

Installation, Operation and Maintenance Instructions



VIBRATORY FEEDER

**MODELS – 10A,
20A, 30A, 40A,
45A, 50A & 55A**

ERIEZ MAGNETICS HEADQUARTERS: 2200 ASBURY ROAD, ERIE, PA 16506-1402 U.S.A.
WORLD AUTHORITY IN SEPARATION TECHNOLOGIES

Introduction

This manual details the proper steps for installing, operating and maintaining the Eriez Vibratory Feeder.

Careful attention to these requirements will assure the most efficient and dependable performance of this equipment.

If there are any questions or comments about the manual, please call Eriez Magnetics at 814/835-6000 for Vibratory Feeder assistance.

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User Technical Safety Information

The following instructions are provided for the personal safety of operators and also for the protection of the described product and connected equipment. Also refer to the IOM for the CE approved feeder control for additional safety information

- Eriez Manufacturing Co. has applied due diligence to ensure that our drives, feeders, and feeder systems are CE compliant. When part of the feeder system is purchased from Eriez, the customer must select components that make the feeder system (drive(s) + tray + control) CE compliant.
- The drivers, feeders and controls are NOT approved for operation in hazardous locations.
- Equipment is to be assembled and installed according to the IOM and local electrical/safety codes by qualified personnel.
- Isolate the mains before installing, dismantling, or repairing the equipment, as well as for fuse changes or post installation modifications.
- Do not operate the equipment if the feeder power cable or control power cable is damaged.
- All electrical connections must be covered.
- All earth (ground) connections must be checked for correct function after installation.
- Equipment is to be operated by technically qualified personnel.
- Personnel are to maintain a safe distance from the equipment during operation. Do NOT stand, sit, or lay on the vibratory feeders during operation.
- Safety devices/relays must be installed by the end user to ensure that the feeder does not start prematurely if power to the control is interrupted and restored.
- The end user of the feeder must determine if hearing protection is required for their feeder application.
- The end user bears responsibility to specify an enclosed tray for dusty product where a potential health hazard is present.
- Eriez drivers produce a weak magnetic field during operation. The end user bears the responsibility to assess if this magnetic field will affect employees with medical devices, and provide adequate warning regarding this potential risk.
- The surface of the driver electrical assembly may exceed 149°F depending upon tuning requirements. Do not contact this surface until sufficient time (30 minutes) is provided after shutdown for this surface to cool.
- Certain products (plastics, for example) can create a static charge as it is introduced, conveyed, and removed from vibratory feeder trays. The end user must assess if this static charge presents a health or a safety hazard. Eriez can supply trays with Earth grounding devices upon request.



Installation

Mounting

This Hi-Vi model should be mounted on a flat surface in one of the following ways:

Positioned and Fastened

Fastened to desired surface with bolts of proper size through the base grommets (see Figure 1). Use flat washers under the bolt heads. Do not fasten the bolts too tightly or the vibration isolating effect of the grommets will be lost.

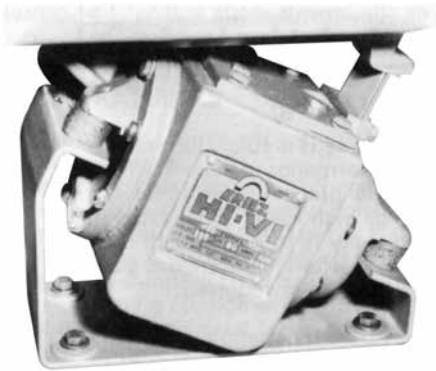


FIGURE 1

Positioned But Not Fastened

Fixed headless stud pins of proper size and spacing (see Figure 2). Set the base (with base grommets in place) over the pins.



FIGURE 2

Not Positioned Or Fastened

Simply place on a flat surface in the desired position. If unit has tendency to “walk” during operation provisions must be taken to secure unit to avoid damage and maintain safety.

Electrical Connections

1. Check the supply voltage and frequency and make certain that they are the same as those shown on the nameplate of the Feeder and Control (see Figure 3).

