



# MANUAL

*Installation, Operation  
and  
Maintenance Instructions*



**SERIES 5900**

**PERMATOWERS**

APRIL, 1974

MANUAL 92 - 1316

OM-5900A

**THE MARLEY COMPANY**

5800 Foxridge Drive — Mission, Kansas 66202

INSTALLATION, OPERATION, MAINTENANCE, DISASSEMBLY — PERMATOWERS

# Installation, Operation and Maintenance Instructions

## SERIES 5900

# PERMATOWER

### TOWER LOCATION

Locate so prevailing wind will blow into the louvered face. Direct fan discharge away from building surfaces to eliminate the possibility of discoloration. Locate so there is free flow of air to and from the tower. Allow clearance on all sides for maintenance. Anchor in a level position to a stable foundation.

**INDOOR INSTALLATION:** A duct is required from the tower air discharge to the outside. In some cases it may also be desirable to install an inlet air duct. If ducts are used, the total draft loss should not exceed .10" water pressure. Draft losses can be minimized by:

- Using 20% oversize ducts.
- Avoiding sharp turns or abrupt changes in size.
- Keeping duct length to a minimum.
- Increasing the area of screened or louvered opening so the net free area is at least 20% greater than the tower discharge opening area.

Ducts should be attached to the tower using rubber or canvas connections. Access openings for servicing the mechanical equipment must be provided if air discharge ducts are installed. If the duct discharges into the prevailing wind, it may be necessary to install a windbreak or an elbow to serve as a deflector. Ducts installed on towers with year around usage should be watertight and insulated to prevent condensation.

### TOWER INSTALLATION

The tower is shipped complete with the motor installed or in a carton within the tower depending on the model. A miscellaneous parts package is shipped within the tower. Anchor tower by bolting a clip to the foundation and basin sides using 3/8" or larger bolts.

#### PIPING TO TOWER (Summer Temperature Conditions)

- Use pipes of sufficient size to provide minimum friction loss.
- Connect Float Valve to make-up water supply.
- Pipe tower drain and overflow to sewer.
- Install bleed-off line. Bleed-off is the continuous wasting of a small amount of water during operation which

retards scale and corrosion. A bleed-off line can be installed at any point in the system, however, the best point is in the hot water line near the top of the tower so water will be removed when the pump is operating. A copper tube, pinched down or with a pet cock can be used.

#### PIPING TO TOWER (Winter Freezing Conditions)

- Where operating conditions require tower use during freezing weather, it is recommended that the towers be installed for "dry basin" operation. See Figure 1.
- Provide an inside open-type storage tank with a capacity of four times the cooling tower GPM.
- Connect tower suction and drain to storage tank.
- Install make-up water, bleed-off, overflow and drain lines on tank.
- Insulate and heat water lines exposed to freezing temperatures.

The following tables show the proper amount of bleed-off.

COOLING RANGE DEGREES F	PERCENT BLEED-OFF OF TOTAL GPM
6	.15
7-1/2	.22
10	.33
15	.54
20	.75

### MECHANICAL EQUIPMENT INSTALLATION TOWER MODELS 5913 THRU 5917

#### MOTOR INSTALLATION

- The motor was installed and run at the Marley factory. Spin the shaft to be sure it turns freely and was not damaged in shipment.
- Check to insure that set screws in fan hub are tightly secured against motor shaft.
- Check the motor name plate, on the fan end of the tower, to be sure its voltage, phase and frequency ratings agree with the power supply.
- Power connections, see wiring diagrams, are made at the front of the tower. There is a drip loop in each lead wire to prevent water following the leads back into the

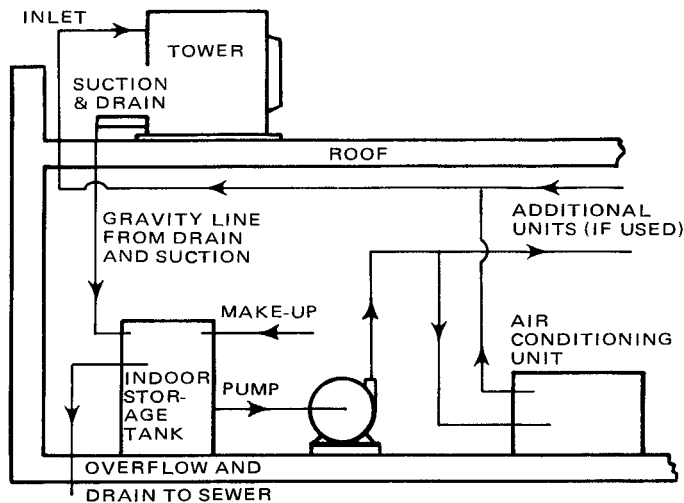


FIGURE 1. Flow Diagram for a Cooling Tower with Indoor Storage Tank. (Piping is arranged so that tower basin will drain when pump is shut off.)

