

PANEL SELECTOR COMMUTATORS
AND COMMUTATOR BRUSHES

1. GENERAL

- 1.01 This section covers Panel Selector Commutators and Commutator Brushes (1, 2, 3, 4, 5, 6, 7 and 10 type commutators and 10 and 14 type commutator brushes) and replaces specification X-70216-01, issue 2-B.
- 1.02 Reference shall be made to Section A400.001 covering General Requirements and Definitions for additional information necessary for the proper application of the requirements listed herein.
- 1.03 Part 1, "General" and Part 2, "Requirements" form part of the Western Electric Co. Inc. Installation Department handbook.
- 1.04 Rack Notch Number - Fig. 1 (A) - This is the number specified to indicate the position at which the rack must rest on the clutch pawl when a requirement is checked or the corresponding readjustment made. Unless otherwise specified, to set the rack on the pawl at the desired notch, the rack notch number specified must appear just above the clutch sight plate. The illustration shows the position of the rack when the rack notch number specified is 10.

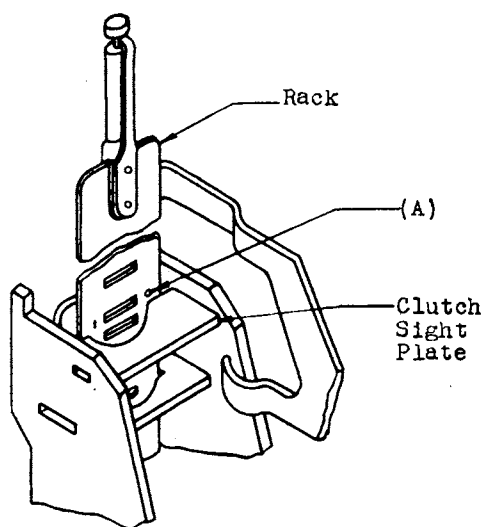


Fig. 1

- 1.05 Contact Spring Pressure is that which it is necessary to overcome to start an individual spring away from the commutator when the gauge is applied at a point on the spring just below the horizontal portion.
- 1.06 Interrupter springs are those commutator brush springs which are associated with perforated commutator strips.
- 1.07 Feeder springs are those commutator brush springs which are associated with solid commutator strips.

2. REQUIREMENTS

Commutator Requirements

- 2.01 Smoothing The contact surfaces of all commutators shall be smooth and free from corrosion or tarnish. Rough corroded or tarnished commutator surfaces shall be smooth with 3/0 sandpaper and treated as covered in requirement 2.02.
- 2.02 Treating
(a) Before the elevator apparatus is operated, the contact surfaces of the commutators shall be treated by first rubbing with the D-89026 panel selector commutator cloth and then by rubbing dry with the KS-2423 cloth.
(b) After turnover, commutators shall be treated periodically as required by local conditions.
- 2.03 Cleaning Commutators shall be kept free from lint and dust by cleaning with KS-2423 cloth only.
- 2.04 Mounting - Fig. 2 (A) - The lower commutator retaining spring and the upper commutator latch plate shall hold the commutator firmly at top and bottom. Side play within the limits of the plate opening is permissible at the bottom. Gauge by feel.

Commutator Brush Requirements

- 2.05 Spring Clearance - Fig. 2 (B) - The two springs of any pair shall not bind on each other when either of the

2.05 (Continued)

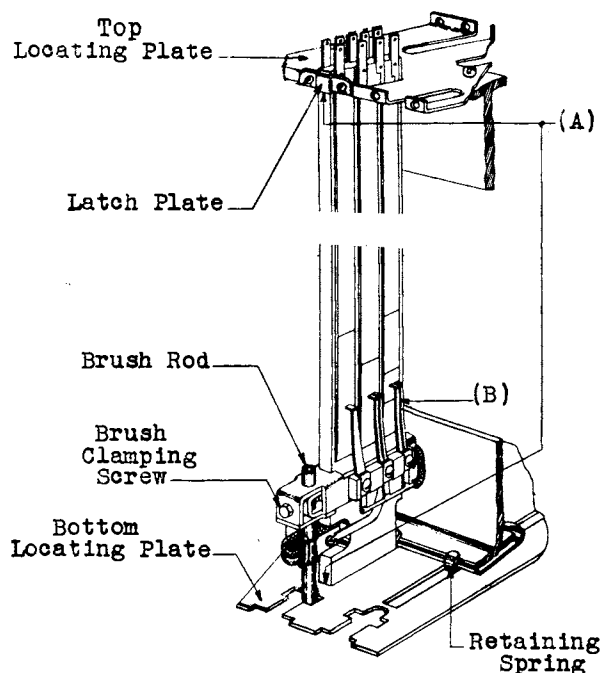


Fig. 2

springs is lifted away from the commutator and allowed to return. Gauge by feel and by eye.

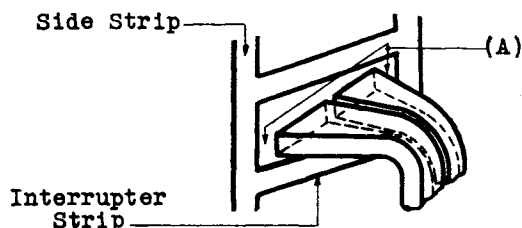


Fig. 3

2.06 Horizontal Position of Interrupter Springs

- (a) Fig. 3 (A) - The contact portion of the lip of the interrupter springs shall not touch the side strips of the segments when the play of the commutator brush assembly is taken up in either direction for any position of travel of the commutator brush. Gauge by eye.
- (b) Fig. 4 (A) - On 4A, 4B, 4C and 3U Commutators there shall be a perceptible clearance (min. .003") between the front edge of the interrupter spring and the front edge of the "X" segment when the play between the brush assembly and the commutator is taken up in the adverse direction. Gauge by eye.

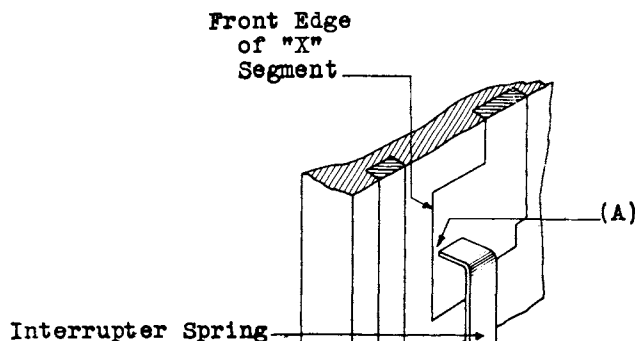


Fig. 4

- 2.07 Horizontal Position of Feeder Springs - Fig. 5 (A) - The contact portion of the lip of the feeder springs shall make contact for their full width with the feeder strips when the play of the commutator brush assembly is taken up in either direction for any position of travel of the commutator brush. Gauge by eye.

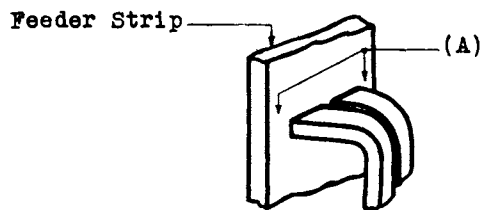


Fig. 5

- 2.08 Angle of Contact - Fig. 6 (A) - The contact portion of the lip of the commutator brush spring shall meet the face of the commutator strip within 1/64" of the point at which the horizontal portion or lip of the brush spring would be perpendicular to the face of the commutator strip. Gauge by eye.

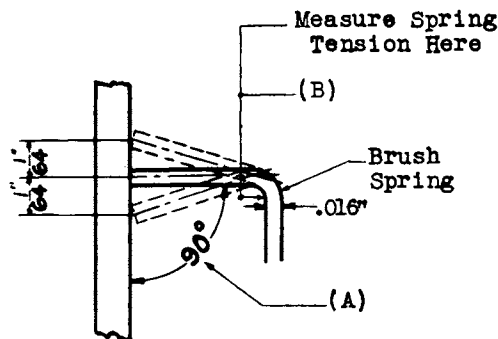


Fig. 6

- 2.09 Vertical Position of Springs The contact portion of the lip of each spring shall set against the commutator within the limits specified on

Pages 4 and 5	District and 3 Wire Office Frames
Page 6	Distant Office Frs.
Pages 7 to 11 Incl.	Incoming Frames
Pages 12, 13 and 14	Final Frames
Pages 15, 16 and 17	"B" Link Frames
Pages 18 and 19	Translator Frames
Page 20	Linefinder Frames
Pages 21 and 22	Subscriber's Link Frames
Page 23	Sender Tandem Link Frames

The term "perceptible" used on the tables on the pages listed above shall be interpreted to be ".005".

- (a) In the Case of Split Springs, the requirements specified must be met with both leaves of the springs; that is both leaves must be within the limits specified, although one leaf may approach the maximum limit while the other leaf approaches the minimum limit. Gauge by eye.
- (b) Fig. 7 (A) - "C" Springs of All Brushes shall be so adjusted that the full width of the contact portion of the spring comes within the specified limits. Gauge by eye.
- (c) Fig. 7 (B) - All Commutator Springs Except the "C" Springs are satisfactorily adjusted for position, if at a point in the middle of the contact portion of the spring, (of each leaf, in the case of a split spring) it is within the specified limits. These limits shall be measured from the top edge or from the bottom edge of the contact portion of the spring to the top edge or the bottom edge of the corresponding commutator segment as indicated in the tables of limits on pages 4 to 23. Adjustments shall always be made either with the brush rod resting on the associated pawl in

the notch of the rack specified in the table, or with the rod in the normal (down) position, as specified. Gauge by eye.

