

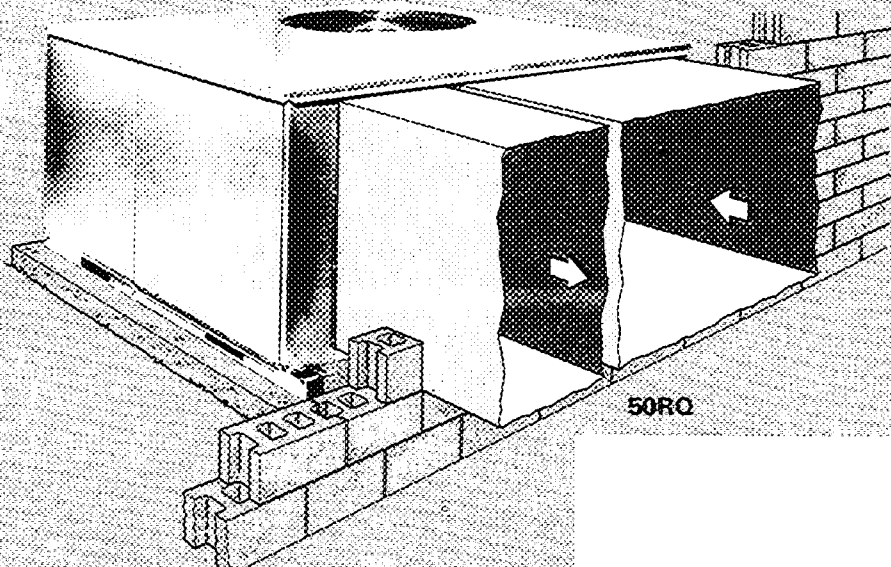
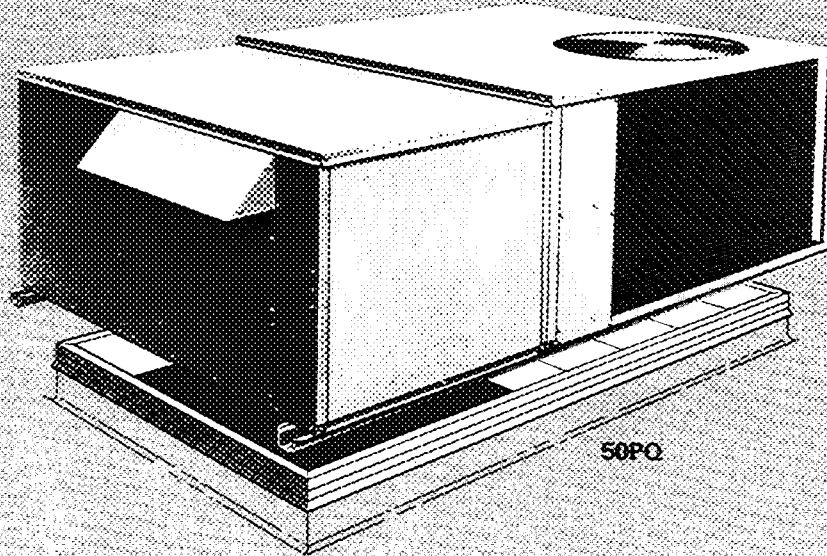
# Carrier Single-Package Heat Pumps

*reprinted*  
9/78

## 50RQ, PQ

Heating 62,000 to 112,000 Btuh  
Cooling 59,000 to 107,000 Btuh

The number 1 package  
for heating & cooling commercial,  
industrial or educational buildings -  
in 5, 7½ and 9 ton capacities.



# The heat pump reverse cycle controls the weather all year round

The Carrier single package heat pump — compact, efficient, reliable. It puts the weather to work for you and lowers operating costs.

Thermodynamically, there is no difference between a heat pump and an air conditioning unit or refrigerator. The heat pump moves heat from a colder heat source to a warmer heat sink thru the vapor compression cycle. (The same as a refrigerator or air conditioner.)

The difference, from a practical standpoint, is in the heat pump's ability to *reverse* the roles of the evaporator and condenser coils.

The heat pump takes advantage of the fact that even cold winter air contains heat that can be absorbed for heating a building. During cooling season operation, the unit can be set to reverse the evaporator and condenser coils, absorbing heat from inside the building and discharging it outside — like a standard air conditioner.

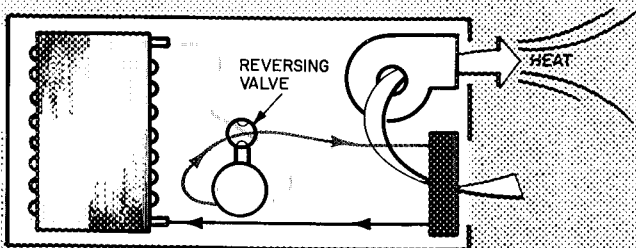
The operating cost advantage of the heat pump occurs primarily during the heating mode. Depending on outdoor temperature, the heat pump can actually produce two to three units of heating energy for every unit of electrical energy it uses.

The heat pump's cost saving reverse cycle principle uses refrigerant circulated within a compact, closed circuit coil to absorb and transfer heat from one area to another.

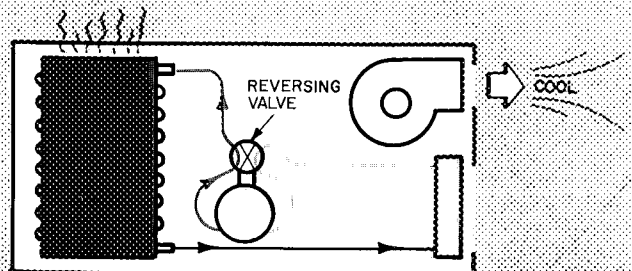
The process begins with the evaporator (cooling) coil absorbing heat from the air around it. The compressor then pumps the refrigerant to the condenser where this heat is then rejected to the surrounding air.

As shown in the diagram, the heat pump makes double use of the two coils by means of a reversing valve. The two coils alternate as evaporator or condenser, depending on whether cooling or heating is required.

**Heating Cycle** — Refrigerant enters the outdoor coil (evaporator) at a lower temperature than the surrounding outdoor air and heat is absorbed by refrigerant. The refrigerant then passes thru the reversing valve and into the compressor where it is brought to a high temperature and pressure. The hot refrigerant leaves the compressor, flows thru the reversing valve to the indoor coil (condenser). Heat is then rejected to the return air from the hot refrigerant as the return air passes over the indoor coil (condenser).



**Cooling Cycle** — The two coils exchange roles as evaporator and condenser thru the action of the reversing valve. Although reversed, system operation is exactly the same. Refrigerant enters the evaporator (indoor coil) at a lower temperature than the return air, heat is absorbed from indoors, the cooler air is then distributed throughout the building. Refrigerant leaves the evaporator, flows thru the reversing valve and into the compressor where it is brought to a higher temperature and pressure. The hot refrigerant gas flows from the compressor, thru the reversing valve and into the outdoor coil (condenser). The outdoor coil (condenser) rejects the heat from the hot refrigerant to the cooler outdoor air as it passes over the coil. The heat transfer cycle is now ready to be repeated.



# A great performer... with unmatched versatility

As the concern for energy grows and grows, Carrier's 50RQ/PQ single package heat pump looks better and better. Short gas supply and high cost electric power are no problem with these versatile units in operation. They're engineered for a wide range of application . . . and installation is easy. For a curbed heat pump with plenum, in one piece ready to swing into place, there's the 50PQ rooftop. Or select the RQ uncurbed . . . on a slab for horizontal air delivery. Or take the RQ, attach the accessory plenum at

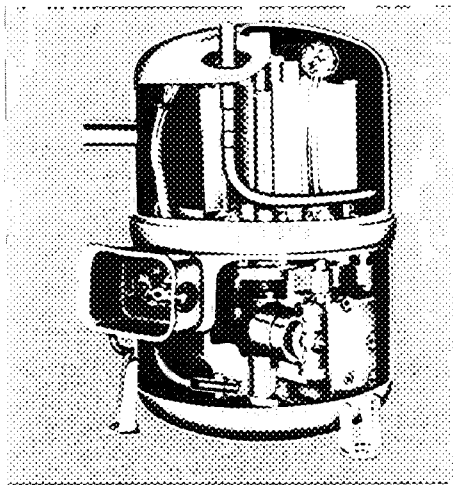
the jobsite and it's a PQ.

With an excellent cooling EER, heating C.O.P. among the highest in industry, factory installed options and field installed accessories, these units will match specifications for the most varied building requirements.

If you're looking for the reliable one, the efficient one, the flexible one . . . the number 1 heat pump on the market, LOOK TO CARRIER!

## New and improved features for a lifetime of dependable performance.

○ New compressor for heavy duty service — Carrier's new P compressor more than meets the rigorous demands of heat pump operation. Most efficient and reliable hermetic in Carrier equipment. Thicker crankshaft. Bigger bearing journals. Larger valves. Extra large oil pump. Crankcase heater.



