

# Instructions for Replacing Vacuum Bottle Subassemblies on Type SJA and Type SJO Contactors

I.L. 16-200-34A  
Model M and W



## CONTACTOR OPERATION

Type SJA and SJO contactors have their main contacts sealed inside ceramic tubes from which all air has been evacuated, i.e., the contacts are in vacuum. No arcboxes are required, because any arc formed between opening contacts in a vacuum has no ionized air to sustain it. The arc simply stops when the current goes through zero as it alternates at line frequency. The arc usually does not survive beyond the first half cycle after the contacts begin to separate. The ceramic tube with the moving and stationary contacts enclosed is called a **vacuum interrupter** or a **bottle**, and there is one such bottle for each pole of the contactor. A two pole contactor has two vacuum bottles, and a three pole contactor has three vacuum bottles. A metal bellows (like a small, circular accordeon) allows the moving contact to be closed and pulled open from the outside without letting air into the vacuum chamber of the bottle.

TABLE 1 — REPLACEMENT INTERRUPTERS				
Type	Contactor Model	Bottle Threads	Bottles Per Kit	Replacement Kit Part Number
SJA	M	Metric	3	2153A02G01
SJO	M	Metric	3	2153A02G02
SJA	W	American	3	2153A02G03
SJO	W	American	3	2153A02G04

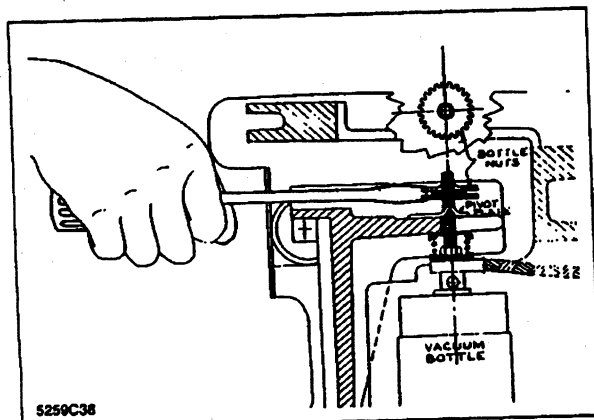


Fig. 1 Bottle Nut Locking/Unlocking

## TOOLS REQUIRED

The following tools are needed when replacing vacuum bottle subassemblies:

1. 8 inch-long common screwdriver.
2. 1/2" socket wrench with driver and extension.
3. Three voltohm meters or three low voltage test lights.
4. Pull force gauge (50 or 60 pound range).
5. Bottle wrench 5259C10 (supplied with contactor).
6. 1/8" Allen wrench.
7. 1/2" open-end wrench.
8. 13mm metric socket, if bottle 5259C21 is used.

## USE OF BOTTLE WRENCH

Bottle wrench part no. 5259C10 in Figure 2 **MUST** be used for holding 5259C33 bottles if the shunt nut on the bottle stud is tightened or loosened, as when individual bottles are replaced.

