Solicitation Response(SR) **Dept:** 0310 **ID:** ESR02152300000003812 **Ver.:** 1 **Function:** New **Phase:** Final

Modified by batch , 02/15/2023

Header 6

General Information | Contact | Default Values | Discount | Document Information | Clarification Request

Procurement Folder:
1163250

Procurement Type:
Agency Purchase Order

Vendor ID:
000000201569

Legal Name:
POWELL INC

Alias/DBA:

Total Bid:
$384,000.00

Response Date:
02/15/2023

Response Time:
10:34

Responded By User ID:
Powellinco

First Name:
Kristin

Last Name:
Howell

Email:
powellinco@yahoo.com

Phone:
304-621-7494

SO Doc Code:
ARFQ

SO Dept:
0310

SO Doc ID:
DNR2300000011

Published Date:
2/3/23

Close Date:
2/15/23

Close Time:
13:30

Status:
Closed

Solicitation Description:
Addendum No.01 - Wildlife: HVAC Renovation Elkins Operations

Total of Header Attachments:
6

Total of All Attachments:
6

State of West Virginia
Agency Request for Quote
Construction

Proc Folder: 1163250		**Reason for Modification:**
Doc Description: Wildlife: HVAC Renovation at Elkins Operations Center		
Proc Type: Agency Purchase Order		

Date Issued	Solicitation Closes	Solicitation No	Version
2023-01-13	2023-02-15 13:30	ARFQ 0310 DNR2300000011	1

BID RECEIVING LOCATION

BID RESPONSE
DIVISION OF NATURAL RESOURCES
PROPERTY & PROCUREMENT OFFICE
324 4TH AVE
SOUTH CHARLESTON WV 25303-1228
US

VENDOR

Vendor Customer Code: 0000003015609
Vendor Name : Powell Inc
Address :
Street : 170 Stringtown Rd
City : Belington
State : WV **Country :** USA **Zip :** 26250
Principal Contact : Carl Allen
Vendor Contact Phone: 304.621.7494 **Extension:**

FOR INFORMATION CONTACT THE BUYER
James H Adkins
(304) 558-3397
jamie.h.adkins@wv.gov

Vendor Signature X  **FEIN#** 55-0490737 **DATE** 2/15/23

All offers subject to all terms and conditions contained in this solicitation

State of West Virginia
Agency Request for Quote
Construction

Proc Folder: 1163250	**Reason for Modification:**
Doc Description: Addendum No.01 - Wildlife: HVAC Renovation Elkins Operations	Addendum Addendum No. 01 is issued to publish and distribute the attached information to the Vendor Community.
Proc Type: Agency Purchase Order	

Date Issued	Solicitation Closes	Solicitation No	Version
2023-02-03	2023-02-15 13:30	ARFQ 0310 DNR2300000011	2

BID RECEIVING LOCATION

BID RESPONSE
DIVISION OF NATURAL RESOURCES
PROPERTY & PROCUREMENT OFFICE
324 4TH AVE
SOUTH CHARLESTON WV 25303-1228
US

VENDOR

Vendor Customer Code: 0000002015169
Vendor Name : Powell Inc
Address :
Street : 170 Stringtown Rd
City : Belington
State : WV **Country :** USA **Zip :** 26250
Principal Contact : Carl Allen
Vendor Contact Phone: 304-621-7494 **Extension:**

FOR INFORMATION CONTACT THE BUYER
James H Adkins
(304) 558-3397
jamie.h.adkins@wv.gov

Vendor Signature X [signature] **FEIN#** 55-0490737 **DATE** 2/15/23

All offers subject to all terms and conditions contained in this solicitation

ADDITIONAL TERMS AND CONDITIONS (Construction Contracts Only)

1. CONTRACTOR'S LICENSE: W. Va. Code § 21-11-2 requires that all persons desiring to perform contracting work in this state be licensed. The West Virginia Contractors Licensing Board is empowered to issue the contractor's license. Applications for a contractor's license may be made by contacting the West Virginia Division of Labor. W. Va. Code § 21-11-11 requires any prospective Vendor to include the contractor's license number on its bid. If an apparent low bidder fails to submit a license number in accordance with this section, the Property and Procurement Office will promptly request by telephone and electronic mail that the low bidder and the second low bidder provide the license number within one business day of the request. Failure of the bidder to provide the license number within one business day of receiving the request shall result in disqualification of the bid. Vendors should include a contractor's license number in the space provided below.

Contractor's Name: Powell Inc

Contractor's License No.: WV- 003726

The apparent successful Vendor must furnish a copy of its contractor's license prior to the issuance of a contract award document.

2. DRUG-FREE WORKPLACE AFFIDAVIT: W. Va. Code § 21-1D-5 provides that any solicitation for a public improvement contract requires each Vendor that submits a bid for the work to submit an affidavit that the Vendor has a written plan for a drug-free workplace policy. If the affidavit is not submitted with the bid submission, the Property and Procurement Office shall promptly request by telephone and electronic mail that the low bidder and second low bidder provide the affidavit within one business day of the request. Failure to submit the affidavit within one business day of receiving the request shall result in disqualification of the bid. To comply with this law, Vendor should complete the enclosed drug-free workplace affidavit and submit the same with its bid. Failure to submit the signed and notarized drugfree workplace affidavit or a similar affidavit that fully complies with the requirements of the applicable code, within one (1) business day of being requested to do so shall result in disqualification of Vendor's bid. Pursuant to W. Va. Code 21-1D-2(b) and (k), this provision does not apply to public improvement contracts the value of which is $100,000 or less or temporary or emergency repairs.

2.1. DRUG-FREE WORKPLACE POLICY: Pursuant to W. Va. Code § 21-1D-4, Vendor and its subcontractors must implement and maintain a written drug-free workplace policy that complies with said article. The awarding public authority shall cancel this contract if: (1) Vendor fails to implement and maintain a written drug-free workplace policy described in the preceding paragraph, (2) Vendor fails to provide information regarding implementation of its drug-free workplace policy at the request of the public authority; or (3) Vendor provides to the public authority false information regarding the contractor's drug-free workplace policy.

Pursuant to W. Va. Code 21-1D-2(b) and (k), this provision does not apply to public improvement contracts the value of which is $100,000 or less or temporary or emergency repairs.

3. DRUG FREE WORKPLACE REPORT: Pursuant to W. Va. Code § 21-1D-7b, no less than once per year, or upon completion of the project, every contractor shall provide a certified report to the public authority which let the contract. For contracts over $25,000, the public authority shall be

Subcontractor List Submission (Construction Contracts Only)

Bidder's Name: Powell Inc.

☒ Check this box if no subcontractors will perform more than $25,000.00 of work to complete the project.

Subcontractor Name	License Number if Required by W. Va. Code § 21-11-1 et. seq.

Attach additional pages if necessary.

DESIGNATED CONTACT: Vendor appoints the individual identified in this Section as the Contract Administrator and the initial point of contact for matters relating to this Contract.

Carl Allen President
(Name, Title)

Carl Allen President
(Printed Name and Title)

170 Stringtown Rd Belington WV 26250
(Address)

304-621-7494
(Phone Number) / (Fax Number)

Powellinco@yahoo.com
(email address)

CERTIFICATION AND SIGNATURE: By signing below, or submitting documentation through wvOASIS, I certify that I have reviewed this Solicitation in its entirety; that I understand the requirements, terms and conditions, and other information contained herein; that this bid, offer or proposal constitutes an offer to the State that cannot be unilaterally withdrawn; that the product or service proposed meets the mandatory requirements contained in the Solicitation for that product or service, unless otherwise stated herein; that the Vendor accepts the terms and conditions contained in the Solicitation, unless otherwise stated herein; that I am submitting this bid, offer or proposal for review and consideration; that I am authorized by the vendor to execute and submit this bid, offer, or proposal, or any documents related thereto on vendor's behalf; that I am authorized to bind the vendor in a contractual relationship; and that to the best of my knowledge, the vendor has properly registered with any State agency that may require registration.

Powell Inc.
(Company)

Carl Allen President
(Authorized Signature) (Representative Name, Title)

Carl Allen President
(Printed Name and Title of Authorized Representative)

2/15/23
(Date)

304-621-7494
(Phone Number) (Fax Number)

14. MISCELLANEOUS:

14.1. Contract Manager: During its performance of this Contract, Vendor must designate and maintain a primary contract manager responsible for overseeing Vendor's responsibilities under this Contract. The Contract manager must be available during normal business hours to address any customer service or other issues related to this Contract. Vendor should list its Contract manager and his or her contact information below.

Contract Manager: Carl Allen

Telephone Number: 304-621-7494

Fax Number: N/A

Email Address: powellinco@yahoo.com

14.2. Owner's Representative: Owner's representative for notice purposes is

Name: Barrow Koslosky

Telephone Number: 304 558 2764

Fax Number: 304 558 0077

Email Address: barrow.a.koslosky@wv.gov

15. Initial Decision Maker: Craig Miller, PE, shall serve as the Initial Decision Maker in matters relating to this contract.

EXHIBIT A – PRICING PAGE
Wildlife Resources Section
Elkins Operation Center HVAC Renovation

Name of Vendor:	Powell Inc
Address of Vendor:	170 Stringtown Rd Bellington WV 26250
Phone Number of Vendor:	304-621-7494

We, the undersigned, having examined the site and being familiar with the local conditions affecting the cost of the work and also being familiar with the general conditions to vendors, drawings, and specifications, hereby proposes to furnish all materials, equipment, and labor to complete all work in a workmanlike manner, as described in the Bidding documents.

Base Bid

The Base Bid shall consist of construction of the facility and related work described in the drawings and specifications. **Total Base Bid** shall be indicated in the space below.

Total Base Bid: Lump sum for all labor, materials, and equipment as stipulated in the Bidding Documents, *written in figures*.	$384,000.00
Total Base Bid: Lump sum for all labor, materials, and equipment as stipulated in the Bidding Documents, *written in words.*	Three hundred eighty four thousand dollars and zero cents

STATE OF WEST VIRGINIA
Purchasing Division

PURCHASING AFFIDAVIT

CONSTRUCTION CONTRACTS: Under W. Va. Code § 5-22-1(i), the contracting public entity shall not award a construction contract to any bidder that is known to be in default on any monetary obligation owed to the state or a political subdivision of the state, including, but not limited to, obligations related to payroll taxes, property taxes, sales and use taxes, fire service fees, or other fines or fees.

ALL CONTRACTS: Under W. Va. Code §5A-3-10a, no contract or renewal of any contract may be awarded by the state or any of its political subdivisions to any vendor or prospective vendor when the vendor or prospective vendor or a related party to the vendor or prospective vendor is a debtor and: (1) the debt owed is an amount greater than one thousand dollars in the aggregate; or (2) the debtor is in employer default.

EXCEPTION: The prohibition listed above does not apply where a vendor has contested any tax administered pursuant to chapter eleven of the W. Va. Code, workers' compensation premium, permit fee or environmental fee or assessment and the matter has not become final or where the vendor has entered into a payment plan or agreement and the vendor is not in default of any of the provisions of such plan or agreement.

DEFINITIONS:

"Debt" means any assessment, premium, penalty, fine, tax or other amount of money owed to the state or any of its political subdivisions because of a judgment, fine, permit violation, license assessment, defaulted workers' compensation premium, penalty or other assessment presently delinquent or due and required to be paid to the state or any of its political subdivisions, including any interest or additional penalties accrued thereon.

"Employer default" means having an outstanding balance or liability to the old fund or to the uninsured employers' fund or being in policy default, as defined in W. Va. Code § 23-2c-2, failure to maintain mandatory workers' compensation coverage, or failure to fully meet its obligations as a workers' compensation self-insured employer. An employer is not in employer default if it has entered into a repayment agreement with the Insurance Commissioner and remains in compliance with the obligations under the repayment agreement.

"Related party" means a party, whether an individual, corporation, partnership, association, limited liability company or any other form or business association or other entity whatsoever, related to any vendor by blood, marriage, ownership or contract through which the party has a relationship of ownership or other interest with the vendor so that the party will actually or by effect receive or control a portion of the benefit, profit or other consideration from performance of a vendor contract with the party receiving an amount that meets or exceed five percent of the total contract amount.

AFFIRMATION: By signing this form, the vendor's authorized signer affirms and acknowledges under penalty of law for false swearing (*W. Va. Code* §61-5-3) that: (1) for construction contracts, the vendor is not in default on any monetary obligation owed to the state or a political subdivision of the state, and (2) for all other contracts, that neither vendor nor any related party owe a debt as defined above and that neither vendor nor any related party are in employer default as defined above, unless the debt or employer default is permitted under the exception above.

WITNESS THE FOLLOWING SIGNATURE:

Vendor's Name: Powell Inc

Authorized Signature: _____ Date: 2/15/23

State of WV

County of Barbour, to-wit:

Taken, subscribed, and sworn to before me this 15th day of February, 2023.

My Commission expires June 3, 2026.

AFFIX SEAL HERE

OFFICIAL SEAL
STATE OF WEST VIRGINIA
NOTARY PUBLIC
KRISTIN HOWELL
170 Stringtown Road Belington WV 26250
My Commission Expires:06/03/26

NOTARY PUBLIC Kristin Howell

WV-73
Approved / April 30, 2020

State of West Virginia
DRUG FREE WORKPLACE CONFORMANCE AFFIDAVIT
West Virginia Code §21-1D-5

I, Carl Allen, after being first duly sworn, depose and state as follows:

1. I am an employee of Powell Inc (Company Name); and,

2. I do hereby attest that Powell Inc (Company Name)

maintains a written plan for a drug-free workplace policy and that such plan and policy are in compliance with ***West Virginia Code*** §21-1D.

The above statements are sworn to under the penalty of perjury.

Printed Name: Carl Allen

Signature: [signature]

Title: President

Company Name: Powell Inc

Date: 2/15/23

STATE OF WEST VIRGINIA,

COUNTY OF Banaar, TO-WIT:

Taken, subscribed and sworn to before me this 15th day of February, 2023.

By Commission expires June 3, 2026

(Seal)

OFFICIAL SEAL
STATE OF WEST VIRGINIA
NOTARY PUBLIC
KRISTIN HOWELL
170 Stringtown Road Belington WV 26250
My Commission Expires:06/03/26

Kristin Howell
(Notary Public)

Rev. July 7, 2017

ADDENDUM ACKNOWLEDGEMENT FORM
SOLICITATION NO.: ARFQ DNR23*11

Instructions: Please acknowledge receipt of all addenda issued with this solicitation by completing this addendum acknowledgment form. Check the box next to each addendum received and sign below. Failure to acknowledge addenda may result in bid disqualification.

Acknowledgment: I hereby acknowledge receipt of the following addenda and have made the necessary revisions to my proposal, plans and/or specification, etc.

Addendum Numbers Received:
(Check the box next to each addendum received)

- [x] Addendum No. 1
- [ ] Addendum No. 2
- [ ] Addendum No. 3
- [ ] Addendum No. 4
- [ ] Addendum No. 5
- [ ] Addendum No. 6
- [ ] Addendum No. 7
- [ ] Addendum No. 8
- [ ] Addendum No. 9
- [ ] Addendum No. 10

I understand that failure to confirm the receipt of addenda may be cause for rejection of this bid. I further understand that any verbal representation made or assumed to be made during any oral discussion held between Vendor's representatives and any state personnel is not binding. Only the information issued in writing and added to the specifications by an official addendum is binding.

Powell Inc
Company

Authorized Signature

2/15/23
Date

NOTE: This addendum acknowledgement should be submitted with the bid to expedite document processing.

POWEINC-01 SMETZ

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY) 2/10/2023

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER
Arthur Krenzel Lett Insurance Group
3327 Winfield Rd.
Winfield, WV 25213

CONTACT NAME: Suzanne Metz
PHONE (A/C, No, Ext):
FAX (A/C, No):
E-MAIL ADDRESS: smetz@aklinsurance.com

INSURER(S) AFFORDING COVERAGE	NAIC #
INSURER A : Erie Insurance P&C (WV)	26830
INSURER B : NorthStone Insurance Company	13045
INSURER C :	
INSURER D :	
INSURER E :	
INSURER F :	

INSURED
Powell, Inc.
PO Box 306
Barboursville, WV 25504

COVERAGES **CERTIFICATE NUMBER:** **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS		
A	X COMMERCIAL GENERAL LIABILITY CLAIMS-MADE X OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: X POLICY PRO-JECT LOC OTHER:			Q43-5150108	7/1/2022	7/1/2023	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG	$ $ $ $ $ $	1,000,000 1,000,000 5,000 1,000,000 2,000,000 2,000,000
A	AUTOMOBILE LIABILITY X ANY AUTO OWNED AUTOS ONLY SCHEDULED AUTOS HIRED AUTOS ONLY NON-OWNED AUTOS ONLY			Q07-5140025	7/1/2022	7/1/2023	COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident)	$ $ $ $	1,000,000
A	X UMBRELLA LIAB X OCCUR EXCESS LIAB CLAIMS-MADE DED RETENTION $			Q31-5170019	7/1/2022	7/1/2023	EACH OCCURRENCE AGGREGATE	$ $	4,000,000 4,000,000
B	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) Y/N N N/A If yes, describe under DESCRIPTION OF OPERATIONS below			WCN6007904	12/3/2022	12/3/2023	X PER STATUTE OTH-ER E.L. EACH ACCIDENT E.L. DISEASE - EA EMPLOYEE E.L. DISEASE - POLICY LIMIT	$ $ $	1,000,000 1,000,000 1,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)
Proof of coverage.

CERTIFICATE HOLDER

State of WV-Division of Natural Resources
Parks & Recreation-PEM section 324 4th Ave
Charleston, WV 25305

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE
Suzanne Metz

Bid Date: 2/15/2023

THE AMERICAN INSTITUTE OF ARCHITECTS

AIA Document A310

Bid Bond

KNOW ALL MEN BY THESE PRESENTS, that we Powell Inc

170 Stringtown Road, Belington, WV 26250
(Here insert full name and address or legal title of Contractor)

as Principal, hereinafter called the Principal, and **RLI Insurance Company**
(Here insert full name and address or legal title of Surety)
9025 N. Lindbergh Dr. Peoria, IL 61615
P.O. Box 3967 Peoria, IL 61612-3967

a corporation duly organized under the laws of the State of Illinois
as Surety, hereinafter called the Surety, are held and firmly bound unto
State of West Virginia Division of Natural Resources
(Here insert full name and address or legal title of Owner)

324 4th Avenue, South Charleston, WV 25305

as Obligee, hereinafter called the Obligee, in the sum of
Four Hundred Twenty Five Thousand and 00/100
Dollars (425,000), for the payment of which sum well and truly to be made, the said Principal and the said Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted a bid for HVAC System Removal and Replacement
(Here insert full name and address and description of project)

NOW, THEREFORE, if the Obligee shall accept the bid of the Principal and the Principal shall enter into a Contract with the Obligee in accordance with the terms of such bid, and give such bond or bonds as may be specified in the bidding or Contract Documents with good and sufficient surety for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof, or in the event of the failure of the Principal to enter such Contract and give such bond or bonds, if the Principal shall pay to the Obligee the difference not to exceed the penalty hereof between the amount specified in said bid and such larger amount for which the Obligee may in good faith contact with another party to perform the Work covered by said bid, then this obligation shall be null and void; otherwise to remain in full force and effect.

Signed and sealed this 13 day of February, 2023.

Powell Inc
(Principal) *(Seal)*

RLI Insurance Company
(Surety) *(Seal)*

Michael Cvechko — Attorney in Fact

POWER OF ATTORNEY

RLI Insurance Company
Contractors Bonding and Insurance Company

9025 N. Lindbergh Dr. Peoria, IL 61615
Phone: 800-645-2402

Know All Men by These Presents:

That this Power of Attorney is not valid or in effect unless attached to the bond which it authorizes executed, but may be detached by the approving officer if desired.

That **RLI Insurance Company** and/or **Contractors Bonding and Insurance Company**, each an Illinois corporation, (separately and together, the "Company") do hereby make, constitute and appoint:

Michael A. Cvechko, Deborah K. Keene, jointly or severally

in the City of Philippi, State of West Virginia its true and lawful Agent(s) and Attorney(s) in Fact, with full power and authority hereby conferred, to sign, execute, acknowledge and deliver for and on its behalf as Surety, in general, any and all bonds and undertakings in an amount not to exceed **Twenty Five Million** Dollars (**$25,000,000.00**) for any single obligation.

The acknowledgment and execution of such bond by the said Attorney in Fact shall be as binding upon the Company as if such bond had been executed and acknowledged by the regularly elected officers of the Company.

RLI Insurance Company and/or **Contractors Bonding and Insurance Company**, as applicable, have each further certified that the following is a true and exact copy of a Resolution adopted by the Board of Directors of each such corporation, and is now in force, to-wit:

> "All bonds, policies, undertakings, Powers of Attorney or other obligations of the corporation shall be executed in the corporate name of the Company by the President, Secretary, any Assistant Secretary, Treasurer, or any Vice President, or by such other officers as the Board of Directors may authorize. The President, any Vice President, Secretary, any Assistant Secretary, or the Treasurer may appoint Attorneys in Fact or Agents who shall have authority to issue bonds, policies or undertakings in the name of the Company. The corporate seal is not necessary for the validity of any bonds, policies, undertakings, Powers of Attorney or other obligations of the corporation. The signature of any such officer and the corporate seal may be printed by facsimile."

IN WITNESS WHEREOF, the **RLI Insurance Company** and/or **Contractors Bonding and Insurance Company**, as applicable, have caused these presents to be executed by its respective Vice President with its corporate seal affixed this 24th day of August, 2021.

CONTRACTORS BONDING AND INSURANCE COMPANY CORPORATE SEAL ILLINOIS

RLI INSURANCE COMPANY CORPORATE SEAL ILLINOIS

RLI Insurance Company
Contractors Bonding and Insurance Company

By: B. H. W. D.
Barton W. Davis — Vice President

State of Illinois }
County of Peoria } SS

On this 24th day of August, 2021, before me, a Notary Public, personally appeared Barton W. Davis, who being by me duly sworn, acknowledged that he signed the above Power of Attorney as the aforesaid officer of the **RLI Insurance Company** and/or **Contractors Bonding and Insurance Company** and acknowledged said instrument to be the voluntary act and deed of said corporation.

By: Catherine D. Glover
Catherine D. Glover — Notary Public

CATHERINE D. GLOVER
OFFICIAL SEAL
Notary Public - State of Illinois
My Commission Expires
March 24, 2024

CERTIFICATE

I, the undersigned officer of **RLI Insurance Company** and/or **Contractors Bonding and Insurance Company**, do hereby certify that the attached Power of Attorney is in full force and effect and is irrevocable; and furthermore, that the Resolution of the Company as set forth in the Power of Attorney, is now in force. In testimony whereof, I have hereunto set my hand and the seal of the **RLI Insurance Company** and/or **Contractors Bonding and Insurance Company** this 13 day of February, 2023.

RLI Insurance Company
Contractors Bonding and Insurance Company

By: Jeffrey D Fick
Jeffrey D Fick — Corporate Secretary

West Virginia
Offices of the Insurance Commissioner

Certificate of Authority

Whereas, **RLI INSURANCE COMPANY ,** domiciled in the State of **Illinois**, has complied with all the requirements of the laws of this State so as to entitle it to transact its appropriate business in the State of West Virginia.

Therefore, I the undersigned, Insurance Commissioner of the State of West Virginia, pursuant to the authority vested in me by the laws of this State, do hereby authorize it to transact the business of insurance as defined in Chapter 33

Marine - Article 1, Section 10(d)
Surety - Article 1, Section 10(f)(1)
Accident & Sickness - Article 1, Section 10(b)
Fire - Article 1, Section 10(c)
Casualty - Article 1, Section 10(e)
Surety - Article 1, Section 10(f)(2)
Surety - Article 1, Section 10(f)(3)
Casualty - Article 1, Section 10(e)(14)

of the 1931 Code of West Virginia as amended, in the State of West Virginia in accordance with the laws thereof until midnight on the 31st day of May, 2022, unless this license be sooner revoked. Pursuant to W. Va. Code §33-3-2(c), the above authorization does not allow the insurer to transact a kind of insurance in this State unless duly authorized or qualified to transact such insurance in the state or country of its domicile.

In Testimony Whereof, I have hereunto set my hand and affixed my seal of office at the City of Charleston this 1st day of June, 2021.

James A. Dodrill
Insurance Commissioner

NAIC # 13056
SBS Company # 109404216

CONTRACTOR LICENSE

AUTHORIZED BY THE

West Virginia Contractor Licensing Board

NUMBER: WV003726

CLASSIFICATION:

ELECTRICAL
HEATING, VENTILATING & COOLING
PLUMBING

POWELL INC
DBA POWELL INC
170 STRINGTOWN RD
BELINGTON, WV 26250

DATE ISSUED	EXPIRATION DATE
OCTOBER 18, 2022	OCTOBER 18, 2023

Authorized Signature

Chair, West Virginia Contractor Licensing Board

WEST VIRGINIA CONTRACTOR LICENSING BOARD

A copy of this license must be readily available for inspection by the Board on every job site where contracting work is being performed. This license number must appear in all advertisements, on all bid submissions, and on all fully executed and binding contracts. This license is non-transferable. This license is being issued under the provisions of West Virginia Code, Chapter 30, Article 42.

DRUG-FREE WORKPLACE POLICY

Powell Inc. intends to help provide a safe and drug-free work environment for our clients and out employees. With this goal in mind and because of the serious drug abuse problem in today's workplace, we are establishing the following policy for existing and future employees of Powell Inc.

The Company explicitly prohibits:

- The use, possession, solicitation for, or sale of narcotics or other illegal drugs, alcohol, or prescription medication without a prescription on Company or customer premises or while performing an assignment.
- Being impaired or under the influence of legal or illegal drugs or alcohol away from the Company or customer premises, if such impairment or influence adversely affects the employee's work performance, the safety of the employee or of others, or puts at risk the Company's reputation.
- Possession, use, solicitation for, or sale of legal or illegal drugs or alcohol away from the company or customer premises, if such activity or involvement adversely affects the employee's work performance, the safety of the employee or of others, or puts at risk the Company's reputation.
- The presence of any detectable amount of prohibited substances in the employee's system while at work, while on the premises of the company or its customers, or while on company business. "Prohibited substances" include illegal drugs, alcohol, or prescription drugs not taken in accordance with a prescription given to the employee.

The Company will conduct drug and/or alcohol testing under any of the following circumstances:

- RANDOM TESTING: Employees may be selected at random for drug and /or alcohol testing at any interval determined by the Company.
- FOR-CAUSE TESTING: The Company may ask an employee to submit to a drug and/or alcohol test at any time it feels that the employee may be under the influence of drugs or alcohol, including, but not limited to, the following circumstances: evidence of drugs or alcohol on or about the employee's person or in the employee's vicinity, unusual conduct on the employee's part that suggest impairment or influence of drugs or alcohol, negative performance patterns, or excessive and unexplained absenteeism or tardiness.
- POST-ACCIDENT TESTING: Any employee involved in an on-the-job accident or injury under circumstances that suggest possible use or influence of drugs or alcohol in the accident or injury event may be asked to submit to a drug and/or alcohol test. "Involved in an on-the-job accident or injury" means not only the one who was or could have been injured, but also any employee who potentially contributed to the accident or injury event in any way.

If an employee is tested for drugs or alcohol outside of the employment context and the results indicate a violation of this policy, or if an employee refuses a request to submit to testing under this policy, the employee may be subject to appropriate disciplinary action, up to and possibly including discharge from employment. In such a case, the employee will be given an opportunity to explain the circumstances prior to any final employment action becoming effective.

PROJECT

WVDNR ELKINS OPERATIONS CENTER

SPEC SECTION

23-0923

DIRECT DIGITAL CONTROL SYSTEM FOR HVAC

OWNER

STATE OF WV - DIVISION OF NATURAL RESOURCES

ARCHITECT

MILLER ENGINEERING, INC.

TABLE OF CONTENTS

TEMPERATURE

EXECUTIVE STYLE THERMISTOR AND RTD SENSORS

*ST-S*E, ST-S*EW SERIES*

DESCRIPTION

The **Precon Model ST-S*E** and **ST-S*EW Executive Thermistor and RTD Sensor** provides precision room temperature sensing for building automation systems in beige or white respectively. The active sensing element is made of a highly stable, precision thermistor material or platinum RTD.

FEATURES

- ***Lifetime warranty***
- ***±0.36°F (±0.2°C) thermistor accuracy***
- ***±0.27°F (±0.15°C) or ±0.54°F (±0.30°C) RTD accuracy***
- ***Ultra high accuracy optional***
- ***Wide selection of thermistor or RTD curves***
- ***Vented housing for quick temperature response***
- ***Adaptable with many options***
- ***Traditional beige or white covers***
- ***Durable plastic housing and base plate***
- ***Easy to mount to wall or electrical box***

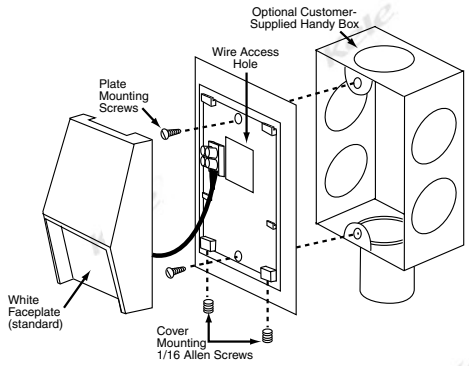
ST-S*EW

ST-S*E-XA-XME-XTA

TYPICAL MOUNTING

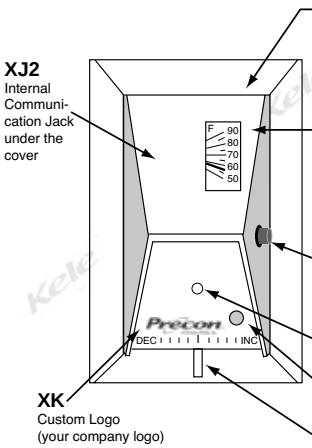
Toggle bolts or other direct wall-mount screws can be used where conduit is not required. Adapters are not required when mounting directly to electrical outlet boxes.

Basic model comes with screw terminal block, white decorator faceplate, two #6-32 screws for handybox mounting, and two #6 x 1" screws for direct wall mounting. Cover screws are #6-32 with a 1/16" allen key head.



The sensor should be mounted approximately 5' (12.7 cm) above the floor, on an interior wall, away from any heating or cooling generating devices.

TYPICAL COVER WITH MULTIPLE OPTIONS



SPECIFICATIONS

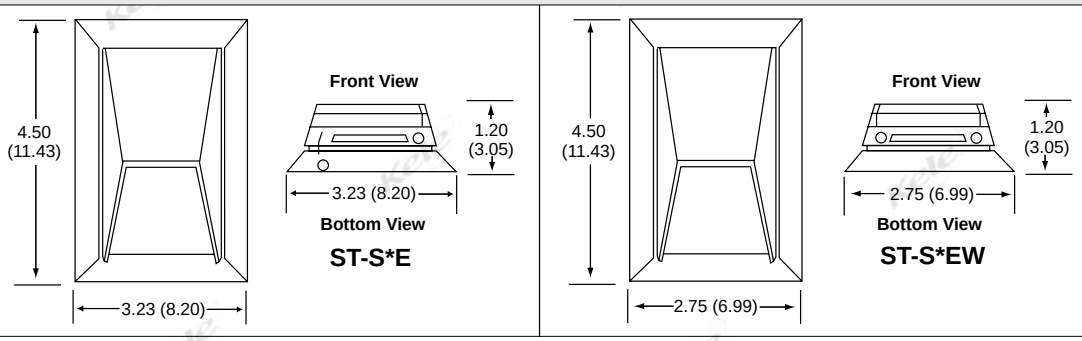
Accuracy	
Thermistor	±0.36°F (0.2°C)
RTD	
Type 63	±0.72°F (0.40°C)
Type 71	+/-0.0774°F (0.043°C)
Type 81, 85	±0.27°F (0.15°C)
Type 91	±0.54°F (0.30°C)
Sensor Type	
Thermistor	2.252 kΩ, 3 kΩ, 10 kΩ Type II, III & III w/11K shunt, 20 kΩ, 100 kΩ
RTD	
Type 63	1000Ω Nickel
Type 71, 81	100Ω PT 385 Curve
Type 85	1000Ω Pt 385 Curve
Type 91	1000Ω Pt 375 Curve
Temperature Range	
Thermistor/RTD	-40° to 221°F (-40° to 105°C)

Temperature Coefficient	
Thermistor	Negative temperature coefficient
RTD	Positive temperature coefficient
Temperature Stability	
Thermistor	0.24°F (0.13°C) over five years
RTD	Max 0.04% after 1k hours @ 500 °C
Heat Dissipation	2.7 mW/°C (power needed to raise the temperature by 1°C)
Enclosure Rating	
ST-S*E	NEMA 1, Beige plastic with tan metal face plate
ST-S*EW	
Mounting	Directly to wall or single gang box
Wiring Terminations	Terminals
Weight	0.15 lb (0.07 Kg)
Approvals	CE
Warranty	Lifetime

EXECUTIVE STYLE THERMISTOR AND RTD SENSORS

*ST-S*E, ST-S*EW SERIES*

DIMENSIONS



ORDERING INFORMATION

MODEL	DESCRIPTION
ST-S3	10,000Ω executive thermistor @ 77°F (25°C), Type III (gray leads)
ST-S11K	10,000Ω executive thermistor @ 77°F (25°C), Type III with 11K shunt (gray leads)
ST-S21	2252Ω executive thermistor @ 77°F (25°C), Type II (green leads)
ST-S22	3000Ω executive thermistor @ 77°F (25°C), Type II (blue leads)
ST-S24	10,000Ω executive thermistor @ 77°F (25°C), Type II (yellow leads)
ST-S27	100,000Ω executive thermistor @ 77°F (25°C), Type II (gray leads)
ST-S42	20,000Ω executive thermistor @ 77°F (25°C), Type IV (green leads)
ST-S63	1000Ω nickel executive RTD @ 32°F (0°C), (yellow leads)
ST-S71	100Ω ultra high accurate executive RTD @ 32°F (0°C), 385 platinum curve (blue leads)
ST-S81	100Ω executive RTD @ 32°F (0°C), 385 platinum curve (yellow leads)
ST-S85	1000Ω executive RTD @ 32°F (0°C), 385 platinum curve (blue leads)
ST-S91	1000Ω executive RTD @ 32°F (0°C), 375 platinum curve (green leads)

E	Executive beige enclosure with wide back plate
EW	Executive white enclosure with narrow back plate
OPTIONS (List options in alphabetical order with dashes)	
XA *	Setpoint adjustment (10,000Ω to 35,000Ω, resistance input)
XA10K *	Setpoint adjustment (1,000Ω to 3,000Ω, resistance input)
XA2K *	Setpoint adjustment (920Ω to 1,278Ω, resistance input)
XD	Dual sensors
XGR	Gray decorator faceplate (tan is standard)
XJ1 *	RJ11 externally-accessible communication jack (CCRJ11AD required)
XJ2 *	Internal RJ11 communication jack
XK	Custom Logo
XM **	Momentary switch wired N.O. to terminal block
XME	Membrane momentary switch wired only N.O. to terminal block, tan faceplate only
XMP	Membrane push button switch (XME) with terminals for separate button termination
XN	Certificate of conformance
XN1	NIST certificate, one reference point 32°F (0°C)
XN2	NIST certificate, two reference points 32°F/158°F (0°C/70°C)
XN3	NIST certificate, three reference points 32°F/77°F/158°F (0°C/25°C/70°C)
XP	Matched sensor pair, matched to ±0.1°F, 0.05°C (must order two sensors)
XPA	Ultra high accuracy, thermistors only, ±0.135˚F (0.075˚C) (not available w/ EW models)
XPL *	Red LED lamp externally powered 24VAC/VDC (not available w/ EW models)
XTA ▲	Analog temperature display , 50 to 90°F ± 1°F
XZ ▲	Three wire RTD connections (Optional only on Type 81, standard on Type 71)

ST-S3 – E – XA – XTA

Example: **ST-S3-E-XA-XTA** 10,000Ω Type III executive sensor zone with setpoint adjustment and analog display

* Circuit board option | ** Cannot be mounted in conjunction with *options | ▲ Not available on EW housing

RELATED PRODUCTS

10-531	White adaptor plate 7" x 5.25" (KTR,KHR)
CC-RJ11AD	Adapter cable for XJ1 option with female RJ11 8-pin connector
KT1	Mounting screwdriver 1/16" allen key
T81U-XR	100 ohm, Type 81 4-20 mA temperature transmitter, custom rangeable
T85U-XR	1000 ohm, Type 85 4-20 mA temperature transmitter, custom rangeable
T91U-XR	1000 ohm, Type 91 4-20 mA temperature transmitter, custom rangeable

TZ100-LX User Room Sensor

ONYXX® LX-TZ | PRODUCT DATA SHEET

Designed and assembled in Canada

Description

- ✓ Room user digital IAQ sensor complementary to the controllers from the Onyxx LX product line
- ✓ Displays user data and information such as time, temperature, and requests for heating and cooling through a backlit LCD display
- ✓ Communicates to the controllers using a proprietary RS-485 protocol. Up to 3 TZ100-LX or TZ200-LX room sensors per controller can be wired when used with the Onyxx LX controllers
- ✓ Has a local BACnet MS/TP USB port for network access
- ✓ Requires an Onyxx LX USB to RS-485 to view/configure devices on the trunk with Onyxx LX UI
- ✓ To order use part number: **TZ100-LX**

Application

This sensor is designed to facilitate simple user interactions typically used in the HVAC industry for terminal equipment control. It allows powerful yet flexible solutions that can be tailored and sized according to any project need.

Technical Specifications

POWER SUPPLY
24 Vac/dc ± 15%

CURRENT CONSUMPTION
1.0 VA room sensor only

MICROPROCESSOR
STM32 (ARM CortexTM M3)
32 bits, 64 MHz

MEMORY
Flash: 64 KB non-volatile
RAM: 10 KB

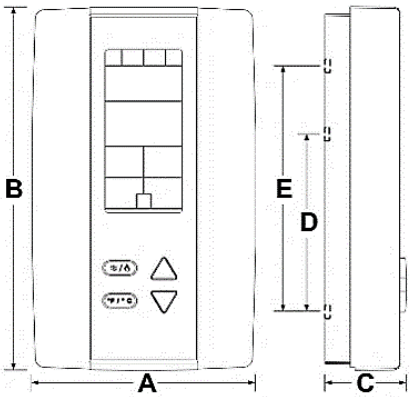
EXTERNAL CONNECTIONS
Mini USB Type-A connector allows local access to the MS/TP network.
Requires the USB to RS-485 adapter: USB-MSTP-LX.

BACKLIGHT DISPLAY / LCD
Multi-HVAC system symbols, time display, 4 segment main numeric display with one decimal

COMMUNICATION PROTOCOLS
Proprietary RS-485 protocol to controller

BAUD RATE TO CONTROLLER
9600, 19200, 38400, 76800 default, 115200, 230400 & 460800 Bps

ROOM SENSOR ADDRESSING
Via DIP switch



DIMENSIONS
B 123 mm x A 73 mm x 24 mm
B 4.85 in. x A 2.85 in. x 1.0 in.

WIRE SIZE
18-24 AWG accepted; 18 AWG recommended

STOCKING TEMPERATURE
-30 °C to 50 °C / -22 °F to 122 °F

OPERATING CONDITIONS
-25 °C to 45 °C / -13 °F to 113 °F
10% to 90% RH without condensation

WEIGHT
120 g. / 0.25 lb.

MOUNTING TYPE
Standard 2 in. x 4 in. electrical junction box

WARRANTY
1 year

ENCLOSURE
White color, ABS material UL94VO

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LYNXSPRING
www.lynxspring.com

Revised 3/17/2022
Onyxx-TZ100-LX-DS-V1.4

DUCT THERMISTOR AND RTD SENSORS

KTD SERIES*

DESCRIPTION

The **Kele KTD* Duct Thermistor and RTD Sensors** are designed to be cost effective with accuracies of ±0.5°F (±0.28°C). Each uses metal enclosures and is constructed for easy installation with any building automation system (BAS). The thermistor is made of a very stable, pre-aged material that offers long-life reliability for HVAC control. The platinum RTD comes in 100Ω and 1000Ω versions. All sensors come with a three-year warranty.

KTDNB3-GF

KTDNB3

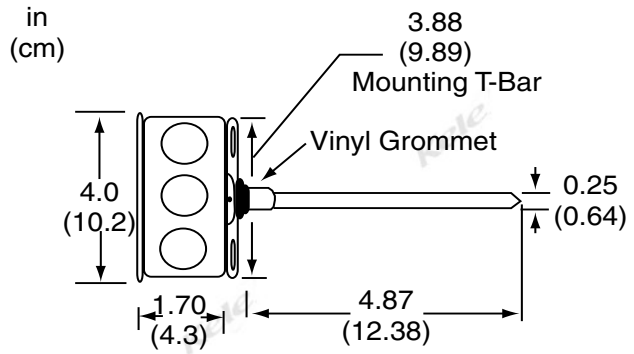
KTD3

KTD3-W

FEATURES

- ***Economical***
- ***Metal enclosures with stainless steel probes***
- ***Three-year warranty***
- ***Thermistor or RTD sensor selections***

DIMENSIONS



KTD*

APPLICATION

The **KTD* Series** sensors are designed for direct mounting on sheet metal duct systems. Where conduit is required, the duct sensors have a universal nylon mounting connector that adapts to a 1/2" knockout in a standard handy box. The nylon fitting has a 1/2" NPT female conduit fitting.

The duct temperature sensors are waterproof and can be used in high humidity and condensing air. The sensors are point-sensitive and come standard with 4 7/8" (12.4 cm) insertion depth. The XL option provides custom lengths.

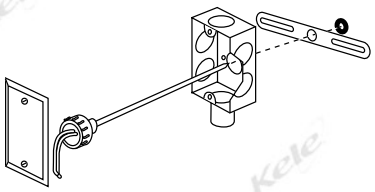
SPECIFICATIONS

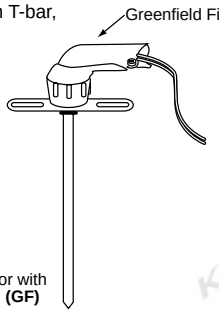
Accuracy	
Thermistor	±0.50°F (0.28°C)
RTD	±0.60°F (0.33°C)
Temperature Stability	
Thermistor	0.24°F (0.13°C) over five years
RTD	Max 0.04% after 1k hours @ 500 °C
Heat Dissipation	2.7 mW/°C (power needed to raise the temperature 1°C)
Sensor Type	
Thermistor	2.252 kΩ, 3 kΩ, 10 kΩ, Type II, III & III w/11K shunt, 20 kΩ, 100 kΩ
RTD	
Type 71, 81	100Ω Pt 385 Curve
Type 85	1000Ω Pt 385 Curve
Type 91	1000Ω Pt 375 Curve
Temperature Coefficient	
Thermistor	Negative temperature coefficient
RTD	Positive temperature coefficient
Temperature Range	
Thermistor/RTD	-40° to 221°F (-40° to 105°C)
Enclosure Rating	Depends on model
Mounting	Directly to duct, wall or single gang box
Wiring Terminations	8' (2.4m), 24 AWG gray wire leads, type 71 & 81 sensors have 18" (0.45m) leads
Probe	Seamless 304 stainless steel tube, 1/4" OD
Weight	
KTD	0.72 lb (0.33 Kg)
KTDNB	0.2 lb (0.09 Kg)
Approvals	CE
Warranty	3 years

MOUNTING

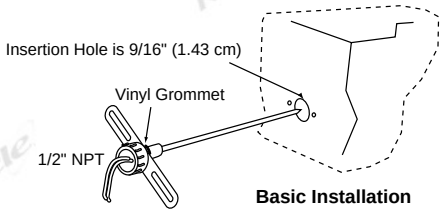
Direct duct-mount screws can be used where conduit is not required. Adapters are not required when mounting directly to outlet boxes. Install grommet in the 9/16" (1.43 cm) insertion hole.

Basic model comes with 8' (2.4m) of 24 AWG, 9" (22.86 cm) probe with T-bar, grommet, and #6 x 1 screws for direct duct mounting.





Duct temperature sensor with Greenfield fitting option **(GF)**



Basic Installation

ORDERING INFORMATION

MODEL	DESCRIPTION
KTD	Duct temperature sensor
KTDNB	Duct temperature sensor with no box
	SENSOR SELECTION
3	10,000Ω thermistor @ 77°F (25°C), Type III, (gray leads)
11K	10,000Ω thermistor @ 77°F (25°C), Type III with 11K shunt (gray leads)
21	2252Ω thermistor @ 77°F (25°C), Type II, (gray leads)
22	3000Ω thermistor @ 77°F (25°C), Type II, (gray leads)
24	10,000Ω thermistor @ 77°F (25°C), Type II, (gray leads)
27	100,000Ω thermistor @ 77°F (25°C), Type II, (gray leads)
42	20,000Ω thermistor @ 77°F (25°C), Type IV, (gray leads)
71	100 ultra high accurat RTD @ 32°F (0°C), 385 platinum curve (gray leads)
81	100Ω RTD @ 32°F (0°C), 385 platinum curve (gray leads)
85	1000Ω RTD @ 32°F (0°C), 385 platinum curve (gray leads)
91	1000Ω RTD @ 32°F (0°C), 375 platinum curve (gray leads)

OPTIONS	
QD¼	Nylon insulated Quick Disconnect 1/4"
X25	25' (7.6m) lead length 24 AWG
XC25	25' (7.6m) lead length jacketed cable
XCO	1/2" LB condulet fitting
XCP25	25' Non-shielded plenum cable
XD	Dual sensors in one probe
XG	Greenfield fitting
XHP	Non-metallic handy box housing (factory installed)
XL	Custom length insertion probes 1" to 108"
XL2 in	Custom length insertion probe, 2"(5.08 cm)
XLT	Liquid-tight fitting (factory installed)
XN	Certificate of conformance
XNB	1/2" MNPT brass close nipple
XN1	NIST certificate, one reference point 32°F(0°C)
XN2	NIST certificate, two reference points 32°F/158°F(0°C/70°C)
XN3	NIST certificate, three reference points 32°F/77°F/158°F(0°C/25°C/70°C)
XP	Matched sensor pair, matched to ±0.1°F, 0.05°C (must order two sensors)
XPA	Ultra high accuracy, thermistors only, ±0.135˚F (0.075˚C)
XW	Weather resistant housing (factory installed)
XZ	Three wire RTD connections (optional only on Type 81)

KTD — 3

Example: **KTD-3** Duct sensor with 10,000Ω thermistor

RELATED PRODUCTS

T81U-XR	100 ohm, Type 81 4-20 mA temperature transmitter, custom rangeable
T85U-XR	1000 ohm, Type 85 4-20 mA temperature transmitter, custom rangeable
T91U-XR	1000 ohm, Type 91 4-20 mA temperature transmitter, custom rangeable
UR	Moisture-resistant three-wire butt splice

BZ424-LX Configurable VAV Zone Controller

ONYXX® LX VAV-ASC | PRODUCT DATA SHEET

Designed and assembled in Canada

Description

- ✓ Supports BACnet MS/TP
- ✓ Has 4 AI/BIs, 2 AOs & 4 BOs with local HOA switches for the outputs
- ✓ Uses a pre-calibrated, precise digital MEMS Omron flow through airflow sensor
- ✓ BTL certified as a B-ASC (BACnet Application Specific Controller)
- ✓ Supports up to 3 TZ100-LX or TZ200-LX room sensors
- ✓ Requires Onyxx LX USB to RS-485 adapter to program with Onyxx LX UI
- ✓ To order use part number: **BZ424-LX**

Application

This controller is designed to facilitate control and management of various VAV equipment typically used in the HVAC industry. It allows powerful yet flexible solutions that can be tailored and sized according to any project needs. Single or dual duct, with or without fan.

Technical Specifications

POWER SUPPLY

24 Vac/dc ± 15%
2 A replaceable fuse
LED power indicator

CURRENT CONSUMPTION

5 VA controller only
Up to 48 VA (8 VA each) with the 4 BOs and 2 AOs @ 0.35 A each

INPUTS

4 x AI/BIs universal inputs

- Thermistor 10 K Ω Type 2 or 3)
- Dry contact, 500 ms minimum (On-Off)
- Voltage 0 - 10 Vdc (Input impedance of 100 K Ω)
- Current 0 - 20 mA (internal resistance of 162 Ω)
- Resolution: 12 bits (4,096 segments)

OUTPUTS

4 x BOs Triad

- 10 to 30 Vac/dc, 0.35 A maximum
- Sink or source
- Built-in overcurrent protection
- Thermal protection with automatic reset
- Triad BOs can be used as pulse outputs

2 x AOs

- Voltage 0 - 10 Vdc linear

INTERNAL ACTUATOR OUTPUTS

2 BO Triad
1 extra AO for analog actuators

AIR FLOW SENSOR

MEMS Omron D6F-PH
1 in. / 250 PA range with rapid response.
Resolution: 12 bits (4,096 segments).
5/32 in. tubes required for airflow probe.

REAL-TIME CLOCK (RTC)

Built in with one-week capacitor backup when charged

MICROPROCESSOR

STM32 (ARM CortexTM M3)
32 bits, 72 MHz

MEMORY

Flash: 768 KB non-volatile for the application program
RAM: 96 KB

RS485 BACNET MS/TP COMMUNICATION SPEED

9600, 19200, 38400, 76800 Bps

CONTROLLER ADDRESSING

Via DIP switch

EXTERNAL CONNECTIONS

Mini USB Type-A connector allows local access to the MS/TP network.
Requires the USB to RS-485 adapter: USB-MSTP-LX.

FLOATING ACTUATOR SUPPLIED

Belimo LMB24-3-T
45 in./lb. 5 Nm

TZ100-LX/TZ200-LX WALL INTERFACE

Up to 3 controllers based on solution used.
Daisy-chained wiring on local RS-485 port.

COMMUNICATION PROTOCOLS

BACnet MS/TP

DIMENSIONS

4.9 in. x 8.5 in. x 2.5 in.
123 mm X 215 mm X 63 mm

WIRE SIZE

18-24 AWG accepted; 18 recommended

STOCKING TEMPERATURE

-30 °C to 50 °C / -22 °F to 122 °F

OPERATING CONDITIONS

-25 °C to 45 °C / -13 °F to 113 °F
10% to 90% RH without condensation

WEIGHT

744 g. / 1.5 lb.

MOUNTING TYPE

Standard Belimo mounting hardware.
Directly on VAV shaft and duct.

WARRANTY

1 year

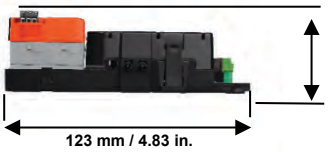
ENCLOSURE

Black color, ABS material UL94-5V
Material FR/ABS

CERTIFICATIONS

UL 916 Energy Management Equipment
BTL listed: B-ASC, BACnet Application Specific Controller

Dimension



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LYNXSPRING
www.lynxspring.com

Revised 5/9/2022
Onyxx-BZ424-LX-DS-V1.1

FRONT END BAS SYSTEM

JENE-PC8000 - Wi-Fi Enabled

EMBEDDED IP CONTROLLER
PRODUCT DATA SHEET

Overview

The JENE-PC8000 is a compact, embedded IP controller and server platform for connecting multiple and diverse devices and sub-systems. With Internet connectivity and Web-serving capability, the JENE-PC8000 controller provides integrated control, supervision, data logging, alarming, scheduling, and network management. It streams data and rich graphical displays to a standard web browser via an Ethernet or wireless LAN, or remotely over the Internet.

The licensing model for the JENE-PC8000 controller is simplified and features standard drivers along with optional I/O and field bus expansion modules for ultimate flexibility and expandability. The JENE-PC8000 controller operates with Niagara 4, the latest version of the Niagara Framework®, for optimum performance.

Applications

A JENE-PC8000 is ideal for any size facility. In larger facilities, multi-building applications and large-scale control system integrations, Niagara 4 Supervisors can be used with JENE-PC8000 controllers to aggregate information, including real-time data, history, and alarms, to create a single, unified application.

