



Product Data

48LJ Rooftop Gas Heating/Electric Cooling Units

20 Nominal Tons



Single-Package Rooftop Products
Designed to Meet Commercial and
Industrial Application Requirements

- convertible units
- constant volume controls

Features/Benefits

Design flexibility

Convertible unit design allows the factory built vertical supply/return unit to be easily converted to horizontal supply/return with the use of the accessory horizontal conversion package. No modification to the optional economizer is required.

Vertical supply/return applications utilize the NRCA (National Roofing Contractors Association) approved roof curb, which is installed and weatherproofed by the roofer. Ducts attach directly to the roof curb, allowing all ductwork to be completed before the unit is positioned.

Horizontal supply/return applications can be curb mounted or slab mounted. Ducts attach to the unit utilizing the factory-supplied flanges.

The convertible design allows the unit to be used for conventional vertical supply/return applications or special horizontal supply/return applications, such as replacement or noise sensitive applications. The horizontal installation means noise can be attenuated before the duct penetrates the roof.

Unit efficiency

Aluminized steel gas heat exchanger is tubular design for low-pressure drop. Induced-draft fan maintains a negative pressure in the heat exchanger.

Dual fully-hermetic compressors on dual circuit evaporator coil provide EERs (Energy Efficiency Ratio) to 8.5. Dual refrigerant circuits provide standby capability should one circuit require service.

Optional integrated economizer utilizes a solid-state enthalpy control to maximize the benefits of free cooling. The economizer operates in conjunction with mechanical cooling when required and is factory installed for either vertical or horizontal operation. Field-installed rainhood/filter assembly prevents moisture or objects from entering the unit.

Exhaust air relief is available for economizer units through the use of barometric relief or power exhaust.

Power exhaust relieves up to 100% of nominal cfm. Field-installed rainhood/backdraft damper assembly prevents infiltration during the unoccupied mode. Factory-installed relief options are unit mounted on vertical units. Accessory relief options can be duct mounted on horizontal applications.

Single supply fan design reduces noise and vibration, and avoids problems related to parallel fan designs.

Alternate motor and drive are available for higher static applications.

Installation/serviceability

Small footprint requires less roof area and makes unit easier to rig. Low unit profile allows units to be mounted closer to edge of building while remaining out of public view. Up to 60% smaller volume than comparable units.

Single-point electric and gas connections are standard on all units, regardless of voltage. Electrical and gas service access can be made through roof curb or side of unit.

Serviceable components are easy to reach; simply remove 4 screws on the access panels and remove panels.

Lightweight but durable construction makes the unit easier to rig and reduces rigging costs.

Unit controls

Units utilize a solid-state relay board that interfaces with any 2-stage heat/2-stage cool thermostat. Economizer units utilize a mixed air thermistor with a field-adjustable set point.

Unit design is ETL (Electrical Testing Laboratory) and CSA (Canadian Standards Association) certified.

When installed with the power exhaust option or accessory and field-supplied switches and wiring, units can be set to run in the building pres-

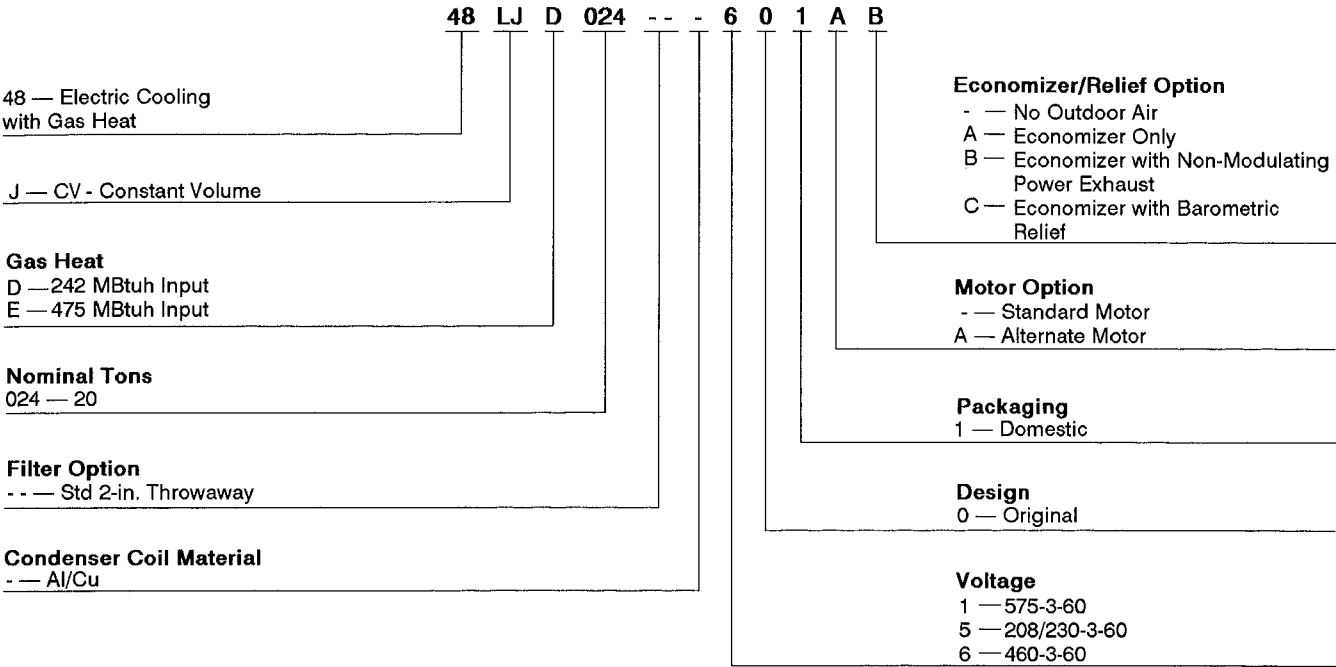
surization mode or the smoke purge mode. In the event of a fire or smoke condition, a zone can be pressurized to prevent smoke from entering the zone, or smoke can be exhausted from a zone. A set of terminals is provided for a switch or relay to disable the unit; all other connections must be made directly to the appropriate device.

