19EF
50/60 Hz
Hermetic Centrifugal Liquid Chillers
With HFC-134a

Installation Instructions

SAFETY CONSIDERATIONS

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 VENT refrigerant relief devices within a building. Outlet from rupture disc or relief valve must be vented outdoors in accordance with the latest edition of American National Standards Institute/American Society of Heating, Refrigeration and Air Conditioning Engineers (ANSI/ASHRAE) 15. The accumulation of refrigerant in an enclosed space can displace oxygen and cause asphyxiation.

PROVIDE adequate ventilation in accordance with ANSI/ASHRAE 15, especially for enclosed and low overhead spaces. Inhalation of high concentrations of vapor is harmful and may cause heart irregularities, unconsciousness, or death. Intentional misuse can be fatal. Vapor is heavier than air and reduces the amount of oxygen available for breathing. Product causes eye and skin irritation. Decomposition products are hazardous.

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.

DO NOT USE air to leak test. Use only refrigerant or dry nitrogen.

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 WELD OR FLAMECUT any refrigerant line or vessel until all refrigerant *(liquid and vapor)* has been removed from chiller. Traces of vapor should be displaced with dry air or nitrogen and the work area should be well ventilated. *Refrigerant in contact with an open flame produces toxic gases.*

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 deenergized before resuming work.

DO NOT siphon refrigerant.

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 liquid refrigerant 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 over pressure can result. When it is necessary to heat refrigerant, use only warm (110 F [43 C]) water.

DO NOT REUSE disposable (nonreturnable) cylinders or attempt to refill them. It is DANGEROUS AND ILLEGAL. When cylinder is emptied, evacuate remaining gas pressure, loosen the collar, and unscrew and discard the valve stem. DO NOT INCINERATE.

CHECK THE REFRIGERANT TYPE before adding refrigerant to the machine. The introduction of the wrong refrigerant can cause machine damage or malfunction.

Operation of this equipment with refrigerants other than those cited herein should comply with ANSI/ASHRAE-15 (latest edition). Contact Carrier for further information on use of this machine with other refrigerants.

DO NOT ATTEMPT TO REMOVE fittings, covers, etc., while machine is under pressure or while machine is running. Be sure pressure is at 0 psig (0 kPa) 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 install relief devices 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 release refrigerant, causing 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 mechanical equipment when there is a risk of slipping or losing your balance.

BE AWARE that certain automatic start arrangements CAN ENGAGE THE STARTER, TOWER FAN, OR PUMPS. Open the disconnect *ahead of* the starter, tower fan, and pumps. Shut off the machine or pump before servicing equipment.

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

DO NOT VENT OR DRAIN waterboxes containing industrial brines, liquid, gases, or semisolids without the permission of your process control group.

DO NOT LOOSEN waterbox cover bolts until the waterbox 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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INTRODUCTION

General — The 19EF machine is factory assembled, wired, and leak tested. Installation (not by Carrier) consists primarily of establishing water and electrical services to the machine. The rigging, installation, field wiring, field piping, and insulation are the responsibility of the contractor and/or customer. Carrier has no installation responsibilities for the equipment.

Job Data

Necessary information consists of:

- job contract or specifications
- machine location prints
- rigging information
- piping prints and details
- field wiring drawings
- starter manufacturer's installation details
- Carrier certified drawings

Equipment Required

- mechanic's tools (refrigeration)
- volt-ohmmeter and clamp-on ammeter
- leak detector (halide or electronic)
- absolute pressure manometer or wet-bulb vacuum indicator
- portable vacuum pumps

INSTALLATION

Receiving the Machine

INSPECT SHIPMENT

⚠ CAUTION

Do not open any valves or loosen any connections. The 19EF machine is shipped with a nitrogen holding charge and the refrigerant shipped separately.

1. Inspect for shipping damage while machine is still on shipping conveyance. If machine appears to be damaged or has been torn loose from its anchorage, have it examined by transportation inspectors before removal. Forward claim papers directly to transportation company. *Manufacturer is not responsible for any damage incurred in transit.*
2. Check all items against shipping list. Immediately notify the nearest Carrier representative if any item is missing.
3. To prevent loss or damage, leave all parts in their original packages until beginning installation. All openings are closed with covers or plugs to prevent dirt and debris from entering machine components during shipping. A full operating oil charge is placed in the oil sump before shipment.

IDENTIFY MACHINE — The machine model number, serial number, and heat exchanger sizes are stamped on the machine identification nameplate (Fig. 1 and 2). Check this information against shipping papers and job data.

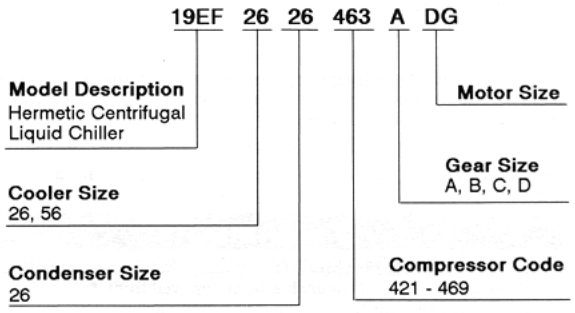
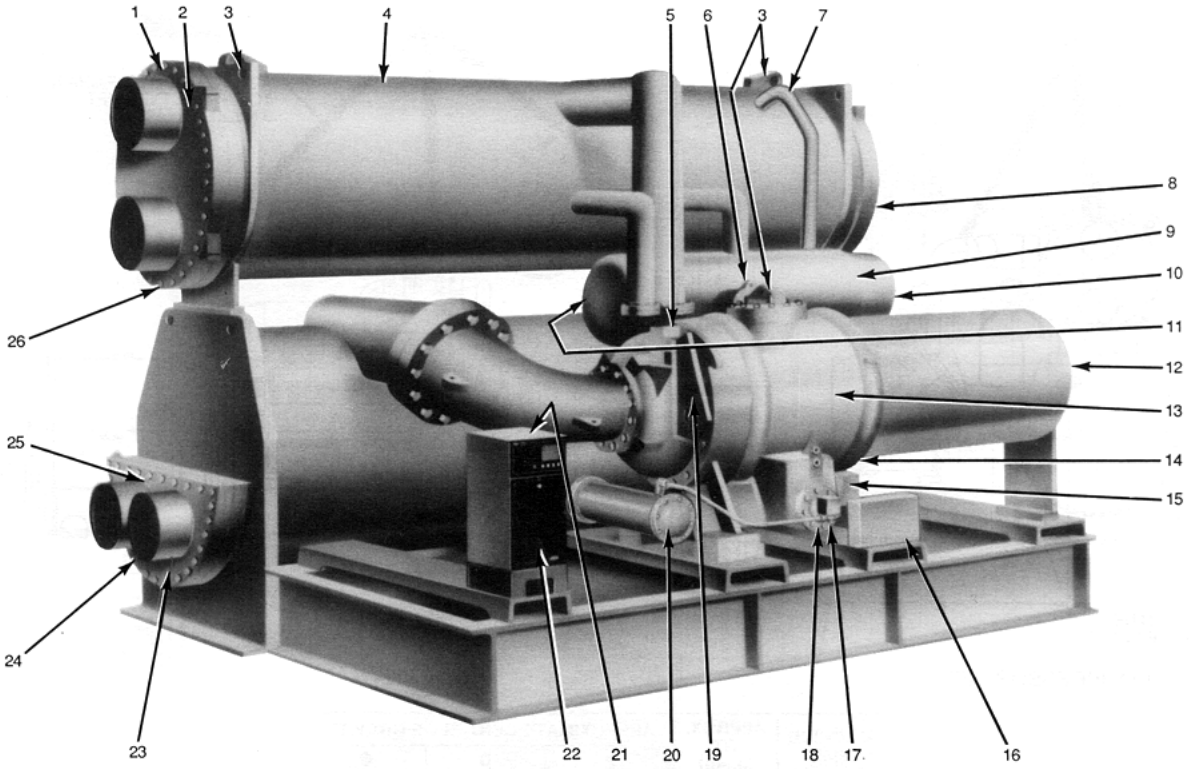


Fig. 1 — Model Number Identification



1 — Condenser Waterbox Vent
2 — Condenser Waterbox Cover
3 — Machine Lifting Lugs
4 — Condenser
5 — Guide Vane Actuator
6 — Economizer Low Side Float Cover (Hidden)
7 — Hot Gas Bypass Line
8 — Condenser Waterbox Cover
9 — Economizer
10 — High Side Float Box Cover
11 — Cooler Relief Valves (Hidden)
12 — Motor Terminals (Hidden)
13 — Compressor
14 — Oil Level Sight Glasses
15 — Oil Heater
16 — Power Panel
17 — Oil Charging Valve
18 — Oil Pump
19 — Actuator Drive Cover
20 — Oil Cooler
21 — Machine Identification Nameplate (Not Shown)
22 — Control Center
23 — Cooler NIH Waterbox Cover
24 — Cooler Waterbox Drain
25 — Cooler Waterbox Vent
26 — Condenser Waterbox Drain

NIH — Nozzle-In-Head

Fig. 2 — Typical 19EF Installation (600-1000 Tons [2100-3515 kW])

PROVIDE MACHINE PROTECTION — Protect machine and starter from construction dirt and moisture. Keep protective shipping covers in place until machine is ready for installation.