Features

- **Platform:** TI AM3352: 1000MHz ARM® Cortex™-A8
- **Standard:** Two RJ-45 Ethernet Ports, two RS-485 Ports
- **Interoperable:** Supports BACnet®, LonWorks®, FOX, Modbus®, oBIX, SNMP, and legacy protocols.
- **Versatile:** Fully customizable with an array of software drivers and custom modules.
- **Reliable:** 1GB DDR3 SDRAM and removable micro-SD card with 4GB flash total storage/2GB user storage.
- **Fast:** Onboard 1GB Ethernet communication provides rapid data transmission.
- **Expandable:** Add up to 16 optional 16 point remote I/O modules.
- **Implementation:** Stand-alone application control, energy management, and multi-protocol integration.

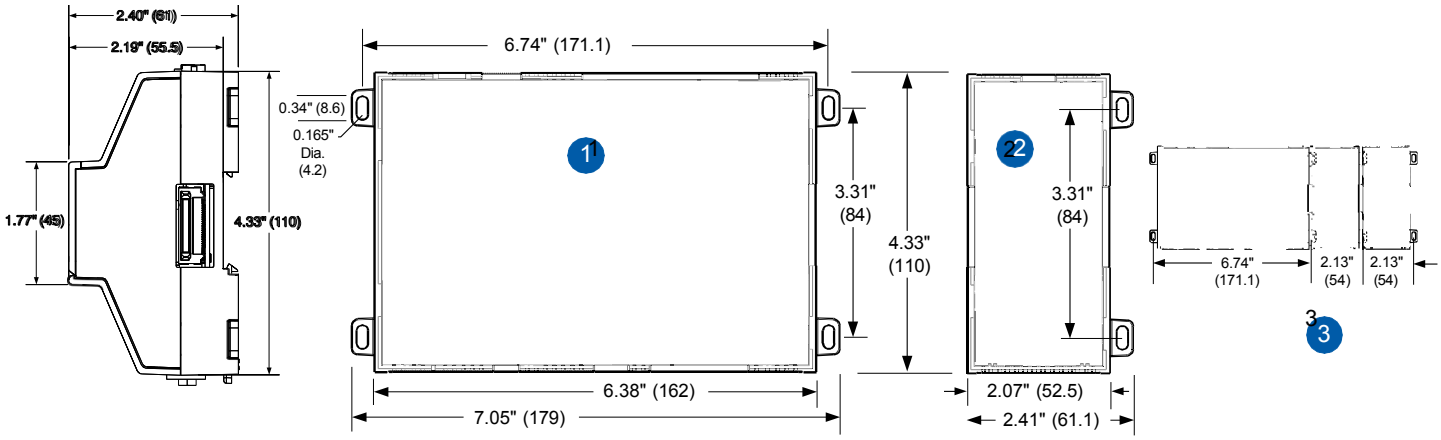
JENESYS® BY LYNXSPRING

powered by niagara framework®

Specifications

PLATFORM	
Operating System	
Processor	TI AM3352: 1000MHz ARM® Cortex™-A8
Memory	1GB DDR3 SDRAM Removable micro-SD card with 4GB flash total storage/2GB user storage
Real-Time Clock	Yes
Secure Boot	Yes
Niagara AX Version	Runs Niagara 4.1 and later
COMMUNICATION PORTS	
Ethernet Port	(2) RJ-45 10/100MB Ethernet ports
RS-485 Port	(2) isolated RS-485 with selectable bias and termination
USB Port	USB type A connector (Back-up and restore support)
Wi-Fi (Client or WAP)	IEEE802.11a/b/g/n IEEE802.11n HT20 @ 2.4 GHz IEEE802.11n HT20/HT40 @ 5GHz Configurable radio (Off, WAP, or Client) WPAPSK/WPA2PSK supported
CHASSIS	
Construction	Base: Plastic, DIN rail or screw mount options. Cover: Plastic
Cooling	Internal air convection
Dimensions	7.05” (179mm) W x 4.33” (110mm) H x 2.41” (51.1mm) D
ENVIRONMENT	
Operating Temperature Range	-20 to 60°C (-4 to 140°F)
Storage Temperature	-40 to 85°C (-40 to 185°F)
Storage Relative Humidity Range	5% to 95%, non-condensing
Shipping & Vibration	ASTM D4169, Assurance Level II
MTTF	10 Years+
AGENCY LISTINGS	
Compliance	UL 916 CE EN 61326-1 FCC Part 15 Subpart B, Class B FCC Part 15 Subpart C C-UL listed to Canadian Standards Association (CSA) C22.2 No. 205-M1983 “Signal Equipment” 1999/5/EC R&TTE Directive CCC SRRC RSS ROHS
POWER	
Power Supply	24VAC/DC power supply
Battery	Batteryless
EXPANSION MODULES SUPPORTED	
NPB-8000-LON: 4	Max 4
NPB-8000-232: 4	Max 4
NPB-8000-2X-485: 2	Max 2
I/O MODULES SUPPORTED	
J-T-IO-16-485	Max 16

Dimensions



Compatible with (DIN43880) enclosures

Suitable for mounting to a panel or to an EN50022 standard 35mm rail

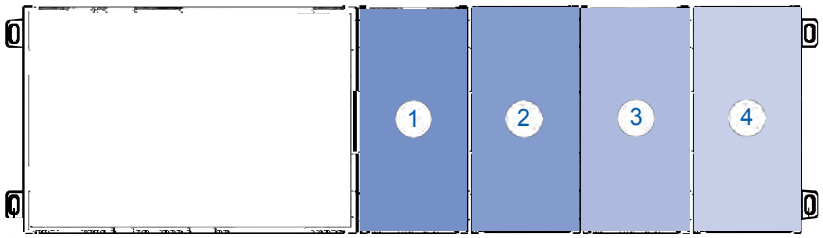
Mounting Instructions

1. JENE-PC8000 Controller. Allow at least 1.5" (38mm) clearance around all sides and minimum 3" (76mm) at bottom for Wi-Fi antenna.
2. Expansion module. Up to four (4) may be used. See "Expansion Modules and I/O Modules Configurations".
3. Distances between center of tabs from one unit to another unit.

Expansion Modules and I/O Modules Configurations

Maximum Combinations

EXPANSION 1	EXPANSION 2	EXPANSION 3	EXPANSION 4
232 or LON	232 or LON	232 or LON	232 or LON
485 485	232 or LON	232 or LON	232 or LON
485 485	485 485	232 or LON	
485 485	485 485		



Ordering Information

JENE-PC8000 NIAGRA 4 CONTROLLERS

PART NUMBER	PART DESCRIPTION
JENE-PC8000 Demo	Base unit includes two isolated RS-485 ports, two RJ-45 10/100MB Ethernet ports, USB Backup & Restore, Wi-Fi connectivity, all available Lynxspring drivers and a 500 device license. Hardware Accessories purchased separately
JENE-PC8005	JENE-PC8000 Controller with 5 Device Core & 250 Points. Includes standard open drivers. Supports up to 5 devices or 250 points. Requires Niagara 4.0 or higher.
JENE-PC8005-SMA-1YR-INIT	JENE-PC8005 - Initial 18 month maintenance must be purchased in conjunction with initial controller purchase. Optional 3 or 5 year maintenance may be substituted.
JENE-PC8010	JENE-PC8000 Controller with 10 Device Core & 500 Points. Includes standard open drivers. Supports up to 10 devices or 500 points. Requires Niagara 4.0 or higher.
JENE-PC8010-SMA-1YR-INIT	JENE-PC8010 - Initial 18 month maintenance must be purchased in conjunction with initial controller purchase. Optional 3 or 5 year maintenance may be substituted.
JENE-PC8025	JENE-PC8000 Controller with 25 Device Core & 1,250 Points. Includes standard open drivers. Supports up to 25 devices or 1,250 points. Requires Niagara 4.0 or higher.
JENE-PC8025-SMA-1YR-INIT	JENE-PC8025 - Initial 18 month maintenance must be purchased in conjunction with initial controller purchase. Optional 3 or 5 year maintenance may be substituted.
JENE-PC8100	JENE-PC8000 Controller with 100 Device Core & 5,000 Points. Includes standard open drivers. Supports up to 100 devices or 5,000 points. Requires Niagara 4.0 or higher.
JENE-PC8100-SMA-1YR-INIT	JENE-PC8100 - Initial 18 month maintenance must be purchased in conjunction with initial controller purchase. Optional 3 or 5 year maintenance may be substituted.
JENE-PC8200	JENE-PC8000 Controller with 200 Device Core & 10,000 Points. Includes standard open drivers. Supports up to 200 devices or 10,000 points. Requires Niagara 4.0 or higher.
JENE-PC8200-SMA-1YR-INIT	JENE-PC8200 - Initial 18 month maintenance must be purchased in conjunction with initial controller purchase. Optional 3 or 5 year maintenance may be substituted.

DEVICE PACKS (OPTIONAL CAPACITY UPGRADE PACKS - AVAILABLE AT THE TIME OF PURCHASE OF THE INITIAL CORE SOFTWARE)

PART NUMBER	PART DESCRIPTION
DEVICE-10	Up to 10 devices/500 point upgrade (can be purchased during initial licensing)
DEVICE-25	Up to 25 devices/1,250 point upgrade (can be purchased during initial licensing)
DEVICE-50	Up to 50 devices/2,500 point upgrade (can be purchased during initial licensing)
DEVICE-UP-10	Up to 10 devices/500 point upgrade (can be purchased post initial licensing)

DEVICE PACKS (OPTIONAL CAPACITY UPGRADE PACKS - AVAILABLE AFTER PURCHASE OF THE INITIAL CORE SOFTWARE)

PART NUMBER	PART DESCRIPTION
DEVICE-UP-25	Up to 25 devices/1,250 point upgrade (can be purchased post initial licensing)
DEVICE-UP-50	Up to 50 devices/2,500 point upgrade (can be purchased post initial licensing)

I/O MODULES

PART NUMBER	PART DESCRIPTION
J-T-IO-16-485	Remote I/O module, compatible with the JENE-PC8000 controller. Communication using RS-485, maximum I/O supported J-T-IO-16-485 modules: 16

EXPANSION MODULES

PART NUMBER	PART DESCRIPTION
JENE-PC8000-485	Add on dual port RS-485 module
JENE-PC8000-LON	Add on single port LON FTT10A module
JENE-PC8000-232	Add on single port RS-232 module

DRIVERS

PART NUMBER	PART DESCRIPTION
DR-CCN-N4	Carrier Comfort Network Niagara 4 driver.

STATION PACKS

PART NUMBER	PART DESCRIPTION
JENE-PC8000-AX	Enables JENE-PC8000 controller to run Niagara AX (3.8U). 3.8U Build with JENE-PC8000 controller support.

POWER SUPPLY OPTIONS

PART NUMBER	PART DESCRIPTION
JENE-PC-PWR	24V power supply for J-T-IO-16-485
JENE-PC-PWR-UN	Universal power supply for J-T-IO-16-485
JENE-PC-WWPM-120	Universal power supply for JENE-PC8000 controller

MAINTENANCE (INCLUDES NEW AND INTERIM RELEASES FROM ONE (1) YEAR FROM PURCHASE DATA)

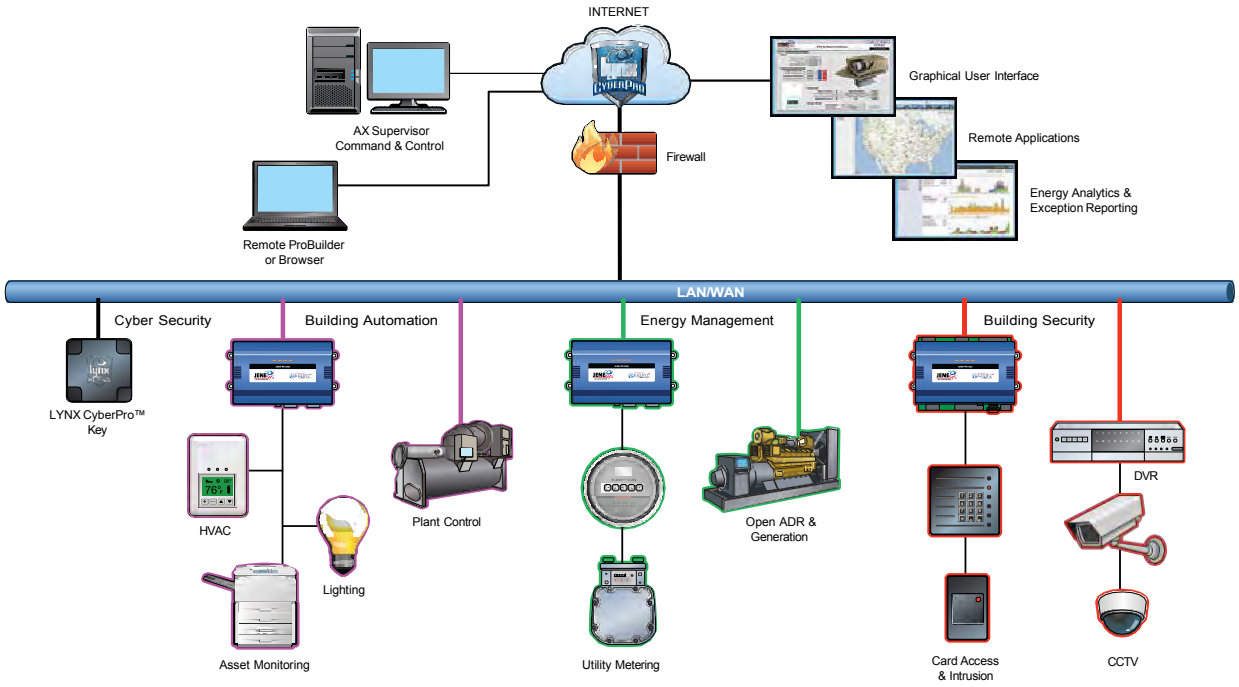
PART NUMBER	PART DESCRIPTION
JENE-PC8005-1YR	JENE-PC8005 - 1 year maintenance.
JENE-PC8005-3YR	JENE-PC8005 - 3 year maintenance
JENE-PC8005-5YR	JENE-PC8005 - 5 year maintenance.
JENE-PC8010-1YR	JENE-PC8010 - 1 year maintenance.
JENE-PC8010-3YR	JENE-PC8010 - 3 year maintenance
JENE-PC8010-5YR	JENE-PC8010 - 5 year maintenance.
JENE-PC8025-1YR	JENE-PC8025 - 1 year maintenance.
JENE-PC8025-3YR	JENE-PC8025 - 3 year maintenance
JENE-PC8025-5YR	JENE-PC8025 - 5 year maintenance.
JENE-PC8100-1YR	JENE-PC8100 - 1 year maintenance.
JENE-PC8100-3YR	JENE-PC8100 - 3 year maintenance
JENE-PC8100-5YR	JENE-PC8100 - 5 year maintenance.
JENE-PC8200-1YR	JENE-PC8200 - 1 year maintenance.
JENE-PC8200-3YR	JENE-PC8200 - 3 year maintenance
JENE-PC8200-5YR	JENE-PC8200 - 5 year maintenance.

**All JENE-PC8XXX parts include a Niagara 4 license and Lynxspring's standard driver suite. Please see Lynxspring standard driver suite documentation for more details.*

JENE-PC8000

EMBEDDED IP CONTROLLER

JENEsys® Platform



The JENEsys® platform (building operating system) is an open, unified, operational and informational system that combines equipment and device connectivity, integration and interoperability, supervision and control, energy management, visualization and actionable information (data & analytics) into a single, integrated architecture within a cyber-secured environment. JENEsys® is scalable and allows organizations to continually build off the same network deployment and add additional applications as desired.

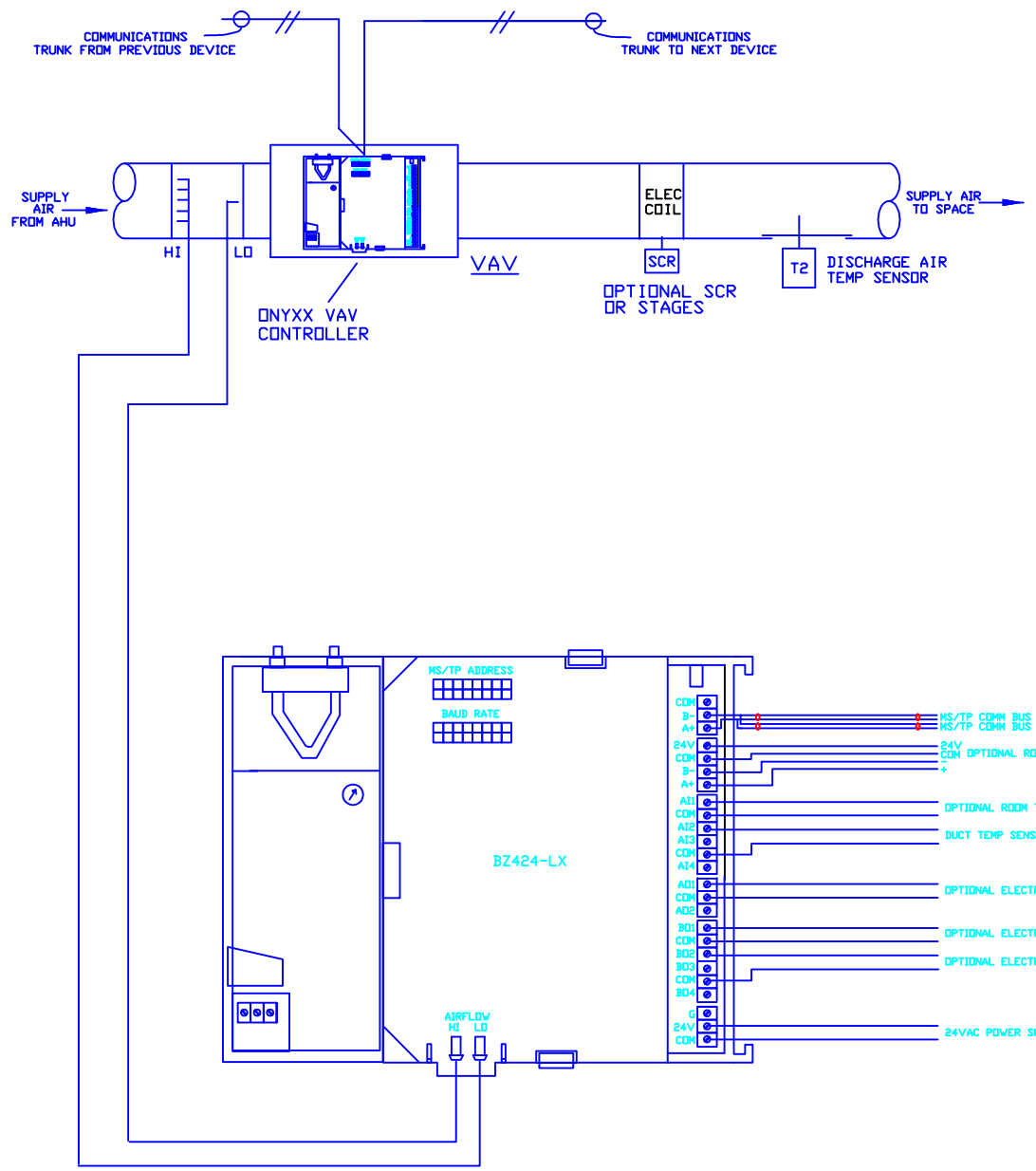
The deployment of JENEsys® hardware and software is the method by which building automation is expertly configured to a client's best needs. JENEsys® enables users to deploy optimal energy and facility operational strategies, capitalize on accurate and concise intelligence relating to the performance of their facilities, reduce energy consumption and costs, gain knowledge of individual usage and trends related to their building systems and equipment from one source, all within a cloud or hosted environment.

- Choice – eliminates building managers and owners from being held captive to proprietary, closed technologies
- Enables multi-vendor integration and interoperability between devices from different manufacturers and disparate systems
- Flexibility/Options – allows facility managers, operators and owners to purchase different products from different manufacturers and choose the solutions that best fit their specific needs
- Simplifies facility operations – users can manage all of their diverse systems via a single, easy-to-use, web-based interface
- Combines the capabilities of network management, protocol conversion, distributed control, and the user interface into a single software solution that can operate on a wide range of hardware platforms from the very small to the very large
- APIs are available to enable independent third parties to develop complementary, enterprise applications that can work effectively with the system
- Data from the system is easily stored and retrieved from a common database and can be used throughout the system
- Future Expansion – offers support for a wide range of applications and the scalability to easily add future service and product upgrades
- Building managers and operators can continue to work with the products and vendors they trust, while gaining all the benefits of an integrated and interoperable system
- Provides operational efficiencies that reduce business risk
- Makes it easier to control and manage buildings and realize facility operational efficiencies, ensure occupant comfort and code compliances
- Reduces system complexity and costs. Maximizes lifetime value of building systems and equipment
- One platform that can be supported by whatever vendor or vendors a building owner, operator or facility manager chooses

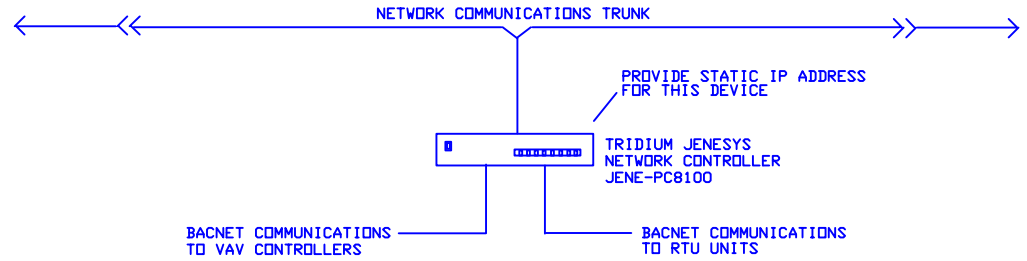
LYNXSPRING®

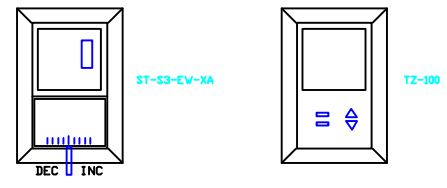
www.lynxspring.com
2900 NE Independence Ave, Lees Summit, MO 64064
877-649-5969 | sales@lynxspring.com

Rev. 01-25-2021
JENE-PC8000-DS-V1.2



AIR TERMINAL UNIT W/ELECTRIC REHEAT LAYOUT





OPTIONAL ROOM TEMP SENSOR LAYOUT

ROOF TOP AIR HANDLING UNITS (TYPICAL OF 2)

VAV TERMINAL UNITS (TYPICAL OF 27)

BARBER COLMAN COMPANY
FIELD OFFICE

POWELL, INC.
P.O. BOX 306
BARBOURSVILLE, W.VA. 25504
(304) 736-8951

REVISIONS	
DATE	CHANGES

JOB NAME WV DNR
LOCATION ELKINS, WV
ARCHITECT
ENGINEER
CONTRACTOR
DRAWN BY
CHECKED BY
DATE
DRAWING NO.

FOR QUESTIONS, CALL THE
FLO AIRE NATIONAL
REGION 22
PHONE: (610) 239-8405
EMAIL: courtney.hardin@floaire.com

EXHAUST FAN INFORMATION – JOB#5844962

FAN UNIT NO	TAG	QTY	FAN UNIT MODEL #	MANUFACTURER	CFM	ESP	RPM	MOTOR ENCL	HP	BHP	PHASE	VOLT	FLA	WEIGHT (LBS)	SONES
1	EF-1	1	DR30H	FLOAIRE	575	0.388	1159	ODP	0.250	0.0900	1	115	3.8	59	6.6

FAN OPTIONS

FAN UNIT NO	TAG	QTY	DESCRIPTION
1	EF-1	1	I 15-BDD DAMPER
		1	2 YEAR PARTS WARRANTY

FAN ACCESSORIES

FAN UNIT NO	TAG	EXHAUST			SUPPLY			
		GREASE CUP	GRAVITY DAMPER	WALL MOUNT	SIDE DISCHARGE	GRAVITY DAMPER	MOTORIZED DAMPER	WALL MOUNT
1	EF-1		YES					

CURB ASSEMBLIES

NO	ON FAN	TAG	WEIGHT	ITEM	SIZE
1	# 1	EF-1	20 LBS	CURB	19.500"W X 19.500"L X 18.000"H ALONG LENGTH, RIGHT.

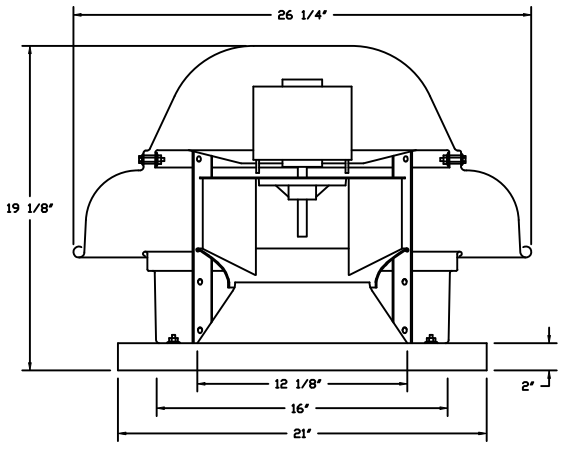
FAN SOUND DATA

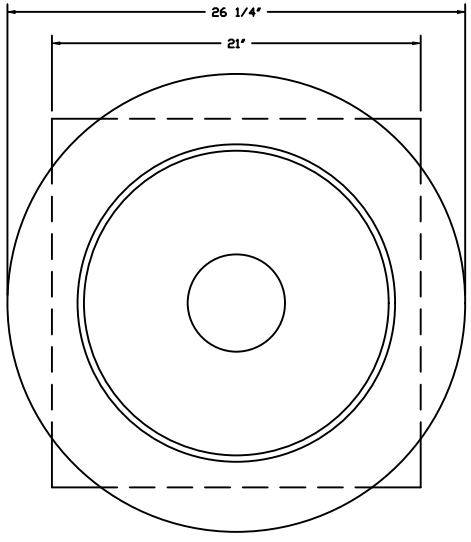
FAN UNIT NO	TAG	MOTOR	SOUND DATA			OCTAVE BAND SOUND DATA								
			LWA	SONES @ 5 FT	DBA @ 5 FT	DISTANCE (FT)	63 HZ	125 HZ	250 HZ	500 HZ	1 KHZ	2 KHZ	4 KHZ	8 KHZ
1	EF-1	EXHAUST	66.6	6.55035836027383	55.1	5	66.3	71	67.9	62.7	60.6	59.7	51.7	40.7

FloAire

JOB 2/6 rev** Roger-Bridgeport, WV	
LOCATION BRIDGEPORT, WV,	
DATE 2/6/2023	JOB # 5844962
DWG # 1	DRAWN BY courtneyh
REV.	SCALE 3/8" = 1'-0"

FAN #1 DR30H - EXHAUST FAN (EF-1)





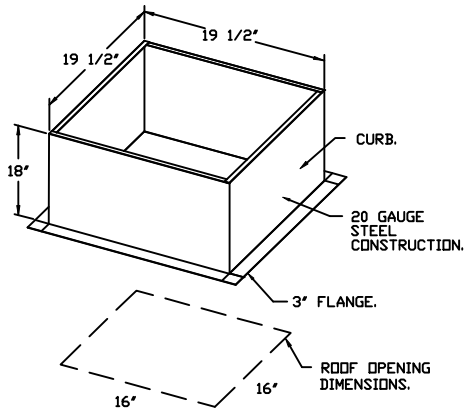
TOP VIEW

FEATURES:

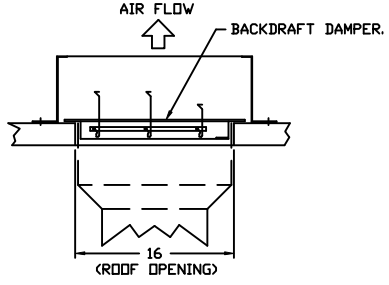
- DIRECT DRIVE CONSTRUCTION (NO BELTS/PULLEYS).
- ROOF MOUNTED FANS.
- UL705.
- SAFETY DISCONNECT.
- STANDARD BIRD SCREEN.
- SPEED CONTROL.

OPTIONS

- 1 15-BDD DAMPER.
- 2 YEAR PARTS WARRANTY.



BACKDRAFT DAMPER INSTALLATION



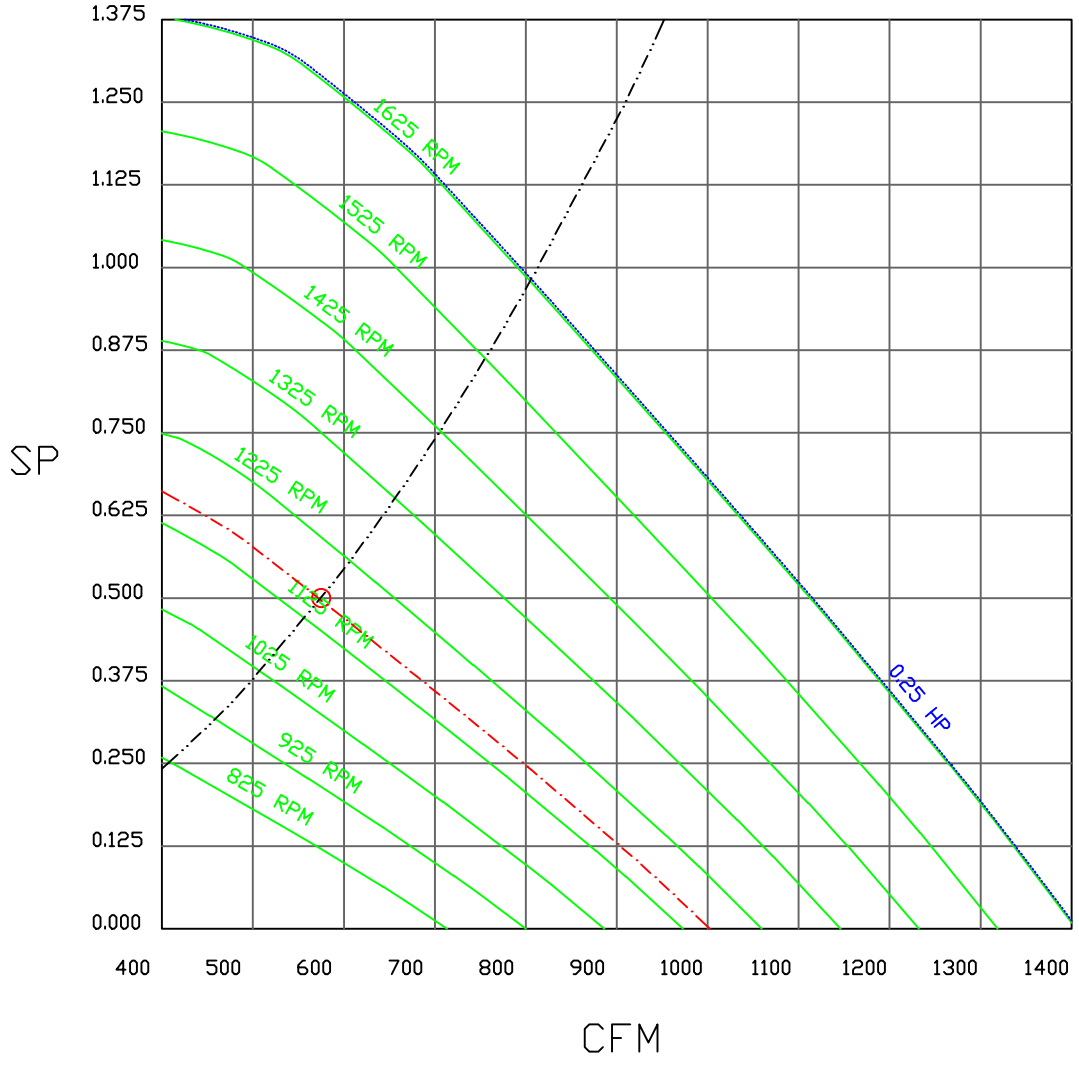
FloAire

JOB 2/6 rev** Roger-Bridgeport, WV	
LOCATION BRIDGEPORT, WV,	
DATE 2/6/2023	*JOB #* 5844962
DWG # 2	*DRAWN BY* courtneyh
REV.	*SCALE* 3/8" = 1'-0"

FAN#1 (EF-1) - EXHAUST PERFORMANCE CURVES.

575 CFM, 0.5 SP @ 1159 RPM AND 0.09 BHP AT 0 FEET AND 70 DEG F.

* PLEASE NOTE THAT THESE CURVES WERE ADJUSTED FOR JOB SPECIFIC TEMPERATURE AND ALTITUDE.



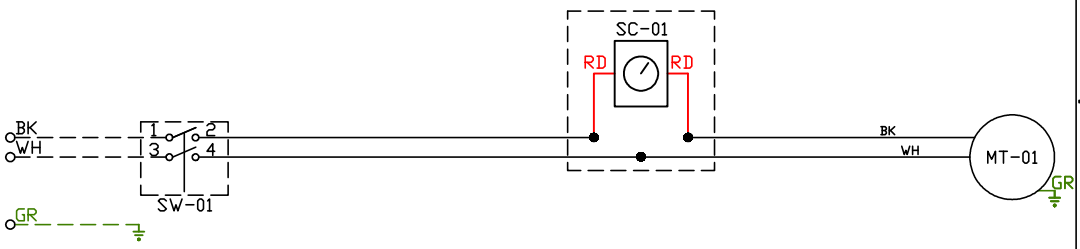
JOB 2/6 rev** Roger-Bridgeport, WV	
LOCATION BRIDGEPORT, WV,	
DATE 2/6/2023	*JOB #* 5844962
DWG # 3	*DRAWN BY* courtneyh
REV.	*SCALE* 3/8" = 1'-0"

FloAire

Exhaust Fan Wiring

DRAWING NUMBER *EXH5844962-1*	SHIP DATE *2/6/2023*	MODEL **DR30H**

JOB *5844962 - 2/6 rev** Roger-Bridgeport, WV*



Installed Options

Speed Control

Component Identification

Label	Description	Location
MT-01	Fan Motor	[3]
QD-01	Quick Disconnect	[3]
SC-01	Speed Control	[2]
SW-01	Main disconnect switch	[3]

MOTOR INFO

EXHAUST 0.25HP-115V-1P-3.8FLA

ELECTRICAL INFORMATION

MOTOR/CTRL MCA: 4.8A
MOTOR/CTRL MOP: 15A

NOTES

– – – – DENOTES FIELD WIRING
———— DENOTES INTERNAL WIRING

WIRE COLOR

BK - BLACK	YW - YELLOW
BL - BLUE	GR - GREEN
BR - BROWN	GY - GRAY
OR - ORANGE	PR - PURPLE
RD - RED	PK - PINK
WH - WHITE	

THE EXPERTS IN ROOM AIR CONDITIONING

FRIEDRICH
1883

FLOATING AIR® SERIES

Ductless Split Systems

The Contractor's Choice for Ductless

Smart

CONTROL W/APP • CLEAN AIR OPTIONS

Quiet

QUIET, POWERFUL FAN

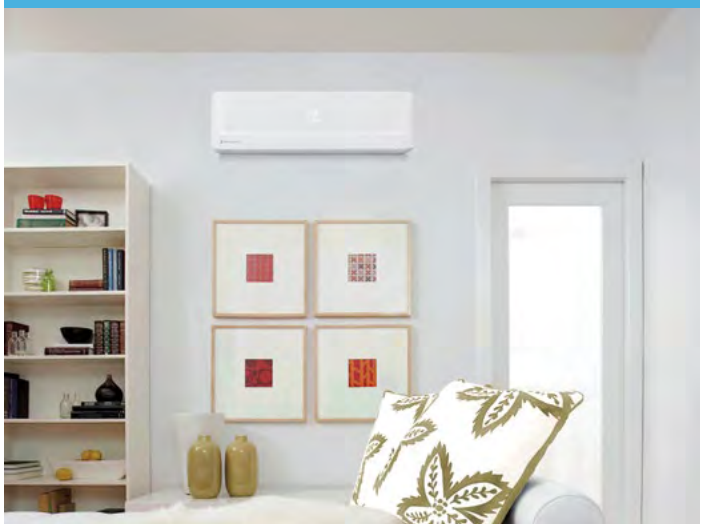
Cool

PRECISE TEMPERATURE CONTROL

FLEXIBLE, EASY-TO-INSTALL ZONED COMFORT SOLUTIONS FROM THE LEADER IN ROOM AIR CONDITIONING

Whether you're heating and cooling a single room or multiple rooms, you won't find quieter, more energy-efficient solutions than Friedrich ductless split systems. Choose from sleek wall-mounted models, ceiling cassettes that mount flush with the ceiling, and ducted units that install out of sight.

RESIDENTIAL APPLICATIONS



COMMERCIAL APPLICATIONS

WI-FI CONTROL* ANYTIME, ANYWHERE.

*Available on Premier and Pro wall-mounted models, and on Pro ceiling cassette models

WATCH VIDEO ON
CONNECT TO FRIEDRICHGO™

ALL OF THE ADVANTAGES OF DUCTLESS SPLIT SYSTEMS AND FRIEDRICH QUALITY

Zero duct loss

According to the DOE, ducted systems lose an average of 25-40% in performance due to leaks, cracks or disconnections in ductwork.

No ductwork means that ductless systems do not experience duct loss, saving energy and money.

No dirty air ducts*

With a ductless system, there's no need to clean dirty air ducts that can harbor dust, germs and allergens that are eventually blown into your home or office.

Zone cooling flexibility

Independently condition up to five separate zones using only a single outdoor unit. Cool or heat only the zones that are in use. Set individual comfort levels for each zone.

FreshAire® IAQ ready

Easy-to-install FreshAire IAQ accessories improve the health and quality of indoor air. **UVL1** light kit removes bacteria, viruses, mold and fungus from circulated air. **APWM1** air purification kills mold, bacteria and viruses, and effectively removes odors and VOCs.

Available built-in Wi-Fi

Easily adjust settings and power units off and on with your smartphone. The FriedrichGo™ app is easy to set up and use. Compatible with Amazon Alexa and Google Home.

Wi-Fi available on Premier and Pro wall-mounted models, and on Pro ceiling cassette models.

Google is a registered trademark of Google LLC.

Friedrich Precision Inverter® delivers exceptional energy efficiency and smooth performance

Precision Inverter technology varies the compressor, the outdoor and the indoor fan speeds, eliminating constant compressor start-ups/shut-downs that traditional systems require to maintain the set temperature.

Each system can adjust capacity and cooling output to provide only the amount of cooling needed at a given time. The result is optimal comfort with low energy costs.

THE ADVANTAGES OF INVERTER DUCTLESS SPLIT SYSTEMS

TRADITIONAL SYSTEM	INVERTER SYSTEM
At initial start up, a fixed capacity system slowly reaches the set temperature.	At initial start up, utilizes variable capacity to quickly reach the set temperature.
Complete shutdown once set temperature is achieved.	Reduces capacity as set temperature is achieved.
Temperature within the space rises until 2nd system start up.	Variable capacity maintains set temperature keeping space comfortable with reduced energy consumption.
System works at full capacity to again reach set temperature.	
System cycles on and off continually to maintain the set temperature.	

Soft start technology

Friedrich soft start technology starts the compressor with significantly reduced amperage at start up, saving energy versus compressors utilizing locked rotor amperage (LRA).

FastPro®

THE EASIEST DUCTLESS TO INSTALL, CLEAN & SERVICE

The Problem

On typical ductless indoor units, accessing the indoor coils is extremely difficult and takes so much time that a thorough cleaning may be next to impossible.

Access to piping, wire terminal blocks, the fan and fan components is also a challenge.

The Solution:

Friedrich FastPro was designed with the HVAC technician in mind. In a few easy steps that can be performed in minutes, the entire blower wheel assembly can be removed for easier, faster cleaning and service.

Also, you'll have easy access to the terminal blocks. FastPro will save you hours on the job site.

40%	45%	50%
FASTER* TO INSTALL	FASTER* TO CLEAN	FASTER* TO SERVICE

WATCH VIDEO ON FastPro®

*Faster than similar installation, cleaning and service performed on standard ductless wall-mounted units.

IN A FEW EASY STEPS

You can access the blower wheel assembly and slide it out for full access to the indoor coil

Back out electrical panel screws

Remove electrical access panels (2)

Lock the access panel

Unplug the wire harness

Remove screws then slide out the blower wheel assembly

Complete access to the coils for easy cleaning

FASTER INSTALLATION, EASIER SERVICE AND OPTIMAL PERFORMANCE

- Alignment arrows on the Friedrich wall bracket help you mark and drill the hole in the wall accurately, and with total confidence
- Easy-to-remove modular drain pan assembly
- Quick access to tangential blower and motor makes repairs easier
- Clear access to piping
- Built-in Wi-Fi on Premier and Pro wall-mounted and cassette models
- Easy access to the wire terminal blocks
- Included kickstand tilts unit away from the wall providing ample space for your hands to work
- Onboard error codes help to ensure trouble-free operation
- Diamonblue Advanced Corrosion Protection®
- Auto clean
- Washable, antimicrobial air filters

THE CONTRACTOR'S CHOICE FOR DUCTLESS

Friedrich has three exceptional lines of ductless with unique features for easy installation. For contractors, this means less time on the job, and the opportunity to provide your customer with maintenance agreements on equipment that is cleaning and service friendly.

Home or away, you're in control with the FriedrichGo™ app.

Integrated Wi-Fi control from your smartphone. Also compatible with Amazon Alexa and Google Home. Power your unit on and off, change temperature, system mode, and adjust fan speeds no matter where you are.

WORKS WITH amazon alexa

works with Hey Google

FLOATING AIR® PREMIER

SINGLE ZONE

Wall-mounted

- Highest efficiencies
- FastPro® design for fast installation, cleaning and service
- Built-in Wi-Fi
- FreshAire® IAQ ready
- Extended operating ranges, heating and cooling

FastPro®

FLOATING AIR® PRO

SINGLE ZONE AND MULTI ZONE

Wall-mounted

Ceiling Cassettes

The Insider® Concealed Ducted Units

- Excellent efficiencies
- FastPro® design for fast installation, cleaning and service
- Built-in Wi-Fi
- FreshAire® IAQ ready
- Extended operating ranges, heating and cooling
- 115V wall-mounted heat pumps

FastPro®

FLOATING AIR® SELECT

SINGLE ZONE

Wall-mounted

- 18.0 SEER
- Moderate pricing
- Exceptional value
- FreshAire® IAQ ready
- 115V wall-mounted heat pumps

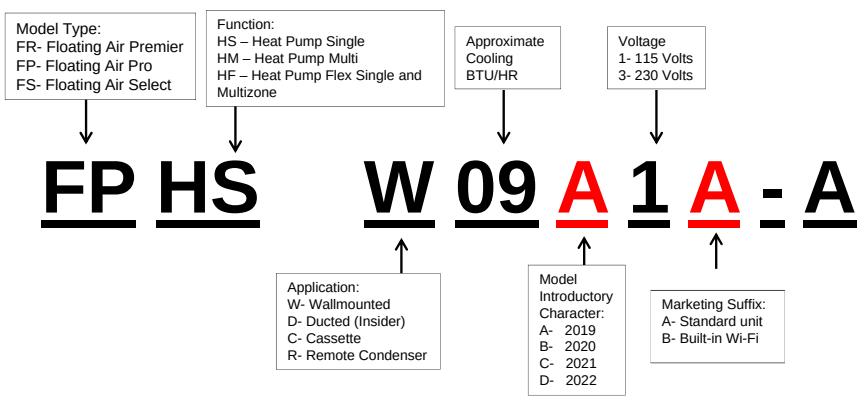
FEATURE COMPARISON

A feature-by-feature comparision to help you select the best ductless system for your application.

SYSTEM TYPE	WALL-MOUNTED				CASSETTE		CONCEALED DUCTED	
Zones	SINGLE ZONE			MULTI ZONE	SINGLE ZONE	MULTI ZONE	SINGLE ZONE	MULTI ZONE
Floating Air® Series	Premier	Pro	Select	Pro	Pro	Pro	Pro The Insider™	Pro The Insider™
Installation	Wall	Wall	Wall	Wall	Ceiling	Ceiling	Concealed	Concealed
FastPro® Design	✓	✓❶	–	✓	–	–	–	–
Heat pump	✓	✓	✓	✓	✓	✓	✓	✓
115 volt models	–	✓	✓	–	–	–	–	–
SEER	Up to 28.0	Up to 23.3	Up to 18.0	Up to 22.0	Up to 19.0	Up to 22.0	Up to 17.6	Up to 21.0
Low ambient cooling operation	0° F	5° F	0° F	5° F	5° F	14° F	5° F	-4° F
Low ambient heating operation	-13° F	-4° F❷	-4° F❷	-13° F❸	-4° F	-13° F ❸	-4° F	-13° F ❸
Inverter driven compressor	✓	✓	✓	✓	✓	✓	✓	✓
Built-in Wi-Fi models, FriedrichGo™ app	✓	✓	–	✓	✓	✓	–	–
Google Home/Amazon Alexa compatible	✓	✓	–	✓	✓	✓	–	–
FreshAire® IAQ ready	✓	✓	✓	✓	–	–	–	–
Auto changeover	✓	✓	✓	–	✓	–	✓	–
24- Hr. Programmable timer	✓	✓	✓	✓	✓	✓	✓	✓
Remote control	✓	✓	✓	✓	✓	✓	–	–
Wall controller option	✓	✓	✓	✓	✓	✓	Included	Included
7-Day Programmability	–	–	–	–	–	–	✓	✓
(with wall control)	✓	✓*	✓	✓	✓	✓	✓	✓
Auto restart	✓	✓	✓	✓	✓	✓	✓	✓
Surge cool/heat	✓	✓	✓	✓	✓	✓	✓	✓
Dry mode	✓	✓	✓	✓	✓	✓	✓	✓
Auto Clean	✓	✓	✓	✓	✓	✓	✓	✓
Advanced Corrosion Protection	✓	✓	✓	✓	✓	✓	✓	✓
4-way auto swing	✓	✓	2-way ❹	✓	✓	✓	–	–
Washable, antimicrobial air filters	✓	✓	✓	✓	✓	✓	✓	✓

❶ Feature not available on FPHSW36A3C. ❷ (9K/12K/18K -4°F) (18K/24K -13°F) ❸ 42K operates as low as 4°F ❹ 2-way auto (up/down)

MODEL IDENTIFICATION GUIDE



SINGLE ZONE | WALL-MOUNTED HEAT PUMPS

Top cooling and heating performance in extreme climates.
28.0 SEER - our highest efficiencies ever!

Built-in Wi-Fi for control anytime, anywhere

- Easy to use FriedrichGo™ app
- Create customizable, 7-day schedules
- Control with smartphone
- Compatible with Amazon Alexa and Google Home

WIRELESS REMOTE WITH THE ABILITY TO CHANGE TO A COOL-ONLY REMOTE

Features for comfort and convenience

- Precision Inverter® technology (variable speed compressor)
- Fast Pro® design for the fastest access for maintenance of any wall-mounted ductless system
- Soft start compressor
- BLDC motor
- Our highest efficiencies for the lowest operating cost
- DiamonBlue Advanced Corrosion Protection®
- Auto Clean indoor coil
- Cooling/Heating/Fan/Auto mode
- Surge Cool/Heat
- Natural air flow
- Ultra quiet operation
- Sleep mode
- Auto restart
- Auto changeover
- 24-hour on/off timer
- ENERGY STAR® qualified model
- Hidden display (only visible during operation)

Operates in extreme conditions

- Low ambient operation down to 0°F (Cooling mode)
- Low ambient operation down to -13°F (Heating mode)
- Low temperature compressor start-up protection

FreshAire® IAQ READY | Wi-Fi | FastPro® | DIAMONDBLUE Advanced Corrosion Protection® | PRECISION INVERTER® | 5YR. PARTS WARRANTY | 7YR. COMPRESSOR WARRANTY

PERFORMANCE RATINGS		Single Zone Wall-Mounted - Heat Pumps	
SYSTEM MODEL NO.		FRHW093A	FRHW123A
INDOOR MODELS		FRHSW09A3B	FRHSW12A3B
OUTDOOR MODEL		FRHSR09A3A	FRHSR12A3A
SPECIFICATIONS			
CAPACITY COOLING (RATED)	Btu	9000	12000
CAPACITY COOLING (MIN~MAX)	Btu	3600-10000	4000-13500
CAPACITY HEATING @47^{0}F (RATED)	Btu	10500	13000
CAPACITY HEATING @17^{0}F (RATED)	Btu	6500	8000
CAPACITY HEATING (MIN~MAX)	Btu	3600-10500	4000-14000
SENSIBLE HEAT RATIO		76%	77%
HSPF		12.5	12.0
SEER		28.0	25.0
EER		16.1	15.4
ENERGY STAR		YES	YES
MOISTURE REMOVAL	Pts/h	1.9	2.5
AIRFLOW (QUIET, LOW, MED, HIGH)	CFM	416/384/355/279	598/536/446/345
SOUND RATING - INDOOR	dB-A	39/34/31	45/41/39
SOUND RATING - OUTDOOR	dB-A	55	55
OPERATING RANGE (COOLING)	°F	0˚-115˚	0˚-115˚
OPERATING RANGE (HEATING)	°F	-13˚-75˚	-13˚-75˚
EST. YEARLY OPERATING COST	$	50	70
ELECTRICAL DATA			
POWER SOURCE	V-Hz-Phase	230/208-60-1	230/208-60-1
MINIMUM AMPACITY	A	10A	12A
COOLING WATTS	W	559	779
COOLING AMPS		2.3	4.6
HEATING WATTS	W	905	856
HEATING AMPS		3.4	4.8
MAX. TD FUSE/BREAKER	A	15A	15A
POWER AND COMMUNICATION CABLE	No. x AWG	4 x 14AWG	4 x 14AWG
REFRIGERATION SYSTEM			
REFRIGERANT		R410a	R410a
COMPRESSOR TYPE		Rotary	Rotary
CONNECTIONS		Flare	Flare
LIQUID LINE O.D.	in	1/4	1/4
SUCTION LINE O.D.	in	3/8	3/8
FACTORY PRECHARGE	ft	25	25
REFRIGERANT CHARGE	oz	38.8	45.9
MIN./MAX. LINE LENGTH	ft	10-66	10-66
MAX. HEIGHT DIFFERENCE	ft	33	33
DIMENSIONS & WEIGHT			
INDOOR UNIT			
W X H X D	in	33 7/8 x 11 1/8 x 8 1/2	38 1/8 X 13 1/8 X 10
NET WEIGHT	lbs	22	28.5
SHIPPING WEIGHT	lbs	26.5	34
OUTDOOR UNIT			
W X H X D	in	31 7/8 x 23 x 11	31 7/8 x 23 x 11
NET WEIGHT	lbs	75	84
SHIPPING WEIGHT	lbs	81.5	92.5
TOTAL NET WEIGHT	lbs	97	112.5
TOTAL SHIPPING WEIGHT	lbs	108	126.5

Your operating costs will depend on your utility rates and use.
The estimated operating cost is based on a electricity cost of $.12 per kWh.
For more information, visit www.ftc.gov/energy.
Due to continuing research in new energy-saving technology, specifications are subject to change without notice.

SINGLE ZONE | WALL-MOUNTED HEAT PUMPS

The contractor's line with extensive features to make installation and service faster and easier. Two 115v models available in 9,000 and 12,000 BTU capacity.

