

STROWGER TWO MOTION SWITCHES
ADJUSTMENT, WIPERS

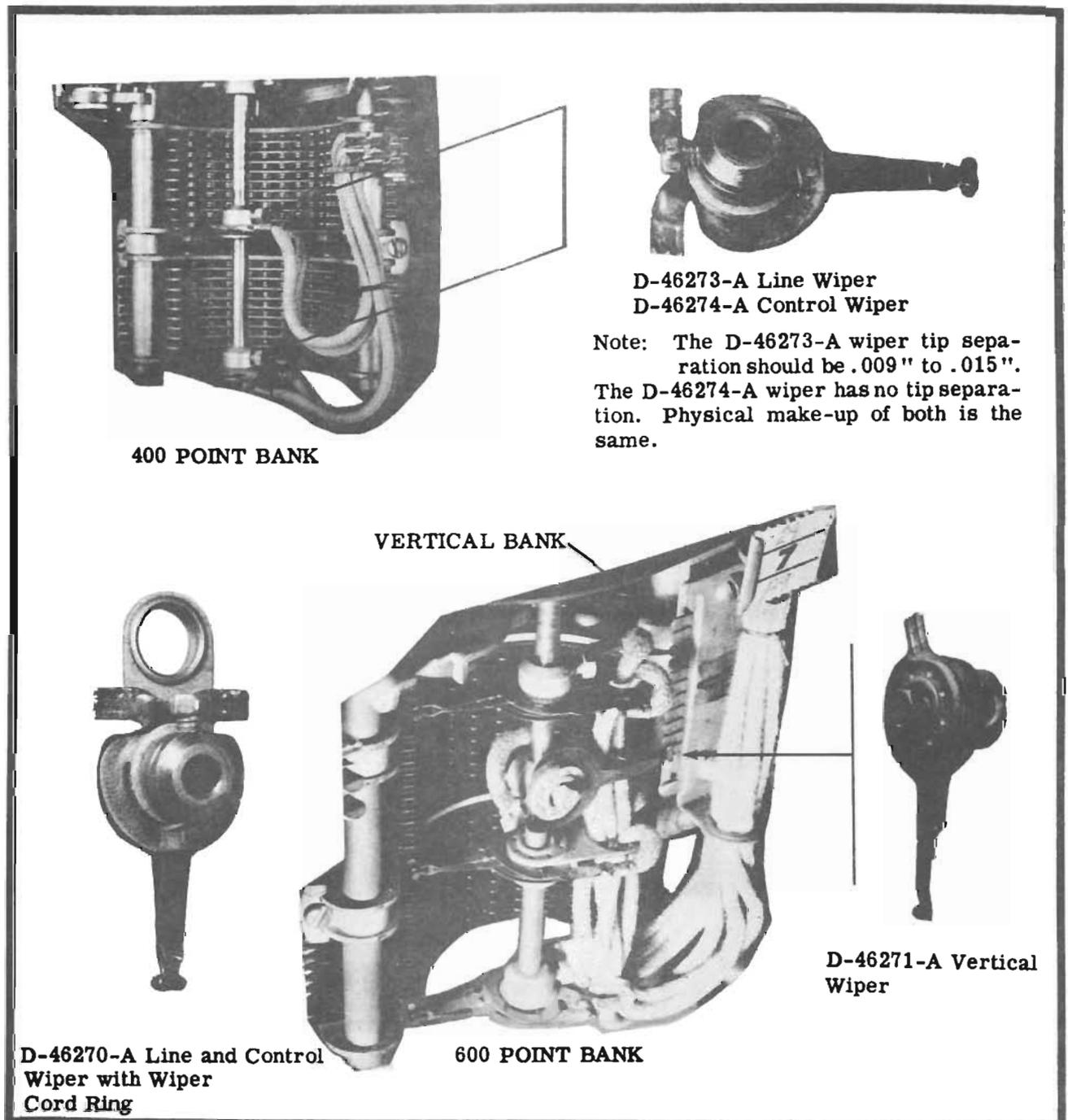


Figure 1. Above are the Wiper Assemblies Referred to in this Practice and Examples Showing Where Each Type is Used. (The 400 Point Bank, Shown, Takes Two D-46273-A Line Wipers. The 300 Point Bank, Not Shown, Takes One D-46273-A Line Wiper and One D-46274-A Control Wiper.)

1. GENERAL

1.01 This practice presents a procedure for adjusting wiper spring assemblies on Strowger two-motion switches.

1.02 This practice is divided into two parts:

Part A - Adjustment of Line and Control Bank Wipers

Part B - Adjustment of Vertical Bank Wipers

1.03 Prior to adjustment, wipers should be cleaned and inspected for wear. All worn wipers should be replaced. See example of worn wiper tips (Fig. 2).

1.04 Check that wiper tips are aligned (Fig. 3). If they are not properly aligned and adapters are not used, replace wiper assembly. If adapters are used, realign adapters. Do not replace complete assembly when adapters are used. If adapter is defective, replace adapter.

