



Installation Instructions

R'Newal Plus Compressor Upgrade



⚠ SAFETY WARNING

Only qualified personnel should install and service the equipment. The installation, starting up, and servicing of heating, ventilating, and air-conditioning equipment can be hazardous and requires specific knowledge and training. Improperly installed, adjusted or altered equipment by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the literature and on the tags, stickers, and labels that are attached to the equipment.



Introduction

Read this manual thoroughly before operating or servicing this unit.

Warnings, Cautions, and Notices

Safety advisories appear throughout this manual as required. Your personal safety and the proper operation of this machine depend upon the strict observance of these precautions.

The three types of advisories are defined as follows:

- WARNING** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
- CAUTION** Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It could also be used to alert against unsafe practices.
- NOTICE** Indicates a situation that could result in equipment or property-damage only accidents.

Important Environmental Concerns

Scientific research has shown that certain man-made chemicals can affect the earth's naturally occurring stratospheric ozone layer when released to the atmosphere. In particular, several of the identified chemicals that may affect the ozone layer are refrigerants that contain Chlorine, Fluorine and Carbon (CFCs) and those containing Hydrogen, Chlorine, Fluorine and Carbon (HCFCs). Not all refrigerants containing these compounds have the same potential impact to the environment. Trane advocates the responsible handling of all refrigerants.

Important Responsible Refrigerant Practices

Trane believes that responsible refrigerant practices are important to the environment, our customers, and the air conditioning industry. All technicians who handle refrigerants must be certified according to local rules. For the USA, the Federal Clean Air Act (Section 608) sets forth the requirements for handling, reclaiming, recovering and recycling of certain refrigerants and the equipment that is used in these service procedures. In addition, some states or municipalities may have additional requirements that must also be adhered to for responsible management of refrigerants. Know the applicable laws and follow them.

WARNING

Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury. All field wiring **MUST** be performed by qualified personnel. Improperly installed and grounded field wiring poses **FIRE** and **ELECTROCUTION** hazards. To avoid these hazards, you **MUST** follow requirements for field wiring installation and grounding as described in **NEC** and your local/state/national electrical codes.

WARNING

Personal Protective Equipment (PPE) Required!

Failure to wear proper PPE for the job being undertaken could result in death or serious injury. Technicians, in order to protect themselves from potential electrical, mechanical, and chemical hazards, **MUST** follow precautions in this manual and on the tags, stickers, and labels, as well as the instructions below:

- Before installing/servicing this unit, technicians **MUST** put on all PPE required for the work being undertaken (Examples; cut resistant gloves/sleeves, butyl gloves, safety glasses, hard hat/bump cap, fall protection, electrical PPE and arc flash clothing). **ALWAYS** refer to appropriate Safety Data Sheets (SDS) and OSHA guidelines for proper PPE.
- When working with or around hazardous chemicals, **ALWAYS** refer to the appropriate SDS and OSHA/GHS (Global Harmonized System of Classification and Labeling of Chemicals) guidelines for information on allowable personal exposure levels, proper respiratory protection and handling instructions.
- If there is a risk of energized electrical contact, arc, or flash, technicians **MUST** put on all PPE in accordance with OSHA, NFPA 70E, or other country-specific requirements for arc flash protection, **PRIOR** to servicing the unit. **NEVER PERFORM ANY SWITCHING, DISCONNECTING, OR VOLTAGE TESTING WITHOUT PROPER ELECTRICAL PPE AND ARC FLASH CLOTHING. ENSURE ELECTRICAL METERS AND EQUIPMENT ARE PROPERLY RATED FOR INTENDED VOLTAGE.**

⚠ WARNING**Follow EHS Policies!**

Failure to follow instructions below could result in death or serious injury.

- All Trane personnel must follow the company's Environmental, Health and Safety (EHS) policies when performing work such as hot work, electrical, fall protection, lockout/tagout, refrigerant handling, etc. Where local regulations are more stringent than these policies, those regulations supersede these policies.
- Non-Trane personnel should always follow local regulations.

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General Information

This literature describes CenTraVac™ R'newal Plus compressor upgrade unit disassembly and reassembly including compressor, economizer, suction elbow, unit mounted starter, and compressor for model CVHE, CVHF, and CDHF duplex CenTraVac units. The information in this literature may be used for all compressor sizes from 130 to 3500 tons.

Brazing and Welding

Refer to CenTraVac manuals for methods of brazing and welding. Trane recommends that only R Stamp certified welders attempt this fabrication.

Recommended: Trane Gas Metal Welding Pulse Process.

If Trane process is not available, stick arc is recommended.

Short Arc Gas Metal Welding Process is NOT recommended.

The unit is made of A36 low carbon steel. The preferred welding rods are as follows:

- **Stick welding:** E7018
Note: *If E7018 is not readily available, E7016 or E6011 are acceptable if the unit is not ASME rated.*
- **MIG welding:** Filler wire ER70S-6 (AWS)

Reference Information

For detailed compressor disassembly and assembly information see:

- *Water-Cooled CenTraVac Chiller CVHE/CVHG Compressor Disassembly Service Guide (CTV-SVG01*-EN).*
- *Water-Cooled CenTraVac Chiller CVHE/CVHG Compressor Assembly Service Guide (CTV-SVG02*-EN).*
- *Water-Cooled CenTraVac Chiller CVHF Compressor Disassembly Service Guide (CTV-SVG03*-EN).*
- *Water-Cooled CenTraVac Chiller CVHF Compressor Assembly Service Guide (CTV-SVG04*-EN).*
- *Water-Cooled CenTraVac Chillers CVHF Extended Capacity Compressor Disassembly Service Guide (CTV-SVG05*-EN).*
- *Water-Cooled CenTraVac Chiller CVHF Extended Capacity Compressor Assembly Service Guide (CTV-SVG06*-EN).*

Material

Table 1. Standard and optional materials

Material	Description	Comments
CVHE or CVHF compressor	Production CVHE or CVHF compressor with support bracket.	Compressor is selected to operating conditions and R-514a refrigerant.
Compressor foot assembly	Compressor mounting plate and brackets for welding to chiller evaporator (if required).	Provided as required for CVHE design sequence 1V and older. These condensers may sit lower than current production condensers. As a result, mounting brackets may be too high and may require modifications.
Suction elbow assembly	Suction elbow with flanges, O-rings, and companion flange for welding to evaporator shell (if required).	Provided whenever required. Flanges require field fitting and welding.
Oil tank and pump assembly	Production oil tank and pump (required for pre-refrigerant pump units).	Provided for all chillers without a refrigerant pump type oil tank and pump.
R-514a oil pump conversion hardware	Oil pump rotor shaft, seals, and other required parts if existing unit has refrigerant pump.	Provided for all chillers having a refrigerant pump type oil tank and pump. These units are typically built in 2000 or newer. See <i>Low Pressure R-514A Engineered Chiller Conversion CenTraVac™ Water-Cooled Chillers Models CVHE, CVHF, and CVHG Service Guide (ECSC-SVG001*-EN)</i> for oil pump conversion instructions.
Refrigerant and oil piping sets	Production piping, flanges, oil separators, filters, and seals for equivalent new chiller	Provided on all chillers requiring new oil tanks and/or where compressor is changed from CVHE to CVHF. Piping modifications may be required for proper fit.
Economizer assembly	Economizer with liquid and vapor piping.	New economizer provided when compressor is changed from CVHE to CVHF. May also be ordered if there is excessive rust on existing economizer. Piping is not assembled and may require modifications for proper fit.
Orifice plates and flanges.	Orifice plates, gaskets, fasteners, and flanges.	Orifice plates with gaskets provided when required. Condenser-to-economizer and economizer-to-evaporator flanges with gaskets and fasteners provided with economizers, or whenever CVHE/CVHF units configuration includes original 4-bolt flange. See <i>Economizer Flange Rebuild Kits Installation Instructions (PART-SVN104*-EN)</i> .



General Information

Table 1. Standard and optional materials (continued)

Material	Description	Comments
Service valves and orifice disk	Vapor and liquid charging valves, service valves and carbon rupture disk and applicable stickers.	R-514a type valves and stickers provided.

Table 2. Field-provided material

Material	Description	Comments
EcoWise Purge	A new EcoWise purge must be ordered separately or the existing EarthWise purge must be converted by removing the carbon tank.	Order EcoWise purge through Trane. See <i>Low Pressure R-514A Engineered Chiller Conversion CenTraVac™ Water-Cooled Chillers Models CVHE, CVHF, and CVHG Service Guide</i> (ECSC-SVG001*-EN) for EarthWise purge conversion instructions.
Symbio™ controls	Symbio controls upgrade is required.	Symbio upgrade is ordered separately.
Paint and insulation	May be required for welded piping, suction elbow, and other materials.	Painting and insulation are field-provided.
Miscellaneous piping and fittings	The pipes and fittings provided are for current CenTraVac chiller design and may not fit properly.	Any required additional materials are field-provided.
Miscellaneous bolts, fasteners, sealants, and assembly materials	Materials pulled from bulk plant stock are not orderable and are not provided.	Any required assembly materials are field-provided.



