
MONDELEZ GLOBAL LLC

JOB# X18547

P.O# 4501455314

Installation, Operation and
Maintenance Manual



Global Headquarters
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Kalamazoo, MI 49048, USA
(800) 427-6260
sales@hapman.com
www.hapman.com

REV	DESCRIPTION	DATE	BY
A	LOWERED DISCHARGE PER CUSTOMER	7/30/2020	MSL
	REVISION DESCRIPTION		

- NOTES:
- PURCHASE ORDER NUMBER: 4501455314
 - MATERIAL: SALT, BBQ FLAVORING, VARIOUS SEASONING BLENDS
PARTICLE SIZE: SUPER FINE TO 150 MESH
BULK DENSITY: 45-72 LBS/ CU FT
MOISTURE CONTENT: MINIMAL
TEMPERATURE: AMBIENT
FLOWABILITY: FREE
ABRASIVENESS: MILDLY
MATERIAL CHARACTERISTICS: COHESIVE, AERATES
 - MATERIAL: STAINLESS STEEL
 - HAPMAN FOOD GRADE FINISH SPECIFICATION #40-108, REV "C"
 - PAINT: UNTREATED EXTERIOR MILD STEEL SURFACES WILL BE PAINTED ONE COAT WHITE ENAMEL.
 - INSTALLATION LABOR FURNISHED BY OTHER.
 - MOTOR 230V/3PH/60HZ
 - AIR REQUIREMENT 80 PSI MIN

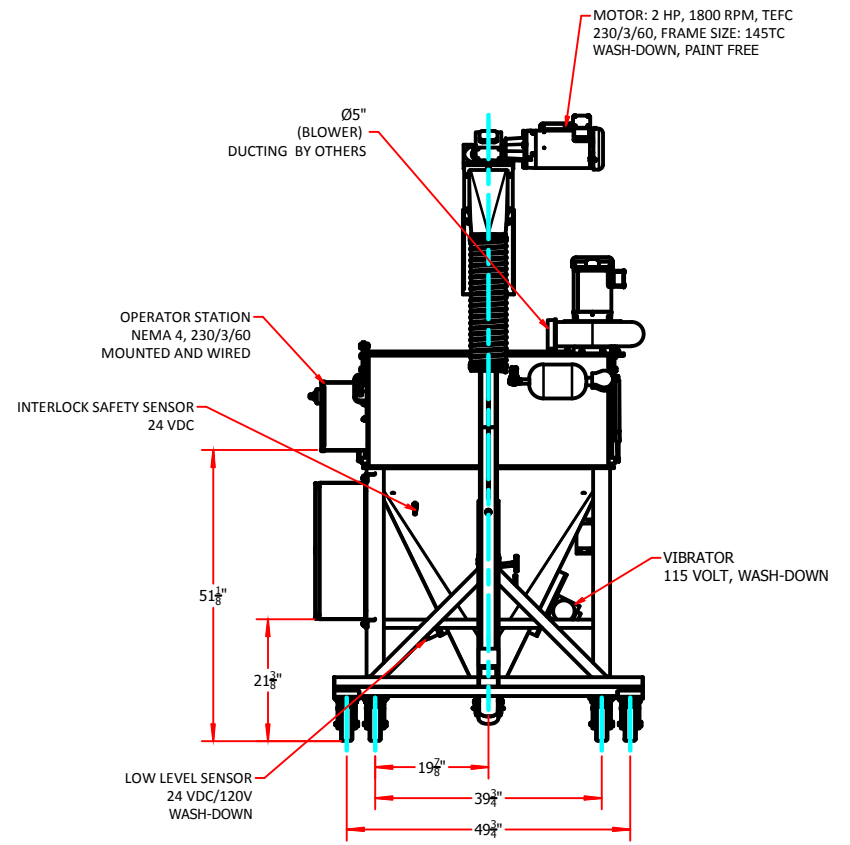
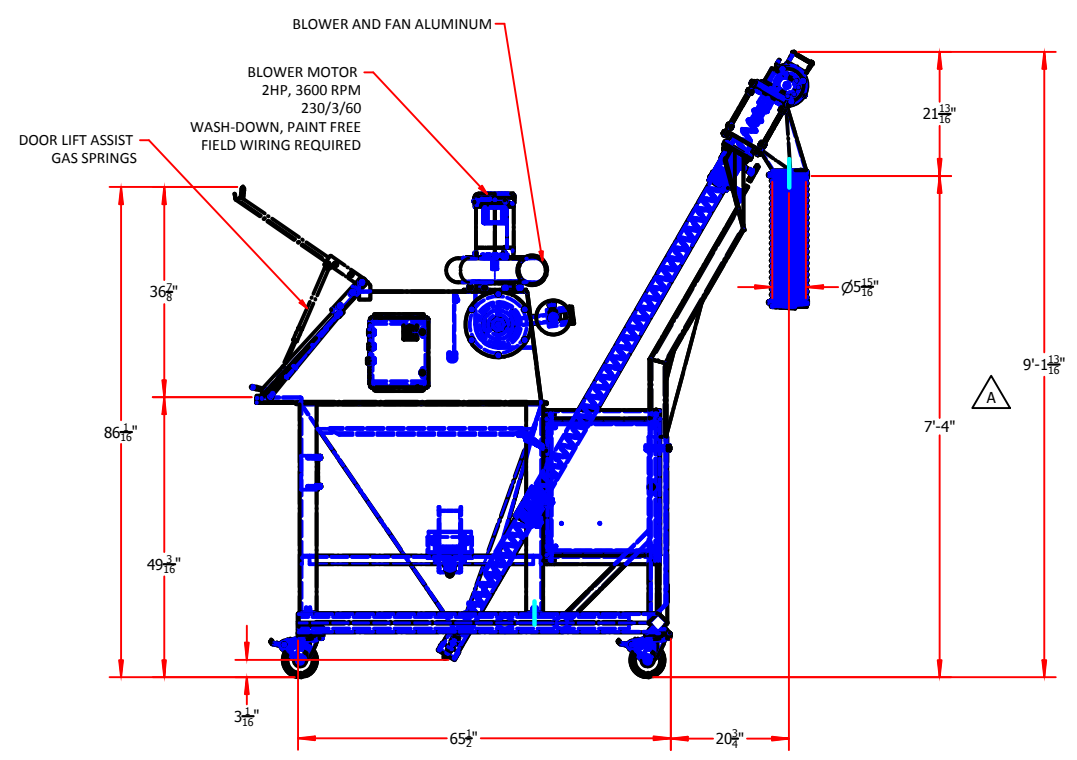
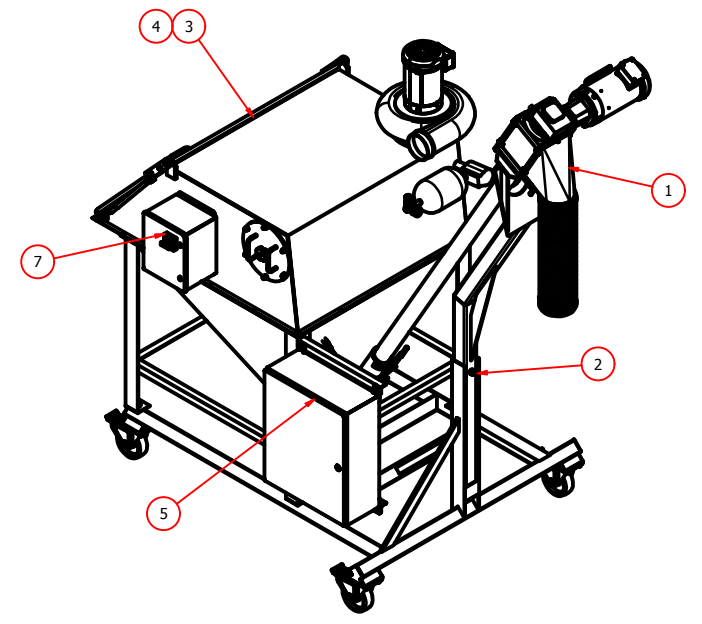
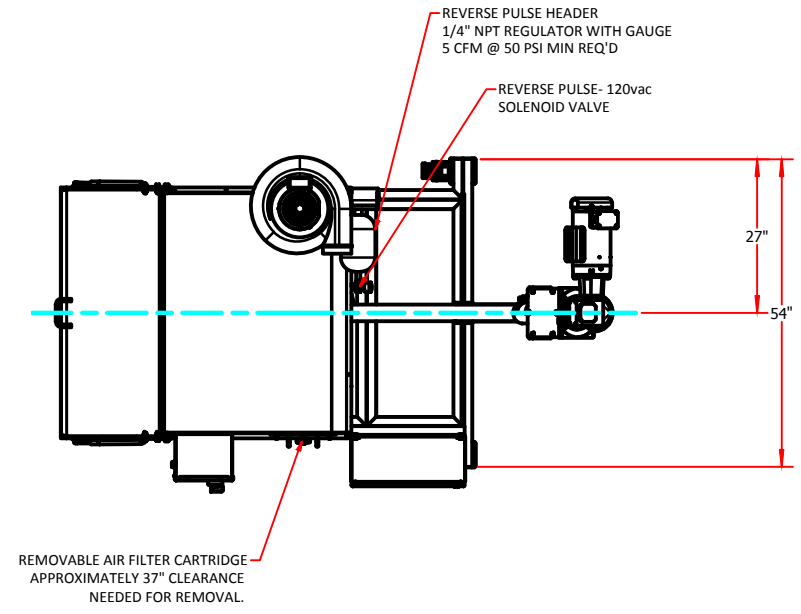
OPERATING PARAMETERS
- Elevating product to a hopper that feeds the seasoning drum.

APPROVAL DRAWING

APPROVED WITH NO CHANGES
 APPROVED AS NOTED
 RESUBMIT WITH CHANGES NOTED

BY _____ DATE _____
 TITLE _____

THE EQUIPMENT SHOWN ON THIS DRAWING WILL BE RELEASED FOR FABRICATION UPON RECEIPT OF THIS SIGNED APPROVAL DRAWING AT HAPMAN. PLEASE VERIFY THE ACCURACY OF THE DIMENSIONAL AND APPLICATION INFORMATION PRIOR TO SIGNING. CHANGES TO THE DESIGN AFTER APPROVAL WILL RESULT IN SCHEDULE DELAYS AND REQUIRE A PURCHASE ORDER PRICE CHANGE.



REV.	SUF.	ITEM NO.	DRAWING / PART NO.	DESCRIPTION	ITEM QTY
AA	1	X18547AA-D00		300 HELIX, 60 DEG 12 CU-FT HOPPER, POLY CASING	1
AB	2	X18547AB-D00		PORTABLE BASE DETAIL, DIAMOND, SS	1
AC	3	9849-D01		DUST COLLECTOR 42" SQ., SR SERIES, SS	1
AD	4	X18547AC-L00		SR SERIES MODEL #42 OPTIONS LIST, SS	1
AD	5	X18547AD-L00		CONTROL PANEL, FSR, NEMA 4X (MOUNTED AND WIRED)	1
AE	6	X07312SD-AS0		AUGER, 300 ROUND, 3/8" x 1 1/2" ID x 2 1/4" OD x 2" PITCH x 110" LG., 304 SS	1
AF	7	X18547AF-L00		RH UNIT, 2 HP, 230 VOLT	1

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE ENGLISH (FEET AND/OR INCHES)
TOLERANCES

DECIMALS	INCHES	FEET	ANGLES
.X ±.030"	X/X" = ± 1/16"	.X'-X" = ± 1/4" UP TO 20 FEET	± .1°
.XX ±.015"		.X'-X" = 1/2" OVER 20 FEET	
.XXX ±.005"			

DO NOT SCALE DRAWING REMOVE ALL SHARP EDGES

HAPMAN Ideas that move 5944 E. N AVE. KALAMAZOO, MICHIGAN 49048
PHONE (269) 343-1675 FAX (269) 349-2477

DATE: 7/20/2020 DB NO.: DRAWN: mittel WEIGHT: N/A

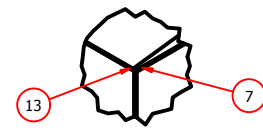
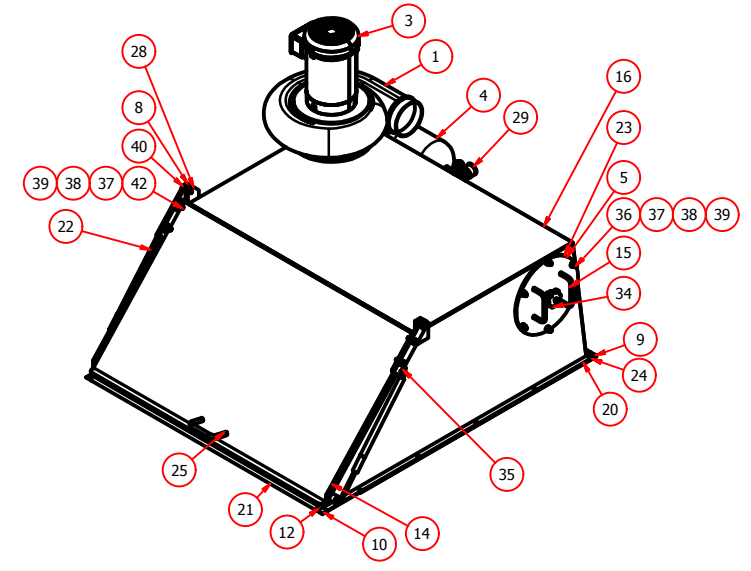
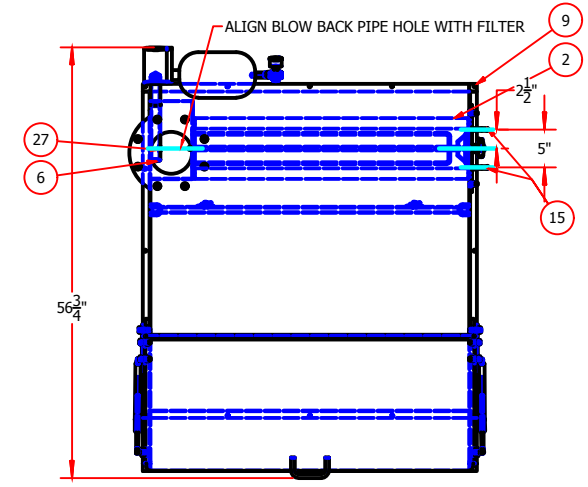
SCALE: TITLE: © 1949 HAPMAN, 0085018547AF Engineering File: X1854700-D00.dwg

**SERIES 300 HELIX CONVEYOR, 360 RPM, SS
WITH PORTABLE BASE & SR DUST COLLECTOR**

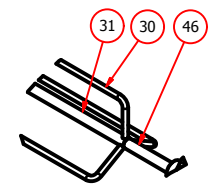
CUSTOMER: MONDELEZ

SHEET 1 OF 1 DRAWING NO.: **X1854700-D00** A

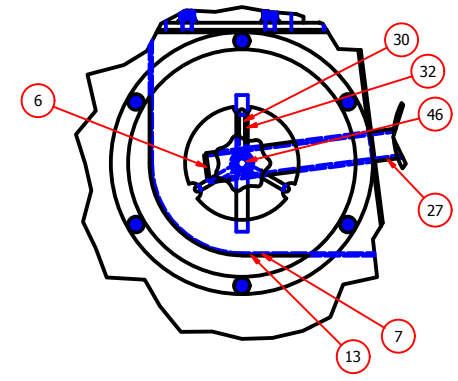
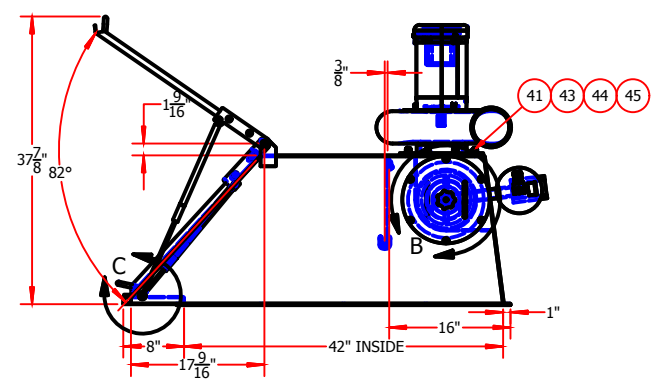
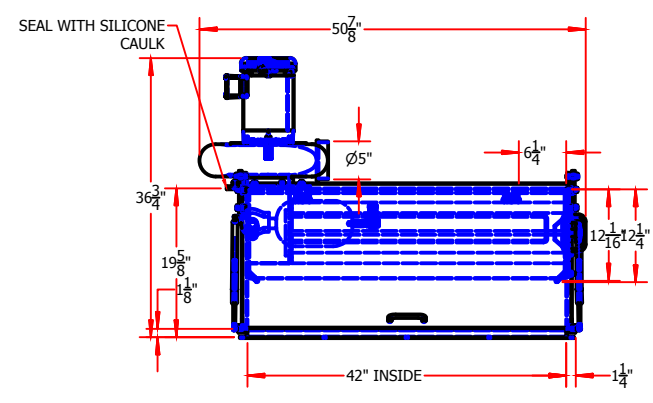
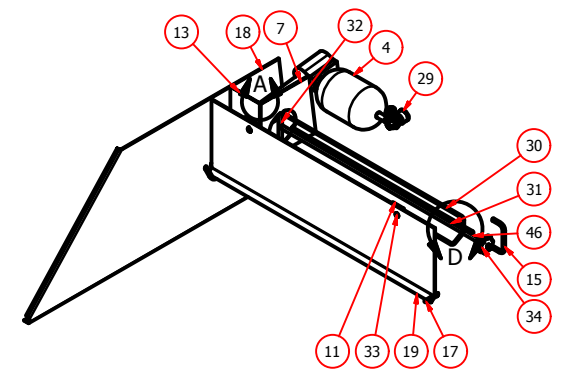
REV	SUF	ITEM NO.	DRAWING / PART NO.	DESCRIPTION	DATE	BY
C				UPDATED ITEM #8, RESTRUCTURED BOM	11/18/2019	JLB
B				CHANGED AIR HEADER IN BOM	11/02/2018	JMD
A				5 HOLES PER SIDE, WAS 3 HOLES, WAS DIA 3/8	2/28/17	TJA
REV				REVISION DESCRIPTION		



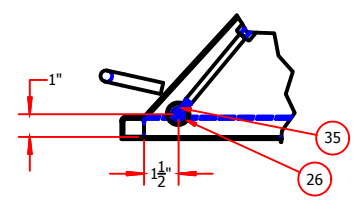
DETAIL A
SCALE 1 / 4



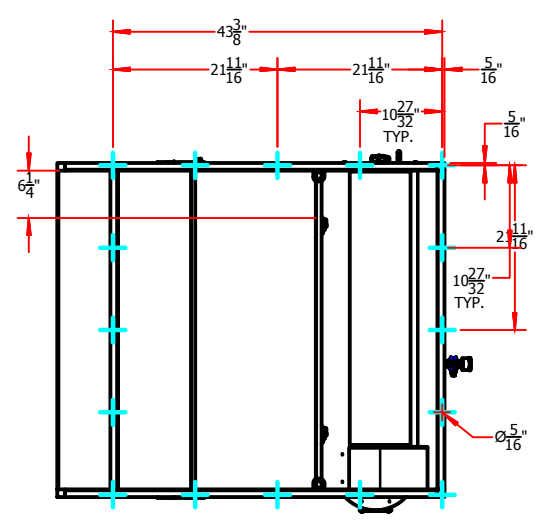
DETAIL D
SCALE 1 / 4



DETAIL B
SCALE 1 / 4



DETAIL C
SCALE 1 / 4



REV.	SUF.	ITEM NO.	DRAWING / PART NO.	DESCRIPTION	QTY.
		1		*SEE TOP LEVEL FOR DETAILS FOR BLOWER*	1
		2		*SEE TOP LEVEL FOR DETAILS FOR FILTER*	1
		3		*SEE TOP LEVEL FOR DETAILS FOR MOTOR*	1
B		4		*SEE TOP LEVEL FOR DETAILS FOR AIR HEADER*	1
		5		FLAT, AIR FILTER COVER, #10 GA., SS	1
		6		FLAT, BLOW BACK FILLER, #12 GA x 1 1/8 DIA, SS	1
		7		FLAT, CLEAN AIR SIDE, #12 GA., SS	1
C		8		FLAT, COLLECTOR DOOR HINGE, 3/8" THK., SS	2
		9		FLAT, CORNER FILLER W/ HOLE, 1 x 1 x #12 GA., SS	2
		10		FLAT, CORNER FILLER, 1 x 1 x #12 GA., SS	2
		11		FLAT, INNER DOOR STOP, 7 GA. x 1 x 2 LG., SS	2
		12		FLAT, SHELF END, 13/16 x 7/8 x #12 GA., SS	2
		13		FORMED, CLEAN AIR FRONT, #12 GA., SS	1
		14		FORMED, DOOR, 12 GA., SS	1
		15		FORMED, HANDLE, 3/8" DIA, SS	2
		16		FORMED, HOUSING, #12 GA., SS	1
		17		FORMED, INNER DOOR HOLDER, 3/8 DIA x 4 LG., SS	2
		18		FORMED, LEFT SIDE, #12 GA., SS	1
		19		FORMED, REMOVABLE INNER DOOR, #12 GA., SS	1
		20		FORMED, RIGHT SIDE, #12 GA., SS	1
		21		FORMED, SHELF, #12 GA., SS	1
		22	SPD-GS-6711	GAS STRUT, 85 LBS FORCE, 11" STROKE, 26.3 FULLY EXT.	2
		23		GASKET, 1/8 x 1 WIDE, WHITE NEO	1
		24		GASKET, FLANGE, 1/8 x 1 WIDE, WHITE NEO	1
		25	X0805SD-B01	HANDLE, 1/2 dia x 2 1/2 x 4 1/2, 304 SS	1
		26	X0807SD-B01	MOUNTING BLOCK, GAS SPRING, 304 SS	2
		27		PIPE, BLOW BACK, 1 SCH 40, SS	1
		28	X08074ED-B01	PIVOT PAD, 5 x 2 x 3.5 LG., 304 SS, 3/8-16 TAP	2
		29	9535-B00	REGULATOR ASSEMBLY, CS	1
		30		ROD, AIR FILTER, .25 DIA, SS	3
		31		ROD, AIR FILTER TEE LONG, 1/2 DIA, SS	1
		32		ROD, AIR FILTER TEE SHORT, 1/2 DIA, SS	1
		33	1866A32	SPRING-CAM LATCH, SS (MCMASTER)	2
		34	6092K170	KNOB, SEVEN-LOBE, NYLON WITH STEEL INSERT (MCMASTER)	1
		35	SPD-BS-1005	BALL STUD, 5/16-18 THREAD, STYLE A	4
		36		WELD STUD, 5/16-18 UNC x 1 LG., SS	6
		37		WASHER, 5/16, PLATED	14
		38		LOCK WASHER, 5/16, PLATED	10
		39		NUT, 5/16-18 UNC, PLATED	10
		40		SHOULDER BOLT, 1/2 x 5/8, 3/8-16 UNC	2
		41		WELD STUD, 3/8-16 UNC x 1 LG., SS	8
		42		BOLT, HEX HEAD, 5/16-18 UNC x 1 1/4 LG., PLATED	4
		43		WASHER, 3/8, PLATED	8
		44		LOCK WASHER, 3/8, PLATED	8
		45		NUT, 3/8-16 UNC, PLATED	8
		46		WELD STUD, 1/2-13 UNC x 4 1/2 LG., SS	1

UNLESS OTHERWISE SPECIFIED
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.XXX ±.005"			

DO NOT SCALE DRAWING **REMOVE ALL SHARP EDGES**

HAFMAN Ideas that move

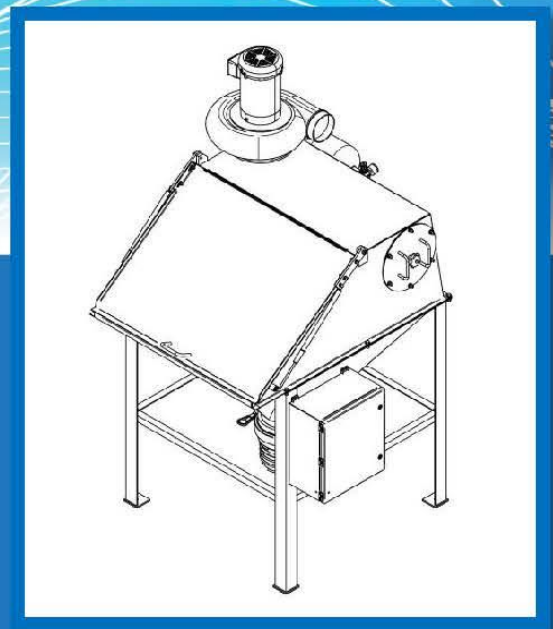
P.O. BOX 2321
6002 E. KILGORE ROAD, KALAMAZOO, MICHIGAN 49048
PHONE (269) 343-1675 FAX (269) 349-2477

DATE: 10/16/2015 JOB NO.: DRAWN: jflees
SCALE: 1/8" = 1" WEIGHT: N/A

TITLE: DUST COLLECTOR, 42 SQ. SR SE

CUSTOMER: SHEET 1 OF 3 9849-D01 C

SR Series Dust Collector



All owners and operators should read this manual and/or be instructed on safe operating and maintenance procedures before attempting to uncrate, install, operate, adjust or service this equipment

Following are symbols used in this manual along with a description of their meanings



DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or severe injury.



WARNING indicates a potentially hazardous situation which, if not avoided, will result in death or severe injury



CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor/moderate injury and/or damage to equipment.

HAPMAN

Bag Dump Station / Dust Collector

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1.0 - WARRANTY

Equipment manufactured by Hapman is warranted to be free of defective material and workmanship under the use and service quoted for a period of one year after date of shipment. This warranty is void if serviced by anyone other than Hapman service personnel.

Hapman agrees to replace or repair any defective parts it has manufactured as covered under this warranty. F.O.B. our plant, subject to inspection of the part in question by Hapman's personnel. No article may be returned to Hapman without Hapman's written consent.

Parts supplied but not manufactured by Hapman are subject to the warranties extended to Hapman by its suppliers. Hapman's liability is limited to such adjustment as the respective manufacturer makes to the seller.

In no event shall Hapman be liable for costs incurred due to equipment malfunction such as consequential damages, lost production or the expenses or losses incurred due to geographical location or fault of the product, difficulty of access to the product as installed, or time urgency on the part of the user and/or buyer of the equipment.

NOTICE:

While all information in this manual has been checked for accuracy, changes in design or specifications may occur at any time in HAPMAN's continuing program of product improvement. HAPMAN cannot assume responsibility for errors in the production of this manual, or for unsafe operating practice of those employing HAPMAN equipment.



BEFORE INSTALLING, OPERATING OR MAINTAINING ANY EQUIPMENT, THE CONTENTS OF THIS MANUAL SHOULD BE THOROUGHLY REVIEWED AND UNDERSTOOD.

Statements and instructions set forth herein are based upon the best information and practices known to HAPMAN, but this may not be construed to suggest that every conceivable safety precaution is contained herein. As a matter of practicality, HAPMAN cannot guarantee that actions in accordance with such statements and instructions will result in the complete elimination of all hazards and thus assumes no liability for accidents which may occur.

For further information regarding installation, operation and maintenance please contact the factory service department.

HAPMAN Customer Service
6002 East N Avenue
Kalamazoo, MI 49048-2321 U.S.A.
Phone: 269-343-1675
U.S. Toll Free: 800-427-6260
Fax: (269) 382 8266
e-mail: service@HAPMAN.com

2.0 - Introduction

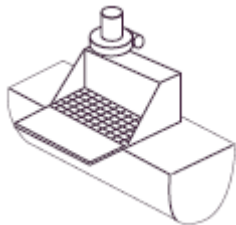
Hapman Dust Collectors and Bag Dump Stations help control dust problems created when bags or drums of dusty material are manually charged into a process stream. An exhaust blower quietly draws ambient air and dust downward through the material-loading grate. Air borne particulates are retained on the outer surface of the filter as the air is drawn through. To maintain efficient dust removal capability, each filter is periodically cleaned by a reverse air pulse method which is achieved by short bursts of compressed air. The effect is a brief controlled inflation of the filter membrane

causing accumulated dust to dislodge and fall into the discharge hopper located beneath the collector.



Typical Applications

The Hapman Dust Collector can be utilized as a stand alone dust control package or as a complete manual bag unloading station complete with discharge hopper.



As part of a blender Charge Port system



The infeed hopper to a Pneumatic Conveyor system



The infeed hopper to a Tubular Drag Conveyor system



The infeed hopper to a Flexible Screw Conveyor system

3.0 - Description

Exhaust Blower

A vacuum blower is furnished to provide dust-entraining airflow through material inlet grating. The blower is externally mounted for ease of access and is furnished complete with an AC drive motor.

Filter Cartridges

Each Hapman Dust Collector is equipped with a Hapman Cartridge filter element for maximum filtration efficiency and clean-ability. This filter utilizes a pleated configuration for greatest surface area and release capabilities. Cartridge is easily removed and replaced.

* Please make a note in the back of this manual of your particular filter type for re-ordering purposes.

Controller

The on-board controller provides on/off control of the dust collector and automatic cleaning of filter media. An adjustable, solid-state timer controls both duration and frequency of compressed air bursts for optimum dust control and cartridge cleaning.

4.0 - Installation Instructions

Install the Hapman Dust Collector/Bag Dump Station indoors, on a solid level foundation. Anchor it securely to minimize movement and vibration. Do not place excessive loads on shelf or bar grate.

Note: The Hapman Dust Collector is designed for indoor operation and for handling dry, dusty materials. Avoid expose to moisture and/or outdoor storage.

A) Compressed Air Requirements:

The filter cleaning mechanism requires a small quantity (from 5-8 scfm) of clean, dry compressed air to operate. For most applications, a compressed air supply of 50 psi will provide sufficient filter cleaning. A commercially available strainer and moisture separator should be installed where compressed air quality is marginal.



Compressed air pressures exceeding 80 psi may damage the air control valves and filter cartridges.

B) Electrical Requirements:

The solid-state filter controller typically requires 110V AC, single phase, 60 cycle electrical supply for operation. Most exhaust blowers require a 460 V AC, 3 phase, 60-cycle supply. However, requests for alternative power are easily accommodated.



Make sure that you verify your power requirements before making any connections.

Motor starters and safety disconnect are not usually supplied by Hapman and should be provided by the purchaser for adequate motor control and operator safety.



In situations where the dust collector is to be situated over a device that presents a known hand hazard - Hapman's included limit safety switch (which disables power when the bar grate is raised or removed) should be wired into your primary interlock circuit and should be tested to verify it's proper operation before placing the unit into service.

5.0 - Start-Up

Before operating the Hapman Dust Collector equipment we recommend the following start-up checklist be reviewed by qualified maintenance personnel.

1. Check the tightness of the filter cartridge attachment hardware.
2. Check the compressed air supply line for leakage, moisture and debris.
3. Verify that the blower exhaust screen is in place and clear of debris.
4. Verify that the blower has the correct rotation.
5. Inspect controller for loose wiring connections, blown or broken fuses.
6. Verify your solid-state timer settings and check the operation of the compressed air cleaning mechanism:

Factory/Timer Settings
45 Seconds Off Interval
0.1 Seconds On Interval



Always disconnect and isolate electrical power supply before conducting any inspection and/or maintenance procedures.

6.0 - Maintenance

Regular maintenance and inspection will prolong the life of the dust collector unit.

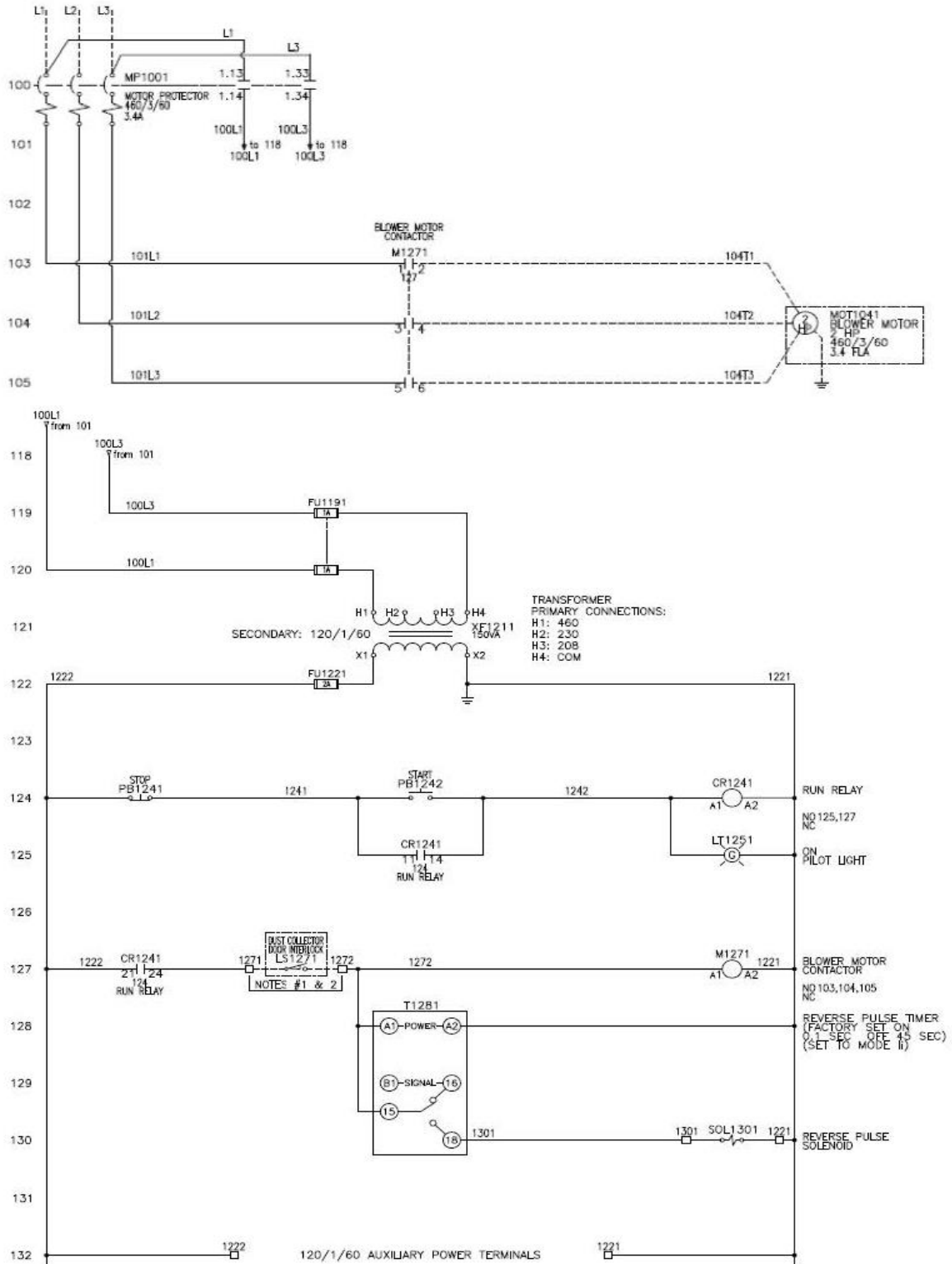
1. Check blower operation for smoothness and wear. Vibration or noise may indicate that the impeller is loose. If detected, cut the power and lock out.
2. Check operation of the filter cleaning mechanism - verify adequate filter cleaning. Insufficient vacuum at the inlet may be indicative of a plugged filter. Check the pulse pressure and frequency.
3. Inspect cartridge filter elements for leakage and excessive buildup. Replace, as necessary.

7.0 - Controls

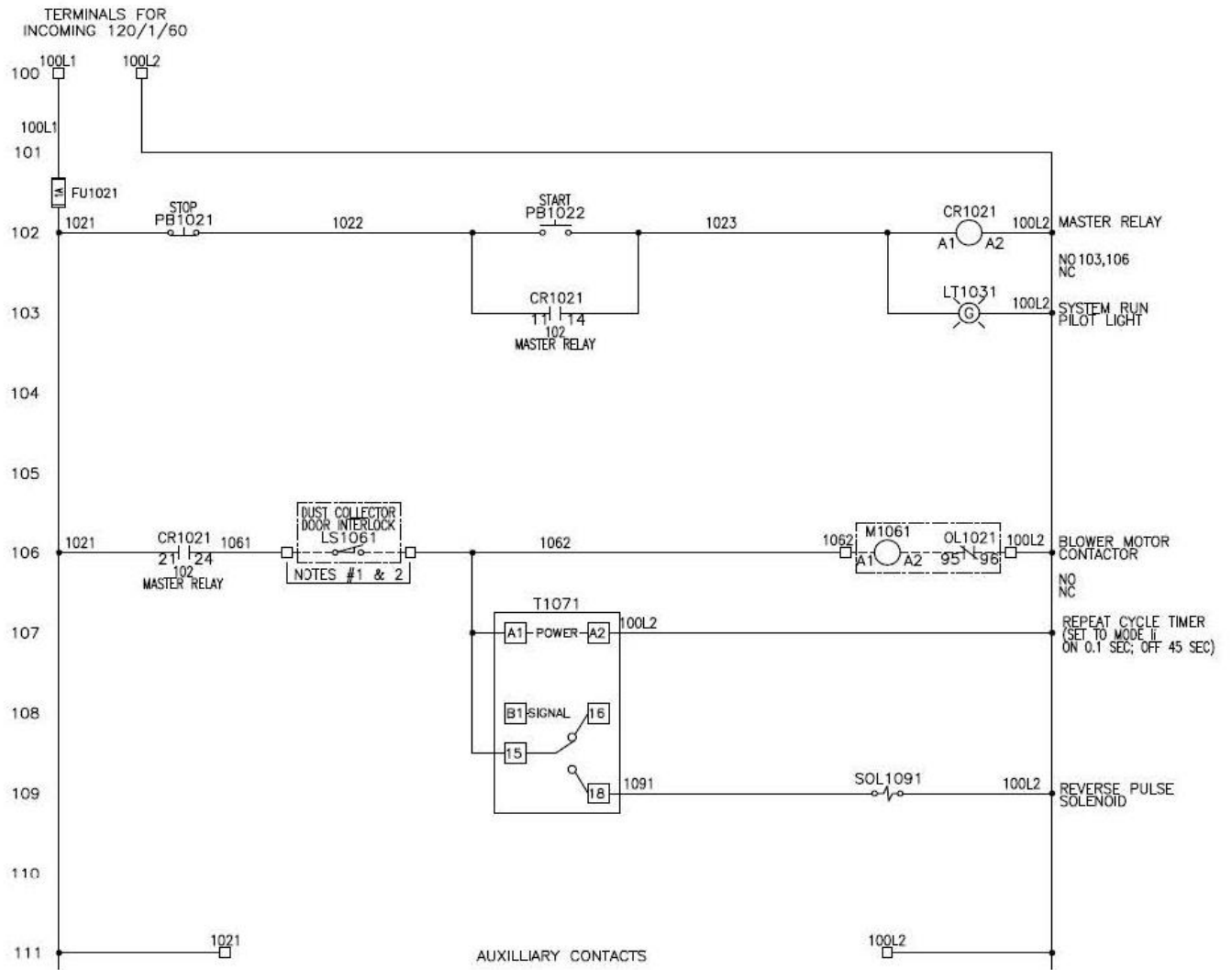


Push Button Station with built-in timer

Dust Collector Control Schematic (With Motor Starter)



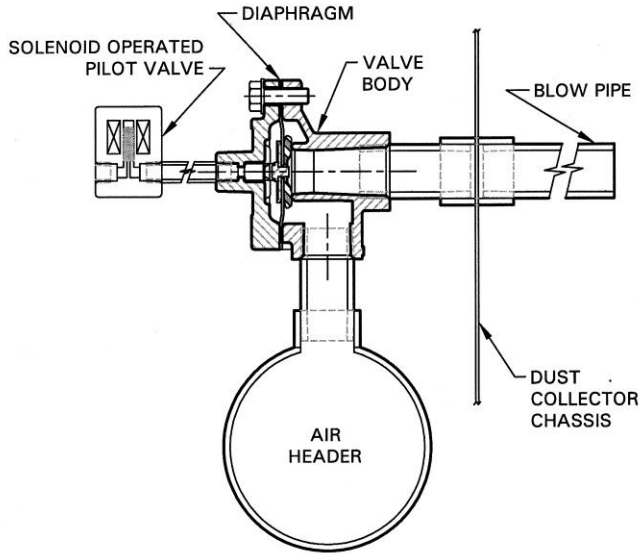
Dust Collector Control Schematic (Without Motor Starter)



8.0 - How The Pulsing Air System Operates

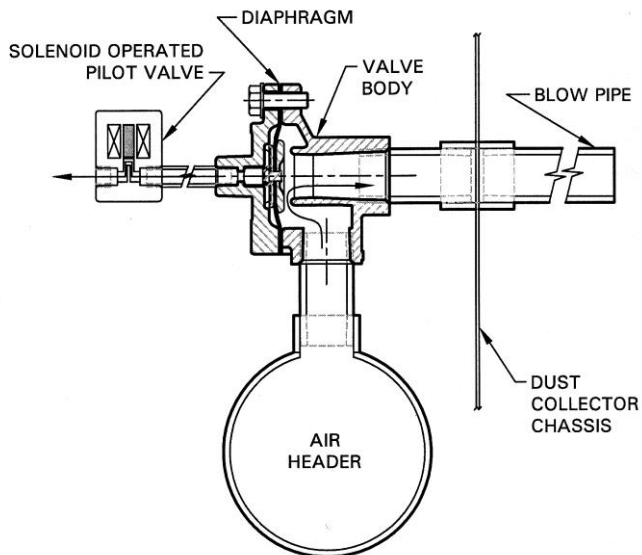
Normally closed Position:

Compressed air passes through a small bleed hole in the diaphragm or air bleed passage in the valve body, and is checked at the pilot valve by the solenoid armature. Pressure in the valve cover increases until it equals the pressure in the air header. Since the pressure is considerably lower in the blow-pipe, the diaphragm seats tightly against the valve body.



Pulsing Position:

When an electrical pulse from the timer energizes the solenoid coil, the solenoid armature lifts off of its seat and allows compressed air to flow through the pilot valve to atmosphere. Pressure drops in the valve cover, and the higher pressure in the valve body moves the diaphragm into the open position. Air flows from the compressed air header through the blow-pipe to clean the cartridge. At the conclusion of the electrical pulse, the pilot valve closes and pressure rises again in the valve cover to return the diaphragm to the closed position.



9.0 - Removing the Filter



1. Remove nuts and washers from filter access plate.



2. Remove filter compression knob from filter access plate.



3. Remove filter access plate.

9.0 - Removing the Filter - Continued



4. Remove filter for inspection. See filter cleaning procedures for washing, or replace filter if necessary.



5. Replace and tighten filter compression knob.



6. Replace nuts and washers from filter access plate.

10.0 - PTFE MEMBRANE FILTER ELEMENT CLEANING

You may clean the membrane filter elements, however, you must use extreme caution and follow the procedure outlined below. Since you are cleaning a membrane 1 to 1 1/2 mils thick (about 1/8 the thickness of plumber's tape) laminated to a substrate, you have to be very careful to avoid damage.

CAUTION:

- Do not use high-pressure air or water.
- Do not use brushes or similar devices.
- Do not use any oils, solvents or harsh detergents.
- Do not use direct pressure on the dust side of the filter.
- Wear appropriate protective clothing for the contaminant you are cleaning and ensure any residue generated is properly contained and discarded.

CLEANING – DRY METHOD

1. Pulse clean the filter element off line (fan off), for 60 minutes with pulse frequency at 15-second intervals at 60 PSI or as close as you can come to those levels, given your equipment design. Pulse duration at 100 milliseconds.
2. Remove the filters from the unit and clean with a compressed air wand at 60 PSI. The size of the wand orifice needs to be 3/8 inch or larger to protect the membrane.

From inside of the filter move the wand up and down, covering the entire area of the filter element. If any contaminate is still visible on the outside (dust side) of the element, clean the outside with the air wand, moving parallel with the pleat and held at a 45° angle to the pleat surface at a sufficient distance away to avoid damage to the media. Try to remove the contaminant from the surface without forcing it into the pores of the filter. When finished, move the wand back to the interior and go over the interior one more time to remove any particles that may have been forced into the pores from the dust side cleaning.

Inspect the clean air side of the collector for any dust buildup, damage and wear to the pulse system components. Clean or repair as necessary.

Reinstall the filters and note the pressure drop. If cleaning makes a significant reduction in the pressure drop and you have to perform manual cleaning frequently, please review your specific operating conditions with your TDC representative.

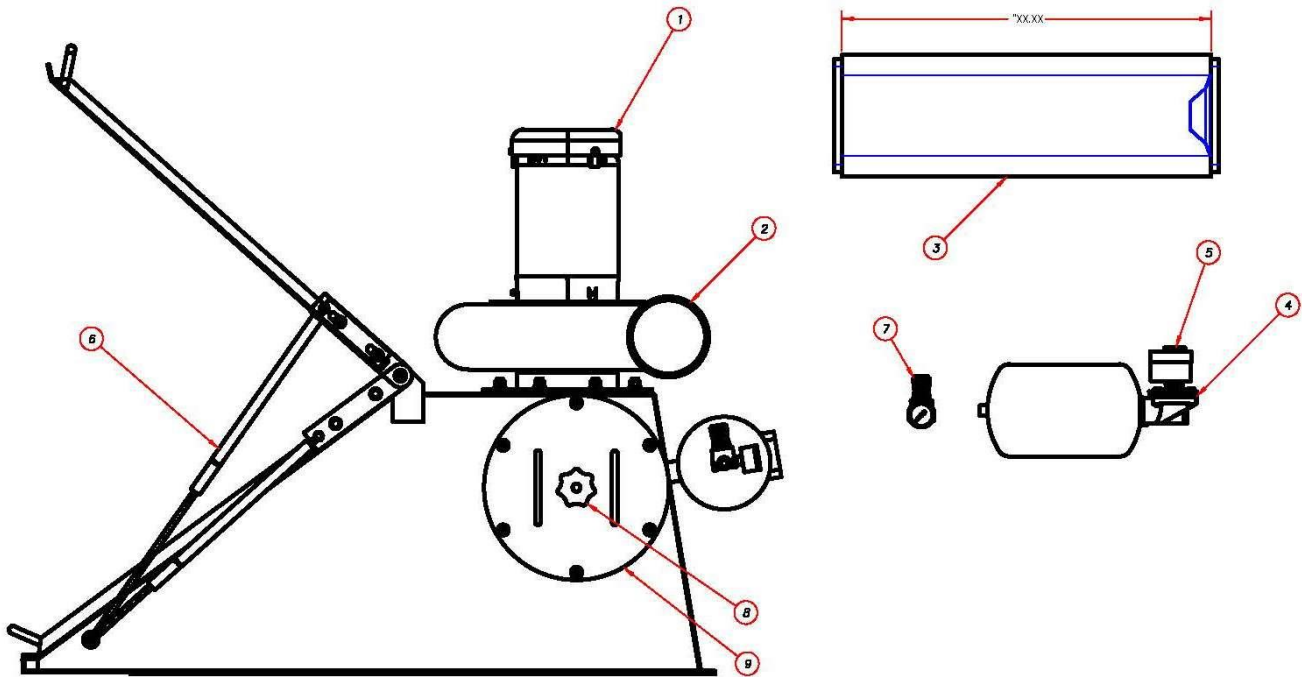
CLEANING – WET METHOD

NOTE:

Hydro and oliophobic units are designed to repel oil and water. Generally water will not freely penetrate the media finish. This is normal and means the finish is working.

1. Remove all excess dust as outlined in the “Cleaning – Dry Method” section.
2. Place the filters in a 2-3% solution (about 4 oz. per gallon) of mild dish washing soap (Joy, Ivory, Palmolive, etc.) and let the cartridge soak for 10 minutes).
3. Remove the element and wash from the inside to the outside with a garden hose, not to exceed 50 PSI. Thoroughly rinse all traces of detergent from both sides of the media.
4. Rinsing outside needs to be done with a warm stream at a 45° angle and parallel to the pleats.
5. Let the element dry completely, normally 24-48 hours at 70°F or higher. Do not dry in the collector with the fan. Filters must be completely dry before reuse.

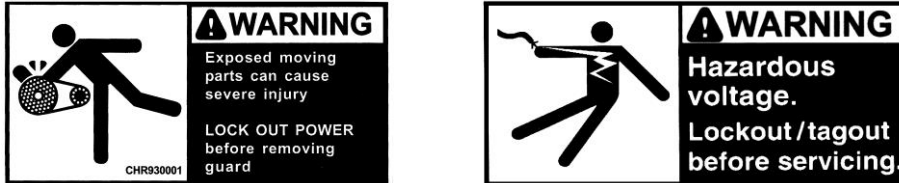
11.0 - SR Dust Collector



ITEM NO.	DESCRIPTION
1	BLOWER MOTOR
2	BLOWER ASSEMBLY
3	FILTER CARTRIDGE
4	PULSE AIR VALVE
5	SOLENIOD
6	GAS SPRING
7	REGULATOR
8	HAND KNOB
9	FILTER DOOR GASKET

12.0 - Warnings

! DANGER !



Electric rotating machinery and high voltage can cause serious or fatal injury if improperly installed, operated or maintained. Responsible personnel should be familiarized with NEMA MG2: Safety Standards for Construction and Guide for Selection, Installation and Use of Electric Motors and Generators: National Electric Code and all local safety requirements.



When servicing, all power sources to the motor and to the accessory devices should be de-energized and disconnected and all rotating parts should be at a standstill.



Installation, Safety, Operation & Maintenance Instructions And Parts List For Models PB, PBS, SPB, LM and LMF. Arrangement 4HM Blowers

NOTE

READ ENTIRE MANUAL, INCLUDING "SECTION IV. INITIAL UNIT STARTUP" BEFORE ATTEMPTING TO INSTALL AND OPERATE THIS EQUIPMENT.

BLOWER SPECIFICATIONS

BLOWER SERIAL NUMBER: _____ **MFG. DATE:** _____

NOTE: The serial number above is a required reference for any assistance. It is stamped on the blower nameplate.

BLOWER SPECIFICATIONS:

Model: _____ **Arrangement:** _____ **Rotation:** _____ **Discharge:** _____

Nominal Inlet Size: _____ (in Inches) **Wheel Size and Type:** _____

BLOWER PERFORMANCE DATA: (If entered on order)

CFM: _____ **SP:** _____ (Inches of Water Gauge) **Motor BHP:** _____

Density: _____ **Altitude:** _____ (Ft. above S.L.) **Airstream Temperature:** _____ °F.

Fan RPM: _____ **Maximum Safe Fan RPM:** _____ **DO NOT EXCEED THIS RPM**

MOTOR DATA: (This section is completed only if the motor was supplied by Cincinnati Fan)

HP: _____ **RPM:** _____ **Voltage:** _____ **Phase:** _____

Hz: _____ **Frame Size:** _____ **Enclosure:** _____ **Efficiency:** _____

IF Motor is EXP, Class(es) & Group(s) are: _____

Manufacturers Model Number: _____ **CFV Part Number:** _____

ATTENTION: RECEIVING DEPARTMENT

All Cincinnati Fan products are packaged to minimize any damage during shipment. The freight carrier is responsible for delivering all items in their original condition as received from Cincinnati Fan. The individual receiving this equipment is responsible for inspecting this unit for any obvious or concealed damage. If any damage is found, it should be noted on the bill of lading before the freight is accepted and the receiver must file a claim with the freight carrier.

LONG TERM STORAGE NOTICE

If this blower will NOT be installed and put into operation within 30 days, refer to the "Long Term Storage Instructions" on pages 12 and 13. Failure to follow all applicable long term storage instructions, will void your warranty. This blower should be stored indoors in a clean, dry location.

 **DANGER**






				
Hazardous voltage can cause electrical shock and death.	High speed rotating equipment can cause severe personal injury.	Lock out/Tag out to prevent personal injury <u>BEFORE</u> starting <u>ANY</u> service or inspection.	Avoid injury. <u>NEVER</u> operate without <u>ALL</u> required safety guards in place.	Avoid injury. You <u>MUST</u> read and understand all instructions in this manual <u>BEFORE</u> installing.

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I. GENERAL

A. Unpacking:

Be careful not to damage or deform any parts of the blower when removing it from the packaging container. **All the packaging material should be kept in the event the blower needs to be returned.**

Handling:

Handling of the blower should be performed by trained personnel and be consistent with all safe handling practices. Verify that all lifting equipment is in good operating condition and has the proper lifting capacity. The blower should be lifted using well-padded chains, cables or lifting straps with spreader bars. **NEVER lift the blower by an inlet or discharge flange, motor shaft, motor eye bolt, or any other part of the blower assembly that could cause distortion of the blower assembly.**

B. Safety Instructions & Accessories:

1. Safety Instructions:

All installers, operators and maintenance personnel should read AMCA Publication 410-96, “**Recommended Safety Practices for Users and Installers of Industrial and Commercial Fans**”. This manual is included with the blower. Additional copies can be requested by writing us at Cincinnati Fan, 7697 Snider Rd., Mason, OH 45040-9135

2. Sound:

Some blowers can generate sound that could be hazardous to personnel. It is the responsibility of the user to measure the sound levels of the blower and/or system, determine the degree of personnel exposure, and comply with all applicable safety laws and requirements to protect personnel from excessive noise.

3. Air Pressure and Suction:

In addition to the normal dangers of rotating machinery, the blower can present additional hazards from the suction or pressure created at the blower inlet or discharge. Suction at the blower inlet can draw materials into the blower where they become high velocity projectiles at the discharge and cause severe personal injury or death. It can also be extremely dangerous to persons in close proximity to the inlet or discharge as the forces involved can overcome the strength of most individuals.

WARNING

NEVER OPERATE A BLOWER WITH A NON-DUCTED INLET AND/OR DISCHARGE. IF THE BLOWER INLET AND/OR DISCHARGE IS NON-DUCTED, IT IS THE USERS RESPONSIBILITY TO INSTALL AN INLET AND/OR DISCHARGE GUARD.

4. Temperature:

Many blowers, blower components and all motors operate at temperatures that could burn someone if they come in contact with them. If this potential hazard could exist in your installation, steps must be taken by the user to protect anyone from coming in contact with this equipment.

