



CHILLER INSTALLATION GUIDE & USER MANUAL

- VERTICAL AIR SERIES -



VERTICAL AIR SERIES CHILLER MANUAL
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CONTENTS

CONTACT INFORMATION & AFTERHOURS SUPPORT	5
INSTALLATION VIDEO LINKS.....	5
RECEIVING YOUR CHILLER.....	6
WARNINGS AND NOTICES.....	6
PACKAGE CHILLER DESCRIPTION	7
INSALLATION OVERVIEW	8
INSTALLATION REQUIREMENTS AND CONTRACTOR RESPONSIBILITIES.....	9
INSTALLER-SUPPLIED COMPONENTS.....	9
CHILLER INSTALLATION - MECHANICAL.....	9
PIPING RECOMMENDATIONS	11
ELECTRICAL INSTALLATION	13
SEQUENCE OF OPERATION	13
CHILLER OPERATING PRINCIPLES.....	14
REFRIGERANT CYCLE	14
CONTROLLER AND NAVIGATION.....	15
CONTROLS INTERFACE	18
UNIT START-UP PROCEDURES.....	18
PRE-START CHECKOUT	19
FREEZE PROTECTION.....	20

NORMAL SHUTDOWN.....	20
START-UP INSTRUCTIONS (9 EASY STEPS).....	21
WARRANTY START-UP CHECKLIST	22
TERA	23
MODEL INFORMATION	24
UNIT NAMEPLATE	24
COMPRESSOR NAMEPLATE.....	25
COMPRESSOR INFORMATION.....	25
COMPRESSOR REPLACEMENT.....	26
POWER SUPPLY WIRING	28
MAINTENANCE.....	30
MAINTENANCE CHECKLIST.....	33
TROUBLESHOOTING.....	36
CAREL ALARMS.....	39
PROPYLENE GLYCOL CHART	41
WARRANTY STATEMENT.....	42

CONTACT INFORMATION & AFTERHOURS SUPPORT

CONTACT INFORMATION

G&D Chillers, Inc.
760 Bailey Hill Rd.
Eugene, Oregon 97402
1.800.555.0973
info@gdchillers.com
Office Hours: 8 AM – 5 PM PST

AFTERHOURS TECHNICAL SUPPORT

G&D Chillers offers 24/7 technical support. For emergency assistance after normal business hours, call the main office at 1.800.555.0973. The voicemail recording will provide contact information for the emergency on-call service technician.

INSTALLATION VIDEO LINKS

Visit the following pages for installation video walk-throughs and FAQs:

gdchillers.com/installation-videos/

gdchillers.com/installation-videos/how-to-install-a-chiller

gdchillers.com/faq

NOTICE: CHILLER WARRANTY REQUIRES ACTIVATION

To activate the chiller parts and labor limited warranty, complete the Warranty Start-Up Checklist and return to G&D Chillers within 30 days.

RECEIVING YOUR CHILLER

INSPECTION CHECKLIST

When the unit is delivered, verify that it is the correct unit and that it is properly equipped.

Compare the information which appears on the unit nameplate with the ordering and submittal information.

Inspect all exterior components for visible damage. Report any apparent damage or material shortage to the carrier and make a "unit damage" notation on the carrier's delivery receipt. Specify the extent and type of damage found and notify the G&D Sales Office at 800-555-0973.

Do not proceed with installation of a damaged unit without sales office approval.

To protect against loss due to damage incurred in transit, complete the following checklist upon receipt of the unit.

- Inspect the individual pieces of the shipment before accepting the unit. Check for obvious damage to the unit or packing material.
- Inspect the unit for concealed damage as soon as possible after delivery and before it is stored. Concealed damage must be reported within 5 days.
- If concealed damage is discovered, stop unpacking the shipment. Do not remove damaged material from the receiving location. Take photos of the damage, if possible. The owner must provide reasonable evidence that the damage did not occur after delivery.
- Notify the carrier's terminal of the damage immediately, by phone and by mail. Request an immediate, joint inspection of the damage with the carrier and the consignee.
- Notify the G&D sales representative and arrange for repair. Do not repair the unit, however, until damage is inspected by the carrier's representative.

WARNINGS AND NOTICES

Note that warnings and notices appear at appropriate intervals throughout this manual. Warnings are provided to alert installing contractors to potential hazards that could result in personal injury or death. Cautions are designed to alert personnel to hazardous situations that could result in personal injury, while notices indicate a situation that could result in equipment or property damage only accidents.

Your personal safety and the proper operation of this machine depend upon the strict observance of these precautions.

ATTENTION: Warnings, Cautions and Notices appear at appropriate sections throughout this literature. Read these carefully.

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.

PACKAGE CHILLER DESCRIPTION

CONDENSER

AIR COOLED – Standard configuration. Copper tube aluminum fin vertical air flow condenser coil. Direct drive propeller type fans with DDP motors and built-in overload protection. Design test pressure 150 PSIG low side, 300 high side.

LIQUID COOLED – Optional configuration. Brazed plate counterflow condenser with water regulation valve. Shell and tube condensers available for custom units.

EVAPORATOR

Brazed plate counterflow heat exchanger fed by electronic expansion valve (EEV).

COMPRESSOR

Hermetically-sealed Frascold compressor with oil level sight glass, rotalock service valves, and crankcase heater.

PUMPS

End suction centrifugal pump with impeller trimmed for 35% propylene glycol mixture. Base mounted. Pump fitted with union, check valve, and supply and return shut off valves for service. Variable frequency drives available upon request.

RESERVOIR TANK

Constructed of molded, seamless high-density cross-linked polyethylene or stainless steel. Insulated with ½" closed cell foam. Glycol level indicator. Auxiliary ports standard on most units.

SUPPLY & RETURN PIPING

Constructed of type M copper. Flanges provided for field connection of supply and return piping. Liquid-filled pressure gauge for discharge pressure.

DYNAMIC FLUID BYPASS VALVE

Allows for balancing of discharge pressure. Over pressure design allows circuiting back to tank without damage to system or pump. Copper and bronze construction.

REFRIGERANT PIPING

Type L ACR copper. Liquid line-filter drier, sight glass/moisture indicator, solenoid valve and electronic expansion valve. Suction line fully insulated and designed for proper oil return with minimum friction loss. Discharge line formed of ACR tubing reformed radius fittings. All piping leak tested and evacuated. Ships with full operating charge of refrigerant, refer to data plate for refrigerant type and charge per circuit.

FRAME & HOUSING

Fully powder coated steel frame. Durable powder coated aluminum housing rated for outdoor use. Access panels for easy service and maintenance.

POWER & CONTROLS

A single-point electrical connection is provided for terminating the chiller power wiring. All power starting controls and safety/operating controls are mounted in a weatherproof steel NEMA 3R enclosure.

Features include:

- Programmable logic controller (PLC)
- On / pump down / off door switch
- Compressor contactor and circuit breaker
- Pump contactor and circuit breaker
- Pressure-based mechanical safeties
- Flow switch interlock
- Freeze protection interlock
- High temperature alarm
- Low ambient control
- Compressor anti short cycle timer
- Variable speed drives (VFD)
- Water regulating valve (water cooled units)

FACTORY TESTING

All chillers are run tested at the factory and verified to be in perfect working order prior to shipment.

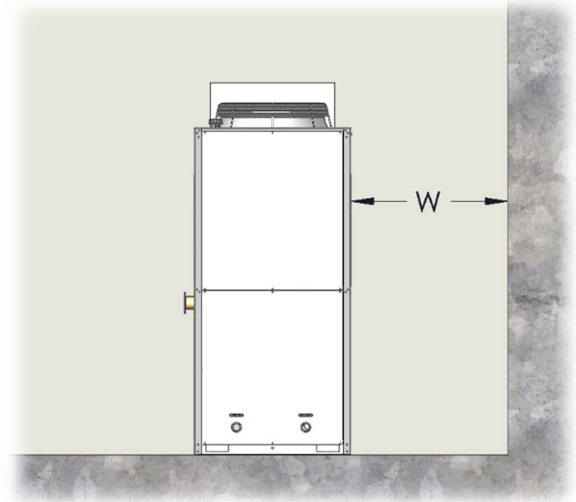
INSTALLATION OVERVIEW

LOCATION

Air cooled units must sit outside and be anchored to a solid level surface. A concrete pad is recommended. Location should be free of grass and other debris that could plug condenser fins.

Ensure minimum clearance* between condenser intake side and any buildings, walls, etc.

No walls or obstructions in front of the unit: Louvered access side must be open to free air. No roofs or overhangs above chiller condenser.



Liquid cooled chillers may be installed on a concrete pad outdoors. A properly sized pump and liquid cooling system for the chiller condenser must be supplied by the end user. Contact G&D Chillers for additional information and assistance with sizing.

*MINIMUM CLEARANCE REQUIREMENTS (W)	
45.25"	GD-30H, GD-35H, GD-40H, GD-50H
90.5"	GD-70H, GD-100H, GD-150H, GD-200H

ELECTRICAL

WARNING: OBEY ALL APPLICABLE LOCAL AND NATIONAL ELECTRIC CODES WHEN INSTALLING THIS EQUIPMENT

- Supply unit with the proper voltage and protect against power spikes. Use only copper wire. Size wire and according to any/all applicable local and national codes. Refer to chart to the right for proper torque values. Refer to spec sticker on control panel for all electrical ratings.
- Field-installed service disconnect required
- Unit must be properly grounded at the provided grounding lug. If multiple ground wires are used, all wires must be twisted together prior to tightening ground lug.
- Use only hubs or fittings that maintain the same environmental ratings as the enclosure.
- When turning unit off for an extended length of time, leave power energized. (This will leave the crankcase heater on and keep the crankcase warm for the next start up.)

TORQUE CHART	
Gauge	lbf-in
1000-500	550
500-4	500
350-6	375
250-6	375
4/0-6	275
2/0-14	120
#2-#3	50
#4-#6	45
#8	40
#10-#14	35

INSTALLATION REQUIREMENTS AND CONTRACTOR RESPONSIBILITIES

A list of the contractor responsibilities typically associated with the unit installation process is provided.

FOUNDATION

- Meet foundation requirements
- Solid level surface
- Anchoring

RIGGING

- Safety Chains
- Clevis connectors
- Lifting beam

ELECTRICAL

- Circuit breakers (optional)
- Unit disconnect
- Electrical connections to unit mounted terminal block
- Wiring sizes per NEC
- Ground connection(s)
- Option relays and wiring

FLUID PIPING

- Fluid strainer
- Taps for thermometers and gauges
- Thermometers
- Fluid flow pressure gauges
- Isolation and balancing valves in fluid piping
- Vents and drain
- Pressure relief valves
- Backflow prevention valves

INSULATION

- Insulation
- High humidity insulation (optional)
- Main line pipe

INSTALLER-SUPPLIED COMPONENTS

Customer wiring interface connections are shown in the electrical schematics and connection diagrams that are shipped with the unit. The installer must provide the following components if not ordered with the unit:

- Power supply wiring (in conduit) for all field-wired connections.
- All control (interconnecting) wiring (in conduit) for field supplied devices.
- Unit disconnect (fused).

