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Shut off all power to this equipment during installation a nd service. There may be more than one disconnect switch. T ag al l disconnect locations to alert others not to restore power until work is

compl eted. DO NOT VENT re frigerant relief valves within a building. The accumulation of refrigerant in an enclosed space can displace oxygen and cause a sphyxiation. Provide adegua te ventilation in enclosed or low overhead area s. Inhalation of high concentrations of vapor i s harmful and may cause heart irregularities, unconsci ousness or death. Misuse can be fatal. V apor is heavier than air and reduces the amount of oxygen available for breathing. Product causes eye and skin irritation. Decomposition products are hazardous. DO NOT att empt to unbraze fact ory joints when servi cing this equipment. Compressor oil is flammable and there is no way to detect how much oil may be in any of the refrigerant lines. Cut lines with a tubing cutter as require d when performing service. Use a pan to catch any oil that may come out of the lines and as a gage for how muc h oil to add to system. DO NOT reuse compressor oil. This unit uses a microprocessorbased electronic control system. Do not use jumpers or ot her tools to short out components, or to bypass or otherwise depart from recom mended procedures. Any shorttoground of the control board or accompanying wiri ng may destroy the electronic modules or electrical components. T o prevent potential damage to heat exchanger, a lways run fluid th rough heat exchang er when add ing or removing refrigerant charge. Proof of flow switch and s trainer are factory installed on all models. Do NOT remove power from this chiller duri ng wint er shutdown periods without taking precaution to remove all wate r from heat exchanger and optional hydronic system. Failure to properly protect the system from freezing may constitute abuse and may void warr anty. Compressors and optional hydronic system pumps require specific rotation.

T est condenser fans first to ensure proper phasing. Swap any two incoming power leads to correct condenser fan rotation before starting any other motors.Do not use jumpers or other tools to short out or bypass components or ot herwise depart from recom mended procedures. Any shorttoground of the control board or accompanying wiring may destroy the board or electrical compone nt. Main Base Boar d MBB — See Fig. 7. The MBB is the h eart of the Comfort Link control system. It contains the major portion of opera ting software and controls the operation of the machine. The MBB re ceives inputs from the discharge and suction pressure transducers and thermistors. See T abl e 2. The MBB also receives the fee dback inputs from e ach compressor contactor, auxiliary cont acts, and other status switches. See T able 3. The MBB also controls several outputs. Relay outputs controlled by the MBB are shown in T able 4. Information is transmitted between modules via a 3wire communication bus or LEN Local Equipment Network. The CCN Carrier Comfort Network bus is also supported. Connections to both LEN and CCN buses are m ade at TB3. See Fig. 8. Scr olling Mar quee Displa y — T his standard device is the keypad interface used for accessing chiller informa tion, reading sensor values, and testing the chiller. The marguee display is a 4key, 4character, 16segment LED lightemitting diode display. Ele ven mode LEDs are located on the display as well as an Alarm Stat us LED. See Marquee Display Usage section on page 23 for further details. Ener gy Management Module EMM — The EMM module is available a s a factory installed option or as a field installed accessory. The EMM module receives 4 to 20 mA inputs for the leaving fluid temperature reset, cool ing set point and demand limit functions. The EMM module also recei ves the switch inputs for the fi eldinstalled 2stage demand limit and ice done functions.

The EMM module comm unicates the status of all input s with the MBB, and the MBB adjusts the control point, capac ity limit, and ot her functions according to the inputs received. When switched to the Enable position the chiller is under its own control. Move the switch to the Off position to shut the chiller down. Move the switch t o the Remote Contact position and a fieldinstalled dry contact can be used to start the chiller. The contact s must be capable of handling a 24 vac, 50mA load. Power to the MB B, EMM, and marquee display is interrupted when this switch is of f and all outputs from these modules will be t urned off. Contr ol Module Comm unication RE D L E D — Proper operation of the control boards can be visually checked by looking at the red stat us LEDs lightemitting diodes. When opera ting correctly, the re d status LEDs should be blinking in unison at a rate of once every 2 seconds. If the red LEDs are not blinking in unison, verify that correct power

is being supplied to all modules. Be sure that the Main Base Board MBB is supplied with the current software. If necessary, re load current software. If the proble m still p ersi sts, replac e the MBB. A red LE D that i s lit cont inu ously or blinking at a rate of once per second or faster indicates that the board should be r eplaced. GR E E N L E D — The MBB has one green LED. The Local Equipment Network LEN LED should always be blinking whenever power is on. All other boar ds have a LEN LED which should be blinking w henever power is on. Communication bet ween modules is accomplished by a 3wire sensor bus. These 3 wires run in parallel from module t o module. The J4 connector on the MBB provides both power and communication directly to the marquee display only. YELLOW LED — T he MB B ha s one yel lo w L ED. The Carrier Comfort Network CCN LED w ill blink during times of network communicat ion. Carrier Comf or t Network CCN Int erface — The 30RA chiller units can be connected to the CCN if desired.

