CHA11 SERIES UNITS

ACCESSORIES — TABLE 1

<table>
<thead>
<tr>
<th>Option</th>
<th>Model No.</th>
<th>Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hot Water</td>
<td>HWC11-95 (100,000 - 250,000 Btu)</td>
<td>Factory Installed Only</td>
</tr>
<tr>
<td>Electric Heat</td>
<td>ECH11-95-15 (15KW)</td>
<td>Factory or Field Installed</td>
</tr>
<tr>
<td></td>
<td>ECH11-95-30 (30KW)</td>
<td>Field Installed Only</td>
</tr>
<tr>
<td></td>
<td>ECH11-95-45 (45KW)</td>
<td>Field Installed Only</td>
</tr>
<tr>
<td>Power Saver</td>
<td>PSD11-95</td>
<td>Factory Installed</td>
</tr>
</tbody>
</table>

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I - INTRODUCTION
CHA11 production is scheduled in 1980 for the 7-1/2 and 10 ton models. Figure 1 shows a unit cutaway. Auxiliary heat (electric or hot water) is available for these units. Other options are listed in Table 1.

Units are designed for rooftop installation with either bottom or horizontal discharge. The RMF11 roof mounting frame mates to the bottom of unit. The added installation of a RMFH11 mounting frame permits horizontal discharge. The RMFA mounting frame adaptor allows unit installation on an existing RMF3 roof mounting frame in retrofit applications.

The CHA11 incorporates the "Honeywell Single Zone Solid State Control System". Figure 2 illustrates the compatible control options and lists the corresponding ordering numbers.

FIGURE 2
Page 2
### A - Specifications

<table>
<thead>
<tr>
<th>Model No.</th>
<th>CHA11-953</th>
<th>CHA11-1353</th>
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<tbody>
<tr>
<td><strong>ARI Standard 270 SNR</strong></td>
<td>21</td>
<td>22</td>
</tr>
<tr>
<td>*ARI Total cooling capacity (Btu/h)</td>
<td>89,000</td>
<td>121,000</td>
</tr>
<tr>
<td>Total unit watts</td>
<td>11,100</td>
<td>15,100</td>
</tr>
<tr>
<td><strong>210 EER (Btu/Watt)</strong></td>
<td>8.0</td>
<td>8.0</td>
</tr>
<tr>
<td>Ratings Dehumidifying capacity</td>
<td>29%</td>
<td>31%</td>
</tr>
<tr>
<td>Refrigerant (22) charge</td>
<td>15 lbs. 2 oz.</td>
<td>22 lbs.</td>
</tr>
<tr>
<td>Evaporator Blower wheel nominal diam. x width (in.)</td>
<td>(1) 15 x 9</td>
<td>(1) 15 x 15</td>
</tr>
<tr>
<td>Blower Motor horsepower (minimum-maximum)</td>
<td>1-1/2 - 3</td>
<td>3 - 5</td>
</tr>
<tr>
<td>Net face area (sq. ft.)</td>
<td>8.3</td>
<td>12.0</td>
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<tr>
<td>Evaporator Coil Tube diam. (in.) &amp; No. of rows</td>
<td>1/2 - 3</td>
<td>1/2 - 3</td>
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<tr>
<td>Fins per inch</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Condenser Coil Net face area (sq. ft.)</td>
<td>14.6</td>
<td>19.8</td>
</tr>
<tr>
<td>Fins per inch</td>
<td>38 - 3</td>
<td>38 - 3</td>
</tr>
<tr>
<td>Condenser Fans Air volume (cfm) (factory setting)</td>
<td>6000</td>
<td>8500</td>
</tr>
<tr>
<td>Motor horsepower</td>
<td>(2) 1/3</td>
<td>(2) 1/2</td>
</tr>
<tr>
<td>Motor watts (factory setting)</td>
<td>850</td>
<td>1150</td>
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<tr>
<td>Optional Coil Diameter (in.) &amp; No. of blades</td>
<td>(2) 20 - 4</td>
<td>(2) 24 - 4</td>
</tr>
<tr>
<td>Condensate drain size mpt (in.)</td>
<td>(2) 3/4</td>
<td>(2) 3/4</td>
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<tr>
<td>No. &amp; size of filters (in.)</td>
<td>(4) 16 x 20 x 1</td>
<td>(6) 16 x 20 x 1</td>
</tr>
<tr>
<td>Net weight of basic unit (lbs.) (1 Package)</td>
<td>1200</td>
<td>1580</td>
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</tbody>
</table>

*Sound Rating Number in accordance with ARI Standard 270.  
*Rated in accordance with ARI Standard 210; 450 cfm (maximum) evaporator air volume per ton of cooling, 95°F outdoor air temperature and 80°F/67°F entering evaporator air.  
**Capacity range shown is possible with varying supply conditions and air volumes. See Figure 21.

### B - Electrical Data

<table>
<thead>
<tr>
<th>Model No.</th>
<th>CHA11-953</th>
<th>CHA11-1353</th>
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<tbody>
<tr>
<td><strong>Line voltage data — 60Hz — 3 phase</strong></td>
<td>200V</td>
<td>230V</td>
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<tr>
<td>Compressors Rated load amps (total)</td>
<td>30.6</td>
<td>28.2</td>
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<tr>
<td>Locked rotor amps (total)</td>
<td>148.0</td>
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<tr>
<td>Condenser Full load amps (total)</td>
<td>4.6</td>
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</tr>
<tr>
<td>Fans Motors (2) Locked rotor amps (total)</td>
<td>9.4</td>
<td>9.4</td>
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<tr>
<td>Evaporator Horsepower</td>
<td>1-1/2</td>
<td>3</td>
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<tr>
<td>Full load amps</td>
<td>6.0</td>
<td>11.0</td>
</tr>
<tr>
<td>Locked rotor amps</td>
<td>39.0</td>
<td>65.0</td>
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<tr>
<td>Recommended max. fuse size (amps)</td>
<td>50</td>
<td>60</td>
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<tr>
<td>Unit Power Factor</td>
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<tr>
<td>*Minimum Circuit Ampacity</td>
<td>45.0</td>
<td>50.0</td>
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</table>

*Refer to National Electric Code manual to determine wire, fuse and disconnect size requirements.  
NOTE — Extremes of operating range are plus and minus 10% of line voltage.
C - Dimensions

ELECTRICAL CONNECTIONS
X - POWER SUPPLY
Y - D.C. LOW VOLTAGE
Z - A.C. LOW VOLTAGE

CONTROL BOX
COMPRESSIONS
CONDENSER COIL INVAT AIR
CONDENSER COIL FAN GUARD
CONDENSER COIL FANS
WIRING JUNCTION BOX
ELECTRICAL INLETS CHAIN 1353
FILTERS

TOP VIEW

TOP VIEW BASE SECTION

OUTDOOR AIR HOOD
CONDENSER COIL EXHAUST AIR
EXHAUST & OUTDOOR AIR INTAKE END VIEW

MODEL NO.
CHA11-953
CHA11-1353

<table>
<thead>
<tr>
<th>MODEL NO.</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
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<tr>
<td>CHA11-953</td>
<td>in.</td>
<td>87-7/8</td>
<td>50</td>
<td>6-1/8</td>
<td>20-3/4</td>
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<td>4-1/2</td>
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<tr>
<td></td>
<td>mm</td>
<td>2232</td>
<td>1270</td>
<td>165</td>
<td>527</td>
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<td>114</td>
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<tr>
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<td>68</td>
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<td>32</td>
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<tr>
<td></td>
<td>mm</td>
<td>2372</td>
<td>1727</td>
<td>398</td>
<td>813</td>
<td>1600</td>
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D - Installation Clearances

NOTE — Top Clearance Unobstructed.
## E - Blower Performance

### LESS ELECTRIC HEAT

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<thead>
<tr>
<th>Air Volume (Cfm)</th>
<th>STATIC PRESSURE EXTERNAL TO UNIT (Return Air System) — (Inches Water Gauge)</th>
<th>0</th>
<th>.10</th>
<th>.20</th>
<th>.30</th>
<th>.40</th>
<th>.50</th>
<th>.60</th>
<th>.70</th>
<th>.80</th>
<th>.90</th>
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<tr>
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<tr>
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<td>770 1.05</td>
<td>800 1.10</td>
<td>830 1.15</td>
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<td>880 1.35</td>
<td>915 1.40</td>
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<tr>
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<td>865 1.70</td>
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</table>

### WITH ELECTRIC HEAT

<table>
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<tr>
<th>Air Volume (Cfm)</th>
<th>STATIC PRESSURE EXTERNAL TO UNIT (Return Air System) — (Inches Water Gauge)</th>
<th>0</th>
<th>.10</th>
<th>.20</th>
<th>.30</th>
<th>.40</th>
<th>.50</th>
<th>.60</th>
<th>.70</th>
<th>.80</th>
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<th>1.00</th>
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<tbody>
<tr>
<td></td>
<td>RPM BHP</td>
<td>RPM BHP</td>
<td>RPM BHP</td>
<td>RPM BHP</td>
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<td>RPM BHP</td>
<td>RPM BHP</td>
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<td>RPM BHP</td>
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F - Pressure Curves

G - RMF11 Roof Mounting Frame

<table>
<thead>
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<th>Model No.</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
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<tbody>
<tr>
<td>RMF11-95</td>
<td>79%</td>
<td>75%</td>
<td>41%</td>
<td>37%</td>
<td>37%</td>
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<tr>
<td>RMF11-135</td>
<td>85%</td>
<td>81%</td>
<td>59%</td>
<td>55%</td>
<td>55%</td>
</tr>
</tbody>
</table>
CHAI1-953

RMF11 WITH SRT11-95 TRANSITIONS

CHAI1-1353

RMF11 WITH SRT11-135 TRANSITIONS

NOTE - Roof deck may be omitted within confines of frame.