CHILLER INSTALLATION - MECHANICAL

LOCATION REQUIREMENTS SOUND CONSIDERATIONS

- Refer to G&D data sheet for sound data
- Locate the unit away from sound-sensitive areas
- Chilled fluid piping should not be supported by chiller frame
- Seal all wall penetrations

Note: Consult an acoustical engineer for critical applications.

FOUNDATION

Provide a concrete foundation of sufficient strength and mass to support the applicable operating weight (i.e., including completed piping, and full operating charges of refrigerant, oil and water). G&D Data sheet for unit operating weights. Once in place, the unit must be level within 1/4" (6.4 mm) over its length and width as well as anchored to the surface. Construct a concrete pad fully supporting the footprint of the chiller. Mount the unit directly to the concrete pads. Level the unit using the base rail as a reference. The unit must be level within 1/4" over the entire length. Chiller must be in contact with the concrete pad around its complete perimeter. G&D Chillers is not responsible for equipment problems resulting from an improperly designed or constructed foundation.

CLEARANCES

Provide enough space around the unit to allow the installation and maintenance personnel unrestricted access to all service points. Observe all applicable local and national codes. Refer to submittal drawings for the unit dimensions, to provide sufficient clearance for the opening of control panel doors and unit service. All sides should have clearance not less one full width of the condenser to any obstruction. Combined void on all four sides shall not be less than 75%, and all obstructions should meet the minimum clearance distance listed above.

PROCESS PIPING

Cooling fluid connections are flanged.

Thoroughly flush all fluid piping to the chiller before making the final piping connections to the unit.

CAUTION: PROPER WATER TREATMENT!

The use of untreated or improperly treated water in a Chiller may result in scaling, erosion, corrosion, algae or slime. It is recommended that the services of a qualified water treatment specialist be engaged to determine what water treatment, if any, is required. G&D assumes no responsibility for equipment failures which result from untreated or improperly treated water, or saline or brackish water.

VALVES AND VENTING

A vent is provided on the top of the reservoir. Be sure to provide additional vents at high points in the piping to bleed air from the chilled fluid system. Do not pressurize reservoir. Install necessary pressure gauges to monitor the entering and leaving chilled water pressures. Provide shutoff valves in lines to the gauges to isolate them from the system when they are not in use. Use rubber vibration eliminators to prevent vibration transmission through the water lines. All piping must be adequately secured and supported. If desired, install thermometers in the lines to monitor entering and leaving fluid temperatures. Install shutoff valves on both the entering and leaving water lines so that the chiller can be isolated for service.

CHILLER PIPING COMPONENTS

Piping components include all devices and controls used to provide proper cooling system operation and unit operating safety.

- Air vents (to bleed air from system)
- Water pressure gauges with shutoff valves
- Vibration eliminators
- Shutoff (isolation) valves
- Thermometers (if desired)
- Fluid Strainer

The fluid strainer is field supplied, field installed and shall provide taps for the pressure gauges on the inlet and outlet. The wye-strainer shall be installed on the return line and must be one pipe size larger than the main line piping.

Install pressure gauges in order to measure differential pressure across the strainer. This will help to determine when it is necessary to clean the water strainer.

PIPING RECOMMENDATIONS

The drawing on the next page shows features that should be included in the piping system. Supplemental details and additional recommendations are listed here:

Insulate supply and return piping

- Use closed-cell foam insulation
- Install protective cladding

Materials: Schedule 80 PVC or ABS typical for cold glycol/water systems

- Verify operating temperatures
- High temp systems may require copper or stainless steel piping

Install isolation ball valves externally at chiller supply and return ports

- True union or flanged valves for serviceability

Wye-strainer (20 mesh) on chiller return line

- Standard ball valve on purge line
- Additional ball valve upstream of Y-strainer for servicing

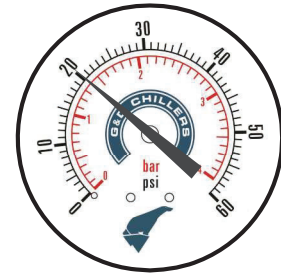
Glycol backflow prevention measures:

- Check valve on chiller supply line
- Two options for return line:
 - (1) Inverted trap with air vent valve and vacuum breaker, or
 - (2) Electronic actuated valve, wired to process pump starter in chiller electrical enclosure

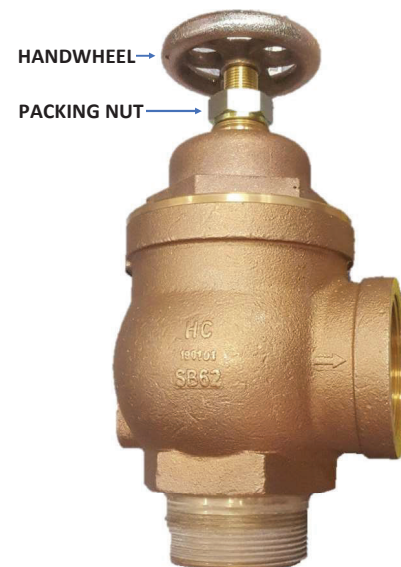
ADJUSTING GLYCOL SUPPLY PRESSURE

The chiller contains a dynamic fluid bypass valve on the supply line.

Refer to "CONTROLLER AND NAVIGATION" section to adjust the pressure setting.

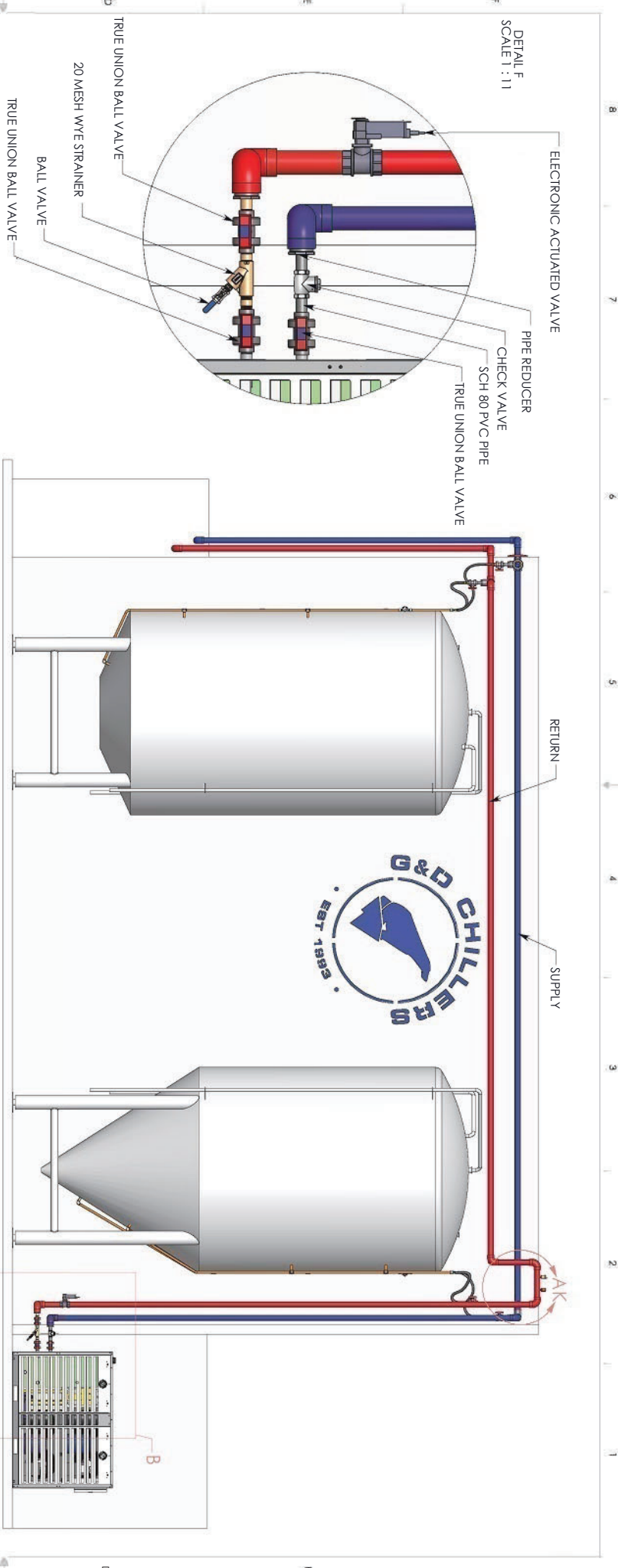


PRESSURE GAUGE

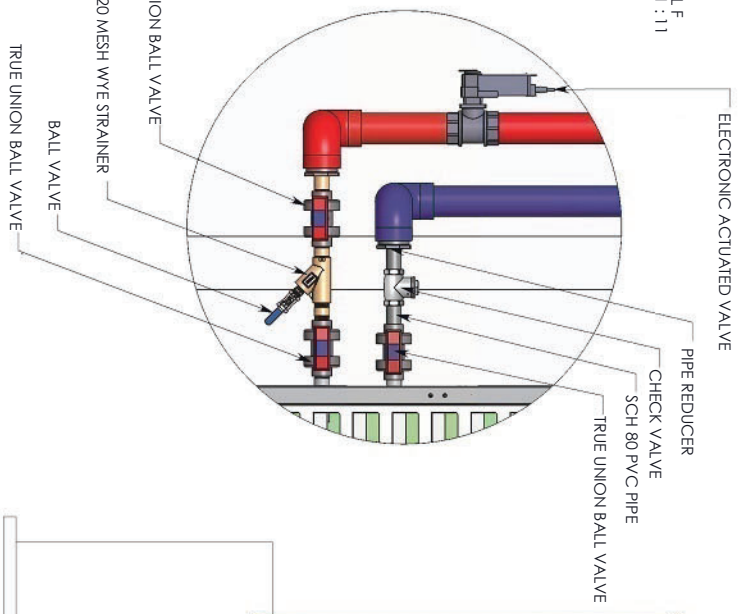


FLUID BYPASS VALVE

WARNING: VERIFY TANK JACKET RATINGS BEFORE PRESSURIZING PIPING

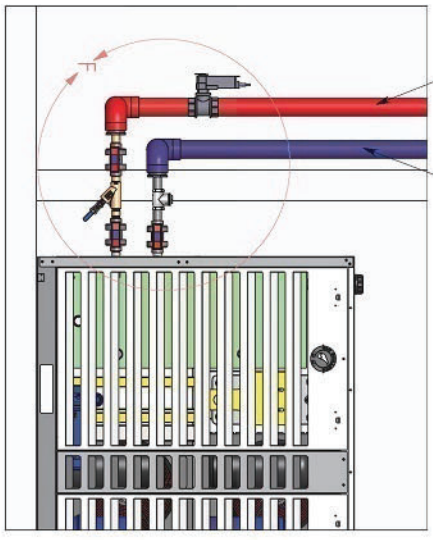


DETAIL F
SCALE 1 : 11

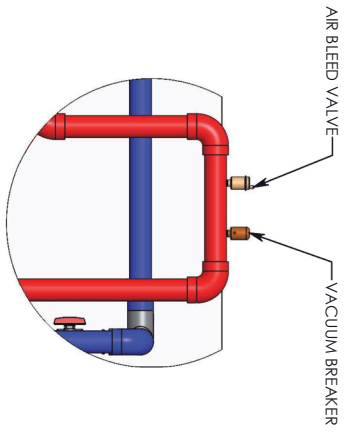


RETURN

SUPPLY



DETAIL B
SCALE 1 : 19



DETAIL AK
SCALE 3 : 46

GENERAL PIPING LAYOUT



G&D CHILLERS

COMMITTED TO COLD

o EST 1993 o

760 BAILEY HILL RD. EUGENE, OR 97402 • TEL (541) 346-3903 (800) 555-9973

ELECTRICAL INSTALLATION

GENERAL RECOMMENDATIONS

All wiring must comply with local codes and the National Electric Code. Minimum circuit ampacities and other unit electrical data are on the unit nameplate. Specific electrical schematics and connection diagrams are shipped with the unit.

