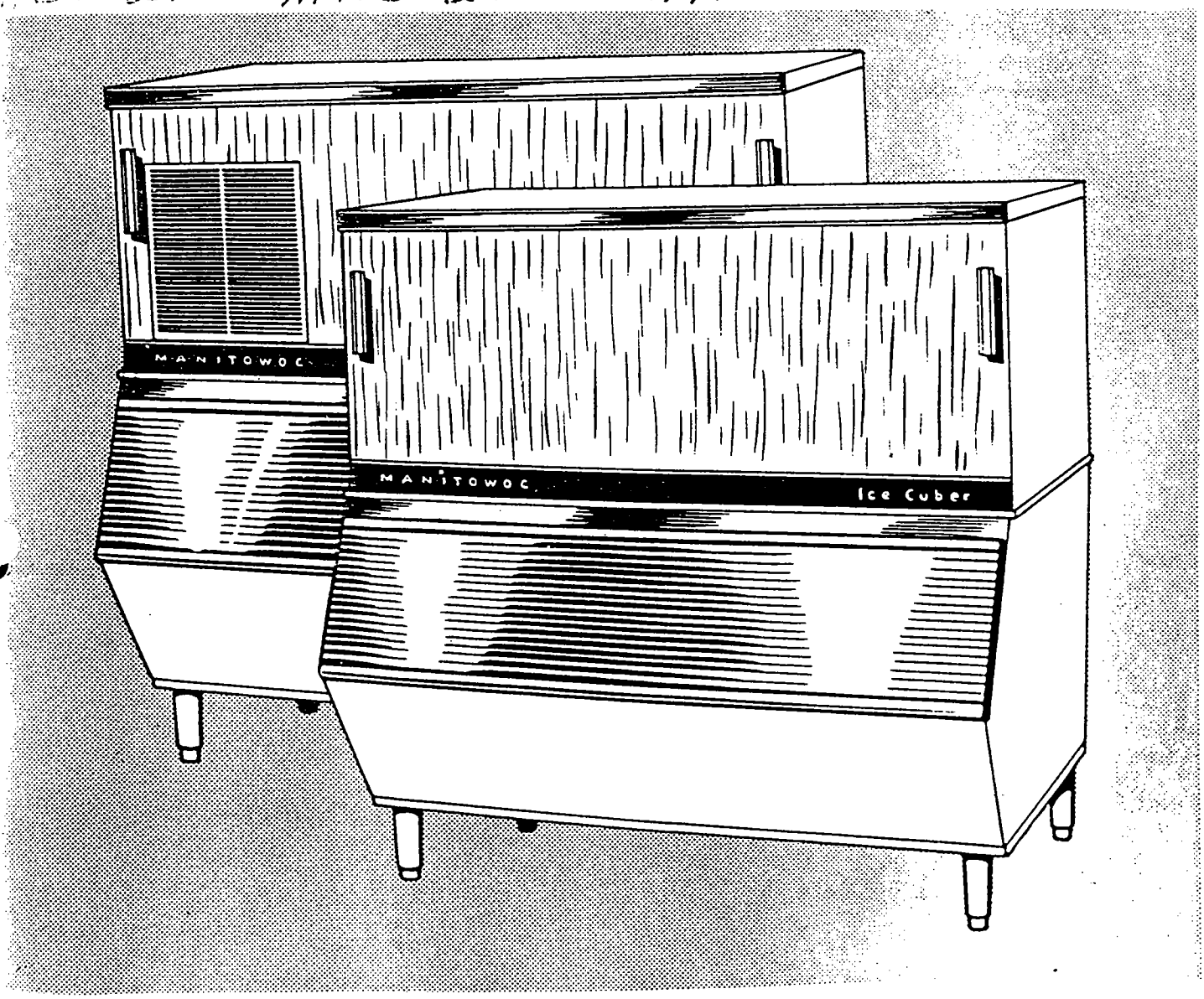
Manitowoc

MSC-21 MAC-22 MAC-45



ICE CUBER
SERVICE MANUAL

Manitowoc equipment works
Division of The Manitowoc Company, Inc.

MANITOWOC
WISCONSIN

80-0186

MANITOWOC manufactures two types of Ice Making Equipment. They are:

1. Ice Flakers to produce a fine dry crushed ice.
2. Ice Cubers to produce crystal clear cubes, sized approximately 1¼ x 1¼ x 1¼ inches and diced cubes, sized approximately ¾ x ¾ x ¾.

This manual covers Ice Cubers and Diced Cube Machines. Refer to Manual No. 80-0187 for Ice Flakers.

Refer to the index section below for your convenience in installing and servicing this equipment.

ICE CUBER

Your MANITOWOC Cuber was designed to produce ample quantities of top quality ice. It is constructed of heavy duty, commercial grade material to withstand the adverse conditions this type of equipment operates in. The ice making compartment is isolated from the machinery compartment. All parts of the ice making section can be completely disassembled for cleaning without the use of tools. The parts are made of materials recommended by the National Sanitation Foundation for use with potable water. They are designed without cracks or crevises and with ample radii for easy cleaning.

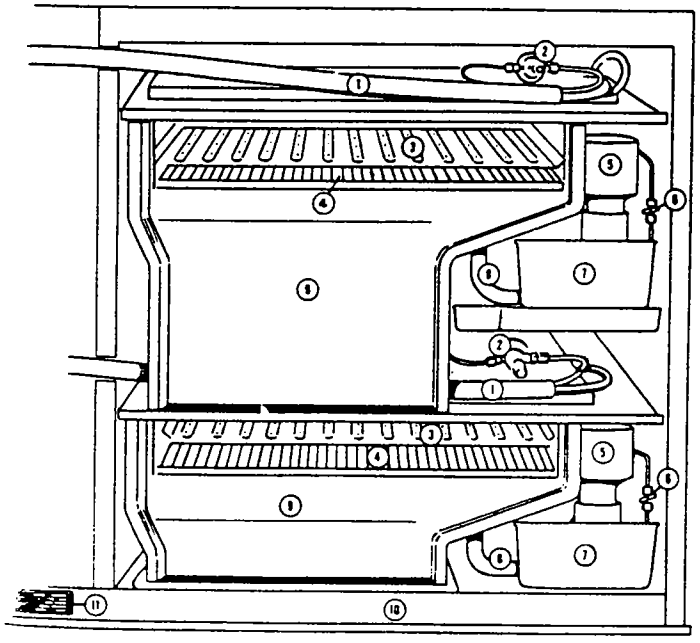
Service problems should be infrequent because the only mechanical operating parts in the ice making section are the water pump and float valve. The water pump unplugs and lifts out for inspection and cleaning. The sealed motor is above the water level and protected by an internal overload device. The pump can run out of water indefinitely without damage. The entire pump assembly or parts can be replaced. The float valve can be disconnected at the shut-off valve and lifted out of the sump pan.

The semi-sealed condensing unit of the air cooled model is mounted with the finned condenser to the front or end for regular inspection and easy cleaning. The complete condensing unit pulls out for access to the compressor, fan, solenoid, condenser and water regulating valves on water cooled models. (NOTE) In ambients higher than 90 degrees it is recommended the grill covering the condenser be removed on air cooled models.

The head unit (compressor and ice making section) is separate from the seamless polyethelene lined foam insulated metal storage bin. This permits leveling up and sealing the light weight bin section to the floor before setting the heavy head unit in place. It also makes practical the removal to a service shop of the head unit should major repairs be necessary.

SERIAL AND ELECTRICAL PLATE (See Figs. 1 and 4)

The combined serial and electrical plate is located on the right end of the head unit or on the front rail below the condensing unit. Be sure to send the complete serial number (14 numbers) and the model number when calling for service or parts.



1. REFRIGERATION LINES
2. THERMOSTATIC EXPANSION VALVE
3. FOUNTAIN FIELD
4. HARVEST BACK
5. MOTOR AND PUMP ASSEMBLY
6. WATER SHUT-OFF VALVE
7. SUMP PAN
8. SUMP DRAIN
9. CUBE CHUTE
10. BASE
11. MODEL AND SERIAL TAG

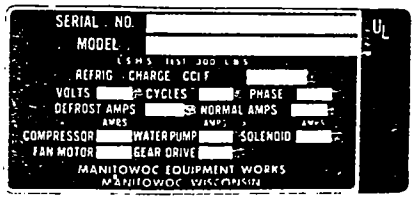


FIG. 1

UNCRATING

The bin complete with door is shipped in a corrugated carton with fold up inserts for added protection. Before opening the carton, inspect for punctures, dents, or evidence of mishandling. Notify the carrier requesting their representative be present if you suspect concealed damage. Insist that freight bills be marked. If you find the bin damaged and no external evidence, save the carton and all packaging for the carrier's inspection. Once inspection has been made, advise the carrier of the cost of repairs, loss due to discounted price or replacement cost if bin can't be salvaged.

The head unit covered with a polyethylene film is bolted to a wooden skid, and crated with an open slat type wooden crate. The open construction makes visual inspection for damage practical before removing the crate. Lift off the crate after removing nails securing the crate to the base. We suggest leaving the unit on the skid until ready to lift it onto the bin.

LOCATION

Most models are designed to slide under a 42 inch bar or any other convenient location. For maximum efficiency pick a location away from sources of heat like radiators, ovens, other refrigeration condensing units, direct sunlight, etc. Provide space around the cabinet for air circulation. Air cooled models require a minimum of 3 inches at any louvered opening to the compressor compartment. Cabinets located in unheated areas must be protected from freezing or shut down and drained.

INSTALLING BIN (Fig. 2)

We recommend wherever possible one of the two available base leg assemblies be used. Base Leg Kit No. 07-0001 provides 6 inches clear space under the bin. Base Leg Kit No. 97-0009 provides 12 inches. Each base assembly has four (4) sanitary adjustable feet for easy leveling and are designed to lock in place on the underside of the bin without the use of tools. Each kit comes with all parts and complete instructions.

Should space limitations make use of either base leg impractical, proceed as follows to set up the bin.

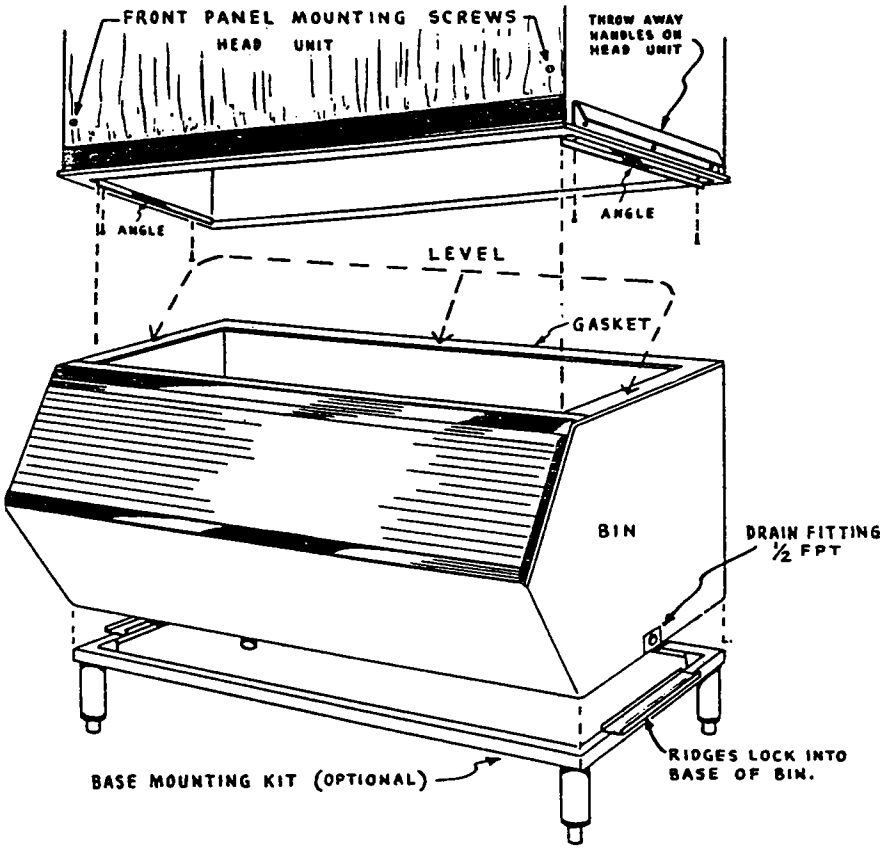
a. Set bin in correct position. (NOTE) Make sure any piping and wiring is in place unless there is adequate room to work around the ice maker.
b. Use a level on the top gasketed surface and shim until bin is level. **Leveling is important for proper operation.**
c. Use caulking compound to seal bin to floor. (This is suggested for sanitary reasons)

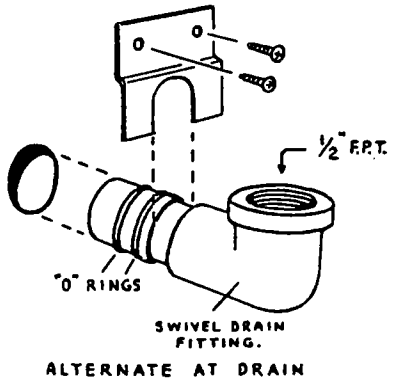
INSTALLING HEAD UNIT (Figs. 2 and 3)

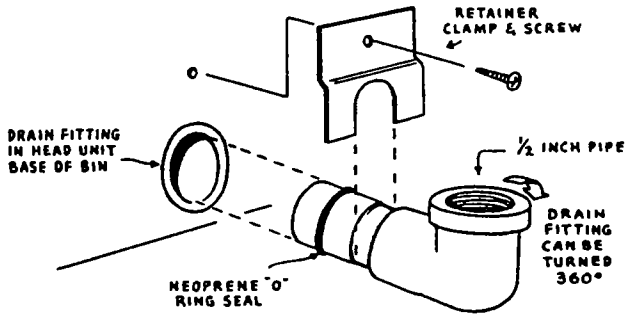
Carefully clean the gasketed surfaces on the top of the bin. Remove the bolts securing the head unit to the base. Peel off the polyethylene film used to protect the underside of the head unit base, and set the head unit in place on the bin as illustrated in Fig. 2, making sure that cube chute opening is clear. Use screws furnished to attach the two (2) positioning angles found nailed to the skids, or packed inside, to the underside of the head unit base. **Angles are correctly installed when the front edges of head unit are 1 in. from front of the bin.** If angles are installed before setting the head unit on base, do not set unit on bin with angles resting on front rail. The rail will bend and disrupt door seal.

The angles are important to keep the head unit from shifting on the bins. (NOTE) It may

be advisable to connect power supply lines prior to installing head unit if top can't be removed when cabinet is in position.







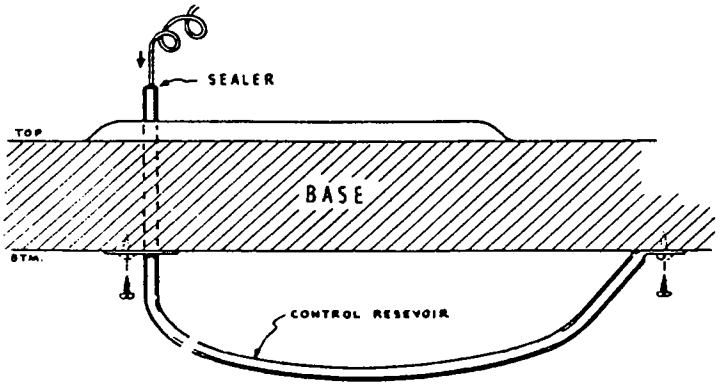


FIG. 2

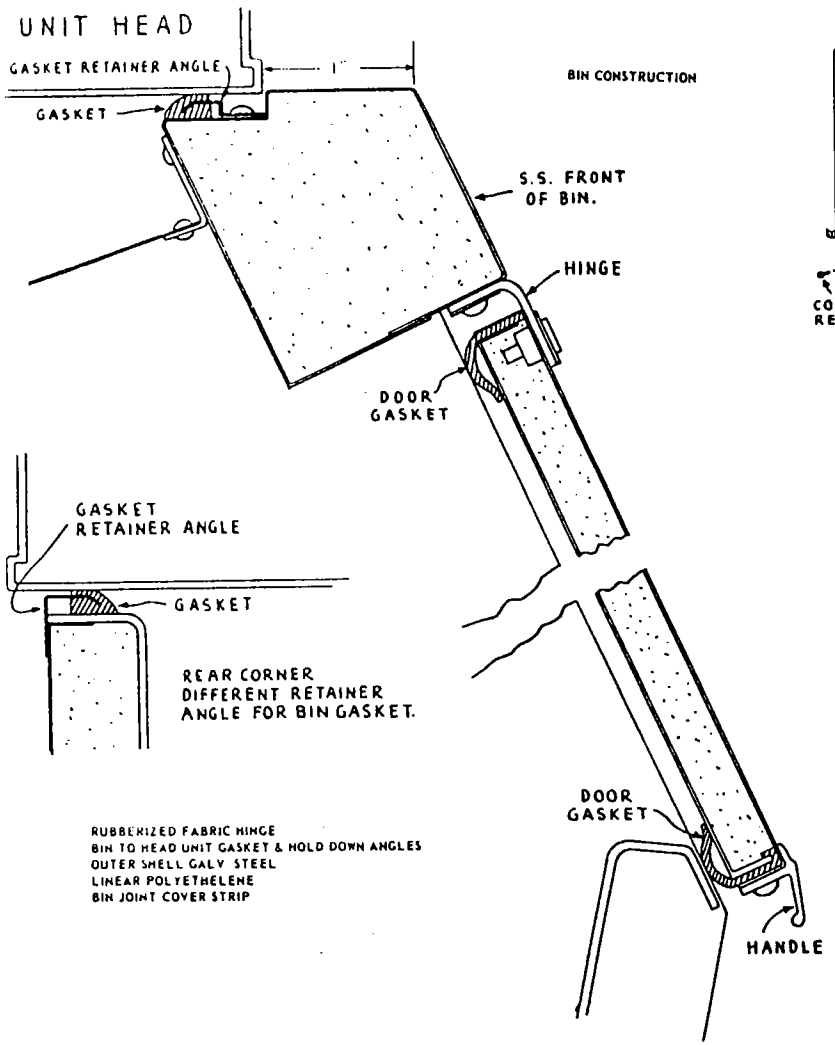
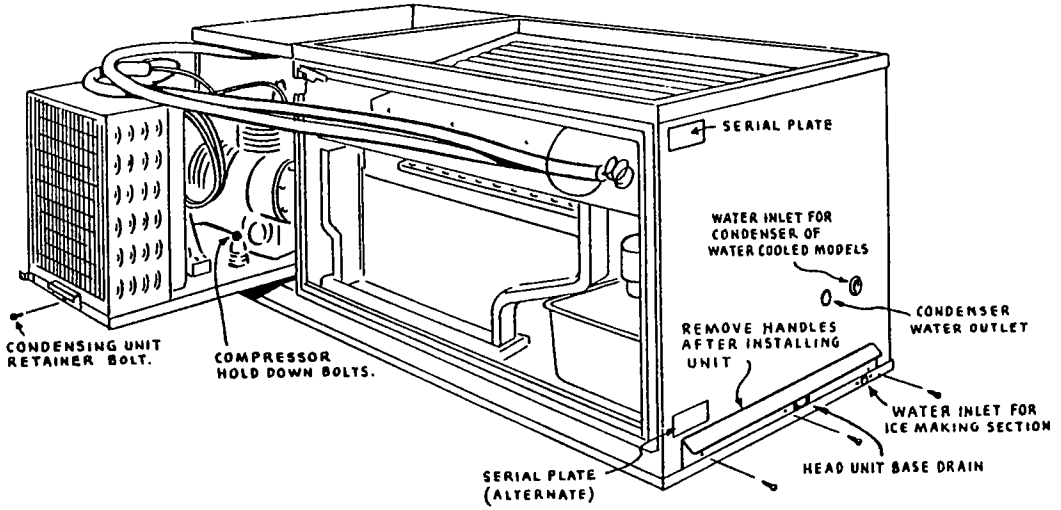
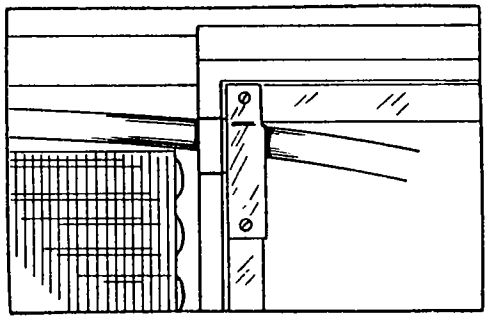

UNIT HEAD
GASKET RETAINER ANGLE
1"
BIN CONSTRUCTION
GASKET
S.S. FRONT OF BIN.
HINGE
DOOR GASKET
GASKET RETAINER ANGLE
GASKET
REAR CORNER DIFFERENT RETAINER ANGLE FOR BIN GASKET.
DOOR GASKET
HANDLE
RUBBERIZED FABRIC HINGE
BIN TO HEAD UNIT GASKET & HOLD DOWN ANGLES
OUTER SHELL GALV STEEL
LINEAR POLYETHELENE
BIN JOINT COVER STRIP

FIG. 3


SERIAL PLATE
WATER INLET FOR CONDENSER OF WATER COOLED MODELS
CONDENSER WATER OUTLET
REMOVE HANDLES AFTER INSTALLING UNIT
WATER INLET FOR ICE MAKING SECTION
HEAD UNIT BASE DRAIN
CONDENSING UNIT RETAINER BOLT.
COMPRESSOR HOLD DOWN BOLTS.
SERIAL PLATE (ALTERNATE)



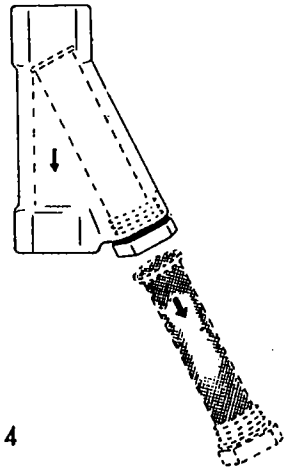


FIG. 4

Insert reservoir for bin thermostat through the hole in the base unit and secure with screws as illustrated. Straighten the coiled thermostat capillary and insert in reservoir until it stops. See Fig. 2.