RTDI1-95 STEP-DOWN DIFFUSER

FTDI1-95 FLUSH DIFFUSER

RTDI1-135 STEP-DOWN DIFFUSER

FTDI1-135 FLUSH DIFFUSER
I - RMFH11 Horizontal Mounting Frame

RMFH11 HORIZONTAL MOUNTING FRAME WITH RMF11

- CROSS BRACE (Supplied with standard RMF11 frame)
- RMFH11 HORIZONTAL DISCHARGE FRAME (Field Installed)
- COMPLETELY INSULATED (Furnished by others)
- CORNER ANGLE (Furnished for frame assembly)
- FILLER PANELS (Furnished by others)
- RMF11 STANDARD FRAME

NOTE: See installation instructions for recommended size and location of filler panels.

RMFH11 AND RMF11 FRAME MOUNTING DETAIL

- BASE BOTTOM
- FIBERGLASS INSULATION (Furnished by Installer)
- UNIT BASE RAIL
- COUNTER FLASHING (Furnished by Installer)
- FIBERGLASS INSULATION (Furnished by Installer)
- COUNTER FLASHING (Furnished by Installer)
- CAN'T STRIP (Furnished by Installer)
- ROOFING MATERIAL
- INCLUDED WITH RMFH11 HORIZONTAL ADAPTOR FRAME
- 2" x 4" NAILER STRIP (Furnished)
- RIGID INSULATION (Furnished by Installer)
- RMF11 MOUNTING FRAME
- RIGID INSULATION (Furnished by Installer)

RMFH11 HORIZONTAL MOUNTING FRAME

<table>
<thead>
<tr>
<th>Model No.</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
</table>
J - RMFA11 Adaptor Mounting Frame

RMFA11 ADAPTOR MOUNTING FRAME
WITH EXISTING RMF3 ROOF MOUNTING FRAME

RMFA11 SERIES ADAPTOR FRAME
SUPPLY & RETURN DIVIDER PANELS
(Furnished with RMFA11)

CORNER ANGLE
(4 Furnished for Frame Assembly)

EXISTING RETURN AIR DUCT

FILLER PANELS
(Furnished with RMFA11)

ROOFING MATERIAL

DUCT SUPPORTS (3)
(Furnished with RMFA11)

EXISTING RMF3 ROOF MOUNTING FRAME

RMFA11 AND RMF3 FRAME
MOUNTING DETAIL

FIBERGLASS INSULATION
(Furnished by Installer)

BASE BOTTOM
(Furnished by Installer)

COUNTER FLASHING
(Furnished by Installer)

UNIT BASE RAIL

CANT STRIP
(Furnished by Installer)

ROOFING MATERIAL

EXISTING RMS ROOF MOUNTING FRAME

2 x 4 NAILER STRIP
(Furnished with RMF3)

EXISTING RMF ROOF MOUNTING FRAME

FILLER PANEL
(Furnished)

MOUNTING FRAME SUPPORT
(Furnished)

2 x 4 NAILER STRIP
(Furnished with RMF3)

ROOFING MATERIAL

EXISTING RMF3 ROOF MOUNTING FRAME

RIGID INSULATION
(Furnished by Installer)

Model No. | A   | B   | C   | D   | E   | F   | G
---------|-----|-----|-----|-----|-----|-----|---

K - Power Supply Field Wiring (Figure 3)

Power Wiring Less Electric Heat
The unit rating plate lists minimum circuit ampacity and maximum fuse size. Connect power supply to high voltage leads in make-up box.

Power Wiring With Factory Installed Electric Heat
The unit rating plate lists minimum circuit ampacity and maximum fuse size. The incoming power connects to the power terminal block on hat section which installs in high voltage junction box.

If the application includes a status panel, the "1, 1" electric heat lead must loop around a current sensing relay (K20). Loop once for "Q" voltage or twice for "G" voltage ECH11. The relay must be ordered separately.

Power Wiring With Field Installed Electric Heat
1 - The "Heater Installed" plate on unit access panel lists the minimum circuit ampacity and maximum fuse size for the CHA11 combined with the various heaters.

2 - The incoming power connects to the power terminal block on hat section which installs in high voltage junction box.

3 - The electric heat leads also connect to this terminal block. All "1" leads to L1, "2" leads to L2, and "3" leads to L3.

4 - If the application includes a status panel, the "1, 1" lead must loop around a current sensing relay. Loop once for "Q" voltage or twice for "G" or "J" voltage. The relay must be ordered separately.

5 - Wire T5 electric heat transformer per unit voltage. Lead "14" connects to common (black). Lead "13" connects to correct voltage — red (208V) and orange (230V & 460V).
**FIGURE 3**

**L - Low Voltage Field Wiring**

1. Low voltage connections are made at the terminal block located in the low voltage junction box.

2. If switching subbase or switching status panel is used, remove jumpers between TBC-9 & TBC-10 and TBE-7 & TBE-1.


4. If application includes electric heat and status panel option, the K20 current sensing relay must be field installed and wired.

5. If application includes hot water heat and status panel option, the K24 electronic relay must be field installed and wired.

6. If application includes power saver, the K23 voltage control relay must be field installed and wired.

7. Figure 4 illustrates field wiring for room thermostat or transmitter, switching subbase, status panel and electric heat. Figure 5 illustrates field wiring for room thermostat or transmitter, switching status panel and electric heat. Do not route DC wires in same conduit or raceway as AC current. AC will interfere with the DC ramp signals.
1. If Switching Subbase is used, remove jumpers between TB-C3 & TB-010 and TB-E1 & TB-E7.
2. Run 1 DC wires from low voltage terminal block to room control and wire as shown.
3. If Switching Subbase is used, run 2 AC wires from room control to termina.
   block. 4. If SP11 Status Panel is used, route 9 additional AC wires from status panel to termina.
   block.
5. If SP11 is used, jumper terminals 8 and 9.
6. If room transmitter is used, run 2 DC wires from remote sensor to transmi.
   ter.
7. If application includes power saver, wire K23 voltage control relay as shown.
8. If application includes hot water heat and SP11 Status Panel, wire K24 hot water proving relay as shown.
9. If application includes electric heat and SP11 Status Panel, wire K20 current sensing relay as shown.
10. On electric heat add on applications, route leads to make up box and wire to terminal block as shown.
11. On all electric heat add on applications except EC11: 95-13E-60-10, remove
    jumper between TB-E6 and TB-56.
12. On EC11: 95 13E-60-10 electric heat add on applications, remove jumper
    between TB-E6 and TB-57.
III - REFRIGERANT SYSTEM
Two compressors are used in separate refrigerant circuits. Each system uses an expansion valve to meter the refrigerant.

Each unit is furnished with a normal operating pressure curve. The curve uses suction pressure, discharge pressure and outdoor temperature comparison. To use the chart, first check suction pressure, then move over to the outdoor temperature and finally down to the discharge pressure. If the discharge pressure is within five pounds of this reading, the unit is properly charged, providing the three conditions meet in the unshaded area of the chart. If they meet in the shaded area, there is something wrong with the system and further checks are needed.

IV - CHA11 COMPONENTS
Table 3 lists the electrical components by their key numbers and then gives a brief description and location. Table 3 also lists control setpoints (if applicable). Key number labels are mounted next to each component for identification. Both the unit schematic diagram and the repair parts key the components.

A - Main Control Box
Figure 6 identifies the components in the main control box.

B - Make-up Box (Figure 7)
1. Cooling Lockout Thermostat (S6)
   S6 has an adjustable range from 20°F to 80°F. It is factory set at 55°F. Both compressors are locked out during a cooling demand if the ambient temperature drops below setting.
2. Low Voltage Terminal Block
   Low voltage field wiring connects to this terminal block.

The terminals are identified by both letters and numbers. The columns are labeled “C” through “G” and the rows are numbered 1 through 10. For example to find TBD-5, locate column labeled “D” and then go to row number 5. This terminal designation is used in the unit wiring diagram.

3. Hat Section (Electric Heat Usage)
On electric heat applications a hat section is added to the make-up box. A fuse block and high voltage terminal block are mounted on hat section. Line connections are made at terminal block.

![FIGURE 6]

![FIGURE 7]
4 - Current Sensing Relay (K20)
This field installed relay is only used with a status panel on electric heat applications. It detects the absence of electric heat operation during a demand.