WARNING: HAZARDOUS VOLTAGE!

Disconnect all electric power, including remote disconnects before servicing. Follow proper lock- out/tagout procedures to ensure the power cannot be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury.

CAUTION: USE COPPER CONDUCTORS ONLY!

Unit terminals are not designed to accept other types of conductors. Failure to use copper conductors may result in equipment damage.

Important! Do not allow conduit to interfere with other components, structural members or equipment. Control voltage wiring in conduit must be separate from conduit carrying low voltage (<30V) wiring. To prevent control malfunctions, do not run low voltage wiring (<30V) in conduit with conductors carrying more than 30 volts.

SEQUENCE OF OPERATION

1. Chiller supply and return ball valves should always be open during normal operation.
2. Fluid bypass valve is factory set at 20 PSI valve design to allow minimum flow across heat exchanger when process is not calling for cooling.
3. Pump circulates at all times when panel door switch is in the Run position.
4. Compressor control circuit is energized when pump is running.
5. If pump fails or flow fails compressor control circuit will de-energize.
6. Programmable logic controller (PLC) energizes Electronic Expansion Valve (EEV) based on leaving fluid temperature.
7. The controller will energize the compressor starter while monitoring system pressures and flow.
8. If all parameters remain in a safe range, the compressor will continue to run until the thermostatic logic detects that it is no longer needed. At that point, the EEV will close, the compressor will pump down and stop.
10. Door switch will pump down compressor then turn off pump if switch is shut off during compressor run cycle.
11. Line voltage power should be left on to main terminal block at all times to keep crank case heater energized during extended off cycles.

CHILLER OPERATING PRINCIPLES

This section contains an overview of the operation of air-cooled liquid chillers equipped with thermostatic control systems.

Note: To ensure proper diagnosis and repair, contact a qualified service organization if a problem should occur.

GENERAL

The large capacity chiller unit is a reciprocating type compressor air-cooled liquid chiller. This unit is equipped with unit-mounted starter/control panels and operates with R404A or R448A refrigerant.

BASIC COMPONENTS OF A CHILLER UNIT:

- Unit-mounted panels containing breakers, starters, and Carel controller
- Reciprocating compressors
- Brazed plate or shell-and-tube evaporators
- Air-cooled condenser
- Electronic expansion valves
- Related interconnecting piping

REFRIGERANT CYCLE

The refrigeration cycle of the large capacity chiller is conceptually similar to other G&D air-cooled chiller products. The chiller uses brazed plate evaporators and an air-cooled condenser. The compressors use suction gas cooled motors and an oil management system to provide almost oil-free refrigerant to the condenser and evaporator for maximum heat transfer while lubricating and sealing compressor bearings. The lubrication system helps to assure long compressor life and contributes to quiet operation.

Refrigerant condenses in the air-cooled condenser.

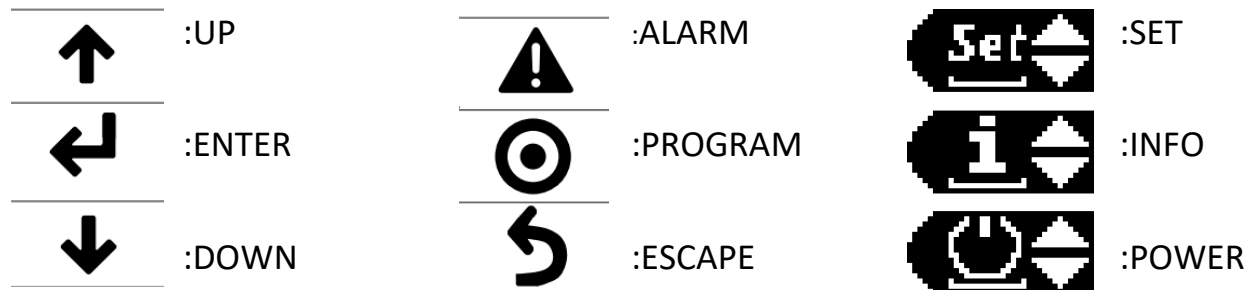
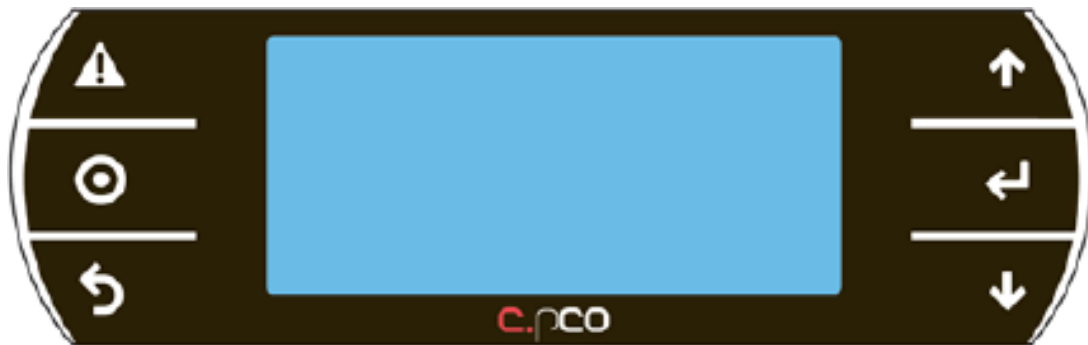
Liquid refrigerant is metered into the brazed plate evaporators using a thermal expansion valve to maximize chiller efficiency at full and part load operation.

The chiller is equipped with a unit-mounted starter and control panel.

The PLC-based unit control module provides accurate chilled fluid control while providing monitoring, protection and limit functions.

The adaptive nature of the controls intelligently prevents the chiller from operating outside of its limits, or compensates for unusual operating conditions while keeping the chiller running rather than simply shutting off the chiller.

CONTROLLER AND NAVIGATION



Set Screens:

- Glycol set point: Ensure you see in the bottom right of the display screen.
 - You can change options from SET, INFO and POWER by using the UP and DOWN buttons.
 - Press ENTER to navigate to the glycol temperature set screen.
 - Press ENTER again to navigate to the numerical readout. Use UP and DOWN buttons to adjust to desired setpoint.
- Pump pressure set point: Ensure you see in the bottom right of the display screen.
 - Press DOWN until you see pump pressure set point.
 - Press ENTER button to navigate to numerical readout and adjust with UP and DOWN to set pump pressure. Please note that pressure setpoints are preset.

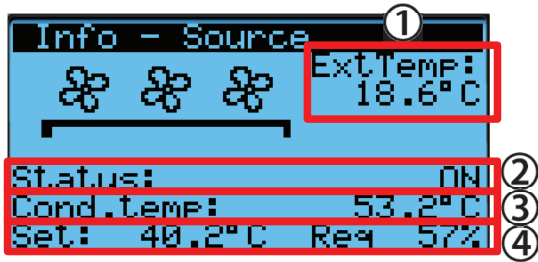
Info screens:

- Ensure you see in the bottom right portion of the display screen.
- Press ENTER to navigate to the first information screen.
- Use DOWN to scroll through the information screens.

Alarms:

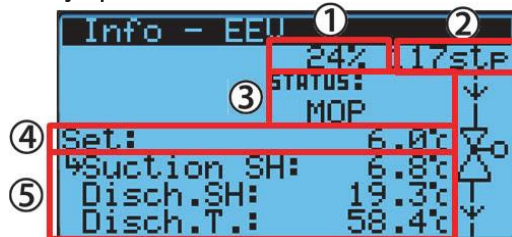
- Press ALARM.
- Navigate with UP and DOWN to see current alarms.
 - To clear the alarms, press UP or DOWN through alarm screen until you see a prompt saying “press Alarm button for 3 seconds.”
 - To check alarm history, cycle through all active alarms and press “enter to data logger.”

Condenser fan synoptic



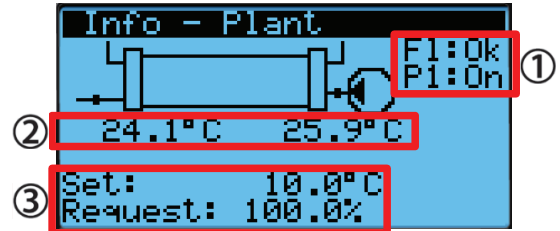
1. External temperature conditions (if any);
2. Ventilation status:
 - Off;
 - On
 - Speed Up
 - Forced by defrost
 - Forced by prevent
 - Anti frost
 - Freecooling
 - Manual
 - Defrost
3. Current condensing saturated temperature value;
4. Control set points and percentage request (the percentage is shown with modulating fans only)

ExV synoptic



- Valve opening percentage;
- Discharge superheat;
- Valve status:
 - **Init:** driver initialization.
 - **Close:** valve closed;
 - **Off:** valve in standby;
 - **Pos:** valve in positioning;
 - **Wait:** valve in activation;
 - **On:** valve in control;
 - **LoSH:** Low SH function running;
 - **LOP:** LOP function running;
 - **MOP:** LOP function running;
 - **HiTc:** HiTc function running;
- Valve steps;
- Regulation values:
 - Suction superheat
 - Discharge superheat;
 - Discharge temperature;
 the arrow indicates the reference value for the set point (i.e. what control is based on - suction SH, in the figure).

Plant synoptic



1. Pump and flow switch status
2. Input and output water temperature;
3. Control set points and unit percentage request

5.3.2 On-Off

The unit can be turned on and off from the user menu (using the parameter with code **Q000**) and the status can be displayed.

The On status requires the following consensus:

- digital input (if enabled)
- keyboard from the On-Off menu
- time bands (if enabled)
- BMS (if enabled)

Before switching from On to Off, OSSTDmCHBE goes through the transitory shutting down status where the controller shuts down the compressors following the shutdown procedure and then shuts down pumps and fans.

5.3.3 Set

In this menu the current set points in chiller mode (parameter code **Q001**) and heat pump mode (parameter code **Q002**) can be displayed and edited.

The user cannot set the set points outside of the minimum and maximum values set in the Plant menu. If the summer/winter change by keyboard is enabled, the unit operating mode (parameter code **Q003**) can also be changed in this menu.

Following a mode change, the unit will remain off with the pump on for a period of time (code **A024**) that can be set from the Plant menu to reduce working mode temperature difference in the evaporator and make the compressor restarting less problematic. Otherwise it will have a high thermal load.

