HS24 SERIES UNITS

The HS24 is a high-efficiency residential split-system condensing unit. Extra large condensing coil, coil circuiting and high condenser air volume result in a high SEER rating (minimum of 10.0). The series is designed for use with an expansion valve or RFCII system in the indoor unit.

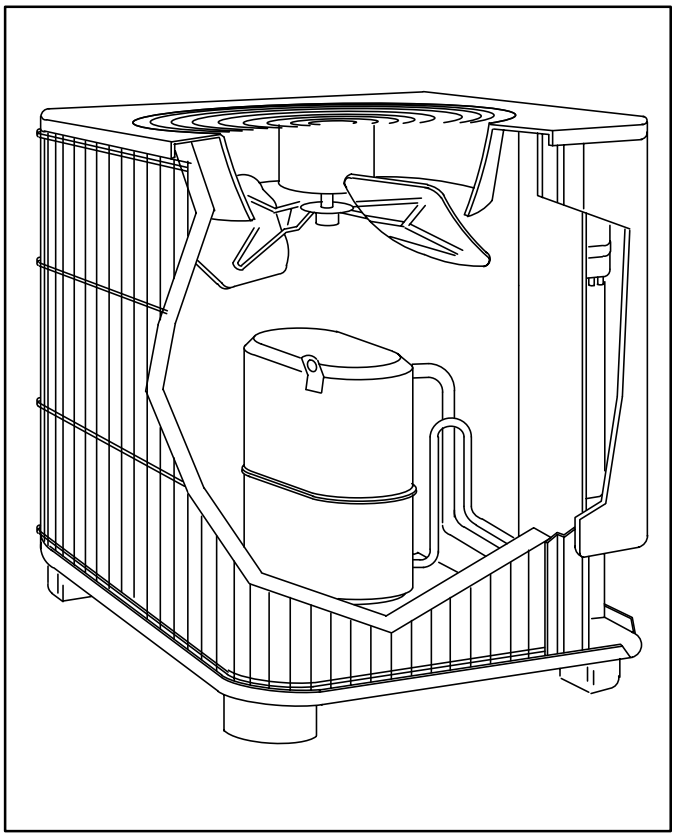
All compressors are hermetically sealed for trouble-free operation and long service life. Compressor components are spring mounted within the sealed housing. The compressor is installed in the unit on resilient rubber mounts to assure quiet, vibration-free operation. A built-in protection device assures protection from excessive current and temperatures.

HS24-510 through HS24-650 models are furnished with crankcase heaters as standard equipment to assure proper compressor lubrication at all times. The heater is temperature-actuated and operates only when required.

Several models are available in sizes ranging from 1 through 5 tons.

This manual is divided into sections which discuss the major components, refrigerant system, charging procedure, maintenance and operation sequence.

All specifications in this manual are subject to change.



SPECIFICATIONS

Model No.		HS24-141	HS24-211	HS24-261	HS24-311
Condenser Coil	Net face area (sq. ft.)	12.60	12.60	12.60	14.70
	Tube diameter (in.) & no. of rows	3/8 — 1	3/8 — 1	3/8 — 1	3/8 — 1
	Fins per inch	20	20	20	20
Condenser Fan	Diameter (in.) & no. of blades	20 — 3	20 — 3	20 — 3	20 — 3
	Motor hp	1/6	1/6	1/6	1/6
	Cfm	2500	2500	2500	2700
	Rpm	850	850	850	850
	Watts	200	200	200	205
*Refrigerant — 22 charge furnished		4 lbs. 5 oz.	4 lbs. 10 oz.	5 lbs. 7 oz.	5 lbs. 12 oz.
Liquid line (o.d. in.) connection (sweat)		**3/8	***3/8	***3/8	3/8
Suction line (o.d. in.) connection (sweat)		1/2	5/8	5/8	3/4
Shipping weight (lbs.) 1 package		121	153	154	168

*Refrigerant charge sufficient for 25 ft. length of refrigerant lines.
** 3/8" x 1/4" reducer furnished to adapt to 1/4 field fabricated line set.
*** 3/8" x 5/16" reducer furnished to adapt unit to 5/16" line set.

SPECIFICATIONS (continued)

Model No.			HS24-411 HS24-413	HS24-461 HS24-463	HS24-511 HS24-513	HS24-651 HS24-653
Condenser Coil	Net face area (sq. ft.)	Outer coil	14.70	14.70	20.00	20.00
		Inner coil	- - - -	9.80	- - - -	15.40
	Tube diameter (in.) & no. of rows		3/8 — 1	3/8 — 1.67	3/8 — 1	3/8 — 1.77
	Fins per inch		20	20	20	20
Condenser Fan	Diameter (in.) & no. of blades		20 — 3	20 — 3	24 — 4	24 — 4
	Motor hp		1/6	1/6	1/4	1/4
	Cfm		2700	2450	3900	4000
	Rpm		840	840	835	830
	Watts		205	210	340	355
*Refrigerant — 22 charge furnished			5 lbs. 15 oz.	9 lbs. 6 oz.	9 lbs. 0 oz.	11 lbs. 5 oz.
Liquid line (o.d. in.) connection (sweat)			3/8	3/8	3/8	3/8
Suction line (o.d. in.) connection (sweat)			3/4	7/8	7/8	1-1/8
Shipping weight (lbs.) 1 package			182	223	238	271

*Refrigerant charge sufficient for 25 ft. length of refrigerant lines.

I - UNIT INFORMATION

HS24 condensing units are available in 1, 1 -1/2, 2, 2 -1/2, 3, 3 -1/2, 4 and 5 ton capacities.

All major components (indoor blower/coil) must be matched according to Lennox recommendations for the compressor to be covered under warranty. Refer to the Engineering Handbook for approved system matchups. A misapplied system will cause erratic operation and can result in early compressor failure.

II - UNIT COMPONENTS

A - Control Box (Figures 1 and 2)