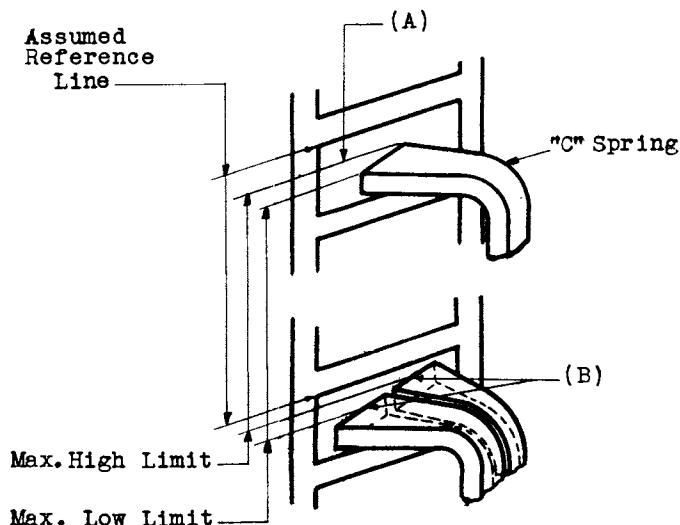


Fig. 7

- 2.10 Contact Pressure - Fig. 6 (B) - The contact pressure of each individual brush spring measured just below the horizontal portion or lip with the brush rod in the position corresponding to the reference terminal of the bank shall be:

<u>Test</u>	- Min. 25 grams
	Max. 55 grams
<u>Readjust</u>	- Min. 30 grams
	Max. 55 grams

Use the No. 68-B gauge.

REASON FOR ISSUE - CHANGES IN REQUIREMENTS

1. To revise the requirement for "Treating" (2.02).
2. To add a table showing requirements for Sender Tandem Link Frames (page 23).

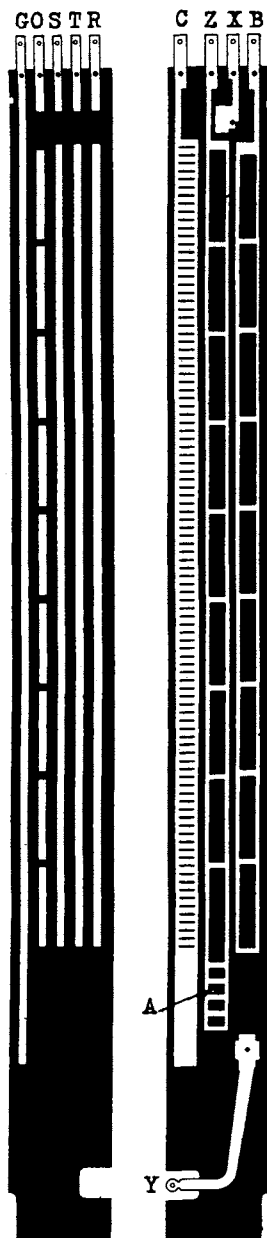


Fig. 8 Fig. 9

1-D COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	TOP	ABOVE	TOP	5TH	SEE NOTE A BELOW			
B	BOTTOM	ABOVE	BOTTOM	5TH	43			
C	TOP	COINCIDE	BOTTOM	45TH	43			
O	TOP	BELOW	BOTTOM	EACH SEGMENT	10, 21, 32, 43, 54, 65, 76, 87 & 99			
	BOTTOM	ABOVE	TOP					
T R S	BOTTOM	ABOVE	BOTTOM	-	0			
	TOP	BELOW	TOP	-	99			

1-D COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	TOP	ABOVE	TOP	5TH	SEE NOTE A BELOW			
B	BOTTOM	ABOVE	BOTTOM	5TH	43			
C	TOP	COINCIDE	BOTTOM	45TH	43			
O	TOP	BELOW	BOTTOM	EACH SEGMENT	10, 21, 32, 43, 54, 65, 76, 87, 93 & 99			
	BOTTOM	ABOVE	TOP					
T R S	BOTTOM	ABOVE	BOTTOM	-	0			
	TOP	BELOW	TOP	-	99			

3-D COMMUTATOR

Note A: Check or adjust the "A" spring with the index number 0 on the rack just below the sight plate.

DISTRICT AND 3 WIRE OFFICE FRAMES

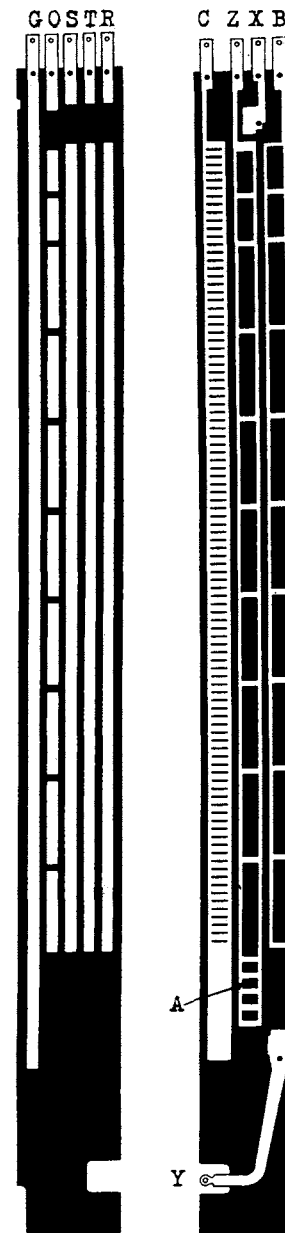


Fig. 10 Fig. 11

3-D COMMUTATOR

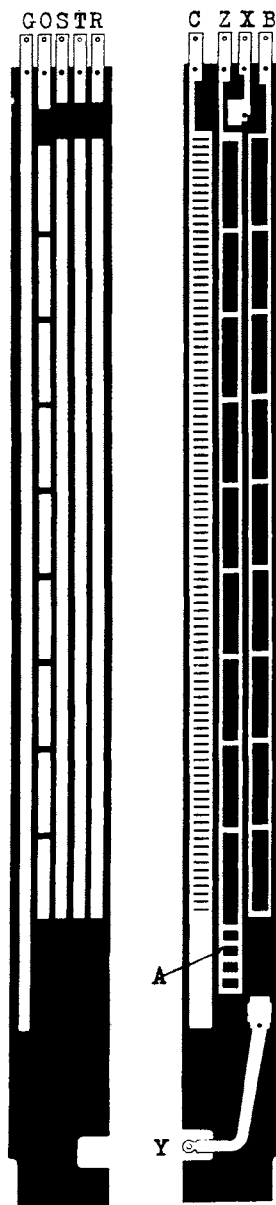


Fig. 12 Fig. 13

3-H COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	TOP	ABOVE	TOP	5TH	SEE NOTE A BELOW			
B	BOTTOM	ABOVE	BOTTOM	5TH	43			
C	TOP	COINCIDE	BOTTOM	45TH	43			
O	TOP	BELOW	BOTTOM	EACH	10, 21, 32, 43, 54, 65, 76, 87, & 99			
	BOTTOM	ABOVE	TOP	SEGMENT				
T R S	BOTTOM	ABOVE	BOTTOM	-	0			
	TOP	BELOW	TOP	-	99			

3-H COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	TOP	ABOVE	TOP	5TH	SEE NOTE A BELOW			
B	BOTTOM	ABOVE	BOTTOM	5TH	43			
CW	TOP	COINCIDE	BOTTOM		43			
	TOP	BELOW	BOTTOM	1ST	SEE NOTE B BELOW			
O	TOP	BELOW	BOTTOM	EACH	10, 21, 32, 43, 54, 65, 76, 87, 93, & 99			
	BOTTOM	ABOVE	TOP	SEGMENT				
T R S	BOTTOM	ABOVE	BOTTOM	-	0			
	TOP	BELOW	TOP	-	99			

3-T COMMUTATOR

Note A: Check or adjust the "A" spring with the index number 0 on the rack just below the sight plate.

Note B: Check or adjust the "W" spring with the brush rod resting on the down stop collar.

