BOATMAN
CONSTRUCTION LLC

TRANSMITTAL

TO: **Xavier Cantu, AIA, RID**
XΛ|COLLECTIVE
21750 Hardy Oak Blvd
Suite 102
San Antonio, TX 78258

DISTRIBUTION: Owner ☐
Architect ■
Contractor ■
Construction Mgr. ■

FROM: Morgan E. Chambers

VIA: Email

PHONE/E-MAIL: MorganC@BoatmanConst.com / 281-516-9826

DATE: July 14, 2022

SUBJECT: **Legent North Houston Surgical Hospital**

WE TRANSMIT: X Attached ____ Under Separate Cover

THE FOLLOWING:

____	Drawings	____	Shop Drawings
____	Specifications	X	Submittals
____	Change Order	X	Product Data / Cut Sheets
____	Contract	____	Other

BCLLC PROJECT NO.: 2222 **ARCHITECTS PROJECT NO.: H.101.002**

COPIES	DATE		DESCRIPTION
1	14-Jul-22	23 34 16	Exhuast Fans R.1

REMARKS:

Please return set (1) set of submittals for future action.

Thank you,
Morgan E. Chambers

cc:
Shane D. Boatman
Marshall Reid

☐ No Exceptions Taken ☐ No Action Taken ☐ Revise & Resubmit

☑ Exceptions Noted, Resubmittal Not Required

This review is only for general conformance with the design concept and the information given in the Construction Documents. Corrections or comments made on the shop drawings during this review do not relieve the contractor from compliance with the requirements of the plans and specifications. Review of a specific item shall not include review of an assembly of which the item is a component. The Contractor is responsible for dimensions to be confirmed and correlated at the jobsite: information that pertains solely to the fabrication process or to the means, methods, techniques, sequences and procedures of construction: coordination of the Work with that of all other trades and performing Work in a safe and satisfactory manner.

BY Brandon Rupp **DATE** 7/26/2022

SUBMITTAL#

SPEC#

KCI TECHNOLOGIES

-Revise EF-2-1 CFM per PR3 issued 7/25/2022
-EF-2-5 and EF-2-2 are not numbered correctly. See fan schedule.
-EF-2-4 shall be selected to provide 365 CFM to meet code minimum exhaust requirements
-EF-2-4 shall be provided with factory VFD with mounting bracket, restrained isolators and gess equipment support. Coordinate equipment support with structural
-Gravity ventilator not included in project.

- Ensure controls for exhaust fans EF-2-2, 2-3,2-4, and 2-5 can be configured from a low voltage kill switch to shut off power. Ensure electrical contractor is aware of the exact wiring requirements for kill switch.

ELECTRICAL COMMENTS

1. FOR EF-2-1. ENSURE ENCLOSURE AND SERVICE SWITCH ARE RATED NEMA 3R. COORDINATE WITH ELECTRICAL CONTRACTOR TO PROVIDE 115V POWER FOR MOTORIZED DAMPER. MOTORIZED DAMPER SHALL BE CIRCUITED TO PANEL LEQB-2 VIA 2#12,1#12G, 3/4"C. PROVIDE 15A/1P BREAKER. PROVIDE NEMA 3R MOTOR RATED SWITCH FOR LOCAL DISCONNECTING MEANS.

2. ENSURE CONTROLS FOR EXHAUST FANS EF-2-2, 2-3, 2-4, AND 2-5 CAN BE CONFIGURED TO ACCEPT A SIGNAL FROM A LOW VOLTAGE KILL SWITCH TO SHUT OFF POWER. ENSURE ELECTRICAL CONTRACTOR IS AWARE OF THE EXACT WIRING REQUIREMENTS FOR KILL SWITCH.

LETSOS COMPANY
MECHANICAL CONTRACTORS

TRANSMITTAL MEMORANDUM

To: Boatman Construction, LLC
27905 Commercial Park Road, Suite 100
Tomball, TX 77375

Attn: Morgan Elizabeth Chambers

PROJECT: Legent Tomball Hospital

DATE: ***July 11, 2022***

Transmitted To You Herewith / Under Separate Cover is the Following:

☐	Prints	☐	Shop Drawings	☐	Supplementary Drawings
☐	Letter	☐	Specifications	☐	Samples
☐	Other	☒	Submittal	☐	Hazcom/MSDS Manuals

One (1) electronic copy of :

23 34 16 Exhaust Fans.R1

Sent To You For The Following Reasons:

☐	Issued for Cost Estimate	☐	For Your Files
☐	Issued for Construction	☒	For Your Review and Approval
☐	For Your Information	☐	Return for Revisions
☐	Other		

REMARKS:

BY: *Cory Byrnes/bs*

cc:

P.O. BOX 36927 • HOUSTON, TX 77236-6927 • CORPORATE OFFICE (713)783-3200
E-Mail: letsosco@letsos.com Web Site: http://www.letsos.com

LETSOS COMPANY
MECHANICAL CONTRACTORS

SUBMITTAL FOR

Legent Tomball Hospital

LETSOS JOB NO: 22111-12-13

ARCHITECT:	*Collective*
ENGINEER:	*KCI*
GENERAL CONTRACTOR:	*Boatman Construction, LLC*
SUBMITTED BY:	*Letsos Company*
SPECIFICATION NUMBER:	*23 34 16*
ITEM DESCRIPTION:	*Exhaust Fans*
VARIATIONS:	*R1*

LETSOS STAMP

THIS SHOP DRAWING HAS BEEN CHECKED PRIOR TO SUBMITTAL AND COMPLIES WITH THE GENERAL CONCEPT, SUBCONTRACTOR - SUPPLIER REMAINS RESPONSIBLE FOR COMPLYING WITH THE CONTRACT DOCUMENTS, VERIFYING AND CORRELATING DIMENSIONS AND QUANTITIES, AND FOR ANY EXCEPTIONS NOTED AFTER APPROVAL.
LETSOS COMPANY

BY: *Cory Byrnes*

DATE: July 11, 2022

GENERAL CONTRACTORS STAMP

SHOP DRAWING / SUBMITTAL REVIEW
☐ APPROVED ☒ APPROVE WITH CHANGES NOTED
☐ REVISE AND RESUBMIT ☐ REJECTED
SUBMITTAL WAS REVIEWED FOR DESIGN CONFORMITY AND GENERAL CONFORMANCE TO CONTRACT DOCUMENTS ONLY. THE SUBCONTRACTOR IS RESPONSIBLE FOR CONFIRMING AND CORRELATING DIMENSIONS AT JOBSITE FOR TOLERANCE, CLEARANCE, QUANTITIES, FABRICATION PROCESSES AND TECHNIQUES OF CONSTRUCTION, COORDINATION OF HIS WORK WITH OTHER TRADES AND FULL COMPLIANCE WITH CONTRACT DOCUMENTS
By Morgan Chambers Date: 07/27/2022
BOATMAN CONSTRUCTION LLC

ARCHITECTS STAMP

ENGINEERS STAMP

SUBMITTAL

Submitted 6/3/2022
Rev #1 6/20/2022
Rev #2 7/5/2022

PROJECT:	*Tomball Legent Hospital and ASC*
LOCATION:	*Houston, Texas*
ENGINEER:	*KCI*
MECHANICAL CONTRACTOR:	*Letsos*
EQUIPMENT:	*Exhaust Fans* *Specification Section 23 34 16*
REPRESENTATIVE:	*Nicholas Munch* *Vicon Equipment, Inc.* *Houston, Texas* *Phone: 713-715-5737* *Fax: 713-784-1290* *Nmunch@viconequip.com*

SECTION 233416 - CENTRIFUGAL HVAC FANS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Backward-inclined centrifugal fans, including airfoil and curved blade fans.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes for fans.
2. Rated capacities, operating characteristics, and furnished specialties and accessories.
3. Certified fan performance curves with system operating conditions indicated.
4. Certified fan sound-power ratings.
5. Motor ratings and electrical characteristics, plus motor and electrical accessories.
6. Material thickness and finishes, including color charts.
7. Dampers, including housings, linkages, and operators.
8. Fan speed controllers.

B. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.
4. Design Calculations: Calculate requirements for selecting vibration isolatorsand for designing vibration isolation bases.
5. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Fan room layout and relationships between components and adjacent structural and mechanical elements, drawn to scale, and coordinated with each other, using input from installers of the items involved.

B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For centrifugal fans to include in normal operation, emergency operation, and maintenance manuals with replacement parts listing.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NFPA Compliance: Comply with NFPA 90A for design, fabrication, and installation of unit components.

C. ASHRAE 62.1 Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Startup."

D. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

2.2 BACKWARD-INCLINED CENTRIFUGAL FANS

COMPLY

A. Description:

1. Factory-fabricated, -assembled, -tested, and -finished, direct-driven centrifugal fans, consisting of housing, wheel, fan shaft, bearings, motor, drive assembly, and support structure. Deliver fans as factory-assembled units, to the extent allowable by shipping limitations.
2. Factory-installed and -wired disconnect switch.

B. Housings:

1. Housing Material: Aluminum or ~~Stainless steel.~~

COMPLY

2. Housing Coating: None.
3. Housing Assembly: Sideplates continuously welded or spot welded or attached by continuous Pittsburgh lock seal or similar seal.
4. Formed panels to make curved-scroll housings with shaped cutoff.
5. Panel Bracing: Steel angle- or channel-iron member supports for mounting and supporting fan scroll, wheel, motor, and accessories.
6. Spun inlet cone with flange.
7. Outlet flange.
8. Discharge Arrangement: Fan scroll housing is field rotatable to any of [**seven**] [**eight**] discharge positions. Provide fan with discharge positioned in proper direction to minimize connected duct turns.

C. Wheels:

1. Wheel Configuration: SWSI construction with a precision-spun curved inlet flange and a backplate fastened to shaft with setscrews. Wheels shall be statically and dynamically balanced, and nonoverloading.
2. Wheel and Blade Material: Aluminum or Stainless steel.

3. Wheel and Blade Coating: None.
4. Cast-iron or cast-steel hub riveted to backplate and fastened to shaft with set screws.
5. Backward-Inclined Airfoil Blades:

    a. Aerodynamic design.
    b. Heavy backplate.
    c. Hollow die-formed, airfoil-shaped blades continuously welded at tip flange and backplate.

6. Backward-Inclined Curved Blades:

    a. Curved design.
    b. Heavy backplate.
    c. Single-thickness blades continuously welded at tip flange and backplate.

D. Shafts:

1. Statically and dynamically balanced, and selected for continuous operation at maximum rated fan speed and motor horsepower, with adjustable alignment and belt tensioning.
2. Turned, ground, and polished hot-rolled steel with keyway. Ship with protective coating of lubricating oil.
3. Designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.

E. Bearings:

1. Prelubricated and Sealed Shaft Bearings:

    a. Self-aligning, pillow-block-type ball bearings.
    b. Ball-Bearing Rating Life: ABMA 9, L(10) at 120,000 hours.
    c. Roller-Bearing Rating Life: ABMA 11, L(10) at 120,000 hours.

COMPLY

F. Motor Enclosure: Open, dripproof, Totally enclosed, fan cooled, or Totally enclosed, air over

G. Accessories:

1. Access for Inspection, Cleaning, and Maintenance: Comply with requirements in ASHRAE 62.1.

2.3 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

B. Where variable-frequency drives are indicated or scheduled, provide fan motor compatible with variable-frequency drive.

2.4 SOURCE QUALITY CONTROL

A. AMCA Certification for Fan Sound Performance Rating: Test, rate, and label in accordance with AMCA 311.

B. AMCA Certification for Fan Aerodynamic Performance Ratings: Test, rate, and label in accordance with AMCA 211.

C. AMCA Certification for Fan Energy Index (FEI): Test, rate, and label in accordance with AMCA 211.

D. Operating Limits: Classify fans in accordance with AMCA 99, Section 14.

PART 3 - EXECUTION

BY OTHERS

3.1 INSTALLATION, GENERAL

A. Install centrifugal fans level and plumb.

B. Disassemble and reassemble units, as required for moving to the final location, according to manufacturer's written instructions.

C. Lift and support units with manufacturer's designated lifting or supporting points.

D. Equipment Mounting:
1. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."

E. Curb Support, Prefabricated: Rail-type wood support provided by fan manufacturer.

F. Unit Support: Install centrifugal fans level on structural curbs. Coordinate with duct connections.

BY OTHERS

G. Install units with clearances for service and maintenance.

H. Label fans according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."

3.2 DUCTWORK AND PIPING CONNECTIONS

A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 233300 "Air Duct Accessories."

B. Install ducts adjacent to fans to allow service and maintenance.

3.3 ELECTRICAL CONNECTIONS

A. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

C. Install electrical devices furnished by manufacturer, but not factory mounted, according to NFPA 70 and NECA 1.

D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

1. Nameplate shall be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."

3.4 CONTROL CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices.

B. Connect control wiring according to Section 260523 "Control-Voltage Electrical Power Cables."

3.5 .STARTUP SERVICE:

A. Perform startup service.

1. Complete installation and startup checks in accordance with manufacturer's written instructions.
2. Verify that shipping, blocking, and bracing are removed.
3. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
4. Verify that cleaning and adjusting are complete.

BY OTHERS

5. For direct-drive fans, verify proper motor rotation direction and verify fan wheel free rotation and smooth bearing operation.
6. For belt-drive fans, disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
7. Adjust belt tension.
8. Adjust damper linkages for proper damper operation.
9. Verify lubrication for bearings and other moving parts.
10. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
11. Disable automatic temperature-control operators, energize motor and confirm proper motor rotation and unit operation, adjust fan to indicated rpm, and measure and record motor voltage and amperage.
12. Shut unit down and reconnect automatic temperature-control operators.
13. Remove and replace malfunctioning units and retest as specified above.

3.6 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Lubricate bearings.

D. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.7 CLEANING

A. After completing system installation and testing, adjusting, and balancing and after completing startup service, clean fans internally to remove foreign material and construction dirt and dust

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Fan Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Fans and components will be considered defective if they do not pass tests and inspections.

B. Prepare test and inspection reports.

3.9 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain centrifugal fans.

END OF SECTION 233416

PENNBARRY

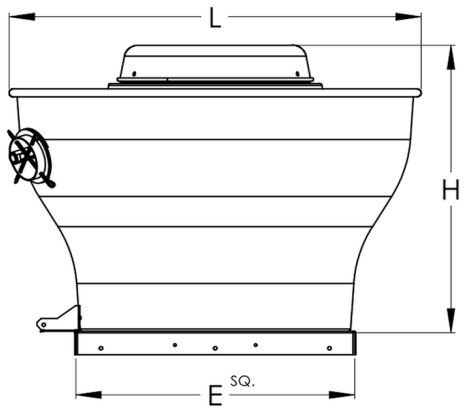
Tag: EF-2-1
Project: Tomball Hospital and AS
Office: VICON EQUIPMENT IN
Version: 1.0.00
Preparer: Nick Munch
Date: 07/07/2022

FX16Q2GP

Roof Mounted Upblast Spun Aluminum Exhaust Fan

Quantity: 1
Special: None

Dimensions



Unit Size	Motor Efficiency	Motor Speed
16	G - Green Plus ECM	S - 1725 RPM

E	H	L	Weight
20.5	22.375	30.75	73

Standard Construction Features

- Two (2) patented wheel designs
- Unique internal bracing design transfers weight directly to curb; no spun parts supply structural support
- Welded curb cap available as either galvanized or aluminum
- Popular direct drive sizes use multi-speed motors for maximum flexibility
- Direct drive (Open/TE) motors include overload protection as standard
- Plug-Disconnect and pre-wired junction box (1-speed ODP motors up to 3/4 HP)

Accessories

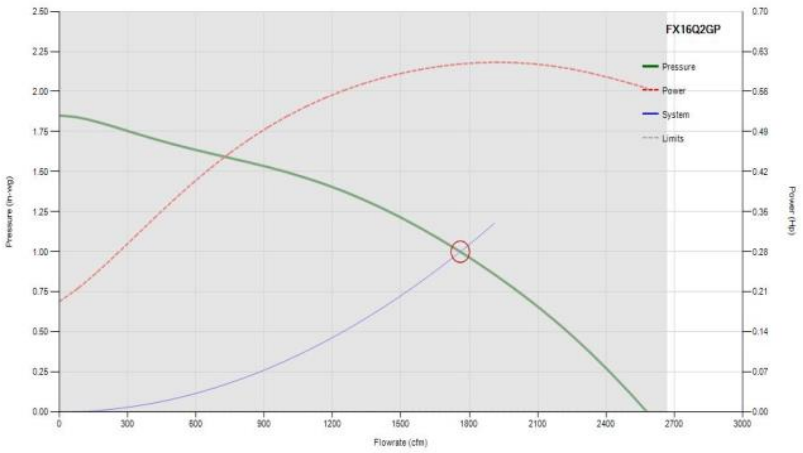
Temperature: 70
UL / ETL Listing: 1 - UL 705
Unit Size: 16
Application: E - Exhaust
Drive Type: D - Direct
Unit Material: A - Aluminum
Motor Efficiency: G - Green Plus ECM
Motor Speed: S - 1725 RPM
Service Switches: A - NEMA 1 - loose
Internal Wiring: 1 - NEMA 1
Damper Holding Plate: P - Plate
Spark Resistance Construction: C - AMCA C Spark Resistance
115V Motorized Damper

-ENSURE ENCLOSURE AND SERVICE SWITCH ARE RATED NEMA 3R.

- COORDINATE WITH ELECTRICAL CONTRACTOR TO PROVIDE 115V POWER FOR MOTORIZED DAMPER. MOTORIZED DAMPER SHALL BE CIRCUITED TO PANEL LEQB-2 VIA 2#12,1#12G, 3/4"C. PROVIDE 20A/1P BREAKER. PROVIDE NEMA 3R MOTOR RATED SWITCH FOR LOCAL DISCONNECTING MEANS.

(continued)

Performance



Operating Point

Volume (CFM)	~~1780~~ 1920
Static Pressure (in. wg)	1
Fan RPM	1575
Horse Power (BHP)	0.61
Elevation (ft)	0
Temperature (°F)	70
Drive Loss (%)	N/A

Motor Information

Motor HP	0.75 - 3/4 HP
Volt/Ph/Hz	230V /1/ 60
Enclosure	4 - OPAO
NEC FLA*	6.9
Weight+ (lbs)	C/F

* NEC FLA - based on tables 430.248 or 430.250 of National Electrical Code 2014. Actual motor FLA may vary depending on motor manufacturer.
+ Motor weight may vary depending on supplier

SOUND POWER

OCTAVE POWER CENTER FREQUENCY (hz)							
63	125	250	500	1000	2000	4000	8000
69	77	80	70	65	65	61	54

LWA	dBA	Sones
75	63.3	12.45

LwA - Weighted sound power, based on ANSI S1.4, dBA - Weighted sound pressure, based on 11.5 dB attenuation per Octave band at 5 ft. Sones - calculated using AMCA 301 at 5 ft.

PENNBARRY

Tag: EF-2-1
Project: Tomball Hospital and ASC
Office: VICON EQUIF **Preparer:** Nick Munch
Version: 1.0.00 **Date:** 07/07/2022

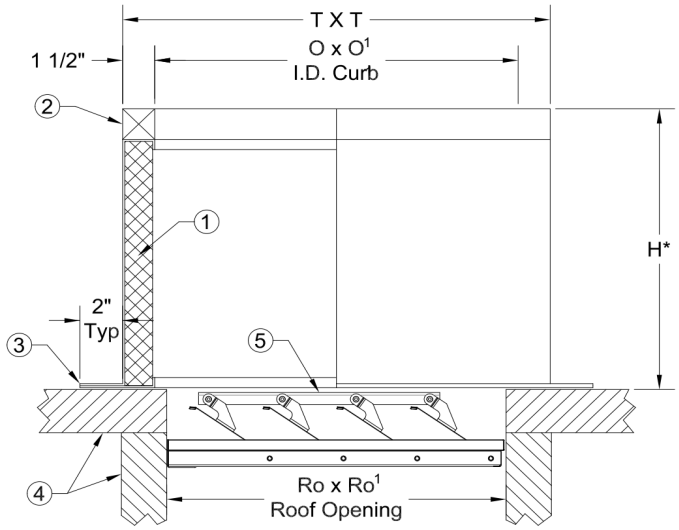
Roof Curb

Prefabricated Roof Curbs

Quantity: 1
Special: None

Product Image

Roof Curb



- Curb Model: UG14
- Heavy-gauge steel with welded corner seams shall cover 1-1/2" thick 3 lb. density fiberglass insulation.
- A 1-1/2" wide wood nailer (Unibeam) with top surface is provided for fan installation and/or roofing paper.
- Flat (single or double pitch optional) curb fastening flange shall be Cantless.
- Optional vented sides available without fiberglass insulation.

Model Parent	T	T'	O	O'	H	Ro	Ro'
FX16D	19	19	16	16	14	16	16

Options or Accessories Listing

Damper Holding Plate P - Plate
Height 14
Model Parent FX16Q2GP
Slope Side 0 - None
Wood Nailer W - Wooden Nailer

Schedule

ID	Quantity	Tag
1	1	EF-2-1

PENNBARRY

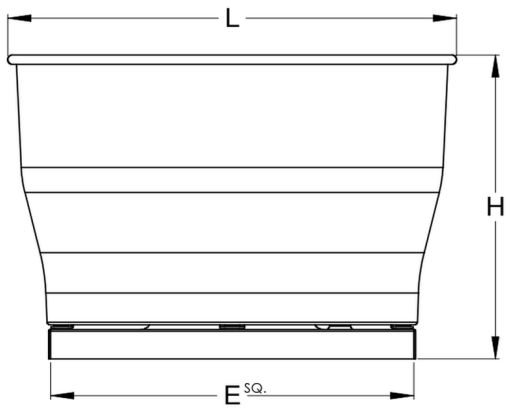
Tag: EF-2-3
Project: Tomball Hospital and AS
Office: VICON EQUIPMENT IN
Version: 1.0.00
Preparer: Nick Munch
Date: 07/07/2022

FX11QGP

Roof Mounted Upblast Spun Aluminum Exhaust Fan

Quantity: 1
Special: None

Dimensions



Unit Size	Motor Efficiency	Motor Speed
11	G - Green Plus ECM	S - 1725 RPM

E	H	L	Weight
18.5	14.125	25	44

Standard Construction Features

- Two (2) patented wheel designs
- Unique internal bracing design transfers weight directly to curb; no spun parts supply structural support
- Welded curb cap available as either galvanized or aluminum
- Popular direct drive sizes use multi-speed motors for maximum flexibility
- Direct drive (Open/TE) motors include overload protection as standard
- Plug-Disconnect and pre-wired junction box (1-speed ODP motors up to 3/4 HP)

Accessories

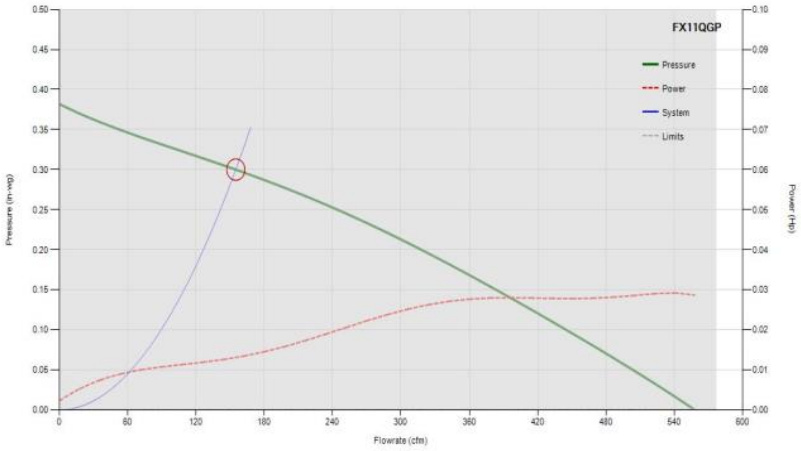
Temperature: 70
UL / ETL Listing: 1 - UL 705
Unit Size: 11
Application: E - Exhaust
Drive Type: D - Direct
Unit Material: A - Aluminum
Motor Efficiency: G - Green Plus ECM
Motor Speed: S - 1725 RPM
Service Switches: A - NEMA 1 - loose
Internal Wiring: 1 - NEMA 1
Damper Holding Plate: P - Plate
Spark Resistance Construction: C - AMCA C Spark Resistance
Model Parent: FX11D
115V Motorized Dmaper

-ENSURE ENCLOSURE AND SERVICE SWITCH ARE RATED NEMA 3R.

- COORDINATE WITH ELECTRICAL CONTRACTOR TO PROVIDE 115V POWER FOR MOTORIZED DAMPER. MOTORIZED DAMPER SHALL BE CIRCUITED TO PANEL LEQB-2 VIA 2#12,1#12G, 3/4"C. PROVIDE 20A/1P BREAKER. PROVIDE NEMA 3R MOTOR RATED SWITCH FOR LOCAL DISCONNECTING MEANS.

(continued)

Performance



Operating Point	
Volume (CFM)	155
Static Pressure (in. wg)	0.3
Fan RPM	931
Horse Power (BHP)	0.01
Elevation (ft)	0
Temperature (°F)	70
Drive Loss (%)	N/A

Motor Information	
Motor HP	0.25 - 1/4 HP
Volt/Ph/Hz	230V /1/ 60
Enclosure	5 - ODP
NEC FLA*	2.9
Weight+ (lbs)	C/F

* NEC FLA - based on tables 430.248 or 430.250 of National Electrical Code 2014. Actual motor FLA may vary depending on motor manufacturer.
+ Motor weight may vary depending on supplier

SOUND POWER							
OCTAVE POWER CENTER FREQUENCY (hz)							
63	125	250	500	1000	2000	4000	8000
68	65	52	47	45	43	35	26

LWA	dBA	Sones
53	41.9	3.23

LwA - Weighted sound power, based on ANSI S1.4, dBA - Weighted sound pressure, based on 11.5 dB attenuation per Octave band at 5 ft. Sones - calculated using AMCA 301 at 5 ft.

PENNBARRY

Tag: EF-2-3
Project: Tomball Hospital and ASC
Office: VICON EQUIF **Preparer:** Nick Munch
Version: 1.0.00 **Date:** 07/07/2022

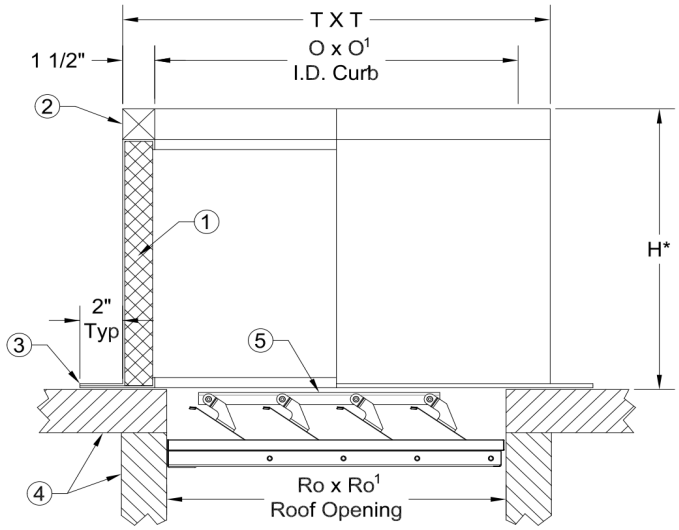
Roof Curb

Prefabricated Roof Curbs

Quantity: 1
Special: None

Product Image

Roof Curb



- Curb Model: UG14
- Heavy-gauge steel with welded corner seams shall cover 1-1/2" thick 3 lb. density fiberglass insulation.
- A 1-1/2" wide wood nailer (Unibeam) with top surface is provided for fan installation and/or roofing paper.
- Flat (single or double pitch optional) curb fastening flange shall be Cantless.
- Optional vented sides available without fiberglass insulation.

Model Parent	T	T'	O	O'	H	Ro	Ro'
FX11D	17	17	14	14	14	11.5	11.5

Options or Accessories Listing

Damper Holding Plate P - Plate
Height 14
Model Parent FX11QGP
Roof Anchor FX11D
Slope Side 0 - None
Wood Nailer W - Wooden Nailer

Schedule

ID	Quantity	Tag
1	1	EF-2-3

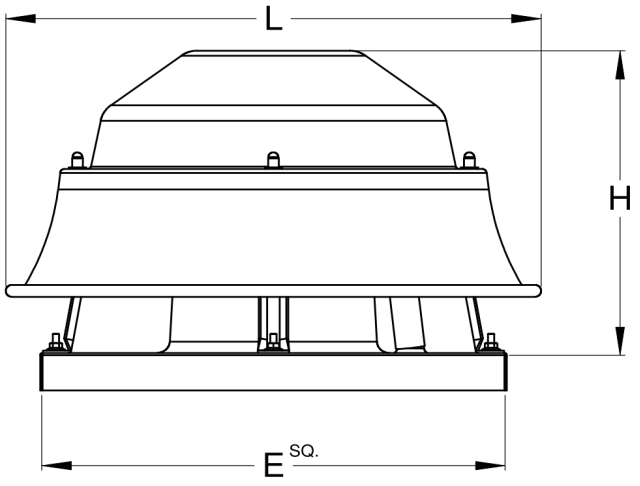
PENNBARRY

Tag: ~~EF-2-2~~ EF-2-5
Project: Tomball Hospital and AS
Office: VICON EQUIPMENT IN
Version: 1.0.00
Preparer: Nick Munch
Date: 07/07/2022

DX11QGP

Quantity: 1
Special: None

Dimensions



Unit Size	E	H	L	Weight
11	18.5	18.5	21.44	48

Standard Construction Features

- Weatherproof Housing
- Heavy Gauge Spun Aluminum Construction
- Aluminum Centrifugal Fan Wheels Statically & Dynamically balanced
- Spark-resistant, Non-overloading
- Aluminum spun venturis
- Continuous Duty Motors
- AMCA Licensed Ratings Seal for Air & Sound Performance (DX)
- UL and cUL Listed

Accessories

Temperature: 70
UL / ETL Listing: 1 - UL 705
Unit Size: 11
Drive Type: D - Direct
Motor Efficiency: G - Green Plus ECM
Motor Speed: S - 1725 RPM
Controllers: A - 0-10V Output Potentiometer
Service Switches: A - NEMA 1 - loose
Internal Wiring: 1 - NEMA 1
Spark Resistance Construction: C - AMCA C Spark Resistance
Model Parent: DX11D
Application: E - Exhaust

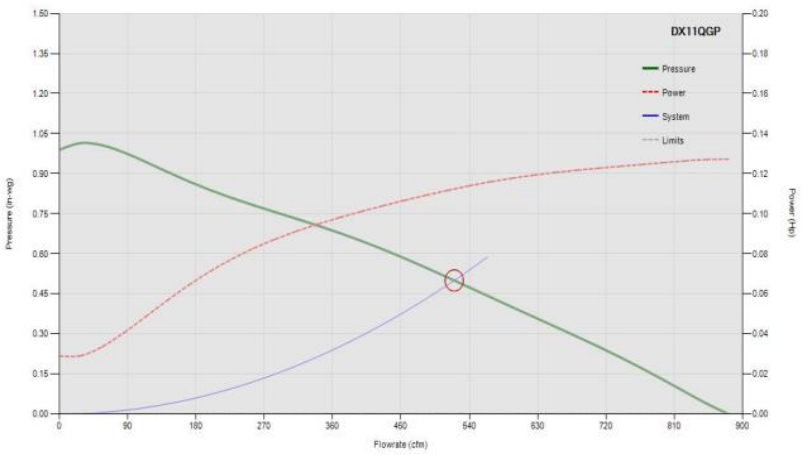
115V Motorized Damper

-ENSURE ENCLOSURE AND SERVICE SWITCH ARE RATED NEMA 3R.

- COORDINATE WITH ELECTRICAL CONTRACTOR TO PROVIDE 115V POWER FOR MOTORIZED DAMPER. MOTORIZED DAMPER SHALL BE CIRCUITED TO PANEL LEQB-2 VIA 2#12,1#12G, 3/4"C. PROVIDE 20A/1P BREAKER. PROVIDE NEMA 3R MOTOR RATED SWITCH FOR LOCAL DISCONNECTING MEANS.

(continued)

Performance



Operating Point	
Volume (CFM)	520
Static Pressure (in. wg)	0.5
Fan RPM	1523
Horse Power (BHP)	0.11
Elevation (ft)	0
Temperature (°F)	70
Drive Loss (%)	N/A

Motor Information	
Motor HP	0.25 - 1/4 HP
Volt/Ph/Hz	115V /1/ 60
Enclosure	2 - TENV
NEC FLA*	5.8
Weight+ (lbs)	C/F

* NEC FLA - based on tables 430.248 or 430.250 of National Electrical Code 2014. Actual motor FLA may vary depending on motor manufacturer.
+ Motor weight may vary depending on supplier

SOUND POWER							
OCTAVE POWER CENTER FREQUENCY (hz)							
63	125	250	500	1000	2000	4000	8000
68	76	68	58	58	55	50	41

LWA	dBA	Sones
65	54	7.45

LwA - Weighted sound power, based on ANSI S1.4, dBA - Weighted sound pressure, based on 11.5 dB attenuation per Octave band at 5 ft. Sones - calculated using AMCA 301 at 5 ft.

-ENSURE ENCLOSURE AND SERVICE SWITCH ARE RATED NEMA 3R.

- COORDINATE WITH ELECTRICAL CONTRACTOR TO PROVIDE 115V POWER FOR MOTORIZED DAMPER. MOTORIZED DAMPER SHALL BE CIRCUITED TO PANEL LEQB-2 VIA 2#12,1#12G, 3/4"C. PROVIDE 20A/1P BREAKER. PROVIDE NEMA 3R MOTOR RATED SWITCH FOR LOCAL DISCONNECTING MEANS.

PENNBARRY

Tag: ~~EF-2-2~~ EF-2-5
Project: Tomball Hospital and ASC
Office: VICON EQUIF **Preparer:** Nick Munch
Version: 1.0.00 **Date:** 07/07/2022

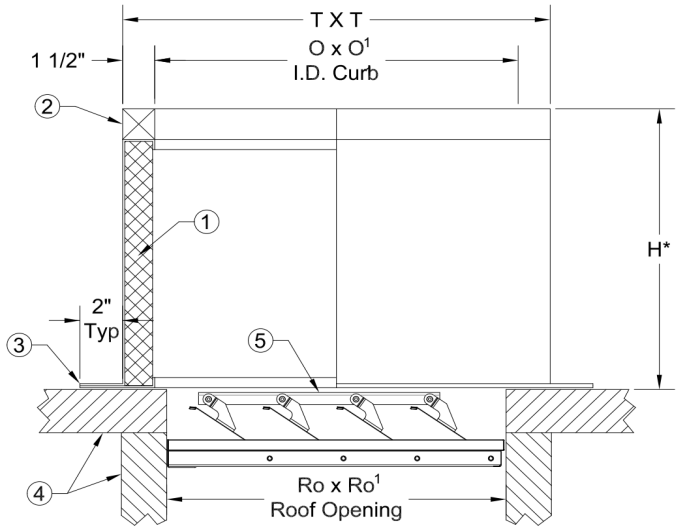
Roof Curb

Prefabricated Roof Curbs

Quantity: 1
Special: None

Product Image

Roof Curb



- Curb Model: UG14
- Heavy-gauge steel with welded corner seams shall cover 1-1/2" thick 3 lb. density fiberglass insulation.
- A 1-1/2" wide wood nailer (Unibeam) with top surface is provided for fan installation and/or roofing paper.
- Flat (single or double pitch optional) curb fastening flange shall be Cantless.
- Optional vented sides available without fiberglass insulation.

