



CONSTRUCTION PERMIT APPLICATION

Applicant Completes: Sections I, II, III (optional), IV, VI, and VII

C16-006804**I. IDENTIFICATION**

1. Proposed Work Site at: 56 Chambers Bridge Rd - Unit #13 (Supercuts)

2. Name of Owner in Fee: Federal Realty Investment Trust
Tel. (301) 998-8100 e-mail IR@FederalRealty.com
Address 1626 East Jefferson St. Rockville, MD 20852
street municipality zip code

3. Ownership in Fee: Public _____ Private _____

4. Principal Contractor: Ambient Conditioning, Inc. Tel. (732) 826-8866
Address 601 King Georges Rd. e-mail ambientac@aol.com
Fords, NJ 08863

License No. OR, if new home, Builder Reg. No. 19HC00101900 Exp. Date 6/30/16

Home Improvement Contractor Registration No. or Exemption Reason (if applicable): 13VH01963700

Federal Emp. ID No. 22-2596529 FAX: (732) 826-9435

5. Architect or Engineer _____ Contact _____
Address _____ e-mail _____
Tel. (_____) _____ FAX: (_____) _____

6. Responsible Person in Charge once Work has Begun Dan Medler
Tel. (732) 826-8866 FAX: (732) 826-9435

V. FEE SUMMARY (for office use only)

		Update	Update
1. Building	\$ <u>300</u> ✓		
2. Electrical	<u>150</u> ✓		
3. Plumbing	<u>150</u> ✓		
4. Fire Protection	<u>100</u> ✓		
5. Elevator Devices			
6. Subtotal			
7. Less 20% for State Plan Review	\$ _____		
8. Subtotal	\$ _____		
9. State Permit Surcharge Fee	\$ <u>12-</u>		
10. Subtotal	\$ _____		
11. Cert. of Occupancy			
12. Other			
13. TOTAL	\$ <u>712-</u>		

VI. BUILDING/SITE CHARACTERISTICS

(office use only)

1. Number of Stories _____

2. Height of Structure _____ ft.

3. Area — Largest Floor _____ sq. ft.

4. New Building Area _____ sq. ft.

5. Volume of New Structure _____ cu. ft.

6. Max. Live Load _____

7. Max. Occupancy Load _____

8. If Industrialized Building: State Approved _____ HUD _____

9. Total Land Area Disturbed _____ sq. ft.

10. Flood Hazard Zone _____

11. Base Flood Elevation _____ ft.

12. Wetlands yes _____ no _____

IIa. PROPOSED WORK

- ☐ Minor Work ☐ New Building ☐ Addition ☐ Demolition
- ☐ Alteration ☐ Renovation ☐ Reconstruction
- ☐ Asbestos Abat. -Subch. 8 ☐ Lead Hazard Abatement ☐ Radon Remediation ☐ Annual Permit

FOR OFFICE USE ONLY (Optional)

Est. Cost	Plans Rec'd by	Date Rec'd	Rejection Date	Approval Date	Re-viewer	Resubmission Dates Approval	Rejection	Re-viewer
	<u>MFF</u>	<u>2/29/16</u>		<u>04/01/16</u>	<u>KEH</u>			
				<u>2/29/16</u>	<u>PE</u>			
				<u>2-26-16</u>	<u>AK</u>			
				<u>4/5/16</u>	<u>ISU</u>			

TOTAL COST

IIb. SUBCODES
(Check all that apply)

- ☒ Building
- ☒ Electrical
- ☒ Plumbing
- ☒ Fire Protection
- ☐ Elevator

VII. DESCRIPTION OF BUILDING USE**A. RESIDENTIAL (primary use)**

1. State Specific Use: _____
2. Use Group, Proposed: _____
3. Change in Use Group, Indicate Present: _____
4. No. of dwelling units: Total Units Income-restricted
- | | |
|----------------|-------|
| Gained, Sale | _____ |
| Gained, Rental | _____ |
| Lost, Sale | _____ |
| Lost, Rental | _____ |

B. NON-RESIDENTIAL (primary use)

1. State Specific Use: _____
2. Use Group, Proposed: _____
3. Change in Use Group, Indicate Present: _____

C. MIXED USE -List secondary use(s): _____

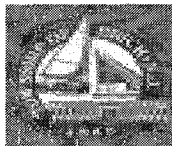
D. Construct. Classification: Present _____
Proposed _____

III. PLAN REVIEW (optional)**DO YOU WANT:**

1. ☐ Partial Releases
2. ☐ Prototype Processing

IV. DOES OR WILL YOUR BUILDING CONTAIN ANY OF THE FOLLOWING?

1. ☐ Elevators/Escalators/Lifts/
Dumbwaiters/Moving Walks
2. ☐ High Pressure Boilers
3. ☐ Pressure Vessels
4. ☐ Refrigeration Systems
5. ☐ Cross-Connections/Backflow Preventers
6. ☐ Hazardous Uses/Places of Assembly
7. ☐ Sanitation/Standpipes
8. ☐ Smoke Control Systems in Open Wells
9. ☐ Underground Storage Tanks
10. ☐ Swimming Pools, Spas and Hot Tubs
11. ☐ LP Gas Tanks
12. ☐ Fire Alarm



Brick Township
401 Chambersbridge Rd
Brick, NJ 08723

Date Issued 5/4/2016
Control Number C-16-000804
Permit Number 16-1081
Permit Issue Date 4/7/2016
Certificate Number 16-1081

Certificate

Construction Code Division
(Certificate of Approval)

Identification

Work Site Location: 56 CHAMBERS BRIDGE RD. SUPERCUTS Block: 671 Lot: 1.01 Qual: _____
UNIT Brick Township, NJ
Owner in Fee: FEDERAL REALTY INVESTMENT TRUST
Owner Address: 1626 EAST JEFFERSON ST ROCKVILLE MD 20852
Telephone: (301) 998-8100
Contractor: AMBIENT CONDITIONING INC
Address: 601 KING GEORGE ROAD FORDS NJ 08863
Telephone: (732) 826-8866 Fax: _____
License Number or Builders Registration Number: 13VH01963700 Federal Emp. Number: _____
19HC00101900

Home Warranty Number: _____

Type of Warranty Plan: ☐ State ☐ Private

Use Group: B Construction Classification: _____

Maximum Live Load: 0 Maximum Occupancy Load: 0

Description of Work/Use: - SUPER CUTS ...DIRECT REPLACEMENT OF RTU

Certificate Comments:

☐ **Certificate of Occupancy**

This serves notice that said building or structure has been constructed in accordance with the New Jersey Uniform Construction Code and is approved for occupancy.

☒ **Certificate of Approval**

This serves notice that the work completed has been constructed or installed in accordance with the New Jersey Uniform Construction Code and is approved. If the permit was issued for minor work, this certificate was based upon what was visible at the time of inspection.

☐ **Certificate of Continued Occupancy**

This serves notice that based on a general inspection of the visible parts of the building there are no imminent hazards and the building is approved for continued occupancy.

☐ **Temporary Certificate of Compliance**

The following conditions must be met no later than or the owner will be subject to fine or order to vacate:

This certificate has an expiration date of:

Conditions to be met:

☐ **Certificate of Clearance - Lead Abatement 5:17**

This serves notice that based on written certification, lead abatement was performed as per NJAC5:17 to the following extent.

- ☐ Total removal of lead-based paint hazards in scope of work
☐ Partial or limited time period (years); see file

☐ **Certificate of Clearance - Asbestos Abatement**

This serves notice that based on written certification, asbestos abatement was performed to the following extent.

- ☐ Total removal of asbestos hazards in scope of work
☐ Partial or limited time period (years); see file

☐ **Certificate of Compliance**

This serves notice that said potentially hazardous equipment has been installed and/or maintained in accordance with the New Jersey Uniform Construction Code and is approved for use until

☐ **Temporary Certificate of Occupancy**

The following conditions must be met no later than: or the owner will be subject to fine or order to vacate:

This certificate has an expiration date of:

Conditions to be met:

Construction Official

Date Printed: 5/4/2016

U.C.C. F260 (rev. 08/05)

Fee: \$0.00

Check Number: _____

Collected By: _____

Page 1

I hereby certify that I am the owner in fee of the property listed on Page 1.

A. () I further certify that a new home (private residence) will be constructed on this property for my own use and occupancy. This dwelling is to be occupied by myself and is not to be used for any purpose other than single family residential use. I attest that all construction, plumbing, or electrical work will be done, in whole or in part, by me or by subcontractors under my supervision, in accordance with all applicable laws; and, I further acknowledge that said new home is not covered under the New Home Warranty and Builders Registration Act (N.J.S.A. 46:3B-1 et seq.) and that such fact shall be disclosed to any person purchasing this property within ten years of the date of issuance of a certificate of occupancy.

B. ☐ I further certify the following as required by the New Jersey Uniform Construction Code, N.J.A.C. 5:23-2.15(e)1.ix:

I personally prepared the plans submitted for: 1) the new home referred to in A.; or, 2) an addition, alteration, renovation, or repair to an existing single family residence owned and occupied by myself and located on the property listed on Page 1; or, 3) a new structure that will be physically separate from, but that will be deemed part of, an existing

C.1. () Building

C.2. () Fire Protection

I further certify that I will perform the following work:

C.3 () Electrical

C4 () Plumbing



BUILDING SUBCODE TECHNICAL SECTION



A. IDENTIFICATION—APPLICANT: COMPLETE ALL APPLICABLE INFORMATION, WHEN CHANGING CONTRACTORS, NOTIFY THIS OFFICE. CALL UTILITY DIG NO: 1-800-272-1000.

Block 671 Lot 1001 Qualification Code _____
Work Site Location 56 Chambers Bridge Rd - Unit #13 (Supercuts)

Owner in Fee: Federal Realty Investment Trust

Tel. 301-998-8100 e-mail IR@federalrealty.com
Address 1626 East Jefferson St Rockville, MD 20852

Contractor: Ambient Conditioning, Inc. Rockville, MD 20852
Address 601 King Georges Rd. Farmersville, NY 08863 Tel. 732-826-8866

Contractor License No. or Builder Registration No. 19HC00101900 Exp. Date 6/30/16
Home Improvement Contractor Registration No. or Exemption Reason 13VH01963700

Federal Emp. ID No. 22-2576529 FAX: 732-826-9435

JOB SUMMARY (Office Use Only)

PLAN REVIEW	Date	Initial	INSPECTIONS	Type	Failure	Dates (Month/Day)	Initial
☒ No Plans Required	<u>04/01/16</u>	<u>MB</u>					
☐ All			Footings				
☐ Footings/Foundations			Footings Bonding				
☐ Structural/Framework			Foundation				
☐ Exterior			Slab				
☐ Interior			Frame				
Joint Plan Review Required:			Truss Sys./Bracing				
☐ Elec. ☐ Plumb. ☐ Fire ☐ Elevator			Barrier-Free				
SUBCODE APPROVAL for PERMIT	<u>04/01/16</u>		Insulation				
Date:			Finishes - Base Layer				
Approved by: <u>MB</u>			Finishes - Final				
SUBCODE APPROVAL for CERTIFICATE			Energy				
☐ CO ☐ CCO ☒ V	<u>05/02/16</u>	<u>MB</u>	Mechanical				
Date:			TCO				
Approved by: <u>MB</u>			Other				
			Final				
			Barrier-Free				

B. BUILDING CHARACTERISTICS

Use Group Present _____ Proposed _____
No. of Stories _____
Height of Structure _____ ft.
Area — Largest Floor _____ sq. ft.
New Bldg. Area/All Floors _____ sq. ft.
Volume of New Structure _____ cu. ft.
Max. Live Load _____
Max. Occupancy Load _____

Constr. Class Present _____ Proposed _____
If Industrialized Building: State Approved _____ HUD _____
Est. Cost of Bldg. Work:
1. New Bldg. \$ _____
2. Rehabilitation \$ _____
3. Total (1+2) \$ 6,000.00

U.C.C. F110 (rev. 11/09) Write = Inspector Copy 2 Canary = Office Copy 3 Pink = Office Copy 4 Gold = Applicant Copy

TOWNSHIP OF ~~WOODBRI~~
CODE ENFORCEMENT AGENCY
BUILDING DEPARTMENT
1 MAIN ST. ~~WOODBRI~~ NJ 07095
732-634-4500

C. CERTIFICATION IN LIEU OF OATH

I hereby certify that I am the (agent of) owner of record and am authorized to make this application.

Sign here: Dan Medler

Print name here: Dan Medler

D. TECHNICAL SITE DATA

DESCRIPTION OF WORK

Proposing to Replace (1) Existing
5 Ton HVAC Rooftop Package Unit-
COMMERCIAL

TYPE OF WORK:

☐ New Building			
☐ Addition			
☐ Rehabilitation			
☐ Roofing			
☐ Siding			
☐ Fence _____ Height (exceeds 6') _____ Sq. Ft.			
☐ Sign _____ Sq. Ft.			
☐ Pool			
☐ Retaining Wall _____ Sq. Ft.			
☐ Asbestos Abatement Subchapter 8			
☐ Lead Haz. Abatement NJAC 5:17			
☐ Radon Remediation			
☒ Other <u>HVAC</u>			
☐ Demolition			

FEE (Office Use Only)
\$ _____

Administrative Surcharge \$ _____
Minimum Fee \$ _____
State Permit Surcharge Fee \$ _____
TOTAL FEE \$ _____

Date Received 4/7/16
Control # _____
Date Issued _____
Permit # 16-1081



FIRE PROTECTION SUBCODE TECHNICAL SECTION



TOWNSHIP OF ~~WOODBRI~~
CODE ENFORCEMENT AGENCY
BUILDING DEPARTMENT
11111 ~~WOODBRI~~ NJ 07095
202-624-4500

Date Received 4/7/14
Control #
Date Issued
Permit # 16-1081

A. IDENTIFICATION—APPLICANT: COMPLETE ALL APPLICABLE INFORMATION. WHEN CHANGING CONTRACTORS, NOTIFY THIS OFFICE. CALL UTILITY DIG NO: 1-800-272-1000.

Block 671 Lot 1.01 Qualification Code
Work Site Location 56 Chambers Bridge Rd - Unit #13 (Supercuts)

Owner in Fee: Federal Realty Investment Trust

Tel. 301 998-8100 e-mail IR@federalrealty.com

Address 1626 East Jefferson St. Rockville, MD 20852

Contractor: Ambient Conditioning, Inc. Tel. 732 826-8866 Zip Code 08060

Address 601 King Georges Rd e-mail ambientac@aol.com

Fords, NJ 08863

Fire Protection Equipment, NJ Div of Fire Safety Permit No. _____

Fire Protection Equipment, NJ Div of Fire Safety Installer No. _____

Fire Alarm Contractor No. _____ Exp. Date _____

Home Improvement Contractor Registration No. or Exemption Reason 13VH01963700

Federal Emp. ID No. 22-2596529 FAX: 732 826-9435

B. FIRE PROTECTION CHARACTERISTICS

Use Group: Present _____ Proposed _____ Fuel Storage Tank:
Constr. Class: Present _____ Proposed _____ Fuel Type: [] Flammable or [] Combustible
Capacity _____

Heating System: [] New or [] Modification to Existing Fire Alarm System: [] New or [] Existing
OR [] Conversion or [] Replacement Location of Panel: _____

Fuel Type: [] Gas [] Oil [] Electric [] Solar
[] Other _____ Location of Main Control Valve: _____

Location: Roof

Total Cost of Fire Protection Work \$ 250.00

JOB SUMMARY (Office Use Only)

PLAN REVIEW INSPECTIONS
[] No Plans Required Type: _____ Failure _____ Approval _____ Initial _____
[] Partial-Underlab Utilities Approved Alarm System _____
Suppression Sys. _____
Standpipe _____
Fire Pump _____
Pre-Eng. System _____
Mechanical _____
Smoke Control _____
TCO _____
Flam/Combust Tanks _____
Fireplace Venting _____
Final _____
Other _____

Date: _____ Approved by: _____
Fire Protection Plans Approved _____
Joint Plan Review Required by: 13V

Subcode Approval for PERMIT 4-13V

Subcode Approval for CERTIFICATE _____

Approved by: _____

Approved by: _____

Approved by: _____

Approved by: _____

Approved by: _____

C. CERTIFICATION IN LIEU OF OATH

I hereby certify that I am the (agent of) owner of record and am authorized to make this application.

Applicant/Contractor sign here: _____

Print name here: _____

D. TECHNICAL SITE DATA

DESCRIPTION OF WORK: Proposing to Replace (1) Existing Water Supply Source 5 to 6 HVAC Rooftop Package Unit.

Method of Alarm/Suppression System Supervision _____

Flammable/Combustible Tanks _____ NUMBER _____
Alarm Systems _____
[] System _____
[] 110v Interconnected _____
[] CO Detectors/110v _____
Alarm Devices (i.e., smoke, heat, pulls, water/flow) _____
Supervisory Devices (i.e., tamper, low/high fail) _____
Signaling Devices (i.e., horn/strobes, bells) _____
Other Devices _____
TOTAL _____

Suppression Systems

Fire Pump _____ GPM Type _____

Dry Pipe/Alarm Valves _____

Pre-action Valves _____

Sprinkler Heads (Dry and Wet) _____

Standpipes _____

Pre-engineered Systems

Wet Chemical _____

Dry Chemical _____

CO₂ Suppression _____

Foam Suppression _____

FM200 Suppression _____

Other _____

Other Systems

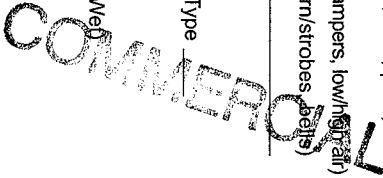
Kitchen Hood Exhaust System _____

Smoke Control System _____

Fuel-Fired Appliances [] Gas [] Oil [] Solid _____

Fireplace Venting/Metal Chimney _____

Other HVAC RTU Replacement 2



Administrative Surcharge \$ _____

Minimum Fee \$ _____

State Permit Surcharge Fee \$ _____

TOTAL FEE \$ _____



CONSTRUCTION PERMIT

Date Issued 4/7/10
Control # C-16-000804
Permit # 16-1081

IDENTIFICATION Block: 671 Lot: 1.01 Qualifier _____
Work Site Location: 56 CHAMBERS BRIDGE RD. SUPERCUTS UNIT Contractor AMBIENT CONDITIONING INC
Brick Township, NJ Address 601 KING GEORGE ROAD FORDS NJ 08863
Owner in Fee FEDERAL REALTY INVESTMENT TRUST
1626 EAST JEFFERSON ST ROCKVILLE MD Telephone: (732) 826-8866
20852 Lic. No. or Bldrs. Reg. No. 13VH01963700 19HC00101900
Telephone: (301) 998-8100 Federal Employee No. 13VH01963700 19HC00101900

Is hereby granted permission to perform the following work:

- | | | |
|--|--|--|
| ☒ BUILDING | ☒ PLUMBING | ☐ LEAD HAZARD ABATEMENT |
| ☒ ELECTRICAL | ☒ FIRE PROTECTION | ☐ DEMOLITION |
| ☐ ELEVATOR DEVICES | ☐ ASBESTOS ABATEMENT
(Subchapter 8 only) | ☐ OTHER |

DESCRIPTION OF WORK:

RENOVATION - COMMERCIAL - SUPER CUTS...DIRECT REPLACEMENT OF RTU

Note: If construction does not commence within one (1) year of date of issuance, or if construction ceases for a period of six (6) months, this permit is void.

Estimated Cost of Work \$6,700

[Signature]
Construction Official

4/6/10
Date

U.C.C. F170
equiv (rev 1/04)

1 WHITE - INSPECTOR

2 CANARY - OFFICE

3 PINK - TAX ASSESSOR

4 GOLD - APPLICANT

PAYMENTS (Office Use Only)

Building	\$300
Electrical	\$150
Plumbing	\$150
Fire Protection	\$100
Elevator Devices	\$0
Other	\$0.00
DCA Training Fee	\$12
CO Fee	
Other	\$0
Total	\$712
Check No. <u>39079</u>	
Cash	\$0
Credit	\$0
Collected By	

REQUIRED INSPECTIONS

Construction work must be inspected in accordance with the State Uniform Construction Code Regulations N.J.A.C. 5:23-2.18. This agency will carry out such periodic inspections during the progress of work as are necessary to insure that the work installed conforms with the requirements of the Uniform Construction Code.

The owner or other responsible person in charge of work must notify this agency when work is ready for any required inspections specified below. Requests for inspections must be made at least 24 hours prior to the time the inspection is desired. Inspections will be performed within three business days of the time for which they are requested. The work must not proceed in a manner which will preclude the inspection until it has been made and approval granted.

☒ Required inspections for all subcodes for one- and two-family dwellings are as follows:

1. The bottom of footing trenches before placement of footings, except that in cases of pile foundations, inspections shall be made in accordance with the requirements of the building subcode.
2. Foundations and all walls up to grade level prior to back filling.
3. All structural framing, connections, wall and roof sheathing and insulation; electrical rough wiring, panel and service installation; rough plumbing. The framing inspection shall take place after the rough electrical and plumbing inspections and after the installation of the heating, ventilation and/or air conditioning duct system. The insulation inspection shall be performed after all other subcode rough inspections and prior to the installation of any interior finish material.
4. Installation of all finished materials, sealings of exterior joints, plumbing piping, trim and fixtures; electrical wiring, devices and fixtures; mechanical systems equipment.

Additional required inspections for all subcodes of construction, for other than one- and two-family dwellings, are fire suppression systems, heat producing devices and Barrier Free subcode accessibility, if applicable.

☐ Required special inspections. The applicant by accepting the permit will be deemed to have consented to these requirements:

☒ A final inspection is required for each applicable subcode area before a final Certificate of Occupancy or Approval may be issued. The final inspections include the installation of all interior and exterior finish materials, sealing of exterior joints, mechanical system and other required equipment; electrical wiring, devices and fixtures; plumbing pipes, trim and fixtures; tests required by any provision of the adopted subcodes, Barrier Free accessibility, if applicable; and verification of compliance with NJAC 5:23-3.5, "Posting structures".

☒ A complete copy of released plans must be kept on the job site.

If you do not understand any of this information, please ask.

04/07/10 10:44 AM 00155849322
SERV. 007
BUILDING \$300.00
ELECTRIC \$150.00
PLUMBING \$150.00
FIRE \$100.00
OTHER \$12.00
CHECK \$712.00



ELECTRICAL SUBCODE TECHNICAL SECTION



TOWNSHIP OF WOODBRIDGE
CODE ENFORCEMENT AGENCY
BUILDING DEPARTMENT
44444 ST. WOODBRIDGE, NJ 07095
732-694-4500

Date Received
Control #
Date Issued
Permit #

4/7/16
16-1081

A. IDENTIFICATION—APPLICANT: COMPLETE ALL APPLICABLE INFORMATION, WHEN CHANGING CONTRACTORS, NOTIFY THIS OFFICE. CALL UTILITY DIG NO: 1-800-272-1000.

