ENVISION™

NKW 020 to 130 kW

Commercial Reversible Chiller - 50 Hz

NKW Reversible Chiller Installation Manual

- Installation Information
- Water Piping Connections
- Electrical Data
- Microprocessor Control
- Startup Procedures
- Preventive Maintenance

APPROVED PRODUCT

MCS nqa.

Certificate Number NQA '00000028'
Factory Standard MCS010
Product Standard MCS007

WaterFurnace® Smarter from the Ground Up™

IM1052WN 04/13

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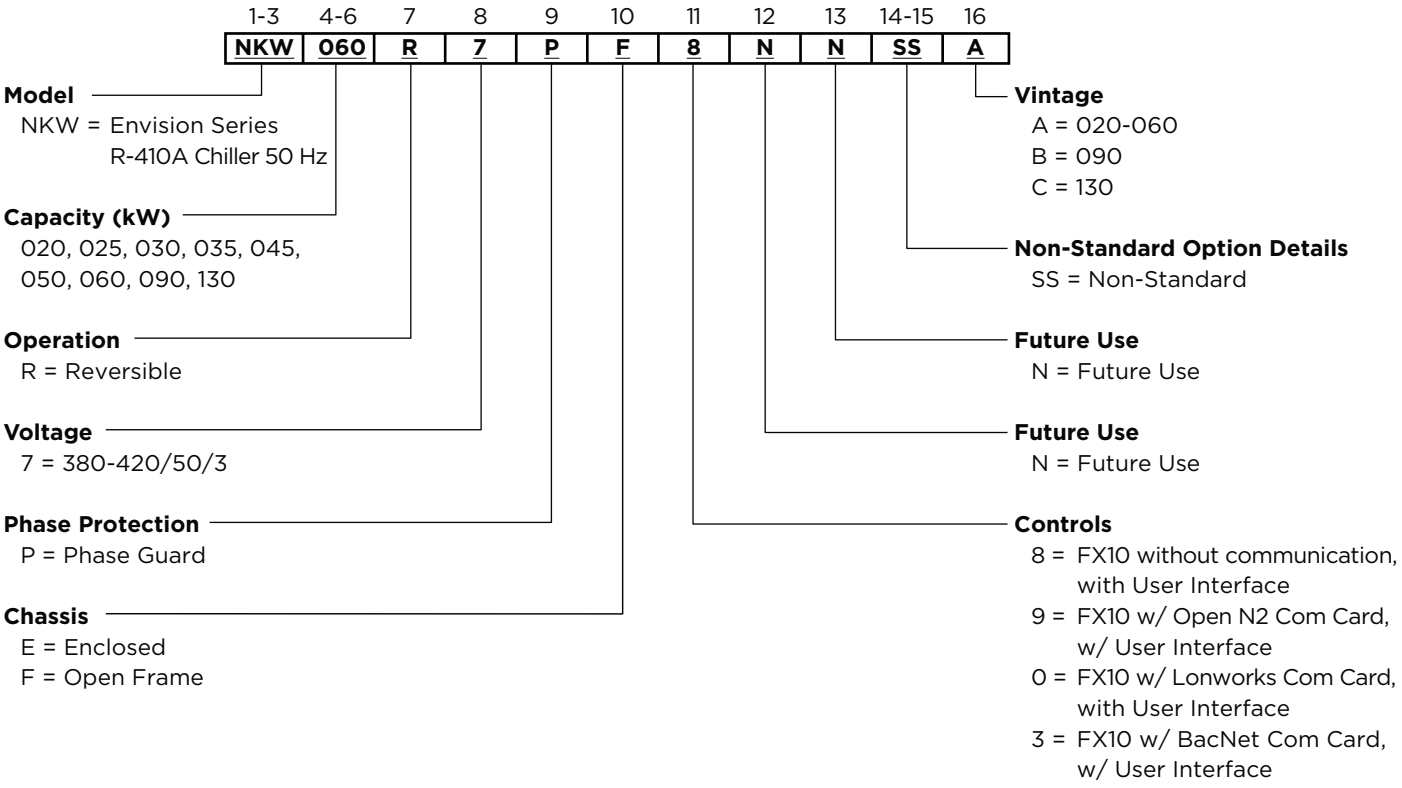
Model Nomenclature



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All Envision Series NKW product is safety tested to CE standards and performance tested in accordance with standard BS EN 14511-2.

BS EN 14511-2 Performance Ratings

Heating Performance

Model	B0/W35			W10/W35			B0/W45			B5/W35			W10/W45		
	Capacity Output kW	COP	Power Input kW	Capacity Output kW	COP	Power Input kW	Capacity Output kW	COP	Power Input kW	Capacity Output kW	COP	Power Input kW	Capacity Output kW	COP	Power Input kW
020	21.7	3.7	5.87	27.6	4.60	5.96	20.8	2.80	7.41	25.0	4.20	5.97	26.7	3.60	7.44
025	25.7	3.6	7.14	32.6	4.50	7.25	24.7	2.70	9.02	30.0	4.10	7.27	31.6	3.50	9.10
030	28.7	3.5	8.20	36.4	4.40	8.33	27.6	2.70	10.4	33.0	4.00	8.35	35.3	3.40	10.4
035	31.7	3.7	8.57	40.3	4.60	8.71	30.4	2.80	10.8	36.5	4.20	8.72	39.0	3.60	10.9
045	38.8	3.6	10.8	49.3	4.50	11.0	37.2	2.70	13.6	44.6	4.10	11.0	47.7	3.50	13.7
050	44.4	3.7	12.0	56.4	4.60	12.2	42.6	2.80	15.2	51.1	4.20	12.2	54.6	3.60	15.2
060	52.3	3.6	14.5	66.4	4.50	14.8	50.2	2.70	18.4	60.1	4.10	14.8	64.3	3.50	18.4
090	77.0	3.6	21.4	97.8	4.50	21.7	73.9	2.70	27.0	88.6	4.10	21.8	94.7	3.50	27.1
130	120.0	3.5	34.3	152.4	4.40	34.8	115.2	2.70	43.3	138.0	4.00	34.9	147.6	3.40	43.5

All ratings based upon 220V operation
All ratings based on new heat pump with clean heat exchangers

9/23/11

Cooling Performance

Model	W30/B0			W30/W12			W30/W23		
	Capacity Output kW	EER (W/W)	Power Input kW	Capacity Output kW	EER (W/W)	Power Input kW	Capacity Output kW	EER (W/W)	Power Input kW
020	16.8	2.70	6.22	24.7	4.00	6.22	34.1	5.40	6.28
025	20.6	2.70	7.63	30.3	4.00	7.63	41.8	5.40	7.71
030	23.2	2.60	8.92	34.1	3.80	8.92	47.1	5.20	9.01
035	25.6	2.70	9.50	37.6	4.00	9.50	51.2	5.40	9.58
045	31.5	2.60	12.1	46.3	3.80	12.1	64.0	5.20	12.2
050	36.1	2.70	13.4	53.1	4.00	13.4	73.3	5.40	13.5
060	42.8	2.50	17.1	62.9	3.70	17.1	86.9	5.00	17.3
090	68.1	2.50	27.2	88.0	3.70	23.8	121.0	5.00	24.2
130	88.0	2.60	34.0	128.9	4.00	32.2	160.0	5.00	32.0

All ratings based upon 220V operation
All ratings based on new heat pump with clean heat exchangers

9/23/11

Legend

ABBREVIATIONS AND DEFINITIONS:

COP = coefficient of performance
EER = cooling energy efficiency (TC/kW)
ELT = entering load fluid temperature
EST = entering source fluid temperature to heat pump
FLA = full load amps
FtHd = pressure drop in feet of head
gpm = US gallon per minute
HC = heating capacity in kW
HE = heat of extraction in kW
HR = heat rejected in kW
kPa = kilopascal
kW = kilowatt
L/s = liters per second
LLT = leaving load fluid temperature from heat pump
LRA = locked rotor amps (starting current)
LST = leaving source fluid temperature from heat pump
LWPD= load heat exchanger water pressure drop
MCC = maximum continuous current
PD = pressure drop
psi = pressure drop in pounds per square inch
P/T = Pressure/Temperature
RLA = run load amps
TC = total cooling capacity in kW
W = Watt

CONVERSIONS:

x°F = (*x* - 32)/1.8°C
1 bar = 100 kPa
1 gpm = 0.0631 L/s
1 US Gallon = 3.785412 L
1 Btu/h = 0.29037 W

General Installation Information

Safety Considerations

The design and installation of heat pumps must be carried out by trained professionals in accordance with applicable regulations and this installation manual. Installing and servicing air conditioning and heating equipment can be hazardous due to system pressure and electrical components. Only trained and qualified service personnel should install, repair or service heating and air conditioning equipment. When working on heating and air conditioning equipment, observe precautions in the literature, tags, and labels attached to the unit and other safety precautions that may apply.

Envision NKW Series heat pumps must be installed in a manner that conforms to relevant UK building codes, EN, and IEC standards.

Wear safety glasses and work gloves. Use quenching cloth for brazing operations. Have fire extinguisher available for all brazing operations.

NOTE: Before installing, check voltage of unit(s) to ensure proper voltage.

WARNING: Before performing service or maintenance operations on the system, turn off main power switches to the unit. Electrical shock could cause serious personal injury.

Application

Units are not intended for heating domestic (potable water) by direct coupling. If used for this type of application, a secondary heat exchanger must be used.

Moving and Storage

Move units in the normal up orientation as indicated by the labels on the unit packaging. When the equipment is received, all items should be carefully checked against the bill of lading to ensure that all crates and cartons have been received in good condition. Examine units for shipping damage, removing unit packaging if necessary to properly inspect unit. Units in question should also be internally inspected. If any damage is observed, the carrier should make the proper notation on delivery receipt acknowledging the damage. Units are to be stored in a location that provides adequate protection from dirt, debris and moisture.

WARNING: To avoid equipment damage, do not leave the system filled in a building without heat during cold weather, unless adequate freeze protection levels of antifreeze are used. Heat exchangers do not fully drain and will freeze unless protected, causing permanent damage.

Unit Location

Provide sufficient room to make water and electrical connections. If the unit is located in a confined space, provisions must be made for unit servicing. Locate the unit in an indoor area that allows easy removal of the access panels and has enough space for service personnel to perform maintenance or repair. These units are not approved for outdoor installation and, therefore, must be installed inside the structure being conditioned. Do not locate units in areas subject to freezing conditions.

WARNING: Do not store or install units in corrosive environments or in locations subject to temperature or humidity extremes (e.g. attics, garages, rooftops, etc.). Corrosive conditions and high temperature or humidity can significantly reduce performance, reliability, and service life.

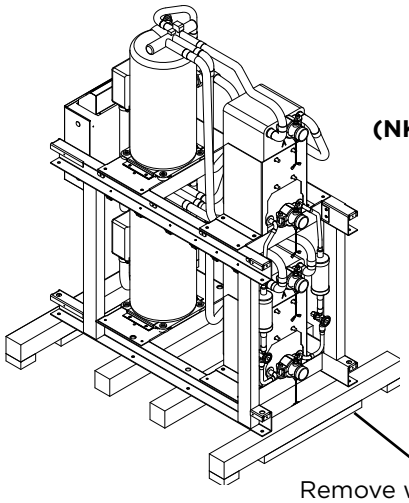
WARNING: To avoid equipment damage and possible voiding of warranty, be sure that properly sized strainers are installed upstream of both brazed plate heat exchangers to protect them against particles in the fluid.

General Installation Information cont.

Mounting Units

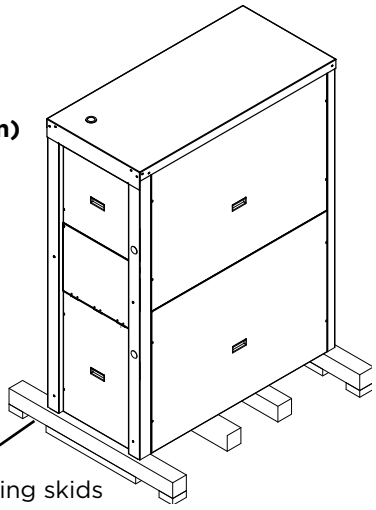
Remove the unit from the wooden shipping skids (see Figures 1 and 2). Units will be shipped with heavy duty rubber grommets to reduce sound that can be transmitted through the floor via the frame (see grommets below). For additional sound attenuation, use heavy duty spring isolation that can reduce sound levels by 3 dBA (see springs below).

Figure 1: Unit Without Enclosure



(NKW090 shown)

Figure 2: Unit With Optional Enclosure



Remove wooden shipping skids

CAUTION: A minimum of 0.6 m clearance should be allowed for service access.

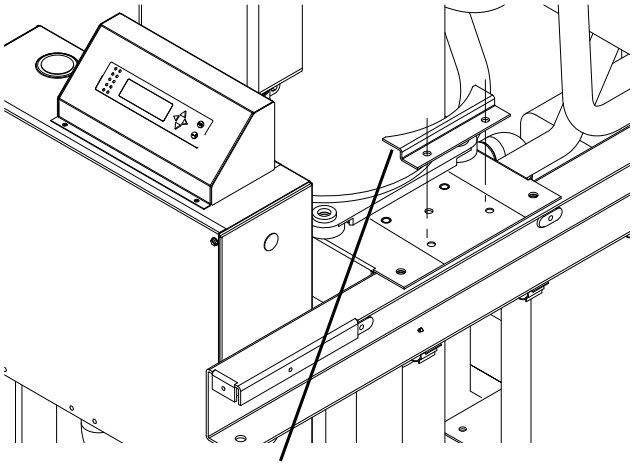
Grommets Standard

Heavy Duty Mounting Springs Optional
IS-325-01 (NKW020-090)
IS-750-01 (NKW130)

Unpacking the Unit

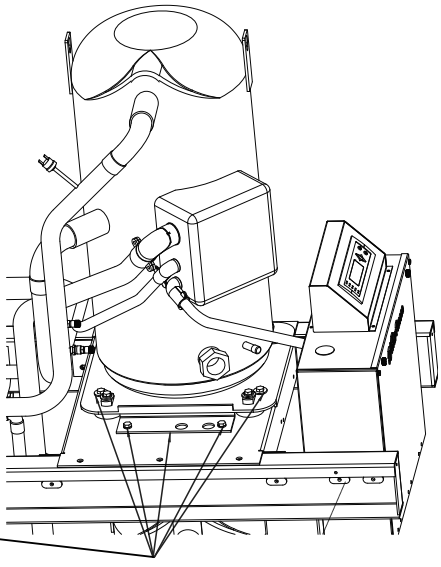
Remove the stretch warp and protective cardboard from the unit. Where applicable, remove the compressor shipping brackets located at the base of each compressor. To do so, lift up the bottom of the compressor sound jacket and remove the two bolts that hold the bracket (see Figure 3a). Discard the brackets. On NKW130, the hold down shipping bolts should then be removed and discarded (Figure 3b).

