

Open Centrifugal Liquid Chilling Package

A SAFETY GUIDE

Centrifugal liquid chillers are designed to provide safe and reliable service when operated within design specifications. When operating this equipment, use good judgment and safety precautions to avoid damage to equipment and property or injury to personnel.

Be sure you understand and follow the procedures and safety precautions contained in the machine instructions as well as those listed in this guide.

▲ DANGER

DO NOT USE OXYGEN to purge lines or to pressurize a machine for any purpose. Oxygen gas reacts violently with oil, grease and other common substances.

NEVER EXCEED specified test pressures. VERIFY the allowable test pressure by checking the instruction literature and the design pressures on the equipment nameplate.

DO NOT VALVE OFF any safety device.

BE SURE that all pressure relief devices are properly installed and functioning before operating any machine.

▲ WARNING

DO NOT USE eyebolts or eyebolt holes to rig machine sections or the entire assembly.

DO NOT work on high voltage equipment unless you are a qualified electrician.

DO NOT WORK ON electrical components, including control panels, switches, starters or oil heater until you are sure ALL POWER IS OFF and no residual voltage can leak from capacitors or solid-state components.

LOCK OPEN AND TAG electrical circuits during servicing. IF WORK IS INTERRUPTED, confirm that all circuits are de-energized before resuming work.

DO NOT syphon refrigerant by mouth.

AVOID SPILLING liquid refrigerant on skin or getting it into the eyes. USE SAFETY GOGGLES. Wash any spills from the skin with soap and water. If any enters the eyes, IMMEDIATELY FLUSH EYES with water and consult a physician.

NEVER APPLY an open flame or live steam to a refrigerant cylinder. Dangerous overpressure can result. When necessary to heat refrigerant, use only warm (110 F/43 C) water.

DO NOT REUSE disposable (nonreturnable) cylinders nor attempt to refill them. It is DANGEROUS AND ILLEGAL. When cylinder is emptied, bleed off remaining gas pressure, loosen the collar and unscrew and discard the valve stem. DO NOT INCINERATE.

CHECK THE REFRIGERANT TYPE before charging machine. High pressure refrigerant in a low pressure machine can cause vessels to rupture if the relief devices cannot handle the refrigerant volume.

DO NOT ATTEMPT TO REMOVE fittings, covers, etc.

while machine is under pressure or while machine is running. Be sure pressure is at zero psig before breaking any refrigerant connection.

CAREFULLY INSPECT all relief valves, rupture discs and other relief devices AT LEAST ONCE A YEAR. If machine operates in a corrosive atmosphere, inspect the devices at more frequent intervals.

DO NOT ATTEMPT TO REPAIR OR RECONDITION any relief valve when corrosion or build-up of foreign material (rust, dirt, scale, etc.) is found within the valve body or mechanism. Replace the valve.

DO NOT VENT refrigerant relief valves within a building; vent to outside. The accumulation of refrigerant in an enclosed space can displace oxygen and cause asphyxiation.

DO NOT install relief valves in series or backwards.

USE CARE when working near or in line with a compressed spring. Sudden release of the spring can cause it and objects in its path to act as projectiles.

▲ CAUTION

DO NOT STEP on refrigerant lines. Broken lines can whip about and cause personal injury.

DO NOT climb over a machine. Use platform, catwalk or staging. Follow safe practices when using ladders.

USE MECHANICAL EQUIPMENT (crane, hoist, etc.) to lift or move inspection covers or other heavy components. Even if components are light, use such equipment when there is a risk of slipping or losing your balance.

DO NOT WELD OR FLAME CUT any refrigerant line or vessel until all refrigerant has been removed from the vessel.

BE AWARE that certain automatic start arrangements CAN ENGAGE THE STARTER. Open the disconnect *ahead of* the starter in addition to shutting off the machine or pump.

USE only repair or replacement parts that meet the code requirements of the original equipment.

DO NOT VENT OR DRAIN water boxes containing industrial brines, liquid, gases or semisolids without permission of your Process Control Group.

DO NOT LOOSEN water box cover bolts until the water box has been completely drained.

DOUBLE-CHECK that coupling nut wrenches, dial indicators or other items have been removed before rotating any shafts.

DO NOT LOOSEN a packing gland nut before checking that the nut has a positive thread engagement.

PERIODICALLY INSPECT all valves, fittings and piping for corrosion, rust, leaks or damage.