Pre-Installation

Inspection Checklist

- Inspect potential chiller corrosion areas including orifice plate flanges, suction flange area, evaporator shell, and economizer for excessive corrosion, which must be repaired for reliable operation.

Note: *If excessive corrosion is found around the suction flange, orifice plate flanges, or in other areas, repair or replacement should be considered.*

- Inspect tube sheet for damage due to corrosion. Consider whether epoxy coating of tube sheet would be beneficial.
- Inspect paint and insulation condition. Identify any needed work in the R'newal Plus compressor upgrade plan.
- An Eddy current test of heat exchanger tubes is recommended to confirm the heat exchanger condition is suitable for 20+ years of future use. Identify any tubes that require replacement or plugging. Include this work in the R'newal Plus compressor upgrade project.

- Review the equipment room monitoring and ventilation systems for adherence to code requirements for R-514A refrigerant. If non-compliances are identified, include any required changes in the R'newal Plus compressor upgrade project.
- Evaluate equipment room access to verify the compressor can be moved intact into the equipment room, or if compressor disassembly is required. Where handling may be difficult (stairwells, elevators, doorways, loading docks, access portholes, hallways), photograph and document dimensions of the space.
- Determine if a suitable gantry is available to lift the compressor off and on the chiller. If the available gantry is insufficient for the motor compressor weight, the compressors must be disassembled for rigging and assembly. See *CenTraVac™ Water-cooled Chillers Disassembly and Reassembly Installation Guide (CVHE-SVN04*-EN)* for compressor and motor weights. Use the heaviest combinations.

Table 3. Compressor and motor weights

Model	NTON	CPKW ^(a)	Volts	Hz	Motor Weight		Compressor and Motor Weight	
					lb	Kg	lb	Kg
CVHE	190–270	242	6600	50	2558	1160	7294	3308
	230–320	287	4160	60	2530	1147	7266	3295
	300–420	379	6600	50	2767	1255	8185	3712
	360–500	453	6600	60	3385	1535	8803	3992
CVHF	350–485	453	6600	60	3385	1535	8013	3634
	350–570	588	480	60	2803	1271	7431	3370
	620–870	957	2300	60	3862	1751	9900	4490
	650–910	957	2300	60	3862	1751	9900	4490
	1060–1280	1228	4160	60	4559	2067	10597	4806
	1070–1300	1228	4160	60	4559	2067	10714	4859
	1470–1720	1340	2400	60	5196	2356	13932	6319
CVHG	480–565	489	6600	50	3794	1720	10000	4535
	670–780	621	6600	50	4685	2125	11311	5130
	920–1067	621	6600	50	4685	2125	12151	5511
CDHF ^(b)	1500–2000	745	460	60	3460	1569	9498	4308
	2100–2500	1062	460	60	4296	1948	10334	4687
	3500	1340	2400	60	5196	2356	13911	6309
CDHG ^(b)	1250–1750	621	6600	50	4685	2125	11311	5130
	2150	621	6600	50	4685	2125	12151	5511

Note: All weights are nominal and $\pm 10\%$.

(a) Heaviest motor used; does not include the weight of the suction elbow.

(b) For Duplex™ chillers, weights shown are for individual components; multiply by two for total component weights (for Duplex chillers only).

Disassembly

Prepare Unit for Disassembly

⚠ WARNING

Hazardous Voltage!

Failure to disconnect power before servicing could result in death or serious injury. Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/ tagout procedures to ensure the power can not be inadvertently energized. Verify that no power is present with a voltmeter.

1. Recover refrigerant and evacuate the unit to 2.5 mm vacuum and bring the unit back up to atmospheric pressure using dry nitrogen.
2. Drain oil tank.

⚠ WARNING

Heavy Object!

Failure to follow instructions below could result in unit dropping which could result in death or serious injury, and equipment or property-only damage.

Ensure that all the lifting equipment used is properly rated for the weight of the unit being lifted. Each of the cables (chains or slings), hooks, and shackles used to lift the unit must be capable of supporting the entire weight of the unit. Lifting cables (chains or slings) may not be of the same length. Adjust as necessary for even unit lift.

Notes:

- Proper lifting fixtures are required for handling various components of CenTraVac™ compressors. For Trane offices these fixtures are available for purchase via the Trane Service Specialty Tools program.
- Trane assumes no responsibility for the use of non-Trane provided materials or methods, or for the improper or faulty assembly and use of lifting fixtures. Never exceed the maximum safe lifting capacity of the fixture.

Important: Some of the lifting tools built for the CenTraVac compressor components have a maximum lifting capacity of 1300 lb. The tool maximum weight capacity is stamped on the tool. Some CenTraVac castings exceed this rating and the proper lifting tool must be used.

Note: Follow proper procedures when handling large compressor components. Use lifting and rigging equipment rated for the maximum component weights shown in Table 3. Each lifting device must be rated at least 100 percent of the component weight. Carefully inspect lifting equipment to confirm it is in good condition and has been certified for continued use at proper intervals.

Remove Suction Elbow

⚠ WARNING

Heavy Objects!

Failure to follow instructions below could result in component dropping which could result in death or serious injury, and equipment or property-only damage.

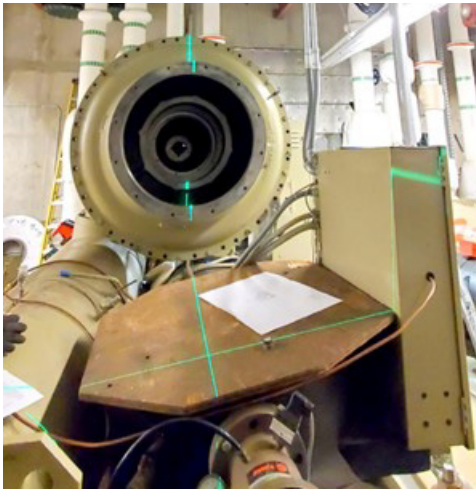
Loads can shift and become off-center during shipping. Ensure that components are centered before lifting and always test lift each component to verify center of gravity using lifting equipment rated for the task. Only experienced riggers should perform unit disassembly/reassembly.

1. Support the suction elbow to the sling and/or lifting lug.

Figure 1. Suction elbow



2. Remove bolts from the mounting bracket on the back of the control panel. Remove control panel and set aside.
3. Remove the suction elbow bolts at the compressor and evaporator connections.
4. Lift the suction elbow from the chiller being careful to not damage flange surface.
5. If the suction elbow will not be reused, remove and retain the control panel bracket.
6. Install protective covers on the evaporator and compressor connections. Plastic, along with duct tape, is adequate cover if no heavy objects are set on the openings. Alternately, wood or metal disks as shown below may be used.

Figure 2. Wood protective covering


Remove Unit Mounted Starter or AFD

If necessary, additional clearance may be obtained by removing the unit mounted starter or Adaptive Frequency Drive (AFD), if installed.

1. Mark and disconnect power wiring at the compressor motor terminal lugs inside the starter panel.
2. Mark and disconnect control wiring entering the starter panel. Remove the control wiring conduit from the starter panel. If AFD is installed, disconnect cooling lines.
3. Remove the bolts securing the bottom of the starter to the brackets on the evaporator.
4. Loosen the bolts which hold the starter/AFD to the flange on the motor.

Important: Support the panel as the bolts are removed to prevent the panel from tipping forward.

5. Remove the starter/AFD panel from the chiller. Store the panel in a clean, dry area free of any corrosive agents.
6. For reinstallation, perform steps in reverse order.

Remove Compressor

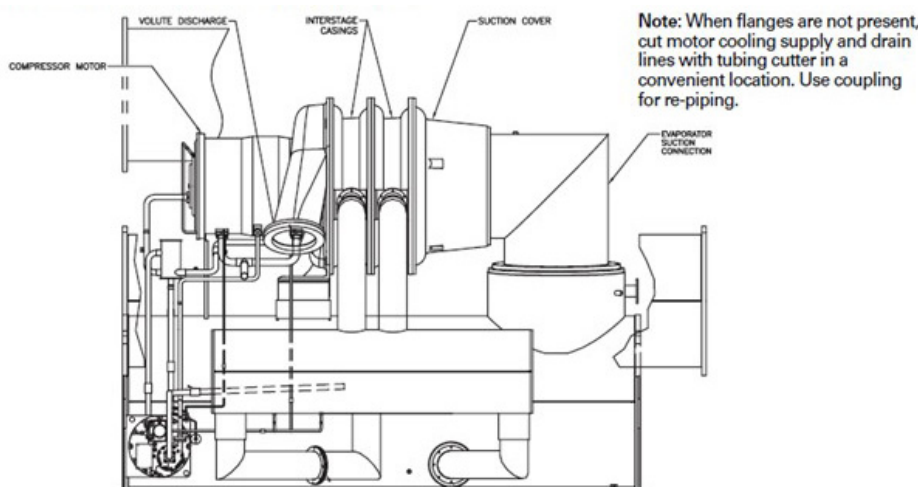
Option 1: Complete Compressor Assembly

Use this option when rigging capacity allows lifting an assembled compressor. When rigging capacity is not sufficient, use **“Option 2: Disassembled Compressor (when rigging capacity insufficient to lift assembled compressor),” p. 10.**

This operation assumes the compressor will be removed and discarded.