DISTRICT AND 3 WIRE OFFICE FRAMES

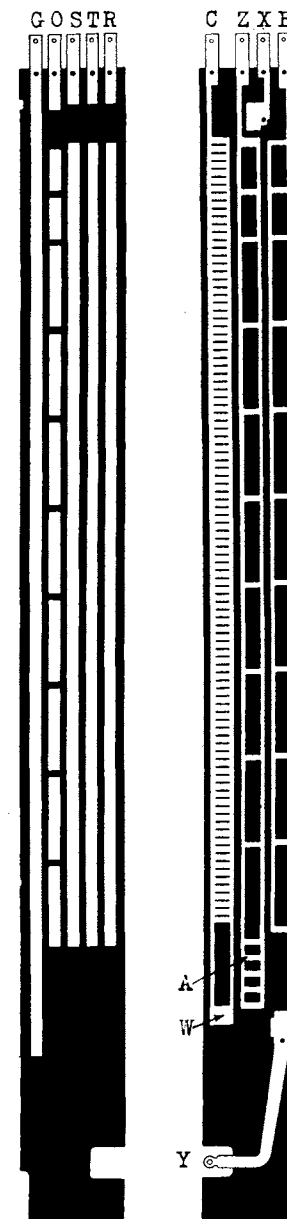


Fig. 14 Fig. 15

3-T COMMUTATOR

G O S T R



Fig. 16
3-Y COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	BOTTOM	COINCIDE	TOP	5TH	SEE NOTE A BELOW			
B	BOTTOM	COINCIDE	BOTTOM	5TH	42			
C	TOP	COINCIDE	BOTTOM	44TH	42			
O	TOP	BELOW	BOTTOM	EACH SEGMENT	10, 21, 32, 43, 54, 65, 76, 87, 93, & 99			
	BOTTOM	ABOVE	TOP					
T R S	BOTTOM	ABOVE	BOTTOM	-	0			
	TOP	BELOW	TOP	-	99			

3-Y (FORMERLY D-76953) COMMUTATOR

Note A: Check or adjust the "A" spring with the index number 0 on the rack just below the sight plate.

DISTANT OFFICE FRAMES

C Z X B

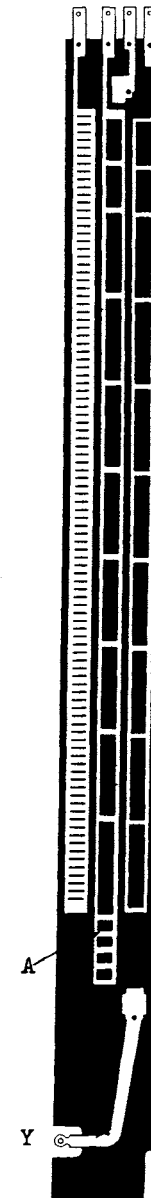


Fig. 17
3-Y COMMUTATOR

PGSTR



Fig. 18
1-A COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	TOP	ABOVE	TOP	5TH	SEE NOTE A BELOW			
B	BOTTOM	ABOVE	BOTTOM	3RD	49			
C	TOP	COINCIDE	BOTTOM	51ST	49			
P	TOP	BELOW	BOTTOM	EACH SEGMENT	24 & 74			
	BOTTOM	ABOVE	TOP		49 & 99			
T	BOTTOM	ABOVE	BOTTOM	-	0			
	TOP	BELOW	TOP	-	99			
R S	TOP	BELOW	BOTTOM	EACH SEGMENT	24, 49, 74 & 99			
	BOTTOM	ABOVE	TOP					

1-A COMMUTATOR (WHEN USED WITH NON-REPEATING INCOMING CIRCUITS)

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	BOTTOM	ABOVE	TOP	5TH	SEE NOTE A BELOW			
B	TOP	COINCIDE	TOP	3RD	49			
C	TOP	COINCIDE	BOTTOM	51ST	49			
P	TOP	BELOW	BOTTOM	EACH SEGMENT	24 & 74			
	BOTTOM	ABOVE	TOP		49 & 99			
T	BOTTOM	ABOVE	BOTTOM	-	0			
	TOP	BELOW	TOP	-	99			
R S	TOP	BELOW	BOTTOM	EACH SEGMENT	24, 49, 74 & 99			
	BOTTOM	ABOVE	TOP					

1-A COMMUTATOR (WHEN USED WITH REPEATING INCOMING CIRCUITS)

Note A: Check or adjust the "A" spring with the index number 0 on the rack just below the sight plate.
INCOMING FRAMES



Fig. 19
1-A COMMUTATOR

PGSTR



Fig. 20
3-A COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	TOP	ABOVE	TOP	5TH	SEE NOTE A BELOW			
B	BOTTOM	ABOVE	BOTTOM	3RD	49			
C	TOP	COINCIDE	BOTTOM	51ST	49			
P	TOP	BELOW	BOTTOM	EACH	24 & 74	PERCEPT		
	BOTTOM	ABOVE	TOP	SEGMENT	49 & 99	PERCEPT NOS 49 & 99		PERCEPT NOS 24 & 74
T	BOTTOM	ABOVE	BOTTOM	-	0	PERCEPT		
	TOP	BELOW	TOP	-	99	PERCEPT NO. 99		PERCEPT NO. 99
R S	TOP	BELOW	BOTTOM	EACH	24, 49, 74 & 99	PERCEPT	EQUAL	
	BOTTOM	ABOVE	TOP	SEGMENT				PERCEPT

3-A COMMUTATOR (WHEN USED WITH NON-REPEATING INCOMING CIRCUITS)

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	BOTTOM	ABOVE	TOP	5TH	SEE NOTE A BELOW			
B	TOP	COINCIDE	TOP	3RD	49			
C	TOP	COINCIDE	BOTTOM	51ST	49			
P	TOP	BELOW	BOTTOM	EACH	24 & 74	PERCEPT		
	BOTTOM	ABOVE	TOP	SEGMENT	49 & 99	PERCEPT NOS 49 & 99		PERCEPT NOS 24 & 74
T	BOTTOM	ABOVE	BOTTOM	-	0	PERCEPT		
	TOP	BELOW	TOP	-	99	PERCEPT NO. 99		PERCEPT NO. 99
R S	TOP	BELOW	BOTTOM	EACH	24, 49, 74 & 99	PERCEPT	EQUAL	
	BOTTOM	ABOVE	TOP	SEGMENT				PERCEPT

3-A COMMUTATOR (WHEN USED WITH REPEATING INCOMING CIRCUITS)

Note A: Check or adjust the "A" spring with the index number 0 on the rack just below the sight plate.

INCOMING FRAMES



Fig. 21
3-A COMMUTATOR

PGSTR



Fig. 22

3-J COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	TOP	ABOVE	TOP	5TH	SEE NOTE A BELOW			
B	BOTTOM	ABOVE	BOTTOM	3RD	49			
C	TOP	COINCIDE	BOTTOM	51ST	49			
P	TOP	BELOW	BOTTOM	-	74			
	BOTTOM	ABOVE	TOP	-	99			
T	BOTTOM	ABOVE	BOTTOM	-	0			
	TOP	BELOW	TOP	-	99			
R	TOP	BELOW	BOTTOM	EACH SEGMENT	24, 49, 74 & 99			
S	BOTTOM	ABOVE	TOP					

3-J COMMUTATOR (WHEN USED WITH NON-REPEATING INCOMING CIRCUITS)

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	BOTTOM	ABOVE	TOP	5TH	SEE NOTE A BELOW			
B	TOP	COINCIDE	TOP	3RD	49			
C	TOP	COINCIDE	BOTTOM	51ST	49			
P	TOP	BELOW	BOTTOM	-	74			
	BOTTOM	ABOVE	TOP	-	99			
T	BOTTOM	ABOVE	BOTTOM	-	0			
	TOP	BELOW	TOP	-	99			
R	TOP	BELOW	BOTTOM	EACH SEGMENT	24, 49, 74 & 99			
S	BOTTOM	ABOVE	TOP					

3-J COMMUTATOR (WHEN USED WITH REPEATING INCOMING CIRCUITS)

Note A: Check or adjust the "A" spring with the index number 0 on the rack just below the sight plate.

INCOMING FRAMES

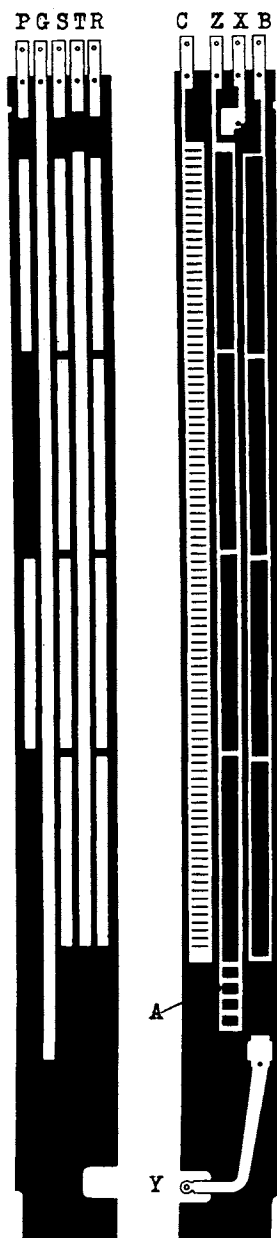
C Z X B



Fig. 23

3-J COMMUTATOR

SECTION A449.002

Fig. 24 Fig. 25
3-K COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	BOTTOM	COINCIDE	TOP	5TH	SEE NOTE A BELOW			
B	BOTTOM	COINCIDE	BOTTOM	3RD	48			
C	TOP	COINCIDE	BOTTOM	50TH	48			
P	TOP	BELOW	BOTTOM	-	24 & 74			
	BOTTOM	ABOVE	TOP	-	49 & 99			
T	BOTTOM	ABOVE	BOTTOM	-	0			
	TOP	BELOW	TOP	-	99			
R	TOP	BELOW	BOTTOM	EACH SEGMENT	24, 49, 74 & 99			
S	BOTTOM	ABOVE	TOP					