C - Compressor Compartment (Figures 8 & 9)
1 - Each compressor is protected with an internal line break overload. This device detects motor winding temperature to protect compressor from excessive heat and/or current draw. The compressors are also protected by an internal pressure relief valve which is set to open at a discharge and suction differential of 450 psig + 50. In addition each compressor has an insertion type self regulating crankcase heater.
2 - Each refrigerant circuit includes high and low pressure switches for compressor protection. The high pressure switch opens at 410 psig and must be manually reset. The low pressure switch cuts out compressor at 10 psig and automatically rests at 30 psig.
3 - The low ambient control box is a component within the Low Ambient Kit LB-37124B. Pressure switches within control box sense discharge pressure for each refrigerant circuit.
4 - The condenser fan draws air through the outdoor coil and discharges it out the top of unit. For fan service access, remove the bolts securing fan assembly. Figure 10 illustrates the condenser fan and motor assemblies.

![Diagram of Compressor Compartment]

<table>
<thead>
<tr>
<th>UNIT</th>
<th>DIMENSION &quot;A&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHA11-953</td>
<td>1.7/8</td>
</tr>
<tr>
<td>CHA11-1353</td>
<td>1.1/4</td>
</tr>
</tbody>
</table>

CONDENSER FAN ASSEMBLY

FIGURE 10

D - Blower Compartment (Figure 11)
1 - Table 2 lists the drive kit options.
2 - The blower control box sets next to blower housing.
3 - The indoor coil has two distinct stages. The top half is for the No. 2 refrigerant circuit while the bottom half is for the No. 1 circuit. This is a draw through coil.
4 - The discharge sensor is located in supply air stream.
5 - If optional status panel or switching status panel is used, Filter Switch (S14) mounts in blower compartment.

![Diagram of Blower Compartment]

<table>
<thead>
<tr>
<th>Model</th>
<th>Nominal Motor HP</th>
<th>Maximum Usable HP</th>
<th>Rpm Range Of All Available Drive Setups @ 1720 RPM Motor Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHA11-953</td>
<td>*1.5</td>
<td>1.75</td>
<td>905-1023</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>3.45</td>
<td>905-1023</td>
</tr>
<tr>
<td>CHA11-1353</td>
<td>5</td>
<td>5.75</td>
<td>677-860</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>3.45</td>
<td>836-1079</td>
</tr>
</tbody>
</table>

*NOTE: The 1-1/2 HP motor can not be used with over 15 KW of electric heat.
<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>DESCRIPTION AND FUNCTION</th>
<th>LOCATION</th>
<th>SETTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>Logic Panel — Receives the signal from room thermostat and balances this against the system output as determined by the discharge sensor; then initiates the heating or cooling modes as needed. Also modulates power saver closed with discharge temperatures between 62° and 50°F</td>
<td>Main Control Box</td>
<td>---</td>
</tr>
<tr>
<td>A2</td>
<td>Room Thermostat or Transmitter — Generates heating and cooling ramp signals based on the temperature deviation from the dual setpoint adjustments and a thermistor. Thermistor is internal to thermostat and remote to transmitter.</td>
<td>Remote</td>
<td>Adj. 55° — 85°</td>
</tr>
<tr>
<td>B1 &amp; B2</td>
<td>Compressors No. 1 &amp; No. 2 — Initiate DX cooling.</td>
<td>Compressor Compartment</td>
<td>---</td>
</tr>
<tr>
<td>B3</td>
<td>Indoor Blower Motor — Provides air supply through unit.</td>
<td>Blower Compartment</td>
<td>---</td>
</tr>
<tr>
<td>B4 &amp; B5</td>
<td>Condenser Fans No. 1 &amp; No. 2 — Draws air across outdoor coil for heat transfer in the refrigeration cycle.</td>
<td>Compressor Compartment</td>
<td>---</td>
</tr>
<tr>
<td>B6</td>
<td>Power Saver Motor (optional) — Modulates outdoor dampers and return air dampers.</td>
<td>Power Saver Minimum Position Adj. at Motor</td>
<td>---</td>
</tr>
<tr>
<td>B7</td>
<td>Motorized Water Valve — Initiates hot water operation.</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>C1 &amp; C2</td>
<td>Capacitors — Condenser Fan.</td>
<td>Compressor Compartment</td>
<td>---</td>
</tr>
<tr>
<td>CB1</td>
<td>Circuit Breaker — Protects the logic panel.</td>
<td>Main Control Box</td>
<td>---</td>
</tr>
<tr>
<td>CR-1</td>
<td>Light Emitting Diode — Used in status panel to show operating mode and failure.</td>
<td>Status Panel</td>
<td>---</td>
</tr>
<tr>
<td>CMC3</td>
<td>Clock Timer (optional) — 24 Hour skip-a-day clock programs a daily schedule. Any day or days can be omitted.</td>
<td>Blower Compartment</td>
<td>---</td>
</tr>
<tr>
<td>DL2</td>
<td>Electric Heat Delay — Steps electric heat elements in 30 second time delay.</td>
<td>Electric Heat Control Box</td>
<td>---</td>
</tr>
<tr>
<td>DL3</td>
<td>Electric Heat Delay — Steps electric heat elements in 60 second time delay.</td>
<td>Electric Heat Control Box</td>
<td>---</td>
</tr>
<tr>
<td>DL6</td>
<td>Hot Water On Delay — This is a 180 second time delay which is used in the status panel circuit on hot water applications.</td>
<td>Blower Compartment</td>
<td>---</td>
</tr>
<tr>
<td>DL8</td>
<td>Electric Heat Delay — Steps electric heat elements in 180 second time delay.</td>
<td>Electric Heat Control Box</td>
<td>---</td>
</tr>
<tr>
<td>F</td>
<td>Fuses — Circuit protectors.</td>
<td>Throughout Unit</td>
<td>---</td>
</tr>
<tr>
<td>HR1 &amp; HR2</td>
<td>No. 1 &amp; No. 2 Compressor Crankcase Heaters — Warms the compressor to prevent liquid refrigerant from migrating to compressor during off cycles and &quot;slugging&quot; it on start-up. (Continuously Energized)</td>
<td>Compressor</td>
<td>---</td>
</tr>
<tr>
<td>HR3</td>
<td>Electric Elements (optional) — Provide resistance heat.</td>
<td>Heating Section</td>
<td>---</td>
</tr>
<tr>
<td>K1</td>
<td>Blower Contactor — Energizes blower motor.</td>
<td>Blower Control Box</td>
<td>---</td>
</tr>
<tr>
<td>K2</td>
<td>Nite Relay — Activates the night setback mode when optional clock timer contacts make.</td>
<td>Main Control Box</td>
<td>---</td>
</tr>
<tr>
<td>K3</td>
<td>Blower Relay — When de-energized it drives power saver motor B6 closed.</td>
<td>Main Control Box</td>
<td>---</td>
</tr>
<tr>
<td>K8</td>
<td>No. 1 Compressor Contactor — Energizes compressor B1 and condenser fan B4 on demand.</td>
<td>Main Control Box</td>
<td>---</td>
</tr>
<tr>
<td>K9</td>
<td>No. 2 Compressor Contactor — Energizes compressor B2 and condenser fan B6 on demand.</td>
<td>Main Control Box</td>
<td>---</td>
</tr>
<tr>
<td>K11</td>
<td>Heating Blower Relay — &quot;H1&quot; at logic panel energizes this relay. It then energizes K1 blower contactor and K3 blower relay during periods of intermittent blower operation.</td>
<td>Main Control Box</td>
<td>---</td>
</tr>
<tr>
<td>K14</td>
<td>Low Ambient No. 2 Relay (optional) — Used in low ambient applications, this relay is energized with K9. It latches itself in to bypass S10 and allow a compressor start-up. After DL5 times out (30 seconds), this circuit opens and S10 is again brought into the control circuit.</td>
<td>Main Control Box</td>
<td>---</td>
</tr>
<tr>
<td>K15</td>
<td>No. 1 Electric Heat Contactor — Energizes first stage of electric heat.</td>
<td>Electric Heat Control Box</td>
<td>---</td>
</tr>
<tr>
<td>K16</td>
<td>No. 2 Electric Heat Contactor — Energizes second stage of electric heat.</td>
<td>Electric Heat Control Box</td>
<td>---</td>
</tr>
<tr>
<td>K17</td>
<td>No. 3 Electric Heat Contactor — Energizes third 15 KW of electric heat.</td>
<td>Electric Heat Control Box</td>
<td>---</td>
</tr>
<tr>
<td>K18</td>
<td>No. 4 Electric Heat Contactor — Energizes fourth 15 KW of electric heat.</td>
<td>Electric Heat Control Box</td>
<td>---</td>
</tr>
<tr>
<td>COMPONENT</td>
<td>DESCRIPTION AND FUNCTION</td>
<td>LOCATION</td>
<td>SETTING</td>
</tr>
<tr>
<td>-----------</td>
<td>--------------------------</td>
<td>----------</td>
<td>---------</td>
</tr>
<tr>
<td>K19</td>
<td>Electric Heat Relay — Relay is energized through “H1” at logic panel. It then initiates electric heat if S11 is made.</td>
<td>Electric Heat Control Box</td>
<td>---</td>
</tr>
<tr>
<td>K20</td>
<td>Current Sensing Relay — Used only with status panel options. Detects absence of electric heat operation (during a demand) to light the no heat light at status panel.</td>
<td>Field Installed in Make-up Box</td>
<td>---</td>
</tr>
<tr>
<td>K21</td>
<td>Low Ambient No. 1 Relay (optional) — Used in low ambient applications. This relay is energized with K8. It latches itself in to bypass S9 and allow a compressor start-up. After DL4 times out (30 seconds), this circuit opens and S9 is again in the control circuit.</td>
<td>Main Control Box</td>
<td>---</td>
</tr>
<tr>
<td>K22</td>
<td>Cooling Blower Relay — On units without switching subbase or switching status panel, K22 is energized thru “C1” of logic panel. On units less switching function, K22 is energized thru K23. It energizes K1 and K3 during periods of intermittent blower operation.</td>
<td>Main Control Box</td>
<td>---</td>
</tr>
<tr>
<td>K23</td>
<td>Voltage Controlled Relay — Used only with switching subbase or switching status panel and power saver. It opens on a 2.5V-3V DC signal. When made it energizes K22.</td>
<td>Main Control Box</td>
<td>---</td>
</tr>
<tr>
<td>K24</td>
<td>Hot Water Proving Relay — This electronic relay is used in the status panel circuit to verify a heating demand.</td>
<td>Blower Compartment</td>
<td>---</td>
</tr>
<tr>
<td>K25</td>
<td>Humid Climate Option — This field provided and field installed relay eliminates power saver operation during excessive humidity conditions.</td>
<td>Field Installed</td>
<td>---</td>
</tr>
<tr>
<td>R1</td>
<td>Night Heating Operation Resistor — Used in night setback option to determine degree of heating setback.</td>
<td>Make-up Box</td>
<td>(5°, 10° or 15°F)</td>
</tr>
<tr>
<td>R2</td>
<td>Night Cool Setup Resistor — Used in night setback option to determine degree of cooling setup.</td>
<td>Make-up Box</td>
<td>(5°, 7°, 9°, 10°, 13°, 15°F or cooling lockout)</td>
</tr>
<tr>
<td>RT1</td>
<td>Discharge Sensor — Sends a dc current voltage to logic panel which is equivalent to the discharge temperature.</td>
<td>Blower Compartment</td>
<td>---</td>
</tr>
<tr>
<td>RT2</td>
<td>Remote Room Sensor (optional) — This is the thermostatic that is used with the room transmitter option.</td>
<td>Remote</td>
<td>---</td>
</tr>
<tr>
<td>S1</td>
<td>No. 1 High Pressure Switch — Shuts off compressor (B1) when refrigerant pressure rises above setting. Must be manually reset.</td>
<td>Compressor Compartment</td>
<td>410 psig out</td>
</tr>
<tr>
<td>S2</td>
<td>No. 2 High Pressure Switch — Shuts off compressor (B2) when refrigerant pressure rises above setting. Must be manually reset.</td>
<td>Compressor Compartment</td>
<td>410 psig out</td>
</tr>
<tr>
<td>S6</td>
<td>Cooling Lockout Thermostat — Shuts off all cooling compressor operation when ambient temperature drops below setting. Factory set at 55°F.</td>
<td>Make-up Box</td>
<td>Adj.</td>
</tr>
<tr>
<td>S9</td>
<td>No. 1 Low Pressure Defrost Switch — Shuts off compressor (B1) when suction pressure drops below setpoint. Automatically resets.</td>
<td>Compressor Compartment</td>
<td>30 psig in 10 psig out</td>
</tr>
<tr>
<td>S10</td>
<td>No. 2 Low Pressure Switch — Shuts off compressor (B2) when suction pressure drops below setpoint. Automatically resets.</td>
<td>Compressor Compartment</td>
<td>30 psig in 19 psig out</td>
</tr>
<tr>
<td>S11</td>
<td>Electric Heat Limit (Used with electric heat) — Drops out all electric heat when temperature exceeds setpoint.</td>
<td>Heating Section</td>
<td>CHA11-853 180°F 120°F CHA11-1353 150°F 110°F</td>
</tr>
<tr>
<td>S13</td>
<td>Enthalpy Control (Used with power saver) — Senses heat content of outside air. When heat content rises above setpoint, control switches to close outdoor dampers to minimum position.</td>
<td>Fresh Air Intake</td>
<td>&quot;A.&quot; Adj.</td>
</tr>
<tr>
<td>S14</td>
<td>Filter Switch — Used with optional status panel. Indicates restricted air flow through the filters.</td>
<td>Blower Compartment</td>
<td>---</td>
</tr>
<tr>
<td>S15</td>
<td>No. 1 Low Ambient Pressure Switch — Shuts off condenser fan (B4) when head pressure drops below setting.</td>
<td>Compressor Compartment</td>
<td>250 psig out 290 psig in</td>
</tr>
<tr>
<td>S16</td>
<td>No. 2 Low Ambient Pressure Switch — Shuts off condenser fan (B5) when head pressure drops below setting.</td>
<td>Compressor Compartment</td>
<td>250 psig out 290 psig in</td>
</tr>
<tr>
<td>S17</td>
<td>Freezestat (Used with hot water) — Prevents coil freezing during a no demand condition. The control opens between 32° - 41°F and then closes again between 50° - 60°F.</td>
<td>Blower Compartment</td>
<td>32° — 41°F open 50° — 60°F close</td>
</tr>
<tr>
<td>S18</td>
<td>System Switch — This switch, used on optional switching subbase or switching status panel, changes operating mode.</td>
<td>Switching Subbase</td>
<td>---</td>
</tr>
<tr>
<td>S19</td>
<td>Fan Switch — This switch, used on optional switching subbase or switching status panel, changes blower operation.</td>
<td>Switching Subbase</td>
<td>---</td>
</tr>
<tr>
<td>S20</td>
<td>Element Limit (Used with electric heat) — This one time limit drops out the element at excessive temperatures</td>
<td>Heating Section</td>
<td>185°F</td>
</tr>
<tr>
<td>S21</td>
<td>Temperature Indicating Thermostat — Used within status panel circuit to indicate a no heat condition for hot water.</td>
<td>Blower Compartment</td>
<td>104°F</td>
</tr>
<tr>
<td>T1</td>
<td>Power Transformer — On 460V &amp; 575V units, T1 drops line voltage to 220V for the control circuit voltages. (200V &amp; 230V)</td>
<td>Compressor Compartment</td>
<td>---</td>
</tr>
<tr>
<td>T3</td>
<td>Control Transformer — Provides 24V power to the control circuit.</td>
<td>Main Control Box</td>
<td>---</td>
</tr>
<tr>
<td>T4</td>
<td>Power Saver Transformer — Provides 24 volts to power saver motor (B6). Has multi-tap leads to choose between 200V &amp; 230V input when field installing.</td>
<td>Power Saver</td>
<td>---</td>
</tr>
</tbody>
</table>
V - BLOWER OPERATION AND ADJUSTMENTS