If machine is exposed to freezing temperatures after water circuits have been installed, open waterbox drains and remove all water from cooler and condenser. Leave drains open until system is filled.

Drain all water from oil cooler coil. See Fig. 2. Disconnect water supply line, if already installed. Remove the drain plug on the waterbox covers and use compressed air to remove any water from the oil cooler coil. Follow the same procedure with the pumpout unit condenser, if supplied.

Rigging the Machine — The 19EF machine is rigged as an entire assembly.

RIG MACHINE ASSEMBLY — See rigging instructions on label attached to machine. Refer to Fig. 3 and 4 and Tables 1A and 1B. *Lift machine only from the 3 points indicated in rigging guide*. Each lifting cable or chain must be capable of supporting the entire weight of the machine. A spreader bar may be used to reduce chain height.

⚠ WARNING

Lifting machine from points other than those specified may result in serious damage to the unit and personal injury. Rigging equipment and procedures must be adequate for machine weight. See Tables 1A and 1B for machine weights.

NOTE: These weights are broken down into component sections. For the complete machine weight, add all component sections together. See Tables 1A and 1B for machine component weights.

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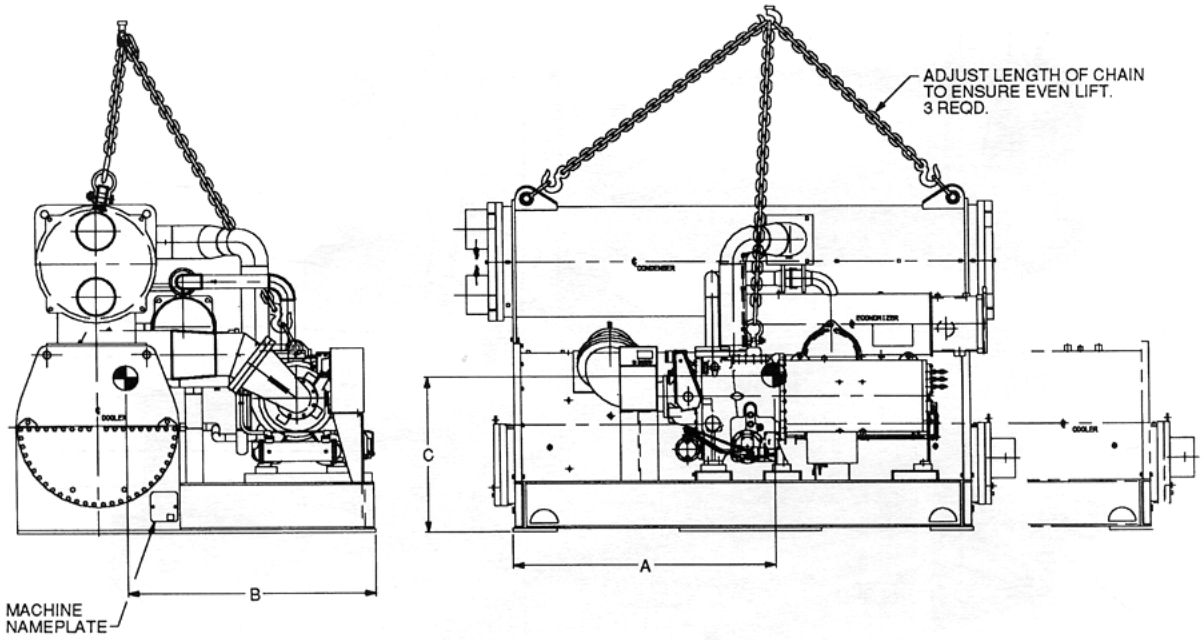

MACHINE SIZE	APPROX. WT lb (kg)	APPROXIMATE CENTER OF GRAVITY		
		A	B	C
19EF2626	43,584 (19,769)	6′-7½″ (2038)	5′-6″ (1676)	4′-4⅜″ (1292)
19EF5626	47,480 (21,536)	6′-10¼″ (2102)	5′-6⅞″ (1699)	3′-1¼″ (908)

NOTES:
1. Do not damage machine components while rigging.
2. Dimensions shown as ( ) are in millimeters.
3. For specific machine dimensions refer to particular job drawings.
4. ◓ Indicates center of gravity.
5. Position chains on machine as shown.
6. Machine shipped with approximately 15 psi (103 kPa) nitrogen charge.
7. *Do not* break joints or connections, or open valves. See installation instructions for recommended procedures.

Fig. 3 — Typical Machine Rigging Guide

Table 1A — Rigging Weights — English (lb)

HEAT EXCHANGER COMBINATIONS	19EF2626	19EF5626
Condenser*	14,815	14,815
Cooler†	15,561	18,696
Economizer	1,112	1,112
Steel Base	4,846	5,607
Compressor	2,625	2,625
Motor	3,500	3,500
Suction Elbow	325	325
Miscellaneous Piping	750	750
Control Center	50	50
Total Rigging Weight	43,584	47,480

Table 1B — Rigging and Weights — SI (kg)

HEAT EXCHANGER COMBINATIONS	19EF2626	19EF5626
Condenser*	6 720	6 720
Cooler†	7 058	8 480
Economizer	504	504
Steel Base	2 198	2 543
Compressor	1 191	1 191
Motor	1 588	1 588
Suction Elbow	147	147
Miscellaneous Piping	340	340
Control Center	23	23
Total Rigging Weight	19 769	21 536

LEGEND

MWB — Marine Waterbox
NIH — Nozzle-In-Head Waterbox

*Based on 2-pass NIH waterboxes. If 2-pass MWB are used, add an additional 2,100 lb (953 kg).
†Based on 2-pass NIH waterboxes. If 2-pass MWB are used, add an additional 2,250 lb (1021 kg).

NOTE: Based on 2-pass nozzle-in-head (NIH) waterboxes, 150 psig (1038 kPa) covers, 4160 v, DP motor, and "5" size economizer. For specific information on unit weights including waterbox options, refer to unit submittal package. All weights ± 3%.

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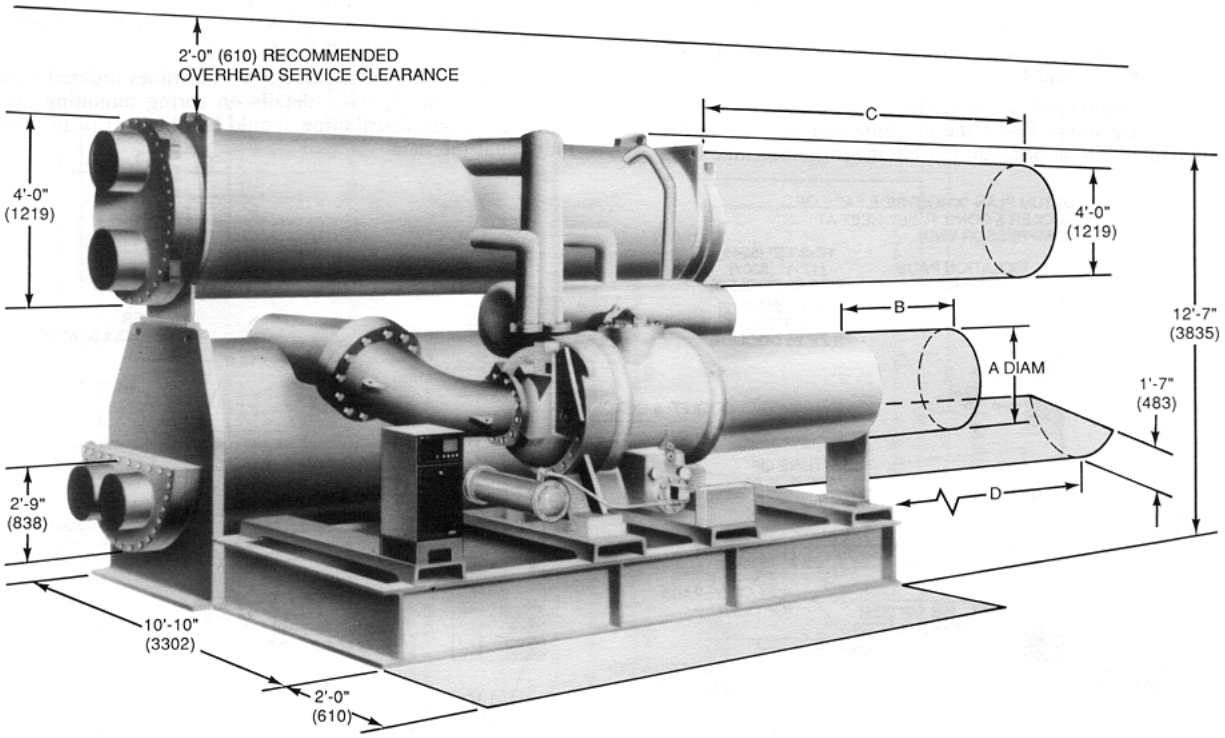

NOTES:
1. Machine length is dependent upon nozzle type, nozzle arrangement, and condenser length.
2. Condenser and cooler tubes may be removed from either end of the chiller. To remove the tubes, the service clearances shown above must be provided on one end of the machine.
3. Service access should be provided per American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) 15, latest edition; National Fire Protection Association (NFPA) 70; and local safety codes.
4. [ ] indicates millimeters.