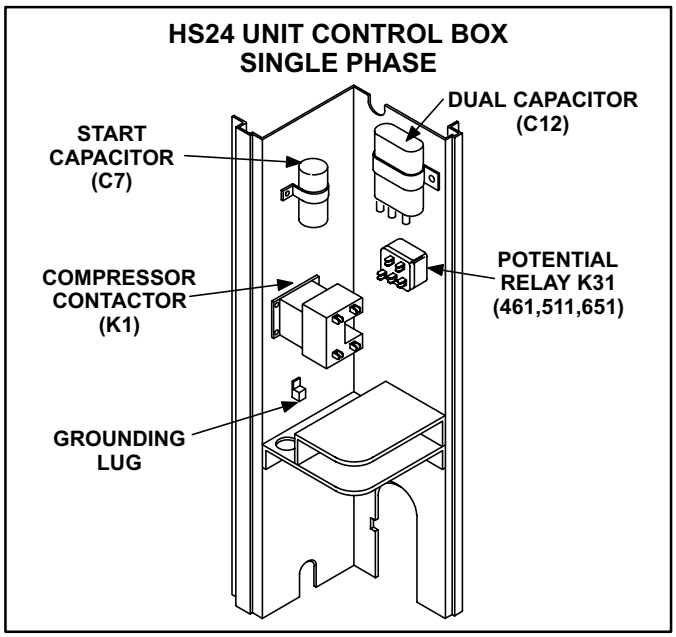


FIGURE 1

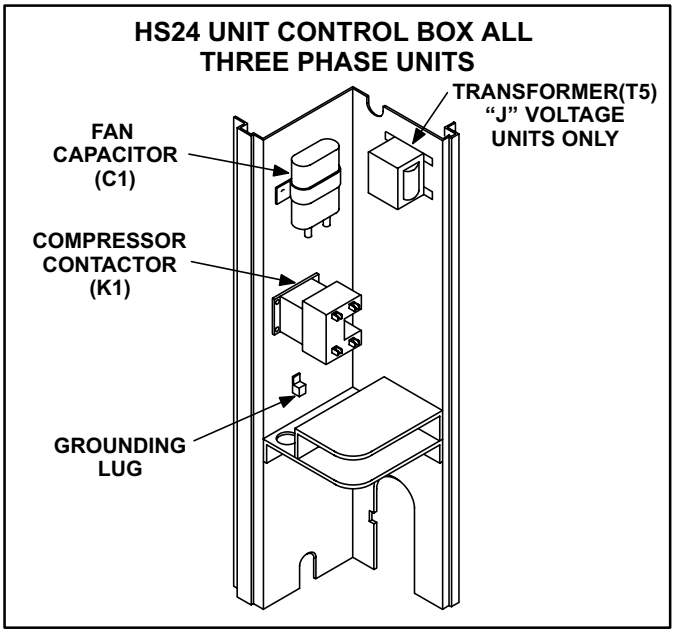


FIGURE 2

⚠ DANGER

Shock Hazard

All single phase HS24 units use single-pole contactors. One leg of compressor, capacitor and condenser fan are connected to line voltage at all times. Potential exists for electrical shock resulting in injury or death. Remove all power at disconnect before servicing.

Can cause personal injury or death.

1 - Compressor Contactor K1

The compressor is energized by a contactor located in the control box. See figures 1 and 2. Contactors are SPST in single phase units and 3PST in three phase units. The contactor is energized by indoor thermostat terminal Y when thermostat demand is present.

The contactor coil is energized by 24VAC supplied by the indoor unit. All other controls in the outdoor unit are powered by line voltage. Refer to unit wiring diagram. The HS24 is not equipped with a line voltage to 24V transformer.

2 - Dual Capacitor C12

The compressor and fan in single phase units use permanent split capacitor motors. The capacitor is located inside the unit control box (see figure 1). A single "dual" capacitor (C12) is used for both the fan motor and the compressor (see unit wiring diagram). The fan side and the compressor side of the capacitor have different MFD ratings. See table 1 for dual capacitor ratings.

TABLE 1

HS24 (C12) DUAL CAPACITOR RATING			
Unit	**Terminal**	**MFD**	**VAC**
HS24-141/211	FAN	5	370
	HERM	25	
HS24-261	FAN	5	
	HERM	30	
HS24-311/411	FAN	5	
	HERM	45	
HS24-461	FAN	5	
	HERM	50	
HS24-511	FAN	10	440
	HERM	45	
HS24-651	FAN	10	
	HERM	60	

3 - Start Capacitor C7

All HS24-461, 511, 651 units use a start capacitor (C7) wired in parallel with the compressor side of the dual capacitor. The capacitor is located inside the unit control box (see figure 1). C7 is switched off by potential relay (K31) when the compressor nears full speed. See table 2 for start capacitor ratings.

TABLE 2

HS24 START CAPACITOR RATING		
Unit	**MFD**	**VAC**
HS24-461	189-227	330
HS24-511	135-155	320
HS24-651	189-227	330

4 - Transformer T5

Transformer T5 is used on all "J" voltage units. T5 is used as a step-down transformer for fan B4. T5 is rated at 3.4 VA with a 575 volt primary and a 460 volt secondary.

5 - Potential (Start) Relay K31

All HS24-461, 511, 651 series units use a potential relay which controls the operation of the starting circuit. The potential relay is located inside the unit control box (see figure 1). The relay is normally closed when contactor K2 is de-energized. When K1 energizes, the compressor immediately begins start-up. K31 remains closed during compressor start-up and the start capacitor remains in the circuit. As the compressor gains speed, K31 is energized. When K31 energizes, the contacts open and the start capacitor is taken out of the circuit.

6 - Fan Capacitor C1

The fan in three-phase units use permanent split capacitor motors. A single capacitor is used for the fan motor. The capacitor is located inside the unit control box (see figure 2). Table 3 shows the ratings of C1.

TABLE 3

HS24 FAN CAPACITOR RATING (C1)		
Unit	**MFD**	**VAC**
HS24-413/463	5	370
HS24-513/653Y,G	10	370
HS24-651J	10	370

B - Compressor

Table 4 shows the specifications of compressors used in HS24 series units.

TABLE 4

HS24 COMPRESSOR SPECIFICATIONS					
Unit	**Voltage**	**Phase**	**LRA**	**RLA**	**Oil fl.oz.**
HS24-141	208/230	1	26.3	4.8	15**
HS24-211	208/230	1	49	9.6	45*
HS24-261	208/230	1	56	10.9	45*
HS24-311	208/230	1	71.0	11.7	32*
HS24-411	208/230	1	86.7	14.2	54*
HS24-413	208/230	3	65.1	9.2	54*
HS24-413	460	3	32.8	4.6	54*
HS24-461	208/230	1	105	16.4	70*
HS24-463	208/230	3	130	11.9	70*
HS24-463	460	3	64	5.6	70*
HS24-511	208/230	1	110	20.5	54*
HS24-513	208/230	3	92.0	13.4	54*
HS24-513	460	3	46.0	6.7	54*
HS24-513	575	3	44.0	5.3	54*
HS24-651	208/230	1	147	24	65*
HS24-653	208/230	3	150	16	65*
HS24-653	460	3	73	8.0	65*
HS24-653	575	3	50.0	6.4	65*

*Shipped with conventional white oil (Sontex 200LT) or 3GS. 3GS oil may be used if additional oil is required.

**Shipped with 60% Zerol 300—40% Sontex 200LT. A 60/40 mixture of Zerol 300/Sontex 200LT may be used if additional oil is required.

1 - Rotary Compressor (-141 Units Only)

HS24-141 units utilize a hermetically sealed rotary-type compressor.

The compressor is manufactured by Tecumseh Products. It is illustrated in figure 3.

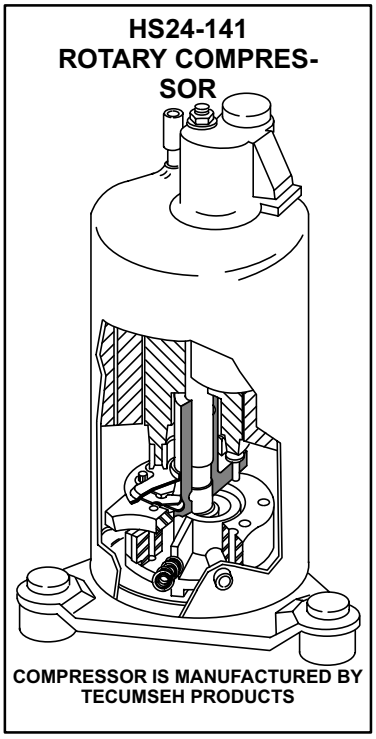


FIGURE 3

A rotary compressor utilizes four moving parts: a rotor shaft, eccentric, roller and a blade. See figure 4.

The compressor rotor shaft is attached directly to the compressor motor. The rotor shaft is permanently attached to an eccentric. The eccentric rotates inside the roller. As the eccentric rotates, the roller rotates. A spring-loaded blade is forced against the roller providing a separation between intake and exhaust ports at all times. The blade edge is slightly rounded and uses a thin layer of refrigerant oil to form a leak free seal.