5. Spark Resistance; (Per AMCA Standard 99-0401-86 and ISO 13499)

DANGER

NO GUARANTEE OF ANY LEVEL OF SPARK RESISTANCE IS IMPLIED BY SPARK RESISTANT CONSTRUCTION. IT HAS BEEN DEMONSTRATED THAT ALUMINUM IMPELLERS RUBBING ON RUSTY STEEL CAN CAUSE HIGH INTENSITY SPARKS. AIR STREAM MATERIAL AND DEBRIS OR OTHER SYSTEM FACTORS CAN ALSO CAUSE SPARKS.

6. Safety Accessories;

Guards:

All moving parts must be guarded to protect personnel. Safety requirements can vary, so the number and types of guards required to meet company, local, state and OSHA regulations must be determined and specified by the actual user or operator of the equipment.

NEVER start any blower without having all required safety guards properly installed. All blowers should be checked on a regular schedule, for missing or damaged guards. If any required guards are found to be missing or defective, the power to the blower should be immediately turned off and locked out in accordance with OSHA regulations. Power to the blower should NOT be turned back on until the required guards have been repaired or replaced.

This blower can become dangerous due to a potential "windmill" effect, even though all electrical power has been turned off or disconnected. The blower wheel should be **carefully** secured to prevent any rotational turning **BEFORE** working on any parts of the blower/motor assembly that could move.

7. Access or Inspection Doors:

DANGER

NEVER OPEN ANY ACCESS OR INSPECTION DOORS WHILE THE BLOWER IS OPERATING. SERIOUS INJURY OR DEATH COULD RESULT FROM THE AFFECTS OF AIR PRESSURE, AIR SUCTION OR MATERIAL THAT IS BEING CONVEYED. DISCONNECT OR LOCK OUT POWER TO THE BLOWER AND LET THE BLOWER WHEEL COME TO A COMPLETE STOP BEFORE OPENING ANY TYPE OF ACCESS OR INSPECTION DOOR.

II. INSTALLATION

A. Vibration:

Before any mounting method is selected, the user should be aware of the effects vibration will have on the blower, motor and other parts. Improper blower installation can cause excessive vibration causing premature wheel and/or motor bearing failure, that is not covered under warranty.

WARNING

SHUT THE BLOWER DOWN IMMEDIATELY IF THERE IS ANY SUDDEN INCREASE IN VIBRATION.

B. Mounting Methods:

An Arrangement 4HM blower is an Arrangement 4, direct driven blower without the bottom base under the motor. If the motor being supplied is a foot mounted motor, an angle base must be used to connect the blower to the motor. A C-Face motor can be bolted directly to the housing without using an angle bracket. Most Arrangement 4HM blowers are supplied with an inlet or discharge flange for mounting the blower to some type of equipment. Some are supplied with both inlet and discharge flanges.

CAUTION

In all cases where the blower flange will be the only connection with another structure, the structure **MUST** be braced enough and/or rigid enough so as not to allow a resonance vibration to occur. Some form of additional bracing under the motor, supplied and installed by the customer, might be required to maintain vibration levels below the maximum limits as indicated in Fig. 3 on page 9. If the blower has an inlet and a discharge flange, be careful not to cause “binding” when bolting them down. That will most definitely cause a vibration problem.

1. Mounting Blower By Inlet Flange only;

a. With motor shaft horizontal (parallel with floor):

If mounting the blower by the inlet flange only and with the motor shaft horizontal (parallel with floor), it is very likely additional support under the motor will be required.

b. With motor shaft vertical (perpendicular to floor):

This is the best way to mount an Arrangement 4HM blower as long as the mounting plate the flange will be bolted to is rigid enough to support the weight of the blower/motor assembly.

2. Mounting Blower By Discharge Flange only;

a. With motor shaft horizontal or vertical:

Because of the forces involved, it will most likely be necessary to add additional support under the motor. Mount the blower and take the vibration readings as shown in Fig. 2 on page 8. If they exceed the maximums shown in Fig. 3 on page 9, you will need to add additional support.

C. Duct Work Connections:

All ducting or accessories, added by the user, should be independently supported. **DO NOT use the blower/motor assembly to support any additional weight. Inlet and/or discharge duct elbows should be located a minimum of 2 blower wheel diameters from the blower. Any duct elbows located closer than 2 wheel diameters to the blower inlet or discharge **WILL** reduce the air performance and blower efficiency. Any duct elbows near the blower discharge should be in the **same rotational direction** as the **blower rotation**.**

Non-Ducted Blower Inlet:

Any blower with no ducting on the inlet **must** have an inlet guard. The blower should be located so the blower inlet is, at least, 1 wheel diameter away from any wall or bulkhead to eliminate a reduction in air flow.

Non-Ducted Blower Discharge:

Any blower with no ducting on the discharge **must** have a discharge guard.

D. Safety Guards:

Cincinnati Fan offers guards, as optional, to keep your blower in compliance with OSHA safety regulations. These include inlet or discharge guards. Any blowers built with high temperature construction, a “heat slinger guard” is standard. It is the responsibility of the user to make sure this blower meets all local, state and OSHA safety regulations. If you have a specific guard requirement not covered by OSHA, please contact the local Cincinnati Fan sales office for assistance.

E. Dampers and Valves: (Airflow control devices)

If the blower is supplied with any type of air flow control device, it should be closed before initial start-up of the blower to minimize overloading of the motor. Any airflow control device, with bearings, should be maintained in accordance with the manufacturers instructions. Any air flow control device, with an automatic control mechanism, should be adjusted per the manufacturers recommendations.

F. Set Screw and Taper-lock Bushing Torque Values:

All blower wheel set screws are tightened to the proper torque prior to shipment. Some wheels may have taper-lock hubs and split, taper-lock bushings to secure the wheel to the motor shaft.

NOTE: Check all set screw or taper-lock bushing torques. Forces encountered during shipment, handling, rigging and temperature can affect factory settings. For correct torque values, see **Tables 1** and **2** below.

Table 1

SET SCREW TORQUE VALUES		
Diameter & Number of Treads/Inch	Hex Wrench Size (Across Flats)	Required Torque (Inch Pounds)
1/4-20	1/8"	65
5/16-18	5/32"	165
3/8-16	3/16"	228
7/16-14	7/32"	348
1/2-13	1/4"	504
5/8-11	5/16"	1104

Table 2

TORQUE VALUES FOR TAPER-LOCK BUSHINGS	
Taper-lock Bushing Size	Required Torque (Inch Pounds)
H	95
B	192
P	192
Q	350
R	350

CAUTION

Set screws should **NEVER** be used more than once. If the set screws are loosened, they **MUST** be replaced. Use only knurled, cup-point, set screws with a nylon locking patch.

III. ELECTRICAL

A. Disconnect Switches:

All blower motors should have an independent disconnect switch located in close visual proximity to turn off the electrical service to the blower motor. **Disconnects must be locked out in accordance with OSHA "lock out-tag out" procedures any time inspection or maintenance is being performed on the blower and/or motor assembly.**

The "lock out-tag out" procedure should be performed by a licensed electrician or authorized personnel.

All disconnects should be sized in accordance with the latest NEC codes (National Electric Codes) and any local codes and should be installed only by a licensed electrician. "Slow blow" or "time delay" fuses or breakers should be used since the initial start-up time for the blower motor, although rare, can be up to 10 seconds.

B. Motors:

DANGER

ALL WIRING CONNECTIONS, INSPECTION AND MAINTENANCE OF ANY MOTOR MUST BE PERFORMED BY A LICENSED ELECTRICIAN IN ACCORDANCE WITH THE MOTOR MANUFACTURERS RECOMMENDATIONS, ALL ELECTRICAL CODES AND OSHA REGULATIONS. FAILURE TO PROPERLY INSTALL, MAKE WIRING CONNECTIONS, INSPECT OR PERFORM ANY MAINTENANCE TO A MOTOR CAN RESULT IN MOTOR FAILURE, PROPERTY DAMAGE, EXPLOSION, ELECTRICAL SHOCK AND DEATH.

- 1. DO NOT connect or operate a motor without reading the motor manufacturers instructions supplied with the blower.** The basic principle of motor maintenance is: **KEEP THE MOTOR CLEAN AND DRY.** This requires periodic inspections of the motor. The frequency of the inspections depends on the type of motor, the service and environment it will be subjected to and the motor manufacturers instructions.
- 2. Cleaning:** Cleaning should be limited to exterior surfaces only. **Follow motor manufacturers cleaning instructions.**
- 3. Lubrication:** Most small motors have sealed bearings that are permanently lubricated for the life of the motor. Some larger motors have grease plugs that should be replaced with grease fittings to perform re-lubrication. These motors, or any motor with grease fittings, should be lubricated in accordance with the motor manufacturers recommendations. Lubrication frequency depends on the motor horsepower, speed and service. **BE SURE** you use compatible grease and **DO NOT** over grease.
- 4. Location:** If the motor will be outside and subjected to the weather, it is recommended that a weather cover be installed to keep rain and snow off of the motor. No motors are guaranteed to be "watertight". Be careful to allow enough openings between the motor and the motor cover to let the motor "breathe". If the back end of the motor is covered, the cover should be no closer than 3" to the back of the motor for proper ventilation.

5. **Wiring Connections:** All wiring connections should be made for the proper voltage and phase as shown on the motor nameplate. Connections should follow the motor manufacturers recommendations as shown on the wiring schematic. This wiring diagram will be located on the outside of the motor, inside of the motor conduit box or on the motor nameplate. **Reversing some wires might be necessary to get the correct blower rotation.**
6. **Motors with Thermal Overload Protection:** If a motor is equipped with thermal overloads, the thermal overload must be wired per the wiring schematic to be operable. **There are 3 types of thermal overloads:**
- a. **Automatic:** These will automatically shut the motor down if the internal temperature exceeds the design limits.

 **DANGER**

MAKE SURE YOU LOCK OUT THE POWER TO THE MOTOR BEFORE INSPECTING ANY MOTOR WITH AUTOMATIC THERMALS. WHEN THE THERMALS COOL DOWN, THEY WILL ALLOW THE MOTOR TO AUTOMATICALLY START UP AGAIN, UNLESS YOU HAVE LOCKED OUT THE POWER TO THE MOTOR.

- b. **Manual:** These motors will have a button on them. If the motor overheats, it will shut down. After you have inspected the motor and eliminated the over heating problem, you will need to “reset” it by pushing the button. **You should still lock out the power BEFORE inspecting the motor.**
 - c. **Thermostats:** This type of thermal is a temperature sensing device **ONLY**. If the motor overheats, the thermostats will open or close (depending on the type) and send a “signal” to the electrical box. **THEY WILL NOT TURN THE MOTOR OFF. These are pilot circuit devices that must be connected to the magnetic starter circuit.**
7. **EXPLOSION PROOF Motors:** No motor is explosion proof. Explosion proof (EXP) motors are designed so if there is an explosion **WITHIN** the motor, the explosion will be **CONTAINED INSIDE** the motor and not allowed to get out to the atmosphere. All explosion proof motors must be selected based on the atmosphere and/or the environment the motor will be operating in. Explosion proof motors are designed, rated, and labeled for their operating conditions based on Classes, Groups and “T” Codes. **The Class, Group and “T” Code of an EXP motor MUST be selected based on the atmosphere and/or environmental conditions the motor will be operating in. Consult the NEC (National Electric Code) and the NFPA (National Fire Protection Association) for the proper EXP motor Class, Group and “T” Code required for your specific application and location.**

 **DANGER**

IF AN EXPLOSION PROOF MOTOR IS USED IN AN AREA CONTAINING VOLITILE LIQUIDS, GASES, FUMES OR DUST FOR WHICH THE MOTOR WAS NOT DESIGNED TO OPERATE IN, AN EXPLOSION AND/OR FIRE CAN OCCUR.

NOTICE:

- a. All EXP motors have some type of thermal overload as required by UL (Underwriters Laboratories). Refer to all of Section 6 above.
 - b. All EXP motors are required to have the UL (Underwriters Laboratories) and CSA (Canadian Standards Association) listing numbers on the motor name plate or on a separate plate attached to the motor. The Class, Group and “T” Code the motor is designed for must also be listed.
8. **Normal Motor Operating Temperatures:**
Using your hand to test the normal running temperature of a motor can be a very painful experience;
The normal operating temperature of a fully loaded, open type, electric motor operating in a 70°F. (21° C.) ambient temperature is 174°F. (79° C.)
- C. **Maximum Blower Speed and Motor Speed Controllers:**
If you will be using any type of motor speed controller with this blower, **DO NOT** exceed the **maximum safe blower speed**. Installing and using a speed control device requires special training and certification as required by the speed control manufacturer. See the manufacturers instructions for proper use, installation and wiring connections for the maximum speed settings. It may also be necessary to “block out” some speeds to eliminate a resonant vibration problem. The maximum safe blower speed is shown on the data sheet shipped with the blower. If you have lost the data sheet, contact Cincinnati Fan or our sales office for your area. You must have the serial number from the **blower** name plate for us to determine the maximum safe blower speed. Cincinnati Fan will only extend the motor manufacturers warranty, when used with a speed controlling device, if the motor has the words “**Inverter Duty**” marked on the motor name plate. If the motor does not have “**Inverter Duty**” marked on the motor name plate, and you have a motor failure, you will be required to contact the motor manufacturer for any service or warranty claims.

IV. INITIAL UNIT STARTUP

NOTICE: Failure to complete and document all the following pre-startup and both post-startup checks, listed in sections A (below) and B on page 8, could void all warranties.

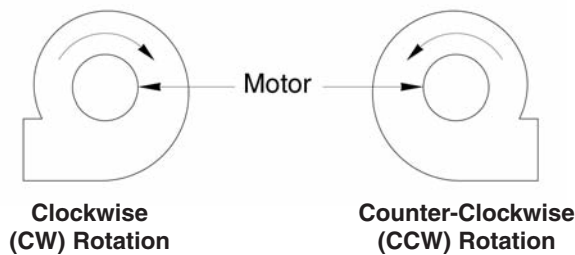
A. Pre-Startup & Post-Startup Checks: (Check blocks as each step is completed. Retain this for your records.)

A1. Pre-Startup Checks Completed By: _____ DATE: _____
 A2. 8 Hour, Post-Startup Checks Completed By: _____ DATE: _____
 A3. 3 Day, Post-Startup Checks Completed By: _____ DATE: _____

MAKE SURE POWER TO THE MOTOR IS LOCKED OUT BEFORE STARTING PRE-STARTUP OR POST-STARTUP CHECKS.

1. If possible, *CAREFULLY* spin the blower wheel by hand to ensure it rotates freely and no rubbing or clicking noise is heard.
2. Check all blower mounting flange and duct work hardware to make sure it is tight.
3. Check all blower wheel set screws to make sure they are tight per **Table 1** on page 5.
4. If the wheel has a taper-lock bushing, make sure the bolts are tightened per **Table 2** on page 5.
5. Make certain there is no foreign material in the blower or duct work that can become a projectile.
6. Make sure any inspection doors in the duct work are securely bolted or locked.
7. Ensure all electrical power components are properly sized and matched for your electrical system.
8. Check that all required guards are properly secured.
9. Any dampers should be fully opened and closed to make sure there is no binding or interference.
10. If your blower is mounted on an elevated support structure, make sure the structure is welded at all the joint connections and the structure is properly braced to prevent "side sway".
11. Close any dampers to minimize load on motor. Especially on blowers with high temperature construction. **Never** subject a "cold" blower to a "hot" gas stream. If the blower will be handling "hot gases" greater than 150°F (65°C) it is imperative that the blower be subjected to a gradual rate of temperature increase, not to exceed 15°F/minute (8°C/minute). The same temperature limits are also important when the blower is experiencing a drop in temperature until the temperature drops down to 150°F (65°C). Only, when the entire blower has reached an equilibrium temperature of 150°F (65°C), or less, should the power be turned off.
12. Make sure the power source connections to the blower motor are per the motor manufacturers instructions.
13. Make sure the blower wheel is stationary prior to startup. **Starting a blower with a wheel that is rotating backwards can cause wheel damage.**
14. Apply power to the blower motor momentarily (i.e. "bump start") to check for proper blower wheel rotation. If the blower is rotating in the wrong direction, reconnect the motor leads per the motor manufacturers wiring schematic. **Blower rotation is determined by viewing the blower from the motor side of the blower, NOT from the inlet side.** After reconnecting the leads, repeat this step. **See Fig. 1 below.**

Fig. 1



15. Apply power to the blower motor and let it come up to full speed. **Turn off the power.** Look and listen for any unusual noise or mechanical abnormality while the blower wheel is still spinning. If any are noticed, lock out the power, wait for the blower wheel to come to a complete stop, locate the cause and correct it.
16. Unlock power and start the blower.
17. Measure, record and keep the following motor data for future reference and comparison:
(Single phase motors will only have L1 and L2 leads)

Amperage draw on each motor lead: L1 _____ L2 _____ L3 _____

(Running amps **SHOULD NOT** exceed the motor nameplate amps for the voltage being operated on)

Voltage coming to motor leads: L1 _____ L2 _____ L3 _____

(Should be about the same input voltage on all leads)

B. Vibration:

The blower was balanced at the factory to comply with ANSI/AMCA Standard 204-05, Category BV-2. However, rough handling in shipment and/or erection, weak and/or non-rigid foundations, and misalignment may cause a vibration problem after installation. After installation, the vibration levels should be checked by personnel experienced with vibration analysis and vibration analysis equipment.

NOTE:

The blower **SHOULD NOT** be operated if the vibration velocity of the fan exceeds 0.50 inches per second, filter out, with the blower rigidly mounted.

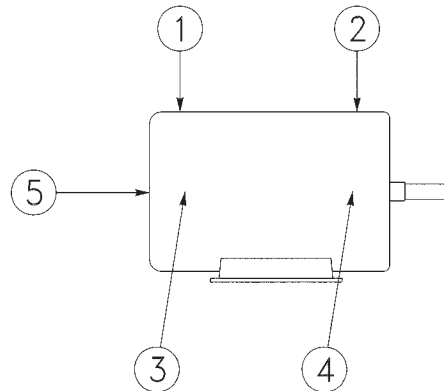
Vibration readings for direct driven blowers should be taken on the motor at the top, sides and end as per **Fig. 2** below. After you have taken your vibration readings, write them down in the spaces below and keep for future comparison.

⚠ DANGER

If the blower is going to be conveying material, it is the users responsibility to periodically turn the blower off and lock out the power. The blower wheel should then be checked for material build-up and/or erosion. If material has built up on any parts of the wheel, it **MUST** be removed and cleaned before it is put back into service. If any parts of the wheel have been eroded, the wheel **MUST** be replaced. Failure to perform this inspection can cause excessive vibration that will damage the blower and/or motor bearings. When vibration becomes excessive, it will lead to complete blower failure that could cause property damage, severe personal injury and death. The user must determine the frequency of this inspection based on the actual circumstances of their operation, **BUT** checking the vibration readings should **NEVER** exceed a 12 month period. For the AMCA/ANSI standard for vibration limits, see Fig. 3 on page 9.

Fig. 2

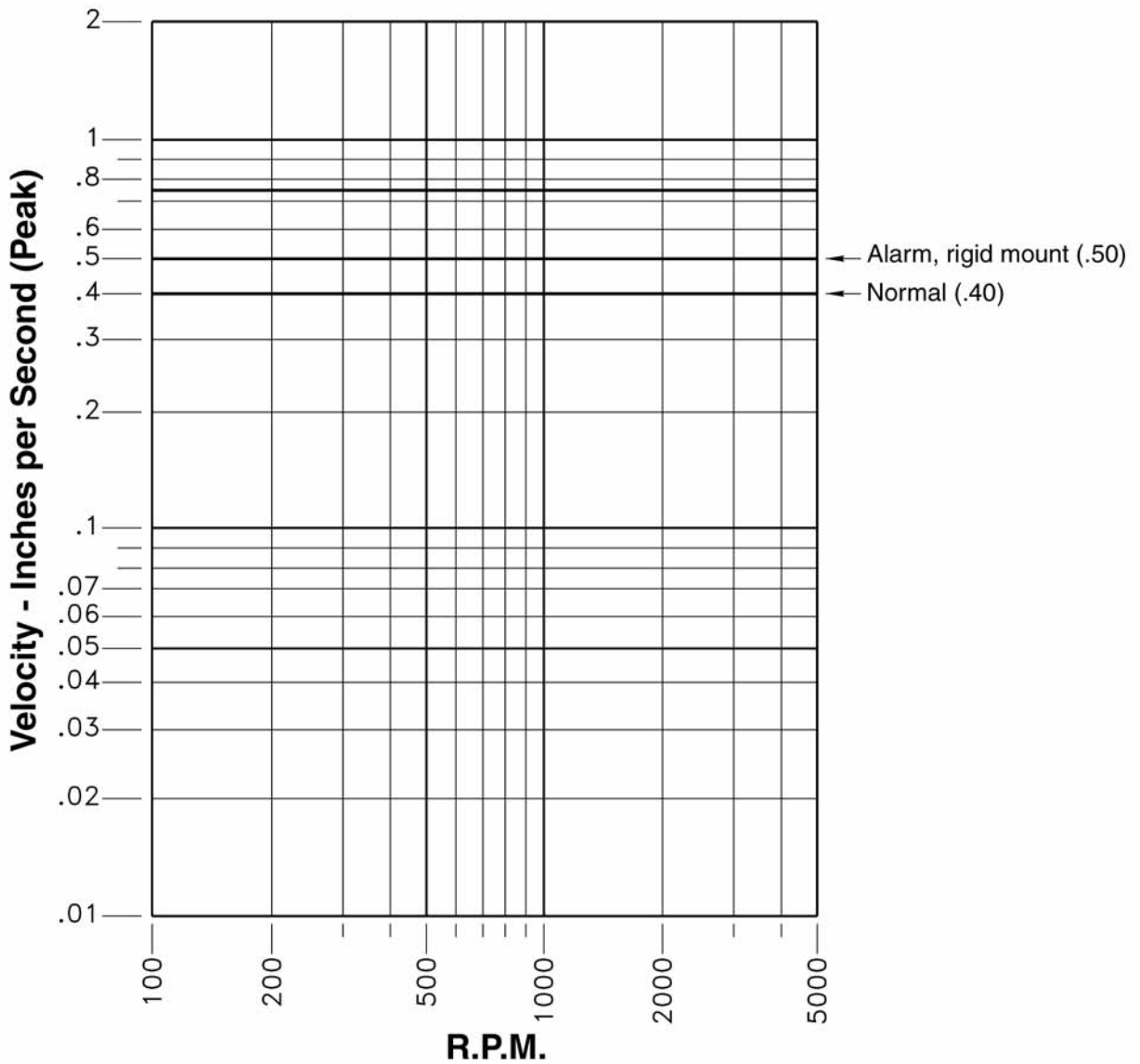
VIBRATION METER PROBE POSITIONS				
For Arrangement 4HM Blowers				
1	2	3	4	5



A	_____	_____	_____	_____	_____
B	_____	_____	_____	_____	_____
C	_____	_____	_____	_____	_____

A Pre-Startup	Readings taken by: _____	Date: _____
B 8 Hour Post-Startup	Readings taken by: _____	Date: _____
C 3 Day Post-Startup	Readings taken by: _____	Date: _____

Fig. 3 Vibration Severity Chart



V. ROUTINE INSPECTION & MAINTENANCE

Periodic inspection of all the blower parts is the key to good maintenance and trouble-free operation. The frequency of inspections must be determined by the user and is dependent upon the severity of the application. **BUT**, it should **NEVER** exceed a 12 month period. The user should prepare an inspection and maintenance schedule and make sure it is adhered to.

⚠ WARNING

BEFORE STARTING ANY INSPECTION OR MAINTENANCE, BE SURE BLOWER IS TURNED OFF, POWER IS LOCKED OUT AND THE BLOWER WHEEL HAS BEEN CAREFULLY SECURED TO PREVENT WIND MILLING. IF THE OPERATING CONDITIONS OF THE BLOWER ARE TO BE CHANGED (SPEED, PRESSURE, TEMPERATURE, ETC.) CONSULT CINCINNATI FAN, OR OUR SALES OFFICE FOR YOUR TERRITORY, TO DETERMINE IF THE UNIT WILL OPERATE SAFELY AT THE NEW CONDITIONS.

A. Hardware:

All blower and foundation hardware should be checked to make sure it is tight. Wheel set screws or taper-lock bushings should be tightened to the torque values shown in **Tables 1 and 2** on page 5.

NOTE: If any set screws have come loose, they must be thrown away and replaced. **NEVER** use set screws more than once. **Replace with knurled, cup-point set screws with a nylon locking patch.**

B. Motor Bearing Lubrication:

1. Motor Bearings:

Most smaller motors have sealed bearings that never require re-lubrication for the life of the motor. For any motors with grease fittings, consult the motor manufacturers recommendations with reference to the lubrication frequency and the type of grease that should be used.

DO NOT over grease the motor bearings. Generally, 1-2 shots should be enough. Use a hand operated grease gun at no more than 40 PSI. **IF POSSIBLE, CAREFULLY lubricate the motor bearings while the motor is running.**

C. Wheel Balance:

All blower wheels are balanced at the factory. It is not uncommon that additional “trim balancing” is required after the blower is assembled. Trim balancing of the blower assembly, in the field, is typically always necessary for all replacement wheels. **After any wheel is installed, the final balance of the entire blower assembly should be checked.** Refer to **Section B** on page 8 and **Fig. 3** on page 9. Air stream material or chemicals can cause abrasion or corrosion of the blower parts. This wear is generally uneven and, over time, will lead to the wheel becoming unbalanced, causing excessive vibration. When that happens, the wheel must be rebalanced or replaced. The other air stream components should also be inspected for wear or structural damage and cleaned or replaced if necessary. **After cleaning any blower wheel, it should be balanced and then “trim balanced” on the motor shaft.**

There are three ways to balance a blower wheel:

1. Add balancing weights for fabricated aluminum, steel or stainless steel wheels:

Balance weights should be rigidly attached to the wheel at a location that will not interfere with the blower housing nor disrupt air flow. They should (if at all possible) be welded to the wheel. When trim balancing the wheel, **on the blower**, be sure to ground the welder **directly** to the blower wheel. Otherwise, the welding current will likely pass through the motor and damage the motor bearings.

2. Grinding off material for cast aluminum wheels:

If you are grinding on the wheel to remove material, be very careful not to grind too much in one area. That could affect the structural integrity of the wheel.

3. Forward curved wheels, Models LM and LMF only (also known as squirrel cage or multivane wheels).

These wheels have balancing clips attached to individual blades around the wheel. That is the only proper way to balance this type of wheel.

NOTE:

Removing any forward curve wheel from the blower to clean it, requires special attention when reinstalling the wheel back into the blower housing. Make sure you reinstall the wheel so the proper wheel-to-inlet clearance is maintained. Failure to do this will affect the blowers airflow (CFM), static pressure (SP) capabilities and efficiency. Consult Cincinnati Fan or our local sales office for your area for assistance if necessary.

D. Vibration:

As mentioned previously in this manual, excessive vibration can cause premature motor bearing failure that could lead to catastrophic failure of the blower. After performing any routine maintenance, the vibration readings should be taken again. New readings should be taken (maximum every 12 months) and compared to the readings you recorded in **Fig. 2** on page 8, during the initial startup. **If any major differences are present, the cause should be determined and corrected before the blower is put back into operation.**

The most common causes of vibration problems are:

1. Wheel unbalance.
2. Mechanical looseness.
3. Poor blower inlet and/or discharge conditions.
4. Foundation stiffness.

E. Dampers and Valves: (Airflow control devices)

Turn off and lock out power to the blower motor. Any dampers or valves should be periodically inspected to make sure all parts are still operable within their full range and there is no interference with any other damper or blower components. Any bearings or seals should be checked for their proper function. The manufacturers maintenance instructions should be followed.

F. Safety Equipment & Accessories:

It is the users responsibility to make sure that all safety guards required by the company, local, state and OSHA regulations are properly attached and fully functional at all times. If any guards become defective or non-functional at any time, **the power to the blower MUST be turned off and locked out** until complete repairs and/or replacements have been made, installed and inspected by authorized personnel.

Any accessories used in conjunction with the blower should also be inspected to make sure they are functioning within their intended limits and design specifications. The manufacturers maintenance manuals should be referred to for correct maintenance procedures. These accessories include, but are not limited to, the following:

Shaft seals, inspection doors, vibration isolators or vibration bases, air flow or pressure measuring equipment, hoods, controls, special coatings, silencers, expansion joints, valves, flexible connectors and filters.

VI. ORDERING REPLACEMENT PARTS:

Under normal conditions, you should not need any spare or replacement parts for at least 24 months after shipment from Cincinnati Fan. That does not include any wear due to abrasion, corrosion, excessive temperatures, abuse, misuse, accident or any severe conditions the fan was not designed for.

NOTICE:

1. **If this blower is vital to any process that could cost you lost revenue, we strongly recommend that you keep a replacement blower wheel and motor at your location.**
2. **If this blower is vital for the safety of any people and/or animals, we strongly recommend that you keep a complete blower/motor assembly, as originally ordered, at your location.**

To order any parts or complete units, contact us for the name of our sales office for your area. Or you can find them on our website at: www.cincinnati-fan.com

WE MUST HAVE THE BLOWER SERIAL NUMBER FROM THE BLOWER NAME PLATE TO IDENTIFY PARTS CORRECTLY.

VII. TROUBLESHOOTING

DANGER

Troubleshooting should only be performed by trained personnel. Any potential electrical problems should only be checked by a licensed electrician. All safety rules, regulations and procedures MUST be followed. Failure to follow proper procedures can cause property damage, severe bodily injury and death.

Potential problems and causes listed below are in no order of importance or priority. The causes are only a list of the most common items to check to correct a problem. If you find the cause of a problem, **DO NOT** assume it is the **ONLY** cause of that problem. Different problems can have the same causes.

PROBLEM	CAUSE
Excessive Vibration	<ol style="list-style-type: none"> 1. Loose mounting bolts, wheel set screws, taper-lock hubs. 2. Worn or corroded blower wheel. 3. Accumulation of foreign material on blower wheel. 4. Bent motor shaft. 5. Worn motor bearings. 6. Motor out of balance. 7. Inadequate structural support. 8. Support structure not sufficiently cross braced. 9. Weak or resonant foundation. 10. Foundation not flat and level.
Airflow (CFM) Too Low	<ol style="list-style-type: none"> 1. Blower wheel turning in wrong direction (rotation). 2. Actual system static pressure (SP) is higher than expected. 3. Motor speed (RPM) too low. 4. Dampers or valves not adjusted properly. 5. Leaks or obstructions in duct work. 6. Filters dirty. 7. Inlet and/or discharge guards are clogged. 8. Duct elbow too close to blower inlet and/or discharge. 9. Improperly designed duct work 10. Blower wheel not properly located relative to the inlet bell (Models LM and LMF only).
Airflow (CFM) Too High	<ol style="list-style-type: none"> 1. Actual system static pressure (SP) is lower than expected. 2. Motor speed (RPM) too high. 3. Filter not in place. 4. Dampers or valves not adjusted properly.

PROBLEM	CAUSE
Motor Overheating	<p>NOTE: A normal motor will operate at 174°F. See B-8 on page 6.</p> <ol style="list-style-type: none"> 1. Actual system static pressure (SP) is lower than expected. 2. Voltage supplied to motor is too high or too low. 3. Motor speed (RPM) too high or defective motor. 4. Air density higher than expected. 5. Motor wired incorrectly or loose wiring connections. 6. Cooling fan cover on back of motor is clogged. (Fan cooled motors only.)
Excessive Noise	<ol style="list-style-type: none"> 1. Wheel rubbing inside of housing. 2. Worn or corroded blower wheel. 3. Accumulation of foreign material on blower wheel. 4. Loose mounting bolts, wheel set screws, or taper-lock hubs. 5. Bent motor shaft. 6. Worn motor bearings. 7. Motor out of balance. 8. Motor bearings need lubrication. 9. Vibration originating elsewhere in system. 10. System resonance or pulsation. 11. Inadequate or faulty design of blower support structure. 12. Blower operating near “stall” condition due to incorrect system design or installation.
Fan Doesn't Operate	<ol style="list-style-type: none"> 1. Motor wired incorrectly. 2. Incorrect voltage supply. 3. Defective fuses or circuit breakers. 4. Power turned off elsewhere. 5. Motor wired incorrectly or loose wiring connections. 6. Defective motor.

VIII. LONG TERM STORAGE INSTRUCTIONS: (Storage exceeding 30 days after receipt of equipment)

NOTE: Failure to adhere to these instructions voids all warranties in their entirety.

1. Storage site selection:
 - a. Level, well-drained, firm surface, in clean, dry and warm location. Minimum temperature of 50°F (10°C).
 - b. Isolated from possibility of physical damage from construction vehicles, erection equipment, etc.
 - c. Accessible for periodical inspection and maintenance.
2. The blower should be supported under each corner of its base to allow it to “breathe”. Supports (2 x 4's, timbers, or railroad ties) should be placed diagonally under each corner.
3. If the equipment is to be stored for more than three (3) months, the entire blower assembly must be loosely covered with plastic, **but not tightly wrapped**.
4. Storage Maintenance:

A periodic inspection and maintenance log, by date and action taken, must be developed and maintained for each blower. See example below. Each item must be checked monthly.

EXAMPLE:

Storage / Maintenance Schedule Log

ITEM	ACTION	DATES CHECKED
1	Re-inspect units to insure any protective devices used are functioning properly. Check for scratches in the finish which will allow corrosion or rust to form.	
2	Rotate wheel a minimum of 10 full revolutions to keep the motor bearing grease from separating and drying out. <i>This is a critical step.</i>	

Long Term Storage instructions continued on page 13.

5. General Motor Procedure:

If the motor is not put into service immediately, the motor must be stored in a clean, dry, warm location. Minimum temperature of 50°F. (10°C,). Several precautionary steps must be performed to avoid motor damage during storage.

- a. Use a "Megger" each month to ensure that integrity of the winding insulation has been maintained. Record the Megger readings. Immediately investigate any significant drop in insulation resistance.
- b. **DO NOT** lubricate the motor bearings during storage. Motor bearings are packed with grease at the factory.
- c. If the storage location is damp or humid, the motor windings **must** be protected from moisture. This can be done by applying power to the motor's space heaters, (IF AVAILABLE) while the motor is in storage. If the motor does not have space heaters, storing it in a damp or humid location will, very quickly, cause internal corrosion and motor failure which is not warranted.

NOTE:

For specific storage instructions, for the actual motor and any accessory parts that were supplied, refer to the manufacturer's instructions.

IX. LIMITED WARRANTY:

Cincinnati Fan & Ventilator Company (Seller) warrants products of its own manufacture, against defects of material and workmanship under normal use and service for a period of eighteen (18) months from date of shipment or twelve (12) months from date of installation, whichever occurs first. This warranty does not apply to any of Seller's products or any part thereof which has been subject to extraordinary wear and tear, improper installation, accident, abuse, misuse, overloading, negligence or alteration. This warranty does not cover systems or materials not of Seller's manufacture. On products furnished by Seller, but manufactured by others, such as motors, Seller extends the same warranty as Seller received from the manufacturer thereof. Expenses incurred by Purchaser's in repairing or replacing any defective product will not be allowed except where authorized in writing and signed by an officer of the Seller.

The obligation of the Seller under this warranty shall be limited to repairing or replacing F.O.B. the Seller's plant, or allowing credit at Seller's option. **THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES EITHER EXPRESSED OR IMPLIED INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE AND OF ALL OTHER OBLIGATIONS AND LIABILITIES OF THE SELLER. THE PURCHASER ACKNOWLEDGES THAT NO OTHER REPRESENTATIONS WERE MADE TO PURCHASER OR RELIED UPON BY PURCHASER WITH RESPECT TO THE QUALITY OR FUNCTION OF THE PRODUCTS HEREIN SOLD.**

Removal of the Seller's nameplate or any generic fan nameplate containing the fan serial number voids all warranties, either written or implied. Failure to complete and document all the pre-startup and post startup checks and perform the suggested routine maintenance checks voids all warranties, either written or implied.

LIMITATION OF LIABILITY:

Notice of any claim, including a claim for defect in material or workmanship, must be given to Seller in writing within 30 days after receipt of the equipment or other products. Seller reserves the right to inspect any alleged defect at Purchaser's facility before any claim can be allowed and before adjustment, credit, allowance replacement or return will be authorized. See **RETURNS** below. Seller's liability with respect to such defects will be limited to the replacement, free of charge, of parts returned at Purchaser's expense F.O.B. Seller's plant and found to be defective by the Seller.

IN NO EVENT WILL SELLER BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, WHETHER IN CONTACT, TORT, NEGLIGENCE, STRICT LIABILITY OR OTHERWISE, INCLUDING WITHOUT LIMITATION DAMAGES FOR INJURY TO PERSONS OR PROPERTY, LOST PROFITS OR REVENUE, LOST SALES OR LOSS OF USE OF ANY PRODUCT SOLD HEREUNDER. PURCHASER'S SOLE AND EXCLUSIVE REMEDY AGAINST SELLER WILL BE THE REPLACEMENT OF DEFECTIVE PARTS AS PROVIDED HEREIN OR REFUND OF THE PURCHASE PRICE FOR DEFECTIVE PRODUCTS, AT SELLER'S SOLE OPTION. SELLER'S LIABILITY ON ANY CLAIM, WHETHER IN CONTRACT, TORT, NEGLIGENCE, STRICT LIABILITY OR OTHERWISE, FOR ANY LOSS OR DAMAGE ARISING OUT OF OR IN CONNECTION WITH PURCHASER'S ORDER OR THE PRODUCTS OR EQUIPMENT PURCHASED HEREUNDER, SHALL IN NO CASE EXCEED THE PURCHASE PRICE OF THE EQUIPMENT GIVING RISE TO THE CLAIM.

RESPONSIBILITY:

It is the understanding of the Seller that Purchaser and/or User will use this equipment in conjunction with additional equipment or accessories to comply with all Federal, State and local regulations. The Seller assumes no responsibility for the Purchaser's or Users compliance with any Federal, State and local regulations.

RETURNS:

Cincinnati Fan & Ventilator Company assumes no responsibility for any material returned to our plant without our permission. An **RMA** (Return Material Authorization) number must be obtained and clearly shown on the outside of the carton or crate and on a packing slip. Any items returned must be shipped freight prepaid. Failure to comply will result in refusal of the shipment at our receiving department.

DISCLAIMER

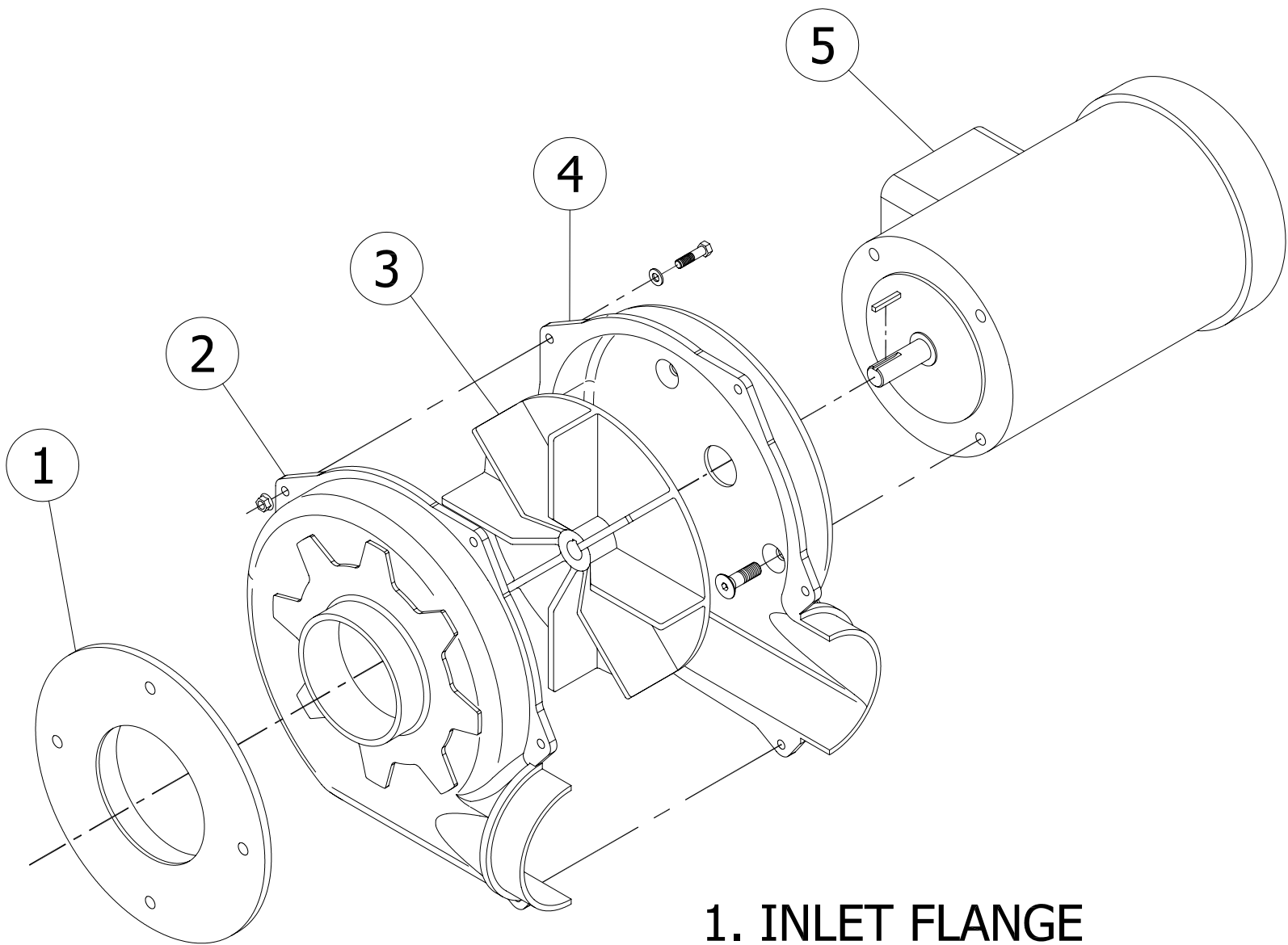
This manual, and all its content herein, is based on all applicable known material at the time this manual was created. **Any parts of this manual are subject to change at any time and without notice.**

If any statements, diagrams and/or instructions contained herein, **for components not manufactured by the Seller**, conflict with instructions in the manufacturer's manual (i.e.: motors, dampers, etc.), the instructions in the manufacturer's manual, for that component take precedent.

Should you want the latest version of this manual, please contact us or our sales office for your area. Or, you can print a current version by going to our website at: www.cincinnati-fan.com



7697 Snider Road, Mason, OH 45040-9135
Phone: (513) 573-0600 Fax: (513) 573-0640
E-Mail: sales@cincinnati-fan.com



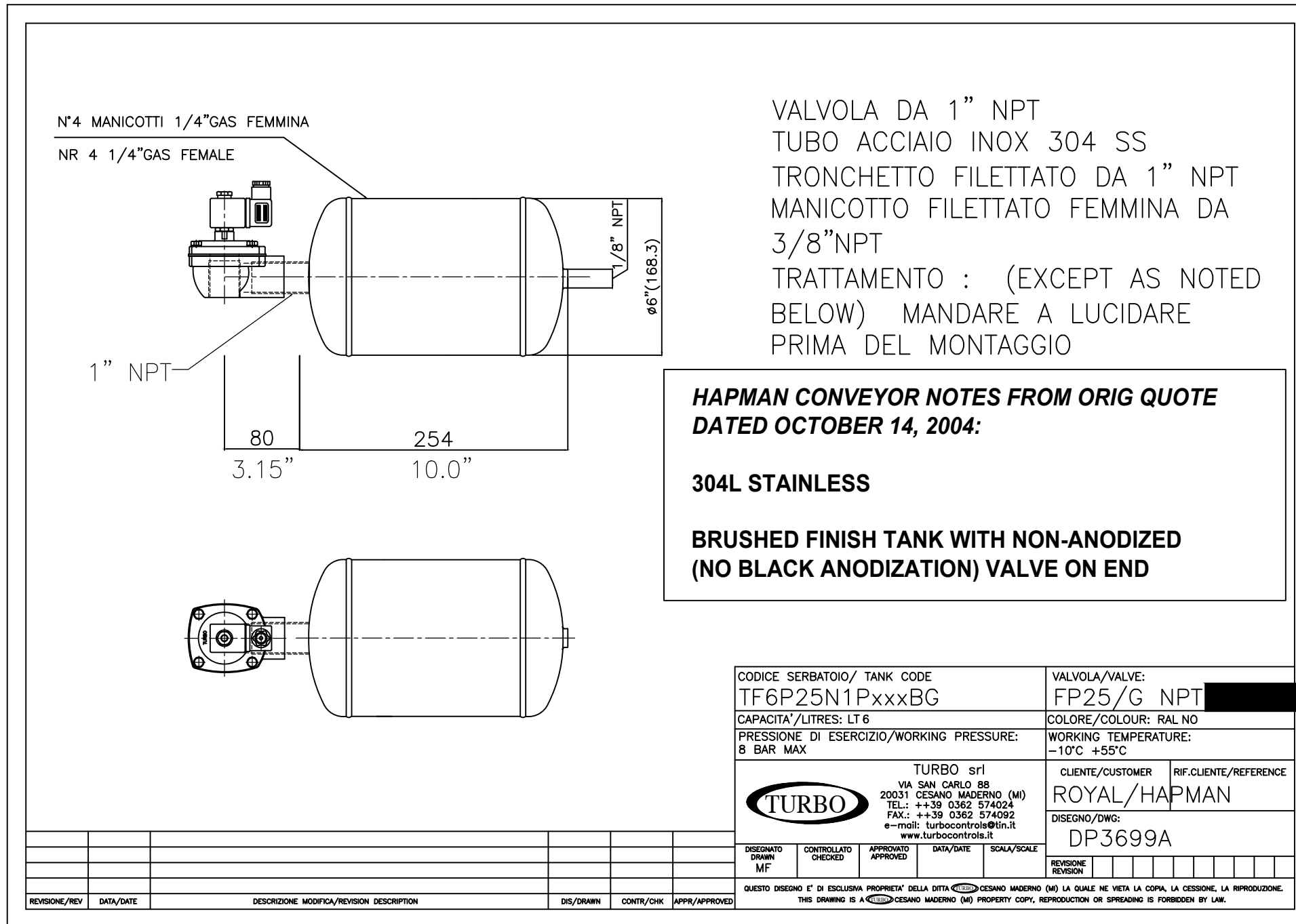
1. INLET FLANGE
2. INLET-SIDE HOUSING
3. BLOWER WHEEL
4. DRIVE-SIDE HOUSING
5. MOTOR

PB 2-PIECE ARRANGEMENT 4HM ASSEMBLY C-FACE MOTOR (PB-8 TO PB-12A)

The drawing shown above is a representation of the basic model blower or fan purchased on the serial number shown on page 1. It does not include any optional or accessory parts or any special construction features that might have been supplied with the original order.

SUFFIX	VOLTAGE	ROYAL #	DESCRIPTION
03	N/A	FP25/G	TANK ONLY
02	N/A	FP25/G NPT 1/8"	TANK & PULSE VALVE
01	24VDC	FP25/G NPT24	TANK/PULSE VALVE/24V SOL
00	110VAC	FP25/G NPT110	TANK/PULSE VALVE/110V SOL

LET	REVISION	DATE	DRAWN
A	ADD SUFFIX FOR 24VDC	4/15/13	EAD
B	ADD SUFFIX FOR 1/8" NPT NO SOLENOID & TANK ONLY	8/28/17	JAF



VALVOLA DA 1" NPT
 TUBO ACCIAIO INOX 304 SS
 TRONCHETTO FILETTATO DA 1" NPT
 MANICOTTO FILETTATO FEMMINA DA 3/8" NPT
 TRATTAMENTO : (EXCEPT AS NOTED BELOW) MANDARE A LUCIDARE PRIMA DEL MONTAGGIO

HAPMAN CONVEYOR NOTES FROM ORIG QUOTE DATED OCTOBER 14, 2004:

304L STAINLESS

BRUSHED FINISH TANK WITH NON-ANODIZED (NO BLACK ANODIZATION) VALVE ON END

Q:STDHAP\PNEU\09155010.DWG

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE ENGLISH (FEET AND/OR INCHES)			
TOLERANCES			
DECIMALS	INCHES	FEET	ANGLES
.X ±.030		X'-X" = ±1/4" UP TO 20 FEET	±1°
.XX ±.015		X'-X" = ±1/2" OVER 20 FEET	
.XXX ±.005	X" = ±1/16"		

DO NOT SCALE DWG.
 BREAK ALL SHARP EDGES

MATERIAL	304L SS
FINISH	BRUSH FINISH



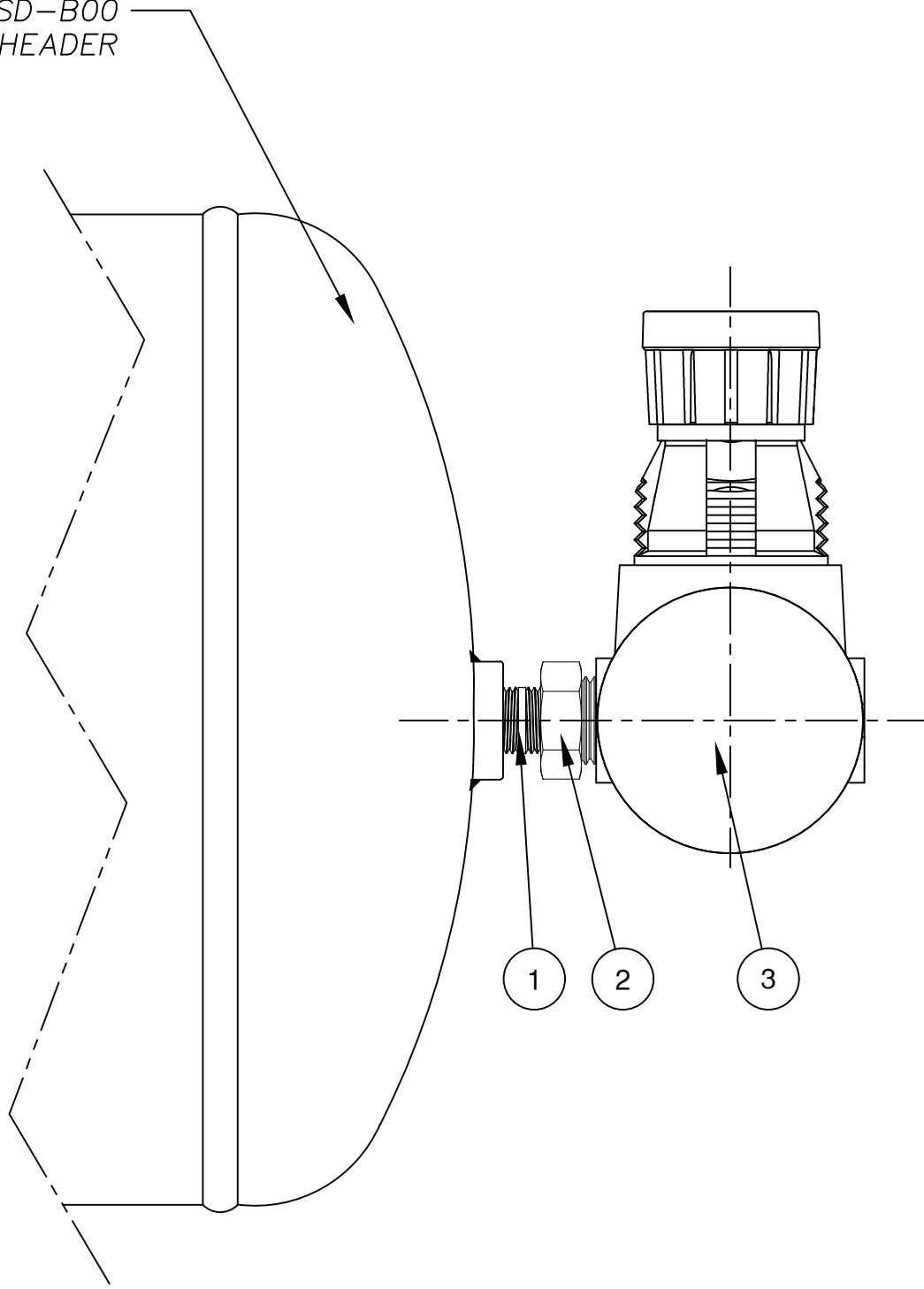
Hapman Conveyors
 6002 EAST KILGORE ROAD
 KALAMAZOO, MICHIGAN 49003
 AREA CODE 616/343-1675
 TEXEX 224468

NAME
 AIR HEADER, 6" DIA X 10" LG
 W/VALVE 304L SS

DRAWN	MH	DATE	1/10/05	SCALE	2"=1"	REV. DATE	08/28/17
SHEET	OF	DWG. NO.	H09155SD-B__		REV.	B	
1	1						

CODICE SERBATOIO/ TANK CODE TF6P25N1PxxxBG		VALVOLA/VALVE: FP25/G NPT	
CAPACITA'/LITRES: LT 6		COLORE/COLOUR: RAL NO	
PRESSIONE DI ESERCIZIO/WORKING PRESSURE: 8 BAR MAX		WORKING TEMPERATURE: -10°C +55°C	
TURBO srl VIA SAN CARLO 88 20031 CESANO MADERNO (MI) TEL.: ++39 0362 574024 FAX.: ++39 0362 574092 e-mail: turbocontrols@tin.it www.turbocontrols.it		CLIENTE/CUSTOMER	RIF.CLIENTE/REFERENCE
		ROYAL/HAPMAN	
DISEGNO/DWG:		DP3699A	
DISEGNATO DRAWN MF	CONTROLLATO CHECKED	APPROVATO APPROVED	DATA/DATE
REVISIONE REVISION		SCALA/SCALE	
QUESTO DISEGNO E' DI ESCLUSIVA PROPRIETA' DELLA DITTA CESANO MADERNO (MI) LA QUALE NE VIETA LA COPIA, LA CESSIONE, LA RIPRODUZIONE. THIS DRAWING IS A PROPERTY COPY, REPRODUCTION OR SPREADING IS FORBIDDEN BY LAW.			