Built-in Wi-Fi for control anytime, anywhere

- Easy to use FriedrichGo™ app
- Create customizable, 7-day schedules
- Control with smartphone
- Compatible with Amazon Alexa and Google Home

WIRELESS REMOTE WITH THE ABILITY TO CHANGE TO A COOL-ONLY REMOTE

Features for comfort and convenience

- Precision Inverter® technology (variable speed compressor)
- Fast Pro® design for the fastest access for maintenance of any wall-mounted ductless system
- Soft start compressor
- BLDC motor
- Auto Clean indoor coil
- Cooling/Heating/Fan/Auto mode
- LCD remote
- Surge Cool/Heat
- Tangential fan for optimum air flow
- Ultra quiet operation
- Sleep mode
- Auto restart
- Auto changeover
- 24-hour on/off timer
- ENERGY STAR® qualified models
- Easy-to-read temperature display

Operates in extreme conditions

- Low ambient operation down to 5°F (Cooling mode)
- Low ambient operation down to -4°F (Heating mode)
- Low temperature compressor start-up protection

FreshAire® IAQ READY | Wi-Fi | FastPro® | DIAMONDBLUE Advanced Corrosion Protection® | PRECISION INVERTER® | 5 YR. PARTS WARRANTY | 7 YR. COMPRESSOR WARRANTY

PERFORMANCE RATINGS		115 volt models		230/208 volt models	
SYSTEM MODEL NO.		FPHW091A	FPHW121A	FPHW093A	FPHW123A
INDOOR MODEL		FPHSW09A1B	FPHSW12A1B	FPHFW09A3B	FPHFW12A3B
OUTDOOR MODEL		FPHSR09A1A	FPHSR12A1A	FPHSR09A3A	FPHSR12A3A
SPECIFICATIONS					
CAPACITY COOLING (RATED)	Btu	9000	12000	9000	12000
CAPACITY COOLING MIN - MAX	Btu	3600-10000	4000-13500	3600-10000	4000-13500
CAPACITY HEATING (RATED) @ 47°F	Btu	9500	13000	9500	13000
CAPACITY HEATING (RATED) @ 17°F	Btu	5000	7500	5000	7500
CAPACITY HEATING MIN - MAX	Btu	3600-10500	4000-14000	3600-10500	4000-14000
SENSIBLE HEAT RATIO		76%	77%	76%	77%
COP		3.56	3.46	3.88	3.42
HSPF		10.0	10.5	10.7	10.5
SEER		19.5	22.0	22.5	22.0
EER		12.8	13.0	13.7	13.0
ENERGY STAR		YES	YES	YES	YES
MOISTURE REMOVAL	Pts/h	1.9	2.5	1.9	2.5
AIRFLOW (HIGH/MED/LOW/QUIET)	CFM	424/382/323/247	424/382/323/247	424/382/323/247	424/382/323/247
SOUND RATING - INDOOR (HIGH/MED/LOW/QUIET)	dB-A	39/32/29/26	39/32/29/26	39/32/29/26	39/32/29/26
SOUND RATING - OUTDOOR	dB-A	53	53	53	53
OPERATING RANGE (HEATING)	°F	(-4° – 75°)	(-4° – 75°)	(-4° – 75°)	(-4° – 75°)
OPERATING RANGE (COOLING)	°F	(5° – 115°)	(5° – 115°)	(5° – 115°)	(5° – 115°)
EST. YEARLY OPERATING COST	U.S. $	$61	$72	$53	$83
ELECTRICAL DATA					
POWER SOURCE	V-Hz-Phase	115-60-1	115-60-1	230/208-60-1	230/208-60-1
MIN. AMPACITY	A	13.5	16.5	10	10
COOLING WATTS	W	700	950	655	960
COOLING AMPS		6.3	8.3	2.9	4.3
HEATING WATTS	W	780	1100	720	1110
HEATING AMPS		7.0	9.7	3.1	5.0
MAX. TD FUSE/BREAKER	A	20	25	15	15
POWER AND COMMUNICATION CABLE	No. x AWG	4 x 14AWG	4 x 14AWG	4 x 14AWG	4 x 14AWG
REFRIGERATION SYSTEM					
REFRIGERANT		R410a	R410a	R410a	R410a
COMPRESSOR TYPE		Rotary	Rotary	Rotary	Rotary
CONNECTIONS		Flare	Flare	Flare	Flare
LIQUID LINE O.D.	in	1/4	1/4	1/4	1/4
SUCTION LINE O.D.	in	3/8	3/8	3/8	3/8
REFRIGERANT CHARGE	oz.	33.5	40.9	33.5	40.9
FACTORY PRECHARGE	ft.	25	25	25	25
MIN. / MAX. LINE LENGTH	ft	9.8-50	9.8-50	9.8-50	9.8-50
MAX. HEIGHT DIFFERENCE	ft	33	33	33	33
DIMENSIONS & WEIGHT					
INDOOR UNIT					
W x H x D	in	33 7/8 x 11 1/8 x 8 1/2		33 7/8 x 11 1/8 x 8 1/2	
NET WEIGHT	lbs	20	20	20	20
SHIPPING WEIGHT	lbs	24.25	24.25	24.25	24.25
OUTDOOR UNIT					
W x H x D	in	28 1/8 x 19 x 9 1/2	31 7/8 x 23 x 11	28 1/8 x 19 x 9 1/2	31 7/8 x 23 x 11
NET WEIGHT	lbs	65	78	59.5	72.5
SHIPPING WEIGHT	lbs	68	82.5	65	79
TOTAL NET WEIGHT	lbs	85	98	79.5	92.5
TOTAL SHIPPING WEIGHT	lbs	92.25	106.75	89.25	103.25

Your operating costs will depend on your utility rates and use. The estimated operating cost is based on a electricity cost of $ .12 per kWh. For more information, visit www.ftc.gov/energy.

Due to continuing research in new energy-saving technology, specifications are subject to change without notice.

SINGLE ZONE | WALL-MOUNTED HEAT PUMPS

The contractor's line with extensive features to make installation and service faster and easier. Exceptional efficiency and dependable performance.

FPHFW18A3A, FPHFW24A3A, FPHFW18A3B, FPHFW24A3B

FPHSW36A3C (Not available with FastPro® design feature)

Built-in Wi-Fi for control anytime, anywhere

- Easy to use FriedrichGo™ app
- Create customizable, 7-day schedules
- Control with smartphone
- Compatible with Amazon Alexa and Google Home

WIRELESS REMOTE WITH THE ABILITY TO CHANGE TO A COOL-ONLY REMOTE

Features for comfort and convenience

- Precision Inverter® technology (variable speed compressor)
- Fast Pro® design for the fastest access for maintenance of any wall-mounted ductless. Feature not on model FPHSW36A3C
- Soft start compressor
- BLDC motor
- Auto Clean indoor coil
- Cooling/Heating/Fan/Auto mode
- LCD remote
- Surge Cool/Heat
- Tangential fan for optimum air flow
- Ultra quiet operation
- Sleep mode
- Auto restart
- Auto changeover
- 24-hour on/off timer
- ENERGY STAR® qualified model
- Easy-to-read temperature display

Operates in extreme conditions

- Low ambient operation down to 5°F (Cooling mode)
- Low ambient operation down to -4°F (Heating mode)
- Low temperature compressor start-up protection

FreshAire® IAQ READY | Wi-Fi | FastPro® | DIAMONDBLUE Advanced Corrosion Protection® | PRECISION INVERTER® | 5 YR. PARTS WARRANTY | 7 YR. COMPRESSOR WARRANTY

PERFORMANCE RATINGS		230/208 volt models		
SYSTEM MODEL NO.		FPHW183A	FPHW243A	FPHW363B
INDOOR MODEL		FPHFW18A3B	FPHFW24A3B	FPHSW36A3C
OUTDOOR MODEL		FPHSR18A3A	FPHSR24A3A	FPHSR36A3B
SPECIFICATIONS				
CAPACITY COOLING (RATED)	Btu	18000	23500	35000
CAPACITY COOLING MIN - MAX	Btu	6500-19500	8000-26500	12000-38000
CAPACITY HEATING (RATED) @ 47°F	Btu	19000	26000	35000
CAPACITY HEATING (RATED) @ 17°F	Btu	11600	14500	15000
CAPACITY HEATING MIN - MAX	Btu	6500-20000	8000-26500	12000-38000
SENSIBLE HEAT RATIO		80%	76%	79%
COP		3.40	3.05	3.05
HSPF		11.6	10.5	8.8
SEER		23.3	21.0	16.4
EER		13.0	12.5	8.6
ENERGY STAR		YES	YES	—
MOISTURE REMOVAL	Pts/h	3.2	5.1	6.8
AIRFLOW (HIGH/MED/LOW/QUIET)	CFM	618/565/482/382	735/665/559/441	1030/824/706/588
SOUND RATING - INDOOR (HIGH/MED/LOW/QUIET)	dB-A	45/41/37/34	47/42/36/33	50/45/40/38
SOUND RATING - OUTDOOR	dB-A	55	58	60
OPERATING RANGE (HEATING)	°F	-4° – 75°	-4° – 75°	-4° – 75°
OPERATING RANGE (COOLING)	°F	5° – 115°	5° – 115°	5° – 115°
EST. YEARLY OPERATING COST	U.S. $	$124	$169	$290
ELECTRICAL DATA				
POWER SOURCE	V-Hz-Phase	230/208-60-1	230/208-60-1	230/208-60-1
MIN. AMPACITY	A	15	20	30
COOLING WATTS	W	1385	1880	4186
COOLING AMPS		6.3	8.3	18.5
HEATING WATTS	W	1638	2500	3459
HEATING AMPS		7.2	11.1	16
MAX. TD FUSE/ BREAKER	A	20	30	35
POWER AND COMMUNICATION CABLE	No.x AWG	4 x 14AWG	4 x 14AWG	4 x 14AWG
REFRIGERATION SYSTEM				
REFRIGERANT		R410a	R410a	R410a
COMPRESSOR TYPE		Rotary	Rotary	Rotary
CONNECTIONS		Flare	Flare	Flare
LIQUID LINE O.D.	in	1/4	3/8	3/8
SUCTION LINE O.D.	in	1/2	5/8	5/8
REFRIGERANT CHARGE	oz.	54.7	66.3	81.2
FACTORY PRECHARGE	ft.	25	25	25
MIN. / MAX. LINE LENGTH	ft	10-66	10-66	10-66
MAX. HEIGHT DIFFERENCE	ft	33	33	33
DIMENSIONS & WEIGHT				
INDOOR UNIT				
W x H x D	in	45 1/8 x 13 1/8 x 10		50 5/8 X 13 5/8 X 10 1/4
NET WEIGHT	lbs	33	33	40
SHIPPING WEIGHT	lbs	38.5	38.5	48
OUTDOOR UNIT				
W x H x D	in	33 7/8 x 25 1/2 x 12 1/8	34 7/8 x 31 1/4 x 14 3/8	34 7/8 x 31 1/4 x 14 3/8
NET WEIGHT	lbs	99	123.5	141
SHIPPING WEIGHT	lbs	108	141	152
TOTAL NET WEIGHT	lbs	132	156.5	181
TOTAL SHIPPING WEIGHT	lbs	146.5	179.5	200

Your operating costs will depend on your utility rates and use. The estimated operating cost is based on a electricity cost of $ .12 per kWh. For more information, visit www.ftc.gov/energy.

Due to continuing research in new energy-saving technology, specifications are subject to change without notice.

SINGLE ZONE | CEILING CASSETTE HEAT PUMPS

Compact cassette units install in a drop ceiling and mount flush to the ceiling for a clean look and efficient installation.

NOTE: Cassette grilles are sold separately.

Features for comfort and convenience

- 24-hour on/off timer
- Precision Inverter® technology (variable speed compressor)
- Soft start compressor
- Natural air flow
- 4-way cooling
- Surge Cool/Heat
- Cooling/Heating/Fan mode
- Dry mode
- Sleep mode
- Independent vane control
- 3 fan speeds
- Ultra-quiet turbo fan
- Evaporator frost control
- Auto restart
- Auto changeover
- Clean, modern look
- Flexible installation
- ENERGY STAR® qualified models
- Precise air distribution

Operates in extreme conditions

- Built-in low ambient, down to 5°F on 9k/12k/18k models, down to -4°F on 24k/36k models (Cooling mode)
- Low ambient operation down to -4°F (Heating mode)

WIRELESS REMOTE WITH THE ABILITY TO CHANGE TO A COOL-ONLY REMOTE

Built-in Wi-Fi for control anytime, anywhere

- Easy to use FriedrichGo™ app
- Create customizable, 7-day schedules
- Control with smartphone
- Compatible with Amazon Alexa and Google Home

Wi-Fi | DIAMONDBLUE Advanced Corrosion Protection® | PRECISION INVERTER® | 5YR. PARTS WARRANTY | 7YR. COMPRESSOR WARRANTY

PERFORMANCE RATINGS		Single Zone Cassette - Heat Pumps				
SYSTEM MODEL NO.		FPHC093A	FPHC123A	FPHC183A	FPHC243A	FPHC363A
INDOOR MODEL		FPHFC09A3B	FPHFC12A3B	FPHFC18A3B	FPHFC24A3B	FPHSC36A3B
OUTDOOR MODEL		FPHFR09A3A	FPHFR12A3A	FPHFR18A3A	FPHFR24A3A	FPHFR36A3A
SPECIFICATIONS						
CAPACITY COOLING (RATED)	Btu	9000	12000	18000	24000	36000
CAPACITY COOLING (MIN-MAX)	Btu	4850-11600	5800-13100	4200-21000	8600-25200	15000-42600
CAPACITY HEATING @47° F (RATED)	Btu	10000	12000	19000	24000	36000
CAPACITY HEATING @17° F (RATED)	Btu	6000	7000	11000	19600	27200
CAPACITY HEATING (MIN-MAX)	Btu	4340-12280	4400-14400	5600-24000	7600-28400	15000-42600
SENSIBLE HEAT RATIO		76%	77%	76%	76%	79%
COP (@47°F)	.	4.13	3.80	3.91	3.61	3.31
HSPF		10.00	11.50	11.00	11.50	10.50
SEER		22.0	23.0	22.0	19.0	19.5
EER		12.85	12.5	12.5	12.5	10.6
ENERGY STAR *		YES	YES	YES	YES	–
MOISTURE REMOVAL	Pts/h	2.0	3.0	1.9	5.1	7.61
AIRFLOW (LOW, MED, HIGH)	CFM	309/274/232	324/294/235	588/500/394	647/530/400	941/794/676
SOUND RATING - INDOOR H/M/L	dB(A)	39/32/29	42/37/33	39/32/29	44/40/38	49/43/39
SOUND RATING - OUTDOOR	dB(A)	52	54	68	54	61
OPERATING RANGE (COOLING)	°FDB	5-118	5-118	5-118	5-118	5-118
OPERATING RANGE (HEATING)	°FWB	-4-75	-4-75	-4-75	-4-75	-4-75
EST. YEARLY OPERATING COST	$	59	83	119	167	244
ELECTRICAL DATA						
POWER SOURCE	V	230/208-60-1	230/208-60-1	230/208-60-1	230/208-60-1	230/208-60-1
MINIMUM AMPACITY	A	23	23	23	23	27
COOLING WATTS	W	700	960	1420	1920	3380
COOLING AMPS		3.6	4.3	6.5	8.6	14.6
HEATING AMPS		3.5	4.1	6.3	8.6	14.0
MAX. TD FUSE/BREAKER	A	15	20	20	35	45
POWER AND COMMUNICATION CABLE No. x AWG		4 x 14AWG	4 x 14AWG	4 x 14AWG	4 x 14AWG	4 x 14AWG
REFRIGERATION SYSTEM						
REFRIGERANT		R410a	R410a	R410a	R410a	R410a
COMPRESSOR TYPE		Rotary	Rotary	Rotary	Rotary	Rotary
CONNECTIONS		Flare	Flare	Flare	Flare	Flare
LIQUID LINE O.D.	in	1/4	1/4	1/4	3/8	3/8
SUCTION LINE O.D.	in	3/8	3/8	1/2	5/8	3/4
FACTORY PRECHARGE	ft	25	25	25	25	25
REFRIGERANT CHARGE	oz	33.5	45.9	56.5	75	111
MIN./MAX. LINE LENGTH	ft	10-82	10-82	10-98	10-164	10-164
MAX. HEIGHT DIFFERENCE	ft	33	49	49	98	98
DIMENSIONS & WEIGHT						
INDOOR UNIT						
W X H X D	in	22 1/2 x 8 1/2 x 22 1/2	22 1/2 x 8 1/2 x 22 1/2	33 1/8 x 9 3/4 x 33 1/8	33 1/8 x 9 3/4 x 33 1/8	33 1/8 x 11 3/4 x 33 1/8
NET WEIGHT	lbs	32	39.7	56	59.5	70.5
SHIPPING WEIGHT	lbs	38.5	46.3	76	79.5	90.4
INDOOR UNIT GRILLE** W X H X D	in	24-1/2 x 24-1/2 x 10	24-1/2 x 24-1/2 x 10	35-7/8 x 35-7/8 x 13 1/2	35-7/8 x 35-7/8 x 13 1/2	35-7/8 x 35-7/8 x 13 1/2
INDOOR UNIT GRILLE** NET WEIGHT	lbs	13.2	13.2	22.0	22.0	22.0
INDOOR GRILLE PART NUMBER		FPCG0912		FPCG182436		
OUTDOOR UNIT						
W X H X D	in	37 x 25 x 16 1/2	37 x 25 x 16 1/2	39 x 17 3/4 x 28 3/4	43 x 36 1/4 x 18 1/8	43 x 36 1/4 x 18 1/8
NET WEIGHT	lbs	75	75	108	155	192
SHIPPING WEIGHT	lbs	85	82	117	166	215
TOTAL NET WEIGHT	lbs	107	108	164	214.5	262.5
TOTAL SHIPPING WEIGHT	lbs	123.5	121	191	245.5	305.4

Your operating costs will depend on your utility rates and use. The estimated operating cost is based on a electricity cost of $ .12 per kWh. For more information, visit www.ftc.gov/energy. *System meets ENERGY STAR® published minimums. **Models require grille. Sold separately.

Due to continuing research in new energy-saving technology, specifications are subject to change without notice.

SINGLE ZONE | THE INSIDER® CONCEALED DUCTED HEAT PUMPS

Indoor unit is installed in the ceiling or furr down, totally concealed, for unobtrusive installation.

Features

- Precision Inverter® technology (variable speed compressor)
- Soft start compressor
- BLDC motor
- Cooling/Heating/Fan mode
- Dry mode
- 3 fan speeds
- Auto restart
- Auto changeover
- DiamonGold Advanced Corrosion Protection™
- Control lock function on controller
- External Static Pressure Range 0-.40

Operates in extreme conditions

- Built-in low ambient, down to 5°F on 9k/12k/18k models, down to -4°F on 24k/36k models (Cooling mode)
- Low ambient operation down to -4°F (Heating mode)

WIRED WALL CONTROLLER

DIAMONDBLUE Advanced Corrosion Protection®

PRECISION INVERTER®

5 YR. PARTS WARRANTY

7 YR. COMPRESSOR WARRANTY

PERFORMANCE RATINGS		Single Zone - The Insider® Concealed Ducted Heat Pumps				
SYSTEM MODEL NO.		FPHD093	FPHD123	FPHD183	FPHD243	FPHD363
INDOOR MODEL		FPHFD09A3A	FPHFD12A3A	FPHFD18A3A	FPHFD24A3A	FPHSD36A3A
OUTDOOR MODEL		FPHFR09A3A	FPHFR12A3A	FPHFR18A3A	FPHFR24A3A	FPHFR36A3A
SPECIFICATIONS						
CAPACITY COOLING (RATED)	Btu	9000	12000	18000	24000	36000
CAPACITY COOLING (MIN~MAX)	Btu	4850-11600	5800-13100	4200-21000	8600-25200	12500-37300
CAPACITY HEATING @47°F (RATED)	Btu	11000	12000	18000	28000	36000
CAPACITY HEATING @17°F (RATED)	Btu	6000	6600	12000	19200	26000
CAPACITY HEATING (MIN~MAX)	Btu	4340-12280	4400-14400	5600-24000	7600-28400	15000-39800
SENSIBLE HEAT RATIO		76%	76%	76%	76%	76%
SEER		20.0	19.5	19.5	18.0	18.0
EER		12.00	11.00	11.80	10.50	10.90
COP (@47°F)	.	3.2	3.2	3.3	3.61	3.01
HSPF		10.00	10.00	10.00	11.00	9.50
ENERGY STAR		–	–	–	–	–
MOISTURE REMOVAL	Pts/h	2.0	3.0	5.0	1.9	7.61
AIRFLOW (LOW, MED, HIGH)	CFM	309/259/208	324/285/235	529/441/371	706/588/500	883/735/617
SOUND RATING - INDOOR H/M/L	dB(A)	35/33/32	36/34/33	38/37/36	42/38/36	43/40/38
SOUND RATING - OUTDOOR	dB(A)	52	54	68	54	61
OPERATING RANGE (COOLING)	°F	5-118	5-118	5-118	5-118	5-118
OPERATING RANGE (HEATING)	°F	-4-75	-4-75	-4-75	-4-75	-4-75
EST. YEARLY OPERATING COST	$	63	83	122	176	376
ELECTRICAL DATA						
POWER SOURCE		230/208-60-1	230/208-60-1	230/208-60-1	230/208-60-1	230/208-60-1
MINIMUM AMPACITY	A	23.0	23.0	23.0	23.0	21.0
COOLING WATTS	W	750	1091	1670	2200	3300
COOLING AMPS		3.7	4.8	7.6	10.3	14.35
HEATING AMPS		3.2	4.8	7.3	8.7	15.2
MAX. TD FUSE/BREAKER	A	15	20	20	35	45
POWER AND COMMUNICATION CABLE	No. x AWG	4 x 14AWG	4 x 14AWG	4 x 14AWG	4 x 14AWG	4 x 14AWG
REFRIGERATION SYSTEM						
REFRIGERANT		R410a	R410a	R410a	R410a	R410a
COMPRESSOR TYPE		Rotary	Rotary	Rotary	Rotary	Rotary
CONNECTIONS		Flare	Flare	Flare	Flare	Flare
LIQUID LINE O.D.	in	1/4	1/4	1/4	3/8	3/8
SUCTION LINE O.D.	in	3/8	3/8	1/2	5/8	3/4
FACTORY PRECHARGE	ft	25	25	25	25	25
REFRIGERANT CHARGE	oz	33.5	45.9	56.5	75.0	111
MIN./MAX. LINE LENGTH	ft	10-82	10-82	10-98	10-164	10-164
MAX. HEIGHT DIFFERENCE	ft	33	49	49	98	98
DIMENSIONS & WEIGHT						
INDOOR UNIT						
W X H X D	in	35 7/8 x 7 1/2 x 17 5/8	35 7/8 x 7 1/2 x 17 5/8	46 1/2 x 7 1/2 x 17 5/8	35 3/8 x 10 5/8 x 28 3/8	51 1/8 x 13 3/4 x 31 1/2
NET WEIGHT	lbs	39.7	39.7	49.6	66.1	112.4
SHIPPING WEIGHT	lbs	46.3	46.3	57.3	77.2	132.3
OUTDOOR UNIT						
W X H X D	in	37 x 25 x 16 1/2	37 x 25 x 16 1/2	39 x 17 3/4 x 28 3/4	43 x 36 1/4 x 18 1/8	43 x 36 1/4 x 18 1/8
NET WEIGHT	lbs	75	75	108	155	192
SHIPPING WEIGHT	lbs	85	82	117	166	215
TOTAL NET WEIGHT	lbs	107	108	108	214.5	262.5
TOTAL SHIPPING WEIGHT	lbs	123.5	121	158	245.5	305.4

Your operating costs will depend on your utility rates and use. The estimated operating cost is based on a electricity cost of $ .12 per kWh. For more information, visit www.ftc.gov/energy.

Due to continuing research in new energy-saving technology, specifications are subject to change without notice.

MULTI ZONE | HEAT PUMPS

Friedrich multi zone systems utilize wall-mounted, ceiling cassette and concealed ducted models in up to 5 zones

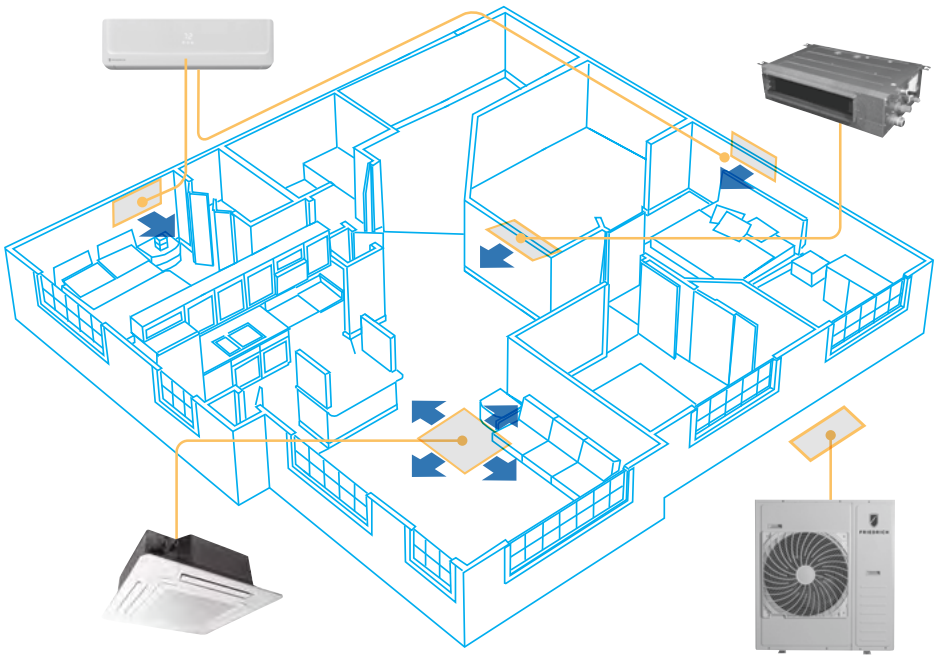
MULTI ZONE SYSTEMS PROVIDE TOTAL INSTALLATION FLEXIBILITY.

Zone cooling and heating provides unmatched customized comfort and energy savings

Occupants have the ability to set the temperature of each zone to their preferred comfort level*, or turn off units in unoccupied rooms without affecting other zones.

That's the beauty and efficiency of a Friedrich Ductless Multi Zone System.

*Multi zone units cannot heat and cool simultaneously



MULTI ZONE CONFIGURATION, AHRI RATINGS

Friedrich Model	AHRI Reference Number	Indoor Type	System Capacity	EER	SEER	High Heat 47 °F	HSPF	Low Heat 17°F
FPHMR18A3A	205150429	Non-ducted Indoor Units	18000	12.50	22.00	18000	11.00	12200
	205150428	Ducted Indoor Units	18000	11.50	19.00	18000	9.60	12200
	205150430	Mixed Ducted and Non-ducted Indoor Units	18000	12.00	20.50	18000	10.30	12200
FPHMR24A3A	204101246	Non-ducted Indoor Units	24000	12.50	22.00	24000	11.00	15400
	204005731	Ducted Indoor Units	24000	12.10	21.00	24000	10.00	15400
	203999079	Mixed Ducted and Non-ducted Indoor Units	24000	12.30	21.50	24000	10.50	15400
FPHMR36A3A	204101247	Non-ducted Indoor Units	32000	12.50	21.00	36000	11.00	23200
	203996910	Ducted Indoor Units	32000	12.00	19.50	36000	10.80	22600
	203999080	Mixed Ducted and Non-ducted Indoor Units	32000	12.25	20.25	36000	10.90	22600
FPHMR42A3A	205141512	Non-ducted Indoor Units	42000	10.50	20.00	42000	10.00	24000
	205141511	Ducted Indoor Units	41000	10.00	18.00	42000	9.50	24000
	205141513	Mixed Ducted and Non-ducted Indoor Units	41500	10.25	19.00	42000	9.75	24000

Select a combination of indoor units that does not exceed the maximum connected capacity, and is within the recommended parameters:

CEILING CASSETTE		WALL-MOUNTED		THE INSIDER®	
9,000 12,000	18,000 24,000	7,000 9,000 12,000	18,000 24,000	9,000 12,000	18,000 24,000

FPHMR18A3A
24,000 Btu MAX.
CONNECTED CAPACITY
DUAL ZONE ONLY

FOR (2) ZONES:
MINIMUM combination must be 50% of nameplate capacity

Combinations SHOULD NOT:
Exceed the maximum allowable total indoor unit connected capacity of 24,000 Btu.

FPHMR24A3A
36,000 Btu MAX.
CONNECTED CAPACITY
TRI-ZONE MAX.

FOR (2) ZONES:
MINIMUM combination must be 50% of nameplate capacity

FOR (3) ZONES:
Select any combination of (3) indoor units.

Combinations SHOULD NOT:
Exceed the maximum allowable total indoor unit connected capacity of 36,000 Btu.

FPHMR36A3A
48,000 Btu MAX.
CONNECTED CAPACITY
DUAL/TRI-ZONE/FOUR ZONE.

FOR (2) ZONES:
Select two (2) 18,000 Btu indoor units

FOR (3) ZONES:
Select any combination of (3) indoor units with no more than (2) 18,000 Btu indoor units plus (1) other indoor unit.

FOR (4) ZONES:
Select any combination of (4) indoor units.

Combinations SHOULD NOT:
Exceed the maximum allowable total indoor unit connected capacity of 48,000 Btu.

FPHMR42A3A
54,000 Btu MAX.
CONNECTED CAPACITY
TRI-ZONE/FOUR/FIVE ZONE WITH NO BRANCH BOXES

FOR (3) ZONES:
Select any combination of (3) indoor units with no more than (2) 18,000 Btu indoor units plus (1) other indoor unit.

FOR (4) ZONES:
Select any combination of (4) indoor units.

FOR (5) ZONES:
Select any combination of (5) indoor units.

Combinations SHOULD NOT:
Exceed the maximum allowable total indoor unit connected capacity of 54,000 Btu.

WORKSHEET EXAMPLE

MAX.CONDENSER CAPACITY	50% OF NAMEPLATE CAPACITY	ZONE 1 Unit Btu	ZONE 2 Unit Btu	ZONE 3 Unit Btu	ZONE 4 Unit Btu	ZONE 5 Unit Btu
24,000	12,000			DUAL ZONE ONLY		
36,000	18,000				TRI-ZONE MAX.	
48,000	24,000					4-ZONE MAX
54,000	27,000					

2 ZONES ONLY

FPHMR18A3A		
ZONE 1	ZONE 2	TOTAL
7	7	14
7	9	16
7	12	19
9	9	18
9	12	21
12	12	24

OUTDOOR UNITS

18000 BTU
24000 BTU Max. connected capacity

24000 BTU
36000 BTU Max. connected capacity

36000 BTU
48000 BTU Max. connected capacity

42000 BTU
54000 BTU Max. connected capacity

Select the outdoor unit that is applicable to the number of indoor spaces you want to condition. Mix-and-match flexibility lets you select the type of indoor units best suited to the application. Select from wall-mounted, ceiling cassette or concealed ducted heat pumps.

INDOOR UNITS

Wall-mounted

Ceiling cassette

Concealed ducted

2 OR 3 ZONES

FPHMR243A			
ZONE 1	ZONE 2	ZONE 3	TOTAL
7	7		14
7	9		16
7	12		19
7	18		25
9	9		18
9	12		21
9	18		27
9	24		33
12	12		24
12	18		30
18	18		36
7	7	7	21
7	7	9	23
7	7	12	26
7	7	18	32
7	9	9	25
7	9	12	28
7	9	18	34
7	12	12	31
7	12	18	37
9	9	9	27
9	9	12	30
9	9	18	36
9	12	12	33
12	12	12	36

Floating Air® Multi Zone allowable combinations that exceed our 100% ratio.

MODEL	BTU
FPHMW07A3B	7000
FPHFW09A3B	9000
FPHFW12A3B	12000
FPHFW18A3B	18000
FPHFW24A3B	24000

MODEL	BTU
FPHFC09A3B	9000
FPHFC12A3B	12000
FPHFC18A3B	18000
FPHFC24A3B	24000

MODEL	BTU
FPHFD09A3A	9000
FPHFD12A3A	12000
FPHFD18A3A	18000
FPHFD24A3A	24000

2, 3 OR 4 ZONES

FPHMR36A3A				
ZONE 1	ZONE 2	ZONE 3	ZONE 4	TOTAL
18	18			36
7	7	7		21
7	7	9		23
7	7	12		26
7	7	18		32
7	7	24		38
7	9	9		25
7	9	12		28
7	9	18		34
7	9	24		40
7	12	12		31
7	12	18		37
7	12	24		43
7	18	24		49
9	9	9		27
9	9	12		30
9	9	18		36
9	9	24		42
9	12	12		33
9	12	18		39
9	12	24		45
9	18	24		51
12	12	12		36
12	12	18		42
12	12	24		48
12	18	24		54
18	18	7		43
18	18	9		45
18	18	12		48
7	7	7	7	28
7	7	7	9	30
7	7	7	12	33
7	7	7	18	39
7	7	7	24	45
7	7	9	9	32
7	7	12	12	35
7	7	9	18	41
7	7	9	24	47
7	7	12	12	38
7	7	12	18	44
7	7	12	24	50
7	9	9	9	34
7	9	9	12	37
7	9	9	18	43
7	9	9	24	49
7	9	12	12	40
7	9	12	18	46
7	9	12	24	52
7	12	12	12	43
7	12	12	18	49
9	9	9	9	36
9	9	9	12	39
9	9	9	18	45
9	9	9	24	51
9	9	12	12	42
9	9	12	18	48
9	9	12	24	54
9	12	12	12	45
9	12	12	18	51
12	12	12	12	48
12	12	12	18	54

FPHMR42A3A					
ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5	TOTAL
7	7	7			21
7	7	9			23
7	7	12			26
7	7	18			32
7	7	24			38
7	9	9			25
7	9	12			28
7	9	18			34
7	9	24			40
7	12	12			31
7	12	18			37
7	12	24			43
7	18	18			43
7	18	24			49
9	9	9			27
9	9	12			30
9	9	18			36
9	9	24			42
9	12	12			33
9	12	18			39
9	12	24			45
9	18	18			45
9	18	24			51
12	12	12			36
12	12	18			42
12	12	24			48
12	18	18			48
12	18	24			54
7	7	7	7		28
7	7	7	9		30
7	7	7	12		33
7	7	7	18		39
7	7	7	24		45
7	7	9	9		32
7	7	9	12		35
7	7	9	18		41
7	7	9	24		47
7	7	12	12		38
7	7	12	18		44
7	7	12	24		50
7	7	18	24		56
7	9	9	9		34
7	9	9	12		37
7	9	9	18		43
7	9	9	24		49
7	9	12	12		40
7	9	12	18		46
7	9	12	24		52
7	9	18	24		58
7	12	12	12		43
7	12	12	18		49
7	12	12	24		55
7	12	18	24		61
9	9	9	9		36
9	9	9	12		39
9	9	9	18		45
9	9	9	24		51
9	9	12	12		42
9	9	12	18		48
9	9	12	24		54
9	9	18	24		60
9	12	12	12		45
9	12	12	18		51
9	12	12	24		57
9	12	18	24		63
12	12	12	12		48
12	12	12	18		54

FPHMR42A3A					
ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5	TOTAL
7	7	7	7	7	35
7	7	7	7	9	37
7	7	7	7	12	40
7	7	7	7	18	46
7	7	7	7	24	52
7	7	7	9	9	39
7	7	7	9	12	42
7	7	7	9	18	48
7	7	7	9	24	54
7	7	7	12	12	45
7	7	7	12	18	51
7	7	9	9	9	41
7	7	9	9	12	44
7	7	9	9	18	50
7	7	9	12	12	47
7	7	12	12	12	50
7	9	9	9	9	43
7	9	9	9	12	46
7	9	9	9	18	52
7	9	9	12	12	49
7	9	12	12	12	52
9	9	9	9	9	45
9	9	9	9	12	48
9	9	9	9	18	54
9	9	9	12	12	51
9	9	12	12	12	54

3, 4 OR 5 ZONES

MULTI ZONE | WALL-MOUNTED HEAT PUMPS

The contractor's line with extensive features to make installation and service faster and easier. Exceptional efficiency and dependable performance.

Built-in Wi-Fi for control anytime, anywhere

- Easy to use FriedrichGo™ app
- Create customizable, 7-day schedules
- Control with smartphone
- Compatible with Amazon Alexa and Google Home

WIRELESS REMOTE WITH THE ABILITY TO CHANGE TO A COOL-ONLY REMOTE

Features for comfort and convenience

- Precision Inverter® technology (variable speed compressor)
- Fast Pro® design for the fastest access for maintenance of any wall-mounted ductless system
- Soft start compressor
- BLDC motor
- Auto Clean indoor coil
- Cooling/Heating/Fan/Auto mode
- Surge Cool/Heat
- Natural air flow
- Ultra quiet operation
- Sleep mode
- Auto restart
- Auto changeover
- 24-hour on/off timer
- ENERGY STAR® qualified model
- Hidden display (only visible during operation)

Operates in extreme conditions

- Low ambient operation down to 14°F (Cooling mode)
- Low ambient operation down to -13°F (Heating mode)
- Low temperature compressor start-up protection

FPHMR18A3A , FPHMR24A3A

FPHMR36A3A

FPHMR42A3A

FreshAire® IAQ READY | Wi-Fi | FastPro® | DIAMONDBLUE Advanced Corrosion Protection® | PRECISION INVERTER® | 5YR. PARTS WARRANTY | 7YR. COMPRESSOR WARRANTY

PERFORMANCE RATINGS		Multi Zone Wall-Mounted - Heat Pumps				
		7k	9k	12k	18k	24k
INDOOR MODEL		FPHMW07A3B	FPHFW09A3B	FPHFW12A3B	FPHFW18A3B	FPHFW24A3B
SPECIFICATIONS						
CAPACITY COOLING (RATED)	Btu	7000	9000	12000	18000	24000
CAPACITY HEATING (RATED)	Btu	8500	9500	13000	19000	24200
MOISTURE REMOVAL	Pts/h	2.5	2.5	3.2	4.2	5.3
AIRFLOW	CFM	424/382/323/247	424/382/323/247	424/382/323/247	618/565/482/382	735/665/559/441
SOUND RATING (HIGH/MED/LOW)	dB-A	38/32/29	38/32/29	39/32/29	45/41/37	48/45/40
ELECTRICAL DATA						
POWER SOURCE	V-Hz-Phase	230/208~60-1	230/208~60-1	230/208~60-1	230/208~60-1	230/208~60-1
REFRIGERATION SYSTEM						
CONNECTIONS		Flare	Flare	Flare	Flare	Flare
LIQUID LINE O.D.	in	1/4	1/4	1/4	1/4	3/8
SUCTION LINE O.D.	in	3/8	3/8	3/8	1/2	5/8
DIMENSIONS & WEIGHT						
W x H x D	in	37 3/8"x 10 3/4"x 8 1/8"			48"x 12 5/8"x 9 1/4"	48"x 12 5/8"x 9 1/4"
NET WEIGHT	lbs	18.7	18.7	18.7	32	32
SHIPPING WEIGHT	lbs	24.3	24.3	24.3	37.5	37.5

PERFORMANCE RATINGS		Multi Outdoor			
		18k	24k	36k	42K
OUTDOOR MODEL		FPHMR18A3A	FPHMR24A3A	FPHMR36A3A	FPHMR42A3A
SPECIFICATIONS					
POWER SOURCE		208~230/60/1	208~230/60/1	208~230/60/1	208~230/60/1
EST. YEARLY OPERATING COST	$	$90	$172	$259	$277
RUNNING CURRENT COOLING RATED	A	6.5	8.7	11	17.5
RUNNING CURRENT HEATING RATED	A	7.3	8.7	13	17
POWER INPUT COOLING MIN. – RATED – MAX.	W	1440 (510~2610)	1920 (420~2640)	2520 (700~5000)	4020 (700~5000)
POWER INPUT HEATING MIN. – RATED – MAX.	W	1530 (450~3510)	1920 (420~4020)	3060 (600~6000)	3870 (600~6000)
POWER AND COMMUNICATION CABLE	No. x AWG	4 x 14AWG	4 x 14AWG	4 x 14AWG	4 x 14AWG
DIMENSIONS W x H x D	in	33 7/8 x 26 3/8 x 12 1/4	37 3/8 x 33 x 13 3/8	37 3/8 x 41 3/8 x 13 3/8	37 3/8 x 41 3/8 x 13 3/8
NET WEIGHT	lbs	108	159	186	196
SHIPPING WEIGHT	lbs	119	170	216	225
REFRIGERATION SYSTEM					
REFRIGERANT		R410A	R410A	R410A	R410A
FACTORY PRECHARGE	oz	63	81	106	120
FACTORY PRECHARGE	ft	50	75	100	125
LIQUID LINE O.D.	in	1/4	1/4	1/4	1/4
SUCTION LINE O.D.	in	3/8	3/8	3/8	3/8
MIN./MAX. LINE LENGTH (EACH)	ft	25/82	25/66	25/66	25/66
LINE LENGTH (TOTAL)	ft	164	197	197	262
MAX. HEIGHT DIFFERENCE	ft	49	49	49	49
SOUND PRESSURE LEVEL COOLING	dB	55	59	59	59
SOUND PRESSURE LEVEL HEATING	A	55	59	59	59
OPERATING RANGE COOLING	°F DB	14~115	14~115	14~115	14~115
OPERATING RANGE HEATING	°F WB	-13~75	-13~75	-13~75	4-75
MINIMUM AMPACITY	A	21A	25A	32A	35A
MAX. TD FUSE/BREAKER	A	30A	30A	50A	50A

Your operating costs will depend on your utility rates and use. The estimated operating cost is based on a electricity cost of $ .12 per kWh. For more information, visit www.ftc.gov/energy.

Due to continuing research in new energy-saving technology, specifications are subject to change without notice.

MULTI ZONE | CEILING CASSETTE HEAT PUMPS

Compact cassette units install in a drop ceiling and mount flush to the ceiling for a clean look and efficient installation.

built-in Wi-Fi for control anytime, anywhere

- Easy to use FriedrichGo™ app
- Create customizable, 7-day schedules
- Control with smartphone
- Compatible with Amazon Alexa and Google Home

NOTE: Cassette grilles are sold separately.

Features for comfort and convenience

- 24-hour on/off timer
- Precision Inverter® technology (variable speed compressor)
- Soft start compressor
- Natural air flow
- 4-way cooling
- Surge Cool/Heat
- Cooling/Heating/Fan mode
- Dry mode
- Sleep mode
- Independent vane control
- 3 fan speeds
- Ultra-quiet turbo fan
- Evaporator frost control
- Auto restart
- Auto changeover
- DiamonBlue Advanced Corrosion Protection®
- Clean, modern look
- Flexible installation
- ENERGY STAR® qualified models
- Precise air distribution

Operates in extreme conditions

- Built-in low ambient standard, down to 14°F (Cooling mode)
- Low ambient operation down to -13°F (Heating mode)
- Low temperature compressor start-up protection

WIRELESS REMOTE WITH THE ABILITY TO CHANGE TO A COOL-ONLY REMOTE

FPHMR18A3A , FPHMR24A3A

FPHMR36A3A

FPHMR42A3A

Wi-Fi | DIAMONDBLUE Advanced Corrosion Protection® | PRECISION INVERTER® | 5 YR. PARTS WARRANTY | 7 YR. COMPRESSOR WARRANTY

PERFORMANCE RATINGS		Multi Zone Cassette - Heat Pumps			
		9k	12k	18k	24k
INDOOR MODEL		FPHFC09A3B	FPHFC12A3B	FPHFC18A3B	FPHFC24A3B
SPECIFICATIONS					
CAPACITY COOLING (RATED)	Btu	9000	12000	18000	24000
CAPACITY HEATING (RATED)	Btu	10200	13500	20400	27000
MOISTURE REMOVAL	Pts/h	1.9	2.5	3.2	5.0
AIRFLOW (HIGH)	CFM	306	471	559	1100
SOUND RATING (MAX.-MIN.)	dB-A	40/28	40/28	40/28	40/28
ELECTRICAL DATA					
POWER SOURCE	V-Hz-Phase	230/208-60-1	230/208-60-1	230/208-60-1	230/208-60-1
POWER AND COMMUNICATION CABLE	No. x AWG	4 x 14AWG	4 x 14AWG	4 x 14AWG	4 x 14AWG
REFRIGERATION SYSTEM					
CONNECTIONS		Flare	Flare	Flare	Flare
LIQUID LINE O.D.	in	1/4	1/4	1/4	3/8
SUCTION LINE O.D.	in	3/8	3/8	1/2	5/8
DIMENSIONS & WEIGHT					
W X H X D	in	22 1/2 x 8 1/2 x 22		33 x 9 3/4 x 33	
NET WEIGHT	lbs	31.9	34	61.8	59.5
SHIPPING WEIGHT	lbs	38.5	40.7	81.6	79.5
PACKAGE DIMENSIONS W X H X D	in	28 3/4 x 11 1/2 x 26		39 1/4 x 37 x 14	39 1/4 x 37 x 14 1/2

PERFORMANCE RATINGS		Multi Outdoor			
		18k	24k	36k	42K
OUTDOOR MODEL		FPHMR18A3A	FPHMR24A3A	FPHMR36A3A	FPHMR42A3A
SPECIFICATIONS					
POWER SOURCE		208~230/60/1	208~230/60/1	208~230/60/1	208~230/60/1
EST. YEARLY OPERATING COST	$	$90	$172	$259	$277
RUNNING CURRENT COOLING RATED	A	6.5	8.7	11	17.5
RUNNING CURRENT HEATING RATED	A	7.3	8.7	13	17
POWER INPUT COOLING MIN. – RATED – MAX.	W	1440 (510~2610)	1920 (420~2640)	2520 (700~5000)	4020 (700~5000)
POWER INPUT HEATING MIN. – RATED – MAX.	W	1530 (450~3510)	1920 (420~4020)	3060 (600~6000)	3870 (600~6000)
POWER AND COMMUNICATION CABLE	No. x AWG	4 x 14AWG	4 x 14AWG	4 x 14AWG	4 x 14AWG
DIMENSIONS W x H x D	in	33 7/8 x 26 3/8 x 12 1/4	37 3/8 x 33 x 13 3/8	37 3/8 x 41 3/8 x 13 3/8	37 3/8 x 41 3/8 x 13 3/8
NET WEIGHT	lbs	108	159	186	196
SHIPPING WEIGHT	lbs	119	170	216	225
REFRIGERATION SYSTEM					
REFRIGERANT		R410A	R410A	R410A	R410A
FACTORY PRECHARGE	oz	63	81	106	120
FACTORY PRECHARGE	ft	50	75	100	125
LIQUID LINE O.D.	in	1/4	1/4	1/4	1/4
SUCTION LINE O.D.	in	3/8	3/8	3/8	3/8
MIN./MAX. LINE LENGTH (EACH)	ft	25/82	25/66	25/66	25/66
LINE LENGTH (TOTAL)	ft	164	197	197	262
MAX. HEIGHT DIFFERENCE	ft	49	49	49	49
SOUND PRESSURE LEVEL COOLING	dB	55	59	59	59
SOUND PRESSURE LEVEL HEATING	A	55	59	59	59
OPERATING RANGE COOLING	°F DB	14~115	14~115	14~115	14~115
OPERATING RANGE HEATING	°F WB	-13~75	-13~75	-13~75	4~75
MINIMUM AMPACITY	A	21A	25A	32A	35A
MAX. TD FUSE/BREAKER	A	30A	30A	50A	50A

Your operating costs will depend on your utility rates and use. The estimated operating cost is based on a electricity cost of $ .12 per kWh. For more information, visit www.ftc.gov/energy.

Models require grille. Sold separately.

Due to continuing research in new energy-saving technology, specifications are subject to change without notice.

MULTI ZONE | THE INSIDER® CONCEALED DUCTED HEAT PUMPS

Indoor unit installs in the ceiling or furr down for unobtrusive installation. Conditioned or non-conditioned air can be added to ducting to allow fresh air into the conditioned space whenever required.

Features

- Precision Inverter® technology (variable speed compressor)
- Soft start compressor
- BLDC motor
- Cooling/Heating/Fan mode
- Dry mode
- 3 fan speeds
- Auto restart
- Auto changeover
- DiamonBlue Advanced Corrosion Protection®
- Control lock function on controller
- External Static Pressure Range (ESP)
  - 9K/12K/18K (0 – .40) WC
  - 24K (0 – .40) WC

- Built-in low ambient standard, down to 14°F (Cooling mode)
- Low ambient operation down to -13°F (Heating mode)
- Low temperature compressor start-up protection

Operates in extreme conditions

WIRED WALL CONTROLLER

FPHMR18A3A , FPHMR24A3A

FPHMR36A3A

FPHMR42A3A

DIAMONDBLUE Advanced Corrosion Protection® | PRECISION INVERTER® | 5 YR. PARTS WARRANTY | 7 YR. COMPRESSOR WARRANTY

PERFORMANCE RATINGS		Multi Zone - The Insider® Concealed Ducted Heat Pumps			
		9k	12k	18k	24k
INDOOR MODEL		FPHFD09A3A	FPHFD12A3A	FPHFD18A3A	FPHFD24A3A
SPECIFICATIONS					
CAPACITY COOLING (RATED)	Btu	9000	12000	18000	24000
CAPACITY HEATING (RATED)	Btu	9000	12000	18000	24000
MOISTURE REMOVAL	Pts/h	2.0	3.0	5.0	5.1
AIRFLOW	CFM	235/285/309	235/285/338	370/440/529	501/574/647
SOUND RATING (MAX.-MIN.)	dB-A	29/27/26	36/33/30	38/35/33	38/36/34
ELECTRICAL DATA					
POWER SOURCE	V-Hz-Phase	230/208-60-1	230/208-60-1	230/208-60-1	230/208-60-1
POWER AND COMMUNICATION CABLE	No. x AWG	4 x 14AWG	4 x 14AWG	4 x 14AWG	4 x 14AWG
REFRIGERATION SYSTEM					
CONNECTIONS		Flare	Flare	Flare	Flare
LIQUID LINE O.D.	in	1/4	1/4	1/4	3/8
SUCTION LINE O.D.	in	3/8	3/8	1/2	5/8
DIMENSIONS & WEIGHT					
W X H X D	in	35 7/8 x 7 1/2 x 17 5/8		48 7/16 x 7 1/2 x 17 5/8	39 x 10 5/8 x 30
NET WEIGHT	lbs	39.7	39.7	49.6	70.5
SHIPPING WEIGHT	lbs	46.3	47.4	56.2	81.6

PERFORMANCE RATINGS		Multi Outdoor			
		18k	24k	36k	42K
OUTDOOR MODEL		FPHMR18A3A	FPHMR24A3A	FPHMR36A3A	FPHMR42A3A
SPECIFICATIONS					
POWER SOURCE		208~230/60/1	208~230/60/1	208~230/60/1	208~230/60/1
EST. YEARLY OPERATING COST	$	$90	$172	$259	$277
RUNNING CURRENT COOLING RATED	A	6.5	8.7	11	17.5
RUNNING CURRENT HEATING RATED	A	7.3	8.7	13	17
POWER INPUT COOLING MIN. – RATED – MAX.	W	1440 (510~2610)	1920 (420~2640)	2520 (700~5000)	4020 (700~5000)
POWER INPUT HEATING MIN. – RATED – MAX.	W	1530 (450~3510)	1920 (420~4020)	3060 (600~6000)	3870 (600~6000)
POWER AND COMMUNICATION CABLE	No. x AWG	4 x 14AWG	4 x 14AWG	4 x 14AWG	4 x 14AWG
DIMENSIONS W x H x D	in	33 7/8 x 26 3/8 x 12 1/4	37 3/8 x 33 x 13 3/8	37 3/8 x 41 3/8 x 13 3/8	37 3/8 x 41 3/8 x 13 3/8
NET WEIGHT	lbs	108	159	186	196
SHIPPING WEIGHT	lbs	119	170	216	225
REFRIGERATION SYSTEM					
REFRIGERANT		R410A	R410A	R410A	R410A
FACTORY PRECHARGE	oz	63	81	106	120
FACTORY PRECHARGE	ft	50	75	100	125
LIQUID LINE O.D.	in	1/4	1/4	1/4	1/4
SUCTION LINE O.D.	in	3/8	3/8	3/8	3/8
MIN./MAX. LINE LENGTH (EACH)	ft	25/82	25/66	25/66	25/66
LINE LENGTH (TOTAL)	ft	164	197	197	262
MAX. HEIGHT DIFFERENCE	ft	49	49	49	49
SOUND PRESSURE LEVEL COOLING	dB	55	59	59	59
SOUND PRESSURE LEVEL HEATING	A	55	59	59	59
OPERATING RANGE COOLING	°F DB	14~115	14~115	14~115	14~115
OPERATING RANGE HEATING	°F WB	-13~75	-13~75	-13~75	4-75
MINIMUM AMPACITY	A	21A	25A	32A	35A
MAX. TD FUSE/BREAKER	A	30A	30A	50A	50A

Your operating costs will depend on your utility rates and use. The estimated operating cost is based on a electricity cost of $ .12 per kWh. For more information, visit www.ftc.gov/energy.