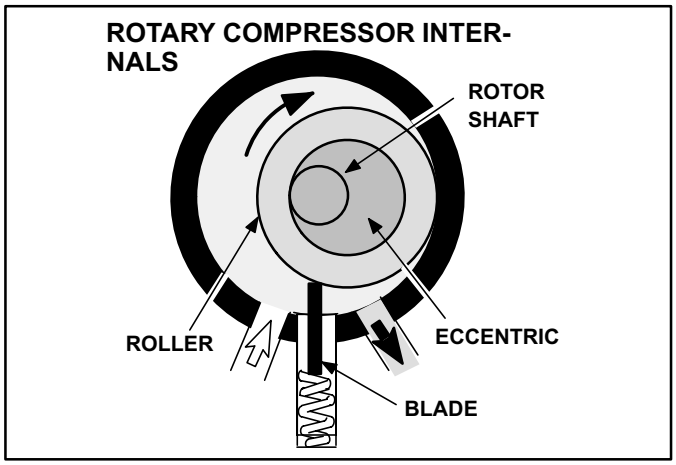


FIGURE 4

Figure 5 illustrates the four steps in a rotary compressor cycle. The spring-loaded blade is compressed fully at the beginning of an exhaust cycle. At this instant the compression is beginning (1). The roller rotates and compression continues (2). When the blade is fully extended the suction port is separated from the discharge port (3). Intake continues and the compressed vapor is discharged (4). A rotary compressor has a continuous intake cycle.

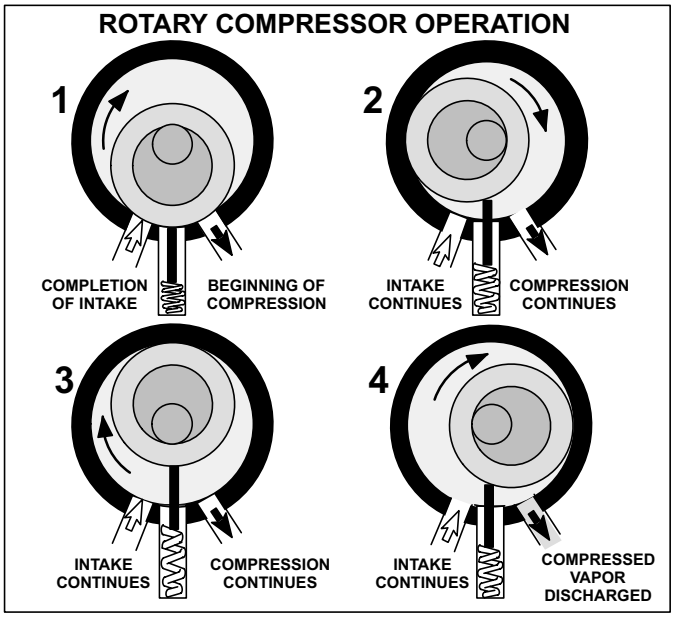


FIGURE 5

a - Suction Muffler (-141 Units Only)

All HS24-141 units are equipped with a suction muffler that is externally mounted on the compressor shell and attaches to the suction line. The muffler contains two wire mesh screen filters for added compressor protection. See figure 6.

2 - Accumulator (-141 Units Only)

All HS24-141 units are equipped with an accumulator that is mounted in the suction line. The accumulator protects the compressor from liquid slugging. See figure 6.

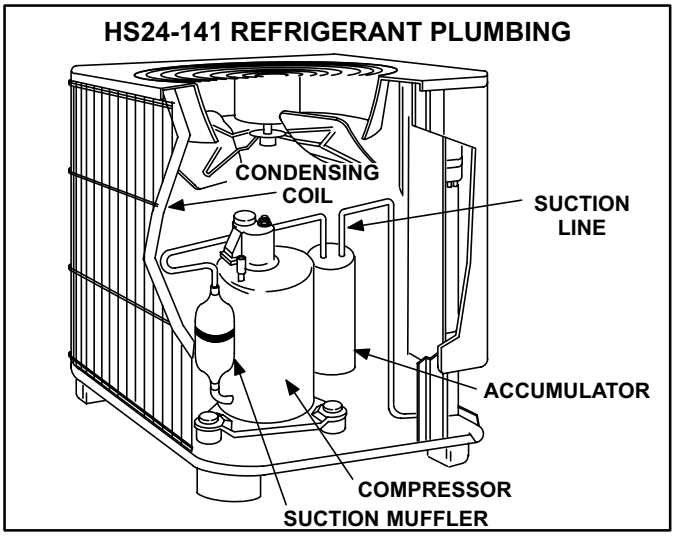


FIGURE 6

3 - Reciprocating Compressor (all other units)

All units except for the -141 units utilize a conventional reciprocating style compressor.

4 - Crankcase Heater

A crankcase heater is used on all HS24-510 through HS24-650 models. The well-mounted insertion-type heater is self-regulating. Heaters are rated at 27 watts for HS24-511/513 and 30 watts for HS24-651/653. The heater is temperature-actuated and operates only when required.

5 - Compressor Cover (Figure 7)

A compressor cover constructed out of vinyl-faced fiberglass is used on all HS24-411 through -651 units. The cover provides an acoustic barrier. The cover slides over the compressor and is held secure with velcro™ straps. Slits are provided for installation around the discharge and suction lines.

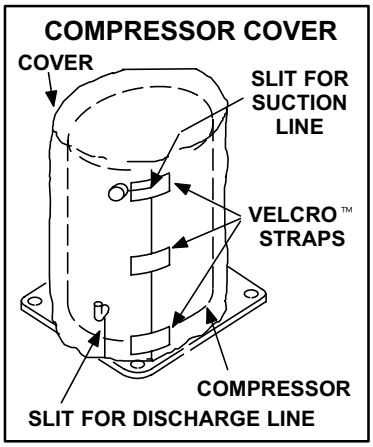


FIGURE 7

C - Condenser Fan Motor

All units use single-phase PSC fan motors which require a run capacitor. The table on page 1 of this manual shows the specifications of condenser fans used in HS24s. In all units, the condenser fan is controlled by the compressor contactor.

Two different mounting arrangements are used (fan up and fan motor up) see figures 8 and 9.

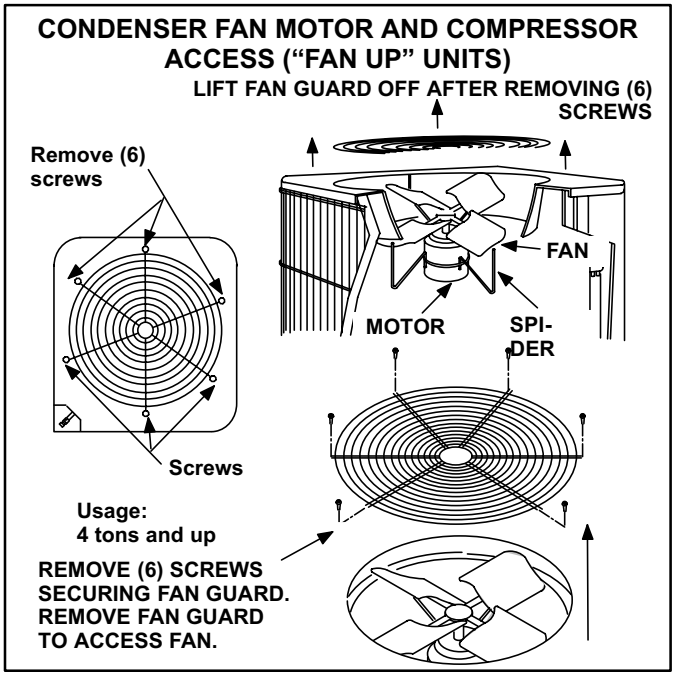


FIGURE 8

Access to the condenser fan motor on all units is gained by removing the six (6) screws securing the fan guard. See figures 8 and 9.

