Preventive Maintenance

Water Coil Maintenance - (Direct ground water applications only) If the system is installed in an area with a known high mineral content (125 P.P.M. or greater) in the water, it is best to establish a periodic maintenance schedule with the owner so the coil can be checked regularly. Consult the well water applications section of this manual for a more detailed water coil material selection. Should periodic coil cleaning be necessary, use standard coil cleaning procedures, which are compatible with the heat exchanger material and copper water lines. Generally, the more water flowing through the unit, the less chance for scaling. Therefore, 1.5 gpm per ton [1.6 l/m per kW] is recommended as a minimum flow. Minimum flow rate for entering water temperatures below 50°F [10°C] is 2.0 gpm per ton [2.2 l/m per kW].

Water Coil Maintenance - (All other water loop applications) Generally water coil maintenance is not needed for closed loop systems. However, if the piping is known to have high dirt or debris content, it is best to establish a periodic maintenance schedule with the owner so the water coil can be checked regularly. Dirty installations are typically the result of deterioration of iron or galvanized piping or components in the system. Open cooling towers requiring heavy chemical treatment and mineral buildup through water use can also contribute to higher maintenance. Should periodic coil cleaning be necessary, use standard coil cleaning procedures, which are compatible with both the heat exchanger material and copper water lines. Generally, the more water flowing through the unit, the less chance for scaling. However, flow rates over 3 gpm per ton (3.9 l/m per kW) can produce water (or debris) velocities that can erode the heat exchanger wall and ultimately produce leaks.

Filters - Filters must be clean to obtain maximum performance. Filters should be inspected every month under normal operating conditions and be replaced when necessary. Units should never be operated without a filter.

Washable, high efficiency, electrostatic filters, when dirty, can exhibit a very high pressure drop for the fan motor and reduce air flow, resulting in poor performance. It is especially important to provide consistent washing of these filters (in the opposite direction of the normal air flow) once per month using a high pressure wash similar to those found at self-serve car washes.

Condensate Drain - In areas where airborne bacteria may produce a “slimy” substance in the drain pan, it may be necessary to treat the drain pan chemically with an algaecide approximately every three months to minimize the problem. The condensate pan may also need to be cleaned periodically to ensure indoor air quality. The condensate drain can pick up lint and dirt, especially with dirty filters. Inspect the drain twice a year to avoid the possibility of plugging and eventual overflow.

Compressor - Conduct annual amperage checks to ensure that amp draw is no more than 10% greater than indicated on the serial plate data.

Fan Motors - All units have lubricated fan motors. Fan motors should never be lubricated unless obvious, dry operation is suspected. Periodic maintenance oiling is not recommended, as it will result in dirt accumulating in the excess oil and cause eventual motor failure. Conduct annual dry operation check and amperage check to ensure amp draw is no more than 10% greater than indicated on serial plate data.

Air Coil - The air coil must be cleaned to obtain maximum performance. Check once a year under normal operating conditions and, if dirty, brush or vacuum clean. Care must be taken not to damage the aluminum fins while cleaning. CAUTION: Fin edges are sharp.

Cabinet - Do not allow water to stay in contact with the cabinet for long periods of time to prevent corrosion of the cabinet sheet metal. Generally, vertical cabinets are set up from the floor a few inches [7 - 8 cm] to prevent water from entering the cabinet. The cabinet can be cleaned using a mild detergent.

Refrigerant System - To maintain sealed circuit integrity, do not install service gauges unless unit operation appears abnormal. Reference the operating charts for pressures and temperatures. Verify that air and water flow rates are at proper levels before servicing the refrigerant circuit.