Due to continuing research in new energy-saving technology, specifications are subject to change without notice.

SINGLE ZONE | WALL-MOUNTED HEAT PUMPS

Excellent efficiency and outstanding quality make Select a truly exceptional value line

115 VOLT MODELS
FSHSW09A1A, FSHSW12A1A

WIRELESS
REMOTE CONTROL

230/208 VOLT MODELS

FSHSW18A3A, FSHSW24A3A

FSHSW36A3A

Features

- Inverter technology is more energy efficient and can self-adjust capacity to match cooling needs
- Multiple operating modes including: auto, cool, dry, fan only and heat
- TURBO mode operates the unit at maximum performance to quickly bring the room to set temperature
- 4 fan speeds heating or cooling: high, medium, low, "quiet", plus auto-fan
- Continuous 'Air Sweep' up & down
- LCD remote
- 24-hour timer and sleep timer
- Indoor unit will briefly display set or room temperature
- Auto-restart after power interruptions
- Auto-shut flaps close when unit is off for a sleek appearance
- Washable antimicrobial air filters
- 115V/230V models will provide cooling in outdoor temperatures down to 0°F

FreshAire® IAQ READY | INVERTER | 5 YR. PARTS WARRANTY | 5 YR. COMPRESSOR WARRANTY

PERFORMANCE RATINGS		115 volt models		230/208 volt models		
SYSTEM MODEL NO.		FSHW091	FSHW121	FSHW183	FSHW243	FSHW363
INDOOR MODEL		FSHSW09A1A	FSHSW12A1A	FSHSW18A3A	FSHSW24A3A	FSHSW36A3A
OUTDOOR MODEL		FSHSR09A1A	FSHSR12A1A	FSHSR18A3A	FSHSR24A3A	FSHSR36A3A
SPECIFICATIONS						
CAPACITY COOLING (RATED)	Btu	9000	12000	18000	24000	36000
CAPACITY COOLING MIN - MAX	Btu	3100-9600	3100-12500	3412-20472	8600-24000	7404-35997
CAPACITY HEATING (RATED) @ 47°F	Btu	9500	13000	19800	24000	34600
CAPACITY HEATING (RATED) @ 17°F	Btu	6800	7100	12800	14600	20200
CAPACITY HEATING MIN - MAX	Btu	3100-12000	3412-15013	3412-21837	8600-26000	14979-35997
SENSIBLE HEAT RATIO		0.79	0.73	0.77	0.77	0.75
HSPF		9.0	9.0	9.0	10.0	9.0
SEER		18.0	18.0	18.0	18.0	18.0
EER		10.0	10.1	9.89	11.0	8.2
MOISTURE REMOVAL	Pts/h	1.69	2.96	3.8	4.23	7.4
AIRFLOW (HIGH/MED/LOW/QUIET)	CFM	318/288/241/171	400/318/241/194	500/441/383/294	588/441/306/206	883/765/647/559
SOUND RATING - INDOOR (HIGH/MED/LOW/QUIET)	dB-A	43/38/34/28	43/39/35/29	47/44/41/35	49/46/42/36	54/49/44/37
SOUND RATING - OUTDOOR	dB-A	52	53	57	58	65
OPERATING RANGE (HEATING)	°F	-4-75	-4-75	-13-75	-13-75	-4-75
OPERATING RANGE (COOLING)	°F	0-115	0-115	0-115	0-115	0-115
EST. YEARLY OPERATING COST	U.S. $	$67	$113	$146	$198	$368
ELECTRICAL DATA						
POWER SOURCE	V-Hz-Phase	115-60-1	115-60-1	230/208-60-1	230/208-60-1	230/208-60-1
MIN. AMPACITY	A	17	20	16	16	24
COOLING WATTS	W	900	1194	1820	2010	4100
COOLING AMPS	A	10.87	13.0	8.1	17.0	10.87
HEATING WATTS	W	870	1250	2090	2130	3800
HEATING AMPS	A	10.36	13.5	8.5	9.45	16.5
MAX. TD FUSE/BREAKER	A	25	30	25	25	40
REFRIGERATION SYSTEM						
REFRIGERANT		R410A	R410A	R410A	R410A	R410A
COMPRESSOR TYPE		Inverter	Inverter	Inverter	Inverter	Inverter
CONNECTIONS		Flare	Flare	Flare	Flare	Flare
LIQUID LINE O.D.	in	1/4"	1/4"	1/4"	1/4"	1/4"
SUCTION LINE O.D.	in	3/8"	3/8"	1/2"	5/8"	5/8"
REFRIGERANT CHARGE	oz.	24.7	31.8	45.68	56.4	91.71
FACTORY PRECHARGE	ft	25	25	25	25	25
MIN. / MAX. LINE LENGTH	ft	7/66	7/98	10/82	10/82	15/98
MAX. HEIGHT DIFFERENCE	ft	32.8	49.2	65.0	65.6	32.8
DIMENSIONS & WEIGHT						
INDOOR UNIT						
W x H x D	in	31 1/8 x 10 7/8 x 8	31 1/8 x 11 3/8 x 8	38 x 11 7/8 x 9	42 1/2 x 12 7/8 x 10	53 1/8 x 12 7/8 x 10
NET WEIGHT	lbs	20.9	23.2	30.9	37.5	42.0
SHIPPING WEIGHT	lbs	25.4	27.6	37.5	45.2	51.8
OUTDOOR UNIT						
W x H x D	in	33 1/2 x 21 1/4 x 12 5/8		37 5/8 x 27 5/8 x 15 5/8		38 5/8 x 31 1/8 x 16 7/8
NET WEIGHT	lbs	62.8	67.3	97.0	103.6	161
SHIPPING WEIGHT	lbs	68.4	72.8	106.9	113.5	171.9
TOTAL NET WEIGHT	lbs	83.7	90.5	127.9	141.1	203
TOTAL SHIPPING WEIGHT	lbs	93.8	100.4	144.4	158.7	223.7

Your operating costs will depend on your utility rates and use. The estimated operating cost is based on a electricity cost of $ .12 per kWh. For more information, visit www.ftc.gov/energy.

Due to continuing research in new energy-saving technology, specifications are subject to change without notice.

REFRIGERATION LINE SETS (REQUIRED) OUTSIDE DIMENSIONS

SYSTEM MODEL	Liquid	Suction	15' Lineset Kit	35' Lineset Kit
Floating Air® Pro Wall-mounted				
FPHW091A	1/4	3/8	T32150	T32350
FPHW121A	1/4	3/8	T32150	T32350
FPHW093A	1/4	3/8	T32150	T32350
PFHW123A	1/4	3/8	T32150	T32350
FPHW183A	1/4	1/2	T42150	T42350
FPHW243A	3/8	5/8	T53150	T53350
FPHW363B	3/8	5/8	T53150	T53350
Floating Air® Pro Multi Zone Outdoor				
FPHMR18A3A	1/4	3/8	T32150	T32350
FPHMR24A3A	1/4	3/8	T32150	T32350
FPHMR36A3A	1/4	3/8	T32150	T32350
FPHMR42A3A	1/4	3/8	T32150	T32350
Floating Air® Premier Wall-mounted				
FRHW093A	1/4	3/8	T32150	T32350
FRHW123A	1/4	3/8	T32150	T32350
Floating Air® Select Wall-mounted				
FSHW091	1/4	3/8	T32150	T32350
FSHW121	1/4	3/8	T32150	T32350
FSHW183	1/4	1/2	T42150	T42350
FSHW243	1/4	5/8	T52150	T52350
FSHW363	1/4	5/8	T52150	T52350
Floating Air® Pro Cassette Single Zone				
FPHC093A	1/4	3/8	T32150	T32350
FPHC123A	1/4	3/8	T32150	T32350
FPHC183A	1/4	1/2	T42150	T42350
FPHC243A	3/8	5/8	T53150	T53350
FPHC363A	3/8	3/4	T63150	T63350
Floating Air® Pro The Insider® Single Zone Concealed Ducted				
FPHD093	1/4	3/8	T32150	T32350
FPHD123	1/4	3/8	T32150	T32350
FPHD183	1/4	1/2	T42150	T42350
FPHD243	3/8	5/8	T53150	T53350
FPHD363	3/8	3/4	T63150	T63350

REFRIGERATION LINE SETS MIN./MAX. LENGTHS

SYSTEM MODEL	Min. (ft.)	Max. Each/Total (ft.)
Floating Air® Pro Wall-mounted		
FPHW091A	10	50
FPHW121A	10	50
FPHW093A	10	50
PFHW123A	10	50
FPHW183A	10	66
FPHW243A	10	66
FPHW363B	10	66
Floating Air® Pro Ceiling Cassette		
FPHC093A	25	82
FPHC123A	25	82
FPHC183A	25	82
FPHC243A	25	164
FPHC363A	25	164
Floating Air® Pro The Insider® Concealed Ducted		
FPHD093	25	82
FPHD123	25	82
FPHD183	25	82
FPHD243	25	164
FPHD363	25	164
Floating Air® Pro Outdoor		
FPHMR18A3A	25	82/164
FPHMR24A3A	25	66/197
FPHMR36A3A	25	66/246
FPHMR42A3A	25	66/246
Floating Air® Premier		
FRHW093A	10	66
FRHW123A	10	66
Floating Air® Select		
FSHW091	10	66
FSHW121	10	66
FSHW183	10	82
FSHW243	10	82
FSHW363	15	98

TORQUE WRENCH SETTINGS

Outside Diameter		Torque	
mm	inch	ft-lbs.	N·m
6.35	1/4	13 – 18	17.6 – 24.5
9.52	3/8	25 – 30	33.3 – 41.2
12.7	1/2	40 – 47	53.9 – 64.7
15.88	5/8	45 – 59	61.7 – 80.4

CEILING CASSETTE GRILLES

(REQUIRED)

Decorative Grille	
FPCG0912	FPCG182436
Fits FPHFC09A3B FPHFC12A3B	Fits FPHFC18A3B FPHFC24A3B FPHFC36A3B

WALL CONTROLLERS

(OPTIONAL)

FPWC1

FSWC1

WIRELESS REMOTE ACCESSORY FOR FLOATING AIR® SELECT MODELS

(OPTIONAL)

DFACC

FPWC1 Optional wired wall controller for Floating Air Premier single zone, and Floating Air® Pro, single and multi zone models. Does not work with FPHSW36A3B at this time. Please check with your Friedrich representative for options.

FSWC1 Optional wired wall controller for Floating Air® Select single zone models.

DFACC LCD remote for cooling only operation of all Floating Air Select heat pump models.

FreshAire® IAQ READY

Introducing Friedrich FreshAire® IAQ.

Proven solutions that improve the health and quality of indoor air, and ease customer concerns about the air they breathe. Easy-to-install FreshAire IAQ accessories improve the health and quality of indoor air.

AIR PURIFICATION

FreshAire® Purifier APWM1

FreshAire Purifier by iWave® features needlepoint bi-polar ionization to address any mold, bacteria, virus, allergens, and VOC's that may be in your air stream to ensure delivery of healthy, clean, purified air. Optional accessory for all Friedrich wall-mounted ductless models.

ULTRAVIOLET LED

Friedrich UV UVL1

Germicidal UV light kits have been tested and certified for use on Friedrich products. The UV kit can be installed on the indoor coil and is designed to disinfect surfaces and the air as it cir culates through the ventilation system. UV light can kill airborne bacteria, viruses, mold, reduce maintenance costs and extend the life of an HVAC system. Optional accessory for all Friedrich wall-mounted ductless models.

FRIEDRICH ADVANTAGE PROGRAM

Make Friedrich Ductless Your Advantage

Exceptional Benefits for Friedrich Ductless Contractors. The Advantage Program is designed to encourage top HVAC contractors, nationwide, to become part of a motivated team of industry professionals dedicated to the sale, installation, and support of the Friedrich Floating Air® Ductless equipment line through Advantage ONLY ductless warranties, contractor rewards, exclusive promotions, and annual Friedrich product training

Ready for your Friedrich Advantage?

Contractor enrollment via your Friedrich Distributor
http://www.advantage.Friedrich.com

ADVANTAGE DEALER

Many Friedrich ductless models qualify for rebates

Many utility companies offer rebates on ductless air conditioners. Contact your local energy provider for information on ductless rebates or visit: http://www.dsireusa.org

Find a factory trained Friedrich ductless installer at www.friedrich.com

LINKS TO INSTALLATION/OPERATION MANUALS

FLOATING AIR® PREMIER Model FRHW093
FLOATING AIR® PREMIER Model FRHW123
FLOATING AIR® PREMIER Remote Controller (All Models)
FLOATING AIR® PRO SINGLE ZONE 115V/230V 9K & 12K Wall-mounted Systems
FLOATING AIR® PRO SINGLE/MULTI-ZONE 7K, 9K, 12K, 18, Wall-mounted Systems
FLOATING AIR® PRO SINGLE ZONE 36K Wall-mounted System
FLOATING AIR® PRO SINGLE/MULTI-ZONE Cassette Systems
FLOATING AIR® PRO MULTI-ZONE 24K, Outdoor Unit
FLOATING AIR® PRO MULTI-ZONE 36K, Outdoor Unit
FLOATING AIR® PRO MULTI-ZONE Cassette Systems
FLOATING AIR® PRO SINGLE ZONE Concealed Ducted Systems
FLOATING AIR® PRO Remote Controller
FLOATING AIR® PREMIER/PRO Wall Controller
FLOATING AIR® Accessory FPCG182436
FLOATING AIR® Accessory FPCG0912
FLOATING AIR® Wall Controller FPWC1
FLOATING AIR® SELECT 9K, 12K, 18K, 24K Wall-mounted Systems Outdoor Units
FLOATING AIR® SELECT 9K, 12K, 18K, 24K Wall-mounted Systems Indoor Units
FLOATING AIR® SELECT 36K Wall-mounted System
FRIEDRICHGO™ APP

FRIEDRICH

SUBMITTAL DATA

Order #: **Date:** 02/08/2023

Project: Elkins DNR Update

Project #:

Submitter: Roger Ward
Johnstone Supply, Inc., Bridgeport #354
PO Box 89,
Bridgeport, West Virginia 26330
304-623-4363

Date
02/08/2023
Project Name
Elkins DNR Update
Project Number
Client / Purchaser

Submittal Summary Page

Qty	Tag #	Model # / Material #	Description
1		ZYG06E4C1EB2C123A4	5 Ton, Coleman Point Core Single Packaged R-410A Air Conditioner, Single Stage Cooling, 15.0 SEER / 12.0 EER, Gas Heat, 112 MBH Two Stage Input Medium Heat Aluminized Gas, 460-3-60 • Hot Gas Reheat • Enthalpy Economizer (Downflow only) (with Barometric Relief) with Economizer Fault Detection & Diagnostic (Meets ASHRAE 90.1-2013, IECC 2015, California Title 24, AMCA 511) • High Static Belt Drive Blower • Smart Equipment Controller including Discharge Air, Return Air, and Outdoor Air Temperature Sensors. BACNet MS/TP, Modbus and N2 Communication Card. • Non-fused Disconnect (60 Amp) • Return Air Smoke Detector • Microchannel All Aluminum Condenser Coil, Copper tube/Aluminum fin Evaporator Coil • Hinged Cabinet Doors
1		1RC0456	Curb Rigid 14" (356 mm) Small Footprint
1		2PM04700224	Phase Monitor Kit
1		2EC0402	Kit, Dual Enthalpy Field Installed (Includes two humidity sensors)
1		CD15N1DH4S1CEH12B2	15 Ton, Air Conditioner, Point Choice Single Packaged R-410A, Four Stage Cooling, Standard Efficiency, Bottom Duct, Natural Gas, Staged Heat, Low Heat, 220 MBH Input, 460-3-60, 5 kA Standard SCCR, 5 HP High Static Belt Drive Blower • VAV Controller with VFD • Dual Enthalpy Economizer w/Barometric Relief with Economizer Fault Detection & Diagnostic (Meets ASHRAE 90.1-2013, IECC 2015, California Title 24, AMCA 511) • 2" Pleated Filters (MERV 8) • Smart Equipment Controller including Discharge Air, Return Air, and Outdoor Air Temperature Sensors. BACNet MS/TP, Modbus and N2 Communication Card. • HACR Circuit Disconnect • Return Air Smoke Detector • Phase Monitor • Microchannel condenser coils • Copper tube/Aluminum fin evaporator coils • No Modulating Hot Gas Reheat • Hinged Access Panel • Polyester SMC Drain Pan

Qty	Tag #	Model # / Material #	Description
1		1RC0443	14" Roof Curb
1		CD25N1DH4S1CEH12B2	25 Ton, Air Conditioner, Point Choice Single Packaged R-410A, Four Stage Cooling, Standard Efficiency, Bottom Duct, Natural Gas, Staged Heat, Low Heat, 220 MBH Input, 460-3-60, 10 HP High Static Belt Drive Blower • VAV Controller with VFD • Dual Enthalpy Economizer w/Barometric Relief with Economizer Fault Detection & Diagnostic (Meets ASHRAE 90.1-2013, IECC 2015, California Title 24, AMCA 511) • 2" Pleated Filters (MERV 8) • Smart Equipment Controller including Discharge Air, Return Air, and Outdoor Air Temperature Sensors. BACNet MS/TP, Modbus and N2 Communication Card. • HACR Circuit Disconnect • Return Air Smoke Detector • Phase Monitor • Microchannel condenser coils • Copper tube/Aluminum fin evaporator coils • No Modulating Hot Gas Reheat • Hinged Access Panel • Polyester SMC Drain Pan
1		1RC0444	14" Roof Curb

Equipment start-up and commissioning by a factory trained technician is recommended.
Contact your supplying distributor or sales representative for additional information & guidance.


WARNING: Cancer and Reproductive Harm - www.P65Warnings.ca.gov

Coleman® Point™ Core 3-12.5 Ton Package

Single Package R-410A Air Conditioner

Project Name: **Elkins DNR Update** | Unit Model #: **ZYG06E4C1EB2C123A4**

Quantity: **1** | System: **ZYG06E4C1EB2C123A4**

Cooling Performance		
Total gross capacity	63.6	MBH
Sensible gross capacity	47.1	MBH
Total net capacity	58.8	MBH
Sensible net capacity	42.3	MBH
Seasonal Efficiency (at ARI)	15.20	SEER2
Seasonal Efficiency (at ARI)	14.30	SEER2
Efficiency (at ARI)	12.00	EER2
Efficiency (at ARI)	12.00	EER2
Ambient DB temp.	95.0	°F
Entering DB temp.	80.0	°F
Entering WB temp.	67.0	°F
Leaving DB temp.	58.2	°F
Leaving WB temp.	56.9	°F
Leaving air temp dew point	56.10	°F
Power input (w/o blower)	5.20	kW
Sound power	79	dB(A)

Refrigerant		
Refrigerant type	R-410A	
Sys1	7 lbs	4 oz

Reheat Performance		
Total capacity	22.6	MBH
Sensible capacity	2.7	MBH
Ambient DB temp.	85	°F
Entering DB temp.	75	°F
Entering WB temp.	67	°F
Leaving DB temp.	73.8	°F
Leaving WB temp.	63.8	°F
Power input (w/o blower)	3.60	kW
Gallons of water per hour	2.27	gal/hr

Gas Heating Performance		
Entering DB temp.	60	°F
Heating output capacity (Max)	90.0	MBH
Supply air	2000	CFM
Heating input capacity (Max)	112	MBH
Leaving DB temp.	101.7	°F
Air temp. rise	41.7	°F
SSE	80.0	%
Stages	2	

Supply Air Blower Performance		
Supply air	2000	CFM
Ext. static pressure	0.6	IWG
Addl. Unit Losses (Options/Accessories)	0.81	IWG
Blower speed	1358	HP
Max BHP of Motor (including service factor)	2.90	HP
Duct location	Bottom	
Motor rating	2.90	HP
Actual required BHP	1.51	HP
Power input	1.40	kW
Elevation	0	ft.
Drive type	BELT	

Electrical Data		
Power supply	460-3-60	
Unit min circuit ampacity	14.3	Amps
Unit min over-current protection	15	Amps
Unit max over-current protection	20	Amps

Dimensions & Weight					
Hgt 41	in.	Len 74	in.	Wth 49	in.
Weight with factory installed options				701	lbs
ERV Weight					lbs

Clearances					
Right	18 in.	Front	18 in.	Rear	18 in.
Top	18 in.	Bottom	18 in.	Left	18 in.

Note: Please refer to the tech guide for listed maximum static pressures

5 Ton

- All units are manufactured at an ISO 9001 registered facility and each rooftop is completely computer-run tested prior to shipment.

Unit Features

- Single Stage Cooling
- 112 MBH Two Stage Input Medium Heat Aluminized Gas
- Unit Cabinet Constructed of Powder Painted Steel, Certified At 750 Hours Salt Spray Test (ASTM B-117 Standards)
- Either supply and/or return can be field converted from vertical to horizontal configuration without cutting panels.
- Full perimeter base rails with built in rigging capabilities
- Scroll Compressors
- Enthalpy Economizer (Downflow only) (with Barometric Relief) with Economizer Fault Detection & Diagnostic (Meets ASHRAE 90.1-2013, IECC 2015, California Title 24, AMCA 511)
- High Static Belt Drive Blower
- Solid Core Liquid Line Filter Driers
- Unit Ships with 2" Throwaway Filters
- Replacement Filters: 4 - (16" x 16"). Unit accepts 2" or 4" wide filters.
- Single Point Power Connection
- Short Circuit Current: 5kA RMS Symmetrical
- Non-fused Disconnect (60 Amp)
- Microchannel All Aluminum Condenser Coil, Copper tube/Aluminum fin Evaporator Coil

Standard Unit Controller

- Smart Equipment Control Board
- On-Board Diagnostic and Fault Code display
- An Integrated Low-Ambient Control, Anti-Short Cycle Protection, Lead-Lag, Fan On and Fan off Delays, Low Voltage Protection, Allows all units to operate in the cooling mode down to 0 °F outdoor ambient without additional components or intervention.
- Safety Monitoring - Monitors the high and low-pressure switches, the freezestats, the gas valve, if applicable, and the temperature limit switch on gas and electric heat units. The unit control board will alarm on ignition failures, safety lockouts and repeated limit switch trips.

BAS Controller

- Smart Equipment Controller including Discharge Air, Return Air, and Outdoor Air Temperature Sensors. BACNet MS/TP, Modbus and N2 communication card.

Warranty

- One (1) Year Limited Warranty on the Complete Unit
- Five (5) Year Warranty - Compressors
- Ten (10) Year Warranty - Aluminized Steel Tubular Heat Exchangers

Coleman® Point™ Core 3-12.5 Ton Package

Single Package R-410A Air Conditioner

Project Name: **Elkins DNR Update** Unit Model #: **ZYG06E4C1EB2C123A4**

Quantity: **1** System: **ZYG06E4C1EB2C123A4**

Additional Electrical Data		
Power supply	460-3-60	
Unit min circuit ampacity	14.3	Amps
Unit max over-current protection	20	Amps
Min Voltage	432	V
Max Voltage	504	V
Comp #1 RLA	7.1	
Comp #1 LRA	52.0	
Indoor Mtr Voltage	460-3-60	
Indoor Mtr FLA	4.1	
Outdoor Mtr Qty	1	
Outdoor Fan Voltage	460-1-60	
OD Fan Mtr FLA (ea.)	1.3	
Power Ex Mtr Qty	1	
Powered Ex Voltage	460-3-60	
Power Ex Mtr FLA (ea)	0.5	
Combustion Mtr Qty	1	
Combustion Motor Voltage	208/230-1-60	
Combustion Mtr FLA (ea)	0.08	

Coleman® Point™ Core 3-12.5 Ton Package

Single Package R-410A Air Conditioner

Project Name: **Elkins DNR Update** | Unit Model #: **ZYG06E4C1EB2C123A4**

Quantity: **1** | System: **ZYG06E4C1EB2C123A4**

Factory Installed Options

ZYG06E4C1EB2C123A4

Equipment Options		Option(s) Selected
Product Category:	**ZY**	Coleman Point Core Single Packaged R-410A Air Conditioner
Heat Type:	**G**	Gas Heat
Nominal Cooling Capacity:	**06**	5 Ton Single Stage Cooling 15.0 SEER / 12.0 EER
Heat Size:	**E**	112 MBH Two Stage Input Medium Heat Aluminized Gas
Voltage:	**4**	460-3-60
Airflow:	**C**	High Static Belt Drive Blower
Airflow Options:	**1**	
Coil Options:	**E**	Hot Gas Reheat Microchannel All Aluminum Condenser Coil, Copper tube/Aluminum fin Evaporator Coil
Controls:	**B**	Smart Equipment Controller including Discharge Air, Return Air, and Outdoor Air Temperature Sensors. BACNet MS/TP, Modbus and N2 Communication Card.
Sensor Options:	**2**	Return Air Smoke Detector
Economizer / Damper:	**C**	Enthalpy Economizer (Downflow only) (with Barometric Relief) with Economizer Fault Detection & Diagnostic (Meets ASHRAE 90.1-2013, IECC 2015, California Title 24, AMCA 511)
Convenience Outlet:	**1**	
Electrical Options:	**2**	Non-fused Disconnect (60 Amp)
Cabinet Options:	**3**	Hinged Cabinet Doors
Special Options:	**A**	
Product Generation:	**4**	

Field Installed Accessories

- ○ 1BD0409 - Burglar Bars (Small Footprint) (32.0 lbs)
- ○ 1CV0402 - Concentric Diffuser,Flush Mount,18RD
- ○ 1CV0411 - Concentric Diffuser,Side Discharge,18RD (55.0 lbs)
- ○ 1CV0419 - Concentric Diffuser,Specialty,18X18
- ○ 1FE0415 - Flue Extension Kit (16.0 lbs)
- ○ 1HA0454 - High Altitude Kit for Natural Gas - For applications between 2000 and 10,000 feet altitude (1.5 lbs)
- ○ 1HA0458 - High Altitude Kit for Propane - For applications between 2000 and 10,000 feet altitude (1.9 lbs)
- ○ 1HG0420 - Hail Guard Kit (Small Footprint Tall Cabinet) (24.0 lbs)
- ○ 1HS0401 - Heat Shield (0.6 lbs)

Coleman® Point™ Core 3-12.5 Ton Package

Single Package R-410A Air Conditioner

Project Name: **Elkins DNR Update** Unit Model #: **ZYG06E4C1EB2C123A4**

Quantity: **1** System: **ZYG06E4C1EB2C123A4**

- ○ 1NP0456 - Propane Conversion Kit (1.9 lbs)
- ● 1RC0456 - Curb Rigid 14" (356 mm) Small Footprint (145.0 lbs)
- ○ 1RC0458 - Curb Rigid 24" (610 mm) Small Footprint (135.0 lbs)
- ○ 1TB0401 - Small Footprint Thru The Base Electrical & Thru The Curb Gas (1.0 lbs)
- ○ 1TB0403 - Small Footprint Thru The Base Electrical & Gas (1.0 lbs)
- ○ 2AQ04700524 - CO^2 Space Sensor - Wall Mount Accessory (5.0 lbs)
- ○ 2AQ04700624 - CO^2 Unit Mount Accessory (4.6 lbs)
- ○ 2EC0401 - Kit, Single Enthalpy Field Installed (1.0 lbs)
- ● 2EC0402 - Kit, Dual Enthalpy Field Installed (Includes two humidity sensors) (1.0 lbs)
- ○ 2LA04704746 - Low Ambient for 1 system Units with 1 phase condenser fans (for 460V units) (4.0 lbs)
- ○ 2PE04704246 - Power Exhaust Vert Flow Small Footprint 460V 3-ph (38.8 lbs)
- ● 2PM04700224 - Phase Monitor Kit (1.0 lbs)
- ○ 2SD04701224 - Smoke Detector - Supply (12.0 lbs)
- ○ S1-03102529000 - Non-Networking Wall Sensor – Allows remote sensing and control from single or multiple zones. (0.2 lbs)
- ○ S1-03102529004 - Non-Networking Wall Sensor with Over-ride button – Allows remote sensing and control from single or multiple zones. Override allows setpoint to be overridden for 2 hour time period. (0.2 lbs)
- ○ S1-03102529100 - Non-Networking Wall Sensor – Allows remote sensing and control from single or multiple zones. (0.0 lbs)
- ○ S1-03102529104 - Non-Networking Wall Sensor with Over-ride button – Allows remote sensing and control from single or multiple zones. Override allows setpoint to be overridden for 2 hour time period. (0.2 lbs)
- ○ S1-03102529106 - Non-Networking Wall Sensor with Setpoint Adjustment and Over-ride Button – Allows remote sensing and control from single or multiple zones. Allows setpoint to be adjusted ± 5º F. Override allows setpoint to be overridden for 2 hour time period. (0.2 lbs)
- ○ S1-ADDWIRE - Add-a-Wire allows 5-wire thermostats to use only 4 wires. (0.3 lbs)
- ○ S1-CTSDTS - CTS Wired Temperature Sensor for thermostat | Duct *Also works for LX Series (0.3 lbs)
- ○ S1-CTSHTS - CTS Hardwired Temperature Sensor for CTS Thermostats *Works with LX series as well (0.2 lbs)
- ○ S1-CTSPLATE - Wall Plate for CTS Thermostats *Also works for new platform LX series models below (0.0 lbs)
- ○ S1-CTSWFTS - CTS Temperature Sensor with WiFi for CTS Thermostats *Also works with LX Series (0.1 lbs)
- ○ S1-LXLOCK - Locking Ring For LX-Series Thermostats (0.4 lbs)
- ○ S1-LXPLATE - Wall Plate For LX-Series Thermostats (0.0 lbs)
- ○ S1-LXWFM - For LX Series Thermostats - WiFi Communication (0.1 lbs)
- ○ S1-MP-PRTKIT-0P - MAP (Multiple Access Portal) Gateway Kit- Replacement MAP gateway protective case, lanyard and communication cable. Use only to replace worn or damaged components. (0.3 lbs)
- ○ S1-MP-STAFBA-0 - Field Bus Adapter (Includes RJ-12 to 4-position Terminal Block Adapter. Used for interfacing directly to MS/TP Field Bus) (1.0 lbs)
- ○ S1-MP-STAKIT-0 - Stationary Cradle Only (Includes mounting bracket and field bus adapter) (0.1 lbs)
- ○ S1-MP-STAKIT-0H - Stationary Cradle Kit (Includes mounting bracket, field bus adapter, and 100-240 VAC line voltage power supply) (1.0 lbs)
- ○ S1-NSB8BHN041-0 - Wall Temperature and 3% Relative Humidity Combined Sensor, No Display, WHITE, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BHN043-0 - Wall Temperature and 3% Relative Humidity Combined Sensor, No Display, BLACK, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BHN141-0 - Wall Temperature and 3% Relative Humidity Combined Sensor, Warmer/Cooler Display, WHITE, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BHN143-0 - Wall Temperature and 3% Relative Humidity Combined Sensor, Warmer/Cooler Display, BLACK, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BHN240-0 - Wall Temperature and 3% Relative Humidity Combined Sensor, Full Display, WHITE, JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BHN241-0 - Wall Temperature and 3% Relative Humidity Combined Sensor, Full Display, WHITE, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BHN243-0 - Wall Temperature and 3% Relative Humidity Combined Sensor, Full Display, BLACK, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BPN240-0 - Wall Temperature and 2% Relative Humidity Combined Sensor, Full Display, WHITE, JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BPN241-0 - Wall Temperature and 2% Relative Humidity Combined Sensor, Full Display, WHITE, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BPN243-0 - Wall Temperature and 2% Relative Humidity Combined Sensor, Full Display, BLACK, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BTN041-0 - Wall Temperature Sensor, No Display, WHITE, NO JCI LOGO, NS8000 Series (0.4 lbs)

Coleman® Point™ Core 3-12.5 Ton Package

Single Package R-410A Air Conditioner

Project Name: **Elkins DNR Update** Unit Model #: **ZYG06E4C1EB2C123A4**

Quantity: **1** System: **ZYG06E4C1EB2C123A4**

- ○ S1-NSB8BTN043-0 - Wall Temperature Sensor, No Display, BLACK, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BTN141-0 - Wall Temperature Sensor, Warmer/Cooler Display, WHITE, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BTN143-0 - Wall Temperature Sensor, Warmer/Cooler Display, BLACK, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BTN240-0 - Wall Temperature Sensor, Full Display, WHITE, JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BTN241-0 - Wall Temperature Sensor, Full Display, WHITE, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BTN243-0 - Wall Temperature Sensor, Full Display, BLACK, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-SE-COM1001-0 - Field Installed Communication Card for Simplicity SE control. Can be field configurable for BACnet, N2 or ModBUS MSTP (0.0 lbs)
- ○ S1-TBPU435-S - Source 1 Branded CTS Series | 4.3" Display | 3/4 Stage Heating | 2 Stage Cooling | (5+1+1) 7-day Programmable | WiFi On-Board (0.7 lbs)
- ○ S1-TBPU436-S - Source 1 Branded CTS Series | 3/4 Stage Heating | 2 Stage Cooling | (5+1+1) 7-day Programmable | WiFi and Humidity On-Board (0.7 lbs)
- ○ S1-TBSU232-S - Source 1 Branded LX Series | 2.3" Display | 2 Stage Heating | 2 Stage Cooling | 7-day Programmable (0.2 lbs)
- ○ S1-TBSU304-S - Source 1 Branded LX Series | 3" Display | 2 Stage Heating | 2 Stage Cooling | Non-Programmable | Humidity On-Board (1.0 lbs)
- ○ S1-TBSU306-S - Source 1 Branded LX Series | 3" Display | 3/4 Stage Heating | 2 Stage Cooling | (5+1+1) 7-day Programmable | Humidity On-Board (1.0 lbs)
- ○ S1-TEC3630-16-000 - 7 DAY PROGRAMMABLE THERMOSTAT, OPTIONAL MSTP OR N2 COMMUNICATION, RTU/HEAT PUMP WITH ECON,FULL COLOR, WHITE, NO LOGO (0.8 lbs)
- ○ S1-YK/AN-RSO-ACI - Non-Networking Wall Sensor with Setpoint Adjustment and Over-ride Button – Allows remote sensing and control from single or multiple zones. (1.0 lbs)
- ○ S1-YK-MAP1810-0P - MAP (Multiple Access Portal) Gateway- For use with SimplicitySE Control. (0.2 lbs)
- ○ S1-YK-MAP1810-0S - Stationary MAP Gateway (Includes MAP Gateway, Field Bus Adapter, Mounting Bracket and 100 to 240 VAC Power Supply). US-compatible counties. (1.9 lbs)

Coleman® Point™ Core 3-12.5 Ton Package

Single Package R-410A Air Conditioner

Project Name: **Elkins DNR Update**

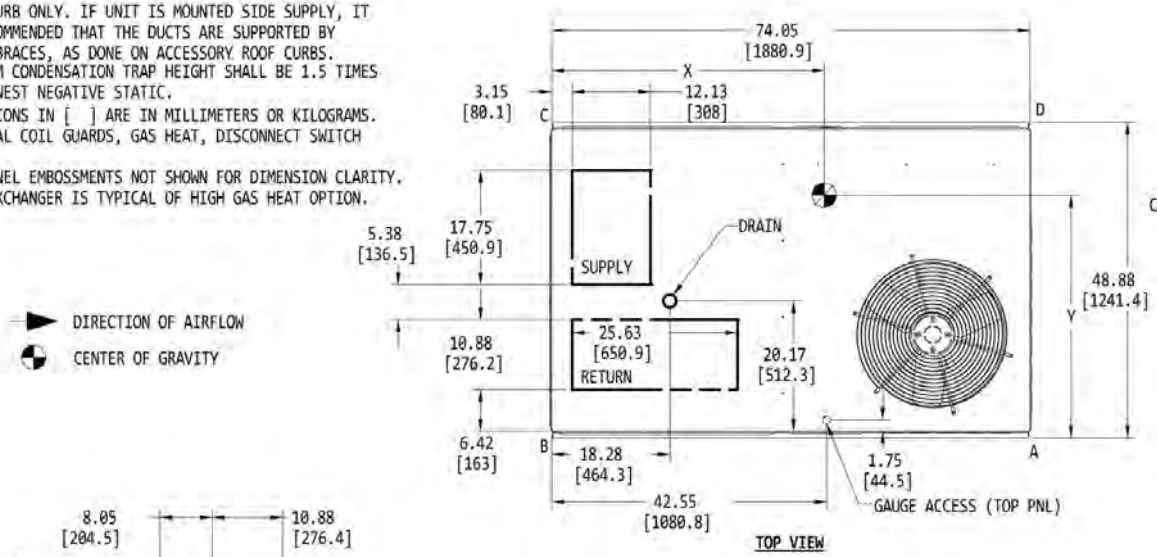
Unit Model #: **ZYG06E4C1EB2C123A4**

Quantity: **1**

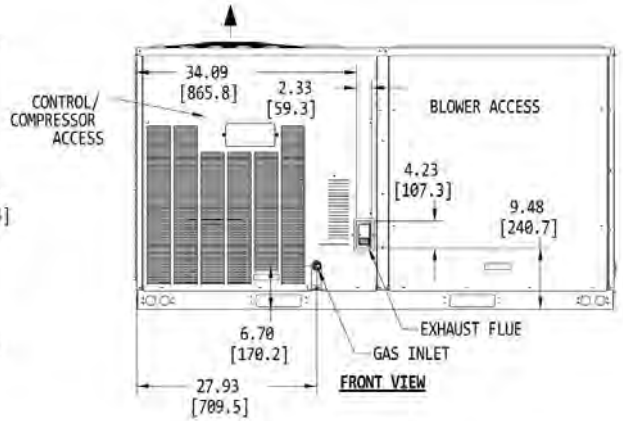
Consolidated Drawing

NOTES:
1. FOR OUTDOOR USE ONLY.
2. WEIGHTS SHOWN ARE FOR COOLING ONLY UNITS.
3. RECOMMENDED MIN. CLEARANCES:
   RIGHT SIDE: 18 [450] W/SIDE CONDENSATE DRAIN: 24 [600]
   LEFT SIDE: 12 [300] W/PIGTAIL: 18 [450]
   FRONT: 36 [900]
   BACK: 18 [450]
   TOP: 72 [1800]
   BOTTOM: 0 [0]
4. FOR SMALLER SERVICE AND OPERATIONAL CLEARANCES CONTACT YOUR APPLICATION ENGINEERING DEPARTMENT.
5. DOWNFLOW DUCTS DESIGNED TO BE ATTACHED TO ACCESSORY ROOF CURB ONLY. IF UNIT IS MOUNTED SIDE SUPPLY, IT IS RECOMMENDED THAT THE DUCTS ARE SUPPORTED BY CROSS BRACES, AS DONE ON ACCESSORY ROOF CURBS.
6. MINIMUM CONDENSATION TRAP HEIGHT SHALL BE 1.5 TIMES THE LOWEST NEGATIVE STATIC.
7. DIMENSIONS IN [ ] ARE IN MILLIMETERS OR KILOGRAMS.
8. OPTIONAL COIL GUARDS, GAS HEAT, DISCONNECT SWITCH SHOWN.
9. TOP PANEL EMBOSSMENTS NOT SHOWN FOR DIMENSION CLARITY.
10. HEAT EXCHANGER IS TYPICAL OF HIGH GAS HEAT OPTION.

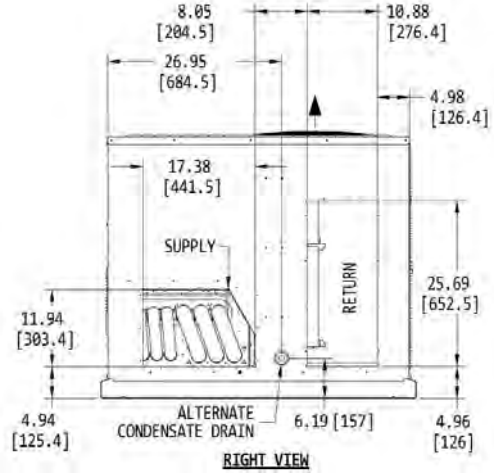
TONNAGE	UNIT	OPERATING WEIGHT (LBS) (BASE UNIT)	CENTER OF GRAVITY LOCATION (BASE UNIT)		4 POINT CORNER LOADS (LBS) (BASE UNIT)			
			X	Y	A	B	C	D
6	ZX	592 [268.5]	36 [900]	24 [600]	148 [67.1]	140 [63.5]	148 [67.1]	156 [70.7]
4	ZY	564 [255.8]	36 [900]	24 [600]	141 [63.9]	136 [61.7]	141 [63.9]	146 [66.2]
5	ZY	582 [263.9]	36 [900]	24 [600]	145 [65.7]	139 [63.0]	146 [66.2]	152 [68.9]



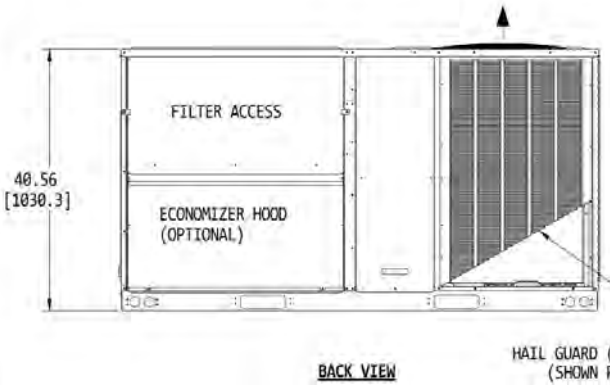
TOP VIEW



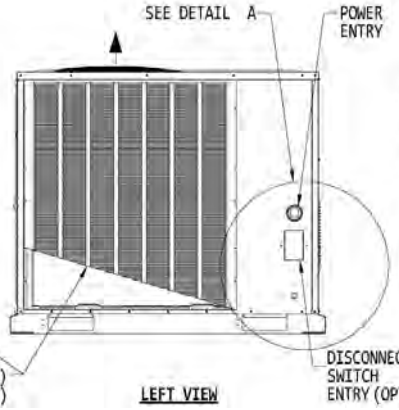
FRONT VIEW



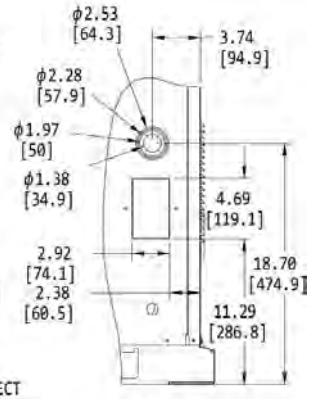
RIGHT VIEW



BACK VIEW



LEFT VIEW



DETAIL A

Coleman® Point™ Core 3-12.5 Ton Package

Single Package R-410A Air Conditioner

Project Name: **Elkins DNR Update** Unit Model #: **ZYG06E4C1EB2C123A4**

Quantity: **1**

Field Installed Accessory Weights

Unit Accessory Weights

Unit Accessory	Weights (lbs.)
Vertical Flow Dry Bulb Economizer Small Footprint	63
Horizontal Flow Dry Bulb Economizer Small Footprint Short	96
Horizontal Flow Dry Bulb Economizer Small Footprint Short	75
Horizontal Flow Dry Bulb Economizer Small Footprint Tall	81
Horizontal Flow Dry Bulb Economizer Large Footprint Short	105
Horizontal Flow Dry Bulb Economizer Large Footprint Tall	102
Power Exhaust Vert Flow Small Footprint	38
Power Exhaust Vert Flow Large Footprint	38
Power Exhaust Horiz Flow Small Footprint	38
Power Exhaust Horiz Flow Large Footprint	38
Hail Guard Kit Small Short Factory Installed	19
Hail Guard Kit Small Tall Factory Installed	24
Hail Guard Kit Large Short Factory Installed	50
Hail Guard Kit Large Tall Factory Installed	50
Curb Rigid 14" Small Footprint	145
Curb Rigid 24" Small Footprint	135
Curb Rigid 14" Large Footprint	135
Curb Rigid 24" Large Footprint	135

Coleman® Point™ Core 3-12.5 Ton Package

Single Package R-410A Air Conditioner

Project Name: **Elkins DNR Update** Unit Model #: **ZYG06E4C1EB2C123A4**

Quantity: **1**

Seismic Certification

036-21805-001-0120

THE VMC GROUP
The Power of Together™

Johnson Controls

CERTIFICATE OF COMPLIANCE

SEISMIC DESIGN OF NONSTRUCTURAL COMPONENTS AND SYSTEMS

Certification No.

VMA -51410 -01 C (Revision 0)

Expiration Date: 04/30/2021

Certification Parameters:

The nonstructural products (mechanical and/or electrical components) listed on this certificate are CERTIFIED[1] FOR SEISMIC APPLICATIONS in accordance with the following building code[2] releases.

IBC 2006, 2009, 2012, 2015

The following model designations, options, and accessories are included in this certification. Reference report number **VMA-51410-01** as issued by The VMC Group for a complete list of certified models, included accessories/options, and certified installation methods.

Johnson Controls, Incorporated: Rooftop Units
3-12.5 Ton Competitive Direct Replacement: 3 – 12.5 Ton Cooling Capacity

The above referenced equipment is **APPROVED** for seismic application when properly installed[3], used as intended, and contains a Seismic Certification Label referencing this Certificate of Compliance[4]. As limited by the tabulated values, below grade, grade, and roof-level installations, installations in essential facilities, for life safety applications, and/or of equipment containing hazardous contents are permitted and included in this certification with an Equipment Importance Factor assigned as I_P=1.5. The equipment is qualified by successful seismic shake table testing at the nationally recognized Dynamic Certification Laboratory under the witness of the ISO Accredited Product Certification Agency, The VMC Group.

Certified Seismic Design Levels			
Certified **IBC**	**Importance $I_P \leq 1.5$** Soil Classes A-E Risk Categories I-IV Design Categories A-F	**$S_{DS} \leq 2.500$ g** **z/h = 0.0**	**$S_{DS} \leq 2.000$ g** **z/h ≤ 1.0**
		Horizontal Design —	—(–) **4.500 g**
Test Datum **AC156**	ISO 17025 Laboratory Pre/Post-Shake Functionality Tri-axial, 5% Damping SRS	$A_{FLEX-H} \leq 3.200$ g $A_{RIG-H} \leq 2.400$ g $ZPA_H \leq 2.160$ g	$A_{FLEX-V} \leq 1.667$ g $A_{RIG-V} \leq 0.667$ g $ZPA_V \leq 0.600$ g

Certified Seismic Installation Methods	
Directly to seismically tested curb/rail	Directly to seismically tested curb/rail with external isolation

Coleman® Point™ Core 3-12.5 Ton Package

Single Package R-410A Air Conditioner

Project Name: **Elkins DNR Update** Unit Model #: **ZYG06E4C1EB2C123A4**

Quantity: **1**

Seismic Certification

036-21805-001-0120

THE VMC GROUP
The Power of Together™

Johnson Controls

CERTIFICATE OF COMPLIANCE

SEISMIC DESIGN OF NONSTRUCTURAL COMPONENTS AND SYSTEMS

Certified Product Table:

Model	Unit Type	Efficiency Rating	Nominal Cooling Capacity (Tons)	Length (in.)	Width (in.)	Height (in.)	Max. Operating Weight (lbs.)
Z*G04	Gas AC Unit	Standard / Mid / 14 SEER	3	74.1	48.9	32.5	527
Z*G05			4	74.1	48.9	32.5	618
Z*G06			5	74.1	48.9	40.6	636
Z*G07		Standard / Mid	6	74.1	48.9	40.6	804
Z*GA7			6	74.1	48.9	40.6	804
Z*G08			7.5	87.1	61.7	40.6	980
Z*G09			8.5	87.2	61.7	48.6	980
Z*G12			10	87.2	61.7	48.6	1008
ZXG14		Standard	12.5	87.2	61.7	55.3	1047
Z*E04	Electric AC Unit	Standard / Mid / 14 SEER	3	74.1	48.9	32.5	481
Z*E05			4	74.1	48.9	40.6	564
Z*E06			5	74.1	48.9	40.6	582
Z*E07		Mid / Standard	6	87.1	61.7	40.6	734
Z*EA7			6	87.1	61.7	40.6	734
Z*E08			7.5	87.2	61.7	48.6	878
Z*E09			8.5	87.2	61.7	48.6	878
Z*E12			10	87.2	61.7	55.3	902
ZXE14		Standard	12.5	87.2	61.7	55.3	941
X*E04	Heat Pump	Mid / 14 SEER	3	74.1	48.9	32.5	535
X*E05			4	74.1	48.9	40.6	614
X*E06			5	74.1	48.9	40.6	653
X*EA7			6	87.1	61.7	40.6	861
XYE07		Mid	6	87.1	61.7	40.6	861
X*E08		Mid / Standard	7.5	87.2	61.7	55.3	1060
X*E09			8.5	87.2	61.7	55.3	1061
XXE12		Standard	10	87.2	61.7	55.3	1060

* Denotes Q, X, Y which represent 14 SEER, Standard, and Mid Efficiency Rating, respectively

This certification **includes** rooftop unit modules as detailed in the above charts. The rooftop unit configuration and options shall be a catalogue design and factory supplied. The rooftop unit shall be installed and attached to the building structure per the manufacturer's supplied seismic installation instructions. For a list of certified configurations and options please directly contact the manufacturer. This certification **excludes** all non-factory supplied accessories, all connections for electrical, fuel, heating or cooling fluid, or other pipe/conduit connections and all non-catalogued, standard options and/or configurations not detailed in the above charts. Flexibility in the connections must be maintained as to not transmit load into the equipment. Design specials are outside the scope of this certification.

IBC CERTIFIED THE VMC GROUP

VMA-51410-01C (Revision 0)
Issue Date: April 23, 2018
Revision Date: April 23, 2018
Expiration Date: April 30 , 2021

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102S-103387 Rev 9

Coleman® Point™ Core 3-12.5 Ton Package

Single Package R-410A Air Conditioner

Project Name: **Elkins DNR Update** Unit Model #: **ZYG06E4C1EB2C123A4**

Quantity: **1**

Seismic Certification

036-21805-001-0120

THE VMC GROUP
The Power of Together™

Johnson Controls

CERTIFICATE OF COMPLIANCE

SEISMIC DESIGN OF NONSTRUCTURAL COMPONENTS AND SYSTEMS

Notes and Comments:

1. All equipment listed herein successfully passed the seismic acceptance criteria for shake testing non-structural components and systems as set forth in the ICC AC-156. The Test Response Spectrum (TRS) enveloped the Required Response Spectrum (RRS) for all units tested. The units cited in this certification were representative sample(s) of a contingent of models and all remained captive and structurally sound after the seismic shake simulation. The units also remained functionally operational after the simulation testing as functional testing was completed by the equipment manufacturer before and after the seismic simulations. Although a seismic qualified unit inherently contains some wind resisting capacity, that capacity is undetermined and is excluded from this certification. Snow/Ice loads have been neglected and thus limit the unit to be installed both indoors (covered by an independent protective structure) and out of doors (exposed to accumulating snow/ice) for ground snow loads no greater than 30 psf for all applications.
2. The following building codes are addressed under this certification:
   IBC 2006 – referencing ASCE7-05 and ICC AC-156
   IBC 2009 – referencing ASCE7-05 and ICC AC-156
   IBC 2012 – referencing ASCE7-10 and ICC AC-156
   IBC 2015 – referencing ASCE7-10 and ICC AC-156
3. Refer to the manufacturer supplied installation drawings for anchor requirements and mounting considerations for seismic applications. Required anchor locations, size, style, and load capacities (tension and shear) may be specified on the installation drawings or specified by a 3rd party. Mounting requirement details such as anchor brand, type, embedment depth, edge spacing, anchor-to-anchor spacing, concrete strength, special inspection, wall design, and attachment to non-building structures must be outlined and approved by the Engineer of Record for the project or building. Structural walls, structural floors, and housekeeping pads must also be seismically designed and approved by the project or building Structural Engineer of Record to withstand the seismic anchor loads as defined on the installation drawings. The installing contractor is responsible for observing the installation detailed in the seismic installation drawings and the proper installation of all anchors and mounting hardware.
4. For this certificate and certification to remain valid, this certificate must correspond to the "Seismic Certification Label" found affixed to the unit per Section 1703.5 of the International Building Code. The label ensures the manufacturer built the unit in conformance to the IBC seismic design criteria set forth by the Certified Seismic Qualification Agency, The VMC Group, and meets the seismic design levels claimed by this certificate.
5. Mechanical, Electrical, and Plumbing connections to the equipment must be flexibly attached as to not transfer load through the connection. The structural integrity of any conduit, cable trays, piping, ductwork and/or flexible connections is the responsibility of others. This certification does not guarantee the equipment will remain compliant to NEMA, IP, UL, or CSA standards after a seismic event.
6. This certificate applies to units manufactured at:
   5005 York Drive, Norman, OK. 73069
7. This project follows The VMC Group's ISO -17065 Scheme for Product Certification of Nonstructural Components.

