Electrical Box

Motor and Gear Reducer

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MAR Components

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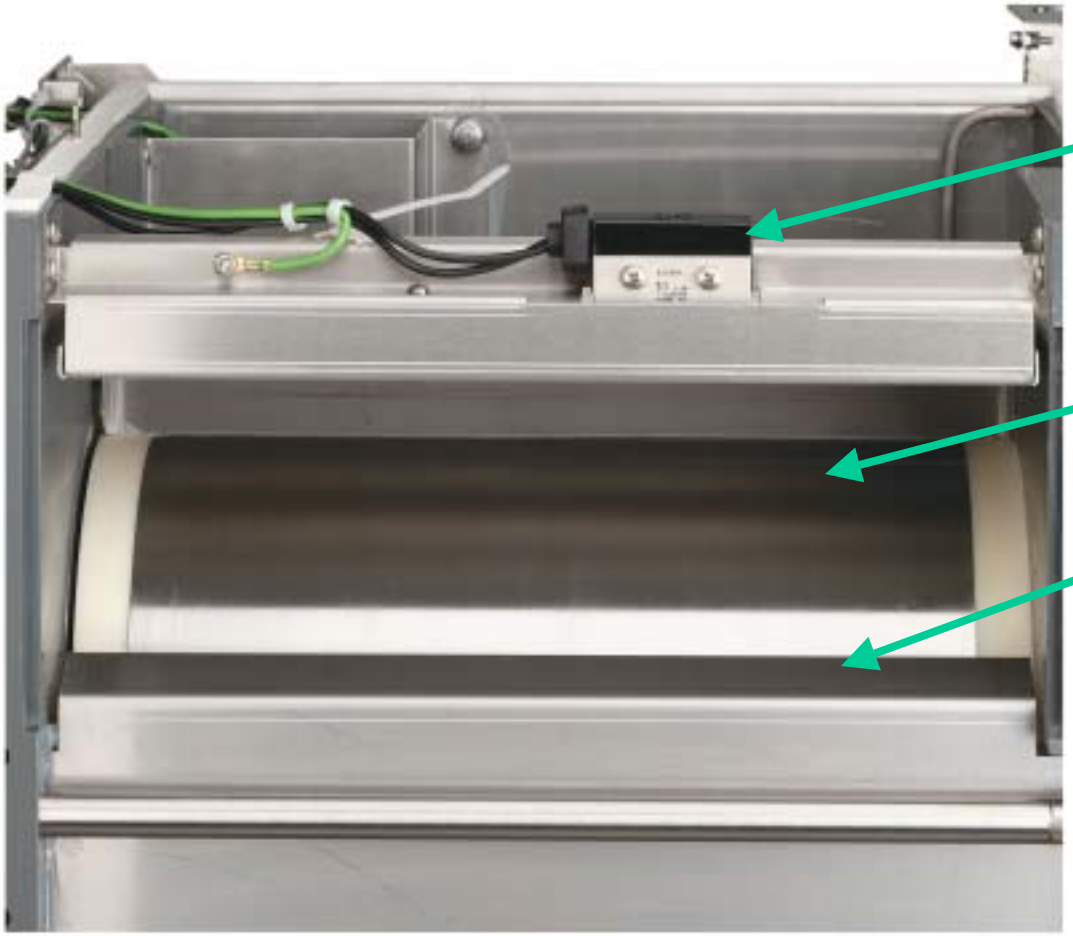
MAR Components



Electrical Components

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DRIVE MOTOR

- 1/2 HP
- 208-230 Volt
- 60 Hertz
- 1,2/2,1 Ampere
- 1400 R.P.M. with thermal protection
- NOTE: ALWAYS CHECK FOR CLOCKWISE ROTATION !

DELAY CONTROL TIMER

- Delays the energizing of main contactor to prevent short cycling of compressor unit and drive motor
- Dial settings: 0 up to 60 min.
- Factory default setting: 10 - 12 min

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WATER FAILURE SWITCH

- Senses pressure to the float valve
  - 0,5 bar (7 psi) OFF
  - 0,8 bar (12 psi) ON
  - Complete cut-off
  - Automatic reset

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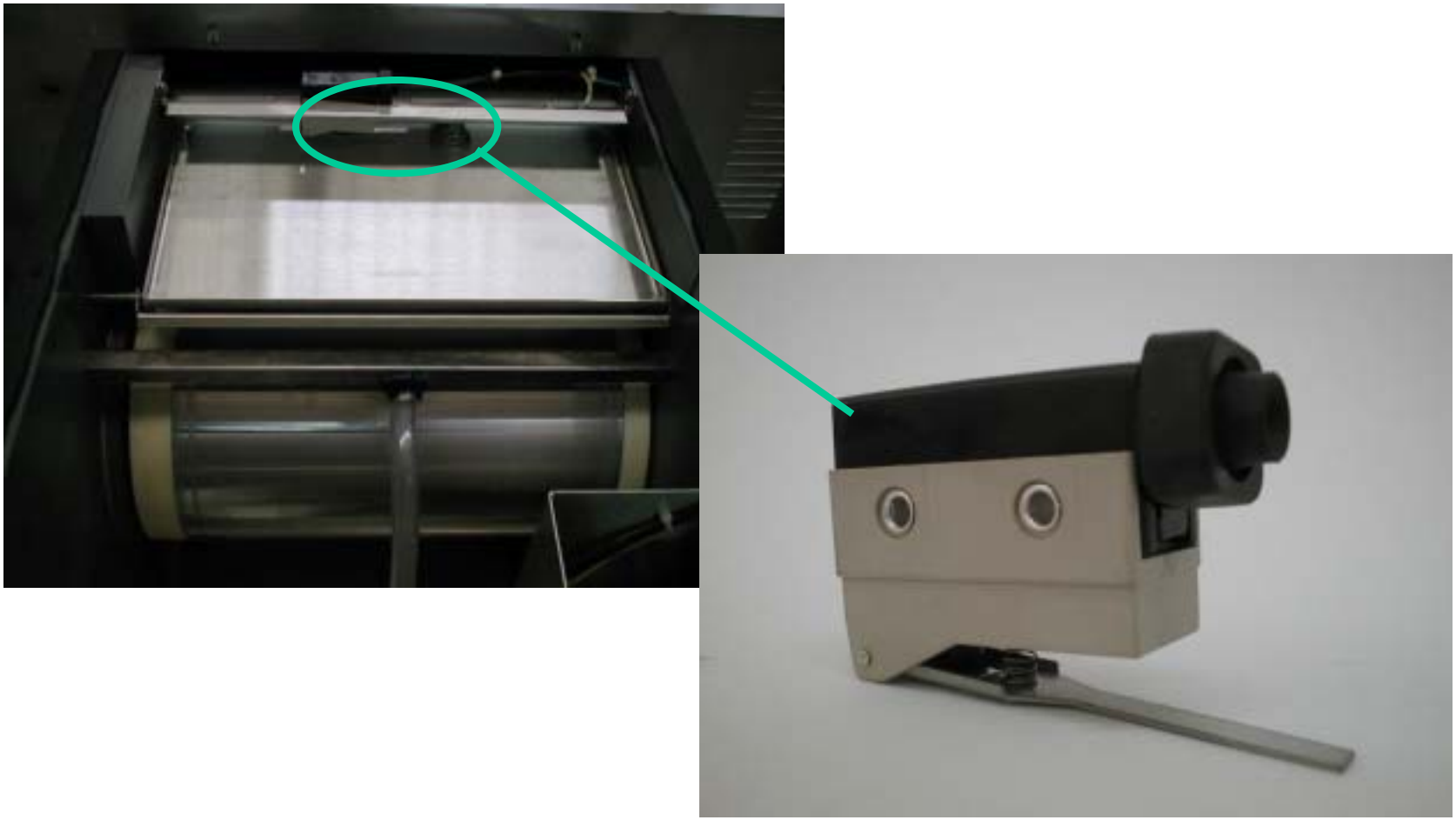
ICE LEVEL CONTROL THERMOSTAT BULB

- Temperature range:
- Adjustable

- Install bulb in chute at time of installation

ICE SPOUT SAFETY SWITCH



IF ACTIVATED, WILL STOP THE MACHINE COMPLETELY

MECHANICAL PARTS

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Evaporator

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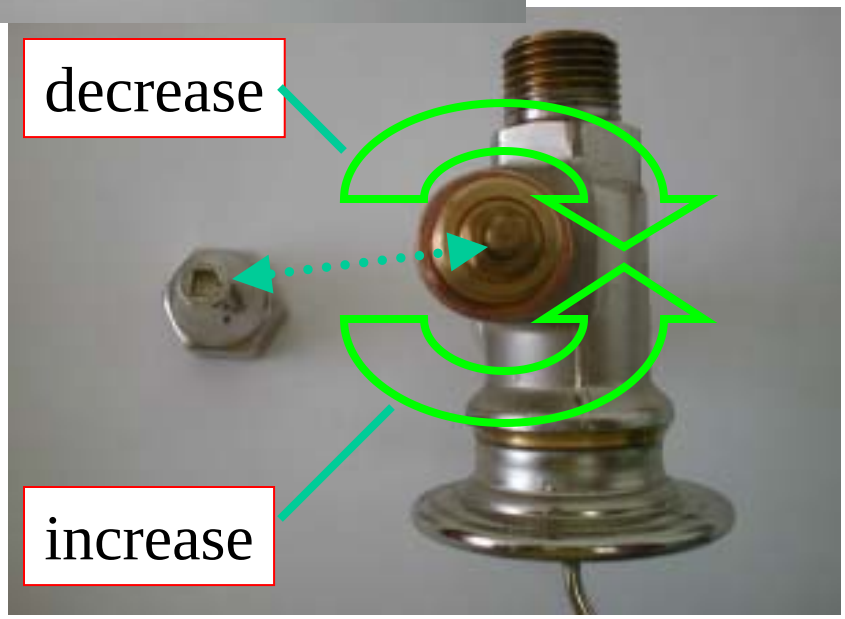
AUTOMATIC EXPANSION VALVE



