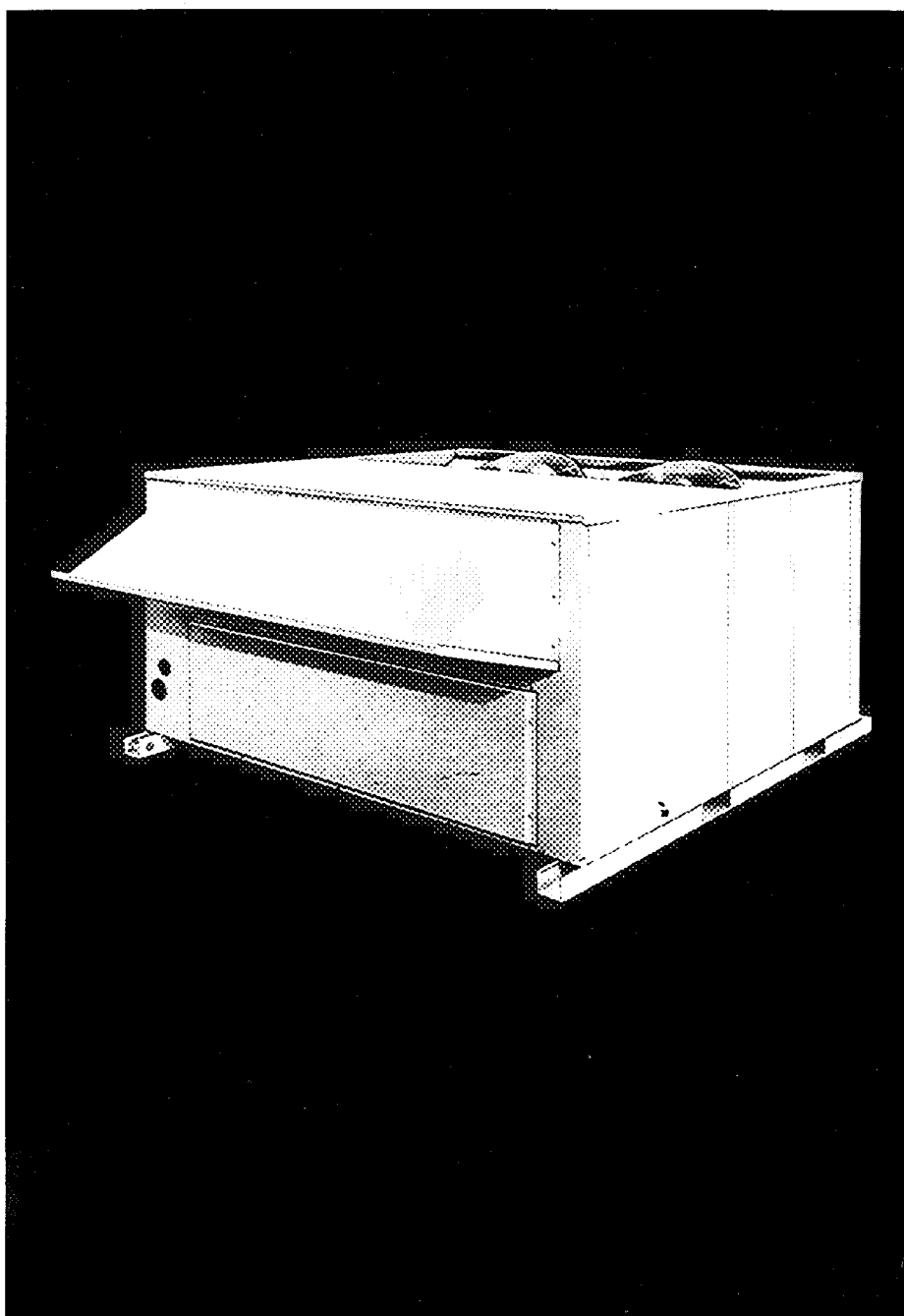




Product Data

48HJD/HJE Single-Package Rooftop Units Electric Cooling/Gas Heating

13 and 20 Nominal Tons



- Single-Package Rooftop Units with
- Turbo-Tubular™ heat exchanger
 - Induced draft fan
 - Alumagard™ heat exchanger coating
 - Cycle-LOC™ compressor anticycle protection

Features/Benefits

Convertible vertical discharge units with reliable, efficient performance

Semi-hermetic compressors

The 48HJ015 and 024 units use the rugged Carrier 06D semi-hermetic compressors. These compressors (one on the 015, and two on the 024) feature multiple steps of capacity control and part-load operation to provide high energy efficiency and lower energy costs.

Oversized evaporator-fan motors

Both the 48HJ015 and 024 units have oversized evaporator-fan motors provided standard to allow the maximum static performance on all units direct from the factory. In addition, these evaporator fans are belt-driven with adjustable pulleys for quiet and efficient operation.

Easy maintenance and installation

All units are shipped in the vertical discharge configuration for fit-up to standard roof curb. Convenient duct openings in the basepan permit side-by-side or concentric duct connections without requiring internal unit modifications. Units may be converted to horizontal discharge with the use of either of the horizontal supply/return adapter curb assemblies.

Gasketing is provided with the roof curb for watertight installation.

Compact and self-contained, the units are readily transported, rigged, and installed. A low-voltage terminal block makes control wiring connections quick and simple.

Designed with the service technician in mind, the combustion section viewport, located on the unit side panel, allows full visibility of flame operation at a safe distance from flue gases.

The efficient in-shot burners and all ignition components are contained in a compact assembly that is easily removed for service and maintenance.

Efficient operation, dependable performance

All compressors are equipped with crankcase heaters, calibrated circuit breakers for overcurrent protection, and Cycle-LOC™ compressor protection. Solid-state Cycle-LOC circuit prevents compressor short cycling by shutting off compressor if any safety device trips.

Aerodynamically-designed condenser fan orifice increases airflow, reduces turbulence, and dampens sound level while minimizing operating costs.

Weather-resistant Carrier Weather Armor® cabinet is coated with pre-painted polyester finish to ensure long life and good looks.

Condenser fans are direct driven, permanently lubricated and positioned for quiet, efficient vertical discharge

Computer designed coils feature staggered copper tubes for increased operating efficiency. Fins are ripple edged for strength and double waved for higher efficiency.

Safety is assured with the redundant gas valve. Both the pilot valve and the main gas valve are in series within one valve body. When there is no call for heat, the main gas valve and the pilot valve block passage of gas to the pilot light and main burners.

Turbo-Tubular™ heat exchangers optimize heat transfer for improved efficiency. The tubular design permits hot gases to make multiple passes across the path of the supply air. In addition, turbulators inside the heat exchanger tube act as baffles, forcing the hot gases to stay in close con-

tact with the cell walls and improving heat transfer. The extra thick Alumagard™ heat exchanger coating provides corrosion resistance and ensures long life performance.

The induced draft combustion system eliminates the unsightly appearance of flue stacks, and diminishes the effects of winds on heating operation. The heat exchanger operates under negative pressure, and if any leakage should occur, the flue gases are drawn outside and will not enter the supply air.

Fuel is never wasted with the intermittent pilot ignition. The pilot flame is ignited only on a call for heat. During the heating mode, the evaporator-fan relay automatically starts the evaporator fan after the heat exchanger warms up. This prevents cold air from entering the supply air when the conditioned space is calling for heat.

Runaway gas conditions are eliminated and safe operation is guaranteed. The pilot flame is proven at the burner farthest from the ignition source, rather than at the ignition source itself. If pilot flame malfunc-

tions and does not reach sensor, the main gas valve will not open.

The system utilizes a flame rectification sensor which quickly senses pilot flame and ignites burners almost instantaneously. Since the sensor is quick to react to any flame outage or system failure, fast shutdown is a certainty.

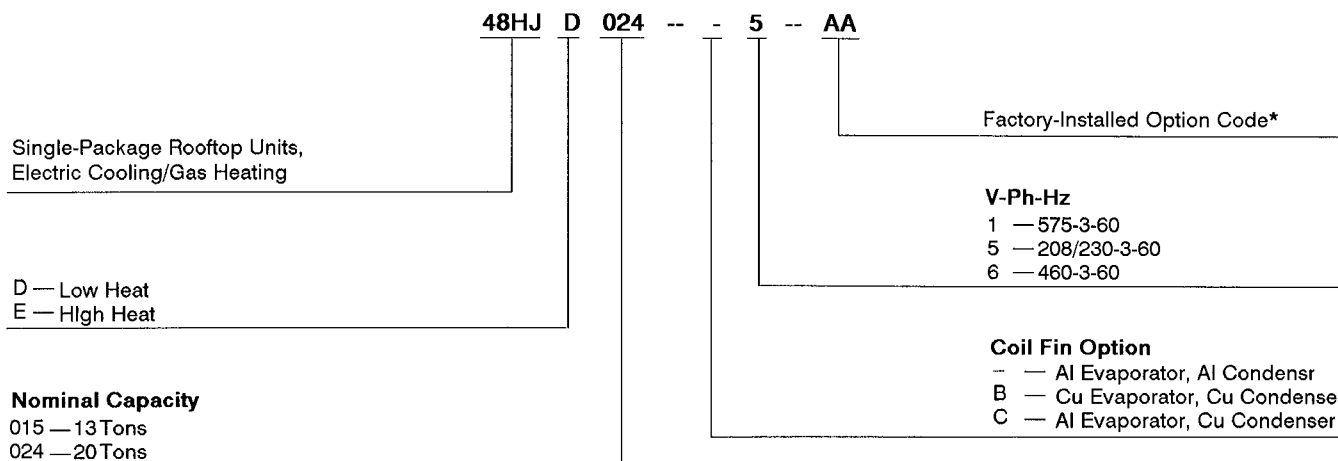
Heating safety controls assure dependability. Limit switches shut off gas valve if excessive temperatures should develop. Pressure switch shuts down main gas valve in case of insufficient combustion air. A rollout switch deenergizes the gas valve on flame rollout.

