INSTALLATION, START-UP
SERVICE AND OPERATING
INSTRUCTIONS

# PORTABLE CHILLERS
# ST-SERIES

## SAFETY CONSIDERATIONS

AEC Portable Chillers are designed to provide safe and reliable operation when installed and operated in accordance with the design specifications, national and local safety codes.

To avoid possible personnel injury or equipment damage when installing or operating this equipment always use good judgment and follow safe practices as follows:

* Follow all SAFETY CODES.
* Wear SAFETY GLASSES and WORK GLOVES.
* Use care when LOADING, UNLOADING, RIGGING or MOVING this equipment.

WARNING DANGER

OPEN, TAG AND LOCK all DISCONNECTS before working on equipment. It is a good idea to remove the fuses and carry them with you.

Make sure that the machinery is properly GROUNDED before switching power on.

When welding or brazing in or around this equipment be sure VENTILATION is ADEQUATE. PROTECT adjacent materials from flame or sparks by shielding with sheet metal. An approved FIRE EXTINGUISHER should be close at hand and ready for use if needed.

The refrigeration system can develop refrigerant pressures in excess of 300 PSI. DO NOT CUT into the system until pressure has been relieved.

Do not jump or bypass any electrical safety control.

Do not restore power until all tools, test equipment etc. have been removed and the panels replaced.

Only fully trained personnel who are familiar with the instructions in this manual should work on this equipment.

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## HELP

If you have problems or need help with our equipment call toll free: 1-800-233-4819 from 8:00 am to 5:00 pm central standard time. If busy call 1-800-451-6870. If calling from the State of Illinois call collect 1-312-595-1060 ext. 305.

## I. INTRODUCTION

The ST-Series of AEC Portable Water Chillers offers to industry an advanced electronic control series which is unmatched for process cooling accuracy, reliability and ease of operation. They are available in air and water cooled designs, sized from 5 to 33 tons. All are self contained, fully portable and ready to process.

As is true with any machinery, full performance of the Portable Chillers can only be obtained through proper installation and operation. Your understanding and compliance to these instructions will ensure many years of reliable operation.

## II. CHECKING THE SHIPMENT

Before accepting delivery, visually inspect the unit for any shipping damage. Any indication of mishandling warrants further inspection. Severely damaged packaging should be opened in front of the delivery driver. All visual damage should be noted on the delivery receipt prior to acceptance. AEC's warranty specifically excludes any damage caused in transit. AEC should be advised of the situation and will provide any assistance required. Be aware, however, that AEC cannot file the actual claim. Once the unit is accepted by you, any liabilities resulting from improper filing of a damaged shipment claim become your responsibility.

## III. UNCRATING

A Portable Chiller is shipped mounted on a skid, enclosed in a plastic wrapper and open crated on all four sides and the top. Using a pry bar, first pull the crating away from the skid and remove. Use the pry bar to remove the blocking securing the unit to the skid. Use a fork truck to lift the unit off the skid. Insert the forks between the skid and the unit, entering from the front and protruding beyond the back of the unit. Be sure the forks are equidistant from the center line of the unit and that the unit is balanced on the forks. Lift slowly and only high enough to clear the base. Use a pry bar if necessary to remove

the skid from the unit. Lower slowly. The unit will land on it's casters and can be rolled into position.

## IV. GALVANIC CORROSION

The materials used in the construction of the water circuit piping of these chillers are primarily ferrous (iron) and will react electro-chemically through galvanic action with metallic non-ferrous materials such as copper. This is particularly true when the mineral content of the water is such that it will accelerate the reaction between dissimilar metals. PVC or ferrous piping is recommended to minimize galvanic action. If piping must be copper, use dielectric unions at the unit.

Water treatment is an integral part of any piping system. In some cases, raw water may be used directly in the system without causing any problems; however, in other cases, it will result in large deposits of scale and corrosion. To avoid system problems, consult your local water treatment expert or AEC.

## V. PREPARING UNIT FOR OPERATION

### 5.1 ELECTRICAL CONNECTIONS

Check nameplate voltage and amperage. Bring properly sized power leads and ground from fused disconnect (by customer) to the unit. Use Fusetrons in the disconnect switch, and size them according to the National Electrical Code recommendations listed on AEC drawing attached to the unit. YOU MUST COMPLY WITH YOUR LOCAL ELECTRICAL CODE. Some units are furnished with a twistlock plug and receptacle together with 10 feet of power cord. Be certain that the unit is grounded. Voltage must be within plus or minus 10% of nameplate rating.

**WARNING**

**Unit must be grounded in accordance with NEC article 250.**

### 5.2 CHILLED WATER CONNECTIONS

There is a chilled water supply connection and a chilled water return connection on each unit. Chilled water supply means water leaving the chiller and going to the process (labelled "TO PROCESS"). All external chilled water connections must be run full size to the process (see Table 3, p. 17). The largest possible openings and passages should be provided for the flow of chilled water through platens, dies, molds, or other

pieces of equipment. It is extremely important to have a minimum pressure drop external to the unit.

Each unit has a spring loaded by-pass valve which is factory set. This will allow a small quantity of water to always flow through the chiller. If the chilled water shut off valves are inadvertently closed while the unit is running, this small flow of water through the unit will allow the unit's safety controls to remain effective.

## 5.3 WATER COOLED CONDENSER

There is a condenser water supply and a condenser water discharge connection on the water cooled units. All external water lines must be run full size. Water should be supplied at a maximum temperature of 85°F (29°C) and a minimum pressure of 25 psi (1.72 Bar). A water regulating valve is a standard feature in the condenser water supply line.

THE WATER REGULATING VALVE IS FACTORY SET AND SHOULD NOT BE ADJUSTED EXCEPT BY A QUALIFIED REFRIGERATION SERVICEMAN.

Normal R-22 refrigerant condensing pressure with 85°F (27°C) water at 25 psi (1.72 Bar) entering condenser water temperature is 210 psi (14.28 Bar).

## 5.4 AIR COOLED CONDENSER

### CONDENSING AIR TEMPERATURE

Air cooled units do not require water for condensing and so do not have condenser water supply and discharge connections. These units should be located in an area where there is a free passage of air for condensing. The air cooled condenser and filter must be cleaned frequently. Failure to do this will result in reduced capacity and possibly failure of the equipment (see page 25 for cleaning instructions).

Normal maximum R-22 refrigerant condensing pressure with 95°F (35°C) air entering the condenser is 260 psi (17.92 Bar).

The units are designed to operate at a minimum condenser entering air temperature of approximately 60°F (15.5°C). Operation of the equipment at a lower condenser entering air temperature can cause the low pressure cut out to shut down the unit due to the low refrigerant pressure. Therefore, it is recommended that the ambient temperature be maintained at 60°F 15.5°C) or above.

## 5.5 WATER RESERVOIR

To prevent any possibility of the unit freezing during transit the reservoir is 1/2 full of a solution of 70% water and 30% ethylene glycol during the summer months and 50% water and 50% ethylene glycol during the winter months.

Verify that all water and electrical connections have been made to the unit. Fill the chilled water reservoir through the fill tube on the top of the unit with a solution as described below.

During start-up and when additional solution is required, refer to ethylene glycol curve Fig 8, Page 20. Add a premixed solution of ethylene glycol (AEC part number A0038024) and water to provide freeze protection to a temperature 0° F.
CAUTION: Failure to add 30% ethylene glycol will result in evaporator damage. If straight water is to be used, consult factory. A chemically inhibited ethylene glycol type antifreeze is recommended. After the chilled water reservoir has been filled, the unit is ready to run.

DO NOT CONNECT MAKEUP WATER DIRECTLY TO CHILLED WATER RESERVOIR. The reservoir is not able to withstand water pressure. Fill opening must be vented to atmosphere for proper operation. On systems with piping a maximum of 15 feet above the reservoir level, install standpipe to a point 1'0" (304.8 mm) above the highest point in the system.

Where overhead piping is above 15 feet, overpressurizing the reservoir may occur on system shut down as the water in the system drains to the reservoir. To prevent this overpressurized condition install a check valve in the unit "TO PROCESS" line and another check valve with a vacuum breaker in a riser 6 inches above the "FROM PROCESS" line.
NOTE: The reservoir's reserve capacity can hold a maximum volume equal to 25 feet of 2 inch pipe.

## 5.6 MOTOR DIRECTION CHECK

All compressors will run properly in either direction. It is necessary to check pump rotation. For standard pumps correct pump rotation will be indicated by a positive pressure of 20 to 30 psi (1.38 to 2.07 Bar) on the control panel pump pressure gauge. (For oversized pumps check appropriate pump curve Fig. 7, p. 19). All condenser air fans draw through the condensers. Units with three-phase fan motors will have to be checked for correct rotation.

## 5.7 SELECTION & ADJUSTMENT SWITCHES

Access to the selection and adjustment switches is achieved by removing six (6) hex buttonhead screws which secure the solid state control panel, and tilting the top forward to allow operation of the slide switch selectors.

5.7.1 Temperature Indication Selection - the °F/°C slide switch S5 is located along the top center of the printed circuit board. Moving the slide switch to the left selects °F, and to the right °C. In addition, the selected mode is displayed on the front panel when the unit is energized.

5.7.2 Temperature Control Mode Selection - the AVG-PRO/SUPPLY switch S6 is located along the top edge of the printed circuit board directly above the Temperature Selector switch. This switch is normally in the (right) SUPPLY position which causes the control to maintain the leaving water to the process at the SET TEMP. This is the optimum position when multiple loads are supplied from the chiller. In some applications, however, a one load per chiller exists. Under these conditions the AVG-PRO/SUPPLY switch may be placed in the AVG-PRO position which will cause the chiller to control the average temperature of the leaving and returning water. This control action in effect acts as though a probe is inserted into the middle of the process and will tend to compensate for low flow or other conditions which would produce higher than normal differential process temperatures.

5.7.3 Freezestat Temperature Adjustment

Your portable chiller has been factory set to deliver 50°F (10°C) chilled water. At this temperature, the freezestat is set at 40°F (4.4°C). ETHYLENE GLYCOL MUST BE ADDED. A 30% BY VOLUME MINIMUM IS RECOMMENDED TO OPERATE DOWN TO 20°F. IF YOUR CHILLER IS DESIGNED TO OPERATE 0°F TO 20°F, ADD 50% BY VOLUME SOLUTION.