Figure 3a: Removing Shipping Brackets



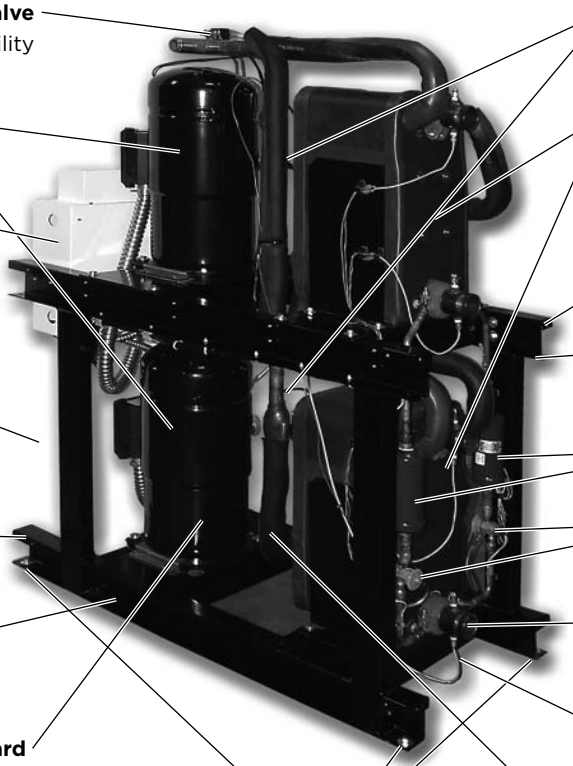
Compressor Shipping Bracket (one on each side of both compressors)

Figure 3b: Removing Shipping Bolts



Remove shipping bolts, brackets and all related hardware

NKW Features



4-Way Reversing Valve permits application flexibility

Dual scroll compressors for efficiency and reliability

Sophisticated microprocessor control with robust safety controls and advanced freeze detection

Optional insulated sheet metal cabinet to reduce noise

Sturdy frame to reduce vibration

Fork truck cutouts for maneuvering at job site

Compressor blanket standard for noise reduction

Durometer selected grommets to reduce noise and vibration (optional springs available as an accessory)

High and low refrigerant pressure cutout switches

High efficiency brazed plate heat exchangers for efficiency and compact size

Integrated lifting points for ease of handling

Small modular design for application flexibility

Bi-flow filter drier

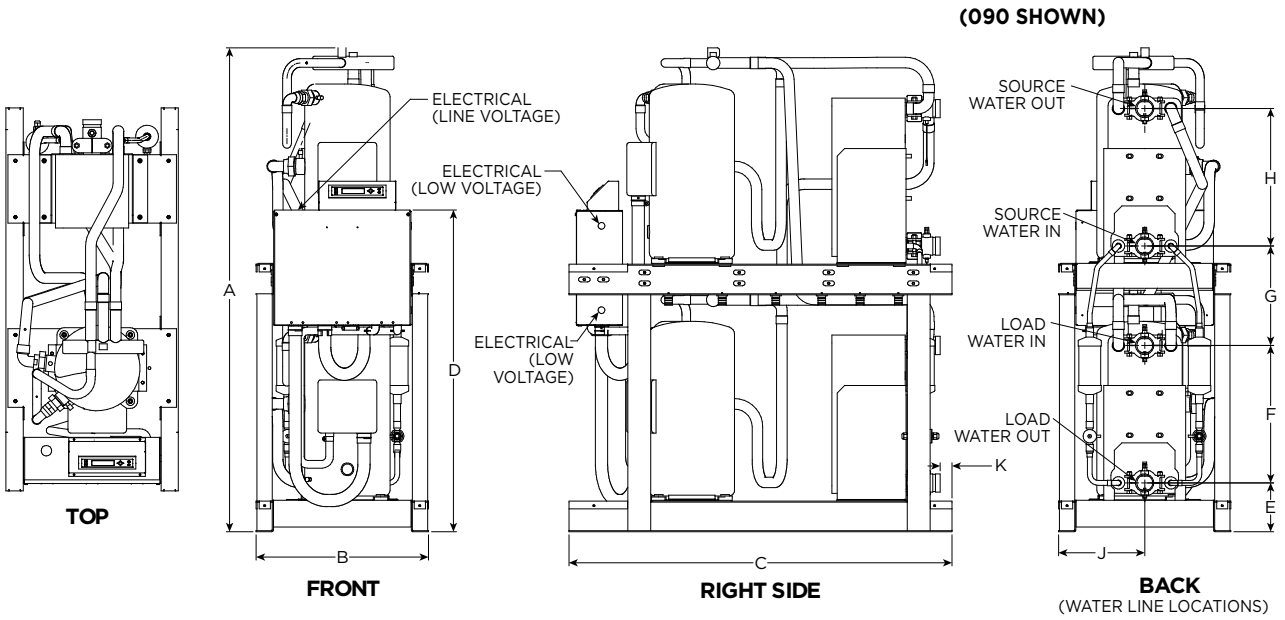
Thermostatic expansion valve (TXV)

Victaulic style water connections for an easier and faster connection

Water Temperature/Pressure Service Port

Fully insulated suction and water lines to prevent condensation at reduced fluid operating temperatures

Physical Dimensions Without Enclosure

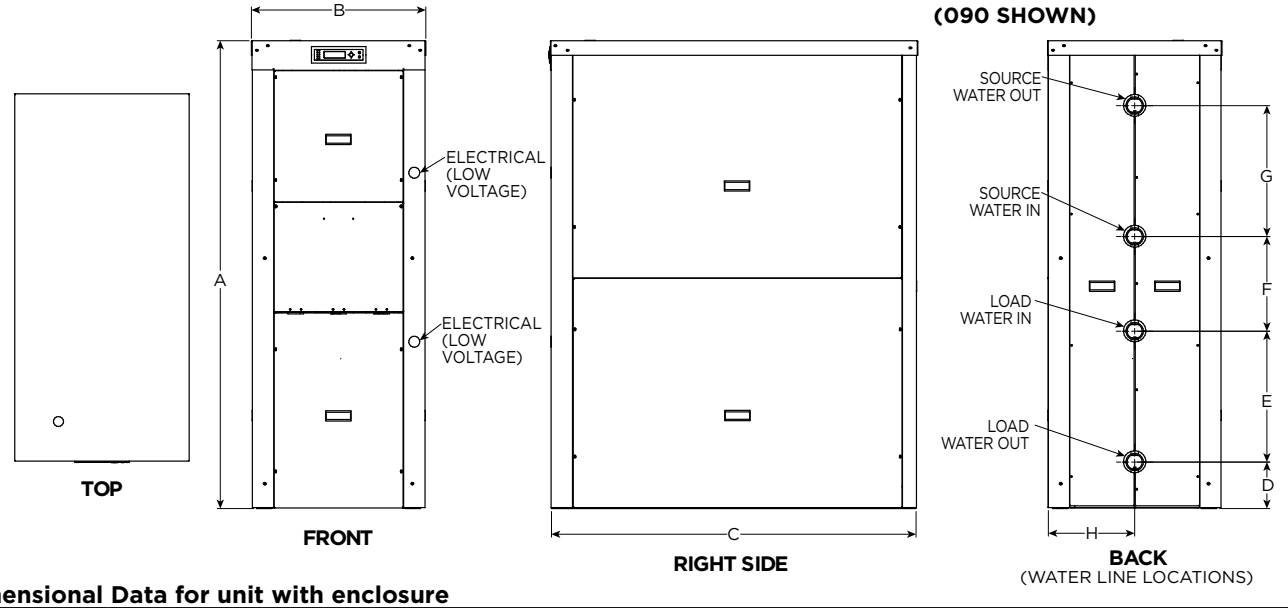


Dimensional Data for unit without enclosure

Model	A	B	C	D	E	F	G	H	J	K
020-060	1295	572	965	891	155	432	202	432	285	38
090	1605	572	1270	1067	162	432	354	432	286	39
130	1778	572	1321	1215	166	432	495	432	362	20

All dimensions in mm 9/20/10
All water connections are 2 in. [50.8 mm] Victaulic

Physical Dimensions With Enclosure



Dimensional Data for unit with enclosure

Model	A	B	C	D	E	F	G	H
020-060	1347	568	965	154	432	202	432	285
090	1620	608	1270	162	432	354	432	301
130	1803	607	1330	166	432	495	432	378

All dimensions in mm 9/20/10
All water connections are 2 in. [50.8 mm] Victaulic

Physical Data

Model	Configuration	Sound Power dBA	Compressor		R-410A Charge*	Fluid Weight	Total Weight		Corner Weights			
			Type (qty)	Oil			Shipping	Installed	Front Left	Rear Left	Front Right	Rear Right
020	Enclosure	62	Scroll (2)	PVE	1.8	11.0	320	284	61	79	63	81
	Frame	71					284	248	52	70	54	72
025	Enclosure	62	Scroll (2)	PVE	1.8	11.0	320	284	61	79	63	81
	Frame	71					284	248	52	70	54	72
030	Enclosure	62	Scroll (2)	POE	1.8	11.0	320	284	61	79	63	81
	Frame	71					284	248	52	70	54	72
035	Enclosure	62	Scroll (2)	PVE	2.2	15.0	332	297	64	83	66	84
	Frame	71					296	261	55	73	57	75
045	Enclosure	64	Scroll (2)	PVE	2.7	15.0	349	313	69	87	70	88
	Frame	74					313	277	59	78	56	79
050	Enclosure	64	Scroll (2)	PVE	3.4	22.0	374	339	75	93	76	95
	Frame	74					343	307	77	95	78	97
060	Enclosure	64	Scroll (2)	PVE	3.4	22.0	374	339	75	93	76	95
	Frame	74					343	307	77	95	78	97
090	Enclosure	66	Scroll (2)	POE	5.6	29.0	510	475	116	119	118	122
	Frame	76					437	401	97	101	100	103
130	Enclosure	69	Scroll (2)	POE	9.6	50.0	871	836	158	270	301	142
	Frame	79					820	785	146	257	288	129

Weights shown in [kg] 03/06/13

* Refrigerant per circuit in [kg]

Field Connected Water Piping

General

System piping should be kept as simple as possible to minimize the pressure drop, but hand valves should be field installed to facilitate unit servicing. The piping installation should provide service personnel with the ability to measure and/or monitor water temperatures and pressures.

Source and load fluid connections are provided with 50.8mm Victaulic grooved nipples (see Figure 4). Each nipple will also have a PT port installed for test and balance purposes. It will be the installing contractor's responsibility to adequately support incoming piping to avoid damage to the unit's piping or heat exchangers. The water lines should be routed so as not to interfere with access to the unit.

For any installation where the transmission of vibration through the piping connections could cause unacceptable noise levels in occupied spaces it is important to provide adequate vibration damping. One method is to use the optional Adapter Hose Kit (kit number TKC16S-4). This Kit consists of four pieces of a braided stainless steel flexible hose with a 50.8 mm Victaulic connection on one end and a 50.8 mm male neutral pipe thread (MPT connection with pipe union on the other. Overall length of each piece is 457 mm.

NOTE: Units are factory run-tested using propylene glycol. Prior to connecting piping to unit, thoroughly flush heat exchangers.

Figure 4: Water Connections (NKW090 shown)

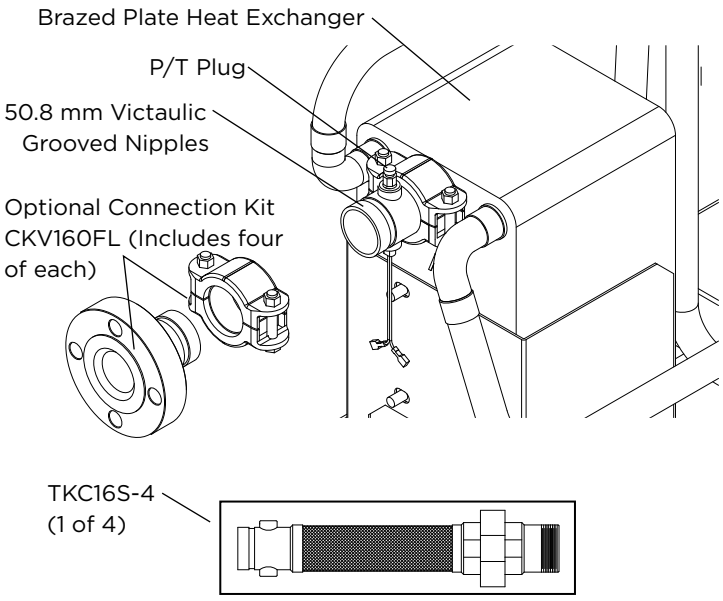
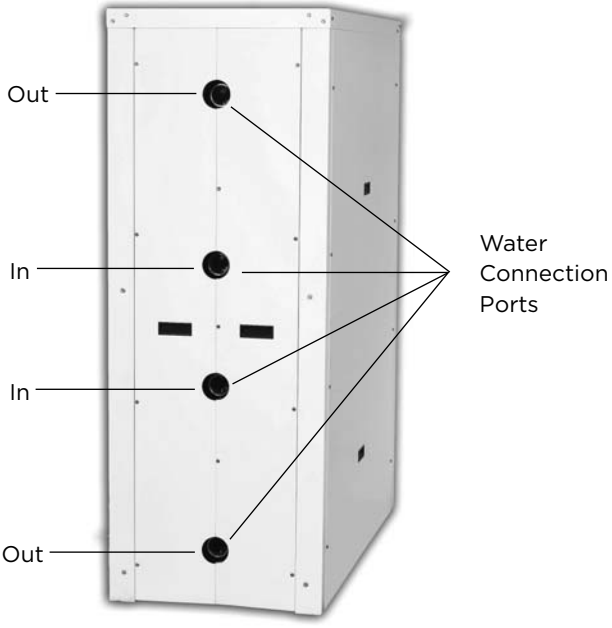


Figure 5: Chiller Back View (NKW090 shown)



CAUTION: Remove the plastic protective caps in the ends of each of the four water pipes on the heat exchangers prior to piping connection. Failure to remove the caps will result in serious damage and could void the warranty.

