YCAS 310 - 380
STYLE D

YCAJ 3 SYSTEM With EPROM
031-01714-103 + 031-01714-103
(Standard, Brine & Metric Models Combined)
TABLE OF CONTENTS

1. INTRODUCTION & PHYSICAL DESCRIPTION .................................. 57
   1.1 General ................................................................................ 57
   1.2 Keypad & Display ................................................................ 57
   1.3 Chiller On (Auto) / Off Switch ............................................ 58
   1.4 Microprocessor Board ....................................................... 58
   1.5 Ancillary Circuit Boards .................................................... 58
   1.6 Current Transformers ....................................................... 59
   1.7 EMS/BAS Connections ................................................. 59
   1.8 Microprocessor Board Layout ........................................... 61
   1.9 Logic Section Layout ....................................................... 63

2. STATUS KEY & FAULT MESSAGES .............................................. 66
   2.1 General ............................................................................. 66
   2.2 General Status Messages ............................................... 66
   2.3 Anticipation Control Status Messages .............................. 68
   2.4 Chiller Fault Status Messages ......................................... 69
   2.5 System Fault Status Messages ....................................... 70
   2.6 Printout on Fault Shutdown ............................................. 73

3. DISPLAY KEYS & OPTION SWITCHES ...................................... 74
   3.1 General ............................................................................. 74
   3.2 Chilled Liquid Temperatures Key ...................................... 74
   3.3 Ambient Temperature Key .............................................. 75
   3.4 System Pressures / Temperatures Keys ............................ 75
   3.5 Percentage Motor Current Key ....................................... 76
   3.6 Operating Hours / Start Counter Key ................................. 76
   3.7 Options Key & Dip Switch Settings ................................ 76

4. PRINT KEYS ............................................................................. 80
   4.1 General ............................................................................. 80
   4.2 Operating Data Key ........................................................... 80
   4.3 Operating Data – Local Display Messages ........................ 80
   4.4 Operating Data – Remote Printout ................................... 84
   4.5 Fault History Key ............................................................... 84
   4.6 Fault History Data – Local Display Messages ................. 85
   4.7 Fault History Data – Remote Printout ............................ 89

5. ENTRY KEYS ............................................................................ 91
   5.1 General ............................................................................. 91
   5.2 Numerical Keypad ............................................................ 91
   5.3 Enter Key ........................................................................ 91
   5.4 Cancel Key ........................................................................ 91
   5.5 AM / PM Key .................................................................. 91
   5.6 Advance Day Key .............................................................. 91

6. SETPOINTS KEYS .................................................................... 92
   6.1 General ............................................................................. 92
   6.2 Chilled Liquid Temperature Control ............................... 92
   6.3 Chilled Liquid Temp / Range Key .................................... 96
   6.4 Remote Reset Temp / Range Key .................................... 97

7. CLOCK KEYS ........................................................................... 98
   7.1 General ............................................................................. 98
   7.2 Set Time Key ................................................................. 98
   7.3 Set Schedule / Holiday Key ........................................... 98
   7.4 Manual Override Key ....................................................... 99

8. PROGRAM KEY ......................................................................... 100
   8.1 General .......................................................................... 100
   8.2 Program Key – User Programmable Values .................. 101
   8.3 Programming “Default” Values ..................................... 107
   8.4 Compressor Motor Full Load Amps Data ....................... 109
   8.5 Design Condensing Temperature Data ......................... 110
The 310-380 Millennium Air Cooled Screw liquid chiller is completely assembled with all interconnecting refrigerant piping and internal wiring, ready for field installation. The unit is pressure-tested, evacuated, and fully charged with Refrigerant-22, and includes an initial oil charge. After assembly, an operational test is performed with water flowing through the cooler to check that each refrigeration circuit operates correctly.

GENERAL CHILLER INFORMATION

The unit structure is heavy gauge, galvanized steel, covered with a baked-on enamel. Base rails are of formed double thickness, painted plate steel. Units are designed in accordance with ARI 550, NFPA 70 (National Electrical Code), ASHRAE/ANSI 15 Safety code for mechanical refrigeration, ASME, and U.L. (200, 230, 460 and 575-3-60 models). Units are rated in accordance with ARI Standard 550.
UNIT NOMENCLATURE

The model number denotes the following characteristics of the unit:

- **YC** - YORK Chiller
- **A** - Air Cooled
- **S** - Compressor Design Series
  - **S** = Screw
- **310** - Unit Model
- **- 46** - Type Start
  - **Y** = WYE-Delta
  - **X** = Across-the-Line
- **D** - Design Series
- **Voltage Code:**
  - **17** = 200-3-60
  - **28** = 230-3-60
  - **40** = 380-3-60
  - **46** = 460-3-60
  - **58** = 575-3-60
NAMEPLATE ENGINEERING DATA

Engineering Data (stamped on unit nameplate) denotes the following characteristics of the components of the unit:

2 Compressor “W” Chiller
Configuration containing
4 Fans & 8 Coils per Module
1 = 50 Hz, Economized, 1 Module
2 = 60 Hz, Economized, 1 Module
3 = 50 Hz, Economized, 1.5 Module
4 = 60 Hz, Economized, 1.5 Module
5 = 50 Hz, Economized, 2 Module
6 = 60 Hz, Economized, 2 Module
7 = 50 Hz, Economized, 2.5 Module
8 = 60 Hz, Economized, 2.5 Module
9 = 50 Hz, Economized, 3 Module
10 = 60 Hz, Economized, 3 Module

Gear in System #1 XHS 120 Compressor
(A, M, F, H, P or S)

Motor in System #1 Compressor

<table>
<thead>
<tr>
<th>Frame</th>
<th>Long</th>
<th>Max. KW</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 = 101</td>
<td>7”</td>
<td>N/A</td>
</tr>
<tr>
<td>1 = 101</td>
<td>8”</td>
<td>85</td>
</tr>
<tr>
<td>2 = 101</td>
<td>9”</td>
<td>105</td>
</tr>
<tr>
<td>3 = 101</td>
<td>9.5”</td>
<td>N/A</td>
</tr>
<tr>
<td>4 = 101</td>
<td>10”</td>
<td>126</td>
</tr>
<tr>
<td>5 = 101</td>
<td>10.75”</td>
<td>150</td>
</tr>
<tr>
<td>6 = 124</td>
<td>9.5” (G)</td>
<td>184</td>
</tr>
<tr>
<td>7 = 124</td>
<td>9.5” (K)</td>
<td>219</td>
</tr>
<tr>
<td>8 = 124</td>
<td>10.75” (P)</td>
<td>263</td>
</tr>
<tr>
<td>9 = 124</td>
<td>10.75” (M)</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Gear in System #2 XHS 120 Compressor
(A, M, F, H, P or S)

Motor in System #2 Compressor
(See System #1 motor list)

Refrigerant Code
A = R-22
B = R-134a

Condenser Fan Code
6, 7, A, or B

Condenser Code
L = 32” x 83”
M = 32” x 83”
N = 32” x 83”

Cooler Code
H = 16” Cooler
K = 18” Cooler
N = 20” Cooler
OPERATIONAL LIMITATIONS
(English)

VOLTAGE LIMITATIONS

The following voltage limitations are absolute and operation beyond these limitations may cause serious damage to the compressor.

VOLTAGES

<table>
<thead>
<tr>
<th>UNIT POWER</th>
<th>MIN.</th>
<th>MAX.</th>
</tr>
</thead>
<tbody>
<tr>
<td>200-3-60</td>
<td>180</td>
<td>220</td>
</tr>
<tr>
<td>230-3-60</td>
<td>207</td>
<td>253</td>
</tr>
<tr>
<td>460-3-60</td>
<td>414</td>
<td>506</td>
</tr>
<tr>
<td>575-3-60</td>
<td>517</td>
<td>633</td>
</tr>
</tbody>
</table>

MODEL YCAS & YDAS COOLER CODE

310, 340, 360, 380 | 3

FIG. 1A – COOLER WATER PRESSURE DROP

TEMPERATURES AND FLOWS
310 – 380 TONS

<table>
<thead>
<tr>
<th>MODEL NUMBER YCAS &amp; YDAS</th>
<th>LEAVING WATER TEMPERATURE (°F)</th>
<th>COOLER FLOW (GPM)²</th>
<th>AIR ON CONDENSER (°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MIN.¹</td>
<td>MAX.²</td>
<td>MIN.</td>
</tr>
<tr>
<td>310</td>
<td>40</td>
<td>52</td>
<td>400</td>
</tr>
<tr>
<td>340</td>
<td>40</td>
<td>52</td>
<td>400</td>
</tr>
<tr>
<td>360</td>
<td>40</td>
<td>52</td>
<td>400</td>
</tr>
<tr>
<td>380</td>
<td>40</td>
<td>52</td>
<td>400</td>
</tr>
</tbody>
</table>

NOTES:
1. For leaving brine temperature below 40°F, contact your nearest YORK office for application requirements.
2. For leaving water temperature higher than 52°F, contact your nearest YORK office for application guidelines.
3. The evaporator is protected against freeze-up to -20°F with an electrical heater as standard.
4. Operation above 115°F requires the Optional High Ambient Kit.
5. YDAS Units have two coolers in parallel.
OPERATIONAL LIMITATIONS
(SI)

VOLTAGE LIMITATIONS

The following voltage limitations are absolute and operation beyond these limitations may cause serious damage to the compressor.

VOLTAGES

<table>
<thead>
<tr>
<th>UNIT POWER</th>
<th>MIN.</th>
<th>MAX.</th>
</tr>
</thead>
<tbody>
<tr>
<td>200-3-60</td>
<td>180</td>
<td>220</td>
</tr>
<tr>
<td>230-3-60</td>
<td>207</td>
<td>253</td>
</tr>
<tr>
<td>460-3-60</td>
<td>414</td>
<td>506</td>
</tr>
<tr>
<td>575-3-60</td>
<td>517</td>
<td>633</td>
</tr>
</tbody>
</table>

MODEL YCAS & YDAS | COOLER CODE
-----------------|------------
310, 340, 360, 380 | 3

FIG. 1B – COOLER WATER PRESSURE DROP

TEMPERATURES AND FLOWS
1089 – 1335 kW

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>LEAVING WATER TEMPERATURE (°C)</th>
<th>COOLER FLOW (L/S)²</th>
<th>AIR ON CONDENSER (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>YCAS &amp; YDAS</td>
<td>MIN.¹</td>
<td>MAX.²</td>
<td>MIN.</td>
</tr>
<tr>
<td>310</td>
<td>4.4</td>
<td>11.1</td>
<td>25.2</td>
</tr>
<tr>
<td>340</td>
<td>4.4</td>
<td>11.1</td>
<td>25.2</td>
</tr>
<tr>
<td>360</td>
<td>4.4</td>
<td>11.1</td>
<td>25.2</td>
</tr>
<tr>
<td>380</td>
<td>4.4</td>
<td>11.1</td>
<td>25.2</td>
</tr>
</tbody>
</table>

NOTES:
1. For leaving brine temperature below 4.4°C, contact your nearest YORK office for application requirements.
2. For leaving water temperature higher than 11°C, contact your nearest YORK office for application guidelines.
3. The evaporator is protected against freeze-up to -28.8°F with an electrical heater as standard.
4. Operation above 46.1°C requires the Optional High Ambient Kit.
5. YDAS Units have two coolers in parallel.
## PHYSICAL DATA
(English)

<table>
<thead>
<tr>
<th>MODEL YCAS</th>
<th>310</th>
<th>340</th>
<th>360</th>
<th>380</th>
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<tbody>
<tr>
<td>NOMINAL CAPACITY (TONS)</td>
<td>297.8</td>
<td>323.2</td>
<td>346.5</td>
<td>358.8</td>
</tr>
<tr>
<td>NO. OF REFRIG CIRCUITS</td>
<td>3</td>
<td>3</td>
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</table>

<table>
<thead>
<tr>
<th>COMPRRESSOR MODEL XHS</th>
<th>Sys. 1</th>
<th>Sys. 2</th>
<th>Sys. 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMPRESSOR Sys. 1</td>
<td>120CH*N</td>
<td>120CP*Q</td>
<td>120CP*Q</td>
</tr>
<tr>
<td>COMPRESSOR Sys. 2</td>
<td>120CH*N</td>
<td>120BF*L</td>
<td>120CP*Q</td>
</tr>
<tr>
<td>COMPRESSOR Sys. 3</td>
<td>120CH*N</td>
<td>120CP*Q</td>
<td>120CS*Q</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COOLER</th>
<th>DIAMETER x LENGTH (in.)</th>
<th>24 x 96</th>
<th>24 x 96</th>
<th>24 x 96</th>
<th>24 x 96</th>
</tr>
</thead>
<tbody>
<tr>
<td>VOLUME (GAL.)</td>
<td>MIN</td>
<td>91</td>
<td>91</td>
<td>91</td>
<td>91</td>
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<tr>
<td>FLOW (GPM)</td>
<td>MAX</td>
<td>400</td>
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<tr>
<td>MAX</td>
<td>1400</td>
<td>1400</td>
<td>1400</td>
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</table>

<table>
<thead>
<tr>
<th>CONDENSER ROWS</th>
<th>Sys. 1</th>
<th>Sys. 2</th>
<th>Sys. 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO.</td>
<td>4</td>
<td>4</td>
<td>4</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>CONDENSER FACE AREA (FT.²)</th>
<th>443</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>CONDENSER HP/KW</th>
<th>NO.</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO. OF BLADES</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AIRFLOW CFM</th>
<th>202,000</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>WEIGHT (LBS.)</th>
<th>SHIPPING</th>
<th>OPERATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Al. FIN</td>
<td>22,614</td>
<td>23,374</td>
</tr>
<tr>
<td>Cu. FIN</td>
<td>26,028</td>
<td>26,788</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>REFRIGERANT CHARGE (LBS. R-22)</th>
<th>Sys. 1</th>
<th>Sys. 2</th>
<th>Sys. 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sys. 1</td>
<td>210</td>
<td>210</td>
<td>235</td>
</tr>
<tr>
<td>Sys. 2</td>
<td>235</td>
<td>235</td>
<td>235</td>
</tr>
<tr>
<td>Sys. 3</td>
<td>235</td>
<td>235</td>
<td>235</td>
</tr>
</tbody>
</table>
### PHYSICAL DATA

(SI)

<table>
<thead>
<tr>
<th>MODEL YCAS</th>
<th>310</th>
<th>340</th>
<th>360</th>
<th>380</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOMINAL CAPACITY (KW)</td>
<td>1046.6</td>
<td>1135.9</td>
<td>1217.8</td>
<td>1261.0</td>
</tr>
<tr>
<td>NO. OF REFRIG CIRCUITS</td>
<td>3</td>
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</tr>
<tr>
<td>COMPRESSOR MODEL XHS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sys. 1</td>
<td>120CH*N</td>
<td>120CP*Q</td>
<td>120CP*Q</td>
<td>120CS*Q</td>
</tr>
<tr>
<td>Sys. 2</td>
<td>120CH*N</td>
<td>120BF*L</td>
<td>120CP*Q</td>
<td>120CS*Q</td>
</tr>
<tr>
<td>Sys. 3</td>
<td>120CH*N</td>
<td>120CP*Q</td>
<td>120CP*Q</td>
<td>120CS*Q</td>
</tr>
<tr>
<td>DIAMETER x LENGTH (mm)</td>
<td>609 x 2438</td>
<td>609 x 2438</td>
<td>609 x 2438</td>
<td>609 x 2438</td>
</tr>
<tr>
<td>VOLUME (L)</td>
<td>345</td>
<td>345</td>
<td>345</td>
<td>345</td>
</tr>
<tr>
<td>FLOW (L/sec)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MIN</td>
<td>25.2</td>
<td>25.2</td>
<td>25.2</td>
<td>25.2</td>
</tr>
<tr>
<td>MAX</td>
<td>88.3</td>
<td>88.3</td>
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<td>88.3</td>
</tr>
<tr>
<td>COOLER</td>
<td></td>
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<tr>
<td>Sys. 1</td>
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<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Sys. 2</td>
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<td>Sys. 3</td>
<td>4</td>
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<tr>
<td>CONDENSER FACE AREA (M²)</td>
<td>41</td>
<td>41</td>
<td>41</td>
<td>41</td>
</tr>
<tr>
<td>CONDENSER HP/KW</td>
<td>3/2.8</td>
<td>3/2.8</td>
<td>3/2.8</td>
<td>3/2.8</td>
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<tr>
<td>NO. OF BLADES</td>
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<td>6</td>
<td>6</td>
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<tr>
<td>AIRFLOW L/sec.</td>
<td>95,331</td>
<td>95,331</td>
<td>95,331</td>
<td>95,331</td>
</tr>
<tr>
<td>WEIGHT (Kg)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHIPPING</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Ai. FIN</td>
<td>10,258</td>
<td>10,258</td>
<td>10,258</td>
<td>10,258</td>
</tr>
<tr>
<td>Cu. FIN</td>
<td>11,806</td>
<td>11,806</td>
<td>11,806</td>
<td>11,806</td>
</tr>
<tr>
<td>OPERATING</td>
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<td>12,151</td>
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<td>12,151</td>
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<td>REFRIGERANT CHARGE (Kg R-22)</td>
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<tr>
<td>Sys. 1</td>
<td>95</td>
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<td>95</td>
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<tr>
<td>Sys. 2</td>
<td>107</td>
<td>107</td>
<td>107</td>
<td>107</td>
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<tr>
<td>Sys. 3</td>
<td>107</td>
<td>107</td>
<td>107</td>
<td>107</td>
</tr>
</tbody>
</table>
NOTES:

1. Clearances - Recommended YORK clearances for peak performance, reliable operation and maintenance:
   Side to wall 8'-0"; Rear to wall 8'-0"; Control Panel End to wall 5'-0"; Over the Top - No obstructions allowed; Distance between adjacent units 12'-0", (Walls should be no higher than the unit.)
   *No more than one wall can be higher than the top of the unit. The area within the clearances shown above and area under the unit must be kept clear of all obstructions or clutter that would impede air flow to the unit. In installations where winter operation is intended and snow accumulations are expected, additional unit height must be provided to insure air flow.
   NOTE: Reduced clearances may be used due to jobsite restrictions. The unit will unload to prevent the condenser pressure and motor current from exceeding the maximum limits and will continue to operate without nuisance high pressure or motor current cutouts even though the air flow will be restricted at these conditions.

2. Cooler liquid connection sizes (inlet and outlet) 8" victaulic for all models.

3. Spring isolators (OPTIONAL) will increase overall height of unit.
YCAS 310 – 380 DIMENSIONS
(English Units)

1. 3 1/2" x 7'-0"

2. POWER PANEL

3. CONTROL PANEL

4. 7/8" KNOCKOUTS
   FOR LOW VOLTAGE
   CONTROL WIRING
   SYS. #1 & #2 AT
   THIS END. SYS.
   #3 AT OTHER END
   (SEE DETAIL)

5. 7/8" KNOCKOUTS
   FOR CONTROL WIRING
   SYS. #1 & #2 AT
   THIS END. SYS.
   #3 AT OTHER END
   (SEE DETAIL)

6. 6 1/2" x 25 1/2"
   REMOVABLE PLATE
   WITH
   (4) 7/8" KNOCKOUTS
   FOR POWER WIRING
   SYS. #1 & #2 AT THIS
   END. SYS. #3 AT OTHER
   END (SEE DETAIL)

7. 1/2" (EDGE OF
   UNIT TO COOLER
   CONNECTION)

8. 7'-7"

9. 8'-0"

10. 7/8" KNOCKOUT (TYP.)
NOTES:

1. Clearances - Recommended YORK clearances for peak performance, reliable operation and maintenance:
   - Side to wall 2438 mm*; Rear to wall 2438 mm; Control Panel End to wall 1524 mm*; Over the top - No obstructions allowed; Distance between adjacent units 3658 mm. (Walls should be no higher than the unit.)
   - *No more than one high wall can be higher than the top of the unit. The area within the clearances shown above and area under the unit must be kept clear of all obstructions or clutter that would impede air flow to the unit. In installations where winter operation is intended and snow accumulations are expected, additional unit height must be provided to insure air flow.
   - NOTE: Reduced clearances may be used due to jobsite restrictions or competitive recommendations. The unit will unload to prevent the condenser pressure and motor current from exceeding the maximum limits and will continue to operate without nuisance high pressure or motor current cutouts even though the air flow will be restricted at these conditions.

2. Cooler liquid connection sizes (inlet and outlet) 10” Victaulic for all models.

3. Spring isolators (OPTIONAL) will increase overall height of unit.
YCAS 310 – 380 DIMENSIONS
(SI Units)

(4) 22 KNOCKOUTS FOR LOW VOLTAGE CONTROL WIRING:
SYS. #1 & #2 AT THIS END. SYS. #3 AT OTHER END
(SEE DETAIL)

(5) 22 KNOCKOUTS FOR CONTROL WIRING:
SYS. #1 & #2 AT THIS END. SYS. #3 AT OTHER END
(SEE DETAIL)

135 X 648 REMOVABLE PLATE WITH
(4) 22 KNOCKOUTS FOR POWER WIRING:
SYS. #1 & #2 AT THIS END. SYS. #3 AT OTHER END
(SEE DETAIL)

13 (EDGE OF UNIT TO COOLER CONNECTION)

231

152

22 KNOCKOUT (TYP.)

BOTTOM VIEW – CONTROL/POWER PANELS
ELECTRICAL DATA

STANDARD COMPRESSOR POWER SUPPLIES
(Each Compressor System Power Supply Individually Protected with Field Supplied Branch Circuit Protection)

<table>
<thead>
<tr>
<th>MODEL</th>
<th>VOLTS</th>
<th>MCA¹</th>
<th>MIN NF DISC SW²</th>
<th>D.E. FU</th>
<th>C.B.</th>
<th>WIRE RANGE³ (LUGS)</th>
<th>COMPRESSOR</th>
<th>FANS</th>
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NOTES for Electrical Data:

1. Minimum circuit ampacity (MCA) is based on 125% of the rated load amps for the largest motor plus 100% of the rated load amps for all other loads included in the circuit, per N.E.C. Article 430-24. If a Factory Mounted Control Transformer is provided, add the following to the system MCA values in the YCAS Tables: -17, add 10 amps; -28, add 9 amps; -40, add 5 amps; -46, add 4 amps; -58, add 3 amps.

2. The recommended disconnect switch is based on a minimum of 115% of the summation rated load amps of all the loads included in the circuit, per N.E.C. 440-12A1.

3. Minimum fuse size is based on 150% of the largest motor RLA plus 100% of the remaining RLA's (U.L. Standard 1995, Section 36.1).

4. Maximum dual element fuse size is based on 225% maximum plus 100% of the rated load amps for all other loads included in the circuit, per N.E.C. 440-22.

5. Minimum circuit breaker is 150% maximum plus 100% of rated load amps included in the circuit, per U.L. 1995 Fig. 36.2.

6. Maximum circuit breaker is based on 225% maximum plus 100% of the rated load amps for all loads included in the circuit, per circuit, per U.L. 1995 Fig. 36.2.

7. The Incoming Wire Range is the minimum and maximum wire size that can be accommodated by unit wiring lugs. The (1), (2), (3) or (4) preceding the wire range indicates the number of termination points or lugs which are available per phase. The (1-2), (1-3) or (1-4) preceding the wire range indicates that a single multi-termination lug is available per phase that can accept from two (1-2) to four (1-4) wires of the wire range specified "(1) #1-600MCM OR (2) #1-250MCM" indicates that a single lug is supplied and it will accept a single wire up to 600MCM or 2 wires up to 250MCM. Actual wired size and number of wires per phase must be determined based on ampacity and job requirements using N.E.C. wire sizing information. The above recommendations are based on the National Electrical Code and using copper connectors only. Field wiring must also comply with local codes.

8. A ground lug is provided from each compr. system to accommodate field grounding conductor per N.E.C. Article 250-54. A control circuit grounding lug is also supplied. Incoming ground wire range is #6 - 250MCM.

9. The supplied disconnect is a “Disconnecting Means” as defined in N.E.C. 100.B, and is intended for isolating the unit from the available power supply to perform maintenance and troubleshooting. This disconnect is not intended to be a Load Break Device.

LEGEND

ACR-LINE ACROSS THE LINE
CB CIRCUIT BREAKER
DE FU DUAL ELEMENT FUSE
DISC SW DISCONNECT SWITCH
FACT MOUNT CB FACTORY MOUNTED CIRCUIT BREAKER
FACT MOUNT FUSE FACTORY MOUNTED FUSES
FLA FULL LOAD AMPS
HZ HERTZ
MAX MAXIMUM
MCA MINIMUM CIRCUIT AMPACITY
MIN MINIMUM
MIN NF MINIMUM NON-FUSED
RLA RUNNING LOAD AMPS
S.P. WIRE SINGLE POINT WIRING
UNIT MTD SERV SW UNIT MOUNTED SERVICE (NON FUSED DISCONNECT SWITCH)
WYE-DELTA WYE-DELTA START
XLRA ACROSS-THE-LINE INRUSH LOCKED ROTOR AMPS
YLRA WYE-DELTA INRUSH LOCKED ROTOR AMPS

CONTROL POWER SUPPLY

<table>
<thead>
<tr>
<th>UNIT VOLTAGÉ</th>
<th>CONTROL POWER SUPPLY</th>
<th>MIN CIRCUIT AMPACITY</th>
<th>MAX DUAL ELEMENT FUSE SIZE</th>
<th>NON-FUSED DISC. SW. SIZE</th>
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<tr>
<td>STD. MODELS W/O TRANSFORMERS</td>
<td>115-1-60</td>
<td>20A</td>
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VOLTAGE CODE

17 = 200-3-60
28 = 230-3-60
40 = 380-3-60
46 = 460-3-60
58 = 575-3-60
### SYSTEM #2 FIELD SUPPLIED WIRING

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<tr>
<th>MODEL</th>
<th>VOLTS</th>
<th>MCA²</th>
<th>MIN NF</th>
<th>D.E. FU</th>
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<th>WIRE RANGE¹ (LUGS)</th>
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</table>

See Power Wiring Schematics on pages 76 - 80.

### STANDARD UNIT COMPRESSOR POWER SUPPLIES

![Diagram of STANDARD UNIT COMPRESSOR POWER SUPPLIES]

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**BY OTHERS**

LD01975
YCAS 310-380 CHILLER COMPONENTS

- FILTER DRIER
- WATER OUTLET
- THERMOSTAT
- WATER INLET
- 27507A
SYS 1 TXV
SYS 2 TXV
SYS 1 SIGHT GLASS
SYS 1 LIQUID LINE SOLENOID
SYS 2 SIGHT GLASS
SYS 2 LIQUID LINE SOLENOID
OIL SUPPLY SOLENOID

OIL PRESSURE TRANSDUCER

OIL FILTER

SUB COOLER (ECONOMIZER)

15 TON TXV LIQUID SUPPLY SOLENOID

15 TON TXV

ECONOMIZER PIPING

OIL INJECTION PIPING

OIL SEPARATOR

LIQUID INJECTION PIPING

5 TON TXV MOTOR COOLING PIPING

LIQUID INJECTION SOLENOID VALVE

5 TON TXV
NOTE: *On newer production chillers, this valve will not be located on the compressor.
FIG. 2 – COMPRESSOR GAS FLOW
FIG. 3 – SCREW CHILLER REFRIGERANT FLOW DIAGRAM
GENERAL

GENERAL DESCRIPTION

The Air Cooled Screw Chiller utilizes many components which are the same or nearly the same as a standard reciprocating chiller of a similar size. This includes modular frame rails, condenser, fans and evaporator.

The chiller consists of three screw compressors in three separate refrigerant circuits, a single shell and tube DX evaporator, economizers, an air cooled condenser, and expansion valves. Standard efficiency chillers have 4 fans per refrigerant system and operate in pairs. High efficiency chillers have 6 fans per refrigerant system and operate in groups of 3 (trio).

COMPRESSOR

The Frick semi-hermetic rotary twin-screw compressor utilizes a twin screw design with a single slide valve for capacity control. The compressor is a positive displacement type characterized by two helically grooved rotors. The 60 Hz motor operating at 3570 RPM drives a geared speed increaser to drive the male rotor between 4125 - 7600 RPM. The female rotor is driven by the male rotor on a light film of oil. Compressors with gear sets running at higher speeds will have greater capacity.

Refrigerant gas is injected into the void created by the un-meshing of the 5 lobed male and 7 lobed female rotor. Further meshing of the rotors closes the rotor threads to the suction port and progressively compresses the gas in an axial direction toward the discharge port. The gas is compressed in volume and increased in pressure before exiting at a designed volume at the discharge end of the rotor casing. Since the intake and discharge cycles overlap, a resulting smooth continuous flow of gas is maintained.

Contact between the male and female rotor is primarily rolling on a contact band on each of the rotors pitch circle. This results in virtually no rotor wear and increased reliability, a trademark of the screw compressor.

The compressor incorporates a complete anti-friction bearing design for reduced power input and increased reliability. Four separated, cylindrical, roller bearings handle radial loads. Angular-contact ball bearings handle axial loads. Together they maintain accurate rotor positioning at all pressure ratios, thereby minimizing leakage and maintaining efficiency. A check valve is installed in the compressor discharge housing to prevent compressor rotor backspin due to system refrigerant pressure gradients during shutdown.

Motor cooling is accomplished by injecting intermediate pressure wet vapor into the motor which allows for better efficiency than the traditional use of lower pressure suction gas which requires more energy to raise to discharge pressure. On demand high pressure liquid injection provides additional motor cooling when internal oil temperatures ruse. Additional motor cooling required during low load operation is supplied by a 5 ton TXV. A drain line drains excess liquid from the motor housing and feeds it into the gear cavity.

The compressor is lubricated by removing oil from the refrigerant using an external oil separator. The pressurized oil is then piped back to the compressor for lubrication. The compressor design working pressure is 144 PSIG on the discharge side. Each chiller receives a 300 PSIG low side and 450 PSIG high side factory test. A 500 watt (115-1-60) immersion heater is located in the compressor. The heater is temperature activated to prevent refrigerant condensation.