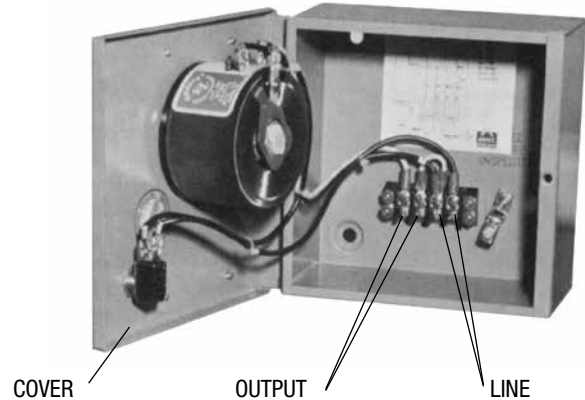


FIGURE 3

2. Connect the black and the white wires in the Feeder power cord to the terminals in the control box marked “Output.”
3. Connect the green wire (ground) to the lug provided in the box.
4. Connect the power line to the terminals in the control box marked “Line.”
5. Connect the lug in the control box to a good earth ground (a cold water line is excellent). If a well-grounded metallic conduit system is used, the latter connection may be dispensed with.
6. On multiple drive feeders (two or more drives on one tray) all drives should be wired electrically in phase and in parallel. The black wires from each power cord should be connected together and the white wires connected together. The black wires should be connected to the line side of the input voltage and the white wires should be connected to the neutral side.

NOTE: The Eriez Vibratory Feeder cannot be operated from a DC source.

YOU ARE NOW READY TO START YOUR VIBRATORY FEEDER.

Operation

To start the Vibratory Feeder after all connections have been made, turn the switch on the control to the "ON" position and adjust the feed rate by rotating the control knob. Normally no warm-up period is required.

Do not operate the unit with any associated equipment touching any part of the unit.

No routine maintenance or lubrication is required, except that any accumulation of foreign matter should be periodically removed from between the tray and the body to prevent restriction of movement of the vibratory elements.

IMPORTANT NOTE:

SPECIAL TRAYS AND ATTACHMENTS

Eriez engineering service should always be consulted before undertaking the design or construction of special trays. Neither standard or special trays as furnished by Eriez Magnetics should be modified or attachments made without first consulting us. To do so will void the warranty. (See Standard Tray Specifications.)

Adjustment (Tuning)

The adjusting means is solely for producing optimum performance of the unit where a specific material of low (under 40 lbs/cu ft [.6 gm/cm³]) or high (over 150 lbs/cu ft [2.4 gm/cm³]) density is to be handled continuously...also where off-standard sizes and shapes of trays are required.

This unit is tuned by changing the stiffness of the tuning spring (see Figure 4) or springs. This adjustment consists of varying the number of springs, or the number of fiberglass plies in individual springs.

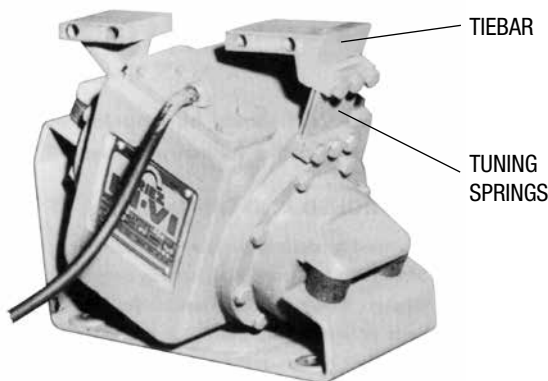


FIGURE 4

In NORMAL OPERATION at full voltage the total displacement measured at the back of the tiebar (or the back of the tray if a displacement sticker is used) is .030" (.25 mm) for 10A; .045" (11.1 mm) for 20A through 55A. In general these displacements should not be exceeded by more than .005" (.1 mm).

