CONAIR
www.conairnet.com

USERGUIDE

Portable Water Chiller

microTrac 1, 2 Control
Single Pump Tank

⚠ **WARNING - Reliance on this Manual Could Result in Severe Bodily Injury or Death!**

This manual is out-of-date and is provided only for its technical information, data and capacities. Portions of this manual detailing procedures or precautions in the operation, inspection, maintenance and repair of the product forming the subject matter of this manual may be inadequate, inaccurate, and/or incomplete and cannot be used, followed, or relied upon. Contact Conair at info@conairgroup.com or 1-800-654-6661 for more current information, warnings, and materials about more recent product manuals containing warnings, information, precautions, and procedures that may be more adequate than those contained in this out-of-date manual.

Table of Contents

INTRODUCTION

!! Congratulations !!

You Now Own The Finest in Portable Water Chillers!

The team at Conair Tempro is dedicated to providing unparalleded products that meet your total auxiliary process control needs for today and tomorrow.

This manual is intended to provide an in-depth overview of the Conair Tempro Portable Water Chillers, and the microTrac 1 & 2 controller. It is strongly recommended that is is read in its entirety to realize the full capabilities provided by this control system.

Disclaimer

Conair Tempro makes no warranty of any kind with regard to this material, including, but no limited to, the implied warranties of merchantability and fitness for a particular purpose.

Conair Tempro shall not be liable for errors contained hererin or for incidental consequential damages in connection with furnishing, performance, or use of this material.

We're Here to Help

Conair has made the largest investment in customer support in the plastics industry. Our service experts are available to help with any problem you might have installing and operating your equipment. Your Conair sales representative also can help analyze the nature of your problem, assuring that it did not result from misapplication or improper use.

How to Contact Customer Service

To contact Customer Service personnel, call:

From outside the United States, call: 814-437-6861

You can commission Conair service personnel to provide on-site service by contacting the Customer Service Department. Standard rates include an on-site hourly rate, with a one-day minimum plus expenses.

Before You Call ...

If you do have a problem, please complete the following checklist before calling Conair:

- ❒ Make sure you have all model, serial and parts list numbers for your particular equipment. Service personnel will need this information to assist you.
- ❒ Make sure power is supplied to the equipment.
- ❒ Make sure that all connectors and wires within and between loading control and related components have been installed correctly.
- ❒ Check the troubleshooting guide of this manual for a solution.
- ❒ Thoroughly examine the instruction manual(s) for associated equipment, especially controls. Each manual may have its own troubleshooting guide to help you.
- ❒ Check that the equipment has been operated as described in this manual.
- ❒ Check accompanying schematic drawings for information on special considerations.

Additional manuals and prints for your Conair equipment may be ordered through the Customer Service or Parts Departments for a nominal fee.

EQUIPMENT GUARANTEE

Conair guarantees the machinery and equipment on this order, for a period as defined in the quotation from date of shipment, against defects in material and workmanship under the normal use and service for which it was recommended (except for parts that are typically replaced after normal usage, such as filters, liner plates, etc.). Conair's guarantee is limited to replacing, at our option, the part or parts determined by us to be defective after examination. The customer assumes the cost of transportation of the part or parts to and from the factory.

PERFORMANCE WARRANTY

Conair warrants that this equipment will perform at or above the ratings stated in specific quotations covering the equipment or as detailed in engineering specifications, provided the equipment is applied, installed, operated and maintained in the recommended manner as outlined in our quotation or specifications.

Should performance not meet warranted levels, Conair at its discretion will exercise one of the following options:

- Inspect the equipment and perform alterations or adjustments to satisfy performance claims. (Charges for such inspections and corrections will be waived unless failure to meet warranty is due to misapplication, improper installation, poor maintenance practices or improper operation.)
- Replace the original equipment with other Conair equipment that will meet original performance claims at no extra cost to the customer.
- Refund the invoiced cost to the customer. Credit is subject to prior notice by the customer at which time a Return Goods Authorization Number (RGA) will be issued by Conair's Service Department. Returned equipment must be well crated and in proper operating condition, including all parts. Returns must be prepaid.

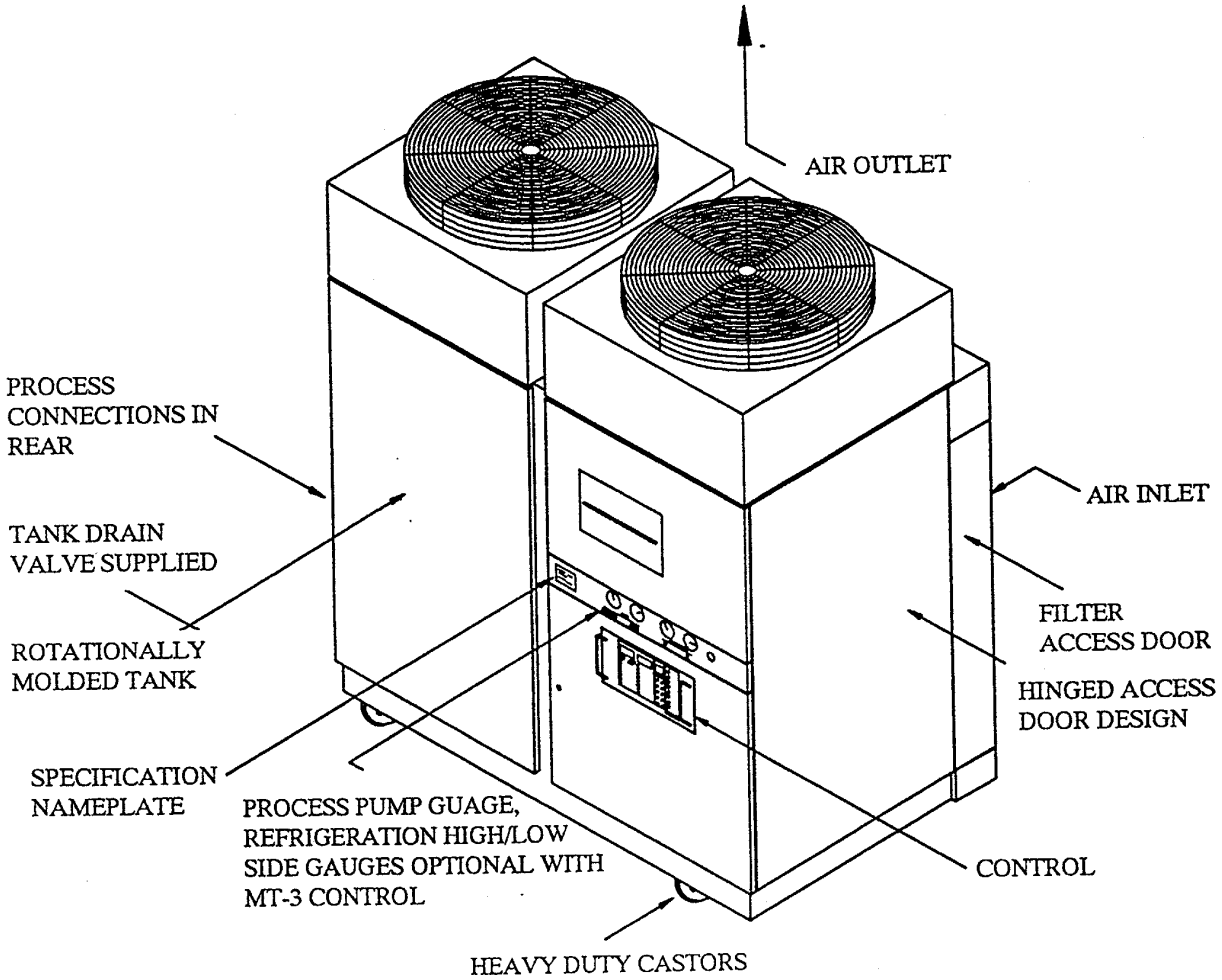
Purchaser must notify Conair in writing of any claim and provide a customer receipt and other evidence that a claim is being made.

WARRANTY LIMITATIONS

Except for the Equipment Guarantee and Performance Warranty stated above, Conair disclaims all other warranties with respect to the equipment, express or implied, arising by operation of law, course of dealing, usage of trade or otherwise, including but not limited to the implied warranties of merchantability and fitness for a particular purpose.

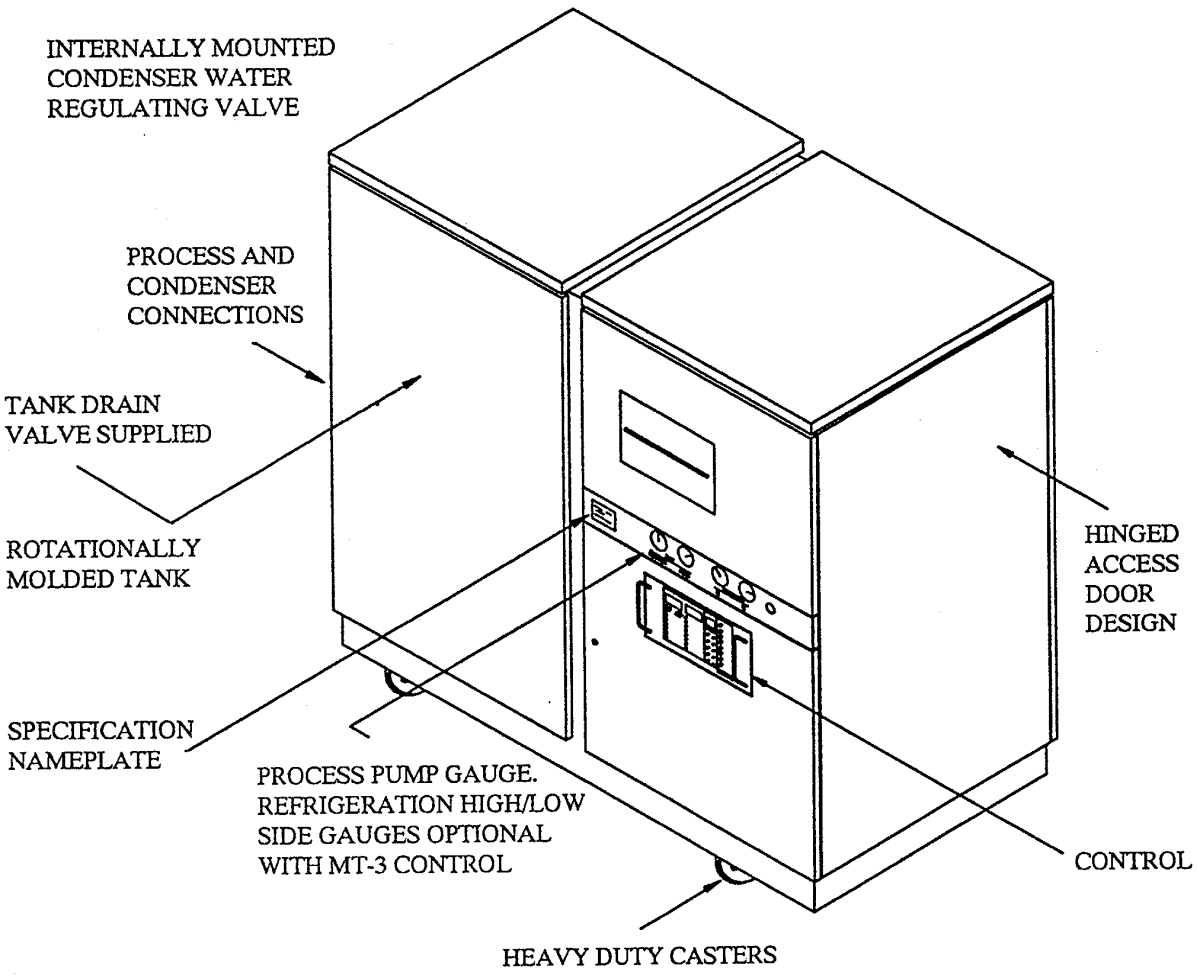
Conair Tempro Portable Chiller

Air Cooled



Conair Tempro Portable Chillers

Water Cooled



Conventions

The following conventions are used throghout this manual:

- **BOLD** type is used to highlight important information in the text.
- *ITALIC* type is used for titles that refer to other documentation.
- [redacted] is used to set off all tasks and lessons.
- Control panel buttons, such as SELECT or RAISE are placed in all tasks and lessions. Everywhere else, the buttons are noted with uppercase letters, (SELECT, RAISE) .

CAUTION!

Caution messages appear before procedures which, if not followed, could result in damage to the equipment.

WARNING!

Warning messages indicate when a procedure, if not followed correctly, could result in personal injury.

Receiving Inspection

(Air Cooled & Water Cooled)

It is important that the following inspection be completed in the presence of the carrier's representative when the equipment is delivered.

☑ Check all crates and cartons received against the bill of lading/shipping papers to be sure they agree.

☑ Check the model number and the electrical characteristics on the nameplate to determine if they are correct.

☑ Check for freight damage, shortages or other discrepancies and note them on the delivery receipt before signing.

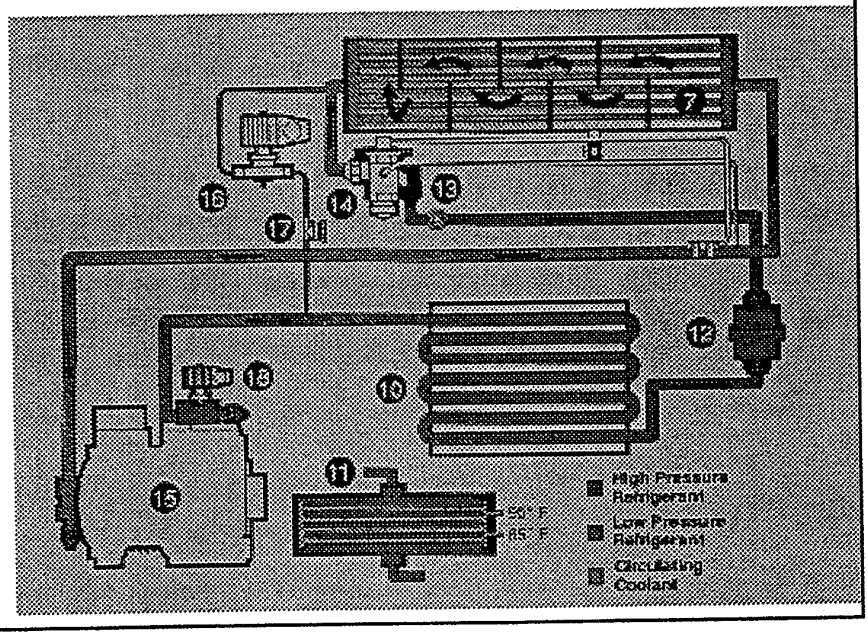
In the event that any damage is found a damage claim should immediately be filed by the purchaser against the delivering carrier.

Intended Use & Limitations

Conair Tempro portable chillers are available in either water or air cooled models. The operating sequence differs only in the media that is used to remove heat from the refrigerant. Either 85°F cooling tower water or 95°F ambient air can typically be used.

Water cooled models utilize cleanable shell-and-tube heat exchangers (condensers) to condense the hot, compressed, refrigerant gas from the compressors to a cool liquid (11). Aluminum finned, copper tube

Refrigeration Circuit Sequence of Operation



1. Process Supply
2. Process Return
3. Molded Tank
4. Level Sensor
5. Tank Fill/Vent
6. Process Pump
7. Refigerant-to-Water Heat Exchanger
8. Evaporator Pump (microTrac 3 only)
9. Chiller Water Bypass (microTrac 1 only)
10. Air Cooled Condenser
11. Water Cooled Condenser
12. Filter/Dryer
13. Sight Glass
14. Thermal Expansion Valve
15. Compressor
16. Hot Gas Bypass Valve (7.5hp & Under)
17. Hot Gas Cutoff Valve (7.5hp & Under)
18. Cylinder Unloader (10hp and higher)

condensers with cleanable filters are used on air cooled models for the same purpose (10).

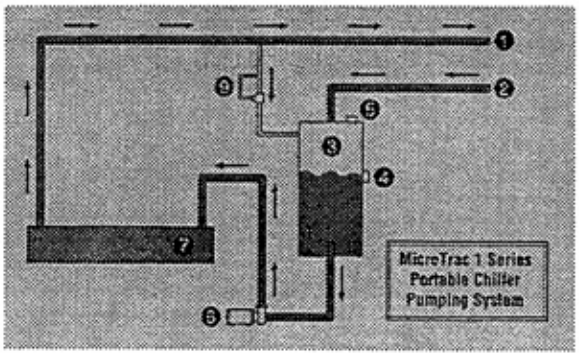
The cool liquid refrigerant then passes through a filter/dryer (12), which protects the systems from moisture or other contaminants. An in-line sight glass (13) then gives a visual indication of proper refrigerant charge and any dangerous moisture present in the system.

The refigerant next passes through a thermal expansion valve (14), where it expands, cools and is precisely metered into the refrigerant heat exchanger (evaporator)-where the heat is removed from the process water (7).

As the refrigeration passes through the evaporator, it extracts the heat from the process coolant and expands to a heat-laden gaseous state. The refrigerant gas is then compressed by the compressor (15) before again giving up its heat by condensing in either the water or air cooled condenser.

Intended Use & Limitations

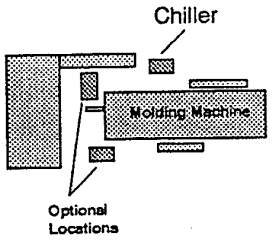
Standard operating set points between 20°F and 65°F LWT. (Adequate Freeze Protection Required)



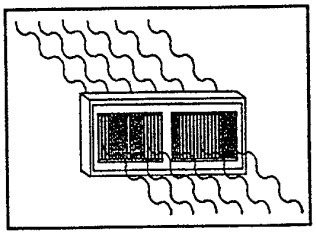
GETTING STARTED

Requirements for Installation

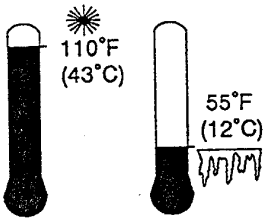
Environmental



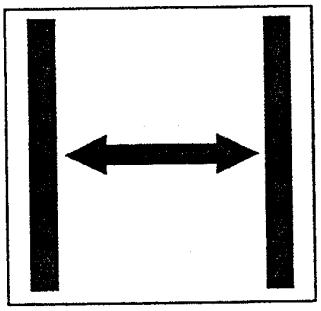
The Portable Chillers are designed for machine side use and should be placed as close to the host machine as practical.



The unit will require an operating environment which is clean and well ventilated. **Nothing should be placed on top of the unit while operating.**



The ambient operating temperature of the chiller must not exceed 110°F (43°C) with 95% relative humidity, noncondensing, or fall below 55°F (12°C). In storage or shipment the unit can withstand a minimum of -40°F (-40°C).



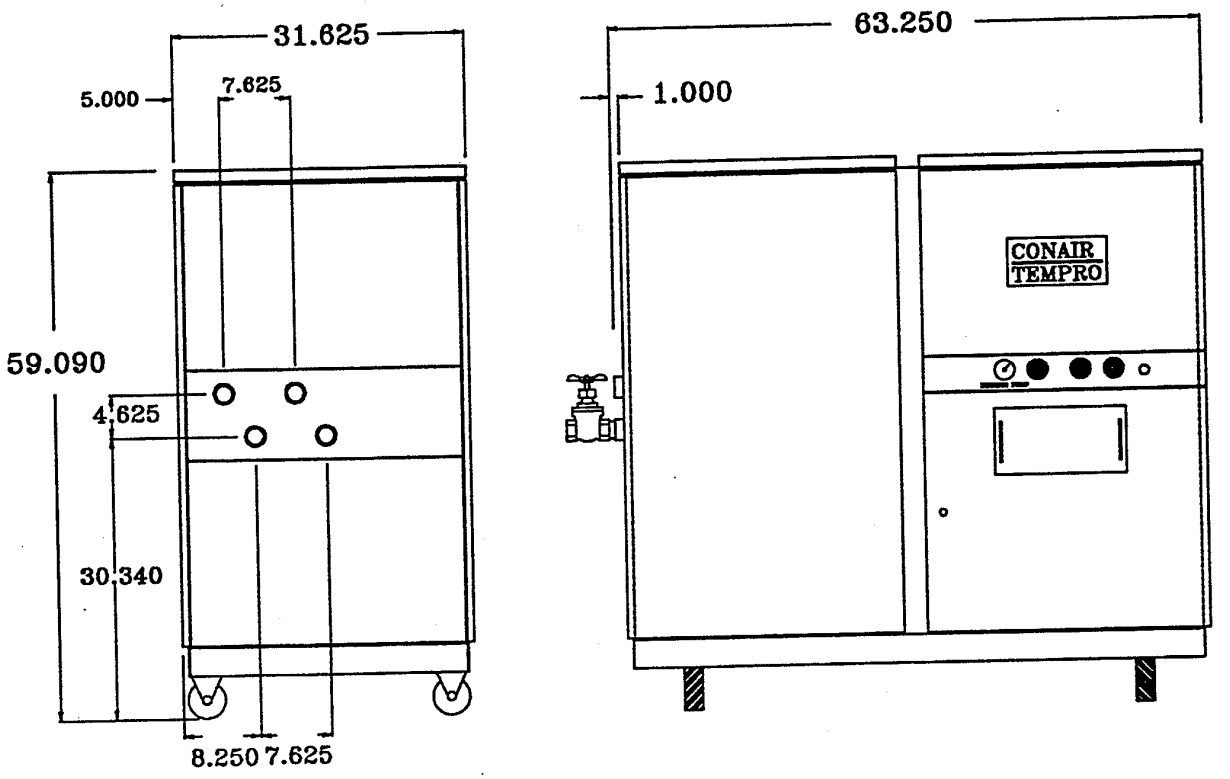
Water cooled units require a minimum clearance of 5ft around the perimiter for serviceability.

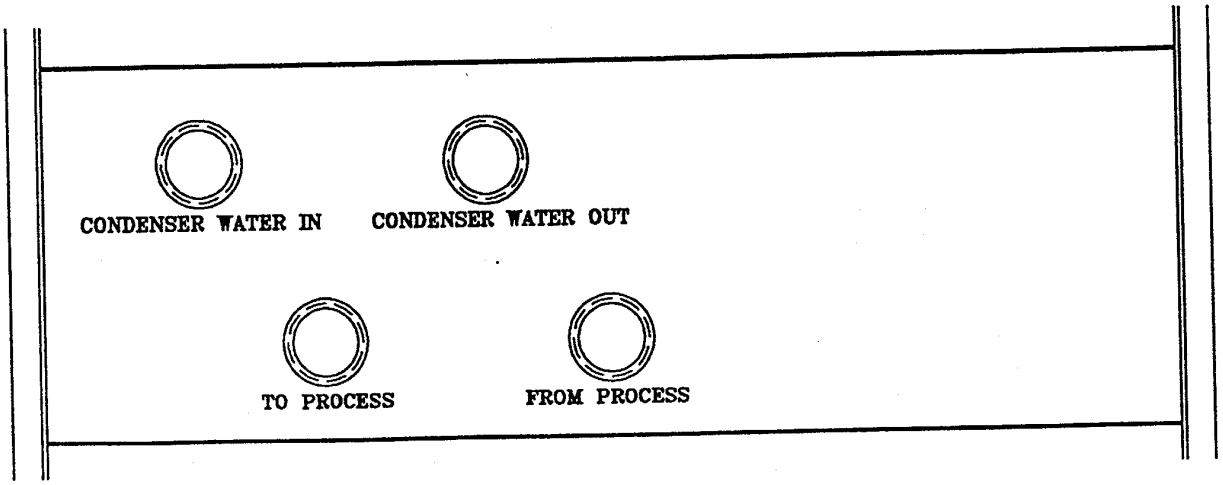
Air cooled units require a minimum clearance of 5ft around perimiter for serviceability. Units with fans require unrestricted outlet air flow. Units with blowers may be ducted at outlet, see page 23.