5. USER INTERFACE

5.1 Terminal pGD1

The OSSTDmCHBE user interface is the pGD1 terminal in the wall versions, built-in or mounted directly in the pCO5+, thus "built-in".

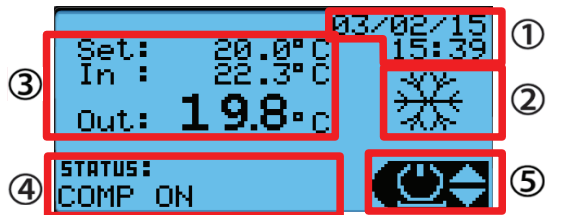


The terminal, which is shown in the figure above, has 6 buttons whose meanings are described below:

	- Alarm	Display the list of active alarms Manually reset alarms
	- Prg	Access the main menu
	- Esc	Return to the previous screen
	Up - Down	Navigate between the display screens or increase/decrease the value.
	- Enter	Switch from parameter display to edit Confirm value and return to the parameter list

5.2 Display

The following screen displays an example of the main screen on an active unit, highlighting the fields and icons used:

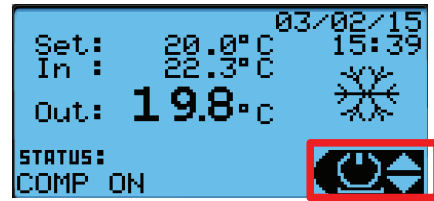


- Date and Time
- Current unit status:

	Summer mode (chiller)
	Winter mode (heat pump)
	Defrosting in progress (all circuits)
	Defrosting in progress (only one circuit)
	Full free cooling
	Partial free cooling
- Control probes, setpoint and reference probe
- Status of the unit:
 - STAND BY;
 - OFF BY ALARM;
 - OFF BY BMS;
 - OFF BY SCHED;
 - OFF BY DI;
 - OFF BY KEYBOARD;
 - OFF BY CHG-OVER;
 - FREECOOLING;
 - COMP ON;
 - DEFROST;
 - SHUTTING DOWN.
- Indicates access to the user menu using the UP, DOWN and ENTER keys to confirm

5.3 User Menu

On the main screen, the UP and DOWN buttons can be used to scroll through the functions and ENTER used to select them. No password is needed to access and edit these parameters.

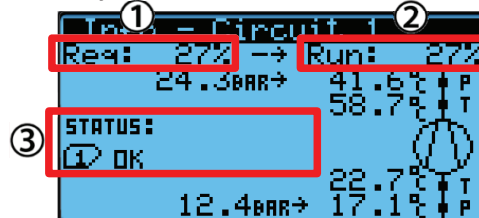


- Info
- On-Off
- Set

5.3.1 Synoptics

The general synoptics of the unit can be shown from the user menu. The physical status of the inputs, device outputs and probes are available in a menu connected to the synoptics. If an input or output is not enabled, its screen does not appear. The individual screens of the synoptics are shown below.

Circuit synoptic



- Circuit request for thermoregulation
- Status of the request processed
- Envelope zone:
 - 1 Ok: zone within operating limits
 - 2 HiDP: High compression ratio
 - 3 HiDscgP: High condensing pressure
 - 4 HiCurr: High motor current
 - 5 HiSuctP: High suction pressure
 - 6 LoPRat: Low compression ratio
 - 7 LoDP: Low differential pressure
 - 8 LoDscgP: Low condensing pressure
 - 9 LoSuctP: Low suction pressure

Compressor synoptic



- Current compressor speed (BLDC only)
- Status of compressor 1:
 - Off (...s): off, indicating, if necessary, the remaining time before restarting;
 - On (...s): on, indicating, if necessary, the remaining time before switching off;
 - Man On: on manually;
 - Man Off: off manually;
 - Frcd Off: forced off by EVD driver (not yet ready for control);
 - Defr: on for defrost cycle;
 - PmpD: pump-down in progress;
 - Alrm: off due to alarm.
- Status of compressor 2:

CONTROLS INTERFACE

MAIN SCREEN

The Main screen is the "dashboard" of the chiller. High level status information is presented so that a user can quickly understand the operating status of the chiller. Controller use and navigation is discussed in depth in the CONTROLLER AND NAVIGATION section.

The Main screen is the default screen.

Additional Screens are accessible through the navigation buttons below the screen.

The current fluid temperature is indicated in the middle of the main screen. Bottom left is the chiller status indicator.

SAFETIES

Safeties include: Flow Switch, Breaker, High Head Pressure, Oil Pressure, and an ECM (Electronic Control Module).

UNIT START-UP PROCEDURES

POWER UP

When power is applied to the chiller, the HMI will boot up to the main screen. The chiller will start if both the control power switch, and the chiller start/stop switch are in the on position. This insures automatic restart in the event of a power outage. As with the chiller, the process pump will only start if the output power switch, and the process pump start/stop switch are both in the on position.

CAUTION: EQUIPMENT DAMAGE!

Ensure that the oil sump heaters have been operating for a minimum of 24 hours before starting. Failure to do so may result in equipment damage. Check oil level before starting.

CAUTION: COMPRESSOR DAMAGE!

Catastrophic damage to the compressor will occur if the isolation valves are left closed on unit start-up.

START UP

Refer to the "9 Easy Steps" document for the most current chiller start-up procedures.

PRE-START CHECKOUT

When installation is complete, but prior to putting the unit into service, the following prestart procedures must be reviewed and verified correct:

CAUTION: COMPRESSOR DAMAGE!

Do not operate the unit with the compressor, oil discharge, liquid line service valves and the manual shutoff on the refrigerant supply to the condenser "CLOSED".

Failure to "OPEN" all valves prior to starting the compressor may cause serious damage.

- Check the power supply voltage to the unit at the main power distribution block. Voltage must be within the voltage utilization range stamped on the unit nameplate. Voltage imbalance must not exceed 2 percent.
- Check the unit power phasing to be sure that it has been installed in phase with the phase monitor.
- Fill the chiller reservoir with the proper solution of freeze inhibitor. Vent the system while it is being filled.

CAUTION: PROPER WATER TREATMENT!

The use of untreated or improperly treated water in the chiller may result in scaling, erosion, corrosion, algae or slime. It is recommended that the services of a qualified water treatment specialist be engaged to determine what water treatment, if any, is required. G&D assumes no responsibility for equipment failures which result from untreated or improperly treated water, or saline or brackish water.

- Close the fused-disconnect switch(es) that supplies power to the main distribution block.

START-UP: OPTIMIZING REFRIGERANT CONDITIONS

Please note: This chiller utilizes a PID formula to maintain the fluid temperature as close to the set point as possible. At times, the compressors may continue to run even if the fluid temperature is below the set point. This is normal.

Note: Once the system has been operating for approximately 30 minutes and has become stabilized, complete the remaining start-up procedures, as follows:

- Check and record the compressor refrigerant suction and discharge pressures.
- Check the liquid line sight glasses after sufficient time has elapsed to stabilize the chiller. The refrigerant flow past the sight glasses should be clear. Bubbles in the refrigerant indicate either low refrigerant charge or excessive pressure drop in the liquid line or a stuck open expansion valve or ice formation in the evaporator. A restriction in the line can sometimes be identified by a noticeable temperature differential between the two sides of the restriction. Frost will often form on the line at this point. Proper refrigerant charges are listed on the unit nameplate.

Note: Important! A clear sight glass alone does not mean that the system is properly charged. Also check system subcooling, and unit operating pressures.

- A shortage of refrigerant is indicated if operating pressures are low and subcooling is also low. If the operating pressures, sight glass, superheat and subcooling readings indicate a refrigerant shortage, gas-charge refrigerant into each circuit, as required. With the unit running, add refrigerant vapor by connecting the charging line to the suction accumulator and service port until operating conditions become normal. Slowly add refrigerant.

CAUTION: REFRIGERANT!

If both suction and discharge pressures are low but sub-cooling is normal, a problem other than refrigerant shortage exists. Do not add refrigerant, as this may result in overcharging the circuit.

Use only the refrigerant specified on the unit nameplate. Contact G&D for the recommended oil type or refer to the data plate on the compressor for your specific chiller. Failure to do so may cause compressor damage and improper unit operation.

WARNING: HAZARDOUS VOLTAGE!

Disconnect all electric power, including remote disconnects before servicing. Follow proper lock- out/tagout procedures to ensure the power cannot be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury.

FREEZE PROTECTION

The chiller system must be protected from freezing by use of a freeze inhibitor. The solution must be strong enough to provide protection against ice formation at the lowest anticipated ambient temperature, and at least 20° cooler than the lowest set point.

A minimum of 35% Propylene Glycol is required. Do not exceed 40%.

NOTICE: Equipment Damage!

In order to provide freeze protection in the event of a power loss you **MUST** use sufficient freeze inhibitor in the chiller.

NORMAL SHUTDOWN

1. Perform the normal unit stop sequence using the chiller pump down/run switch.
2. Verify that the chiller, and process pumps are cycled off.
3. Verify that the oil heaters are working.

Note: Do not open the external chiller disconnect switch. This must remain closed to provide control power from the control power transformer to the oil heaters.



9 Easy Steps to Start-up Your New G&D Chiller


Please view install videos online at www.gdchillers.com/installation-videos

Vertical Air Chillers

1. Chiller positioning: **Clearance on all 4 sides of the chiller needs to be equal to one full width of the condenser.** Electrical code may dictate greater clearance. There should be **no obstructions above the chiller.** Anchoring required. Refer to the figure CHILLER CLEARANCE REQUIREMENTS for more details.
2. Install Wye-strainer (required) one size larger than mainline and purge valve on return line at chiller.
3. With the door switches in the OFF position, ensure all breakers are in the ON position. **The chiller must then be supplied with power for at least 4 hours. Verify there is a visible oil level in compressor sight glasses before proceeding.**
4. Flush all piping lines:
 - a. Ensure chiller start/stop door switch remains in the OFF position.
 - b. Open supply valve, close return and open purge valve. Turn control power door switch ON, then process pump door switch ON and **verify correct pump rotation.** Proceed with flushing the system. Once all debris has been flushed from the system, remove as much water from system as possible.
5. Fill reservoir/ loop with 35% propylene glycol. Temporarily close the supply valve. **Confirm glycol pressure shows 20 PSI** using both the Carel controller and the manual pressure gauge located on the process pump discharge line (refer to #9 if a lower pump pressure is required).
6. Open the supply valve, and circulate glycol through the entire loop for at least 30 minutes. Re-verify glycol mixture using a refractometer. The glycol mixture **MUST** be 35 to 40 %. Correct as needed before proceeding. **Re-verify oil level in compressor sight glasses before proceeding. Do not proceed unless there is a visible oil level in the compressor sight glass.**
7. **Open all service valves/refrigerant ball valves in chiller marked with tags:** Suction/discharge of each compressor, and refrigerant ball valves at receiver. Models with remote condensers will have additional valves. Contact us for more details as needed: 800-555-0973.
8. Turn chiller start/stop door switch the RUN position. Compressors should start to run. Fans to follow shortly.
9. Adjusting set points on Carel controller: Press the up/down arrows until SET displays in bottom right corner. Press enter and change the temperature to desired set point. Pump pressure adjustment is also located here for the VFD. If decreasing the pressure is required for tank jacket rating, do so using the Carel controller at this time.