- Keeps constant pressure in the evaporator
- Manually adjustable

SETTING: 23 PSIG for R-404A

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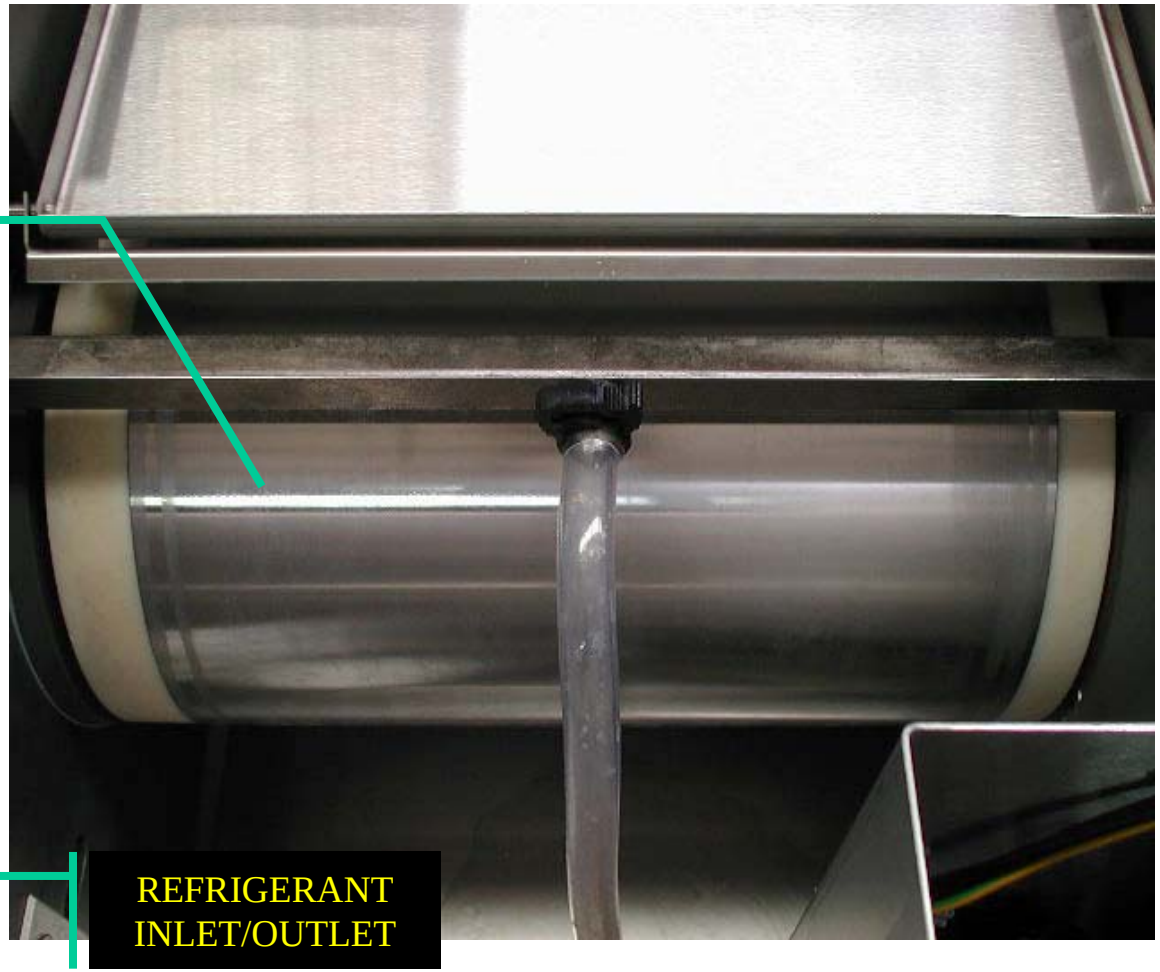
Evaporator Drum (Back View)



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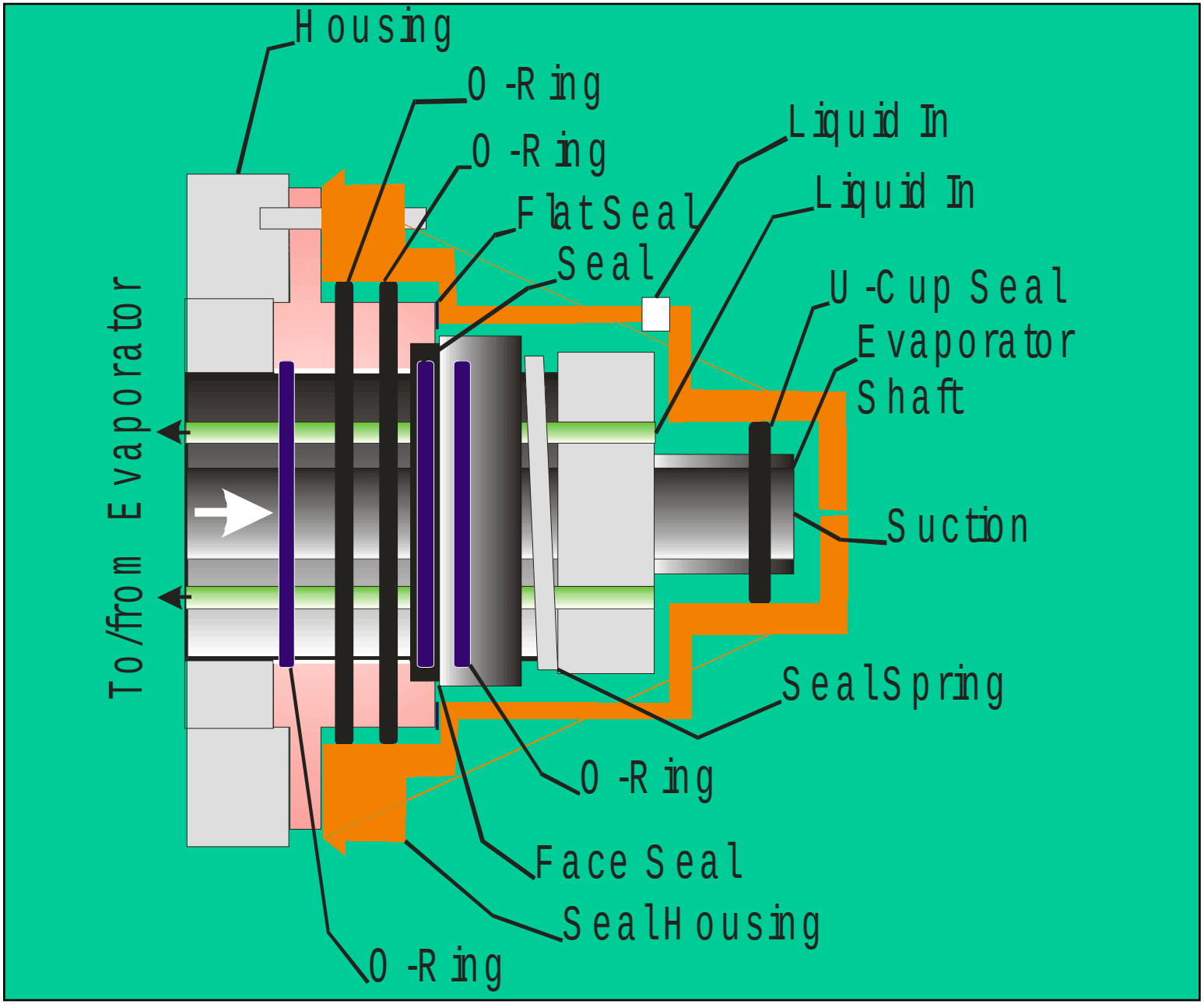
Refrigerant Seal System

- 7 Seals between evaporator inlet and atmosphere
  - 2 Stationary O-Rings
  - 1 Shaft O-Ring
  - 1 Face Seal
  - 1 Flat Seal
  - 2 Shaft-to-Face Seal O-rings
- 1 U-cup seal between evaporator inlet and outlet


Housing
O-Ring
O-Ring
Flat Seal
Seal
Liquid In
Liquid In
U-Cup Seal
Evaporator
Shaft
Suction
To/from Evaporator
Seal Spring
O-Ring
Face Seal
Seal Housing
O-Ring

Refrigerant Seal System

- Rotating parts:
- clip retainer ring
- spring collar
- compression spring
- stainless steel seal ring with O-ring
- Stationary parts:
- Graphite ring with O-ring
- stainless steel housing ring with gasket and O-rings

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HEAT EXCHANGER

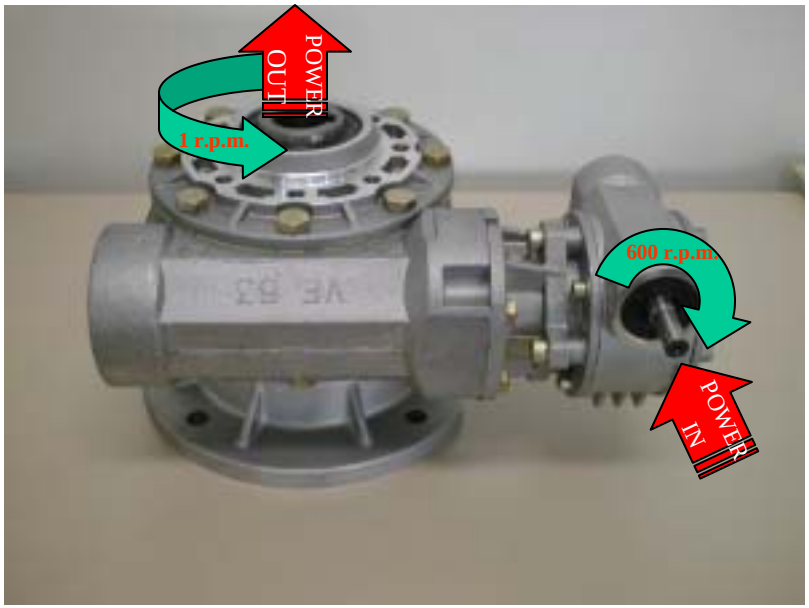
- reduces flash gas in liquid line
- reduces liquid refrigerant in suction line
- subcools liquid refrigerant