Units MUST be protected against freeze-up to a minimum of 10°F below the desired set point. Use only industrial grade Ethlene Glycol, corrosion inhibitors are allowed. Do NOT use automotive antifreeze. Consult Conair Tempro Parts Department for available fluids for use.

Dimensional Data

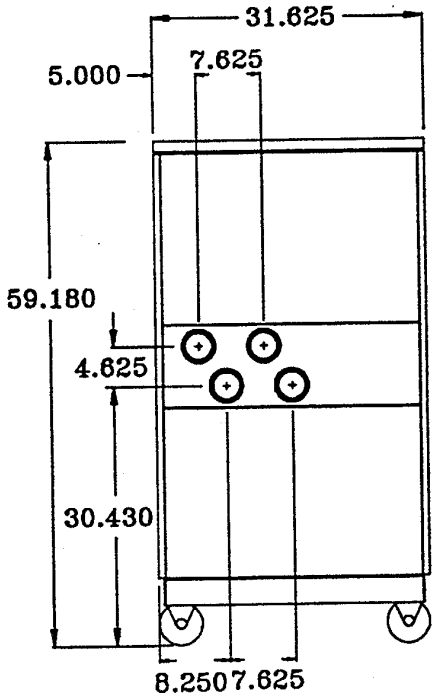
WC(X) - 3 through WC(X) - 10

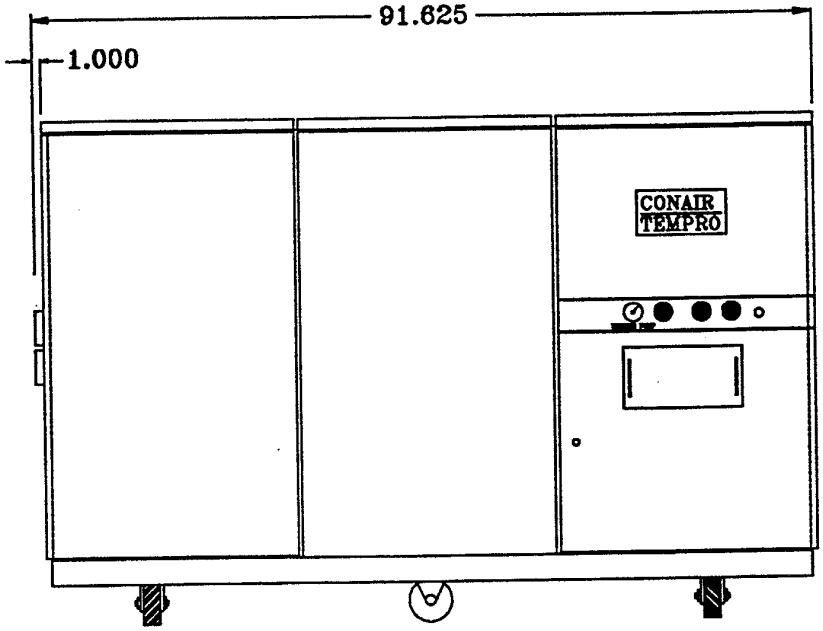


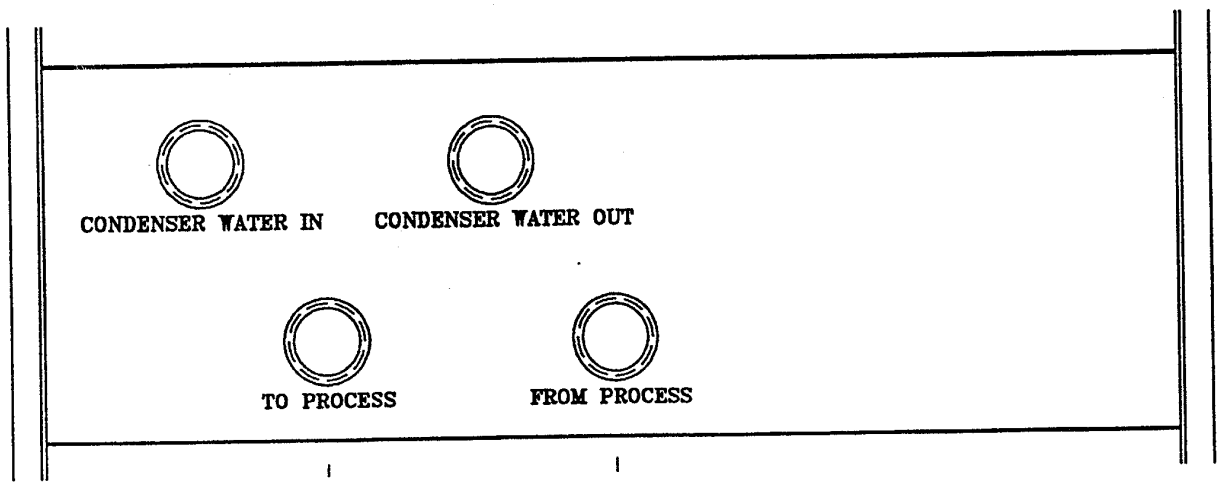


Dimensional Data

WC(X)-15 through WC(X)-40

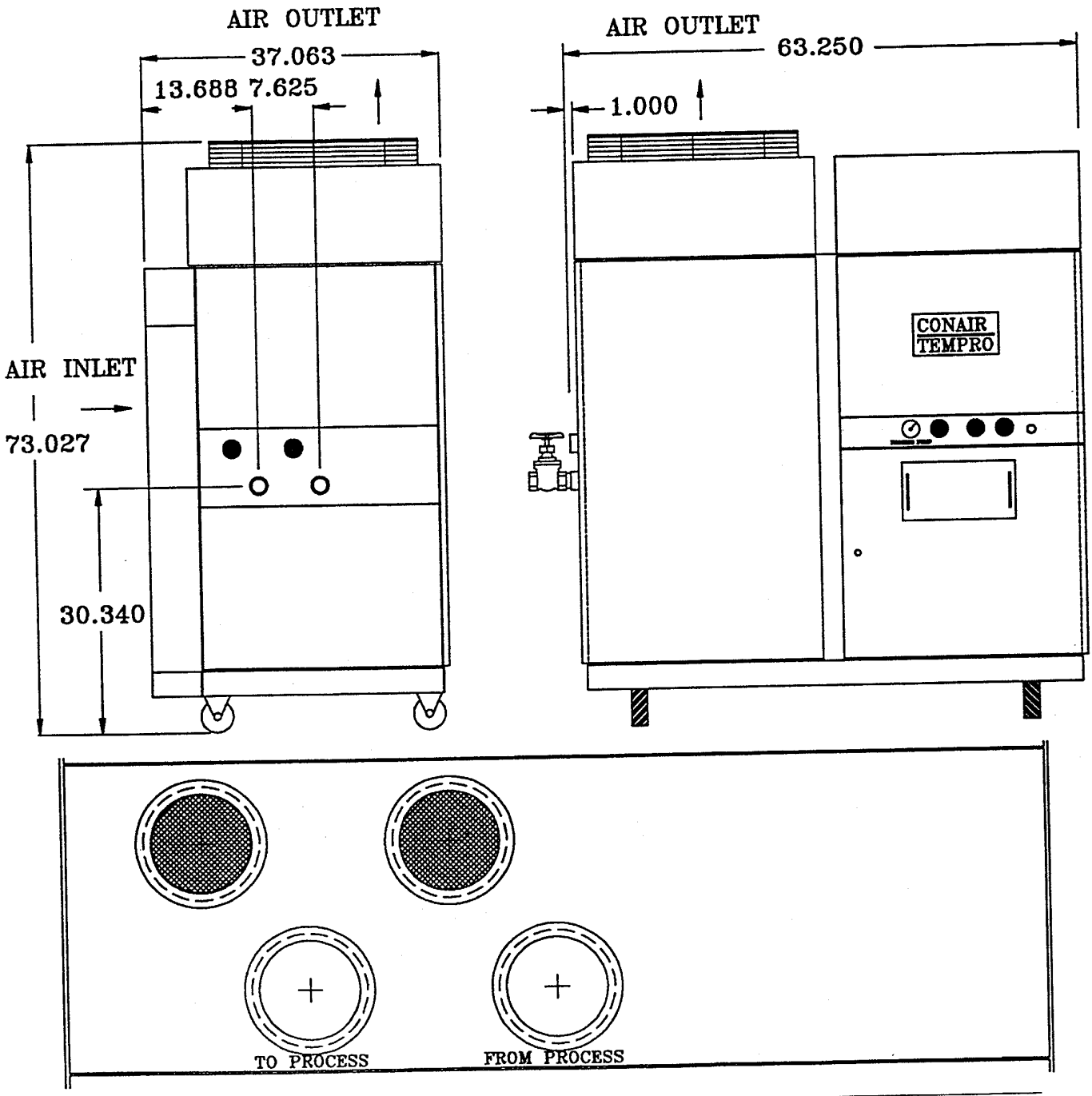






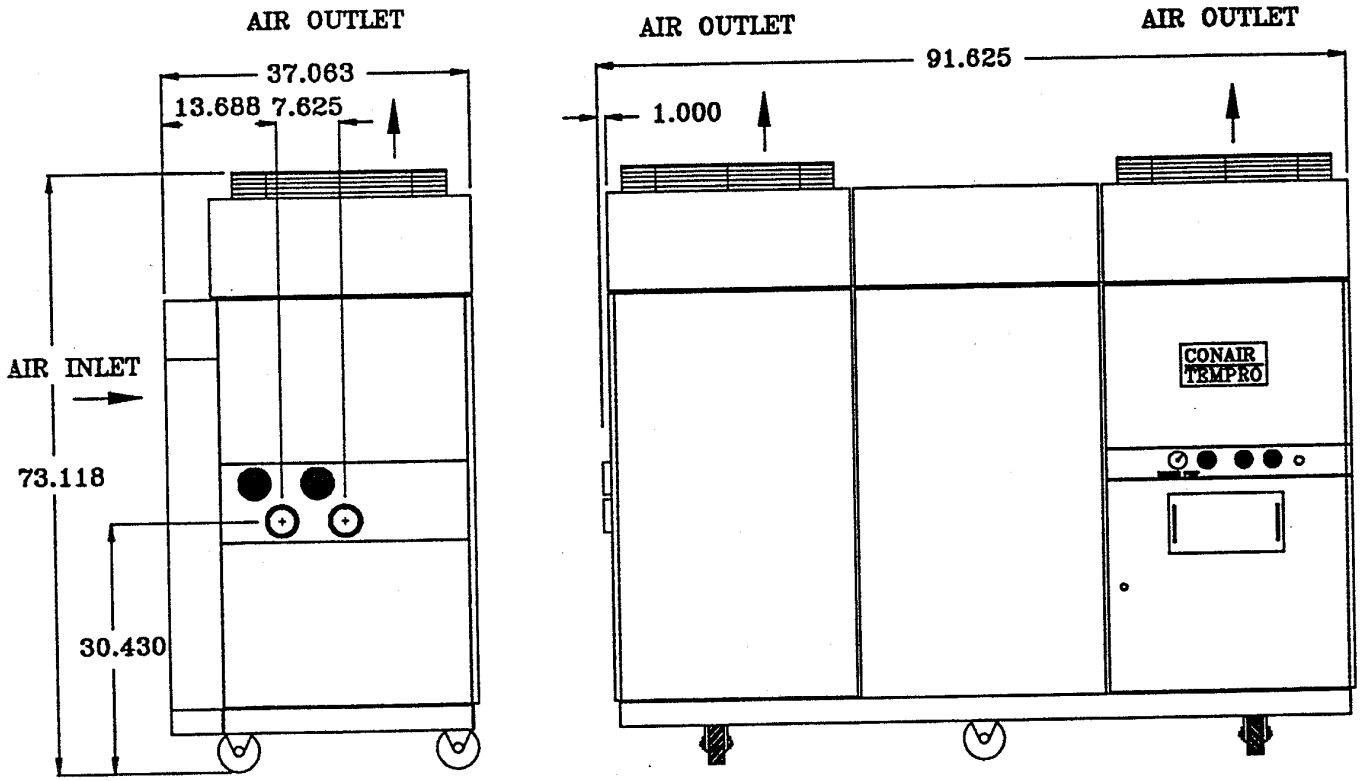
Dimensional Data

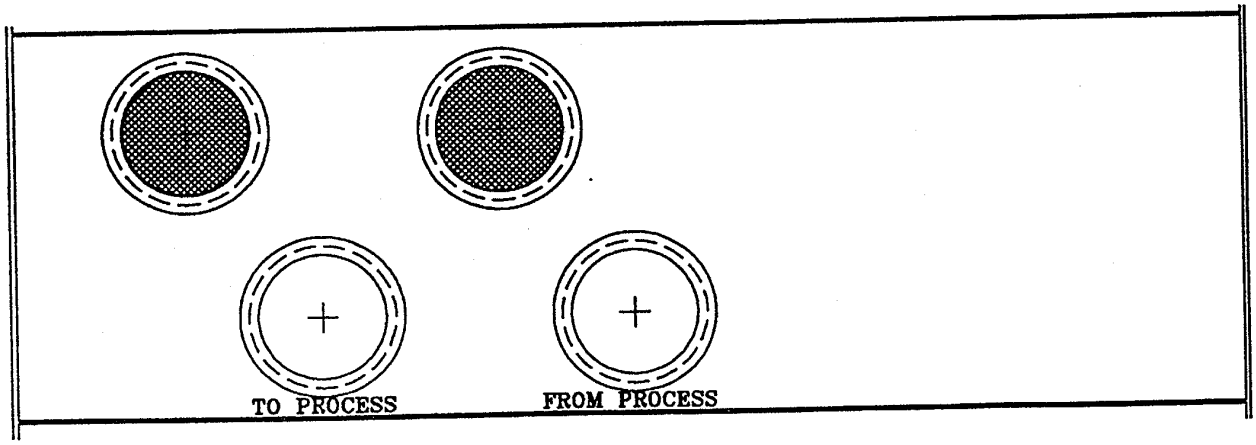
AC(X)-3 through AC(X)-71/2



Dimensional Data

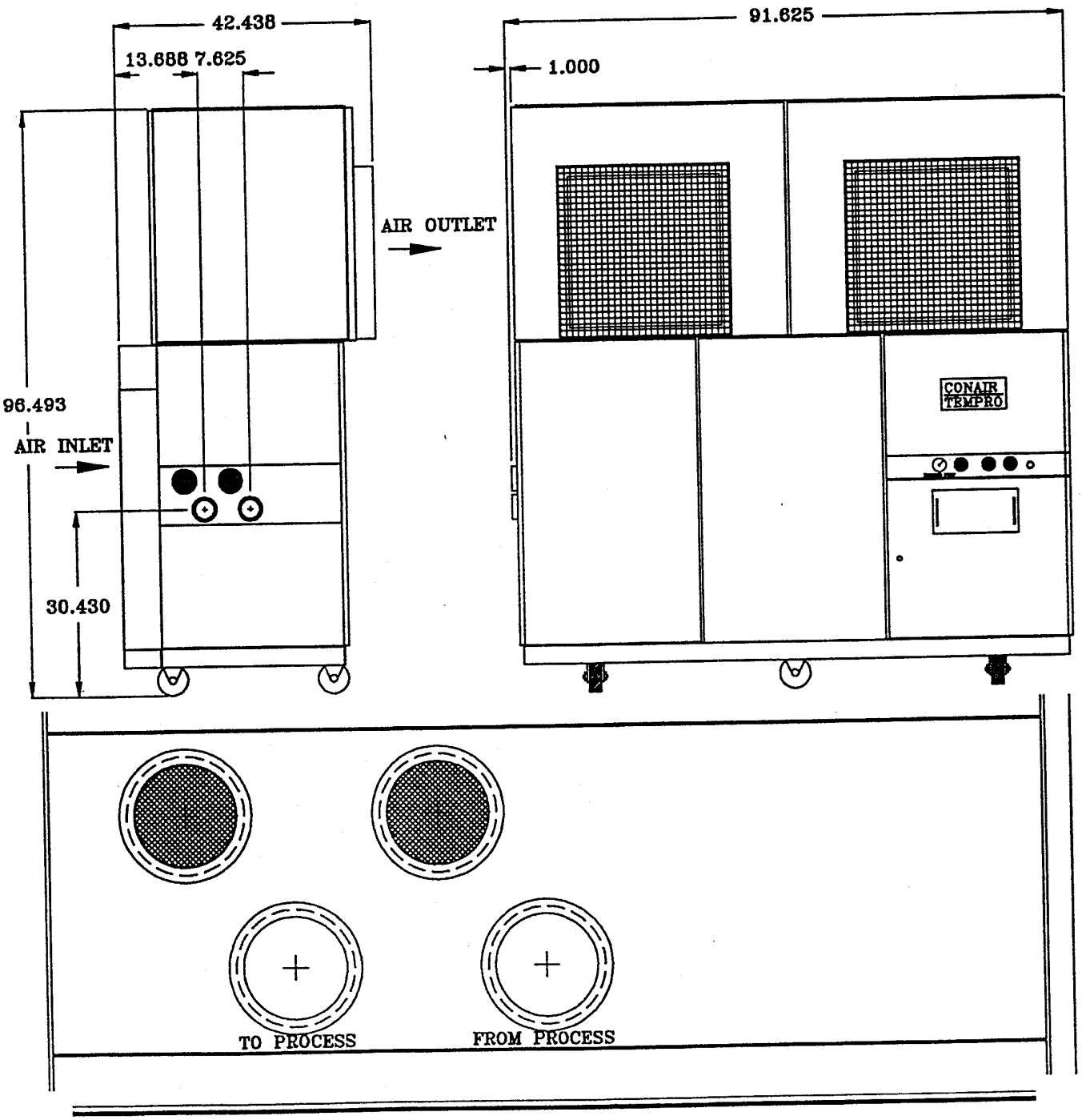
AC(X)-10, 15, 20-1





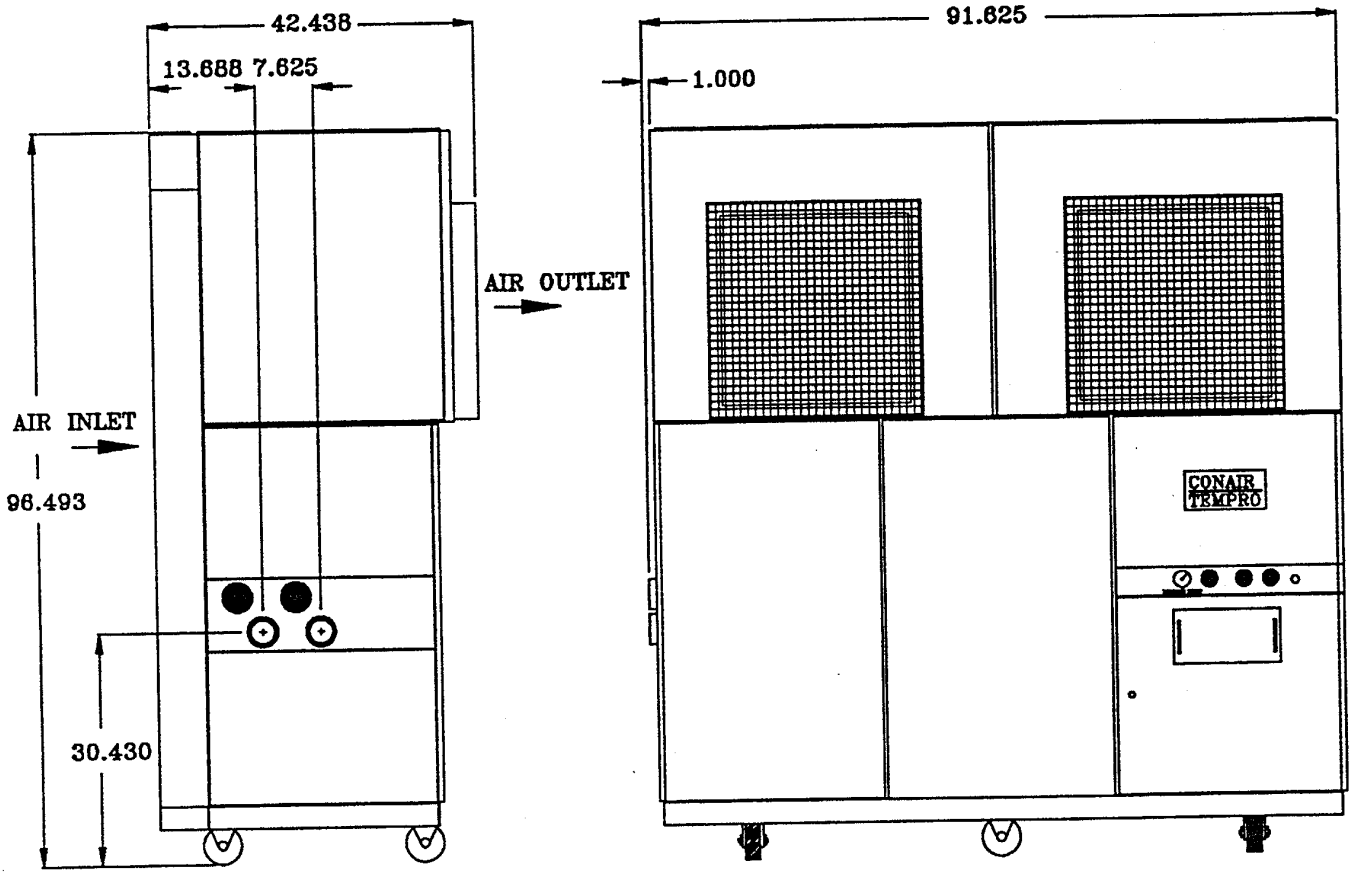
Dimensional Data

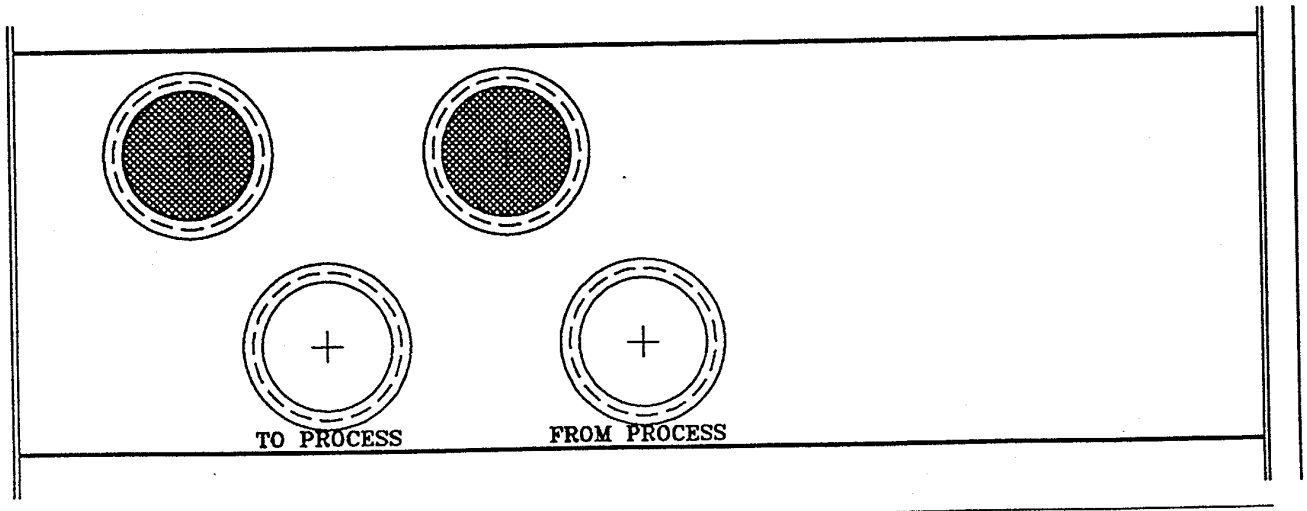
AC(X)-20-2



Dimensional Data

AC(X)-25 throught AC(X)-40





Specifications-Air & Water Cooled

microTrac 1&2 Series

MODEL	Refrigeration Capacity (tons)	Compressor (hp)	Normal flow to process (GPM/PSI)	Process Pump (hp)	Condenser Water flow (GPM)(3)	Shipping Weight (lbs.)	AMPS @ 460/3/60 Full load	Running	FPT Process / Condenser Connections (inches)
WC1-3	3.9	3.25	8/34	.75	12	425	11	9	1.5
WC1-5	5.8	5	12/39	1.5	17	475	15	13	1.5
WC1-7.5	9.0	7.5	19/39	1.5	27	750	20	16	2
WC1-10	12.1	10	26/38	1.5	36	825	24	20	2
WC1-15	17.2	15	37/37	1.5	52	1225	33	26	2.5
WC1-20	19.0	20	41/42	2	57	1425	40	28	2.5
WC1-25	24.8	25	54/40	2	74	1625	48	35	3
WC1-30	28.1	30	61/40	3	84	1925	63	43	3
WC1-35	36.3	35	78/55	5	109	2075	70	55	3
WC1-40	42.6	40	94/53	5	128	2225	78	64	3