If your operating temperature requirements are lower than the factory settings, you can contact the factory for service or follow the instructions given below to re-adjust the freezestat.

a) Turn on the ON/OFF switch and rotate the TEMPERATURE SELECTOR switch to FREEZESTAT. Read the freezestat cutout temperature on the TEMPERATURE display. This should read 40°F (4.4°C).

b) Beneath the chiller Control Panel (see removal instructions above) you will notice two small

adjustable potentiometers located at the top of the circuit board on the right hand.

c) The potentiometer for adjusting the freezestat is on the left and is labeled "FZST" on the circuit board. The potentiometer on the right is marked "GAIN". DO NOT adjust this unit. A small blade screwdriver (1/8") should be used to adjust the potentiometer. With the TEMPERATURE SELECTOR switch set on FREEZESTAT, turn the adjusting screw on the freezestat potentiometer counterclockwise to lower the setting (clockwise to raise the setting). Watch the TEMPERATURE display to obtain the desired temperature.

d) Set the freezestat cut out point 10°F below the desired operating temperature.

WARNING

Verify that the new freezestat setting is at least 10°F (5.6°C) above anti-freeze protection level or damage will result to the unit. Such resulting damage is not covered by Warranty protection.

e) After replacing front panel, re-set the TEMPERATURE SELECTOR to SET-TEMP and set operating temperature to the desired temperature.

## VI. SEQUENCE OF OPERATION

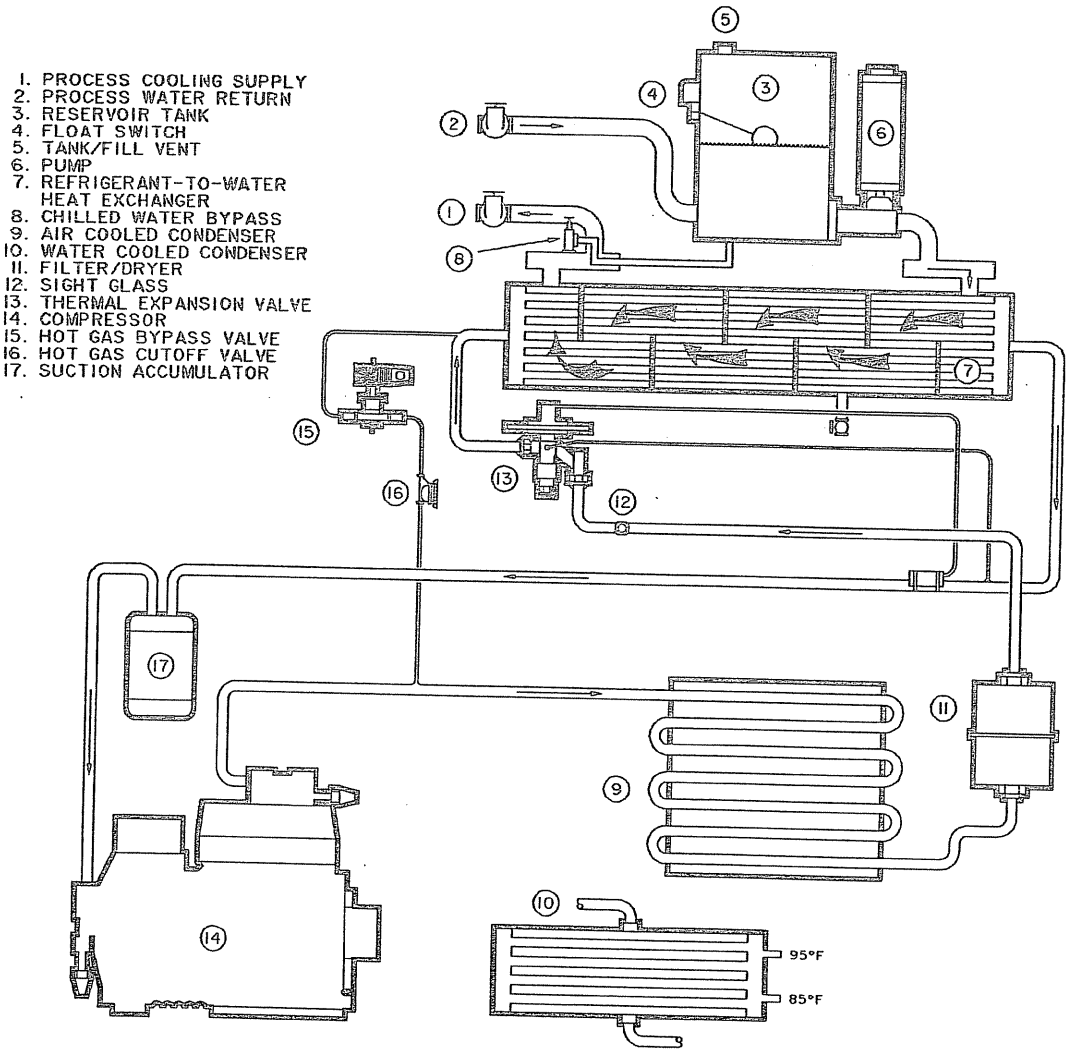
### 6.1 Chilled Water Circuit

Process cooling water supply (#1, Fig. 1, p.7) and return (#2) connections are made at the gate valves provided inside the unit. Warm coolant (water and ethylene glycol) returns from process, entering the reservoir tank (#3). Coolant is then pumped by a centrifugal pump (#6) through the refrigerant-to-water heat exchanger (#7) where it is cooled before returning to process. A chilled water bypass (#8) between the supply line and reservoir tank guarantees a constant flow in the unit during intermittent fluctuation load conditions.

### 6.2 Refrigeration Circuit

AEC Portable Water Chillers are available with either air (#9) or water cooled (#10) refrigerant condensing. The sequence of operation of the two types differ only in the method in which hot compressed freon gas from the compressor (#14) is condensed to a liquid. Liquid refrigerant from the air or water cooled condenser passes through a filter/dryer (#11) which is capable of

removing water or other contaminants. The refrigerant then passes through the thermal expansion valve (#13) where the refrigerant commences to expand and cool the inside of the refrigerant-to-water heat exchanger (#7). The refrigerant gas is then compressed by the compressor (#14) before giving up its heat and recondensing to a liquid in either an air or water cooled condenser. To prevent excessive cooling and compressor off-on cycling, a hot gas bypass valve (#15) is used to control the cooling capacity during intermittent or partial load conditions. This feature contributes substantially to longevity by eliminating excessive cycling of the compressor and providing close temperature control.




SEQUENCE OF OPERATION DIAGRAM

Figure 1

## VII. CONTROL PANEL DESCRIPTION

### 7.1 SWITCHES

ON/OFF - This switch controls the 110V AC source to all electrical control circuits except for the crankcase heater which is directly wired to the 110V AC secondary of the control power transformer. NOTE: In systems with the remote control option the local ON/OFF switch is the master switch and has priority over the remote ON\OFF switch. The local ON/OFF switch must be ON in order for the remote ON/OFF to function.

START - This momentary action switch causes the unit to start provided the unit is first turned ON, the LOCAL/ REMOTE switch is in the proper position, all operating safety controls are normal, and sufficient water is in the reservoir tank.

RESET - This momentary action switch resets the cutout safety controls i.e. LOW PRESSURE CUTOUT-RESET-, HIGH PRESSURE CUTOUT-RESET-, FREEZESTAT CUTOUT-RESET-. This action is "Trip-Free" which means as long as the unsafe condition exists, the -RESET- switch cannot defeat the safety control and will not reset the unit. In systems with the remote control option or the shutdown alarm option, the -RESET- switch must be operated twice to effect a reset action. The first actuation silences the audible alarm and acknowledges the visual alarm from flashing to steady-on. The second actuation provides the reset action.

LOCAL/REMOTE - This switch selects the operating station which has control over the system. In the LOCAL position the controls on the chiller are operational. In the REMOTE position the controls on the remote control panel are operational. The control functions transferred from LOCAL to REMOTE are ON/OFF, START, SET TEMP.

TEMPERATURE SELECTOR - This switch determines the temperature being displayed on the digital indicator. On the local panel five positions are provided i.e.

AVG/PROCESS This is the average temperature of the supply and return water and is the equivalent of having a single remote temperature probe in the middle of the process. It may be selected as the controlled temperature by behind the panel switch option (see 5.7.2).

SET TEMP - This is the control point temperature.

SUPPLY - This is the water temperature at the discharge of the evaporator. It may be selected as the controlled temperature by behind the panel switch option (see 5.7.2).

RETURN - This is the water temperature at the inlet to the evaporator.

FREEZESTAT - This is the supply water temperature cutout setting which will shut down the compressor.

7.2 CONTROLS

SET TEMP - This control adjusts the control point temperature and is a blind set control, meaning the TEMPERATURE SELECTOR switch must be in the SET TEMP position in order to have the digital display indicate the setting of this control.

7.3 GRAPHICS

The control panel utilizes a multi-colored graphic display to depict the functioning elements of the system. The graphics are also backlighted with light emitting diode indicator lamps which show the operating condition of the chiller system. These indicators and their functions are listed below and shown on Fig. 3, p. 13.

LOW WATER -SERVICE- Indicates that the water level in the reservoir is insufficient for safe operation of the circulating pump and service is required.

ELECTRICAL -SERVICE- Indicates the unit is disabled because of an electrical problem. A motor controller failed to energize within 2 seconds after the command was given. This is probably due to an over load tripped, loose wire, etc. or other electrical problem requiring service by a qualified electrician.

OIL PRESSURE -SERVICE- Indicates the unit is disabled because of an oil pressure problem, and a qualified refrigeration repairman should be called for service.

LOW PRESSURE CUTOUT -RESET- Indicates the unit has shut down because of a low refrigeration pressure on the suction side of the compressor. This is a front panel reset control indicator which will require a refrigeration serviceman to effect repairs if repeated reset actions are required by the operator.

HIGH PRESSURE CUTOUT -RESET- Indicates the unit has shut down because of high refrigeration pressure in

the system. This could be caused by too much hot water being introduced into the process loop, incorrect valving on the condensing water supply, too warm condensing water or air, or clogged air filters, etc. This is a front panel reset control indicator which will permit operator reset action once the corrective action has been taken.

NOTE: Resetting more than two times indicates a refrigeration serviceman should be called for repairs. If reset more than two times, the high pressure relief valve may rupture causing a loss of refrigerant in the system.

FREEZESTAT CUTOUT -RESET- Indicates the supply water has been cooled below a preset limit, and the compressor has been turned off, although the water circulating pump will continue to operate. This is caused by improper SET TEMP adjustment. This is a front panel reset control indicator which will permit operator reset action once the water temperature has risen 2°F (1.1°C) above the cutout temperature. Make proper SET TEMP adjustments, add ethylene glycol to the unit before adjusting freezestat setting (see 5.7.3) RESET and START unit. (The freezestat control is set by a behind the panel adjustment).

