



**Direct-Action
Electro-mechanical
Valve Instructions**

Patent # 5,608,176

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READ COMPLETELY BEFORE INSTALLATION

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**KADAK INC, 369 ST. CLAIR AVE., ST. PAUL, MN 55102
1-877-222-7479**

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Direct-Action Electro-mechanical Valve Instructions - Page 1
Patent # 5,608,176

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☒ MOUNTING OF MAGNET TO CHEST

The magnet assembly is attached to the windchest toeboard using a sheet metal screw of #8 by 5/8". The screw may be pre-installed by inserting into toeboard using the following dimensions locating the screw from the pipe windhole center. To make this procedure easier, construct two templates using clear plastic with crosshairs scratched in and a drilled hole to allow marking the screw location.

Valve Size	Distance from screw to toehole center
3/4" to 7/8"	1-3/8"
> 7/8"	1-1/2"

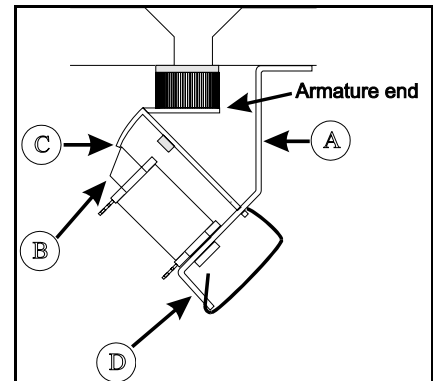


Figure 1 - primary adjustments

It is important to position the magnet frame so that the final resting position of the pallet valve edge is near the inside armature end (figure 1.) Large pallet valves (> 3/4") will extend beyond the outer armature end when glued in place. This technique will give maximum pallet valve lift and prevent pallet valve binding against the toeboard.

Note: Never use a pallet valve smaller than 3/4" diameter.

Note: Use only pallets supplied by us or pallets that have the same felt stiffness and leather surface as ours.

Use the following table when selecting a pallet valve size.

Toehole Size	Pallet Valve Size
1/8" to 1/2"	3/4"
9/16" to 5/8"	7/8"
11/16" to 3/4"	1"
7/8"	1-1/8"
1"	1-1/4"

Note: do not use a valve larger than specified in the preceding table for a given toehole size.

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☒ ADJUSTING MAGNET FRAME AND PALLET VALVE

Adjustment of the pallet valve is very important for optimum pipe speech. The goal is to adjust the magnet frame to limit the pallet valve travel. The ideal adjustment is to limit the pallet valve travel to provide just enough airflow required for a given toehole size. If the travel of a small toehole pallet is excessive for a given toehole diameter the response of the magnet may be slower than desired. By not providing enough travel for a large pallet valve there may not be enough airflow for the pipe.

The following pallet valve height dimensions are optimum and should only be used as a guide. Experience will allow the installer to make adjustments by eye. The following table is not meant to be followed exactly as this would be very time consuming.

Toehole Diameter	< 3/8"	7/16"	1/2"	9/16"	5/8"	11/16"	3/4"
Valve Height	0.1"	0.11"	0.13"	0.14"	0.16"	0.17"	0.19"

IMPORTANT - while the pallet adhesive is fresh, immediately adjust the magnet frame and magnet pole as follows:

View the overlap between magnet pole (figure 1, B) and armature (figure 1, C) The armature should overlap pole (figure 1, B) by about 0.05" minimum. If overlap is incorrect, bend the frame (figure 1, A) backward or forward to adjust. Recheck pallet valve location over toehole.

For reference only, Not Field Adjustable - view the gap between the end of pole (figure 1, B) and armature (figure 1, C). Gap clearance should be 0.008" to 0.013". If clearance is too close the armature may bind during operation (clicking noise.) If too wide, the armature may not pull pallet valve open completely, or not at all. If clearance is incorrect, do not use the magnet. Return the magnet for replacement. There is a method to correct the gap, but return is preferred.

When adjustments are complete, check to see that pallet valve is still aligned properly over toehole and seated **FLAT**.