Terminals are provided for a field-installed 115-v convenience outlet to be used during servicing when unit is not operating. Terminals can also be used to power field-installed smoke detectors. The maximum available voltage is 10 va in standby mode and 45 va in alarm mode.

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Model number nomenclature



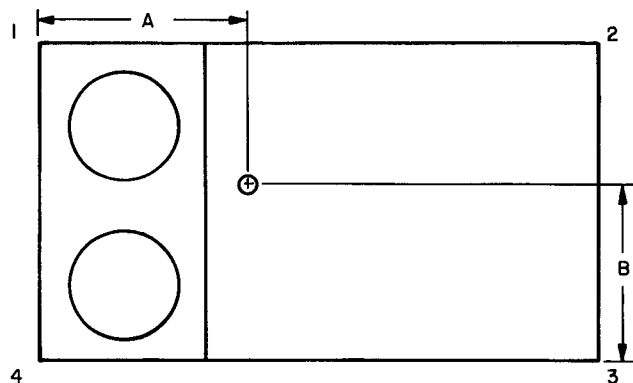
Physical data

BASE UNIT 48LJ	D024	E024
Nominal Capacity (tons)	20	20
OPERATING WEIGHT (lb)*	2895	2975
COMPRESSORS (2 each unit) Capacity Steps (%)	Hermetic, 1750 Rpm 50, 100	
REFRIGERANT Operating Charge (lb), Sys 1/Sys 2	R-22 Controlled by Acutrol™ Metering Device 20.0/20.0	
CONDENSER COILS Face Area (sq ft) Fins Per Inch (A1)	3-Row, 3/8-in. Tube Diameter 24.75 17.0	
EVAPORATOR COILS Face Area (sq ft) Fins Per Inch	4-Row, 3/8-in. Tube Diameter 20.3 15	
FURNACE SECTION Number of Heat Exchangers Input (MBtuh) Output (MBtuh) Temperature Rise (°F) Burner Orifice Diameter (in. ...drill no.) Pilot Orifice Diameter (in. ...drill no.) Firing Stages Number of Gas Valves	5 242 194 10-40 .129 .30 .046 .56 2 1	10 475 380 30-60 129 .30 .055 .54 2 2
OUTDOOR AIR FANS (2 each unit) Nominal Cfm Nominal Hp	Propeller Type, 30-in. Diameter, 1140 Rpm 13,000 1.0	
INDOOR AIR FANS (1 each unit)† Nominal Cfm Maximum Allowable Cfm Maximum Allowable Rpm	Centrifugal Type, 18 x 15 in., 1750 Rpm 8,000 10,000 1,200	
Standard Motor and Drive Motor Hp Full Load Efficiency (%) Motor Frame Size Fan Pulley Pitch Diameter (in.) Motor Pulley Pitch Diameter (in.) Resulting Fan Rpm	1 438-in. Fan Pulley Bore 5 84.3 184T 10.6 4.75 780	
Optional Motor and Drive Motor Hp Full Load Efficiency (%) Motor Frame Size Fan Pulley Pitch Diameter (in.) Motor Pulley Pitch Diameter (in.) Resulting Fan Rpm	1 438-in. Fan Pulley Bore 7½ 84.8 213T 8.0 4.12 900	
Optional Power Exhaust Motors...Hp Fans...Diameter (in.)	Propeller Type, 1140 Rpm 1 .1 1. 24	
Filters (Quantity...L x W x D) 20% Standard Efficiency Throwaway	2 18 x 24 x 2 4 .24 x 24 x 2	

*Weights include economizer, but not rain-hood. See table below for weights of options and accessories.

†Standard fan motor is supplied with standard fan drive and belts. Optional fan motor is supplied with optional fan drive, pulleys, and belts. Other combinations are field supplied.

WEIGHT DISTRIBUTION AND CENTER OF GRAVITY



UNIT	WEIGHT (lbs) OF CORNER				DIM. (ft-in.)	
	1	2	3	4	A	B
48LJD	787	724	663	721	6-1¾	3-11¾
48LJE	808	744	682	741	6-1¾	3-11¾

NOTE: Weights include economizer, but not rainhood. See table at right for weights of options and accessories

OPERATING WEIGHTS OF OPTIONS AND ACCESSORIES

OPTION OR ACCESSORY	WEIGHT (lb)
ROOF CURB	280
ECONOMIZER	140
ECONOMIZER HOOD	140
25% OUTDOOR AIR HOOD	40
POWER EXHAUST	50
HOOD FOR POWER EXHAUST OR BAROMETRIC RELIEF	100
HAIL GUARD	40
ALTERNATE MOTOR AND DRIVE	45

EER and IPLV ratings

UNIT 48	EER	IPLV
LJD	8.5	8.6
LJE	8.5	8.7

LEGEND

EER — Energy Efficiency Ratio
IPLV — Integrated Part-Load Values

The integrated part-load value is an efficiency rating calculated using actual performance data taken at 80 F ambient temperature and 80/67 F indoor air temperature, at all stages of mechanical cooling. Refer to ARI 360-D1 (Air Conditioning and Refrigeration Institute) for additional information.



Options and accessories

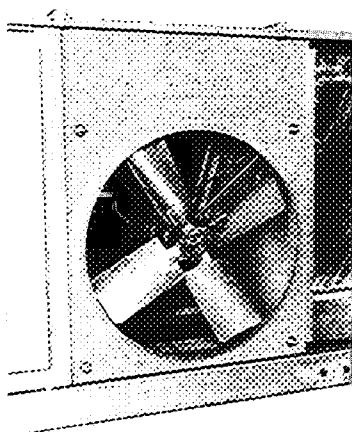
ITEM	OPTION*	ACCESSORY†
Integrated Economizer	X	
Alternate Supply Fan Motors	X	
Barometric Relief	X	X
Non-Modulating Power Exhaust	X	X
Roof Curb		X
Condenser Hail Guard		X
Thermostat and Subbase		X
Head Pressure Control Package		X
Outdoor Air Thermostat		X
Horizontal Conversion Package		X
Manual 25% Outdoor Air Damper		X
Differential Enthalpy Sensor		X
LP Gas Conversion ETL/CSA Approved		X

LEGEND

LP — Liquid Propane
CSA — Canadian Standards Association
ETL — Electrical Testing Laboratory

*Factory installed
†Field installed

POWER EXHAUST



When combined with the economizer, the power exhaust can exhaust up to 100% of the return air and eliminate over-pressurization of the building.