Note: If the complete compressor assembly will be reused on a different chiller, install dowel pins in the compressor motor assembly to prevent interstage casings from shifting. If the compressor/motor assembly is lifted without doweling installed, the internal components may shift and serious compressor damage may result if the compressor is re-used.

1. For chillers requiring a new oil tank:
 - a. Disconnect, remove and set aside the oil return eductor lines, motor cooling lines, and oil supply and return lines.
 - b. Remove the oil tank from top of condenser.
2. For refrigerant pump chillers:
 - a. Cut and reserve the oil return eductor lines, motor cooling lines, and oil supply and return lines as required for clearance. Use a tube cutter in a convenient location clear of compressor.
 - b. Disconnect connections from compressor and reserve the lines for the new compressor.
 - c. Use a coupling for re-piping as shown in [Figure 3](#).

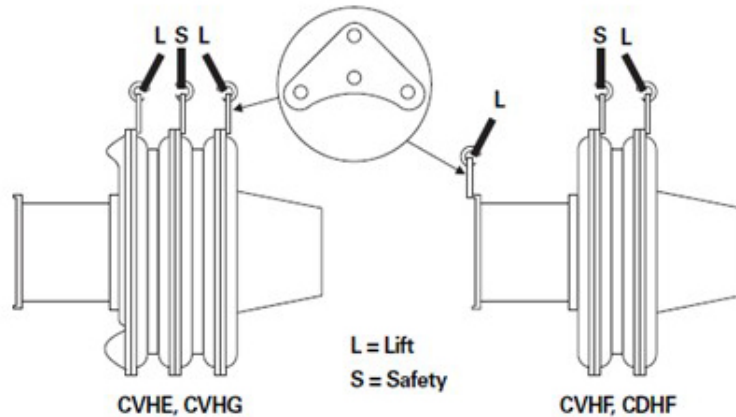
Figure 3. Typical motor cooling supply and drain lines


3. Remove the control panel, if necessary.
4. Remove the economizer vent pipe flange bolts at the compressor connection. See the “Remove Economizer,” p. 11 section for instructions.

5. Install lifting plates on top of the compressor volute flanges. See Figure 4. Each plate must be secured by three volute flange bolts. The lifting plates are to be fabricated from 1-1/2-inch steel plates.

Figure 4. Rigging the compressor/motor assembly

Note: CVHE 200 thru 500 tons require 3 mounting holes, plate to volute. CVHE 800 thru 1280, CVHF 800, CDHF require 4 mounting holes, plate to volute.



6. Support the compressor/motor assembly as shown in Figure 4. Do not lift the assembly. Support is required to prevent it from slipping as the compressor base and discharge connection flange bolts are removed.
7. Remove the compressor/motor assembly. Remove the locating dowel pins from the compressor base and discharge flange connections. To remove the dowel pin, remove the nut on the dowel pin, place a bushing on the pin, and reinstall the nut. See Figure 5 and Figure 6.

Option 2: Disassembled Compressor (when rigging capacity insufficient to lift assembled compressor)

Use this option when rigging capacity is insufficient to lift the assembled compressor.

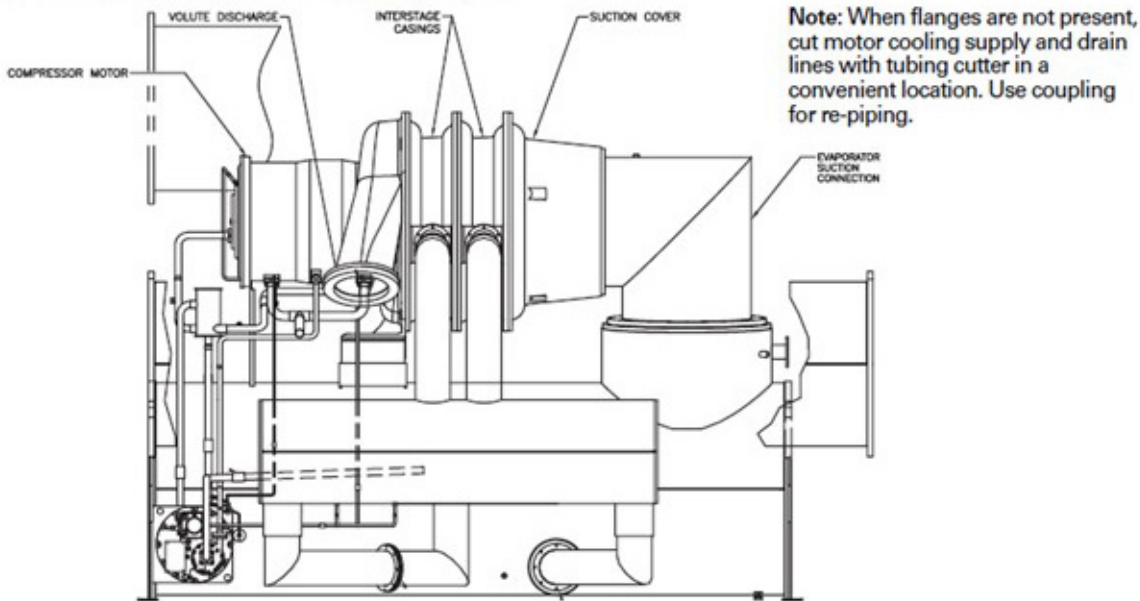
1. On chillers requiring a new oil tank, disconnect the oil return eductor lines, motor cooling lines and oil supply and return lines. Then remove the tank from top of condenser.
2. For refrigerant pump chillers, cut and reserve the oil return eductor lines, motor cooling lines, and oil supply and return lines as required for clearance with a tubing cutter in a convenient location clear of compressor. Disconnect connections from compressor and reserve the lines for the new compressor. Use a coupling for re-piping, see Figure 7.

Figure 5. Discharge flange dowel pin



Figure 6. Compressor foot dowel pin



Figure 7. Typical motor cooling supply and drain lines


3. Disassemble the compressor using the appropriate disassembly procedure:
 - *CVHE/CVHG Compressor: Water-Cooled CenTraVac Chiller CVHE/CVHG Compressor Disassembly Service Guide (CTV-SVG01*-EN).*
 - *CVHF Compressor: Water-Cooled CenTraVac Chiller CVHF Compressor Disassembly Service Guide (CTV-SVG03*-EN).*
 - *CVHF Extended Capacity Compressor: Water-Cooled CenTraVac Chiller CVHF Extended Capacity Compressor Disassembly Assembly Service Guide (CTV-SVG05*-EN).*
4. Remove the discharge volute.
5. Remove the locating dowel pins from the compressor base and discharge flange connections. To remove the dowel pin, remove the nut on the dowel pin, place a bushing on the pin, and reinstall the nut.

Figure 8. Discharge flange dowel pin

Figure 9. Compressor foot dowel pin


Remove Economizer

1. Economizer weights are show in the [Table 4](#) below. Support the weight of the economizer with a movable floor jack. For larger economizers, support using overhead crane rigging may be necessary. Do not lift the economizer.

Table 4. Economizer weights

Model	Evap Shell Size	Economizer without Free Cooling		Economizer with Free Cooling	
		lb	kg	lb	kg
CVHE	032	404	183	564	256
CVHE CVHG	050	635	288	885	401
	080	976	443	1296	588
CVHF	050	420	191	670	304
	080	735	333	1055	479
	142/210/250	878	398	1348	611
CVHG	142/210	1433	650	1903	863
CDHF ^(a)	210/250D/250M/250X	878	398	1348	611
CDHG	210/250	1433	650	1903	863

Note: All weights are nominal and $\pm 10\%$.

(a) For Duplex chillers, weights shown are for individual components; multiply by two for total component weights (for Duplex chillers only).

- Remove the insulation and loosen the bolts on the condenser liquid line flange. See Figure 10. Do not remove the bolts at this time.

