VM-3841B

Installation, Operation and Maintenance Instructions

ERIEZ®

HIGH SPEED VIBRATORY FEEDER
MODEL - HS-30

ERIEZ MAGNETICS HEADQUARTERS: 2200 ASBURY ROAD, P.O. BOX 10608, ERIE, PA 16514–0608 U.S.A.
WORLD AUTHORITY IN ADVANCED TECHNOLOGY FOR MAGNETIC, VIBRATORY and METAL DETECTION APPLICATIONS

Introduction

This manual details the proper steps for installing, operating and maintaining the Eriez Model HS-30 High Speed 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 Manufacturing at 814/835-6000 for Vibratory Feeder assistance.

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ERIEZ MODEL HS-30 HIGH SPEED VIBRATORY FEEDER

Installation

MOUNTING

This Hi-Vi model should be mounted on a flat surface, fastened with bolts of proper size. Use lock washers under the bolt heads.

FIGURE 1

ELECTRICAL CONNECTIONS

SEE FIGURE 2

1. Check the specifications of the power line to be certain that they are the same as those shown on the nameplate of the control box.
2. Connect the black and 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. The black wires from each power cord should be connected together and the white wires connected together.

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

YOU ARE NOW READY TO START YOUR VIBRATORY FEEDER.

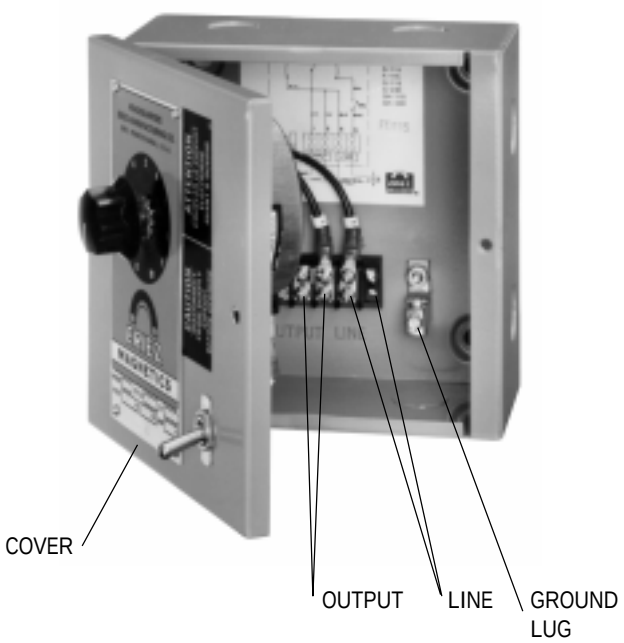

FIGURE 2

Operation and Maintenance

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

To start the feeder after all connections have been made, throw the control box switch and adjust the output voltage to maximum by rotating the control knob to the full clockwise position. Ordinarily (at ordinary room temperatures) the unit will take about two minutes to warm up and reach full steady-state displacement.

After full steady-state displacement has been attained, use the controller to adjust the unit to the desired feed rate.

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

SPECIAL TRAYS AND ATTACHMENTS

Eriez Engineering Service should always be consulted before undertaking the design or construction of special trays. Neither standard nor special trays as furnished by Eriez Manufacturing Co. should be modified nor attachments made without first consulting us. To do so will void the warranty. See *Standard Tray Specifications*.

TUNING GUIDE

GENERAL INFORMATION

The tuning means is provided solely for the purpose of mechanically tuning the unit, with its tray, to the desired vibratory displacement at full voltage. When a unit is furnished complete with tray, it is properly tuned to the tray at the factory. Such tuning is naturally somewhat different for trays of different size or weight.

Tuning is accomplished by changing the stiffness of the tuning spring stacks of the feeder (see Figure 3). Variations in stiffness are obtained by changing the number of springs in the stacks and/or by changing the thickness of fiberglass springs.

