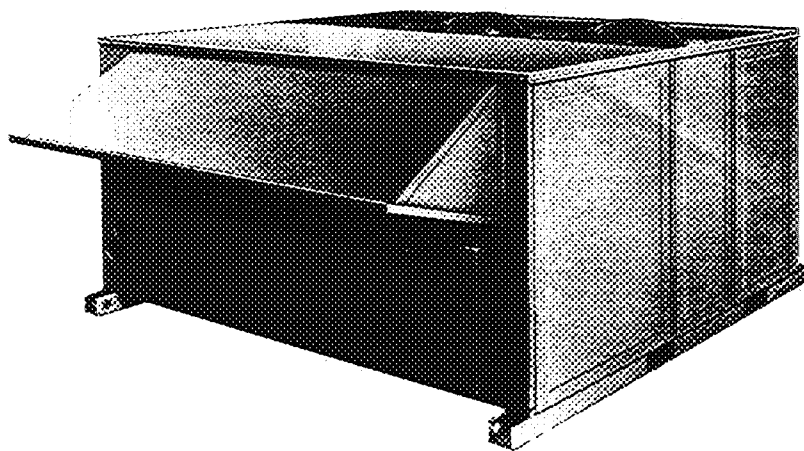




Advance Product Data

48TJ Single-Package Rooftop Units Electric Cooling/Gas Heating

20 Nominal Tons



Single-Package Rooftop Units with

- Alumagard™ heat exchanger coating
- Cycle-LOC™ compressor anticycle protection
- induced-draft fan
- Turbo-tubular™ heat exchanger

Features/Benefits

Convertible vertical discharge units with reliable, efficient performance

Easy maintenance and installation

NOTE: Performance data has been confirmed and certified by ARI (Air Conditioning and Refrigeration Institute).

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

The self-contained units are easily transported, rigged, and installed. To ensure watertight installation, gasketing is provided with the roof curb. The weather-resistant cabinet is coated with a pre-painted polyester finish to maintain its appearance and durability.

The 48TJ was designed with service technicians in mind. The efficient in-shot burners and all ignition components are contained in an easily removable, compact assembly. Located on the unit side panel, the combustion section viewport allows full visibility

of flame operation at a safe distance from flue gases. A low-voltage terminal block simplifies control wiring connections.

The unit features 2 compressors and 50% and 100% capacity steps. Compressors are equipped with crank-case heaters, internal protectors and circuit breakers for protection against overtemperature and overcurrent conditions (respectively), and Cycle-LOC™ compressor protection. The solid-state Cycle-LOC circuit shuts off the compressor if any safety device trips.

Evaporator fans have fixed drives and are belt driven. They are capable of moving large quantities of air and achieving high external static pressures suitable for the most demanding applications.

Condenser fans are direct driven, permanently lubricated, and positioned for quiet, efficient discharge. Operating costs are minimized, airflow is increased, turbulence is reduced, and sound level is dampened by the aerodynamically designed condenser fan orifice

Increased operating efficiency is achieved through computer designed coils featuring staggered copper tubes. Fins are ripple edged for strength and double waved for higher heat transfer.

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

The unsightly appearance of flue stacks is eliminated and the effects of winds on heating operations are diminished by the induced draft combustion system. The heat exchanger operates under negative pressure, preventing flue gas leakage into the indoor air.

Efficient operations

Since the pilot flame is ignited only on a call for heat, fuel is never wasted with the intermittent pilot ignition. 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

Safety procedures

Runaway gas conditions are eliminated and safe operation is guaranteed. The pilot flame is proven at the burner farthest from the ignition source, instead of at the ignition source itself. The main gas valve will not open if the pilot flame malfunctions and fails to reach the sensor.

The system's flame rectification sensor quickly senses the pilot flame and ignites burners almost immediately. Fast shutdown is a certainty

since the sensor reacts quickly to any flame outage or system failure.

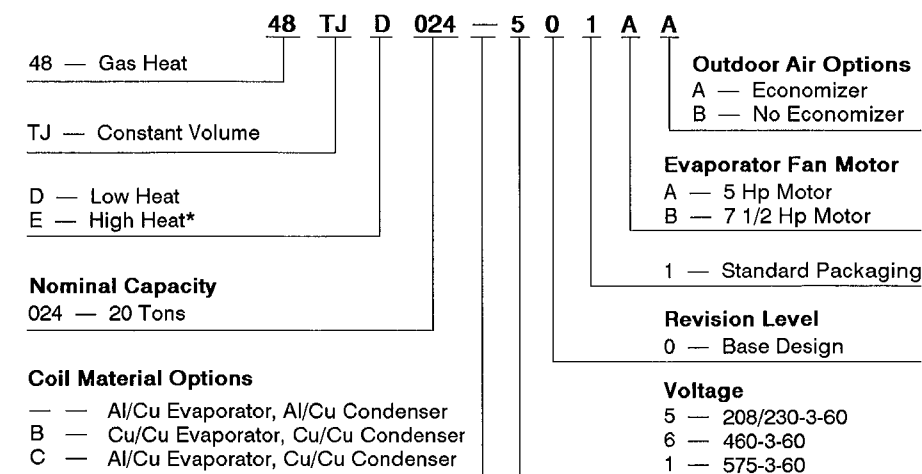
Safety is assured through heating safety controls since the unit will shut down for 3 different reasons. First, if excessive temperatures develop, limit switches shut off the gas valve. Second, the pressure switch shuts down the main gas valve in case of insufficient combustion air. Third, a rollout switch deenergizes the gas valve in the event of a flame rollout.