Figure 10. Economizer and liquid line flange


- Cut the motor cooling drain line(s) if present. Cut the entering and leaving 5/8-inch OD copper oil cooler lines.
- Economizers are connected to the condenser shell with a bolted flange. Remove the bolts at this flanged connection. See Figure 10.
- Loosen the economizer vent pipe bolts which secure the vent pipes to the compressor interstage castings (unless the compressor has already been removed to gain clearance).
- Remove the bolts from the condenser and evaporator liquid line connection flanges. Adjust the floor jack as necessary to support the weight of the economizer.

Important: If the vent pipe bolts have already been removed, two people should steady the economizer on the floor jack as the liquid line bolts are removed.

- Remove the economizer vent pipe flange bolts to loosen the economizer. See Figure 10. When the bolts are free, back the economizer away from the chiller.

Important: The economizer may tend to rotate off the jack towards the chiller. Be prepared to offset the rotation.

- Remove the economizer orifice plates and mark for reinstallation in the proper location.
 - The orifice with the greatest number of holes is located between the economizer and the evaporator.
 - The orifice with fewer holes is located between the condenser and economizer.
- Move the economizer away from the chiller and set on a pallet.
- Cover all openings to prevent the entry of foreign material into the economizer, condenser, and compressor.

Remove Unit Mounted Purge

If additional vertical clearance is required, remove the purge assembly from the top of the condenser as follows.

1. Disconnect and mark all piping and wiring attached to the purge unit. Sand all paint off at cut points. Use a tubing cutter for cutting pipes. See [Figure 11](#).

Figure 11. Purge assembly



2. Remove the fasteners connecting the purge unit base to its mounting bracket.
3. Lift the purge unit clear of the chiller, and store in a clean dry area.
4. Reassemble the purge unit in reverse order.

Compressor Replacement and Unit Assembly

⚠ WARNING

Heavy Object!

Failure to follow instructions below could result in unit dropping which could result in death or serious injury, and equipment or property-only damage. Ensure that all the lifting equipment used is properly rated for the weight of the unit being lifted. Each of the cables (chains or slings), hooks, and shackles used to lift the unit must be capable of supporting the entire weight of the unit. Lifting cables (chains or slings) may not be of the same length. Adjust as necessary for even unit lift.

Notes:

- Proper lifting fixtures are required for handling various components of CenTraVac™ compressors. For Trane offices these fixtures are available for purchase via the Trane Service Specialty Tools program.
- Trane assumes no responsibility for the use of non-Trane provided materials or methods, or for the improper or faulty assembly and use of lifting fixtures. Never exceed the maximum safe lifting capacity of the fixture.

Important: Some of the lifting tools built for the CenTraVac compressor components have a maximum lifting capacity of 1300 lb. The tool maximum weight capacity is stamped on the tool. Some CenTraVac castings exceed this rating and the proper lifting tool must be used.

Note: Follow proper procedures when handling large compressor components. Use lifting and rigging equipment rated for the maximum component weights shown in Table 3. Each lifting device must be rated at least 100 percent of the component weight. Carefully inspect lifting equipment to confirm it is in good condition and has been certified for continued use at proper intervals.

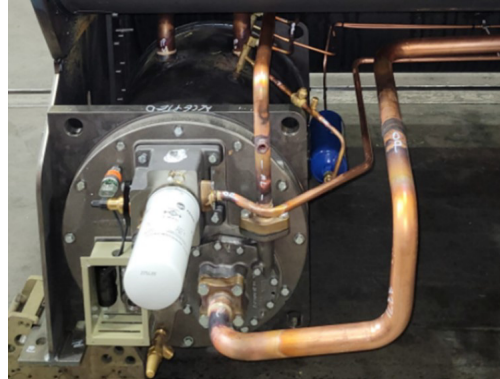
Oil Tank/Oil Pump Configuration

Chillers without Refrigerant Pumps – Locate/Install Oil Tank

This process is required for chillers build prior to 2000 that do not have refrigerant pumps, or a new oil tank with refrigerant pump. Non-refrigerant pump chillers included tanks mounted on top of the evaporator.

Note: If the unit is refrigerant pump chiller with tank mounted below the condenser as shown below, proceed to “Chillers with Refrigerant Pump Type Oil Tank – Convert Oil Pump to R-514A Compatibility,” p. 16.

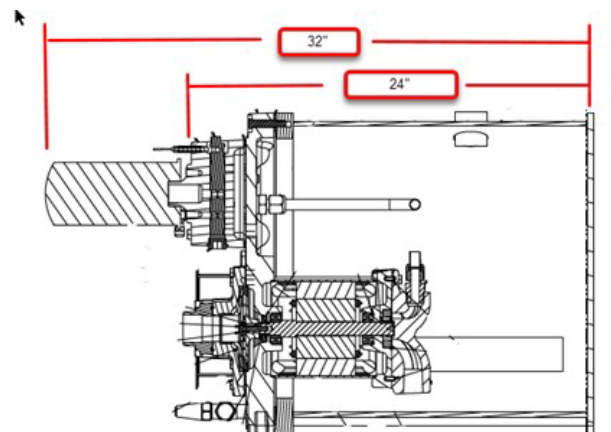
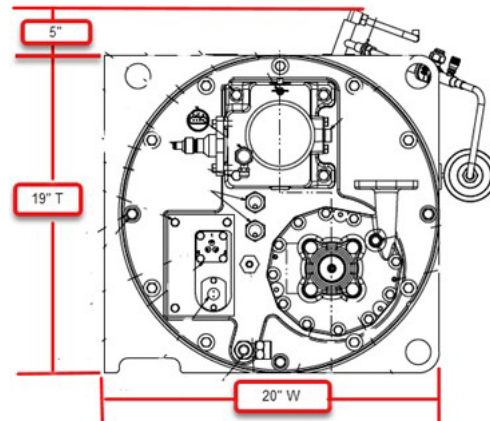
Figure 12. Oil tank below condenser on refrigerant pump chiller



Mounting Options

The R'newal Plus compressor upgrade oil tank design has been modified to move the vent connections to the rear of the tank, rather than the top. Verify sufficient clearance for mounting and assembly under the condenser before proceeding with the installation.

Figure 13. Oil tank clearance



Compressor Replacement and Unit Assembly

Two mounting options are available for units with insufficient clearance under the condenser.

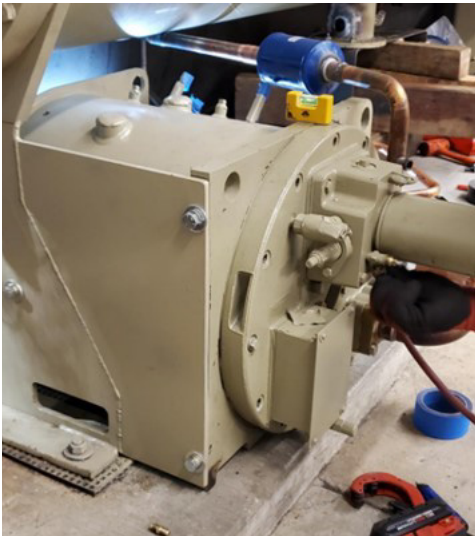
Option 1: Mount the tank sideways in line with the unit economizer. If this option is used, better clearance may be obtained by trimming the upper left rigging ear as shown below.

Figure 14. Tank in-line with economizer – rigging ear trimmed



Option 2: Partially locate the oil tank under the condenser as clearance allows.

Figure 15. Oil tank partially under condenser



Oil Tank Installation Requirements

Confirm the following:

- Sufficient clearance at the back of the tank for connection of the evaporator vent lines.

Figure 16. Evaporator vent line clearance



- If the unit is on isolator springs, tank assembly must be supported. A common support method is to add material as needed to attached assembly to the condenser support.

Figure 17. Tank assembly support



- When attaching the tank to the leg, if clearance allows, elevate the tank off the floor to facilitate access and cover removal. A 2 x 4-inch (or similar) block of wood may be used.

Figure 18. Oil tank elevated off the floor



Chillers with Refrigerant Pump Type Oil Tank – Convert Oil Pump to R-514A Compatibility

If the chiller already has a refrigerant pump type oil tank, the oil pump must be converted to refrigerant R-514S compatibility. Refer to Refrigerant/Oil Pump Modifications instructions in *Low Pressure R-514A Engineered Chiller Conversion CenTraVac™ Water-Cooled Chillers Models CVHE, CVHF, and CVHG Service Guide (ECSC-SVG001*-EN)*.