PLEASE VISIT GDCHILLERS.COM TO VIEW OUR INSTALLATION VIDEOS & FAQs

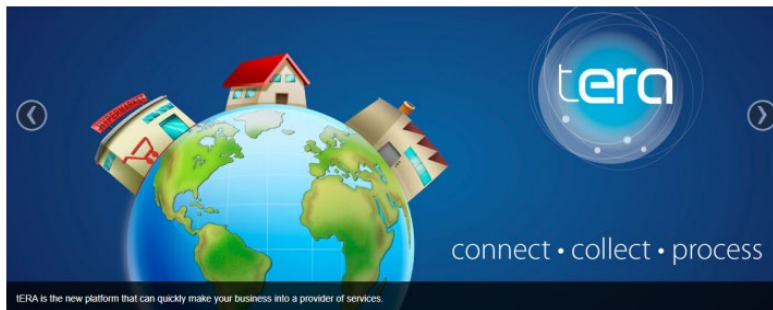
*G&D Chillers welcomes any and all questions or concerns. We can be reached at **800-555-0973** or **541-345-3903**

Jobsite:				Tech Company:
Chiller Model:				Technician:
Chiller Serial #:				Start-Up Date:
FOLLOWING START-UP OF CHILLER, PLEASE SEND A COPY OF COMPELTED FORM TO G&D TECH SUPPORT				
CLEARANCE AROUND CHILLER <small>(Include photos for warranty)</small>	FRONT:	BACK:	LEFT:	RIGHT:
CHILLER MOUNTING <small>(Anchor required)</small>				
GLYCOL/DYNALENE MIXTURE %				
GLYCOL/DYNALENE LEVEL (Reservoir % Full)				
PHASE/VOLTAGE				
VOLTAGE TO GROUND <small>(Note: High Leg to L2)</small>	L1:	L2:	L3:	
PUMP ROTATION				
GLYCOL PRESSURE				
	COMPRESSOR A	COMPRESSOR B	COMPRESSOR C	COMPRESSOR D
CRANK CASE HEATER ENGERGIZED 4 HOURS				
COMPRESSOR OIL LEVEL				
MOTOR AMPS:	L1:	L1:	L1:	L1:
	L2:	L2:	L2:	L2:
	L3:	L3:	L3:	L3:
SUPERHEAT (°F) @ 30°F FLUID TEMP				
SUBCOOLING (°F) @ 30°F FLUID TEMP				
SUCTION PRESSURE @ 30°F FLUID TEMP.				
DISCHARGE PRESSURE @ 30°F FLUID TEMP.				
	PUMP #1	PUMP #2	PUMP #3	PUMP #4
MOTOR AMPS:	L1:	L1:	L1:	L1:
	L2:	L2:	L2:	L2:
	L3:	L3:	L3:	L3:
	FAN MOTOR #1	FAN MOTOR #2	FAN MOTOR #3	FAN MOTOR #4
MOTOR AMPS:	L1:	L1:	L1:	L1:
	L2:	L2:	L2:	L2:
	L3:	L3:	L3:	L3:
	FAN MOTOR #5	FAN MOTOR #6	FAN MOTOR #7	FAN MOTOR #8
MOTOR AMPS:	L1:	L1:	L1:	L1:
	L2:	L2:	L2:	L2:
	L3:	L3:	L3:	L3:
AMBIENT TEMP @ STARTUP				

TERA SERVICE

We have chosen to partner with Carel, the largest refrigeration controls manufacturer. They are a robust, global partner that specializes in remote monitoring communications with the latest technology. Unlike other chiller manufacturers, we're committed to build chillers with no proprietary parts.

The Offsite Remote Monitoring system integrates with your chiller to monitor and remotely display chiller parameters for glycol supply and return temperatures, pressure and flow. It also sends SMS text alerts for any abnormal conditions. The web-based interface allows you to pull up the information on your phone from anywhere in the world, providing the peace of mind to keep operations running smoothly. For more information, please visit <https://gdchillers.com/products/remote-monitoring-communications/>



**REMOTELY MONITOR YOUR CHILLER'S PERFORMANCE.
ANYTIME. ANYWHERE.**



MODEL INFORMATION

UNIT DESCRIPTION

G&D large capacity chillers are reciprocating type, air-cooled, liquid chillers, designed for installation outdoors. This chiller utilizes independent condenser circuits, with one compressor per circuit. It includes complete refrigeration circuits, including on board controls, pumps, reservoir, evaporators and condensers, and all the necessary controls and safeties.

Note: Each large capacity chiller unit is a completely assembled, hermetic package that is factory- piped, wired, leak-tested, dehydrated, charged and tested for proper control operations prior to shipment. The chilled fluid inlet and outlet openings are covered for shipment.

The chiller features G&D's custom chiller controls, with tunable staging for accurate and efficient temperature control.

Each refrigerant circuit is provided with a removable core filter/drier, sight glass, electronic expansion valve, and charging valves.

The evaporator is a brazed plate or shell-and-tube heat exchanger. The condenser is an air-cooled horizontal fin and tube coil.

Accessory/Options Information

Check all the accessories and loose parts which are shipped with the unit against the original order. This may include glycol, spare parts, etc.

UNIT NAMEPLATE

OVERVIEW

This manual covers the installation, operation and maintenance of the Vertical Air series package chillers.



NAMEPLATES

The chiller nameplate is applied to the exterior surface of the control panel door.

A compressor nameplate is located on each compressor.

The chiller nameplate provides the following information:

- Unit model and size descriptor
- Unit serial number
- Identifies unit electrical requirements
- Lists correct operating charges of refrigerant
- Lists unit design pressures

Industrial Control Panel For Industrial Machinery			
Model		Serial #	
Voltage		Phase	Cycle
RLA		MCA	MOC
Compressor 1 HP		RLA	QTY
Compressor 2 HP		RLA	QTY
Pump 1 HP		PH	RLA
Pump 2 HP		PH	RLA
Pump 3 HP		PH	RLA
Condenser RLA		Charge R404A	
Test PSI Hi/Low		SCCR	Reservoir
Outdoor Use		Utilisation à l'extérieur	
			
		800.555.0973	www.GDChillers.com

COMPRESSOR NAMEPLATE

The compressor nameplate provides the following information:

- Unit model and size descriptor
- Unit serial number
- Identifies unit electrical

COMPRESSOR INFORMATION

OIL LEVEL

To check compressor oil level, refer to the label near the compressor sight glass. The compressor(s) must be off. Wait three minutes. Compressor oil level should be within the range indicated on the sticker; close to half full. When adding oil, always use a fresh can of POE 32 or POE 68 per the compressor data plate.

NOTICE: Never reuse oil or use oil from an unsealed container.

OIL TESTING

Use the oil test kit provided or recommended by the testing laboratory. Note that the POE oil used in this product is very hygroscopic and easily absorbs and retains moisture. The acceptable moisture content is less than 100 ppm and acceptable acid level is less than 0.5 TAN. Note that refrigerant and moisture is very difficult to remove from this oil using vacuum. Also note that once the seal on a container of POE oil is opened, the oil must be used. Any unused oil should be discarded.

In the event of a compressor failure, always test the oil with an acid test kit and determine whether the compressor failure was mechanical or electrical. This is important because it dictates correct cleanup procedure.

COMPRESSOR OPERATIONAL PUMP DOWN

The operational pump down is used to manage the refrigerant charge and prevent liquid slugging into the compressors, oil dilution and oil starvation. The pump down occurs during all normal shut-down conditions. The electronic expansion valve will close.

The operational pump down sequence will end when the suction pressure drops below the operational pump down set point.

ELECTRICAL COMPRESSOR FAILURE

Replace the failed compressor and add a suction filter with cleanup cores and change the liquid line filter drier. Change filters and oil until the oil no longer tests acidic. See "Oil Testing."

COMPRESSOR MOTOR MEGGING

Motor megging determines the electrical integrity of the compressor motor winding insulation. Use a 500-volt megger. A less than 1 meg-ohm reading is acceptable and 1000 ohms per nameplate volts is required to safely start the compressor.

COMPRESSOR CURRENT IMBALANCE

Normal current imbalance could be 4 to 15 percent with balanced voltage due to motor design. Each phase should register 0.3 to 1.0 ohms and each phase should be within 7 percent of the other two phases. Phase to ground resistance must be infinity.

NOTICE: Maximum allowable voltage imbalance is 2 percent.

REFRIGERANT PIPING

The compressor suction and discharge lines are copper. In most instances, piping may be reused. If piping is not reusable, order the correct service parts. Cut all tubing with a tubing cutter to prevent copper filings from entering the system. Cut the tubing in a straight length of pipe after the compressor connection has been un-sweated. The line can then be reinstalled using a slip coupling and brazing.

NOTICE: The compressor suction line configuration must not be changed in any way. Changing compressor suction line configuration will compromise proper oil return to the compressor(s).

COMPRESSOR ELECTRICAL TERMINAL BOX

Be sure to protect the terminal box and all wiring when un-brazing or brazing compressor refrigerant piping connections

COMPRESSOR REPLACEMENT

If the chiller suffers a failed compressor, use these steps for replacement:

Each compressor has lifting eyes. Use proper lifting techniques.

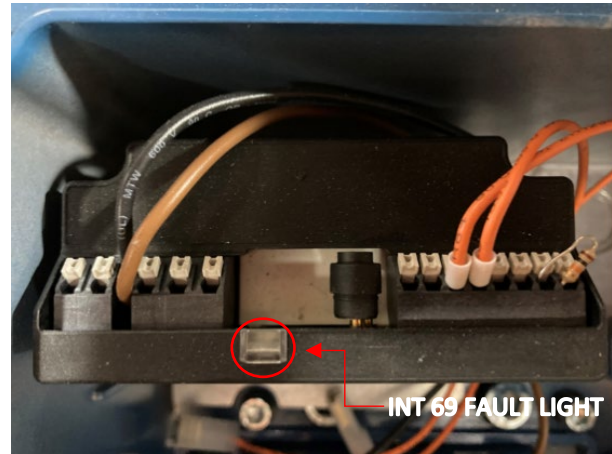
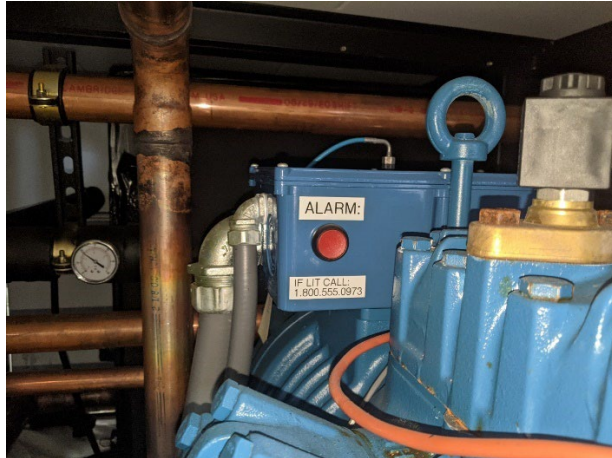
After a mechanical failure of a compressor, it is necessary to replace the liquid line filter drier. After an electrical failure of a compressor, it will also be necessary to replace the liquid line filter drier and add a suction filter drier with clean-up cores.