John P. Giuliano, PE
President, The VMC Group

VMA-51410-01C (Revision 0)
Issue Date: April 23, 2018
Revision Date: April 23, 2018
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Page 3 of 3

102S-103387 Rev 9

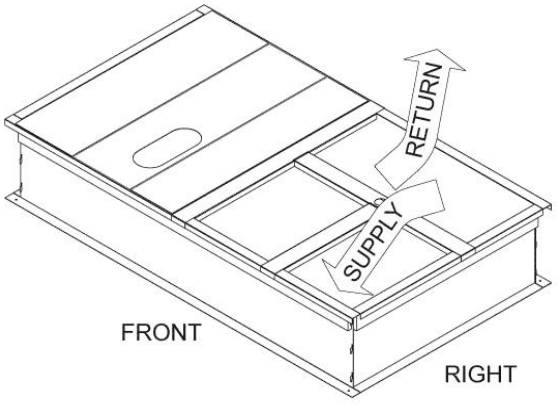
Coleman® Point™ Core 3-12.5 Ton Package

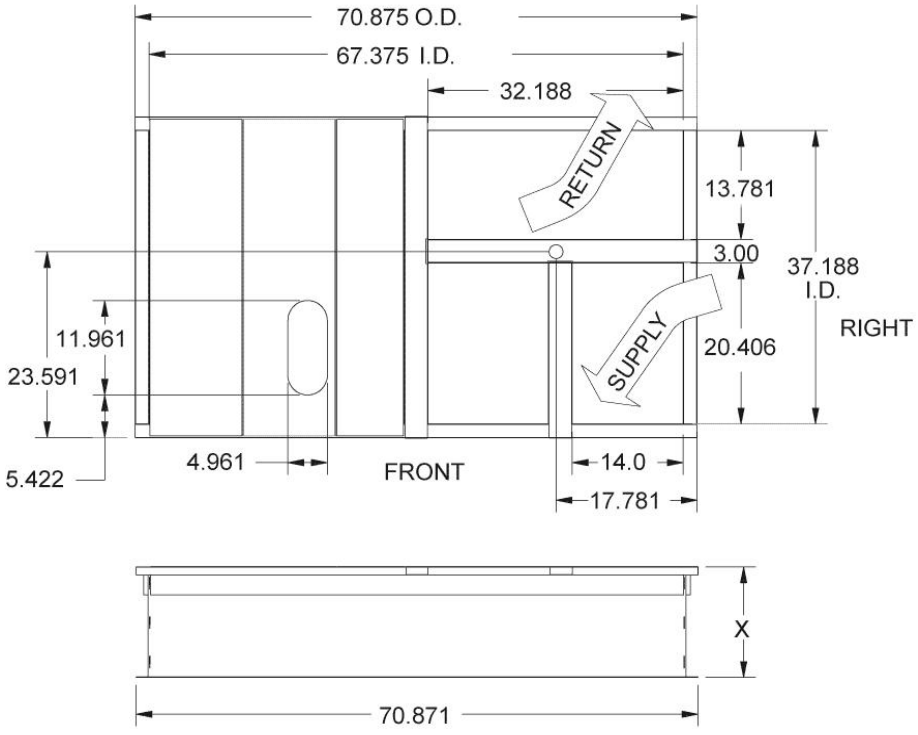
Single Package R-410A Air Conditioner

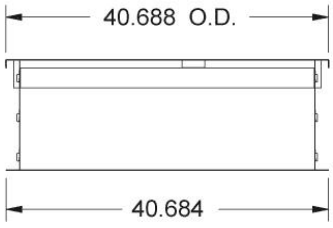
Project Name: **Elkins DNR Update** Unit Model #: **ZYG06E4C1EB2C123A4**

Quantity: **1**

1RC0456 Roof Curb







1RC0456 X= 14" Height
1RC0458 X= 24" Height

Notes:

1. Sides, ends and cross support are 18-G90. Deck pans, R/A & S/A supports are 20-G90.
2. Full perimeter wood nailer.
3. Insulated deck pans.

Unit Models used with 1RC0456, 1RC0458 Roof Curb

ZX04	ZY04
ZX05	ZY05
ZX06	ZY06
ZX07	

Point Choice 15-27.5 Ton Package

Coleman Single Package R-410A Air Conditioner

Project Name: **Elkins DNR Update** Unit Model #: **CD15N1DH4S1CEH12B2**

Quantity: **1** System: **CD15N1DH4S1CEH12B2**

No Performance Data Available

Run Performance to view metrics

15 Ton

- Manufactured at an ISO 9001 Registered Facility and Each Rooftop is Completely Computer-Run Tested Prior to Shipment.

Unit Features

- Four Stage Cooling
- Full Perimeter Base Rails with Built in Rigging Capabilities
- Dual Enthalpy Economizer w/Barometric Relief with Economizer Fault Detection & Diagnostic (Meets ASHRAE 90.1-2013, IECC 2015, California Title 24, AMCA 511)
- 5 HP High Static Belt Drive Blower
- 2" Pleated Filters (MERV 8)
- Replacement Filters: 6 (20" x 25" x 2" or 4"). Unit accepts 2" or 4" wide filters.
- Units are provided with the selected 2-inch or 4-inch filter and can easily be converted in the field to accept either size in the standard filter rack
- Utility Connections - Gas and electrical utility locations are supplied in the unit underside as well as the side of the unit. Utility connections can be made quickly and with a minimum amount of field labor
- Copper tube/Aluminum fin evaporator coils
- Microchannel condenser coils

BAS Controller

- Smart Equipment Controller including Discharge Air, Return Air, and Outdoor Air Temperature Sensors. BACNet MS/TP, Modbus and N2 Communication Card.

Standard Unit Controller: Smart Equipment Control Board

- An Integrated Low-Ambient Control, Anti-Short Cycle Protection, Lead-Lag, Fan On and Fan off Delays, Low Voltage Protection, On-Board Diagnostic and Fault Code Display. Allows all units to operate in the cooling mode down to 0 °F outdoor ambient without additional components or intervention.
- Safety Monitoring - Monitors the High and Low-Pressure Switches, the Freezestats, the Gas Valve, if Applicable, and the Temperature Limit Switch on Gas and Electric Heat Units. The Unit Control Board will Alarm on Ignition Failures, Safety Lockouts and Repeated Limit Switch Trips.

Warranty

- One (1) Year Limited Warranty on the Complete Unit
- Five (5) Year Warranty - Compressors and Electric Heater Elements
- All Factory installed VFDs come with a 5-year manufacturer warranty
- Ten (10) Year Warranty - Aluminized Steel Tubular Heat Exchangers

Point Choice 15-27.5 Ton Package

Coleman Single Package R-410A Air Conditioner

Project Name: **Elkins DNR Update** | Unit Model #: **CD15N1DH4S1CEH12B2**

Quantity: **1** | System: **CD15N1DH4S1CEH12B2**

Factory Installed Options

CD15N1DH4S1CEH12B2

Equipment Options		Option(s) Selected
Product Category:	**C**	Air Conditioner Point Choice Single Packaged R-410A
Efficiency:	**D**	Standard Efficiency, Bottom Duct
Nominal Cooling Capacity:	**15**	15 Ton
Heat Type:	**N**	Natural Gas, Staged Heat
Heat Size:	**1**	Low Heat, 220 MBH Input
Blower Option:	**D**	5 HP High Static Belt Drive Blower
Air Volume:	**H**	Four Stage Cooling VAV Controller with VFD
Voltage:	**4**	460-3-60 5 kA Standard SCCR
Outside Air Option:	**S**	Dual Enthalpy Economizer w/Barometric Relief with Economizer Fault Detection & Diagnostic (Meets ASHRAE 90.1-2013, IECC 2015, California Title 24, AMCA 511)
Coil Options:	**1**	Microchannel condenser coils Copper tube/Aluminum fin evaporator coils
Controls:	**C**	Smart Equipment Controller including Discharge Air, Return Air, and Outdoor Air Temperature Sensors. BACNet MS/TP, Modbus and N2 Communication Card.
Sensor Options:	**E**	Return Air Smoke Detector
Service Options:	**H**	HACR Circuit Disconnect Phase Monitor
Refrigeration:	**1**	No Modulating Hot Gas Reheat
Additional Options:	**2**	2" Pleated Filters (MERV 8)
Cabinet Options:	**B**	Hinged Access Panel Polyester SMC Drain Pan
Product Generation:	**2**	

Field Installed Accessories

- ○ 1BD0411 - Burglar Bars
- ○ 1CV0406 - Concentric Diffuser,Flush Mount,18X36
- ○ 1CV0407 - Concentric Diffuser,Flush Mount,24X28
- ○ 1CV0415 - Concentric Diffuser,Side Discharge,18X36
- ○ 1CV0416 - Concentric Diffuser,Side Discharge,24X48
- ○ 1CV0421 - Concentric Diffuser,Specialty,28X28

Point Choice 15-27.5 Ton Package

Coleman Single Package R-410A Air Conditioner

Project Name: **Elkins DNR Update** Unit Model #: **CD15N1DH4S1CEH12B2**

Quantity: **1** System: **CD15N1DH4S1CEH12B2**

- ○ 1CV0422 - Concentric Diffuser,Specialty,30X30
- ○ 1CV0423 - Concentric Diffuser,Specialty,36X36
- ○ 1CV0427 - Concentric Diffuser,Specialty,28X28
- ○ 1CV0428 - Concentric Diffuser,Specialty,30X30
- ○ 1FE0418 - Flue Exhaust Kit
- ○ 1HA0401 - Natural Gas High Altitude Conversion Kit - For applications between 2000 and 10,000 feet altitude (3.0 lbs)
- ○ 1HA0402 - Propane High Altitude Conversion Kit - For applications between 2000 and 10,000 feet altitude
- ○ 1HG0437 - Louvered Hail Guard, 15 and 17.5 ton models (75.0 lbs)
- ○ 1NP0401 - Propane Conversion Kit (4.0 lbs)
- ● 1RC0443 - 14" Roof Curb (171.0 lbs)
- ○ 1RC0446 - 24" Roof Curb (237.0 lbs)
- ○ 2AP0402 - Air Proving Switch (1.0 lbs)
- ○ 2AQ04700524 - CO^2 Space Sensor - Wall Mount Accessory (5.0 lbs)
- ○ 2AQ04700624 - CO^2 Unit Mount Accessory (4.6 lbs)
- ○ 2DF0403 - Dirty Filter Switch (1.0 lbs)
- ○ 2ET077001124 - Honeywell T7350, 2 Heat / 4 Cool, Auto/Man Changeover, Electronic 7 Day Programmable (2.0 lbs)
- ○ 2FS0401 - Condensate Overflow Switch (2.0 lbs)
- ○ 2LA04700646 - Low Ambient Controller for 460V (12.0 lbs)
- ○ 2NC0401 - Non-powered Convenience Outlet (5.0 lbs)
- ○ 2SD04702024 - Supply Air Smoke Detector (8.0 lbs)
- ○ S1-03102529000 - Non-Networking Wall Sensor – Allows remote sensing and control from single or multiple zones. (0.2 lbs)
- ○ S1-03102529004 - Non-Networking Wall Sensor with Over-ride button – Allows remote sensing and control from single or multiple zones. Override allows setpoint to be overridden for 2 hour time period. (0.2 lbs)
- ○ S1-03102529006 - Non-Networking Wall Sensor with Setpoint Adjustment and Over-ride Button – Allows remote sensing and control from single or multiple zones. Allows setpoint to be adjusted ± 5º F. Override allows setpoint to be overridden for 2 hour time period. (0.2 lbs)
- ○ S1-03103489000 - Temp sensor, 80mm x 80mm, LCD display, screw terminals, adjustable setpoint, JCI logo (0.1 lbs)
- ○ S1-03103490000 - Temp sensor w/Economizer FDD, 120mm x 80mm, LCD display, screw terminals, adjustable setpoint, no logo (0.0 lbs)
- ○ S1-03103516000 - Temp & humidity sensor, 120mm x 80mm, LCD display, screw terminals, warmer/cooler dial, JCI logo (0.4 lbs)
- ○ S1-03103517000 - Temp sensor, 120mm x 80mm, no display, no dial, screw terminals, no logo (0.4 lbs)
- ○ S1-03103518000 - Temp & humidity sensor, 120mm x 80mm, no display, modular jack, warmer/cooler dial, JCI logo (0.4 lbs)
- ○ S1-03103519000 - Network Sensor ,CO2, No Display (0.2 lbs)
- ○ S1-MP-PRTKIT-0P - MAP (Multiple Access Portal) Gateway Kit- Replacement MAP gateway protective case, lanyard and communication cable. Use only to replace worn or damaged components. (0.3 lbs)
- ○ S1-NSB8BHN041-0 - Wall Temperature and 3% Relative Humidity Combined Sensor, No Display, WHITE, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BHN043-0 - Wall Temperature and 3% Relative Humidity Combined Sensor, No Display, BLACK, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BHN141-0 - Wall Temperature and 3% Relative Humidity Combined Sensor, Warmer/Cooler Display, WHITE, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BHN143-0 - Wall Temperature and 3% Relative Humidity Combined Sensor, Warmer/Cooler Display, BLACK, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BHN240-0 - Wall Temperature and 3% Relative Humidity Combined Sensor, Full Display, WHITE, JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BHN241-0 - Wall Temperature and 3% Relative Humidity Combined Sensor, Full Display, WHITE, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BHN243-0 - Wall Temperature and 3% Relative Humidity Combined Sensor, Full Display, BLACK, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BPN240-0 - Wall Temperature and 2% Relative Humidity Combined Sensor, Full Display, WHITE, JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BPN241-0 - Wall Temperature and 2% Relative Humidity Combined Sensor, Full Display, WHITE, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BPN243-0 - Wall Temperature and 2% Relative Humidity Combined Sensor, Full Display, BLACK, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BTN041-0 - Wall Temperature Sensor, No Display, WHITE, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BTN043-0 - Wall Temperature Sensor, No Display, BLACK, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BTN141-0 - Wall Temperature Sensor, Warmer/Cooler Display, WHITE, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BTN143-0 - Wall Temperature Sensor, Warmer/Cooler Display, BLACK, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BTN240-0 - Wall Temperature Sensor, Full Display, WHITE, JCI LOGO, NS8000 Series (0.4 lbs)

Point Choice 15-27.5 Ton Package

Coleman Single Package R-410A Air Conditioner

Project Name: **Elkins DNR Update** Unit Model #: **CD15N1DH4S1CEH12B2**

Quantity: **1** System: **CD15N1DH4S1CEH12B2**

- ○ S1-NSB8BTN241-0 - Wall Temperature Sensor, Full Display, WHITE, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BTN243-0 - Wall Temperature Sensor, Full Display, BLACK, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-SE-COM1001-0 - Field Installed Communication Card for Simplicity SE control. Can be field configurable for BACnet, N2 or ModBUS MSTP (0.0 lbs)
- ○ S1-TEC3030-14-000 - 7 DAY PROGRAMMABLE THERMOSTAT, ZIGBEE PRO WIRELESS COMMUNICATION, RTU/HEAT PUMP WITH ECON,FULL COLOR, WHITE, JCI LOGO (0.8 lbs)
- ○ S1-TEC3030-16-000 - 7 DAY PROGRAMMABLE THERMOSTAT, ZIGBEE PRO WIRELESS COMMUNICATION, RTU/HEAT PUMP WITH ECON, AND FULL COLOR, WHITE, NO LOGO (0.8 lbs)
- ○ S1-TEC3031-14-000 - 7 DAY PROGRAMMABLE THERMOSTAT, ZIGBEE PRO WIRELESS COMMUNICATION, RTU/HEAT PUMP WITH ECON, OCC SENSOR, FULL COLOR, WHITE, JCI LOGO (0.8 lbs)
- ○ S1-TEC3031-16-000 - 7 DAY PROGRAMMABLE THERMOSTAT, ZIGBEE PRO WIRELESS COMMUNICATION, RTU/HEAT PUMP WITH ECON, OCC SENSOR, FULL COLOR, WHITE, NO LOGO (0.8 lbs)
- ○ S1-TEC3630-14-000 - 7 DAY PROGRAMMABLE THERMOSTAT, OPTIONAL MSTP OR N2 COMMUNICATION, RTU/HEAT PUMP WITH ECON,FULL COLOR, WHITE, JCI LOGO (0.8 lbs)
- ○ S1-TEC3631-14-000 - 7 DAY PROGRAMMABLE THERMOSTAT, OPTIONAL MSTP OR N2 COMMUNICATION, RTU/HEAT PUMP WITH ECON, OCC SENSOR, FULL COLOR, WHITE, JCI LOGO (0.8 lbs)
- ○ S1-TEC3631-16-000 - 7 DAY PROGRAMMABLE THERMOSTAT, OPTIONAL MSTP OR N2 COMMUNICATION, RTU/HEAT PUMP WITH ECON, OCC SENSOR, FULL COLOR, WHITE, NO LOGO (0.8 lbs)
- ○ S1-YK-MAP1810-0P - MAP (Multiple Access Portal) Gateway- For use with SimplicitySE Control. (0.2 lbs)
- ○ S1-YK-MAP1810-0S - Stationary MAP Gateway (Includes MAP Gateway, Field Bus Adapter, Mounting Bracket and 100 to 240 VAC Power Supply). US-compatible counties. (1.9 lbs)

Point Choice 15-27.5 Ton Package

Coleman Single Package R-410A Air Conditioner

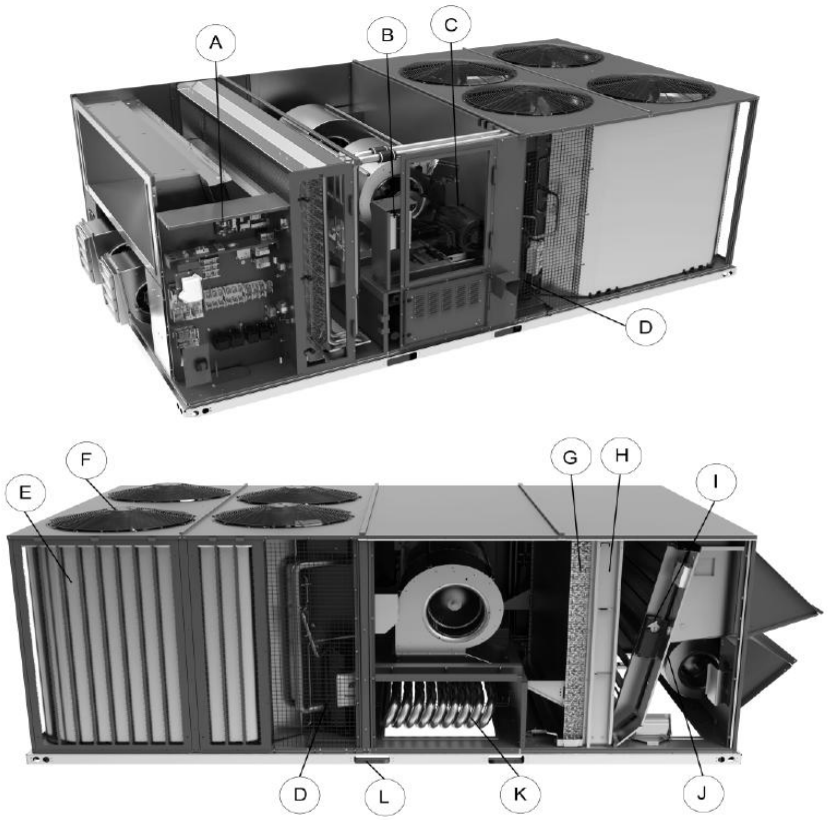
Project Name: **Elkins DNR Update** Unit Model #: **CD15N1DH4S1CEH12B2**

Quantity: **1**

Component Location

Unit components

Figure 1: Component location



The previous figure shows the AVXX model. The following table lists the components of the unit.

Table 1: Component location table

Item	Description	Item	Description
A	Smart Equipment ™ controls	G	Copper tube/aluminum fin evaporator coil
B	Optional variable frequency drive	H	Filter access, 2-inch or 4-inch filter options
C	Belt drive blower motor with dual centrifugal fan design	I	Optional economizer. Optional manual or motorized outside air dampers not shown.
D	Scroll compressors in various arrangements to produce 2 or 4 stages of cooling depending on the selected model	J	Optional powered exhaust. Optional barometric relief not shown.
E	MicroChannel condenser coils	K	Optional staged or modulating gas heat with aluminized or stainless steel heat exchanger
F	Condenser fans	L	Full perimeter base rails with holes for overhead rigging

Point Choice 15-27.5 Ton Package

Coleman Single Package R-410A Air Conditioner

Project Name: **Elkins DNR Update** Unit Model #: **CD15N1DH4S1CEH12B2**

Quantity: **1**

Typical Installation

Typical installation

The following figures show the typical installations for the unit.

Figure 14: Roof jack installation

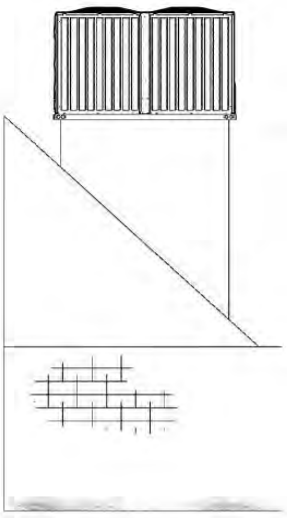
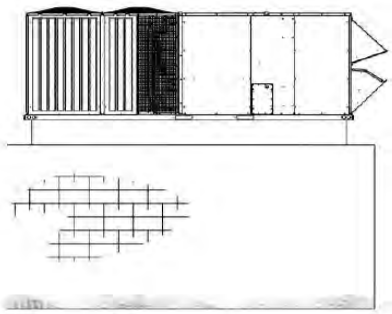


Figure 15: Roof curb installation



Point Choice 15-27.5 Ton Package

Coleman Single Package R-410A Air Conditioner

Project Name: **Elkins DNR Update** Unit Model #: **CD15N1DH4S1CEH12B2**

Quantity: **1**

Economizer Drawing

Economizer options

Figure 13: Economizer options

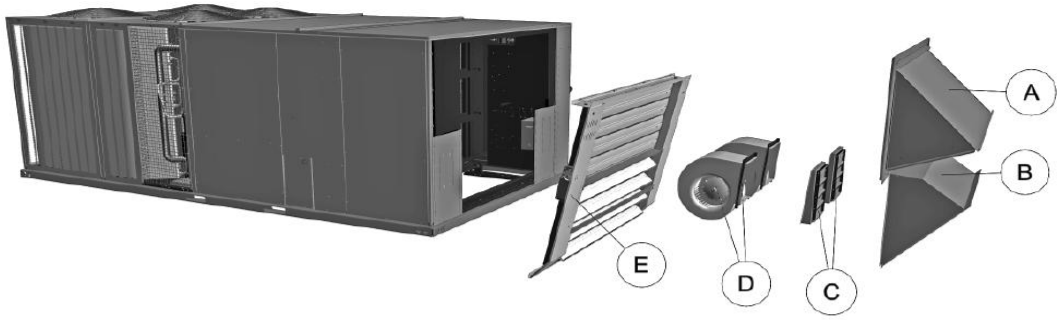


Table 38: Economizer components

Item	Description
A	Fresh air hood
B	Power exhaust hood
C	Power exhaust damper
D	Power exhaust
E	Low leak economizer

Point Choice 15-27.5 Ton Package

Coleman Single Package R-410A Air Conditioner

Project Name: **Elkins DNR Update** Unit Model #: **CD15N1DH4S1CEH12B2**

Quantity: **1**

Rainhood Drawing

Rain hood dimensions

Figure 8: Rain hood dimensions

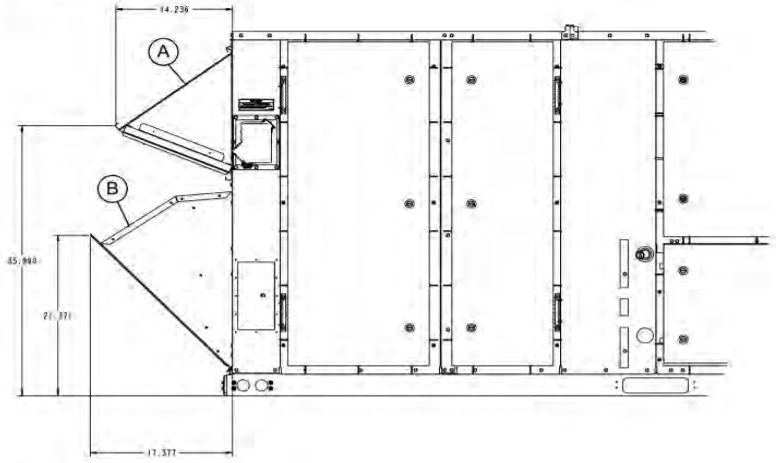


Table 32: Rain hood components

Item	Description
A	Economizer/motorized damper and power exhaust rain hood
B	Air intake hood

Point Choice 15-27.5 Ton Package

Coleman Single Package R-410A Air Conditioner

Project Name: **Elkins DNR Update** Unit Model #: **CD15N1DH4S1CEH12B2**

Quantity: **1**

Roof Curb Drawings 0443,0446

Roof curbs

The following figures show the roof curbs for the units. All dimensions are in inches.

Return air

Supply air

Figure 9: 1RC0443 and 1RC0446 roof curb dimensions

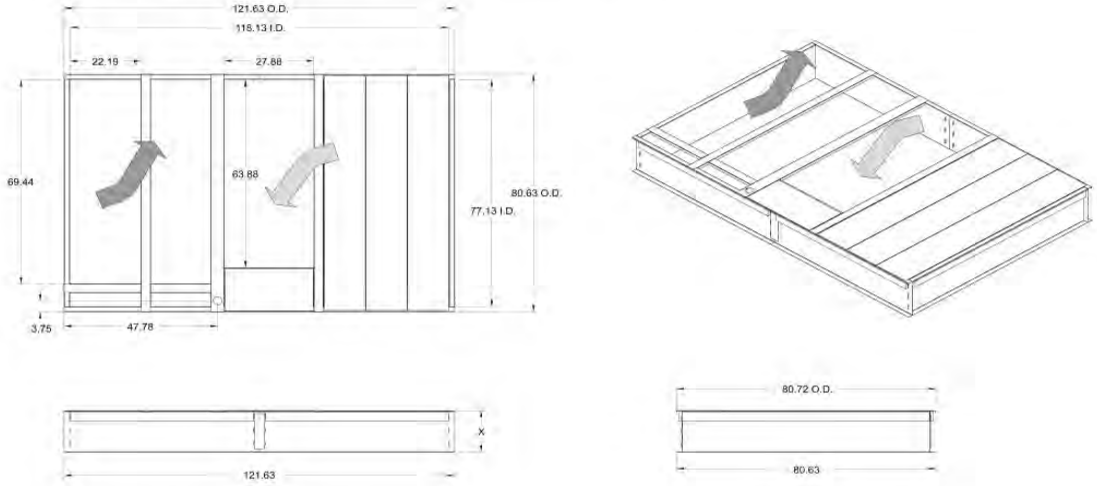


Table 34: 1RC0443 and 1RC0446 dimensions

Roof curb	X measurement (in.)
1RC0443	14
1RC0446	24

Point Choice 15-27.5 Ton Package

Coleman Single Package R-410A Air Conditioner

Project Name: **Elkins DNR Update** Unit Model #: **CD15N1DH4S1CEH12B2**

Quantity: **1**

Roof Curb Cutaway

Figure 12: Roof curb cutaway

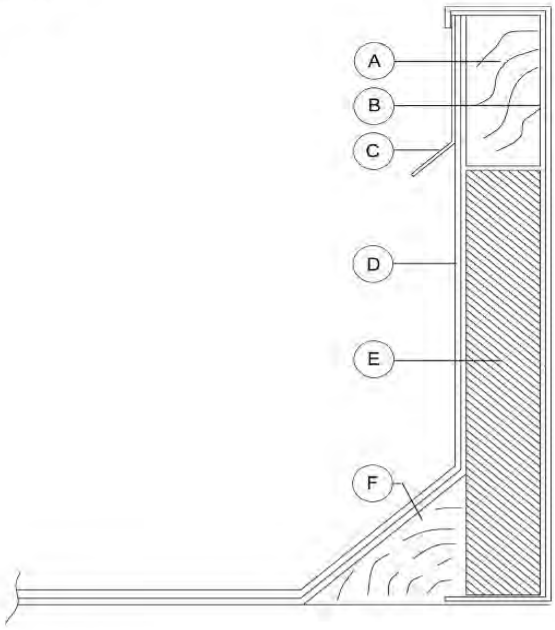


Table 37: Roof curb cutaway components

Item	Description	Item	Description
A	Wood nailer	D	Roof felt (field supplied)
B	Curb frame	E	Rigid insulation (field supplied)
C	Counter flashing (field supplied)	F	Cant strip (field supplied)

Point Choice 15-27.5 Ton Package

Coleman Single Package R-410A Air Conditioner

Project Name: **Elkins DNR Update** Unit Model #: **CD25N1DH4S1CEH12B2**

Quantity: **1** System: **CD25N1DH4S1CEH12B2**

No Performance Data Available

Run Performance to view metrics

25 Ton

- Manufactured at an ISO 9001 Registered Facility and Each Rooftop is Completely Computer-Run Tested Prior to Shipment.

Unit Features

- Four Stage Cooling
- Full Perimeter Base Rails with Built in Rigging Capabilities
- Dual Enthalpy Economizer w/Barometric Relief with Economizer Fault Detection & Diagnostic (Meets ASHRAE 90.1-2013, IECC 2015, California Title 24, AMCA 511)
- 10 HP High Static Belt Drive Blower
- 2" Pleated Filters (MERV 8)
- Replacement Filters: 9 (16" x 25" x 2" or 4"). Unit accepts 2" or 4" wide filters.
- Units are provided with the selected 2-inch or 4-inch filter and can easily be converted in the field to accept either size in the standard filter rack
- Utility Connections - Gas and electrical utility locations are supplied in the unit underside as well as the side of the unit. Utility connections can be made quickly and with a minimum amount of field labor
- Copper tube/Aluminum fin evaporator coils
- Microchannel condenser coils

BAS Controller

- Smart Equipment Controller including Discharge Air, Return Air, and Outdoor Air Temperature Sensors. BACNet MS/TP, Modbus and N2 Communication Card.

Standard Unit Controller: Smart Equipment Control Board

- An Integrated Low-Ambient Control, Anti-Short Cycle Protection, Lead-Lag, Fan On and Fan off Delays, Low Voltage Protection, On-Board Diagnostic and Fault Code Display. Allows all units to operate in the cooling mode down to 0 °F outdoor ambient without additional components or intervention.
- Safety Monitoring - Monitors the High and Low-Pressure Switches, the Freezestats, the Gas Valve, if Applicable, and the Temperature Limit Switch on Gas and Electric Heat Units. The Unit Control Board will Alarm on Ignition Failures, Safety Lockouts and Repeated Limit Switch Trips.

Warranty

- One (1) Year Limited Warranty on the Complete Unit
- Five (5) Year Warranty - Compressors and Electric Heater Elements
- All Factory installed VFDs come with a 5-year manufacturer warranty
- Ten (10) Year Warranty - Aluminized Steel Tubular Heat Exchangers

Point Choice 15-27.5 Ton Package

Coleman Single Package R-410A Air Conditioner

Project Name: **Elkins DNR Update** | Unit Model #: **CD25N1DH4S1CEH12B2**

Quantity: **1** | System: **CD25N1DH4S1CEH12B2**

Factory Installed Options

CD25N1DH4S1CEH12B2

Equipment Options		Option(s) Selected
Product Category:	**C**	Air Conditioner Point Choice Single Packaged R-410A
Efficiency:	**D**	Standard Efficiency, Bottom Duct
Nominal Cooling Capacity:	**25**	25 Ton
Heat Type:	**N**	Natural Gas, Staged Heat
Heat Size:	**1**	Low Heat, 220 MBH Input
Blower Option:	**D**	10 HP High Static Belt Drive Blower
Air Volume:	**H**	Four Stage Cooling VAV Controller with VFD
Voltage:	**4**	460-3-60
Outside Air Option:	**S**	Dual Enthalpy Economizer w/Barometric Relief with Economizer Fault Detection & Diagnostic (Meets ASHRAE 90.1-2013, IECC 2015, California Title 24, AMCA 511)
Coil Options:	**1**	Microchannel condenser coils Copper tube/Aluminum fin evaporator coils
Controls:	**C**	Smart Equipment Controller including Discharge Air, Return Air, and Outdoor Air Temperature Sensors. BACNet MS/TP, Modbus and N2 Communication Card.
Sensor Options:	**E**	Return Air Smoke Detector
Service Options:	**H**	HACR Circuit Disconnect Phase Monitor
Refrigeration:	**1**	No Modulating Hot Gas Reheat
Additional Options:	**2**	2" Pleated Filters (MERV 8)
Cabinet Options:	**B**	Hinged Access Panel Polyester SMC Drain Pan
Product Generation:	**2**	

Field Installed Accessories

- ○ 1BD0411 - Burglar Bars
- ○ 1CV0408 - Concentric Diffuser,Flush Mount,24X54
- ○ 1CV0409 - Concentric Diffuser,Flush Mount,28X60
- ○ 1CV0417 - Concentric Diffuser,Side Discharge,24X54
- ○ 1CV0418 - Concentric Diffuser,Side Discharge,28X60
- ○ 1CV0424 - Concentric Diffuser,Specialty,42X42
- ○ 1CV0425 - Concentric Diffuser,Specialty,44X44

Point Choice 15-27.5 Ton Package

Coleman Single Package R-410A Air Conditioner

Project Name: **Elkins DNR Update** Unit Model #: **CD25N1DH4S1CEH12B2**

Quantity: **1** System: **CD25N1DH4S1CEH12B2**

- ○ 1CV0430 - Concentric Diffuser,Specialty,42X42
- ○ 1CV0431 - Concentric Diffuser,Specialty,44X44
- ○ 1FE0418 - Flue Exhaust Kit
- ○ 1HA0401 - Natural Gas High Altitude Conversion Kit - For applications between 2000 and 10,000 feet altitude (3.0 lbs)
- ○ 1HA0402 - Propane High Altitude Conversion Kit - For applications between 2000 and 10,000 feet altitude
- ○ 1HG0452 - Louvered Hail Guard, 25 ton models (14.2 lbs)
- ○ 1NP0401 - Propane Conversion Kit (4.0 lbs)
- ● 1RC0444 - 14" Roof Curb (188.0 lbs)
- ○ 1RC0447 - 24" Roof Curb (260.0 lbs)
- ○ 2AP0402 - Air Proving Switch (1.0 lbs)
- ○ 2AQ04700524 - CO^2 Space Sensor - Wall Mount Accessory (5.0 lbs)
- ○ 2AQ04700624 - CO^2 Unit Mount Accessory (4.6 lbs)
- ○ 2DF0403 - Dirty Filter Switch (1.0 lbs)
- ○ 2ET077001124 - Honeywell T7350, 2 Heat / 4 Cool, Auto/Man Changeover, Electronic 7 Day Programmable (2.0 lbs)
- ○ 2FS0401 - Condensate Overflow Switch (2.0 lbs)
- ○ 2LA04700646 - Low Ambient Controller for 460V (12.0 lbs)
- ○ 2NC0401 - Non-powered Convenience Outlet (5.0 lbs)
- ○ 2SD04702024 - Supply Air Smoke Detector (8.0 lbs)
- ○ S1-03102529000 - Non-Networking Wall Sensor – Allows remote sensing and control from single or multiple zones. (0.2 lbs)
- ○ S1-03102529004 - Non-Networking Wall Sensor with Over-ride button – Allows remote sensing and control from single or multiple zones. Override allows setpoint to be overridden for 2 hour time period. (0.2 lbs)
- ○ S1-03102529006 - Non-Networking Wall Sensor with Setpoint Adjustment and Over-ride Button – Allows remote sensing and control from single or multiple zones. Allows setpoint to be adjusted ± 5º F. Override allows setpoint to be overridden for 2 hour time period. (0.2 lbs)
- ○ S1-03103489000 - Temp sensor, 80mm x 80mm, LCD display, screw terminals, adjustable setpoint, JCI logo (0.1 lbs)
- ○ S1-03103490000 - Temp sensor w/Economizer FDD, 120mm x 80mm, LCD display, screw terminals, adjustable setpoint, no logo (0.0 lbs)
- ○ S1-03103516000 - Temp & humidity sensor, 120mm x 80mm, LCD display, screw terminals, warmer/cooler dial, JCI logo (0.4 lbs)
- ○ S1-03103517000 - Temp sensor, 120mm x 80mm, no display, no dial, screw terminals, no logo (0.4 lbs)
- ○ S1-03103518000 - Temp & humidity sensor, 120mm x 80mm, no display, modular jack, warmer/cooler dial, JCI logo (0.4 lbs)
- ○ S1-03103519000 - Network Sensor ,CO2, No Display (0.2 lbs)
- ○ S1-MP-PRTKIT-0P - MAP (Multiple Access Portal) Gateway Kit- Replacement MAP gateway protective case, lanyard and communication cable. Use only to replace worn or damaged components. (0.3 lbs)
- ○ S1-NSB8BHN041-0 - Wall Temperature and 3% Relative Humidity Combined Sensor, No Display, WHITE, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BHN043-0 - Wall Temperature and 3% Relative Humidity Combined Sensor, No Display, BLACK, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BHN141-0 - Wall Temperature and 3% Relative Humidity Combined Sensor, Warmer/Cooler Display, WHITE, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BHN143-0 - Wall Temperature and 3% Relative Humidity Combined Sensor, Warmer/Cooler Display, BLACK, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BHN240-0 - Wall Temperature and 3% Relative Humidity Combined Sensor, Full Display, WHITE, JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BHN241-0 - Wall Temperature and 3% Relative Humidity Combined Sensor, Full Display, WHITE, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BHN243-0 - Wall Temperature and 3% Relative Humidity Combined Sensor, Full Display, BLACK, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BPN240-0 - Wall Temperature and 2% Relative Humidity Combined Sensor, Full Display, WHITE, JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BPN241-0 - Wall Temperature and 2% Relative Humidity Combined Sensor, Full Display, WHITE, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BPN243-0 - Wall Temperature and 2% Relative Humidity Combined Sensor, Full Display, BLACK, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BTN041-0 - Wall Temperature Sensor, No Display, WHITE, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BTN043-0 - Wall Temperature Sensor, No Display, BLACK, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BTN141-0 - Wall Temperature Sensor, Warmer/Cooler Display, WHITE, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BTN143-0 - Wall Temperature Sensor, Warmer/Cooler Display, BLACK, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BTN240-0 - Wall Temperature Sensor, Full Display, WHITE, JCI LOGO, NS8000 Series (0.4 lbs)

Point Choice 15-27.5 Ton Package

Coleman Single Package R-410A Air Conditioner

Project Name: **Elkins DNR Update** Unit Model #: **CD25N1DH4S1CEH12B2**

Quantity: **1** System: **CD25N1DH4S1CEH12B2**

- ○ S1-NSB8BTN241-0 - Wall Temperature Sensor, Full Display, WHITE, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-NSB8BTN243-0 - Wall Temperature Sensor, Full Display, BLACK, NO JCI LOGO, NS8000 Series (0.4 lbs)
- ○ S1-SE-COM1001-0 - Field Installed Communication Card for Simplicity SE control. Can be field configurable for BACnet, N2 or ModBUS MSTP (0.0 lbs)
- ○ S1-TEC3030-14-000 - 7 DAY PROGRAMMABLE THERMOSTAT, ZIGBEE PRO WIRELESS COMMUNICATION, RTU/HEAT PUMP WITH ECON,FULL COLOR, WHITE, JCI LOGO (0.8 lbs)
- ○ S1-TEC3030-16-000 - 7 DAY PROGRAMMABLE THERMOSTAT, ZIGBEE PRO WIRELESS COMMUNICATION, RTU/HEAT PUMP WITH ECON, AND FULL COLOR, WHITE, NO LOGO (0.8 lbs)
- ○ S1-TEC3031-14-000 - 7 DAY PROGRAMMABLE THERMOSTAT, ZIGBEE PRO WIRELESS COMMUNICATION, RTU/HEAT PUMP WITH ECON, OCC SENSOR, FULL COLOR, WHITE, JCI LOGO (0.8 lbs)
- ○ S1-TEC3031-16-000 - 7 DAY PROGRAMMABLE THERMOSTAT, ZIGBEE PRO WIRELESS COMMUNICATION, RTU/HEAT PUMP WITH ECON, OCC SENSOR, FULL COLOR, WHITE, NO LOGO (0.8 lbs)
- ○ S1-TEC3630-14-000 - 7 DAY PROGRAMMABLE THERMOSTAT, OPTIONAL MSTP OR N2 COMMUNICATION, RTU/HEAT PUMP WITH ECON,FULL COLOR, WHITE, JCI LOGO (0.8 lbs)
- ○ S1-TEC3631-14-000 - 7 DAY PROGRAMMABLE THERMOSTAT, OPTIONAL MSTP OR N2 COMMUNICATION, RTU/HEAT PUMP WITH ECON, OCC SENSOR, FULL COLOR, WHITE, JCI LOGO (0.8 lbs)
- ○ S1-TEC3631-16-000 - 7 DAY PROGRAMMABLE THERMOSTAT, OPTIONAL MSTP OR N2 COMMUNICATION, RTU/HEAT PUMP WITH ECON, OCC SENSOR, FULL COLOR, WHITE, NO LOGO (0.8 lbs)
- ○ S1-YK-MAP1810-0P - MAP (Multiple Access Portal) Gateway- For use with SimplicitySE Control. (0.2 lbs)
- ○ S1-YK-MAP1810-0S - Stationary MAP Gateway (Includes MAP Gateway, Field Bus Adapter, Mounting Bracket and 100 to 240 VAC Power Supply). US-compatible counties. (1.9 lbs)

Point Choice 15-27.5 Ton Package

Coleman Single Package R-410A Air Conditioner

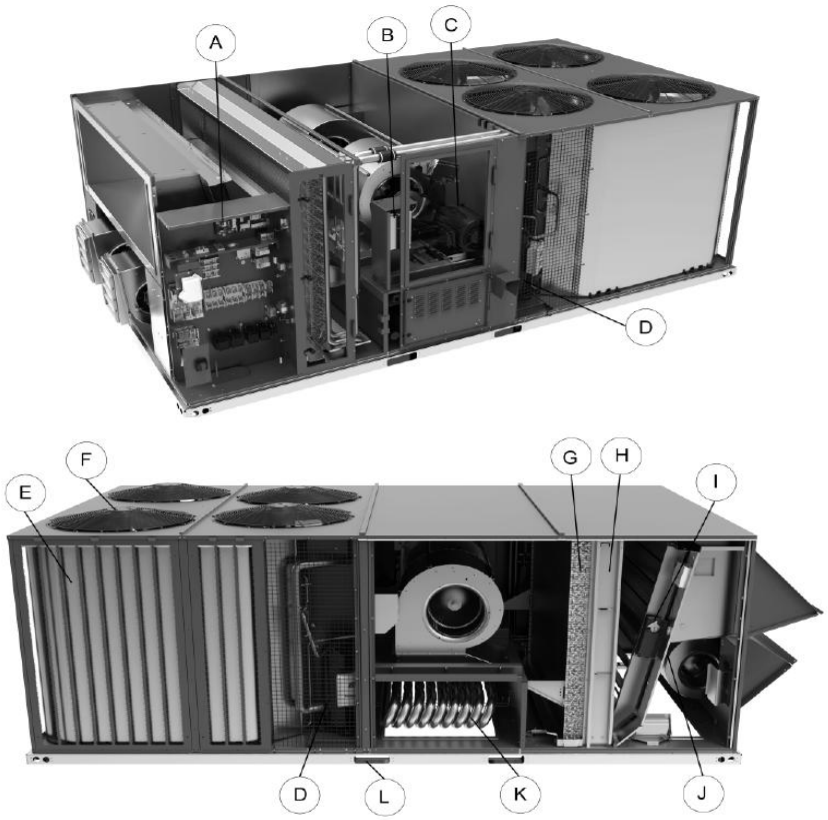
Project Name: **Elkins DNR Update** Unit Model #: **CD25N1DH4S1CEH12B2**

Quantity: **1**

Component Location

Unit components

Figure 1: Component location



The previous figure shows the AVXX model. The following table lists the components of the unit.

Table 1: Component location table

Item	Description	Item	Description
A	Smart Equipment ™ controls	G	Copper tube/aluminum fin evaporator coil
B	Optional variable frequency drive	H	Filter access, 2-inch or 4-inch filter options
C	Belt drive blower motor with dual centrifugal fan design	I	Optional economizer. Optional manual or motorized outside air dampers not shown.
D	Scroll compressors in various arrangements to produce 2 or 4 stages of cooling depending on the selected model	J	Optional powered exhaust. Optional barometric relief not shown.
E	MicroChannel condenser coils	K	Optional staged or modulating gas heat with aluminized or stainless steel heat exchanger
F	Condenser fans	L	Full perimeter base rails with holes for overhead rigging

Point Choice 15-27.5 Ton Package

Coleman Single Package R-410A Air Conditioner

Project Name: **Elkins DNR Update** Unit Model #: **CD25N1DH4S1CEH12B2**

Quantity: **1**

Typical Installation

Typical installation

The following figures show the typical installations for the unit.

Figure 14: Roof jack installation

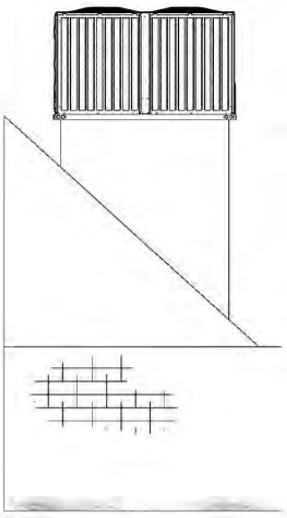
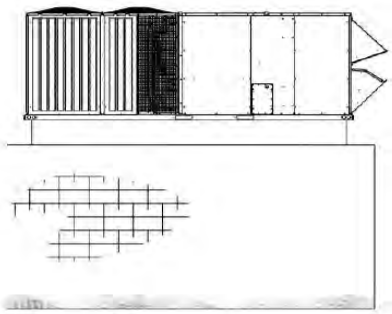


Figure 15: Roof curb installation



Point Choice 15-27.5 Ton Package

Coleman Single Package R-410A Air Conditioner

Project Name: **Elkins DNR Update** Unit Model #: **CD25N1DH4S1CEH12B2**

Quantity: **1**

Economizer Drawing

Economizer options

Figure 13: Economizer options

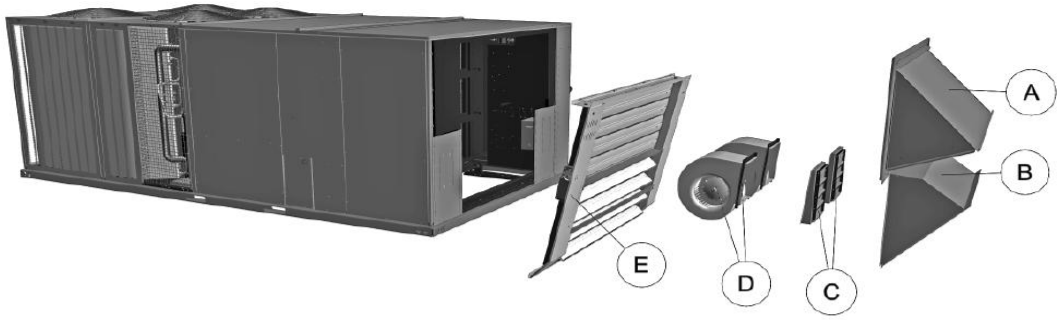


Table 38: Economizer components

Item	Description
A	Fresh air hood
B	Power exhaust hood
C	Power exhaust damper
D	Power exhaust
E	Low leak economizer

Point Choice 15-27.5 Ton Package

Coleman Single Package R-410A Air Conditioner

Project Name: **Elkins DNR Update** Unit Model #: **CD25N1DH4S1CEH12B2**

Quantity: **1**

Rainhood Drawing

Rain hood dimensions

Figure 8: Rain hood dimensions

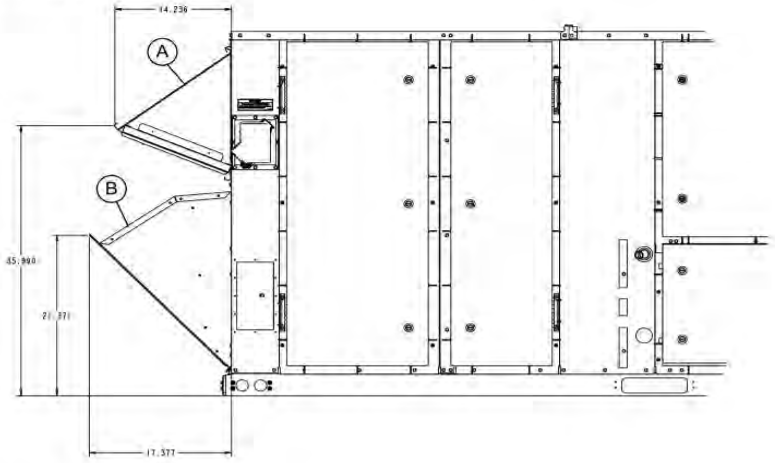


Table 32: Rain hood components

Item	Description
A	Economizer/motorized damper and power exhaust rain hood
B	Air intake hood

Point Choice 15-27.5 Ton Package

Coleman Single Package R-410A Air Conditioner

Project Name: **Elkins DNR Update** Unit Model #: **CD25N1DH4S1CEH12B2**

Quantity: **1**

Roof Curb Drawings 0444,0447

Figure 10: 1RC0444 and 1RC0447 roof curb dimensions

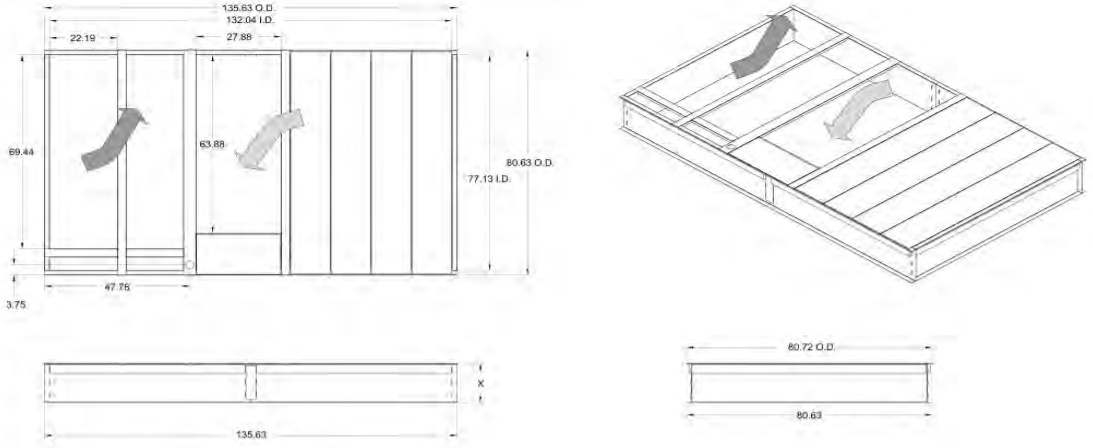


Table 35: 1RC0444 and 1RC0447 dimensions

Roof curb	X measurement (in.)
1RC0444	14
1RC0447	24

Point Choice 15-27.5 Ton Package

Coleman Single Package R-410A Air Conditioner

Project Name: **Elkins DNR Update** Unit Model #: **CD25N1DH4S1CEH12B2**

Quantity: **1**

Roof Curb Cutaway

Figure 12: Roof curb cutaway

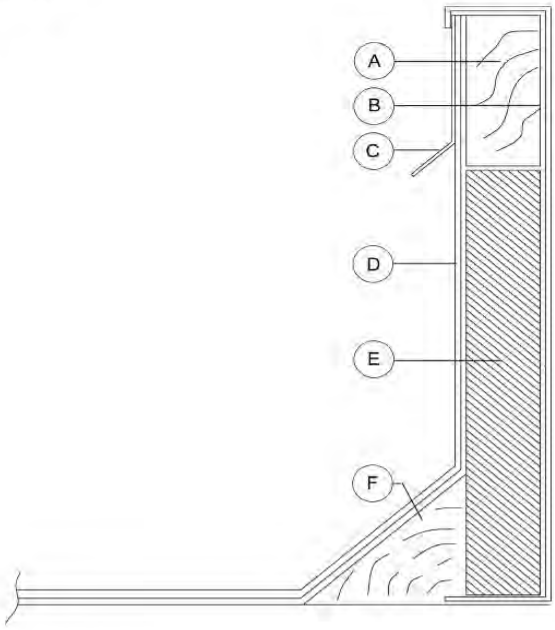


Table 37: Roof curb cutaway components

Item	Description	Item	Description
A	Wood nailer	D	Roof felt (field supplied)
B	Curb frame	E	Rigid insulation (field supplied)
C	Counter flashing (field supplied)	F	Cant strip (field supplied)

Date
02/08/2023
Project Name
Elkins DNR Update
Project Number
Client / Purchaser

Guide Specification Summary Page

Product Series	Models and Unit Tags
Coleman® Point™ Core 3-12.5 Ton Package	ZYG06E4C1EB2C123A4
Point Choice 15-27.5 Ton Package	CD15N1DH4S1CEH12B2 CD25N1DH4S1CEH12B2

DIVISION 23 – HEATING, VENTILATING, AND AIR-CONDITIONING(HVAC)

Number Title

23 00 00 HEATING VENTILATING, AND AIR-CONDITIONING(HVAC)

23 06 00 Schedules for HVAC

23 06 80 Schedules for Decentralized HVAC Equipment

23 06 80. 13 Decentralized Unitary HVAC Equipment Schedule

23 06 80. 13.A Rooftop unit schedule

23 07 00 HVAC Insulation

23 07 16 HVAC Equipment Insulation

23 07 16. 13 Decentralized, Rooftop Units

23 07 16. 13.A Evaporator fan compartment

1. Interior cabinet surfaces shall be insulated with a minimum 1/2- in. thick, minimum 1 1/2 lb density, flexible fiberglass insulation 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

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 00 Instrumentation and Control for HVAC

23 09 13 Instrumentation and Control Devices for HVAC

23 09 13. 23 Sensors and Transmitters

23 09 13. 23.A Thermostats

1. Thermostat must:
   a. energize “G” when calling for fan only or continuous fan.
   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

23 09 23. 13 Decentralized, Rooftop Units

23 09 23. 13.A Smart Equipment (Unit based microprocessor control)

1. Shall be ASHRAE 62-2001 compliant.
2. Shall include an integrated economizer controller to support an economizer with 2 to 10 v DC actuator input.
3. Controller shall accept the following inputs: space temperature, setpoint adjustment, outdoor air temperature, indoor air quality, outdoor air quality, indoor relative humidity, compressor lockout, fire shutdown, enthalpy, fan status, remote time clock/door switch.
4. Shall accept a CO_2 sensor in the conditioned space, and be Demand Control Ventilation ready.
5. Unit shall provide surge protection for the controller through a circuit breaker.
6. Shall have an LED display independently showing the status of activity on the communication bus, and processor operation.
7. Software upgrades will be accomplished by local download. Software upgrades through chip replacements are not allowed.

