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Vibratory Feeding Equipment Troubleshooting Manual

Vibratory Bowl Feeders · Straight Line (Inline) Drivers · Vibratory Hoppers

Customer Service Manual · Updated November 5, 2026

This manual explains the parts of a vibratory feeding system and how to find and fix the most common problems. It covers bowl feeders, straight line drivers and vibratory hoppers. For step-by-step spring replacement, see the FCI *Leaf Spring & Spacer Replacement Guide*.

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1. Terminology: feeder bowl parts and tooling

Term	What it is
Basic bowl	An untooled bowl: a vertical band and a domed bottom, with an internal or external helical track. An internal track can also be inverted.
Vibratory feeder bowl	The basic bowl with internal or external tooling built to meet the feed rate, part orientation and other specs.
Orientation	The position the part must be in at the discharge, as the assembly or placing operation needs it.
Rate	The number of parts discharged per minute or per hour to keep up with production.
Angle skirt	A cone section fitted between the underside of the track and the bowl wall. It stops parts from stacking and jamming between tracks.
External tooling	Any construction outside the vertical band that separates, orients, selects, confines or relieves pressure on oriented parts.
Return pan	The structure on the outer band that sends rejected parts back into the bowl.
Pre-orientor	Tooling that turns parts toward the right position before final selection. It raises feed rate and cuts down on recirculation, which extends bowl life with metal or abrasive parts.
Final selector	A tooled section that lets through only parts in the correct position.
Adjustable narrow track section	A short stainless or tool steel track insert, inside or outside the bowl, that can be set to different widths. It orients parts or limits them to single file.
Sweep (or cam)	A stainless or tool steel insert inside or outside the bowl that controls part level or orientation.
Chord section	A straight section of stainless or tool steel used to select or orient parts, inside or outside the bowl.
Parallel blade section	A fixed or adjustable gap that hangs parts such as bolts and screws by their heads.
Baffle	A stainless deflector on the bowl bottom that guards the return hole so parts flow evenly back up the track.
Air jet	A small tube, bolted or welded in place, that helps move, orient or select parts with the least air pressure possible.
Back pressure relief ("bubble")	An area just before confinement where parts buckle and fall back into the bowl when the discharge is full. It prevents jams and stops wrong-way parts from bridging across the tooling.
Full track sensor	A proximity, photo-eye, fiber optic or air sensor that stops and starts the feeder, or fires an air jet to blow off extra parts, when parts will not bubble off on their own.
Confinement	The section that holds parts in position through the discharge chute. It usually has bolt-on covers for access.
Discharge chute	A short track mounted tangent to the bowl that keeps parts in the orientation set in the bowl and carries them to an inline or gravity track.
Running surface	The part of the bowl, pre-orientor, selector or discharge chute the part rides on.

Term	What it is
Scrap chute	An opening that lets dirt and small debris leave the bowl without disturbing the parts.
Quick dump chute	A quick-opening window used to empty the bowl when changing to a different part.
Flange mount	An extension of the bowl band that clamps the bowl to the drive's cross arms with toe clamps. Large bowls also use a center bolt.
Counterbalance weight	A steel block added to the outside of the bowl to offset the weight of external tooling. Its location is set on a balancing wheel.

2. Terminology: drive units, hoppers, tracks and escapements

How a bowl base drive works. One or more electromagnetic coils pull on armature plates (pole faces). Leaf springs attached to the cross arms hold the bowl and turn that pull into a twisting vibration that pushes parts up the track at about 12 degrees from horizontal. The drive works best when it is tuned to the frequency of the power: parts feed at full speed with the least current. The weight and diameter of the bowl decide how many springs the drive needs. The rubber feet also affect tuning and must be the correct hardness.