EVAPORATOR

The system uses a Shell and Tube type Direct Expansion Evaporator. Each of the three refrigerant circuits consists of 4 passes with the chilled liquid circulating back and forth across the tubes from one end to the other. The design working pressure of the cooler shell on the liquid side is 150 PSIG, and 235 PSIG for the tube (refrigerant side). The cooler is equipped with a heater to provide freeze protection to -20°F (-28.8°C).

Water connections are grooved to accept victaulic couplings.
CONDENSER

The air cooled condenser coils use state-of-the-art louvered fins for heat transfer. Eight fans move air through the coils. Design working pressure of the condenser is 450 PSIG.

ECONOMIZER

A plate and frame heat exchanger (Economizer) is installed in the high side of each system for subcooling of the primary refrigerant liquid to the evaporator. This increases the efficiency of the system.

The wet vapor to the economizer is supplied by a small 15 ton TXV set for 10°F superheat that flashes off 10 - 20% of the liquid from the condenser. 10 - 12 tons are utilized for subcooling liquid refrigerant and 2-3 tons for motor cooling. The wet vapor for motor cooling is at an intermediate pressure between discharge and suction and therefore requires little energy to pump it back through the compressor to condenser pressure. This results in a very small loss to system efficiency.

The economizer provides approximately 20°F of additional subcooling (15°F in, 35°F out) to the liquid refrigerant which flows to the evaporator at 95°F ambient, 55°F RWT, 44°F LWT. Subcooling will drop to approximately 0°F below 90°F ambient. The subcooled liquid is then fed to the primary TXV in the system. This additional subcooling results in a significant increase in the efficiency of the system. The design working pressure of the economizer is 450 PSIG. The economizer liquid supply solenoid is activated on start-up coincident with the liquid line solenoid, after pumpdown.

OIL SEPARATOR / SYSTEM

The external oil separator, with no moving parts and designed for minimum oil carry-over, is mounted in the discharge line of the compressor. The high pressure discharge gas is forced around a 90 degree bend and through centrifugal action, oil is forced to the outside of the separator and captured on wire mesh where it drains to the bottom of the oil separator and into the compressor.

The oil (YORK “E” oil - used for R-22 applications), which drains back into the compressor through a replaceable 0.5 - 3.0 micron oil filter, and oil supply solenoid (energized when the compressor starts), is at high pressure. This high pressure “oil injection” forces the oil into the compressor where it is gravity fed to the gears and bearings for lubrication. After lubricating the gears and bearings, it is injected through orifices on a closed thread near the suction end of the rotors. The oil is automatically injected because of the pressure difference between discharge pressure and the reduced pressure at the suction end of the rotors. This lubricates the rotors as well as provides an oil seal against leakage around the rotors to assure refrigerant compression (volumetric efficiency).

The oil also provides cooling by transferring much of the heat of compression from the gas to the oil keeping discharge temperatures down and reducing the chance for oil breakdown. Oil injected into the rotor cage flows into the rotors at a point about 1.2x suction. This assures that a required minimum differential of at least 30 PSID exists between discharge and 1.2x suction, to force oil into rotor case, a minimum 10 PSI differential is all that is required to assure protection of the compressor. Oil pressure is measured as the difference between discharge pressure and the pressure of the oil entering the rotor case.

Maximum working pressure of the oil separator is 450 PSIG. A relief valve is installed in the oil separator piping. This will soon be incorporated into the oil separator. Oil level should be above the midpoint of the “lower” oil sight glass when the compressor is running. Oil level should not be above the top of the “upper” sight glass. Oil temperature control is provided through liquid injection activated by the microprocessor, utilizing a discharge temperature sensor, and a solenoid valve.

OIL COOLING / LIQUID INJECTION SYSTEM

A liquid injection system is utilized to maintain oil temperature and proper oil viscosity. Liquid injection is controlled by the microprocessor on a demand basis to provide stable oil, discharge, and motor temperature control. Liquid injection is fed directly into the motor cover along with the economizer wet vapor.

A discharge temperature sensor on the compressor sends an analog signal to the microprocessor to allow the micro to monitor oil temperature. The micro in turn controls a solenoid which injects liquid whenever the discharge temperature rises above 180°F and turns it off when temperature falls to 160°F. In most circumstances, liquid injection will not energize during part load operation.

CAPACITY CONTROL

The function of the compressor capacity control system is to automatically adjust the pumping capacity of the compressor to satisfy the cooling load to regulate leaving water temperature (LWT) within the programmed Control Range (CR). Capacity control is accomplished by moving a slide valve with a series of load and unload pulses which changes the entrance point of the suction gas entering the rotors. This allows refrigerant gas to be injected at virtually any point on the rotors, keeping in mind that a minimum capacity of 20% load per compressor (10% total chiller) is maintained on a compressor for oil return. The micro also attempts to sequence compressor loading to maximize efficiency and minimize compressor cycling.
Movement of the slide valve is accomplished by forcing pressurized oil against a piston which drives the slide valve open to load the compressor. Electrical pulses open a solenoid valve, allowing oil pressure to move the piston which operates the slide valve. The pulses originate at the micro and are a function of the required load on the chiller in response to leaving water temperature.

The micro must repetitively pulse the slide valve to maintain a constant load. This is required because discharge pressure is always present on the other end of the slide valve, trying to force it closed.

To unload the compressor, a second solenoid is opened, which vents oil pressure away from the piston. By releasing the pressure on the piston, the discharge pressure is able to push the valve toward the closed or unload position.

It will be noted that slide valve movement is greater at high discharge pressures. This is due to higher oil pressure which is directly proportional to discharge pressure. Higher oil pressures exert more pressure on the slide valve causing greater movement as the slide valve is pulsed with oil. This condition is normal. Also normal and a result of compressor design is non-linear movement at various points in the slide valve travel as the slide valve is pulsed. Closely monitoring the movement will show that the slide valve will move easier at the ends and in the center of its travel range.

When the compressor is shut down, a check valve releases oil from the piston. Since no discharge pressure is available to push the valve closed, the slide valve will maintain the position it was in when the compressor stopped. To assure the compressor starts unloaded, the micro sends an unload signal to the slide valve on start-up. In some cases, oil pressure may not be high enough at start-up to move the slide valve. This means the compressor could start-up partially loaded. This will seldom occur and will not hurt the motor due to the extra torque built into the design.

**STARTER**

Two types of compressor motor starting are available: Across-the-line and optional Wye-Delta Closed Transition Starter. The Across-the-line starters will utilize one contactor per compressor.

The optional Wye-Delta starter utilizes 4 contactors, a time delay relay, and wire wound power resistors for each compressor. See Fig. 5.

The Wye-Delta start allows inrush current to be limited to approximately 33% LRA for the first 15 seconds with current increasing to normal running current when the Delta connection is completed.

When the micro initiates a start signal to run a compressor, the 1CR (SYS 1) or 2CR (SYS 2) relay is energized. At the same time, the 1TR (SYS 1) or 2TR (SYS 2) “15 second” time delay relay is energized and begins timing. The transition of the 1CR (SYS 1) or 2CR (SYS 2) contactor also energizes 1S (SYS 1) or 2S (SYS 2) normally open auxiliary interlock contacts after approximately 16ms which in turn energizes the 1M (SYS 1) or 3M (SYS 2) motor contactor after approximately another 16ms. This completes the “WYE” connection of the motor start. At the same time, the normally closed 1S or 2S auxiliary interlock open, preventing 2M (SYS 1) or 4M (SYS 2) from energizing.

The “WYE” connection of the motor start is enabled for approximately 15 seconds. When the 1TR or 2TR timer times out after 15 seconds, the interlock contacts energize 1A (SYS 1) or 2A (SYS 2) “TRANSITION” contactor which puts the resistance networks across each winding of the “WYE” connection. At the same time, the normally closed 1A or 2A auxiliary interlock contacts de-energize 1S or 2S after approximately 16ms. The normally closed auxiliary interlock contacts on 1S or 2S will close energizing 2M or 4M after approximately 16ms.

With the 1M or 3M contactors already held in by the 1M or 3M auxiliary contacts and 2M or 4M energized, the normally closed auxiliary interlock contact on 2M or 4M contactor holding in the 1A or 2A “TRANSITION” contactor opens removing the resistor network and completing the “DELTA” connection of the “WYE-Delta” start.
WARNING

To protect warranty, this equipment must be installed and serviced by an authorized YORK service mechanic or a qualified service person experienced in chiller installation. Installation must comply with all applicable codes, particularly in regard to electrical wiring and other safety elements such as relief valves, HP cut-out settings, design working pressures, and ventilation requirements consistent with the amount and type of refrigerant charge.

*Lethal voltages exist within the control panel. Before servicing, open and tag all disconnect switches.*

INSTALLATION CHECK LIST

The following items, 1 thru 5, must be checked before placing the units in operation.

1. Inspect the unit for shipping damage.
2. Rig unit per Fig. 6A or 6B. Remove unpainted shipping braces.
3. Open the unit only to install water piping system. Do not remove protective covers from water connections until piping is ready for attachment. Check water piping to insure cleanliness.
4. Pipe unit using good piping practice (see ASHRAE handbook section 215 and 195 or YORK Service Manuals for detailed piping).
5. Check to see that the unit is installed and operated within LIMITATIONS.

The following pages outline detailed procedures to be followed to install and start up the chiller.

HANDLING

These units are shipped as completely assembled units containing full operating charge, and care should be taken to avoid damage due to rough handling.

The units are shipped with export crating unless it is specified by Sales Order.

A unit should be lifted by inserting hooks through the holes provided in unit base rails. Spreader bars should be used to avoid crushing the unit frame rails with the lifting chains. (See Fig. 6A & 6B)

INSPECTION

Immediately upon receiving the unit, it should be inspected for possible damage which may have occurred during transit. If damage is evident, it should be noted in the carrier’s freight bill. A written request for inspection by the carrier’s agent should be made at once. See “Instruction” manual, Form 50.15-NM for more information and details.

LOCATION AND CLEARANCES

These units are designed for outdoor installations on ground level, rooftop, or beside a building. Location should be selected for minimum sun exposure and to insure adequate supply of fresh air for the condenser. The units must be installed with sufficient clearances for air entrance to the condenser coil, for air discharge away from the condenser, and for servicing access.

In installations where winter operation is intended and snow accumulations are expected, additional height must be provided to insure normal condenser air flow. (See DIMENSIONS.)

FIG. – RIGGING THE CHILLER
FOUNDATION

The unit should be mounted on a flat and level foundation, floor, or rooftop capable of supporting the entire operating weight of the equipment. See PHYSICAL DATA for operating weight. If the unit is elevated beyond the normal reach of service personnel, a suitable catwalk must be capable of supporting service personnel, their equipment, and the compressors.

GROUND LEVEL LOCATIONS

It is important that the units be installed on a substantial base that will not settle. A one piece concrete slab with footers extended below the frost line is highly recommended. Additionally, the slab should not be tied to the main building foundations as noise and vibration may be transmitted.

Mounting holes are provided in the steel channel for bolting the unit to its foundation. (See DIMENSIONS.)

For ground level installations, precautions should be taken to protect the unit from tampering by or injury to unauthorized persons. Screws and/or latches on access panels will prevent casual tampering. However, further safety precautions such as a fenced-in enclosure or locking devices on the panels may be advisable. A tamper proof kit is available as an option. Check local authorities for safety regulations.

ROOFTOP LOCATIONS

Choose a spot with adequate structural strength to safely support the entire weight of the unit and service personnel. Care must be taken not to damage the roof.

Consult the building contractor or architect if the roof is bonded. Roof installations should have wooden beams (treated to reduce deterioration), cork, rubber, or vibration isolators under the base to minimize vibration.

NOISE SENSITIVE LOCATIONS

Efforts should be made to assure that the chiller is not located next to occupied spaces or noise sensitive areas where chiller noise level would be a problem. Chiller noise is a result of compressor and fan operation. Considerations should be made utilizing noise levels published in the YORK Engineering Guide for the specific chiller model. If questions arise, contact YORK PRODUCT MARKETING.

SHIPPING BRACES

A single painted shipping bracket on the opposite end of the control panel runs diagonally along the end of the unit. This may be removed once the unit is mounted on its foundation, however, it may remain in place.

SPRING ISOLATORS (OPTIONAL)

When ordered, eight (8) spring isolators will be furnished.

1. Identify the isolator and locate at the proper mounting point see pages 44 - 51.
2. Block up the equipment so as to install spring mounts with the pin on top of the housing into the chiller mounting holes.
3. The Mounting Adjustment Nut is inside the isolator mount located just below the top plate of the mount. Turn the nut 2 turns clockwise (down) to load the spring mount at each location.
4. Take additional turns on the Adjustment Nut of each location.
5. Repeat Step No. 3 as many times as necessary to bring the height of the isolator to the proper height.
6. Take additional turns on the mounts at the low side or corner to level the equipment.

COMPRESSOR MOUNTING

The compressors are mounted on four (4) vibration isolators. (See Fig. 7) The mounting bolts should NEVER be loosened or adjusted at installation of the chiller.

CHILLED LIQUID PIPING

General – When the unit has been located in its final position, the unit liquid piping may be connected. Normal installation precautions should be observed in order to receive maximum operating efficiencies. Piping should be kept free of all foreign matter. All liquid evaporator piping must comply in all respects with local plumbing codes and ordinances.

Since elbows, tees and valves decrease pump capacity, all piping should be kept as straight and as simple as possible.

Hand stop valves should be installed in all lines to facilitate servicing.

FIG. 7 – COMPRESSOR VIBRATION ISOLATOR
Piping to the inlet and outlet connections of the chiller should include high-pressure rubber hose or piping loops to insure against transmission of water pump vibration. This is optional and the necessary components must be obtained in the field.

Drain connections should be provided at all low points to permit complete drainage of the liquid cooler and system piping.

A small valve or valves should be installed at the highest point or points in the chilled liquid piping to allow any trapped air to be purged. Vent and drain connections should be extended beyond the insulation to make them accessible.

The piping to and from the cooler must be designed to suit the individual installation. It is important that the following considerations be observed:

1. The chilled liquid piping system should be laid out so that the circulating pump discharges directly into the cooler. The suction for this pump should be taken from the piping system return line and not the cooler. This piping scheme is recommended, but is not mandatory. Keep in mind that a pump whose suction is taken from the evaporator may suffer performance problems.

2. The inlet and outlet cooler connection sizes are 8".

3. A strainer, preferably 40 mesh, must be installed in the cooler inlet line just ahead of the cooler. This is important to protect the cooler from entrance of large particles which could cause damage to the evaporator.

4. All chilled liquid piping should be thoroughly flushed to free it from foreign material before the system is placed into operation. Use care not to flush any foreign material into or through the cooler.

5. As an aid to servicing, thermometers and pressure gauges should be installed in the inlet and outlet water lines. One connection point (plugged) is provided in each cooler nozzle. Thermometers and gauges are not furnished by other suppliers.

6. The chilled liquid lines that are exposed to outdoor ambients should be wrapped with supplemental heater cable and insulated to protect against freeze-up during low ambient periods, and to prevent formation of condensation on lines in warm humid climates.

7. Two chilled water flow switches, (either by YORK or others) MUST be installed in the leaving water piping of the cooler. There should be a straight line horizontal run of at least 5 diameters on each side of the switch. Adjust the flow switch paddles to the size of pipe in which it is to be installed. (See Manufacturer’s Instructions furnished with switch). The switches are to be wired to terminals in the control panels as shown in the WIRING DIAGRAM as shown on pages 24 and 30. Two sets of contacts MUST be wired to the chiller; one pair of contacts to the master panel and one pair of contacts to the slave panel. This is necessary to allow both micros to shut down all 3 compressors immediately, when the flow switch opens. Otherwise, a time delay on complete chiller shutdown will occur due to delays in communication on the RS-485 communication link and the possibility of evaporator damage. NEVER connect a single flow switch contact to both control panels. It is important that the power supplies in each control panel remain isolated.

**WARNING**

*The Flow Switch MUST NOT be used to start and stop the chiller. It is intended only as a safety switch. Never bypass a flow switch. This will cause damage to the chiller and void any warranties.*

**COMPRESSOR INSULATION**

In high humidity environments, compressor sweating may be noted. In most applications, this is of no concern. However, if it is undesirable, it is the responsibility of the installer to make provisions to field insulate the compressors or install factory insulation when the option becomes available. Contact YORK Factory Marketing for availability of factory supplied kits.

**ELECTRICAL WIRING**

Liquid Chillers are shipped with all factory mounted controls wired for operation.

**Field Wiring** – Power wiring must be provided through a fused disconnect switch to the unit terminals (or optional molded disconnect switch) in accordance with N.E.C. or local code requirements. Minimum circuit ampacity and maximum dual element fuse size are given in the ELECTRICAL DATA tables. A 115-1-60, 20 amp source must be supplied for the control panel through a fused disconnect when a control panel transformer (optional) is not provided. Refer to Wiring Diagram (Page 52) in this manual or Form 201.10-W1.

Affiliated apparatus, such as chilled water flow switch, auxiliary contacts from the chilled water pump starter, alarms, etc., should be interlocked into the control panel circuit. These field modifications may be made as shown on the WIRING DIAGRAM.

**MULTIPLE UNITS**

For increased compressor protection and to reduce power inrush at start-up on multiple chiller installations, provisions must be made to prevent simultaneous start-up of two or more units. Also, some method must be employed to automatically cycle one or more of the units on or off to permit more efficient operation at part load conditions.
WEIGHT DISTRIBUTION AND ISOLATOR LOCATION  

(English Units)

**ALUMINUM CONDENSER COILS**

<table>
<thead>
<tr>
<th>MODEL</th>
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**COPPER CONDENSER COILS**

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<td>YCAS340</td>
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**TYPE & SIZE**

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<tr>
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<th>DEFL IN.</th>
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<tr>
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</table>

![Diagram](image-url)
WEIGHT DISTRIBUTION AND ISOLATOR LOCATION
(SI Units)

ALUMINUM CONDENSER COILS

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<th>DEFL (mm)</th>
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<td>CP-2-32</td>
<td>1179.3</td>
<td>WHITE</td>
<td>18.7</td>
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Any contacts connected to flow switch inputs or BAS inputs on terminals 13 - 19 or TB3, or any other terminals, must be suppressed with a YORK P/N 031-00808-000 suppressor across the relay/contactor coil which activates the contacts.

CAUTION:
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<td>ALL MODELS W/O TRANS.</td>
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<tr>
<td>MODELS -17 WITH TRANS.</td>
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* All primary and secondary wiring between transformer and control panel included.
YCAS 310 - 380 SYSTEMS 1 AND 2
WIRING DIAGRAM
WYE-DELTA START
YCAS 310 - 380 SYSTEMS 1 AND 2
WIRING DIAGRAM
WYE-DELTA START

YCAS 310 - 380 SYSTEM 3
COMRESSOR TERMINAL BOX
WYE-DELTA START

COMPRSOR TERMINAL BOX SYSTEM NO. 2

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YCAS 310 - 380 SYSTEM 3
CONNECTION DIAGRAM
WYE-DELTA START

LEGEND
3HPCD SIS NO. 3 HIGH PRESS. CUTOUT
3MTR SYS. NO. 3 COMPR. CRANKCASE HEATER
3S11V SYS. NO. 3 OIL SEPARATOR SUMP HEATER (OPTIONAL)
3L1CY SYS. NO. 3 LIQUID INJECTION CONTROL VALVE (UNIT IDENT.)
3L3SV1 SYS. NO. 3 LIQUID LINE SOLENOID VALVE (UNIT IDENT.)
3L3SV2 SYS. NO. 3 LOADING SOLENOID VALVE (UNIT IDENT.)
3L3SV3 SYS. NO. 3 UNLOADING SOLENOID VALVE (UNIT IDENT.)
3OL5V1 OIL LINE SUPPLY SOLENOID VALVE (UNIT IDENT.)
3OL5V2 ECONOMIZER LIQUID SUPPLY SOLENOID VALVE (UNIT IDENT.)
1XY3 SYS. NO. 3 THERMAL EXPANSION SOLENOID VALVE (UNIT IDENT.)

COMRESSOR
SYSTEM NO. 3 SHOWN
THERMAL EXPANSION SOLENOID VALVE
ECONOMIZER LIQUID SUPPLY SOLENOID VALVE
OIL LINE SUPPLY SOLENOID VALVE
LOADING/UNLOADING SOL. VALVE
LIQUID INJECTION CONTROL VALVE
SUITION PRESS. TRANSDUCER
COMPRESSOR TERMINAL BOX
HEATER JUNCTION BOX
DISCH. PRESS. TRANSDUCER
CONNECTOR (TYP.)
HIGH PRESS. CUTOUT

LD0097,  LD0098,  LD0099
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8. Control panel to be securely connected to earth ground.

9. Use 2KVA transformer in optional transformer kit unless there are optional oil separator sump heaters which necessitates using a 3KVA transformer.
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YCAS 310 - 380 SYSTEMS 1 AND 2
CONNECTION DIAGRAM (SYSTEM WIRING)
ACROSS-THE-LINE START

LEGEND
1HPCO STS. NO. 1 HIGH PRESS. CUTOUT
2HPCO STS. NO. 2 HIGH PRESS. CUTOUT
1HRT STS. NO. 1 COMPR. CRANKCASE HEATER
2HRT STS. NO. 2 COMPR. CRANKCASE HEATER
3HRT COOLER HEATER
4HRT STS. NO. 1 OIL SEPARATOR SUPP. HEATER (OPTIONAL)
5HRT STS. NO. 2 OIL SEPARATOR SUPP. HEATER (OPTIONAL)
1L0SVY STS. NO. 1 LIQUID INJECTION CONTROL VALVE UNIT IDENT.
1L0SVY STS. NO. 1 LIQUID LINE SOLENOID VALVE UNIT IDENT.
1L0SV2 STS. NO. 1 OIL OILING SOLENOID VALVE UNIT IDENT.
1L0SV3 STS. NO. 1 OILING SOLENOID VALVE UNIT IDENT.
2LCV STS. NO. 2 LIQUID INJECTION CONTROL VALVE UNIT IDENT.
2L0SVY STS. NO. 2 LIQUID LINE SOLENOID VALVE UNIT IDENT.
2L0SV2 STS. NO. 2 OIL OILING SOLENOID VALVE UNIT IDENT.
2L0SV3 STS. NO. 2 OIL OILING SOLENOID VALVE UNIT IDENT.
1L0SYV DIL OIL SUPPLY SOLENOID VALVES UNIT. IDENT.
2L0SYV ECONOMIZER LIQUID SUPPLY SOLENOID VALVES UNIT IDENT.
1LE0SYV THERMAL EXPANSION SOLENOID VALVE
2LE0SYV LIQUID INJECTION CONTROL VALVE
1LE0SYV THERMAL EXPANSION SOLENOID VALVE UNIT IDENT.
2LE0SYV THERMAL EXPANSION SOLENOID VALVE UNIT IDENT.

COOLER

SYST. NO. 1 LIQUID LINE SOLENOID VALVE (1L0SVY)
SYST. NO. 2 LIQUID LINE SOLENOID VALVE (2L0SVY)

LEAVING CHILLED WATER TEMP. SENSOR

SOLVENT CABLE TO ELECTRONIC PANEL

CONDENSER FANS

HIGH PRESS. CUTOUT

HEATER JUNCTION BOX

COMPRESSION TERMINAL BOX

DISCH. PRESS. TRANSDUCER

ECONOMIZER LIQUID SUPPLY SOLENOID VALVE

THERMAL EXPANSION SOLENOID VALVE

LIQUID INJECTION CONTROL VALVE
YCAS 310 - 380 SYSTEMS 1 AND 2
COMPRESSOR TERMINAL BOX
ACROSS-THE-LINE START

YCAS 310 - 380 SYSTEM 3
COMPRESSOR TERMINAL BOX
ACROSS-THE-LINE START
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CAUTION:
Any inductive devices (relays) wired in series with the flow switch for start/stop, into the Alarm circuitry, or pilot relays for pump starters wired through motor contactor auxiliary contacts must be suppressed with YORK P/N 031-00808-000 suppressor across the relay/contactor coil which activates the contacts.

Any contacts connected to flow switch inputs or BAS inputs on terminals 13 - 19 or TB3, or any other terminals, must be suppressed with a YORK P/N 031-00808-000 suppressor across the relay/contactor coil which activates the contacts.

CAUTION:
Control wiring connected to the control panel should never be run in the same conduit with power wiring.

---

**CONTROL POWER SUPPLY**

<table>
<thead>
<tr>
<th>UNIT VOLTAGE</th>
<th>CONTROL POWER SUPPLY</th>
<th>MIN CIRCUIT AMP</th>
<th>MAX DUAL ELEMENT FUSE SIZE</th>
<th>NON-FUSED DISC. SWITCH SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALL MODELS W/O TRANS.</td>
<td>115-1-50/60</td>
<td>20A</td>
<td>20A 250V</td>
<td>30A 240V</td>
</tr>
<tr>
<td>MODELS -17 WITH TRANS.</td>
<td>200-1-60</td>
<td>15A</td>
<td>15A 250V</td>
<td>30A 240V</td>
</tr>
<tr>
<td>MODELS -28 WITH TRANS.</td>
<td>230-1-60</td>
<td>15A</td>
<td>15A 250V</td>
<td>30A 240V</td>
</tr>
<tr>
<td>MODELS -46 WITH TRANS.</td>
<td>400-1-60</td>
<td>8A</td>
<td>8A 600V</td>
<td>30A 480V</td>
</tr>
<tr>
<td>MODELS -58 WITH TRANS.</td>
<td>575-1-60</td>
<td>8A</td>
<td>8A 600V</td>
<td>30A 600V</td>
</tr>
</tbody>
</table>

* All primary and secondary wiring between transformer and control panel included.
YCAS 310 - 380 SYSTEM 3
CONNECTION DIAGRAM (SYSTEM WIRING)
ACROSS-THE-LINE START

LEGEND

3HPCO SYST. NO. 3 HIGH PRESS. CUTOUT
6HTR SYST. NO. 3 COMPR. CRANKCASE HEATER
7HTR SYST. NO. 3 OIL SEPARATOR SUPP. HEATER (OPTIONAL)
3LICY SYST. NO. 3 LIQUID INJECTION CONTROL VALVE (UNIT IDENT.)
3LSV1 SYST. NO. 3 LIQUID LINE SOLENOID VALVE (UNIT IDENT.)
3LSV2 SYST. NO. 3 LOADING SOLENOID VALVE (UNIT IDENT.)
3LSV3 SYST. NO. 3 UNLOADING SOLENOID VALVE (UNIT IDENT.)
3OLSV1 OIL LINE SUPPLY SOLENOID VALVE (UNIT IDENT.)
3ELSV2 ECONOMIZER LIQUID SUPPLY SOLENOID VALVE (UNIT IDENT.)
1TX3 SYST. NO. 3 THERMAL EXPANSION SOLENOID VALVE (UNIT IDENT.)
**CHILLER CONTROL PANEL**
**PROGRAMMING AND DATA ACCESS**

**DISPLAY & STATUS INFORMATION KEYS**

**Status Key – see Section 2**
This key provides a display of the current operational and/or fault status of the chiller or individual refrigerant systems.

**Display Keys – see Section 3**
Each key provides a real-time display of commonly required information about the chiller operating conditions and settings.

**Print Keys – see Section 4**
These keys allow display or remote printout of both current real time operating and programmed data as well as fault history data from recent safety shutdowns.

**PROGRAM & SETUP KEYS**

**Entry Keys – see Section 5**
The numeric and associated keys are used for entering data as required for programming of the chiller. The “Enter” key is also used for scrolling through information available after pressing certain keys.

**Setpoint Keys – see Section 6**
These keys are used for display and programming of the local and remote offset chilled liquid temperature setpoints.

**Clock Keys – see Section 7**
These keys are used for display and programming of the clock and operating schedule for the chiller.

**Program Key – see Section 8**
This key is used for display and programming of the chiller operational settings and limits.
1.1 GENERAL

The YORK Millennium Screw Chiller Control Center is a microprocessor-based control system fitted to YCAS and YDAS liquid chillers. It is capable of multi-refrigerant system control to maintain chilled liquid temperature within programmed limits and to provide safety control of the chiller. The microprocessor monitors leaving chilled liquid temperature deviation from setpoint and the rate of change of this temperature, then starts, stops, loads and unloads compressors as required.

User interface is via a touch keypad and a liquid crystal display allowing access to operating and programmed data. Information can be displayed in English (Imperial) units or S.I. (Metric) units. For clarity this manual uses English (Imperial) units only. Conversion tables are provided at the back of this manual.

A master ON/OFF rocker switch is provided on the chiller control panel to activate or deactivate the complete chiller while switches to activate or deactivate individual refrigerant systems are provided on the Microprocessor Board(s).

External interface is available for control of the chiller via a YORK ISN system or YORK Remote Control Center. In addition, EMS/BAS system connections are provided for remote cycling, current limiting, temperature setpoint reset and alarm annunciation.

YCAS chillers each have a single split circuit evaporator serving either 2 or 3 independent refrigerant systems.

YCAS 2 system chillers are configured as a single, self-contained section with a single control panel controlling the 2 refrigerant systems. YCAS 3 system chillers are divided into a Master section containing systems 1 & 2 and the evaporator, and a Slave section containing system 3.

YDAS chillers have two split circuit evaporators each serving 2 independent refrigerant systems. YDAS chillers are divided into a Master section containing systems 1 & 2 together with dual circuit evaporator 1, and a Slave section containing systems 3 & 4 together with dual circuit evaporator 2.

Master and Slave sections on YCAS (3 compressor) and YDAS (4 compressor) chillers each have their own control panel complete with microprocessor board to control their associated systems. Communications between panels is via a 2-wire RS-485 interface. The master section control panel only is fitted with a Keypad, Display and Chiller Switch as described below.

1.2 KEYPAD & DISPLAY

An operator keypad allows complete control of the chiller from a central location. The keypad offers a multitude of commands available to access displays, program setpoints, and initiate system commands. Keys are grouped and color-coded for clarity and ease of use.