PUMP ON Indicates the pump starter is energized supplying power to the pump motor.

COMPRESSOR ON Indicates the compressor starter is energized supply power to the compressor motor.

HOT GAS BY-PASS ON Indicates an electrically operated solenoid valve is energized causing an additional heat load to be added to the evaporator to maintain proper water temperature control. This indicator should normally be flashing on and off for some period of time within a 10 second time period. The flashing indication shows the load on the chiller to be within the machine control capacity.

AVG/PROCESS- Indicates the controlled circulating water temperature is more than 3°F (1.6°C) below the SET TEMP value.

AVG/PROCESS NORMAL Indicates the controlled circulating water temperature is within plus or minus 3°F (1.6°C) of the SET TEMP value.

AVG/PROCESS+ Indicates the controlled circulating water temperature is more than 3°F (1.6°C) above the SET TEMP valve.

°C The lighting of the degree circle symbol adjacent to the letter C indicates the TEMPERATURE indicator is in Celsius Degrees. This is selected by a behind the panel switch option (see 5.7.1).

°F The lighting of the degree circle symbol adjacent to the letter F indicates the TEMPERATURE indicator is in Fahrenheit Degrees. This is selected by a behind the panel switch option (see 5.7.1).

The graphic display of the circulating fluid media are color coded as follows:

Light Blue - Warm Returning Water

Dark Blue - Cool Supply Water

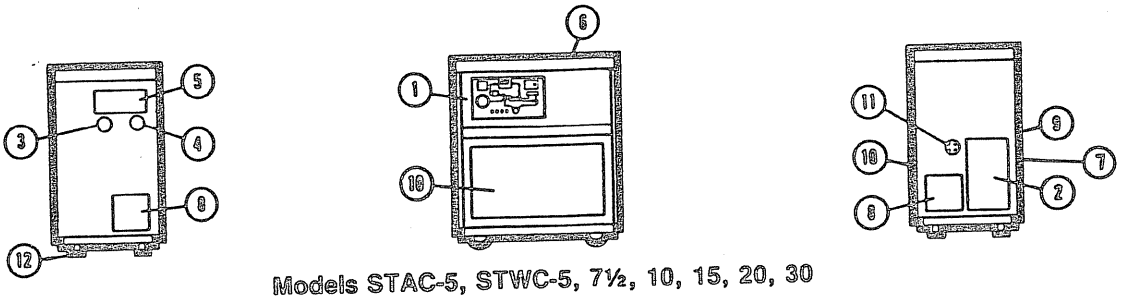
Dark Red - High Pressure Refrigeration Gas

Light Red - High Pressure Refrigeration Liquid

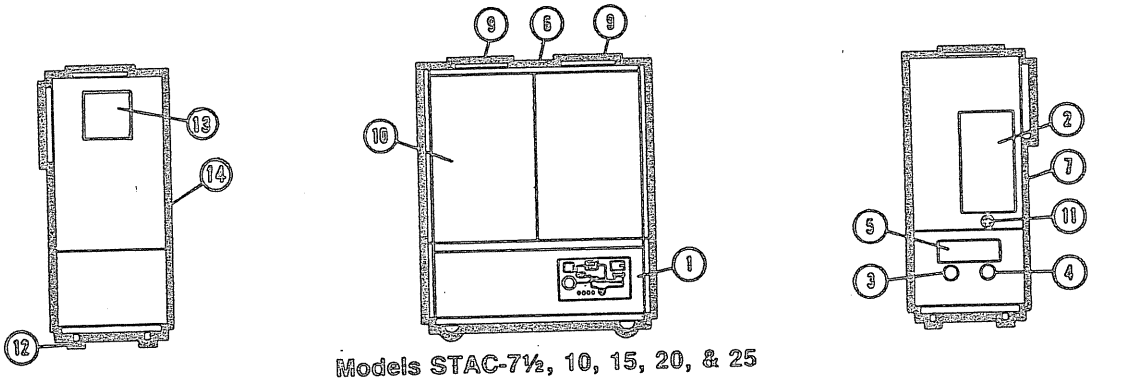
Orange - Low Pressure Refrigeration Gas

PRESSURE INDICATOR The pump water pressure is displayed on the front panel by means of a pressure gauge.

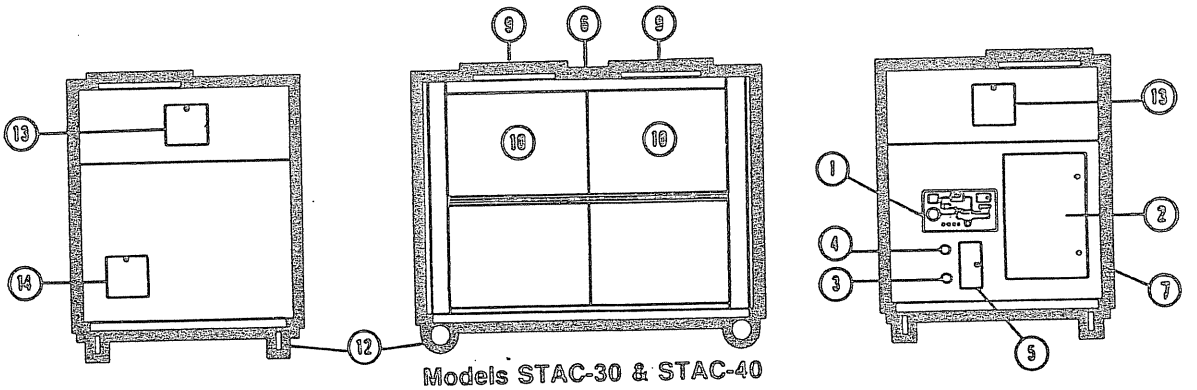
## VIII. SYSTEM DIAGRAMS AND SPECIFICATIONS




Models STAC-5, STWC-5, 7½, 10, 15, 20, 30



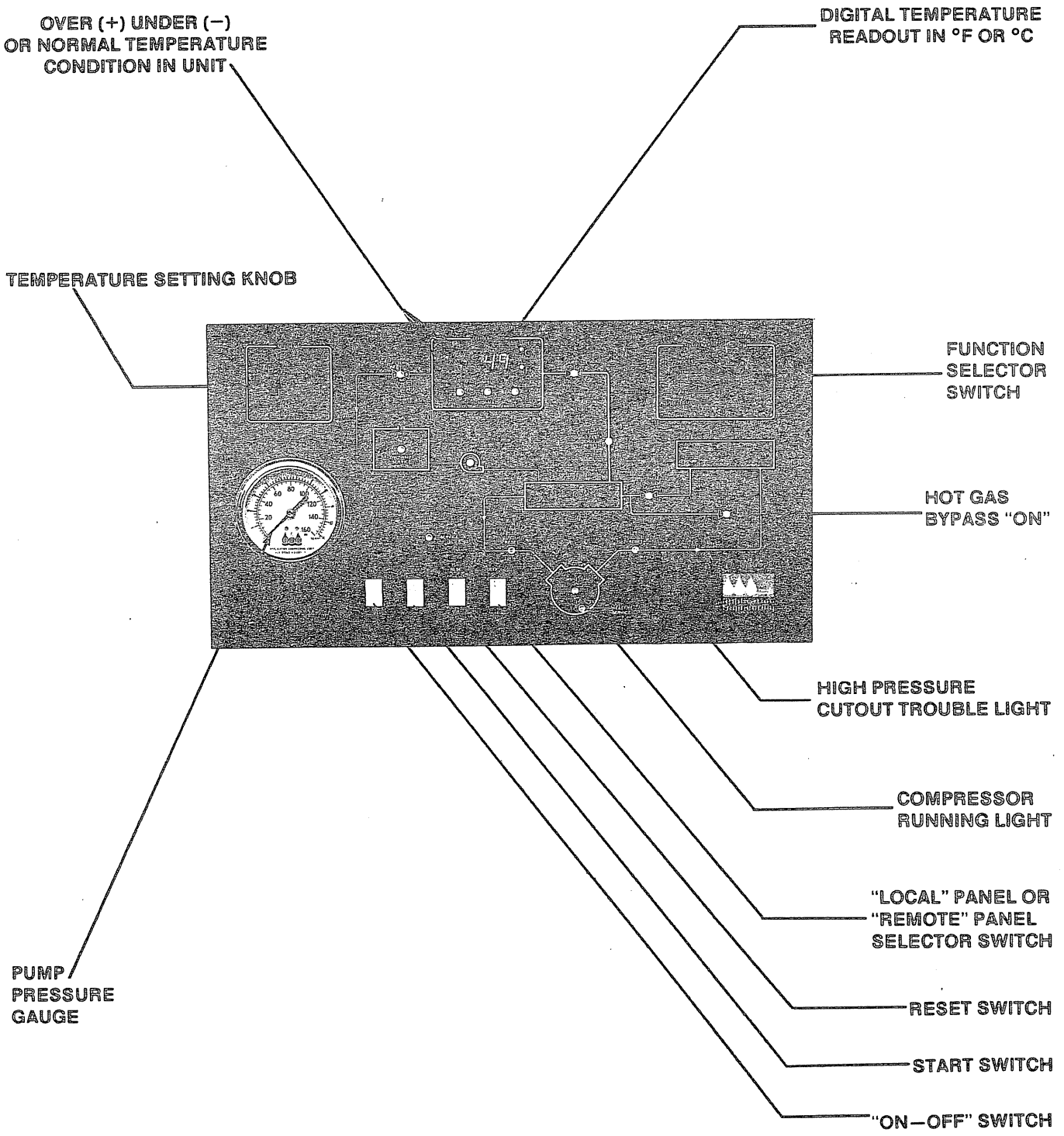

Models STAC-7½, 10, 15, 20, & 25




Models STAC-30 & STAC-40

1. Control Panel
2. Control Box Access
3. Chilled Water Discharge
4. Chilled Water Return
5. Access Door
6. Tank Fill/Vent
7. Compressor Access
8. Condenser Access
9. Air Outlet (air cooled)
10. Air Inlet (air cooled)
11. Power Receptacle
12. Casters
13. Fan Bearing Access
14. Expansion/Shut-off Valve Access