Term	What it is
Coil pack / non-coil pack	On a bowl drive, some spring packs sit next to a coil (coil packs) and some do not (non-coil packs). Non-coil packs must have the same number of springs as the coil packs, or fewer.
Spring spacer (shim)	The thin spacer between each leaf spring. Every spring needs one.
Toe clamps	The clamps at the end of each cross arm that hold the bowl's flange to the drive. They must be torqued to spec so all the vibration reaches the bowl.
Coil gap	The air gap between the coil face and the armature plate. See section 5 for settings.
Coil clatter	A banging sound that means the coil gap is too small and the pole faces are hitting. Fix it right away or the drive will be damaged.
Tuning	Matching the spring stiffness to the weight of the bowl, bin or track so it moves at the power frequency. On AC (full wave), the coil pulls 120 times a second. On DC (half wave, rectified), it pulls 60 times a second. AC drives use fewer, thicker springs and DC drives use more, thinner springs (see section 5). An over-sprung or under-sprung unit can't return to center before the next pulse, so it loses motion.
Storage hopper	Holds extra parts and refills the bowl automatically from a level switch, so the bowl is never empty or overloaded.
Gravity track	A track set at enough angle that gravity carries parts from the feeder discharge.
Magazine	A track that holds a stack of oriented parts. It is usually preloaded and the feeder keeps it full.
Straight line (inline) feeder	A drive that makes straight-line vibration. It moves parts horizontally from the bowl discharge to a dead nest or machine.
Overhang	How far the track extends past either end of the inline drive's top member.
Escapement	A mechanical device at the end of the discharge, inline or gravity track that separates the end part.
Placing device (head)	A mechanism that places an escaped part into a nest or onto another part.

3. Bowl feeders: troubleshooting

Bowl does not vibrate at all

1. The power supply to the controller may be inadequate.
2. The cord from the feeder to the controller may be loose, wired wrong or damaged.
3. A fuse may be blown in the controller.
4. A coil may be shorted out.
5. The coil gap may be closed up or too wide.
6. A part or other object may be stuck between the coil and the armature.
7. The bowl may be touching a rigid track, or the bowl or drive may be touching other equipment.

Weak vibration, or slow, uneven or erratic part movement

1. One or more springs may be cracked or broken.
2. The base plate may be too thin. A thin plate flexes ("oil cans") and soaks up vibration.
3. The base plate may not be rigid. A plate that overhangs the machine base won't give enough vibration. Top plates on column stands or tables should be at least 1-1/2 in thick, and column stands should have gusset braces.
4. The table may not be level or bolted down properly.
5. Dirt or buildup may be on the bowl's running surfaces.
6. The coil gap may be set wrong. See section 5. The pole faces must be parallel.
7. The machine may be indexing so hard that parts fall off the bowl tooling.
8. The voltage to the controller may be fluctuating.
9. The drive may need retuning to the local power supply.
10. The parts may be out of tolerance, burred, bent or warped, or have oil, mold release or other lubricant on them.
11. **The toe clamp bolts that hold the bowl to the cross arms may be loose, or the bowl may not be seated in the toe clamps.** This is very important. Torque them to the values in section 5.
12. The bowl may be overloaded. Too many parts make the motion erratic. Find the right load by adding parts a layer at a time until the bowl runs best. An auxiliary supply hopper with a level control will hold that level automatically.
13. The drive may be out of tune. Tuning means adding or removing springs to match spring stiffness to the weight of the bowl. See section 4.
14. The part may have changed since the feeder was built. A changed part needs new tooling and retuning.
15. Air jets may be set wrong, or the air may be dirty. Air must be dry, filtered and regulated, with a separate flow control valve on each jet. Water or oil in the air builds up on the running surfaces and slows or stops parts. Use soft, flexible tubing. Rigid lines or hard plastic tubing dampen vibration.
16. The controller may be set to the wrong frequency. Check that the switch on the power board is in the correct position.

4. Tuning bowl base drive units

Use this procedure on any FCI bowl drive, AC or DC.

Spring pack rules

- **Non-coil packs must have the same number of springs as the coil packs, or fewer.** Packs on opposite sides do not need to match.
- **The thinnest springs always go on the outside of the pack.**
- **A spacer goes between every spring.** A missing spacer acts like an extra spring.
- **Change one spring at a time,** then test again.