Starting with serial number 5-01093-0525-323-01 it is practical to "stack" the head units for multiple capacity by ordering Kit No. 07-0007 for 115V or Kit No. 07-0008 for 230V for each unit above the base unit. Specify whether unit is 115 or 230 volts. See Fig. 5.

Kit contains:

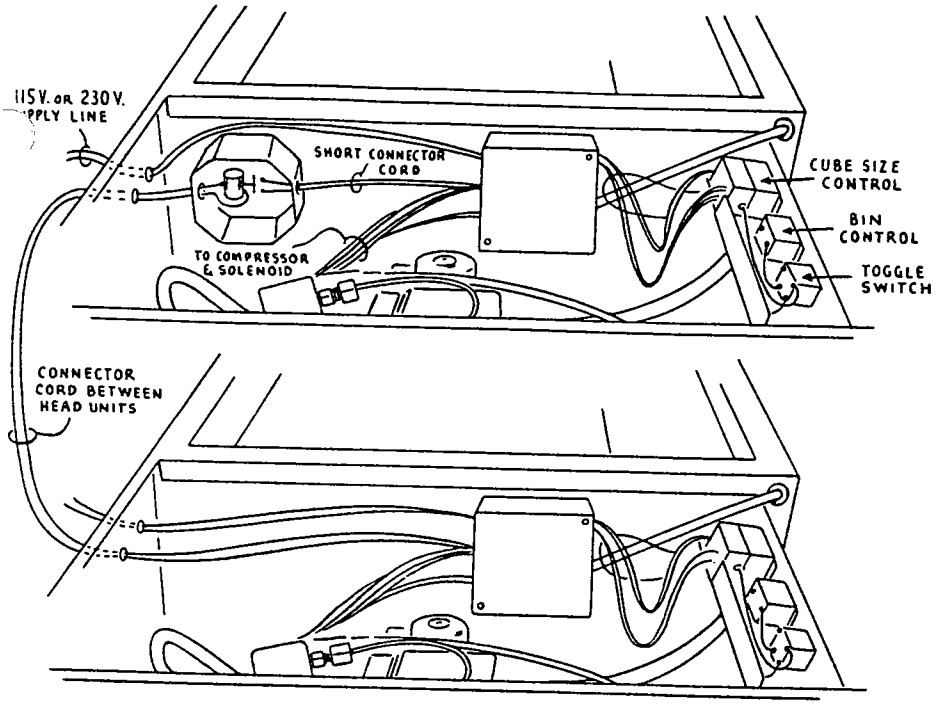
1. New top assembly with cut out.
2. Cube chute extension.
3. Relay assembly.
4. Octagonal mounting box, cover and fasteners.
5. Connector cord.
6. Installation instructions.

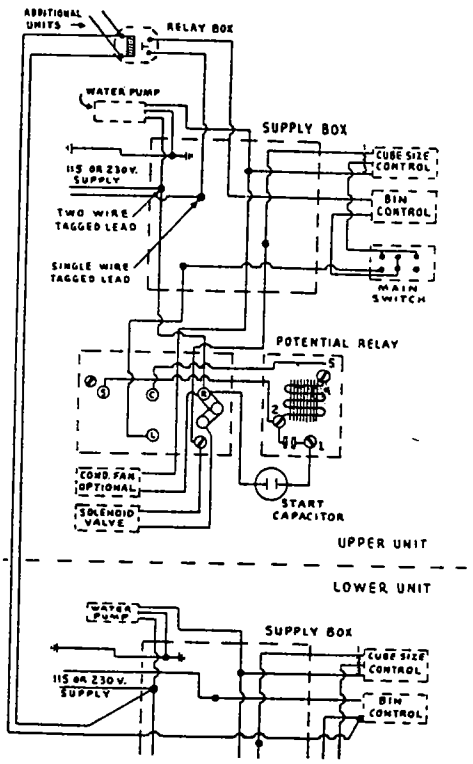
Proceed as follows:

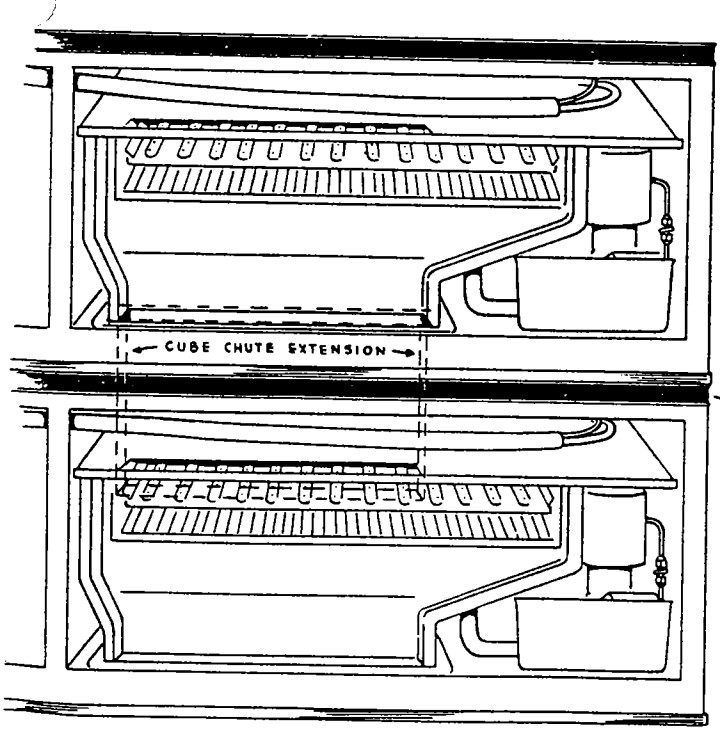
A. Complete following operations on lower or master head unit.
   1. Level and assemble lower (master) unit on bin. NOTE: If base leg kit is used, be sure floor will support combined weight of ice makers and product.
   2. Remove bin control cord that goes to toggle switch. Reconnect on the same terminal along with the eyelet end of the long cord supplied with kit. (Longer screws furnished.)
   3. Connect stripped end of the same cord to the TWO-WIRE supply lead. Run cord through thin wall or greenfield to connector installed in knock-out in rear wall of compartment.
   4. Connect power supply to lower unit in normal manner.
   5. Install new top assembly.

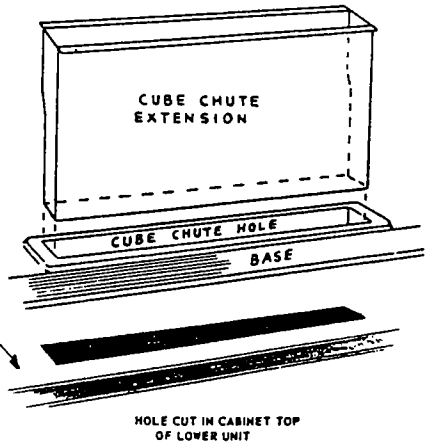
B. Complete following operations on upper unit before installing.
   1. Remove top of upper unit and drill 1/8" diameter holes to mount relay and relay mounting box to bulkhead as illustrated.
   2. Connect both bin control wires together on one terminal. (Longer terminal screw supplied)
   3. Install outlet box and relay furnished with kit on bulkhead as illustrated.
   4. Connect one end of short cord furnished with kit to relay contacts and put other end into the main wiring enclosure.

C. Set upper head unit in place aligning all four sides flush with lower head unit, then proceed as follows:
   1. Remove cube chute of upper unit and drop cube chute extension through opening. Adjust position of lower unit tubing if it interferes. Replace upper cube chute.
   2. Route jumper cord connected to lower unit through thin wall or greenfield to knock-out in rear of upper unit. Quick connect terminals to relay coil.
   3. Run a separate supply into the wiring box of the upper unit. Connect one lead to the labeled cabinet leads that are taped together. Connect the second supply lead to the stripped lead from the relay contacts. The second lead from the relay contacts should be connected to the single labeled supply lead on the cabinet.
   4. If more than one unit is stacked, the relay supply wire of each upper unit will connect to the relay coil connectors of the unit directly below it.









STACKING KIT FOR MODEL MBC-21-A & W

MODEL MBC-21-A&W

FIG. 5

FRONT PANEL REMOVAL (See Fig. 6.)

Remove screws near bottom of panel. Pull panel outward at bottom and downward. Panel may or may not have handles.

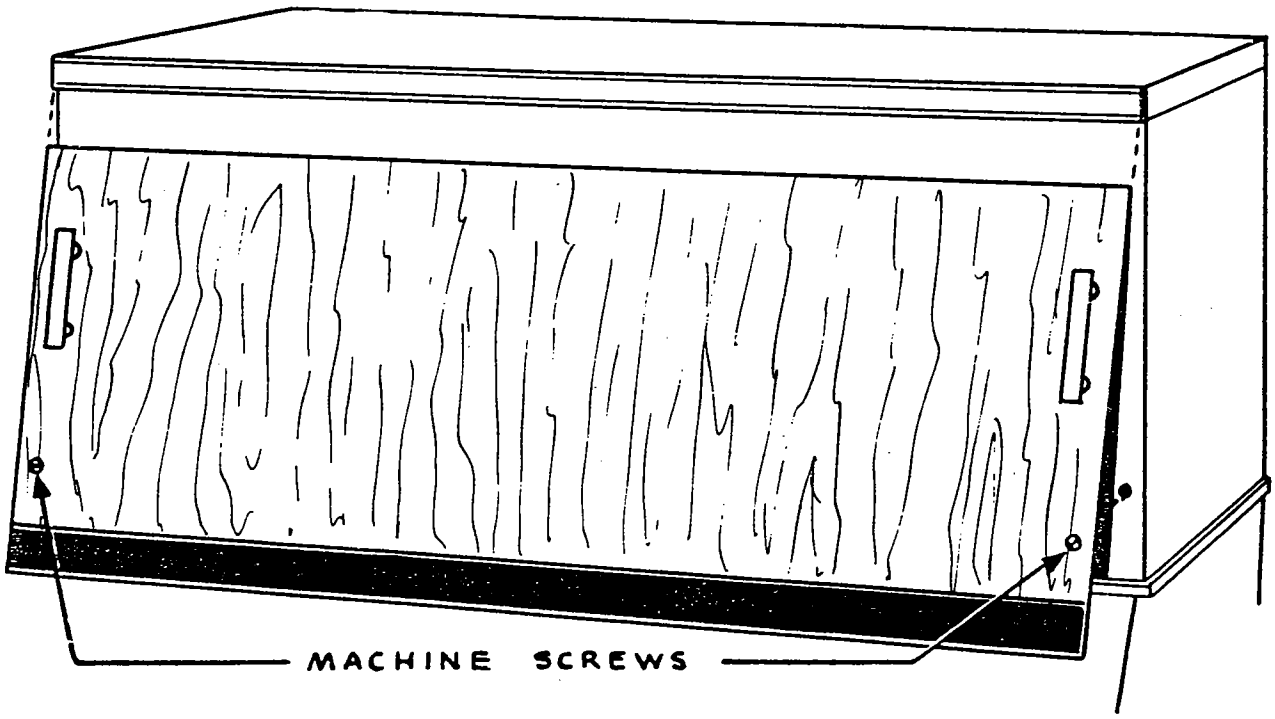


Fig. 6

LOOSEN FRONT COMPRESSOR HOLD DOWN BOLTS

On small air cooled models, this will require removing the machine screw at the center of the condensing unit base, and the tie strip over the opening where the heat exchanger passes through the center partition. Pull condensing unit far enough forward to get at the front two compressor mounting bolts. See Fig. 4. Back off nuts to top of bolts. Raise compressor with hand or screwdriver and knock out wooden shipping blocks. Check to see that compressor floats freely. Check for lines that might touch or rattle. Straighten carefully if required. Spin fan blade to see that it runs free. Push condensing unit back in place and secure.

On all other models, compressor hold down bolts can be loosened without pulling out condensing unit.

WATER SUPPLY

Quality and ice making capacity are affected more by chemistry, temperature and foreign matter in supply water than any other factor. A survey made of water departments of large cities all over the country made it obvious that external filters or strainers should be installed. Such equipment is very effective in improving ice quality and reducing the frequency of cleaning out the ice making sections.

LOCATION OF FILTER SCREENS

1. External strainer is packed inside the ice making section or will be found installed on water inlet connection. See "Connecting Water Supply" for installation. (NOTE) Strainer may be installed by factory. (See Fig. 4)
2. The float valve has an internai screen. See Fig. 7.
3. A screen is located at the water inlet in the fountain field between the top and bottom plates. See Fig. 8.

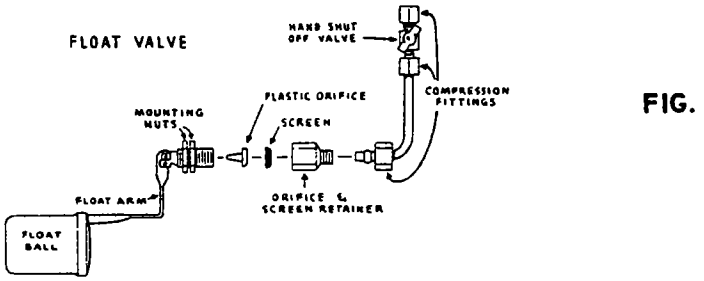
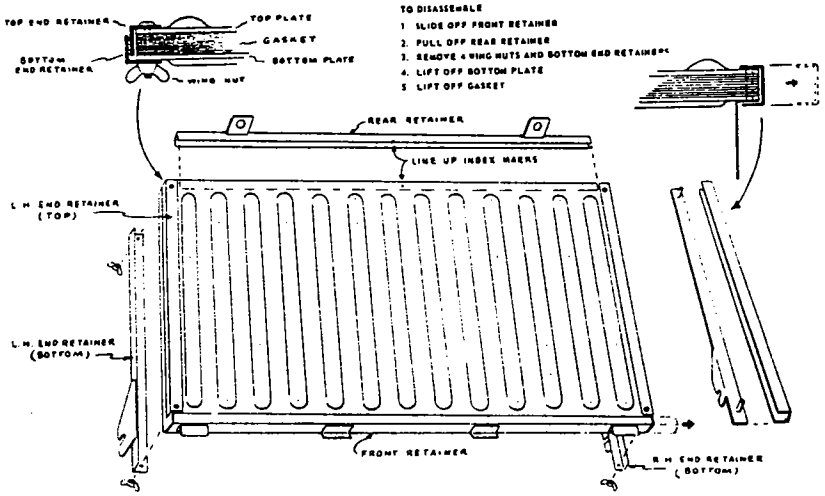
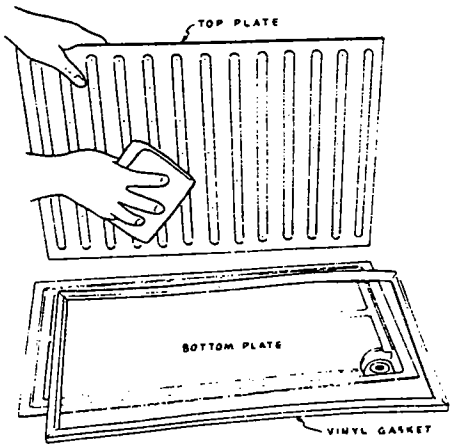


FIG. 7





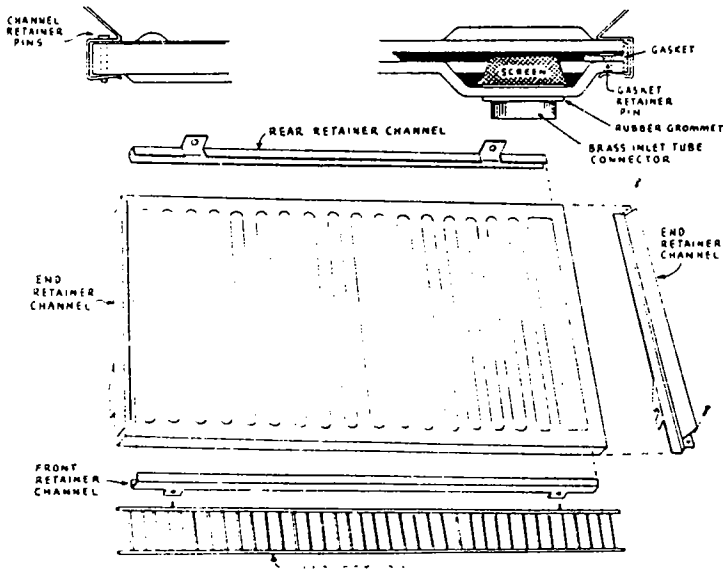


FIG. 8

CONNECTING WATER SUPPLY

One or more 1/2" female pipe or sweat fittings are provided on the right end of the head unit. Provide shut off valves in the water supply line and **install the strainer provided** (Fig. 4) in the ice making water line in a **downward position** so that it can be removed for cleaning. Strainer is packed inside ice making section or factory installed. Every effort should be made to keep the water supply as cool as possible to improve ice making capacity. For example, uninsulated water lines should not be run close to heat sources or in the sun. **All water lines supplying ice makers should be thoroughly flushed before connecting to machine.**

DRAIN CONNECTIONS

The fiber glass bins and some head units have 1/2" FIP drain connections. New simplified separate drain connections are provided from the head unit and metal bin for connection to vented or trapped drains.

Fitting may be either copper with one (1) Neoprene "O" ring, or brass with two (2) Neoprene "O" rings, and is installed by wetting "O" ring and pushing fitting into drain. Secure with two screws. See Fig. 2. Use standard pipe fittings to connect to the 1/2" FIP (90° ell) connectors provided or copper sweat joints to connect to optional copper tee vented connector. NOTE: Remove fittings and "O" rings before making sweat connections. The fittings provided rotate 360 degrees without removing the screw making it simple to connect drain lines. It is essential that drain connections be made so waste water can't back up into the head unit or bin. On water cooled models a separate connection is provided for discharging condenser water. All connections are labeled. (See Figs. 4 and 11) We **recommend covering all drains with cork insulating tape to prevent sweating.**

If head unit and bin drains are tied together through a "T" connection we suggest using **a 3/4" pipe and a stand pipe vented** to the atmosphere to prevent water traps. See Fig. 11.