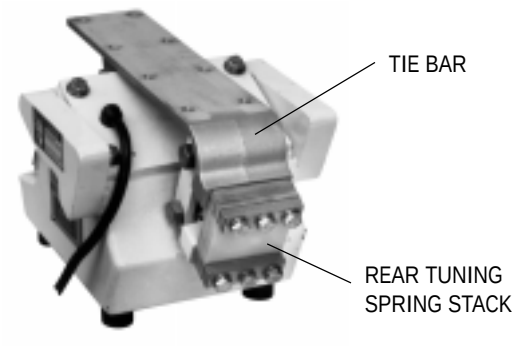

FIGURE 3

In normal operation at full voltage after warmup, the total displacement for standard size trays, measured at the back of the tray, is .085" to .090" (2.2 mm to 2.3 mm). For trays substantially larger than standard this normal displacement range may be reduced by .005" (.1 mm), while for trays substantially smaller the range may be increased by. 005" (.1 mm).

HOW TO MEASURE DISPLACEMENT

SEE FIGURE 4.

Position an Eriez displacement sticker on the outer side of the tray, near the rear of the tray and at an angle of 25° from vertical.

With unit operating observe where the fine gray lines on the displacement sticker appear to meet. This point will be higher or lower as the displacement changes. Opposite the point where they appear to 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.

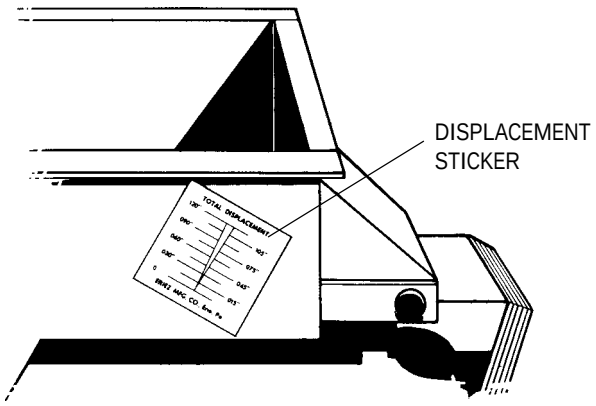

FIGURE 4

Operation and Maintenance (cont.)

The following general rules, which apply only to the warmed-up feeder operating ideally on the normal side of its tuning curve, should be borne in mind when making tuning adjustments to increase or decrease the displacement:

1. To DECREASE the tray displacement, DECREASE the stiffness of the tuning springs.
2. To INCREASE the tray displacement, INCREASE the stiffness of the tuning springs.

If decreasing or increasing the tuning spring stiffness has an opposite effect, it means that the spring stiffness is great enough (or the tray mass small enough) that the unit is operating on the "opposite side of the tuning curve," which is not the ideal operating condition even though it can be tolerated. If possible, the spring stiffness should be reduced (or the tray mass increased) until the behavior is in accordance with rules 1 and 2. The unit can then be properly tuned to the desired displacement.

As a guide to the stiffness of individual tuning springs, each spring is marked with a code number (example, 5-27). The first number (5) is the number of fiberglass plies in the spring. The following number (27) indicates the relative stiffness of the spring; the higher this number the stiffer the spring.

The total stiffness of the tuning spring stack is the sum of the relative stiffness numbers. By various combinations of different ply springs having different relative stiffnesses, practically any desired total stiffness can be obtained.

TUNING FOR NON-STANDARD TRAYS

Note: See *Special Trays and Attachments* section in this manual.

If it is necessary to tune the unit to an off-size or non-standard tray, follow this procedure:

1. Attach the tray, making sure that all lockwashers are in place and the fasteners tight.
2. Energize the unit at the nameplate voltage and frequency and allow it to warm up at full voltage.
3. (a) If a hammering or striking noise appears during warmup or if such a noise occurs when the unit is turned off and on quickly, the displacement is well in excess of normal. Whether striking or not, if the displacement exceeds the normal range for that particular size of tray (see *Tuning Guide – General Information*), it must be reduced by substituting a tuning spring leaf or leaves of lesser stiffness, or by subtracting one or more leaves, until approximately normal full voltage displacement is attained. Then use the controller for fine or variable control of displacement and feed rate.

   (b) If the displacement at full voltage after warmup is below the nominal range for that particular size tray, and greater displacement is desired, increase the tuning spring stiffness by substituting leaves of greater stiffness or by adding more leaves.