REF. H09155SD-B00
MINI-VAC AIR HEADER



REV.	SUF.	ITEM NO.	DRAWING/PART NO.	DESCRIPTION	QTY	UOM
A		1		CLOSE NIPPLE- 1/8 NPT, PLATED	1	---
A		2		REDUCING HEX- 1/4 NPT TO 1/8 NPT, PLATED	1	---
		3	14R116FC	REGULATOR W/GAUGE, 0-60 PSI, 1/4 NPT	1	---

B01	A	1		CLOSE NIPPLE- 1/8 NPT, S.S.	1	---
A		2		REDUCING HEX- 1/4 NPT TO 1/8 NPT, S.S.	1	---
		3	14R116FC	REGULATOR W/GAUGE, 0-60 PSI, 1/4 NPT	1	---

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE ENGLISH (FEET AND/OR INCHES)

TOLERANCES

DECIMALS	INCHES	FEET	ANGLES
.X	±.030"	X'-X"=±1/4" UP TO 20 FEET X'-X"=±1/2" OVER 20 FEET	±1°
.XX	±.015"		
.XXX	±.005"		

DO NOT SCALE DRAWING REMOVE ALL SHARP EDGES

A	SEPERATED THE BOM BY THE ASSEMBLY SUFFIX NUMBER	4/30/13	CJC
REV	REVISION DESCRIPTION	DATE	BY

HAPMAN
Ideas that move

P.O. BOX 2321
6002 E. KILGORE ROAD, KALAMAZOO, MICHIGAN 49048
PHONE (269) 343-1675 FAX (269) 349-2477

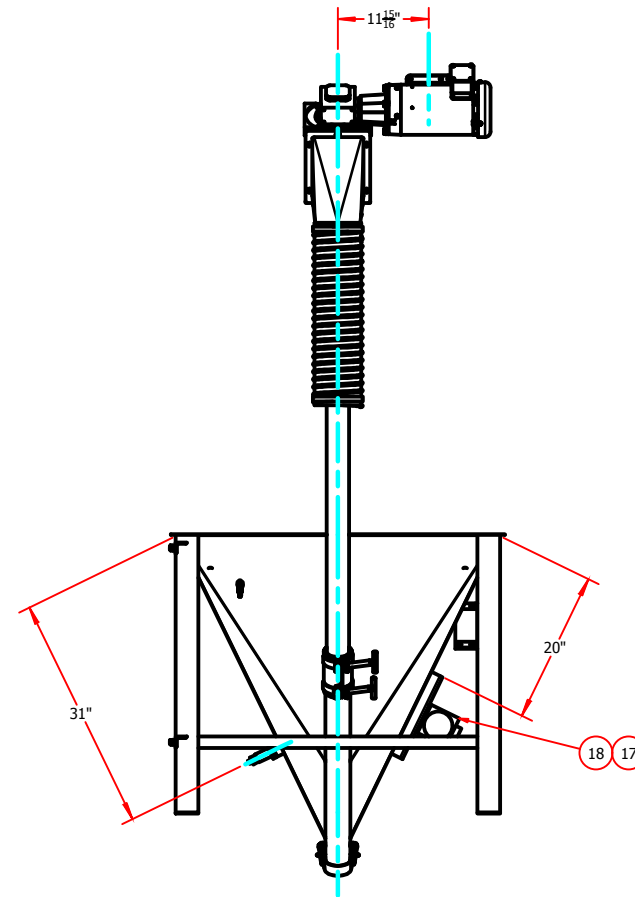
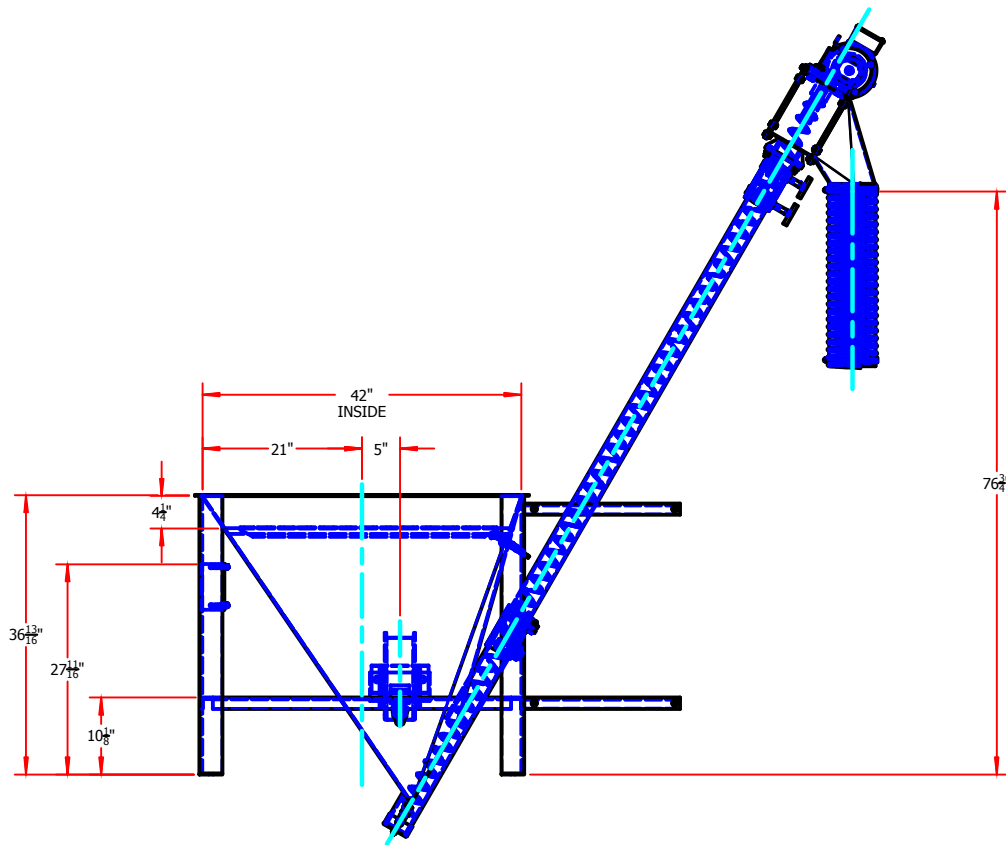
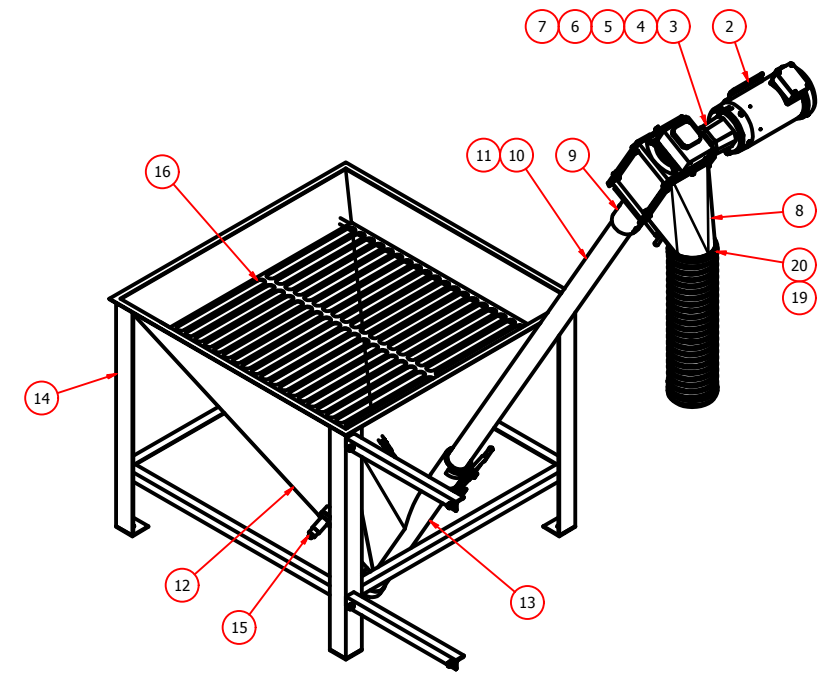
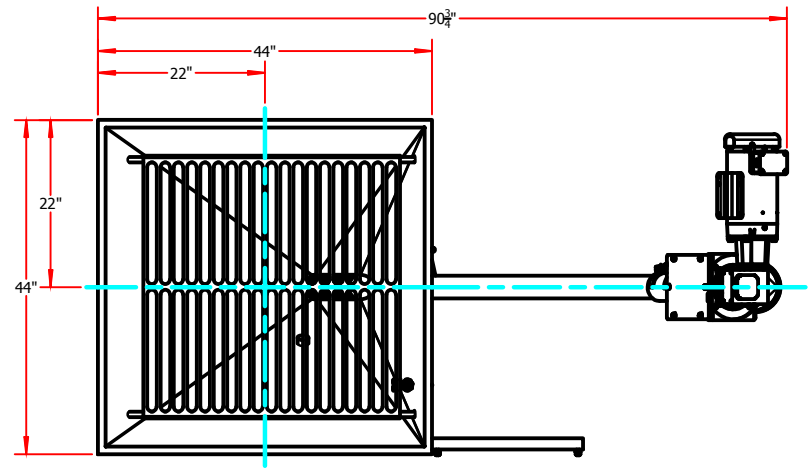
DATE	8/25/11	JOB NO.	DRAWN	E. DZIERFZYC
SCALE	NONE	BOM =	0	DWG = 1

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**REGULATOR ASSEMBLY FOR
MINI-VAC AIR HEADER**

CUST.			
SHEET	1	OF	1
DWG. NO.	9535-B		REV. A

01	304 STAINLESS STEEL CONSTRUCTION
00	CARBON STEEL CONSTRUCTION
SUFFIX	MATERIAL OF CONSTRUCTION

REV	REVISION DESCRIPTION	DATE	BY



REV.	SUF.	ITEM NO.	DRAWING / PART NO.	DESCRIPTION	ITEM QTY
		1	40-108 REV C	HAPMAN FOOD GRADE FINISH SPEC.	
		2	C39933SD-L00	MOTOR, 2 HP, 230-460/3/60, 1800 RPM, 145TC, WASHDOWN, SS, TENV (CESWDM358BT)	1
		3	9473-CD1	SERIES 300 HELIX, RIGHT ANGLE ASSY., 140 FRAME, LH, 5:1 RATIO, 360 RPM, 304 SS	1
		4	X06771SD-B00	TOP COVER, 304 SS, 250-500 HELIX (SHIP LOOSE W/DRIVE ASSY.)	1
		5	X06785SD-B00	GASKET PACKAGE, SERIES 200,300,400,500	1
		6	X06910SD-B00	HARDWARE PACKAGE, SS (SHIP LOOSE W/DRIVE ASSY.)	1
		7	X06816SD-A00	SERIES 200 & 300 HELIX, 1-BOLT, 304 SS (SHIP LOOSE W/DRIVE ASSY.)	1
		8	X06916SD-CD0	DISCHARGE TRANSITION, 60 DEG x 6" OD, SS	1
		9	X09290SD-L00	COUPLING, STEPPED, 3 1/4" DIA. x 3" DIA., SS QUICK RELEASE (LORENZ) 325X3HDW	2
		10	X08969SD-B15	POLY CASING, 2.96 OD x 2.7 ID x .130 WALL x 88 1/2" LG., POLY	1
		11	7844-B	AUGER BEVEL, 300 FLAT, 3/16" x 1 1/2" ID x 2 3/8" OD x 2" PITCH x 110" LG., SS	1
		12	X18547AA-D01	FORMED, SURGE HOPPER, 42" SQ. X 60 DEG., #12 GA, SS	1
		13	X18547AA-D02	SERIES 300 BOOT ASSEMBLY, 60 DEG PICKUP, SS	1
		14	X18547AA-D03	HOPPER SUPPORT FRAME, SS	1
		15	X07411SD-C05	LOW LEVEL PROXIMITY SWITCH, 45 DEG UNIVERSAL HOPPERS	1
		16	6403-D07	BAR GRATE ASSY, 42" HOPPER, INTERLOCK, SS	1
		17	X09449SD-D01	VIBRATOR MOUNTING PAD, 12" LG, ELECTRIC, 304L SS	1
		18	2P-75CE-1-NH	VIBRATOR, ELEC. 115 VAC, NEMA 4X, IP65, VIBCO	1
		19	UVF-600	6" ID TIGER FLEX, 24" LG.	1
		20	HS-104	HOSE CLAMP, 6 DIA, SS	2
		21		HELIX MANUALS- (SHIP LOOSE WITH CONVEYOR)	2

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE ENGLISH (FEET AND/OR INCHES)
TOLERANCES

DECIMALS	INCHES	FEET	ANGLES
X ±.030"		.X'-X" = ± 1/4" UP TO 20 FEET	
.XX ±.015"	X/X" = ± 1/16"	.X'-X" = 1/2" OVER 20 FEET	± .1°
.XXX ±.005"			

DO NOT SCALE DRAWING **REMOVE ALL SHARP EDGES**

HAPMAN Ideas that move 5944 E. N AVE. KALAMAZOO, MICHIGAN 49048
PHONE (269) 343-1675 FAX (269) 349-2477

DATE: 7/31/2020 DB NO.: DRAWN: mittel
SCALE: WEIGHT: N/A

TITLE: 300 HELIX, 60 DEG 12 CU-FT HOPPER, POLY CASING
CUSTOMER: SHEET 1 OF 1 DRAWING NO.: X18547AA-D00

HAPMAN

Ideas that move.



Helix™ Flexible Screw Conveyor

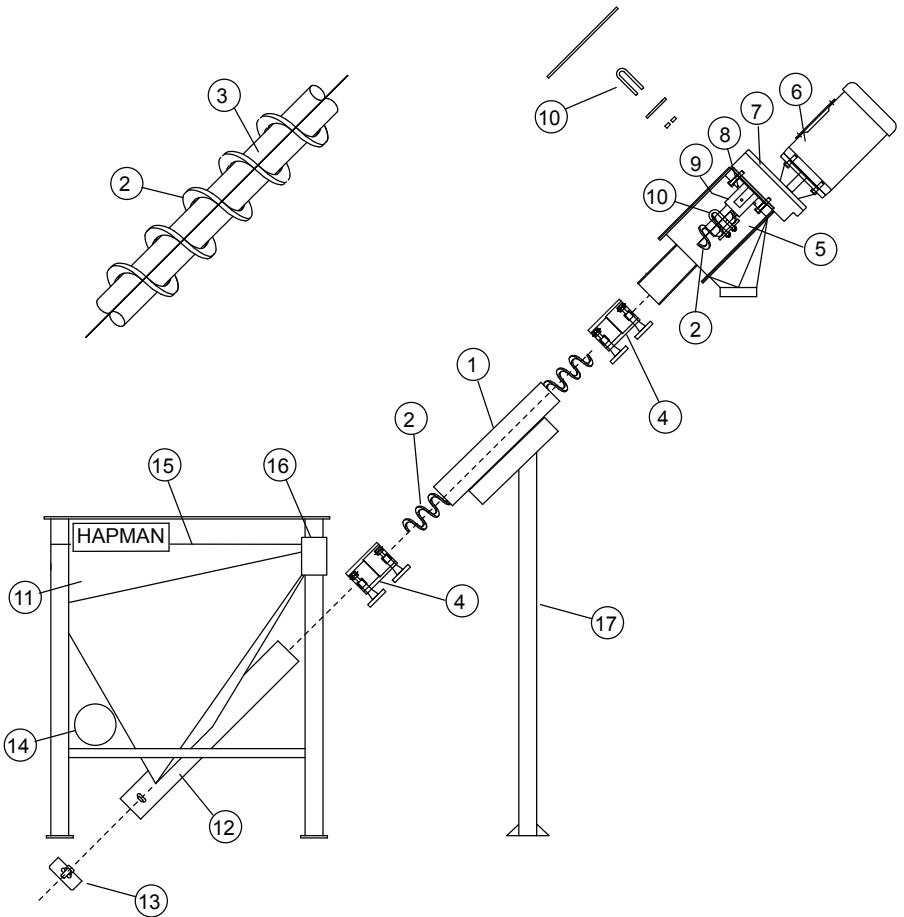
Installation, Operation
and Maintenance Manual

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1. IDENTIFICATION VIEW



- 1. Casing
- 2. Auger
- 3. Center Core (if equipped)
- 4. Casing Clamp
- 5. Drive Box
- 6. Motor
- 7. Gear Reducer
- 8. Seal
- 9. Auger Connector
- 10. U-Bolt Assembly
- 11. In-feed Hopper
- 12. Hopper Boot
- 13. Clean Out Cap
- 14. Vibrator Or Agitator (If Equipped)

- 15. Safety Grid
- 16. Safety Interlock Switch
- 17. Casing Support (by others)

Note: The marker numerical designations listed in this manual are for reference purposes only within this manual.

1.1 Warranty

Equipment manufactured by Hapman is warranted to be free of defective material and workmanship under the use and service quoted for a period of one year after date of shipment. This warranty is void if serviced by anyone other than Hapman service personnel.

Hapman agrees to replace or repair any defective parts it has manufactured as covered under this warranty. F.O.B. our plant, subject to inspection of the part in question by Hapman's personnel. No article may be returned to Hapman without Hapman's written consent.

Parts supplied but not manufactured by Hapman are subject to the warranties extended to Hapman by its suppliers. Hapman's liability is limited to such adjustment as the respective manufacturer makes to the seller.

In no event shall Hapman be liable for costs incurred due to equipment malfunction such as consequential damages, lost production or the expenses or losses incurred due to geographical location or fault of the product, difficulty of access to the product as installed, or time urgency on the part of the user and/or buyer of the equipment.

NOTE:

While all information in this manual has been checked for accuracy, changes in design or specifications may occur at any time in HAPMAN's continuing program of product improvement. HAPMAN cannot assume responsibility for errors in the production of this manual, or for unsafe operating practice of those employing HAPMAN equipment.



WARNING

Prevent serious injury or death.

Before installing, operating or maintaining any equipment, read and understand this manual.

Statements and instructions set forth herein are based upon the best information and practices known to HAPMAN, but this may not be construed to suggest that every conceivable safety precaution is contained herein. As a matter of practicality, HAPMAN cannot guarantee that actions in accordance with such statements and instructions will result in the complete elimination of all hazards and thus assumes no liability for accidents which may occur.

For further information regarding installation, operation and maintenance please contact the factory service department.

HAPMAN Customer Service
5944 East N. Avenue
Kalamazoo, MI 49048-2321 U.S.A.
Phone: 269-343-1675
U.S. Toll Free: 1-800-427-6260
Fax: 269-349-2477
E-mail: service@hapman.com

1.2 General Information

This manual provides instructions of how to install, operate and maintain the equipment supplied by Hapman. Recommended spare parts lists are provided to help you determine which parts should be kept on hand or readily accessible.

Assistance on parts orders or service calls may be obtained from Hapman. When calling or writing for parts or service, please reference the equipment serial number. This number is stamped on the Hapman name-plate affixed to each piece of equipment. Record this number on the last page of this manual for easy reference.

2. SAFETY

2.1 Safety Alert Symbols And Signal Words

This manual contains instructions to assemble, operate and maintain a Helix Flexible Screw Conveyor.

You must read, understand and follow the instructions in this manual.

The safety information in this manual is denoted by the safety alert symbol:



This symbol means ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!

The level of risk is indicated by the following signal words:



DANGER

DANGER - Indicates a hazardous situation, which, if not avoided, **WILL** result in death or serious injury.



WARNING

WARNING - Indicates a hazardous situation, which, if not avoided, could result in death or serious injury.




CAUTION

CAUTION - Indicates a hazardous situation, which, if not avoided, could result in minor or moderate injury.

NOTICE

NOTICE - Indicates a situation that could result in damage to the equipment or other property.

2.2 Operational Hazards

 Do not attempt to install, connect power to, operate and/or service a Helix™ Conveyor without reading and understanding this manual and fully understanding the operation of this conveyor.

It is the owner/employers's responsibility to train the employee/operator in the proper and safe use of this conveyor.



WARNING

Prevent serious injury or death.

Conveyor must be installed and wired according to national, industry and local electrical code requirements by a qualified electrician.



WARNING

Severing and entanglement hazard.

Conveyor may start automatically or from a remote location.

Keep clear of conveyor and all moving parts.

Disconnect and lockout power source before adjusting, cleaning, unclogging or servicing.



WARNING

Severing and entanglement hazard.

Rotating and moving parts must be completely enclosed before connecting electrical power.



WARNING

Prevent serious injury or death.

Do not override, remove or disable any safety device.



WARNING

Prevent serious injury or death.

Wear personal protective devices (PPD) appropriate for the job.

Do not wear loose fitting clothing, neckties or jewelry. Long hair must be contained.



WARNING

Use conveyor only for the designed applications.

Any other use may result in personal injury, damage to equipment and may void the warranty.



WARNING

Severing and entanglement hazard.

Do not operate conveyor with any guard, shield or cover removed.



WARNING

Prevent serious injury or death.

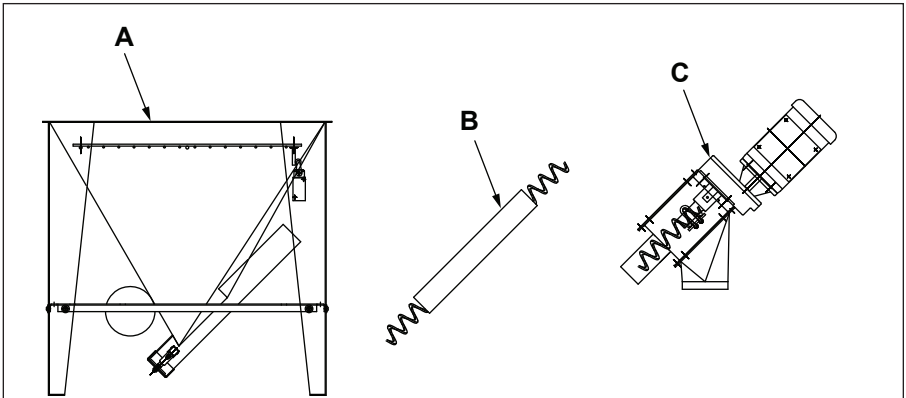
Do not alter or modify this equipment.

Altering or modifying equipment may render the equipment unsafe and will void the manufacturers warranty.

3. INSTALLATION

3.1 Major Components

Hapman Helix™ Conveyors are shipped as three major assemblies.



A - In-feed Hopper: Standard or customized in-feed hopper/transition.

B - Auger/Casing: Includes auger and conveyor casing. May also include center core if applicable.

C - Drive Box: Includes motor or gear motor, auger connection and discharge enclosure.

3.2 Installation Guidelines

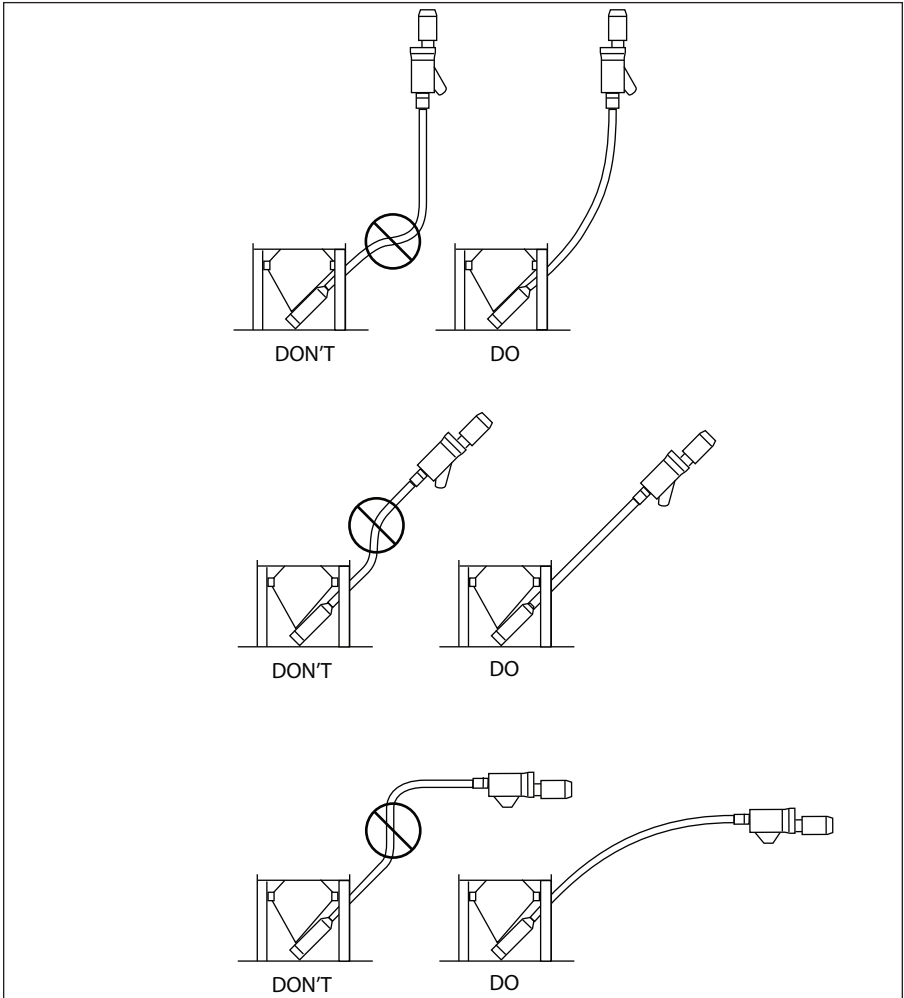
1. Determine where to mount drive assembly and how it will discharge into related equipment.
2. Place in-feed hopper into desired position and observe the path that the casing/auger must travel to reach drive assembly. The conveyor path can now be finalized and drive support requirements determined.
3. The auger/casing should be as straight as possible to minimize wear and maintain capacity. The auger/casing should be shortened or supported if drooping.

If it is necessary for the auger/casing to be curved, maintain a smooth and generous radius to prevent a collapse of auger/casing wall. A tight radius will cause premature wear on auger and casing.

Suggested Curve Radius Dimensions

<i>Helix Conveyor Model</i>	<i>Maximum Curve Radius</i>
#250	8 Ft. (2.4 m)
#300	10 Ft. (3.0 m)
#400	20 Ft. (6.1 m)
#500 - #800	N/A
Dairy Grade	N/A

4. Avoid two or more curves in one conveyor.



NOTICE

Prevent equipment damage.

Always obtain as large a radius as possible. Avoid two or more curves in one conveyor.

On long conveyor runs, it may be necessary to support the casing. Additional support will minimize sag, reduce vibration and strain on connections.

The casing must not exert lateral force on drive assembly or in-feed hopper as a result of curves in conveyor casing.

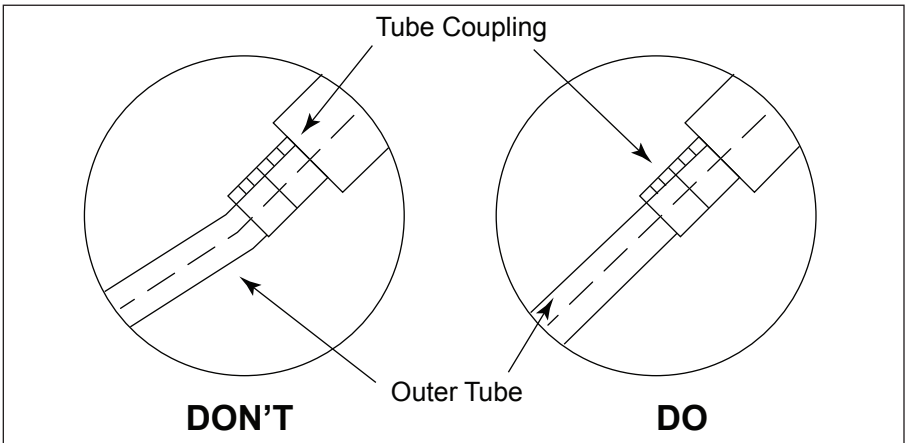
Isolate casing from sharp or protruding objects that may cause casing to collapse.

NOTICE

Prevent equipment damage.

Casing exerting excessive strain on drive assembly or in-feed hopper may change alignment of those components.

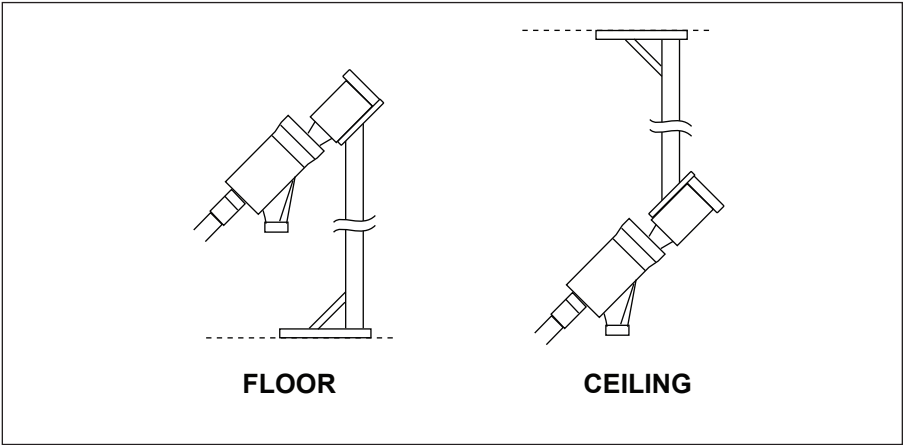
This can result in excessive wear or collapsed casing.



3.3 Install Drive Assembly

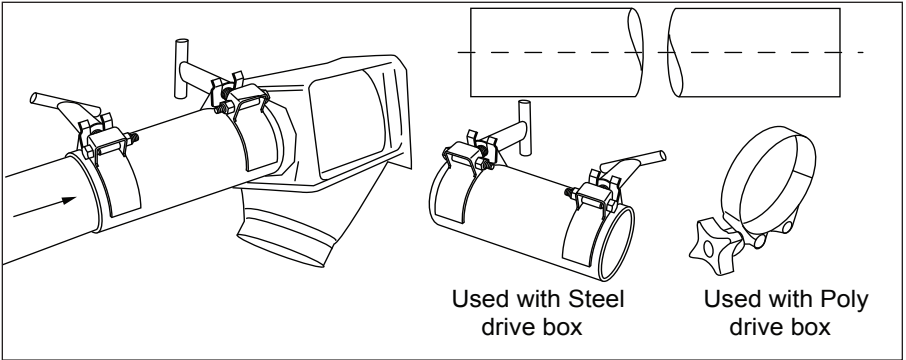
Drive assembly must be securely supported.

If overhead support is not available, a floor mounted mast can be purchased through Hapman.



3.4 Install Casing

Standard Models



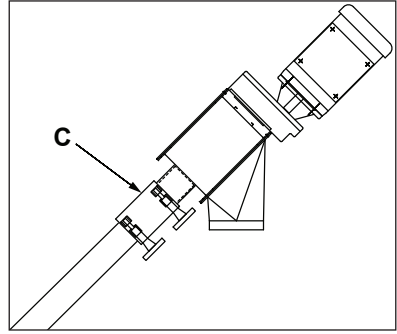
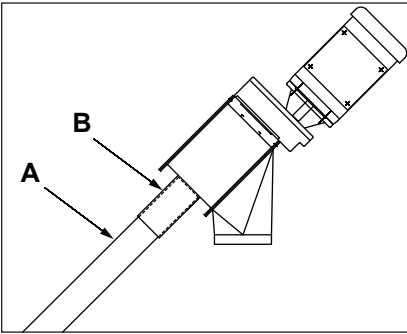
1. Remove auger from casing.
2. Insert end of casing (A) into inlet (B) of drive assembly. Push casing in until firmly against end of housing. If you have a dairy grade conveyor, see Dairy Grade Models for handling instructions.

NOTICE

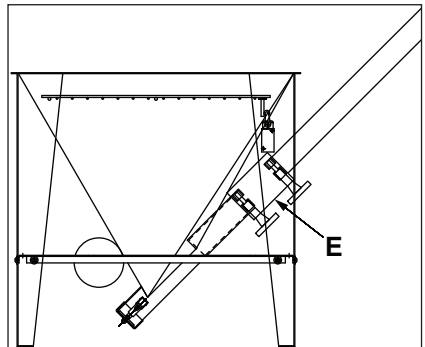
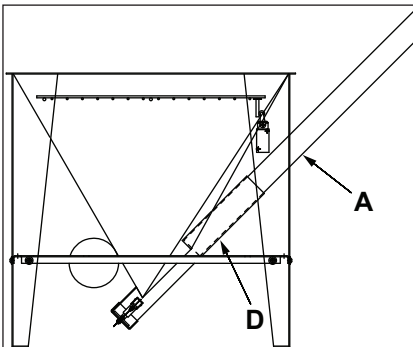
Prevent equipment damage.

Do not overtighten clamps. Overtightening may cause casing distortion, resulting in premature wear.

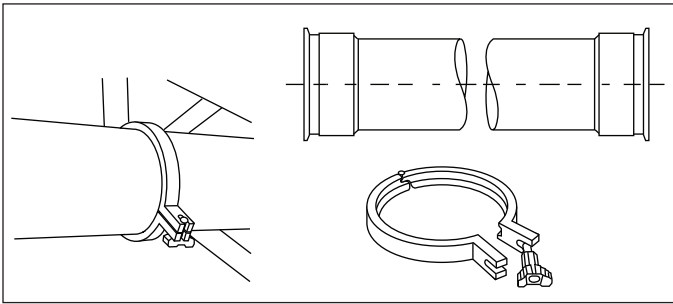
3. Install clamp (C) to fasten casing to drive assembly.



4. Insert other end of casing (A) into in-feed hopper boot (D). Casing should extend to the leading edge of the fill area of hopper boot.
5. Install clamp (E) to fasten casing to drive hopper assembly.



USDA Dairy Grade Models



NOTICE

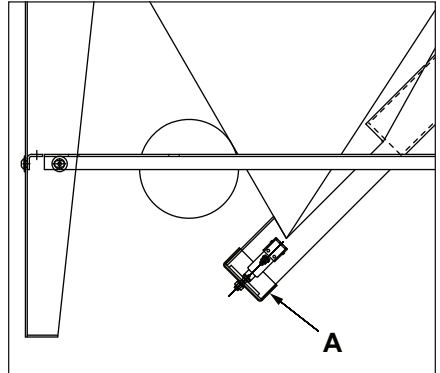
Prevent equipment damage.

**The casing end aligns flat against the drive housing input area.
Place clamp around drive flange and casing flange to connect both together.**

3.5 Install Auger

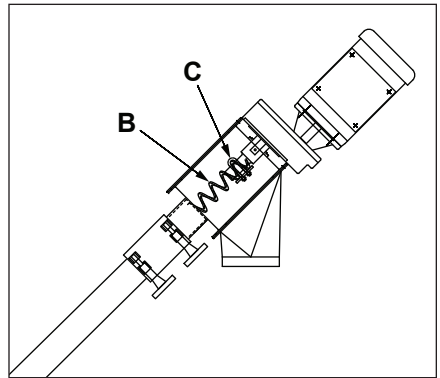
1. Remove clean out cap (A) at base of in-feed hopper boot.
2. Feed auger into casing through clean out opening. (Series 300 and smaller)

Note: Auger must be installed so that flattened end of auger is in in-feed hopper (300 series only).



Note: Series 400 or larger, the auger would need to be installed prior to installing the hopper.

3. Connect auger (B) to motor connector with clamp (C). Tighten clamp.
4. It is essential that auger has room to stretch. End of auger must be 2-3 inches (50-75 mm) from clean out cap (A).
5. It may be necessary to cut auger to obtain proper clearance.

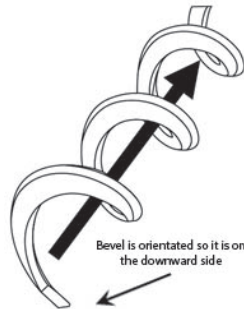


Remove auger and cut drive end. Do not cut off flattened auger section (series 300 only) (hopper end). Install auger and check for proper cleanout cap clearance. Install auger and clamp (C) to specifications.

6. **Auger “Up” / “Down” Orientation**

Some augers which are 3” and smaller in diameter have a forged or flattened section, added on to their bottom end. These augers should be orientated and installed so that this flattened end is located down in the infeed hopper. If both ends of the auger have the same appearance (no flattened section is present), orientation is not an issue.

Beveled edge auger must be orientated as shown in the illustration below.



It is essential that the auger has room to stretch in the direction opposite to the motor end. It must not come in contact with the clean-out cap.

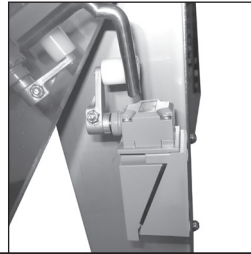
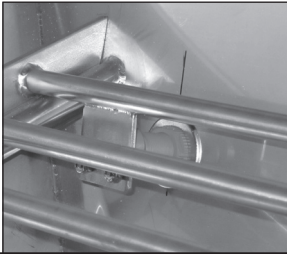
It may be necessary to adjust the length of the auger. When cutting, reduce the length of the auger in order to maintain approximately 2” to 3” clearance from the flat auger end to the clean-out cap. Always shorten the auger from the top drive end, so as not to remove the flattened auger section at the bottom.

7. Install cleanout clamp (A).

3.6 Connect Critical Wiring

The safety grid covering in-feed hopper is hinged and is equipped with a safety interlock switch. Connect wiring from this switch to the control panel and to drive motor control. When properly wired, drive motor will not operate (or will automatically stop if it is running) when safety grid is lifted.

If auger continues to rotate when safety grid is lifted, stop drive motor and verify proper electrical connection of the safety interlock switch.



WARNING

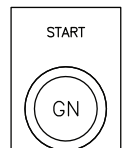
Prevent serious injury or death.

Do not override, remove or disable any safety device.

3.7 Final Assembly

Install:

- Access covers and cleanout ports.
- Inlet hopper safety grid and interlock switch.
- Guarding for all moving parts.
- Safety labels. See Safety Section for diagram.
- Verify that all hardware is tight.



3.8 Electrical

Refer to specification plate on drive motor for electrical requirements.



WARNING

Prevent serious injury or death.

Electrical service installation must be performed by a qualified electrician and conform to all electrical codes.

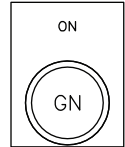


WARNING

Severing and entanglement hazard.

Keep clear of conveyor and all moving parts.

Press ON button to energize conveyor.



Press START button momentarily to jog conveyor motor to verify rotation of auger. Auger must rotate counter clockwise when viewed from in-feed end.

4. OPERATION

4.1 Modes Of Operation

There are three basic modes of operation which correlate to the design of the conveyor.

1. Batch/Refill

Batch operation is the easiest of all modes of operation. Typically, the conveyor is not operated for a large percentage of time. There are no special design criteria to implement in this regard.

Not all material being conveyed is completely evacuated from the conveyor. The residual material remaining in the conveyor should be considered since its variance will cause loss of accuracy in pre-weighed batches and batches consisting of various materials. There are operating methods available which will minimize the amount of residual amount and maximize the repeatability of the residual amount.

2. Intermittent

Intermittent operation is one where the conveyor starts and stops in a repetitive fashion. Therefore, it consistently starts under full load. Although starting under load is not a problem for standard equipment in most applications, some materials that are very heavy or prone to severe densifying and/or solidification may cause start-up problems.

In such cases, special modifications to the conveyor can be made which will add to its structural integrity and/or reduce the amount of material in the conveyor during start-up. Two example modifications are:

- 1) The utilization of a special heavy-duty auger;
- 2) The utilization of restriction devices such as a center core within the auger, or an inlet baffle.

3. Continuous

A continuous operation is one where the conveyor may run for long intervals without stopping. Some adverse applications require very slow auger speeds to perform satisfactorily. Also, a more conservative design in the curving of the conveyor casing should be implemented.

4.2 Initial Startup

NOTICE

Prevent equipment damage.

Note: Do not run vibrator on an empty hopper.

Do not run conveyor empty. Material is required to cushion auger within casing.

Press EMERGENCY STOP button at any time to stop all conveyor functions.



1. Add a small amount of material into in-feed hopper.

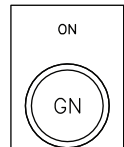


WARNING

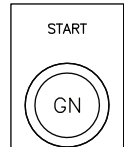
Severing and entanglement hazard.

Keep clear of conveyor and all moving parts.

2. Press ON button to energize conveyor.

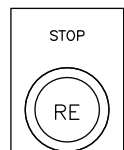


3. Press START button and add more material as it is conveyed upward.



4. Run conveyor to empty all material from auger.

5. Push STOP button. Disconnect and lock out power source.





WARNING

Severing and entanglement hazard.

Conveyor may start automatically or from a remote location.

Disconnect and lockout power source before adjusting or servicing.

6. Inspect in-feed hopper, casing and drive for wear points.
7. Verify casing to hopper and drive assembly clamps are tight.
8. Verify auger to motor connector u-bolt clamp is tight.
9. Inspect connections for signs of material dust leakage.
10. If equipped with a gear box, inspect for oil leakage.
11. Verify all guards, covers and access ports are properly installed and secured.
12. Conveyor is now ready for normal operation.

4.2 Clean Out

When most material has been conveyed forward, a small amount of material will remain in the in-feed hopper.

The auger can be damaged if the reverse jog button is activated while unit is under full load. Always remove as much material as possible by running auger in its forward motion. Follow instructions below to clean out auger and in-feed hopper.

1. Disconnect and lock out power source.



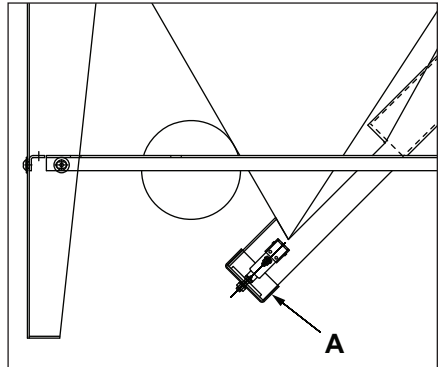
WARNING

Severing and entanglement hazard.

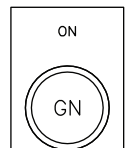
Conveyor may start automatically or from a remote location.

Disconnect and lockout power source before adjusting or servicing.

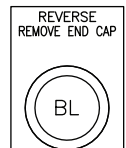
2. Remove clean out cap (A) at base of in-feed hopper boot.
3. Place a catch basin under hopper boot.



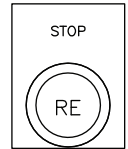
4. Press ON Button to energize conveyor.



5. Press and hold reverse button for 3-5 second incremental surges.



-
6. Press STOP button.
 7. Disconnect and lock out power source.
 8. Verify that material is removed from in-feed hopper.
 9. If additional clean out is needed, repeat steps 4-6.
 10. Verify that power source is disconnected and locked out.
 11. Depending on the material and your cleaning requirements, further disassembly may be necessary. Drive box covers may be removed to allow a cleaning solution or water to flushed through casing.

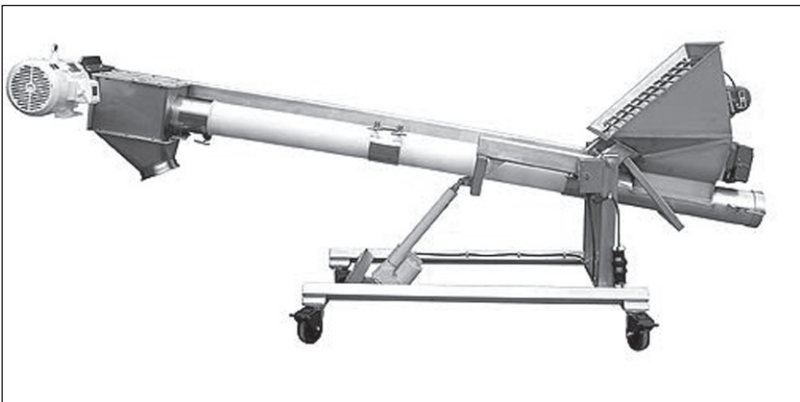


If necessary to disassemble conveyor, loosen both casing clamps and drive auger u-bolt. Auger can now be removed from in-feed hopper and drive assembly.

12. If disassembled, re-assemble conveyor.
13. Install clean out cap (A).

4.3 Care Of Hi/Lo Conveyor System

The Hi/Lo Helix™ is self-contained and should require no maintenance or lubrication if operated at normal duty cycle at rated thrust and in ordinary environmental conditions. If service/disassembly is required, please contact Hapman for instructions.



5. TROUBLESHOOTING

5.1 Hi/Lo System

Problem	Possible Causes	Solutions
Actuator's rod will not extend or retract.	Check for a blown fuse or circuit breaker. Check for a loose wire. Check for correct limit switch setting. Check any binding in load being actuated. Check for an open capacitor lead. Check for a worn drive unit.	Replace or reset. Tighten. Adjust. Clear Repair connection. Disconnect actuator from load and pull or push on extension rod. Replace if necessary.
Actuator only actuates in one direction.	Check for any open wiring. Check that the position limit switch is properly adjusted. Check for excessive external load on actuator in one direction.	Replace wiring. Reposition switch. Adjust load.
Actuator is excessively noisy.	Check for worn bearing. Check for worn or damaged gear. Check for a bent auger or misalignment.	Replace bearing. • Replace bad part Put in new screw or realign.

5.2 Standard Helix

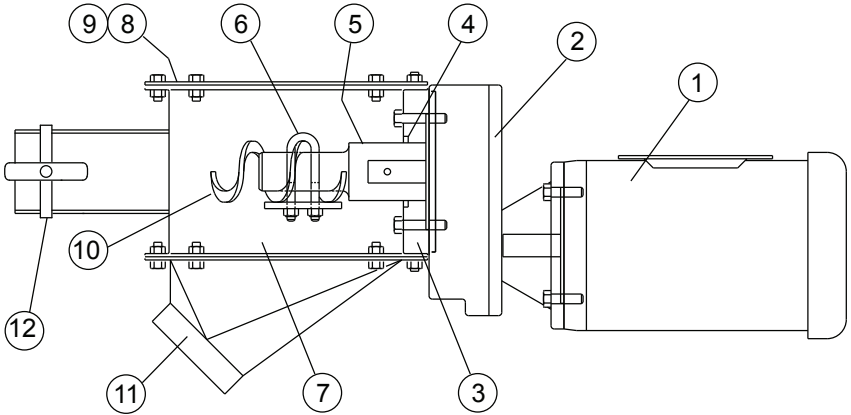
Problem	Possible Causes	Solutions
Motor overload protection trips.	Over tightened casing clamps. Auger rubbing on clean out cap. Material lodging between casing and auger.	Loosen clamps. Shorten auger. Install proper sized screen on hopper.
Auger breaks.	Over tightened casing clamps. Auger rubbing on clean out cap. Too sharp radius bend.	Loosen clamps. Shorten auger. Realign conveyor. Shorten conveyor if needed.
Casing wearing excessively.	Over tightened casing clamps. Check for casing contacting external surfaces.	Loosen clamps. Isolate contact points.
Conveyor noisy or no material being conveyed.	Material bridging in hopper. Material aerating and acts like fluid.	Disconnect and lock out power source and remove material bridge. An agitator may be required. Reduce conveyor speed (RPM) or add auger core.

Problem	Possible Causes	Solutions
Actuator exhibits high motor current.	<p>Check for external binding related to the load being actuated.</p> <p>Check for excessive external load.</p> <p>Check for loss of lubricant.</p> <p>Check rod for contaminates.</p> <p>Check for low voltage.</p>	<p>Clear area of obstructions.</p> <p>Remove load.</p> <p>Refill to specified levels.</p> <p>Clean and/or replace.</p> <p>Correct voltage at its source.</p>

If after making all troubleshooting checks, you still have a specific problem with your actuator, contact Hapman for further assistance.