Drains must be at least 1/2" inside diameter and have 1½" drop per 5 feet of run. If drains are not close enough to allow drop for proper drainage, or water is to be drained in a stationary sink higher than ice-machine drains, use an automatic condensate disposal pump such as the model C-12 available from Eddington Metal Specialty Co., Eddington, Pa. (Check and follow local plumbing codes).

GENERAL REQUIREMENT

All electrical and water supply and drain connections must conform to local codes

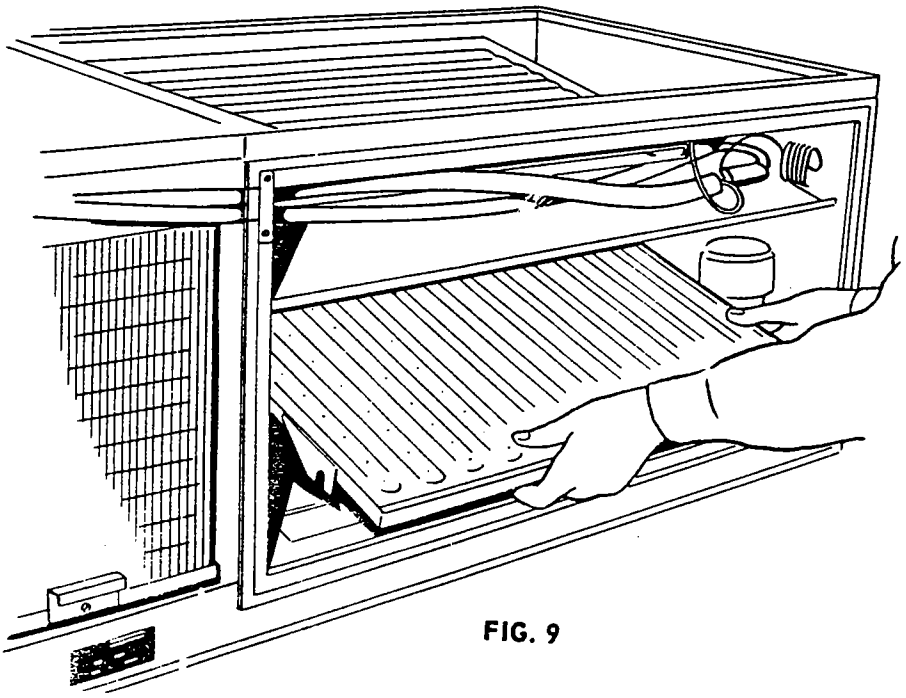
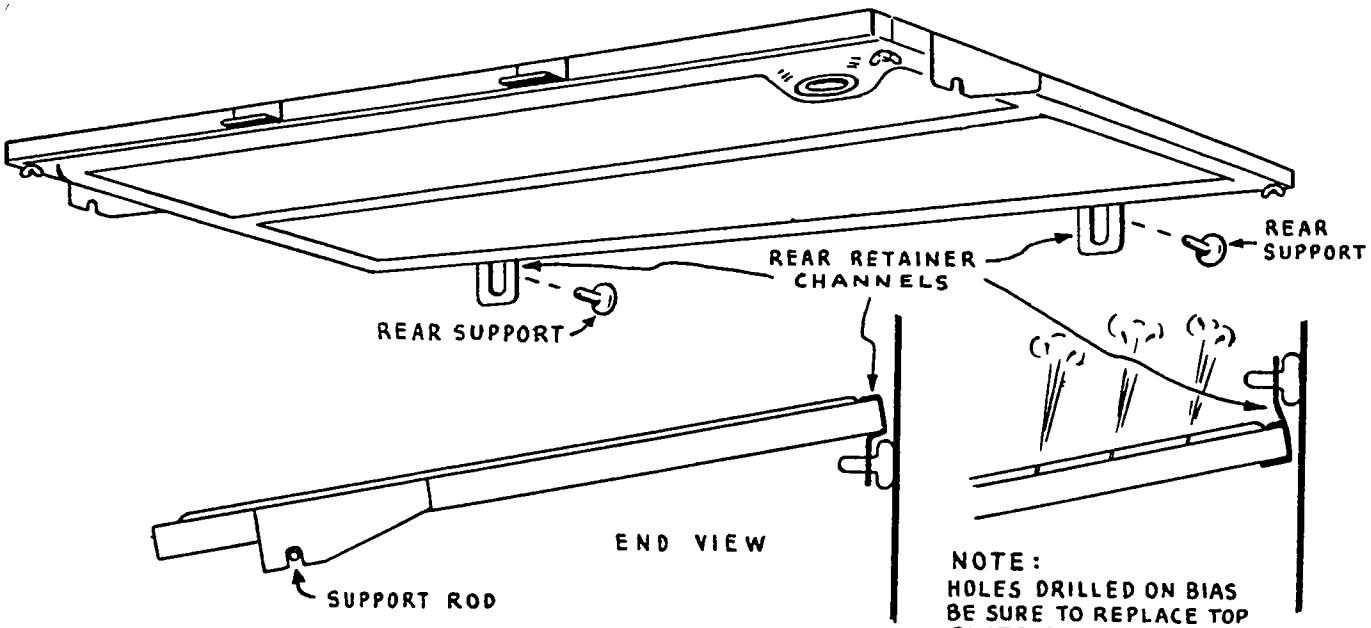


FIG. 9

FOUNTAIN FIELD MOUNTING



This mounting on cabinets with Serial No.
52500535508 to 52500547509 to
&
52500546508 inc. 52500552509 inc.

FIG. 10

WATER COOLED CONDENSER MODEL

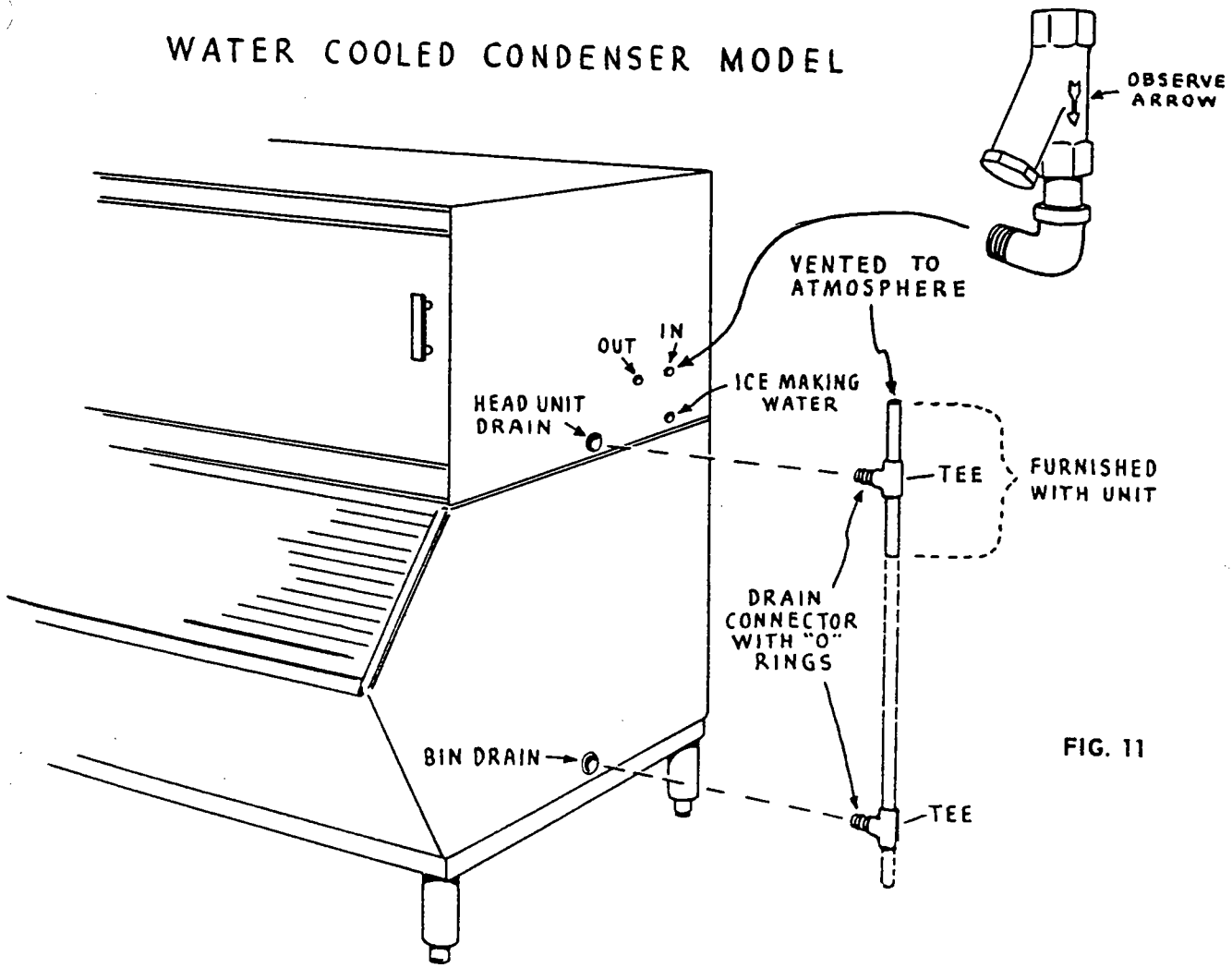


FIG. 11

ELECTRICAL CONNECTIONS

An opening is provided in the back of the unit compartment for your convenience in running supply leads to the supply box located on the bulkhead separating the compressor and ice making sections. We recommend a separate individually fused supply line. Use the table below in selecting fuse and wire sizes. While a shut off switch close to the cabinet is convenient for service it should be protected from unauthorized persons. All wiring is complete to supply box.

Wire Gauge and Fusetron Rating

	115 V			230 V		
MODEL	WIRE GAUGE	AIR COOLED	WATER COOLED	WIRE GAUGE	AIR COOLED	WATER COOLED
MAC22	No. 14	15-A	12-A	No. 14	8-A	7½-A
MAC45				No. 14	10-A	8-A
MBC21	No. 14	15-A	12-A	No. 14	8-A	7½-A

SETTING UP HEAD UNIT

1. Remove the cube chute front and its protective gummed paper covering. See Fig. 12.
2. Remove tape and lift out harvest rack and metal channel securing the cube chute to the spray housing.
3. Remove packaged parts in ice making section, all tape and packing.
4. Thoroughly clean all parts, spray housing and base unit inside.
5. The MBC models may have a water pump mounted on the right wall of the ice making section. It is shipped with all parts in place. Remove shipping screw (See Fig. 13) unplug power supply, lift off water outlet tube, lift pump assembly up and out. Clean all parts before starting unit.
6. On the MAC models, set sump pan in place on the base plate, tip in water pump, pump end first, and plug in supply cord. (See Fig. 13). (NOTE) Pump discharge should be towards the front opening.
7. Install the 2 pieces of the water discharge tube separately as follows: On fountain fields with rubber grommet, pump discharge tube must be pushed in a minimum of 3/8" but not over 1/2". If tube is in less than stated minimum, pump pressure could force it out and insertion over 1/2" could restrict water flow into fountain field.

   On fountain fields with brass swaged connection, tube should bottom in swage.

   Pump end of tube should bottom on water pump.

   After both pieces are installed twist tubes together into plastic collar, positioning pump so discharge tube and wiring do not tip or tend to twist pump assembly or sump pan. See Fig. 14.

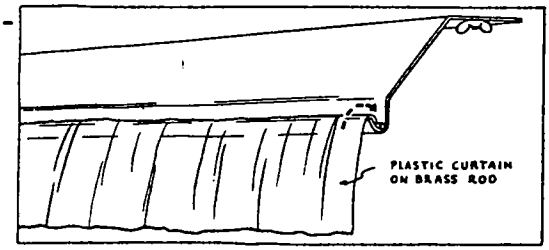
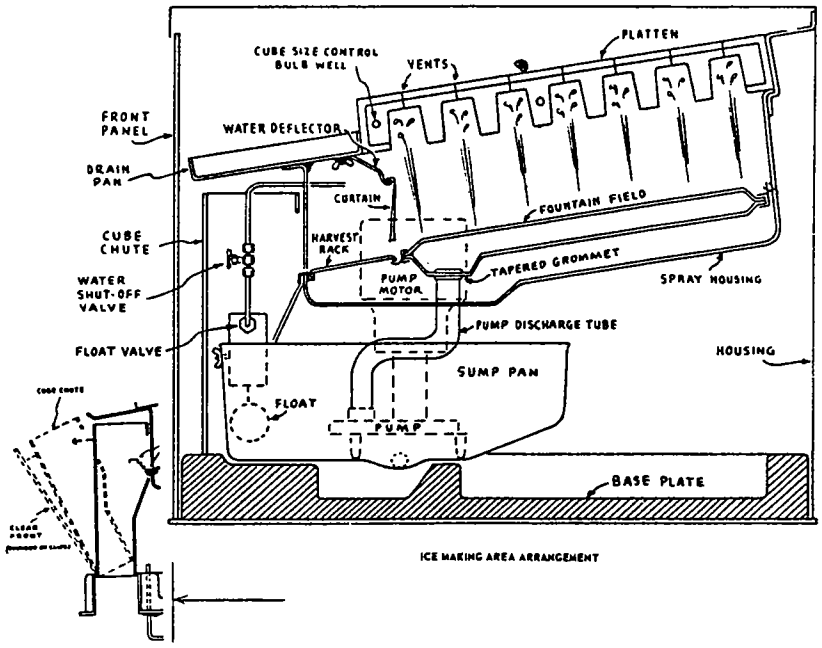


FIG. 12



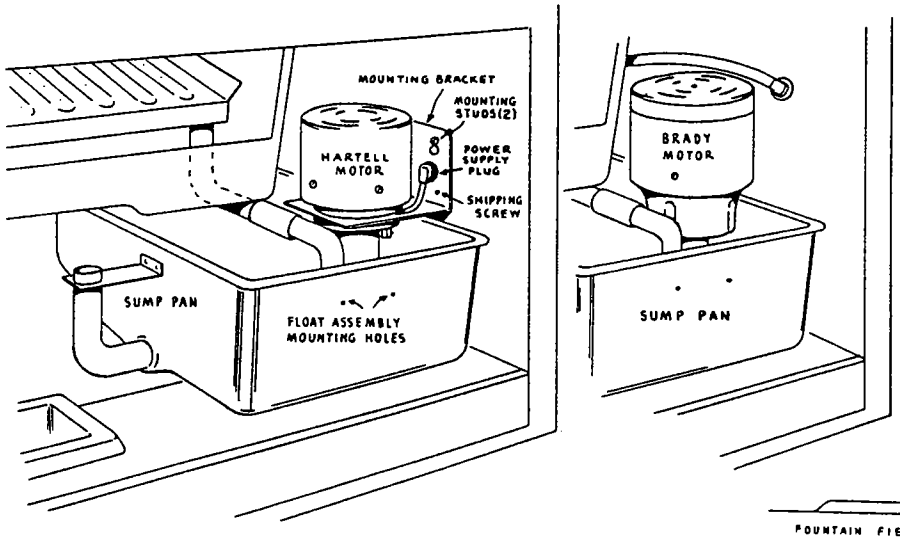


FIG. 13

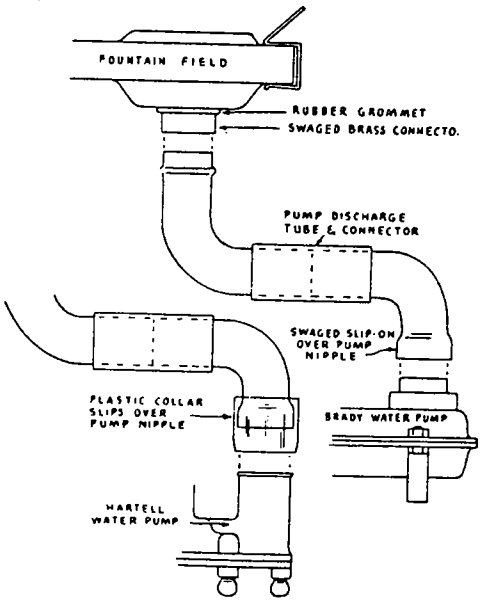


FIG. 14

8. Install float valve on sump pan and connect to water line. (Fig. 15) Float arm must have freedom of movement up and down and not bind against any side of sump pan.
9. Replace cube chute and harvest rack, and see that fountain field is in position as illustrated (See Fig. 12)
10. Open water supply line valve. Float should shut off when water level in sump is about 2-1/8" deep. When unit is not operating water level will be higher than while operating.
11. Turn toggle switch located at the top front of the compressor compartment to the left. Fan and water pump should start.
12. Within 5 minutes after the water pump starts a steady stream of water should spray into each of the cavities in the evaporator. If water spray rises and falls it is an indication that the water level in the sump is not high enough, cabinet is not level, pump or spray plate leaks or water is being lost down the drain. Bend float valve to raise float and water level only enough to maintain a steady stream. A higher level than necessary will waste water and ice making capacity.
13. Shut off switch (center position). The fan and water pump should stop, the water level in the sump should rise rapidly and water from the bottom of the sump discharge through the under flow tube.
14. Start and stop the unit several times to flush out the ice making section.
15. Water streams from fountain field must not hit sides of cube cavities or white milky shell formed cubes will result. Fountain field may be moved left or right to adjust.
16. Install splash curtain (Fig. 12) and replace cube chute cover with clips furnished. Bottom of curtain should just touch wire rack.

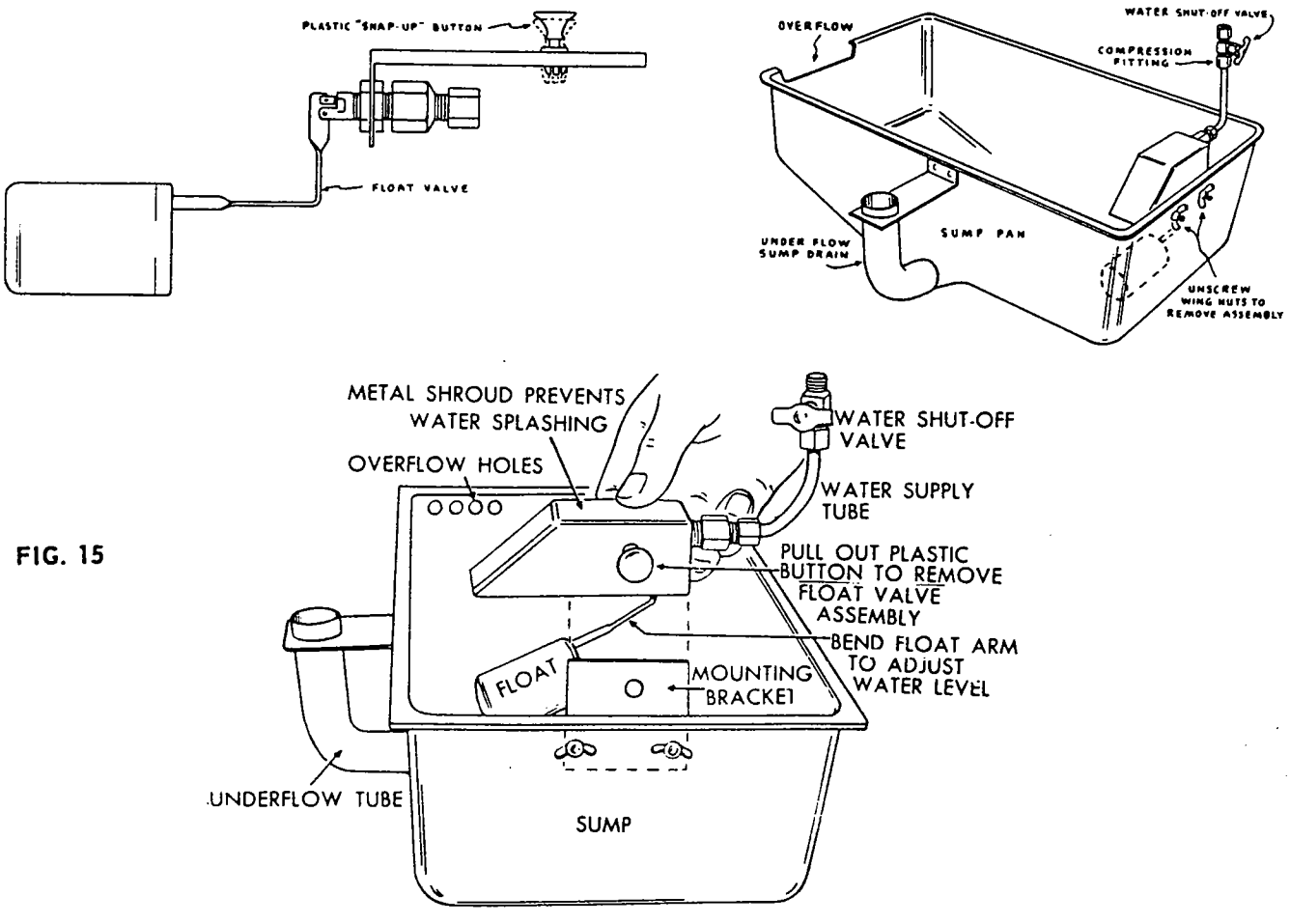


FIG. 15

CHECK LIST PRIOR TO STARTING CUBER

On occasion, after a cuber installation, it has been our experience to receive complaints of white ice partially formed or shell cubes and insufficient capacity. These instructions are meant to acquaint the owner and installer with our machine and list a few items to check to help eliminate the above complaints.