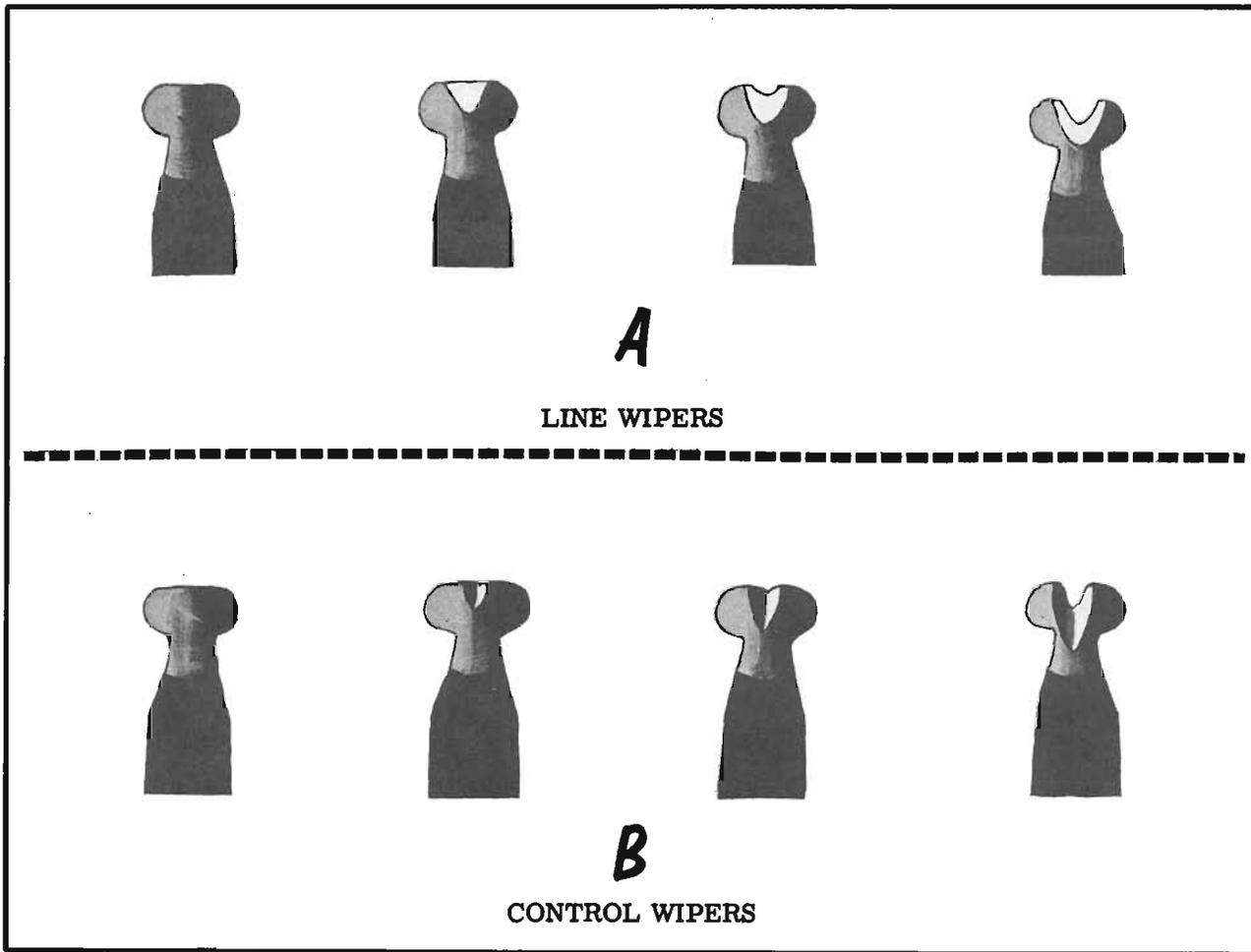


Figure 2. Examples of Wiper Tips That Are in Various Stages of Wear. (Note That Line Wiper Tip Wear is Distributed Over a Wider Tip Area Than Control Wiper Tip Wear.)

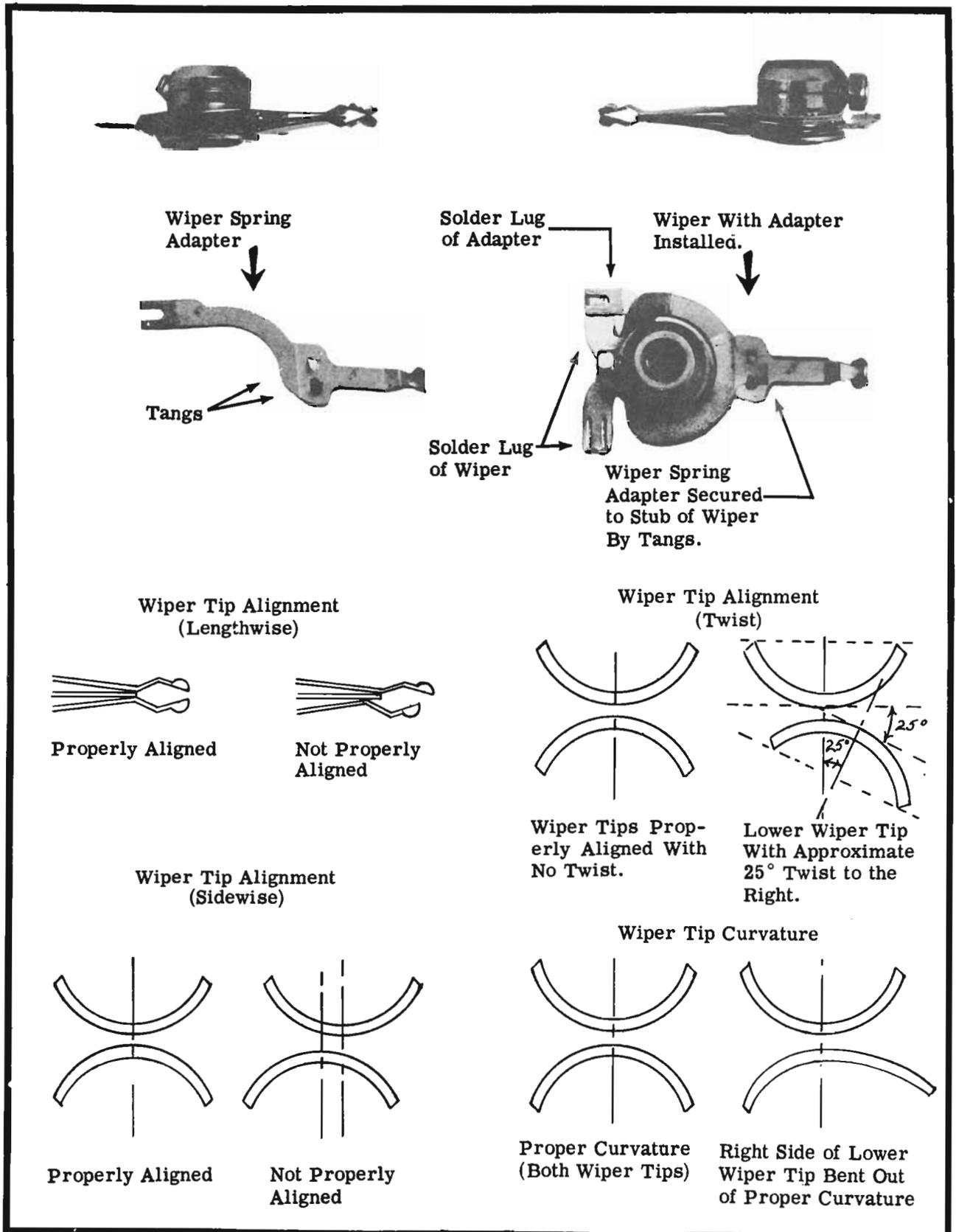


Figure 3. The Above Are Wiper Spring Assemblies, Wiper Spring Adapters, and Examples of Alignment.

1.05 Switches not equipped with wiper cord brackets should have wiper cords tied. Each tie is to be two complete turns of #12

cotton thread made about the wiper cords and secured with a square knot sufficiently tight to prevent the tie from slipping.