PROVIDE A DRAIN connection in the vent line near each pressure relief device to prevent a build-up of condensate or rain water.

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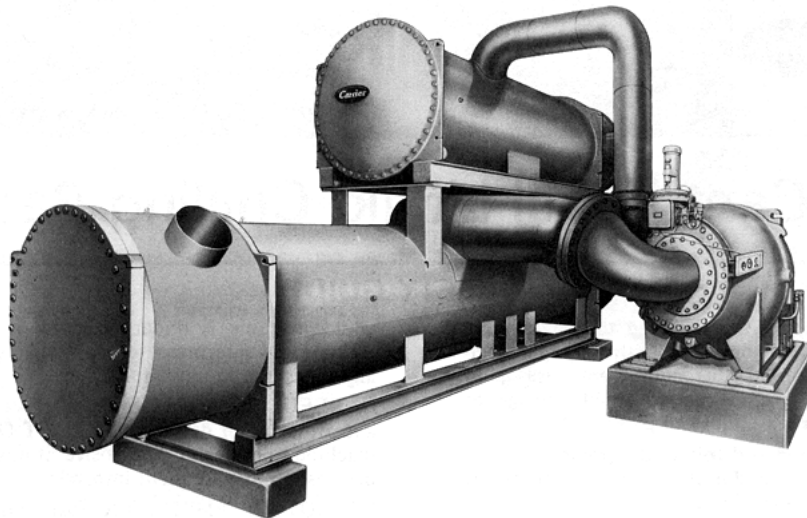
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Other items normally furnished to complete the refrigeration machine are:

- Safety Controls
- Flexible Couplings
- Suction Elbow
- Initial Charge of Refrigerant and Oil
- Condenser Drain Valve and Level Control

Job Data — Additional information necessary for proper installation consists of the following:

- Machine Location Prints
- Field Wiring Diagrams
- Installation Instructions for Compressor drive and gear (if applicable)

Receiving Machine

1. Inspect machine while it is still on railroad car or truck for damage in shipment. If the machine is damaged or torn away from its anchorage, have the transportation inspectors look it over before removing it from the conveyance. Forward claim papers directly to the transportation company.

Carrier Air Conditioning is not responsible for any damage incurred in transit.

2. Check the shipping list to see that all parts, boxes, crates and drums are received.
3. When the machine is delivered to the jobsite, open box No. 1. Remove shipping list. Check inventory of boxes against the shipping list. Notify Carrier Air Conditioning if any boxes, skids or crates are missing.
4. Leave all parts in their original packages until installation to prevent accidental damage or loss.

GENERAL

Introduction — These instructions are provided as a guide for installation of the 17DA Centrifugal Refrigeration Machine. For details on gear and drive installation, refer to gear and drive manufacturer's instructions. The machine assembly consists of the following major components:

- Compressor with Integral Lubrication System
- Cooler
- Condenser
- Purge
- Gear (if applicable)
- Drive
- Pumpout System

MACHINE FOUNDATIONS

Base Preparations

1. Check concrete base against foundation blueprints for correct dimensions and anchor bolt locations.
2. Check foundation surface for required roughness needed for good grout bonding. Chip the concrete to create the roughness required.
3. Clean concrete from threads of all anchor bolts. Straighten any bolts that are bent.
4. Treat foundation with caustic or chip sufficiently to remove all oil residue.
5. Lay out equipment centerlines in preparation for positioning major components. See Standard Service Techniques, Chapter 15, Compressors, Centrifugal, for detailed instructions.

INSTALLING MACHINE

General — The following paragraphs explain the assembly procedure for the machine components.

If more than one machine is located at the site, do not mix the major components. The serial number identification plate, located on drive end of compressor (Fig. 2, K-9) includes the compressor, cooler, condenser and machine serial numbers. The numbers applied to the condenser and cooler must match the last 4 digits of the machine serial number.

WARNING: Remove all shipping covers and blank-off flanges prior to assembly. Check the openings for any foreign material which may have accidentally fallen into the machine.

Rigging

COMPRESSOR

1. Lift the compressor by placing slings thru the 3 lifting lugs provided on the unit. The center of

gravity is just forward of the back plate. The front lug is mainly for steadying the unit and holding it in level position during the lift.

WARNING: Do not use eyebolt holes for lifting compressor.