CAUTION: NEVER OPERATE THE UNIT IN A STRIKING CONDITION

How To Measure Displacement

With unit operating observe where the fine gray lines on the displacement sticker meet (see Figure 5). This point will be higher or lower as the displacement changes. Opposite the point where they meet, read amount of displacement. If a rule is used, the displacement can readily be measured as a "blurred bar" at the back of the tiebar.

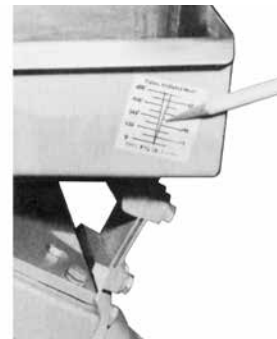


FIGURE 5

Adjusting Guide

The following general rules should be borne in mind when making adjustments.

1. To **increase** the tray displacement, **decrease** the stiffness of the spring system.
2. To **decrease** the tray displacement, **increase** the stiffness of the spring system.

The above rules apply where the unit is operating on the normal side of the tuning curve. If increasing or decreasing the spring stiffness has an opposite effect, it means that the mass of the tray and/or load has been great enough to throw the operating point to the reverse side of the curve, which is undesirable. In this event, the stiffness should be increased (or the tray-load mass reduced) until the behavior is in accordance with rules (1) and (2) above. The unit can then be properly tuned.

Operation (cont.)

To serve as a guide to the stiffness of the tuning springs, each spring is marked with a code number. Example: 13–125. The first digit indicates the number of plies in the spring. The following numbers indicate the relative spring stiffness. The higher this number, the stiffer the spring.

The total stiffness of the spring system is the sum of the relative stiffness numbers. By combinations of standard stiffness springs, virtually any desired stiffness can be obtained.

Adjustment For Non-Standard Trays

In the adjustment of the unit, the following steps should be followed:

1. Attach the tray (see Tray Installation Procedure). Be sure that all bolts are tight.
2. Energize the unit at the nameplate voltage and frequency.
3. a) If a control box is used, turn the control slowly toward the full “ON” position and observe the unit in operation. If a control box is not used, turn the unit on and off quickly and note its performance during the “ON” period.
b) If a hammering noise is in evidence, the tray displacement is excessive. To produce normal quiet operation at full voltage, increase the stiffness of the tuning spring stack by substituting a leaf or leaves of greater ply for one or more of the tuning spring leaves, or by adding additional leaf or leaves, until approximately normal total displacement is obtained. Under normal operating conditions, the unit may be turned on or off without any momentary or prolonged striking noise.
c) If the displacement at full voltage is considerably less than normal, decrease the tuning spring stiffness by substituting leaves of fewer plies. When installing tuning springs, be sure that all spring clamping bolts are torqued to their proper value. Additional springs may be purchased from Eriez Magnetics.

Adjusting or Tuning for Various Densities of Materials

The unit may be adjusted to provide optimum performance for a specific density of material in the same manner as described for non-standard trays. When a unit is adjusted, with the tray empty, to the normal total displacement for that unit (given above), it is set for optimum performance on a material having a density of 100 lbs/cu ft (1.6 g/cm³). All standard units are so adjusted at the factory. For very light materials, optimum performance occurs with displacements above the normal value, but not to exceed .005" (.1 mm) above the normal value. For denser materials, optimum performance occurs with displacements below the normal value.

The basic characteristic of these units is such that the volume output is virtually constant for materials from 40 lbs/cu ft to 150 lbs/cu ft (.6 gm/cm³ to 2.4 gm/cm³) when units are equipped with standard trays. When nonstandard trays are used (particularly large trays), a tuning change is often necessary to provide optimum performance for a specific material; also, since the actual “dead” weight of material on the tray may be appreciable.

Repairs

Coil Replacement

The coil in a vibratory Feeder may require replacement due to operation at over-voltage, or normal aging of the unit. Re-assembly after a coil change will require checking and possible re-centering of the air gap between the E-Frame and the permanent magnet elements. In the 30A, 40A, 45A, 50A, and 55A the air gap is directly accessible from the outside of the unit as described below. In the 10A and 20A, the air gap is not directly accessible from the outside, so that a somewhat different adjustment procedure is required.