Figure 2




ST CHILLER CONTROL PANEL

Figure 3

## AIR COOLED DESIGN - STAC UNIT

| MODEL NUMBER | COOLING CAPACITY TONS (1) | CHILLLED WATER GPM(2) | STANDARD PUMP HP | PIPE SIZE INCHES | TOTAL RUNNING AMPS 230/3/60 | APPROX.DIM. L x W x H INCHES | APPROX-SHIPPING WT.(LBS) |
|---|---|---|---|---|---|---|---|
| STAC-5 | 4.3 | 11 | 1.5 | 2 | 30 | 53 x 32 x 55 | 1300 |
| STAC-7.5 | 6.5 | 16 | 1.5 | 2 | 45 | 72 x 38 x 88 | 2100 |
| STAC-10 | 8.2 | 20 | 1.5 | 2 | 60 | 72 x 38 x 88 | 2300 |
| STAC-15 | 12 | 29 | 1.5 | 2 | 75 | 72 x 38 x 88 | 2400 |
| STAC-20 | 16 | 39 | 1.5 | 2 | 80 | 72 x 38 x 88 | 2450 |
| STAC-25 | 18.7 | 46 | 3 | 2 | 102 | 72 x 38 x 88 | 2600 |
| STAC-30 | 23 | 55 | 3 | 2 | 125 | 99 x 63 x 81 | 4700 |
| STAC-40 | 33 | 80 | 5 | 2.5 | 183 | 99 x 63 x 81 | 5500 |

(1) Based on 50°F chilled water supply temperature. Consult factory for other requirements.
(2) Flow rate based upon 2.4 gpm/ton at 25 PSI or higher. Alternate pump selections available. Consult factory.

| MODEL NUMBER | COOLING CAPACITY KCAL/HR(1) | CHILLLED WATER $M^3$/MIN(2) | STANDARD PUMP kW | PIPE SIZE MM | TOTAL RUNNING AMPS 230/3/60 | APPROX.DIM. L x W x H MM | APPROX-SHIPPING WT. (KG) |
|---|---|---|---|---|---|---|---|
| STAC-5 | 13,000 | 0.042 | 1.12 | 50.8 | 30 | 1346x 812x1397 | 589 |
| STAC-7.5 | 19,600 | 0.060 | 1.12 | 50.8 | 45 | 1829x 965x2235 | 953 |
| STAC-10 | 24,800 | 0.076 | 1.12 | 50.8 | 60 | 1829x 965x2235 | 1043 |
| STAC-15 | 36,200 | 0.110 | 1.12 | 50.8 | 75 | 1829x 956x2235 | 1089 |
| STAC-20 | 48,300 | 0.148 | 1.12 | 50.8 | 80 | 1829x 965x2235 | 1111 |
| STAC-25 | 56,500 | 0.174 | 2.23 | 50.8 | 102 | 1829x 965x2235 | 1179 |
| STAC-30 | 69,500 | 0.208 | 2.23 | 50.8 | 125 | 2515x1600x2057 | 2132 |
| STAC-40 | 99,800 | 0.303 | 3.73 | 63.5 | 183 | 2515x1600x2057 | 2495 |

(1) Based on 10°C chilled water supply temperature. Consult factory for other requirements.
(2) Flow rate based upon $3.004 \times 10^{-6}$ $m^3$/min/kcal/hr per kW at 1.723 Bar or higher. Alternate pump selections available, consult factory.

NOTE: Specifications may change without notice.

Table 1

## WATER COOLED DESIGN - STWC UNIT

| MODEL NUMBER | COOLING CAPACITY TONS (1) | CHILLLED WATER GPM(2) | STANDARD PUMP HP | PIPE SIZE INCHES | TOTAL RUNNING AMPS(3) | CONDENSER CITY WATER GPM (4) | CONDENSER TOWER GPM | APPROX.DIM. L x W x H INCHES | APPROX-SHIPPING WT.(LBS) |
|---|---|---|---|---|---|---|---|---|---|
| STWC-5 | 5.1 | 13 | 1.5 | 2 | 25 | 6 | 16 | 53 x 32 x 55 | 1400 |
| STWC-7.5 | 8 | 19 | 1.5 | 2 | 32 | 10 | 24 | 53 x 32 x 55 | 1600 |
| STWC-10 | 10 | 24 | 1.5 | 2 | 42 | 12 | 30 | 53 x 32 x 55 | 1625 |
| STWC-15 | 15 | 36 | 1.5 | 2 | 57 | 18 | 45 | 53 x 32 x 55 | 1900 |
| STWC-20 | 21 | 50 | 3 | 2 | 75 | 25 | 63 | 67 x 32 x 55 | 2100 |
| STWC-30 | 30 | 72 | 5 | 2.5 | 108 | 36 | 90 | 67 x 32 x 55 | 2200 |

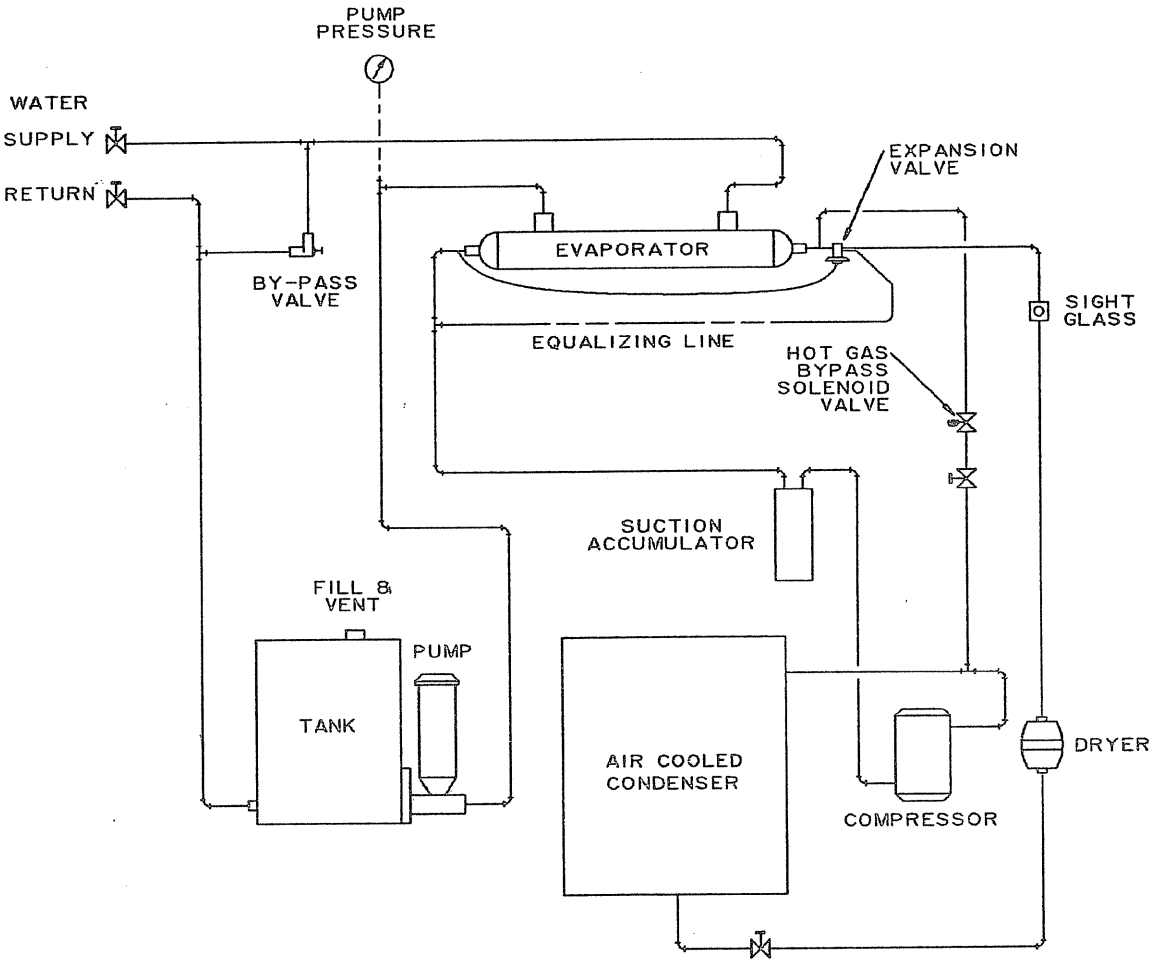
(1) Based on 50°F chilled water supply temperature. Consult factory for other requirements.
(2) Flow rate based upon 2.4 gpm/ton at 25 PSI or higher. Alternate pump selections available, consult factory.
(3) 230/3/60
(4) Requirement based on availability of 70°F city water or 85°F tower water at 25 PSI minimum. Consult factory for other conditions.

| MODEL NUMBER | COOLING CAPACITY KCAL/HR(1) | CHILLLED WATER $M^3$/MIN(2) | STANDARD PUMP kW | PIPE SIZE MM | TOTAL RUNNING AMPS(3) | CONDENSER CITY WATER $M^3$/MIN (4) | CONDENSER TOWER $M^3$/MIN | APPROX.DIM. L x W x H MM | APPROX-SHIPPING WT.(KG) |
|---|---|---|---|---|---|---|---|---|---|
| STWC-5 | 15,400 | 0.049 | 1.12 | 50.8 | 25 | 0.023 | 0.061 | 1346x812x1397 | 635 |
| STWC-7.5 | 24,2000 | 0.072 | 1.12 | 50.8 | 32 | 0.038 | 0.091 | 1346x812x1397 | 726 |
| STWC-10 | 30,200 | 0.091 | 1.12 | 50.8 | 42 | 0.045 | 0.114 | 1346x812x1397 | 737 |
| STWC-15 | 45,300 | 0.136 | 1.12 | 50.8 | 57 | 0.068 | 0.170 | 1346x812x1397 | 862 |
| STWC-20 | 63,500 | 0.189 | 2.23 | 50.8 | 75 | 0.095 | 0.240 | 1702x812x1397 | 952 |
| STWC-30 | 90,700 | 0.273 | 3.73 | 63.4 | 108 | 0.136 | 0.341 | 1702x812x1397 | 998 |

(1) Based on 10°C chilled water supply temperature. Consult factory for other requirements.
(2) Flow rate based upon $3.004 \times 10^{-6}$ $m^3$/mm./kcal/hr per kW at 1.723 Bar or higher. Alternate pump selections available.
(3) 230/3/60
(4) Requirements based on availability of 21°C city water or 29°C tower water at 1.723 Bar minimum. Consult factory for other conditions.