NOTE: Rainhood/damper assembly not shown

ECONOMIZER



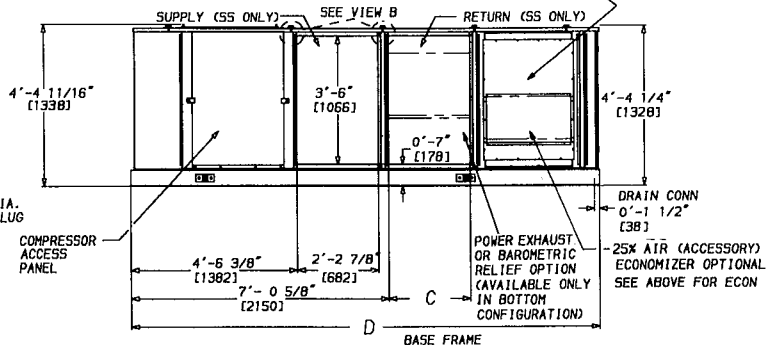
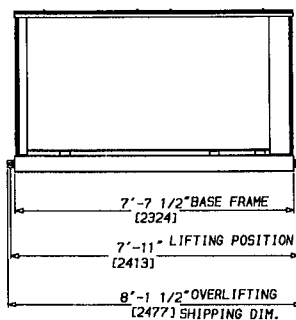
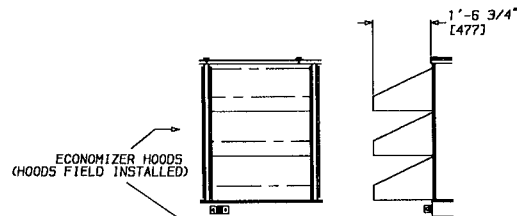
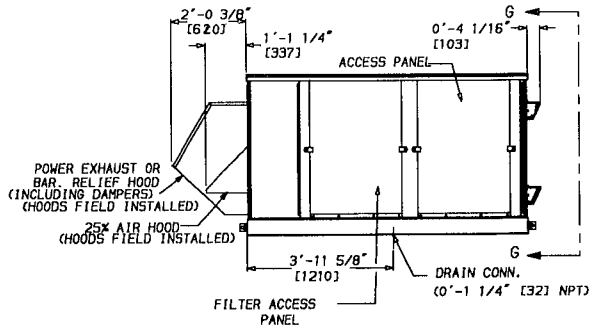
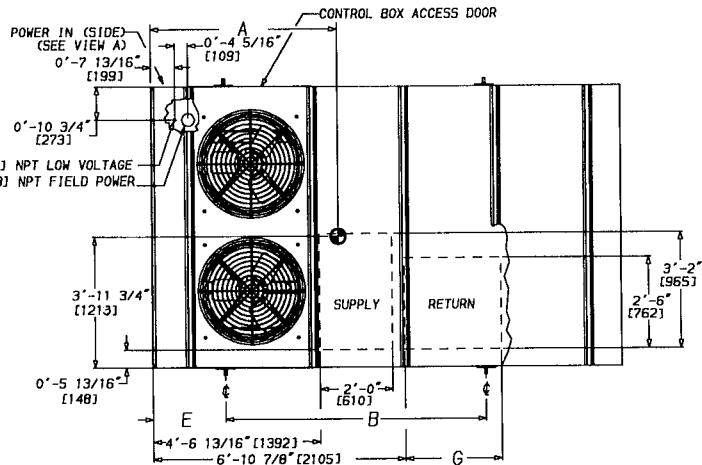
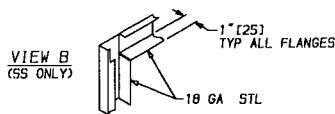
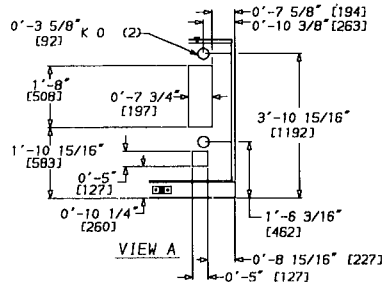
Integrated economizer saves energy by using low temperature outside air to provide cooling. The electronic control logic located in the economizer motor integrates economizer cooling with mechanical cooling. If the conditioned space requires more cooling, mechanical cooling will be brought on to satisfy the cooling need. Solid state enthalpy control senses both dry-bulb and wet-bulb of outside air to provide an accurate enthalpy reading. Spring return damper motor automatically closes the outdoor air dampers in the event of a power failure.

Base unit dimensions

UNIT SIZE	WEIGHT (see note #9)		A		B		C		D		E		F		G	
	Lbs	Kgs	mm	ft-in.	mm	ft-in.	mm	ft-in.	mm	ft-in.	mm	ft-in.	mm	ft-in.	mm	ft-in.
48LJD024	2895	1313.0	1813.3	6'-1 3/4"	2182.0	7'-1 7/8"	682.0	2'-2 7/8"	3909.0	12'-9 7/8"	533.5	1'-9"	2187.0	7'-2 7/8"	807.0	2'-7 3/4"
48LJE024	2975	1349.4	1813.3	6'-1 3/4"	2182.0	7'-1 7/8"	682.0	2'-2 7/8"	3909.0	12'-9 7/8"	533.5	1'-9"	2187.0	7'-2 7/8"	807.0	2'-7 3/4"

NOTES:

- Dimensions in [] are in millimeters
- Center of gravity.
- Allow 12'-0" (3658) at top and 6'-0" (1829) on sides for service and operational clearance.
- On multiunit applications allow 12'-0" (3658) between adjacent condensers and economizers.
- For smaller service and operational, clearances, contact Carrier Application Engineering Department
- Bottom ducts designed to be attached to accessory roof curb. If unit is mounted on dunnage, it is recommended the ducts be supported by cross braces as done on the accessory roof curb
- Always line up condenser end of unit tight against the roof curb
- Units with bottom return and power exhaust require a 90° elbow in return air duct
- Weight of unit includes optional economizer, for unit without economizer deduct 130 Lbs/59 Kgs.
- When unit is slab mounted locate the condensate drain as low as possible on vertical face of base rail at the same location as the standard condensate drain using factory supplied fitting. Plug factory drilled condensate hole

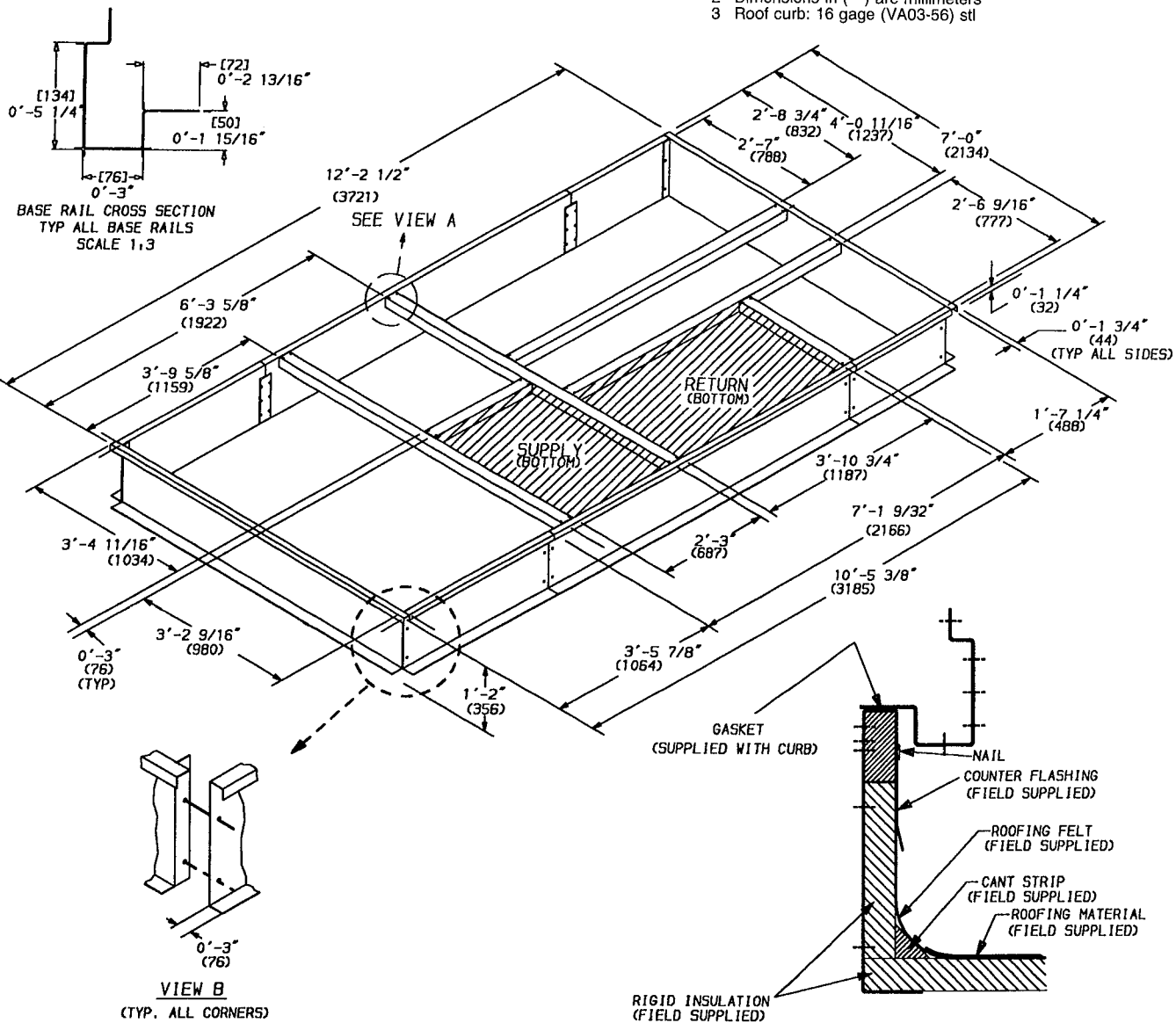


Accessory dimensions

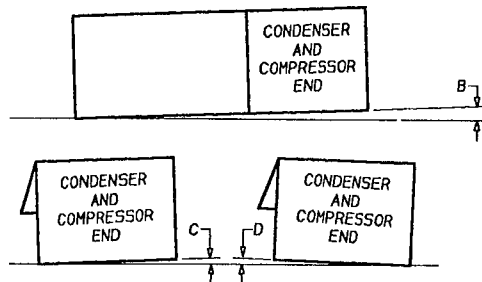
ROOF CURB

NOTES:

- 1 Roof curb accessory 50DJ900401 is shipped disassembled
2 Dimensions in () are millimeters
3 Roof curb: 16 gage (VA03-56) stl



NOTE:
TO PREVENT THE HAZARD OF STAGNANT WATER
BUILD-UP IN THE DRAIN PAN OF THE INDOOR SEC-
TION, UNIT CAN ONLY BE PITCHED AS SHOWN



DIMENSIONS (degrees and inches)

UNIT	B		C		D	
	Deg	in.	Deg	in.	Deg	in.
48LJ	1.38	4 00	50	75	50	75

UNIT LEVELING TOLERANCES

*From edge of unit to horizontal

Selection procedure (with example)

I Determine cooling and heating requirements at design conditions.

Given:

Required Cooling Capacity (TC) 230,000 Btuh
Sensible Heat Capacity (SHC) 175,000 Btuh
Required Heating Capacity 375,000 Btuh
Condenser Entering Air Temperature 95 F
Indoor Air Temperature 80 F edb, 67 F ewb
Evaporator Air Quantity 8,000 cfm
External Static Pressure 1.20 in. wg
Electrical Characteristics (V-Ph-Hz) 460-3-60
Integrated Economizer Required

I Select unit based on required cooling capacity.