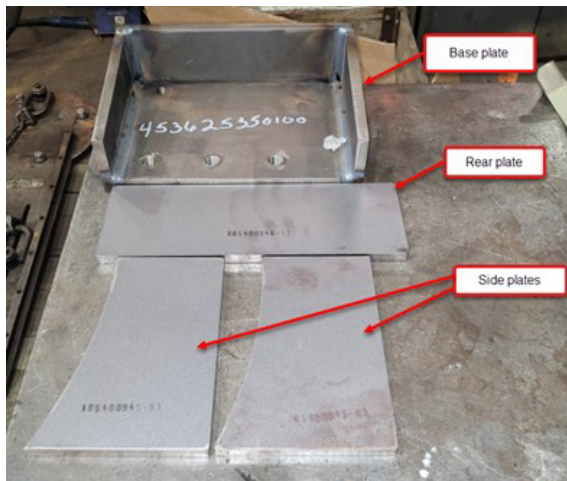
Compressor Mounting Base

Note: This process is required for chillers with base not parallel to discharge flange. This process is likely required for some, but not all, CVHE chillers, design sequence 1V or earlier, which were manufactured prior to May 1993.

The compressor mounting base must be modified to accommodate current compressor mounting base design. This modification changes the flat horizontal mounting base to an angled base, allowing connection to the condenser flange.

1. Set the base, rear, and side plates on the shell to confirm how the parts will fit. Determine if any modifications to the base plate or side plates are needed before installation.

Figure 19. Plates



2. Cut existing base plate assembly from evaporator shell and grind shell smooth.
3. If a new oil tank assembly is being installed, place cardboard box in condenser to catch debris from drilling the condenser coupling hole. Verify box is of sufficient size to capture all of the debris created when drilling condenser coupling hole.

Figure 20. Debris capture box



4. Lift complete compressor or discharge volute with motor, and bolt new base plate to compressor.
5. Lift complete compressor or discharge volute with motor onto shell and install discharge flange bolts.

Important: Continue to support the compressor assembly with the rigging during this operation.

6. Clamp rear and side plates to the base plate. Tack side plates in place with sufficient welds to support the compressor without rigging.

Figure 21. Rear and side plate tacks



Condenser and Evaporator Coupling

Note: This process is required when converting the chiller to refrigerant pump type.

1. Place cardboard box in condenser to catch debris from drilling the condenser coupling hole. Verify box is of sufficient size to capture all of the debris created when drilling condenser coupling hole.

Figure 22. Debris capture box

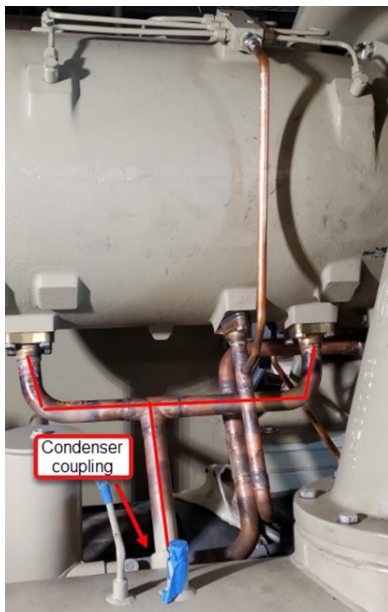


2. Install compressor, or compressor discharge volute and motor, on condenser and base.

Important: Support compressor assembly during this process, as the base is not finish welded.

3. Temporarily fit motor refrigerant drain line fittings and coupling together, and mark location for coupling installation on condenser.

Figure 23. Condenser coupling temporary fit



4. Drill condenser coupling hole, fit coupling and tack in place.

Note: Place a box inside the evaporator to catch debris while drilling the coupling hole. To allow the box to clear the eliminator brackets, use rigid tube. Alternately, attach cord to bottom of box to lift it over the brackets.

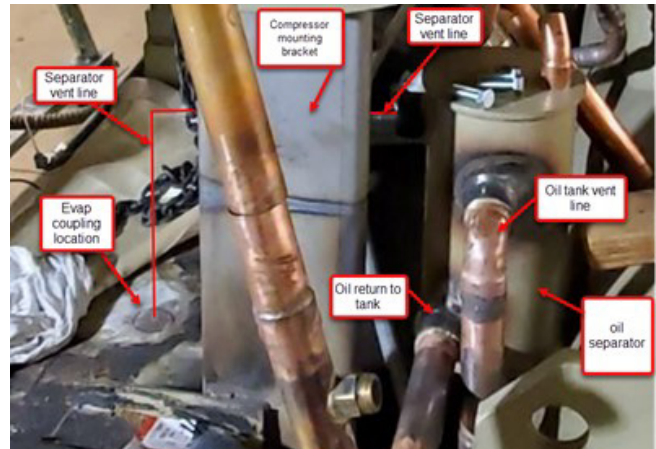
Figure 24. Box in evaporator to catch debris



5. Temporarily fit the oil separator return line and oil separator vent line from the separator to the oil tank. Fit the evaporator vent line from the separator to the evaporator to determine the location of the evaporator coupling.
6. Drill condenser evaporator hole, fit coupling and tack in place.

Note: Observe the compressor bracket locations and verify the lines do not interfere with the support location.

Figure 25. Line locations



Suction Elbow

If the new compressor is the same model and size as the original, the existing suction elbow may be reused.

Note: Compressor alignment may require adjustment for proper fit of the existing elbow.

1. If assembling the compressor on the shells, install the empty compressor interstage casings and suction cover to build a mocked-up compressor assembly.
2. If suction elbow is to be re-used, mount existing suction elbow on the chiller and verify fit to the compressor suction cover and evaporator flange.
 - a. The compressor may require adjustment on the base and discharge flange for best alignment.
 - b. When properly positioned, install the discharge flange and base bolts and remove suction elbow.

Compressor Replacement and Unit Assembly

3. For new suction elbow:
 - a. Remove existing companion flange from evaporator and install new flange.
 - b. Install evaporator flange and compressor inlet flanges using several bolts to secure.
 - c. Mark the compressor end of the elbow in the following locations: 1 inch from end at 0, 90, 180 and 270 degrees. Markings will be used as a reference for elbow depth inside the compressor suction flange.
 - d. Rig the elbow and lift it into the evaporator suction flange.
 - e. Position into the compressor flange.

Note: Elbow welds may need to be ground down to ease installation of the elbow within the flanges.

- f. Once the elbow is in place, adjust so position is as follows:
 - Elbow is horizontal.
 - Elbow is inserted approximately 1 inch into the compressor flange.
 - Elbow is symmetrically located in each flange. Use screwdrivers as shims to center the elbow in both the evaporator and compressor flanges.
 - g. Tack weld evaporator and compressor flanges to secure elbow in place.
 - h. Remove suction elbow assembly and finish weld flanges.
4. Drill and install condenser flange and compressor base dowel pins.

- a. Obtain the following drill bits:
 - i. Precision R517/16 051028 Taper Length Drill Long 7/16-inch twist or 29/64 in. diameter.
 - ii. Cleveland C24243 #6 650 tapered pin reamer or tapered reamer for 0.25 in. per foot (or No. 8 dowel).
 - iii. No. 8 dowel pin.
- b. Dowel the condenser discharge flange at two locations and the compressor foot at one location. The holes into the discharge flange of the condenser should be no deeper than the existing bolt holes. Deeper holes will extend into the flange and cause refrigerant leakage. The same size dowel pins can be used in all locations.
- c. Use the 7/16-inch or 29/64-inch drill bit and tapered reamer at the locations indicated in [Figure 26](#) and [Figure 27](#). The pilot area of the reamer must be removed to ream blind holes. Be sure the holes do not extend through the flange.
- d. See the following table for number of dowels required and the appropriate depth of the holes. To determine the depth of the dowel hole at the motor flange to discharge volute, remove a bolt and measure the hole depth. Drill holes straight whenever possible.

Table 5. Dowel information

Compressor Size	Discharge Flange	Compressor Foot
013-020	(2) no. 8 x 2.0 in.	(1) no. 8 x 2.0 in.
022-032	(2) no. 8 x 1.5 in.	(1) no. 8 x 2.0 in.
035-050	(2) no. 8 x 2.0 in.	(1) no. 8 x 2.0 in.
055-080	(2) no. 8 x 2.0 in.	(1) no. 8 x 2.0 in.
089-125	(2) no. 8 x 2.0 in.	(1) no. 8 x 2.0 in.

Notes:

- All pins (Trane part number PIN00084) are 2.5 in. in length.
- Dimensions in table are length of engagement.

5. Disassembly and/or remove the compressor assembly.
6. Finish weld evaporator and condenser couplings onto shells.
7. Remove boxes from condenser and evaporator.
8. Finish weld compressor base, and paint.