SERVICE CLEARANCE

COMPONENT	A (DIAMETER)		B (LENGTH)	
	ft-in.	mm	ft-in.	mm
MOTOR DF-DP	1-11¼	591	3-7½	1105

NOZZLE TYPE	NOZZLE SIZES (in.)					
	Cooler Passes		Condenser Passes			
	1	2	1	2	3	4
MARINE	14	14	18	18	14	12
NIH	20	12	24	18	14	12

NIH — Nozzle-In-Head

CONDENSER TUBE PULL

CONDENSER SIZE	C (LENGTH)	
	ft-in.	mm
26	12-3	3734

COOLER TUBE PULL

COOLER SIZE	D (LENGTH)	
	ft-in.	mm
26	12-3	3734
56	17-1½	5220

Fig. 4 — 19EF Dimensions

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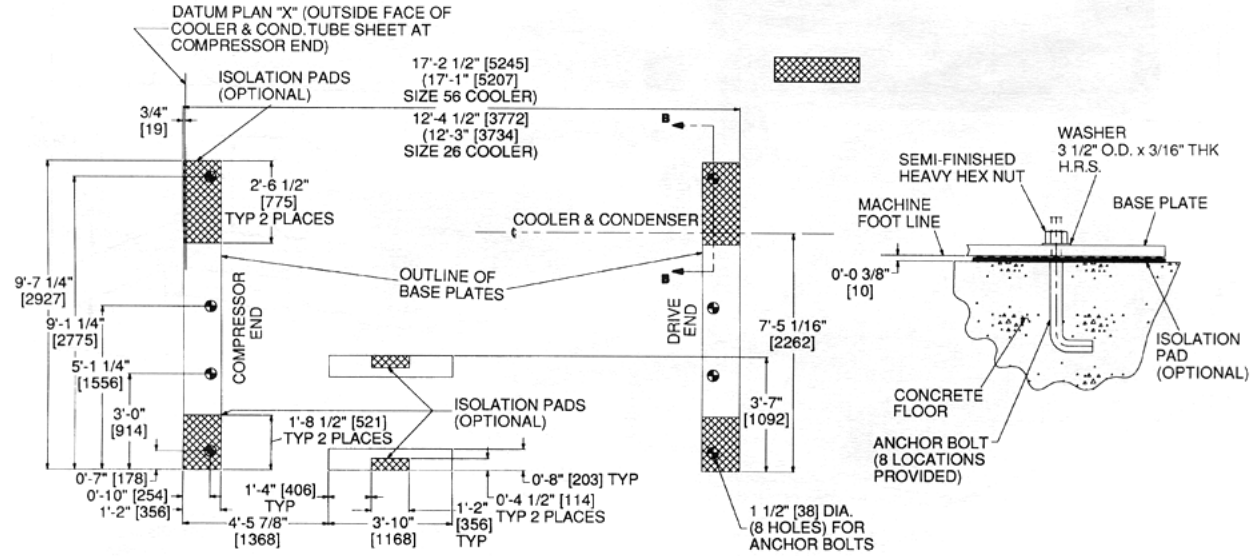
Install Machine Supports — The 19EF machines are typically placed directly on a level floor and do not require isolation equipment. Check job data for specific information. The standard contact surfaces for floor mounting are shown in Fig. 5 and 6.

When isolation pads are specified by the customer, 7 shear flex pads are shipped with the machine and strapped to the cooler shell. These pads are placed under the machine base as shown in Fig. 5 and 6. If desired, the base may be anchored through four 1½ in. (38 mm) diameter holes located on the machine base assembly that provide for optional, customer-supplied anchor bolts.

Springs are shipped separately on machines ordered with spring isolation. Specific details on spring mounting and machine weight distribution should be obtained from your individual job data.



LEGEND

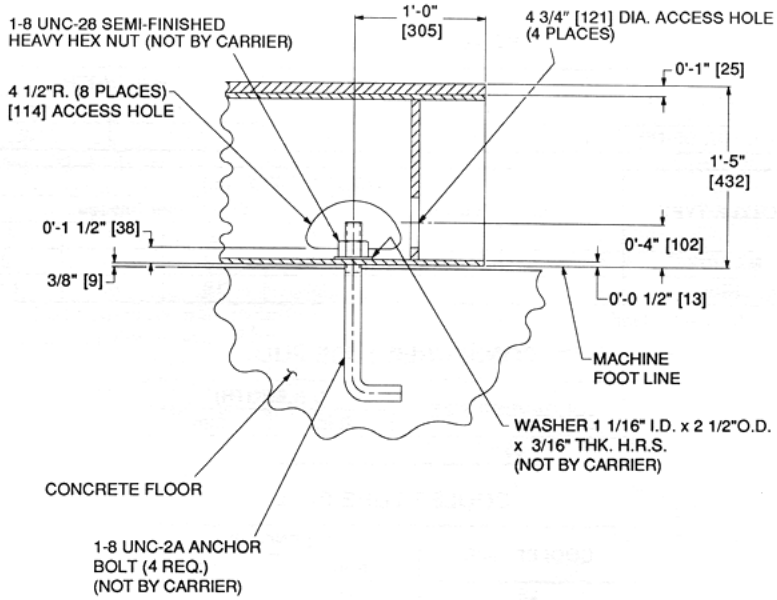
H.R.S. — Hot-Rolled Steel

Denotes Anchor Bolt Locations

Denotes Outline of Isolation Pads

NOTE: Dimensions in [ ] are in millimeters.

Fig. 5 — Machine Footprint



H.R.S. — Hot-Rolled Steel

NOTE: Dimensions in [ ] are in millimeters.

Fig. 6 — Machine Contact Surfaces with Anchor Bolts

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Connect Piping

INSTALL WATER PIPING TO HEAT EXCHANGERS — Install piping using job data, piping drawings, and the procedures outlined below. A typical piping installation is shown in Fig. 7.

⚠ CAUTION

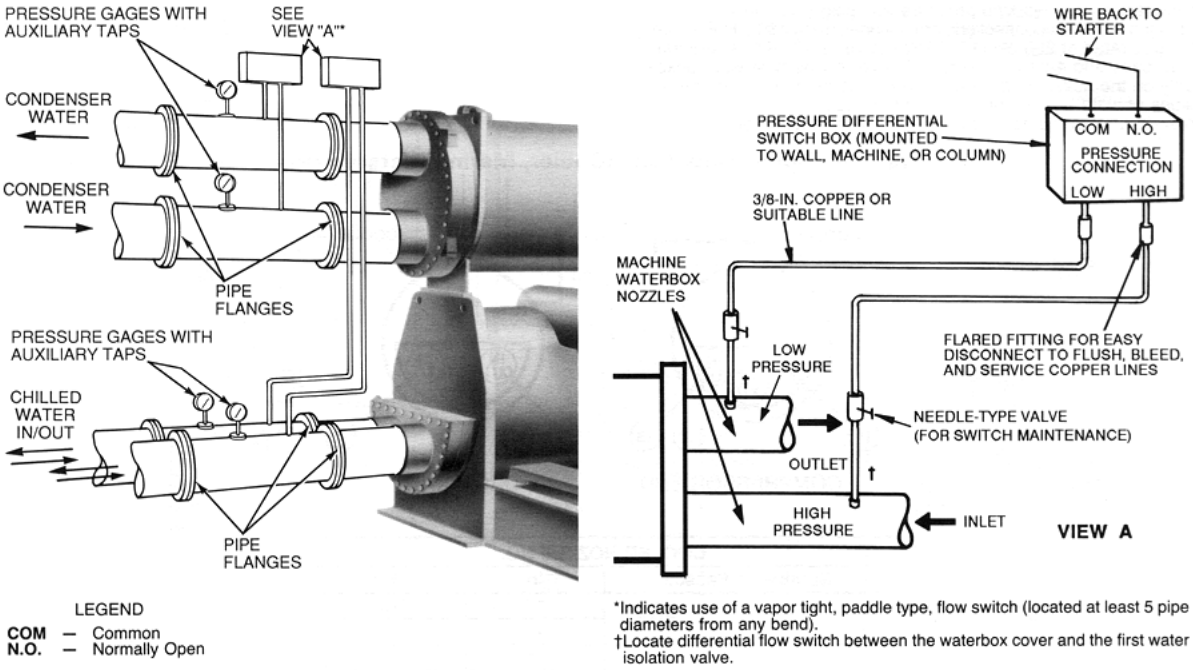
Factory-supplied insulation is not flammable but can be damaged by welding sparks and open flame. Protect insulation with a wet canvas cover.