IMPORTANT - The pallet valve must seat with the toeboard in a perfectly flat position. Visually test this by gently lifting the armature away from the toeboard and then gently return it. Do not let the pallet valve return with force because it will change position on the armature. When in the rest state there should be no visible gaps or lifting of the pallet valve edges from the toeboard. If pallet valve is not seated properly there are two options. One, check to see that the pallet valve is the correct thickness (not diameter) and replace with correct thickness valve. Two, bend the magnet frame at point A in figure 1 by moving it backward or forward. This adjustment will require that all previous adjusting methods be rechecked. Experience is the best way to master this adjustment.

Direct-Action Electro-mechanical Valve Instructions continued - page 3

☒ ADHERING PALLET VALVE TO ARMATURE (**VERY IMPORTANT**)

With the magnet assembly installed (includes pallet valve) and frame position adjusted, lift the armature away from toeboard. Remove the pallet, place adhesive (3M 008008 or equivalent) on the pallet and position pallet valve with adhesive into place under armature. Hold the pallet valve in place against toeboard with fingers and press the armature against pallet valve to squeeze adhesive. While continuing to holding the pallet valve, gently lift the armature away from the pallet valve and **very gently** let it rest back onto the pallet valve. Do not press the armature into the adhesive during this last procedure. Let only the spring pressure press armature and pallet together. If this procedure is not followed, large pallet valves may leak air or bind against the toeboard.

Note: Please view last page of this document about valve thickness.

HINT - Do not use the same pallet valve to adjust another magnet as the pallet valve may be different do to manufacturing tolerances. Install the pallet valve used for measuring adjustment with the action it was adjusted with.

☒ ADJUSTING SPRING TENSION

Adjustment of spring tension should only be made after pallet valve adhesive has cured. There are two methods to adjusting spring tension. The first method will affect pallet valve tension against the toeboard. The second method will affect the tension that holds the armature into the magnet frame.

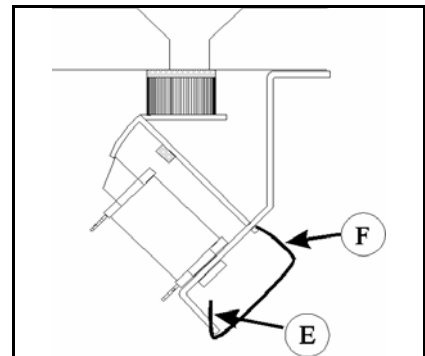


Figure 2 - pallet tension adjustment

To adjust pallet tension, bend the L shaped end of spring (figure 2, F). Do this by holding the spring with needle nose pliers near the corner and bend with finger for new tension. Close the bend for more spring tension and open for less.

Note: The spring should naturally (without tension) rest about an 1/8" from the end of armature before insertion.

To adjust armature to frame spring tension, bend the spring wire (figure 2, E) that protrudes through the frame hole using a needle nose pliers. The spring uses the magnet frame to pivot against and hold the armature in place. Close the bend for less spring tension or open for more. **NOTE:** This procedure is different then the previous paragraph.

Direct-Action Electro-mechanical Valve Instructions continued - page 4

IMPORTANT - do not adjust (bend) the frame spring mounting TAB as this will affect both pallet valve and armature tension and create more problems.

☒ CONSIDERATIONS:

Toehole - Gently debur, or break the edge of the toehole where pallet valve rests. Use 45 degree stone or fine sand paper.

WIRING - Always use a suppression diode in the driving circuit. If you need to add a suppression diode, mount it as close as possible to the magnet. Mounting on the magnet is preferable. Many solid state relay systems already incorporate them.

SERIES 45 MOUNTING POSITIONS - The magnet is shipped with spring tension for the mounting positions shown in figure 3. To mount in first position shown in figure 4, the spring tension needs to be changed. Do not mount in the second position shown in figure 4 as this position may have potential opening problems due to friction.

Note: the pallet tension will need to be relaxed, but not armature to frame tension (see previous page for spring adjusting methods).