A - Blower Operation

1. Units with standard room thermostat subbase:
   Blower operates continuously in normal operation. Units with optional night operation controls will have intermittent blower operation during night control period.

2. Units with switching subbase or switching status panel:
   Blower operation is manually set at the fan switch. In “ON” position the blower operates continuously. Intermittent blower will only occur if optional night operation controls are installed. During night operation the blowers will cycle with demand.

   With fan switch set in “Auto”, the blower cycles with demand. If the application includes power saver, a field installed K23 Voltage Controlled Relay picks up blower for power saver operation.

   Blower operation drops out when system switch is set at “Off”.

B - Determining Unit CFM

1. The following measurements must be made with a dry indoor coil. Run blower without a heating or cooling demand. The air filters must be in place while taking measurements.

2. Measure static pressure external to unit.

3. Measure the indoor blower motor RPM.

4. Refer to Blower Performance Chart on Page 5. Use the static pressure and RPM readings to determine unit CFM.

5. The CFM can be adjusted at the motor pulley on CHA11-1353 units. Loosen the allen screw. Turn adjustable sheave clockwise to increase CFM or counter-clockwise to decrease CFM. See Figure 12.

   On CHA11-953 units the pulley has a fixed sheave and there is no adjustment. On 953 electric heat add on applications, a substitute pulley (provided) must be field installed.

C - Blower Belt Adjustment

Maximum life and wear can be obtained from belts only if proper pulley alignment and belt tension are maintained. Initially, tension new belt(s) after a run in period of 24-48 hours. This allows belt(s) to stretch and seat in the grooves. To adjust belt tension, loosen 4 locking bolts. Turn adjusting bolt to slide motor up or down. See Figure 12.

VI - THERMOSTAT OR TRANSMITTER OPERATION

A room control installed with a standard subbase allows only heating and cooling setpoint adjustment. The temperature gap between the setpoint levers represents the “no load” band where no heating or cooling can occur. With levers positioned side by side, the no load band is 3°F. With levers wide apart, the no load band is 30°F.

A room control installed with an optional switching subbase or optional switching status panel will allow heating and cooling setpoint adjustment, system function selection and blower operating control. The system function switch is manually set for the desired operation mode:

HEAT — Auxiliary heat only.
COOL — Cooling only.
AUTO — System automatically provides heating or cooling on demand.
OFF — System off.