Functional Troubleshooting

Fault	Htg	Clg	Possible Cause	Solution
Main power problems	X	X	Green Status LED Off	Check line voltage circuit breaker and disconnect.
				Check for line voltage between L1 and L2 on the contactor.
				Check for 24VAC between R and C on CXM/DXM'
				Check primary/secondary voltage on transformer.
HP Fault Code 2 **High Pressure**		X	Reduced or no water flow in cooling	Check pump operation or valve operation/setting.
				Check water flow adjust to proper flow rate.
		X	Water Temperature out of range in cooling	Bring water temp within design parameters.
	X		Reduced or no air flow in heating	Check for dirty air filter and clean or replace.
				Check fan motor operation and airflow restrictions.
				Dirty Air Coil- construction dust etc.
				Too high of external static. Check static vs blower table.
	X		Air temperature out of range in heating	Bring return air temp within design parameters.
	X	X	Overcharged with refrigerant	Check superheat/subcooling vs typical operating condition table.
	X	X	Bad HP Switch	Check switch continuity and operation. Replace.
LP/LOC Fault Code 3 **Low Pressure / Loss of Charge**	X	X	Insufficient charge	Check for refrigerant leaks
	X		Compressor pump down at start-up	Check charge and start-up water flow.
LT1 Fault Code 4 **Water coil low temperature limit**	X		Reduced or no water flow in heating	Check pump operation or water valve operation/setting.
				Plugged strainer or filter. Clean or replace..
				Check water flow adjust to proper flow rate.
	X		Inadequate antifreeze level	Check antifreeze density with hydrometer.
	X		Improper temperature limit setting (30°F vs 10°F [-1°C vs -2°C])	Clip JW3 jumper for antifreeze (10°F [-12°C]) use.
	X		Water Temperature out of range	Bring water temp within design parameters.
	X	X	Bad thermistor	Check temp and impedance correlation per chart
LT2 Fault Code 5 **Air coil low temperature limit**		X	Reduced or no air flow in cooling	Check for dirty air filter and clean or replace.
				Check fan motor operation and airflow restrictions.
				Too high of external static. Check static vs blower table.
		X	Air Temperature out of range	Too much cold vent air? Bring entering air temp within design parameters.
		X	Improper temperature limit setting (30°F vs 10°F [-1°C vs -12°C])	Normal airside applications will require 30°F [-1°C] only.
	X	X	Bad thermistor	Check temp and impedance correlation per chart.
Condensate Fault Code 6	X	X	Blocked drain	Check for blockage and clean drain.
	X	X	Improper trap	Check trap dimensions and location ahead of vent.
		X	Poor drainage	Check for piping slope away from unit.
				Check slope of unit toward outlet.
				Poor venting. Check vent location.
		X	Moisture on sensor	Check for moisture shorting to air coil.
	X	X	Plugged air filter	Replace air filter.
	x	X	Restricted Return Air Flow	Find and eliminate restriction. Increase return duct and/or grille size.
Over/Under Voltage Code 7 **(Auto resetting)**	X	X	Under Voltage	Check power supply and 24VAC voltage before and during operation.
				Check power supply wire size.
				Check compressor starting. Need hard start kit?
				Check 24VAC and unit transformer tap for correct power supply voltage.
	X	X	Over Voltage	Check power supply voltage and 24VAC before and during operation.
				Check 24VAC and unit transformer tap for correct power supply voltage.
Unit Performance Sentinel Code 8	X		Heating mode LT2>125°F [52°C]	Check for poor air flow or overcharged unit.
		X	Cooling Mode LT1>125°F [52°C] OR LT2< 40ºF [4ºC])	Check for poor water flow, or air flow.
Swapped Thermistor Code 9	X	X	LT1 and LT2 swapped	Reverse position of thermistors
No Fault Code Shown	X	X	No compressor operation	See "Only Fan Operates".
	X	X	Compressor overload	Check and replace if necessary.
	X	X	Control board	Reset power and check operation.
Unit Short Cycles	X	X	Dirty air filter	Check and clean air filter.
	X	X	Unit in "test mode"	Reset power or wait 20 minutes for auto exit.
	X	X	Unit selection	Unit may be oversized for space. Check sizing for actual load of space.
	X	X	Compressor overload	Check and replace if necessary
Only Fan Runs	X	X	Thermostat position	Ensure thermostat set for heating or cooling operation.
	X	X	Unit locked out	Check for lockout codes. Reset power.
	X	X	Compressor Overload	Check compressor overload. Replace if necessary.
	X	X	Thermostat wiring	Check thermostat wiring at heat pump. Jumper Y and R for compressor operation in test mode.
Only Compressor Runs	X	X	Thermostat wiring	Check G wiring at heat pump. Jumper G and R for fan operation
	X	X	Fan motor relay	Jumper G and R for fan operation. Check for Line voltage across BR contacts.
	X	X		Check fan power enable relay operation (if present).
	X	X	Fan motor	Check for line voltage at motor. Check capacitor.
	X	X	Thermostat wiring	Check thermostat wiring at heat pump. Jumper Y and R for compressor operation in test mode
Unit Doesn't Operate in Cooling		X	Reversing valve	Set for cooling demand and check 24VAC on RV coil and at CXM/DXM board.
				If RV is stuck, run high pressure up by reducing water flow and while operating engage and disengage RV coil voltage to push valve.
		X	Thermostat setup	Check for 'O' RV setup not 'B'.
		X	Thermostat wiring	Check O wiring at heat pump. Jumper O and R for RV coil 'click'.
		X	Thermostat wiring	Put thermostat in cooling mode. Check 24 VAC on O (check between C and O); check for 24 VAC on W (check between W and C). There should be voltage on O, but not on W. If voltage is present on W, thermostat may be bad or wired incorrectly.