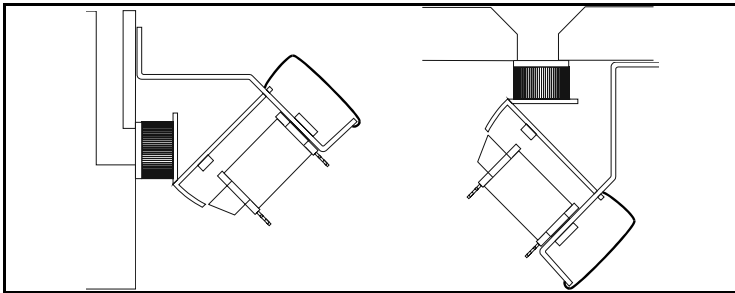


Figure 3 - recommended mounting positions

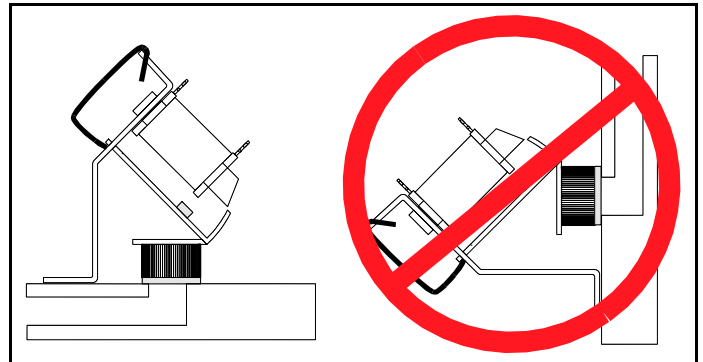


Figure 4 - Alternate mounting positions requiring spring tension change

PALLET MOUNTING POSITIONS FOR VALVES 1" IN DIAMETER AND LARGER

For maximum air flow past pallet valve, adhere the armature as shown in figure 5. The pallet should be mounted in an offset position in relation to the toehole. This allows the pallet to move forward when open and allow superior air flow into the toehole.

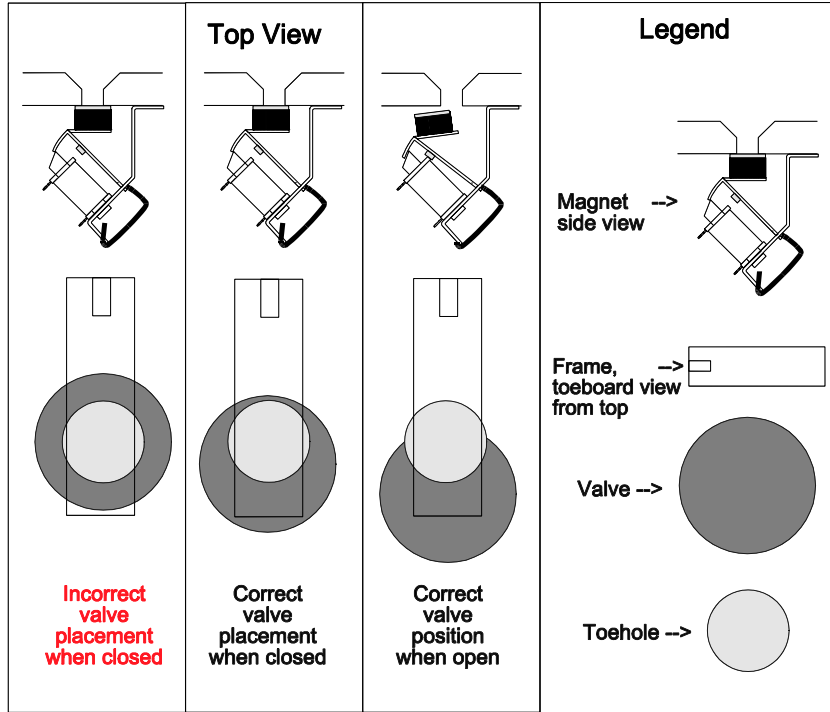


Figure 5

Diagnostic Hints - page 6

Action does not reiterate quickly -

Armature travel may be too great for pallet valve size. Reduce travel by bending frame at base toward valve.