Water Draining

1. Disconnect the power supply to the heat pump and circulating pumps.
2. Close the inlet and outlet water valves to isolate the heat pump from the ground collector, water tank, or piping system.
3. Open the field installed drain valve located at the lowest part of the piping system between the heat exchanger and the water valves.
4. Be sure to drain the fluid into a nearby floor drain or container in order to avoid water or brine fluid spilling on the floor.
5. Release the pressure in the piping system by opening the field installed pressure relief valve.
6. In order to remove all the water from the system, it may be necessary to blow pressurized air through the braze plate heat exchanger.

Field Connected Water Piping cont.

Before final connection to the unit, the supply and return hose kits must be connected to each other, bypassing the unit, and the system flushed to remove dirt, piping chips and other foreign material. Normally, a combination balancing and close-off (ball) valve is installed at the return, and a rated gate or ball valve is installed at the supply. The return valve can be adjusted to obtain the proper water flow. The valves allow the unit to be removed for servicing.

The proper water flow must be delivered to each unit whenever the unit heats or cools. The proper flow rate cannot be accurately set without measuring the water pressure drop through the refrigerant-to-water heat exchanger. **A 0.054 L/s per kW of cooling capacity (0.04 L/s per kW minimum) is required.**

NOTE: The placement and connection of the water circulating pump(s) must be taken into consideration prior to designing the final water piping systems.

Closed Loop Tower/Boiler Systems

The water loop is usually maintained between 15.5°C and 32.2°C for proper heating and cooling operation. This is accomplished with a cooling tower and a boiler.

To reject excess heat from the condenser water loop, the use of a closed-circuit evaporative cooler or an open type cooling tower with a secondary heat exchanger between the tower and the condenser water loop is recommended. If an open type cooling tower is used without a secondary heat exchanger, continuous chemical treatment and filtering of the water must be performed to ensure the water is free from damaging materials.

CAUTION: Water piping exposed to outside temperature may be subject to freezing.

Open Loop Well Water Systems

Installation of an open loop system is not recommended without using a secondary heat exchanger unless water quality guidelines are met.

Earth Coupled Systems

All supply and return water piping should be insulated to prevent excess condensation from forming on the water lines. Ensure pumping system is capable of providing adequate flow rate at the system pressure drop, 0.054 L/s per kW (source side) is recommended. Antifreeze in the loop is strongly recommended.

Ground Loop Design and Installation

This instruction manual does not cover the design and installation of the ground loop system. WaterFurnace recommends that all ground loops are designed using a commercial software package. Installers shall follow the guidelines detailed in Microgeneration Certification Scheme (MCS) Installation Standard MIS 3005 for designing ground loop collectors. Additional guidance on ground collectors is provided by International Ground-Source Heat Pump Association (IGSHPA).

Domestic Hot Water Applications

NKW heat pumps are not capable of heating domestic hot water (DHW) directly. An optional field installed secondary heat exchanger must be used between the heat pump and storage tank. The temperature of the hot water produced by the heat pump cannot be adjusted and will vary with the inlet temperature. WaterFurnace recommends the use of a properly sized buffer tank equipped with supplemental electric immersion heaters in conjunction with all NKW models used in a DHW application. Immersion heaters must be capable of heating the water to 60°C at a regular time interval to prevent the build-up of bacteria such as Legionella. Installations must meet minimum requirements outlined in UK Domestic Heating Compliance Guide.

CAUTION: Hot water in excess of 60°C can cause scalding.

Water Quality

General

Reversible chiller systems may be successfully applied in a wide range of commercial and industrial applications. It is the responsibility of the system designer and installing contractor to ensure that acceptable water quality is present and that all applicable codes have been met in these installations.

Water Treatment

Do not use untreated or improperly treated water. Equipment damage may occur. The use of improperly treated or untreated water in this equipment may result in scaling, erosion, corrosion, algae or slime. The services of a qualified water treatment specialist should be engaged to determine what treatment, if any, is required. The product warranty specifically excludes liability for corrosion, erosion or deterioration of equipment.

The heat exchangers in the units are 316 stainless steel plates with copper brazing. The water piping in the heat exchanger is steel. There may be other materials in the building's piping system that the designer may need to take into consideration when deciding the parameters of the water quality.

If an antifreeze or water treatment solution is to be used, the designer should confirm it does not have a detrimental effect on the materials in the system.

Contaminated Water

In applications where the water quality cannot be held to prescribed limits, the use of a secondary or intermediate heat exchanger is recommended to separate the unit from the contaminated water.

The following table outlines the water quality guidelines for unit heat exchangers. If these conditions are exceeded, a secondary heat exchanger is required. Failure to supply a secondary heat exchanger where needed will result in a warranty exclusion for primary heat exchanger corrosion or failure.

Strainers

These units must have properly sized strainers upstream of both brazed plate heat exchangers to protect them against particles in the fluid. Failure to install proper stainers and perform regular service can result in serious damage to the unit, and cause degraded performance, reduced operating life and failed compressors. Improper installation of the unit (which includes not having proper strainers to protect the heat exchangers) can also result in voiding the warranty.

Field supplied strainers with 420-840 microns are recommended, with 500 microns being the optimum choice. The strainers selected should have a mesh open area of at least 39 cm^2 for each unit being serviced by the strainer. Using strainers with a smaller amount of open area will result in the need for more frequent cleaning.

Strainers should be selected on the basis of acceptable pressure drop, and not on pipe diameter. The strainers selected should have a pressure drop at the nominal flow rate of the units; low enough to be within the pumping capacity of the pump being used.

WARNING: Must have intermediate heat exchanger when used in pool applications.

Water Quality Guidelines

Material		Copper	90/10 Cupronickel	316 Stainless Steel
pH	**Acidity/Alkalinity**	7 - 9	7 - 9	7 - 9
Scaling	Calcium and Magnesium Carbonate	(Total Hardness) less than 350 ppm	(Total Hardness) less than 350 ppm	(Total Hardness) less than 350 ppm
Corrosion	Hydrogen Sulfide	Less than 0.5 ppm (rotten egg smell appears at 0.5 ppm)	10 - 50 ppm	Less than 1 ppm
	Sulfates	Less than 125 ppm	Less than 125 ppm	Less than 200 ppm
	Chlorine	Less than 0.5 ppm	Less than 0.5 ppm	Less than 0.5 ppm
	Chlorides	Less than 20 ppm	Less than 125 ppm	Less than 300 ppm
	Carbon Dioxide	Less than 50 ppm	10 - 50 ppm	10 - 50 ppm
	Ammonia	Less than 2 ppm	Less than 2 ppm	Less than 20 ppm
	Ammonia Chloride	Less than 0.5 ppm	Less than 0.5 ppm	Less than 0.5 ppm
	Ammonia Nitrate	Less than 0.5 ppm	Less than 0.5 ppm	Less than 0.5 ppm
	Ammonia Hydroxide	Less than 0.5 ppm	Less than 0.5 ppm	Less than 0.5 ppm
	Ammonia Sulfate	Less than 0.5 ppm	Less than 0.5 ppm	Less than 0.5 ppm
	Total Dissolved Solids (TDS)	Less than 1000 ppm	1000 - 1500 ppm	1000 - 1500 ppm
	LSI Index	+0.5 to -0.5	+0.5 to -0.5	+0.5 to -0.5
Iron Fouling (Biological Growth)	Iron, FE^{2}+ (Ferrous) Bacterial Iron Potential	< 0.2 ppm	< 0.2 ppm	< 0.2 ppm
	Iron Oxide	Less than 1 ppm, above this level deposition will occur	Less than 1 ppm, above this level deposition will occur	Less than 1 ppm, above this level deposition will occur
Erosion	Suspended Solids	Less than 10 ppm and filtered for max. of 600 micron size	Less than 10 ppm and filtered for max. of 600 micron size	Less than 10 ppm and filtered for max. of 600 micron size
	Threshold Velocity (Fresh Water)	< 1.8 m/sec	< 1.8 m/sec	< 1.8 m/sec

NOTES: Grains = ppm divided by 17
mg/L is equivalent to ppm

2/22/12

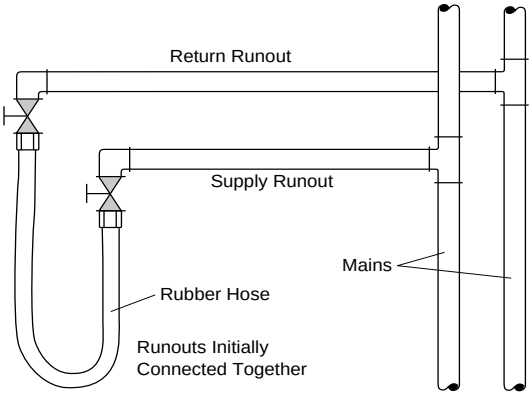
System Cleaning and Flushing

Cleaning and Flushing

Prior to start up of any heat pump, the water circulating system must be cleaned and flushed of all dirt and debris.

If the system is equipped with water shutoff valves, the supply and return runouts must be connected together at each unit location (This will prevent the introduction of dirt into the unit, see Flushing with Water Shutoff Valve Equipped Systems illustration). The system should be filled at the water make-up connection with all air vents open. After filling, vents should be closed.

Flushing with Water Shutoff Valve Equipped Systems



The contractor should start the main circulator with the pressure reducing valve makeup open. Vents should be checked in sequence to bleed off any trapped air and to verify circulation through all components of the system.

As water circulates through the system, the contractor should check and repair any leaks found in the piping system. Drain(s) at the lowest point(s) in the system should be opened for initial flush and blowdown, making sure water fill valves are set at the same rate. Check the pressure gauge at the pump suction and manually adjust the make-up water valve to hold the same positive pressure both before and after opening the drain valves. Flushing should continue for at least two hours, or longer if required, until drain water is clean and clear.

The supplemental heater and/or circulator pump, if used, should be shut off. All drains and vents should be opened to completely drain the system. Short-circuited supply and return runouts should now be connected to the unit supply and return connections.

Refill the system with clean water. Test the system water for acidity and treat as required to leave the water slightly alkaline (pH 7.5 to 8.5). The specified percentage of antifreeze may also be added at this time. Use commercial grade antifreeze designed for HVAC systems only. Environol™ brand antifreeze is recommended.

Once the system has been filled with clean water and antifreeze (if used), precautions should be taken to protect the system from dirty water conditions. Dirty water will result in system-wide degradation of performance, and solids may clog valves, strainers, flow regulators, etc. Additionally, the heat exchanger may become clogged which reduces compressor service life and can cause premature unit failure.

In boiler/tower application, set the loop control panel set points to desired temperatures. Supply power to all motors and start the circulating pumps. After full flow has been established through all components including the heat rejector (regardless of season), air vented and loop temperatures stabilized, each of the units will be ready for check, test and start up and for air and water balancing.

Ground Source Loop System Checkout

Once piping is completed between the unit pumping system and ground loop, final purging and charging of the loop is needed. A high pressure pump is needed to achieve adequate flow velocity in the loop to purge air and dirt particles from the loop itself. Antifreeze solution is used in most areas to prevent freezing. Flush the system adequately to remove as much air as possible; then pressurize the loop to a static pressure of 276-345 kPa (summer) or 345-517 kPa (winter). This is normally adequate for good system operation. Loop static pressure may decrease soon after initial installation, due to pipe expansion and loop temperature change. Run the unit for at least 30 minutes after the system has been completely purged of air. It may be necessary to adjust static loop pressure (by adding water) after the unit has run for the first time. Loop static pressure will also fluctuate with the seasons. Pressures will be higher in the winter months than during the cooling season. This fluctuation is normal and should be considered when charging the system initially.

Ensure the pump provides adequate flow through the unit by checking pressure drop across the heat exchanger. Usually 0.042-0.054 L/s per kW of cooling capacity is recommended in earth loop applications.

Electrical Data

Electrical

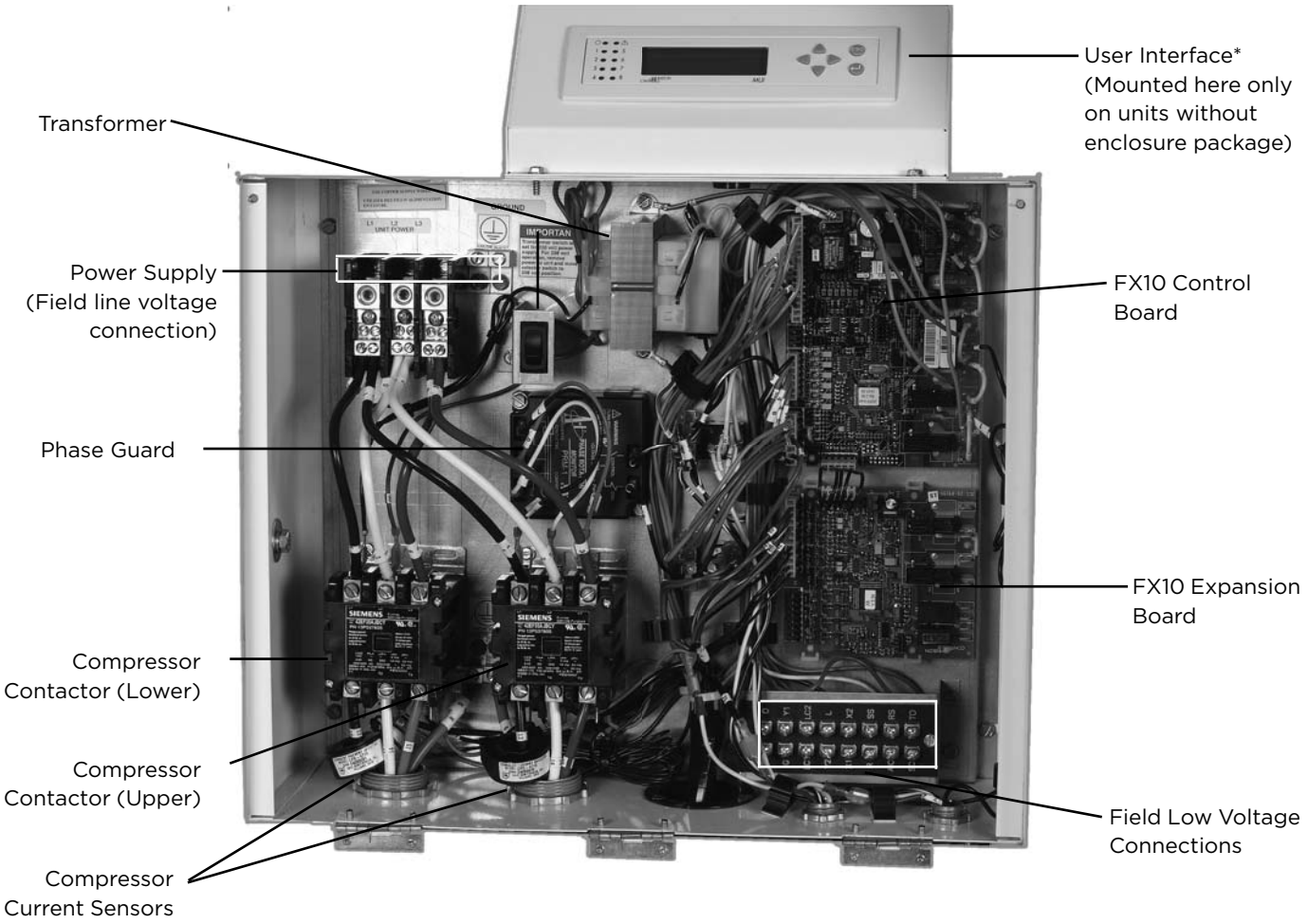
Be sure the available power is the same voltage and phase as that shown on the unit serial plate. Line and low voltage wiring must be done in accordance with local codes or the 17th Edition IEE Wiring Regulations, whichever is applicable. Refer to the Electrical Data table for wire and fuse or circuit breaker sizing information.