Model Parent	T	T'	O	O'	H	Ro	Ro'
DX11D	17	17	14	14	14	11.5	11.5

Options or Accessories Listing

Height 14
Model Parent DX11QGP
Roof Anchor DX11D
Wood Nailer W - Wooden Nailer

Schedule

ID	Quantity	Tag
1	1	EF-2-2

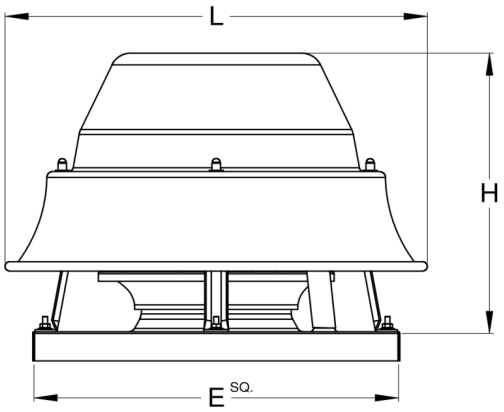
PENNBARRY

Tag: ~~EF-2-5~~ EF-2-2
Project: Tomball Hospital and AS
Office: VICON EQUIPMENT IN
Version: 1.0.00
Preparer: Nick Munch
Date: 07/07/2022

DX13RGP

Quantity: 1
Special: None

Dimensions



Unit Size	Motor Speed	Motor Efficiency
13	Q - 1550 RPM	G - Green Plus ECM

E	H	L	Weight
18.5	18.5	21.44	51

Standard Construction Features

- Weatherproof Housing
- Heavy Gauge Spun Aluminum Construction
- Aluminum Centrifugal Fan Wheels Statically & Dynamically balanced
- Spark-resistant, Non-overloading
- Aluminum spun venturis
- Continuous Duty Motors
- AMCA Licensed Ratings Seal for Air & Sound Performance (DX)
- UL and cUL Listed

Accessories

Temperature: 70
UL / ETL Listing: 1 - UL 705
Unit Size: 13
Drive Type: D - Direct
Motor Efficiency: G - Green Plus ECM
Motor Speed: Q - 1550 RPM
Service Switches: A - NEMA 1 - loose
Internal Wiring: 1 - NEMA 1
Spark Resistance Construction: C - AMCA C Spark Resistance
Model Parent: DX13D
Application: E - Exhaust

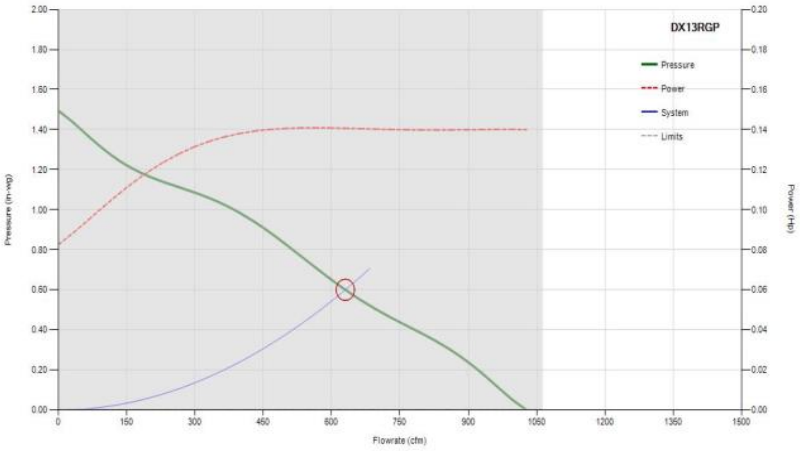
115V Motorized Dmaper

-ENSURE ENCLOSURE AND SERVICE SWITCH ARE RATED NEMA 3R.

- COORDINATE WITH ELECTRICAL CONTRACTOR TO PROVIDE 115V POWER FOR MOTORIZED DAMPER. MOTORIZED DAMPER SHALL BE CIRCUITED TO PANEL LEQB-2 VIA 2#12,1#12G, 3/4"C. PROVIDE 20A/1P BREAKER. PROVIDE NEMA 3R MOTOR RATED SWITCH FOR LOCAL DISCONNECTING MEANS.

(continued)

Performance



Operating Point	
Volume (CFM)	630
Static Pressure (in. wg)	0.6
Fan RPM	1511
Horse Power (BHP)	0.14
Elevation (ft)	0
Temperature (°F)	70
Drive Loss (%)	N/A

Motor Information	
Motor HP	0.167 - 1/6 HP
Volt/Ph/Hz	115V /1/ 60
Enclosure	5 - ODP
NEC FLA*	4.4
Weight+ (lbs)	C/F

* NEC FLA - based on tables 430.248 or 430.250 of National Electrical Code 2014. Actual motor FLA may vary depending on motor manufacturer.
+ Motor weight may vary depending on supplier

SOUND POWER							
OCTAVE POWER CENTER FREQUENCY (hz)							
63	125	250	500	1000	2000	4000	8000
68	70	73	62	58	55	51	45

LWA	dBA	Sones
67	55.8	7.95

LwA - Weighted sound power, based on ANSI S1.4, dBA - Weighted sound pressure, based on 11.5 dB attenuation per Octave band at 5 ft. Sones - calculated using AMCA 301 at 5 ft.

PENNBARRY

Tag: ~~EF-2-5~~ EF-2-2
Project: Tomball Hospital and ASC
Office: VICON EQUIF **Preparer:** Nick Munch
Version: 1.0.00 **Date:** 07/07/2022

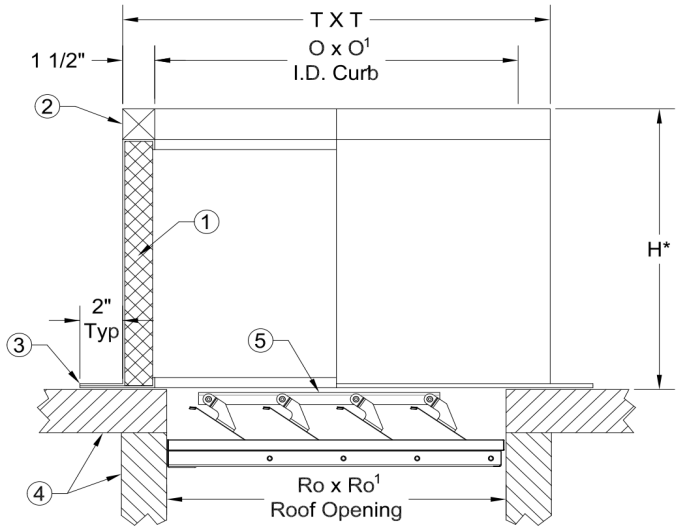
Roof Curb

Prefabricated Roof Curbs

Quantity: 1
Special: None

Product Image

Roof Curb



- Curb Model: UG14
- Heavy-gauge steel with welded corner seams shall cover 1-1/2" thick 3 lb. density fiberglass insulation.
- A 1-1/2" wide wood nailer (Unibeam) with top surface is provided for fan installation and/or roofing paper.
- Flat (single or double pitch optional) curb fastening flange shall be Cantless.
- Optional vented sides available without fiberglass insulation.

Model Parent	T	T'	O	O'	H	Ro	Ro'
DX13D	17	17	14	14	14	11.5	11.5

Options or Accessories Listing

Height 14
Model Parent DX13RGP
Roof Anchor DX13D
Wood Nailer W - Wooden Nailer

Schedule

ID	Quantity	Tag
1	1	EF-2-5

PENNBARRY

Tag: EF-2-4
Project: Tomball Hospital and AS
Office: VICON EQUIPMENT IN
Version: 1.0.00
Preparer: Nick Munch
Date: 07/07/2022

VCR-SWSI-BI 105 DD

Free Standing Centrifugal Fan

Quantity: 1
Special: None

Feature Industrial

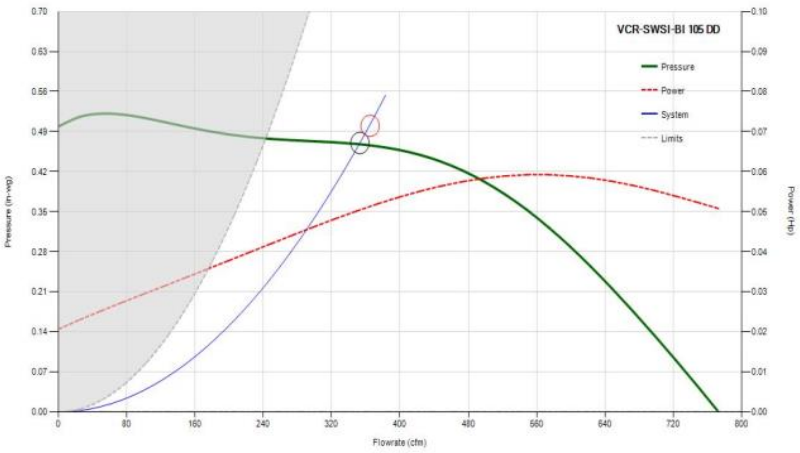
Product Description

- Heavy gauge steel, continuously welded housing
- Wheels are standard mild steel construction
- Shafts are precision turned ground & polished solid steel for critical speed of 125% maximum
- Statically and dynamically balanced
- Heavy duty, self-aligning bearings
- Corrosion resistant painted finish

Accessories

Temperature: 70
Unit Size: 105
Drive Type: D - Direct
Class: 1 - Class I
Arrangement: 4 - Arr. 4
Rotation/Discharge: G - CCW TH
Unit Material: H - Mild Steel
Paint/Coating: A - Standard Enamel
Motor Efficiency: P - Premium
Service Switches: D - NEMA 3R - loose
Internal Wiring: 3 - NEMA 3R
Application: E - Exhaust
Flange: 0 - None
Motor, Shaft and Belt Guards: C - Weather/Motor Cover
Inlet Flange: G - Punched Companion Flange Kit
Outlet Flange: H - Punched Companion Flange Kit
Vibration Isolator: 5 - Housed Spring Floor

Performance



Operating Point

Volume (CFM)	~~353~~ 365
Static Pressure (in. wg)	0.47
Fan RPM	1150
Horse Power (BHP)	0.05
Elevation (ft)	0
Temperature (°F)	70
Drive Loss (%)	N/A

Motor Information

Motor HP	0.25 - 1/4 HP
Volt/Ph/Hz	460V /3/ 60
Enclosure	1 - TEFC
NEC FLA*	0
Weight+ (lbs)	C/F

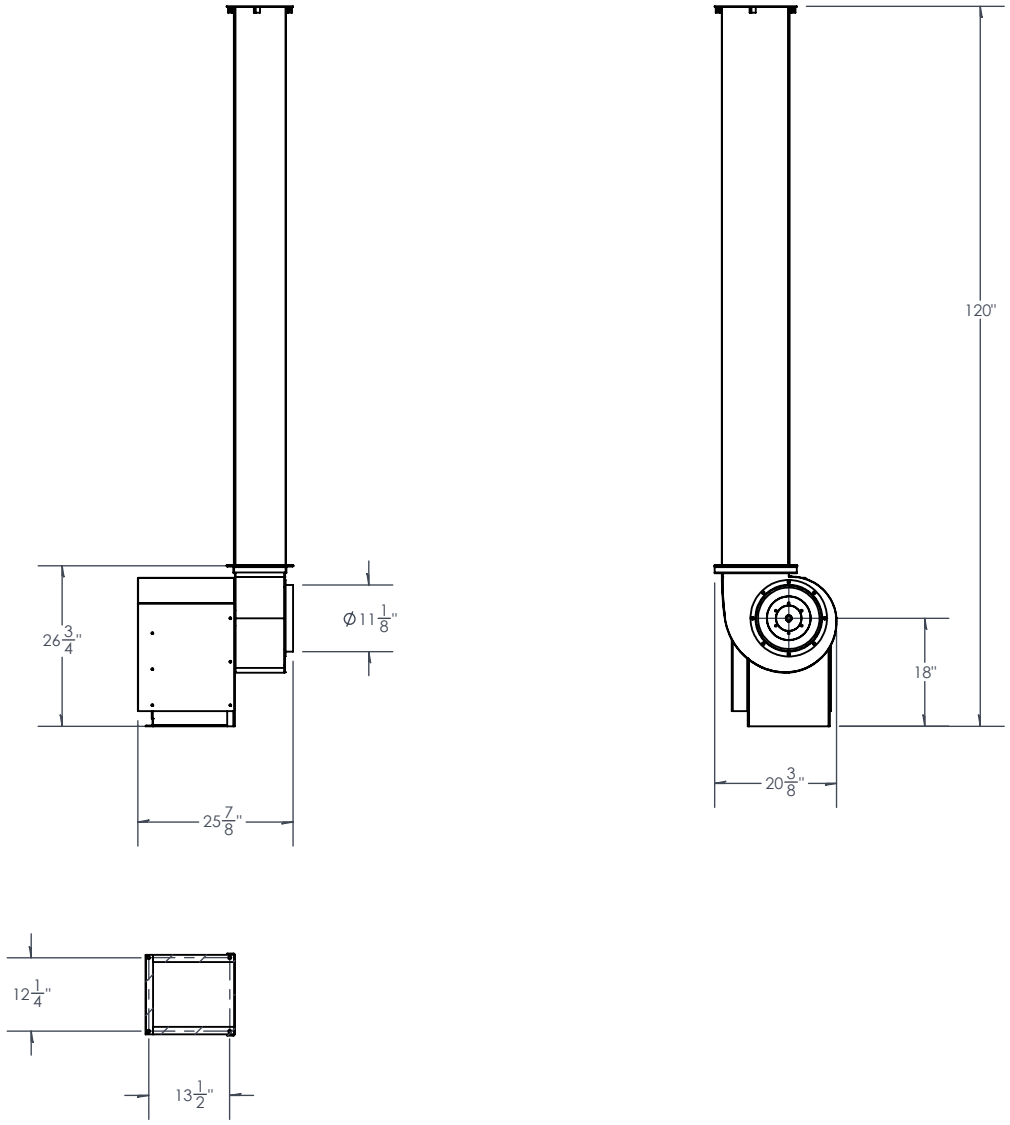
* NEC FLA - based on tables 430.248 or 430.250 of National Electrical Code 2014. Actual motor FLA may vary depending on motor manufacturer.
+ Motor weight may vary depending on supplier

Feature Industrial (continued)

SOUND POWER							
OCTAVE POWER CENTER FREQUENCY (hz)							
63	125	250	500	1000	2000	4000	8000
63	63	63	60	55	55	54	51

LWA	dBA	Sones
63	51.3	6.24

LwA - Weighted sound power, based on ANSI S1.4, dBA - Weighted sound pressure, based on 11.5 dB attenuation per Octave band at 5 ft. Sones - calculated using AMCA 301 at 5 ft.



CUSTOMER DATA

ORDER	ITEM	CUST PO NO	TAG	QTY
-	-	-	-	-

SOLD TO	REPRESENTATIVE NAME
-	-

FAN DATA

PROD	SIZE	WHL	CLASS	ARRG	WIDTH(% STD)	ROT	DISCH
VCR	105	BI	1	4	-	CCW	UB

SHAFT & BEARING DATA

SFT DIA	KWY	BRG DIA	L-10	ADDITIONAL DATA
-	-	-	-	-

PERF DATA @ OPER COND

CFM	SP	RPM	BHP	OV	TEMP°F	ELEV
335	.47	1150	-	-	70	-

MOTOR DATA

HP	RPM	ENCL	FRAME	V/HZ/PH	POS	SUP	MTD
.25	1200			460/3/60			

ADDITIONAL MOTOR DATA

-

DRIVE DATA

TYPE	SERV FACT	BELT CENTERS	SUP	MTD
DD	-	-	-	-

ACCESSORIES

WEATHER COVER

BOLTED ACCESS DOOR

10' OVER ALL DISCHARGE

-

-

NOTES

-

-

-

-

-

-

-

-

-

-

REVISIONS

-	-	-
-	-	-
-	-	-
-	-	-
-	-	-

PENNBARRY

DRN	CHK	DATE	SCALE
CBL	-	5/31/2022	-

DRAWING NO	DASH NO.	PART DWG. NO	REV.
22021350	01	-	-

PENNBARRY

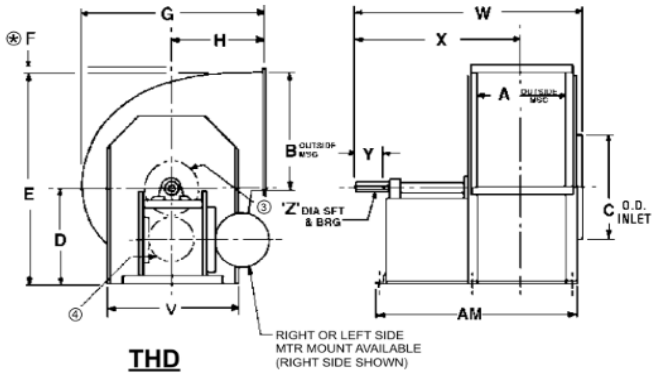
Tag: EF-2-4
Project: Tomball Hospital and AS
Office: VICON EQUIPMENT IN
Preparer: Nick Munch
Version: 1.0.00
Date: 07/07/2022

VCR-SWSI-BI 105 DD

Free Standing Centrifugal Fan

Quantity: 1
Special: None

Feature Industrial

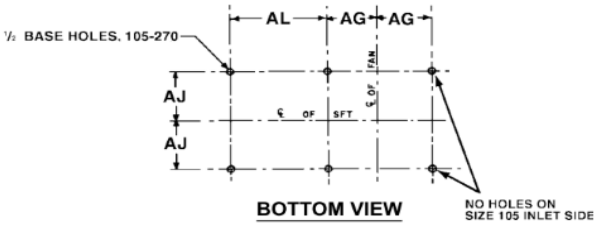


THD

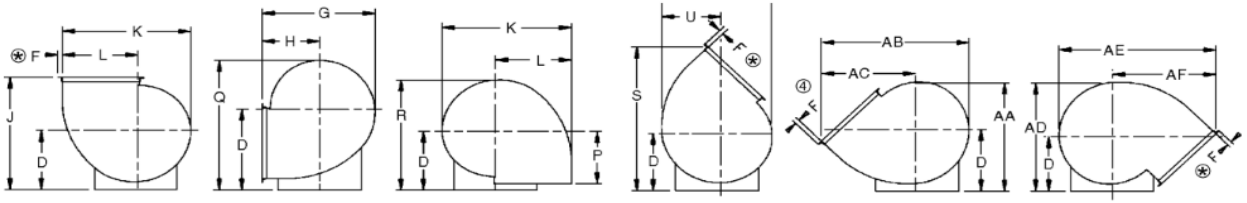
Discharge angles optional on all sizes. (Hole punching optional on all sizes.)

Notes

1. CW rotation shown; CCW rotation similar but opposite.
2. On Arrangement 9, the standing motor position is left side for CW units and right side for CCW units.
3. Dimensions for Arrangement 4 are the same as shown except motor is mounted on pedestal in lieu of shaft and bearings.
4. On Arrangement 10, the motor is located within the pedestal. Housing is field rotatable to the discharges shown.
5. Unit size 105 has no inlet stand.



BOTTOM VIEW



UBD BHD DBD TAUD 45° BAUD 45° TADD 45°

Feature Industrial (continued)

Unit Size	A	B	C	D	E	F	G	H	J	K	L	P	R
105	8.75	11.19	11.12	18	29.12	1.25	17.69	8.62	26.62	19.12	11.12	8.62	27.06

S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF
32	17	9.56	13.44	25.56	20.06	2	1	25.44	22.5	14	27.56	24.38	15.88

AG	AJ	AL	AM	Impeller Type
5.06	6.12	13.5	24.62	B - Backward Inclined

PENNBARRY

Tag:
Project: Tomball Hospital and ASC
Office: VICON EQUIF **Preparer:** Nick Munch
Version: 1.0.00 **Date:** 07/07/2022

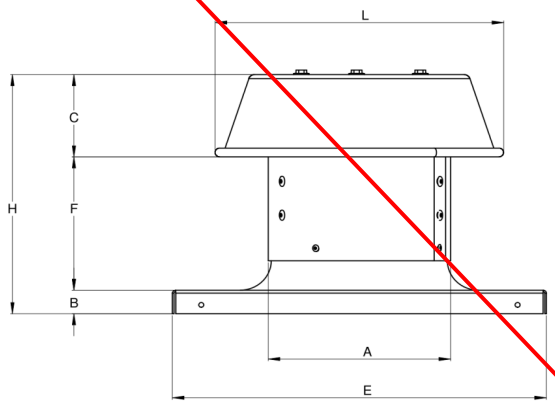
WCC08

Roof Mounted Spun Aluminum Gravity Ventilator (Curb Base)

Quantity: 1
Special: None

Product Image

WCC



Spun Aluminum Gravity Rooftop exhaust (relief) or supply (fresh air) ventilator shall be Weather Cap WCC (curb

Constructed of a heavy-gauge spun aluminum dome, aluminum base and airshaft, and galvanized internal bracing. Dome

Airshaft overlaps base venturi and is sealed to prevent water entry. Dome fasteners are sealed and dome is easily removable.

All units are provided with bird screen.

Unit Size	A	B	C	E sqr	F	H	L	D sqr	Ship Volume
08	9	1.5	5.5	18.5	4	11	18.5	11.25	4

Ship Weight	CFM	Static Pressure	Throat Area	Throat Velocity	VelP
8	50	.01	0.442	113.2	0.001

Pressure Drop	HoodVelocity
0.002	39.0

Options or Accessories Listing

Application E - Exhaust
Unit Size 08
Damper Holding Plate P - Plate
Flange 0 - None

Schedule

ID	Quantity	Tag	CFM	Static Pressure	Temperature	Altitude
1	1	GV-1	50	.01	0	0

PENNBARRY

Tag:
Project: Tomball Hospital and ASC
Office: VICON EQUIF **Preparer:** Nick Munch
Version: 1.0.00 **Date:** 07/07/2022

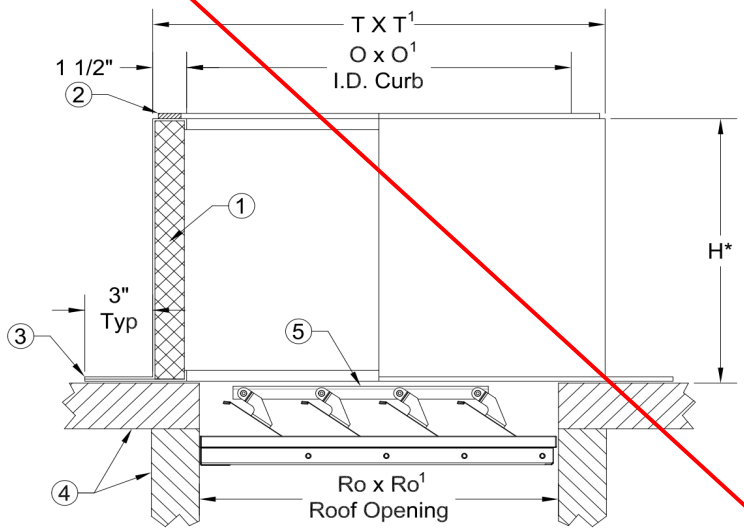
Roof Curb

Prefabricated Roof Curbs

Quantity: 1
Special: None

Product Image

Roof Curb



- Heavy-gauge steel with welded corner seams and neoprene gasket (Self-Flashing) top surface is provided for fan installation and/or roofing paper.
- Flat (single or double pitch optional) curb fastening flange shall be Cantless.
- Optional vented sides available without fiberglass insulation.

Model Parent	T	T'	O	O'	RO	RO'
WCC08	17	17	14	14	11.5	11.5

Options or Accessories Listing

Damper Holding Plate P - Plate
Height 12
Model Parent WCC08

Schedule

ID	Quantity	Tag
1	1	GV-1

Fumex

(Standard, Heat & Smoke & Restaurant Exhaust) Centrifugal Roof & Wall: Direct & Belt Drive Exhausters

OPERATION & MAINTENANCE MANUAL

IMPORTANT! Read before proceeding!

Please read and save these instructions. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage! Retain instructions for future reference.

TABLE OF CONTENTS

INTRODUCTION

Description

These laboratory fume hoods were designed for severe service removing foul air from industrial and commercial buildings. The housing and wheel are constructed of aluminum; heat and smoke removal utilizes a steel wheel. Motor compartment is externally cooled and located out of the discharge air stream. Power ventilators suitable for Restaurant Exhaust Appliances (YZHW) are accordingly labeled. Power ventilators suitable for smoke removal are accordingly labeled. These units require installation according to NFPA-96 standards, local codes and general practices. Sizes up to Model 24B are available as wall mounted units (WFX).

Receiving and handling

PennBarry fans are carefully inspected before leaving the factory. When the unit is received, inspect the carton for any signs of tampering. Inspect the unit for any damage that may have occurred during transit and check for loose, missing or damaged parts. Mishandled units can void the warranty provisions. If units are damaged in transit, it is the responsibility of the receiver to make all claims against the carrier. PennBarry is not responsible for damages incurred during shipment.

Avoid severe jarring and/or dropping. Handle units with care to prevent damage to components or finishes. If the unit is scratched due to mishandling, the protective coating may be damaged. Incorrect lifting may damage the fan and void the warranty.

Storage

Long-term storage requires special attention. Store units on a level, solid surface, preferably indoors. If outside storage is necessary, protect the units against moisture and dirt by encasing the cartons in plastic or in some similar weatherproof material. Periodically inspect units and rotate wheels to spread bearing lubricant. Failure to rotate wheels results in reduced bearing life and may void the manufacturer's warranty. If the unit will be stored for an extended time, remove belts. Belts which remain under tension in a stationary position for extended periods are likely to have a reduced operating life.

Unpacking

Place the carton in an upright position and remove the staples or use a sharp (knife edge) tool to carefully cut or scribe the sealing tape on both sides at the top of the carton. Open carton flaps. Remove any cardboard and wooden filler pieces, as well as loose components or accessories shipped with the unit.

Carefully remove the unit from the carton. Inspect the unit for any damage that may have occurred during transit and check for loose, missing or damaged parts.

INSTALLATION

CAUTION

When the unit is installed on a sloped roof, suitable footing and/or other safety devices must be provided around the ventilator for normal maintenance. Depending upon the site conditions, the hinging of the ventilator off the curb during maintenance should be either parallel to the roof ridge or toward the roof ridge but NOT away from the ridge.

CAUTION

NFPA-96 recommends that dampers should not be installed when exhauster is used for the removal of smoke and grease laden vapors from commercial cooking equipment. Consult state and local codes for detailed requirements.

CAUTION

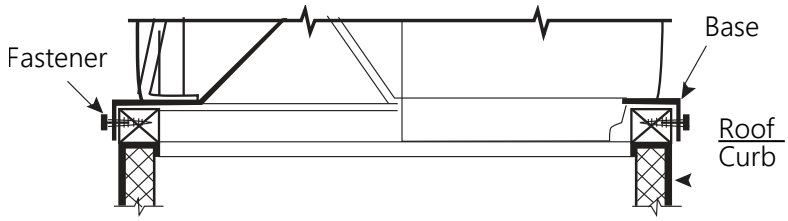
For installation in high velocity hurricane zones, unit must be installed per instructions under Anchoring and Installing the Ventilator

WARNING

To fulfill our obligations towards Article 33, in accordance to European REACH Regulation No 1907/2006 EC, we hereby inform you that this article contains the following Substances of Very High Concern mentioned on the Candidate list:

- Lead

Figure 1: Roof Curb Installation



DAMPERS: ROOF MOUNTING

When required, install dampers prior to mounting the unit on the curb or frame. Dampers are sized to fit within the roof opening. Secure using standard hardware. If the damper is installed on the inside of the curb, a piece of wood may be required as a "spacer". Do not twist or distort the damper frame. Damper frame must be reasonably level on all sides. Check for free operation. If dampers are motor operated type, ascertain that proper voltage is applied on motor terminals.

ANCHORING AND INSTALLING THE VENTILATOR

Roof mounting must be in accordance with the latest edition of NFPA-96 and local codes. If not specified by codes, secure unit to curb through pre-punched holes in the ventilator base's vertical flange (see Figure 1 below).

In order to complete some installations, specifically kitchen exhaust, you will require an 18" high curb as well as a weather resistant junction box and hinge assembly.

Guy down large units installed in areas subject to high winds or unusual field conditions. If the installer removes any ventilator parts to facilitate installation or electrical connection, reassemble all parts by replacing all spacers, washers, nuts, bolts, fasteners and components exactly as they were found prior to removal. Draw all fasteners tight and secure.

FLOATING HINGE INSTRUCTIONS

1. If any gasket is to be field installed, this should be completed before installing the floating hinge. If a grease collection box will be installed, it should be installed after the floating hinge is and not on either the hinge or handle sides of the unit.
2. If this item is provided, hardware is included. Review figure 2 for illustrations regarding this installation.
3. Take backplate and position inside the pedestal, flush with both the top and rear vertical surfaces, to allow for the pedestal metal thickness. Use this plate as a template to mark the hole locations. Drill two "3/8" diameter holes through curb or pedestal. Fasten with two (2) 3/8-16 X 1/2" whiz bolts and nuts as shown in the drawing. Do this for both sides of the pedestal.
4. Bolt both backplates in place INSIDE the pedestal. Slide bushing over the rear most backplate bolt.

INSTALLATION

Figure 2: Floating Hinge Installation

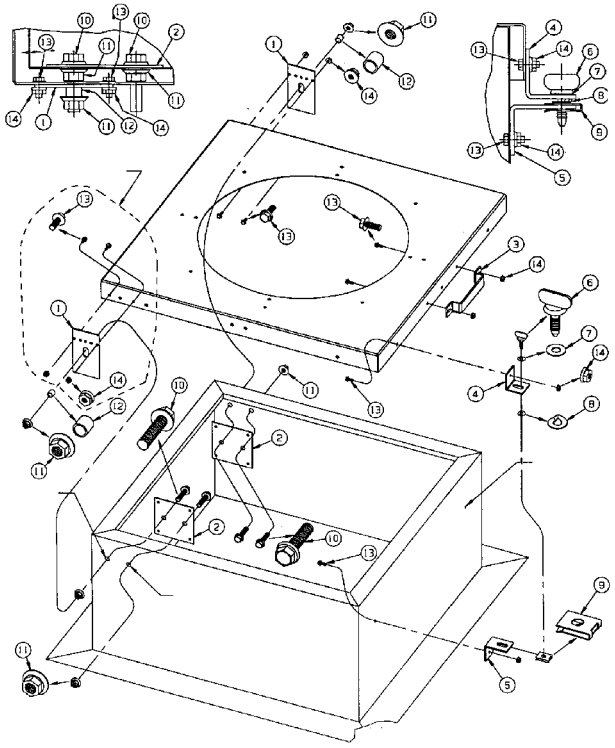


Figure 3: Wall Mount Installation

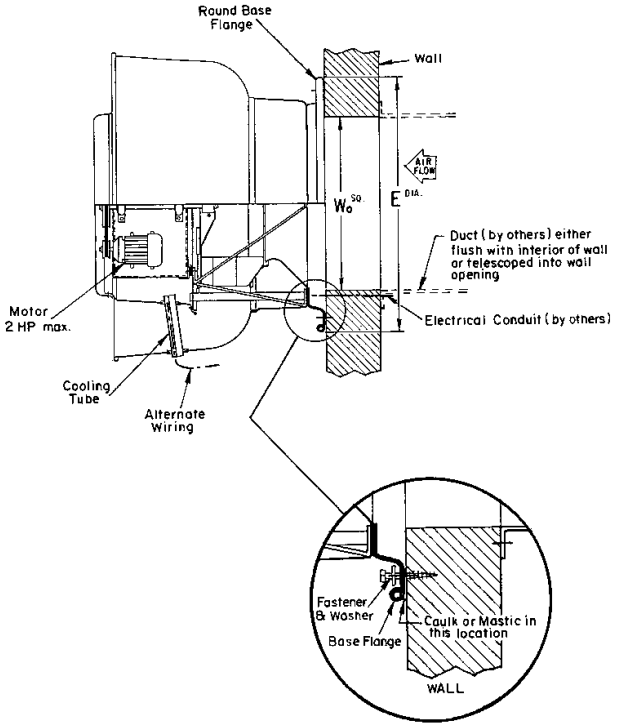


Table 1: Wall Mount Dimensions

Drive Type	Model	E DIA	Wo SQ
Direct Drive	FX08	24"	9"
	FX10-FX13	24"	11 1/2"
	FX16	24"	16"
	FX18	29 1/2"	20"
Belt Drive	FX08B-FX14B	27 1/4"	16"
	FX16B-FX18B	29 1/2"	20"
	FX24B	35 7/8"	25"

5. Insert two (2) 10/32 X 1/2" whiz bolts through pre-punched holes on each side of the ventilator base.
6. Position the ventilator on top of the pedestal. Install the floating hinge by aligning the slotted hole over the bushing (on rear most bolt) and onto the two bolts on the ventilator base. Fasten with (2) 10/32 whiz nuts and tighten on each side. Also, take 3/8" whiz nut and install on hinge bolt to hold bushing and hinge at pivot point. The forward backplate bolt functions as a stop; nothing is attached to it.
7. Install the lift handle with two (2) 10/32 X 1" bolts and nuts and equip the hold-down lugs to ventilator base with one (1) 10/32 X 1" bolt and nut each using the pre-punched holes.
8. Drill 15/64" diameter hole in each side of curb or pedestal to match slotted hole on hold down lug and insert 1/4" X 3/4" self tap screw from inside curb or pedestal. Attach 1/4"-20 wing nut to screw on each side lug. Tighten wing nut on each side to hold unit down in locking position.

INSTALLATION

WALL MOUNTING

Fumex fans are available with round bases to facilitate wall mounting through size 24B (WFX). If installing these units, ensure the wall mounting surface is leak-free. To ensure weather-tightness, coat the entire rear side (that portion which mates with the wall) of the mounting flange with a suitable caulking compound or an approved waterproof mastic sealer.

On masonry walls, attach the base flange with lead cinch type anchors and a nonferrous bolt. On sidings, use nonferrous lag bolts. Washers are recommended to be used under the bolt heads.