By presetting the manual outdoor air damper, up to 25% outdoor air is provided for year-round ventilation. Units equipped with an optional or accessory economizer have a thermostatically controlled, fully modulating damper which admits up to 100% outdoor air and provides low-cost cooling. Enthalpy control governs economizer cooling changeover to provide the lowest cost operation in mild weather.

Table of contents

	Page
Features/Benefits	1,2
Model Number Nomenclature	2
ARI Capacity Ratings	3
Physical Data	4,5
Options and Accessories	5
Base Unit Dimensions	6
Accessory Dimensions	7
Selection Procedure	8
Performance Data	9,10
Electrical Data	10
Typical Piping and Wiring	11
Typical Wiring Schematic	12
Controls	13
Application Data	14
Guide Specifications	15,16

Model number nomenclature



*To be released in 1993

ARI capacity ratings

UNIT 48	TOTAL kW	NET COOLING CAPACITY (Btuh)	STANDARD CFM	IPLV	EER
TJ024	27.6	217,000	6300	8.7	8.6

LEGEND

db — Dry Bulb
EER — Energy Efficiency Ratio
IPLV — Intergrated Part-Load Value
wb — Wet Bulb

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 air temperature and 95 F db outdoor air temperature.



HEATING CAPACITIES AND EFFICIENCIES

UNIT 48	HEATING INPUT (Btuh)	OUTPUT CAPACITY (Btuh)	TEMPERATURE RISE (F)	AGA STEADY STATE EFFICIENCY (%)
TJ024*	115,500/270,000	216,000	15-45	80

AGA — American Gas Association

*Two-Stage heat

NOTE: The information in this table applies to the 48TJD024.



Physical data

UNIT SIZE 48	TJ024	
OPERATING WT (lb)	2150	
AI/AI*	2280	
Unit AI/Cu*	2390	
Cu/Cu*	110	
Economizer	200	
Roof Curb†		
COMPRESSOR	Semi-Hermetic — 6 Cylinders	
Number	2	
Oil (oz)	152 ea	
Capacity Steps (%)	50,100	
REFRIGERANT	R-22	
Charge (lb) Sys 1**, Sys 2	16.25, 16.25	
REFRIGERANT METERING DEVICE	Capillary Tubes	
Upper Circuit		
No. ...Length (in.)...ID/OD	13 .25. .0.055/0.125	
Lower Circuit		
No. ...Length (in.)...ID/OD	13 .25 . 0.055/0.125	
CONDENSER COIL	Copper Tubes, Aluminum or Copper Plate Fins	
Rows	4	
Fins/in.	13.6 Al or 12.4 Cu	
Total Face Area (sq ft)	22.2	
CONDENSER AIR FAN	Propeller Type, Direct Drive	
Nominal Cfm	11,400	
Number...Diameter (in.)	2...26	
Motor Hp (1075 Rpm)	1	
Watts Input (Total)	3000	
EVAPORATOR COIL	Copper Tubes, Aluminum or Copper Plate Fins	
Rows	4	
Fins/in.	14.4 Al or 13.1 Cu	
Total Face Area (sq ft)	17.9	
EVAPORATOR FAN	Centrifugal, Fixed Pitch Belt Drive	
Quantity...Size (in.)	Standard 7½ hp	Optional 5 hp
Nominal Cfm	2. .12x12	2. .12x12
Maximum Allowable Rpm	8000	8000
Motor Pulley Pitch Diameter (in.)	1500	1500
Fan Pulley Pitch Diameter (in.)	6.10	5.10
Belt, Quantity...Type...Length (in.)	8.40	8.40
Factory Speed Setting (Rpm)	1...BX .51	1 .B...50
Motor Hp (Service Factor)	1287	1070
Motor Frame Size	7½ (1.15)	5 (1.15)
	184T	184T
FURNACE SECTION		
Rollout Switch Cutout Temp (F)††	190	
Burner Orifice Diameter (in. ...drill size)	113 33	
Natural Gas		
Pilot Orifice Diameter (in. ...drill size)	.064...52	
Natural Gas		
Thermostat Heat Anticipator Setting		
208/230/575; Stage 1/Stage 2	98/ 44	
460; Stage 1/Stage 2	1.2/ 44	
Gas Valve Quantity	2	
HIGH-PRESSURE SWITCH		
Cutout (psig)	426	
Reset (psig)	320	
LOW-PRESSURE SWITCH (Liquid Line)		
Cutout (psig)	7	
Reset (psig)	22	
AIR INLET SCREENS		
Economizer, Quantity...Size (in.)	2 .20 x 25 x 1	
	1 . 20 x 20 x 1	
RETURN-AIR FILTERS (TYPE)	10% Efficient — 2-in. Throwaway Fiberglass	
Quantity... Size (in.)	4...20 x 20 x 2	
	4 . 16 x 20 x 2	

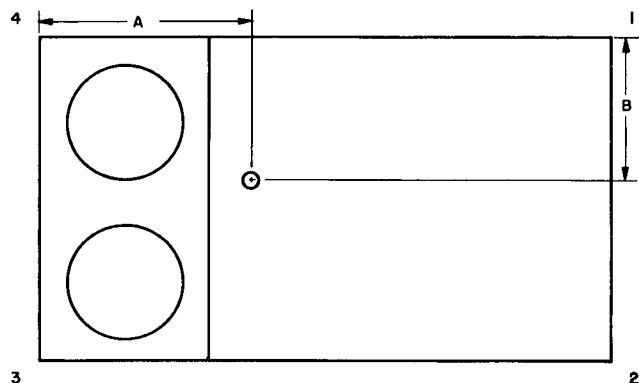
*Evaporator coil fin material/condenser coil fin material.