Note: Do not alter the refrigerant piping in any way as this can affect compressor lubrication.

Note: Do not add a filter drier within 16 inches of the elbow of any compressor 25hp or larger.

INT69 TML

All Frascold compressors used in G&D Chillers vertical air series of chillers feature a red alarm button (depicted below). If the light in this button is lit, do not press the alarm button. Please call G&D Chillers technical support for assistance with INT69 TML flash code sequence diagnosis (located in box on top of compressor).



VARIABLE FREQUENCY DRIVE

Note alarm description and call G&D Chillers technical support team.

To reset faults on a Siemens VFD:

1. From main screen, press the ESC button
2. Arrow to diagnostics and press OK
3. Arrow to ACKN ALL and press OK

To access the fault logger on a Siemens VFD:

1. From main screen, press the ESC button
2. Arrow to faults and press OK
 - a. To return to the main screen press ESC
 - b. Arrow to monitor and press OK

To reset faults on an ABB VFD:

1. From the main screen press the top left button indicating RESET

To access fault logger on an ABB VFD:

1. Press the menu button
2. Arrow to FAULT LOGGER
3. Press the top right button indicating ENTER

NOTICE: DO NOT CLEAR FAULTS WITHOUT DOCUMENTING FAULT DESCRIPTION AND CONTACTING G&D CHILLERS TECHNICAL SUPPORT

1st flashing sequence (red)	2nd flashing sequence (orange)	Description
1	1	Motor temperature: Static Switch-off, Permissible winding temperature exceeded
	2	Motor temperature: Dynamic switch-off, Temperature rise in the motor winding unusually fast
	3	Motor temperature: Reset delay after static switch-off
	4	Motor temperature: sensor input detected open circuit or short circuit
	5	Motor temperature: Reset delay after dynamic switch-off
3	5	General: Reset delay after "General" error
4	1	Oil: Differential pressure too low
	3	Oil: Reset delay after "Oil" error
	4	Oil: Sensor incorrectly connected
	5	Oil: Sensor input detected open circuit or short circuit
5	1	Permissible discharge gas temperature exceeded
	2	Reset delay after discharge gas error
	3	Discharge gas sensor input detected open circuit or short circuit

REFRIGERANT CYCLE DESCRIPTION

The chiller refrigeration cycle is described below. Refrigerant evaporation occurs in the brazed plate evaporator. Metered refrigerant vaporizes as it cools the chilled liquid flowing through the evaporator passages. The refrigerant vapor leaves the evaporator as superheated gas. Refrigerant vapor generated in the evaporator flows to the compressor suction manifold where it enters and flows across the compressor motor windings to provide cooling. The vapor is then compressed by the compressor pistons and discharged. Oil from the compressor sump lubricates the bearings and seals the small clearances between the piston rings and cylinder walls. Refrigerant vapor is discharged to the air-cooled condenser as a hot vapor. After the refrigerant vapor condenses into liquid, it is returned to the evaporator where the refrigerant again flashes into vapor and the refrigeration cycle repeats.

REFRIGERANT SYSTEM OPEN TIME

G&D chillers use POE oil and therefore refrigerant system open time must be kept to a minimum. The following procedure is recommended:

Leave a new compressor sealed until it is ready to be installed in the unit. Maximum system open time is dependent upon ambient conditions, but do not exceed one-hour open time.

Plug the open refrigerant line to minimize moisture absorption.

Always change the liquid line filter drier. Evacuate the system to 500 microns or below. **Remove pressure transducer and cap service ports prior to evacuating system. Transducers will be damaged if placed in vacuum.**

Do not leave POE oil containers open to the atmosphere. Always keep them sealed.

MECHANICAL COMPRESSOR FAILURE

Replace the failed compressor(s) and change the refrigerant system liquid line filter drier.

POWER SUPPLY WIRING

WARNING: GROUND WIRE!

All field-installed wiring must be completed by qualified personnel. All field-installed wiring must comply with NEC and applicable local codes. Failure to follow this instruction could result in death or serious injuries.

All power supply wiring must be sized and selected accordingly by the project engineer in accordance with NEC Table 310-16.

All wiring must comply with local codes and the National Electrical Code. The installing (or electrical) contractor must provide and install the system interconnecting wiring, as well as the power supply wiring. It must be properly sized and equipped with the appropriate fused disconnect switches.

The type and installation location(s) of the fused disconnects must comply with all applicable codes.

CAUTION: USE COPPER CONDUCTORS ONLY!

Unit terminals are not designed to accept other types of conductors. Failure to use copper conductors may result in equipment damage.

WARNING: HAZARDOUS VOLTAGE!

Disconnect all electric power, including remote disconnects before servicing. Follow proper lock- out/tagout procedures to ensure the power cannot be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury.

WARNING: LIVE ELECTRICAL COMPONENTS!

During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

Voltage to the unit must meet the criteria given in. Measure each leg of the supply voltage at the unit's main power fused-disconnect. If the measured voltage on any leg is not within specified range, notify the supplier of the power and correct the situation before operating the unit.

CAUTION: EQUIPMENT DAMAGE!

Inadequate voltage to the unit may cause control components to malfunction and shorten the life of relay contact, compressor motors and contactors.

UNIT VOLTAGE IMBALANCE

Excessive voltage imbalance between the phases of a three-phase system can cause motors to overheat and eventually fail. The maximum allowable imbalance is 2 percent.

UNIT VOLTAGE PHASING

It is important that proper rotation of the pumps be established before the unit is started. Proper motor rotation requires confirmation of the electrical phase sequence of the power supply. The motor is internally connected for clockwise rotation with the incoming power supply phased A, B, C.

Verify proper rotation at the voltage and phase monitor. Improper phasing is indicated by a "Front phase reversal" alarm on the phase monitor.

Basically, voltages generated in each phase of a polyphase alternator or circuit are called phase voltages. In a three-phase circuit, three sine wave voltages are generated, differing in phase by 120 electrical degrees. The order in which the three voltages of a three-phase system succeed one another is called phase sequence or phase rotation. This is determined by the direction of rotation of the alternator. When rotation is clockwise, phase sequence is usually called "ABC", when counterclockwise, "CBA". This direction may be reversed outside the alternator by interchanging any two of the line wires. Proper compressor motor electrical phasing can be quickly determined and corrected before starting the unit.

CAUTION: EQUIPMENT DAMAGE!

Do not interchange any load leads that are from the unit contactors or the motor terminals.

MAINTENANCE

GENERAL

Perform all maintenance procedures and inspection at the recommended intervals. This will prolong the life of the chiller and minimize the possibility of malfunctions.

Use an "Operator's Log" to record the unit's operating history. The log serves as a valuable diagnostic tool for service personnel. By observing trends in operating conditions, an operator can anticipate and prevent problem situations before they occur. If the unit is not operating properly during maintenance inspections, consult the "Diagnostic and Troubleshooting" section of this manual.

WEEKLY/MONTHLY MAINTENANCE

Please contact G&D Technical Support if you have any questions or concerns regarding the performance, operation, or maintenance of your chiller: **800-555-0973**

- Refer to the separate G&D Chillers Preventive Maintenance Checklist for a complete list of maintenance tasks.
- Contract a licensed refrigeration technician to evaluate the chiller refrigeration circuit(s) regularly. These checkups should occur annually at a minimum. Every 3-6 months is recommended.

The following tasks can be performed without the need for specialized equipment or training:

- Check glycol level and glycol/water ratio monthly. Use glycol refractometer to confirm 35% glycol mixture.
- Check compressor oil in sight glass at bottom of compressor monthly. Inspect for any oil leaks.
- Verify pump function quarterly. Confirm glycol supply pressure. Listen for abnormal sounds from the pump.
- Verify thermostat function quarterly. Check displayed temperature against a thermometer measurement.
- Condenser should be cleaned at least every 6 months for proper operation and efficiency. Use a garden hose and spray at an angle. If using harsh water, condenser cleaner will be needed.
- See warning below. With the service disconnect in the OFF position (no power to the chiller), inspect control panel contacts on compressor and pump contactors. Contact an electrician if replacements are needed.

WARNING: Position all electrical disconnects in the "OPEN" position and lock them to prevent injury or death due to electrical shock or moving parts.

ANNUAL MAINTENANCE

Complete all weekly and monthly maintenance checks.

Check the oil level and refrigerant charge. Routine changing of oil is not required.

Have a qualified laboratory perform a compressor oil analysis to determine system moisture content and acid level. This analysis is a valuable diagnostic tool. Contact a qualified service provider to leak test the chiller, check operating and safety controls, and to inspect electrical components for proper operation. Leak testing may be accomplished using soap solution or with electronic or ultrasonic leak detectors.

Inspect all piping components for leaks and damage.

Clean all fluid strainers. Clean and repaint any components that show corrosion.

Clean the condenser coils. Refer to "Coil Cleaning" in this manual. Please refer to preventative maintenance (next page) for items to verify the chiller is in perfect working order. Note that the fields highlighted in yellow are things the owner/operator can perform. All other fields should be filled out by a licensed technician. Feel free to send the completed form to info@gdchillers.com for review to ensure your chiller is to factory spec.

WARNING: Position all electrical disconnects in the "OPEN" position and lock them to prevent injury or death due to electrical shock or moving parts.

Clean the condenser fans. Check the fan assemblies for proper clearance in the fan shroud openings and for motor shaft misalignment or abnormal end-play, vibration and noise.

CONDENSER MAINTENANCE

Clean the condenser coils at least once a year or more frequently if the unit is in a "dirty" environment. A clean condenser coil will help to maintain chiller operating efficiency.

Follow the detergent manufacturer's instructions to avoid damaging the condenser coils.

To clean the condenser coils, use a soft brush and a sprayer such as a garden pump type or a high- pressure type. A high-quality detergent is recommended.

Note: If detergent mixture is strongly alkaline (pH value greater than 8.5, an inhibitor must be added).

EVAPORATOR MAINTENANCE

G&D liquid chillers use brazed plate heat exchanger (BPHX) evaporators with factory-installed electronic flow switch that is positioned in the evaporator fluid outlet pipe.

Note: Strainer maintenance is critical to proper operation and reliability. Any particles larger than 1mm entering the BPHX evaporator may cause the evaporator to fail, requiring replacement.

The BPHX evaporator is difficult to clean should it become plugged with debris.

Indications of a plugged evaporator include "wet" suction due to lack of heat exchange, loss of superheat control, depressed discharge superheat (superheat less than 63°F), compressor oil dilution and/or starvation and premature compressor failure.

EVAPORATOR REPLACEMENT

If the evaporator requires replacement, it is very important that the new evaporator be replaced correctly and with the correct refrigerant and fluid piping connections. The refrigerant inlet/liquid connection is at the bottom of the evaporator and the refrigerant outlet/suction connection is at the top of the evaporator and both are on the same side. Avoid cross-circuiting when installing the new evaporator.