A. Unit shall be complete with self-contained low-voltage control circuit protected by a resettable circuit breaker on the 24-volt transformer side.

B. Unit shall incorporate a lockout circuit which provides reset capability at the space thermostat or base unit should any of the following standard safety devices trip and shut off compressor:

C. Loss-of-charge/Low-pressureswitch.

D. High-pressure switch.

E. Freeze-protection thermostat, evaporator coil. If any of the above safety devices trip, an LED (light-emitting diode) indicator shall flash a diagnostic code that indicates which safety switch has tripped.

F. Unit shall incorporate “AUTO RESET” compressor over temperature, over current protection.

G. Unit shall operate with conventional thermostat designs and have a low voltage terminal strip for easy hook-up.

H. Unit control board shall have on-board diagnostics and fault code display.

I. Standard controls shall include anti-short cycle and low voltage protection, and permit cooling operation down to 0 ºF.

J. Control board shall monitor each refrigerant safety switch independently.

K. Control board shall retain last 5 fault codes in non-volatile memory, which will not be lost in the event of a power loss.

23 09 23. 13.B RTU Open-multi-protocol, direct digital controller

1. Shall be ASHRAE 62-2001 compliant.
2. Shall include built-in protocol for BACNET , Modbus , and Johnson N2.
3. Shall allow access of up to 62 network variables (SNVT). Shall be compatible with all open controllers
4. Baud rate Controller shall be selectable using a dip switch.
5. Shall have an LED display independently showing the status of serial communication,running, errors, power, all digital outputs, and all analog inputs.
6. 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.
7. 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.

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" or 4" thick fiberglass filters of commercially available sizes.
2. Units can accept 2” or 4” filters and have a field convertible toolless
3. Filters shall be accessible through an access panel with toolless 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

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 environmentally sound, R-410A 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. ZY units are Energy Star certified.
3. Unit shall be rated in accordance with AHRI Standards 210/240 and 340/360.
4. Unit shall be designed to conform to ASHRAE 15, 2001.
5. Unit shall be UL- tested and certified in accordance with ANSI Z21.47 -2012/CSA 2.3-2012, CSA C22.2 No. 236-11 (UL 1995) 4th edition and CSA C22.2 No. 3 - M 1988
6. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
7. Unit casing shall be capable of withstanding 750-hour salt spray exposure per ASTM B117 (scribed specimen).
8. Unit shall be designed in accordance with ISO 9001, and shall be manufactured in a facility registered by; ISO 9001.
9. Roof curb shall be designed to conform to NRCA Standards.
10. 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.
11. Unit shall be designed in accordance with UL Standard 1995, including tested to withstand rain.
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.B Delivery, Storage, and Handling

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

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 125°F (52°C)ambient outdoor temperature, meeting maximum load criteria of AHRI Standard 210/240 or 340/360 at ± 10% voltage.
2. Compressor with standard controls shall be capable of operation down to 0°F (2°C), ambient outdoor temperatures.See below for head pressure control package or winter start kit.
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.
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 with exterior surfaces coated with a non-chalking, powder paint finish, certified at 750 hour salt spray test per ASTM-B117 standards.**
2. 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 1/2 lb density, flexible fiberglass insulation, neoprene coated on the air side. Aluminum foil- faced fiberglass insulation shall be used in the gas heat compartment. Fan shall be a belt drive assembly and include an adjustable pitch motor pulley. Job site selected brake horsepower shall not exceed the motors nameplate horsepower rating plus the service factor (Only premium efficiency motors have hp rating on the nameplate). Units shall be designed to operate within the service factor. Fan wheel shall be double inlet type with forward curve blades, dynamically balanced to operate smoothly throughout the entire range of operation. Airflow design shall be constant volume. Bearings shall be sealed and permanently lubricated for longer life and no maintenance.

   Condenser Fan Assembly: The outdoor fans shall be of the direct drive type, discharge air vertically, have aluminum blades riveted to corrosion resistant steel spider brackets and shall be dynamically balanced for smooth operation. The outdoor fan motors shall have permanently lubricated bearings internally protected against overload conditions and staged independently.
3. Base of unit shall have a minimum of four locations for thru-the-base gas and electrical connections (factory installed or field installed), standard.
4. Base Rail
   a. Unit shall have base rails on a minimum of 4 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.
5. Condensate pan and connections
   a. Shall be an internally 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.
6. Top panel
   a. Shall be a single piece top panel.
7. Gas Connections
   a. All gas piping connecting to unit gas valve shall enter the unit cabinet at a single location on side of unit
   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.

8. 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.
9. Component access panels (standard)
   a. Cabinet panels shall be easily removable for servicing.
   b. Unit shall have one factory installed, toolless, removable, filter access panel.
   c. Panels covering control box, indoor fan, indoor fan motor, gas components(where applicable), and compressors shall have a 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. The LED shall be visible without removing the control box access panel.
   c. IGC board shall contain algorithms that modify evaporator-fan operation to prevent future cycling on high temperature limit switch.
   d. 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.
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 CSA C22.2 No. 236-11 (UL 1995) 4th edition burst test at 1775 psig.

c. Condenser coils shall be leak tested to 150 psig, pressure tested to 650 psig, and qualified to CSA C22.2 No. 236-11 (UL 1995) 4th edition burst test at 1980 psig.

23 81 19. 13.K Refrigerant Components

1. Refrigerant circuit shall include the following control, safety, and maintenance features
   a. Thermostatic Expansion Valve (TXV) shall help provide optimum performance across the entire operating range. Shall contain removable power element to allow change out of power element and bulb without removing the valve body.(Orifice on ZX08, ZX09, ZX12, ZQ04, ZQ05 & ZQ06)
   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 provided by the factory.

23 81 19. 13.L Filter Section

1. Filters access is specified in the unit cabinet section of this specification.
2. Shall consist of factory-installed, low velocity, throw-away 2” or 4” thick fiberglass filters.
3. Units can accept 2” or 4” filters and have a field convertible toolless

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 protection (Only on single-phase, belt-drive motors, three - phase, belt-drive motors have internal thermostat used for external line-break control.).
3. 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

The outdoor fans shall be of the direct drive type, discharge air vertically, have aluminum blades riveted to corrosion resistant steel spider brackets and shall be dynamically balanced for smooth operation. The outdoor fan motors shall have permanently lubricated 60°C ball bearings internally protected against overload conditions and staged independently. A cleaning window shall be provided on two sides of the units for coil cleaning.

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. All models shall use a shaft-down design except shaft-up on ZX14 & ZY12 size with rain shield.

2. Condenser Fans

a. Shall be a direct-driven propeller type fan.

b. Shall have aluminum blades riveted to corrosion-resistant steel spiders and shall be dynamically balanced.

23 81 19. 13.O Special Features Options and Accessories

3. Standard Integrated Economizers:

a. Integrated, gear-driven opposing modulating blade design type capable of simultaneous economizer and compressor operation.

b. Independent modules for vertical or horizontal return configurations 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 models shall be equipped with low- leakage dampers, not to exceed 2% leakage at 1 in. wg pres- sure differential. Economizers will come with Actuator and module that is tied to Smart Equipment™

(1.) Combined minimum and DCV maximum damper position potentiometers with compressor staging re-lay.

(2.) Functions with solid state analog enthalpy or dry bulb changeover control sensing.

(3.) Contain LED indicates for:when free cooling is availablewhen module is in DCV mode when exhaust fan contact is closed

8. Unit- Mounted, Non-Fused Disconnect Switch: (Verify on the unit nameplate that the disconnect is properly sized for the application. Units with field installed electric heat may exceed the factory installed disconnect amperage rating.)

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.

11. 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.

14. 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.

15 to 27.5 Tons Nominal Cooling
178,000 to 324,000 BTUH Nominal Gas Heating Output
25 to 75 kW Electric Heating

23 06 80 Schedules for Decentralized HVAC Equipment

23 06 80. 13 Decentralized Unitary HVAC Equipment Schedule

23 06 80. 13.A. Rooftop unit schedule

1. Schedule is per the project specification requirements.

23 07 16. HVAC Equipment Insulation

23 07 16. 13 Decentralized, Rooftop Units:

23 07 16. 13.A. Evaporator fan compartment:.

1. Interior cabinet surfaces shall be insulated with a minimum 0.5 in. thick, fiber glass insulation with thermal conductivity of 0.23 or better, adhered with water based adhesive.
2. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

23 07 16. 13.B. Gas heat compartment:

1. Interior cabinet surfaces shall be insulated with a minimum 0.5 in. thick, fiber glass insulation with thermal conductivity of 0.23 or better, adhered with water based adhesive.
2. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

23 07 16. 13.C. Economizer and Control compartment:

1. Shall be Interior cabinet surfaces shall be insulated with a minimum 0.5 in. thick, fiber glass insulation with thermal conductivity of 0.23 or better, adhered with water based adhesive.
2. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

23 07 16. 13.D. Partition and Duct Panel:

1. Interior cabinet surfaces shall be insulated with a minimum 0.5 in. thick, fiber glass insulation with thermal conductivity of 0.23 or better, adhered with water based adhesive.
2. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

23 07 16. 13.E. Base Pan and Blower Back:

1. Interior cabinet surfaces shall be insulated with a minimum 0.5 in. thick, foil faced fiber glass insulation with thermal conductivity of 0.23 or better, adhered with water based adhesive.
2. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

23 09 13 Instrumentation and Control Devices for HVAC

23 09 13. 23 Sensors and Transmitters

23 09 13. 23.A. Thermostats

1. Thermostat must
   a. Energize “Y” when calling for cooling and “W” when calling for heating.
   b. Shall have capability to energize 4 different stages of cooling, and 2 different stages of heating.
   c. Shall include capability for occupancy scheduling.

23 09 23 Direct- digital Control system for HVAC

23 09 23. 13 Decentralized, Rooftop Units:

23 09 23. 13.A. Simplicity SMART Equipment Control

1. Shall be ASHRAE 62 compliant.
2. Shall accept 20-30 VAC input power, 50/60Hz. 24 VAC nominal.
3. Shall have an operating temperature range from -40°F to 158°F; 10-90% RH (non-condensing UI), and -4°F to 158°F; 10-90% RH (non-condensing), with a storage temperature range from -40°F to 194°F; 5-95% RH (non-condensing).
4. Shall include an option of an Economizer microprocessor controller which communicates directly with the Unit Control Board and has 8 Analog outputs, 2 Analog inputs, 2 Binary outputs, 3 Binary inputs.
5. Controller shall accept the following inputs: space temperature, return air temperature sensor, set point adjustment, outdoor air temperature, indoor air quality, outdoor air quality, indoor relative humidity, compressor lock- out, fire/smoke

shutdown, single and dual enthalpy, fan status, remote time clock, Sensor Actuator (SA) Bus communicated temperature/humidity/CO2 values from Network sensors, Field Controller (FC) Bus Network Overrides for space temperature, outdoor air temperature, space humidity, outdoor air quality, Indoor air quality, System purge.

6. Shall accept a CO2 sensor or multiple CO2 sensors networked together in the conditioned space, and be Demand Control Ventilation (DCV) ready.
7. Shall provide compressor short-cycle protection with minimum compressor runtime set at 3 minutes standard and adjustable from 2 to 7 minutes.
8. Unit shall provide surge protection for the controller through a circuit breaker.
9. Shall have open communication protocols with all required points exposed. Protocols supported include: BACnet®, MS/TP, Modbus®, and N2 communication.
10. Shall have an LCD display on the Unit Control Board to display fault messages as well as navigate the menu structure to review and change set points.
11. Shall utilize a USB connection to allow for uploading and downloading of data.
    a. USB shall allow for downloading of “trending data” for analysis of inputs and values on other device such as a PC.
    b. USB shall allow for uploading of new firmware to the UCB.
    c. USB shall allow for backing up controller set points and parameters and for uploading of these same parameters to the UCB.
12. Shall include an RJ-12 port to be used with a Wi-Fi signal transmitting device and allow unit(s) access via any non-proprietary smart device.
    a. Unit access shall include ability to view and change all adjustable parameters and set points using the same characteristics and values available directly through the UCB joystick and LCD display.
    b. Unit access shall be configurable at 3 different levels to allow control over parameter and set point changes.
    c. Wi-Fi transmitting device can be connected by 3 means.
        1) RJ-12 port connected directly to UCB.
        2) Optional connection port mounted in operating space.
        3) Optional connection to building network allowing unit access from any internet browser worldwide.
13. Shall have the capability to integrate with Verasys zoning controls system.
14. Shall not require any proprietary software or contractor tool to start-up, commission and troubleshoot unit operation.
15. Software upgrades will be accomplished by local download via USB port on main Unit Control Board.
16. Shall be UL Recognized, File E107041, UL 916, Energy management Equipment, UL 60335-2-40, Heating and Cooling Equipment; FCC Compliant to CFR47, Part 15, Subpart B, Class B, CSA 22.2 No. 236, Signal Equipment Industry Canada, ICES-003 Recognized, and BTL certified.

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 minimum 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 gas furnace shall be controlled by an integrated gas controller (IGC) microprocessor. See heat exchanger section of this specification.

23 09 33. 23.B. Safeties:

1. Compressor over- temperature and over- current.
2. Low pressure switch and high pressure switch.
    a. 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. Automatic reset, motor thermal overload protector.
4. Gas heating section shall be provided with the following minimum protections.
    a. Primary and auxiliary high temperature limit switches

b. Induced draft pressure sensor
c. Flame rollout switch
d. Flame proving controls

5. Electric heat section shall be provided with the following minimum protections:
   a. Primary, backup and auxiliary high temperature limit switches

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. Units can accept 2” or 4” filters and have a field convertible transition.
3. Filters shall be accessible through an access panel; hinged panel with toolless access is available as described in the Special Features Options and Special Features Options and Accessories section of this specification.

23 81 19 Self- Contained Air Conditioners

23 81 19 13 Small- Capacity Self- Contained Air Conditioners

23 81 19. 13.A. General

1. Outdoor, rooftop mounted, electrically controlled, heating and cooling unit utilizing a fully hermetic, suction gas cooled, direct drive compressor(s) for cooling duty and gas combustion or nickel chromium elements 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 environmentally sound, R-410A 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 or 340/360.
3. Unit shall be designed to conform to ASHRAE 15.
4. Unit shall be CSA tested and certified in accordance with ANSI Z21.47 -2016/CSA 2.3-2016, and CSA C22.2 No. 60335-2-40.
5. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
6. Unit casing shall be capable of withstanding 750- hour salt spray exposure per ASTM B117 (scribed specimen).
7. Roof curb shall be designed to conform to NRCA Standards.
8. 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.
9. Unit shall be designed in accordance with CSA C.22.2 NO.60335-2-40, including tested to withstand rain.
10. Unit shall be constructed to prevent intrusion of snow into the control box.
11. 15 – 25 ton units shall be shake tested to Truck 2, ASTM D4169 to ensure shipping reliability.

23 81 19. 13.C. Delivery, Storage, and Handling

1. Unit shall be stored and handled per manufacturer’s recommendations.
2. Overhead crane can be used to place the units on a roof using rigging holes built into the unit base rails without any additions to the unit.
3. Unit shall only be stored or positioned in the upright position.

23 81 19. 13.D. Project Conditions

1. As specified in the contract.

23 81 19. 13.E. Operating Characteristics

1. Unit shall be capable of starting and running at 115°F (52°C) ambient outdoor temperature, meeting maximum load criteria of AHRI Standard 210/240 or 340/360 at ±10% voltage.
2. Compressor with standard controls shall be capable of operation down to 45°F (7°C), ambient outdoor temperatures. Intermittent cooling shall be operational down 0° F (-17° C). Low ambient kit is necessary if mechanically cooling at ambient temperatures below 40°F (4°C).

3. Unit shall be factory configured for vertical supply & return configurations.

23 81 19. 13.F. Electrical Requirements

1. Main power supply voltage, phase, and frequency must match those required by the manufacturer.

23 81 19. 13.G. Unit Cabinet

1. Unit cabinet shall be constructed of galvanized steel with exterior surfaces coated with a non-chalking, powder paint finish, certified at 750 hour salt spray test per ASTM-B117 standards.
2. Unit cabinet exterior paint shall be: film thickness, (dry) 3.0 MILS minimum, gloss (per ASTM D523, 60°F / 16°C): 80+/- 5, Hardness: H- 2H Pencil hardness.
3. Unit cabinet shall have gas utility entry holes in the side of the unit and in the unit underside. Entry holes shall not require field setup and shall be capped from the factory to prevent water intrusion when not in use.
4. Unit cabinet shall have electric utility entry locations marked from the factory with a dimple for accuracy of field drilling. Entry locations shall be available for entry through the side of the unit or from the unit underside.
5. Base Rail
   a. Unit shall have base rails on all 4 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 unit by fork truck.
   d. Base rail shall be a minimum of 15 gauge thickness.
6. Condensate pan and connections:
   a. Shall be a multidirectional internally sloped condensate drain pan made of a non- corrosive material.
   b. Shall comply with ASHRAE Standard 62.
   c. Shall use a 1” NPT female drain connection through the side of the drain pan. Connection shall be made per manufacturer’s recommendations.
   d. Shall include intentional “overflow notch” and water containment path to guide flow of water where desired in the event of a drain pan overflow.
7. Top panel:
   a. Shall be a multi piece top panel.
8. Electrical Connections
   a. All unit power wiring shall enter unit cabinet through a field drilled hole located by a factory provided dimple.
   b. Through- the- base capability.
      1) Standard unit shall have a through- the- base electrical location(s) using a raised, embossed portion of the unit base-pan.
      2) No base-pan penetration, other than those authorized by the manufacturer, is permitted.

23 81 19. 13.H. 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.
   d. Burners shall be of the in- shot type constructed of aluminum- coated steel.
   e. 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.
   f. Each heat exchanger tube shall contain multiple dimples for increased heating effectiveness.
2. The gas furnace 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. Unit shall be equipped with anti- cycle protection with one cycle on the unit flame rollout switch, 3 short cycles on the high temperature limit switch, one cycle on the auxiliary limit switch, and one cycle on indoor blower fault detection. Fault indication shall be made using an LED.
3. Staged gas heat
   a. Shall have two stages of heating capacity with first stage capacity 75% of total capacity.
4. Aluminized Steel Heat Exchanger construction.

a. Heat exchanger shall be of the tubular- section type constructed of a minimum of 20- gauge steel coated with a T1-40 aluminum-silicon alloy for corrosion resistance.

5. 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 with automatic reset feature.

23 81 19. 13.I. Coils

1. Evaporator Coils, Aluminum Fin - Copper Tube:
   a. Standard evaporator coils shall have aluminum plate fins mechanically bonded to seamless internally grooved copper tubes with all joints brazed.
   b. b. Shall be leak tested to 150 psig, pressure tested to 250 psig, and burst qualified to CSA C22.2 No. 60335-2-40.th edition burst test at 1775 psig.
   c. Assembled unit shall be pressure tested to 450 psig.
2. Condenser Coils, All Aluminum Microchannel:
   a. Condenser coils shall have all aluminum microchannel design consisting of aluminum multiport 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. Microchannel condenser coils shall be leak tested to 150 psig, pressure tested by supplier to 600 psig, and burst qualified to CSA C22.2 No. 60335-2-40.
   c. Assembled unit shall be pressure tested to 450 psig.

23 81 19. 13.J. Refrigerant Circuits

1. 4 speed IntelliSpeed and Variable Air Volume airflow options shall have 2 independent refrigerant circuits with 4 stages of cooling.
2. Refrigerant circuit shall include the following control, safety, and maintenance features:
   a. Thermostatic Expansion Valve (TXV) shall help provide optimum performance across the entire operating range.
   b. Refrigerant filter drier - Solid core design.
   c. Service gauge connections on suction and discharge lines.
3. Compressors
   a. Unit shall use fully hermetic scroll compressors for each independent refrigeration circuit.
   b. Four stage models that are 15, 17.5, or 20 tons shall use a two speed compressor on circuit one and a fixed speed compressor on circuit two.
   c. Four stage models that are 25 or 27.5 tons shall use a tandem compressor set on circuit one and a fixed speed compressor on circuit two.
   d. Compressor motors shall be cooled by refrigerant gas passing through motor windings.
   e. Compressors shall be internally protected from high discharge temperature conditions.
   f. Compressors shall be protected from an over- temperature and over- amperage conditions by an internal, motor overload device.
   g. Compressor shall be factory mounted on rubber grommets.
   h. Crankcase heaters shall be installed in the factory as needed on tandem compressor sets.

23 81 19. 13.K. Filter Section

1. Filters access is specified in the unit cabinet section of this specification.

23 81 19. 13.L. Evaporator Fan and Motor

1. Evaporator fan motor:
   a. Shall have permanently lubricated ball-bearings.
   b. Shall have inherent automatic- reset thermal overload protection.
   c. The job site selected brake horsepower shall be required to not exceed the motor’s nameplate horsepower rating plus the service factor.
2. Evaporator Fan:
   a. Fan shall be a belt drive assembly with an adjustable pitch motor pulley.

b. Blower bearings shall have an L10 life of 100,000 hrs
c. Shall use sealed, permanently lubricated ball-bearing type.
d. Shall use dual blower design consisting of two balanced blower fans on a single shaft.
e. Blower fan shall be double- inlet type with forward- curved blades.
f. Shall be constructed from steel with a corrosion resistant finish and dynamically balanced.

23 81 19. 13.M. Condenser Fans and Motors

1. Condenser fan motors:
   a. Shall be a totally enclosed motor.
   b. Shall use permanently lubricated ball-bearings.
   c. Shall have inherent thermal overload protection with an automatic reset feature.
   d. Shall use a shaft- down design.
2. Condenser Fans:
   a. Shall be a direct- driven propeller type fan.

23 81 19. 13.N. Special Features Options and Accessories

1. Variable Frequency Drive (VFD). Available on multi-speed (IntelliSpeed) and VAV indoor fan motor options:
   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.
   d. Built in LED display and controls. Does not require additional kit or options.
   e. RS485 capability standard.
   f. Electronic thermal overload protection.
   g. All printed circuit boards shall be conformal coated.
2. Low Leak Economizer:
   a. Integrated, tie-bar driven parallel modulating blade design type capable of simultaneous economizer and compressor operation.
   b. Damper blades shall be galvanized steel with tie-bar metal linkages. Plastic or composite blades on intake or return shall not be acceptable.
   c. Damper blades shall be class 1A dampers.
   d. Shall include all hardware and controls to provide free cooling with outdoor air when temperature and/or humidity are below set points.
   e. Shall be equipped with tie-bar driven dampers for both the outdoor ventilation air and the return air for positive air stream control.
   f. Economizer shall comply with, and be certified to, the AMCA 511 standard.
   g. Standard leak rate shall be equipped with dampers not to exceed 3 cfm/ft2 leakage at 1 in. wg pressure differential.
   h. Economizer controller shall be the Johnson Controls SE Economizer Controller
      1) On- board Fault Detection and Diagnostics (FDD) that senses and alerts when the economizer is not operating properly, meets the requirements for California Title 24, IECC 2015, and ASHRAE 90.1.
      2) Display alarms if the following occur
         i. Economizer is economizing when conditions do not support
         ii. Economizer is not economizing when conditions do support
         iii. Damper Stuck
         iv. Excess Outdoor Air
         v. Failed Sensor
      3) Automatic sensor detection
      4) Capabilities for use with multiple-speed indoor fan systems
      5) Utilize digital sensors: Dry bulb and Enthalpy
      6) UL, CSA, and ICES-003 recognized and FCC compliant to CFR47

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. Barometric relief can be replaced by optional power exhaust.

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. Single or dual enthalpy sensing is available as a factory or field installed sensing option.fg Outdoor air sensor set point shall be adjustable and shall range from 40° to 80°F / 4° to 27°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. Economizer controller shall provide indications when in free cooling mode, in the DCV mode, or the exhaust fan contact is closed.

3. Barometric Relief Damper:

   a. Shall contain all materials necessary to field install a barometric relief damper capable of relieving up to 100% return air and contain seals that meet ASHRAE 90.1 requirements.

4. Phase Monitor:

   a. Shall provide protection against phase reversal, phase loss, and phase unbalance.

   b. Switch shall automatically shut off unit control circuit if any of the above conditions is detected.

   c. Shall have visual LED indication of operational status.

5. Hinged and tool less access panels:

   a. Cabinet panels shall be hinged.

   b. Shall provide easy access with toolless latching mechanism.

   c. Shall be on major panels of: filter, control box, fan motor, and gas or electric heat controls.

6. Unit-Mounted, Non-Fused Disconnect Switch:

   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.

7. Roof Curbs:

   a. Formed galvanized steel with wood nailer strip and shall be capable of supporting entire unit weight.

   b. Permits installation and securing of ductwork to curb prior to mounting unit on the curb.

8. Dual Enthalpy Sensor:

   a. The dual enthalpy sensor option or kit shall provide 2 relative humidity sensors to be mounted in the return and outdoor air streams to provide dual enthalpy economizer control.

   b. This kit contains all components required for dual enthalpy control and does not need to be used in conjunction with the Single Enthalpy Sensor Kit.

9. Smoke detectors:

   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 a recessed momentary switch for testing and resetting the detector.

   e. 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 49 other duct smoke detectors for multiple fan shutdown applications.

Date
02/08/2023
Project Name
Elkins DNR Update
Project Number
Client / Purchaser

Control Summary Page

Control	Models and Unit Tags
BACnet MSTP,Mdbs,N2 COM Card	ZYG06E4C1EB2C123A4
BACnet MSTP,Mdbs,N2 COM Card	CD15N1DH4S1CEH12B2
	CD25N1DH4S1CEH12B2

23 09 23 Direct- digital Control system for HVAC

23 09 23. 13 Decentralized, Rooftop Units:

23 09 23. 13.A. Unit Control Board

1. ASHRAE 62- 2001compliant. BTL certified.
2. Shall accept 20-30 VAC input power, 50/60Hz. 24 VAC nominal.
3. Operating temperature range from -40F to 158F; 10-90% RH (non-condensing UI), and -4F to 158F; 10-90% Rh (non-condensing), with a storage temperature range from -40F to 194F; 5-95% RH (non-condensing).
4. Shall include an option of and Economizer microprocessor controller which communicates directly with the Unit Control Board and has 8 Analog outputs, 2 Analog inputs, 2 Binary outputs, 3 Binary outputs.
5. Controller shall accept the followinginputs: space temperature, return air temperature sensor, setpointadjustment, outdoor air temperature, indoor air quality, outdoor air quality, indoor relative humidity, compressor lock- out, fire/smoke shutdown, single and dual enthalpy,fan status, remote time clock, SA Bus communicated temperature/humidity/CO2 values from Network sensors, FC Bus Network Overrides for space temperature, outdoor air temperature, space humidity, outdoor air quality, Indoor air quality, System purge.
6. Shall accept a single CO_2 sensor or multiple CO_2 sensors networked together via communication bus 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 showingthe status of activity on the communication bus, and processor operation.
11. Unit shall incorporate a lockout circuit which provides reset capability at the space thermostat or base unit should any of the following standard safety devices trip and shut off compressor. If any of these safety devices trip, the LCD screen will display alarm message indicating the specific safety device that caused the lockout.
    a. Loss of charge/Low-pressure switch.
    b. High-pressure switch.
    c. Freeze condition sensor on evaporator coil.
12. Unit control board must support each usage case:
    a. Conventional thermostat with low voltage input terminals for easy installation
    b. Communicating network sensors in the occupied space to provide feedback on space conditions for unit control board to compare with associated setpoints
    c. Communication via BACnet MS/TP, Modbus RTU, N2 protocols for integration into a building automation/management system
13. Anti-short cycle and low voltage protection features included.
14. Internal occupied/unoccupied scheduling
15. Unit control board shall permit cooling operation down to a selectable value as low as 0 degrees F.
16. Shall allow for start-up, commissioning, troubleshooting, parameter adjustment, setpoint adjustment via onboard display and navigable menu with no additional interface tool or controls technician required.
17. The unit control board shall run a self-test diagnostics algorithm at startup that operated the cooling cycle, heating cycle, fan operation. A status report shall be provided upon completion of the diagnostic self-test.
18. Utilize any wi-fi enabled smart device to access the HVAC or multiple HVAC units if communication wiring between them is present (FC Bus or SA Bus). Remote access shall allow complete ability to perform start-up, commissioning, troubleshooting, parameter adjustment, setpoint adjustment.
19. Local embedded trending and scheduling. Trending data and occupancy scheduling predefined from the factory. Occupancy schedule to be modified via control board joystick menu navigation and remotely using a smart device (cellular phone, laptop, tablet)
20. A menu on the onboard screen shall display the unit status and allow changing parameters where applicable. These include but are not limited to:
    a. Demand Ventilation Mode – enable or disable
    b. Operational Setpoint – display current value
    c. Supply Air Temperature (SAT) – display current value
    d. Return Air Temperature (RAT) – display current value

e. Operational Supply Humidity (OprSH) – display current value as provided by a 0-10VDS input, SA Bus Network Sensor, or FC Bus communicated value
f. Return Air Humidity (RAH) – display current value
g. Operational outdoor Air Temperature (OprOAT) – enthalpy calculated from OAH 0-10VDC input to Economizer board and OprOAT only if economizer is present
h. Operational Outdoor Air Humidity (OprOAH) – the buffered outdoor air humidity. May be from economizer boards OAH 0-10VDC input or FC Bus communicated value
i. Operational outdoor Air Quality (OprOAQ) – the buffered outdoor air quality in use. May be from economizer boards OAQ 0-10VDC input or FC Bus communicated value
j Operational Indoor Air Quality (OprIAQ) – the buffered indoor air quality in use. May be from economizer board IAQ 0-10VDC input, SA Bus Network Sensor, or FC Bus communicated value

21. A menu shall display and allow modification to the following operations and settings:
    a. HVAC Zone Fan
    b. Cooling
    c. Heating
    d. Economizer
    e. Demand Ventilation
    f. Power Exhaust
    g. Sensors
    h. Network
22. A menu shall display and allow modification to the following operations and settings:
    a. HVAC Zone – Occupied status
    b. Indoor Fan status
    c. Cooling status
    d. Heating status
    e. Economizer indication whether free-cooling is available or not
    f. Enabling or disabling of Demand Ventilation
    g. Power Exhaust
        1) Enable/disable hot-gas reheat if available
        2) Warmup/Cooldown
        3) Title 24 Load Shed
        4) Defrost
23. A menu shall display and allow modification to the following operations and settings:
    a. Firmware version (of UCB, Economizer, other peripheral boards)
    b. Setting time zone
    c. Network information
        1) Device name that will appear on the FC Bus
        2) Selection of communication protocol
        3) Operational Baud Rate
        4) Device ID
24. A menu shall display and allow modification to the following operations and settings:
    a. Version of firmware
    b. Ability to Load new firmware
    c. Create a backup file of the firmware and parameter setting via USB port
    d. Restore factory default parameter values and setup
    e. Full and Partial Cloning of parameter setpoints from or to other units
    f. Data trend exporting
25. A menu shall display and allow modification to the following operations and settings:

a. Unit serial number, model number and name
b. Ability to reset Lockouts
c. Controller name
d. Displays the current values of all setpoints in use
e. Displays all current values for the indoor and outdoor zones
f. Displays current values related to:
    1) Indoor Fan
    2) Cooling
    3) Heating
    4) Heat Pump operation
    5) Economizer operation
    6) Power Exhaust
    7) Demand Ventilation
    8) Air monitoring station
    9) Hot Gas Reheat
    10) Smoke Control
g. Current information for inputs; including
    1) Sensors
    2) Coil Sensors
    3) Thermostat
    4) Binary Inputs
    5) Unit Protection
    6) Network Inputs
    7) All outputs (relay and binary)
h. Self-Test
    1) A patented self-test system that runs through a series of algorithms to provide a report of all functioning characteristics of the system at time of startup and commissioning.

23 09 23. 13.B. Auxiliary Control Boards

1. ASHRAE 62- 2001 compliant. BTL certified.
2. Economizer controller CEC Title 24 Compliant
    a. Display alarms if the following occur
        1) Economizer is economizing when conditions do not support
        2) Economizer is not economizing when conditions do support
        3) Damper Stuck
        4) Excess Outdoor Air
        5) Failed Sensor
3. Refrigeration Fault Detection & Diagnostics
    a. There is insufficient refrigerant in any circuit
    b. There is excessive refrigerant in any circuit
    c. There is excessive refrigerant flow
    d. There is insufficient refrigerant flow (restriction)
    e. Inefficient compressor
    f. Insufficient High-side heat transfer
    g. Excessive High-side heat transfer (low ambient control problem, low ΔP)
    h. Insufficient Low-side heat transfer
    i. Excessive Low-side heat transfer

j. Sensor fault- The liquid temperature is greater than the condenser temperature (Could also be triggered if refrigerant level is very low in the system)
k. Sensor fault- Sensor data is not available
l. The unit is off
m. The ambient temperature is too low
n. The ambient temperature is too high
o. The return air wet-bulb temperature is too low
p. The return air wet-bulb temperature is too high
q. Sensor fault- The condensing temperature is lower than the ambient temperature (Could also be triggered when the condenser is wet)
r. The suction line temperature is less than the evaporator temperature
s. The evaporator temperature is greater than the ambient temperature
t. The liquid temperature is lower than the ambient temperature
u. Sensor fault- Suction temperature or ambient temperature is invalid
v. Sensor fault- The return air dry-bulb or wet-bulb temperature is invalid
w. Sensor fault- The liquid pressure or suction pressure is invalid
x. Sensor fault- The suction line temperature is invalid
y. The return air dry-bulb temperature is too low
z. The return air dry-bulb temperature is too high
aa. The Efficiency Index is below 75% of ideal
bb. The Capacity Index is below 75% of ideal

23 09 23. 13.C Remote Accessibility:

1. ASHRAE 62- 2001 compliant. BTL certified.
2. Provide the ability to adjust parameter values, setpoints, limits remotely
3. Connectivity to an Ethernet network via static IP address or Dynamic Name Server (DNS)
4. Allow a maximum of 100 devices on the same FC bus trunk and accessed by one remote device

START-UP & SERVICE DATA INSTRUCTION

COMMERCIAL PACKAGE UNITS

3.0 To 40.0 TONS

START-UP CHECKLIST

Date: _____

Job Name: _____

Customer Name: _____

Address: _____

City: _____ State: _____ Zip: _____

Model Number: _____ Serial Number: _____

Qualified Start-up Technician: _____ Signature: _____

HVAC Contractor: _____ Phone. _____

Address: _____

Contractor's E-mail Address: _____

Electrical Contractor: _____ Phone: _____

Distributor Name: _____ Phone: _____

WARRANTY STATEMENT

Johnson Controls/UPG is confident that this equipment will operate to the owner's satisfaction if the proper procedures are followed and checks are made at initial start-up. This confidence is supported by the 30 day dealer protection coverage portion of our standard warranty policy which states that Johnson Controls/UPG will cover parts and labor on new equipment start-up failures that are caused by a defect in factory workmanship or material, for a period of 30 days from installation. Refer to current standard warranty policy and warranty manual found on UPGnet for details.

In the event that communication with Johnson Controls/UPG is required regarding technical and/or warranty concerns, all parties to the discussion should have a copy of the equipment start-up sheet for reference. A copy of the original start-up sheet should be filed with the Technical Services Department.

The packaged unit is available in constant or variable air volume versions with a large variety of custom options and accessories available. Therefore, some variation in the startup procedure will exist depending upon the products capacity, control system, options and accessories installed.

This start-up sheet covers all startup check points common to all package equipment. In addition it covers essential startup check points for a number of common installation options. Depending upon the particular unit being started not all sections of this startup sheet will apply. Complete those sections applicable and use the notes section to record any additional information pertinent to your particular installation.

Warranty claims are to be made through the distributor from whom the equipment was purchased.

EQUIPMENT STARTUP

Use the local LCD or Mobile Access Portal (MAP) Gateway to complete the start-up.

A copy of the completed start-up sheet should be kept on file by the distributor providing the equipment and a copy sent to:

Johnson Controls/UPG
Technical Services Department
5005 York Drive
Norman, OK 73069

SAFETY WARNINGS

The inspections and recording of data outlined in this procedure are required for start-up of Johnson Controls/UPG's packaged products. Industry recognized safety standards and practices must be observed at all times. General industry knowledge and experience are required to assure technician safety. It is the responsibility of the technician to assess all potential dangers and take all steps warranted to perform the work in a safe manner. By addressing those potential dangers, prior to beginning any work, the technician can perform the work in a safe manner with minimal risk of injury.

⚠WARNING

Lethal voltages are present during some start-up checks. Extreme caution must be used at all times.

⚠WARNING

Moving parts may be exposed during some startup checks. Extreme caution must be used at all times.

NOTE: Read and review this entire document before beginning any of the startup procedures.

DESIGN APPLICATION INFORMATION

This information will be available from the specifying engineer who selected the equipment. If the system is a VAV system the CFM will be the airflow when the remote VAV boxes are in the full open position and the frequency drive is operating at 60 HZ. **Do not proceed with the equipment start-up without the design CFM information.**

Design Supply Air CFM: _____ Design Return Air CFM: _____

Design Outdoor Air CFM At Minimum Position: _____

Total External Static Pressure: _____

Supply Static Pressure: _____

Return Static Pressure: _____

Design Building Static Pressure: _____

Outside Air Dilution: Economizer Position Percentage: _____ CFM: _____

Supply Gas Pressure After Regulator W/o Heat Active _____ Inches _____

ADDITIONAL APPLICATION NOTES FROM SPECIFYING ENGINEER:

REFERENCE

General Inspection	Completed	See Notes
Unit inspected for shipping, storage, or rigging damage	☐	☐
Unit installed with proper clearances	☐	☐
Unit installed within slope limitations	☐	☐
Refrigeration system checked for gross leaks (presence of oil)	☐	☐
Terminal screws and wiring connections checked for tightness	☐	☐
Filters installed correctly and clean	☐	☐
Economizer hoods installed in operating position	☐	☐
Condensate drain trapped properly, refer to Installation Manual	☐	☐
Economizer damper linkage tight	☐	☐
Gas Heat vent hood installed	☐	☐
All field wiring (power and control) complete	☐	☐

Air Moving Inspection	Completed	See Notes
Alignment of drive components	☐	☐
Belt tension adjusted properly	☐	☐
Blower pulleys tight on shaft, bearing set screws tight, wheel tight to shaft	☐	☐
Pressure switch or transducer tubing installed properly	☐	☐

Exhaust Inspection Powered ☐ Barometric Relief ☐	Completed	See Notes
Check hub for tightness	☐	☐
Check fan blade for clearance	☐	☐
Check for proper rotation	☐	☐
Check for proper mounting (screen faces towards unit)	☐	☐
Prove operation by increasing minimum setting on economizer	☐	☐

Economizer Inspection Standard ☐ BAS ☐	Completed	See Notes
CO_2 sensor installed Yes ☐ No ☐	☐	☐
Check economizer setting (Reference SSE Control Board LCD menu location)	☐	☐
Prove economizer open/close through SSE Board Setting	☐	☐

Reheat Mode Normal ☐ or Alternate ☐ Not Applicable ☐
Humidity Sensor (2SH0401) _____

Operating Measurements - Air Flow

Fan operates with proper rotation	ID Fans ☐	Exh. Fans ☐	Cond. Fans ☐
Pressure drop across dry evaporator coil (At maximum design CFM) [1]			IWC
External Static Pressure			IWC
Return Static Pressure			IWC
Supply Static Pressure			IWC
Supply Air CFM Using Dry Coil Chart			CFM
Final Adjusted Supply Air CFM[2]			CFM

1. Consult the proper airflow to pressure drop table to obtain the actual airflow at the measured pressure differential.
2. Was a motor pulley adjustment or change required to obtain the correct airflow?
   Was it necessary to increase of decrease the airflow to meet the design conditions?
   If the motor pulley size was changed, measure the outside diameters of the motor and blower pulleys and record those diameters here:

Blower Motor HP _____ FLA_____ RPM_____

Pulley Pitch Diameter _____ Turns Out_____ Final Turns Out_____

Blower Pulley Pitch Diameter _____ Fixed Sheave_____

ELECTRICAL DATA

T1 - T2 _____ Volts T2 - T3 _____ Volts

Control Voltage _____ Volts T1 - T3 _____ Volts

Device	Nameplate	Measured List All Three Amperages
Supply Fan Motor[1, 2]	AMPS	AMPS
Exhaust Motor (Dampers 100%)	AMPS	AMPS
Condenser Fan #1	AMPS	AMPS
Condenser Fan #2 (if equipped)	AMPS	AMPS
Condenser Fan #3 (if equipped)	AMPS	AMPS
Condenser Fan #4 (if equipped)	AMPS	AMPS
Compressor #1	AMPS	AMPS
Compressor #2 (if equipped)	AMPS	AMPS
Compressor #3 (if equipped)	AMPS	AMPS
Compressor #4 (if equipped)	AMPS	AMPS

1. VAV units with heat section - simulate heat call to drive VAV boxes and VFD/IGV to maximum design airflow position.
2. VAV units without heat section - VAV boxes must be set to maximum design airflow position.

OPERATING MEASUREMENTS - COOLING

Stage	Discharge Pressure	Discharge Temp.	Liquid Line Temp.[1]	Subcooling[2]	Suction Pressure	Suction Temp.	Superheat
First	#	°	°	°	#	°	°
Second (if equipped)	#	°	°	°	#	°	°
Third (if equipped)	#	°	°	°	#	°	°
Fourth (if equipped)	#	°	°	°	#	°	°
Reheat 1st Stage	#	°	°	°	#	°	°

1. Liquid temperature should be taken before filter/drier.
2. Subtract 10 psi from discharge pressure for estimated liquid line pressure

Outside air temperature	_____	°F db	_____	°F wb	_____ %RH
Return Air Temperature	_____	°F db	_____	°F wb	_____ %RH
Mixed Air Temperature	_____	°F db	_____	°F wb	_____ %RH
Supply Air Temperature	_____	°F db	_____	°F wb	_____ %RH

REFRIGERANT SAFETIES

Action	Completed	See Notes
Prove Compressor Rotation (3 phase only) by gauge pressure	☐	☐
Prove High Pressure Safety, All Systems	☐	☐
Prove Low Pressure Safety, All Systems	☐	☐

OPERATING MEASUREMENTS - GAS HEATING

Fuel Type: ☐ Natural Gas ☐ LP Gas

Action		Completed	See Notes
Check for gas leaks		☐	☐
Prove Ventor Motor Operation		☐	☐
Prove Primary Safety Operation		☐	☐
Prove Auxiliary Safety Operation		☐	☐
Prove Rollout Switch Operation		☐	☐
Prove Smoke Detector Operation		☐	☐
Manifold Pressure	Stage 1	IWC	☐
	Stage 2 (If Equipped)	IWC	☐
	Stage 3 (If Equipped)	IWC	☐
Supply gas pressure at full fire		IWC	☐
Check temperature rise[1]	☐ measured at full fire	°F	☐

1. Input X Eff. (BTU output)
1.08 X Temp. Rise

OPERATIONAL MEASUREMENTS - STAGING CONTROLS

Verify Proper Operation of Heating/Cooling Staging Controls	
Create a cooling demand at the Thermostat, BAS System or Simplicity SE Verify that cooling/economizer stages are energized.	☐
Create a heating demand at the Thermostat, BAS System or Simplicity SE Verify that heating stages are energized.	☐
Verify Proper Operation of the Variable Frequency Drive (If Required)	
Verify that motor speed modulates with duct pressure change.	☐

FINAL - INSPECTION

Verify that all operational control set points have been set to desired value Scroll through all setpoints and change as may be necessary to suit the occupant requirements.	☐
Verify that all option parameters are correct Scroll through all option parameters and ensure that all installed options are enabled in the software and all others are disabled in the software. (Factory software settings should match the installed options)	☐
Verify that all access panels have been closed and secured	☐

OBSERVED PRODUCT DIFFICIENCIES & CONCERNS:

WVDNR ELKINS OPERATIONS CENTER
ELKINS, WV

February 10, 2023

TITUS VAV SCHEDULE

SPECIFICATION SECTION: 233600

Tag	Model	Size		CFM		Static Pressure			NC Levels		Electric Heat Coil						Electrical		NOTES
		Unit	Outlet	Max	Min	Inlet	Down	Min	Rad.	Disch.	CFM	KW	Volts/Ph.	Steps	EAT	LAT	MCA	MOP	
VAV-01	DESV	08	12x10	875	440	1.0	0.25	0.06	25	28	620	8.5	480/3	S	55.0	101.2	12.8	15	1 thru 11
VAV-02	DESV	08	12x10	660	330	1.0	0.25	0.03	23	28	475	6.5	277/1	S	55.0	101.1	29.3	30	1 thru 11
VAV-03	DESV	06	12x8	400	200	1.0	0.25	0.11	21	25	295	4.0	277/1	S	55.0	100.7	18.1	20	1 thru 11
VAV-04	DESV	07	12x10	540	270	1.0	0.25	0.09	22	25	405	5.5	277/1	S	55.0	100.8	24.8	25	1 thru 11
VAV-05	DESV	08	12x10	650	325	1.0	0.25	0.03	22	28	475	6.5	277/1	S	55.0	101.1	29.3	30	1 thru 11
VAV-06	DESV	08	12x10	750	380	1.0	0.25	0.05	24	27	475	6.5	277/1	S	55.0	101.1	29.3	30	1 thru 11
VAV-07	DESV	08	12x10	600	300	1.0	0.25	0.03	22	28	405	5.5	277/1	S	55.0	100.8	24.8	25	1 thru 11
VAV-08	DESV	07	12x10	530	265	1.0	0.25	0.08	22	25	365	5.0	277/1	S	55.0	101.2	22.6	25	1 thru 11
VAV-09	DESV	10	14x12.5	1,140	570	1.0	0.25	0.17	23	28	800	11.0	480/3	S	55.0	101.3	16.5	20	1 thru 11
VAV-10	DESV	07	12x10	530	265	1.0	0.25	0.08	22	25	365	5.0	277/1	S	55.0	101.2	22.6	25	1 thru 11
VAV-11	DESV	14	20x17.5	2,220	1,110	1.0	0.25	0.18	22	22	1,530	21.0	480/3	S	55.0	101.3	31.6	35	1 thru 11
VAV-12	DESV	09	14x12.5	960	480	1.0	0.25	0.11	22	27	695	9.5	480/3	S	55.0	101.1	14.3	15	1 thru 11
VAV-13	DESV	05	12x8	270	135	1.0	0.25	0.03	20	31	185	2.5	277/1	S	55.0	100.6	11.3	15	1 thru 11
VAV-14	DESV	08	12x10	770	385	1.0	0.25	0.05	24	27	550	7.5	480/3	S	55.0	101.0	11.3	15	1 thru 11
VAV-15	DESV	08	12x10	600	300	1.0	0.25	0.03	22	28	405	5.5	277/1	S	55.0	100.8	24.8	25	1 thru 11
VAV-16	DESV	09	14x12.5	870	435	1.0	0.25	0.09	20	25	620	8.5	480/3	S	55.0	101.2	12.8	15	1 thru 11
VAV-17	DESV	10	14x12.5	1,060	530	1.0	0.25	0.15	23	27	730	10.0	480/3	S	55.0	101.2	15.0	15	1 thru 11
VAV-18	DESV	07	12x10	600	300	1.0	0.25	0.11	23	27	440	6.0	277/1	S	55.0	101.0	27.1	30	1 thru 11
VAV-19	DESV	05	12x8	230	115	1.0	0.25	0.02	17	29	185	2.5	277/1	S	55.0	100.6	11.3	15	1 thru 11
VAV-20	DESV	06	12x8	340	170	1.0	0.25	0.08	19	23	220	3.0	277/1	S	55.0	101.0	13.5	15	1 thru 11
VAV-21	DESV	04	12x8	170	85	1.0	0.25	0.05	21	32	110	1.5	277/1	S	55.0	101.0	6.8	15	1 thru 11
VAV-22	DESV	07	12x10	540	270	1.0	0.25	0.09	22	25	365	5.0	277/1	S	55.0	101.2	22.6	25	1 thru 11
VAV-23	DESV	07	12x10	545	280	1.0	0.25	0.09	23	25	365	5.0	277/1	S	55.0	101.2	22.6	25	1 thru 11
VAV-24	DESV	04	12x8	100	50	1.0	0.25	0.02	10	25	75	1.0	277/1	S	55.0	99.9	4.5	15	1 thru 11
VAV-25	DESV	06	12x8	330	165	1.0	0.25	0.08	18	23	220	3.0	277/1	S	55.0	101.0	13.5	15	1 thru 11
VAV-26	DESV	05	12x8	220	110	1.0	0.25	0.02	16	28	150	2.0	277/1	S	55.0	99.9	9.0	15	1 thru 11
VAV-27	DESV	05	12x8	220	110	1.0	0.25	0.02	16	28	150	2.0	277/1	S	55.0	99.9	9.0	15	1 thru 11

NOTES:

1. **22 Ga Casing with 1" 1.5 lbs/cu ft. density Fiber-Free liner.**
2. **Control Enclosure for field-installed controls.**
3. **Plenum Air Inlets are round stub connections. Plenum Air Outlets are S-slip and drive connections.**
4. **Multipoint center averaging Velocity Sensor.**
5. **Each terminal labeled with plan number, nominal airflow, maximum and minimum airflow coil type and ARI certification.**
6. **Right Hand Orientation Standard as shown on Submittal - VERIFY.**
7. **Includes 24V Transformer.**
8. **Electric Heat must be locked out by Control System until minimum scheduled heating CFM is obtained.**
9. **Controls Contractor shall field install DDC controller and actuator on VAV box .**

SELECTION NOTES:

1. Room NC level shown includes attenuation transfer functions obtained from tables in ARI Standard 885.
2. Sound data shall be obtained from tests conducted in accordance
3. All CFM, pressure and heating performance values are corrected for altitude.
4. In the "**Steps**" column, code **S** denotes a Lynergy™ **SCR**-controlled modulating heater.