Manual outdoor-air damper can be preset to provide up to 25% outdoor air for year-round ventilation. Units equipped with optional or accessory economizer have a thermostatically controlled, fully modulating damper which admits up to 100% outdoor air and provides low-cost cooling. Temperature control governs economizer cooling changeover to provide lowest cost operation in mild weather.

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Model number nomenclature



LEGEND

Al — Aluminum
Cu — Copper

*Refer to 48HJ price pages for 48HJ factory-installed option table.

ARI* capacity ratings

UNIT 48	TOTAL kW	NET COOLING CAPACITY (Btuh/hr)	STANDARD CFM	IPLV	EER	BELS
HJD/HJE015	15.6	144,000	5000	10.4	9.0	8.4
HJD024	27.6	216,000	6300	8.7	8.6	—

LEGEND

BELS — Sound Level (1 bel = 10 decibels)
EER — Energy Efficiency Ratio
IPLV — Integrated Part-Load Value

*Air Conditioning and Refrigeration Institute.

Rated in accordance with ARI Standard 360-86.

Ratings are net values, reflecting the effects of circulating fan heat. Ratings are based on:

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



HEATING CAPACITIES AND EFFICIENCIES

UNIT 48	HEATING INPUT (Btuh)	OUTPUT CAPACITY (Btuh)	TEMPERATURE RISE (F)	AGA STEADY STATE EFFICIENCY (%)
HJD015	154,000	123,000	15-45	80
HJE015*	115,500/231,000	183,000	25-55	80
HJD020*	115,500/270,000	216,000	15-45	80

*Two-stage heat

Physical data



UNIT SIZE 48	HJD015	HJE015	HJD024
OPERATING WT (lb)			
Al/Al*	1570	1590	2150
Unit Al/Cu*	1650	1670	2280
Cu/Cu*	1730	1750	2390
Economizer	110	110	110
Roof Curb†	200	200	200
COMPRESSOR	06D Semi-Hermetic — 6 Cylinders		
Number	1	2	2
Oil (oz)	152		152 ea
Capacity Steps (%)	67,100		50,100
REFRIGERANT	R-22		
Charge (lb) Sys 1**, Sys 2	21.3, —		16.25, 16.25
REFRIGERANT METERING DEVICE	Capillary Tubes		
Upper Circuit	6 .25 .0 055/0.125		
No. ...Length (in.)...ID/OD	6 .25 .0 055/0.125		13...25 .0 055/0 125
Lower Circuit	6 .25 .0.055/0.125		
No. ...Length (in.)...ID/OD	—		13...25. .0.055/0.125
CONDENSER COIL	Copper Tubes, Aluminum or Copper Plate Fins		
Rows	3		4
Fins/in.	13.6 Al or 12 4 Cu		13 6 Al or 12.4 Cu
Total Face Area (sq ft)	18.9		22.2
CONDENSER AIR FAN	Propeller Type, Direct Drive		
Nominal Cfm	12,000		11,400
Number...Diameter (in.)	2...26		2...26
Motor Hp (1075 Rpm)	1		1
Watts Input (Total)	2672		3000
EVAPORATOR COIL	Copper Tubes, Aluminum or Copper Plate Fins		
Rows	3		4
Fins/in.	15.6 Al or 14 2 Cu		14 4 Al or 13.1 Cu
Total Face Area (sq ft)	16 5		17.9
EVAPORATOR FAN**	Centrifugal, Adjustable Pitch Belt Drive		
Quantity...Size (in.)	2 ..10x10		2 ..12x12
Nominal Cfm	6000		8000
Fan Rpm Range	1194-1526		1238-1494
Maximum Allowable Rpm	1550		1550
Motor Pulley Pitch Diameter (in.)	3 4/4.4		5.4/6 4
Fan Pulley Pitch Diameter (in.)	5 2		7.9
Belt, Quantity...Type...Length (in.)	1. AX .42		1.. BX 50
Factory Speed Setting (Rpm)	1294		1366
Motor Hp (Service Factor)	3 (1 15)		7½ (1.15)
Motor Frame Size	56 H		184T
FURNACE SECTION			
Rollout Switch Cutout Temp (F)††	190	190	190
Burner Orifice Diameter (In. ...drill size)	.113...33	.113...33	.113 . 33
Natural Gas			
Pilot Orifice Diameter (Quantity) in. ...drill size	(1) .055...54	(1) .055 .54	(1) .055...54
Natural Gas		(1) .041 59	(1) .041...59
Thermostat Heat Anticipator Setting			
208/230,575; Stage 1/Stage 2	.98/—	.98/44	.98/44
460; Stage 1/Stage 2	1 2/—	1 2/ 44	1.2/44
Gas Valve Quantity	1	2	2
HIGH-PRESSURE SWITCH		426	
Cutout (psig)		320	
Reset (psig)			
LOW-PRESSURE SWITCH		7	
Cutout (psig)		22	
Reset (psig)			
AIR INLET SCREENS		2 20 x 25 x 1	
Economizer, Quantity...Size (in.)		1. 20 x 20 x 1	
RETURN-AIR FILTERS (TYPE)	10% Efficient — 2-in. Throwaway Fiberglass		
Quantity... Size (in.)	2...20 x 20 x 2		4...20 x 20 x 2
	3...16 x 20 x 2		4...16 x 20 x 2
	2...16 x 25 x 2		

LEGEND

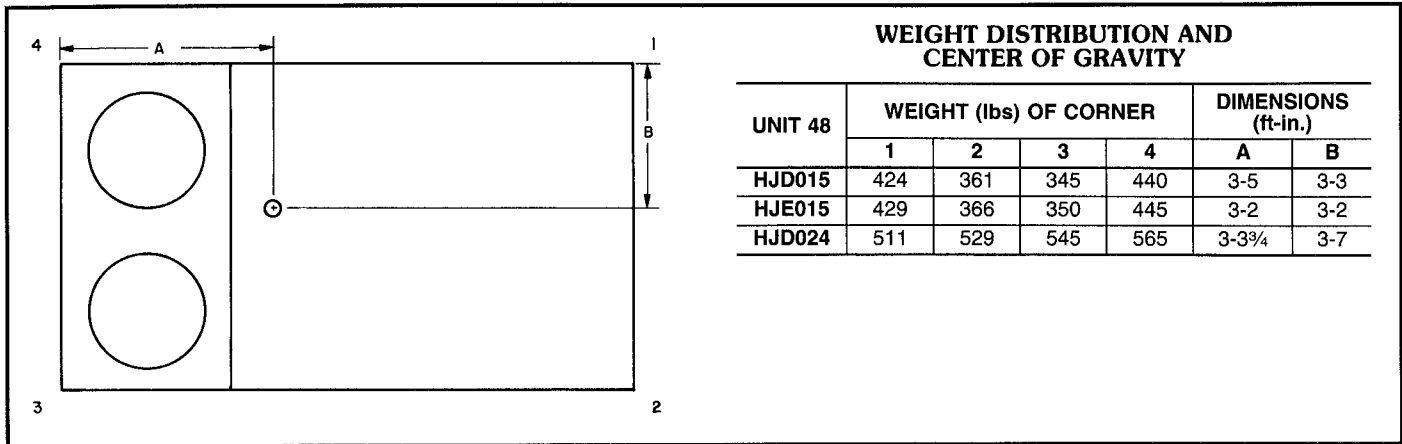
Al — Aluminum
Cu — Copper

*Evaporator coil fin material/condenser coil fin material.

†Weight of 14 in. roof curb.

**Evaporator coil is intertwined. System 1 is lower portion of condenser coil, and System 2 is upper portion of condenser coil

††Rollout switch is manual reset.