Pallet spring tension against toeboard may be too weak (*See 'Adjusting Spring Tension'*).

Cipherring occasionally occurs -

Pallet spring tension against toeboard may be too weak, or pallet may not be perfectly flat just as it touches toeboard upon closing.

Cipherring is continuous -

Check for dirt between valve and toeboard.

Check to see if pallet valve is laying flat against the toeboard and completely covers and seals toehole.

Pallet spring tension against toeboard may be too weak. *See 'Adjusting Spring Tension'* in the instruction sheet.

Magnet action makes clicking noise when ACTIVATED -

Check the pallet spring tension that affects armature to frame tension. **Armature spring tension will most likely need to be increased.** *See 'Adjusting Spring Tension'* in the instruction sheet.

Check the clearance between the armature and magnet pole. They are most likely touching when energized. Even though they do not touch when moved by hand, they may touch due to bending from magnetic forces. Armature to magnet pole clearance should be 0.008" to 0.013". If not, replace and return magnet.

Magnet action makes clicking noise when RELEASED -

Check the armature to frame spring tension. It will most likely need to be *increased*. *See 'Adjusting Spring Tension'* in the instruction sheet.

Test the suppression diode, if it has failed, clicking will occur.

If everything checks out ok, call tech support or return magnet to factory for replacement.

Pallet valve bounces -

Check both armature and pallet spring tensions. Most often the spring tension is too light.

Pallet valve travel may be too great for pallet valve size. Reduce travel by bending frame at base toward valve. *See 'Distance to toehole center'* table in instruction sheet.

Pallet valve adhered to armature in wrong position.

Diagnostic Hints (con't) - page 7

Pallet valve does not open -

Check magnet coil resistance at the relay connection. This will determine if both the coil and magnet wiring are correct. If resistance is correct, check the armature to magnet pole clearance, and armature to magnet pole overlap. See instruction sheet for specifications.

Check to see if pallet valve has a tendency to stick to toeboard. Sometime the sealer or finish that has been applied to the toeboard will have residual tackiness that keeps the pallet valve closed. If this is the case, apply Baby Power or Talc on the pallet valve and toeboard.

Test the voltage at the magnet coil contacts. It must be sufficient to operate magnet.

Supplemental Electro-mechanical Valve Instructions

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Use this page for shop reference

Basics for installing magnets

Layout chest design so that magnets do not interfere physically with each other.

- ▶ Consider routes for wires to be put, including future removal of magnet action. This includes common wires.
- ▶ Leave room between magnet actions for installation of pallet valve under armature. i.e., do not mount one magnet close to the end of another magnet to prevent sliding of pallet under armature.
- ▶ Make the chest tall enough for magnet height and wiring looms. Leave clearance for any regulator parts that may be installed in chest.
- ▶ If any chest frame bracing or other pieces are mounted over magnets, try and make them removable for servicing magnets.

Rack all pipework on chest before installation of magnets.

Gently debur, or break the edge of the toehole where pallet valve rests. Use 45 degree stone or fine sand paper.

Blow out all toeholes and clean chest assembly inside and out.

Allow all wood finishes to dry completely. Some require days to dry.

- ▶ It is recommended that NO finish be applied to the surface that pallet valves rest on. If a finish is used, talc the surface completely.
- ▶ **Talc toeboard bottom completely, whether sealed or not.**

Try sample positioning of magnets in chest without attaching them. Especially in tight spots.

Completely install one row of magnets at a time. This includes frame adjustments and adhering of pallet valves to the armatures.

Put labels inside the chest with rank and pipe numbers for easy location during servicing.