Block 671 Lot 1.01 Qualification Code
Work Site Location 56 Chambers Bridge Rd. Unit # 13 (Supercuts)

Owner in Fee: Federal Realty Investment Trust

Tel. 301 998-8100 e-mail IR@federalrealty.com

Address 1626 East Jefferson St Rockville, MD 20852

Contractor: Ambient Conditioning, Inc. Tel. 732 826-8866

Address 601 King Georges Rd. e-mail ambientac@aol.com

Contractor License No. 19HCO0101900 Exp. Date 6/30/16

Home Improvement Contractor Registration No. or Exemption Reason 13VH01963700

Federal Emp. ID No. 22-2596529 FAX: 732 826-9435

B. ELECTRICAL CHARACTERISTICS

Use Group Present Proposed

Pole/Pad # Temporary [] Other

Building Occupied as Utility Co.

Est. Cost of Elec. Work \$ 350.00

JOB SUMMARY (Office Use Only)

PLAN REVIEW	INSPECTIONS	Dates (Month/Day)
[] No Plans Required	Type:	Failure Failure Approval Initial
[] Partial - Underslab Utilities Approved	Rough	
Date: <u>Approved by:</u>	Barrier-Free	
[] Electric Plans Approved <u>SPEC'S</u>	Trench	
Date: <u>2/29/16</u> Approved by: <u>RE</u>	Temp. Serv.	
Joint Plan Review Required:	Constr. Serv.	
[] Bldg. [] Plumb. [] Fire. [] Elev.	TCO	
SUBCODE APPROVAL for PERMIT	Other	
Date: <u>2/29/16</u>	Service	
Approved by: <u>[Signature]</u>	Final	
SUBCODE APPROVAL for CERTIFICATE	Barrier-Free	
[] CO [] CCO [] CA	Temp. Cut-in-Card Date Issued	
Date: <u>4/2/16</u>	Final Cut-in-Card Date Issued	
Approved by: <u>[Signature]</u>	Annual Pool Inspection	
	Date of Grounding and Bonding Certification	

C. CERTIFICATION IN LIEU OF OATH

I hereby certify that I am the (agent of) owner of record and am authorized to make this application and perform the work listed on this application.

Applicant sign/Contractor sign and seal here: [Signature]

Print name here: Dan Medler

D. TECHNICAL SITE DATA

[] Licensed Elec. Contractor [] Certifd Landscape Irrigation Contr [] Exempt Applicant

DESCRIPTION OF WORK: Proposing to Replace (1) Existing 5 Ton HVAC Rooftop Package Unit

QTY. SIZE ITEMS

Lighting Fixtures

Receptacles

Switches

Detectors

Light Poles

Motors—Fract. HP

Emergency & Exit Lights

Communications Points

Alarm Devices/F.A.C. Panel

TOTAL NUMBERS

Pool Permit/with UW Lights

Storable Pool/Spa/Hot Tub

KW Elec. Range/Receptacle

KW Oven/Surface Unit

KW Elec. Water Heater

KW Elec. Dryer/Receptacle

KW Dishwasher

HP Garbage Disposal

KW Central A/C Unit + Heat HVAC

HP/KW Space Heater/Air Handler

KW Baseboard Heat

HP Motors 1/4 HP

KW Transformer/Generator

AMP Service

AMP Subpanels

AMP Motor Control Center

KW Elec. Sign/Outline Light

COMMERCIAL

FEE (Office Use Only)

Administrative Surcharge \$
Minimum Fee \$
State Permit Surcharge Fee \$
TOTAL FEE \$

State Board of Examiners of Heating, Ventilating, Air Conditioning and Refrigeration Contractors Laws

expansion tanks, pumps, gauges on the load side of a meter; thermostatic controls; or natural or manufactured gas piping; or the installation, maintenance or connection of: pneumatic controls and control piping for the control of air, liquid or gas temperatures, radiators, convectors, cabinet unit heaters, fan coil units, air handlers utilizing hydronic coils, mechanical ventilation for radon mitigation, humidifiers, flues and patented chimneys; or of pneumatic controls and control piping of automatic oil, gas or coal burning equipment, gasoline or diesel oil dispensing equipment and in replacement cases only, the connection thereof of the wiring from a dedicated electrical service disconnect box of adequate size to accommodate the equipment and controls, and the testing and balancing of hydronic systems; or the installation, repair, testing or closure of waste oil underground storage tanks.

b. Nothing in this act shall be construed to prevent licensed electrical contractors from engaging in the installation of: electrical resistance heating equipment and ventilation equipment with the exhaust duct not exceeding 60 square inches in area, or in commercial applications the connection sleeve between a roof-top mounted exhaust fan and its central connecting register, provided that this connection sleeve is not more than 15 inches in length or the length necessary to penetrate a roof or other similar openings; and the maintenance and repair of the electrical sections of any equipment used for heating, ventilating, air conditioning or refrigeration.

L.2007, c.211, s.27.

45:16A-28 Certain electrical work, performance prohibited.

28. Notwithstanding any other provision of this act to the contrary, a licensed master plumber or a person with a Master HVACR license shall not perform any electrical work which has a potential of greater than 30 volts, involving the wiring of equipment used for heating, ventilating, air conditioning or refrigeration, except in the case of replacement installations as described in sections 2 and 27 of this act or as provided for in section 18 of P.L.1962, c.162 (C.45:5A-18).

L.2007, c.211, s.28.

NOT AN
ELECTRICIAN'S
OR PLUMBER'S
LICENSE

State Of New Jersey
New Jersey Office of the Attorney General
Division of Consumer Affairs

THIS IS TO CERTIFY THAT THE
Division of Consumer Affairs

HAS REGISTERED

Ambient Conditioning Inc
Daniel Medler
601 King George Road
Fords NJ 08863

FOR PRACTICE IN NEW JERSEY AS A(N): Home Improvement Contractor

New Jersey Office of the Attorney General
Division of Consumer Affairs
THIS IS TO CERTIFY THAT THE
Division of Consumer Affairs
HAS REGISTERED
Ambient Conditioning Inc
Home Improvement Contractor

NOT AN ELECTRICIAN'S OR PLUMBER'S LICENSE
02/01/2016 TO 03/31/2017
VALID

SIGNATURE

13VH01963700

ACTING DIRECTOR

02/01/2016 TO 03/31/2017
VALID

13VH01963700
LICENSE/REGISTRATION/CERTIFICATION #

Daniel Medler

Signature of Licensee/Registrant/Certificate Holder

ACTING DIRECTOR

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P.O. Box 46016
Newark, NJ 07101

PLEASE DETACH HERE

Ambient Conditioning Inc

EXPIRATION DATE 2017

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State Of New Jersey
New Jersey Office of the Attorney General
Division of Consumer Affairs

THIS IS TO CERTIFY THAT THE
Board of Exam. of HVACR Contractors

HAS LICENSED

Daniel J. Medler
601 King Georges Road
Fords NJ 08863

FOR PRACTICE IN NEW JERSEY AS A(N): Master HVACR Contractor

10/02/2014 TO 06/30/2016
VALID

19HC00101900
LICENSE/REGISTRATION/CERTIFICATION #

Signature of Licensee/Registrant/Certificate Holder

ACTING DIRECTOR

New Jersey Office of the Attorney General
Division of Consumer Affairs

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Board of Exam. of HVACR Contractors
HAS LICENSED

Daniel J. Medler
Master HVACR Contractor

10/02/2014 TO 06/30/2016
VALID

19HC00101900

License/Registration/Certificate #

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Board of Exam. of HVACR Contractors
P.O. Box 47031
Newark, NJ 07101

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Daniel J. Medler

EXPIRATION DATE 2016

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READ AND COMPLETE ALL RELEVANT SECTIONS. PAY SPECIAL ATTENTION TO CHIMNEY LINER DETAILS.



CHIMNEY VERIFICATION FOR REPLACEMENT OF FUEL-FIRED EQUIPMENT

BLOCK 671 LOT 101 QUALIFICATION CODE _____ PERMIT # _____
 WORK SITE ADDRESS 256 Chambers Bridge Rd. - Unit # 13 (Supercuts)
 Owner in Fee Federal Realty Investment Trust
 Verifying Individual Dan Medler Company Ambient Conditioning, Inc.
 Address 601 King Georges Rd Fords NJ 08863
Street City State Zip Code
 Tel: (732) 826-8866 Fax: (732) 826-9435

Check the Appropriate Box(es):

Type of Replacement:

- ☐ Oil to Gas Conversion
☐ Gas to Oil Conversion
☒ Gas Appliance Replacement
☐ Oil to Oil Replacement
☐ Other _____

Existing Vent/Chimney: Size _____

- ☐ "B" Label Vent ☐ Chimney-Interior
☐ "L" Label Vent ☐ Chimney-Exterior
☐ Flexible Liner ☐ Masonry Chimney-Tile Lined
☐ Power Vent/Exhauster ☐ Masonry Chimney-Unlined
☐ Other _____

Type	Fuel Type	BTU Rating (input/hour)
Appliance 1: <u>HVAC RTU</u>	Oil / Gas / Other: <u>Natural Gas</u>	_____
Appliance 2: _____	Oil / Gas / Other: _____	_____
Appliance 3: _____	Oil / Gas / Other: _____	_____

CHIMNEY LINER

If a chimney liner is being installed, all documentation on the liner must accompany the Permit application.

Manufacturer: _____ Model: _____ UL Listing: _____

Material of Liner: Stainless Steel _____ Aluminum _____

Size of Appliance Vent: _____ Size of Liner: _____ Height of Chimney: _____

Length of Connector: _____ Vent Connector Rise: _____

How does the appliance vent? ☐ Natural Draft ☐ Fan-assisted ☐ Other: _____

PLEASE SIGN ONE OF THE FOLLOWING VERIFICATION STATEMENTS

For Oil or Coal to Gas Conversions:

I have verified that the chimney/vent is in good repair and clear of obstruction and is substantially clean of residue from its previous use serving an oil or coal appliance. I have verified that the chimney/vent is appropriately lined and sized for the appliance(s) being installed.

Signature _____ Date _____

Oil to Oil or Gas to Gas Replacements or New/Additional Appliances:

I have verified that the existing chimney/vent is in good repair and clear of obstruction. I have verified that the existing chimney/vent is appropriately lined and sized for the appliance(s) being installed and/or remaining.

Signature _____ Date _____

Direct Vent Appliance:

I hereby verify that the appliance(s) being installed is a direct vent appliance. I further verify that the existing chimney/vent is appropriately lined and sized for any remaining appliances.

Dan Medler 2/24/16
 Signature Date

Verification Not Submitted:

I choose not to submit verification. I understand that I will be required to be present for the inspection to remove and reinstall the chimney vent connector.

Signature _____ Date _____

FOR MINOR AND EMERGENCY WORK, THIS FORM MUST BE PROVIDED WITH YOUR PERMIT APPLICATION. FOR ALL OTHER WORK, THIS FORM MUST BE PRESENTED TO THE CODE OFFICIAL PRIOR TO FINAL INSPECTION.

All applicable information requested on this form must be supplied.

This form may not be submitted by a homeowner in lieu of the required inspection.

REPLACEMENT ROOF TOP UNITS FOR COMMERICAL

WEIGHT OF OLD UNIT 836#

WEIGHT OF NEW UNIT 569# Add Adaptor CURB 97#

IF THE NEW UNIT WEIGHT IS MORE WE WILL NEED AN ENGINEER TO CERTIFY ROOF STRUCTURE, OR PROVIDE DETAILED REINFORCEMENT PLAN.

PLUMBING TECH FILLED OUT AND SIGNED AND SEALED.

BTU'S OF OLD AND NEW UNITS OR NEED TO SUPPLY HEAT LOSS/COOLING

OLD BTU'S 130,000 INPUT 104,000 OUTPUT

NEW BUT'S 120,000 INPUT 90,000 OUTPUT

NEED TO SUPPLY LOAD CALCUATIONS

ELECTRIC TECH FILLED OUT AND SIGNED AND SEALED.

BUILDING TECH FILLED OUT AND SIGNED AND SEALED.

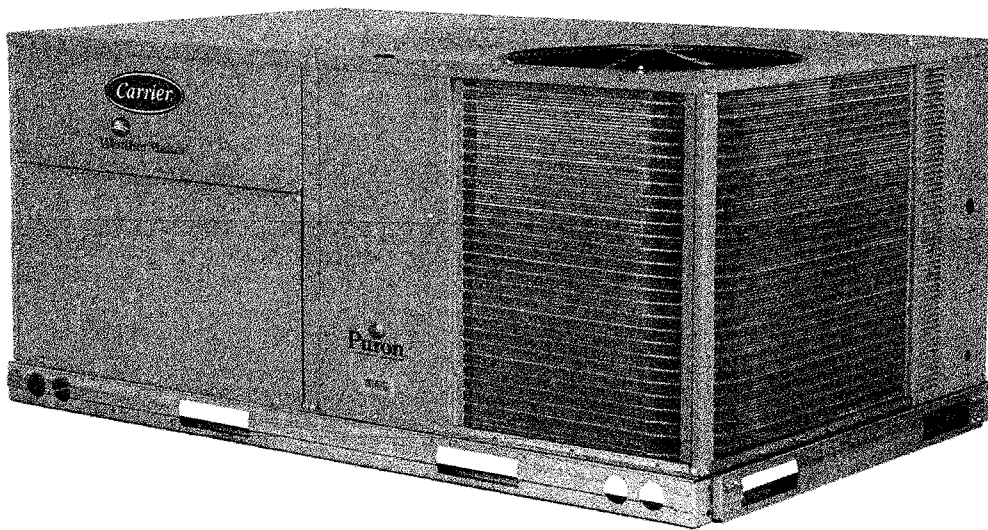
BROCHURE/SPEC'S OF NEW UNIT (NOT INSTALLATION GUIDE)

7/26/11

48TC
Gas Heat/Electric Cooling
Packaged Rooftop
3 to 15 Nominal Tons



Product Data



C08613



Proposing to Replace Existing w/ (1) Carrier HVAC RTU
Model # 48TCEA06A2A5

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Turn to the Experts.™

The Carrier rooftop unit (RTU) was designed by customers for customers. With “no-strip screw” collars, handled access panels, and more we’ve made your unit easy to install, easy to maintain and easy to use.

Easy to install:

All WeatherMaker® units are field-convertible to horizontal air flow which makes it easy to adjust to unexpected job site complications. Lighter units make easy replacement. Most Carrier 48TC rooftops fit on existing Carrier curbs dating back to 1989. Also, our large control box gives you room to work and room to mount Carrier accessory controls.

Easy to maintain:

Easy access handles by Carrier provide quick and easy access to all normally serviced components. Our “no-strip” screw system has superior holding power and guides screws into position while preventing the screw from stripping the unit’s metal. Take accurate pressure readings by reading condenser pressure with panels on. Simply remove the black, composite plug, route your gauge line(s) through the hole, and connect them to the refrigeration service valve(s).

Easy to use:

The newly designed, central terminal board by Carrier puts all your connections and troubleshooting points in one convenient place, standard. Most low voltage connections are made to the same board and make it easy to find what you’re looking for and easy to access it. Carrier rooftops have high and low pressure switches, a filter drier, and 2-in (51mm) filters standard.

FEATURES AND BENEFITS

- Single cooling stage models are available from 3 – 10 ton.
- Two cooling stage models are available from 7.5 – 15 ton.
- SEER up to 13.0.
- EER's up to 11.1.
- IEER's up to 11.8 with single speed indoor fan motor and up to 12.8 with 2-speed/VFD indoor fan motor.
- Up to 28% lighter than similar industry units. Lighter rooftops make easier replacement jobs.
- Utility connections are the same because 3 – 12.5 ton units fit on existing Carrier rooftop curbs. This saves time and money on replacement jobs.
- Standardized components and layout. Standardized components and controls make service and stocking parts easier.
- Scroll compressors on all units. This makes service, stocking parts, replacement, and troubleshooting easier.
- Field convertible airflow (3 – 15 ton). Being able to convert a unit from vertical airflow to horizontal makes it easy to overcome job site complications. 15 ton models require a simple supply duct cover to field convert from factory vertical to horizontal.
- Easy-adjust, belt-drive motor available.
- Provisions for bottom or side condensate drain.
- Capable of thru-the-base or thru-the-curb gas line routing.
- Single-point gas / electrical connection.
- Sloped, composite drain pan sheds water; and won't rust.
- Standardized controls & control box layout. Standardized components & controls make stocking parts & service easier.
- Tool-less filter access door.
- Clean, large, easy to use control box.
- Color-coded wiring.
- Large, laminated wiring and power wiring drawings which are affixed to unit make troubleshooting easy.
- Single, central terminal board for test and wiring connections.
- Fast-access, handled, panels for easy access on normally accessed service panels.
- "No-strip" screw system guides screws into the panel & captures them tightly without stripping the screw, the panel, or the unit.
- Mechanical cooling (115°F to 40°F or 46°C to 4°C) standard on all models. Winter Start Kit allows cooling operation down to 25°F (-4°C) and MotorMaster to -20°F (-29°C).
- High efficiency, gas heat with induced-draft flue exhaust design.
- Induced draft motor ensures no flue gas can escape into the indoor air stream.
- Carrier designed naturally draining heat exchanger, unlike positive pressure heat exchangers, do not need to be periodically, manually drained. This saves labor and maintenance expense.
- 2-in (51mm) disposable filters on all units.
- Refrigerant filter-drier on each circuit.
- Each circuit is protected with a high and low pressure switch.
- Many factory-installed options ranging from air management economizers, 2 position dampers, plus convenience outlets, disconnect switches and smoke detectors.
- Standard (parts only) Warranty: 10 yr. aluminized heat exchanger, 5 yr. compressor, 3 yr. Novation condenser coil, 1 yr. parts.
- Factory-installed Humidi-MiZer® adaptive dehumidification system on all sizes with round tube / plate fin condenser coils, includes MotorMaster I controller.
- Optional Staged Air Volume (SAV) system utilizes a Variable Frequency Drive (VFD) to automatically adjust the indoor fan motor speed between cooling stages. Available on 2-stage cooling models 08-16 with electromechanical controls or RTU Open.

MODEL NUMBER NOMENCLATURE

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
4	8	T	C	D	A	0	4	A	1	A	5	-	0	A	0	A	0

Unit Heat Type
48 – Gas Heat
Packaged
Rooftop

Series/Model
TC – Standard Efficiency

Heat Size
D – Low heat
E – Medium Heat
F – High Heat
L – Low NO_x, Low Heat
M – Low NO_x, Medium Heat
N – Low NO_x, High Heat
S – Stainless Steel, Low Heat
R – Stainless Steel, Medium Heat
T – Stainless Steel, High Heat

Refrig. Systems Options
A – Standard One Stage Cooling Models
B – Standard One Stage Cooling Models
with Humidi-Mizer (04-07 models only)
D – Two Stage Cooling Models 08-16
E – Two Stage Cooling Models 08-16
with Al/Cu condenser Coils and
with Humidi-Mizer

Cooling Tons
04 - 3 ton 08 – 7.5 ton 16 – 15 Tons
05 - 4 ton 09 – 8.5 ton
06 - 5 ton 12 – 10 ton
07 - 6 ton 14 – 12.5 ton

Sensor Options
A = None
B = RA Smoke Detector
C = SA Smoke Detector
D = RA + SA Smoke Detector
E = CO2 Sensor
F = RA Smoke Detector and CO2 Sensor
G = SA Smoke Detector and CO2 Sensor
H = RA + SA Smoke Detector and CO2 Sensor

Indoor Fan Options
1 = Standard Static Option
2 = Medium Static Option
3 = High Static Option
C = High Static Option w/ High Effy Motor (Size 16 Only)

Note: On single phase (-3 voltage code) models, the following are not available as a factory installed option:

- Humidi-Mizer
- Coated Coils or Cu Fin Coils
- Louvered Hail Guards
- Economizer or 2 Position Damper
- Powered 115 Volt Convenience Outlet

Not all possible options can be displayed above.

Packaging and Seismic Compliant

0 = Standard
1 = LTL
3 = CA Seismic Compliant
4 = LTL and CA Seismic Compliant Label

Electrical Options

A = None
C = Non-Fused Disconnect
D = Thru-The-Base Connections
F = Non-Fused Disconnect and Thru-The-Base Connections
G = 2-Speed Indoor Fan (VFD) Controller
J = 2 Speed Fan Controller (VFD) and Non-Fused Disconnect
K = 2 Speed Fan Controller (VFD) and Thru-The Base Connections
M = 2 Speed Fan Controller (VFD) with Non-Fused Disconnect and Thru-The Base Connections

Service Options

0 = None
1 = Unpowered Convenience Outlet
2 = Powered Convenience Outlet
3 = Hinged Panels
4 = Hinged Panels, Unpowered Convenience Outlet
5 = Hinged Panels, Powered Convenience Outlet

Intake / Exhaust Options

A = None
B = Temperature Economizer w/ Barometric Relief
F = Enthalpy Economizer w/ Barometric Relief
K = 2-Position Damper
U = Temp Ultra Low Leak Economizer w/Baro Relief
W = Enthalpy Ultra Low Leak Econo w/Baro Relief

Base unit controls

0 = Electro Mechanical controls. Can be used with W7212 EconoMi\$er IV (Non-Fault Detection and Diagnostic)
1 = PremierLink Controller
2 = RTU Open Multi-Protocol Controller
6 = Electro Mechanical controls. Can be used with W7220 EconoMi\$er X (with Fault Detection and Diagnostic)

Design Revision Factory Assigned

Voltage

1 = 575/3/60 5 = 208-230/3/60
3 = 208-230/1/60 6 = 460/3/60

Coil Options For Round Tube/Plate Fin Condenser Coil Models Only (outdoor-indoor-hailguard)

A = Al/Cu - Al/Cu
B = Precoat Al/Cu - Al/Cu
C = E-coat Al/Cu - Al/Cu
D = E-coat Al/Cu - E-coat Al/Cu
E = Cu/Cu - Al/Cu
F = Cu/Cu - Cu/Cu
M = Al/Cu - Al/Cu – Louvered Hail Guards
N = Precoat Al/Cu - Al/Cu – Louvered Hail Guards
P = E-coat Al/Cu - Al/Cu – Louvered Hail Guards
Q = E-coat Al/Cu - E-coat Al/Cu – Louvered Hail Guards
R = Cu/Cu - Al/Cu – Louvered Hail Guards
S = Cu/Cu - Cu/Cu – Louvered Hail Guards

Coil Options For All Aluminum – Novation Condenser Coil Models Only (outdoor-indoor-hailguard)

G = Al/Al – Al/Cu
H = Al/Al – Cu/Cu
J = Al/Al – E-coat Al/Cu
K = E-coat Al/Al – Al/Cu
L = E-coat Al/Al – E-coat Al/Cu
T = Al/Al – Al/Cu, Louvered Hail Guards
U = Al/Al – Cu/Cu, Louvered Hail Guards
V = Al/Al – E-coat Al/Cu, Louvered Hail Guards
W = E-coat Al/Al – Al/Cu, Louvered Hail Guards
X = E-coat Al/Al – E-coat Al/Cu, Louvered Hail Guards

C13211B

Table 1 – FACTORY-INSTALLED OPTIONS AND FIELD-INSTALLED ACCESSORIES

CATEGORY	ITEM	FACTORY INSTALLED OPTION	FIELD INSTALLED ACCESSORY
Cabinet	Thru-the-base electrical or gas-line connections	X	X
	Supply Duct Cover (16 size only)		X
	California Seismic Compliant Labeling	X	
	Hinged Access Panels	X	
Coil Options	Cu/Cu indoor and/or outdoor coils ^{1, 6}	X	
	Pre-coated outdoor coils ^{1, 6}	X	
	Premium, E-coated outdoor coils ^{1, 6}	X	
Humidity Control	Humidi-MiZer Adaptive Dehumidification System ⁶	X	
Condenser Protection	Condenser coil hail guard (louvered design) ⁶	X	X
Controls	Thermostats, temperature sensors, and subbases		X
	PremierLink DDC communicating controller	X	X
	RTU Open-protocol controller	X	
	Smoke detector (supply and/or return air)	X	
	Time Guard II compressor delay control circuit		X
	Phase Monitor		X
Economizers & Outdoor Air Dampers	EconoMi\$er IV for electro-mechanical controls – Non FDD (Standard air leak damper models) ^{6, 7}	X	X
	EconoMi\$er2 for DDC controls, complies with FDD (Standard and Ultra Low Leak air damper models) ^{6, 8}	X	X
	Motorized 2 position outdoor air damper ⁶	X	X
	Manual outdoor air damper (25% and 50%)		X
	Barometric relief ²	X	X
	Power exhaust		X
	EconoMi\$er X for electro-mechanical controls, complies with FDD. (Standard and Ultra Low Leak air damper models) ^{6, 7}	X	X
Economizer Sensors & IAQ Devices	Single dry bulb temperature sensors ³	X	X
	Differential dry bulb temperature sensors ³		X
	Single enthalpy sensors ³	X	X
	Differential enthalpy sensors ³		X
	Wall or duct mounted CO ₂ sensor ³		X
	Unit mounted CO ₂ sensor ³	X	
Gas Heat	Propane conversion kit		X
	Stainless steel heat exchanger	X	
	High altitude conversion kit		X
	Flue Shield (04–14 sizes only)		X
	Flue Discharge Deflector (04–14 sizes only)		X
Indoor Motor & Drive	Multiple motor and drive packages	X	
	Staged Air Vol (SAV) system w/VFD controller (2-stage cool only with electrical mechanical and RTU Open controls)	X	
	Display Kit for SAV system with VFD		X
Low Ambient Control	Winter start kit ⁴		X
	Motormaster® head pressure controller ⁴		X
Power Options	Convenience outlet (powered) ⁶	X	
	Convenience outlet (un-powered)	X	
	Non-fused disconnect ⁵	X	
	Disconnect Switch Bracket (16 size only)		X
Roof Curbs	Roof curb 14-in (356mm)		X
	Roof curb 24-in (610mm)		X

NOTES:

1. Novation coated coils only available with E-coat.
2. Included with economizer.
3. Sensors used to optimize economizer performance.
4. See application data for assistance.
5. Available on units with MOCP's of 80 amps or less.
6. Not available as factory installed option on single phase (208/230/1/60) models. Use field-installed accessory where available.
7. FDD (Fault Detection and Diagnostic) capability per California Title 24 section 120.2.
8. Models with RTU Open DDC controls comply with California Title 24 Fault Detection and Diagnostic (FDD). PremierLink is non FDD.