Cooling capacity and Condenser water flow based on 85°F water at 25psi minimum supply pressure at condenser inlet.

microTrac 1&2 Series

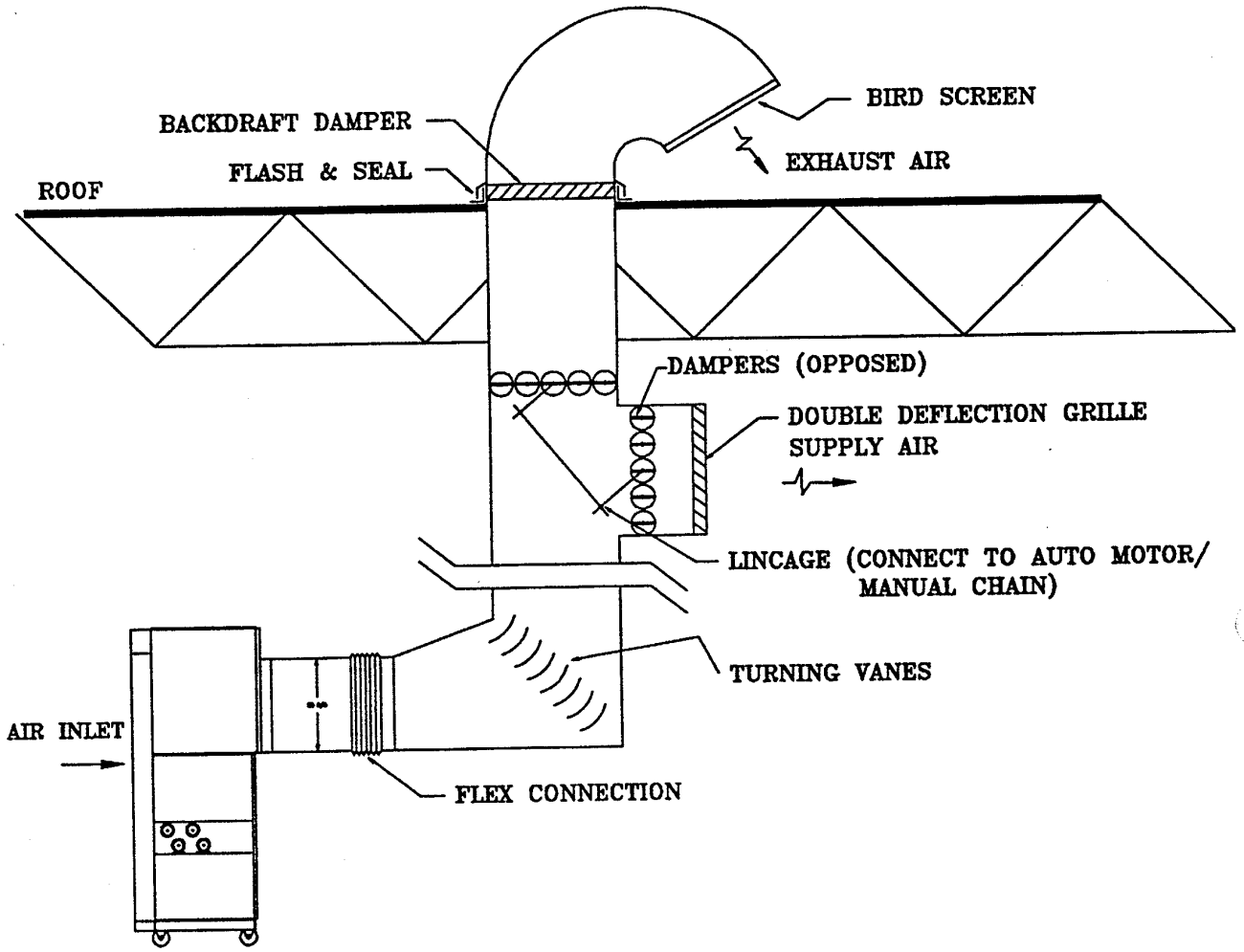
MODEL	Refrigeration Capacity (tons)	Compressor (hp)	Norminal flow to process (GPM/PSI)	Process Pump (hp)	Condenser Fan (qty/hp)	Space Heating Capacity (btu/hr x 1000)	Condenser Air flow (cfm)	Shipping Weight (lbs)	AMPS @ 460/3/60 Full load	Running	FPT Process Connections (inches)
AC1-3	3.4	3.25	7/34	.75	1/1	59	6,200	425	13	11	1.5
AC1-5	5.1	5	11/39	1.5	1/1	88	6,200	500	17	15	1.5
AC1-7.5	7.8	7.5	17/39	1.5	1/1.5	139	8,300	750	23	19	2
AC1-10	11.0	10	24/38	1.5	2/1	171	10,000	875	28	23	2
AC1-15	15.7	15	34/37	1.5	2/1.5	260	14,000	1225	38	31	2.5
AC1-201	17.3	20	37/43	2	3/1.5	356	16,000	1475	48	36	2.5
AC1-202	17.3	20	37/43	2	2/3	360	16,000	1675	50	37	2.5
AC1-25	22.5	25	49/41	2	2/5	445	21,000	2025	63	49	3
AC1-30	25.6	30	55/41	3	2/7.5	537	22,800	2525	85	63	3
AC1-35	33.1	35	70/56	5	2/10	637	27,900	2725	99	82	3
AC1-40	38.7	40	83/54	5	2/10	737	27,900	2925	107	91	3

Cooling Capacity based on 95°F ambient conditions. Condenser Air Flows also represent Air Make-up requirements if ducting outside.

All customer supplied water piping must be sized for minimal pressure loss at rated flows.

Ductwork System

Typical Ductwork Detail for Air Exhaust and Space Heating
AC20-2 through AC-40



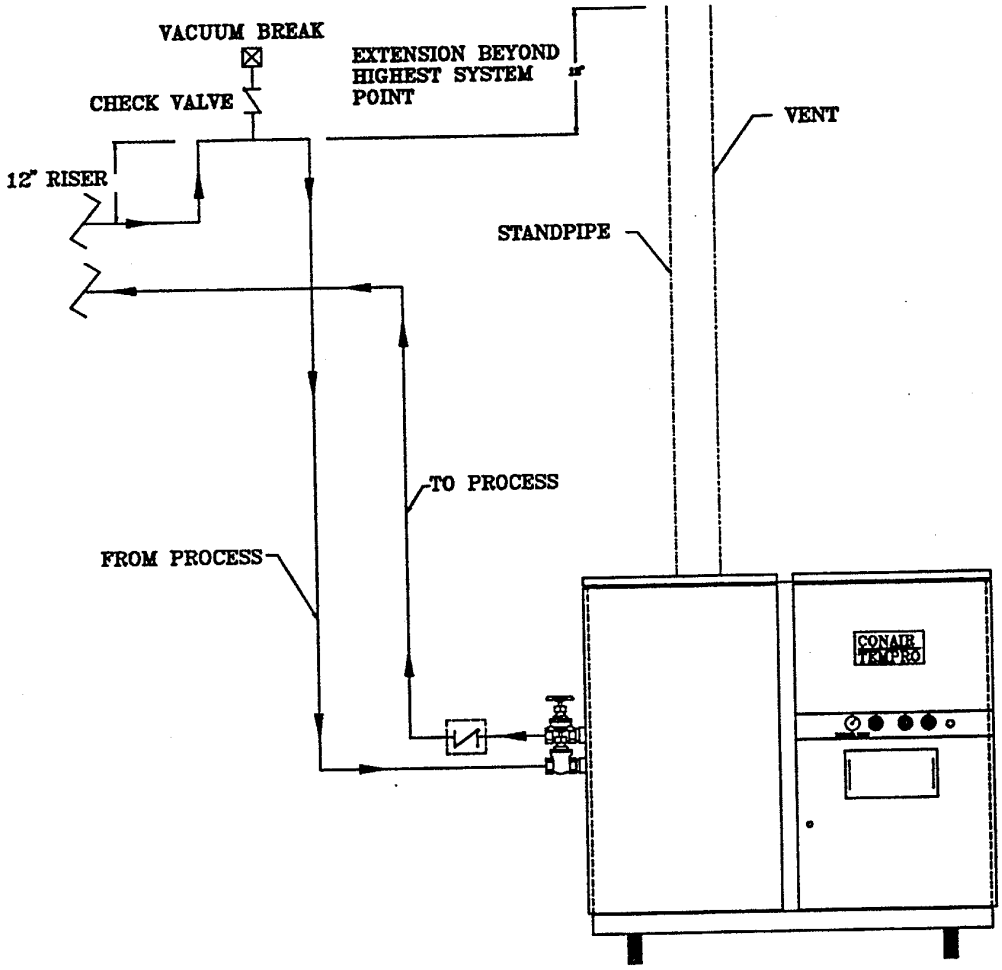
Ductwork must be securely attached to the building construction in an approved manner.

Duct area to be sized for a minimum velocity of 1800ft/min and static pressure not to exceed 2" wc.

AC20-2 = 9 ft• = 1296 in• minimum
AC25 = 12 ft• =1728 in•
AC30 = 13 ft• = 1872 in•
AC35, AC40 = 16 ft• = 2304 in•

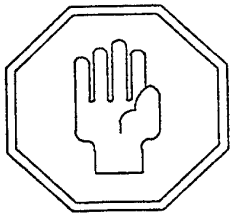
External Vents must be closed when chiller is not in operation.

Overhead Piping Detail

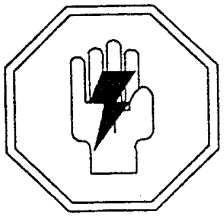


Overhead piping installations above process connections require the installation of a check valve in the To Process line, and riser with check valve and vacuum break in the From Process line to prevent syphoning at shut down. A standpipe and vent tube must be installed to 12 inches above the highest system point. This prevents over pressurization. The maximum height of piping above process connections = 10 ft.

Electrical



It is strongly recommended that when installing the electrical portion of the Portable Chiller, all wiring, disconnects, and fusing follow the National Electrical Code and any local electrical codes for your area.



ALWAYS maintain a safe GOUND and ALWAYS disconnect the incoming power BEFORE an attempt is made to open the unit or other nonstandard operating procedures, such as routine maintenance.

The electrical specifications are located on the nameplate mounted on the side of the unit, (see figure below). This will indicate the required voltage, number of phases, frequency, full load amps, disconnect fuse size, and minimum wire connection size for this unit. The electrical hookup should be identical, with a maximum of +/- 10% variance in voltage.

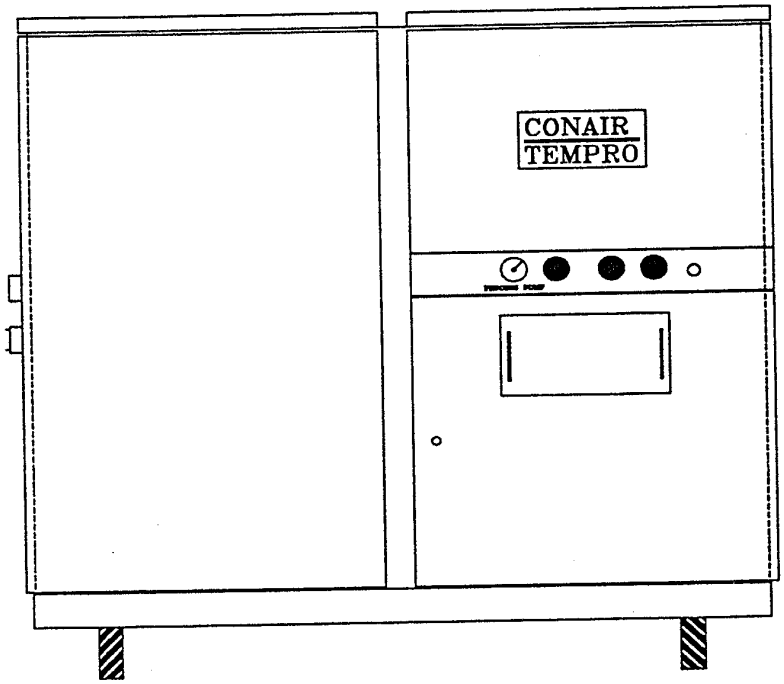
The electrical hookup should be also run through a fused disconnect, sized in accordance with the nameplate amoerage and conforming to *Article 250 of the National Electrical Code.*

CONAIR TEMPRO Part of The Conair Group		1175 DAVIS ROAD ELGIN, ILLINOIS U.S.A. 60123 (847) 888-8800
MODEL	SERIAL #	
VOLTS	PHASE	HZ
FLA	DISCONNECT FUSE SIZE	
MIN. WIRE CONNECTION SIZE		
WIRING SCHEMATIC #		
RECIRC PUMP	HP	FLA
PROC PUMP	HP	FLA
COMP	HP	FLA
FANS (x 2)	HP	FLA
OPERATING TEMP. RANGE		
TESTED BY		

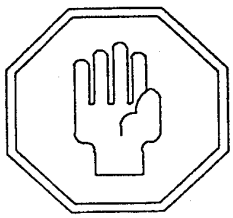
Electrical

Before power is initiated to the unit, make sure the proper voltage, phase, frequency, full load amps, disconnect fuse size, and minimum wire size meet the specifications stated on the nameplate mounted on the outside of the unit. Improper power supply could result in damage to the unit as well as serious injury to the operator.

Connect the power feed to the unit



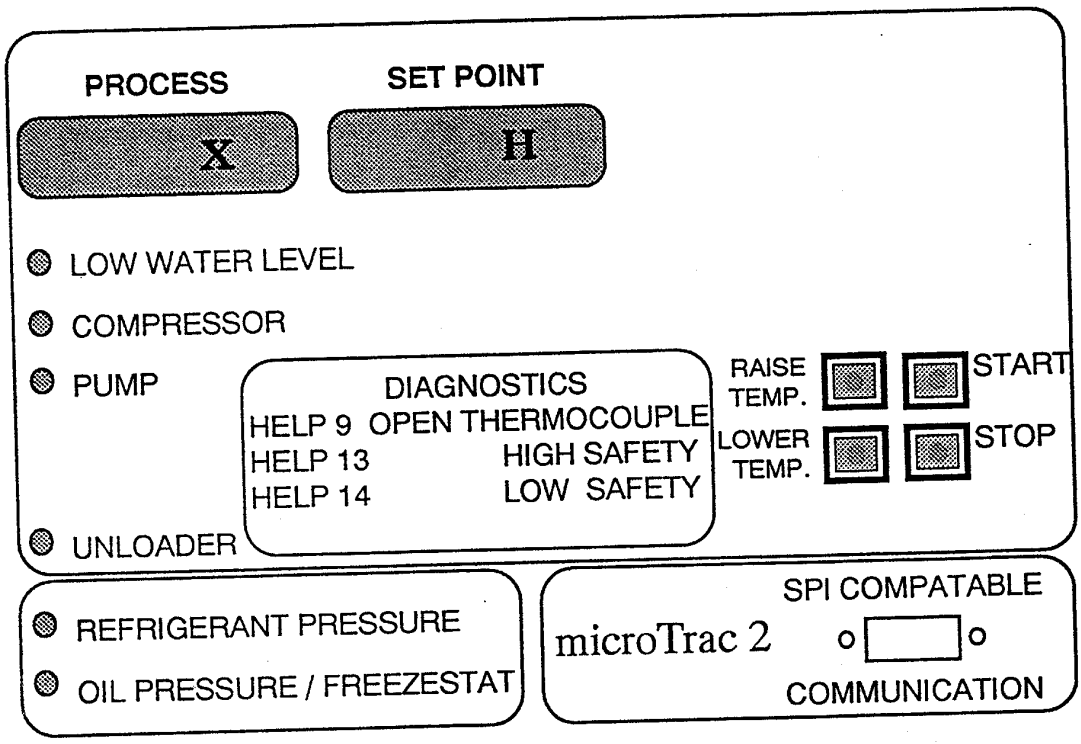
A flexible pig-tail is recommended at the unit for servicability.



Power must be applied to the chiller for at least 24hrs. prior to start-up to allow the crankcase heater to sufficiently vaporize dissolved refrigerant.

Electrical

Upon power hookup, the control display will indicate the hours the unit has been in operation by displaying "X" in the Process Screen, "X" being the number of hours, and "H" in the Display Screen indicating hours. All L.E.D.s will be lit for 5 seconds.

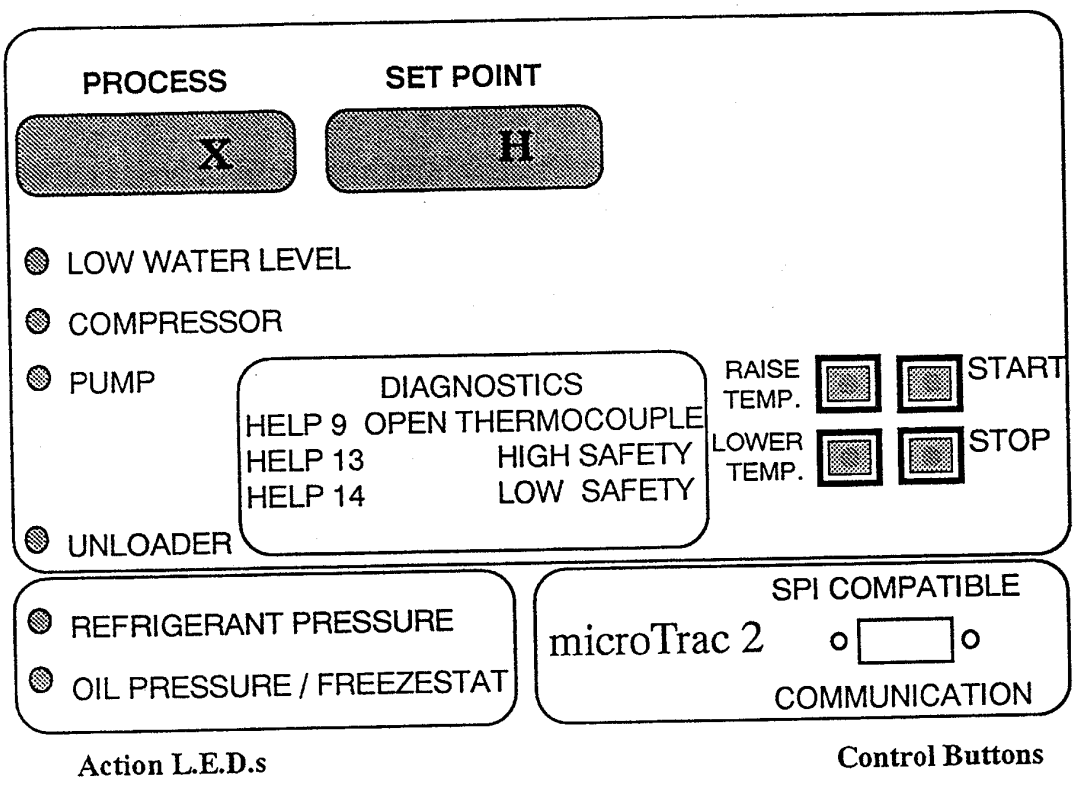


LAYOUT & FUNCTION of the CONTROL PANEL

Control Panel

The Control Panel consists of 3 areas that provide process information and control. These 3 areas are:

Display Screens



Action L.E.D.s **Control Buttons**

Display Screens

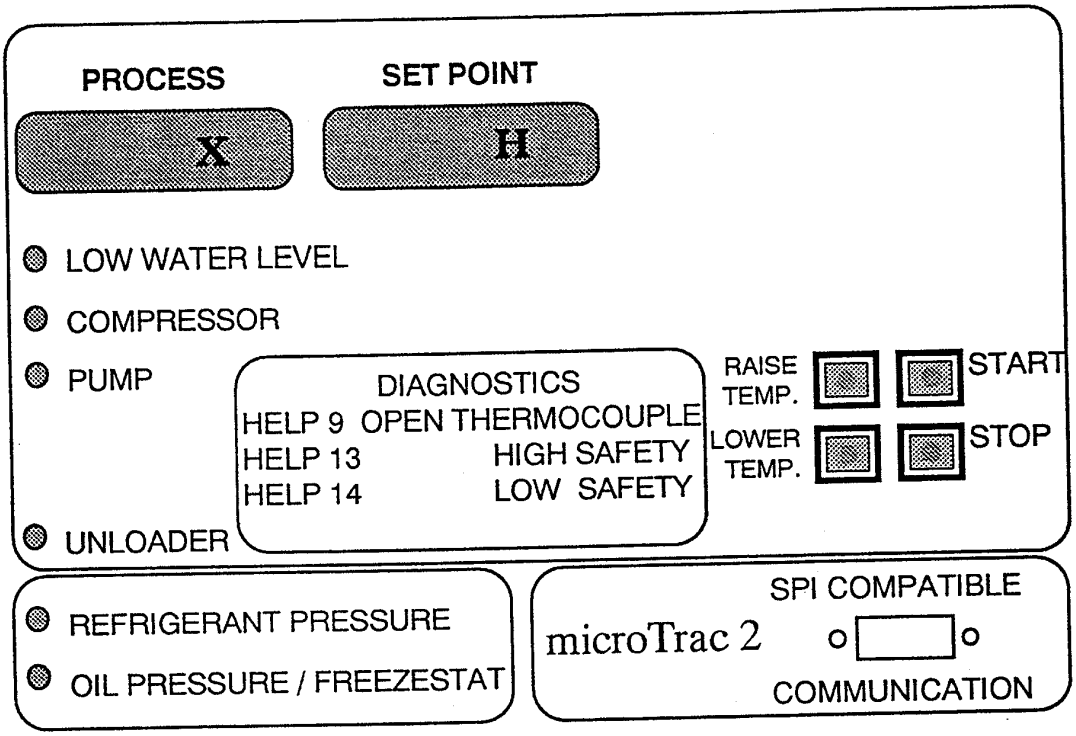
Process Display
This screen will continuously monitor and display the process temperature of the Chiller.