Enter Cooling Capacities table at condenser entering temperature of 95 F. Unit 48LJ024 at 8,000 cfm and 67 F ewb will provide a total capacity of 234,000 Btuh and a SHC of 181,000 Btuh. Calculate SHC correction, if required, using notes under cooling capacities tables.

I Select heating capacity of unit to provide design condition requirement.

In the Heating Capacities table on page 9, note that unit 48LJE024 will provide 395,000 Btuh with an input of 500,000 Btuh.

I Determine fan speed and power requirements at design conditions.

Tabulated fan performance includes 2-in. disposable filters and wet evaporator coil. Refer to Component Pressure Drops table on page 10 for economizer pressure drop (.25 in. wg) and high heat pressure drop (.15 in. wg). Add these pressure drops to the specified external static pressure of 1.2 in. wg:

$$25 + .15 + 1.20 = 1.60 \text{ in. wg}$$

Find fan rpm and bhp at 1.6 in. wg and 8,000 cfm on 48LJD024 Fan Performance table. Note that the fan speed is 990 rpm and the power required is 7.0 bhp. The optional 7.5 hp motor is required.

I Select unit that corresponds to power source available.

The Electrical Data table on page 10 shows that a 460-3-60 unit is available.

Performance data

COOLING CAPACITIES

48LJ024																
Temp (F) Air Entering Condenser		Evaporator Air Quantity — Cfm/BF														
		6000/0.03			7000/0.03			8000/0.04			9000/0.05			10,000/0.06		
		Evaporator Air Quantity — Ewb (F)														
		72	67	62	72	67	62	72	67	62	72	67	62	72	67	62
85	TC SHC kW	254	228	204	260	238	214	268	246	224	276	254	236	286	262	246
		124	154	184	132	168	204	138	184	222	150	200	234	160	216	246
		19.9	19.0	18.2	20.2	19.5	18.7	20.6	19.9	19.3	21.0	20.4	19.7	21.4	20.8	20.2
95	TC SHC kW	242	216	191	250	226	202	256	234	214	266	242	226	274	248	236
		120	150	183	129	165	198	138	181	214	149	196	226	160	212	236
		21.0	20.0	19.1	21.4	20.4	19.7	21.6	21.0	21.4	22.2	21.4	21.0	22.6	21.8	21.4
100	TC SHC kW	236	210	184	242	218	197	250	228	208	258	234	220	266	242	230
		118	147	180	127	163	194	136	179	208	146	194	220	157	210	230
		21.4	20.6	19.6	21.8	21.0	20.2	22.2	21.6	21.0	22.8	22.0	21.4	23.2	22.4	22.0
105	TC SHC kW	228	204	178	236	212	194	244	220	204	252	228	214	258	234	226
		116	145	178	125	161	194	134	177	204	144	192	214	154	208	226
		22.0	21.0	20.0	22.4	21.6	20.8	22.8	22.0	21.4	23.2	22.4	22.0	23.6	23.0	22.6
115	TC SHC kW	216	192	165	224	199	179	232	206	192	238	214	202	242	220	214
		112	139	165	121	156	179	131	173	192	140	188	202	148	204	214
		23.0	22.0	21.0	23.4	22.6	21.8	24.0	23.0	22.6	24.2	23.6	23.2	24.6	24.0	23.6

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

ENTERING AIR DRY-BULB TEMP (F)						
BF	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	4.91	
.20	.87	1.74	2.62	3.49	4.36	

Interpolation is permissible

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

4. Cooling capacities are gross and do not include deduction for indoor fan motor heat.

HEATING CAPACITIES (Liquid Propane and Natural Gas)

UNIT 48	STAGE	INPUT	BONNET	TEMP RISE LIMITS °F	MINIMUM HEATING CFM
		Btuh x 1000			
LJD	1st*	185	148	10-40	4409
	1st and 2nd	242	194		
LJE	1st	242	194	30-60	5757
	1st and 2nd	475	380		

*48LJD units operating on LP (Liquid Propane) gas are capable of single stage, high fire operation only.

NOTES:

1. Ratings are approved for altitudes to 2000 feet. At altitudes over 2000 ft, ratings are 4% less for each 1000 ft above sea level.

2. At altitudes up to 2000 ft, the following formula may be used to calculate air temperature rise:

$$\Delta t = \frac{\text{bonnet capacity}}{1.10 \times \text{air quantity}}$$

3. At altitudes above 2000 ft, the following formula may be used:

$$\Delta t = \frac{\text{bonnet capacity}}{(.24 \times \text{specific weight of air} \times 60) (\text{air quantity})}$$

4. Minimum allowable temperature of mixed air entering the heat exchanger during half-rate (first stage) operation is 35 F. There is no minimum mixture temperature limitation during full-rate operation.
5. Temperature rise limits are 35 F minimum, 65 F maximum.

FAN PERFORMANCE – HORIZONTAL APPLICATIONS

UNIT 48LJD*	AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)																	
		0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8	
		Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
024	6,000	610	2.0	660	2.3	700	2.5	740	2.8	780	3.1	820	3.4	860	3.7	890	4.0	930	4.4
	7,000	680	2.8	720	3.2	760	3.6	800	3.9	840	4.3	880	4.6	920	5.0	950	5.4	980	5.9
	8,000	750	4.3	780	4.5	820	4.8	850	5.1	890	5.5	930	6.0	960	6.5	990	7.0	1020	7.4
	9,000	830	5.8	860	6.1	890	6.4	920	6.8	950	7.3	980	7.8	1020	8.3	—	—	—	—
	10,000	900	7.6	930	8.0	950	8.4	—	—	—	—	—	—	—	—	—	—	—	—