Model	Rated Voltage	Voltage Min/Max	Compressor*			Power Factor**	Total Unit FLA	Min Circ Amp	Max Fuse/ HACR
			MCC	RLA	LRA				
020	380-420/50/3	342/462	13.0	8.3	70.0		16.6	18.7	25
025	380-420/50/3	342/462	15.0	9.6	70.0		19.2	21.6	30
030	380-420/50/3	342/462	16.5	10.6	74.0		21.1	23.8	30
035	380-420/50/3	342/462	19.0	12.2	87.0		24.3	27.4	35
045	380-420/50/3	342/462	19.0	12.2	110.0	0.74	24.3	27.4	35
050	380-420/50/3	342/462	25.0	16.0	110.0	0.74	32.0	36.0	50
060	380-420/50/3	342/462	27.0	19.2	140.0	0.73	34.6	38.9	60
090	380-420/50/3	342/462	39.0	25.0	173.0	0.73	49.9	56.2	80
130	380-420/50/3	342/462	67.0	42.9	250.0	0.72	85.8	96.5	125

* - MCC, RLA, & LRA rating per compressor. Breaker & FLA sized for both compressors. 1/18/12

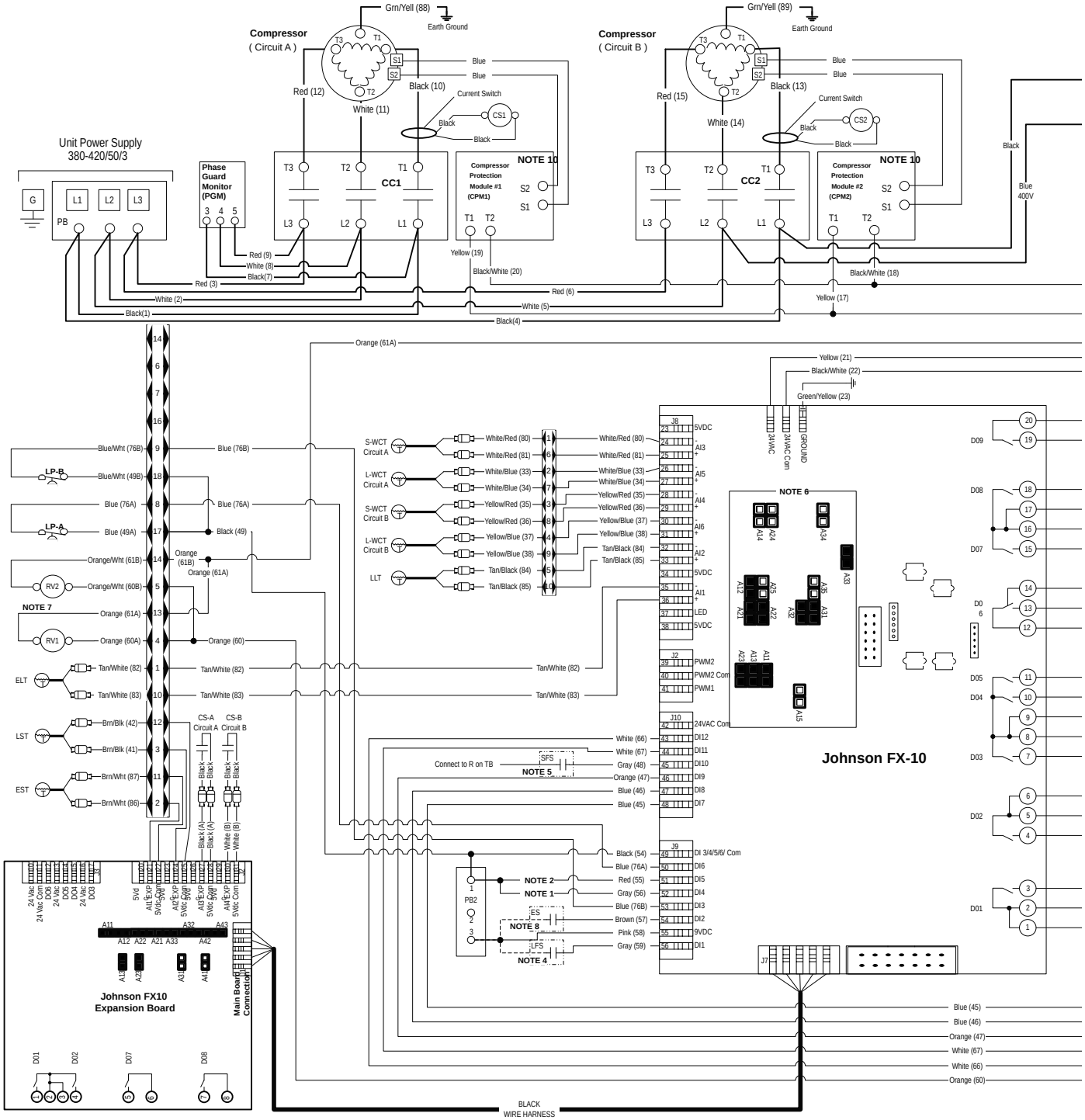
** - Power Factor at B0/W35 rating condition.

Figure 6: Control Box



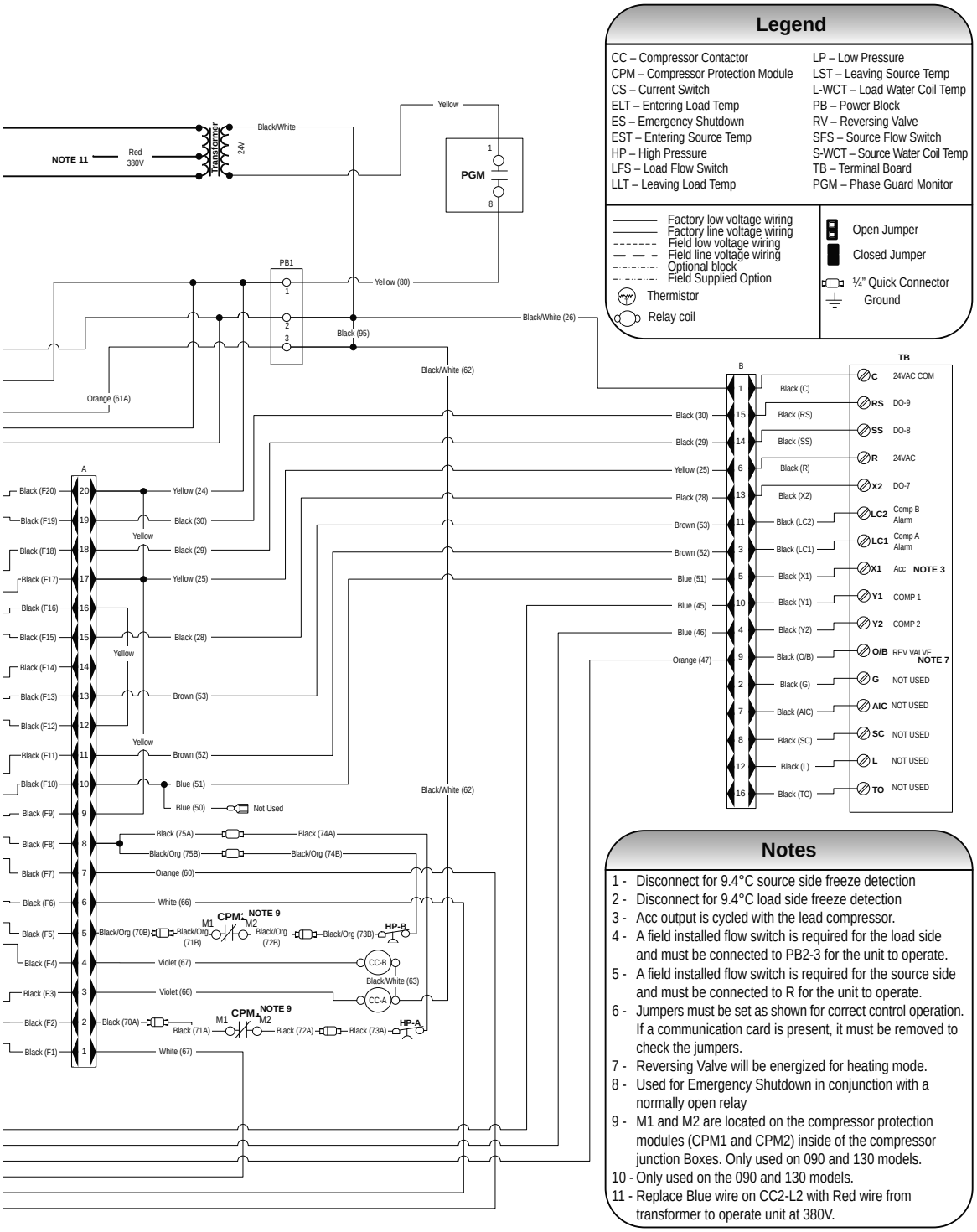
Wiring Schematic

380-420/50/3



Wiring Schematic cont.

380-420/50/3 cont.



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Field Wiring and Control Setup

Figure 8a & 8b - High Voltage Connections

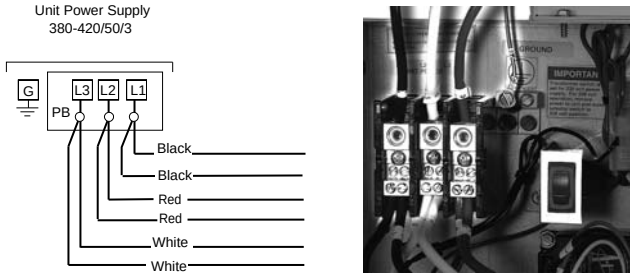
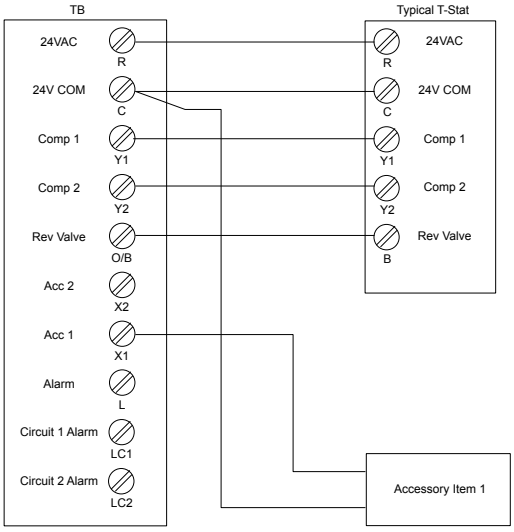
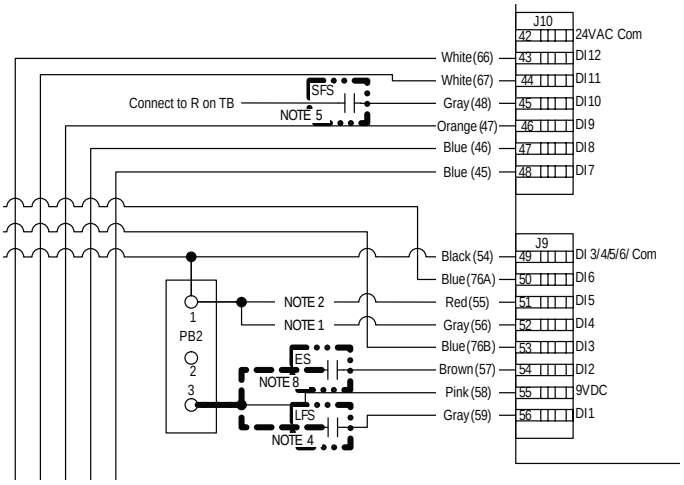


Figure 9 - Low Voltage Connections



NOTES:
1) Acc Output 1 is cycled with the lead compressor
2) Acc Output 2 is cycled with the lag compressor

Figure 10 - Wiring Schematic



Line Voltage

High Voltage Connections

Connect power wiring as shown in Figure 8a and 8b.

Low Voltage Operation

Thermostat/Controller (Aquastat)

A two-stage 24 VAC thermostat or liquid controller (field supplied) must be used to turn the reversible chiller on or off, and to switch it from cooling to heating if necessary. Multiple chillers in the same bank must be controlled from one thermostat/controller (must be isolation relays for multiple unit applications).

Low Voltage Connections

Connect low voltage thermostat wiring as shown in Figure 9. Connections shown are for typical thermostat. Actual connections may vary with specific device used.

NOTE: If a separate transformer is used to supply a Y1, Y2, or B signal to the unit controls, isolation relays must be used.

CAUTION: Use only copper conductors for field installed wiring. Terminals in the unit are not designed for other types of conductors.

WARNING: All wiring must comply with local and state codes. Disconnect the power supply before beginning to wire to prevent electrical shock or equipment damage.

NOTE: Accessory 1 output is selectable as normally open or normally closed using the unit display. Normally closed is the factory default setting.

Source Flow Switch (SFS)

Unit is factory shipped with no connections on Flow Switch pins J10-45 (entering). If flow proving switch is required, hook up as shown in Fig. 10 and Note 5. The unit will not operate with out a flow proving switch installed.

Load Flow Switch (LFS)

Unit is factory shipped with no connections on Flow Switch pins J9-56 (leaving). If flow proving switch is required, hook up as shown in Fig. 10 and Note 4. The unit will not operate with out a flow proving switch installed.

ATTENTION: Flow Switches must be installed before unit will operate!

Field Wiring and Control Setup cont.