OPERATING EFFICIENCY

MOTOR SHAFT PULLEY

Reverse motor pulley to change drum RPM

GEAR REDUCER



Gear reducer ratio

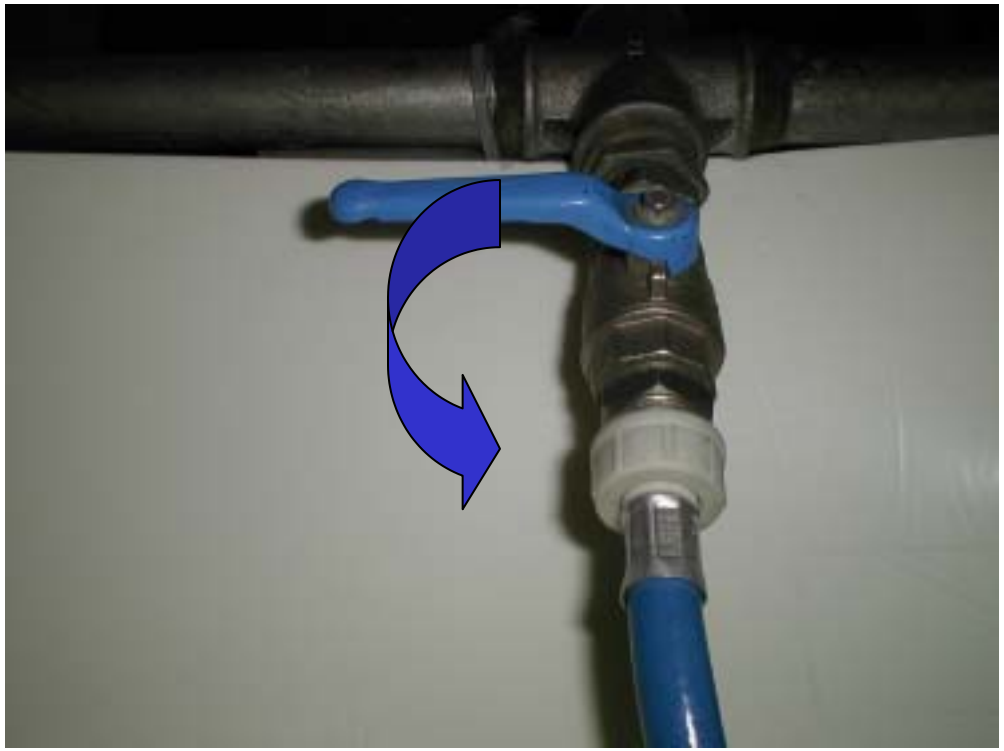
- 1/600

NOTE: the gear reducer is lubricated / greased and then sealed. It is maintenance free!

Initial Start Up

- Apply Power
  - Bin Thermostat is Closed, Water Pump Starts
- Supply Water
  - Water Pressure switch Closes, Power to Time Delay Relay
- Delay Time expires
  - Liquid Line Coil and Drive Motor Contactor get Power

START- UP



- Open the water supply line shut-off valve to the evaporator drum
- Observe that water fills the reservoir and stops

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START-UP

Float stops water flow when water level reaches maximum level in the water basin:

- **4.5 to 4.75 inches**

DELAY CONTROL TIMER

- Delays the energizing of main contactor
- **Factory default setting: 10 - 12 min**
- **Delays initial start up also**
  - Can adjust to lower time
  - Must return to original setting

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START-UP

Rotation Direction is Clockwise for:

- Motor
- Gear reducer pulley
- Evaporator Drum

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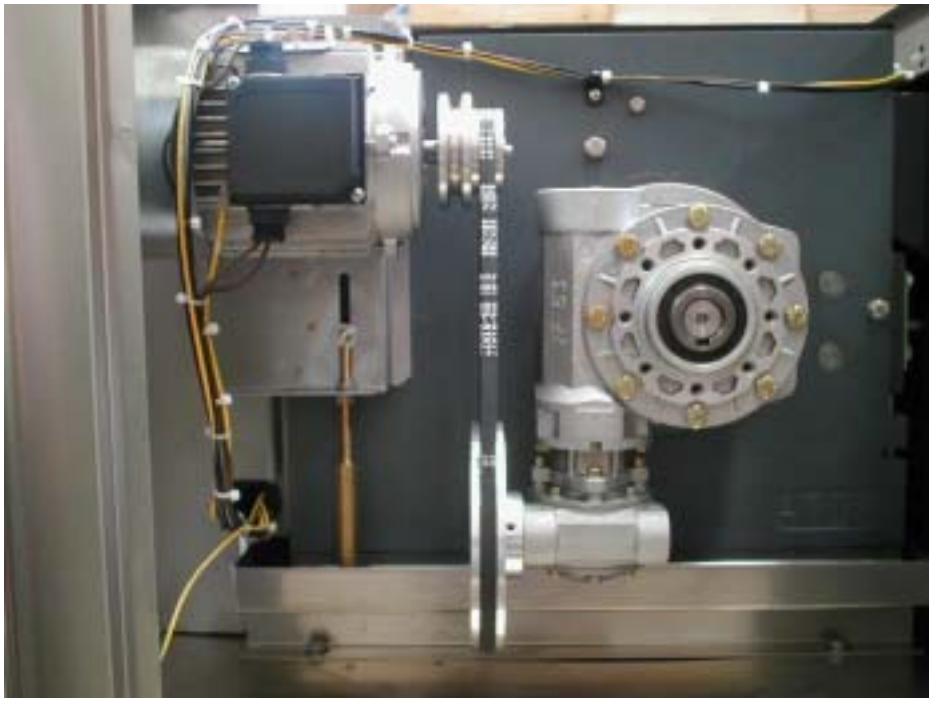
START-UP



Double pulley for two different ice thickness.

Drum R.P.M. (thick ice):

- MAR1400 only
- MAR2000 has a fixed speed

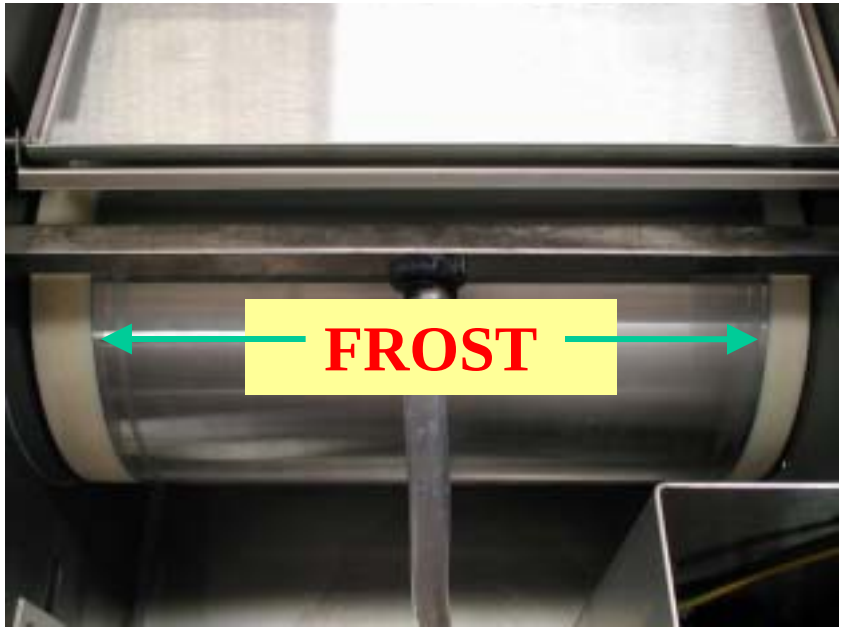
START-UP

- Liquid line valve opens, condensing unit starts
  - Low side pressure may drop to the cut out of the low pressure control at start up. This is normal
  - It will rapidly rise and restart the unit
  - It is also normal to frost back to the compressor when it is in a dedicated condensing unit

START-UP

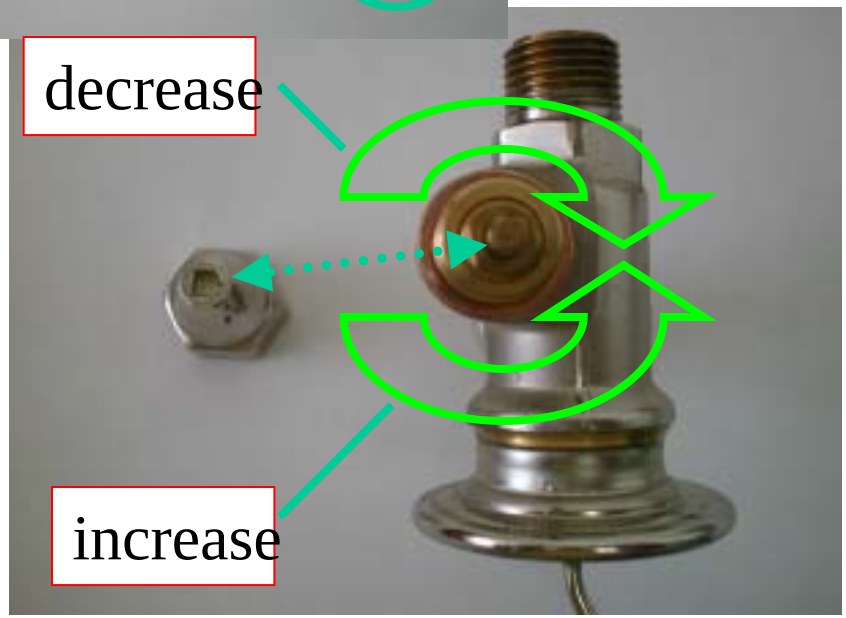
- After 3 minutes operation, the ice skin begins to form and be scraped by the blade.
- After 20 minutes check for noises from:
  - touching lines
  - compressor holding bolts
  - mis-aligned drive motor pulley (V-belt vibrations)

START-UP



- Evaporator drum must be frosted from end to end.
- If not, adjustment of the refrigerant expansion valve is required.
- Suction pressure range: 22 to 24 PSIG

AUTOMATIC EXPANSION VALVE



- Remove stem cap from AXV
- Use cap as adjustment tool
- Adjust EPR first
  - If EPR will not adjust lower, and external suction pressure is lower than EPR reading, AXV is overfeeding