Checking the tuning

Load parts to the proper level. If the drive has a base cover, keep it on. Set the controller to 35–40% of input voltage. Some part movement should start. Raise the setting slowly until you reach the feed rate you need. If you reach 80% without enough movement, or the bowl runs violently, look for anything touching the bowl or drive first. Then:

1. With the bowl running, slowly loosen one spring clamp bolt, preferably a lower one, until the bowl speeds up or slows down.
    - **Bowl speeds up:** the drive is over-sprung. Remove the thinnest spring from a non-coil pack.
    - **Bowl slows down:** the drive is under-sprung. Add a thin spring to a coil pack.
2. Retighten the bolt to full torque (section 5) and test again after each change.
3. Leave the drive slightly under-sprung. Find how much by testing.
4. Springs work-harden over time, so a drive that has run for years can read over-sprung. Check it with step 1.
5. If the drive still reads under-sprung after you add a spring, look for a cracked spring. Cracks usually form near the bottom of the spring, at the top of the spring clamp hanger. Paint can hide them, and some don't go all the way through. Remove the springs and strike each one on a hard surface. A cracked spring will break. Check the thickest spring first.
6. Make sure the bolts are the right length. Each spring you add uses up thread, and a short bolt can strip and give a false reading. The holes are blind, so a bolt that is too long bottoms out and feels tight when it is not. This applies to spring bolts, armature bolts and toe clamp bolts. Rule this out before judging the tuning.
7. Use the bolt sizes in section 5. Replace any bolt that is stretched or has damaged threads, since a stretched bolt throws off the tuning.
8. Cracked or broken welds throw off tuning. Check the bowl mounting flange, the track and skirts, the bottom of the return pan, and the braces, pan wall and discharge area. A broken weld usually makes an odd noise.
9. Check the bolts that hold the rubber feet to the drive. If they back out, the drive touches the mounting surface and the tuning reads wrong. To fix it, take the drive off the base plate, lift it to expose the feet, and tighten the screws.
10. Torque the toe clamp bolts that hold the bowl to the drive to the values in section 5.
11. Never pull a bowl partly out of its toe clamps to line it up with a track. Level the drive instead. A bowl that isn't level lets parts fall off or drift before the selector, causing jams, wrong-way parts and lost feed rate.

12. Never leave out a spring spacer when changing springs. If one is missing, make one. Don't run without it.
13. Bolt every rubber foot securely to the mounting plate so the drive can't turn. Drill the holes on center so the feet aren't stretched when tightened.
14. Don't connect a gravity track or inline to the bowl to get vibration. It hurts the bowl's feed. Give the track its own inline drive.
15. **Dead spots:** look about 180 degrees across from the dead spot. The usual causes are weight added without counterbalancing the bowl, a wrong coil gap, a broken weld, or a broken spring or loose spring bolt.
16. When tuning is done, witness mark every bolt with a paint line across the bolt head and the part it holds.

5. AC and DC drives, coil gap and torque specs

Coil gap

The coil gap must be right for the feeder to run properly. Too small and the coil clatters and damages the drive. Too large and the feeder runs slow and the coil overheats. The middle and all four corners of the coil should be the same distance from the armature plate, with the pole faces parallel.

	AC drive (120 cycle)	DC drive (60 cycle)
Also called	Non-rectified, full wave	Rectified, half wave
Pulses per second	120	60
Vibrations per minute	7,200	3,600
Leaf springs	Fewer, thicker springs	More, thinner springs
Coil gap	0.030 in	0.040 in

Switching a drive between AC and DC changes the spring set and the coil gap it needs. Call FCI before you switch.

Always unplug the unit before turning any coil bolt.

1. With the unit off, measure the gap with a feeler gauge at the middle and all four corners. Write the readings down before changing anything.
2. Use the four bolts on the back of the coil to adjust it. Two bolts pull the coil toward the coil post and two push it away.
3. Set the gap from the table above.
4. Plug in and run the controller at 80–100%.
5. If the coil hammers, the gap is too small. Unplug, open it slightly and test again.
6. Record the final readings and torque the coil mounting bolts to 85 in-lb.

Bowl drive torque specs

Use a torque wrench on every bolt. Bolts are socket head cap screws (SHCS) unless noted. Drive size is the bowl diameter the drive is built for.