Powercord orientation, left side versus right side varies for feeder model; 20A and 30A powercords exit on left side. All other units referred to in this manual can exit either side of unit.

The following procedure should be followed in removing and replacing the electrical assembly (see Figures 6 & 7).

1. Remove the bolts securing the lower end of the tuning spring and those securing the tray channel to the front section of the tiebar. Remove the tray, the rear section of the tiebar and the tuning springs in one piece.
2. Remove the bolts securing the electrical assembly plate to the body casting and lift the entire electrical assembly out of the body cavity.
3. Remove defective coil or E-Frame assembly and install new coil or E-Frame assembly (Order from Eriez parts list).

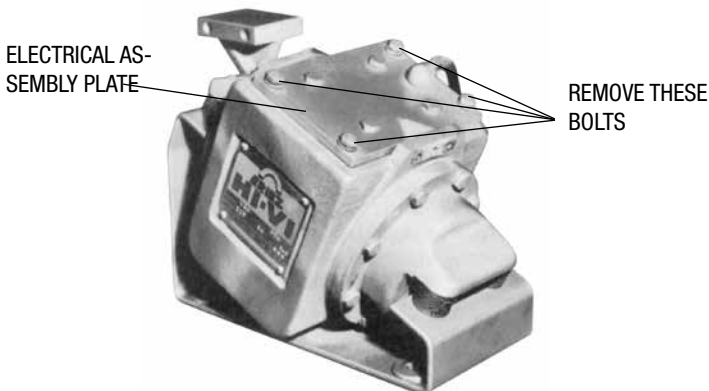


FIGURE 6



FIGURE 7

4. In replacing the electrical assembly, insert it into original position in the body casting. **DO NOT FORCE THE ASSEMBLY INTO PLACE.** When properly aligned, the assembly will go in readily although there will be a distinct “pull” exerted by the permanent magnet in the armature. To overcome this pull, it may be necessary to guide the plate with a screwdriver, meanwhile applying pressure to the top of the plate.
5. Start the electrical assembly plate bolts into the casting, but do not tighten completely.
6. 20A, 30A, 40A, 45A, 50A, and 55A only (see Figure 8).
 - a) Remove the cover nameplate from one side of the body casting. With a screwdriver, remove the cork from the gap access port.

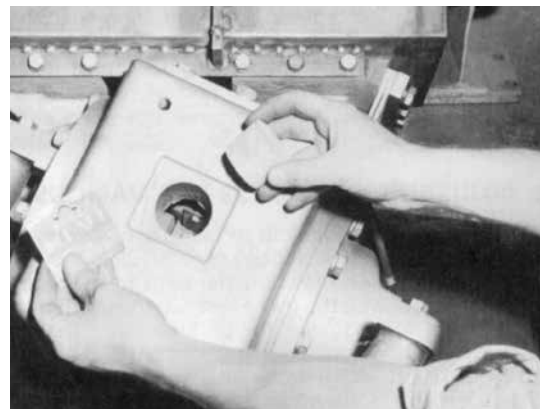


FIGURE 8

Repairs (cont.)

b) Working through the gap access port in the side of the body casting, and using a non-magnetic feeler gauge (furnished with each unit) approximately .080" (2 mm) thick (Model 30A) or .063" (1.6 mm) thick (Models 20A, 40A, 45A, 50A and 55A), check the air gaps between the E-Frame legs and the armature pole pieces (see Figure 9). These gaps should be uniform in width and parallel and as nearly alike as possible. If they are not, they should be adjusted by shifting the electrical assembly plate. In checking and adjusting the gaps, it may be found convenient, and the internal parts will be easier to see, if both cover nameplates and both corks are removed.