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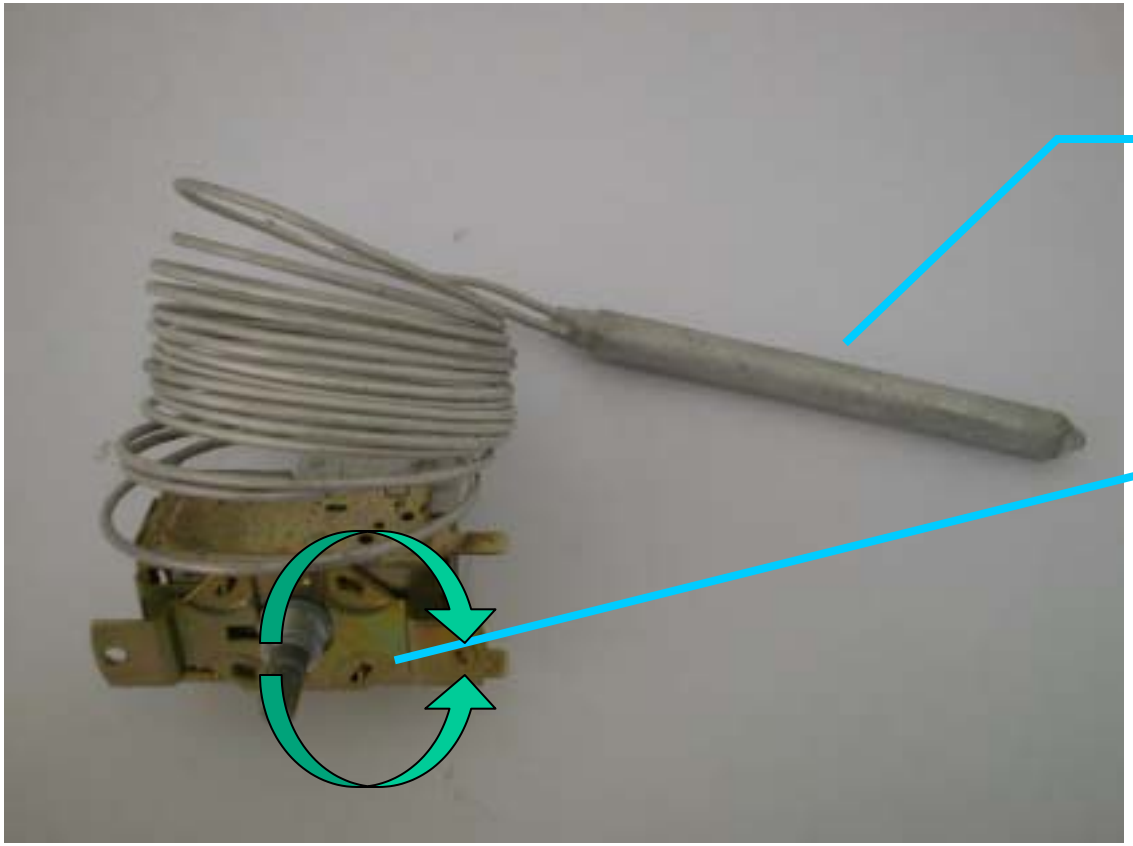
MAINTENANCE

- Clean evaporator with Scotsman Ice Machine Cleaner
  - Block float closed and Drain the basin
  - Add 68 ounces of IM cleaner to 7 gallons of warm water
  - Pour mixture into the basin
  - Operate unit for 10 minutes and drain the basin
  - Un-block the float

ADJUSTMENTS

ICE LEVEL CONTROL



- Sensing bulb
- Setting of temperature range dial

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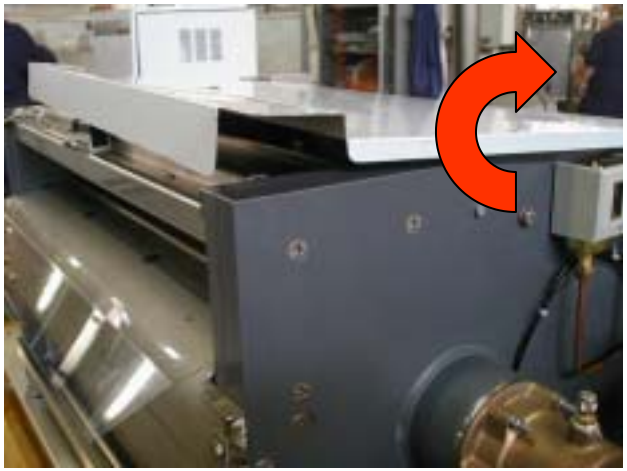
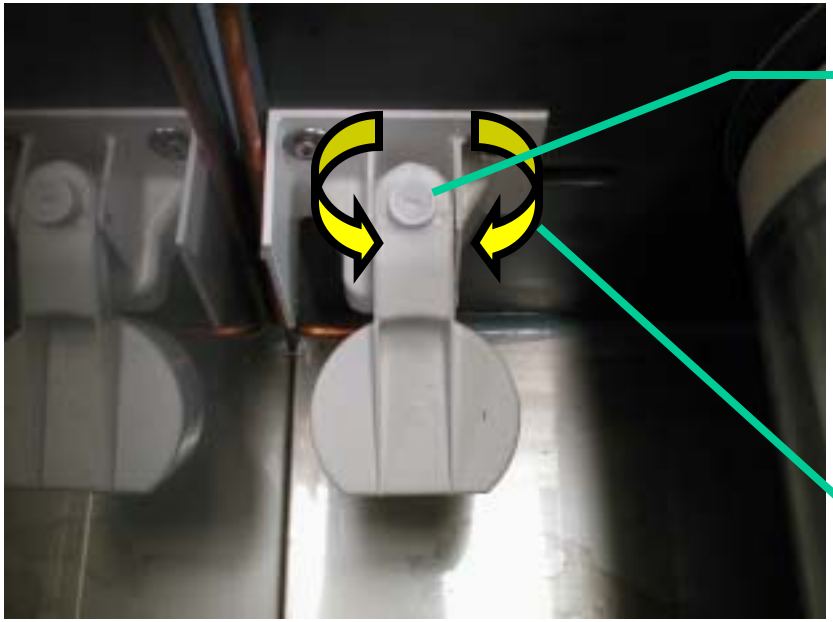
WATER LEVEL IN DRUM BASIN



- Remove top panel
- Remove drum basin cover

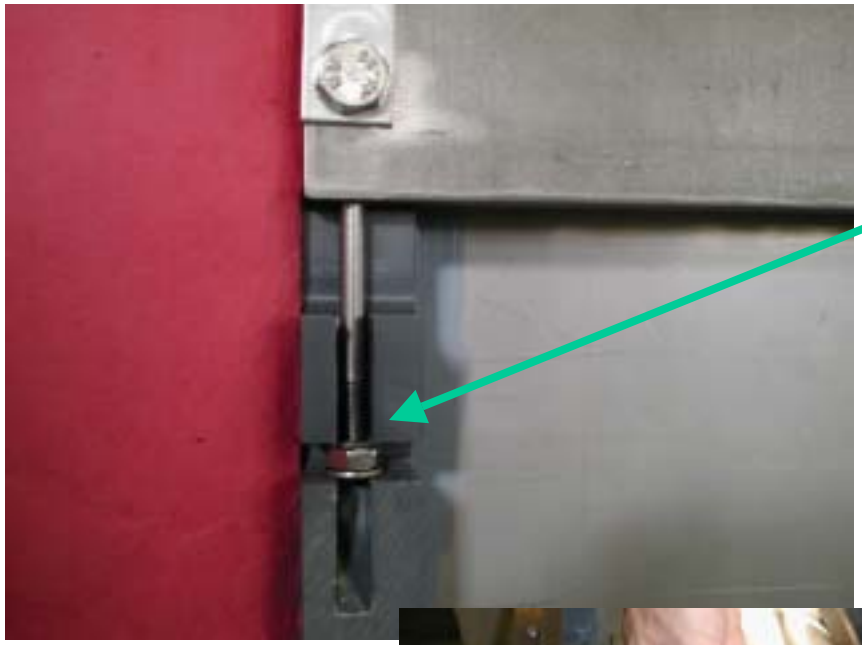
ADJUSTMENT OF WATER LEVEL

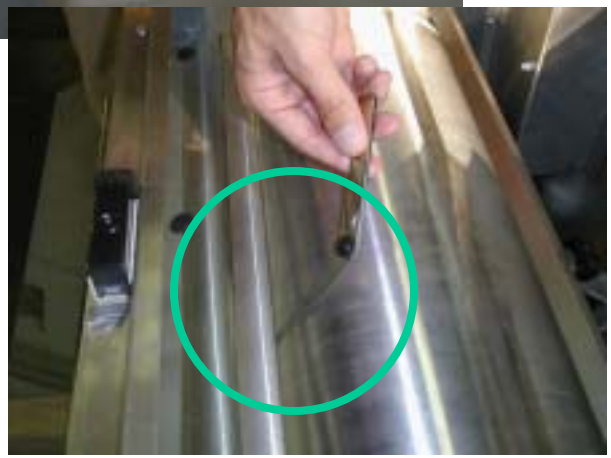


4.5 to 4.75 inches

- Turn the grooved screw located at the center of the float valve counterclockwise to increase water level..
- Turn clockwise decrease water level

SCRAPING BLADE ADJ.





- Check and adjust clearance between blade and drum by means of adjusting nuts
- Correct clearance must be between 0.1 and 0.05 mm (.004”)

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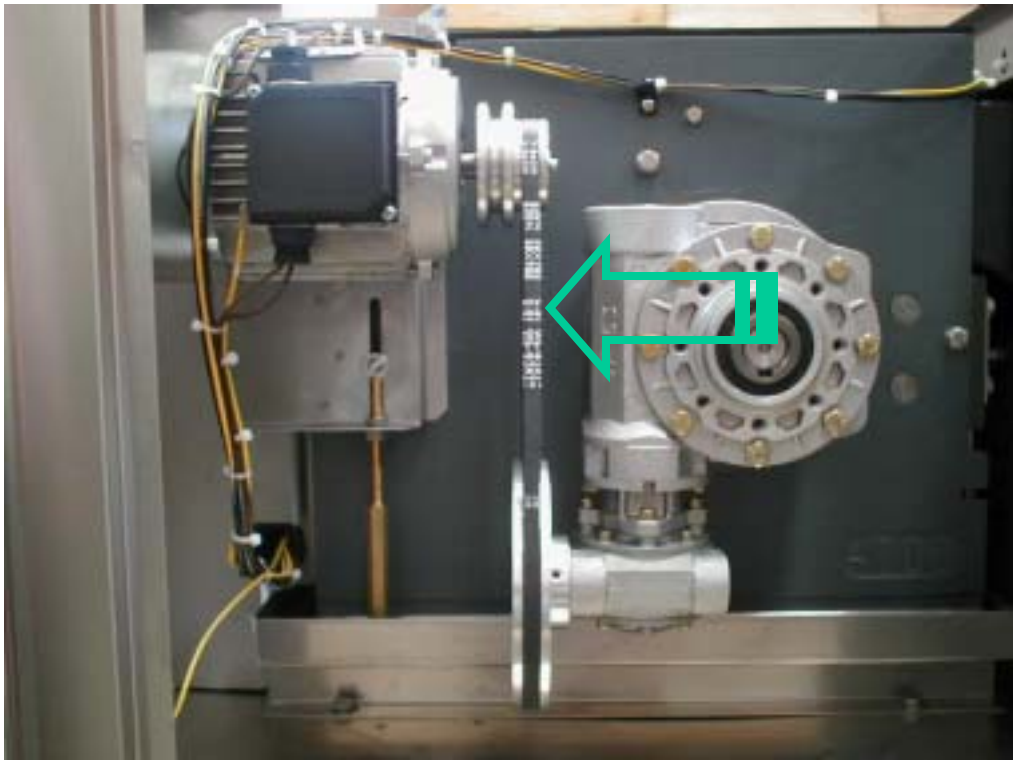
GEAR BOX and FIBER KEYS

INSTRUCTION FOR REMOVAL AND REPLACEMENT

GEAR BOX and FIBER KEYS

Remove screws and front, top and right side panels.

