I - INTRODUCTION
The HS13 was first introduced in 1977 in the 2-1/2, 3 and 3-1/2 ton models. 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 refrigerant connections are compression fittings with exception of a 1-1/8 inch sweat suction line connection on 460 units. A low Ambient Kit (BM-3434) allows unit operation down to 0°F.

Figure 1 shows a cutaway of the unit.

II - UNIT INFORMATION

A - Specifications

<table>
<thead>
<tr>
<th>Condenser Fan</th>
<th>Model No.</th>
<th>HS13-261V</th>
<th>HS13-311V</th>
<th>HS13-411V</th>
<th>HS13-461V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net face area (sq. ft.)</td>
<td>Outer coil</td>
<td>15.66</td>
<td>15.66</td>
<td>18.51</td>
<td>18.51</td>
</tr>
<tr>
<td>Inner coil</td>
<td>14.34</td>
<td>14.34</td>
<td>17.65</td>
<td>17.65</td>
<td></td>
</tr>
<tr>
<td>Fins per inch</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Diameter (in.) &amp; No. of blades</td>
<td>24 - 3</td>
<td>24 - 3</td>
<td>24 - 4</td>
<td>24 - 4</td>
<td></td>
</tr>
<tr>
<td>Motor hp</td>
<td>1/10</td>
<td>1/6</td>
<td>1/4</td>
<td>1/4</td>
<td></td>
</tr>
<tr>
<td>Cfm (factory setting)</td>
<td>2800</td>
<td>3400</td>
<td>4100</td>
<td>4300</td>
<td></td>
</tr>
<tr>
<td>Rpm (factory setting)</td>
<td>820</td>
<td>820</td>
<td>820</td>
<td>815</td>
<td></td>
</tr>
<tr>
<td>Watts (factory setting)</td>
<td>150</td>
<td>210</td>
<td>310</td>
<td>380</td>
<td></td>
</tr>
<tr>
<td><strong>Refrigerant - 22 charge furnished</strong></td>
<td>9 lbs - 13 oz</td>
<td>9 lbs - 10 oz</td>
<td>10 lbs - 0 oz</td>
<td>10 lbs - 8 oz</td>
<td></td>
</tr>
<tr>
<td>Liquid line (o.d. in.) connection (compression)</td>
<td>3/8</td>
<td>3/8</td>
<td>3/8</td>
<td>3/8</td>
<td></td>
</tr>
<tr>
<td>Shipping weight (lbs.)</td>
<td>260</td>
<td>260</td>
<td>275</td>
<td>310</td>
<td></td>
</tr>
</tbody>
</table>

B - Electrical Data

<table>
<thead>
<tr>
<th>Model No.</th>
<th>HS13-261V</th>
<th>HS13-311V</th>
<th>HS13-411V</th>
<th>HS13-461V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line voltage data (60hz - 1 phase)</td>
<td>208-230V</td>
<td>208-230V</td>
<td>208-230V</td>
<td>208-230V</td>
</tr>
<tr>
<td>Compressor</td>
<td>Rated load amps</td>
<td>9.4</td>
<td>11.8</td>
<td>16.1</td>
</tr>
<tr>
<td></td>
<td>Power factor</td>
<td>98</td>
<td>99</td>
<td>96</td>
</tr>
<tr>
<td></td>
<td>Locked rotor amps</td>
<td>54.0</td>
<td>54.0</td>
<td>87.0</td>
</tr>
<tr>
<td>Condenser</td>
<td>Full load amps</td>
<td>1.0</td>
<td>1.0</td>
<td>1.7</td>
</tr>
<tr>
<td>fan motor</td>
<td>Locked rotor amps</td>
<td>1.9</td>
<td>1.9</td>
<td>2.9</td>
</tr>
<tr>
<td>Recommended maximum fuse size (amps)</td>
<td>20.0</td>
<td>25.0</td>
<td>35.0</td>
<td>40.0</td>
</tr>
<tr>
<td>*Minimum circuit ampacity</td>
<td>12.5</td>
<td>16.0</td>
<td>22.0</td>
<td>25.0</td>
</tr>
</tbody>
</table>

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

NOTE: Extremes of operating range are plus and minus 10% of line voltage.
II - REFRIGERANT SYSTEM

All the service valve seating adjustments and gauge ports are located on the outside of cabinet except for the suction valve on the 460 units. The external adjustment valves do not backseat. The gauge port can not be shut off by backseating the valve. The suction valve for the 460 units is located inside cabinet and is both front and back seating.

A liquid line gauge port inside cabinet is used to monitor pressures during a system pumpdown.

**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.

This is a super efficient machine and **MUST** be charged according to the Normal Operating Pressure Curve. HS13 operating pressures vary drastically from standard condensing units. For example, an HS9-411 operating with a 75°F condenser entering air temperature could expect approximately a 70 psig suction and 195 psig head pressure. In contrast an HS13-411 operating at the same 75°F temperature could expect approximately 82 psig suction and 168 psig head pressure. If the head pressure is increased to the expected head pressure of previously produced condensing units, the unit will be seriously overcharged, thus reducing condenser space. The operating cost goes up and the overcharge decreases the compressor life.
IV - COMPONENTS

Figure 2 shows an exploded view of an HS13.
A - Control Box (Figure 3)
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.

B - Compressor Compartment (Figure 4)
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. The HS13-460
   compressor employs an internal self-regulating crankcase
   heater.
4. Crankcase Heater Thermostat
   The crankcase heater is controlled by a refrigerant temp-
   erature thermostat (with exception to Tecumseh 4 and 5
   ton compressors). Thermostat closes at 65°F and opens at
   85°F. Between 65°F and 85°F heater operation depends on
   whether outdoor temperature is on the rise or fall.

C - Condenser Coil Compartment
The unit utilizes a draw through coil with a vertical discharge.
Fan motor is prelubricated and sealed. No further lubrication
required under normal operation. For fan service access,
remove the fan guard. The motor has a rain shield for protec-
tion from moisture. Figure 5 illustrates the condenser fan and
motor assembly.
V - SCHEMATIC WIRING DIAGRAM OPERATING SEQUENCE

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

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 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 thorough “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. It also energizes the Condenser Fan Motor.
6 - When the demand is satisfied, the thermostat contacts open. The Timed Off Control locks out the unit for a 5 minute period.
7 - Crankcase Heater operation is controlled by a thermostat which senses refrigerant temperature.

NOTE - On 3-1/2 ton units the crankcase heater is self-regulating.