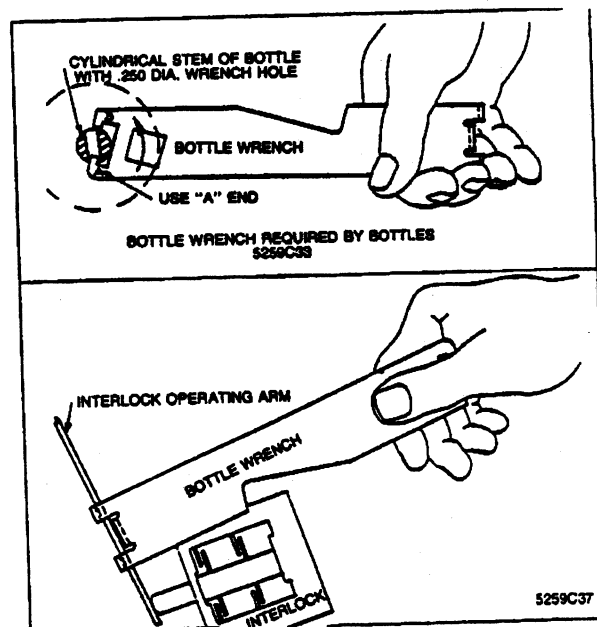


Fig. 2 Use of Bottle Wrench

# VACUUM BOTTLE SUBASSEMBLY REPLACEMENT

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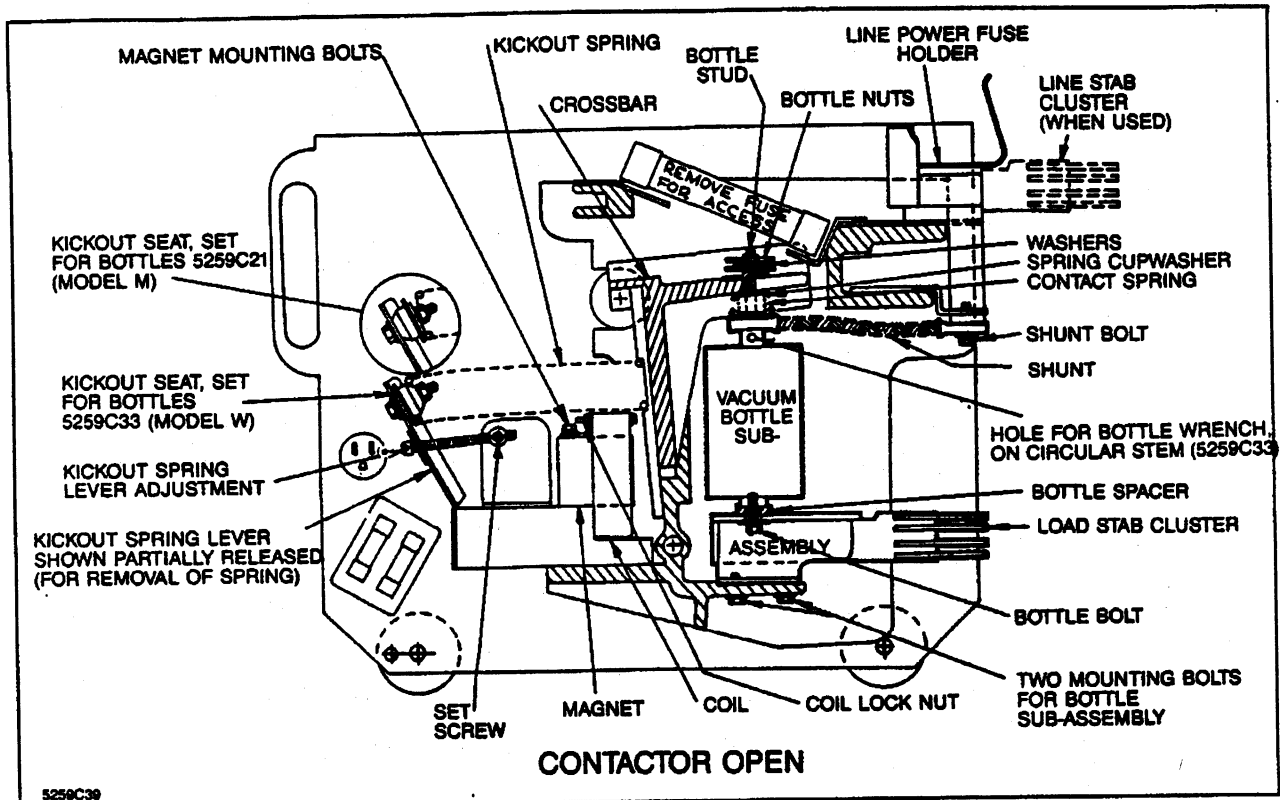