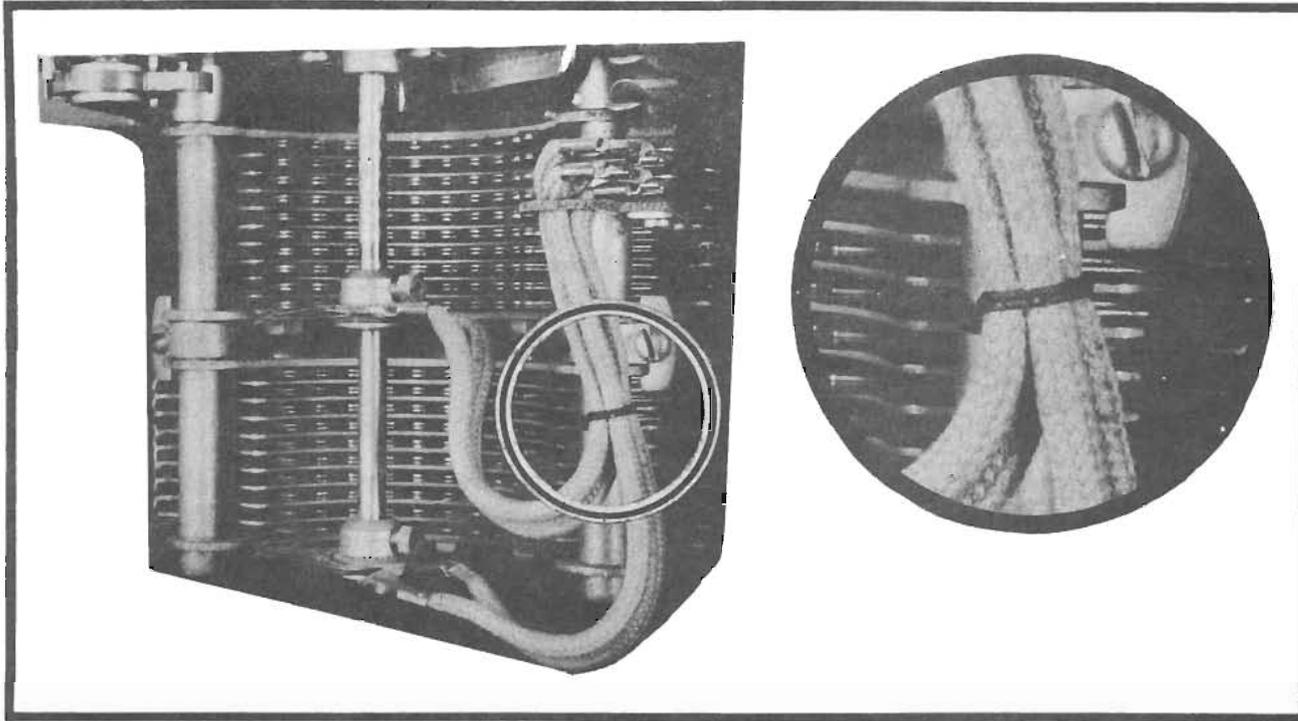


Figure 4. Example of a Switch that is Not Equipped With Wiper Cord Bracket, With the Wiper Cords Properly Tied.

1.06 Procedure for adjustment appears in the following order:

	Paragraph(s)		
Cleaning	3.04	Wiper Bridging Adjacent Bank Contacts	3.27
Inspection	3.05	Alignment of Wipers in the Eleventh Rotary Position	3.28 - 3.29
Angle of Wiper Spring Assembly to Shaft	3.06	Wiper Tip Drag (Left Edge of Bank)	3.30
Forming of Wipers	3.07 - 3.14	Bank Rod Collar Adjustment	3.31 - 3.32
Wiper Tension (Follow)	3.15 - 3.17	Vertical Wiper Alignment to Vertical Bank	3.35 - 3.37
Alignment of Wiper Spring Assembly to Bank Level at Rotary Normal	3.18 - 3.19	Vertical Wiper Alignment to Vertical Bank Contacts	3.38
Alignment of Wiper Spring Assembly to Bank Contacts	3.20 - 3.23	Vertical Wiper Backstop and Wiper Spring Clearance	3.39
Rotary Centering	3.24 - 3.26	Vertical Wiper Tension	3.40

2. LIST OF TOOLS AND MATERIALS

2.01 See Table 1.

3 If necessary, open the release circuit for each switch at the V. O. N. spring assembly. See Fig. 5.

TABLE 1

<u>Part</u>	<u>Description</u>
A	H-16290-7 Klein Co., Adjusting Pliers or similar
A	#12 Cotton Thread
A	Dental Mirror
A	A.E. Co., 7063 Wrench
A	Small Paint Brush
A	Work Lamp
A-B	Screwdriver (4" x 3/16")
A-B	Wiper Spring Adjusters
A-B	Nut Driver (3/16")
A-B	A.E. Co., D-15455-A Busy Tool
A-B	Toothpicks
B	G.E. Co., GT-1102 Tension Gauge (10 GMS. - 80 GMS.) or similar
B	A.E. Co., H-7066 Spring Adjuster

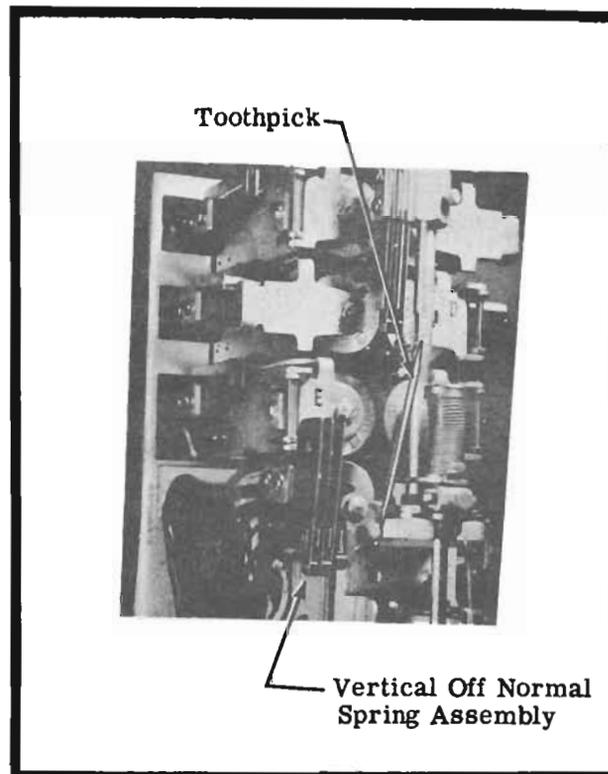


Figure 5. One Method for Opening the Release Circuit of a Strowger Two Motion Switch is by the Use of a Toothpick.