The condenser fan motor is attached to the fan guard on "motor up" units and is removed with the fan guard. See figure 9.

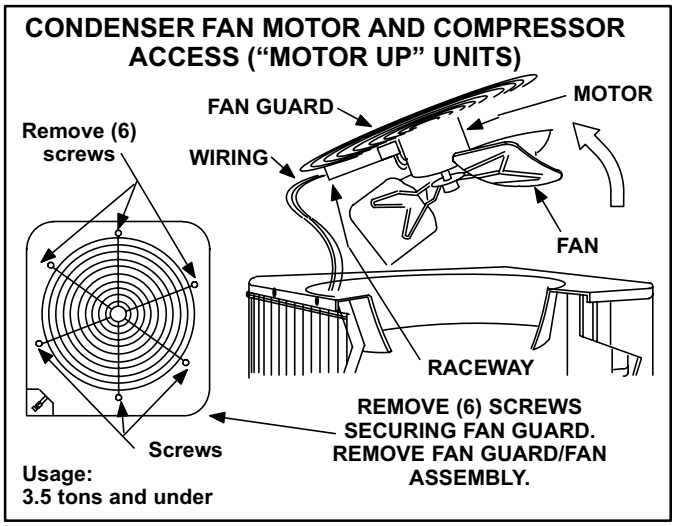


FIGURE 9

III - REFRIGERANT SYSTEM

A - Plumbing

Field refrigerant piping consists of liquid and suction lines from the outdoor unit (sweat connections). Use Lennox L10 series line sets as shown in table 5 or field fabricated refrigerant lines.

Separate discharge and suction service ports are provided outside the unit for connection of gauge manifold during charging procedure.

TABLE 5

LINE SET SPECIFICATIONS

Condensing Unit Model No.	Line Set Model No.	Length of Suct. & Liq. Lines (ft.)	Liquid Line (o.d. ft.)	Suction Line (o.d. ft.)
HS24-141	*Not Available	— — —	**1/4	1/2
HS24-211	L10-21-20	20	***5/16	5/8
	L10-21-25	25	***5/16	5/8
HS24-261	L10-21-35	35	***5/16	†5/8
	L10-21-50	50	***5/16	†5/8
HS24-311	L10-41-20	20	3/8	3/4
	L10-41-30	30	3/8	3/4
HS24-410	L10-41-40	40	3/8	3/4
	L10-41-50	50	3/8	3/4
HS24-460 HS24-510	L10-65-30	30	3/8	7/8
	L10-65-40	40	3/8	7/8
	L10-65-50	50	3/8	7/8
HS24-651	*Not Available	— — —	3/8	1-1/8

*Field Fabricate

**3/8" x 1/4" reducer furnished to adapt unit to 1/4 field fabricated line set.

*** 3/8" x 5/16" reducer furnished to adapt unit to 5/16" line set.

B - Service Valves

The liquid line and suction line service valves and gauge ports are accessible from outside of the unit. Full service liquid and suction line valves are used. See figures 10 and 11. The service ports are used for leak testing, evacuating, charging and checking charge.

1 - Liquid Line Service Valve

A full service liquid line valve is used on all HS24 series units. Different manufacturers of valves may be used. All liquid line service valves function the same way, differences are in construction. Valves manufactured by Parker are forged assemblies. Valves manufactured by Primore are brazed together. Valves are not rebuildable. Defective valves must be replaced. The liquid line service valve is illustrated in figure 10.

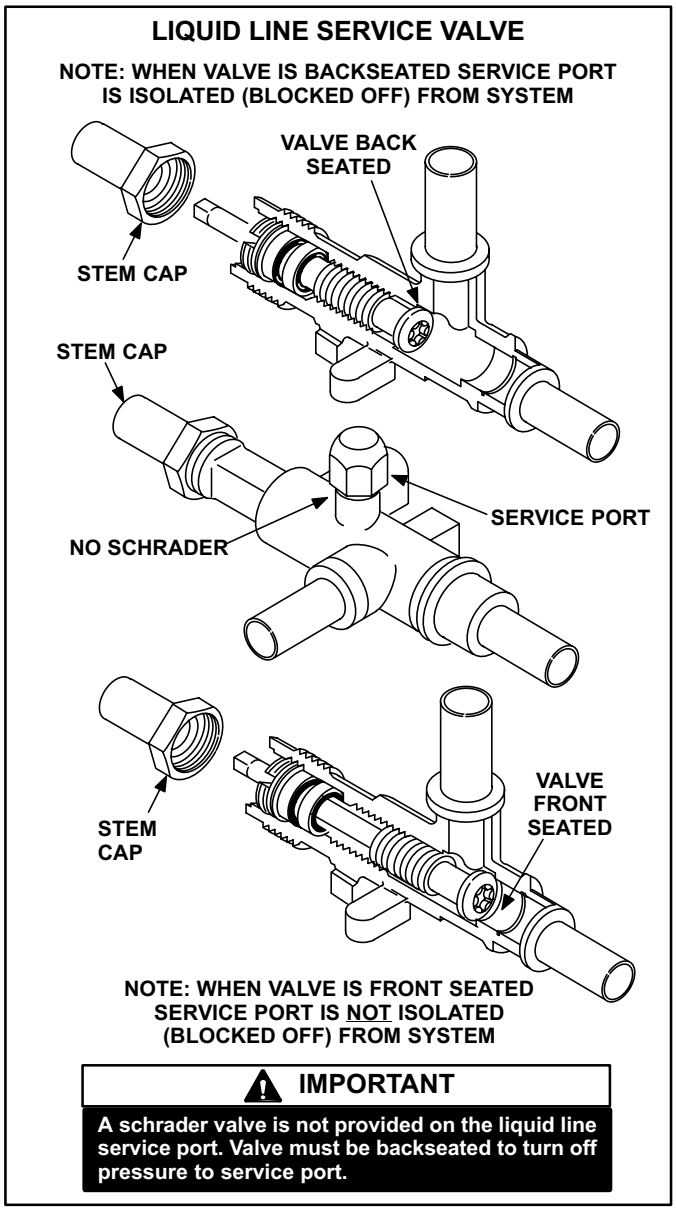


FIGURE 10

The valve is equipped with a service port. There is no schrader valve installed in the liquid line service port. A service port cap is supplied to seal off the port.

The liquid line service valve is a front and back seating valve. When the valve is backseated the service port is isolated from the system.

⚠ CAUTION

The service port cap is used to seal the liquid line service valve. Access to service port requires backseating the service valve to isolate the service port from the system. Failure to do so will cause refrigerant leakage.

⚠ IMPORTANT

A schrader valve is not provided on the liquid line service port. Valve must be backseated to turn off pressure to service port.

To Access Service Port:

1 - Remove the stem cap with an adjustable wrench.

2 - Remove service port cap with an adjustable wrench.

3 - Connect high pressure gauge to liquid line service port.

4 - Open valve stem (1/2 turn clockwise) from backseated position.

5 - When finished using port, backseat stem, tighten firmly, remove gauge; install service port cap, tighten firmly. Replace stem cap, tighten firmly. See table 6 for service port cap and stem cap torque specifications.

To Close Off Service Port:

1 - Backseat valve with service wrench.

a - Turn stem counterclockwise.

b - Tighten firmly.

To Open Liquid Line Service Valve:

1 - Remove the stem cap with an adjustable wrench.