○ Exclusive, innovative variable circuit refrigeration system — capacity and C.O.P. are among the highest in industry. Maximizes refrigerant to air heat transfer on both heating and cooling cycles. No other heat pump has it. **Carrier Exclusive.**

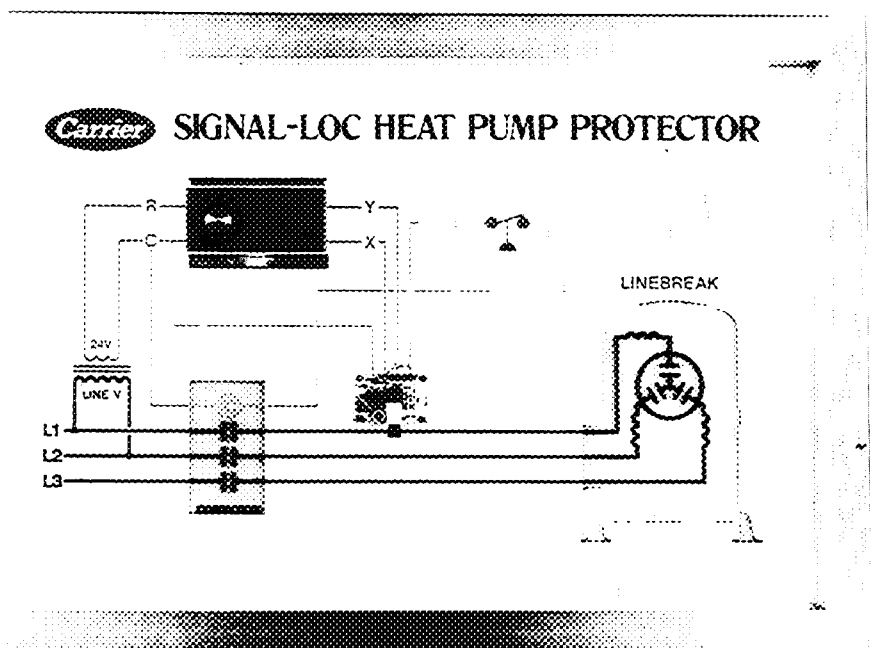
○ Automatic defrost system — Keeps coil frost-free at temperatures below 40 F. Chrono-temp control activates defrost system every 90 minutes if required. Automatically deactivates defrost cycle when coil is clear or after a maximum of 10 minutes. **Carrier Exclusive.**

○ **Signal-LOC™** — Carrier's new compressor protection system. Holds the compressor off the line if any operational or safety device trips the compressor. Operation of any one of the following devices trips the compressor and lights an indicator light on thermostat: low-pressure switch, high-pressure switch, indoor coil freezeup thermostat, internal line-break overload. Unit can be reset manually at the thermostat. **Carrier Exclusive.**

○ Separate System capability (008,010 units) — Individual, independent refrigeration systems. Operate circuit required

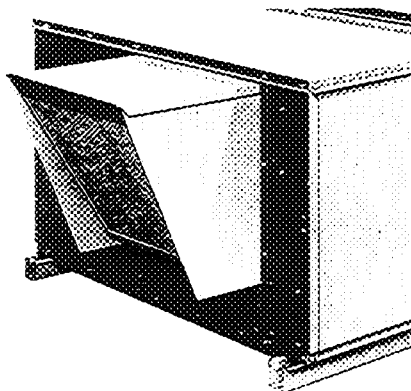
to maintain desired temperature. Provides for stand-by operation. Less down time, lowers service costs. Dual compressor units with 2-stage heating and cooling — operate with excellent part-load performance on heating and cooling. Electric resistance heat is locked out above 40 F. This lowers demand charges and costs. **Carrier Exclusive.**

○ Terminal strip — located in base unit control box for easy connection to room thermostat, outdoor thermostat(s), emergency heat control, economizer and electric heat.

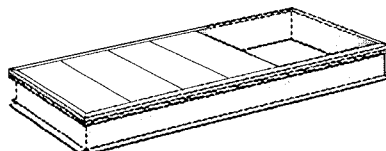


# Accessories and factory installed options

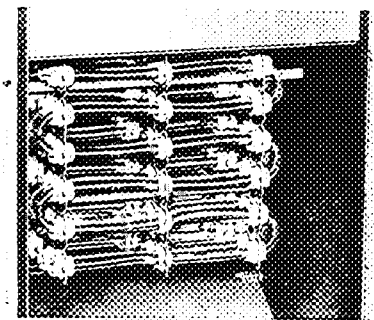
**Economizer assembly** is available as a factory-installed option or field-installed accessory. Located in plenum, it provides low-cost cooling on in-between days. Automatically controlled dampers open to admit cool, filtered outdoor air. The compressor(s) and outdoor air fan remain off to save energy if the outdoor temperature is low enough to satisfy cooling requirements without compressor operation.



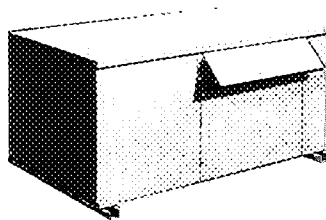
**Roof Curb** with insulated base pans supports PQ unit (RQ unit with accessory plenum) and frames roof opening for plenum and interior ductwork. Once curb is in place, and ductwork connected, unit can be placed anytime — to meet your schedule. Curb design meets all National Roofing Contractors Association (NRCA) requirements.



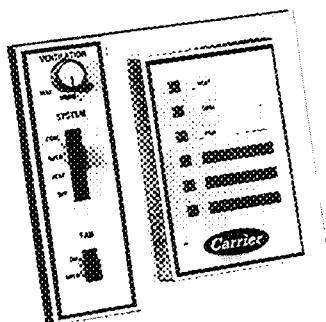
**Electric resistance heaters** — Available as factory-installed option or for field installation. Complete with high temperature limit switches and overcurrent protection. Offered in 4 heating capacities for each unit. Where heaters are factory installed, unit electrical input is single-point at a factory-supplied terminal block. Connection point is suitable for copper or aluminum wire (except for 200-v, 3-phase unit with 1.5:1 electric heat ratio which uses copper only).



**Downturn plenum** is standard equipment, factory-installed on PQ units, field-installed accessory on RQ units. Directs airflow downward and provides weather-proof openings for ductwork connections. Unit with plenum is curb mounted.



**Remote control panel** consists of a separate heating and cooling thermostat assembly plus a decorative wall-mounted panel. In addition to switches for heating, cooling and fan operation, the panel contains 6 indicator lights and, for economizer-equipped units, a ventilation control knob.



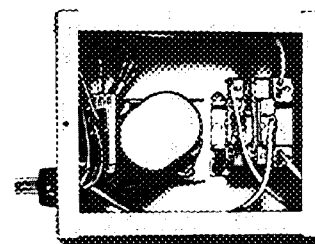
**Alternate motor and drive**, a factory-installed option, provides extra performance for installations requiring higher horsepower than the standard motor has to offer.

**Thermostat and subbase (24 V)** — Accessory package provides for selection of heating, cooling, continuous or automatic fan operation. Works hand-in-hand with Signal-LOC™ circuit. Subbase has warning light (LK-OUT) to automatically indicate compressor lockout condition. Occupant is immediately aware if compressor is inoperative due to malfunction.

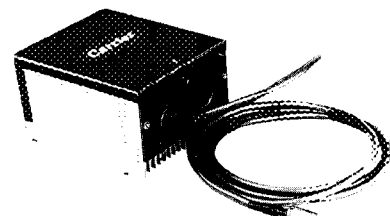
**Emergency heat control** — Accessory emergency heat subbase and relay allow occupant to manually switch compressor off and electric heat on if warning light indicates system malfunction. Can be used for quick morning warm-up or to merely lock out compressor.

**Outdoor thermostat(s)** — Used to lock out electric heat above certain outdoor temperature for economical operation. Field-installed with wide range of adjustments available to suit building design requirements.

**Time Guard® circuit** protects compressor against thermostat "jiggling," automatically prevents compressor from restarting for at least 5 minutes after a shutdown. Accessory prevents short cycling of compressor if thermostat is rapidly changed (field installed).



**Motormaster® Head Pressure Control** — Units are designed to operate at outdoor temperatures down to 35 F on cooling mode. Below 35 F, accessory 32LT Motormaster control modulates outdoor fan motor to maintain correct condensing temperature at outdoor temperatures down to -20 F.