UNIT 48LJD*	AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
		2.0		2.2		2.4		2.6		2.8		3.0		3.2		3.4	
		Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
024 (cont)	6,000	970	4.8	1000	5.2	1030	5.6	1060	5.9	1090	6.3	1130	6.7	1160	7.1	1190	7.6
	7,000	1010	6.3	1040	6.6	1070	7.0	1100	7.3	1130	7.7	1160	8.1	—	—	—	—
	8,000	1050	7.7	1080	8.1	1110	8.5	—	—	—	—	—	—	—	—	—	—

FAN PERFORMANCE – VERTICAL APPLICATIONS

UNIT 48LJD*	AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)																	
		0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8	
		Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
024	6,000	600	2.0	650	2.3	700	2.5	730	2.7	760	3.0	800	3.3	850	3.7	890	4.0	930	4.4
	7,000	680	2.8	720	3.2	760	3.6	800	3.9	830	4.2	870	4.5	910	4.8	940	5.2	970	5.7
	8,000	760	4.4	800	4.7	830	5.0	860	5.3	900	5.6	930	6.0	960	6.5	990	7.0	1020	7.4
	9,000	850	5.9	880	6.3	910	6.6	940	7.0	970	7.6	1000	8.1	1030	8.5	1060	—	—	—
	10,000	920	7.8	950	8.4	—	—	—	—	—	—	—	—	—	—	—	—	—	—

UNIT 48LJD*	AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
		2.0		2.2		2.4		2.6		2.8		3.0		3.2		3.4	
		Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
024 (cont)	6,000	960	4.7	1000	5.1	1030	5.5	1060	5.9	1090	6.3	1120	6.7	1160	7.1	1190	7.7
	7,000	1000	6.2	1030	6.5	1060	6.9	1090	7.2	1120	7.5	1160	8.0	1190	8.6	—	—
	8,000	1050	7.7	1080	8.1	1110	8.5	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower

*For 48LJE high heat units, see Component Pressure Drops table, page 10.

NOTES:

1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Component Pressure Drops table before using fan performance tables
3. Conversion — Bhp to watts

$$\text{watts} = \frac{\text{Bhp} \times 746}{\text{motor efficiency}}$$

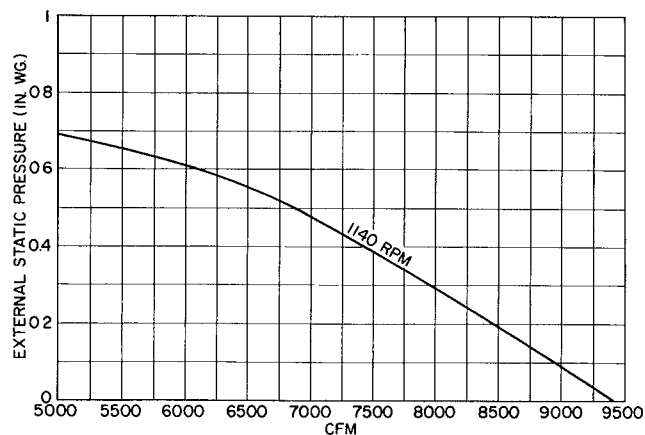
See Physical Data table, page 4 for motor efficiencies.

Performance data (cont)

COMPONENT PRESSURE DROPS (in. wg)

COMPONENTS	CFM				
	6000	7000	8000	9000	10,000
ECONOMIZER	0.18	0.20	0.25	0.28	0.32
HIGH GAS HEAT (48LJE)	0.10	0.12	0.15	0.17	0.20

POWER EXHAUST FAN PERFORMANCE —
48LJ024



Electrical data

UNIT 48LJ024

NOMINAL V-PH-HZ	VOLTAGE RANGE		COMPR NO. 1		COMPR NO. 2		OFM	IFM		POWER EXHAUST FAN MOTOR	POWER SUPPLY	
	Min	Max	RLA	LRA	RLA	LRA	Total FLA	Hp	FLA	FLA	MCA	MOCP Fuse Only
208/230-3-60	187	254	38.5	193.0	38.5	193.0	10.8	5.0	15.2	— 6.6-6.0	101.8-112.6 108.4-118.6	150-150 150-150
								7.5	22.0	— 6.6-6.0	108.6-119.4 115.2-125.4	150-150 150-150
460-3-60	414	508	19.3	96.5	19.3	96.5	5.4	5.0	7.2	— 3.0	56.0 59.0	70 70
								7.5	10.5	— 3.0	59.3 62.3	70 80
575-3-60	518	632	14.4	77.2	14.4	77.2	4.8	5.0	5.2	— 2.4	42.4 44.8	50 50
								7.5	8.6	— 2.4	45.8 48.2	60 60

FLA — Full Load Amps
Hp — Nominal Horsepower
IFM — Indoor Fan Motor
LRA — Locked Rotor Amps
MCA — Minimum Circuit Amps (for wire sizing)
MOCP — Maximum Overcurrent Protection
OFM — Outdoor Fan Motor
RLA — Rated Load Amps

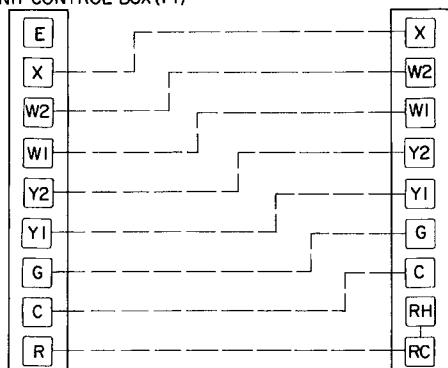


Typical control wiring schematic

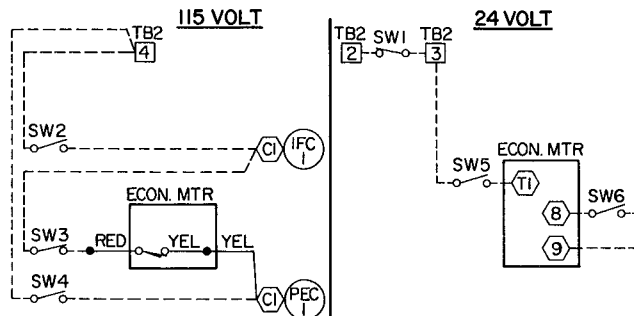
FIELD CONTROL THERMOSTAT WIRING

LOW-VOLTAGE
TERMINAL BLOCK
IN UNIT CONTROL BOX (PI)