WATER STRAINER MAINTENANCE

The field-installed strainer should be equipped with a blowdown valve. The strainer shall be 20 mesh or higher. For maximum efficiency, a differential pressure gauge installed across the inlet and outlet will indicate pressure loss due to clogging and may be used as a guide to determine when cleaning is required. Normally when differential pressure reaches 5-10psi, the screen must be cleaned. To clean open the blowdown valve, and flush out until evacuation is complete.

NOTICE: 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.

G&D advocates the responsible handling of all refrigerants-including industry replacements for CFCs such as HCFCs and HFCs.

NOTICE: RESPONSIBLE REFRIGERANT PRACTICES!

G&D 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. 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: REFRIGERANT WARNING INFORMATION!

G&D Large Capacity Chillers use R404A or R448A refrigerant.

Use only manifold gauge sets designed for use with R404A or R448A refrigerant. Use only refrigerant recovery units and cylinders designed for use with R404A or R448A refrigerant and POE oil.

R404A / R448A must only be charged into the unit in a liquid state!

R404A and R448A refrigerant must be stored in a clean, dry area out of sunlight. Never heat or allow refrigerant storage cylinder temperatures to reach 125°F or store the cylinders where temperatures will exceed 125°F. Keep cylinder valves tightly closed and valve caps in place when refrigerant cylinders are not in use.

WARNING: PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIRED!

Always refer to appropriate MSDS and OSHA guidelines when handling refrigerants. Use proper breathing, eye and body protection when handling refrigerants. Failure to follow proper handling guidelines could result in serious injury or death.

WARNING: LIVE ELECTRICAL COMPONENTS!

During installation, testing, servicing and troubleshooting of this product it may be necessary to work with live electrical components. Have a qualified, licensed electrician or other person who has been properly trained in working with live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in serious injury or death.

NOTICE: TRADEMARKS!

G&D and the G&D logo are trademarks of G&D in the United States and other countries. All trademarks referenced in this document are the trademarks of their respective owners.

QUARTERLY PREVENTIVE MAINTENANCE

Date: _____	Company: _____
Tech: _____	Contact Name: _____
Phone: _____	Address: _____ _____
Email: _____	

MAINTENANCE CHECKLIST (PERFORM EVERY 3 MONTHS)							
	A	B	C	D	E	F	G

	A	B	C	D	E	F	G
Glycol Pressure							
Glycol Level							
Glycol Mixture							
Fan Function							
Fan Amps							
Pump Function							
Pump Amps							
Pump Rotation							
Compressor Function							
Compressor Amps							
Condenser Integrity							
Condenser Cleanliness							
Fan Switch Setting							
Hi/Lo Cut Out Setting							
Flow Switch Function							

Highlighted items can be checked without the need for specialized equipment or training; contact the manufacturer for advice specific to your chiller model. Do not attempt to service electrical components or make adjustments in electrical panel without proper training and implementation of lockout/tag-out safety procedures.

QUARTERLY PREVENTIVE MAINTENANCE

CHECKLIST	A	B	C	D	E	F	G
T-Stat Function							
Time Delay Function							
Alt-Relay/Sequencer Function							
Oil Level							
Refrigerant Charge							
Grease Motors							
Contactors Function							
Breaker Function							
SuperHeat							
SubCooling							
Inspect All Terminations (Tightness/Burns)							
Check TXV Bulbs							
Insulation Integrity							
Cosmetic Integrity: Skin,Screws,Knobs							
Check All Capacitors							
Cap Tube Silicone/Wire Zip Tie							

Highlighted items can be checked without the need for specialized equipment or training; contact the manufacturer for advice specific to your chiller model. Do not attempt to service electrical components or make adjustments in electrical panel without proper training and implementation of lockout/tag-out safety procedures.

TROUBLESHOOTING

	COMPLAINT	SYMPTOMS	CAUSE	SOLUTION
1	System short of capacity	Lower than expected suction and discharge pressures	Low refrigerant charge	Check for leaks, repair, and recharge. See item 5
		Higher than expected head pressure	Dirty condenser	Clean. See item 2
		Lower than normal suction pressure	Incorrect superheat - too high	Adjust superheat
2	Head pressure too high	Tripping high pressure switch, or compressor trips on internal overload	Dirty condenser	Clean condenser
			Condenser air short circuiting or location too hot	Remove obstructions, causes for air short circuiting
			Defective condenser fan motor or blade	Replace
			Air or non-condensable gases in the system	Purge the system
			Refrigerant over charge	Remove excess refrigerant
3	Head pressure too low	Sight glass with bubbles	Refrigerant leak or system undercharged	Check for leaks, repair and recharge
			Plugged filter drier	Replace filter drier
			Insufficient subcooling	Check condenser subcooling circuit
4	Suction pressure too high	Glycol temperature will not reach set point	Excessive load on the system	Check load and improve conditions
		Incorrect superheat	TEV stuck open due to ice or defect	Check, repair, or replace TEV
			Incorrect superheat setting of the expansion valve	Adjust superheat
5	Suction pressure too low	Sight glass with bubbles	See item 3	See item 3
		Warm suction line, signs of frost on the TEV and low system capacity	Plugged TEV or strainer	Clean TEV and strainer
		Compressor cycling due to low pressure cutout	See item 12	See item 12
6	Noisy compressor	Oil level below midpoint of the compressor sight glass during operation	Lack of oil	Avoid compressor short cycling or run compressor enough to return oil to crankcase, correct low load conditions. Add oil.
		Noticeable knock in compressor	Worn or scored bearings	Replace the compressor
		Frosted suction line and compressor shell	Liquid flood back	Check superheat and TEV operation

TROUBLESHOOTING

	COMPLAINT	SYMPTOMS	CAUSE	SOLUTION
7	Compressor does not pump	Minimal difference in pressure between high side and low side of system, when compressor motor has power	Broken suction valves	Change compressor
			Broken discharge line	Change compressor
			Internal pressure safety valve stuck open	Check item 13 and change compressor if necessary
8	Compressor will not start	Blown fuse or open disconnect	Short circuit or other electrical failure	Check electrical circuit and wiring
		Tripped or damaged overload	Overheating or overcurrent	Wait 2-3 hours for overload to reset and check refrigerant charge or power quality to the compressor
		Open pressure switch	Loss of refrigerant charge	Check for leaks, repair and recharge
		Loose wires	Vibration, bad crimping or under-torque	Check terminals at compressor, contactor and wiring in general
		Motor seized	Low oil level or phase reversal	Check oil level. Restart 3-ph compressor by switching 2 phases; replace if it does not restart
9	Compressor starts but start relay does not drop out	High running current, overload trips	Incorrect wiring of start components	Check wiring
			Incorrect or defective start relay	Confirm operation, model and make
			Incorrect or defective start capacitor	Confirm integrity and specs, check if fitted with discharge resistance
			Incorrect or defective run capacitor	Confirm integrity and specs
			Low voltage	Fix undervoltage protection
10	Compressor runs but cuts out on overload	Internal overload tripping MUST WAIT 2-3 HOURS TO CHECK IF IT WILL RESET	Excessive head pressure due to dirty condenser or lack of condenser air or water flow	See item 2 above
			Low voltage or unbalanced	Fix undervoltage protection
			Faulty electrical connections causing single phasing or high current surges	Remake the connections
			Sticking start relay on single phase machines leaving start cap on circuit	Replace relay and ensure start cap is fitted with a discharge resistance

TROUBLESHOOTING

	COMPLAINT	SYMPTOMS	CAUSE	SOLUTION
11	Compressor starts but cycles on overload	Internal overload tripping MUST WAIT 2-3 HOURS TO CHECK IF IT WILL RESET	Loss of charge causing insufficient motor cooling	Check for leaks, repair, and recharge
			Voltage is low or unbalanced if 3-ph	1-ph fix undervoltage protection, 3-ph correct phase imbalance
			Defective or wrong run cap	Check and replace
			Defective overload	Check current and replace compressor if necessary
12	Compressor runs but cycles on...	...overload	See items 10 and 11	See items 10 and 11
		...thermostat	Thermostat differential set too close	Check and widen differential
		...high pressure switch	See item 2	See item 2
		---low pressure switch	See items 3 and 5	See items 3 and 5
		Leaking liquid line solenoid valve (LLSV)	Replace LLSV	
		Leaking compressor valves	Replace compressor	
		Undercharged system	Check for leaks and recharge	
13	Internal pressure safety valve (IPRV) opens	Refrigerant trapped in compressor	Discharge service valve closed	Open discharge service valve
		Discharge pressure exceeds high pressure setting	High pressure switch malfunction	Reset or replace high pressure switch, see item 2
14	Will not start, trips on overload	Start relay damaged or burned out	Too low or too high line voltage	Correct and replace relay
			Incorrect wiring	Replace relay and rewire per compressor wiring diagram
			Excessive cycling	See item 11
15	Start Capacitor damaged or burned out	Single phase compressor will not start	Incorrect relay	Check w/ manufacturer and replace
			Too high or too low line voltage	Correct and replace
			Excessive short cycling	See item 11
			Incorrect wiring	Replace and rewire per compressor manufacturer wiring diagram
			Wrong start or run capacitor	Correct and replace

CAREL ALARMS

CODE	DESCRIPTION	RESET	ACTION	DELAY
AL004	Unit – User inlet water temperature probe	A	Switch the unit off	10s
AL005	Unit – User outlet water temperature probe	A	Switch the unit off	10s
AL008	Unit – User pump 1 overload	M	None	No
AL009	Unit – User pump 2 overload	M	None	No
AL018	Unit – User 1 pump maintenance	A	None	Parameter A00
AL019	Unit – User 2 pump maintenance	A	None	Parameter A02
AL022	Unit – High chilled water temperature	A	None	Parameter A021/A022
AL100	Circuit 1 – Alarm discharge probe pressure	A	Stop circuit 1	10s
AL101	Circuit 1 – Alarm suction probe pressure	A	Stop circuit 1	10s
AL102	Circuit 1 – Alarm discharge probe temperature	A	Stop circuit 1	10s
AL103	Circuit 1 – Alarm suction probe temperature	A	Stop circuit 1	10s
AL105	Circuit 1 Envelope – High compression ratio	A	Stop circuit 1	Parameter Cb17
AL106	Circuit 1 Envelope – High discharge pressure	M	Stop circuit 1	Parameter Cb17
AL108	Circuit 1 Envelope – High suction pressure	A	Stop circuit 1	Parameter Cb17
AL109	Circuit 1 Envelope – Low compression ratio	A	Stop circuit 1	Parameter Cb17
AL110	Circuit 1 Envelope – Low differential pressure	A	Stop circuit 1	Parameter Cb18
AL111	Circuit 1 Envelope – Low discharge pressure	A	Stop circuit 1	Parameter Cb17
AL112	Circuit 1 Envelope – Low suction pressure	A	Stop circuit 1	Parameter Cb17
AL113	Circuit 1 Envelope – High discharge temperature	A	Stop circuit 1	Parameter Cb17
AL123	Circuit 1 EVD – Offline	A	Stop circuit 1	No
AL165	Circuit 1 – Alarm freeze evaporation temperature	M	Stop circuit 1	Parameter A041
AL166	Circuit 1 – Compressor 1 maintenance	A	None	Parameter Ca00
AL167	Circuit 1 – Compressor 2 maintenance	A	None	Parameter Ca02
AL173	Circuit 1 – High pressure alarm by pressure switch	M	Stop circuit 1	No
AL174	Circuit 1 – Low pressure alarm by pressure switch	R	Stop circuit 1	Parameter Ca19/Ca20
AL175	Circuit 1 – Overload compressor 1	M	Stop compr.1 Circ.1	No