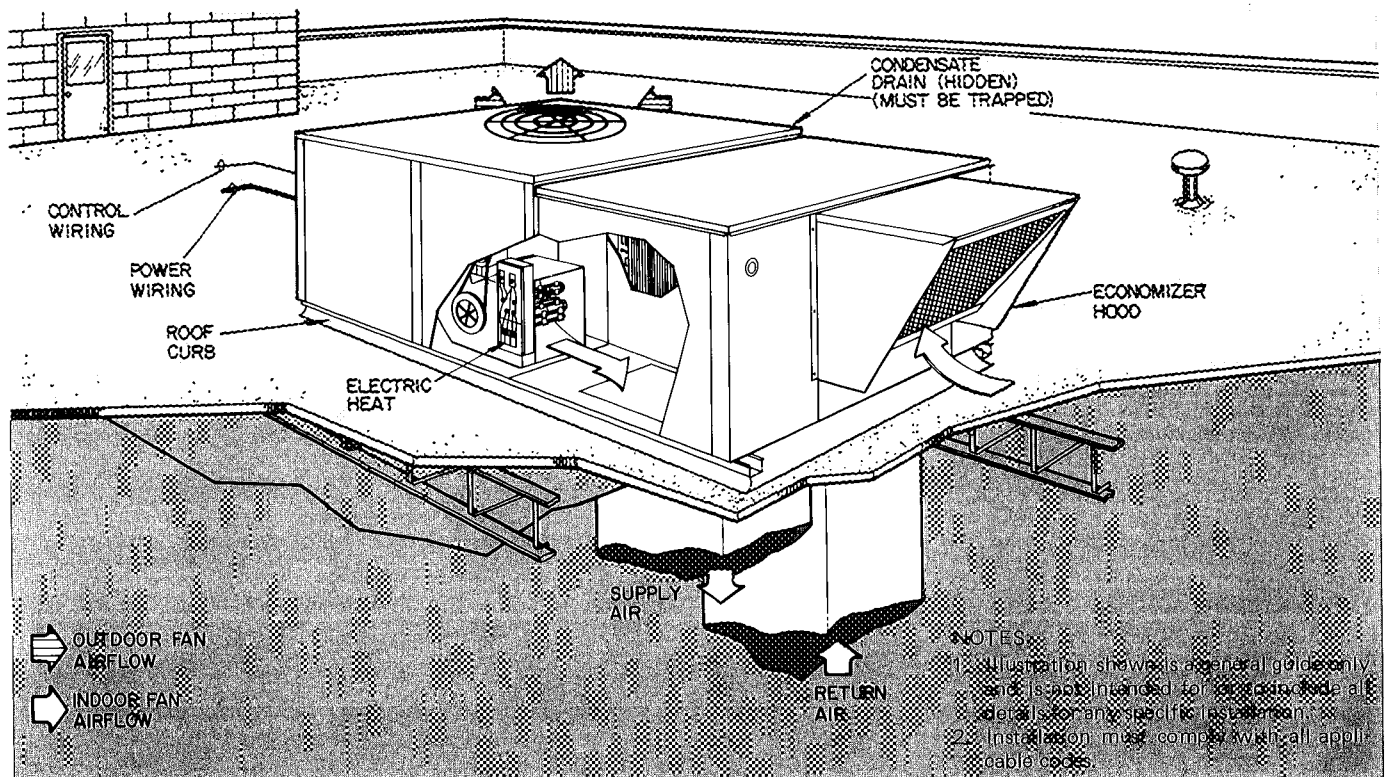
# Physical data

UNIT 50RQ,PQ	006	008	010
<b>OPERATING WEIGHT (lb)</b>			
Unit 50RQ (no plenum)	460	765	825
Unit 50PQ (plenum)	590	925	1005
With Economizer	620	955	1035
Roof Curb	175	225	225
<b>COMPRESSOR</b>	Carrier Full Hermetic, 2 Cylinders		
No. ...Type	1 .6P	2...6P	2. P
Capacity Steps (%)	0, 100	0, 50, 100	0, 60, 100
<b>REFRIGERANT</b>	R-22	R-22	R-22
Charge (lbs) Sys 1, Sys 2	9 2, -	6 4, 7 0	10 5, 8 0
<b>OUTDOOR COIL</b>	2-Row, Copper Tube, 15 Aluminum Plate Fins/in		
Total Face Area (sq ft)	11.7	17.0	22.5
<b>OUTDOOR AIR FAN</b>	Propeller Type, Direct Drive		
Nominal Cfm	4000	7000	7000
No. ...Diam (in.)	1. 22	1 .26	1. 26
Motor Hp...Kw	½ ..0.8	¾. 1.1	1.. 1.35
<b>INDOOR COIL</b>	Copper Tube, 15 Aluminum Plate Fins/in.		
Total Face Area (sq ft)	4 0	6 56	8 5
Rows	4	4	4
<b>INDOOR AIR FAN</b>	One, Centrifugal Adjustable Belt Drive		
Size (in.)	10x9	12x11	12x11
Nominal Cfm	2000	3000	3600
Rpm Range	Std 920-1300 Alt 1070-1460	690- 980 805-1093	690- 980 800-1090
Max Allowable Rpm	1600	1500	1500
Fan Pulley Pitch Diam (in.)	Std 9 0 Alt 9 0	12 12	6 6
Center Line Distance (in.)	15¼	16¾	16¾
Motor Hp (See note)	Std ¾ Alt 1	1 1½	1½ 2
Max Bhp	Std 1.18 Alt 1.69	1.69 2.11	2.5 2.7
<b>INDOOR AIR FILTERS (50DP) TYPE</b>	10% efficient, Disposable Fiber Glass		
No. ...Size (in.)*	2 20x25x1	2 20x25x1 2...16x25x1	2 20x25x2 2 16x25x2

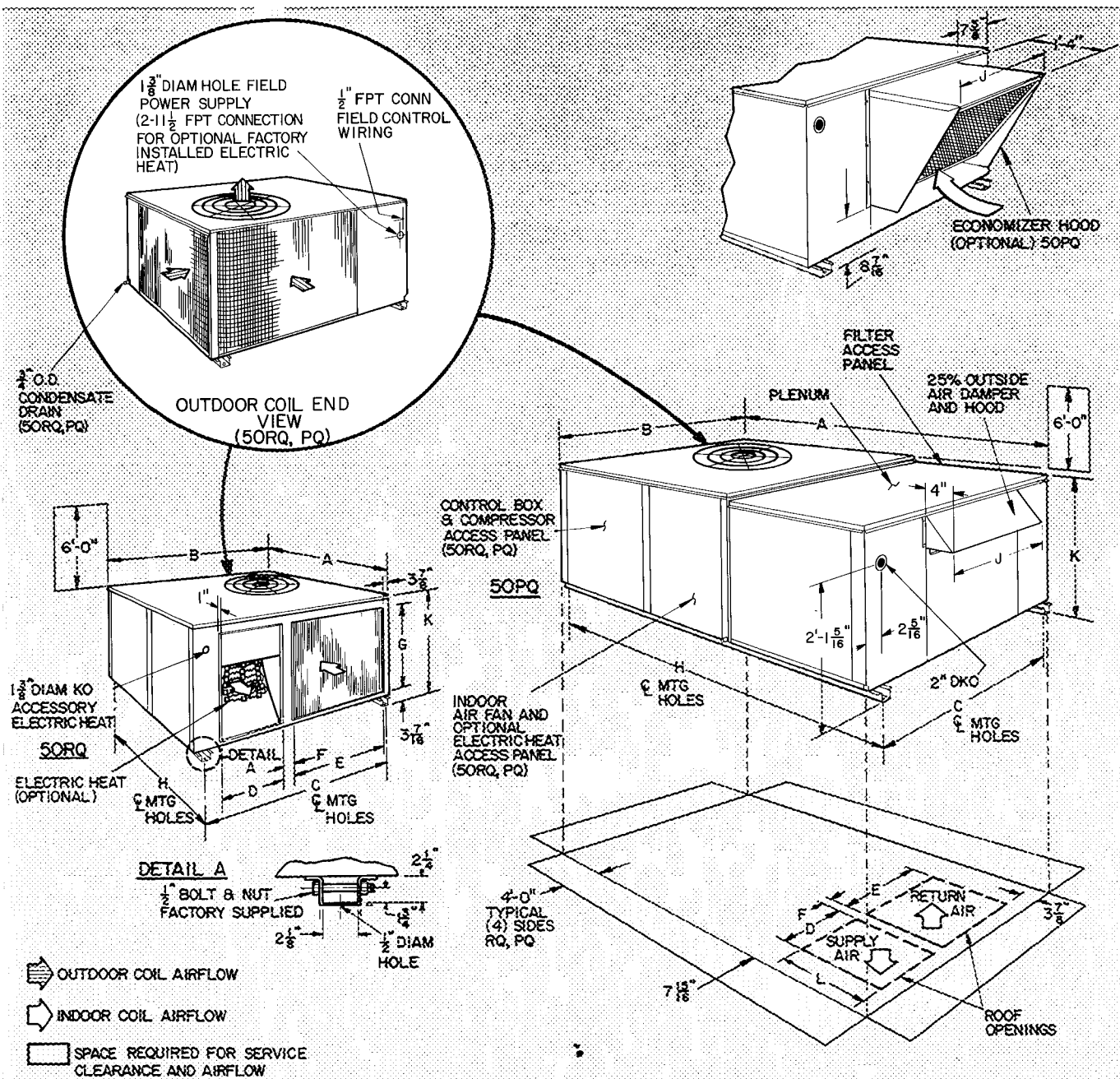
\*Factory installed in plenum Unit 50RQ,PQ008 will accept 2-in thick filters, field supplied

NOTE: Nominal rpm for 50RQ,PQ006,008 is 3450; for 50RQ,PQ010 is 1725

## Typical piping and wiring



# Base unit dimensions

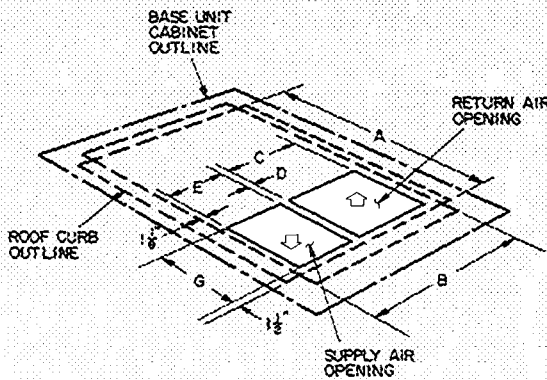
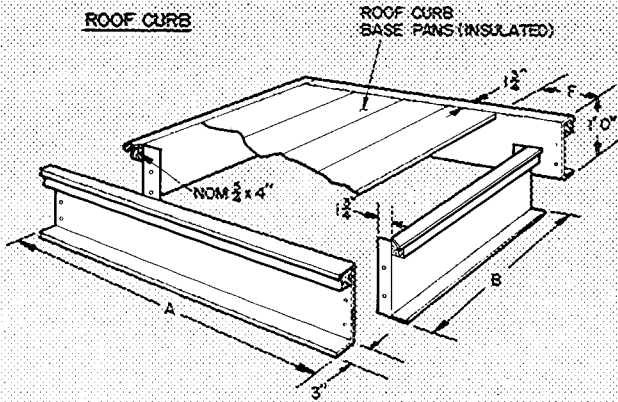


DIMENSIONS (ft.-in.)

UNIT	A	B	C	D	E	F	G	H	J	K	L
50RQ006	3- 8 1/2	4-1 1/2	3-7 15/16	1-0 23/32	2- 0	0-2 3/16	2-0 3/16	3-10 3/4	-	2-6 3/8	-
50RQ008	5- 0 13/16	5-2"	4-8 13/16	1-2 33/64	2-11	0-2 3/16	2-1 1/2	5- 3	-	2-6 3/8	-
50RQ010	5- 0 13/16	5-2"	4-8 13/16	1-2 33/64	2-11	0-2 3/16	2-9 3/8	5- 3	-	3-2 3/8	-
50PQ006	5-11 1/2	4-1 1/2	3-7 13/16	1-1 1/8	1- 6 1/2	0-1 3/8	-	6- 1 3/16	1-8 3/16	2-5 3/16	1-4 1/2
50PQ008	7-10	5-2"	4-8 33/64	1-5 23/64	2- 3 3/8	0-1 1/8	-	7-11 13/16	2-5 3/8	2-5 3/8	1-4 3/8
50PQ010	8- 3 3/4	5-2"	4-8 13/16	1-5 13/16	2- 3 3/8	0-1 1/8	-	8- 5 3/8	2-5 3/8	3-1 1/8	2-0

Certified dimension drawings are available on request.