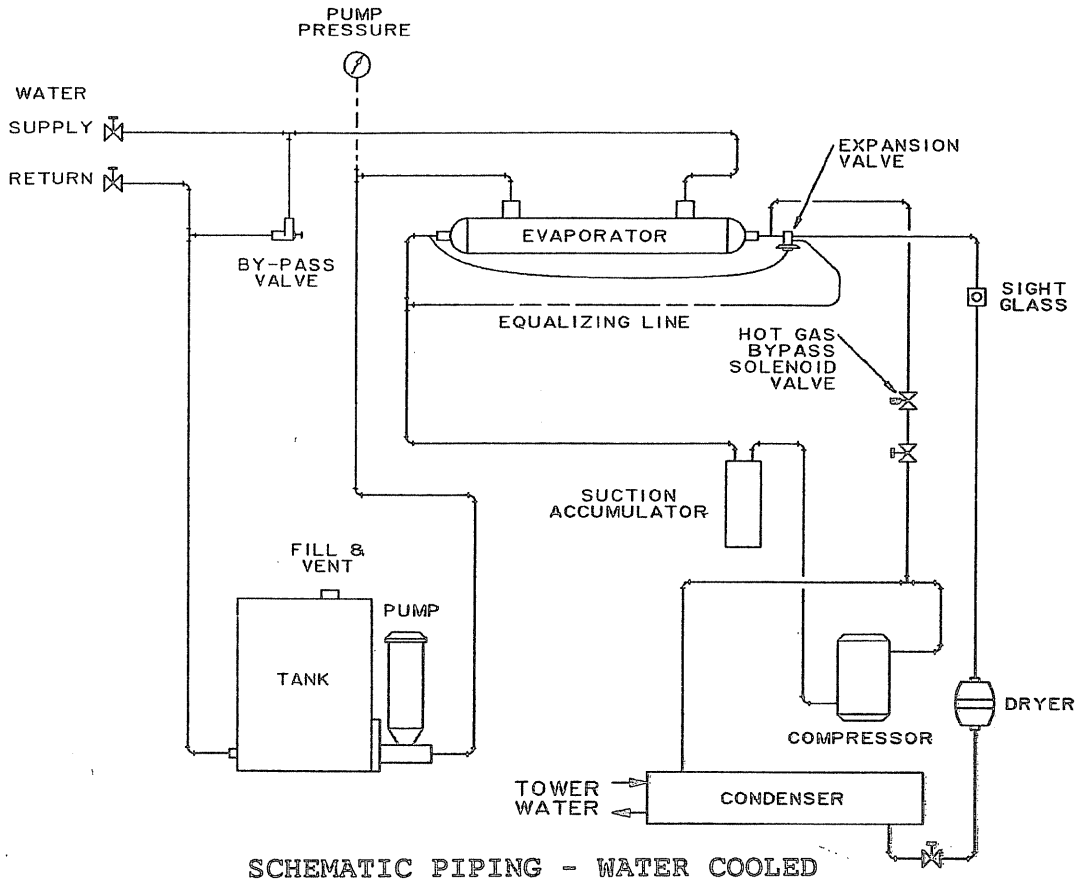
NOTE: Specifications may change without notice.

Table 2




SCHEMATIC PIPING - AIR COOLED

Figure 4



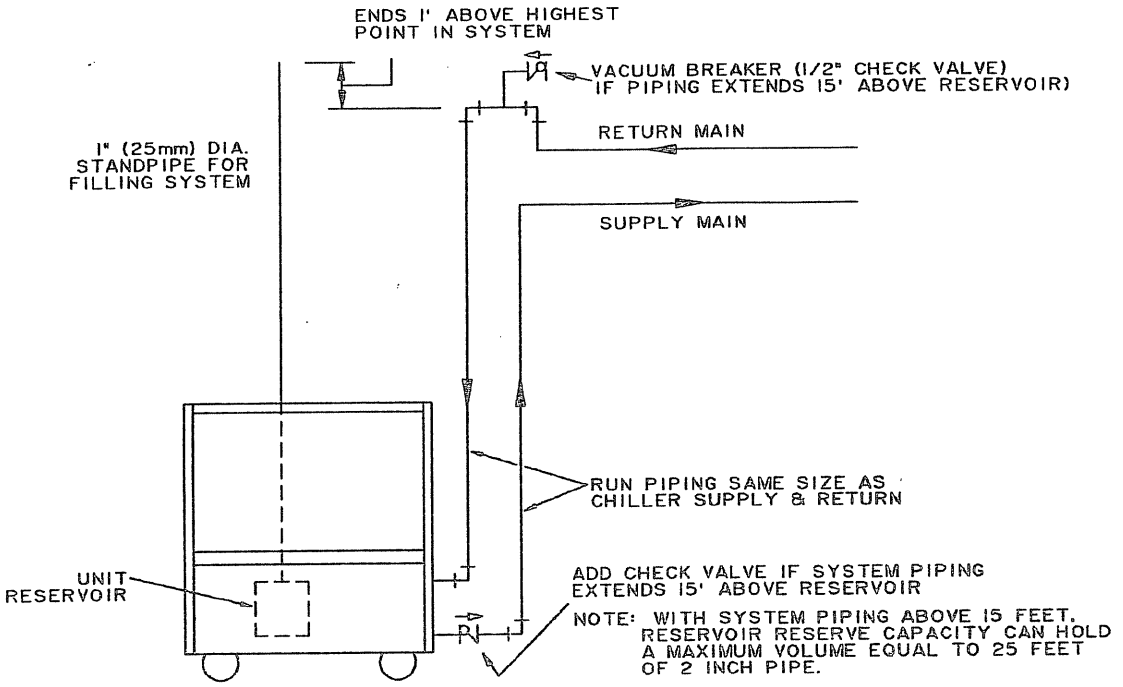

SCHEMATIC PIPING - WATER COOLED

Figure 5

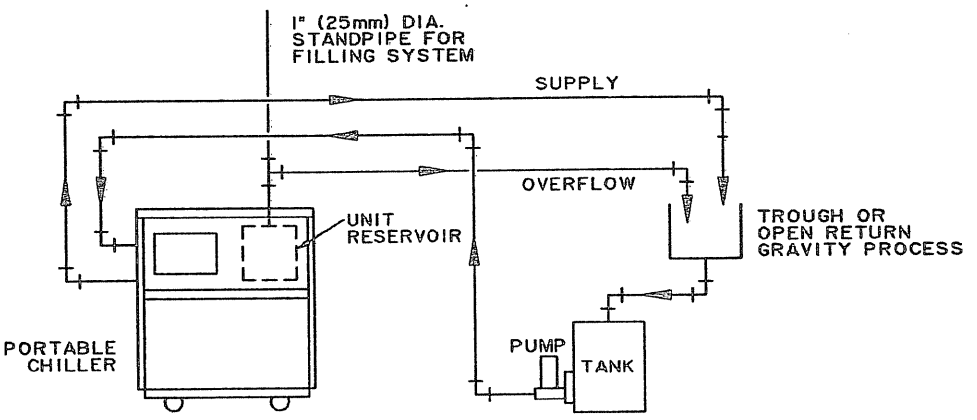
RECOMMENDED CONDENSER WATER PIPE SIZES AND GPM (GALS./MIN.)

| UNIT SIZE | CITY WATER | | | | TOWER WATER | | | |
|---|---|---|---|---|---|---|---|---|
| | SIZE | | FLOW | | SIZE | | FLOW | |
| | Inches | mm | gpm | $m^3$/min. | Inches | mm | gpm | $m^3$/min. |
| STWC- 5 | 1 | 25.4 | 6 | 0.023 | 1 1/4 | 31.7 | 16 | 0.061 |
| STWC-7 1/2 | 1 | 25.4 | 10 | 0.038 | 1 1/4 | 31.7 | 24 | 0.091 |
| STWC 10 | 1 1/4 | 31.7 | 12 | 0.045 | 1 1/2 | 38.1 | 30 | 0.114 |
| STWC-15 | 1 1/4 | 31.7 | 18 | 0.068 | 2 | 50.8 | 45 | 0.170 |
| STWC-20 | 1 1/2 | 38.1 | 25 | 0.095 | 2 | 50.8 | 60 | 0.227 |
| STWC-30 | 2 | 50.8 | 36 | 0.136 | 2 1/2 | 63.5 | 90 | 0.341 |

Table 3




FIELD MODIFICATION FOR CENTRAL SYSTEM
WITH OVERHEAD SUPPLY & RETURN



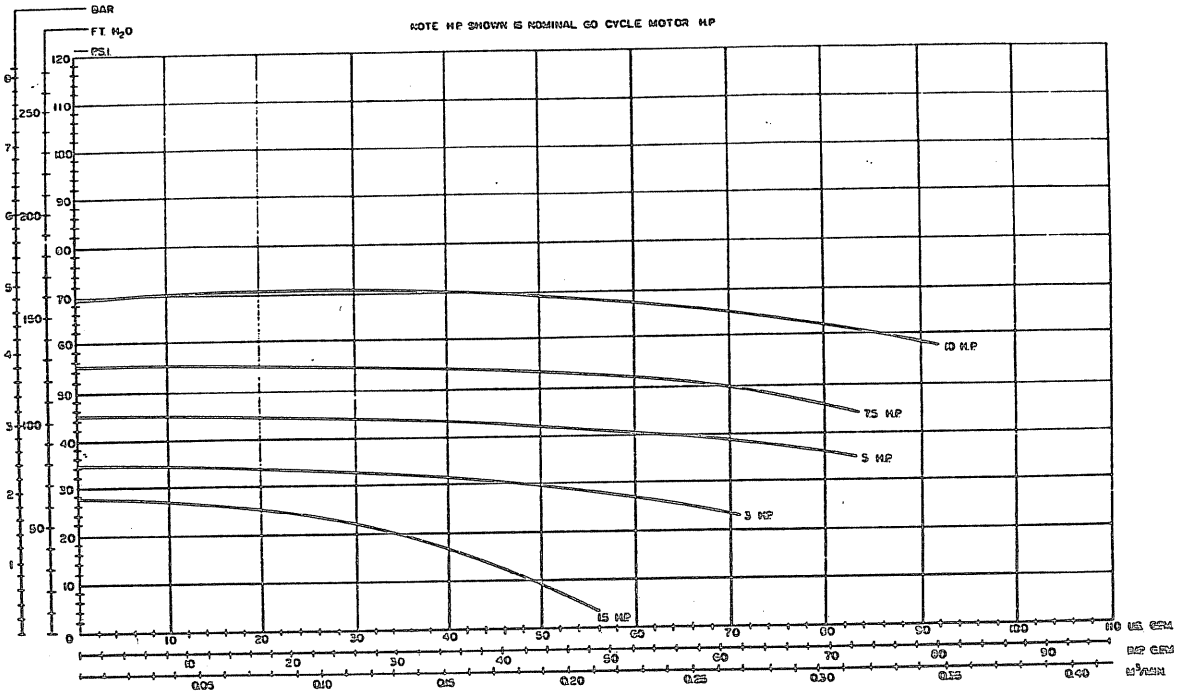

FIELD MODIFICATION FOR GRAVITY RETURN

NOTE: (1) Do not plug vent or standpipe.
(2) Do not connect city water or other pressurized line to reservoir.