Options and accessories

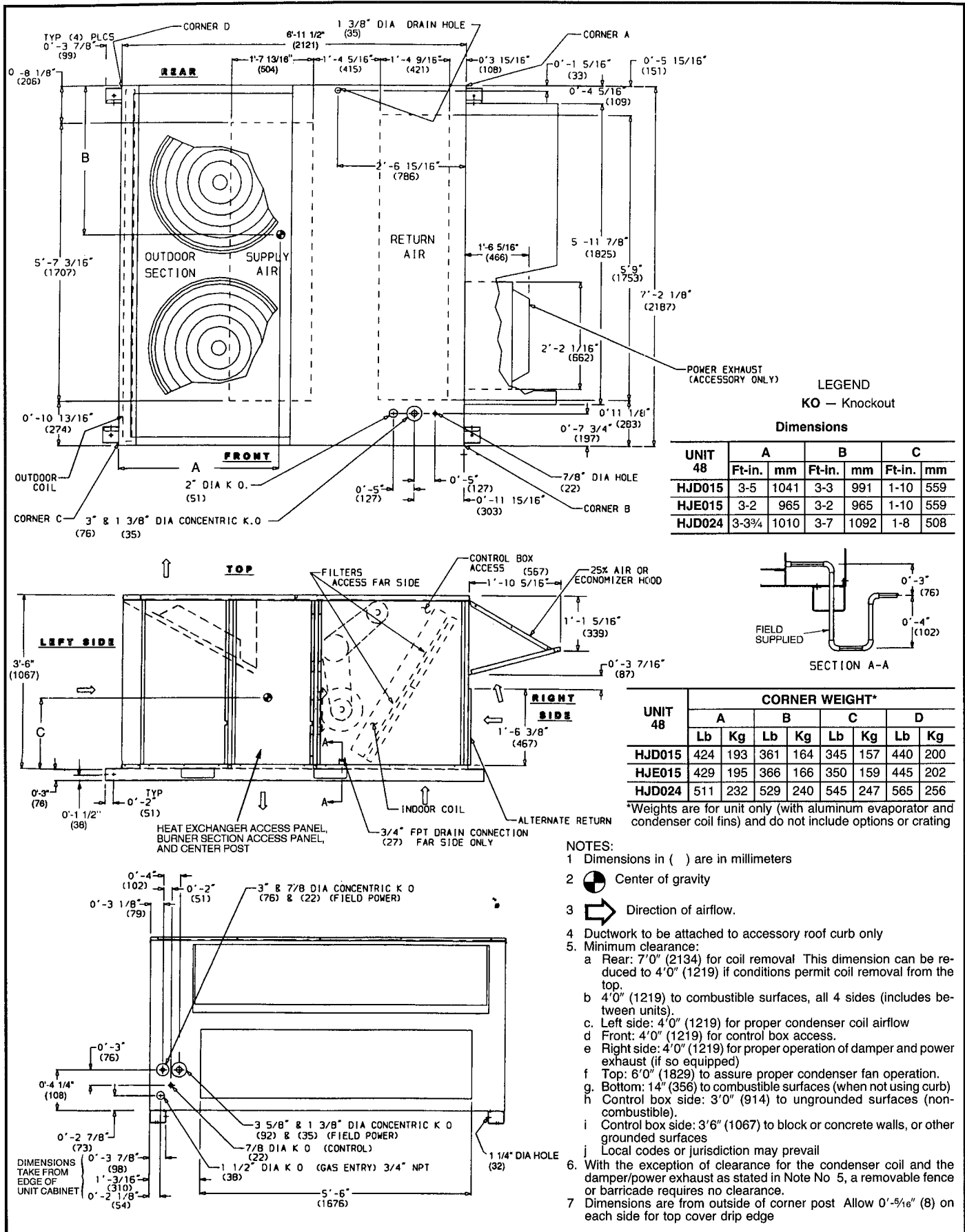
ITEM	OPTION*	ACCESSORY†
Integrated Economizer With Hood	X	X
Two-Position Damper With Hood		X
Barometric Relief Damper		X
Roof Curbs (Vertical)		X
Horizontal Adapter Curbs		X
Remote Control		X
Thermostat and Subbase		X
Electronic Programmable Thermostat		X
Time Guard® II Circuit		X
Motormaster® Head Pressure Control		X
25 F Low-Ambient Kit		X
- 20 F Low-Ambient Kit**		X
Winter Start Time-Delay Relay Kit (024 Only)		X
Power Exhaust		X
Pressure Operated Unloader (015 Only)		X
Differential Enthalpy Sensor		X

*Factory installed

†Field installed.

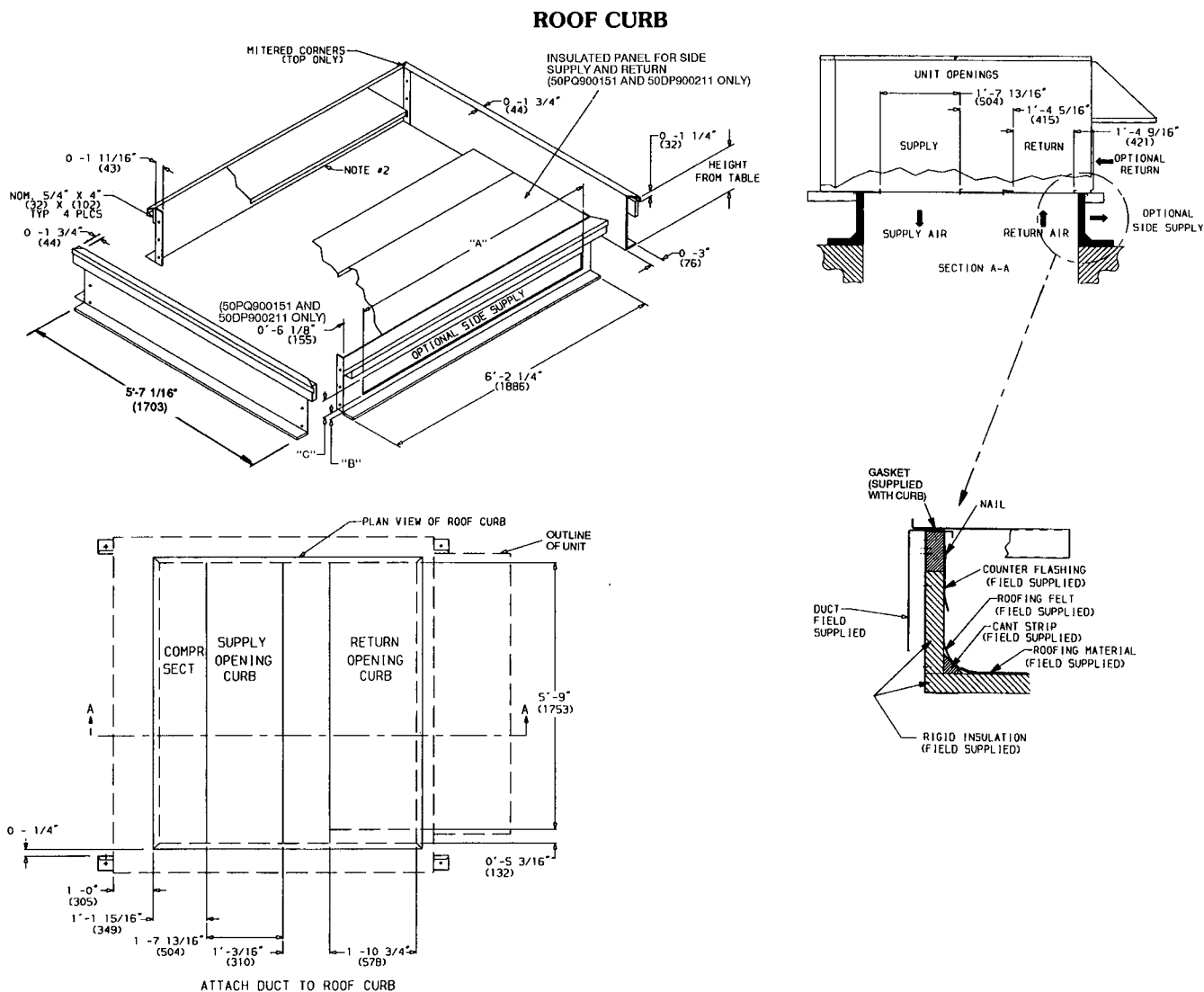
**Consists of other accessory kits. See Minimum Ambient Temperature Cooling Operation table on page 15 for more details.

Base unit dimensions



Accessory dimensions

Carrier®



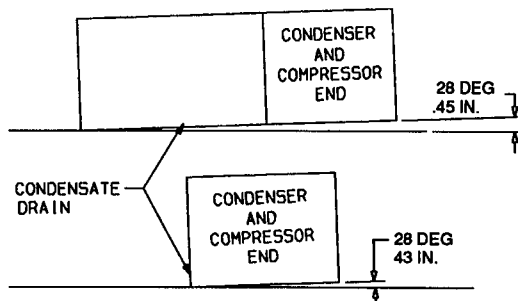
ACCESSORY PACKAGE NO.	CURB HEIGHT	DESCRIPTION	"A"	"B"	"C"
50PQ900221	1'-2" (305)	Standard Curb — 14" High	—	—	—
50PQ900141	2'-0" (610)	Standard Curb for Units Requiring High Installation	—	—	—
50PQ900151	2'-0" (610)	Horizontal Adapter Curb	5'-6" (1676)	0'-2 1/2" (64)	1'-6" (457)
50DP900211	1'-11" (584)	Pre-Assembled, High-Static Horizontal Adapter Curb	6'-2" (1880)	0'-6 1/4" (159)	1'-2 5/8" (371)

LEGEND

COMP SECT. — Compressor Section

NOTES:

1. Roof curb accessory is shipped unassembled.
2. Insulated panels, 1/2-in. thick neoprene-coated, 2 lb density.
3. Dimensions in () are in millimeters.
4. Direction of airflow.
5. Roof curb: 18 gage steel.
6. Attach all ductwork to roof curb.
7. Field installation of sidewall is mandatory.

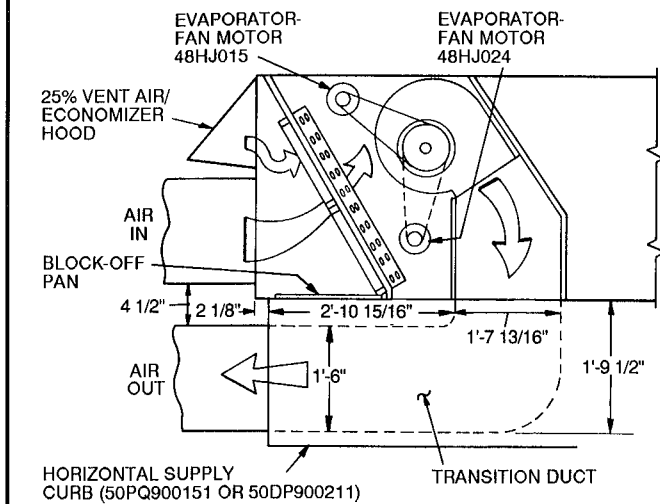


NOTE: To prevent the hazard of stagnant water build-up in the drain pan of the indoor-air section, unit can only be pitched as shown

Accessory dimensions (cont)



HORIZONTAL ADAPTER CURB (CURB PART NO. 50PQ900151 SHOWN)



NOTES:

1. The preassembled horizontal adapter curb part no. 50DP900211 includes a factory-designed, high-static transition duct which substantially improves evaporator fan performance. Refer to Accessory/FIOP Static Pressure on page 11 for more details.
2. For horizontal adapter curb part no. 50PQ900151, a field-supplied transition duct is required as shown

Selection procedure (with 48HJ024 example)

I Determine cooling and heating requirements at design conditions.