Set Point Display
This screen will display the temperature set point selected by the operator through the use of the Raise (Orange) and Lower (Blue) buttons.

Action L.E.D.s

There are two catagories of L.E.D.s on the microTrac1 & 2. L.E.D.s that monitor the action of the chiller and L.E.D.s that indicate a problem has occured. The action monitoring L.E.D.s include; Compressor, Pump and Unloader.

Control Panel



Pump
The PUMP L.E.D. indicator will light when the chiller pump is turned on by the controller.

Compressor
The COMPRESSOR L.E.D. will light indicating the compressor has been turned on by the controller. This will only occur if the proper pump operation is initiated.

Unloaders
The UNLOADERS L.E.D. will light indicating the unloaders or hot gas bypass valve, if equiped, has energized due to load falling below chiller capacity. The unloader provides capacity controls as well as reduced energy consumption.

The L.E.D.s that indicate a problem has iccured with the Chiller are; Low Water Level, Refrigerant Pressure, and Oil Pressure / Freezestat.

Low Water Pressure
The LOW WATER LEVEL L.E.D. will light indicating the reservoir level has dropped below the minimum level, causing the chiller to cease operation. Once adequate water exists, the light will extinguish and the Chiller will start it selft, as long as the STOP (Red) button has not been pressed. Chillers without reservoirs sense this condition via a flow switch in the To-Process line.

Control Panel

Refrigerant Pressure
The REFRIGERANT PRESSURE L.E.D. will light indicating that the refrigerant circuit pressure is at an unacceptable level, high or low. See further details in the *Troubleshooting* section of this manual.

Oil Pressure / Freezestat
The OIL PRESSURE / FREEZESTAT L.E.D. will light indicating either of the two possible failures. Oil pressure pertains to discus compressors only, (10 ton and above), and is reflective of the compressors oil pump to maintain an adquate pressure differential. FREEZESTAT is a safety shut down to prevent damage to the evaporator from freeze-up of the water, water/glycol solution. Refer to the *Troubleshooting* section of this manual for further details.

Control Buttons

There are 4 control buttons on the microTrac 1 & 2 controller. When a button is depressed you will feel a click to confirm your actions. When a button is held down the button will repeat its function until the button is released. No two buttons should be pressed at the same time.

Raise (Orange)
The Raise button is used to raise the temperature set point. The temperature set point will be raised 1 degree each time the button is depressed.

Lower (Blue)

The Lower button is used to lower the temperature set point. The temperature set point will be lowered 1 degree each time the button is depressed.

Start (Green)
The Start button is used to activate the Chiller into normal operation. The compressor may not start immediately if anti-short cycle timers (5 min.) are engaged.

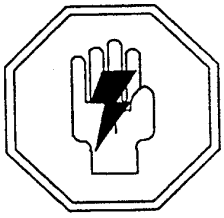
Stop (Red)
The Stop button is used to stop the operation of the Chiller, however, the Process and Set Point screens will still show their respective values.

Control Panel

The microTrac 2 provides SPI compatable communication with a host machine. Events that are capable of being monitored and/or changed are;

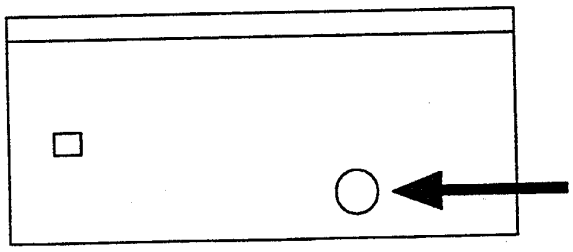
Alarms
Temperature settings
Starting the unit
Stoping the unit

The following are the steps to take to activate SPI communication.

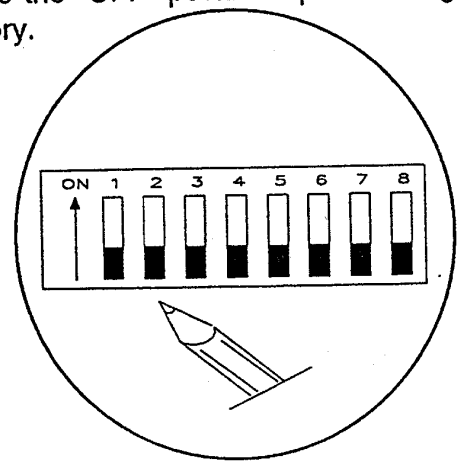


Make sure the Chiller has stopped operation and the power supply has been disconnected.

Open the electrical access door to expose the rear of the operator panel. In the rear of the panel is a round hole exposing the communication setting switches.



There is a bank of eight switches. They are set to the "OFF" position upon leaving the factory.



Switches 6 and 7 determine the baud rate.

Baud Rate	6	7
1200	X	X
2400		X
4800	X	
9600		

Control Panel

Using the chart below, set the baud rate, and address for the unit. Every unit on the network must have a different address.

Switches 1 thru 5 determine the network address.

"X" = ON
" " = OFF

	Switches				
Address	1	2	3	4	5
32	X	X	X	X	X
33		X	X	X	X
34	X		X	X	X
35			X	X	X
36	X	X		X	X
37		X		X	X
38	X			X	X
39				X	X
40	X	X	X		X
41		X	X		X
42	X		X		X
43			X		X
44	X	X			X
45		X			X
46	X				X
47					X
48	X	X	X	X	
49		X	X	X	
50	X		X	X	
51			X	X	
52	X	X		X	
53		X		X	
54	X			X	
55				X	
56	X	X	X		
57		X	X		
58	X		X		
59			X		
60	X	X			
61		X			
62	X				
63					

Plug the male DB9 connector from your host machine into the SPI communications port located on the front of the operator panel. Reconnect the power supply and start the unit.

The Chiller now has SPI communication enabled.

Preventative & Routine Maintenance

Maintenance

A program of REGULAR inspection, cleaning and PREVENTIVE MAINTENANCE by trained personnel will contribute greatly to the long satifactory service life of this product.

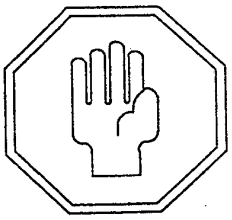
WHERE MAINTENANCE PROCEDURES CALL FOR SHUT DOWN -- DISCONNECT THE POWER SUPPLY BEFORE PROCEEDING!

HIGH VOLTAGE OR UNEXPECTED (AUTO START) OPERATION CAN BE HAZARDOUS!

Periodic Inspection	Read essential temperatures and pressures periodically to see that they indicate normal operation. Record these readings on a log sheet on the maintance log, supplied on page 39. If any abnormal operation is observed, see the Troubleshooting Section of the manual.
Monthly Inpection	Check cooling tower water treatment system, (for water cooled units). Wipe down external surfaces of the unit. **SHUT UNIT DOWN, OPEN MAIN DISCONNECT.** Inspect control panel, checking for loose wires, burned contacts, signs of overheated wires, etc. Apply power to the unit and restart, check performance of controls. Check the sight glass for proper refrigerant charge while the unit is operating **at full load.**

Maintenance

Vessel Maintenance

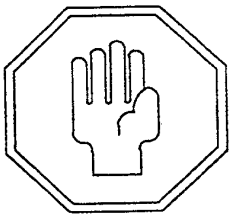


The efficient performance of the evaporator and condenser heat transfer surfaces is essential for proper performance of your portable chiller.

If these surfaces accumulate a film of dirt, scale or slime, their performance efficiency will degrade substantially.

The refrigerant side of the heat transfer surface does not foul, since refrigerant is a good solvent and is in a closed, filtered cycle.

Evaporator Cleaning



The surfaces of the heat transfer system exposed to water can foul from minerals and other contaminants in the water system. A program of water treatment can slow the rate of fouling on heat transfer surfaces, but will not eliminate it.

The effects of fouling can be detected by recording full load performance data on the log sheet. Degrading performance over time may signify fouling.

Check the supply water for the cause of fouling, i.e., minerals, dirt, slime, and algae.

The evaporator should be cleaned with chemicals and procedures that are suitable for the kind of fouling.

Clean the evaporator water side surfaces at least annnually, and more often if serverely foul water is used.

To remove **minerals** and **slime**, cleaning must be done chemically. The proper chemicals can be recommended by a water treatment specialists.

It is important to **rinse** the system thoroughly after cleaning to remove the chemicals before they attack the metal surfaces.

Maintenance

Water Cooled Condenser Cleaning

To remove **dirt, slime,** and **algae** fouling from condenser tubes;

Drain the condenser water.

Remove the condenser heads.

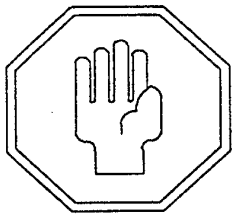
Brush each tube with a tube cleaning brush until clean. An acid solution may be required.

Always remove both heads before cleaning the tubes.

Replace the heads making sure to position the gaskets properly.

Refill the system with water.

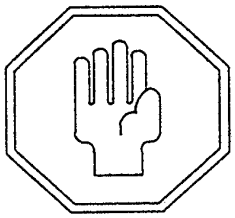
Head Gaskets



Head gaskets do not need to be replaced after each head disassembly operation. However, **Inspect the head gaskets carefully!**

Gaskets must be renewed if they are physically disfigured or otherwise deteriorated. New gaskets are available from the Conair Tempro Parts Department.

Tube Replacement, Water Cooled Units



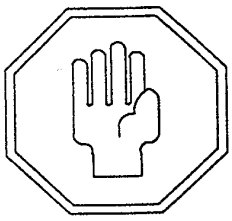
In case of condenser tube failure; call Conair Tempro Service. Special procedures and tools are required and this should only be performed by Conair Tempro designated service personnel.

The tubes in the evaporators are not replaceable.

If the evaporator tubes should fail, replacement vessels are available from the Conair Tempro Parts Department.

Maintenance

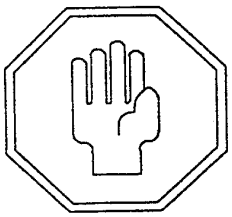
Air Cooled Condenser Cleaning



The face of the condenser should be inspected regularly for dirt and clogging. It should be cleaned at least once a month. More frequent cleaning will be required if conditions are bad and the condenser picks up dirt very quickly. If the condenser is allowed to get too dirty the unit will run a high head pressure, performance will be poor and the fan motors may overload.

Clean dirty coils with a soft brush, flush with cool water, or commercially available coil cleaners.

Discus Compressor Maintenance



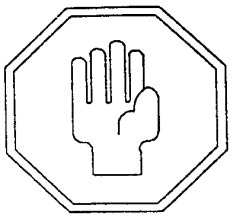
The discus compressor has four components that may be replaced; the suction strainer, oil pump, cylinder heads, and valve plates. If a component other than listed fails, the compressor will require replacement. This service may only be performed by an authorized Conair Tempro Service Representative.

Refrigerant Charge

All chillers are given a complete charge of refrigerant at the factory. See Pyhsical Specifications for the type and amount of refrigerant charge for your model. The total refrigerant shown is for the entire system.

In order to check for proper refrigerant charge, look in the liquid line sight glass with the aid of a flashlight during system operation. At full load conditions, the sight glass should be clear. Bubbles may be visible while cylinder unloaders or hot gas valves are energized. This is normal and does not signify that refrigeration charge is low.

Recharging



If recharging is necessary, addition or replacement of refrigerant must be performed by qualified Conair Tempro Service Personnel.

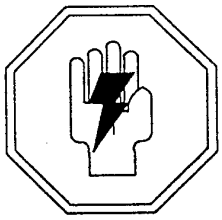
Maintenance Log

CONAIR TEMPRO

PORTABLE CHILLER MAINTENANCE LOG

DATE														
Comp Amps 100% / Unloaded														
Discharge														
Suction														
Evap.Press.														
Oil Press. hi / lo														
Oil Level														
Lo. Press. Setting														
Hi Press. Setting														
Freestat. Setting														
Evap. Water out Temp.														
Process Water, P														
Recirc. Water, P														
Cond. Water Temp: in / out														
Cond. Water Press: in / out														
Cond. Fan Amps	1													
	2													
	3													

TROUBLESHOOTING



WARNING! The procedures in this section should be performed ONLY by qualified service personnel. Failure to take appropriate precautions could result in serious injury or death!

Symptom	Possible Cause	Solution
Unit will not start.	1.) Power turned off.	1.) Check main disconnect and fuses.
	2.) Control Circuit Fuse Blown.	2.) Check fuse at chiller terminal block. (Note: Control board does remain illuminated).
	3.) Loose wiring connection.	3.) Turn power off! Check all wires/cables for tightness. Stranded wire tends to "flow" over time.
	4.) Alarm condition exists.	4.) Check control board for possible errors.
	5.) Compressor time delay in effect.	5.) Wait for the 5 minute anti-cycle timer to elapse. Do not apply heat load until compressor starts.
Compressor Hums but does not run.	1.) Low Input Voltage.	1.) Check main supply voltage, must be within 10% of nameplate rating.
	2.) Phase Loss	2.) Check for phase open error. Check main supply fusing and phase-to-phase voltages. If ok, check phase continuity through compressor contactor. Check wiring at compressor.

Symptom	Possible Cause	Solution
Compressor Cycles on Low Pressure cut-out.	1.) Refrigerant Charge Low.	1.) Check for leaks, repair and recharge required.
	2.) Low pressure switch setting incorrect.	2.) Factory standard setting 70# cut-in, 40# differential = 30# cut-out. Reset to factory parameters.
	3.) Low load and low flow rate through chiller.	3.) Check line size to/from process, possible excessive resistance, or closed valves in piping.
	4.) Restriction in liquid line.	4.) Check for temperature differential across filter drier - replace or change core if possible. Open liquid line shut-off valve fully. Check for closed suction valve at compressor - open fully. Expansion valve clogged, inoperative or misadjusted. Check superheat.
	AIR COOLED	
Compressor Cycles on High Pressure Cut - Out. (Manual Reset Required at Pressure Switch)	1.) Condenser dirty.	1.) Clean Air Filters and Coil.
	2.) Fan(s) inoperative.	2.) Check for overload. Confirm rotation. Check for proper voltage at output of starter(s). Check blower belts.
	3.) Excessive ambient temperature.	3.) Ambient temperature above 110°F (43°C) will create problems.
	4.) Insufficient air flow.	4.) Obstructions at condenser inlets and/or outlets must be removed. Check for properly sized ductwork if applicable.

Symptom	Possible Cause	Solution
Compressor Cycles on High Pressure Cut - Out. (contd.)	5.) Improperly set high pressure switch. WATER COOLED 1.) Condenser dirty 2.) Insufficient condenser water flow. 3.) Condense supply water temperature excessive. 4.) Improperly set high pressure switch. ALL UNITS 1.) Refrigerant overcharge.	5.) Factory standard setting = 360# cut - out. 1.) Remove heads to examine, clean tubes and shell. 2.) Check flow source, closed valves, etc. Check for minimum 25psi at condenser water inlet. Check for proper water regulating valve operation, factory preset for 85°F condenser supply water = 210 psi head pressure. 3.) Temperatures above 95°F may present problems. Check cooling tower fan / nosles / fill, etc., if applicable. 4.) Standard factory setting = 290# cut - out. 1.) Pump system down, if not possible due to high pressure trip - overcharged. Bleed system while fully loaded and in operation until bubbles appear in sight glass. Then as small amount of refigerant until sight glass clears.

Symptom	Possible Cause	Solution
Compressor Cycles On, Oil - Pressure Cut - Out (Manual Reset Required at Oil Safety Switch)	1.) Oil level insufficient	1.) Check oil level sight glass at compressor crankase, should be 1/2 to 3/4 full during operation - add if required.
	2.) Oil pump at compressor inoperative.	2.) Check pressure at oil pump repair / replace as required.
	3.) Oil pressure switch / sensor defective.	3.) Replace
	4.) Crankase heater defective.	4.) Replace
Unit Cycles Off / On, Freezestat Cut - Out	1.) Setting too high for the desired set-point.	1.) Adjust to protect chiller based on the concentration of ethylene glycol used. Set to cut - out 5°F above the freeze point of the solution. Solution should protect chiller to 10°F below set-point, minimum 10°F.
	2.) Freezestat installed improperly.	2.) Check that bulb is inserted completely into evaporator well, and insulated.
	3.) Freezestat defective.	3.) Replace
High Safety Cut - Out	1.) Water temperature leaving evaporator has been above 75°F for over 1/2 hr. (standard units). Water temperature above 100°F will cause immediate shut down.	1.) Low evaporator flow. Defective control board.
Open Thermocouple	1.) Thermocouple defective, control displays temperature as 185°F	1.) Replace thermocouple. Check for possible cause of a broken thermocouple wire. Check junction block at mother board, repair if possible. Check unit and mother board for proper earth grounding

System Tests

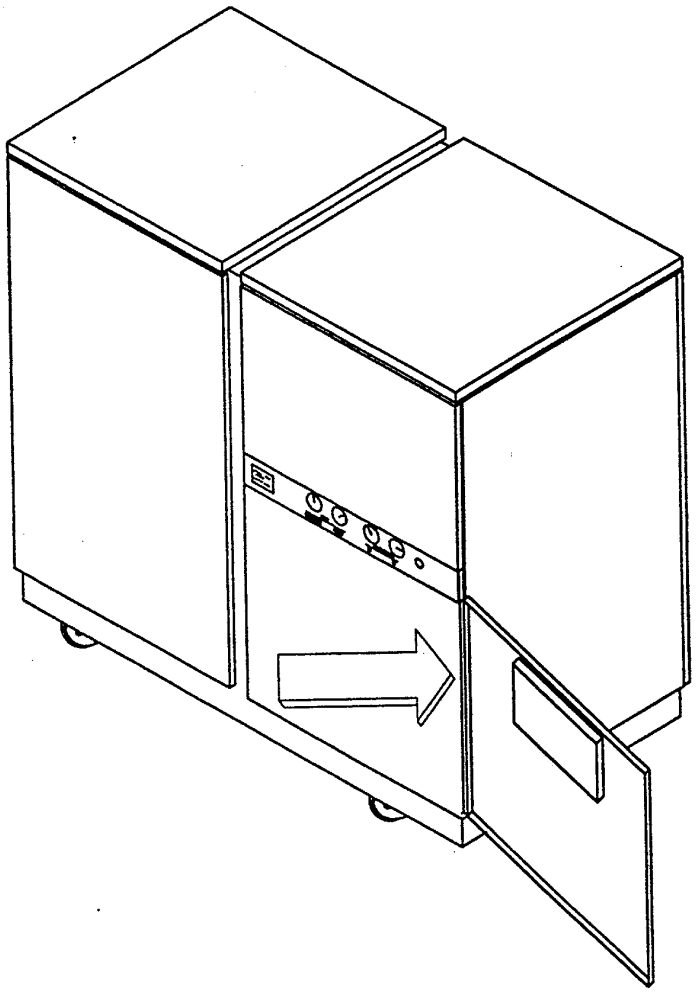
System Tests

This chapter is provided for the operator to perform simple diagmostic tests on the microTrac 1 & 2 controller.

☑ Press the Stop (Red) button to stop the operation of the Chiller.

☑ Access the rear of the control panel and press the Test (Black) button on the back of the control panel.

When attempting maintenance of any kind, disconect the power supply first !



System Tests

The display on the operator panel should now read "SEL O", meaning that the test number has been selected. All available tests may be selected by pressing the RAISE and LOWER buttons until the desired test number is displayed. To start a test, press the START button. To stop a test press the STOP button. The following is a list of the currently available test routines:

TEST NUMBER	DESCRIPTION
0	Watchdog Test
1	Ram Test
2	L.E.D. Test
3	Button Test
4	Solid State Relay Test
7	Hour Meter

Test 0, Watchdog Test

The display will increment by tens. A failed test is indicated when the microTrac 1 & 2 preforms a hardware reset before the count of 90 is reached on the display. A failed test is also indicated when the microTrac 1 & 2 does not perform a hardware reset before the count of 150 is reached on the display.

Test 1, Ram Test

The random access memory is pattern tested. During the test, the "SEL" portion of the display is blanked. If the RAM was found to be good, the "SEL 1" will return to the display, otherwise "HELP XXX" will be displayed, with "XXX" representing the address in HEX notation. If a bad address is encountered, the controller must be powered down to exit the test. Note: A similar test is execued every time the controller is turned on, displaying "HELP 102" if the test failed.

Test 2, L.E.D. Test

The digits are incremented for "0" to "9" followed by "-", "E", "H", "L", and "P". The digits are all turned to "8" and are turned off sequentially.

Test 3, Button Test

When the controller detects a button pressed, the coresponding L.E.D. in the display section of the operation panel is lit. To exit the test, the STOP button must be pressed twice consecutively. It is necessary to test the button repeat on only one of the four buttons.

System Tests

Test 4, Solid State Relay Test

The operatior panel display reads "SOL X" where "X" is the number of the solid state relay that is on. The SSR selected may be changed by pressing the RAISE and LOWER buttons. The selected SSR will stay on for 30 seconds. The START button will turn on the same SSR for 30 more seconds.