# Accessory dimensions

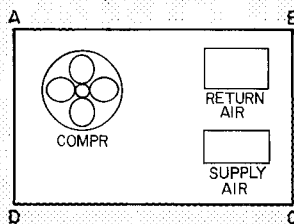


**ROOF CURB DIMENSIONS**  
(ft.-in.)\*

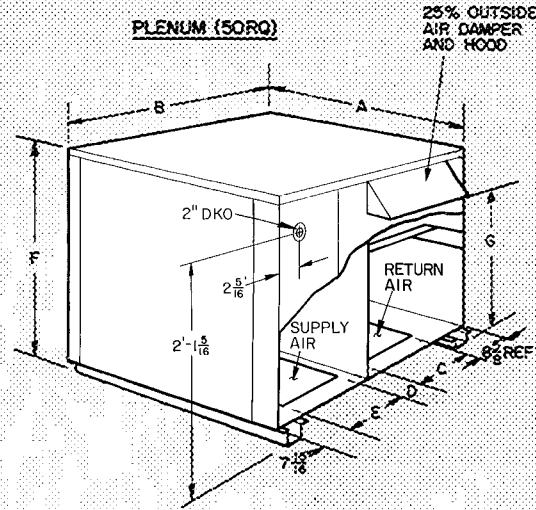
BASE UNIT	50PQ006	50PQ008	50PQ010
A	5- 4 <sup>5</sup> / <sub>16</sub>	7-0 <sup>7</sup> / <sub>16</sub>	7-0 <sup>7</sup> / <sub>16</sub>
B	2-11 <sup>7</sup> / <sub>16</sub>	4-0 <sup>7</sup> / <sub>16</sub>	4-0 <sup>7</sup> / <sub>16</sub>
C	1- 6 <sup>5</sup> / <sub>16</sub>	2-3 <sup>3</sup> / <sub>16</sub>	2-3 <sup>3</sup> / <sub>16</sub>
D	0- 1 <sup>3</sup> / <sub>16</sub>	0-1 <sup>3</sup> / <sub>16</sub>	0-1 <sup>3</sup> / <sub>16</sub>
E	1- 1 <sup>7</sup> / <sub>16</sub>	1-5 <sup>1</sup> / <sub>16</sub>	1-5 <sup>1</sup> / <sub>16</sub>
F	1- 7 <sup>7</sup> / <sub>16</sub>	2-0 <sup>7</sup> / <sub>16</sub>	2-0 <sup>7</sup> / <sub>16</sub>
G	1- 4 <sup>5</sup> / <sub>16</sub>	1-4 <sup>5</sup> / <sub>16</sub>	2-0

\*Curb dimensions also apply to 50RQ units with field-installed accessory plenum.

**BASE UNIT CORNER WEIGHTS (lb) FOR ROOF INSTALLATION**



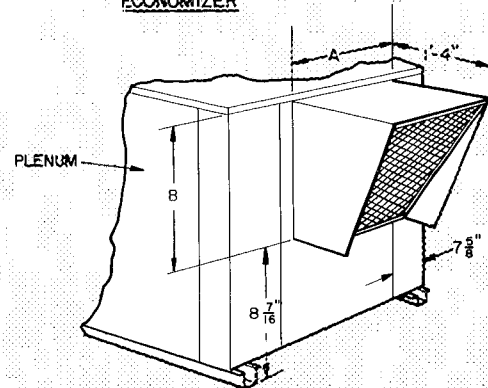
UNIT		A	B	C	D
50RQ	006	104	84	121	150
	008	157	142	222	244
	010	169	153	239	264
50PQ	006	150	108	126	176
	008	214	134	221	356
	010	267	207	231	299



**PLENUM DIMENSIONS**  
(ft.-in.)

BASE UNIT	50RQ006	50RQ008	50RQ010
A	2- 3	2- 9 <sup>1</sup> / <sub>16</sub>	3-2 <sup>7</sup> / <sub>16</sub>
B	4- 1 <sup>1</sup> / <sub>2</sub>	5- 2 <sup>5</sup> / <sub>16</sub>	5-2 <sup>5</sup> / <sub>16</sub>
C	1- 6 <sup>5</sup> / <sub>16</sub>	2- 3 <sup>3</sup> / <sub>16</sub>	2-3 <sup>3</sup> / <sub>16</sub>
D	0- 1 <sup>3</sup> / <sub>16</sub>	0- 1 <sup>3</sup> / <sub>16</sub>	0-1 <sup>3</sup> / <sub>16</sub>
E	1- 1 <sup>7</sup> / <sub>16</sub>	1- 5 <sup>1</sup> / <sub>16</sub>	1-5 <sup>1</sup> / <sub>16</sub>
F	2- 5 <sup>1</sup> / <sub>16</sub>	2- 5 <sup>1</sup> / <sub>16</sub>	3-1 <sup>1</sup> / <sub>16</sub>
G	1-11 <sup>7</sup> / <sub>16</sub>	1-11 <sup>7</sup> / <sub>16</sub>	2-7 <sup>7</sup> / <sub>16</sub>

**ECONOMIZER**



**ECONOMIZER HOOD DIMENSIONS**  
(ft.-in.)

UNIT	50RQ, PQ006	50RQ, PQ008	50RQ, PQ010
A	1-8 <sup>5</sup> / <sub>16</sub>	2-5 <sup>5</sup> / <sub>16</sub>	2-7 <sup>5</sup> / <sub>16</sub>
B	1-7 <sup>5</sup> / <sub>16</sub>	1-7 <sup>5</sup> / <sub>16</sub>	2-3 <sup>5</sup> / <sub>16</sub>

# Selection procedure (with example)

## I Determine job requirements.

Estimated requirements

Cooling load — total capacity . . . . .	54,000 Btuh
— sensible capacity . . . . .	42,000 Btuh
Outside air temperature (Cooling) . . . . .	95 F
Air entering indoor coil (Cooling) wb . . . . .	64 F
db . . . . .	80 F
Air quantity (cfm) . . . . .	2,000
External static pressure — ESP (in. wg) . . . . .	0.4
Heating load . . . . .	60,000 Btuh
Outdoor temperature (winter design) . . . . .	-10 F
Air entering indoor coil (Heating) . . . . .	70 F
Power supply . . . . .	230-3-60

## II Determine unit size.

Select unit on cooling capacity.  
Enter the cooling capacity table at the given air quantity and evaporator entering wet bulb (2,000 cfm, 64 ewb). Read across table for net total capacity (TC) and net sensible capacity (SHC), under the condenser entering air temperature (95 F) to find by interpolation TC of 56,000 and SHC of 47,400 at 2,000 cfm, 64 F wb for the 50RQ006.

Since these net capacities have been calculated at 0.2 in. wg external static (ARI condition), for any additional static — the net capacities must be adjusted to reflect the resulting IFM heat. To obtain the total required static, all accessory pressure drops must be calculated. Therefore, calculation of heater requirements must be made since pressure drop varies for each size of electric heater.

## III Heating requirements — number of electric heaters required.

Enter instantaneous/integrated heating ratings at 006 size and 2,000 cfm. Under temperature at air entering outdoor coil, -10 F, the integrated heating capacity is 18,000 Btuh. The heating load is 60,000 Btuh, therefore, 42,000 Btuh additional electric heat is necessary. Enter electric resistance heater capacity table at 006 size and 230-3-60. The .75:1 heat ratio/or 13 Kw electric heater most closely satisfies the electric heater requirement.

13 Kw or                   — 44,400 Btuh (from Electric Heating Capacities Table)  
44,400 + 18,000 — 62,400 Btuh

## IV Adjustments to capacities and Kw's for additional indoor fan motor heat for statics above 0.2 in. wg at listed cfm's.

The .75:1 electric heater resistance at 2,000 cfm is 0.26 in. wg ESP; therefore, to obtain 0.4 in. wg required, the fan must operate at 2,000 cfm with 0.66 ESP to overcome the heater pressure drop.

From the fan tables at 2,000 cfm with 0.66 ESP requires 1,208 rpm, 1,130 watts.

NOTE For PQ units or RQ units with plenums, use PQ fan table at required ESP.

	ESP	IFM Kw
2,000 cfm	*.2	83
	.66	1.13
	(Diff in Kw) =	0.30

\*NOTE Use motor Kw from RQ fan tables for .2 in ESP at specified cfm for all plenum applications.

Adjust all capacities for additional IFM heat at higher statics than .2 in. wg.

$$\text{Diff (Btuh)} = 3,413 \text{ Btu/Kw} \times \text{Kw}$$

$$= 3,413 \times .30 = 1,024 \text{ Btuh}$$

### COOLING

$$\text{Adjusted TC} = \text{TC} - \text{Diff (Btuh)}$$

$$= 56,000 - 1,024 = 54,976 \text{ Btuh}$$

$$\text{Adjusted SHC} = \text{SHC} - \text{Diff (Btuh)}$$

$$= 47,400 - 1,024 = 46,376 \text{ Btuh}$$

$$\text{Adjusted power input} = \text{Kw}^* + \text{Diff}$$

$$= 7.9 + 0.30 = 8.1 \text{ Kw}$$

\*Kw-unit total from cooling capacity table at selected conditions.

### HEATING

$$\text{Adjusted heating capacity} = 18,000 + 1,024 = 19,024$$

$$\text{Adjusted power input} = \text{Kw}^{**} + \text{Diff (Kw)}$$

$$= 4.2 + .30 = 4.5 \text{ Kw}$$

\*\*Kw from heating capacity tables of selected conditions.

## V Corrections to SHC for dry bulb above or below 80 F — see SHC correction factor table.

For this example, no correction is necessary since the entering dry bulb is 80 F.

Therefore, the final net capacities are  
SHC = 46,376 Btuh  
TC = 54,976 Btuh

The 50RQ at the required design conditions has enough sensible capacity for the job application.

# Performance data

ARI CAPACITY RATINGS

UNIT	CFM	COOLING		HTG (Hi-Temp)		HTG (Lo-Temp)	
		Cap. (Btuh)	EER	Cap. (Btuh)	C.O.P.	Cap. (Btuh)	C.O.P.
50RQ 006	2000	59,000	7.5	62,000	2.8	35,000	2.0
50RQ 008	3000	88,000	7.8	91,000	2.8	51,000	2.0
50RQ 010	3600	108,000	7.7	112,000	2.8	61,000	2.0
50PQ 006	2000	59,000	7.4	62,000	2.8	35,000	1.9
50PQ 008	3000	87,000	7.6	92,000	2.8	52,000	2.0
50PQ 010	3600	107,000	7.5	113,000	2.8	62,000	2.0



Rated in accordance with ARI Standard 240-75.