TUNING FOR DIFFERENT CONDITIONS OF TRAY LOADING

Units with Eriez-built trays are factory tuned for normal displacement (approximately .085" [2.2 mm]) with light loading (light head load, light materials, limited depth of flow of heavier materials), and ordinarily this tuning will not need to be changed. However, in cases where somewhat greater than normal loading is unavoidable, it may be necessary to increase the tuning spring stiffness slightly to maintain normal deflection under load. In no case, however, should the unit be permitted to deflect more than .090" (2.3 mm) without load.

CAUTION: A small amount of striking during tuning is permissible, but must not be allowed during regular operation since damage to the feeder can result.

Repairs

COIL REPLACEMENT

REFER TO PARTS LIST DRAWING AND FIGURES 5, 6, 7 & 8

The coil in a Vibratory Feeder may eventually fail due to overvoltage operation or normal aging.

The following procedure should be followed in removing and replacing the electrical assembly, which includes the coil:

1. Remove both nameplates and insert the two gap spacers (furnished with the unit) between the E-frame center leg and the two armature pole pieces (see Figures 5 & 6).

2. Remove, in order, the bolts securing (a) the upper end of the rear tuning spring stack to the tiebar, (b) the lower ends of the spring lever arms to the body housing, and (c) the lower end of the tiebar to the spring bar. Lift the tray-tiebar-ever assembly away from the body housing (see Figure 7)

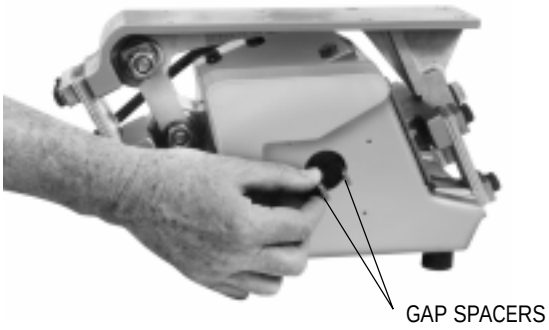

FIGURE 5

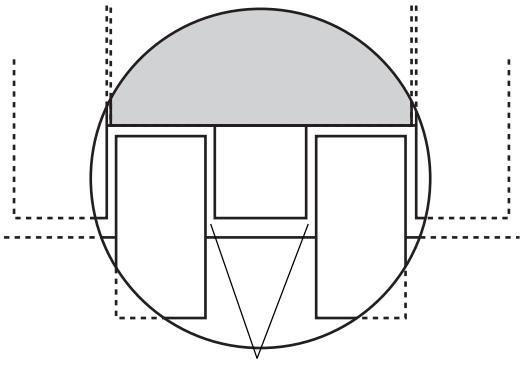

FIGURE 6

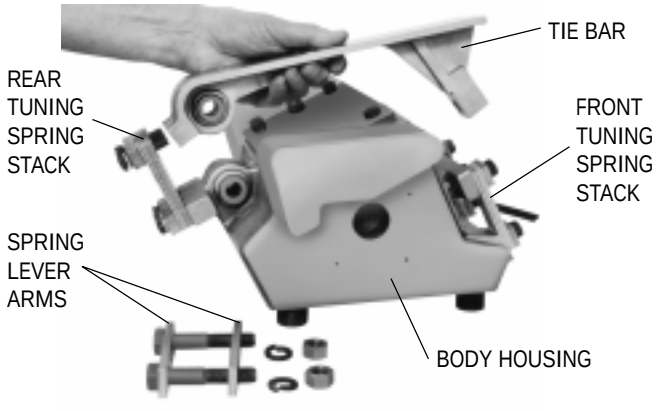

FIGURE 7

3. Remove the bolts securing the electrical assembly to the body housing and lift the assembly out of the body housing (see Figure 8).

4. If the coil is defective, the entire E-Frame assembly including the coil must be replaced (order from Eriez parts list).