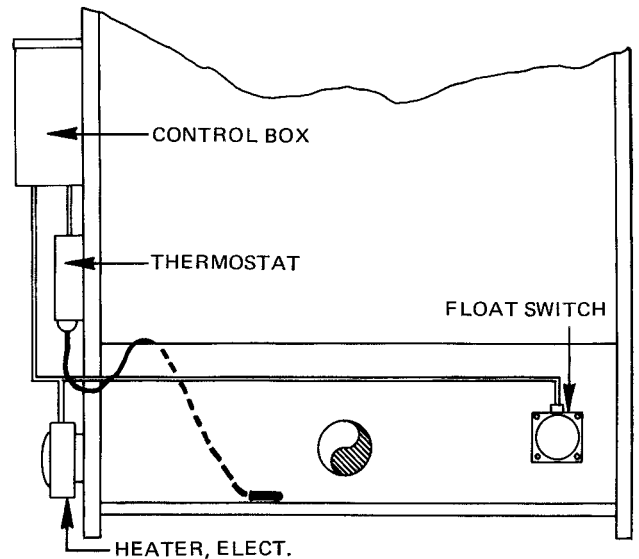
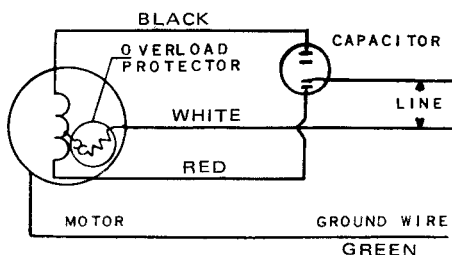


FIGURE 2. Electric heater systems are available as optional equipment to prevent freezing the cold water basin when it cannot be drained.

motor. Do not remove this loop. Connect motor ground wire to water pipe or suitable ground rod.

5. All wiring, switching and short circuit protection must be in accordance with the National Electric Code and local requirements. Failure to wire the motor correctly will void its warranty. Any Single Phase motor supplied with these towers has a built-in overload protector which is actuated by the temperature of the motor. If the temperature becomes too high, the motor will stop, and when it cools sufficiently, it will start automatically.



#### WIRING DIAGRAM

(Models 5913 through 5917 with single phase motors. Single phase motors with capacitors are optional on Model 5917.)

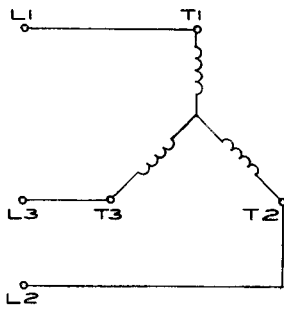
#### MECHANICAL EQUIPMENT INSTALLATION TOWER MODELS 5919R THRU 5937R

##### MOTOR, SHEAVE AND V-BELT INSTALLATION

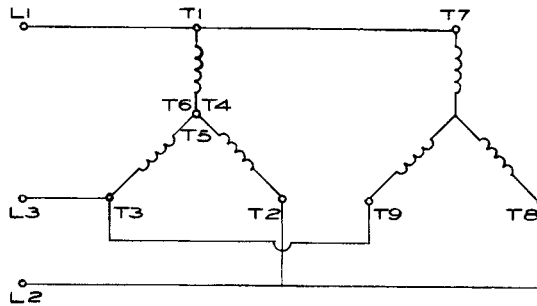
1. Check the motor name plate to be sure its voltage, phase and frequency ratings are the same as the power supply.
2. Check to insure that fan is tightly secured to bearing housing shaft and free to rotate and that bearing housing is secured to its support.
3. Install all thread belt tension adjusting bolts in motor base cradle, see Detail A, page 6. Install lock washers and nuts, fastening adjusting bolts to motor base cradle. Run galvanized nuts about halfway down on bolts. Insert bolts through slots in motor base, install lock washers and run top nuts down, locking base in place. Bolt motor to motor base.
4. Install motor sheave and align it with fan sheave. A plumb line will be helpful in aligning sheaves. See Detail "B".
5. Install V-belt and adjust tension by means of belt tension adjusting bolts. A correctly tensioned belt does not slip when the fan is started; and, when running, the "tight" side is straight between sheaves. The "slack" side will have a slight bow. Correct tension can only be determined by trial runs at successively higher tensions until slipping has stopped.