The communication bus w iring is a shielded, 3conductor cable with drain wire and is supplied and installed in the field. See T able 5. The system elements are connected to the communication bus in a daisy chain arrangement. The positive pin of each system element communica tion connector must be wired to the positive pins of the system elements on either side of it. This is also required for the negative and signal ground pins of each system eleme nt. W i ring connections for CCN should be made at TB3. Consult the CCN Contrac tor 's Manual f or further information. NOTE Conductors and dra in wire must be 20 A W G Ameri can W i re Gage minimum stranded, tinned copper. W ire manufactured by Alpha 2413 or 5463, American A22503, Bel den 8772, or Columbia 02525 meets the above mentione d requirements. It is important when connecting to a CCN c ommunication bus that a color coding scheme be used for the entire netw ork to simplify the installation. It is recommended that red be used for the signal positive, black for the signal negative, and white for the signal ground. Use a similar scheme f or cables c ontain ing different colored wires. If the c ommunication bus is entirely within one building, the resulting continuous shield must be connected to a ground at one point only. If the c ommu nication bus cable exits from one building and enters another, the shields must be connected to grounds at the lightning suppressor in each building where the cable enters or exits the building one point per building only. Table 2 — Thermistor De signations LEGEN D Table 3 — Stat us Swit ches Table 4 — Output Relays Table 5 — CCN Communication Bus Wiring OPERATING DATA Sensors — The electronic control uses 3 to 6 thermistors to sense temperatures for cont rolling chiller operation. See T able 2. These sensors are outlined below. Thermistors T1, T2, T9 and accessory suction gas temperatures T7, T8 are 5 k. The rmistor T10 is 10 k.

See Thermi stors section for temperaturere sistancevol tage drop charact eristic s. T 1 - C OOL ER LEA VI NG FL UID SEN SO R — On 30RA010 030 sizes, this thermistor is installed in a fri ction fit well at the bottom of t he brazed plate heat exchanger on the cont rol box side. For 30RA032055 sizes, this thermi stor is installed in a well in the factory installed leaving fluid piping coming from the bottom of the brazedpl ate heat exchange r opposite the control box side. T 2 - C OO L ER E NT E R I NG F LU I D SE N SO R — On 30RA010 030 sizes, this thermistor is installed in a fri ction fit well at the top of the brazed plate heat exchanger on the control box side. For 30RA032055 sizes, this thermistor is installed in a well in the factory installed entering fluid piping coming from the top of the brazedplate heat exchanger opposite the control box side. T7,T8 - COMPRESSOR RETUR N GAS TEMPERA TURE SENSOR ACCESSOR Y — A w el l fo r t hi s se ns or is factory installed in eac h circuits suction line. If desired, a 5 k t hermistor Carrier part number HH79NZ0 29 can be installed in this well and connected to t he Main Base Board as shown in T able 2. Use the Scrolling Ma rquee display to con figure the sensor Configuration mode, submode OP T1 — enable item R G.EN. T9 - OUTDOORAIR TEMPERA TURE SENSOR - This sensor is factory installed on a bracket at the l eft side of compressor A1 on 30RA010030 models. For mode ls 30RA032055, it is installed behind the panel below the control box center door. IMPOR T ANT A shorted CCN bus cable will prevent so me routines from run ning and may prevent the unit from s tart ing. If abnormal con

ditions occur, unplug the connector. If conditions return to norm al, check the CCN connector and cable. Run new cable if necessary. A short in one section of the bus can cause problems with all system elements on the bus.