⚠ CAUTION

Remove chilled and condenser water temperature sensors before welding connecting piping to water nozzles. Refer to Fig. 2. Replace sensors after welding is complete.

1. Offset pipe flanges to permit removal of waterbox cover for maintenance and to provide clearance for pipe cleaning. No flanges are necessary with marine waterbox option; however, water piping should not cross in front of the waterbox since access will be blocked.
2. Provide openings in water piping for required pressure gages and thermometers. For thorough mixing and temperature stabilization, wells in the leaving water pipe should extend inside pipe at least 2 in. (50 mm).
3. Install air vents at all high points in piping to remove air and prevent water hammer.
4. Install pipe hangers where needed. Make sure no weight or stress is placed on waterbox nozzles or flanges.
5. Water flow direction must be as specified in Fig. 7-11.

   NOTE: On 2-pass machines, entering water is always the lower of the 2 nozzles. Leaving water is always the upper nozzle for cooler or condenser.
6. If paddle type flow switches are used, they must be of vapor-tight construction and must be installed on top of pipe in a horizontal run and at least 5 pipe diameters from any bend. Contacts must be rated at 24 vdc (see certified drawings).
7. Install waterbox vent and drain piping in accordance with individual job data. All connections are ¾-in. FPT.
8. Install waterbox drain plugs in the unused waterbox drains and vent openings.



LEGEND

COM — Common
N.O. — Normally Open

*Indicates use of a vapor tight, paddle type, flow switch (located at least 5 pipe diameters from any bend).
†Locate differential flow switch between the waterbox cover and the first water isolation valve.

Fig. 7 — Typical Nozzle Piping

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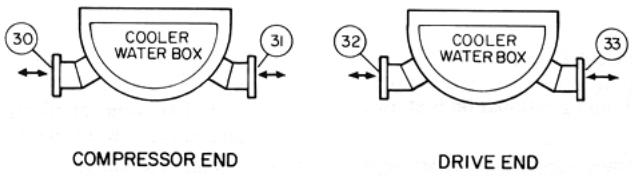
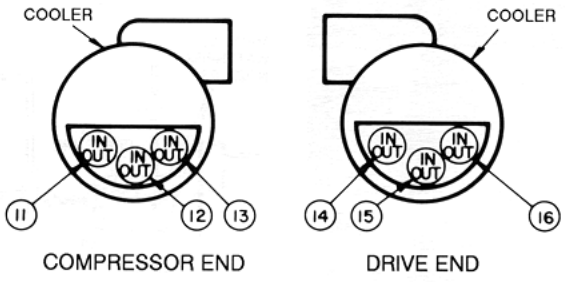


COOLER NOZZLE NO.		
Number of Passes	In	Out
1	30	33
	31	32
	32	31
	33	30
1 or 3	30	32
	31	33
	32	30
	33	31
2 or 4	30	31
	31	30
	32	33
	33	32

RF — Raised Face

NOTES:
1. Standard design working pressure 250 psig (1723 kPa).
2. Flanged waterbox connections are optional, using 150 #R.F. A.S.A. flanges rated at 250 psi (1723 kPa) at 166 F (77.4 C) maximum.
3. Two-pass and 4-pass coolers will have marine-type waterboxes only on the nozzle end. See standard outline drawing for dimensions of waterbox on the other end of cooler.
4. Nozzle arrangements listed are the only selections offered.

Fig. 8 — Piping Flow Data (Cooler, Marine Waterboxes)



COOLER NOZZLE NO.		
Number of Passes	In	Out
1	12	15
	15	12
2	11	13
	13	11
	14	16
	16	14
3	11	14
	13	16
	14	11
	16	13
4	11	13
	13	11
	14	16
	16	14

Fig. 9 — Piping Flow Data (Cooler, NIH Waterboxes)

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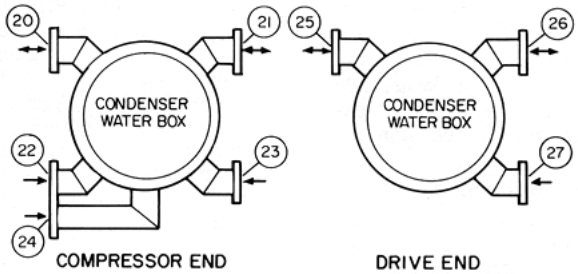


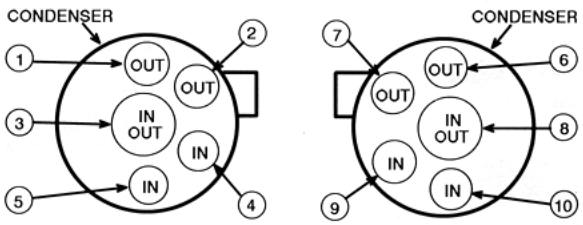
LEGEND

ANSI — American National Standards Institute
RF — Raised Face

NOTES:
1. Design working pressure is 250 psig (1723 kPa).
2. When ordered with flanged waterbox connections, 150 RF steel ANSI flanges rated at 250 psig (1723 kPa) 166 F (77.4 C) are supplied. Mating flanges, gaskets, and bolting are not supplied.
3. Only the nozzle arrangements shown above are offered with these waterboxes.
4. Field-supplied piping must be arranged and supported to avoid stresses on the equipment, transmission of vibrations from the equipment, and to prevent interference with routing access for the reading, adjustment, and servicing of the equipment. Provisions must be made for adjustment in each plane of the piping and for all equipment servicing.

CONDENSER NOZZLE NO.		
Number of Passes	In	Out
1	20	25
	20	26
	21	25
	21	26
	25	20
	25	21
	26	20
	26	21
2	22	20
	27	26
	22	21
	27	25
	23	21
	23	20
3	24	25
	23	25
4	24	21
	23	21

Fig. 10 — Piping Flow Data (Condenser, Marine Waterboxes)



CONDENSER NOZZLE NO.		
Number of Passes	In	Out
1	3 8	8 3
2	5 10	1 6
3	4 9	7 2
4	4 9	2 7

NIH — Nozzle-In-Head

Fig. 11 — Piping Flow Data (Condenser, NIH Waterboxes)

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INSTALL WATER PIPING TO OIL COOLER — Water supply may be either city water or chilled water. See Fig. 12.

City water must be clean and noncorrosive. Water-side erosion or corrosion of the oil cooler coil may lead to extensive machine damage not covered by the standard warranty.

City water should be piped to an open sight drain.

If water from the machine chilled water circuit is used for oil cooling, it should enter the oil cooler inlet from the entering water line of the machine cooler. See Fig. 12. Water leaving the oil cooler should connect to the leaving water line of the machine cooler to a point downstream from the chilled water sensor, so that oil cooler leaving water temperature does not affect the sensor readings. See Fig. 12.

Locate the oil cooler leaving water connection at some distance from any chilled water temperature indicator. On single-pass machines, water leaving the oil cooler should be connected into the suction side of the chilled water pump so that adequate pressure drop is assured for oil cooling.

The nominal conditions for oil cooler water flow are:

Flow rate ..... 30 gpm (114 L/s)
Leaving temperature (max) ..... 85 F to 100 F (29 to 39 C)
Pressure drop at oil cooler ..... 10.5 ft (3.2 m)
Max differential pressure across closed solenoid valve ..... 150 psid (1029 kPa)

The oil cooler water connections at the plug valve are 1-in. FPT.

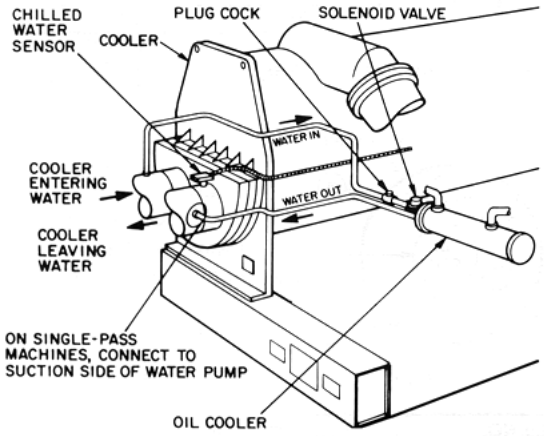


Fig. 12 — Water Piping, Oil Cooler to Chilled Water Circuit (Typical)

INSTALL VENT PIPING TO RELIEF DEVICES — The 19EF chiller is factory equipped with relief devices on the cooler. Refer to Fig. 2 and Table 2 for size and location of relief devices. Vent relief devices to the outdoors in accordance with ASHRAE 15, latest edition, and all other applicable codes. To ensure relief valve serviceability as required in ASHRAE 15, latest edition, 3-way valves and redundant relief valves are installed. See Fig. 13. Only one valve on each relief valve tree (quantity listed in Table 2) is in service at any time.

