



Installation Instructions

Disassembly and Reassembly Units Series S™ Water-Cooled CenTraVac™ Chillers



Model: CVHS

X39641248060

⚠ 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.

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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-including industry replacements for CFCs and HCFCs such as saturated or unsaturated HFCs and HCFCs.

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 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 Material Safety Data Sheets (MSDS)/Safety Data Sheets (SDS) and OSHA guidelines for proper PPE.
- When working with or around hazardous chemicals, **ALWAYS** refer to the appropriate MSDS/SDS and OSHA/GHS (Global Harmonized System of Classification and Labelling 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 Ingersoll Rand personnel must follow Ingersoll Rand Environmental, Health and Safety (EHS) policies when performing work such as hot work, electrical, fall protection, lockout/tagout, refrigerant handling, etc. All policies can be found on the **BOS site**. Where local regulations are more stringent than these policies, those regulations supersede these policies.
- Non-Ingersoll Rand personnel should always follow local regulations.

Factory Warranty Information

Compliance with the following is required to preserve the factory warranty:

All Unit Installations

Startup **MUST** be performed by Trane, or an authorized agent of Trane, to **VALIDATE** this WARRANTY. Contractor must provide a two-week startup notification to Trane (or an agent of Trane specifically authorized to perform startup).

Additional Requirements for Units Requiring Disassembly and Reassembly

When a new chiller is shipped and received from our Trane manufacturing location and, for any reason, it requires disassembly or partial disassembly, and reassembly—which could include but is not limited to the evaporator, condenser, control panel, compressor/motor, economizer, purge, factory-mounted starter or any other components originally attached to the fully assembled unit—compliance with the following is required to preserve the factory warranty:

- Trane, or an agent of Trane specifically authorized to perform start-up and warranty of Trane® products, will perform or have direct on-site technical supervision of the disassembly and reassembly work.
- The installing contractor must notify Trane—or an agent of Trane specifically authorized to perform startup and warranty of Trane® products—two weeks in advance of the scheduled disassembly work to coordinate the disassembly and reassembly work.
- Start-up must be performed by Trane or an agent of Trane specifically authorized to perform startup and warranty of Trane® products.

Trane, or an agent of Trane specifically authorized to perform start-up and warranty of Trane® products, will provide qualified personnel and standard hand tools to perform the disassembly and reassembly work at a

location specified by the contractor. The contractor shall provide the rigging equipment such as chain falls, gantries, cranes, forklifts, etc. necessary for the disassembly and reassembly work and the required qualified personnel to operate the necessary rigging equipment.

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Revision History

Updated AFD information.



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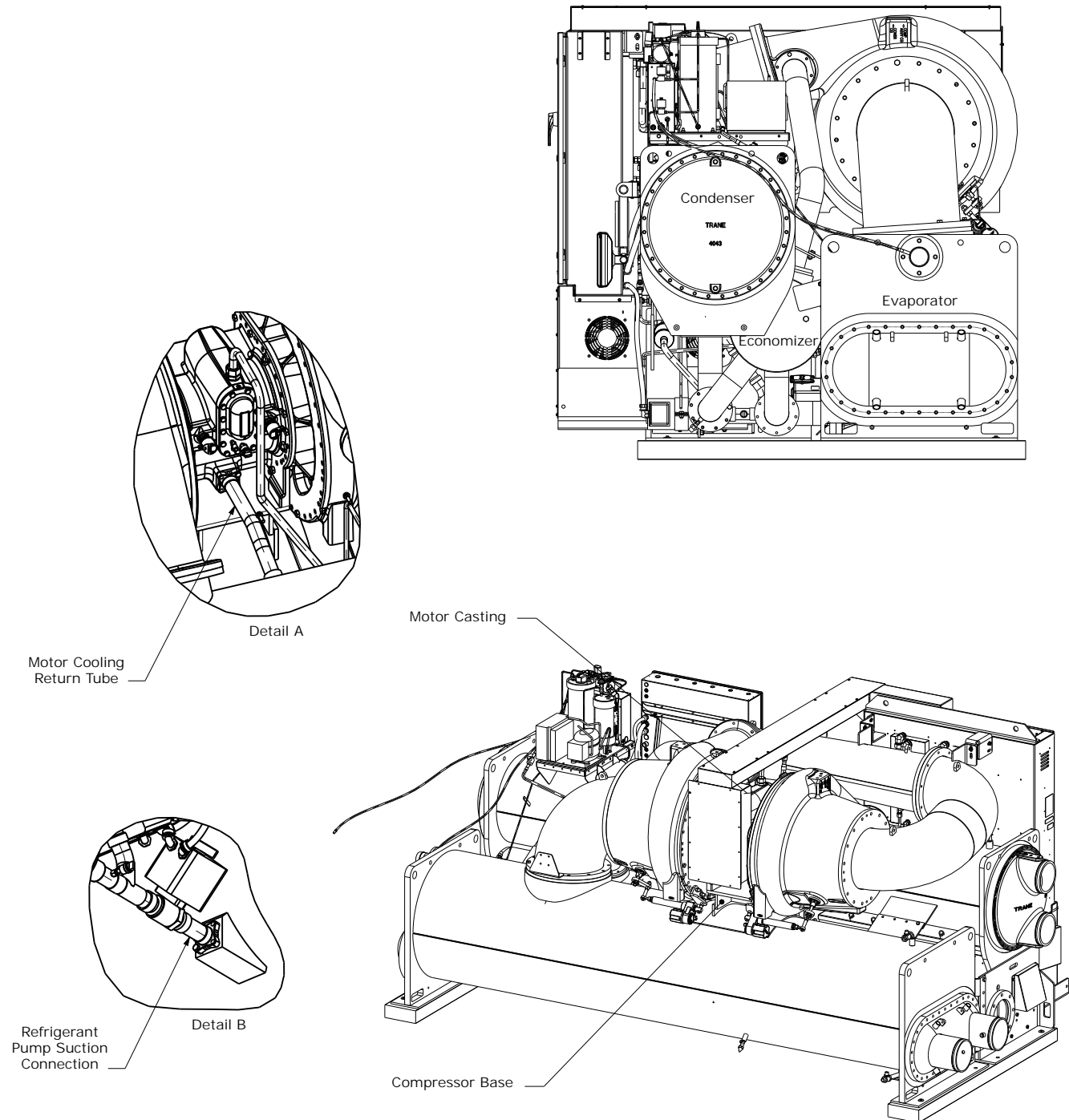
Components and Weights

Important: All fasteners are metric except waterbox hardware.

Note: Use only new O-rings and gaskets. Do NOT reuse O-rings or gaskets.

Figure 1. CVHS Components (page 1 of 2)

Components



Components and Weights

Figure 1. CVHS Components (page 2 of 2)