Regular Wi ring Plenum Wiring Alpha 1895 — American A214 51 A48 301 Belden 8205 8 84421 Columbia D6 451 — Manhat tan M1340 2 M64 430 Quab ik 6130 — T10 — Remote Space T emperature Sens or — Sensor T10 part no. 33ZCT55SP T is an accessory sensor that is remotely mounted in the controlled space and used for space tempera ture reset. The sensor should be installed as a wallmounted thermostat would be in t he conditioned space whe re it will not be subjected to either a cooling or heating source or direct exposure to sunlight, and 4 to 5 ft above t he floor. Space tempe rature sensor w ires are t o be connected t o terminals in the uni t main control box. The space t emperature sensor includes a terminal block SEN and a RJ1 1 female connector. The RJ1 1 connec tor is used acce ss into the Carrier Comfort Network CCN at the sensor. T o c onnect the spa ce temp erature sensor Fig. 9 1. Using a 20 A WG twisted pair conductor cable rated for the application, connect 1 wire of the twisted pair to one SEN terminal and connect the other wire to the other SEN terminal loc ated under the co ver of the space temperature sens or. 2. Connect the other ends of the wires to terminals 5 and 6 on TB5 located in the unit control box. Units on the CCN can be monitored from the space at the sensor through the RJ1 1 connector, if desired. T10 — Dual Leaving W ater T emperature Sensor — For dual chiller applications parallel only are supported, connect the dual chiller leaving fluid temperature sensor 5 k.HH79NZ029 to the space tempe rature input of the Master chiller. If space temperature is required for reset applications, connect the sens or to the Slave chiller and configure the slave chil ler to broad cast th e valu e to th e Master chil ler. LEGEND FOR FIG. 16 IMPOR T ANT The cable selected for the RJ1 1 conne ctor wiring MUST be identical to the CCN communication bus wire used for the ent ire network. Refer to T able 5 for acceptable w iring.

It is recommended that proper operation of the switch be verified on a regular basis. Thermostatic Ex pansion V alves TXV — All units are equipped from the fa ctory with conventional TX Vs. Each refrigeration ci rcuit is also supplie d with a fact oryinstalled liquid line filter drier and sight glass. All TXVs are adjustable, but should not be adjusted unless absolutely necessary. The TXV is designed to limit the cooler saturated suction temperature to 55 F 12.8 C. This makes it possible for unit to start at high cooler fluid temperatures without overloading the compressor. Capacity Cont rol — The cont rol system cycles com pressors, and minimum load valve solenoids if equipped to maintain the user configured leaving chi lled fluid temperature set point. Entering fluid temperature is used by the Main Base Board MBB to de termine the tempera ture drop across the cooler and is used in determining the optimum time to add or subtract capacity stages. The chilled fluid temperat ure set point can be automatically reset by the return fluid tempe rature, space, or out doorair temperat ure reset fe atures. It can also be reset from an external 4 to 20mA signal requires Energy Management Module FIOP or accessory. The control has an a utomatic leadlag fea ture built in which determines the wear factor combination of starts and run hours for each compressor. If all compressors are off and less than 30 minutes has elapsed si nce the last compre ssor was turned off, the wear factor is used to determine which compres sor to start next. If no compre ssors have been running for mo re than 30 minutes and the leaving fluid tempe rature is greater than the saturated condensing temperature, the wear factor is still used to determine which compressor to start next.

If the leaving fluid temperature is less than the saturated condensing temper ature, then the control will start eith er compress or A1 or compressor B1 first, depending on the userconfigurable circuit leadlag value. The TXVs will provide a controlled startup. As additional stages of compression are required, the processor control will add them. See T able 6 and 7. If a circuit is to be stopped, the compressor with the lowest wear factor will be shut off first in most cases. Cert ain

override conditions may shut of f the smaller of two compressors on a circuit first. The capacity control algorithm runs every 30 seconds. The algor ithm att empts to m aint ain t he Co ntrol Poi nt at the desi red set point. Each time it runs, the control reads the entering and leaving fluid tempera tures. The control determines the rate at which conditions are changing and calculates 2 variables based on these conditions. Next, a capacity ratio i s calculated using the 2 variables to det ermine whether or not to make any changes to the current stages of capacity. If installed, the minimum l oad valve sole noid will be energized with t he first stage of capacity. Minimum load valve value is a fixed 30% in the total capacity calculation. The c ontrol will also use the minimum load valve solenoid as the last stage of capaci ity before turning off the last compressor. A delay of 90 seconds occurs after ea ch capacity step change. Refer to T ables 6 and 7. Care should be taken when interfac ing with other manufac turer ' s control systems due to possible power supply differences, full wave bridge versus half wave rectification. The two different power supplies cannot be m ixed. A signal isolation device should be utilized if a full wave bridge signal generating device is used. If the machine should be running and none of the above are true, a minimum off time DEL Y, se e below may be in effect. The machine should start normally once the time l imit has expired.