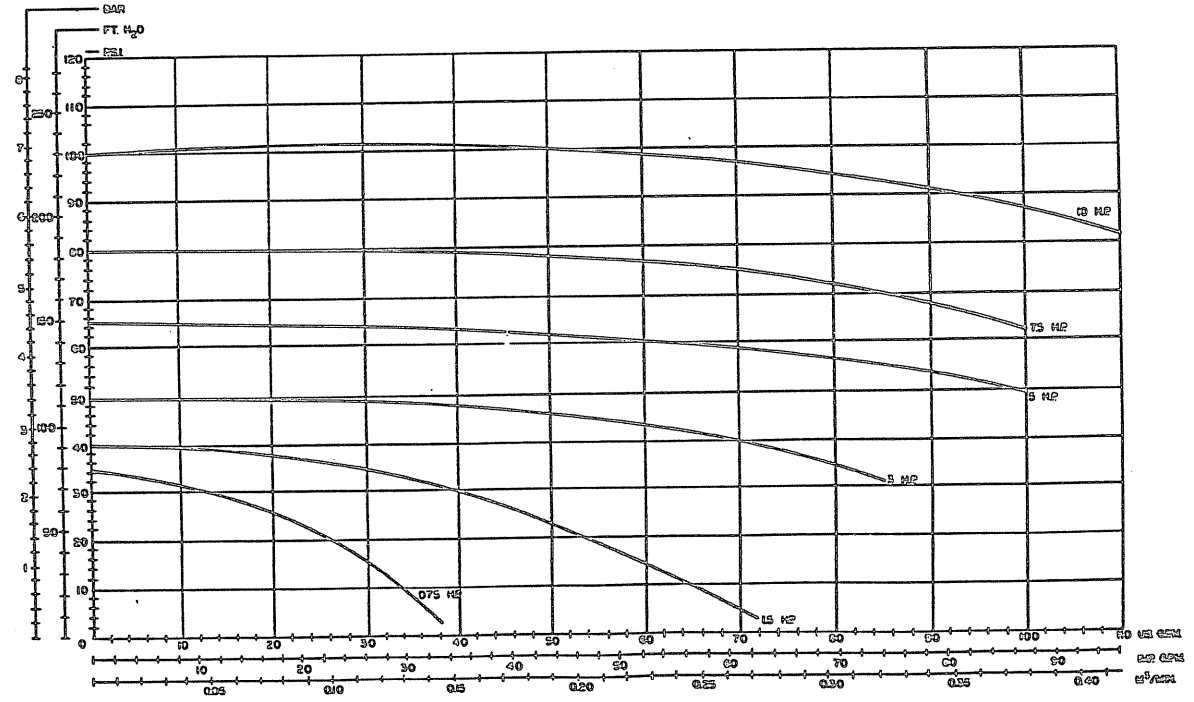
CENTRAL AND GRAVITY RETURN PIPING MODIFICATIONS

Figure 6

50 HERTZ

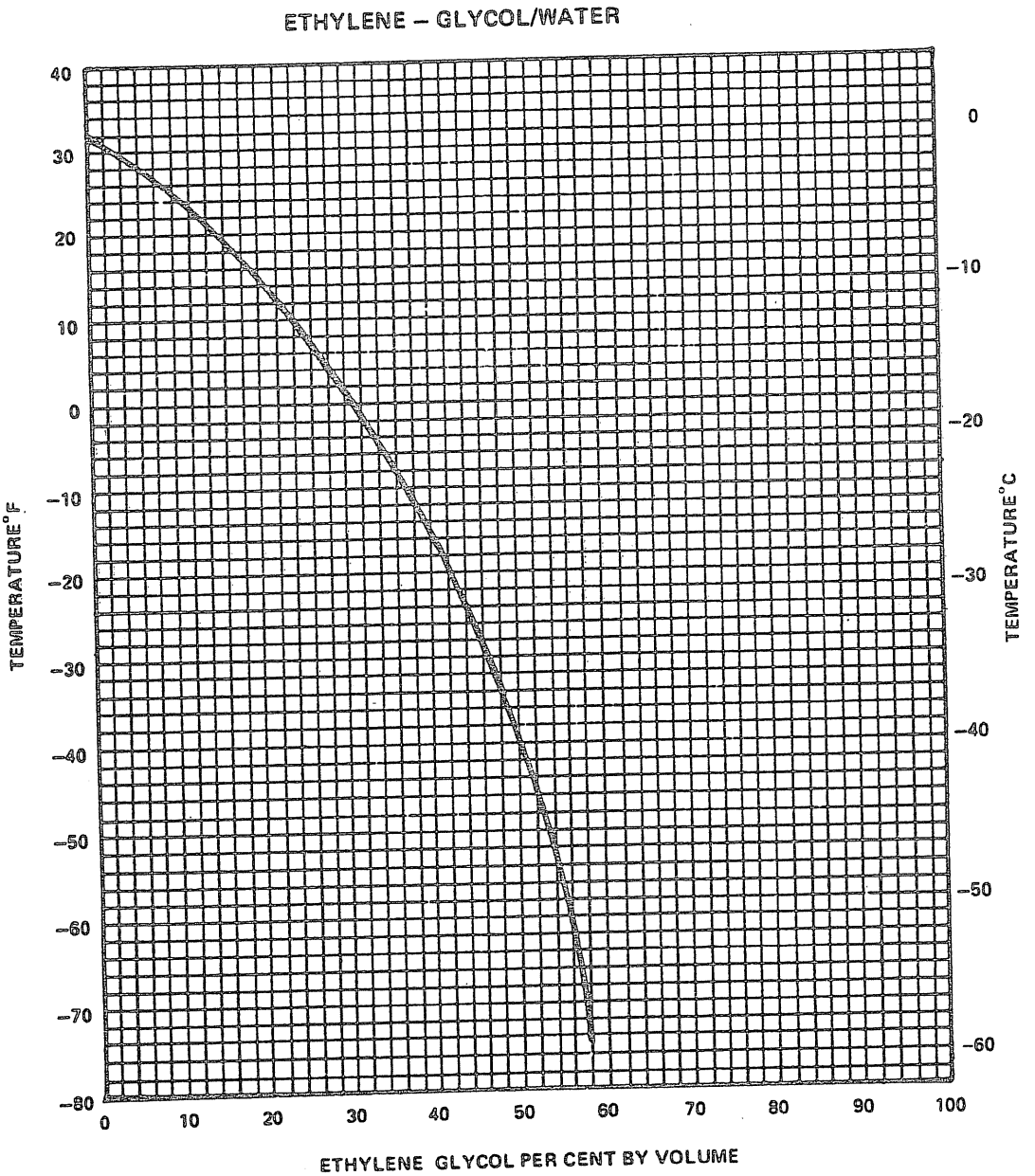



60 HERTZ




PUMP CURVES

Figure 7




FREEZING POINT CURVE

Figure 8

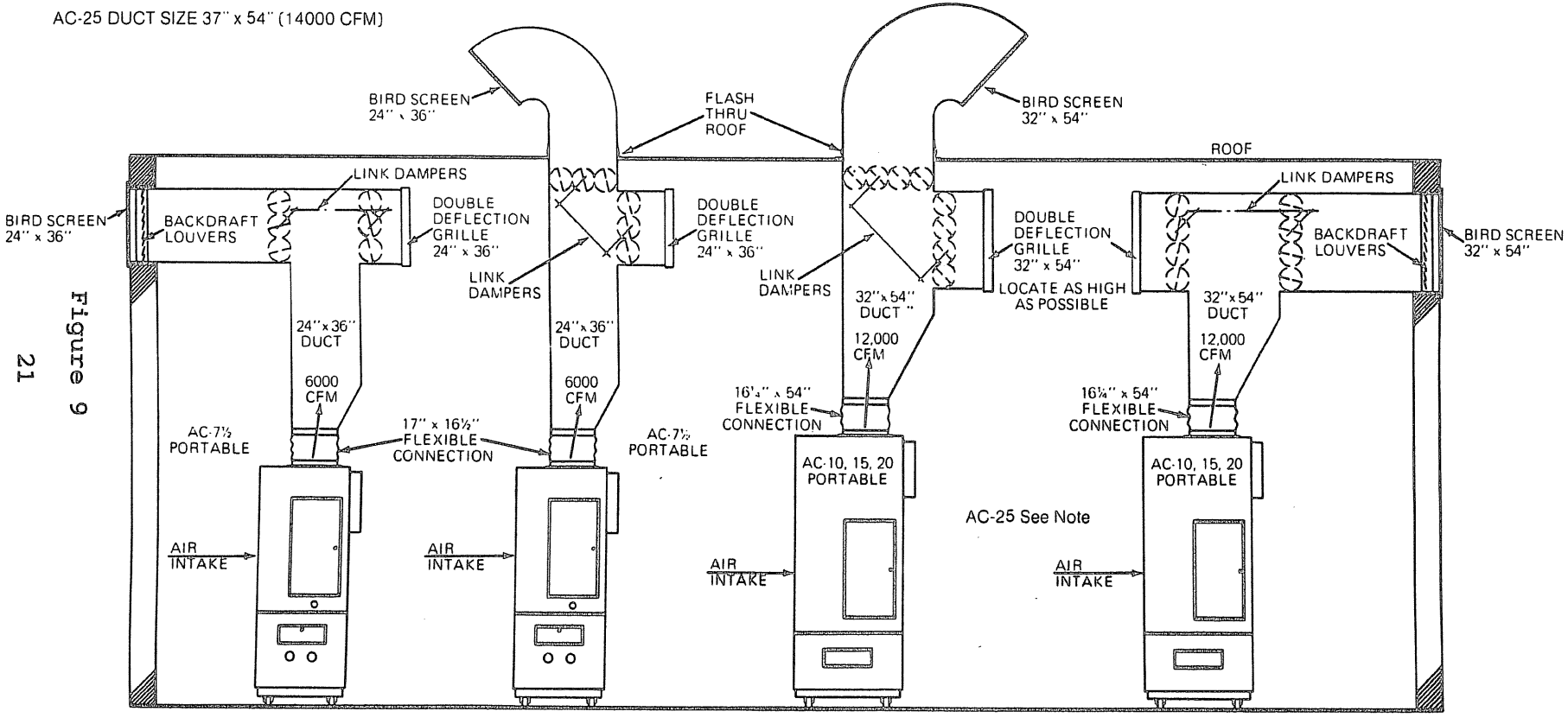
NOTES:

DUCT SIZES SHOWN ARE MINIMUM – DO NOT REDUCE

DAMPER TO OUTSIDE MUST BE CLOSED AT ALL TIMES WHEN UNIT FAN IS NOT RUNNING.