THERMOSTAT/
SUBBASE



FIELD WIRING FOR BUILDING PRESSURIZATION AND SMOKE PURGE



BUILDING PRESSURIZATION

- Switch 1
- Switch 2
- Switch 3 (if unit equipped with power exhaust)
- Switch 5
- Switch 6

- Switch 1 — Firestat or smoke detector — normally closed
- Switch 2 — Building pressurization switch (energize indoor fan motor) — normally open.
- Switch 3 — Switch to isolate indoor fan motor from power exhaust motor — normally closed.
- Switch 4 — Smoke purge switch (energize power exhaust motor) — normally open.
- Switch 5 — Switch to provide 24 volts to economizer motor — normally open
- Switch 6 — Switch to drive economizer outdoor air damper full open — normally open

SMOKE PURGE

- Switch 1
- Switch 3
- Switch 4
- Switch 5
- Switch 6

LEGEND

- IFC — Indoor Fan Contactor
- PEC — Power Exhaust Contactor Coil
- SW — Switch
- TB — Terminal Block

NOTES:

1. Power exhaust option can be unit mounted on vertical units only; accessory can be duct mounted on horizontal units.
2. - - - - is field wiring.
3. ——— is factory wiring.
4. All switches are field supplied

Controls

Operating sequences

Cooling, units without economizer — Unit power ON, system selector switch at COOL or AUTO., fan switch at AUTO.; thermostat at setting below room temperature.

Y1 on the thermostat subbase closes, energizing compressor no. 1 as first stage of cooling and energizing the indoor fan through G on the thermostat. If cooling load cannot be satisfied with only first-stage cooling, Y2 on the thermostat will close, energizing compressor no. 2.

Condenser fans are energized with compressor no. 1. The no. 1 fan runs continuously while the unit is on mechanical cooling; the no. 2 fan is cycled on and off for head pressure control. Check cooling effects at a setting below room temperature. Reset thermostat at a setting above room temperature. Indoor fan and compressors will shut off.

Heating, units without economizer

48LJD (Low Heat) — Unit power ON, thermostat system switch set at HEAT or AUTO., and fan switch set at AUTO.

First-stage thermostat (W1) calls for heat. Induced-draft contactor closes and induced-draft motor starts.

Centrifugal switch closes. Pilot valve opens, allowing gas to flow to first-stage pilot. Spark ignitor ignites pilot flame. Sensor detects flame, energizes main gas valve coil and main gas valve opens. Gas flows to main burners and first-stage burners ignite. Spark ignitor shuts off and pilot remains on. Indoor fan motor starts.

On low-heat units 48LJD, when additional heat is needed, W2 is energized and a second coil in the main gas valve is energized. This brings on an additional stage of heat. When second-stage thermostat is satisfied, the second-stage gas valve coil is deenergized.

When the first-stage thermostat is satisfied, first-stage main gas valve and the pilot valve close. Induced-draft motor shuts off. Indoor fan motor shuts off.

48LJE (High Heat) — Unit power ON, thermostat system switch set at HEAT or AUTO., and fan switch set at AUTO.

First-stage thermostat (W1) calls for heat. Indoor fan starts.

When indoor fan starts, airflow switch closes, closing induced draft contactor, and induced-draft motor starts.

Centrifugal switch closes. Pilot valve opens, allowing gas to flow to first-stage pilot. Spark ignitor ignites pilot flame. Sensor detects flame, energizes main gas valve coil, and main gas valve opens. Gas flows to main burners and first-stage burners ignite. Spark ignitor shuts off and pilot remains on.

When additional heat is needed, W2 is energized. Pilot valve no. 2 opens, allowing gas to flow to second-stage pilot. Spark ignitor ignites pilot flame. Sensor detects flame, energizes main gas valve coil, and main gas valve no. 2 opens. Gas flows to main burners and second-stage burners ignite. Second-stage spark ignitor shuts off. When the second-stage thermostat is satisfied, W2 is deenergized and the second induced-draft motor and gas valve are shut off.

When the first-stage thermostat is satisfied, first-stage main gas valve and the pilot valve close. Induced draft motor shuts off. Indoor fan motor shuts off.

Cooling, units with economizer — With subbase switch set at COOL and fan switch set at AUTO., indoor fan is energized when Y1 on thermostat closes. If enthalpy is "good" (below setting on enthalpy switch), the economizer outside air dampers will modulate open to satisfy the cooling requirement. If outside air alone will not meet the cooling requirements, Y2 on the thermostat will close energizing compressor no. 1 to work in conjunction with the modulating economizer to meet the cooling requirement. While the unit is operating using outside air, compressor no. 2 cannot be energized. If enthalpy is "no good" (above setting on enthalpy switch), the economizer outside air dampers move to the minimum (ventilation) position, and condenser fans numbers 1 and 2 cycle on and off as described in Cooling, units without economizer.

NOTE. If fan switch is ON and the room thermostat is satisfied, the outside air dampers move to the minimum position.

Heating, units with economizer — Operation is the same as described in Heating, units without economizer, except that the outside air dampers move to the minimum position.

Guide specifications

Packaged Rooftop Cooling Unit with Gas Heat — Constant Volume Application

HVAC Guide Specifications — Section 48LJ

Size Range: **20 Tons, Nominal**

Carrier Model Number: **48LJ (Convertible)**

Part 1 — General

1.01 SYSTEM DESCRIPTION

- A. Outdoor rooftop mounted, electronically controlled heating and cooling unit utilizing fully-hermetic type reciprocating compressors for cooling duty. Unit shall discharge supply air downward and be easily field converted to horizontal supply by installing the accessory horizontal conversion package.