Accessory Relay Setup

The accessory output set to “close” upon Y1 compressor call (compressor is delayed 90 sec. after Y1) but can be set to “open” with Y1.

To change ACC1 or ACC2: (ACC1 shown)

- On FX10 control using the left and right arrow keys, scroll to “PASSWORD” menu (password “5667”)
- Once you have entered the password scroll to “MAINT” menu.
- Using up and down keys, scroll to “Acc 1 Sel” hit “ENTER” and “ON Comp” begins flashing
- Using up and down keys, select “ON Comp” for actuation with Y1 Call or “OFF Comp” for deactivation with Y1

Lead/Lag Selection

Compressor Lead/Lag Selection is factory set to “ON” but can be set to “OFF”.

To change Lead/Lag On/Off:

- On FX10 control using the left and right arrow keys, scroll to “MAINT” menu
- Using up and down keys, scroll to “LEAD/LAG SELECT” hit “ENTER” and “OFF” begins flashing
- Using up and down keys, select “ON” for activation or “ OFF” for deactivation

°F or °C - Unit of Measure

Degrees Fahrenheit is factory set, however degrees Celsius can be selected using the following procedure:

To Change Unit of Measure:

- On FX10 control using up and down keys, scroll to “SETTINGS”
- Using up and down keys, scroll to “UNIT OF MEASURE” hit “ENTER” and “UNIT OF MEASURE” begins flashing
- Using up and down keys, select “F” for degrees Fahrenheit or “C” for degrees Celsius

Other Field Options

Other field selectable options are available as shown in the maintenance menu on page 20 of the FX10 control using a similar procedure as shown in the above examples. These would include thermostat enabling, and emergency shutdown. See page 20 for details.

DDC Operation & Connection

Consult your factory representative for application details.

Unit Startup

Verify the following:

- High voltage is correct and matches nameplate
- Fuses, breakers and wire size are correct
- Low voltage wiring is complete
- Piping is complete and the water system has been cleaned and flushed
- Air is purged from closed loop system
- Isolation valves are open and water control valves or loop pumps are wired
- Service/access panels are in place
- Unit controls are in “off” position
- Flow switches are installed and ready or wires are jumpered
- Freeze detection setpoints have been set in the microprocessor

WARNING: Verify ALL water controls are open and allow water flow PRIOR to engaging the compressor. Failure to do so can result in freezing the heat exchanger or water lines causing permanent damage to the unit.

Startup Steps

- Set thermostat control above cooling setpoint.
- Set thermostat control in cooling mode.
- Slowly reduce the control setting until both the compressor and water control valve/loop pumps are activated. Verify that the compressor is on and that the water flow rate is correct by measuring pressure drop through the heat exchanger and comparing to the Pressure Drop table. Check for correct rotation of scroll compressors. Switch any two power leads at the L1, L2, and L3 line voltage termination block if incorrect.
- Perform a cooling capacity test by multiplying L/s x ΔT x 4.1 (antifreeze/water). Use 4.2 for 100% water. Check capacity against catalog data at same conditions.
- Set control to “OFF” position.
- Leave unit “OFF” for approximately five (5) minutes to allow pressure to equalize.
- Adjust control below heating setpoint.
- Set control in “HEAT” position mode.
- Slowly increase the control setting until both compressor and water control valve/loop pumps are activated. The reversing valve should be heard changing over.
- Perform a heating capacity test by multiplying L/s x ΔT x 4.1 (antifreeze/water). Use 4.2 for 100% water. Check capacity against catalog data at same conditions.
- Check for vibrations, noise and water leaks.
- Set system to maintain desired setpoint.
- Instruct the owner/operator of correct control and system operation.

Envision Controls - FX10

FX10 Advanced Control Overview

- The Johnson Controls FX10 board is specifically designed for commercial heat pumps and provides control of the entire unit as well as input ports for Open N2, LonTalk, BACnet (MS/TP @ 19,200 Baud Rate) communication protocols as well as an input port for a user interface. The user interface can be used to aid in diagnostics and unit setup and is standard on all NKW chillers. A 16-pin low voltage terminal board provides terminals for common field connections. The FX10 Control provides:
- Operational sequencing
- High and low-pressure switch monitoring
- General lockout
- Advanced Freeze Detection Temperature Sensing
- Lockout mode control
- Emergency shutdown mode
- Random start and short cycle protection

Short Cycle Protection

Allows a minimum compressor "off" time of five minutes and a minimum "on" time of two minutes.

Random Start

A delay of 1 to 120 seconds is generated after each power-up to prevent simultaneous startup of all units within a building after the release from an unoccupied cycle or power loss.

Emergency Shutdown

A field-applied dry contact can be used to place the control into emergency shutdown mode. During this mode, all outputs on the board are disabled.

Freeze Detection Temperature Limit

Field selectable for -9.4° or 0.6°C

Installation Options

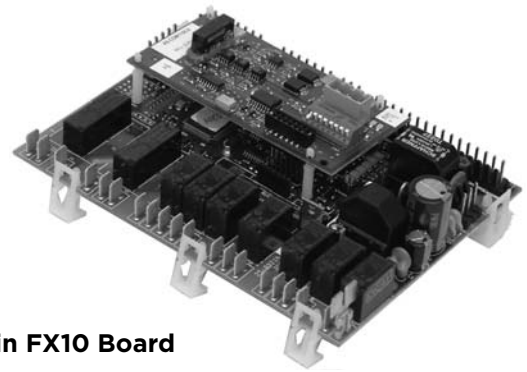
- Standalone controlled by aquastat
- Integrated into BAS by adding communication module

Accessory Outputs

Quantity 1. Cycled with the lead compressor. Field selectable for normally open (factory default) or normally closed through the building automation system or user interface.

User Interface

10 cm x 51 cm backlit LCD



Main FX10 Board

Optional Plug-in Communication Modules - (compatible with standard BAS protocols)

- Open N2
- LonTalk
- BACnet (MS/TP @ 19,200 Baud Rate)

Display

One local display is standard on all NKW units. Up to 2 displays, either 1 local and 1 remote, or 2 remote. (A 2-display configuration requires identical displays.) Local display can be up to 3 meters from the controller, power supply, and data communication. Remote display can be up to 300 meters from the controller. Remote display must be independently powered with data communication done via 3 pole shielded cable.

Control Timing & Fault Recognition Delays

Lead compressor "ON" delay (not applicable for single compressor models)	90 seconds
Minimum compressor "ON" time (except for fault condition)	2 minutes
Short cycle delay	5 minutes
Random start delay	0-120 seconds
High pressure fault	<1 second
Low pressure fault	30 seconds
Freeze detection fault	0-30 seconds
Low pressure fault bypass	2 minutes

Envision Controls - FX10 cont.

FX10 Microprocessor and BAS System

The FX10 is a microprocessor based control that not only monitors and controls the heat pump but also can communicate any of this information back to the building automation system (BAS). This means that not only does the control monitor the heat pump at the unit you can also monitor and control many of the features over the BAS. This clearly puts the FX10 in a class of its own.

The control will enumerate all fault conditions (HP, LP, LOC, and Freeze Detection) over a BAS as well as display them on a medium user interface (MUI). HP, LP, and Freeze Detection faults can all be reset over a BAS. A Loss Of Charge fault can not be reset or bypassed until the problem has been corrected. A MUI is invaluable as a service tool for the building service team.

The unit can be commanded to run by applying Y1, Y2, and B commands to the terminal board or commanded through a BAS. The control board is wired with quick connect harnesses for easy field change out of a faulty control board. An alarm history can be viewed through the MUI and will be held in memory until the unit is power cycled.

The FX10 control has unused analog and digital inputs for field installed items such as water temperature or current status switches. The control has unused binary and PWM outputs that can be commanded over the BAS for field use. A Medium User Interface (MUI) for control setup and advanced diagnostics is standard on all reversible chiller models.

Standard Features

- Anti Short Cycle
- High Pressure Protection
- Low Pressure Protection
- Freeze Detection
- Loss of Charge Detection
- Random Start
- Display for diagnostics
- Reset Lockout at disconnect or through BAS
- 1 Accessory outputs
- Optional BAS add-on controls
- Compressor Lead/Lag

DDC Operation & Connection

Other optional network protocol boards that can be added to the FX10 are:

- Johnson Control N2
- LonWorks
- BACnet

- MS/TP @ 19,200 Baud rate
- Limit devices to 30 on a single trunk line.

Control and Safety Feature Details

Emergency Shutdown

The emergency shutdown mode can be activated by a command from a facility management system or a closed contact on BI-2. The default state for the emergency shutdown data point is off. When the emergency shutdown mode is activated, all outputs will be turned off immediately and will remain off until the emergency shutdown mode is de-activated. The first time the compressor starts after the emergency shutdown mode has been de-activated, there will be a random start delay present.

Lockout Mode

Lockout mode can be activated by any of the following fault signals: refrigerant system high pressure, refrigerant system low pressure, or freeze detection. When any valid fault signal remains continuously active for the length of its recognition delay, the controller will go into fault retry mode, which will turn off both compressors. After the compressor short cycle delay, the compressors will attempt to operate once again. If three consecutive faults occur in 60 minutes, the unit will go into lockout mode, turning off the compressor(s), enabling the alarm output until the controller is reset. If the control faults due to the low pressure input being open during the pre-compressor startup check, the control will go into lockout mode immediately, disabling the compressors from starting and enabling the alarm output. The lockout condition can be reset by powering down the controller, by a command from the BAS, or by the holding the ESC and Return keys on the user interface for 5 seconds. **NOTE: See freeze detection section for more detail.**

Envision Controls - FX10 cont.

Reversible Chiller Advanced Freeze Detection System

The reversible chiller source and load heat exchangers are protected by a multi-sourced temperature logic strategy. The temperature logic is based upon the refrigerant temperature sensed as the refrigerant is about to enter the heat exchanger; while entering and leaving water temperatures are being used as correlating factors. The detection scheme is shown as basic and advanced algorithms.

Basic Freeze Detection Operation: "Comp1 or Comp2 Freeze" Alarm

This alarm can be triggered by one of two detection schemes.

Hard Limit Freeze Detection

If the refrigerant temperature drops below the freeze detection setpoint by 1°C, the associated compressor is locked out immediately regardless of any other factors and requires a manual reset. **NOTE: This Lockout produces a "Comp 1 or Comp 2 Freeze" error on the MUI display.**

Freeze Detection

The refrigerant temperature is compared to the freeze detection setpoint (-9.4°C [antifreeze] or 0.6°C [water] field selectable), and if the temperature falls below the setpoint for 30 continuous seconds, the associated compressor will be halted. This function becomes enabled after the first two minutes of compressor operation. Three such events in 60 minutes will trigger a compressor lockout that requires a manual reset. **NOTE: This Lockout produces a "Comp 1 or Comp 2 Freeze" error on the MUI display.**

In addition to the above:

Entering Water Temperature Influence

If the entering water temperature of the evaporative heat exchanger is within 10°F [5.6°C] of the freeze setpoint, the previously mentioned two minute delay will be eliminated. This allows the freeze detection to operate immediately when the compressor starts based on entering water temperature.

Leaving Water Temperature Influence

If the leaving water temperature of the evaporative heat exchanger is within 5.6°C of the freeze setpoint, the previously mentioned 30 second delay will begin to be proportionately reduced, ending at a 1 second delay when the leaving water temperature is 0.8°C above the freeze setpoint.

Dual Circuited Heat Exchanger Protection

A low temperature condition on either refrigerant circuit will prevent the start of both compressors. If the low temperature condition exists for 5 minutes when both compressors are off, a lockout is triggered for both compressors. However, if for instance both compressors are operating and circuit 1 experiences a refrigerant temperature below the freeze detection setpoint such that compressor 1 is halted, compressor 2 will not be halted as a result.

Advanced Freeze Detection Operation: "Pre Freeze" Alarm

Predictive freeze condition detection:

If the refrigerant temperature is within 4.0°C of the freeze detection setpoint, the predictive freeze detection algorithm is enabled, and if the logic determines that a freeze condition is likely to happen based on current conditions, the compressor of the involved refrigerant circuit is immediately stopped. Three (3) such events in 60 minutes will trigger a compressor lockout that requires a manual reset. In the absence of such a condition, the compressor is allowed to operate so that the refrigerant temperature may eventually be at the threshold of the freeze detection setpoint. **NOTE: This Lockout produces a "Pre Freeze" detection error on the MUI display.**

Capacity Limiting

If the leaving water temperature drops to 1.0°C above the freeze detection setpoint, the lead compressor is halted. When the leaving water temperature rises to 2.0°C above the freeze detection setpoint, it will be allowed to resume operation. This limiting is allowed to repeat indefinitely with no lockout or indication on the display.

If the leaving water temperature drops to the freeze detection setpoint, the lag compressor is halted. When the leaving water temperature rises to 1.0°C above the freeze detection setpoint, it will be allowed to resume operation. This limiting is allowed to repeat indefinitely with no lockout or indication on the display.

High Pressure

The high-pressure switch shall be a normally closed (NC) switch that monitors the systems refrigerant pressure. If the input senses the high-pressure switch is open it must disable the compressor output immediately and count the fault. The compressor minimum on time does not apply if the high-pressure switch opens. The compressor will not restart until the compressor short cycle time delay has been satisfied.

Envision Controls - FX10 cont.

Low Pressure

The low-pressure switch shall be a normally closed (NC) switch that monitors the systems refrigerant pressure. The control checks the input 15 seconds before compressor start up and then ignored for the first 2 minutes after the compressor output (BO-2) is enabled. If the switch is open continuously for 30 seconds during compressor operation the compressor output (BO-2) will be disabled. The compressor will not restart until the compressor short cycle time delay has been satisfied.

Alarm Outputs

The control has two alarm outputs, one for each compressor circuit. These 24VAC outputs are designated as LC1 (compressor 1) and LC2 (compressor2) on the low voltage terminal board.

Test Mode

By holding the ESC and down arrow keys on the MUI for 5 seconds will put the control into test mode. In test mode the random start delay and the compressor fixed on delay time will both be shortened to 5 seconds and the reversing valve will be allowed to cycle with out shutting down the compressor. If an MUI is connected to the control LED 8 will flash and the words "Test Mode Enabled" will be shown on the LCD display when the control is in test mode. Test mode will be disabled after a power cycle, 30 minute timeout, or by holding the ESC and Up arrow keys on the MUI.

Sequence of Operation

Power Fail Restart

When the controller is first powered up, the outputs will be disabled for a random start delay. The delay is provided to prevent simultaneous starting of multiple heat pumps. Once the timer expires, the controller will operate normally.