Test 7, Hours On, Pump Hours, Compressor Hours, Solenoid Cycles

Select test 7 using the RAISE and LOWER buttons. Press the START button and "XX" will be displayed in the Process screen, and "OH" will be displayed in the Display screen. The "XX" represents the number of hours the unit has been turned on, while the "OH" represents On Hours.

With the test running, press the RAISE button and the screens will now display the hours that the pump has been running. "XX" will be displayed in the Process screen, and "PH" will be displayed in the Display sreen.

Press the RAISE button again and the compressor hours will be displayed. "XX" will be be displayed in the Process screen and "LH" will be displayed in the Set Point screen.

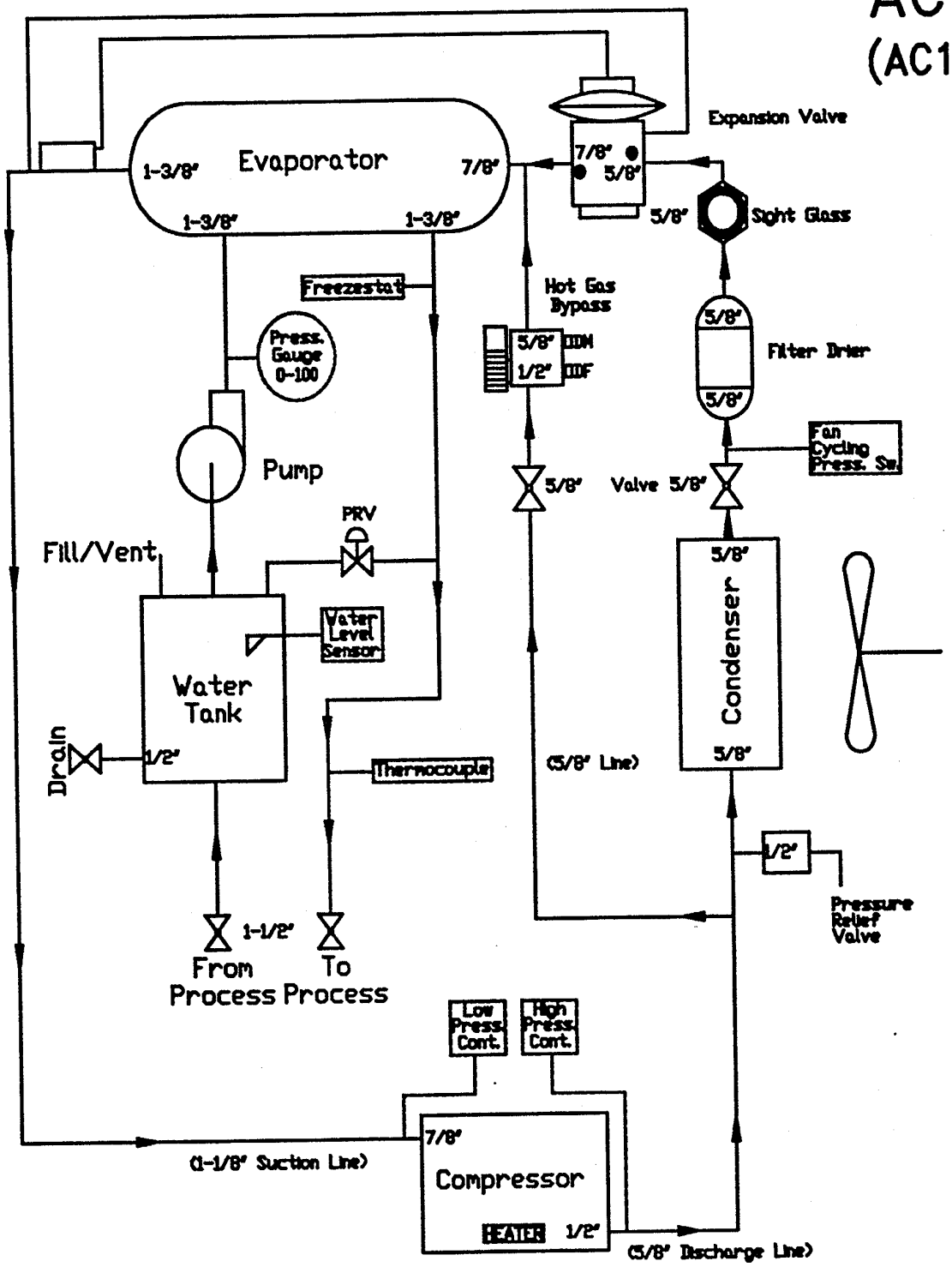
Press the RAISE button again and the unloader cycles, how may times the unloader / hot gas solenoid has been opened and closed, will be displayed. "XX" will be displayed in the Process Screen, and "HS" will be displayed in thousands of cycles.

Test numbers other than those indicated should be performed only by qualified CONAIR TEMPRO service personel. Performance of these tests by other than CONAIR TEMPRO service personel may cause serious damage to the equipment and void the warranty.

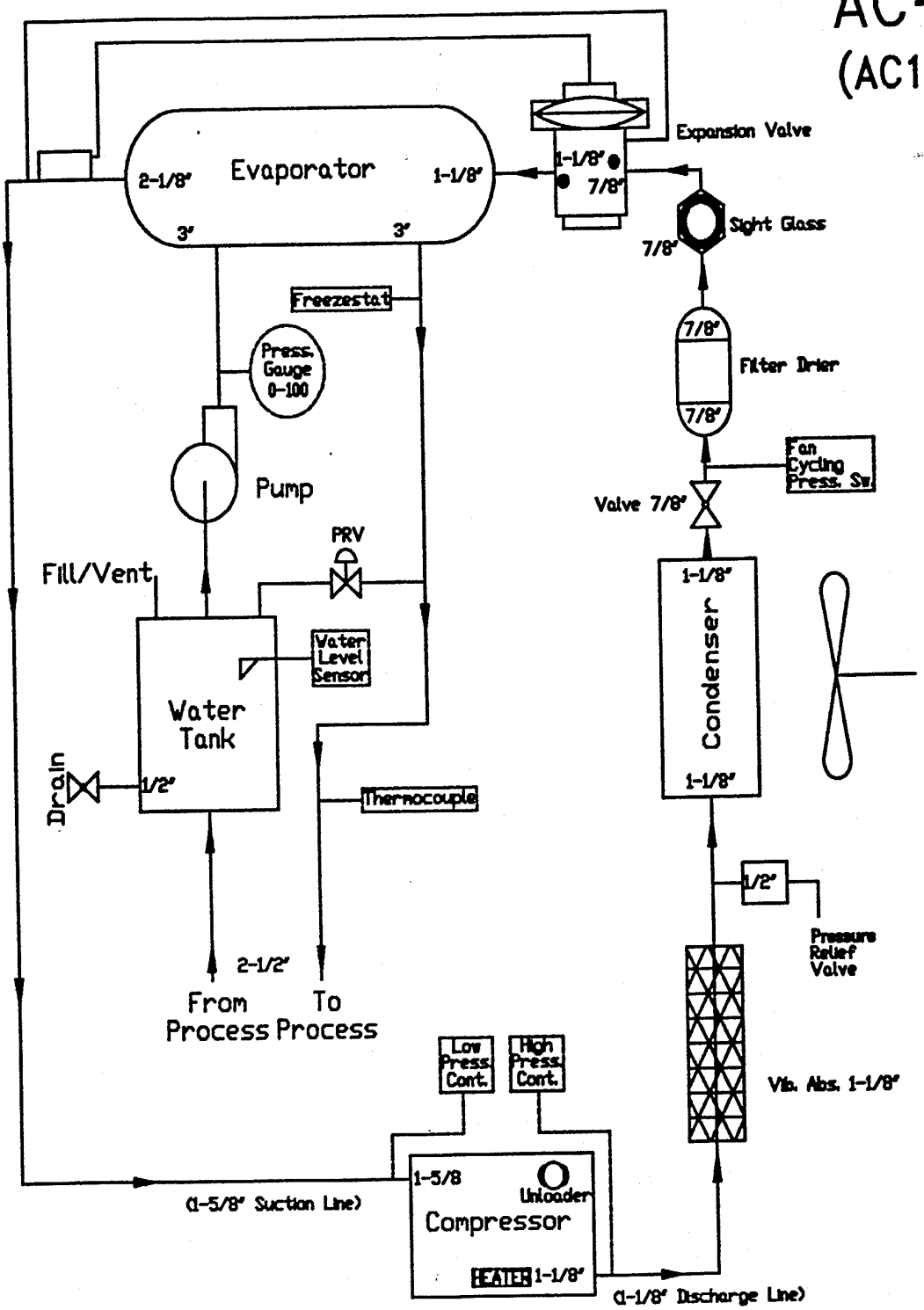
Power down the unit and then power the unit up again to restore the Chiller to noral operating mode.

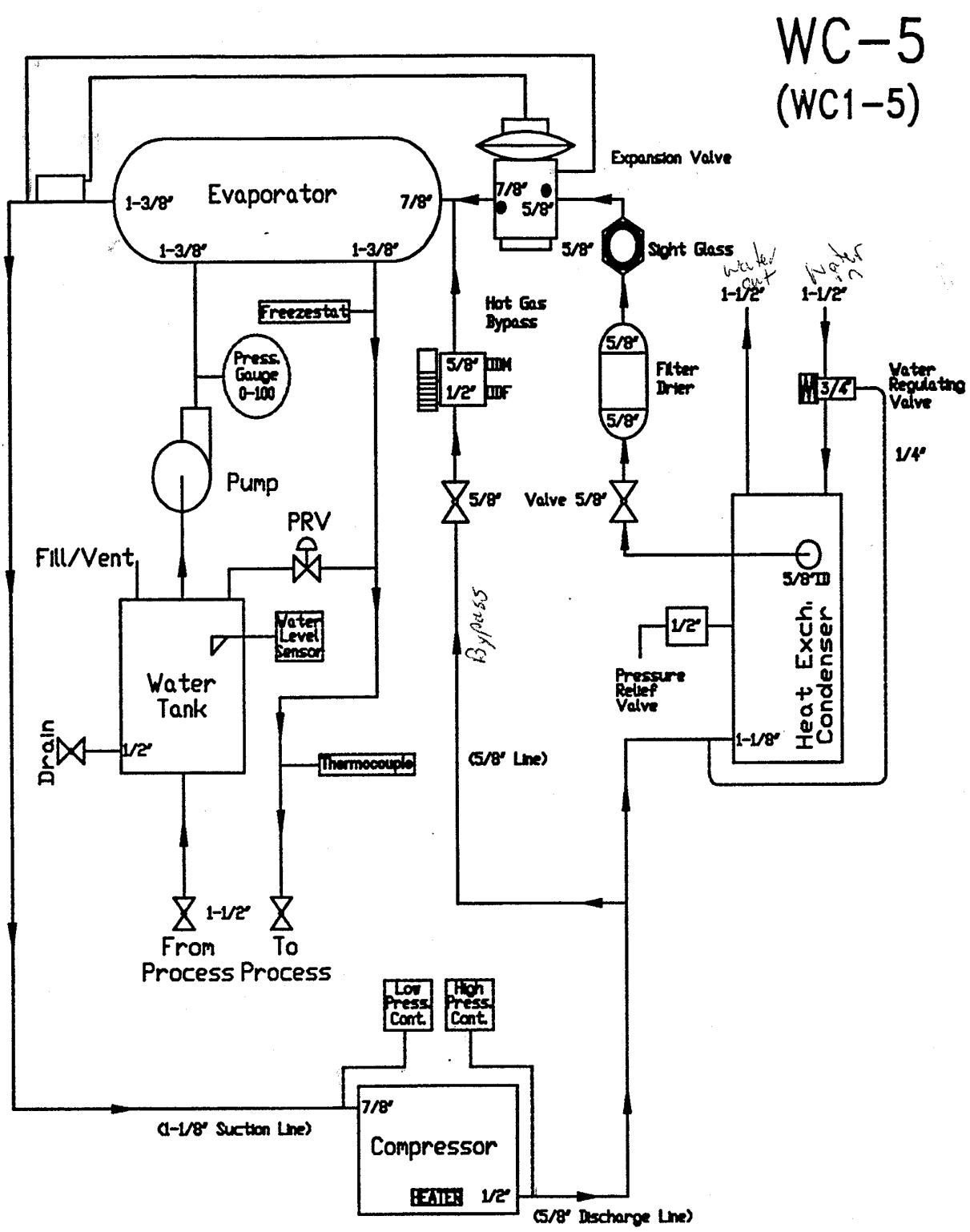
Typical Plumbing Diagrams

AC-5
(AC1-5)

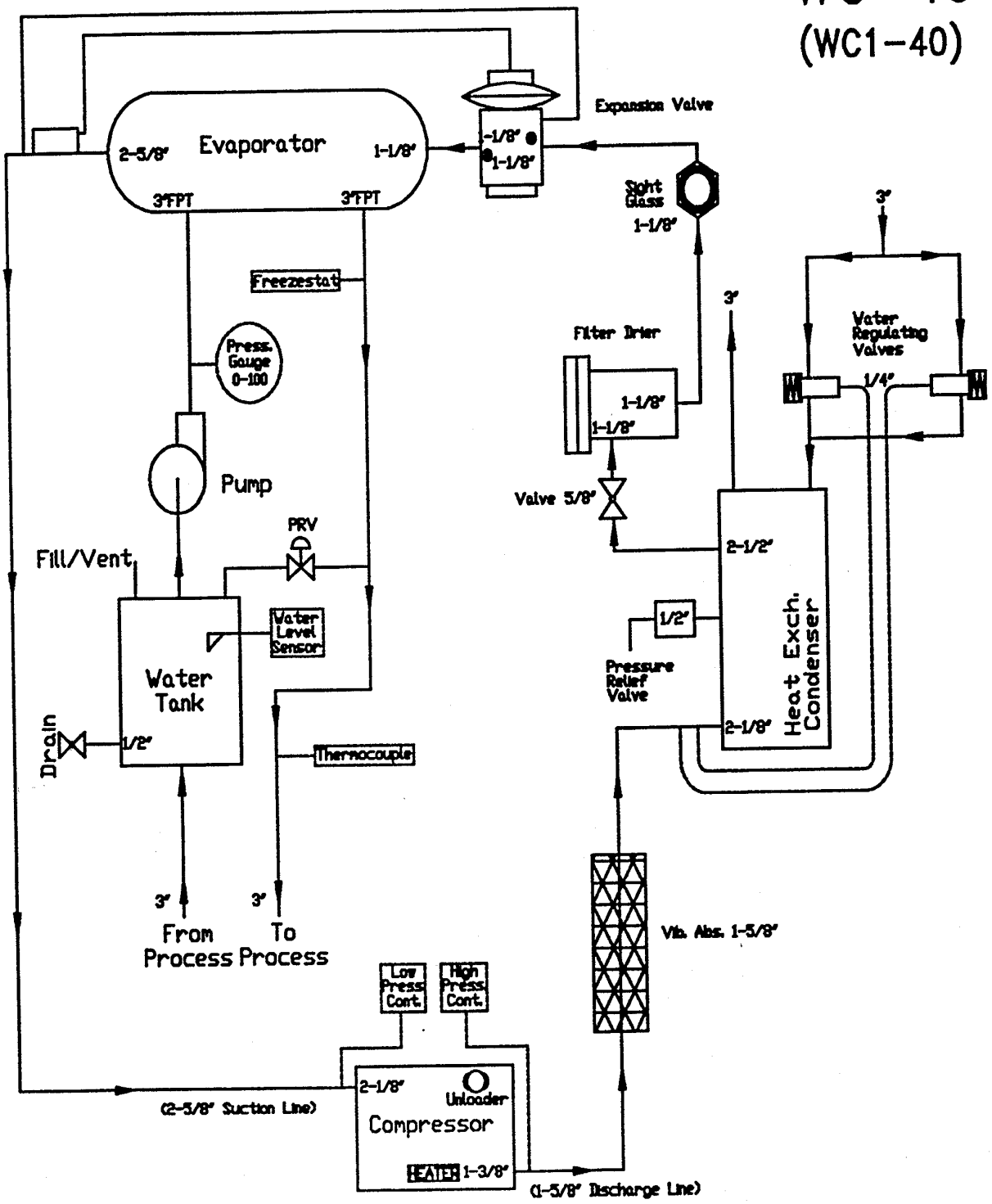

Evaporator
1-3/8"
7/8"
1-3/8"
1-3/8"
Expansion Valve
7/8"
5/8"
5/8"
Sight Glass
Freezestat
Hot Gas Bypass
5/8" MIN
1/2" MIF
5/8"
Filter Drier
5/8"
Press. Gauge 0-100
Pump
Fan Cycling Press. Sw
5/8"
Valve 5/8"
PRV
Fill/Vent
5/8"
Condenser
Water Level Sensor
Water Tank
Drain
1/2"
Thermocouple
(5/8" Line)
5/8"
1/2"
Pressure Relief Valve
1-1/2"
From Process
To Process
Low Press. Cont.
High Press. Cont.
7/8"
(1-1/8" Suction Line)
Compressor
HEATER
1/2"
(5/8" Discharge Line)

AC-20
(AC1-20)


Evaporator
2-1/8"
1-1/8"
3"
3"
Expansion Valve
1-1/8"
7/8"
Sight Glass
7/8"
Freezestat
Press. Gauge 0-100
7/8"
Filter Drier
7/8"
Fan Cycling Press. Sw.
Pump
Valve 7/8"
PRV
Fill/Vent
1-1/8"
Condenser
1-1/8"
Water Level Sensor
Water Tank
Drain
1/2"
Thermocouple
1/2"
Pressure Relief Valve
2-1/2"
From Process
To Process
Low Press. Cont.
High Press. Cont.
Vib. Abs. 1-1/8"
1-5/8
Unloader
Compressor
HEATER
1-1/8"
(1-5/8" Suction Line)
(1-1/8" Discharge Line)

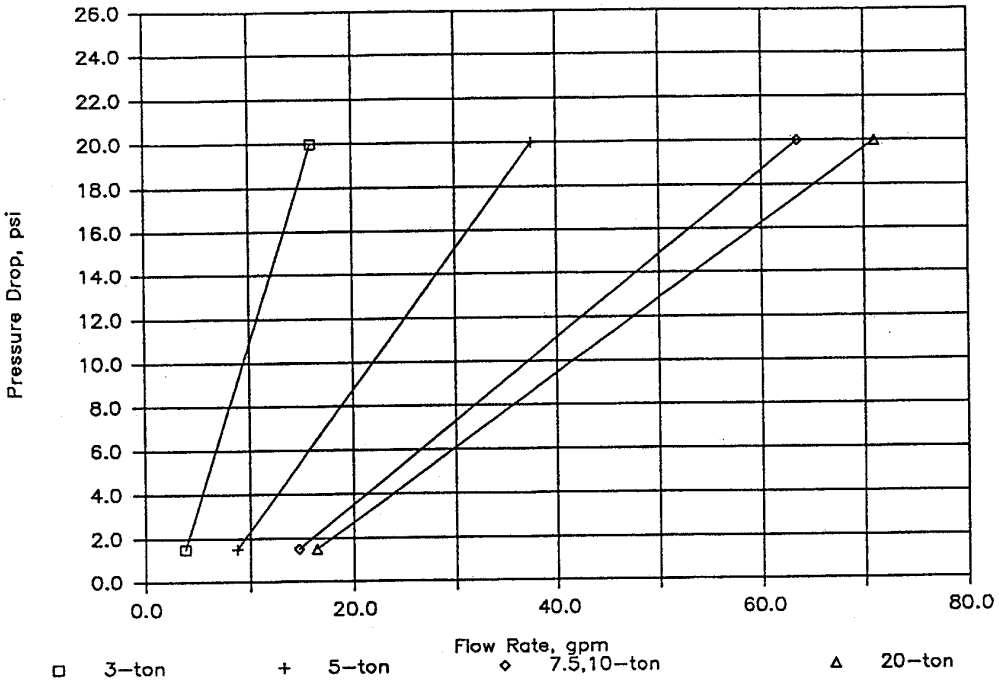

WC-5
(WC1-5)
Evaporator
1-3/8"
7/8"
1-3/8"
1-3/8"
Expansion Valve
7/8"
5/8"
5/8"
Sight Glass
Freezestat
Hot Gas Bypass
Press. Gauge 0-100
5/8"
1/2"
Filter Drier
5/8"
5/8"
1-1/2"
1-1/2"
Water Regulating Valve
3/4"
1/4"
Pump
5/8"
Valve 5/8"
PRV
Fill/Vent
5/8"ID
Water Level Sensor
Water Tank
Heat Exch. Condenser
1/2"
Pressure Relief Valve
Drain
1/2"
Thermocouple
(5/8" Line)
1-1/8"
1-1/2"
From Process
To Process
Low Press. Cont.
High Press. Cont.
7/8"
Compressor
HEATER
1/2"
(1-1/8" Suction Line)
(5/8" Discharge Line)

WC-40
(WC1-40)

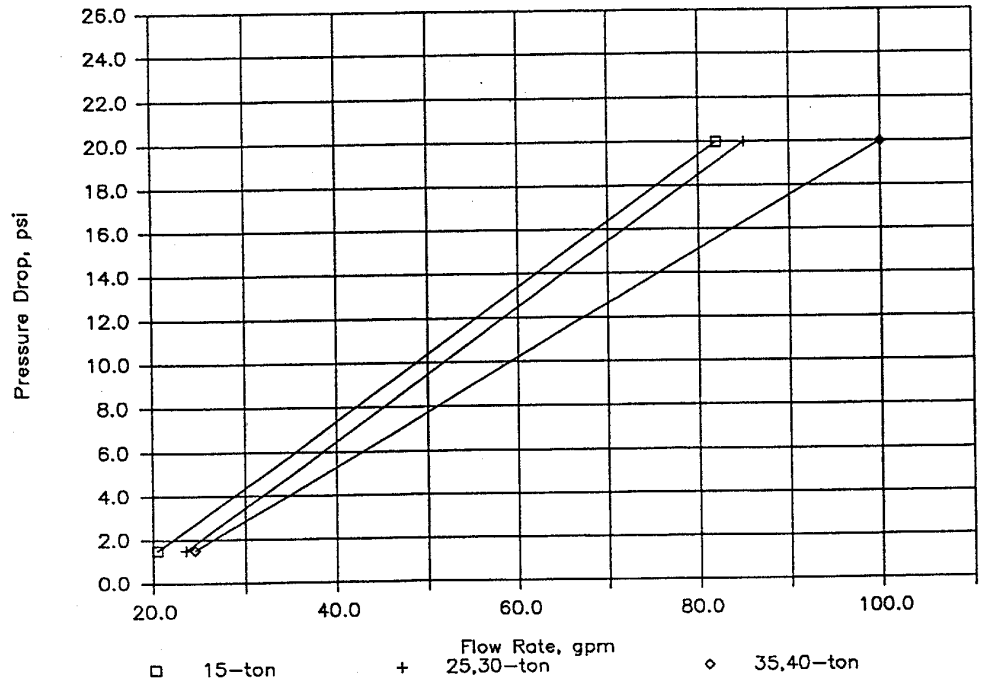

Evaporator
2-5/8"
1-1/8"
3"FPT
3"FPT
Expansion Valve
1-1/8"
1-1/8"
Sight Glass
1-1/8"
3"
Freezestat
Press. Gauge 0-100
Filter Drier
1-1/8"
1-1/8"
3"
Water Regulating Valves
1/4"
Pump
Valve 5/8"
PRV
Fill/Vent
2-1/2"
Water Level Sensor
Water Tank
1/2"
Pressure Relief Valve
Heat Exch. Condenser
2-1/8"
Drain
1/2"
Thermocouple
3"
3"
From Process
To Process
Vib. Abs. 1-5/8"
Low Press Cont.
High Press Cont.
2-1/8"
Unloader
Compressor
HEATER 1-3/8"
(2-5/8" Suction Line)
(1-5/8" Discharge Line)