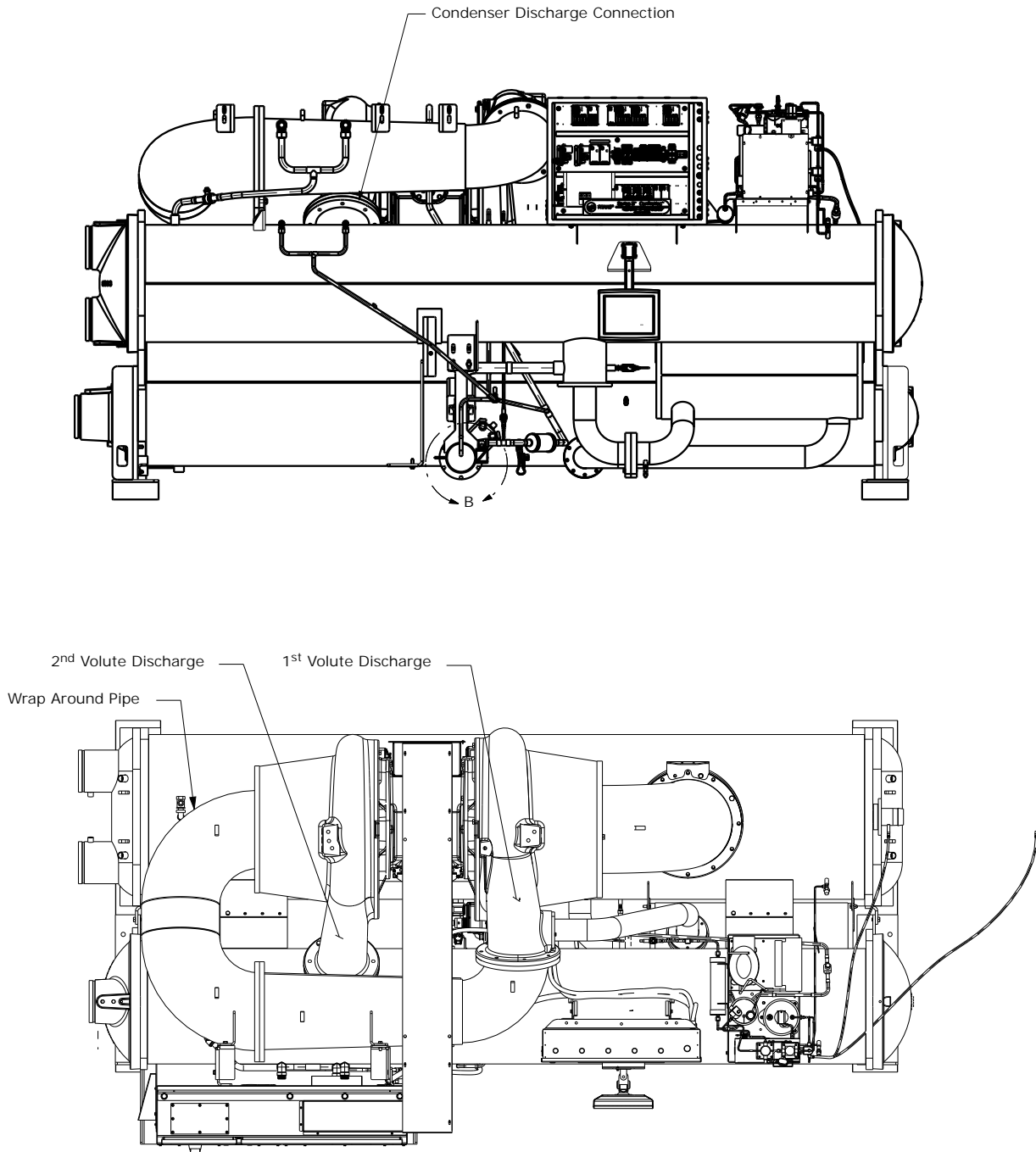
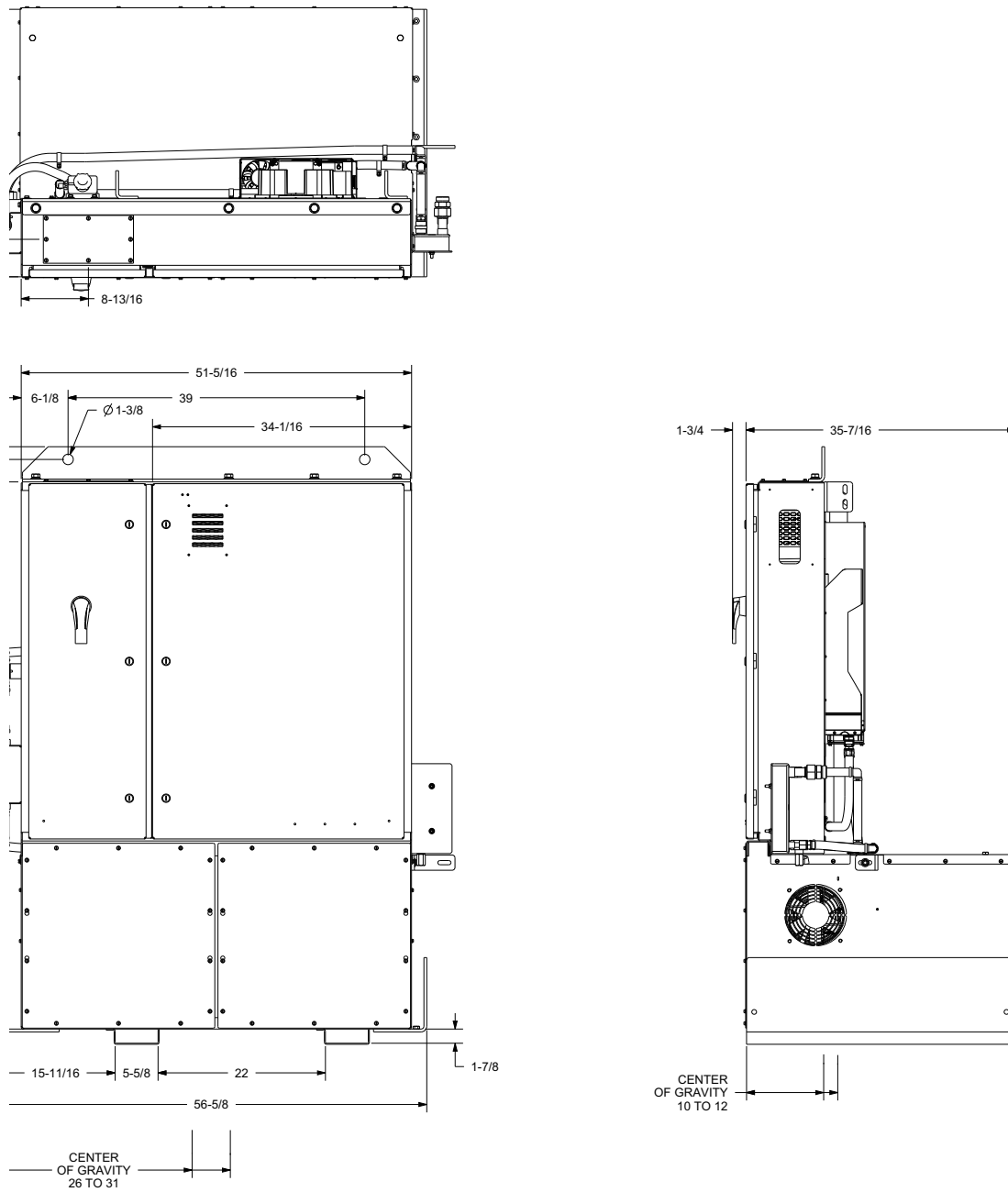


Figure 2. CVHS drive dimensions, in.



Note: The holes on the top of the drive can be used for lifting the drive.



Components and Weights

Maximum Component Weights

Table 1. Maximum CVHS unit component weights

Component	Maximum Weight	
	(lb)	(kg)
Condenser without waterboxes	4253	1934
Condenser waterboxes ^(a)	923	420
Evaporator without waterboxes	6095	2771
Evaporator waterboxes ^(a)	776	353
Economizer	348	159
Compressor	5474	2483
Compressor wrap pipe	770	350
Compressor suction elbow	361	164
Control panel	88	40
Purge	165	75
Drive	1900	862
Wire tray with lid	57	26
<hr/>		
Shipping (Estimated)	22611	10193
Shipping without drive (Estimated)	20787	9429
Operating (Estimated)	25837	11656

(a) *Optional waterbox hinges*: each waterbox hinge weighs 35 lb (15.9 kg); optional waterbox hinges are not included in the estimated maximum weights.

Important: *Two M20 swivel D-rings are required for lifting the compressor assembly (metric threads).*

Note: *Wrap pipe requires three 5/8-in. shackles. Trane recommends using Crosby screw pin shackles, model S-209, stock number 1018482 with 5/8-in. pin.*



Disassembly

General Information

⚠ WARNING

Refrigerant under Positive Pressure!

Failure to follow instructions below could result in an explosion which could result in death or serious injury or equipment damage. System contains refrigerant and may be under positive pressure. Recover refrigerant to relieve pressure before opening the system. See unit nameplate for refrigerant type. Do not use non-approved refrigerants, refrigerant substitutes, or refrigerant additives.

Important: Remove the nitrogen charge from the chiller vessel before starting any disassembly procedures.