†Weight of 14 in. roof curb

**On 48TJ024 units, 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.

NOTE: The information in this table applies to the 48TJD024.



WEIGHT DISTRIBUTION AND CENTER OF GRAVITY

UNIT 48	WEIGHT (lb) OF CORNER				DIMENSIONS (ft-in.)	
	1	2	3	4	A	B
TJ024	695	521	396	606	2-9	3-10

Options and accessories

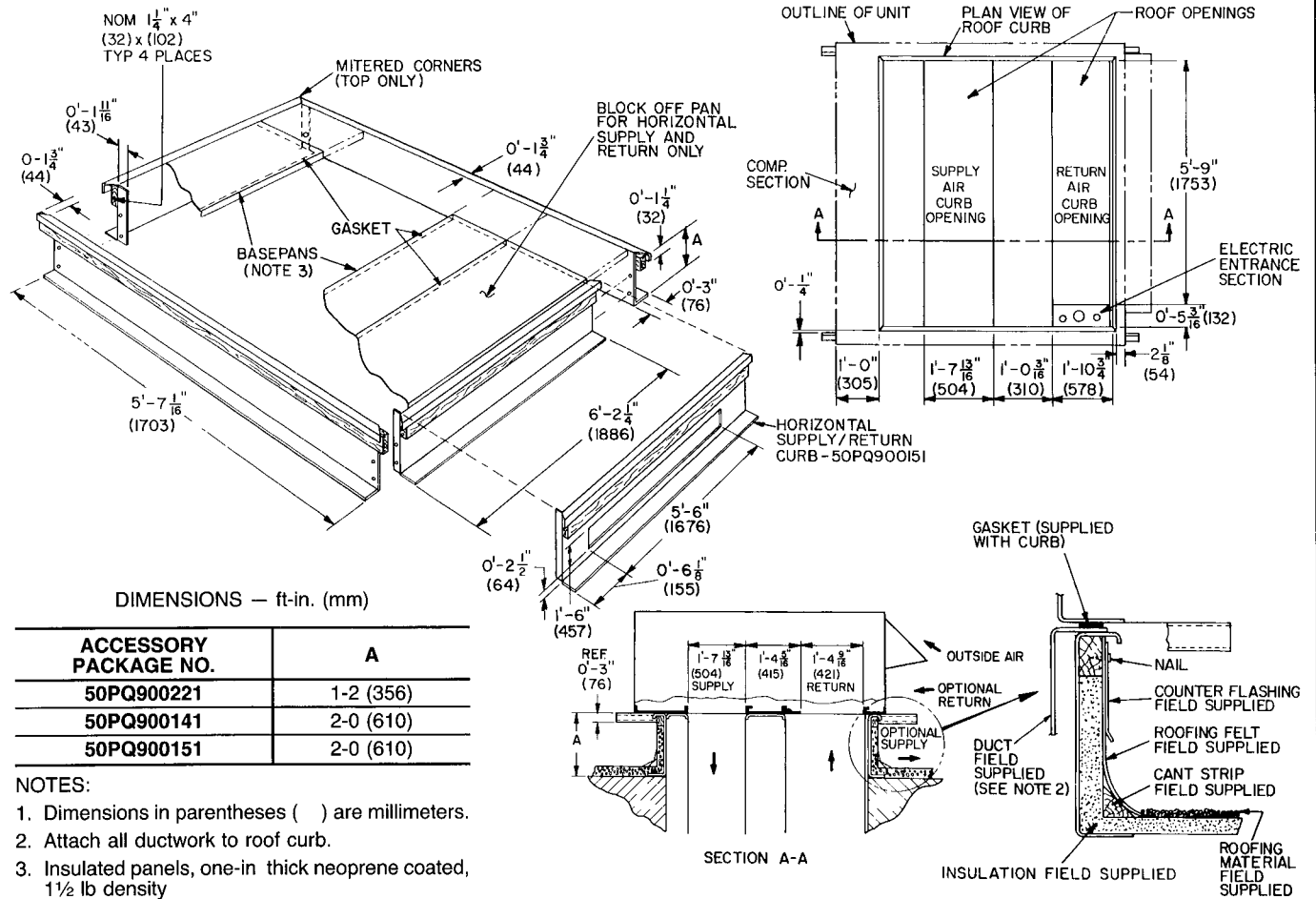
ITEM	OPTION*	ACCESSORY†
Integrated Economizer With Hood	X	X
Two-Position Damper With Hood		X
Barometric Relief Damper		X
Optional Motor and Drive	X	
Roof Curb		X
Remote Control		X
Thermostat and Subbase		X
Time Guard® Circuit		X
Motormaster® Head Pressure Control (-20 F Ambient)		X
Power Exhaust		X
Pressure Operated Unloader		X