A small further increase in tension should be made to account for normal belt stretch. Avoid over tensioning. Too much tension reduces bearing and belt life.

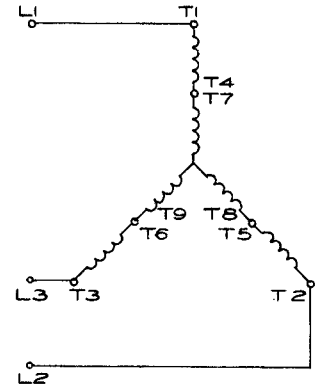
New belts must be retensioned after 8 to 12 hours oper-



200 VOLT

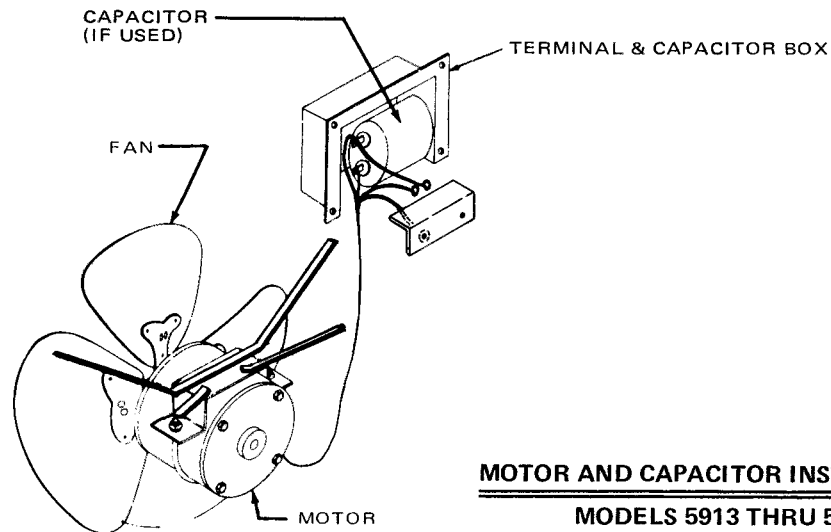


230 VOLT



460 VOLT

**WIRING DIAGRAM 3 PHASE MOTORS**  
**MODELS 5917 THRU 5937R**



**MOTOR AND CAPACITOR INSTALLATION**  
**MODELS 5913 THRU 5917**

ation since new belts stretch at a higher rate and "seat" into sheave grooves.

6. Connect motor to power supply using wiring, switching, short circuit protection and overload protection in accordance with the National Electric Code and local requirements. Failure to wire the motor correctly will void its warranty. The overload protection for Motors on models 5919R through 5937R must be part of the control system see Diagram "C", page 6.

#### INSTALLATION OF OPTIONAL EQUIPMENT

##### AIR INLET SCREEN

Attach air inlet screen to side casing sheets with screws.

**BELT GUARD** (Standard Equipment on Models 5919R thru 5925R)

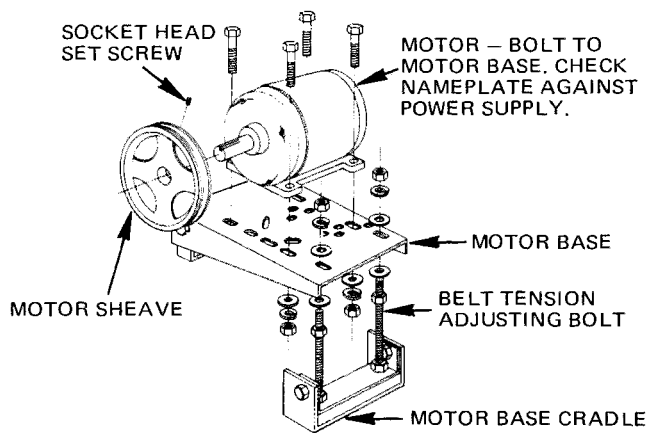
Attach belt guard to tower with screws.