The 40-character liquid crystal display (2 lines of 20 characters) is used for displaying system parameters and operator messages. The display has a lighted background for night viewing as well as a special feature which intensifies the display for viewing in direct sunlight.
1.3 UNIT (CHILLER) ON (AUTO) / OFF SWITCH

A Master UNIT (Chiller) On (Auto) / Off switch is located just below the keypad. This switch allows the operator to turn the entire chilled Off if desired. The switch must be placed in the On position for the chiller to operate. Any time the switch is in the Off position, a Status message indicating this is displayed. See Page 16 for the location of this switch.

1.4 MICROPROCESSOR BOARD(S)

The Microprocessor Board(s) controls and makes decisions for the chiller. Information inputs from transducers and sensors around the chiller are either connected directly to the Microprocessor Board or are connected to the I/O Expansion Board and multiplexed before being sent to the Microprocessor Board. The Microprocessor Board circuitry multiplexes all these analog inputs, digitizes them, and constantly scans them to monitor chiller operating conditions. Based on this information, the Microprocessor issues commands to the Relay Boards to activate and deactivate contactors, solenoids, etc. for chilled liquid control and safety control.

Keypad commands are acted upon by the micro to change setpoints, cutouts, scheduling, operating requirements, and to provide displays.

A +12VDC REG supply voltage from the Power Supply Board is converted to +5V REG by a voltage regulator located on the Microprocessor Board. This voltage is used to operate the integrated circuitry on the board.

System Switches 1 - 4

System Switches for up to four systems are located on the Microprocessor Board (Section 1.8, Item 5). These switches allow the operator to selectively turn a given system on or off as desired. On models fitted with a Master and Slave Control Panels, system 3 & 4, can be controlled using the system switches on the Master and Slave Microprocessor boards.

Internal Clock & Memory Backup Battery

The Microprocessor Board contains a Real Time Clock integrated circuit chip (Section 1.8, Item 5) with an internal battery backup. The battery backup assures that any programmed values (setpoints, clock, cutouts, etc.) are not lost during a power failure or shutdown period regardless of the time involved.

The battery is a 10-year lithium type, but its life will depend upon whether the Real Time Clock’s internal clock circuit is energized. With the clock Off, a rated life of approximately 10 years can be expected. With the clock on, approximately 5 years. The clock is enabled and disabled using a jumper on the Microprocessor Board.

If the chiller is shut down or power failure is expected for extended periods, it may be desirable to disable the clock to save battery life. The clock can then be reactivated and reprogrammed when the chiller is returned to service. This will not affect the maintenance of programmed values and stored data by the backup battery.

While the chiller is operating, the clock must be ON (Section 1.8, Item 1) or the internal clock on the microprocessor will not be active and the micro cannot keep track of time, although all other functions will operate normally. Failure to turn clock On could result in the chiller not starting due to the time frozen on the clock falling outside the Start/Stop time programmed in the Daily Schedule, see Section 7.3. Also, on master/slave chillers (3 & 4 compressor models), be sure that both micropanels have the clock jumper in the same position.

An EPROM is installed in the microprocessor board(s). The EPROM holds the program which controls all chiller action. On 3 and 4 compressor chillers, identical part # EPROM’s are installed in each control panel. To enable the EPROM’s program to know which panel is to be the MASTER and SLAVE, a wire is factory installed between J4-3 of the microprocessor board and Terminal 13 of TB4.

1.5 ANCILLARY CIRCUIT BOARDS

Power Supply Board

The on-board switching power supply is fuse protected and converts 24VAC from the logic transformer to +12V REG which is supplied to the Microprocessor Board, Relay Output Boards, Opto Boards and the 40 character display to operate the integrated circuitry.

24VAC is filtered, but not regulated, to provide unregulated +24VDC to supply the flow switch, PWM remote temperature reset, PWM remote current reset, lead / lag select, and remote print circuitry which may be utilized with user supplied contacts.

24VAC is also filtered and regulated to +24VDC to be used by the optional EMS/BAS Circuit Boards for remote temperature or remote current reset.

Individual rectifier and filtering circuits are present which receive the Current Transformer signals for each phase of motor current on each compressor. These circuits rectify and filter the signals to variable DC. A phase rotation circuit for each compressor is also present to assure that the screw compressors do not run in the wrong direction. All of these signals are sent to the I/O Expansion Board which multiplexes them and then feeds them to the Microprocessor Board.

I/O Expansion Board

The I/O Expansion Board is a multiplexer allowing additional inputs to be connected to the Microprocessor Board via a single data line. The additional inputs are multiplexed according to the selection made by the Microprocessor by means of address lines.
Signals routed through the I/O Expansion Board include Discharge Temperature, Current Transformer outputs, and Oil Temperature. Mixed Water Temperature Sensor Outputs on YDAS models also are routed through this board.

**Relay Output Boards**

One Relay Output Board per system is used to operate the motor contactors / starters, solenoid valves and heaters which control system operation.

The relay boards are located in the logic section of the control panel(s). The boards convert 0-12VDC logic levels outputs from the Microprocessor Board to 115VAC levels used by the contactors, valves, etc.

The common side of all relays on the Relay Output Board is connected to +12VDC REG. The open collector outputs of the Microprocessor Board energize the DC relays or triacs by pulling the other side of the relay coil to 0VDC. When not energized, both sides of the relay coils or triacs will be at +12VDC potential. Triacs are used to control load and unload slide valve solenoids as well as liquid line solenoid valves.

1.6 **CURRENT TRANSFORMERS (C.T.)**

C.T.s on each of the 3 phases of the power wiring of each compressor motor send AC signals proportional to motor current to the Power Supply Board which rectifies and filters the signals to variable DC Voltage (analog). These analog levels are then fed to the Microprocessor Board via the I/O Expansion Board to allow it to monitor motor currents for low current, high current, unbalanced current, and single phasing.

1.7 **EMS/BAS CONNECTIONS**

The Microprocessor system can accept remote signals to Start/Stop the chiller, adjust maximum allowable running current for each compressor, and adjust the chilled liquid leaving temperature setpoint. These functions can easily be controlled by connecting user supplied "dry" contacts to the customer terminals in the control panel. In addition, Alarm Contacts are provided to remotely signal a fault with the chiller.

**Remote Start/Stop**

Remote Start/Stop can be accomplished using a time clock, manual contact or other “dry” contact in series with the flow switch (Terminals 13 & 14 of TB4) connected to terminals in the logic section of each control panel. The contacts must be electrically isolated since each panel has its own power supply. The contacts must be closed to allow the chiller to run. Any time the contacts open, the chiller will shut down and the NO RUN PERM message will be displayed. The location of the flow switch (Start/Stop) connections is shown in Section 1.9.

**NOTE:** Never bypass a flow switch. This will cause damage to the chiller and void any warranties.

**NOTE:** Wiring from remote “dry” contacts (for stop/start reset functions) should not exceed 25 ft. and should be run in grounded conduit that does not carry any wiring other than control wiring or in screened cable. If an inductive device (relay, contactor) is supplying these contacts, the coil of the device must be suppressed with a suppressor YORK Part Number 031-00808-000 (60 Hz models) or a standard RC suppressor (50 Hz models) across the inductive coil.

**Remote Current Reset**

The maximum allowable running current for each compressor can be adjusted remotely to a lower value using repeated timed closure of “dry” contacts connected to Terminals 13 & 16 of TB4 (see Section 1.9) in the logic section of the control panel. The duration of the contact closure will decide the amount of adjustment. Generally, this input is used for purposes of demand limiting and operates as follows:

Closing the input contact for a defined period of time allows reset of the % Current Limit downward. Contact closure of 1-18 seconds will allow % Current Limiting to be adjusted downward from 115% by a maximum of 85%, i.e. to a minimum value of 30% FLA. EMS Current Limiting operates independently of the Programmable Current Limiting (See Section 8.2). The micro will always look at the two Current Limit Setpoints and choose the lower as the controlling value, whenever Remote Current Limiting is utilized. Contact closures of less than 1 second will be ignored. A closure of 18 seconds is the maximum allowable closure and provides a Current Limit reduction of 85%. The required contact closure can be calculated as follows:

1. Subtract the desired Current Limit % FLA from 115% to calculate the required Offset %.
2. Convert the Offset % to a decimal equivalent by dividing by 100%.
3. Calculate the Pulse Width (PW) in seconds using the formula: PW seconds = (Offset x 20) + 1

For example, if 75% FLA is the Desired Current Limit %:

1. Offset % = 115% – 75% = 40%
2. Offset = 40% / 100% = 0.4
3. PW = (0.4 x 20) + 1 = 9 seconds

To maintain a given offset, the contact closure signal must be regularly repeated at not more than 30 minute intervals but not less than 30 seconds from the end of the each PWM signal. After 30 minutes, if no refresh is provided, the setpoint will change back to its original value.
Whenever current is being limited by a remove reset signal, the following STATUS message will appear:

**SYS 1 EMS LIMITING**  
**SYS 2 EMS LIMITING**

NOTE: After an offset signal, the new Remote Current Limit may be viewed on the Remote EMS Limiting Display under the % Motor Current Key (See Section 3.5). However, if this display is being viewed when the reset pulse occurs, the setpoint will not change on the display. To view the new offset, first press any other display key on the keypad and then press the Remote EMS Limiting Display.

NOTE: Remote EMS Reset will not operate when a Remote Control Center Option Kit is connected to the micro. The Remote Control Center will always determine the setpoint.

NOTE: Wiring from remove “dry” contact (for reset functions) should not exceed 25 ft. and should never be run in grounded conduit that does not carry any wiring other than control wiring or in screened cable. If an inductive device (relay, contactor) is supplying these contacts, the coil of the device must be suppressed with a suppressor YORK Part Number 031-00808-000 (60 Hz models) or a standard RC suppressor (50 Hz models) across the inductive coil.

**Remote Setpoint Reset**

The chilled liquid leaving temperature setpoint programmed into the micro can be remotely adjusted to a higher value using repeated timed closure of “dry” contacts connected to Terminals 13 & 17 of TB4 in the logic section of the control panel (see Section 1.9). The duration of the contact closure will decide the amount of adjustment. This is achieved as follows:

A maximum allowable reset value can be programmed from 2°F - 40°F, as appropriate to the application – see Section 6.4. Once the maximum reset is programmed, an input contact closure of 21 seconds gives the maximum reset. Closure for less than 21 seconds will provide a smaller reset. For noise immunity, the micro will ignore closures of less than 1 second. To compute the necessary contact closure time to give a required Reset, use the following steps:

1. Reset per sec. (°F) = \( \frac{\text{Programmed Max Reset}}{20} \)
2. Closure Time (sec.) = \( \frac{\text{Required Reset}}{\text{Reset Per Sec}} + 1 \)

For Example:

Programmed Max Reset = 30°F; Required Reset = 12°F
1. Reset per sec. = \( \frac{30}{20} = 1.5°F \) per sec.
2. Closure Time = \( (12/1.5) + 1 = 9 \) seconds

To determine the new setpoints, add the reset to the setpoint programmed into memory. In the example above, if the programmed setpoint = 44°F, the new setpoint after the 9 second contact closure would be 44°F + 12°F = 56°F. This new setpoint can be viewed on the display by pressing the Remote Reset Temperature / Range key.

To maintain a given offset, the contact closure signal must be repeated every 30 seconds - 30 minutes. The refresh is not accepted sooner than 30 seconds from the end of the last PWM signal but must be refreshed before 30 minutes has elapsed. After 30 minutes, if no refresh is provided, the setpoint will change back to its original value.

NOTE: After an offset signal, the new Remote Setpoint may be viewed on the Remote Reset Temperature Range display. However, if this display is being viewed when the reset pulse occurs, the setpoint will not change on the display. To view the new offset, first press any other display key on the keypad and then press the Remote Reset Temperature Range key. The new setpoint will then appear.

NOTE: Remote Setpoint Reset will not operate when a Remote Control Center Option Kit is connected to the micro. The Remote Control Center will always determine the setpoint.

NOTE: Wiring from remote “dry” contact (for reset functions) should not exceed 25 ft. and should be run in grounded conduit that does not carry any wiring other than control wiring or in screened cable. If an inductive device (relay, contactor) is supplying these contacts, the coil of the device must be suppressed with a suppressor YORK Part Number 031-00808-000 (60 Hz models) or a standard RC suppressor (50 Hz models) across the inductive coil.

To program the reset, press the REMOTE SETPOINT TEMP RANGE key. The following message will appear:

**REM SETPOINT = 20.0**  
**REM RANGE = 40°F**

The display will indicate the REM SETPOINT which is always equal to the chilled liquid setpoint programmed by the CHILLED LIQUID TEMP/RANGE key plus the offset from the remote reset signal. The display will also show the REM RANGE which is the same as the maximum reset required by the application. Key in the maximum reset required for the application after REM RANGE and press the ENTER key to store the new value in memory.

**Alarm Contacts (Annunciation Alarm)**

Internal contacts are provided on Terminals 23 & 24 of TB1 in the Power Panel (See Section 1.9) which can be used to remotely signal a warning whenever a fault
lockout occurs on any system or if power is lost to the control panel. The internal contacts are normally open (N.O.) and will close when control power is applied to the panel, if no fault conditions are present. When a fault occurs or power is lost, the contacts open.

A 28VDC or 120VAC (60 Hz models) or up to 240VAC (50 Hz models) external alarm circuit (supplied by others) should be wired into the alarm contact terminals to use this feature. The contacts are rated at 125VA.

NOTE: If any inductive load devices (relay or contactor) supplied by the user are in the electrical circuit connected to the dry alarm contacts, the device must be suppressed at the load with a RC suppressor YORK Part Number 031-00808-000 across the inductive coil. (Typically, several are supplied loose with the panel.) Failure to install suppressors will result in nuisance faults and possible damage to the chiller.

NOTE: If the alarm circuit is applied in an application used for critical duty (such as process duty or cooling other critical equipment) and the alarm circuit should fail to function, YORK will not be liable for damages.

### 1.8 MICROPROCESSOR BOARD LAYOUT

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESIGNATION</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>J18</td>
<td>Clock Enable/Disable Jumper</td>
</tr>
<tr>
<td>2</td>
<td>RTC (U13)</td>
<td>Real Time Clock and Battery Backup I.C. (031-00955-000)</td>
</tr>
<tr>
<td>3</td>
<td>EPROM</td>
<td>Microprocessor I.C. (label shows version) <em>NOTE: Dimple is positioned at top edge</em></td>
</tr>
<tr>
<td>4</td>
<td>S1</td>
<td>Dip Switch Set (8 Switches)</td>
</tr>
<tr>
<td>5</td>
<td>S2 to S5</td>
<td>System Switches: S2 = System 1, S3 = System 2, S4 = System 3, S5 = System 4</td>
</tr>
</tbody>
</table>
1.9 – MICROCOMPUTER CONTROL CENTER COMPONENT LOCATION
1.9 – WYE-DELTA START POWER PANEL COMPONENT LOCATION
1.10 COMPRESSOR HEATER

The Compressor Heater in each compressor will be ON for the first five minutes after the compressor is shut down. Then the heater is controlled by discharge temperature. If the heater is ON and the discharge temperature rises above 170°F will shut off. If the heater is OFF and the discharge temperature falls below 100°F, it will turn ON. The heater is controlled by the microprocessor.

The purpose of the heater is to prevent the migration of refrigerant into the compressor during shutdown, assuring proper lubrication of the compressor on start-up.

Anytime power is removed from the chiller for more than an hour, 115VAC control power should be reapplied to allow the compressor heaters to remain on for 24 hours prior to restart.

1.11 EVAPORATOR HEATER

The evaporator heater prevents water standing in the evaporator from freezing. Whenever the outdoor ambient temperature drops below 40°F, the microprocessor will turn the evaporator heaters ON. If temperature rises above 45°F, the heater will be turned off.

1.12 LEAD LAG COMPRESSOR SELECTION

2 COMPRESSOR LEAD/LAG COMPRESSOR SELECTION

The chiller may be set up for AUTO or MANUAL Lead/Lag. This is accomplished by properly configuring the S1 Dip Switches on the Microprocessor Board. Details for configuring the switches are discussed in the “Display Key” Section under OPTIONS key.

When AUTO Lead/Lag is utilized, the micro attempts to balance run time between the two compressors. A number of conditions can occur which will prevent this from happening. Factors determining lead/lag selection and the resulting lead/lag determination are discussed below:

1. The micro automatically defaults the lead to SYS 1 and the lag to SYS 2 if both compressors are ready to start (Anti-recycle Timers timed out) and compressors have equal run time.
2. If both compressors are ready to start (Anti-recycle Timers timed out), the compressor with the lowest run hours will start first.
3. If both compressors are waiting to start (Anti-recycle Timers are not timed out), the micro will assign the lead to the compressor with the shortest anti-recycle time in an effort to provide cooling quickly.
4. If the lead compressor is locked out, faulted and waiting to restart, SYS switch on the micro boards is off, or a run permissive is keeping an individual system from running, the lag compressor is swapped to the lead. This is true regardless of whether the lag compressor is on or off.

If MANUAL Lead/Lag is selected, an external “dry” contact (switch) must be wired into the chiller. This contact is field supplied. With the contact open, SYS 1 is placed in the lead. When the contact is closed, SYS 2 will be lead system.

MANUAL Lead/Lag selection will be automatically overridden by the micro to allow the lag compressor to automatically become the lead anytime the selected lead compressor shuts down due to a lock-out, lead system faults and is waiting to restart, lead system switch on the micro board is in the OFF position, or if a run permissive is keeping the lead of the system off. Automatic switchover in the MANUAL mode is provided to try to maintain chilled liquid temperature as close to setpoint as possible.

The “dry” contact for manual lead/lag selection is wired into terminals 13 and 19 of the TB3 Terminal Block. The location of these contacts is shown in Fig. 1.13.
3 COMPRESSOR CHILLER (YCAS 310-380)
LEAD/LAG COMPRESSOR SELECTION

The Chiller may be set up for AUTO or MANUAL Lead/Lag. This is accomplished by properly configuring the S1 Dip Switches on the Microprocessor Board. Details for configuring the switches are discussed in the DISPLAY KEY Section under “OPTIONS KEY AND DIP SWITCH SETTINGS.”

When AUTO Lead/Lag is utilized, the micro attempts to balance run time between the three compressors. A number of conditions can occur which will prevent this from happening. Factors determining lead/lag selection and the resulting lead/lag determination are discussed below:

1. The micro automatically defaults the lead to SYS 1 and the lag to SYS 2 if both compressors are ready to start (Anti-recycle Timers timed out) and compressors have equal run time.
2. If all compressors are ready to start (Anti-recycle Timers are timed out), the compressor with the lowest run hours will start first.
3. If all compressors are waiting to start (Anti-recycle Timers are not timed out), the micro will assign the lead to the compressor with the shortest anti-recycle time in an effort to provide cooling quickly.
4. If the lead compressor is locked out, faulted and waiting to restart, SYS switch on the micro board is off, or a run permissive is keeping an individual system from running, the lag compressor is swapped to the lead. This is true regardless of whether the lag compressor is on or off.

In Manual Lead/Lag Mode (See Section 8.1 and 3.7, Switch 7), the sequence of operation is selectable. After selecting the lead compressor, the micro will determine the starting sequence of the remaining two compressors. This sequence is shown below. These sequences will be followed as long as anti-recycle timers and safeties do not prevent it.

<table>
<thead>
<tr>
<th>LEAD COMRESSOR SELECT</th>
<th>SECOND COMPRESSOR</th>
<th>THIRD COMPRESSOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

4 COMPRESSOR CHILLER (YDAS 410-490)
LEAD/LAG COMPRESSOR SELECTION

The Chiller may be set up for AUTO or MANUAL Lead/Lag. This is accomplished by properly configuring the S1 Dip Switches on the Microprocessor Board. Details for configuring the switches are discussed in the DISPLAY KEY Section under “OPTIONS KEY AND DIP SWITCH SETTINGS.”

When AUTO Lead/Lag is utilized, the micro attempts to balance run time between the two compressors in either the Master or Slave modules. A number of conditions can occur which will prevent this from happening. Factors determining lead/lag selection and the resulting lead/lag determination are discussed below:

1. The micro automatically defaults the lead to SYS 1 or 3 and the lag to SYS 2 or 4 if both compressors in either the Master or Slave modules, are ready to start (Anti-recycle Timers timed out) and compressors have equal run time.
2. If all compressor are ready to start in a module (Anti-recycle Timers timed out), the compressor with the lowest run hours will start.
3. If all compressors are waiting to start in a module (Anti-recycle Timers are not timed out), the micro will assign the lead to the compressor with the shortest anti-recycle time in an effort to provide cooling quickly.
4. If the lead compressor in a module is locked out, faulted and waiting to restart, SYS switch on the micro board is off, or a run permissive is keeping an individual system from running, the lag compressor is swapped to the lead. This is true regardless of whether the lag compressor is on or off.

If MANUAL Lead/Lag is selected, an external “dry” contact (switch) must be wired into the “Master” module (Fig. 1.13). This contact is field supplied. With the contact open, SYS 1 or 3 is placed in the lead. When the contact is closed, SYS 2 or 4 will be the lead system.

Selection of the lead compressor on the Master module defines the lead compressor on the Slave module. This lead compressor on the Slave module is defined by the Master lead compressor +2. Thus, if System #1 is the lead on the Master module, System #3 will be the lead on the Slave module. If System #2 is the lead on the Master module, System #4 will be the lead on the Slave module. The position of the Slave module microboard S1 switch 7 (lead/lag) is ignored.

MANUAL Lead/Lag selection will be automatically overridden by the micro to allow the lag compressor to automatically become the lead any time the selected lead compressor shuts down due to a lock-out, lead system faults and is waiting to restart, lead system switch on the micro board is in the OFF position, or if a run permissive is keeping the lead of the system off. Automatic switchover in the MANUAL mode is provided to try to maintain chilled liquid temperature as close to setpoint as possible.
2. STATUS KEY & FAULT MESSAGES

2.1 GENERAL

Pressing the Status key displays the current chiller or individual system operational status. The messages displayed include running status, cooling demand, fault status, external cycling device status, load limiting, and anti-recycle timer status. The display will show one message relating to the highest priority information to be displayed as determined by the Microprocessor.

For individual system status or fault messages the display shows information for up to two refrigerant systems. For models with three or four systems, pressing the Status key again will scroll through messages for all systems.

The main categories of messages available using the Status key are:

- General Status Messages
- Anticipation Control Status Messages
- Chiller Fault Status Messages
- System Fault Status Messages

These messages are described in detail below, with examples of each display. In each example “#” is used as applicable to represent the system number where messages apply to individual systems.

2.2 GENERAL STATUS MESSAGES

Unit Switch Off:

```
UNIT SWITCH IS IN THE OFF POSITION
```

This message indicates that the Chiller On (Auto) / Off Switch on the Control Panel is in the Off position which will not allow the chiller to run.

Schedule Shutdown:

```
DAILY SCHEDULE SHUTDOWN
```

This message indicates that the chiller has been shut down by the daily schedule programmed into the Clock – Set Schedule / Holiday system.

Compressors Running:

```
SYS # COMP RUNNING
SYS # COMP RUNNING
```

This message indicates that the respective compressor is running due to demand.

System Switches OFF:

```
SYS # SYS SWITCH OFF
SYS # SYS SWITCH OFF
```

This message indicates that the system switch on the Microprocessor Board for the respective system is in the Off position. A system can only run if the system switch is in the On position. The switch for System 1 and System 2 should normally be in the On position for all models. Switches for System 3 and 4 should only be in the On position for three or four compressor chillers respectively. See Section 1.8, page 8, for the location of the system switches.
Anti-Recycle Timers:

The anti-recycle timer message shows the amount of time left before a compressor can be restarted. These 300 - 600 second timers start when a compressor starts, although a minimum of two minutes must always elapse after a compressor shuts down before it may again restart. If a power failure occurs, the anti-recycle timers will reset to 120 seconds after power is restored.

Anti-Coincidence Timers:

The anti-coincident timer guards against two or more compressors starting simultaneously. This avoids excessive instantaneous starting currents. A minimum of one minute between compressor starts is maintained even if demand is present and the anti-recycle timers are timed out. The display shows the time before the respective compressor can start. This display will only appear after the anti-recycle timers have timed out.

Run Permissive Contacts OPEN:

This display indicates that an external cycling contact and/or the flow switch connected to Terminals 13 & 14 in the Logic Section(s) of the control panel(s) is/are open. Whenever the contact(s) is/are open, the No Run Permissive will be displayed, and the indicated system will not run.

System Loading Requirement:

This message indicates that the chilled liquid temperature is below the point that will bring the lead system on and/or that the loading sequence has not loaded the chiller far enough yet to bring the lag system on. The lag system will display this message until the loading sequence is ready for the lag system to start.

Refrigerant Program Mismatch:

This message indicates that the type of refrigerant programmed under the Program key does not match the type of refrigerant selected on the S1 Dip Switches on the Microprocessor Board. The chiller will not operate until this situation is corrected. See Section 3.7 and 8.2 for more details.

NOTE: It is extremely important that the programmed settings correspond to the type of refrigerant used in the chiller or serious damage may occur.

Pumpdown Cycle:

Each compressor undergoes a pump down cycle on start-up and shutdown. This assures that liquid refrigerant does not enter the compressor on start-up, eliminating the need for recycling pump down, saving energy and reducing compressor starts and wear.

On start-up, the controls unload the compressor and the system either pumps down to the low suction pressure cutout setting, or for 30 seconds, whichever comes first, after which the Liquid Line Solenoid Valve and Economizer / Motor Cooling Liquid Supply Solenoid Valve are energized and normal operation commences.

On shutdown, the microprocessor controls unload the compressor, and the Liquid Line Solenoid Valve and Economizer / Motor Cooling Liquid Supply Solenoid Valve are de-energized. The compressor continues to operate until it either pumps down to the low suction pressure cutout setting or operates for 30 seconds, whichever comes first. Pump down occurs on “normal” shutdowns where cooling demand has been satisfied or when a system is turned off, a flow switch opens, a run permissive is lost or when a Daily Schedule or a Remote Shutdown is called for.

The pumping down display is only shown when a cooling demand shutdown, micro board system switch shutdown, or a run permissive / flow switch shutdown occurs. After pump down is complete, the respective shutdown message will be displayed for the system.

EMS Demand Limiting (Remote Current Reset):

This message indicates the current limiting is in effect from a Current Limit PWM input. As long as this input is activated, the micro will not allow loading beyond the PWM % that has been sent to the Microprocessor through the PWM input. Generally, this input is used for purposes of demand limit – see Section 1.7.

ISN Demand Limiting:

This display indicates that the external current limit from a Current Limit PWM input is active. As long as this input is activated, the micro will not allow loading beyond the PWM % that has been sent to the Microprocessor through the PWM input. Generally, this input is used for purposes of demand limit – see Section 1.7.
This message indicates that the chiller is operating under load limiting from an ISN System through the RS-485 input. This feature controls loading under a number of ISN programmable values, enhancing the flexibility of controlling the chiller to obtain desired chiller loading within the overall building control scheme.

Memory Backup Battery Fault:

!!WARNING!!
!!LOW BATTERY!!

The Microprocessor Board contains a Real Time Clock (RTC) I.C Chip with an internal battery back-up. This battery back-up assures that any programmed values (setpoints, etc.), clock, all fault information, and accumulated information such as starts/run time, etc. stored in the RTC memory is not lost when a power failure occurs, regardless of length of the power loss.

The battery is a 10 year lithium type. The life of the battery will depend upon whether the Real Time Clock’s internal clock circuit is energized. With the clock OFF, a rated life of approximately 10 years can be expected. With the clock ON, approximately 5 years.

The clock is turned ON and OFF by a jumper on the Microprocessor Board. While the chiller is operating, the clock must be ON. Otherwise the internal clock on the microprocessor will not be active and the micro can not keep track of time, although all other functions will operate normally. Failure to turn the Clock ON could result in the chiller not starting due to the time frozen on the clock falling outside the START/STOP time window that is programmed in the DAILY SCHEDULE.

If the chiller is shut down for extended periods of months, it may be desirable to disable the clock to save battery life. The clock can then be reactivated and reprogrammed when the chiller is returned to service.

NOTE: All programmed values and stored data, other than the internal clock time-keeping, will be maintained in memory regardless of whether the clock is on or off and regardless of the length of the power failure.

To disable the clock, place the jumper (Fig. 39) in the OFF position. To activate it, place the jumper in the ON position.

On power-up the microprocessor will check the Real Time Clock (RTC Chip) battery to assure that the internal battery is still operational. This is accomplished by performing an RTC RAM location check. As long as the battery checks out, the micro will continue on with business without operation.

If a check is made and the battery has failed, the microprocessor will not allow the chiller to run and the

!!WARNING!! !!LOW BATTERY!! message will appear.

Under low battery conditions, the only way to run the chiller is to press the “MANUAL OVERRIDE” key (Section 7.4). The “MANUAL OVERRIDE” key will function differently than it does in service situations where it overrides the daily schedule for only 30 minutes. In a low battery condition, the “MANUAL OVERRIDE” key will zero out the daily schedule to allow unlimited operation regardless of the time on the internal clock. Default values will also be loaded into memory for all setpoints and cut-outs. These may require reprogramming to assure they meet the chiller operating requirements for operation board 30 minutes. In addition, the low battery message which is displayed for this condition will disappear.

NOTE: If a power failure should again occur, the above process will again need to be repeated to bring the chiller back on line.

In the unlikely event the low battery message should ever appear, it will require the RTC chip U13 on the Microprocessor Board (Fig. 39) to be replaced. Care should be taken to assure that the chip is properly installed. Pin 1 (dimple in the top part of the chip) must be oriented as shown in Fig. 39. The part number of the RTC Chip is 031-00955-000.

2.3 ANTICIPATION CONTROL STATUS MESSAGES

Anticipation controls are built into the software to prevent safety shutdowns by automatically overriding the temperature controls if system conditions approach safety thresholds. This avoids total loss of cooling resulting from a lockout by a safety control.