Table 2: Floating Hinge Parts List

Ref. #	Description
1	Floating Hinge (2)
2	Back Plate (2)
3	3/8"-16 X 1 1/2 Whiz Bolt (4)
4	3/8" Whiz Nut (6)
5	1/2-3/8 X 3/8 Lg. Bushing (2)
6	10-32 X 1/2" Whiz Bolt (4)
7	10-32 Whiz Nut (8)
8	Lifting Handle
9	Hold Down Lug (2)
10	10-32 X 1" Bolt (4)
11	1/4" X 3/4" Self Tap Screws (2)
12	1/4"-20 Wing Nut (2)

POSITIONING AND RUNNING POWER LINES

ROOF MOUNTING

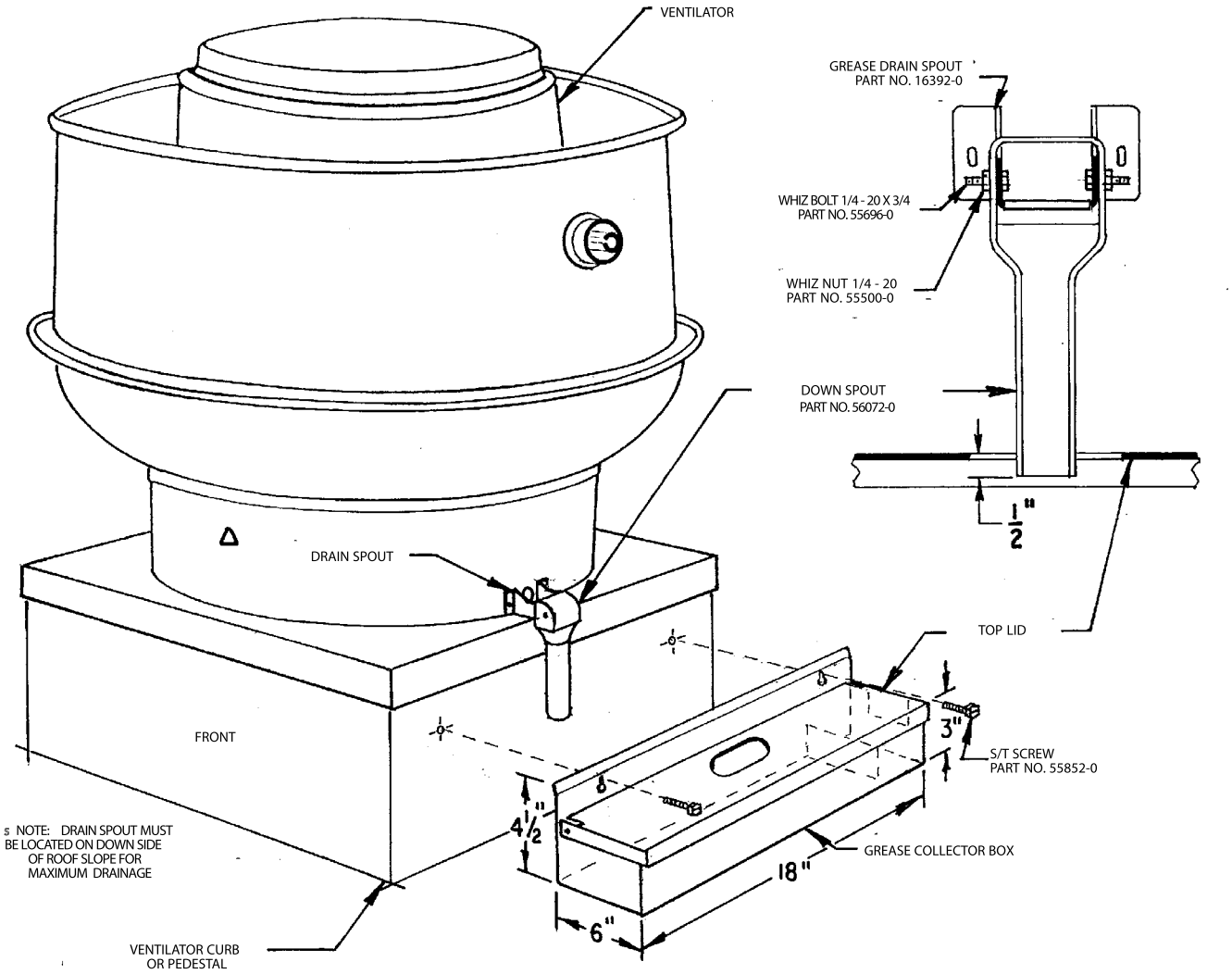
Power is normally brought from within the building through proper conduit lines and placed inside the curb. Feed power line through the clearance hole provided in the damper if furnished, if not clearance hole is provided, remove a corner of the lower damper (with a shear cutter or other instrument), through the ventilator to the service switch, if furnished, and motor. Feed
power through the ventilator to the (Service Switch or Junction Box to) motor. Wiring can be brought through the cooling tube from the outside; this is the method to be used for NFPA96 and smoke control systems installations if an external service switch or junction box is not already provided.

WALL MOUNTING

Power is normally brought up from within the building through proper conduit lines to the wall opening, then fed to the (Service Switch or Junction Box to) motor. Wiring can be brought through the cooling tube from the outside; this is the method to be used for NFPA96 installations if an external service switch or junction box is not already provided.

INSTALLATION

Grease Collector Box Assembly

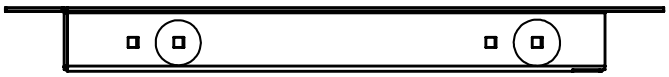


1. Attach Down Spout to Drain Spout with 2-1/4" bolts and nuts as detailed above.
2. Install Grease Collector Box to Ventilator Curb or Pedestal with s/m screws provided. Down Spout should pass through the hole in the Grease Collector Box Lid about 1/2".
3. If unit is hinged, hinge unit so it opens front to back.

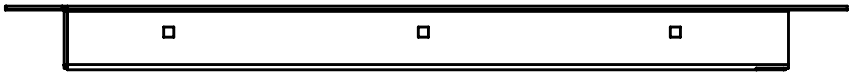
INSTALLATION

Fumex Wall Mount Adapter Installation Instructions

1. Locate top side of adapter for each size listed below.

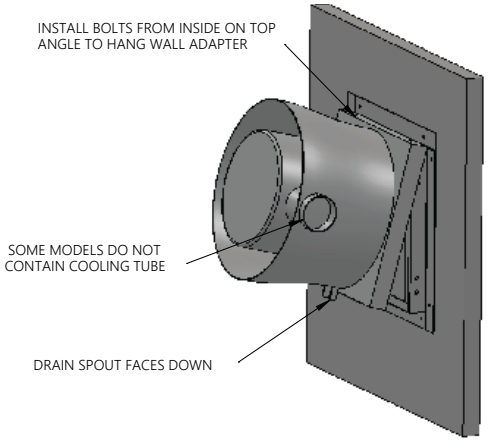


(FX8, 11, 13, and 16 DIRECT DRIVE)

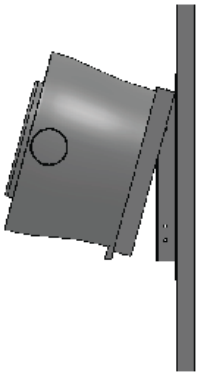


(ALL OTHER SIZES)

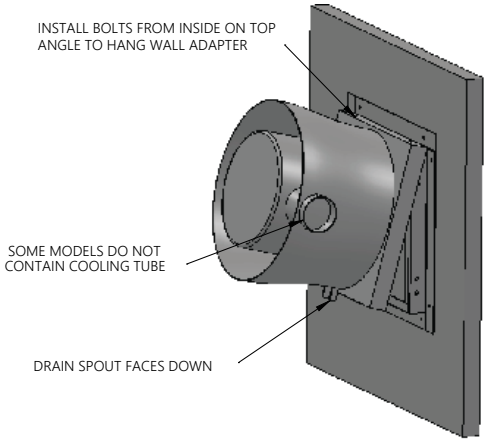
2. Install bolts threads up on top side.



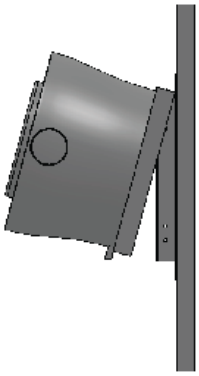
3. Apply gasket to surface as shown.



4. Attach adapter securely to wall (Fasteners not included. Depending on wall construction, this is to be attached at discretion of the installer.)



5. Hang fan from top bolts as shown; secure to wall adapter with remaining bolts.

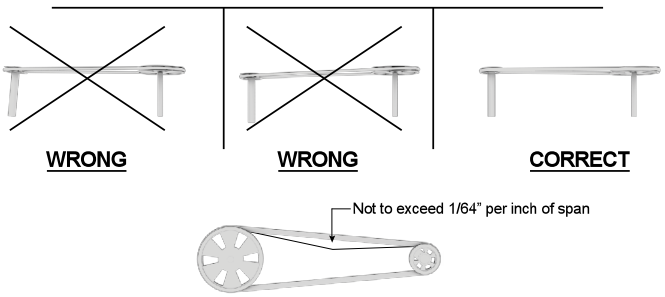


START-UP AND OPERATION

Carefully inspect the unit before startup. All motor bearings should be properly lubricated, and all fasteners should be securely tightened. Rotate centrifugal wheel by hand to ensure free movement. Before placing hand on centrifugal wheel or belts, lock out the power source. Check all set-screws and keys. Tighten when necessary. Check the condition of belts and the amount of tension prior to start-up. DO NOT overtighten, as bearing damage will occur.

Recommended belt tension should permit deflection of 1/64" per inch of span. Exercise extreme care when adjusting belts as not to misalign pulleys. Any misalignment will cause a sharp reduction in belt life and can produce excess belt noise. (see Figure 4). On units equipped with two groove pulleys, adjust all belts with equal tension. Belts must be adjusted after approx. 40 hours of operation.

Figure 4: Pulley Alignment & Tension



CAUTION

Whenever belts are removed or installed, never force belts over pulleys without loosening motor first to relieve belt tension.

Make sure inlets and approaches to the unit are free from obstruction. To ensure maximum air movement, make sure adequate supply air is available to ventilated space.

When power lines are brought up to the unit, provide a generous amount of slack to allow for motor adjustments and to permit movement of motor for belt tension adjustments. Ground motor adequately and securely. Protect power lines from sharp objects. Do not kink power line or permit it to contact hot surfaces, chemicals, grease or oil. Use only UL recognized electrical parts, rated for proper voltage, load and environment.

Before putting fan into operation, complete the following checklist:

a. Turn off and LOCK OUT the power source.

b. Make sure installation is in accordance with manufacturer's instructions.

c. Check and tighten all fasteners.

d. Spin centrifugal wheel to see if rotation is free.

e. Check all set-screws and keys; tighten if necessary.

f. Torqued set-screws have a colored Torque Seal mark indicating the correct torque has been applied

g. Check belt or direct drive coupling for alignment

h. Check belt for proper belt tension

i. Make sure there is no foreign or loose material in ductwork leading to and from fan or in the fan itself.

j. Properly secure all safety guards.

k. Secure all access doors to fan and ductwork.

l. Check line voltage with motor nameplate.

m. Check wiring.

START-UP AND OPERATION

CAUTION

On single phase motors, the terminal block must be set up in accordance with the nameplate instructions and/or wiring diagram. This set up must match the line voltage. If the motor is multi-speed or multi-voltage, the winding leads must be grouped and connected as shown on the motor wiring diagram. The line voltage must correspond with proper grouping of motor leads. The wiring diagram must be followed explicitly, or serious motor or starter damage will occur.

Do not operate models from line frequencies higher than 60Hz + or -5% with standard motors.

The ventilator has been checked at the factory prior to shipment for mechanical noises. If mechanical noises should develop:

a. Check rotating component for adequate clearance and direction of rotation. See page 6 for the wheel alignment procedure. See top of plate for wheel direction.

b. Check proper belt tension and pulley alignment.

c. Check installation and anchoring.

d. Check fan bearings.

e. Check that cooling tube is in place and well sealed.

CAUTION

Incorrect rotation overloads motor severely and results in serious motor damage. To change rotation of three phase units, interchange any 2 of the 3 line leads. On single phase units, change the terminal block set-up following the wiring diagram on the motor.

f. Check motor and bearing temperature for excessive heat.

CAUTION

Use care when touching the exterior of an operating motor. Modern motors normally run hot. They are designed to operate at higher temperatures. This is a normal condition, but they may be hot enough to be painful or injurious to the touch.

If any problem is indicated, TURN OFF POWER TO UNIT IMMEDIATELY. Lock out the electrical supply, check carefully for the cause of the trouble, and correct as needed. Even if the fan appears to be operating satisfactorily, shut down after a brief period and check all fasteners, set-screws and keys for tightness.

During the first eight (8) hours of operation, check the fan periodically for excessive vibration or noise. At this time, also check motor input current and motor bearing temperatures to ensure that they do not exceed manufacturer's recommendations. After eight hours of satisfactory operation, shut down the fan and lock out the electrical power to check the following items and adjust if necessary:

a. All set-screws, keys and fasteners.

b. Belt alignment.

c. Belt tension.

MAINTENANCE

Do not attempt maintenance on the fan until the electrical supply has been completely disconnected. If a service switch has not been provided, remove all fuses from the circuit and lock the fuse panel so they cannot be accidentally replaced.

Lubrication is a primary maintenance responsibility. Check all bearings periodically. Inspect belts for tightness. If the fan is installed in a corrosive or dirty atmosphere, periodically clean the centrifugal wheel, inlet, motor housing and other moving parts.

FAN SHAFT LUBRICATION

Fan shaft bearing pillow blocks are furnished in either the pre-lubricated sealed-for-life type or the greasable type. The pre-lubricated type requires no servicing for 7 to 10 years of normal use. Follow the lubricating schedule recommended by the factory. This practice should not supersede any safety considerations.

Use low pressure grease guns only. High pressure guns tend to blow out or unseat bearing seals, leaving the bearing open to collect grime, dust and foreign particles.

LUBRICATION SCHEDULE

Always follow the bearing manufacturer's recommended lubrication schedule. If none is available, use the following general schedule:

a. Under average conditions where ambient temperatures do not exceed 120°F, lubrication is required 1 to 2 times a year.

b. In dirt laden atmospheres where there is a temperature range of 120°F to 150°F, lubrication is required from 3 to 6 times a year.

c. Under extreme temperature conditions and extremely dirty atmospheres, lubrication should be scheduled at least once or twice a month.

d. Belt drive units maximum temperature should not exceed 160°F. Direct driven models have temperature range stamped on motor.

MOTOR LUBRICATION

In general, standard motors are furnished with prelubricated, sealed-for-life ball bearings which require no lubrication for 7 to 10 years of normal service. Where motors have been ordered with greasable bearings, these bearings are factory lubricated and require no attention for one year under normal conditions. If grease relief fittings are provided, remove them when performing maintenance to allow grease to flow out. Whenever possible, apply grease while the motor is running. This practice should not supersede any safety considerations. DO NOT OVERGREASE, as most lubricants deteriorate motor windings, thereby reducing motor life.

Table 3: Recommended Lubricants

Manufacturer	Product	Temp. Range
BP	LG-#P-1	Below 32°F (0°C)
Gulf	Gulfcrown EP-1	
Imperial Oil	Unirex EP-1	
Shell	Alvania R-1	
BP	Energrease, MPMK11	32°F to 150°F (0°C to 66°C)
Gulf	Gulfcrown EP-2	
Imperial Oil	Unirex EP-2	
Shell	Alvania R-3	
Sun Oil	Sun Prestige 42	
Texaco	Regal AFB2	

MAINTENANCE

Guards

All fans have moving parts which require guarding in the same way as other moving machinery.

Where the fan is accessible to untrained personnel or the general public, use maximum safety guards, even at the cost of some performance loss. Unprotected fans located less than 7' above the floor also require guarding as specified in the Occupational Safety and Health Act (OSHA). PennBarry strongly recommends the use of guards on all exposed nonducted fans, ceiling and wall mounted.

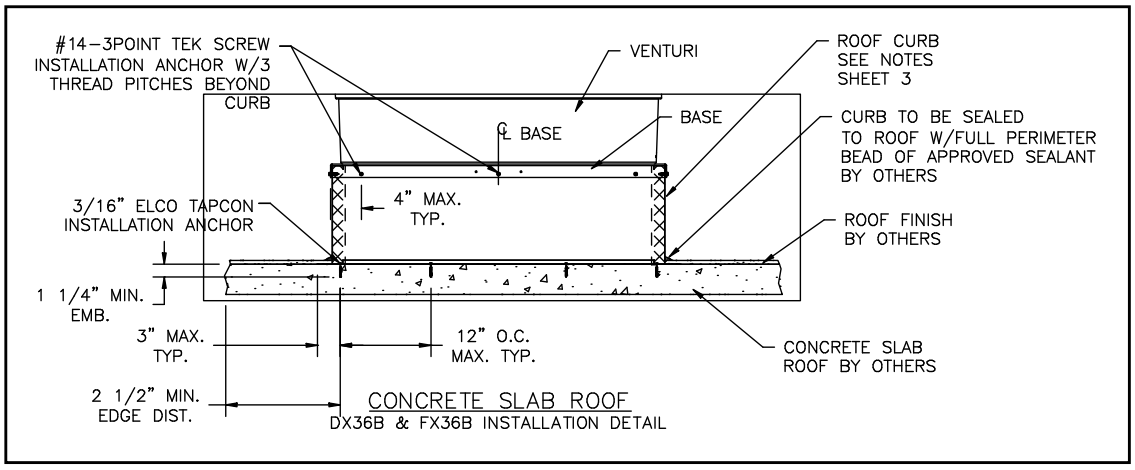
Centrifugal fans may be connected directly to ductwork which will prevent contact with the internal moving parts, but when the inlet or outlet is exposed, install a suitable guard.

Replacement Parts

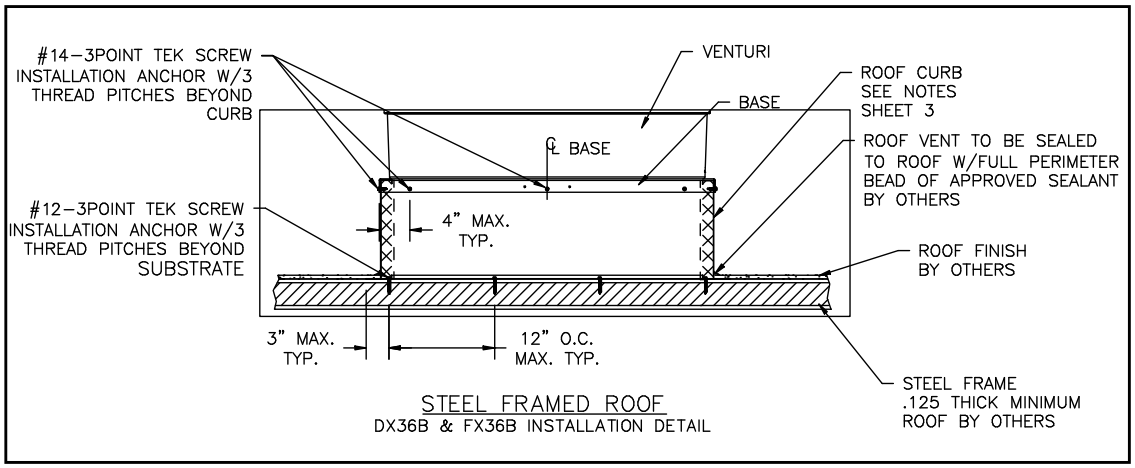
Replace parts with components which duplicate original parts correctly. Incorrectly sized shafts, belts, pulleys, etc. can damage the fan.

Spare or replacement parts and prices are available upon request. Please supply the following information: Factory Order Number, Customer's Name and Order Number, and Date. If this information is not available, furnish a complete description of the part required. Names of parts are shown on page 7. To order motors, provide the HP, RPM, voltage, phase, hertz and type of enclosure.

Typical Concrete Slab Roof Installation

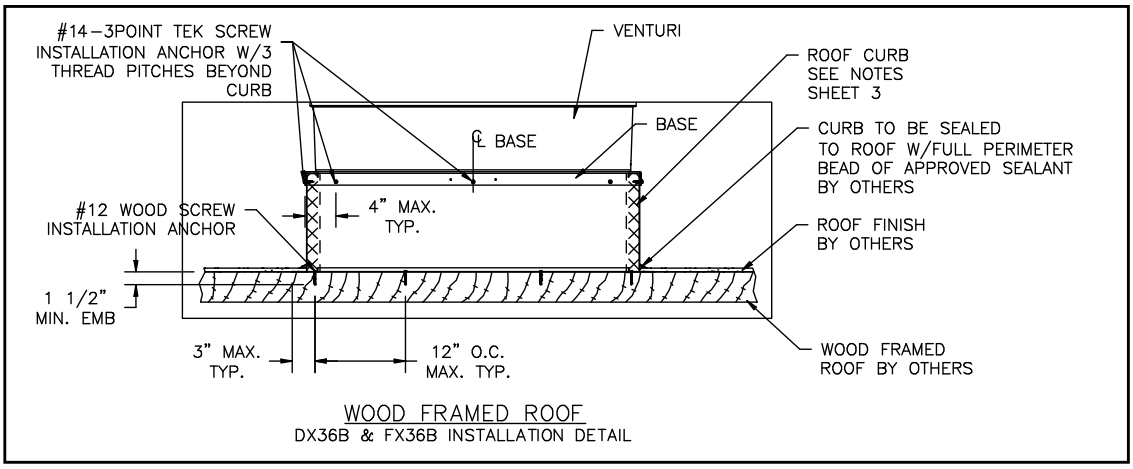


Typical Steel Framed Roof Installation



MAINTENANCE

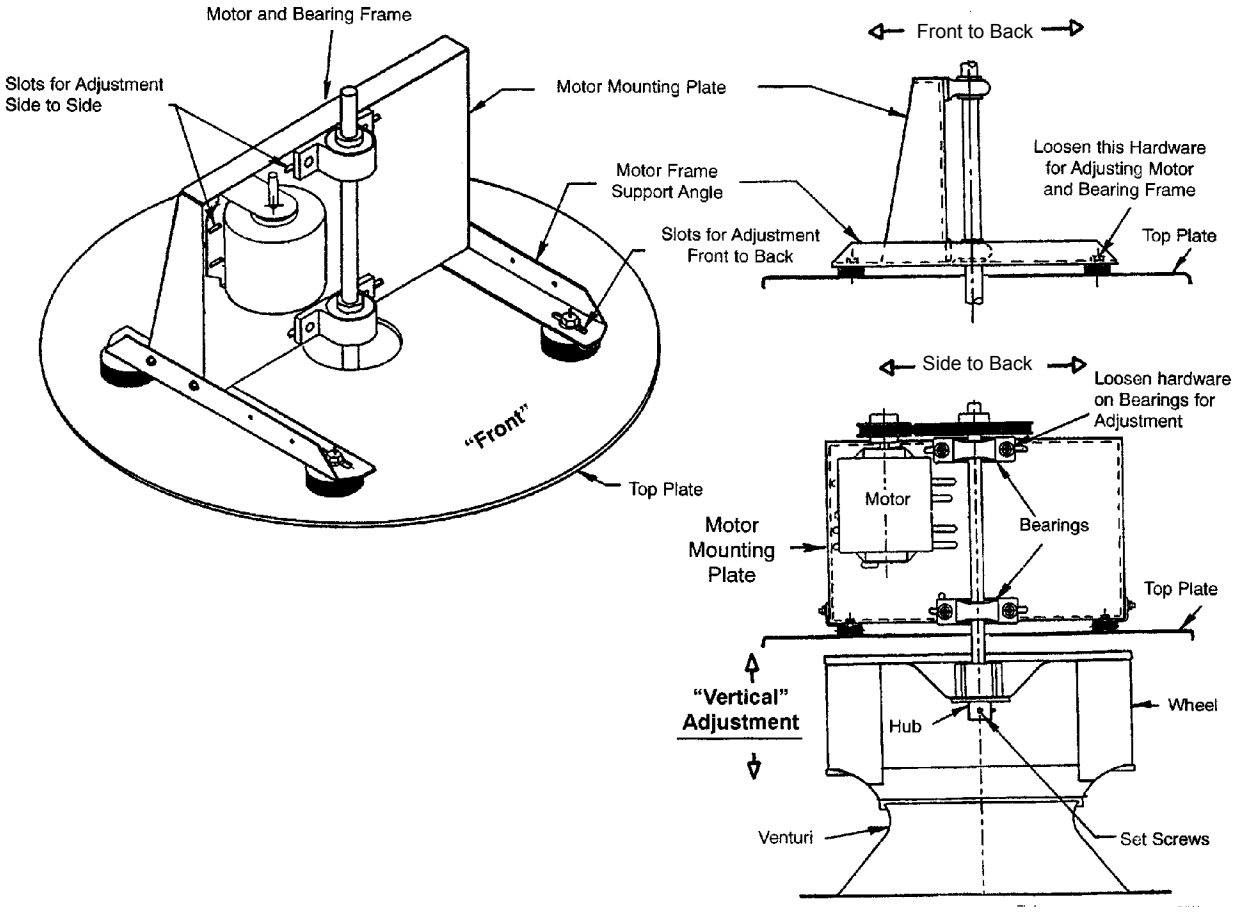
Typical Wood Framed Roof Installation



Installation Notes: All four sides of curb and base are anchored identically.
Curb Notes: 18 gauge galvanized steel minimum, maximum height 18"

WHEEL ALIGNMENT PROCEDURES

Figure 5: Wheel Alignment



The wheel position is preset at factory and must rotate freely. However, movement may occur due to rough handling prior to installation, and realignment may be necessary. If field correction is required, follow these procedures:

1. If "Front to Back" adjustment is required, loosen both motor frame support angles (four nuts), relocate frame, and retighten.
2. If "Side to Side" adjustment is required, loosen both bearings (four nuts), relocate, and retighten.
3. If "Vertical" adjustment is required, loosen both set screws on the wheel hub (accessible from the bottom side of the unit), raise or lower the wheel, and retighten.

TROUBLESHOOTING CHECKLIST

Symptom	Possible Cause(s)	Corrective Action
Excessive noise	1. Defective or loose motor bearings	1. Replace motor with same frame size, RPM, HP
	2. Ventilator base not securely anchored	2. Reset properly
	3. Loose or unbalanced wheel/propeller	3. Tighten screws, remove build-up, balance wheel/ propeller
	4. Misaligned pulleys or shaft	4. correct alignment
	5. Loose or damaged wheel/propeller	4. Replace wheel/propeller
	6. Wheel running in wrong direction	6. Reverse direction
Fan Inoperative	1. Blown fuse or open circuit breaker	1. Replace fuses or circuit breaker
	2. Loose or disconnected wiring	2. Shut off power and check wiring for proper connections
	3. Defective motor	3. Repair or replace motor
	4. Broken belts	4. Replace belts
Insufficient Airflow	1. Open access doors or loose sections of ducts	1. Check for leakage
	2. Clogged filters	2. Clean or replace filters
	3. Operation in wrong direction	3. Correct rotation of wheel
	4. Insufficient make-up air direction	4. Add make-up fan or louver opening
	5. Fan speed to low	5. Speed fan up by adjusting varaible pitch pulley on motor shaft
Water leaking into ductwork or collection of grease under fan	1. Fan installed with slope in the wrong direction	1. Slope should be fitted in the direction of thedrainage opening or grease collection box and drainspout
	2. Clogged drain spout	2. Clean drain spout
	3. Cooling tube or motor dome top removed	3. Install new cooling tube with gasket and dome top
	4. Grease container full	4. Empty grease box
Motor overheating	1. Belt slippage	1. Adjust tension or replace bad belts
	2. Overvoltage or under voltage	2. Contact power supply company
	3. Operation in wrong direction	3. Reverse direction of motor
	4. Slow down fan by opening variable pitch	4. Fan speed too high pulley on motor shaft
	5. Incorrect motor (service factor 1.0, low ambient temperature)	5. Replace motor with correct one, NEMA service factors (1.15 or higher) with 40 degrees ambient
	6. Blocked cooling tube or leaky gasket	6. Remove blockage and seal cooling tube in place
	7. Insufficient airflow to kitchen hood fan operating on low speed with kitchen in full operation.	7. Check airflow under hood and adjust kitchen equipment output
	8. Undersized motor	8. Check motor ratings with catalog speed and air capacity chart

Note: Care should be taken to follow all local electrical, safety and building codes. Provisions of the National Electric Code (NEC) as well as the Occupational Safety and Health Act (OSHA) should be followed.

All motors are checked prior to shipment. If motor defects should develop, prompt service can be obtained from the nearest authorized service station of the motor manufacturer while under warranty. Exchange, repair or replacement will be provided on a no charge basis if the motor is defective within the warranty period. The PennBarry representative in your area will provide a name and address of an authorized service station if requested. WARNING: Motor guarantee is void unless overload protection is provided in motor wiring circuit.

PARTS LISTS & DIMENSIONS

Direct Drive

Figure 6: FX08RS, 10RS, 11RS, 11Q

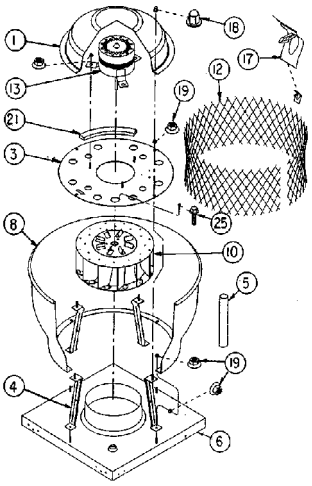


Figure 7: FX13RSV, 13Q

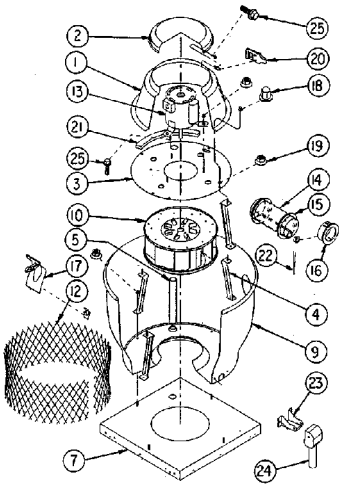
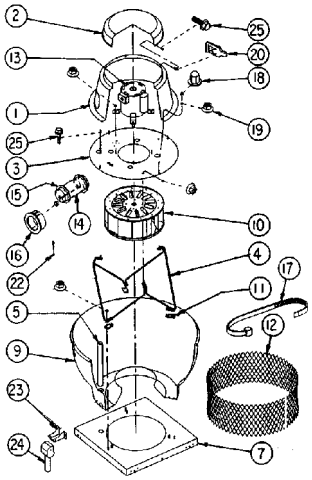


Figure 8: FX16RSV, Q1, Q2



Direct Drive Parts List

1. Hood Apron	6. Base Venturi	11. Wire Clip	16. Bushing	21. Gasket
2. Hood Top	7. Base (Round for WFX)	12. Screen (Optional)	17. Screen Clip	22. Cotter Pin
3. Top Plate	8. Discharge Apron	13. Motor	18. Acorn Nut	23. Drain Spout
4. Brace	9. Apron Venturi	14. Cooling Tube	19. 1/4 - 20 Nut	24. Down Spout
5. Conduit Pipe	10. Wheel	15. Clg. Tube Gasket	20. Clip	

Part	Description
1	Wind Band (2 pcs. FMX50B)
2	Discharge Apron
3	Cooling Tube
4	Cooling Tube Gaskets
5	Motor Hood Lid
6	Motor Hood
7	Motor & Bearing Frame
8	Anti-Vibration Mounts
9	Top Plate
10	Bird Guard (Optional)
11	Support Wires
12	Support Wire Mounting Clips
13	Conduit Guide
14	Venturi
15	Base (Round for WFX)
16	Fan Pulley
17	Belt
18	Motor Pulley
19	Motor
20	Bearings
21	Shaft
22	Centrifugal Wheel
23	Main Fastening Braces

Figure 6: FX08RS, 10RS, 11RS, 11Q

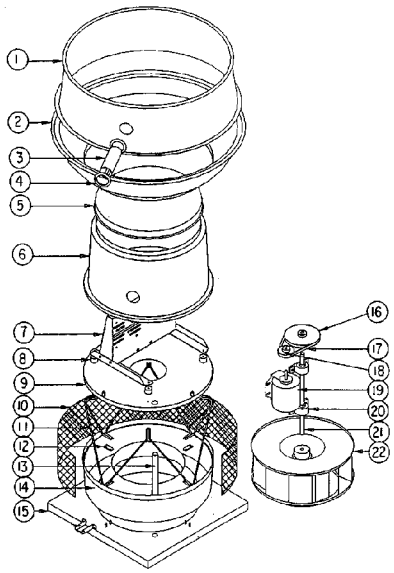
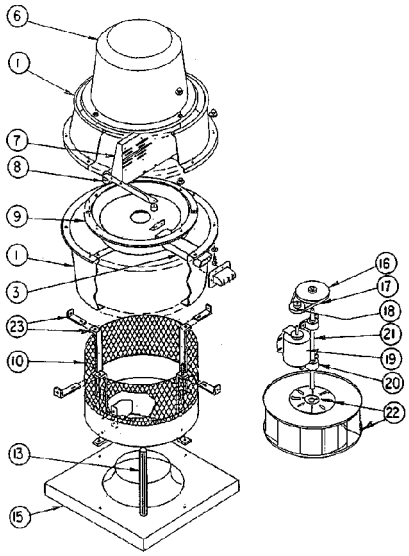


Figure 7: FX13RSV, 13Q



	Direct Drive Models					Belt Drive Models										
Fan Size	8	10	11	13	16	08B	10B	12B	13B(H)	14B	16B	18B(H)	24B(H)	30B	36B	50B
Base Dimensions	18.5	18.5	18.5	18.5	20.5	24.75	24.75	24.75	24.75	24.75	28.5	28.5	33.5	36.5	44.5	59

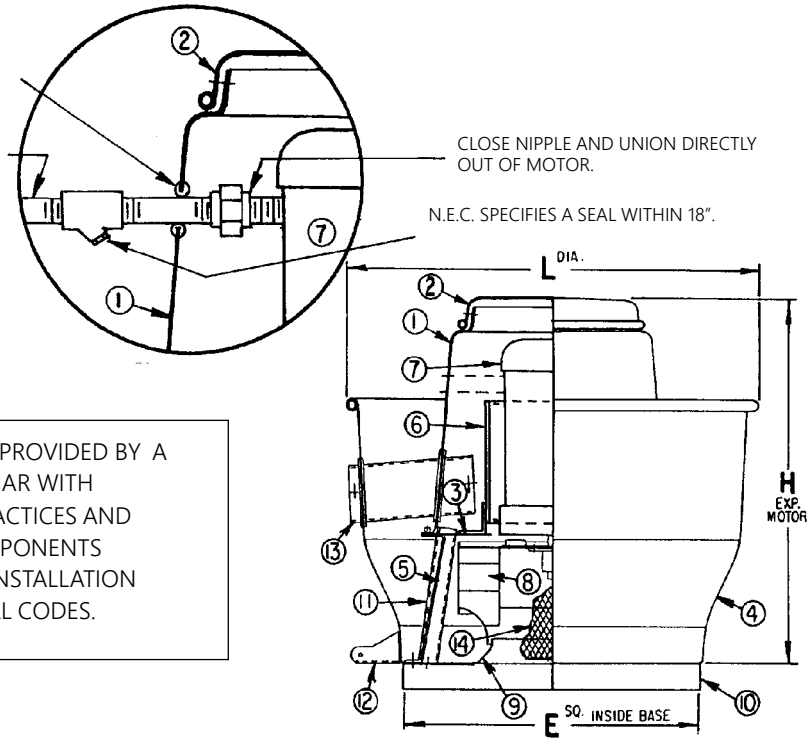
All dimensions are in inches. "E"- (outside curb dimension should be 1" smaller than inside fan base dimension)

DIRECT DRIVE - EXPLOSION PROOF MOTOR

Spun Aluminum Centrifugal Roof Exhauster

PUNCH OR DRILL HOLE FOR CONDUIT PATH. HOLE MUST BE SEALED OR CAULKED TO PREVENT WATER ENTRY.