##### HOT WATER BASIN COVER

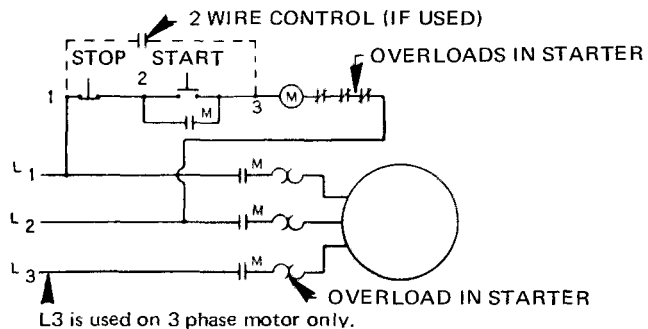
Place the cover over the hot water basin, and attach to hot water basin with screws.

#### OPERATION INSTRUCTIONS

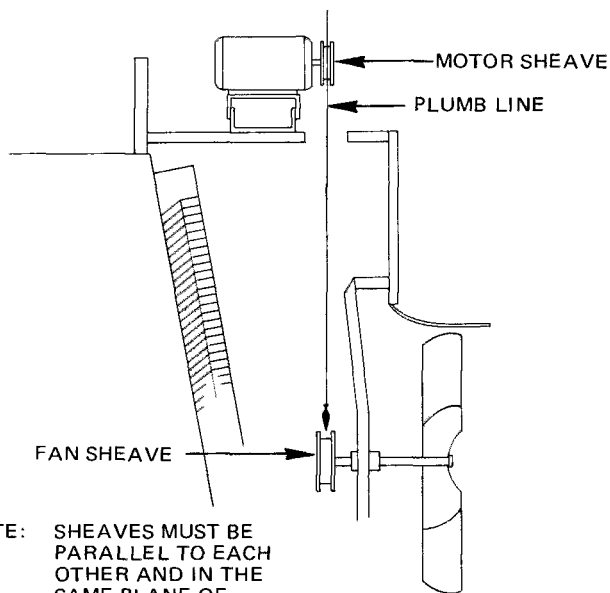
1. Wash foreign matter from fill and basin.
2. Fill circulating system with water.
3. Start pump and adjust float valve to maintain about 4" (5" on models 5929R thru 5933R and 7" on models



DETAIL "A"



Showing Overload in Starter  
DIAGRAM "C"



NOTE: SHEAVES MUST BE PARALLEL TO EACH OTHER AND IN THE SAME PLANE OF OPERATION.

DETAIL "B"

5935R and 5937R) of water in cold water basin.

4. Check bleed-off to make sure water is being discharged during operation.
5. Check fan for free rotation and oil level in bearing housing (see Maintenance Instructions). Start motor and check direction of rotation. Fan must rotate clockwise when viewed from the outside. If, on models 5919R thru 5937R, the rotation is incorrect, change any two of the three motor leads for a three-phase motor or interchange the connections of either the main or starter windings for single-phase capacitor start motor.

If on models 5913 through 5917\*, the rotation is incorrect, check lead connections. If capacitor and power are properly connected single phase permanent split capacitor motor can not be reversed. Three phase motors can be reversed by changing any two of the three motor leads. (\*5917 uses 3-phase or permanent split capacitor motor.)

6. Depth of water in hot water basin should be uniform. If the basin overflows, reduce the flow rate. Do not pump more water than design capacity.
7. Limit accumulative starting time to a total of 30 seconds each hour.

## MAINTENANCE INSTRUCTIONS

**MOTOR LUBRICATION** (Does not apply to models 5913 through 5917. Motor bearings for these models are lubricated for the life of the motor.)

Lubricate the motor according to the motor manufacturer's instructions shipped with the motor. Ball bearing motors are grease lubricated by motor manufacturer. Motors should be relubricated at the start and end of each operating season.

**FAN BEARING HOUSING LUBRICATION** (Does not apply to models 5913 through 5917.)

Lubricate bearing housings with SAE 20 Mineral Oil on models 5919R through 5937R.

Oil cups on models 5919R through 5929R should be kept full to insure proper oil level in bearing housings.

Oil cups on models 5931R through 5937R should not be filled above level mark. Space must be left in the cup above the static oil level to allow for thermal expansion of the oil during operation.