Performance Troubleshooting

Performance Troubleshooting	Htg	Clg	Possible Cause	Solution
Insufficient capacity/ Not cooling or heating	X	X	Dirty filter	Replace or clean.
	X		Reduced or no air flow in heating	Check for dirty air filter and clean or replace.
				Check fan motor operation and airflow restrictions.
				Too high of external static. Check static vs. blower table.
		X	Reduced or no air flow in cooling	Check for dirty air filter and clean or replace.
				Check fan motor operation and airflow restrictions.
				Too high of external static. Check static vs. blower table.
	X	X	Leaky duct work	Check supply and return air temperatures at the unit and at distant duct registers if significantly different, duct leaks are present.
	X	X	Low refrigerant charge	Check superheat and subcooling per chart.
	X	X	Restricted metering device	Check superheat and subcooling per chart. Replace.
		X	Defective reversing valve	Perform RV touch test.
	X	X	Thermostat improperly located	Check location and for air drafts behind stat.
	X	X	Unit undersized	Recheck loads & sizing. Check sensible clg. load and heat pump capacity.
	X	X	Scaling in water heat exchanger	Perform scaling check and clean if necessary.
	X	X	Inlet water too hot or too cold	Check load, loop sizing, loop backfill, ground moisture.
High Head Pressure	X		Reduced or no air flow in heating	Check for dirty air filter and clean or replace.
				Check fan motor operation and air flow restrictions.
				Too high of external static. Check static vs. blower table.
		X	Reduced or no water flow in cooling	Check pump operation or valve operation/setting.
				Check water flow. Adjust to proper flow rate.
		X	Inlet water too hot	Check load, loop sizing, loop backfill, ground moisture.
	X		Air temperature out of range in heating	Bring return air temperature within design parameters.
		X	Scaling in water heat exchanger	Perform scaling check and clean if necessary.
	X	X	Unit overcharged	Check superheat and subcooling. Re-weigh in charge.
	X	X	Non-condensables in system	Vacuum system and re-weigh in charge.
	X	X	Restricted metering device.	Check superheat and subcooling per chart. Replace.
Low Suction Pressure	X		Reduced water flow in heating.	Check pump operation or water valve operation/setting.
				Plugged strainer or filter. Clean or replace.
				Check water flow. Adjust to proper flow rate.
	X		Water temperature out of range.	Bring water temperature within design parameters.
		X	Reduced air flow in cooling.	Check for dirty air filter and clean or replace.
				Check fan motor operation and air flow restrictions.
				Too high of external static. Check static vs. blower table.
		X	Air temperature out of range	Too much cold vent air? Bring entering air temperature within design parameters.
	X	X	Insufficient charge	Check for refrigerant leaks.
Low Discharge Air Temperature in Heating	X		Too high of air flow	Check fan motor speed selection and air flow chart.
	X		Poor performance	See 'Insufficient Capacity'
High humidity		X	Too high of air flow	Check fan motor speed selection and airflow chart.
		X	Unit oversized	Recheck loads & sizing. Check sensible clg load and heat pump capacity.

Start-Up Log Sheet

Installer: Complete unit and system checkout and follow unit start-up procedures in the IOM. Use this form to record unit information, temperatures and pressures during start-up. Keep this form for future reference.

Job Name: _____ **Street Address:** _____

Model Number: _____ **Serial Number:** _____

Unit Location in Building: _____

Date: _____ **Sales Order No:** _____

In order to minimize troubleshooting and costly system failures, complete the following checks and data entries before the system is put into full operation.