1. All water lines supplying ice makers should be thoroughly flushed before connecting to machine.
2. Provide at least 3" clearance for air circulation at all grilles. Capacity is reduced with restricted air flow.
3. Unit must set level for proper drainage and operation of the float valve.
4. Front compressor hold down nuts must be backed off to top of bolts and wooden blocks removed. Compressor must float freely on springs to eliminate noise and vibrations.
5. All foreign material must be removed from ice making section and its parts. Dirt and packing will plug float screen and fountain field holes, substantially reducing capacity.
6. On fountain fields with rubber grommet, pump discharge tube must be pushed in a minimum of 3/8" but not over 1/2". If tube is in less than stated minimum, pump pressure could force it out and insertion over 1/2" could restrict water flow into fountain field.

   On fountain fields with brass swaged connection, tube should bottom in swage.

   Pump end of tube should bottom on water pump.
7. Position pump so discharge tube and wiring do not tip or tend to twist pump assembly. Pump discharge should be towards front opening.
8. Float arm must have freedom of movement up and down and not bind against any side of sump pan.
9. Plastic curtain must be installed to prevent loss of cooled water and the resultant lowering of ice-making capacity. See Fig. 12. Curtain should just touch harvest rack. If curtain is too short water will splash out and down cube chute to bin. If curtain is too long, water runs down rods of harvest rack into cube chute and into bin.
10. Drain retainers must be secured to prevent drains being inadvertently loosened or disconnected. (See Fig. 2)
11. All drain and water supply tubes should be wrapped with insulating material to prevent condensation dripping on floor.
12. External screen strainer furnished with unit must be installed in the ice-making water line so screen can be removed (downward) for cleaning. See Fig. 4.
13. Separate drain must be run for condenser water on water cooled units.
14. If head unit and bin drains are tee'd together make sure water from head unit does not back up into bin when unit goes into harvest. See stand-pipe installation in Fig. 11. Separate drains are recommended unless drain goes straight down through floor.
15. If head unit and bin drains are plumbed directly into sewer with trap or both drains tied together it is necessary to tee in a stand-pipe 1 ft. high vented to the atmosphere to prevent trapping of drain water. Fig. 11. If head unit and bin drains drip into a floor sink, a stand pipe is not necessary.
16. Drains over 12 feet long should be avoided.
17. Drains must have enough drop and be wrapped with insulated tape. Refer to page 10.
18. Be sure bin control bulb-well is installed under head unit in bin and that sensing element

is pushed in as far as it will go. This will automatically stop unit when bin is full of cubes and start unit when cubes are removed.

19. Turn on water supply valve.
20. Turn toggle switch to left and allow 5 minutes for float valve to let in enough water to fill fountain field and sump pan. Water level in sump pan should just cover top of lower holes on pump housing or be approximately 2-1/8" deep.
21. Make sure that float opens and closes to maintain this water level. Water level set too high will waste water and reduce ice making capacity. Water level set too low will starve spray plate and not make full sized clear cubes.
22. Water streams from fountain field must not hit sides of cube cavities or white milky shell formed cubes will result. Fountain field may be moved left or right to adjust. (See Item 21 above for other causes of poor cubes)
23. Turn the toggle switch to the right to start making ice. On water cooled models shut off water supply line. Unit should shut off by the high pressure cut-out control in a few minutes. It should restart when water is turned on.
24. Use a gauge to check head pressure on water cooled models. Set water valve if required following instructions on page 34
25. Cubes should be clear, solid and well formed. White or partially formed cubes are usually caused by misalignment of water streams squirting into each cavity. Correct by:
    a. Cleaning inlet strainer.
    b. Cleaning strainer in float assembly.
    c. Cleaning out sump pan.
    d. Disassembling and cleaning fountain field – be sure to visually inspect all holes by holding cleaned plate up to light.

On new installations residue left in water supply lines frequently plug screens and fountain field openings a few days after starting machine. Steps outlined above will be necessary to correct. Frequency of cleaning thereafter depends on type water, etc. See pages 19 through 23 for cleaning instructions.

STARTING SYSTEM

All valves in the refrigeration system are open when the unit is shipped. Once the check list above has been completed it should only be necessary to turn the toggle switch to the right to start making ice. You may hear a clattering noise when the compressor first starts. It should only last a few seconds and is caused by oil or liquid refrigerant in the cylinders. If clattering persists shut unit off for a few minutes, then restart. Repeat if necessary. It takes approximately one hour for a harvest of cubes on the MAC models, and approximately one half hour on the MBC models.

While all controls are set during test operation at the factory, adjustment may be required after installation due to local conditions.

Installer should replace the top on the head unit, put the front panel in place and check the first harvest of cubes to see that machine functions properly. If cubes are reasonably close to desired size, allow 12 to 24 hours for temperatures to stabilize before adjusting control. See "Adjusting Controls" - pages 19 and 35.

On MAC 22A models, the mixture of liquid and gas returning to the compressor may cause a rattling noise during harvest. The compressor manufacturer assures us the small amount of returning liquid will not damage the compressor. Starting with serial number 5009630524322-01 the MBC-21A has an accumulator in the suction line to eliminate this noise. Both the MAC45A and W have always had an accumulator in the suction line.

CONTROL FUNCTIONS AND SETTINGS (See Fig. 16)

Air cooled units have two controls. The water cooled units have three. They are:

1. High Pressure Cut Out used on water cooled models to stop compressor when the head pressure rises above normal.

2. Bin Thermostat – This control has its sensing element in the reservoir in the storage bin. It shuts off the entire machine when the ice level in the bin reaches the reservoir. Check control operation after the bin is thoroughly chilled by ice and bin door has been closed for at least one hour. Hold a minimum of eight (8) cubes in tight contact with the reservoir. It may take several minutes for the unit to stop. It should restart several minutes after cubes are removed. Most problems are caused by setting the control warmer in which case it shuts the unit off before the bin is full. Where bin controls appear erratic the condition has been eliminated by filling the reservoir with water before inserting the control capillary. The water apparently improves the thermal contact making controls react faster. It is important that the bin door be closed while testing operation. Water leaking into a reservoir not originally filled may account for unexplained calibration changes.

3. Cube Size Thermostat (Figs. 17 and 18). On the original production of the MAC models, the cube size control made contact by slipping into a 1/4" reservoir tube cast into the right front side of the evaporator. Starting with Serial No. 58300045508101 mountings were provided on the top of the evaporators for clamping on the control bulb, although cabinets were shipped with the bulb in the reservoir. Starting with Serial No. 322005625-08201 the reservoir was eliminated and the external clamp used on all models for a more positive operation of the control. Order clamp No. 76-1766 and 2 stainless steel 6x32x3/8 machine screws, Part No. 50-2346.

   The MBC models have a 1/4" x 10" reservoir located at the top right rear corner of the evaporator.

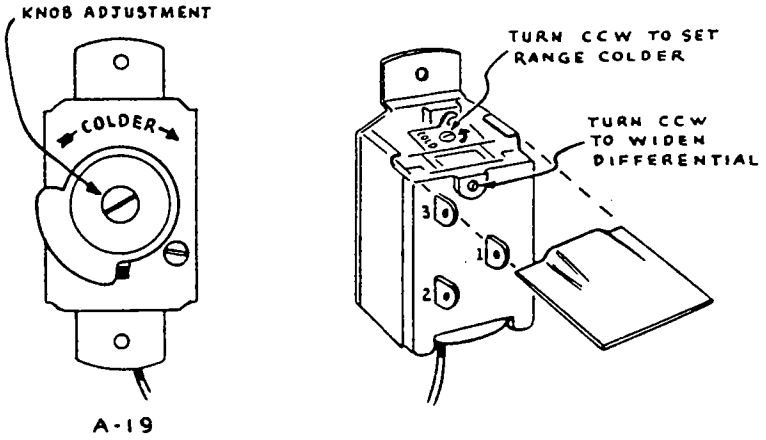


FIG. 16

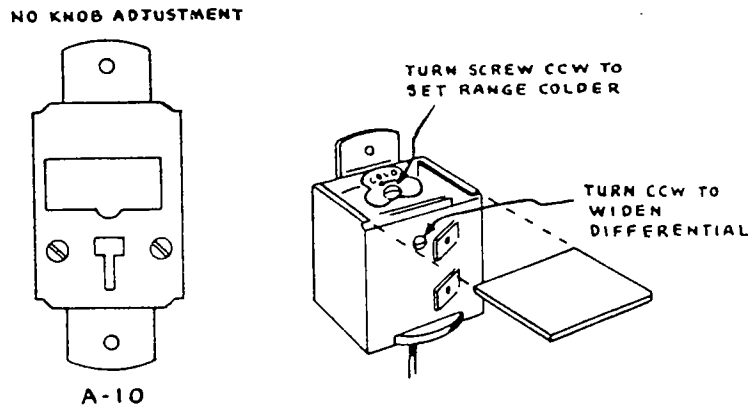
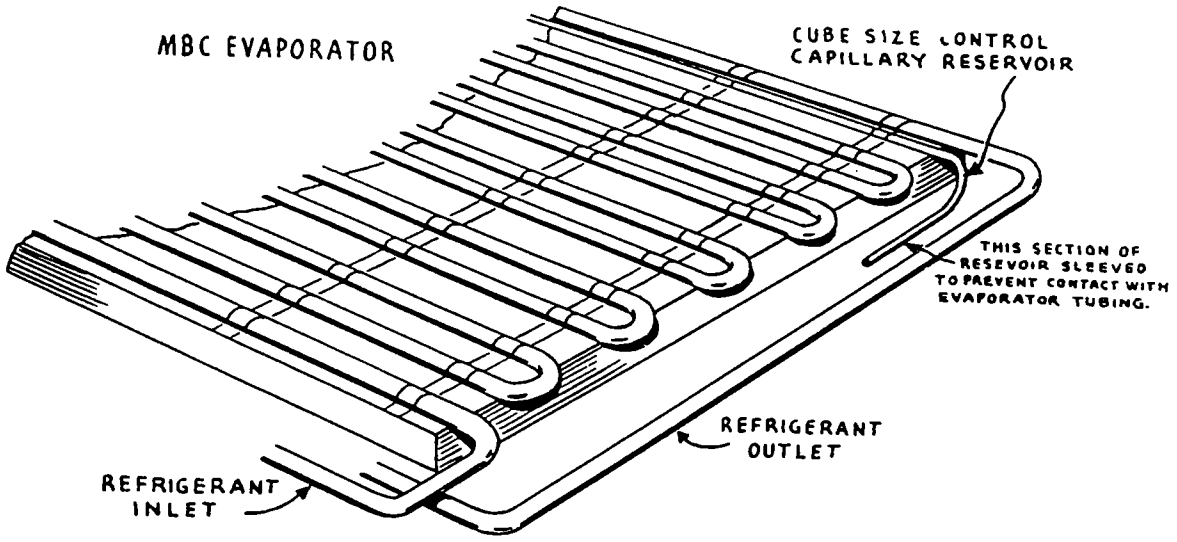
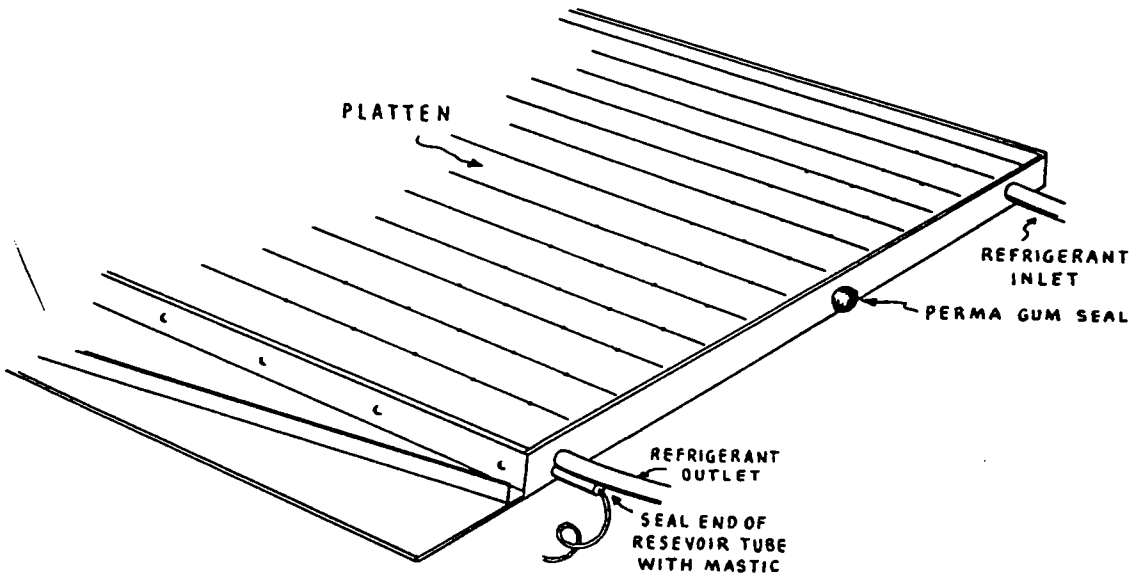


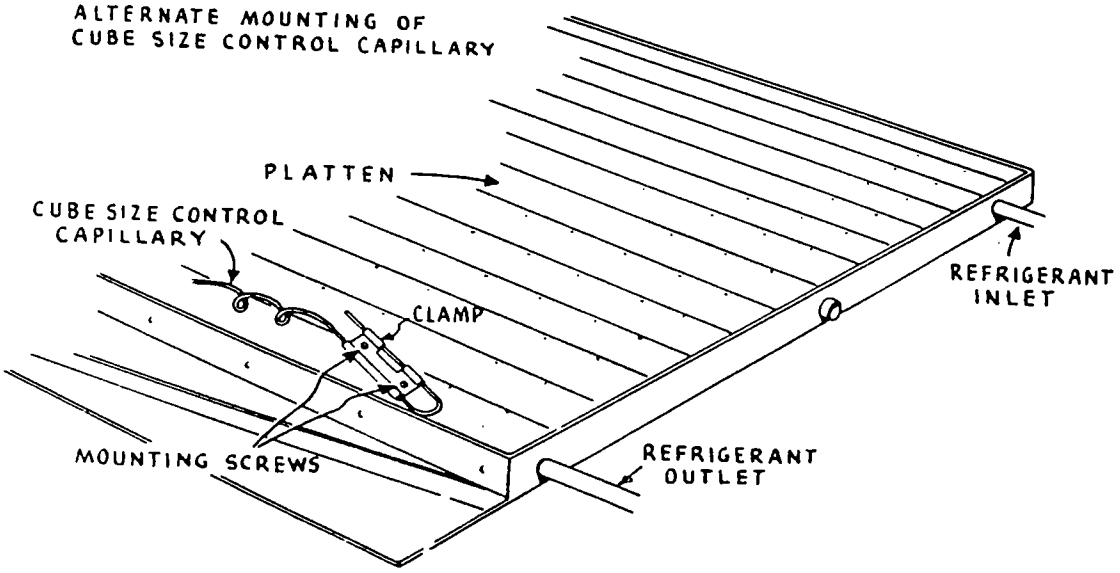
FIG. 17

MBC EVAPORATOR





MAC
ALTERNATE MOUNTING OF CUBE SIZE CONTROL CAPILLARY



CUBE SIZE CONTROL FUNCTION

When the temperature of the evaporator drops after cubes are frozen the normally open contacts close energizing the solenoid and the defrost cycle. The normally closed contact opens stopping the condenser fan and water pump. When the sensing element temperature reaches a temperature above freezing, the control contacts revert to the original position, and another ice making cycle starts.

ADJUSTING CONTROLS

Before attempting any adjustment of the cube size control the unit should be run 12 to 24 hours with the **top on head unit** and the **front panel in place**. The reason for this recommendation is that settings change after the ice making section cools down to a stable temperature around 40 degrees. The control adjustment screw is very sensitive. Turn only about 5 degrees, then replace **front panel** to check results. Should it be necessary to change the factory setting, follow the appropriate instructions given in the repair section page 35. Thermostats and toggle switch are located on panel above condensing unit. High pressure cutout is bolted to the compressor body.

CAUTION

If cube size thermostat is changed, be sure to replace sealer over reservoir hole after sensing element is inserted. Moisture in the reservoir will freeze, crushing the sensing element if sealer is not used.

SERVICING AND CLEANING THE ICE MAKING SECTION

Turn water and electrical supplies off.

Soak all parts in one of the solutions listed under "Removing and Cleaning Water Pump" page 20 then clean with a nylon (non-scratching) scouring pad.

REMOVING CUBE CHUTE (See Fig. 12)

The cube chute is made in two sections. To remove the clear plastic front (the section closest to you) remove the spring retainer clips and lift front off.

The rear section of the chute is secured to the spray housing by a metal cube chute retainer channel. Remove short harvest rack and cube chute retainer channel, by lifting up and out, and pull the top of the chute forward enough to clear top and lift up and out.

Use a non-scratching type scouring pad and detergent to clean inside. Flush thoroughly with clean water to remove all traces of the detergent. When cleaning the wire harvest rack do not use any metal objects which could damage the PVC coating. Use the scouring pad and detergent as described above in this paragraph.

REMOVING FOUNTAIN FIELD

Lift up and out slotted stainless steel cube guide on each end of the MAC models. On the MBC models these cube guides are an integral part of the fountain field end retainers. (Figs. 8, 9 and 12) Raise the front edge of the fountain field holding the water pump down until the pump discharge tube pulls out of the tapered grommeted hole or brass swaged connector in the bottom of the fountain field. Raise the front of the plate and pull it forward through the opening in the spray housing.

DISASSEMBLING AND CLEANING FOUNTAIN FIELD (See Figs. 8, 9 and 12)

The fountain field consists of two vacuum drawn Cycolac plates separated by a soft vinyl gasket. The sections are held together by four stainless steel channels, one of which

slides on each side. Remove the four wing nuts, one in each corner, then slide the channels off to take apart for cleaning.

On the MBC model, pull out pin in each corner, then slide off the 4 stainless steel channels.

Use the scouring pad and detergent to clean the inside and outside of both plates. Use a small brush to remove any build up in the spray holes in the top plate. Hold the plate up to the light and carefully examine all the holes to make sure they are thoroughly clean. Rinse the plates thoroughly with clean water before reassembling. When reassembling be sure to replace the channels properly. See Fig. 8.

CAUTION

The spray holes on the MBC models are drilled on the bias. **Be sure to replace top plate properly so water sprays will hit cube cavities.**

CLEANING SPRAY HOUSING AND EVAPORATOR

Cover the opening into the storage bin before attempting to clean the spray housing.

Reach through the front opening of the spray housing and scour with the scouring pad and detergent to remove any residue from the spray housing walls and the evaporator. Rinse the inside as well as possible with a sponge or cleaning rag. The balance will be removed by a power flush.

REMOVING AND CLEANING BRADY WATER PUMP (Figs. 12, 13 and 14)

Remove pump supply cord and lift the pump out of the sump.