3. PROCEDURE

Part A (Adjustment of Line And Control Bank Wipers)

3.01 Complete the following steps:

1 Make busy the switches to be worked on. Where necessary, use the D-15455-A busy tool.

2 Remove the necessary switch covers.

3.02 Place the work lamp to properly illuminate the switches to be worked on.

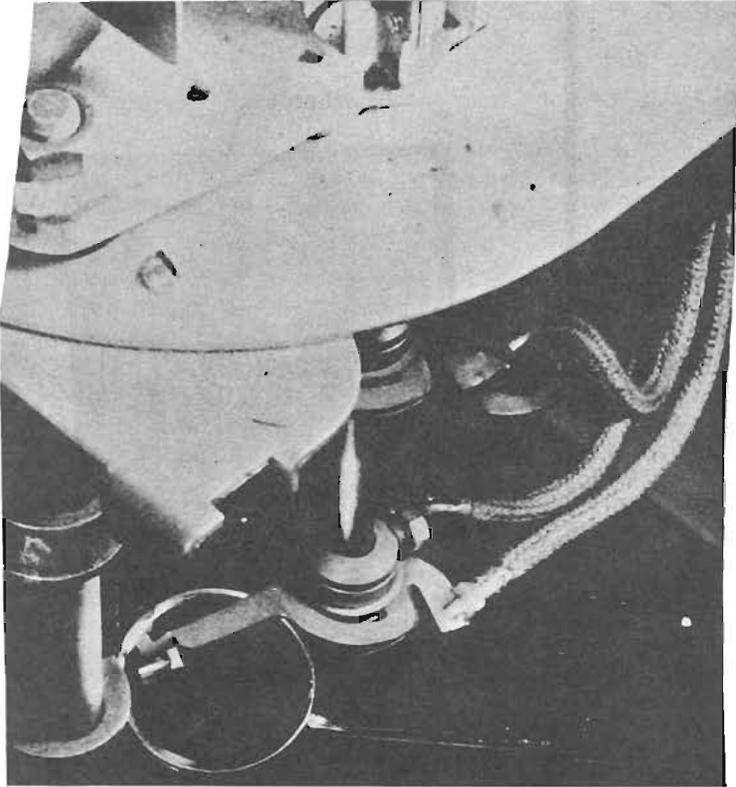
3.03 The number of switches made busy at one time should be governed by traffic conditions of the individual office.

Cleaning

3.04 If necessary, brush wipers with the paint brush.

Inspection

- 3.05 Inspect upper and lower wiper spring tips for wear (Fig. 6).



A

UPPER WIPER TIP
(Position Dental Mirror so that
the Upper Wiper Tip may be
Inspected for Wear.)

B

LOWER WIPER TIP
(Using a Toothpick, Position the
Lower Wiper Tip so that it can
be Inspected for Wear.)

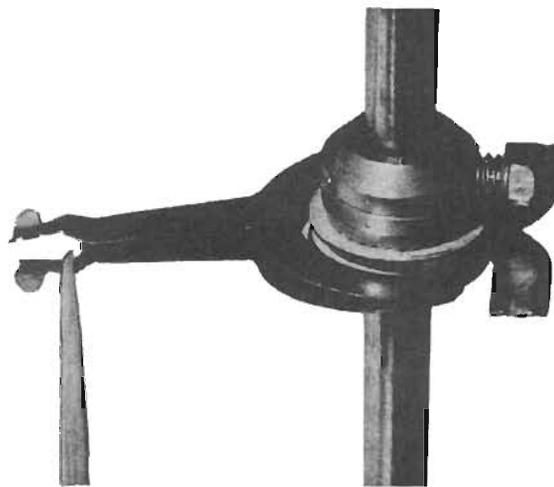


Figure 6. The Above Method is Used When Inspecting Upper and Lower Wiper Tips for Wear.

Angle of Wiper Spring
Assembly to Shaft

3.06 Check that the wipers are approximately at a 90 degree angle to the shaft (Fig. 7). If necessary, place adjuster at A or B and adjust up or down.

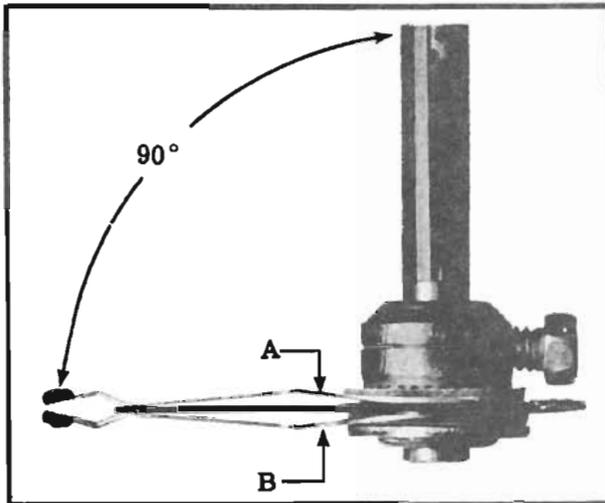


Figure 7. Properly Formed Wiper Springs are Shown Above.

Forming of Wipers

3.07 Check space between the wiper springs at L (Fig. 8). Spacing should be 1/8". If necessary, adjust by placing adjusters at K and M (near L) and bend each wiper at L as required.

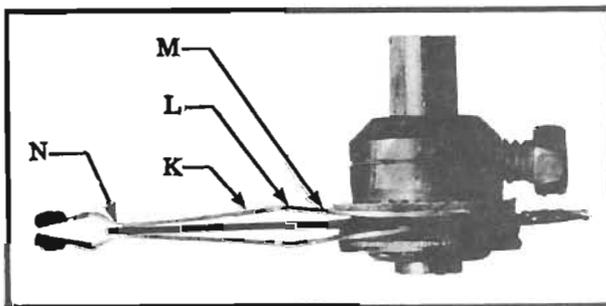


Figure 8. Properly Spaced Wiper Springs are Shown Above.

3.08 The wiper should be formed as shown in Fig. 8. Check that there is no bow between N and L. Adjust by working the H-16290-7 adjusting pliers along wiper, from L to N.

3.09 Check space between wiper springs at C (Fig. 9). Adjust by changing angle of bend at D and C.

3.10 To change the angle of bend at D, place one adjuster between D and C (Fig. 9a). Place another adjuster at J (Fig. 9a). Bend at D as required.

3.11 To change angle of bend at C (Fig. 9a) place one adjuster between D and C. Place the other adjuster at E. Bend at C as required.