2 - Backseat valve with service wrench.

a - Turn stem counterclockwise until backseated.

b - Tighten firmly.

3 - Replace stem cap, tighten firmly. See table 6 for stem cap torque specifications.

To Close Liquid Line Service Valve:

1 - Remove the stem cap with an adjustable wrench.

2 - Turn the stem in clockwise to seat the valve. See table 6 for valve seating torque specifications.

3 - Replace stem cap. See table 6 for stem cap torque specifications.

TABLE 6

3/8" LIQUID LINE SERVICE VALVE TORQUE SPECS*			
Manufacturer	**Seating Torque Front Seat**	**Service Port Cap Torque**	**Stem Cap Torque**
PRIMORE (Brazed Body)	**9-12 lbs./ft.**	**3-5 lbs./ft.**	**20-24 lbs./ft.**
PARKER (Forged Body)	**7-11 lbs./ft.**	**8-10 lbs./ft.**	**18-22 lbs./ft.**

***Tighten each component firmly; if leaks are evident, tighten to appropriate torque.**

2 - Suction Line Service Valve

A full service suction line service valve is used on all HS24 series units. Suction valves are non-backseating type. Three different manufacturers of valves may be used. All suction line service valves function the same way, differences are in construction. Valves manufactured by Aeroquip and Parker are forged assemblies. Valves manufactured by Primore are brazed together. Valves are not rebuildable. Defective valves must be replaced. The suction line service valve is illustrated in figures 11 and 12.

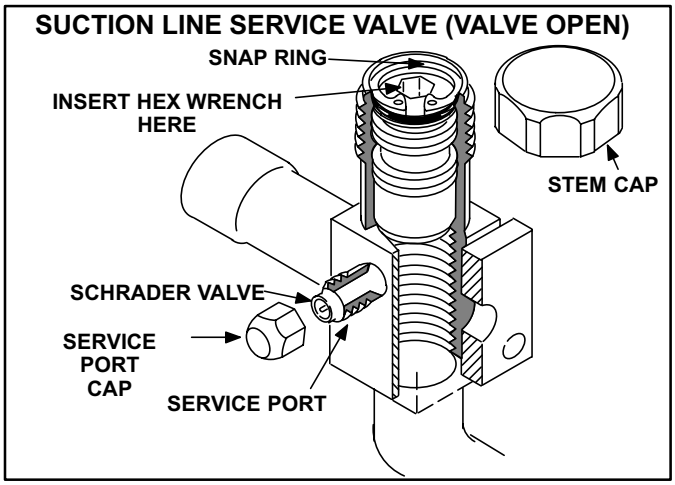


FIGURE 11

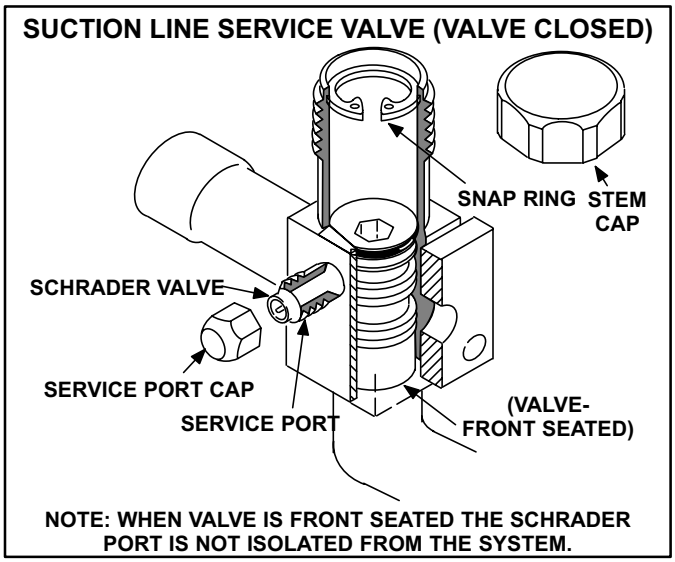


FIGURE 12

The valve is equipped with a service port. A schrader valve is factory installed. A service port cap is supplied to protect the schrader valve from contamination and assure a leak free seal.

The suction line service valve is a front-seating valve and does not backseat.

⚠ WARNING

Suction valves are non-backseating. Do not attempt to backseat this valve. Attempts to backseat this valve will cause snap ring to explode from valve body under pressure of refrigerant. Personal injury and unit damage will result.

To Access Schrader Port:

1 - Remove service port cap with an adjustable wrench.

2 - Install in reverse order. Tighten firmly. See table 7 for service port cap torque values.

To Open Suction Line Service Valve:

1 - Remove stem cap with an adjustable wrench.

2 - Insert a 5/16" hex wrench into the stem.

3 - Back the stem out counterclockwise until the valve stem just touches the retaining ring.

4 - Replace stem cap, tighten firmly. See table 7 for stem cap torque specifications.

TABLE 7

SUCTION LINE SERVICE VALVE TORQUE SPECS*				
Size	**Manufacturer**	**Seating Torque Front Seat**	**Service Port Cap**	**Stem Cap Torque**
1/2"	Parker** Primore	18-20 lbs./ft.	6-10 lbs./ft.	12-15 lbs./ft.
	Aeroquip	18-24 lbs./ft.	6-10 lbs./ft.	12-16 lbs./ft.
5/8"	Parker**	18-20 lbs./ft.	6-10 lbs./ft.	15-20 lbs./ft.
3/4"	Primore	18-20 lbs./ft.	6-10 lbs./ft.	12-15 lbs./ft.
	Aeroquip	18-24 lbs./ft.	6-10 lbs./ft.	12-16 lbs./ft.
7/8"	Parker**	18-22 lbs./ft.	6-10 lbs./ft.	15-20 lbs./ft.
1 1/8"	Primore	22-25 lbs./ft.	6-10 lbs./ft.	15-20 lbs./ft.
	Aeroquip	18-24 lbs./ft.	6-10 lbs./ft.	15-21 lbs./ft.

***Tighten each component firmly; if leaks are evident, tighten to appropriate torque.**

****Parker valves have a forged body, Primore and Aeroquip valves have a brazed body.**

To Close Suction Line Service Valve:

1 - Remove stem cap with an adjustable wrench.

2 - Insert a 5/16" hex wrench into the stem.

3 - Turn stem in clockwise to seat the valve. Tighten firmly. See table 7 for valve seating torque specifications.

4 - Replace stem cap, tighten firmly. See table 7 for stem cap torque specifications.

IV - CHARGING

The unit is factory-charged with the amount of R-22 refrigerant indicated on the unit rating plate. This charge is based on a matching indoor coil and outdoor coil with a 25 foot (7620mm) line set. For varying lengths of line set, refer to table 8 for refrigerant charge adjustment. A blank space is provided on the unit rating plate to list actual field charge.

TABLE 8

LIQUID LINE SET DIAMETER	Ounce per 5 foot (ml per mm) adjust from 25 foot (7620 mm) line set*
1/4 in. (6 mm)	1 ounce per 5 feet (30 ml per 1524 mm)
5/16 in. (8mm)	2 ounce per 5 feet (60 ml per 1524 mm)
3/8 in. (10 mm)	3 ounce per 5 feet (90 ml per 1524 mm)

***If line set is greater than 25 ft. (7.62m) add this amount. If line set is less than 25 feet (7.62m) subtract this amount**

Units are designed for line sets up to 50ft. Consult Lennox Refrigerant Piping Manual for line sets over 50ft.

⚠ IMPORTANT

If line length is greater than 25 feet (7620 mm), add this amount. If line length is less than 25 feet (7620 mm), subtract this amount.