3-K COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	BOTTOM	COINCIDE	TOP	5TH	SEE NOTE A BELOW			
B	BOTTOM	COINCIDE	BOTTOM	3RD	48			
C	TOP	COINCIDE	BOTTOM	50TH	48			
P	TOP	BELOW	BOTTOM	-	74			
	BOTTOM	ABOVE	BOTTOM	-	99			
T	BOTTOM	ABOVE	BOTTOM	-	0			
	TOP	BELOW	TOP	-	99			
R	TOP	BELOW	BOTTOM	EACH SEGMENT	24, 49, 74 & 99			
S	BOTTOM	ABOVE	TOP					

3-L COMMUTATOR

Note A: Check or adjust the "A" spring with the index number 0 on the rack just below the sight plate.
INCOMING FRAMES

Fig. 26 Fig. 27
3-L COMMUTATOR

PGSTR



Fig. 28

C Z X B



Fig. 29

3-N COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	BOTTOM	ABOVE	TOP	5TH	SEE NOTE A BELOW			
B	TOP	COINCIDE	TOP	3RD	49			
C	TOP	COINCIDE	BOTTOM	51ST	49			
P	TOP	BELOW	BOTTOM	-	24 & 74			
	BOTTOM	ABOVE	TOP	-	49 & 99			
T	BOTTOM	ABOVE	BOTTOM	-	0			
	TOP	BELOW	TOP	-	99			
R	TOP	BELOW	BOTTOM	EACH	24, 49,			
S	BOTTOM	ABOVE	TOP	SEGMENT	74 & 99			

3-N COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	BOTTOM	COINCIDE	TOP	5TH	SEE NOTE A BELOW			
B	BOTTOM	COINCIDE	BOTTOM	3RD	48			
C	TOP	COINCIDE	BOTTOM	50TH	48			
P	TOP	BELOW	BOTTOM	-	24 & 74			
	BOTTOM	ABOVE	TOP	-	49 & 99			
T	BOTTOM	ABOVE	BOTTOM	-	0			
R	TOP	BELOW	TOP	-	99			
S	TOP	BELOW	BOTTOM	EACH	24, 49			
	BOTTOM	ABOVE	TOP	SEGMENT	74 & 99			

3-W (FORMERLY D-44660) COMMUTATOR

Note A: Check or adjust the "A" spring with the index number 0 on the rack just below the sight plate.

INCOMING FRAMES

PGSTR



Fig. 30

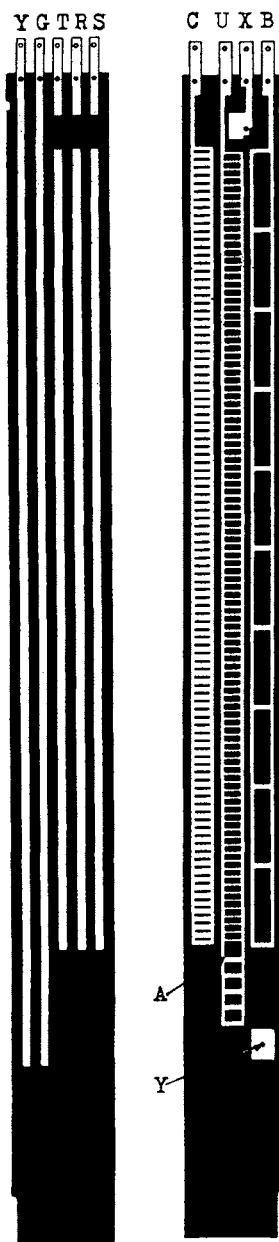
C Z X B



Fig. 31

3-W COMMUTATOR

SECTION A449.002

Fig. 32 Fig. 33
1-B COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	TOP	ABOVE	TOP	5TH	SEE NOTE A BELOW			
B	BOTTOM	ABOVE	BOTTOM	6TH	49			
C	TOP	ABOVE	TOP	50TH	49			
T R S	BOTTOM	ABOVE	BOTTOM	-	0			
	TOP	BELOW	TOP	-	99			

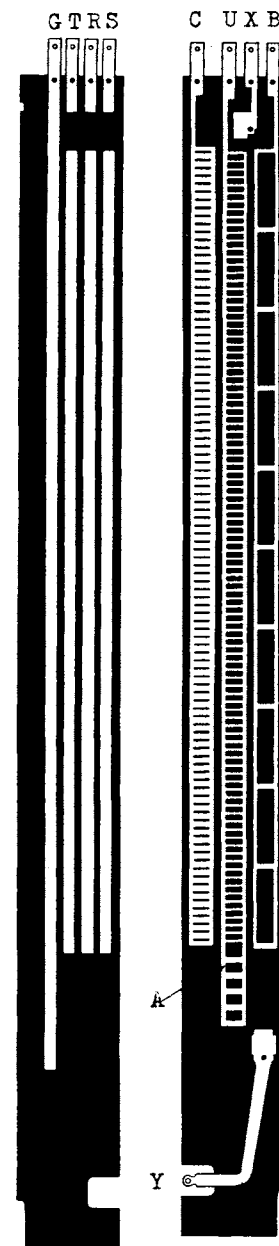
1-B COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	TOP	ABOVE	TOP	5TH	SEE NOTE A BELOW			
B	BOTTOM	ABOVE	BOTTOM	6TH	49			
C	TOP	ABOVE	TOP	50TH	49			
T R S	BOTTOM	ABOVE	BOTTOM	-	0			
	TOP	BELOW	TOP	-	99			

3-B COMMUTATOR

Note A: Check or adjust the "A" spring with the index number 0 on the rack just below the sight plate

FINAL FRAMES

Fig. 34 Fig. 35
3-B COMMUTATOR

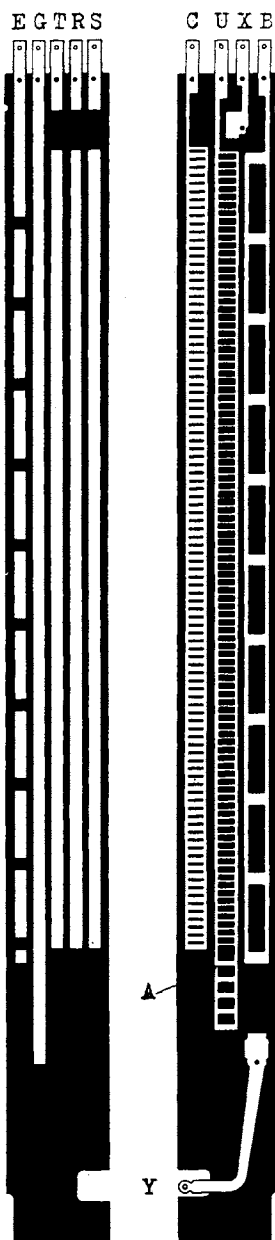


Fig. 36 Fig. 37
3-G COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	TOP	ABOVE	TOP	5TH	SEE NOTE A BELOW			
B	BOTTOM	COINCIDE	BOTTOM	6TH	48			
C	TOP	ABOVE	TOP	49TH	48			
T R S	BOTTOM	ABOVE	BOTTOM	-	0			
	TOP	BELOW	TOP	-	99			

3-G COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	TOP	ABOVE	TOP	5TH	SEE NOTE A BELOW			
B	BOTTOM	COINCIDE	BOTTOM	6TH	48			
C	TOP	ABOVE	TOP	49TH	48			
T R S	BOTTOM	ABOVE	BOTTOM	-	0			
	TOP	BELOW	TOP	-	99			

3-M COMMUTATOR

Note A: Check or adjust the "A" spring with the index number 0 on the rack just below the sight plate.

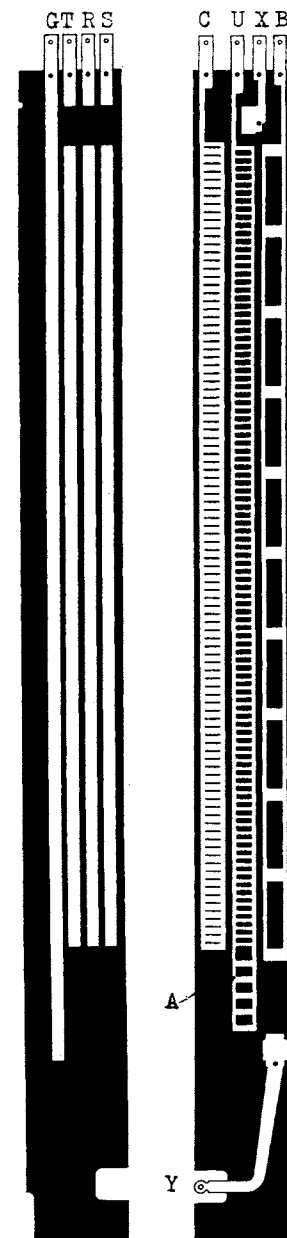







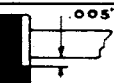


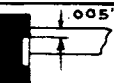


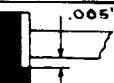
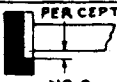
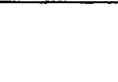


Fig. 38 Fig. 39
3-M COMMUTATOR

FINAL FRAMES

GTRSE



Fig. 40
3-P COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	BOTTOM	COINCIDE	TOP	5TH	SEE NOTE A BELOW			
B	BOTTOM	COINCIDE	BOTTOM	6TH	48			
C	TOP	COINCIDE	TOP	49TH	48			
E	BOTTOM	COINCIDE	BOTTOM	7TH	48			
T R S	BOTTOM	ABOVE	BOTTOM	-	0			
	TOP	BELOW	TOP	-	99			

3-P COMMUTATOR

Note A: Check or adjust the "A" spring with the index number 0 on the rack just below the sight plate.