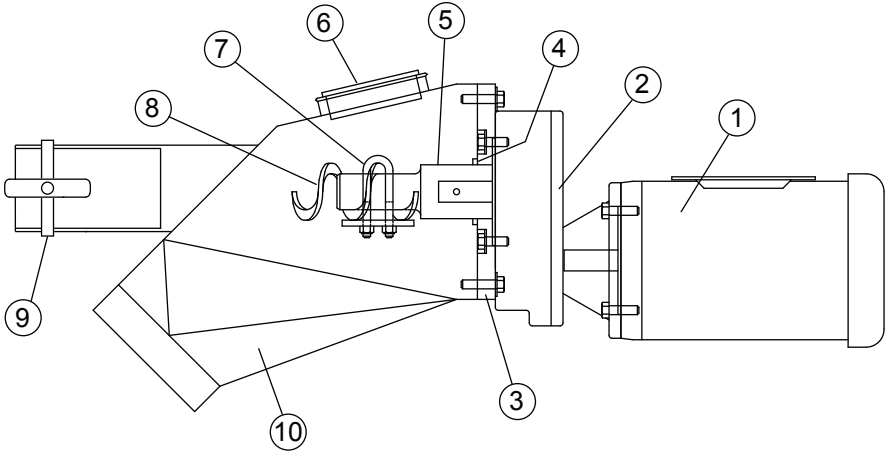
6. PART IDENTIFICATION

6.1 Steel Drive Box - Gear Reducer Assembly



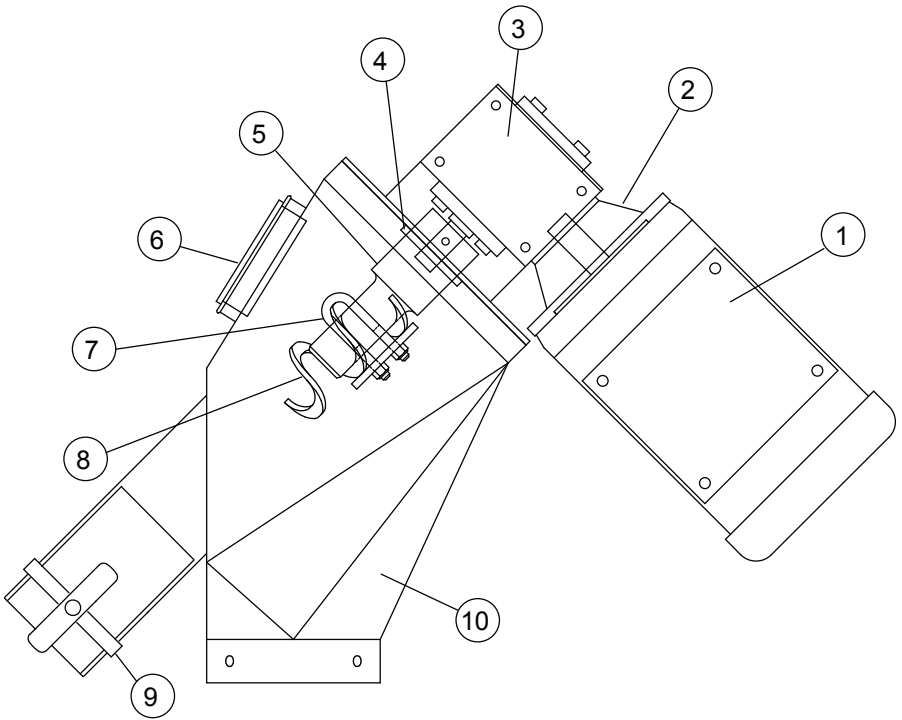
- | | |
|-----------------------------|--------------------------|
| 1. Drive Motor | 7. Drive Box |
| 2. Gear Reducer | 8. Top Cover |
| 3. Backing Plate | 9. Cover Gasket |
| 4. Seal | 10. Auger |
| 5. Connector | 11. Discharge Transition |
| 6. U-Bolt / J-Bolt Assembly | 12. Coupling |

6.2 Polyethylene Drive Box - Gear Reducer Drive



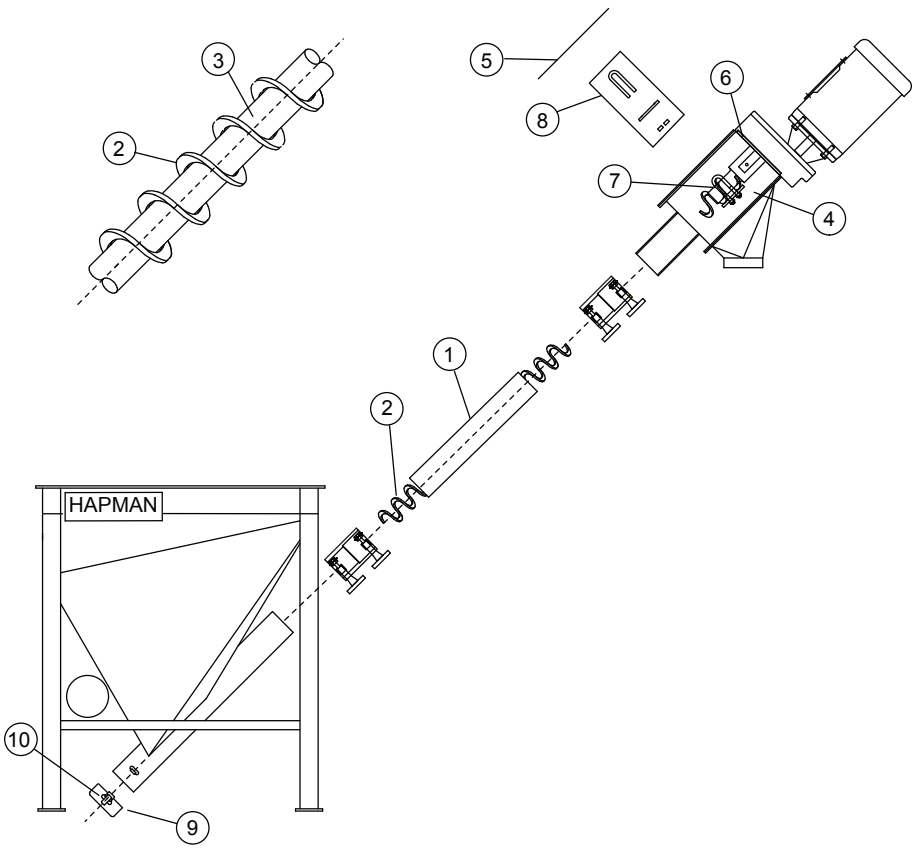
- | | |
|------------------|--------------------|
| 1. Drive Motor | 6. Access Cover |
| 2. Gear Reducer | 7. U-Bolt Assembly |
| 3. Backing Plate | 8. Auger |
| 4. Seal | 9. Casing Clamp |
| 5. Connector | 10. Drive Box |

6.3 Polyethylene Drive Box - Right Angle Gear Reducer Assembly



- | | |
|------------------------------|--------------------|
| 1. Drive Motor | 6. Access Cover |
| 2. Worm Gear Reducer | 7. U-Bolt Assembly |
| 3. Reducer Mounting Assembly | 8. Auger |
| 4. Seal | 9. Casing Clamp |
| 5. Connector | 10. Drive Box |

7. REPLACEMENT PARTS



Helix Models: 250, 300, 400, 500, 600 and 800

Item	Description	Unit Quantity
1	Polyethylene Casing	As Required
2	Auger	As Required
3	Polyethylene Center Core	As Required
4	Drive Box	As Required
5	Cover Gasket Package	2/Package
6	Seals (0.25 Square Teflon)	2
7	Connector	1
8	U-Bolt or J-Bolt	1
9	Clean Out Cap	1
10	Cap Probe (Polyethylene Only)	1
	Backing Plate (Polyethylene)	1

8. MACHINE INFORMATION

Serial Number: _____

Model Number: _____

For operational information in this plant contact:

Name: _____

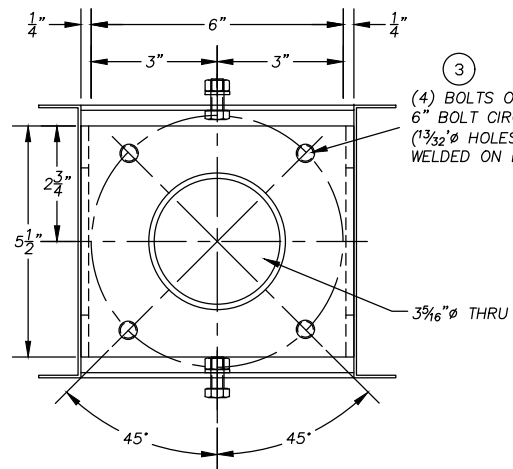
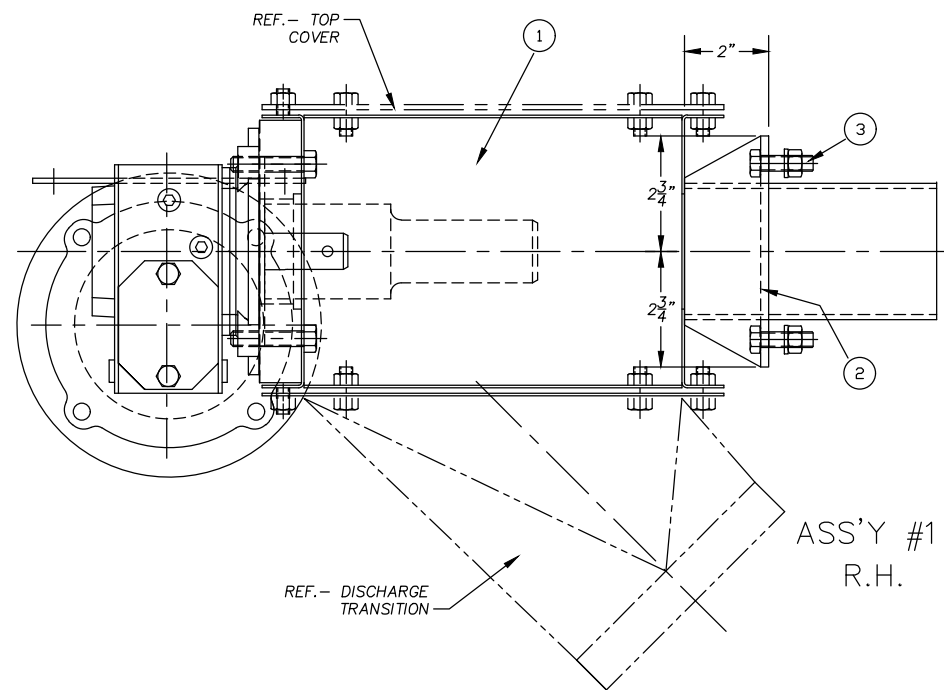
Dept./Phone Number: _____

Hapman
5944 East N. Avenue
PO Box 2321
Kalamazoo, MI 49048
Phone: 269-343-1675
Toll Free USA 1-800-427-6260
Fax: 269-349-2477
www.hapman.com



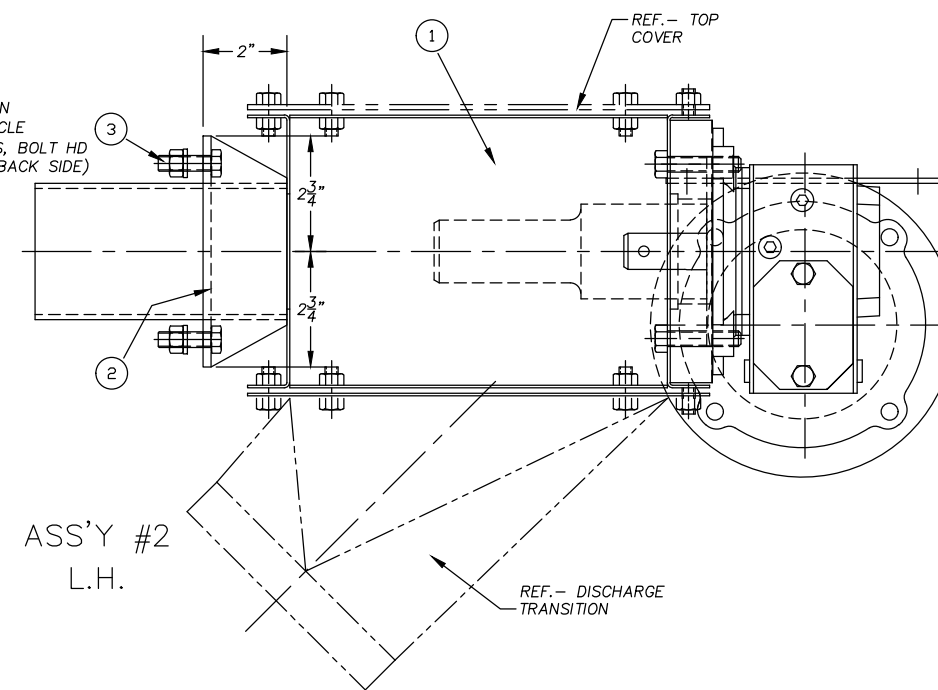
5944 East N Avenue, Kalamazoo, MI 49048
(800) 427-6260 • sales@hapman.com
www.hapman.com

REV	DESCRIPTION	DATE	BY
A	ITEM #3 WAS 3/8"-16 X 1" LG STUDS	12/22/10	DRB

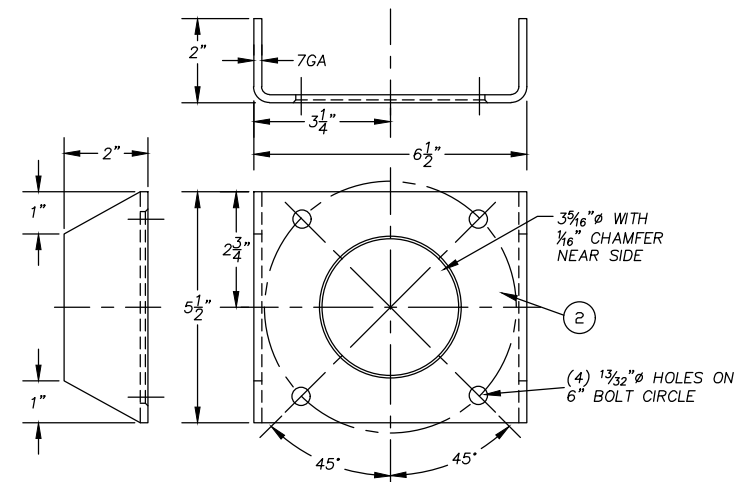


(3)
(4) BOLTS ON
6" BOLT CIRCLE
(1 1/32" Ø HOLES, BOLT HD
WELDED ON BACK SIDE)

3/16" Ø THRU



DWG #	ITEM #	PART ID	DESCRIPTION	QTY.
9473-C01 ASS'Y 2, 360 RPM	1	X08728SD-C01	RIGHT ANGLE DR- 300, 140TC, 5:1 RATIO, SS (ASS'Y 2)	1
	2	.	CHANNEL, FORMED- 7GA, SS (SEE DETAIL)	1
	3	.	HX HD BOLT- 3/8-16 X 1.25 LG, SS, W/FWR & LOCK NUT	4
9473-C02 ASS'Y 2, 240 RPM	1	X08728SD-C02	RIGHT ANGLE DR- 300, 140TC, 7.5:1 RATIO, SS (ASS'Y 2)	1
	2	.	CHANNEL, FORMED- 7GA, SS (SEE DETAIL)	1
	3	.	HX HD BOLT- 3/8-16 X 1.25 LG, SS, W/FWR & LOCK NUT	4
9473-C03 ASS'Y 2, 180 RPM	1	X08728SD-C03	RIGHT ANGLE DR- 300, 140TC, 10:1 RATIO, SS (ASS'Y 2)	1
	2	.	CHANNEL, FORMED- 7GA, SS (SEE DETAIL)	1
	3	.	HX HD BOLT- 3/8-16 X 1.25 LG, SS, W/FWR & LOCK NUT	4
9473-C04 ASS'Y 1, 360 RPM	1	X08728SD-C04	RIGHT ANGLE DR- 300, 140TC, 5:1 RATIO, SS (ASS'Y 1)	1
	2	.	CHANNEL, FORMED- 7GA, SS (SEE DETAIL)	1
	3	.	HX HD BOLT- 3/8-16 X 1.25 LG, SS, W/FWR & LOCK NUT	4
9473-C05 ASS'Y 1, 240 RPM	1	X08728SD-C05	RIGHT ANGLE DR- 300, 140TC, 7.5:1 RATIO, SS (ASS'Y 1)	1
	2	.	CHANNEL, FORMED- 7GA, SS (SEE DETAIL)	1
	3	.	HX HD BOLT- 3/8-16 X 1.25 LG, SS, W/FWR & LOCK NUT	4
9473-C06 ASS'Y 1, 180 RPM	1	X08728SD-C06	RIGHT ANGLE DR- 300, 140TC, 10:1 RATIO, SS (ASS'Y 1)	1
	2	.	CHANNEL, FORMED- 7GA, SS (SEE DETAIL)	1
	3	.	HX HD BOLT- 3/8-16 X 1.25 LG, SS, W/FWR & LOCK NUT	4
9473-C07 ASS'Y 2, 120 RPM	1	X08728SD-C07	RIGHT ANGLE DR- 300, 140TC, 15:1 RATIO, SS (ASS'Y 2)	1
	2	.	CHANNEL, FORMED- 7GA, SS (SEE DETAIL)	1
	3	.	HX HD BOLT- 3/8-16 X 1.25 LG, SS, W/FWR & LOCK NUT	4
9473-C08 ASS'Y 1, 120 RPM	1	X08728SD-C08	RIGHT ANGLE DR- 300, 140TC, 15:1 RATIO, SS (ASS'Y 1)	1
	2	.	CHANNEL, FORMED- 7GA, SS (SEE DETAIL)	1
	3	.	HX HD BOLT- 3/8-16 X 1.25 LG, SS, W/FWR & LOCK NUT	4



HAPMAN
Ideas that move

P.O. BOX 2321
6002 E. KILGORE ROAD, KALAMAZOO, MICHIGAN 49048
PHONE (269) 343-1675 FAX (269) 349-2477

DATE	4/2/09	JOB NO.		DRAWN	DRB
SCALE	1/2" = 1"	BOM =	1	DWG =	1
TITLE					
HI/LO RIGHT ANGLE DRIVE ASSEMBLY 300 SERIES, 140TC MOTORS, SS (CHARTED)					
CUST.					REV.
SHEET	2	OF	2	DWG. NO.	9473-C__
					A

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE ENGLISH (FEET AND/OR INCHES)			
TOLERANCES			
DECIMALS	INCHES	FEET	ANGLES
.X ±.030			X°-X°=±1/4" UP TO 20 FEET
.XX ±.015			X°-X°=±1/2" OVER 20 FEET
.XXX ±.005	X"=±1/16"		±1°
DO NOT SCALE DWG. BREAK ALL SHARP EDGES			
MATERIAL			
FINISH			

BALDOR • RELIANCE

**Integral Horsepower
AC Induction Motors
ODP, WPI, WPII Enclosure
TEFC Enclosure
Explosion Proof**

Installation & Operating Manual

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Section 1

General Information

Overview This manual contains general procedures that apply to Baldor Motor products. Be sure to read and understand the Safety Notice statements in this manual. For your protection, do not install, operate or attempt to perform maintenance procedures until you understand the Warning and Caution statements. A Warning statement indicates a possible unsafe condition that can cause harm to personnel. A Caution statement indicates a condition that can cause damage to equipment.

Important: **This instruction manual is not intended to include a comprehensive listing of all details for all procedures required for installation, operation and maintenance. This manual describes general guidelines that apply to most of the motor products shipped by Baldor. If you have a question about a procedure or are uncertain about any detail, Do Not Proceed. Please contact your Baldor distributor for more information or clarification.**

Before you install, operate or perform maintenance, become familiar with the following:

- NEMA Publication MG-2, Safety Standard for Construction and guide for Selection, Installation and Use of Electric Motors and Generators.
- The National Electrical Code
- Local codes and Practices

Limited Warranty

1. Most Baldor products are warranted for 18 months from the date of shipment to Baldor's customer from Baldor's district warehouse or, if applicable, from Baldor's factory. Baldor Standard-E® standard efficient motors are warranted for 24 months. Standard-E is limited to three phase, general purpose, 1-200 HP ratings that fall under the Energy Policy Act (EPAAct). Baldor Super-E® premium efficient motors are warranted for 36 months. Baldor IEEEE841 motors are warranted for 60 months. All warranty claims must be submitted to a Baldor Service Center prior to the expiration of the warranty period.
2. Baldor will, at its option repair or replace a motor which fails due to defects in material or workmanship during the warranty period if:
 - a. the purchaser presents the defective motor at or ships it prepaid to, the Baldor plant in Fort Smith, Arkansas or one of the Baldor Authorized Service Centers and
 - b. the purchaser gives written notification concerning the motor and the claimed defect including the date purchased, the task performed by the Baldor motor and the problem encountered.
3. Baldor will not pay the cost of removal of any electric motor from any equipment, the cost of delivery to Fort Smith, Arkansas or a Baldor Authorized Service Center, or the cost of any incidental or consequential damages resulting from the claimed defects. (Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above exclusion may not apply to you.) Any implied warranty given by laws shall be limited to the duration of the warranty period hereunder. (Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.)
4. Baldor Authorized Service Centers, when convinced to their satisfaction that a Baldor motor developed defects in material or workmanship within the warranty period, are authorized to proceed with the required repairs to fulfill Baldor's warranty when the cost of such repairs to be paid by Baldor does not exceed Baldor's warranty repair allowance. Baldor will not pay overtime premium repair charges without prior written authorization.
5. The cost of warranty repairs made by centers other than Baldor Authorized Service Centers **WILL NOT** be paid unless first authorized in writing by Baldor.
6. Claims by a purchaser that a motor is defective even when a failure results within one hour after being placed into service are not always justified. Therefore, Baldor Authorized Service Centers must determine from the condition of the motor as delivered to the center whether or not the motor is defective. If in the opinion of a Baldor Authorized Service Center, a motor did not fail as a result of defects in material or workmanship, the center is to proceed with repairs only if the purchaser agrees to pay for such repairs. If the decision is in dispute, the purchaser should still pay for the repairs and submit the paid invoice and the Authorized Service Center's signed service report to Baldor for further consideration.
7. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Safety Notice:

This equipment contains high voltage! Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt installation, operation and maintenance of electrical equipment.

Be sure that you are completely familiar with NEMA publication MG-2, safety standards for construction and guide for selection, installation and use of electric motors and generators, the National Electrical Code and local codes and practices. Unsafe installation or use can cause conditions that lead to serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.

- WARNING:** Do not touch electrical connections before you first ensure that power has been disconnected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.
- WARNING:** Be sure the system is properly grounded before applying power. Do not apply AC power before you ensure that all grounding instructions have been followed. Electrical shock can cause serious or fatal injury. National Electrical Code and Local codes must be carefully followed.
- WARNING:** Avoid extended exposure to machinery with high noise levels. Be sure to wear ear protective devices to reduce harmful effects to your hearing.
- WARNING:** This equipment may be connected to other machinery that has rotating parts or parts that are driven by this equipment. Improper use can cause serious or fatal injury. Only qualified personnel should attempt to install operate or maintain this equipment.
- WARNING:** Do not by-pass or disable protective devices or safety guards. Safety features are designed to prevent damage to personnel or equipment. These devices can only provide protection if they remain operative.
- WARNING:** Avoid the use of automatic reset devices if the automatic restarting of equipment can be hazardous to personnel or equipment.
- WARNING:** Be sure the load is properly coupled to the motor shaft before applying power. The shaft key must be fully captive by the load device. Improper coupling can cause harm to personnel or equipment if the load decouples from the shaft during operation.
- WARNING:** Use proper care and procedures that are safe during handling, lifting, installing, operating and maintaining operations. Improper methods may cause muscle strain or other harm.
- WARNING:** Before performing any motor maintenance procedure, be sure that the equipment connected to the motor shaft cannot cause shaft rotation. If the load can cause shaft rotation, disconnect the load from the motor shaft before maintenance is performed. Unexpected mechanical rotation of the motor parts can cause injury or motor damage.
- WARNING:** Disconnect all electrical power from the motor windings and accessory devices before disassembly of the motor. Electrical shock can cause serious or fatal injury.
- WARNING:** Do not use non UL/CSA listed explosion proof motors in the presence of flammable or combustible vapors or dust. These motors are not designed for atmospheric conditions that require explosion proof operation.

Safety Notice Continued

WARNING: Motors that are to be used in flammable and/or explosive atmospheres must display the UL label on the nameplate along with CSA listed logo.

Specific service conditions for these motors are defined in NFPA 70 (NEC) Article 500.

WARNING: UL Listed motors must only be serviced by UL Approved Authorized Baldor Service Centers if these motors are to be returned to a hazardous and/or explosive atmosphere.

Caution: To prevent premature equipment failure or damage, only qualified maintenance personnel should perform maintenance.

Caution: Do not over-lubricate motor as this may cause premature bearing failure.

Caution: Do not lift the motor and its driven load by the motor lifting hardware. The motor lifting hardware is adequate for lifting only the motor. Disconnect the load from the motor shaft before moving the motor.

Caution: If eye bolts are used for lifting a motor, be sure they are securely tightened. The lifting direction should not exceed a 20° angle from the shank of the eye bolt or lifting lug. Excessive lifting angles can cause damage.

Caution: To prevent equipment damage, be sure that the electrical service is not capable of delivering more than the maximum motor rated amps listed on the rating plate.

Caution: If a HI POT test (High Potential Insulation test) must be performed, follow the precautions and procedure in NEMA MG1 and MG2 standards to avoid equipment damage.

If you have any questions or are uncertain about any statement or procedure, or if you require additional information please contact your Baldor distributor or an Authorized Baldor Service Center.

Receiving

Each Baldor Electric Motor is thoroughly tested at the factory and carefully packaged for shipment. When you receive your motor, there are several things you should do immediately.

1. Observe the condition of the shipping container and report any damage immediately to the commercial carrier that delivered your motor.
2. Verify that the part number of the motor you received is the same as the part number listed on your purchase order.

Storage

If the motor is not put into service immediately, the motor must be stored in a clean, dry and warm location. Several precautionary steps must be performed to avoid motor damage during storage.

1. Use a "Megger" periodically to ensure that the integrity of the winding insulation has been maintained. Record the Megger readings. Immediately investigate any significant drop in insulation resistance.
2. Do not lubricate bearings during storage. Motor bearings are packed with grease at the factory. Excessive grease can damage insulation quality.
3. Rotate motor shaft at least 10 turns every two months during storage (more frequently if possible). This will prevent bearing damage due to storage.
4. If the storage location is damp or humid, the motor windings must be protected from moisture. This can be done by applying power to the motors' space heater (if available) while the motor is in storage.

Unpacking

Each Baldor motor is packaged for ease of handling and to prevent entry of contaminants.

1. To avoid condensation inside the motor, do not unpack until the motor has reached room temperature. (Room temperature is the temperature of the room in which it will be installed). The packing provides insulation from temperature changes during transportation.
2. When the motor has reached room temperature, remove all protective wrapping material from the motor.

Handling

The motor should be lifted using the lifting lugs or eye bolts provided.

1. Use the lugs or eye bolts provided to lift the motor. Never attempt to lift the motor and additional equipment connected to the motor by this method. The lugs or eye bolts provided are designed to lift only the motor. Never lift the motor by the motor shaft or the hood of a WP11 motor.
2. When lifting a WP11 (Weather Proof Type 2) motor, do not lift the motor by inserting lifting lugs into holes on top of the cooling hood. These lugs are to be used for hood removal only. A spreader bar should be used to lift the motor by the cast lifting lugs located on the motor frame.
3. If the motor must be mounted to a plate with the driven equipment such as pump, compressor etc., it may not be possible to lift the motor alone. For this case, the assembly should be lifted by a sling around the mounting base. The entire assembly can be lifted as an assembly for installation. Do not lift using the motor lugs or eye bolts provided.

If the load is unbalanced (as with couplings or additional attachments) additional slings or other means must be used to prevent tipping. In any event, the load must be secure before lifting.

Section 2 Installation & Operation

Overview

Installation should conform to the National Electrical Code as well as local codes and practices. When other devices are coupled to the motor shaft, be sure to install protective devices to prevent future accidents. Some protective devices include, coupling, belt guard, chain guard, shaft covers etc. These protect against accidental contact with moving parts. Machinery that is accessible to personnel should provide further protection in the form of guard rails, screening, warning signs etc.

Location

It is important that motors be installed in locations that are compatible with motor enclosure and ambient conditions. Improper selection of the motor enclosure and ambient conditions can lead to reduced operating life of the motor.

Proper ventilation for the motor must be provided. Obstructed airflow can lead to reduction of motor life.

1. **Open Drip-Proof/WPI** motors are intended for use indoors where atmosphere is relatively clean, dry, well ventilated and non-corrosive.
2. **Totally Enclosed and WPII** motors may be installed where dirt, moisture or dust are present and in outdoor locations.

Severe Duty, IEEE 841 and Washdown Duty enclosed motors are designed for installations with high corrosion or excessive moisture conditions. These motors should not be placed into an environment where there is the presence of flammable or combustible vapors, dust or any combustible material, unless specifically designed for this type of service.

Mounting

The motor must be securely installed to a rigid foundation or mounting surface to minimize vibration and maintain alignment between the motor and shaft load. Failure to provide a proper mounting surface may cause vibration, misalignment and bearing damage.

Foundation caps and sole plates are designed to act as spacers for the equipment they support. If these devices are used, be sure that they are evenly supported by the foundation or mounting surface.

After installation is complete and accurate alignment of the motor and load is accomplished, the base should be grouted to the foundation to maintain this alignment.

The standard motor base is designed for horizontal or vertical mounting. Adjustable or sliding rails are designed for horizontal mounting only. Consult your Baldor distributor or authorized Baldor Service Center for further information.

Alignment

Accurate alignment of the motor with the driven equipment is extremely important.

1. **Direct Coupling**
For direct drive, use flexible couplings if possible. Consult the drive or equipment manufacturer for more information. Mechanical vibration and roughness during operation may indicate poor alignment. Use dial indicators to check alignment. The space between coupling hubs should be maintained as recommended by the coupling manufacturer.
2. **End-Play Adjustment**
The axial position of the motor frame with respect to its load is also extremely important. The motor bearings are not designed for excessive external axial thrust loads. Improper adjustment will cause failure.
3. **Pulley Ratio**
The pulley ratio should not exceed 8:1.
4. **Belt Drive**
Align sheaves carefully to minimize belt wear and axial bearing loads (see End-Play Adjustment). Belt tension should be sufficient to prevent belt slippage at rated speed and load. However, belt slippage may occur during starting.

Caution: Do not over tension belts.

5. Sleeve bearing motors are only suitable for coupled loads.

Doweling & Bolting

After proper alignment is verified, dowel pins should be inserted through the motor feet into the foundation. This will maintain the correct motor position should motor removal be required. (Baldor motors are designed for doweling.)

1. Drill dowel holes in diagonally opposite motor feet in the locations provided.
2. Drill corresponding holes in the foundation.
3. Ream all holes.
4. Install proper fitting dowels.
5. Mounting bolts must be carefully tightened to prevent changes in alignment. Use a flat washer and lock washer under each nut or bolt head to hold the motor feet secure. Flanged nuts or bolts may be used as an alternative to washers.

Power Connection

Conduit Box

Motor and control wiring, overload protection, disconnects, accessories and grounding should conform to the National Electrical Code and local codes and practices.

For ease of making connections, an oversize conduit box is provided. The box can be rotated 360° in 90° increments. Auxiliary conduit boxes are provided on some motors for accessories such as space heaters, RTD's etc.

AC Power

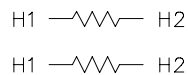
Connect the motor leads as shown on the connection diagram located on the name plate or inside the cover on the conduit box. Be sure the following guidelines are met:

1. AC power is within $\pm 10\%$ of rated voltage with rated frequency. (See motor name plate for ratings).
OR
2. AC power is within $\pm 5\%$ of rated frequency with rated voltage.
OR
3. A combined variation in voltage and frequency of $\pm 10\%$ (sum of absolute values) of rated values, provided the frequency variation does not exceed $\pm 5\%$ of rated frequency.

Performance within these voltage and frequency variations are shown in Figure 2-2.

Figure 2-1 Accessory Connections

HEATERS



One heater is installed in each end of motor.
Leads for each heater are labeled H1 & H2.
(Like numbers should be tied together).

THERMISTERS



Three thermistors are installed in windings and tied in series.
Leads are labeled T1 & T2.

WINDING RTDS



Winding RTDs are installed in windings (2) per phase.
Each set of leads is labeled W1, W2, W3, W4, W5, & W6.

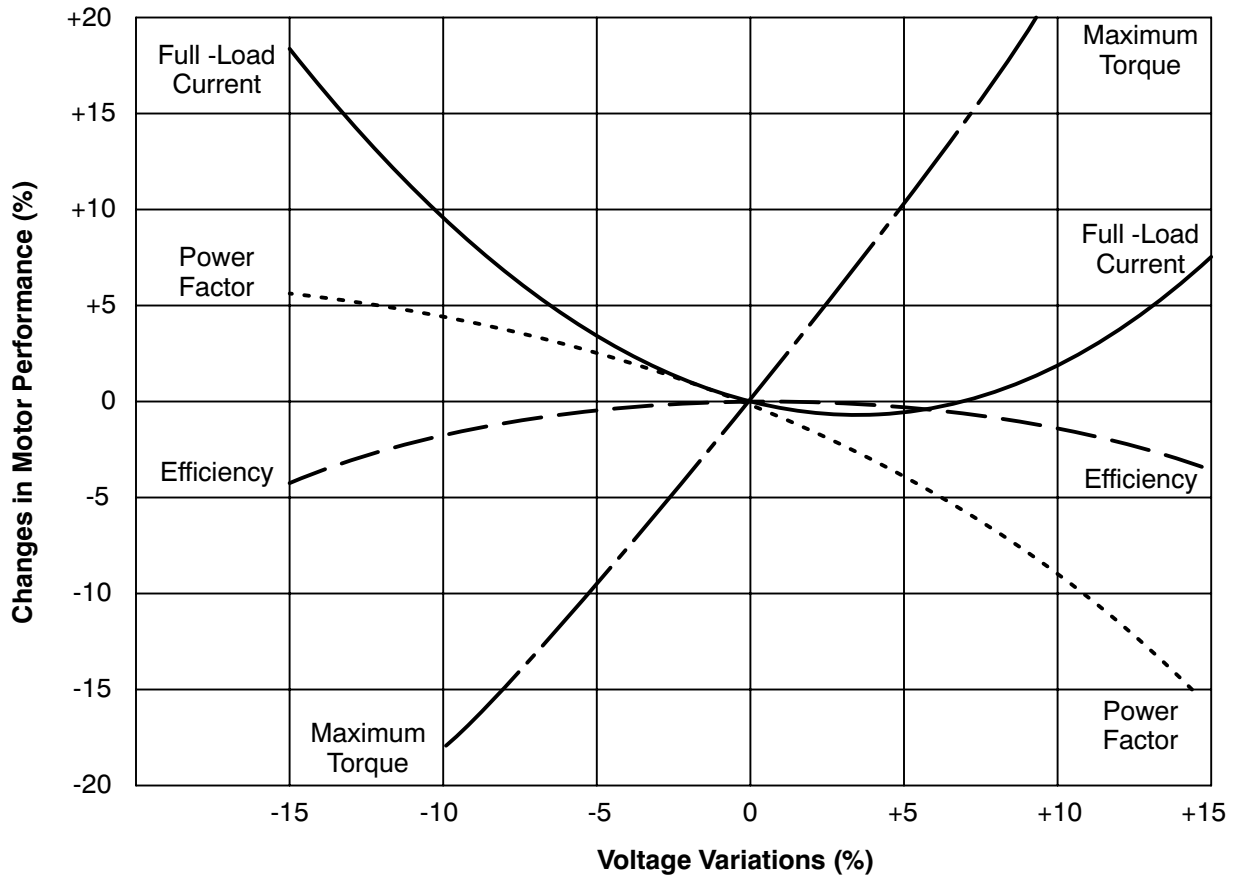
BEARING RTD



- * One bearing RTD is installed in Drive endplate (PUEP), leads are labeled RTDDE.
- * One bearing RTD is installed in Opposite Drive endplate (FREP), leads are labeled RTDODE.

* Note RTD may have 2-Red/1-White leads; or 2-White/1-Red Lead.

Figure 2-2 Typical Motor Performance VS Voltage Variations



First Time Start Up

Be sure that all power to motor and accessories is off. Be sure the motor shaft is disconnected from the load and will not cause mechanical rotation of the motor shaft.

1. Make sure that the mechanical installation is secure. All bolts and nuts are tightened etc.
2. If motor has been in storage or idle for some time, check winding insulation integrity with a Megger.
3. Inspect all electrical connections for proper termination, clearance, mechanical strength and electrical continuity.
4. Be sure all shipping materials and braces (if used) are removed from motor shaft.
5. Manually rotate the motor shaft to ensure that it rotates freely.
6. Replace all panels and covers that were removed during installation.
7. Momentarily apply power and check the direction of rotation of the motor shaft.
8. If motor rotation is wrong, be sure power is off and change the motor lead connections. Verify rotation direction before you continue.
9. Start the motor and ensure operation is smooth without excessive vibration or noise. If so, run the motor for 1 hour with no load connected.
10. After 1 hour of operation, disconnect power and connect the load to the motor shaft. Verify all coupling guards and protective devices are installed. Ensure motor is properly ventilated.

Coupled Start Up

This procedure assumes a coupled start up. Also, that the first time start up procedure was successful.

1. Check the coupling and ensure that all guards and protective devices are installed.
2. Check that the coupling is properly aligned and not binding.
3. The first coupled start up should be with no load. Apply power and verify that the load is not transmitting excessive vibration back to the motor through the coupling or the foundation. Vibration should be at an acceptable level.
4. Run for approximately 1 hour with the driven equipment in an unloaded condition.

The equipment can now be loaded and operated within specified limits. Do not exceed the name plate ratings for amperes for steady continuous loads.

Jogging and Repeated Starts Repeated starts and/or jogs of induction motors generally reduce the life of the motor winding insulation. A much greater amount of heat is produced by each acceleration or jog than by the same motor under full load. If it is necessary to repeatedly start or jog the motor, it is advisable to check the application with your local Baldor distributor or Baldor Service Center.

Heating - Duty rating and maximum ambient temperature are stated on the motor name plate. Do not exceed these values. If there is any question regarding safe operation, contact your local Baldor distributor or Baldor Service Center.

Section 3 Maintenance & Troubleshooting

WARNING: UL Listed motors must only be serviced by UL Approved Authorized Baldor Service Centers if these motors are to be returned to a hazardous and/or explosive atmosphere.

General Inspection

Inspect the motor at regular intervals, approximately every 500 hours of operation or every 3 months, whichever occurs first. Keep the motor clean and the ventilation openings clear. The following steps should be performed at each inspection:

WARNING: Do not touch electrical connections before you first ensure that power has been disconnected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.

1. Check that the motor is clean. Check that the interior and exterior of the motor is free of dirt, oil, grease, water, etc. Oily vapor, paper pulp, textile lint, etc. can accumulate and block motor ventilation. If the motor is not properly ventilated, overheating can occur and cause early motor failure.
2. Use a "Megger" periodically to ensure that the integrity of the winding insulation has been maintained. Record the Megger readings. Immediately investigate any significant drop in insulation resistance.
3. Check all electrical connectors to be sure that they are tight.

Relubrication & Bearings

Bearing grease will lose its lubricating ability over time, not suddenly. The lubricating ability of a grease (over time) depends primarily on the type of grease, the size of the bearing, the speed at which the bearing operates and the severity of the operating conditions. Good results can be obtained if the following recommendations are used in your maintenance program.

Type of Grease

A high grade ball or roller bearing grease should be used. Recommended grease for standard service conditions is Polyrex EM (Exxon Mobil).

Equivalent and compatible greases include:

Texaco Polystar, Rykon Premium #2, Pennzoil Pen 2 Lube and Chevron SRI.

Relubrication Intervals

Recommended relubrication intervals are shown in Table 3-1. It is important to realize that the recommended intervals of Table 3-1 are based on average use.

Refer to additional information contained in Tables 3-2, 3-3 and 3-4.

Table 3-1 Relubrication Intervals *

NEMA / (IEC) Frame Size	Rated Speed - RPM					
	10000	6000	3600	1800	1200	900
Up to 210 incl. (132)	**	2700 Hrs.	5500 Hrs.	12000 Hrs.	18000 Hrs.	22000 Hrs.
Over 210 to 280 incl. (180)		**	3600 Hrs.	9500 Hrs.	15000 Hrs.	18000 Hrs.
Over 280 to 360 incl. (225)		**	* 2200 Hrs.	7400 Hrs.	12000 Hrs.	15000 Hrs.
Over 360 to 5800 incl. (300)		**	*2200 Hrs.	3500 Hrs.	7400 Hrs.	10500 Hrs.

* Relubrication intervals are for ball bearings.

For vertically mounted motors and roller bearings, divide the relubrication interval by 2.

** For motors operating at speeds greater than 3600 RPM, contact Baldor for relubrication recommendations.

Table 3-2 Service Conditions

Severity of Service	Hours per day of Operation	Ambient Temperature Maximum	Atmospheric Contamination
Standard	8	40° C	Clean, Little Corrosion
Severe	16 Plus	50° C	Moderate dirt, Corrosion
Extreme	16 Plus	>50° C* or Class H Insulation	Severe dirt, Abrasive dust, Corrosion, Heavy Shock or Vibration
Low Temperature		<-29° C **	

* Special high temperature grease is recommended (Dow Corning DC44). Note that Dow Corning DC44 grease does not mix with other grease types. Thoroughly clean bearing & cavity before adding grease.

** Special low temperature grease is recommended (Aeroshell 7).

Table 3-3 Relubrication Interval Multiplier

Severity of Service	Multiplier
Standard	1.0
Severe	0.5
Extreme	0.1
Low Temperature	1.0

Some motor designs use different bearings on each motor end. This is normally indicated on the motor nameplate. In this case, the larger bearing is installed on the motor Drive endplate. For best relubrication results, only use the appropriate amount of grease for each bearing size (not the same for both).

Table 3-4 Bearings Sizes and Types

Frame Size NEMA (IEC)	Bearing Description (These are the "Large" bearings (Shaft End) in each frame size)			
	Bearing	Weight of Grease to add * oz (Grams)	Volume of grease to be added	
			in ³	teaspoon
56 to 140 (90)	6203	0.08 (2.4)	0.15	0.5
140 (90)	6205	0.15 (3.9)	0.2	0.8
180 (100-112)	6206	0.19 (5.0)	0.3	1.0
210 (132)	6307	0.30 (8.4)	0.6	2.0
250 (160)	6309	0.47 (12.5)	0.7	2.5
280 (180)	6311	0.61 (17)	1.2	3.9
320 (200)	6312	0.76 (20.1)	1.2	4.0
360 (225)	6313	0.81 (23)	1.5	5.2
400 (250)	6316	1.25 (33)	2.0	6.6
440 (280)	6319	2.12 (60)	4.1	13.4
5000 to 5800 (315-450)	6328	4.70 (130)	9.2	30.0
5000 to 5800 (315-450)	NU328	4.70 (130)	9.2	30.0
360 to 449 (225-280)	NU319	2.12 (60)	4.1	13.4
AC Induction Servo				
76 Frame 180 (112)	6207	0.22 (6.1)	0.44	1.4
77 Frame 210 (132)	6210	0.32 (9.0)	0.64	2.1
80 Frame 250(160)	6213	0.49 (14.0)	0.99	3.3

* Weight in grams = .005 DB of grease to be added

Note: Not all bearing sizes are listed. For intermediate bearing sizes, use the grease volume for the next larger size bearing.

Caution: To avoid damage to motor bearings, grease must be kept free of dirt. For an extremely dirty environment, contact your Baldor distributor or an authorized Baldor Service Center for additional information.

Relubrication Procedure Be sure that the grease you are adding to the motor is compatible with the grease already in the motor. Consult your Baldor distributor or an authorized service center if a grease other than the recommended type is to be used.

Caution: Do not over-lubricate motor as this may cause premature bearing failure.

With Grease Outlet Plug

1. With the motor stopped, clean all grease fittings with a clean cloth.
2. Remove grease outlet plug.

Caution: Over-lubricating can cause excessive bearing temperatures, premature lubrication breakdown and bearing failure.

3. Add the recommended amount of grease.
4. Operate the motor for 15 minutes with grease plug removed. This allows excess grease to purge.
5. Re-install grease outlet plug.

Without Grease Provisions

Note: Only a Baldor authorized and UL or CSA certified service center can disassemble a UL/CSA listed explosion proof motor to maintain it's UL/CSA listing.

1. Disassemble the motor.
2. Add recommended amount of grease to bearing and bearing cavity. (Bearing should be about 1/3 full of grease and outboard bearing cavity should be about 1/2 full of grease.)
3. Assemble the motor.

Sample Relubrication Determination

Assume - NEMA 286T (IEC 180), 1750 RPM motor driving an exhaust fan in an ambient temperature of 43° C and the atmosphere is moderately corrosive.

1. Table 3-1 list 9500 hours for standard conditions.
2. Table 3-2 classifies severity of service as "Severe".
3. Table 3-4 shows that 1.2 in³ or 3.9 teaspoon of grease is to be added.

Note: Smaller bearings in size category may require reduced amounts of grease.

Table 3-5 Troubleshooting Chart

Symptom	Possible Causes	Possible Solutions
Motor will not start	Usually caused by line trouble, such as, single phasing at the starter.	Check source of power. Check overloads, fuses, controls, etc.
Excessive humming	High Voltage.	Check input line connections.
	Eccentric air gap.	Have motor serviced at local Baldor service center.
Motor Over Heating	Overload. Compare actual amps (measured) with nameplate rating.	Locate and remove source of excessive friction in motor or load. Reduce load or replace with motor of greater capacity.
	Single Phasing.	Check current at all phases (should be approximately equal) to isolate and correct the problem.
	Improper ventilation.	Check external cooling fan to be sure air is moving properly across cooling fins. Excessive dirt build-up on motor. Clean motor.
	Unbalanced voltage.	Check voltage at all phases (should be approximately equal) to isolate and correct the problem.
	Rotor rubbing on stator.	Check air gap clearance and bearings.
		Tighten "Thru Bolts".
	Over voltage or under voltage.	Check input voltage at each phase to motor.
	Open stator winding.	Check stator resistance at all three phases for balance.
	Grounded winding.	Perform dielectric test and repair as required.
	Improper connections.	Inspect all electrical connections for proper termination, clearance, mechanical strength and electrical continuity. Refer to motor lead connection diagram.
Bearing Over Heating	Misalignment.	Check and align motor and driven equipment.
	Excessive belt tension.	Reduce belt tension to proper point for load.
	Excessive end thrust.	Reduce the end thrust from driven machine.
	Excessive grease in bearing.	Remove grease until cavity is approximately $\frac{3}{4}$ filled.
	Insufficient grease in bearing.	Add grease until cavity is approximately $\frac{3}{4}$ filled.
	Dirt in bearing.	Clean bearing cavity and bearing. Repack with correct grease until cavity is approximately $\frac{3}{4}$ filled.
Vibration	Misalignment.	Check and align motor and driven equipment.
	Rubbing between rotating parts and stationary parts.	Isolate and eliminate cause of rubbing.
	Rotor out of balance.	Have rotor balance checked and repaired at your Baldor Service Center.
	Resonance.	Tune system or contact your Baldor Service Center for assistance.
Noise	Foreign material in air gap or ventilation openings.	Remove rotor and foreign material. Reinstall rotor. Check insulation integrity. Clean ventilation openings.
Growling or whining	Bad bearing.	Replace bearing. Clean all grease from cavity and new bearing. Repack with correct grease until cavity is approximately $\frac{3}{4}$ filled.

Suggested bearing and winding RTD setting guidelines

Most large frame AC Baldor motors with a 1.15 service factor are designed to operate below a Class B (80°C) temperature rise at rated load and are built with a Class H winding insulation system. Based on this low temperature rise, RTD (Resistance Temperature Detectors) settings for Class B rise should be used as a starting point. Some motors with 1.0 service factor have Class F temperature rise.

The following tables show the suggested alarm and trip settings for RTDs. Proper bearing and winding RTD alarm and trip settings should be selected based on these tables unless otherwise specified for specific applications.

If the driven load is found to operate well below the initial temperature settings under normal conditions, the alarm and trip settings may be reduced so that an abnormal machine load will be identified.

The temperature limits are based on the installation of the winding RTDs imbedded in the winding as specified by NEMA. Bearing RTDs should be installed so they are in contact with the outer race on ball or roller bearings or in direct contact with the sleeve bearing shell.

Winding RTDs - Temperature Limit In °C (40°C Maximum Ambient)

Motor Load	Class B Temp Rise ≤ 80°C (Typical Design)		Class F Temp Rise ≤ 105°C		Class H Temp Rise ≤ 125°C	
	Alarm	Trip	Alarm	Trip	Alarm	Trip
≤ Rated Load	130	140	155	165	175	185
Rated Load to 1.15 S.F.	140	150	160	165	180	185

- Note:
- Winding RTDs are factory production installed, not from Mod-Express.
 - When Class H temperatures are used, consider bearing temperatures and relubrication requirements.

Bearing RTDs - Temperature Limit In °C (40°C Maximum Ambient)

Bearing Type Oil or Grease	Anti-Friction		Sleeve	
	Alarm	Trip	Alarm	Trip
Standard*	95	100	85	95
High Temperature**	110	115	105	110

- Note: * Bearing temperature limits are for standard design motors operating at Class B temperature rise.
 ** High temperature lubricants include some special synthetic oils and greases.

Greases that may be substituted that are compatible with Polyrex EM (but considered as "standard" lubricants) include the following:

- Texaco Polystar
- Mobilith SHC-100
- Darmex 707
- Rykon Premium #2
- Pennzoil Pennzlube EM-2
- Darmex 711
- Chevron SRI #2
- Chevron Black Pearl
- Petro-Canada Peerless LLG

See the motor nameplate for replacement grease or oil recommendation.

Contact Baldor application engineering for special lubricants or further clarifications.

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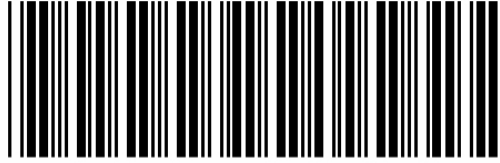
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Worm Gear Reducers Installation, Lubrication and Maintenance Instructions

Selection Information

Read ALL instructions prior to operating reducer. Injury to personnel or reducer failure may be caused by improper installation, maintenance or operation.

Written authorization from GROVE GEAR / ELECTRA-GEAR is required to operate or use reducers in man lift or people moving devices.

Check to make certain application does not exceed the allowable load capacities published in the current catalog.

Buyer shall be solely responsible for determining the adequacy of the product for any and all uses to which Buyer shall apply the product. The application by Buyer shall not be subject to any implied warranty of fitness for a particular purpose.

Safety Alert



- For safety, Buyer or User should provide protective guards over all shaft extensions and any moving apparatus mounted thereon. The User is responsible for checking all applicable safety codes in his area and providing suitable guards. Failure to do so may result in bodily injury and/or damage to equipment.
- Hot oil and reducers can cause severe burns. Use extreme care when removing lubrication plugs and vents.
- Make certain that the power supply is disconnected before attempting to service or remove any components. Lock out the power supply and tag it to prevent unexpected application of power.
- Reducers are not to be considered fail safe or self-locking devices. If these features are required, a properly sized, independent holding device should be utilized. **Reducers should not be used as a brake.**
- Any brakes that are used in conjunction with a reducer must be sized or positioned in such a way so as to not subject the reducer to loads beyond the catalog rating.
- Lifting supports including eyebolts are to be used for vertically lifting the gearbox only, with no other associated attachments or motors.
- Use of an oil with an EP additive on units with backstops may prevent proper operation of the backstop. Injury to personnel, damage to the reducer or other equipment may result.
- Overhung loads subject shaft bearings and shafts to stress which may cause premature bearing failure and/or shaft breakage from bending fatigue, if not sized properly.

CAUTION

- Test run unit to verify operation. If the unit tested is a prototype, that unit must be of current production.
- If the speed reducer cannot be located in a clear and dry area with access to adequate cooling air supply, then precautions must be taken to avoid the ingestion of contaminants such as water and the reduction in cooling ability due to exterior contaminants.
- Mounting bolts should be routinely checked to ensure that the unit is firmly anchored for proper operation.

Important Information

In the event of the resale of any of the goods, in whatever form, Resellers/Buyers will include the following language in a conspicuous place and in a conspicuous manner in a written agreement covering such sale:

The manufacturer makes no warranties or representations, express or implied, by operation of law or otherwise, as to the merchantability or fitness for a particular purpose of the goods sold hereunder. Buyer acknowledges that it alone has determined that the goods purchased hereunder will suitably meet the requirements of their intended use. In no event will the manufacturer be liable for consequential, incidental or other damages. Even if the repair or replacement remedy shall be deemed to have failed of its essential purpose under Section 2-719 of the Uniform Commercial Code, the manufacturer shall have no liability to Buyer for consequential damages.

Resellers/Buyers agree to also include this entire document including the warnings above in a conspicuous place and in a conspicuous manner in writing to instruct users on the safe usage of the product.

This instructions manual should be read together with all other printed information such as catalogs, supplied by Grove Gear / Electra-Gear.

General Operation

1. Run the motor which drives the reducer and check the direction of reducer output rotation. Consult motor nameplate for instructions to reverse the direction of rotation.
2. Attaching the load: On direct coupled installations, check shaft and coupling alignment between speed reducer and loading mechanism. On chain/sprocket and belt/pulley installation, locate the sprocket or pulley as close to the oil seal as possible to minimize overhung load. Check to verify that the overhung load does not exceed specifications published in the catalog.
3. High momentum loads: If coasting to a stop is undesirable, a braking mechanism should be provided to the speed reducer output shaft or the driven mechanism.

CAUTION

The system of connected rotating parts must be free from critical speed, torsional or other type vibration, no matter how induced. The responsibility for this system analysis lies with the purchaser of the speed reducer.

Installation

1. Mount the unit to a rigid flat surface using grade 5 or higher fasteners. The mounting fasteners should be the largest standard size that will fit in the base mounting hole. Shim as required under flange or base feet which do not lie flat against the mounting surface.
2. For shipment, pipe plugs are installed in the unit and a vent plug is packed separately. After mounting the unit in position, remove the appropriate pipe plug and install the vent plug in the location shown on page 5. On double reduction units both the primary and the secondary must be vented. Failure to vent the unit can cause premature seal wear or loss of seal and oil. These conditions are not covered by warranty. Check for correct oil level. Contact the Factory for level and vent recommendations on non-standard mounting positions.
3. Connect motor to speed reducer.

Depending upon gear geometry and operating conditions worm gear reducers may or may not back-drive. Use of a brake or external holding device is required if any evidence of backdriving is not desired.

Special consideration should be given to high inertia loads connected to the output shaft. Consult the factory for further details.

⚠ WARNING DO NOT CHANGE MOUNTING POSITIONS WITHOUT CONTACTING FACTORY. Altering the mounting position may require special lubrication provisions which must be factory installed.

⚠ CAUTION Do not operate the reducer without making sure it contains the correct amount of oil. Do not overfill or underfill with oil, or injury to personnel, reducer or other equipment may result.

⚠ CAUTION A unit cannot be used as an integral part of a machine superstructure which would impose additional loads on the unit other than those imposed by the torque being transmitted either through a shaft-mounted arrangement, and any shaft mounted power transmitting device. (*e.g., sprockets, pulleys, couplings*)

⚠ CAUTION For safe operation and to maintain the unit warranty, when changing a factory installed fastener for any reason, it becomes the responsibility of the person making the change to properly account for fastener grade, thread engagement, load, tightening torque and the means of torque retention.

Lubrication - Standard and WASHGUARD® / Platinum Units

All standard reducers ordered from Factory are filled with Mobil Glygoyle 460 polyglycol (**PAG**) lubricant or equivalent suitable for continuous operation within a -10° F to 120° F ambient temperature range. Double and triple reduction units have separate oil sumps and must be filled/checked independently. Prior to startup, verify that the oil is at the level shown on page 6. Lubricant type is stamped on all nameplates.

Change Intervals: Standard compounded lubricants (non-synthetic) should be changed every six months or 2500 operating hours, whichever comes first. Factory installed synthetic lubricants should be changed only when performing maintenance that requires gearbox disassembly.

CAUTION Oil should be changed more often if reducer is used in a severe environment (i.e. dusty, humid).

CAUTION In the Food and Drug Industry (including animal food), consult the lubrication supplier for recommendation of lubricants which are acceptable to the Food and Drug Administration and/or other authoritative bodies having jurisdiction. Factory supplied **PAG** oil is acceptable for incidental food contact (NSF H1) for use in and around food processing areas.

CAUTION Do not mix different oils in the reducer. Grove Gear / Electra-Gear reducers are shipped standard with **PAG** lubricant – this lubricant is not compatible with conventional mineral or PAO synthetic oils.

Special Lubrication Requirements - Size 818 and Larger

Units shipped from Factory are assembled to properly lubricate all internal components based on a specific assumed mounting orientation. If a size 818 or larger unit will be mounted in an orientation different from its original intension, as shown in product catalog, or run with sustained input speeds less than 1200 RPM, it should be specified with the order. The unit can then be modified to assure proper lubrication.

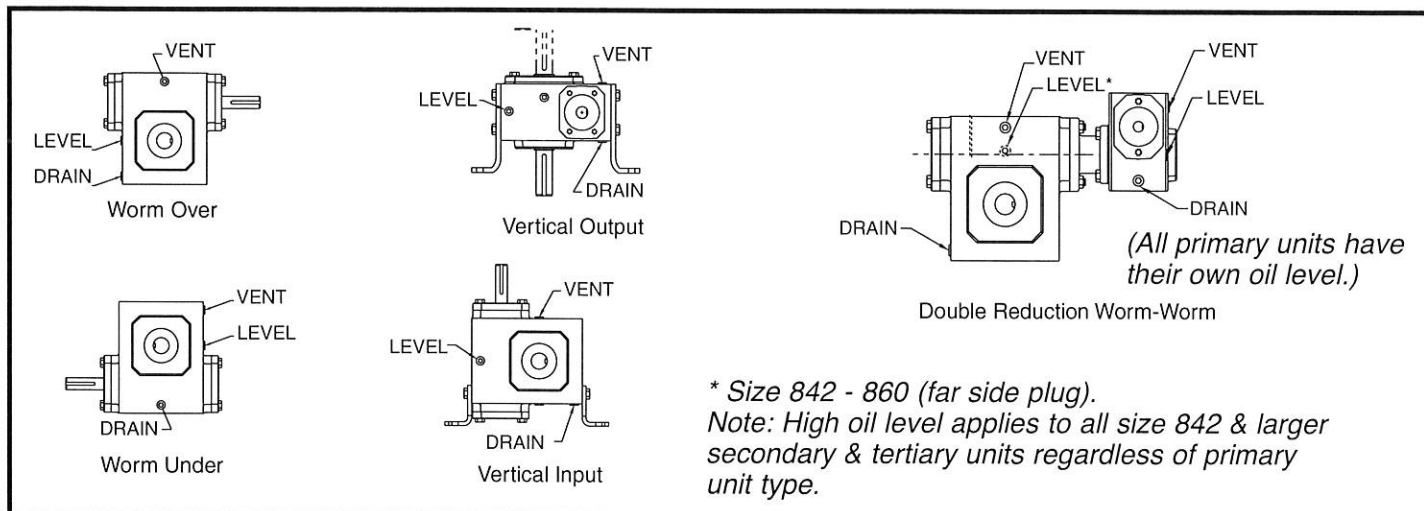
The precision-made gears and bearings in Grove Gear / Electra-Gear Speed Reducers require high-grade lubricants of the proper viscosity to maintain trouble-free performance. All standard reducers ordered from the factory are filled with ISO viscosity grade 460 polyglycol (**PAG**) lubricant. If oil needs to be added or changed, ONLY compatible polyglycol lubricants should be used. Contact the factory for more information.

Oil Capacities (ounces) - Standard Units

Mounting Position	UNIT SIZE													
	813	815	818	821	824	826	830	832	842	852	860	870*	880*	8100*
Worm Over	4	12	12	20	24	40	56	72	112	188	312	560	768	1152
Worm Under	8	16	20	28	40	60	84	108	152	304	328	524	820	1280
Vertical Output	4	16	16	28	32	48	68	88	128	248	320	332	460	640
Vertical Input	4	16	16	24	32	48	72	92	128	248	325	584	800	1200
Extended Bearing	N/A	N/A	N/A	N/A	N/A	N/A	N/A	8	12	17	27	640	1008	1632
Worm Over on Secondary Unit of Double Reduction	N/A	N/A	N/A	N/A	N/A	N/A	N/A	192	308	320	485	805	114	1716
Stainless Steel + WASHGUARD® - All Mounting Positions	6	14	18	26	32	50	78	98	N/A	N/A	N/A	N/A	N/A	N/A

CAUTION Always check for proper oil level after filling. Capacities vary somewhat with model and mounting position. Oil should rise to bottom edge of level hole. Do not overfill.

Standard Gear Reducer Mounting Positions & Vent Plug, Level and Drain Locations ▲



▲ Does not apply to Stainless Steel, WASHGUARD® or units with Enviroseal option.

Maintenance - Standard Units

Your Grove Gear / Electra-Gear reducer has been tested and adjusted at Factory. Dismantling or replacement of components must be done by Grove Gear / Electra-Gear to maintain the warranty.