Fig. 3 Type SJA Contactor

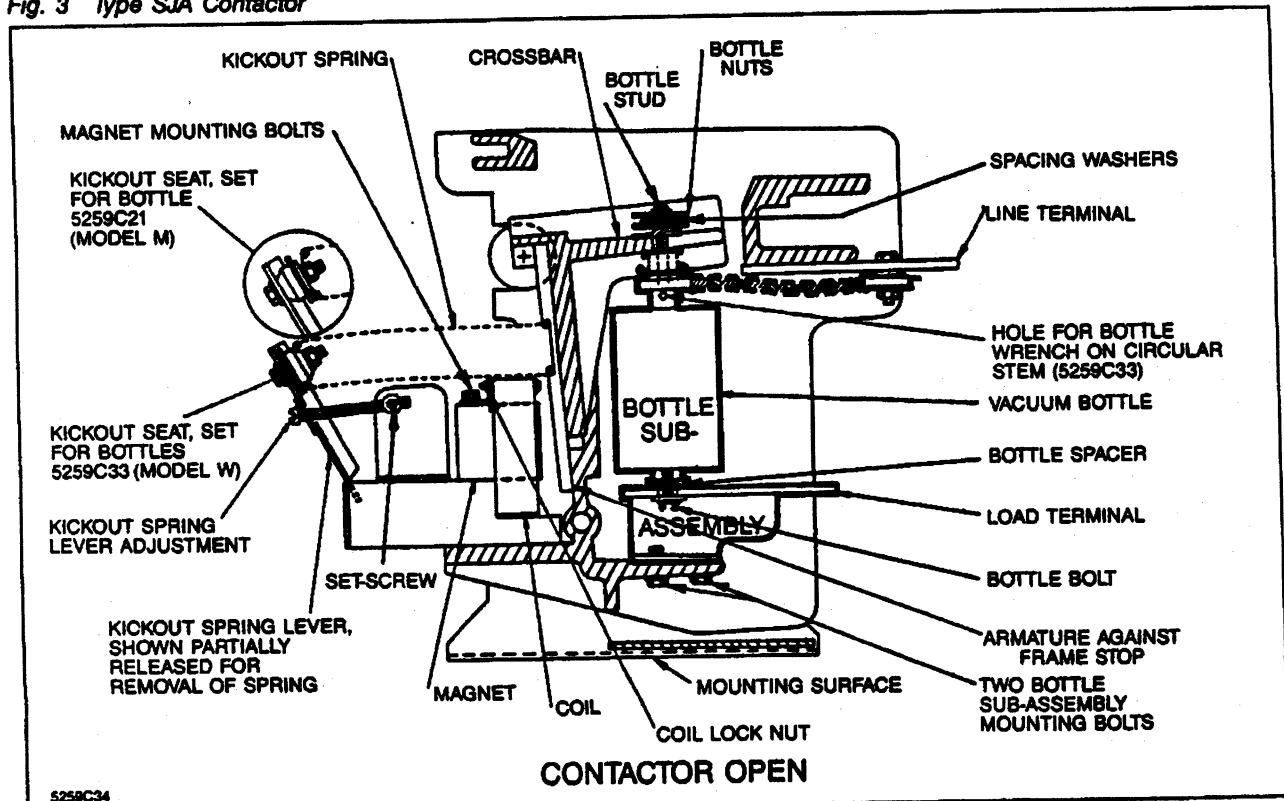


Fig. 4 Type SJO Contactor

## VACUUM BOTTLE SUBASSEMBLY REPLACEMENT

To replace the vacuum bottle subassemblies proceed as follows:

0. Assemble the proper tools and sufficient vacuum bottle subassemblies to renew all poles.
1. Deenergize the contactor. Remove to a workbench. Remove barriers.
2. Unbolt the shunts at the line side.
3. Remove control transformer primary fuses, if so equipped.
4. Remove the bottle nuts from the top stems, using a screwdriver, as shown in Figure 1, to unlock. Set aside the nuts and washers.
5. Remove the two  $\frac{5}{16}$ " bolts attaching each bottle subassembly. See Figure 3 or 4. Set bolts aside.
6. Withdraw the bottle subassemblies from the contactor chassis, pulling the bottom end out first so that the top stud clears the rear frame of the chassis. The contact springs are loose at this point and should be captured and stored before they are lost. The bottle subassembly is the heavy outline shown in Figures 3 and 4.
7. The used vacuum bottles should be destroyed. Destroying the vacuum bottles will insure that they are not later considered new and installed in another contactor.