RIGID CONDUIT OR I.M.C. (INTERMEDIATE METAL CONDUIT) PER N.E.C. AND/OR LOCAL CODES. (BY OTHERS)



*NOTE - ALL WIRING MUST BE PROVIDED BY A LICENSED ELECTRICIAN FAMILIAR WITH EXPLOSION PROOF WIRING PRACTICES AND REGULATIONS, USING COMPONENTS APPROPRIATE TO THE SPECIFIC INSTALLATION AND N.E.C. AND/OR LOCAL CODES.

Legend

1. Motor Dome	5. Structural Support Braces	9. Spun Venturi	13. Cooling Tube (Models FX13 and FX16)
2. Motor Hood Top (For Exp. Motor)	6. Motor Mounting Plate	10. Mounting Base	14. Aluminum Bird Screen (Optional)
3. Top Plate	7. Motor (Exp. Motor)	11. Conduit Guide (Not for Exp. Motor)	
4. Discharge Apron	8. Centrifugal Fan Wheel with Cooling Vanes	12. Drain Spout (Models FX13 and FX16)	

Dimensional Data

	FX08Q	FX10Q	FX11Q	FX13Q	FX16Q
$L^{DIA.}$	25	25	25	25 1/2	30 1/2
$H^{EXP. MOTOR}$	18	19	19	19	26 716
$E^{†SQ.}$	18 1/2	18 1/2	18 1/2	18 1/2	20 1/2
$Ro^{SQ.}$	9	11 1/2	11 1/2	11 1/2	16 1/4

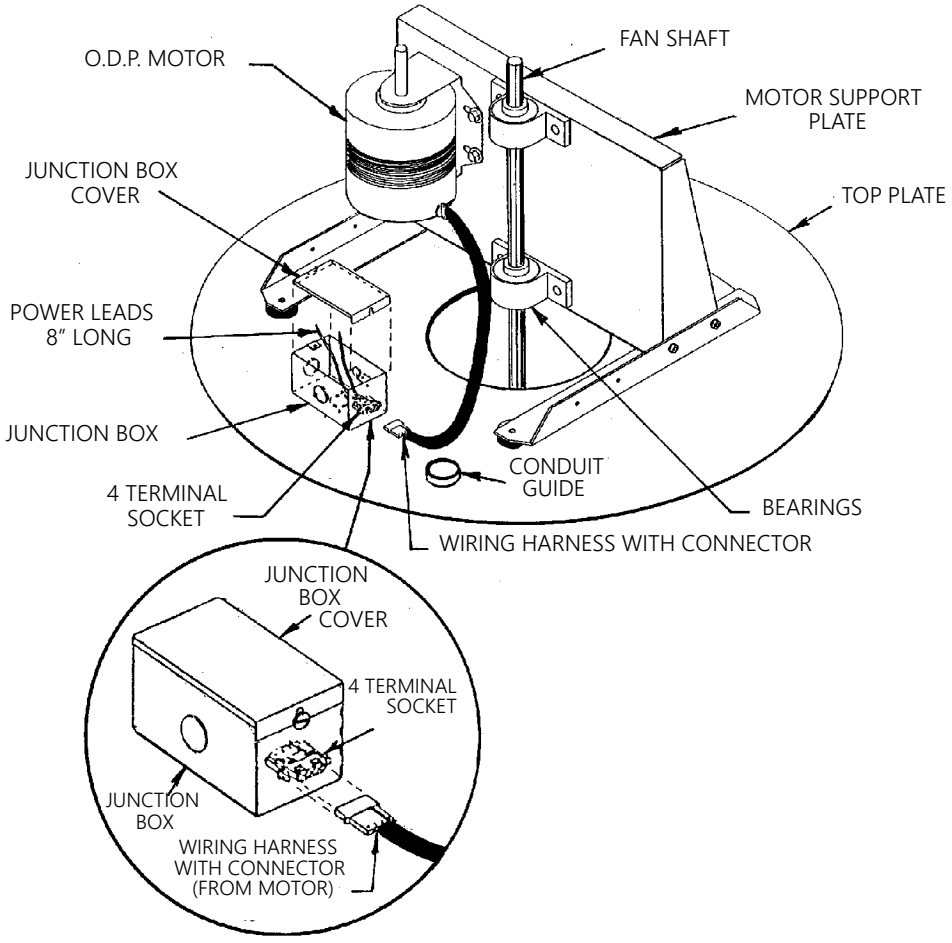
† Outside dimension of curb should be 1 1/2" less than 'E' dimension
All dimensions in inches.

Material: Spun Aluminum Housing

This drawing illustrates our understanding of order requirements. When approved, it represents details for fabrication, as such, PennBarry will not be responsible for revisions in the field or other changes after release for fabrication. Published and protected by PennBarry, Richardson, TX. All rights reserved. May not be reproduced partially or in full without permission from the publisher. No rights conveyed to manufacture partially or in full, use, or sell either the method of construction represented or any invention in any way related thereto. Spun Aluminum Centrifugal Roof Exhauster

WIRING HARNESS - DISCONNECT DEVICE

O.D.P. Motors (ITW Harness) 115/220 Single Phase



ELECTRICAL CONNECTIONS

Connect motor per nameplate to correct power supply. Install all wiring, protection and grounding in accordance with National Electrical Code and local requirements. Follow all local electrical and safety codes, as well as the National Electrical Code (NEC) and the Occupational Safety and Health Act (OSHA).

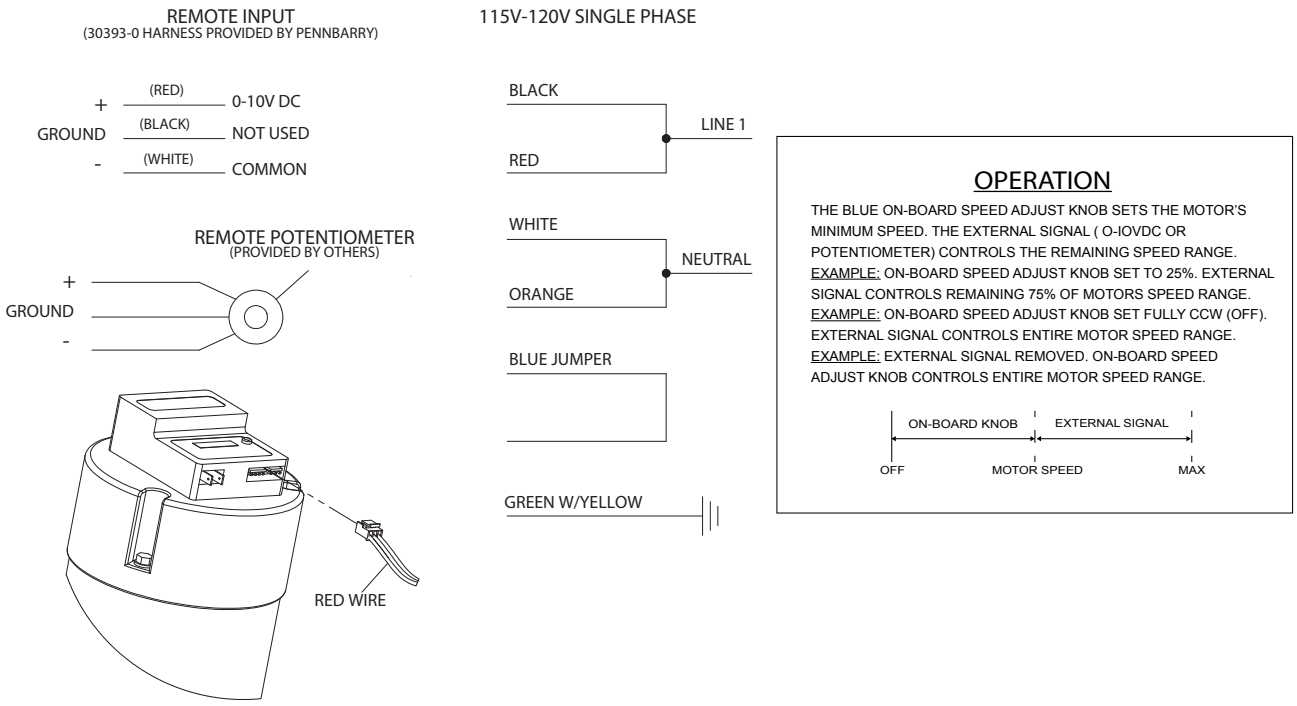
WIRING INSTRUCTIONS

CAUTION: When bringing power lines up, power MUST be off.

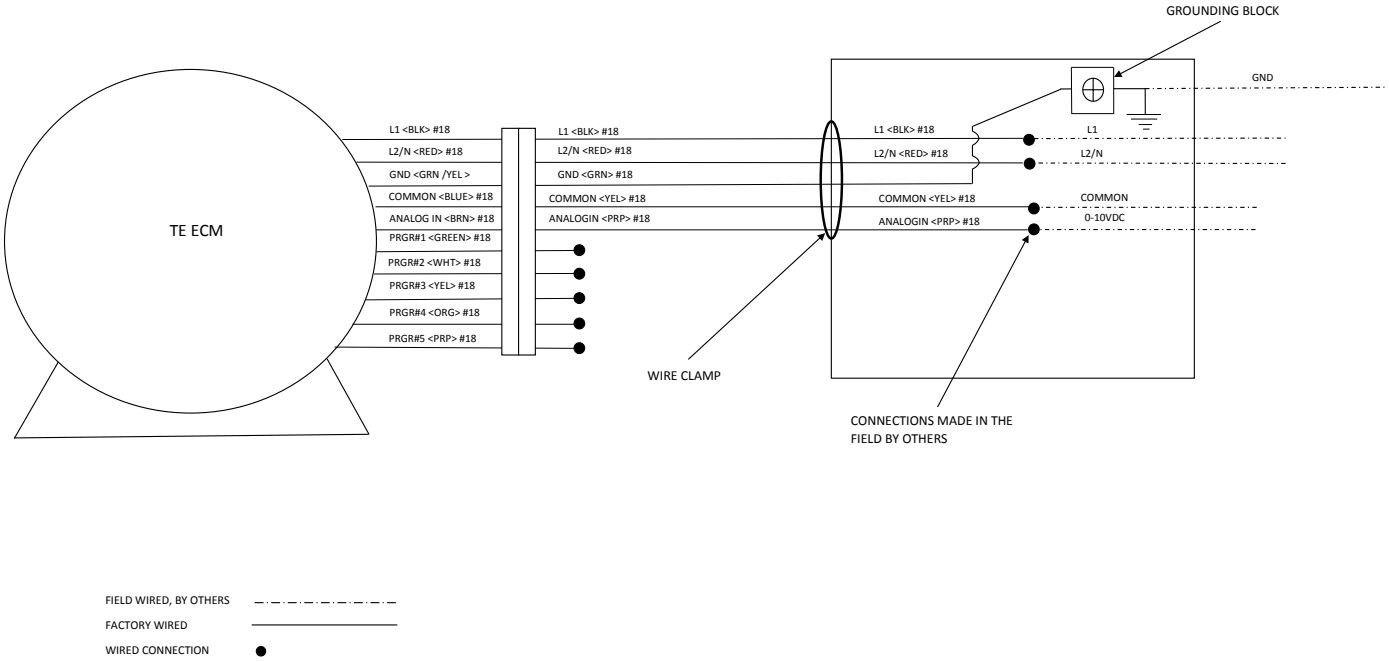
1. Bring power lines up to motor compartment through conduit guide.
2. Remove junction box cover so that power leads are exposed.
3. Remove one knock-out, attach connector, and run power lines from source into junction box.
4. Terminal socket has two 8" long pigtails already stripped. Make connection to power lines using properly sized wire nuts and fold wires back into box.
5. Replace junction box cover and secure in place with screw.
6. Plug harness connector (from motor) into terminal socket at end of junction box. Unit is now ready to test.

WIRING HARNESS – ECM

1) O.D.P. Motors 120v Single Phase



2) T.E. Motors 120v/240v/460v Single Phase (control provided by others)



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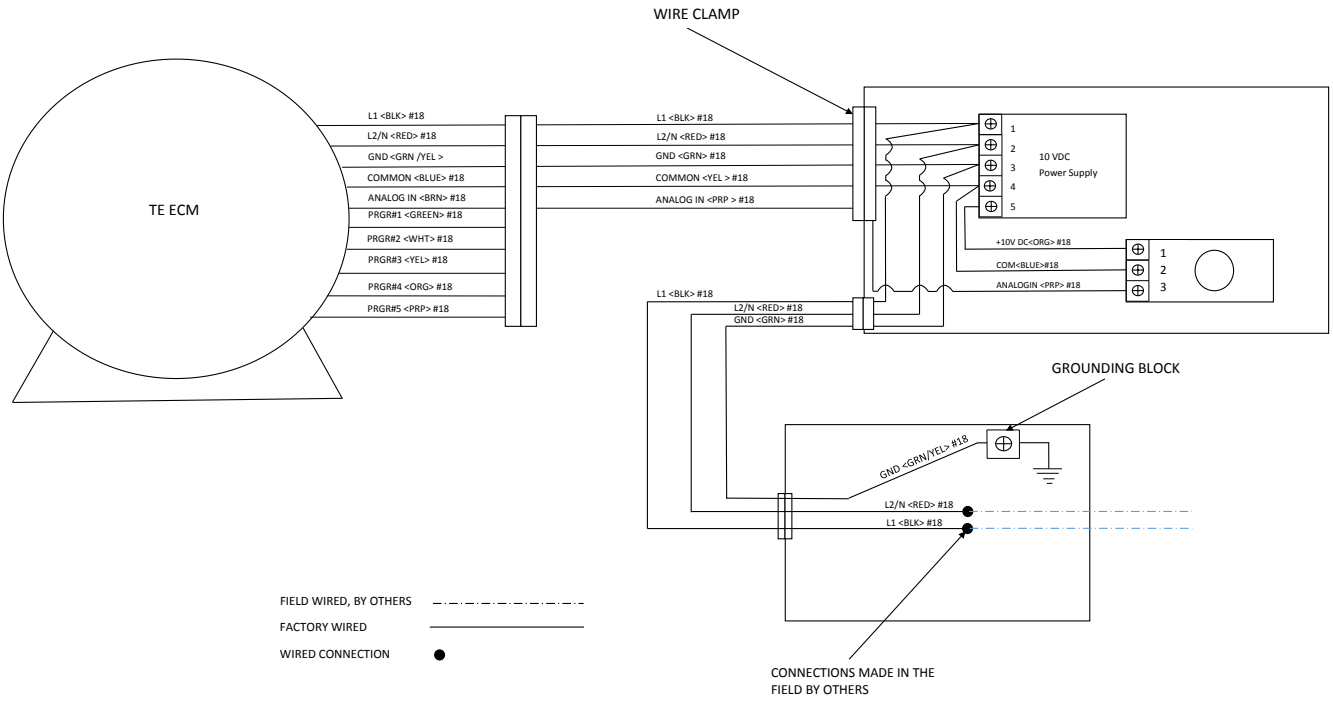
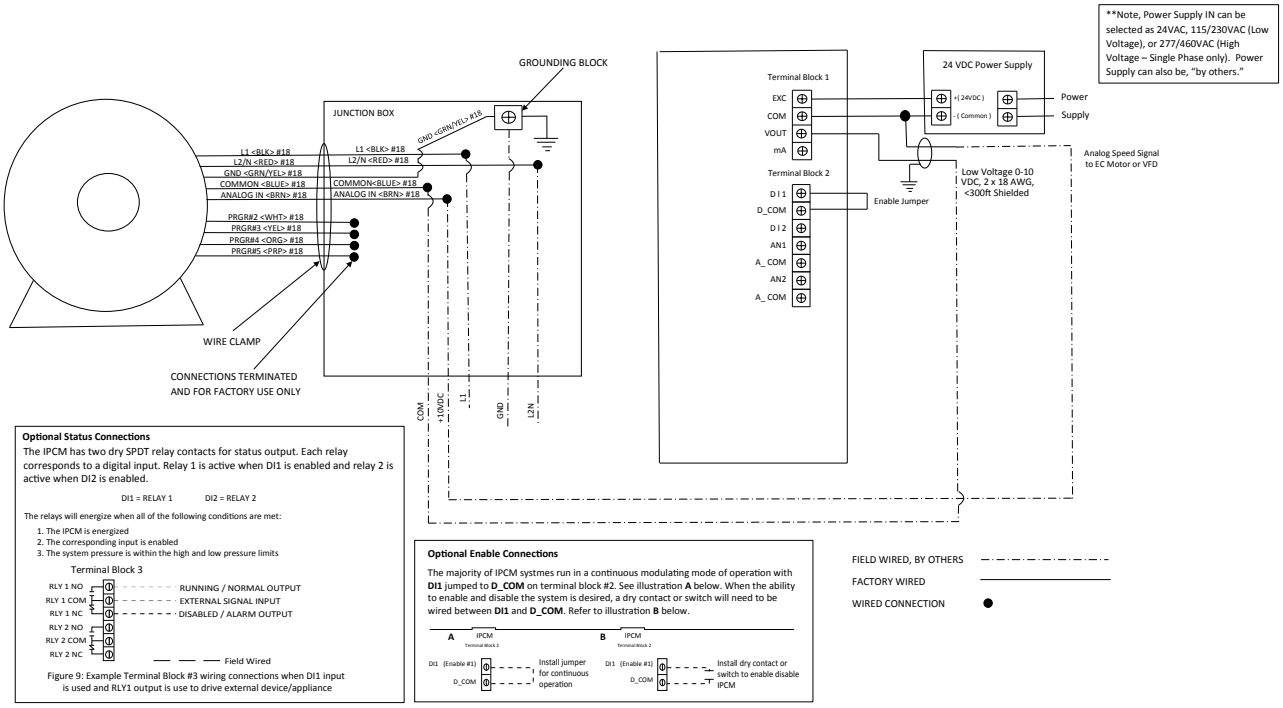
WIRING HARNESS – ECM

3) T.E. Motors 120v/240v/460v Single Phase (0-10V output potentiometer)

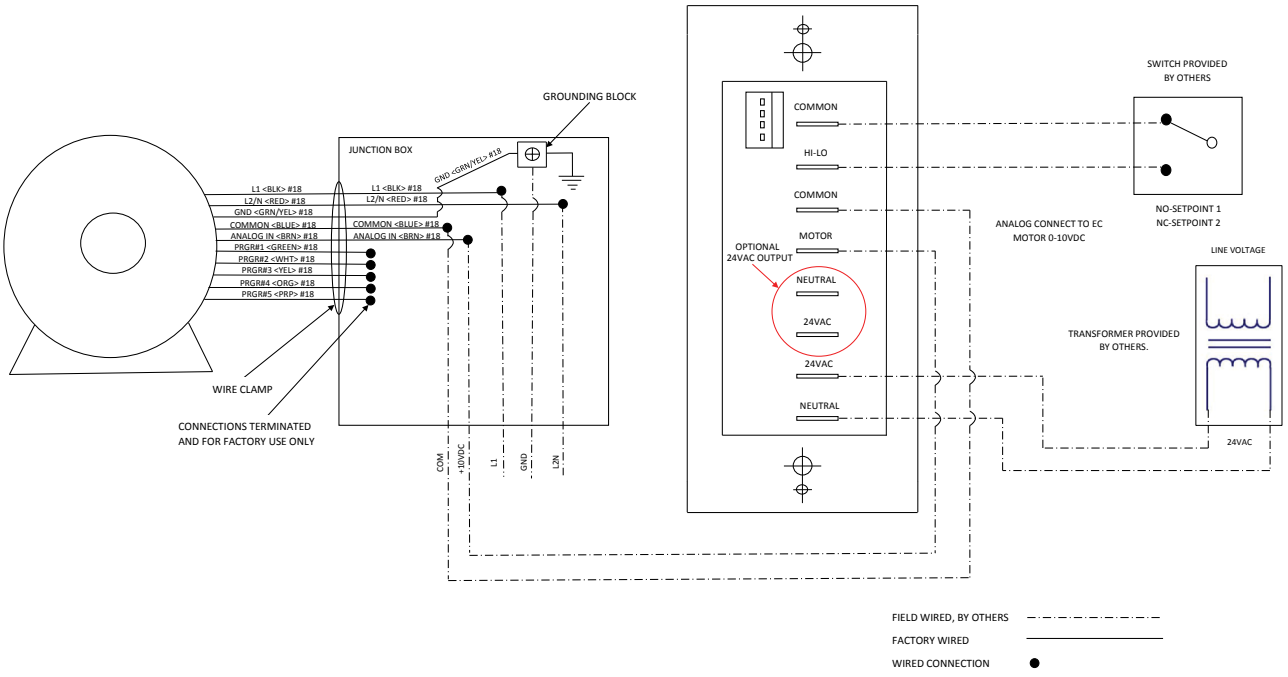


4) T.E. Motors 120v/240v/460v Single Phase (with iQ-IPCM controller)

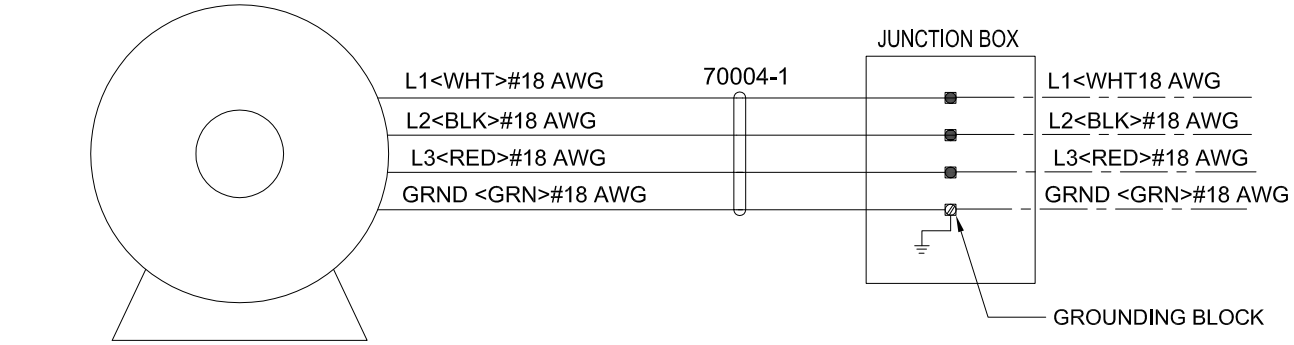


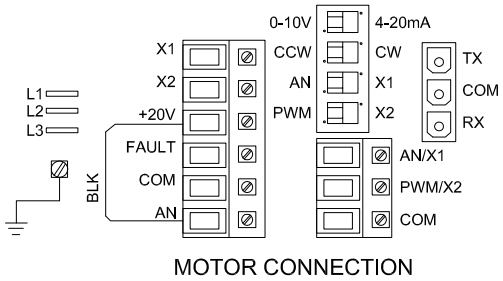
WIRING HARNESS – ECM

5) T.E. Motors 120v/240v/460v Single Phase (with iQ-MS controller)



6) T.E. Motors 208v/460v Three Phase





MOTOR CONNECTION

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PennBarry™

PennBarry is proud to be your preferred manufacturer of commercial and industrial fans and blowers. Learn how PennBarry can assist you in your next application by contacting your PennBarry Representative or visiting us on the web at www.pennbarry.com.

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Domex

Centrifugal Roof, Direct & Belt Drive Exhausters

OPERATION & MAINTENANCE MANUAL

PENN BARRY™

IMPORTANT! Read before proceeding!

Please read and save these instructions. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage! Retain instructions for future reference.

TABLE OF CONTENTS

INTRODUCTION

Description

PennBarry roof-mounted ventilators are belt-driven centrifugal exhausters designed to meet air delivery requirements where steady exhaust is needed under moderate static pressure. Housings are of spun aluminum construction with built-in bird screen. Ventilators are furnished with self-aligning, pre-lubricated, ball bearing pillow blocks, spark proof aluminum wheels, and an aluminum backdraft damper.

Receiving and handling

PennBarry fans are carefully inspected before leaving the factory. When the unit is received, inspect the carton for any signs of tampering. Inspect the unit for any damage that may have occurred during transit and check for loose, missing or damaged parts. Mishandled units can void the warranty provisions. If units are damaged in transit, it is the responsibility of the receiver to make all claims against the carrier. PennBarry is not responsible for damages incurred during shipment.

Avoid severe jarring and/or dropping. Handle units with care to prevent damage to components or finishes. If the unit is scratched due to mishandling, the protective coating may be damaged. Incorrect lifting may damage the fan and void the warranty.

Storage

Long-term storage requires special attention. Store units on a level, solid surface, preferably indoors. If outside storage is necessary, protect the units against moisture and dirt by encasing the cartons in plastic or in some similar weatherproof material. Periodically inspect units and rotate wheels to spread bearing lubricant. Failure to rotate wheels results in reduced bearing life and may void the manufacturer's warranty. If the unit will be stored for an extended time, remove belts. Belts which remain under tension in a stationary position for extended periods are likely to have a reduced operating life.

Unpacking

Place the carton in an upright position and remove the staples or use a sharp (knife edge) tool to carefully cut or scribe the sealing tape on both sides at the top of the carton. Open carton flaps. Remove any cardboard and wooden filler pieces, as well as loose components or accessories shipped with the unit.

Carefully remove the unit from the carton. Inspect the unit for any damage that may have occurred during transit and check for loose, missing or damaged parts.

INSTALLATION

Note: For Installation in high velocity Hurricane Zones, unit must be installed per instructions under Anchoring and Securing the Ventilator."

Installing Motors

In some instances, large frame motors may be shipped loose and require field mounting. If so, carefully review motor mounting installation procedures per Figure 1, Figure 2 and Figure 3.

Installing The Dampers: Roof Mounting

When required, install dampers prior to mounting the unit on the curb or frame. Secure dampers to the inside of the roof opening (preferred) or curb without undue twisting, which may distort the damper frame. Damper frame must be reasonably level on all sides. Check for free operation. If dampers are motor operated type, ascertain that proper voltage is impressed on motor terminals.

Positioning And Running Power Lines: Roof Mounting

Power is normally brought from within the building through proper conduit lines and placed inside one corner of the curb. Feed power line through the clearance hole provided in the damper if furnished, if not clearance hole is provided, remove a corner of the lower damper (with a shear cutter or other instrument), through the ventilator to the service switch, if furnished, and motor.

When power lines are brought up to the unit, provide a generous amount of slack to allow for motor adjustments and to permit movement of motor for belt tension adjustments. Ground motor adequately and securely. Protect power lines from sharp objects. Do not kink power line or permit it to contact hot surfaces, chemicals, grease or oil. Use only UL recognized electrical parts, rated for proper voltage, load and environment. Check motor nameplate.

Anchoring And Securing The Ventilator: Roof Mounting

Whenever possible, anchor the fan by fastening through the vertical portion of the mounting flange. The type, size and number of fasteners depends upon the unit size and curb construction. If code or specification prescribes fastening through the top (vertical portion) of the mounting flange, use neoprene or lead washers under the head of each fastener.

Guy down large units installed in areas subject to high winds or unusual field conditions. If the installer removes any ventilator parts to facilitate installation or electrical connections, reassemble all parts by replacing all spacers, washers, nuts, bolts, fasteners and components exactly as they were found prior to removal. Draw all fasteners tight and secure. Fasteners should be protected against corrosion.

Motor Installation Procedures

1. Install motor pulley assembly (bracket if it is provided - type 3) with hardware provided through holes in motor mounting plate/ frame. Keep driven pulley and drive pulley in line. (Do not tighten hardware).
2. Install belt over drive and driven pulleys and pull up on motor mounting plate/bracket until belt is tight. Tighten motor plate hardware.
3. Wire motor or plug harness connector (from motor if equipped) into terminal socket at end of junction box. Unit is now ready to test to check for smooth operation.
4. See belt adjustment label and Figure 4 for more details.
5. Check for proper wheel rotation.

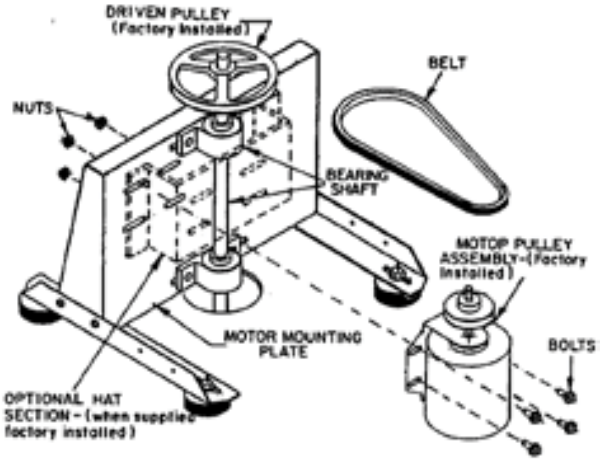
WARNING

To fulfill our obligations towards Article 33, in accordance to European REACH Regulation No 1907/2006 EC, we hereby inform you that this article contains the following Substances of Very High Concern mentioned on the Candidate list:

- Lead

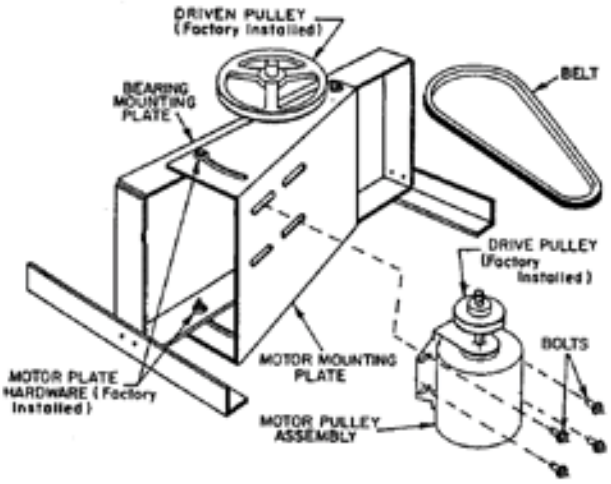
INSTALLATION

Figure 1: Motor Installation Procedures



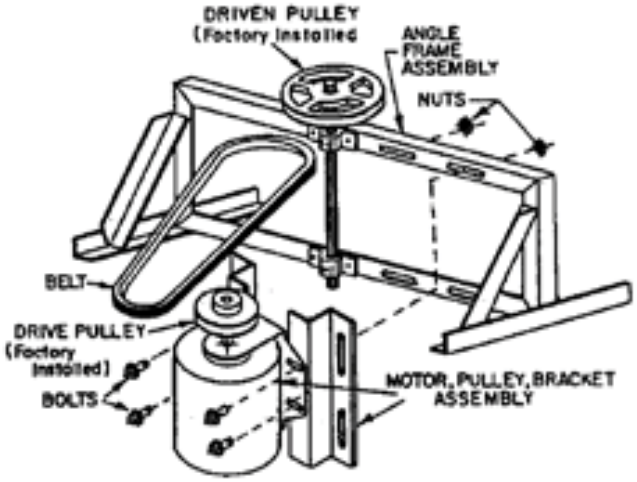
Type 1

Figure 2: Motor Installation Procedures



Type 2

Figure 3: Motor Installation Procedures



Type 3

START-UP AND OPERATION

Carefully inspect the unit before start-up. All motor bearings should be properly lubricated, and all fasteners should be securely tightened. Rotate centrifugal wheel by hand to ensure free movement.

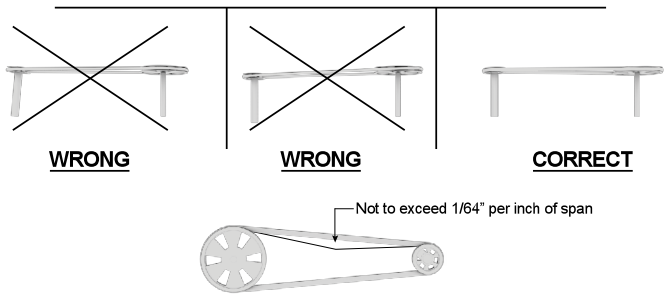
CAUTION

Before placing hand on centrifugal wheel or belts, lock out power source. Check all set-screws and keys. Tighten when necessary.

Check condition of belts and the amount of tension prior to start-up. DO NOT overtighten, as bearing damage will occur.

Recommended belt tension should permit deflection of 1/64" per inch of span. Exercise extreme care when adjusting belts as not to misalign the pulleys. Any misalignment will cause a sharp reduction in belt life and produce squeaky, annoying noises. On units equipped with two groove pulleys, adjust all belts with equal tension. Belts must be adjusted after approximately 40 hours of operation.

Figure 4: Pulley Alignment & Tension



CAUTION

Whenever belts are removed or installed, never force belts over pulleys without loosening motor first to relieve belt tension.

Make sure inlets and approaches to the unit are free from obstruction. To ensure maximum air movement, make sure adequate supply air is available to ventilated space.

Before putting fan into operation, complete the following checklist:

a. Turn off and LOCK OUT the power source.

b. Make sure installation is in accordance with manufacturer's instructions.

c. Check and tighten all fasteners.

d. Spin centrifugal wheel to see if rotation is free.

e. Check all set-screws and keys; tighten if necessary.

f. Torqued set screws have a colored Torque Seal mark indicating the correct torque has been applied.

g. Check belt or direct drive coupling for alignment (use recommended belt tension gauges).

h. Check belt for proper sheave selection.

i. Make sure there is no foreign or loose material in ductwork leading to and from fan or in the fan itself.

j. Properly secure all safety guards.

k. Secure all access doors to fan and ductwork.

l. Check line voltage with motor nameplate.

m. Check wiring.

START-UP AND OPERATION

CAUTION

(On single phase motors, the terminal block must be set up in accordance with the nameplate instructions and/or wiring diagram. This set up must match the line voltage. If the motor is multi-speed or multi-voltage, the winding leads must be grouped and connected as shown on the motor wiring diagram. The line voltage must correspond with proper grouping of motor leads. The wiring diagram must be followed explicitly, or serious motor or starter damage will occur.) Don't operate at RPM higher than cataloged.