2. Remove shipping skids.
3. Clean dirt and rust preventive (Tectyl 506) from bottom of the soleplates. Use hot soap and water or petroleum solvents to remove the rust preventive. Remove rust.
4. Place steel blocks at points where jacking screws will touch foundation.

COOLER AND CONDENSER

1. Use a sling around each water box. Place 2-by-4's or other suitable timbers under the slings to avoid damaging the shell.
2. Clean the cooler feet and their corresponding condenser supports.
3. Set steel blocks on floor where jacking screws will touch. Set soleplates on steel blocks in locations shown in machine location prints. Set hardwood isolators (field supplied) on the soleplates. Set the cooler down on the isolators and install bolts thru the feet into the soleplates.
4. Install jacking screws which are provided to raise the cooler to the height shown on the job blueprint.
5. Level the cooler end-to-end, side-to-side and diagonally. Use the level lines stamped on each side of each tube sheet. See Standard Service Techniques, Chapter 15.
6. Place compressor and line up suction connection of compressor with the suction connection of the cooler.
7. Place condenser on top of cooler.

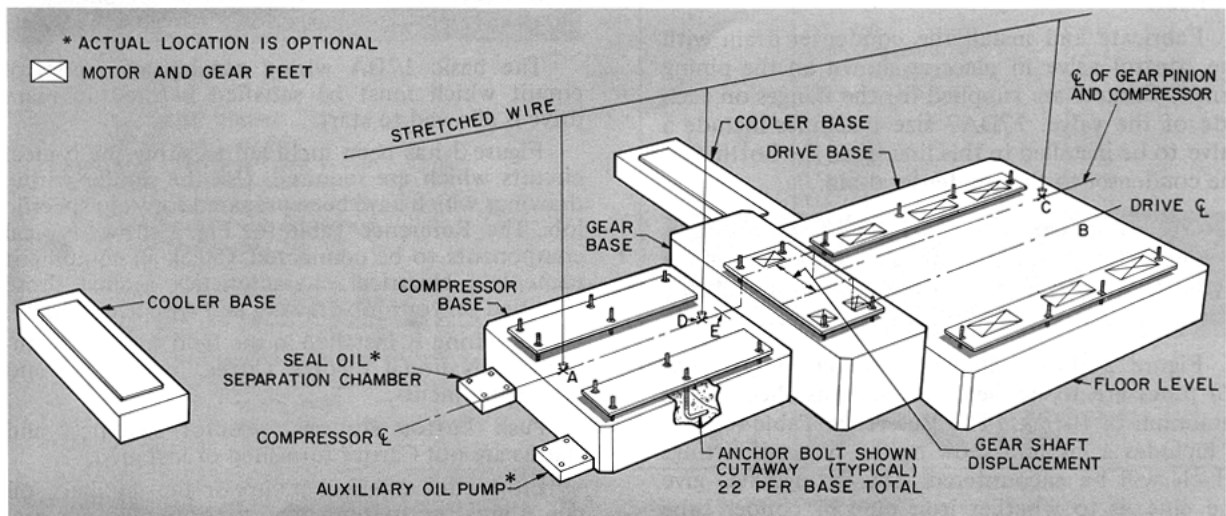


Fig. 1 — Typical 17DA Foundation Layout

8. Install bolts and washers in condenser foot on drive end. Tighten bolts sufficiently to allow condenser foot to slide on top of the cooler pad, thus adjusting for thermal expansion and contraction.

GEAR AND DRIVE — See gear and drive manufacturer's installation information for details on rigging this equipment.

→ **WARNING:** There must be a minimum of .100-in. but not more than .150-in. of shim material between equipment base and component soleplate at each component mounting bolt to allow for hot alignment adjustments.

ASSEMBLE MACHINE

Compressor

1. Use jacking screws provided to level the compressor. The suction flange and the discharge flange are perfectly perpendicular to each other and therefore make good reference planes for the machinist's level.
2. See the job outline prints for the refrigeration machine elevations.
3. Refer to Standard Service Techniques, Chapter 15, for leveling, aligning of equipment, couplings, hot check alignment, and grouting operations.

Auxiliary Equipment — Install the auxiliary equipment in accordance with the job layout drawings. This may consist of the following items:

1. Purge
2. Auxiliary Oil Pump
3. Control Panel
4. Pumpout Unit

PIPING

General — The piping and flat faced flanges used on the 17DA machines are to be field supplied and fabricated.