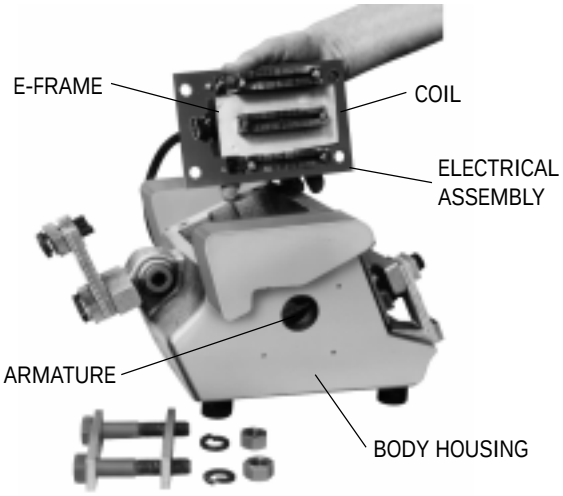

FIGURE 8

5. In reassembling the unit, first center the armature at the bottom of the body cavity; then insert the E-frame into the body cavity, making sure that the center leg enters the space between the armature pole pieces. Insert the bolts securing the electrical assembly and fasten only finger tight.

Repairs (cont.)

6. Place the tray-tiebar-lever assembly into its original position and replace, in order, the bolts securing: (a) the lower end of the tiebar to the spring bar, (b) the lower ends of the spring lever arms to the body housing, and (c) the upper end of the rear tuning spring stack to the tiebar. Make sure that all tuning spring spacers are in place and that all bolts are tight.

7. Loosen the electrical assembly bolts slightly and roughly center the E-frame center leg between the pole pieces. Insert the two spacers between the E-frame center leg and the pole pieces and adjust the electrical assembly forward or backward until both spacers move freely in the gaps. Tighten the electrical assembly plate and replace the nameplates.

SPRING CHANGE OR REPLACEMENT

REFER TO THE PARTS LIST DRAWING AND FIGURES 9 AND 10.

Although the nonmetallic springs used in the Feeder have outstanding life characteristics, failure may eventually occur, especially if the displacement is greater than normal. The symptoms of such failure will be:

1. Erratic behavior of the unit.
2. Greatly reduced displacement.

If spring failure is suspected, the tuning spring stacks should be removed after first inserting the two gap spacers between the center leg of the E-frame and the two pole pieces (see Figure 9). The purpose of this is to hold the tiebar or tray-tiebar assembly in position while the tuning springs are removed.

Carefully examine each tuning spring for signs of delamination or breakage, especially in the area next to the spring shims. A failed spring can be recognized by the appearance of the spring surface. If this surface is discolored or has a patchy whitish appearance, perhaps accompanied by surface bulging or other irregularity, the spring is defective and should be replaced with a new spring ordered from the parts list.

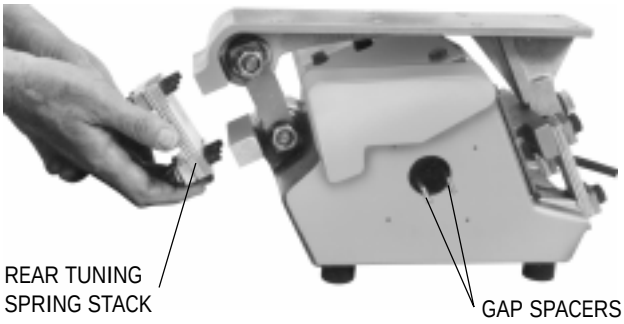

FIGURE 9

If the feeder still exhibits signs of spring malfunction after the tuning spring has been checked and replaced, check the two cylindrical elastomer springs after first inserting the two gap spacers, then removing the spring lever arms, and finally removing the elastomer springs in the following manner:

1. Lay the unit on its side, making sure that the gap spacers stay in place, and use a small hammer and flat ended round bar or dowel to tap the elastomer spring out of the body housing. Next, support the tiebar with a small block between the tiebar and work surface, and tap the elastomer spring out of the tiebar.

2. Carefully examine both elastomers for signs of failure and replace if such signs are found. A failed elastomer spring will exhibit one or more of the following characteristics:

   (a) Looseness of the elastomer combined with signs of rubbing or abrasion at the outer surface of the cylinder. Looseness of the metal sleeve.