Set the pump into a solution capable of dissolving deposits from water. Vinegar, Calgon Ice Machine Cleaner, a solution of three parts muriatic acid in seven parts water, Oakite No. 32 or Casco Ice Machine Cleaner are some effective solutions. (NOTE) All cleaning and sanitizing solutions must meet with local Public Health Departments requirements. Replace discharge tubes on pump and twist top half to face down, forming a "U" return to avoid splashing.

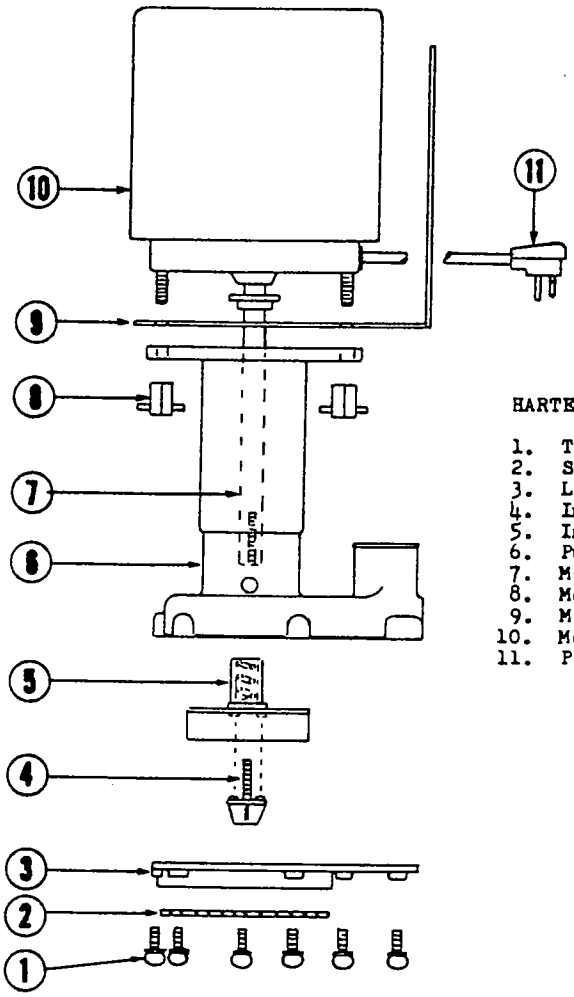
An accessory is available for water pump to be run outside of unit for cleaning. It is a 5 foot extension cord with connectors to fit water pump and power source on cuber wall. Order Part No. 20-6208.

Run the pump in this solution for ten or fifteen minutes; then for five minutes in clean water. Change the water several times while rinsing to remove all traces of cleaning solution. There is no need to disassemble the pump since it is cleaned or replaced as a unit. The top of the impeller is factory set at .015" clearance from the housing above it.

DISASSEMBLY AND ASSEMBLY PROCEDURE OF HARTELL WATER PUMP (See Fig. 19)

DISASSEMBLY PROCEDURE

1. Invert pump (motor down) remove six thumb screws shown as (1) on print.
2. Remove lower plate (3) and screen (2).
3. Push screen (2) out of plate (3)
4. With thumb and forefinger depress impeller (5) against pump housing (6)
5. With impeller (5) depressed unscrew plastic impeller screw (4)
6. Remove impeller (5) and screw (4)
7. Remove motor wing nuts (8) and flat brass washers or bushings.
8. Remove motor (10) from pump housing (6) and mounting bracket (9)



HARTELL WATER PUMP

1. Thumb screws (6)
2. Screen (snap-in)
3. Lower plate
4. Impeller screw
5. Impeller
6. Pump housing
7. Motor shaft
8. Motor wing nuts (2)
9. Mounting bracket
10. Motor
11. Power supply cord

FIG. 19

ASSEMBLY PROCEDURE

1. Invert motor (10 with shaft (7) extending up.
2. Place pump mounting bracket (9) on motor studs making sure bracket is flat with surface of motor.
3. Place pump body (6) on motor visually aligning the shaft in the center of the opening, and hold in place. (Brass eyelets for centering are optional)
4. Screw special wing nuts (8) on motor studs and snug securely by hand with even tension on each nut.
5. Place impeller (5) over motor shaft (7) lining up flats.
6. With thumb and forefinger depress impeller (5) against pump housing (6) so that impeller and housing touch and remain in contact.
7. While holding the impeller in this position, insert plastic thumb screw (4) and screw in until one of the two nibs on the screw just touches one of the 4 nibs on the impeller, then back screw off one nib or notch.
8. Release pressure on impeller (5) which will allow impeller to move off pump body (6) giving proper clearance between impeller and body. Rotate impeller by hand to make sure impeller is properly aligned and has clearance from opening in pump body. A slight adjustment may be necessary. (See No. 3 above)
9. Place bottom plate (3) on pump body (6).

10. Insert six thumb screws (1) and snug securely by hand with even tension on each screw.
11. Snap screen (2) in place on bottom plate lining up tab and slot.
12. Run pump before installing in machine to insure proper assembly procedure was followed.

WATER DEFLECTORS (See Fig. 20)

The pumping rate of water pumps can be increased to compensate for low voltage, leaks, etc. by adding a stainless steel plate to the legs secured to the water pump base. The deflector keeps the water draining back into the sump from sweeping under the pump causing air entrapment. The deflector clips to the pump base legs without the use of tools, order part No. 76-1704 for models where base legs are bolted to the pump – order part No. 76-1698 for models where base legs are welded on. Some models using the Brady water pump were factory equipped with deflectors. All models using the Hartell pump are factory equipped with deflectors.

PUMP GASKET RETAINER CLIPS (Brady) (See Fig. 20)

In the event you have a water pump that leaks around the gasket in the pick-up section order No. 56-0019 clip to improve the seal between the bolted together areas. Some models use clips only for assembling the lower section.

PUMP SUPPLY CORD

No. 20-6208 jumper cord is available for use in cleaning the water pump away from the ice maker. It is a grounding type cord with a plug and receptacle to fit the special size plug on the ice maker.

REMOVING AND CLEANING FLOAT VALVE (See Fig. 15)

Disconnect compression fitting with 1/2" open end wrench, or unscrew plastic ferrule nut with fingers below water shut-off valve. If assembly plate has plastic "snap-out" button to disengage plate from mounting angle, hold sump firmly with hand, and with other hand snap-up or snap out to disengage. On other models, remove wing nuts and float assembly.

Disassemble float valve to clean screen and nylon orifice. See Fig. 7. The float valve parts can be soaked in the solution while cleaning the water pump or carefully scrubbed with the detergent and scouring pad. Use extreme care to avoid bending the float valve arm. If it is bent the proper float level will have to be reestablished when the cabinet is restarted.

REMOVING AND CLEANING SUMP (See Figs. 12 and 13)

The sump sets on the base with no fastening. Clean the same way as the spray housing. Use a little brush to clean the interior of the drain tube. Rinse thoroughly with clean water.

Caution: Overflow tube must be vertical to prevent loss of water. Sump may or may not have support bracket.

CLEANING BASE

Use the detergent and scouring pad to clean the base. Use care to keep any solution from getting into the storage bin. Rinse with clean water. The short stand pipe in the drain should be lifted out while cleaning base. Replace when done. By maintaining a water level in the base the inlet water is chilled, increasing capacity.

SCREEN

Remove and clean or replace external screens following manufacturer's recommendations.

POWER RINSE

Reassemble all parts. Turn on water and watch that sump fills to proper level and float shuts off water. Turn toggle switch to the left. Allow system to run 5 minutes then shut off and allow to drain. Repeat three times then turn toggle switch to the right to restart compressor. Replace cube chute and front cover.

ON LOCATION CLEANING

If the above procedure for cleaning is impractical due to cabinet location or lack of facilities, proceed as follows:

1. Turn toggle switch to center (OFF) position and shut off water supply.
2. Remove cube chute and cover opening to bin to prevent contaminating cubes.
3. Drain water from sump pan. On some models this can be done by removing the underflow tube, then replacing it. On models that have the underflow tube cemented on, it may be necessary to remove the float valve and water pump to empty the sump pan, then replace pan, pump, float valve and reconnect.
4. Slowly pour one of the cleaning solutions listed on Page 20 into the sump pan. Turn toggle switch to LEFT position to run water pump. Keep adding cleaning solution in sump until float level balances out.
5. With spray curtain in place, circulate cleaning solution until all parts are clean.
6. Empty sump pan, reassemble all parts and turn on water, then Power Flush (see paragraph above) until all parts are thoroughly rinsed.

THE REFRIGERATION SYSTEM (See Figs. 21 and 22)

Liquid refrigerant is metered by the thermostatic expansion valve discharging into the serpentine coil of evaporator. The sensing bulb clamped to the line leaving the evaporator causes the expansion valve to let more refrigerant into the evaporator whenever this line warms up. The temperature drop or superheat is 8° on MAC models, and 4° on MBC models. Chilled gas in the suction line cools liquid refrigerant on the way to the valve through the heat exchanger made by soldering the liquid and suction lines together. The suction gas is pumped under elevated pressure into the condenser where the air or water circulation removes heat causing the refrigerant to condense ready to flow to the expansion valve when required.

On the MAC models, the suction pressure remains high (approximately 44 to 46 psig) during the first one minute of the cycle. It then starts dropping rapidly as the cubes form.

On the MBC models, the suction pressure will drop to approximately 35 psig in 10 seconds then drop rapidly as the cubes start to form. When the cube size control is satisfied, usually 4 lb. to 7 lb. back pressure, its normally closed contacts open stopping the water pump and the condenser fan (air cooled models) and energizes the defrost solenoid. The solenoid, when open, permits the discharge gas from the compressor to pass directly into the evaporator rapidly warming it, causing the cubes to drop. (Approximately 8 to 12 minutes on

the MAC models and 4 to 8 minutes on the MBC models. When the evaporator temperature reaches 42 degrees the cube size control snaps back into its original position and another freezing cycle starts. When the storage bin fills, cubes touching the bin thermostat shut off the entire system. When cubes are used the bin thermostat warms up restarting the the system.

BRADY WATER PUMPS

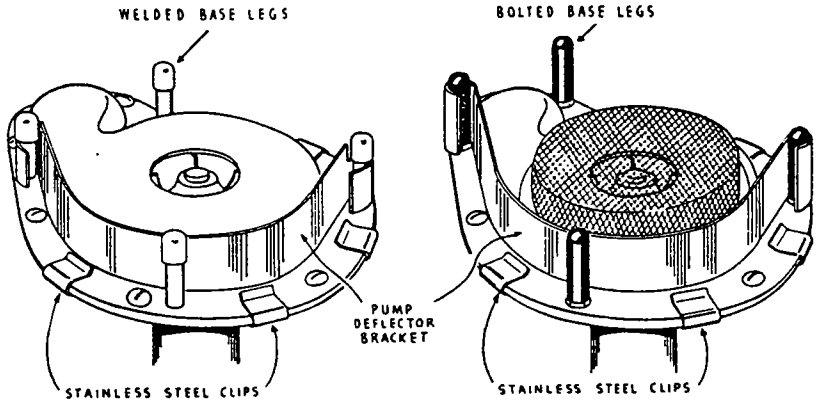
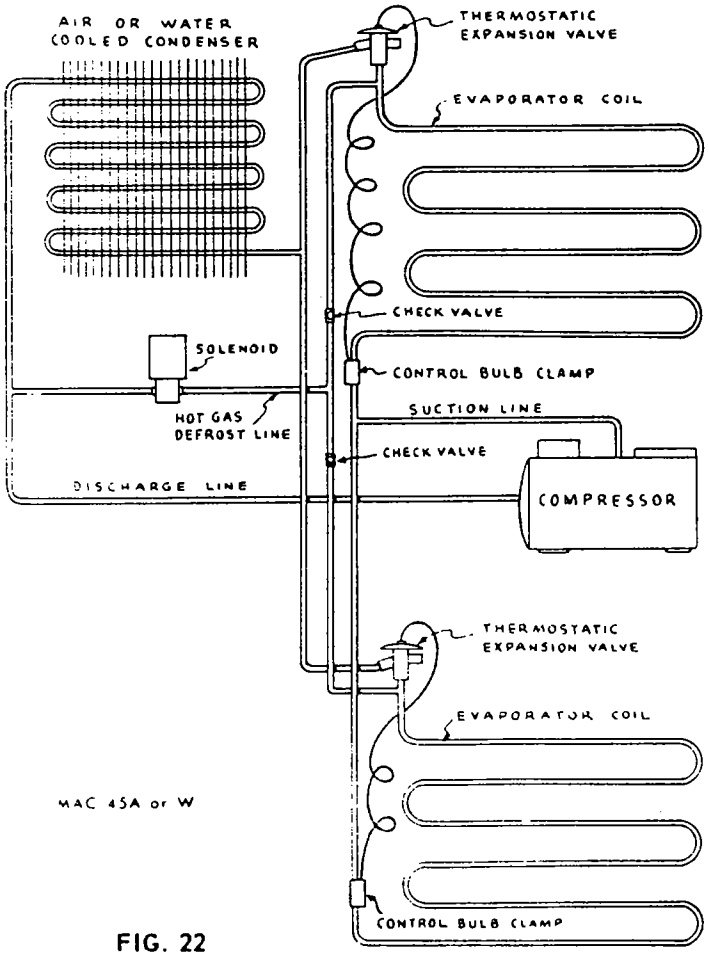
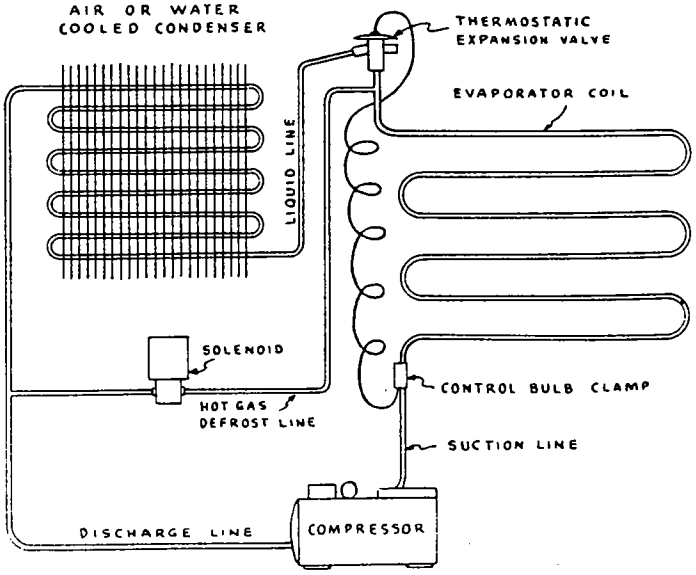


FIG. 20



MAC 45A or W

FIG. 22



MAC-22-A or W and MBC-21-A or W

FIG. 21

MAC-45 (See Figs. 1, 23 and 24)

The ice making section of the MAC 45 consists of two identical assemblies mounted one above the other. Each consists of an evaporator, spray plate, spray housing, sump and water pump. Each evaporator has its own identical thermostatic expansion valve. Check valves in the suction line of each evaporator prevent refrigerant from one evaporator backing up into the other.

The bulb of the cube size control is attached to the upper evaporator and any malfunction of either evaporator section will affect the others.

Examples:

a. Expansion valve of upper evaporator sticks shut. Unit cannot go into defrost and ice continues to build up into large mass on upper evaporator.

b. Obstructed water flow in upper evaporator will cause temperatures to drop too soon causing shells or undersized cubes from both evaporators.

c. Excess water loss from the upper or lower assembly will reduce ice making capacity of the entire machine.

d. If cube size control is defective system may stay on defrost or stay on freezing cycle. These extremes would cause no ice or large sheets of solid ice.

e. It is possible for the upper evaporator to freeze and harvest normal sized cubes, while in the lower evaporator freeze into a solid mass and fail to drop. To correct this problem, move cube size control bulb from the upper to the lower evaporator. By moving the bulb to the slower acting evaporator a complete defrost will be assured. (NOTE) If control capillary fits into a 1/4" tube cast in the evaporator we suggest changing to the external clamp type (See Page 17 for details).

f. Water dripping from above will freeze on top of lower evaporator resulting in cubes of lower evaporator not dropping during harvest. Some possible causes and corrections are listed below.

1. Cracks in spray housing.
   (a) Seal cracks with silicone rubber cement. (Part No. 91-0062)
2. Gasket between evaporator and spray housing not seating and water drips down back or sides of spray housing onto lower evaporator.
   (a) Fill voids with silicone rubber cement.
3. Kinked drain tube on upper sump support tray.
   (a) Remove upper support tray (secured with 4 wing nuts), lift tray and drain tube out.
   (b) Elongate to the right (the hole drain tube goes through) enough so drain tube has straight drop without kinking.
   (c) Cut off kinked section of drain tube, and replace all parts in reverse order.
4. Upper sump support tray slanting forward.
   (a) Loosen wing nut at vertical adjustment brace (left front corner) raise tray and retighten wing nut (Fig. 23)
   (b) Level cabinet.