Fabricate and install the condenser drain with the control valve in place as shown on the piping prints. Gaskets are supplied for the flanges on each side of the valve. 17DA7 size machines include a valve to be installed in this line from the bottom of the condenser to the condenser drain.

NOTE: Take care while welding to prevent dirt from entering the system and expansion and contraction, due to the welding, from pulling machine components out of line.

Figure 2 shows the main piping connections. All pipes are to be field run and installed with a minimum of fittings. The Reference Table for Fig. 2 includes a column showing the types of fittings which will be encountered. The fittings also give the clue as to whether iron pipe or copper tube should be used.

The water to the oil coolers should be as clean and cool as possible. City water or chilled water may be used. The water supply pressure must not exceed 150 psig.

The pumpout unit has a water-cooled condenser. Chilled water may also be used in place of city water for cooling this unit.

Chilled Water Circuit — Chilled water connections should be made according to job specifications. The pump should discharge into the cooler. Vent all high spots to remove air and prevent water hammer. There must be no strain applied to the cooler flanges by the pipe. Use isolation-type pipe hangers and supports to remove strain on the equipment.

Condenser Water Circuit — Install condenser water piping so that the water enters the lower pass of the condenser and leaves thru the top pass. This ensures that the coldest water enters the subcooler section first. Inspection will reveal which nozzle leads into the top pass. Do not switch nozzles under any conditions.

Gages, Vents, Drain Lines, and Thermometers — Figure 2 shows the openings provided for these services. Thermometers and drain valves may not be furnished with the machine. Chilled water thermometers must have bulb extensions to allow them to reach thru the cooler insulation thickness. Typical thermometer ranges are:

Entering and leaving chilled water: +20 F to +100 F.

Entering and leaving condenser water: +20 F to +150 F.

Gear and Drive — Refer to manufacturer's installation material for piping instructions.

WIRING AND CONTROLS

General — Wiring must be done in accordance with wiring diagrams furnished by Carrier Air Conditioning.

CAUTION: Do not start motors on the centrifugal compressor to check rotation. Lubrication may not be present and serious damage will result.

The basic 17DA wiring consists of a control circuit which must be satisfied before the main drive is allowed to start.

Figure 3 has been included to show the typical circuits which are required. Use the similar wiring drawings which have been prepared for your specific job. The Reference Table for Fig. 3 shows typical components to be connected. Check all equipment nameplate electrical characteristics against those specified on your job drawing and wire accordingly.

All wiring is installed in the field and must conform to National Electric Codes, local codes and job requirements.

Push button stations, selector switches, and alarms are not Carrier furnished or installed.

Either the main oil pump or the auxiliary oil pump must be running at all times to maintain seal oil pressure and prevent refrigerant leakage.