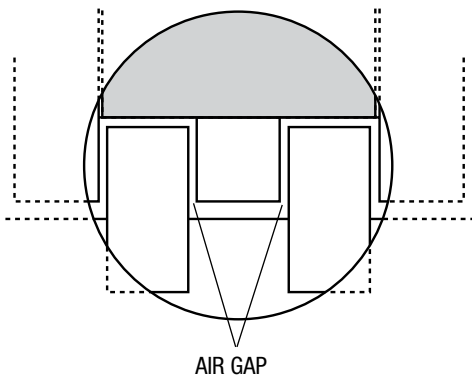


FIGURE 9

7. 10A only.

a) After installing the electrical assembly and inserting the bolts somewhat loosely, approximately center the assembly with respect to the armature. This can be done by noting the front and rear points at which the E-Frame contacts the armature. Tighten the electrical assembly bolts.

b) Reinstall the tray-tiebar-tuning spring assembly (see instructions below).

c) With the unit operating at normal displacement, check the centering of the electrical assembly with respect to the armature by exerting equal hand pressure alternately forward and backward on the tray. If such equal hand pressure causes armature striking in one direction but not in the other, the electrical assembly should be loosened slightly and shifted in the same direction until striking ceases to occur. Retighten the bolts.

Tray Installation Procedure

Use of the Alignment Plate

The alignment plate furnished should be used to insure proper alignment of the tray, tiebar and tuning springs whenever a new tray is installed, or an old one reinstalled after repair work. The following instructions should be followed:

1. Attach the rear section of the tiebar to the body casting, using the alignment plate in place of the tuning springs. This puts the two sections of the tiebar into proper dimensional relationship (see Figure 10).

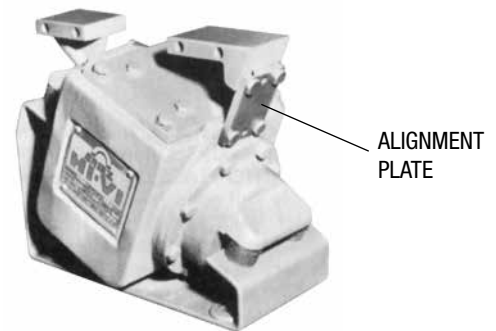


FIGURE 10

2. Attach the tray and fasten the bolts securely (see Figure 11).

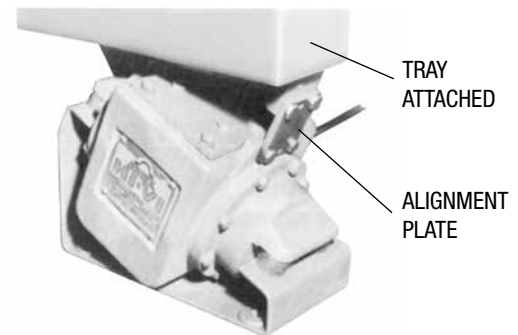


FIGURE 11

Repairs (cont.)

3. Remove the alignment plate and install tuning springs in the proper number and ply to give the desired displacement (see Figure 12). See tuning instructions.

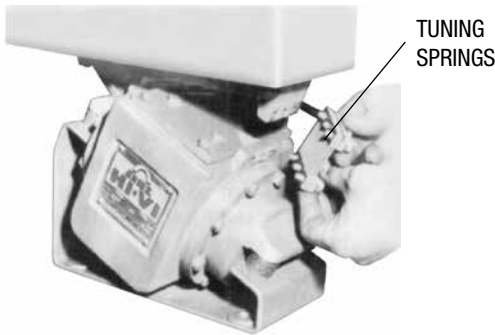


FIGURE 12

Spring Replacement

Although the non-metallic springs used in the V3B Series Feeders have outstanding life characteristics, failure may eventually occur, especially if the displacement is greater than normal. The symptoms of such failure are:

1. Erratic behavior of the unit.
2. Greatly reduced displacement.
3. Greatly increased and perhaps uncontrollable displacement.
4. Strike sound with tray empty at 100% voltage.
5. Higher amperage reading than that on the name plate with the tray empty at 100% voltage.