The fan switch manually sets to desired position:
AUTO — Blower cycles with demand.
ON — Blower runs continuously.
VII — CHA11 UNIT OPTIONS

A - Power Saver (Figure 13)

1 - The power saver motor modulates in response to the cooling ramp signal, discharge low limit feature, and enthalpy control setting. The range is 1.5 to 4VDC. The outside dampers are in minimum position at 1.5 volts and are open at 4 volts.

2 - The enthalpy control senses the heat content of the air. If heat content rises above control setpoint, the power saver dampers drive to minimum position. The recommended setpoint is “A”. If power saver is allowing air which is too warm or humid to enter system, set control to a lower setpoint.

3 - The power saver motor includes a spring return feature which closes motor on a power failure. The motor stroke is 160 degrees as shown in Figure 14 and the timing is 40 seconds. With R-W terminals shorted or B leg open, the motor drives outside dampers closed. With R-B terminals shorted or W leg open, the motor drives outside dampers open.

4 - Dampers are factory adjusted. The dampers rotate 90 degrees. If adjustment is needed, drive the dampers closed and adjust each blade individually.

5 - Adjust minimum positioner with outside dampers at minimum position (turn enthalpy control to “D”). Rotate screw clockwise to open dampers or counterclockwise to close dampers. Table 4 lists the percentage of fresh air per damper blade opening. Return enthalpy control back to normal setting.

If desired a remote minimum positioner may be used in place of the one at motor bracket. Simply disconnect existing minimum positioner and wire the new one with “W” lead to TBC-6 and “R” lead to TBC-7. The remote minimum positioner rotates counterclockwise to open and clockwise to close.

### TABLE 4

<table>
<thead>
<tr>
<th>Damper Blade Angle</th>
<th>Fresh Air Percentage (%)</th>
<th>Return Air Duct Static Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PSD11</td>
<td>OAD11</td>
</tr>
<tr>
<td>5°</td>
<td>13%</td>
<td>12%</td>
</tr>
<tr>
<td>10°</td>
<td>26%</td>
<td>21%</td>
</tr>
<tr>
<td>15°</td>
<td>37%</td>
<td>27%</td>
</tr>
<tr>
<td>20°</td>
<td>48%</td>
<td>31%</td>
</tr>
<tr>
<td>25°</td>
<td>58%</td>
<td>34%</td>
</tr>
<tr>
<td>30°</td>
<td>69%</td>
<td>37%</td>
</tr>
<tr>
<td>35°</td>
<td>79%</td>
<td>40%</td>
</tr>
<tr>
<td>40°</td>
<td>90%</td>
<td>45%</td>
</tr>
</tbody>
</table>

6 - If the CHA11 application includes power saver and a switching subbase or a switching status panel, a K23 Voltage Control Relay must be field installed. When the fan switch is set at “Auto”, this relay picks up the blower for power saver operation. The blower comes on at 4 VDC (cooling ramp signal) and cycles off at 2.5 - 3 VDC.

7 - Humid Climate Option:

In very humid climates it may be desirable to eliminate

power saver operation during high humidity conditions. This would keep the outside dampers closed and blower motor stopped until there was a mechanical cooling demand. On a mechanical cooling demand, the outside dampers would open to minimum position for ventilation and the blower would run. During favorable conditions the power saver would function normally.

This can be accomplished with the use of a switching subbase or switching status panel and the field installation of a special relay. Figure 15 shows the hook-up and explains the sequence of operation.
B - Fresh Air Dampers
In lieu of a power saver, the OAD11 outdoor air damper may be installed for minimum fresh air intake. This option is available with either manual or automatic damper control (damper motor). The damper motor has a remote minimum position control. This control rotates counterclockwise to open and clockwise to close outdoor air dampers. Table 4 lists the percentage of fresh air per damper blade opening.

**INSTALLATION**
A - Connect enthalpy control and K25 coil to the power saver transformer T4.
B - Connect K25-1 contacts as follows:
   - Common - Black lead going to minimum positioner
   - N.C. - Blue lead going to "W" at logic panel
   - N.O. - Orange lead going to "Y" at logic panel
C - Connect K25-2 contacts as follows:
   - Common - To TBE-1 low voltage terminal block
   - N.C. - In series with field installed K23 voltage control relay contacts.
   - N.O. - To TBE-7 low voltage terminal block
D - Place fan switch to "Auto" on switching subbase or switching status panel.

**OPERATION**
1 - On a power saver demand during low humidity conditions, K23 relay makes to energize K22 Cool Blower Relay through N.C. K25-2.
   1a - As K23-1 contacts close both K3 Blower Relay and K1 Blower Contactor are energized.
   1b - N.C. K3 contact breaks to allow power saver motor to modulate.
   1c - N.O. K1 contacts make to start blower motor.
2 - Enthalpy control energizes K25 at excessive humidity.
3 - N.C. K25-2 contacts open to de-energize K22, which in turn de-energizes K3 and K1.
   3a - With N.C. K3 contacts made, the outside dampers drive closed.
   3b - With K1 de-energized the blower motor stops.
4 - N.O. K25-2 contacts are made. On a compressor demand "C1" makes at logic panel. This again energizes K22.
   4a - With N.C. K3 contacts open, the outside dampers open to minimum position for ventilation.
   4b - K1 contacts make to start blower motor.
5 - When outside air is again suitable for cooling, enthalpy control de-energizes K25 to return system to power saver operation.

**FIGURE 15**
C - Electric Heat (Figure 16)

1 - An ECH11-95 fits into a CHA11-953 while an ECH11-135 fits into a CHA11-1353. The ECH11 is available in four sizes, from one to four elements. In addition the ECH11 is also available in two voltages. The ECH11-W uses standard delta elements. The ECH11-G uses standard wye elements.

Table 5 lists the possible CHA11/ECH11 combinations and gives the corresponding KW input.

2 - The elements install in the heating section. The electric heat control box sets adjacent to blower housing. Figure 17 identifies components in the ECH11 control box.

3 - The Electric Heat Limit (S11) drops out all the elements when temperature exceeds setpoint. ECH11 heaters are protected by one time limits (S20). See Figure 18 for location of limits.

![Figure 16](image)

**TABLE 5**

<table>
<thead>
<tr>
<th>CHA11 USAGE</th>
<th>ECH11 HEATER USAGE</th>
<th>NO. OF ELEMENTS</th>
<th>KW INPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHA11-953-W</td>
<td>ECH11-953/1353-15-Q</td>
<td>1</td>
<td>10.4</td>
</tr>
<tr>
<td>CHA11-1353-W (200/60/3)</td>
<td>ECH11-953/1353-30-Q</td>
<td>2</td>
<td>20.8</td>
</tr>
<tr>
<td></td>
<td>ECH11-953/1353-45-Q</td>
<td>3</td>
<td>31.3</td>
</tr>
<tr>
<td></td>
<td>ECH11-953/1353-60-Q</td>
<td>4</td>
<td>41.7</td>
</tr>
<tr>
<td>CHA11-953-Q</td>
<td>ECH11-953/1353-15-Q</td>
<td>1</td>
<td>13.8</td>
</tr>
<tr>
<td>CHA11-1353-Q (230/60/3)</td>
<td>ECH11-953/1353-30-Q</td>
<td>2</td>
<td>27.5</td>
</tr>
<tr>
<td></td>
<td>ECH11-953/1353-45-Q</td>
<td>3</td>
<td>41.3</td>
</tr>
<tr>
<td></td>
<td>ECH11-953/1353-60-Q</td>
<td>4</td>
<td>55.1</td>
</tr>
<tr>
<td>CHA11-953-G</td>
<td>ECH11-953/1353-15-G</td>
<td>1</td>
<td>13.8</td>
</tr>
<tr>
<td>CHA11-1353-G (46/60/3)</td>
<td>ECH11-953/1353-30-G</td>
<td>2</td>
<td>27.5</td>
</tr>
<tr>
<td></td>
<td>ECH11-953/1353-45-G</td>
<td>3</td>
<td>41.3</td>
</tr>
<tr>
<td></td>
<td>ECH11-1353-60-G</td>
<td>4</td>
<td>55.1</td>
</tr>
<tr>
<td>CHA11-1353-J (575/60/3)</td>
<td>ECH11-953/1353-30-G</td>
<td>2</td>
<td>27.6</td>
</tr>
<tr>
<td></td>
<td>ECH11-953/1353-45-G</td>
<td>3</td>
<td>41.3</td>
</tr>
<tr>
<td></td>
<td>ECH11-1353-60-G</td>
<td>4</td>
<td>55.1</td>
</tr>
<tr>
<td>CHA11-1353-M (390/420/50/3)</td>
<td>ECH11-953/1353-30-G</td>
<td>2</td>
<td>18.8 — 23.0</td>
</tr>
<tr>
<td></td>
<td>ECH11-953/1353-45-G</td>
<td>3</td>
<td>26.2 — 34.6</td>
</tr>
<tr>
<td></td>
<td>ECH11-1353-60-G</td>
<td>4</td>
<td>37.6 — 44.9</td>
</tr>
</tbody>
</table>