2/10/2023
11:23 AM

Project: **WVDNR Elkins Operation Center** Tag: **VAV-01**

Project Location: Elkins, WV
Altitude: 1925 Feet
User: MVP5

File: WVDNR Elkins Op Center.tw2
Room:

Selection

		Size		CFM			Static			Max NC Levels		Electrical	
Quantity	Model	Unit	Outlet	Max.	Min.	Heating	Inlet	Down	Min.	Rad	Dis	MCA	MOP
1	DESV	08	12x10	875	440	620	1	0.25	0.06	25	28	12.8	15

Notes: 1. See below for PWL calculations used to obtain Max NC rating.
2. Outlet size is approximate and does not include coil dimensions. See submittal drawings for exact dimensions.
3. Inlet static pressure includes downstream pressure drop.

Electric Heating Coil Performance

KW	Max KW	CFM	EAT	LAT	Volts / Phase	Steps
8.5	13	620	55	101.2	480/3	S

Other Information

Maximum CFM : 930
Design CFM : 875
Safety Factor: 6%

Unit L x W x H: 39.5 X 12 X 10 in.

Controls: DDC

Accessories

Outlet: Attenuator

Lining: 1" Fibre Free

Heating Coil: Electric

Attenuator: Yes

Acoustic Summary

	Radiated Sound PWL							Discharge Sound PWL						
Sound Description	2	3	4	5	6	7	NC	2	3	4	5	6	7	NC
Primary Sound	63	55	46	42	40	35	*	76	69	57	49	44	41	*
Total Attenuation per	18	19	20	26	31	36	*	29	30	41	51	52	39	*
Room Sound Level	45	36	26	16	-	-	25	47	39	16	-	-	-	28

Notes: 1. Selections are based on Titus as Manufacturer.
2. All performance based on tests conducted in accordance with ASHRAE 130-2008 and AHRI 880-2011.
3. All NC levels determined using AHRI 885-2008 Appendix E.
4. All airflow, pressure losses and heating performance values have been corrected for altitude.
5. Units of measure: dimensions (in), airflow (cfm), water flow (gpm), air pressure (in wg), water head losses (ft) and temperatures (degF).
6. In the "Steps" column, code "S" denotes a modulating SCR heater.
7. The minimum supply circuit ampacity (MCA) and maximum overcurrent protection (MOP) ratings were calculated in accordance with UL standards based on motor and electric coil full load current ratings.

Project: **WVDNR Elkins Operation Center** Tag: **VAV-02**

Project Location: Elkins, WV
Altitude: 1925 Feet
User: MVP5

File: WVDNR Elkins Op Center.tw2
Room:

Selection

		Size		CFM			Static			Max NC Levels		Electrical	
Quantity	Model	Unit	Outlet	Max.	Min.	Heating	Inlet	Down	Min.	Rad	Dis	MCA	MOP
1	DESV	08	12x10	660	330	475	1	0.25	0.03	23	28	29.3	30

Notes: 1. See below for PWL calculations used to obtain Max NC rating.
2. Outlet size is approximate and does not include coil dimensions. See submittal drawings for exact dimensions.
3. Inlet static pressure includes downstream pressure drop.

Electric Heating Coil Performance

KW	Max KW	CFM	EAT	LAT	Volts / Phase	Steps
6.5	13	475	55	101.1	277/1	S

Other Information

Maximum CFM : 930
Design CFM : 660
Safety Factor: 29%

Unit L x W x H: 39.5 X 12 X 10 in.

Controls: DDC

Accessories

Outlet: Attenuator

Lining: 1" Fibre Free

Heating Coil: Electric

Attenuator: Yes

Acoustic Summary

	Radiated Sound PWL							Discharge Sound PWL						
Sound Description	2	3	4	5	6	7	NC	2	3	4	5	6	7	NC
Primary Sound	61	51	44	39	37	32	*	74	66	55	47	42	39	*
Total Attenuation per	18	19	20	26	31	36	*	27	29	39	51	53	39	*
Room Sound Level	43	32	24	13	-	-	23	47	37	16	-	-	-	28

Notes: 1. Selections are based on Titus as Manufacturer.
2. All performance based on tests conducted in accordance with ASHRAE 130-2008 and AHRI 880-2011.
3. All NC levels determined using AHRI 885-2008 Appendix E.
4. All airflow, pressure losses and heating performance values have been corrected for altitude.
5. Units of measure: dimensions (in), airflow (cfm), water flow (gpm), air pressure (in wg), water head losses (ft) and temperatures (degF).
6. In the "Steps" column, code "S" denotes a modulating SCR heater.
7. The minimum supply circuit ampacity (MCA) and maximum overcurrent protection (MOP) ratings were calculated in accordance with UL standards based on motor and electric coil full load current ratings.

Project: **WVDNR Elkins Operation Center** Tag: **VAV-03**

Project Location: Elkins, WV
Altitude: 1925 Feet
User: MVP5

File: WVDNR Elkins Op Center.tw2
Room:

Selection

		Size		CFM			Static			Max NC Levels		Electrical	
Quantity	Model	Unit	Outlet	Max.	Min.	Heating	Inlet	Down	Min.	Rad	Dis	MCA	MOP
1	DESV	06	12x8	400	200	295	1	0.25	0.11	21	25	18.1	20

Notes: 1. See below for PWL calculations used to obtain Max NC rating.
2. Outlet size is approximate and does not include coil dimensions. See submittal drawings for exact dimensions.
3. Inlet static pressure includes downstream pressure drop.

Electric Heating Coil Performance

KW	Max KW	CFM	EAT	LAT	Volts / Phase	Steps
4	7.5	295	55	100.7	277/1	S

Other Information

Maximum CFM : 516
Design CFM : 400
Safety Factor: 22%

Unit L x W x H: 39.5 X 12 X 8 in.

Controls: DDC

Accessories

Outlet: Attenuator

Lining: 1" Fibre Free

Heating Coil: Electric

Attenuator: Yes

Acoustic Summary

	Radiated Sound PWL							Discharge Sound PWL						
Sound Description	2	3	4	5	6	7	NC	2	3	4	5	6	7	NC
Primary Sound	59	53	43	37	33	28	*	72	65	55	46	41	39	*
Total Attenuation per	18	19	20	26	31	36	*	27	29	39	51	53	39	*
Room Sound Level	41	34	23	11	-	-	21	45	36	16	-	-	-	25

Notes: 1. Selections are based on Titus as Manufacturer.
2. All performance based on tests conducted in accordance with ASHRAE 130-2008 and AHRI 880-2011.
3. All NC levels determined using AHRI 885-2008 Appendix E.
4. All airflow, pressure losses and heating performance values have been corrected for altitude.
5. Units of measure: dimensions (in), airflow (cfm), water flow (gpm), air pressure (in wg), water head losses (ft) and temperatures (degF).
6. In the "Steps" column, code "S" denotes a modulating SCR heater.
7. The minimum supply circuit ampacity (MCA) and maximum overcurrent protection (MOP) ratings were calculated in accordance with UL standards based on motor and electric coil full load current ratings.

Project: **WVDNR Elkins Operation Center** Tag: **VAV-04**

Project Location: Elkins, WV
Altitude: 1925 Feet
User: MVP5

File: WVDNR Elkins Op Center.tw2
Room:

Selection

		Size		CFM			Static			Max NC Levels		Electrical	
Quantity	Model	Unit	Outlet	Max.	Min.	Heating	Inlet	Down	Min.	Rad	Dis	MCA	MOP
1	DESV	07	12x10	540	270	405	1	0.25	0.09	22	25	24.8	25

Notes: 1. See below for PWL calculations used to obtain Max NC rating.
2. Outlet size is approximate and does not include coil dimensions. See submittal drawings for exact dimensions.
3. Inlet static pressure includes downstream pressure drop.

Electric Heating Coil Performance

KW	Max KW	CFM	EAT	LAT	Volts / Phase	Steps
5.5	9.5	405	55	100.8	277/1	S

Other Information

Maximum CFM : 671
Design CFM : 540
Safety Factor: 20%

Unit L x W x H: 39.5 X 12 X 10 in.

Controls: DDC

Accessories

Outlet: Attenuator

Lining: 1" Fibre Free

Heating Coil: Electric

Attenuator: Yes

Acoustic Summary

	Radiated Sound PWL							Discharge Sound PWL						
Sound Description	2	3	4	5	6	7	NC	2	3	4	5	6	7	NC
Primary Sound	60	51	43	39	33	24	*	72	65	55	47	42	39	*
Total Attenuation per	18	19	20	26	31	36	*	27	29	39	51	53	39	*
Room Sound Level	42	32	23	13	-	-	22	45	36	16	-	-	-	25

Notes: 1. Selections are based on Titus as Manufacturer.
2. All performance based on tests conducted in accordance with ASHRAE 130-2008 and AHRI 880-2011.
3. All NC levels determined using AHRI 885-2008 Appendix E.
4. All airflow, pressure losses and heating performance values have been corrected for altitude.
5. Units of measure: dimensions (in), airflow (cfm), water flow (gpm), air pressure (in wg), water head losses (ft) and temperatures (degF).
6. In the "Steps" column, code "S" denotes a modulating SCR heater.
7. The minimum supply circuit ampacity (MCA) and maximum overcurrent protection (MOP) ratings were calculated in accordance with UL standards based on motor and electric coil full load current ratings.

Project: **WVDNR Elkins Operation Center** Tag: **VAV-05**

Project Location: Elkins, WV
Altitude: 1925 Feet
User: MVP5

File: WVDNR Elkins Op Center.tw2
Room:

Selection

		Size		CFM			Static			Max NC Levels		Electrical	
Quantity	Model	Unit	Outlet	Max.	Min.	Heating	Inlet	Down	Min.	Rad	Dis	MCA	MOP
1	DESV	08	12x10	650	325	475	1	0.25	0.03	22	28	29.3	30

Notes: 1. See below for PWL calculations used to obtain Max NC rating.
2. Outlet size is approximate and does not include coil dimensions. See submittal drawings for exact dimensions.
3. Inlet static pressure includes downstream pressure drop.

Electric Heating Coil Performance

KW	Max KW	CFM	EAT	LAT	Volts / Phase	Steps
6.5	13	475	55	101.1	277/1	S

Other Information

Maximum CFM : 930
Design CFM : 650
Safety Factor: 30%

Unit L x W x H: 39.5 X 12 X 10 in.

Controls: DDC

Accessories

Outlet: Attenuator

Lining: 1" Fibre Free

Heating Coil: Electric

Attenuator: Yes

Acoustic Summary

	Radiated Sound PWL							Discharge Sound PWL						
Sound Description	2	3	4	5	6	7	NC	2	3	4	5	6	7	NC
Primary Sound	60	51	43	39	37	32	*	74	66	55	47	42	39	*
Total Attenuation per	18	19	20	26	31	36	*	27	29	39	51	53	39	*
Room Sound Level	42	32	23	13	-	-	22	47	37	16	-	-	-	28

Notes: 1. Selections are based on Titus as Manufacturer.
2. All performance based on tests conducted in accordance with ASHRAE 130-2008 and AHRI 880-2011.
3. All NC levels determined using AHRI 885-2008 Appendix E.
4. All airflow, pressure losses and heating performance values have been corrected for altitude.
5. Units of measure: dimensions (in), airflow (cfm), water flow (gpm), air pressure (in wg), water head losses (ft) and temperatures (degF).
6. In the "Steps" column, code "S" denotes a modulating SCR heater.
7. The minimum supply circuit ampacity (MCA) and maximum overcurrent protection (MOP) ratings were calculated in accordance with UL standards based on motor and electric coil full load current ratings.

Project: **WVDNR Elkins Operation Center** Tag: **VAV-06**

Project Location: Elkins, WV
Altitude: 1925 Feet
User: MVP5

File: WVDNR Elkins Op Center.tw2
Room:

Selection

		Size		CFM			Static			Max NC Levels		Electrical	
Quantity	Model	Unit	Outlet	Max.	Min.	Heating	Inlet	Down	Min.	Rad	Dis	MCA	MOP
1	DESV	08	12x10	750	380	475	1	0.25	0.05	24	27	29.3	30

Notes: 1. See below for PWL calculations used to obtain Max NC rating.
2. Outlet size is approximate and does not include coil dimensions. See submittal drawings for exact dimensions.
3. Inlet static pressure includes downstream pressure drop.

Electric Heating Coil Performance

KW	Max KW	CFM	EAT	LAT	Volts / Phase	Steps
6.5	13	475	55	101.1	277/1	S

Other Information

Maximum CFM : 930
Design CFM : 750
Safety Factor: 19%

Unit L x W x H: 39.5 X 12 X 10 in.

Controls: DDC

Accessories

Outlet: Attenuator

Lining: 1" Fibre Free

Heating Coil: Electric

Attenuator: Yes

Acoustic Summary

	Radiated Sound PWL							Discharge Sound PWL						
Sound Description	2	3	4	5	6	7	NC	2	3	4	5	6	7	NC
Primary Sound	62	53	45	40	38	33	*	75	67	56	48	43	40	*
Total Attenuation per	18	19	20	26	31	36	*	29	30	41	51	52	39	*
Room Sound Level	44	34	25	14	-	-	24	46	37	15	-	-	-	27

Notes: 1. Selections are based on Titus as Manufacturer.
2. All performance based on tests conducted in accordance with ASHRAE 130-2008 and AHRI 880-2011.
3. All NC levels determined using AHRI 885-2008 Appendix E.
4. All airflow, pressure losses and heating performance values have been corrected for altitude.
5. Units of measure: dimensions (in), airflow (cfm), water flow (gpm), air pressure (in wg), water head losses (ft) and temperatures (degF).
6. In the "Steps" column, code "S" denotes a modulating SCR heater.
7. The minimum supply circuit ampacity (MCA) and maximum overcurrent protection (MOP) ratings were calculated in accordance with UL standards based on motor and electric coil full load current ratings.

Project: **WVDNR Elkins Operation Center** Tag: **VAV-07**

Project Location: Elkins, WV
Altitude: 1925 Feet
User: MVP5

File: WVDNR Elkins Op Center.tw2
Room:

Selection

		Size		CFM			Static			Max NC Levels		Electrical	
Quantity	Model	Unit	Outlet	Max.	Min.	Heating	Inlet	Down	Min.	Rad	Dis	MCA	MOP
1	DESV	08	12x10	600	300	405	1	0.25	0.03	22	28	24.8	25

Notes: 1. See below for PWL calculations used to obtain Max NC rating.
2. Outlet size is approximate and does not include coil dimensions. See submittal drawings for exact dimensions.
3. Inlet static pressure includes downstream pressure drop.

Electric Heating Coil Performance

KW	Max KW	CFM	EAT	LAT	Volts / Phase	Steps
5.5	13	405	55	100.8	277/1	S

Other Information

Maximum CFM : 930
Design CFM : 600
Safety Factor: 35%

Unit L x W x H: 39.5 X 12 X 10 in.

Controls: DDC

Accessories

Outlet: Attenuator

Lining: 1" Fibre Free

Heating Coil: Electric

Attenuator: Yes

Acoustic Summary

	Radiated Sound PWL							Discharge Sound PWL						
Sound Description	2	3	4	5	6	7	NC	2	3	4	5	6	7	NC
Primary Sound	60	50	43	38	36	31	*	74	65	54	46	41	38	*
Total Attenuation per	18	19	20	26	31	36	*	27	29	39	51	53	39	*
Room Sound Level	42	31	23	12	-	-	22	47	36	15	-	-	-	28

Notes: 1. Selections are based on Titus as Manufacturer.
2. All performance based on tests conducted in accordance with ASHRAE 130-2008 and AHRI 880-2011.
3. All NC levels determined using AHRI 885-2008 Appendix E.
4. All airflow, pressure losses and heating performance values have been corrected for altitude.
5. Units of measure: dimensions (in), airflow (cfm), water flow (gpm), air pressure (in wg), water head losses (ft) and temperatures (degF).
6. In the "Steps" column, code "S" denotes a modulating SCR heater.
7. The minimum supply circuit ampacity (MCA) and maximum overcurrent protection (MOP) ratings were calculated in accordance with UL standards based on motor and electric coil full load current ratings.

Project: **WVDNR Elkins Operation Center** Tag: **VAV-08**

Project Location: Elkins, WV
Altitude: 1925 Feet
User: MVP5

File: WVDNR Elkins Op Center.tw2
Room:

Selection

		Size		CFM			Static			Max NC Levels		Electrical	
Quantity	Model	Unit	Outlet	Max.	Min.	Heating	Inlet	Down	Min.	Rad	Dis	MCA	MOP
1	DESV	07	12x10	530	265	365	1	0.25	0.08	22	25	22.6	25

Notes: 1. See below for PWL calculations used to obtain Max NC rating.
2. Outlet size is approximate and does not include coil dimensions. See submittal drawings for exact dimensions.
3. Inlet static pressure includes downstream pressure drop.

Electric Heating Coil Performance

KW	Max KW	CFM	EAT	LAT	Volts / Phase	Steps
5	9.5	365	55	101.2	277/1	S

Other Information

Maximum CFM : 671
Design CFM : 530
Safety Factor: 21%

Unit L x W x H: 39.5 X 12 X 10 in.

Controls: DDC

Accessories

Outlet: Attenuator

Lining: 1" Fibre Free

Heating Coil: Electric

Attenuator: Yes

Acoustic Summary

	Radiated Sound PWL							Discharge Sound PWL						
Sound Description	2	3	4	5	6	7	NC	2	3	4	5	6	7	NC
Primary Sound	60	51	43	38	33	24	*	72	64	55	47	42	39	*
Total Attenuation per	18	19	20	26	31	36	*	27	29	39	51	53	39	*
Room Sound Level	42	32	23	12	-	-	22	45	35	16	-	-	-	25

Notes: 1. Selections are based on Titus as Manufacturer.
2. All performance based on tests conducted in accordance with ASHRAE 130-2008 and AHRI 880-2011.
3. All NC levels determined using AHRI 885-2008 Appendix E.
4. All airflow, pressure losses and heating performance values have been corrected for altitude.
5. Units of measure: dimensions (in), airflow (cfm), water flow (gpm), air pressure (in wg), water head losses (ft) and temperatures (degF).
6. In the "Steps" column, code "S" denotes a modulating SCR heater.
7. The minimum supply circuit ampacity (MCA) and maximum overcurrent protection (MOP) ratings were calculated in accordance with UL standards based on motor and electric coil full load current ratings.

Project: **WVDNR Elkins Operation Center** Tag: **VAV-09**

Project Location: Elkins, WV
Altitude: 1925 Feet
User: MVP5

File: WVDNR Elkins Op Center.tw2
Room:

Selection

		Size		CFM			Static			Max NC Levels		Electrical	
Quantity	Model	Unit	Outlet	Max.	Min.	Heating	Inlet	Down	Min.	Rad	Dis	MCA	MOP
1	DESV	10	14x12.5	1140	570	800	1	0.25	0.17	23	28	16.5	20

Notes: 1. See below for PWL calculations used to obtain Max NC rating.
2. Outlet size is approximate and does not include coil dimensions. See submittal drawings for exact dimensions.
3. Inlet static pressure includes downstream pressure drop.

Electric Heating Coil Performance

KW	Max KW	CFM	EAT	LAT	Volts / Phase	Steps
11	21	800	55	101.3	480/3	S

Other Information

Maximum CFM : 1446
Design CFM : 1140
Safety Factor: 21%

Unit L x W x H: 39.5 X 14 X 13 in.

Controls: DDC

Accessories

Outlet: Attenuator

Lining: 1" Fibre Free

Heating Coil: Electric

Attenuator: Yes

Acoustic Summary

	Radiated Sound PWL							Discharge Sound PWL						
Sound Description	2	3	4	5	6	7	NC	2	3	4	5	6	7	NC
Primary Sound	61	51	46	44	41	29	*	76	63	56	50	44	41	*
Total Attenuation per	18	19	20	26	31	36	*	29	30	41	51	52	39	*
Room Sound Level	43	32	26	18	10	-	23	47	33	15	-	-	-	28

Notes: 1. Selections are based on Titus as Manufacturer.
2. All performance based on tests conducted in accordance with ASHRAE 130-2008 and AHRI 880-2011.
3. All NC levels determined using AHRI 885-2008 Appendix E.
4. All airflow, pressure losses and heating performance values have been corrected for altitude.
5. Units of measure: dimensions (in), airflow (cfm), water flow (gpm), air pressure (in wg), water head losses (ft) and temperatures (degF).
6. In the "Steps" column, code "S" denotes a modulating SCR heater.
7. The minimum supply circuit ampacity (MCA) and maximum overcurrent protection (MOP) ratings were calculated in accordance with UL standards based on motor and electric coil full load current ratings.

Project: **WVDNR Elkins Operation Center** Tag: **VAV-10**

Project Location: Elkins, WV
Altitude: 1925 Feet
User: MVP5

File: WVDNR Elkins Op Center.tw2
Room:

Selection

		Size		CFM			Static			Max NC Levels		Electrical	
Quantity	Model	Unit	Outlet	Max.	Min.	Heating	Inlet	Down	Min.	Rad	Dis	MCA	MOP
1	DESV	07	12x10	530	265	365	1	0.25	0.08	22	25	22.6	25

Notes: 1. See below for PWL calculations used to obtain Max NC rating.
2. Outlet size is approximate and does not include coil dimensions. See submittal drawings for exact dimensions.
3. Inlet static pressure includes downstream pressure drop.

Electric Heating Coil Performance

KW	Max KW	CFM	EAT	LAT	Volts / Phase	Steps
5	9.5	365	55	101.2	277/1	S

Other Information

Maximum CFM : 671
Design CFM : 530
Safety Factor: 21%

Unit L x W x H: 39.5 X 12 X 10 in.

Controls: DDC

Accessories

Outlet: Attenuator

Lining: 1" Fibre Free

Heating Coil: Electric

Attenuator: Yes

Acoustic Summary

	Radiated Sound PWL							Discharge Sound PWL						
Sound Description	2	3	4	5	6	7	NC	2	3	4	5	6	7	NC
Primary Sound	60	51	43	38	33	24	*	72	64	55	47	42	39	*
Total Attenuation per	18	19	20	26	31	36	*	27	29	39	51	53	39	*
Room Sound Level	42	32	23	12	-	-	22	45	35	16	-	-	-	25

Notes: 1. Selections are based on Titus as Manufacturer.
2. All performance based on tests conducted in accordance with ASHRAE 130-2008 and AHRI 880-2011.
3. All NC levels determined using AHRI 885-2008 Appendix E.
4. All airflow, pressure losses and heating performance values have been corrected for altitude.
5. Units of measure: dimensions (in), airflow (cfm), water flow (gpm), air pressure (in wg), water head losses (ft) and temperatures (degF).
6. In the "Steps" column, code "S" denotes a modulating SCR heater.
7. The minimum supply circuit ampacity (MCA) and maximum overcurrent protection (MOP) ratings were calculated in accordance with UL standards based on motor and electric coil full load current ratings.

Project: **WVDNR Elkins Operation Center** Tag: **VAV-11**

Project Location: Elkins, WV
Altitude: 1925 Feet
User: MVP5

File: WVDNR Elkins Op Center.tw2
Room:

Selection

		Size		CFM			Static			Max NC Levels		Electrical	
Quantity	Model	Unit	Outlet	Max.	Min.	Heating	Inlet	Down	Min.	Rad	Dis	MCA	MOP
1	DESV	14	20x17.5	2220	1110	1530	1	0.25	0.18	22	22	31.6	35

Notes: 1. See below for PWL calculations used to obtain Max NC rating.
2. Outlet size is approximate and does not include coil dimensions. See submittal drawings for exact dimensions.
3. Inlet static pressure includes downstream pressure drop.

Electric Heating Coil Performance

KW	Max KW	CFM	EAT	LAT	Volts / Phase	Steps
21	25	1530	55	101.3	480/3	S

Other Information

Maximum CFM : 3098
Design CFM : 2220
Safety Factor: 28%

Unit L x W x H: 39.5 X 20 X 18 in.

Controls: DDC

Accessories

Outlet: Attenuator

Lining: 1" Fibre Free

Heating Coil: Electric

Attenuator: Yes

Acoustic Summary

	Radiated Sound PWL							Discharge Sound PWL						
Sound Description	2	3	4	5	6	7	NC	2	3	4	5	6	7	NC
Primary Sound	60	53	45	43	39	34	*	71	62	58	49	48	43	*
Total Attenuation per	18	19	20	26	31	36	*	29	30	41	51	52	39	*
Room Sound Level	42	34	25	17	-	-	22	42	32	17	-	-	-	22

Notes: 1. Selections are based on Titus as Manufacturer.
2. All performance based on tests conducted in accordance with ASHRAE 130-2008 and AHRI 880-2011.
3. All NC levels determined using AHRI 885-2008 Appendix E.
4. All airflow, pressure losses and heating performance values have been corrected for altitude.
5. Units of measure: dimensions (in), airflow (cfm), water flow (gpm), air pressure (in wg), water head losses (ft) and temperatures (degF).
6. In the "Steps" column, code "S" denotes a modulating SCR heater.
7. The minimum supply circuit ampacity (MCA) and maximum overcurrent protection (MOP) ratings were calculated in accordance with UL standards based on motor and electric coil full load current ratings.

Project: **WVDNR Elkins Operation Center** Tag: **VAV-12**

Project Location: Elkins, WV
Altitude: 1925 Feet
User: MVP5

File: WVDNR Elkins Op Center.tw2
Room:

Selection

		Size		CFM			Static			Max NC Levels		Electrical	
Quantity	Model	Unit	Outlet	Max.	Min.	Heating	Inlet	Down	Min.	Rad	Dis	MCA	MOP
1	DESV	09	14x12.5	960	480	695	1	0.25	0.11	22	27	14.3	15

Notes: 1. See below for PWL calculations used to obtain Max NC rating.
2. Outlet size is approximate and does not include coil dimensions. See submittal drawings for exact dimensions.
3. Inlet static pressure includes downstream pressure drop.

Electric Heating Coil Performance

KW	Max KW	CFM	EAT	LAT	Volts / Phase	Steps
9.5	16	695	55	101.1	480/3	S

Other Information

Maximum CFM : 1084
Design CFM : 960
Safety Factor: 11%

Unit L x W x H: 39.5 X 14 X 13 in.

Controls: DDC

Accessories

Outlet: Attenuator

Lining: 1" Fibre Free

Heating Coil: Electric

Attenuator: Yes

Acoustic Summary

	Radiated Sound PWL							Discharge Sound PWL						
Sound Description	2	3	4	5	6	7	NC	2	3	4	5	6	7	NC
Primary Sound	60	50	43	37	34	29	*	75	64	56	48	44	41	*
Total Attenuation per	18	19	20	26	31	36	*	29	30	41	51	52	39	*
Room Sound Level	42	31	23	11	-	-	22	46	34	15	-	-	-	27

Notes: 1. Selections are based on Titus as Manufacturer.
2. All performance based on tests conducted in accordance with ASHRAE 130-2008 and AHRI 880-2011.
3. All NC levels determined using AHRI 885-2008 Appendix E.
4. All airflow, pressure losses and heating performance values have been corrected for altitude.
5. Units of measure: dimensions (in), airflow (cfm), water flow (gpm), air pressure (in wg), water head losses (ft) and temperatures (degF).
6. In the "Steps" column, code "S" denotes a modulating SCR heater.
7. The minimum supply circuit ampacity (MCA) and maximum overcurrent protection (MOP) ratings were calculated in accordance with UL standards based on motor and electric coil full load current ratings.

Project: **WVDNR Elkins Operation Center** Tag: **VAV-13**

Project Location: Elkins, WV
Altitude: 1925 Feet
User: MVP5

File: WVDNR Elkins Op Center.tw2
Room:

Selection

		Size		CFM			Static			Max NC Levels		Electrical	
Quantity	Model	Unit	Outlet	Max.	Min.	Heating	Inlet	Down	Min.	Rad	Dis	MCA	MOP
1	DESV	05	12x8	270	135	185	1	0.25	0.03	20	31	11.3	15

Notes: 1. See below for PWL calculations used to obtain Max NC rating.
2. Outlet size is approximate and does not include coil dimensions. See submittal drawings for exact dimensions.
3. Inlet static pressure includes downstream pressure drop.

Electric Heating Coil Performance

KW	Max KW	CFM	EAT	LAT	Volts / Phase	Steps
2.5	5	185	55	100.6	277/1	S

Other Information

Maximum CFM : 361
Design CFM : 270
Safety Factor: 25%

Unit L x W x H: 39.5 X 12 X 8 in.

Controls: DDC

Accessories

Outlet: Attenuator

Lining: 1" Fibre Free

Heating Coil: Electric

Attenuator: Yes

Acoustic Summary

	Radiated Sound PWL							Discharge Sound PWL						
Sound Description	2	3	4	5	6	7	NC	2	3	4	5	6	7	NC
Primary Sound	58	52	41	36	33	28	*	73	62	52	42	40	36	*
Total Attenuation per	18	19	20	26	31	36	*	24	28	38	53	59	40	*
Room Sound Level	40	33	21	10	-	-	20	49	34	14	-	-	-	31

Notes: 1. Selections are based on Titus as Manufacturer.
2. All performance based on tests conducted in accordance with ASHRAE 130-2008 and AHRI 880-2011.
3. All NC levels determined using AHRI 885-2008 Appendix E.
4. All airflow, pressure losses and heating performance values have been corrected for altitude.
5. Units of measure: dimensions (in), airflow (cfm), water flow (gpm), air pressure (in wg), water head losses (ft) and temperatures (degF).
6. In the "Steps" column, code "S" denotes a modulating SCR heater.
7. The minimum supply circuit ampacity (MCA) and maximum overcurrent protection (MOP) ratings were calculated in accordance with UL standards based on motor and electric coil full load current ratings.

Project: **WVDNR Elkins Operation Center** Tag: **VAV-14**

Project Location: Elkins, WV
Altitude: 1925 Feet
User: MVP5

File: WVDNR Elkins Op Center.tw2
Room:

Selection

		Size		CFM			Static			Max NC Levels		Electrical	
Quantity	Model	Unit	Outlet	Max.	Min.	Heating	Inlet	Down	Min.	Rad	Dis	MCA	MOP
1	DESV	08	12x10	770	385	550	1	0.25	0.05	24	27	11.3	15

Notes: 1. See below for PWL calculations used to obtain Max NC rating.
2. Outlet size is approximate and does not include coil dimensions. See submittal drawings for exact dimensions.
3. Inlet static pressure includes downstream pressure drop.

Electric Heating Coil Performance

KW	Max KW	CFM	EAT	LAT	Volts / Phase	Steps
7.5	13	550	55	101	480/3	S

Other Information

Maximum CFM : 930
Design CFM : 770
Safety Factor: 17%

Unit L x W x H: 39.5 X 12 X 10 in.

Controls: DDC

Accessories

Outlet: Attenuator

Lining: 1" Fibre Free

Heating Coil: Electric

Attenuator: Yes

Acoustic Summary

	Radiated Sound PWL							Discharge Sound PWL						
Sound Description	2	3	4	5	6	7	NC	2	3	4	5	6	7	NC
Primary Sound	62	53	45	41	38	34	*	75	68	56	48	43	40	*
Total Attenuation per	18	19	20	26	31	36	*	29	30	41	51	52	39	*
Room Sound Level	44	34	25	15	-	-	24	46	38	15	-	-	-	27

Notes: 1. Selections are based on Titus as Manufacturer.
2. All performance based on tests conducted in accordance with ASHRAE 130-2008 and AHRI 880-2011.
3. All NC levels determined using AHRI 885-2008 Appendix E.
4. All airflow, pressure losses and heating performance values have been corrected for altitude.
5. Units of measure: dimensions (in), airflow (cfm), water flow (gpm), air pressure (in wg), water head losses (ft) and temperatures (degF).
6. In the "Steps" column, code "S" denotes a modulating SCR heater.
7. The minimum supply circuit ampacity (MCA) and maximum overcurrent protection (MOP) ratings were calculated in accordance with UL standards based on motor and electric coil full load current ratings.

Project: **WVDNR Elkins Operation Center** Tag: **VAV-15**

Project Location: Elkins, WV
Altitude: 1925 Feet
User: MVP5

File: WVDNR Elkins Op Center.tw2
Room:

Selection

		Size		CFM			Static			Max NC Levels		Electrical	
Quantity	Model	Unit	Outlet	Max.	Min.	Heating	Inlet	Down	Min.	Rad	Dis	MCA	MOP
1	DESV	08	12x10	600	300	405	1	0.25	0.03	22	28	24.8	25

Notes: 1. See below for PWL calculations used to obtain Max NC rating.
2. Outlet size is approximate and does not include coil dimensions. See submittal drawings for exact dimensions.
3. Inlet static pressure includes downstream pressure drop.

Electric Heating Coil Performance

KW	Max KW	CFM	EAT	LAT	Volts / Phase	Steps
5.5	13	405	55	100.8	277/1	S

Other Information

Maximum CFM : 930
Design CFM : 600
Safety Factor: 35%

Unit L x W x H: 39.5 X 12 X 10 in.

Controls: DDC

Accessories

Outlet: Attenuator

Lining: 1" Fibre Free

Heating Coil: Electric

Attenuator: Yes

Acoustic Summary

	Radiated Sound PWL							Discharge Sound PWL						
Sound Description	2	3	4	5	6	7	NC	2	3	4	5	6	7	NC
Primary Sound	60	50	43	38	36	31	*	74	65	54	46	41	38	*
Total Attenuation per	18	19	20	26	31	36	*	27	29	39	51	53	39	*
Room Sound Level	42	31	23	12	-	-	22	47	36	15	-	-	-	28

Notes: 1. Selections are based on Titus as Manufacturer.
2. All performance based on tests conducted in accordance with ASHRAE 130-2008 and AHRI 880-2011.
3. All NC levels determined using AHRI 885-2008 Appendix E.
4. All airflow, pressure losses and heating performance values have been corrected for altitude.
5. Units of measure: dimensions (in), airflow (cfm), water flow (gpm), air pressure (in wg), water head losses (ft) and temperatures (degF).
6. In the "Steps" column, code "S" denotes a modulating SCR heater.
7. The minimum supply circuit ampacity (MCA) and maximum overcurrent protection (MOP) ratings were calculated in accordance with UL standards based on motor and electric coil full load current ratings.

Project: **WVDNR Elkins Operation Center** Tag: **VAV-16**

Project Location: Elkins, WV
Altitude: 1925 Feet
User: MVP5

File: WVDNR Elkins Op Center.tw2
Room:

Selection

		Size		CFM			Static			Max NC Levels		Electrical	
Quantity	Model	Unit	Outlet	Max.	Min.	Heating	Inlet	Down	Min.	Rad	Dis	MCA	MOP
1	DESV	09	14x12.5	870	435	620	1	0.25	0.09	20	25	12.8	15

Notes: 1. See below for PWL calculations used to obtain Max NC rating.
2. Outlet size is approximate and does not include coil dimensions. See submittal drawings for exact dimensions.
3. Inlet static pressure includes downstream pressure drop.

Electric Heating Coil Performance

KW	Max KW	CFM	EAT	LAT	Volts / Phase	Steps
8.5	16	620	55	101.2	480/3	S

Other Information

Maximum CFM : 1084
Design CFM : 870
Safety Factor: 20%

Unit L x W x H: 39.5 X 14 X 13 in.

Controls: DDC

Accessories

Outlet: Attenuator

Lining: 1" Fibre Free

Heating Coil: Electric

Attenuator: Yes

Acoustic Summary

	Radiated Sound PWL							Discharge Sound PWL						
Sound Description	2	3	4	5	6	7	NC	2	3	4	5	6	7	NC
Primary Sound	59	49	43	36	33	28	*	74	63	55	48	43	41	*
Total Attenuation per	18	19	20	26	31	36	*	29	30	41	51	52	39	*
Room Sound Level	41	30	23	10	-	-	20	45	33	14	-	-	-	25

Notes: 1. Selections are based on Titus as Manufacturer.
2. All performance based on tests conducted in accordance with ASHRAE 130-2008 and AHRI 880-2011.
3. All NC levels determined using AHRI 885-2008 Appendix E.
4. All airflow, pressure losses and heating performance values have been corrected for altitude.
5. Units of measure: dimensions (in), airflow (cfm), water flow (gpm), air pressure (in wg), water head losses (ft) and temperatures (degF).
6. In the "Steps" column, code "S" denotes a modulating SCR heater.
7. The minimum supply circuit ampacity (MCA) and maximum overcurrent protection (MOP) ratings were calculated in accordance with UL standards based on motor and electric coil full load current ratings.

Project: **WVDNR Elkins Operation Center** Tag: **VAV-17**

Project Location: Elkins, WV
Altitude: 1925 Feet
User: MVP5

File: WVDNR Elkins Op Center.tw2
Room:

Selection

		Size		CFM			Static			Max NC Levels		Electrical	
Quantity	Model	Unit	Outlet	Max.	Min.	Heating	Inlet	Down	Min.	Rad	Dis	MCA	MOP
1	DESV	10	14x12.5	1060	530	730	1	0.25	0.15	23	27	15.0	15

Notes: 1. See below for PWL calculations used to obtain Max NC rating.
2. Outlet size is approximate and does not include coil dimensions. See submittal drawings for exact dimensions.
3. Inlet static pressure includes downstream pressure drop.

Electric Heating Coil Performance

KW	Max KW	CFM	EAT	LAT	Volts / Phase	Steps
10	21	730	55	101.2	480/3	S

Other Information

Maximum CFM : 1446
Design CFM : 1060
Safety Factor: 27%

Unit L x W x H: 39.5 X 14 X 13 in.

Controls: DDC

Accessories

Outlet: Attenuator

Lining: 1" Fibre Free

Heating Coil: Electric

Attenuator: Yes

Acoustic Summary

	Radiated Sound PWL							Discharge Sound PWL						
Sound Description	2	3	4	5	6	7	NC	2	3	4	5	6	7	NC
Primary Sound	61	51	46	44	40	28	*	75	63	56	50	44	41	*
Total Attenuation per	18	19	20	26	31	36	*	29	30	41	51	52	39	*
Room Sound Level	43	32	26	18	-	-	23	46	33	15	-	-	-	27

Notes: 1. Selections are based on Titus as Manufacturer.
2. All performance based on tests conducted in accordance with ASHRAE 130-2008 and AHRI 880-2011.
3. All NC levels determined using AHRI 885-2008 Appendix E.
4. All airflow, pressure losses and heating performance values have been corrected for altitude.
5. Units of measure: dimensions (in), airflow (cfm), water flow (gpm), air pressure (in wg), water head losses (ft) and temperatures (degF).
6. In the "Steps" column, code "S" denotes a modulating SCR heater.
7. The minimum supply circuit ampacity (MCA) and maximum overcurrent protection (MOP) ratings were calculated in accordance with UL standards based on motor and electric coil full load current ratings.

Project: **WVDNR Elkins Operation Center** Tag: **VAV-18**

Project Location: Elkins, WV
Altitude: 1925 Feet
User: MVP5

File: WVDNR Elkins Op Center.tw2
Room:

Selection

		Size		CFM			Static			Max NC Levels		Electrical	
Quantity	Model	Unit	Outlet	Max.	Min.	Heating	Inlet	Down	Min.	Rad	Dis	MCA	MOP
1	DESV	07	12x10	600	300	440	1	0.25	0.11	23	27	27.1	30

Notes: 1. See below for PWL calculations used to obtain Max NC rating.
2. Outlet size is approximate and does not include coil dimensions. See submittal drawings for exact dimensions.
3. Inlet static pressure includes downstream pressure drop.

Electric Heating Coil Performance

KW	Max KW	CFM	EAT	LAT	Volts / Phase	Steps
6	9.5	440	55	101	277/1	S

Other Information

Maximum CFM : 671
Design CFM : 600
Safety Factor: 11%

Unit L x W x H: 39.5 X 12 X 10 in.

Controls: DDC

Accessories

Outlet: Attenuator

Lining: 1" Fibre Free

Heating Coil: Electric

Attenuator: Yes

Acoustic Summary

	Radiated Sound PWL							Discharge Sound PWL						
Sound Description	2	3	4	5	6	7	NC	2	3	4	5	6	7	NC
Primary Sound	61	53	45	40	34	24	*	73	66	56	49	43	40	*
Total Attenuation per	18	19	20	26	31	36	*	27	29	39	51	53	39	*
Room Sound Level	43	34	25	14	-	-	23	46	37	17	-	-	-	27

Notes: 1. Selections are based on Titus as Manufacturer.
2. All performance based on tests conducted in accordance with ASHRAE 130-2008 and AHRI 880-2011.
3. All NC levels determined using AHRI 885-2008 Appendix E.
4. All airflow, pressure losses and heating performance values have been corrected for altitude.
5. Units of measure: dimensions (in), airflow (cfm), water flow (gpm), air pressure (in wg), water head losses (ft) and temperatures (degF).
6. In the "Steps" column, code "S" denotes a modulating SCR heater.
7. The minimum supply circuit ampacity (MCA) and maximum overcurrent protection (MOP) ratings were calculated in accordance with UL standards based on motor and electric coil full load current ratings.

Project: **WVDNR Elkins Operation Center** Tag: **VAV-19**

Project Location: Elkins, WV
Altitude: 1925 Feet
User: MVP5

File: WVDNR Elkins Op Center.tw2
Room:

Selection

		Size		CFM			Static			Max NC Levels		Electrical	
Quantity	Model	Unit	Outlet	Max.	Min.	Heating	Inlet	Down	Min.	Rad	Dis	MCA	MOP
1	DESV	05	12x8	230	115	185	1	0.25	0.02	17	29	11.3	15

Notes: 1. See below for PWL calculations used to obtain Max NC rating.
2. Outlet size is approximate and does not include coil dimensions. See submittal drawings for exact dimensions.
3. Inlet static pressure includes downstream pressure drop.

Electric Heating Coil Performance

KW	Max KW	CFM	EAT	LAT	Volts / Phase	Steps
2.5	5	185	55	100.6	277/1	S

Other Information

Maximum CFM : 361
Design CFM : 230
Safety Factor: 36%

Unit L x W x H: 39.5 X 12 X 8 in.

Controls: DDC

Accessories

Outlet: Attenuator

Lining: 1" Fibre Free

Heating Coil: Electric

Attenuator: Yes

Acoustic Summary

	Radiated Sound PWL							Discharge Sound PWL						
Sound Description	2	3	4	5	6	7	NC	2	3	4	5	6	7	NC
Primary Sound	56	50	39	34	32	26	*	72	60	50	41	38	35	*
Total Attenuation per	18	19	20	26	31	36	*	24	28	38	53	59	40	*
Room Sound Level	38	31	19	-	-	-	17	48	32	12	-	-	-	29

Notes: 1. Selections are based on Titus as Manufacturer.
2. All performance based on tests conducted in accordance with ASHRAE 130-2008 and AHRI 880-2011.
3. All NC levels determined using AHRI 885-2008 Appendix E.
4. All airflow, pressure losses and heating performance values have been corrected for altitude.
5. Units of measure: dimensions (in), airflow (cfm), water flow (gpm), air pressure (in wg), water head losses (ft) and temperatures (degF).
6. In the "Steps" column, code "S" denotes a modulating SCR heater.
7. The minimum supply circuit ampacity (MCA) and maximum overcurrent protection (MOP) ratings were calculated in accordance with UL standards based on motor and electric coil full load current ratings.

Project: **WVDNR Elkins Operation Center** Tag: **VAV-20**

Project Location: Elkins, WV
Altitude: 1925 Feet
User: MVP5

File: WVDNR Elkins Op Center.tw2
Room:

Selection

		Size		CFM			Static			Max NC Levels		Electrical	
Quantity	Model	Unit	Outlet	Max.	Min.	Heating	Inlet	Down	Min.	Rad	Dis	MCA	MOP
1	DESV	06	12x8	340	170	220	1	0.25	0.08	19	23	13.5	15

Notes: 1. See below for PWL calculations used to obtain Max NC rating.
2. Outlet size is approximate and does not include coil dimensions. See submittal drawings for exact dimensions.
3. Inlet static pressure includes downstream pressure drop.

Electric Heating Coil Performance

KW	Max KW	CFM	EAT	LAT	Volts / Phase	Steps
3	7.5	220	55	101	277/1	S

Other Information

Maximum CFM : 516
Design CFM : 340
Safety Factor: 34%

Unit L x W x H: 39.5 X 12 X 8 in.

Controls: DDC

Accessories

Outlet: Attenuator

Lining: 1" Fibre Free

Heating Coil: Electric

Attenuator: Yes

Acoustic Summary

	Radiated Sound PWL							Discharge Sound PWL						
Sound Description	2	3	4	5	6	7	NC	2	3	4	5	6	7	NC
Primary Sound	58	51	41	35	31	27	*	70	63	53	44	40	37	*
Total Attenuation per	18	19	20	26	31	36	*	27	29	39	51	53	39	*
Room Sound Level	40	32	21	-	-	-	19	43	34	14	-	-	-	23

Notes: 1. Selections are based on Titus as Manufacturer.
2. All performance based on tests conducted in accordance with ASHRAE 130-2008 and AHRI 880-2011.
3. All NC levels determined using AHRI 885-2008 Appendix E.
4. All airflow, pressure losses and heating performance values have been corrected for altitude.
5. Units of measure: dimensions (in), airflow (cfm), water flow (gpm), air pressure (in wg), water head losses (ft) and temperatures (degF).
6. In the "Steps" column, code "S" denotes a modulating SCR heater.
7. The minimum supply circuit ampacity (MCA) and maximum overcurrent protection (MOP) ratings were calculated in accordance with UL standards based on motor and electric coil full load current ratings.

Project: **WVDNR Elkins Operation Center** Tag: **VAV-21**

Project Location: Elkins, WV
Altitude: 1925 Feet
User: MVP5

File: WVDNR Elkins Op Center.tw2
Room:

Selection

		Size		CFM			Static			Max NC Levels		Electrical	
Quantity	Model	Unit	Outlet	Max.	Min.	Heating	Inlet	Down	Min.	Rad	Dis	MCA	MOP
1	DESV	04	12x8	170	85	110	1	0.25	0.05	21	32	6.8	15

Notes: 1. See below for PWL calculations used to obtain Max NC rating.
2. Outlet size is approximate and does not include coil dimensions. See submittal drawings for exact dimensions.
3. Inlet static pressure includes downstream pressure drop.

Electric Heating Coil Performance

KW	Max KW	CFM	EAT	LAT	Volts / Phase	Steps
1.5	3	110	55	101	277/1	S

Other Information

Maximum CFM : 232
Design CFM : 170
Safety Factor: 27%

Unit L x W x H: 39.5 X 12 X 8 in.

Controls: DDC

Accessories

Outlet: Attenuator

Lining: 1" Fibre Free

Heating Coil: Electric

Attenuator: Yes

Acoustic Summary

	Radiated Sound PWL							Discharge Sound PWL						
Sound Description	2	3	4	5	6	7	NC	2	3	4	5	6	7	NC
Primary Sound	58	53	40	36	32	27	*	74	65	52	41	39	35	*
Total Attenuation per	18	19	20	26	31	36	*	24	28	38	53	59	40	*
Room Sound Level	40	34	20	10	-	-	21	50	37	14	-	-	-	32

Notes: 1. Selections are based on Titus as Manufacturer.
2. All performance based on tests conducted in accordance with ASHRAE 130-2008 and AHRI 880-2011.
3. All NC levels determined using AHRI 885-2008 Appendix E.
4. All airflow, pressure losses and heating performance values have been corrected for altitude.
5. Units of measure: dimensions (in), airflow (cfm), water flow (gpm), air pressure (in wg), water head losses (ft) and temperatures (degF).
6. In the "Steps" column, code "S" denotes a modulating SCR heater.
7. The minimum supply circuit ampacity (MCA) and maximum overcurrent protection (MOP) ratings were calculated in accordance with UL standards based on motor and electric coil full load current ratings.

Project: **WVDNR Elkins Operation Center** Tag: **VAV-22**

Project Location: Elkins, WV
Altitude: 1925 Feet
User: MVP5

File: WVDNR Elkins Op Center.tw2
Room:

Selection

		Size		CFM			Static			Max NC Levels		Electrical	
Quantity	Model	Unit	Outlet	Max.	Min.	Heating	Inlet	Down	Min.	Rad	Dis	MCA	MOP
1	DESV	07	12x10	540	270	365	1	0.25	0.09	22	25	22.6	25

Notes: 1. See below for PWL calculations used to obtain Max NC rating.
2. Outlet size is approximate and does not include coil dimensions. See submittal drawings for exact dimensions.
3. Inlet static pressure includes downstream pressure drop.

Electric Heating Coil Performance

KW	Max KW	CFM	EAT	LAT	Volts / Phase	Steps
5	9.5	365	55	101.2	277/1	S

Other Information

Maximum CFM : 671
Design CFM : 540
Safety Factor: 20%

Unit L x W x H: 39.5 X 12 X 10 in.

Controls: DDC

Accessories

Outlet: Attenuator

Lining: 1" Fibre Free

Heating Coil: Electric

Attenuator: Yes

Acoustic Summary

	Radiated Sound PWL							Discharge Sound PWL						
Sound Description	2	3	4	5	6	7	NC	2	3	4	5	6	7	NC
Primary Sound	60	51	43	39	33	24	*	72	65	55	47	42	39	*
Total Attenuation per	18	19	20	26	31	36	*	27	29	39	51	53	39	*
Room Sound Level	42	32	23	13	-	-	22	45	36	16	-	-	-	25

Notes: 1. Selections are based on Titus as Manufacturer.
2. All performance based on tests conducted in accordance with ASHRAE 130-2008 and AHRI 880-2011.
3. All NC levels determined using AHRI 885-2008 Appendix E.
4. All airflow, pressure losses and heating performance values have been corrected for altitude.
5. Units of measure: dimensions (in), airflow (cfm), water flow (gpm), air pressure (in wg), water head losses (ft) and temperatures (degF).
6. In the "Steps" column, code "S" denotes a modulating SCR heater.
7. The minimum supply circuit ampacity (MCA) and maximum overcurrent protection (MOP) ratings were calculated in accordance with UL standards based on motor and electric coil full load current ratings.