Next, proceed to install the replacement subassemblies:

- a. Loosen but do not remove the bottle mounting bolt.
- b. Preset the shunt by bending the free end in a smooth curve to touch the stud, then release.
- c. Install contact springs and cups onto the top stems, with cup on top, flange down.
- d. Insert bottle subassemblies into chassis, putting top end in first and guiding the bottle stud into the slot in the crossbar. Check to make certain that the spring and cup washers are between the bottle and the crossbar.
- e. Bolt the subassemblies into the chassis, using the  $\frac{5}{16}$ " bolts, two per pole.
- f. Align the bottle on the bottle mounting (the bottle bolt is loose) until the stud does not rub or touch the slot in the crossbar. Tighten the bottle bolt. See Figure 3 or 4. Check alignment again to make sure it was maintained while tightening.
- g. Attach shunts to line side.
- h. Recheck to make sure that the bottle studs remain clear of crossbar slots. In particular, make certain that the shunts have a slight bow downward and

do not push the bottle studs against the crossbar slots. If they do push the studs, loosen the shunts from the line terminals and repeat "b" before refastening.

- i. Close the contactor by applying rated voltage through an extension cord from an isolated power source, using adequate care against electrical shock. The contactor can also be closed mechanically by hand, using the yoke interlock or shaft extension.
- j. Install two bottle nuts, plus the two flatwashers previously removed, onto the center pole bottle stud. Both bottle nuts **MUST** have their threaded flanges facing UP, on TOP.
- k. Turn the center pole bottle nuts clockwise until they are  $.080 \pm .005$  inch from the pivot plate. This is the **OVERTRAVEL GAP** setting. See Figure 4. Lock the bottle nuts with a screwdriver inserted from the front of the frame molding, turning the screwdriver counterclockwise with the blade fitted from a notch in one bottle nut across to a notch of the other bottle nut. See Figure 1.
- l. De-energize the coil and remove the extension cord.
- m. Note and record the length of the kickout spring. Loosen the setscrew that locks the kickout spring adjusting screw, then loosen the kickout spring adjusting screw until the contacts on the center pole barely touch, using a volt-ohmmeter or a low voltage test light as an indicator of touch and open.  
**Note:** Whenever adjusting the kickout spring lever, put your free hand over the kickout spring as a precaution.
- n. With the contactor in this position, install and adjust the bottle nuts (and spacing washers) on the two other poles so that these two poles make contact (touch) simultaneously with the center pole when checked with a volt-ohmmeter or test lamp circuit. Lock the bottle nuts with a screwdriver as before.
- o. Tighten the kickout spring adjusting screw back to its original position to the original compressed length of the kickout spring. Check that the armature rests firmly against its stop on the molded frame. When a screwdriver is pushed against the bottom end of the armature in the open position, the armature must not move. If it does, the kickout spring should be tightened further to push the armature to a solid position. Re-tighten set-screw, **BUT NOT TOO TIGHT.**
- p. Install control transformer primary fuses; if removed.
- q. Install all barriers removed.

# VACUUM BOTTLE SUBASSEMBLY REPLACEMENT

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## VACUUM BOTTLE REPLACEMENT

In the event that vacuum bottle subassemblies are not available, but new vacuum bottles are, proceed as follows:

1. Remove and set aside the shunt and cupwasher spring seat from the top of each bottle subassembly. On bottles marked 5259C21, the stud will unscrew from the top of the bottle. On bottles marked 5259C33, the nut will unscrew from the stud. Use bottle wrench (Figure 2) to hold the 5259C33 bottle while removing nut. If the bottle wrench is not used the bellows is likely to be damaged.
2. Remove the bottle bolt at the bottom of each bottle. (See Figure 5.) Save the hardware, particularly the copper bottle spacer. Retain the bottle mounting bracket and discard old bottles.
3. Mount new bottles on mounting brackets with hardware removed. Check location of copper bottle spacer. Do not tighten bottle bolts as yet.
4. Install shunt on top of each bottle as shown in Figure 5 without tightening the  $\frac{1}{8}$ " nut or stud.
5. Measure the dimension "H" as shown in Figure 5.
6. Add flatwashers as specified in Table II or III, between the shunt clip and cup washer spring seat.
7. Tighten the  $\frac{1}{8}$ " nuts to secure the shunt to the top of each bottle.
8. Install the newly created vacuum bottle subassemblies as explained on page 3.

TABLE II - VACUUM BOTTLE 5259C33		
H Dim.	Cup Washer Required	Flatwasher Required
7.68-7.73	0	0
7.62-7.67	1	0
7.56-7.61	1	1
7.50-7.55	1	2
7.44-7.49	1	3
7.38-7.43	1	4

TABLE III - VACUUM BOTTLE 5259C21		
H Dim.	Cup Washer Required	Flatwasher Required
7.61-7.65	0	0
7.55-7.60	1	0
7.49-7.54	1	1
7.45-7.48	1	2

## REPLACEMENT WITH DIFFERENT STYLE VACUUM BOTTLES

The previous instruction applies if the replacement bottles have the same part number as the original bottles. (All bottles on any one contactor must have same identification.) If the replacement bottles are different from the original, the kickout spring seat may have to be reversed. Refer to Figure 3 or 4.

Only vacuum bottle kits with part numbers shown in Table I should be used.

The hardware on the Model W Type SJA or SJO has American threads. Model M of the Type SJA or SJO has an M8 x 1.25 metric thread on the vacuum bottle. Model M has an M8 x 1.25 x 30mm bolt at the bottom end of each bottle, and a metric stud, part number 7860A23H01, is used at the top end. (Metric bottle number is 5259C21; American hardware bottle number is 5259C33.)

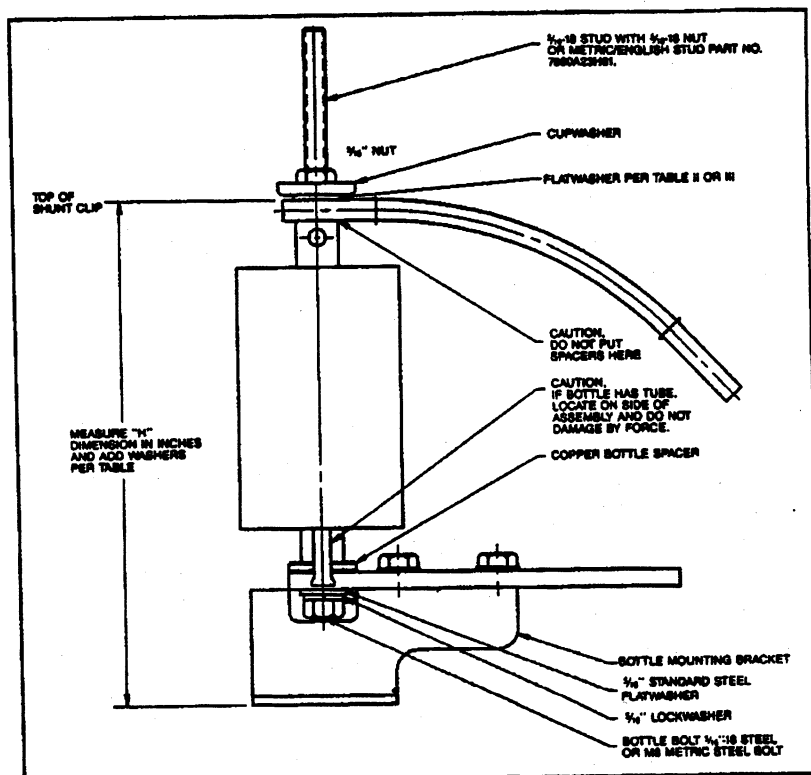


Fig. 5 Bottle Installation