Reference Table for Fig. 2

COMPONENTS AND CONNECTING PIPING	PIPING ROUTE	FITTINGS REQUIRED	LOCATION
FOUNDATION			C7, K6, M5
COOLER			B5
CONDENSER			F2
MAIN COMPONENT PIPING			
Compressor Suction	A to A		G4-K5
Compressor Discharge	B to B		J4-H1
Condenser Drain	C to C		C17-D19
PURGE PIPING			
Salvaged refrigerant return to cooler	D to D	1/2" MFT	B19-D18
Suction connection from condenser	E to E	1/2" MFT	C16-B18
Liquid refrigerant supply from condenser	F to F	1/2" MFT	B18-D17
RELIEF VALVE			
Cooler to atmosphere per code requirements	G to G	See Job Specifications	C17-B14
REFRIGERANT LEVEL SIGHT GLASS	H to H	3/4" FPT	G18-G19
LEVEL CONTROL PACKAGE	J to J	1/2" FPT	E15-F4
CONTROL PANEL			
Condenser pressure gage to condenser	K to K	1/4" MFT to 1/2" FPT *	E5-G2
Cooler pressure gage to cooler	L to L	1/4" MFT to 1/2" FPT *	E5-F5
Seal oil supply (red hand-duplex gage) to compressor bearing housing	M to M	1/4" MFT to 1/2" FPT *	E6-K11
Back of seal oil pressure (black hand-duplex gage) to line leading to differential backpressure regulator	N to N	1/4" MFT to 1/4" MFT *	E5-K11
Bearing oil supply pressure gage to line leading to pressure reg. valve	P to P	1/4" MFT to 1/4" MFT *	E6-J11
LEVEL CONTROL - to condenser drain valve operator	Q to Q	3/8" MFT and 1/4" MFT *†	E16-C18
OIL SEPARATOR			
Oil separator refrigerant gas to compressor suction	R to R	1-1/8" ODS to 1-1/8" ODS × 1-1/4" FPT	L10-J4
Compressor seal oil return line to separator	S to S	3/4" MFT to 3/4" FPT	K11-L12
Separator float valve to oil reservoir	T to T	1/2" FPT to 1/2" FPT	L12-K13
AUXILIARY OIL PUMP (Optional accessory - see job prints)			
Oil reservoir to auxiliary oil pump suction	U to U	1-1/2" MPT × 1-5/8" ODS to 1-1/4" MPT × 1-5/8" ODS	L5-K7
Auxiliary oil pump discharge to compressor oil cooler	V to V	1-1/4" MPT × 1-1/8" ODS to 1" IPS	L6-K11
OIL COOLER			
Cold city water to compressor oil cooler or	W to W	1-1/2" FPT	N4-J11
Entering chilled water nozzle to compressor oil cooler	W' to W'	1-1/2" FPT	D6-J11
Compressor oil cooler to open sight drain or	X to X	1-1/2" FPT	J12-M6
Oil cooler to leaving chilled water nozzle	X to X'	1-1/2" FPT	J12-H19
PUMPOUT UNIT‡			
Refrigerant Storage Tank to bottom of cooler	Y to Y	2' FPT to 2' FPT	C12-D19
Refrigerant gas line (refer to 17DA Operating and Maintenance In- structions for details) from storage tank to condenser and cooler connections	Z to Z	1" pipe socket weld connection to 2" FPT on cooler and cond	C10,-C16,-C17
City water to pumpout unit condenser	AA to AA	1/2" FPT	N4-D10
Pumpout water cooled condenser to open sight drain	BB to BB	1/2" FPT	E10-F13
OPENINGS			
Vent	CC	Dished cover 1/2' FPT Flat cover 3/4" FPT	C16, J17 and all similar spots
Drains	DD	Dished cover 1/2' FPT Flat cover 2" FPT	C7, K6, J20 and all similar spots
Auxiliary flanged connection	MM	Flat cover 4" or 6" flange	D16
WIRING	WIRING ROUTE	POWER CHARACTERISTICS	LOCATION
POWER WIRING			
Purge		115/1/60	A18
Oil Pump		3 HP, 230-460/3/60	J12
Auxiliary Oil Pump		3 HP, 230-460/3/60	K7
Oil Heater		170 watts, 115/1/60	H6
CONTROL CIRCUIT WIRING			
Control Panel cutout switches	K, L, N	115/1/60	E5
Discharge gas high temp cutout switch	EE	115/1/60	K10
Chilled water low temp cutout switch	FF	115/1/60	H18
Thrust bearing high temp cutout switch	GG	115/1/60	K10
Guide vane operator shutdown solenoid	HH	115/1/60	J4
Chilled water flow switch		Not factory supplied, see text for location instructions	
CONTROL PIPING	PIPING ROUTE	FITTINGS REQUIRED	LOCATION
AIR CONNECTIONS		AIR PRESSURE	
Compressor control panel to guide vane operator	HH to HH	3-15 psig 1/4" FPT	K5-J4
Outside air supply to guide vane operator power air	JJ to JJ	35 psig controlled 1/4" FPT	N2-J4
Outside air supply to control panel	KK to KK	3-15 psig 1/4" FPT	N2-K5
Outside air supply to control panel - manual control	LL to LL	20-250 psig 1/4" FPT	N2-K5
Leveltrol®	Q	40-250 psig 1/4" FPT	E16

*Use 3/8" outside diameter copper tubing for all 1/4" MFT hookups.

†3/8" MFT for compressor size 7. 1/4" MFT for compressor size 8.

‡Multiple machine installations require only one pumpout unit.

This list may be superseded by Job Specifications.
See Job Drawings for your job.