If spring failure is suspected, the base should be re-moved (see Figure 13) and the front disc spring carefully examined for signs of delamination or breakage, especially at the center of the spring. A failed spring can be recognized by the appearance of the surface adjacent to the steel hub of the spring. If this surface has a discolored or whitish appearance in this area, perhaps accompanied by a bulging or irregular appearance, the spring is defective and should be replaced. If found defective, the front spring should be removed and re-placed before disturbing the rear spring (see Figure 14).

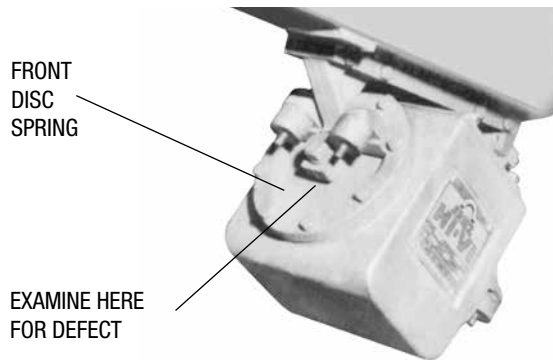


FIGURE 13

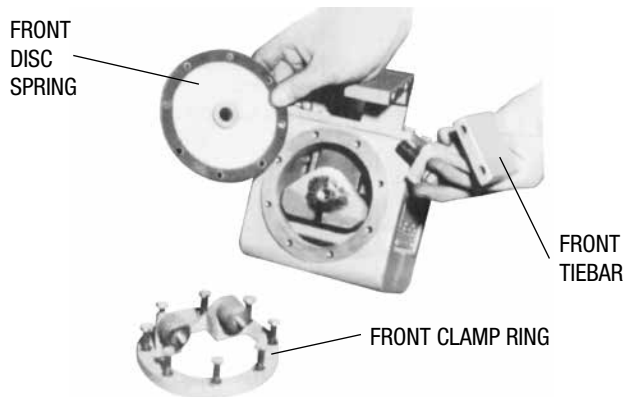


FIGURE 14

Remove the tray, the front section of the tiebar and the front clamp ring, replace the spring, and replace the clamp ring and the tiebar section in order. Make sure that the arrow stamped on the spring points up, and that the tiebar section is straight and lined up with the rear section.

After the front spring has been checked and, if found defective, replaced, the rear spring should be checked, in much the same fashion without disturbing the front spring (see Figure 15).

Remove the rear clamp ring, examine the spring, replace if necessary (making sure that the arrow stamped on the spring points up and that the holes line up with the tapped holes in the body casting after the center bolt is tightened), and re-install the rear clamp ring. The other parts can then be reassembled, following the tray installation procedure described, and the unit tuned to the correct displacement.

Repairs (cont.)

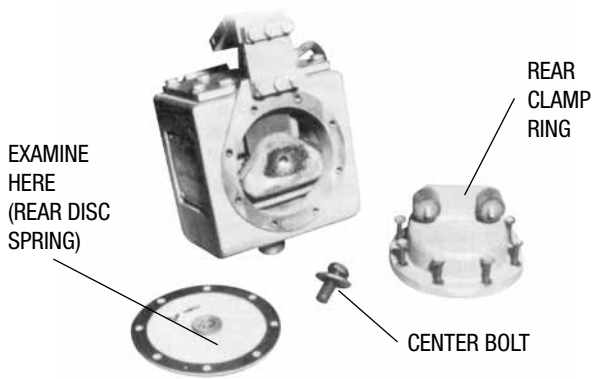


FIGURE 15

WHEN TIGHTENING THE DISC SPRING CENTER CLAMP BOLTS, THE FOLLOWING BOLT TORQUE VALUES SHOULD BE ADHERED TO:

10A–25 lbs/ft (18 Nm) 45A–100 lbs/ft (74 Nm)
 20A–40 lbs/ft (29 Nm) 50A–275 lbs/ft (200 Nm)
 30A–65 lbs/ft (48 Nm) 55A–275 lbs/ft 200 Nm
 40A–100 lbs/ft (74 Nm)

These values apply to unlubricated bolts with a hardened flat washer (not lock washer) under the head.