*Factory installed

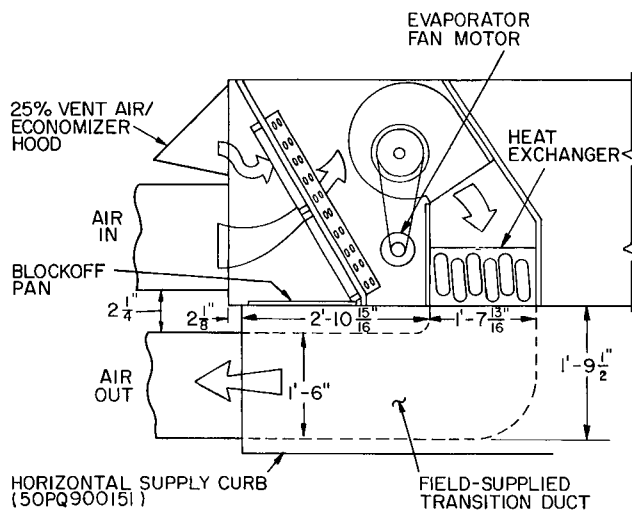
†Field installed

Accessory dimensions

ROOF CURB

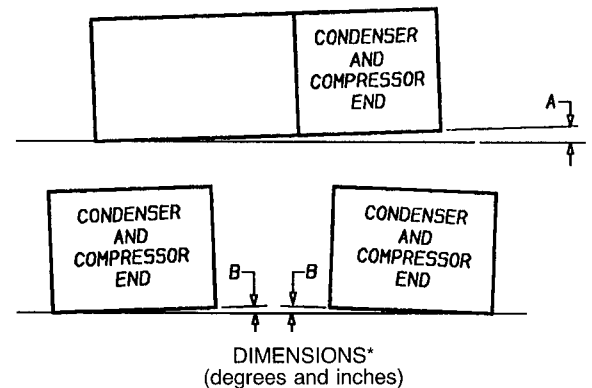


HORIZONTAL SUPPLY/RETURN CURB



UNIT LEVELING

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



UNIT LEVELING TOLERANCES

*From edge of unit to horizontal.

Selection procedure

I Determine cooling and heating requirements at design conditions.

Given:

Required Cooling Capacity 205,000 Btuh
Sensible Heat Capacity 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 8000 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 48TJ024 at condenser entering temperature 95 F, evaporator air entering at 8000 cfm and 67 F wb. The 48TJ024 unit will provide a total cooling capacity of 234,000 Btuh and a sensible heating capacity of 183,000 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 capacities of unit to provide design condition requirements.

In the Heating Capacities and Efficiencies table (page 3) note that the 48TJ024 will provide an 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 Economizer Pressure Drop table (page 10) (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 48TJ024 at 8000 cfm and 1.40 in wg external static pressure. The rpm is 1305 and the bhp is 6.36. The shading indicates that the selection is the factory-installed 7½ hp motor and drive.

V Determine net cooling capacity.

Cooling capacities are gross capacities and do not include indoor fan motor (IFM) heat. To determine input power to the motor, convert bhp to watts using the motor efficiencies found in the notes following the Fan Performance table.

$$\begin{aligned}\text{IFM Watts} &= \frac{\text{Bhp} \times 746 \text{ Watts/Bhp}}{\text{Motor Efficiency}} \\ &= \frac{6.36 \times 746}{0.82}\end{aligned}$$

$$\text{IFM Watts} = 5786$$

Determine net cooling capacity using the following formula:

$$\text{Net capacity} = \text{Gross capacity} - \text{IFM heat}$$

$$\begin{aligned}&= 234,000 \text{ Btuh} - 5786 \left(3.412 \frac{\text{Btuh}}{\text{Watts}}\right) \\ &= 234,000 \text{ Btuh} - 19,742 \text{ Btuh} \\ &= 214,258 \text{ Btuh}\end{aligned}$$

$$\begin{aligned}\text{Net sensible capacity} &= 183,000 \text{ Btuh} - 19,742 \text{ Btuh} \\ &= 163,258 \text{ Btuh}\end{aligned}$$

The calculations show that a 48TJ024 unit is the correct selection for the given conditions.

Performance data

COOLING CAPACITIES

TEMP (F) AIR ENT COND (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} = Wet-bulb temperature corresponding to enthalpy of air leaving evaporator coil (h_{lwb})

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

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) 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.

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

FAN PERFORMANCE

EXTERNAL STATIC PRESSURE (in. wg)																				
CFM	0.20		0.40		0.60		0.80		1.00		1.20		1.40		1.60		1.80		2.00	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
6000	792	1.85	855	2.17	922	2.44	985	2.71	1044	3.04	1104	3.26	1160	3.57	1216	3.82	1271	4.13	1327	4.34
6500	843	2.26	905	2.60	967	2.90	1027	3.22	1084	3.54	1138	3.90	1192	4.13	1249	4.45	1297	4.72	1348	5.30
7000	898	2.57	944	2.99	1014	3.43	1070	3.86	1125	4.08	1177	4.13	1231	4.80	1273	5.15	1324	5.44	1374	5.75
7500	947	3.23	1006	3.65	1064	4.10	1118	4.50	1169	4.82	1220	5.15	1270	5.56	1311	5.90	1346	6.11	1393	6.50
8000	1001	3.87	1066	4.45	1115	4.79	1165	5.18	1216	5.58	1264	5.98	1305	6.36	1345	6.64	1394	7.05	1442	7.45
8500	1062	4.72	1115	5.13	1166	5.50	1216	6.00	1265	6.44	1305	6.86	1356	7.28	—	—	—	—	—	—
9000	1117	5.47	1169	5.90	1218	6.43	1265	6.97	1307	7.45	—	—	—	—	—	—	—	—	—	—

LEGEND

Indicates factory-supplied 7½ hp motor and drive.