   (b) Small crack in the elastomer around the end of the metal sleeve, possibly with small abraded particles of the elastomer present.

   (c) Tackiness of the elastomer around the metal sleeve and at the outer surface of the cylinder, possibly with some outward bulging of the elastomer.

Repairs (cont.)

3. In replacing the elastomer springs, lay the unit on its side so that the chamfered ends of the spring holes are up. After making sure that the holes and their chamfered ends are clean and free from obstructions, lubricate the springs with a little water (never use a petroleum or silicone lubricant) and press them partly into place with the thumbs. Then tap the springs back into place, again using the small supporting block between tiebar and work surface. Make sure that the springs go in straight and that the steel inner sleeves protrude equally at both ends of both spring holes. See Figure 10.

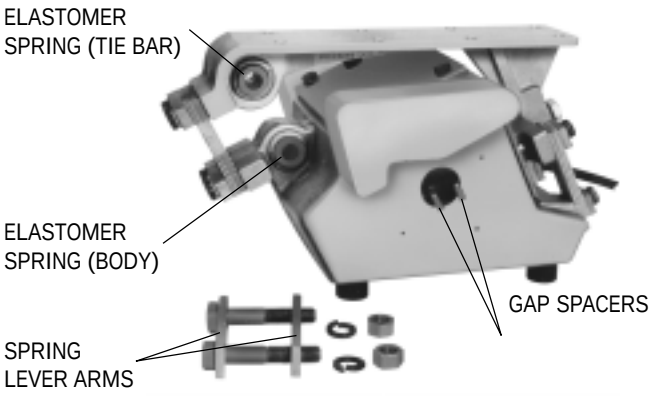

FIGURE 10

The tie bar spring must be installed with the tube spacer (Parts List Item 10); the body spring is installed without a tube spacer.

4. Replace the lever arms, tightening the two fastening bolts securely, and remove the two gap spacers. If a new elastomer spring has been installed, it may be necessary to retune the feeder. See Tuning Guide section in this manual.

CAUTION: Make sure that all of the fasteners in the assembly are tight or torqued to spec at all times. Periodic checks for tightness should be made to insure against possible malfunction or damage due to loose parts.

ARMATURE REPLACEMENT

REFER TO PARTS LIST DRAWING AND FIGURES 5, 6, 7 & 8

Prolonged striking may damage the armature to an extent that it will have to be replaced. If this should become necessary, order a new armature from the parts list and begin by following the same instructions as for coil replacement.

1. Continue by removing, in order, the bolts securing (a) the upper end of the front tuning spring stacks to the spring bar and (b) the spring bar to the armature.

2. Remove the bolts securing the elastomer diaphragm to the body housing and lift the armature out of the body cavity.

3. To reassemble the unit reverse the above procedure.

THE HI-VI MAGNETIC DRIVE CIRCUIT

Old-style electromagnetic 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 new Hi-Vi method incorporates a lifetime permanent ceramic magnet and is operated directly from an alternating current line.

In the Hi-Vi method, the spring-mounted mass is alternately both attracted and repelled by an AC electromagnet assisted by the springs. Intermeshing a fixed polarity permanent magnet with an alternating polarity AC electromagnet eliminates the rectifier.

It will be noted that the pole pieces of the permanent magnet are intermeshed in the air gaps of an electromagnet. The polarity of the permanent magnet is fixed; the polarity of the electromagnet alternates at the line frequency. We have shown the polarity of the electromagnet 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 elec-

Repairs (cont.)

tromagnet 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 demagnetizing force is very minor for the attracting force and the magnetic lines of flux would much prefer to be attracted than repelled. This always tends to place the permanent magnet in a 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.