GEAR BOX & FIBER KEYS



Loosen drive motor mounts

Move drive motor down

Slide V Belt from gear box pulley.

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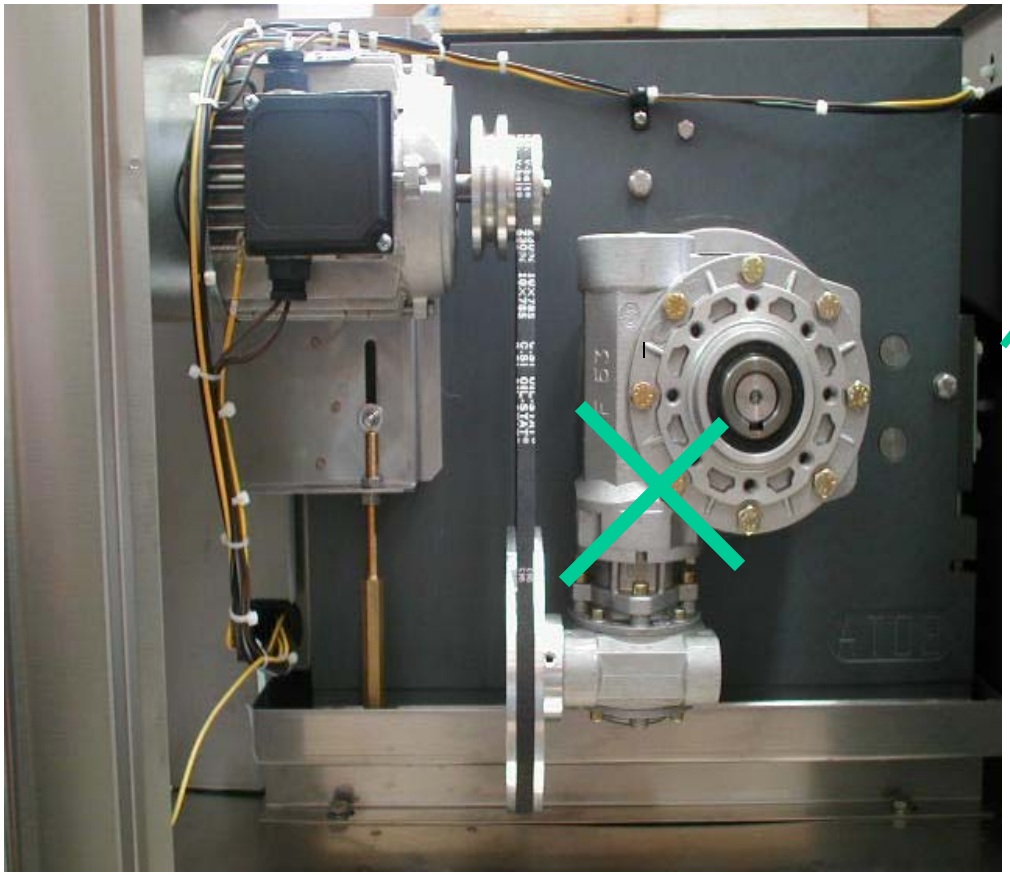
GEAR BOX & FIBER KEYS



Remove four nuts and washers which secure the gear box to the evaporator basin side frame.

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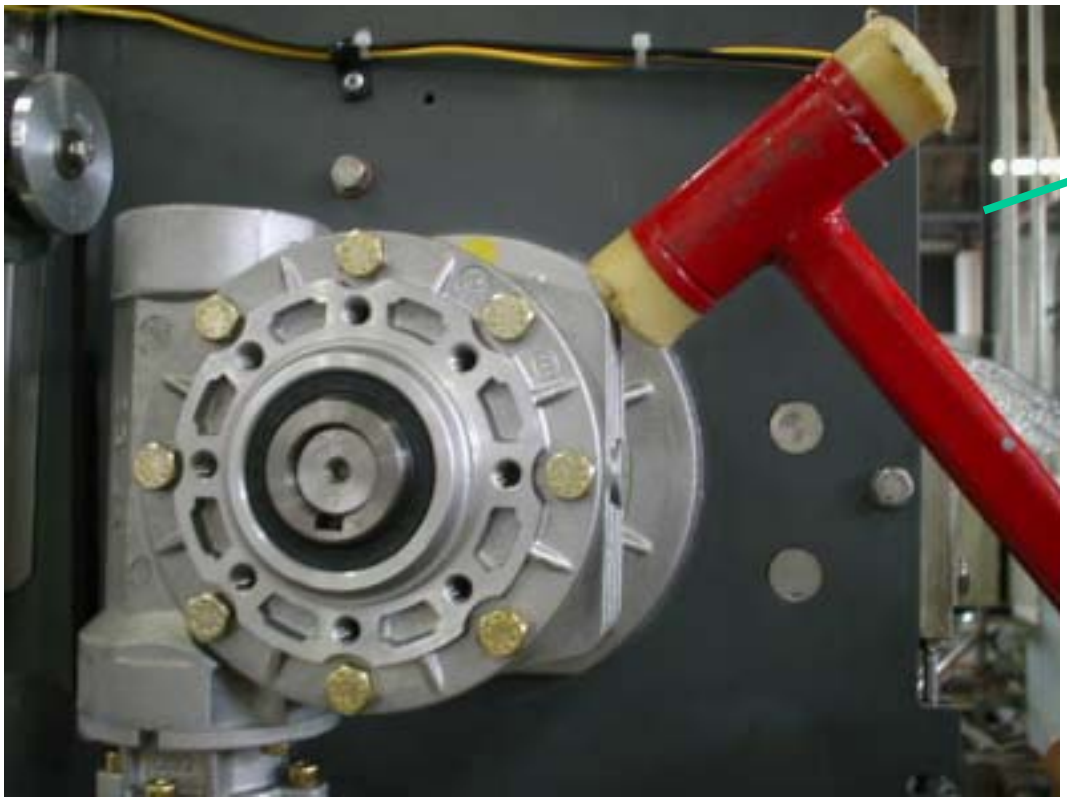
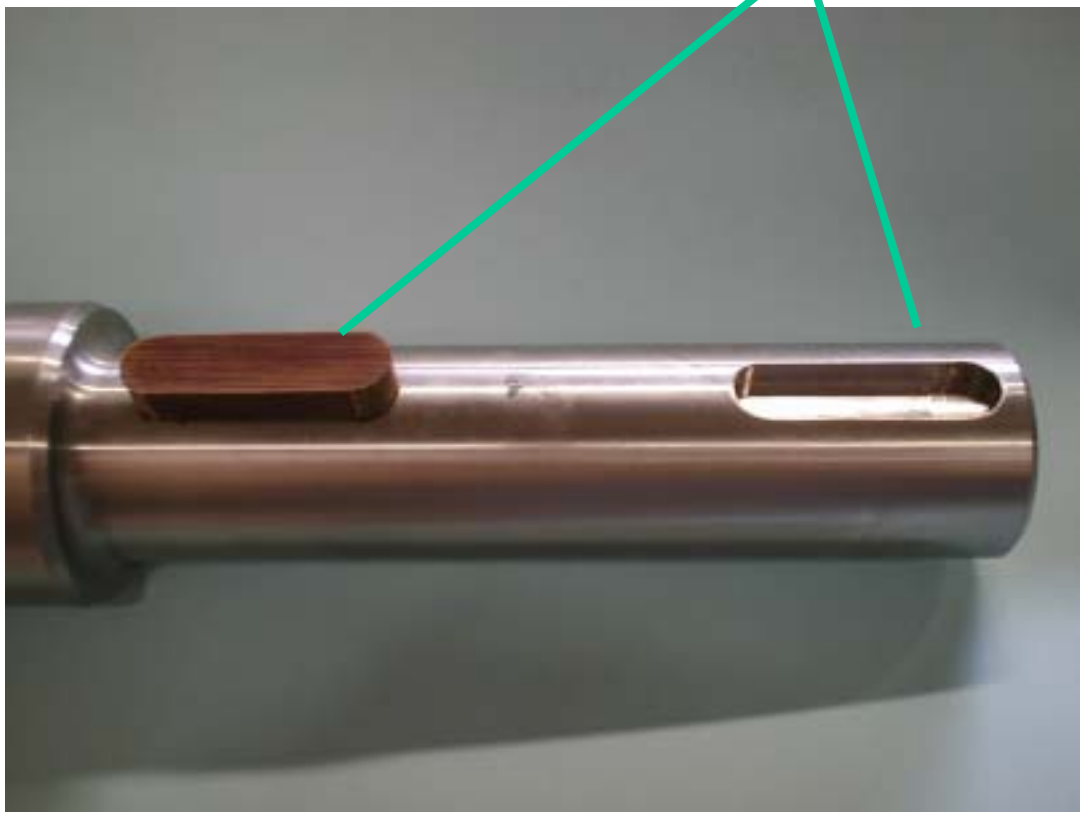
GEAR BOX & FIBER KEYS



With a mallet, tap the gear box to loosen it.

Then remove it.

GEAR BOX & FIBER KEYS



Locate the two fiber keys and replace with new ones.