Boldface — Indicates optional 5 hp motor and drive.

Bhp — Brake horsepower input to fan.

Rpm — Revolutions per minute.

NOTES:

- 1 Fan performance data that is not shaded or in boldface indicates field-supplied drive.
- 2 Fan performance is based on wet coils, clean filters, and casing losses.
3. Refer to Physical Data table for condenser fan watts input.
4. Static pressure losses must be added to external static pressure before entering Fan Performance table.

ECONOMIZER PRESSURE DROP (in. wg)

CFM				
4000	5000	6000	7000	9000
.03	.05	.07	.09	.11

- 5 To convert Bhp to watts use the following equation:

$$\text{Watts input} = \frac{\text{Bhp} \times 746}{\text{Motor efficiency}}$$

Motor efficiencies:

Service factors:

5 Hp-0.85

5 Hp-1.15

7½ Hp-0.82

7½ Hp-1.15

6. All other rpms require replacement drives.

Electrical data

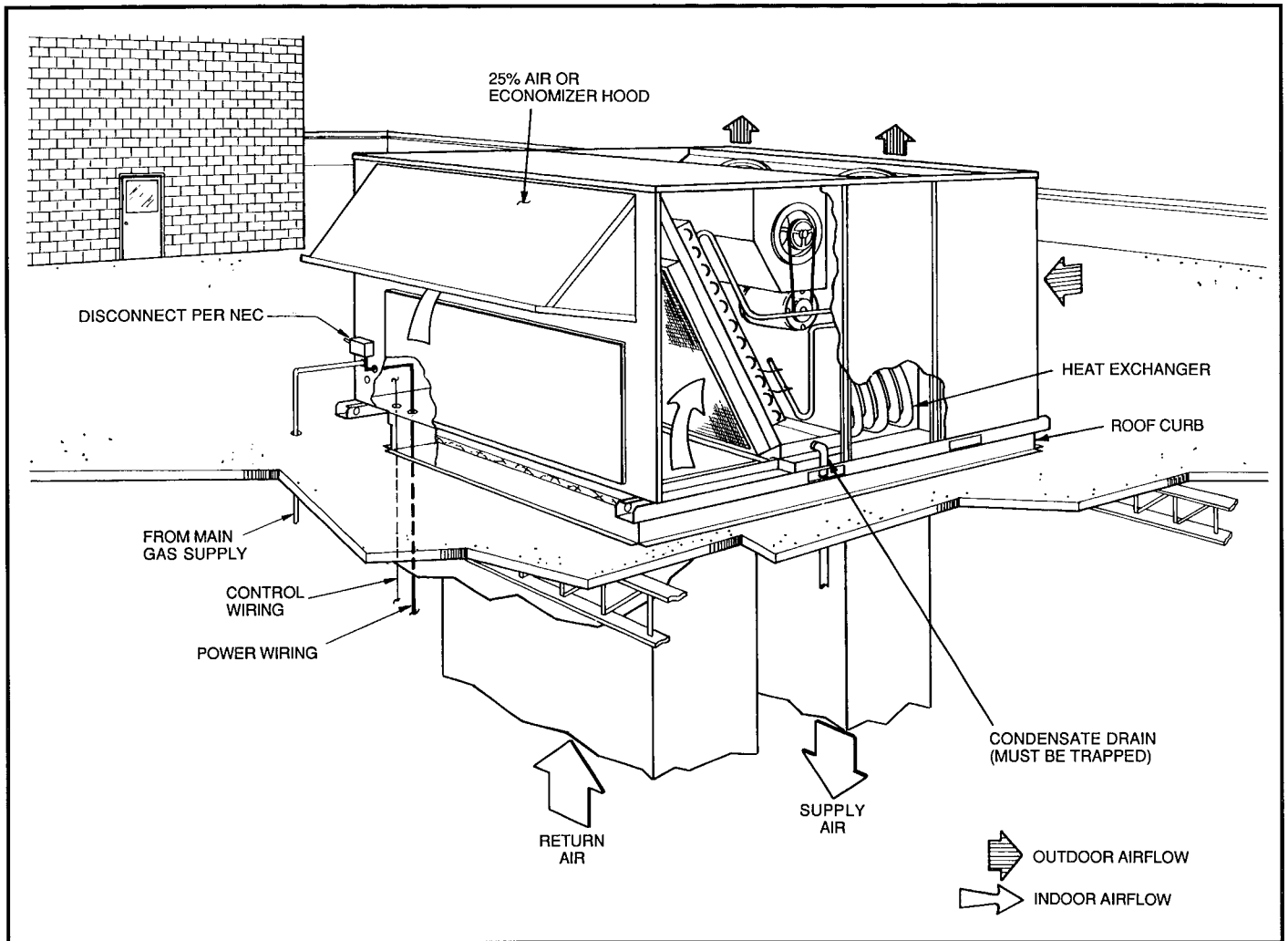
UNIT	V-PH-HZ	VOLTAGE RANGE		COMPR		OFM		IFM		COMBUSTION FAN MOTOR	POWER SUPPLY	
		Min	Max	RLA	LRA	Qty	FLA	Hp	FLA	FLA	MCA	MOCP* (Amps)
48TJ024	208/230-3-60	187	253	49.3 (ea)	170 (ea)	2	5.4 (ea)	5.0 7.5	16.2 21.9	57	138 144	175 175
	460-3-60	414	508	22.2 (ea)	77 (ea)	2	2.7 (ea)	5.0 7.5	6.6 10.0	57	62 66	80 80
	575-3-60	518	632	15.9 (ea)	62 (ea)	2	5.6 (ea)	5.0 7.5	6.1 9.0	90	53 56	60 70