Ratings are net values, reflecting the effects of circulating fan heat. Supplementary electric heat is not included. Ratings are based on:

**Cooling Standard:** 80 F db, 67 F wb indoor entering air temperature and 95 F db air entering outdoor unit

**Hi-Temp Heating Standard:** 70 F db indoor entering air temperature and 47 F db, 43 F wb air entering outdoor unit

**Lo-Temp Heating Standard:** 70 F db indoor entering air temperature and 17 F db, 15 F wb air entering outdoor unit



## NET COOLING CAPACITIES\*

UNIT	EVAP AIR		CONDENSER ENTERING AIR TEMPERATURE (F)															
			85			95			100			105			115			
	Cfm	Ewb	TC	SHC	Kw	TC	SHC	Kw	TC	SHC	Kw	TC	SHC	Kw	TC	SHC	Kw	
50RQ	1800	72	66	32	7.7	64	31	8.0	62	31	8.2	60	30	8.4	56	29	8.7	
		056	67	61	42	7.4	58	41	7.7	56	40	7.9	54	40	8.0	49	38	8.3
		62	56	51	7.1	52	50	7.4	51	49	7.6	49	47	7.7	46	44	8.0	
	2000	72	66	32	7.9	64	31	8.3	62	31	8.5	60	30	8.6	56	29	8.9	
		063	67	62	43	7.6	59	42	7.9	57	42	8.1	54	41	8.3	50	39	8.5
		62	57	53	7.3	54	51	7.7	52	49	7.8	51	48	8.0	47	44	8.4	
	2500	72	66	33	8.6	64	32	9.1	62	32	9.3	61	31	9.4	56	30	9.7	
		081	67	62	46	8.4	59	46	8.8	57	45	8.9	54	44	9.1	50	42	9.4
		62	58	55	8.3	56	52	8.6	54	51	8.8	52	49	9.0	49	45	9.3	
2700	72	100	48	11.0	96	47	11.6	93	46	12.0	90	45	12.3	84	43	12.8		
	048	67	92	64	10.7	87	61	11.2	84	61	11.4	81	59	11.7	74	57	12.2	
	62	84	77	10.3	79	74	10.8	76	73	11.0	74	71	11.3	69	66	11.9		
3000	72	101	50	11.1	97	49	11.8	94	48	12.0	92	47	12.4	85	45	12.9		
	055	67	94	67	10.8	88	65	11.3	84	64	11.6	82	63	11.8	76	60	12.3	
	62	86	81	10.4	81	78	10.9	79	76	11.2	76	73	11.5	71	68	12.1		
3700	72	101	51	11.8	98	51	12.6	96	50	12.9	93	50	13.1	86	48	13.7		
	070	67	95	71	11.5	90	70	12.1	87	69	12.4	84	68	12.6	77	66	13.2	
	62	90	85	11.3	86	81	11.9	83	78	12.2	81	75	12.5	75	70	13.1		
3200	72	123	63	13.8	117	61	14.5	114	60	14.8	111	59	15.0	103	56	15.6		
	043	67	113	80	13.2	107	78	13.8	103	77	14.1	99	75	14.3	91	12	14.9	
	62	103	97	12.7	97	92	13.3	94	91	13.6	90	89	13.9	84	84	14.4		
3600	72	124	65	14.0	119	63	14.7	115	62	15.0	112	62	15.4	104	58	15.9		
	050	67	115	85	13.5	108	83	14.1	105	81	14.4	101	80	14.7	93	76	15.2	
	62	106	102	13.0	99	98	13.6	96	95	13.9	93	93	14.2	87	87	14.8		
4500	72	124	67	15.2	118	66	16.0	115	65	16.3	112	64	16.6	104	62	17.2		
	064	67	115	92	14.8	108	90	15.4	105	89	15.7	101	87	15.9	93	84	16.5	
	62	108	107	14.3	102	102	15.0	99	99	15.3	96	96	15.6	89	89	16.3		

### NOTES:

- Direct interpolation is permissible. Do not extrapolate.
- The following formulas may be used:  

$$t_{ldb} = t_{edb} - \frac{\text{sensible capacity (Btuh)}}{1.09 \times \text{cfm}}$$

$$t_{lwb} = \text{Wet-bulb temperature corresponding to enthalpy of air leaving evaporator coil (h}_{lwb}\text{)}$$

$$h_{lwb} = h_{ewb} - \frac{\text{total capacity (Btuh)}}{4.5 \times \text{cfm}}$$
 Where:  
 $h_{ewb}$  = Enthalpy of air entering evaporator coil.  
 SHC is based on 80 F edb temp of air ent evap coil.  
 Below 80 F edb, subtract (corr factor x cfm) from SHC.  
 Above 80 F edb, add (corr factor x cfm) to SHC.

ENTERING AIR DRY-BULB TEMP (F)						
BF	79	78	77	76	75	under 75 over 85
	81	82	83	84	85	
Correction Factor						
.04	1.05	2.09	3.14	4.19	5.23	use formula shown below
.10	.98	1.96	2.94	3.92	4.91	
.15	.93	1.85	2.78	3.71	4.63	

Interpolation is permissible

Correction Factor = 1.09 x (1 - BF) x (edb - 80)

- 4 Capacities are at 2 in. wg ESP for cfm indicated for 006 units; at 25 in. wg for 008 units, at 3 in. wg for 010 units

**BF** — Bypass Factor      **Kw** — Total Power Input      **TC** — Net Total Capacity  
**Ewb** — Entering Wet Bulb      **SHC** — Net Sensible Capacity      \*Fan motor heat deducted

## INSTANTANEOUS/INTEGRATED HEATING RATINGS

UNIT	CFM (Std Air)	TEMPERATURE AIR ENTERING OUTDOOR COIL (F db at 70% rh)																			
		-20		-10		0		10		17		30		40		47		50		60	
		Cap.	Kw	Cap.	Kw	Cap.	Kw	Cap.	Kw	Cap.	Kw	Cap.	Kw	Cap.	Kw	Cap.	Kw	Cap.	Kw	Cap.	Kw
006	1800	14	3.8	19	4.1	25	4.4	31	4.7	38	5.1	46	5.6	54	6.0	61	6.4	64	6.7	73	7.3
		13		17		23		28		34		40		54		61		64		73	
	2000	15	3.9	20	4.2	26	4.5	32	4.8	39	5.2	47	5.7	55	6.1	62	6.5	65	6.8	74	7.3
	2500	18	4.8	23	5.1	29	5.4	35	5.7	42	6.1	50	6.7	58	7.1	65	7.6	69	7.7	78	8.1
		17		21		27		32		38		44		58		65		69		78	
008	2700	20	5.4	27	5.9	34	6.4	44	6.9	55	7.5	66	8.1	80	8.8	90	9.5	94	9.8	104	10.4
		18		25		31		40		50		58		80		90		94		104	
	3000	21	5.5	28	6.0	35	6.5	45	7.0	56	7.6	67	8.2	81	8.9	91	9.6	95	9.9	105	10.5
	3700	19		26		32		41		51		59		81		91		95		105	
		24	5.9	30	6.4	38	6.9	48	7.6	59	8.1	71	8.7	85	9.5	94	10.0	99	10.2	108	10.8
	3200	15	6.2	31	7.0	43	7.8	56	8.6	65	9.1	83	10.2	97	11.0	110	11.7	116	12.1	134	13.1
		14		28		39		51		59		72		97		110		116		134	
010	3600	16	6.3	32	7.1	44	7.9	57	9.1	67	9.1	84	10.3	99	11.1	112	11.8	118	12.1	136	13.1
		15		29		40		52		61		73		99		112		118		136	
	4500	20	7.2	36	8.0	48	8.8	61	10.2	71	10.2	89	11.1	104	11.9	118	12.6	124	12.9	140	13.8
		18		33		44		56		75		89		104		118		124		140	

Instantaneous Rating       Integrated Rating

**Cap.** — Heating Capacity (1000 Btuh), includes indoor fan motor heat  
**Kw** — Total Power Input, includes compressor motor power input, outdoor fan motor input, and indoor fan motor input

NOTE: Ratings are based on 70 F air entering indoor coil without resistance heaters. Integrated capacity is maximum (instantaneous) capacity less the effect of frost on the outdoor coil and the heat required to defrost it. Ratings are at 2 in. wg ESP for cfm indicated for 006 units, at 25 in. wg for 008 units and, 3 in. wg for 010 units



→ ACCESS/FIOP STATIC PRESSURE LOSSES (in. wg)

UNIT 50RQ,PQ	CFM	HEATERS				PLENUM*
		Low	.75:1	1.0:1.0	1.5:1.0	
006	1800	13	21	21	25	14
	2000	16	26	26	32	17
	2500	24	42	42	48	25
008	2700	09	11	11	17	21
	3000	10	13	13	20	25
	3700	15	22	22	30	41
010	3200	.12	.15	.15	.23	.14
	3600	.15	.20	.20	.28	.16
	4500	.29	.35	.35	.45	.24

\*Standard on 50PQ, accessory on 50RQ. Standard filter pressure drop included in plenum

INDOOR FAN DRIVE DATA

UNIT 50RQ,PQ	TYPE	FAN RPM					
		Turns Open					
		0	1	2	3	4	5
006	Std	1300	1224	1148	1072	996	920
	Alt	1460	1382	1304	1226	1148	1070
008	Std	980	922	864	806	745	690
	Alt	1093	1035	978	920	863	805
010	Std	978	920	863	805	748	691
	Alt	1093	1035	978	920	863	805