FACTORY OPTIONS AND/OR ACCESSORIES

Economizer

Economizers save energy, money and improve comfort levels in the conditioned space. They bring in fresh, outside air for ventilation; and provide cool outside air to cool your building. This also is the preferred method of low ambient cooling. When integrated with CO₂ sensors, economizers can provide even more savings by coupling the ventilation air to only that amount required based on space occupancy. Economizers are available, installed and tested by the factory, with either enthalpy or temperature dry-bulb inputs. There are also models for electromechanical, direct digital controllers and single speed fan or 2-speed indoor fan motors. Additional sensors are available as accessories to optimize the economizer. Economizers include gravity controlled barometric relief that helps equalize building pressure and ambient air pressures. This can be a cost effective solution to prevent building pressurization. Economizers are available in Ultra Low Leak and standard low leak versions.

CO₂ Sensor

Improves productivity and saves money by working with the economizer to intake only the correct amount of outside air for ventilation. As occupants fill your building, the CO₂ sensor detects their presence through increasing CO₂ levels, and opens the economizer appropriately.

When the occupants leave, the CO₂ levels decrease, and the sensor appropriately closes the economizer. This intelligent control of the ventilation air, called Demand Control Ventilation (DCV) reduces the overall load on the rooftop, saving money.

Smoke Detectors

Trust the experts. Smoke detectors make your application safer and your job easier. Carrier smoke detectors immediately shut down the rooftop unit when smoke is detected. They are available, installed by the factory, for supply air, return air, or both.

Louvered Hail Guards

Sleek, louvered panels protect the condenser coil from hail damage, foreign objects, and incidental contact.

Convenience Outlet (powered or un-powered)

Reduce service and/or installation costs by including a convenience outlet in your specification. Carrier will install this service feature at our factory. Provides a convenient, 15 amp, 115v GFCI receptacle with "Wet in Use" cover. The "powered" option allows the installer to power the outlet from the line side of the disconnect or load side as required by code. The "un-powered" option is to be powered from a separate 115/120v power source.

Non-fused Disconnect

This OSHA-compliant, factory installed, safety switch allows a service technician to locally secure power to the rooftop.

Disconnect Switch Bracket

Provides a pre-engineered and sized mounting bracket for applications requiring a unit mounted fused and non-fused disconnect of greater than 100 amps. Bracket assures that no damage will occur to coils when mounting with screws and other fasteners (16 size only).

Power Exhaust with Barometric Relief

Superior internal building pressure control. This field installed accessory may eliminate the need for costly, external pressure control fans.

PremierLink, DDC Controller

This CCN controller regulates your rooftop's performance to tighter tolerances and expanded limits, as well as facilitates zoning systems and digital accessories. It also unites your Carrier HVAC equipment together on one, coherent CCN network. The PremierLink can be factory installed, or easily field installed. Not available with 2-speed Staged Air Volume (SAV) system.

RTU Open, Multi-Protocol Controller

Connect the rooftop to an existing BAS without needing complicated translators or adapter modules using the RTU Open controller. This new controller speaks the 4 most common building automation system languages (Bacnet, Modbus, N2, and Lonworks). Use this controller when you have an existing BAS.

Time Guard II Control Circuit

This accessory protects your compressor by preventing short-cycling in the event of some other failure, prevents the compressor from restarting for 30 seconds after stopping. Not required with PremierLink, RTU Open, or authorized commercial thermostats.

Motorized 2-Position Damper

The new Carrier 2-position, motorized outdoor air damper admits up to 100% outside air. Using reliable, gear-driven technology, the 2-position damper opens to allow ventilation air and closes when the rooftop stops, stopping unwanted infiltration.

Manual OA Damper

Manual outdoor air dampers are an economical way to bring in ventilation air. The dampers are available in 25% and 50% versions.

Optional Humidi-MiZer Adaptive Dehumidification System

Carrier's Humidi-MiZer Adaptive Dehumidification System is an all-inclusive factory installed option that can be ordered with any WeatherMaker 48TC**04-16 rooftop unit.

FACTORY OPTIONS AND/OR ACCESSORIES (cont.)

Opt. Humidi-MiZer Adap. Dehum. Sys. (cont.)

This system expands the envelope of operation of Carrier's WeatherMaker rooftop products to provide unprecedented flexibility to meet year round comfort conditions.

The Humidi-MiZer adaptive dehumidification system has the industry's only dual dehumidification mode setting. The Humidi-MiZer system includes two new modes of operation.

The WeatherMaker 48TC**04-16 rooftop coupled with the Humidi-MiZer system is capable of operating in normal design cooling mode, subcooling mode, and hot gas reheat mode. Normal design cooling mode is when the unit will operate under its normal sequence of operation by cycling compressors to maintain comfort conditions.

Subcooling mode will operate to satisfy part load type conditions when the space requires combined sensible and a higher proportion of latent load control. Hot Gas Reheat mode will operate when outdoor temperatures diminish and the need for latent capacity is required for sole humidity control. Hot Gas Reheat mode will provide neutral air for maximum dehumidification operation.

Staged Air Volume (SAV) Indoor Fan Speed System

Carrier's Staged Air Volume (SAV) system saves energy and installation time by utilizing a Variable Frequency Drive (VFD) to automatically adjust the indoor fan motor speed in sequence with the units cooling operation. Per ASHRAE 90.1 2010 standard section 6.4.3.10.b, during the first stage of cooling operation the VFD will adjust the fan motor to provide 2/3rd of the total cfm established for the unit. When a call for the second stage of cooling is required, the VFD will allow the total cfm for the unit established (100%). During the heating mode the VFD will allow total design cfm (100%) operation and during the ventilation mode the VFD will allow operation to 2/3rd of total cfm.

Compared to single speed indoor fan motor systems, Carrier's SAV system can save substantial energy, 25%+*, versus single speed indoor fan motor systems.

The VFD used in Carrier's SAV system has soft start capabilities to slowly ramp up the speeds, thus eliminating any high inrush air volume during initial start-up. It also has internal over-current protection for the fan motor and a field installed display kit that allows adjustment and in depth diagnostics of the VFD.

This SAV system is available on models with 2-stage cooling operation with electromechanical or RTU Open, Multi Protocol controls. Both space sensor and conventional thermostats/controls can be used to provide accurate control in any application.

The SAV system is very flexible for initial fan performance set up and adjustment. The standard factory shipped VFD is pre-programmed to automatically stage the fan speed between the first and second stage of cooling. The unit fan performance static pressure and cfm can be easily adjusted using the traditional means of pulley adjustments. The other means to adjust the unit static and cfm performance is to utilize the field installed Display Kit and adjust the frequency and voltage in the VFD to performance requirements. In either case, once set up, the VFD will automatically adjust the speed between the cooling stage operations.

*Data based on .10 (\$/kWh) in an office application utilizing Carrier's HAP 4.6 simulation software program

Motormaster Head Pressure Controller

The Motormaster motor controller is a low ambient, head pressure controller kit that is designed to maintain the unit's condenser head pressure during periods of low ambient cooling operation. This device should be used as an alternative to economizer free cooling when economizer usage is either not appropriate or desired. The Motormaster will either cycle the outdoor fan motors or operate them at reduced speed to maintain the unit operation, depending on the model.

Winter Start Kit

The winter start kit by Carrier extends the low ambient limit of your rooftop to 25°F (-4°C). The kit bypasses the low pressure switch, preventing nuisance tripping of the low pressure switch. Other low ambient precautions may still be prudent.

Propane Heating

Convert your gas heat rooftop from standard natural gas operation to propane using this field installed kit.

High Altitude Heating

High altitudes have less oxygen, which means heat exchangers need less fuel. The new gas orifices in this field installed kit make the necessary adjustment for high altitude applications. They restore the optimal fuel to air mixture and maintain healthy combustion at altitudes above 2000 ft (610m). Kits may not be required in all areas.

Hinged Access Panels

Allows access to unit's major components with specifically designed hinged access panels. Panels are: filter, control box, fan motor, and compressor.

FACTORY OPTIONS AND/OR ACCESSORIES (cont.)

Flue Discharge Deflector

The flue discharge deflector is a useful accessory when flue gas recirculation is a concern. By venting the flue discharge upwards, the deflector minimizes the chance for a neighboring unit to intake the flue exhaust (04-14 sizes only).

Optional Stainless Steel Heat Exchanger

The stainless steel heat exchanger option provides the tubular heat exchanger be made out of a minimum 20 gauge type 409 stainless steel for applications where the mixed air to the heat exchanger is expected to drop below 45°F (7°C). Stainless steel may be specified on applications where the presence of airborne contaminants require its use (applications such as paper mills) or in areas with very high outdoor humidity that may result in severe condensation in the heat exchanger during cooling operation.

Flue Discharge Heat Shield

The flue discharge heat shield keeps people from touching the rooftop unit's potentially hot flue discharge. This is especially useful for ground level applications, where more, untrained people could have access to the unit's exterior (04-14 sizes only).

Alternate Motors and Drives

Some applications need larger horsepower motors, some need more airflow, and some need both. Regardless of the case, your Carrier expert has a factory installed combination to meet your application. A wide selection of motors and pulleys (drives) are available, factory installed, to handle nearly any application.

Thru-the-Base Connections

Thru-the-base connections, available as either an accessory or as a factory option, are necessary to ensure proper connection and seal when routing wire and piping through the rooftop's basepan and curb. These couplings eliminate roof penetration and should be considered for gas lines, main power lines, as well as control power.

Supply Duct Cover

This supply duct cover is required when field converting the factory standard vertical duct supply to horizontal duct supply configuration. One required per unit (16 size only).

California OSHPD Seismic Certification

Label

Units meet the seismic requirements of the International Code Council Evaluation Service (ICC-ES) document AC156 (Acceptance Criteria for Seismic Qualification by Shake-Table Testing of Nonstructural Components and Systems) and per International Building Code (IBC 2009) at an SDS (g) value of 2.00 $z/h=1.0$, $I_p=1.5$ and certified by independent structural engineers. A certification label is applied to the unit that meets the CA OSHPD Special Seismic Certification pre-approval labeling requirements on the external chassis of the unit.

Table 2 – AHRI COOLING RATING TABLE

UNIT	COOLING STAGES	NOM. CAPACITY (TONS)	NET COOLING CAPACITY (MBH)	TOTAL POWER (KW)	SEER	EER	IEER WITH SINGLE SPEED INDOOR MOTOR	IEER WITH 2-SPEED INDOOR MOTOR
A04	1	3	34.6	3.1	13.0	11.00	N/A	N/A
A05	1	4	45.0	4.0	13.0	11.00	N/A	N/A
A06	1	5	59.0	5.5	13.0	10.75	N/A	N/A
A07	1	6	70.0	6.4	N/A	11.00	11.2	N/A
A08	1	7.5	88.0	8.0	N/A	11.00	11.2	N/A
D08	2	7.5	83.0	7.5	N/A	11.00	11.7	12.8
A09	1	8.5	97.0	8.8	N/A	11.00	11.2	N/A
D09	2	8.5	99.0	9.0	N/A	11.00	11.7	12.8
A12	1	10	117.0	10.6	N/A	11.00	11.2	N/A
D12	2	10	114.0	10.3	N/A	11.10	11.8	12.8
D14	2	12.5	140.0	12.9	N/A	10.80	11.0	11.8
D16	2	15	174.0	16.1	N/A	10.80	11.7	12.4

LEGEND

- AHRI – Air Conditioning, Heating and Refrigeration Institute Test Standard
- ASHRAE – American Society of Heating, Refrigerating and Air Conditioning, Inc.
- EER – Energy Efficiency Ratio
- IEER – Integrated Energy Efficiency Ratio
- N/A – Not Applicable
- SEER – Seasonal Energy Efficiency Ratio

NOTES:

1. Rated in accordance with AHRI Standard 210/240 or 340/360, as appropriate.
2. Ratings are based on:
Cooling Standard: 80°F (27°C) db, 67°F (19°C) wb indoor air temp and 95°F (35°C) db outdoor air temp.
IEER Standard: A measure that expresses cooling part-load EER efficiency for commercial unitary air conditioning and heat pump equipment on the basis of weighted operation at various load capacities.
3. All 48TC units comply with ASHRAE 90.1 Energy Standard for minimum SEER and EER requirements.
4. 48TC units comply with US Energy Policy Act (2005). To evaluate code compliance requirements, refer to state and local codes.



Use of the AHRI Certified TM Mark indicates a manufacturer's participation in the program. For verification of certification for individual products, go to www.ahridirectory.org.

Table 3 – HEATING RATING TABLE - NATURAL GAS & PROPANE

UNITS		GAS HEAT	AL/SS HEAT EXCHANGER		TEMP RISE (DEG F)	THERMAL EFFICIENCY (%)	AFUE (%)
			INPUT / OUTPUT STAGE 1 (MBH)	INPUT / OUTPUT STAGE 2 (MBH)			
Single Phase	04	LOW	–	72 / 56	25 – 55	82%	79.1%
		MED	–	115 / 89	55 – 85	80%	78.5%
		HIGH	–	–	–	–	–
	05	LOW	–	72 / 56	25 – 55	82%	79.1%
		MED	–	115 / 90	35 – 65	81%	79%
		HIGH	–	150 / 117	50 – 80	80%	78.8%
	06	LOW	–	72 / 56	20 – 55	82%	79.1%
		MED	–	115 / 90	30 – 65	81%	79%
		HIGH	–	150 / 117	40 – 80	80%	78.8%
Three Phase	04	LOW	–	72 / 56	25 – 55	82%	N/A
		MED	82 / 66	115 / 89	55 – 85	80%	N/A
		HIGH	–	–	–	–	–
	05	LOW	–	72 / 56	25 – 55	82%	N/A
		MED	–	115 / 90	35 – 65	81%	N/A
		HIGH	120 / 96	150 / 117	50 – 80	80%	N/A
	06	LOW	–	72 / 56	20 – 55	82%	N/A
		MED	–	115 / 90	30 – 65	81%	N/A
		HIGH	120 / 96	150 / 117	40 – 80	80%	N/A
	07	LOW	–	72 / 59	15 – 55	82%	N/A
		MED	–	115 / 93	25 – 65	81%	N/A
		HIGH	120 / 96	150 / 120	35 – 80	80%	N/A
	08	LOW	–	125 / 103	20 – 50	82%	N/A
		MED	120 / 98	180 / 148	35 – 65	82%	N/A
		HIGH	180 / 147	224 / 184	45 – 75	82%	N/A
	09	LOW	–	125 / 103	20 – 50	82%	N/A
		MED	120 / 98	180 / 148	30 – 65	82%	N/A
		HIGH	180 / 147	224 / 184	40 – 75	82%	N/A
	12	LOW	120 / 98	180 / 148	25 – 65	82%	N/A
		MED	180 / 147	224 / 184	30 – 65	82%	N/A
		HIGH	200 / 160	250 / 205	35 – 70	80%	N/A
	14	LOW	120 / 98	180 / 148	20 – 65	82%	N/A
		MED	180 / 147	224 / 184	25 – 65	82%	N/A
		HIGH	200 / 160	250 / 205	25 – 70	80%	N/A
	16	LOW	144 / 118	180 / 146	15 – 55	81%	N/A
		MED	192 / 156	240 / 195	20 – 60	81%	N/A
		HIGH	280 / 224	350 / 280	35 – 65	80%	N/A

NOTES:

Heat ratings are for natural gas heat exchangers operated at or below 2000 ft (610 m). For information on propane or altitudes above 2000 ft (610 m), see the Application Data section of this book. Accessory Propane/High Altitude kits are also available.

In the USA the input rating for altitudes above 2000 ft (610m) must be derated by 4% for each 1000 ft (305 m) above sea level. In Canada, the input rating must be derated by 10% for altitudes of 2000 ft (610 m) to 4500 ft (1372 m) above sea level.

Table 4 – HEATING RATING TABLE - LOW NO_x¹

UNIT		GAS HEAT	LOW NO _x HEAT EXCHANGER		TEMP RISE (DEG F)	THERMAL EFFICIENCY (%)	AFUE (%)
			INPUT / OUTPUT STAGE 1 (MBH)	INPUT / OUTPUT STAGE 2 (MBH)			
Single Phase	04	LOW	—	60 / 47	20 – 50	81%	80.6%
		MED	—	90 / 72	30 – 60	81%	80.6%
		HIGH	—	—	—	—	—
	05	LOW	—	60 / 47	20 – 50	81%	80.6%
		MED	—	90 / 72	30 – 60	81%	80.6%
		HIGH	—	120 / 97	40 – 70	81%	81.5%
	06	LOW	—	60 / 47	15 – 50	81%	80.6%
		MED	—	90 / 72	25 – 60	80%	80.6%
		HIGH	—	120 / 97	35 – 70	80%	81.5%
Three Phase	04	LOW	—	60 / 47	20 – 50	81%	N/A
		MED	—	90 / 72	30 – 60	81%	N/A
		HIGH	—	—	—	—	—
	05	LOW	—	60 / 47	20 – 50	81%	N/A
		MED	—	90 / 72	30 – 60	81%	N/A
		HIGH	—	120 / 97	40 – 70	81%	N/A
	06	LOW	—	60 / 47	15 – 50	81%	N/A
		MED	—	90 / 72	25 – 60	80%	N/A
		HIGH	—	120 / 97	35 – 70	80%	N/A

NOTE:

- Units meet California's South Coast Air Quality Management District (SCAQMD) Low-NO_x emissions requirement of 40 nanograms per joule or less.
- Not Applicable

Table 5 – SOUND PERFORMANCE TABLE

UNIT	COOLING STAGES	OUTDOOR SOUND (DB) @60HZ								
		A-WEIGHTED	63	125	250	500	1000	2000	4000	8000
A04	1	80	90.6	80.9	80.2	76	74.6	71.3	68.5	63.9
A05	1	81	90.9	84.6	79.5	77.9	76.5	71.1	66.9	62.5
A06	1	78	84.0	82.2	76.3	74.8	72.5	68.8	65.6	61.8
A07	1	78	88.8	81.8	76.9	74.4	73.3	69.8	66.3	62.7
A08	1	82	90.1	82.6	81.0	79.4	77.0	73.0	70.4	66.7
D08	2	82	85.8	84.3	80.5	78.7	76.4	72.7	68.3	65.1
A09	1	83	91.2	86.4	81.9	81.0	78.3	73.9	71.4	67.3
D09	2	82	88.6	85.0	81.6	79.5	77.4	74.1	71.0	66.3
A12	1	82	88.6	85.0	81.6	79.5	77.4	74.1	71.0	66.3
D12	2	82	89.0	83.1	80.5	78.5	75.5	71.6	69.6	69.3
D14	2	87	87.0	85.2	84.6	84.9	82.2	78.4	75.3	72.9
D16	2	87	87.0	85.2	84.6	84.9	82.2	78.4	75.3	72.9

LEGEND

dB – Decibel



NOTES:

- Outdoor sound data is measure in accordance with AHRI standard 270–2008.
- Measurements are expressed in terms of sound power. Do not compare these values to sound pressure values because sound pressure depends on specific environmental factors which normally do not match individual applications. Sound power values are independent of the environment and therefore more accurate.
- A-weighted sound ratings filter out very high and very low frequencies, to better approximate the response of "average" human ear. A-weighted measurements for Carrier units are taken in accordance with AHRI standard 270–2008.