Given:

Required Cooling Capacity (TC) 205,000 Btuh
Sensible Heat Capacity (SHC) 162,000 Btuh
Required Heating Capacity 190,000 Btuh
Condenser Entering Air Temp 95 F Summer
Evaporator Entering Air Temp 80 F db, 67 F ewb
Evaporator Air Quantity 8,000 cfm
External Static Pressure 1.30 in. wg
Electrical Characteristics (V-Ph-Hz) 460-3-60
Vertical discharge unit with optional economizer required.

II Select unit based on required cooling capacity.

Enter cooling capacity table for 48HJ024 at condenser entering temperature 95 F, evaporator air entering at 8000 cfm and 67 F wb. The 48HJ024 unit will provide a total cooling capacity of 236,000 Btuh and a sensible heating capacity of 189,000 Btuh. For evaporator air temperatures other than 80 F edb, calculate sensible heat capacity correction, as required, using the formula in the notes following the Cooling Capacities tables.

NOTE: Unit ratings are gross capacities and do not include the effect of indoor fan motor heat. To calculate net capacities, see Step V.

III Select heating capacity of unit to provide design condition requirements.

In the Heating Capacities and Efficiencies table (page 3) note that the 48HJ024 will provide output capacity of 216,000 Btuh, which is adequate for the given application.

IV Determine fan speed and power requirements at design conditions.

Before entering the Fan Performance tables, calculate the total static pressure required based on unit compo-

nents. From the given and the Accessory/FIOP Pressure table (page 11) (number derived through interpolation) find:

External static pressure	1.30 in. wg
Economizer static pressure	0.10 in. wg
Total static pressure	1.40 in. wg

Enter the Fan Performance table for 48HJ024 at 8000 cfm and 1.40 in. wg external static pressure. The rpm is 1373 and the bhp is 6.70. The factory-installed 7½ hp motor and drive are sufficient for this application

V Determine net cooling capacity.

Cooling capacities are gross capacities and do not include indoor (evaporator) fan motor (IFM) heat. To determine input power to the motor, enter the Fan Performance table for the 48HJ024 at 8000 cfm and 1.40 in. wg external static pressure. Input watts to the motor are 6024.

Determine net cooling capacity using the following formula:

$$\begin{aligned} \text{Net capacity} &= \text{Gross capacity} - \text{IFM heat} \\ &= 236,000 \text{ Btuh} - 6024 \left(3.412 \frac{\text{Btuh}}{\text{Watts}} \right) \\ &= 236,000 \text{ Btuh} - 20,554 \text{ Btuh} \\ &= 215,446 \text{ Btuh} \end{aligned}$$

$$\begin{aligned} \text{Net sensible capacity} &= 189,000 \text{ Btuh} - 20,554 \text{ Btuh} \\ &= 168,446 \text{ Btuh} \end{aligned}$$

The calculations show that a 48HJ024 unit is the correct selection for the given conditions.

Performance data



COOLING CAPACITIES

48HJD,HJE015 (13 Tons)										
Temp (F) Air Entering Condenser (Edb)		Evap Air — Cfm/BF								
		3750/.058			5000/.090			6250/.125		
		Evap Air — Ewb (F)								
		72	67	62	72	67	62	72	67	62
85	TC	161	150	137	166	156	146	171	161	153
	SHC	80	102	121	88	116	142	96	129	153
	kW	10.7	10.5	10.1	10.9	10.6	10.4	11.0	10.7	10.5
95	TC	155	142	124	159	149	136	165	154	149
	SHC	78	99	115	86	114	136	95	129	149
	kW	11.8	11.5	11.1	11.9	11.7	11.3	12.1	11.8	11.6
105	TC	147	134	111	152	141	126	155	145	140
	SHC	75	95	108	84	111	126	92	126	140
	kW	12.9	12.4	12.0	13.0	12.7	12.3	13.1	12.8	12.6
115	TC	139	121	102	144	128	118	147	139	131
	SHC	72	90	102	82	106	118	90	124	131
	kW	13.9	13.4	13.0	14.1	13.6	13.3	14.2	13.7	13.3

LEGEND

BF — Bypass Factor
Edb — Entering Dry-Bulb
Ewb — Entering Wet-Bulb
kW — Compressor Motor Power Input
SHC — Sensible Heat Capacity (1000 Btuh) Gross
TC — Total Capacity (1000 Btuh) Gross

NOTES:

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

$$t_{ldb} = t_{edb} - \frac{\text{sensible capacity (Btuh)}}{1.10 \times \text{cfm}}$$

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

$$h_{lwb} = h_{ewb} - \frac{\text{total capacity (Btuh)}}{4.5 \times \text{cfm}}$$

Where: h_{ewb} = Enthalpy of air entering evaporator coil

3. SHC is based on 80 F edb temperature of air entering evaporator coil. Below 80 F edb, subtract (corr factor x cfm) from SHC. Above 80 F edb, add (corr factor x cfm) to SHC.

BYPASS FACTOR (BF)	ENTERING AIR DRY-BULB TEMP (F)					
	79	78	77	76	75	under 75
	81	82	83	84	85	over 85
Correction Factor						
.05	1.04	2.07	3.11	4.14	5.18	Use formula shown below
.10	.98	1.96	2.94	3.92	4.90	
.20	.87	1.74	2.62	3.49	4.36	
.30	.76	1.53	2.29	3.05	3.82	

Interpolation is permissible.

$$\text{Correction Factor} = 1.10 \times (1 - \text{BF}) \times (\text{edb} - 80)$$

48HJD024 (20 Tons)													
Temp (F) Air Entering Condenser (Edb)		Evap Air — Cfm/BF											
		6000/0.04			7000/0.05			8000/0.05			9000/0.06		
		Evap Air — Ewb (F)											
		72	67	62	72	67	62	72	67	62	72	67	62
85	TC	256.0	238.0	217.0	259.0	243.0	224.0	262.0	247.0	230.0	265.0	250.0	236.0
	SHC	132.0	168.0	200.0	139.0	181.0	215.0	146.0	192.0	226.0	154.0	202.0	235.0
	kW	19.0	18.6	17.9	19.1	18.7	18.1	19.3	18.8	18.3	19.4	18.9	18.5
95	TC	247.0	226.0	201.0	252.0	231.0	210.0	255.0	236.0	218.0	258.0	239.0	226.0
	SHC	129.0	164.0	191.0	136.0	177.0	206.0	144.0	189.0	217.0	151.0	200.0	226.0
	kW	20.8	20.2	19.5	21.0	20.4	19.8	21.1	20.6	20.0	21.2	20.7	20.3
105	TC	236.0	211.0	188.0	240.0	217.0	196.0	243.0	222.0	204.0	245.0	226.0	213.0
	SHC	125.0	158.0	184.0	133.0	171.0	194.0	141.0	184.0	204.0	148.0	196.0	213.0
	kW	22.6	21.8	21.0	22.8	22.0	21.4	22.9	22.2	21.7	23.0	22.4	22.0
115	TC	221.0	193.0	168.0	226.0	198.0	180.0	229.0	204.0	190.0	232.0	210.0	199.0
	SHC	121.0	150.0	168.0	129.0	163.0	180.0	136.0	176.0	190.0	143.0	189.0	199.0
	kW	24.3	23.4	22.8	24.5	23.7	23.1	24.6	23.8	23.4	24.7	23.9	23.7

LEGEND

BF — Bypass Factor
Edb — Entering Dry-Bulb
Ewb — Entering Wet-Bulb
kW — Compressor Motor Power Input
SHC — Sensible Heat Capacity (1000 Btuh) Gross
TC — Total Capacity (1000 Btuh) Gross

NOTES:

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

$$t_{ldb} = t_{edb} - \frac{\text{sensible capacity (Btuh)}}{1.10 \times \text{cfm}}$$

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

$$h_{lwb} = h_{ewb} - \frac{\text{total capacity (Btuh)}}{4.5 \times \text{cfm}}$$

Where: h_{ewb} = Enthalpy of air entering evaporator coil.

3. SHC is based on 80 F edb temperature of air entering evaporator coil. Below 80 F edb, subtract (corr factor x cfm) from SHC. Above 80 F edb, add (corr factor x cfm) to SHC.