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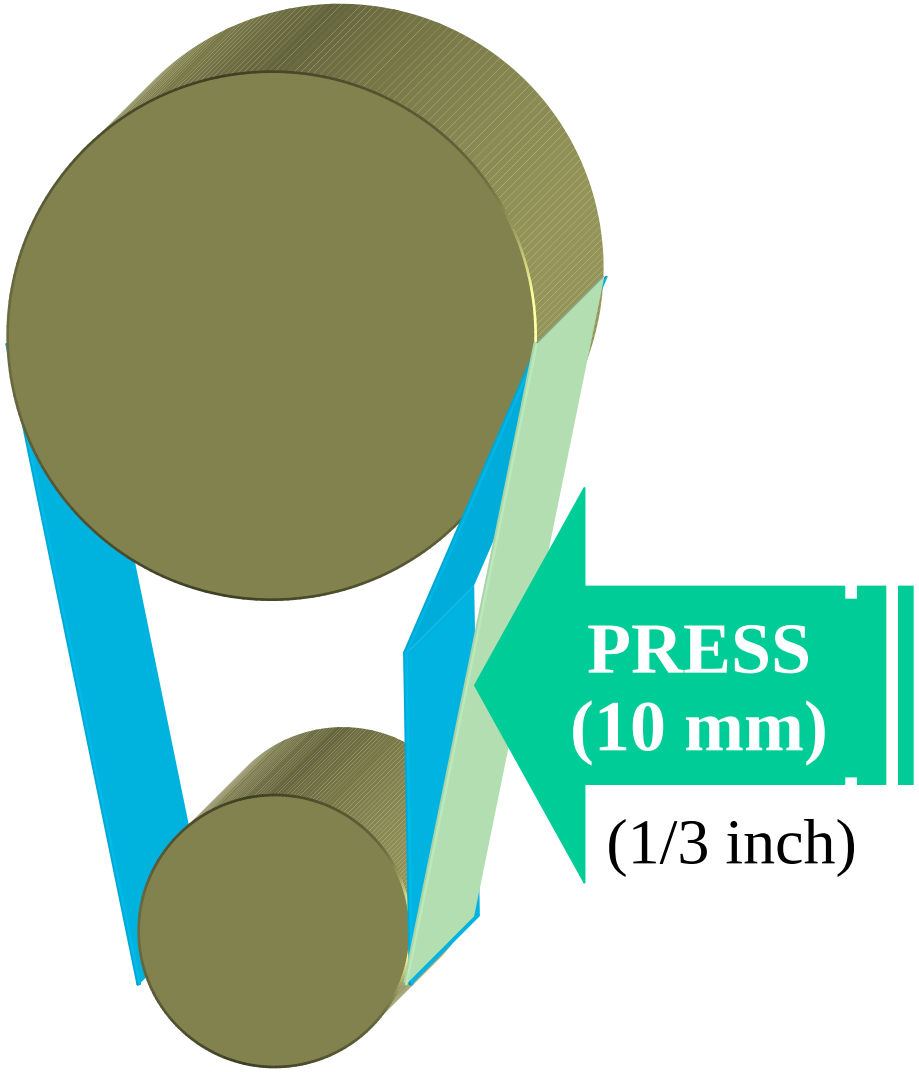
V-BELT



- Used on motor shaft pulley and gear box
- Changing the V-belt from one grove to another, pay attention to adjust it for proper tension and alignment.

REFRIGERANT MECHANISM

INSTRUCTION FOR REMOVAL AND REPLACEMENT

Before removing the refrigerant manifold:

- Recover all refrigerant

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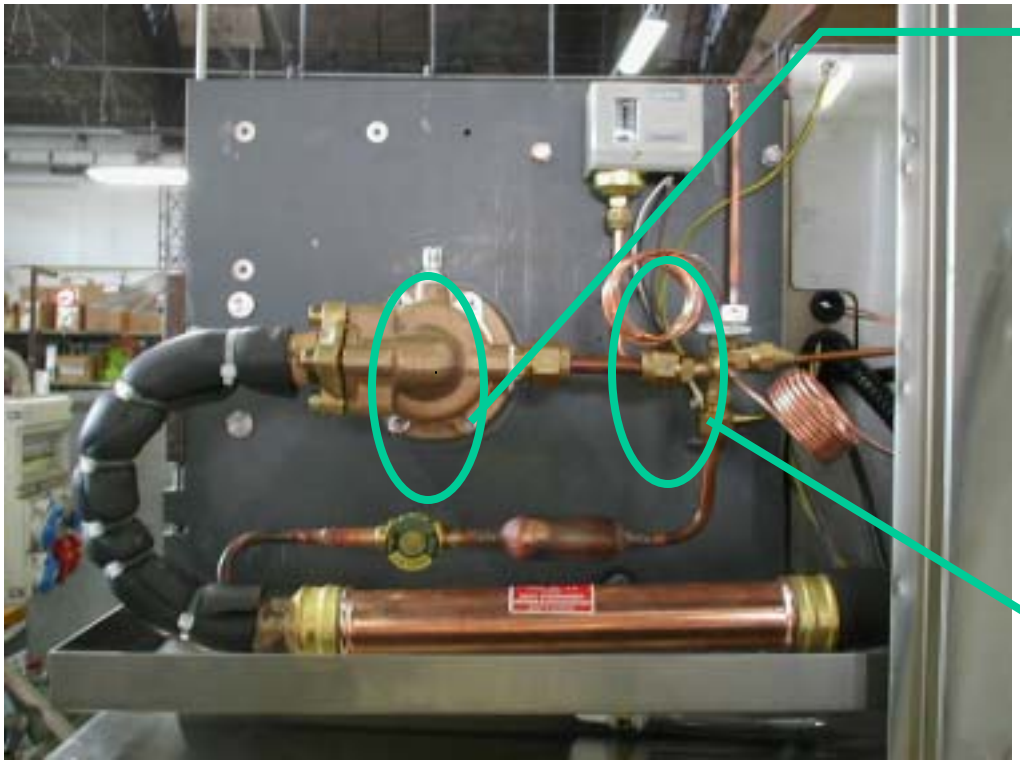
SEAL MECHANISM



Remove the 4 *allen* screws from the refrigerant outlet fitting and…….

….flared nut from the inlet.

Note: Metric Wrenches Required

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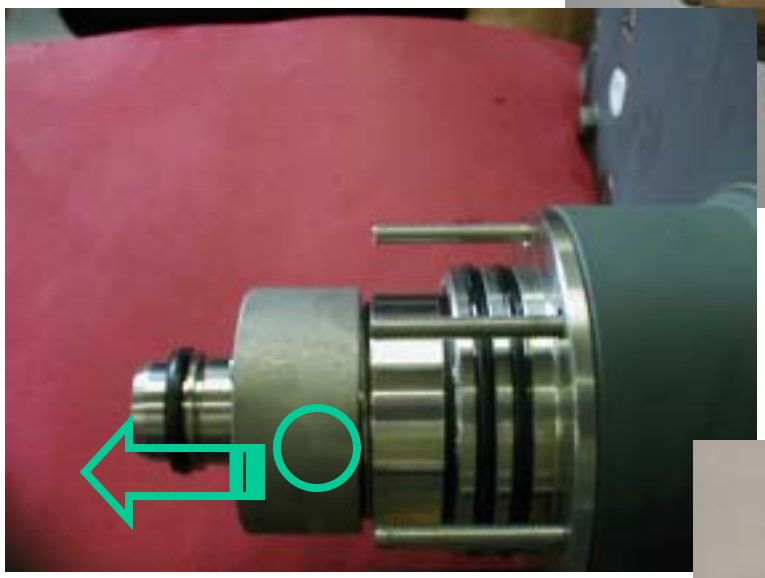
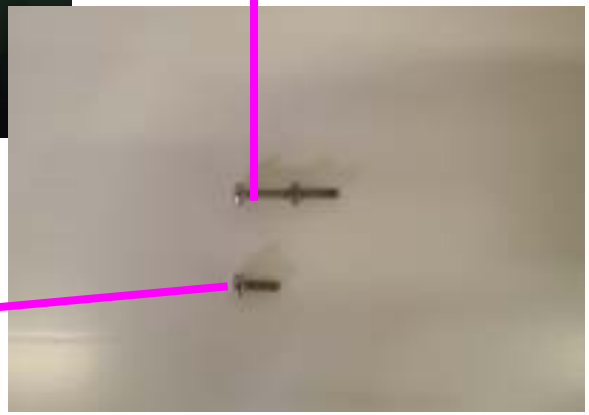
SEAL MECHANISM

Remove the 6 nuts and washers securing the refrigerant manifold to the seal mechanism housing.

SEAL MECHANISM



With kit



Standard (3)

Once the refrigerant manifold has been removed, remove **one** of the three screws securing the seal mechanism ring to the drum shaft journal.

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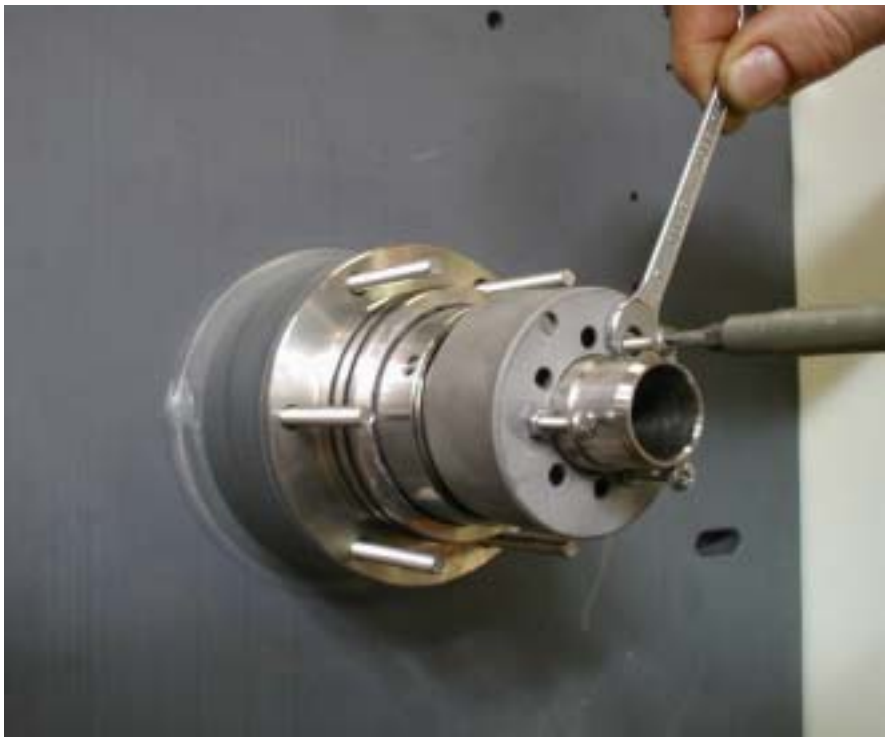
SEAL MECHANISM



Install the long screw from the seal kit in place of the screw that was removed, then tighten its nut.