Figure 28. Compressor base finish weld



Figure 26. Discharge flange dowel

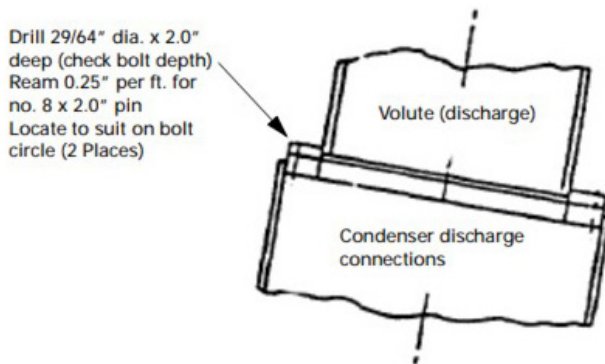
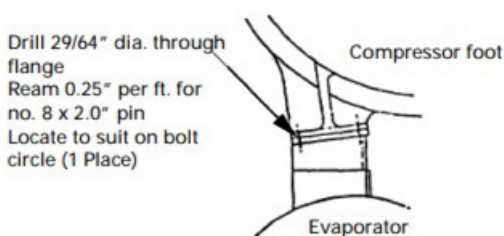


Figure 27. Compressor foot dowel



Compressor Installation

Compressor Reassembly on the Chiller

Note: This section is for chillers where compressor reassembly on the chiller is required. For installation of assembled compressors, see [“Assembled Compressor,” p. 19.](#)

1. Hoist compressor discharge volute onto chiller. Install compressor discharge flange and bolts discharge to condenser flange.
2. Install base bolts.
3. Install dowel pins in compressor base and discharge flange using hammer to drive them in.
4. Assemble compressor per applicable manual.
 - *Water-Cooled CenTraVac Chiller CVHE/CVHG Compressor Assembly Service Guide (CTV-SVG02*-EN).*
 - *Water-Cooled CenTraVac Chiller CVHF Compressor Assembly Service Guide (CTV-SVG04*-EN).*
 - *Water-Cooled CenTraVac Chiller CVHF Extended Capacity Compressor Assembly Service Guide (CTV-SVG06*-EN).*
5. Install compressor support leg and weld to evaporator shell.

Figure 29. Compressor support leg



6. Install suction elbow.

Assembled Compressor

Note: This section is for installation of assembled compressors. If compressor reassembly on the chiller is required, see [“Compressor Reassembly on the Chiller,” p. 19.](#)

1. Hoist compressor onto stand on condenser flange. Install compressor discharge flange O ring and bolts in order to secure compressor to the chiller.
2. Install base bolts and nuts.
3. Install dowel pins in compressor base and discharge flange, using hammer to drive in.
4. Install the suction elbow.
5. Install compressor support leg and weld to evaporator shell.
6. Install suction elbow.

Figure 30. Compressor support leg



Refrigeration Piping

Option 1: New Oil Tank is Required

Note: This section is used when a new oil tank is required. For others, see [“Option 2: Refrigerant Pump Oil Tank is Already Installed,” p. 22.](#)

Refrigerant piping provided is consistent with current CenTraVac production chillers. Piping is selected based on the closest size production shells and may not be an exact fit for legacy shells and the necessary oil tank location. Extra piping and couplings required to complete the installation are field provided.

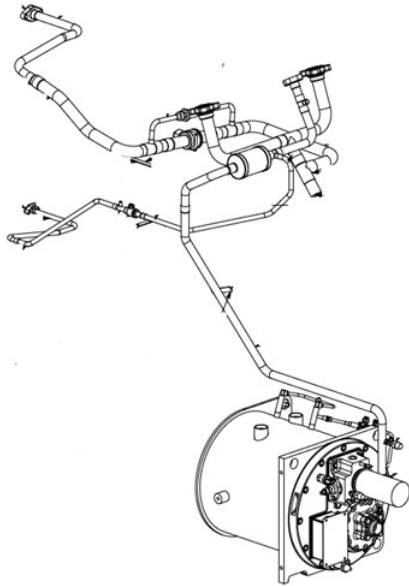
Compressor Replacement and Unit Assembly

Table 6. Refrigerant piping

Copper Pipe Description	OD (inch)
Oil pump discharge	1/2
Refrigerant supply from condenser	1 1/8
Refrigerant supply to motor	1 1/2
Refrigerant extension to enhanced cooling manifold	5/8
Refrigerant to educators	3/8
Motor refrigerant drain to condenser	1 5/8 or 2 1/8 ^(a)
Shaft bearing oil drain to separator	1 5/8
Roller bearing oil drain to separator	1 5/8
Oil tank vent to separator	1 5/8
Oil return from separator to tank	1 5/8
Separator vent to evaporator	1 5/8
AFD Liquid Supply Frame 3	5/8
AFD Liquid Supply Frame 4	5/8
AFD Vapor Return Frame 3	1 1/8
AFD Vapor Return Frame 4	1 5/8
Refrigerant to inductors	3/8
Oil return to educators	1/4

(a) Diameter depends on compressor size.

Figure 31. Refrigerant piping general layout



Note: For convenience and to confirm AFD refrigerant is strained, the discharge refrigerant strainer should be installed at the pump.

1. Remove existing condenser refrigerant supply coupling.
2. Use drill on magnetic base to cut new hole for 1 5/8-inch supply line coupling and weld coupling in place.

Note: Avoid cutting into the capture fixture located inside the condenser drain assembly.

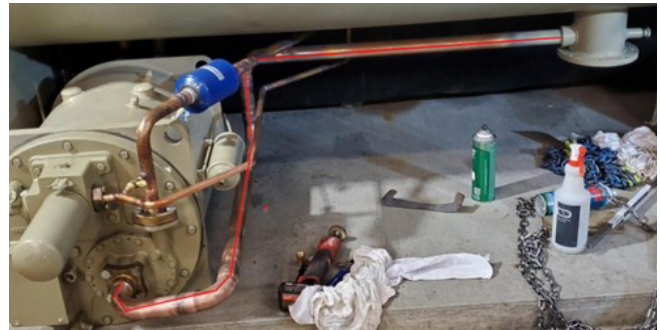
Figure 32. Drilling supply line coupling



3. Install and braze 1 5/8-inch refrigerant supply line from coupling to refrigerant pump suction. Line can be mounted level or with slight slope downward in the direction of flow.

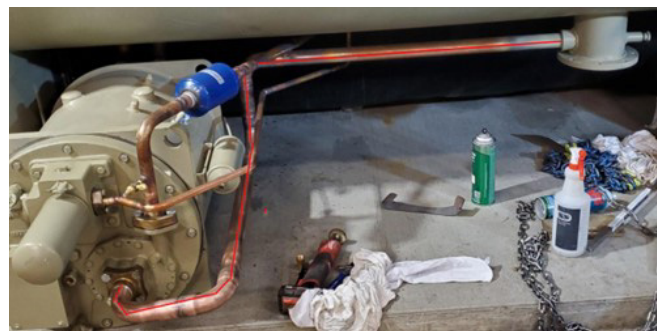
Note: For convenience and to confirm AFD refrigerant is strained, the discharge refrigerant strainer should be installed at the pump.

Figure 33. Supply line to pump



4. Use provided 1 5/8-inch copper from refrigerant pump discharge through filter/strainer. Mount the non-serviceable filter/strainer horizontally between the pump discharge and the first tee. Line can be mounted level or with a slight upward slope in the direction of flow.

Figure 34. Filter/strainer line



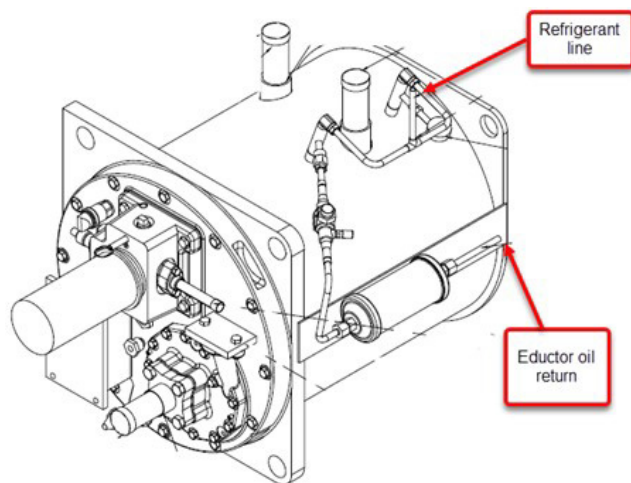
5. Complete refrigerant supply lines to motor, motor coolant distributor, and the AFD (if equipped).

Figure 35. Refrigerant supply lines



6. Use material provided for motor and AFD refrigerant returns to determine the location of the condenser return coupling. Drill and weld in the coupling.
7. Pipe oil return eductors and refrigerant lines to tank and filter.

Figure 36. Oil return eductors and refrigerant lines



8. See figures below for refrigerant cooled Frame 3 and Frame 4 coolant piping.
 - a. Locate the filter/strainer at the pump for convenience and to verify AFD refrigerant is strained.
 - b. If the chiller does not include AFD cooling isolation valves, consider adding them. Use KIT17830 for Frame 3 size drives and KIT17831 for Frame 4 size drives.