3.12 Check space between wiper tips at F (Fig. 9a) and G (Fig. 9b). Adjust by changing angles at D and C (Fig. 9a).

3.13 Check clearance between wiper springs and insulator at K (Fig. 9a), and H (Fig. 9b). Gauge by eye.

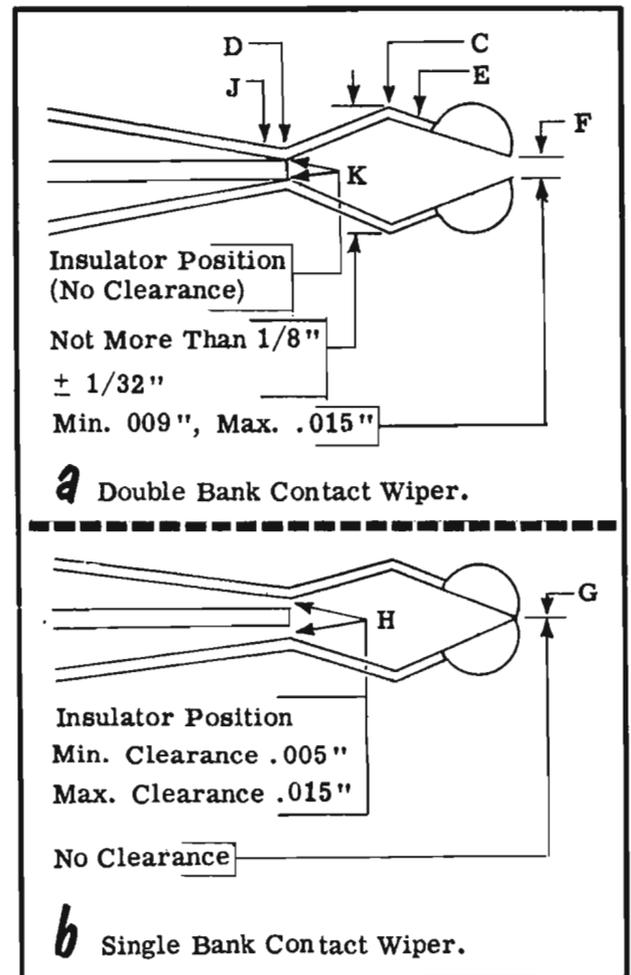


Figure 9. Wiper Tip and Insulator Clearance Requirements.

3.14 If one portion of wiper is adjusted, re-check all other adjustments.

Wiper Spring Tension (Follow)

3.15 Check wiper spring tension (follow). When checking, hold one wiper spring away from the other with a toothpick. See Fig. 10. If wiper spring follow does not meet requirements shown in Fig. 10, adjust wiper spring.

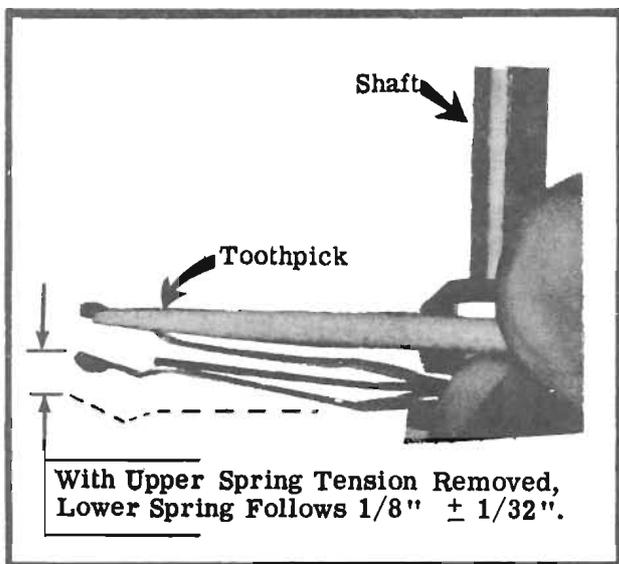


Figure 10. A Toothpick can be used for Checking Wiper Spring Tension (Follow) and Requirements. (Procedure Shown is Reversed When Checking Upper Wiper Spring Tension.)

3.16 If wiper spring tension (follow) is to be added, place the adjuster on hub end of wiper spring as shown in Fig. 11. With a slight twisting motion (toward intended follow), work the adjuster to O forming a gradual bow. Remove as much of the bow as possible without destroying tensioning effect. Adjust both upper and lower wiper springs to insure equal wiper pressure on the bank contacts.

3.17 If wiper spring tension (follow) is to be removed, place the adjuster on hub end of wiper spring as shown in Fig. 12. With a slight twisting motion (opposite to wiper spring follow), work the adjuster to P to remove tensioning effect. Adjust both upper and lower wiper springs to insure equal wiper pressure on the bank contact.

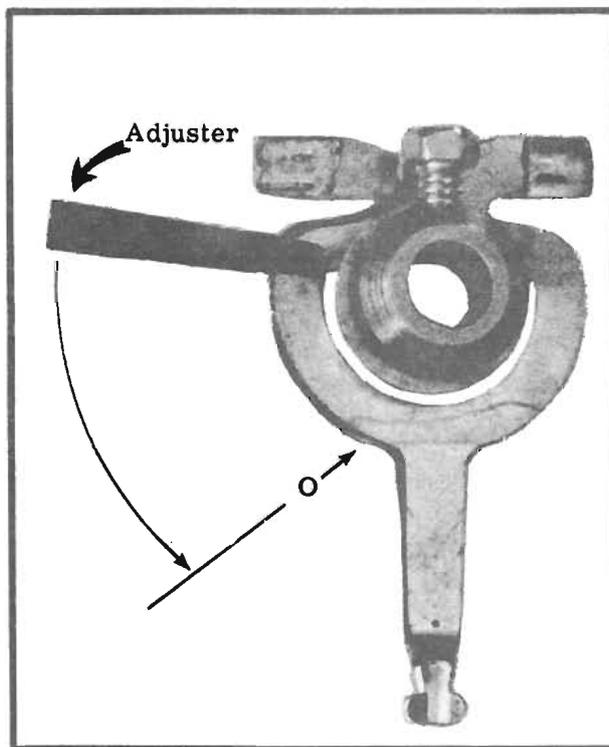


Figure 11. An Adjuster is being Used to Add Tension (Follow) to Line and Control Wiper Springs.

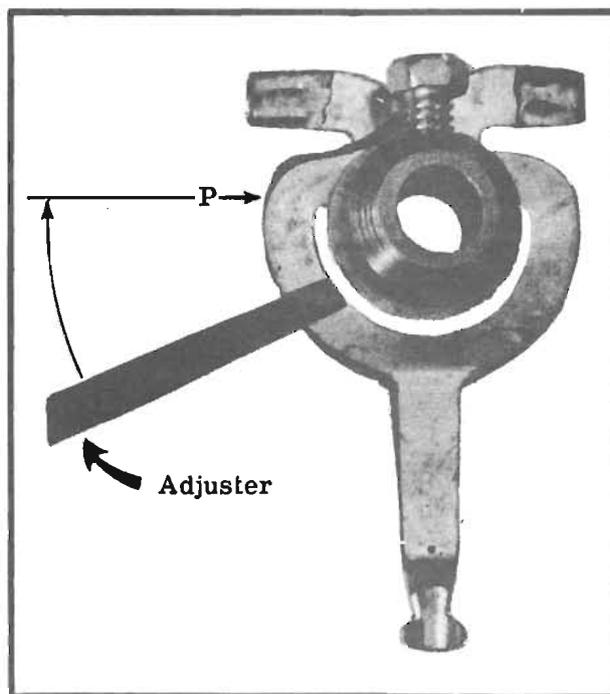


Figure 12. Remove Tension (Follow) From Line and Control Wiper Spring by Working Adjuster to Point P.

