HS10 SERIES UNITS

I - INTRODUCTION
The HS10 was first introduced in 1974. It is an expansion valve system only. Expansion valve kit information is available in the evaporator section of the Engineering Handbook. Since these valves have a bleed-off feature, hard start kits are not necessarily needed. However, hard start kits are available and information can be found in the "Cross Reference Section" of the Lennox Repair Parts Handbook.

The unit includes a 2 speed condenser fan motor. The refrigerant connections are compression fittings with exception of a 1-1/8 inch sweat suction line connection on 510 and 650 units. A Low Ambient Kit (BM-3434) allows unit operation down to 0°F.

The larger condenser coil surface compared to previous condensing units results in lower head pressures and higher efficiency. In 1977 compressor improvements resulted in even higher efficiency. These units are designated by dash 4 and 5.

II - UNIT INFORMATION

A - Specifications

<table>
<thead>
<tr>
<th>Model No.</th>
<th>HS10-311V</th>
<th>HS10-411V</th>
<th>HS10-461V</th>
<th>HS10-511V</th>
<th>HS10-651V</th>
<th>HS10-653V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condenser</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net face area (sq. ft.) Outer coil</td>
<td>11.8</td>
<td>15.1</td>
<td>15.1</td>
<td>15.1</td>
<td>15.1</td>
<td>15.1</td>
</tr>
<tr>
<td>Inner coil</td>
<td>7.8</td>
<td>3.6</td>
<td>7.2</td>
<td>7.2</td>
<td>10.9</td>
<td></td>
</tr>
<tr>
<td>Fins per inch</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Condenser Fan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diameter (in.) &amp; No. of blades</td>
<td>20 — 4</td>
<td>20 — 4</td>
<td>20 — 4</td>
<td>20 — 4</td>
<td>20 — 4</td>
<td>20 — 4</td>
</tr>
<tr>
<td>Motor hp</td>
<td>1/4</td>
<td>1/4</td>
<td>1/4</td>
<td>1/4</td>
<td>1/4</td>
<td>1/4</td>
</tr>
<tr>
<td>Cfm (factory setting)</td>
<td>2550</td>
<td>3350</td>
<td>3300</td>
<td>3300</td>
<td>3250</td>
<td></td>
</tr>
<tr>
<td>Rpm (factory setting)</td>
<td>860</td>
<td>1020</td>
<td>1040</td>
<td>1040</td>
<td>1060</td>
<td></td>
</tr>
<tr>
<td>Watts (factory setting)</td>
<td>260</td>
<td>310</td>
<td>310</td>
<td>310</td>
<td>310</td>
<td></td>
</tr>
</tbody>
</table>

**Refrigerant — 22 charge furnished**
- 5 lbs. — 10 oz.
- 6 lbs. — 10 oz.
- 8 lbs. — 0 oz.
- 8 lbs. — 0 oz.
- 9 lbs. — 3 oz.

Liquid line (o.d. in.) connection
- 3/8 comp.
- 3/8 comp.
- 3/8 comp.
- 3/8 comp.
- 3/8 comp.

Suction line (o.d. in.) connection
- 3/4 comp.
- 3/4 comp.
- 7/8 comp.
- *1-1/8 sweat*
- *1-1/8 sweat*

Shipping weight (lbs.) 1 Package
- 218
- 240
- 252
- 277
- 294

*Refer to National Electric Code manual to determine wire, fuse and disconnect size requirements.