BYPASS FACTOR (BF)	ENTERING AIR DRY-BULB TEMP (F)					
	79	78	77	76	75	under 75
	81	82	83	84	85	over 85
Correction Factor						
.05	1.04	2.07	3.11	4.14	5.18	Use formula shown below
.10	.98	1.96	2.94	3.92	4.90	
.20	.87	1.74	2.62	3.49	4.36	
.30	.76	1.53	2.29	3.05	3.82	

Interpolation is permissible.

$$\text{Correction Factor} = 1.10 \times (1 - \text{BF}) \times (\text{edb} - 80)$$

Performance data (cont)



FAN PERFORMANCE

Unit	Airflow (Cfm)	External Static Pressure (in. wg)																	
		0.2			0.4			0.6			0.8			1.0			1.2		
		Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
48HJD/HJE015	3700	740	0.78	582	856	0.95	709	957	1.11	828	1049	1.27	947	1132	1.44	1074	1202	1.62	1209
	4000	773	0.92	686	885	1.11	828	983	1.27	947	1074	1.44	1074	1155	1.61	1201	1230	1.79	1335
	4250	807	1.07	798	914	1.26	940	1011	1.44	1074	1099	1.61	1201	1180	1.80	1343	1254	1.98	1477
	4500	842	1.23	918	945	1.43	1067	1039	1.63	1216	1124	1.80	1343	1204	1.99	1485	1278	2.18	1626
	4750	878	1.40	1044	978	1.62	1209	1069	1.83	1365	1152	2.01	1499	1230	2.21	1649	1303	2.41	1798
	5000	915	1.60	1194	1011	1.82	1358	1099	2.05	1529	1181	2.25	1679	1256	2.44	1820	1329	2.65	1977
	5250	952	1.83	1365	1045	2.06	1537	1129	2.30	1716	1210	2.52	1880	1283	2.71	2022	1355	2.93	2186
	5500	990	2.06	1537	1079	2.30	1716	1161	2.55	1902	1240	2.78	2074	1313	3.00	2238	1381	3.20	2387
	5750	1028	2.31	1723	1114	2.56	1910	1194	2.82	2104	1270	3.06	2283	1342	3.30	2462	—	—	—
	6000	1067	2.59	1932	1149	2.85	2126	1228	3.11	2320	1300	3.37	2514	—	—	—	—	—	—
	6250	1105	2.88	2148	1184	3.15	2350	1261	3.42	2551	—	—	—	—	—	—	—	—	—

UNIT	Airflow (Cfm)	External Static Pressure (in. wg)											
		1.4			1.6			1.8			2.0		
		Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
48HJD/HJE015	3750	1255	1.81	1350	1282	2.00	1492	—	—	—	—	—	—
	4000	1293	1.99	1485	1340	2.19	1634	1366	2.39	1783	—	—	—
	4250	1322	2.17	1619	1379	2.38	1775	1423	2.59	1932	1450	2.80	2089
	4500	1346	2.38	1775	1409	2.59	1932	1462	2.81	2096	1504	3.03	2260
	4750	1371	2.61	1947	1435	2.82	2104	1493	3.04	2268	1544	3.28	2447
	5000	1396	2.86	2134	1459	3.07	2290	1519	3.29	2454	—	—	—
	5250	1422	3.15	2350	1485	3.36	2507	—	—	—	—	—	—
	5500	1448	3.43	2559	—	—	—	—	—	—	—	—	—
	5750	—	—	—	—	—	—	—	—	—	—	—	—
	6000	—	—	—	—	—	—	—	—	—	—	—	—
	6250	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower Input to Fan
Watts — Input Watts to Motor

NOTES:

- 1 Factory shipped motor drive range is 1194 to 1526 rpm. Other rpms require a field-supplied drive.
- 2 Static pressure losses (i.e., economizer, electric heater) must be added to

external static pressure before entering Fan Performance table. See page 11 for accessory/FIOP static pressure information.

- 3 Interpolation is permissible. Do not extrapolate.
- 4 Maximum continuous bhp is 3.45 and the maximum continuous watts are 3065. Extensive motor and drive testing on these units ensures that the full horsepower range of the motor can be utilized with confidence. Using your fan motors up to the watts rating shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.

Unit	Airflow (CFM)	External Static Pressure (in. wg)																	
		0.2			0.4			0.6			0.8			1.0			1.2		
		Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
48HJD024	6000	767	1.80	1617	858	2.20	1932	944	2.50	2256	1026	2.90	2600	1104	3.30	2967	1181	3.80	3358
	6500	817	2.20	1992	903	2.60	2329	985	3.00	2673	1062	3.40	3031	1136	3.80	3410	1209	4.30	3811
	7000	869	2.70	2427	950	3.10	2787	1028	3.50	3151	1102	3.90	3527	1172	4.40	3919	1241	4.80	4331
	7500	920	3.30	2919	998	3.70	3303	1073	4.10	3689	1143	4.60	4083	1210	5.00	4490	1275	5.50	4914
	8000	973	3.90	3476	1047	4.30	3886	1119	4.80	4294	1186	5.30	4708	1250	5.70	5131	1313	6.20	5569
	8500	1026	4.60	4102	1097	5.10	4635	1166	5.60	4967	1231	6.00	5401	1292	6.50	5843	1352	7.00	6297
	9000	1079	5.40	4800	1147	5.90	5257	1214	6.40	5714	1276	6.90	6171	1336	7.40	6632	1393	7.90	7102
	9500	1133	6.20	5576	1199	6.80	6058	1263	7.30	6540	1323	7.90	7018	1381	8.40	7500	1436	8.90	7988
	10,000	1188	7.20	6432	1250	7.80	6939	1313	8.30	7444	1371	8.90	7946	1426	9.50	8449	—	—	—

Unit	Airflow (Cfm)	External Static Pressure (in. wg)											
		1.4			1.6			1.8			1.9		
		Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
48HJD024	6000	1255	4.20	3772	1327	4.70	4206	1396	5.20	4658	1431	5.45	4884
	6500	1279	4.70	4233	1348	5.20	4677	1415	5.80	5139	1449	6.10	5370
	7000	1308	5.30	4762	1373	5.80	5215	1437	6.40	5686	1469	6.70	5922
	7500	1339	6.00	5356	1401	6.50	5818	1462	7.00	6298	1493	7.25	6538
	8000	1373	6.70	6024	1433	7.30	6495	1493	7.80	6966	1523	8.05	7202
	8500	1410	7.60	6765	1467	8.10	7248	1524	8.70	7731	—	—	—
	9000	1449	8.50	7584	1503	9.00	8033	—	—	—	—	—	—
	9500	1488	9.40	8403	—	—	—	—	—	—	—	—	—
	10,000	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower Input to Fan
Watts — Input Watts to Motor

NOTES:

- 1 **Boldface** indicates additional capability of the 460-v motor.
- 2 Factory shipped motor drive range is 1238 to 1494 rpm. Other rpms require a field-supplied drive.
- 3 Static pressure losses (i.e., economizer, electric heater) must be added to external static pressure before entering Fan Performance table. See page 11 for accessory/FIOP static pressure information.

- 4 Interpolation is permissible. Do not extrapolate.
- 5 Maximum continuous bhp is 8.7 for 208/230 and 575-v units and 9.5 for 460-v units. The maximum continuous watts are 7915 for the 208/230 and 575-v units and 8640 for the 460-v units. Extensive motor and drive testing on these units ensures that the full horsepower range of the motor can be utilized with confidence. Using your fan motors up to the watts rating shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.

ACCESSORY/FIOP ECONOMIZER STATIC PRESSURE (in. wg)

UNIT 48HJ	UNIT VOLTAGE	CFM	ECONOMIZER PRESSURE DROP	FACTORY-ASSEMBLED HORIZONTAL ADAPTER CURB PRESSURE INCREASE
015	All	4,000	.03	0.68
		5,000	.05	0.65
		6,000	.07	0.60
		7,500	.10	0.45
024	All	6,000	.07	0.60
		7,200	.09	0.48
		9,000	.11	0.30
		10,000	.12	0.26
		11,250	.13	0.24

FIOP — Factory-Installed Option

NOTE: The factory-assembled horizontal adapter curb substantially improves 48TJ015 and 024 fan performance (by the amount of static pressure listed)

Electrical data

UNIT	V-PH-HZ	VOLTAGE RANGE		COMPRESSOR				CONDENSER FAN MOTOR		EVAPORATOR FAN MOTOR		COMBUSTION FAN MOTOR	POWER SUPPLY	
				No. 1		No. 2								
		Min	Max	RLA	LRA	RLA	LRA	Qty	FLA (ea)	Hp	FLA	FLA	MCA	MOCP*
48HJD,HJE015	208/230-3-60	187	253	49.3	191	—	—	2	7.7	3	10.5/10.5	0.57	88/88	130/130
	460-3-60	414	508	22.1	86	—	—	2	3.3	3	4.8	0.30	39	60
	575-3-60	518	632	17.9	69	—	—	2	2.6	3	3.9	0.57	32	45
48HJD024	208/230-3-60	187	253	43.9	170	43.9	170	2	5.4	7½	24.2/22.0	0.57	134/132	175/175
	460-3-60	414	508	19.9	77	19.9	77	2	2.7	7½	11.0	0.30	62	80
	575-3-60	518	632	15.9	62	15.9	62	2	3.4	7½	9.0	0.57	52	60