Note: New units ship with a 5 psig (34.5 kPag) dry nitrogen holding charge at nominal 72°F (22.2°C).

Important: New units that have been factory run-tested contain residual refrigerant; vent discharge outdoors.

- Check to make sure there is a positive pressure holding charge.

Contractor Responsibilities

⚠ WARNING

Heavy Objects!

Failure to follow instructions below or properly lift component could result in component dropping and possibly crushing operator/technician 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 component being lifted. Each of the cables (chains or slings), hooks, and shackles used to lift the component must be capable of supporting the entire weight of the component. Lifting cables (chains or slings) may not be of the same length. Adjust as necessary for even component lift.

NOTICE

Equipment Damage!

Failure to remove the strain relief with the sensor could result in equipment damage. Do NOT attempt to pull sensor bulb through the strain relief; always remove the entire strain relief with the sensor.

- Handle/lift and rig equipment

- Protect all internal components from exposure to elements, which could contaminate or corrode chiller components
- Chiller reassembly
- Replace all gaskets with new gaskets or O-rings and sealing compound; the contractor should assist a qualified Trane Technician with this responsibility
- Evacuate the chiller under 1000 microns; the contractor should assist a qualified Trane Technician with this responsibility
- Recharge the chiller with dry nitrogen to 5 psig; the contractor should assist a qualified Trane Technician with this responsibility
- Replace and/or repair insulation
- Reconnect electrical connections
- Spot paint the chiller if necessary

The disassembly and reassembly procedures described in this manual should be performed only on chillers that have been ordered with this shell option. The process is to be initiated by experienced service technicians. Contact your local Trane Service office for assistance if required.

This manual discusses a typical disassembly process. Proper lifting techniques vary based on mechanical room layout.

- It is the responsibility of the person(s) performing the work to be properly trained in the safe practice of rigging, lifting, securing, and fastening the components involved.
- It is the responsibility of the person(s) providing and using the rigging and lifting devices to inspect these devices to ensure they are free from defect and are rated to meet or exceed the published weights.
- Always use rigging and lifting devices in accordance with the applicable instructions for such devices.
- Cap or cover open lines to prevent entry of foreign material.

Note: Additional O-rings and couplings are shipped with the chiller when the separable shell kit is selected.

Also refer to wiring diagram 2311-3555*.

Wiring Disassembly

Before separating shells, remove the purge, the compressor, wrap pipe, economizer line, control panel, and the various unit mounted sensors (frame LLIDs) as indicated. If possible, the best method is to remove the sensor and carefully coil the wire after labeling the device and its location to aid in reinstallation. All sensors connect to the buss wiring with a universal plug. This allows easy disconnection and reconnection of the sensors.

Unit-mounted Starter Removal

If you need to temporarily remove the entire AFD cabinet from the chiller to allow unit installation through restricted spaces or the AFD cabinet shipped disassembled from the chiller, use the following general information and instructions. The maximum weight of the drive is 1900 lb (862 kg).

Note: For specific weights of the AFD cabinet, refer to submittal package.

⚠ WARNING

Heavy Objects!

Failure to follow instructions below or properly lift component could result in component dropping and possibly crushing operator/technician 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 component being lifted. Each of the cables (chains or slings), hooks, and shackles used to lift the component must be capable of supporting the entire weight of the component. Lifting cables (chains or slings) may not be of the same length. Adjust as necessary for even component lift.

⚠ WARNING

Improper Unit Lift!

Failure to properly lift unit could result in death or serious injury or possible equipment or property-only damage. Test lift unit approximately 24 inches (61 cm) to verify proper center of gravity lift point. To avoid dropping of unit, reposition lifting point if unit is not level.

1. Remove the AFD upper support bracket hex head screws at the wrap-around pipe side. There are two screws in each bracket.
2. Close the isolation valves for the AFD cooling lines, both feed and return.

⚠ WARNING

Hazard of Explosion and Deadly Gases!

Failure to follow all proper safe refrigerant handling practices could result in death or serious injury. Never solder, braze or weld on refrigerant lines or any unit components that are above atmospheric pressure or where refrigerant may be present. Always remove refrigerant by following the guidelines established by the EPA Federal Clean Air Act or other state or local codes as appropriate. After refrigerant removal, use dry nitrogen to bring system back to atmospheric pressure before opening system for repairs. Mixtures of refrigerants and air under pressure may become combustible in the presence of an ignition source leading to an explosion. Excessive heat from soldering, brazing or welding with refrigerant vapors present can form highly toxic gases and extremely corrosive acids.

⚠ WARNING

Refrigerant under Positive Pressure!

Failure to follow instructions below could result in an explosion which could result in death or serious injury or equipment damage. System contains refrigerant and may be under positive pressure. Recover refrigerant to relieve pressure before opening the system. See unit nameplate for refrigerant type. Do not use non-approved refrigerants, refrigerant substitutes, or refrigerant additives.

Important: Any unit pressure must be relieved before disconnecting refrigerant lines. The units ship from the factory with a 5 psi dry nitrogen holding charge.

3. Disconnect the AFD cooling lines at the bottom of the elbows coming out of the chill plate, both feed and return. Cap the lines and chill plate elbows to prevent debris from entering the system.
4. Mark and disconnect the motor power wires at the drive output terminals and inside motor junction box. There will be six power wires and two ground wires.

Note: Always compare the wire connections to the as-built wiring diagrams to assure the schematics match the actual connections. Make notes as necessary to assure the wires are reconnected to the same locations.

5. Remove wire tray covers and completely remove wires from wire tray. Disassemble and remove the wire tray by unscrewing the tray at the compressor junction box and then removing the screws from support bracket on the AFD cabinet.
6. Mark and disconnect the high pressure cutout switch wires at the terminal block and pull the cable out of the AFD cabinet.

7. Mark and disconnect the wires that run between the drive and the control panel at the drive and pull the conduit out of the AFD cabinet.
8. Mark and disconnect the refrigerant pump wires from the terminal block and pull conduit out of the AFD cabinet.
9. Mark and disconnect drive communication cable at terminal block and pull the cable out of the AFD cabinet.
10. Support the weight of the AFD cabinet with a fork truck or another suitable lifting device (minimum 2-ton rated capacity).
11. Loosen and remove the hex head screws that secure the AFD cabinet to the lower mounting brackets. Unhook the right side at the L-bracket welded to the condenser, four screws total. Unhook the left side at the condenser support leg, four screws and nuts total.
12. Carefully lift the AFD cabinet away from the chiller. Do NOT bump or jolt the AFD while lifting.

Installation of the AFD cabinet is essentially the reverse of the removal procedure. All mounting screws should be torqued to ANSI standards based on the screw diameter. The motor power wires connecting to the drive output terminals should be torqued according to the label inside the AFD cabinet. Tighten the control wires that connect to the AFD terminal block to 8.3 ft-lb (11.3 N-m). The motor powers wires connecting to the motor terminals inside the compressor motor junction box shall be torqued between 20–26 ft-lb. Torque the corresponding ground cables inside the compressor motor junction box to 38 ft-lb. Refer to the as-built wiring diagrams for connection locations.

Purge Unit Removal

⚠ WARNING

Refrigerant under Positive Pressure!

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⚠ WARNING

Hazardous Voltage w/Capacitors!

Disconnect all electric power, including remote disconnects and discharge all motor start/run capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized. Verify with an appropriate voltmeter that all capacitors have discharged. Failure to disconnect power and discharge capacitors before servicing could result in death or serious injury.

For additional information regarding the safe discharge of capacitors, see PROD-SVB06A-EN

To remove the purge assembly from the top of the condenser:

1. Isolate the purge unit from the condenser shell by closing the vapor and liquid line valves.
2. Disconnect and mark all piping and wiring attached to the purge unit. Sand all paint off at points and use a tubing cutter where cuts are to be made. See [Figure 3, p. 11](#) and [Figure 4, p. 12](#).
3. Remove the fasteners connecting the purge unit base to its mounting bracket.
4. Two people will be needed to lift purge unit clear of the chiller. Refer to [Table 1, p. 8](#) for purge unit weight. Store the purge unit in a clean dry area.