FINAL FRAMES

C U X B



Fig. 41
3-P COMMUTATOR

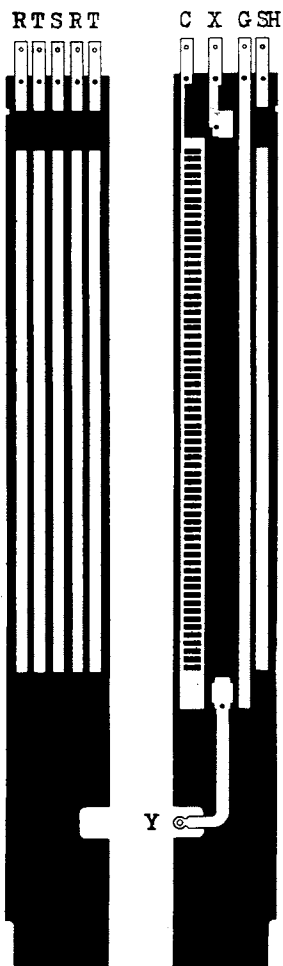


Fig. 42 Fig. 43

3-C COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS		
DESIG.	EDGE	POSITION	EDGE	EDGE		MAX. LOW	IDEAL	MAX. HIGH
C	TOP	COINCIDE	BOTTOM	34TH	32			
T R S	BOTTOM	ABOVE	BOTTOM	-	0			
	TOP	BELOW	TOP	-	64			
SH (Some- times desig- nated "S")	The bottom edge of the "SH" spring shall make contact with its feeder segment approximately .015" before the "C" spring breaks contact with its first segment.							

3-C COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
C	TOP	COINCIDE	BOTTOM	51ST	49			
T R S	BOTTOM	ABOVE	BOTTOM	-	0			
	TOP	BELOW	TOP	-	99			
SH (Some- times desig- nated "S")	The bottom edge of the "SH" spring shall make contact with its feeder segment approximately .015" before the "C" spring breaks contact with its first segment.							

3-E COMMUTATOR

"B" LINK FRAMES

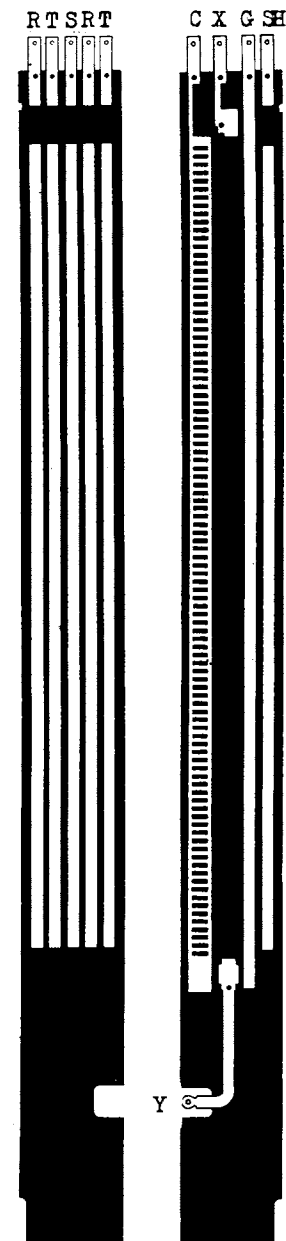


Fig. 44 Fig. 45

3-E COMMUTATOR

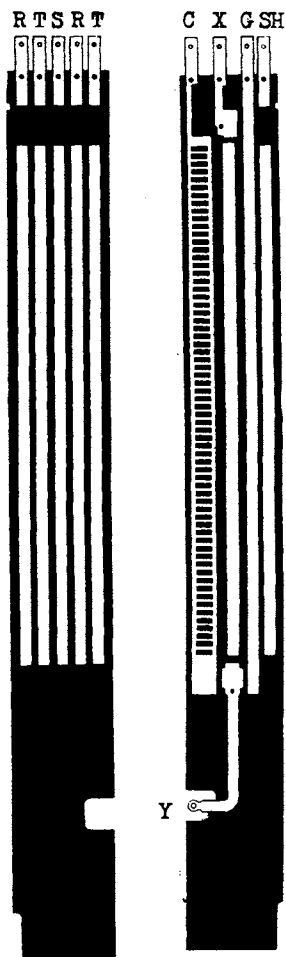


Fig. 46 Fig. 47
3-R COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX.LOW	IDEAL	MAX.HIGH
C	TOP	COINCIDE	BOTTOM	34TH	32			
T R S	BOTTOM	ABOVE	BOTTOM	-	0			
	TOP	BELOW	TOP	-	64			
SH (Some- times desig- nated "S")	The bottom edge of the "SH" spring shall make contact with its feeder segment approximately .015" before the "C" spring breaks contact with its first segment.							

3-R COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX.LOW	IDEAL	MAX.HIGH
C	TOP	COINCIDE	BOTTOM	51ST	49			
T R S	BOTTOM	ABOVE	BOTTOM	-	0			
	TOP	BELOW	TOP	-	99			
SH (Some- times desig- nated "S")	The bottom edge of the "SH" spring shall make contact with its feeder segment approximately .015" before the "C" spring breaks contact with its first segment.							

3-S COMMUTATOR

"B" LINK FRAMES

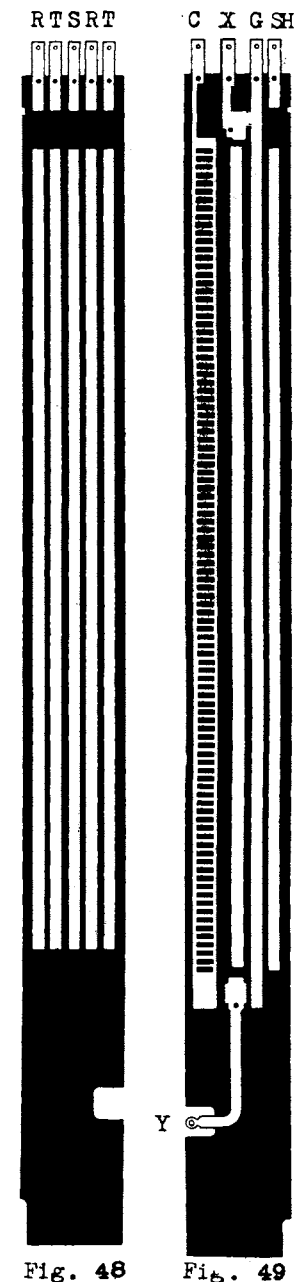


Fig. 48 Fig. 49
3-S COMMUTATOR

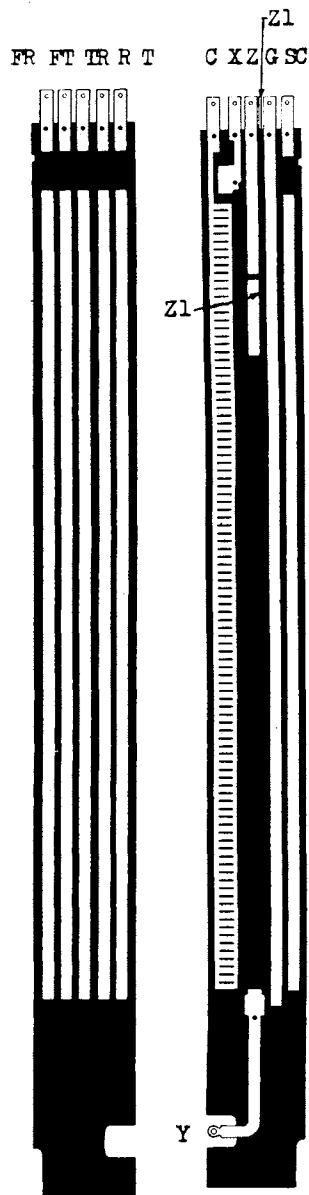


Fig. 50 Fig. 51

3-U COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
C	BOTTOM	COINCIDE	TOP	50TH	49			
T, R, TR, SC, FT & FR	BOTTOM	ABOVE	BOTTOM	-	0			
	TOP	BELOW	TOP	-	99			
X	BOTTOM	ABOVE	BOTTOM	-	101			
Z	BOTTOM	NOT BELOW	BOTTOM	Z	90			
	TOP	NOT ABOVE	TOP	Z1	89			

3-U COMMUTATOR (SENDER SELECTOR)

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
C	BOTTOM	COINCIDE	TOP	31ST	30			
N	TOP	BELOW	TOP	-	59			
KX	BOTTOM	ABOVE	BOTTOM	-	61			
	BOTTOM	ABOVE	TOP	1	SEE NOTE A BELOW			
T R S	BOTTOM	ABOVE	BOTTOM	-	0			
	TOP	BELOW	TOP	-	59			
H M	TOP	BELOW	BOTTOM	-	SEE NOTE A BELOW			

10-A COMMUTATOR (TRUNK-FINDER)

Note A: The H, M and K springs shall be checked with the brush rod resting on the down stop collar and after all other springs have been adjusted.