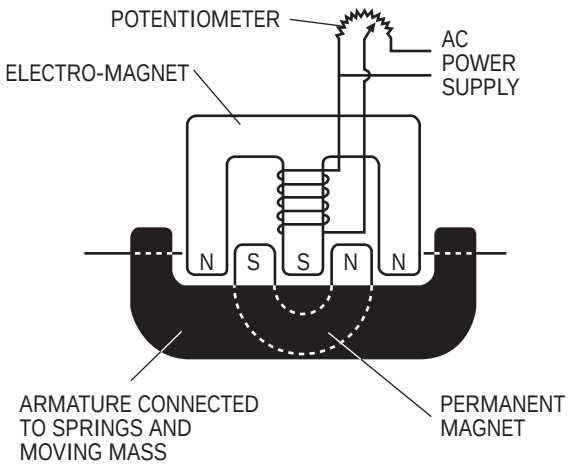

FIGURE 11

CAUTION NOTE: For 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 (+ or -1 cycle) can 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 2. 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	Poor or Broken Weld on Tray	Incorrect Factory Adjustment	Sympathetic Vibration in Other Equipment	In Contact with Other Equipment	Line Voltage or Hz Variation	Blown Fuse or Circuit Breaker	Other Electrical Connections	Shockmount Deterioration	Corrosive or Abrasive Material	Product Variation
Initial Installation	Reduced or Low Output	1	2			5	6	7	8	9		11		13	14		16			19
	Noisy but Output Okay		2	3					8	9	10	11	12	13						
	Noisy Certain Periods Only											11		13	14					
Develop After Satisfactory Initial Operation	Completely Inoperative		2		4	5		7						13		15	16			
	Operating But Reduced Output		2	3		5	6	7	8	9	10	11	12	13	14		16	17		19
	Output Okay Too Much Noise		2					7	8	9	10	11	12	13	14					
	Gradual Fading					5		7	8	9	10			13						19
	Excessive Tray Wear																		18	
	Turbulent Flow										10	11			14			17		
	Inconsistent Output		2	3		5	6	7		9	10	11	12	13	14		16	17		19

REFER TO TABLE 1. SERVICE CHART

1. Misapplication

a. Feeder too small.

b. Product difficult or impossible to handle.

c. Impossible temperatures or atmospheres.

d. Impossible dimensional requirements.

e. Feeding requirements too precise or excessive.

f. Consult Engineering.

2. Tampering or Changing of Base or Tray

a. Extensions, covers, weights, screens or other modifications or attachments that may have affected performance.

b. Disassembly or other modifications without either carefully following printed instructions or consulting Eriez Manufacturing Company.

3. Loose Spring Clamp or Tray Mounting Bolts

a. Tighten all bolts.

4. Coil Failure

a. Replace coil or coil and E-frame assembly.

b. Order from Eriez parts lists.

c. Follow maintenance instructions carefully.

5. Control Failure

a. Check for burned out powerstat or rheostat, defective capacitor, defective switch, loose wiring, defective transformer (if used).

b. Order new parts from Eriez.

c. Possibility special control needed.

d. Consult Engineering.

6. Incorrect voltage

a. Check nameplate specifications and line voltage

Troubleshooting (cont.)

7. Spring Failure

a. See maintenance instructions.

b. Disassemble for examination. Tuning spring failure will show up as white areas.

b. Order new parts from factory and replace per instructions.

8. Foreign Material

a. Examine and remove foreign material.

9. Incorrect Tuning

a. See maintenance instructions. To decrease displacement and output, use fewer or lesser ply tuning springs. To increase displacement and eliminate striking, use more or greater ply tuning springs.

10. Poor or Broken Weld on Tray

a. Check and correct.

11. Incorrect Factory Adjustment

a. See *Repairs* section in this manual for information on gap adjustment.

12. Sympathetic Vibration in Other Equipment

a. Check and correct.

13. Contact with Other Equipment

a. Check and correct.

14. Line Voltage or Hz Variation

a. Check and install voltage regulator if necessary. Check and install Hz regulator.

15. Blown Fuse or Circuit Breaker

a. Check for short circuits and correct.

16. Other Electrical Connections

a. Check all connections and correct.

17. Shockmount Deterioration

a. Check and correct.

18. Corrosive or Abrasive Material

a. May require special tray.

b. Consult Eriez Manufacturing Company.

19. Product Variation

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

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