Alignment of Wiper Spring
Assembly to Bank Level at
Rotary Normal

3.18 Check alignment of wiper spring assembly to the middle level of normally accessed bank levels with wiper spring assembly at rotary normal.

3.19 Step shaft vertically to position wiper in line with level to be checked. The horizontal center line of the wiper tip should coincide ($\pm .015$ ") with the centerline of the bank level. To adjust, loosen the wiper locking screw and position wiper assembly as required. Retighten locking screw.

Alignment of Wiper Spring
Assembly to Bank Contacts

3.20 Check alignment to bank contact at levels 1, 5, and 10. To check, step shaft vertically to position wipers on desired bank level.

3.21 Check position of wipers on bank contacts 1 and 10. Observe that the wiper tips overlap the front edge of the bank contacts by at least $1/16$ " (Fig. 13). To adjust, loosen bank rod nuts (Fig. 17) with the H-7063 wrench. Move bank assembly toward or away from the shaft as required. Retighten bank rod nuts.

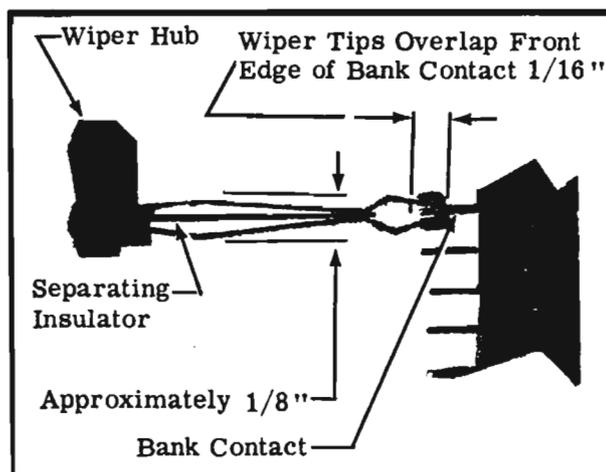


Figure 13. Check that Wiper Tips Overlap Bank Contacts and that All Related Requirements are Met.

3.22 Check wiper tip angle on bank levels 1, 5, and 10, contact 1. Observe that the angle of the upper wiper to the bank contact is the same as the angle of the lower wiper tip to the bank contact. See Fig. 13. To adjust, loosen the wiper locking screw with the nut-driver or screwdriver. Move wiper on shaft as required. Retighten locking Screw.

3.23 Recheck wiper tip adjustments if the following is observed:

- (1) If the wiper tip tension is applied to the wiper insulator when the wiper is resting on bank contact.
- (2) If more than just the tip edge of the wiper is in contact with the bank contact.

Rotary Centering

3.24 Check rotary centering of wipers on bank contacts 1, 5 and 10 of bank levels 1 and 10 (Fig. 14). If difficulty is encountered in centering the wipers, adjust by repositioning either the wiper assembly or banks.

3.25 To reposition the wiper assembly, step shaft vertically to bank level 5, and rotate to contact 5. Loosen locking screw with nut-driver or screwdriver. Center wiper tip on contact 5. Retighten locking screw.

3.26 Recheck rotary centering on bank contacts 1, 5, and 10 of bank levels 1 and 10. The wipers should approximately center on all bank contacts. In some cases, the wipers will not approximately center on all contacts. In these cases, the distance the wipers are off-center on contact 1 should be the same as the distance the wipers are off-center on contact 10. However, if the wipers rest to left of center on contact 1, they should rest to right of center on contact 10. Conversely, if the wipers rest to the right of center on contact 1, they should rest to the left of center on contact 10. See Fig. 14.

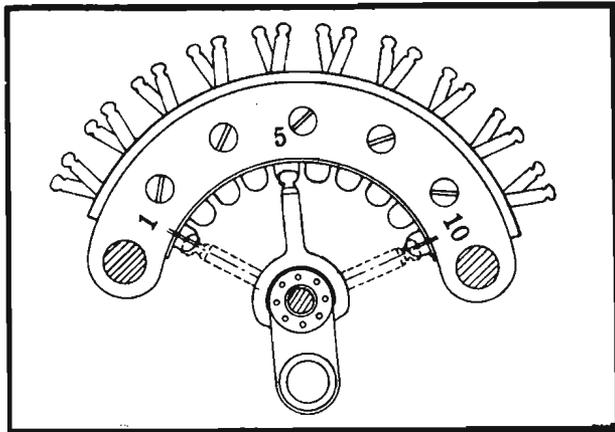


Figure 14. Rotary Centering is Checked on Contacts 1, 5, and 10 and Adjusted on Contact 5.

Wiper Bridging Adjacent Contacts

3.27 Check wipers for bridging between adjacent contacts (Fig. 15). To check, step shaft vertically until the wiper is aligned with any one bank level. Rotate wipers across bank level. With the completion of each rotary step, observe that the wiper is not resting on more than one bank contact. Should the wipers bridge, recheck rotary centering. Also check for bent wiper tip ears. To adjust wiper tip ears, place the adjuster as shown in Fig. 16 and bend as required.

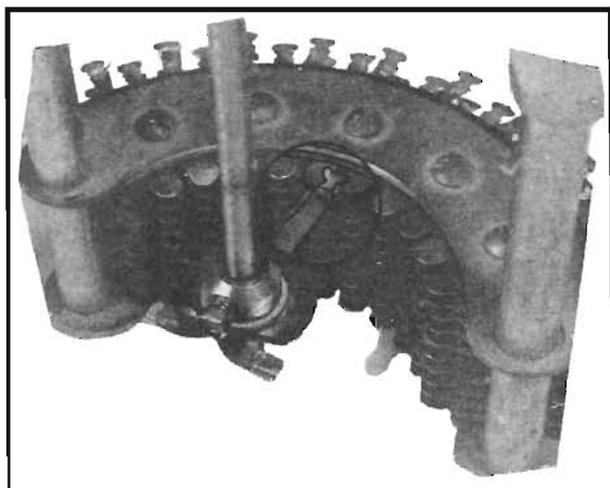


Figure 15. A Wiper Spring Assembly which is Bridging Between Bank Contacts 5 and 6, Level O.