Fan Motor: Speed Tap (PSC) _____

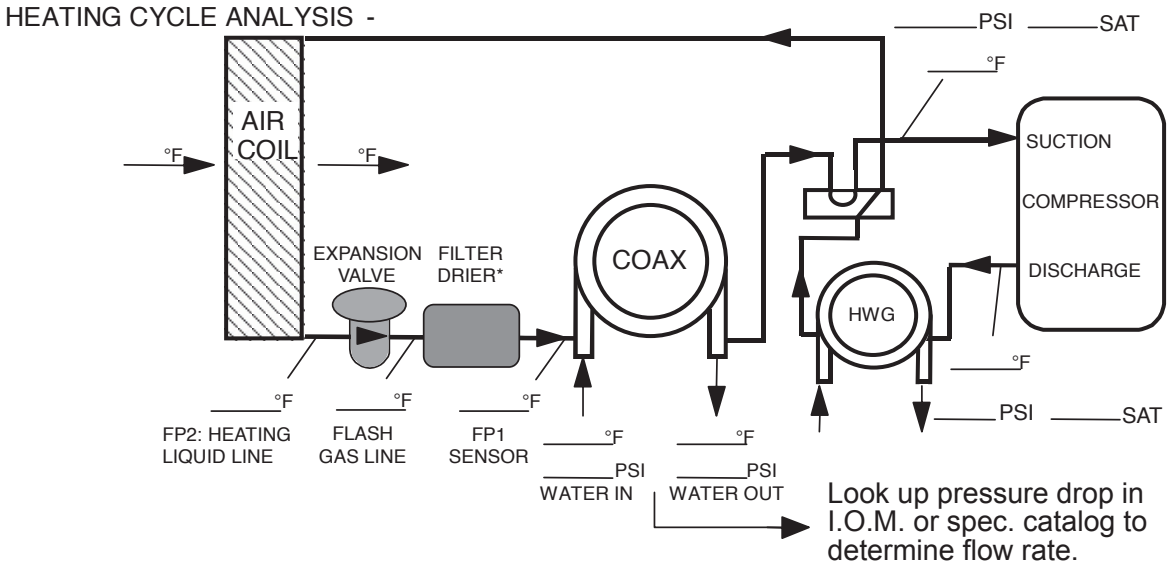
Temperatures: F or C **Antifreeze:** _____**%**

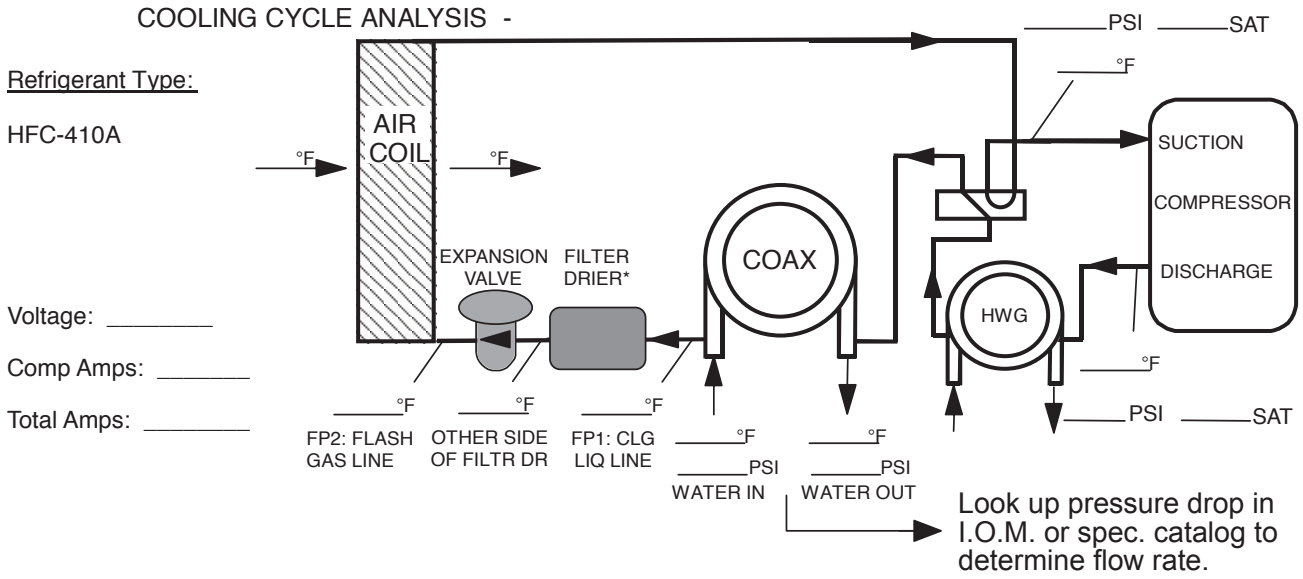
Pressures: PSIG or kPa **Type:** _____

	Cooling Mode		Heating Mode
Entering Fluid Temperature			
Leaving Fluid Temperature			
Temperature Differential			
Return-Air Temperature	DB	WB	DB
Supply-Air Temperature	DB	WB	DB
Temperature Differential			
Water Coil Heat Exchanger (Water Pressure IN)			
Water Coil Heat Exchanger (Water Pressure OUT)			
Pressure Differential			
Water Flow GPM			
Compressor			
Amps			
Volts			
Discharge Line Temperature			
Motor			
Amps			
Volts			