### BELT TENSION

Check belt tension every two to three weeks during peak operating season. Refer to page 4, item 5.

### BLEED-OFF

Check the bleed-off for continuous water discharge.

### BASIN AND SUCTION SCREEN

Drain and clean cold water basin and suction screen periodically.

### FLOAT VALVE

Check float valve periodically for proper operation and maintenance of water level.

## GENERAL

### CHEMICAL TREATMENT

The dissolved solids in the circulating water are concentrated by evaporation and must be limited by bleed-off of some of the water. Chemical treatment is not normally required if adequate bleed-off is maintained.

Algae and slime may occur and can be controlled by careful application of proper chemicals. Improper application of concentrated water treating chemicals may damage parts of the system. If scale or algae and slime accumulate, obtain the services of a competent water treating consultant.

### WATER DISCOLORATION

Discoloration of water may occur when a cooling tower is placed in operation. This discoloration is not harmful and will normally disappear after several weeks of operation. Application of a common bleach solution or increased bleed-off will alleviate this condition.

### FOAMING

Foaming may occur when the concentration of dissolved solids in the circulating water is high. Increasing the bleed-off rate or application of commercial foam depressants will alleviate the problem. Foam depressants slightly alter the physical properties of the circulating water and may affect the tower operating characteristics. Dosages should not exceed manufacturer's recommended amounts. Trials of several brands may be necessary to achieve optimum foam control and tower operation.

## SEASONAL SHUTDOWN INSTRUCTIONS

### BASIN AND FRAME

Drain the tower basins and all exposed piping. Leave the basin drain open. Water may be left in cold water basin if tower is located in a non-freezing area.

During shutdown, clean the tower and make any necessary repairs. Apply protective coating as required to all metal parts. Particular attention should be given to bearing supports.

## MECHANICAL EQUIPMENT

### V-BELTS AND SHEAVES

1. At shutdown, remove and store belts in a cool, dark, dry room. Clean and coat sheave grooves with rust preventive lacquer or paint.
2. Before putting belts back on sheaves, remove rust preventive. Replace belts with excessive wear.
3. When putting tower back into service refer to "Mechanical Equipment Installation" sections for belt installation and tensioning instructions.

### BEARING HOUSING, Oil Lubricated Type

1. At shutdown, operate until oil is warm; drain and refill. Use SAE 20 mineral oil.
2. Each month, drain water condensate at the drain plug. Check oil level and add oil if necessary.
3. At start-up, operate until oil is warm; drain and refill.

### ELECTRIC MOTORS

*Do not start motor without determining that fan is free to rotate.*

Motors are equipped with grease lubricated bearings. Refer to motor manufacturer's recommendations for lubrication and maintenance instructions. Also, see Maintenance Instructions in this manual.

If shutdown period is longer than seasonal, contact The Marley Company, 5800 Foxridge Drive, Mission, Kansas 66202, for additional information. Always refer to tower serial number when writing for information or ordering parts. The serial number is stamped on the tower name plate.

## DISASSEMBLY AND REASSEMBLY INSTRUCTIONS

Tower Models 5913 through 5917 do not normally require disassembly, however, sequence similar to that noted below may be used. Disassembly sequence for models 5935R and 5937R similar to that noted below.

Never disassemble the Permatower any more than is necessary; for example, if removal of the top basin is sufficient to get the tower to its installation site, remove only that section.

When disassembling, remember how each part is screwed, nailed, bolted and set in place; fasten screws, nails and bolts for each part with each section. Be careful not to mar galvanized coating.

**DISASSEMBLY**  
For 5919R through 5933R

1. Remove motor base.
2. Remove nails from top cover sheet, then remove sheet.
3. Remove nails attaching top fill retainer to louver posts, then remove retainer.
4. Remove bolts at each end of distribution basin, then remove basin.
5. Remove fill packs.
6. Remove screws at eliminator posts. Remove eliminator and eliminator supports.
7. If further disassembly is required contact The Marley Company.

**REASSEMBLY**

Reassembly of the Permatower is the reverse of the steps noted above.

The following precautions are important:

1. Fill must be installed level to assure full tower performance.
2. Bolts should be tightened securely and vulkem sealer added at these bolt holes to prevent leaks.
3. Be sure mechanical equipment is installed correctly and fan rotates freely.