DUCTWORK MUST BE SUPPORTED FROM BUILDING STRUCTURE NOT FROM UNIT.

AC-25 DUCT SIZE 37" x 54" (14000 CFM)



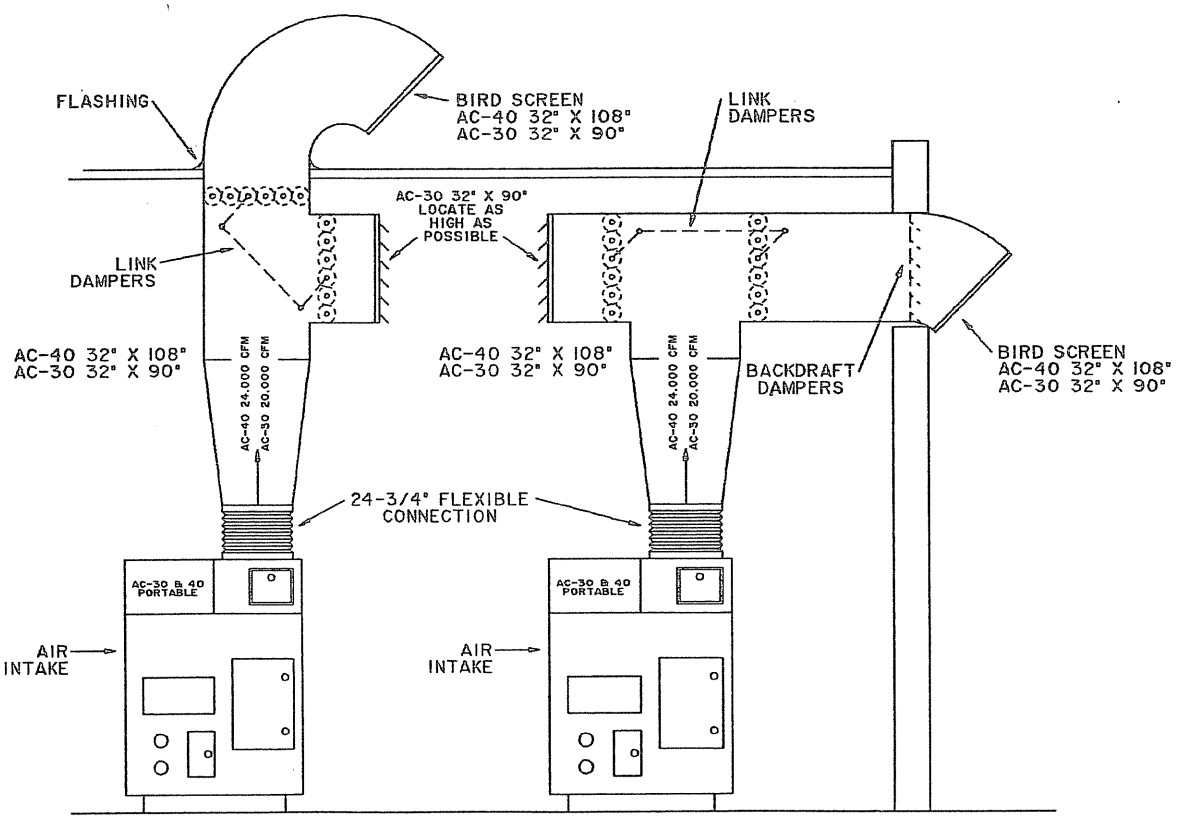

TYPICAL DUCTWORK FOR PORTABLE INSTALLATIONS

Figure 9

NOTES:
Duct sizes shown are minimum - DO NOT REDUCE.

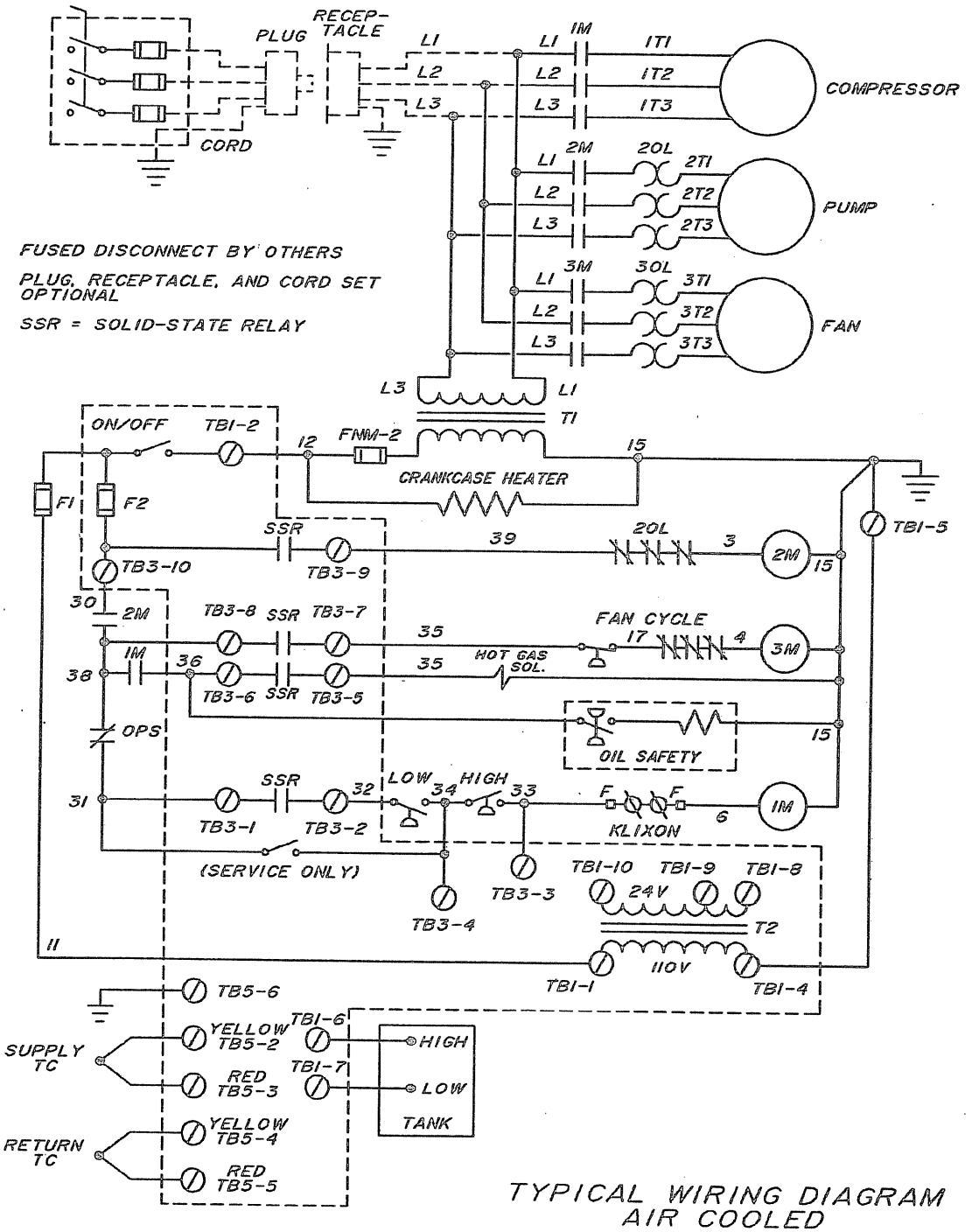
Damper to outside must be closed at all times when unit fan is not running.

Ductwork must be supported from building structure not from unit.