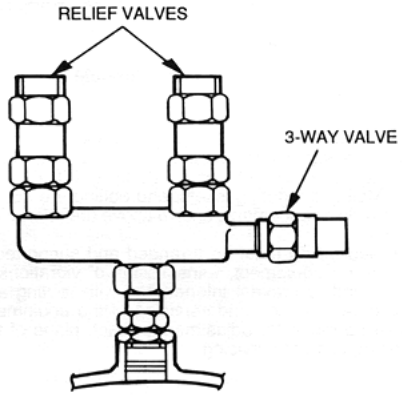


Fig. 13 — Typical 19EF Relief Valve Tree

⚠ DANGER

Refrigerant discharged into confined spaces can displace oxygen and cause asphyxiation.

1. If relief device piping is manifolded, the cross-sectional area of the relief pipe must at least equal the sum of the areas required for individual relief pipes.
2. Provide a pipe plug near outlet side of each relief device for leak testing. Provide pipe fittings that allow vent piping to be disconnected periodically for inspection of valve mechanism.
3. Piping to relief devices must not apply stress to the device. Adequately support piping. A length of flexible tubing or piping near the device is essential on spring-isolated machines.
4. Cover the outdoor vent with a rain cap and place a condensation drain at the low point in the vent piping to prevent water build-up on the atmospheric side of the relief device.

Table 2 — Relief Valve Tree Locations

RELIEF VALVE OUTLET SIZE	LOCATION	QUANTITY
1¼-in. NPT FEMALE CONNECTOR	Cooler	3

Contents

Make Electrical Connections — Field wiring must be installed in accordance with job wiring diagrams and all applicable electrical codes.

⚠ CAUTION

Do not run 120-v wiring into the control center. The control center should only be used for additional extra low-voltage wiring (50 v maximum).

Wiring information in this publication (Fig. 14-22) is for reference only and is not intended for use during actual installation; follow job specific wiring diagrams.

⚠ WARNING

Do not attempt to start compressor or oil pump (even for a rotation check) or apply test voltage of any kind while machine is under dehydration vacuum. Motor insulation breakdown and serious damage may result.

CONNECT CONTROL INPUTS — Connect the control input wiring from the chilled and condenser water flow switches to the starter terminal strip. Wiring may also be specified for a spare safety switch, and a remote start/stop contact can be wired to the starter terminal strip. Additional spare sensors and Carrier Comfort Network modules may be specified as well. These are wired to the machine control center as indicated in Fig. 19 and 20.

CONNECT CONTROL OUTPUTS — Connect auxiliary equipment, chilled and condenser water pumps, and spare alarms as required and indicated on job wiring drawings.

CONNECT FREE-STANDING, FIELD INSTALLED STARTER — Assemble and install compressor terminal box in desired orientation, and cut necessary conduit openings in conduit support plates. See Fig. 14-16 and 21. Attach power leads to compressor terminals in accordance with job wiring drawings, observing caution label in terminal box. Use only copper conductors. The motor must be grounded in accordance with NEC (National Electrical Code), applicable local codes, and job wiring diagrams. Installer is responsible for any damage caused by improper wiring between starter and compressor motor.

Figures 14-16 illustrate 3 methods for assembling multiple lead wires within the compressor terminal box. For the purposes of illustration, the terminal insulation has been omitted.

IMPORTANT: Do not insulate terminals until wiring arrangement has been checked and approved by Carrier start-up personnel. Also, make sure correct phasing is followed for proper motor rotation.

Insulate Motor Terminals and Lead Wire Ends — Insulate compressor motor terminals, lead wire ends, and electrical wires to prevent moisture condensation and electrical arcing. For low-voltage units (up to 600 v), obtain insulation material from machine shipping package consisting of 3 rolls of insulation putty and one roll of vinyl tape.

1. Insulate each terminal by wrapping with one layer of insulation putty.
2. Overwrap putty with 4 layers of vinyl tape.

High-Voltage Units — High-voltage units require special terminal preparation. Follow local electrical codes for high-voltage installation. Vinyl tape is not acceptable; high-voltage termination methods must be used.

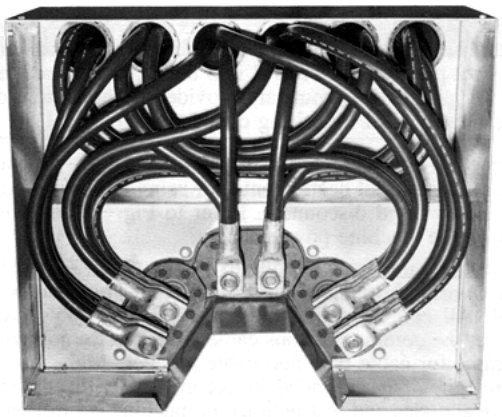


Fig. 14 — Compressor Terminal Arrangement 18 Lead, Rear Inlet

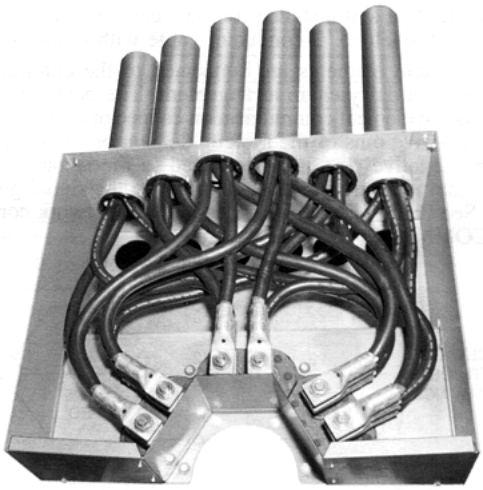


Fig. 15 — Compressor Terminal Arrangement 18 Lead, Top Inlet

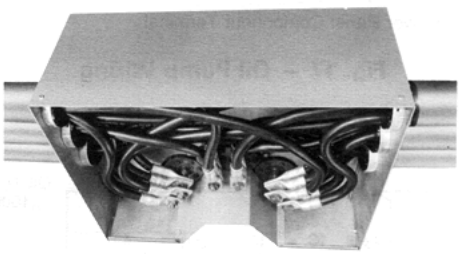


Fig. 16 — Compressor Terminal Arrangement 18 Lead, Side Inlet

Connect Power Wires to Oil Pump Starter — See Fig. 17. Connect power wires to oil pump starter mounted in machine power panel. Use separate fused disconnect or circuit breaker as shown on job wiring diagrams and Fig. 22. Check that power supply voltage agrees with oil pump voltage. Follow correct phasing for proper motor rotation.

Contents

⚠ CAUTION

Do not punch holes or drill into the top surface of the power panel. Knockouts are provided in the bottom of the power panel for wiring connections.

Connect Power Wires to Oil Heater Contactor — Connect power wiring to oil heater contactor using a separate power source and fused disconnect. Refer to Fig. 18 and wiring label on the machine power panel.

Connect Wiring from Starter to Power Panel — Connect control wiring from main motor starter to the machine power panel. All control wiring must use shielded cable. Also, connect the communications cable. Refer to the job wiring diagrams for cable type and cable number. Make sure the control circuit is grounded in accordance with applicable electrical codes and instructions on machine control wiring label.

CARRIER COMFORT NETWORK INTERFACE — The Carrier Comfort Network (CCN) communication bus wiring is supplied and installed by the electrical contractor. It consists of shielded, 3-conductor cable with drain wire.

The system elements are connected to the communication bus in a daisy chain arrangement. The positive pin of each system element communication connector must be wired to the positive pins of the system element on either side of it. The negative pins must be wired to the negative pins. The signal ground pins must be wired to the signal ground pins. See Fig. 19 for location of the CCN network connector (COMM1) on the processor module.

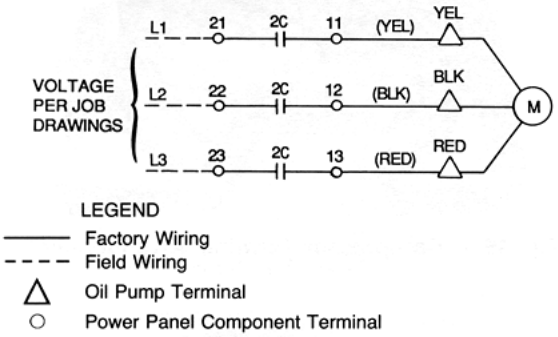
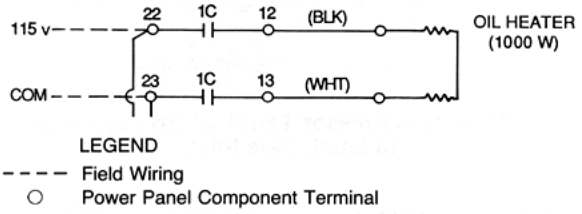


Fig. 17 — Oil Pump Wiring



NOTE: The voltage selector switch in the machine power panel is factory set for 115 v control power source. Do not set the voltage selector switch to 230 v since this setting will not power the oil heater.

Fig. 18 — Oil Heater and Control Power Wiring

NOTE: Conductors and drain wire must be 20 AWG (American Wire Gage) minimum stranded, tinned copper. Individual conductors must be insulated with PVC, PVC/nylon, vinyl, Teflon, or polyethylene. An aluminum/polyester 100% foil shield and an outer jacket of PVC, PVC/nylon, chrome vinyl, or Teflon with a minimum operating temperature range of −4 F to 140 F (−20 C to 60 C) is required. See table below for cables that meet the requirements.