Technical Information

Evaporator Pressure Drop Data

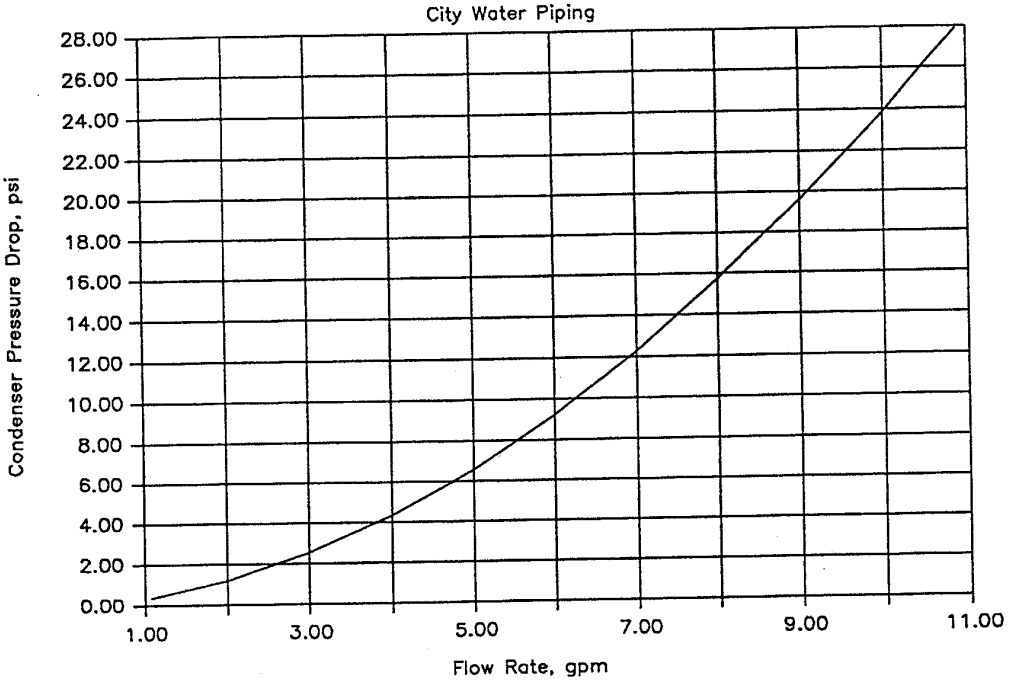


Evaporator Pressure Drop Data



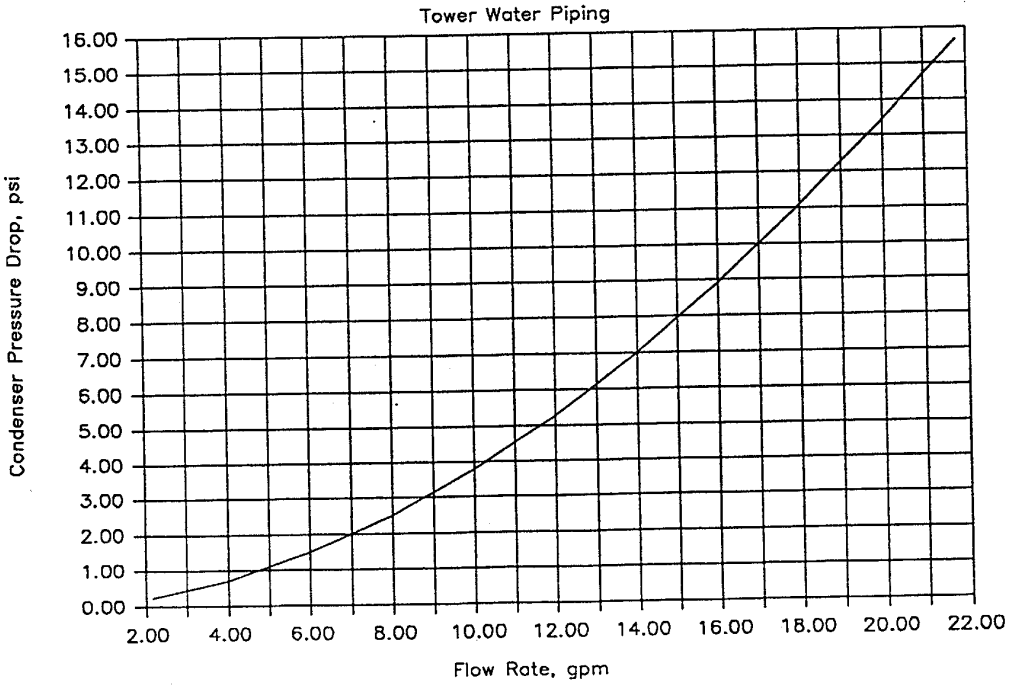
3–ton Portable Chiller

City Water Piping

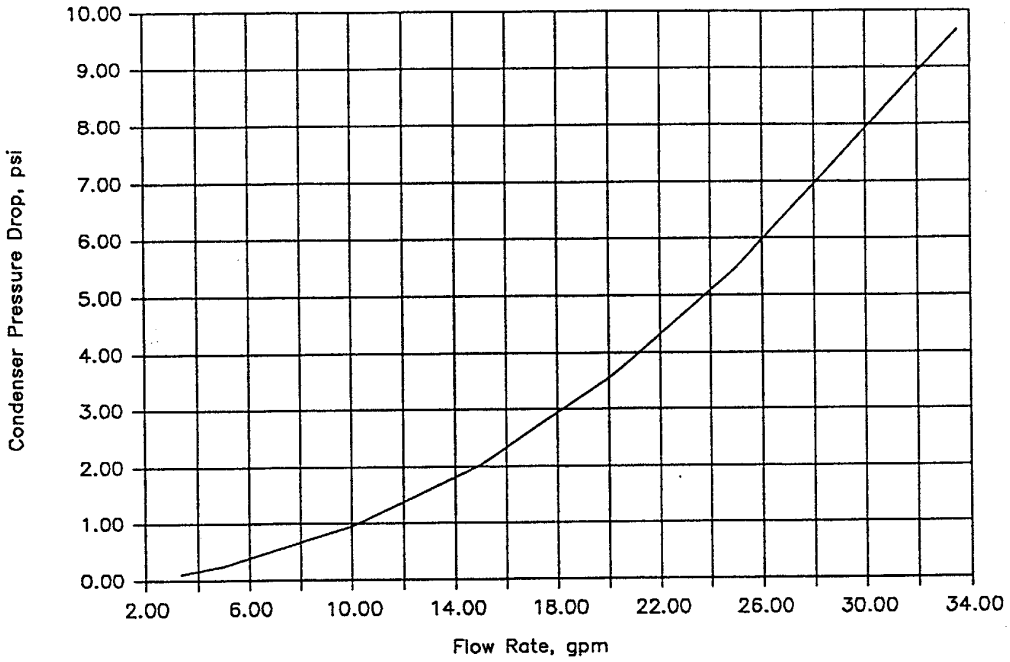


3–ton Portable Chiller

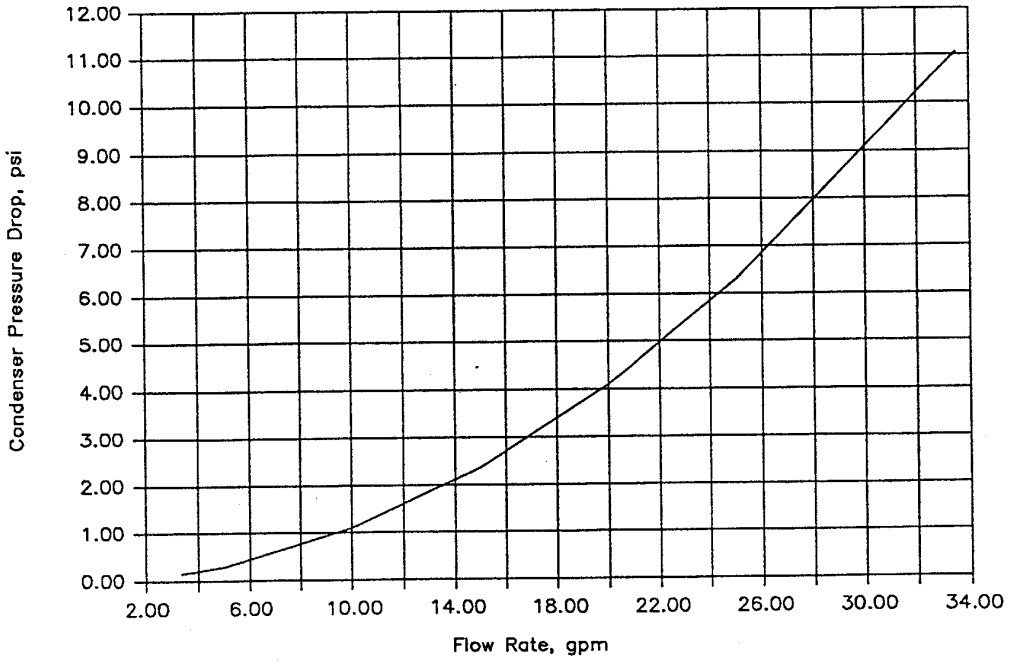
Tower Water Piping



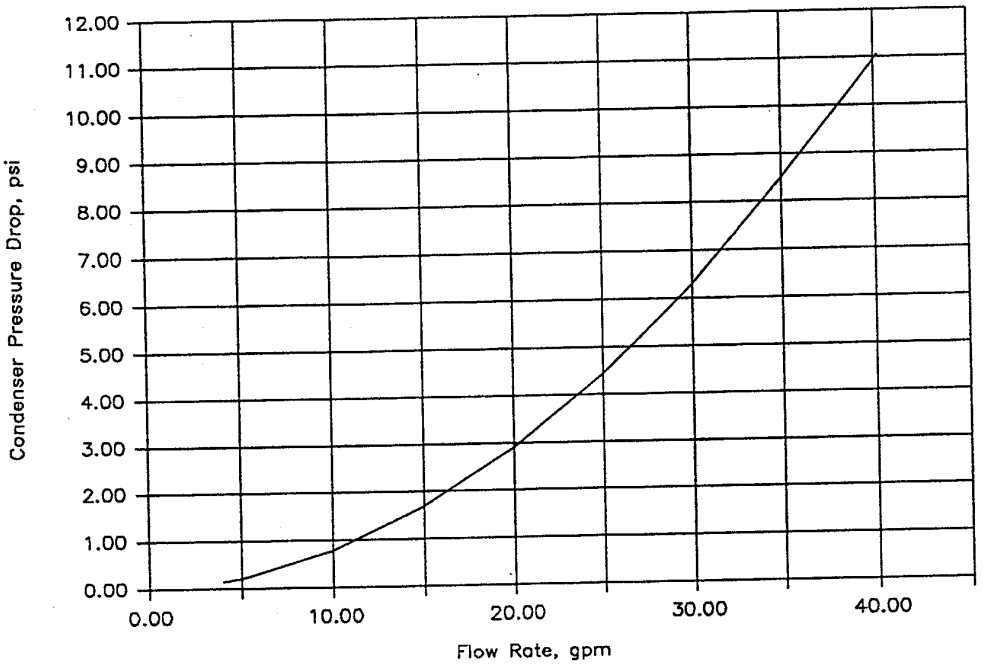
5–ton Portable Chiller



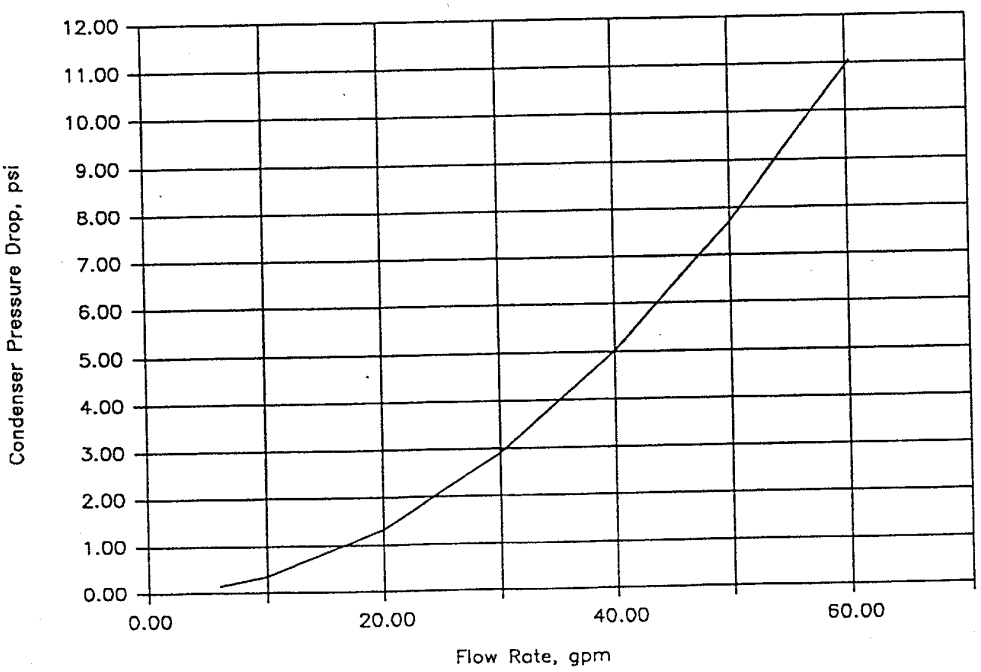
7.5–ton Portable Chiller



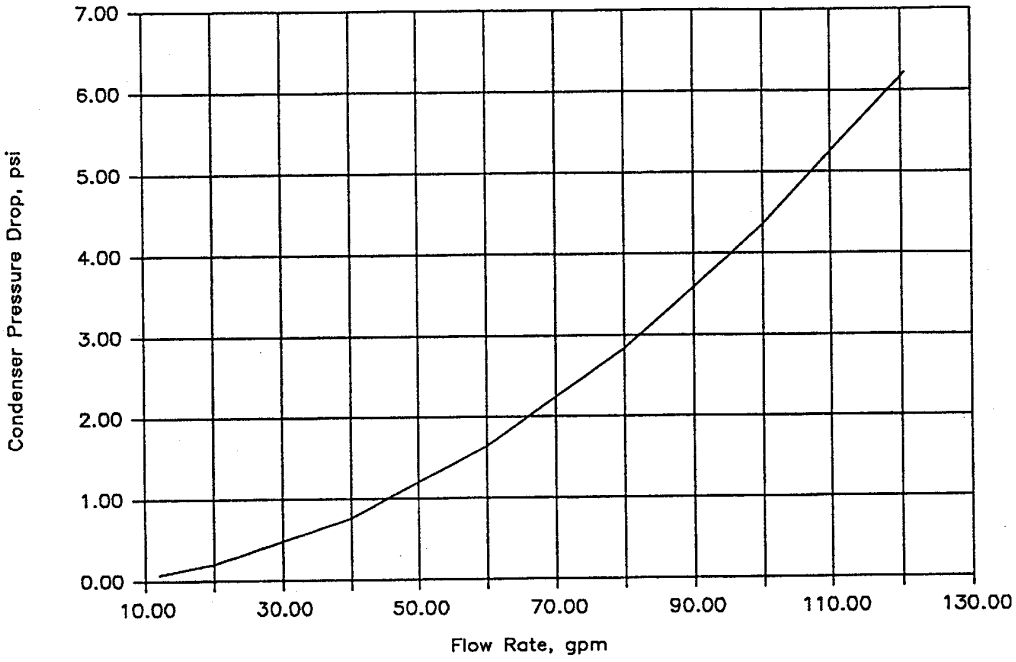
10–ton Portable Chiller



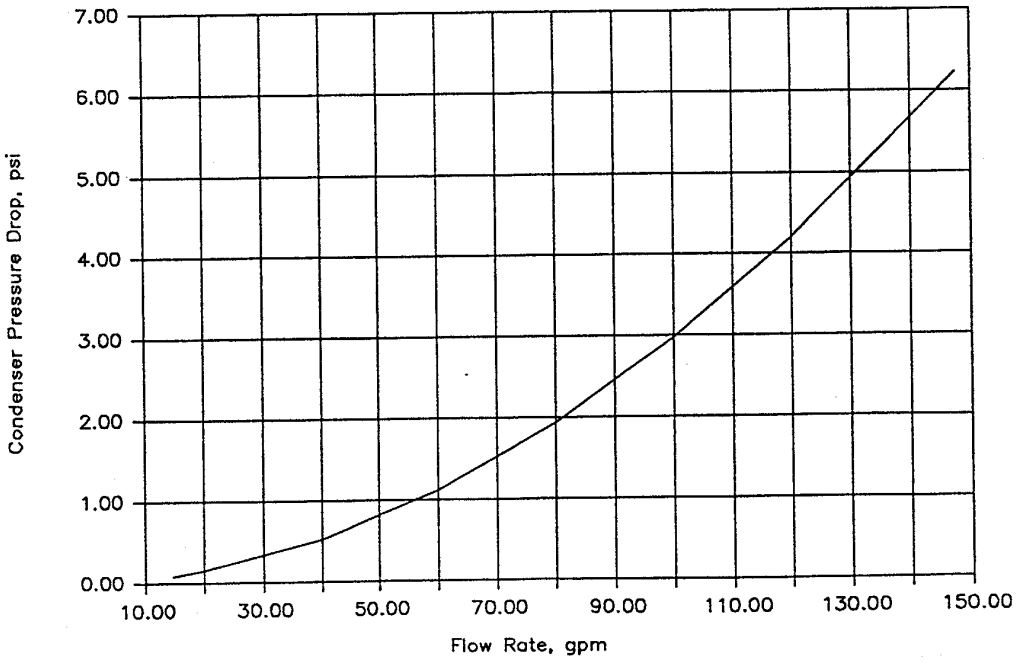
15–ton Portable Chiller



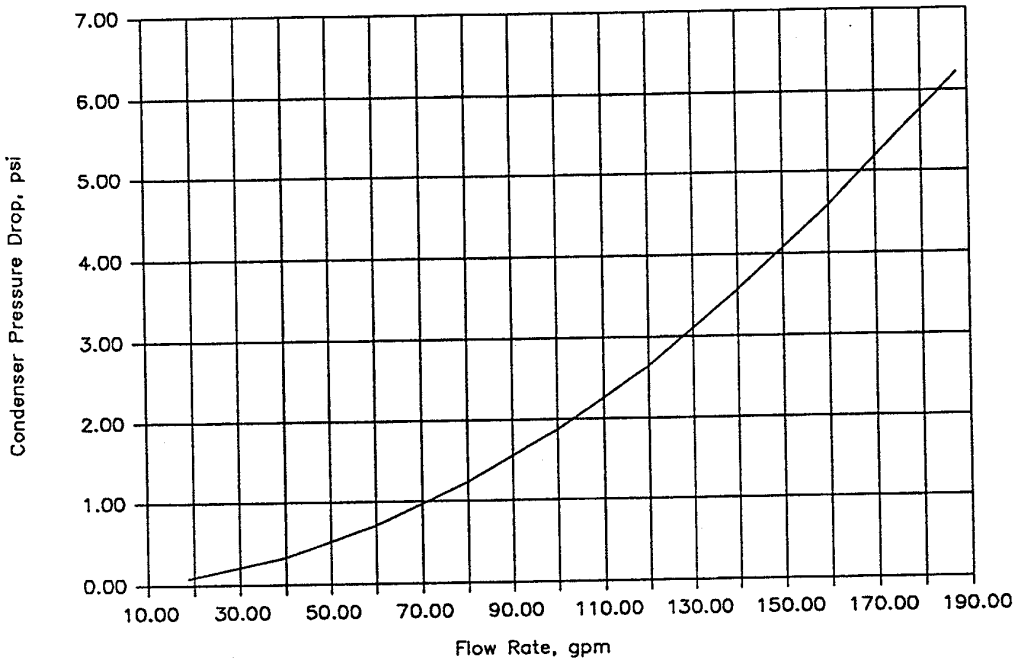
20–ton Portable Chiller



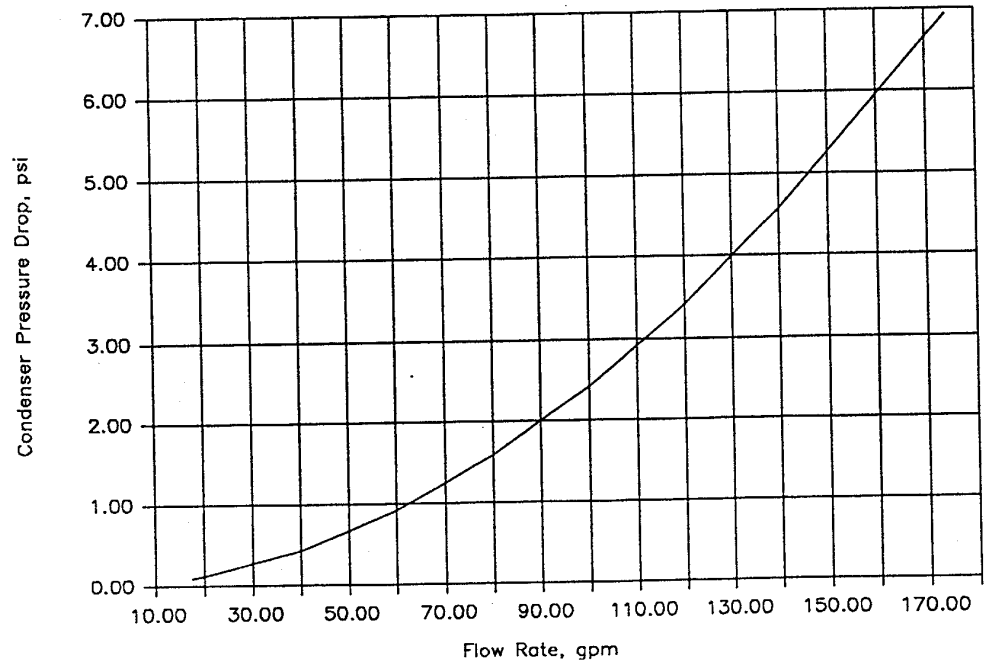
25–ton Portable Chiller



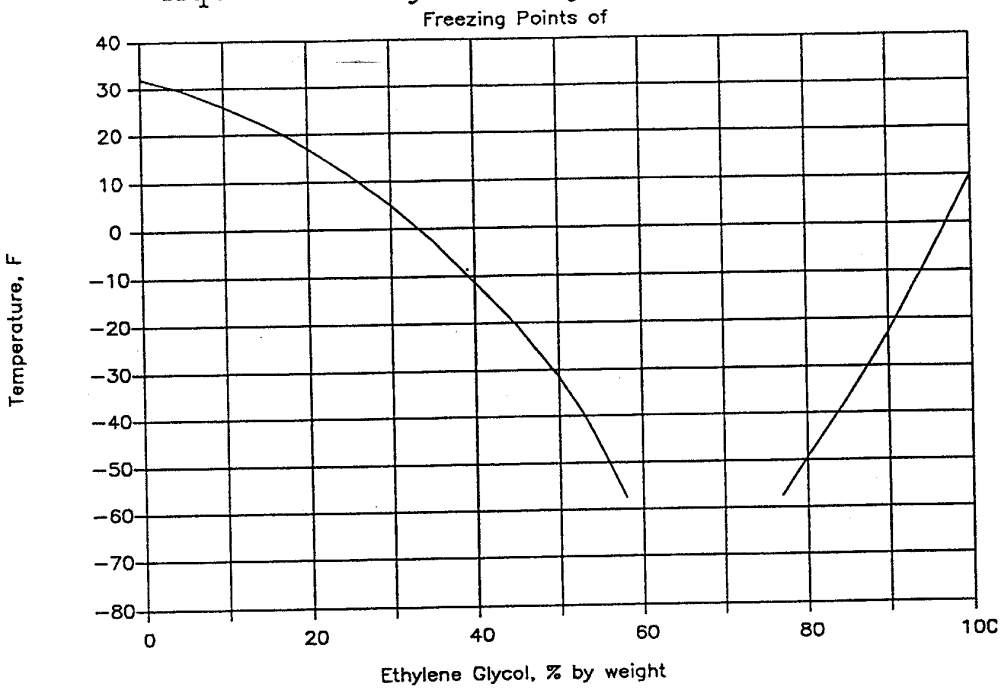
30–ton Portable Chiller



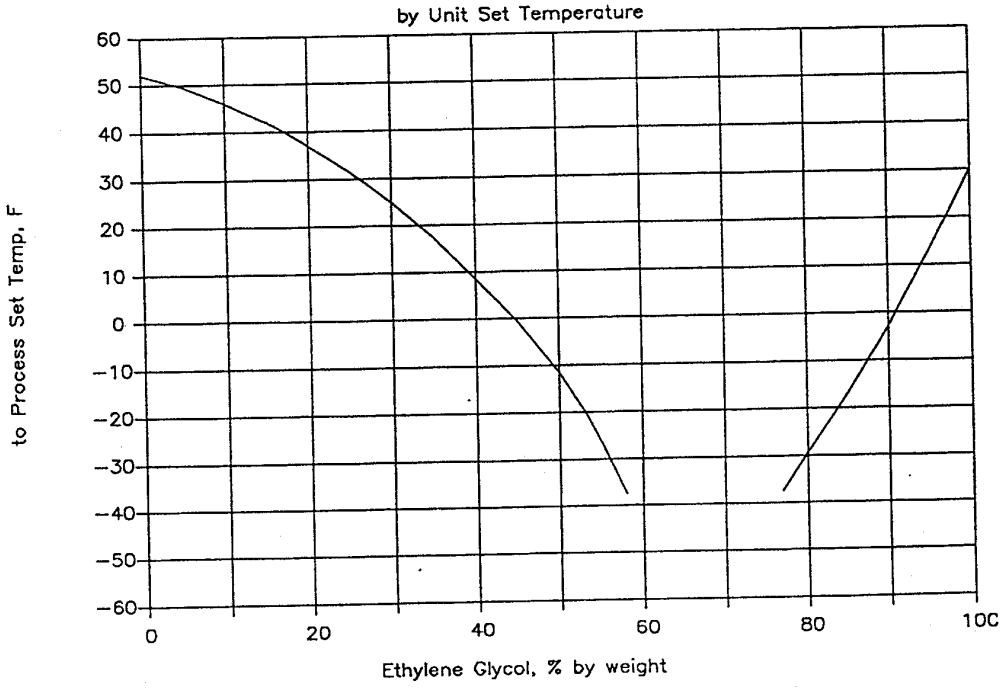
40–ton Portable Chiller



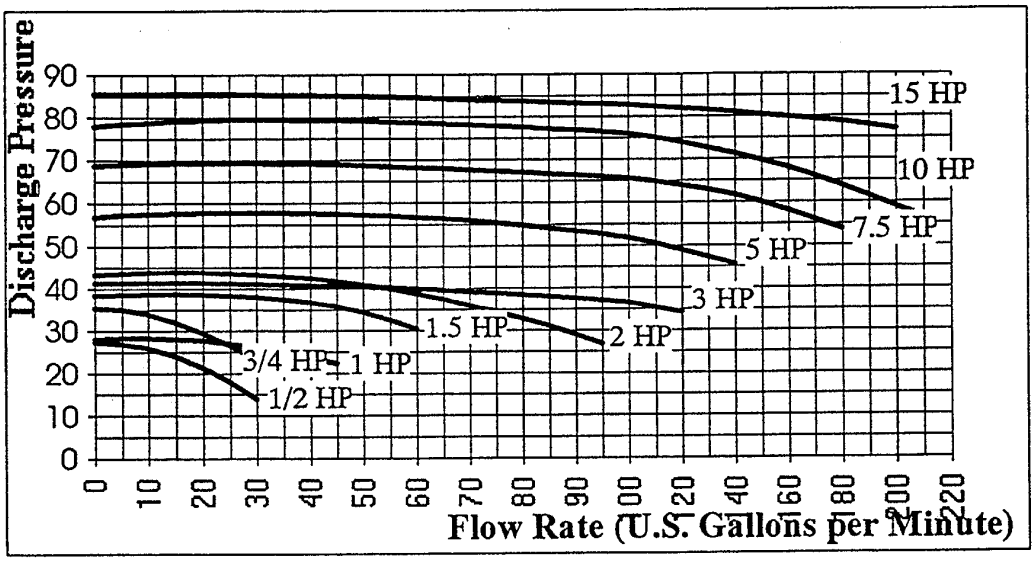
Aqueous Ethylene Glycol Solutions



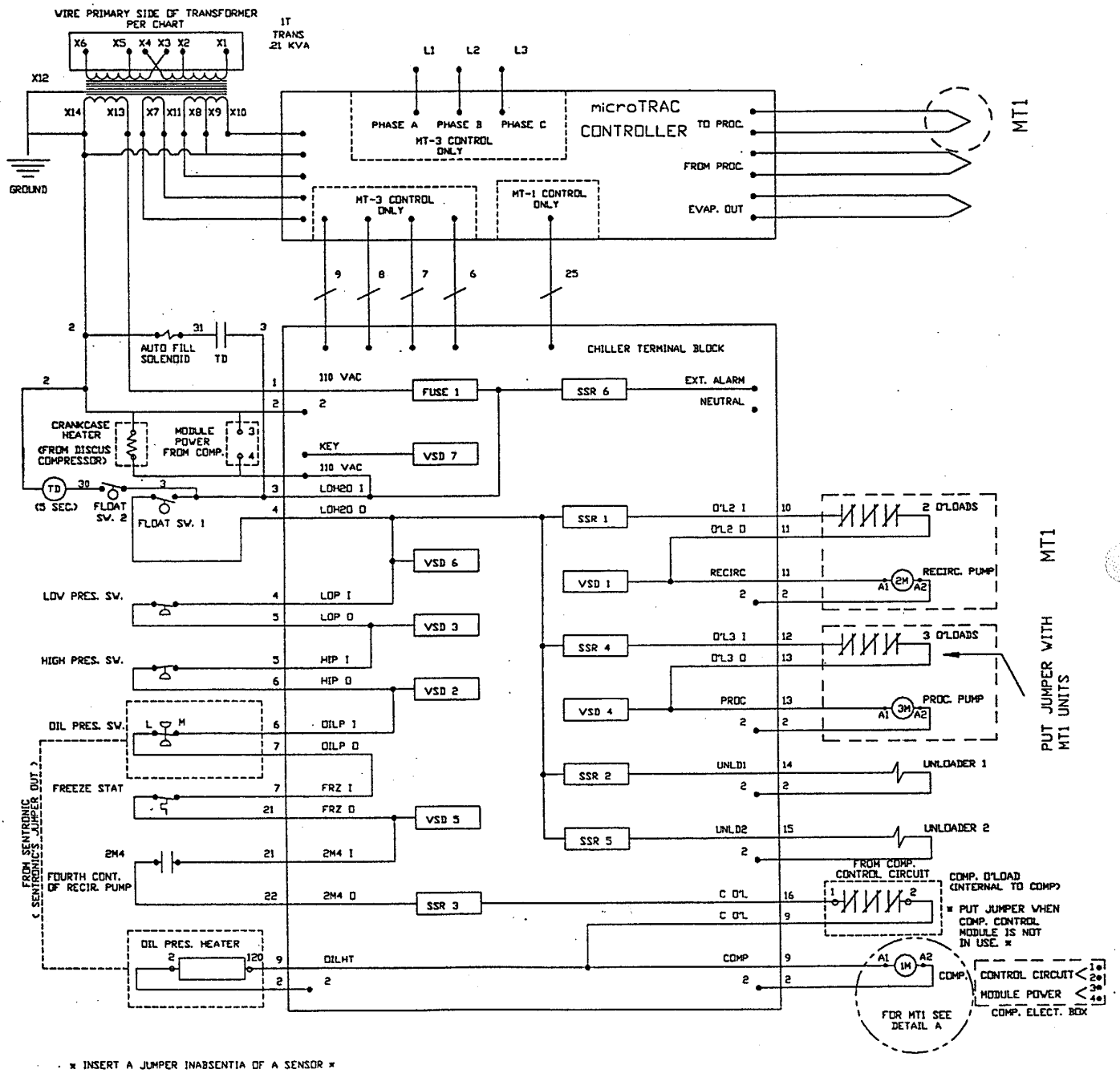
Freeze Protection Requirements



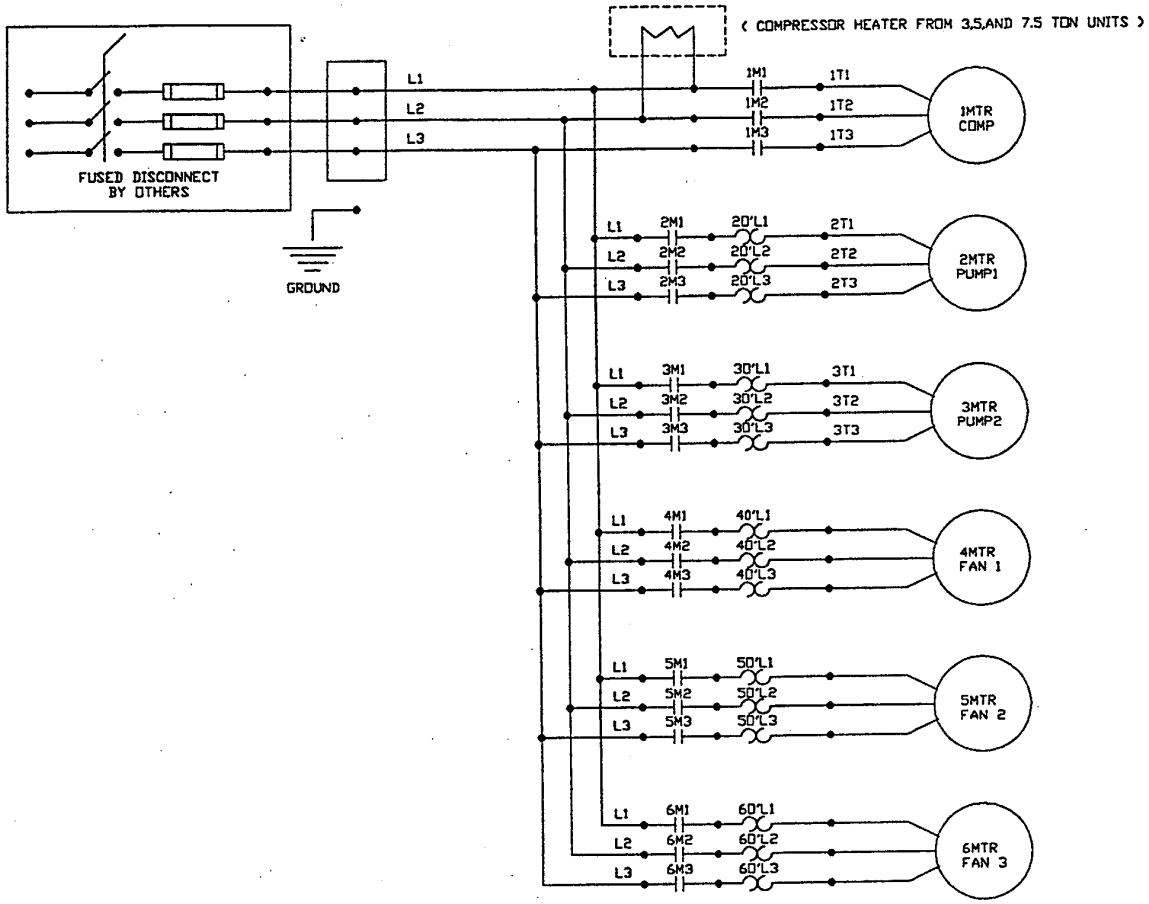
Pump Curve

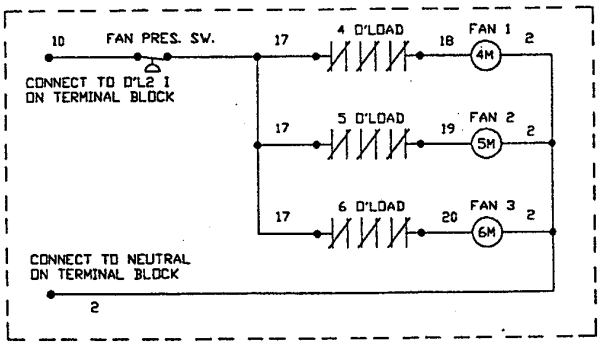

Discharge Pressure
90
80
70
60
50
40
30
20
10
0
15 HP
10 HP
7.5 HP
5 HP
3 HP
2 HP
1.5 HP
1 HP
3/4 HP
1/2 HP
0
10
20
30
40
50
60
70
80
90
100
120
140
160
180
200
220
Flow Rate (U.S. Gallons per Minute)

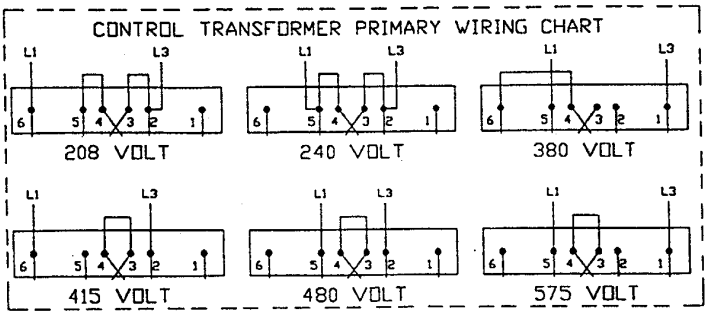
Electrical Schematic

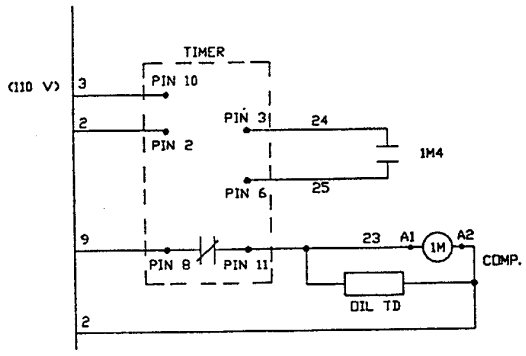


Electrical Schematic









SET TIMER AT H005M

DETAIL A

Parts List

Controls

Operator Panel MT-1 Control	11000580
Operator Panel MT-2 Control	09002779
Graphic Overlay MT-1	11001302
Graphic Overlay MT-2	09002782
Power Cable MT-1	05300321
Power Cable MT-2	05300390
I/O Cable	05300320
Thermocouple	09001207
Chiller Terminal Block	11000511
Control Transformer	11001213
Low Pressure Switch	09001264
High Pressure Switch	09001850
Fan Cycle Switch	09001864
Freezestat	09000782
Oil Pressure Switch / Sensor	09000595
Crankcase Heater (10 ton and up)	09000575
Flow Switch	09000502
Float Switch	09000657
Solenoid Valve (Auto Make up)	09004500
Time Delay Relay (Auto Make up)	09002422
Control Fuse 1A	10001118
Output Fuse 2 1/2A	10001124
Compressor Time Delay	09002119

Contactors

9 AMP	11002215
12 AMP	11002016
18 AMP	09000348
24 AMP	09000349
30 AMP	11002015
38 AMP	09001856
45 AMP	09000596
60 AMP	09001398
75 AMP	09001399
110 AMP	09001400

Overloads

.06 - 1 AMP	09001843
.08 - 1.2 AMP	09001289
1.0 - 1.6 AMP	09001857
1.5 - 2.3 AMP	11002550
2 - 3 AMP	11003215
4 - 6 AMP	11002552
5.5 - 8 AMP	09000344
6 - 10 AMP	09000343
10 - 15 AMP	09000345
16 - 24 AMP	09000346
16 - 24 AMP	09000347
22 - 32 AMP	09001859

Pump / Motor Assemblies (208/230/465) - 575 consult factory

1/3 HP	09001676
1/2 HP	09001005
3/4 HP	09000769
1 HP	09001274
1 1/2 HP	09002369
2 HP	09001071
3 HP	09001275
5 HP	09001291
7 1/2 HP	09002449
10 HP	09002531
15 HP	09001337

Fan Motors

	208/230/460 Volts	575 Volts
3,5 ton (1 req)	09001332	09002427
10 ton (2 req)		
7.5 ton (1 req)	09001745	09002448
15 ton (2 req)		
20 - 1 (3 req)		
20 - 2 ton	09002463	09002464
25 ton	09002485	09002487