Table 6 – MINIMUM - MAXIMUM AIRFLOW RATINGS - NATURAL GAS & PROPANE

UNIT	HEAT LEVEL	COOLING		AL HX HEATING		SS HX HEATING	
		MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM
48TC**04	LOW	900	1500	990	2190	990	2190
	MED			1000	1550	1000	1550
	HIGH						
48TC**05	LOW	1200	2000	990	2190	990	2190
	MED			1330	2460	1330	2460
	HIGH			1390	2220	1390	2220
48TC**06	LOW	1500	2500	990	2730	990	2730
	MED			1330	2880	1330	2880
	HIGH			1390	2780	1390	2780
48TC**07	LOW	1800	3000	990	3640	990	3640
	MED			1330	3450	1330	3450
	HIGH			1390	3170	1390	3170
48TC**08	LOW	2250	3750	1900	4750	1900	4750
	MED			2100	3900	2100	3900
	HIGH			2270	3780	2270	3780
48TC**09	LOW	2550	4250	1900	4750	1900	4750
	MED			2100	4560	2100	4560
	HIGH			2270	4250	2270	4250
48TC**12	LOW	3000	5000	2100	5470	2100	5470
	MED			2620	5670	2620	5670
	HIGH			2650	5290	2650	5290
48TC**14	LOW	3600	6000	2100	6830	2100	6830
	MED			2620	6800	2620	6800
	HIGH			2650	7410	2650	7410
48TC**16	LOW	4500	7500	2450	7500	2450	9000
	MED			3000	6750	3000	9000
	HIGH			3990	7200	3990	7410

Table 7 – PHYSICAL DATA

(COOLING)

3 - 6 TONS

Refrigeration System		48TC*A04	48TC*A05	48TC*A06	48TC*A07
# Circuits / # Comp. / Type		1 / 1 / Scroll	1 / 1 / Scroll	1 / 1 / Scroll	1 / 1 / Scroll
Puron® refrig. (R-410A) (lbs-oz)		5-10	8-8	10-11	14-2
Humidi-MiZer Puron® refrig. charge A/B (lbs - oz)		8-11	14-13	16-0	22-5
Metering Device		Acutrol	Acutrol	Acutrol	Acutrol
High-press. Trip / Reset (psig)		630 / 505	630 / 505	630 / 505	630 / 505
Low-press. Trip / Reset (psig)		54 / 117	54 / 117	54 / 117	54 / 117
Compressor Capacity Staging (%)		100%	100%	100%	100%
Evap. Coil					
Material (Tube/Fin)		Cu / Al	Cu / Al	Cu / Al	Cu / Al
Coil type		3/8-in RTPF	3/8-in RTPF	3/8-in RTPF	3/8-in RTPF
Rows / FPI		2 / 15	2 / 15	4 / 15	4 / 15
Total Face Area (ft²)		5.5	5.5	5.5	7.3
Condensate Drain Conn. Size		3/4-in	3/4-in	3/4-in	3/4-in
Evap. Fan and Motor					
Standard Static 1 phase	Motor Qty / Drive Type	1 / Belt	1 / Belt	1 / Belt	—
	Max BHP	1.2	1.2	1.2	—
	RPM Range	560-854	560-854	770-1175	—
	Motor Frame Size	48	48	48	—
	Fan Qty / Type	1 / Centrifugal	1 / Centrifugal	1 / Centrifugal	—
	Fan Diameter (in)	10 x 10	10 x 10	10 x 10	—
Medium Static 1 phase	Motor Qty / Drive Type	1 / Belt	1 / Belt	1 / Belt	—
	Max BHP	1.2	1.2	1.5	—
	RPM Range	770-1175	770-1175	1035-1466	—
	Motor Frame Size	48	48	56	—
	Fan Qty / Type	1 / Centrifugal	1 / Centrifugal	1 / Centrifugal	—
	Fan Diameter (in)	10 x 10	10 x 10	10 x 10	—
Standard Static 3 phase	Motor Qty / Drive Type	1 / Belt	1 / Belt	1 / Belt	1 / Belt
	Max BHP	1.7	1.7	1.7	2.4
	RPM Range	560-854	560-854	770-1175	1073-1457
	Motor Frame Size	48	48	48	56
	Fan Qty / Type	1 / Centrifugal	1 / Centrifugal	1 / Centrifugal	1 / Centrifugal
	Fan Diameter (in)	10 x 10	10 x 10	10 x 10	10 x 10
Medium Static 3 phase	Motor Qty / Drive Type	1 / Belt	1 / Belt	1 / Belt	1 / Belt
	Max BHP	1.7	1.7	2.4	2.9*
	RPM Range	770-1175	770-1175	1035-1466	1173-1518
	Motor Frame Size	48	48	56	56
	Fan Qty / Type	1 / Centrifugal	1 / Centrifugal	1 / Centrifugal	1 / Centrifugal
	Fan Diameter (in)	10 x 10	10 x 10	10 x 10	10 x 10
High Static 3 phase	Motor Qty / Drive Type	1 / Belt	1 / Belt	1 / Belt	1 / Belt
	Max BHP	2.4	2.4	2.9	3.7
	RPM Range	1035-1466	1035-1466	1303-1687	1474-1788
	Motor Frame Size	56	56	56	56
	Fan Qty / Type	1 / Centrifugal	1 / Centrifugal	1 / Centrifugal	1 / Centrifugal
	Fan Diameter (in)	10 x 10	10 x 10	10 x 10	10 x 10
Cond. Coil					
Material (Tube/Fin)		Cu / Al	Cu / Al	Cu / Al	Cu / Al
Coil type		3/8-in RTPF	3/8-in RTPF	3/8-in RTPF	3/8-in RTPF
Rows / FPI		1 / 17	2 / 17	2 / 17	2 / 17
Total Face Area (ft²)		14.6	16.5	16.5	21.3
Humidi-MiZer Coil					
Material (Tube/Fin)		Cu / Al	Cu / Al	Cu / Al	Cu / Al
Rows..Fins/in.		1 / 17	2 / 17	2 / 17	2 / 17
Total Face Area (ft²)		3.9	3.9	3.9	5.2
Cond. fan / motor					
Qty / Motor Drive Type		1/ Direct	1/ Direct	1/ Direct	1/ Direct
Motor HP / RPM		1/4 / 1100	1/4 / 1100	1/4 / 1100	1/4 / 1100
Fan diameter (in)		22	22	22	22
Filters					
RA Filter # / Size (in)		2 / 16 x 25 x 2	2 / 16 x 25 x 2	2 / 16 x 25 x 2	4 / 16 x 16 x 2
OA inlet screen # / Size (in)		1 / 20 x 24 x 1	1 / 20 x 24 x 1	1 / 20 x 24 x 1	1 / 20 x 24 x 1

NOTE: Humidi-MiZer is not available with Novation condenser coil models, only Round Tube / Plate Fin (RTPF).

* 575V motor utilizes 3.7 BHP.

— Not applicable

Table 8 – PHYSICAL DATA

(HEATING)

3 - 6 TONS

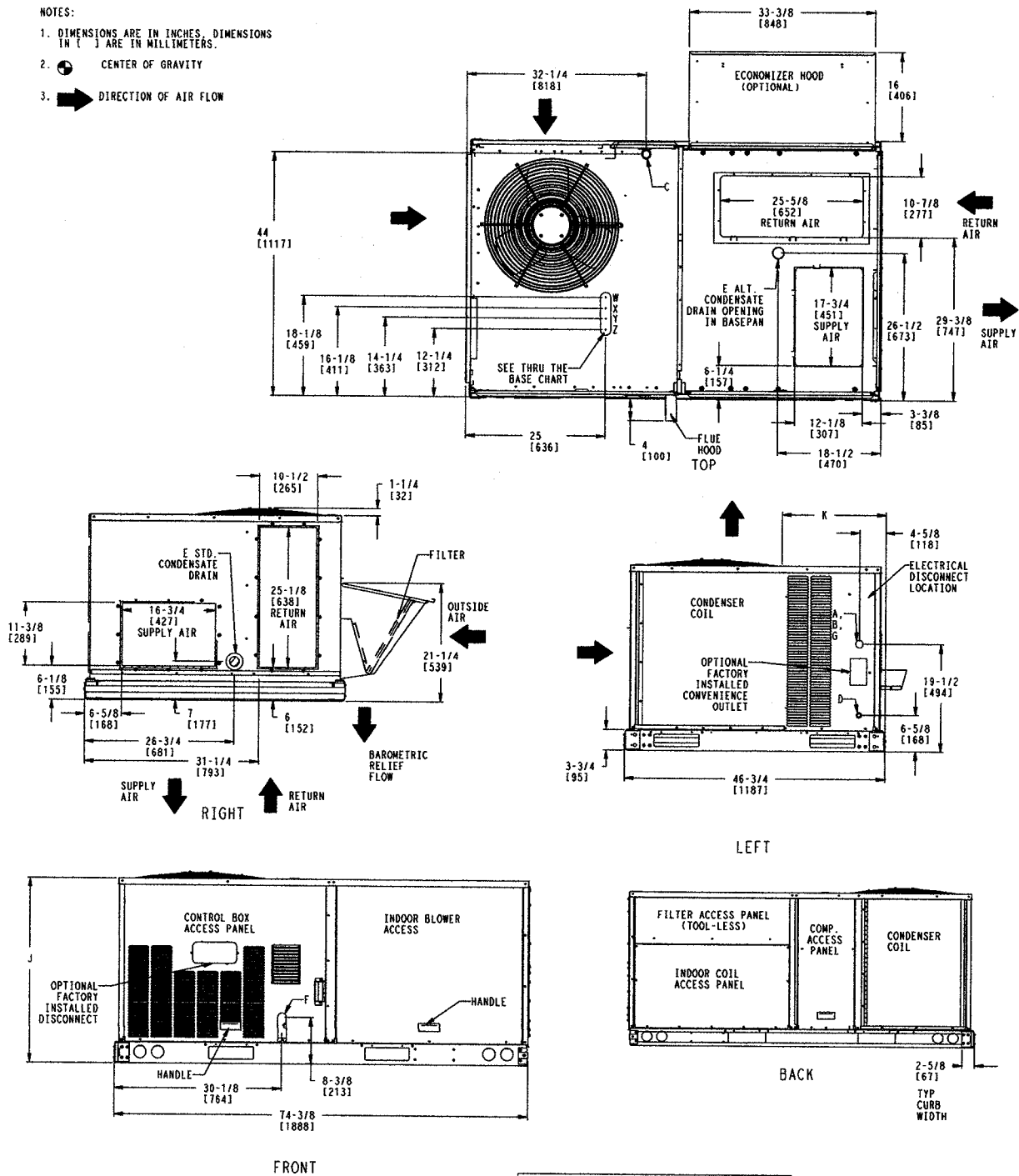
		48TC**04	48TC**05	48TC**06	48TC**07
Gas Connection					
	# of Gas Valves	1	1	1	1
	Nat. gas supply line press (in. w.g.) / (PSIG)	4 – 13 / 0.18 – 0.47	4 – 13 / 0.18 – 0.47	4 – 13 / 0.18 – 0.47	4 – 13 / 0.18 – 0.47
	LP supply line press (in. w.g.) / (PSIG)	11 – 13 / 0.40 – 0.47	11 – 13 / 0.40 – 0.47	11 – 13 / 0.40 – 0.47	11 – 13 / 0.40 – 0.47
Heat Anticipator setting (Amps)					
	1st stage	0.14	0.14	0.14	0.14
	2nd stage	0.14	0.14	0.14	0.14
Natural Gas Heat					
LOW	# of stages / # of burners (total)	1 / 2	1 / 2	1 / 2	1 / 2
	Connection Size	1/2-in NPT	1/2-in NPT	1/2-in NPT	1/2-in NPT
	Rollout switch opens / closes	195 / 115	195 / 115	195 / 115	195 / 115
	Temperature Rise	25 – 55	25 – 55	20 – 55	15 – 55
MED	# of stages / # of burners (total)	1 or 2 / 3	1 / 3	1 / 3	1 / 3
	Connection Size	1/2-in NPT	1/2-in NPT	1/2-in NPT	1/2-in NPT
	Rollout switch opens / closes	195 / 115	195 / 115	195 / 115	195 / 115
	Temperature Rise	55 – 85	35 – 65	30 – 65	25 – 65
HIGH	# of stages / # of burners (total)	–	1 or 2 / 3	1 or 2 / 3	2 / 3
	Connection Size	–	1/2-in NPT	1/2-in NPT	1/2-in NPT
	Rollout switch opens / closes	–	195 / 115	195 / 115	195 / 115
	Temperature Rise	–	50 – 80	40 – 80	35 – 80
Liquid Propane Heat					
LOW	# of stages / # of burners (total)	1 / 2	1 / 2	1 / 2	1 / 2
	Connection Size	1/2-in NPT	1/2-in NPT	1/2-in NPT	1/2-in NPT
	Rollout switch opens / closes	195 / 115	195 / 115	195 / 115	195 / 115
	Temperature Rise	25 – 55	25 – 55	20 – 55	15 – 55
MED	# of stages / # of burners (total)	1 or 2 / 3	1 / 3	1 / 3	1 / 3
	Connection Size	1/2-in NPT	1/2-in NPT	1/2-in NPT	1/2-in NPT
	Rollout switch opens / closes	195 / 115	195 / 115	195 / 115	195 / 115
	Temperature Rise	55 – 85	35 – 65	30 – 65	25 – 65
HIGH	# of stages / # of burners (total)	–	1 or 2 / 3	1 or 2 / 3	2 / 3
	Connection Size	–	1/2-in NPT	1/2-in NPT	1/2-in NPT
	Rollout switch opens / closes	–	195 / 115	195 / 115	195 / 115
	Temperature Rise	–	50 – 80	40 – 80	35 – 80
Low NOx Gas Heat					
LOW	# of stages / # of burners (total)	1 / 2	1 / 2	1 / 2	–
	Connection Size	1/2-in NPT	1/2-in NPT	1/2-in NPT	–
	Rollout switch opens / closes	195 / 115	195 / 115	195 / 115	–
	Temperature Rise	20 – 50	20 – 50	15 – 50	–
MED	# of stages / # of burners (total)	1 / 3	1 / 3	1 / 3	–
	Connection Size	1/2-in NPT	1/2-in NPT	1/2-in NPT	–
	Rollout switch opens / closes	195 / 115	195 / 115	195 / 115	–
	Temperature Rise	30 – 60	30 – 60	25 – 60	–
HIGH	# of stages / # of burners (total)	–	1 / 3	1 / 3	–
	Connection Size	–	1/2-in NPT	1/2-in NPT	–
	Rollout switch opens / closes	–	195 / 115	195 / 115	–
	Temperature Rise	–	40 – 70	35 – 70	–

– Not applicable

CURBS, WEIGHTS & DIMENSIONS

NOTES:

1. DIMENSIONS ARE IN INCHES, DIMENSIONS IN () ARE IN MILLIMETERS.
2.  CENTER OF GRAVITY
3.  DIRECTION OF AIR FLOW



CONNECTION SIZES	
A	1 3/8" [35] DIA. FIELD POWER SUPPLY HOLE
B	2" [50] DIA. POWER SUPPLY KNOCKOUT
C	1 3/4" [51] DIA. GAUGE ACCESS PLUG
D	7/8" [22] DIA. FIELD CONTROL WIRING HOLE
E	3/4" -14 NPT CONDENSATE DRAIN
F	1/2" -14 NPT GAS CONNECTION
G	2 1/2" [64] DIA. POWER SUPPLY KNOCK-OUT

THRU-THE-BASE CHART THESE HOLES REQUIRED FOR USE CRBTMPW001A01, 003A01			
	THREADED CONDUIT SIZE	WIRE USE	REQ'D HOLE SIZES (MAX.)
W	1/2"	ACC.	7/8" [22.2]
X	1/2"	24V	7/8" [22.2]
Y *	3/4" (001, 003)	POWER	1 1/8" [28.4]
Z **	(003) 1/2" FPT	GAS	1 3/16" [30.0]
FOR "THRU-THE-BASEPAN" FACTORY OPTION, FITTINGS FOR ONLY X, Y, & Z ARE PROVIDED			
SELECT EITHER 3/4" OR 1/2" FOR POWER, DEPENDING ON WIRE SIZE			
** (001) PROVIDES 3/4" FPT THRU CURB FLANGE & FITTING.			

UNIT	J	K
48TC-A04	33 3/8 [841]	18 5/8 [472]
48TC-A05	33 3/8 [841]	14 7/8 [377]
48TC-A06	33 3/8 [841]	14 7/8 [377]
48TC-A07	41 3/8 [1051]	14 7/8 [377]

Fig. 1 - Dimensions 48TC 04-07

A10484

CURBS, WEIGHTS & DIMENSIONS (cont.)

UNIT	STD. UNIT WEIGHT		CORNER WEIGHT (A)		CORNER WEIGHT (B)		CORNER WEIGHT (C)		CORNER WEIGHT (D)		C.G.		HEIGHT
	LBS.	KG.	LBS.	KG.	LBS.	KG.	LBS.	KG.	LBS.	KG.	X	Y	
48TC-A04	483	219	111	50	125	57	131	59	116	53	39 [991]	23 [584]	16 3/8 [416]
48TC-A05	537	244	124	56	139	63	145	66	129	59	39 [991]	23 [584]	17 [432]
48TC-A06	569	258	131	59	147	67	154	70	137	62	39 [991]	23 [584]	17 1/4 [438]
48TC-A07	652	296	150	68	169	76	176	80	157	71	39 [991]	23 [584]	20 1/8 [511]

*STANDARD UNIT WEIGHT IS WITH LOW HEAT & WITHOUT PACKAGING.
FOR OPTIONS & ACCESSORIES, REFER TO THE PRODUCT DATA CATALOG.

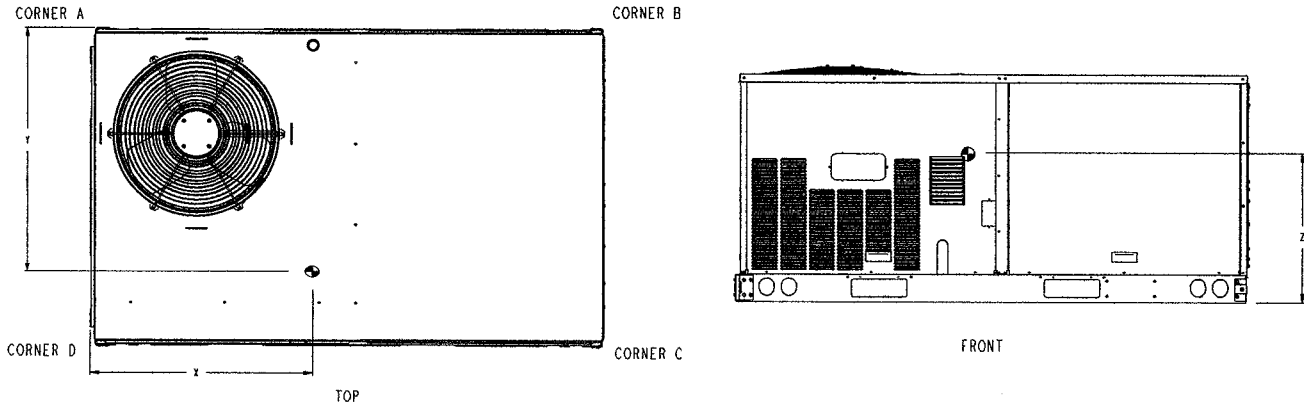


Fig. 2 - Dimensions 48TC 04-07

A10485A

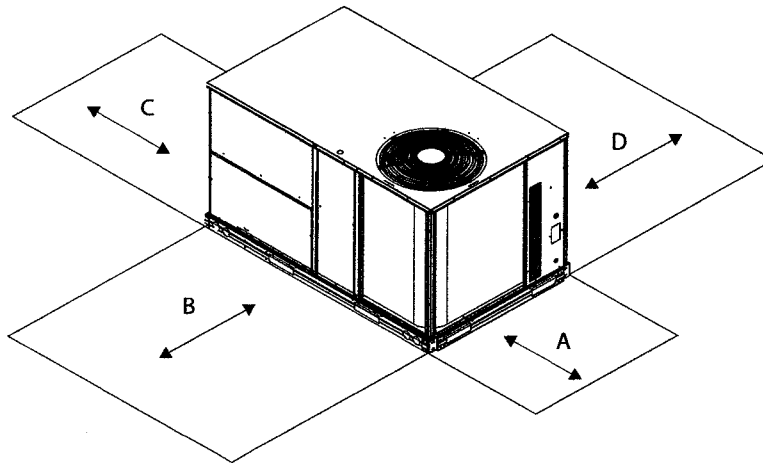


Fig. 3 - Service Clearance

C08337

LOC	DIMENSION	CONDITION
A	48-in (1219 mm)	Unit disconnect is mounted on panel
	18-in (457 mm)	No disconnect, convenience outlet option
	18-in (457 mm)	Recommended service clearance
	12-in (305 mm)	Minimum clearance
B	42-in (1067 mm)	Surface behind servicer is grounded (e.g., metal, masonry wall)
	36-in (914 mm)	Surface behind servicer is electrically non-conductive (e.g., wood, fiberglass)
	Special	Check for sources of flue products within 10-ft of unit fresh air intake hood
C	36-in (914 mm)	Side condensate drain is used
	18-in (457 mm)	Minimum clearance
D	48-in (1219 mm)	No flue discharge accessory installed, surface is combustible material
	42-in (1067 mm)	Surface behind servicer is grounded (e.g., metal, masonry wall, another unit)
	36-in (914 mm)	Surface behind servicer is electrically non-conductive (e.g., wood, fiberglass)
	Special	Check for adjacent units or building fresh air intakes within 10-ft of this unit's flue outlet

NOTE: Unit not designed to have overhead obstruction. Contact Application Engineering for guidance on any application planning overhead obstruction or vertical clearances.

APPLICATION DATA

Min operating ambient temp (cooling):

In mechanical cooling mode, your Carrier rooftop unit can safely operate down to an outdoor ambient temperature of 40°F (4°C) and 25°F (-4°C), with an accessory winter start kit. It is possible to provide cooling at lower outdoor ambient temperatures by using less outside air, economizers, and/or accessory low ambient kits.

Max operating ambient temp (cooling):

The maximum operating ambient temperature for cooling mode is 115°F (46°C). While cooling operation above 115°F (46°C) may be possible, it could cause either a reduction in performance, reliability, or a protective action by the unit's internal safety devices.

Min mixed air temp (heating):

Using the factory settings, the minimum temperatures for the mixed air (the combined temperature of the warm return air and the cold outdoor air) entering the dimpled, gas heat exchangers are:

<u>Aluminized</u>	<u>Stainless Steel</u>
50°F (10°C) continuous	40°F (4°C) continuous
45°F (7°C) intermittent	35°F (2°C) intermittent

Operating at lower mixed-air temperatures may be possible, if a field supplied, outdoor air thermostat initiates both heat stages when the temperature is less than the minimum temperatures listed above. Please contact your local Carrier representative for assistance.

Min and max airflow (heating and cooling):

To maintain safe and reliable operation of your rooftop, operate within the heating airflow limits during heating mode and cooling airflow limits during cooling mode. Operating above the max may cause blow-off, undesired airflow noise, or airflow related problems with the rooftop unit. Operating below the min may cause problems with coil freeze-up and unsafe heating operation. Heating and cooling limitations differ when evaluating operating cfm, the minimum value is the HIGHER of the cooling and heating minimum cfm values published in Table 6 and the maximum value is the LOWER of the cooling and heating maximum values published in Table 6.

Heating-to-cooling changeover:

Your unit will automatically change from heating to cooling mode when using a thermostat with an auto-changeover feature.

Airflow:

All units are draw-through in cooling mode and blow-through in heating mode.

Outdoor air application strategies:

Economizers reduce operating expenses and compressor run time by providing a free source of cooling and a means of ventilation to match application changing needs. In fact, they should be considered for most applications. Also, consider the various economizer control methods and their benefits, as well as sensors required to accomplish your application goals. Please contact your local Carrier representative for assistance.

Motor limits, Brake horsepower (BHP):

Due to internal design of Carrier units, the air path, and specially designed motors, the full horsepower (maximum continuous BHP) band, as listed in Table 8 and 10, can be used with the utmost confidence. There is no need for extra safety factors, as Carrier motors are designed and rigorously tested to use the entire, listed BHP range without either nuisance tripping or premature motor failure.

Propane heating:

Propane has different physical qualities than natural gas. As a result, propane requires different fuel to air mixture. To optimize the fuel/air mixture for propane, Carrier sells different burner orifices in an easy to install accessory kit. To select the correct burner orifices or determine the heat capacity for a propane application, use either the selection software, or the unit's service manual.