A - Leak Testing

1- Attach gauge manifold and connect a drum of dry nitrogen to center port of gauge manifold.

⚠ CAUTION

When using dry nitrogen, a pressure reducing regulator must be used to prevent excessive pressure in gauge manifold, connecting hoses, and within the system. Regulator setting must not exceed 150 psig (1034 kpa). Failure to use a regulator can cause equipment failure resulting in injury.

2- Open high pressure valve on gauge manifold and pressurize line set and indoor coil to 150 psig (1034 kPa).

3- Check lines and connections for leaks.

NOTE-If electronic leak detector is used, add a trace of refrigerant to the nitrogen for detection by leak detector.

4- Release nitrogen pressure from the system, correct any leaks and recheck.

B - Evacuating the System

1- Attach gauge manifold. Connect vacuum pump (with vacuum gauge) to center port of gauge manifold. With both manifold service valves open, start pump and evacuate indoor coil and refrigerant lines.

⚠ IMPORTANT

A temperature vacuum gauge, mercury vacuum (U-tube), or thermocouple gauge should be used. The usual Bourdon tube gauges are not accurate enough in the vacuum range.

⚠ IMPORTANT

The compressor should never be used to evacuate a refrigeration or air conditioning system.

2- Evacuate the system to 29 inches (737mm) vacuum. During the early stages of evacuation, it is desirable to stop the vacuum pump at least once to determine if there is a rapid loss of vacuum. A rapid loss of vacuum would indicate a leak in the system and a repeat of the leak testing section would be necessary.

3- After system has been evacuated to 29 inches (737mm), close gauge manifold valves to center port, stop vacuum pump and disconnect from gauge manifold. Attach an upright nitrogen drum to center port of gauge manifold and open drum valve slightly to purge line at manifold. Break vacuum in system with nitrogen pressure by opening manifold high pressure valve. Close manifold high pressure valve to center port.

4- Close nitrogen drum valve and disconnect from gauge manifold center port. Release nitrogen pressure from system.

5- Connect vacuum pump to gauge manifold center port. Evacuate system through manifold service valves until vacuum in system does not rise above 29.7 inches (754mm) mercury (5mm absolute pressure) within a 20-minute period after stopping vacuum pump.

6- After evacuation is complete, close manifold center port, and connect refrigerant drum. Pressurize system slightly with refrigerant to break vacuum.

C - Charging

If the system is completely void of refrigerant, the recommended and most accurate method of charging is to weigh the refrigerant into the unit according to the total amount shown on the unit nameplate and in table 9.

TABLE 9

HS24 REFRIGERANT CHARGE	
Unit	**Refrigerant Charge R-22**
HS24-141	4 lbs. 5 oz.
HS24-211	4 lbs. 10 oz.
HS24-261	5 lbs. 7 oz.
HS24-311	5 lbs. 12 oz.
HS24-411	5 lbs. 15 oz.
HS24-413	5 lbs. 15 oz.
HS24-413	6 lbs. 2 oz.
HS24-461/463	9 lbs. 6 oz.
HS24-511/513	9 lbs. 0 oz.
HS24-651/653	11 lbs. 5 oz.

If weighing facilities are not available or if unit is just low on charge, the following procedure applies.

1 - Expansion Valve Systems

The following procedures are intended as a general guide for use with expansion valve systems only. For best results, indoor temperature should be between 70 °F and 80 °F. Outdoor temperature should be 60 °F or above. Slight variations in charging temperature and pressure should be expected. Large variations may indicate a need for further servicing.

⚠ IMPORTANT

The following procedure requires accurate readings of ambient (outdoor) temperature, liquid temperature and liquid pressure for proper charging. Use a thermometer with accuracy of ±2 °F and a pressure gauge with accuracy of ±5 PSIG.

1 - Connect gauge manifold. Connect an upright R-22 drum to center port of gauge manifold.

2 - Record outdoor ambient temperature.

3 - Operate indoor and outdoor units. Allow outdoor unit to run until system pressures stabilize.

4 - Make sure thermometer well is filled with mineral oil before checking liquid line temperature.

5 - Place thermometer in well and read liquid line temperature. Difference between ambient and liquid line temperatures should match values given in table 10 (approach temperature = liquid line temperature minus ambient temperature). Refrigerant must be added to lower approach temperature. Remove refrigerant from system to increase approach temperature.

TABLE 10

APPROACH METHOD - EXPANSION VALVE SYSTEMS	
Model	**Liquid Temp Minus Ambient Temp. (°F)**
HS24-141	1±1
HS24-211	5±1
HS24-261	4±1
HS24-311	8±1
HS24-411/413	10±1
HS24-461/463	16±1
HS24-511/513	7±1
HS24-651/653	10±1

6 - When unit is properly charged liquid line pressures should approximate those given in table 11.

⚠ IMPORTANT

Use table 11 as a general guide for performing maintenance checks. Table 11 is not a procedure for charging the system. Minor variations in these pressures may be expected due to differences in installations. Significant deviations could mean that the system is not properly charged or that a problem exists with some component in the system. Used prudently, table 11 could serve as a useful service guide.

TABLE 11

NORMAL OPERATING PRESSURES																	
OUTDOOR COIL ENTERING AIR TEMPERATURE	**HS24-141**		**HS24-211**		**HS24-261**		**HS24-311**		**HS24-411/413**		**HS24-461/463**		**HS24-511/513**		**HS24-651/653**	
	LIQ. ± 10 PSIG	**SUC. ± 10 PSIG**	**LIQ. ± 10 PSIG**	**SUC. ± 10 PSIG**	**LIQ. ± 10 PSIG**	**SUC. ± 10 PSIG**	**LIQ. ± 10 PSIG**	**SUC. ± 10 PSIG**	**LIQ. ± 10 PSIG**	**SUC. ± 10 PSIG**	**LIQ. ± 10 PSIG**	**SUC. ± 10 PSIG**	**LIQ. ± 10 PSIG**	**SUC. ± 10 PSIG**	**LIQ. ± 10 PSIG**	**SUC. ± 10 PSIG**
65° F (RFCII)	126	52	137	56	142	59	154	58	158	58	166	56	146	60	152	55
75° F (RFCII)	149	64	161	64	168	66	181	64	185	64	191	65	167	66	179	62
85° F (RFCII)	178	71	188	71	194	72	210	70	218	70	223	71	200	71	206	67
95° F (RFCII)	208	78	216	77	220	78	238	75	250	75	255	77	231	75	233	72
105° F (RFCII)	236	83	252	80	253	81	276	78	283	77	294	80	261	79	278	75
65° F (TXV)	126	58	133	60	140	63	151	61	164	60	163	58	146	63	147	59
75° F (TXV)	149	70	157	68	164	70	178	67	191	66	188	67	167	69	174	66
85° F (TXV)	178	77	184	75	190	76	207	73	218	72	220	73	200	74	201	71
95° F (TXV)	208	79	214	77	221	78	238	75	251	74	255	78	231	76	233	73
105° F (TXV)	236	84	250	80	254	81	276	78	292	77	294	81	261	80	278	76

2 - RFCII Systems

The following procedures are intended as a general guide for use with RFCII systems only. For best results, indoor temperature should be between 70 °F and 80 °F. Outdoor temperature should be 60 °F or above. Slight variations in charging temperature and pressure should be expected. Large variations may indicate a need for further servicing.

⚠ IMPORTANT

The following procedure requires accurate readings of ambient (outdoor) temperature, liquid temperature and liquid pressure for proper charging. Use a thermometer with accuracy of ±2 °F and a pressure gauge with accuracy of ±5 PSIG.