Figure 37. Frame 3 AFD cooling piping

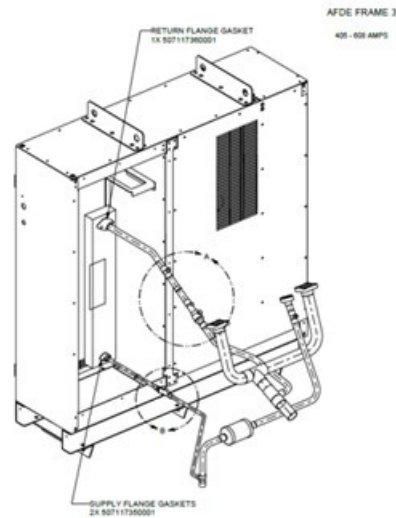
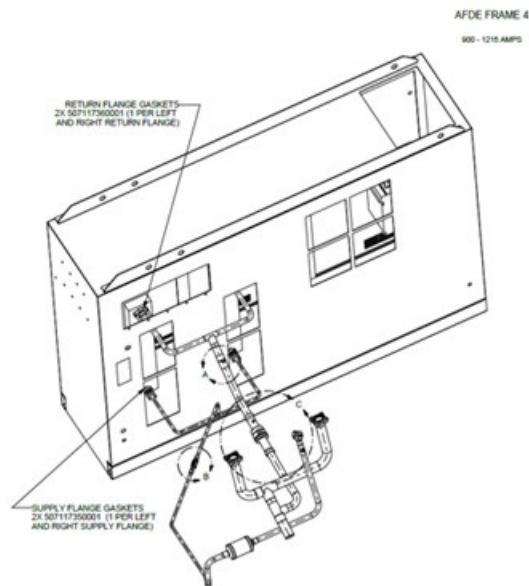


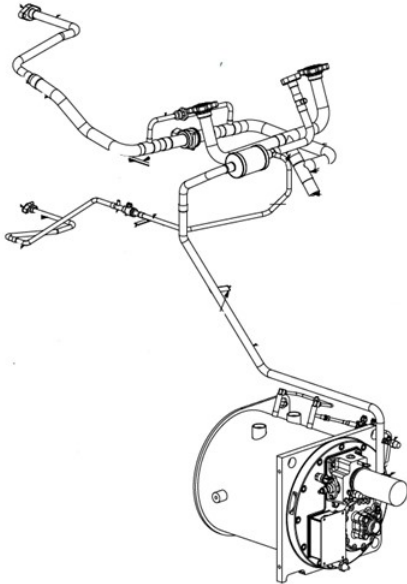
Figure 38. Frame 4 AFD cooling piping



Option 2: Refrigerant Pump Oil Tank is Already Installed

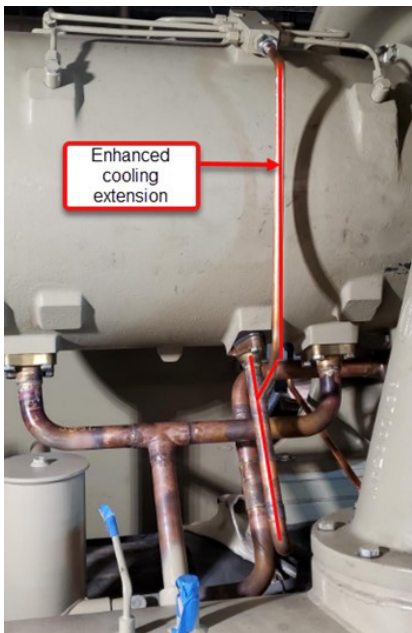
Note: This section is used for chillers that already have a refrigerant pump oil tank installed. If a new oil tank is required, see “Option 1: New Oil Tank is Required,” p. 19.

Figure 39. Refrigerant piping general layout



1. Re-install existing refrigerant cooling and drain lines.
2. Modify as needed to accommodate the new compressor.
3. When using existing piping, if original compressor motor did not have enhanced cooling manifold, install an extension line to the new motor from the original supply.

Figure 40. Enhanced cooling extension line



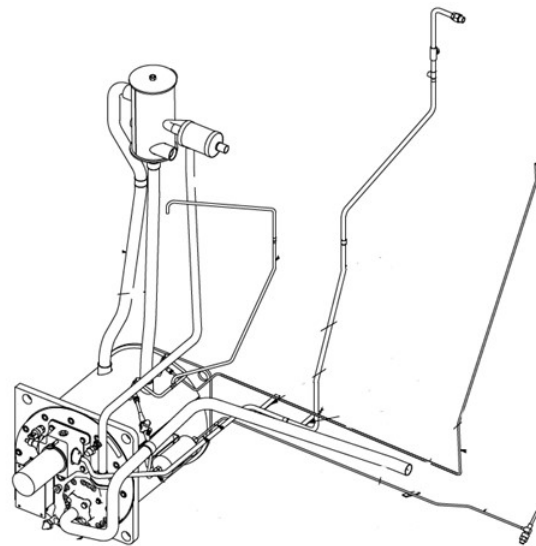
Oil System Piping

Option 1: New Oil Tank is Required

Note: This section is used when a new oil tank is required. For others, see “Option 2: Refrigerant Pump Oil Tank is Already Installed,” p. 22.

Oil piping provided is consistent with current CenTraVac™ production chillers. Piping is selected based on the closest size production shells and may not be an exact fit for legacy shells and the necessary oil tank location. Extra piping and couplings required to complete the installation are field provided.

Figure 41. Oil system piping general layout



1. Complete oil supply lines from oil pump to compressor shaft and roller bearings.

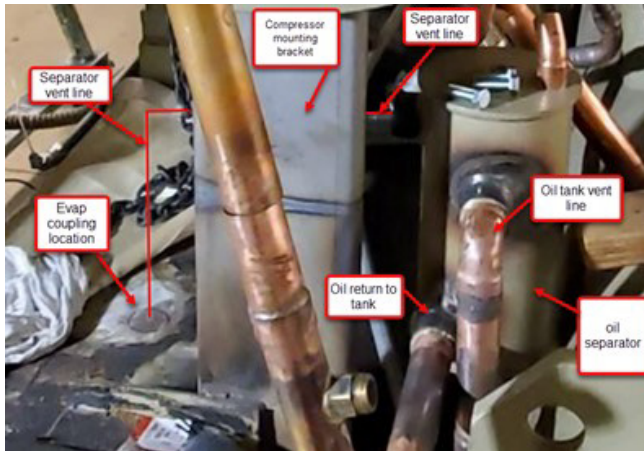
Figure 42. Oil supply lines to compressor shaft and bearings



2. Braze the oil tank vent line and oil return lines into place.
3. Install the evaporator vent line from the separator to the newly installed coupling.

Important: Verify provided orifice is installed in the separator vent line before final brazing.

Figure 43. Oil tank vent line and oil return lines



4. Install shaft bearing oil drain line and roller bearing oil drain line from compressor to oil separator.

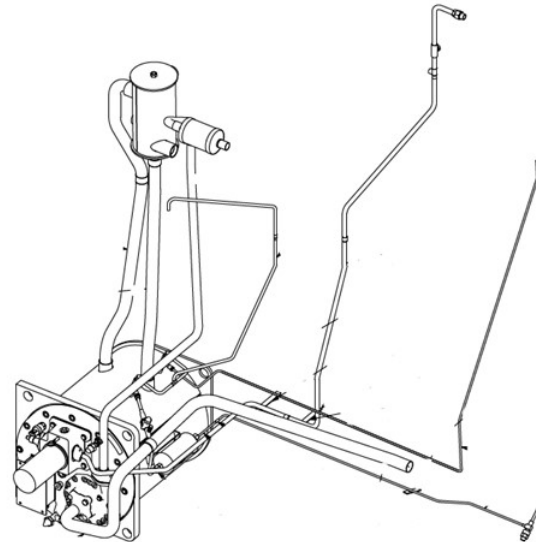
Figure 44. Drain lines



Option 2: Refrigerant Pump Oil Tank is Already Installed

Note: This section is used for chillers that already have a refrigerant pump oil tank installed. If a new oil tank is required, see “Option 1: New Oil Tank is Required,” p. 22.

Figure 45. Oil piping general layout

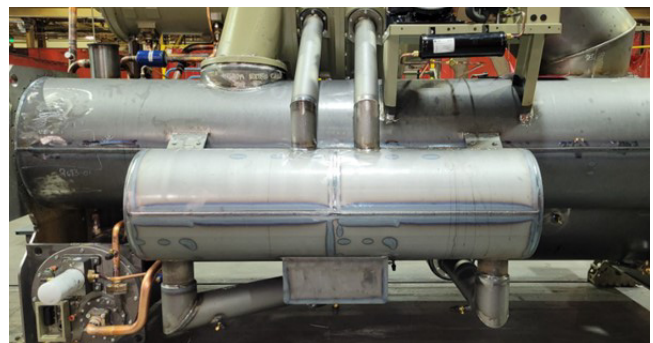


1. Re-install existing oil supply and drain lines.
2. Modify lines as required to accommodate the new compressor.

Economizer

If replacement economizer is required, install as follows:

Figure 46. Replacement economizer



Note: The existing piping will be reused if the economizer is replaced with an one of the same tonnage and type.