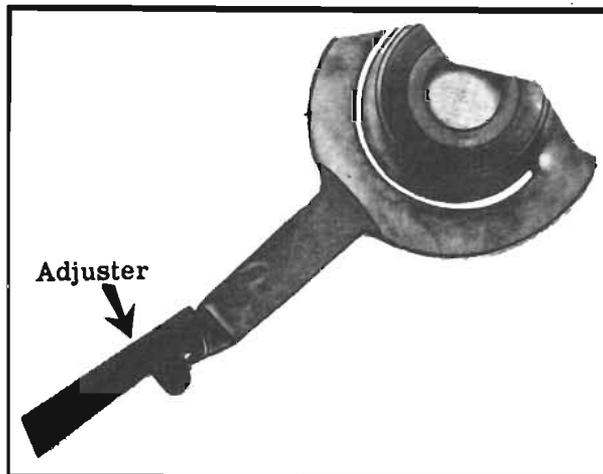


Figure 16. A Wiper Tip Ear being bent by an Adjuster.

Alignment of Wipers in the Eleventh Rotary Position

3.28 Check alignment of wipers to the eleventh rotary position on the bank level. Step wipers vertically to any bank level. Rotate wipers to eleventh rotary position. Return shaft until wiper tips nearly touch contact 10. The wiper tip horizontal center line should coincide to the horizontal center line of the bank level $\pm .015$ ". If necessary, loosen locking screw of wiper assembly and move wiper up or down as required.

3.29 Alignment of wipers at the eleventh rotary step need not be checked if the following conditions exist:

- (1) If cam springs on the associated switch are adjusted to operate on rotary position 10.
- (2) If the associated bank has a bank contact insulator extending to the eleventh rotary position.

Wiper Tip Drag (Left Edge of Bank)

3.30 To check for wiper tip drag along left edge of bank, move shaft vertically. No drag should be felt. If necessary, loosen locking screw on wiper assembly and adjust as required. Retighten locking screw and recheck rotary centering of wiper. If difficulty is encountered in adjusting for drag, check for bent shaft or improper switch adjustment.

Bank Rod Collar Adjustment

3.31 Check that bank rod collar assemblies secure all banks in place. The upper bank should be in contact with at least one of the two bank rod locating shoulders (Fig. 17). Adjust by moving bank and collar as required.

3.32 To change position of bank rod collar, loosen locking screw (Fig. 17) with the screwdriver. Reposition bank and lock bank in bank collar slots. Tighten locking screw.

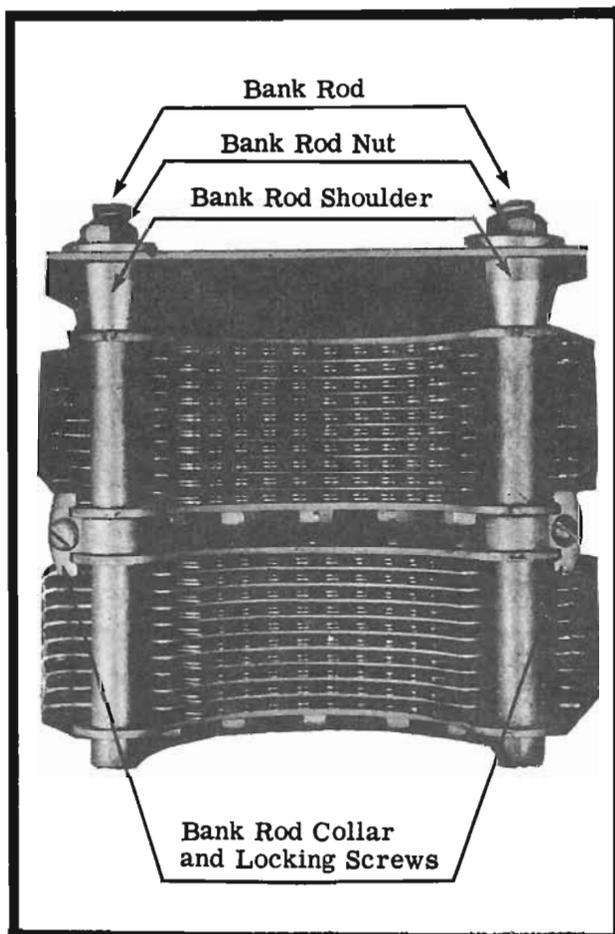


Figure 17. A 400 Point Bank with Arrows Indicating Bank Rods, Bank Rod Nuts, Bank Rod Shoulders, Bank Rod Collars and Locking Screws.

3.33 After adjustments are completed, remove toothpicks from off-normal spring assemblies and replace switch covers.

3.34 Remove buses from switches. Perform operating tests on each switch. Observe that switches function properly.

Part B (Adjustment of Vertical Bank Wipers)

Vertical Wiper Alignment to Vertical Bank

3.35 Check angle between vertical wiper and shaft (Fig. 18). If necessary, adjust by moving wiper assembly as required. Replace wiper assembly if requirement cannot be met.

3.36 Check that the vertical bank is parallel with the shaft (Fig. 18). To adjust loosen bank mounting screws with screwdriver and move as required.

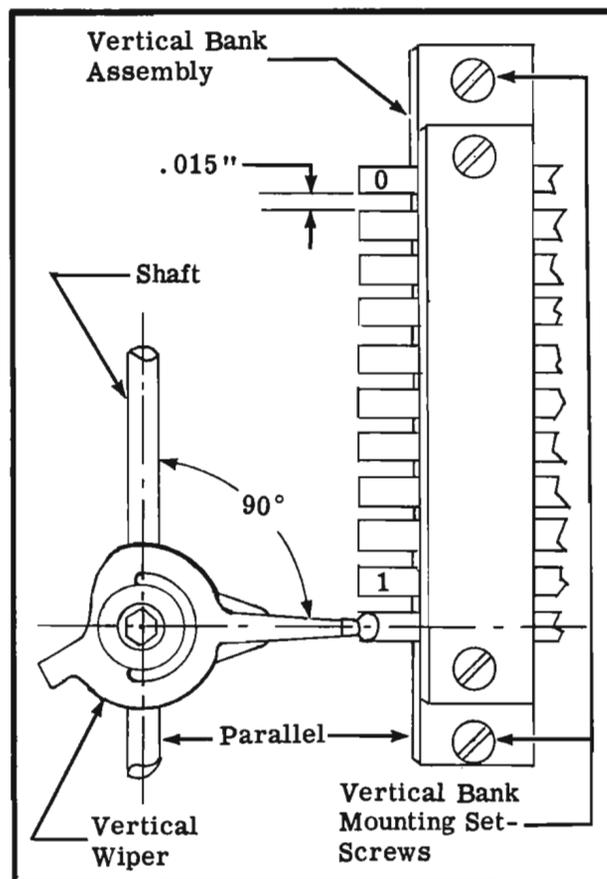


Figure 18. The Vertical Wiper Assembly and Vertical Bank is Shown With Related Requirements.

3.37 Check that center line of vertical wiper is not more than .030" above nor .015" below center line of bank contact. Gauge by eye. Note that distance between vertical bank contacts is .015". See Fig. 18. Adjust wiper as required.