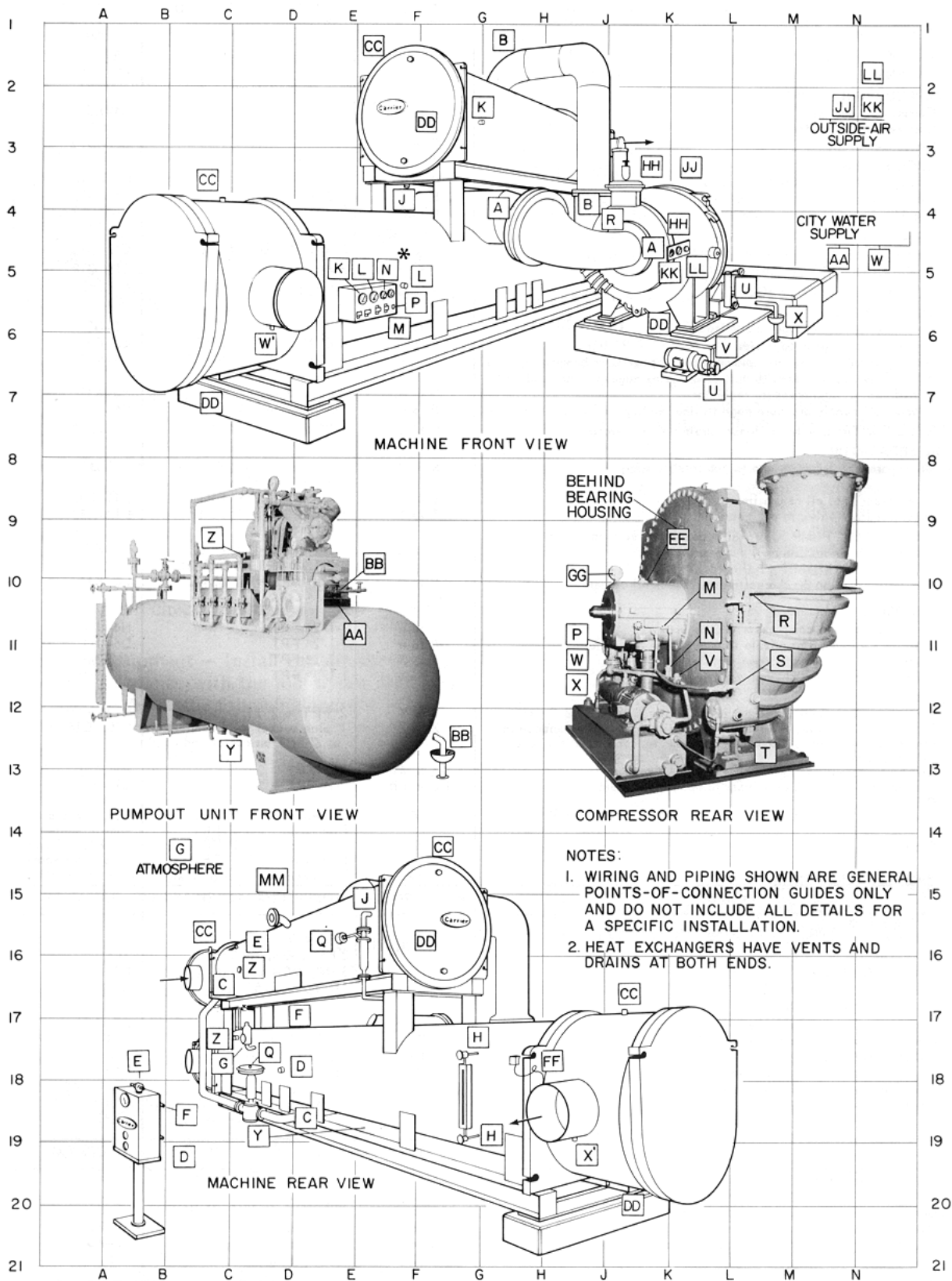