High altitude heating:

High altitudes have less oxygen, which affects the fuel/air mixture in heat exchangers. In order to maintain a proper fuel/air mixture, heat exchangers operating in altitudes above 2000 ft (610 m) require different orifices. To select the correct burner orifices or determine the heat capacity for a high altitude application, use either the selection software, or the unit's service manual.

High altitudes have less oxygen, which means heat exchangers need less fuel. The new gas orifices in this field installed kit make the necessary adjustment for high altitude applications. They restore the optimal fuel to air mixture and maintain healthy combustion on altitudes above 2000 ft (610 m).

NOTE: Typical natural gas heating value ranges from 975 to 1050 Btu/ft³ at sea level nationally. The heating value goes down approximately 1.7% per every thousand feet elevation. Standard factory orifices can typically be used up to 2000 ft (610m) elevation without any operational issues.

NOTE: For installations in Canada, the input rating should be derated by 10% for altitudes from 2000 ft (610m) to 4500 ft (1372m) above sea level.

APPLICATION DATA (cont.)

Sizing a rooftop

Bigger isn't necessarily better. While an air conditioner needs to have enough capacity to meet the design loads, it doesn't need excess capacity. In fact, excess capacity typically results in very poor part load performance and humidity control.

Using higher design temperatures than ASHRAE recommends for your location, adding "safety factors" to the calculated load, are all signs of oversizing air conditioners. Oversizing the air conditioner leads to poor humidity control, reduced efficiency, higher utility bills, larger indoor temperature swings, excessive noise, and increased wear and tear on the air conditioner.

Rather than oversizing an air conditioner, engineers should "right size" or even slightly undersize air conditioners. Correctly sizing an air conditioner controls humidity better; promotes efficiency; reduces utility bills; extends equipment life, and maintains even, comfortable temperatures. Please contact your local Carrier representative for assistance.

Low ambient applications

The optional Carrier economizer can adequately cool your space by bringing in fresh, cool outside air. In fact, when so equipped, accessory low ambient kit may not be necessary. In low ambient conditions, unless the outdoor air is excessively humid or contaminated, economizer based "free cooling" is the preferred less costly and energy conscious method.

In low ambient applications where outside air might not be desired (such as contaminated or excessively humid outdoor environments), your Carrier rooftop can operate at ambient temperatures down to -20°F (-29°C) using the recommended accessory Motormaster low ambient controller.

Staged Air Volume (SAV) with Variable Frequency Drive (VFD)

Carrier's Staged Air Volume (SAV) system utilizes a Variable Frequency Drive (VFD) to automatically adjust the indoor fan motor speed in sequence with the units cooling operation. Per ASHRAE 90.1 2010 standard section 6.4.3.10.b, during the first stage of cooling operation the VFD will adjust the fan motor to provide 2/3rd of the total cfm established for the unit. When a call for the second stage of cooling is required, the VFD will allow the total cfm for the unit established (100%). During the heating mode, the VFD will allow total design cfm (100%) operation and during the ventilation mode the VFD will allow operation to 2/3rd of total cfm.

The VFD used in Carrier's SAV system has soft start capabilities to slowly ramp up the speeds, thus eliminating any high inrush air volume during initial start-up. It also has internal over current protection for the fan motor and a field installed display kit that allows adjustment and in depth diagnostics of the VFD.

This SAV system is available on models with 2-stage cooling operation with electrical mechanical or RTU Open (multi Protocol) controls. Both space sensor and conventional thermostats/controls can be used to provide accurate control in any application.

The SAV system is very flexible for initial fan performance set up and adjustment. The standard factory shipped VFD is pre programmed to automatically stage the fan speed between the first and second stage of cooling. The unit fan performance static pressure and cfm can be easily adjusted using the traditional means of pulley adjustments. The other means to adjust the unit static and cfm performance is to utilize the field installed display module and adjust the frequency and voltage in the VFD to required performance requirements. In either case, once set up the VFD will automatically adjust the speed between the cooling stage operation.

SELECTION PROCEDURE (WITH 48TC*A07 EXAMPLE)¹

I. Determine cooling and heating loads.

Given:

Mixed air dry bulb	80°F (27°C)
Mixed air wet bulb	67°F (19°C)
Ambient dry bulb	95°F (35°C)
TC _{Load}	72.0 MBH
SHC _{Load}	54.0 MBH
Vertical supply air	2100 CFM
Heating load	85.0 MBH
External static pressure	0.67 in. wg
Electrical characteristics	230-3-60

II. Make an initial guess at cooling tons.

Refrig. tons = TC_{Load} / 12 MBH per ton
 Refrig. tons = 72.0 / 12 = 6.0 tons
 In this case, start by looking at the 48TC**07.

III. Look up the rooftop's TC and SHC.

Table 19 shows that, at the application's supply air CFM, mixed air and ambient temperatures, the 48TC*A07 supplies:
 TC = 73.7 MBH²
 SHC = 54.4 MBH²

IV. Calculate the building latent heat load.

LC_{Load} = TC_{Load} - SHC_{Load}
 LC_{Load} = 72.0 MBH - 54.0 MBH = 18.0 MBH

V. Calculate RTU latent heat capacity.

LC = TC - SHC
 LC = 73.7 MBH - 54.4 MBH = 19.3 MBH

VI. Compare RTU capacities to loads.³

Compare the rooftop's SHC and LC to the building's sensible and latent heat loads.

VII. Select factory options (FIOP)

Local code requires an economizer for any unit with TC greater than 65.0 MBH.

VIII. Calculate the total static pressure.

External static pressure	0.67 in. wg
Sum of FIOP / Accessory static	+0.13 in. wg
Total Static Pressure	0.80 in. wg

IX. Look up the indoor fan RPM & BHP.

Table 47 shows, at 2100 CFM & ESP= 0.8, RPM = 1358 & BHP = 1.52

X. Convert BHP (Step VIII) into fan motor heat.

Fan motor heat = 2.546* BHP/Motor Eff.⁴
 Fan motor heat = 4.9 MBH

XI. Calculate RTU heating capacity.

Building heating load	85.0 MBH
Fan motor heat	-4.9 MBH
Required heating capacity	80.1 MBH

XII. Select a gas heater.

Table 3 shows the heating capacities of the 48TCEA07 = 93.0 MBH. Select the 48TCEA07

XIII. Determine electrical requirements.

The MCA and MOCP tables show 48TC*A07 (without convenience outlet) as:
 MCA = 30.5 amps & MOCP = 45.0 amps
 Min. disconnect size: FLA = 30 & LRA = 157.

Legend

BHP	— Brake horsepower
FLA	— Full load amps
LC	— Latent capacity
LRA	— Lock rotor amp
MBH	— (1,000) BTUH
MCA	— Min. circuit ampacity
MOCP	— Max. over-current protection
RPM	— Revolutions per minute
RTU	— Rooftop unit
SHC	— Sensible heat capacity
TC	— Total capacity

NOTES:

1. Selection software by Carrier saves time by performing many of the steps above. Contact your Carrier sales representative for assistance.
2. Unit ratings are gross capacities and do not include the effect of evaporator fan motor heat. See Step X. for determining amount of evaporator fan motor heat to subtract from total and sensible capacities to obtain net cooling and net sensible capacities.
3. Selecting a unit with a SHC slightly lower than the SHC_{Load} is often better than oversizing. Slightly lower SHC's will help control indoor humidity, and prevent temperature swings.
4. Indoor fan motor efficiency is available in the Electrical Information. Use the decimal form in the equation, eg. 80% = .8.

Table 17 – COOLING CAPACITIES

1-STAGE COOLING

5 TONS

48TC*A06 (RTPF)				AMBIENT TEMPERATURE											
				85			95			105			115		
				EAT (db)			EAT (db)			EAT (db)			EAT (db)		
				75	80	85	75	80	85	75	80	85	75	80	85
1500 Cfm	EAT (wb)	58	TC	52.9	52.9	60.0	49.9	49.9	56.6	46.6	46.6	52.9	43.1	43.1	48.9
			SHC	45.8	52.9	60.0	43.2	49.9	56.6	40.4	46.6	52.9	37.3	43.1	48.9
		62	TC	56.2	56.2	57.6	52.2	52.2	55.7	47.8	47.8	53.5	43.2	43.2	51.0
			SHC	41.8	49.7	57.6	39.9	47.8	55.7	37.8	45.6	53.5	35.5	43.2	51.0
		67	TC	62.4	62.4	62.4	58.8	58.8	58.8	54.4	54.4	54.4	49.5	49.5	49.5
			SHC	34.8	42.8	50.7	33.2	41.2	49.1	31.4	39.3	47.3	29.4	37.3	45.3
		72	TC	68.2	68.2	68.2	64.8	64.8	64.8	60.8	60.8	60.8	56.2	56.2	56.2
			SHC	27.2	35.2	43.2	25.9	33.9	41.9	24.4	32.4	40.4	22.6	30.6	38.6
		76	TC	–	71.1	71.1	–	69.0	69.0	–	65.4	65.4	–	60.9	60.9
			SHC	–	28.4	36.6	–	27.6	35.9	–	26.3	34.6	–	24.8	33.0
1750 Cfm	EAT (wb)	58	TC	56.5	56.5	64.0	53.3	53.3	60.4	49.8	49.8	56.5	46.1	46.1	52.3
			SHC	48.9	56.5	64.0	46.1	53.3	60.4	43.1	49.8	56.5	39.9	46.1	52.3
		62	TC	58.5	58.5	63.4	54.4	54.4	61.3	49.9	49.9	58.9	46.1	46.1	54.4
			SHC	45.2	54.3	63.4	43.2	52.2	61.3	41.0	49.9	58.9	37.9	46.1	54.4
		67	TC	64.3	64.3	64.3	60.5	60.5	60.5	56.2	56.2	56.2	51.3	51.3	51.3
			SHC	36.9	46.1	55.2	35.3	44.5	53.7	33.6	42.8	51.9	31.6	40.8	49.9
		72	TC	69.5	69.5	69.5	66.5	66.5	66.5	62.4	62.4	62.4	57.7	57.7	57.7
			SHC	27.8	36.9	45.9	26.7	35.9	45.1	25.2	34.5	43.7	23.5	32.8	42.0
		76	TC	–	72.2	72.2	–	70.1	70.1	–	66.6	66.6	–	–	–
			SHC	–	29.3	38.9	–	28.6	38.2	–	27.4	36.8	–	–	–
2000 Cfm	EAT (wb)	58	TC	59.3	59.3	67.3	56.1	56.1	63.6	52.5	52.5	59.5	48.6	48.6	55.1
			SHC	51.4	59.3	67.3	48.6	56.1	63.6	45.4	52.5	59.5	42.1	48.6	55.1
		62	TC	60.1	60.1	68.5	56.2	56.2	66.3	52.5	52.5	62.0	48.7	48.7	57.4
			SHC	48.1	58.3	68.5	46.2	56.2	66.3	43.1	52.5	62.0	39.9	48.7	57.4
		67	TC	65.7	65.7	65.7	61.9	61.9	61.9	57.5	57.5	57.5	52.6	52.6	54.4
			SHC	38.8	49.1	59.5	37.3	47.7	58.1	35.6	46.0	56.4	33.6	44.0	54.4
		72	TC	70.1	70.1	70.1	67.6	67.6	67.6	63.6	63.6	63.6	58.9	58.9	58.9
			SHC	28.3	38.1	48.0	27.4	37.7	48.0	26.0	36.4	46.7	24.3	34.7	45.2
		76	TC	–	72.9	72.9	–	70.8	70.8	–	67.4	67.4	–	–	–
			SHC	–	30.1	40.7	–	29.3	39.9	–	28.2	38.7	–	–	–
2250 Cfm	EAT (wb)	58	TC	61.5	61.5	69.8	58.4	58.4	66.2	54.8	54.8	62.1	50.8	50.8	57.6
			SHC	53.2	61.5	69.8	50.5	58.4	66.2	47.4	54.8	62.1	43.9	50.8	57.6
		62	TC	61.6	61.6	72.6	58.4	58.4	68.9	54.8	54.8	64.6	50.8	50.8	59.9
			SHC	50.6	61.6	72.6	47.9	58.4	68.9	45.0	54.8	64.6	41.7	50.8	59.9
		67	TC	66.8	66.8	66.8	63.0	63.0	63.0	58.5	58.5	60.6	53.6	53.6	58.6
			SHC	40.5	52.0	63.4	39.1	50.7	62.3	37.4	49.0	60.6	35.5	47.0	58.6
		72	TC	70.8	70.8	70.8	68.5	68.5	68.5	64.5	64.5	64.5	59.8	59.8	59.8
			SHC	28.7	39.5	50.2	28.0	39.3	50.5	26.7	38.1	49.6	25.0	36.6	48.1
		76	TC	–	73.4	73.4	–	71.2	71.2	–	67.9	67.9	–	–	–
			SHC	–	30.7	42.1	–	30.0	41.4	–	28.9	40.4	–	–	–
2500 Cfm	EAT (wb)	58	TC	63.3	63.3	71.8	60.1	60.1	68.2	56.5	56.5	64.1	52.6	52.6	59.6
			SHC	54.8	63.3	71.8	52.1	60.1	68.2	49.0	56.5	64.1	45.5	52.6	59.6
		62	TC	63.4	63.4	74.7	60.2	60.2	71.0	56.6	56.6	66.7	52.6	52.6	62.1
			SHC	52.0	63.4	74.7	49.4	60.2	71.0	46.5	56.6	66.7	43.2	52.6	62.1
		67	TC	67.6	67.6	67.6	63.8	63.8	66.2	59.3	59.3	64.6	54.4	54.4	62.5
			SHC	42.1	54.6	67.1	40.9	53.5	66.2	39.2	51.9	64.6	37.2	49.8	62.5
		72	TC	71.3	71.3	71.3	69.0	69.0	69.0	65.1	65.1	65.1	60.4	60.4	60.4
			SHC	29.1	40.7	52.2	28.5	40.7	52.9	27.3	39.7	52.2	25.7	38.3	50.9
		76	TC	–	73.8	73.8	–	71.4	71.4	–	68.3	68.3	–	–	–
			SHC	–	31.2	43.3	–	30.5	42.6	–	29.6	41.9	–	–	–

LEGEND:

–	– Do not operate
Cfm	– Cubic feet per minute (supply air)
EAT(db)	– Entering air temperature (dry bulb)
EAT(wb)	– Entering air temperature (wet bulb)
SHC	– Sensible heat capacity
TC	– Total capacity

Table 18 – COOLING CAPACITIES

1-STAGE COOLING

5 TONS

48TC06 (5 TONS) – UNIT WITH HUMIDI-MIZER SYSTEM IN SUBCOOLING MODE										
Air Entering Evaporator – CFM										
Temp (F) Air Ent Condenser (Edb)		80 dry bulb 72 wet bulb			80 dry bulb 67 wet bulb			80 dry bulb 62 wet bulb		
		1750	2000	2250	1750	2000	2250	1750	2000	2250
75	TC	73.1	78.7	84.5	63.2	66.9	70.8	53.2	55.1	57.1
	SHC	35.3	37.2	38.8	42.0	43.7	45.3	48.7	50.3	51.8
	kW	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
85	TC	67.6	71.2	75.0	59.1	61.2	63.3	50.6	51.1	51.5
	SHC	27.9	30.0	31.9	36.3	38.3	40.1	44.8	46.6	48.2
	kW	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8
95	TC	62.1	63.8	65.5	55.1	55.4	55.8	48.0	47.0	46.0
	SHC	20.5	22.9	24.9	30.7	32.9	34.8	40.9	42.9	44.7
	kW	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
105	TC	56.6	56.3	56.0	51.0	49.6	48.3	45.4	43.0	40.5
	SHC	13.1	15.7	18.0	25.0	27.5	29.6	36.9	39.2	41.2
	kW	4.8	4.8	4.8	4.8	4.8	4.8	4.7	4.7	4.7
115	TC	51.1	48.8	46.5	46.9	43.9	40.7	42.8	39.0	35.0
	SHC	5.8	8.6	11.0	19.4	22.0	24.4	33.0	35.5	37.7
	kW	5.3	5.3	5.3	5.3	5.3	5.3	5.2	5.2	5.2

48TC06 (5 TONS) – UNIT WITH HUMIDI-MIZER SYSTEM IN HOT GAS REHEAT MODE										
Air Entering Evaporator – CFM										
Temp (F) Air Ent Condenser (Edb)		75 dry bulb 62.5 wet bulb (50% relative)			75 dry bulb 64 wet bulb (55% relative)			75 dry bulb 65.3 wet bulb (60% relative)		
		1750	2000	2250	1750	2000	2250	1750	2000	2250
80	TC	23.0	24.4	25.6	24.7	26.2	27.4	26.3	27.7	29.0
	SHC	5.3	6.1	6.8	3.2	4.0	4.7	1.4	2.2	2.9
	kW	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
75	TC	23.3	24.6	25.7	25.0	26.3	27.5	26.4	27.8	29.0
	SHC	5.1	5.8	6.5	3.1	3.9	4.5	1.4	2.2	2.8
	kW	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
70	TC	23.5	24.8	25.9	25.2	26.4	27.5	26.6	27.9	29.0
	SHC	4.8	5.5	6.2	3.0	3.7	4.3	1.4	2.1	2.8
	kW	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
60	TC	24.1	25.2	26.1	25.6	26.7	27.7	26.9	28.0	29.0
	SHC	4.3	5.0	5.5	2.8	3.4	3.9	1.4	2.0	2.6
	kW	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
50	TC	24.7	25.6	26.4	26.1	27.0	27.8	27.2	28.2	29.0
	SHC	3.8	4.4	4.8	2.5	3.1	3.5	1.4	2.0	2.4
	kW	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
40	TC	25.3	26.0	26.7	26.5	27.3	27.9	27.6	28.3	29.0
	SHC	3.3	3.8	4.2	2.3	2.8	3.1	1.4	1.9	2.3
	kW	3.1	3.1	3.1	3.2	3.2	3.2	3.2	3.2	3.2

LEGEND

Edb – Entering Dry–Bulb
 Ewb – Entering Wet–Bulb
 kW – Compressor Motor Power Input
 ldb – Leaving Dry–Bulb
 lwb – Leaving Wet–Bulb
 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})

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

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

ECONOMIZER, BAROMETRIC RELIEF AND PE PERFORMANCE

Vertical Application

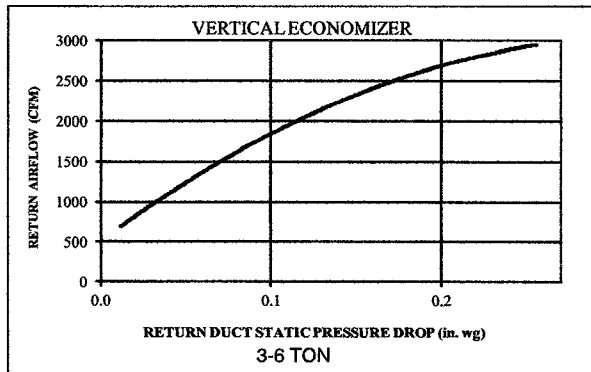


Fig. 16 - Return Air Pressure Drop

C11238

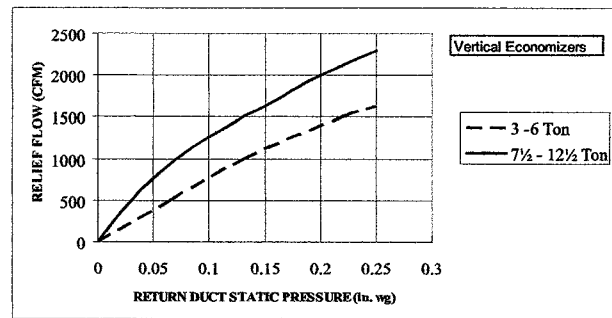


Fig. 19 - Barometric Relief Flow Capacity

C08073

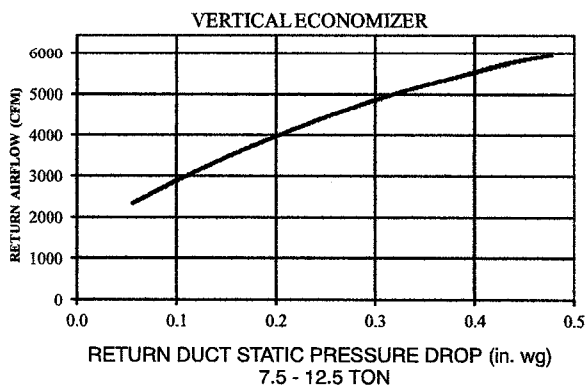


Fig. 17 - Return Air Pressure Drop

C11240

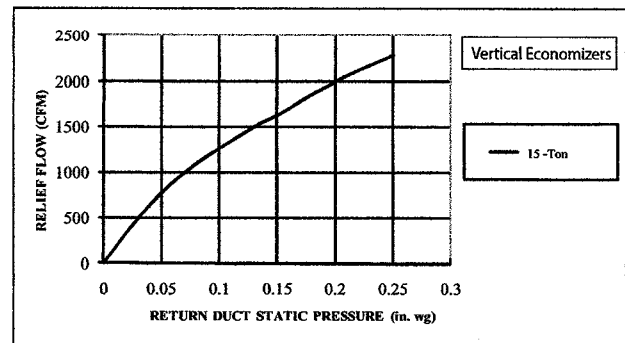


Fig. 20 - Barometric Relief Flow-Vertical 15 Ton

C101122

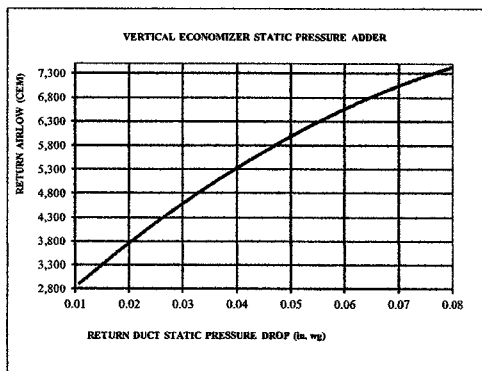


Fig. 18 - Return Air Pressure Drop-Vertical 15 Tons

C11257

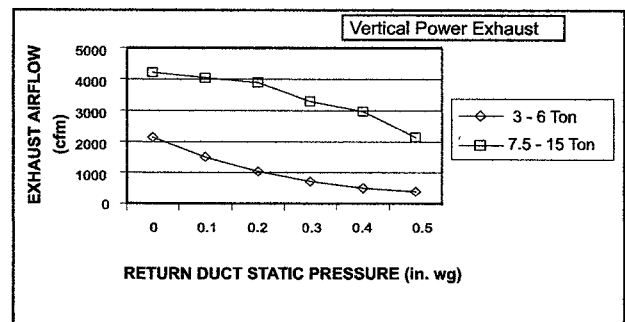


Fig. 21 - Vertical Power Exhaust Performance

C11248

All above data for both standard and ultra low leak models, where available.

ECONOMIZER, BAROMETRIC RELIEF AND PE PERFORMANCE (cont.)