1 - Connect gauge manifold. Connect an upright R-22 drum to center port of gauge manifold.

2 - Operate indoor and outdoor units. Allow outdoor unit to run until system pressures stabilize.

3 - Make sure thermometer well is filled with mineral oil before checking liquid line temperature.

4 - Place thermometer in well and read liquid line temperature.

5 - Read liquid line pressure.

6 - Convert liquid line pressure to condensing temperature.

7 - Subtract liquid line temperature from condensing temperature to determine subcooling. Compare with table12.

8 - Add refrigerant to increase subcooling. Remove refrigerant to decrease subcooling.

9 - When unit is properly charged liquid line pressures should approximate those given in table 11.

TABLE 12

SUBCOOLING METHOD								
Outdoor Temp. (°F)	Liquid Subcooling (± 1 °F)							
	-141	-211	-261	-311	-410	-460	-510	-650
60	9	11	14	18	15	15	20	17
65	8	11	14	17	14	15	19	16
70	7	10	13	17	13	14	19	16
75	7	10	13	16	12	14	18	15
80	6	9	12	16	11	13	18	15
85	6	9	12	15	10	13	17	14
90	5	8	11	15	9	12	17	14
95	4	8	11	14	8	12	16	13
100	4	7	10	13	6	11	15	13
105	3	6	10	12	5	10	15	12
110	3	6	9	11	4	10	14	11
115	2	5	8	9	2	9	13	10

D - Oil Charge

Table 4 on page 3 shows the factory oil charge in HS24 units.

V - Maintenance

At the beginning of each heating or cooling season, the system should be cleaned as follows:

A - Outdoor Unit

1 - Clean and inspect condenser coil. (Coil may be flushed with a water hose).

2 - Condenser fan motor is prelubricated and ports are sealed with plugs. No further lubrication is required. Oiling ports can be accessed for lubrication after extended operation by removing plugs. Be sure to securely seal after servicing.

3 - Visually inspect all connecting lines, joints and coils for evidence of oil leaks.

⚠ IMPORTANT

If insufficient heating or cooling occurs, the unit should be gauged and refrigerant charge checked.

B - Indoor Coil

1 - Clean coil if necessary.

2 - Check connecting lines, joints and coil for evidence of oil leaks.

3 - Check condensate line and clean if necessary.

C - Indoor Unit

1 - Clean or change filters.

2 - Use the following as a guide when lubricating the blower motor:

a- *Motors without Oiling Ports* -- Prelubricated and sealed. No further lubrication required.

b- *Direct Drive Motors with Oiling Ports* -- Prelubricated for an extended period of operation. For extended bearing life, relubricate with a few drops of SAE 10 non-detergent oil once every two years. It may be necessary to remove blower assembly for access to oiling ports.

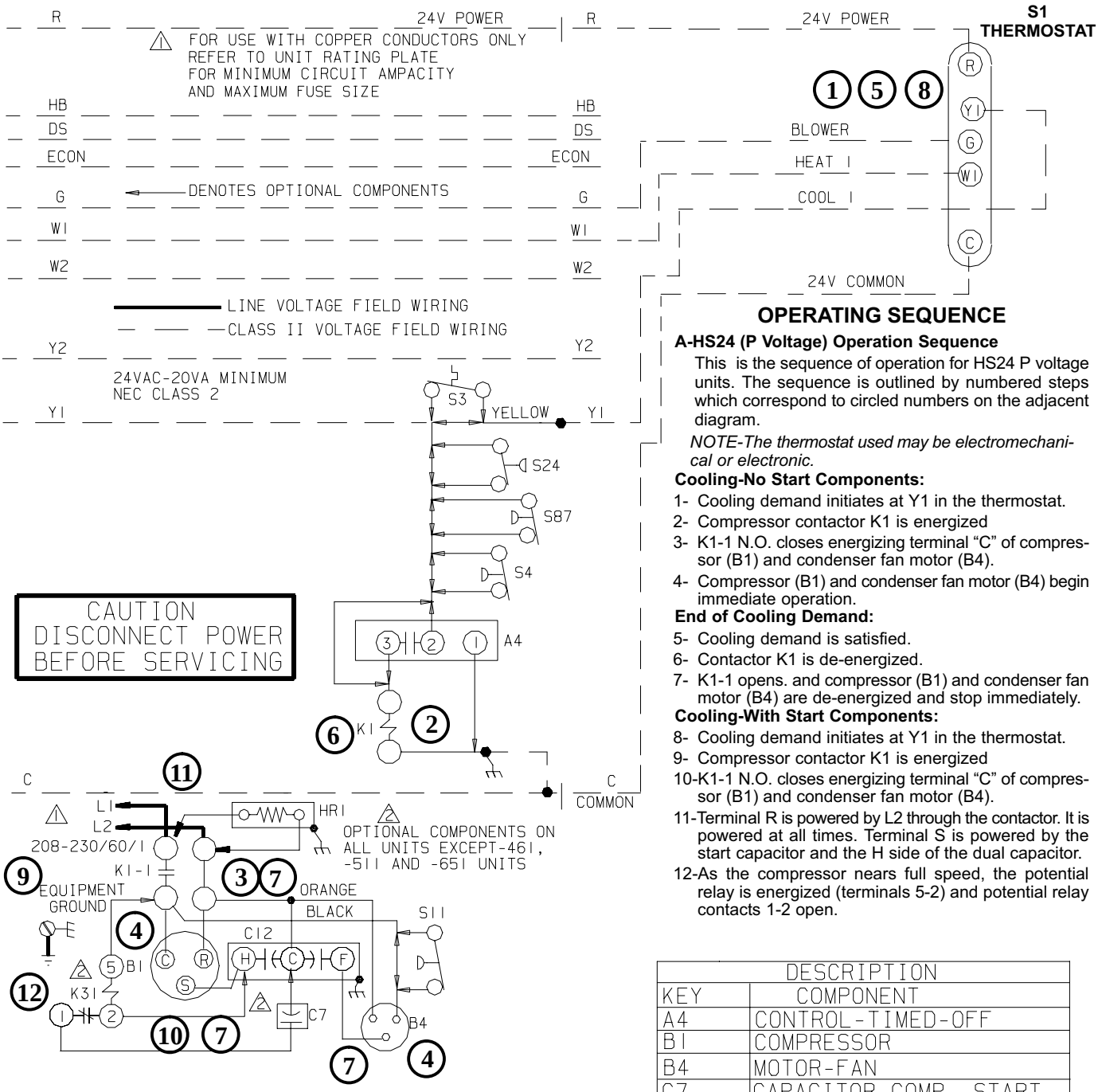
3 - Adjust blower speed for cooling. The static pressure drop over the coil should be checked to determine the correct blower CFM. Refer to Lennox Engineering Handbook for Static Pressure and CFM tables.

4 - Check all wiring for loose connections.

5 - Check for correct voltage at unit.

6 - Check amp-draw on blower motor.
Unit nameplate_____Actual_____.

SINGLE PHASE OPERATING SEQUENCE



OPERATING SEQUENCE

A-HS24 (P Voltage) Operation Sequence

This is the sequence of operation for HS24 P voltage units. The sequence is outlined by numbered steps which correspond to circled numbers on the adjacent diagram.

NOTE-The thermostat used may be electromechanical or electronic.

Cooling-No Start Components:

1- Cooling demand initiates at Y1 in the thermostat.
2- Compressor contactor K1 is energized
3- K1-1 N.O. closes energizing terminal “C” of compressor (B1) and condenser fan motor (B4).
4- Compressor (B1) and condenser fan motor (B4) begin immediate operation.