Random Start Delay

This delay will be used after every power failure, as well as the first time the compressor is started after the control exits the unoccupied mode or the emergency shutdown mode. The delay should not be less than 1 second and not longer than 120 seconds. If the control is in test mode the random start delay will be shortened to 5 seconds.

Lead Compressor Start Delay Time

The Lead Compressor Fixed On Delay Time will ensure that the lead compressor output is not enabled for 90 seconds after the control receives a call to start the compressor. This delay is adjustable from 30 – 300 seconds over a BAS or a MUI. If the control is in test mode the Lead Compressor Start Delay Timer will be shortened to 5 seconds.

Lag Compressor Start Delay Time

The Lag Compressor Fixed On Delay Time will ensure that the lag compressor output is not enabled for 120 seconds after the control receives a call to start the compressor. If the control is in test mode the Lag Compressor Start Delay Timer will be shortened to 5 seconds.

Compressor Minimum On Delay

The compressor minimum on delay will ensure that the compressor output is enabled for a minimum of two (2) minutes each time the compressor output is enabled. This will apply in every instance except in the event the high pressure switch is tripped or emergency shutdown then the compressor output will be disable immediately.

Compressor Minimum Off Delay Time

The compressor minimum time delay will ensure that the compressor output will not be enabled for a minimum of five (5) minutes after it is disabled. This allows for the system refrigerant pressures to equalize after the compressor is disabled.

Compressor Lead/Lag

Compressor lead/lag is a standard part of the FX10 control system. The unit is shipped from the factory with lead/lag enabled. Lead/lag can be activated through the unit mounted user interface.

Heating Cycle

The control will position the reversing valve for heating mode when there is a command on the O/B terminal on the terminal board. The compressors will be commanded by Y1 and Y2.

Cooling Cycle

The control will position the reversing valve for cooling mode when there is no command on the O/B terminal on the terminal board. The compressors will be commanded by Y1 and Y2.

MUI Alarm History Reporting

If a fault occurs the fault will be recorded in history for display on the medium user interface in the History Menu. Each fault type will be displayed in the history menu with a number between 0 and 3. A reading of 3+ will mean that fault has occurred more than three times in the past. The history menu can be cleared with a power cycle only. Alarm date and time are not included in the history.

Envision Controls - FX10 cont.

Inputs and Outputs Configuration

Field Selectable Options

Load and Source Freeze Detection Setpoint

The freeze detection setpoint input allows you to adjust the freeze detection setpoint for either the load or source sides of the heat pump. When the jumper is installed on BI-5 the load freeze detection setpoint is factory set for 0.6°C. When the jumper on BI-5 is removed the load freeze detection setpoint will be -9.4°C. When the jumper is installed on BI-4 the source freeze detection setpoint is factory set for 0.6°C. When the jumper on BI-4 is removed the source freeze detection setpoint will be -9.4°C. **NOTE: Piping circuit must be antifreeze protected to the set levels or the warranty will be voided.**

Accessory Output

The Accessory Output will be energized 90 seconds prior to the lead compressor output being energized. When both compressor outputs are turned off the accessory output will be deactivated immediately. This output is selectable for normally open or normally closed operation through the Medium User Interface or through the Building Automation System.

Control Accessories

- A99 Sensor
- MUI (LCD User interface) for diagnostics and commissioning
- MUIK3 - Panel Mount, Portable
- MUIK4 - Wall Mount

Sequence of Operation

Power Fail Restart

When the controller is first powered up, the outputs will be disabled for a random start delay time (See Section 4.2). The delay is provided to prevent simultaneous starting of multiple heat pumps. Once the timer expires, the controller will operate in the occupied mode until it is commanded to another mode by a facility management system or a remote thermostat. A restart status variable is available for indication of this occurrence.

Random Start Delay

This delay will be used after every power failure, as well as the first time the compressor(s) is started after the control exits the emergency shutdown mode. The default time period for the start delay will be random between 1 and 120 seconds.

Compressor Fixed On Delay Time

The Compressor Fixed On Delay Time will ensure that the compressor output is not enabled for (90) seconds after the control receives a call to start the compressor.

Compressor Minimum On Delay

The compressor minimum on delay will ensure that the compressor output(s) are enabled for a minimum of (2) minute each time the compressor output is enabled. This will apply in every instance except in the event the high-pressure switch is tripped or emergency shutdown, then the compressor output will be disabled immediately.

Compressor Short Cycle Delay Time

The compressor short cycle time delay will ensure that the compressor output will not be enabled for a minimum of (5) minutes after it is disabled. This allows for the system refrigerant pressures to equalize after the compressor is disabled.

Compressor Stage Lead Lag

The factory setup software, a facility management system, Service/Commissioning Tool, or a user interface can be used to select compressor lead lag option for the compressors. The factory setup software, a facility management system, Service/Commissioning Tool, or a user interface must also be used to select the number of run time hours the compressors will lead before being switched, the factory default will be 24 hours. The two compressors will still be staged depending on load when the lead lag option is enabled.

Heating Cycle

During the heating cycle, the reversing valves will be positioned for heating operation. The thermostat or aquastat will command the reversing valves “On” for heating. If the compressor short cycle time delay has been satisfied, the lead compressor will turn on after the accessory output has been enabled, the low pressure switches has been verified, and the fixed compressor start delay timer has been satisfied. When heating is no longer required, the compressor will be turned off immediately after the compressor minimum on delay has been satisfied. After the compressor output is turned off, it will remain off for the time specified in the compressor short cycle time delay. If the dual compressor option is selected, the compressors will be sequenced to maintain the heating setpoint. As the temperature drops below the heating setpoint and begins to operate in the heating proportional band, the first stage compressor will be activated. If the first stage compressor is not able to satisfy the heating demand, the second stage compressor will be activated by the thermostat or aquastat. The controller is allowed to operate the heat pump in the heating mode regardless of the outdoor air temperature.

Cooling Cycle

During the cooling cycle, the reversing valves will be positioned for cooling operation. The thermostat or aquastat will command the reversing valves “Off” for cooling. If the compressor short cycle time delay has been satisfied, the lead compressor will turn on after the accessory output has been enabled, the low pressure switches has been verified, and the fixed compressor start delay timer has been satisfied. When cooling is no longer required, the compressor will be turned off immediately after the compressor minimum on delay has been satisfied. After the compressor output is turned off, it will remain off for the time specified in the compressor short cycle time delay. If the dual compressor option is selected, the compressors will be sequenced to maintain the cooling setpoint. As the temperature drops below the cooling setpoint and begins to operate in the cooling proportional band, the first stage compressor will be activated. If the first stage compressor is not able to satisfy the cooling demand, the second stage compressor will be activated by the thermostat or aquastat. The controller is allowed to operate the heat pump in the cooling mode regardless of the outdoor air temperature.

Inputs and Outputs Configuration

DUAL STAGE WW			
Input Name	**Input**	**Output Name**	**Output**
Entering Load Water Temperature	AI 1	Compressor 1	DO1
Leaving Load Water Temperature 1	AI 2	Compressor 2	DO2
Source Heating Freeze Detection 1	AI 3	Reversing Valve	DO3
Source Heating Freeze Detection 2	AI 4	Accessory	DO4
Load Cooling Freeze Detection 1	AI 5	Compressor 1 Alarm	DO5
Load Cooling Freeze Detection 2	AI 6	Compressor 2 Alarm	DO6
		Network Output	DO7
Load Flow Proving Switch	DI 1	Network Output	DO8
Emergency Shutdown	DI 2	Network Output	D09
Stage 2 Low Pressure	DI 3		
Source Htg Freeze Detection Select: -1.1°C	DI 4	Future	PWM1
Load Htg Freeze Detection Select: -1.1°C	DI 5	Future	PWM2
Stage 1 Low Pressure	DI 6		
Thermostat Y1	DI 7		
Thermostat Y2	DI 8		
Thermostat B	DI 9		
Source Flow Proving Switch	D10		
Stage 1 High Pressure	DI11		
Stage 2 High Pressure	DI12		
XP10 Expansion Card			
Input Name	**Input**	**Output Name**	**Output**
Entering Source Water Temperature	AI 1	Unused	DO 1
Leaving Source Water Temperature 1	AI 2	Unused	DO 2
Current Switch 1 - Compressor 1	AI 3	Unused	DO 3
Current Switch 2 - Compressor 2	AI 4	Unused	DO 4

Networking Protocol

The Johnson FX10 Board is specifically designed for commercial heat pumps and provides control of the entire unit as well as input ports for Open N2, Lontalk and BACnet communications protocols as well as an input port for a user interface.

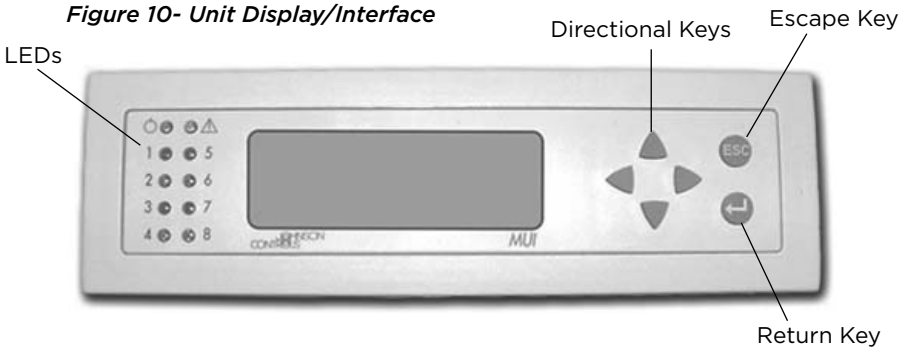
Unit Display and Interface

The Unit Display allows the user to view entering and leaving water temperatures, freeze detection readings, inputs and outputs, and allows the user enable and disable certain control functions through the various menus. The interface also displays all faults on the LCD once the unit has locked out to aid in diagnostics.

There are 10 LED indicator lights that indicate the following:

- ◯ Power - Shows that the FX processor is operational
- ⚠ Alarm - Lights when there is a lock-out or faulty freeze detection sensor
- 1 - Flashing shows Compressor 1 is running
- 2 - Flashing shows Compressor 2 is running
- 3 - On shows Compressor 2 is lead
- 4 - On shows Reversing valve in cool
- 8 - On shows unit in 'Test' mode

Figure 10- Unit Display/Interface



MUI Menu Navigation for NKW Reversible Chiller

Welcome

Info Temp Stat Outputs Settings Alarm ALM_History Password Maint

Info

WFI
Dual Stage
Reversible Chiller
PRODCWWE-06
MM/DD/YY

Temp

Temperatures	
Enter Load	25.1°C
Leave Load	10.6°C
Enter Source	21.1°C
Leave Source	18.9°C
Source Frz1	25.4°C
Source Frz2	-1.1°C
Load Frz1	-1.1°C
Load Frz2	-1.1°C
Src Frz Setpt	-1.1°C
LD Frz Setpt	-1.1°C

Stat

Status	
Unit Status	Auto
Y1 Status	OFF
Y2 Status	OFF
B Status	OFF
Emerg Shutdown	OFF
Current Sens1	OFF
Current Sens2	OFF
Load Flow	OFF
Src Flow	OFF
Low Pres1	ON
Hi Pres1	OFF
Low Pres2	ON
Hi Pres2	ON
Comp1 Low Limit	NML
Comp2 Low Limit	NML

Outputs

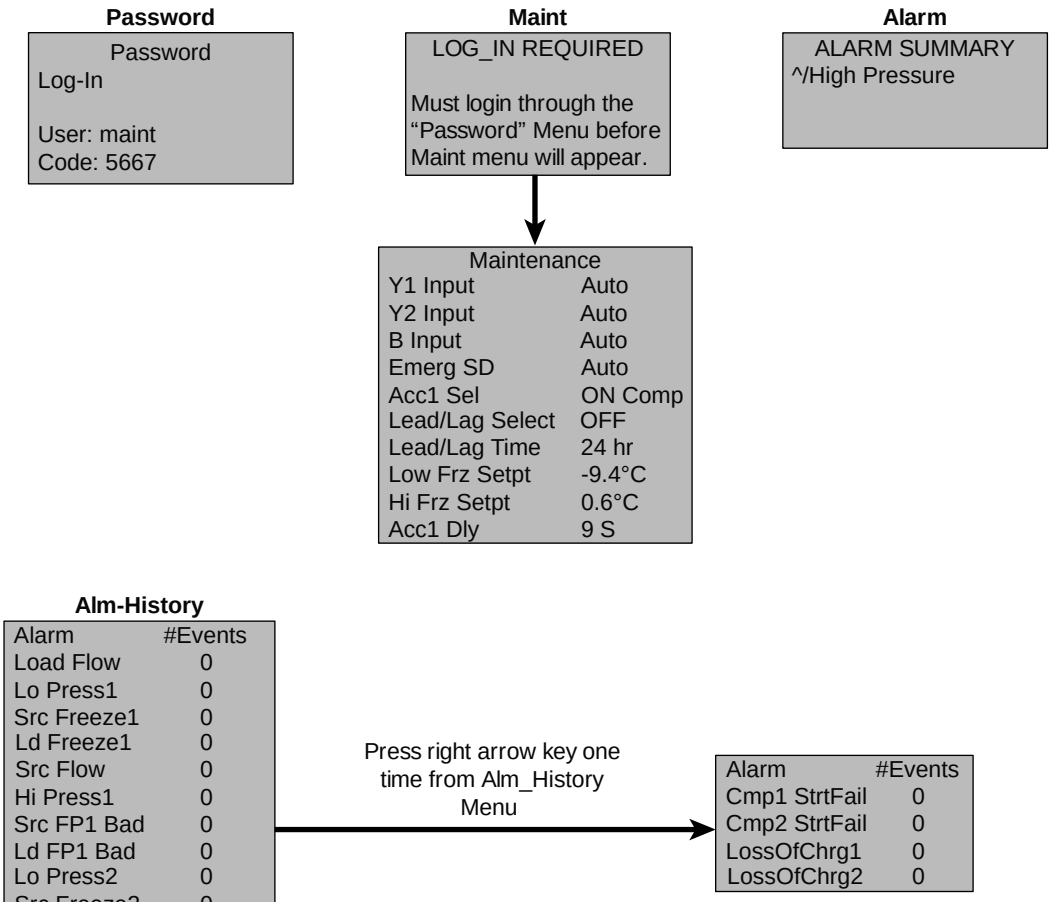
Outputs	
Comp1 Status	ON
Comp2 Status	OFF
Lead	Comp1
Acc1 Status	OFF
Stg1 Status	Normal
Stg2 Status	Normal
BO7	OFF
BO8	OFF
BO9	OFF
EXPB01	OFF
EXPB02	OFF
EXPB07	OFF
EXPB08	OFF

Settings

Settings	
Unit of Measure	C

Unit Display and Interface cont.