The Hi-Vi Magnetic Drive Circuit

Old-style electromagnetic vibratory equipment has an inefficient attract-release type operation, where a mass mounted on springs is attracted by a DC electromagnet and returned to its original position solely by the springs. The Eriez Hi-Vi method incorporates a lifetime permanent magnet and is operated directly from an alternating current line. No rectifier is required.

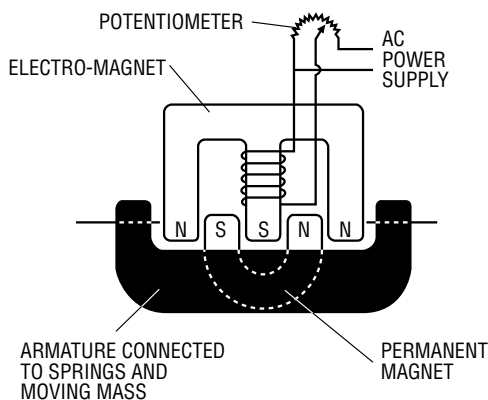


FIGURE 16

In the Hi-Vi method, the spring-mounted mass is alternately both attracted and repelled by an AC electromagnet assisted by the springs.

The pole pieces of the permanent magnet are intermeshed in the air gaps of the electromagnet. The polarity of the electromagnet alternates at the line frequency. The polarity of the electromagnet is shown as it would exist on one side of the sine wave.

Note that both poles of the permanent magnet are being attracted toward the unlike electromagnet poles. They are also being repelled in the same direction by the like electromagnet poles. This results in four forces accumulating to drive the armature in the same direction. It also results in closing the magnetic circuit through the electromagnet providing a magnetizing effect on the permanent magnet on each side of the sine wave. The de-magnetizing force is very minor, for the magnet poles and the magnetic lines of flux would much rather be attracted than repelled. This always places the permanent magnet in a net magnetizing circuit regardless of where the AC current is on the sine wave.

As the polarity of the electromagnet changes, all of the forces are reversed and the permanent magnet armature is driven in the opposite direction.

CAUTION: Operation from portable engine driven power plants.

Varying and unstable line frequency has a diverse effect on vibratory feeders because they are tuned mechanical devices, designed around either 50 or 60 cycle operating frequency. Shifts in the operating point due to changes in frequency (greater than 61 Hz or less than 59 Hz) cause higher than normal spring stress, striking and high line currents which can cause drive and tray failure. When operating from portable engine-driven power plants, be certain that the engine is up to speed and all other loads are started and at running speed before starting the electromagnet feeder.

The feeder should always be stopped first when the engine-driven power plant is shut down.

Troubleshooting

TABLE 1. SERVICE CHART

NATURE OF PROBLEM		Misapplication	Tampering or Changing of Base or Tray	Loose Spring Clamp or Tray Mounting Bolts	Coil Failure	Control Failure	Incorrect Voltage	Spring Failure	Foreign Material Between Tray & Reaction Mass	Incorrect Tuning	Broken Weld on Tray	Incorrect Factory Adjustment	Sympathetic Vibration in Other Equipment	In Contact with Other Equipment	Line Voltage Variation	Blown Fuse or Circuit Breaker	Other Electrical Connections	Shockmount	Deterioration	Corrosive or Abrasive Material	Product Variation or Product Sticking to Tray Surface	
		1	2	3		5	6	7	8	9	10	11		13	14		16					19
Initial Installation	Reduced or Low Output	1	2	3		5	6	7	8	9	10	11		13	14		16					19
	Noisy but Output Okay		2	3					8	9	10	11	12	13	14							19
	Noisy Certain Periods Only									9		11		13	14							19
Develop After Satisfactory Initial Operation	Completely Inoperative		2		4	5		7	8			11		13		15	16					
	Operating But Reduced Output		2	3		5	6	7	8	9	10	11	12	13	14		16	17	18	19		
	Output Okay Too Much Noise		2	3				7	8	9	10	11	12	13	14							19
	Gradual Fading			3		5		7		9	10	11		13							18	19
	Excessive Tray Wear																				18	
	Turbulent Flow		2	3							10	11			14				17			19
	Inconsistent Output		2	3		5	6	7		9	10	11	12	13	14		16	17				19