MANUFACTURER	CABLE NO.
Alpha	2413 or 5463
American	A22503
Belden	8772
Columbia	02525

When connecting the CCN communication bus to a system element, a color code system for the entire network is recommended to simplify installation and checkout. The following color code is recommended:

SIGNAL TYPE	CCN BUS CONDUCTOR INSULATION COLOR	COMM1 PLUG PIN NO.
+	Red	1
Ground	White	2
−	Black	3

If a cable with a different color scheme is selected, a similar color code should be adopted for the entire network.

At each system element, the shields of its communication bus cables must be tied together. If the communication bus is entirely within one building, the resulting continuous shield must be connected to ground at only one single point. See Fig. 20. If the communication bus cable exits from one building and enters another, the shields must be connected to ground at the lightning suppressor in each building where the cable enters or exits the building (one point only).

To connect the 19EF chiller to the network, proceed as follows (Fig. 20):

1. Remove power to the Product Integrated Control (PIC) center.
2. Remove the COMM1 plug from the processor module.
3. Cut a CCN wire and strip the ends of the RED, WHITE, and BLACK conductors.
4. Using a wirenut, connect the drain wires together.
5. Insert and secure the RED wire to Terminal 1 of the COMM1 plug.
6. Insert and secure the WHITE wire to Terminal 2 of the COMM1 plug.
7. Insert and secure the BLACK wire to Terminal 3 of the COMM1 plug.
8. Mount a terminal strip in a convenient location.
9. Connect the opposite ends of each conductor to separate terminals on the terminal strip.
10. Cut another CCN wire and strip the ends of the conductors.
11. Connect the RED wire to the matching location on the terminal strip.
12. Connect the WHITE wire to the matching location on the terminal strip.
13. Connect the BLACK wire to the matching location on the terminal strip.

Contents

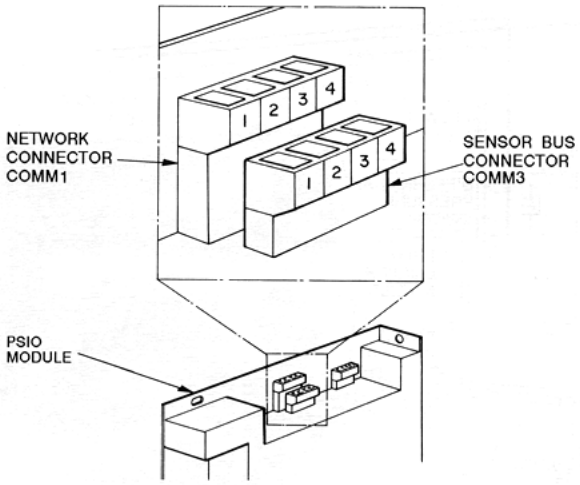


Fig. 19 — Carrier Comfort Network Communication Bus Wiring

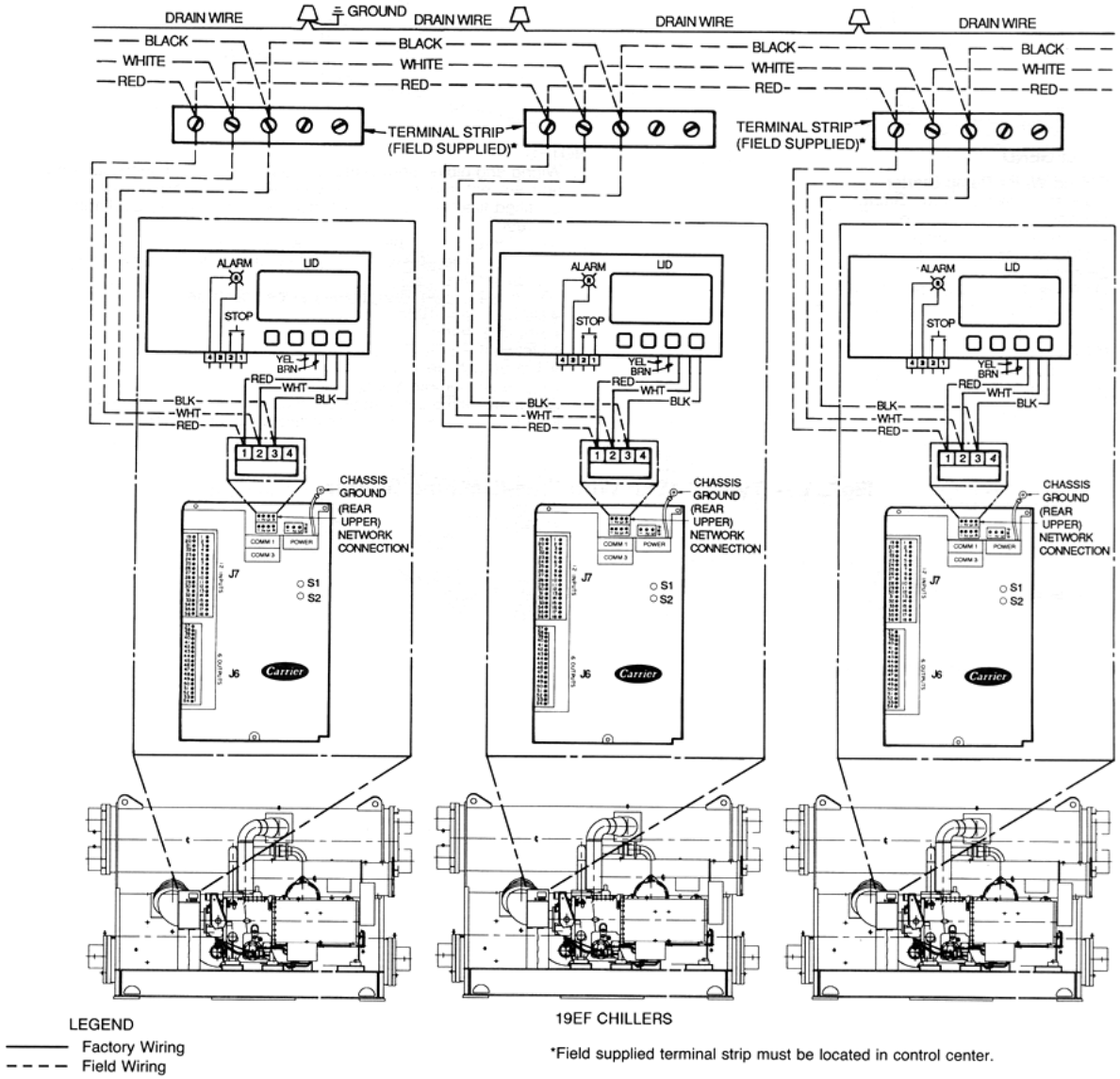
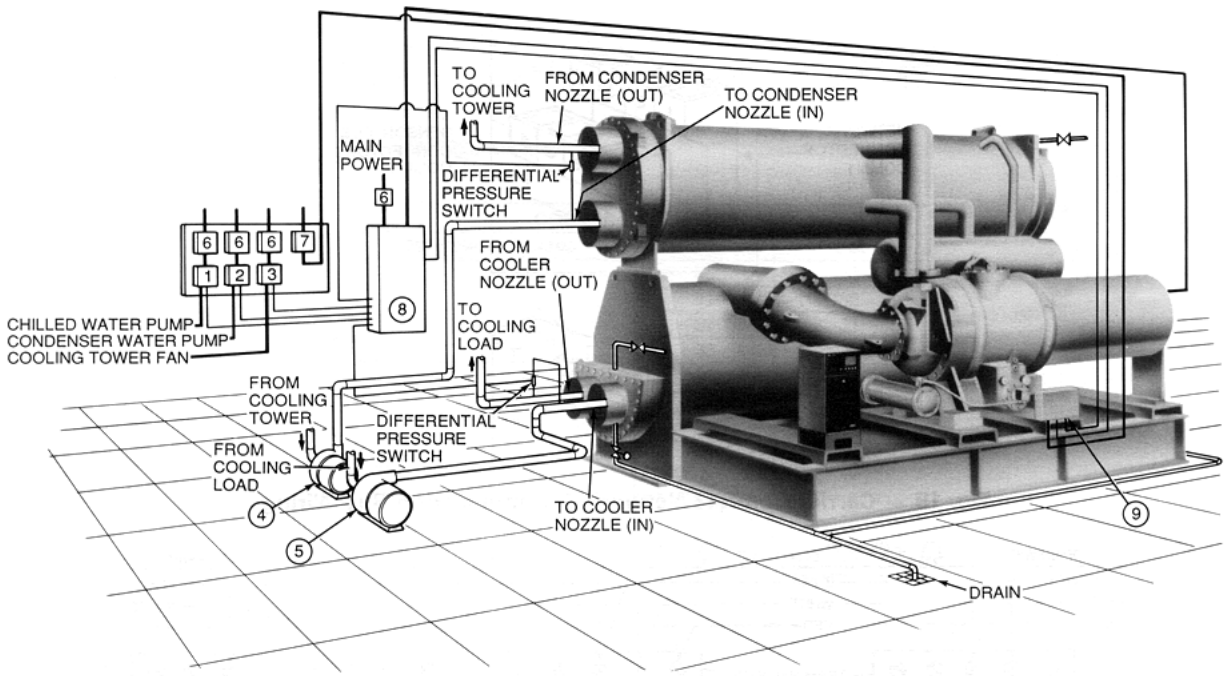