Page 20
### TABLE 6

<table>
<thead>
<tr>
<th>CHA11 UNIT VOLTAGE</th>
<th>ECH11 HEATER</th>
<th>ELEMENT STAGING</th>
<th>SECOND STAGE (H2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>W (200/60/3) Q (230/60/3)</td>
<td>ECH11-953/1353-15 (1 Element)</td>
<td>1 element is energized by K15 when K19-2 makes.</td>
<td>--</td>
</tr>
<tr>
<td>W (200/60/3) Q (230/60/3)</td>
<td>ECH11-953/1353-30 (2 Elements)</td>
<td>1 element is energized by K15 when K19-2 makes.</td>
<td>Uses 2 additional elements. One is energized by K16 thirty seconds (DL2) after &quot;H2&quot; makes, the next is energized by K17, 60 seconds (DL3) after &quot;H2&quot; makes.</td>
</tr>
<tr>
<td>W (200/60/3) Q (230/60/3)</td>
<td>ECH11-953/1353-45 (3 Elements)</td>
<td>1 element is energized by K15 when K19-2 makes.</td>
<td>Uses 2 additional elements. One is energized by K17, 60 seconds (DL3) after &quot;H2&quot; makes, the next is energized by K18, 180 seconds (DL8) after &quot;H2&quot; makes.</td>
</tr>
<tr>
<td>W (200/60/3) Q (230/60/3)</td>
<td>ECH11-953/1353-60 (4 Elements)</td>
<td>2 initial elements. First is energized by K15 when K19-2 makes. The next is energized by K16, thirty seconds (DL2) after K19-2 makes.</td>
<td>Uses 2 additional elements. One is energized by K17, 60 seconds (DL3) after &quot;H2&quot; makes, the next is energized by K18, 180 seconds (DL8) after &quot;H2&quot; makes.</td>
</tr>
<tr>
<td>G (460/60/3) J (575/60/3) M (380-420/50/30)</td>
<td>ECH11-953/1353-15 (1 Element)</td>
<td>1 element is energized by K15 when K19-2 makes.</td>
<td>--</td>
</tr>
<tr>
<td>G (460/60/3) J (575/60/3) M (380-420/50/30)</td>
<td>ECH11-953/1353-30 (2 Elements)</td>
<td>2 elements are energized by K15 when K19-2 makes.</td>
<td>--</td>
</tr>
<tr>
<td>G (460/60/3) J (575/60/3) M (380-420/50/30)</td>
<td>ECH11-953/1353-45 (3 Elements)</td>
<td>2 elements are energized by K15 when K19-21 makes.</td>
<td>1 additional element is energized by K16, 30 seconds (DL2) after &quot;H2&quot; makes.</td>
</tr>
<tr>
<td>G (460/60/3) J (575/60/3) M (380-420/50/30)</td>
<td>ECH11-953/1353-60 (4 Elements)</td>
<td>2 elements are energized by K15 when K19-2 makes.</td>
<td>Uses 2 additional elements. Both are energized by K16, 30 seconds (DL2) after &quot;H2&quot; makes.</td>
</tr>
</tbody>
</table>

*Only applicable to CHA11-1353 units.

---

**D - Hot Water (Figure 19)**

**General**

1. The factory installed hot water option fits into the heating section. The coil is equipped with an air bleed valve and a drain valve. Figure 20 illustrates the system piping.

2. The motorized three way valve either directs hot water through coil or by-passes coil.

3. A manual balancing valve is located in the by-pass line to equalize pressure drop through coil.

---

**FIGURE 18**

4. Time delays stage the elements in 30, 60 and 180 second increments. Element staging is determined by CHA11 voltage and ECH11 heater size. Table 7 explains the operating sequence for each combination.

5. Field installed ECH11-95 series heaters are packaged with a blower motor drive sheave. Replace sheave in CHA11-953 units.

6. Field installed ECH11 heaters (except ECH11-95-60-10Q) are also packaged with 3 additional fuses. On the units listed in Table 7, remove the existing fuses from fuse block and substitute these extra fuses.

---

**TABLE 7**

<table>
<thead>
<tr>
<th>UNIT</th>
<th>BLOWER MOTOR</th>
<th>REMOVE</th>
<th>INSTALL</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHA11-953-1W, -2W</td>
<td>3 HP</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>CHA11-953-2Q</td>
<td>3 HP</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>CHA11-953-2G</td>
<td>3 HP</td>
<td>25</td>
<td>30</td>
</tr>
<tr>
<td>CHA11-1353-1W, -2W</td>
<td>5 HP</td>
<td>70</td>
<td>80</td>
</tr>
</tbody>
</table>

---

**FIGURE 19**

- Motor
- Remove two bolts securing motor to support bracket
- Three-way valve
- Air bleed valve
- Freeze protection thermostat (S17)
- Drain valve
- Hot water option
4 - The flow rate through coil can be determined per Figure 21. A correction factor is included in illustration for the affects of glycol.

![Diagram of coil system]

**FIGURE 20**

5 - Coil Btuh output can be determined by either of the following formulas. Table 8 lists the correction factors for a glycol solution. Multiply the calculated Btuh output by correction factor to obtain actual Btuh's.

\[
\text{Water Tmp. Difference} \times 500 \times \text{gpm} - \text{Btuh} = \text{Air Temp. Rise} \times 1.08 \times \text{cfm} - \text{Btuh}
\]

**TABLE 8**

<table>
<thead>
<tr>
<th>% Glycol</th>
<th>Correction Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1.00</td>
</tr>
<tr>
<td>10</td>
<td>0.97</td>
</tr>
<tr>
<td>20</td>
<td>0.94</td>
</tr>
<tr>
<td>30</td>
<td>0.91</td>
</tr>
<tr>
<td>40</td>
<td>0.87</td>
</tr>
<tr>
<td>50</td>
<td>0.84</td>
</tr>
</tbody>
</table>

NOTE - Multiply calculated capacity by correction factor.

**Operation**

1 - The logic panel modulates the motor in response to the heating ramp signal. The range is 6 to 9 VDC. Figure 22 shows the motor and valve at 6 VDC or less. Figure 23 shows the motor and valve at 9 VDC or more.

2 - The motor includes a spring return feature. On a loss of power the motor opens the valve to coil to allow water flow, thus preventing freezing. The motor and valve are positioned as shown in Figure 23.

3 - A Freeze Protection Thermostat (S17) monitors manifold temperature. Thermostat closes at 32°F to 41°F which opens valve for water flow through coil. This prevents coil freezing during a no-demand condition. The thermostat opens on a temperature increase to 50°F to 60°F.

4 - A proving circuit, used in conjunction with the optional status panel, warns of a no heat condition. This circuit is composed of a field installed Hot Water Proving Relay (K24) a Sensing Thermostat (S21) and a Hot Water Delay (DL6). The relay makes on a heating demand as dictated by the heating ramp chart. The thermostat makes on a water temperature fall. If both devices make together, the “NO HEAT” light at status panel will light after a short delay caused by DL6. The K24 Electronic Relay makes at 10 VDC and opens at 8 VDC.

**Checking Motor Operation**

1 - Remove leads from terminal 5 at logic panel. Put a jumper across terminals “C” and “F” at motor. Valve motor shaft should rotate clockwise, raising valve stem. Refer to Figure 23.

   a - At end of stroke notch in motor shaft should be down, at an angle 10% to right of vertical.

   b - The motor should be free to run its complete stroke.

   c - With valve in this position, the by-pass line is closed and water will flow through coil.

2 - Remove jumper previously installed. Valve motor shaft should rotate counter-clockwise, lowering valve stem. Refer to Figure 22.

   a - At end of stroke notch in motor shaft should be up, at an angle 10° to right of vertical.

   b - Motor should be free to run its complete stroke.

   c - With valve in this position, the by-pass line is open and water flow through coil is stopped.

3 - Remove lead from “TR” terminal at motor. Valve motor shaft should spring return clockwise, raising valve stem. See Figure 23. With the valve in this position, the by-pass line is closed and water will flow through coil.

4 - Reconnect leads at motor and logic panel.
E - Low Ambient Kit (LB-37124B)
This kit allows cooling operation at low outdoor ambients. It provides a momentary low pressure switch by-pass during compressor start-up and also cycles condenser fan to maintain adequate head pressure. Figure 24 shows field hook-up.

Low ambient relay (K14 or K21) is energized with the compressor contactor on a cooling demand closing the relay contacts. Low ambient delay (DL4 or DL5) provides a 30 second timed on circuit to by-pass the compressor low pressure switch. The compressor will stop after 30 sec. if the low pressure switch does not close.

Pressure switches S15 and S16 are wired in series with the condenser fan. Pressure switch set points are:
- open @ 140 psig
- reset @ 180 psig
When discharge pressure drops below S15 or S16 setpoint the fan cycles off until the discharge pressure rises to automatically reset low ambient pressure switch.

F - Night Setback
A Night Setback Time Clock (LB-38134CB) is available. The 24 hour skip-a-day clock programs a daily schedule. Any day or days can be omitted. Wiring consists of jacket plug connections in blower compartment.

The degree of heating setback or cooling setup is determined by separate resistors located at the low voltage terminal block. See Figure 25. The resistors can be substituted according to Table 9 to obtain the desired setting. Substitute resistors must be within 10% tolerance.