LEGEND

FLA — Full Load Amps
IFM — Indoor (Evaporator) Fan Motor
LRA — Locked Rotor Amps
MCA — Minimum Circuit Amps
MOCP — Maximum Overcurrent Protection
OFM — Outdoor (Condenser) Fan Motor
RLA — Rated Load Amps

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

Typical piping and wiring



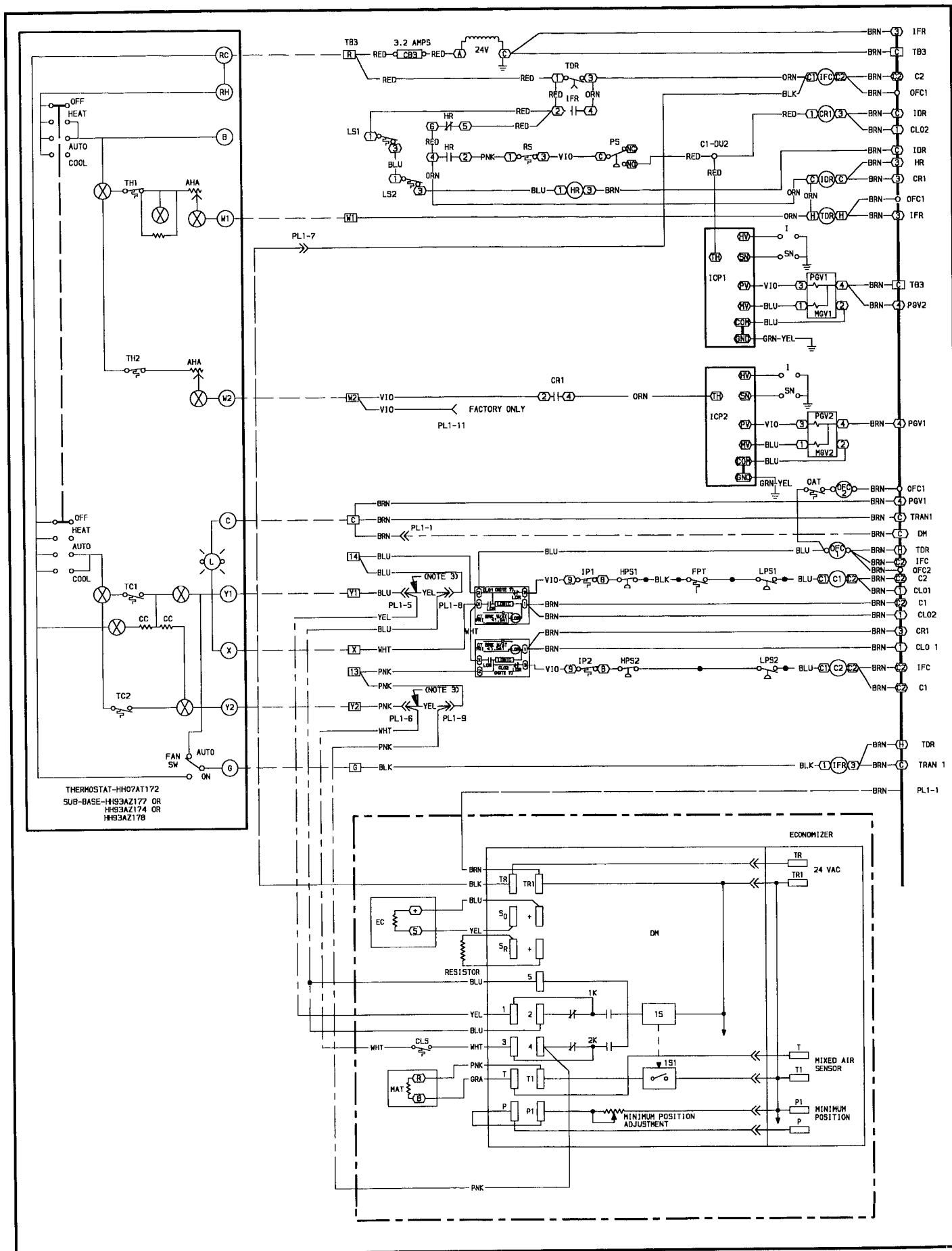
LEGEND FOR TYPICAL CONTROL WIRING SCHEMATIC

AHA — Adjustable Heat Anticipator
BKR W/AT — Breaks with Amp Turns
C — Contactor, Compressor
CB — Circuit Breaker
CC — Cooling Compensator
CH — Crankcase Heater
CLO — Compressor Lockout
CLS — Compressor Lockout Switch
COMP — Compressor Motor
CR — Control Relay
CT — Current Transformer
DM — Damper Motor
DU — Dummy Terminal
EC — Enthalpy Control
EQUIP — Equipment
FPT — Freeze Protection
FU — Fuse
GND — Ground
HPS — High-Pressure Switch
HR — Heat Relay
HV — High Voltage
I — Ignitor
ICP — Ignitor Control Pack
IDM — Induced Draft Motor
IDR — Induced Draft Relay