Allow unit to run 15 minutes in each mode before taking data.
Note: Never connect refrigerant gauges during startup procedures. Conduct water-side analysis using P/T ports to determine water flow and temperature difference. If water-side analysis shows poor performance, refrigerant troubleshooting may be required. Connect refrigerant gauges as a last resort.

Functional Troubleshooting





Heat of Extraction (Absorption) or Heat of Rejection =

_____ flow rate (gpm) x _____ temp.diff. (deg. F) x _____ fluid factor† = _____ (Btu/hr)

Superheat = Suction temperature - suction saturation temp. = _____ (deg F)

Subcooling = Discharge saturation temp. - liquid line temp. = _____ (deg F)

† Use 500 for water, 485 for antifreeze.

Note: Never connect refrigerant gauges during startup procedures. Conduct water-side analysis using P/T ports to determine water flow and temperature difference. If water-side analysis shows poor performance, refrigerant troubleshooting may be required. Connect refrigerant gauges as a last resort.

LIMITED EXPRESS WARRANTY - HBH/HBV SERIES WATER-SOURCE HEAT PUMP - COMPACT

Congratulations on purchasing your new HVAC equipment. It has been designed for long life and reliable service, and is backed by one of the strongest warranties in the industry. Your unit automatically qualifies for the warranty coverage listed below, provided you keep your proof of purchase (receipt) for the equipment and meet the warranty conditions.

LIMITED ONE (1) YEAR PARTS EXPRESS WARRANTY

MARS/Comfort-Aire/Century warrants all parts of the HBH/HBV water-source heat pump used in commercial applications to be free from defects in workmanship and materials for normal use and maintenance for one (1) year from the date of purchase by the original consumer for the original installation. This Express Limited Warranty applies only when the water-source heat pump is installed as part of a complete matched system, and only when the system is installed per Comfort-Aire/Century installation instructions and in accordance with all local, state and national codes for normal use.

LIMITED FIVE (5) YEAR EXTENDED EXPRESS WARRANTY ON COMPRESSOR

We will replace a compressor which proves to be defective for a period of five (5) years from date of heat pump purchase. All restrictions, limitations and procedures for the one year parts warranty apply to the additional compressor warranty period.

EXCEPTIONS

The Limited Express Warranty does not cover normal maintenance—Comfort-Aire/Century recommends that regular inspection/maintenance be performed at least once a season and proof of maintenance be kept. Additionally, labor charges, transportation charges for replacement parts, replacement of refrigerant or filters, any other service calls/repairs are not covered by this Limited Warranty. It also does not cover any portion or component of the system that is not supplied by Comfort-Aire/Century, regardless of the cause of failure of such portion or component.

CONDITIONS OF WARRANTY COVERAGE

- Unit must be operated according to Comfort-Aire/Century operating instructions included with the unit and cannot have been subjected to accident, alteration, improper repair, neglect or misuse, or an act of God (such as a flood)
- Serial numbers and/or rating plate have not been altered or removed
- Installation was done by a trained, licensed or otherwise qualified geothermal dealer/contractor
- Performance cannot be impaired by use of any product not authorized by Comfort-Aire/Century, or by any adjustments or adaptations to components
- Damage has not been a result of inadequate wiring or voltage conditions, use during brown-out conditions, or circuit interruptions
- Air flow around any section of the unit has not been restricted
- Unit remains in the original installation
- Unit was not purchased over the internet

DURATION OF WARRANTY & REGISTRATION

The warranty begins on the date of purchase by the original consumer. The consumer must register their product at www.marsdelivers.com within 90 days of purchase. The consumer must retain a receipted bill of sale as proof of warranty period. Without this proof, the express warranty begins on the date of shipment from the factory.