1. Frequently check the oil level of the reducer. If oil level is low, (refer to reducer vent and level position chart) add proper lubrication through the filler plug until it comes out the oil level plug.
2. Inspect vent plug often to insure it is clean and operating.
3. Always check for proper oil level after filling. Do not overfill or underfill with oil, or injury to personnel, reducer, or other equipment may result.
4. Do not mix different oils in the reducer.

Seals: The Grove Gear / Electra-Gear line of speed reducers utilizes premium quality seals which are the state-of-the-art in sealing technology. Seals are, however, a wear item and eventually need to be replaced. Replacement can be easily accomplished by following the steps below:

1. Remove the worn seal without damaging the shaft surface or the seal bore. This can be done by drilling a .062 diameter hole in the seal casing (being careful not to drill into the bearing behind the seal). Install a #10 sheet metal screw into the hole and pry out the seal.
2. Clean the seal bore of sealant.
3. Before installing the new seal, use electrical tape to cover any keyways on the shaft to prevent seal lip damage.
4. Grease the seal lips with bearing grease and apply a sealant to the seal bore.
5. Slide the seal into the shaft being careful not to fold the inner lip over on any shaft steps.
6. Press the seal into its bore with a sleeve that presses on the seal casing, being careful to keep the seal square in its bore.

Class of Service

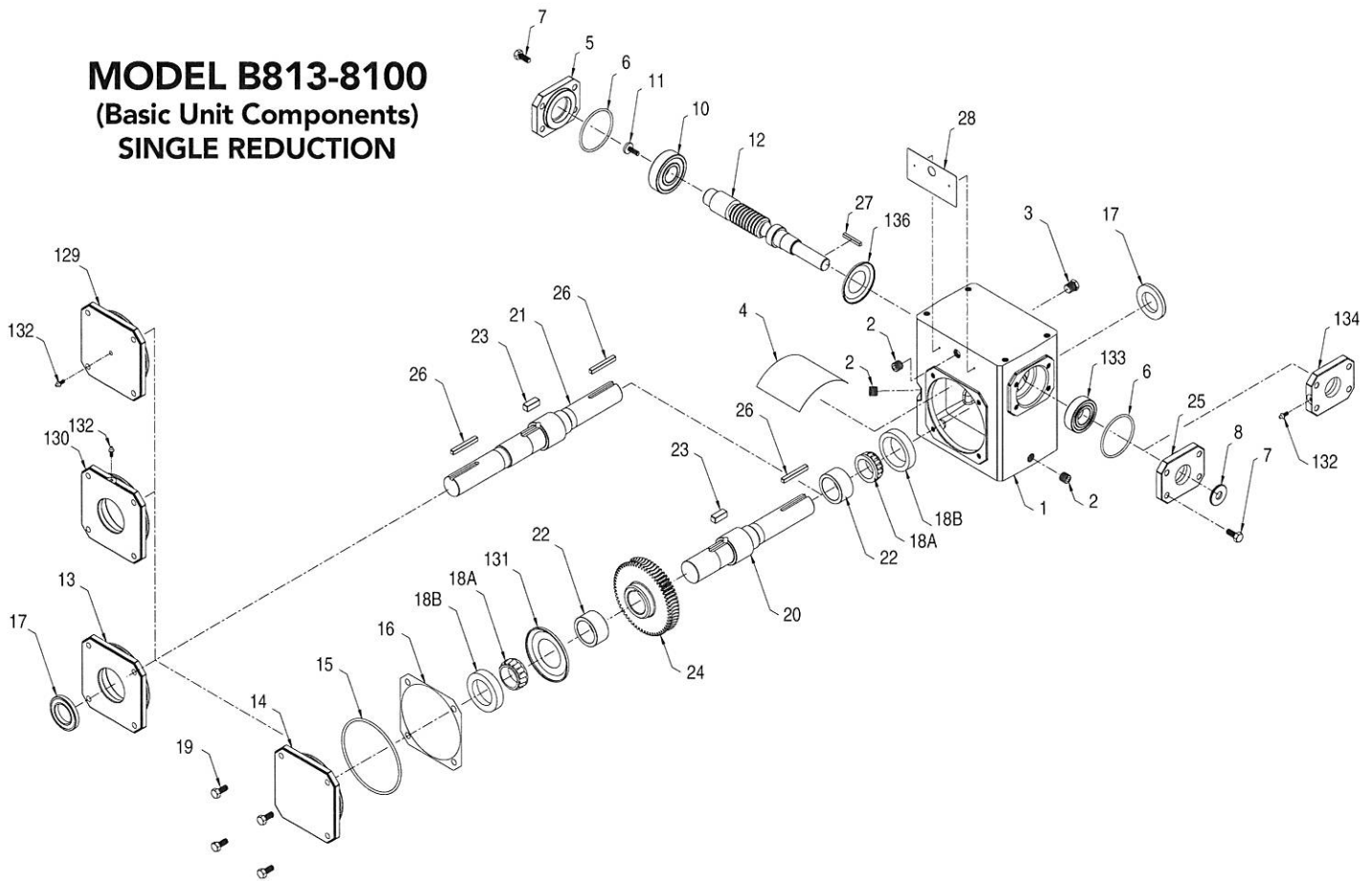
Load conditions must be within cataloged ratings published in the current Grove Gear / Electra-Gear Catalog (available upon request).

Published ratings assume lubrication with ISO 460 viscosity grade polyglycol (**PAG**) oil. Contact Factory for ratings when an alternate lubricant is used.

Warranty From Grove Gear / Electra-Gear - See 8050 catalog for warranty terms and conditions.

PARTS LIST

MODEL B813-8100 (Basic Unit Components) SINGLE REDUCTION



BASIC SINGLE REDUCTION UNIT (B-STYLE)

ITEM # DESCRIPTION

- 1 HOUSING
- 2 PIPE PLUG
- 3 VENT PLUG
- 4 SPLASH GUARD
- 5 INPUT CAP
- 6 O-RING
- 7 HEX HEAD CAP SCREW
- 8 INPUT OIL SEAL
- 9 INPUT BEARING (cup and cone for 842 and larger units)
- 10 INPUT BEARING (cup and cone for 842 and larger units)
- *11 RETAINING SCREW
- 12 INPUT WORM SHAFT
- 13 OUTPUT COVER - OPEN
- 14 OUTPUT COVER - CLOSED
- 15 O-RING

- 16 OUTPUT COVER SHIM (as required)
- 17 OUTPUT OIL SEAL
- 18 OUTPUT BEARING (18A. CONE, 18B. CUP)
- 19 HEX HEAD CAP SCREW
- ♣ 20 OUTPUT SHAFT - SINGLE
- ♣ 21 OUTPUT SHAFT - DOUBLE
- 22 GEAR SPACER
- 23 GEAR KEY (only used on size 826 and larger units)
- ♣ 24 OUTPUT GEAR
- *25 INPUT COVER
- 26 KEY - OUTPUT EXTENSION
- 27 KEY - INPUT EXTENSION
- 28 NAMEPLATE

(supplied only when mounting position involves a vertical shaft)

- *129 OUTPUT COVER - CLOSED
- *130 OUTPUT COVER - OPEN
- *131 OUTPUT BEARING GREASE RETAINER
- 132 GREASE FITTING
- 133 SEALED BALL BEARING (only used on size 818 thru 826 units)
- ◆134 INPUT COVER
- ◆136 INPUT BEARING GREASE RETAINER

- * ONLY USED ON SIZE 842 AND LARGER UNITS
- ◆ ONLY USED ON SIZE 830 AND LARGER UNITS
- ♣ SUPPLIED ONLY AS OUTPUT ASSEMBLY ON 813 THROUGH 824 UNITS

VERTICAL SHAFT REQUIRED PARTS

Complete information is available online at www.grovegear.com

Continued on next page

PARTS LIST (cont'd)

**QUILL MOTOR FLANGE UNIT
(BMQ-STYLE)**

- 40 QUILL MOTOR FLANGE
- 41 INPUT OIL SEAL
- 42 HEX HEAD CAP SCREW (flange to housing)
- 43 RETAINING RING - SHAFT
- *44 RETAINING RING - HOUSING
- 45 QUILL INPUT SHAFT
- 46 KEY - INPUT
- 47 HEX HEAD CAP SCREW (motor to flange)

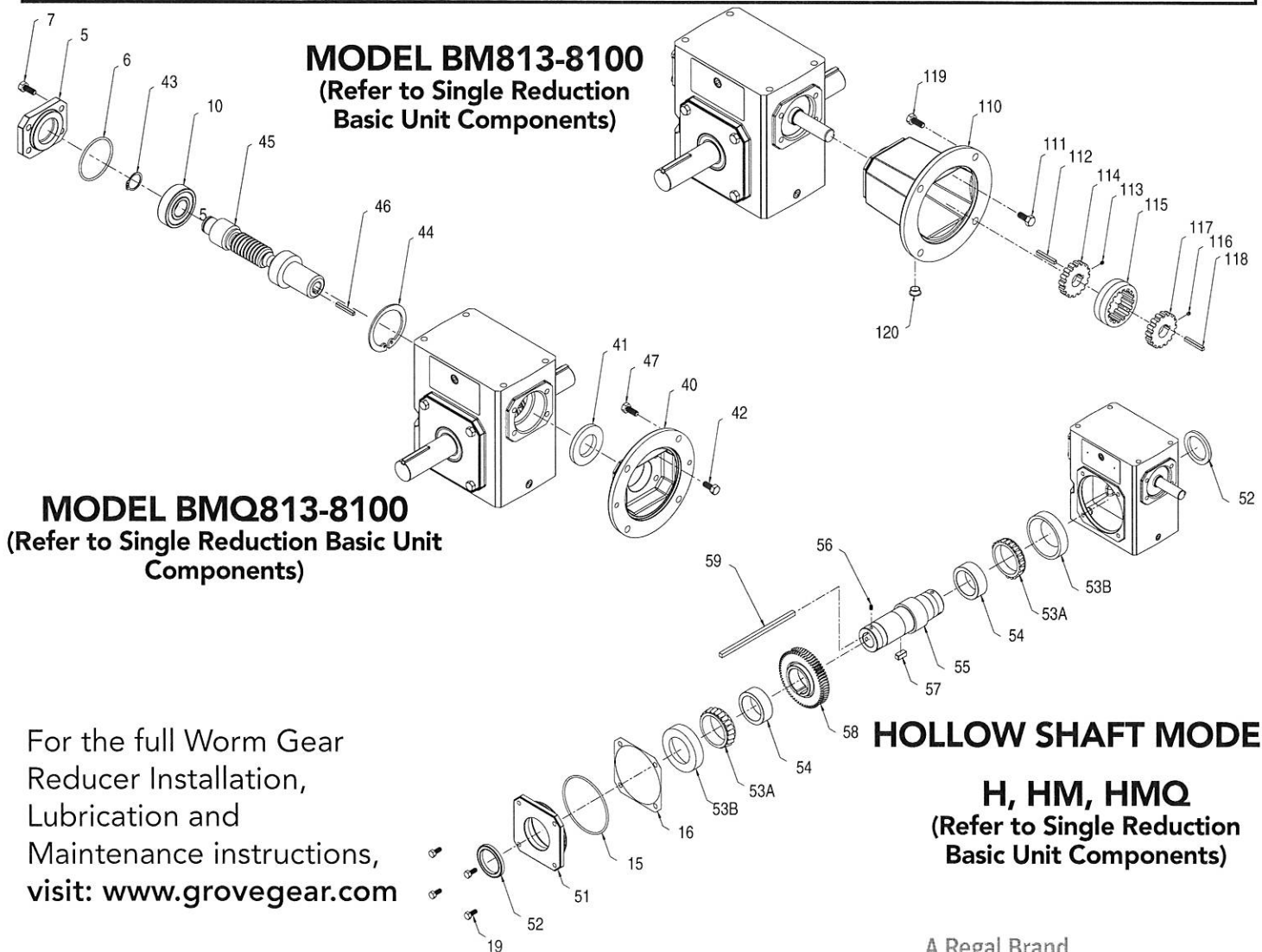
- 51 OUTPUT COVER
- 52 OUTPUT OIL SEAL
- 53 OUTPUT BEARING (53A. CONE, 53B. CUP)
- 54 GEAR SPACER
- ♣ 55 OUTPUT SHAFT
- 56 SETSCREW
- 57 GEAR KEY (only used on size 826 and larger units)
- ♣ 58 OUTPUT GEAR
- 59 OUTPUT KEY

- 111 HEX HEAD CAP SCREW (flange to housing)
- 112 COUPLING KEY - REDUCER SHAFT
- 113 SETSCREW - REDUCER SHAFT
- 114 COUPLING GEAR - REDUCER SHAFT
- 115 COUPLING SLEEVE
- 116 SETSCREW - MOTOR SHAFT
- 117 COUPLING GEAR - MOTOR SHAFT
- 118 COUPLING KEY - MOTOR SHAFT
- 119 HEX HEAD CAP SCREW (motor to flange)
- 120 PLASTIC PLUG

**HOLLOW OUTPUT SHAFT UNIT
(H-STYLE)**

**LONG MOTOR FLANGE AND
COUPLING KIT (BM-STYLE)**

- 110 "C" FACE MOTOR FLANGE



For the full Worm Gear Reducer Installation, Lubrication and Maintenance instructions, visit: www.grovegear.com

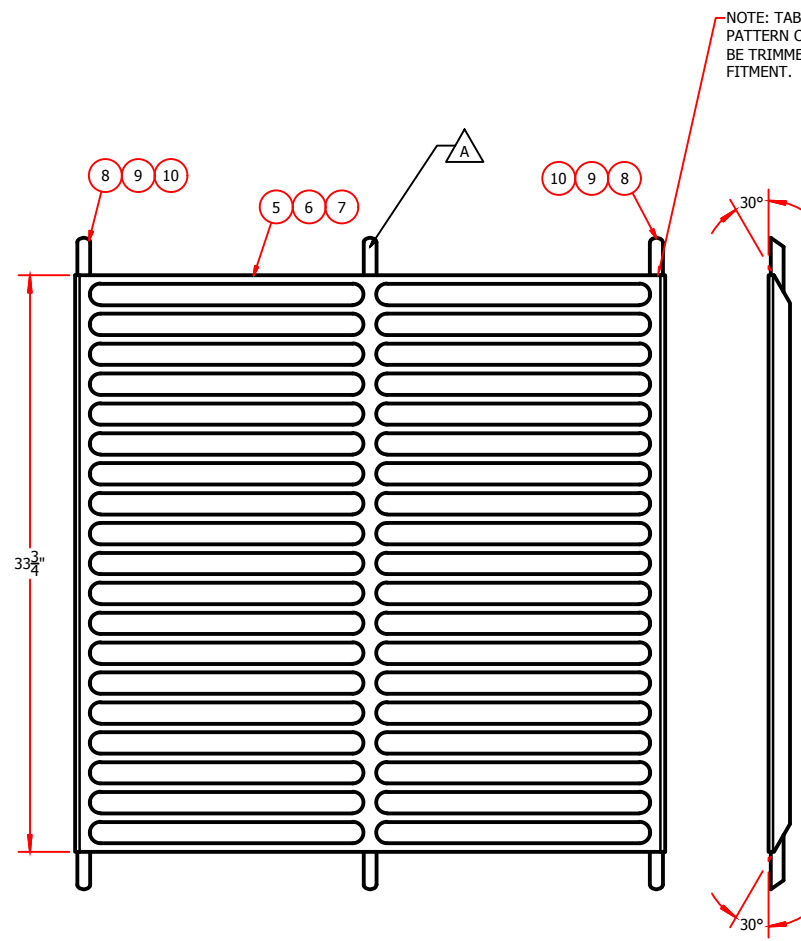
Grove Gear
Union Grove, Wisconsin 53182
PH: 262-878-1221
FAX: 262-878-1968

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Rev2, 01-13 7471G/01-13/BH/PDF ONLY

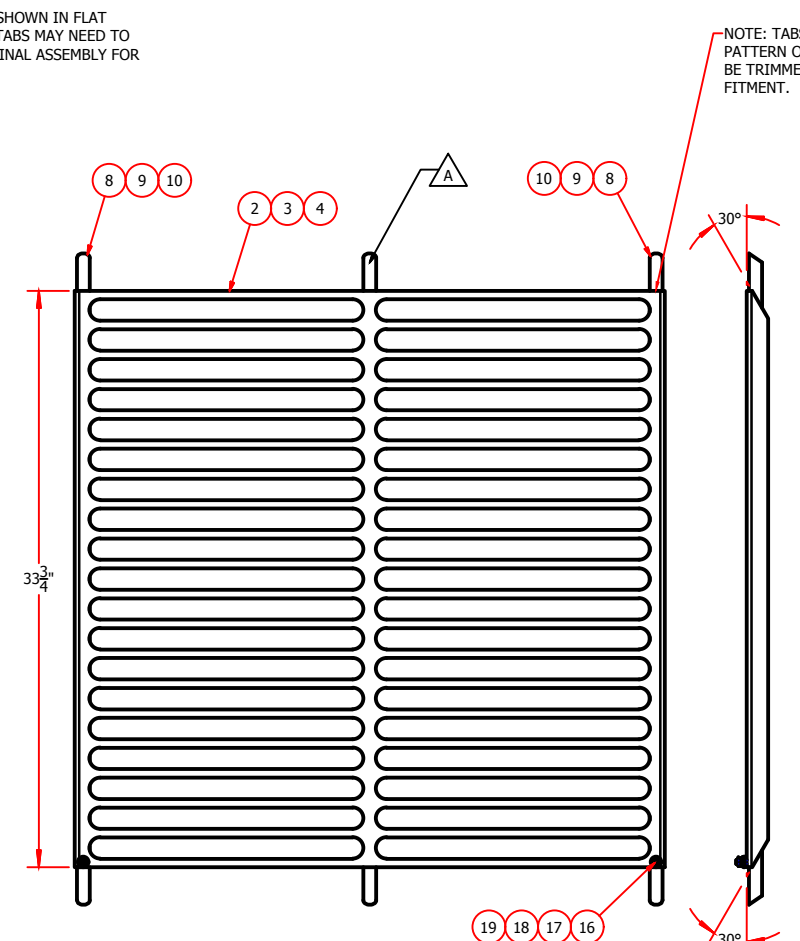
A Regal Brand



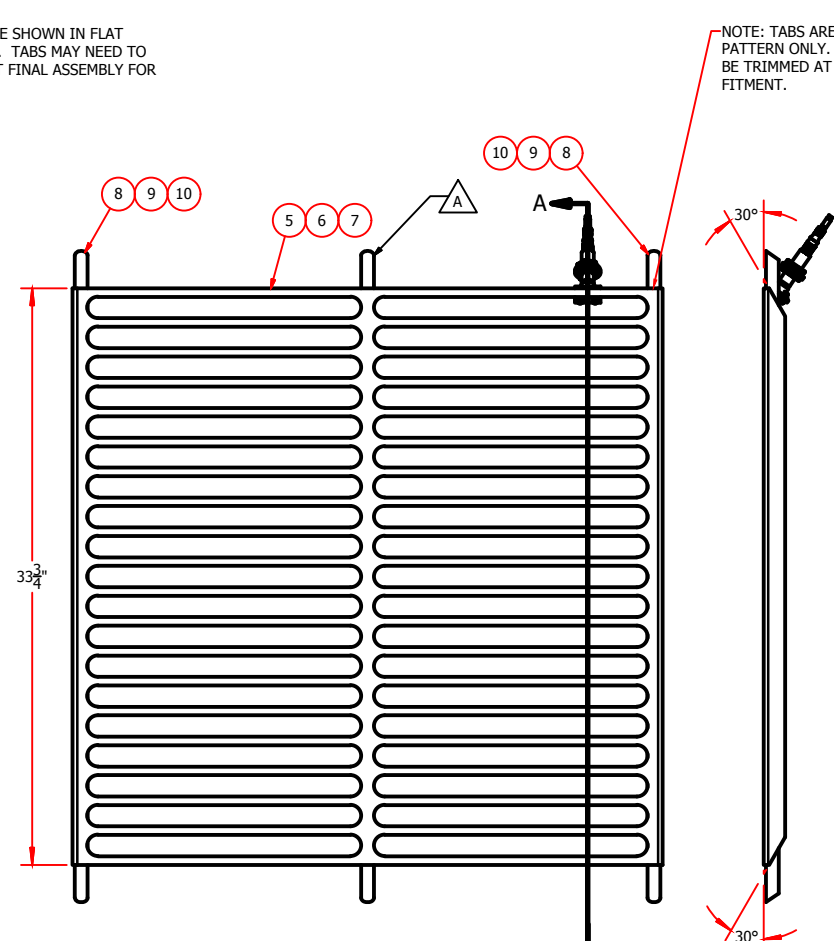
www.regalbeloit.com



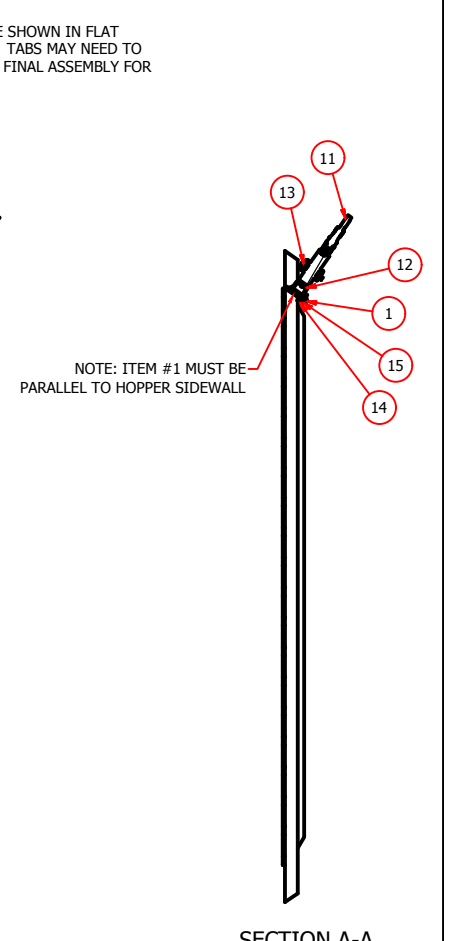
NO BOLT-IN OR INTERLOCK ASSY.



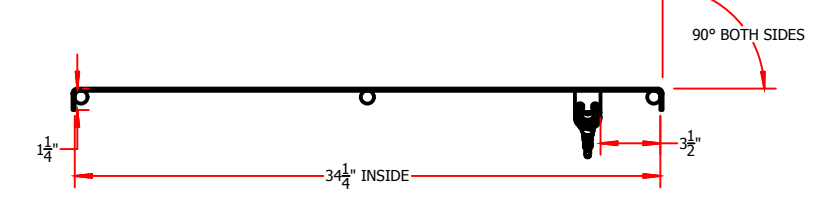
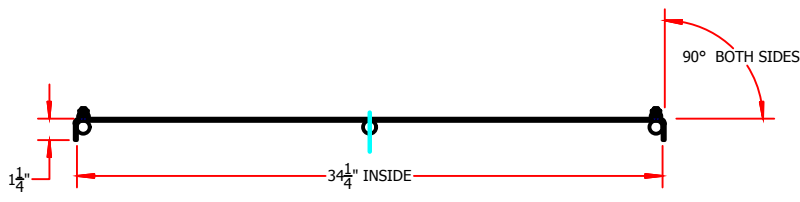
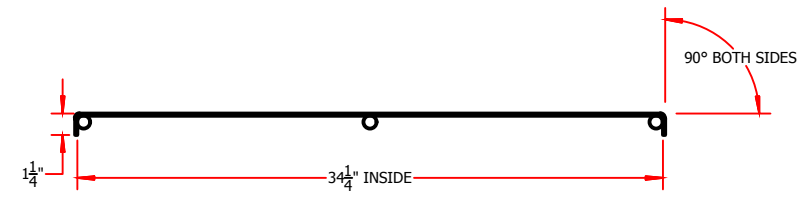
BOLT-IN ASSY.



INTERLOCK ASSY.



SECTION A-A
SCALE 3/16



NOTE: ITEMS #8, #9, #10 WELD SUPPORT RODS ONLY TO INSIDE OF HOPPER (DO NOT WELD TO GRATE)

REV.	SUF.	ITEM NO.	DRAWING / PART NO.	DESCRIPTION	6403-000	6403-D01	6403-D02	6403-D03	6403-D04	6403-D05	6403-D06	6403-D07	6403-D08
		1		FLAT, TAB, 10 GA., SS	0	0	0	0	0	0	1	1	1
		2		FORMED, BAR GRATE, 42" HOPPER WITH HOLES, #10GA., CS	0	0	0	1	0	0	0	0	0
		3		FORMED, BAR GRATE, 42" HOPPER WITH HOLES, #10GA., SS	0	0	0	0	1	0	0	0	0
		4		FORMED, BAR GRATE, 42" HOPPER WITH HOLES, #10GA., 316	0	0	0	0	0	1	0	0	0
		5		FORMED, BAR GRATE, 42" HOPPER, #10GA., CS	1	0	0	0	0	0	1	0	0
		6		FORMED, BAR GRATE, 42" HOPPER, #10GA., SS	0	1	0	0	0	0	0	1	0
		7		FORMED, BAR GRATE, 42" HOPPER, #10GA., 316	0	0	1	0	0	0	0	0	1
A		8		ROUND, BAR GRATE SUPPORT ROD, 3/4" DIA. X 40" LG. (CUT IN ASSY), 42" HOPPER, CS	3	0	0	3	0	0	3	0	0
A		9		ROUND, BAR GRATE SUPPORT ROD, 3/4" DIA. X 40" LG. (CUT IN ASSY), 42" HOPPER, SS	0	3	0	0	3	0	0	3	0
A		10		ROUND, BAR GRATE SUPPORT ROD, 3/4" DIA. X 40" LG. (CUT IN ASSY), 42" HOPPER, 316	0	0	3	0	0	3	0	0	3
		11	889D-F8AB-10	CABLE (AB), 10 METER QC	0	0	0	0	0	0	1	1	1
		12	440N-Z21S1GH	SAFETY SENSOR & ACTUATOR (AB), 18 mm	0	0	0	0	0	0	1	1	1
		13	38600-01	WASHER, .1875 x .75 ID x 1.5 OD, WHITE NED	0	0	0	0	0	0	1	1	1
		14		SHCS, #8-32UNC X 1/2" LG.	0	0	0	0	0	0	2	2	2
		15		NUT, #8-32UNC	0	0	0	0	0	0	2	2	2
		16		WELD STUD, 1/4"-20 UNC x 3/4" LG., SS	0	0	0	2	2	2	0	0	0
		17		FW, 1/4"	0	0	0	2	2	2	0	0	0
		18		LW, 1/4"	0	0	0	2	2	2	0	0	0
		19		NUT, 1/4"	0	0	0	2	2	2	0	0	0

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE ENGLISH (FEET AND/OR INCHES)
TOLERANCES

DECIMALS	INCHES	FEET	ANGLES
X ±.030"		.X'-X" = ± 1/4" UP TO 20 FEET	± .1°
.XX ±.015"	X/X" = ± 1/16"	.X'-X" = 1/2" OVER 20 FEET	
.XXX ±.005"			

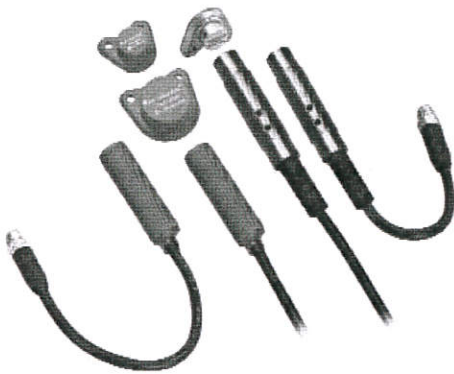
DO NOT SCALE DRAWING **REMOVE ALL SHARP EDGES**

HAPMAN Ideas that move 5944 E. N AVE. KALAMAZOO, MICHIGAN 49048
PHONE (269) 343-1675 FAX (269) 349-2477

DATE: 12/10/2019 JOB NO.: DRAWN: jbouchard
SCALE: WEIGHT: N/A

FORMED BAR GRATE ASSY., 42" HOPPER

CUSTOMER: SHEET 1 OF 3 DRAWING NO.: 6403-DXX A



Description

When it comes to machine safety, Rockwell Automation knows that protection of personnel and equipment is your main concern. At the same time, flexibility and productivity are points that must also be considered as you design your safety system. Optimize all of these with the new Allen-Bradley SensaGuard family of noncontact switches.

Featuring the latest generation of RFID technology for coding and inductive technology for sensing, SensaGuard's large sensing range and tolerance to misalignment is a cost-effective solution that is ideally suited for a wide range of industrial safety applications.

The SensaGuard product line is a Category 4 /SIL 3 rated switch per EN954-1, TÜV functional safety approved to IEC 61508.

Features

- Switches can be connect to a standard safety relay, for example, the MSR126, MSR127, MSR200/300 Family, SmartGuard and Safety I/O Blocks
- Multiple actuator sizes for large sensing distance
- IP 69K environmental rating
- Short-circuit and over-voltage protection
- Led located on the switch for door status and troubleshooting

Benefits

- No dedicated controller required
- Cat 4/SIL 3 rating maintained even with multiple units connected in series
- Switches can be connected in series with other devices (light curtain, E-stops, key interlock switches)
- Extended diagnostics for easy troubleshooting
- Large sensing distances
- Tolerance to misalignment
- Multiple sensing directions
- Stainless steel version suitable for use in harsh environments
- Use standard proximity brackets

Specifications

Category	Cat. 4/SIL3		
Certifications	TÜV, CE, cULus (UL 508)		
Standards	IEC 60947-5-3, IEC 61508, EN 954		
PFHd	1.119...10 ⁻⁹		
Operating Characteristics			
Sensing Distance (Target)	18 mm Plastic	30 mm Plastic	18 mm SS
Operating Distance, Make—mm (in)	Assured: 15 (0.59)	Assured: 25 (0.98)	Assured: 10 (0.39)
Case Material	Valox® DR 48		304 Stainless Steel
Actuator Material	Valox® DR 48		304 Stainless Steel
Typical Misalignment	See misalignment curve.		
Repeat Accuracy	10% of Sensing Range		
Output Current, Max.	200 mA (all outputs)		
Switching Current @ Voltage, Max.	24V DC +10%/-15%		
Operating Voltage/Supply Current	24V DC, +10%/-15% Class 2 SELV power supply		
Frequency of Operating Cycle	1 Hz		
Response Time (Off)	54 ms		
Outputs (Guard Door Closed, Actuator in Place)			
Safety Outputs	2 x PNP, 0.2 A, max.; Status: ON (+24V DC)		
Auxiliary Outputs	1 x PNP, 0.2 A max.; Status: OFF (0V DC)		
Environmental			
Operating Temperature—C (F)	-10...+55° (+14...+131°)		
Relative Humidity	5...95%		
Enclosure Type Rating	NEMA 3, 4X, 12, 13, IP 69K		
Shock	IEC68-2-27 30 g, 11 ms		
Vibration	IEC 68-2-6 10...55 Hz		
Radio Frequency	IEC 61000-4-3, IEC 61000-4-6		
Protection			
Protection Type	Short Circuit, Current Limitation, Overload, False Pulse, Transient Noise, Reverse Polarity, Overvoltage (inc. load dump), Thermal Shutdown with restart, Loss of GND and Vdd		
Loss of GND and Vdd protection	Incorporated		
Electrical Life	10 x 10 ⁶		

Safety Switches

Noncontact Switches

SensaGuard™ 18 mm Barrel

Product Selection

Description	Operating Voltage/ Input Current	Safety Outputs	Auxiliary Outputs	Actuator Type	Assured Sensing Distance	Connection	Cat. No.
18 mm Plastic Barrel	24V DC, +10%/- 15%/ 50 mA max.	2 Solid State outputs	1 Solid State output	18 mm	15 mm (0.59 in)	6 in Pigtail, 8-Pin Micro (M12)	440N-Z21S16H
						3 m Cable	440N-Z21S16A
						10 m Cable	440N-Z21S16B
				30 mm	25 mm (0.98 in)	6 in Pigtail, 8-Pin Micro (M12)	440N-Z21S26H
						3 m Cable	440N-Z21S26A
						10 m Cable	440N-Z21S26B
18 mm Stainless Steel Barrel				18 mm	10 mm (0.39 in)	6 in Pigtail, 8-Pin Micro (M12)	440N-Z21S17H
						3 m Cable	440N-Z21S17A
						10 m Cable	440N-Z21S17B

Recommended Logic Interfaces

Description	Safety Outputs	Auxiliary Outputs	Terminals	Reset Type	Power Supply	Cat. Pg. No.	Cat. No.
Single-Function Safety Relays							
MSR127RP	3 N.O.	1 N.C.	Removable Screw	Monitored Manual	24V AC/DC	—	440R-N23135
MSR127TP	3 N.O.	1 N.C.	Removable Screw	Automatic/Manual	24V AC/DC	—	440R-N23132
Modular Safety Relays							
MSR211P Base 2 N.C. only	2 N.O.	1 N.C. and 2 PNP Solid State	Removable	Automatic/Manual Monitored Manual	24V DC	—	440R-H23176
MSR220P Input Module	—	—	Removable	—	24V DC	—	440R-H23178
MSR310P Base	—	3 PNP Solid State	Removable	Automatic/Manual Monitored Manual	24V DC	—	440R-W23219
MSR320P Input Module	—	2 PNP Solid State	Removable	—	24V DC	—	440R-W23218








Note: For additional Safety Relays connectivity, see the Logic section of this catalog.
 For additional Safety I/O connectivity, see the Safety I/O section of this catalog.
 For Application and wiring diagrams, see the Applications section of this catalog.

Connection Systems

Description	Cat. No.
Cordset	889D-F8AB-*

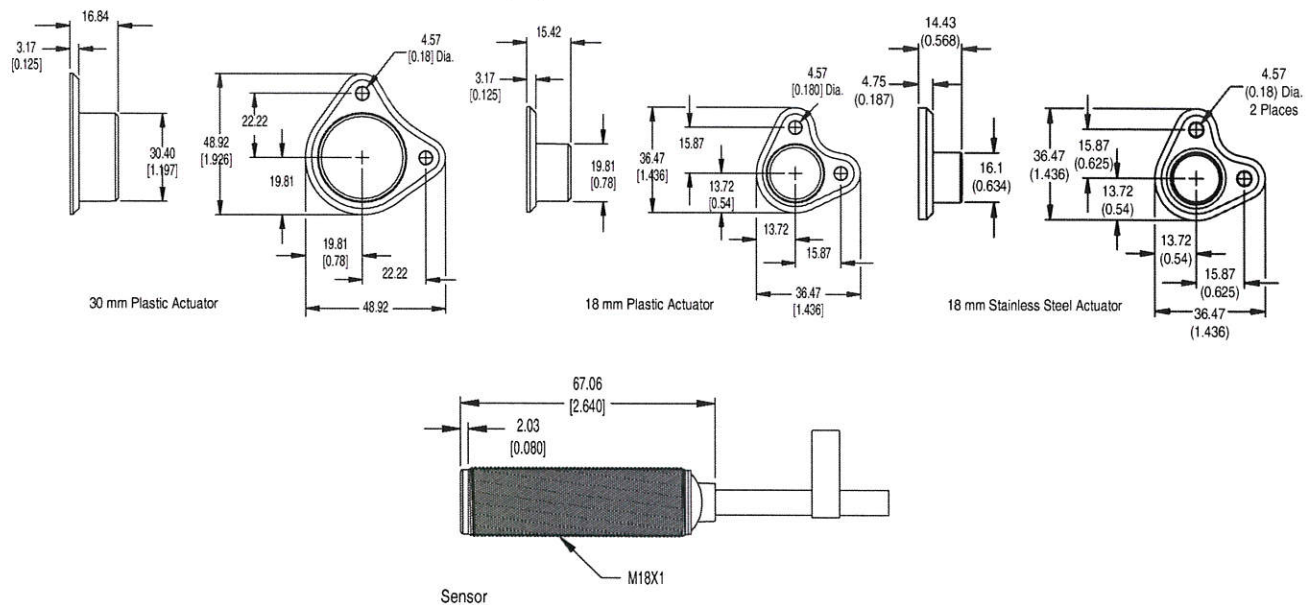
* Replace symbol with 2 (2 m), 5 (5 m), or 10 (10 m) for standard cable lengths.

Accessories

	Description	Dimensions	Cat. No.
	18 mm Plastic Actuator	—	440N-Z18PT
	30 mm Plastic Actuator	—	440N-Z30PT
	18 mm Stainless Steel Actuator	—	440N-Z18SST
	Mounting Bracket for Tubular Sensors—Right Angle Style	—	871A-BRS18
	Mounting Bracket for Tubular Sensors—Clamp Style	—	871A-BP18
	Snap Clamp Mounting Bracket	—	871A-SCBP18
	Swivel/Tilt bracket allows ±10° vertical and 360° rotation adjustment.	—	60-2649

Approximate Dimensions—mm (inches)

Dimensions are not intended to be used for installation purposes.



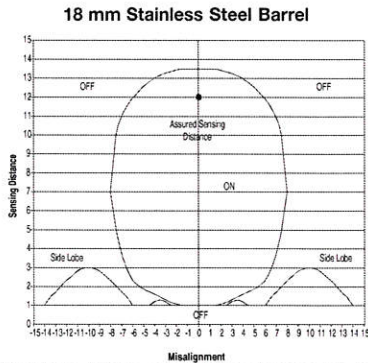
Safety Switches
Noncontact Switches
 SensaGuard™ 18 mm Barrel

Typical Wiring Diagrams

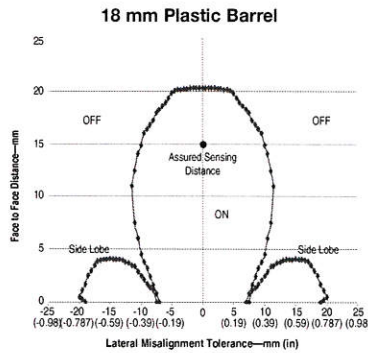
Description		Plastic		Stainless Steel	
8-Pin Micro (M12)					
8-Pin Cordset 889D-F8AB-*	Grey	OSSD 1	Safety A	OSSD 1	Safety A
	Red	OSSD 1+		OSSD 1+	
	Pink	OSSD 2	Safety B	OSSD 2	Safety B
	Yellow	OSSD 2+		OSSD 2+	
	White	Aux A		Aux A	
	Brown	24V DC	Unit Power	24V DC	Unit Power
	Blue	Gnd		Gnd	
Green	NA		Shield		

* Replace symbol with 2 (2 m), 5 (5 m) or 10 (10 m) for standard cable lengths.

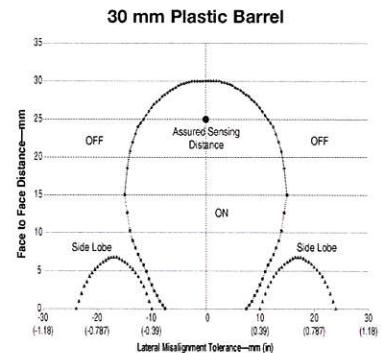
Misalignment Curve



Note: There must be a minimum spacing of 4 mm (0.157 in) if actuator and sensor face approaches laterally. This will prevent false triggering due to the side lobe areas.

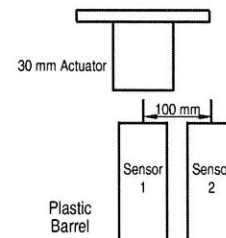
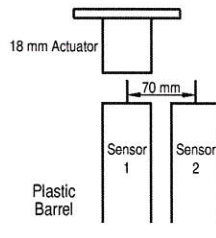
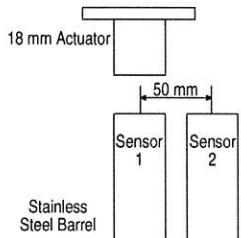


Note: There must be a minimum spacing of 4 mm (0.157 in) if actuator and sensor face approaches laterally. This will prevent false triggering due to the side lobe areas.



Note: There must be a minimum spacing of 7 mm (0.275 in) if actuator and sensor face approaches laterally. This will prevent false triggering due to the side lobe areas.

Minimum Distance Between Sensors



Diagnostic

Unit Indicators (per IEC 60073)

	State	Status	Troubleshooting
Device Output LED	Off	Not Powered	NA
	Red	Not Safe, OSSD Not Active	NA
	Green	Safe, OSSD Active	NA
	Green Flash	Power Up Test or OSSD Inputs Not Valid	Check 24V DC on OSSD Inputs (yellow and red wire)
	Red Flash	1 Hz Flash Recoverable Fault 4 Hz Flash Nonrecoverable Fault	Recoverable Fault: Check OSSD Outputs Are Not Shorted to GND, 24V DC or Each Other. Cycle Power.

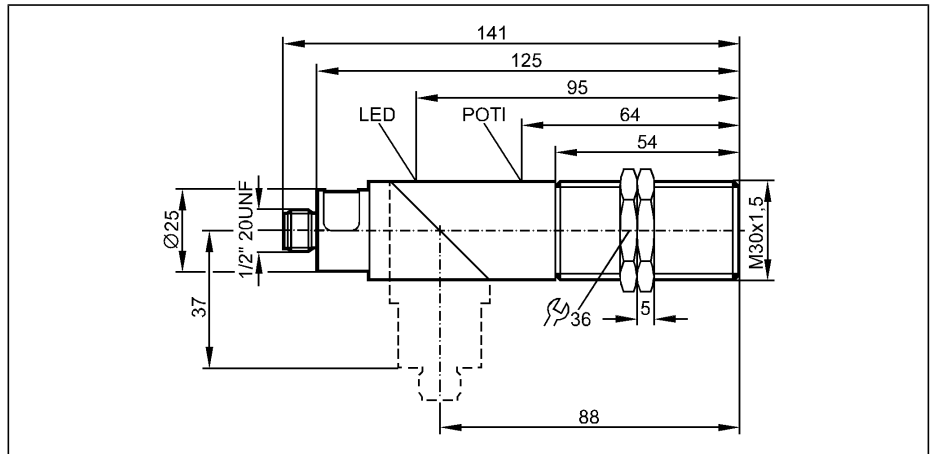
Capacitive sensors

KI3513

KIE2015-FBOA/NI/LS
 Capacitive sensor
 Plastic thread M30 x 1.5
 Quick disconnect

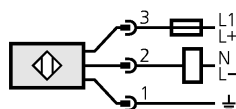
Factory setting: normally open
 Increased immunity to conducted radio frequency interference

Sensing range 15mm [nf]
 adjustable 3...15 mm
 non-flush mountable



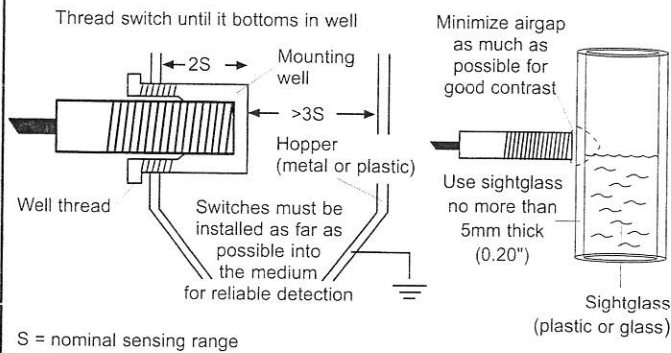
Electrical design	AC/DC
Output	normally open / closed programmable
Operating voltage [V]	20...250 AC/DC
Current rating (continuous) [mA]	250 (...50 °C) / 200 (...70 °C)
Current rating (peak) [mA]	\hat{i} : 2.2 A (20 ms / 0.5 Hz)
Minimum load current [mA]	5
Short circuit proof	no
Reverse polarity protection	no
Overload protection	no
Voltage drop [V]	< 10 AC / < 8 DC
Leakage current [mA]	< 2.5 (250 V AC) / < 1.7 (110 V AC) / < 1.5 (24 V DC)
Real sensing range [mm]	15 ± 10 %
Operating distance [mm]	0...12.1
Switch-point drift [% of Sr]	-15...15
Hysteresis [% of Sr]	1...15
Switching frequency [Hz]	25 AC / 50 DC
Correction factors	water = 1 / glass approx. 0.4 / ceramics approx. 0.2 / PVC approx. 0.2
Operating temperature [°C]	-25...70
Protection	IP 65, I
EMC	IEC 60947-5-2: 1997 + A1: 1999 + A2: 2003
Housing material	PBT; brass nickel-plated
Function display	
Switching status LED	red
Connection	1/2" connector
Remarks	Recommendation: check the unit for reliable function after a short circuit.
Accessories (included)	2 lock nuts, screwdriver

Wiring

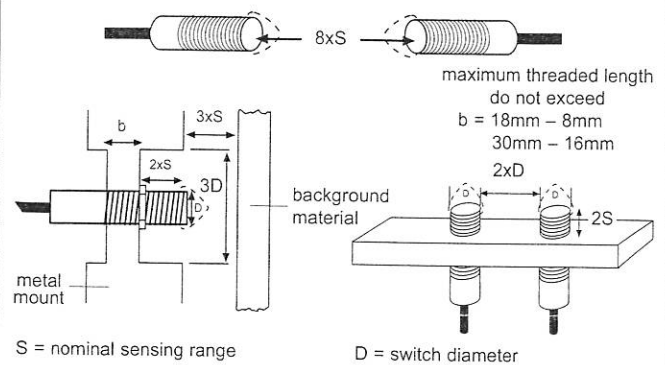


Note: miniature fuse to IEC60127-2 sheet 1,
 ≤ 2 A (fast acting)

Level Sensing



Position Sensing



Normally Open Sensor Adjustment

All capacitive switches have a potentiometer which allows switch sensitivity to be adjusted for the best results. To establish the proper sensitivity for a particular set of target conditions, follow these procedures.

- 1) Mount the switch in the application. Set up the worst case conditions which can cause a false "ON" signal. As an example, assume the switch is being used to sense the level of a liquid through a sight glass. The worst case condition exists when moisture is present on the inside surface of the glass. Turn the potentiometer clockwise (CW) until the LED is ON, then turn the potentiometer counterclockwise (CCW) until it just turns OFF.
- 2) Bring the target into position. In the example, bring the water above the level of the switch. The LED should be ON. Turn the potentiometer CCW and count the number of turns until the LED turns OFF.
- 3) Turn the potentiometer CW for 1/2 the number of turns counted in step 2. For example, if it took 4 turns CCW to have the LED go OFF, now turn the potentiometer to 2 turns CW. The switch will now be set.

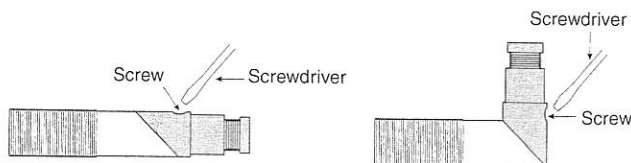
Normally Closed Sensor Adjustment

All capacitive switches have a potentiometer which allows switch sensitivity to be adjusted for the best results. To establish the proper sensitivity for a particular set of target conditions, follow these procedures.

- 1) Mount the switch in the application. Set up the worst case condition which can cause a false "OFF" signal. As an example assume the switch is being used to sense the level of a liquid through a sight glass. The worst case condition exists when moisture is present on the inside surface of the glass. Turn the potentiometer clockwise (CW) until the LED is OFF, then turn the potentiometer counterclockwise (CCW) until it just turns ON.
- 2) Bring the target into position. In the example, bring the water above the level of the switch. The LED should be OFF. Turn the potentiometer CCW and count the number of turns until the LED turns ON.
- 3) Turn the potentiometer CW for 1/2 the number of turns counted in step 2. For example, if it took 4 turns to have the LED go ON, now turn the potentiometer 2 turns CW. The switch will now be set.

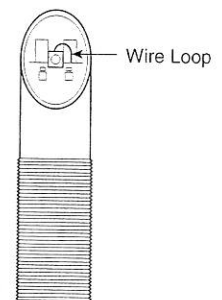
90° Mounting

- 1) Loosen screw with a screwdriver.
- 2) Separate the black rear of the switch from the orange front of the switch.
- 3) Reattach the black rear of the switch to the orange front of the switch as shown for 90° mounting.
- 4) Tighten the screw with the screwdriver.



Normally Open / Normally Closed Programming

- 1) Loosen screw with a screwdriver.
- 2) Separate the black rear of the switch from the orange front of the switch.
- 3) This product is manufactured normally open. To convert the switch to normally closed operation, cut the wire loop
- 4) To return to normally open operation, solder the wire loop together.
- 5) Reattach the black rear of the switch to the orange front of the switch and tighten screw.



Electrical



DO NOT operate an incandescent light bulb as a load. The current inrush when the bulb is cold can cause a current overload.



DO NOT operate a proximity sensor directly from a voltage supply without a load. This is considered a short circuit and can cause damage.



ifm efector

TEL: 800-441-8246 • FAX: 800-329-0436
 www.ifmefector.com

Concerning Safety...ifm efector makes every effort to build a dependable product, but every product will eventually fail. Therefore, your equipment must be designed to prevent property damage and personal injury if our products fail. efector proximity switches are not designed to be used as stand-alone devices to protect or guard human life or limb.

Service & Installation Manual



Electric Vibrators

VIBCO
VIBRATORS

Vibco Vibrators

75 Stilson Road, Wyoming, RI 02898

800-633-0032 P 401-539-2392 F 401-539-2584

www.vibco.com • vibrators@vibco.com

CANADA

2215 Dunwin Drive, Mississauga, Ontario L5L 1X1

800-465-9709 P 905-828-4191 F 905-828-5015

GENERAL INFORMATION

ORDERING SPARE PARTS

Parts should be ordered only through authorized distributors or direct from the factory. The following data should be provided when ordering:

From the nameplate:	Type and serial number of unit.
From spare parts list:	Reference number; Part number; Description; Number of pieces required.
Shipping instructions:	Specify shipping point; Specify method of shipping (truck, air).

ERRORS, SHORTAGES, COMPLAINTS

Complaints concerning goods received or errors, should be made at once. Claims must be made within five days after receipt of goods. Clerical errors are subject to correction.

RETURNING PARTS

No parts shall be returned to the factory without written or verbal permission. Material returned to stock is subject to a 10% rehandling charge. Shipping charges must be prepaid.

All return shipments should clearly show your name and address. Our invoice number, against which these parts were returned, must be supplied to insure proper credit.

Orders for equipment built to specifications which vary from our standard units are not subject to cancellation.

RESPONSIBILITY

We cannot be responsible for delays resulting from strikes, accidents, negligence of carriers, or other causes beyond our control.

FREIGHT CLAIMS

Should you receive a shipment from us which was damaged in transit, your claim should be filed immediately with the carrier. All parts sold by us are on the basis of F.O.B. Wyoming, Rhode Island.

PRODUCT CHANGES

The right is reserved to make changes in pattern, design, or materials when deemed necessary without prior notice or obligation to make corresponding changes in previous models.

PRICE CHANGES

The right is reserved to make changes in pattern, design, or materials when deemed necessary without prior notice or obligation to make corresponding changes in previous models.

PRICE CHANGES

Prices are subject to change without notice.

PATENTS

Most of VIBCO'S vibrators are manufactured under one or more of the following patents
3,870,282, 3,932,057, 3,638,914, 3,938,905, 3,672,639, 3,790,137, 3,945,246, 4,042,102, 4,280,616.
Most of these patents are also filed in most countries outside of the United States.



MOUNTING INSTRUCTION CHECK LIST

NOTE: Warranty is void if vibrators are not properly installed. During installation follow and check off these steps:

1. Determine where the vibrators should be placed on bin, 1/4 or 1/3 up sloping side (page 4)
2. Select thickness of vibrator mounting plate and drill holes for mounting (page 5 #8).
3. Determine the length of channel iron (page 5 #9).
4. Weld mounting plate to channel iron (page 5 #10).
5. Weld channel iron to bin (page 5 #11).
6. Put vibrator on mounting plate. Important — check for warping (page 6 #A, B, C). Secure vibrator firmly.
7. Install safety chain or wire (page 6 #9C).
8. Have a qualified electrician make all necessary electrical installations and install proper overload protection.
9. Take a voltage reading at vibrator while running (page 6 #II). VOLT _____
10. Take an amp reading while vibrator is running (page 6 #III). AMPS _____
11. Is the force the vibrator produces sufficient? Do you need more or less, see service instructions, page 13

If the above steps have been followed, your vibrator has been installed properly and it should give you years of trouble free service.

NOTES ABOUT INSTALLATION:

IF YOU HAVE ANY QUESTIONS CALL VIBCO's ENGINEERING DEPARTMENT.



VIBCO, INC. In Canada:
75 Stilson Rd. 2215 Dunwin Dr.
Wyoming, RI 02898 Mississauga, Ont. L5L 1X1
Phone: 800-633-0032 Phone: 800-465-9709
Fax: 401-539-2584 Fax: 905-828-5015

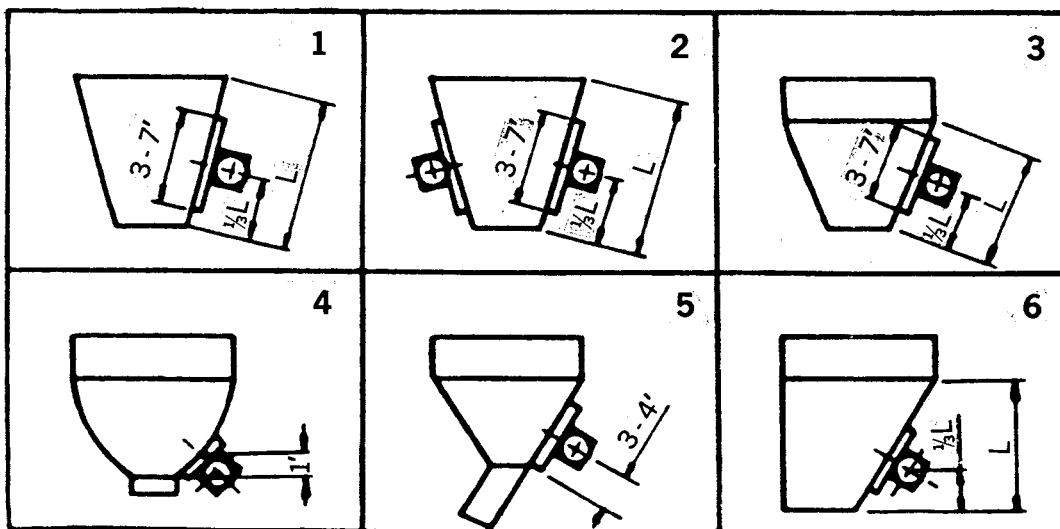
MOUNTING INSTRUCTIONS

You are now the owner of the finest electric vibrator available. We have complete confidence in it's quality and dependability. You can make it perform at peak efficiency and insure yourself of years of trouble-free service and unnecessary maintenance expense by following these simple "mounting" and "preventive maintenance" rules when you install your vibrator.