Reassemble the purge unit in reverse order when the process is complete.

Figure 3. Purge unit

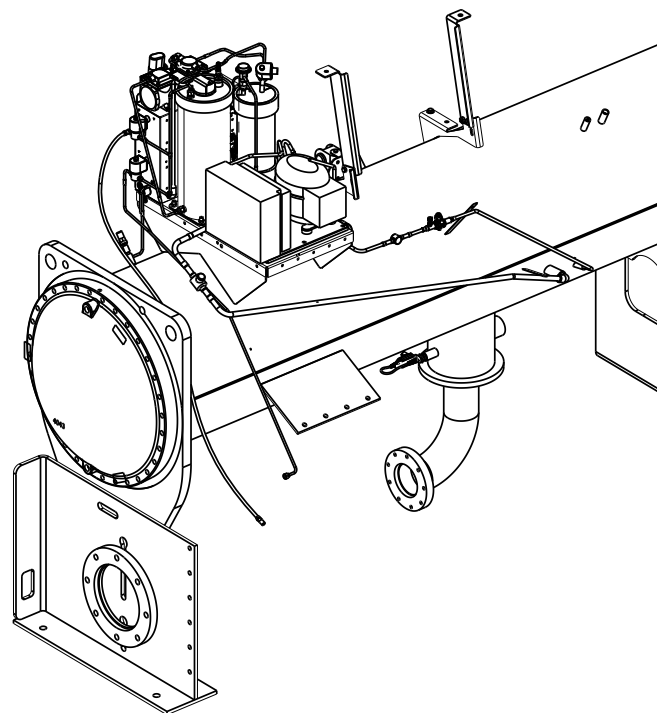
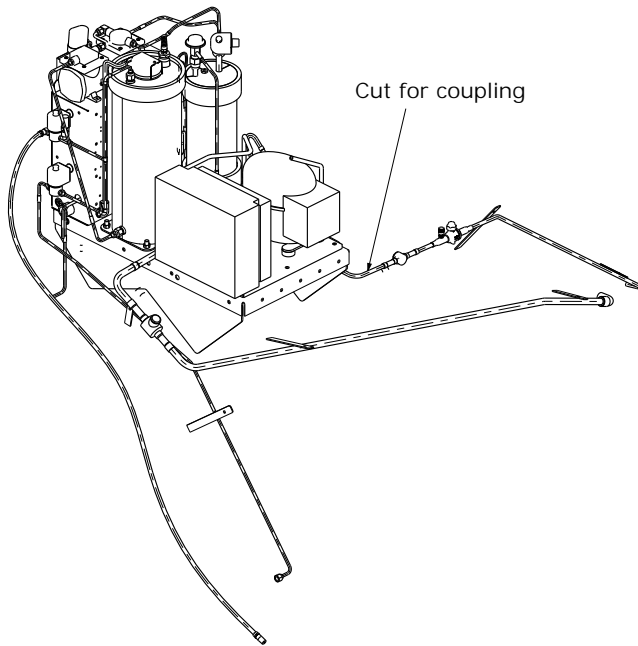
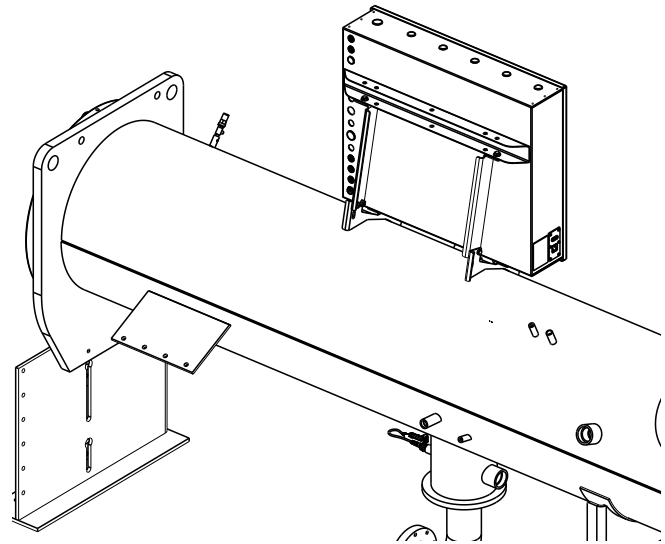


Figure 4. Purge unit detail


- Loosen the two hex head screws on the back of the panel which secure the panel to the top mounting brackets. See [Figure 5](#).

Figure 5. Control panel mounting brackets


Control Panel Removal

⚠ WARNING

Hazardous Voltage w/Capacitors!

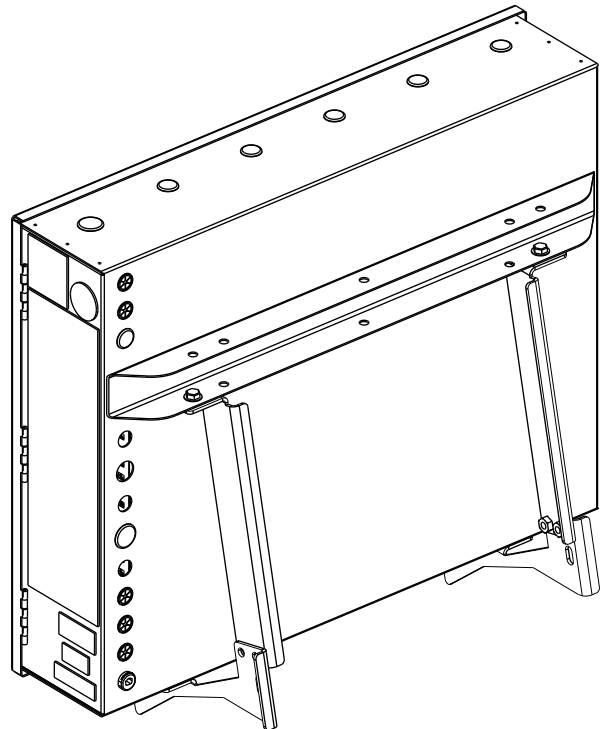
Failure to disconnect power and discharge capacitors before servicing could result in death or serious injury. Disconnect all electric power, including remote disconnects and discharge all motor start/run capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized. For variable frequency drives or other energy storing components provided by Trane or others, refer to the appropriate manufacturer's literature for allowable waiting periods for discharge of capacitors. Verify with an appropriate voltmeter that all capacitors have discharged.

For additional information regarding the safe discharge of capacitors, see PROD-SVB06A-EN

Use the following steps to remove the control panel if additional vertical clearance is required.

Note: The control panel can be rotated back and downward on two mounting screws with wiring remaining intact.

- Mark and disconnect incoming wiring to the control panel.
- Remove the four hex head screws from the bottom of the panel which secure the panel to the lower mounting brackets.

Figure 6. Control panel mounting brackets details


- Two people will be needed to lift the panel clear of the chiller. Refer to [Table 1, p. 8](#) for control panel weight. Steady the panel as the top retaining screws are removed. Then lift the panel clear. Store the panel in a clean dry area.

5. Use the reverse order to reassemble the control panel.

Tracer AdaptiView Display Arm Removal

⚠ WARNING

Hazardous Voltage w/Capacitors!

Failure to disconnect power and discharge capacitors before servicing could result in death or serious injury. Disconnect all electric power, including remote disconnects and discharge all motor start/run capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized. For variable frequency drives or other energy storing components provided by Trane or others, refer to the appropriate manufacturer's literature for allowable waiting periods for discharge of capacitors. Verify with an appropriate voltmeter that all capacitors have discharged.

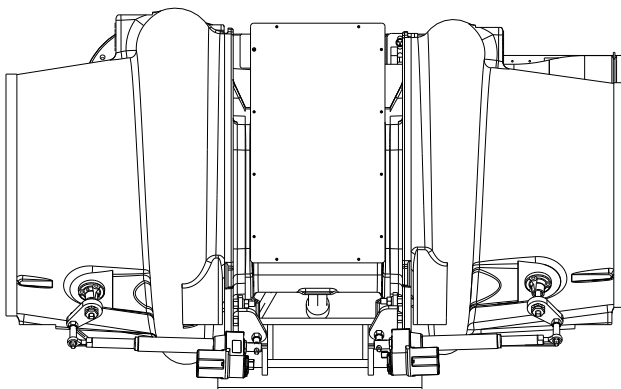
For additional information regarding the safe discharge of capacitors, see PROD-SVB06A-EN

Use the following steps to remove the Tracer AdaptiView™ display arm if additional clearance is required.