When an application includes night setback and switching status panel options, the “After Hour Timer” function must be field wired into the night setback circuit. Refer to Figure 5 for field hook-up.

Figure 26 explains night setback operation.

TABLE 9

<table>
<thead>
<tr>
<th>°F</th>
<th>Night Setback (R1)</th>
<th>Cool Setup (R2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>7.5K</td>
<td>20K</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>16K</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>11K</td>
</tr>
<tr>
<td>10</td>
<td>3.6K*</td>
<td>15K</td>
</tr>
<tr>
<td>13</td>
<td></td>
<td>10K</td>
</tr>
<tr>
<td>15</td>
<td>2K</td>
<td>12K</td>
</tr>
</tbody>
</table>

*This resistor is factory installed for heating. There is a 7.5K resistor taped to side of low voltage junction box.
**This resistor is factory installed for cooling. Establishing a cooling setup value with a resistor of less than 1.2K ohm resistance will limit the maximum heat setback value to 12°F.

VIII - STATUS PANEL OPTIONS
The status panel allows remote monitoring of system operation. Two types of panels are available. The SP11 provides system readout only. The SSP11 switching status panel combines the switching subbase and status panel functions together. In addition the SSP11 has a night setback override. Figures 27 and 28 show both panels.

1 - The “Cool Mode” LED is green when lit. It indicates Power Saver operation when unit is so equipped. Otherwise the LED will indicate DX cooling operation.

2 - The “Heat Mode” LED lights green during heating operation. The system switch on the SSP11 panel includes an emergency heat position. This function is not applicable to the CHA11; however, the “Heat Mode” light will change to red if the switch is placed at emergency heat. To avoid confusion, cut out the yellow wire at the SSP11. This prevents light from changing to red.

3 - The “Compressor 1” and “Compressor 2” LED’s are green when the respective compressors are running. Either light will turn red if a compressor safety switch opens during a compressor demand.

4 - The “No Heat” LED lights red on a loss of auxiliary heat. When applied to an ECH11 heater, a field installed current sensing relay (K20) detects current flow to the first element. On hot water applications, a sensing circuit consisting of an electronic relay (K24), a sensing thermostat (S21) and a hot water delay (DL6) detects a no heat situation.

5 - The “Filter” LED will light red when the field installed filter pressure switch (S14) contacts close indicating a dirty filter.

6 - The “System” switch on the SSP11 has five positions to indicate the following modes:
   OFF - System off.
   HEAT - Heating only.
   AUTO - System automatically provides heating or cooling on demand.
   COOL - Cooling only.
   EMERGENCY HEAT - Not applicable.

7 - The “Fan” switch on the SSP11 has two positions to indicate the following modes:
   AUTO - Blower cycles with demand.
   ON - Blower runs continuously.

8 - The “After Hours” timer on the SSP11 provides an override of night setback from 0 to 12 hours. A momentary push button switch initiates the time period.
1 - On applications using SSP11 switching status panel, the 24VAC circuit feeds through TBC-3. On applications less SSP11, the 24VAC circuit feeds through TBE-3.
2 - Clock timer motor is powered by 230VAC.
3 - Clock timer contacts close to energize Night Relay (K2) and initiate unoccupied mode.
4 - N.O. K2-1 contacts close to bring “R2” cooling resistor into cooling thermostat circuit. The amount of setup is determined by resistor size.
5 - N.O. K2-2 contacts close to bring “R1” heating resistor into heating thermostat circuit. The amount of setback is dependent upon resistor size.
6 - N.O. K2-3 contacts close to jumper “W1” on logic panel to “W1” on power saver motor. This drives motor closed.
7 - N.C. K2-4 contacts open to de-energize Blower Relay (K3) and Blower Contactor (K1). The blower cycles with demand.
8 - If the “After Hours Timer” on SSP11 is pressed, the circuit opens for the designated period. This de-energizes K2 to temporarily return unit into normal operation. At the end of designated period, the SSP11 timer again makes to return system into the unoccupied mode.
9 - At the end of unoccupied mode, clock timer contacts open to return unit to normal operation.
IX - FIRESTATS
Some local codes may require the installation of supply air and return air firestats to automatically shut down the equipment at excessive temperatures. These field provided firestats must be mounted and wired per local codes. Manual reset type controls must be accessible. Figure 29 illustrates two suggested methods of wiring the firestats into the control circuit. When a firestat opens the control circuit is de-energized and the unit shuts down.

FIGURE 29
X - MAINTENANCE

A - Lubrication
Always relubricate motors according to manufacturer’s lubrication instructions on each motor. If no instructions are provided, use the following as a guide:

1. Indoor Blower Motor Bearings - Bearings are prelubricated. For extended bearing life, relubricate at least once every two years with a lithium base grease, such as Westinghouse 53701RW, Chevron BRB2 (Standard Oil) or Andok 260 (Exxon Oil). To relubricate, replace top plugs with standard grease fittings. Remove lower outlet plugs and add grease with hand gun until new grease appears at bottom outlets. Run motor for a short time before replacing bottom plugs.

2. Condenser Fan Motors - Bearings are prelubricated. For extended bearing life, relubricate at least once every two years with a lithium base grease, such as Alvanie 3 (Shell Oil), Chevron ABRB3 (Standard Oil) or Regal AFB 2 (Texas Oil). Use hand grease gun for relubrication. Add only enough grease to purge through the bearings so that a bead of grease appears at the seal lip contacts.

B - Filters
Inspect filters at least twice annually. Units equipped with optional status panel will indicate at the status panel when filters are dirty or plugged resulting in restricted air flow. Replace the 16 in. x 20 in. x 1 in. frame type filters with equivalent filters available from your Lennox dealer.

C - Outdoor Coil
Annually rinse the outdoor fin coil with water to remove dirt or other accumulation.

D - Compressor Oil Charge
CHA11-953 with Bristol compressors uses 65 oz. of the type Suniso 3GS per compressor.

CHA11-953 with Copeland compressors uses 60 oz. of heat pump grade mineral oil of 190 to 210 viscosity per compressor.

CHA11-1353 with Bristol compressors uses 65 oz. of the type Suniso 3Gs per compressor.

CHA11-1353 with Copeland compressors uses 72 oz. of heat pump grade mineral oil of 190 to 210 viscosity per compressor.

XI - GENERAL SCHEMATIC INFORMATION

1. The unit schematic wiring diagram format incorporates a horizontal power line which separates the line voltage circuit (motors-compressors-electric elements) from the controlling circuit. The motors, compressors and electric elements are located below the power line with the controlling circuit directly above the line.

2. The graphic symbols for components and code lettering conforms to the “IEEE Standard and American National Standard” of graphic symbols for electrical diagrams. All symbols and code lettering used are approved by the International Electrotechnical Commission (IEC). Refer to Figure 30 for code and symbol identification.
3 - Terminal numbers on jack plugs are located by a ridge on the corner of the plug called the "Key." Refer to Figure 31 for proper numbering sequence.

4 - A component index chart is provided on each diagram which includes:
   - Code numbers (Key).
   - Description of component.
   - Location of component. See Example A in Figure 33.
   - Cross reference to other diagram sections. See Example B in Figure 33.

NOTE - Figure 33 actually shows a CHP11 wiring diagram in the cross reference example. However, the technique is still the same.

5 - Jack plugs are shown in the schematic circuit by both jack plug number and terminal number. In Figure 33, JP1-5 indicates jack plug number 1 and terminal number 5.

6 - Optional circuits are shown with arrow connections. In Example D, the remote minimum positioner (R4) is a substitute for the minimum positioner (R3) in unit.

7 - Solid lines around a control indicate a complete control — Example E. Dashed lines around a control indicates only a part of a control — Example F.

8 - The "Compressor 1", "Compressor 2" and "Heat Mode" indicator lights used in the status panel options are dual color. Figure 32 illustrates "Compressor 1" light schematically. The light is green during a compressor demand but changes to red if a safety switch opens.

During normal operation internal status panel circuits place potential at the green leg of indicator light. When a compressor safety switch opens, potential feeds through the red leg.

9 - Pages 30 and 31 show a complete CHA11 unit schematic for an application including SSP11 switching status panel, power saver and electric heat. Pages 32 and 33 show another CHA11 unit schematic for switching subbase, SP11 status panel, power saver and electric heat.
A - Cooling Mode (Figure 34)

Continuous Blower
1 - The K1 Blower Contactor and K3 Blower Relay are energized continuously unless the optional fan switch (used with switching subbase or switching status panel) is set to "auto" or the K2 Night Relay is activated by the night setback option.
2 - K1 energizes blower motor.
3 - N.C. K3 contacts open to break the "W" to "W1" circuit between Logic Panel and Power Saver Motor. This permits power saver operation.

Intermittent Blower
4 - On applications with switching subbase or switching status panel and power saver a K23 Voltage Control Relay must be field installed. This relay initiates blower operation.
5 - Positioning fan switch to "auto" or activation of night setback option puts system into intermittent blower.
6 - K23 Voltage Control Relay makes on a cooling ramp signal of 4VDC. This energizes K22 Cool Blower Relay.
7 - N.O. K22-1 contacts close to energize K1 Blower Contactor and K3 Blower Relay.
8 - K1 energizes blower motor.
9 - K3 permits power saver operation. See step 3.