1. Misapplication

Feeder too small. Product difficult or impossible to handle. Impossible temperatures or atmospheres. Impossible dimensional requirements. Feeding requirements too precise or excessive. Consult Engineering.

2. Tampering or Changing of Base or Tray

Extensions, covers, weights, screens or other modifications or attachments that may have affected performance. Disassembly or other modifications without either carefully following printed instructions or consulting Eriez Manufacturing Company. Restore to original configuration.

3. Loose Spring Clamp or Tray Mounting Bolts

Tighten all bolts except center bolt of each disc spring.

4. Coil Failure

Replace coil or coil and E-Frame assembly. Order from Eriez parts lists. Follow maintenance instructions carefully.

5. Control Failure

Check for burned out powerstat or rheostat, defective capacitor, defective switch, loose wiring, defective transformer (if used). Order new parts from Eriez. Possibility special control needed. Consult Engineering.

6. Incorrect Voltage

Check nameplate specifications and line voltage. Correct line voltage if necessary.



Troubleshooting *(cont.)*

7. **Spring Failure**

See maintenance instructions. Disassemble for examination. If a disc spring has failed, it will show either as complete breaking away of the center steel hub or delamination adjacent to this hub. A white area of irregular shape around the hub indicates delamination. Tuning spring failure will also show up as white areas. Order new parts from factory and replace per instructions.

8. **Foreign Material**

Examine and remove foreign material.

9. **Incorrect Tuning**

See maintenance instructions. To increase displacement and output, use fewer or lesser ply tuning springs. To decrease displacement and eliminate striking, use more or greater ply tuning springs. (Note: Opposite on HS Feeder only.)

10. **Broken Weld on Tray**

Check and correct.

11. **Incorrect Factory Adjustment**

See maintenance instructions (gap adjustments).

12. **Sympathetic Vibration in Other Equipment**

Check and correct.

13. **Contact with Other Equipment**

Check and correct.

14. **Line Voltage Variation**

Check and install voltage regulator if necessary.

15. **Blown Fuse or Circuit Breaker**

Check for short circuits and correct.

16. **Other Electrical Connections**

Check all connections and correct.

17. **Shockmount Deterioration**

Check and correct.

18. **Corrosive or Abrasive Material**

May require special tray—Consult Eriez Manufacturing Company.

19. **Product Variation**

If product density, moisture content or other characteristics vary, customer should take own corrective measures.

Declaration of Conformity

Eriez Manufacturing declares that the Electromagnetic Vibratory drives conform to the following:

EN 60204-1 in accordance with the Low Voltage Directive (73/23/EEC).

Eriez Manufacturing declares that the Electromagnetic Feeders (vibratory drives with trays) conform to the following:

EN 60204-1 in accordance with the Low Voltage Directive (73/23/EEC).

EN ISO 12100-1, BS EN ISO 12100-2, and EN 1050 in accordance with the Machinery Directive (98/37/EC).

Eriez Manufacturing declares that the Electromagnetic Feeder System (vibratory drives with trays and controls) conform to the following:

EN 60204-1 in accordance with the Low Voltage Directive (73/23/EEC).

EN ISO 12100-1, BS EN ISO 12100-2, and EN 1050 in accordance with the Machinery Directive (98/37/EC).

EN 61000-6-4 and EN 61000-6-2 in accordance with the Electromagnetic Compatibility Directive (89/336/EEC).



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