Fig. 20 — COMM1 CCN Communication Wiring For Multiple Chillers (Typical)

Contents



LEGEND

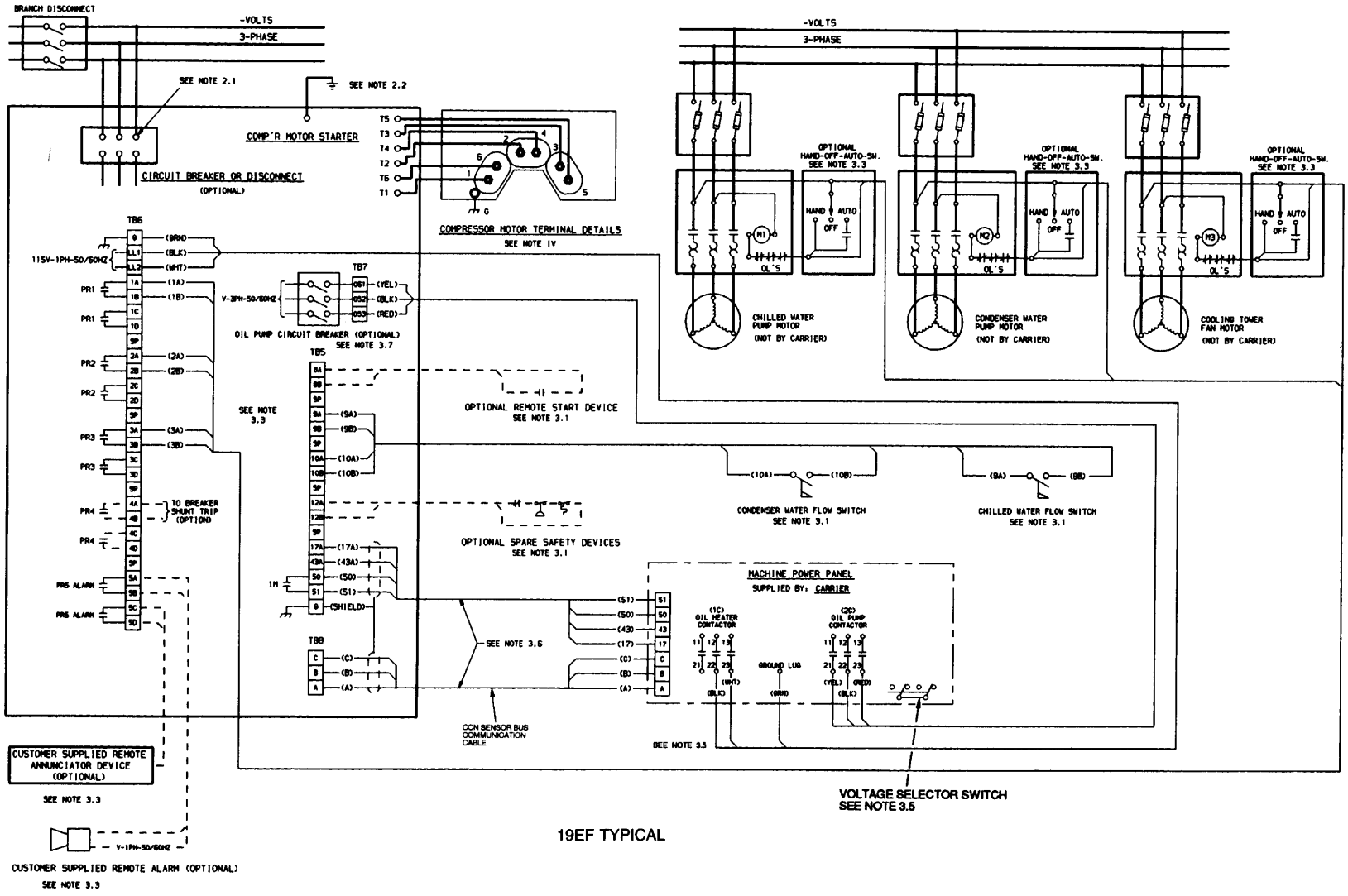
1	—	Chilled Water Pump Starter
2	—	Condenser Water Pump Starter
3	—	Cooling Tower Fan Starter
4	—	Condenser Water Pump
5	—	Chilled Water Pump
6	—	Disconnect
7	—	Oil Pump Disconnect (See Note 5)
8	—	Free-Standing Compressor Motor Starter
9	—	Chiller Power Panel

Piping
Control Wiring
Power Wiring

NOTES:
1. Wiring and piping shown are for general point-of-connection only and are not intended to show details for a specific installation. Certified field wiring and dimensional diagrams are available on request.
2. All wiring must comply with applicable codes.
3. Refer to Carrier System Design Manual for details regarding piping techniques.
4. Wiring not shown for optional devices such as:
   - Remote Start/Stop
   - Remote Alarms
   - Optional Safety Device
   - 4 to 20 mA Resets
   - Optional Remote Sensors
5. Oil pump disconnect may be located within the enclosure of Item 8 — Free-Standing Compressor Motor Starter.

Fig. 21 — Typical 19EF With Free-Standing Starter

Contents



19EF TYPICAL

Fig. 22 — Field Wiring (Low Voltage Motors) of PIC (Product Integrated Control) Free-Standing Starter

Contents

LEGEND AND NOTES FOR FIG. 22

LEGEND

Required Power Wiring
Required Control Wiring
Options Wiring

NOTES:

I GENERAL

1.0 Starters shall be designed and manufactured in accordance with Carrier Engineering requirement Z-375.
1.1 All field-supplied conductors, devices and the field-installation wiring, termination of conductors and devices, must be in compliance with all applicable codes and job specifications.
1.2 The routing of field-installed conduit and conductors and the location of field-installed devices, must not interfere with equipment access of the reading, adjusting, or servicing of any component.
1.3 Equipment installation and all starting and control devices must comply with details in equipment submittal drawings and literature.
1.4 Contacts and switches are shown in the position they would assume with the circuit deenergized and the chiller shut down.
1.5 WARNING: Do not use aluminum conductors.
1.6 Installer is responsible for any damage caused by improper wiring between starter and machine.

II POWER WIRING TO STARTER

2.0 Power conductor rating must meet minimum unit nameplate voltage and compressor motor RLA (rated load amps).
When (3) conductors are used:
Minimum ampacity per conductor = 1.25 x compressor RLA
When (6) conductors are used:
Minimum ampacity per conductor = 0.721 x compressor RLA.
2.1 Lug adapters may be required if installation conditions dictate that conductors be sized beyond the minimum ampacity required. Contact starter supplier for lug information.
2.2 Compressor motor and controls must be grounded by using equipment grounding lugs provided inside starter enclosure.

III CONTROL WIRING

3.0 Field supplied control conductors to be at least 18 AWG (American Wire Gage), or larger.
3.1 Chilled water and condenser water flow switch contacts, optional remote start device contacts, and optional spare safety device contacts must have 24 vdc rating. Maximum current is 60 ma, nominal current is 10 ma. Switches with gold plated bifurcated contacts are recommended.
3.2 Remove jumper wire between 12A and 12B before connecting auxiliary safeties between these terminals.
3.3 Pilot relays can control cooler and condenser pump and tower fan motor contactor coil loads rated up to 10 amps at 115 vac or up to 3 amps at 600 vac. Do not use starter control transformer as the power source for pilot relay loads.
3.4 Do not route control wiring carrying 30 v or less within a conduit which has wires carrying 50 v or higher or along side wires carrying 50 v or higher.
3.5 Voltage selector switch in machine power panel is factory set for 115 v control and oil heater power source. If switch is set to 230 v position, oil heater will not function.
3.6 Control wiring cables between starter and power panel must be shielded with minimum rating of 600 v, 80 C. Ground shield at starter. The CCN sensor bus and the control wiring must be run in separate cables.
3.7 If optional oil pump circuit breaker is not supplied within the starter enclosure as shown, it must be located within sight of the machine with wiring routed to suit.