When the vibrator is to be used on concrete pipe, prestressed or precast forms or on vibrating tables, ask for your free copy of mounting instructions pertaining to these.

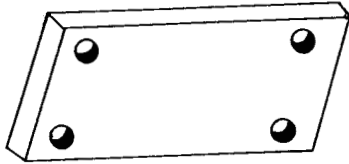
MOUNTING

The vibrator should, for coarse materials, be placed approximately 1/3 of the distance from the discharge opening to the top. For fine grain materials, 1/4 of the same distance. NOTE: If possible, mount the vibrator with it's shaft horizontal.



1. CONICAL BINS OR HOPPERS are easily vibrated. Should a second vibrator be necessary, it should be mounted diametrically opposite; for coarse material, mount one vibrator 1/3 up the side, the other 1/2 up. For fine materials mount the first vibrator 1/4 up and the second one 1/3 up.
2. RECTANGULAR BINS AND HOPPERS. One vibrator generally clears the walls; if the material still sticks in the corners, increase the vibration by first changing the impact of the vibrator, or change to a larger size or use a second unit mounted opposite the first.
3. RECTANGULAR BINS WITH HOPPER BOTTOMS react the same as #2, but usually more impact is needed.
4. PARABOLIC BINS OR HOPPERS. Normally only one vibrator is needed for each discharge point.
5. BINS WITH SLOPING DISCHARGE. The vibrator is mounted close to the transition between chute and bin to give the chute sufficient vibration for a steady flow.
6. BIN OR HOPPER WITH VERTICAL SIDES reacts the same as paragraph 2.
7. The following pages will show several different applications.

8. MOUNTING PLATE. The vibrator is NEVER placed directly on the skin of a bin. It is either mounted to a plate or channel iron welded to the bin. VIBCO vibrators can be mounted with their shaft vertically or horizontally. The most common is the horizontal mounting with vibrator rotation in direction of material flow. Vertically mounted vibrators will try to create a gyratory effect on the bin and materials, especially desirable when bins are free floating — hanging in springs or resting on isolation shocks.



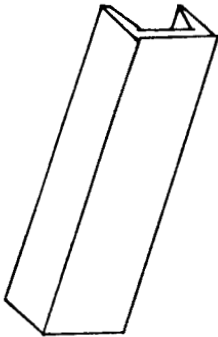
FOR UP TO 100 LBS. OF VIBRATION IMPACT the mounting plate should be 1/8 to 1/4" thick and extend 1-2" larger than the vibrator and welded to a 3" channel iron.

FOR UP TO 1000 LBS. OF VIBRATION IMPACT the mounting plate should be 1/2" thick and be 1-2" larger than the vibrator and welded to a 4" channel iron.

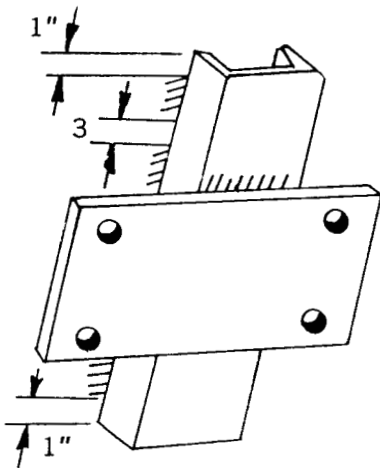
FOR 1000 TO 2000 LBS. OF VIBRATION IMPACT the mounting plate should be 5/8" thick and 1-2" larger than the vibrator and welded to a 4 or 6" channel iron.

FOR 3000 TO 5000 LBS. OF VIBRATION IMPACT use a 3/4" plate and 1-2" larger than the vibrator and welded to a 6-8" channel iron.

FOR OVER 5000 TO 15000 LBS. OF VIBRATION IMPACT use a 1" plate 1-2" larger than the vibrator and welded to a 8-10" channel iron.

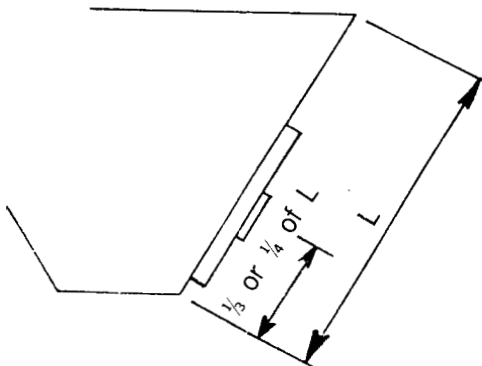


9. THE LENGTH OF THE CHANNEL IRON is determined by the thickness of the bin plate. For 3/16 to 3/8" plate, make the channel iron 3-5' long; under 3/16", make channel iron the length of bin side or 6-7' long; over 3/8" thick, it need only be 2-3' long.



10. WELDING MOUNTING PLATE TO CHANNEL IRON. Weld mounting plate to channel iron so that when channel iron is mounted to the bin side the mounting plate ends up 1/3 up the bin side for coarse material, or 1/4 up for fine materials. Mounting plate should be as close to the middle of the channel iron as possible.

MAKE SURE MOUNTING PLATE DOES NOT WARP. If it warps or bends from welding, follow procedures in paragraph 12 when mounting vibrator.



11. WELDING CHANNEL IRON TO BIN. Tack weld channel iron in place then weld intermittent welds 3-6" long with 3" between them. NOTE: STOP WELDS AT LEAST 1" FROM THE ENDS OF THE CHANNEL IRON — DO NOT WELD THE ENDS. The heat concentration when welding the ends could cause crystallization of the metal and the start of fatigue cracks.

12. INSTALLATION OF VIBRATOR

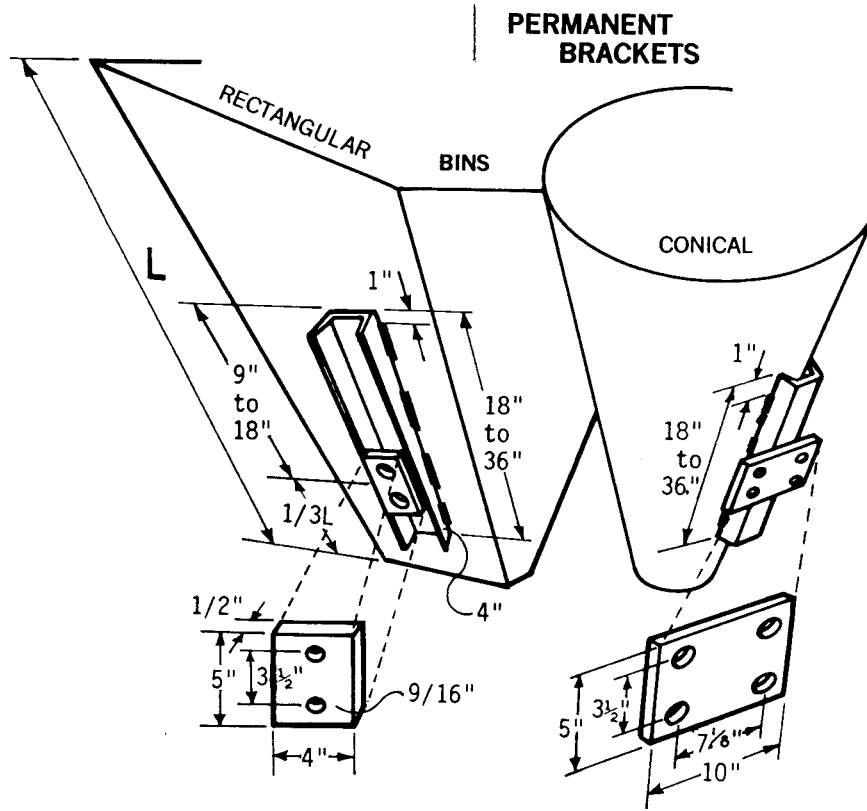
MAKE SURE A QUALIFIED ELECTRICIAN MAKES ALL NECESSARY ELECTRICAL INSTALLATIONS.

THE VIBCO VIBRATOR IS NOW PUT IN PLACE.

- A. Secure one end bell to the mounting plate with 2 bolts.
 - B. If mounting plate is warped or bent due to the welding, shim up the opposite end bell (over-shim slightly) then tighten mounting bolts.
 - C. Remove end cover on vibrator and spin shaft with finger, it should spin freely — if not, re-shim vibrator. Retighten the bolts after the first 10-15 minutes of running, then check them periodically for tightness. NOTE: A loose vibrator can cause damage to the bin and may also get electrically overloaded, which could cause a motor burnout. It is also advisable to install a safety chain or wire in case the vibrator works itself loose.
- II. TAKE A VOLTAGE READING at the vibrator when running to make sure there is no voltage drop and the vibrator is connected for the same voltage as stamped on the nameplate. If a voltage drop of more than 10% exists, you will overload your vibrator. On single phase units the relay or switch controlling the cut-out of the starter winding will not disengage, causing a fast overheating of starter winding with danger of burnout. The remedy is to:
- A. Check incoming voltage if it is too low notify your electric company.
 - B. Make sure the voltage drop is not caused by a too long extension cord. If this is the case, try to make your connection closer to the vibrator or use a larger wire size in the extension cord, instead of #16 wire, use #14 or #12.
- III. TAKE AN AMPERE READING OF THE VIBRATOR. This is the most important check because it will tell you about your installation. Too high amperage is caused by:
- A. Too flexible installation or too powerful a vibrator. To avoid overloading the vibrator, it will be necessary to reduce the amperage to a safe value (below what is stamped on the nameplate).
 - 1. If a vibrator is too powerful, reduce the vibration by changing the eccentrics to a lower setting (see service instructions).
 - 2. Stiffen up the structure to be vibrated by welding on additional stiffeners — angle or channel irons (same length or longer than the vibrator channel iron). Weld stiffeners 1-1/2 to 2' away from each other. Normally 1 or 2 stiffeners are all that's needed.
 - B. Bin or weld cracks — especially if the new vibrator replaces an old one or your vibrator has been repaired. Inspect all welds and especially end of welds where bin or structural material cracks usually start. To effectively stop a crack, follow it to the end, drill a hole there to prevent further creeping of the crack, weld over the hole and crack.
 - C. Material in a bin acts as a stiffener and the vibrator might operate satisfactorily as long as bin is full or partially full. The vibrator might overload if used when the bin is empty. Overload protection should be used to stop vibrator before the overload damages the winding.

NORMALLY — DO NOT USE VIBRATOR WITH AN EMPTY BIN OTHER THAN FOR SHORT PERIODS TO CLEAN OUT THE BIN.

MOUNTING SUGGESTIONS



Mounting For
US-300 - 450T

Mounting For
US-900



Vertically mounted 2P-450 on
Crushed Cullet Hopper.

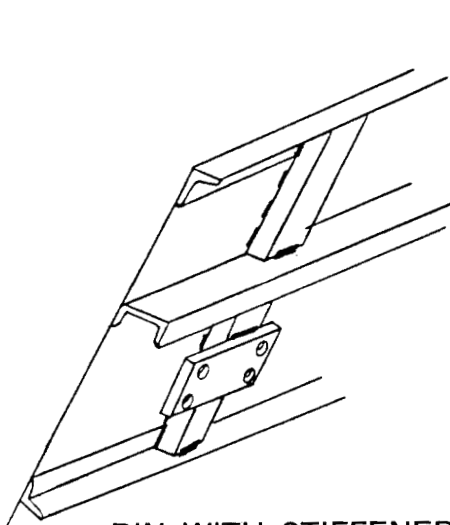
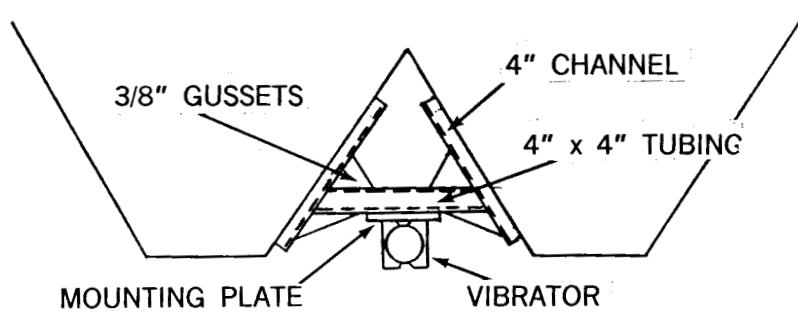


4P-700 on Woodchip Bin with
Screw Feeder.

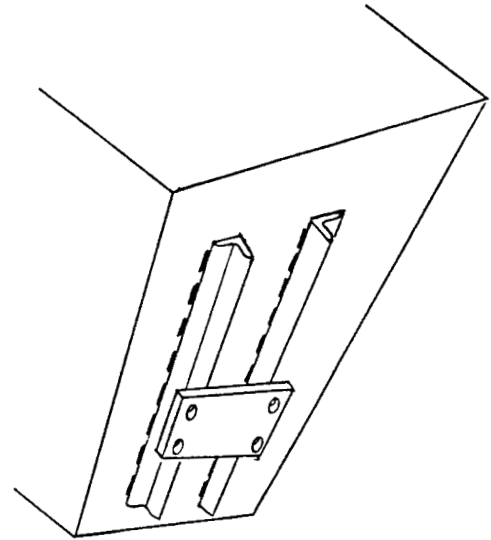


2P-200 on Dust Collector Hoppers

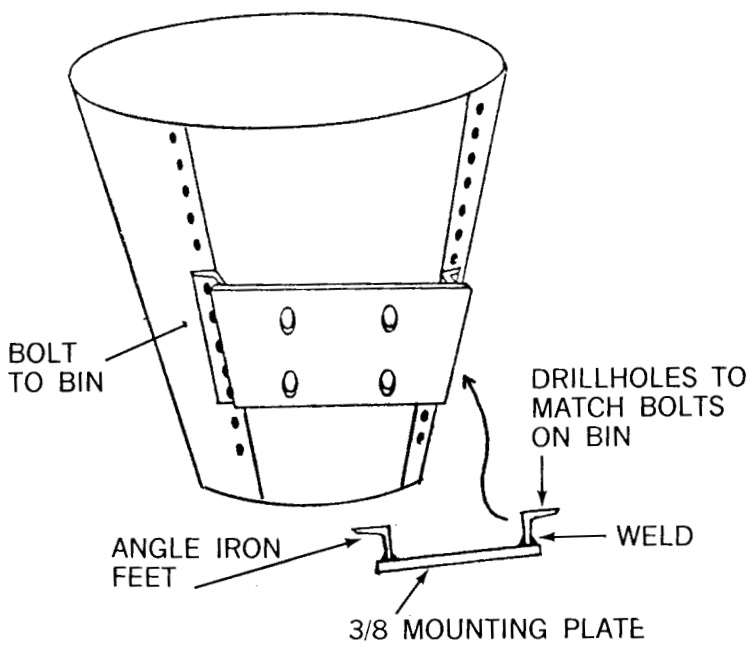
ONE VIBRATOR FOR A DOUBLE BIN



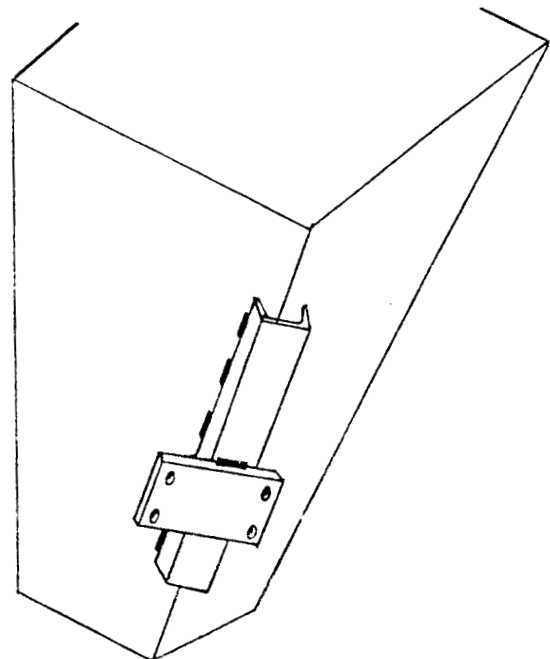
BIN WITH STIFFENERS



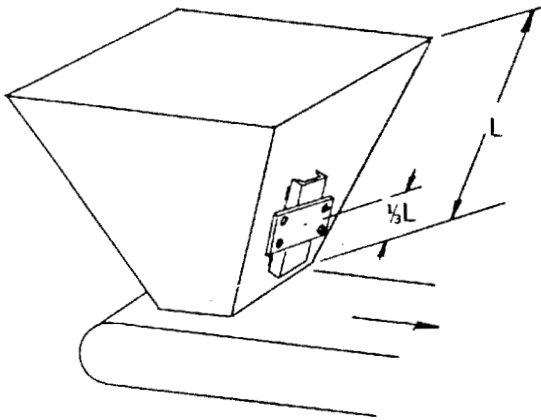
ANGLE IRON STIFFENERS
INSTEAD OF CHANNEL IRON



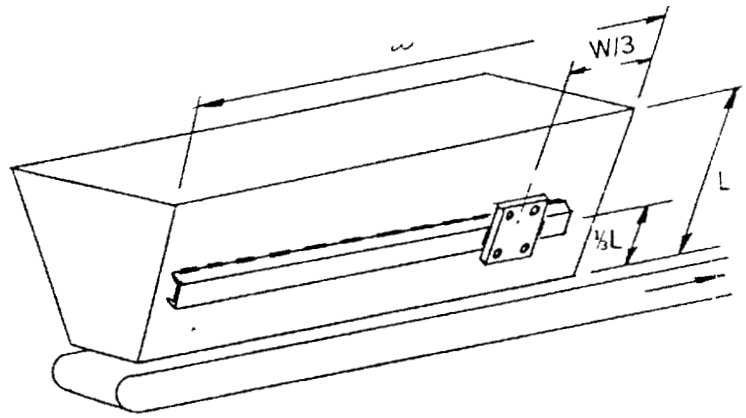
SHEET METAL BIN



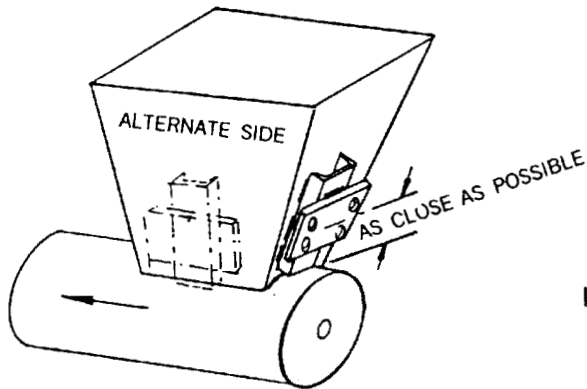
THIN SKINNED BIN — CORNER MOUNT



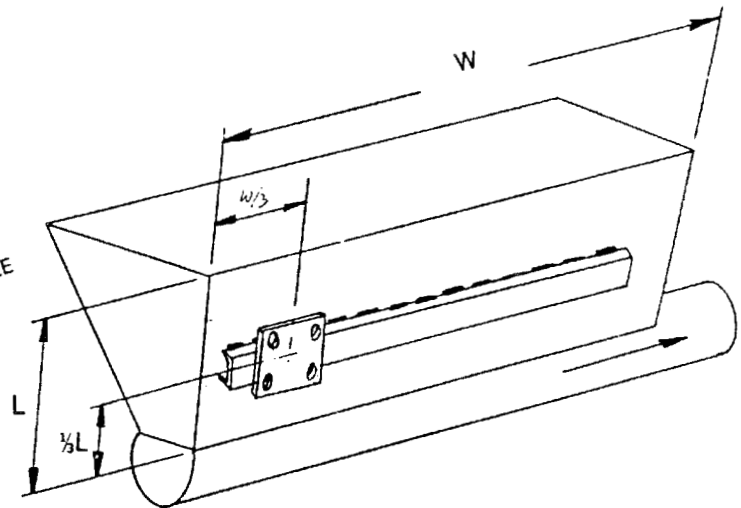
BELT CONVEYOR & STANDARD BIN



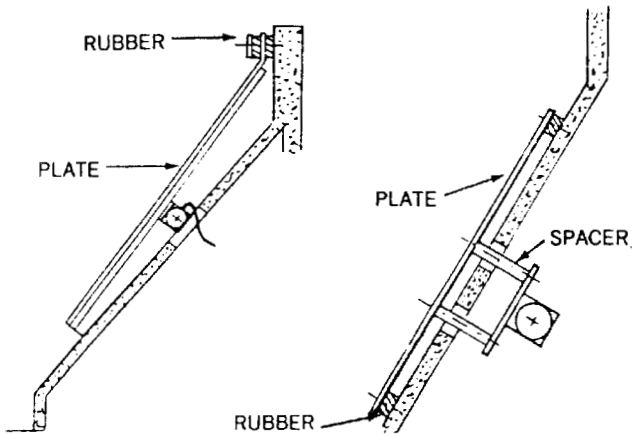
LONG BIN — Belt conveyor feeds from the front. Vibrator should be placed 1/3 from front. If 2 vibrators are used place 2nd one directly opposite 1/3 from back. Do not run back one until bin is empty in front. Stop front unit.



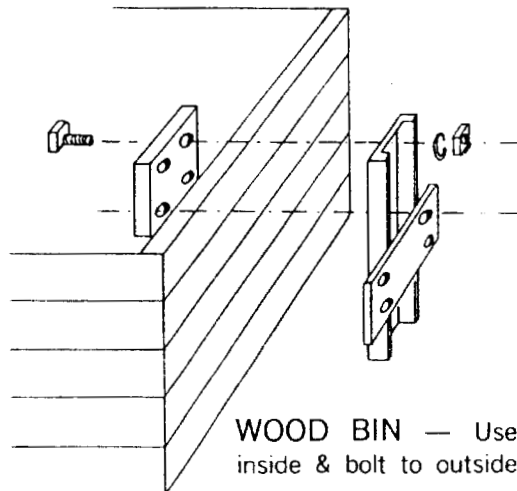
SHORT SCREW FEEDER — Place vibrator as close as possible to feeder.



SCREW FEEDER — Feeds from back. Vibrator should be placed 1/3 from back. If 2 vibrators are used place 2nd vibrator directly opposite 1/3 from front. Do not run front one until bin is empty in back. Stop back unit. For more details consult Vibco.



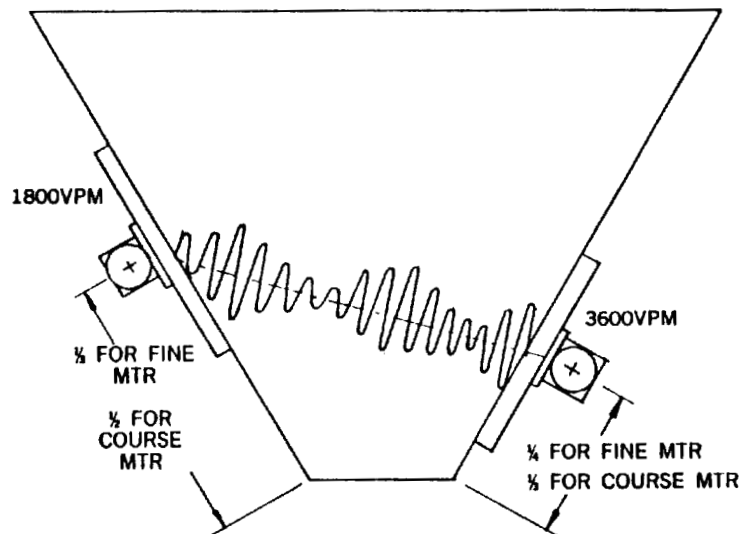
CONCRETE BIN — Mount steel plate on inside of bin - mount so that vibrator ends up 1/3 up bin side. Isolate the plate from the concrete by using vibration shock absorbers. Consult Vibco for detailed drawings.



WOOD BIN — Use steel plate on inside & bolt to outside mounting plate.

INTERFERENCE VIBRATION

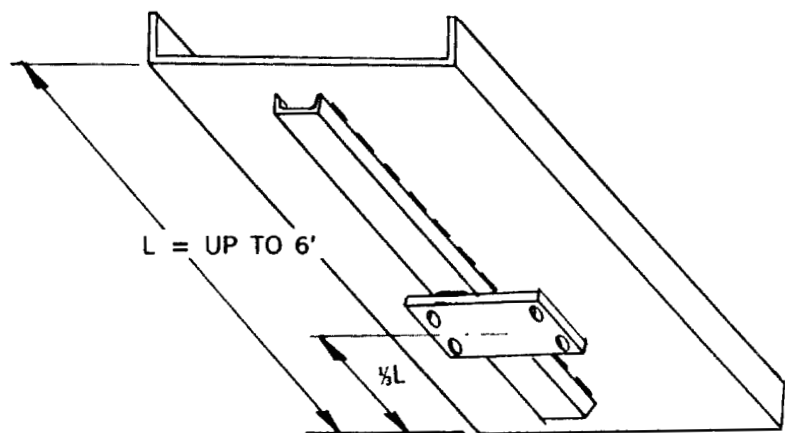
For real tough materials, large bins, bins containing different particle sizes or a bin used to store different materials, a better result in moving the material is obtained with "Interference Vibration". This is accomplished by using two vibrators on the bin with different frequencies (speed). The most common vibrator speeds are 3600 and 1800 rpm. For example: A bin containing 15,000 lbs. of material needs 1500 lbs. of vibration force. We elect to use two vibrators, one 1800 rpm 4P-700 with 700 lbs. of force max, and one 2P-450 3600 rpm with 900 lbs. max force. The 3600 rpm unit is mounted closest to the discharge, 1/3 up the bin side, the 4P-700, directly opposite and 1/2 way up the bin side. The two frequencies of the vibrators will "interfere" with each other and create a simulated vibration of $3600 + 1800 = 5400$ vpm to $3600 - 1800 = 1800$ vpm. The cycling between 5400 vpm and 1800 vpm will, in 90% of all materials, go through the materials "resonance" frequency. At "resonance" frequency, any material will flow easily and freely. This is the reason why interference vibration will move the most stubborn materials. Consult VIBCO for further details.



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CHUTES

To successfully move material in a chute, the "angle of repose" of the material has to be known. It can be found in most handbooks or can easily be measured by dumping a cup of the material on a table. The angle between the table and the cone the material makes is the angle of repose. To move the material in the chute, it should be inclined no less than 1/2 of the angle of repose. If this cannot be obtained, a feeder is necessary to move the material.



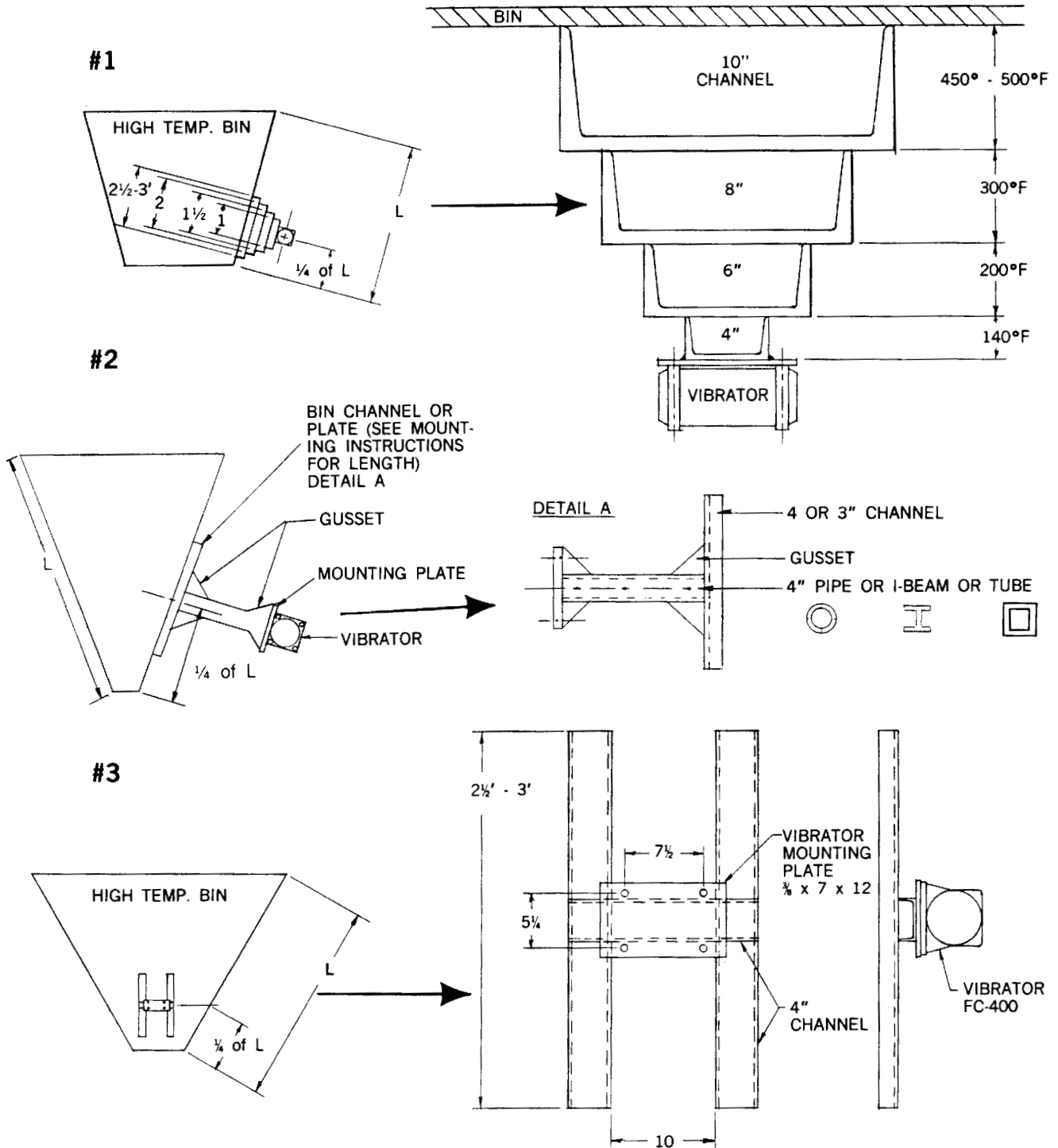
- A. Chutes up to 6' are generally handled by one vibrator mounted approximately $\frac{1}{3}$ from the discharge.
- B. On chutes over 6' to 10' long, two vibrators are needed, one should be placed 18-24" from the discharge. The other approximately in the middle. Since chutes are very sensitive to vibration, provision should be made to move the lower vibrator 6" in either direction. This could mean the difference between moving the material or not moving it.
- C. The direction of rotation of the vibrator shaft should be in the direction of material flow.
- D. Force (impact) needed on vibrator is equal to weight of chute + vibrator + max material in chute.

Chutes must have an inclination of at least 10° for vibrators to be able to move the material. If inclination is less the chute has to be made into a feeder. Contact VIBCO for selecting the proper size vibrator or ask for bulletin covering chutes.

FOR OTHER APPLICATIONS CONSULT VIBCO

HEAT MOUNTS FOR (INSULATED) BINS CONTAINING HIGH TEMP MATERIALS

When materials in bin have a temp. over 150°F, it is advisable to use a "heat" mount to prevent excessive heat reaching the vibrator causing vibrator overload or bearing failures. Also ask for "high" temp. grease in vibrator bearing and special high heat resistant winding. Consult with a VIBCO engineer.



GENERAL SERVICE INSTRUCTIONS

ELECTRIC VIBRATOR MODEL SELECTOR

<u>ELECTRICAL DATA</u>	<u>2P</u>	<u>4P</u>	<u>6P</u>	<u>8P</u>	<u>SPR</u>	<u>US</u>	<u>SFC</u>	<u>FC</u>	<u>SCR</u>
115 volt 1 phase	X	X	X	X	X	X	X	X	X
230 volt 1 phase	X	X	X	X			X	X	
Any voltage 3 phase	X	X	X	X			X	X	
50 cycles	X	X	X	X	X	X	X	X	X
Continuous duty	X	X	X	X	X		X	X	X
Intermittent duty						X			
More than 20 stops & starts per hr. 3 phase	X	X	X	X			X	X	
More than 20 stops & starts per hr. 1 phase	X1	X1	X1	X1	X	X	X1	X1	
Totally enclosed	X	X	X	X	X2	X3	X	X	X
Outside fan cooled								X	
Built in overload protection 1 phase	X	X	X	X	X	X	X	X	X
Adjustable speed	X4				X4	X			X
Adjustable eccentric	X	X	X	X		X	X	X	X
Decibel at 3' on A scale	60	60	60	60	48	90	62	62	65

<u>APPLICATION</u>	<u>2P</u>	<u>4P</u>	<u>6P</u>	<u>8P</u>	<u>SPR</u>	<u>US</u>	<u>SFC</u>	<u>FC</u>	<u>SCR</u>
Outside	X	X	X	X	X	X	X	X	X
Water splash	X	X	X	X	X	X5	X	X	X
Powder in air dry	X	X	X	X	X2	X	X	X	X
Powder in air sticky	X	X	X	X	X	X	X	X	X
Powder in air metallic	X	X	X	X		X	X		X
High temperature	X6	X6	X6	X6			X6	X	
Bins with coarse mtr.	X				X	X	X	X	X
Bins with fine mtr.	X				X	X	X	X	X
Bins lumpy or stick mtr.		X	X						
Bins with stringy mtr.		X	X	X					
Bins powdery & sticky mtr.						X			
Packing coarse mtr.	X						X	X	X
Packing fine mtr.		X							X
Stringy-fluffy mtr.			X	X					
Concrete	X					X			
Screens		X	X	X					X
Feeder-chutes	X	X	X	X					X

"X" indicates availability

X1- Model 2P, 4P, 6P, 8P, SFC, & FC are capacitor start or capacitor run motors. The capacitor manufacturer recommends max 30 stops & starts an hour.

X2- Model SPRT is totally enclosed (close to NEMA 12 general enclosure), Model SPWT is water-tight (NEMA 4)

X3- Model US-100 is of open construction, the other US models are totally enclosed (NEMA 12).

X4- See "speed adjustability."

X5- US-100 has an open construction and should not be water splashed.

X6- See "winding temperature."

CENTRIFUGAL FORCE (IMPACT)

All the electric vibrators have eccentrics attached to the motor shaft. Some are permanently fixed and some are adjustable as per below.

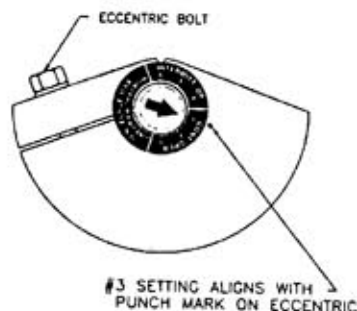
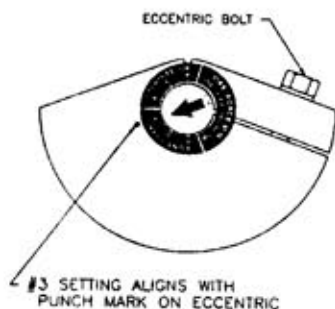
Model 2P (see 2P-75, 2P-100, US-450, SCR-200 below), 4P, 6P, 8P, FC, SFC, US-900, 1600, SCR-500, 1000 vibrators have adjustable eccentrics to give higher or lower impact to suit the application. They are adjustable as follows: Remove the end covers, both sides of the vibrator. The eccentrics will then be in view. There are two different systems of eccentrics. **First system:** The outside eccentric is secured to the inside one with a socket head cap screw. There is either 3 or 6 holes in the outside eccentric. Remove the set screw and turn eccentric to desired position, the diagram below will tell the force at the different positions. **NOTE:** The eccentric should be set at the same number on each side of the vibrator to give uniform vibration.

Second system: The eccentrics are clamped onto the shaft. They are also marked from 1 to 6. Loosen bolt holding eccentrics to shaft and swing eccentric on shaft, line up desired number (force as per table below) with arrow stamped in shaft. Secure bolt firmly. **NOTE:** Set eccentrics on both sides of vibrator on the same number.

Force (Impact) at Different Eccentric Settings in Lbs.

Model	1	2	3	4	5	6	Model	1	2	3	4	5	6
2P-75	50	75*	100										
2P-100	50	100*	150				6P-1500	800	1000	1200*	1300	1400	1500
2P-150	75	150*	300				6P-2500	1200	1600	1900*	2100	2350	2500
2P-200	150	300*	450				6P-5000	2450	3050	3850*	4150	4350	4500
2P-450	50	350	650*	900	1000	1100	6P-7500	3650	4800	5700*	6300	6650	7000
2P-800	50	500	950*	1300	1500	1700	8P-500	150	225	300*	360	425	500
2P-1700	800	1000	1500*	2000	2300	2500	8P-750	200	400	525*	650	700	750
2P-2500	0	1000	1900*	2600	3100	3500	8P-1000	200	400	600*	750	875	1000
4P-350	75	150*	300				8P-1250	700	900	1050*	1110	1190	1250
4P-600	230	270	350	425	480	500	8P-2500	1370	1750	2150*	2250	2375	2500
4P-700	0	160	325*	450	575	700	8P-4000	2100	2700	3200*	3350	3575	3750
4P-1000	275	350	550*	700	870	1000	US-900	600	950*	1100			
4P-1400	250	500	750*	1000	1200	1400	US-1600	1100	1600*	1900			
4P-2000	650	850	1200*	1500	1800	2000	SCR-200	50	125*	200			
4P-3000	1500	1800	2200	2500	2700	3000	SCR-500	150	300*	500			
4P-5000	2500	3500	3800*	4100	4300	5000	SCR-1000	50	350	675*	900	1000	1100
4P-10000	5475	7660	8550*	9000	9450	10000	SFC-100	50	100*	150			
4P-15000	8200	10500	12800*	13600	14300	15000	SFC-300	75	150*	300			
6P-300	0	100	225*	250	275	300	FC-100	75	150*	300			
6P-500	50	150	225*	300	400	500	FC-400	150	300*	450			
6P-1000	200	500	625*	750	875	1000							

* Normal setting - higher settings for intermittent use only



To Adjust Eccentric Settings:

1. Remove both end covers of vibrators.
2. Loosen the bolt that holds the eccentric to the shaft.
3. Turn the eccentric on the shaft to adjust force output. Align the arrow on the shaft to the desired setting. The higher the number, the greater the force.
NOTE: Both ends of vibrator must be at same setting.
4. Tighten eccentric bolts and reinstall end covers.
5. Figures above show eccentrics at factory setting (#3 setting).

CONTINUOUS VERSUS INTERMITTENT OPERATION

Experience has taught us that it is always preferable to use a vibrator intermittently instead of continuously.

When vibrating a bin 1/2 or more full continuously, a densification effect due to the vibration will occur in the straight part as well as the sloping part of the bin. This is especially so during low discharge rates. This densification will, in some cases, set up dead storage of dormant material in the corners of the bin. This material will not be moved out of the bin until all other material has been removed and in some cases, additional vibration force is necessary to move this material.

The intermittent operation or cycling of the vibrators will prevent this dead storage build-up, due to the vibrator exciting it's speed from 0 to maximum and then from maximum to 0 when stopping. Most materials have a resonance frequency in the 0 - maximum range. When the vibrator frequency reaches the material resonance, the vibrator force will move and vibrate the material more violently than at any other speed. This will prevent build-up and dead storage.

TIMERS

To obtain cycling automatically, a timer can easily be connected into the circuit. For a manual operation, a simple push for "on" and release for "off" switch can be installed. A micro-switch, actuated by a paddle in the material flow direction is useful to automatically control intermittent flow application, or for continuous flow installations where bridging occurs infrequently.

The "on" and "off" time is easily determined by timing the discharge; when the discharge is just above the minimum rate required, a new vibration shock is necessary to keep it moving. The vibration shock should be between 5 to 30 seconds. The very short periods have the best effect. A note has to be made: always be sure to use an "on-off" ratio of at least 1:7 for short spurts of vibration of up to 10 seconds. For example, 5 seconds on, 35 seconds off. By observing this, you will stay within the limits for the motor and it will not overheat. For shorter off time, the motor duty is called "severe duty" and the life of the motor will be severely reduced due to overheating.

Capacitor start motors have a maximum of 30 stops and starts per hour. If more frequent, the capacitor may shorten out and "blow." For more stops and starts, either use 3 phase units for larger applications or the SPR line.

SPEED ADJUSTABILITY

2P-75, 2P-100 and 2P-150 are capacitor run motors and can be speed adjusted with standard rheostat or electric speed control. All other heavy duty line 3 phase can be speed adjusted with a frequency inverter.

SFC, & FC

MODEL SFC End Mount MODEL FC Fan Cooled

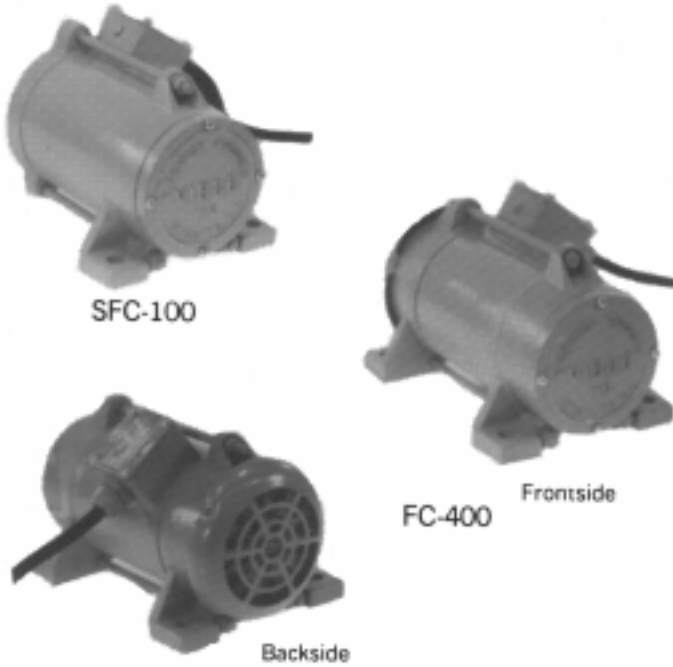
PLUS VALUES:

- **TOTALLY ENCLOSED**
- **CONTINUOUS DUTY**
- **ADJUSTABLE ECCENTRICS**
- **OUTSIDE FAN-COOLED FOR HIGH HEAT APPLICATIONS**
- **CAN TAKE ANY NUMBER OF STARTS AND STOPS**
- **1 AND 3 PHASE MODELS**

VIBCO'S POPULAR SFC VIBRATORS ARE:

favorites for use indoors and outdoors where a lightweight, totally enclosed vibrator is required to keep materials moving to automatic productions machines, in small to medium size bins, chutes, screens, etc. Ease of mounting, low amperage draw, makes these units popular for O.E.M. applications.

MODEL FC with high capacity external fan and heat resistant winding makes the FC units ideal for applications where ambient temperature is high or heat is transferred through bin skin. Consult VIBCO for application limits.



TECHNICAL DATA

Model	Ph.	Amp.	Volt***	V.P.M.**	Force (Impact) lbs./N Adjustable						dB*	Wt.	
					Min.		Norm.		Max.			lbs.	kg.
					lbs.	N	lbs.	N	lbs.	N			
SFC-100	1	4.2/2.1	115/230	3600	60	267	100	445	150	667	60	25	11.3
	3	1.6/.8	230/460									21	9.5
SFC-300	1	4.2/2.1	115/230	3600	100	445	220	979	300	1335	62	27	12.2
	3	1.6/.8	230/460									23	10.4
FC-100	1	4.2/2.0	115/230	3600	100	445	220	979	300	1335	62	34	15.4
	3	1.6/.8	230/460									31	14.1
FC-400	1	4.2/2.1	115/230	3600	150	667	300	1335	450	2002	64	35	15.9
	3	1.6/.8	230/460									32	14.5

* dB at 3' (1 meter) on A-scale N = Centrifugal force in Newton

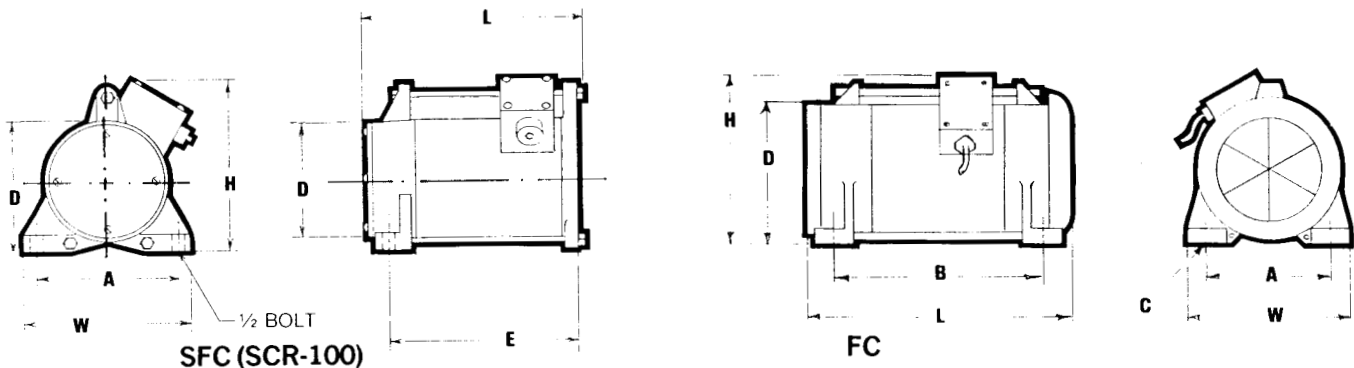
** 1800 V.P.M. (Vibrations Per Minute) available

***575 Volt available

DIMENSIONS

Model	8	203	6½	165	6¾	170	5¼	133	—	½	12	4½	114	6¾	155
SFC															
FC	10	254	6½	165	6¾	170	5¼	133	7½	190	½	12	4½	114	—

*Bolt size to be used



ELECTRIC VIBRATORS



2P-75



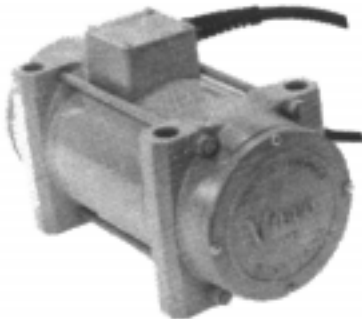
2P-100



2P-150



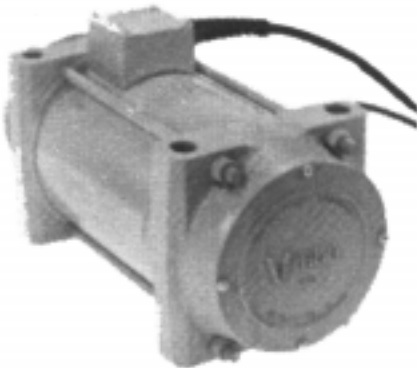
2P-200
4P-350



2P-450
4P-700
6P-300



4P-1000
6P-500



2P-800
2P-1700
4P-1400

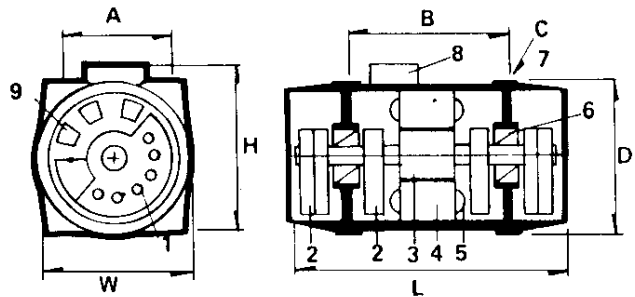
The Unbeatable

- Adjustable Eccentrics •
- Rugged •

Vibco noiseless motor vibrators made in the U.S. by skilled American Craftsmen follow American NEMA and ASTM standards. Vibco Vibrators are totally enclosed, continuous duty and completely noiseless. They can be used inside or outside, in dust, dirt, rain or snow. Vibco's lines of heavy duty vibrators will solve any vibration problem such as: speed the flow of bulk materials through the smallest bin, hopper, and chute, to the largest silo; pack materials in drums and bags; consolidate concrete in pipe, precast and prestressed industries; for screens and screeds and a variety of other industrial applications.

WHY VIBCO BECAUSE

- CHOICE — 30 - made in the U.S. heavy duty and completely self-contained units.
- DURABILITY — built stronger throughout; years of service in all types of applications, inside and outside, have proven the Vibco quality.
- EFFECTIVE — multi-directional force proven safest to your equipment and most efficient.
- NOISELESS — no more sound than an electric motor
- ECONOMY — maintenance free, no costly controls, low operating cost.
- GUARANTEE — every VIBCO is fully guaranteed both mechanically and performance-wise.
- SERVICE — over two-decades of vibration know-how, and distributors throughout the U.S.



- DESIGN — 1. Adjustable eccentrics for easy change of force to suit application.
- 2. Load equally distributed over bearings for additional life.
- 3. Unloaded rotor due to No. 2 to take excessive vibration shock without it hitting stator lamination and burning out.
- 4. Oversized electric motor for higher safety factor - watt/lbs. impact.
- 5. High heat resistant winding to take additional overload and heat.
- 6. Oversized bearings for longer life.
- 7. Mounting bolts over force center for efficient vibration transfer.
- 8. Terminal box for easy connection and change of voltage.
- 9. Internal vent holes for additional cooling in high temperature application.

VIBCO Heavy Duty Lines

- Totally Enclosed • Continuous • Completely Noiseless
- Maintenance Free • Fully Guaranteed

TECHNICAL DATA

Model	Phase	1 phase			3 phases			Force (Impact) lbs./N**** Adjustable						**dB	Weight***	
		Amperes at Volt			H.P.	Min.		Max.		lbs.	N	lbs.	N		lbs.	kg.
		115/230	230/460	575		lbs.	N	lbs.	N							
3600 VIBRATIONS PER MINUTE — 2 POLE																
2P-75	1 & 3	.5/25	.2/1	—	1/5	50	222	75	334	100	445	60	8	3.6		
2P-100	1 & 3	.5/25	.2/1	—	1/5	75	334	100	445	150	667	63	10	4.5		
2P-150	1 & 3	1.8/9	.6/3	.12	1/4	100	445	200	990	300	1335	63	19/18	8.6/8.2		
2P-200	1 & 3	3/1.5	1/5	.45	1/3	150	667	300	1335	450	2002	62	30/28	23.6/12.7		
2P-450	1 & 3	5/2.5	1.2/6	.5	1/2	50	489	650	2002	1100	4004	64	48/34	21.8/15.4		
2P-800	1 & 3	8/4	2/1	.8	3/4	50	2002	950	3893	1700	7563	70	85/80	38.6/36.3		
2P-1700	3	—	3/1.5	1.2	1 1/2	800	3782	1500	7341	2500	11123	72	90	31.8		
2P-2500	3	—	5/2.5	3.0	2	1700	7563	2450	10900	3500	15572	73	95	43.1		
2P-3500*	3	—	5/2.5	1.7	2	1700	7563	2450	10900	3500	15572	75	95	43.1		
2P-4500*	3	—	5.5/2.8	3.1	2	2200	9790	3150	14018	4500	20021	76	98	44.5		
2P-5500*	3	—	8/4	3.2	3	2700	12015	4600	20470	5800	25810	72	155	70.5		
*Special Bearings for Concrete Applications. 1800 VIBRATIONS PER MINUTE — 4 POLE																
4P-350	1 & 3	4/2	1/5	.3	1/4	100	445	200	890	300	1335	60	33/31	15/14		
4P-600	1 & 3	4.2/2.1	1/5	.3	3/8	280	1246	370	1646	500	2225	60	36/34	16.4/15.5		
4P-700	1 & 3	6/3	1.2/6	.6	1/2	300	1335	500	2225	700	3114	63	51/40	23.2/18.2		
4P-1000	1 & 3	6.2/3.1	1.2/6	.6	1/2	350	1557	700	3114	1000	4449	63	54/43	24.6/19.6		
4P-1400	1* & 3	*—	3.5/1.8	1.2	1	600	2669	1100	4894	1400	6229	70	70/63	31.8/28.8		
4P-2000	3	—	4/2	1.6	1 1/2	1000	4449	1500	6674	2000	8898	72	98	44.5		
4P-3000	3	—	6/3	2.4	2 1/2	1500	6674	2200	9788	3000	13347	74	155	70.3		
4P-5000	3	—	6/3	2.4	3	2500	11123	3800	16906	5000	2245	75	195	88.5		
4P-10000	3	—	10/5	4	5	5475	24358	8550	38039	10000	44490	76	495	225		
4P-15000	3	—	24/12	10	7.5	8200	36482	12825	57058	15000	66735	76	660	299		
1200 VIBRATIONS PER MINUTE — 6 POLE																
6P-300	1 & 3	4/2	1.2/6	.5	1/4	150	667	200	890	300	1335	60	48/34	21.8/15.4		
6P-500	1 & 3	4.2/2.1	1.6/8	.5	1/4	150	667	300	1335	500	2225	60	52/38	23.6/17.2		
6P-1000	3	—	4/2	1.6	1	500	2225	750	3337	1000	4449	72	98	44.5		
6P-1500	3	—	6/3	2.4	1 1/2	800	3559	1200	5339	1500	6674	74	155	70.3		
6P-2500	3	—	6/3	2.4	2	1200	5339	1900	8453	2500	11123	75	195	88.5		
6P-5000	3	—	10/5	4	3	2450	10900	3850	17129	4500	20021	76	495	225		
6P-7500	3	—	24/12	10	5	3650	16239	5700	25359	7000	31143	76	660	299		
900 VIBRATIONS PER MINUTE — 8 POLE																
8P-500	1 & 3	—	4/2	1.6	1/4	150	667	300	1335	500	2225	65	98	44.5		
8P-750	3	—	6/3	2.4	1/4	400	1780	650	2892	750	3337	74	165	74.8		
8P-1250	3	—	6/3	2.4	1	700	3114	1050	4671	1250	5561	75	195	88.5		
8P-2500	3	—	10/5	4	1 1/2	1370	6095	2150	9565	2500	11123	76	495	225		
8P-4000	3	—	24/12	10	2	2100	9343	3200	14237	3750	16684	76	660	299		

* Consult factory for availability

Note: Most Vibrators available in both 50 & 60 cycles. 115 to 575 volt.

** Decibel at 3' (1 meter) on A scale

***First figure 1 phase units, the other 3 phase units

**** N = Centrifugal Force in Newton

The VIBCO Engineer is at your disposal for supplying you with the recommendations, engineering data, mounting instructions and installation drawings. Our Field Engineers have a thorough knowledge built up through years of practical experience in applied vibration. All recommendations are free and without obligation.