The ventilator has been checked at the factory prior to shipment for mechanical noises. If mechanical noises should develop:

a. Check rotating components for adequate clearance (wheel alignment procedures are on page 15) and direction of rotation. Judge CW and CCW looking from drive side.

b. Check proper belt tension and pulley alignment.

c. Check installation and anchoring.

d. Check fan bearings.

Switch on electrical supply and allow fan to reach full speed. Then:

1. Check carefully for correct rotation of the centrifugal wheel.

CAUTION

Incorrect rotation overloads motor severely and results in serious motor damage. To change rotation of three phase units, interchange any 2 of the 3 line leads. On single phase units, change the terminal block set-up following the wiring diagram on the motor.

2. Check motor and bearing temperatures for excessive heat.

CAUTION

Use care when touching the exterior of an operating motor. Modern motors normally run hot. They are designed to operate at higher temperatures. This is a normal condition, but they may be hot enough to be painful or injurious to the touch.

If any problem is indicated, TURN OFF POWER TO UNIT IMMEDIATELY. Lock out the electrical supply, check carefully for the cause of the trouble and correct as needed. Even if the fan appears to be operating satisfactorily, shut down after a brief period and check all fasteners, set-screws and keys for tightness.

During the first eight (8) hours of operation, check the fan periodically for excessive vibration or noise. At this time, also check motor input current and motor bearing temperatures to ensure that they do not exceed manufacturer's recommendations. After eight hours of satisfactory operation, shut down the fan and lock out the electrical power to check the following items and adjust if needed:

a. All set-screws, keys and fasteners.

b. Drive coupling alignment.

c. Belt alignment.

d. Belt tension.

MAINTENANCE

Do not attempt maintenance on fan until the electrical supply has been completely disconnected. If a service switch has not been provided, remove all fuses from the circuit and lock the fuse panel so they cannot accidentally be replaced.

Lubrication is a primary maintenance responsibility. Check all bearings periodically. Inspect belts for tightness. If the fan is installed in a corrosive or dirty atmosphere, periodically clean the impeller, inlet and other moving parts.

Fan Shaft Lubrication

Fan shaft bearing pillow blocks are furnished in either the prelubricated sealed-for-life type or the greasable type depending on what was ordered. The prelubricated type requires no servicing for 7 to 10 years of normal use, and the greasable type are factory greased eliminating the need for greasing initially. Follow the lubricating schedule recommended by the factory. When required, apply grease while the shaft is rotating. This practice should not supersede any safety considerations.

Use low pressure grease guns only. High pressure guns tend to blow out or unseat bearing seals, leaving the bearing open to collect grime, dust and foreign particles.

Lubrication Schedule

Always follow the bearing manufacturer's recommended lubrication schedule. If none is available, use the following general schedule.

a. Under average conditions where ambient temperatures do not exceed 120°F., lubrication is required 1 to 2 times a year.

b. In dirt laden atmospheres or where there is a temperature range of 120°F to 150°F, lubrication is required from 3 to 6 times a year.

c. Under extreme temperature conditions and extremely dirty atmospheres, lubrication should be at least once or twice a month.

Table 1: Recommended Lubricants

Manufacturer	Product	Temp. Range
BP	LG-#P-1	Below 32° F (0° C)
Gulf	Gulfcrown EP-1	
Imperial Oil	Unirex EP-1	
Shell	Alvania R-1	
BP	Energrease, MPMK11	32° F to 150° F (0° C to 66° C)
Gulf	Gulfcrown EP-2	
Imperial Oil	Unirex EP-2	
Shell	Alvania R-3	
Sun Oil	Sun Prestige 42	
Texaco	Regal AFB2	

Motor Lubrication

In general, standard motors are furnished with prelubricated, sealed-for-life ball bearings which require no lubrication for 7 to 10 years of normal service. Where motors have been ordered with greasable bearings, these bearings are factory lubricated and require no attention for one year under normal conditions. If grease relief fittings are provided, remove them when performing maintenance to allow grease to flow out. Whenever possible, apply grease while the motor is running. This practice should not supersede any safety considerations. DO NOT OVERGREASE, as most lubricants deteriorate motor windings, thereby reducing motor life.

MAINTENANCE

Hidden Danger

In addition to the normal dangers of rotating machinery, fans present an additional hazard in their ability to suck in not only air, but loose material as well. Solid objects can pass through the fan and be discharged by the impeller as potentially dangerous projectiles. Therefore, screen intake to ductwork, whenever possible, to prevent the accidental entrance of solid objects. Never open access doors to a duct system with the fan running. When starting the fan for the first time, completely inspect the ductwork and interior of the fan (with power locked off) to make certain there is no foreign material which can be sucked into or blown through the ductwork.

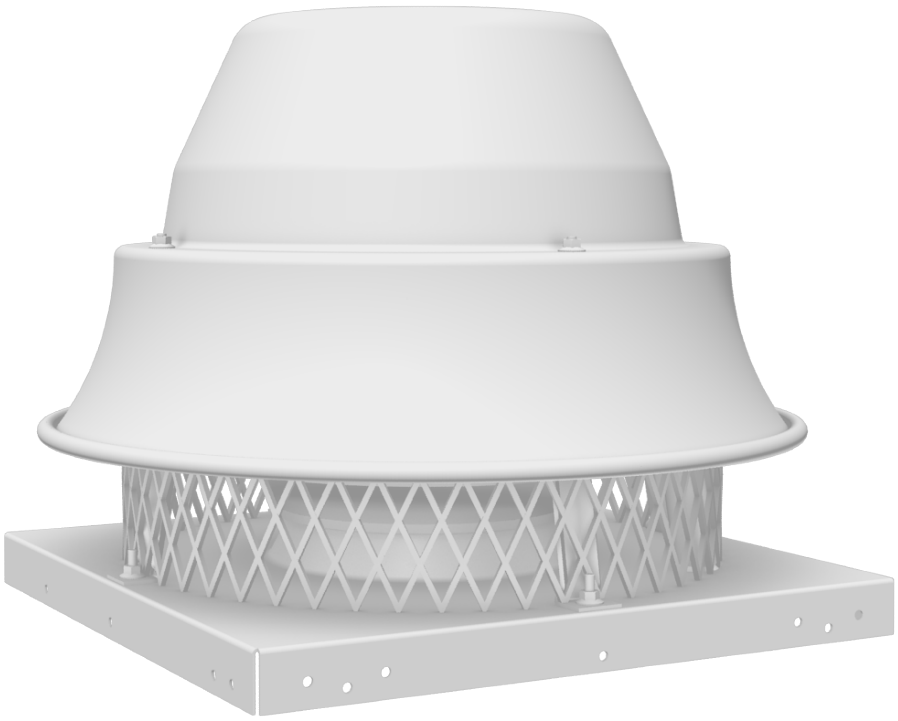
Guards

All fans have moving parts which require guarding in the same way as other moving machinery.

Where the fan is accessible to untrained personnel or the general public, use maximum safety guards, even at the cost of some performance loss. Unprotected fans located less than 7' above the floor also require guarding as specified in the Occupational Safety and Health Act (OSHA).

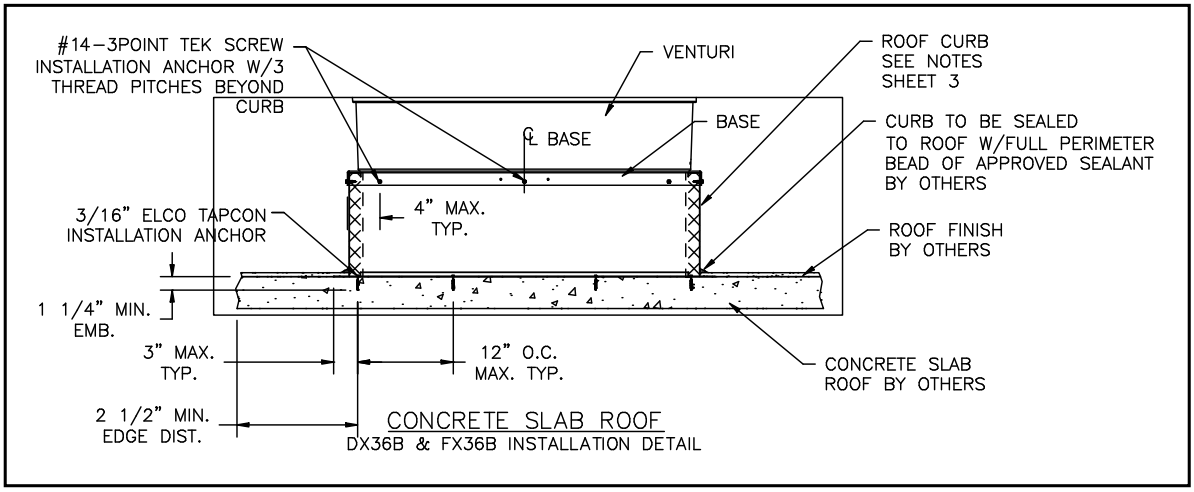
PennBarry recommends the use of guards on all exposed nonducted fans, ceiling and wall mounted.

Centrifugal fans may be connected directly to ductwork which will prevent contact with the internal moving parts, but when the inlet or outlet is exposed, install a suitable guard.

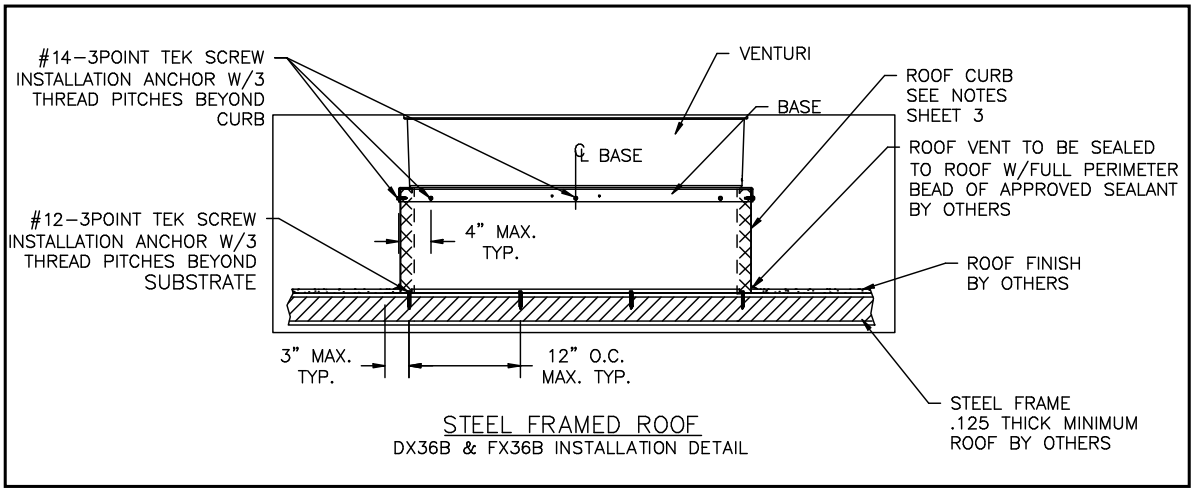


MAINTENANCE

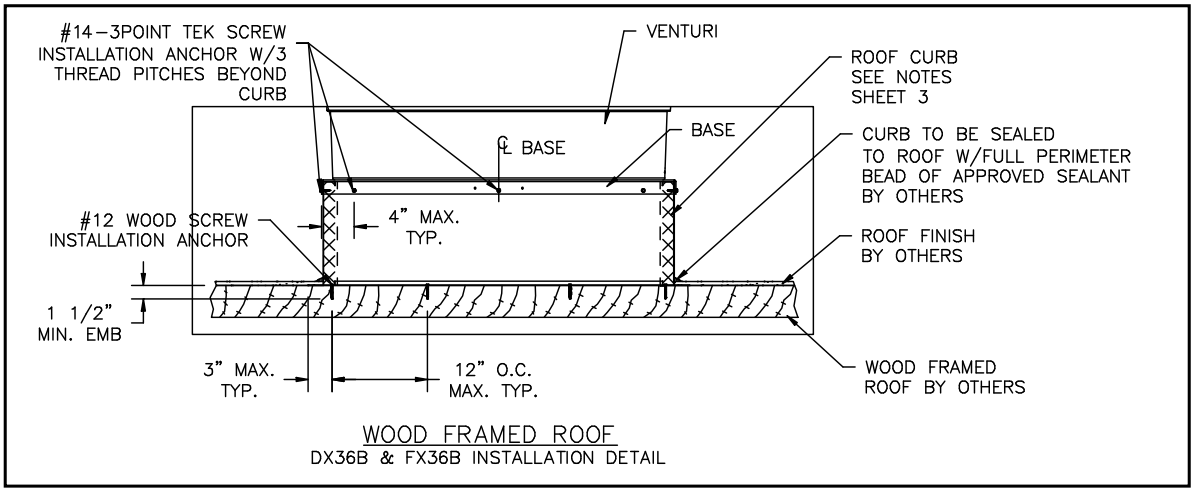
Typical Concrete Slab Roof Installation



Typical Steel Framed Roof Installation



Typical Wood Framed Roof Installation



Installation Notes: All four sides of curb and base are anchored identically.
Curb Notes: 18 gauge galvanized steel minimum, maximum height 18"

TROUBLESHOOTING CHECKLIST

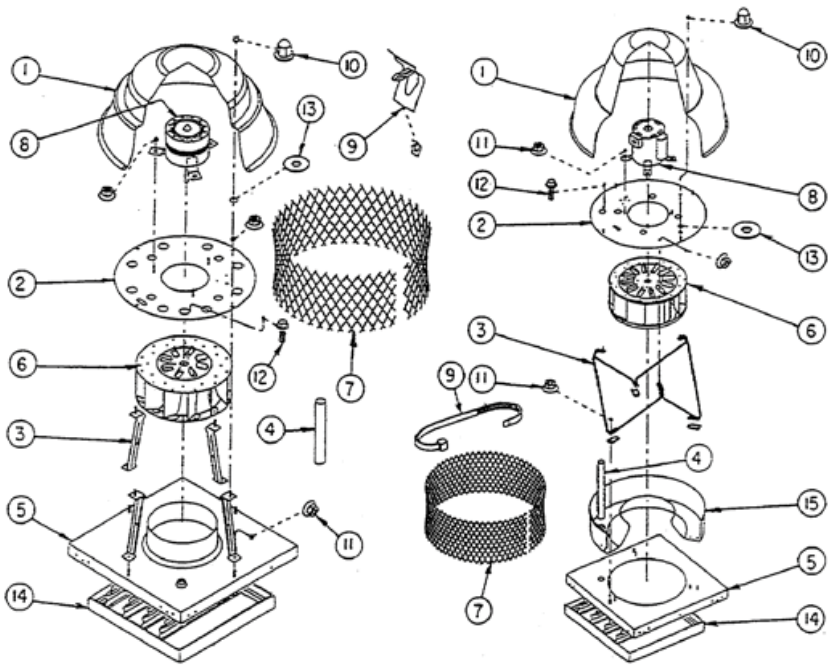
Symptom	Possible Cause(s)	Corrective Action
Excessive noise	1. Defective or loose motor bearings	1. Replace motor with same frame size, RPM, HP
	2. Ventilator base not securely anchored	2. Reset properly
	3. Loose or unbalanced wheel/propeller	3. Tighten screws, remove build-up, balance wheel/ propeller
	4. Misaligned pulleys or shaft	4. correct alignment
	5. Loose or damaged wheel/propeller	4. Replace wheel/propeller
	6. Wheel running in wrong direction	6. Reverse direction
Fan inoperative	1. Blown fuse or open circuit breaker	1. Replace fuses or circuit breaker
	2. Loose or disconnected wiring	2. Shut off power and check wiring for proper connections
	3. Defective motor	3. Repair or replace motor
	4. Broken belts	4. Replace belts
Insufficient airflow	1. Open access doors or loose sections of ducts	1. Check for leakage
	2. Clogged filters	2. Clean filters
	3. Operation in wrong direction	3. Correct rotation of wheel
	4. Insufficient make-up air direction	4. Add make-up fan or louver opening
Water leaking into ductwork or collection of grease under fan	1. Fan installed with slope in the wrong direction	1. Slope should be fitted in the direction of the drainage opening or grease collection box and drain spout
	2. Clogged drain spout	2. Clean drain spout
	3. Cooling tube or motor dome top removed	3. Install new cooling tube with gasket and dome top
	4. Grease container full	4. Empty grease box
Motor overheating	1. Belt slippage	1. Adjust tension or replace bad belts
	2. Overvoltage or under voltage	2. Contact power supply company
	3. Operation in wrong direction	3. Reverse direction of motor
	4. Fan speed too high	4. Slow down fan by opening variable pitch pulley on motor shaft
	5. Incorrect motor (service factor 1.0, low ambient temperature)	5. Replace motor with correct open, NEMA service factors (1.15 or higher) with 40 degrees ambient
	6. Blocked cooling tube or leaky gasket	6. Remove blockage and seal cooling tube in place
	7. Insufficient airflow to kitchen hood fan operating on low speed with kitchen in full operation	7. Check airflow under hood and adjust kitchen equipment output
	8. Undersized motor	8. Check motor ratings with catalog speed and air capacity chart

Note: Care should be taken to follow all local electrical, safety and building codes. Provisions of the National Electric Code (NEC), as wells as the Occupational Safety and Health Act (OSHA) should be followed.

All motors are checked prior to shipment. If motor defects should develop, prompt service can be obtained from the nearest authorized service station of the motor manufacturer while under warranty. Exchange, repair or replacement will be provided on a no charge basis if the motor is defective within the warranty period. The PennBarry representative in your area will provide a name and address of an authorized service station if requested. WARNING: Motor guarantee is void unless overload protection is provided in motor wiring circuit.

DIRECT DRIVE MODELS DX06R, DX08S/R, 10S/R, 11S/R, 11Q, 13V/S/R, 13Q, 16V/S/R, Q1 & Q2

Figure 5: (Left Image) DX06R, DX08S/R, 10S/R, 11S/R, 11Q, 13V/S/R & 13Q (Right Image) DX16V/S/R, Q1 & Q2



Part	Description
1	Hood Apron
2	Top Plate
3	Brace
4	Conduit Pipe
5	Base
6	Wheel
7	Screen
8	Motor
9	Screen Clip
10	Acorn Nut
11	1/4-20 Nut
12	1/4-20 Bolt
13	Washer
14	Backdraft Damper
15	Venturi

Direct Drive Models	
Fan Size	**Base Dim.**
6	18.5
8	18.5
10	18.5
11	18.5
13	18.5
16	20.5

Fan Base Dimensions (outside curb dimension should be 1" smaller than inside fan base dimension)

BELT DRIVE MODELS DX06B-36B, KB, JB & MB

Figure 6: DX06B, 08B

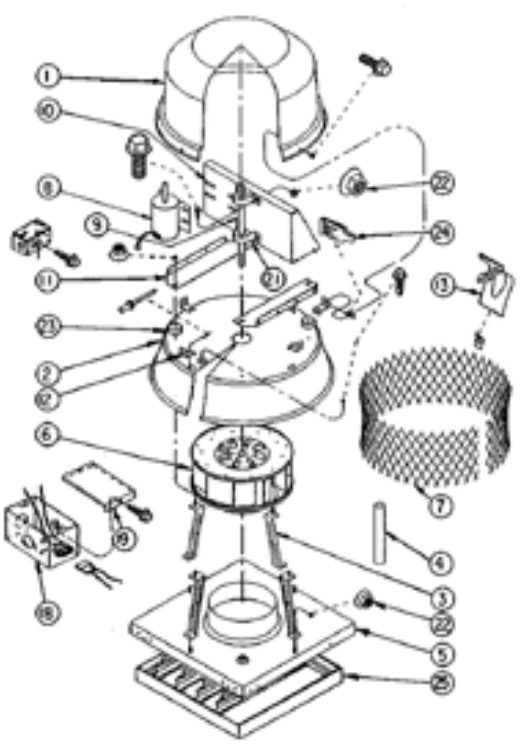


Figure 7: DX11B

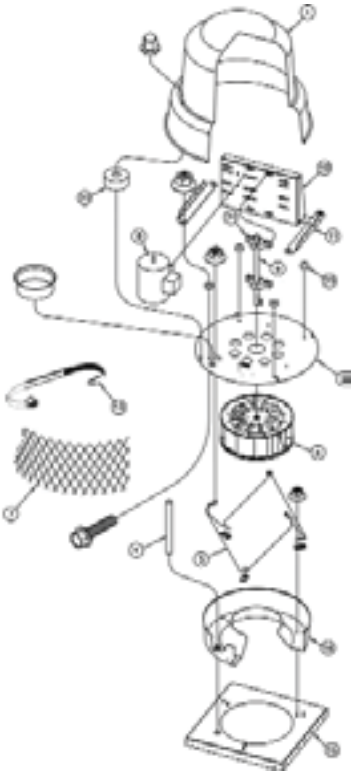


Figure 8: KB, JB, MB

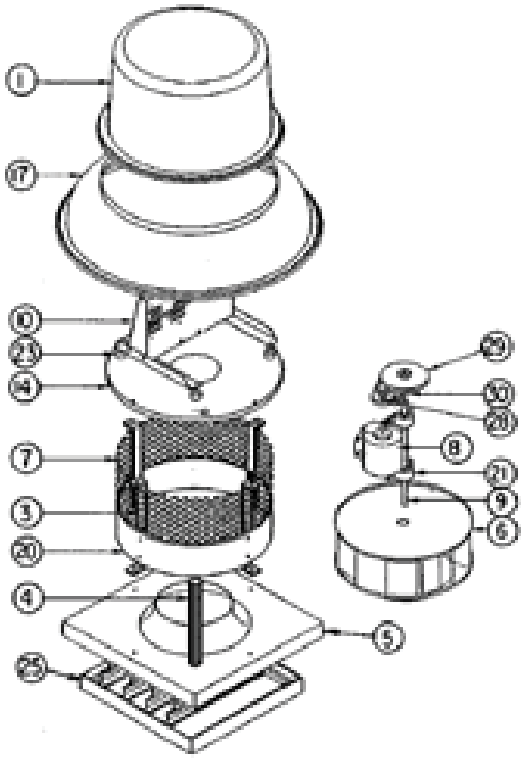
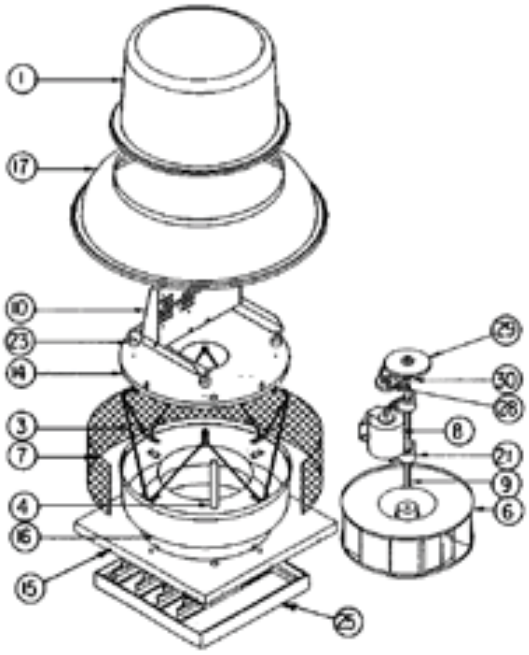


Figure 9: DX11BA thru DX36B



BELT DRIVE MODELS DX06B-36B, KB, JB & MB

Part	Description
1	Hood
2	Top Plate Apron
3	Vertical Brace
4	Conduit Pipe
5	Base Venturi
6	Centrifugal Wheel
7	Screen
8	Motor
9	Shaft
10	Motor Bearing Frame
11	Motor Frame Support Angle
12	Hood Mounting Lug
13	Screen Clip
14	Top Plate
15	Base

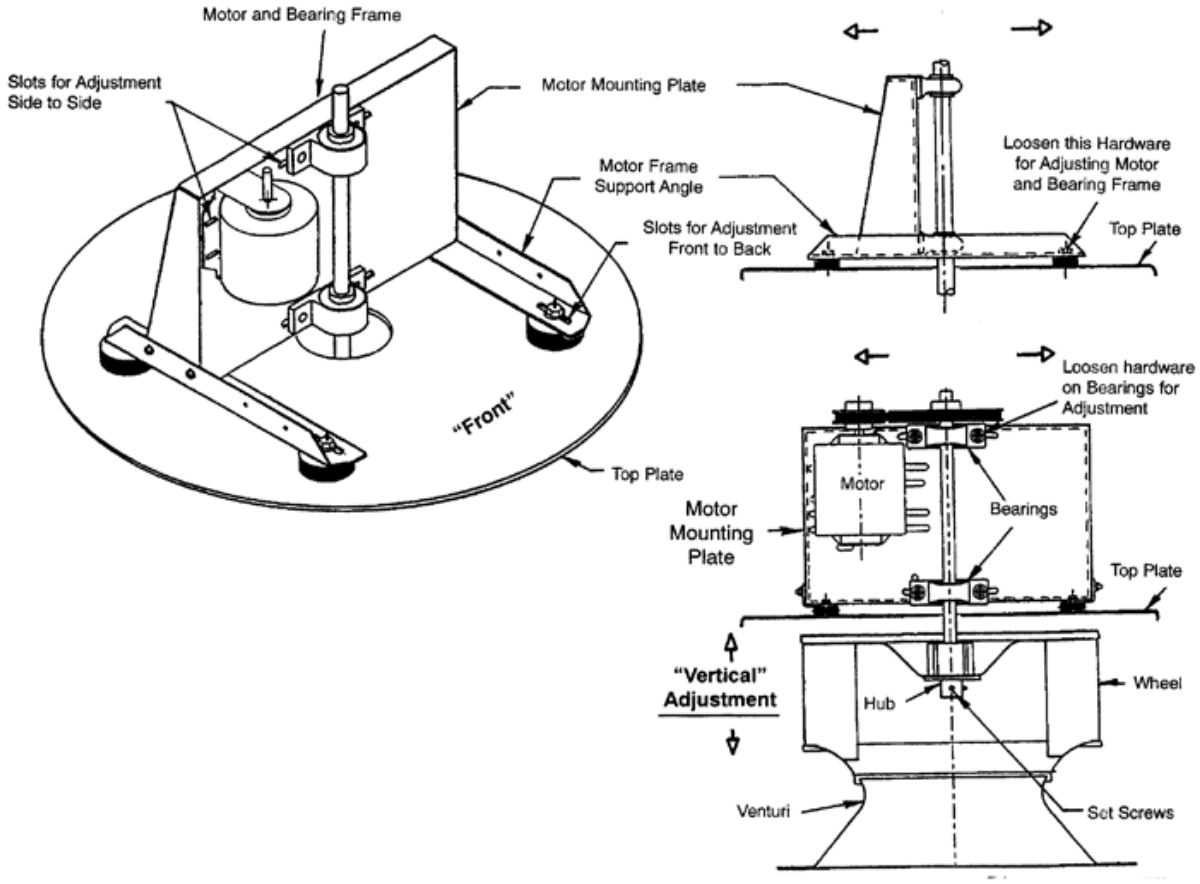
Part	Description
16	Venturi
17	Apron
18	Junction Box
19	Junction Box Cover
20	Baffle
21	Bearings
22	1/4-20 Nut
23	Rubber Bushing
24	Bolt Clip
25	Backdraft Damper
26	Bearing Support Plate
27	Motor Support Plate
28	Motor Pulley
29	Fan Pulley
30	Belt

Belt Drive Models	
Fan Size	**Base Dim.**
06B	18.5
08B	18.5
11B(A)	20.5
12B	24.75
14B	24.75
16B	28.5
18B	28.5
24B	33.5
30B	36.5
36B	44.5
KB	52.5
JB	59
MB	63.5

Maximum Fan RPM and Motor Horsepower Size Belt Drive Models													
Fan Size	06B	08B	11B(A)	12B	14B	16B	18B	24B	30B	36B	KB	JB	MB
Max Safe RPM	1437	1437	1575	2007	1793	1631	1326	1275	988	810	600	480	440
Max Motor Frame Size	42	42	56	56	56	145T	145T	184T	184T	213T	213T	215T	254T

WHEEL ALIGNMENT PROCEDURES

Figure 10



The wheel position is preset at factory and must rotate freely. However, movement may occur due to rough handling prior to installation, and realignment may be necessary. If field correction is required follow these procedures:

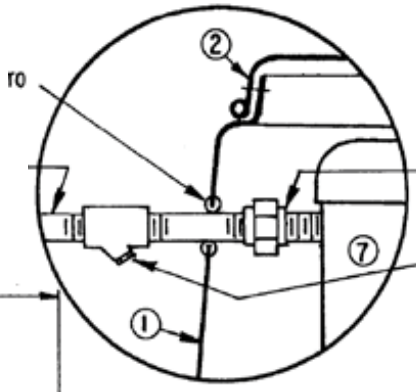
1. If "Front to Back" adjustment is required, loosen both motor frame support angles (four nuts), relocate frame and retighten.
2. If "Side to Side" adjustment is required, loosen both bearings (four nuts), relocate, and retighten.
3. If "Vertical" adjustment is required, loosen both set screws on the wheel hub (accessible from the bottom side of the unit), raise or lower the wheel, and retighten.

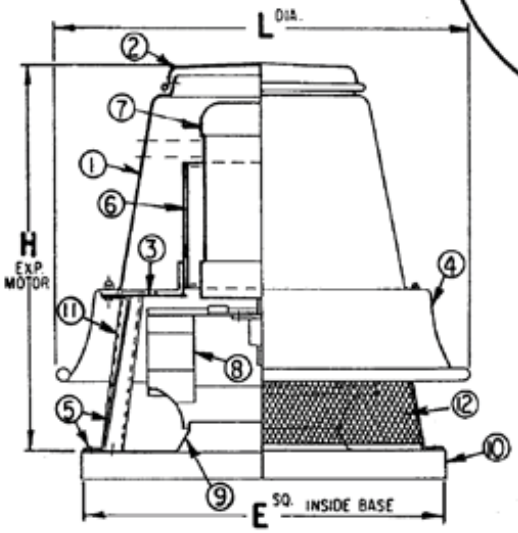
DIRECT DRIVE - EXPLOSION PROOF MOTOR

Spun Aluminum Centrifugal Roof Exhauster

PUNCH OR DRILL HOLE FOR CONDUIT PATH. HOLE MUST BE SEALED OR CAULKED TO PREVENT WATER ENTRY.

RIGID CONDUIT OR I.M.C. (INTERMEDIATE METAL CONDUIT) USED PER N.E.C. AND/OR LOCAL CODES. (BY OTHERS)





*NOTE - ALL WIRING MUST BE PROVIDED BY A LICENSED ELECTRICIAN FAMILIAR WITH EXPLOSION PROOF WIRING PRACTICES AND REGULATIONS, USING COMPONENTS APPROPRIATE TO THE SPECIFIC INSTALLATION AND N.E.C. AND/OR LOCAL CODES.

Legend

1. Motor Dome	4. Discharge Apron	7. Motor (Exp. Motor)	10. Mounting Base
2. Motor Hood Top (For Exp. Motor)	5. Structural Support Braces	8. Centrifugal Fan Wheel with Cooling Vanes	11. Conduit Guide (Not for Exp. Motor)
3. Top Plate	6. Motor Mounting Plate	9. Spun Venturi	12. Aluminum Bird Screen

Dimensional Data

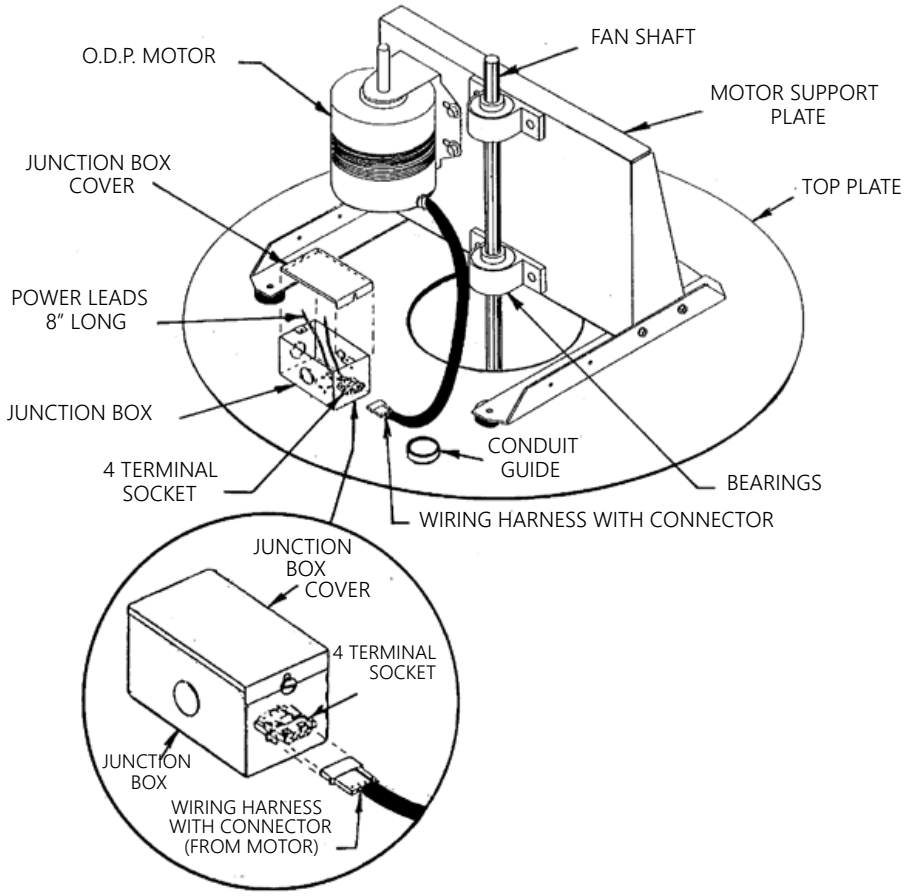
	DX08Q	DX10Q	DX11Q	DX13Q	DX16Q
$L^{DIA.}$	20 7/8	20 7/8	20 7/8	21 7/16	28 1/2
$H^{EXP. MOTOR}$	18	19	19	19	26 11/16

† Outside dimension of curb should be 1 1/2" less than 'E' dimension.
All dimensions in inches.

Material: Spun Aluminum Housing

WIRING HARNESS - DISCONNECT DEVICE

O.D.P. Motors (ITW Harness) 115/220 Single Phase



Electrical Connections

Connect motor per nameplate to correct power supply. Install all wiring, protection and grounding in accordance with National Electrical Code and local requirements. Follow all local electrical and safety codes, as well as the National Electrical Code (NEC) and the Occupational Safety and Health Act (OSHA).