→ Electrical data

ELECTRIC HEATING CAPACITIES\*

UNIT	VOLTS/ PHASE	HTR SIZE	TOT. KW	KW†		BTUH	
				Stage 1	Stage 2	(1000)	(1000)
50RQ, PQ 006	230/ 1	Low	6.4	6.4	21.9	—	—
		.75:1.0	13	13	44.4	—	—
		1.0:1.0	20	13	44.4	7	23.9
		1.5:1.0	26	13	44.4	13	44.4
	200/ 3	Low	4.4	4.4	15.0	—	—
		.75:1.0	13	13	44.4	—	—
		1.0:1.0	15	10	34.2	5	17.1
		1.5:1.0	26	13	44.4	13	44.4
	230/ 3	Low	4.5	4.5	15.4	—	—
		.75:1.0	13	13	44.4	—	—
		1.0:1.0	20	13	44.4	7	23.9
		1.5:1.0	26	13	44.4	13	44.4
460/ 3	Low	5.2	5.2	17.8	—	—	
	.75:1.0	13	13	44.4	—	—	
	1.0:1.0	20	13	44.4	7	23.9	
	1.5:1.0	26	13	44.4	13	44.4	
50RQ, PQ 008/ 010	200/ 3	Low	6.5	6.5	22.2	—	—
		.75:1.0	20	10	34.2	10	34.2
		1.0:1.0	26	13	44.4	13	44.4
		1.5:1.0	39	13	44.4	26	88.8
	230/ 3	Low	6.4	6.4	21.9	—	—
		.75:1.0	19	12	41.1	7	24.0
		1.0:1.0	26	13	44.4	13	44.4
		1.5:1.0	39	13	44.4	26	88.8
	460/ 3	Low	6.4	6.4	21.9	—	—
		.75:1.0	19	12	41.1	7	24.0
		1.0:1.0	26	13	44.4	13	44.4
		1.5:1.0	39	13	44.4	26	88.8

Available as an accessory only

\*Available as factory-installed option or field-installed accessory except as noted

† Available if outdoor thermostat is used.

50RQ, PQ006

V-PH-HZ	COMPR	OFM	IFM		FACTORY- INSTALLED HEATERS		POWER† SUPPLY				
			Hp	FLA	Kw	FLA	Min Ckt Amps	Max Fuse Amps			
230-1-60 207-264	35.3 135	4.4	.75	6.9	—	—	55	60			
			1.0	8.0	—	—	57	60			
			.75	6.9	6.4	28	90	90			
			.75	6.9	13.0	55	124	125			
			.75	6.9	20.0	83	159	150			
			1.0	8.0	6.4	28	92	90			
			1.0	8.0	13.0	55	125	125			
			1.0	8.0	20.0	83	160	150			
			200-3-60 180-229	22.2 113	5.1	.75	7.9	—	—	41	50
						1.0	9.2	—	—	42	50
						.75	7.9	4.4	22	69	75
						.75	7.9	13.0	55	110	110
.75	7.9	15.0				42	94	100			
.75	7.9	26.0				83	145	150			
1.0	9.2	4.4				22	70	75			
1.0	9.2	13.0				55	111	110			
1.0	9.2	15.0				42	95	100			
1.0	9.2	26.0				83	146	150			
230-3-60 207-264	20.9 98	4.4				.75	6.9	—	—	38	50
						1.0	8.0	—	—	39	50
			.75	6.9	4.5	19	61	70			
			.75	6.9	13.0	48	98	100			
			.75	6.9	20.0	48	98	100			
			.75	6.9	26.0	74	130	125			
			1.0	8.0	4.5	19	62	70			
			1.0	8.0	13.0	48	99	100			
			1.0	8.0	20.0	48	99	100			
			1.0	8.0	26.0	74	131	125			
			460-3-60 414-528	10.4 49	2.2	.75	1.4	—	—	17	20
						1.0	1.8	—	—	17	20
.75	1.4	5.2				11	30	35			
.75	1.4	13.0				25	48	50			
.75	1.4	20.0				25	48	50			
.75	1.4	26.0				37	63	60			
1.0	1.8	5.2				11	31	35			
1.0	1.8	13.0				25	48	50			
1.0	1.8	20.0				25	48	50			
1.0	1.8	26.0				37	63	60			
575-3-60 518-660	8.3 41	4.4				.75	1.1	—	—	16	20
						1.0	1.4	—	—	16	20

- Compr — Compressor
- FLA — Full Load Amps
- Hp — Horsepower
- IFM — Indoor Fan Motor
- Kw — Kilowatts
- LRA — Locked Rotor Amps
- OFM — Outdoor Fan Motor
- RLA — Rated Load Amps

\*Fuse only



# Electrical data (cont)

→ 50RQ,PQ008

V-PH-HZ	COMPR* NO. 1,2		OFM	IFM		FACTORY-INSTALLED HEATERS		POWER† SUPPLY	
	RLA	LRA		FLA	Hp	FLA	Kw	FLA	Min Ckt Amps
200-3-60 180-229	16.6 79 (ea)	4.5	4.5	1.0	9.2	-	-	51	60
				1.5	11.5	-	-	53	60
				1.0	9.2	6.5	33	93	100
				1.0	9.2	20.0	65	135	125
				1.0	9.2	26.0	83	162	150
				1.0	9.2	39.0	113	196	150
				1.5	11.5	6.5	33	95	100
				1.5	11.5	20.0	65	137	125
				1.5	11.5	26.0	83	164	150
				1.5	11.5	39.0	113	199	150
230-3-60 207-264	14.3 67 (ea)	4.5	4.5	1.0	8.0	-	-	45	60
				1.5	10.0	-	-	47	60
				1.0	8.0	6.4	29	82	80
				1.0	8.0	19.0	49	108	100
				1.0	8.0	26.0	75	142	125
				1.0	8.0	39.0	99	171	150
				1.5	10.0	6.4	29	84	80
				1.5	10.0	19.0	49	110	110
				1.5	10.0	26.0	75	144	125
				1.5	10.0	39.0	99	173	150
460-3-60 414-528	7.2 35 (ea)	1.9	1.9	1.0	1.8	-	-	20	25
				1.5	2.6	-	-	21	25
				1.0	1.8	6.4	15	39	40
				1.0	1.8	19.0	26	52	50
				1.0	1.8	26.0	39	69	60
				1.0	1.8	39.0	51	83	70
				1.5	2.6	6.4	15	40	40
				1.5	2.6	19.0	26	53	50
				1.5	2.6	26.0	39	69	60
				1.5	2.6	39.0	51	84	70
575-3-60 518-660	6.8 23 (ea)	4.5	4.5	1.0	1.4	-	-	21	25
				1.5	2.1	-	-	22	25

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 OFM — Outdoor Fan Motor  
 RLA — Rated Load Amps



\*2 per unit, values apply to each  
 †Fuse only

→ 50RQ,PQ010

V-PH-HZ	COMPR NO. 1		COMPR NO. 2		OFM	IFM		FACTORY-INSTALLED HEATERS		POWER SUPPLY*	
	RLA	LRA	RLA	LRA		FLA	Hp	FLA	Kw	FLA	Min Ckt Amps
200-3-60 180-229	24 113	18.3 87	7.7	7.7	7.7	1.5	6.0	-	-	62	60
						2.0	7.8	-	-	64	60
						1.5	6.0	6.5	33	102	110
						1.5	6.0	20.0	65	142	150
						1.5	6.0	26.0	83	170	150
						1.5	6.0	39.0	113	202	150
						2.0	7.8	6.5	33	104	110
						2.0	7.8	20.0	65	144	150
						2.0	7.8	26.0	83	172	150
						2.0	7.8	39.0	113	204	150
230-3-60 207-264	20.9 98	16.4 70	6.6	6.6	6.6	1.5	5.2	-	-	54	60
						2.0	6.8	-	-	56	60
						1.5	5.2	6.4	29	91	90
						1.5	5.2	19.0	49	116	110
						1.5	5.2	26.0	75	148	150
						1.5	5.2	39.0	99	178	150
						2.0	6.8	6.4	29	92	90
						2.0	6.8	19.0	49	117	110
						2.0	6.8	26.0	75	150	150
						2.0	6.8	39.0	99	180	150
460-3-60 414-528	10.4 49	8.8 35	3.3	3.3	3.3	1.5	2.6	-	-	28	35
						2.0	3.4	-	-	29	35
						1.5	2.6	6.4	15	45	50
						1.5	2.6	19.0	26	58	60
						1.5	2.6	26.0	39	74	70
						1.5	2.6	39.0	51	88	80
						2.0	3.4	6.4	15	46	50
						2.0	3.4	19.0	26	59	60
						2.0	3.4	26.0	39	75	70
						2.0	3.4	39.0	51	89	80
575-3-60 518-660	8.3 11	6.4 27	6.6	6.6	6.6	1.5	2.1	-	-	21	25
						2.0	2.7	-	-	22	30

Compr — Compressor  
 FLA — Full Load Amps  
 Hp — Horsepower  
 IFM — Indoor Fan Motor  
 Kw — Kilowatts  
 LRA — Locked Rotor Amps  
 OFM — Outdoor Fan Motor  
 RLA — Rated Load Amps



\*Fuse only

## Controls

### Base unit operating sequence

**Cooling** — With unit main power on, thermostat at COOL and desired room temperature, fan switch at AUTO

ALL UNITS — On a rise in room temperature, cooling contact no 1 in thermostat closes, energizing compressor no 1 contactor on all units. Compressor no 1, indoor and outdoor fan motors start. Compressor no 1 cycles on demand of thermostat to satisfy room conditions.

50RQ/PQ008 — On 008 and 010 units with 2 compressors, with an additional rise in room temperature, cooling contact no 2 in thermostat closes energizing compressor contactor no 2. Compressor no 2 starts. Compressor no 2 cycles on demand of the thermostat to satisfy room conditions.

**Heating** — Power on and thermostat set at HEAT and desired temperature, fan at AUTO

On a drop in room temperature, heating contact no 1 in the thermostat closes energizing compressor contactor no 1 and reversing valve, and starting compressor no 1. Indoor fan contactor and outdoor fan contactor are energized at the same time for heat pump cycle.