Vertical Wiper Alignment to Vertical Bank Contacts

3.38 Check that the vertical wiper is aligned with the vertical bank contacts. To check, move wiper to first vertical step and rotate shaft until the vertical wiper back stop just lifts the wiper tip from the vertical bank contact. The end of the wiper spring should overlap bank contact by at least 1/16". This requirement should be met if the back edge of the wiper tip is approximately aligned with the front edge of the vertical bank contact. Check all levels. To adjust, place the H-7066 adjuster on the back-stop as shown in Fig. 19. Bend as required.

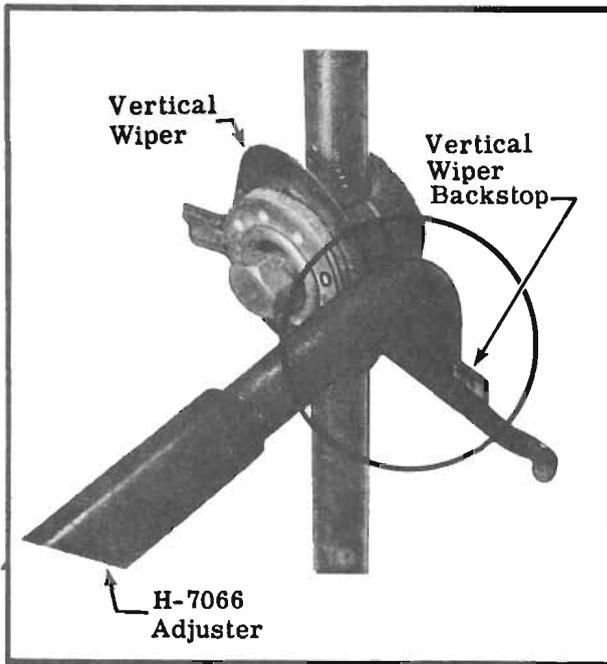


Figure 19. Method for Adjusting Vertical Wiper Backstop is Shown in Circle.

Vertical Wiper Backstop and Wiper Spring Clearance

3.39 Check vertical wiper backstop and wiper spring clearance at rotary normal. To check, move shaft to position the vertical wiper on contact 1 of the vertical bank. Check for a clearance of not more than .002" between the end of the backstop and wiper spring

(Fig. 20). Check all levels. To adjust, place the H-7066 spring adjuster as shown in Fig. 19. Bend as required.

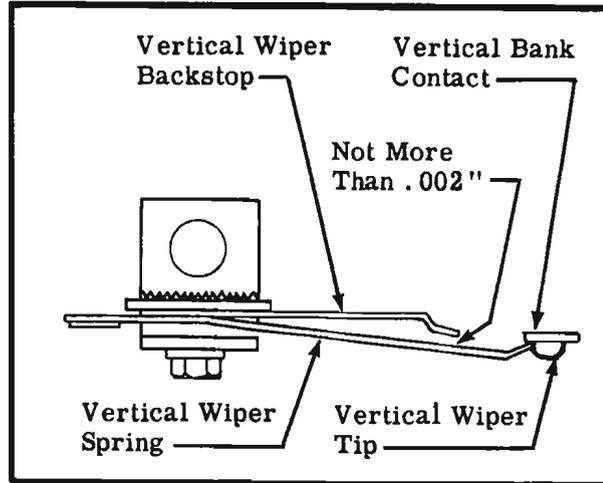


Figure 20. Above is a Side View of the Vertical Wiper and Backstop Requirements.

Vertical Wiper Tension

3.40 Check vertical wiper tension (30 gms. to 45 gms.). To check, move the shaft vertically to position the vertical wiper on any vertical bank contact. Place the GT-1102 tension gauge as shown in Fig. 21. Pull gauge until tip just leaves bank contact. To adjust, place the H-7066 adjuster as shown in Fig. 22. Bend as required.

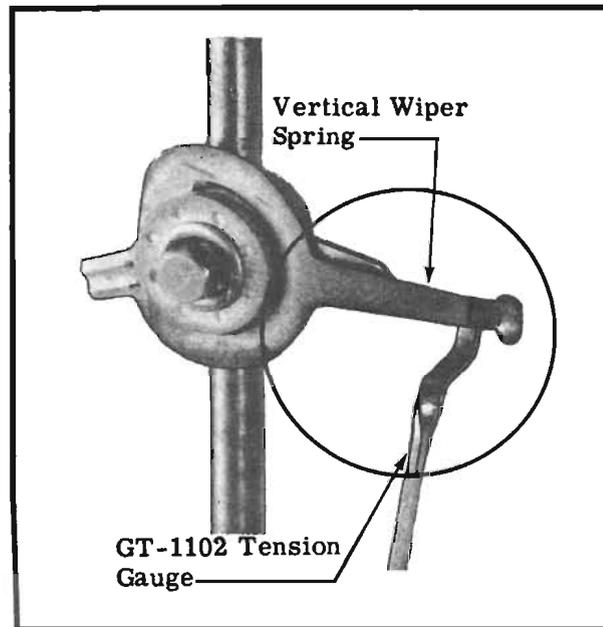


Figure 21. Tension Gauge is Being Used for Checking Vertical Wiper Spring Tension.

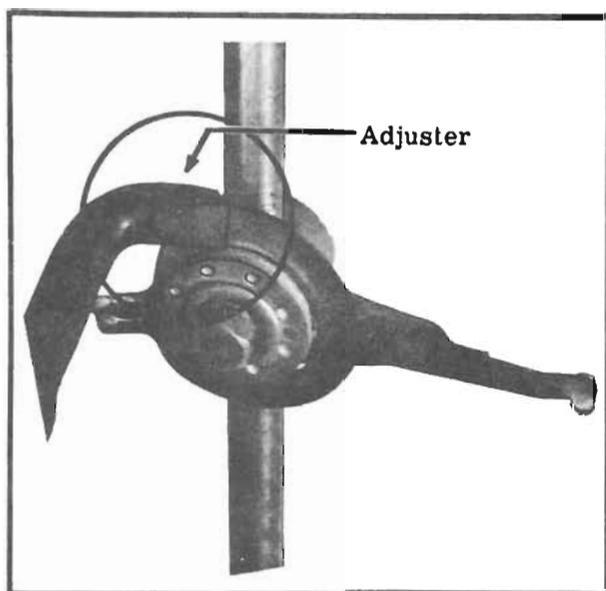


Figure 22. Spring Adjuster is Being Used to Adjust Tension of Vertical Wiper Spring.

3.41 When adjustments are completed, remove toothpicks from off-normal spring assemblies and replace switch covers.

3.42 Remove busies from switches and perform operating tests on each switch. Observe that switches function properly.

4. REPORTS

4.01 Complete the required reports in accordance with local practices.