Anticipation controls monitor discharge pressure, motor current and suction temperature for each compressor and, if maximum limits are approached, the slide valve loading of the respective compressor will be reduced to avoid exceeding the limit.

Displays of anticipation safety control messages and their meanings are as follows:

Discharge Pressure Limiting:

SYS # DSCH LIMITING
SYS # DSCH LIMITING

Discharge Pressure Limiting takes effect when compressor discharge pressure nears the point at which the high pressure cutout would shut the system down. When the above message appears, discharge pressure has exceeded the programmable threshold and the compressor is being unloaded in an effort to prevent shutdown on the high pressure cutout. The operation of this safety is important if condenser coils become dirty, if there is a problem with the condenser fan operation, or if extreme ambient or
load conditions occur (see Section 8.2, High Discharge Pressure Unload Point for more details).

**Compressor Motor Current Limiting:**

SYS # CRNT LIMITING
SYS # CRNT LIMITING

The Motor Current Limiting message indicates that a compressor motor current has reached a programmable limit and the system is being unloaded to assure that motor current does not become excessively high causing a fault (see Section 8.2, High Average Current Unload Point).

**Suction Temperature Limiting:**

SYS # SUCT LIMITING
SYS # SUCT LIMITING

The Suction Temperature Limiting message applies only when the chiller is set for Water Cooling Mode (see Section 3.7). The message indicates that saturated suction temperature on a system has dropped to 29°F and that any further temperature reduction could cause some icing of the evaporator tubes. Saturated suction temperature is computed by the micro by converting suction pressure to temperature.

For the first 3 minutes that the saturated suction temperature is at or below 29°F any further compressor loading is inhibited to allow time for the temperature to rise. If the condition persists for more than three minutes, a five minute timer is started. As this timer counts down to zero, a one second unload pulse will be sent to the slide valve of the affected compressor every five seconds as long as the temperature is below 31°F. If the temperature rises above 31°F, the micro will inhibit loading for the remainder of the five minute period.

If, after the five minute period, the saturated suction temperature is above 29°F, the compressor is allowed to reload if required to maintain leaving chilled water temperature. Otherwise, the micro will reset the five minute timer and start the process over again. To assure that leaving chilled water requirements are satisfied while one compressor is under Suction Temperature Limiting control, the micro will start or load other compressor(s) as necessary.

**2.4 CHILLER FAULT STATUS MESSAGES**

A Chiller Fault will shut the entire chiller down when a preset safety threshold is exceeded. The chiller will automatically restart after the condition causing the shutdown clears. Restart will occur only after anti-recycle timers are satisfied and demand requires. A reset hysteresis is built into each safety so repetitive faulting and clearing will not occur in a short time period.

Continuous monitoring by the Microprocessor assures that instantaneous reactions result. When the chiller is shut down on one of these safeties, a message will appear on the Status display informing the operator of the problem as follows:

**Low Ambient Temperature:**

CHILLER FAULT: LOW AMBIENT TEMP

The Low Ambient Temperature Safety protects the chiller from running in very low temperatures which could cause damage due to low system pressures. This feature is programmable and can be used to shut down the chiller at a temperature where continued running of the chiller is not economical compared to the use of “free” cooling techniques (see Section 8.2, Low Ambient Temperature Cutout). The fault will clear when ambient temperature rises 1°F above the cut-out.

**High Ambient Temperature:**

CHILLER FAULT: HIGH AMBIENT TEMP

The High Ambient Temperature Safety protects the chiller from running in ambients above 130°F where the potential malfunction of system mechanical and electrical components may result. The High Ambient Cutout is programmable and can be set for lower limit values if required (see Section 8.2/High Ambient Temperature Cutout). The fault will clear when ambient temperature drops 1°F above the cutout.

**Low Leaving Water Temperature:**

CHILLER FAULT: LOW WATER TEMP

The Low Water Temperature Safety assures that the evaporator is not damaged from freezing due to improperly set control points. It also attempts to protect the chiller from freezing if the flow switch should fail. Whenever the chilled liquid temperature drops below the programmable cutout, the chiller will shut down (see Section 8.2, Leaving Water Temperature Cutout). The chiller fault will clear when temperature rises 4°F above the cutout.

**Low Control Supply Voltage:**

CHILLER FAULT: VAC UNDER VOLTAGE

The Under Voltage Safety assures that the system is not operated at voltages where malfunction of the Microprocessor could result in system damage. Whenever the Microprocessor senses an on board control power supply failure while a compressor is running, the chiller is shut down. The Microprocessor circuitry is capable of operating at voltages 10% below the nominal 115VAC supply to the panel. Auto-restart of the chiller
occurs after a two minute start-up timer has elapsed from when power is re-applied.

**Flow Switch Open:**

Closure of the flow switch(es) is monitored to check that flow is present in the evaporator when a compressor is running. Any external cycling devices installed by the customer are also connected in series with the flow switch(es). YCAS 2 system chillers have a single flow switch wired to the control panel. YCAS 3 system chillers have two flow switches mounted together with one wired to each control panel. YDAS chiller have two flow switches, one mounted in the flow from each evaporator and wired to the associated control panel. If the flow switch opens, all systems controlled by the panel it is connected to will shut down and a NO RUN PERM (Permissive) message is displayed. Closing of the flow switch, when flow is present, will cause the message to disappear and auto-restart to occur.

**CAUTION:** Never bypass a flow switch. This will cause damage to the chiller and void any warranties.

### 2.5 SYSTEM FAULT STATUS MESSAGES

A System Fault will shut the affected system down whenever a preset safety threshold is exceeded. Automatic restart will occur after the first 2 shutdowns when the anti-recycle timer times out and temperature demand exists. After any combination of 3 Manual Reset Safeties in a 90 minute time period, the affected system will shut down and lock out. When one or more systems are shut down on one of these safeties, a message will appear on the Status display informing the operator of the problem.

**NOTE:** The High Motor Current Safety is a unique safety which will lock out a system after only a single fault.

To reset a locked out system, turn the System Switch for the affected system to the Off position, then back to the On position (see Section 1.8 for location of switches).

**CAUTION:** Before returning a locked out system to service, a thorough investigation of the cause of the fault should be made. Failure to repair the cause of the fault while manually allowing repetitive restarts may cause further expensive damage to the system.

The Discharge Pressure Safety prevents system pressure from exceeding safe working limits. This safety is a backup for the mechanical High Pressure Cutout in the system. The Discharge Pressure Safety is programmable for a range of values below the system upper limit (see Section 8.2, High Discharge Pressure Cutout for more details, page 40).

**High Discharge Temperature Cutout:**

This safety protects the compressor rotors from damage due to overheating, expansion and breakdown of the oil film seal between the rotors. It also protects against excessive oil temperature in the discharge separator.

The compressor will not start, or, in the first five seconds of operation, will shut down if the discharge temperature exceeds 225°F. After five seconds of operation, a warning message will be displayed if discharge temperature exceeds 225°F. The compressor will shut down if the discharge temperature exceeds 230°F.

**High Oil Differential Pressure Cutout:**

The High Oil Pressure Differential Safety protects the compressors against loss of proper lubrication due to oil return line blockage. The “differential oil pressure” for this safety is computed by measuring discharge (oil separator) pressure and subtracting oil pressure returning to the compressor (Discharge – Oil = Oil PSID). Under typical operation, the oil pressure differential display will read less than 25 PSID. If oil pressure at the compressor drops due to filter blockage, the differential pressure on the display will increase and when the maximum limit is reached, the compressor will be shut down.

This safety is activated after three minutes of operation. Oil pressure must be less than 45 PSID for R22 models or 40 PSID for R134a models for as long as the compressor continues to run.

**Low Oil Differential Pressure Cutout:**

The Low Oil Pressure Differential Safety assures the compressor receives proper lubrication by monitoring the differential between oil pressure returning to the compressor and suction pressure. Lack of a differential indicates that the compressor is not pumping and no oil is being pumped through the compressor to lubricate the bearings and rotors.
This type of oil failure will not be picked up by the High Oil Differential Safety since no flow will cause the differential through the oil piping to drop to zero.

TheLow Oil Differential Safety is activated after 1 minute of compressor operation when the oil pressure differential must be greater than 10 PSID. After two minutes it must be greater than 20 PSID, after three minutes, 30 PSID, after four minutes, 40 PSID, and from five minutes of operation and onwards, oil pressure must remain higher than 50 PSID or the system will be shut down.

The micro computes “differential oil pressure”, for this safety by measuring oil pressure as sensed by the oil transducer and subtracting suction pressure as sensed by the suction transducer (Oil – Suction = Oil PSID).

There is presently no display which allows the operator to view the oil pressure differential.

**High Oil Temperature Cutout:**

![SYS # HIGH OIL TEMP](image)

The safety assures oil temperature does not exceed a safe operating temperature which could damage a compressor. Typical oil temperature during normal operation will be approximately 130 - 150°F.

The High Oil Temperature Safety is activated after two minutes of compressor operation, after which if oil temperature is above 225°F (107.2°C) for more than three seconds, the compressor will shut down.

**Low Suction Pressure Cutout:**

![SYS # LOW SUCTION](image)

The Low Suction Pressure Cutout protects the evaporator from damage due to ice build up caused by operation at low refrigerant suction pressure or restricted refrigerant flow. A number of transient timer features prevent nuisance trips during start-up, compressor loading, etc. The Low Suction Pressure Safety is programmable (See Section 8.2 / Low Suction Pressure Cutout for more details).

After the compressor starting pump down cycle is completed (pump down to cutout or 30 seconds, whichever comes first), suction pressure is monitored as long as the compressor runs. For the first 270 seconds of running, suction pressure can be lower than the programmed cutout, but must be greater than:

\[
\text{Programmed Cutout} \times \frac{\text{Run Time} / 3 + 10}{100}
\]

Example: If Programmed Cutout = 44 PSIG and Run-Time = 60 seconds

New Cutout = 44 x \( \frac{60 / 3 + 10}{100} \) = 13.2 PSIG

The transient timer cutout value also increases with time until after 90 seconds it equals the programmed cutout value. If the suction pressure now rises to more than 5 psi above the programmed cutout value, the 90 second timer will be reset. If the suction pressure does not rise to more than 5 psi above the cutout, the timer will remain at zero and if the pressure then falls below the cutout again the system will shut down on low pressure fault.

If the Dip Switch on the microprocessor board is set for “Water Cooling” (See Section 3.7), the cutout is programmable between 44-70 PSIG for R-22 models, 19-36 for R-134a models. If this mode, settings of 44 PSIG for R-22 and 19 PSIG for R-134a are recommended. If the Switch is set for “Brine Cooling” (glycol) the cutout is programmable between 20-70 PSIG for R-22 models, 4.5-36 PSIG for R-134a models. In this mode, the cutout should be set to the saturated refrigerant pressure equivalent to 18°F below the freezing/sludge temperature of the chilled liquid. This programmable value is password protected.

To program the Suction Pressure Cutout, key in the required setting and press the Enter key to store the value into memory and scroll to the next display.

**Incorrect Phase Rotation Cutout:**

![SYS # PHASE ROTATION](image)

The Phase Rotation Safety prevents the compressor from running in the wrong direction potentially causing damage. The micro will shut the compressor down after four seconds of operation if the phasing of the incoming power wiring is incorrect.
Motor Current Imbalance Cutout:

The Motor Current Imbalance Safety checks that the current balance between each of the three phases is within an acceptable limit. This protects against motor overheating and damage due to loss of one phases of the main supply phases, a faulty or worn contactor, loose wiring or a fault in the motor winding.

After 1 second of operation, the current of any phase must be within +/- 40% of the average current of the three phases. If a phase current is outside these limits for more than three seconds the system will be shut down.

High Compressor Motor Current Cutout:

The High Motor Current Safety shuts a system down and locks it out after only a single occurrence of a rise in average motor current above the cutout point. Motor current is monitored using 3 Current Transformers (C.T.s) per motor, one on each phase.

Average motor current is monitored after five seconds (Across-The-Line Starters) or 20 seconds (Wye-Delta Starters) of compressor operation. In the first two seconds of monitoring, the system will be shut down if average motor current exceeds 120% FLA. After the first 2 seconds current in monitored, the system will be shut down if average motor current exceeds 115% FLA for more than 3 seconds.

NOTE: FLA (full load amps) is approximately 1.2 x RLA (rated load amps). RLA is specified on the motor / chiller nameplate and is typical current demand under rated operating conditions in a fully loaded system. When a system is fully loaded typical motor currents may be at 65 - 85% FLA depending on operating conditions.

LOW COMPRESSOR MOTOR CURRENT CUTOUT / MOTOR PROTECTOR (HI MOTOR WINDING TEMP CUTOUT) / MECHANICAL HIGH PRESSURE CUTOUT

The Low Motor Current Safety prevents a compressor motor running with less current than would normally be expected. This may result from a loss of refrigerant, contactor or power problems as well as from a compressor that is not pumping due to a mechanical malfunction. Motor current is monitored using 3 Current Transformers (C.T.s) per motor, one on each phase.

Average motor current is monitored after five seconds (Across-The-Line Starters) or twenty seconds (Wye-Delta Starters) of compressor operation. From this time the system will be shut down if average motor current is less than 5% of FLA for ambient temperatures ≤ 25°F, 10% of FLA for ambient = 26 - 45°F, or 15% FLA for ambient > 45°F, for more than three seconds.

Compressor motor protection modules, external motor overloads and mechanical high pressure cutouts are fitted to each system. All these devices stop the compressor by removing power from its motor contactor coils. This causes the C.T.s to obviously sense a zero current draw by the compressor motor and causes a Low Motor Current Fault to be displayed. These devices operate as follows:

The Motor Protection Module protects against excessive motor winding temperature by monitoring 3 or 6 sensors built into the motor windings. If the temperature becomes excessive the module will cause power to be removed from the compressor contactors shutting down the compressor. Auto restart will not occur since manual reset is required. A fault lockout will automatically occur after the micro attempts two more starts with the MP contacts open. Manual reset is accomplished by removing 115VAC control power from the micro panel after the motor sensors have sufficient time to cool.

The External Motor Overload is responsive to motor current. When the overload relay senses single phase operation, locked rotor current in excess of 10 seconds, or sustained current overloads in excess of 140% of RLA, it will trip. This causes power to be removed from the compressor contactors and shuts down the compressor.

Auto-restart will not be permitted as a manual reset of the device is required to restart the compressor. After the first fault, the micro will try two more restarts, but with the External Motor Overload Relay tripped, no restart can occur. The micro will then lock out the system. In addition to manually resetting the External Motor Overload Relay, the fault will also require reset by turning the appropriate system switch OFF then ON.

The Overload Relay setting should never be altered. If for some reason the Overload Relay is replaced, the following procedure is used for setup:
A/L Start: Dial Setting = \((1.1 \times RLA) / 350\)
WYE-Delta Start: Dial Setting = \((0.64 \times RLA) / 350\)

The Mechanical HP (High Pressure) Cut-out will also cause the low current safety to activate. If discharge pressure exceeds 405 PSIG (HP cut-out), the cut-out will open. When the cut-out opens, 115VAC power will be removed from the Motor Protector Module. When power is removed from the module, its MP contacts will open, breaking the 115VAC fed to the 1CR (Sys 1) or 2CR (Sys 2) control relay. When a control relay is de-energized, power is removed from the compressor contactors which shuts the compressor off. When the motor contactor de-energizes, motor current falls to zero. The low motor current is sensed by the microprocessor and the system is shut down.

Auto-restart will be permitted after shutdown, when discharge pressure drops below 330 PSIG and the HP contacts close. A fault lock-out will result if safety thresholds are exceeded three times in a 90 minute period.

2.6 PRINTOUT ON FAULT SHUTDOWN

If an optional printer is installed, the contents of History Buffer #1 will be sent to the printer any time a fault shutdown occurs. This will allow record keeping of individual faults, even if they do not cause a lockout of the system. This information may be useful in identifying developing problems and troubleshooting. See also Section 4.7.

The No Run Permissive fault messages will not be stored in the History Buffer and will not cause an auto printout.

**NOTE:** Due to extreme operating conditions or systems where control deficiencies are present, occasional faults may occur with the automatic printout. This is not a cause for concern.
3. DISPLAY KEYS & OPTION SWITCHES

3.1 GENERAL

The Display keys give direct access to commonly required data about the operation of the chiller. This is particularly useful during commissioning, monitoring the operation of the chiller, diagnosing potential future problems and service troubleshooting.

When a Display key is pressed, the corresponding message will be displayed and will remain on the display until another key is pressed.

Displayed data is in “real-time” and is updated approximately every 2 seconds. If updating of one of the messages is required faster than every 2 seconds, the appropriate key for the desired display can be pushed and held to give updating every 0.4 seconds.

Display messages may show characters indicating “greater than” (>) or “less than” (<). These characters indicate the actual values are greater than or less than the values which are being displayed but are outside the ability of the micro to give an actual reading. This is unlikely to occur unless a fault exists in the measuring sensors or during extreme conditions.

The Display keys and the data available from each is as follows:

3.2 CHILLED LIQUID TEMPS KEY

When the Chilled Liquid Temperatures key is pressed a display of chilled liquid temperatures leaving the chiller (LWT) and returning to the chiller (RWT) is provided as follows:

YCAS Models:

<table>
<thead>
<tr>
<th>LWT</th>
<th>RWT</th>
</tr>
</thead>
<tbody>
<tr>
<td>49.2°F</td>
<td>52.0°F</td>
</tr>
</tbody>
</table>

YDAS Models:

On YDAS chillers a display indicating the chilled liquid temperature leaving the individual master (LWT1) and slave (LWT2) evaporators is provided when the key is first pressed:

<table>
<thead>
<tr>
<th>LWT1</th>
<th>LWT2</th>
</tr>
</thead>
<tbody>
<tr>
<td>49.4°F</td>
<td>49.6°F</td>
</tr>
</tbody>
</table>

Pressing the key again changes the display to mixed chilled leaving liquid temperature and return liquid temperature.

<table>
<thead>
<tr>
<th>MIXED LWT</th>
<th>RWT</th>
</tr>
</thead>
<tbody>
<tr>
<td>49.5°F</td>
<td>52.0°F</td>
</tr>
</tbody>
</table>

Display limits: Minimum 9.1°F  
Maximum 84.2°F
3.3 AMBIENT TEMP KEY

When the Ambient Temperature key is pressed ambient air temperature as measured surrounding the chiller is displayed.

| AMBIENT AIR |
| = 71.9 °F |

Display Limits: Minimum – 4.6°F (-20.3°C) Maximum 137.9°F (58.8°C)

3.4 SYSTEM PRESS / TEMP KEYS

Pressing one of the System Pressures / Temperatures keys a number of times scrolls through six displays giving differential oil pressure (OIL), suction pressure (SP) and discharge pressure (DP), suction (SUC) and discharge (DSCH) temperature, oil temperature saturated discharge and suction temperature, compressor slide valve position and compressor suction superheat.

Examples of these displays are as follows where # is the appropriate system number:

| SYS # | OIL = 15 PSID |
| SP = 55 DP = 248 PSIG |

| SYS # | SUC = 36.2 °F |
| DSCH = 121.2 °F |

(Suction temperature is not given on 50 Hz models.)

| OIL TEMP# = 77.9 °F |

| SAT DSCH# = 130.0 °F |
| SAT SUCT# = 24.3 °F |

| SYS # SLIDE VALVE |
| POSITION = 100% |

| SYS # SUPERHEAT |
| = 12.2 °F |

(Superheat is not given on 50 Hz models.)

Differential oil pressure is the pressure difference between oil leaving the discharge separator and oil pressure reaching the compressor. It is computed by subtracting oil pressure measured after the oil line filter from discharge pressure (oil in the oil separator is at discharge pressure). Typically for a clean oil filter the drop will be 2 – 10 PSID (14 – 69 kPa) but may reach up to 40 PSID (276 kPa).

Saturated discharge and suction temperatures are computed by converting measured pressure to temperature.

Slide Valve Position is computed from average % FLA motor current, discharge pressures and the number of load pulses sent to the compressor.

NOTE: Slide valve position is approximate and should be used for reference only. Under many conditions, it will read well below 100%, possibly as low as 60%, when a compressor is fully loaded.

Superheat is computed by subtracting saturated suction temperature from suction temperature.

Display Limits are as follows for the System Pressures and Temperature displays are as follows:

<table>
<thead>
<tr>
<th>MIN. LIMIT</th>
<th>MAX. LIMIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil Pressure</td>
<td>208 PSID 0 PSID</td>
</tr>
<tr>
<td>Suction Pressure</td>
<td>0 PSIG 199 PSIG</td>
</tr>
<tr>
<td>Discharge Pressure</td>
<td>0 PSIG 399 PSIG</td>
</tr>
<tr>
<td>Suction Temp.</td>
<td>*9.0°F 84.2°F</td>
</tr>
<tr>
<td>Discharge Temp.</td>
<td>40.3°F 302.6°F</td>
</tr>
<tr>
<td>Oil Temp.</td>
<td>40.3°F 240.0°F</td>
</tr>
<tr>
<td>Sat. Discharge Temp.</td>
<td>–41.0°F 140.5°F</td>
</tr>
<tr>
<td>Sat. Suction Temp.</td>
<td>–41.0°F 101.3°F</td>
</tr>
<tr>
<td>Slide Valve Position</td>
<td>0% 100%</td>
</tr>
<tr>
<td>Suction Superheat</td>
<td>*–81.5°F 60.9°F</td>
</tr>
</tbody>
</table>

NOTE: Minimum and maximum values may change as software (EPROM) revisions are made.

NOTE: *Below 9.0°F the Suction Temp. display will disappear. This will in turn cause the Superheat display to disappear.
3.5 % MOTOR CURRENT KEY

Pressing the Percentage Motor Current key a number of times scrolls through displays of compressor current for each system, ISN/EMS current limits and ISN lag compressor start percentage. Example displays and detailed explanations are as follows:

| COMP # = AVG; PH L, 1, 2, 3 | 100; 99, 101, 101 % FLA |

This display shows the average compressor motor current and each individual phase current (L1, L2, and L3) on each compressor as a percentage of FLA. All values are approximate.

| ISN CRNT LIMIT: NONE |
| EMS CRNT LIMIT: NONE |

Demand limiting can be accomplished remotely by a YORK ISN system or an external PWM (dry contact closure) from an EMS system. This display shows the % current limiting that may be in effect from these devices. See Section 2.2, for more details.

| ISN LAG COMPRESSOR START %: NONE |

This display indicates the ISN (Remote Building Automation System) programmed value of lead compressor current (%FLA) at which the lag compressor will start. See Section 8.2, for more details.

| COMP # = 281 AMPS 100 % FLA |
| COMP # = 275 AMPS 99 % FLA |

This display shows the % FLA current as measured by the 3 C.T.s on each system together with the equivalent full load amps. Values are approximate.

NOTE: Due to typical large variations in discharge pressure, a compressor running “fully loaded” may run at a wide range of currents and % FLAs. Also FLA is approximately equal to 1.2 x RLA. This means amps equal to RLA of the compressor will only be approximately 80% FLA.

3.6 OPERATING HRS / START COUNTER KEY

When the Operating Hours / Starts Counter key is pressed the accumulated running hours and starts for System 1 and 2 compressors are displayed. Where applicable, pressing the key again displays the values for Systems 3 and 4 on larger models:

| HRS 1 = 1143, 2 = 1382 |
| STR 1 = 285, 2 = 322 |

| HRS 3 = 1255, 4 = 1095 |
| STR 3 = 365, 4 = 455 |

Display Limits: Maximum run hours 99,999
Maximum starts 99,999

Values roll over to zero if maximum limit is exceeded.

NOTE: These counters are zeroed at the factory but may indicate run time and number of starts logged during factory testing prior to shipment.

3.7 OPTIONS KEY & DIP SWITCH SETTINGS

The Options key provides a display of options which are programmed by the positions of the S1 Dip Switches on the Microprocessor Board. Proper programming of the switches is important during the commissioning of the chiller. The Options key can be used to verify the Dip Switch positions without looking at or handling the Microprocessor Board.

When the Options key is pressed, the following message will first be displayed for three seconds:

| THE FOLLOWING ARE PROGRAMMED |

Eight Option Messages will then be displayed in sequence, each for three seconds. At the end of the sequence the display will automatically revert to the current chiller Status message, as if the Status key had been pressed.

The following is a detailed guide to programming the Dip Switches together with the associated message display given for each selection when the Options key is pressed:

SWITCH 1: Water / Brine Cooling
Open:

Water Cooling Mode is for water cooling applications and allows the chilled liquid leaving temperature set-
Remote Control Mode allows an ISN system or an RCC (Remote Control Center – 60 Hz models only) panel to receive chiller data from the chiller through the RS-485 port. This mode will also allow programming of loading, unloading, shutdown, Leaving Water Setpoint Reset, Current Limit Setpoint, and Lag Start Setpoint from an ISN or RCC. If communications are lost to the ISN or RCC, the micro will run the chiller on the locally programmed values.

**SWITCH 4: Expansion Valve Type**

**Both Positions:**

- **THERMAL EXPANSION VALVES**

This switch is presently disabled. In the future, it will allow selection of control from either thermal expansion valves or electronic expansion valves.

**SWITCH 5: Units of Measurement**

**Open:**

- **ENGLISH UNITS READOUT**

English Units Mode causes all information relating to pressures, temperatures, etc., to be displayed in English (Imperial) units (°F, PSI, etc).

**Closed:**

- **SI UNITS READOUT**

S.I. Units Mode causes all information relating to pressures, temperatures, etc., to be displayed in S.I. (Metric) units (°C, BAR, etc.). For conversion purposes, 1BAR = 14.5 PSIG.

**SWITCH 6: Compressor Motor Starting**

**Open:**

- **ACROSS-THE-LINE MOTOR STARTING**

Across-The-Line Mode MUST be used for chillers with single contactor Across-the-Line (D.O.L.) starters on each compressor.

Remote Control Mode also auto-programs the Low Chilled Liquid Cut-Out at 36°F and the Suction Pressure Cut-Out at 44 PSIG and are not adjustable.

**Closed:**

- **REMOTE CONTROL MODE**

Brine Cooling Mode is for brine / glycol applications with setpoints below 40°F and allows the chilled liquid leaving temperature setpoint to be programmed from 10 to 70°F. In this mode, the Low Chilled Liquid Cut-Out can be programmed from 8 to 36°F and the Suction Pressure Cut-Out programmed from 20 to 70 PSIG.

**SWITCH 2: Ambient Temp. Low Limit**

**Open:**

- **STANDARD AMBIENT**

Standard Ambient Mode fixes the Low Ambient Cut-Out setting at 25°F (−3.9°C) and should normally be selected if a Low Ambient Kit is NOT installed.

**Closed:**

- **LOW AMBIENT CONTROL**

Low Ambient Mode allows the Low Ambient Cut-Out to be programmed from 0 to 50°F. Values above 25°F can be used to automatically shut down the chiller when direct cooling methods become operational.

**SWITCH 3: Chiller Control**

**Open:**

- **LOCAL CONTROL MODE**

Local Control Mode allows an ISN system or an RCC (Remote Control Center – 60 Hz models only) panel to receive chiller data from the chiller through the RS-485 port but not change programmable setpoint values remotely.

**Closed:**

- **REMOTE CONTROL MODE**
Parameters for the automatic lead / lag selection are as follows:
1. If both compressors in a group are ready to start and the anti-recycle timers are timed out, the compressor with the lowest run hours will start first. If run hours are equal, the lower system number will start first.
2. If both compressors in a group are waiting to start but the anti-recycle timers are not yet timed out, lead will be assigned to the compressor with the shortest anti-recycle time in an effort to provide cooling quickly.
3. If the lead compressor / group is locked out, faulted and waiting to restart, has its system switch on the micro board in the OFF position, or a run permissive is keeping an individual system from running, the lag compressor is swapped to the lead. This occurs whether the lag compressor / group is on or off. See Sections 1.12 and 8.2 for additional details and programming.

**SWITCH 7: Compressor Lead/Lag**

**Open:**

**Manual Lead / Lag Mode** allows selection of the compressor or compressor group lead / lag sequence using external contact closure.

The manual lead / lag selection is automatically overridden (causing the lag compressor / group to become the lead) any time the selected lead compressor / group shuts down due to a lockout, is awaiting restart after a fault, has its system switch(es) on the Micro Board in the Off position, or if a run permissive is keeping the lead system off. This is done to maintain chilled liquid temperature as close to setpoint as possible. See Sections 1.12 and 8.3 for additional details & programming.

**Closed:**

**Automatic Lead / Lag**

In the Automatic Lead / Lag Mode, lead / lag selection between compressors and compressor groups is automatic. In this mode the micro attempts to balance run time between the compressors / groups. The parameters for the automatic lead / lag selection are as follows:

1. If both compressors in a group are ready to start and the anti-recycle timers are timed out, the compressor with the lowest run hours will start first. If run hours are equal, the lower system number will start first.
2. If both compressors in a group are waiting to start but the anti-recycle timers are not yet timed out, lead will be assigned to the compressor with the shortest anti-recycle time in an effort to provide cooling quickly.
3. If the lead compressor / group is locked out, faulted and waiting to restart, has its system switch on the micro board in the OFF position, or a run permissive is keeping an individual system from running, the lag compressor is swapped to the lead. This occurs whether the lag compressor / group is on or off. See Section 1.12 and 8.2 for additional details and programming.

**SWITCH 8: Refrigerant**

**Open:**

**R134a Mode** MUST be selected for models using refrigerant R134a. Incorrect selection of this switch may cause serious damage to the chiller.