**NOTE** - Extremes of operating range are plus 10% and minus 5% of line voltage. 3 phase models are plus and minus 10% of line voltage.
B - Electrical Data

<table>
<thead>
<tr>
<th>Model No</th>
<th>HS10-311V</th>
<th>HS10-411V</th>
<th>HS10-461V</th>
<th>HS10-511V</th>
<th>HS10-651V</th>
<th>HS10-653V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line voltage data</td>
<td>208/230v</td>
<td>230v</td>
<td>230v</td>
<td>208/230v</td>
<td>208/230v</td>
<td>460v</td>
</tr>
<tr>
<td></td>
<td>60Hz — 1ph</td>
<td>60Hz — 1ph</td>
<td>60Hz — 1ph</td>
<td>60Hz — 1ph</td>
<td>60Hz — 1ph</td>
<td>60Hz — 3ph</td>
</tr>
<tr>
<td>Compressor</td>
<td>13.3</td>
<td>14.7</td>
<td>17.1</td>
<td>27.3</td>
<td>31.0</td>
<td>10.5</td>
</tr>
<tr>
<td>Rate load amps</td>
<td>.96</td>
<td>.96</td>
<td>.96</td>
<td>.95</td>
<td>.93</td>
<td>.86</td>
</tr>
<tr>
<td>Power factor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condenser</td>
<td>61.0</td>
<td>75.0</td>
<td>88.0</td>
<td>132.0</td>
<td>165.0</td>
<td>66.0</td>
</tr>
<tr>
<td>Locked rotor amps</td>
<td>Full load amps</td>
<td>2.1</td>
<td>2.1</td>
<td>1.4</td>
<td>1.4</td>
<td>1.4</td>
</tr>
<tr>
<td>fan motor</td>
<td>4.5</td>
<td>4.5</td>
<td>2.4</td>
<td>2.4</td>
<td>2.4</td>
<td>1.0</td>
</tr>
<tr>
<td>Locked rotor amps</td>
<td>18.8</td>
<td>20.5</td>
<td>22.8</td>
<td>35.5</td>
<td>40.2</td>
<td>13.8</td>
</tr>
</tbody>
</table>

*Minimum circuit ampacity

* Refer to National Electric Code manual to determine wire, fuse and disconnect size requirements.

NOTE - Extremes of operating range are plus 10% and minus 5% of line voltage. 3 phase models are plus and minus 10% of line voltage.

C - Unit Dimensions

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**Front View**

**Top View**

**Side View**

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All the service valve seating adjustments and gauge ports are located on the outside of cabinet except for the suction valve on the 4 and 5 ton models. The external adjustment valves do not back seat. The gauge port can not be shut off by back seating the valve. See Figure 2.

The suction valve for the 4 and 5 ton units is located inside the cabinet and is both front and back seating.

A liquid line gauge port inside cabinet is used to monitor system pressure during a pump down.

**WARNING** - Condenser coil may not have sufficient volume to allow a complete pump down. Always connect a high pressure gauge to the liquid line gauge port during system pump down. High pressure must not exceed 410 psig (2827 kPa).

Each unit is furnished with a normal operating pressure curve. The curve uses suction pressure, liquid pressure and outdoor temperature comparison. To use the chart, first check suction pressure, then move over to the outdoor temperature and finally down to the liquid pressure. If the liquid pressure is within five pounds of this reading, the unit is properly charged, providing the three conditions...
A - Control Box (Figure 4)

1 - Compressor Contactor
   Energizes compressor and condenser fan motor.

2 - Timed Off Control
   Prevents compressor short cycling and allows time for suction and discharge pressures to equalize. The control
   locks out the control circuit for 5 minutes at the end of a cycle.

3 - Transformer & Control Relay
   On single phase and "J" voltage 4 and 5 ton units, the compressor contactor rating exceeds the rating of the
   indoor unit transformers. On these units an additional transformer is used. The control relay isolates the two
   transformers.
   230V primary/24V secondary — 30VA

B - Compressor Compartment (Figure 5)

1 - High Pressure Switch
   Switch cuts out at 410 psig and must be manually reset below 180 psig.

2 - Low Pressure Switch
   Switch is in suction line. It cuts out at 25 psig ± 5 and automatically resets at 55 psig ± 5.

3 - Compressor
   Compressor uses an internal overload and a pressure relief valve. The relief valve opens at a discharge and
   suction differential of 450 psig ± 50. Four and five ton Tecumseh compressors employ an internal self-
   regulating crankcase heater.