IFC — Indoor Fan Contactor
IFCB — Indoor Fan Circuit Breaker
IFM — Indoor Fan Motor
IFR — Indoor Fan Relay
IP — Internal Protector
L — Light
LOR — Lockout Relay
LPS — Loss-of-Charge/ Low-Pressure Switch
LS — Limit Switch
MAT — Mixed-Air Thermostat
MGV — Main Gas Valve
OAT — Outdoor-Air Thermostat
OFC — Outdoor Fan Contactor
OFM — Outdoor Fan Motor
PGV — Pilot Gas Valve
PL — Plug
PRI — Primary
PS — Pressure Switch
QT — Quadruple Terminal
R — Relay
RS — Rollout Switch
SN — Sensor
SW — Switch
TB — Terminal Block
TC — Thermostat Cooling

TDR — Time Delay Relay
TH — Thermostat Heating
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



Controls

Operating Sequence

Cooling, units without economizer — Turn unit power on and set thermostat assembly at COOL position and desired temperature. Set fan switch at AUTO. position.

When room temperature rises, cooling contact no. 1 in the thermostat closes, energizing the first-stage of cooling. This starts the no. 1 compressor, evaporator fan motor, and condenser fan motor.

Upon a further rise in room temperature, cooling contact no. 2 in the thermostat closes, energizing the second-stage cooling contactor. The second-stage compressor starts and runs.

If unit operation is interrupted by the low-pressure/loss-of-charge switch, evaporator defrost thermostat, high-pressure switch, compressor circuit breaker, or thermal protector, and there is a call for cooling, the Cycle-LOC™ circuit prevents the compressor from restarting until manual reset is accomplished at the thermostat by turning the unit off and then on.

All units have condenser fan cycling thermostats which, at 55 F, shut off one condenser fan motor. This permits unit to operate down to 40 F outdoor air temperature.

Heating, units without economizer

NOTE: The 48TJ024 units have 2 stages of heat.

Turn unit power on. Open manual gas line valve. Set thermostat system switch at HEAT or AUTO. position and fan switch at AUTO. position for heating.

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

Pressure switch closes and pilot valve no. 1 opens, allowing gas to flow to 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 fan starts.

With an additional heating call, the second-stage thermostat closes. (The control relay closes during first-stage of

operation.) Pilot valve no. 2 opens. 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 main burners and 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 goes off, the time relay opens, and the timer sequence begins. When sequence is complete, the evaporator fan motor goes off.

Air circulation, units without economizer — Turn unit power on. Set control at OFF position and fan switch at ON position. The evaporator fan contactor is energized through the switch on the thermostat, causing the evaporator fans to circulate air continuously. When heating or cooling is called for, controls are set at the HEAT or COOL position.

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

Upon a first call for cooling, when outdoor ambient is below the enthalpy control setting, the evaporator fan starts and the economizer is fully open. The compressor remains 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 compressor 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 compressor, allowing the coil to clear. Once frost has melted, the compressor can be reenergized.

Heating, units with economizer — Outdoor-air damper stays at VENT position while evaporator fan is operating.

Application Data

Outdoor installation — Units designed for outdoor installation only.

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

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

Operating limits — Cfm and other values indicated illustrate the operating range of the equipment. Operation outside these limits is not recommended.

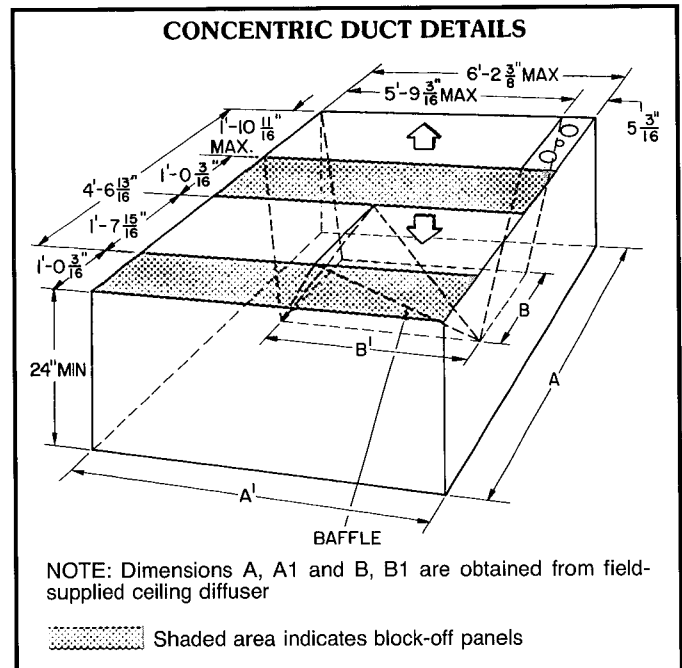
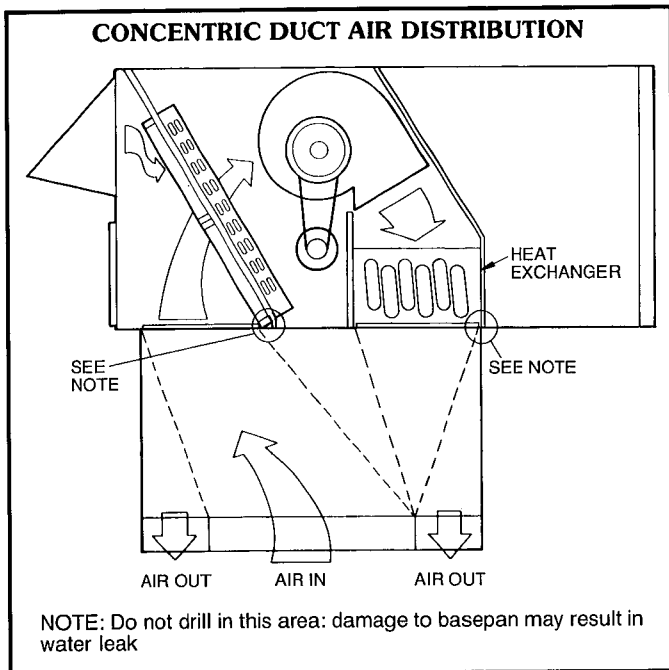
Low ambient temperature cooling operation — Units are designed to operate at outdoor temperatures down to