30 ton	09001746	09002491
35, 40 ton	09001072	09002499

Evaporators

3 ton	09001677
5 ton	09000805
7 1/2 ton	09001277
10 ton	09001277
20 ton	09001678
25 ton	09001679
30 ton	09001668
35 ton	09001668
40 ton	09001862
	09001862

Condensers

AC 3	09001685
AC 5	09001685
AC 7 1/2	09001687
AC 10	09001288
AC 15	09001686
AC 20	09001688
AC 25	09001550
AC 30	09002492
AC 35	09002492
AC 40	09002402
WC 3	09001689
WC 5	09001690
WC 7 1/2	09001691
WC 10	09001692
WC 15	09001693
WC 20	09001694
WC 25	09002488
WC 30	09002494
WC 35	09002500
WC 40	09002504

Hot GAs Bypass Valves

3 ton	09001669
5 ton	09001270
7 1/2 ton	09004550
10 ton	09002899
15 ton	09002900

Bypass Valve Solenoid

	09004551

Cylinder Unloader Kit (Valve, Solenoid and Gasket)

10 thru 15 ton	09002574
20 thru 40 ton	09002575

Cylinder Unloader (Valve Only)

10 thru 15 ton	09002580
20 thru 40 ton, ALCO	09002578
20 thru 40 ton, Sporlan	09002579

Cylinder Unloader (Solenoid Only)

ALCO	09002576
Sporlan	09002577

Refrigerant Pressure Relief Valves

Water Cooled 350#	09001280
Air Cooled 450#	09001737

Filter Drier

3 ton	09001671
5 ton thru 7 1/2 ton	09018005
10 ton	09001269
15 ton	09018015
20 thru 30 ton	09018020
35, 40 ton Replaceable Cores (2 required)	09001090

Expansion Valves

3 ton	09001672
5 ton	09001266
7 1/2 ton	09001673
10 thru 15 ton	09007015
20 thru 25 ton	09001268
30 thru 35 ton	09002493
40 ton	09001091

Compressors

HP	Voltage	Part #
3	208/230	09000581
	460	09000582
5	208/230	09000583
	460	09000305
	575	09002425
7 1/2	208/230	09000584
	460	09000585
	575	09002450
10	208/230	09000586
	460	09000587
	575	09002446
15	208/230	09000588
	460	09000589
	575	09002453
20	208/230/460	09000590
	575	09002465
25	208/230/460	09000591
	575	09002486
30	208/230/460	09000592
	575	09002490
35	208/230/460	09000593
	575	09002490
40	208/230/460	09002401
	575	09002502

Water Regulating Valves

3 thru 5 ton	09001278
7 1/2 ton	09001814
10 ton	09001813
15 ton	09008015
20 thru 25 ton	09001812
30 thru 35 ton	09001812
40 ton (2 required)	09002495

Miscellaneous

Water Pressure Gauge 0 - 100 #	09030001
Air Filter 28 x 42	09001098
Fan Guard 3 thru 20 - 1 ton	09000261
Blower Belt 20 ton	09002581
(2 per motor required)	
Blower Belt 25 thru 40 ton	09001081
(2 per motor required)	

MICROTRAC CONTROL CALIBRATION

STEP 1: (IF REQUIRED) SELECT AND INSTALL THE APPROPRIATE EPROM

A) **DISCONNECT BOARD FROM POWER SUPPLY**

B) **GROUNDING WRISTSTRAP SHOULD BE WORN.** GROUND YOURSELF BEFORE REMOVING OR INSERTING AN EPROM, BY TOUCHING THE GROUND TEST POINT ON THE BOARD.

C) IF REMOVING AN EPROM GENTLY PRY IT FROM THE BOARD BEING CAREFUL NOT TO BEND ANY PINS. PLACE THE EPROM DIRECTLY IN A STORAGE TUBE OR ON A FLAT CONDUCTIVE PLATE **WITH THE PINS DOWN.**

D) IF INSTALLING AN EPROM REMOVE IT DIRECTLY FROM A STORAGE TUBE AND PLACE IT INTO THE BOARD SOCKET WITH THE NOTCHED END MATCHING THE GRAPHIC NOTCH ON THE BOARD. IF THE EPROM IS ON A FLAT CONDUCTIVE PLATE, **TOUCH THE PLATE BEFORE TOUCHING THE EPROM** AND INSTALL PER ABOVE. ENSURE THAT ALL PINS PROPERLY FIT INTO THEIR APPROPRIATE SOCKET, THEN FIRMLY PUSH INTO THE BOARD.