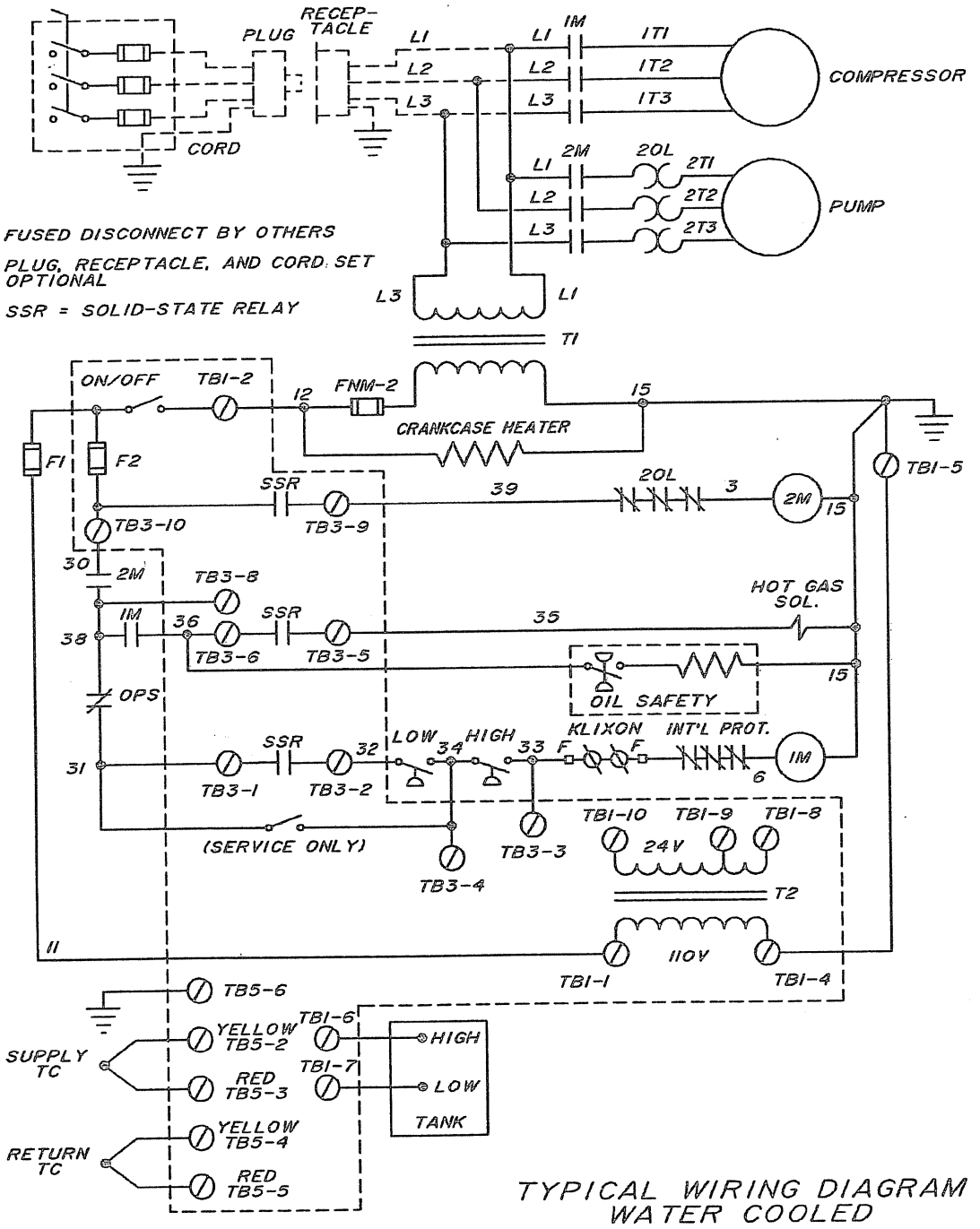

TYPICAL DUCTWORK

Figure 10




ELECTRICAL SCHEMATIC - AIR COOLED

Figure 11




TYPICAL WIRING DIAGRAM
WATER COOLED

ELECTRICAL SCHEMATIC - WATER COOLED

Figure 12

## IX. ROUTINE MAINTENANCE

### 9.1 Lubrication: (Every Three Months)

Grease all fan bearings, fan motors, and pump motors that do not have permanently sealed bearings. Remove grease relief plug (motors only) before adding grease. Failure to do so may result in dislodging the bearing grease retainer which will eventually cause bearing failure.

Compressors are hermetically sealed and no oiling is required. Compressors with cast iron bodies have an oil level sight glass on the side of the crankcase. Normal oil level is half way up in the glass while the compressor is running. If oil level stays abnormally low, call in a trained refrigeration serviceman to check it.

### 9.2 Filters:

Air filters should be cleaned as often as they become dirty. Ordinary dirt and dust are best removed by hosing the filter with clear water. If the filter cannot be cleaned with water alone, then a mild detergent may be used. Be certain that all soap has been flushed from the filter and that it is completely dry before reinstalling it on the unit. It is suggested that you maintain a spare set of filters to use while cleaning and drying, (STAC 7 1/2-25 AEC part number A0006189, STAC 30-40 AEC part number A0104410).

Blowing filters out with compressed air does not satisfactorily clean them and may actually cause damage to the filter media.

CAUTION: Never run unit without filters.

### 9.3 Condensers:

Fouled condenser heat exchange surfaces will cause a serious reduction in system capacity. They should be cleaned as follows:

1. Air Cooled: If dirt accumulation is light and on the surface of the coil, it may be removed by brushing and/or vacuuming. Care should be taken not to bend or damage the fins.
2. Water Cooled: Dirt in the condenser tubes should be removed with a nylon tube brush.

Mineral deposits (calcium, etc.) can be removed by circulating AEC liquid descaling solution through the water side of the condenser.

9.4 Preventative Maintenance Service:

A planned program of scheduled inspections at regular intervals is the best deterrent to machine breakdown. Such an arrangement can be worked out through your local AEC service representative.

## X. TROUBLESHOOTING

High negative supply temperature reading on digital display (greater than -100°F. Unit does not run, freezestat light on, "-" light on.

| | CAUSE | CORRECTION |
|---|---|---|
| 1. | Loose wire on thermocouple probe on terminal block #5 (TB-5) on printed circuit board | Reconnect wire and operate restart and reset switches. |
| 2. | Defective probe. (Check by replacing probe wires by jumper wires across terminals #22 to terminal #3 on terminal block #5 (TB-5) on printed circuit board. You should read approximately ambient temperature on the digital readout when this is done.) | Replace probe and operate reset and restart switches. |
| 3. | Loose ground wire from evaporator to terminal block 5 (TB-5) terminals 1 or 6 | Reconnect loose ground wire and operate reset and restart switches. |
| 4. | Defective printed circuit board. (Make above checks first). | Replace printed circuit board and operate reset and restart switches. |

High negative return temperature reading on digital display (greater than -100°F). Unit not running.

| | CAUSE | CORRECTION |
|---|---|---|
| 1. | Loose wire on thermocouple probe on terminal block #5 (TB-5) on printed circuit board. | Reconnect wire and operate reset and restart switches. |
| 2. | Defective probe. (Check by replacing probe by a jumper wire across terminals 4 & 5 on terminal block #5 (TB-5). You should read approximately ambient temperature on the digital readout). | Replace probe and operate reset and restart switches. |

| | | |
|---|---|---|
| 3. | Loose ground wire from evaporator to terminal block 5 (TB-5) terminals 1 or 6. | Reconnect loose ground wire and operate reset restart switches. |
| 4. | Defective printed circuit board. (Make above checks first). | Replace printed circuit board and operate reset and restart switches. |

High negative process temperature reading on digital display (greater than + or - 100°F). Unit is not operating and "-" or "+" light "on".

| | CAUSE | CORRECTION |
|---|---|---|
| 1. | Check the supply and return temperature return settings. If either the supply or the return temperatures give a high negative temperature reading, repair as in Condition I or II. | Repair as in Condition I or Condition II. Operate reset and restart switches. |
| 2. | If the supply and return temperatures are correct and the process temperature reading still gives a high negative reading, the printed circuit board is defective. | Replace printed circuit board. Operate reset and restart switches. |

Unit will not run - low water level light is "on".

| | CAUSE | CORRECTION |
|---|---|---|
| 1. | Check liquid level in reservoir. | Fill reservoir. Operate reset and restart switches. |
| 2. | Disconnected probe in either the probes themselves or at the printed circuit board. | Reconnect probes. Operate reset and restart switches. |
| 3. | Printed circuit board defective. | Replace printed circuit board. Operate reset and restart switches. |

Unit will not run - freezestat light "on".

| | CAUSE | CORRECTION |
|---|---|---|
| 1. | Temperature setting is set too close to the freezestat setting. | Check the anti-freeze level and reset freezestat to 10°F below the desired temperature setting (see 5.7.3). Operate reset and restart switches. |

| | |
|---|---|
| 2. "Supply" thermocouple probe. (See Condition I). | Correct as is indicated under Condition I. |
| 3. Printed circuit board is defective. | Change printed circuit board. Operate reset and restart switches. |

Unit will not run. High pressure cutout light is "on".

| CAUSE | CORRECTION |
|---|---|
| 1. See Section 7.3. | When pressure returns to normal, operate reset and restart switch. Do not operate reset and restart switch more than twice. Call a qualified serviceman if operated more than twice. |
| 2. A loose wire. (Unit will not reset). | Reconnect wire. Operate reset and restart switch. |
| 3. Defective high pressure cut-out switch. (Unit will not reset). | Replace high pressure cutout switch. Operate reset and restart switches. |
| 4. Defective circuit board. (Unit will not reset and all of above checks are correct). | Replace defective circuit board and operate reset and restart switches. |

Unit will not run. Low pressure cutout light is "on".

| CAUSE | CORRECTION |
|---|---|
| 1. See Section 7.3. | When pressure returns to normal, operate reset and restart switch. Do not operate reset and restart switch more than twice. Call a qualified serviceman if it is nec- more than twice. |
| 2. A loose wire. (Unit will not reset). | Reconnect wire. Operate reset and restart switch. |
| 3. Defective high pressure cut-out switch. (Unit will not reset. | Replace high pressure cutout switch. Operate reset and restart switch. |

Unit will not operate - oil pressure light is "on".

| | CAUSE | CORRECTION |
|---|---|---|
| 1. | Loose wire. (Unit will not restart after resetting oil pressure control and operating reset and restart switches on panel. | Reconnect wire to terminal block 3 (TB-3) terminal #1 and terminal block 3 (TB-3) terminal #8. Check connections at oil pressure switch and operate reset and restart buttons. |
| 2. | Defective pressure switch. (Unit will not restart after resetting oil pressure control and operating reset and restart switches on the panel). | Replace the control and operate reset and restart switches on the unit. |
| 3. | Low oil pressure. | Call qualified serviceman. |
| 4. | Defective printed circuit board. (Items 1, 2 & 3 check O.K.) | Replace printed circuit board. Operate reset and restart switches. |

Unit not running. Electrical service light is "on".

| | CAUSE | CORRECTION |
|---|---|---|
| 1. | An overload tripped on any one of the contactors. | Reset overload. Operate reset and restart switches on unit. |
| 2. | Loose wire preventing contactor operation. | Check all power wiring in control panel and all wiring to printed circuit board. Operate reset and restart switches on unit. |
| 3. | Bad coil on the contactor. | Replace coil and operate reset and restart switches. |
| 4. | Loss of phase on power supply to the unit. | Correct power supply to the unit. Reset overloads and operate reset and restart switches. |

# SERVICE POLICY

Application Engineering Corporation extends a one year free service policy in addition to the company's standard parts warranty on specific types of manufactured equipment shipped to a final destination within the Continental USA and Canada. This only applies to cooling towers when accompanied by a pump tank.

The company's obligation is limited to provide service labor in the event of equipment malfunction caused by defects in material or workmanship. The service will be provided at the installation during normal day shift hours. Should service be required at other times, the customer is responsible for overtime labor charges in excess of straight time labor rates.

This service policy does not apply to equipment which in the company's opinion has been subject to misuse, negligence or operation in excess of recommended limits including freezing or which has been repaired or altered without the company's express authorization.

This service policy does not include maintenance of equipment. Service work determined to be plant maintenance work will be billed at current service rates.

This service policy extends for one full year commencing four weeks after date of shipment or upon equipment start-up whichever occurs first on portable water chilling equipment.

This service policy extends for one full year commencing twelve weeks after date of shipment or upon equipment start-up whichever occurs first on Central Systems.

On equipment which includes factory start-up this start-up must occur a maximum of four weeks after shipment in the case of portable equipment and twelve weeks after shipment in the case of Central Systems. Start-ups requested after these time periods may be billed at current service rates along with any additional costs incurred by Application Engineering because of the delayed start-up.

The company neither assumes nor authorizes any other persons to assume for it any service obligation in connection with the sale of its equipment not expressed in this policy.

Application Engineering