1. Cut tie wraps holding wires inside of control arm and remove wires from arm.
2. Remove four hex head screws from the display arm base connecting to the condenser bracket.
3. Use the reverse order to re-attach the arm to the control panel mounting bracket.

Compressor Motor Assembly Removal

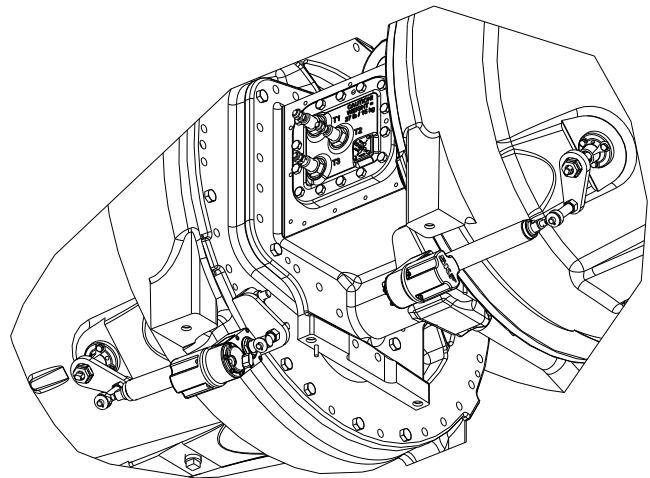
Figure 7. Compressor dowelings to baseplate



1. Disconnect the vane actuators.

- a. Remove the cotter pins and washers securing the vane operator studs to the vane drive and slide the vane actuators off the mounting studs.
- b. Mark each actuator "right" or "left," accordingly, and replace in the correct location.

Figure 8. Vane actuator and operator details

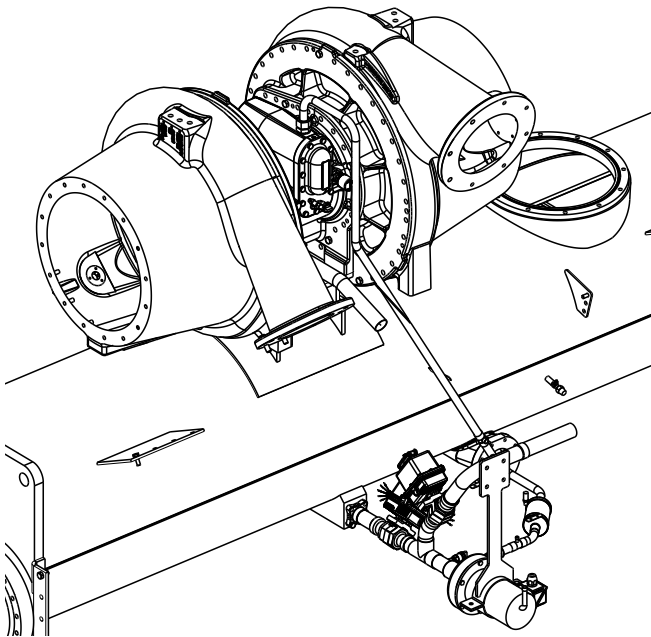
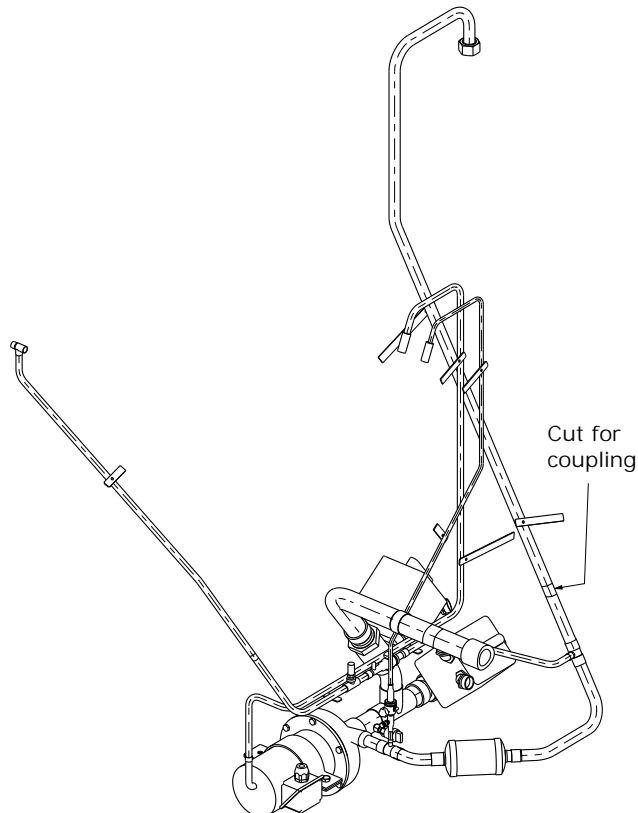


⚠ WARNING

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2. Disconnect motor cooling supply and drain line that is connected to the compressor motor. Couplings will be used to reconnect the lines when reassembling the chiller. Cap or cover open lines to prevent entry of foreign material.

Figure 9. Lubrication system

Figure 10. Lubrication system detail


3. Remove the control panel if necessary. Also, disconnect and remove the unit mounted starter, if so

equipped. See "Control Panel Removal," p. 12 for instructions.

4. Remove the economizer vent pipe flange hex head screws at the compressor and economizer connection. See "Economizer Removal," p. 16 for instructions.

⚠ WARNING

Heavy Objects!

Failure to follow instructions below or properly lift component could result in component dropping and possibly crushing operator/technician 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 component being lifted. Each of the cables (chains or slings), hooks, and shackles used to lift the component must be capable of supporting the entire weight of the component. Lifting cables (chains or slings) may not be of the same length. Adjust as necessary for even component lift.

5. Before removing the compressor/motor assembly, consult with a rigging specialist. Employ rigging specialist procedures when removing the compressor motor/assembly.

Important: Two M20 swivel D-rings are required for lifting the compressor assembly (metric threads).

⚠ WARNING

Improper Use of Elbow Lifting Tab!

Using the elbow lifting tab to lift chiller could result in chiller dropping which could result in death, serious injury, or equipment damage. Do NOT lift chiller using elbow lifting tab. Elbow lifting tab and approved clevis are used ONLY when removing elbow from chiller.

6. Remove the suction elbow.
 - a. The suction elbow has lifting tabs. You will need a lifting clevis to remove the elbow. A Crosby screw pin shackle, model S-209, stock number 1018482 with a 5/8-in. pin is acceptable as shown in [Figure 11](#).

Figure 11. Lifting clevis on the suction elbow lifting tab


- b. Remove the suction elbow hex head screws at the compressor and evaporator connections.
- c. Lift the suction elbow from the chiller being careful to avoid damage to flange surfaces.

Note: Compressor assembly can be removed with wrap pipe still installed.
- d. Unscrew the economizer vent pipe at the first stage volute connection and at the economizer connection.
- e. The two-piece wrap pipe has four lifting tabs. You will need three lifting clevises to remove the pipe. A Crosby screw pin shackle, model S-209, stock number 1018482 with a 5/8-in. pin is acceptable as shown in [Figure 11](#).
- f. Remove the first stage discharge volute hex head screws and the second stage suction hex head screws.
- 7. *If required by installation dimension constraints, remove the two-piece wrap pipe. The wrap pipe can be disassembled at the mid-flange joint.*
 - a. Lift the wrap pipe from the chiller, being careful to avoid damaging flange surfaces.
 - b. Install protective covers on the evaporator, wrap pipe, and compressor connections. Plastic secured with duct tape makes an adequate cover if no heavy objects are set on the openings.