MAC 45-A CONDENSER

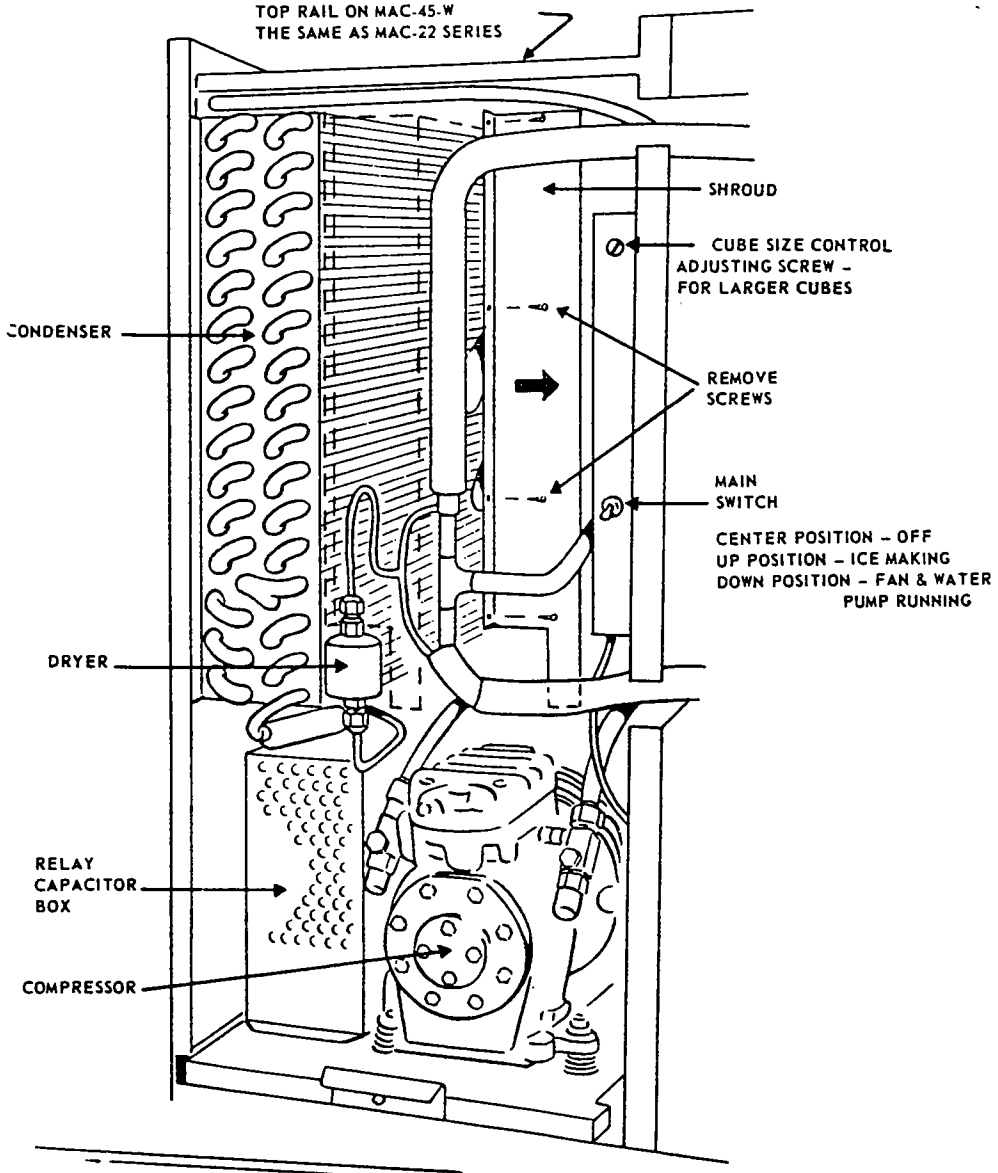


FIG. 23

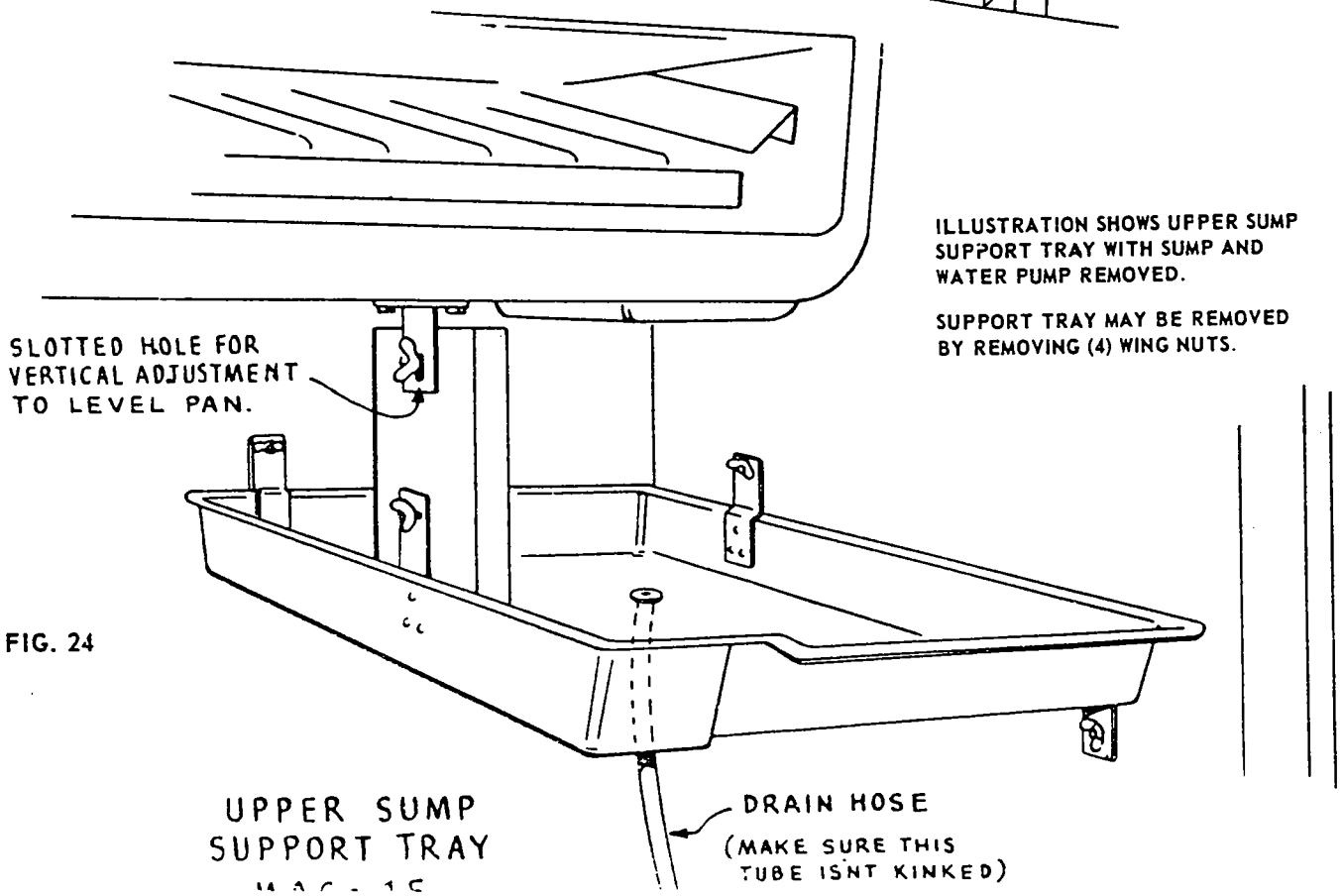


FIG. 24

TROUBLE SHOOTING

Complaint	Possible Causes	Corrections
INSUFFICIENT ICE	A. Condenser air restricted	a. Clean condenser b. Remove inlet grill c. Move unit or obstruction to get more air.
	B. Insufficient water - Condenser (on Water Cooled units)	a. Adjust water valve b. Flush water valve c. Clean condenser
	C. Insufficient water- Ice Making Section	
	a. Water pump not producing full capacity pressure	a. Install S.S. clips if pressure lost at gasket (Fig. 20) b. Install deflector baffle (Fig. 20) c. Check discharge tube for proper assembly and any leakage. d. Replace water pump e. Incorrect clearance for impeller
	b. Improper water level in sump pan	a. Clean external screen b. Clean float screen c. Adjust float valve d. Elongate water return hole in spray housing (See Fig. 25 and page 31) e. Make sure underflow drain tube on sump pan is in vertical position and not bent outward. See Fig. 13.
	c. Fountain Field leaking	a. Check for proper assembly b. Tighten retainer channels c. Replace gasket
	d. Fountain Field plugged.	a. Take apart and clean making sure all holes are clear and open.

	D. Defective fan.	a. Lubricate or replace fan
	E. Solenoid leaking	a. Replace solenoid
	F. Unit short of gas	a. Find leak source, repair and add gas.
	G. Inefficient compressor	a. Change valve plate. b. Replace compressor c. Correct low voltage
	H. Expansion valve malfunction	a. Clean b. Reset superheat c. Replace d. Install new drier if moisture is suspected.
	I. Undersized head unit	a. Replace with larger capacity head unit b. Get second unit
	J. Door off or loose	a. Replace or tighten b. Readjust c. Replace
	K. Cube size control setting off	a. Adjust control b. Replace control
CLOUDY CUBES	A. Contaminated water	a. Clean and flush system
	B. Plugged spray holes	a. Replace or install strainer b. Install water conditioner c. Clean float valve and fountain field screens d. Clean fountain field spray holes.
CRACKED CUBES	A. Thermal shock of defrost	a. Can't correct without loss of capacity
UNDERSIZED CUBES	A. Plugged holes in spray plate	a. Clean system.
	B. Cube size setting off	a. Adjust control
	C. Cubes don't drop	a. Clean vent holes in top of cavities on MAC models b. Clean lime deposits from evaporator c. Adjust control
PARTIALLY FORMED CUBES	A. Plugged holes in fountain field	a. Clean system b. Poke out obstruction c. Install strainer
	B. Cubes don't drop	a. Clean vent holes on MAC models
	C. Defective water pump	a. Replace pump or motor
	D. Water leak	a. Determine location and repair
	E. Float valve setting low	a. Readjust

POWER CONSUMPTION HIGH	A. Insufficient air supply	a. Clean condenser b. Remove obstruction c. Replace fan d. Move to cooler location
	B. Water supply warm	a. Install pre-cooler b. Relocate supply line
	C. Condensing temperature high	a. Reset water valve b. Reduce water temperature c. Clean condenser
	D. Heavy Usage	a. Provide excess storage and produce during slack period b. Install pre-chiller
USING TOO MUCH WATER	A. Leaking down chute	a. Clean holes in spray plate b. Remove stuck cubes c. Correctly install parts d. Level cabinet e. Check to see that spray curtain is in place and is the proper length f. Sump is level g. Sump overflow tube is vertical
	B. Defective water valve	a. Readjust valve b. Replace valve
	C. Float valve set high	a. Readjust by bending arm
	D. Inefficient condenser	a. Cleanout lime deposits b. Reset water valve c. Replace condenser d. Clean finned condenser
	E. High Ambient	a. Relocate unit b. Provide more air circulation
	F. Cycling too often	a. Reset controls b. Push cubes away from bin reservoir until bin is full
	G. Excess water through top vent holes on MAC models	a. See text below

In some cases the streams of water from the spray plate hit the vent holes in the top of evaporator exactly. When this happens a larger than normal amount of water runs off through the top drain. This wasted water reduces ice making capacity and by chilling the metal surfaces may cause sweating. It can be corrected by shifting the spray plate rear retainer slightly to the right or left. This will shift the position of the spray plate holes causing the water streams to miss the vent holes.

STICKING CUBES

In certain areas mineral deposits tend to build up on the fountain field causing the cubes to slide slower or to stick. This build up can be stopped or reduced by the application of a silicone coating. The coating is factory applied on all new production. It may be necessary to renew this coating. The frequency is entirely dependent on local water conditions. Silicone coatings used must be approved for use on food processing equipment. We suggest Dow Cornings Slipicone. 16 oz. spray cans are available from the factory under Part No. 94-0059. 2 oz. tubes under Part No. 94-0061. Be sure to clean all mineral deposits from the surface before applying silicone. Polish down with a soft cloth to remove any excess.

COMPRESSOR CYCLES ON OVERLOAD	A. Insufficient water	a. Reset water valve b. Clean condenser c. Increase size of supply line d. Repair kinked supply line e. Check for leaks
	B. High water temperature	a. Install pre-chiller b. Relocate water lines
	C. Defective overload	a. Replace
	D. Defective relay	a. Replace
	E. Defective capacitor	a. Replace
	F. Air in system	a. Determine source and repair leak. b. Install new drier c. Evacuate and recharge
	G. Tight compressor	a. Replace
	H. Compressor short of oil	a. Add oil
	I. Fan stuck	a. Lubricate b. Remove obstruction c. Replace fan motor
	J. Low voltage	a. Run separate line to cuber with heavier wire. b. Call local power company if entrance service voltage is low.
DRIPS WATER DOWN FRONT	A. Leak in water lines	a. Tighten compression fittings above float and shut off valve packing
	B. Water splashing at float valve	a. Bend metal shroud of float valve to deflect water downward
	C. Kinked drain tube on upper drain of MAC45	a. Enlarge hole drain goes through. See Fig. 24
	D. Upper drain pan not level on MAC45	a. Raise left edge at vertical adjustment. See Fig. 24
	E. Drain plugged from top of platen (MAC models)	a. Clean drain
	F. Lower drain plugged.	a. Clean drain and be sure to replace stand-pipe.

The suggestions above may assist you in determining the cause of unsatisfactory harvest. The section following covers methods used to check and repair.

SERVICE AIDS

Our company policy is to incorporate product improvements as quickly as they are proved out by field history and hot room tests. A system of Field Bulletins are used to get this information to our customers. For your information all bulletins to date are complete in this section of your manual.

A. Enlarging Water Return Opening. Fig. 25

On some units water from the fountain field returning to the sump pan tends to "dam-up" against the pump discharge tube in the spray housing. Symptoms of this are as follows:

1. At start of freezing cycle after harvest, water level in sump pan will go up and down many times before balancing out at the normal 2-1/8" depth.
2. Water will spill out over lip of spray housing wasting refrigerated water and lengthening time to balance water in sump pan.
3. When most of the water is trapped in the spray housing, the water pump will suck air and lose its prime. When water does return to sump pan, its velocity is greater than the pumping rate, so excess water spills out under flow tube.

The results of the above are as follows:

1. Several minutes lost at the start of each freezing cycle, which could add up to one or two less harvests per 24 hours.
2. Increased power and water costs.

This can be remedied as follows:

1. Shut off power and water supply.
2. Remove float valve and water pump.
3. Remove sump pan.
4. Remove cube chute and fountain field.
5. Using a small key-hole hacksaw or hacksaw blade, cut out shaded area in illustration.
6. Replace parts in reverse order, turn on power and water supply.

B. Insufficient Water

In some instances it may be difficult to maintain a pumping rate sufficient to force water into all of the ice making cavities. This condition usually is caused by one of the following:

a. Low voltage
b. Water leakage
c. Water movement under the pump

a. The first is easily corrected by raising the voltage by installing adequate wiring or a transformer.

b. The second can be corrected by finding the leak. Probable locations are the tubes connecting the water pump and the spray plate, the gasketed bottom section of the pump, or the spray plate gasket.

c. Metal clips (part No. 56-0019) can be added to the water pump as in Fig. No. 20.

CHECKING COMPRESSOR

Front seat the suction service valve. Adjust water valve or block condenser until head pressure is at least 150 psig. Suction pressure should pull down to 25 inches of vacuum in a few minutes and hold vacuum three to five minutes. If pressure rises immediately, replace valve plate.

Check compressor motor for electrical continuity and open or grounded circuits. If you find any, replace the compressor. If not, proceed as follows: If compressor won't start connect test set (Fig. 26) to compressor terminals. Depress starting button (not over 5 seconds) When compressor starts, release button. Compressor should continue to run. If compressor won't start or keep running, replace it. If it starts and keeps running, determine by process of elimination whether to replace the relay, overload, or capacitor. Do not overlook the possibility of a defective wire.

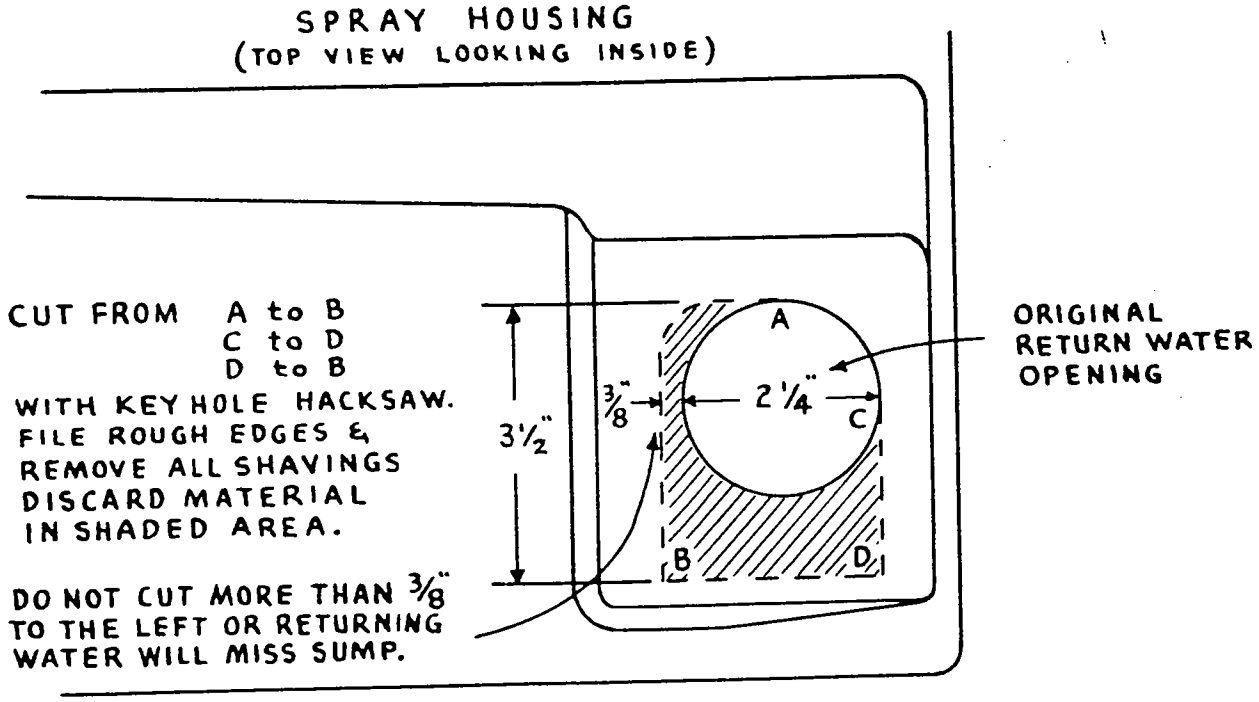


Fig. 25

CHANGING COMPRESSORS See Figs. 27, 28, and 29

Shut off power supply. Attach gauge manifold to high and low side service valves. If compressor is not burned out and system not contaminated, service valves may be front seated, the wiring disconnected, and the compressor body changed adding refrigerant if needed. If the compressor is burned out, bleed off charge, disconnect wiring, change the compressor, and clean complete system.

See next paragraph for Cleaning Contaminated Systems, evacuations and charging system.

CLEANING CONTAMINATED SYSTEM

Remove compressor. Flush liquid freon (F-11 preferred) through the system. Remove the original dryer and install a clean up type dryer. Install replacement compressor and evacuate the system thoroughly for at least one hour. After 24 hours operation replace clean up dryer with new regular dryer.

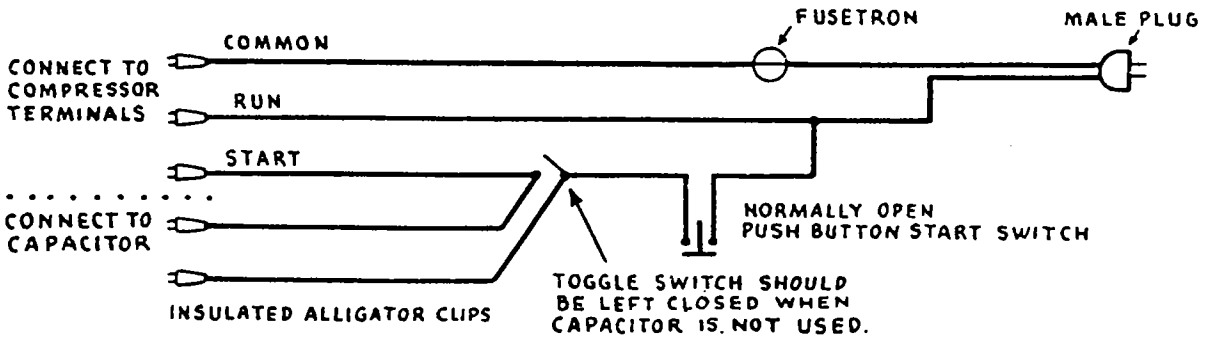
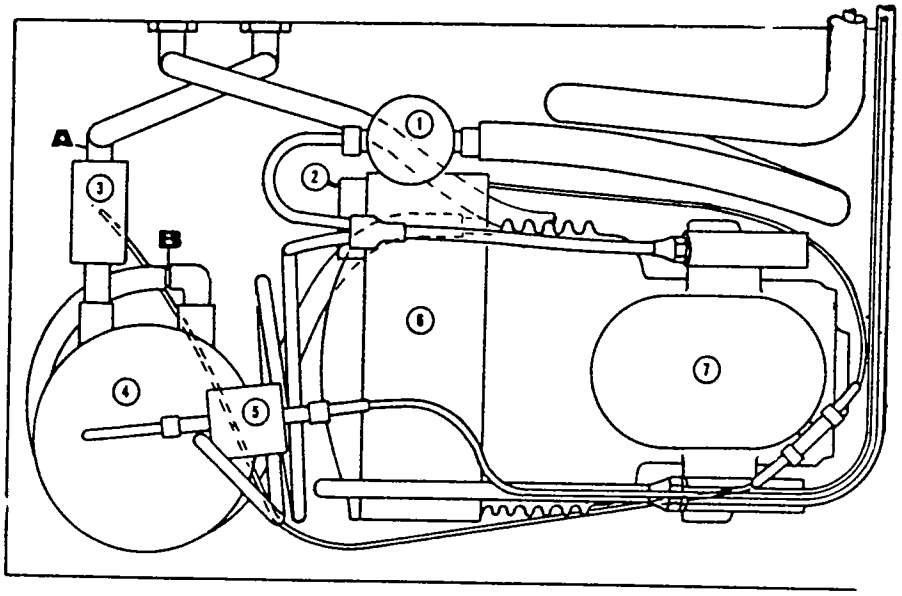