LEGEND

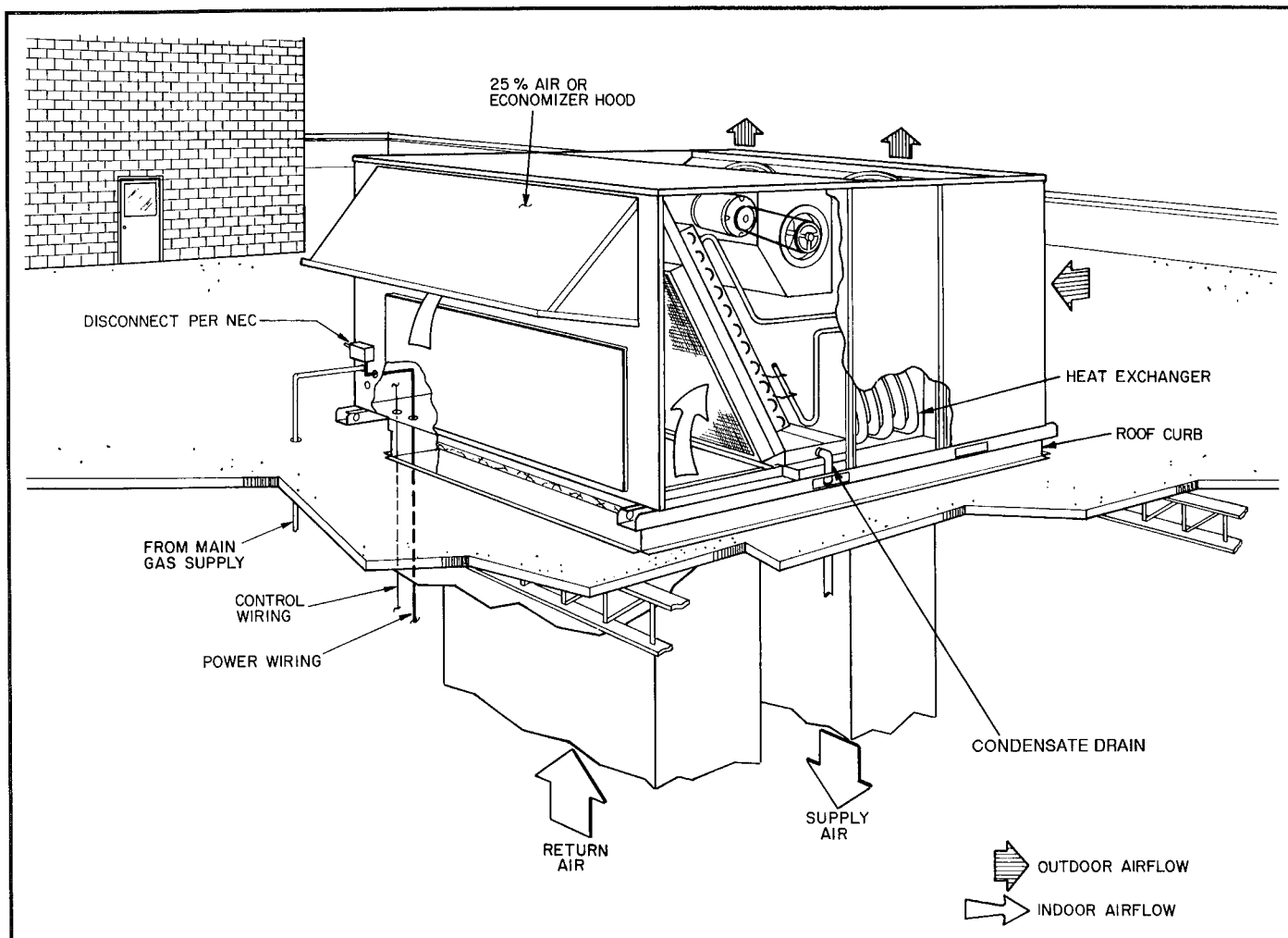
FLA	— Full Load Amps
HACR	— Heating, Air Conditioning & Refrigeration
LRA	— Locked Rotor Amps
MCA	— Minimum Circuit Amps
MOCP	— Maximum Overcurrent Protection
NEC	— National Electrical Code
RLA	— Rated Load Amps

*This is the maximum size permissible; smaller fuse size may be used where conditions permit



NOTE: In compliance with NEC requirements for multimotor and combination load equipment (refer to NEC Articles 430 and 440), the overcurrent protective device for the unit shall be fuse or HACR breaker. Canadian units may be fuse or circuit breaker

Typical piping and wiring



LEGEND FOR TYPICAL CONTROL WIRING SCHEMATIC

BRK W/AT — Breaks with Amp Turns
C — Contactor, Compressor
CLO — Compressor Lockout
COM — Common
CR — Control Relay
CT — Current Transformer
DM — Damper Motor
FPT — Freeze Protection Thermostat
GND — Ground
HPS — High-Pressure Switch
HR — Heat Relay
HV — High Voltage
IP — Ignitor Pilot
ICP — Ignitor Control Pack
IDR — Induced Draft Relay
IFR — Indoor (Evaporator) Fan Relay
LOR — Lockout Relay
LPS — Low-Pressure Switch/Loss of Charge
LS — Limit Switch
MAT — Mixed Air Thermostat
MGV — Main Gas Valve
MV — Main Valve
OAT — Outdoor-Air Thermostat
OFC — Outdoor (Condenser) Fan Contactor

PGV — Pilot Gas Valve
PL — Plug Assembly
PRI — Primary
PV — Pilot Valve
SN — Sensor
TB — Terminal Block
TDR — Time Delay Relay
TR — Timer Relay
TRAN — Transformer

Terminal (Marked)

Terminal (Unmarked)

Terminal Block

Splice

Splice (Marked)

Factory Wiring

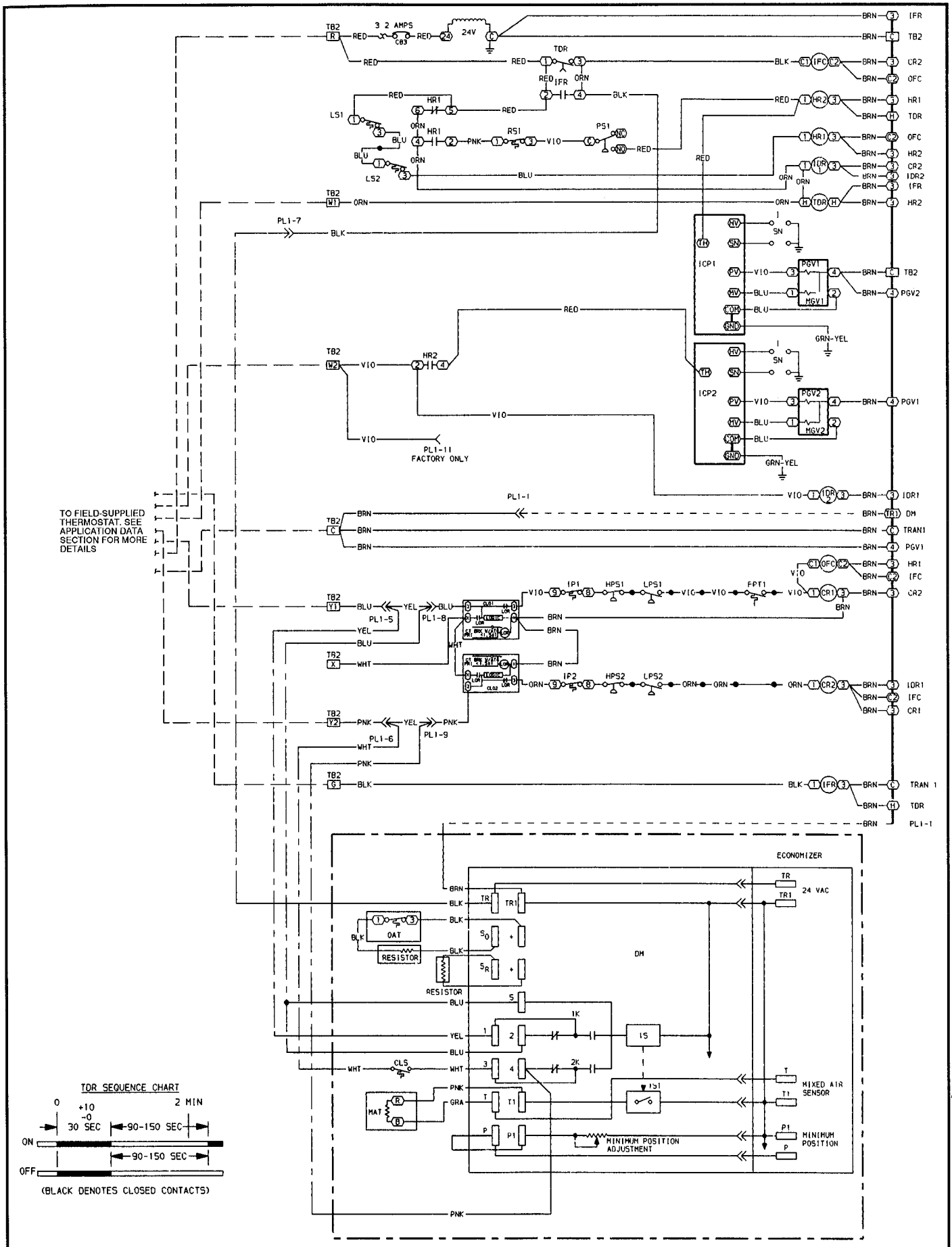
Field Control Wiring

Field Power Wiring

Accessory or Optional Wiring

To indicate common potential only; not to represent wiring.

Typical wiring schematic (48HJ024 shown)



Operating sequence

Cooling, units without economizer — When thermostat calls for cooling, terminals G and Y1 are energized. The indoor (evaporator) fan contactor (IFC) and compressor contactor no. 1 (C1) are energized, and evaporator-fan motor (IFM), compressor no. 1 (48HJ024) or unloaded compressor (48HJ015), and condenser fan start. The condenser-fan motor runs continuously while unit is cooling. For units with 2 stages of cooling, if the thermostat calls for a second stage of cooling by energizing Y2, compressor contactor no. 2 (C2) is energized and compressor no. 2 starts (48HJ024), or compressor no. 1 runs fully loaded (48HJ015).