4 - Crankcase Heater Thermostat
   The crankcase heater is controlled by a refrigerant tem-
Motor may be on either high or low speed between these temperatures, depending if outdoor temperature is on a rise or fall condition.

**C - Condenser Coil Compartment**

The unit utilizes a draw through coil with vertical discharge. Fan motor is prelubricated for an extended period of operation. Some motors employ ball bearing motors which need no further lubrication. Check motor for lubrication requirements. For fan service access, remove the fan guard. The motor has a rain shield for moisture protection. Figure 6 illustrates the condenser fan and motor assembly.

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**5 - Fan Speed Thermostat**

A refrigerant temperature thermostat, attached to the condenser coil controls the two speed fan motor.

The thermostat (non-adjustable) switches fan motor at following approximate temperatures:

<table>
<thead>
<tr>
<th>HS10 Model</th>
<th>HIGH Ambient</th>
<th>Refrigerant</th>
<th>LOW Ambient</th>
<th>Refrigerant</th>
</tr>
</thead>
<tbody>
<tr>
<td>260 thru 510</td>
<td>90°F (32.1°C)</td>
<td>110°F (43.3°C)</td>
<td>75°F (23.8°C)</td>
<td>95°F (35.0°C)</td>
</tr>
</tbody>
</table>

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**FIGURE 4**

**FIGURE 5**

**FIGURE 6**
V - SCHEMATIC WIRING DIAGRAM OPERATING SEQUENCE

Each of the steps within this section are labeled in the diagram.

**HS10 LESS TRANSFORMER**

1. The thermostat makes on a cooling demand.
2. If the thermostat is set on "Auto", the Blower Relay is energized. Blower Relay closes its N.O. contacts to energize the Blower Motor at cooling speed.
3. As the thermostat makes it also completes a circuit to the Timed Off Control through the High and Low Pressure Switches. These switches open at abnormal pressures to de-energize the machine.
4. With a circuit complete through "R1" and "R2" terminals of Timed Off Control the "Y" terminals energize the Compressor Contactor.

5. The Compressor Contactor closes its N.O. contacts to energize the compressor.
6. Compressor Contactor also completes a circuit to the Condenser Fan Motor through the Fan Speed Thermostat. The refrigerant temperature determines the speed of motor. Black is high speed; red is low speed.
7. When demand is satisfied, the thermostat contacts open. The Timed Off Control locks out the unit for a 5 minute period.
8. Crankcase Heater operation is controlled by a thermostat which senses refrigerant temperature.

**NOTE** - On some units the heater is self regulating and on others it is energized continuously.
HS10 WITH TRANSFORMER

1 - The thermostat makes on a cooling demand.
2 - If the thermostat is set on "Auto", the Blower Relay is energized. The Blower Relay closes its N.O. contacts to bring the Indoor Blower Motor at cooling speed.
3 - As the thermostat makes it also energizes the Control Relay at the HS10.
4 - The N.O. Control Relay contacts close to power the HS10 Transformer.
5 - The transformer provides a 24V circuit to the Timed Off Control through the High and Low Pressure Switches. These switches open at abnormal pressures to de-energize the machine.
6 - With circuit complete through "R1" and "R2" terminals of Timed Off Control the "Y" terminals energize the Compressor Contactor.

7 - Compressor Contactor closes its N.O. contacts to energize the compressor.
8 - Compressor Contactor also completes a circuit to the condenser fan motor through the Fan Speed Thermostat. Refrigerant temperature determines the speed of motor. Black is high; red is low.
9 - When the demand is satisfied, the thermostat contacts open. The Timed Off Control locks out the unit for a 5 minute period.
10 - On 208 - 230v/60/1 units, the crankcase is self regulating.
   On 375v/60/3 units the crankcase heater is controlled by the control relay. It is energized on "off" cycles and de-energized when the machine is on.