IV POWER WIRING BETWEEN STARTER AND COMPRESSOR MOTOR

4.0 Medium voltage (over 600 volts) compressor motors have 3 terminals. Connections out of terminals are 3 in. long no. 4 stranded wire pigtails. Use suitable splice connectors and insulation for high-voltage alternating current cable terminations (these items are not supplied by Carrier). Compressor motor starter must have nameplate stamped as to conforming with Carrier requirement Z-375.
4.1 When more than one conduit is used to run conductors from starter to compressor motor terminal box, one conductor from each phase must be in each conduit, to prevent excessive heating, (e.g., conductors to motor terminals 1, 2, and 3 in one conduit, and those to 1, 2, and 3 in another).
4.2 Compressor motor power connections can be made through top of compressor motor terminal box by using holes cut by contractor to suit conduit. Flexible conduit should be used for the last few feet to the terminal box for unit vibration isolation. Use of stress cones or 12 conductors larger than 500 MCM may require an oversize (special) motor terminal box (not supplied by Carrier).
4.3 Compressor motor frame to be grounded in accordance with the National Electrical Code (NFPA-70) and applicable codes. Means for grounding compressor motor is (1) pressure connector for 300 to 800 MCM wire, supplied and located in the lower left side corner of the compressor motor terminal box.
4.4 Do not allow motor terminals to support weight of wire cables, use cable supports and strain reliefs as required.

Install Field Insulation — Apply insulation as specified in the job data and Fig. 23. If the pressure gage reading (above) indicates a significant loss of the 10 psig (68 kPa) holding charge, the machine may require dehydration. *Do not apply insulation before dehydration.*

Standard factory insulation covers the compressor motor shell, motor end cover, motor cooling line, and refrigerant drain from the compressor. Field coverage may include the compressor suction housing and suction elbow, flash economizer, and the cooler. The approximate square footage required for insulating this area is given in Table 3. When insulating the cooler waterboxes and economizer, apply insulation so that all covers may be removed for service access. Do not cover nameplates.

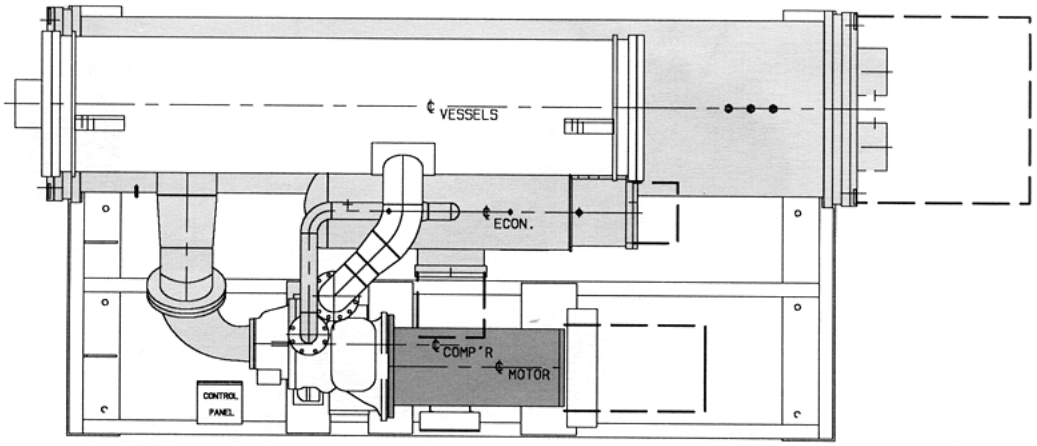
Cooler and condenser waterboxes are not factory insulated. Insulation must be field supplied and installed at the jobsite by the installation contractor. Field insulation of other small lines and fittings may be required. If system conditions lead to condensation, the condenser and storage tank may require field supplied and installed insulation.

Table 3 — Insulation Areas

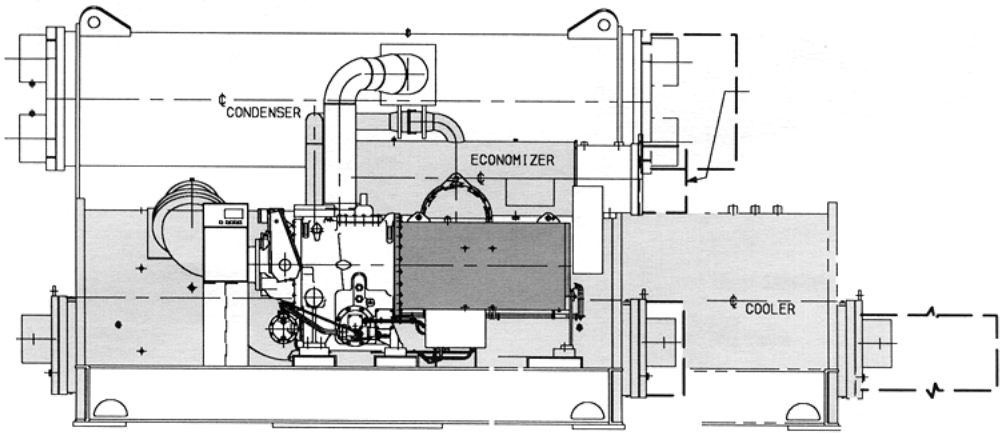
PASS ARRANGEMENT	COOLER*		FLASH ECONOMIZER†		COMPRESSORS SUCTION HOUSING		TOTAL	
	ft^2	m^2	ft^2	m^2	ft^2	m^2	ft^2	m^2
1	505	47	45	4.2	15	1.4	565	52.6
2	460	43	45	4.2	15	1.4	520	48.6

*Includes marine waterboxes, suction elbow, tubesheet, shell, and supports.
†Includes low side float chamber and shell.

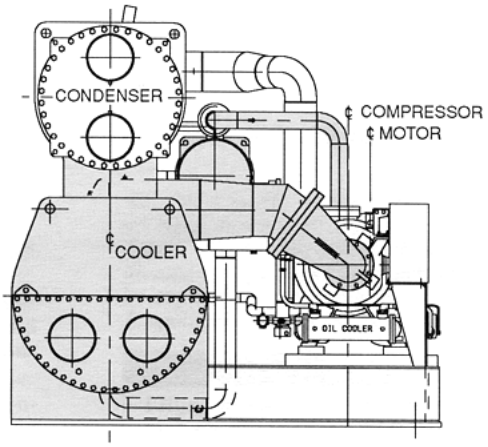
Contents



PLAN VIEW



FRONT VIEW



FIELD INSULATION AREA

FACTORY INSULATION AREA

COMPRESSOR END VIEW

Fig. 23 — 19EF Insulation Area

Contents

INSTALLATION START-UP REQUEST CHECKLIST

Machine Model Number: 19EF Serial Number: _____

To: _____ Date _____

_____

_____ Project Name

Attn: _____

_____ Carrier Job Number

The following information provides the status of the chiller installation.

	YES/NO (N/A)	DATE TO BE COMPLETED
1. The machine is level.		
2. The machine components are installed and connected in accordance with the installation instructions.		
3. The isolation package and grouting (if necessary) are installed.		
4. The relief valves are piped to the atmosphere.		
5. All piping is installed and supported. Direction of flow is indicated in accordance with the installation instructions and job prints.		
a. Chilled water piping		
b. Condenser water piping		
c. Waterbox drain piping		
d. Oil cooler water piping		
e. Pumpout unit condenser water piping (if installed)		
f. Other _____		
6. Flow switches are installed on both cooler and condenser water loops.		
7. Gages are installed as called for on the job prints required to establish design flow for the cooler and condenser.		
a. Water pressure gages IN and OUT		
8. The machine's starter wiring is complete. The wiring is installed per installation instructions and certified prints.		
a. Power wiring to compressor motor. (Motor leads will not be taped until the Carrier technician megger tests the motor.)		
b. Oil pump wiring		
c. Oil heater/control wiring		
d. Flow switch wiring on cooler and condenser		
e. Other _____		
9. The motor starter has not been supplied by Carrier. It has been installed according to the manufacturer's instructions.		
10. The motor starter has not been supplied by Carrier and it has been checked for proper operation.		

COMMENTS:

_____

_____

_____

_____

Contents

TESTING	YES/NO	DATE TO BE COMPLETED
1. The cooling tower fan has been checked for blade pitch and proper operation.	_____	_____
2. The chilled water and condenser water lines have been:		
a. Filled	_____	_____
b. Tested	_____	_____
c. Flushed	_____	_____
d. Vented	_____	_____
e. Strainers cleaned	_____	_____
3. The chilled water and condenser water pumps have been checked for proper rotation and flow.	_____	_____
4. The following cooling load will be available for start-up:		
a. 25%	_____	_____
b. 50%	_____	_____
c. 75%	_____	_____
d. 100%	_____	_____
5. The refrigerant charge is at the machine.	_____	_____
6. Services such as electrical power and control air will be available at start-up.	_____	_____
7. The electrical and mechanical representatives will be available to assist in commissioning the machine.	_____	_____
8. The customer's operators will be available to receive instructions for proper operation of the chiller after start-up.	_____	_____

Concerns about the installation/request for additional assistance:

_____

_____

_____

_____

_____

I am aware that the start-up time for a Carrier chiller can take between 2 and 6 days depending on the model of the machine and the options and accessories used with it.

Your contact at the job site will be _____

Phone number _____

Beeper number _____

Fax number _____

In accordance with our contract, we hereby request the services of your technician to render start-up services per contract terms for this job on _____ (Date). I understand that the technician's time will be charged as extra services due to correcting items in this checklist that are incomplete.

Signature of Purchaser _____

Signature of Job Site Supervisor _____

CUT ALONG PERFORATED LINE

Contents