Heating, units without economizer

NOTE: The 48HJE015 and HJD024 units have 2 stages of heat.

Set thermostat system switch at HEAT or AUTO. position and set fan switch to AUTO. position for heating.

When first-stage thermostat calls for heat, time-delay relay for evaporator fan begins timer sequence. Induced-draft relay closes, and induced-draft motor starts.

Draft pressure switch closes and pilot valve no. 1 opens, allowing gas to flow to the first-stage pilot. Spark ignitor ignites pilot flame. Sensor detects flame and the main gas valve no. 1 opens. Gas flows to main burners and first-stage burners ignite. Spark igniter turns off.

When sequence is complete, time-delay relay closes and evaporator fans start.

SECOND STAGE — 48HJD024 LOW-HEAT AND 48HJE015 HIGH-HEAT UNITS — With an additional heating call, the second-stage thermostat closes. (The control relay closes during the first stage of operation.) Pilot valve no. 2 opens, and the spark ignitor ignites pilot. The sensor detects a flame and energizes main gas valve coil no. 2, opening main gas valve no. 2. Gas flows to the main burners, and the second stage burners ignite. The spark ignitor turns off.

When the second-stage thermostat is satisfied, the second-stage gas valve closes.

When the first-stage thermostat is satisfied, the first-stage gas valve closes. The induced-draft motor turns off, the time relay opens, and the timer sequence begins. When the sequence is complete, the evaporator-fan motor turns off.

Cooling, units with economizer — Upon a call for cooling, when outdoor ambient is above the temperature control setting, the economizer damper moves to VENT position. The compressors and evaporator and condenser fans energize.

Upon a first call for cooling, when outdoor ambient is below the temperature control setting, the evaporator fan starts and the economizer opens to maintain 53 F leaving-air temperature. The compressors remain off.

Upon a second-stage call for cooling, compressor no. 1 is energized and mechanical cooling is integrated with economizer cooling. If the outdoor-air temperature drops below 50 F, a cooling lockout switch prevents the compressors from running.

When supply-air temperature drops below a fixed set point, the economizer damper modulates to maintain the temperature at the fixed set point.

A freeze protection thermostat (FPT) is located on the evaporator coil. It detects frost build-up and turns off the compressors, allowing the coil to clear. Once frost has melted, the compressors can be reenergized.

Heating, units with economizer — Outdoor-air damper stays at VENT position while evaporator fan is operating. Refer to Heating, units without economizer section on this page for remainder of operating sequence.

Application data



Ductwork — Ductwork should be attached to the curb on all units. Interior installation may proceed before unit is set in place on roof. If ductwork will be attached to the unit, do not drill in condensate drain pan area — leaks may result. See figures on page 16 for information on field-installed concentric ductwork when applicable.

Thru-the-curb service connections — Roof curb connections allow field power wires, control wires, and gas supply to enter through the roof curb opening.

Thermostat — Use of 2-stage cooling thermostat is required for all units.

Heating-to-cooling changeover — All units are automatic changeover from heating to cooling when automatic changeover thermostat and subbase are used.

Airflow — Units are draw-thru on cooling and blow-thru on heating.

Maximum airflow — To minimize the possibility of condensate blow-off from evaporator, airflow through units should not exceed 500 cfm/ton.

Minimum airflow — The minimum airflow for cooling is 300 cfm/ton.

Minimum ambient cooling operation temperature — Units are designed to operate at outdoor temperatures down to 40 F. To operate at lower outdoor-air temperatures, see Minimum-Ambient Temperature Cooling Operation table below for operating limits and required accessories.

Maximum operating outdoor-air temperature — For cooling, this temperature is 115 F

High altitude — A change to the gas orifice may be required at high altitudes. Refer to Altitude Compensation charts below.

Minimum temperature — Air entering the heat exchanger in heating is 50 F continuous and 45 F intermittent

Internal unit design — Due to Carrier's internal unit design (draw-thru over the motor), air path, and specially designed motors, the full horsepower (maximum continuous bhp and watts) listed in the notes following each Fan Performance table can be utilized with extreme confidence.

Using Carrier motors with the values listed in the Fan Performance Data tables *will not* result in nuisance tripping or premature motor failure. The unit warranty will not be affected.

MINIMUM-AMBIENT TEMPERATURE COOLING OPERATION

UNIT 48HJ	OUTDOOR COOLING TEMPERATURE (F)			
	Base Unit	With Accessory 25 F Low-Ambient Kit	With Accessory Head Pressure Control Device and Accessory 25 F Low-Ambient Kit	With Accessory Head Pressure Control Device and 2 Accessory Winter Start Time-Delay Relay Kits
015	40	25	- 20	—
024	40	25*	—	- 20

*Also need 1 accessory winter start time-delay relay.

NOTES:

- 1 All 575-v units also require transformer part no. HT01AH954 to convert 575 v to 230 v
2. The 48HJ024 requires the additional winter start kit(s) because this kit contains the time-delay relay needed for the second compressor.

ALTITUDE COMPENSATION*

ELEVATION (Ft)	NATURAL GAS Orifice Size†
0-2,000	33
2,000	35
3,000	35
4,000	36
5,000	36
6,000	37
7,000	38
8,000	38
9,000	40
10,000	41
11,000	43
12,000	44
13,000	44
14,000	45

*As the height above sea level increases, there is less oxygen per cubic foot of air. Therefore, heat input rate should be reduced at higher altitudes.

†Orifices available through your Carrier distributor.

ALTITUDE DERATING FACTOR*

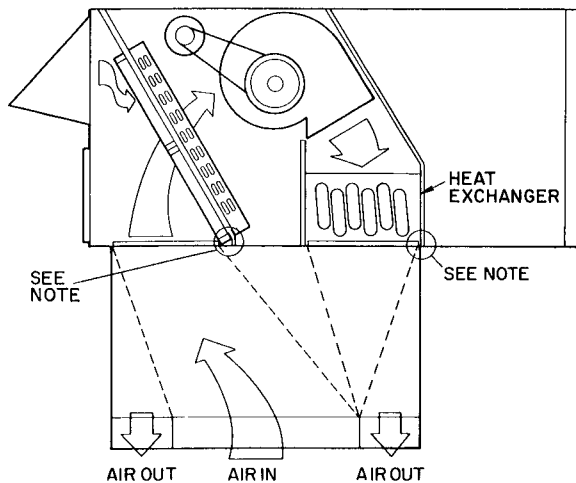
ELEVATION (Ft)	MAXIMUM HEATING VALUE (Btu/ft ³)
0-2,000	1,100
2,001-3,000	1,050
3,001-4,000	1,000
4,001-5,000	950
5,001-6,000	900

*Derating of the unit is not required unless the heating value of the gas exceeds the values listed in the table above, or if the elevation exceeds 6000 ft. Derating conditions must be 4% per thousand ft above sea level. For example, at 4000 ft, if the heating value of the gas exceeds 1000 Btu/ft³, the unit will require a 16% derating. For elevations above 6000 ft, the same formula applies. For example, at 7000 ft, the unit will require a 28% derating of the maximum heating value per the National Fuel Gas Code.

Application data (cont)

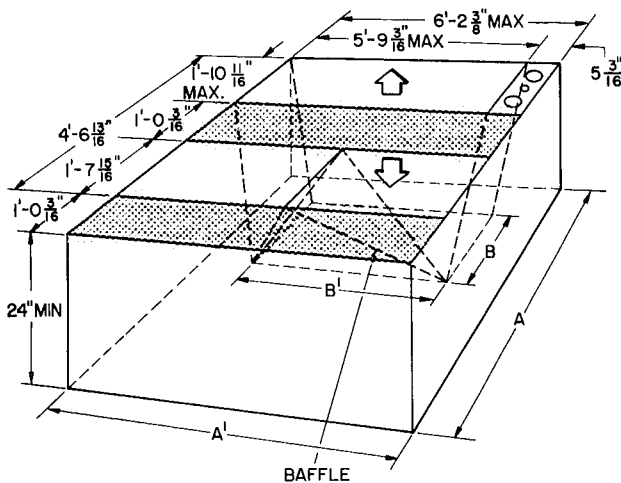


CONCENTRIC DUCT AIR DISTRIBUTION (48HJ015 SHOWN)



NOTE: Do not drill in this area, damage to basepan may result in water leak.

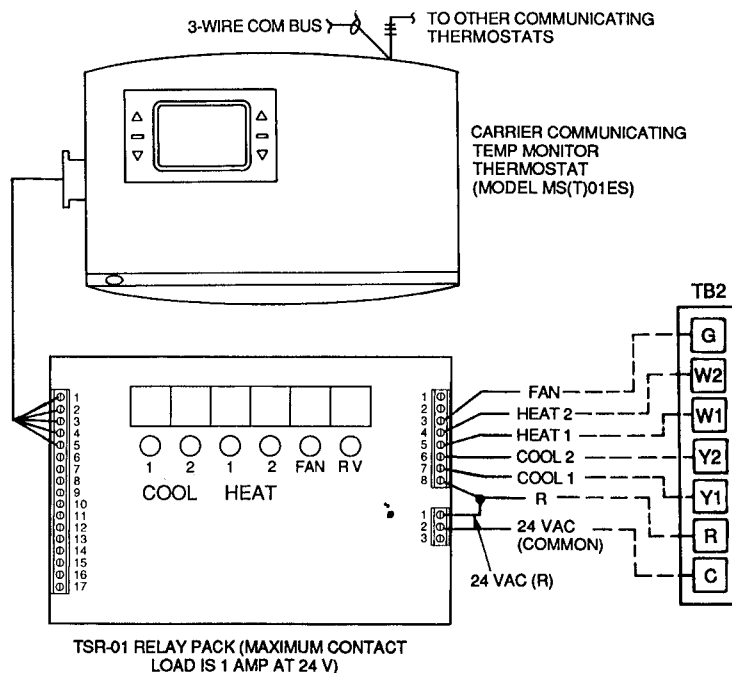
CONCENTRIC DUCT DETAILS



NOTE: Dimension A, A1 and B, B1 are obtained from field-supplied ceiling diffuser.