"B" LINK FRAMES

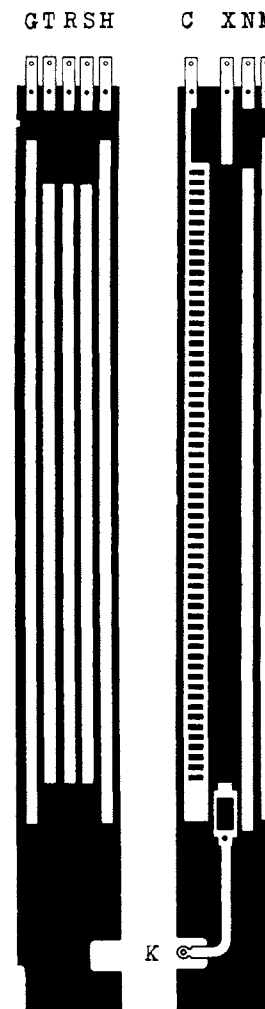


Fig. 52 Fig. 53

10-A COMMUTATOR

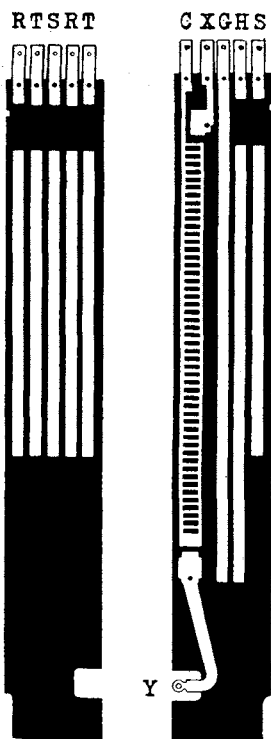


Fig. 54 Fig. 55

4-A COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
C	TOP	BELOW	BOTTOM	30TH	18			
T R S	BOTTOM	ABOVE	BOTTOM	-	0			
	TOP	BELOW	TOP	-	39			
H	TOP	BELOW	TOP	-	39			

4-A COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	TOP	ABOVE	TOP	5TH	SEE NOTE A BELOW			
B	BOTTOM	ABOVE	TOP	3RD	16			
T R S	BOTTOM	ABOVE	BOTTOM	-	0			
	TOP	BELOW	TOP	-	39			

4-B COMMUTATOR

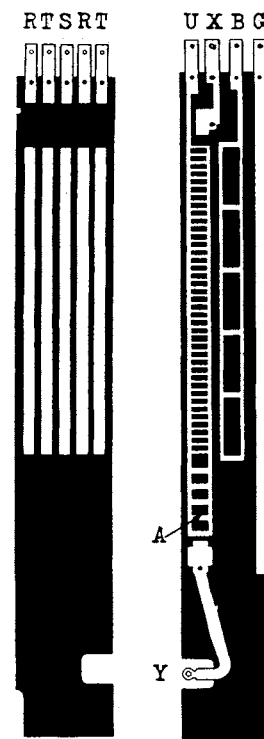


Fig. 56 Fig. 57

4-B COMMUTATOR

Note A: Check or adjust the "A" spring with the index number 0 on the rack just below the sight plate.

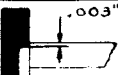


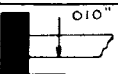
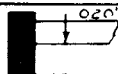
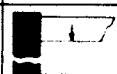
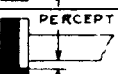

TRANSLATOR FRAMES

RTSRT



Fig. 58

4-C COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	TOP	ABOVE	TOP	5TH	SEE NOTE A BELOW			
B	BOTTOM	ABOVE	TOP	3RD	16			
T R S	BOTTOM	ABOVE	BOTTOM	-	0			
	TOP	BELOW	TOP	-	39			

4-C COMMUTATOR

Note A: Check or adjust the "A" spring with the index number 0 on the rack just below the sight plate.

TRANSLATOR FRAMES

UXBG



Fig. 59

4-C COMMUTATOR

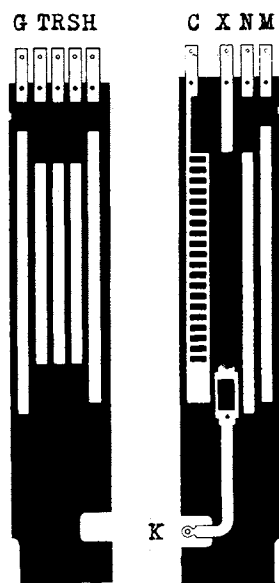


Fig. 60 Fig. 61
2-A COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
C	TOP	ABOVE	TOP	10TH	9			
N	BOTTOM	ABOVE	TOP	-	20			
KX	BOTTOM	ABOVE	BOTTOM	-	20			
	BOTTOM	ABOVE	TOP	1	SEE NOTE A BELOW			
T R S	BOTTOM	ABOVE	BOTTOM	-	0			
	TOP	BELOW	TOP	-	19			
H M	TOP	BELOW	BOTTOM	-	SEE NOTE A BELOW			

2-A COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
C	BOTTOM	COINCIDE	TOP	21ST	20			
N	TOP	BELOW	TOP	-	39			
KX	BOTTOM	ABOVE	BOTTOM	-	41			
	BOTTOM	ABOVE	TOP	1	SEE NOTE A BELOW			
T R S	BOTTOM	ABOVE	BOTTOM	-	0			
	TOP	BELOW	TOP	-	39			
H M	TOP	BELOW	BOTTOM	-	SEE NOTE A BELOW			

5-A (FORMERLY D-76821) COMMUTATOR

Note A: The H, M and K springs shall be checked with the brush rod resting on the down stop collar and after all other springs have been adjusted.

LINE FINDER FRAMES

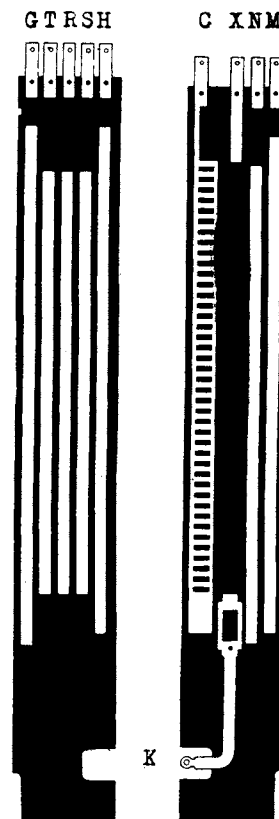


Fig. 62 Fig. 63
5-A COMMUTATOR

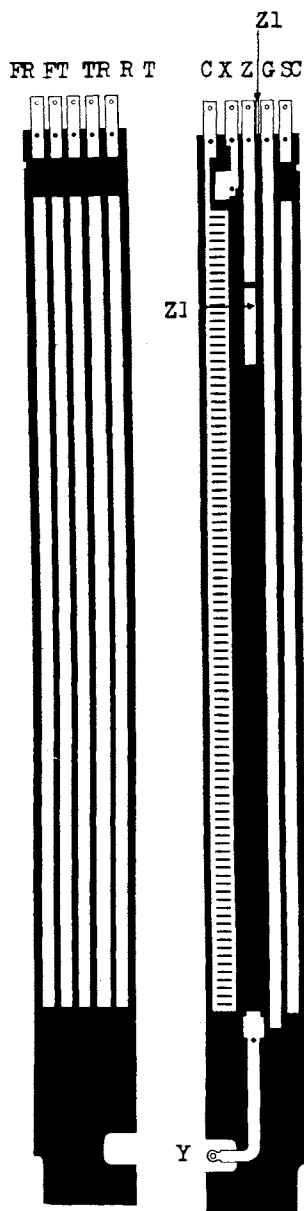


Fig. 64 Fig. 65
3-U COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
C	BOTTOM	COINCIDE	TOP	50TH	49			
T, R, TR, SC, FT & FR	BOTTOM	ABOVE	BOTTOM	-	0			
	TOP	BELOW	TOP	-	99			
X	BOTTOM	ABOVE	BOTTOM	-	101			
Z	BOTTOM	NOT BELOW	BOTTOM	Z	90			
	TOP	NOT ABOVE	TOP	Z1	89			

3-U COMMUTATOR (SENDER SELECTOR)

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
C	BOTTOM	COINCIDE	TOP	11TH	10			
T, R, TR, FT, FR & SC	BOTTOM	ABOVE	BOTTOM	-	0			
	TOP	BELOW	TOP	-	21			
X	BOTTOM	ABOVE	BOTTOM	-	23			
	BOTTOM	NOT BELOW	BOTTOM					
	TOP	NOT ABOVE	TOP					

6-A COMMUTATOR (DISTRICT FINDER)

SUBSCRIBERS LINK FRAMES

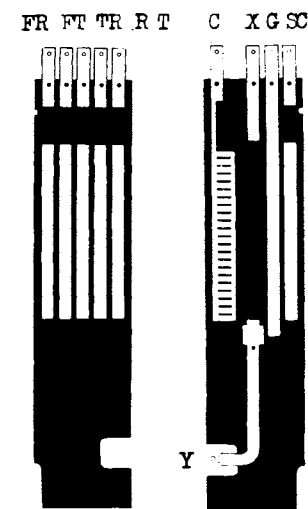


Fig. 66 Fig. 67
6-A COMMUTATOR

FR FT TR R T



Fig. 68

7-A COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
C	BOTTOM	COINCIDE	TOP	21ST	20			
T, R, TR, FT, FR & SC	BOTTOM	ABOVE	BOTTOM	-	0			
	TOP	BELOW	TOP	-	41			
X	BOTTOM	ABOVE	BOTTOM	-	43			