Horizontal Application

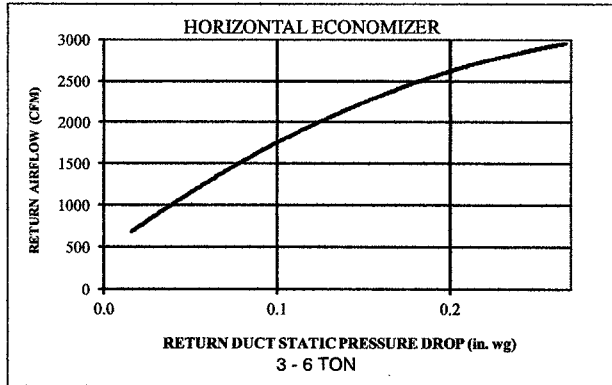


Fig. 22 - Return Air Pressure Drop

C11239

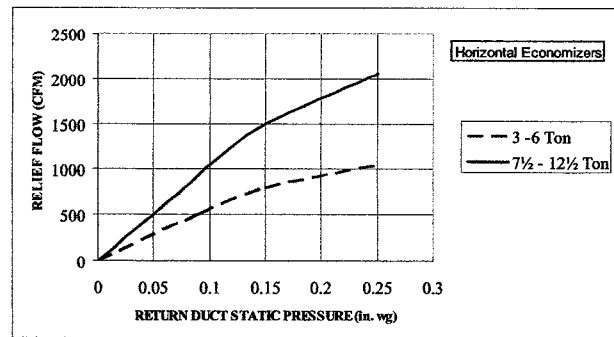


Fig. 25 - Barometric Relief Flow Capacity

C08070

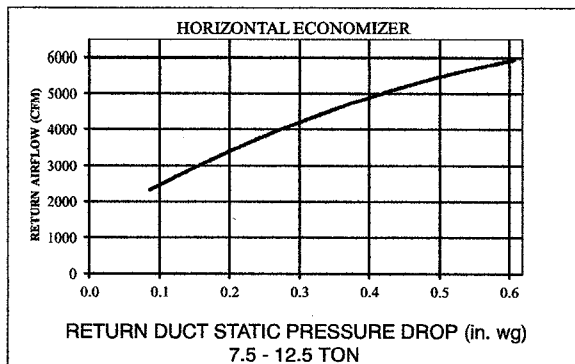


Fig. 23 - Return Air Pressure Drop

C11241

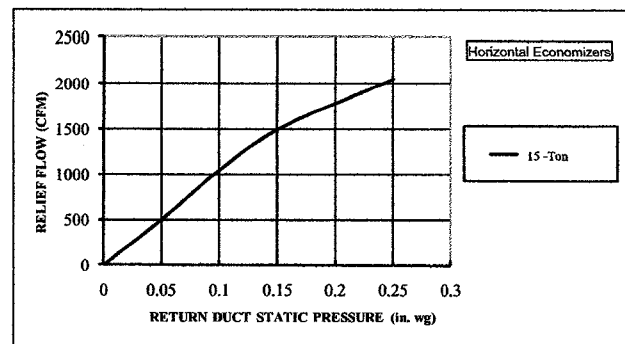


Fig. 26 - Barometric Relief Flow-Horizontal 15 Ton

C101120

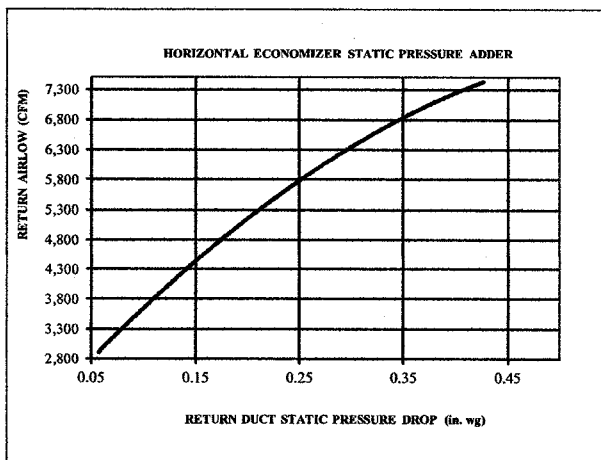


Fig. 24 - Return Air Pressure Drop-Horizontal 15 Ton

C11258

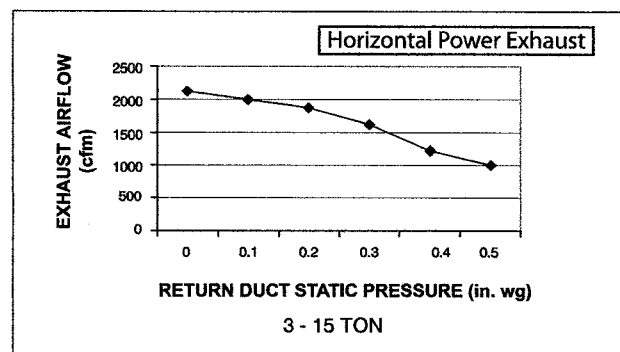


Fig. 27 - Horizontal Power Exhaust Performance

C08012

GENERAL FAN PERFORMANCE NOTES

1. Interpolation is permissible. Do not extrapolate.
2. External static pressure is the static pressure difference between the return duct and the supply duct plus the static pressure caused by any FIOPs or accessories.
3. Tabular data accounts for pressure loss due to clean filters, unit casing, and wet coils. Factory options and accessories may add static pressure losses. Selection software is available, through your salesperson, to help you select the best motor/drive combination for your application.
4. The Fan Performance tables offer motor/drive recommendations. In cases when two motor/drive combinations would work, Carrier recommended the lower horsepower option.
5. For information on the electrical properties of Carrier motors, please see the Electrical information section of this book.
6. For more information on the performance limits of Carrier motors, see the application data section of this book.
7. The EPACT (Energy Policy Act of 1992) regulates energy requirements for specific types of indoor fan motors. Motors regulated by EPACT include any general purpose, T-frame (three-digit, 143 and larger), single-speed, foot mounted, polyphase, squirrel cage induction motors of NEMA (National Electrical Manufacturers Association) design A and B, manufactured for use in the United States. Ranging from 1 to 200 Hp, these continuous-duty motors operate on 230 and 460 volt, 60 Hz power. If a motor does not fit into these specifications, the motor does not have to be replaced by an EPACT compliant energy efficient motor. Variable speed motors are exempt from EPACT compliance requirements. Therefore, the indoor fan motors for Carrier 48TC**04-16 units are exempt from these requirements.

FAN PERFORMANCE (cont.)

Table 45 – 48TC**06

3 PHASE

5 TON HORIZONTAL SUPPLY

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
Standard Static Option										
1500	800	0.39	904	0.49	999	0.60	1087	0.72	1169	0.85
1625	849	0.48	947	0.59	1038	0.70	1122	0.83	1201	0.96
1750	899	0.59	992	0.70	1078	0.82	1159	0.95	1235	1.08
1875	950	0.70	1038	0.82	1120	0.95	1198	1.08	1271	1.22
2000	1001	0.84	1085	0.96	1163	1.09	1238	1.23	1309	1.38
2125	1053	0.99	1133	1.12	1208	1.26	1280	1.40	1348	1.55
2250	1106	1.16	1182	1.29	1254	1.44	1323	1.59	1389	1.74
2375	1159	1.34	1231	1.49	1300	1.64	1367	1.80	1430	1.96
2500	1212	1.55	1281	1.70	1348	1.86	1412	2.02		
Medium Static Option										
1500	1247	0.98	1320	1.13	1390	1.28	1457	1.44		
1625	1276	1.10	1348	1.24	1416	1.40				
1750	1308	1.22	1377	1.38	1444	1.53				
1875	1342	1.37	1409	1.52						
2000	1377	1.53	1442	1.69						
2125	1414	1.71								
2250	1452	1.91								
2375									1719	2.85
2500										
High Static Option										
1500										
1625										
1750										
1875										
2000										
2125										
2250										
2375										
2500										

NOTE: For more information, see General Fan Performance Notes.

Boldface indicates field supplied drive is required.

1. Recommend using field supplied fan pulley (part no. KR11AZ506), motor pulley (part no. KR11HY191) and belt (part no. KR30AE042).

Table 46 – 48TC**06

3 PHASE

5 TON VERTICAL SUPPLY

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
Standard Static Option										
1500	848	0.42	968	0.55	1069	0.68	1158	0.80	1238	0.94
1625	897	0.51	1013	0.65	1111	0.79	1198	0.93	1277	1.07
1750	947	0.61	1059	0.76	1155	0.91	1240	1.06	1318	1.21
1875	997	0.72	1105	0.89	1199	1.05	1283	1.21	1359	1.37
2000	1048	0.85	1153	1.03	1244	1.20	1326	1.37	1401	1.54
2125	1100	1.00	1201	1.19	1290	1.37	1370	1.55	1443	1.73
2250	1152	1.16	1250	1.36	1336	1.55	1415	1.75		
2375	1205	1.34	1299	1.55	1384	1.76	1460	1.96		
2500	1258	1.54	1349	1.76	1431	1.98				
Medium Static Option										
1500	1312	1.07								
1625	1350	1.21								
1750	1390	1.36								
1875	1430	1.53								
2000									1713	2.41
2125							1696	2.47	1752	2.65
2250							1736	2.72	1791	2.91
2375					1720	2.78				
2500			1704	2.84						
High Static Option										
1500										
1625										
1750										
1875										
2000										
2125										
2250										
2375										
2500										

NOTE: For more information, see General Fan Performance Notes.

Boldface indicates field supplied drive is required.

1. Recommend using field supplied fan pulley (part no. KR11AZ506), motor pulley (part no. KR11HY191) and belt (part no. KR30AE042).

ELECTRICAL INFORMATION

Table 60 – 48TC04 SINGLE STAGE COOLING WITH SINGLE SPEED INDOOR FAN MOTOR 3 TONS**

V-Ph-Hz	VOLTAGE RANGE		COMP (ea)		OFM (ea)		IFM		
	MIN	MAX	RLA	LRA	WATTS	FLA	TYPE	EFF at Full Load	FLA
208-1-60	187	253	16.6	79	325	1.5	STD	67%	4.9
					325	1.5	MED	67%	4.9
230-1-60	187	253	16.6	79	325	1.5	STD	67%	4.9
					325	1.5	MED	67%	4.9
208-3-60	187	253	10.4	73	325	1.5	STD	75%	5.2
					325	1.5	MED	75%	5.2
					325	1.5	HIGH	87%	6.9
230-3-60	187	253	10.4	73	325	1.5	STD	75%	5.2
					325	1.5	MED	75%	5.2
					325	1.5	HIGH	87%	6.7
460-3-60	414	506	5.8	38	325	0.8	STD	75%	2.6
					325	0.8	MED	75%	2.6
					325	0.8	HIGH	87%	3.4
575-3-60	518	633	3.8	37	325	0.6	STD	73%	2.4
					325	0.6	MED	73%	2.4
					325	0.6	HIGH	78%	2.0

Table 61 – 48TC05 SINGLE STAGE COOLING WITH SINGLE SPEED INDOOR FAN MOTOR 4 TONS**

V-Ph-Hz	VOLTAGE RANGE		COMP (ea)		OFM (ea)		IFM		
	MIN	MAX	RLA	LRA	WATTS	FLA	TYPE	EFF at Full Load	FLA
208-1-60	187	253	21.8	117	325	1.5	STD	67%	4.9
					325	1.5	MED	67%	4.9
230-1-60	187	253	21.8	117	325	1.5	STD	67%	4.9
					325	1.5	MED	67%	4.9
208-3-60	187	253	13.7	83	325	1.5	STD	75%	5.2
					325	1.5	MED	75%	5.2
					325	1.5	HIGH	87%	6.9
230-3-60	187	253	13.7	83	325	1.5	STD	75%	5.2
					325	1.5	MED	75%	5.2
					325	1.5	HIGH	87%	6.7
460-3-60	414	506	6.2	41	325	0.8	STD	75%	2.6
					325	0.8	MED	75%	2.6
					325	0.8	HIGH	87%	3.4
575-3-60	518	633	4.8	33	325	0.6	STD	73%	2.4
					325	0.6	MED	73%	2.4
					325	0.6	HIGH	78%	2.0

Table 62 – 48TC06 SINGLE STAGE COOLING WITH SINGLE SPEED INDOOR FAN MOTOR 5 TONS**

V-Ph-Hz	VOLTAGE RANGE		COMP (ea)		OFM (ea)		IFM		
	MIN	MAX	RLA	LRA	WATTS	FLA	TYPE	EFF at Full Load	FLA
208-1-60	187	253	26.2	134	325	1.5	STD	67%	4.9
					325	1.5	MED	76%	7.0
230-1-60	187	253	26.2	134	325	1.5	STD	67%	4.9
					325	1.5	MED	76%	7.0
208-3-60	187	253	15.6	110	325	1.5	STD	75%	5.2
					325	1.5	MED	87%	6.9
					325	1.5	HIGH	89%	8.4
230-3-60	187	253	15.6	110	325	1.5	STD	75%	5.2
					325	1.5	MED	87%	6.7
					325	1.5	HIGH	89%	8.3
460-3-60	414	506	7.7	52	325	0.8	STD	75%	2.6
					325	0.8	MED	87%	3.4
					325	0.8	HIGH	89%	4.2
575-3-60	518	633	5.8	39	325	0.6	STD	73%	2.4
					325	0.6	MED	78%	2.0
					325	0.6	HIGH	77%	2.8

ELECTRICAL INFORMATION cont.

Table 77 – UNIT WIRE/FUSE OR HACR BREAKER SIZING DATA WITH SINGLE SPEED INDOOR FAN MOTOR (cont.)

UNIT	NOM. V-Ph-Hz	IFM TYPE	NO C.O. or UNPWR C.O.						w/ PWRD C.O.					
			NO PE.			w/ RE. (pwrd fr/ unit)			NO PE.			w/ RE. (pwrd fr/ unit)		
			MCA	MAX FUSE or HACR BRKR	FLA	DISC. SIZE	LRA	MCA	MAX FUSE or HACR BRKR	FLA	DISC. SIZE	LRA	MCA	MAX FUSE or HACR BRKR
48TC**06	208/230-1-60	STD	40	60	37	150	42	60	40	152	44	60	43	155
		MED	42	60	40	175	44	60	42	177	47	60	45	180
		STD	27	40	26	133	29	40	28	135	31	45	31	138
	208/230-3-60	MED	28/28	40/40	28/27	171	30/30	45/45	30/30	173	33/33	45/45	33/33	176
		HIGH	30/30	45/40	29/29	186	32/32	45/45	32/31	188	35/35	45/45	37/36	191
		STD	13	20	13	63	14	20	14	64	16	20	15	65
	460-3-60	MED	14	20	14	82	15	20	15	83	16	20	16	84
		HIGH	15	20	15	90	16	20	16	91	17	20	17	92
		STD	11	15	10	48	13	15	12	50	12	15	12	50
	575-3-60	MED	10	15	10	52	12	15	12	54	12	15	12	54
		HIGH	11	15	11	63	13	15	13	65	13	15	13	65
48TC*A07	208/230-3-60	STD	33/32	50/50	32/31	184	35/34	50/50	34/33	186	37/37	50/50	37/37	189
		MED	34/34	50/50	33/33	199	36/36	50/50	35/35	201	39/39	50/50	39/39	204
		HIGH	36	50	36	213	38	50	38	215	41	50	41	218
	460-3-60	STD	17	25	16	92	18	25	17	93	19	25	19	94
		MED	18	25	17	100	19	25	18	101	20	25	19	102
		HIGH	19	25	18	107	20	25	19	108	21	30	21	109
	575-3-60	STD	12	15	12	63	14	20	14	65	14	20	13	65
		MED	13	20	12	74	15	20	15	76	15	20	14	76
		HIGH	13	20	12	74	15	20	15	76	15	20	14	76
	208/230-3-60	STD	40/40	60/60	38/38	208	44/43	60/60	43/42	212	45/44	60/60	44/43	213
		MED	43/43	60/60	42/42	244	47/47	60/60	46/46	248	48/48	60/60	47/47	249
48TC*A08	208/230-3-60	HIGH	48/47	60/60	48/47	260	52/51	60/60	52/51	264	53/52	60/60	53/52	265
		STD	20	30	19	122	22	30	21	124	22	30	21	124
		MED	22	30	21	140	23	30	23	142	24	30	23	142
	460-3-60	HIGH	24	30	23	148	26	30	25	150	26	30	26	150
		STD	15	20	14	89	18	25	18	93	16	20	16	91
		MED	16	20	15	104	20	25	19	108	17	25	17	106
	575-3-60	HIGH	19	25	18	118	22	30	23	122	20	25	20	120
		STD	17	25	16	104	20	25	19	108	17	25	17	106
		MED	16	20	15	104	20	25	19	108	17	25	17	106
	575-3-60	HIGH	19	25	18	118	22	30	23	122	20	25	20	120
		STD	17	25	16	104	20	25	19	108	17	25	17	106
		MED	16	20	15	104	20	25	19	108	17	25	17	106

SEQUENCE OF OPERATION

General

The sequence below describes the sequence of operation for an electromechanical unit with and without a factory installed EconoMi\$er IV and X (called “economizer” in this sequence). For information regarding a direct digital controller, see the start-up, operations, and troubleshooting manual for the applicable controller.

Electromechanical units with no economizer

Cooling (Single speed indoor fan motor) —

When the thermostat calls for cooling, terminals G and Y1 are energized. As a result, the indoor fan contactor (IFC) and the compressor contactor (C1) are energized, causing the indoor fan motor (IFM), compressor #1, and outdoor fan to start. If the unit has 2 stages of cooling, the thermostat will additionally energize Y2. The Y2 signal will energize compressor contactor #2 (C2), causing compressor #2 to start. Regardless of the number of stages, the outdoor fan motor runs continuously while unit is cooling. When SAV system is utilized, indoor fan motor runs at design CFM (full speed) during the heating operation.

Cooling (2-speed indoor fan motor) —

Per ASHRAE 90.1 2010 standard section 6.4.3.10.b, during the first stage of cooling operation the VFD will adjust the fan motor to provide 2/3rd of the total cfm established for the unit. When a call for the second stage of cooling is required, the VFD will allow the total cfm for the unit established (100%).

Heating (Single or 2-speed indoor fan motor) —

NOTE: WeatherMaker (48TC) units have either 1 or 2 stages of gas heat. When SAV system is utilized, indoor fan motor runs at design cfm (full speed) during the heating operation.

When the thermostat calls for heating, power is sent to W on the Integrated Gas Controller (IGC) board. An LED (light-emitting diode) on the IGC board turns on and remains on during normal operation. A check is made to ensure that the rollout switch and limit switch are closed. If the check was successful, the induced-draft motor is energized, and when its speed is satisfactory, as proven by the “hall effect” sensor, the ignition activation period begins. The burners will ignite within 5 seconds. If the burners do not light, there is a 22-second delay before another 5-second attempt. This sequence is repeated for 15 minutes or until the burners light. If, after the 15 minutes, the burners still have not lit, heating is locked out. To reset the control, break 24-v power to the thermostat.

When ignition occurs, the IGC board will continue to monitor the condition of the rollout switch, the limit switches, the “hall effect” sensor, as well as the flame sensor. 45 seconds after ignition occurs, assuming the unit is controlled through a room thermostat set for fan auto, the indoor fan motor will energize (and the outdoor air dampers will open to their minimum position). If, for

some reason, the over-temperature limit opens prior to the start of the indoor fan blower, the unit will shorten the 45-second delay to 5 seconds less than the time from initiation of heat to when the limit tripped. Gas will not be interrupted to the burners and heating will continue. Once the fan-on delay has been modified, it will not change back to 45 seconds until power is reset to the control.

On units with 2 stages of heat, when additional heat is required, W2 closes and initiates power to the second stage of the main gas valve. When the thermostat is satisfied, W1 and W2 open and the gas valve closes, interrupting the flow of gas to the main burners.

If the call for W1 lasted less than 1 minute, the heating cycle will not terminate until 1 minute after W1 became active. If the unit is controlled through a room thermostat set for fan auto, the indoor fan motor will continue to operate for an additional 45 seconds then stop. If the over-temperature limit opens after the indoor motor is stopped, but within 10 minutes of W1 becoming inactive, on the next cycle the time will be extended by 15 seconds. The maximum delay is 3 minutes. Once modified, the fan off delay will not change back to 45 seconds unless power is reset to the control. A LED indicator is provided on the IGC to monitor operation.

Electromechanical units with an economizer

Cooling —

When free cooling is not available, the compressors will be controlled by the zone thermostat. When free cooling is available, the outdoor air damper is modulated by the EconoMi\$er IV and X control to provide a 50°F (10°C) to 55°F (13°C) mixed air temperature into the zone. As the mixed air temperature fluctuates above 55°F (13°C) or below 50°F (10°C) dampers will be modulated (open or close) to bring the mixed air temperature back within control. If mechanical cooling is utilized with free cooling, the outdoor air damper will maintain its current position at the time the compressor is started. If the increase in cooling capacity causes the mixed air temperature to drop below 45°F (7°C), then the outdoor air damper position will be decreased to the minimum position. If the mixed air temperature continues to fall, the outdoor air damper will close. Control returns to normal once the mixed air temperature rises above 48°F (9°C). The power exhaust fans will be energized and de-energized, if installed, as the outdoor air damper opens and closes.

If field installed accessory CO₂ sensors are connected to the EconoMi\$er IV and X control, a demand controlled ventilation strategy will begin to operate. As the CO₂ level in the zone increases above the CO₂ setpoint, the minimum position of the damper will be increased proportionally. As the CO₂ level decreases because of the increase in fresh air, the outdoor air damper will be proportionally closed. For EconoMi\$er IV and X operation, there must be a thermostat call for the fan (G).

SEQUENCE OF OPERATION (cont.)

If the unit is occupied and the fan is on, the damper will operate at minimum position. Otherwise, the damper will be closed.

If field installed accessory CO₂ sensors are connected to the EconoMi\$er IV and X control, a demand controlled ventilation strategy will begin to operate. As the CO₂ level in the zone increases above the CO₂ setpoint, the minimum position of the damper will be increased proportionally. As the CO₂ level decreases because of the increase in fresh air, the outdoor air damper will be proportionally closed. For EconoMi\$er IV and X operation, there must be a thermostat call for the fan (G). If the unit is occupied and the fan is on, the damper will operate at minimum position. Otherwise, the damper will be closed.

When the EconoMi\$er IV and X control is in the occupied mode and a call for cooling exists (Y1 on the thermostat), the control will first check for indoor fan operation. If the fan is not on, then cooling will not be activated. If the fan is on, then the control will open the EconoMi\$er IV and X damper to the minimum position.

On the initial power to the EconoMi\$er IV and X control, it will take the damper up to 2 1/2 minutes before it begins to position itself. After the initial power-up, further changes in damper position can take up to 30 seconds to initiate. Damper movement from full closed to full open (or vice versa) will take between 1 1/2 and 2 1/2 minutes. If free cooling can be used as determined from the appropriate changeover command (switch, dry bulb, enthalpy curve, differential dry bulb, or differential enthalpy), then the control will modulate the dampers open to maintain the mixed air temperature setpoint at 50°F (10°C) to 55°F (13°C). If there is a further demand for cooling (cooling second stage - Y2 is energized), then the control will bring on compressor stage 1 to maintain the mixed air temperature setpoint. The EconoMi\$er IV and X damper will be open at maximum position.

2-Speed Note: When operating in ventilation mode only, the indoor fan motor will automatically adjust to 2/3rd of the total cfm established.