- c. Remove the second stage volute-to-condenser hex head screws.
- 8. Use designated lift point for level lift.
 - a. *If the wrap pipe is still on the unit, see [Figure 12](#).*
 - b. *If lifting the compressor only (no wrap pipe), see [Figure 13](#).*

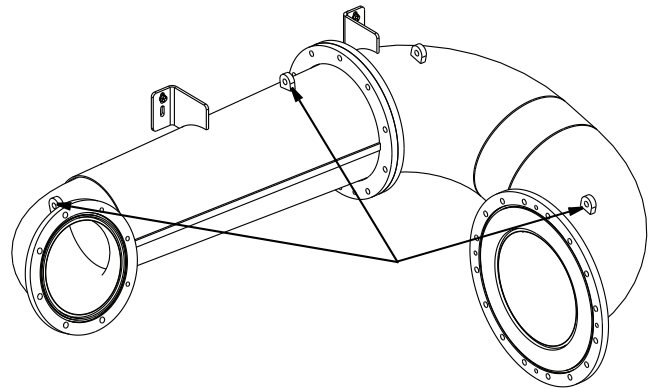
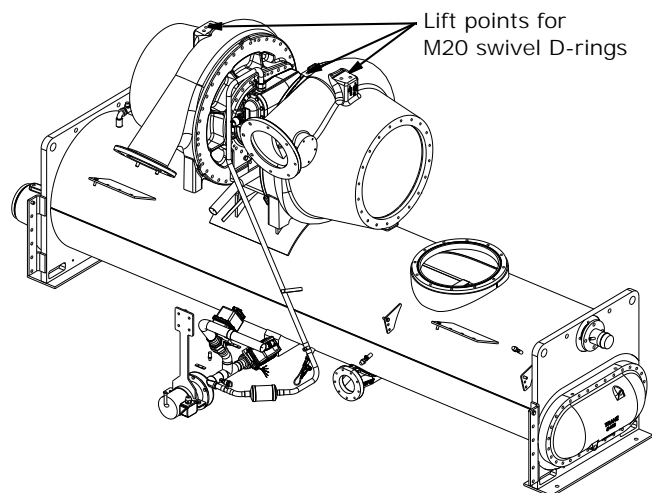
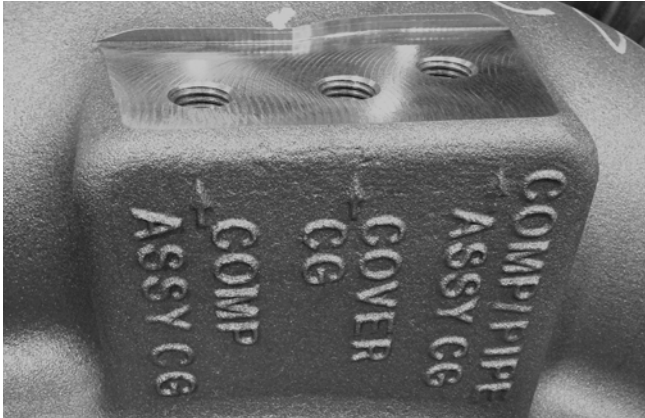
Figure 12. Wrap pipe lifting points (requires three 5/8-in. shackles to lift)

Figure 13. Compressor-only lifting points


Figure 14. Casting identifies lifting points by component



- Support compressor on wood blocks or plywood to prevent damage to the compressor or wrap pipe components.

NOTICE

Handle with Care!

Failure to follow instructions below could result in equipment damage.

The cast iron base of the compressor and the discharge flange of the volute can be broken easily if rough handling of the compressor/motor assembly is allowed. **Take great care to prevent this breakage when removing the compressor/motor assembly and setting it down, or when moving it laterally on the floor (e.g., on rollers, etc). Take extra care to gently sit the compressor/motor assembly down and avoid letting it swing or drop into an obstruction while lifting or moving it.**

- Remove the compressor/motor assembly. Remove the two locating roll pins from the compressor and/or compressor base. Grip each pin and pull out of its hole; at this point, remove the compressor/motor assembly.

Economizer Removal

⚠ WARNING

Heavy Objects!

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⚠ WARNING

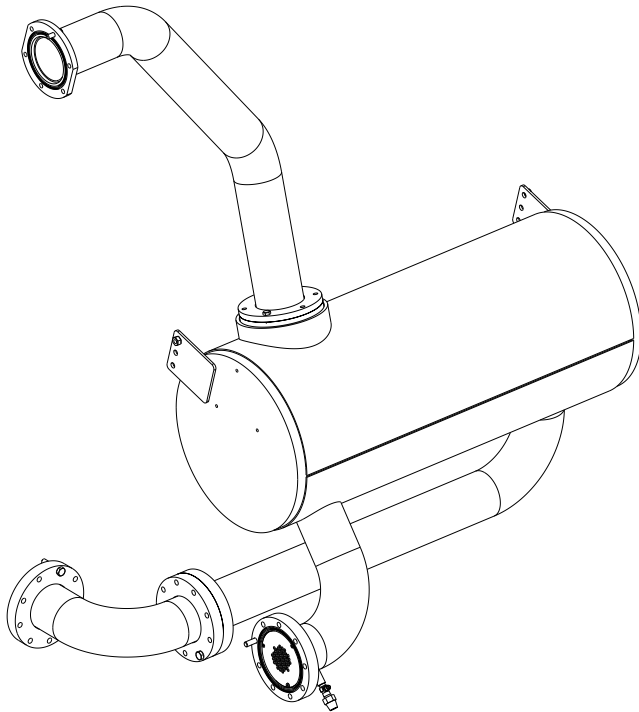
Refrigerant under Positive Pressure!

Failure to follow instructions below could result in an explosion which could result in death or serious injury or equipment damage. System contains refrigerant and may be under positive pressure. Recover refrigerant to relieve pressure before opening the system. See unit nameplate for refrigerant type. Do not use non-approved refrigerants, refrigerant substitutes, or refrigerant additives.

Use the following steps to remove the economizer if additional horizontal clearance is required.

- Support the weight of the economizer with a movable floor jack. Do NOT lift the economizer; simply support it. Maximum economizer weight is provided in [Table 1, p. 8](#); also see submittal.
- If the unit has insulation, remove the insulation and loosen the hex head screws on the condenser liquid line flange. Loosen the hex head screws on the evaporator liquid line flange. See [Figure 15](#). Do NOT remove the screws at this time.

Figure 15. Evaporator-Condenser-Economizer line flanges



3. This connection is near the bottom of the evaporator. See [Figure 15](#). Do NOT remove the screws at this time.
4. Economizers are connected to the evaporator shell via screwed flanges. See [Figure 17, p. 18](#). Remove the screws at this flanged connection.
5. Remove the economizer vent pipe flange hex head screws on the economizer and the vent pipe to the compressor first stage volute connection flange hex head screws. Remove economizer vent line (unless the compressor has already been removed to gain vertical clearance.)
6. Secure economizer with appropriate rigging.
7. Remove the hex head screws from the condenser and evaporator liquid line connection flanges. Adjust the floor jack as necessary to support the weight of the economizer.
8. Remove the economizer vent pipe flange screws to loosen the economizer. When the screws are free, back the economizer away from the chiller. The economizer may tend to rotate off the jack. Be prepared to offset any rotation.
9. Move the economizer away from the chiller and set it on a pallet. Cover all openings to prevent the entry of foreign material into the economizer, condenser and compressor.

10. Use the reverse order to reassemble the economizer on the chiller. Be sure to install new O-rings at the appropriate joints.
11. Torque all screws to specifications. Consult with your Trane service group for specific torques for your economizer design.

Condenser/Evaporator Disassembly

After the compressor assembly has been removed, the condenser and evaporator shells can be taken apart at flanged connections to reduce the horizontal clearance required for the chiller installation.