- The replacement economizer supplied by Trane Parts for field installation is configured as follows:
 - New
 - Painted
 - With pipe stubs and welded cap
 - 1/4-inch angle valve for use in removal of 5 psig dry nitrogen holding charge
- Lifting lugs are provided on the welded caps of the condenser and evaporator tube stubs for ease of lifting.

Compressor Replacement and Unit Assembly

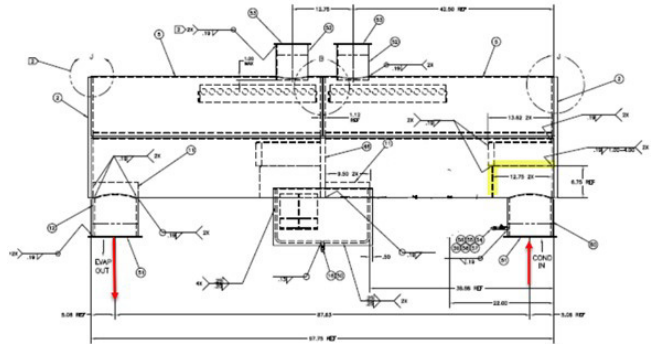
- Any weld rings, reducers, couplings, or other similar parts required to fit up the economizer are field provided.
- New condenser-to-economizer and economizer-to-evaporator flange kits are provided for all units without current flanges design. Current flange design was introduced in 2006 - 2007. For installation, see *Economizer Flange Rebuild Kit Installation Instructions* (PART-SVN104*-EN).
- Mounting brackets are reused.
- The economizer is made of A36 low carbon steel as are the pipe stubs. The preferred welding rods for stick welding are E7018 or if MIG welding, use filler wire ER70S-6 (AWS). If E7018 is not readily available, then it is permissible to use E7016 or E6011 for stick welding if the economizer is not ASME rated.
- The economizer and pipe stubs are made of A36 low carbon steel. The preferred welding rods are as follows:
 - Stick welding: E7018
 - MIG welding: Filler wire ER70S-6 (AWS)

Notes: If E7018 is not readily available, E7016 or E6011 are acceptable if the economizer is not ASME rated.

- Upon receipt of the replacement economizer, verify the nitrogen holding charge (5 psig nominal). If the 5 psig holding charge is not present, a leak has developed. Unless the leak is at a weld joint of a sealing caps to be removed for installation, repair the leak.
- If the economizer must be stored for any length of time before installation, verify no leaks are present, and confirm the 5 psig nitrogen holding charge.
- Prior to installation, relieve the holding charge of dry nitrogen through the 1/4-inch valve, and cut the sealing caps off the pipe stubs.
- Measure original old economizer height and distance from the shell. Use these measurements to position the replacement economizer in the same location.
- Cut the mounting brackets off the old economizer for reuse on the replacement.
- Cut the 5/8-inch copper lines to the old oil cooler.
- Remove the original economizer and position the replacement in the same location, Support as required to allow welding of the pipes.
- Orient the economizer so that the perforated plate on the inlet is on the condenser side.

Note: The following figure is a rear view. As viewed from the back the back of the chiller, the economizer inlet is on the left and economizer outlet is on the right.

Figure 47. Economizer as viewed from the evaporator shell



Important: Inlet is on the left when viewed standing behind the chiller.

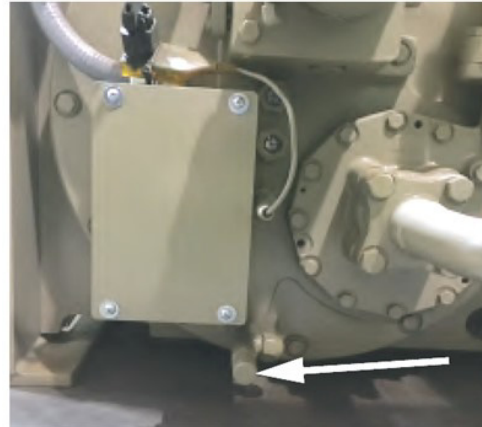
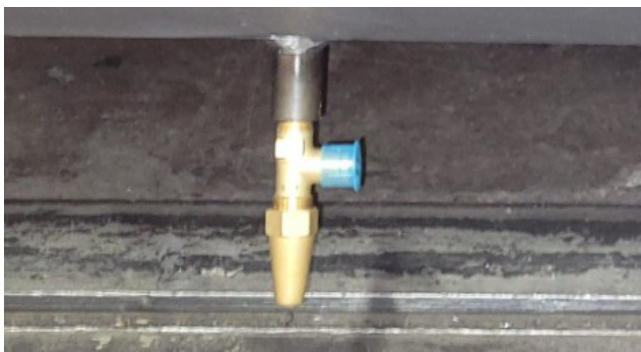
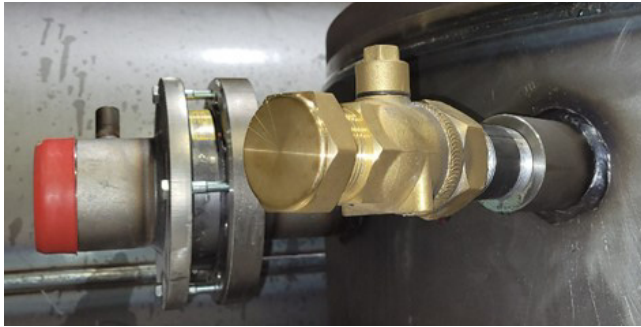
Figure 48. Perforated plate on inlet



- Align compressor vent line opening to the compressor flange opening.
- Adjust the economizer tank elevation until the condenser liquid line and the evaporator orifice supply lines are level.
- Measure the length of the pipe required to fit the vent, condenser, and evaporator lines. Cut the existing piping to fit according to the measurements recorded.
- Any weld rings or couplings required for welding the new economizer to the existing pipes must be obtained locally. Use new gaskets for all economizer flange connections.
- Weld the economizer pipes in place.
- Re-install the original mounting brackets by welding to the economizer and the companion brackets on the evaporator.
- Torque all flange bolts to the proper specification in steps using a crossing pattern.

Rupture Disk, Access Valves, Charging Valves, Accessory Valves

Install new rupture disk, access valves, charging valves and accessory valves as shown in the following figures.



Purge

Install new R-514A purge or modify existing EarthWise purge to an EcoWise type purge per Purge Modification section of *Low Pressure R-514A Engineered Chiller Conversion CenTraVac™ Water-Cooled Chillers Models CVHE, CVHF, and CVHG Service Guide (ECSC-SVG001*-EN)*.

Note: Existing EarthWise purges can be converted for R514A compatibility.

Starter or AFD

Reinstall starter or AFD, reversing the disassembly steps provided in [“Remove Unit Mounted Starter or AFD,” p. 9](#).

Controls

Unit controls must be either Symbio™ or UC800 with solid state oil pump relay. Symbio controls with remote monitoring is strongly recommended.

Wire oil pump and heater, and complete the chiller's control installation.

Paint and Re-insulate

- Zinc-rich galvanized coating is recommended for areas to be insulated, such as the suction elbow and compressor base supports.
- For uninsulated surfaces, use Trane Executive Beige: It is ordered as a spray can as PAI00061 (spray can) or PAI00062 (gallon).

Evacuate and Charge

The total oil charge for CenTraVac chillers is 9 gallons (34 liters) per oil sump. Use oil S100A.

- OIL00379: OIL; REFRIGERATION LUBRICANT, POE, ICEMATIC S100A, 1 GALLON (3.78 liters)
- OIL00380: OIL; REFRIGERATION LUBRICANT, POE, ICEMATIC S100A, 5 GALLON (18.9 liters)



Compressor Replacement and Unit Assembly

Follow advice from annual maintenance oil tests. Contact the appropriate tech support team as needed.

If an air run is required, use oil S68C. S100A has higher viscosity which causes bearing to heat up faster when run on air, and an air run cannot be executed quickly enough to avoid damage. For air runs, S68C is acceptable, as the viscosity is similar to previously used RL68LPC.

- OIL00381: OIL; REFRIGERATION LUBRICANT, POE, ICEMATIC S68C (VG68), 1 GALLON (3.78 liters)
- OIL00382: OIL; REFRIGERATION LUBRICANT, POE, ICEMATIC S68C (VG68), 5 GALLON (18.9 liters)

Start-Up

Start-up per CenTraVac factory start-up procedure.

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