FIG. 26

FIG. 27

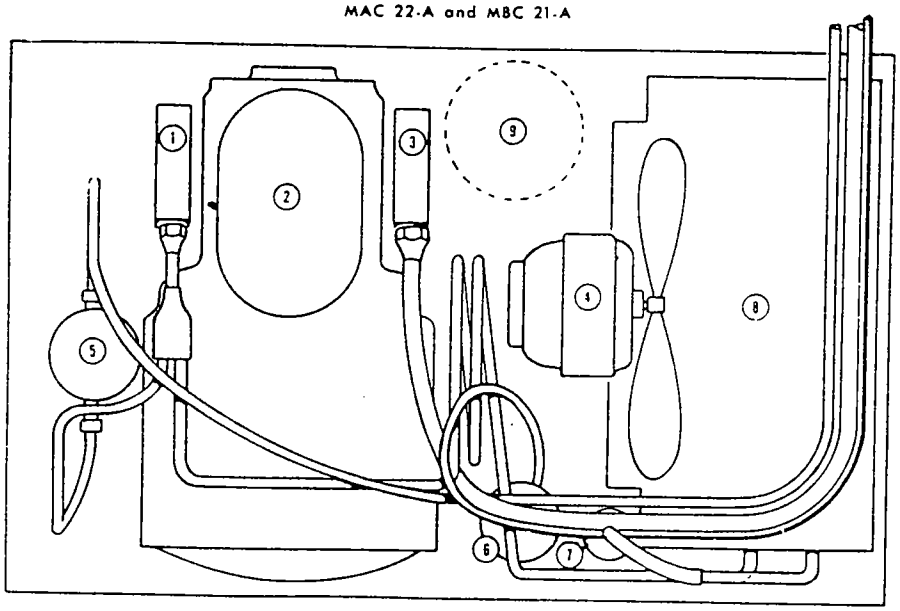
MBC-21-W

MAC 22W or MAC 45W
Condensing Unit



1. Hot Gas Solenoid
2. High Pressure Cut Out
3. Water Valve
4. Water Cooled Condenser
5. Drier
6. Compressor Terminal Box
7. Compressor

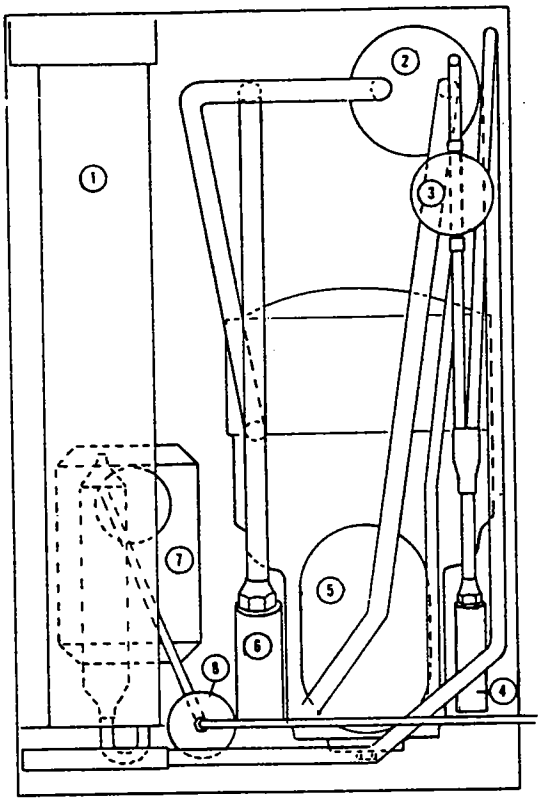
MAC 22-A and MBC 21-A



1 HIGH SIDE SERVICE VALVE
2 COMPRESSOR
3 LOW SIDE SERVICE VALVE
4 FAN MOTOR
5 SOLENOID
6 DRIER
7 RECEIVER
8 CONDENSER
9 ACCUMULATOR (Optional)

FIG. 28

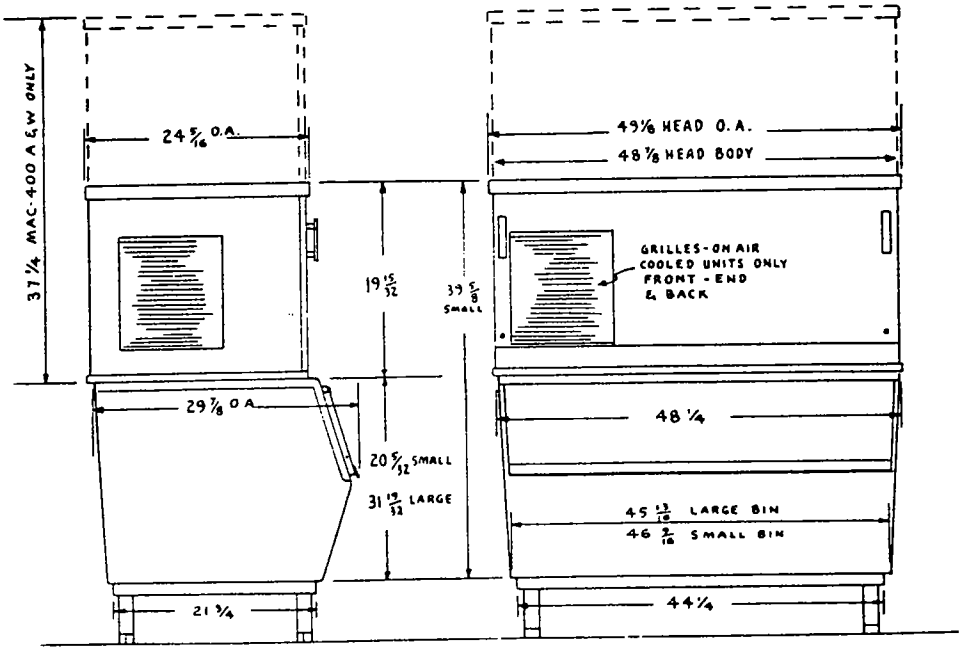
FIG. 29



MAC 45-A

1. Condenser
2. Suction Accumulator
3. Solenoid
4. Discharge Service Valve
5. Compressor
6. Suction Service Valve
7. Relay & Capacitor Box
8. Drier

FIG. 32



EVACUATING AND CHARGING

Run system long enough to heat up compressor slightly (10 minutes). Connect evacuating tubes to the high and low side service valves using a manifold or T connections for high and low side gauges. Turn valves in, two full turns. Replace valve caps. Run separate evacuating pump for at least one hour. Connect a service drum to the low side service valve through the manifold or by back seating both service valves and removing the evacuating tube. After opening valve on tank, crack line at compressor to bleed off air, then retighten. Open service valves and allow gas to enter system until pressure in tank and system equalize. Start compressor and by closing off (front seating) the suction service valve draw gas into the system. Use calibrated charging cylinder or weigh proper charge into drum, as listed in Table 1 page 40.

CHANGING DRYER

Discharge system through service valve ports. Remove original dryer, then quickly unseal the replacement and install, check for leaks, then evacuate and recharge system.

CHANGING EXPANSION VALVE

Discharge system through service valve ports. Unclamp bulb and disconnect flared fittings. Make sure parts are dry to keep moisture out of system. Install replacement expansion valve exactly as original was installed. Replace dryer, then check for leaks and evacuate and recharge system.

SETTING SUPERHEAT

The replacement valve is factory set for 8 degrees superheat on MAC models, and 4 degrees on the MBC models and should normally require no adjustment. Should adjustment be required determine which valve system has, and proceed as follows:

ALCO MODEL B1/2FW55

This valve cannot be adjusted and should be replaced if defective.

DETROIT MODEL 717

Thermostatic expansion valve internally adjustable. When it is necessary to change the superheat setting in the field, the adjustment can be made through the inlet connection. Remove the strainer and insert an Allen set screw wrench into the adjustment nut. One turn of the superheat adjustment changes the setting approximately four degrees. Looking into the bottom of the valve, turning the adjustment screw clockwise increases the superheat setting.

CONTROL CO. OF AMERICA A-207C

Remove bottom cap and turn stem clockwise to increase superheat and counterclockwise to decrease superheat.

REPLACING WATER REGULATING VALVE

1. Shut off water supply and drain system.
2. Front seat both service valves on the Copelematic units and only the gas in the compressor head and capillary line to the water valve will be lost.
3. Disconnect water pipe and bellows flare tube connections. Install replacement as original was installed, vertically with bellows down.
4. Open service valves and water supply. Check for leaks.
5. Add gas if necessary.

SETTING WATER REGULATING VALVE (Factory setting 120 lb.) See Fig. 30

The capillary connection to the compressor dome causes a rise in head pressure to open the water valve allowing more cooling water into the condenser which reduces the head pressure. The reduced head pressure causes the valve to reduce the flow of cooling water. The valve action maintains head pressure at a constant level.

On the Penn No. 246 water valve, the level can be raised by turning the adjusting screw counterclockwise, and lowered by turning the adjusting screw clockwise.

On the A-P No. 65A water valve, the head pressure can be raised by turning the adjusting screw clockwise, and lowered by turning the adjusting screw counterclockwise. Once set, the valve should need no further adjusting. (Note) Water usage can be reduced by setting valve for a higher head pressure, but ice making capacity will be reduced. To manually flush the Penn valve, insert screwdriver or similar tool under both sides of main spring, and lift upwards.

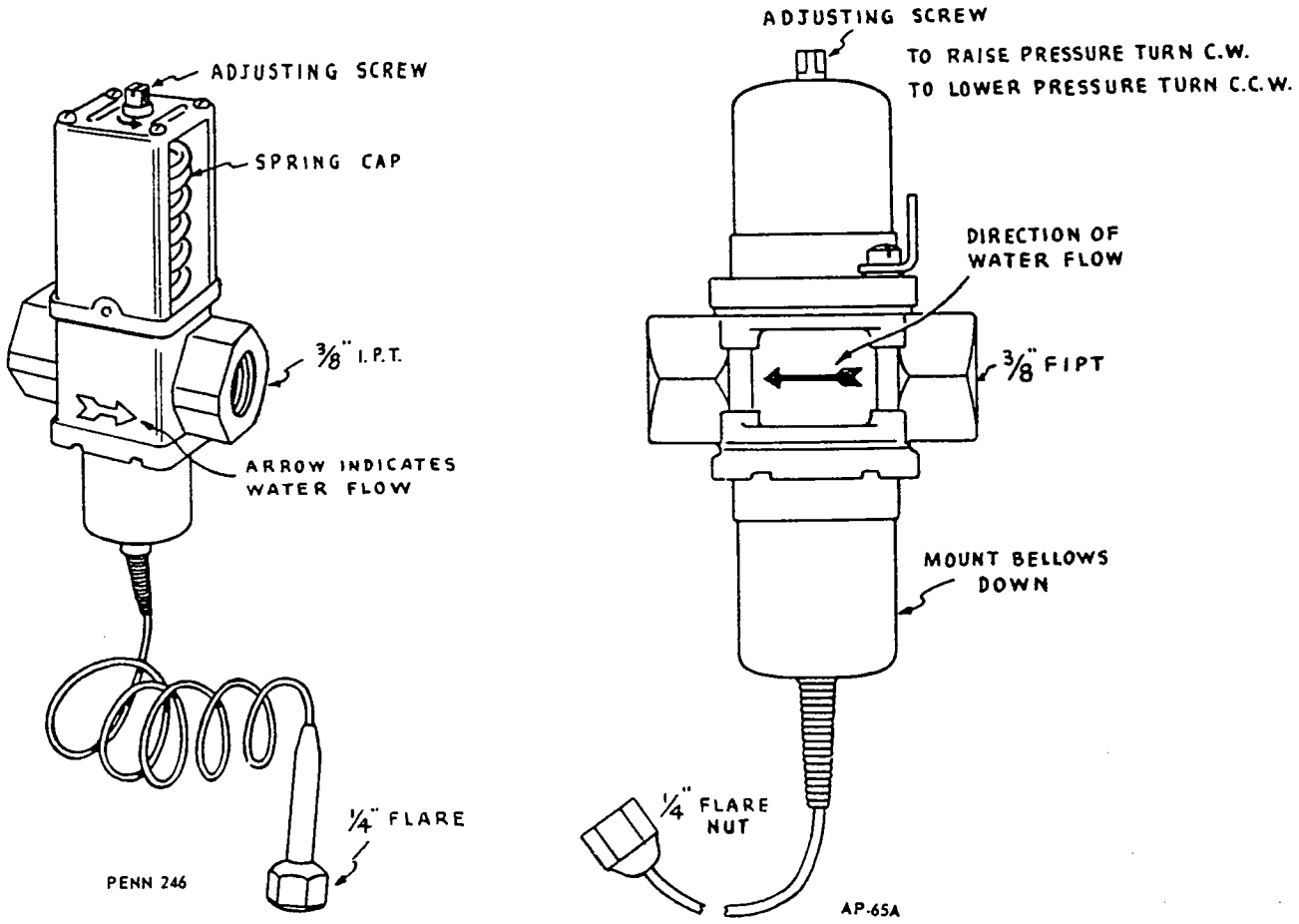


FIG. 30

WATER COOLED CONDENSER

A. OPERATION

Water cooled condensers lose efficiency due to a build-up of mineral deposits on the inner surfaces, and periodically have to be cleaned. Frequency of cleaning will vary with local water conditions. The symptoms of a limed-up condenser are loss of ice capacity, the necessity for adjusting water valve for more water flow and inability to maintain normal operating head pressures. See Tables 1 and 2. For proper operation of water valve, see page 36. See Tables 1 and 2 for normal water outlet temperature.

B. CLEANING

Upon ascertaining that condenser needs cleaning, proceed as follows: Shut off water supply, disconnect lines at A and B. See Fig. 27 Page 33. On the American Standard condenser pump a solution of three parts muriatic acid and seven parts water or commercial solvent through condenser until lime and scale is removed. On the Halstead-Mitchell condenser the manifolds can be removed, and the water tubes rodded out. Flush thoroughly with fresh water after cleaning, then reassemble.

THERMOSTAT ADJUSTMENTS See Figs. 16 and 31

CUBE SIZE CONTROL

(Ranco Type A-19)

Constant Cut in 42°

Variable Cut Out 3°, 10°, and 17°

Front knob adjustment - Turn C.W. for colder

Range adjustment - Remove fiber cover
Turn c.c.w. to set range colder

Differential adjustment - Is on terminal end. Turn c.c.w. to widen differential.

Connections: Terminal 2 and 1 open on temp. rise
Terminal 2 and 3 close on temp. rise

BIN CONTROL - Ranco Type A10 – Cut-in + 39.6° Cut-out + 34.1°

No Adjustment From	Range Adjustment	Differential Adjustment
Front with Knob	Remove fiber cover. Turn screw c.c.w. to set range colder	Is on terminal end. Turn c.c.w. to widen differential

ALTITUDE ADJUSTMENT

All controls are set to operate at about 578 ft. above sea level. This is the altitude at the factory. Controls must be reset by a serviceman if altitude in installation area is 2000 ft. or higher.

TYPE CONTROL	CUBER BIN CONTROL	CUBER SIZE CONTROL
Altitude	Turn Range Screw Clockwise	Turn Range Screw Clockwise
2000	11/64 turns	3/64 turns clockwise
3000	20/64 turns	7/64 turns clockwise
4000	29/64 turns	7/64 turns clockwise
5000	38/64 turns	12/64 turns clockwise
6000	46/64 turns	12/64 turns clockwise
7000	55/64 turns	16/64 turns clockwise
8000	63/64 turns	16/64 turns clockwise
9000	1-7/64 turns	20/64 turns clockwise
10,000	1-14/64 turns	20/64 turns clockwise

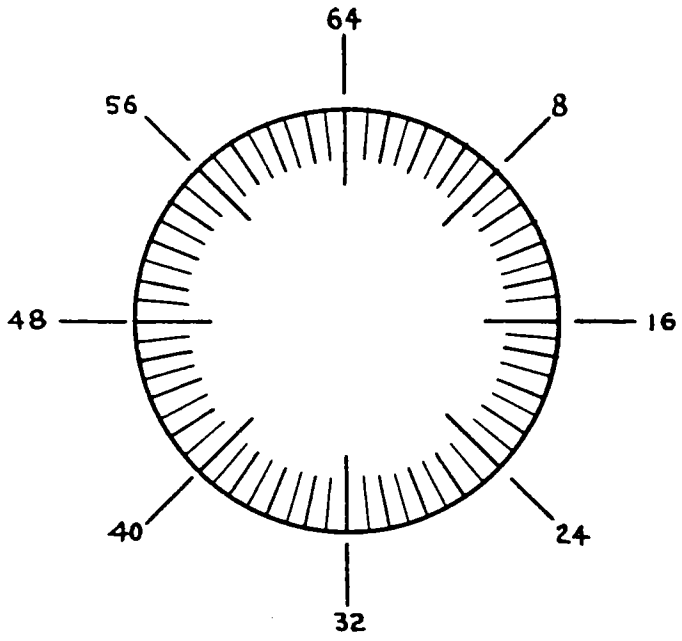


FIG. 31

High Pressure Cut Out - Ranco Type G23
(Water Cooled Models)

Factory set for 195 lb. cut out. No adjustment. Controls reset automatically when pressure drops to 145 lbs.