T vpically, this time pe riod is con figured when multiple machines are located on a single site. For example, this gives the user t he ability to preve nt all t he units from restarting at once after a power fai lure. A value of zero for this variable does not mean that the unit should be running. The val ue can be changed to Circuit A or Circuit B leading as desired. Set at automatic, the control w ill sum the curre nt number of l ogged circuit starts and onequarter of the current operat ing hours for each c ircui t. The circu it with the lo west su m is started first. Changes to which circuit is the lead circuit and whi ch is the lag are also made when total machine capacity is at 100% or when there is a change in the direction of capac ity increase or decrease and eac h circuit' s capac ity is equal. CAP ACITY CONT ROL OVERR IDES — The f oll owing over rides will modify the normal operation of the routine. The larger this value is set, the longer t he control will delay betwe en adding or removing stages of capacity. Figure 12 shows how compressor starts can be reduced over time if the l eaving water temperature is allowed to drift a larger a mount above and be low the set point. This value should be set in the range of 3.0 to 4.0 for systems with small loop volumes. First Stage Override — If t he curr ent capacit y stage is zero, the control will modi fy the routine with a 1.2 fac tor on adding the first st age to reduce c vcling. This f actor is also a pplied when the control is attempting to remove the last stage of capacity. Slow Change Override — The control prevents the capa city stages from being changed when t he leaving fluid temperature is close to the set point within an adjustable deadband and moving towards the set point. If the unit is in a Cooling mode and configured for Ramp Loading, the control makes 2 comparisons before deciding to change stages of ca pacity.

The control calculate s a temperature differen ce between the control point and leaving fluid temperat ure. Low Enteri ng Fluid T emperat ure Unloading — Wh en the entering fluid tem perature is below the control point, the control will attempt to remove 25% of the current stages being used. If exactly 25% c annot be removed, the control removes an amount greater than 25% but no more than nece ssary. T he lowest stage will not be removed. Minimum Lo ad Control — If equipped, the minimum load control valve is energized only when one compressor in t he circuit is running. If the close control feat ure is enabled the minimum load control valve may be used a s needed to obtai n leaving fluid temperature c lose to set point. Cooler Freeze Protection — The cont rol will tr y to preven t shutting the chiller down on a Cooler Freeze Protect ion alarm by removing stages of capacity. This alarm condition A207 only references leaving fluid temperat ure and NOT Brine Freeze point. This can be repe ated once e very 30 seconds. Low Saturated Suctio n Protection — The control will try to prevent shutting a circuit down due t o low saturated suction conditions by removing stages of capacity. The Bri ne Freeze point is a userconfigurable value that must be left at 34 F 1.1 C for 100% water systems. A lower value may be entered for syste ms with brine solutions,

but this value should be set according to the freeze prote ction level of the brine mixture. Failure to properly set this brine free ze point value may pe rmanently dama ge the braze d plate he at exchang er. The control will initiate Mode 7 Circuit A or Mode 8 Cir cuit B to indicat e a circuit's capacity is limited and that even tually the circuit may shut down. 47 46 45 44 43 42 41 0 200 400 600 800 1000 TIME SECONDS 2 ST ARTS 3 ST ARTS DEADBAND EXAMPLE L WT F MODIFIED DEADBAND ST ANDARD DEADBAND 8 7 6 5 L WT C LEGEND LW T — Leaving W ater T emperature Fig.

12 — Deadband Mu ltiplier The MBB uses the sat urated condensing tempera ture input from the discharge pressure transducer to control the fans. Head pressure control is maintained through a calculat ed set point which is automatically adjusted based on actual saturated condensing and saturated suction tempera tures so that the compressors is are always operating within the manufacturers specified enve lope see Fig. 13. The control will autom a tic ally reduce the unit capa city as the sa turate d condensing temperature approa ches an upper limit. The control will indicate through an alert that a high ambient unloading mode is in effect. If the saturat ed condensing temperature in a circuit exce eds the calculat ed maxim um, the circuit will be stopped. For these reas ons, there are no head pressure control methods or set points to enter. If the saturated condensing temperature in a circuit is greater than or equal to 95 F 35 C at startup, all ava ilable condenser fans will be started to prevent excessive discharge pressure during pulldown. The control will turn off a fan stage when the condensing temperature has been below the calculated head pressure set point by 35 F 19.4 C for more than 2 minutes. The control will automatical ly raise the head press ure set point by 5 F 2.8 C when Motormaster control is configured. The controller is ene rgized with the first fan stage and adjusts fan speed to maintain a liquid pressure of 135 psi g 931 kPa. For sizes 010018 and Circuit B of sizes 032040, the twospeed fan is wired for high speed operation and the Motormaster V controller adjusts fan speed. For size 022030, 042055 and circuit A of the 032040 sizes, the lead fan A1 or B1 in the circuit is controlled. Refer to Fig. 14 for condenser fan staging information. Refer to Fig. 15 for typical pressure transducer locati on. LEGEND Fig.