STEP 2: SELECT THE PROPER DEVICE TYPE FROM THE ATTACHED LIST. THE DEVICE TYPE IS DETERMINED BY THE CONFIGURATION OF THE JUMPER BLOCK LOCATED AT **SW6** (MT-1&2 CONTROLS) OR **SW3** (MT-3 CONTROLS). ENSURE THAT THE PROPER COMBINATION OF **MADE** OR **BROKEN** CONNECTIONS IS SELECTED FOR THE APPLICATION. USE THE SAME INSTALLATION CAUTION AS WITH EPROMS. CONSULT THE **RECAL** COLUMN FROM THE ATTACHED LIST. IF **NO** RECAL GO TO STEP 4. IF RECAL IS **OTHER THAN NO**, GO TO STEP 3.

STEP 3: **WITH POWER DISCONNECTED** MAKE THE CORRECT SOLDER CONNECTIONS USING THE FOLLOWING TABLE;

RECAL	MT-1/2		MT-3	
NUMBER	BROKEN	MADE	BROKEN	MADE
250	NONE	NONE	NONE	NONE
499	JP6, JP10	JP7, JP11	JP5,JP10,JP15	JP6,JP11,JP16
749	JP6, JP10	JP8, JP12	JP5,JP10,JP15	JP7,JP12,JP17

DEVICE	MT-1/2		MT-3	
TYPE	BROKEN	MADE	BROKEN	MADE
OIL/WATER TC	NONE	NONE	JP3	JP1,JP2
CHILLER	JP5	JP18	JP2,JP3	JP1

STEP 4: APPLY POWER TO BOARD AND ALLOW 1/2 HR FOR THE BOARD TEMPERATURE TO STABILIZE BEFORE CALIBRATING. CALIBRATION WILL REQUIRED A GOOD QUALITY VOLTMETER, A **K** TYPE THERMOCOUPLE SIMULATOR AND UP TO THREE THERMOCOUPLE SHORTING JUMPERS, OR BLOCKS.

MICROTRAC 1 CALIBRATION

A) THE CONTROL MUST BE LOOSENED FROM THE PEDESTAL SUPPORT BY REMOVING THE FOUR PHILLIPS HEAD SCREWS SECURING IT, AND FLIP THE BOARD FORWARD TO EXPOSE THE BACK SIDE. DEPRESS THE **TEST** BUTTON **(SW3)** ON THE BACK OF THE BOARD. THE EPROM REVISION NUMBER WILL BE DISPLAYED ON THE CONTROL FACE FOR 8 SECONDS, OR UNTIL ANY OTHER BUTTON IS PRESSED. AFTER 8 SECONDS THE DISPLAY WILL READ **SEL 0**, MEANING THAT TEST NUMBER 0 IS SELECTED. THE TEST NUMBER IS SELECTABLE BY PRESSING THE **RAISE** OR **LOWER** BUTTONS. TO START A TEST, PRESS **START**. TO STOP A TEST, PRESS **STOP**. CALIBRATION IS DONE IN TEST 5.

B) IN TEST 5 **(SEL 5)**, THERE ARE THREE STEPS, EACH DENOTED BY AN **S**, FOLLOWED BY A **NUMBER** ON THE DISPLAY. STEPS ARE SELECTED BY THE **RAISE** AND **LOWER** BUTTONS.

STEP 0 **(S0)**
CONNECT THE VOLTMETER GROUND LEAD TO THE **AGND** TEST POINT ON THE BOARD. CONNECT THE VOLTMETER POSITIVE LEAD TO THE **2.5VREF** TEST POINT ON THE BOARD. ADJUST THE POTENTIOMETER **P5** TO OBTAIN 2.50 VAC +/- 0.01 VOLTS. ADJUST POTENTIOMETER **P3** SO THAT THE **RECAL NUMBER** IS DISPLAYED ON THE CONTROL. IF THIS READING IS NOT STEADY, SET **P3** SO THAT THE DISPLAY TOGGLES BETWEEN THE RECAL NUMBER AND THE NEXT HIGHER NUMBER.

STEP 1 **(S1)**
ADJUST POTENTIOMETER **P4** SO THAT THE DISPLAY READS AMBIENT TEMPERATURE IN **DEGREES F.**

STEP 3 **(S3)** NOTE: THERE IS NO STEP 2.
INSTALL THE **K** TYPE THERMOCOUPLE SIMULATOR ON THERMOCOUPLE CHANNEL 1, **(J1)**. **NO CONNECTION** SHOULD BE MADE ON THERMOCOUPLE CHANNEL 2, **(J2)**. POTENTIOMETER **P6** IS THE THERMOCOUPLE GAIN. POTENTIOMETER **P7** IS THE THERMOCOUPLE OFFSET.
ADJUST P6 AND P7 INDEPENDENTLY WHILE SIMULATING THE **CAL TEMP LOW** AND **CAL TEMP HI** VALUES PER THE ATTACHED TABLE. THIS MAY REQUIRE 2 OR 3 ITERATIONS TO ACCURATELY ESTABLISH THE CALIBRATION SINCE THE POTENTIOMETERS DO INTERACT.
WITH THE VOLTMETER NEGATIVE LEAD STILL CONNECTED TO **AGND** CONNECT THE POSITIVE LEAD TO THE **DERIVATIVE** TEST POINT ON THE BOARD. SIMULATE A 50 F TEMPERATURE AND ALLOW THE BOARD TO STABILIZE FOR AT LEAST ONE MINUTE. ADJUST POTENTIOMETER **P2** TO OBTAIN THE BEST **ZERO VOLTS** READING. REPEAT WITH SIMULATED 200 F TEMPERATURE, WAITING AGAIN ONE MINUTE FOR STABILIZATION.

CALIBRATION IS COMPLETE

MICROTRAC 2 CALIBRATION

A) THE CONTROL MUST BE LOOSENED FROM THE PEDESTAL SUPPORT BY REMOVING THE FOUR PHILLIPS HEAD SCREWS SECURING IT, AND FLIP THE BOARD FORWARD TO EXPOSE THE BACK SIDE. DEPRESS THE **TEST** BUTTON **(SW3)** ON THE BACK OF THE BOARD. THE EPROM REVISION NUMBER WILL BE DISPLAYED ON THE CONTROL FACE FOR 8 SECONDS, OR UNTIL ANY OTHER BUTTON IS PRESSED. AFTER 8 SECONDS THE DISPLAY WILL READ **SEL 0**, MEANING THAT TEST NUMBER 0 IS SELECTED. THE TEST NUMBER IS SELECTABLE BY PRESSING THE **RAISE** OR **LOWER** BUTTONS. TO START A TEST, PRESS **START**. TO STOP A TEST, PRESS **STOP**. CALIBRATION IS DONE IN TEST 5.

B) IN TEST 5 **(SEL 5)**, THERE ARE FOUR STEPS, EACH DENOTED BY AN **S**, FOLLOWED BY A **NUMBER** ON THE DISPLAY. STEPS ARE SELECTED BY THE **RAISE** AND **LOWER** BUTTONS.

STEP 0 **(S0)**
CONNECT THE VOLTMETER GROUND LEAD TO THE **AGND** TEST POINT ON THE BOARD. CONNECT THE VOLTMETER POSITIVE LEAD TO THE **2.5VREF** TEST POINT ON THE BOARD. ADJUST THE POTENTIOMETER **P3** TO OBTAIN 2.50 VAC +/- 0.01 VOLTS. ADJUST POTENTIOMETER **P4** SO THAT THE **RECAL NUMBER** IS DISPLAYED ON THE CONTROL. IF THIS READING IS NOT STEADY, SET **P4** SO THAT THE DISPLAY TOGGLES BETWEEN THE RECAL NUMBER AND THE NEXT HIGHER NUMBER.

STEP 1 **(S1)**
ADJUST POTENTIOMETER **P9** SO THAT THE DISPLAY READS AMBIENT TEMPERATURE IN **DEGREES F.**

STEP 3 **(S3)** NOTE: THERE IS NO STEP 2.
INSTALL THE **K** TYPE THERMOCOUPLE SIMULATOR ON THERMOCOUPLE CHANNEL 2, **(J2). NO CONNECTION** SHOULD BE MADE ON THERMOCOUPLE CHANNEL 1, **(J1).** POTENTIOMETER **P8** IS THE THERMOCOUPLE CHANNEL 2 GAIN. POTENTIOMETER **P6** IS THE THERMOCOUPLE CHANNEL 2 OFFSET.
ADJUST P8 AND P6 INDEPENDENTLY WHILE SIMULATING THE **CAL TEMP LOW** AND **CAL TEMP HI** VALUES PER THE ATTACHED TABLE. THIS MAY REQUIRE 2 OR 3 ITERATIONS TO ACCURATELY ESTABLISH THE CALIBRATION SINCE THE POTENTIOMETERS DO INTERACT.

STEP 4 **(S4)**
INSTALL THE **K** TYPE THERMOCOUPLE SIMULATOR ON THERMOCOUPLE CHANNEL 1, **(J1). NO CONNECTION** SHOULD BE MADE ON THERMOCOUPLE CHANNEL 2, **(J2).** POTENTIOMETER **P7** IS THE THERMOCOUPLE CHANNEL 1 GAIN. POTENTIOMETER **P5** IS THE THERMOCOUPLE CHANNEL 1 OFFSET.
ADJUST P7 AND P5 INDEPENDENTLY WHILE SIMULATING THE **CAL TEMP LOW** AND **CAL TEMP HI** VALUES PER THE ATTACHED TABLE. THIS MAY REQUIRE 2 OR 3 ITERATIONS TO ACCURATELY ESTABLISH THE CALIBRATION SINCE THE POTENTIOMETERS DO INTERACT.
WITH THE VOLTMETER NEGATIVE LEAD STILL CONNECTED TO **AGND** CONNECT THE POSITIVE LEAD TO THE **DERIVATIVE** TEST POINT ON THE BOARD. THE THERMOCOUPLE SIMULATOR SHOULD BE CONNECTED TO CHANNEL 1 **(J1)**, AND A SHORTING JUMPER, OR BLOCK SHOULD BE INSTALLED ON CHANNEL 2 **(J2)**. CONNECT

A JUMPER WIRE ACROSS **R19**. SIMULATE A 50 F TEMPERATURE AND ALLOW BOARD TO STABILIZE FOR AT LEAST ONE MINUTE. ADJUST POTENTIOMETER **P1** TO OBTAIN THE BEST **ZERO VOLTS** READING. REMOVE THE **R19** JUMPER. REPEAT WITH SIMULATED 200 F TEMPERATURE, WAITING AGAIN ONE MINUTE FOR STABILIZATION.

CALIBRATION IS COMPLETE

MICROTRAC 3 CALIBRATION

A) ACCESS THE CONTROL MOTHERBOARD LOCATED ON THE ELECTRICAL ENCLOSURE DOOR. WITH **POWER OFF** , PLACE SWITCH 1 OF THE 8-SWITCH BANK **SW2** IN THE **ON** POSITION. APPLY POWER. THE EPROM REVISION NUMBER WILL BE DISPLAYED ON THE OPERATOR INTERFACE PANEL FOR 8 SECONDS, OR UNTIL ANY OTHER BUTTON IS PRESSED. AFTER 8 SECONDS THE DISPLAY WILL READ **SEL 0**, MEANING THAT TEST NUMBER 0 IS SELECTED. THE TEST NUMBER IS SELECTABLE BY PRESSING THE **RAISE** OR **LOWER** BUTTONS. TO START A TEST PRESS **START**. TO STOP A TEST, PRESS **STOP**. CALIBRATION IS DONE IN STEP 9.

B) IN TEST 9 (SEL9), THERE ARE FIVE STEPS, EACH DENOTED BY AN **S**, FOLLOWED BY A **NUMBER** ON THE DISPLAY. STEPS ARE SELECTED BY THE RAISE AND LOWER BUTTONS.

STEP 0 **(S0)**
CONNECT THE VOLTMETER GROUND LEAD TO THE **AGND** TEST POINT ON THE BOARD. CONNECT THE VOLTMETER POSITIVE LEAD TO THE **2.5VREF** TEST POINT ON THE BOARD. ADJUST THE POTENTIOMETER **P4** TO OBTAIN 2.50 VAC +/- 0.01 VOLTS. ADJUST POTENTIOMETER **P11** SO THAT THE **RECAL NUMBER** IS DISPLAYED ON THE CONTROL. IF THIS READING IS NOT STEADY, SET **P11** SO THAT THE DISPLAY TOGGLES BETWEEN THE RECAL NUMBER AND THE NEXT HIGHER NUMBER.

STEP 1 **(S1)**
ADJUST POTENTIOMETER **P3** SO THAT THE DISPLAY READS AMBIENT TEMPERATURE IN **DEGREES F.**

STEP 2 **(S2)**
INSTALL THE **K** TYPE THERMOCOUPLE SIMULATOR ON THERMOCOUPLE CHANNEL 3, **(J5)**. **NO CONNECTIONS** SHOULD BE MADE ON THERMOCOUPLE CHANNELS 2 **(J4)** OR 1 **(J3)**. POTENTIOMETER **P9** IS THE THERMOCOUPLE CHANNEL 3 GAIN. POTENTIOMETER **P10** IS THE THERMOCOUPLE CHANNEL 3 OFFSET. ADJUST **P9** AND **P10** INDEPENDENTLY WHILE SIMULATING THE **CAL TEMP LOW** AND **CAL TEMP HI** VALUES PER THE ATTACHED TABLE. THIS MAY REQUIRE 2 OR 3 ITERATIONS TO ACCURATELY ESTABLISH THE CALIBRATION SINCE THE POTENTIOMETERS DO INTERACT.

STEP 3 **(S3)**
INSTALL THE **K** TYPE THERMOCOUPLE SIMULATOR ON THERMOCOUPLE CHANNEL 2, **(J4)**. **NO CONNECTIONS** SHOULD BE MADE ON THERMOCOUPLE CHANNELS 1 **(J3)** OR 3 **(J5)**. POTENTIOMETER **P7** IS THE THERMOCOUPLE CHANNEL 2 GAIN. POTENTIOMETER **P8** IS THE THERMOCOUPLE CHANNEL 2 OFFSET. ADJUST **P7** AND **P8** INDEPENDENTLY WHILE SIMULATING THE **CAL TEMP LOW** AND **CAL TEMP HI** VALUES PER THE ATTACHED TABLE. THIS MAY REQUIRE 2 OR 3 ITERATIONS TO ACCURATELY ESTABLISH THE CALIBRATION SINCE THE POTENTIOMETERS DO INTERACT.

STEP 4 (S4)

INSTALL THE **K** TYPE THERMOCOUPLE SIMULATOR ON THERMOCOUPLE CHANNEL 1, **(J3). NO CONNECTIONS** SHOULD BE MADE ON THERMOCOUPLE CHANNELS 2 **(J4)** OR 3 **(J5)**. POTENTIOMETER **P5** IS THE THERMOCOUPLE CHANNEL 1 GAIN. POTENTIOMETER **P6** IS THE THERMOCOUPLE CHANNEL 1 OFFSET. ADJUST **P5** AND **P6** INDEPENDENTLY WHILE SIMULATING THE **CAL TEMP LOW** AND **CAL TEMP HI** VALUES PER THE ATTACHED TABLE. THIS MAY REQUIRE 2 OR 3 ITERATIONS TO ACCURATELY ESTABLISH THE CALIBRATION SINCE THE POTENTIOMETERS DO INTERACT.

WITH THE VOLTMETER NEGATIVE LEAD STILL CONNECTED TO **AGND** CONNECT THE POSITIVE LEAD TO THE **DERIVATIVE** TEST POINT ON THE BOARD. THE THERMOLATOR SIMULATOR SHOULD BE CONNECTED TO CHANNEL 1 **(J3)**, AND SHORTING JUMPERS, OR BLOCKS SHOULD BE INSTALLED ON CHANNELS 2 **(J4)** AND 3 **(J5)**. CONNECT A JUMPER WIRE ACROSS **R9**. REMOVE THE JUMPER BLOCK FROM **JP2**. **JP1** SHOULD REMAIN JUMPED. SIMULATE A 50 F TEMPERATURE AND ALLOW THE BOARD TO STABILIZE FOR AT LEAST ONE MINUTE. ADJUST POTENTIOMETER **P2** TO OBTAIN THE BEST ZERO VOLTS READING. REMOVE THE **R9** JUMPER. REPEAT WITH SIMULATED 200 F TEMPERATURE, WAITING AGAIN ONE MINUTE FOR STABILIZATION. REPLACE JUMPER BLOCK ON **JP2**.

CALIBRATION IS COMPLETE

DEVICE TYPES SUPPORTED BY REVISION H20.014

X=DON'T CARE
1=MADE
0=BROKEN

STD = Standard
PCHL = Port. chiller

DEVICE # BINARY	DEV. DEC.	DEVICE TYPE	TEMP RANGE	RECAL #	CAL LOW	CAL HI	GENERAL COMMENTS
XX111111	0	NOT VALID					
XX111110	1	MT-3 WTCU	32-180	NO	50	200	TC-TCC,STD
XX111101	2	MT-3 WTCU	32-250	NO	50	250	TC-DI,STD
XX111100	3	MT-3 PCHL	20-65	250	0	100	PCHL,STD
XX111011	4	MT-3 PCHL	-20-(+30)	250	0	100	PCHL,LT1
XX111010	5	MT-1/2 WTCU	32-180	NO	50	200	TC-TCC,STD
XX111001	6	MT-1/2 WTCU	32-250	NO	50	250	TC-DI,STD
XX111000	7	MT-1/2 PCHL	20-65	250	0	100	PCHL,STD
XX110111	8	MT-1/2 PCHL	-20-(+30)	250	0	100	PCHL,LT1
XX110110	9	MT-1/2 WTCU	0-82 C	NO	50	200	TC-TCC,METRIC
XX110101	10	MT-1/2 WTCU	0-120 C	NO	50	250	TC-DI,METRIC
XX110100	11	MT-1/2 PCHL	0-18 C	250	0	100	PCHL,METRIC
XX110011	12	MT-1/2 PCHL	-28-(+0) C	250	0	100	PCHL,LT1,MET
XX110010	13	MT-3 WTCU	-20-(+150)	250	0	150	TC-DI,LT2
XX110001	14	MT-3 WTCU	-20-(+150)	250	0	150	TC-DI,LT2,NO HT
XX110000	15	MT-1/2 WTCU	-20-(+150)	250	0	150	TC-DI,LT2
XX101111	16	MT-1/2 WTCU	-20-(+150)	250	0	150	TC-DI,LT2,NO HT
XX101110	17	MT-3 WTCU	32-180	NO	50	200	TC-DI,LT1,EX PRG
XX101101	18	MT-3 WTCU	32-250	NO	50	250	TC-DI,EX PURGE
XX101100	19	MT-1/2 BFC	35-60	250	0	100	BFC,STD
XX101011	20	MT-1/2 BFC	32-180	250	50	200	BFC,EX RANGE
XX101010	21	MT-3 WTCU	32-300	499	50	300	TC-DI,HT3
XX101001	22	MT-3 OIL	70-400	499	50	400	TC400,STD
XX101000	23	MT-3 OIL	70-500	499	50	500	TC500,STD
XX100111	24	MT-3 OIL	70-600	740	50	500	TC600,STD
XX100110	25	MT-3 OIL	70-400	499	50	400	TC400,NO COOL
XX100101	26	MT-3 OIL	70-500	499	50	500	TC500,NO COOL
XX100100	27	MT-3 OIL	70-600	749	50	500	TC600,NO COOL
XX100011	28	MT-1/2 WTCU	32-300	499	50	300	TC-DI,HT3
XX100010	29	MT-1/2 WTCU	0-149 C	499	50	300	TC-DI,HT3 METRIC
XX100001	30	MT-1/2 OIL	70-400	499	50	400	TC400,STD
XX100000	31	MT-1/2 OIL	70-500	499	50	500	TC500,STD

CONTINUED NEXT PAGE

X=DON'T CARE
1=MADE
0=BROKEN

DEVICE # BINARY	DEV. DEC.	DEVICE TYPE	TEMP RANGE	RECAL #	CAL LOW	CAL HI	GENERAL COMMENTS
XX011111	32	MT-1/2 OIL	70-600	749	50	500	TC600,STD
XX011110	33	MT-1/2 OIL	70-400	499	50	400	TC400,METRIC
XX011101	34	MT-1/2 OIL	70-500	499	50	500	TC500,METRIC
XX011100	35	MT-1/2 OIL	70-600	749	50	500	TC600,METRIC
XX011011	36	MT-3 WTCU	32-180	NO	50	200	TC-TCC,RAMP
XX011010	37	MT-3 WTCU	32-250	NO	50	250	TC-DI,RAMP
XX011001	38	MT-1/2 OIL	70-400	499	50	400	TC400,NO COOL
XX011000	39	MT-1/2 OIL	70-500	499	50	500	TC500,NO COOL
XX010111	40	MT-1/2 OIL	70-600	749	50	500	TC600,NO COOL
XX010110	41	MT-1/2 OIL	70-400	499	50	400	TC400,NO CL,MET
XX010101	42	MT-1/2 OIL	70-500	499	50	500	TC500,NO CL,MET
XX010100	43	MT-1/2 OIL	70-600	749	50	500	TC600,NO CL,MET
XX010011	44	MT-3 WTCU	0-140 C	499	50	300	TC-DI,HT2,METRIC
XX010010	45	MT-1/2 WTCU	0-140 C	499	50	300	TC-DI,HT2,METRIC
XX010001	46	MT-1/2 WTCU	0-140 C	499	50	300	TC-DI,HARMO
XX0f0000	47	MT-3 WTCU	0-140 C	499	50	300	TC-DI,HARMO,X PG
XX001111	48	MT-3 WTCU	0-140 C	499	50	300	TC-DI,HT2,MET,RMP
XX001110	49	MT-3 WTCU	32-200	NO	50	200	TC-TCC,HT1
XX001101	50	MT-1/2 WTCU	32-200	NO	50	200	TC-TCC,HT1
XX001100	51	MT-1/2 WTCU	0-94 C	NO	50	200	TC-TCC,HT1,METRIC
XX001001	52	MT-3 WTCU	32-200	NO	50	200	TC-TCC,HT1,RAMP
XX001010	53	MT-3 PCHL	-40-(-10)	250	-25	75	PCHL,LT2
XX001001	54	MT-1/2 PCHL	-40-(-10)	250	-25	75	PCHL,LT2
XX001000	55	MT-1/2 PCHL	-40-(-10)	250	-25	75	PCHL,LT2,METRIC
XX000111	56	MT-3 PCHL	15-70	250	0	100	PCHL,EX RANGE
XX000110	57	MT-1/2 PCHL	15-70	250	0	100	PCHL,EX RANGE
XX000101	58	MT-1/2 PCHL	-9-(+21)	250	0	100	PCHL,EX RNG,MET
XX000100	59	FUTURE USE					
XX000011	60	FUTURE USE					
XX000010	61	FUTURE USE					
XX000001	62	FUTURE USE					
XX000000	63	NOT VALID					