**Closed:**

**R22 Mode** MUST be selected for models using refrigerant R22. Incorrect selection of this switch may cause serious damage to the chiller.
Summary of Settings

The following table gives a summary of Modes (displayed messages) which can be selected using the Open and Closed positions for each of the eight SW1 Dip Switches:

<table>
<thead>
<tr>
<th>SWITCH</th>
<th>SWITCH “OPEN” SETTING</th>
<th>SWITCH “CLOSED” SETTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Water Cooling</td>
<td>Brine Cooling</td>
</tr>
<tr>
<td>2</td>
<td>Standard Ambient Control</td>
<td>Low Ambient Control</td>
</tr>
<tr>
<td>3</td>
<td>Local Control Mode</td>
<td>Remote Control Mode</td>
</tr>
<tr>
<td>4</td>
<td>Thermal Expansion Valves</td>
<td>Thermal Expansion Valves</td>
</tr>
<tr>
<td>5</td>
<td>English Units Readouts</td>
<td>SI Units Readouts</td>
</tr>
<tr>
<td>6</td>
<td>Across-the-Line Starting</td>
<td>Wye-Delta Starting</td>
</tr>
<tr>
<td>7</td>
<td>Manual Lead / Lag</td>
<td>Automatic Lead / Lag</td>
</tr>
<tr>
<td>8</td>
<td>Refrigerant R134a</td>
<td>Refrigerant R22</td>
</tr>
</tbody>
</table>

DIP SWITCH PHYSICAL LOCATION AND SETTING

“OPEN” Position: Left side of switch pushed in

“CLOSED” Position: Right side of switch pushed in
4. PRINT KEYS

4.1 GENERAL

The Print keys provide access to two sets of information either locally on the panel display, or, if an optional printer is connected, remotely as hard copy printouts.

The Operating Data key provides a real-time list of system operating data and programmed settings. The History key provides a comprehensive list of operating data and programmed settings “at the instant of fault” on each of the last nine faults (local display) or three faults (remote printout) which occurred on the chiller.

4.2 OPER DATA KEY

If a remote printer is not connected, pressing the Operating Data key allows the user to scroll through information, on the 40 character display, which is not directly available from the Display keys on the panel.

If a remote printer is connected, pressing the Operating Data key causes a snapshot to be taken of system operating conditions and of the user programming selections. The data is stored in temporary memory, then transmitted from the Microprocessor to the remote printer. As the data is transmitted, it is erased from the memory.

Information available using the Operating Data key is described in the following sections. In example displays, “#” is used to indicate system number where appropriate:

4.3 OPERATING DATA – LOCAL DISPLAY MESSAGES

YCAS 2 SYSTEM MODELS:

When the Operating Data key is pressed, the following message appears:

```
PRESS ENTER TO DISPLAY DATA
```

Repetitively pressing the Enter key will then scroll through the following Common (whole chiller) Data and individual System Data information displays:

**Common Data:**

```
LOAD TIMER  70 SEC
UNLOAD TIMER 60 SEC
```

This message shows the time remaining on the Load Timer and the Unload Timer. Timers constantly recycle and are used in conjunction with “rate control” and “temperature deviation from setpoint” to determine when loading should occur.

**NOTE:** These timers may appear not to count according to actual time. This is normal and is controlled by the micro to compensate for changing loading requirements.

```
TEMP ERROR  12.0 °F
TEMP RATE   0.9 °F / M
```

The upper message gives the difference (error) between actual leaving chilled liquid temperature and the programmed Target temperature. The lower message gives the rate of change of the chilled liquid leaving temperature in degrees per minute. A minus sign indicates falling temperature. No sign indicates rising temperature.
This message advises which system is selected as the lead.

This message indicates the position of auxiliary contacts (optional) for the evaporator water pump: On = contacts closed, Off = contacts open.

The Evaporator Heater status is controlled on ambient temperature as follows: If measured ambient falls below 40°F the Evaporator Heater is switched On. If measured ambient then rises above 45°F, the heater is switched Off. The evaporator heater prevents water standing in the evaporator from freezing.

System Data:

The following sequence of five displays are given twice, firstly for System 1, then for System 2:

This message displays the accumulated Run Time since the last start in Days (D), Hours (H), Minutes (M), and Seconds (S).

This message indicates the Liquid Line Solenoid Valve position: On = Energized / Open, Off = De-energized / Closed.

This message advises the Liquid Injection Valve position On = Energized / Injecting, Off = De-energized / Closed.

This message advises the number of forward running pairs of condenser fans on the system.

This message advises the number of reverse running pairs of condenser fans on this system.

Once the System Data sequence has been repeated for the second system, pressing the Enter key again will loop back to the beginning of the common data section. To leave the sequence at any point press a key from another section of the keypad.

YCAS 3 SYSTEM MODELS:

YCAS 3 system models are constructed in two sections. One section contains numbers 1 and 2 refrigerant systems plus the common three circuit evaporator. This section is called the Master section. The second section contains number 3 refrigerant system and is called the Slave section. Both sections have their own control panel, but only the master panel is fitted with a keypad and display.

Operating data for the chiller is stored in three sections: common data for the whole chiller, master section system data and slave section system data. Each section of data can be accessed separately or scrolled through as a continuous loop as follows:

Pressing the Operating Data key the FIRST time causes the following message to be displayed:

The Enter key can now be used to scroll through the common operating data for the chiller followed by the individual system data for the Master, then the Slave sections of the chiller.

Pressing the Operating Data key a SECOND time before pressing the Enter key causes the following message to be displayed:

The Enter key can now be used to scroll through the operating data starting at the data specific to Systems 1 and 2.

Pressing the Operating Data key a THIRD time before pressing the Enter key causes the following message to be displayed:
The Enter key can now be used to scroll through the operating data starting at the data specific to System 3.

**Common Data:**

The Common operating data messages and their meanings are as follows:

- **Load Timer 70 Sec**
- **Unload Timer 60 Sec**

This message shows the time remaining on the Load Timer and the Unload Timer. These Timers constantly recycle and are used in conjunction with "rate control" and "temperature deviation from setpoint" to determine when loading should occur.

*NOTE: These timers may appear not to count according to actual time. This is normal as a result of the micro's algorithm compensating for changing loading requirements.*

- **Temp Error 12.0 °F**
- **Temp Rate - 0.9 °F/M**

The upper message gives the difference (error) between the actual leaving chilled water temperature and the programmed Target temperature. The lower message gives the rate of change of the chilled liquid leaving temperature in degrees per minute. The minus sign indicates falling temperature. No sign indicates rising temperature.

- **Lead Lag Sequence Sys 1, 2, 3**

This message advises which system is selected as lead, first lag and second lag. In this case system 1 is in lead followed by Systems 2 then 3.

- **Evaporator Water Pump Status On**

This message indicates the position of the auxiliary contacts (optional) for the evaporator water pump: On = contacts closed, Off = contacts open.

- **Evaporator Heater Status On**

The Evaporator Heater Mat status depends on ambient temperature as follows: If measured ambient falls below 40°F the Evaporator Heater is switched On. If measured ambient then rises above 45°F, the heater is switched Off. The evaporator heater prevents water standing in the evaporator from freezing.

**System Data:**

Pressing Enter again gives the following message:

- **Press Enter to Display Master Data**

This advises that the common data has been completed and that pressing the Enter key will now scroll through the system data for the master section of the chiller, i.e. the data for System 1 followed by the data for System 2. Pressing the Operating Data key twice jumps directly to this point.

The data for each system is given by the five displays as described under YCAS 2 System Models – System Data above.

After completing the system data for the master section, pressing Enter again gives the following message:

- **Press Enter to Display Slave Data**

Pressing the Enter key will now scroll through the system data for System 3. Pressing the Operating Data key three times jumps directly to this point.

At the end of this sequence, the displays scroll back to the beginning of the common data section.

**YDAS MODELS:**

YDAS models are constructed in two sections. One section contains numbers 1 and 2 refrigerant systems and their associated evaporator. This section is called the Master section. The second section contains numbers 3 and 4 refrigerant systems and their associated evaporator. This is called the Slave section. Both sections have their own control panel, but only the master panel is fitted with a keypad and display.

Operating data for the chiller is stored in three sections: Common Data for the Whole Chiller, Master Section System Data, and Slave Section System Data. Each section of data can be accessed separately or scrolled through as a continuous loop as follows:

Pressing the Operating Data key the FIRST time causes the following message to be displayed:

- **Press Enter to Display Common Data**

The Enter key can now be used to scroll through the common operating data for the chiller followed by the individual system data for the Master, then the Slave sections of the chiller.
Pressing the Operating Data key a SECOND time before pressing the Enter key causes the following message to be displayed:

**PRESS ENTER TO DISPLAY MASTER DATA**

The Enter key can now be used to scroll through the operating data starting at the data specific to Systems 1 and 2.

Pressing the Operating Data key a THIRD time before pressing the Enter key causes the following message to be displayed:

**PRESS ENTER TO DISPLAY SLAVE DATA**

The Enter key can now be used to scroll through the operating data starting at the data specific to Systems 3 and 4.

**Common Data:**

The Common operating data messages and their meanings are as follows:

<table>
<thead>
<tr>
<th>Master Load</th>
<th>Slave Balance</th>
</tr>
</thead>
</table>

At any particular point in the loading sequence, the micro will decide which section of the chiller will load next and which will be held at a fixed (balanced) load state. The above message indicates that in this case the slave section is being held in balance and the master section will be allowed to load at the next load pulse.

<table>
<thead>
<tr>
<th>Master Load Timer</th>
<th>10 SEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slave Unload Timer</td>
<td>40 SEC</td>
</tr>
</tbody>
</table>

The master and slave sections of the chiller each have their own loading and unloading timers. These two messages show the time remaining on the Master Section Load Timer and Unload Timer followed by the Slave Section Load Timer and Unload Timer. These Timers constantly recycle and are used in conjunction with “rate control” and “temperature deviation from setpoint” to determine when loading should occur.

**NOTE:** These timers may appear not to count according to actual time. This is normal as a result of the micro’s algorithm compensating for changing loading requirements.

This message advises which section of the chiller is acting in lead. In this case, the Master Section consists of Systems 1 and 2.

**Lead Master Systems 1 & 2**

This message shows which system is in lead for each of the two sections of the chiller. In this case, System 1 for the Master Section and System 3 for the Slave Section.

**Lead Master Systems 1 & 2**

This message gives the rate of change of the chilled liquid leaving temperature in degrees per minute leaving the Master and Slave section evaporators. A minus sign indicates a falling temperature. No sign indicates rising temperature.

<table>
<thead>
<tr>
<th>Master Rate</th>
<th>Slave Rate</th>
</tr>
</thead>
</table>

This message indicates the position of the auxiliary contacts (optional) for the evaporator water pump: On = contacts closed, Off = contacts open.

**Evaporator Water Pump Status ON**

The Evaporator Heater status is controlled by ambient temperature as follows: If measured ambient falls below 40°F the Evaporator Heater is switched On. If measured ambient then rises above 45°F the heater is switches Off. The evaporator heater prevents water standing in the evaporator from freezing.

**Evaporator Heater Status ON**

The data for each system is given by the five displays as described under YCAS 2 System Models – System Data, page 22.
After completing the system data for the master section, pressing Enter again gives the following message:

PRESS ENTER TO DISPLAY SLAVE DATA

Pressing the Enter key will now scroll through the system data for Systems 3 and 4. Pressing the Operating Data key three times jumps directly to System 4.

At the end of this sequence the displays scroll back to the beginning of the common data section.

4.4 OPERATING DATA – REMOTE PRINTOUT

The following text shows a typical example printout obtained by pressing the Operating Data key with an optional printer attached. In this case an example is given for a YCAS 3 System Chiller. YCAS 2 System models and YDAS models provide similar printouts for the appropriate number of systems:

```
YORK INTERNATIONAL CORPORATION
MILLENNIUM SCREW CHILLER
ISN OPTION ENABLED
SOFTWARE VERSION W.04F.02.500.02

SYSTEM STATUS
11:43PM 01 JAN 96

SYS 1 COMPRESSOR RUNNING
SYS 2 COMPRESSOR RUNNING
SYS 3 COMPRESSOR RUNNING

RETURN WATER TEMP 58.1 DEGF
LEAVING WATER TEMP 49.3 DEGF
LOW WATER CUTOUT 36.0 DEGF
COOLING RANGE 42.0 TO 44.0 DEGF
TARGET TEMP 43.0 DEGF
AMBIENT AIR TEMP 70.2 DEGF
LOW AMBIENT CUTOUT 25.0 DEGF
LOW PRESSURE CUTOUT 44 PSIG
LEAD SYSTEM SYS 1
LOCAL REMOTE SETTING: LOCAL

SYSTEM 1 DATA
COMPRESSOR STATUS ON
RUN TIME 0-0-31-26 D-H-M-S
AVERAGE MTR 65 %FLA
PHASE L1 MTR 66 %FLA
PHASE L2 MTR 65 %FLA
PHASE L3 MTR 65 %FLA
DIFF OIL PRESSURE 9 PSID
SUCTION PRESSURE 72 PSIG
SATURATED SUCTION 42.6 DEGF
SUCTION TEMP 49.0 DEGF
SUPERHEAT 6.4 DEGF
DISCHARGE PRESSURE 214 PSIG
SATURATED DISCHARGE 106.2 DEGF
DISCHARGE TEMP 128.1 DEGF
OIL TEMPERATURE 131.2 DEGF
LIQUID INJECTION VALVE OFF
FORWARD FANS 2
REVERSE FANS 2
LIQUID LINE SOLENOID ON
RUN PERMISSIVE ON

SYSTEM 2 DATA
COMPRESSOR STATUS ON
RUN TIME 0-0-26-11 D-H-M-S
AVERAGE MTR 65 %FLA
PHASE L1 MTR 66 %FLA
PHASE L2 MTR 65 %FLA
PHASE L3 MTR 65 %FLA
DIFF OIL PRESSURE 4 PSID
SUCTION PRESSURE 72 PSIG
SATURATED SUCTION 41.0 DEGF
SUCTION TEMP 48.0 DEGF
SUPERHEAT 7.0 DEGF
DISCHARGE PRESSURE 211 PSIG
SATURATED DISCHARGE 104.4 DEGF
DISCHARGE TEMP 131.8 DEGF
OIL TEMPERATURE 85.2 DEGF
LIQUID INJECTION VALVE OFF
FORWARD FANS 2
REVERSE FANS 2
LIQUID LINE SOLENOID ON
RUN PERMISSIVE ON

SYSTEM 3 DATA
COMPRESSOR STATUS ON
RUN TIME 0-0-18-11 D-H-M-S
AVERAGE MTR 64 %FLA
PHASE L1 MTR 63 %FLA
PHASE L2 MTR 64 %FLA
PHASE L3 MTR 64 %FLA
DIFF OIL PRESSURE 7 PSID
SUCTION PRESSURE 72 PSIG
SATURATED SUCTION 42.7 DEGF
SUCTION TEMP 49.0 DEGF
SUPERHEAT 6.3 DEGF
DISCHARGE PRESSURE 214 PSIG
SATURATED DISCHARGE 107.4 DEGF
DISCHARGE TEMP 128.8 DEGF
OIL TEMPERATURE 85.2 DEGF
LIQUID INJECTION VALVE OFF
FORWARD FANS 2
REVERSE FANS 2
LIQUID LINE SOLENOID ON
RUN PERMISSIVE ON

S M T W T F S * = HOLIDAY
SUN START=00:00AM STOP=00:00AM
MON START=00:00AM STOP=00:00AM
TUE START=00:00AM STOP=00:00AM
WED START=00:00AM STOP=00:00AM
THU START=00:00AM STOP=00:00AM
FRI START=00:00AM STOP=00:00AM
SAT START=00:00AM STOP=00:00AM
HOL START=00:00AM STOP=00:00AM

4.5 HISTORY KEY

If a safety shutdown occurs on the chiller, a comprehensive list of operating and programmed settings data is stored by the Microprocessor. The information is stored at the instant of the fault, regardless of whether the fault caused lockout to occur. This information is not affected by power failures or manual resetting of a fault lockout.

The Microprocessor stores data for up to nine safety shutdowns (up to nine on YCAS 2 system units). Once the limit is reached, a further shutdown will cause the oldest set of data to be discarded in favor of storing the new shutdown data. The safety shutdowns are numbered from 1-9 with number 1 always being the most recent.
If a remote printer is not connected, pressing the History key allows the operator to locally scroll through information relating to the stored safety shutdowns on the 40 character display.

If a remote printer is connected, pressing the History key will cause data for the last three shutdowns to be transmitted from the Microprocessor to the remote printer. The printout will begin with the most recent fault which occurred. This does not affect the stored data and as many prints as desired may be taken. See Section 4.7 for a HISTORY printout sample.

Samples of local display information for YCAS 2 system, YCAS 3 system and YDAS models are as follows:

**4.6 FAULT HISTORY DATA–LOCAL DISPLAY MESSAGES**

**YCAS 2 SYSTEM MODELS:**

When the History key is pressed, the following message will appear:

```
DISPLAY SAFETY SHUTDOWN NO. 1 (1 TO 9)
```

To select a Safety Shutdown, press the appropriate key on the numeric key pad, then press Enter. Remember that the most recent fault information is stored as shutdown No. 1.

Repetitively pressing the Enter key now scrolls through the information available in the Safety Shutdown buffer. This is divided into Common (whole chiller) Data and Individual System Data displays as follows:

**Common Data:**

```
SHUTDOWN OCCURRED
5:59 AM 01 01 98
```

This message advises the time and date of the fault.

```
SYS 1 HIGH OIL DIFF
SYS 2 NO FAULTS
```

This message indicates the nature of the chiller or system fault which occurred. In this case, a system fault of excessive oil pressure differential on System 1.

```
RETURN WATER TEMP
49.3 °F
```

This message indicates the Return Water Temperature at the time of the fault.

```
LEAVING WATER TEMP
44.6 °F
```

This message indicates the Leaving Water Temperature at the time of fault.

**System Data:**

There now follows a sequence of twenty information displays which are given twice, firstly for system 1, then for system 2. In each example, # is used to indicate system number:

```
LOW WATER CUTOUT
36.0 °F
```

This display shows the Low Water (leaving) Cutout programmed at the time of the fault.

```
COOLING RANGE
42.0 TO 46.0 °F
```

This message shows the Cooling Range (Control Range) programmed at the time of the fault.

```
TARGET TEMP
44.0 °F
```

This display shows the Target temperature programmed at the time of the fault.

```
AMBIENT AIR TEMP
77.6 °F
```

This message indicates the surrounding Ambient Air Temperature at the time of the fault.

```
LOW WATER CUTOUT
25.0 °F
```

This display shows the Low Ambient Cutout programmed at the time of the fault.

```
LOW PRESSURE CUTOUT
44 PSIG
```

This display shows the Low Suction Pressure Cutout programmed at the time of the fault.

```
LEAD SYSTEM
SYS 1
```

This message indicates which system was in the lead at the time of the fault.