NOISELESS — AS LOW AS 60dB AT 3' ON A-SCALE

ELECTRIC VIBRATORS



2P-2500

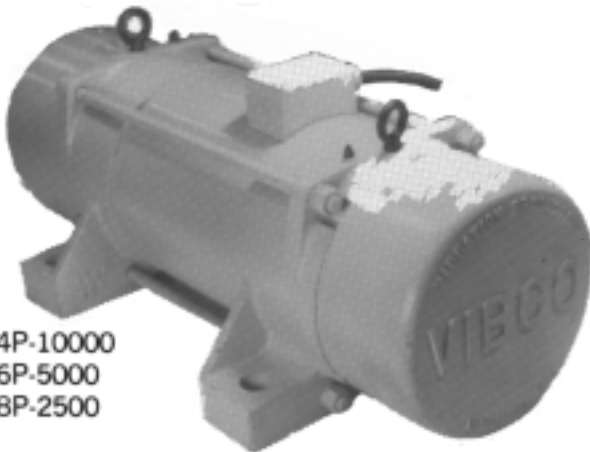
4P-2000
6P-1000
8P-500



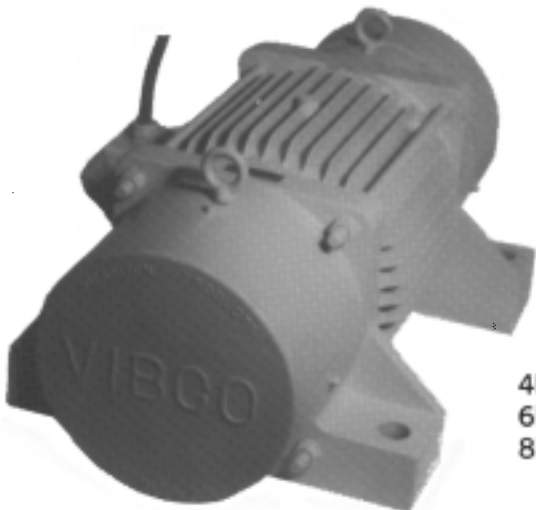
4P-5000
6P-2500
8P-1250



4P-10000
6P-5000
8P-2500



4P-15000
6P-7500
8P-4000



The Unbeatable

2P Models with 3600 rpm are the most versatile and popular vibrators. Centrifugal force output from 50-3500 lbs. used on all types of bins containing fine to granular materials, for packing coarse materials and casting concrete, etc.

4P Models with 1800 rpm have a force output of 100 to 15,000 lbs. Used on bins containing lumpy or sticky materials for packing light fluffy materials, also a typical screen vibrator.

6P & 8P Models with 1200 & 900 rpm are used in applications requiring low frequency and very high amplitude vibration such as screening and packing of very light and fluffy materials.

FORCE OUTPUT: 50-150 lbs.

Force output 50-150 lbs. Model 2P-75 & 2P-100, smallest in the line. For bins up to 10 cu. ft. capacity. Typical uses: powder hoppers, filling machines, feeding tracks, small O.E.M. applications. Comes in both single phase 115 volt and 3 phase. Single phase units speed adjustable with standard rheostat.

FORCE OUTPUT: 50-300 lbs.

Force output 50-300 lbs., Model 2P-150. For bins up to 20 cu. ft. Adjustable eccentrics with 3 force settings. Typical uses: batchers, supply and blending hoppers.

FORCE OUTPUT: 150-450 lbs.

Force output 150-450 lbs. Model 2P-200, 4P-350. For bins up to 50 cu. ft. or 3 ton. Model 2P-200 the most popular unit for the larger bins in the small bin group. A unit to standardize on for the indoor filling bins. Typical uses: Model 2P-200, batchers, surge hoppers, chutes; 4P-350, screening and scalping of parts, packaging: conveyors and tables.

FORCE OUTPUT: 100-900 lbs.

Force output 100-900 lbs., Model 2P-450, 4P-700 & 1000, 6P-300 & 500. Model 2P-450, our most popular vibrator, to be used on bins up to 25 tons. Can be used on the small to large chemical, food, foundry, and concrete bins. It's low cost makes it a true unit to standardize on. The just-right-size and weight, under 50 lbs., makes it ideal to use for packing and casting tables, for precast and prestressed forms, and other portable installations.

Model 4P & 6P. Excellent units for the medium size screen in foundry, chemical or food industries, packing powder materials in cartons, barrels or boxes.

FORCE OUTPUT: 450-1700 lbs.

Force output 450-1700 lbs., Model 2P-800. For bins with capacity of 25-50 tons. The unit with the reputation of "lasting forever." It's oversized bearings truly make it operate year in and year out without any maintenance. Typical uses: railroad car-shakers, cement silos, stone bins, large screens, concrete tables.

FORCE OUTPUT: 700-3500 lbs.

Force output 700-3500 lbs. Models 2P-1700 & 2500, 4P-1400 & 2000, 6P-1000 & 8P-500. For bins of 100-200 ton capacity. Typical uses: coal bunkers, chip silos, concrete pipe, precast tables, packing, chutes and screens. The lower rpm units especially for packing tables and screens.

FORCE OUTPUT: 3500-15,000 lbs.

Force output 3500-15,000 lbs. Models 4P-3000, 500, 10,000 and 15,000, 6P-1500, 2500, 5000 & 7500; 8P-750, 1250, 2500 & 4000. The only vibrators with large enough force and amplitude to move such stubborn materials as cinder, coal, lime, clay, ore, etc., in the large bunker or silo, the large screen or chute or wherever a giant vibration shock is needed to break material loose and moving.

VIBCO Heavy Duty Lines

DIMENSIONS

Model	Phase	L Inch/mm		W Inch/mm		H Inch/mm		A Inch/mm		B ± 1/16 Inch/mm		C** Inch/mm		D Inch/mm	
2P-75	1 & 3	7 1/2	190	4 1/8	105	5	127	3	76	4 11/16	119	5/16	8	3 9/16	90
2P-100	1 & 3	8 3/16	208	4 1/8	105	5	127	3	76	4 11/16	119	5/16	8	3 9/16	90
2P-150	1 & 3	10 3/4	258	4 7/8	124	6 1/4	160	3 1/2	89	6 3/8	162	1/2	12	4	102
2P-200 4P-350	1 & 3	11 3/16	284	5 3/4	145	6 3/8	162	4 1/2	114	7	178	1/2	12	5 1/16	130
4P-600	1 & 3	13	330	5 3/4	145	6 3/8	162	4 1/2	114	7 7/8	200	1/2	12	5 1/16	130
2P-450 4P-700* 6P-300	1	13 1/2	343	6 1/2	165	7 3/8	187	5	127	8 3/8	210	5/8	16	6	152
	3	12 3/8	312	6 1/2	165	7 3/8	187	5	127	7 5/8	194	5/8	16	6	152
4P-1000 6P-500	1 3	15 1/2	394	6 1/2	165	7 3/8	187	5	127	8 3/8	210	5/8	16	6	152
	1	14 3/4	375	7 1/4	184	8 1/2	216	5 1/2	140	9 5/8	244	5/8	16	7	178
2P-800	3	13 1/2	343	7 1/4	184	8 1/2	216	5 1/2	140	8 5/8	215	5/8	16	7	178
2P-1700 4P-1400	3 1 & 3	16 1/2	420	7 1/4	184	8 1/2	216	5 1/2	140	10 13/16	275	5/8	16	7	178
2P-2500 2P-3500	3	17 3/8	441	7 1/4	184	8 1/2	216	5 1/2	140	11 5/8	291	5/8	16	7	178
2P-4500	3	18 7/8	480	7 1/4	184	8 1/2	216	5 1/2	140	11 5/8	291	5/8	16	7	178
2P-5500	3	22 1/4	565	10 1/4	260	10 1/2	267	7 7/8	200	12 13/16	325	1	25	8 7/8	225
4P-2000 6P-1000 8P-500	3 3 1 & 3	18	457	7 1/4	184	8 1/2	216	5 1/2	140	10 13/16	275	5/8	16	7	178
4P-3000 6P-1500 8P-750	3	21 1/2	546	10 1/4	260	10 1/2	267	7 7/8	200	12 3/4	325	1	25	8 7/8	225
4P-5000 6P-2500 8P-1250	3	24	610	10 1/4	260	10 1/2	267	7 7/8	200	12 13/16	325	1	25	8 7/8	225
4P-10000 + 6P-5000 + 8P-2500 +	3	29 3/4	756	15 5/8	397	13	330	12 5/8	321	15 1/2	395	1 1/4	32	10 3/4	273
4P-15000 + 6P-7500 + 8P-4000 +	3	31 3/4	806	19	483	15	380	16	405	18 1/2	470	1 1/4	32	11 3/8	290

*4P-700, 3 phase dimensions same as 1 phase

**Bolt Size

+Use Figure 2 for dimensions

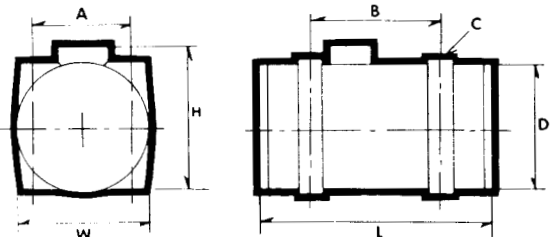


Fig. 1

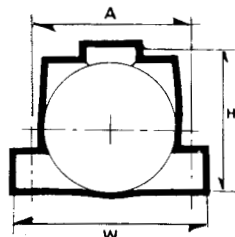
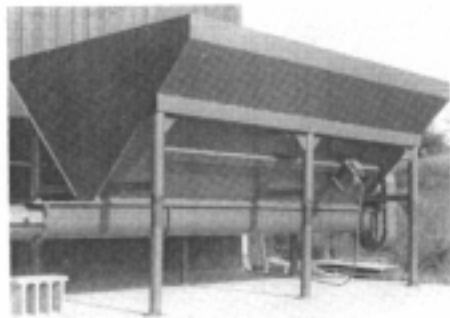


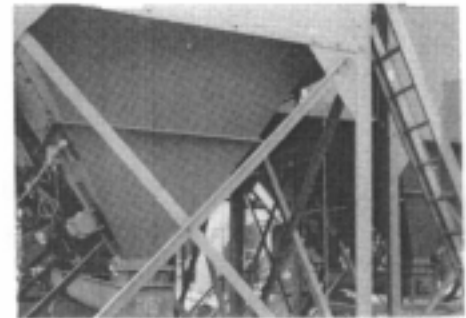
Fig. 2



Vertically mounted 2P-450 on



4P-700 on Woodchip Bin with Screw



2P-200 on Dust Collector Hoppers

LUBRICATION INSTRUCTIONS

The ball bearings in the 2P-75, 2P-200, 2P-450, 4P-350, 4P-700, 4P-1000, 6P-500, FC, SFC, SPR, US, and SCR, are pre-lubricated for life. Model 2P-800 has one pre-lubricated ball bearing and one roller bearing. All other models have two roller bearings. The life of the roller bearings reach far beyond the ball bearings, however, the roller has a larger contact area than the ball and need more lubricant. Therefore they have to be re-lubricated at certain intervals. For vibrators with 3450 RPM, every two weeks for continuous duty or 400 or 500 operating hours; for 1725 RPM vibrators, every 1000 to 2000 operating hours or every month for continuous duty. The amount of lubricant should be 2.5 to 3 grams (two pumps with standard manual grease gun). Do not overgrease, if too much grease, it will leak out. By removing the end cover you will find out if unit has been excessively over-greased. Clean out excess grease. The same amount is on inside of bearings on stator side. If too heavy, unit should be taken apart and cleaned. For vibrators without grease nipple, (2P-800), the outside eccentric and bearing cover have to be removed. If the bearing has a grease seal, remove it and discard it, remove as much as possible of the old grease and repack bearing.

RECOMMENDED LUBRICANT

American Oil Co., Rykon #2 EP, or Chevron BRB #2, or other comparable lithium base lubricant with a temperature range of 300°F; for 4P-10000 use lithium base lubricant with a temperature range of 350°F.

TROUBLE SHOOTING DIAGRAM

Vibrator does not start: short in lines; burned out overload protection; short in winding, check with ohmmeter.

Overload protection shuts off vibrator.

Vibrator overloaded, caused by:

1. Bad Bearings
2. Bolts holding vibrator are loose.
3. Fatigue cracks in structure to be vibrated.
4. Structure to be vibrated too weak, reinforce structure by welding on additional stiffeners.
5. Excessive ambient heat.
6. One phase open, check: (a) Power source; (b) wiring.

TEST PROCEDURE FOR ELECTRIC VIBRATORS, FOR SHORT, BURNED OUT WINDING, CONTINUITY TEST, ETC.

SINGLE PHASE

Model 2P-75 - Remove red, black and white wire from switch and capacitor in switch box, test with continuity meter between black-white (running circuit), black-red (starting circuit), and white and red - all should show a reading, lowest reading between black and white. If all readings are different, stator is OK; then check out the rest of the cable, switch for loose or cut wires, test capacitor with continuity meter.

Models with 4 wires from stator to conduit box — Disconnect all wires in the conduit box. Continuity should show between (10) 5 & 8 (starter winding) and 1 & 4 (running winding).

Models with 6 wires — Disconnect all wires in conduit box. Continuity should show between 5 (10) & 8 (starter winding) / 1 & 2; 3 & 4 (running winding).

THREE PHASE

3 wires from stator to conduit box, this stator is single voltage, could be 220, 230 volt, 440, 460, 480 volt or 550, 575 volt. Continuity should show between any two wires.

9 wires from stator to conduit box, disconnect all wires, continuity should show between 1 & 4; 2 & 5; 3 & 6; 9 & 7; 9 & 8; 7 & 8.

NOTE: ALWAYS MAKE SURE THAT THE DATA STAMPED ON THE NAMEPLATE CORRESPONDS TO POWER SOURCES.

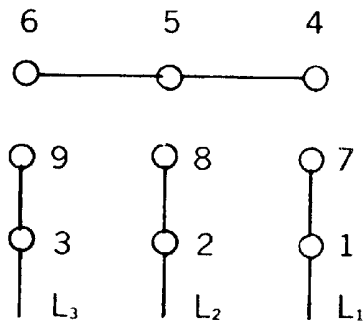
NOTE: ALWAYS CHECK FOR SHORT BETWEEN LEAD WIRES AND GROUND.

CONNECTION DIAGRAMS

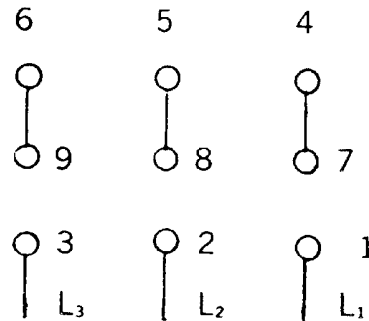
Model SFC, FC, 2P-150 and larger 2P, 4P, 6P and 8P units have DUAL voltage in 3 phase 230/460 volt. To change from one voltage to another, remove cover on conduit box and reconnect as per diagram below.

Note: Some wires are color coded as follows:

1 -- Blue	4 -- Yellow	7 -- Pink
2 -- White	5 -- Dark gray	8 -- Red
3 -- Orange	6 -- Purple	9 -- Light gray



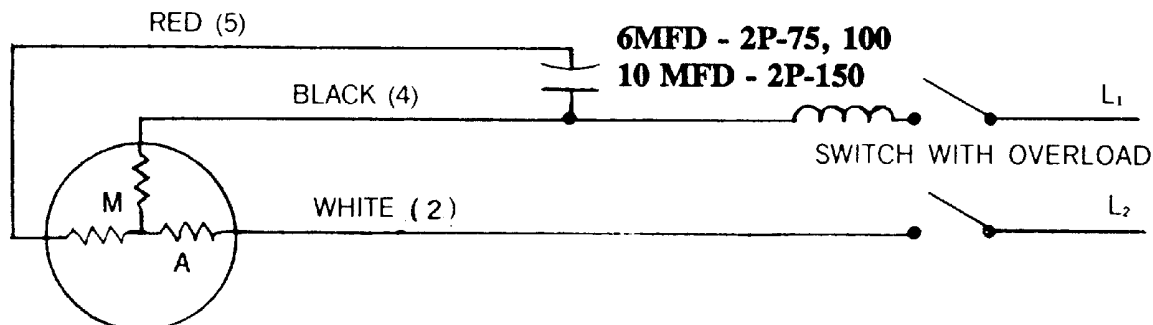
220 or 230 Volt



440 or 460 Volt

To change rotation of rotor, interchange any two lead wires, (1, 2, or 3). This is done either in conduit box or at the plug.

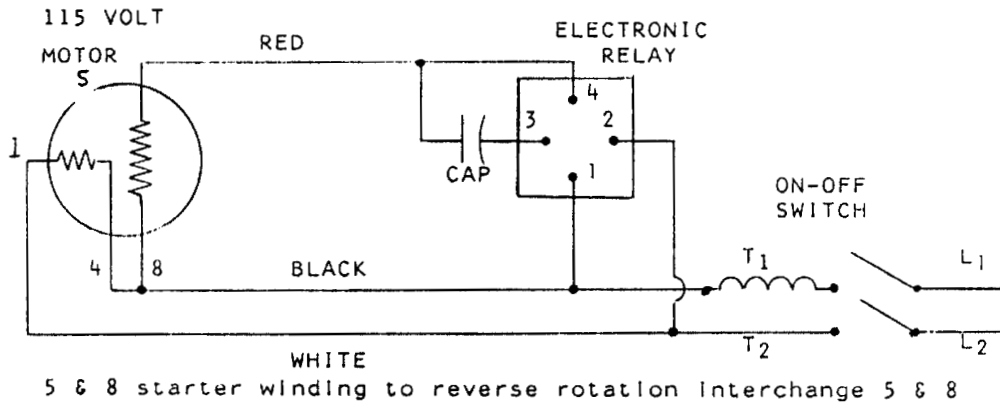
MODEL 2P-75, 2P-100 & 2P-150 SINGLE PHASE 115 VOLT ARE CAPACITOR RUN VIBRATORS



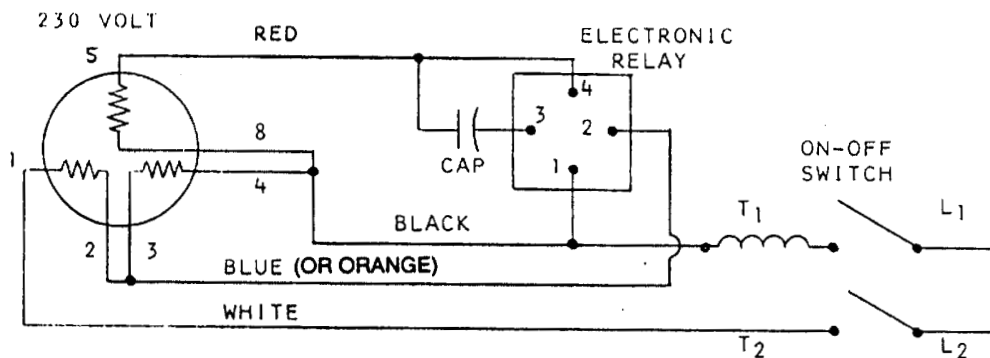
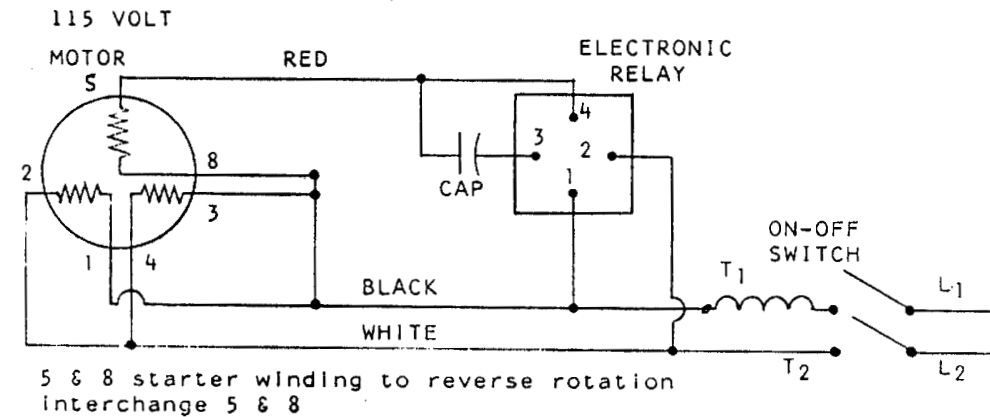
NEW ELECTRONIC RELAY (SEE SERIAL NUMBERS LISTED BELOW)

Models 2P-200, 4P-350, SFC & FC vibrators are capacitor start vibrators with an electronic relay (solid state switch) instead of a voltage or current relay. The wiring diagram below should be followed.

NOTE: The electronic relay is supplied from serial numbers (2P-200 62E..., 4P-350 72E..., SFC-100 41C..., SFC-300 43C..., FC-100 50B..., FC-400 53C...) for 115 volt, 1 phase, 60 cycles.



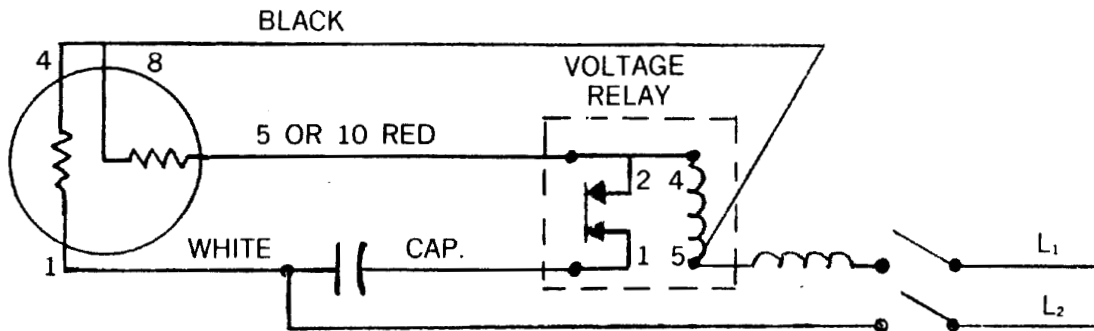
Models 2P-200, 2P-450, 2P-800, 4P-700, 4P-1000, & 6P-500 are capacitor start motors with dual voltage winding 115/230 volt (6 wires in conduit box). Serial numbers 2P-450, 64F...; 4P-700, 73D...; 4P-1000, 78B...; 6P-300, 80B...; 6P-500, 81B...; these units are supplied with an electronic relay (solid state switch) instead of a voltage relay. The wiring diagram below should be followed:



- NOTE:
1. A 5 wire cable is needed from motor to control box.
 2. 5 & 8 starter winding, to reverse rotation, interchange 5 & 8.
 3. Capacitor and switch does not have to be changed for 220 volt operation, the overload heater in switch should be changed to new motor amperage to properly protect the motor for overload.

MODEL 2P-200, 4P-350, FB, SFC AND FC VIBRATORS ARE CAPACITOR START
VIBRATORS WITH VOLTAGE RELAY AND SINGLE VOLTAGE WINDING
(4 Wires in Conduit Box)

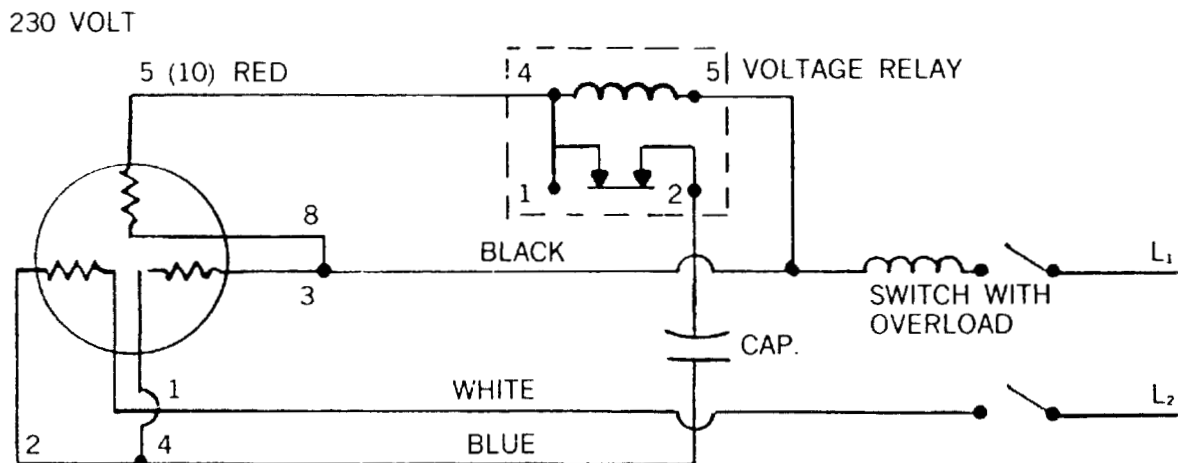
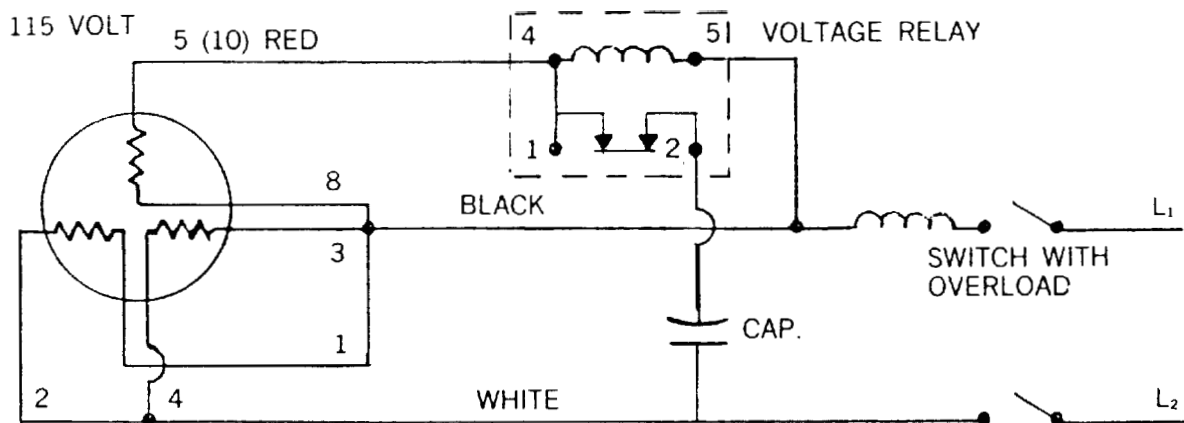
The starting relay (voltage relay) is designed to use with capacitor start induction run single phase motors. The relay functions as follows. The relay (closed) contacts connect the start winding with the running winding. As the motor approaches running speed, the relay coil across the start winding operates (pulls in) on the generated back E.M.F. force. This opens the circuit and disconnects the start winding from the circuit. The motor should come up to speed quickly and the relay should operate just before full running speed is attained. If relay clatters excessively, a slight adjustment is possible by bending the relay armature tail-piece to change the normal armature coil gap. A larger gap raises the pull in point and a smaller gap drops the pull in point. **DO NOT MAKE ADJUSTMENTS WITHOUT THE USE OF A VOLTMETER.** **NOTE:** Make sure that the armature tail-piece rests on the brass frame and not on the frame.



MODEL 2P-450, 2P-800, 4P-700, 6P-500 ARE CAPACITOR START MOTORS WITH
VOLTAGE RELAY AND DUAL VOLTAGE WINDING 115/230 VOLT
(6 Wires in Conduit Box)

To change from one voltage to the other, follow the diagram above. **NOTE:** The capacitor or relay does not have to be changed. You must use a 5 wire cable for 230 volt from conduit box to starter box.

To change rotation, interchange 5 & 8 leads in conduit box.



To change rotation interchange wire 5 & 8 in conduit box on vibrator.

IMPORTANT

SINGLE PHASE MOTORS - MODELS SFC, FC, 2P, 4P, 6P AND 8P

If unit starts but only runs for less than a couple of minutes, then the overload protection will turn off vibrator. Check the following:

1. Voltage at vibrator has to be minimum 105 volt for motor and starting relay to operate properly. (If long cord is used from power supply and there is too much of a voltage drop, use a larger wire in extension cord; if it was #16, use #14, or #12)
2. If voltage is okay but vibrator still does not work, remove it from it's mounting. Put it on a rubber mat or similar mat and run it. If it operated okay on the mat, it was drawing too much amperage when mounted. Remount vibrator and check amperage. If too high, (higher than what is stamped on the nameplate) do the following:

Lower the impact on the unit by changing the eccentrics to a lower setting (#1 for example) or better stiffen up the structure to be vibrated by welding or reinforcing angle or channel irons next to vibrator. See service and mounting instructions.

3. On units started with a capacitor, capacitor may have blown for too much overload. If it is blown (the little red cap will usually have broken and some of the fluid inside it leaked out) change capacitor and try vibrator again. For internal short in capacitor, check it for leakage.

If the above will not start the unit, let a certified electrician check it



Model US

MODEL US High Frequency Line

PLUS VALUES:

- **HIGH SPEED**
- **RUGGED**
- **SPEED ADJUSTABLE**
- **115 VOLT PLUG IN**

VIBCO's Model US High Frequency line are 115 volt single phase motors with low amperage draw. They can be plugged into any light outlet or operated from field generators. All units are speed adjustable with rheostat or electronic speed controls. US-900 and 1600 have adjustable eccentrics. The US line is, due to the high frequency, rated for intermittent operation.

HIGH FREQUENCY VIBRATORS IDEAL FOR ALL CONCRETE WORK

PLUS VALUES:

- | | |
|---|---|
| FOR CONCRETE PRODUCT <ul style="list-style-type: none"> • Faster pouring • Less cement needed • Greater density • Smoother finish • Faster form removal | FOR VIBRATOR <ul style="list-style-type: none"> • Totally enclosed • High impact • Light weight • Assortment of brackets available |
|---|---|

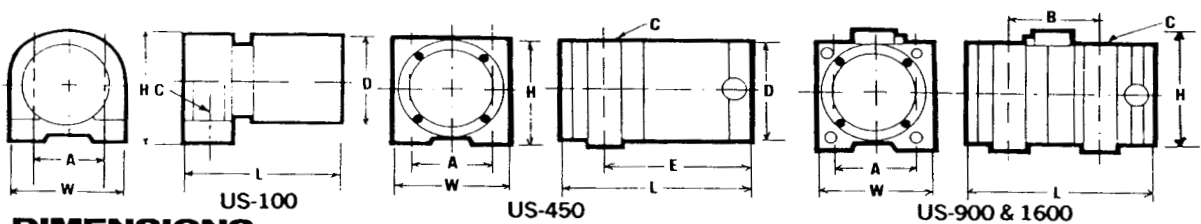
Casting Concrete. Model US is ideal both at the precast plant on tables, vaults, septic tanks, patio blocks, steps, etc., and at the construction site giving "architectural" finishes and fireproofing to poured-in-place walls and columns. Model US-900, the most popular unit for septic tanks, burial vaults, step forms, for architectural surface finish and fireproofing columns, casting tables for up to 300 lbs. of product. US-1600 - the problem solver - for similar applications as the US-900. See page 35 and 36 for different brackets.

Bins & Weigh-Batchers. The US-450 has become the standard unit throughout the industry for weigh-batchers. The US-900 and US-1600 for moving powdery and sticky materials in bins and chutes.

Fatigue and Test Tables. For verifying integrity of electric circuits, removing dangerous residues, detect marginal connections.

TECHNICAL DATA

Model	1 Phase Amperes at Volt 115/230	3 Phase Amperes at Volt 230/460	Force Impact						dB**	Weight**	
			Min.		Norm		Max			lbs.	Kg.
			lbs.	N	lbs.	N	lbs.	N			
HIGH FREQUENCY											
US-100	.65/-	—	Speed Adjustable To				100	445	78	4	1.8
US-450	3.0/-	—	Speed Adjustable To				450	2002	80	13	5.9
US-900	4.5/-	—	600	2669	900	4004	1100	4894	85	18	8.2
US-1600	5.0/-	—	1100	4894	1600	7118	1900	8453	85	20	9.1



DIMENSIONS HIGH FREQUENCY

Model	A		B		C		D		E		L		W		H	
US-100	5	127	—	—	1/8	10	4	102	5 1/2	140	6	171	6	152	4 1/4	108
US-450	3 1/2	89	—	—	1/8	12	4	102	6 1/2	165	8	210	4	124	4 1/4	105
US-900	3 1/2	89	6 1/4	175	1/2	12	4	102	—	—	11 1/2	283	4	124	6	160
US-1600	4	114	7	178	1/2	12	4 1/4	184	—	—	11 1/4	286	5	143	5 1/4	143

MODEL US SERIES SERVICE INSTRUCTION

BRUSH LIFE

Average brush life is at least 1,000 hours. The brush life is dependent on the duty cycle.

DUTY CYCLE

All US series are intermittent duty motors. "Time-On" equals "Time-Off," with "Time-On" not exceeding 30 minutes each hour.

Drilling holes in the end covers to provide the unit with ventilation will increase the duty cycle. The duty cycle has to be determined in each such particular application. A temperature test of the field casing can help determine the duty cycle, with the temperature not exceeding 180°.

It must be noted that a longer duty cycle considerably decreases the brush life.

VIBCO's liability under the guarantee does not cover a duty cycle longer than 30 minutes.

LUBRICATION

Bearings are pre-lubricated for life.

ADJUSTABILITY

1. Speed. The speed of all units can be controlled with rheostats or solid state speed controls.
2. Eccentrics. Model US-100 and 450 have fixed eccentrics and are not adjustable. Models US-900 and US-1600 are equipped with adjustable eccentrics. Removal of both end covers allows access to the eccentrics. The adjustment of the eccentrics can be made by removing the cap screw and turning the outside eccentric to the desired setting. Setting #1 is minimum and Setting #3 is maximum. Eccentrics on both sides must have the same setting.

NOTE: The speed of the unit will vary with the load. Data is calculated at "no load" speed. Maximum load is not to exceed a load allowing at least 5,000 RPM at full voltage.

TROUBLE SHOOTING

If vibrator does not start:

1. Short in lines--check line.
2. Brushes worn, carbonized or dity--replace or clean.
3. Fuse in speed control or line burned out--check lines.
4. Short in winding--check with ohmmeter.
5. Bearings making noise or binding--replace.



Model PX

MODEL PX Explosion Proof

PLUS VALUES:

VIBCO NOW OFFERS THE FIRST AMERICAN MADE EXPLOSION PROOF MOTOR VIBRATOR IN NEMA 42, 48, 56 AND 182 FRAME SIZES.

MODEL 2PX-200 AND 4PX-350--42 FRAME AND 2PX-450 AND 4PX-700--48 FRAME, ARE SUPPLIED IN 3 PHASE AND SINGLE PHASE IN CLASS 1, GROUP D, DIV. 1&2.

MODEL 4PX-2000--56 FRAME AND 4PX-5000--182 FRAME, ARE SUPPLIED IN 3 PHASE, CLASS 2, GROUP F&G, DIV. 1&2.

THE ECCENTRICS HAVE 6 ADJUSTABLE FORCE SETTINGS FOR EASY ADJUSTMENT TO MATCH IMPACT FORCE TO APPLICATIONS.

OVERSIZED ROLLER BEARINGS IN MODEL 4PX-2000 AND 4PX-5000 ASSURE EXTRA LONG LIFE. ACCESSIBLE LUBRICATOR NIPPLES MAKE THEM EASY TO LUBRICATE.* THE OTHER MODELS HAVE BALL BEARINGS WHICH ARE PRELUBRICATED FOR LIFE.

*SEE HEAVY DUTY LUBRICATION INSTRUCTIONS

TECHNICAL DATA

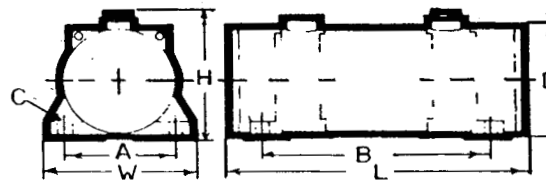
Model	Ph.	Amp.	Volt***	V.P.M.**	dB*	Wt.	
						lbs.	kg.
2PX-200	1	3.4/1.7	115/230	3600	60	20	9.1
	3						
2PX-450	1	5/2.5	115/230	3600	62	56	25.5
	3						
4PX-350	1	3.4/1.7	115/230	1800	62	20	10
	3						
4PX-700	1	6/3	115/230	1800	64	58	26.4
	3						
4PX-2000	3	3.6/1.8	230/460	1800	72	130	59
4PX-5000	3	5.2/2.6	230/460	1800	75	240	109

* dB at 3' (1 meter) on A-scale N = Centrifugal force in Newton ** 1800 V.P.M. (Vibrations Per Minute) available ***575 Volt available

DIMENSIONS

MODEL	L	W	H	A	B	C*	D
2PX 200	14 7/8	6 3/4	5 1/4	5 1/2	11 3/4	1/2	4 1/2
2PX 450	14 1/2	8 1/4	5 3/4	6 5/8	9 5/8	5/8	5 3/8
4PX 350	16 7/8	6 3/4	5 1/4	5 1/2	11 3/4	1/2	4 1/2
4PX 700	14 1/2	8 1/4	5 3/4	6 5/8	9 5/8	5/8	5 3/8
4PX 2000	18	12 7/8	11 1/8	10	13 11/16	1	7 7/8
4PX 5000	20 1/2	15 7/8	14 1/2	13	17	1	10 3/4

*Bolt Size



ECCENTRIC SETTINGS	1	2	3	4	5	6
2PX-200	140	270	385	470	520	540
4PX-350	95	180	255	310	345	356
2PX-450	320	840	900	1100	1220	1260
4PX-700	160	300	425	520	580	600
4PX-2000	550	1050	1500	1850	2050	2100
4PX-5000	1721	3338	4746	5790	6468	6677

ECCENTRIC SETTING

Each unit has non-sparking brass eccentrics. To adjust, remove socket head cap screw and turn eccentric to desired position, #1, #2, ect. Re-secure cap screws. The forces obtained are as followed. (Forces in lbs. centrifugal force.)

ELECTRICAL INSTALLATION:

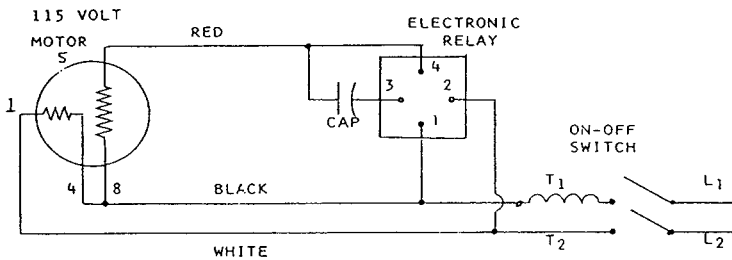
EXPLOSION PROOF VIBRATORS SHOULD BE INSTALLED BY A CERTIFIED ELECTRICIAN TO MAKE SURE THE INSTALLATION FOLLOWS THE ELECTRICAL CODES.

NOTE: The vibrator has a 1/2"NPT nipple connector on the motor part with long lead wires coming out of motor. DO NOT MAKE A SOLID CONNECTION TO THIS NIPPLE, vibrators might crack nipple and destroy the integrity of the explosion proof rating. Use a flexible cable (like Crouse-Hinds or equal) following the code. Attach one end of it to the vibrator nipple, the other end to an explosion proof approved conduit box mounted on the bin or table, etc., to be vibrated (not on the vibrator mounting plate or vibrator). From this box solid connections can be made from your power supply. For single phase units, a relay and capacitor is necessary to start the vibrator. These components should be mounted in an explosion proof approved enclosure. Make sure it is large enough to house these components. If they are placed further than 10' away from motor, make sure pick-up voltage is 140±7 and drop out voltage 40 or less. Nominal current in MA = 49. Coil DC resistant in OHMS 530 ± 15% at 25°C. If further away from motor than 10', a #14 or #12 wire might be necessary.

WIRING INSTRUCTIONS

MODEL 2PX-200, 4PX-350 ARE CAPACITOR START VIBRATORS, THE WIRING DIAGRAM BELOW SHOULD BE FOLLOWED

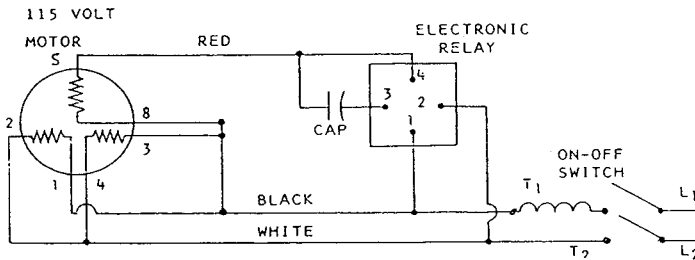
MODELS 2PX-450, 700, 2000 & 5000 ARE DUAL VOLTAGE IN 3 PHASE 230/460 VOLT. TO CHANGE FROM ONE VOLTAGE TO THE OTHER FOLLOW DIAGRAM BELOW.



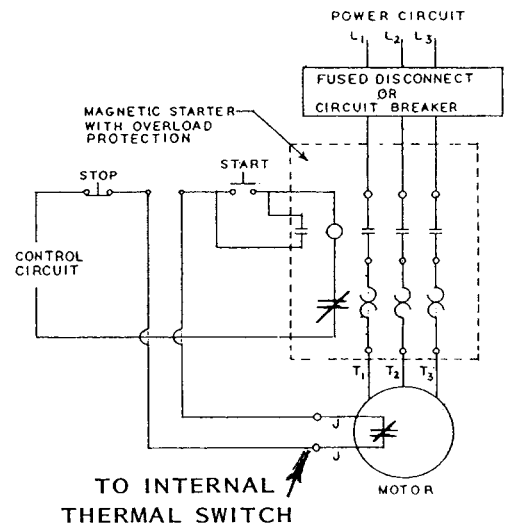
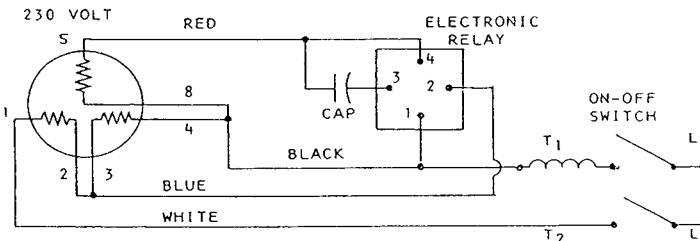
5 & 8 STARTER WINDING, TO CHANGE ROTATION INTERCHANGE 5 & 8

TO CHANGE ROTATION OF ROTOR. INTERCHANGE ANY TWO LEAD WIRES, (1,2 or 3). THIS IS DONE EITHER IN THE CONDUIT BOX OR AT THE PIG TAIL END.

MODELS 2PX-450, 4PX-700 ARE CAPACITOR START VIBRATORS WITH DUAL VOLTAGE WINDING 115/230 VOLT, THE WIRING DIAGRAM BELOW SHOULD BE FOLLOWED.



5 & 8 STARTER WINDING, TO REVERSE ROTATION INTERCHANGE 5 & 8.



- NOTE: FOR 230 VOLT**
- (1) A 5 WIRE CABLE IS NEEDED FROM MOTOR TO CONTROL BOX.
 - (2) 5 & 8 STARTER WINDING, TO REVERSE ROTATION INTERCHANGE 5 & 8.
 - (3) CAPACITOR AND SWITCH DO NOT HAVE TO BE INTERCHANGED FOR 220 VOLT OPERATION.

NOTE: CAPACITOR AND RELAY SHOULD BE PLACED IN AN EXPLOSION PROOF ENCLOSURE.

ELECTRIC VIBRATORS

Model SCR

MODEL SCR

Adjustable Force & Speed

PLUS VALUES:

- 0-4000 RPM • ADJUSTABLE FORCE
- TOTALLY ENCLOSED, SILENT
- HEAVY, CONTINUOUS DUTY
- 115-VOLT PLUG-IN
- EASY SPEED DIAL CONTROL

Another first by VIBCO — a noiseless, heavy duty electric vibrator that can be force and speed adjusted while running. Unlike old-fashioned, noisy electro-magnetic vibrators, this newly developed silent motor vibrator can meet even the most stringent anti-noise pollution requirement.

Model SCR consists of a rugged, permanent magnet DC motor, and SCR control, which is composed of a solid state, full wave rectifier and overload protection. The control is mounted on the cord and plugs into standard 115-volt AC current. No special wiring or circuitry is needed. Accurate and reliable performances throughout the full speed range. Totally enclosed, non-vented housing makes the SCR ideal for use inside or outside in dusty or wet locations. Easy to adjust eccentric settings give additional adjustability. SCR is continuous duty rated even at maximum eccentric setting.

WHERE TO USE:

BINS, CHUTES: Controlled feed. Dial control vibration gives positive flow rate from trickle to torrent, even with hard to move materials or different bin contents.

PACKAGING: Select and settle. Select ideal shake for optimum densification and settling.

SCREENING: Fast, non-blinding. For sifting, scalping and sorting, controlled vibration gives fastest and most complete results.

TEST TABLES: Verify part integrity, simulate handling and over the road transport. Low cost, full range control gives multitude of speeds, "G" values and amplitudes necessary to meet most specs.



NOTE: ALL SCR UNITS SUPPLIED WITH SPEED CONTROL.

TECHNICAL DATA

Model	Force (Impact) lbs./N Adjustable		Amp.	Volt	Ph.	Vibrations per Minute		Wt.		dB*
	lbs.	N				Cont. Duty	Int. Duty	lbs.	kg.	
SCR-60	60	267	2.5	115	1	950-2500	2500-4000	5/8	2.3/3.6	68
SCR-100	100	445	1.3	115	1	950-2500	2500-4000	4	1.8	68
SCR-200	200	890	2.6	115	1	950-2500	2500-4000	12	5.4	70
SCR-300	300	1335	1.7	115	1	950-2500	2500-4000	8	3.6	70
SCR-350	350	1558	3.0	115	1	950-2500	2500-4000	20	9.1	71
SCR-400	400	1780	2.0	115	1	950-2500	2500-4000	9	4.1	70
SCR-500	500	2225	3.5	115	1	950-2500	2500-4000	41	18.4	70
SCR-1000	1000	4449	6.5	115	1	950-2500	2500-4000	53	24.0	72

*Decibel at 3' (1 meter on A-Scale)

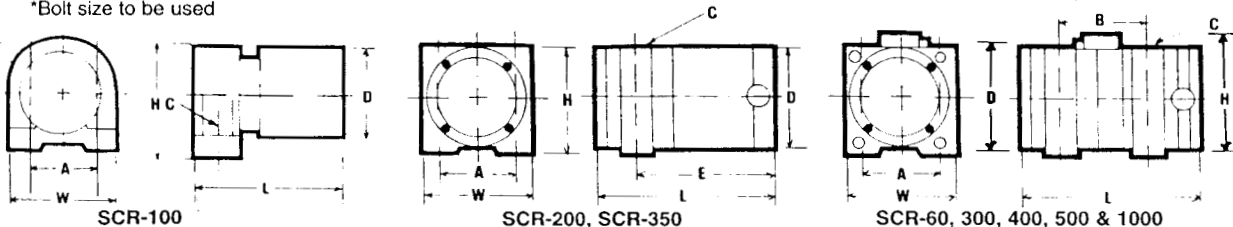
N = Centrifugal force in Newton

**5 lbs. Aluminum 8 lbs. Cast Iron

DIMENSIONS

Model	lbs. / mm	L / mm	lbs. / mm	W / mm	lbs. / mm	H / mm	lbs. / mm	A / mm	lbs. / mm	B / mm	lbs. / mm	C* / mm	lbs. / mm	D / mm	lbs. / mm	E / mm
SCR-60	6 3/8	162	4 1/2	114	3 1/4	83	3 5/8	64	1 5/16	33	5/16	8	3	76	—	—
SCR-100	6 3/4	187	6	152	4 1/4	108	5	127	—	—	3/8	10	4	102	165	165
SCR-200	8 3/16	208	4 7/8	124	4 7/8	105	3 1/2	89	—	—	1/2	12	4	102	6 1/2	165
SCR-300	8 1/2	216	4 1/8	105	5	127	3	76	5 3/4	145	5/16	8	3 9/16	90	6 1/2	—
SCR-350	8 3/4	210	5 5/8	143	5 1/4	133	4 1/2	114	—	—	1/2	12	5 1/16	128	—	165
SCR-400	9	229	4 1/8	105	5	127	3	76	5 3/4	145	5/16	8	3 9/16	90	6 1/2	—
SCR-500	13 3/16	335	5 3/4	146	6 1/2	165	4 1/2	114	8 15/16	227	1/2	12	5 1/16	128	—	—
SCR-1000	14 1/4	362	6 1/2	165	7 1/2	190	5	127	9 7/8	238	5/8	16	6	140	—	—

*Bolt size to be used



MODEL SCR SERVICE INSTRUCTIONS

GENERAL FEATURES

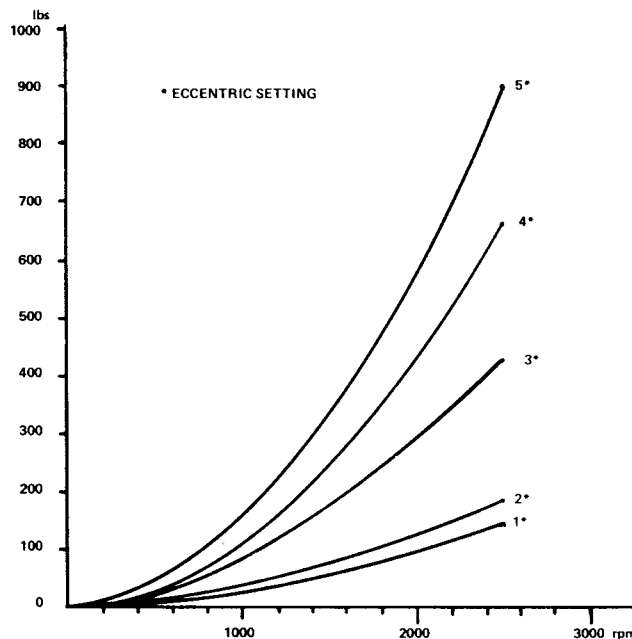
The Model SCR incorporates the controllability of a DC motor vibrator with the availability of 115 volt AC 60 HZ power supply. The rugged, totally enclosed permanent magnet motor is integrated with a compact solid state full wave rectifier and power control. A fast action fuse, located in the control, protects the motor from an overload. This continuous duty permanent magnet motor vibrator employs the latest ceramic magnetic material and advanced manufacturing techniques.

CHANGE OF IMPACT

The SCR-SERIES vibrators have adjustable eccentrics that provide higher or lower impacts throughout the speed range. To change force just remove the end covers from both sides of vibrator (note the cap screw holding the two eccentrics halves together). Remove the cap screw and rotate the eccentric to the desired setting. Replace and securely tighten screw. Repeat this process on other end. **Both ends must be set at the same number.** Vibrator is continuous duty rated at all settings. Factory setting is Number 3 on SCR-1000 and Number 2 on all others. For impact (force) and value, see page 29.

CAUTION: DO NOT USE VIBRATOR UNDER 950 RPM FOR CONTINUOUS DUTY OPERATION

FREQUENCY FORCE CURVE FOR SCR-1000 (NO LOAD CONDITION)



The curve represents the different forces obtained at different speeds at Setting #1, 2, 3, 4 and 5 on the eccentrics. These values may vary depending on the load on the vibrator and should be made up for each load. (For example, a vibrating table will show a different curve for a larger or smaller load).

INSTALLATION

Refer to separate installation instructions.

LUBRICATION

Bearings are pre-lubricated for life.

BRUSHES

Unit has two brushes. Brush life is approximately 1,000 hours. To change brushes, remove brush caps and brushes. Make sure new brush slides freely in brush slot (if not, file down gently).

TECHNICAL DATA

Unit is connected to 115 volt AC current. Control will convert this to 90 volt DC adjustable with rheostat on control panel. At 90 volts, vibrator frequency is 4000 VPM. Frequency 950-2500 vibrations per minute, continuous duty, 2500-4000 VPM intermittent duty, 58 dB at 6 feet "C" scale.

WARNING

Improper installation or operation of this control may cause injury to personnel or electronic failure. The control must be installed and grounded in accordance with local state and national safety codes. At no time should circuit continuity be checked by shorting terminals with a screwdriver or other metal device.

TROUBLE SHOOTING

1. Unit will not operate:
 - (a) check power to unit.
 - (b) check motor continuity, if "open" motor armature should be replaced.
 - (c) check control potentiometer (2000.000 ohms nominal resistance) if "open" replace.
2. Unit operates at full speed and is not speed adjustable:
 - (a) check potentiometer, if "shorted" replace.
3. Unit will not turn off:
 - (a) replace on-off switch.

ELECTRIC RAILROAD CARSHAKERS

The VIBCO Carshaker consists of a vibrator built especially sturdy to take heavy shocks, and is connected to a VMC (clamp-on bracket) or VMW (wedge-type bracket).

INSTALLATION AND OPERATING INSTRUCTIONS

1. Be sure the motor voltage is the same as the line voltage.
2. When you install your vibrators, make sure you use an overload protection (starter box) with proper overload protection. The starter box should be mounted no closer than 4' from motor (on it's cord) but no further away than 20'. If you have to mount it further away, a voltage reading should be taken at the vibrator while running, as well as at the overload protection.

If there is no voltage drop, proper size wire is used, if more than 5% lower at the vibrator, a heavier wire is necessary. For example, if #16 wire was used, change to #14.

3. The VMW bracket is secured in the female bracket on the car by use of the flat bracket which is put on the lower bolt and held in place with the nut and lockwasher. DO NOT NEGLECT TO USE THIS SECURING METHOD. If not used, the vibrator can jump out of the bracket or it will vibrate loose and overload. To remove the male bracket, put the flat bracket on the top bolt and use it as a puller.
4. The VMC bracket is clamped on the flange of a channel or angle iron. After starting unit, only run it for 30 to 60 seconds then retighten bolts. It is now possible to tighten up on the bolts considerably, due to dirt, paint and burrs being vibrated away.
5. Unit should now operate smoothly and quietly.
6. The unit should not jump or vibrate violently, you are then only shaking the vibrator itself, and not the car. The kickback vibration will also overload the motor. If unit is shaking or jumping so hard that the nameplate cannot be read, stop unit and restart while bracing up the unit with the hand or a heavy piece of wood (2 x 4 or similar). If this does not help, MOVE THE UNIT TO A MORE RIGID PLACE ON THE CAR, or CHANGE THE SETTING ON THE ECCENTRICS TO GIVE A LOWER IMPACT. Change it down to the point where the unit operates smoothly and quietly.
7. When a railroad car is full, it is very rigid and can take almost any vibration force. However, as it empties, it gets less and less rigid. When close to being empty, it's rigidity is low and it might not absorb all the vibration the railroad carshaker is developing. The vibration it cannot absorb is "kicked back" to the vibrator and acts as a braking force on it. If this "kick back" vibration is large enough it will overload (stall) your vibrator and kick out the overload and stop the vibrator. When railroad car is close to being empty use vibrator only intermittently giving railroad car only short spurts of vibration.