MUI Menu Navigation for NKW Reversible Chiller cont.



NOTE: This FX10 application implements an **alarm history** which is reset only by cycling power. This history shows on the Alm-History page. Any alarm showing 2+ events has occurred more than 2 times.

Alarm lock-outs are reset by cycling power, by pressing the "ESC" and Return ↵ keys simultaneously for a minimum of 15 seconds, or by commanding the nviAlarmReset over the BAS network.

Test mode is enabled by holding the 'Esc' and Down Arrow simultaneously for a minimum of 15 seconds and releasing. Test mode times out after 30 minutes, and may also be ended by pressing 'ESC' and Up Arrow simultaneously and releasing. Test Mode bypasses the On Delay (90 sec) and Random Start timers for quicker troubleshooting. It also allows cycling the reversing valve without compressor shutdown.

Unit Display and Interface cont.

Menu and Menu Contents

Alarm

- Displays unit alarms until the unit has been reset (Unit alarms can be reset by holding both the Escape (ESC) key and Return (←) key for five seconds or by power cycling the unit.)

Alarm History

If a fault occurs the fault will be recorded in history viewable on the unit mounted display. Each fault type will be displayed in the history menu with a number between 0 and 3. A reading of 3+ means that the fault has occurred more than 3 times in the past. The history menu can be cleared with a power cycle only. Alarm date and time are not included in the history.

Unit Alarms

Unit alarms are shown on the display once the unit has locked out.

Load Flow – Load flow switch is not closed

- The load flow switch must be closed prior to either compressor starting and must remain closed for the entire run time of the compressor(s).

Low Pressure 1 – Compressor Circuit 1 Low Pressure switch

- The low pressure switch is checked before compressor start up and is monitored during compressor operation.

Src FP 1 Temp Low – Source Freeze Detection Sensor 1

- The source freeze detection sensor on compressor circuit 1 has reached its setpoint.

Src FP 1 Sensor Bad

- The sensor for Source freeze detection on compressor circuit 1 is unreliable or is not reading.

LD FP 1 Temp Low – Load Freeze Detection Sensor 1

- The load freeze detection sensor on compressor circuit 1 has reached its setpoint.

LD FP 1 Sensor Bad

- The sensor for Load freeze detection on compressor circuit 1 is unreliable or is not reading.

Source Flow – Source Flow switch is not closed

- The source flow switch must be closed prior to either compressor starting and must remain closed for the entire run-time of the compressor(s).

High Pressure 1 – Compressor Circuit 1 High Pressure Switch

- If high pressure switch 1 opens at any time during compressor 1 run time the compressor will be shut down immediately.

Low Pressure 2 - Compressor Circuit 2 Low Pressure Switch

- The low pressure switch is checked before compressor start up and is monitored during compressor operation.

Src FP 2 Temp Low - Source Freeze Detection Sensor 2

- The source freeze detection sensor on compressor circuit 2 has reached its setpoint.

Src FP 2 Sensor Bad

- The sensor for Source freeze detection on compressor circuit 2 is unreliable or is not reading.

LD FP 2 Temp Low - Load Freeze Detection Sensor 2

- The load freeze detection sensor on compressor circuit 2 has reached its setpoint.

LD FP 2 Sensor Bad

- The sensor for Load freeze detection on compressor circuit 2 is unreliable or is not reading.

High Pressure 2 - Compressor Circuit 2 High Pressure Switch

- If high pressure switch 2 opens at any time during compressor 2 run time the compressor will be shut down immediately.

Comp Start Failure – Compressor Start Failure

- If either compressor fails to start when the contactor pulls in the compressor current switch will cause that compressor to be locked out after 2 retries. The other compressor will continue to operate normally in this condition.

Reference Calculations

Heating Calculations:	Cooling Calculations:
$LWT = EWT - \frac{HE}{L/s \times 4.2^*}$	$LWT = EWT + \frac{HR}{L/s \times 4.2^*}$

NOTE: * When using water. Use 4.1 for 15% methanol/water or Environol solution.

Operating Parameters

Heating Mode

Entering Load Temp °C	Entering Source Temp °C	Suction Pressure kPa	Discharge Pressure kPa	Superheat °C	Subcooling °C
15	0	517-690	1379-1482	6-7	6-7
	10	690-862	1379-1482	7-8	4-7
	20	862-1034	1482-1586	8-10	4-7
	30	1034-1138	1586-1758	14-17	4-7
25	0	517-690	1965-2069	6-7	6-7
	10	690-862	2069-2172	7-8	4-7
	20	862-1034	2172-2275	8-10	4-7
	30	1034-1138	2275-2379	14-17	4-7
35	0	586-758	2517-2620	6-7	4-6
	10	758-931	2655-2758	7-8	4-6
	20	931-1138	2758-2861	8-10	2-4
50	10	758-931	3344-3448	7-8	4-6
	20	931-1138	3448-3551	8-10	2-4

NOTE: Operating data based on normal conditions with 0.2 L/s per kW for the load and source. 9/20/10

Cooling Mode

Entering Load Temp °C	Entering Source Temp °C	Suction Pressure kPa	Discharge Pressure kPa	Superheat °C	Subcooling °C
10	0	552-621	965-1207	8-11	2-3
	10	621-690	1379-1620	6-8	3-5
	20	690-758	1724-1965	6-8	5-7
	30	690-827	2275-2517	4-7	7-8
	45	758-896	2965-3206	4-7	8-11
20	0	552-621	1034-1276	8-11	2-3
	10	621-690	1448-1689	6-8	3-5
	20	690-758	1793-2034	6-8	5-7
	30	758-827	2344-2586	4-7	7-8
	45	758-965	3034-3344	4-7	8-11
30	0	552-621	1034-1276	8-11	2-3
	10	621-690	1448-1689	6-8	3-5
	20	690-758	1793-2034	6-8	5-7
	30	758-827	2344-2586	4-7	7-8
45	0	621-690	1103-1345	22-25	2-3
	10	758-896	1517-1758	17-22	3-5

NOTE: Operating data based on normal conditions with 0.2 L/s per kW for the load and source. 9/20/10

Pressure Drop

Model	L/s	Pressure Drop				
		0°C kPa	10°C kPa	20°C kPa	30°C kPa	45°C kPa
020	0.8	5.5	4.1	2.8	1.4	0.7
	1.0	11.7	10.3	9.0	6.9	5.5
	1.5	18.6	16.5	15.2	13.1	10.3
	2.0	26.2	24.8	22.8	21.4	16.5
025	1.0	7.6	6.2	4.8	3.2	2.3
	1.5	15.2	13.8	12.4	10.3	8.3
	1.8	23.5	22.0	20.1	18.5	14.4
	2.3	33.7	32.2	30.3	28.8	22.8
030	1.0	6.9	5.5	3.4	2.1	0.7
	1.5	17.2	15.9	13.8	12.4	9.0
	2.0	26.2	24.8	22.8	21.4	16.5
	2.5	38.6	37.2	35.2	33.8	26.9
035	1.0	4.8	2.8	2.1	0.7	0.7
	2.0	10.3	9.0	8.3	6.9	6.2
	2.5	21.4	19.3	17.2	15.2	13.1
	3.0	36.1	33.1	29.2	26.2	22.8
045	1.5	7.6	6.2	5.5	4.1	3.4
	2.0	18.6	17.2	15.2	13.1	11.7
	3.0	32.4	29.6	26.2	23.4	20.3
	4.0	50.8	46.9	41.1	37.2	32.4
050	1.5	4.8	3.4	2.1	1.4	0.7
	2.5	9.7	7.6	6.2	4.8	3.4
	3.5	17.2	15.2	13.1	11.0	9.0
	4.5	36.0	32.2	29.0	25.8	21.9
060	2.0	6.2	4.1	2.8	1.4	0.7
	3.0	15.2	13.1	11.0	9.0	6.9
	4.0	29.6	26.2	23.4	20.7	17.2
	5.0	44.7	40.0	36.3	32.6	27.9
090	3.0	10.3	9.0	8.3	7.2	6.6
	4.5	24.8	23.4	22.1	20.7	19.3
	6.0	30.3	28.3	26.2	24.1	22.8
	7.5	40.0	37.9	35.9	33.8	31.7
130	4.5	9.7	8.3	6.9	5.5	4.8
	7.0	23.4	22.1	20.7	18.6	17.2
	8.5	34.5	33.1	31.0	29.0	26.9
	11.5	53.1	51.7	48.3	46.2	42.7

2/12/12

Compressor Resistance

Model	380-420
020	2.330
025	2.330
030	2.270
035	2.088
045	1.280
050	1.280
060	1.110
090	0.833
130	0.450

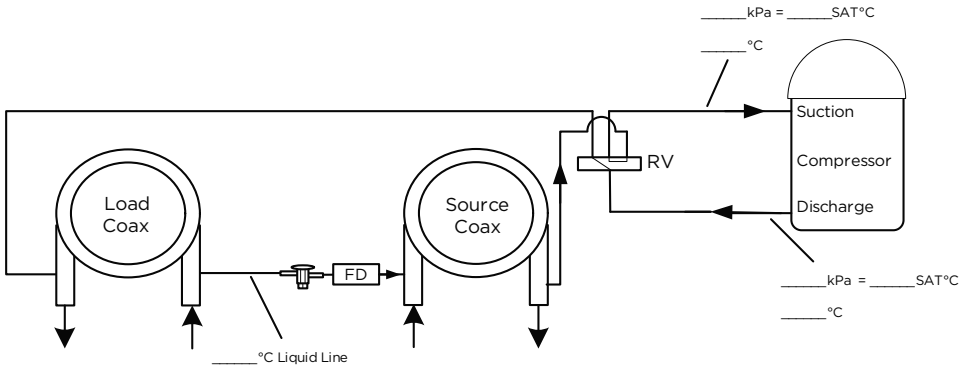
Values in ohms 9/20/10

Heat of Extraction/Rejection Data

Model	Source L/s	Load L/s	EST ºC	Heat Of Extraction, HE (kW)				Heat of Rejection (HR) in kW			
				15°C	25°C	40°C	50°C	10°C	20°C	30°C	45°C
020	1.5	1.5	0	17.6	16.1	13.7	12.2	33.4	44.7	56.0	73.0
			10	23.4	21.7	19.3	17.7	34.0	45.8	57.7	75.5
			20	29.1	27.4	24.8	23.0	32.9	44.0	55.1	
			30	32.3	30.7	28.3		30.9	41.1	51.3	
			45					28.1	37.4		
025	1.8	1.8	0	20.9	18.9	15.9	13.9	40.9	54.6	68.2	88.7
			10	27.8	25.7	22.6	20.5	41.7	56.0	70.2	91.6
			20	34.7	32.4	29.1	26.8	40.3	53.7	67.0	
			30	38.5	36.4	33.3		37.9	49.9	61.9	
			45					34.4	45.4		
030	2.0	2.0	0	22.9	20.8	17.7	15.6	46.2	61.8	77.4	100.8
			10	30.5	28.3	25.1	22.9	47.1	63.5	79.8	104.3
			20	38.2	35.8	32.3	30.0	45.7	60.9	76.2	
			30	42.4	40.2	37.0		43.0	56.8	70.7	
			45					39.1	51.8		
035	2.5	2.5	0	25.7	23.2	19.5	17.0	50.8	68.0	85.1	110.9
			10	34.1	31.5	27.5	24.9	51.8	69.7	87.7	114.6
			20	42.6	39.7	35.4	32.5	50.1	66.9	83.6	
			30	47.3	44.5	40.5		47.1	62.2	77.2	
			45					42.8	56.6		
045	3.0	3.0	0	31.0	28.1	23.9	21.0	62.8	83.9	105.1	136.8
			10	41.2	38.2	33.8	30.8	64.0	86.1	108.2	141.4
			20	51.5	48.3	43.5	40.3	62.0	82.7	103.3	
			30	57.1	54.1	49.7		58.4	77.3	96.1	
			45					53.1	70.4		
050	3.5	3.5	0	37.8	33.8	27.7	23.7	66.8	92.1	117.3	155.1
			10	50.1	45.7	39.2	34.8	71.7	99.3	126.9	168.2
			20	62.4	57.6	50.4	45.6	69.4	95.2	121.0	
			30	69.1	64.5	57.6		65.3	88.6	112.0	
			45					59.3	80.7		
060	4.0	4.0	0	44.0	39.7	33.2	28.9	81.4	108.2	134.9	175.1
			10	58.3	53.7	46.8	42.2	87.4	116.8	146.1	190.1
			20	72.8	67.7	60.2	55.1	84.8	112.2	139.7	
			30	80.6	75.9	68.7		80.0	104.9	129.8	
			45					73.0	95.9		
090	6.0	6.0	0	61.7	55.6	46.6	40.5	113.7	142.1	170.5	213.1
			10	82.1	75.7	66.1	59.8	122.0	153.4	184.8	231.9
			20	102.6	95.7	85.3	78.4	118.3	147.8	177.2	
			30	113.7	107.3	97.6		111.5	138.4	165.4	
			45					101.6	126.9		
130	8.5	8.5	0	105.5	93.6	75.9	64.0	168.9	196.5	224.1	265.4
			10	138.8	126.1	107.1	94.4	176.4	206.5	236.5	281.5
			20	172.2	158.4	137.7	123.9	170.5	198.9	227.2	
			30	190.6	177.3	157.3		160.0	186.0	211.9	
			45					144.8	170.0		

2/12/12

Heating Cycle Analysis

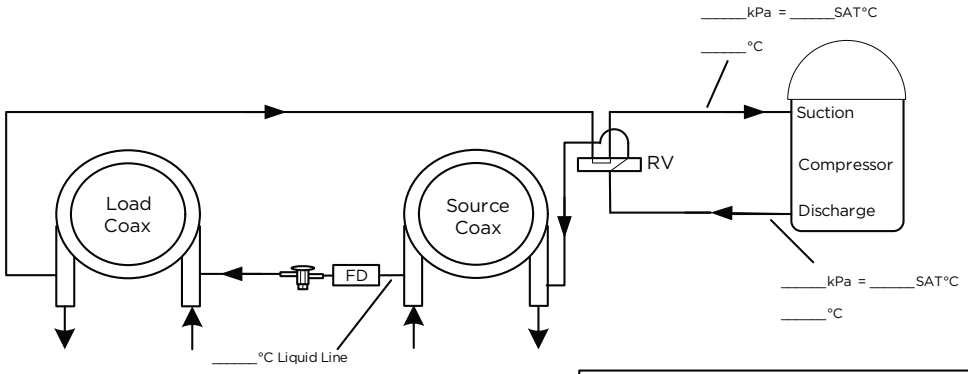


Unit Amp Draw	
Line Voltage	
Loop:	Open ____ Closed
Subcooling	
Superheat	

Entering Source Water	____ °C
Entering Water Pressure	____ kPa
Leaving Source Water	____ °C
Leaving Water Pressure	____ kPa
Entering Load Water	____ °C
Entering Load Water Pressure	____ kPa
Leaving Load Water	____ °C
Leaving Load Water Pressure	____ kPa

NOTE: Do not attach refrigerant gauges unless a problem is suspected!