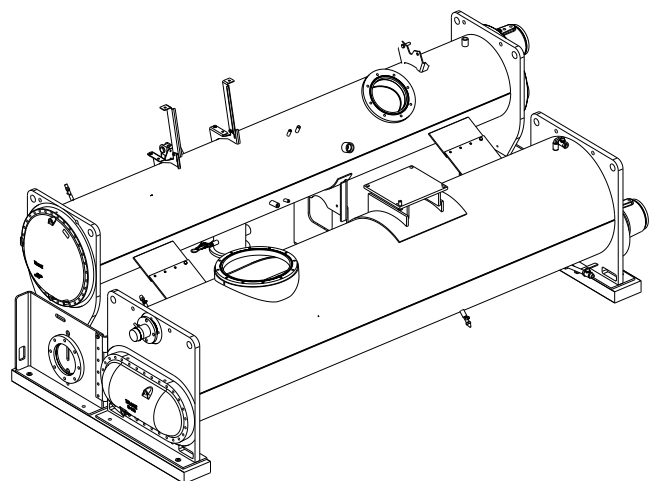
⚠ WARNING

Heavy Objects!

Failure to follow instructions below or properly lift component could result in component dropping and possibly crushing operator/technician 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 component being lifted. Each of the cables (chains or slings), hooks, and shackles used to lift the component must be capable of supporting the entire weight of the component. Lifting cables (chains or slings) may not be of the same length. Adjust as necessary for even component lift.

1. Ensure that condenser and evaporator shells are securely supported on level ground. If not, shim under the bases.
2. Support the condenser with rigging using the lifting holes on the tube sheets. See [Figure 16](#). Do NOT lift the shell, simply support it to avoid slipping as the screws are removed from the connecting flange.

Figure 16. Separable shell unit



Disassembly

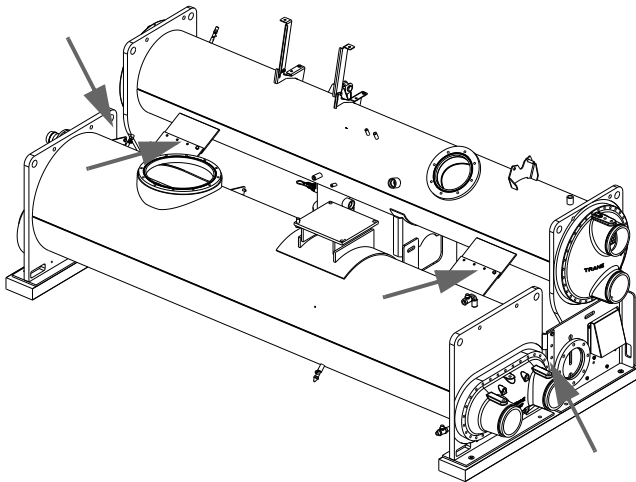
3. Remove the hex head screws from the flanges connecting the evaporator tube sheet and condenser shell support (see [Figure 17](#)). Then remove the screws from the flanges connecting the shells.

4. Reassemble the evaporator and condenser shells in the reverse order.

Note: Install the top screws first as these have limited clearance and act as dowel pins.

5. Torque all screws to specifications listed in [Table 2](#), p. 21.

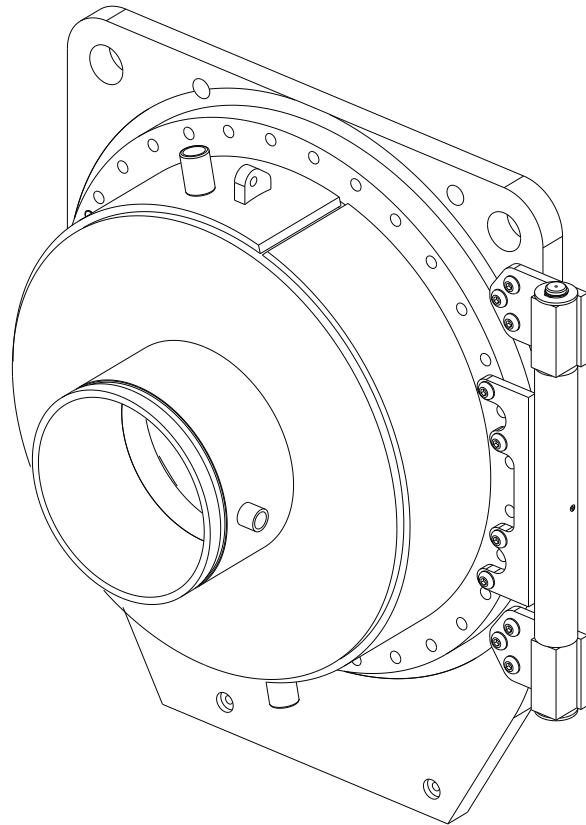
Figure 17. Separable shell unit (flange connection)



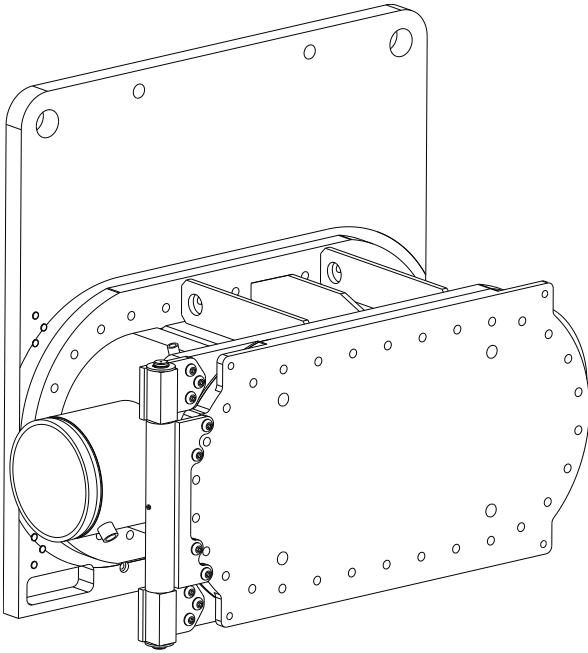
Optional Hinged Waterboxes

If the chiller includes optional hinged waterboxes, the waterboxes and hinge may be removed for installation or service.

Figure 18. Example of CVHS hinged waterbox option (non-marine waterbox)



**Figure 19. Example of CVHS hinged waterbox option
(marine waterbox)**



Each waterbox hinge weighs 35 lb (15.9 kg); refer to [Table 1, p. 8](#) for condenser and evaporator waterbox maximum weights.

Reassembly

NOTICE

Equipment Damage!

Failure to remove the strain relief with the sensor could result in equipment damage. Do NOT attempt to pull sensor bulb through the strain relief; always remove the entire strain relief with the sensor.

It is important to remove used O-rings and gaskets and clean joints before reassembling the compressor with new O-rings. All necessary replacement O-rings are supplied by the factory when the separable shell option is ordered.

Use the following procedure to reattach the compressor/motor assembly to the chiller.

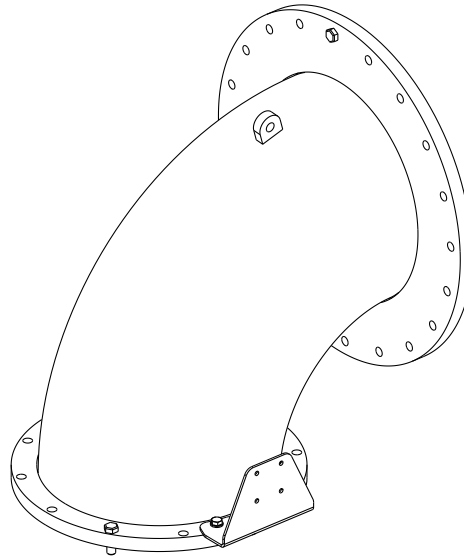
1. Remove the protective covers on all compressor, condenser, evaporator, and economizer connections. Clean all mating surfaces using Loctite® “Chisel” cleaner or CRC® Industrial Gasket Remover. Completely remove old sealing compound from O-ring grooves. Use Loctite “N” primer for final surface preparation.
2. Refer to CTV-SB-66F (*General Service Bulletin: CenTraVac O-Ring and Flange Sealant*) for proper installation of gaskets, O-Rings, and Loctite sealant. Install a new O-ring on the compressor discharge connection mating surfaces. Use Loctite 515 “Gasket Eliminator” to lubricate the O-ring and provide additional sealing. This is the only sealing compound recommended by Trane for use on O-ring joints. To use this sealing compound, apply a light bead (approximately 1/8-in. in diameter) to the O-ring groove, insert the O-ring and then apply a light bead to the O-ring. Also apply a 1/8-in. bead of sealing compound between the O-ring groove and the screw hole circle. The parts can now be assembled.