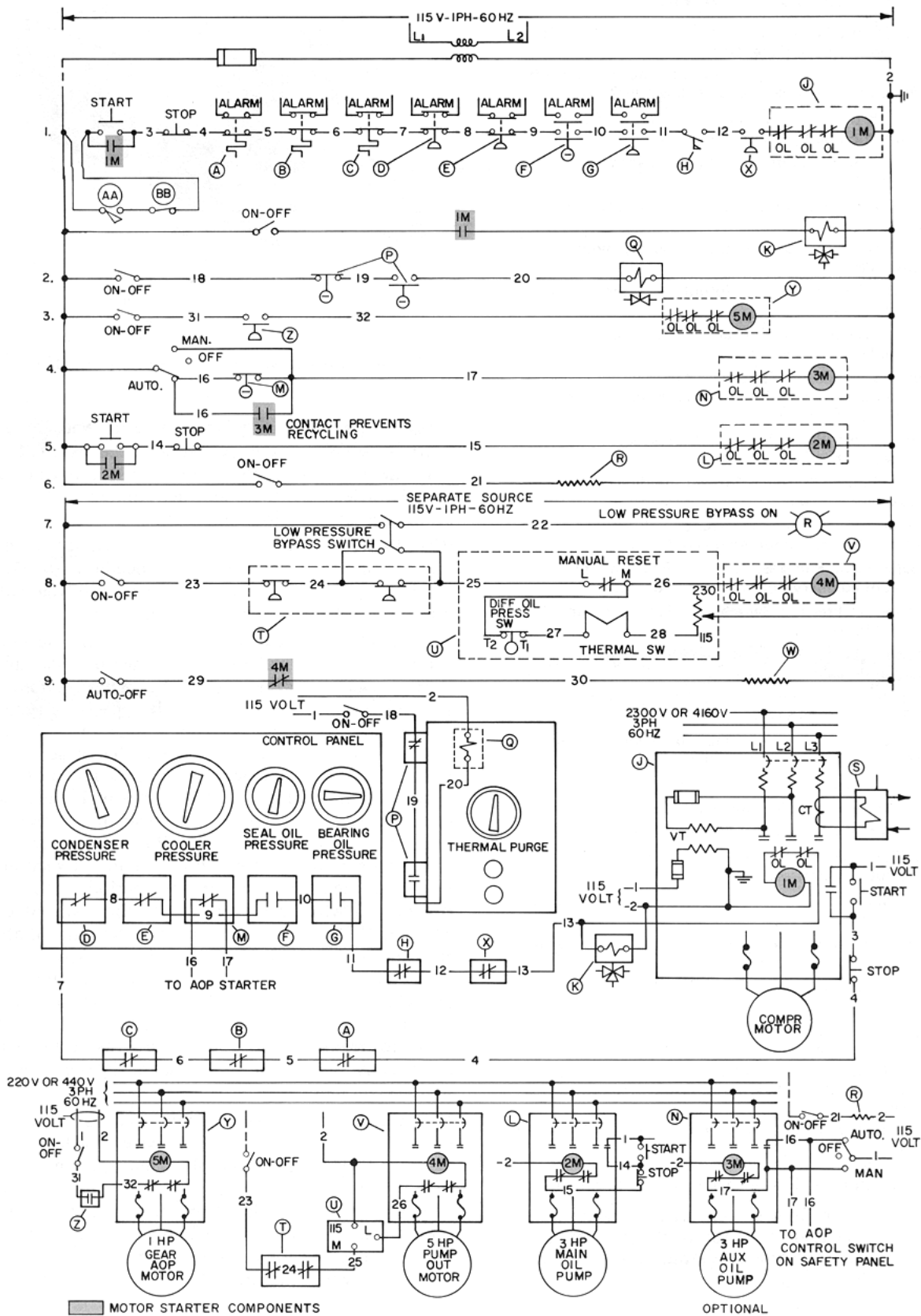