Cooling Cycle Analysis



Unit Amp Draw	
Line Voltage	
Loop:	Open ____ Closed
Subcooling	
Superheat	

Entering Source Water	____ °C
Entering Water Pressure	____ kPa
Leaving Source Water	____ °C
Leaving Water Pressure	____ kPa
Entering Load Water	____ °C
Entering Load Water Pressure	____ kPa
Leaving Load Water	____ °C
Leaving Load Water Pressure	____ kPa

NOTE: Do not attach refrigerant gauges unless a problem is suspected!

Envision NKW Startup and Troubleshooting Form

Company Name: _____ Company Phone No: _____
Technician Name: _____ Date: _____
Model No: _____ Serial No: _____
Owner's Name: _____ Open or Closed Loop: _____
Installation Address: _____ Installation Date: _____

Check One
❑ Start up/Check-out for new installation ❑ Troubleshooting Problem: _____

1. FLOW RATE IN L/s (SOURCE SIDE HEAT EXCHANGER)

Water In Pressure:	a._____	kPa
Water Out Pressure:	b._____	kPa
Pressure Drop = a - b	c._____	kPa
Convert Pressure Drop to Flow Rate (refer to *Pressure Drop* table)	d._____	L/s

2. TEMPERATURE RISE OR DROP ACROSS SOURCE SIDE HEAT EXCHANGER

	COOLING		HEATING	
Water In Temperature:	e._____	°C	e._____	°C
Water Out Temperature:	f. _____	°C	f. _____	°C
Temperature Difference:	g._____	°C	g._____	°C

3. TEMPERATURE RISE OR DROP ACROSS LOAD SIDE HEAT EXCHANGER

	COOLING		HEATING	
Water In Temperature:	h._____	°C	h._____	°C
Water Out Temperature:	i. _____	°C	i. _____	°C
Temperature Difference:	j. _____	°C	j. _____	°C

4. HEAT OF REJECTION (HR) / HEAT OF EXTRACTION (HE) CALCULATION

HR or HE = Flow Rate x Temperature Difference x Brine Factor*
d. (above) x g. (above) x 4.1 for Methanol or Environol, 4.2 for water*
Heat of Extraction (Heating Mode) = _____ kW/hr
Heat of Rejection (Cooling Mode) = _____ kW/hr
Compare results to Capacity Data Tables

Note: Steps 5 through 8 need only be completed if a problem is suspected

5. WATTS

	COOLING		HEATING		HYDRONIC	
Volts:	m._____	VOLTS	m._____	VOLTS	m. _____	VOLTS
Total Amps (Comp. + Fan):	n. _____	AMPS	n. _____	AMPS	n. _____	AMPS
Watts = m. x n. x 0.85	o. _____	WATTS	o. _____	WATTS	o. _____	WATTS

6. CAPACITY

Cooling Capacity = HR. - o.	p. _____	kW/hr
Heating Capacity= HE. + o.	p. _____	kW/hr

7. EFFICIENCY

Cooling EER = p. / o.	q. _____	COP
Heating COP = p. / o.	q. _____	COP

8. SUPERHEAT (S.H.) / SUBCOOLING (S.C.)

COOLING	COOLING		HEATING		HYDRONIC	
Suction Pressure:	r. _____	kPa	r. _____	kPa	r. _____	kPa
Suction Saturation Temperature:	s. _____	°C	s. _____	°C	s. _____	°C
Suction Line Temperature:	t. _____	°C	t. _____	°C	t. _____	°C
Superheat = t. - s.	u. _____	°C	u. _____	°C	u. _____	°C
Head Pressure:	v. _____	kPa	v. _____	kPa	v. _____	kPa
High Pressure Saturation Temp.:	w. _____	°C	w. _____	°C	w. _____	°C
Liquid Line Temperature*:	x. _____	°C	x. _____	°C	x. _____	°C
Subcooling = w. - x.	y. _____	°C	y. _____	°C	y. _____	°C

* Note: Liquid line is between the source heat exchanger and the expansion valve in the cooling mode; between the load heat exchanger and the expansion valve in the heating mode.

Troubleshooting

Should a major problem develop, refer to the following information for possible causes and corrective steps.

If compressor won't run:

1. The fuse may be open or the circuit breaker is tripped. Check electrical circuits and motor windings for shorts or grounds. Investigate for possible overloading. Replace fuse or reset circuit breakers after fault is corrected.
2. Supply voltage may be too low. Check it with a volt meter.
3. Control system may be faulty. Check control for correct wiring of thermostat or aquastat and check the 24 volt transformer for proper voltage.
4. Wires may be loose or broken. Replace or tighten.
5. The low pressure switch may have tripped due to one or more of the following:
    a) Heating
        1) Plugged heat exchanger on source side
        2) Water flow source side -(Low)
        3) Water too cold source side
        4) Low refrigerant
    b) Cooling
        1) Plugged heat exchanger on load side
        2) Water flow load side - (Low)
        3) Water too cold load side
        4) Low refrigerant
6. The high pressure switch may have tripped due to one or more of the following:
    a) Heating
        1) Plugged heat exchanger on load side
        2) Low water flow load side
        3) Water too warm load side
    b) Cooling
        1) Plugged heat exchanger on source side
        2) Low water flow on source side
        3) Water too warm source side
7. The compressor overload protection may be open. Disconnect power. Remove S1 & S2 wires from the compressor protection module. Measure the resistance between the S1 & S2 wires. If the resistance measures > 2750 ohms, then the internal compressor resistance has tripped the compressor protection module. The compressor protection module will reset after a 30 minute delay and the resistance measures < 2250 ohms. Cycling the power off for a minimum of 3 seconds will manually reset the compressor module. The internal compressor resistance must measure < 2250 ohms for the compressor module to reset.
8. The internal winding of the compressor motor may be grounded to the compressor shell. If so, replace the compressor.
9. The compressor winding may be open or shorted. Disconnect power. Check continuity with ohm meter. If the winding is open, replace the compressor.

If sufficient cooling or heating is not obtained:

1. Check control for improper location or setting.
2. Check for restriction in water flow.
3. Check refrigerant subcooling and superheat for proper refrigerant charge and expansion valve operation.
4. The reversing valve may be defective and creating a bypass of refrigerant. If the unit will not heat, check the reversing valve coil.

If the unit operation is noisy:

1. Check compressor for loosened mounting bolts. Make sure compressor is floating free on its isolator mounts. Check for tubing contact with the compressor or other surfaces. Readjust it by bending slightly.
2. Check screws on all panels.
3. Check for chattering or humming in the contactor or relays due to low voltage or a defective holding coil. Replace the component.
4. Check for proper installation of vibration absorbing material under the unit.
5. Check for abnormally high discharge pressures.
6. Compressor rotation incorrect

Preventive Maintenance

Unit Heat Exchanger Maintenance

1. Keep all air out of the water or antifreeze solution.
2. Keep the system under pressure at all times. Closed loop systems must have positive static pressure or air vents may draw air into the system.

NOTES: If the installation is in an area with a known high mineral content in the water, it is best to establish with the owner a periodic maintenance schedule for checking the water-to-refrigerant heat exchanger on a regular basis. Should periodic cleaning be necessary, use standard cleaning procedures. Generally, the more water flowing through the unit, the less chance there is for scaling. Low L/s flow rates produce higher temperatures through the heat exchanger. To avoid excessive pressure drop and the possibility of metal erosion, do not exceed L/s flow rate as shown on the specification sheets for each unit.

Replacement Procedures

When contacting the company for service or replacement parts, refer to the model number and serial number of the unit as stamped on the serial plate attached to the unit. If replacement parts are required, mention the date of installation of the unit and the date of failure, along with an explanation of the malfunctions and a description of the replacement parts required.

In-Warranty Material Return

Material may not be returned except by permission of authorized warranty personnel. Contact your local distributor for warranty return authorization and assistance.

Service Parts List

Part Description		020	025	030	035	045	050	060	090	130
		380-420/50/3	380-420/50/3	380-420/50/3	380-420/50/3	380-420/50/3	380-420/50/3	380-420/50/3	380-420/50/3	380-420/50/3
Refrigeration Components	Compressor	34P613-04	34P616-04	34P569-04	34P614-04	34P617-04	34P618-04	34P619-04	34P606-04	34P610-04
	Compressor Sound Jacket	92P519-02	92P519-02	92P504A03	92P519-02	92P519-03	92P519-03	92P519-03	92P518-01	92P517-01
	Thermal Expansion Valve	33P608-18	33P608-10	33P608-16	33P608-16	33P605-14	33P572-02	33P572-02	33P572-01	33P615-01
	TXVs per circuit	1	1	1	1	1	1	1	1	1
	Filter Dryer	36P500B02	36P500B02	36P500B02	36P500B02	36P500B04	36P500B04	36P500B04	36P500B06	36D500B06
	Reversing Valve with Coil	33P526-04	33P526-04	33P526-04	33P526-04	33P077-05	33P077-05	33P077-05	33P546-04	33P607-01
	Brazed Plate Heat Exchanger	62P562-01	62P562-01	62P562-01	62P563-01	62P563-01	62P564-01	62P564-01	62P550-02	62P551-01
	Heat Exchanger Support Bracket	47C775-03	47C775-03	47C775-03	47C775-03	47C775-03	47C775-03	47C775-03	47C698-01	47C713-01
Safeties / Sensors	High Pressure Switch	35P506B02	35P506B02	35P506B02	35P506B02	35P506B02	35P506B02	35P506B02	35P506B02	35P506B02
	Low Pressure Switch	35P506B01	35P506B01	35P506B01	35P506B01	35P506B01	35P506B01	35P506B01	35P506B01	35P506B01
	Water Temperature Sensor	12P529-01	12P529-01	12P529-01	12P529-01	12P529-01	12P529-01	12P529-01	12P529-01	12P529-01
	Low Water Coil Temp Sensor	12P529-01	12P529-01	12P529-01	12P529-01	12P529-01	12P529-01	12P529-01	12P529-01	12P529-01
Electrical	Compressor Contactor	13P537B03	13P537B03	13P537B03	13P537B03	13P537B03	13P537B03	13P537B03	13P537B04	13P537B05
	Transformer	15P505B01	15P505B01	15P505B01	15P505B01	15P505B01	15P505B01	15P505B01	15P505B01	15P505B01
	Power In Terminal Block	12P524A01	12P524A01	12P524A01	12P524A01	12P524A01	12P524A01	12P524A01	12P524A01	12P524A01
	Connection Block - Small	12P503-06	12P503-06	12P503-06	12P503-06	12P503-06	12P503-06	12P503-06	12P503-06	12P503-06
	Connection Block - Low Voltage	12P520-01	12P520-01	12P520-01	12P520-01	12P520-01	12P520-01	12P520-01	12P520-01	12P520-01
	Grounding Lug	12P004A	12P004A	12P004A	12P004A	12P004A	12P004A	12P004A	12P004A	12P004A
	Phase Guard Monitor	19P541A05	19P541A05	19P541A05	19P541A05	19P541A05	19P541A05	19P541A05	19P541A05	19P541A05
Control	FX10 Main Board - no communications	17X51606-09	17X51606-09	17X51606-09	17X51606-09	17X51606-09	17X51606-09	17X51606-09	17X51606-09	17X51606-09
	FX10 Main Board & N2 Open Com Card	17X51606-10	17X51606-10	17X51606-10	17X51606-10	17X51606-10	17X51606-10	17X51606-10	17X51606-10	17X51606-10
	FX10 Main Board & Lonworks Com Card	17X51606-12	17X51606-12	17X51606-12	17X51606-12	17X51606-12	17X51606-12	17X51606-12	17X51606-12	17X51606-12
	FX10 Main Board & BACnet Com Card	17X51606-11	17X51606-11	17X51606-11	17X51606-11	17X51606-11	17X51606-11	17X51606-11	17X51606-11	17X51606-11
	FX10 Expansion Board	17P516-07	17P516-07	17P516-07	17P516-07	17P516-07	17P516-07	17P516-07	17P516-07	17P516-07
	Display	19P563-01	19P563-01	19P563-01	19P563-01	19P563-01	19P563-01	19P563-01	19P563-01	19P563-01
	FX10 Display Interface Board	17P516-11	17P516-11	17P516-11	17P516-11	17P516-11	17P516-11	17P516-11	17P516-11	17P516-11
Enclosure	Side Access Panel	40C792-10	40C792-10	40C792-10	40C792-10	40C792-10	40C792-10	40C792-10	40C752-01	40C758-01
	Front Upper Access Panel	40C792-08	40C792-08	40C792-08	40C792-08	40C792-08	40C792-08	40C792-08	40C750-01	40C757-01
	Lower Front Access Panel	40C792-09	40C792-09	40C792-09	40C792-09	40C792-09	40C792-09	40C792-09	40C751-01	40C756-01
	Top Panel	40C792-05	40C792-05	40C792-05	40C792-05	40C792-05	40C792-05	40C792-05	42C356-01	42C357-01
	Rear Left Panel	40C792-07	40C792-07	40C792-07	40C792-07	40C792-07	40C792-07	40C792-07	40C754-01	40C760.01
	Rear Right Panel	40C792-06	40C792-06	40C792-06	40C792-06	40C792-06	40C792-06	40C792-06	40C753-01	40C759-01

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Revision Guide

Pages:	Description:	Date:	By:
10	Updated NXW140 Refrigerant Charge	10 Apr 2013	DS
39	Added Revision Guide	10 Apr 2013	DS

Smarter from the Ground Up™

Manufactured by
WaterFurnace International, Inc.
9000 Conservation Way
Fort Wayne, IN 46809
www.waterfurnace.com

Product:	**Envision NKW**
Type:	Commercial Reversible Chiller - 50 Hz
Size:	020-130 kW
Document:	Installation Manual

APPROVED PRODUCT

Certificate Number NQA '00000028'
Factory Standard MCS010
Product Standard MCS007

IM1052WN 04/13