Note: Trim 3/8-in. off the 2-1/8-in. copper compressor drain line to allow clearance when reassembling.

3. Lift the compressor/motor assembly into place. Be sure to caulk or paint the compressor base plate to protect the bare metal. Install two new roll pins into the compressor casting. Align the pins into the compressor mounting base. Insert the hex head screws in the compressor base and discharge flange connections.
4. Tighten the compressor base and discharge flange hex head screws. See [Table 2, p. 21](#) for screw torque specifications.
5. Remove the lifting equipment.
6. Set up dial indicators on the compressor end of the compressor/motor assembly. See [Figure 20](#). The dial indicators are used to monitor horizontal and vertical movement of the compressor/motor assembly when the suction elbow retaining hex head screws are

tightened. Support the dial indicators from the condenser or from a floor stand.

Figure 20. Suction elbow flange screws^(a)



(a) For flange tightening sequences, refer to [“Tightening Flanges,” p. 21](#)

7. Clean the suction elbow flange surfaces and O-ring grooves per [Step 1](#). For the evaporator to suction elbow joint, use Loctite 515 per [Step 2](#). For the suction elbow to compressor joint, use 1/8-in. GORE-TEX® Joint Sealant placed approximately 1/8-in. in board of the O-ring groove. This is used in addition to the O-ring. Also use 1/8-in. GORE-TEX on wrap pipe to second stage inlet connection in the same manner as on the section elbow to compressor joint.

As an option, Loctite 515 may be used in place of GORE-TEX. However, great care must be taken to prevent the sealant from entering the first stage IGV housing. Refer to CTV-SB-66F (*General Service Bulletin: CenTraVac O-Ring and Flange Sealant*).

Figure 21. Installation of 1/8-in. GORE-TEX tape



8. Lift the suction elbow into place using a sling or chain-fall hoist.
9. Install the suction elbow retaining hex head screws.
10. Tighten the retaining screws only “hand tight”. Tighten two retaining screws, 180 degrees apart at the compressor connection. Then tighten two screws, 180 degrees apart at the evaporator connection. Alternate between connections until all retaining screws are tight. Monitor the dial indicators to ensure that there is no more than 0.010 inches of compressor movement. If there is more movement than this, loosen all of the screws, “zero” the dial indicators, and repeat the procedure. Refer to [“Tightening Flanges,” p. 21](#) for screw tightening sequences.
11. Reconnect the economizer vent pipe. Be sure to clean the mating surfaces and use new O-rings on the connections. Tighten first stage volute and economizer top flange screws; refer to [Table 2, p. 21](#) and [“Tightening Flanges,” p. 21](#).
12. Reinstall all other chiller components which were removed.
13. Torque all screws to specifications listed in [Table 2](#).

Table 2. Screw torques for waterbox mounting

Screw Size		Torque	
(in)	(mm)	(ft·lb)	(N·m)
1/2	13	70–100	95–136
5/8	16	130–190	176–258

Metric Screw Size (Non-Gasketed Joints or O-ring Joints)

Screw Size	Torque	
	(ft·lb)	(N·m)
M8	12–16	16–22
M10	24–33	33–45
M12	48–65	65–89
M16	130–179	177–243
M20	239–334	324–453

14. Reconnect the previously cut compressor supply and return lines and the motor cooling lines using the factory-supplied couplings.

Optional Hinged Waterboxes

If the chiller includes optional hinged waterboxes and if the waterboxes have been removed for installation or service, or if waterbox holes do not line up with the tube sheet, perform the following procedure.

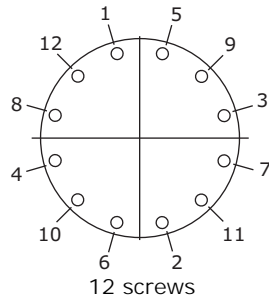
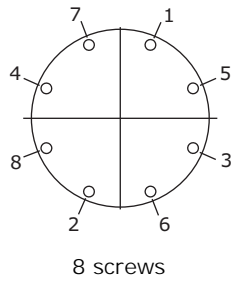
1. Move waterbox into position.
2. Install the hex head screws for the waterbox and hand-tighten.
3. Lift and hold the waterbox as high as the screws will allow.
4. While holding the waterbox as high as the screws will allow, tighten the waterbox screws to the tube sheet. Torque to specifications listed in [Table 2](#).
5. Move hinge into position.
6. Install hinge button head screws and hand-tighten.
7. Torque button head screws for center hinge section to waterbox to specifications listed in [Table 2](#).
8. Lift lower hinge section and hold in contact with middle hinge section.
9. Torque button head screws for lower hinge section to tube sheet to specifications listed in [Table 2](#).
10. Torque button head screws for upper hinge section to tube sheet to specifications listed in [Table 2](#).

Each waterbox hinge weighs 35 lb (15.9 kg); refer to [Table 1, p. 8](#) for condenser and evaporator waterbox maximum weights.

Tightening Flanges

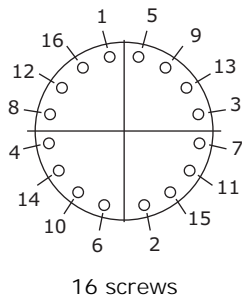
Flanges with 8 or 12 Screws

Tighten all screws to a snug tightness, following the numerical sequence for the appropriate pattern as shown below. Repeat this sequence to apply the final torque to each screw.



Flanges with 16 Screws

Tighten only the first half of the total number of screws to a snug tightness, following the numerical sequence for the pattern as shown below. Next, sequentially tighten the remaining half of the screws in numerical order.



Brazing

⚠ WARNING

Hazard of Explosion and Deadly Gases!

Failure to follow all proper safe refrigerant handling practices could result in death or serious injury. Never solder, braze or weld on refrigerant lines or any unit components that are above atmospheric pressure or where refrigerant may be present. Always remove refrigerant by following the guidelines established by the EPA Federal Clean Air Act or other state or local codes as appropriate. After refrigerant removal, use dry nitrogen to bring system back to atmospheric pressure before opening system for repairs. Mixtures of refrigerants and air under pressure may become combustible in the presence of an ignition source leading to an explosion. Excessive heat from soldering, brazing or welding with refrigerant vapors present can form highly toxic gases and extremely corrosive acids.

Except as noted in the following, braze with the following filler metals:

- Braze all copper-to-copper joints with A.W.S. BcuP-6 filler metal.
- Braze all copper-to-brass joints with A.W.S. BcuP-6 filler metal using white or black brazing flux.
- Braze all other joints with A.W.S. Bag-28 filler metal.

Bleed dry nitrogen through the lines while brazing to prevent the formation of oxides which can contaminate the refrigerant systems.

Note: Use silver soldering with 96% Sn-4% Ag (for example, J.W. Harris Co. Stay Brite®) to replace brazing when the heat from brazing would be detrimental to the immediate or nearby parts.

Examples:

1. Joints next to threaded joints in which the copper or brass threads become too soft and/or Loctite loses its sealing capability due to excess heat.
2. Joints next to valves in which the valves cannot be taken apart or are not recommended for brazing.

Final Installation Procedures

After the chiller has been moved to the equipment room and reassembled under Trane supervision, leak testing, and evacuation can be performed by Trane or under Trane supervision. Upon verification of leak tightness, installation can proceed for unit piping, wiring, etc. After installation has been completed, fill out CTV-ADF001*-EN (*CenTraVac™ Installation Completion Check Sheet and Request for Trane Service*) to schedule the startup; the chiller commissioning process can be completed by Trane or under the supervision of authorized Trane personnel.

Note: CTV-ADF001*-EN is also included in the "Forms" section of CVHS-SVX01*-EN (Installation, Operation, and Maintenance: Series S™ Water-Cooled CenTraVac Chillers with Tracer AdaptiView Control).



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