50RQ/PQ006 — On a further drop in room temperature, heating contact no 2 in the thermostat closes energizing the electric resistance heat. For heaters with 2 or more stages, outdoor thermostats can be wired into the control circuit to energize electric heat elements in accordance with outdoor air temperature. Outdoor thermostats are set according to building load requirements and have an adjustable set point. When

outdoor ambient reaches the outdoor thermostat set point, the heating element contactor is energized when thermostat second stage heating contacts close, bringing on additional electrical resistance heat

50RQ,PQ008/010 — On the 50RQ,PQ008 and 010, 2-compressor units, when thermostat second stage heating contacts close, compressor contactor no 2 energizes and compressor no 2 is brought on. Units have a built-in electric resistance heat lock-out thru the defrost thermostat. Above 40 F (approximate) outdoor temperature, electric resistance heat is locked out and second stage heat is from compressor no 2. Below 40 F (approximate) ambient, when thermostat first stage heating contacts close, compressor contacts no 1 and no. 2 energize sequentially thru a time delay and both compressors (no 1 and no 2) are brought on to satisfy heating requirements.

On a further drop in room temperature (outdoor ambient below 40 F), thermostat second stage heating contacts close, energizing electric resistance heat contactor and second stage heat operates. Electric heaters with 2 or more contactors can have outdoor thermostats wired into the control circuit for additional staging.

**Automatic changeover** — When the system selection switch is set at AUTO, unit automatically changes from heat operation to cooling operation when the temperature of the conditioned space rises to the cooling lever setting. When the temperature of the conditioned space falls to the heating lever setting, unit automatically changes from cooling to heating operation (with a 3 F deadband in between).

**Continuous air circulation** — Unit power on. System control set at OFF, fan switch set at ON. Indoor fan contactor is energized thru the thermostat switch and the indoor fan runs continuously. When controls are set at HEAT, COOL, or AUTO, operation is as above and indoor fan runs continuously.

#### **Defrost cycle**

50RQ/PQ006 — The defrost thermostat on the outdoor coil activates a defrost timer which energizes electric resistance heaters and de-energizes the reversing valve relay and the outdoor fan motor. When the defrost thermostat is satisfied or when 10 minutes have elapsed, the reversing valve solenoid energizes and electric heaters de-energize. The defrost timer prevents defrost again for 90 minutes.

50RQ,PQ008/010 — Operation is same as above, except both reversing valve relays de-energize or energize simultaneously off the defrost timer and thermostat.

On the 008 and 010 units, the defrost thermostat in conjunction with a time delay relay prevent electric heat operation above an ambient temperature of approximately 40 F (depends on coil frost conditions). If defrost thermostat closes, the time delay relay energizes and pulls in compressor contactor no 2. Both compressors now operate off of W1 and W2 controls electric heat.

#### **Economizer operation**

Unit power on, thermostat set at COOL or AUTO, outside temperature below setting of outside air changeover thermostat.

Upon a rise in room temperature, cooling contact no 1 in the thermostat closes. Indoor fan motor starts and outside air damper modulates to maintain mixture of outside air and return air at present temperature. Cooling is provided with outside air. Mechanical cooling is locked out.

At temperatures above outdoor air changeover thermostat setting, outdoor air damper moves to VENT position whenever fan is running, and cooling operation is as described for base unit. When heat is energized, outdoor air damper moves to VENT position. Outdoor air damper closes when fan is not operating.

#### **Signal-LOC™ protection with “LK-OUT” light**

If unit operation is interrupted by an open high-pressure switch, low-pressure switch, indoor coil freeze-stat, or by the compressor internal line break device (overcurrent or over-temperature), and the compressor is calling for either cooling or heating, Signal-LOC simultaneously locks out the unit and lights a warning light (LK-OUT) on the thermostat. Unit is restarted by manually turning room thermostat OFF and then ON. If any of the protective devices open again, unit continues to lock out until corrective action is taken.

#### **Accessories**

##### **Emergency heat**

If the compressor is inoperative due to a tripped safety device (high pressure, low pressure, indoor coil freeze-stat, overcurrent or over-temperature), Signal-LOC locks out the compressor and lights the warning light (LK-OUT) on the room thermostat. When the switch is on, the thermostat is moved to the EM. HT. position, the compressor circuit and the outdoor thermostats are bypassed and the second stage of the thermostat energizes the indoor fan and the electric resistance heaters.

##### **Time Guard®**

The accessory Time Guard control circuit provides a 5-minute delay of compressor restart after the desired space temperature has been attained and the room thermostat has shut down the compressor. Assuming that the compressor has been off for at least 5 minutes due to room thermostat action, the Time Guard control sequence is as follows:

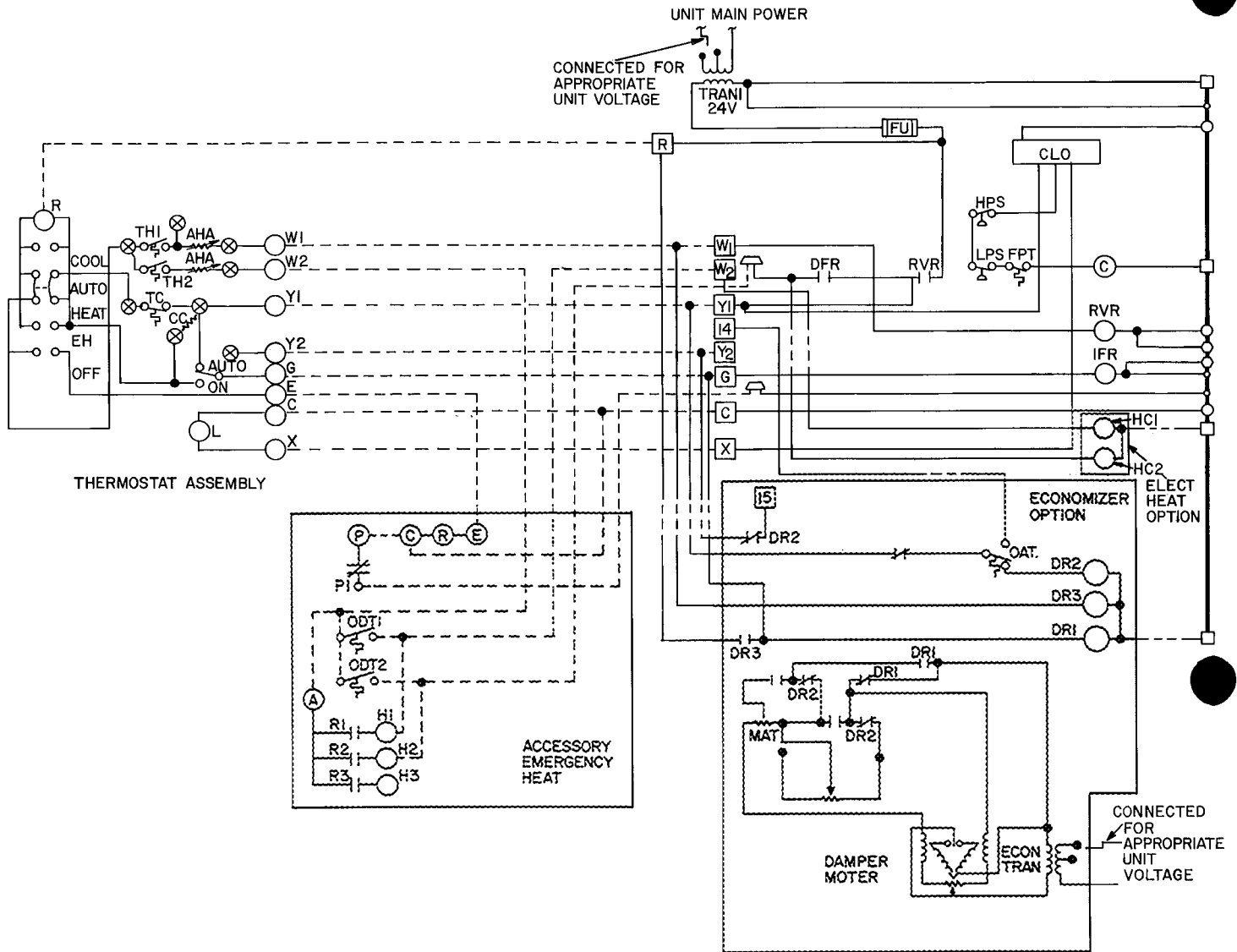
With the fan selector switch at AUTO, a call for cooling from the room thermostat causes the indoor air fan to start immediately, the compressor and outdoor air fan start 15 seconds later. When the room thermostat is satisfied, the compressor shuts off. The Time Guard timer motor then runs for 4 minutes and 45 seconds, at which point its internal switches reset so the normal sequence can begin again.

The base unit contains as standard equipment, a factory-installed Signal-LOC compressor protection device. If the overload protector causes the compressor to shut off, the compressor remains locked out until the control circuit is manually reset. Reset manually by moving the system selector lever on the room thermostat to OFF momentarily and then return it to the cooling position. After the standard 5-minute Time Guard delay, the compressor can restart.



# Typical wiring schematic

(Unit 006 shown with electric heat option, economizer option and accessory emergency heat; schematic is for reference only, do not use for wiring unit.)



## LEGEND

- AHA** — Adjustable Heat Anticipator
- C** — Contactor, Compressor
- CC** — Cooling Compensator
- CLO** — Compressor Lock-Out
- DFR** — Defrost Relay
- DR** — Damper Relay
- EH** — Emergency Heat
- FPT** — Freeze-Up Protection Thermostat
- Fu** — Fuse
- HC** — Heater Contactor
- HPS** — High Pressure Switch
- IFR** — Indoor Fan Relay
- L** — Lamp
- LPS** — Low Pressure Switch
- MAT.** — Mixed Air Thermostat
- OAT.** — Outdoor Air Thermostat
- ODT** — Outdoor Thermostat (Emer Heat)
- RVR** — Reversing Valve Relay

- TC** — Thermostat, Cooling
- TH** — Thermostat, Heating
- TRAN** — Transformer
- Terminal Block Connection
- Terminal (Unmarked)
- ⊕ Terminal (Marked)
- Field Splice
- ⊙ Splice (Marked)
- Wire Marker
- Factory Wiring
- Factory Splice
- Accessory or Optional Wiring
- Field Control Wiring
- Field Power Wiring
- To indicate common potential only not to represent wire

# Application notes

**Filters** — Plenum filter racks for 008 size units can accommodate 2-in. filters for higher filtration efficiency and/or longer filter life. Filters other than 1-in. standard must be field supplied.