End of Cooling Demand:

5- Cooling demand is satisfied.
6- Contactor K1 is de-energized.
7- K1-1 opens. and compressor (B1) and condenser fan motor (B4) are de-energized and stop immediately.

Cooling-With Start Components:

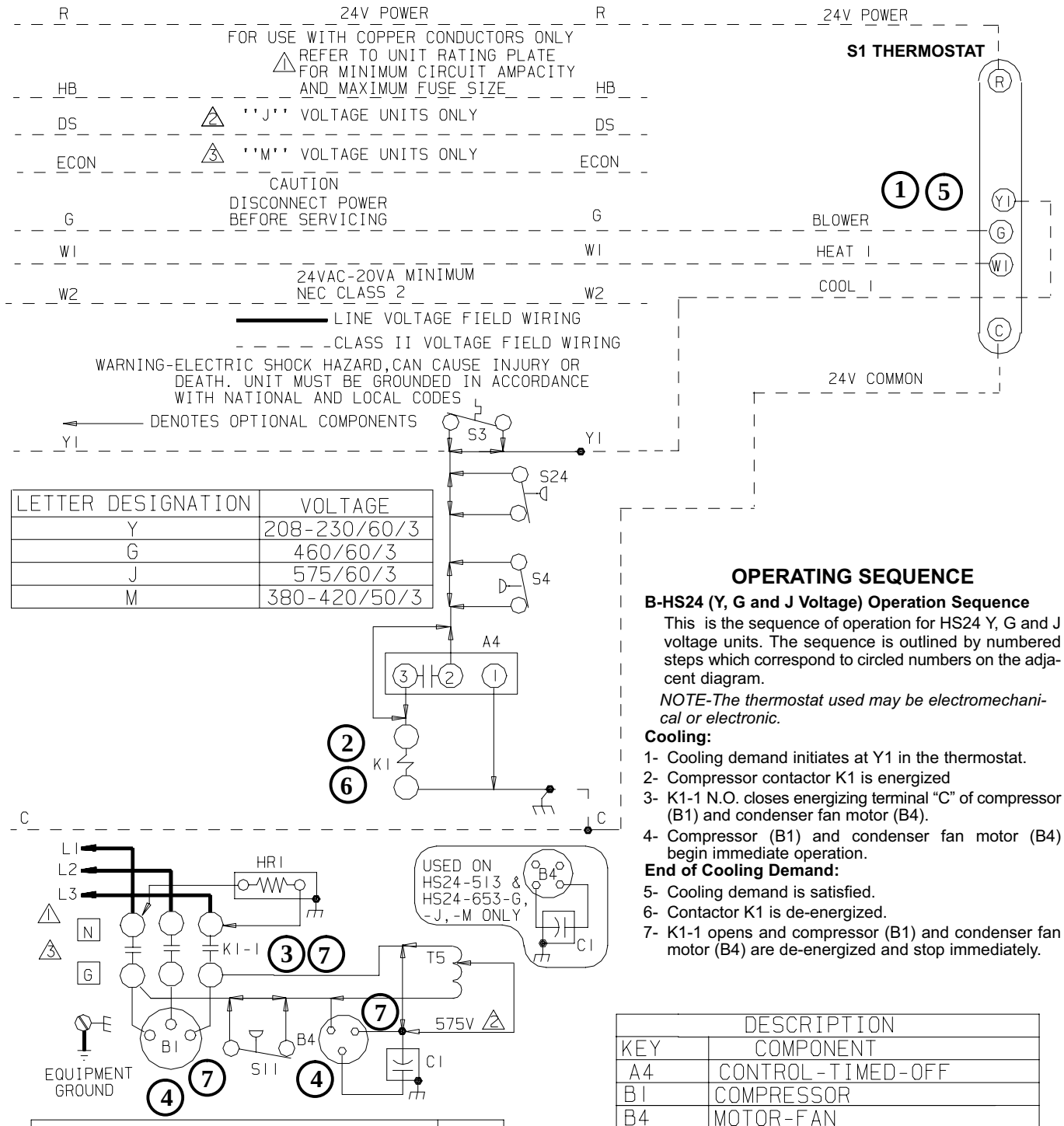
8- Cooling demand initiates at Y1 in the thermostat.
9- Compressor contactor K1 is energized
10-K1-1 N.O. closes energizing terminal “C” of compressor (B1) and condenser fan motor (B4).
11-Terminal R is powered by L2 through the contactor. It is powered at all times. Terminal S is powered by the start capacitor and the H side of the dual capacitor.
12-As the compressor nears full speed, the potential relay is energized (terminals 5-2) and potential relay contacts 1-2 open.

LENNOX® Industries Inc.	WIRING DIAGRAM	10/91 2/92
COOLING UNITS-CONDENSING UNITS		
HS24-141,-211,-261,-311-1,-P HS24-411,-461,-511,-651-1,-P		
COOLING UNITS-SEC. B		
Supersedes Form No.	New Form No. 529,213W	

 Litho U.S.A.

DESCRIPTION	
KEY	COMPONENT
A4	CONTROL-TIMED-OFF
B1	COMPRESSOR
B4	MOTOR-FAN
C7	CAPACITOR-COMP. START
C12	CAPACITOR-DUAL
HR1	HEATER-COMPRESSOR
K1-1,2	CONTACTOR-COMPRESSOR
K31	RELAY-HARD START KIT
S3	LIMIT LOW COMP. TEMP.
S4	LIMIT-HI PRESS. COMP.
S11	SWITCH-PRESS.LO AMB KIT
S24	SWITCH-LOSS OF CHARGE
S87	SWITCH-LO PRESS.LIMIT

THREE PHASE OPERATING SEQUENCE



LETTER DESIGNATION	VOLTAGE
Y	208-230/60/3
G	460/60/3
J	575/60/3
M	380-420/50/3

OPERATING SEQUENCE

B-HS24 (Y, G and J Voltage) Operation Sequence

This is the sequence of operation for HS24 Y, G and J voltage units. The sequence is outlined by numbered steps which correspond to circled numbers on the adjacent diagram.

NOTE-The thermostat used may be electromechanical or electronic.

Cooling:

1- Cooling demand initiates at Y1 in the thermostat.
2- Compressor contactor K1 is energized
3- K1-1 N.O. closes energizing terminal "C" of compressor (B1) and condenser fan motor (B4).
4- Compressor (B1) and condenser fan motor (B4) begin immediate operation.

End of Cooling Demand:

5- Cooling demand is satisfied.
6- Contactor K1 is de-energized.
7- K1-1 opens and compressor (B1) and condenser fan motor (B4) are de-energized and stop immediately.

DESCRIPTION	
KEY	COMPONENT
A4	CONTROL-TIMED-OFF
B1	COMPRESSOR
B4	MOTOR-FAN
C1	CAPACITOR-OUTDOOR FAN
HR1	HEATER-COMPRESSOR
K1-,-1	CONTACTOR-COMPRESSOR
S3	LIMIT-LOW COMP. TEMP.
S4	LIMIT-HI PRESS. COMP.
S11	SWITCH-PRESS.LO AMB. KIT
S24	SWITCH-LOSS OF CHARGE
T5	TRANSFORMER-OUTDOOR FAN

LENNOX® Industries Inc. WIRING DIAGRAM 10/91 3/92

COOLING UNITS-CONDENSING UNITS

HS24-413,-463-1,Y,G,J,M
HS24-513,-653-1,Y,G,J,M

COOLING UNITS-SEC. B

Supersedes Form No.	New Form No.
	529,328W