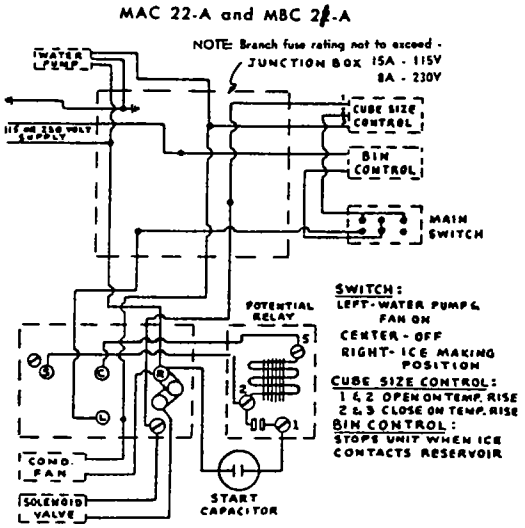


FIG. 33

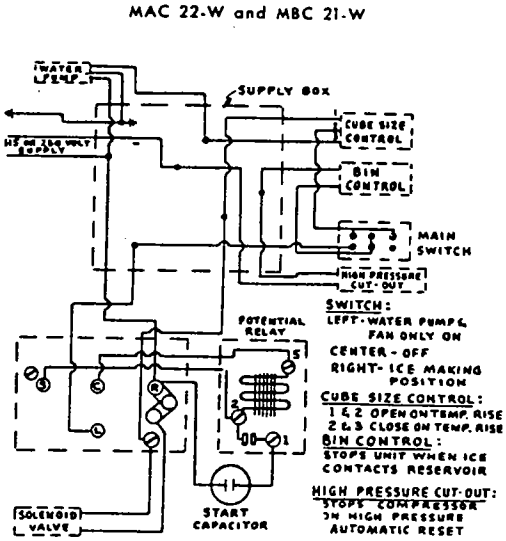


FIG. 34

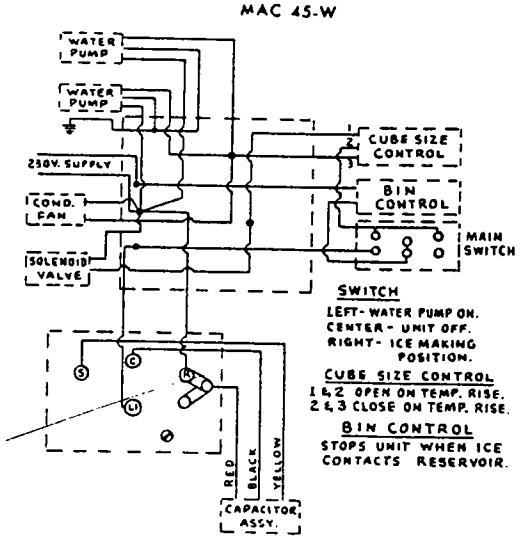


FIG. 35

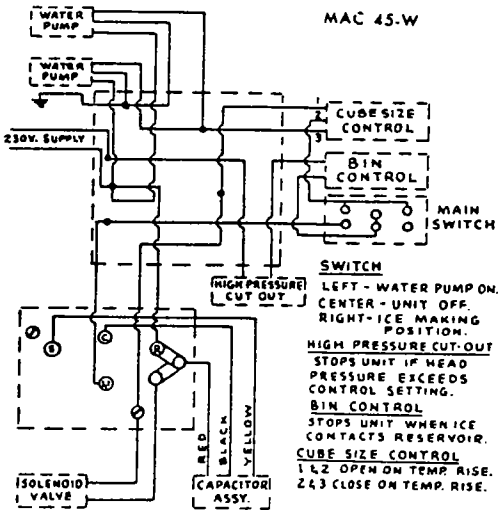


FIG. 36

PRODUCTION CHARTS

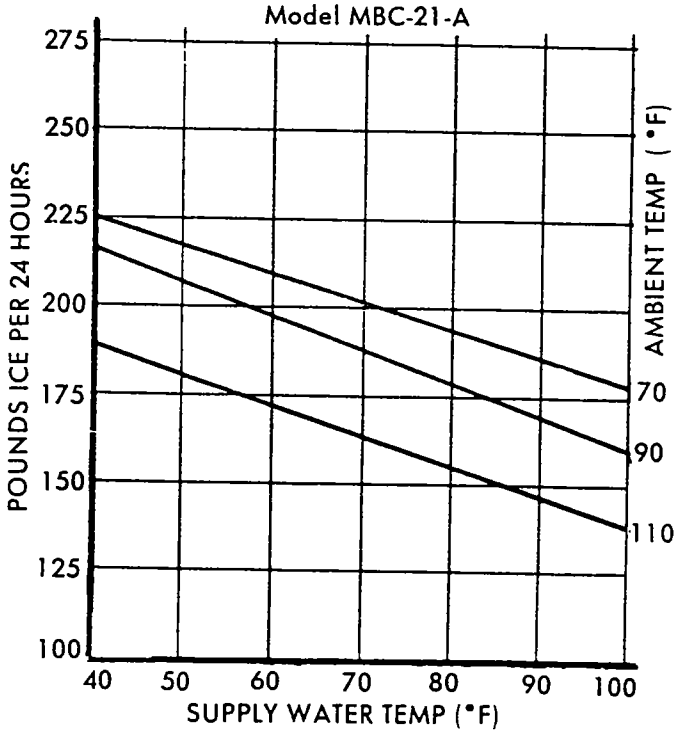


FIG. 37

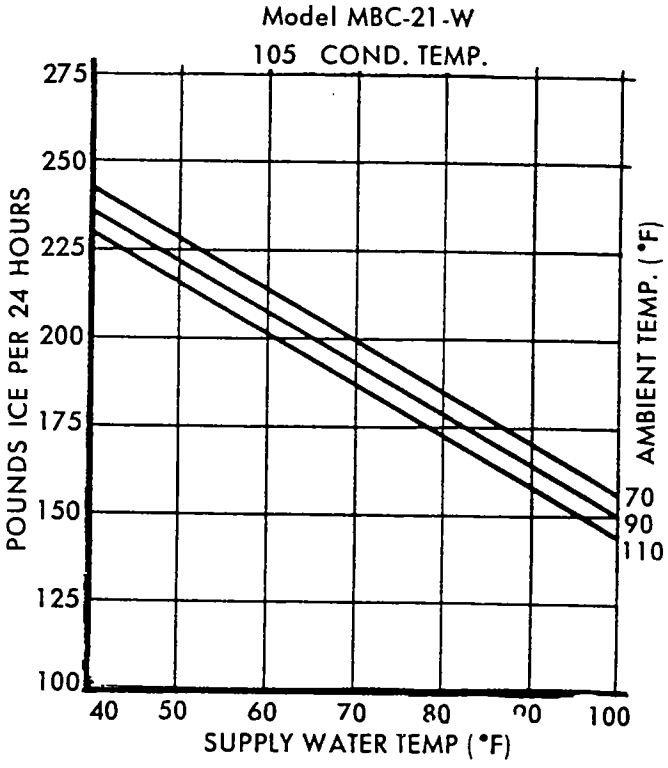


FIG. 38

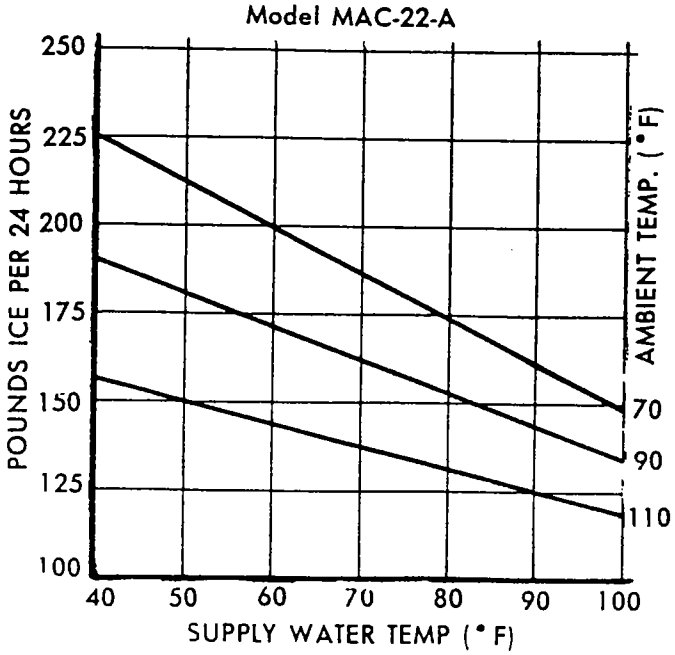


FIG. 39

ICE PRODUCTION WILL VARY WITH INSTALLATION LOCATION

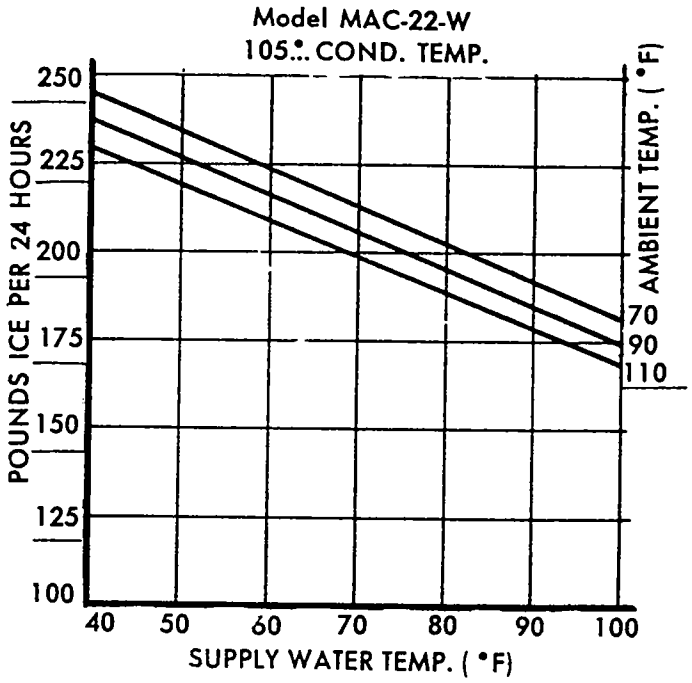


FIG. 40

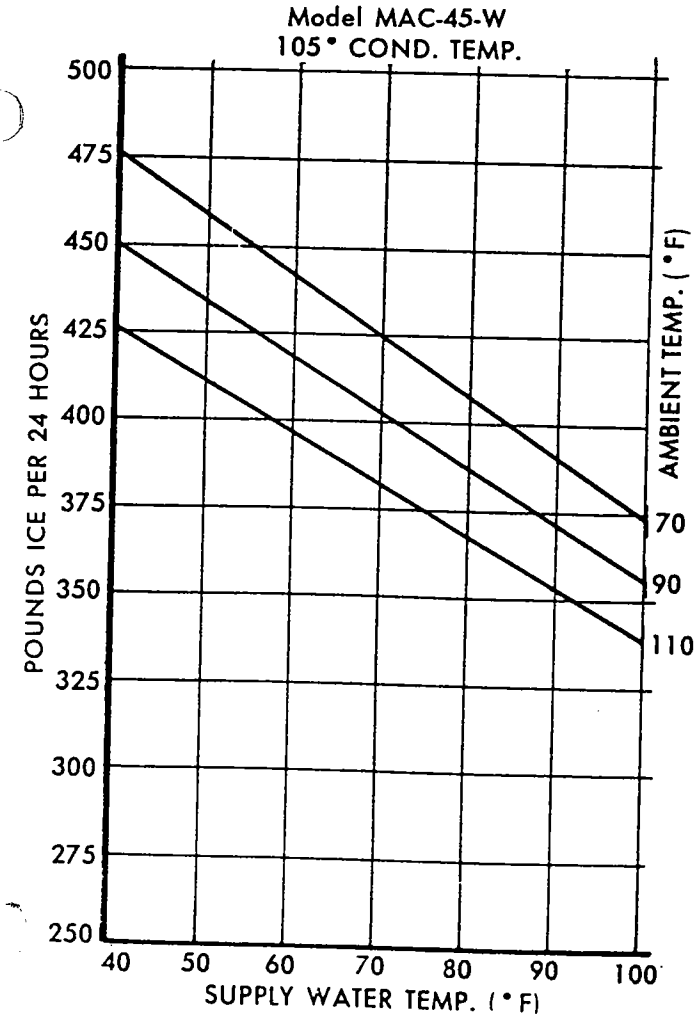


FIG. 42

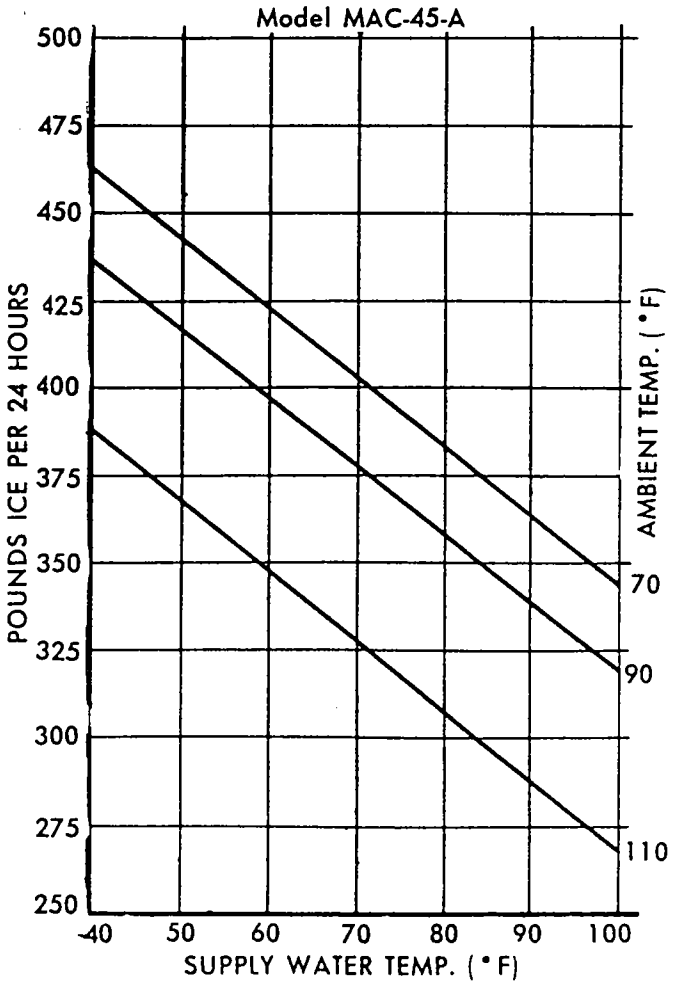


FIG. 41

ICE PRODUCTION WILL VARY WITH INSTALLATION LOCATION

TABLE 1

REFRIGERATION SYSTEM PARTS LIST - MAJOR

	Voltage	MAC-22-A	MAC-22-W	MAC-45-A 230-V only	MAC-45-W 230-V only	MBC-21-A	MBC-21-
Compressor	115	14-0101	14-0089			14-0101	14-008
Compressor	230	14-0102	14-0103	14-0109	14-0116	14-0102	14-01(
Relay	115	15-0154	15-0154			15-0154	15-015
Relay	230	15-0161	15-0161	15-0164	15-0164	15-0161	15-01(
Starting Capacitor	115	15-0153	15-0153			15-0153	15-015
Starting Capacitor	230	15-0163	15-0163	15-0165	15-0165	15-0163	15-01(
Run Capacitor	230			15-0167	15-0167		
Overload Protector	115	15-0144	15-0144			15-0144	15-014
Overload Protector	230	15-0132	15-0132	15-0166	15-0166	15-0132	15-013
Capacitor and Relay Assembly	230			15-0168	15-0168		
Fan Motor	115	24-0132				24-0132	
Fan Motor	230	24-0134		24-0137		24-0134	
Drier Drymaster Mod. 8		12-3004	12-3004	12-3004	12-3004	12-3004	12-30(
Water Valve - Penn 246 or AP65A			13-6040		13-6040		13-60
Therm. Exp. Valve AP207-C-1/2 Ton		13-6053	13-6053	13-6053	13-6053	13-6053	13-605
Bin Control Ranco A-10		23-5051	23-5051	23-5051	23-5051	23-5051	23-505
Cube Size Control Ranco-A-19		23-5050	23-5050	23-5050	23-5050	23-5050	23-505
High Press. Cut-out - Ranco G-23			23-5045		23-5045		23-50
Toggle Switch - DPDT-Center Off		23-0033	23-0033	23-0033	23-0033	23-0033	23-00
Float Valve Assembly		13-6038	13-6038	13-6038	13-6038	13-6038	13-60
Float Valve Plastic Seat		13-6073	13-6073	13-6073	13-6073	13-6073	13-60
Brady Pump Assembly *	115	14-8003	14-8003			14-8003	14-80
Brady Pump Assembly	230	14-8005	14-8005	14-8005	14-8005	14-8005	14-80
Brady Pump Deflector Bracket for pumps with welded base legs		76-1698	76-1698	76-1698	76-1698	76-1698	76-16
Brady Pump Deflector Bracket for pumps with bolted base legs		76-1704	76-1704	76-1704	76-1704	76-1704	76-17
Brady Pump S.S. Base Clips		56-0019	56-0019	56-0019	56-0019	56-0019	56-00
Hartell Pump Assembly	115	14-8006	14-8006			14-8006	14-80
Hartell Pump Assembly	230	14-8007	14-8007	14-8007	14-8007	14-8007	14-80
Solenoid	115	24-0116	24-0116			24-0116	24-01
Solenoid	230	24-0117	24-0117	24-0117	24-0117	24-0117	24-01
Drain Adaptor		13-0033	13-0033	13-0033	13-0033	13-0033	13-00
Drain Adaptor "O" Ring		43-0113	43-0113	43-0113	43-0113	43-0113	43-01
Drain Adaptor and Tee Assembly		524A09	524A09	524A09	524A09	524A09	524A0
Compression Valve (water supply)		13-6056	13-6056	13-6056	13-6056	13-6056	13-60
Condenser Air		11-5004		11-5008		11-5004	
Condenser Water			11-0014		11-0029		11-00
Pump Extension Cord (for cleaning)		20-6208	20-6208	20-6208	20-6208	20-6208	20-62

* On Cubers with serial numbers 58300001508101 to 58300060508101 inclusive and 58300061509101 to 58300089509101 inclusive - change pump lead from old motor to new motor.

TABLE 2 SPECIFICATIONS

Part		MAC-22-A	MAC-22-W	MAC-45-A 230-V only	MAC-45-W 230-V only	MBC-21-A Copelematic	MBC-21-W Copelematic
Compressor - 115-60-1		Cope. KAM2-0050-1AA	Cope. KWM2-0050-1AA			Cope. KAM2-0050-1AA	Cope. KWM2-0050-1AA
Winding Resistance - Common to Run		0.79 OHMS	0.79 OHMS			0.79 OHMS	0.79 OHMS
Winding Resistance - Common to Start		2.30 OHMS	2.30 OHMS			2.30 OHMS	2.30 OHMS
Start Capacitor Rating		430-516-MFD-125VAC	430-516-MFD-125VAC			430-516-MFD-125 VAC	430-516-MFD-125 VAC
Run Capacitor Rating		None	None			None	None
Compressor - 230-60-1		Cope. KAM2-0050-1AB	Cope. KWM2-0050-1AB	KAT2-0150-CAB	KWT2-0150-CAB	Cope. KAM2-0050-1AB	Cope. KWM2-0050-1AB
Winding Resistance - Common to Run		3.8 OHMS	3.8 OHMS	1.5 OHMS	1.5 OHMS	3.8 OHMS	3.8 OHMS
Winding Resistance - Common to Start		9.8 OHMS	9.8 OHMS	4.0 OHMS	4.0 OHMS	9.8 OHMS	9.8 OHMS
Start Capacitor Rating		108-120-MFD-220 VAC	108-120-MFD-220 VAC	108-120-MFD-320 VAC	108-120-MFD-320 VAC	108-120-MFD-220 VAC	108-120-MFD-220 VAC
Run Capacitor Rating		None	None	20-MFD-440 VAC	20-MFD- 440 VAC	None	None
Fan Model		SPA-6 SPA-9		ESP-L35-SE2		SPA-6 SPA-9	
Fan Amps	115-60-1	0.56 A 0.85A				0.56A 0.85A	
	230-60-1	0.28A 0.45A		0.7A		0.28A 0.45A	
Fan Winding Resistance	115-60-1	44 OHMS 22 OHMS				44 OHMS 22 OHMS	
	230-60-1	95 OHMS		57.5 OHMS		95 OHMS	
Solenoid Amps	115-60-1	1.0-A	1.0-A			1.0-A	1.0-A
	230-60-1	0.5-A	0.5-A	0.5-A	0.5-A	0.5-A	0.5-A
Solenoid Winding Resist.	115-60-1	62 OHMS	62 OHMS			62 OHMS	62 OHMS
	230-60-1	225 OHMS	225 OHMS	225 OHMS	225 OHMS	225 OHMS	225 OHMS
Refrigerant Charge - OZ. R-12		19 oz.	19 oz.	50 oz.	30 oz.	21 oz.	21 oz.
Normal Amps	115-60-1	10.5-A to 12.5-A	11.5-A to 12.5-A			7.7 to 11.2	7.8 to 10.3
	230-60-1	5.3-A to 6.3-A	5.8-A to 6.3-A	5.7 to 10.1	5.6 to 8.2	3.5 to 5.6	3.6 to 5,2
Brady Water Pump Amps	115-60-1	(1) 1.0 AMPS	(1) 1.0 AMPS			(1) 1.0-A	(1) 1.0-A
	230-60-1	(1) 0.5 AMPS	(1) 0.5 AMPS	(2) 0.5 AMPS each	(2) 0.5 AMPS each	(1) 0.5-A	(1) 0.5-A
Brady Water Pump Winding Resist.	115-60-1	(1) 16 OHMS	(1) 16 OHMS			(1) 16 OHMS	(1) 16 OHMS
	230-60-1	(1) 64 OHMS	(1) 64 OHMS	(2) 64 OHMS each	(2) 64 OHMS each	(1) 64 OHMS	(1) 64 OHMS
Hartell Water Pump Amps	115-60-1	(1) 1.1 AMPS	(1) 1.1 AMPS			(1) 1.1-A	(1) 1.1-A
	230-60-1	(1) 0.55 AMPS	(1) 0.55 AMPS	(2) 0.55 AMPS each	(2) 0.55 AMPS each	(1) 0.55-A	(1) 0.55-A
Hartell Water Pump Winding Resist.	115-60-1	(1) 10 OHMS	(1) 10 OHMS			(1) 10 OHMS	(1) 10 OHMS
	230-60-1	(1) 40 OHMS	(1) 40 OHMS	(2) 40 OHMS each	(2) 40 OHMS each	(1) 40 OHMS	(1) 40 OHMS
Room Temperature		70 90 110	70 90 110	70 90 110	70 90 110	70 90 110	70 90 110
Head Pressure	Max.	155 180 220	120 120 120	160 188 220	121 121 121	132 161 203	126 126 126
	Min.	123 150 175	120 120 120	124 158 170	119 119 119	125 158 188	125 123 124
Suction Pressure	Max.	23 23 25	23 23 24	22 23 24	20 21 25	19 20 25	18 21.0 21
	Min.	4 4 4	5 5 4	6 6.5 6	5 5 4	17 18.5 21	13 14.0 14.5
Water Temp. Cond Out		100° F		100° F			100° F