This will allow the other screws to be removed.

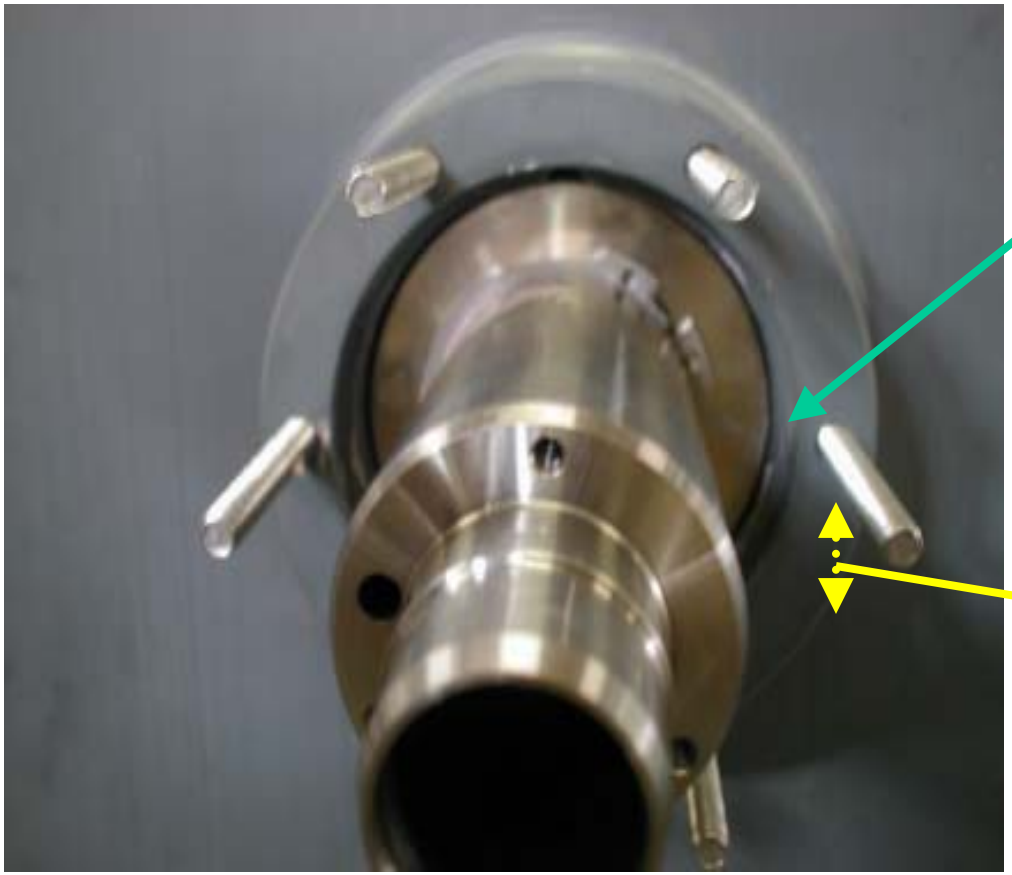
SEAL MECHANISM

Gradually remove the two standard screws then the longer screw by slowly unscrewing the nut till the spring of the seal mechanism releases

SEAL MECHANISM

Remove the stainless steel ring that houses the Graphite seal ring.

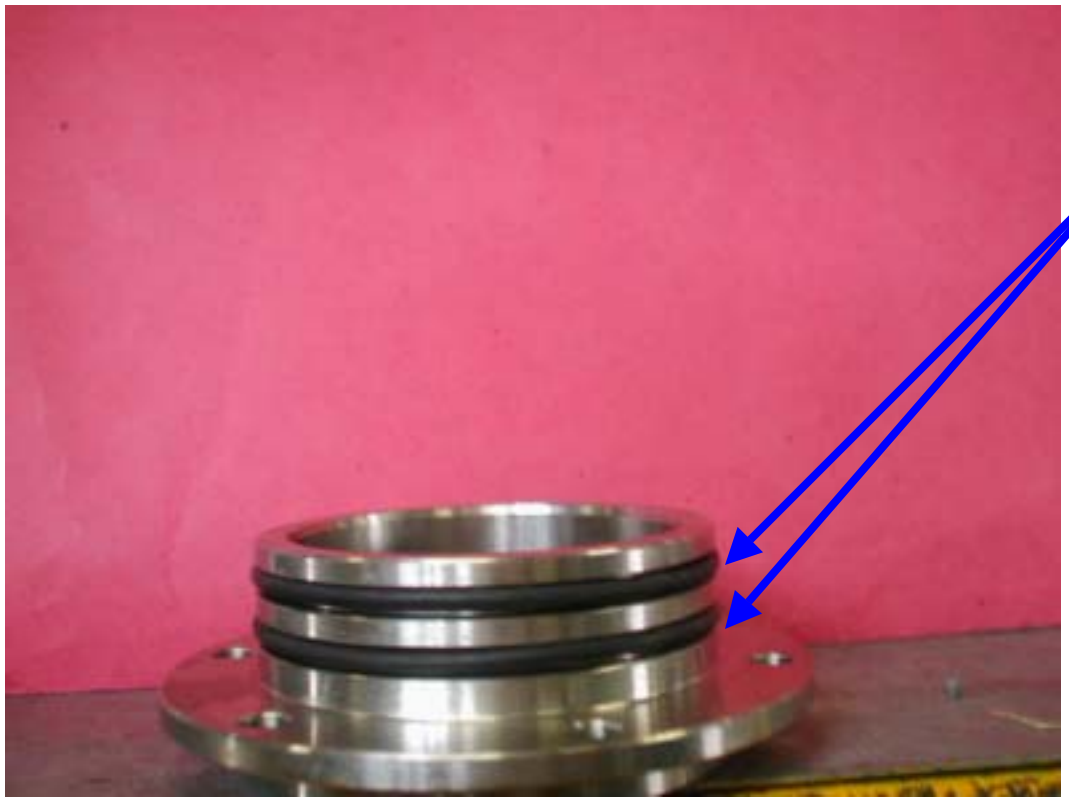
SEAL MECHANISM



Check to see that washer is properly clean and positioned with keyway to match the key

Check the surface conditions of cylinder shaft journal.

SEAL MECHANISM



Replace the O-rings of the stainless steel ring that houses the Graphite ring.

SEAL MECHANISM

Replace the O-ring on retainer

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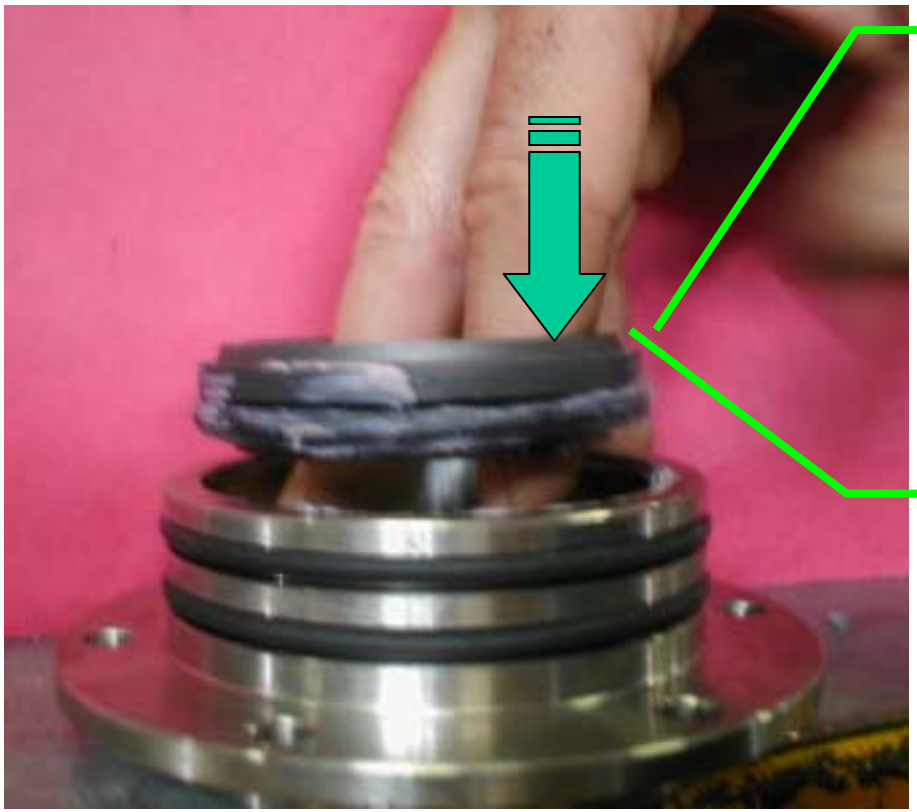
SEAL MECHANISM



Check the Graphite surface of the seal ring. It must be perfectly smooth.

Lubricate the outer surface of the new seal ring with refrigerant oil and place it in its seat in the housing, polished side out.