7-A COMMUTATOR (DISTRICT FINDER)

SUBSCRIBERS LINK FRAMES

C XG SC



Fig. 69

7-A COMMUTATOR

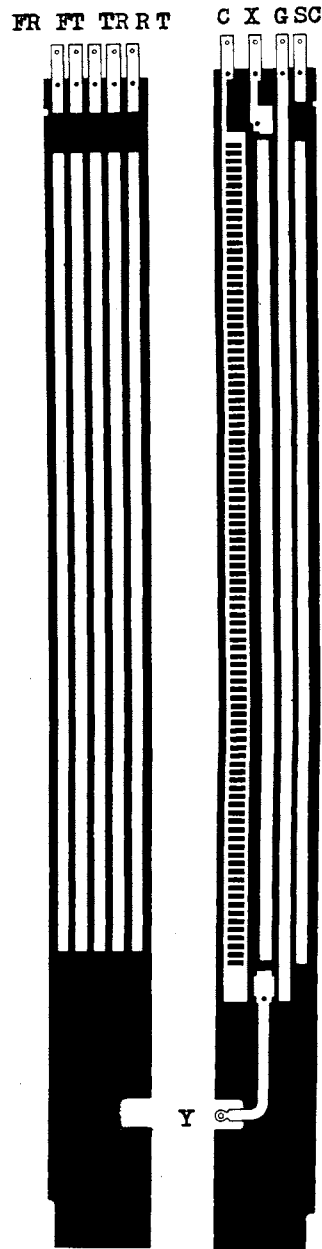


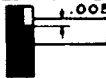
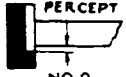



Fig. 70 Fig. 71
3-S COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
C	TOP	COINCIDE	BOTTOM	51ST	49			
T, R, TR, FT & FR	BOTTOM	ABOVE	BOTTOM	-	0			
	TOP	BELOW	TOP	-	99			
SC	The bottom edge of the "SC" spring shall make contact with its feeder segment approximately .015" before the "C" spring breaks contact with its first segment.							

3-S COMMUTATOR (TRUNK FINDER)

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
C	BOTTOM	COINCIDE	TOP	50TH	49			
T, R, TR, SC, FT & FR	BOTTOM	ABOVE	BOTTOM	-	0			
	TOP	BELOW	TOP	-	99			
X	BOTTOM	ABOVE	BOTTOM	-	101			
Z	BOTTOM	NOT BELOW	BOTTOM	Z	90			
	TOP	NOT ABOVE	TOP	Z1	89			

3-U COMMUTATOR (SENDER SELECTOR)

SENDER TANDEM LINK FRAMES

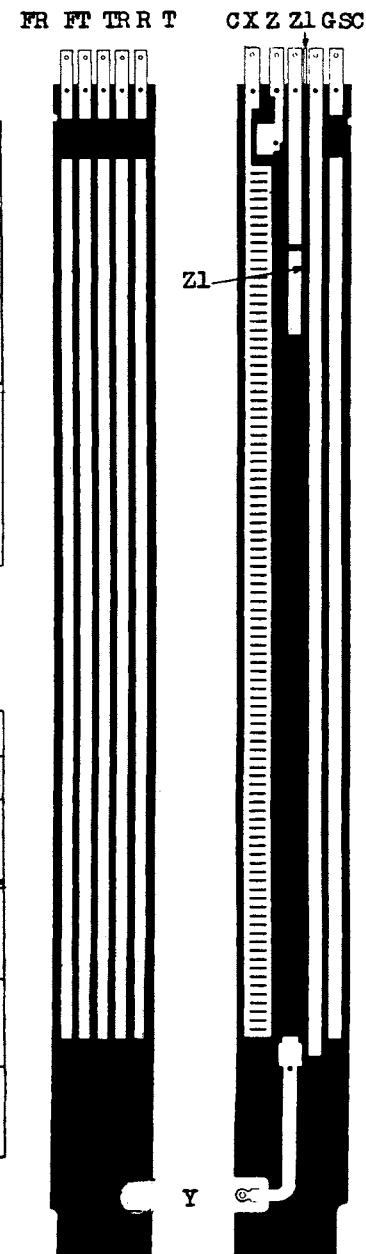


Fig. 72 Fig. 73
3-U COMMUTATOR

3. ADJUSTING PROCEDURESTools

<u>Code No.</u>	<u>Description</u>
206	Screw-driver - 30° Offset
207	Screw-driver - 90° Offset
220	Wrench - 3/16" Hex. Socket
224	Spring Adjuster
278	Commutator Brush Guard
279	Commutator Brush Guard
280	Sandpaper Holder
308	Brush Spring Crimper
KS-2632	Reading Glass
KS-6320	Orange Stick
-	No. 4 Artist's Sable Rigger Brush
-	Bell System Cabinet Screw-driver - 3-1/2" per A. T. & T. Co. Drawing 46-X-40
-	Bell System P-Long Nose Pliers - 6-1/2" per A. T. & T. Co. Drawing 46-X-56
-	Vacuum Cleaner

Gauges

68-B	70-0-70 Gram Gauge
104-A	.247" Thickness Gauge

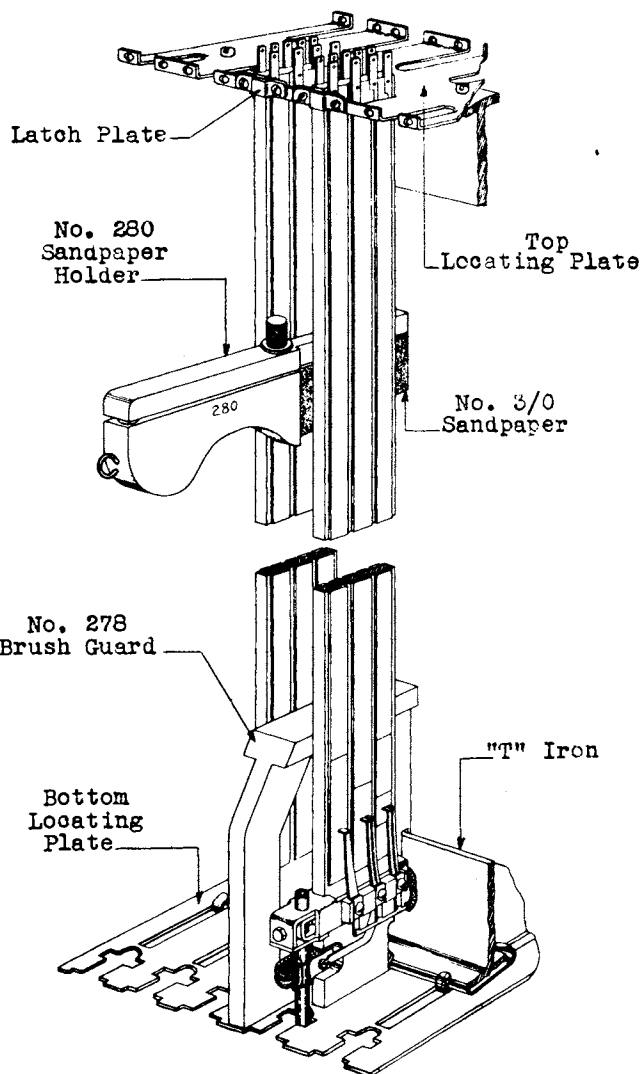
Materials

KS-2423	Cloth
D-89026	Panel Selector Commutator Cloths
-	No. 3/0 Sandpaper

3.001 No. 3/0 sandpaper is specified for use in the smoothing operation covered in procedure 3.01. Precaution should be taken to guard against the use of garnet paper or any other abrasive paper or cloth other than No. 3/0 sandpaper or flint paper.

3.002 Before smoothing, oiling or cleaning a commutator and before checking or re-adjusting a commutator brush, the associated circuit should be made busy. The circuit associated with the commutator adjacent to a commutator whose surface

is to be smoothed must also be made busy. This is necessary because of the construction of the No. 278 and No. 279 commutator brush guards, which must be used during the smoothing operation to protect the commutator brushes. These guards are placed between commutators and straddle the brush springs of the adjacent commutator brush as shown in Fig. 74.



Smoothing Commutators with No. 280 Sandpaper Block in Conjunction with the No. 278 Brush Guard

Fig. 74

3.01 Smoothing (Rq.2.01)

M-1 Place the No. 278 commutator brush guard between two adjacent commutators with the notched foot resting on the "T" iron between the front and rear commutators and the flat foot resting on the bearing plate as shown in Fig. 74. This tool will protect the commutator brushes while the commutator is being sandpapered.

NOTE In smoothing the surfaces of Nos. 3C, 3E, 3R and 3S commutators, the No. 279 commutator brush guard may be used instead of the No. 278 guard.

M-2 Rub two pieces of the 3/0 sandpaper together a few times to smooth them off. This operation should not be done over or near the frame.