AL176	Circuit 1 – Overload compressor 2	M	Stop compr.2 Circ.1	No
AL178	Circuit 1 – Pump-Down end for maximum time	A	Stop circuit 1	Parameter B035
AL200	Circuit 2 – Alarm discharge probe pressure	A	Stop circuit 2	10s
AL201	Circuit 2 – Alarm suction probe pressure	A	Stop circuit 2	10s
AL202	Circuit 2 – Alarm discharge probe temperature	A	Stop circuit 2	10s
AL203	Circuit 2 – Alarm suction probe temperature	A	Stop circuit 2	10s
AL205	Circuit 2 Envelope – High compression ratio	A	Stop circuit 2	Parameter Cb17
AL206	Circuit 2 Envelope – High discharge pressure	M	Stop circuit 2	Parameter Cb17
AL208	Circuit 2 Envelope – High suction pressure	A	Stop circuit 2	Parameter Cb17
AL209	Circuit 2 Envelope – Low compression ratio	A	Stop circuit 2	Parameter Cb17
AL210	Circuit 2 Envelope – Low differential pressure	A	Stop circuit 2	Parameter Cb18
AL211	Circuit 2 Envelope – Low discharge pressure	A	Stop circuit 2	Parameter Cb17
AL212	Circuit 2 Envelope – Low suction pressure	A	Stop circuit 2	Parameter Cb17
AL213	Circuit 2 Envelope – High discharge temperature	A	Stop circuit 2	Parameter Cb17
AL223	Circuit 2 EVD – Offline	A	Stop circuit 2	No
AL265	Circuit 2 – Alarm freeze evaporation temperature	M	Stop circuit 2	Parameter A041
AL266	Circuit 2 – Compressor 1 maintenance	A	None	Parameter Ca00
AL267	Circuit 2 – Compressor 2 maintenance	A	None	Parameter Ca02
AL273	Circuit 2 – High pressure alarm by pressure switch	M	Stop circuit 2	No
AL274	Circuit 2 – Low pressure alarm by pressure switch	R	Stop circuit 2	Parameter Ca19/Ca20
AL275	Circuit 2 – Overload compressor 1	M	Stop compr.1 Circ.2	No
AL276	Circuit 2 – Overload compressor 2	M	Stop compr.2 Circ.2	No
AL278	Circuit 2 – Pump-Down end for maximum time	A	Stop circuit 2	Parameter B035

Reset:

A: automatic reset

M: manual reset

R: Automatic reset with retries

PROPYLENE GLYCOL CHART

Percent by volume	Percent by weight	Freezing point °F	Degrees Brix °Bx
32.4	33.0	5.3	24.4
32.8	33.4	4.8	24.8
33.1	33.7	4.4	25.0
33.5	34.0	3.9	25.3
34.0	34.6	3.1	25.8
34.4	35.0	2.4	26.1
35.0	35.6	1.5	26.5
35.5	36.0	0.8	26.9
36.5	37.0	-0.8	27.5
37.5	38.0	-2.4	28.0
38.2	38.7	-3.7	28.4
38.5	39.0	-4.2	28.5

For most applications, G&D Chillers recommends no less than and no more than 35% propylene mixture.

The volume percentages in this table apply for pure propylene glycol; however, inhibited propylene glycol solutions will require higher volume percentages. For example, a solution of 36.6%vol DOWFROST contains 35%vol pure propylene glycol. Use the refractometer included with the chiller to verify proper glycol concentration.

****TO ACTIVATE WARRANTY, FILL OUT STARTUP CHECKLIST AND RETURN WITHIN 30 DAYS****

WARRANTY STATEMENT

TWO-YEAR LIMITED WARRANTY ON PARTS, ONE-YEAR LIMITED WARRANTY ON LABOR

G&D CHILLERS, INC. provides a limited warranty to the original purchaser of new products against defects in materials and workmanship for a period of one (1) year of normal commercial usage. For the subsequent period of one (1) year of normal commercial usage immediately following the first, this warranty is extended to cover parts only. This warranty is not transferable. If a product covered by this warranty is determined to be defective within the applicable warranty periods, G&D CHILLERS, INC. will, unless otherwise required by applicable law, either repair or exchange the product at its sole option and discretion.

EXCHANGE

Should G&D CHILLERS, INC. elect to exchange a product due to a covered defect during the warranty period, the replacement unit may, at G&D CHILLERS, INC.'s sole option and discretion, be new or one which has been recertified, reconditioned, refurbished or otherwise remanufactured from new or used parts and is functionally equivalent to the original product.

REPAIR: PARTS AND LABOR

There will be no charge for parts or labor to repair a product for a covered defect during the applicable warranty periods. Replacement parts may, at G&D CHILLERS, INC.'s sole option and discretion, be new, used, reconditioned, refurbished or otherwise remanufactured or recertified as functionally equivalent replacement parts.

REMAINING WARRANTY

Repaired or exchanged products are warranted for the remaining portion of the product's original warranty or for ninety (90) days from warranty service or exchange, whichever is longer. Any upgrade to the original product will be covered only for the duration of the original warranty period.

EXCLUSIONS

This warranty does not cover, for example: abuse, accident, acts of God, consumable parts such as batteries, cosmetic damage (e.g. scratches, dents, cracks), damage caused by use with non-G&D CHILLERS, INC. products (e.g. accessories, housing, parts, etc.), damages from shipping, improper installation or operation, improper voltage supply or power surges, lack of reasonable use, misuse, modifications or alterations, normal wear and tear or aging, as well as installation and set-up issues or any tampering or repairs attempted by anyone other than by a G&D CHILLERS, INC. authorized repair technician. This limited warranty does not cover products sold "AS IS", "FACTORY RECERTIFIED", or by a non-authorized reseller.

ASSIGNMENT OF WARRANTIES

G&D CHILLERS, INC. assigns to product purchasers any and all warranties of manufacturers and suppliers of component parts that are assignable, but G&D CHILLERS, INC. makes no representations as to the effectiveness or extent of such warranties and assumes no liability or responsibility for any third-party manufacturer or supplier's products or component parts that are sold by G&D CHILLERS, INC.

DISCLAIMER OF WARRANTY

THERE ARE NO EXPRESS WARRANTIES OTHER THAN THOSE LISTED OR DESCRIBED ABOVE. EXCEPT AS SPECIFIED IN THIS WARRANTY SECTION, ALL EXPRESS OR IMPLIED CONDITIONS, REPRESENTATIONS, AND WARRANTIES INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR ARISING FROM A COURSE OF DEALING, LAW, USAGE, OR TRADE PRACTICE, ARE HEREBY EXCLUDED TO THE EXTENT ALLOWED BY APPLICABLE LAW AND ARE EXPRESSLY DISCLAIMED BY G&D CHILLERS, INC.

TO THE EXTENT THAT ANY OF THE SAME CANNOT BE EXCLUDED, SUCH IMPLIED CONDITION, REPRESENTATION AND/OR WARRANTY IS LIMITED IN DURATION TO THE EXPRESS WARRANTY PERIOD REFERRED TO IN THE "LIMITED WARRANTY" SECTION ABOVE. BECAUSE SOME STATES OR JURISDICTIONS DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, THE ABOVE LIMITATION MAY NOT APPLY IN SUCH STATES. THIS WARRANTY GIVES THE CUSTOMER SPECIFIC LEGAL RIGHTS, AND THE CUSTOMER MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM JURISDICTION TO JURISDICTION.

DISCLAIMER OF LIABILITY

G&D CHILLERS, INC.'S TOTAL LIABILITY FOR ANY AND ALL LOSSES AND DAMAGES RESULTING FROM ANY CAUSE WHATSOEVER INCLUDING G&D CHILLERS, INC.'S NEGLIGENCE, ALLEGED DAMAGE, OR DEFECTIVE GOODS, WHETHER SUCH DEFECTS ARE DISCOVERABLE OR LATENT, SHALL IN NO EVENT EXCEED THE PURCHASE PRICE OF THE PRODUCT. G&D CHILLERS, INC. SHALL NOT BE RESPONSIBLE FOR LOSS OF USE, WORK STOPPAGE, FAILURE OF OTHER EQUIPMENT TO WHICH THE PRODUCT IS CONNECTED, COMMERCIAL LOSS, LOST REVENUE OR LOST PROFITS, LOSS OF GOODWILL, LOSS OF REPUTATION, OR OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES. NO ORAL OR WRITTEN REPRESENTATIONS MADE BY G&D CHILLERS, INC. SHALL CREATE ANY ADDITIONAL WARRANTY OBLIGATIONS, INCREASE THE SCOPE, OR OTHERWISE MODIFY IN ANY MANNER THE TERMS OF THIS LIMITED WARRANTY. TO THE EXTENT PERMITTED BY APPLICABLE LAW, G&D CHILLERS, INC. DOES NOT WARRANT THAT THE OPERATION OF ANY PRODUCTS COVERED UNDER THIS LIMITED WARRANTY WILL MEET YOUR REQUIREMENTS, OR THIRD PARTY SERVICES, BE UNINTERRUPTED, ERROR-FREE, OR THAT DEFECTS IN THE PRODUCTS WILL BE CORRECTED. SOME STATES DO NOT ALLOW THE EXCLUSION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATIONS OR EXCLUSIONS MAY NOT APPLY TO YOU. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS, WHICH VARY FROM STATE TO STATE. THIS LIMITED WARRANTY IS SUBJECT TO CHANGE WITHOUT NOTICE. CHECK www.gdchillers.com FOR THE MOST CURRENT VERSION OF THIS WARRANTY.

SEVERABILITY

In the event that any term or provision contained in this limited warranty is found to be invalid, illegal or unenforceable by a court of competent jurisdiction, then such provision shall be deemed modified to the extent necessary to make such provision enforceable by such court, taking into account the intent of the parties. The invalidity in whole or in part of any portion of this limited warranty shall not impair or affect the validity or enforceability of the remaining provisions of this limited warranty.

HOW TO OBTAIN WARRANTY SERVICE (PRE-AUTHORIZATION REQUIRED)

To obtain warranty service, contact G&D CHILLERS, INC.:

1. Email: info@gdchillers.com
2. Phone: (800) 555-0973 from 9:00AM to 5:00PM Monday through Friday Pacific Time.
3. By mail: G&D Chillers, Inc.
760 Bailey Hill Rd
Eugene, OR 97402



G&D Chillers welcomes any and all questions or concerns
We can be reached at 800-555-0973 or 541-345-3903