Fig. 2 – Typical Machine Arrangement with Piping Connections



**Fig. 3 — Typical Schematic Wiring Diagram for 17DA Machine
Reference Only (See Job Prints for your job)**



Reference List for Fig. 3

- A. Low Chilled Water Temperature Cutout — Factory mounted on cooler water box.
 - B. High Discharge Gas Temperature Cutout — Factory mounted in compressor end wall. Set at 240F.
 - C. High Thrust Bearing Oil Temperature Cutout — Factory mounted in bearing housing.
 - D. High Condenser Pressure Cutout — Factory mounted on Control Panel.
 - E. Low Cooler Pressure Cutout — Factory mounted on Control Panel.
 - F. Low Seal Oil Pressure Cutout — Factory mounted on Control Panel.
 - G. Low Bearing Oil Pressure Cutout — Factory mounted on Control Panel.
 - H. Chilled Water Flow Switch — Field obtained and mounted in chilled water pipe.
 - J. Compressor Motor Starter — 115-volt holding coil; 115-volt control transformer (VT); 4- to 6-amp output current transformer (CT).
 - K. Solenoid Air Bleed Valve — Closes guide vanes on compressor shutdown.
 - L. Main Oil Pump Starter — 115-volt holding coil, one set of auxiliary contacts.
 - M. Auxiliary Oil Pump Differential Pressure Control Switch — Factory mounted on control panel.
 - N. Auxiliary Oil Pump Starter — 115-volt holding coil, one set of auxiliary normally open contacts.
 - P. Differential Pressure Switches — Factory mounted in Thermal Purge.
 - Q. Solenoid Air Purge Valve — Factory mounted in Thermal Purge.
 - R. Strip Heater — Factory mounted on Seal Oil Separator — 62.5 watts at 115 volts.
 - S. Load Limit Relay — Adjustable between 3—7 amps, field mounted or panel mounted.
 - T. HI—LO Pressure Safety Switch on Pumpout Unit.
 - U. Low Oil Pressure Safety Switch on Pumpout Unit.
 - V. Pumpout Motor Starter — 115-volt holding coil.
 - W. 100-Watt Oil Heater — Factory mounted on the Pumpout Compressor.
 - X. Low Oil Pressure Switch — Factory mounted on Speed Increasing Gear.
 - Y. Speed Increasing Gear Auxiliary Oil Pump Motor Starter, 115-volt holding coil.
 - Z. Speed Increasing Gear Auxiliary Oil Pump Control Switch.
 - AA. Shutdown Seal Movement Limit Switch — Factory mounted in bearing housing.
 - BB. Shaft Excess Movement Switch — Factory mounted on lower half of bearing housing *inside* bearing housing.
- Items such as H, J, L, N, V, Y and Z are not furnished by Carrier.

Strip heater (R) Fig. 3 should be on at all times.

Chilled water flow switch must be vaptight and must be located at the top of the pipe and in a horizontal run. Provide ample straight pipe on each side of switch (see Fig. 4).

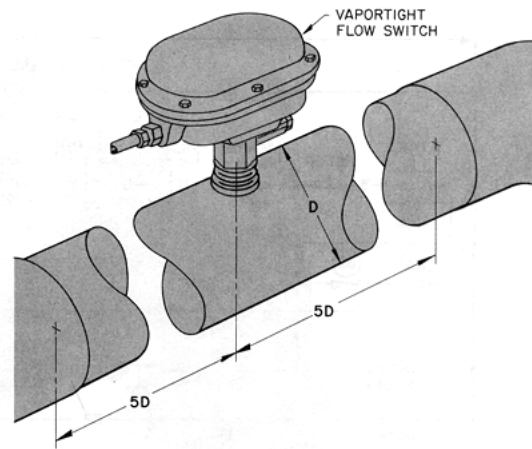


Fig. 4 — Chilled Water Flow Switch Location

TESTING

Pressure Test, Standing Vacuum Test, and Dehydration — When the refrigerant spaces of the machine have been completely closed, it can be tested for leak tightness and dehydrated by evacuation to a safe standby condition.

PRESSURE TEST — See Standard Service Techniques, Chapter 1, Refrigerants, Procedure 1-6. The total test pressure of dry air or nitrogen refrigerant mixture must not exceed 150 psig.

STANDARD VACUUM TEST — After the successful pressure test, pull 25 inches mercury vacuum on the machine and let it stand for at least 8 hours. Use a mercury manometer (absolute pressure type) to indicate the vacuum. The permissible rate of leakage cannot be detected on a dial gage. The maximum acceptable leakage is at a rate not to exceed 0.1 inch of mercury in 24 hours. If the leak rate exceeds this tolerance, repeat the pressure refrigerant leak test and repair all discernible leaks. After satisfactory completion of standard vacuum test, machine may be prepared for period of storage (uncharged with refrigerant) or further evacuated. See DEHYDRATION (preparation for immediate refrigerant charging). If machine is to be stored for an extended period, break or relieve vacuum by applying dry nitrogen until a positive pressure of 5 to 10 psi is obtained. Valve off machine and record pressure readings and temperature for reference later. Only dehydrate when full refrigerant charging is scheduled.

DEHYDRATION — The machine is dehydrated by evacuation. See Standard Service Techniques, Chapter 1, Procedure 1-7. The machine must be dry enough to maintain a vacuum reading of 0.20 inches mercury absolute, which is equivalent to 29.80 inches of vacuum referenced to a 30-inch barometer. Once the machine proves tight and dry, commence with applying full refrigerant charge.

Manufacturer reserves the right to discontinue, or change at any time, specifications or designs without notice and without incurring obligations.

Book 2
Tab 5d

Form 17DA-2SI Supersedes 17DA-1SI

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