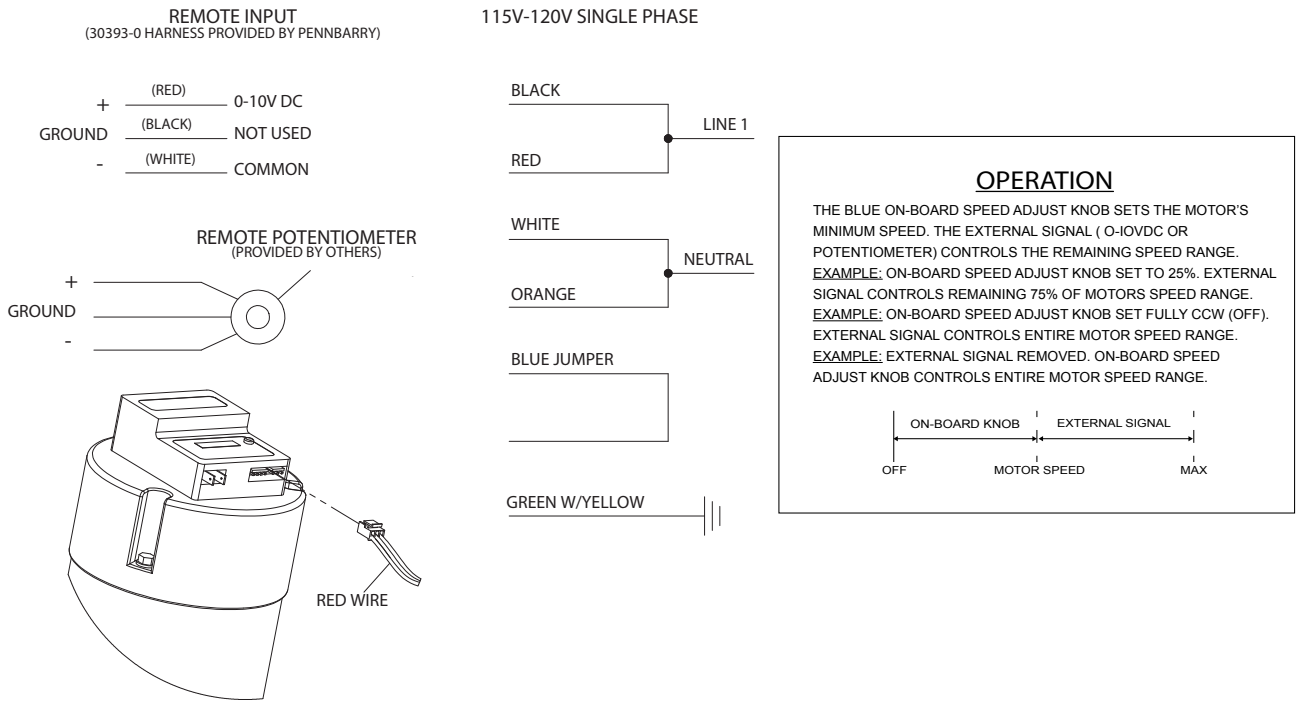
Wiring Instructions

CAUTION: When bringing power lines up, power MUST be off.

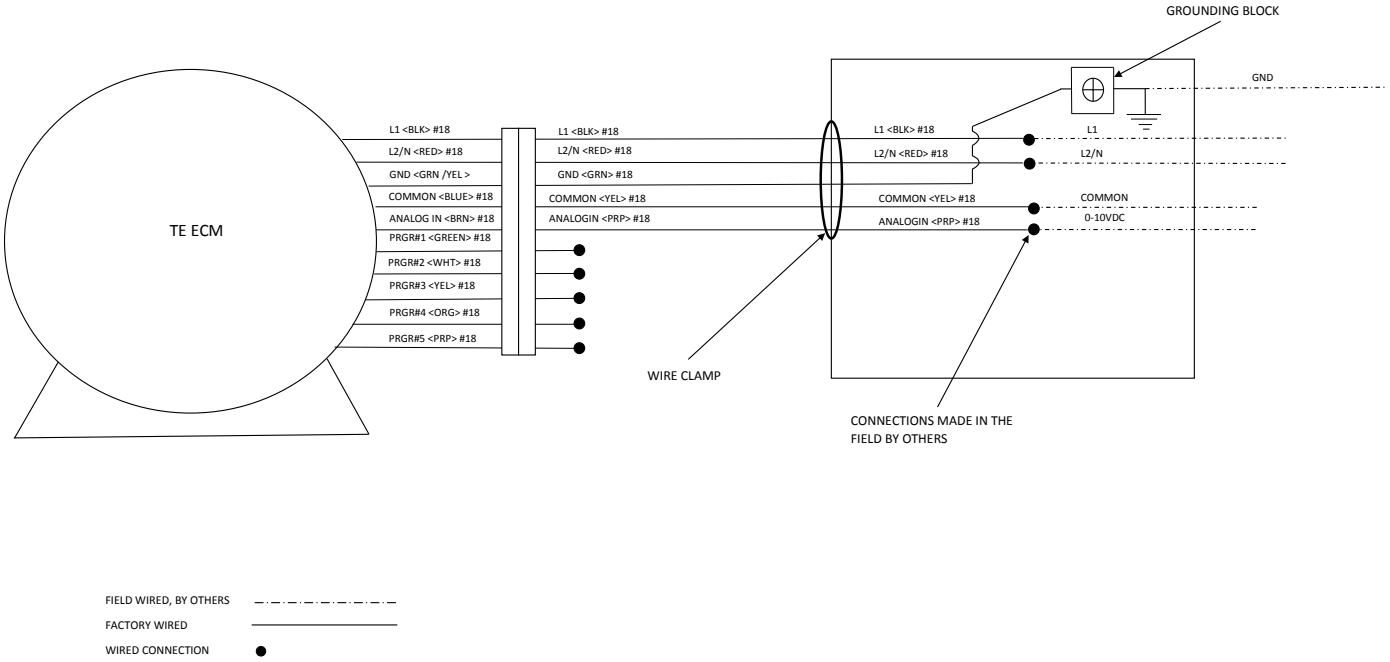
1. Bring power lines up to motor compartment through conduit guide.
2. Remove junction box cover so that power leads are exposed.
3. Remove one knock-out, attach connector, and run power lines from source into junction box.
4. Terminal socket has two 8" long pigtails already stripped. Make connection to power lines using proper size wire nuts and fold wires back into box.
5. Replace junction box cover and secure in place with screw.
6. Plug harness connector (from motor) into terminal socket at end of junction box. Unit is now ready to test.

WIRING HARNESS – ECM

1) O.D.P. Motors 120v Single Phase

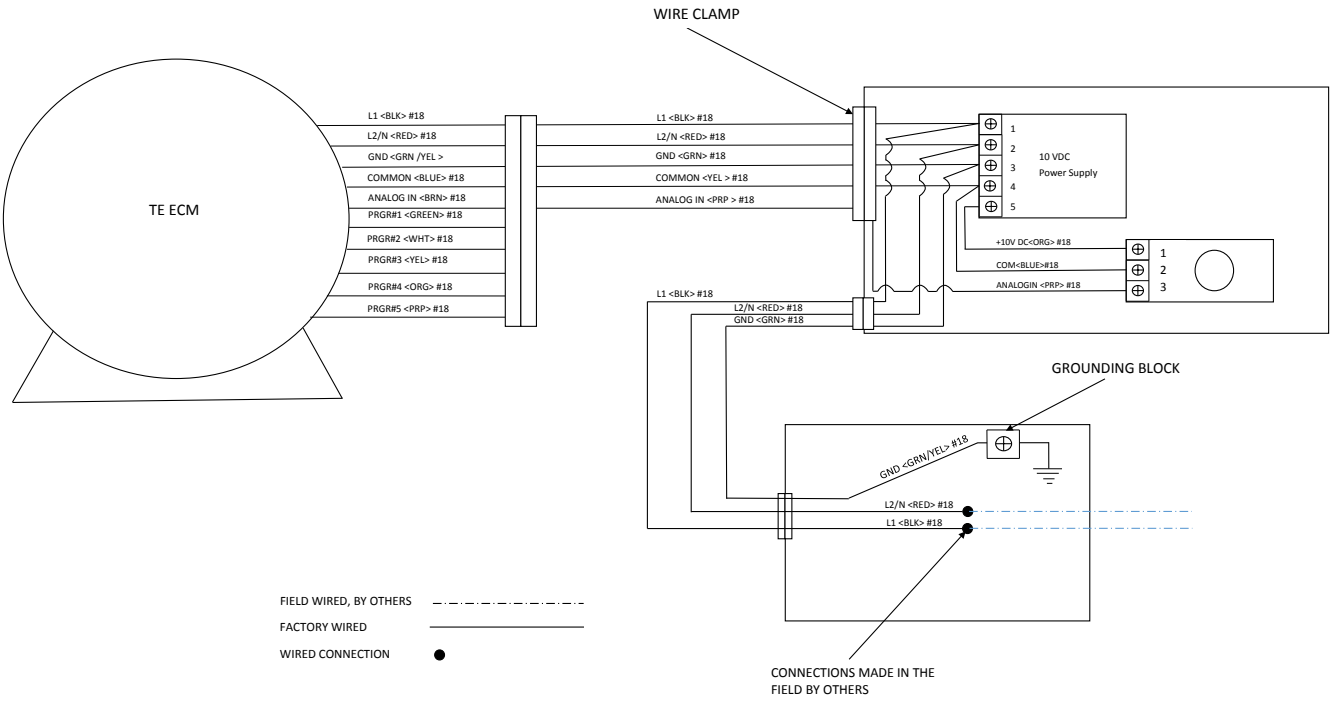


2) T.E. Motors 120v/240v/460v Single Phase (control provided by others)

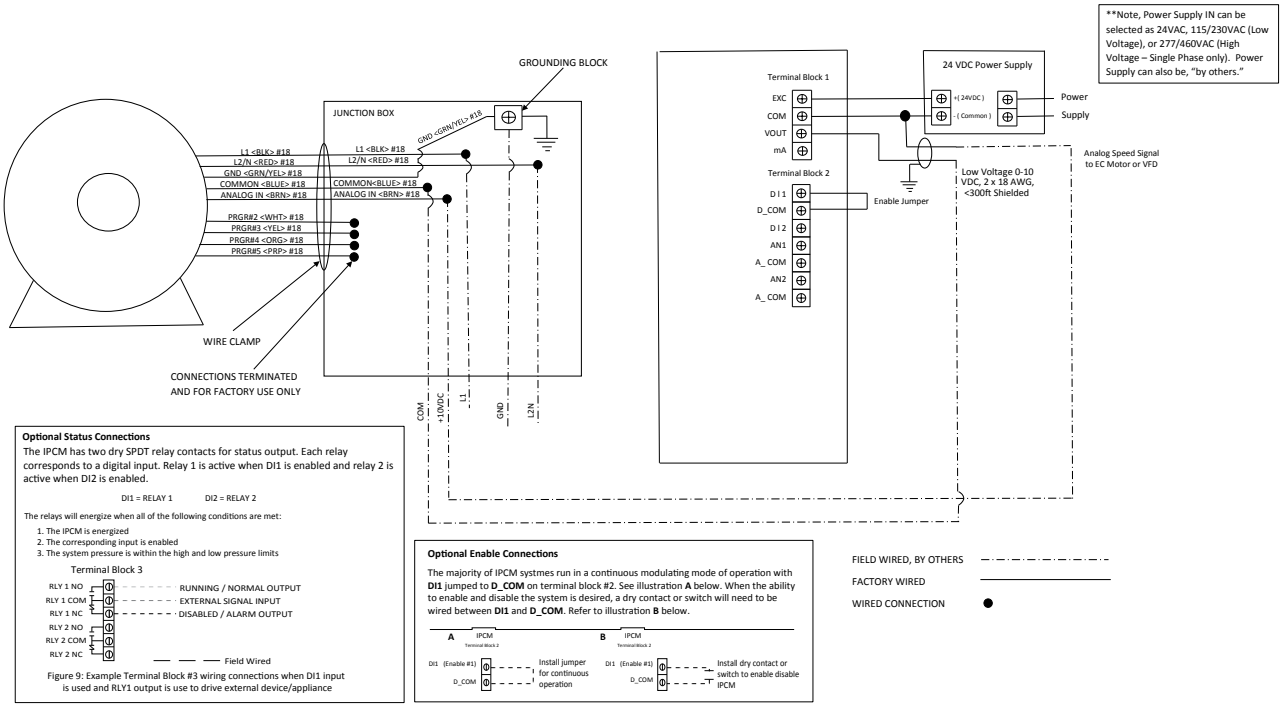


WIRING HARNESS – ECM

3) T.E. Motors 120v/240v/460v Single Phase (0-10V output potentiometer)

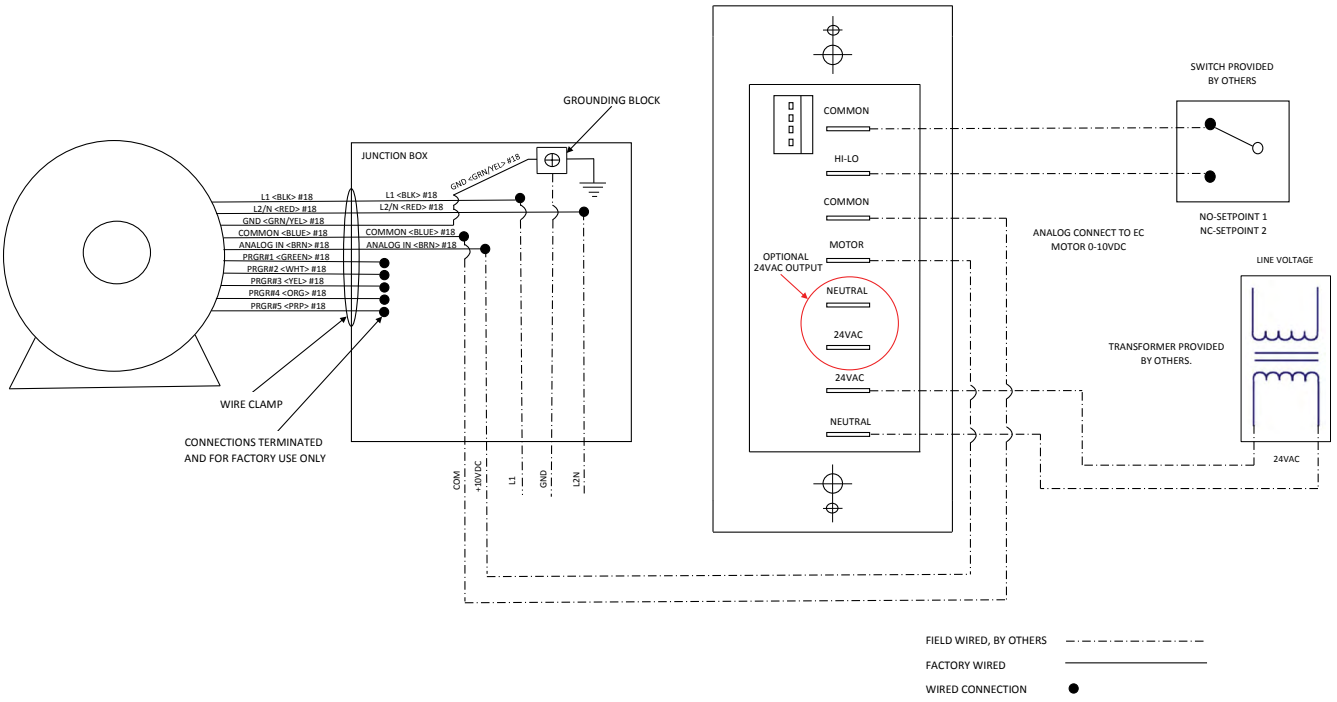


4) T.E. Motors 120v/240v/460v Single Phase (with iQ-IPCM controller)

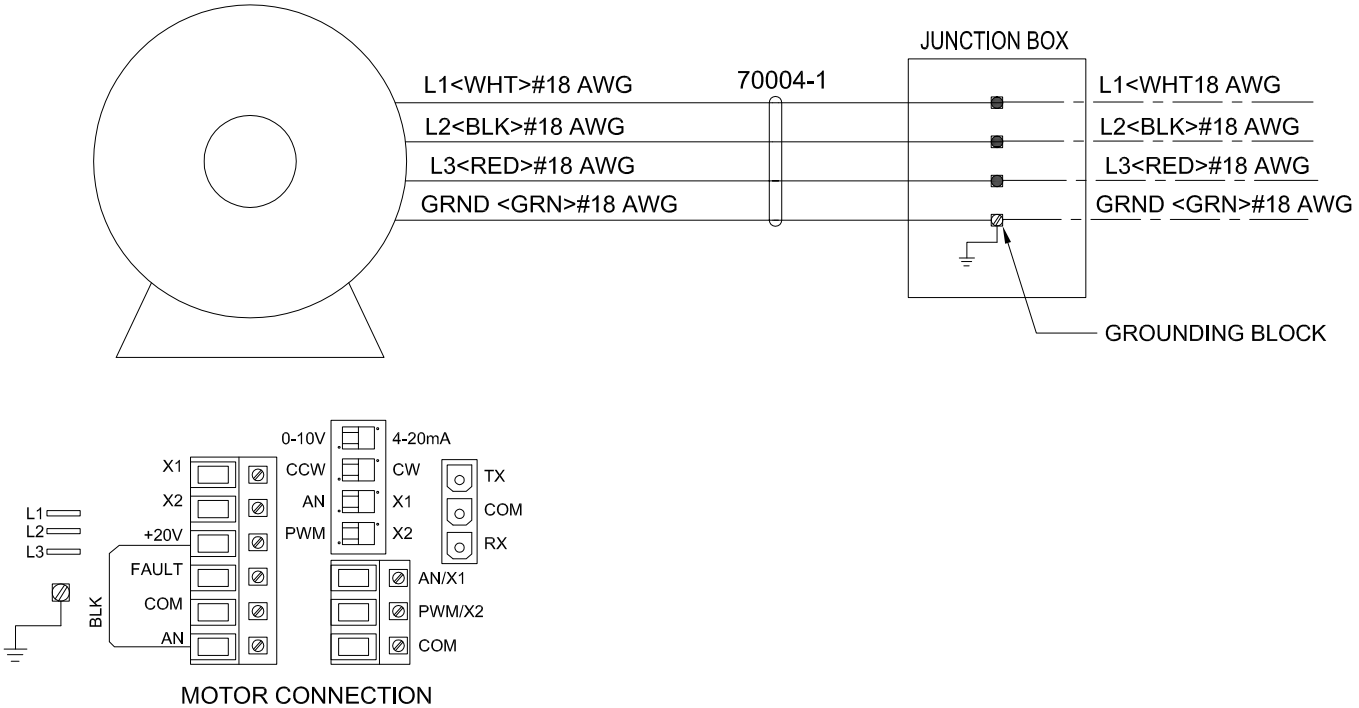


WIRING HARNESS – ECM

5) T.E. Motors 120v/240v/460v Single Phase (with iQ-MS controller)



6) T.E. Motors 208v/460v Three Phase



MOTOR CONNECTION

PENNBARRY™

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AMCA Standards On Fan Arrangements, Rotation, Discharge & Motor Position

Data contained in this issue should be thoroughly understood, as it is important in properly choosing, applying, pricing and ordering centrifugal and axial fans of all types. The terminology contained is a standard with the Air Movement and Control Association (AMCA) and has been adapted by the industry as a whole. It should be a part of your everyday language when considering fans.

Drive Arrangements

AMCA Standards 99-2404-03, 99-2410-03 (see pages 2, 3 and 7). These pages illustrate the usual fan arrangements with their proper numbers. When ordering fans, or when requesting data or prices, the required fan arrangement MUST always be indicated.

Inlet Box Positions For Centrifugal Fans

Standard 99-2405-03 (see page 4 and 8). This page shows proper designations for inlet box positions, in degrees. When ordering fans with inlet boxes this information is required.

Designations For Rotation & Discharge Of Centrifugal Fans

AMCA Standard 99-2406-03 (see page 5). Proper terminology is clearly indicated on this page. When ordering equipment, or when requesting certified prints, always be sure to include this information. No order will begin fabrication without it, if in doubt as to proper designation, draw a sketch. In the event that an angular discharge is required that is NOT at 45º, be sure to clearly state what is required, such as “top angular down 30º from horizontal” or “bottom angular up 20º from horizontal.” Here again, draw a sketch if in doubt.

Motor Positions For Belt Drive Centrifugal Fans

AMCA Standard 99-2407-03 (see page 6). This page indicates standard nomenclature for properly locating the motor in reference to the drive side of the fan. It is fully accepted by the industry and vibration base manufacturers as well. If a bare fan without motor or drive is ordered this information is not needed; but whenever a drive or vibration base is to be included this information is absolutely necessary. Please note that motor position is always determined from the drive side of the fan, and has no reference whatsoever to fan rotation or discharge.

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Printed in the USA Jan 2005
ED 16002

Drive Arrangements For Centrifugal Fans AMCA Standard 99-2404-03

NOTES:

SW - Single Width **DW** - Double Width

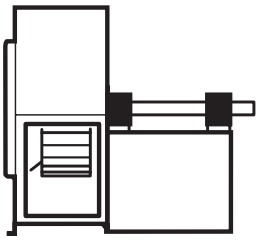
SI - Single Inlet **DI** - Double Inlet

Arrangements 1, 3, 7 and 8 are also available with bearings mounted on pedestals or base set independent of the fan housing.

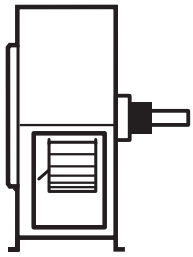
For designation of rotation and discharge, see page 5.

For motor position, belt or chain drive, see page 6.

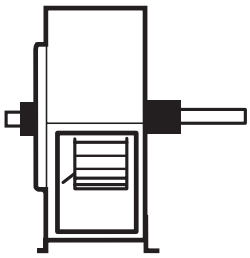
For designation of position of inlet boxes, see page 4.



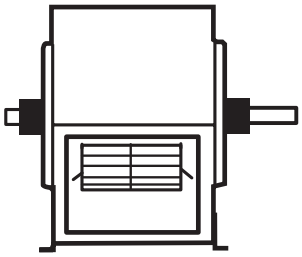
ARR. 1 SWSI - For belt drive or direct connection. Impeller overhung. Two bearings on base.



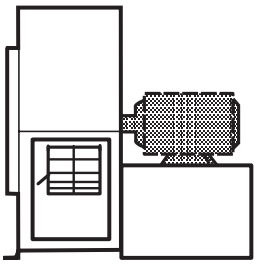
ARR. 2 SWSI - For belt drive or direct connection. Impeller overhung. Bearings in bracket supported by fan housing.



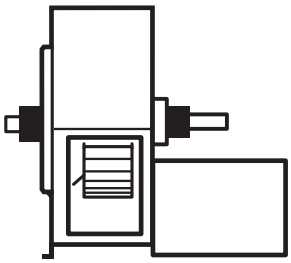
ARR. 3 SWSI - For belt drive or direct connection. One bearing on each side and supported by fan housing.



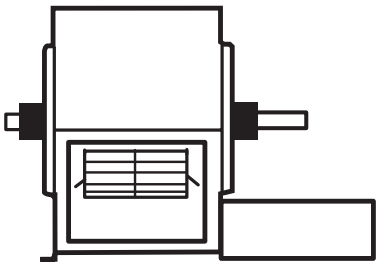
ARR. 3 DWDI - For belt drive or direct connection. One bearing on each side and supported by fan housing.



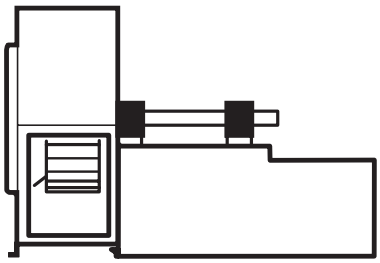
ARR. 4 SWSI - For direct drive. Impeller overhung on prime mover shaft. No bearings on fan. Prime mover base mounted or integrally directly connected.



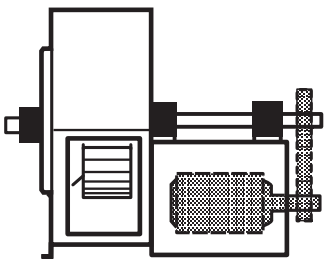
ARR. 7 SWSI - For belt drive or direct connection. Arrangement 3 plus base for prime mover.



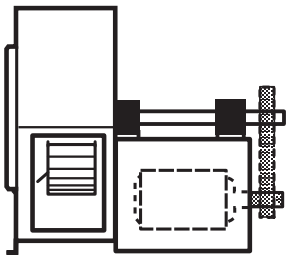
ARR. 7 DWDI - For belt drive or direct connection. Arrangement 3 plus base for prime mover.



ARR. 8 SWSI - For belt drive or direct connection. Arrangement 1 plus extended base for prime mover.



ARR. 9 SWSI - For belt drive. Impeller overhung, two bearings, with prime mover outside base.



ARR. 10 SWSI - For belt drive. Impeller overhung, two bearings, with prime mover inside base.

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Drive Arrangements For Centrifugal Fans AMCA Standard 99-2404-03

NOTES:

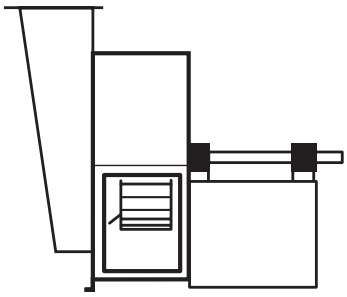
SW - Single Width **DW** - Double Width

SI - Single Inlet **DI** - Double Inlet

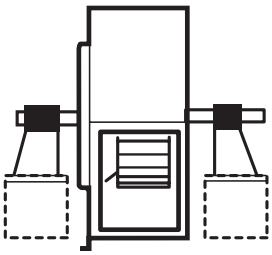
For designation of rotation and discharge, see page 5.

For motor position, belt or chain drive, see page 6.

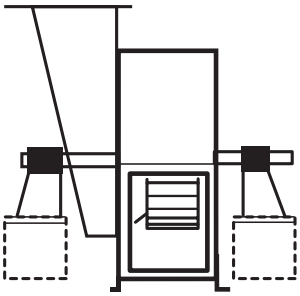
For designation of position of inlet boxes, see page 4.



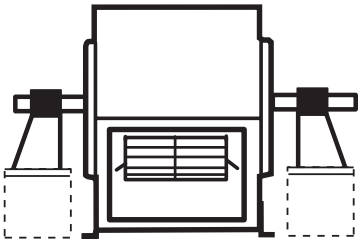
ARR. 1 SWSI With Inlet Box - For belt drive or direct connection. Impeller overhung, two bearings on base. Inlet box may be self-supporting.



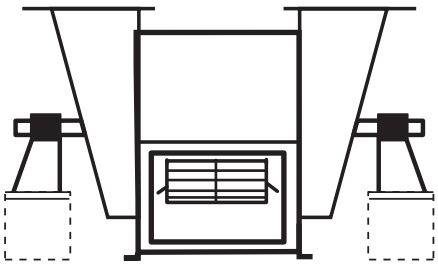
ARR. 3 SWSI With Independent Pedestal - For belt drive or direct connection fan. Housing is self-supporting. One bearing on each side supported by independent pedestals.



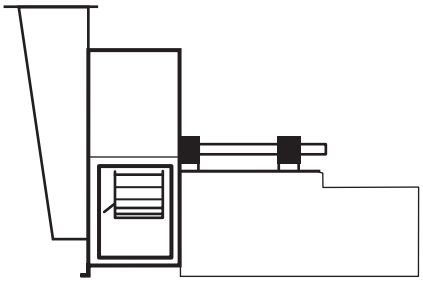
ARR. 3 SWSI With Inlet Box and Independent Pedestals - For belt drive or direct connection fan. Housing is self-supporting. One bearing on each side supported by independent pedestals with shaft extending through inlet box.



ARR. 3 DWDI With Independent Pedestal - For belt drive or direct connection fan. Housing is self-supporting. One bearing on each side supported by independent pedestals.

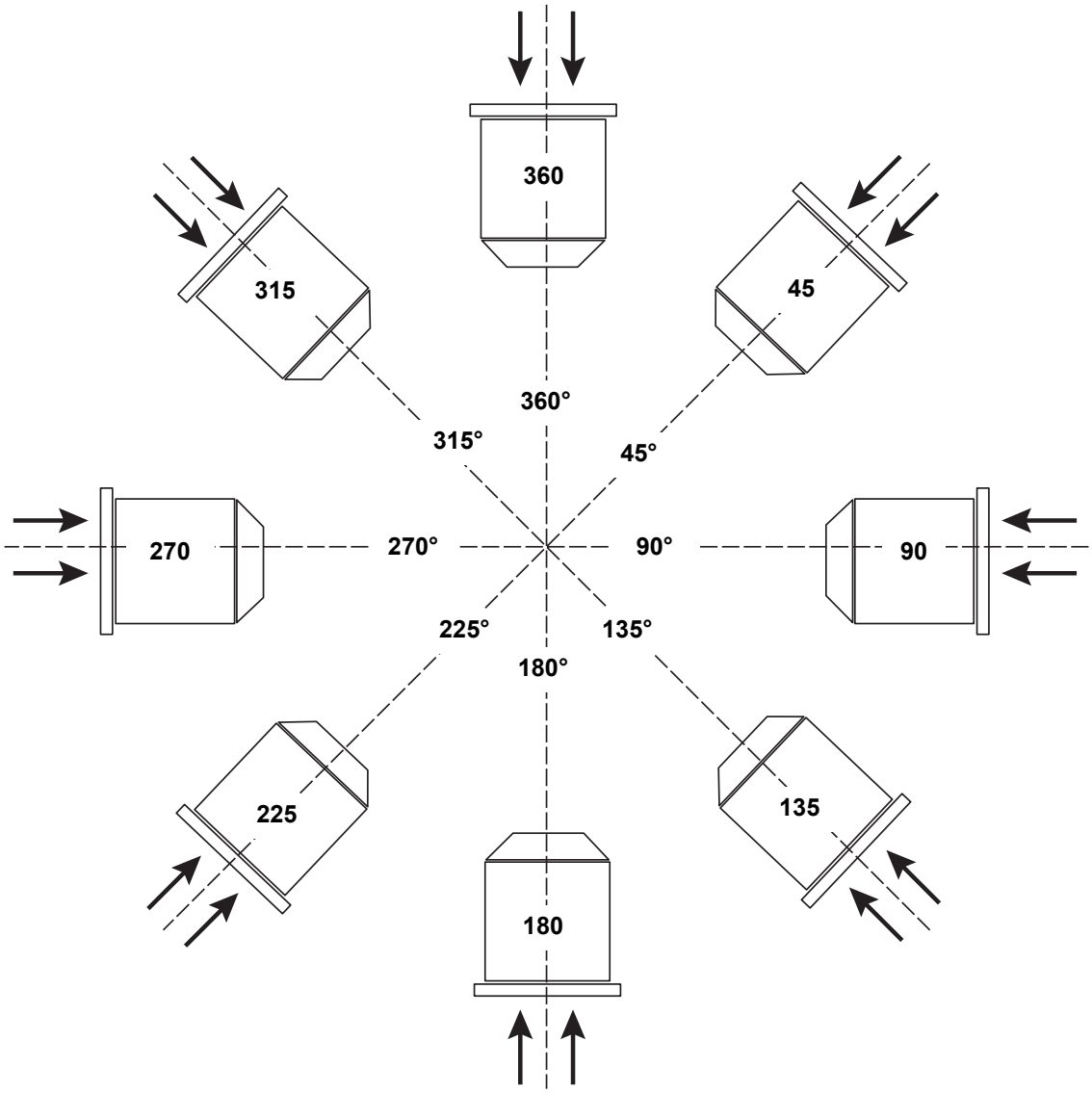


ARR. 3 DWDI With Inlet Box and Independent Pedestals - For belt drive or direct connection fan. Housing is self-supporting. One bearing on each side supported by independent pedestals with shaft extending through inlet box.



ARR. 8 SWSI With Inlet Box - For belt drive or direct connection. Impeller overhung, two bearings on base plus extended base for prime mover. Inlet box may be self-supporting.

Inlet Box PositionsFor Centrifugal Fans
AMCA Standard 99-2405-83



NOTES:

1. Reference line is the top vertical axis through center of fan shaft.
2. Position of inlet box and air entry to inlet box in determined from DRIVE SIDE OF FAN.
3. Position on inlet box is designated in degrees clockwise from top vertical axis as shown, and may be any intermediate angle as required.
4. Positions 135° to 225° in some cases interfere with floor structure.