```
LOCAL REMOTE SETTING
LOCAL
```

This message shows whether remote or local communications were selected at the time of the fault.
This message shows the Run Time logged on the system since the last compressor start, in Days (D), Hours (H), Minutes (M), and Seconds (S).

These four messages indicate the compressor motor average and individual line currents in amps and as a percentage of Full Load Amps.

This message shows the system differential oil pressure at the time of the fault.

These four messages indicate the compressor suction gas conditions or pressure, saturation temperature, actual temperature and superheat at the time of the fault.

These three messages indicate the compressor discharge gas conditions of pressure, saturation temperature and actual temperature at the time of the fault.

This message gives the system oil line temperature at the time of the fault.

This message indicates that the Liquid Injection Solenoid Valve on this system was either energized (On) or de-energized (Off) at the time of the fault.

These two messages indicate the number of pairs of condenser fans running in the forward and reverse directions for this system at the time of the fault.

This message indicates that the Liquid Line Solenoid Valve on this system was either energized (On) or de-energized (Off) at the time of the fault.

This message indicates the Liquid Line Solenoid Valve on this system was either energized (On) or de-energized (Off) at the time of the fault.

This message indicates if the system Run Permissive (flow switch, remote Start/Stop) was in the Run mode (On/Closed) or “Stop” mode (Off/open) at the time of the fault.

YCAS 3 SYSTEM MODELS:

YCAS 3 system models are constructed in two sections. One section contains numbers 1 and 2 refrigerant systems plus the common 3 circuit evaporator. This section is called the Master section. The second section contains number 3 refrigerant system and is called the Slave section. Both sections have their own control panel, but only the master panel is fitted with a keypad and display.

When the History key is pressed, the following message will appear:

To select a Safety Shutdown, press the appropriate key on the numeric keypad then press Enter. Remember that the most recent fault information is stored as shutdown No. 1. Repetitively pressing the Enter key now scrolls through the information available in the Safety Shutdown buffer. This is divided into Common (whole chiller) Data, Master Section Individual System Data and Slave Section Individual System Data as follows:
Common Data:

The next message to appear is shown below, indicating that the Enter key can now be used to scroll next set of displays which deal with common chiller data.

The common chiller data messages and their meanings are as follows:

This message advises the time and date of the fault.

These messages indicate the nature of the chiller or system fault which has occurred. In this case, a system fault or excessive oil pressure differential on System 1.

This message indicates the Return Water Temperature at the time of the fault.

This message indicates the Leaving Water Temperature at the time of the fault.

This display shows the Low Water Cutout (Leaving) programmed at the time of the fault.

This message shows the Cooling Range (Control Range) programmed at the time of the fault.

This display shows the Target Temperature programmed at the time of the fault.

This message indicates the surrounding Ambient Air Temperature at the time of the fault.

Press Enter to Display Common Data

System Data:

Pressing Enter again gives the following message:

Press Enter to Display Master Data

This advises that the common data has been completed and that pressing the Enter key will now scroll through the system history data for the master section of the chiller, i.e. the data for System 1 followed by the data for System 2.

The data for each system is given by twenty information displays as described under YCAS 2 System Models – System Data above.

After completing the system data for the master section, pressing Enter again gives the following message:

Press Enter to Display Slave Data

Pressing the Enter key will now scroll through the system data for System 3.

At the end of this sequence, the displays scroll back to the request to select a safety shutdown number to display.

YDAS MODELS:

YDAS models are constructed in two sections. One section contains number 1 and 2 refrigerant systems and their associated evaporator. This section is called the Master section. The second section contains number 3 and 4 refrigerant system and their associated evaporator. This is called the Slave section. Both sections have their own control panel, but only the master panel is fitted with a keypad and display.
When the History key is pressed, the following message will appear:

**DISPLAY SAFETY SHUTDOWN NO. 1 (1 TO 9)**

To select a Safety Shutdown, press the appropriate key on the numeric keypad and then press Enter. Remember that the most recent fault information is stored as shutdown No. 1.

Repetitively pressing the Enter key now scrolls through the information available in the Safety Shutdown buffer. This is divided into Common (whole chiller) Data, Master Section Individual System Data, and Slave Section Individual System Data as follows:

**Common Data:**

The next message to appear is shown below, indicating that the Enter key can now be used to scroll the next set of displays which deal with common chiller data.

**PRESS ENTER TO DISPLAY COMMON DATA**

The common chiller data messages and their meanings are as follows:

**SHUTDOWN OCCURRED**
5:59 AM 01 01 98

This message advises the time and date of the fault.

**SYS 1 HIGH OIL DIFF**
**SYS 2 NO FAULTS**
**SYS 3 NO FAULTS**
**SYS 4 NO FAULTS**

One or two messages indicate the nature of the chiller or system fault which has occurred. In this case, a system fault of excessive oil pressure differential occurred on Sys. 1.

**RETURN WATER TEMP**
49.3 °F

This message indicates the Return Water Temperature at the time of the fault.

**LEAVING WATER TEMP 1**
44.6 °F

**LEAVING WATER TEMP 2**
44.2 °F

These two messages indicated the chilled water temperatures leaving the Master Section evaporator (1) and the Slave Section evaporator (2) at the time of the fault.

**MIXED WATER TEMP**
44.4 °F

This message indicates the mixed chilled water temperature leaving the chiller at the time of the fault. This is measured after the flows from the two evaporators has been combined and mixed.

**LOW WATER CUTOUT**
36.0 °F

This display shows the Low Water Cutout (Leaving) programmed at the time of the fault.

**COOLING RANGE**
42.0 TO 46.0 °F

This message shows the Cooling Range (Control Range) programmed at the time of the fault.

**TARGET TEMP**
44.0 °F

This display shows the Target temperature programmed at the time of the fault.

**AMBIENT AIR TEMP**
77.6 °F

This message indicates the outdoor Ambient Air Temperature at the time of the fault.

**LOW AMBIENT CUTOUT**
25.0 °F

This display shows the Low Ambient Cutout programmed at the time of the fault.

**LOW PRESSURE CUTOUT**
44 PSIG

This display shows the Low Suction Pressure Cutout programmed at the time of the fault.

**MASTER LEAD SYSTEM**
SYS 1

This message indicates which system was acting in lead in the Master Section of the chiller at the time of the fault. In this case System 1.

**SLAVE LEAD SYSTEM**
SYS 3

This message indicates which system was acting as the lead in the Slave section of the chiller at the time of the fault. In this case, System 3.

**LOCAL REMOTE SETTING**
LOCAL

This message shows whether remote or local communications was selected at the time of the fault.

**System Data:**

Pressing Enter again gives the following message:

**PRESS ENTER TO DISPLAY MASTER DATA**
This advises that the common data has been completed and that pressing the Enter key will now scroll through the system history data for the master section of the chiller, i.e. the data for System 1 followed by the data for System 2.

The data for each system is given by twenty information displays as described under YCAS 2 System Models – System Data above.

After completing the system data for the master section, pressing Enter again gives the following message:

**PRESS ENTER TO DISPLAY SLAVE DATA**

Pressing the Enter key will now scroll through the system data for System 3, then System 4, as for Systems 1 and 2 above.

At the end of this sequence, the display scrolls back to the request to select a safety shutdown number to display.

### 4.7 FAULT HISTORY DATA – REMOTE PRINTOUT

The following text shows a typical example printout obtained by pressing the History key with an optional printer attached. In this case an example is given for a YCAS 3 System Chiller. YCAS 2 System Models and YDAS models provide similar printouts for the appropriate number of system:

<table>
<thead>
<tr>
<th>SYSTEM 1 DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>COMPRESSOR STATUS</strong></td>
</tr>
<tr>
<td><strong>RUN TIME</strong></td>
</tr>
<tr>
<td><strong>AVERAGE MTR</strong></td>
</tr>
<tr>
<td><strong>PHASE L1 MTR</strong></td>
</tr>
<tr>
<td><strong>PHASE L2 MTR</strong></td>
</tr>
<tr>
<td><strong>PHASE L3 MTR</strong></td>
</tr>
<tr>
<td><strong>DIFF OIL PRESSURE</strong></td>
</tr>
<tr>
<td><strong>SUCTION PRESSURE</strong></td>
</tr>
<tr>
<td><strong>SATURATED SUCTION</strong></td>
</tr>
<tr>
<td><strong>SUCTION TEMP</strong></td>
</tr>
<tr>
<td><strong>SUPERHEAT</strong></td>
</tr>
<tr>
<td><strong>DISCHARGE PRESSURE</strong></td>
</tr>
<tr>
<td><strong>SATURATED DISCHARGE</strong></td>
</tr>
<tr>
<td><strong>DISCHARGE TEMP</strong></td>
</tr>
<tr>
<td><strong>OIL TEMP</strong></td>
</tr>
<tr>
<td><strong>LIQUID INJECTION VALVE</strong></td>
</tr>
<tr>
<td><strong>FORWARD FANS</strong></td>
</tr>
<tr>
<td><strong>REVERSE FANS</strong></td>
</tr>
<tr>
<td><strong>LIQUID LINE SOLENOID</strong></td>
</tr>
<tr>
<td><strong>RUN PERMISSIVE</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SYSTEM 2 DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>COMPRESSOR STATUS</strong></td>
</tr>
<tr>
<td><strong>RUN TIME</strong></td>
</tr>
<tr>
<td><strong>AVERAGE MTR</strong></td>
</tr>
<tr>
<td><strong>PHASE L1 MTR</strong></td>
</tr>
<tr>
<td><strong>PHASE L2 MTR</strong></td>
</tr>
<tr>
<td><strong>PHASE L3 MTR</strong></td>
</tr>
<tr>
<td><strong>DIFF OIL PRESSURE</strong></td>
</tr>
<tr>
<td><strong>SUCTION PRESSURE</strong></td>
</tr>
<tr>
<td><strong>SATURATED SUCTION</strong></td>
</tr>
<tr>
<td><strong>SUCTION TEMP</strong></td>
</tr>
<tr>
<td><strong>SUPERHEAT</strong></td>
</tr>
<tr>
<td><strong>DISCHARGE PRESSURE</strong></td>
</tr>
<tr>
<td><strong>SATURATED DISCHARGE</strong></td>
</tr>
<tr>
<td><strong>DISCHARGE TEMP</strong></td>
</tr>
<tr>
<td><strong>OIL TEMP</strong></td>
</tr>
<tr>
<td><strong>LIQUID INJECTION VALVE</strong></td>
</tr>
<tr>
<td><strong>FORWARD FANS</strong></td>
</tr>
<tr>
<td><strong>REVERSE FANS</strong></td>
</tr>
<tr>
<td><strong>LIQUID LINE SOLENOID</strong></td>
</tr>
<tr>
<td><strong>RUN PERMISSIVE</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SYSTEM 3 DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>COMPRESSOR STATUS</strong></td>
</tr>
<tr>
<td><strong>RUN TIME</strong></td>
</tr>
<tr>
<td><strong>AVERAGE MTR</strong></td>
</tr>
<tr>
<td><strong>PHASE L1 MTR</strong></td>
</tr>
<tr>
<td><strong>PHASE L2 MTR</strong></td>
</tr>
<tr>
<td><strong>PHASE L3 MTR</strong></td>
</tr>
<tr>
<td><strong>DIFF OIL PRESSURE</strong></td>
</tr>
<tr>
<td><strong>SUCTION PRESSURE</strong></td>
</tr>
<tr>
<td><strong>SATURATED SUCTION</strong></td>
</tr>
<tr>
<td><strong>SUCTION TEMP</strong></td>
</tr>
<tr>
<td><strong>SUPERHEAT</strong></td>
</tr>
<tr>
<td><strong>DISCHARGE PRESSURE</strong></td>
</tr>
<tr>
<td><strong>SATURATED DISCHARGE</strong></td>
</tr>
<tr>
<td><strong>DISCHARGE TEMP</strong></td>
</tr>
<tr>
<td><strong>OIL TEMP</strong></td>
</tr>
<tr>
<td><strong>LIQUID INJECTION VALVE</strong></td>
</tr>
<tr>
<td><strong>FORWARD FANS</strong></td>
</tr>
<tr>
<td><strong>REVERSE FANS</strong></td>
</tr>
<tr>
<td><strong>LIQUID LINE SOLENOID</strong></td>
</tr>
<tr>
<td><strong>RUN PERMISSIVE</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SYSTEM 4 DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>COMPRESSOR STATUS</strong></td>
</tr>
<tr>
<td><strong>RUN TIME</strong></td>
</tr>
<tr>
<td><strong>AVERAGE MTR</strong></td>
</tr>
<tr>
<td><strong>PHASE L1 MTR</strong></td>
</tr>
<tr>
<td><strong>PHASE L2 MTR</strong></td>
</tr>
<tr>
<td><strong>PHASE L3 MTR</strong></td>
</tr>
<tr>
<td><strong>DIFF OIL PRESSURE</strong></td>
</tr>
<tr>
<td><strong>SUCTION PRESSURE</strong></td>
</tr>
<tr>
<td><strong>SATURATED SUCTION</strong></td>
</tr>
<tr>
<td><strong>SUCTION TEMP</strong></td>
</tr>
<tr>
<td><strong>SUPERHEAT</strong></td>
</tr>
<tr>
<td><strong>DISCHARGE PRESSURE</strong></td>
</tr>
<tr>
<td><strong>SATURATED DISCHARGE</strong></td>
</tr>
<tr>
<td><strong>DISCHARGE TEMP</strong></td>
</tr>
<tr>
<td><strong>OIL TEMP</strong></td>
</tr>
<tr>
<td><strong>LIQUID INJECTION VALVE</strong></td>
</tr>
<tr>
<td><strong>FORWARD FANS</strong></td>
</tr>
<tr>
<td><strong>REVERSE FANS</strong></td>
</tr>
<tr>
<td><strong>LIQUID LINE SOLENOID</strong></td>
</tr>
<tr>
<td><strong>RUN PERMISSIVE</strong></td>
</tr>
<tr>
<td>Component</td>
</tr>
<tr>
<td>--------------------------</td>
</tr>
<tr>
<td>Suction Pressure</td>
</tr>
<tr>
<td>Saturated Suction</td>
</tr>
<tr>
<td>Suction Temp</td>
</tr>
<tr>
<td>Superheat</td>
</tr>
<tr>
<td>Discharge Pressure</td>
</tr>
<tr>
<td>Saturated Discharge</td>
</tr>
<tr>
<td>Discharge Temp</td>
</tr>
<tr>
<td>Oil Temp</td>
</tr>
<tr>
<td>Liquid Injection Valve</td>
</tr>
<tr>
<td>Forward Fans</td>
</tr>
<tr>
<td>Reverse Fans</td>
</tr>
<tr>
<td>Liquid Line Solenoid</td>
</tr>
<tr>
<td>Run Permissive</td>
</tr>
</tbody>
</table>

**Ambient Air Temp:** 70.0 DEGF  
**Low Ambient Cutout:** 25.0 DEGF  
**Low Pressure Cutout:** 44.0 PSIG  
**Lead System:** SYS 1  
**Local Remote Setting:** LOCAL

**System 1 Data**
- Compressor Status: ON  
- Run Time: 0-0-0-0 D-H-M-S  
- Average MTR: 0 %FLA  
- Phase L1 MTR: 0 %FLA  
- Phase L2 MTR: 0 %FLA  
- Phase L3 MTR: 0 %FLA  
- Diff Oil Pressure: 0.0 PSID  
- Suction Pressure: 62.2 PSIG  
- Saturated Suction: 35.2 DEGF  
- Suction Temp: 37.0 DEGF  
- Superheat: 1.8 DEGF  
- Discharge Pressure: 92.8 PSIG  
- Saturated Discharge: 55.1 DEGF  
- Discharge Temp: 56.0 DEGF  
- Oil Temp: 180.4 DEGF  
- Liquid Injection Valve: OFF  
- Forward Fans: OFF  
- Reverse Fans: OFF  
- Liquid Line Solenoid: OFF  
- Run Permissive: ON

**System 2 Data**
- Compressor Status: ON  
- Run Time: 0-0-0-0 D-H-M-S  
- Average MTR: 93.47 %FLA  
- Phase L1 MTR: 93.48 %FLA  
- Phase L2 MTR: 93.47 %FLA  
- Phase L3 MTR: 93.46 %FLA  
- Diff Oil Pressure: 2.9 PSID  
- Suction Pressure: 59.9 PSIG  
- Saturated Suction: 31.8 DEGF  
- Suction Temp: 46.9 DEGF  
- Superheat: 15.1 DEGF  
- Discharge Pressure: 181.5 PSIG  
- Saturated Discharge: 94.5 DEGF  
- Discharge Temp: 232.2 DEGF  
- Oil Temp: 122.3 DEGF  
- Liquid Injection Valve: OFF  
- Forward Fans: OFF  
- Reverse Fans: OFF  
- Liquid Line Solenoid: ON  
- Run Permissive: ON

**System 3 Data**
- Compressor Status: OFF  
- Run Time: 0-0-0-0 D-H-M-S  
- Average MTR: 0 %FLA  
- Phase L1 MTR: 0 %FLA  
- Phase L2 MTR: 0 %FLA  
- Phase L3 MTR: 0 %FLA  
- Diff Oil Pressure: 0.0 PSID  
- Suction Pressure: 78.2 PSIG  
- Saturated Suction: 46.1 DEGF  
- Suction Temp: 48.2 DEGF  
- Superheat: 2.1 DEGF  
- Discharge Pressure: 157.0 PSIG  
- Saturated Discharge: 85.1 DEGF  
- Discharge Temp: 86.2 DEGF  
- Oil Temp: 100.1 DEGF  
- Liquid Injection Valve: OFF  
- Forward Fans: OFF  
- Reverse Fans: OFF  
- Liquid Line Solenoid: OFF  
- Run Permissive: ON
5. ENTRY KEYS

**5.1 GENERAL**

The Entry keys allow the user to change numerical values programmed in as chiller setpoints, cutouts, clock, etc. Cancel Key

**5.2 NUMERICAL KEYPAD**

The Numerical keypad provides all keys necessary to program numerical values into the micropanel.

The "*" key is used to designate holidays when programming special start/stop times for designated holidays in the SET SCHEDULE/HOLIDAY program mode.

The "+/–" key allows programming –C setpoints and cutouts in the metric display mode.

**5.3 ENTER KEY**

The Enter key must be pushed after any change is made to setpoints, cutouts, or system clock. Pressing this key tells the micro to accept new values into memory. If this is not done, the new values entered will be lost and the original values will be returned.

The Enter key is also used to scroll through available data when using the Program, Operating Data, History, or Set Schedule / Holiday keys.

**5.4 CANCEL KEY**

When the Cancel key is pressed, the cursor will always return to the first character to be programmed in the display message. This allows the operator to begin reprogramming if an error is made. When the Cancel key is pressed, the values already keyed in will be erased and the original or internally programmed default values will appear. In other instances, the display will remain the same and the only reaction will be the cursor returning to the first character.

**5.5 AM / PM KEY**

The AM / PM key allows the user to change AM / PM while programming the micro with the correct time and date. This key is also used when setting the stop / start timers for the Set Schedule / Holiday feature.

**5.6 ADVANCE DAY KEY**

The Advance Day key is used to select the correct day of the week when programming the micro with the correct time and date.
6.1 GENERAL

The Microprocessor monitors leaving chilled liquid temperature and adjusts the chiller cooling capacity to maintain this temperature within a programmed range. The capacity is controlled by switching compressors on or off, and by sending a series of load and unload pulses to each compressor slide valve to adjust the capacity of the compressors. Internal algorithms are used to combine temperature control zones and timers, maximizing efficiency by spreading the cooling load between compressors and minimizing compressor cycling. This method of control is suitable for both water and brine cooling. Control setpoints can be programmed into the chiller to establish the desired range of leaving chilled liquid operating temperatures. A description of the operation and programming follows.

6.2A CHILLED LIQUID TEMPERATURE CONTROL

YCAS Models:

The Setpoints keys are used to program the required chilled water leaving temperature, called the Target temperature, for the application. This is done by programming the acceptable deviation or range of leaving temperatures around the desired Target temperature. This range is called the Control Range and has the Target temperature at its midpoint.

The minimum acceptable temperature in the Control Range is referred to as the Low Limit Water Temperature which is the lowest user acceptable leaving temperature, and the High Limit Water Temperature which is the highest user acceptable leaving temperature. For example, if the desired Target temperature is 44.0°F and the allowable deviation from this temperature is 2.0°F, then the programmed acceptable Control Range limits are 42°F and 46°F. This can be viewed pictorially as follows:

<table>
<thead>
<tr>
<th>High Limit Water Temperature</th>
<th>Target temp.</th>
<th>CONTROL RANGE</th>
<th>Low Limit Water Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>46.0°F</td>
<td>44.0°F</td>
<td></td>
<td>42.0°F</td>
</tr>
</tbody>
</table>

To assure that the chilled liquid leaving temperature stays within the Control Range, the micro will attempt to control the leaving temperature with an even tighter temperature band than the low and high limits of the Control Range. This smaller band is called the Neutral Zone. When the chilled liquid leaving temperature is within the
Neutral Zone, load / unload pulses will only be initiated if the leaving liquid temperature rises or falls faster than preset rate control limits internal to the micro.

The Neutral Zone is equally spaced between the low and high limits of the Control Range and therefore also has the Target temperature at its midpoint. The "width" of the Neutral Zone is half of the "width" of the Control Range. The upper and lower limits of the Neutral Zone can be calculated as follows:

\[
\text{NEUTRAL ZONE LIMITS} = \text{TARGET} \pm \frac{\text{HLWT} - \text{LLWT}}{4}
\]

For example, if the desired Target temperature is 44.0°F and the programmed acceptable Control Range limits are 42.0°F and 46.0°F, then the Neutral Zone limits are as follows:

\[
\begin{align*}
\text{NEUTRAL ZONE LIMITS} &= 44.0°F \pm \frac{46.0°F - 42.0°F}{4} \\
&= 44.0°F \pm 1.0°F \\
&= 43.0°F \text{ and } 45.0°F
\end{align*}
\]

This can be viewed pictorially as follows:

As stated above, no loading or unloading will occur in the Neutral Zone unless the internal non-programmable rate control limit (rate of temperature change of the leaving liquid) is exceeded. Limiting loading will occur; however, is the temperature range between the top end of the Neutral Zone and the High Limit Water Temperature Normal loading, as dictated by internal timers will occur above the Control Range. Limited unloading will also occur when temperature falls between the bottom of the Neutral Zone and the Low Limit Water Temperature. Normal unloading, as dictated by internal timers, will occur below the Control Range.

**Compressor Starting Sequence for 2 and 3 Compressor YCAS Chillers**

If no compressors are running, all safeties and run permissives are satisfied, the anti-recycle timers have timed out, and the leaving liquid temperature rises above the upper limit of the Control Range, the lead compressor will be started. An unload pulse of 3 seconds duration is sent to the compressor to assure it is fully unloaded. After an initial period of 150 seconds, the micro will begin to load up the lead compressor to match cooling demand.

If the lead compressor reaches a programmed percentage of full load (Lead Compressor Start Point) and demand continues to rise, the (first) lag compressor will be started in a fully unloaded condition. The lead compressor will then be maintained at a constant load and the micro will load up the lag compressor to match the cooling demand.

On 2 compressor chillers, if the lag compressor reaches the same percentage of full load as the lead compressor and demand continues to rise, equalized loading of the two compressors will take place.

On 3 compressor chillers, if the first lag compressor reaches the same percentage of full load as the lead compressor, and demand continues to rise, the two running compressors will be maintained at constant load and the second lag compressor will be started. The micro will then begin loading the second lag compressor. If the second lag compressor reaches the same percentage of full load as the other two compressors and demand still continues to rise, equalized loading of all three compressors will take place.

**NOTE:** Under some conditions, lag compressor(s) may be started before the lead compressor reaches the required percentage of full load. This may occur if the chilled liquid is not brought to within 2°F of the control range after 5 minutes of operation time on the lead compressor. For more details, see Section 8.2 – Lag Compressor Start Point.

**Compressor Loading and Unloading**

The micro loads and unloads individual compressor by pulsing the slide valve solenoids which control oil flow to the slide valve. The slide valve load solenoid applies oil pressure to the slide valve which increases capacity. The slide valve unload solenoid allows venting of oil pressure which allows discharge pressure to move the slide valve in the opposite direction, decreasing capacity.

Whenever chilled liquid leaving temperature is above the Neutral Zone, loading pulses will be applied to open the loading port on the control solenoid allowing oil pressure to move the slide valve to increase capacity. Every 10-120 seconds, the micro will pulse the slide valve with a 0.4-5 second pulse. The time between pulses will be a function of the leaving liquid temperature de-
viation from the Target temperature. The duration of the pulse will be a function of the deviation from Target temperature, rate of change of leaving chilled liquid temperature, suction pressure, discharge pressure, and % load current. Pressure is a factor since the amount of slide valve movement for a given pulse is dependent on the discharge pressure. Motor current is a factor to assure the slide valve position changes do not cause the compressor to exceed the current limit unload point. For the first two and a half minutes of compressor operation, no loading will occur.

Whenever temperature is below the Neutral Zone, unloading pulses will be sent to open the unloading port on the control solenoid to relieve oil pressure on the slide valve. This allows discharge pressure to move the slide valve to decrease capacity. Every 6-70 seconds, the micro will pulse the slide valve with a 0.4-5 second pulse. The duration and length of the pulse will be a function of the deviation from setpoint. The larger the deviation, the longer the pulse. Limited loading/unload may occur in the Neutral Zone, if internal rate control limits regulating abrupt changes in leaving chilled liquid are exceeded.

**Compressor Shutdown Sequence**

If the chiller is near full load and cooling demand fails, the compressors will be unloaded equally until they reach a programmed percentage of full load - see Section 8.2 Lag Compressor Differential Off.

On 2 system chillers, if demand continues to fall, the lead compressor will be maintained at constant load and the lag compressor will be unloaded. If the lag compressor reaches a fully unloaded condition, it will be shut down under the following conditions: a. chilled liquid temperature drops below the Neutral Zone, b. chilled liquid temperature drops below the Target temperature and the rate of change exceeds the internally programmed rate limits. When the lag compressor shuts down, the lead compressor loading is then adjusted to match the cooling demand.

If only one compressor is running and if fully unloaded, when cooling demand falls, it will cycle off when leaving liquid temperature drops below the low limit of the Control Range.

On 3 compressor chillers, the process is the same as for 2 compressor chillers except that when the minimum level of equalized loading is reached, the lead and first lag compressor are maintained at constant load and only the second lag compressor continues to unload. If the second lag compressor shuts down according to decreasing load and demand continues to fall, then the first lag compressor will begin to unload and if necessary shut down.

**NOTE:** A lag compressor may be shut down before it is fully unloaded to avoid a Chiller fault on a Low Water Temperature cut-out under the following conditions: a. if chilled liquid temperature falls below the low end of the Control Range (CR) for more than 37 seconds, b. if chilled liquid temperature drops more than CR/4 below the low limit of the control range.

If demand continues to fall and the lead compressor is the only compressor running, it will continue to unload and shut down when leaving liquid temperature drops below the low limit of the Control Range.

**NOTE:** The lead compressor may be shut down before it is fully unloaded to avoid a Chiller Fault on a Low Water Temperature fault under the following conditions: a. if chilled liquid temperature drops 2°F below the low limit of the Control Range (CR), b. if chilled liquid temperature drops more than CR/2 below the low limit of the Control Range.

**6.2B CHILLED LIQUID TEMPERATURE CONTROL – YDAS MODELS**

The four refrigerant systems on a YDAS chiller are divided into two pairs, or groups, each having its own two circuit evaporator. Control of the chilled liquid temperature leaving the chilled is divided into two distinct levels, control of the temperature after the flow from both evaporators has been mixed and control of the temperature leaving the individual evaporators.

The Setpoints keys are used to program the chiller with both the required mixed water leaving temperature for the application, called the Mixed Target Temperature, and with the individual evaporator leaving Target temperature, called the Panel Target Temperature. This is performed by programming the acceptable deviation or range of leaving temperatures above and below both Target Temperatures. The tops and bottoms of the ranges (Control Range, CR) are called the High and Low Temperature Limits. The Target Temperatures are midway between these programmed limits.

The Mixed Temperature Limits are programmed first based on the desired Target Temperature for the “chiller” application. For example, if the desired Mixed Target Temperature is 46.0°F and the allowable deviation from the temperature is +/– 2.0°F, then the programmed acceptable Mixed Temperature Low and High Limits are 44.0°F and 48.0°F respectively. This can be view pictorially as follows:
If no compressors are running, all safeties and run permissives are satisfied, and the mixing leaving liquid temperature rises above the upper limit of the Mixed Control Range, the Master compressor group lead compressor will start and load. If demand continues to rise, the lag compressor will start and load. Load signals will be sent to the lead compressor group until cooling demand is matched.

If demand continues to rise and the total load of the lead compressor group reaches a programmed percentage of full load (the Lag Panel Star Point), balance signals will be sent to the lead group and load signals will be sent to the lag group to start and match the cooling demand.

If the lag compressor group reaches the same total percentage of full load as the lead group, and demand continues to rise, equalized loading of the two groups will take place.

**NOTE:** Under some conditions, the lag compressor group may be sent load signals before the lead compressor reaches the required percentage of full load, if chilled liquid temperature is not brought within the control range after 10 minutes of run time. For more details, see Section 8.2 – Lag Point Start Point.

If the chiller is near full load and cooling demand falls, the compressor groups are unloaded equally until they reach the programmed percentage of full load – see Section 8.2 Lag Panel Differential Off.

If demand continues to fall, the lead group will be maintained at constant load and the lag group will continue to be sent unload signals. If the lag compressor group shuts down and demand continues to fall, the lead group will then be sent unload signals until cooling demand is matched or the lead group shuts down.

### Panel Temperature Control

Overall control of the chilled liquid temperature is primarily based on the load/balance/unload signals to the compressor groups by the “Mixed Temperature Control Algorithm” described above. Acting on these signals, the two compressors in each group are started, load, unloaded, and shutdown by the “Individual Panel Algorithms” control as described in Section 6.2 for 2 system YCAS chillers. During very low cooling demand and some other conditions, the signals sent to the individual compressors may be modified by the “Individual Panel Algorithms” based on the individual evaporator leaving temperature and the programmed Panel High and Low Temperature Limits. The actual action taken on the compressors is modified by the Panel Algorithms according to the following table:
6.3 CHILLED LIQUID TEMP/RANGE KEY

The Chilled Liquid Temperature / Range key is used to program the required leaving liquid control temperatures for the application. When pressed, one of the following messages will be displayed for 3 seconds:

This message will indicate if the chiller is selected to be controlled by Local (Control Panel) Setpoint control or Remote (ISN, Remote PWM Signal, or Remote Control Center) Setpoint. This is controlled by the S1 Dip Switch settings on the Microprocessor Board (see Section 3.7).

The display will then scroll to one of the following messages depending on the type of chiller:

**YCAS Models:**

The display scrolls to a message showing the currently programmed Control Range (CR) and desired Target temperature with the cursor below the first digit of the Control Range Low Limit Water Temperature as shown:

| CR = 42.0 TO 46.0 °F | TARGET = 44.0 °F |

Key in the Low Limit of the Control Range within the allowed limits. The micro will accept values from 10.0 - 70.0°F. For values below 38°F, Dip Switch S1, Switch #1 on the Microprocessor Board must be properly programmed for Brine Cooling (see Section 3.7). If unacceptable values are entered, or the switch is incorrectly selected when setpoints below 38°F are entered, the following message will be displayed before returning to the Control Range message:

**YDAS Models:**

Programming for YDAS models is similar to that for YCAS models given above except that the display first scrolls to a message showing the currently programmed Mixed Chilled Liquid Control Range (CR) and desired Mixed Target temperature as shown:

| CR = 44.0 TO 48.0 °F | MIXED TARGET = 46.0 °F |

After the Low Limit Water Temperature is keyed in, the cursor will automatically advance to the first digit of the High Limit Water Temperature value of the Control Range (CR) as shown:

| CR = 42.0 TO 46.0 °F | TARGET = 44.0 °F |

This value should be programmed for the highest leaving water temperature which is acceptable in the system application. A typical value would be 4°F above the Low Limit Water Temperature and is the default value programmed into the micro. The micro will accept a value 1 - 5°F above the Low Limit Water Temperature. Key in the upper limit High Limit Water Temperature of the CR and press the Enter key.

The display automatically shows the Target temperature which is the midpoint of the programmed Control Range. The Target temperature is the value which the micro will attempt to control leaving liquid temperature.

**NOTE:** Failure to press the Enter key will cause the newly programmed values to be ignored and not entered into memory.

**NOTE:** A Control Range (CR) selection that is too small for the application will result in excessive compressor cycling or hunting of the compressor slide valves. If this situation occurs, leaving chilled liquid temperature may vary considerably. It is recommended that a CR of less than 3.0°F be avoided. Increase the CR as needed to reduce cycling and hunting.

After pressing the Enter key, the display will continue to show the message until another key is pressed.
These values can now be programmed. The recommended CR and TARGET for the individual panels should be programmed 2.0 – 4.0 °F below the “Mixed” programmed values. Both Master and Slave Panels will be programmed to the PANEL TARGET after the ENTER key is pressed.

NOTE: Remember to program the Mixed Target temperature to a slightly higher value than the Panel Target temperature.

NOTE: Failure to press the Enter key will cause the newly programmed values to be ignored and not entered into memory.

6.4 REMOTE RESET TEMP/RANGE KEY

Remote Setpoint Reset allows resetting the setpoint upward from the programmed value in memory. This feature is typically used for demand limiting or ice storage application. Reset is accomplished by timed closure of external contacts for a defined period of time and allows reset of the setpoint upward by up to 40°F above the setpoint programmed in memory – see Section 1.7.

The maximum allowable reset must be programmed into memory and can be a value of 2° to 40°F depending on user requirements. To program the reset, press the Remote Reset Temperature Range key. The following message will appear:

**REM SETPOINT = 40.0**

**REM RANGE = 20 °F**

The display indicates the Remote Setpoint which is always equal to the chilled liquid setpoint programmed by the Chilled Liquid Temperature / Range key plus the offset from the remote reset signal. The display will also show the Remote Range which is the programmed maximum reset allowed for the application. The cursor will stop beneath the first digit of the Remote Range. Key in the maximum reset allowed for the application, remembering to use a leading “0” for values less than 10°F, then press the Enter key to store the new value in memory.
7. CLOCK KEYS

7.1 GENERAL

The Microprocessor features a continuously running internal Clock and calendar and can display actual time as well as the day of the week and the date. An automatic schedule feature is provided for starting and stopping the chiller on individual days of the week, eliminating the need for an external time clock. Also provided are a Holiday feature, allowing special start/stop times to be set for designated holidays, and a Manual Override feature to aid servicing. If the automatic schedule feature is not required, the micro can be programmed to run the chiller on demand as long as the Chiller On/Off and System switches are in the On position.

Programming the internal clock / calendar and operating schedule are described below:

7.2 SET TIME KEY

When the Set Time key is pressed, a message showing the day, time, and date will be displayed with the cursor below the first digit of the time shown:

```
T O D A Y I S M O N 1 1 . 1 2 A M
1 9 F E B 9 5
```

First press the Advance Day key until the proper day appears. Next key in the time (hours/minutes) using a leading “0” for times before 10 o’clock, e.g. 08:31. The cursor will then advance to the AM/PM designation. If necessary, press the AM/PM key to change to the opposite time period.

NOTE: The AM/PM key can only be used once. If an error is made, press the Cancel key and begin again.

Next, key in the required date of the month (the cursor will automatically skip from AM/PM to the first digit of the date when a “number key” is pressed). The cursor will then skip to the first digit of the year. Key in the year as required. Always use two digits for the day and the year using a leading “0” for days 1 - 9, e.g. 02 FEB 97. Finally change the month as needed by repetitively pressing the “+/–” key until the proper month appears. Once the desired information is keyed in, it must be stored into memory by pressing the Enter key.

Any valid time or data will be accepted. If an out of range value is entered the following message will be displayed for three seconds then revert back to the Set Time display message for reprogramming:

```
O U T O F R A N G E
T R Y A G A I N !
```

NOTE: Pressing the Set Time key once enters “programming” mode in which the displayed time does not update. Pressing the Set Time a second time enters “display” mode in which the cursor will disappear and the “live” clock will be displayed.

7.3 SET SCHEDULE / HOLIDAY KEY

Messages giving each week day and the holiday start / stop schedule, as shown below, can be displayed using the Set Schedule / Holiday key:
The displays for each day are scrolled through by repetitively pressing the Advance Day key. To reprogram any of the daily schedule, key in the new Start time, then if necessary, change the associated AM/PM by pressing the AM/PM key.

**NOTE:** The AM/PM key can only be pressed once. If an error is made, press Cancel and begin again.

Next key in the Stop Time (the cursor will automatically skip from AM/PM to the first digit of the time when a “number key” is pressed) and the AM/PM if necessary. Now press the Enter key to store the new schedule. The display will scroll to the next day. If an unacceptable time is entered, the following message will be displayed for three seconds, then return to the schedule display:

**OUT OF RANGE TRY AGAIN!**

**NOTE:** New start/stop times programmed for Monday are automatically used for all following days of the week.

**NOTE:** Always use the Advance Day key, not the Enter key, to scroll through the schedule displays. This will assure that after viewing Monday, the Enter key is not pressed which will change times programmed for the remainder of the week.

If the chiller is not cycled by the Daily Schedule, but is required to run whenever remote cycling devices, system switches, and main Chiller On / Off switch are in the On position, all 00.00s should be programmed into the daily schedule. This can be done manually for individual days or for all days by pressing Cancel or Enter for the Monday Start / Stop schedule.

**NOTE:** Programming the DAILY SCHEDULE will not affect on the holiday schedule.

If the chiller is not required to run on a given day, the Start time should be programmed for 00:00 AM and the Stop time programmed for 12:00 AM.

Continue to program each day as needed. After SUN has been entered, the Holiday message will be displayed:

**HOL START = 08:30 AM
STOP = 12:00 PM**

The Holiday (HOL) Start / Stop allows a specific day(s) for be assigned for special requirements. This is provided so that a day(s) needing special start / stop requirements can be programmed without disturbing the normal working schedule. The start / stop times for the Holiday schedule are programmed just as any other day.

**NOTE:** Only one start / stop time can be programmed which will apply to each of the Holiday days selected.

After the Enter key is pressed, a display to designate which days of the week are holidays will appear:

7.4 MANUAL OVERRIDE KEY

When the Manual Override key is pressed, the Daily Schedule programmed into the chiller is ignored and the chiller will start up when water temperature is above the high limit of the Control Range and the Chiller On / Off switch is ON, remote cycling devices are CLOSED, and the system switches permit.

Normally this key is used only for servicing when the chiller is required to run but the Daily Schedule is in an Off period. This key avoids the need to reprogram the Daily Schedule. Once activated, Manual Override is only active for a period of 30 minutes.

**NOTE:** If a Warning – Low Battery fault message appears on the display, the internal clock, calendar and program settings can not be relied on for accuracy. Default values are loaded into the Microprocessor memory and the Manual Override key can be used to zero out the daily schedule and allow unlimited operation regardless of the time on the internal clock. Reprogramming of the setpoints and cutout values may also be necessary. When the MANUAL OVERRIDE key is pressed, the low battery message will disappear. If a power failure should again occur, the above process will again need to be repeated to bring the chiller back on line. See also Section 2.2.
8. PROGRAM KEY

8.1 GENERAL

The Program key is used to program 21 system operating parameters including cutout points for safeties, anticipatory unload points to avoid faults, and anti-recycle timer duration.

When the Program key is pressed, the following message will be displayed:

```
PROGRAM MODE
```

Press the Enter key repeatedly to scroll through the programmable value displays.

As each value is displayed, it may be reprogrammed using the 12 Entry keys. New values will be programmed into memory when the Enter key is pressed to scroll on to the next display.

Some programmable values are critical to the correct operation of the chiller and are therefore password protected. These are identified by the absence of the cursor when the display is viewed. Programmable values not password protected are identified by the presence of the cursor under the first digit of the numerical value. Unprotected values may be keyed in by simply typing a new value and pressing the Enter key. Failure to press Enter will cause the new value to be lost.

To reprogram password protected values an access code must be entered as follows:

When the Program key is first pressed and the above message is displayed, key in the 4 digit code “7396” then press Enter.

As the code is being keyed in the digits are not displayed but are shown as “*” as shown:

```
PROGRAM MODE
```

Pressing the Enter key repeatedly now scrolls through the programmable values with access to reprogram all values indicated by the cursor positioned at the first digit of the numerical value.

Once accessed, the display will stay in the password protected mode until a Display, Print, Setpoint, or Clock key is pressed.

If an unacceptable value is entered at any stage, the following message is displayed for a few seconds and the entered value is ignored:

```
OUT OF RANGE
TRY AGAIN!
```

The following section shows examples of each programmable value display in the order in which they appear after pressing the Program key, together with guidance on programming of each parameter.

NOTE: The programmable values under the Program key must be checked and properly programmed when commissioning the chiller. Fail-
ure to properly program these values may cause damage to the chiller or operating problems.

8.2 PROGRAM KEY – USER PROGRAMMABLE VALUES

Refrigerant Type

The Refrigerant Type value is used to program the chiller for the type of refrigerant and is password protected. This value MUST be programmed correctly. Failure to do so may cause serious damage to the chiller. The type of refrigerant used on individual models is noted in the Engineering Data stamped on the chiller nameplate.

To program for R22, key in “022”. To program for R134a key in “134”. Press the Enter key to store the programmed value into memory.

NOTE: The type of refrigerant programmed must match the refrigerant selected on the SW1 Dip Switch on the Microprocessor Board. These selections can be viewed by pressing the Options key (see Section 3.7). If these two selections do not match, the following message will appear:

The chiller will not operate until this situation is corrected.

High Discharge Pressure Cutout

The Discharge Pressure Cutout is a microprocessor backup for the mechanical high pressure cutout located in each refrigerant circuit. This safety is bypassed for the first 5 seconds of operation after which if the cutout point is exceeded for 3 seconds, the system will shut down.

Normally air-cooled chillers such as YCAS/YDAS chillers should have the cutout set at 395 PSIG for R22 models and 275 PSIG for R134a models. The micro will, however, accept values between 200 - 399 PSIG for R22 models and between 128 - 275 PSIG for R134a models. For this cutout to be functional, the Discharge Pressure Readout Option must be installed (fitted as standard on 50 Hz models). This programmable value is password protected.

To program the Discharge Pressure Cutout, key in the desired value and press the Enter key to store the value into memory and scroll to the next display.

Low Ambient Temperature Cutout

The Low Ambient Cutout is used to select the ambient temperature below which the chiller may not operate. If the ambient temperature falls 1°F below this point, the chiller will shut down. Restart will occur automatically, when temperature rises more than 1°F above the cutout and cooling demand is present (see also Section 2.4). This programmable value is password protected.

If the SW1 Dip Switch on the Microprocessor Board is set for “Standard Ambient Control” (see Section 3.7) the low ambient cutout is set at 25°F and is NOT programmable. If the Dip Switch is set for “Low Ambient Control”, programming of the cutout between 00.0° - 50.0°F is allowed. This allows higher values than 25°F to be programmed to shut down the chiller when direct cooling methods become operational. Values below 25°F can be used for applications requiring chiller operation at lower temperatures. Values below 1°F will not be displayed.

To program the Low Ambient Cutout, key in the required setting and press the Enter key to store the value into memory and scroll to the next display.

NOTE: Operation below 1°F may occasionally cause nuisance low pressure safety shutdowns. This will not cause a problem provided ambient temperature is not expected to be below 1°F for more than a short time.

High Ambient Temperature Cutout

The High Ambient Cutout is used to select the ambient temperature above which the chiller may not operate. If the ambient temperature rises 1°F above this point, the chiller will shut down. Restart will occur automatically, when temperature falls more than 1°F below the cutout and cooling demand is present.

This cutout is normally set at 130°F to allow operation to the absolute maximum temperature capability of the electromechanical components, however, values between
100.0 - 130.0°F are accepted. This programmable value is password protected.

To program the High Ambient Cutout, key in the required setting and press the Enter key to store the value into memory and scroll to the next display.

**High Discharge Pressure Unload Point**

**DISCHARGE PRESSURE UNLOAD = 360.0 PSIG**

The Discharge Pressure Unload point is used to avoid a high pressure cutout shutdown by unloading a compressor if its discharge pressure approaches the cutout value. The chiller can then continue to run automatically at reduced capacity until the cause of the excessive pressure is attended to (e.g. dirty condenser coils) or ceases naturally (e.g. high ambient temperature).

For the first 60 seconds of operation discharge pressure limiting is disabled. After this time, if discharge pressure exceeds the programmed limit, a 1 second unload pulse will be sent to the slide valve of the affected compressor every 5 seconds until the discharge pressure drops below the programmed limit. The message will be removed and reloading take place when discharge pressure has dropped 60 PSIG below the threshold.

Typically, the unload point should be set 20 - 25 PSI below the discharge pressure cutout setting. The micro will accept a range of programmable values between 200 - 390 PSIG for R22 models, 128 - 270 PSIG for R134a models. This programmable value is password protected.

To program the Discharge Pressure Unload, key in the required setting and press the Enter key to store the value into memory and scroll to the next display.

**High Average Current Unload Point**

**AVERAGE CURRENT UNLOAD = 105 % FLA**

The Average Current Unload point is used to avoid a high motor current safety shutdown by unloading a compressor if its current draw approaches the maximum limit cutout value. The chiller can then continue to run automatically at reduced capacity until the cause of the excessive current is attended to.

The micro will accept between 30 - 115% for the unload point. The motor current safety will shut the compressor down whenever current exceeds 115%.

If the programmable limit is set between 100% and 115% of full load current, this safety will protect against excessive current which would cause compressor shutdown due to extremely high ambient, high chilled liquid temperature, and condenser malfunction caused by dirt or fan problems.

If the programmable limit is set below 100% of full load current, this feature can be used for “demand limiting”. This is important when demand limiting is critical due to power requirements or limitations in the building (See also Section 1.7).

For the first 60 seconds of operation, the unloading safety is disabled. After this time, if motor current exceeds the programmed limit the SYS X CRNT LIMITING message will appear and a 1 second unload pulse will be sent to the slide valve of the affected compressor every 5 seconds until the motor current drops below the programmed limit. The message will be removed and additional loading will take place when motor current drops below the programmed threshold.

Typically, this setpoint should be set at 100 - 105%. It is not recommended to program a value greater than 105%. For maximum motor protection, programming for 100% is advisable. When programming values below 100% use of a leading “0” is required, e.g. 085%.

To program the Average Motor Current Unload, key in the required setting and press the Enter key to store the value into memory and scroll to the next display.

**Anti-Recycle Timer**

**ANTI RECYCLE TIMER = 600 SECS**

The Anti-Recycle Timer controls the minimum time between starts for each compressor. This is the time available for the heat build-up caused by inrush current at start to be dissipated before the next start. Insufficient cooling time between starts can cause heat build-up and motor damage. A fast compressor start response is needed in some applications and not in others. Although the minimum setting allowed on this timer will avoid excessive heat build-up, adjusting the timer for the longest period acceptable in each application will reduce cycling and maximize motor life. **600 seconds is recommended.**

The micro will accept a range of programmable values between 300 - 600 seconds.

To program the Anti-Recycle Timer, key in the required setting and press the Enter key to store the value into memory and scroll to the next display.
Low Leaving Water Temperature Cutout

LEAVING WATER TEMP
CUTOUT = 36.0 °F

The Low Leaving Water Temperature Cutout protects the evaporator from damage due to ice build-up caused by operation below the chilled liquid freezing point.

If the leaving chilled liquid temperature (water or glycol) drops below the cutout point, the chiller will shut down. The chiller will be restarted automatically when temperature rises more than 4°F above the cutout point and cooling demand exists.

If the Dip Switch on the microprocessor board is set for “Water Cooling” (See Section 3.7) the cutout is automatically set at 36°F and cannot be reprogrammed. If the Switch is set for “Brine Cooling” (glycol) the cutout can be programmed between 8 - 36°F. The cutout should normally be set to 4°F below the Low Limit Water Temperature of the programmed Control Range (See Section 6).

To program the Leaving Water Temperature Cutout, key in the required setting and press the Enter key to store the value into memory and scroll to the next display.

Low Suction Pressure Cutout

SUCTION PRESSURE
CUTOUT = 44.0 PSIG

The Low Suction Pressure Cutout protects the evaporator from damage due to ice build up caused by operation at low refrigerant suction pressure.

After the compressor starting pump down cycle is completed (pump down to cutout or 30 seconds, whichever comes first), suction pressure is monitored as long as the compressor runs. For the first 270 seconds of running, suction pressure can be lower than the programmed cutout, but must be greater than:

\[
\text{Programmed Cutout} \times \frac{\text{Run Time} / 3 + 10}{100}
\]

Example: If the Programmed Cutout = 44 PSIG and Run-Time = 60 seconds

New Cutout = \(44 \times \frac{60 / 3 + 10}{100} = 13.2\) PSIG

This cutout value increases with time until, after 270 seconds, it equals the programmed cutout value. If suction pressure falls below the calculated cutout value before 270 seconds the system will be shut down.

After 270 seconds a transient timer system prevents short term fluctuations in suction pressure from causing shutdown as follows: If suction pressure drops below the cutout point, a 90 second transient timer begins, during which the suction pressure must be greater than:

\[
\text{Programmed Cutout} \times \frac{100 - \text{transient time left}}{100}
\]

Example: If Programmed Cutout = 44 PSIG and the timer has run 30 seconds so far

New Cutout = \(44 \times \frac{100 - 60}{100} = 17.6\) PSIG

Again, this cutout value increases with time until, after 90 seconds, it equals the programmed cutout value. If the suction pressure now rises to more than 5 PSI above the programmed cutout value, the 90 second timer will be reset. If the suction pressure does not rise to more than 5 PSI above the cutout, the timer will remain at zero. If the pressure then falls below the cutout again the system will shut down on low pressure fault.

If the Dip Switch on the microprocessor board is set for “Water Cooling” (see Section 3.7), the cutout is programmable between 44 - 70 PSIG for R22 models and 19 - 36 PSIG for R134a models. In this mode, settings of 44 PSIG for R22 and 19 PSIG for R134a are recommended. If the Switch is set for “Brine Cooling” (glycol) the cutout is programmable between 20 - 70 PSIG for R22 models, 4.5 - 36 PSIG for R134a models. In this mode, the cutout should be set to the saturated refrigerant pressure equivalent to 18°F below of the temperature of the chilled liquid. This programmable value is password protected.

To program the Suction Pressure Cutout, key in the required setting and press the Enter key to store the value into memory and scroll to the next display.

Lag Panel Start Point (YDAS only)

LAG PANEL
START POINT
40%

On rising demand for cooling, the Lag panel Start Point % is the load level of the lead compressor group (% FLA or % Slide Valve whichever is programmed, see Load Sharing Basis later in this section) at which the lag compressor group is allowed to start. A compressor group is a pair of compressors operating on one evaporator. The % FLA or % Slide Valve for a group is the sum of the values for the two compressors in the group.

The micro will accept values between 30 - 99%, for this control. Once the lag group of compressors has started, equalizing loading and unloading for the two
compressor groups will occur until each has reached 100% load, if demand allows. A setting of 40 - 60% is recommended for the Lag Panel Start Point % for most applications.

To program the Lag Panel Start Point %, key in the required setting and press the Enter key to store the value into memory and scroll to the next display.

NOTE: Care is needed not to set the Lag Panel Start Point % too high. If this occurs the lead group of compressors will attempt to chill the liquid flowing through their evaporator below the Low Limit Water Temperature (See Section 6) to compensate for the unchilled flow through the other evaporator. The mixed chilled liquid temperature will remain above the Control Range until the lag group of compressors start.

NOTE: Situations may occur in low ambient conditions, when control is based on %FLA, where current drawn at full load (100% slide valve) will be quite low. The actual operating current for a fully loaded compressor may be as low as 65 - 85% of the motor FLA at ambients below 95°F. If due to system conditions, the lead compressor does not reach the programmed %, even though the lead system is fully loaded, the lag compressor will start regardless of the programmed % after 5 minutes of operation whenever the lead compressor can not bring the LWT to within 2.0°F of the high end of the Control Range (CR). Once the lag compressor is started, equalized loading and unloading of the two compressor will occur. This assures that the chiller will fully load and maintain chilled liquid temperature.

Lag Panel Differential Off (YDAS Only)

On falling demand for cooling the Lag Panel Differential Off % is the overall load level for both groups of compressors below which equal load sharing will be stopped. This load level is calculated as the Lag Panel Start Point % minus the Lag Panel Differential Off %. Below this level of loading, the lead compressor group (SYS 1 and 2) maintains its loading while the lag compressor group (SYS 3 and 4) continues to unload, then, if necessary, shut down. The lead group load level will then be adjusted to maintain correct liquid temperature control.

The micro will accept a range of programmable values between 0 - 50% for this control, provided the Lag Panel Start Point % minus the Lag Panel Differential Off % is not less than 20%. A setting of 20 - 30% is recommended for the Lag Panel Differential Off % for most applications.

To program the Lag Panel Differential %, key in the required setting and press the Enter key to store the value into memory and scroll to the next display.

Lag Compressor Start Point

On rising demand for cooling, the Lag Compressor Start Point % is the load on the lead compressor (% FLA or % Slide Valve, whichever is programmed, see Load Sharing Basis later in this section) at which a lag compressor is allowed to start.

The micro will accept values between 40 - 99% for this control. Selecting a Lag Compressor Start Point % of 99% requires the lead compressor to be fully loaded before the lag compressor is allowed to start. This is desirable in order to minimize compressor cycling if very low or very variable loads are expected. Once the lag compressor has started, the loading of lead and lag compressors will be adjusted to share the cooling load evenly in order to maximize the efficiency of the chiller.

Selecting a Lag Compressor Start Point % of less than 99% increases the efficiency of chiller over a wider range of operation. At lower percentages, the lag compressor is started and loading is equalized between the lead and lag compressors at lower overall cooling loads. This makes more efficient use of the heat exchangers than running one compressor highly loaded with the other idle.

If a lower % is desired for efficiency purposes, a value of 60% is recommended. This will typically assure that the lag compressor will start before the lead is fully loaded.

To program the Lag Compressor Start Point %, key in the required setting and press the Enter key to store the value into memory and scroll to the next display.

NOTE: Situations may occur in low ambient conditions when control is based on %FLA, where current drawn at full load (100% slide valve) will be quite low. The actual operating current for a fully loaded compressor may be as low as 65 - 85% of the motor FLA at ambients below 95°F. If due to the system conditions the lead compressor group does not reach the programmed % even though the lead group is fully loaded, the lag group will start regardless of the programmed % after 10 minutes of operation whenever the lead group can not bring the LWT below the high end of the Control Range (CR). Once the lag group started, equalizing loading
and unloading of the two groups will occur. This assures that the chiller will fully load and maintain chilled liquid temperature.

NOTE: Viewing % FLA or % Slide Valve of each compressor can often show a significant difference in the value for each compressor even though load equalization should occur. This is usually due to small pressure and mechanical variations in each system causing each compressor to load or unload a different amount with a load or unload signal of a specific duration. Any differences will normally be readjusted in time, but regardless of any difference in % FLA or % Slide Valve, the micro will still assure that leaving chilled liquid temperature is properly controlled.

**Lag Compressor Differential Off**

| LAG COMPRESSOR DIFFERENTIAL OFF 30% |

On falling demand for cooling, the Lag Compressor Differential Off % decides the overall load level below which equal load sharing will be stopped. This load level is calculated as the Lag Compressor Start Point % minus the Lag Compressor Differential Off %. Below this level of loading, the lead compressor maintains its loading while the lag compressor continues to unload and, if necessary, shut down. The lead compressor loading will then be adjusted to maintain correct liquid temperature control.

The micro will accept a range of programmable values between 0 - 50% for this control, provided the Lag Compressor Start Point % minus the Lag Compressor Differential Off % is not less than 20%. This is calculated by the micro and an “Out of Range” message will be displayed if this condition is not satisfied.

Larger % differential values increase chiller efficiency by keeping the lag compressor operating on equalized loading over a wide load range, which makes more efficient the use for the chiller heat exchangers. Cycling of the lag compressor will also be minimized. For efficiency purposes a setting of 50% is recommended.

A small % differential will increase cycling and lower efficiency slightly but will minimize overall compressor running time.

To program the Lag Compressor Differential Off %, key in the required setting and press the Enter key to store the value into memory and scroll to the next display.

**Fan Control Discharge Pressure Setpoint**

| FAN CNTRL DSCH PRESS SET POINT = 230 PSIG |

When a compressor starts, the discharge pressure begins to rise. The Fan Control Discharge Pressure Setpoint is the discharge pressure at which the first stage of condenser fan operation begins. If compressor load increases and discharge pressure continues to rise, then at 20 PSI above the FAN CNTRL DSCH SETPOINT, the second stage of fan operation begins. If more cooling is required, then at 40 PSI above the setting the third and final stage of fan operation begins. The Fan Control Discharge Pressure Setpoint is password protected.

The micro will accept programmable values between 149 - 351 PSIG on R22 models and between 72 - 203 PSIG on R134a models for this set point. A low setting will give most efficient operation of the chiller by minimizing discharge pressure, however, too low a setting will cause oil to return and expansion valve problems which could cause damage to the compressor. The recommended point of fan starting for most applications is 230-270 PSIG for R22 models or 102-XXX PSIG for R134a models.

To program the Fan Control Discharge Pressure Setpoint, key in the required setting and press the Enter key to store the value into memory and scroll to the next display.

**Fan On/Off Differential Pressure**

| FAN ON / OFF PRESS DIFF = 50 PSIG |

On falling discharge pressure the Fan On/Off Pressure Differential determines the “Off” pressure at which each stage of fan operation will cycle off. The off pressure of each stage is calculated as the start pressure for that stage of fans (see above) minus the differential. When all fans have stopped, restart will not occur until discharge pressure again rises to the Fan Control Discharge Pressure Setpoint.

A Fan On/Off Pressure Differential setting of 50 - 70 PSI is recommended.

To program the Fan On/Off Pressure Differential, key in the required setting and press the Enter key to store the value into memory and scroll to the next display.

**Compressor Motor FLA Setting**

| SYSTEM # MOTOR CURR 183 AMPS = 100 % FLA |

To program the Compressor Motor FLA Setting, key in the required setting and press the Enter key to store the value into memory and scroll to the next display.
In order to display compressor current draw in amps the micro needs to be programmed with the compressor motor FLA at 100% load at design conditions for each compressor on the chiller. This also allows the micro to calculate approximate compressor slide valve position which is important when controlling load sharing between compressors based on % Slide Valve instead of % FLA. The System # Motor Current at 100% FLA value is password protected.

The FLA value at the specified conditions varies with compressor model and supply voltage. These values are given for each system on each chiller model for each supply voltage in the tables in Section 8.4.

To program the System # Motor Current at 100% FLA, begin with System 1 (the # on the sample display will read 1) and key in the value given in the table, then press the Enter key to store the value into memory and scroll the display on to the next system. Now key in the value given in the table for System 2, then repeat for System 3 and System 4 where appropriate. After all systems have been programmed the display will scroll to the next programmable control setting.

Liquid Injection Temperature Limit

LIQUID INJECTION TEMP LIMIT = 180.0°F

The Liquid Injection Temperature Limit setting is the compressor discharge gas temperature above which the liquid injection solenoid is energized to allow liquid injection into the compressor to limit discharge gas temperature and hence oil system temperature. This is used to maintain the oil within the correct temperature range to provide proper lubrication and cooling of the compressor mechanical parts.

Once liquid injection is activated, discharge temperature must fall 20°F below the temperature limit before injection is deactivated. A setting of 180°F is recommended for this control for most applications. This programmable value is password protected.

To program the Liquid Injection Temperature Limit, key in the required setting and press the Enter key to store the value into memory and scroll to the next display.

Condensing Temperature Full Load Setting

SYSTEM # COND TEMP 119.0°F = 100% LOAD

If load equalization utilizing % Slide Valve is selected (See Load Sharing Basis later in this section), the micro must be programmed with the design condensing temperature (discharge pressure converted to temperature or CTP) at 100% load at design conditions for each system on the chiller. This also allows the micro to calculate approximate compressor slide valve position which is important when controlling load sharing between compressors. The System # Condensing Temperature at 100% Load value is password protected.

The allowable range of Condensing Temperature at 100% Load is 100 - 140°F with the default set for 125°F. The value which must be programmed varies with chiller and compressor model. Values for each system on each chiller model are given in the tables in Section 8.5.

To program the System # Condensing Temperature at 100% Load, begin with system 1 (the # on the sample display will read 1) and key in the value given in the table, then press the Enter key to store the value into memory and scroll the display on to the next system. Now key in the value given in the table for System 2, then repeat for System 3 and System 4 where appropriate. After all systems have been programmed, the display will scroll to the next programmable control setting.

Communications Mode

COMMUNICATIONS MODE 1 = ISN, 2 = RCC, 2

If an ISN system or an optional Remote Control Center (RCC) is connected to the chiller, the Communications Mode value is used to select the correct type of communication protocol required.

To program the Communications Mode, key in the number corresponding to the connected device (1=ISN, 2=RCC), then press the Enter key to store the value into memory and scroll to the next display.

Load Sharing Basis

LOAD SHARE BASED ON? 1 = SV % , 2 = % FLA 2

Equalized loading / unloading of compressors to give the maximum chiller efficiency is based on the calculated loading of each running compressor. This calculation can in turn be based on either the estimated compressor slide valve position, or the % of full load current being drawn by the compressor motor. The Load Share Based On ? value determines which basis is used by the micro for its calculations.

The % FLA method is suitable for most applications and is the default setting for this control. Where significant running in low ambient temperature conditions is expected, however, more accurate load equalization will be achieved using the % Slide Valve method which includes discharge pressure in the calculation.
To program the Load Share Based On ?, key in the number corresponding to the connected device (1=% Slide Valve, 2=% FLA), then press the Enter key to store the value into memory and scroll to the next display.

NOTE: It is recommended that YDAS chillers are programmed for % Slide Valve control as this will provide better balancing between compressor groups.

**Economizer Valve On & Off Points**

<table>
<thead>
<tr>
<th>Economizer Valve On Point</th>
<th>50%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economizer Valve Off</td>
<td>40%</td>
</tr>
</tbody>
</table>

Economizer circuits in each refrigerant system are used to increase chiller performance and efficiency and also to provide compressor motor cooling at high loads. The economizer system must be shut off at low compressor loads, however, to prevent excessive liquid feed to the compressor. This is done using a solenoid valve in the economizer circuit refrigerant supply, based on programmable values for opening (On) and closing (Off) the valve.

If compressor start points are controlled by % FLA (See Load Sharing Basis value earlier in this section) the recommended On Point is 50% and the recommended Off Point is 40%. The Economizer Valve On Point and Off Point values are password protected.

To program the Economizer Valve On Point, key in the required setting and press the Enter key. This will store the value into memory and loop back to the beginning of the programmable values display sequence.

3 COMPRESSOR LEAD SYSTEM SELECTION ONLY

| Lead System Number = System #1 |

The LEAD SYSTEM selection allows the operator to select any one of the three compressors as the lead when in MANUAL Lead/Lag Mode (See Section 1.12 and 3.4 (Dip Switch #7).

To program the LEAD SYSTEM NUMBER, key in the desired number (1, 2, or 3) and press the ENTER key. The new value will be entered into memory and the display will advance to the next programmable limit.

NOTE: After selecting the lead compressor, the micro will determine the starting sequence of the remaining two compressors. The sequence possibilities are shown below:

<table>
<thead>
<tr>
<th>Lead Compressor Select</th>
<th>2nd Compressor</th>
<th>3rd Compressor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

These sequences will be followed as long as anti-re-cyle timers and safeties do not prevent it.

8.3 PROGRAMMING “DEFAULT” VALUES

Programmable values may be individually programmed at start-up or any time thereafter. For ease of programming, once the type of refrigerant is programmed in under the Program key, a “defaults password” may be programmed in to automatically program default values into memory. This will preset all programmable values under the Program key to values that will allow operation of the chiller under most operating conditions. This allows quick start-up programming for typical chilled water applications.

To program the default values into memory, first press the PROGRAM key followed by the ENTER key to program refrigerant type. Press the Program key again, key in the number “6140”, then press Enter. As the code is being keyed, in the digits are not displayed but are shown as “***” as shown:

**Program Mode**

```
***
```

When the Enter key is pressed, the following message will appear:

**Default Setpoints?**