Project: **WVDNR Elkins Operation Center** Tag: **VAV-23**

Project Location: Elkins, WV
Altitude: 1925 Feet
User: MVP5

File: WVDNR Elkins Op Center.tw2
Room:

Selection

		Size		CFM			Static			Max NC Levels		Electrical	
Quantity	Model	Unit	Outlet	Max.	Min.	Heating	Inlet	Down	Min.	Rad	Dis	MCA	MOP
1	DESV	07	12x10	545	280	365	1	0.25	0.09	23	25	22.6	25

Notes: 1. See below for PWL calculations used to obtain Max NC rating.
2. Outlet size is approximate and does not include coil dimensions. See submittal drawings for exact dimensions.
3. Inlet static pressure includes downstream pressure drop.

Electric Heating Coil Performance

KW	Max KW	CFM	EAT	LAT	Volts / Phase	Steps
5	9.5	365	55	101.2	277/1	S

Other Information

Maximum CFM : 671
Design CFM : 545
Safety Factor: 19%

Unit L x W x H: 39.5 X 12 X 10 in.

Controls: DDC

Accessories

Outlet: Attenuator

Lining: 1" Fibre Free

Heating Coil: Electric

Attenuator: Yes

Acoustic Summary

	Radiated Sound PWL							Discharge Sound PWL						
Sound Description	2	3	4	5	6	7	NC	2	3	4	5	6	7	NC
Primary Sound	61	51	44	39	33	24	*	72	65	55	48	42	39	*
Total Attenuation per	18	19	20	26	31	36	*	27	29	39	51	53	39	*
Room Sound Level	43	32	24	13	-	-	23	45	36	16	-	-	-	25

Notes: 1. Selections are based on Titus as Manufacturer.
2. All performance based on tests conducted in accordance with ASHRAE 130-2008 and AHRI 880-2011.
3. All NC levels determined using AHRI 885-2008 Appendix E.
4. All airflow, pressure losses and heating performance values have been corrected for altitude.
5. Units of measure: dimensions (in), airflow (cfm), water flow (gpm), air pressure (in wg), water head losses (ft) and temperatures (degF).
6. In the "Steps" column, code "S" denotes a modulating SCR heater.
7. The minimum supply circuit ampacity (MCA) and maximum overcurrent protection (MOP) ratings were calculated in accordance with UL standards based on motor and electric coil full load current ratings.

Project: **WVDNR Elkins Operation Center** Tag: **VAV-24**

Project Location: Elkins, WV
Altitude: 1925 Feet
User: MVP5

File: WVDNR Elkins Op Center.tw2
Room:

Selection

		Size		CFM			Static			Max NC Levels		Electrical	
Quantity	Model	Unit	Outlet	Max.	Min.	Heating	Inlet	Down	Min.	Rad	Dis	MCA	MOP
1	DESV	04	12x8	100	50	75	1	0.25	0.02	10	25	4.5	15

Notes: 1. See below for PWL calculations used to obtain Max NC rating.
2. Outlet size is approximate and does not include coil dimensions. See submittal drawings for exact dimensions.
3. Inlet static pressure includes downstream pressure drop.

Electric Heating Coil Performance

KW	Max KW	CFM	EAT	LAT	Volts / Phase	Steps
1	3	75	55	99.9	277/1	S

Other Information

Maximum CFM : 232
Design CFM : 100
Safety Factor: 57%

Unit L x W x H: 39.5 X 12 X 8 in.

Controls: DDC

Accessories

Outlet: Attenuator

Lining: 1" Fibre Free

Heating Coil: Electric

Attenuator: Yes

Acoustic Summary

	Radiated Sound PWL							Discharge Sound PWL						
Sound Description	2	3	4	5	6	7	NC	2	3	4	5	6	7	NC
Primary Sound	49	44	34	31	28	24	*	69	56	45	35	34	32	*
Total Attenuation per	18	19	20	26	31	36	*	24	28	38	53	59	40	*
Room Sound Level	31	25	14	-	-	-	10	45	28	-	-	-	-	25

Notes: 1. Selections are based on Titus as Manufacturer.
2. All performance based on tests conducted in accordance with ASHRAE 130-2008 and AHRI 880-2011.
3. All NC levels determined using AHRI 885-2008 Appendix E.
4. All airflow, pressure losses and heating performance values have been corrected for altitude.
5. Units of measure: dimensions (in), airflow (cfm), water flow (gpm), air pressure (in wg), water head losses (ft) and temperatures (degF).
6. In the "Steps" column, code "S" denotes a modulating SCR heater.
7. The minimum supply circuit ampacity (MCA) and maximum overcurrent protection (MOP) ratings were calculated in accordance with UL standards based on motor and electric coil full load current ratings.

Project: **WVDNR Elkins Operation Center** Tag: **VAV-25**

Project Location: Elkins, WV
Altitude: 1925 Feet
User: MVP5

File: WVDNR Elkins Op Center.tw2
Room:

Selection

Quantity	Model	Size		CFM			Static			Max NC Levels		Electrical	
		Unit	Outlet	Max.	Min.	Heating	Inlet	Down	Min.	Rad	Dis	MCA	MOP
1	DESV	06	12x8	330	165	220	1	0.25	0.08	18	23	13.5	15

Notes: 1. See below for PWL calculations used to obtain Max NC rating.
2. Outlet size is approximate and does not include coil dimensions. See submittal drawings for exact dimensions.
3. Inlet static pressure includes downstream pressure drop.

Electric Heating Coil Performance

KW	Max KW	CFM	EAT	LAT	Volts / Phase	Steps
3	7.5	220	55	101	277/1	S

Other Information

Maximum CFM : 516
Design CFM : 330
Safety Factor: 36%

Unit L x W x H: 39.5 X 12 X 8 in.

Controls: DDC

Accessories

Outlet: Attenuator

Lining: 1" Fibre Free

Heating Coil: Electric

Attenuator: Yes

Acoustic Summary

Sound Description	Radiated Sound PWL							Discharge Sound PWL						
	2	3	4	5	6	7	NC	2	3	4	5	6	7	NC
Primary Sound	57	51	40	34	31	27	*	70	63	53	44	40	37	*
Total Attenuation per	18	19	20	26	31	36	*	27	29	39	51	53	39	*
Room Sound Level	39	32	20	-	-	-	18	43	34	14	-	-	-	23

Notes: 1. Selections are based on Titus as Manufacturer.
2. All performance based on tests conducted in accordance with ASHRAE 130-2008 and AHRI 880-2011.
3. All NC levels determined using AHRI 885-2008 Appendix E.
4. All airflow, pressure losses and heating performance values have been corrected for altitude.
5. Units of measure: dimensions (in), airflow (cfm), water flow (gpm), air pressure (in wg), water head losses (ft) and temperatures (degF).
6. In the "Steps" column, code "S" denotes a modulating SCR heater.
7. The minimum supply circuit ampacity (MCA) and maximum overcurrent protection (MOP) ratings were calculated in accordance with UL standards based on motor and electric coil full load current ratings.

Project: **WVDNR Elkins Operation Center** Tag: **VAV-26**

Project Location: Elkins, WV
Altitude: 1925 Feet
User: MVP5

File: WVDNR Elkins Op Center.tw2
Room:

Selection

		Size		CFM			Static			Max NC Levels		Electrical	
Quantity	Model	Unit	Outlet	Max.	Min.	Heating	Inlet	Down	Min.	Rad	Dis	MCA	MOP
1	DESV	05	12x8	220	110	150	1	0.25	0.02	16	28	9.0	15

Notes: 1. See below for PWL calculations used to obtain Max NC rating.
2. Outlet size is approximate and does not include coil dimensions. See submittal drawings for exact dimensions.
3. Inlet static pressure includes downstream pressure drop.

Electric Heating Coil Performance

KW	Max KW	CFM	EAT	LAT	Volts / Phase	Steps
2	5	150	55	99.9	277/1	S

Other Information

Maximum CFM : 361
Design CFM : 220
Safety Factor: 39%

Unit L x W x H: 39.5 X 12 X 8 in.

Controls: DDC

Accessories

Outlet: Attenuator

Lining: 1" Fibre Free

Heating Coil: Electric

Attenuator: Yes

Acoustic Summary

	Radiated Sound PWL							Discharge Sound PWL						
Sound Description	2	3	4	5	6	7	NC	2	3	4	5	6	7	NC
Primary Sound	55	49	39	34	32	26	*	71	59	50	40	38	35	*
Total Attenuation per	18	19	20	26	31	36	*	24	28	38	53	59	40	*
Room Sound Level	37	30	19	-	-	-	16	47	31	12	-	-	-	28

Notes: 1. Selections are based on Titus as Manufacturer.
2. All performance based on tests conducted in accordance with ASHRAE 130-2008 and AHRI 880-2011.
3. All NC levels determined using AHRI 885-2008 Appendix E.
4. All airflow, pressure losses and heating performance values have been corrected for altitude.
5. Units of measure: dimensions (in), airflow (cfm), water flow (gpm), air pressure (in wg), water head losses (ft) and temperatures (degF).
6. In the "Steps" column, code "S" denotes a modulating SCR heater.
7. The minimum supply circuit ampacity (MCA) and maximum overcurrent protection (MOP) ratings were calculated in accordance with UL standards based on motor and electric coil full load current ratings.

Project: **WVDNR Elkins Operation Center** Tag: **VAV-27**

Project Location: Elkins, WV
Altitude: 1925 Feet
User: MVP5

File: WVDNR Elkins Op Center.tw2
Room:

Selection

		Size		CFM			Static			Max NC Levels		Electrical	
Quantity	Model	Unit	Outlet	Max.	Min.	Heating	Inlet	Down	Min.	Rad	Dis	MCA	MOP
1	DESV	05	12x8	220	110	150	1	0.25	0.02	16	28	9.0	15

Notes: 1. See below for PWL calculations used to obtain Max NC rating.
2. Outlet size is approximate and does not include coil dimensions. See submittal drawings for exact dimensions.
3. Inlet static pressure includes downstream pressure drop.

Electric Heating Coil Performance

KW	Max KW	CFM	EAT	LAT	Volts / Phase	Steps
2	5	150	55	99.9	277/1	S

Other Information

Maximum CFM : 361
Design CFM : 220
Safety Factor: 39%

Unit L x W x H: 39.5 X 12 X 8 in.

Controls: DDC

Accessories

Outlet: Attenuator

Lining: 1" Fibre Free

Heating Coil: Electric

Attenuator: Yes

Acoustic Summary

	Radiated Sound PWL							Discharge Sound PWL						
Sound Description	2	3	4	5	6	7	NC	2	3	4	5	6	7	NC
Primary Sound	55	49	39	34	32	26	*	71	59	50	40	38	35	*
Total Attenuation per	18	19	20	26	31	36	*	24	28	38	53	59	40	*
Room Sound Level	37	30	19	-	-	-	16	47	31	12	-	-	-	28

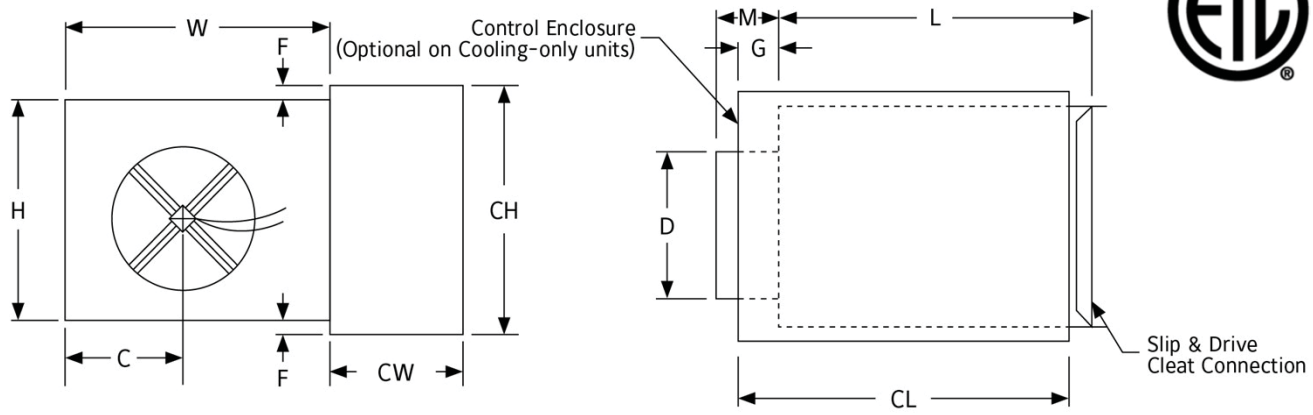
Notes: 1. Selections are based on Titus as Manufacturer.
2. All performance based on tests conducted in accordance with ASHRAE 130-2008 and AHRI 880-2011.
3. All NC levels determined using AHRI 885-2008 Appendix E.
4. All airflow, pressure losses and heating performance values have been corrected for altitude.
5. Units of measure: dimensions (in), airflow (cfm), water flow (gpm), air pressure (in wg), water head losses (ft) and temperatures (degF).
6. In the "Steps" column, code "S" denotes a modulating SCR heater.
7. The minimum supply circuit ampacity (MCA) and maximum overcurrent protection (MOP) ratings were calculated in accordance with UL standards based on motor and electric coil full load current ratings.

ESV

Single Duct Terminal Unit

Digital, Analog or Electric Control, Pressure Independent

☑ Digital Control, DESV ☐ Analog Control, AESV ☐ Electric Control, EESV



Right hand unit shown. All dimensions are in inches.

Size	CFM Range	D (H x W)	C	F	G	H	L	M	W	CH	CL	CW
4	0-225	3 7/8	6 1/2	2 1/8	7 3/8	8	15 1/2	5 3/8	12	12 1/4	18	6 1/2
5	0-350	4 7/8	6 1/2	2 1/8	7 3/8	8	15 1/2	5 3/8	12	12 1/4	18	6 1/2
6	0-500	5 7/8	6 1/2	2 1/8	7 3/8	8	15 1/2	3 3/8	12	12 1/4	18	6 1/2
7	0-650	6 7/8	6	1 1/8	7 3/8	10	15 1/2	3 3/8	12	12 1/4	18	6 1/2
8	0-900	7 7/8	6	1 1/8	7 3/8	10	15 1/2	3 3/8	12	12 1/4	18	6 1/2
9	0-1050	8 7/8	7	-	5 3/8	12 1/2	15 1/2	3 3/8	14	12 1/4	18	6 1/2
10	0-1400	9 7/8	7	-	5 3/8	12 1/2	15 1/2	3 3/8	14	12 1/4	18	6 1/2
12	0-2000	11 7/8	8	-	5 3/8	15	15 1/2	3 3/8	16	12 1/4	18	6 1/2
14	0-3000	13 7/8	10 1/2	-	3 3/8	17 1/2	15 1/2	3 3/8	20	12 1/4	18	6 1/2
16	0-4000	15 7/8	13 1/2	-	3 3/8	18	15 1/2	3 3/8	24	12 1/4	18	6 1/2
20	0-2000	7 1/2 x 12 1/4	8	1/4	3	10	15 1/2	3 3/8	16	10 1/4	15 1/4	6 1/2
30	0-4000	7 1/2 x 23 3/4	13 5/8	1/4	3	10	15 1/2	3 3/8	27 1/4	10 1/4	15 1/4	6 1/2
40	0-8000	15 7/8 x 23 7/8	19	1 1/8	5 3/8	18	15	3 3/8	38	12 1/4	18	6 1/2
5E	0-350	4 7/8	6	2 1/8	7 3/8	10	15 1/2	3 3/8	12	12 1/4	18	6 1/2
6E	0-500	5 7/8	6	2 1/8	7 3/8	10	15 1/2	3 3/8	12	12 1/4	18	6 1/2
7E	0-650	6 7/8	7	1 1/8	5 3/8	12 1/2	15 1/2	3 3/8	14	12 1/4	18	6 1/2
8E	0-900	7 7/8	7	1 1/8	5 3/8	12 1/2	15 1/2	3 3/8	14	12 1/4	18	6 1/2
1E	0-1400	9 7/8	8	-	5 3/8	15	15 1/2	3 3/8	16	12 1/4	18	6 1/2
2E	0-2000	11 7/8	10	-	3 3/8	17 1/2	15 1/2	3 3/8	20	12 1/4	18	6 1/2
4E	0-3000	13 7/8	12	-	3 3/8	18	15 1/2	3 3/8	24	12 1/4	18	6 1/2

This submittal is meant to demonstrate general dimensions of this product. The drawings are not meant to detail every aspect of the product. Drawings are not to scale. Titus reserves the right to make changes without written notice.

General Description

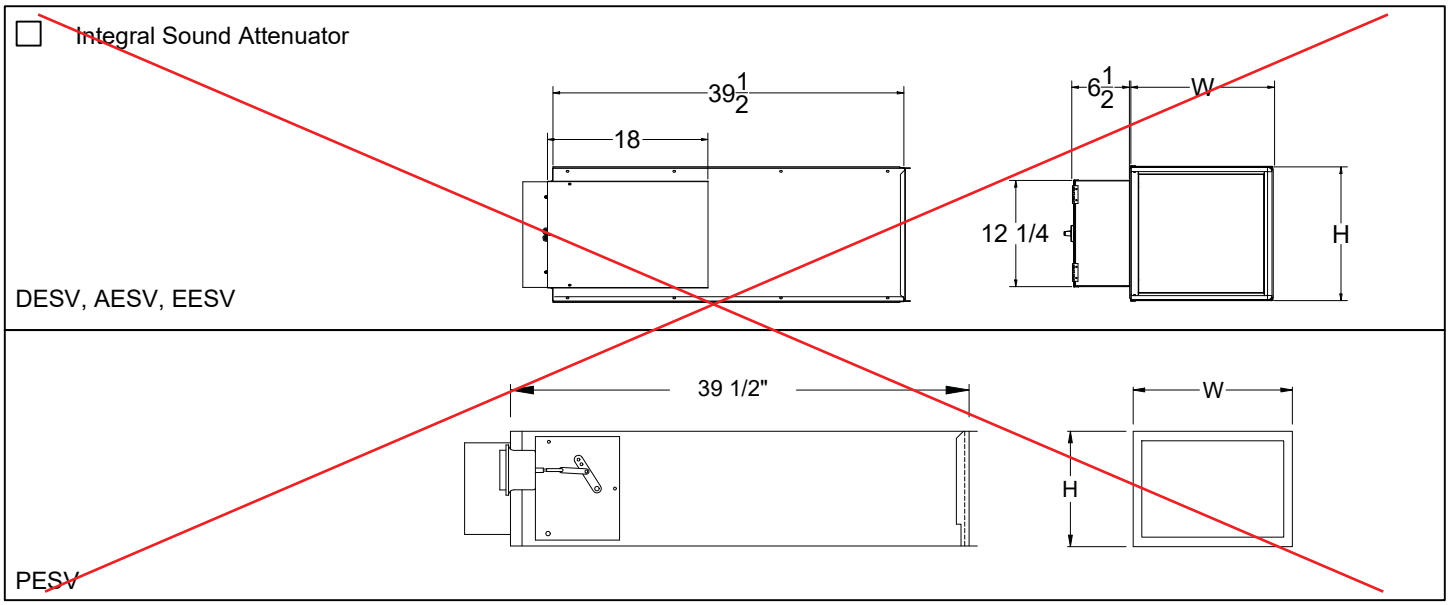
- Heavy gauge steel housing. Mechanically sealed and gasketed, leak resistant construction. Less than 2% of nominal cfm at 1.5" sp wg.
- Dual density internal insulation, treated to resist air erosion. Meets requirements of NFPA 90A and UL 181.
- Units equipped with the Titus II velocity controller can either be direct acting or reverse acting, with the damper either normally open or normally closed. Controller maintains constant span and start point. (Span and start point are adjustable.)
- Rectangular discharge opening is designed for slip and drive cleat duct connection.
- Multipoint center averaging inlet velocity sensor.
- Control packages can be factory mounted by Titus.
- Choice of right hand or left hand control location.
- Units equipped with the Titus I velocity controller are available in both direct acting / normally open and reverse acting / normally closed operating modes.
- Model DESV without coils can be installed horizontally, vertically, or at any angle. Operation is not affected by position. For units with coils, consult technical support.
- Gauge tees for cfm measurement.
- OSHPD Seismic Certification: OSP-0352-10
- Only Titus Alpha digital and pneumatic controls approved for seismic installation.

Accessories (Optional)

Check ☑ if provided.

- ☐ 24 V Control Transformer
- ☐ Dust Tight Enclosure Seal
- ☑ Fibre Free Liner 1"
- ☐ ½" EcoShield Liner
- ☐ ½" Fibre Free Liner
- ☐ 1" Fiberglass Liner
- ☐ 1" EcoShield Liner
- ☐ 1" Fibre Free Liner
- ☐ Low Leakage Seal/Test/Certify
- ☐ SteriLoc Liner
- ☐ UltraLoc Liner
- ☐ ½" EcoShield Liner (Foil Face)
- ☐ 1" EcoShield Liner (Foil Face)
- ☐ Disconnect Switch
- ☐ Hanger Brackets
- ☐ Removable Air Flow Sensor
- ☐ Bottom Access Door
- ☐ OSP & IBC -S Seismic Certification
- ☐ Red List Compliant "Google" Gasketing
- ☐ _____

☐ Integral Sound Attenuator

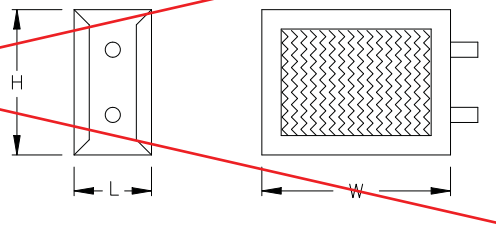


Accessories (Optional)

☐ Hot Water Coil Section

- Aluminum ripple fins, 10 per inch
- Coil pipe connections are male, sweat, type "L" copper. Connection sizes on unit sizes 04-08 are $^{1}/_{2}$" OD for 1 row coil and $^{5}/_{8}$" on 2 row coils. All other coils have $^{7}/_{8}$" OD.
- Coil is installed at discharge of unit.
- On units with attenuators, coil are installed at the discharge of attenuator.
- Coils rated and certified to AHRI Standard 410

☐ 1 Row
☐ 2 Row
☐ 3 Row
☐ 4 Row



☐ Electric Coil Section ☐ Optional SCR Controlled Electric Heater ☑ Optional Lynergy Controlled Electric Heater

Standard Features

- Single side access to low voltage, high voltage, and electric heater controls.
- Automatic reset thermal cutouts, one per element
- Manual reset secondary protection.
- Positive pressure flow switch
- Magnetic contactor for each step.
- Slip and drive cleat discharge duct connection.

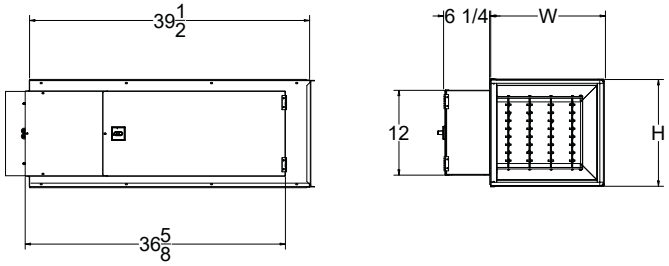
Options

☑ Fuse Block
☑ Disconnect switch, door interlock type
☐ Dust tight construction
☑ Mercury contactors

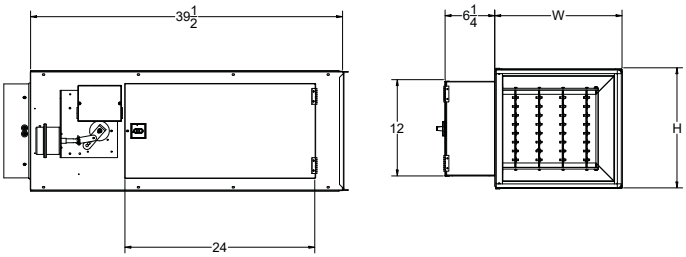
Supply Voltage

☐ 120V, 1 ph, 60Hz
☐ 208V, 1 ph, 60Hz
☐ 240V, 1 ph, 60Hz
☑ 277V, 1 ph, 60Hz
☐ 208V, 3 ph, 60Hz
☑ 480V, 3 ph, 60Hz (4 wire wye standard)

DESV, AESV, EESV



PESV



Size	H	W	Water Coil	
			L (1-2 Row)	L (3-4 Row)
4	8	12	5	7 1/4
5	8	12	5	7 1/4
6	8	12	5	7 1/4
7	10	12	5	7 1/4
8	10	12	5	7 1/4
9	12 1/2	14	5	7 1/4
10	12 1/2	14	5	7 1/4
12	15	16	5	7 1/4
14	17 1/2	20	7 1/2	9 3/4
16	18	24	7 1/2	9 3/4
20	10	16	5	7 1/4
30	10	27 1/4	5	7 1/4
40	18	38	5	7 1/4

The total length of the ESV unit is the summation of the unit length (with or without attenuator) and the length of the optional water coil.

This submittal is meant to demonstrate general dimensions of this product. The drawings are not meant to detail every aspect of the product. Drawings are not to scale. Titus reserves the right to make changes without written notice.

Last Updated - 1/14/2021

ESV									
Size	22 ga. Base Box	20 ga. Base Box	Attenuator	Ultraloc Liner	w/Pneumatic Controls	w/DDC or Analog	w/Electric Heat	w/1 Row Coil	w/2 Row Coils
4	11	15	+15	+7	+4	+9	+18	+5	+6
5	11	15	+15	+7	+4	+9	+18	+5	+6
6	11	15	+15	+7	+4	+9	+18	+5	+6
7	13	16	+16	+8	+4	+9	+18	+5	+7
8	13	16	+16	+8	+4	+9	+18	+5	+7
9	17	20	+19	+8	+4	+9	+23	+7	+9
10	17	20	+19	+8	+4	+9	+23	+7	+9
12	20	24	+23	+10	+4	+9	+25	+9	+12
14	28	30	+28	+15	+4	+9	+27	+10	+15
16	32	34	+31	+17	+4	+9	+28	+12	+17
40	52	55	+45	+27	+4	+9	+30	+17	+25

EDV					
Size	22 ga. Base Box No Attenuator	22 ga. Attenuator Box w/o Mixing Baffle	22 ga. Attenuator w/ Mixing Baffle	w/Pneumatic Controls	w/DDC
4	38	66	68	+8	+18
5	38	66	68	+8	+18
6	38	66	68	+8	+18
7	42	76	79	+8	+18
8	42	76	79	+8	+18
9	52	94	98	+8	+18
10	52	94	98	+8	+18
12	62	116	120	+8	+18
14	78	144	148	+8	+18
16	86	166	171	+8	+18

Note: Weights are approximate. Actual weight may vary based on specific options selected.

Fibre Free Insulation

Insulation Characteristics

Material:	EPFI (Engineered Polymer Foam Insulation)
Thickness:	1 inch
R-Value:	4.0 ft^2 °F h/Btu @ 75°F
Density:	1.5 lbs/ft^3
Flame Spread:	less than 25
Smoke Density:	less than 50
Mold Growth:	None

Code Compliances

NFPA 90A & 90B	Appliances
NFPA 255	Flame / Smoke Spread (25/50)
UL 181	Air Erosion
UL 181	Mold Growth and Humidity
UL 723	Flame / Smoke Spread (25/50)
ASTM E96	Water Vapor Transmission
ASTM E84	Flame / Smoke Spread (25/50)
Factory Mutual Listed	

Acoustical Performance

Correction factors to standard liner catalog data are shown below.

ESV Basic Units

Band	2	3	4	5	6	7	NC
HZ	125	250	500	1000	2000	4000	Impact
Discharge	0	0	0	0	0	0	0
Radiated	-1	-3	-4	-4	-5	-5	-1

ESV Attenuator Units (Average Correction Factor - Actual correction factor is dependent on unit size.)

Band	2	3	4	5	6	7	NC
HZ	125	250	500	1000	2000	4000	Impact
Discharge	-1	-2	-4	-8	-9	-6	-1
Radiated	-1	-3	-4	-4	-5	-5	-1

Fan Powered Terminals

Band	2	3	4	5	6	7	NC
HZ	125	250	500	1000	2000	4000	Impact
Discharge	0	0	0	0	0	0	0
Radiated	+3	+4	+4	+6	+6	+1	+3

AG-Lynergy-03
December 6, 2021

Lynergy™ Comfort Control SCR Electric Heater Application Guide

Titus™
Redefine your comfort zone.™ | www.titus-hvac.com

605 Shiloh Road
Plano, Texas 75074
972.212.4800

Contents Page

General

This document provides application highlights covering the Lynergy™ Comfort Control SCR Electric Heater. (USPN 7,177534)

Additional information may be found at the Titus website, www.titus-hvac.com.

Introduction

The zone reheat in an HVAC system needs to address concerns about comfort, indoor air quality, energy and acoustics. Several ASHRAE Standards are used to cover all of these areas of design.

The ASHRAE Fundamentals Handbook states that discharging air at a temperature more than 15°F above the room (90°F in a 75°F room) will likely result in significant unwanted air temperature stratification.

ASHRAE Standard 62 (Indoor Air Quality) has been modified to require increased outside air when heating from the ceiling (Table 6.2, Addenda N. Using the ASHRAE 129 test procedure for Air Change Effectiveness, mixing effectiveness values as low as 20% (or lower) have been observed, when the supply to room differential exceeds 15°F. In most cases, it only requires 85°F air to handle a typical winter design perimeter load at 1 cfm/Sq.Ft. air supply rate (the airflow rate recommended for both good ventilation mixing and comfort).

Standard staged electric heat energizes each stage of heat as the zone temperature calls for more heat. In a three-stage heater, the increase happens in 33% heater output increments. If an additional 33% heater output provides too much heating, then the heater will de-energize that stage. The result is over- and under-heating of the zone.

A proportional SCR heater eliminates the over- and under-heating of the zone by providing only as much heater output needed to satisfy the zone.

In addition to providing the exact amount of heater output required, the Titus Lynergy™ heater has an optional discharge temperature sensor. This allows the Lynergy™ controller to limit the maximum discharge temperature of the electric heater allowing you to meet the requirements of the ASHRAE standards.

During the time a standard staged electric heater is over-heating the zone, it is using more energy than needed to satisfy the zone. For example, if the zone requires 50% of the heater capacity, a three-stage heater would have to output 66% of its capacity until the thermostat responds to the temperature in the over-heated zone and de-energizes the second stage of heat.

Standard staged electric heat typically uses magnetic contactors to energize the stages of heat. Due to acoustic requirements in many building designs, engineers often specify mercury contactors for silent operation. Mercury contactors significantly increase the cost of the heater.

There are also growing environmental concerns about the use of mercury in buildings. Many building components contain mercury and, in the component's application, pose little risk to the environment, but the potential for a spill is always present. For this reason, some local codes require registration of mercury devices, and careful controlled disposal. Because of this, many engineers are limiting the use of mercury contactors.

The solid-state relays, used in the Lynergy™ heater, address the acoustic concern of using magnetic contactors and the environmental concern of mercury contactors.

Description

The Lynergy™ Comfort Control SCR electric heater is an electronic, time proportional electric heater, which utilizes silent, rapid responding solid-state relays. The solid-state relays are controlled by the Lynergy™ Comfort Controller.

The Lynergy™ Comfort Controller accepts one of several input signal types to provide superior control and flexibility.

The order code determines the input signal jumper position the Lynergy™ heater will be set to when shipped. The electric heater order code for the Lynergy™ heater is in the format LXY, where X represents the same supply voltages used on the standard electric heaters and Y represents the inputs signal code. The table below shows the voltage options.

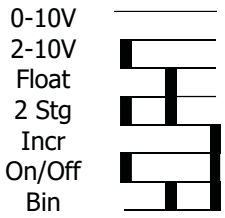
X Code	Voltage
2	208V, single phase
3	240V, single phase
4	277V, single phase
6	208V, three phase
9	480V, three phase

The table below shows the signal type options.

Y Code	Signal Type
1	PWM heat
2	2 stage heat
3	0-10V / 0-20mA
4	2-10V /4-20mA
5	Incremental T-stat
6	Binary
7	3 point floating

For example, code L91 is a 480V, three-phase heater with PWM heater control.

The Lynergy™ heater provides flexibility in input signal by simply putting a jumper between contacts on the controller board. The figure below shows the various jumper positions on the Lynergy™ control board.



Discharge Temperature Sensor

If the optional discharge temperature sensor is used, the heater is set to modulate heat to a set discharge temperature. The sensor can be mounted up to 20 feet from the unit discharge. User defined maximum temperature and controller defined temperature desired are maintained independent of heater kW or incoming air temperature.

The maximum discharge temperature produced by the heater is set by rotary dial on the Lynergy™ control board. When the unit receives a signal to start heating, the board will take an initial temperature reading and modulate heat from that point to the maximum temperature. For example, if a thermostat requires only a 10% increase in heating of air that was initially 60°F, and has a maximum temperature setting of 90°F, the Lynergy™ controller will modulate the heater's output temperature to 63°F (the additional 3 degrees coming from (90°-60°)*10%). This option allows an increase of heater energy into occupancy by increasing discharge airflow while keeping an optimal discharge temperature.

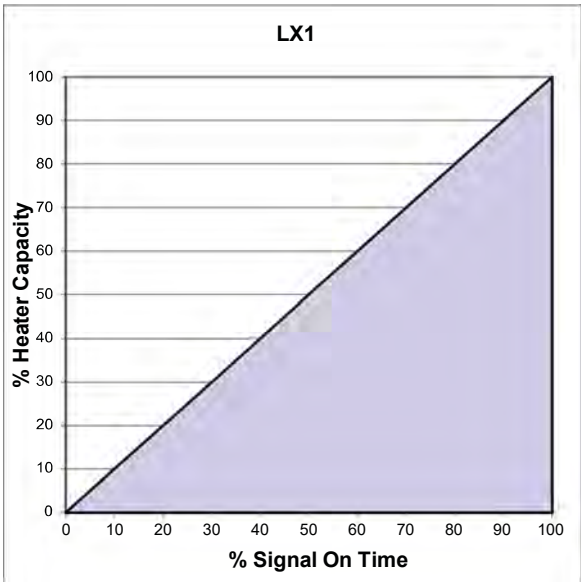
Lynergy™ Code LX1

Proportional electric heat controlled by single 24Vac output.

LX1 provides proportional electric heat from 0-100% for use with controllers that can supply a pulsed 24V signal.

When a 24Vac signal is sent, the heater control board immediately turns the heater on to 100%. Heater output can be proportionally modulated by decreasing length of pulse within a constant time period. For example, if every 5 seconds the heater

is turned on for only 3 seconds, the unit provides 60% (3s/5s * 100%) of the heater's kW rating.

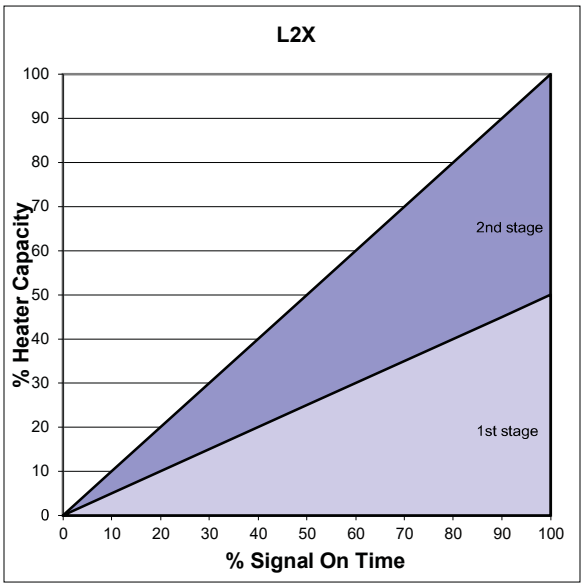


Lynergy™ Code LX2

Proportional electric heat controlled by two 24Vac outputs.

LX2 provides proportional electric heat from 0 to 100% for those controllers that have two 24Vac outputs available for supplemental heat control that cannot be programmed to provide "open/close" signals.

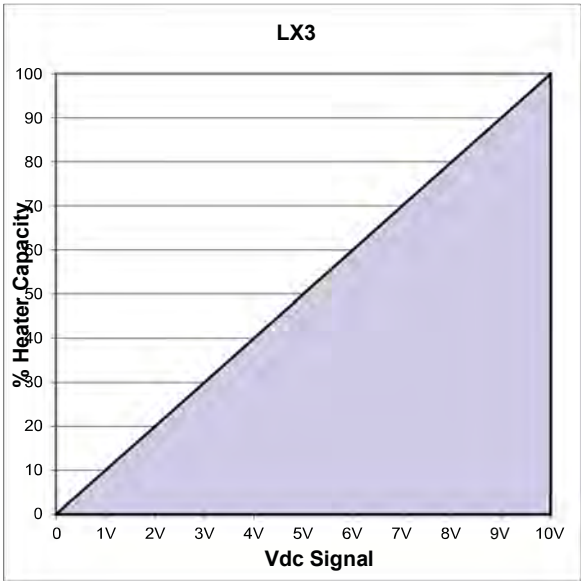
One output is used for controlling heat from 0 to 50%. The second output is for controlling heat from 0 to100%. Proportional heat is available by decreasing the length of pulse within a constant time period. For example, if every 5 seconds only Input 2 (Dec) is turned on for only 3 seconds, the unit provides 60% (3s/5s * 100%) of the heater's kW rating. Applications using two 24Vac signals can have more accurate control of the lower heater outputs. By modulation of Input 1 (Inc), the turn down ratio is greater, increasing the accuracy of low heat output. For example, if every 5 seconds Input 1 is turned on for only 3 seconds, the unit provides 30% (3s/5s * 50%) of the heater's kW rating. This can also be used for dual staging electric heat to 50% and 100% capacity.



Lynergy™ Code LX3

Proportional electric heat controlled by analog 0-10 Vdc or 0-20 mA output.

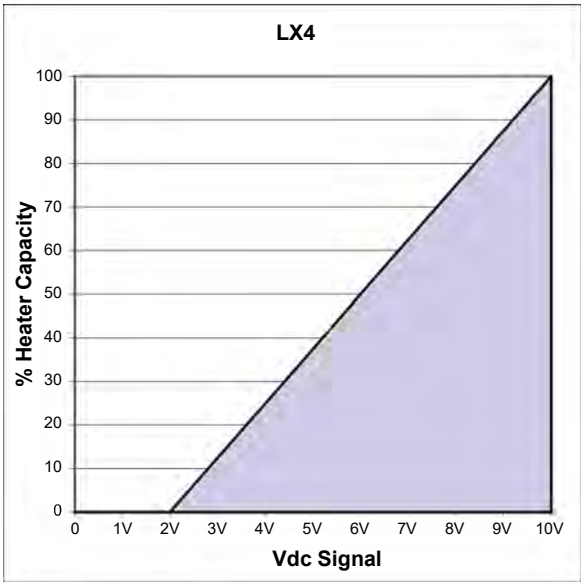
LX3 provides proportional electric heat from 0 to 100% for those controllers that have 0-10 Vdc (0-20 mA) available for supplemental heat control. Heater output is directly proportional to Vdc signal. For example, 2 Vdc (4 mA) provides 20% (2s/10s * 100%) of the heater's kW rating.



Lynergy™ Code LX4

Proportional electric heat controlled by analog 2-10 Vdc or 4-20mA output.

LX4 provides proportional electric heat from 0 to 100% for those controllers that have 2-10 Vdc (4-20 mA) available for supplemental heat control. Heater output is directly proportional to Vdc signal over 2Vdc. For example, 4Vdc (6mA) provides 25% (2dcV/ 8dcVs * 100%) of the heater's kW rating. For inputs below 2Vdc (4mA), the heater will stay off.

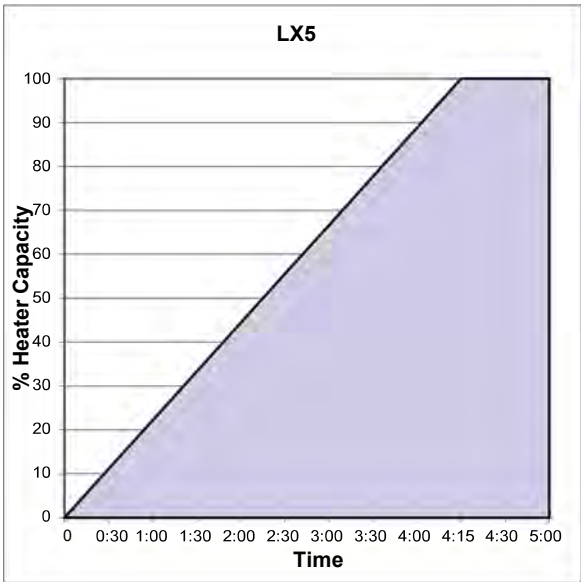


Lynergy™ Code LX5

Proportional electric heat controlled by single 24Vac output with gradual increase and decrease of heater output.

LX5 provides electric heat from 0 to 100% for those controllers that only have one 24Vac output available for supplemental heat control. This application does not provide proportional heat with pulsed input, but is appropriate for those controls with only one definite purpose 24Vac that cannot pulse rapidly.

The application mimics the use of hot water reheat controlled by a Normally Closed valve and provides gradual heating cycling without occupant awareness. When 24Vac signal is sent, the heater control board begins increasing heater output to 100% over a 4 minute 15 second interval. When desired room temperature has been met and the 24Vac signal is removed, the heater output will begin to decrease at the same rate. If input is given again while heater is decreasing, the heater output will again begin to climb from the current capacity.



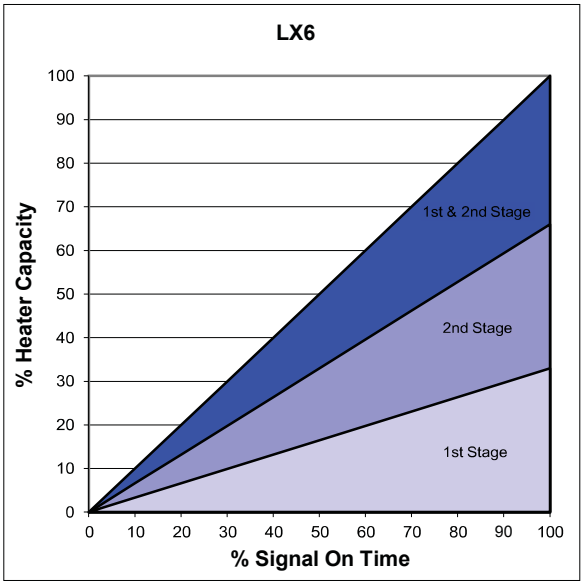
Lynergy™ Code LX6

Proportional electric heat controlled by two binary acting 24Vac outputs.

LX6 provides proportional electric heat from 0 to 100% for those controllers that have two 24Vac outputs available for supplemental heat control that can be operated in a binary fashion (A on/B off, A off/B on, and A on/B on), but not programmed to provide "open/close" signals. One output is used for controlling heat from 0 to 33%, the second output is for controlling heat from 0 to 67%, and both together provide 100% heat. Proportional heat is available by decreasing length of pulse within a constant time period.

For example, if every 5 seconds both inputs (Inc & Dec) are turned on for only 3 seconds, the unit provides 60% (3s/5s * 100%) of the heater's kW rating. Applications using two 24Vac signals can have more accurate control of the lower heater outputs. By modulation of Input 1 (Inc), the turn down ratio is greater, increasing accuracy of low heat output. If every 5 seconds Input 1 is turned on for only 3 seconds, the unit provides 20% (3s/5s * 33%) of the heater's kW rating, and if every 5 seconds Input 2 is turned on for only 3 seconds, the unit provides 40% (3s/5s * 67%) of

heater capacity. This can also be used for staging electric heat to 33%, 67% and 100% capacity.

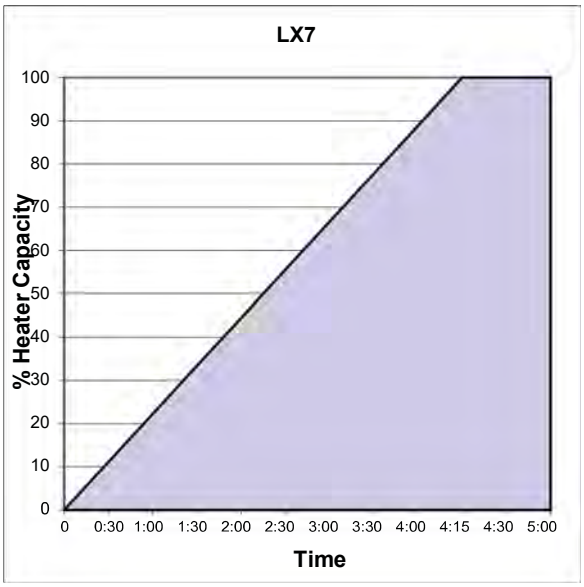


Lynergy™ Code LX7

Proportional electric heat controlled by two 24Vac outputs with floating control.

LX7 provides proportional electric heat from 0 to 100% for those controllers that have two 24Vac outputs available for supplemental heat control. This application mimics the use of hot water reheat controlled by a Three Point modulating valve and provides gradual heating cycling without occupant awareness.

When 24Vac “open” signal is sent, the heater control board begins increasing heater output from 0 to 100% over a 4 minute 15 second interval. When desired room temperature has been met and the 24Vac signal is removed, or the 24Vac “close” signal is sent at the same time, the heater output will stay constant. When the 24 Vac “close” signal is sent alone, the heater will decrease at the same rate. If the 24 Vac “open” signal is again sent alone, the heater will again start increasing from current capacity.



Suggested Specification

Electric Reheat Coils

1. Proportional electric coils shall be supplied and installed on the terminal by the terminal manufacturer. Coils shall be ETL listed. Coils shall be housed in an attenuator section integral with the terminal with element grid recessed from unit discharge a minimum of 5 inches to prevent damage to elements during shipping and installation. Elements shall be 80/20 nickel chrome, supported by ceramic isolators a maximum of 3.5 inches apart, staggered for maximum thermal transfer and element life, and balanced to ensure equal output per step. The integral control panel shall be housed in a NEMA 1 enclosure with hinged access door for access to all controls and safety devices.

2. (For Single Duct terminals) Electric coils shall contain a primary automatic reset thermal cutout, a secondary manual reset thermal cutout, differential pressure airflow switch for proof of flow, and line terminal block. Unit shall include an optional integral door interlock type disconnect switch that will not allow the access door to be opened while power is on. Non-interlocking type disconnects are not acceptable. All individual components shall be UL listed or recognized.

2. (For Fan Powered Terminals) Electric coils shall contain a primary automatic reset thermal

cutout, a secondary replaceable heat limiter per element, differential pressure airflow switch for proof of flow, and line terminal block. Coil shall include an integral door interlock type disconnect switch, which will not allow the access door to be opened while power is on. Non-interlocking type disconnects are not acceptable. All individual components shall be UL listed or recognized.

3. Heaters shall be equipped with a Lynergy™ Comfort Controller to control heater coil firing. The control panel shall include an interface to control heater coil firing in proportion to the ATC signal. The ATC signal shall connect to low voltage universal signal interface circuitry supplied and installed by the terminal manufacturer. The universal interface shall allow at least the following seven interface options without additional interface circuitry. ATC equipment providers with 0-20mA or 4-20mA signals shall supply and install a suitable dropping resistor to convert the current signal to a 0-10Vdc signal or 2-10Vdc signals:

- PWM heat
- 2 stage heat
- 0-10V / 0-20mA
- 2-10V /4-20mA
- Incremental T-stat
- Binary
- 3 point floating

4. A downstream air temperature limit and control shall be automatically invoked by adding a downstream air temperature sensor. When invoked, the downstream air from the heater shall not exceed an adjustable maximum temperature set point. When the ATC's call for heat is less than 100%, the heater shall control the downstream air temperature to a point in proportion to the span between the heater's probable entering air temperature and the maximum air temperature set point.

Abbreviations

The following table lists abbreviations used within this document.

Abbrev.	Term
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
Vac	Volts Alternating Current
Vdc	Volts Direct Current
DDC	Direct Digital Control
ETL	Electrical Testing Laboratories
NEMA	National Electrical Manufacturers Association
PWM	Pulse Width Modulated
mA	Milliamps

Typical Specification for Titus Single Duct Terminal Units

Models: DESV Basic Unit

ESV Basic Unit

See Section S for control specifications.

1. Furnish and install TITUS Model (P)(A)(D) ESV single duct, variable air volume terminals of the sizes and capacities shown in the plans.

2. Terminals shall be certified under the ARI Standard 880 Certification Program and carry the ARI Seal. Noncertified terminals may be submitted after testing at an independent testing laboratory under conditions selected by the engineering consultant in full compliance with ARI Standard 880. These tests must be witnessed by the engineering consultant with all costs to be borne by the terminal manufacturer. Testing does not ensure acceptance.

3. The terminal casing shall be minimum 22-gauge galvanized steel, internally lined with engineered polymer foam insulation which complies to UL181 and NFPA 90A. Insulation shall be 1½ pound density, closed cell foam. Exposed fiberglass is not acceptable. The insulation shall be mechanically fastened to the unit casing. The casing shall be constructed to hold leakage to the maximum values shown in the Casing Leakage table.

4. The damper shall be heavy gauge steel with shaft rotating in Delrin® self-lubricating bearings. Nylon bearings are not acceptable. Shaft shall be clearly marked on the end to indicate damper position. Stickers or other removable markings are not acceptable. The damper shall incorporate a mechanical stop to prevent overstroking and a synthetic seal to limit close-off leakage to the maximum values shown in the Damper Leakage table.

5. Actuators shall be capable of supplying at least 35-inch lbs. of torque to the damper shaft and shall be mounted externally for service access. Terminals with internal actuator mounting or linkage connection must include gasketed access panel, removable without disturbing ductwork. Casing with access panel shall be constructed to hold leakage to the maximum values shown in the Casing Leakage table.

6. At an inlet velocity of 2000 fpm, the minimum static pressure required to operate any terminal size shall not exceed 0.13-inch W.G. for the basic terminal.

7. Sound ratings for the terminal shall not exceed ____ NC at ____ static pressure. Sound performance shall be ARI certified.

Accessories

Hot Water Reheat Coils

Electric Reheat Coils

Optional Lynergy Electric Heat

1. Proportional electric coils shall be supplied and installed on the terminal by the terminal manufacturer. Coils shall be ETL listed. Coils shall be housed in an attenuator section integral with the terminal with element grid recessed from unit discharge a minimum of 5 inches to prevent damage to elements during shipping and installation. Elements shall be 80/20 nickel chrome, supported by ceramic isolators a maximum of 3½ inches apart, staggered for maximum thermal transfer and element life, and balanced to ensure equal output per step. The integral control panel shall be housed in a NEMA 1 enclosure with hinged access door for access to all controls and safety devices.

2. Electric coils shall contain a primary automatic reset thermal cutout, a secondary replaceable heat limiter per element, differential pressure airflow switch for proof of flow, and line terminal block. Coil shall include an integral door interlock type disconnect switch, which will not allow the access door to be opened while power is on. Non-interlocking type disconnects are not acceptable. All individual components shall be UL listed or recognized.

3. Heaters shall be equipped with a Lynergy Comfort Controller to control heater coil firing. The control panel shall include an interface to control heater coil firing in proportion to the ATC signal. The ATC signal shall connect to low voltage universal signal interface circuitry supplied and installed by the terminal manufacturer. The universal interface shall allow at least the following seven interface options without additional interface circuitry.

ATC equipment providers with 0-20mA or 4-20mA signals shall supply and install a suitable dropping resistor to convert the current signal to a 0-10VDC signal or 2-10VDC signals:

- PWM heat
- 2 stage heat
- 0-10V / 0-20mA
- 2-10V /4-20mA
- Incremental T-stat
- Binary
- 3 point floating

4. A downstream air temperature limit and control shall be automatically invoked by adding a downstream air temperature sensor. When invoked, the downstream air from the heater shall not exceed an adjustable maximum temperature set point. When the ATC's call for heat is less than 100%, the heater shall control the downstream air temperature to a point in proportion to the span between the heater's probable entering air temperature and the maximum air temperature set point.