Drive size	Top spring bolts	Bottom spring bolts	Coil mounting bolts	Coil stand bolts	Toe clamp bolts
6 in	10-32: 33 in-lb, or 1/4": 14 ft-lb	10-32: 33 in-lb, or 1/4": 14 ft-lb	85 in-lb	Application specific	1/4": 14 ft-lb
8 and 10 in	1/4": 14 ft-lb, or 5/16": 25 ft-lb	1/4": 14 ft-lb, or 5/16": 25 ft-lb	85 in-lb	Application specific	1/4": 14 ft-lb
12 and 15 in	3/8": 55 ft-lb	3/8": 55 ft-lb	85 in-lb	1/2-13: 95 ft-lb	1/4": 14 ft-lb
18 and 21 in	1/2-13: 95 ft-lb	5/8-11: 165 ft-lb	85 in-lb	1/2-13: 95 ft-lb	3/8": 55 ft-lb
24 to 42 in	5/8-11: 165 ft-lb	3/4-10: 235 ft-lb	85 in-lb	1/2-13: 95 ft-lb *	3/8": 55 ft-lb

* On 27 to 42 in drives, high-speed or high-mass units may use a different coil stand bolt. Call FCI if yours doesn't match.

After tuning, witness mark every bolt. Draw a paint line across the bolt head and the part it holds. If the line ever breaks, that bolt has moved.

6. Straight line (inline) drivers

Driver does not vibrate at all

1. The power supply to the controller may be inadequate.
2. The cord from the driver to the controller may be loose, wired wrong or damaged.
3. A fuse may be blown in the controller.
4. A coil may be shorted out.
5. The coil gap may be closed up or too wide.
6. A part or other object may be stuck between the coil and the armature or top member.
7. The driver may be touching the bowl or other equipment, such as the escapement or placing station.

Weak vibration, or slow, uneven or erratic part movement

1. One or more springs may be cracked or broken.
2. The base plate may be too thin and flexing.
3. The base plate may not be rigid, or may overhang the machine base. Top plates on column stands or tables should be at least 1-1/2 in thick, with gusset braces on column stands.
4. The bolts holding the track to the aluminum top member may be loose.
5. The table may not be level or bolted down properly.
6. Dirt or buildup may be on the track surface.
7. The coil gap may be set wrong. See section 5. The pole faces must be parallel.
8. The voltage to the controller may be fluctuating.
9. The driver may need retuning to the local power supply.
10. The parts may be out of tolerance, burred, bent or warped, or contaminated with oil or mold release.
11. A changed part may need new track tooling and retuning.
12. Air jets may be set wrong, or the air may be dirty. Air must be dry, filtered and regulated, with a flow control on each jet. Use soft, flexible tubing, not rigid lines.
13. The driver may be out of tune. See below.
14. The controller may be set to the wrong frequency. Check the switch on the power board.

Tuning a straight line driver

Fill the track with parts. Set the controller to 35–40% of input voltage. Some part movement should start. Raise the setting slowly until you reach the feed rate you need. If you reach 80% without enough movement, or the track runs violently, look for anything touching the track or driver first. Then:

1. With the driver running, loosen one spring clamp bolt, preferably a lower one, about a half turn.
    - **Parts speed up:** over-sprung. Remove the thinnest spring from the pack with the most springs.
    - **Parts slow down:** under-sprung. Add a thin spring to the pack with the fewest springs.
2. Repeat until it is tuned. Leave it slightly under-sprung. The two packs do not need the same number of springs. Keep the thinnest springs on the outside of each pack and a spacer between every spring.
3. Make sure the bolts are long enough after adding springs, and not so long they bottom out in the blind holes. Either one gives a false tuning reading.
4. Replace stretched bolts, and make sure all spring bolts and hold-down bolts and nuts are tight.
5. Never leave out a spring spacer. If one is missing, make one.
6. **Dead spot at one end:** if the front runs slow, add spacers under the lower end of the front spring pack. If the rear runs slow, add spacers under the top end of the rear spring pack. Changing the number of springs in the lower (vertical) spring packs can also improve feed motion.

Hopper and inline bolt torque

Use these typical values for socket head cap screws on hoppers and inlines. For bowl drives, always use the table in section 5.

Bolt size	Typical torque
1/4-20	190 in-lb (about 16 ft-lb)
3/8-16	59 ft-lb
1/2-13	144 ft-lb
5/8-11	180 ft-lb
3/4-10	200 ft-lb

7. Vibratory hoppers

Hopper does not vibrate at all

1. The power supply to the controller may be inadequate.
2. The cord from the driver to the controller may be loose, wired wrong or damaged.
3. A fuse may be blown in the controller.
4. A coil may be shorted out.
5. The coil gap may be closed up or too wide.
6. A part or other object may be stuck between the coil and the armature or top member.
7. The hopper driver may be touching the bowl or other equipment.