REMEDY PROVIDED BY THE LIMITED EXPRESS WARRANTY

The sole remedy under the Limited Warranty is replacement of the defective part. If replacement parts are required within the period of this warranty, Comfort-Aire/Century replacement parts shall be used; any warranty on the replacement part(s) shall not affect the applicable original unit warranty. Labor to diagnose and replace the defective part is not covered by this Limited Express Warranty. Access to the unit for service is the owner's responsibility. If for any reason the replacement part/product is no longer available during the warranty period, Comfort-Aire/Century shall have the right to allow a credit in the amount of the current suggested retail price of the part/product instead of providing repair or replacement.

LIMITATION OF LIABILITY

1. **EXCLUSION OF ALL IMPLIED WARRANTIES AND LIMITATION. There are no other express or implied warranties. Comfort-Aire/Century makes no warranty of merchantability.** We do not warrant that the unit is suitable for any particular purpose or can be used in buildings or rooms of any particular size or condition except as specifically provided in this document. There are no other warranties, express or implied, which extend beyond the description in this document.
2. All warranties implied by law are limited in duration to the five-year term of the Parts Warranty. Your exclusive remedy is limited to the replacement of defective parts. **We will not be liable for any consequential or incidental damages caused by any defect in this unit.**
3. This warranty gives you specific legal rights and you may also have other rights which vary from state to state. Some states do not allow limitation on how long an implied warranty lasts or do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you.
4. No warranties are made for units sold outside the continental United States and Canada. Your distributor or final seller may provide a warranty on units sold outside these areas.
5. Comfort-Aire/Century will not be liable for damages if our performance regarding warranty resolution is delayed by events beyond our control including accident, alteration, abuse, war, government restrictions, strikes, fire, flood, or other acts of God.

Please follow the below steps to register your product.

- ***Please log onto our website www.marsdelivers.com***
- ***Resources***
- ***Product Registration***
- ***Complete the requested information in all caps, especially the Email Address***
- ***Press the "Continue" button at the bottom***
- ***A copy of the registration will be sent to the email address that you entered at the top of the page for your records***

KEEP THIS INFORMATION AS A RECORD OF YOUR PURCHASE

Apply Serial Number and Model Number sticker here (from product carton). if unavailable, write serial number and model number below (can be found on unit rating plate).

_____

Date of Purchase

Date Installation Completed

☐ Component of new HVAC system ☐ Replacement heat pump only

Remember to retain your bill of sale as proof of warranty period and ownership.

Delivering Confidence

Please visit www.marsdelivers.com to register your new product

HBH/HBV COMPACT_WARRANTY_8/2017

Revision History

Date:	Item:	Action:
3/23/17	Page 36	Update wiring matrix
1/30/17	Page 22, 23	Update notes
10/6/16	Page 7	Text Update
10/4/16	WSE right hand Field Fabricated Tube	Corrrected
9/27/16	TCH WSE Dim Q	Corrrected
9/7/16	Page,24	Updated voltage codes size 041
05/16/16	Table- corrected cenimettersin dimensional tables	Updated
04/15/16	Text	Updated
2/24/16	Pages 30, 31	EMC Blower Performance information,
02/06/15	Page 3	Changed E-Coated to Tin-Plated
01/27/16	All	Added WSE Information
01/21/15	All	Added ECM Information
06/16/14	Pages 8, 11 & 19	Change Text - Filter “rack” to “frame”
05/29/14	Physical Data Table	Removed Fan Motor (hp)
05/12/14	Physical Data Table and Water Quality Table	Updated Ref. Charge on 024 and Unit Maximum Working Water Pressure; Updated Water Quality Table
10/07/13	Figure 10a: Vertical Condensate Drain	Updated
02/04/13	Electrical Table	Miscellaneous Edits
11/09/12	POE Oil Warning	Added
	Water Quality Table	
	Condensate Drain Connection	
01/23/12	TCV041	Added
08/09/11	Unit Maximum Working Water Pressure	Updated to Reflect New Safeties
08/01/11	First Published	

Due to ongoing product improvements, specifications and dimensions are subject to change and correction without notice or incurring obligations. Determining the application and suitability for use of any product is the responsibility of the installer. Additionally, the installer is responsible for verifying dimensional data on the actual product prior to beginning any installation preparations.

Incentive and rebate programs have precise requirements as to product performance and certification. All products meet applicable regulations in effect on date of manufacture; however, certifications are not necessarily granted for the life of a product. Therefore, it is the responsibility of the applicant to determine whether a specific model qualifies for these incentive/rebate programs.

Comfort-Aire® Century®

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