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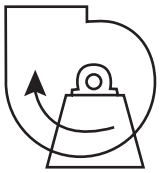
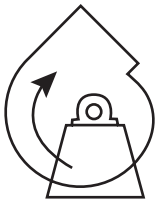
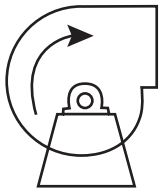
Designations For Rotation & Discharge Of Centrifugal Fans AMCA Standard 99-2406-03



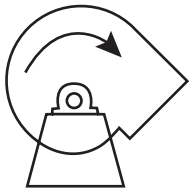
Clockwise
Up Blast
CW 360



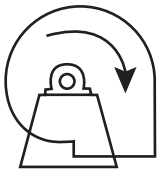
Clockwise
Top Angular Up
CW45



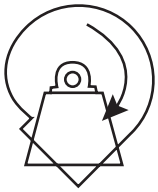
Clockwise
Top Horizontal
CW90



Clockwise
Top Angular Down
CW45

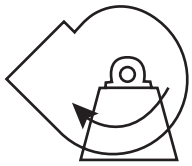


Clockwise
Down Blast
CW 180

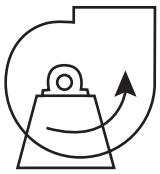


Clockwise
Bottom Angular Up
CW225

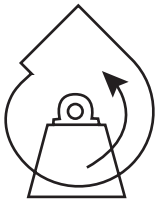
Clockwise
Bottom Horizontal
CW270



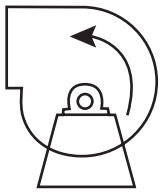
Clockwise
Bottom Angular Up
CW315



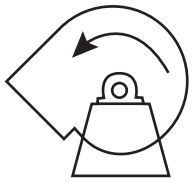
Counterclockwise
Up Blast
CW 360



Counterclockwise
Top Angular Up
CW45



Counterclockwise
Top Horizontal
CW90

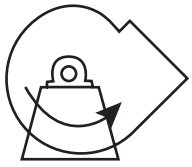


Counterclockwise
Top Angular Down
CW135

Counterclockwise
Down Blast
CW 180

Counterclockwise
Bottom Angular Down
CW225

Counterclockwise
Bottom Horizontal
CW270

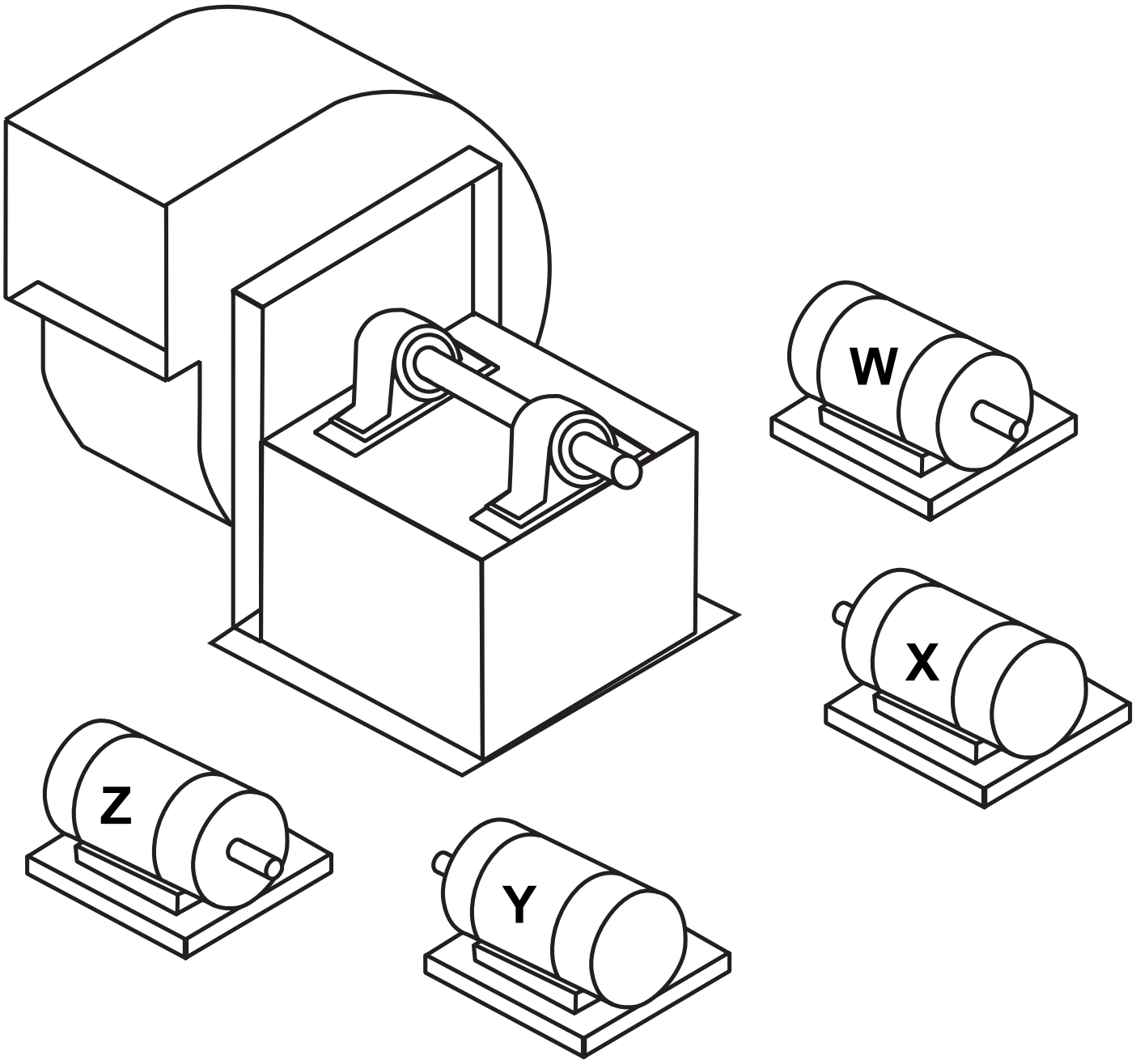


Counterclockwise
Bottom Angular Up
CW315

NOTES:

1. Direction of rotation is determined from drive side of fan (see Note 2 and 3).
2. On single inlet fans, drive side is always considered as the side opposite fan inlet (even when driven through fan inlet).
3. On double inlet fans with drives on both sides, drive side is that with the higher powered drive unit.
4. Direction of discharge is determined in accordance with diagrams. Angle of discharge is referred to the vertical axis of fan and designated in degrees from such standard reference axis. Angle of discharge may be any intermediate angle as required.
5. For fan inverted for ceiling suspension, or side wall mounting, direction of rotation and discharge is determined when fan is resting on floor.

Motor Positions For Belt Or Chain Drive Centrifugal Fans
AMCA Standard 99-2407-03



NOTE:

Location of motor is determined by facing the drive side of fan and designating the motor positions by letters W, X, Y or Z as the case may be.

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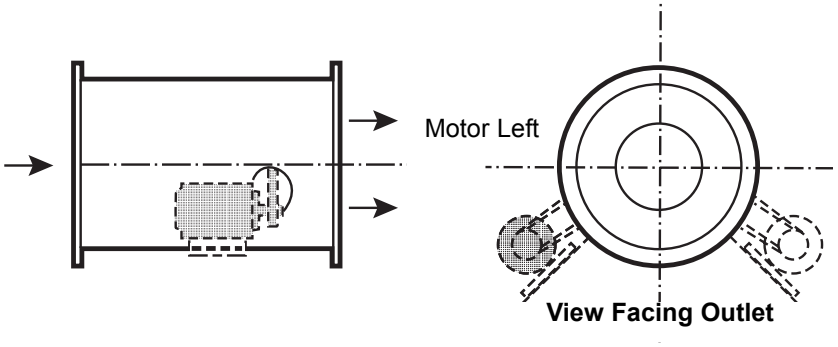
Drive Arrangements For Tubular Centrifugal Fans AMCA Standard 99-2410-03

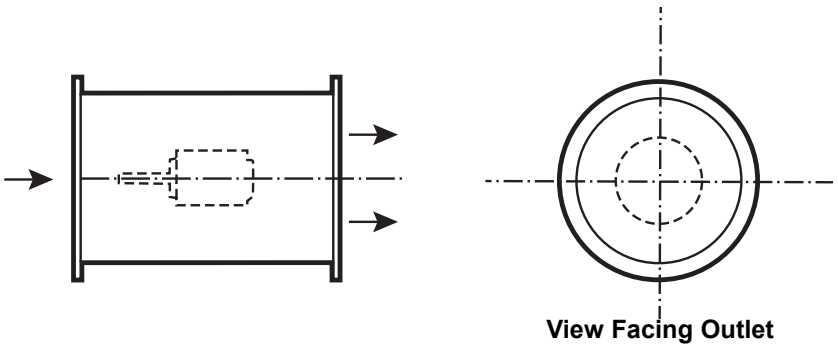
ARRANGEMENT 1

For belt drive. Impeller overhung on a shaft supported by bearings mounted within casing. Motor mounted independent of casing. horizontal discharge.



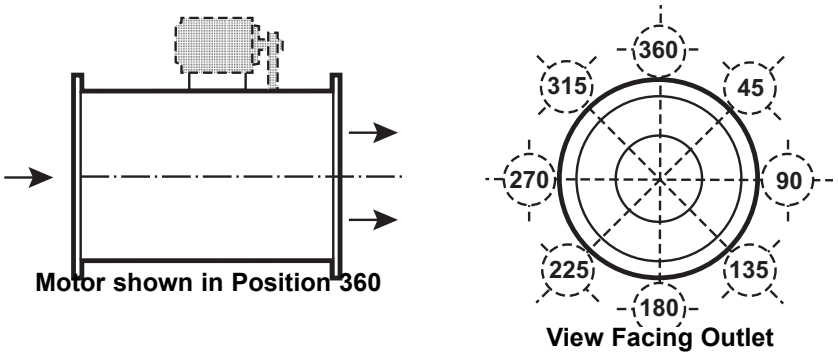
ARRANGEMENT 4

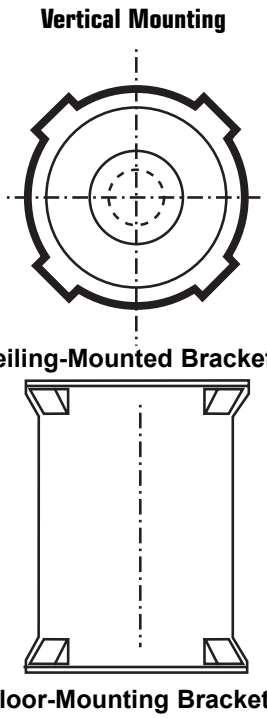
For direct drive. Impeller overhung on motor shaft. Motor supported within casing. For horizontal and vertical discharge. Duct mounting shown.



ARRANGEMENT 9

For belt drive. Impeller overhung on a shaft supported by bearings mounted within casing. Designed for mounting of motor on outside of casing in one of the standard locations shown. For horizontal and vertical discharge. Duct mounting shown.





The Arrow shown above designates the direction of airflow.

Rotation of fans is determined by viewing from the fan outlet end.

Specify either up blast or down blast discharge for vertically-mounted fans.

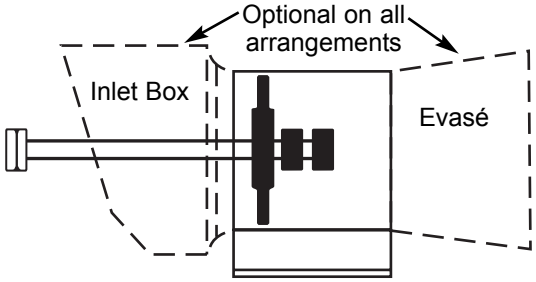
The locations of motors, supports, access doors, etc., are determined by viewing the outlet of the fan and resting location 180 on the floor as shown for Arrangement 9.

Arrangements 4 and 9 can be furnished with supports for floor, wall or ceiling mounting. The position of these supports determines which motor locations are available for motor placement. Generally motor locations 135, 180 and 225 are not available on floor, wall or inverted ceiling-mounted fans and motor locations 45, 90, 270 and 315 may not be available for ceiling-hung fans.

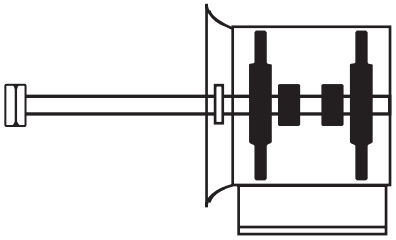
Another method of mounting vertical fans as shown in the view on the right. Specify fan to be furnished with ceiling-mounting brackets, floor-mounting brackets or both.

Inlet Box Positions For Centrifugal Fans
AMCA Standard 99-2405-03

NOTE: All fan orientations may be horizontal or vertical.

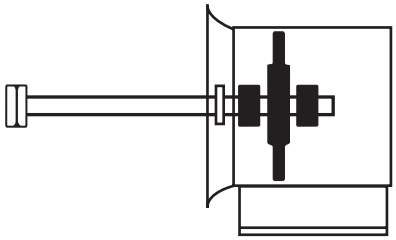


Arrangement 1



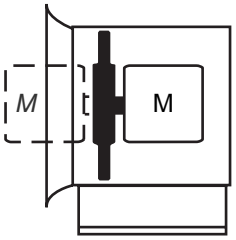
Arrangement 1 / 2-Stage

For belt drive or direct connection. Impeller overhung.
Two bearings located either upstream or downstream of impeller.

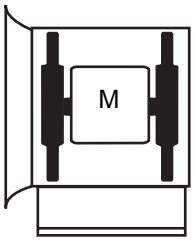


Arrangement 3

For belt drive or direct connection. Impeller between bearings that are on integral supports. Drive through inlet.

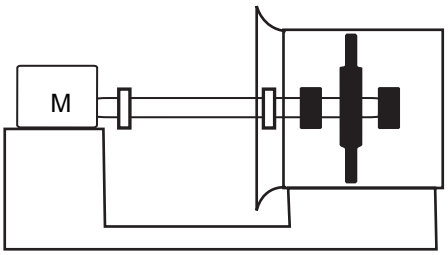


Arrangement 4



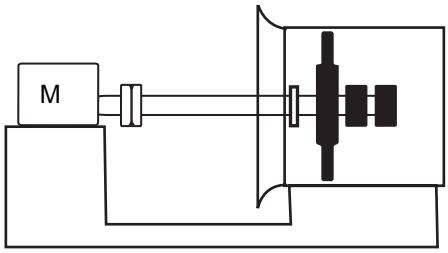
Arrangement 4 / 2-Stage

For direct connection. Impeller overhung on motor shaft. No bearings on fan. Motor on internal supports.



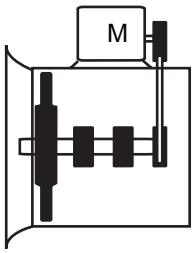
Arrangement 7

For belt drive or direct connection. Impeller between bearings that are on integral supports. Drive through inlet.

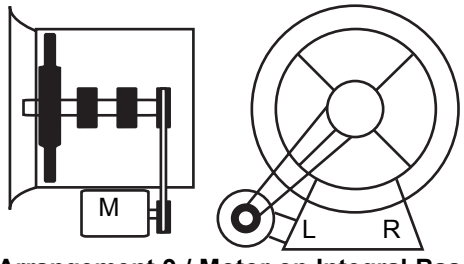


Arrangement 8 (1 or 2-Stage)

For direct connection. Impeller overhung on motor shaft. No bearings on fan. Motor on internal supports.



Arrangement 9 / Motor on Casing



Arrangement 9 / Motor on Integral Base

For belt drive. Two bearings on internal supports.
Motor on casing or on integral base. Drive through belt fairing.

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PENN BARRY

Shipping Weights

Wheels

Backward Inclined Wheels

WHEEL SIZE	SINGLE WIDTH				DOUBLE WIDTH			
	CL I	CL II	CL III	CL IV	CL I	CL II	CL III	CL IV
105	11	13	NA	NA	NA	NA	NA	NA
122	13	18	22	25	20	27	35	40
135	15	21	26	29	23	37	40	44
150	19	25	30	33	28	43	52	58
165	27	33	36	40	44	58	73	80
182	33	40	42	57	56	68	84	95
200	39	49	52	65	63	95	100	110
222	64	73	82	106	114	131	143	170
245	73	83	110	132	127	146	177	207
270	84	97	128	158	144	170	207	242
300	103	118	149	184	174	212	239	313
330	135	150	177	217	210	250	315	400
365	169	196	232	292	270	312	380	476
402	257	287	320	394	393	435	483	555
445	294	331	392	457	449	503	562	650
490	335	402	453	530	515	583	656	768
542	530	584	679	705	806	885	1072	1100
600	682	684	790	858	1036	1036	1240	1300
660	791	790	924	1120	1199	1225	1445	1520
730	926	996	1091	1295	2135	2270	2500	2560
807	1170	1256	1405	1527	2450	2620	2800	2900
890	1385	1488	1648	1788	2750	3000	3170	3300

NA = Not Available

Airfoil Wheels

WHEEL SIZE	SINGLE WIDTH				DOUBLE WIDTH			
	CL I	CL II	CL III	CL IV	CL I	CL II	CL III	CL IV
182	38	39	54	74	62	66	108	128
200	46	46	64	85	72	89	126	147
222	69	69	69	118	122	122	171	191
245	78	79	123	148	137	137	202	237
270	101	102	144	178	167	168	235	278
300	124	125	169	210	203	211	276	360
330	158	159	193	247	242	250	353	455
365	184	185	255	322	279	287	421	529
402	297	298	327	431	417	419	577	615
445	343	345	453	502	516	519	667	721
490	397	419	525	578	600	603	788	846
542	575	606	730	786	883	915	1160	1222
600	657	697	851	954	1008	1050	1346	1463
660	753	805	991	1233	1155	1235	1560	1701
730	939	943	1173	1473	2222	2232	2665	2892
807	1277	1283	1506	1728	2732	2744	3000	3282
890	1514	1521	1683	2031	3070	3085	3413	3742
982	1785	1793	1989	2299	3442	3458	3820	4180

Notes:
1. Weights (in pounds) are approximate and are based on PennBarry's standard steel construction.
2. Aluminum weights are 40% of steel. For stainless steel or abrasion resistant steel use the standard steel weight.

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ED 16011

Wheels

IndustraCon Wheels

FAN SIZE	OT			WT		AH		HSGS
	OT - 15	OT - 17	OTH - 15 OT - 20	WT - 15 WT - 17	WTH - 15	AH - 15	AH - 17	ALL TYPES
5 - 61	6	NA	7	NA	NA	NA	NA	30
7 - 61	9	NA	11	14	17	21	NA	37
9 - 61	18	27	30	25	30	31	33	55
11 - 61	21	35	47 *62	32	52	52	57	102
13 - 61	47	74	55 *83	66	82	81	84	112
15 - 61	53	90	77 *113	78	100	107	116	188
17 - 61	67	67 *118	91 *141	96	125	146	157	336
19 - 61	90	90 *146	122 *179	166	231	174	193	372
21 - 61	99	99 *189	133 *224	206	286	217	277	462
23 - 61	166	166 *272	358	247	342	282	334	571
26 - 61	191	191 *329	424	322	441	398	431	672
29 - 61	275	445	555	411	556	563	617	817
33 - 61	316	538	791	748	940	704	837	1224
37 - 61	745	739	1076	963	1202	955	1025	1484
41 - 61	859	852	1249	1193	1483	1251	1303	OA

* Indicates weight with reinforcing end NA = Not Available OA = On Application

Efficient Silent Inline (ESI) Wheels

WHEEL SIZE	CLASS I	CLASS II
150	31	31
165	38	38
182	38	49
200	52	65
222	66	78
245	81	93
270	99	114
300	140	165
330	184	212
365	239	257
402	286	324
445	371	394
490	459	488
542	NA	629
600	NA	753
660	NA	952
730	NA	1298

NA = Not Available

Notes:
1. Weights (in pounds) are approximate and are based on PennBarry's standard steel construction.
2. Aluminum weights are 40% of steel. For stainless steel or abrasion resistant steel, use the standard steel weight.

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Centrifugal Fans

VCR

FAN SIZE	CLASS ③									
	SINGLE WIDTH								DOUBLE WIDTH	
	ARR. 1	ARR. 3	ARR. 4	ARR. 7	ARR. 8	ARR. 9	SWO ARR. 9	ARR. 10	ARR. 3	ARR. 7
105	NA	NA	77	NA	NA	NA	NA	54	NA	NA
122	111	96	102	139	183	114	NA	119	143	236
135	135	117	129	170	222	139	NA	138	163	269
150	169	147	163	204	265	174	NA	157	194	304
165	222	193	214	270	347	229	NA	192	224	350
182	244	214	235	288	362	253	NA	216	255	377
200	280	244	270	326	413	289	NA	281	347	511
222	316	280	306	377	474	332	315	346	457	685
245	362	346	347	428	505	373	355	446	520	727
270	438	423	418	510	612	452	429	496	653	911
300	729	637	699	856	979	755	717	658	908	1219
330	1020	892	979	1203	1377	1061	1008	762	1020	1377
365	1122	969	1060	1295	1499	1142	1085	928	1377	1840
402	1402	1224	NA	1632	1867	1448	1376	1306	1703	2267
445	1734	1530	NA	2019	2336	1805	1716	1530	2040	2748
490	1989	1734	NA	2295	2652	2040	1938	1938	2346	3128
542	2550	2244	NA	2958	3437	2652	NA	2346	3009	4057
600	3468	3060	NA	4029	4590	3570	NA	3264	4182	5535
660	4488	3876	NA	5100	5865	4590	NA	4182	5304	6931
730	5304	4590	NA	6018	6936	5406	NA	4896	6222	8137
807	6120	5304	NA	6732	7956	6324	NA	5712	7650	9945
890	7242	6324	NA	8058	9384	7446	NA	6732	9180	11895

NA = Not Available

Notes:

1. Weights (in pounds) are approximate and are based on PennBarry's standard steel construction.
2. Aluminum weights are 40% of steel. For stainless steel or abrasion resistant steel, use the standard steel weight.
3. For Classes II, III and IV apply increase factors:
   - Class II above weights x 1.10
   - Class III above weights x 1.40
   - Class IV above weights x 1.70
4. Sizes below the heavy black line may require contract haul, if shipped by truck. Check trucking companies for special rates. Also consider rail.
5. For accessory weights, see page 9.
6. Shipping weights are for VCR Backward Inclined and Airfoil fans.

Centrifugal Fans

Plenum

FAN SIZE	ARR. 3	
	CLASS I	CLASS II
122	81	89
135	97	107
150	126	139
165	147	162
182	160	176
200	195	210
222	220	242
245	272	274
270	338	345
300	438	462
330	525	545
365	601	612
402	807	821
445	992	1012
490	1027	1145
542	1427	1470
600	1836	1891
660	2747	2810
730	3304	3880
807	3818	4433
890	4787	5284

Efficient Silent Plenum (ESP)

FAN SIZE	CLASS I	CLASS II
122	NA	NA
135	102	112
150	132	146
165	154	170
182	164	180
200	184	194
222	201	212
245	273	259
270	334	389
300	403	429
330	515	544
365	590	623
402	792	836
445	974	991
490	1156	1182
542	1582	1618
600	1878	1921
660	2810	2874
730	3383	3938
807	3945	4499
890	4896	5363

NA = Not Available

Notes:
1. Weights (in pounds) are approximate and are based on PennBarry's standard steel construction.
2. Aluminum weights are 40% of steel. For stainless steel or abrasion resistant steel, use the standard steel weight.

Industrial Fans

IndustraCon

FAN SIZE	OT - 15 OT - 17	OTH - 15 OT - 20	WT - 15 WT - 17	WTH - 15	AH - 15 AH - 17
5 - 61	105	118	105	NA	105
7 - 61	120	135	120	135	120
9 - 61	210	230	210	230	210
11 - 61	280	310	280	310	280
13 - 61	400	440	400	440	400
15 - 61	540	600	540	600	540
17 - 61	750	830	750	830	750
19 - 61	950	1050	950	1050	950
21 - 61	1200	1320	1200	1320	1200
23 - 61	1500	1650	1500	1650	1500
26 - 61	1800	1990	1800	1990	1800
29 - 61	2500	2750	2500	2750	2500
33 - 61	3250	3570	3250	3570	3250
37 - 61	4500	4950	4500	4950	4500
41 - 61	6000	6600	6000	6600	6000

NA = Not Available

Notes:
1. Weights (in pounds) are approximate net and are based on PennBarry's standard steel construction.
2. Aluminum weights are 40% of steel. For stainless steel or abrasion resistant steel, use the standard steel weight.
3. Fan sizes 37 - 61 and larger may require contract haul, if shipped by truck. Check trucking companies for special rates. Also consider rail. See standard shipping method.
4. For accessory weights, see page 9.

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Inline Fans

Tubular Centrifugal

FAN SIZE	ARR. 1 HORIZONTAL			ARR. 3 & 9 HORIZONTAL & VERTICAL			MAX. ACCESS		TRAK SWO	
	CLASS I	CLASS II	CLASS III	CLASS I	CLASS II	CLASS III	CLASS I	CLASS II	CLASS I	CLASS II
90	OA	NA	NA	75	NA	NA	NA	NA	NA	NA
105	OA	NA	NA	85	NA	NA	NA	NA	NA	NA
122	NA	NA	NA	OA	OA	NA	NA	NA	NA	NA
135	NA	NA	NA	OA	OA	NA	NA	NA	NA	NA
150	NA	NA	NA	OA	OA	NA	NA	NA	NA	NA
165	NA	NA	NA	OA	OA	NA	NA	NA	NA	NA
182	390	429	468	300	330	360	NA	NA	NA	NA
200	590	649	708	360	396	432	NA	NA	NA	NA
222	675	743	810	440	484	528	537	591	550	605
245	790	869	948	525	578	630	641	705	656	722
270	930	1023	1116	640	704	768	781	859	800	880
300	1100	1210	1320	790	869	948	964	1060	988	1087
330	1295	1425	1554	960	1056	1152	1171	1288	1200	1320
365	1530	1683	1836	1200	1320	1440	1464	1610	1500	1650
402	2190	2409	2628	1490	1639	1788	1818	2000	1863	2049
445	2540	2794	3048	1900	2090	2280	2318	2550	2375	2613
490	3085	3394	3702	2410	2651	2892	2940	3234	3013	3314
542	3660	4026	4392	3175	3493	3810	NA	NA	NA	NA
600	5205	5726	6246	4300	4730	5160	NA	NA	NA	NA
660	6495	7145	7794	5800	6380	6960	NA	NA	NA	NA
730	8970	9867	10764	7800	8580	9360	NA	NA	NA	NA
807	10890	11979	13068	9900	10890	11880	NA	NA	NA	NA
890	14300	15730	17160	13000	14300	15600	NA	NA	NA	NA

OA = On Application NA = Not Available

Efficient Silent Inline (ESI)

FAN SIZE	CLASS I	CLASS II
150	NA	206
165	NA	248
182	282	297
200	335	353
222	408	430
245	482	507
270	623	656
300	853	898
330	999	1052
365	1101	1159
402	1583	1666
445	1923	2024
490	2494	2625
542	NA	3266
600	NA	4634
660	NA	5477
730	NA	7365

NA = Not Available

Notes:
1. Weights (in pounds) are approximate and are based on PennBarry's standard construction (steel on Tubular and FCS/DDS).
2. Aluminum weights are 40% of steel. For stainless steel or abrasion resistant steel, use the standard steel weight.
3. Tubular horizontal units, sizes 660 and up, are split into front and rear sections, and are usually shipped in two (2) pieces for joining at the job site.
4. For Tubular wheel weights, see Backward Inclined and Airfoil wheels, page 1.
5. For accessory weights, see page 9.

VersaPlug Fans

FAN SIZE	ARRANGEMENT 9	
	CLASS I	CLASS II
122	95	105
135	115	127
150	145	160
165	190	209
182	210	231
200	240	264
222	275	303
245	340	374
270	415	457
300	625	688
330	875	963
365	950	1045
402	1200	1320
445	1500	1650
490	1700	1870

Notes:
1. Weights (in pounds) are approximate net and are based on PennBarry's standard steel construction.
2. Weights are for bare fan only. For accessory and motor weights, see page 9.

Housings and Funnels

FAN SIZE	HOUSING						FUNNEL
	SINGLE WIDTH			DOUBLE WIDTH			ALL CLASSES
	CL I & II	CL III	CL IV	CL I & II	CL III	CL IV	
105	26	NA	NA	NA	NA	NA	6
122	31	37	40	41	49	53	6
135	39	47	51	50	60	65	7
150	46	55	60	58	70	75	8
165	57	68	74	76	91	99	10
182	71	85	92	90	108	117	12
200	85	102	111	107	128	139	15
222	93	112	121	127	152	165	16
245	125	150	163	172	206	224	18
270	157	188	204	198	238	257	21
300	280	336	364	307	368	399	25
330	310	372	403	379	455	493	30
365	385	462	501	468	562	608	41
402	476	571	619	518	622	673	50
445	560	672	728	643	722	836	58
490	681	817	885	916	1099	1091	70
542	852	1022	1108	1070	1284	1391	97
600	1020	1224	1326	1293	1552	1681	122
660	1237	1484	1608	1757	2108	2284	133
730	OA	OA	OA	OA	OA	OA	210
807	OA	OA	OA	OA	OA	OA	308
890	OA	OA	OA	OA	OA	OA	OA
982	OA	OA	OA	OA	OA	OA	OA

OA = On Application NA = Not Available

Notes:
1. Weights (in pounds) are approximate and are based on PennBarry's standard steel construction.
2. Aluminum weights are 40% of steel. For stainless steel or abrasion resistant steel, use the standard steel weight.
3. For VersaPlug fans, wheel funnel and housing weights are the same as VCR Backward Inclined fans. VersaPlug fan weights do not include housings.
4. Plenum shipping weights include protective enclosure and backward inclined or airfoil wheel.
5. Housing weight includes inlet funnel(s).
6. For accessory weights, see page 9.

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Vibration Equipment

RIS/SPRING Rails amd Bases for IndustraCon Fans

FAN SIZE	TYPE "C" RUBBER-IN-SHEAR (1/4 INCH DEFLECTION)		TYPE "F" RAILS
	ARR. I	ARR. 9	ARR. 4 & 10
005	60 - 82	50	18
007	70 - 90	56	23
009	75 - 115	63	25
011	76 - 128	70	27
013	86 - 145	75	27
015	92 - 150	79	30
017	96 - 155	88	30
019	120 - 160	100	36
021	135 - 165	110	
023	140 - 165	120	
026	160 - 180	130	
029	175 - 250		

FAN SIZE	TYPE "S" SPRING (3/4 INCH DEFLECTION)		OUTDOOR TYPE "FS" RAILS
	ARR. I	ARR. 9	ARR. 4 & 10
005 - 011	155 - 175	130	18
013	170 - 180	135	23
015	175 - 190	140	25
017	180 - 195	145	27
019	185 - 205	150	27
021	190- 210	155	31
023	195 - 215	160	34
026	200 - 220	170	36
029	205 - 220	185	
033	210 - 225	200	
037	220 - 240	210	
041	230 - 270		

Unitary Bases for VCR and IndustraCon Fans

FAN SIZE		SHIP WT. (LBS.)
VCR	IND.	
182	**–**	134 - 140
200	**011**	144 - 132
222	**013**	153 - 248
245	**–**	160 - 256
270	**015**	171 - 271
300	**017**	273 - 308
330	**019**	288 - 324
365	**021**	304 - 356
402	**023**	327 - 377
445	**026**	347 - 403
490	**029**	368 - 564
542	**–**	400 - 613
600	**033**	439 - 594
660	**037**	649 - 850
730	**041**	706 - 900

Notes:

1. Weights (in pounds) are approximate and are based on PennBarry's standard steel construction.

Vibration Equipment

VCR Fans with Type "C" and "D" RIS Bases

FAN WHEEL DIAMETER	SHIP WT. (LBS.)
122 - 200	120
222 - 270	150
300	180
330	190
365	195
402	200
445	210
490	220
542	240
600	260
DEDUCT FOR MOTOR SLIDE RAILS	18 - 60

VCR Fans with Type "S" Housed Spring Bases

FAN WHEEL DIAMETER	APROX. SHIP WT. (LBS.)
122 - 165	110 - 120
182 - 200	120 - 220
222 - 245	130 - 250
270	140 - 260
300	140 - 340
330	150 - 360
365	160 - 400
402	180 - 450
445	180 - 450
490	280 - 500
542	280 - 500
600	330 - 550
660	400 - 600
730	400 - 600
807	400 - 650
890	450 - 700
DEDUCT FOR MOTOR SLIDE RAILS	18 - 60

VCR Fans with Type "OSK" Spring Bases

Up to 1" Deflection

FAN WHEEL DIAMETER	APPROX. SHIP WT. (LBS.)
122 - 165	130 - 140
182 - 222	140 - 240
245 - 270	150 - 270
300	160 - 280
330	160 - 450
365	170 - 470
402	180 - 500
445	200 - 550
490	200 - 550
542	300 - 600
600	300 - 700
660	300 - 750
730	500 - 800
807	550 - 850
890	650 - 1050
DEDUCT FOR MOTOR SLIDE RAILS	18 - 60

1.1" to 2.0" Deflection

FAN WHEEL DIAMETER	APPROX. SHIP WT. (LBS.)
122 - 165	190 - 200
182 - 222	200 - 300
245 - 270	210 - 330
300	220 - 340
330	220 - 510
365	230 - 530
402	340 - 560
445	250 - 610
490	250 - 700
542	350 - 750
600	350 - 800
660	400 - 850
730	550 - 900
807	600 - 950
890	700 - 1200
DEDUCT FOR MOTOR SLIDE RAILS	18 - 60

2.1" to 3.5" Deflection

FAN WHEEL DIAMETER	APPROX. SHIP WT. (LBS.)
122 - 165	380 - 390
182 - 222	390 - 490
245 - 270	400 - 520
300	410 - 530
330	410 - 700
365	420 - 720
402	430 - 750
445	450 - 800
490	450 - 800
542	550 - 850
600	550 - 1000
660	600 - 1050
730	750 - 1100
807	800 - 1150
890	850 - 1350
DEDUCT FOR MOTOR SLIDE RAILS	18 - 60

Notes:

1. Weights (in pounds) are approximate and are based on PennBarry's standard steel construction (steel or aluminum wheel on AxiFlo; aluminum wheel on AxiFlex).

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Accessories

FAN SIZE		VARIABLE INLET VANES	WEATHER COVER	DISCHARGE CAP	CURB CAP
VCR	IND.				
105	**05**	NA	5	NA	NA
122	**07**	32	9	NA	NA
135	**–**	35	11	NA	NA
150	**09**	38	12	NA	NA
165	**–**	42	15	NA	NA
182	**–**	45	17	148	82
200	**11**	50	21	165	87
222	**13**	55	26	180	93
245	**–**	60	34	210	98
270	**15**	70	38	230	103
300	**17**	85	50	250	119
330	**19**	112	57	300	131
365	**21**	125	70	350	145
402	**23**	145	OA	375	159
445	**26**	165	OA	400	176
490	**29**	185	OA	441	196
542	**–**	208	OA	488	217
600	**33**	232	OA	NA	NA
660	**37**	260	OA	NA	NA
730	**41**	295	OA	NA	NA
807	**–**	335	OA	NA	NA
890	**–**	380	OA	NA	NA
982	**–**	OA	OA	NA	NA

OA = On Application NA = Not Available

Notes:
1. Weights (in pounds) are approximate and are based on PennBarry's standard steel construction.
2. Aluminum weights are 40% of steel. For stainless steel or abrasion resistant steel, use the standard steel weight.

Motor Weights

HP		1/2	3/4	1	1 1/2	2	3	5	7 1/2	10	15	20	25	30	40	50	60	75	100	125	150	200
1800	**Open**	30	33	35	35	40	54	64	104	130	176	198	304	350	433	485	500	740	982	1020	1140	1160
RPM	**T.E.**	30	33	35	37	41	58	68	110	146	200	290	350	412	568	610	765	855	1040	1155	1535	–
1200	**Open**	34	36	40	60	61	84	108	176	196	305	356	430	485	682	912	992	1115	1300	2200	2500	2800
RPM	**T.E.**	34	36	38	60	58	104	140	236	266	364	416	535	648	900	1000	1220	1350	1900	–	–	–

Notes:
1. Motor weights (in pounds) are based on standard NEMA frame sizes and are approximate net.
2. For explosion proof and 2-speed motors, use the totally enclosed weights.

PENN BARRY

Please read and save these instructions. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage! Retain instructions for future reference.

Centrifugal Fan
VCR BI & AF, ESP Plenum, VersaPlug™ and IndustraCon™

Description

PennBarry fans consist of a fan housing, impeller, shaft, bearings and motor mounting plate (where required). All impellers are statically and dynamically balanced.

Receiving and Inspection

PennBarry fans are carefully inspected before leaving the factory. When the unit is received, inspect the packaging for any signs of tampering. Inspect the unit for any damage that may have occurred during transit and check for loose, missing or damaged parts. Mishandled units can void the warranty provisions. If units are damaged in transit, it is the responsibility of the receiver to make all claims against the carrier. PennBarry is not responsible for damages incurred during shipment.

Avoid severe jarring and/or dropping. Handle units with care to prevent damage to components or finishes. If the unit is scratched due to mishandling, the protective coating may be damaged. Incorrect lifting may damage the fan and void the warranty.

Handling

Fans should be hoisted with slings placed around the fan housing. When a single hoist is used, a "spreader" will keep the sling from slipping on the housing. If it is necessary to use hooks placed in lifting holes of fan, BE CAREFUL NOT TO DISTORT OR BEND THE HOUSING. Large units may have lifting lugs or holes which should be used only to stabilize the unit while using a sling to support the weight.