The overload protection **will not** guarantee you from "burning out" your vibrator, it is only a warning that tells you "check me out." If vibrator is immediately turned on again without checking out and rectifying the problem, you may burn out your vibrator motor.



VIBCO, INC.

75 Stilson Rd.
Wyoming, RI 02898
Phone: 401-539-2392
800-633-0032
Fax: 401-539-2584
Internet: [HTTP/WWW.VIBCO.COM](http://WWW.VIBCO.COM)
E-Mail: VIBRATORS@VIBCO.COM

CANADA

2215 Dunwin Drive
Mississauga, Ont. L5L 1X1
905-828-4191
800-465-9709
905-828-5015

Maximize Equipment Life

Proactively Prevent Component Failures, Major Repairs, and Unplanned Downtime

Your Hapman equipment was robustly engineered to run trouble-free for years. However, it must be properly maintained to prevent component failures and major repairs from causing unplanned downtime. To keep maintenance on track, start with a top-to-bottom inspection of your Hapman equipment by one of our expert technicians. This initial inspection will take between 4-8 hours and includes:

- Maintenance baseline for your Hapman equipment to discover any early warnings of part wear and/or impending component failures.
- Detailed inspection report pinpointing maintenance/repair needs, so they can be addressed before causing a problem.

Maintenance Program Options:

Hapman offers three Managed Maintenance Program (MMP) options based on the level of assistance you want. All three will improve your machine uptime, reliability, performance, and longevity.

OPTION 1: Regularly scheduled equipment inspections by a Hapman technician.

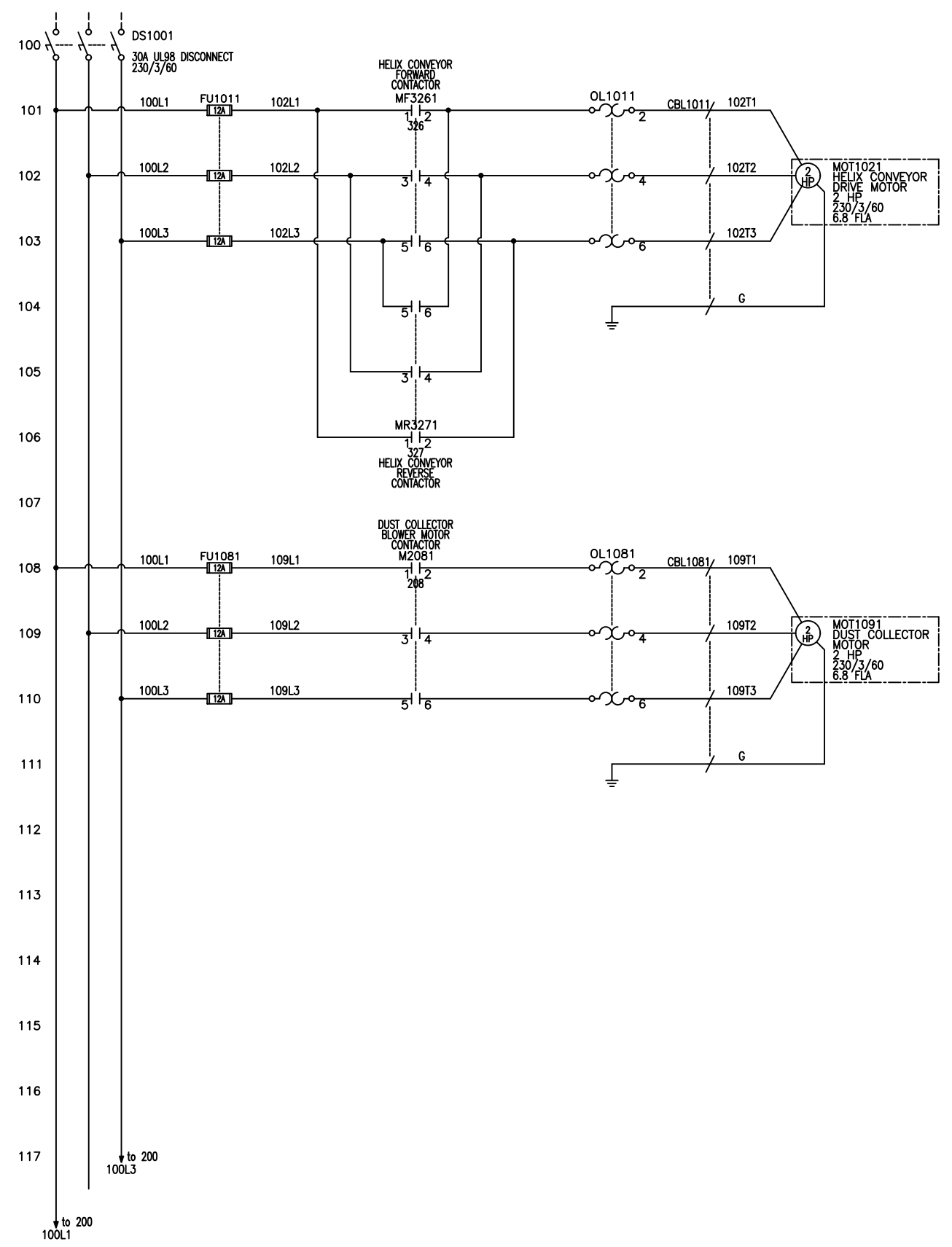
OPTION 2: Shared maintenance responsibilities between Hapman and your staff.

OPTION 3: Full maintenance performed by Hapman.



If you need technical support, give us a call. We are available 24/7.

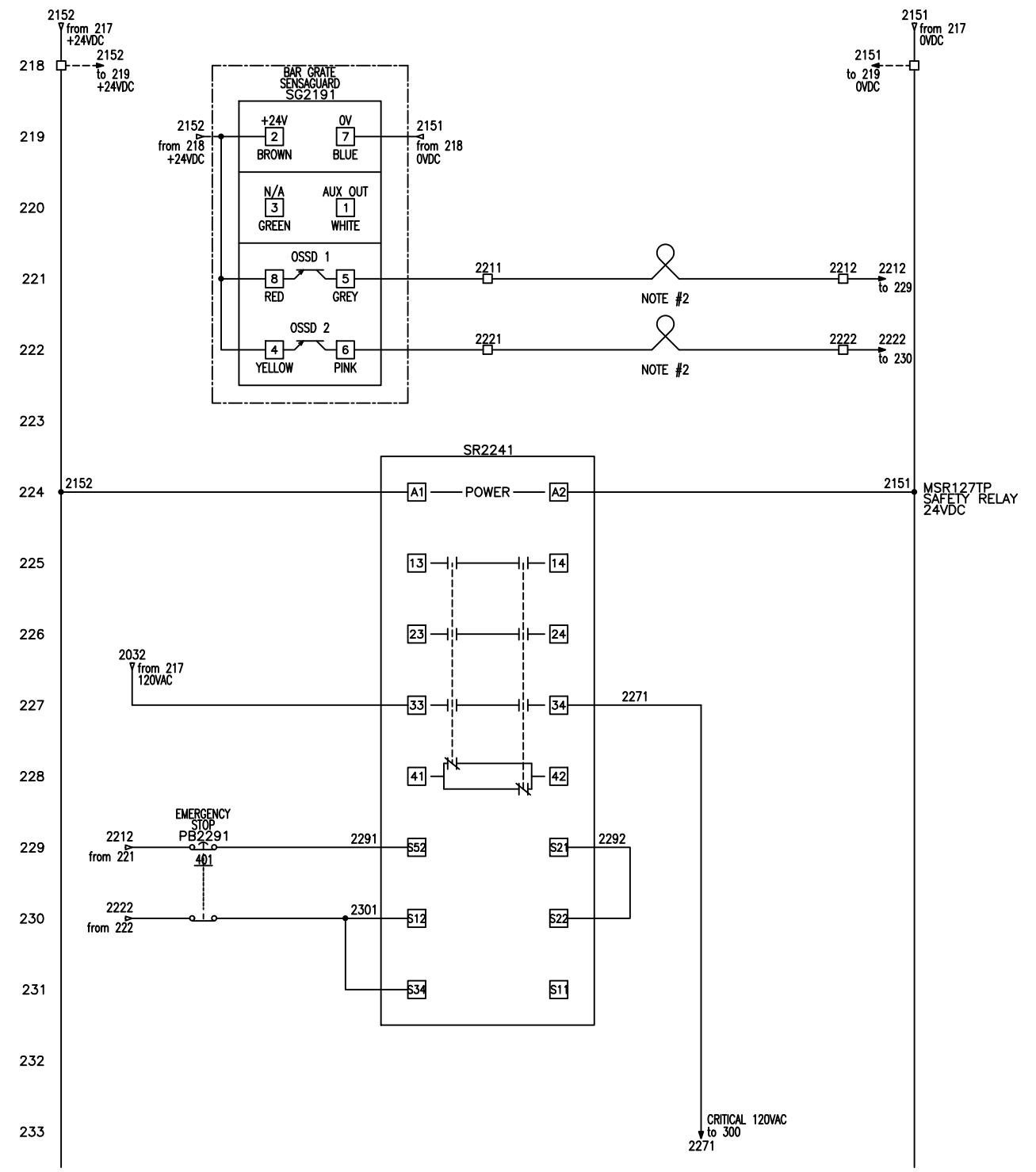
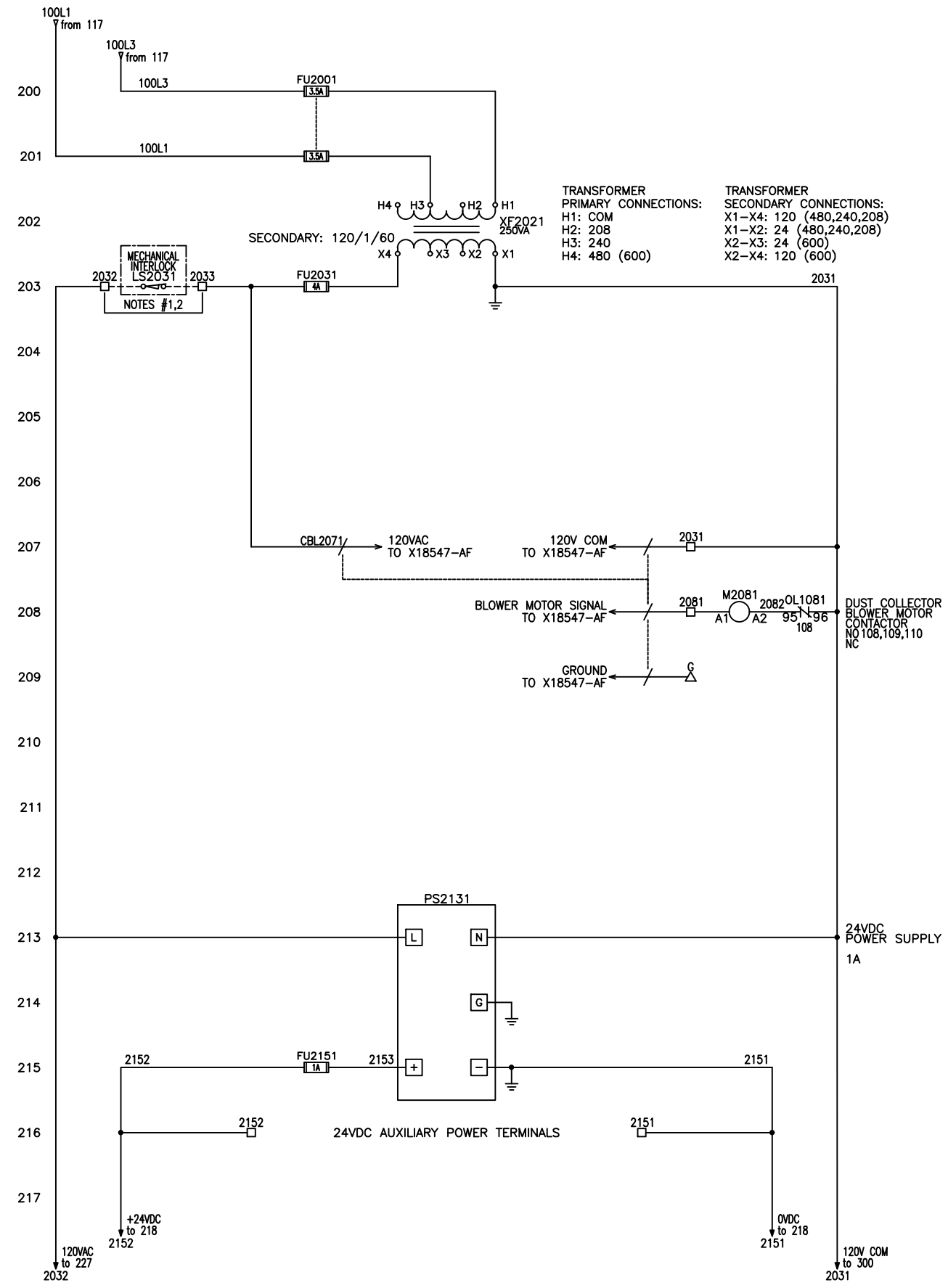
REV	DESCRIPTION	DATE	BY
0.0	AS BUILT	08/14/20	BDJ



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HAPMAN <i>ideas that move</i>		P.O. BOX 2321 6002 E. KILGORE ROAD, KALAMAZOO, MICHIGAN 49003 PHONE (269) 343-1675 FAX (269) 348-2477	
DATE 07/31/20	JOB NO. X18547-AD	DRAWN BDJ	BY BDJ
SCALE N/A		BOM = 1	DWG = 1
TITLE MOTOR WIRING DIAGRAM NEMA 4X - HELIX FIXED SPEED REVERSING SERIES REMOTE/SENSOR CONTROL W/ TIMER FOR AUTO RESTART			
CUST. MONDELEZ GLOBAL			
SHEET 1 OF 6	DWG. NO. X18547AD-B00	REV. 0.0	

REV	DESCRIPTION	DATE	BY
0.0	AS BUILT	08/14/20	BDJ



NOTE #1: SENSOR IS NORMALLY OPEN HELD CLOSED
NOTE #2: REMOVE JUMPER IF CIRCUIT IS UTILIZED

HAPMAN
ideas that move

5944 E. N AVE., KALAMAZOO, MICHIGAN 49048
PHONE (269) 343-1675 FAX (269) 348-2477

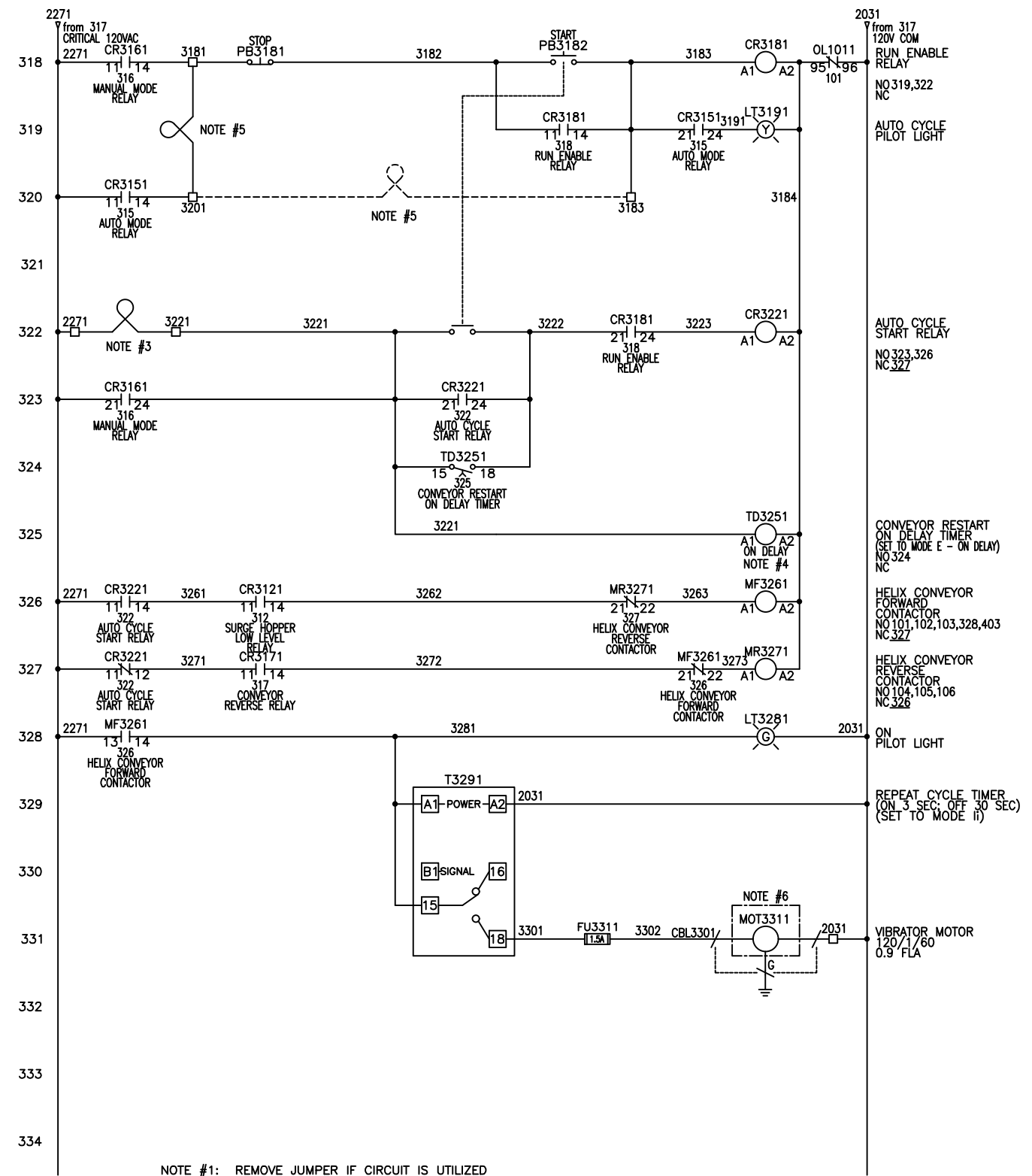
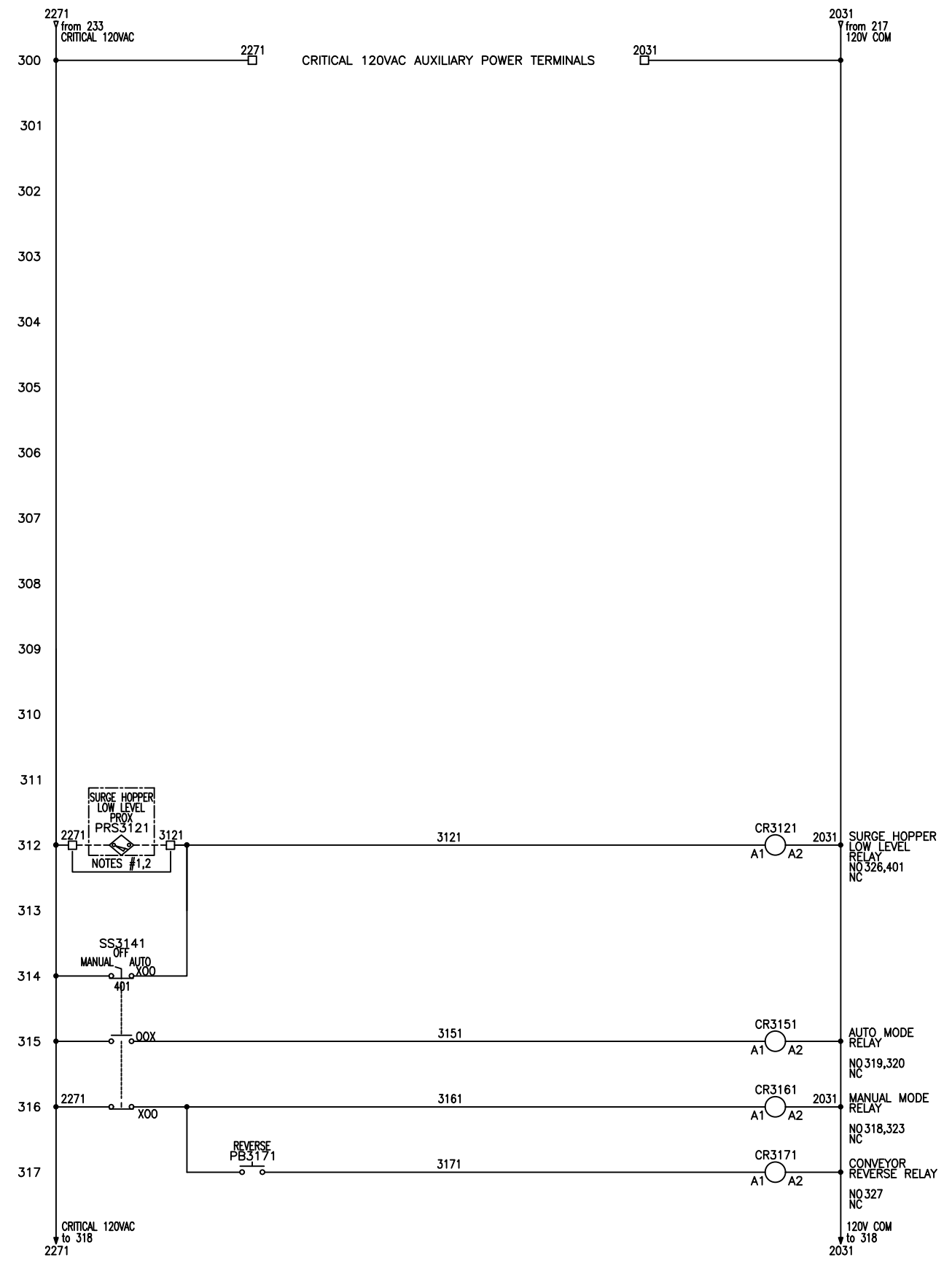
DATE 07/31/20	JOB NO. X18547-AD	DRAWN BDJ
SCALE N/A	BOM = 1	DWG = 1

TITLE
120VAC/24VDC/SAFETY RELAY WIRING DIAGRAM
NEMA 4X - HELIX FIXED SPEED REVERSING SERIES
REMOTE/SENSOR CONTROL W/ TIMER FOR AUTO RESTART

CUST. MONDELEZ GLOBAL

SHEET 2 OF 6	DWG. NO. X18547AD-B00	REV. 0.0
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REV	DESCRIPTION	DATE	BY
0.0	AS BUILT	08/14/20	BDJ

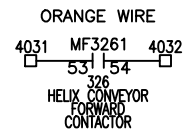
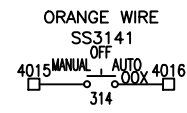
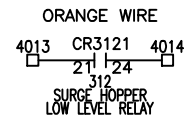
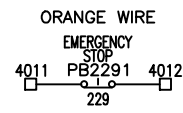


- NOTE #1: REMOVE JUMPER IF CIRCUIT IS UTILIZED
- NOTE #2: PROXIMITY SWITCH IS NORMALLY OPEN
- NOTE #3: N.O. REMOTE CONTACT OR N.C. PROXIMITY SWITCH
- NOTE #4: SET ON-DELAY TIMER TO DESIRED TIME SETTING
- NOTE #5: WHEN USING A REMOTE SIGNAL, REMOVE JUMPER BETWEEN TERMINALS 3181 & 3201 AND ADD JUMPER BETWEEN TERMINALS 3183 & 3201, UNLESS OPERATOR IS REQUIRED TO ENABLE THE CONVEYOR. WHEN A JUMPER BETWEEN TERMINALS 3183 & 3201 IS ADDED, THE REMOTE SIGNAL MUST BE REMOVED IN THE EVENT OF THE E-STOP BEING PRESSED.
- NOTE #6: THE VIBRATOR MUST BE USED INTERMITTENTLY THROUGH AN ADJUSTABLE CYCLE TIME. THE VIBRATOR SHOULD NOT RUN WHEN THE CONVEYOR IS OFF.

HAPMAN <i>ideas that move</i>		P.O. BOX 2321 8002 E. KILGORE ROAD, KALAMAZOO, MICHIGAN 49003 PHONE (269) 343-1675 FAX (269) 348-2477	
DATE	07/31/20	JOB NO.	X18547-AD
SCALE	N/A	DRAWN	BDJ
		BOM = 1	DWG = 1
TITLE LOGIC WIRING DIAGRAM NEMA 4X - HELIX FIXED SPEED REVERSING SERIES REMOTE/SENSOR CONTROL W/ TIMER FOR AUTO RESTART			
CUST. MONDELEZ GLOBAL			
SHEET	3	OF	6
DWG. NO.	X18547AD-B00		REV.
			0.0

REV	DESCRIPTION	DATE	BY
0.0	AS BUILT	08/14/20	BDJ

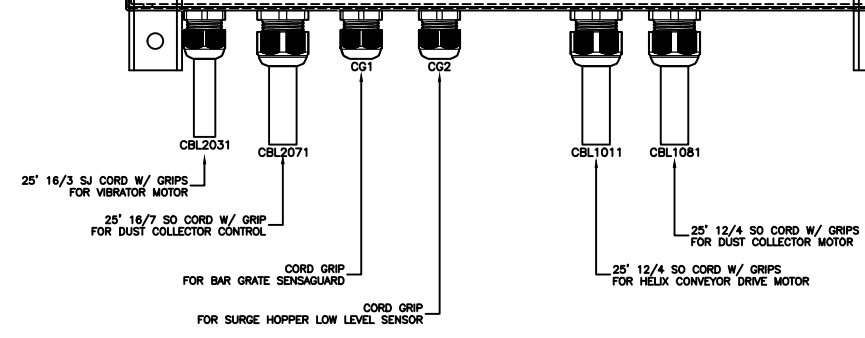
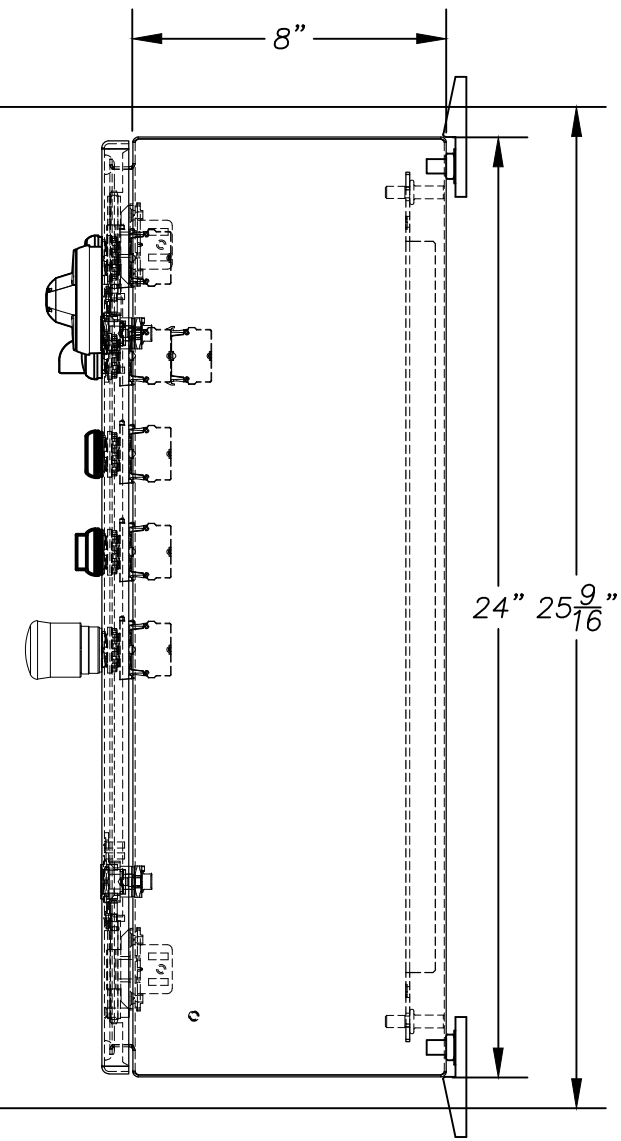
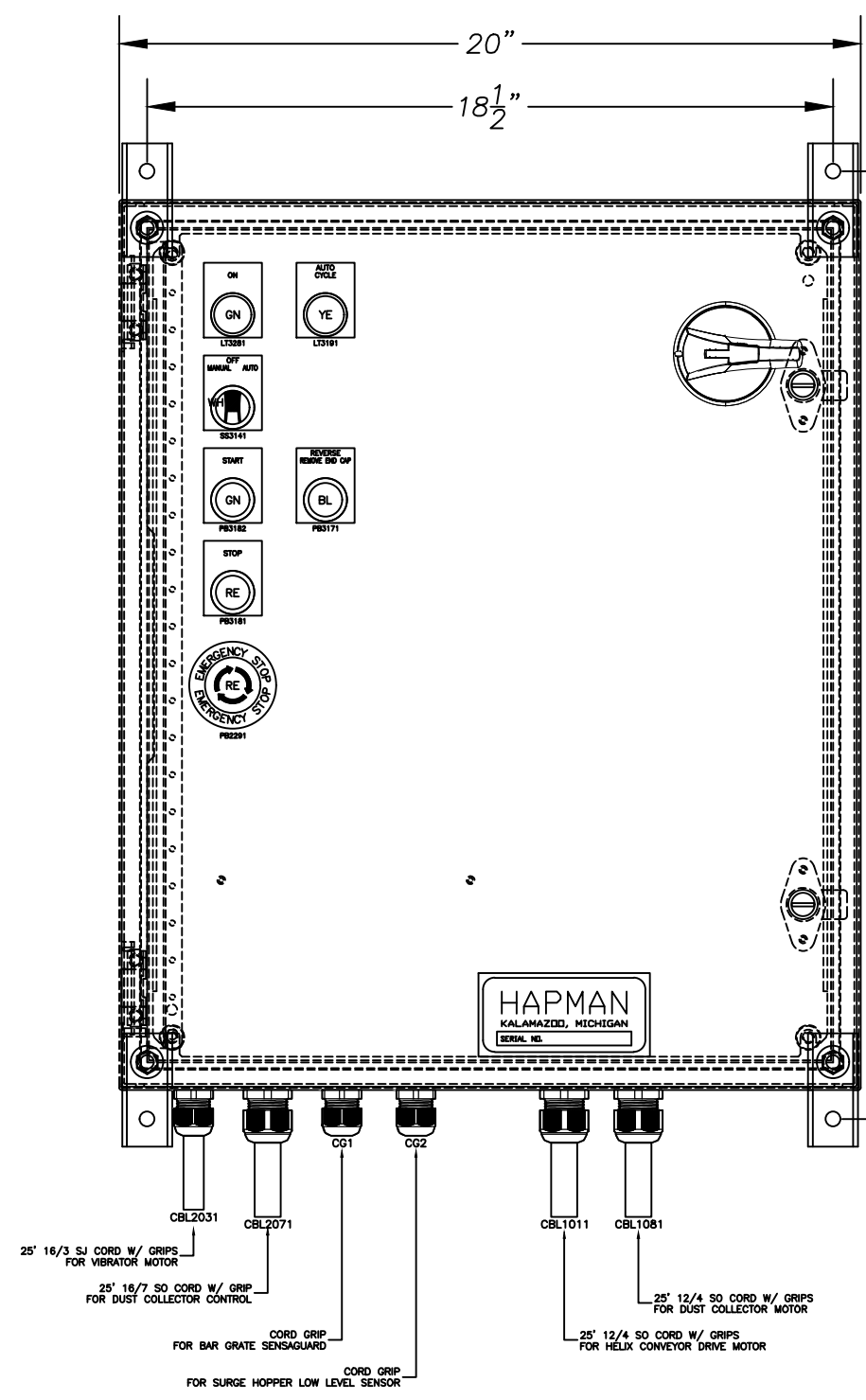
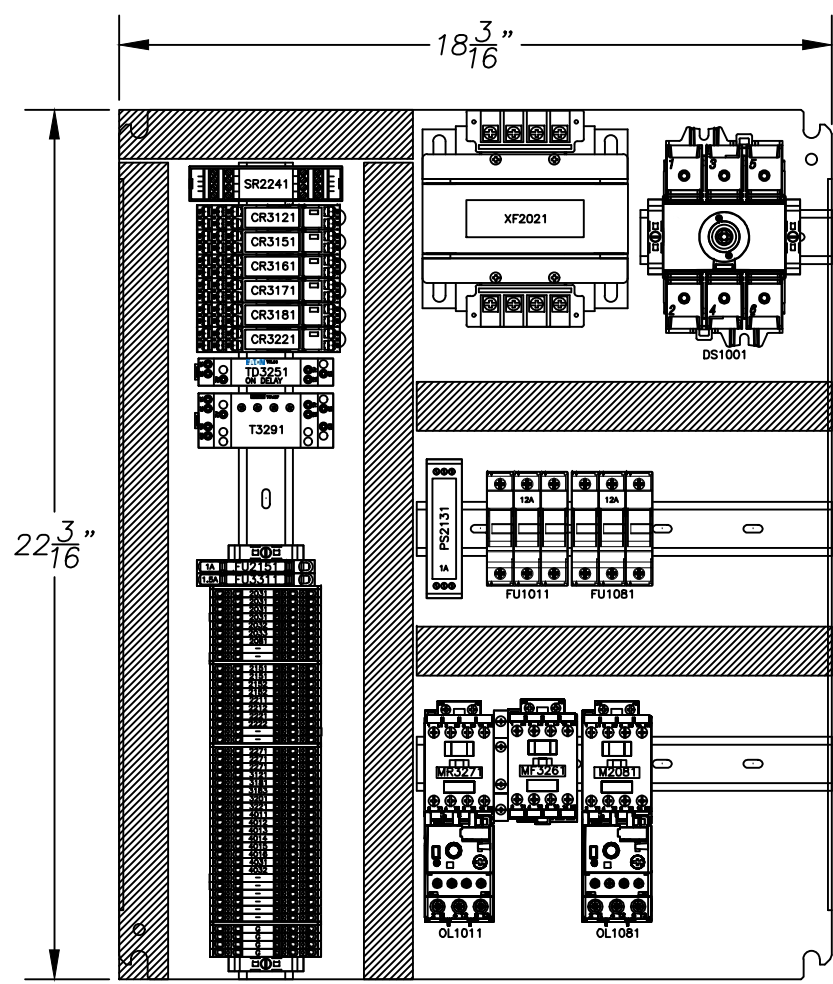
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HAPMAN <i>ideas that move</i>		5944 E. N AVE., KALAMAZOO, MICHIGAN 49048 PHONE (269) 343-1675 FAX (269) 348-2477	
DATE 07/31/20	JOB NO. X18547-AD	DRAWN BDJ	
SCALE N/A		BOM = 1	DWG = 1
TITLE CONTACTS FOR CUSTOMER USE NEMA 4X - HELIX FIXED SPEED REVERSING SERIES REMOTE/SENSOR CONTROL W/ TIMER FOR AUTO RESTART CUST. MONDELEZ GLOBAL			
SHEET 4	OF 6	DWG. NO. X18547AD-B00	REV. 0.0

REV	DESCRIPTION	DATE	BY
0.0	AS BUILT	08/14/20	BDJ



VOLTAGE:	230 VOLT
PHASE & FREQ.:	3PH., 60HZ
FULL LOAD CURRENT:	15 AMP
S.C.C.R.:	100k AMP
ENCLOSURE RATING:	TYPE 4X
SCHEMATIC:	X18547AD-B00
MFG. BY:	KMC Global Controls & Automation

NOTE: MAX OVERCURRENT PROTECTION OF FEEDER ALLOWED IS 30A J CLASS FUSE IN ORDER TO MAINTAIN THE 100kA S.C.C.R.

HAPMAN
Ideas that move

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PHONE (269) 343-1675 FAX (269) 348-2477

DATE	07/31/20	JOB NO.	X18547-AD	DRAWN	BDJ
SCALE	N/A			BOM = 1	DWG = 1

TITLE
PANEL LAYOUT
NEMA 4X - HELIX FIXED SPEED REVERSING SERIES
REMOTE/SENSOR CONTROL W/ TIMER FOR AUTO RESTART

CUST. MONDELEZ GLOBAL
SHEET 5 OF 6 DWG. NO. X18547AD-B00 REV. 0.0

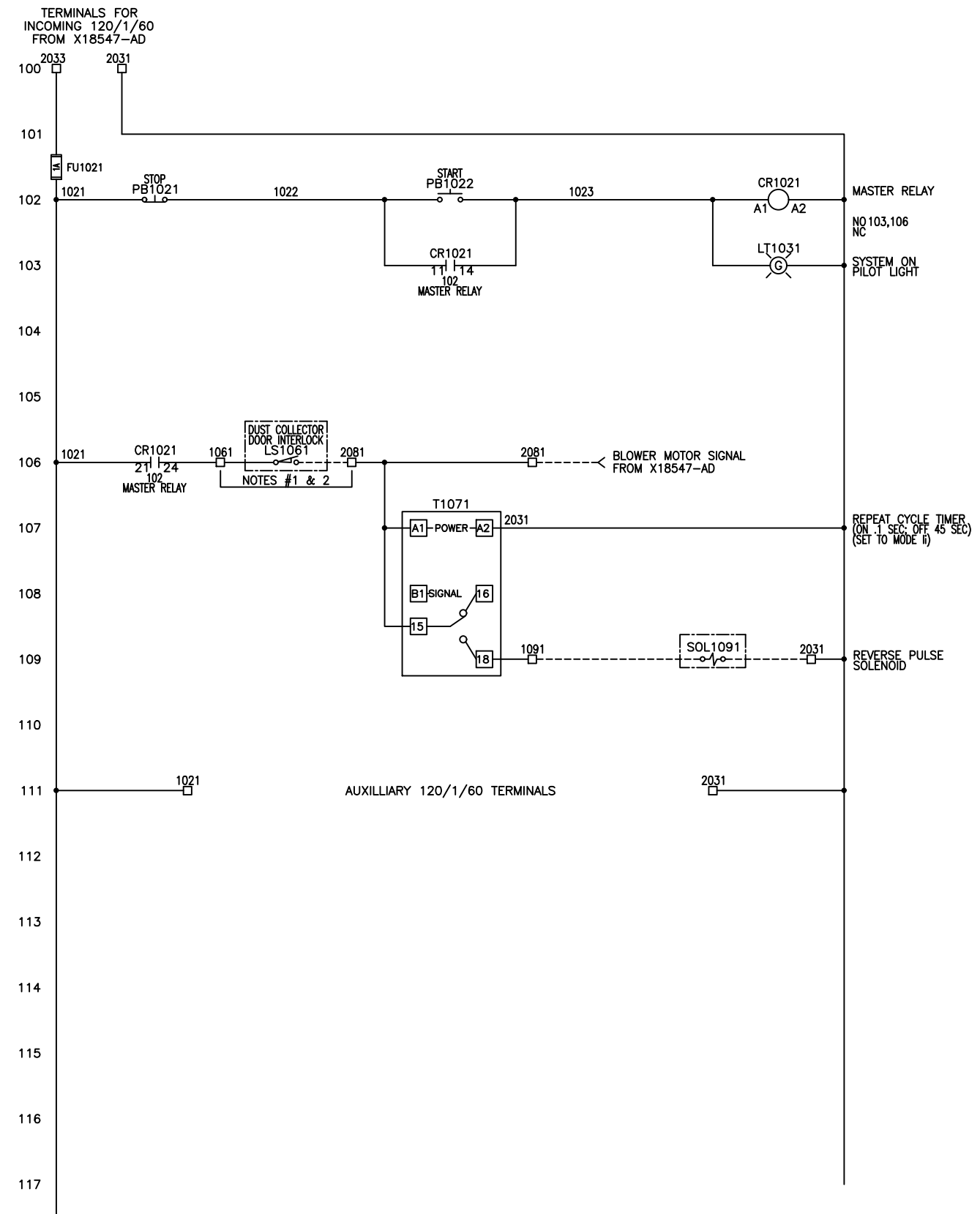
REV	DESCRIPTION	DATE	BY
0.0	AS BUILT	08/14/20	BDJ

ITEM	QTY	PART #	MANUFACTURE	DESCRIPTION	DESCRIPTOR
1	1	CSD24208SS-MOD-STANDARD	HOFFMAN	24"x20"x8" NEMA 4X STAINLESS STEEL ENCLOSURE	.
2	1	CP2420G	HOFFMAN	GALVANIZED SUB PANEL	.
3	1	CMFKSS	HOFFMAN	STAINLESS STEEL FOOT KIT	.
4	1	RD30-3	BUSSMANN	30A UL98 ROTARY DISCONNECT	DS1001
5	1	SH4-200	BUSSMANN	DISCONNECT SHAFT	DS1001
6	1	H4X-02B	BUSSMANN	NEMA 3R/4/4X/12, DISCONNECT SELECTOR HANDLE, SIZE 2	DS1001
7	2	CHCC3DU	BUSSMANN	3 POLE 30A CLASS CC FUSE BLOCK	FU1011,1191,1261
8	6	LP-CC-12	BUSSMANN	12A CLASS CC FUSE	FU1011,1081
9	1	104-C09D22	AB	120VAC 9A IEC REVERSING CONTACTOR	MF3261,MR3271
10	1	100-FA20	AB	2 N.O. FRONT MOUNT AUX CONTACT	MF3261
11	1	100-C09D10	AB	120VAC 9A IEC NON-REVERSING CONTACTOR	M2081
12	2	193-EEDB	AB	3.2-16A SOLID STATE OVERLOAD	OL1011,1081
13	2	LP-CC-3.5	BUSSMANN	3.5A CLASS CC FUSE	FU2001
14	1	E250JN	SOLA	250VA CPT	XF2021
15	1	FBPC1	SOLA	PRIMARY FUSE BLOCK & FINGERSAFE COVERS	XF2021,FU2001
16	1	FB2	SOLA	FUSE BLOCK SECONDARY FUSE HOLDER FOR E_JN TRANSFORMERS	XF2021,FU2031
17	1	ABC-4-R	BUSSMANN	4A 1/4"x1-1/4" FAST-ACTING CERAMIC FUSE	FU2031
18	1	MDR-20-24	MEANWELL	1A 24VDC POWER SUPPLY	PS2131
19	2	3036385	PHOENIX	8.2mm FUSIBLE SPRING TERMINAL	FU2151,3311
20	1	AGC-1-R	BUSSMANN	1A 1/4"x1-1/4" FAST-ACTING GLASS FUSE	FU2151
21	1	MDL-1.5-R	BUSSMANN	1A 1/4"x1-1/4" TIME DELAY GLASS FUSE	FU3311
22	1	440R-N23126	AB	24VDC MSR127TP SAFETY RELAY	SR2241
23	1	800FP-MT44PX02	AB	22mm RED EMERGENCY STOP PB W/ 2 N.C. CONTACTS	PB2291
24	1	800F-X01	AB	22mm N.C. CONTACT BLOCK	PB2291
25	1	CT-22ESTOP	CT	22mm LEGEND - EMERGENCY STOP	PB2291
26	6	2903332	PHOENIX	120VAC DPDT RELAY CUBE AND SOCKET	CR3121-3221
27	1	800FP-SM32PX20	AB	22mm 3 POSITION SELECTOR SWITCH W/ 2 N.O. CONTACTS	SS3141
28	2	800F-X10	AB	22mm N.O. CONTACT BLOCK	SS3141
29	1	CT-22MAN/OFF/AUTO	CT	22mm LEGEND - MANUAL/OFF/AUTO	SS3141
30	1	800FP-F2PX10	AB	22mm BLACK FLUSH HEAD PB W/ 1 N.O. CONTACT	PB3171
31	1	CT-22RREC	CT	22mm LEGEND - REVERSE REMOVE END CAP	PB3171
32	1	800FP-E4PX01	AB	22mm RED EXTENDED HEAD PB W/ 1 N.C. CONTACT	PB3181
33	1	CT-22STOP	CT	22mm LEGEND - STOP	PB3181
34	1	800FP-F3PX10	AB	22mm GREEN FLUSH HEAD PB W/ 1 N.O. CONTACT	PB3182
35	1	800F-X10	AB	22mm N.O. CONTACT BLOCK	PB3182
36	1	CT-22START	CT	22mm LEGEND - START	PB3182
37	1	800FP-P5PN5W	AB	22mm 120VAC YELLOW LED PILOT LIGHT	LT3191
38	1	CT-22AUTO/CYCLE	CT	22mm LEGEND - AUTO/CYCLE	LT3191
39	1	TRL04	EATON	24-240 VAC/DC MULTI-FUNCTION SPDT TIMER	TD3251
40	1	800FP-P3PN5G	AB	22mm 120VAC GREEN LED PILOT LIGHT	LT3281
41	1	CT-22ON	CT	22mm LEGEND - ON	LT3281
42	1	TRW27	EATON	24-240 VAC/DC MULTI-FUNCTION DPDT TIMER	T3291
43	41	3209578	PHOENIX	5.2mm 4-WIRE PUSH IN TERMINAL	.
44	4	3209594	PHOENIX	5.2mm 4-WIRE PUSH IN GROUND TERMINAL	.
45	4	3030514	PHOENIX	END PLATE FOR 5.2mm 4-WIRE PUSH IN TERMINAL	.
46	4	0800886	PHOENIX	SCREW ON END STOP	.
47	6'	F1X4LG6	PANDUIT	1"x4" LIGHT GRAY WIREWAY	.
48	6'	C1LG6	PANDUIT	1" LIGHT GRAY WIREWAY COVER	.
49	3.5'	111023	E-RAIL	35mm DIN RAIL	.
50	54'	12/4 SO CORD	CAROL	12/4 SO CORD	CBL1011,1081
51	26'	16/7 SO CORD	CAROL	16/7 SO CORD	CBL2071
52	5	RDC21NA-GR	TECHSPAN	3/4" NPT CORD GRIP (0.51"-0.71")	CBL1011,1081,2071
53	26'	16/3 SJ CORD	CAROL	16/3 SJ CORD	CBL3301
54	4	RDC13NA-GR	TECHSPAN	1/2" NPT CORD GRIP (0.23"-0.47")	CBL3301,CG1,CG2
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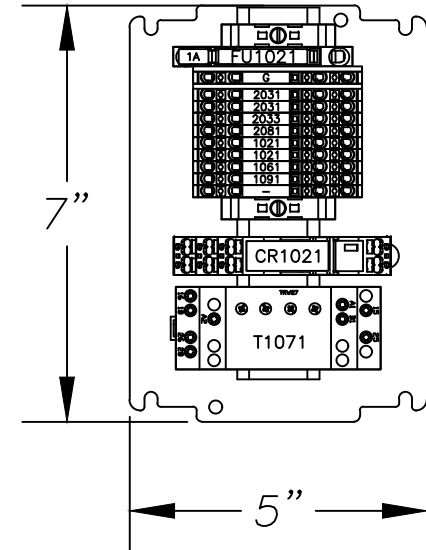
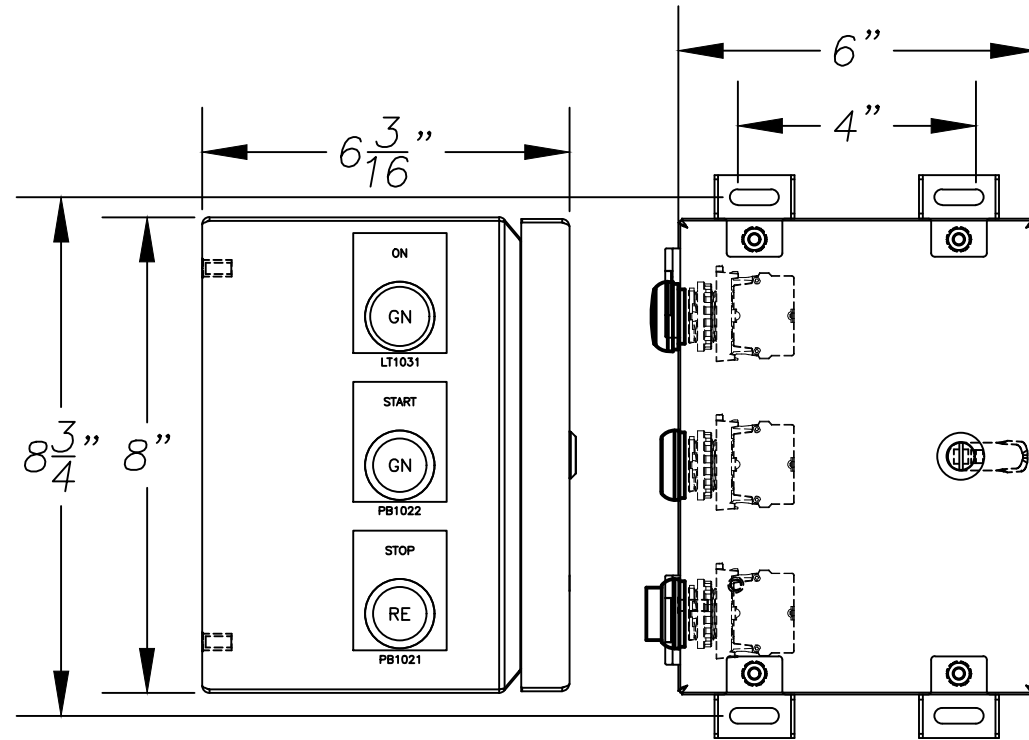
ITEM	QTY	PART #	MANUFACTURE	DESCRIPTION	DESCRIPTOR
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HAPMAN <small>ideas that move</small>		<small>5944 E. N. AVE., KALAMAZOO, MICHIGAN 49048 PHONE (269) 343-1675 FAX (269) 348-2477</small>	
DATE	07/31/20	JOB NO.	X18547-AD
SCALE	N/A	DRAWN	BDJ
TITLE		BOM - 1 DWG - 1	
BILL OF MATERIALS			
NEMA 4X - HELIX FIXED SPEED REVERSING SERIES REMOTE/SENSOR CONTROL W/ TIMER FOR AUTO RESTART			
CUST. MONDELEZ GLOBAL			
SHEET	6	DWG. NO.	X18547AD-B00
			REV. 0

REV	DESCRIPTION	DATE	BY
0.0	AS BUILT	08/14/20	BDJ



NOTES:
 1. SENSOR IS NORMALLY CLOSED HELD OPEN
 2. REMOVE JUMPER IF DUST COLLECTOR DOOR INTERLOCK IS PRESENT



VOLTAGE:	120 VOLT
PHASE & FREQ.:	1PH., 60HZ
FULL LOAD CURRENT:	1 AMP
ENCLOSURE RATING:	TYPE 4X
SCHEMATIC:	X18547AF-B00
MFG. BY:	KMC Global Controls & Automation

HAPMAN <small>ideas that move</small>		P.O. BOX 2321 6002 E. KILGORE ROAD, KALAMAZOO, MICHIGAN 49003 PHONE (269) 343-1675 FAX (269) 348-2477	
		DATE 08/03/20 SCALE N/A	JOB NO. X18547-AF DRAWN BDJ BOM = 1 DWG = 1
TITLE WIRING DIAGRAM/PANEL LAYOUT NEMA 4X - DUST COLLECTOR CONTROL SERIES 120/1/60, RIGHT HAND UNIT			
CUST. MONDELEZ GLOBAL SHEET 1 OF 2		DWG. NO. X18547AF-B00 REV. 0.0	

REV	DESCRIPTION	DATE	BY
0.0	AS BUILT	08/14/20	BDJ

ITEM	QTY	PART #	MANUFACTURE	DESCRIPTION	DESCRIPTOR
1	1	8066ELJSS	SCE	8"x6"x6" NEMA 4X STAINLESS STEEL ENCLOSURE	OP-STATION
2	1	8P6J	SCE	PAINTED SUB PANEL	.
3	1	3036385	PHOENIX	8.2mm FUSIBLE SPRING CAGE TERMINAL	FU1021
4	1	MDL-1-R	BUSSMANN	1A 1/4"x1-1/4" TIME-DELAY GLASS FUSE	FU1021
5	1	800FP-E4PX01	AB	22mm RED EXTENDED HEAD PB W/ 1 N.C. CONTACT	PB1021
6	1	CT-22STOP	CT	22mm LEGEND - STOP	PB1021
7	1	800FP-F3PX10	AB	22mm GREEN FLUSH HEAD PB W/ 1 N.O. CONTACT	PB1022
8	1	CT-22START	CT	22mm LEGEND - START	PB1022
9	1	2903332	PHOENIX	120VAC DPDT RELAY CUBE	CR1021
10	1	800FP-P3PN5G	AB	22mm 120VAC GREEN LED PILOT LIGHT	LT1031
11	1	CT-22ON	CT	22mm LEGEND - ON	LT1031
12	1	TRW27	EATON	24-240 VAC/DC MULTI-FUNCTION DPDT TIMER	T1071
13	9	3209578	PHOENIX	5.2mm 4-WIRE PUSH IN TERMINAL	.
14	1	3209594	PHOENIX	5.2mm 4-WIRE PUSH IN GROUND TERMINAL	.
15	2	3030514	PHOENIX	END PLATE FOR 5.2mm 4-WIRE PUSH IN TERMINAL	.
16	2	0800886	PHOENIX	SCREW ON END STOP	.
17	1'	111023	E-RAIL	35mm DIN RAIL	.
18	1	RDC21NA-GR	TECHSPAN	3/4" NPT CORD GRIP (0.51"-0.71")	(SHIPPED LOOSE)
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ITEM	QTY	PART #	MANUFACTURE	DESCRIPTION	DESCRIPTOR
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HAPMAN <small>ideas that move</small>		P.O. BOX 2321 6002 E. KILGORE ROAD, KALAMAZOO, MICHIGAN 49003 PHONE (269) 343-1675 FAX (269) 348-2477	
DATE 08/03/20	JOB NO. X18547-AF	DRAWN BDJ	BY BDJ
SCALE N/A		BOM = 1	DWG = 1
TITLE BILL OF MATERIALS NEMA 4X - DUST COLLECTOR CONTROL SERIES 120/1/60, RIGHT HAND UNIT			
CUST. MONDELEZ GLOBAL			
SHEET 2 OF 2	DWG. NO. X18547AF-B00	REV. 0.0	