SEAL MECHANISM

- Reinstall spacer (if removed)

- Place washer (Teflon coated surface faces spacer) on housing matching pin with hole

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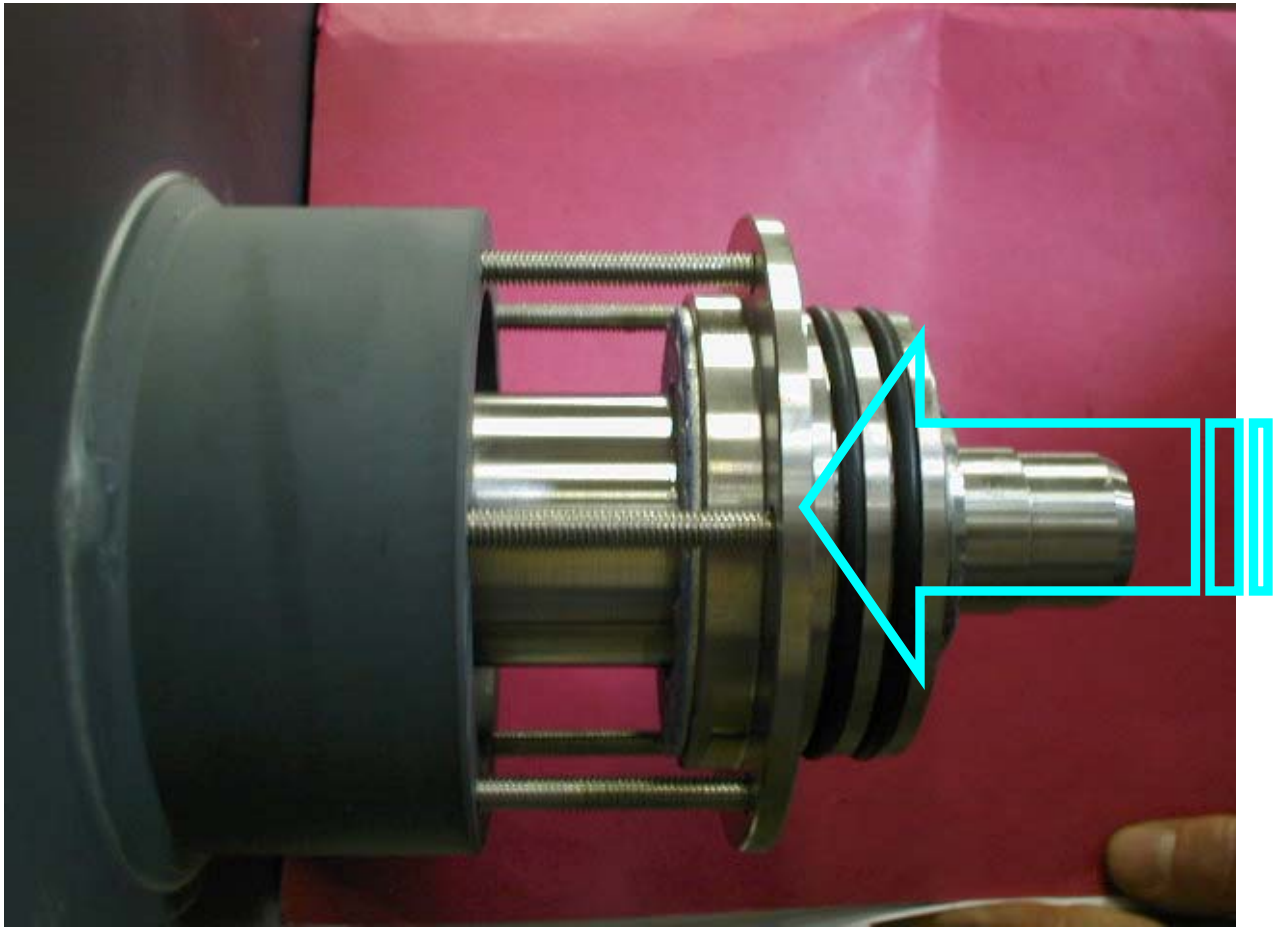
SEAL MECHANISM

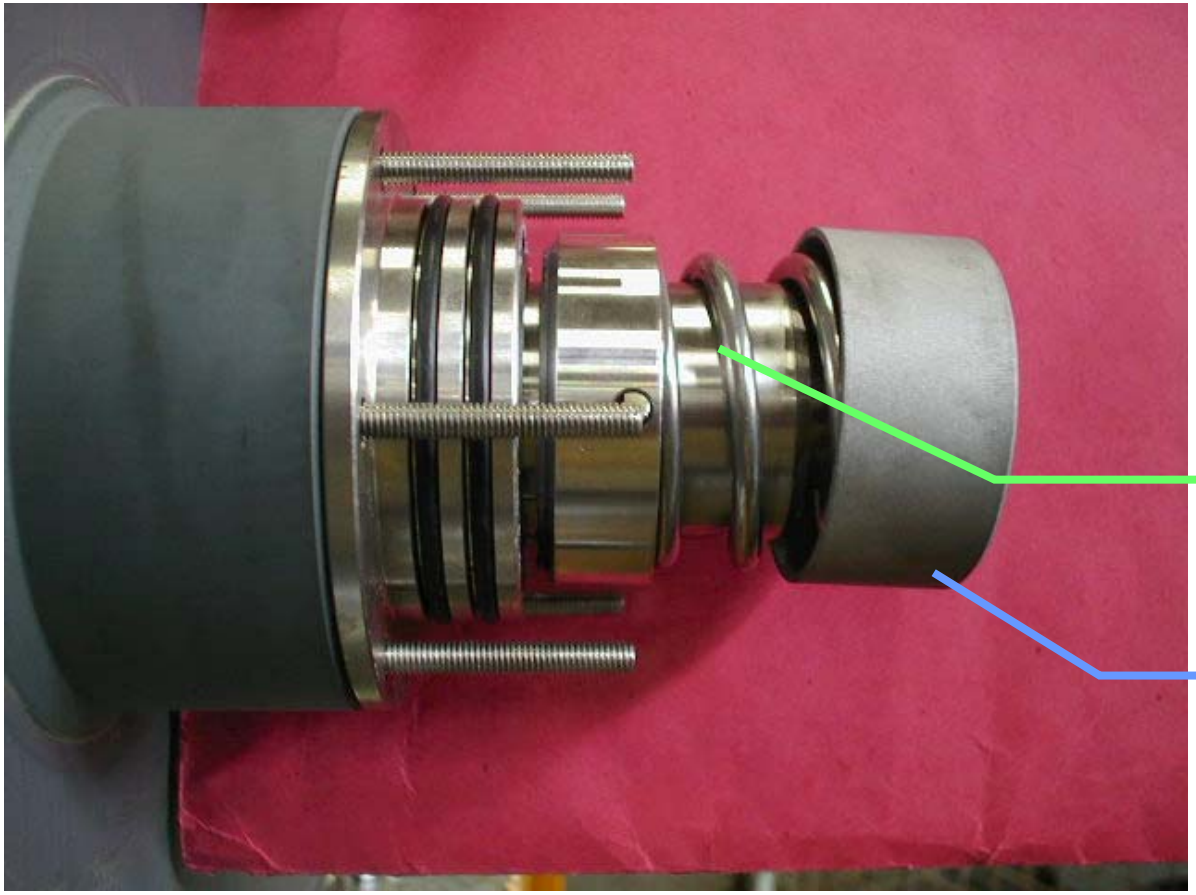


Install the graphite ring housing onto the drum shaft

SEAL MECHANISM

- Lubricate the O ring (inner surface of seal mechanism) with refrigerant oil.

SEAL MECHANISM



Mount the remaining portion of seal mechanism on drum shaft journal (stainless steel seal ring with spring), then the lock ring.

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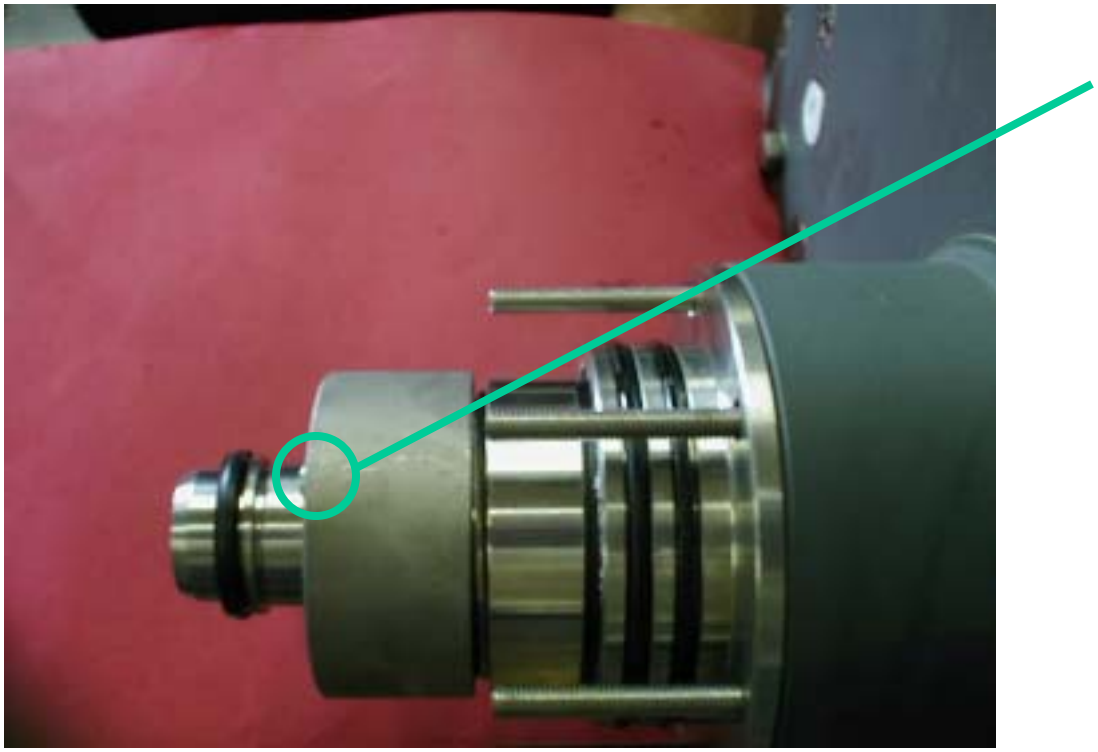
SEAL MECHANISM

Place the long screw with its nut in one of the three threaded holes then tighten the nut in order to compress the spring; finally lock it by using the standard shorter screws.

SEAL MECHANISM



After having tightened the screws remove the long screw and replace it with the third one.

SEAL MECHANISM

First place the SS ring on the shaft end ….

……then the spring ring (lip seal) with the inside spring facing the S.S. ring.

SEAL MECHANISM

Carefully clean the inner surface of refrigerant manifold and lubricate with refrigerant oil.

SEAL MECHANISM

Carefully reinstall refrigerant manifold on shaft then tighten nuts

SEAL MECHANISM

Connect the outlet refrigerant line to the corresponding port of the manifold and tighten it with the four Allen screws.

SEAL MECHANISM

Connect the refrigerant inlet line to its manifold fitting and tighten the flare nut.

MAR Summary

- Remote Low Side
- R-404A
- Produces Sub-Cooled Ice
- Refrigerated, Rotating Drum
- Ice is Scraped Off
- Multiple Seals at Refrigerant Inlet/Outlet

End of presentation