Chain or wire slings should be well-padded where they contact the fan, especially where special coatings and paints are involved. Rubber, phenolic enamels, etc. require special care as they may easily be damaged by contact in lifting. Even a small chip will destroy the corrosion prevention seal of the coating and allow corrosion to start. Always repair scratched surfaces with touch up of like coating prior to installation.

Storage

Store in a dry, protected area being sure fan shaft, bearings and impeller are protected against dust and corrosion.

If it is necessary to store outdoors or within a building under construction, special care must be taken to prevent moisture, corrosion, dirt or dust accumulation. Coat the shaft with grease or rust preventative compound. Cover and seal bearings to prevent entrance of contaminants. Impeller should be rotated at least once a month to circulate the grease in bearings.

If stored outdoors over seven (7) days, cover completely with a tarp or heavy waterproof paper. Electrical connections and leads must be protected from moisture. Block impeller to prevent natural rotation. Do not allow material of any kind to be piled on top or inside of fan.

Long Term Storage (Over 1 month)

Long-term storage is defined as storage for period exceeding one month from the date the equipment was received. Fans and motors should be stored in a dry, low humidity area indoors.

Equipment which is to be installed, but not operated for several months, should first be blocked to take the weight off of the vibration isolators (if provided), and then given the same protection, periodic inspection and maintenance as a unit in storage.

To prevent puddle corrosion of fan bearings that undergo long-term storage the following preventive maintenance must be performed:

1. Fan bearings must be relubricated every month until the fans are put into service. A clear 1/16" bead of grease must appear on each side of the bearings. Fan wheels are to be rotated manually while the bearings are relubricated. Refer to the specific bearing lubrication instructions located on the fan housing for the type of lubricant to use.
2. Inlet vanes should be operated at least once a month while in storage. A spray lubricant such as:

   Dow Corning Molykote 557
   Dow Corning Molykote G Spray-Bonded Lubricant

   or equivalent should be applied to the bushing joints to assure corrosion protection while in storage.
3. Motor bearings should be lubricated as recommended by the motor manufacturer.

Surface Protection

Most fans are available with special paint finished to protect the fan against a wide variety of adverse conditions. The standard finish furnished without additional charge is well suited for indoor use. Fans installed in severe outdoor applications (i.e., coastal areas, etc.) may require additional surface protection. The outdoor finish must be compatible with Alkyd base paint. Architecturally pleasing colors are available from many paint manufacturers. This allows the owner to make the outside color choice at the time of the fan installation to match architectural features of the building.

Bearing Protection

Fans equipped with standard duty bearings have been test run at the factory. These bearings are prelubricated and should not require any additional grease for startup. However, if unit is not put in service immediately, it is advisable to add lubricant so as to expel any air voids in the bearing reservoir which may ultimately collect condensation or moisture. The excess lubricant which is expelled at startup through the seals should not be replaced. This purging action will permit cooler operation and remaining grease will be adequate to **properly** lubricate the bearing. During the inactive period, the bearing should be protected from the elements by a securely attached plastic film and rotated several turns once a month. On belt driven units, it is advisable to protect the bearings from contamination by covering the belt guard opening with a suitable material. Belts should be removed from the motor sheave and stored in the guard. This will allow both the guard and the motor to be completely covered with a waterproof material.

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Safety Precautions

DO. . . .

1. Make sure unit is stopped and electrical power is locked out before putting hands into inlet or outlet opening or near belt drive. We suggest a LOCK-OUT and a warning sign on the start switch cautioning not to start the unit.
2. Follow maintenance instructions.
3. Make sure all drive guards are installed at all times fan is in operation. If the inlet or outlet is exposed, a suitable guard should also be installed.
4. Take special care not to open any fan or system access panels while the system is under pressure (negative or positive).
5. Never allow untrained or unauthorized persons to work on equipment.
6. Take special care when working near electricity. Also insure the power is off and can not be turned on while servicing the fan.
7. Keep area near equipment clean.

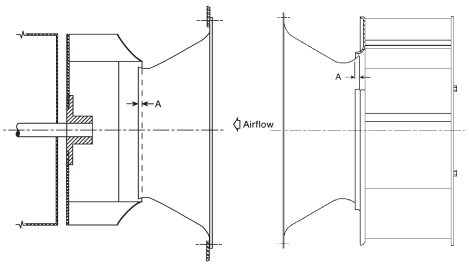
CAUTION . . . .

1. **DO NOT** put hands near or allow loose or hanging clothing to be near belts or sheaves while the unit is running.
2. **DO NOT** put hands into inlet or outlet while unit is running. It is sometimes difficult to tell whether or not it is running . . . be sure it is not running and cannot be operated before doing any inspection or maintenance.
3. **DO NOT** operate fan with guards removed.
4. **DO NOT** take chances.

SAFETY FIRST!!!

Installation

Mounting holes have been provided for mounting to either stationary or resilient bases. Fans must be located and fastened firmly in a level position. The motor and drive are then mounted in their proper relative positions, if not already mounted on the fan.



Wheel Clearance

Before staring up a fan, the wheel should be inspected to assure that the assembly has not shifted while in transit. Incorrect wheel clearance could cause damage to the wheel and housing, and lower the efficiency of the fan. The clearance between the wheel and housing should be equal around the entire circumference of the wheel.

Motor and Drive Alignment

It is important that motor pulleys and fan pulleys be properly aligned to allow belts to run true and straight. Misalignment can result in blower noise and excessive belt wear.

Belt Tension

To assure performance and belt life, proper tensioning of the belts is required. Adjustable motor bases are provided on Arrangement 9 fans for belt tensioning. Belt tension should be provided such that belt slippage does not exceed one (1) second duration at fan start up. Check belt tension at least two (2) times during the first day of operation.

Heat Fan Package

All PennBarry heat fan packages are designed based on a maximum temperature rise of 15°F/min.

Fan Rotation

Fan rotation per AMCA is determined from the discharge end of the fan. PennBarry provides a rotation sticker on the fan housing for verification. Bump start the fan to confirm rotation is correct before running fan at full speed. Running the fan in reverse may overload and possibly damage the motor.

Motors

⚠WARNING ***Always disconnect or shut off electrical power before attempting to service fan and/or motor.***

All AC induction motors will perform satisfactorily with a 10% variation in voltage, a 5% variation in frequency or a combination voltage-frequency variation of 10%. For motors rated 208-220 volts, the above limits apply only to 220 volt rating. To select control for 208-220 volt motors, use same amps for either 208 or 220 volts.

Motors are received with bearings lubricated and require no lubrication for some time depending on operating conditions. (See Maintenance Section on Motor Bearings)

TO REVERSE DIRECTION OF ROTATION

Single Phase Motors

Shaded Pole — Rotation cannot be reversed unless motor is constructed so that the shading coil on one half of the stator pole can be shifted to the other half of the stator pole.

Table 1: Inlet funnel/wheel cone overlap for Backward Inclined, Airfoil and ESP

FAN SIZE VCR, PLN, VSP	"A" DIMENSION (in.) SWSI & DWDI	FAN SIZE ESP	"A" DIMENSION (in.) CL. 1-3
105	1/8	135	1/8
122	5/16	150	3/16
135	11/32	165	1/4
150	3/8	182	5/16
165	7/16	200	3/8
182	9/16	222	7/16
200	5/8	245	1/2
222	5/8	270	9/16
245	3/4	300	5/8
270	7/8	330	3/4
300	1 1/16	365	13/16
330	1 1/8	402	7/8
365	1 1/8	445	15/16
402	1 1/4	490	1
445	1 3/8	542	1 1/16
490	1 1/2	600	1 1/8
542	1 5/8	660	1 1/4
600	1 7/8	730	1 3/8
660	2 1/16	807	1 1/2
730	2 1/4	890	1 11/16
807	2 1/2	—	—
890	2 3/4	—	—

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Split Phase — Interchange connections to supply of either main or auxiliary winding.

Capacitor — All types of capacitor motors are reversed in rotation by interchanging connections to supply of either main or auxiliary winding.

Repulsion — Remove plate on motor end bracket and turn bracket (holding Brushes) in direction **opposite** to direction of existing rotation.

NOTE: It is suggested that rotation change be made for single phase motors by the manufacturer's approved repair shop.

Three Phase Motors

To reverse rotation, interchange any two line leads.

Normal operation of motors results in temperature rise. Permitted temperature rise depends on type of motor installation. The total motor operating temperature includes ambient temperature plus motor temperature rise. The motor temperature rise includes nameplate temperature rise, service factor allowance and hot spot allowance.

IMPORTANT NOTE:
MOTORS ARE WARRANTED BY THE MOTOR MANUFACTURER. PENNBARRY WILL ASSIST IN LOCATING A LOCAL VENDOR APPROVED REPAIR SHOP, IF REQUIRED.

Motor Lubrication and Maintenance

Regrease or lubricate motor bearings according to manufacturer's recommendations. DO NOT OVER LUBRICATE. Motor manufacturer's lubrication recommendations are printed on tags attached to motor. Should these tags be missing the following will apply:

FRACTIONAL HORSEPOWER BALL BEARING MOTORS:

Under normal conditions, ball bearing motors will operate for five years without relubrication. Under continuous operation at higher temperature (but not to exceed 140°F ambient) relubricate after one year.

INTEGRAL HORSEPOWER BALL BEARING MOTORS

Motors having pipe plugs or grease fittings should be relubricated while warm and at a stand still. Replace one pipe plug on each end shield with grease fitting. Remove other plug for grease relief. Use low pressure grease gun and lubricate until grease appears at grease relief. Allow motor to run for 10 minutes to expel excess grease. Replace pipe plugs.

Recommended relubrication intervals - **general guide only.**

H.P. Range	Standard Duty 8 Hr./Day	Severe Duty 24 Hr./Day Dirty, Dusty	Extreme Duty Very Dirty High Ambients
1 1/2 - 7 1/2	5 Years	3 Years	9 Months
10 - 40	3 Years	1 Year	4 Months
50 - 150+	1 Year	9 Months	4 Months

These ball bearing greases or their equivalents are satisfactory for ambient temperatures from 20°F to 200°F.

Chevron SRIU #2	(Standard Oil of California)
Chevron BRB #2	(Standard Oil of California)
Premium RB	(Texaco, Inc.)
Alvania No. 2	(Shell Oil Company)

Make certain motor is not overloaded. Check amps. with nameplate.

KEEP MOTORS DRY. Where motors are idle for a long time, single phase heaters or small space heaters might be necessary to prevent water condensation in windings.

Start-Up

Before Start-Up:

Fastenings - It is recommended that all foundation bolts, impeller hub set screws and bearing set screws be checked for tightness before start-up.

Access Doors - They should be tight and sealed.

NOTE: The maximum torque values for weld studs are as follows:

STUD SIZE	TORQUE (FL. LBS.)
1/4"	5
15/16"	10
3/8"	17
1/2"	39
5/8"	83

The fan bearings, whether pillow block or flange mounted, are prelubricated and should not require additional grease for start-up.

"Bump" the motor to check for proper impeller rotation. The motor should be started in accordance with manufacturer's recommendations.

Bearings - Check bearing alignment and make certain they are properly locked to shaft.

Impeller - Turn over rotating assembly by hand to see that it runs free and does not bind or strike fan housing. If impeller strikes housing, it may have to be moved on the shaft or bearing pillow blocks and reshimmed. Check location of impeller in relation to fan inlets. Be sure fan housing is not distorted. See ALIGNMENT section.

Driver - Check electrical wiring to the motor. See MOTOR section.

Guards - Make certain all safety guards are installed properly.

Belt Drive - Must be in alignment; with belts at proper tension. See BELT DRIVE section.

Duct Connections - The connections from fan to ductwork must not be distorted. Ducts should never be supported by the fan. Expansion joints between duct connections should be used where expansion is likely to occur or where the fan is mounted on vibration isolators. All joints should be sealed to prevent air leaks and all debris removed from ductwork and fan.

Dampers and Variable Inlet Vanes (VIVs) – They should operate freely with blades closed tightly. All dampers and VIVs should be partially closed during starting periods to reduce power requirements. This is particularly important for a fan designed for high temperature operation being "run in" at room temperature or at appreciably less than design temperature. When air is up to temperature, the damper or VIV may be opened. Complete closing of dampers could cause the fan to run rough.

Fan may now be brought up to speed. Watch for anything unusual such as vibration, overheating of bearings and motors, etc. Multi-speed motors should be started at lowest speed and run at high speed only after satisfactory low speed operation. Check fan speed on belt drive units and adjust motor sheave to give the desired RPM. Balance system by adjusting damper or VIVs.

At first indication of trouble or vibration, shut down and check for cause of difficulty.

Maintenance

Always disconnect or shut off fan before attempting any maintenance.

A definite time schedule for inspecting all rotating parts should be established. The frequency of inspection depends on the severity of operation and the location of the equipment.

Fan bearing alignment should be checked at regular intervals. Misalignment can cause overheating, wear to bearing dust seals, bearing failure and/or unbalance.

Fan bearings should be lubricated at regular intervals. Periodic inspection will be necessary. If grease is found to be breaking down, replenish grease by

pumping new grease into bearing until all the old grease has been evacuated. See section on BEARING LUBRICATION.

Bearings on high speed fans tend to run hot: 75°F to 100°F above ambient. Do not replace a bearing because it feels to hot to touch. Place a contact thermometer against the bearing pillow block and check the temperature. Before you investigate high temperature, realize that ball or roller bearing pillow blocks can have a total temperature of 225°F (107°C). High temperature bearings are rated at 425°F (218°C).

Foundation bolts and all set screws should be inspected for tightness.

Fans should be inspected for wear and dirt periodically. Any dirt accumulated in housing should be removed. The impeller may have to be cleaned. A wash down with steam or water jet is usually sufficient, covering bearings so water will not enter the pillow blocks. Impellers having worn blades should be replaced. Impellers require careful rebalancing before being returned to service. Replacement impellers should have the balance checked upon start-up and corrected as required to operate properly in its specific application.

Repairing of exterior and interior parts of fans and ducts will extend the service life of the installation. Select a paint which will withstand the operating temperatures. For normal temperatures a good machinery paint may be used. Corrosive fumes require all internal parts to be wire brushed, scraped clean and repainted with an acid resisting paint. Competent advice should be sought when corrosive fumes are present.

Blow out open type motor windings with low pressure air to remove dust or dirt. Air pressure above 50 psi should not be used, as high pressure may damage insulation and blow dirt under loosened tape. Dust can cause excessive insulation temperatures. Do **not exceed** OSHA air pressure requirements.

Excessive vibration will shorten the life of any mechanical device. Correct any imbalance situation before returning fan to service.

LUBRICATION OF HINGE BEARINGS ON POWER ROOF VENTILATORS

Stack cap damper hinge bearings are oil impregnated and may never need lubrication. A drop or two of 10W30 motor oil every 6 to 12 months will not hurt the bearings. Check damper operation to detect binding or checking. Adjust hinge pin bearing bracket to resume free damper operation.

SHAFT COOLING WHEEL OPTION (HIGH TEMPERATURE UNITS)

For some high temperature applications, a shaft cooling wheel is factory installed. Fan maintenance may require the cooling wheel to be removed. Be certain to reassemble the cooling wheel with the fins towards the bearings. Reversing the assembly will heat rather than cool the shaft. **Mark** one side of the split in the cooling wheel and **match mark** the shaft so that the cooling wheel can be repositioned on the shaft where it was originally installed. Changing the angular position of the cooling wheel on the shaft will affect the dynamic balance of the fan.

LUBRICATION LINES - PLASTIC OR COPPER

Lubrication lines installed at the factory are not filled with grease at the factory. Caution must be used when first greasing the bearings to purge air from the lines without blowing bearing seals or over-greasing a bearing.

ADJUSTABLE MOTOR BASE

Belt drives can be aligned and adjusted by loosening clamping bolts and sliding motor axially and retightening. Belt tension can be fine tune adjusted by loosening or tightening the adjustment bolts. Loosen clamping bolts first, then adjust adjusting bolts and retighten clamping bolts. Belt tension is adjusted with the adjusting bolts and maintained with the clamping bolts.

FAN MECHANICAL BALANCING

Fan impellers are balanced statically and dynamically by the factory, but may require further trim balancing. The final installed vibration level of the fan is also dependent upon its installation and foundation. Fans shipped completely assembled have been trim balanced at the factory.

Before any attempt is made at balancing, check for any other causes of vibration or unbalance as listed in the TROUBLESHOOTING CHECKLIST.

A fan handling clean air should not need rebalancing after original balance. Dust build-up on fan blades or wear can cause fan unbalance. Periodic inspection of the fan should be made to determine the amount of dirt build-up or wear.

Portable instruments are available that will indicate vibration in mils (1 mil = 0.001 inches). Each fan has a Quality Assurance label affixed to the fan. All pertinent information on factory balance is recorded on the label for the owner's information and use.

IMPORTANT NOTE:

THE FAN MUST BE CHECKED AND CORRECTED FOR ANY OUT OF BALANCE CONDITION ANY TIME A COMPONENT OF THE ROTATING ASSEMBLY IS REPLACED OR ALTERED.

LUBRICATION OF ANTI-FRICTION BEARINGS

Bearings on assembled fans receive their initial lubrication from the bearing manufacturer. Bearings shipped separate from the fan or as a replacement may not be lubricated before shipment. When there is the slightest doubt, the safe practice is to assume that the bearing has not been lubricated. Always turn fan off before lubricating.

For grease lubricated ball or roller bearing pillow block, a good grade of grease, free from chemically or mechanically active material should be used. These greases are a mixture of lubricating oil and a soap base to keep the oil in suspension. They have an upper temperature limit where oil and soap base oxidize and thermally decompose into a gummy sludge.

Mixing of different lubricants is not recommended. If it is necessary to change to a different grade, make or type of lubricant, flush bearing thoroughly before changing. Regreasing will vary from 3 months to a year depending on the hours of operation, temperature and surrounding conditions. Special greases may be required for a dirty or wet atmosphere (consult your lubricant supplier).

When grease is added, use caution to prevent any dirt from entering the bearing. The pipe plug or grease relief fitting should be open when greasing to allow excess grease to flow out. The pillow block should be about 1/3 full, as excess grease may cause overheating. Use a low pressure gun.

These ball bearing greases or their equivalents are satisfactory for ambient temperatures from 20°F to 200°F.

Chevron SRIU #2	(Standard Oil of California)
Chevron BRB #2	(Standard Oil of California)
Premium RB	(Texaco, Inc.)
Alvania No. 2	(Shell Oil Company)

FREQUENCY OF LUBRICATION

The bearings are lubricated at predetermined intervals and the condition of the grease established as it is purged out of the seals or by examination of the grease in the housing. An average installation where the environmental conditions are clean and room temperatures prevail may only require bearing lubrication every 3 to 6 months, while operation in a dirty atmosphere at high temperatures will require much more frequent intervals.

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Figure 1: Frequency of Lubrication

SHAFT SIZE	OPERATING SPEED (RPM)									
	500	1000	1500	200	2500	3000	3500	4000	4500	5000
	LUBRICATION FREQUENCY (Months)									
.50" - 1.00"	6	6	6	6	6	6	4	4	2	2
1.06" - 1.44"	6	6	6	6	6	6	4	4	2	1
1.50" - 1.75"	6	6	6	4	4	2	2	2	1	1
1.88" - 2.19"	6	6	4	4	2	2	1	1	1	
2.25" - 2.44"	6	4	4	2	2	1	1	1		
2.50" - 3.00"	6	4	4	2	1	1	1			
3.06" - 3.50"	6	4	2	1	1	1				
3.56" - 4.00"	6	4	2	1	1					

Base your particular interval on condition of grease after a specific service period.

The chart above is intended as a guideline for your consideration. (Figure 1)

BELT DRIVES

Fans shipped completely assembled have had the belt drive aligned at the factory. Alignment must be checked before operation.

- Be sure shelves are locked in position.
- Key should be seated firmly in keyway.
- The motor and fan shafts must be properly aligned, with the center line of the belts at a right angle to the shafts.
- Start the fan. Check for proper rotation of impeller. Run fan at full speed. A slight belt bow should appear on the slack side. Adjust belt tension by adjusting motor on its adjustable base.
- If belts squeal excessively at start-up, they are too loose and should be tightened.
- When belts have had time to seat in the sheave grooves, readjust belt tension. Check belt tension after 8, 24 and 100 hours of operation.

BELT DRIVE ASSEMBLY CAN BE MOUNTED AS FOLLOWS:

- Clean motor and drive shafts. Be sure they are free from corrosive material. Clean bore of sheaves and coat with heavy oil for ease of shaft entry. Remove oil, grease, rust or burrs from sheaves. Place fan sheave on fan shaft and motor sheave on its shaft. DO NOT POUND ON sheave as it may result in damage. Tighten sheaves in place.
- Move motor on base so belts can be placed in grooves of both sheaves without forcing. Do not roll belts or use tool to force belts over grooves.
- Align fan and motor shafts so they are parallel. The belts should be at right angles to the shafts. A straight edge or taut cord placed across the faces of the sheaves will aid in alignment with single groove sheaves. If multiple groove sheaves are installed, use the center line of the drive as your alignment point.
- Tighten belts by sliding motor in its base. Correct tension gives the best efficiency. Excessive tension causes undue bearing pressure.
- Be sure all safety guards are in place.
- Start the fan and run at full speed. Adjust belt tension until only a slight bow appears on the slack side of the belts. If slippage occurs, a squeal will be heard at start-up. Eliminate the squeal by tightening the belts.
- Belts require time to become fully seated in the sheave grooves. Check belt tension after 8, 24 and 100 hours of operation. Allowing belts to operate with improper tension will shorten belt life substantially.
- If the shafts become scratched or marked, carefully remove the sharp edges and high spots such as burrs with fine emery cloth or a honing stone. Avoid getting emery dust in the bearings.
- Do not apply any belt dressing unless it is recommended by the drive manufacturer. Belts are designed for frictional contact between the grooves and sides of the belts. Dressing will reduce this friction.
- Minimum belt center distances are available from factory upon request.
- Belt tension on an adjustable pitch drive is obtained by moving the motor, **not by changing the pitch diameter** of the adjustable sheaves.

Disassembly of Fan

Before removing any equipment, the fan's power source should be locked "off" for personal safety. The position of mating parts such as bearing, drive, etc., should be marked in their relative position for simplifying assembly.

1. Remove all safety guards.
2. Disconnect ducting or supports to remove fans.
3. Remove drive cover plate to provide access to inner housing for Arr. 9 fans.
4. Remove drive from fan.
5. Clean off the shaft, removing dirt and burrs and lubricate with oil for bearing and wheel removal.
6. Loosen setscrews on pillowblock bearing and remove the bearings (Arr. 9 fan only). Bearing bars should be checked with straightedge to determine if the bar has a crown, and bearings shimmed accordingly when assembled.

Assembly of Fans

To reassemble fan, reverse the process as listed above. Care should be taken once the fan is reassembled to assure components are firmly fastened and aligned. Shimming of bearings may be required to attain proper bearing and shaft alignment. Also, the straightedge should be laid across the full-length of the bearing mounting plate to determine if a crown exists. Shim each bearing accordingly. Wheel clearances and split housed bearing assembly tolerances must be adhered to. PennBarry requires that for any rotating assembly replacements, the fan should be rebalanced.

Vibration Tolerances

All fans are dynamically balanced at the factory before shipment. The dynamic balance is made utilizing a PMC, IRD or Schenck analyzer at the operating speed if known, or the maximum RPM of the unit. Measurements are taken off both bearings in mil readings of displacement. The readings will meet or exceed the guidelines as established in AMCA Std. 204-96, "Balance Quality and Vibration Levels for Fans." Final measurements are recorded on PennBarry's inspection copies. When motors and drives are not provided by PennBarry it will be necessary for the customer to provide a trim balance in the field.

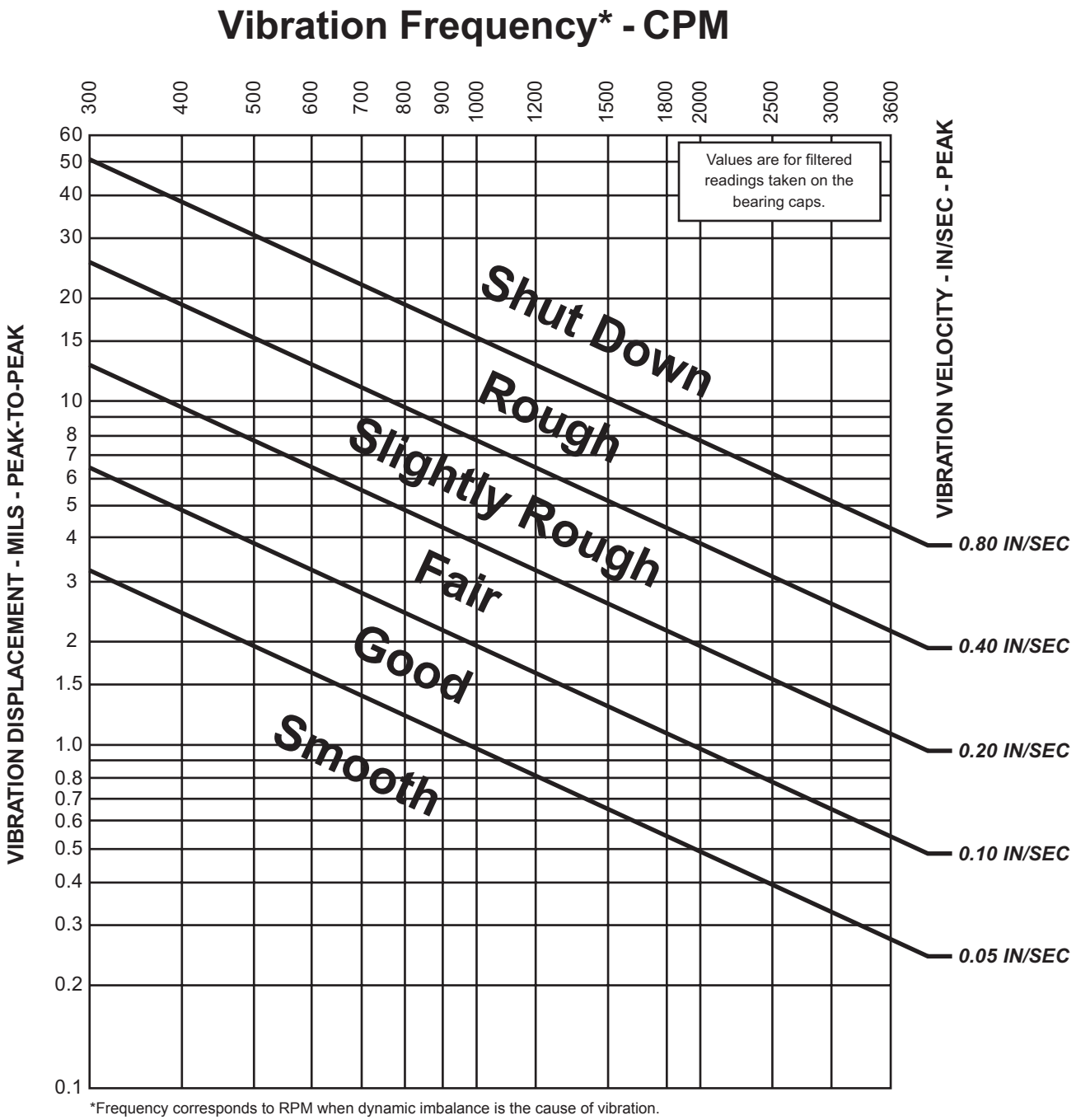
Ordering Replacement Parts

When ordering replacement parts it is necessary to provide PennBarry with the serial number of the unit and/or the original shop order number on which the fan was ordered. Typical replacement parts are as follows:

1. Wheel
2. Housing
3. Shaft
4. Bearings
5. Motor
6. Drives

When ordering replacement parts, specify any required accessories, such as special material, flanges and coatings. This will assure that the replacement parts are correct.

Vibration Severity Chart



*Frequency corresponds to RPM when dynamic imbalance is the cause of vibration.

Guidelines for Interpreting the Classifications on the Severity Chart

Smooth: Alignment, balance and the integrity of the support structure must be near perfect and the vibration from sources other than the fan equipment must be low.

Good: Requires reasonable care on installation, proper foundation, good balance on the rotating components and good alignment of the running gear.

Fair: Fan equipment can operate in this region, but imperfections are indicated.

Slightly Rough: Requires service. Continued use in this condition will reduce equipment life. Monitor equipment for deterioration.

Rough: Requires service. Dangerous operating conditions for fan equipment. Shut equipment down.

Shut Down: Do not operate fan equipment. Potential for catastrophic failure.

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Troubleshooting Checklist

In the event trouble is experienced in the field, listed below are the most common fan difficulties.

Symptom	Possible Cause(s)	Corrective Action
Capacity or Pressure Below Rating	1. Total resistance of system higher than anticipated	1. System problems
	2. Speed too low	2. Adjust drive
	3. Dampers or variable inlet vanes improperly adjusted.	3. Adjust
	4. Poor fan inlet or outlet conditions	4. Elbows at or too close to fan
	5. Air leaks in system	5. Seal joints / correct damper settings
	6. Damaged impeller or incorrect direction of rotation	6. Correct
Vibration and Noise	1. Misalignment of impeller, bearings, couplings	1. Loosen, align, tighten
	2. Unstable foundation	2. Inferior design, start over
	3. Foreign material in fan causing unbalance	3. Remove
	4. Worn bearings	4. Replace bearings and shaft
	5. Damaged impeller or motor	5. Check and repair
	6. Broken or loose bolts or set screws	6. Replace
	7. Bent shaft	7. Replace
	8. Worn coupling	8. Replace
	9. Impeller or driver unbalanced	9. Balance
	10. 60/120 Hz cycle magnetic hum due to electrical input	10. Check for high or unbalanced voltage
	11. Fan delivering more than rated capacity	11. Reduce speed
	12. Loose dampers or VIVs	12. Adjust and tighten
	13. Speed too high or fan rotating in wrong direction	13. Correct
	14. Vibration transmitted to fan from some other source	14. Isolate
Overheated Bearings	1. Too much grease in ball bearings	1. Allow run time to purge (24 hours)
	2. Poor alignment	2. Correct
	3. Damaged impeller or drive	3. Inspect, correct or replace
	4. Bent shaft	4. Replace
	5. Abnormal end thrust	5. Loosen set screws and adjust
	6. Dirt in bearings	6. Replace bearing; use filtered grease
	7. Excessive belt tension	7. Adjust
Overloaded Motor (Pulls too many AMPs)	1. Speed too high	1. Reduce speed or change HP
	2. Discharge over capacity due to existing system resistance being lower than original rating	2. Adjust system resistance
	3. Specific gravity or density of gas above design value	3. Recalculate and correct
	4. Wrong direction of rotation	4. Correct
	5. Poor alignment	5. Correct
	6. Impeller wedging or binding on inlet bell	6. Loosen and adjust
	7. Bearings improperly lubricated	7. See page 4
	8. Motor improperly wired	8. Verify and correct
Motor Problems	1. Check for low or high voltage from power source	1. Correct voltage
	2. High temperature; drawing too much current or dirt in windings	2. Repair motor
	3. Vibration and noise	3. Correct armature imbalance
	4. Armature rubs against stator	4. Replace worn bearings
	5. Too much or not enough lubrication in bearings	5. Correct lubrication
	6. Commutator brushes on d-c motor worn or not seated under proper tension	6. Repair motor
	7. Vibration and noise; loose hold down bolts	7. Tighten hold down bolts
	8. Low insulation resistance due to moisture	8. Check resistance with a megohm meter ("Megger") or similar instrument employing a 500 volt d-c potential. Resistance should read at least 1 megohm

Note: Care should be taken to follow all local electrical, safety and building codes. Provisions of the National Electric Code (NEC), as well as the Occupational Safety and Health Act (OSHA) should be followed.

All motors are checked prior to shipment. If motor defects should develop, prompt service can be obtained from the nearest authorized service station of the motor manufacturer while under warranty. Exchange, repair or replacement will be provided on a no charge basis, if the motor is defective within the warranty period. The PennBarry representative in your area will provide a name and address of an authorized service station, if requested.
WARNING: Motor guarantee is void unless overload protection is provided in motor wiring circuit.

Limited Warranty

What Products Are Covered

PennBarry Commercial and Industrial Fans (each, a “PennBarry Product”)

One Year Limited Warranty For PennBarry Products

PennBarry warrants to the original commercial purchaser that the PennBarry Products will be free from defects in material and workmanship for a period of one (1) year from the date of shipment.

Exclusive Remedy

PennBarry will, at its option, repair or replace (without removal or installation) the affected components of any defective PennBarry Product; repair or replace (without removal or installation) the entire defective PennBarry Product; or refund the invoiced price of the PennBarry Product. In all cases, a reasonable time period must be allowed for warranty repairs to be completed.

What You Must Do

In order to make a claim under these warranties:

1. You must be the original commercial purchaser of the PennBarry Product.
2. You must promptly notify us within the warranty period of any defect and provide us with any substantiation that we may reasonably request.
3. The PennBarry Product must have been installed and maintained in accordance with good industry practice and any specific PennBarry recommendations.

Exclusions

These warranties do not cover defects caused by:

1. Improper design or operation of the system into which the PennBarry Product is incorporated.
2. Improper installation.
3. Accident, abuse or misuse.
4. Unreasonable use (including any use for non-commercial purposes, failure to provide reasonable and necessary maintenance as specified by PennBarry, misapplication and operation in excess of stated performance characteristics).
5. Components not manufactured by PennBarry.

Limitations

1. In all cases, PennBarry reserves the right to fully satisfy its obligations under the Limited Warranties by refunding the invoiced price of the defective PennBarry Product (or, if the PennBarry Product has been discontinued, of the most nearly comparable current product).
2. PennBarry reserves the right to furnish a substitute or replacement component or product in the event a PennBarry Product or any component of the product is discontinued or otherwise unavailable.
3. PennBarry’s only obligation with respect to components not manufactured by PennBarry shall be to pass through the warranty made by the manufacturer of the defective component.

General

The foregoing warranties are exclusive and in lieu of all other warranties except that of title, whether written, oral or implied, in fact or in law (including any warranty of merchantability or fitness for a particular purpose).

PennBarry hereby disclaims any liability for special, punitive, indirect, incidental or consequential damages, including without limitation lost profits or revenues, loss of use of equipment, cost of capital, cost of substitute products, facilities or services, downtime, shutdown or slowdown costs.

The remedies of the original commercial purchaser set forth herein are exclusive and the liability of PennBarry with respect to the PennBarry Products, whether in contract, tort, warranty, strict liability or other legal theory shall not exceed the invoiced price charged by PennBarry to its customer for the affected PennBarry Product at the time the claim is made.

Inquiries regarding these warranties should be sent to: PennBarry, 1401 North Plano Road, Richardson, TX 75081.

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