40 F. At temperatures below 40 F, accessory Motormaster® device will permit operation at outdoor temperatures as low as -20 F

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

Power supply — Electric power may be brought to unit within curb perimeter through knockouts provided in basepan. Provide power supply in accordance with local codes. Branch circuit protection to unit must be provided by fuses no larger than maximum overcurrent protection amps shown in Electrical Data

Control wiring — The 24-v wiring to the thermostat is NEC (National Electrical Code) Class II



Guide specifications

Packaged Rooftop Cooling Unit with Gas Heat

Constant Volume Application

HVAC Guide Specifications

Size Range : **20 Ton, Nominal Cooling**
115,500 to 270,000 Btuh
Nominal Input Heating.

Carrier Model Numbers: **48TJD, Low Heat**
48TJE, High Heat

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 for cooling duty and gas combustion for heating duty. Supply air shall be discharged downward or horizontally, 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 Standard 360 and designed with UL Standard 465.
- B. Unit shall be designed to conform to ANSI B9.1.
- C. Unit shall be ETL tested and certified in accordance with ANSI Z21.47 Standards as a total package.
- 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.

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:

The 48TJ024 shall be a factory-assembled single-piece heating and cooling unit. Contained within the unit enclosure shall be all factory-installed wiring, piping, controls, refrigerant charge (R-22), and special features required prior to field startup. Unit shall be mounted on full perimeter roof curb.

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 fiberglass insulation shall be used in the furnace 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.

C. Fans:

1. Indoor blower (evaporator fan):
 - a. Fan shall be belt driven. Belt drive shall include a fixed-pitch 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.
 - c. Fan motor bearings shall be sealed and permanently lubricated.
 - d. Lubricate fan shaft bearings at least once a year.
2. Condenser fan shall be of the direct-driven propeller type, with aluminum 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 dynamically balanced.

D. Compressor

1. The reciprocating semi-hermetic compressor has a factory-installed vibration isolation.
2. Factory-installed crankcase heater prevents refrigerant dilution of oil.

E. Coils:

1. Standard evaporator and condenser coils shall have copper or aluminum plate fins mechanically bonded to seamless copper tubes with all joints brazed.
2. Tube sheet openings shall be belled to prevent tube wear.

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 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:

1. Expansion device (cap tubes), filter driers, and service valves shall be included.

H. Filter Section:

1. Standard filter section shall consist of two sizes of factory-installed low-velocity, 2-in. thick throwaway fiberglass filters of commercially available sizes.
2. Filter face velocity shall not exceed 400 fpm at nominal airflows

I. Controls and Safeties:

1. Unit Controls:

Unit shall be complete with self-contained, low-voltage control circuit.

Guide specifications (cont)

2. Safeties:

- a. Unit shall incorporate a solid-state compressor protector 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/loss-of-charge switch.
 - 3) Freezestat, evaporator coil.
 - 4) High-pressure switch.
- b. Heating section shall be provided with the following minimum protections:
 - 1) High-temperature limit switch.
 - 2) Induced-draft motor pressure switch.
 - 3) Flame rollout switch (manual reset)
 - 4) Flame proving controls.
 - 5) Redundant gas valves(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 ambient.
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. Compressor motors shall be of the refrigerant cooled type with thermal and current overload protection
2. Outdoor fan motors shall have permanently lubricated bearings, inherent automatic reset thermal over-load protection, and be totally enclosed.
3. Evaporator fan motors shall have a circuit breaker.

M. Special Features:

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

1 Roof Curb:

- a. Formed of 16-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.

* 2. Integrated Economizer:

- a. Integrated type capable of simultaneous economizer and compressor operation to provide cooling with outside 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% outside air.
- d. Equipped with enthalpy control to govern economizer changeover.

* 3. Alternate Motor and Drive:

For low-static applications use 5 Hp motor and drive assembly option.

* 4. Two-Position Damper:

Two-position damper package shall include single blade damper and motor. Admits up to 50% outdoor air, and shall close upon unit shutoff.

5. Accessory Compressor Cycle Delay:

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

* 6. Thermostat and Subbase:

To provide staged heating and cooling in addition to automatic changeover and fan control.

* 7. Barometric Relief Damper:

An automatic damper and all hardware are provided to relieve positive building pressure.

* 8. Power Exhaust:

To be used with economizer to control overpressurization of building.

* 9. Head Pressure Control Package:

Consists of a solid state control and 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.

10. Remote Control:

Panel shall be a decorative, indoor, wall-mounted panel to provide central control of heating, cooling, evaporator fan, and outdoor-air damper. Indicator lights for unit functions shall be provided

11. Pressure Operated Unloader:

Provides an extra step of unloading.