**Ductwork** — At installer's option, ductwork may be attached to the curb on 50PQ units (and 50RQ units with accessory plenum). Interior installation may proceed before unit is set in place on roof.

**Field power connections** — Accessory (field-installed) electric heaters may require separate power entry to comply with local codes. Factory-installed electric heat allows single power entry to unit for both heating and cooling.

**Condensate trap** — Evaporator is draw-thru configuration. A trap (minimum 4 in. deep) must be field provided prior to start-up on cooling cycle.

**Static pressure limits** — When return air ductwork systems are used, return side static pressures should be limited to 0.4 in. wg.

**Operating limits** — Cfm values indicated illustrate the operating range of the indoor fan. Operation above or below these limits is not recommended. Exception: Operation of the 50RQ008 460-3-60 unit with 1.5:1.0 electric heat ratio, minimum cfm is 2800 at 80 F return air temperature.

**Remote control panel** — When use is required with emergency heat, emergency heat switch, Carrier Part No. HR59JP115 must be used. Emergency heat subbase cannot be used with the remote control panel.

**Low ambient cooling operation** — Units are designed to operate at outdoor temperatures down to 35 F. At temperatures below 35 F, accessory Motormaster® will permit operation at outdoor temperatures as low as -20 F.

**Roof curb** — All curb installations must be counterflashed to prevent water leakage.

# Guide specifications

**Base unit** — Furnish and install a one-piece, air-to-air electric heat pump designed to function as a year-round air conditioning system. Unit shall be completely assembled, and tested complete with refrigerant charge and ready to operate. The total unit shall be U.L. listed and carry a U.L. label. Unit shall be designed for either slab mount (RQ) or single-piece curb mount (PQ). PQ unit to have outdoor air inlet with filter, plus factory-supplied 1-in. throwaway return air filters.

**Cooling capacity (net)** — Unit cooling cycle capacity shall be a NET capacity with indoor fan motor heat deducted and shall be \_\_\_\_\_ Btuh or greater total, \_\_\_\_\_ Btuh sensible at conditions of \_\_\_\_\_ cfm air entering indoor coil, \_\_\_\_\_ F dry bulb, \_\_\_\_\_ F wet bulb, and \_\_\_\_\_ F dry bulb entering outdoor coil. The total unit cooling EER shall be \_\_\_\_\_ or greater when rated in accordance with ARI Standard 240 for air-to-air heat pumps.

**Heating capacity** — Heating cycle capacity shall be \_\_\_\_\_ Btuh or greater (integrated rating) when rated at \_\_\_\_\_ F db outdoor ambient, with \_\_\_\_\_ cfm and \_\_\_\_\_ F air entering the indoor (heating) coil. The total unit C.O.P. at above conditions shall be \_\_\_\_\_ or greater. The ARI heating C.O.P. shall be \_\_\_\_\_ at 47 F db outdoor ambient (hi-temp), \_\_\_\_\_ at 17 F db outdoor ambient (low temp) or greater when rated in accordance with ARI Standard 240 for air-to-air heat pumps.

**Electric resistance heat** — Electric resistance heaters shall be supplied to offset building heat loss (at winter design conditions) when the heat pump heating cycle capacity cannot satisfy space requirements. Heaters shall consist of open wire nichrome elements with controls necessary for operation. Safety controls shall include primary overtemperature and

overcurrent protection. Heaters shall be U.L. listed when factory installed.

**Unit compressor(s)** shall be welded, fully hermetic with crankcase heater(s) and suitable vibration isolators. Compressors shall be of the same manufacture as unit and shall be tested and designed in unit to operate to -20 F OAT on heating cycle without shutting off. The standard unit shall be capable of operating to 35 F OAT. On cooling cycle. Compressors shall have a 5-year warranty.

**Coils** — Indoor and outdoor coils shall be of nonferrous construction with aluminum plate fins mechanically bonded to seamless copper tubes with all joints brazed.

**Fans and motors** — Indoor air fan shall be forward curved, centrifugal, belt-driven type capable of delivering \_\_\_\_\_ cfm at \_\_\_\_\_ in. wg external static pressure. Motor pulley shall be adjustable pitch. Indoor fan shall be \_\_\_\_\_ hp with permanently lubricated bearings. Outdoor fan shall be of the propeller type, with direct driven permanently lubricated motor of \_\_\_\_\_ hp or less. Fans shall discharge upward.

**Unit cabinet** shall be constructed of galvanized steel, bonderized and coated with a baked enamel finish. Cabinet interior shall be insulated with 1-in. thick neoprene coated fiberglass. Cabinet panels shall be easily removable for service to all operating components. A condensate drain for the indoor coil shall be provided.

**Controls** — The heat pump cooling/heating system shall be protected with high pressurestat, low pressurestats, loss of charge protection, indoor coil freezestats, and current and temperature sensitive overload devices.

# Guide specifications (cont)

Each of these devices shall be wired thru the Signal-LOC™ circuit to prevent compressor restart until reset at the thermostat. The standard room thermostat shall contain a "compressor malfunction light" designed to illuminate if any of the beforementioned safety controls trip out the compressor thru the lockout circuit. Two-compressor units shall have separate and independent refrigeration and control systems designed to allow for standby operation of either compressor if one is locked out. Two-compressor units shall have 2-stage compressor heat and cool with built-in electric strip heat lock out to prevent resistance heat operation above 40 F ambient.

**Defrost control** — An outdoor coil defrost control system (Chronotemp®) shall be incorporated into the base unit to prevent frost accumulation during heating cycle. The defrost cycle shall function on the basis of time and coil temperature. A 90-minute timer shall actuate a defrost mode only if coil temperature is low enough to indicate a heavy frost condition. Defrost shall have a positive termination time of a maximum of 10 minutes or when the defrost thermostat is satisfied to prevent prolonged operation on a defrost cycle. Electric resistance heaters shall be operational automatically during the defrost cycle.

**Unit electrical connections** — Unit with factory-installed electric heat shall have single point power connection to a terminal block. Cabinet shall contain suitable openings for routing of all utility connections. The base unit shall contain a terminal strip in the control compartment to allow for terminal-to-terminal connection of room thermostat and field-installed accessories.

**Maximum dimensions** — Width \_\_\_\_ in., depth \_\_\_\_ in., height \_\_\_\_ inches.

## Accessories and options

The following factory-installed options, (FIOP) or field-installed accessories (accessory) shall be provided.

**Roof curb** shall be of the same manufacture as unit and shall include an insulated panel under compressor section to prevent condensation forming on the bottom. Dimensions shall be provided to allow for easy duct location and connection to roof curb prior to unit placement. Roof curb shall be a minimum of 12 in. high to allow for proper defrost meltage run-off. Curb design shall comply with National Roofing Contractors Association requirements (accessory).

**Economizer control** shall include R.A. and O.A. dampers, outdoor air filter and hood, and fully modulating electric control system with O.A. thermostat and adjustable mixed air stat. Economizer control shall be capable of introducing up to

100% outdoor air. The control changeover from mechanical cooling to economizer operation shall be fully automatic thru an adjustable outdoor air changeover thermostat. PQ units (accessory or FIOP). RQ units with accessory plenum (accessory).

**Alternate motor and drive assembly** to provide added cfm and static pressure capability (FIOP).

**Downturn plenum** for use on RQ units designed to easily field attach to the base unit to direct airflow downward thru the roof. Plenum to provide for a weatherproof opening for ductwork assembly (accessory only on RQ units).

**Electric resistance heaters** shall be available in 4 selections (low, 75/1, 1/1, 1/5/1 heat-to-cool ratio) and shall have open wire nichrome elements with all necessary safety and operating controls. Heaters shall be U.L. listed and approved for use when factory installed. Units with factory-installed heat shall have single power entry by terminal blocks suitable for copper or aluminum wires (200-v, 3-phase unit with 39 Kw factory-installed heat, copper only).

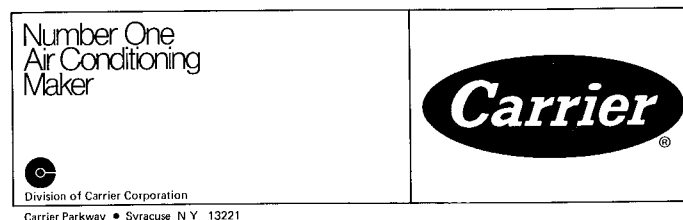
**Thermostat assembly** shall provide staged heating and cooling, manual or automatic changeover and fan control. Standard subbase shall include "compressor malfunction light" (LK-OUT) designed to illuminate if compressor lockout is activated (accessory).

**Emergency heat control** shall consist of emergency heat control box containing emergency heat relays and outdoor thermostat(s), and an emergency heat thermostat subbase (with warning light). Control shall allow for manual bypass of compressor and outdoor thermostats if compressor becomes inoperative, or for service. Subbase light shall illuminate if compressor lock-out is activated. Outdoor thermostats shall provide for staging of electric resistance heat according to outdoor temperature. Thermostats shall be wired into the electric heater contactors and shall have an adjustable set point to provide economical resistance heat staging (accessory).

**Remote control panel** to provide central unit control of heating, cooling, indoor fan and outdoor air damper. Panel shall contain indicator lights for up to 6 unit functions (accessory).

**Time Guard® circuit** to prevent compressor short cycling as a result of a rapid change in thermostat setting. Also, automatically prevents compressor restart at least 5 minutes after shutdown (accessory).

**Head pressure control** — A solid state outdoor fan speed control (32LT) to maintain head pressure control down to -20 F OAT on cooling cycle (accessory). (Inoperative during heating cycle.)



Manufacturer reserves the right to discontinue, or change at any time, specifications or designs without notice and without incurring obligations.

Book	1	4
Tab	5a	5a

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