Shaded area indicates block-off panels

FIELD-THERMOSTAT WIRING



LEGEND
COM — Communications
TB — Terminal Block

Packaged Rooftop Electric Cooling Unit with Gas Heat — Constant Volume Application

HVAC Guide Specifications

Size Range: **13 and 20 Tons, Nominal (Cooling)**
115,500 — 270,000 Btuh, Nominal
(Input Heating)

Carrier Model Numbers: **48HJD**
48HJE

Part 1 — General

1.01 SYSTEM DESCRIPTION

- A. Unit is an outdoor rooftop mounted, electrically controlled heating and cooling unit utilizing a reciprocating semi-hermetic compressor(s) for cooling duty and gas combustion for heating duty. Supply air shall be discharged downward or horizontally (with horizontal supply/return adapter curb assembly), as shown on contract drawings. Standard unit shall include a manual outdoor-air inlet.

1.02 QUALITY ASSURANCE

- A. Unit shall be rated in accordance with ARI Standards 270 and 360 and designed in accordance with UL Standard 1995.
- B. Unit shall be designed to conform to ASHRAE 15.
- C. Unit shall be ETL-tested and certified in accordance with ANSI Z21.47 Standards as a total package.
- D. Unit shall be certified by Warnock Hersey.
- E. Roof curb shall be designed to conform to NRCA Standards.
- F. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
- G. Unit casing shall be capable of withstanding Federal test method Standard No. 141 (Method 6061) 500-hour salt spray test.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Unit shall be stored and handled per manufacturer's recommendations.

Part 2 — Products

2.01 EQUIPMENT (STANDARD)

A. General:

The 48HJ unit shall be a factory assembled, single-piece heating and cooling unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, refrigerant charge (R-22), and special features required prior to field start-up.

B. Unit Cabinet:

- 1. Unit cabinet shall be constructed of galvanized steel, bonderized and coated with a prepainted baked enamel finish
- 2. Indoor blower compartment interior surfaces shall be insulated with a minimum 1/2-in. thick insulation

coated on the air side. Aluminum foil-faced fiber-glass insulation shall be used in the gas heat compartment.

- 3. Cabinet panels shall be easily removable for servicing.
- 4. Filters shall be accessible through an access panel.
- 5. Holes shall be provided in the base rails for rigging shackles to facilitate overhead rigging.
- 6. Unit shall have a factory-installed internal condensate drain connection and a sloped condensate pan.

C. Fans:

- 1. Indoor blower (evaporator fan):
 - a. Fan shall be belt driven. Belt drive shall include an adjustable pulley.
 - b. Fan wheel shall be made from steel with a corrosion resistant finish. It shall be a dynamically balanced, double-inlet type with forward-curved blades.
- 2. Condenser fan shall be of the direct-driven propeller type, with corrosion-resistant blades riveted to corrosion-resistant steel supports. It shall be dynamically balanced and discharge air upwards.
- 3. Induced-draft blower shall be of the direct-driven, single inlet, forward-curved, centrifugal type. It shall be made from steel with a corrosion-resistant finish and shall be dynamically balanced.

D. Compressor(s):

- 1. The reciprocating semi-hermetic compressor(s) has factory-installed external spring vibration isolation.
- 2. Factory-installed crankcase heater prevents refrigerant dilution of oil.
- 3. The semi-hermetic compressor shall have unloading capability (015 only).
- 4. On independent circuits (024).

E. Coils:

Standard evaporator and condenser coils shall have copper or aluminum plate fins mechanically bonded to seamless copper tubes with all joints brazed.

F. Heating Section:

- 1. Induced-draft combustion type with energy saving direct-spark ignition system and redundant main gas valve
- 2. The heat exchanger shall be of the tubular-section type constructed of a minimum of 20-gage steel coated with a nominal 1.2 mil aluminum-silicone alloy for corrosion resistance.
- 3. Burners shall be of the in-shot type constructed of aluminum-coated steel.
- 4. All gas piping shall enter the unit at a single location.

G. Refrigerant Components:

Refrigerant circuit components shall include:

1. Fixed expansion device with filter driers.
2. Service gage connection on suction, discharge, and liquid lines.
3. Suction and discharge service valves.

H. Filter Section:

Standard filter section shall consist of 2 sizes of factory-installed 2-in. thick throwaway fiberglass filters of commercially available sizes.

I. Controls and Safeties:

1. Unit Controls:

- a. Economizer control (optional)
- b. Capacity control (2-step)
- c. Unit shall be complete with self-contained low-voltage control circuit.

2. Safeties.

- a. Unit shall incorporate a solid-state compressor lockout which provides reset capability at the space thermostat, should any of the following safety devices trip and shut off compressor:
 - 1) Compressor overtemperature, overcurrent.
 - 2) Low-pressure switch.
 - 3) Freezestat (evaporator coil).
 - 4) High-pressure switch.
- b. Supply-air thermostat shall be located in the unit.
- c. Heating section shall be provided with the following minimum protections:
 - 1) High-temperature limit switch.
 - 2) Induced-draft pressure switch.
 - 3) Flame rollout switch (manual reset).
 - 4) Flame proving controls.
 - 5) Redundant gas valve(s).

J. Operating Characteristics:

1. Unit shall be capable of starting and running at 115 F ambient outdoor temperature per maximum load criteria of ARI Standard 360.
2. Unit with standard controls will operate in cooling to 40 F.
3. Unit provided with fan time delay to prevent cold air delivery.

K. Electrical Requirements:

All unit power wiring shall enter unit cabinet at a single location.

L. Motors:

1. The compressor motors shall be of the refrigerant cooled type with thermal and calibrated circuit breaker overload protection.
2. All fan motors shall have permanently lubricated, sealed bearings and inherent automatic-reset thermal overload protection or manual reset calibrated circuit breakers.

M. Special Features.

Certain features are not applicable when the features designated * are specified. For assistance in amending the specifications, your local Carrier Sales Office should be contacted.

1. Roof Curbs:

- a. Formed of 18-gage galvanized steel with wood nailer strip and capable of supporting entire unit weight.
- b. Allows for installing and securing ductwork to curb prior to mounting unit on the curb.
- c. Both horizontal and vertical supply/return curbs shall be available.

* 2. Integrated Economizer:

- a. Integrated type capable of simultaneous economizer and compressor operation to provide cooling with outdoor air.
- b. Equipped with low-leakage dampers not to exceed 3% leakage, at 1.0 in. wg pressure differential.
- c. Capable of introducing up to 100% outdoor air.
- d. Equipped with dry-bulb temperature control to govern economizer changeover.

* 3. Two-Position Damper:

Two-position damper package shall include single blade damper and motor. Admits up to 25% outdoor air, and shall close upon unit shutoff

4. Accessory Compressor Cycle Delay:

Compressor shall be prevented from restarting for a minimum of 5 minutes after shutdown.

* 5. Thermostat and Subbase:

To provide staged heating and cooling in addition to automatic (or manual) changeover and fan control.

* 6. Barometric Relief Damper Package:

- a. Package shall include damper, seals, hardware, and hoods to relieve excess internal pressure.
- b. Damper shall close due to gravity upon unit shutdown.

- * 7. Power Exhaust:
Package shall include an exhaust fan, motor, and damper for vertical flow units with economizer to control overpressurization of building.
- * 8. Head Pressure Control Package:
Consists of an accessory outdoor-air package and a solid-state control with condenser coil temperature sensor for controlling condenser-fan motor speed to maintain condensing temperature between 90 F and 100 F at outdoor ambient temperature down to -20 F.
- 9. 25 F Low-Ambient Kit:
When used alone or in conjunction with head pressure control and/or winter start package, allows unit to operate at lower outdoor ambient temperatures.
- * 10. Differential Enthalpy Sensor:
 - a. For use with economizer only.
 - b. Capable of comparing heat content (temperature and humidity) of outdoor air and indoor air and controlling economizer cut-in point at the most economical level.
- * 11. Remote Control Panel:
Panel shall be a decorative, indoor, wall-mounted panel consisting of.
 - a. Two-stage heat/2-stage cool thermostat.
 - b. Automatic changeover.
 - c. System switch with HEAT-COOL-AUTO.-OFF settings.
 - d. Fan switch with ON-AUTO. settings.
 - e. Ventilation control for remote variation of the amount of outdoor-air intake.
 - f. Indicator lights for HEAT-COOL-FAN operation.
 - g. Three unused indicator lights for field use.
- * 12. Electronic Programmable Thermostat:
Capable of using deluxe full-featured electronic thermostat.
- 13. Winter Start Time-Delay Relay:
When used in conjunction with accessory low-ambient and/or head pressure control kits, permits operation of 48HJ024 in cooling down to -20 F outdoor ambient.
- 14. Pressure Operated Unloader (015 only):
Adds an extra stage of unloading for increased efficiency at low loads.