Heating

The sequence of operation for the heating is the same as an electromechanical unit with no economizer. The only difference is how the economizer acts. The economizer will stay at the Economizer Minimum Position while the evaporator fan is operating. The outdoor air damper is closed when the indoor fan is not operating.

Optional Humidi-MiZer Dehumidification System

Units with the factory equipped Humidi-MiZer option are capable of providing multiple modes of improved dehumidification as a variation of the normal cooling cycle. The Humidi-MiZer option includes additional valves in the liquid line and discharge line of each refrigerant circuit, a small reheat condenser coil downstream of the evaporator, and Motormaster variable-speed control of some or all outdoor fans. Operation of the revised refrigerant circuit for each mode is described below.

The Humidi-MiZer system provides three sub-modes of operation: Cool, Reheat1, and Reheat2.

Cool mode - provides a normal ratio of Sensible and Latent Cooling effect from the evaporator coil.

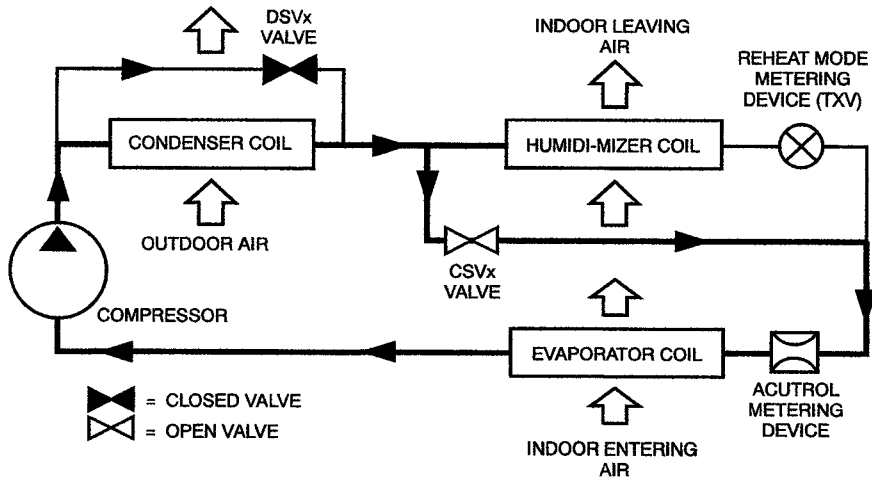
Reheat1 - provides increased Latent Cooling while slightly reducing the Sensible Cooling effect.

Reheat2 - provides normal Latent Cooling but with null or minimum Sensible Cooling effect delivered to the space.

The Reheat1 and Reheat2 modes are available when the unit is not in a Heating mode and when the Low Ambient Lockout switch is closed.

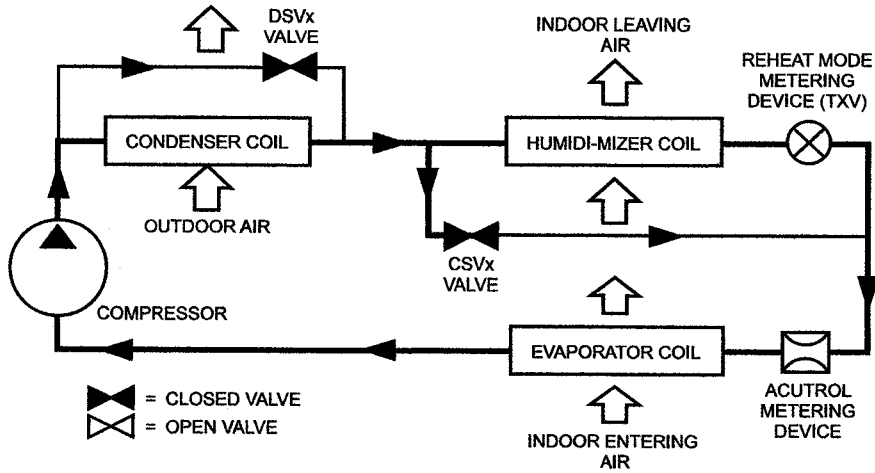
The following diagrams depict piping for Single Stage cooling units.

SEQUENCE OF OPERATION (cont.)



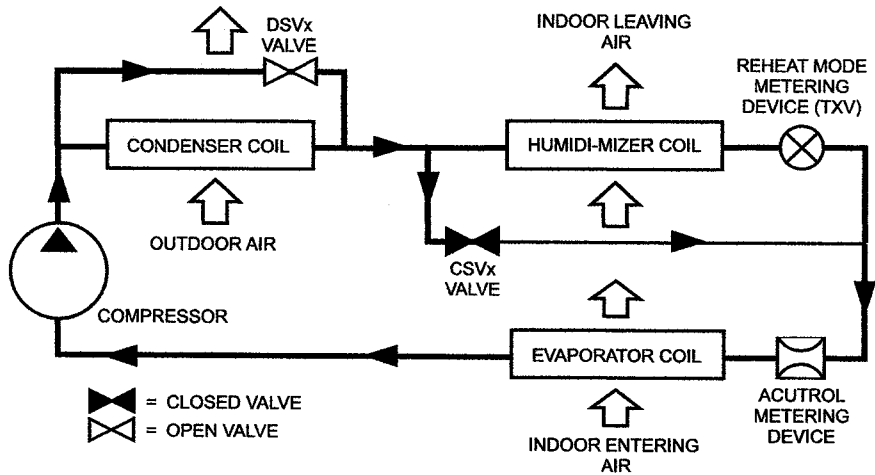
C12647

Normal Cooling Mode - Humidi-MiZer System with Single Stage Cooling



C12648

Subcooling Mode (Reheat 1) - Humidi-MiZer System with Single Stage Cooling



C12649

Hot Gas Reheat Mode (Reheat 2) - Humidi-MiZer System with Single Stage Cooling

GUIDE SPECIFICATIONS - 48TC**04-16

Gas Heat/Electric Cooling Packaged Rooftop

HVAC Guide Specifications

Size Range: 3 to 15 Nominal Tons



<u>Section</u>	<u>Description</u>
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23 06 80	Schedules for Decentralized HVAC Equipment
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23 06 80.13	Decentralized Unitary HVAC Equipment Schedule
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23 06 80.13.A.	Rooftop unit schedule
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- | | |
|----|---|
| 1. | Schedule is per the project specification requirements. |
|----|---|

23 07 16	HVAC Equipment Insulation
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23 07 16.13	Decentralized, Rooftop Units:
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23 07 16.13.A.	Evaporator fan compartment:
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- | | |
|----|---|
| 1. | Interior cabinet surfaces shall be insulated with a minimum 1/2-in. thick, minimum 1 1/2 lb density, flexible fiberglass insulation bonded with a phenolic binder, neoprene coated on the air side. |
| 2. | Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation. |

23 07 16.13.B.	Gas heat compartment:
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- | | |
|----|---|
| 1. | Aluminum foil-faced fiberglass insulation shall be used. |
| 2. | Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation. |

23 09 13	Instrumentation and Control Devices for HVAC
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23 09 13.23	Sensors and Transmitters
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23 09 13.23.A.	Thermostats
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- | | |
|----|---|
| 1. | Thermostat must |
| a. | energize both "W" and "G" when calling for heat. |
| b. | have capability to energize 2 different stages of cooling, and 2 different stages of heating. |
| c. | include capability for occupancy scheduling. |

23 09 23	Direct-digital Control system for HVAC
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23 09 23.13	Decentralized, Rooftop Units:
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23 09 23.13.A.	PremierLink controller
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- | | |
|-----|---|
| 1. | Shall be ASHRAE 62-2001 compliant. |
| 2. | Shall accept 18-32 VAC input power. |
| 3. | Shall have an operating temperature range from -40°F (-40°C) to 158°F (70°C), 10% - 95% RH (non-condensing). |
| 4. | Shall include an integrated economizer controller to support an economizer with 4 to 20 mA actuator input and no microprocessor controller. |
| 5. | Controller shall accept the following inputs: space temperature, setpoint adjustment, outdoor air temperature, indoor air quality, outdoor air quality, indoor relative humidity, compressor lock-out, fire shutdown, enthalpy, fan status, remote time clock/door switch. |
| 6. | Shall accept a CO ₂ sensor in the conditioned space, and be Demand Control Ventilation (DCV) ready. |
| 7. | Shall provide the following outputs: economizer, fan, cooling stage 1, cooling stage 2, heat stage 1, heat stage 2, heat stage 3/ exhaust/ reversing valve/ dehumidify/ occupied. |
| 8. | Unit shall provide surge protection for the controller through a circuit breaker. |
| 9. | Shall be Internet capable, and communicate at a Baud rate of 38.4K or faster |
| 10. | Shall have an LED display independently showing the status of activity on the communication bus, and processor operation. |
| 11. | Shall include an EIA-485 protocol communication port, an access port for connection of either a computer or a Carrier technician tool, an EIA-485 port for network communication to intelligent space sensors and displays, and a port to connect an optional LonWorks plug-in communications card. |
| 12. | Shall have built-in Carrier Comfort Network™ (CCN) protocol, and be compatible with other CCN devices, including ComfortLink™ and ComfortVIEW™ controllers. |
| 13. | Shall have built-in support for Carrier technician tool. |

14. Software upgrades will be accomplished by local download. Software upgrades through chip replacements are not allowed.
 15. Shall be shock resistant in all planes to 5G peak, 11ms during operation, and 100G peak, 11ms during storage.
 16. Shall be vibration resistant in all planes to 1.5G @ 20-300 Hz.
 17. Shall support a bus length of 4000 ft (1219m) max, 60 devices per 1000 ft (305m) section, and 1 RS-485 repeater per 1000 ft (305m) sections.
- 23 09 23.13.B. RTU Open - Open protocol, direct digital controller:**
1. Shall be ASHRAE 62-2001 compliant.
 2. Shall accept 18-30VAC, 50-60Hz, and consumer 15VA or less power.
 3. Shall have an operating temperature range from -40°F (-40°C) to 130°F (54°C), 10% - 90% RH (non-condensing).
 4. Shall include built-in protocol for BACNET (MS/TP and PTP modes), Modbus (RTU and ASCII), Johnson N2 and LonWorks. LonWorks Echelon processor required for all Lon applications shall be contained in separate communication board.
 5. Shall allow access of up to 62 network variables (SNVT). Shall be compatible with all open controllers.
 6. Baud rate Controller shall be selectable using a dipswitch.
 7. Shall have an LED display independently showing the status of serial communication, running, errors, power, all digital outputs, and all analog inputs.
 8. Shall accept the following inputs: space temperature, setpoint adjustment, outdoor air temperature, indoor air quality, outdoor air quality, compressor lock-out, fire shutdown, enthalpy switch, and fan status/filter status/humidity/ remote occupancy.
 9. Shall provide the following outputs: economizer, variable frequency drive, fan, cooling stage 1, cooling stage 2, heat stage 1, heat stage 2, exhaust reversing valve/high fan speed.
 10. Shall have built-in surge protection circuitry through solid state polyswitches. Polyswitches shall be used on incoming power and network connections. Polyswitches will return to normal when the "trip" condition clears.
 11. Shall have a battery back-up capable of a minimum of 10,000 hours of data and time clock retention during power outages.
 12. Shall have built-in support for Carrier technician tool.
 13. Shall include an EIA-485 protocol communication port, an access port for connection of either a computer or a Carrier technician tool, an EIA-485 port for network communication to intelligent space sensors and displays, and a port to connect an optional LonWorks communications card.
 14. Software upgrades will be accomplished by either local or remote download. No software upgrades through chip replacements are allowed.

23 09 33 Electric and Electronic Control System for HVAC

23 09 33.13 Decentralized, Rooftop Units:

23 09 33.13.A. General:

1. Shall be complete with self-contained low-voltage control circuit protected by a resettable circuit breaker on the 24-v transformer side. Transformer shall have 75VA capability.
2. Shall utilize color-coded wiring.
3. Shall include a central control terminal board to conveniently and safely provide connection points for vital control functions such as: smoke detectors, phase monitor, gas controller, economizer, thermostat, DDC control options, and low and high pressure switches.
4. The heat exchanger shall be controlled by an integrated gas controller (IGC) microprocessor. See heat exchanger section of this specification.
5. Unit shall include a minimum of one 8-pin screw terminal connection board for connection of control wiring.

23 09 33.23.B. Safeties:

1. Compressor over-temperature, over-current. High internal pressure differential.
2. Low pressure switch.
 - a. Units with 2 compressors shall have different sized connectors for the circuit 1 and circuit 2 low and high pressure switches. They shall physically prevent the cross-wiring of the safety switches between circuits 1 and 2.
 - b. Low pressure switch shall use different color wire than the high pressure switch. The purpose is to assist the installer and service technician to correctly wire and or troubleshoot the rooftop unit.

3. High pressure switch.
 - a. Units with 2 compressors shall have different sized connectors for the circuit 1 and circuit 2 low and high pressure switches. They shall physically prevent the cross-wiring of the safety switches between circuits 1 and 2.
 - b. High pressure switch shall use different color wire than the low pressure switch. The purpose is to assist the installer and service technician to correctly wire and or troubleshoot the rooftop unit.
4. Automatic reset, motor thermal overload protector.
5. Heating section shall be provided with the following minimum protections:
 - a. High temperature limit switches.
 - b. Induced draft motor speed sensor.
 - c. Flame rollout switch.
 - d. Flame proving controls.

23 09 93 Sequence of Operations for HVAC Controls

23 09 93.13 Decentralized, Rooftop Units:

23 09 93.13 INSERT SEQUENCE OF OPERATION

23 40 13 Panel Air Filters

23 40 13.13 Decentralized, Rooftop Units:

23 40 13.13.A. Standard filter section

1. Shall consist of factory installed, low velocity, disposable 2-in. thick fiberglass filters of commercially available sizes.
2. Unit shall use only one filter size. Multiple sizes are not acceptable.
3. Filters shall be accessible through an access panel with "no-tool" removal as described in the unit cabinet section of this specification (23 81 19.13.H).

23 81 19 Self-Contained Air Conditioners

23 81 19.13 Small-Capacity Self-Contained Air Conditioners (48TC**04-16)

23 81 19.13.A. General

1. Outdoor, rooftop mounted, electrically controlled, heating and cooling unit utilizing a fully hermetic scroll compressor(s) for cooling duty and gas combustion for heating duty.
2. Factory assembled, single-piece heating and cooling rooftop unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, and special features required prior to field start-up.
3. Unit shall use Puron refrigerant.
4. Unit shall be installed in accordance with the manufacturer's instructions.
5. Unit must be selected and installed in compliance with local, state, and federal codes.

23 81 19.13.B. Quality Assurance

1. Unit meets ASHRAE 90.1 minimum efficiency requirements.
2. Unit shall be rated in accordance with AHRI Standards 210/240 and 340/360.
3. Unit shall be designed to conform to ASHRAE 15, 2001.
4. Unit shall be UL-tested and certified in accordance with ANSI Z21.47 Standards and UL-listed and certified under Canadian standards as a total package for safety requirements.
5. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
6. Unit casing shall be capable of withstanding 500-hour salt spray exposure per ASTM B117 (scribed specimen).
7. Unit shall be designed in accordance with ISO 9001, and shall be manufactured in a facility registered by ISO 9001.
8. Roof curb shall be designed to conform to NRCA Standards.
9. Unit shall be subjected to a completely automated run test on the assembly line. The data for each unit will be stored at the factory, and must be available upon request.
10. Unit shall be designed in accordance with UL Standard 1995, including tested to withstand rain.
11. Unit shall be constructed to prevent intrusion of snow and tested to prevent snow intrusion into the control box up to 40 mph.
12. Unit shake tested to assurance level 1, ASTM D4169 to ensure shipping reliability.
13. High Efficient Motors listed shall meet section 313 of the Energy Independence and Security Act of 2007 (EISA 2007)

23 81 19.13.C. Delivery, Storage, and Handling

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

2. Lifted by crane requires either shipping top panel or spreader bars.
 3. Unit shall only be stored or positioned in the upright position.
- 23 81 19.13.E. Project Conditions
1. As specified in the contract.
- 23 81 19.13.F. Operating Characteristics
1. Unit shall be capable of starting and running at 115°F (46°C) ambient outdoor temperature, meeting maximum load criteria of AHRI Standard 210/240 or 340/360 at $\pm 10\%$ voltage.
 2. Compressor with standard controls shall be capable of operation down to 40°F (4°C), ambient outdoor temperatures. Accessory winter start kit is necessary if mechanically cooling at ambient temperatures down to 25°F (-4°C).
 3. Unit shall discharge supply air vertically or horizontally as shown on contract drawings.
 4. Unit shall be factory configured for vertical supply & return configurations.
 5. Unit shall be field convertible from vertical to horizontal airflow on all models. No special kit required on 04-14 models. Supply duct kit required for 16 size model only.
 6. Unit shall be capable of mixed operation: vertical supply with horizontal return or horizontal supply with vertical return.
- 23 81 19.13.G. Electrical Requirements
1. Main power supply voltage, phase, and frequency must match those required by the manufacturer.
- 23 81 19.13.H. Unit Cabinet
1. Unit cabinet shall be constructed of galvanized steel, and shall be bonderized and coated with a prepainted baked enamel finish on all externally exposed surfaces.
 2. Unit cabinet exterior paint shall be: film thickness, (dry) 0.003 inches minimum, gloss (per ASTM D523, 60°F / 16°C): 60, Hardness: H-2H Pencil hardness.
 3. Evaporator fan compartment interior cabinet insulation shall conform to AHRI Standards 210/240 or 340/360 minimum exterior sweat criteria. Interior surfaces shall be insulated with a minimum 1/2-in. thick, 1 lb density, flexible fiberglass insulation, neoprene coated on the air side. Aluminum foil-faced fiberglass insulation shall be used in the gas heat compartment.
 4. Base of unit shall have a minimum of four locations for thru-the-base gas and electrical connections (factory installed or field installed), standard.
 5. Base Rail
 - a. Unit shall have base rails on a minimum of 2 sides.
 - b. Holes shall be provided in the base rails for rigging shackles to facilitate maneuvering and overhead rigging.
 - c. Holes shall be provided in the base rail for moving the rooftop by fork truck.
 - d. Base rail shall be a minimum of 16 gauge thickness.
 6. Condensate pan and connections:
 - a. Shall be a sloped condensate drain pan made of a non-corrosive material.
 - b. Shall comply with ASHRAE Standard 62.
 - c. Shall use a 3/4" -14 NPT drain connection, possible either through the bottom or side of the drain pan. Connection shall be made per manufacturer's recommendations.
 7. Top panel:
 - a. Shall be a single piece top panel on 04 thru 12 sizes, two piece on 14 and 16 sizes.
 8. Gas Connections:
 - a. All gas piping connecting to unit gas valve shall enter the unit cabinet at a single location on side of unit (horizontal plane).
 - b. Thru-the-base capability
 - (1.) Standard unit shall have a thru-the-base gas-line location using a raised, embossed portion of the unit basepan.
 - (2.) Optional, factory approved, water-tight connection method must be used for thru-the-base gas connections.
 - (3.) No basepan penetration, other than those authorized by the manufacturer, is permitted.
 9. Electrical Connections
 - a. All unit power wiring shall enter unit cabinet at a single, factory prepared, knockout location.
 - b. Thru-the-base capability
 - (1.) Standard unit shall have a thru-the-base electrical location(s) using a raised, embossed portion of the unit basepan.
 - (2.) Optional, factory approved, water-tight connection method must be used for thru-the-base electrical connections.

(3.) No basepan penetration, other than those authorized by the manufacturer, is permitted.

10. Component access panels (standard)

- a. Cabinet panels shall be easily removable for servicing.
- b. Unit shall have one factory installed, tool-less, removable, filter access panel.
- c. Panels covering control box, indoor fan, indoor fan motor, gas components (where applicable), and compressors shall have molded composite handles.
- d. Handles shall be UV modified, composite. They shall be permanently attached, and recessed into the panel.
- e. Screws on the vertical portion of all removable access panel shall engage into heat resistant, molded composite collars.
- f. Collars shall be removable and easily replaceable using manufacturer recommended parts.

23 81 19.13.I. Gas Heat

1. General

- a. Heat exchanger shall be an induced draft design. Positive pressure heat exchanger designs shall not be allowed.
- b. Shall incorporate a direct-spark ignition system and redundant main gas valve.
- c. Gas supply pressure at the inlet to the rooftop unit gas valve must match that required by the manufacturer.

2. The heat exchanger shall be controlled by an integrated gas controller (IGC) microprocessor.

- a. IGC board shall notify users of fault using an LED (light-emitting diode).
- b. IGC board shall contain algorithms that modify evaporator fan operation to prevent future cycling on high temperature limit switch.
- c. Unit shall be equipped with anti-cycle protection with one short cycle on unit flame rollout switch or 4 continuous short cycles on the high temperature limit switch. Fault indication shall be made using an LED.

3. Standard Heat Exchanger construction

- a. Heat exchanger shall be of the tubular-section type constructed of a minimum of 20-gauge steel coated with a nominal 1.2 mil aluminum-silicone alloy for corrosion resistance.
- b. Burners shall be of the in-shot type constructed of aluminum-coated steel.
- c. Burners shall incorporate orifices for rated heat output up to 2000 ft (610m) elevation. Additional accessory kits may be required for applications above 2000 ft (610m) elevation, depending on local gas supply conditions.
- d. Each heat exchanger tube shall contain multiple dimples for increased heating effectiveness.

4. Optional Stainless Steel Heat Exchanger construction

- a. Use energy saving, direct-spark ignition system.
- b. Use a redundant main gas valve.
- c. Burners shall be of the in-shot type constructed of aluminum-coated steel.
- d. All gas piping shall enter the unit cabinet at a single location on side of unit (horizontal plane).
- e. The optional stainless steel heat exchanger shall be of the tubular-section type, constructed of a minimum of 20-gauge type 409 stainless steel.
- f. Type 409 stainless steel shall be used in heat exchanger tubes and vestibule plate.
- g. Complete stainless steel heat exchanger allows for greater application flexibility.

5. Optional Low NO_x Heat Exchanger construction

- a. Low NO_x reduction shall be provided to reduce nitrous oxide emissions to meet California's Air Quality Management District (SCAQMD) low-NO_x emissions requirement of 40 nanograms per joule or less.
- b. Primary tubes and vestibule plates on low NO_x units shall be 409 stainless steel. Other components shall be aluminized steel.

6. Induced draft combustion motor and blower

- a. Shall be a direct-drive, single inlet, forward-curved centrifugal type.
- b. Shall be made from steel with a corrosion-resistant finish.
- c. Shall have permanently lubricated sealed bearings.
- d. Shall have inherent thermal overload protection.
- e. Shall have an automatic reset feature.

23 81 19.13.J. Coils

1. Standard Aluminum Fin - Copper Tube Coils:

- a. Standard evaporator and condenser coils shall have aluminum lanced plate fins mechanically bonded to seamless internally grooved copper tubes with all joints brazed.