```
1 = YES, 0 = NO, 1
```

Key in a “1” if default setpoints are required, or a “0” for individually programmed values, then press Enter to store the selection into memory.

If individual programming is selected, the display will now return to the Status display. If default setpoints have been selected, the display will momentarily display the message shown below before returning to the Status display:

**Program Options Set to Default Values**

NOTE: It is often easier to select Default Setpoints and then reprogram a few that require changing rather than programming each individual value from scratch.
A List of the default values entered into memory, if this program option is selected, is shown below:

<table>
<thead>
<tr>
<th>PROGRAMMABLE VALUE</th>
<th>6140 DEFAULT SETTING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>R22</td>
</tr>
<tr>
<td>Discharge Pressure Cutout</td>
<td>399 PSIG</td>
</tr>
<tr>
<td></td>
<td>R134a</td>
</tr>
<tr>
<td>Low Ambient Cutout</td>
<td>25°F</td>
</tr>
<tr>
<td>Low Ambient Cutout</td>
<td>0°F</td>
</tr>
<tr>
<td>High Ambient Temp. Cutout</td>
<td>100°F</td>
</tr>
<tr>
<td>Discharge Pressure Unload</td>
<td>375 PSIG</td>
</tr>
<tr>
<td></td>
<td>R134a</td>
</tr>
<tr>
<td>Average Current Unload</td>
<td>105%</td>
</tr>
<tr>
<td>Anti-Recycle Timer</td>
<td>600 sec.</td>
</tr>
<tr>
<td>Leaving Chilled Liquid Cutout</td>
<td>36°F</td>
</tr>
<tr>
<td>Suction Pressure Cutout</td>
<td>44 PSIG</td>
</tr>
<tr>
<td></td>
<td>R134a</td>
</tr>
<tr>
<td>Lag Panel Start Pt (YDAS Only)</td>
<td>50%</td>
</tr>
<tr>
<td>Lag Panel Diff. Off (YDAS Only)</td>
<td>20%</td>
</tr>
<tr>
<td>Lag Compressor Start Point</td>
<td>70%</td>
</tr>
<tr>
<td>Lag Compressor Differential Off</td>
<td>50%</td>
</tr>
<tr>
<td>Fan Control Dischg. Press. Setpt.</td>
<td>230 PSIG</td>
</tr>
<tr>
<td></td>
<td>R134a</td>
</tr>
<tr>
<td>Fan On / Off Differential</td>
<td>50 PSIG</td>
</tr>
<tr>
<td></td>
<td>R134a</td>
</tr>
<tr>
<td>System Motor Current</td>
<td>–</td>
</tr>
<tr>
<td>Liquid Injection Temp.</td>
<td>108°F</td>
</tr>
<tr>
<td>System Full Load Cond. Temp.</td>
<td>–</td>
</tr>
<tr>
<td>Communications Mode</td>
<td>2</td>
</tr>
<tr>
<td>Load Share Based On ?</td>
<td>2</td>
</tr>
<tr>
<td>Economizer Valve On Point</td>
<td>50%</td>
</tr>
<tr>
<td>Economizer Valve Off Point</td>
<td>40%</td>
</tr>
</tbody>
</table>
### 8.4 COMPRESSOR MOTOR FULL LOAD AMPS (FLA) DATA

#### Compressor Motor FLA – 60 Hz Models

<table>
<thead>
<tr>
<th>MODEL</th>
<th>ENG. DATA</th>
<th>460 VOLTS (-46)</th>
<th>575 VOLTS (-58)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SYS 1 FLA</td>
<td>SYS 2 FLA</td>
</tr>
<tr>
<td>310</td>
<td>6H6H6RNAA</td>
<td>198 198 198</td>
<td>158 158 158</td>
</tr>
<tr>
<td>340</td>
<td>6H6H6RNAA</td>
<td>250 250 250</td>
<td>199 137 199</td>
</tr>
<tr>
<td>360</td>
<td>6H6H6RNAA</td>
<td>250 250 250</td>
<td>199 137 199</td>
</tr>
<tr>
<td>380</td>
<td>6H6H6RNAA</td>
<td>265 265 265</td>
<td>211 211 211</td>
</tr>
</tbody>
</table>

#### Compressor Motor FLA – 50 Hz / R22 Models

<table>
<thead>
<tr>
<th>MODEL</th>
<th>ENGINEERING DATA</th>
<th>380 / 400 VOLTS (-50)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SYS 1 FLA</td>
</tr>
<tr>
<td>570</td>
<td>H6H6KL7</td>
<td>251 251  —  —  —  —</td>
</tr>
<tr>
<td>620</td>
<td>P7H6KN7</td>
<td>313 313  —  —  —  —</td>
</tr>
<tr>
<td>660</td>
<td>P7P7KN7</td>
<td>313 313  —  —  —  —</td>
</tr>
<tr>
<td>690</td>
<td>S7S7KN7</td>
<td>313 313  —  —  —  —</td>
</tr>
<tr>
<td>765</td>
<td>F5F5F5RL7</td>
<td>188 188 188  —  —  —  —</td>
</tr>
<tr>
<td>855</td>
<td>H6H6H6RN7</td>
<td>251 251 251  —  —  —  —</td>
</tr>
<tr>
<td>950</td>
<td>P7P7H6RN7</td>
<td>313 313 313  —  —  —  —</td>
</tr>
<tr>
<td>1035</td>
<td>S7S7S7RN7</td>
<td>313 313 313  —  —  —  —</td>
</tr>
</tbody>
</table>

#### Compressor Motor FLA – 50 Hz / R134a Models

<table>
<thead>
<tr>
<th>MODEL</th>
<th>ENGINEERING DATA</th>
<th>380 / 400 VOLTS (-50)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SYS 1 FLA</td>
</tr>
<tr>
<td>395</td>
<td>H2H2HL7</td>
<td>136 136  —  —  —  —</td>
</tr>
<tr>
<td>445</td>
<td>P4H2KL7</td>
<td>162 162  —  —  —  —</td>
</tr>
<tr>
<td>485</td>
<td>P4P4KL7</td>
<td>162 162  —  —  —  —</td>
</tr>
<tr>
<td>505</td>
<td>S5S5KL7</td>
<td>188 188 188  —  —  —  —</td>
</tr>
<tr>
<td>592</td>
<td>H2H2H2PL7</td>
<td>136 136 136  —  —  —  —</td>
</tr>
<tr>
<td>682</td>
<td>P4P4H2PL7</td>
<td>162 162 162  —  —  —  —</td>
</tr>
<tr>
<td>727</td>
<td>S5S5S5PL7</td>
<td>188 188 188  —  —  —  —</td>
</tr>
<tr>
<td>790</td>
<td>H2H2HL7</td>
<td>136 136 136  —  —  —  —</td>
</tr>
<tr>
<td>890</td>
<td>P4H2KL7</td>
<td>162 162 162  —  —  —  —</td>
</tr>
<tr>
<td>970</td>
<td>P4P4KL7</td>
<td>162 162 162  —  —  —  —</td>
</tr>
<tr>
<td>1010</td>
<td>S5S5KL7</td>
<td>188 188 188  —  —  —  —</td>
</tr>
</tbody>
</table>
### 8.5 SYSTEM DESIGN CONDENSING TEMPERATURE (CTP) DATA

#### Design Condensing Temperature – 60 Hz Models

<table>
<thead>
<tr>
<th>MODEL ENGINEERING DATA</th>
<th>ALL VOLTAGES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SYS 1 CTP</td>
</tr>
<tr>
<td>140 YCAS 6A2A2KN6A</td>
<td>116.1°F</td>
</tr>
<tr>
<td>160 6M4M4KN6A</td>
<td>118.3°F</td>
</tr>
<tr>
<td>170 6F5M5NN6A</td>
<td>121.3°F</td>
</tr>
<tr>
<td>180 6F55NN6A</td>
<td>121.4°F</td>
</tr>
<tr>
<td>190 6H65NN6A</td>
<td>124.3°F</td>
</tr>
<tr>
<td>216 6P7H6NN6A</td>
<td>128.8°F</td>
</tr>
<tr>
<td>236 6P7P7NN6A</td>
<td>128.8°F</td>
</tr>
<tr>
<td>246 6S7S7NN6A</td>
<td>130.1°F</td>
</tr>
<tr>
<td>216x 10H5H5NN6A</td>
<td>115.4°F</td>
</tr>
<tr>
<td>236x 10P6H6NN6A</td>
<td>118.6°F</td>
</tr>
<tr>
<td>266x 10S7S7NN6A</td>
<td>119.6°F</td>
</tr>
</tbody>
</table>

#### Design Condensing Temperature – 50 Hz / R22 Models

<table>
<thead>
<tr>
<th>MODEL ENGINEERING DATA</th>
<th>ALL VOLTAGES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SYS 1 CTP</td>
</tr>
<tr>
<td>395 H2H2HL7</td>
<td>114.0°F</td>
</tr>
<tr>
<td>445 P4H2KL7</td>
<td>117.0°F</td>
</tr>
<tr>
<td>485 P4P4KL7</td>
<td>117.0°F</td>
</tr>
<tr>
<td>505 S5S5KL7</td>
<td>118.0°F</td>
</tr>
<tr>
<td>592 H2H2H2PL7</td>
<td>114.0°F</td>
</tr>
<tr>
<td>682 P4P4H2PL7</td>
<td>117.0°F</td>
</tr>
<tr>
<td>727 P4P4P4PL7</td>
<td>117.0°F</td>
</tr>
<tr>
<td>757 S5S5S5PL7</td>
<td>118.0°F</td>
</tr>
<tr>
<td>790 H2H2HL7</td>
<td>114.0°F</td>
</tr>
<tr>
<td>890 P4H2KL7</td>
<td>117.0°F</td>
</tr>
<tr>
<td>970 P4P4KL7</td>
<td>117.0°F</td>
</tr>
<tr>
<td>1010 S5S5KL7</td>
<td>118.0°F</td>
</tr>
</tbody>
</table>

#### Design Condensing Temperature – 60 Hz Models

<table>
<thead>
<tr>
<th>MODEL ENGINEERING DATA</th>
<th>ALL VOLTAGES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SYS 1 CTP</td>
</tr>
<tr>
<td>310 6H66RNAA</td>
<td>116.1</td>
</tr>
<tr>
<td>340 6H66RNAA</td>
<td>121.3</td>
</tr>
<tr>
<td>360 6H66RNAA</td>
<td>121.1</td>
</tr>
<tr>
<td>380 6H66RNAA</td>
<td>128.8</td>
</tr>
</tbody>
</table>

#### Design Condensing Temperature – 50 Hz / R134a Models

<table>
<thead>
<tr>
<th>MODEL ENGINEERING DATA</th>
<th>ALL VOLTAGES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SYS 1 CTP</td>
</tr>
<tr>
<td>395 H2H2HL7</td>
<td>114.0°F</td>
</tr>
<tr>
<td>445 P4H2KL7</td>
<td>117.0°F</td>
</tr>
<tr>
<td>485 P4P4KL7</td>
<td>117.0°F</td>
</tr>
<tr>
<td>505 S5S5KL7</td>
<td>118.0°F</td>
</tr>
<tr>
<td>592 H2H2H2PL7</td>
<td>114.0°F</td>
</tr>
<tr>
<td>682 P4P4H2PL7</td>
<td>117.0°F</td>
</tr>
<tr>
<td>727 P4P4P4PL7</td>
<td>117.0°F</td>
</tr>
<tr>
<td>757 S5S5S5PL7</td>
<td>118.0°F</td>
</tr>
<tr>
<td>790 H2H2HL7</td>
<td>114.0°F</td>
</tr>
<tr>
<td>890 P4H2KL7</td>
<td>117.0°F</td>
</tr>
<tr>
<td>970 P4P4KL7</td>
<td>117.0°F</td>
</tr>
<tr>
<td>1010 S5S5KL7</td>
<td>118.0°F</td>
</tr>
</tbody>
</table>
The chiller is equipped with 12 condenser fans; 4 per system. Fan control from discharge pressure is standard. Fan start/stop pressures are programmable in the PROGRAM Mode (Section 8) under FAN CONTROL DISCHARGE PRESSURE SETPOINT and FAN ON/OFF PRESS DIFF displays. Ambient temperature has no effect on fan cycling.

When discharge pressure reaches the programmed setpoint, the first pair of fans on a respective system starts. After the first pair of fans are brought on in the reverse direction, discharge pressure must rise an additional 20 PSIG above the setpoint before a second pair of fans will be brought on in the forward direction. When this pair of fans starts, the reversing fans will turn off. If discharge pressure rises 40 PSIG above the setpoint, a second pair of fans will start in the forward direction. This is the same pair of fans that originally ran in the reverse direction. The first pair of forward fans will also continue to run.

The point at which each pair of fans cycles off is also programmable. This is accomplished in the PROGRAM Mode when the FAN ON/OFF PRESS DIFF display appears. The programmable “differential” establishes the pressure at which each pair of fans turn off. The “differential” is the amount the discharge pressure must drop below the pressure at which the fan turned on.

Locations of the fans and a table showing the operation is shown in Fig. XX.

<table>
<thead>
<tr>
<th>FAN</th>
<th>FAN RELAY</th>
<th>PRESSURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 &amp; 2 REV (SYS 1) OR 5 &amp; 6 REV (SYS 2) OR 9 &amp; 10 REV (SYS 3)</td>
<td>9M &amp; 10M SETPOINT</td>
<td>SETPOINT - DIFF.</td>
</tr>
<tr>
<td>3 &amp; 4 FOR (SYS 1) OR 7 &amp; 8 FOR (SYS 2) OR 11 &amp; 12 FOR (SYS 3)</td>
<td>6M &amp; 8M SETPOINT + 20 PSIG</td>
<td>(SETPOINT + 20 PSIG) - DIFF.</td>
</tr>
<tr>
<td>1 &amp; 2 FOR (SYS 1) OR 5 &amp; 6 FOR (SYS 2) OR 9 &amp; 10 FOR (SYS 3)</td>
<td>5M &amp; 7M SETPOINT + 40 PSIG</td>
<td>(SETPOINT + 40 PSIG) - DIFF.</td>
</tr>
</tbody>
</table>

FIG. XX – YCAS 310-380 FAN LOCATION/OPERATION
CHECKING THE SYSTEM 24 HOURS PRIOR TO INITIAL START (No Power)

Unit Checks

1. Inspect the unit for shipping or installation damage.
2. Assure that all piping has been completed.
3. Check that the unit is properly charged and that there are no piping leaks.
4. Open each compressor suction service valve, discharge service valve, economizer service valve, liquid line stop valve, and oil line ball valves.
5. The compressor oil level should be maintained so that an oil level is visible in either of the two oil separator sight glasses. In other words, oil level should always be maintained, running or not, above the bottom of the lower sight glass and below the top of the upper sight glass.

NOTE: In actual operation, due to splashing, an oil level may be seen in both sight glasses. Run the compressor for a few minutes, shut the system down, and assure there is an oil level showing in the bottom or top sight glass with the compressor off.

If it is necessary to add oil, connect a YORK oil pump to the charging valve on the oil separator, but do not tighten the flare nut on the delivery tubing. With the bottom (suction end) of the pump submerged in oil to avoid entrance of air, operate the pump until oil drips from the flare nut joint, allowing the air to be expelled, and tighten the flare nut. Open the compressor oil charging valve and pump in oil until it reaches the proper level as described above.

6. Assure water pumps are on. Check and adjust water pump flow rate and pressure drop across the cooler.

NOTE: Excessive flow may cause catastrophic damage to the evaporator

7. Check the control panel to assure it is free of foreign material (wires, metal chips, etc.).
8. Visually inspect wiring (power and control). Wiring MUST meet NEC and local codes. See Fig. 20.
9. Check tightness of power wiring inside the power panel on both sides of the motor contactors and inside the motor terminal boxes.
10. Check for proper size fuses in main and control circuits.
11. Verify that field wiring matches the 3-phase power requirements of the compressor. See chiller nameplate (Page 4).
12. Assure 115VAC Control Power to TB1 has 30A minimum capacity. See Fig. 20.
13. Be certain all water temp sensors are inserted completely in their respective wells and are coated with heat conductive compound.
14. Assure that evaporator TXV bulbs are strapped onto the suction lines at 4 or 8 o’clock positions.
15. Assure that 5 ton TXV bulbs are inserted fully into the wells in the compressors and that the bulbs are coated with heat conductive compound.
16. Assure that the 15 ton economizer TXV bulbs are strapped onto the compressor economizer supply lines at 4 or 8 o’clock positions.
PANEL CHECKS
(Power On – Both System Switches “OFF”)

1. Apply 3 phase power and verify its value (See Fig. 20).

2. Apply 115VAC and verify its value on the terminal block in the lower left of the Power Panel. Make the measurement between terminals 5 and 2 of TB1 (See Fig. 20.). The voltage should be 115VAC +/- 10%.

3. Assure the heaters on each compressor are on. Allow the compressor heaters to remain on a minimum of 24 hours before startup. This is important to assure that no refrigerant is in the compressor oil at start-up!

4. Program the dip switches on the microprocessor board for the desired operating requirements. See Page 80. OPEN = Left side of switch pushed down. CLOSED = Right side of switch pushed down.

<table>
<thead>
<tr>
<th>SW#</th>
<th>OPEN</th>
<th>CLOSED</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Water</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Std Amb</td>
<td>Low Amb</td>
</tr>
<tr>
<td>3</td>
<td>Local</td>
<td>Remote</td>
</tr>
<tr>
<td>4</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>5</td>
<td>English</td>
<td>SI (Metric)</td>
</tr>
<tr>
<td>6</td>
<td>ACL Start</td>
<td>W-D Start</td>
</tr>
<tr>
<td>7</td>
<td>M Lead/Lag</td>
<td>A Lead/Lag</td>
</tr>
<tr>
<td>8</td>
<td>R- 1 34a</td>
<td>R-22</td>
</tr>
</tbody>
</table>

Verify the selections by pressing the OPTIONS Key on the control panel. Check them off.

CAUTION: Damage to the chiller could result if switches are improperly programmed.

5. Program the required twenty-two operating values into the micro for cut-outs, safeties, etc. and record them in the chart below. See Page 88.

If Default Values are desired for programming convenience, press the PROGRAM key, 6140, and ENTER. This loads default values. Record these values in the chart below.

PROGRAMMED VALUES

<table>
<thead>
<tr>
<th>Refrigerant Type =</th>
<th>Dischg Press Cut-out =</th>
<th>Low Amb Cut-out =</th>
<th>High Amb Cut-out =</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PSIG (kPa)</td>
<td>°F (°C)</td>
<td>°F (°C)</td>
</tr>
<tr>
<td>Avg Current Unld =</td>
<td>%FLA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anti Recycle Time =</td>
<td>Secs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LWT Cut-out =</td>
<td>°F (°C)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suction Press Cut-out =</td>
<td>PSIG (kPa)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lag Cmpr Start Point =</td>
<td>%FLA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lag Compr Diff Off =</td>
<td>%FLA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fan Dsch Press Setpt =</td>
<td>PSIG (kPa)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fan On/Off Press Diff =</td>
<td>PSIG (kPa)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sys 1 Curr = 100 %FLA =</td>
<td>AMPS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sys 2 Curr = 100 %FLA =</td>
<td>AMPS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sys 3 Curr = 100 % FLA =</td>
<td>AMPS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sys 4 Curr = 100 % FLA =</td>
<td>AMPS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liq Inj Temp Limit =</td>
<td>°F (°C)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sys 1 Cond Tmp =</td>
<td>°F (°C) = 100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sys 2 Cond Tmp =</td>
<td>°F (°C) = 100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sys 3 Cond Tmp =</td>
<td>°F (°C) = 100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sys 4 Cond Tmp =</td>
<td>°F (°C) = 100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Com Mode = ISN _________ or RCC __________</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Load Share = SV% ________ or %FLA __________</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Econ Valve On Point =</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Econ Valve Off Point =</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6. Program the Chilled Liquid Temp/Range and record:

\[ CR = ________ to ________ °F (°C) \]

Target = ________ °F (°C)

Keep in mind that the Target temperature displayed by the micro should equal the desired leaving water temperature.

7. Assure that the CLK jumper J18 on the Microprocessor Board is in the ON position (Top 2 pins).

8. Set the Time and Date.

9. Program the Daily Schedule start and stop times.
INITIAL START-UP

After the control panel has been programmed and the compressor heater has been on for 24 hours prior to start-up, the chiller may be placed into operation.

1. Place the System Switches on the Microprocessor Board to the ON position.

2. The compressor will start and a flow of refrigerant will be noted in the sight glass. After several minutes of operation, the bubbles in the sight glass will disappear and there will be a solid column of liquid when the TXV stabilizes. After the water temperature stabilizes at desired operating conditions, the oil should be clear.

3. Allow the compressor to run a short time, being ready to stop it immediately if any unusual noise or adverse conditions develop. Immediately at start-up, the compressor will make sounds different from its normal high pitched sound. This is due to the compressor coming up to speed and lubrication changing from liquid refrigerant to oil. This should be of no concern and lasts for only a short time.

4. Check the system operating parameters. Do this by selecting various displays such as pressures and temperatures. Compare these to test gauge readings.

CHECKING SUPERHEAT AND SUBCOOLING

The subcooling should always be checked when charging the system with refrigerant and/or before setting the superheat.

When the refrigerant charge is correct, there will be no bubbles in the liquid sight glass with the system operating under full load conditions, and there will be 10 - 15°F subcooled liquid leaving the condenser.

An overcharged system should be guarded against. Evidence of overcharge are as follows:

a. If a system is overcharged, the discharge pressure will be higher than normal. (Normal discharge/condensing pressure can be found in the refrigerant temperature/pressure chart; use entering air temperature +30°F for normal condensing temperature.

b. The temperature of the liquid refrigerant out of the condenser should be not be more than 15°F less than the condensing temperature (The temperature corresponding to the condensing pressure from the refrigerant temperature/pressure chart).

The subcooling temperature of each system should be calculated by recording the temperature of the liquid line at the outlet of the condenser and subtracting it from the recorded liquid line pressure at the liquid stop valve, converted to temperature from the temperature/pressure chart.

Example:

- Liquid line pressure = 202 PSIG converted to 102°F
- minus liquid line temp. - 87°F
- SUBCOOLING = 15°F

The subcooling should be adjusted to 10 - 15°F.

1. Record the liquid line pressure and its corresponding temperature, liquid line temperature and subcooling below:

<table>
<thead>
<tr>
<th></th>
<th>SYS1</th>
<th>SYS2</th>
<th>SYS3</th>
<th>SYS4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liq Line Press</td>
<td>_____</td>
<td>_____</td>
<td>_____</td>
<td>_____</td>
</tr>
<tr>
<td>Temp</td>
<td>_____</td>
<td>_____</td>
<td>_____</td>
<td>_____</td>
</tr>
<tr>
<td>Liq Line Temp</td>
<td>_____</td>
<td>_____</td>
<td>_____</td>
<td>_____</td>
</tr>
<tr>
<td>Subcooling</td>
<td>_____</td>
<td>_____</td>
<td>_____</td>
<td>_____</td>
</tr>
</tbody>
</table>

After the subcooling is set, the suction superheat should be checked. The superheat should be checked only after steady state operation of the chiller has been established, the leaving water temperature has been pulled down to the required leaving water temperature, and the unit is running in a fully loaded condition. Correct superheat setting for a system is 10 - 15°F.

The superheat is calculated as the difference between the actual temperature of the returned refrigerant gas in the suction line entering the compressor and the temperature corresponding to the suction pressure as shown in a standard pressure/temperature chart.

Example:

- Suction Temp = 46°F
- minus Suction Press 60 PSIG converted to Temp - 34°F
- 12°F

The suction temperature should be taken 6" before the compressor suction service valve, and the suction pressure is taken at the compressor suction service valve.

Normally, the thermal expansion valve need not be adjusted in the field. If, however, adjustment needs to be made, the expansion valve adjusting screw should be turned not more than one turn at a time, allowing sufficient time (approximately 15 minutes) between adjustments for the system and the thermal expansion valve to respond and settle out. Assure that superheat is set at 10 - 15°F.

2. Record the suction temperature, suction pressure, suction pressure converted to temperature, and superheat of each system below:

<table>
<thead>
<tr>
<th></th>
<th>SYS1</th>
<th>SYS2</th>
<th>SYS3</th>
<th>SYS4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suction Temp</td>
<td>_____</td>
<td>_____</td>
<td>_____</td>
<td>_____</td>
</tr>
<tr>
<td>Suction Press</td>
<td>_____</td>
<td>_____</td>
<td>_____</td>
<td>_____</td>
</tr>
<tr>
<td>Temp</td>
<td>_____</td>
<td>_____</td>
<td>_____</td>
<td>_____</td>
</tr>
<tr>
<td>Superheat</td>
<td>_____</td>
<td>_____</td>
<td>_____</td>
<td>_____</td>
</tr>
</tbody>
</table>
CHECKING ECONOMIZER SUPERHEAT (15 TON TXV)

The economizer superheat should be checked to assure proper economizer operation and motor cooling. Correct superheat setting is approx. 10 - 15°F.

The superheat is calculated as the difference between the pressure at the Economizer Service Valve on the compressor converted to the corresponding temperature in a standard pressure/temperature chart and temperature of the gas at the bulb on the entering piping to the motor housing.

Example:

Motor Gas Temp = 90°F
minus Economizer Press
139 PSIG converted
to Temp = 78°F
12°F

Normally, the thermal expansion valve need not be adjusted in the field. If however, adjustment needs to be made, the expansion valve adjusting screw should be turned not more than one turn at a time, allowing sufficient time (approximately 15 minutes) between adjustments for the system and the thermal expansion valve to respond and settle out. Assure that superheat is set between 10 -15°F.

1. Record the motor gas temperature, economizer pressure, economizer pressure converted to temperature, and economizer superheat below:

<table>
<thead>
<tr>
<th>SYS 1</th>
<th>SYS 2</th>
<th>SYS 3</th>
<th>SYS 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor Gas Temp =</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Economizer Press =</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Economizer Temp =</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Superheat =</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTE: This superheat should only be checked in an ambient above 90°F. Otherwise, mid-range adjustment (factory setting) is acceptable.

5 TON TXV SUPERHEAT SETTING

The 5 Ton TXV Superheat does not require checking. It should typically operate at 10 - 15°F. Since it is difficult to check, the factory set “mid-range adjustment” is acceptable.

LEAK CHECKING

1. Leak check compressors, fittings, and piping to assure no leaks.

If the unit is functioning satisfactorily during the initial operating period, no safeties trip and the compressors load and unload to control water temperature, the chiller is ready to be placed into operation.
## TROUBLESHOOTING

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>CAUSE</th>
<th>SOLUTION</th>
</tr>
</thead>
</table>
| No display on panel. Unit will not operate. | 1. No 115VAC to 2T.  
2. No 24VAC to Power Supply Supply Board.  
3. 2T defective, no 24VAC output.  
4. No + 12V output (J2) from Power Supply Board. | 1. Check wiring and fuses (IFU and 2 FU). Check emergency stop contacts 5 to 1 of TB1 Terminal Block.  
2. Check wiring 2T to Power Supply Board.  
3. Replace 2T  
4. Replace Power Supply Board or load on the board.  
**NOTE: Contact YORK Service before Replacing circuit Boards!** |
| “NO RUN PERMISSIVE” | 1. No chilled liquid flow.  
2. Flow switch improperly installed.  
3. Defective flow switch.  
4. Remote cycling device open.  
5. “System” switch in the OFF position. | 1. Check chilled liquid flow.  
2. Check that the flow switch is installed according to manufacturer’s instructions.  
3. Replace flow switch.  
4. Check cycling devices connected to terminals 13 & 14 of the TB3 Terminal Block.  
5. Place switches to the ON position. |
<p>| “LOW OIL DIFFERENTIAL” FAULT | 1. Faulty oil or suction pressure transducer or wiring | 1. Check / replace transducers or repair wiring. |</p>
<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>CAUSE</th>
<th>SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>“MOTOR CURRENT” FAULT</strong></td>
<td><strong>CONTACTOR DOES NOT ENERGIZE</strong></td>
<td></td>
</tr>
<tr>
<td>Motor contactor may not energize.</td>
<td>1. External high pressure switch tripped.</td>
<td>1. Check mechanical high pressure cut out, fan</td>
</tr>
<tr>
<td></td>
<td></td>
<td>operation, and discharge stored in memory.</td>
</tr>
<tr>
<td></td>
<td>2. External motor protector tripped.</td>
<td>2. Check for defective motor protector, wiring,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>and motor problems. Assure the motor protector</td>
</tr>
<tr>
<td></td>
<td></td>
<td>is not tripped due to a tripped mechanical high</td>
</tr>
<tr>
<td></td>
<td></td>
<td>pressure switch.</td>
</tr>
<tr>
<td><strong>CONTACTOR ENERGIZES</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Improper system high high voltage.</td>
<td>1. Check system high voltage supply.</td>
<td></td>
</tr>
<tr>
<td>2. Defective contactor contacts or</td>
<td>2. Check contactor and contact.</td>
<td></td>
</tr>
<tr>
<td>contactor.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Faulty high voltage wiring.</td>
<td>3. Check wiring.</td>
<td></td>
</tr>
<tr>
<td>4. High motor current stored in</td>
<td>4. Loose J10 (SYS 1) or J11 (SYS 2) calibration</td>
<td></td>
</tr>
<tr>
<td>memory.</td>
<td></td>
<td>resistors on Power Board.</td>
</tr>
<tr>
<td>PROBLEM</td>
<td>CAUSE</td>
<td>SOLUTION</td>
</tr>
<tr>
<td>-------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>&quot;LOW SUCTION PRESSURE&quot;</strong> &lt;br&gt;FAULT</td>
<td>1. Improper suction pressure cut-out adjustments. &lt;br&gt;2. Low refrigerant charge. &lt;br&gt;3. Fouled filter dryer. &lt;br&gt;4. EEV defective &lt;br&gt;5. Reduced flow of chilled liquid through the cooler. &lt;br&gt;6. Defective suction pressure transducer or faulty wiring.</td>
<td>1. Adjust per recommended settings. &lt;br&gt;2. Repair leak if necessary and add refrigerant. &lt;br&gt;3. Change dryer core. &lt;br&gt;4. Replace EEV. &lt;br&gt;5. Check GPM (See OPERATION LIMITATIONS) Check operation of pump, clean pump strainer, purge chilled liquid system of air. &lt;br&gt;6. Replace transducer or repair wiring.</td>
</tr>
<tr>
<td><strong>&quot;HIGH DISCHARGE PRESSURE&quot;</strong> FAULT</td>
<td>1. Condenser fans not operating or operating backwards. &lt;br&gt;2. Too much refrigerant. &lt;br&gt;3. Air in refrigerant system. &lt;br&gt;4. Defective discharge pressure transducer. &lt;br&gt;5. Assure outdoor ambient sensor is reading correctly.</td>
<td>1. Check fan motor, fuses, and contactors. Assure forward fan blow air upward. &lt;br&gt;2. Remove refrigerant. &lt;br&gt;3. Evacuate and recharge system. &lt;br&gt;4. Replace discharge pressure transducer. &lt;br&gt;5. Verify displayed ambient temperature is within + or - 15°F of thermometer placed next to sensor.</td>
</tr>
</tbody>
</table>

**NOTE:** If a mechanical high pressure cut-out opens, the system will shut down on low motor current.
<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>CAUSE</th>
<th>SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>“HIGH DSCH TEMP”</td>
<td>1. Fault discharge temp sensor.</td>
<td>1. Check / replace discharge temp sensor.</td>
</tr>
<tr>
<td></td>
<td>2. Low oil flow to compressor.</td>
<td>2. Check ball valves on oil lines are open.</td>
</tr>
<tr>
<td></td>
<td>3. Liquid injection not working.</td>
<td>3. Check liquid injection.</td>
</tr>
<tr>
<td></td>
<td>4. Oil filter dirty.</td>
<td>4. Change oil filter.</td>
</tr>
<tr>
<td></td>
<td>Pressure differential across filter approaching 45 PSID</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. Low oil level in separator.</td>
<td>5. Add oil to separator.</td>
</tr>
<tr>
<td></td>
<td>2. Faulty oil temp diverting valve.</td>
<td>2. Check / replace valve.</td>
</tr>
<tr>
<td></td>
<td>3. Fault oil temp sensor.</td>
<td>3. Check / replace oil temp sensor.</td>
</tr>
<tr>
<td></td>
<td>4. Liquid injection not operating</td>
<td>4. Check liquid injection</td>
</tr>
<tr>
<td>“LOW WATER TEMP”</td>
<td>1. Improperly adjusted low water temp. cut-out.</td>
<td>1. Re-program the low water temp. cut-out.</td>
</tr>
<tr>
<td>FAULT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMPRESSOR HEATER</td>
<td>1. Open in 115VAC wiring to heater.</td>
<td>1. Check wiring.</td>
</tr>
<tr>
<td>WON’T ENERGIZE</td>
<td>2. Defective oil heater.</td>
<td>2. Replace oil heater.</td>
</tr>
<tr>
<td></td>
<td>3. Auxiliary contacts of of compressor contactor defective.</td>
<td>3. Replace contacts or or contactor.</td>
</tr>
<tr>
<td>PROBLEM</td>
<td>CAUSE</td>
<td>SOLUTION</td>
</tr>
<tr>
<td>------------------------------</td>
<td>--------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>LOW COMPRESSOR OIL LEVEL</td>
<td>1. Low oil charge.</td>
<td>1. Oil level should be visible in either sight glass at all times. Add YORK “E” (R-22) oil if necessary.</td>
</tr>
<tr>
<td>“HIGH OIL DIFFERENTIAL</td>
<td>1. Oil filter is dirty.</td>
<td>1. Change oil filter.</td>
</tr>
<tr>
<td>PRESSURE” FAULT</td>
<td>2. Faulty oil or discharge pressure</td>
<td>2. Check / replace transducers or repair wiring.</td>
</tr>
<tr>
<td>“HIGH AMBIENT TEMP”</td>
<td>1. High ambient cut-out is set too low.</td>
<td>1. Re-program cut-out.</td>
</tr>
<tr>
<td>FAULT</td>
<td>2. Temperature sensed incorrectly by</td>
<td>2. Verify displayed ambient temp. is within + or - 15°F of a thermometer placed next to the OAT sensor.</td>
</tr>
<tr>
<td></td>
<td>thermistor.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Fans rotating backwards.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Air flow to unit restricted or is</td>
<td></td>
</tr>
<tr>
<td></td>
<td>being recirculated.</td>
<td></td>
</tr>
<tr>
<td>“LOW AMBIENT TEMP”</td>
<td>1. Temperature of outside air is below</td>
<td>1. No problem exists.</td>
</tr>
<tr>
<td>FAULT</td>
<td>cut-out.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Temperature sensed incorrectly by</td>
<td>2. Verify displayed ambient temperature is within + or - 15°F of a thermometer placed next to the OAT sensor.</td>
</tr>
<tr>
<td></td>
<td>thermistor.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Low ambient cut-out set too high.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Fans rotating backwards.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Air flow to unit restricted or is</td>
<td></td>
</tr>
<tr>
<td></td>
<td>being recirculated.</td>
<td></td>
</tr>
</tbody>
</table>

“HIGH AMBIENT TEMP” FAULT:
Auto restart will occur after a drop in temperature.

Cut-out = 25°F for standard ambient operation.

A Low Ambient Kit must be installed for operation below 25°F.
<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>CAUSE</th>
<th>SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compressor Won’t Load</td>
<td>1. Demand not great enough.</td>
<td>1. No problem. Consult Installation Manual to aid in understanding compressor operation.</td>
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<td></td>
<td>2. Low oil pressure.</td>
<td>2. Check oil circuit. Assure oil load solenoid valve is working. Assure that discharge pressure is at least 50 pounds over suction. Contact the local YORK service representative.</td>
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<td></td>
<td>3. Defective water temperature sensor.</td>
<td>3. Compare the display with a thermometer. Should be within + or - 2 degrees.</td>
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<tr>
<td>Lack of Cooling Effect</td>
<td>1. Fouled evaporator surface. Low suction pressure will be observed.</td>
<td>1. Contact the local YORK service representative.</td>
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<td></td>
<td>2. Improper flow through the evaporator.</td>
<td>2. Reduce flow to within chiller design specs.</td>
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<td>3. Low refrigerant charge. Low suction pressure will be noted.</td>
<td>3. Check subcooling and add charge as needed.</td>
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<td>“MOTOR CURRENT UNBALANCE”</td>
<td>1. Incoming voltage not balanced phase to phase.</td>
<td>1. Resolve incoming voltage imbalance.</td>
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TEMPERATURE CONVERSION TABLES

The numbers in bold-face type in the center column refer to the temperature, either in Centigrade or Fahrenheit, which is to be converted to the other scale. Converting Fahrenheit to Centigrade the equivalent temperature will be found in the left column. If converting Centigrade to Fahrenheit, the equivalent temperature will be found in the column on the right.