1.02 QUALITY ASSURANCE

- A. Unit shall be rated in accordance with ARI Standards 360 and 270.
- B. Unit shall be designed to conform to UL Standards 465.
- C. Unit shall be ETL listed and CSA certified as a total package for safety requirements.
- D. Roof curb shall be designed to conform to NRCA Standards.
- E. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
- F. Unit casing shall be capable of withstanding a 500 hour salt spray test.
- G. Evaporator and condenser coils shall be leak tested at 150 psig (1034 kPa) and pressure tested at 450 psig (3103 kPa).

1.03 DELIVERY, STORAGE AND HANDLING

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

Part 2 — Products

2.01 EQUIPMENT

A. General:

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 baked enamel finish.
- 2. Cabinet panels shall be easily removed for servicing.
- 3. Lifting lugs shall be factory installed to facilitate overhead rigging.
- 4. Unit shall be equipped with factory-supplied condensate drain connection for evaporator coil.

C. Fans:

- 1. The single indoor blower (evaporator fan) shall be of the forward-curved centrifugal belt-driven type only, with fixed pitch pulley drive.
- 2. Outdoor (condensing) fans shall discharge air vertically upward and shall have permanently lubricated bearings.
- 3. Outdoor (condensing) fans shall be of the direct driven propeller type only and be protected by a coated steel wire guard.
- 4. Indoor blower (evaporator fan) shaft bearings shall be of the ball bearing type with lubrication provisions.

D. Compressors:

- 1. Two fully-hermetic type.
- 2. Factory mounted on rubber vibration isolators.
- 3. Equipped with a factory-installed crankcase heater to minimize liquid refrigerant accumulation in compressor during shutdown and prevent refrigerant dilution of oil.

E. Coils:

- 1. Evaporator and condenser coils shall have aluminum plate fins mechanically bonded to seamless copper tubes with all joints brazed.
- 2. Tube sheet openings to be swaged to prevent tube wear.
- 3. Evaporator coil shall be of the face split design.
- 4. Coils shall be circuited to provide 2 independent refrigeration systems.

F. Heating Section:

- 1. Induced-draft combustion type with energy saving intermittent spark ignition pilot flame systems and redundant main gas valves.
- 2. The heat exchanger shall be of the tubular section type constructed of a minimum of 20-gage steel coated with a nominal 1.4 mil aluminum-silicon alloy for corrosion resistance.
- 3. Burners shall be of the in-shot type constructed of DACROMET 320 steel.
- 4. All gas piping shall enter the unit cabinet at a single location.

G. Refrigerant Components:

Refrigerant circuit components shall include filter-driers and Acutrol™ fixed orifice metering device.

H. Filter Section:

- 1. Filter section shall consist of low velocity, throw-away 2-in. thick fiberglass filters in commercially available sizes.
- 2. Filter face velocity shall not exceed 400 fpm at nominal airflows.

Guide specifications (cont)

I. Controls and Safeties:

1. Unit Controls:

- a. Unit shall be complete with self-contained, demand-oriented solid state control system.
- b. Unit staging shall be minimum 2-cool, 2-heat.
- c. Unit shall perform in response to a variable space temperature signal.
- d. In the event of a power failure, unit control system shall sequence the unit to re-start beginning with the first stage of cooling or heating.
- e. Thermostats shall be of the dual set point type for heating and cooling.
- f. Set points must have adjustable dead band between heat and cool.

2. Safeties:

- a. Compressors shall be provided with the following minimum protection:
 - 1) Inherent internal line break.
 - 2) Low-pressure switch.
 - 3) High-pressure switch.
- b. Unit shall incorporate a solid-state compressor protector which provides compressor lockout with reset capability at the space thermostat should any of the compressor safety devices trip and shut off compressor.

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. Compressor with standard controls shall be capable of operation down to 20 F ambient outdoor temperature.
3. Cooling capacity control shall be accomplished through compressor staging.

K. Electrical Requirements:

All unit power wiring shall enter unit cabinet at a single location, either through side or bottom (curb opening)

L. Motors:

1. Compressor motors shall be cooled by suction gas passing through motor windings and shall have internal thermal overload protection.
2. Indoor blower poly-phase motor bearings shall be of the ball bearing type.
3. Outdoor totally enclosed motors shall have permanently lubricated sealed ball bearings and inherent automatic reset thermal overload protection.
4. Each poly-phase compressor and indoor fan motor shall be protected against overcurrent and single-phasing conditions.

M. Special Features:

Certain standard 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. Integrated Economizer:

- a. Integrated modulating type capable of simultaneous economizer and compressor operation; with spring return motor to close outside dampers on shutdown or power failure.
- b. Includes all hardware and controls to provide cooling with outside air.
- c. Equipped with low-leakage outside air dampers not to exceed 1% leakage at 1.0 in. wg pressure differential.
- d. Capable of introducing up to 100% outside air.

* 2. Roof Curb:

- a. Formed 16-gage galvanized steel with wood nailer strip and capable of supporting entire unit.

* 3. Head Pressure Control Package:

- a. Package shall consist of solid state control panel, condensing temperature sensor(s) and variable speed outdoor fan motor.
- b. Package shall be capable of modulating outdoor fan speed to maintain condensing temperature between 90 F and 110 F at outdoor ambient temperatures down to -20 F.
- c. Requires change to approved condenser fan motor for application.

* 4. Power Exhaust Package:

- a. Packages shall be unit mounted on vertical units with economizer package only.
- b. Package shall include integral propeller-type exhaust fan complete with fan drive and damper.
- c. Power exhaust shall be permitted to operate only in conjunction with unit economizer to assure proper building pressurization.

* 5. Barometric Relief Damper Package:

- a. Package shall relieve excess internal pressure and consist of damper assembly, hoods, damper screen, seal strip and required hardware.
- b. Damper assembly shall close due to gravity upon unit shut-off.
- c. Unit mounted on vertical applications. May be duct mounted on horizontal applications.

6. Condenser Coil (Hail) Guards:

Expanded metal grille complete with support retainers and fasteners shall be provided for the protection of the condensing coil.

7. Thermostat and subbase:

Provides staged cooling and heating, automatic (or manual) changeover and fan control.

8. Liquid Propane (LP Gas) Conversion Package:

Provide field conversion from natural gas to LP gas heat.