- b. Evaporator coils shall be leak tested to 150 psig, pressure tested to 450 psig, and qualified to UL 1995 burst test at 1775 psig.
 - c. Condenser coils shall be leak tested to 150 psig, pressure tested to 650 psig, and qualified to UL 1995 burst test at 1980 psig.
2. Optional Pre-coated aluminum-fin condenser coils (3 Phase Models Only):
- a. Shall have a durable epoxy-phenolic coating to provide protection in mildly corrosive coastal environments.
 - b. Coating shall be applied to the aluminum fin stock prior to the fin stamping process to create an inert barrier between the aluminum fin and copper tube.
 - c. Epoxy-phenolic barrier shall minimize galvanic action between dissimilar metals.
3. Optional Copper-fin evaporator and condenser coils (3 Phase Models Only):
- a. Shall be constructed of copper fins mechanically bonded to copper tubes and copper tube sheets.
 - b. Galvanized steel tube sheets shall not be acceptable.
 - c. A polymer strip shall prevent coil assembly from contacting the sheet metal coil pan to minimize potential for galvanic corrosion between coil and pan.
4. Optional E-coated aluminum-fin evaporator and condenser coils (3 Phase Models Only):
- a. Shall have a flexible epoxy polymer coating uniformly applied to all coil surface areas without material bridging between fins.
 - b. Coating process shall ensure complete coil encapsulation of tubes, fins and headers.
 - c. Color shall be high gloss black with gloss per ASTM D523-89.
 - d. Uniform dry film thickness from 0.8 to 1.2 mil on all surface areas including fin edges.
 - e. Superior hardness characteristics of 2H per ASTM D3363-92A and cross-hatch adhesion of 4B-5B per ASTM D3359-93.
 - f. Impact resistance shall be up to 160 in.-lb (ASTM D2794-93).
 - g. Humidity and water immersion resistance shall be up to minimum 1000 and 250 hours respectively (ASTM D2247-92 and ASTM D870-92).
 - h. Corrosion durability shall be confirmed through testing to be no less than 1000 hours salt spray per ASTM B117-90.
5. Standard All Aluminum Novation Coils:
- a. Standard condenser coils shall have all aluminum NOVATION Heat Exchanger Technology design consisting of aluminum multi port flat tube design and aluminum fin. Coils shall be a furnace brazed design and contain epoxy lined shrink wrap on all aluminum to copper connections.
 - b. Condenser coils shall be leak tested to 150 psig, pressure tested to 650 psig, and qualified to UL 1995 burst test at 1980 psig.
6. Optional E-coated aluminum-fin, aluminum tube condenser coils:
- a. Shall have a flexible epoxy polymer coating uniformly applied to all coil external surface areas without material bridging between fins or louvers.
 - b. Coating process shall ensure complete coil encapsulation, including all exposed fin edges.
 - c. E-coat thickness of 0.8 to 1.2 mil with top coat having a uniform dry film thickness from 1.0 to 2.0 mil on all external coil surface areas, including fin edges, shall be provided.
 - d. Shall have superior hardness characteristics of 2H per ASTM D3363-00 and cross-hatch adhesion of 4B-5B per ASTM D3359-02.
 - e. Shall have superior impact resistance with no cracking, chipping or peeling per NSF/ANSI 51-2002 Method 10.2.
- 23 81 19.13.K. Refrigerant Components
1. Refrigerant circuit shall include the following control, safety, and maintenance features:
- a. Fixed orifice metering system shall prevent mal-distribution of two-phase refrigerant by including multiple fixed orifice devices in each refrigeration circuit. Each orifice is to be optimized to the coil circuit it serves.
 - b. Refrigerant filter drier - Solid core design.
 - c. Service gauge connections on suction and discharge lines.
 - d. Pressure gauge access through a specially designed access port in the top panel of the unit.
2. There shall be gauge line access port in the skin of the rooftop, covered by a black, removable plug.
- a. The plug shall be easy to remove and replace.
 - b. When the plug is removed, the gauge access port shall enable maintenance personnel to route their pressure gauge lines.

- c. This gauge access port shall facilitate correct and accurate condenser pressure readings by enabling the reading with the compressor access panel on.
 - d. The plug shall be made of a leak proof, UV-resistant, composite material.
3. Compressors
- a. Unit shall use fully hermetic, scroll compressor for each independent refrigeration circuit.
 - b. Compressor motors shall be cooled by refrigerant gas passing through motor windings.
 - c. Compressors shall be internally protected from high discharge temperature conditions.
 - d. Compressors shall be protected from an over-temperature and over-amperage conditions by an internal, motor overload device.
 - e. Compressor shall be factory mounted on rubber grommets.
 - f. Compressor motors shall have internal line break thermal, current overload and high pressure differential protection.
 - g. Crankcase heaters shall not be required for normal operating range, unless required by compressor manufacturer due to refrigerant charge limits.
- 23 81 19.13.L. Filter Section
- 1. Filters access is specified in the unit cabinet section of this specification.
 - 2. Filters shall be held in place by a pivoting filter tray, facilitating easy removal and installation.
 - 3. Shall consist of factory installed, low velocity, throw-away 2-in. thick fiberglass filters.
 - 4. Filters shall be standard, commercially available sizes.
 - 5. Only one size filter per unit is allowed.
- 23 81 19.13.M. Evaporator Fan and Motor
- 1. Evaporator fan motor:
 - a. Shall have permanently lubricated bearings.
 - b. Shall have inherent automatic-reset thermal overload protection or circuit breaker.
 - c. Shall have a maximum continuous bhp rating for continuous duty operation; no safety factors above that rating shall be required.
 - 2. Belt-driven Evaporator Fan:
 - a. Belt drive shall include an adjustable pitch motor pulley.
 - b. Shall use sealed, permanently lubricated ball-bearing type.
 - c. Blower fan shall be double-inlet type with forward-curved blades.
 - d. Shall be constructed from steel with a corrosion resistant finish and dynamically balanced.
- 23 81 19.13.N. Condenser Fans and Motors
- 1. Condenser fan motors:
 - a. Shall be a totally enclosed motor.
 - b. Shall use permanently lubricated bearings.
 - c. Shall have inherent thermal overload protection with an automatic reset feature.
 - d. Shall use a shaft-down design on 04 to 12 and 16 models and shaft-up on 14 size with rain shield.
 - 2. Condenser Fans:
 - a. Shall be a direct-driven propeller type fan.
 - b. Shall have galvalum blades riveted to corrosion-resistant steel spiders and shall be dynamically balanced.
- 23 81 19.13.O. Special Features Options and Accessories
- 1. Staged Air Volume System (SAV) for 2-stage cooling models only:
 - a. Evaporator fan motor:
 - (1.) Shall have permanently lubricated bearings.
 - (2.) Shall have a maximum continuous bhp rating for continuous duty operation; no safety factors above that rating.
 - (3.) Shall be Variable Frequency duty and 2-speed control.
 - (4.) Shall contain motor shaft grounding ring to prevent electrical bearing fluting damage by safely diverting harmful shaft voltages and bearing currents to ground.
 - 2. Variable Frequency Drive (VFD). Only available on 2-speed indoor fan motor option (SAV):
 - a. Shall be installed inside the unit cabinet, mounted, wired and tested.
 - b. Shall contain Electromagnetic Interference (EMI) frequency protection.
 - c. Insulated Gate Bi-Polar Transistors (IGBT) used to produce the output pulse width modulated (PWM) waveform, allowing for quiet motor operation.

- d. Self diagnostics with fault and power code LED indicator. Field accessory Display Kit available for further diagnostics and special setup applications.
 - e. RS485 capability standard.
 - f. Electronic thermal overload protection.
 - g. 5% swinging chokes for harmonic reduction and improved power factor.
 - h. All printed circuit boards shall be conformal coated.
3. Integrated EconoMi\$er IV, EconoMi\$er2, and EconoMi\$er X **standard leak rate models.** (Factory installed on 3 phase models only. Field installed on all 3 and 1 phase models)
- a. Integrated, gear driven opposing modulating blade design type capable of simultaneous economizer and compressor operation.
 - b. Independent modules for vertical or horizontal return configuration shall be available. Vertical return modules shall be available as a factory installed option.
 - c. Damper blades shall be galvanized steel with composite gears. Plastic or composite blades on intake or return shall not be acceptable.
 - d. Shall include all hardware and controls to provide free cooling with outdoor air when temperature and/or humidity are below setpoints.
 - e. Shall be equipped with gear driven dampers for both the outdoor ventilation air and the return air for positive air stream control.
 - f. Standard leak rate shall be equipped with dampers not to exceed 2% leakage at 1 in. wg pressure differential.
 - g. Economizer controller on EconoMi\$er IV models shall be Honeywell W7212 that provides:
 - (1.) Combined minimum and DCV maximum damper position potentiometers with compressor staging relay.
 - (2.) Functions with solid state analog enthalpy or dry bulb changeover control sensing.
 - (3.) Contain LED indicates for:
when free cooling is available, when module is in DCV mode, when exhaust fan contact is closed.
 - h. Economizer controller on EconoMi\$er X models shall be the Honeywell W7220 that provides:
 - (1.) 2-line LCD interface screen for setup, configuration and troubleshooting.
 - (2.) On-board Fault Detection and Diagnostics (FDD) that senses and alerts when the economizer is not operating properly, per California Title 24.
 - (3.) Sensor failure loss of communication identification
 - (4.) Automatic sensor detection
 - (5.) Capabilities for use with multiple-speed indoor fan systems
 - (6.) Utilize digital sensors: Dry bulb and Enthalpy
 - i. Economizer controller on EconoMi\$er 2 models with PremierLink shall be 4-20mA design and controlled by the PremierLink controller. PremierLink does not comply with California Title 24 Fault Detection & Diagnostic (FDD) requirements.
 - j. Economizer controller on EconoMi\$er 2 models with RTU Open models shall be a 4-20mA design controlled directly by the RTU Open controller. RTU Open meets California Title 24 Fault Detection & Diagnostic (FDD) requirements.
 - k. Shall be capable of introducing up to 100% outdoor air.
 - l. Shall be equipped with a barometric relief damper capable of relieving up to 100% return air and contain seals that meet ASHRAE 90.1 requirements.
 - m. Shall be designed to close damper(s) during loss-of-power situations with spring return built into motor.
 - n. Dry bulb outdoor air temperature sensor shall be provided as standard. Enthalpy sensor is also available on factory installed only. Outdoor air sensor setpoint shall be adjustable and shall range from 40 to 100F / 4 to 38C. Additional sensor options shall be available as accessories.
 - o. The economizer controller shall also provide control of an accessory power exhaust unit function. Factory set at 100%, with a range of 0% to 100%.
 - p. The economizer shall maintain minimum airflow into the building during occupied period and provide design ventilation rate for full occupancy.
 - q. Dampers shall be completely closed when the unit is in the unoccupied mode.
 - r. Economizer controller shall accept a 2-10 Vdc CO2 sensor input for IAQ/DCV control. In this mode, dampers shall modulate the outdoor air damper to provide ventilation based on the sensor input.
 - s. Compressor lockout temperature on W7220 is adjustable from -45F to 80F, set at a factory default of 32F. Others shall open at 35F (2C) and closes at 50F (10C).

- t. Actuator shall be direct coupled to economizer gear. No linkage arms or control rods shall be acceptable.
 - u. Economizer controller shall provide indications when in free cooling mode, in the DCV mode, or the exhaust fan contact is closed.
4. **Integrated EconoMi\$er2, and EconoMi\$er X Ultra Low Leak rate models.**(Factory installed on 3 phase models only. Field installed on all 3 and 1 phase models)
- a. Integrated, gear driven opposing modulating blade design type capable of simultaneous economizer and compressor operation.
 - b. Independent modules for vertical or horizontal return configuration shall be available. Vertical return modules shall be available as a factory installed option.
 - c. Damper blades shall be galvanized steel with composite gears. Plastic or composite blades on intake or return shall not be acceptable.
 - d. Shall include all hardware and controls to provide free cooling with outdoor air when temperature and/or humidity are below setpoints.
 - e. Shall be equipped with gear driven dampers for both the outdoor ventilation air and the return air for positive air stream control
 - f. Ultra Low Leak design meets California Title 24 section 140.4 and ASHRAE90.1 requirements for 4 cfm per sq.ft. on the outside air dampers and 10 cfm per sq. ft. on the return dampers.
 - g. Economizer controller on EconoMi\$er X models shall be the Honeywell W7220 that provides:
 - (1.) 2-line LCD interface screen for setup, configuration and troubleshooting
 - (2.) On-board Fault Detection and Diagnostics (FDD) that senses and alerts when the economizer is not operating properly, per California Title 24.
 - (3.) Sensor failure loss of communication identification
 - (4.) Automatic sensor detection
 - (5.) Capabilities for use with multiple-speed indoor fan systems
 - (6.) Utilize digital sensors: Dry bulb and Enthalpy
 - h. Economizer controller on EconoMi\$er 2 models with RTU Open models shall be a 4-20mA design controlled directly by the RTU Open controller. RTU Open meets California Title 24 Fault Detection & Diagnostic (FDD) requirements.
 - i. Shall be capable of introducing up to 100% outdoor air.
 - j. Shall be equipped with a barometric relief damper capable of relieving up to 100% return air and contain seals that meet ASHRAE 90.1 requirements.
 - k. Shall be designed to close damper(s) during loss-of-power situations with spring return built into motor.
 - l. Dry bulb outdoor air temperature sensor shall be provided as standard. Enthalpy sensor is also available on factory installed only. Outdoor air sensor setpoint shall be adjustable and shall range from 40 to 100° F / 4 to 38° C. Additional sensor options shall be available as accessories.
 - m. The economizer controller shall also provide control of an accessory power exhaust unit function. Factory set at 100%, with a range of 0% to 100%.
 - n. The economizer shall maintain minimum airflow into the building during occupied period and provide design ventilation rate for full occupancy.
 - o. Dampers shall be completely closed when the unit is in the unoccupied mode.
 - p. Economizer controller shall accept a 2-10 Vdc CO₂ sensor input for IAQ/DCV control. In this mode, dampers shall modulate the outdoor air damper to provide ventilation based on the sensor input.
 - q. Compressor lockout temperature on W7220 is adjustable from -45° F to 80° F, set at a factory default of 32° F. Others shall open at 35°F (2°C) and closes at 50°F (10°C).
 - r. Actuator shall be direct coupled to economizer gear. No linkage arms or control rods shall be acceptable.
 - s. Economizer controller shall provide indications when in free cooling mode, in the DCV mode, or the exhaust fan contact is closed.
5. **Two-Position Damper (Factory installed on 3 Phase Models Only. Field installed on all 3 and 1 Phase Models)**
- a. Damper shall be a Two-Position Damper. Damper travel shall be from the full closed position to the field adjustable %-open setpoint.
 - b. Damper shall include adjustable damper travel from 25% to 100% (full open).
 - c. Damper shall include single or dual blade, gear driven dampers and actuator motor.
 - d. Actuator shall be direct coupled to damper gear. No linkage arms or control rods shall be acceptable.
 - e. Damper will admit up to 100% outdoor air for applicable rooftop units.
 - f. Damper shall close upon indoor (evaporator) fan shutoff and/or loss of power.

- g. The damper actuator shall plug into the rooftop unit's wiring harness plug. No hard wiring shall be required.
- h. Outside air hood shall include aluminum water entrainment filter.
- 6. Manual damper
 - a. Manual damper package shall consist of damper, air inlet screen, and rain hood which can be preset to admit up to 25 or 50% outdoor air for year round ventilation.
- 7. Humidi-MiZer Adaptive Dehumidification System (3 Phase Models Only):
 - a. The Humidi-MiZer Adaptive Dehumidification System shall be factory installed in single stage 48TC04-07 and 2-stage 48TC08-16 models with RTPF (round tube plate tin) condenser coils, and shall provide greater dehumidification of the occupied space by two modes of dehumidification operations in addition to its normal design cooling mode:
 - (1.) Subcooling mode further sub cools the hot liquid refrigerant leaving the condenser coil when both temperature and humidity in the space are not satisfied.
 - (2.) Hot gas reheat mode shall mix a portion of the hot gas from the discharge of the compressor with the hot liquid refrigerant leaving the condenser coil to create a two-phase heat transfer in the system, resulting in a neutral leaving air temperature when only humidity in the space is not satisfied.
 - (3.) Includes head pressure controller.
- 8. Head Pressure Control Package
 - a. Controller shall control coil head pressure by condenser fan speed modulation or condenser fan cycling and wind baffles.
 - b. Shall consist of solid-state control and condenser coil temperature sensor to maintain condensing temperature between 90°F (32°C) and 110°F (43°C) at outdoor ambient temperatures down to -20°F (-29°C).
- 9. Propane Conversion Kit
 - a. Package shall contain all the necessary hardware and instructions to convert a standard natural gas unit for use with liquefied propane, up to 2000 ft (610m) elevation.
 - b. Additional accessory kits may be required for applications above 2000 ft (610m) elevation.
- 10. Flue Shield (04-14 sizes only)
 - a. Flue shield shall provide protection from the hot sides of the gas flue hood.
- 11. Condenser Coil Hail Guard Assembly (Factory installed on 3 Phase Models Only. Field installed on all 3 and 1 Phase Models)
 - a. Shall protect against damage from hail.
 - b. Shall be either hood style or louvered.
- 12. Unit-Mounted, Non-Fused Disconnect Switch (Available on units with MOCP's of 80 amps or less):
 - a. Switch shall be factory installed, internally mounted.
 - b. National Electric Code (NEC) and UL approved non-fused switch shall provide unit power shutoff.
 - c. Shall be accessible from outside the unit.
 - d. Shall provide local shutdown and lockout capability.
- 13. Convenience Outlet:
 - a. Powered convenience outlet. (3 Phase Models Only)
 - (1.) Outlet shall be powered from main line power to the rooftop unit.
 - (2.) Outlet shall be powered from line side or load side of disconnect by installing contractor, as required by code. If outlet is powered from load side of disconnect, unit electrical ratings shall be UL certified and rated for additional outlet amperage.
 - (3.) Outlet shall be factory installed and internally mounted with easily accessible 115-v female receptacle.
 - (4.) Outlet shall include 15 amp GFI receptacles with independent fuse protection.
 - (5.) Voltage required to operate convenience outlet shall be provided by a factory installed step-down transformer.
 - (6.) Outlet shall be accessible from outside the unit.
 - (7.) Outlet shall include a field installed "Wet in Use" cover.
 - b. Non-Powered convenience outlet.
 - (1.) Outlet shall be powered from a separate 115/120v power source.
 - (2.) A transformer shall not be included.
 - (3.) Outlet shall be factory installed and internally mounted with easily accessible 115-v female receptacle.
 - (4.) Outlet shall include 15 amp GFI receptacles with independent fuse protection.
 - (5.) Outlet shall be accessible from outside the unit.

- (6.) Outlet shall include a field installed "Wet in Use" cover.
14. Flue Discharge Deflector (04-14 sizes only):
 - a. Flue discharge deflector shall direct unit exhaust vertically instead of horizontally.
 - b. Deflector shall be defined as a "natural draft" device by the National Fuel and Gas (NFG) code.
 15. Thru-the-Base Connectors:
 - a. Kits shall provide connectors to permit gas and electrical connections to be brought to the unit through the unit basepan.
 - b. Minimum of four connection locations per unit.
 16. Supply Duct Cover: (16 size only.)
 - a. Required when field converting the factory standard vertical duct supply to horizontal duct supply configuration. One required per unit.
 17. Propeller Power Exhaust:
 - a. Power exhaust shall be used in conjunction with an integrated economizer.
 - b. Independent modules for vertical or horizontal return configurations shall be available.
 - c. Horizontal power exhaust is shall be mounted in return ductwork.
 - d. Power exhaust shall be controlled by economizer controller operation. Exhaust fans shall be energized when dampers open past the 0-100% adjustable setpoint on the economizer control.
 18. Roof Curbs (Vertical):
 - a. Full perimeter roof curb with exhaust capability providing separate air streams for energy recovery from the exhaust air without supply air contamination.
 - b. Formed galvanized steel with wood nailer strip and shall be capable of supporting entire unit weight.
 - c. Permits installation and securing of ductwork to curb prior to mounting unit on the curb.
 19. High Altitude Gas Conversion Kit:
 - a. Package shall contain all the necessary hardware and instructions to convert a standard natural gas unit to operate from 2000-7000 ft (610 to 2134m) elevation with natural gas or from 0-7000 ft (90-2134m) elevation with liquefied propane.
 20. Outdoor Air Enthalpy Sensor:
 - a. The outdoor air enthalpy sensor shall be used to provide single enthalpy control. When used in conjunction with a return air enthalpy sensor, the unit will provide differential enthalpy control. The sensor allows the unit to determine if outside air is suitable for free cooling.
 21. Return Air Enthalpy Sensor:
 - a. The return air enthalpy sensor shall be used in conjunction with an outdoor air enthalpy sensor to provide differential enthalpy control.
 22. Indoor Air Quality (CO₂) Sensor:
 - a. Shall be able to provide demand ventilation indoor air quality (IAQ) control.
 - b. The IAQ sensor shall be available in duct mount, wall mount, or wall mount with LED display. The set-point shall have adjustment capability.
 23. Smoke detectors (factory installed only):
 - a. Shall be a Four-Wire Controller and Detector.
 - b. Shall be environmental compensated with differential sensing for reliable, stable, and drift-free sensitivity.
 - c. Shall use magnet-activated test/reset sensor switches.
 - d. Shall have tool-less connection terminal access.
 - e. Shall have a recessed momentary switch for testing and resetting the detector.
 - f. Controller shall include:
 - (1.) One set of normally open alarm initiation contacts for connection to an initiating device circuit on a fire alarm control panel.
 - (2.) Two Form-C auxiliary alarm relays for interface with rooftop unit or other equipment.
 - (3.) One Form-C supervision (trouble) relay to control the operation of the Trouble LED on a remote test/reset station.
 - (4.) Capable of direct connection to two individual detector modules.
 - (5.) Can be wired to up to 14 other duct smoke detectors for multiple fan shutdown applications

24. Winter start kit
 - a. Shall contain a bypass device around the low pressure switch.
 - b. Shall be required when mechanical cooling is required down to 25°F (-4°C).
 - c. Shall not be required to operate on an economizer when below an outdoor ambient of 40°F (4°C).
25. Time Guard
 - a. Shall prevent compressor short-cycling by providing a 5-minute delay (± 2 minutes) before restarting a compressor after shutdown for any reason.
 - b. One device shall be required per compressor.
26. Disconnect Switch Bracket (16 size only)
 - a. Provides a pre-engineered and sized mounting bracket for applications requiring a unit mounted fused and non-fused disconnect of greater than 100 amps. Bracket assures that no damage will occur to coils when mounting with screws and other fasteners.
27. California OSHPD Seismic Certification Label
 - a. Units meet the seismic capacity requirements of the International Code Council Evaluation Service (ICC-ES) document AC156 (Acceptance Criteria for Seismic Qualification by Shake-Table Testing of Nonstructural Components and Systems) and per International Building Code (IBC 2009) at an SDS (g) value of 2.00 $z/h=1.0$, $I_p=1.5$ and certified by independent structural engineers.
 - b. Units shall include a certification label that meets the CA OSHPD Special Seismic Certification pre-approval labeling requirements on the external chassis of the unit.
28. Hinged Access Panels
 - a. Shall provide easy access through integrated quarter turn latches.
 - b. Shall be on major panels of: filter, control box, fan motor, and compressor.
29. Display Kit for Variable Frequency Drive
 - a. Kit allows the ability to access the VFD controller programs to provide special setup capabilities and diagnostics.
 - b. Kit contains display module, mounting bracket and communication cable.
 - c. Display Kit can be permanently installed in the unit or used on any SAV system VFD controller as needed.