Weak vibration, or slow, uneven or erratic part movement

1. One or more springs may be cracked or broken.
2. The base plate may be too thin and flexing.
3. The base plate may not be rigid, or may overhang the machine base. Top plates on column stands or tables should be at least 1-1/2 in thick, with gusset braces on column stands.
4. The bolts holding the bin to the top member may be loose.
5. The table may not be level or bolted down properly.
6. Dirt or buildup may be on the bin surface.
7. The coil gap may be set wrong. See section 5. The pole faces must be parallel.
8. The voltage to the controller may be fluctuating.
9. The hopper driver may need retuning to the local power supply.
10. The parts may be out of tolerance, burred, bent or warped, or contaminated with oil or mold release.
11. A changed part may need a reworked bin or retuning.
12. Air jets may be set wrong, or the air may be dirty. Air must be dry, filtered and regulated, with a flow control on each jet. Use soft, flexible tubing, not rigid lines.
13. The hopper may be out of tune. See below.
14. The controller may be set to the wrong frequency. Check the switch on the power board.

Tuning a vibratory hopper

Fill the hopper with parts. Set the controller to 35–40% of input voltage. Some part movement should start. Raise the setting slowly until you reach the delivery rate you need. If you reach 80% without enough movement, or the hopper runs violently, look for anything touching the bin or driver first. Then:

1. With the hopper running, loosen one spring clamp bolt, preferably a lower one, about a half turn.
    - **Parts speed up:** over-sprung. Remove the thinnest spring from the pack with the most springs.
    - **Parts slow down:** under-sprung. Add a thin spring to the pack with the fewest springs.
2. Repeat until it is tuned. Leave it slightly under-sprung. The two packs do not need the same number of springs. Keep the thinnest springs on the outside of each pack and a spacer between every spring.
3. Make sure the bolts are long enough after adding springs, and not so long they bottom out in the blind holes. Either one gives a false tuning reading.
4. Replace stretched bolts, and make sure all spring bolts and hold-down bolts and nuts are tight. See the hopper and inline torque table in section 6.
5. Never leave out a spring spacer. If one is missing, make one.
6. **Dead spot:** if the front runs slow, add spacers under the lower end of the front spring pack. If the rear runs slow, add spacers under the top end of the rear spring pack. Changing the number of springs in the lower (vertical) spring packs can also improve feed motion.

8. How tuning works

Tuning means getting the right balance between the weight on the drive (bowl, tooling, bin or track) and the stiffness of the springs. The goal is a natural frequency as close as possible to the running frequency of the coil.

Change	Effect on frequency
Add springs	Raises it
Remove springs	Lowers it
Add weight (tooling, counterweights)	Lowers it, same as removing springs
Remove weight	Raises it, same as adding springs

A feeder bowl moves by twisting, so both the amount of weight and how far it sits from the center matter. Weight on the outer edge of the bowl has more effect than the same weight near the center.

Checks an experienced tech uses

- **Spring check:** slowly loosening a spring bolt is the same as removing a spring for a moment. This is the test in sections 4, 6 and 7.
- **Tone check:** the instant the power is shut off, the bowl rings at its natural frequency. A pitch higher or lower than the normal running hum shows which way it is out of tune.
- **Hand check:** gripping the bowl band changes its frequency. To a trained ear, the change in tone shows an over-sprung or under-sprung bowl.
- **Base cover:** taking the cover off the drive changes the frequency. Tune with the cover on, or with weight blocks that match it. A big change in power when the cover comes off means the bowl is far out of tune.

From FCI's Feeder Theory and Part Application.

9. Help and replacement parts

Call Feeding Concepts at 317-773-2040 (parts: ext. 102) or email parts@feedingconcepts.com. Send the FC serial number from the unit's tag and we will quote the correct springs, spacers, coils and controls. We service, retool and refurbish vibratory feeders of any brand.

Feeding Concepts Inc. · 15235 Herriman Blvd., Noblesville, IN 46060 · 317-773-2040 · Fax 317-773-1494 · feedingconcepts.com. Vibratory feeder bowls and automatic parts feeders, built in Noblesville, Indiana since 1989. If you are not sure about a step, give us a call before running the unit.