Cooling
10 - The room control and discharge thermostat generate a cooling ramp signal based on the cooling demand.
11 - The power saver dampers modulate in response to the cooling ramp signal, discharge low limit feature and enthalpy control setting. The range is 1.5 to 4VDC. The dampers are in minimum position at 1.5 volts and are open at 4 volts.
12 - The logic panel switches its contacts also in response to the cooling ramp signal. At approximately 5VDC; "C1" closes at logic panel.
13 - As "C1" closes it energizes K8 No. 1 Compressor Contactor through:
   S6 - Cooling Lockout Thermostat
   S1 - High Pressure Switch (manual reset)
   S9 - Low Pressure Switch (auto reset)
14 - If unit does not include power saver option, "C1" also energizes K22 Cool Blower Relay. This in turn energizes K1 Blower Contactor to energize blower motor.
15 - N.O. K8-1 contacts close to energize both the No. 1 compressor and condenser fan.
16 - "C1" also energizes another circuit to "C2" through the Cooling Lockout Thermostat S6.
17 - "C2" closes at a cooling ramp signal of approximately 6.75VDC.
18 - This energizes the K9 No. 2 Compressor Contactor through:
   S2 - High Pressure Switch (manual reset)
   S11 - Low Pressure Switch (auto reset)
19 - N.O. K9-1 contacts close to energize both the No. 2 compressor and condenser fan.
20 - The logic panel opens the switches in reverse order according to cooling command signal
   C2 opens at approximately 7.5V dc
   C1 opens at approximately 4V dc
   K23 opens between 2.5V - 3V dc
B - Auxiliary Heating Mode (Figure 35)

1 - The K1 Blower Contactor and K3 Blower Relay are energized continuously unless the optional fan switch (used with switching subbase or switching status panel) is set to "auto" or the K2 Night Relay is activated by the night setback option.

2 - K1 energizes blower motor.

3 - N.C. K3 contacts open to break the "W" to "W1" circuit between Logic Panel and Power Saver Motor. This permits power saver dampers to open to minimum fresh air setting.

4 - Positioning fan switch to "auto" or activation of night setback option puts system into intermittent blower.

5 - The room control and discharge sensor generate a heating ramp signal based on the heating demand. The logic panel switches its contacts in response to this signal.

6 - A heating ramp signal of approximately 5VDC closes "H1" at the logic panel.

7 - As "H1" closes the K11 Heat Blower Relay is energized. If the unit was in intermittent blower, N.O. K11-1 contacts close to energize K1 and K3. Refer to steps 2 and 3.

8 - On electric heat applications, "H1" also energizes K19 Electric Heat Relay.


10 - N.O. K15-1 contacts close to energize first stage of electric heat. See Table 0 for a detailed electric heat sequence of operation.

11 - A heating ramp signal of approximately 6.75VDC closes "H2" at logic panel.

12 - This energizes the contactor controlling next stage of electric heat through:
   - T5 - Electric Heat Transformer
   - S11 - Electric Heat Limit
   - DL - Electric Heat Time Delay

13 - The logic panel opens the "H" switches in reverse order according to heating ramp signal:
   - H2 opens at approximately 5.75VDC
   - H1 opens at approximately 4VDC

14 - On hot water applications, the valve motor modulates directly in response to heating ramp signal. The range is 6 to 9VDC. The valve is closed at 6 volts and open at 9 volts.
XIII - TROUBLESHOOTING

The CHA11 is engineered for troubleshooting convenience. Many problems can be determined at the unit make-up box before opening unit access panels. All that is needed is an ohmmeter and an AC/DC voltmeter.

Perform the checks outlined in the following flow charts.

Each check shows the terminal block, meter test points and voltage.

Additional information is available for troubleshooting the Honeywell solid-state control system. Refer to the "Miscellaneous" section within this manual. Before condemning any components, be sure all terminal connections are tight in the circuit. This is particularly important on DC voltages, especially at the thermostat.
ELECTRIC HEAT TROUBLESHOOTING CHART

MAKE "NO HEAT OR INSUFFICIENT HEAT" CHECKS.
(Page 36)

IS THERE AN ELECTRIC HEAT DEMAND?

AC VOLTMETER

24

T3 COM.

9
TB-F
TB-D

NO VOLTAGE

YES VOLTAGE

CHECK LOGIC PANEL HEATING RELAY SEQUENCE (H1).

*IS THE ELECTRIC HEAT LIMIT (S11) OPEN?

NO VOLTAGE

YES VOLTAGE

CHECK T5 TRANSFORMER. CHECK CAUSE OF EXCESSIVE TEMPERATURE.

AC VOLTMETER

24

GRD.

8
TB-F

*IS THERE POTENTIAL TO K15 ELECTRIC HEAT CONTACTOR?

NO VOLTAGE

YES VOLTAGE

CHECK K19 RELAY

AC VOLTMETER

24

GRD.

5
TB-F

*IS THERE A SECOND STAGE ELECTRIC HEAT DEMAND?

NO VOLTAGE

YES VOLTAGE

CHECK LOGIC PANEL HEATING RELAY SEQUENCE (H2).

TROUBLESHOOT ELECTRIC HEAT SECTION

*THESE CHECKS CANNOT BE MADE ON ECH11 "Q" VOLTAGE HEATERS WITH 15KW OR ECH11 "G" VOLTAGE HEATERS WITH 15/30 KW.

**ON ECH11-95/135-60-Q UNITS, THIS CHECK IS MADE AT TB-F7.
CHA11 NO COOLING OR INSUFFICIENT COOLING

CHECK POWER

HAVE THE FUSES BLOWN AT THE DISCONNECT, OR IF UNIT INCLUDS ELECTRIC, HEAT HAVE F2 FUSES BLOWN.

YES

NO

TURN OFF POWER AND REMOVE FUSES. CHECK THE RESISTANCE FROM THE LOAD SIDE OF EACH FUSE HOLDER TO GROUND. IS THERE A DIRECT SHORT TO GROUND?

YES

NO

REPLACE FUSES. RUN THROUGH A COMPLETE CYCLE AND MONITOR UNIT AMPERAGE. IF FUSES BLOW AGAIN, TROUBLESHOOT COMPONENTS FOR SHORTED WINDING.

TROUBLESHOOT COMPONENTS AND WIRING FOR CAUSE.

AC VOLTMETER

24

T3 COM.

TB-E

TB-D

CHECK T3 TRANSFORMER CONTROL CIRCUIT

YES VOLTAGE

NO VOLTAGE

CHECK 1 POWER TRANSFORMER (IF USED). CHECK 1 TRANSFORMER CONTROL CIRCUIT FUSING.

DC VOLTMETER

20

TB-C

TB-C

CHECK POWER TO ROOM CONTROL

YES VOLTAGE

NO VOLTAGE

CHECK CONNECTIONS. CHECK CB-1 CIRCUIT BREAKER MAKE LOGIC PANEL POWER SUPPLY CHECK.

AC VOLTMETER

24

T3 COM.

TB-E

TB-D

CHECK FOR COOLING DEMAND

YES VOLTAGE

NO VOLTAGE

CHECK LOGIC PANEL COOLING RELAY SEQUENCE (C1).

AC VOLTMETER

24

T3 COM.

TB-E

TB-D

CHECK FOR COOLING LOCKOUT

YES VOLTAGE

NO VOLTAGE

CHANGE SETTING.

AC VOLTMETER

24

T3 COM.

TB-E

TB-D

CHECK FOR NO. 2 COMPRESSOR DEMAND

YES VOLTAGE

NO VOLTAGE

CHECK LOGIC PANEL COOLING RELAY SEQUENCE (C2).

AC VOLTMETER

24

T3 COM.

TB-E

TB-D

CHECK FOR OPEN SAFETY SWITCHES IN COMPRESSOR 1 CONTROL CIRCUIT

YES VOLTAGE

NO VOLTAGE

IF HIGH PRESSURE SWITCH, MANUALLY RESET CONTROL. DETERMINE CAUSE OF TRIPOUT.

AC VOLTMETER

24

TB-D

TB-D

VISUALLY CHECK COMPRESSOR 1 AND CONDENSER FAN. 1. IF COMPRESSOR RUNS BUT FAN DOES NOT, THE UNIT IS EITHER IN LOW AMBIENT OPERATION OR FAN IS BAD. 2. IF COMPRESSOR RUNS BUT COMPRESSOR DOES NOT, COMPRESSOR IS BAD OR IS OUT ON INTERNAL PROTECTION. IF BOTH COMPRESSOR AND FAN DO NOT RUN, CHECK KB CONTACOR.

VISUALLY CHECK COMPRESSOR 1 AND CONDENSER FAN 2. IF COMPRESSOR RUNS BUT FAN DOES NOT, THE UNIT IS EITHER IN LOW AMBIENT OPERATION OR FAN IS BAD. 2. IF COMPRESSOR RUNS BUT COMPRESSOR DOES NOT, COMPRESSOR IS BAD OR IS OUT ON INTERNAL PROTECTION. IF BOTH COMPRESSOR AND FAN DO NOT RUN, CHECK KB CONTACOR.

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