KADAK INC
 2910 ASTON AVENUE, PLANT CITY, FL 33567
 (1-877-222-7479)
Price Sheet
 10/21/2004

Stock #	Product Description	Cost
	Direct-Action^(tm) Pallet Magnets	Visit our website for current prices.
DA-SAM	Direct-Action ^(tm) pallet magnet sample kit. Contains one DA-M1-1 and one DA-M2-1 with 3/4" and 1-1/8" pallets.	www.kadak.us
DA-M1-1	Direct-Action ^(tm) pallet magnet for 3/4" and smaller valves.	
DA-M1-21	Direct-Action ^(tm) pallet magnet for 3/4" and smaller valves.	In boxes of 21pcs.
DA-M1-63	Direct-Action ^(tm) pallet magnet for 3/4" and smaller valves.	In boxes of 63pcs
DA-M2-1	Direct-Action ^(tm) pallet magnet for valves larger then 3/4".	
DA-M2-21	Direct-Action ^(tm) pallet magnet for valves larger then 3/4".	In boxes of 21pcs.
DA-M2-63	Direct-Action ^(tm) pallet magnet for valves larger then 3/4".	In boxes of 63pcs
	Pallet Valves (1/2 listed price with each action purchased).	
PV-1-1	Pallet valve for DA-M1 series magnet, 5/8" dia.	
PV-1-50	Pallet valve for DA-M1 series magnet, 5/8" dia.	
PV-2-1	Pallet valve for DA-M1 series magnet, 3/4" dia.	
PV-2-50	Pallet valve for DA-M1 series magnet, 3/4" dia.	
PV-3-1	Pallet valve for DA-M2 series magnet, 7/8" dia.	
PV-3-20	Pallet valve for DA-M2 series magnet, 7/8" dia.	
PV-4-1	Pallet valve for DA-M2 series magnet, 1" dia.	
PV-4-20	Pallet valve for DA-M2 series magnet, 1" dia.	
PV-5-1	Pallet valve for DA-M2 series magnet, 1-1/8" dia.	
PV-5-20	Pallet valve for DA-M2 series magnet, 1-1/8" dia.	
PV-6-1	Pallet valve for DA-M2 series magnet, 1-1/4" dia.	
PV-6-2-	Pallet valve for DA-M2 series magnet, 1-1/4" dia.	
	Adhesive One Free with each 1000 DA-M actions purchased.	
GL-8008	3M 08008 adhesive, 8oz. tube (glues approx 500 valves)	

Notice About Pallet Felt Thickness

July 2004

Due to the nature of the 95% (minimum) pure wool felt used in our pallet valves, the total thickness of pallet valves will increase over time when left unused. The total thickness should be 0.290" to 0.310" just before adhering to a Direct-Action magnet.

Pallets are currently shipped in paper rolls that maintain pressure on the pallet valves to help them remain within specification. Once the paper shipping roll is opened, the pallet valves will possibly begin to expand in thickness. If it is noticed that the valves are too thick to achieve proper armature positioning, they will need to be restored to thickness specification.

Symptoms:

- 1). Pallet valves do not correctly position between toeboard and action armature.
- 2). Armature does not position squarely against pallet valve.
- 3). Limited travel of armature affecting proper pipe operation.

Cause:

Pure wool felt is manufactured to thickness through a rolling and pounding technique. There are no adhesives or binding agents to hold its shape. The nature barbs of wool fibers hook together and provide a binding effect to lock wool hairs together to create felt sheets. This natural hooking of fibers will slowly release within small limits over time due to environmental changes and other external movement.

Resolution:

- 1). Store pallet valves under limit compression until assembly in a Direct-Action magnet.
- 2). Restore pallet valve thickness with a light pounding affect. Place a pallet valve (leather side down) on a smooth flat surface and gently pound the pallet valve to reduce the thickness. It takes several light taps with a piece of wood or other suitable device to affect stable dimensions. Don't try to pound a pallet valve with a single hard pounding hit. It will not be as stable as using many light pounding hits. Best results will occur when the pallet valves are used with two hours of reducing their thickness to proper specs.

Notations:

Once pallet valves are installed in a Direct-Action magnet, they will remain stable due to the slight pressure maintained by the armature spring.