M-3 With the smoothed sandpaper fitted into the No. 280 sandpaper holder as shown in Fig. 74, rub the tool lightly against the surface of the commutator, from the top down as far as the guard and up again. Repeat this operation forty or fifty times. The adjacent surface of the adjacent commutator may also be smoothed at this time without moving the commutator brush guard.

M-4 Wipe the commutator surface which has been sandpapered, with a piece of dry KS-2423 cloth and remove all particles of abrasive from the brush springs, by using a No. 4 artist's sable rigger brush before running them up over the cleaned portion.

CAUTION Care should be exercised in removing the loose particles of abrasive from the commutator brushes not to disturb the brush adjustment. Care should also be taken when applying the artist's sable rigger brush not to sweep the metal dust down on the elevator apparatus beneath.

M-5 Now remove the commutator brush guard and raise the brush rods to the tell-tale position. Repeat the operation on the remaining portion of the commutator at the bottom.

M-6 After sandpapering the lower portion, wipe the commutator surface clean with a piece of dry clean KS-2423 cloth.

M-7 After the smoothing operation has been completed on both sides of a frame clean the apparatus and framework adjacent to the commutators with a vacuum cleaner.

M-8 When the above operations have been completed on all commutators requiring smoothing on both sides of the frame, treat as covered by procedure 3.02 those which were smoothed and clean

the contact surfaces of any other commutators that may have become dirty due to the performance of smoothing operations, by rubbing with a piece of KS-2423 cloth.

3.02 Treating (Rq.2.02)

M-1 Remove a piece of D-89026 panel selector commutator cloth from the center of a roll in the container. Cloths should be removed from the container one at a time and as required. One cloth will usually be sufficient to treat six commutators.

M-2 Fold the cloth crosswise to three thicknesses and then fold double. This will give a surface equal to 1/6 the entire side of the cloth. By refolding so as to use both sides of the cloth, this will permit treating both sides of six commutators with one cloth. Use a clean portion of the cloth for each commutator surface.

M-3 Rub the cloth over the contact surfaces of the commutator several times. Then rub the surfaces dry with a piece of KS-2423 cloth. This operation may be performed any time before the circuit associated with the commutator is put back into service.

M-4 As soon as the cloths become dirty, they shall be placed in the metal container approved for discarded oily materials.

3.03 Cleaning (Rq.2.03)

M-1 Clean a commutator by rubbing the contact surface with a piece of KS-2423 cloth. Discard the cloth as soon as it becomes dirty.

3.04 Mounting (Rq.2.04)

M-1 If there is end play in the bottom locating plate, it will be necessary to remove the commutator and adjust the retaining spring.

M-2 To do this raise the brush rod about half way. Remove the latch plate using the 3-1/2" cabinet screwdriver. Pull the top of the commutator away from the top commutator locating plate sufficiently to disengage the notch. Then raise the commutator enough to allow adjustment of the retaining spring.

M-3 Adjust the retaining spring by bending it forward as required to make a snug fit when the commutator is in place.

M-4 Lower the commutator into the slot in the lower commutator mounting plate again and replace the latch plate.

3.04 (Continued)

M-5 Make an inspection of the commutator wiring to see that no wires have been broken.

M-6 Recheck all adjustments on the commutator brush.

M-7 If there is side or end play at the top latch plate, remove the latch plate and slightly flatten it with the long nose pliers.

M-8 Check the "Vertical Position of Springs" on the commutator brush.

3.05 Spring Clearance (Rq.2.05)

M-1 In order to determine whether or not a binding condition exists between two springs, lift one spring away from the commutator with the KS-6320 orange stick and note whether the other spring is lifted from the commutator. Then release the spring and note whether it returns freely to its original position.

M-2 To correct for this, loosen the assembly clamping screw with the No. 206 or No. 207 offset screw-driver. Heat the soldering lug and before the solder has cooled sufficiently to set, separate the leaves. Do this by shifting the leaf of the spring that is furthest away from the edge of the contact strip by means of the No. 224 spring adjuster.

M-3 Set up the assembly clamping screw moderately tight and check the spring for its correct position against the commutator as covered in procedures 3.06 to 3.09 inclusive.

M-4 Securely tighten the assembly clamping screws, resolder the terminals to insure a good connection if any solder has been removed and check the spring for "Contact Pressure" as covered in procedure 3.10.

between the edges of an interrupter spring and the side strips of a commutator segment loosen the spring assembly clamping screw with the No. 206 or No. 207 offset screw-driver and shift the spring to the front or rear as required until the desired clearance is obtained. Then set up the assembly clamping screw moderately tight.

M-2 Check the spring for "Spring Clearance" and for the vertical position against the commutator as covered in procedures 3.05 and 3.09, respectively. Then set up the assembly clamping screw.

3.07 Horizontal Position of Feeder Springs (Rq.2.07)

M-1 If the contact portion of the lips of feeder springs do not make contact with the feeder strips for their full width when the play of the commutator brush assembly is taken up in either direction inspect for a loose or improperly set commutator, bowed brush rod, loose or improperly located brush rod bearing. Care for such faults as are found as specified in the specification covering the particular piece of apparatus at fault.

M-2 Misalignment of the brush springs, with respect to the brush assembly, may also tend to cause the springs to run off the feeder strips. In the case of a spring out of alignment, the spring assembly screw should be loosened with a No. 206 offset screw-driver, about 1/4 turn is enough to permit shifting the spring. Shift the spring until its full width is making contact on the segment. Hold the spring firmly in position and tighten the assembly screw firmly. After this adjustment, a spring must always be checked for location on the commutator as covered in procedure 3.09. Also check for clearance between spring leaves as covered in procedure 3.05.

3.06 Horizontal Position of Interrupter Springs (Rq.2.06)

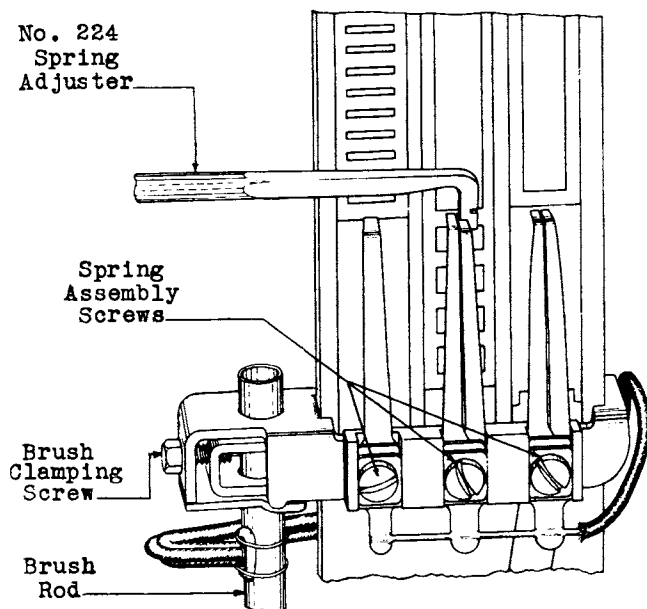
M-1 If there is not a perceptible amount of insulation showing

3.08 Angle of Contact (Rq.2.08)

M-1 When it is noted that the horizontal portion of the spring does not meet the face of the commutator within 1/64" of the point at which it would be perpendicular to the commutator strip, correct by adjusting the horizontal portion of the spring with the No. 224 spring adjuster as shown in Fig. 75 and Fig. 76 either up or down

3.08 (Continued)

as required until it comes within the specified limits.



Adjusting the Rear Leaf of a Brush Spring for Angle of Contact and Vertical Position

Fig. 75

M-2 After performing this operation it will be necessary to check the spring for correct contact pressure as covered in procedure 3.10. Also check the spring for position as covered in procedure 3.09.

3.09 Vertical Position of Springs (Rq.2.09)

M-1 General Procedures In general no gauges are specified for spring positions for which definite limits are specified. It should be possible to relocate the commutator brush quickly and accurately and to make the necessary adjustments of the contact portion of the individual springs by comparing the limits specified in this specification with the thickness of the spring under adjustment. The commutator brush springs are .016" (approximately 1/64") thick with the exception of the "C" spring which in most cases is .013" thick. The KS-2632 reading glass may be used in connection with the visual inspection specified herein.

M-2 Locating the Brush Assembly by Means of the Adjustment of the "A" or "C" Springs The location of the commutator brush assembly, with respect to the reference notch of the associated rack, is determined by the setting of the "A" spring except where 2-A, 3-C, 3-E, 3-R, 3-S, 3-U, 4-A, 5-A, 6-A, 7-A, 10-A and D-76821 commutators are used. Where these commutators are used the location of the commutator brush assembly, with respect to the reference notch of the associated rack, is determined by the setting of the "C" spring. If the brush assembly has been moved on the brush rod, as, for example, if the assembly is replaced for any reason, or if the maximum adjustment permissible on an individual spring is not sufficient to bring it within the specified limits, thus requiring the movement of the entire brush assembly, locate the assembly with reference to the "A" or "C" spring.

M-3 To do this raise the brush rod by hand until the clutch pawl is engaged in the notch of the rack specified in the tables of limits on pages 4 to 23.

M-4 Make sure that the horizontal portion or lip of the "A" or "C" spring is as nearly as possible at right angles with the face of the commutator and check visually to insure that the spring is not perceptibly raised or lowered above the other springs on the brush. If necessary adjust the contact portion of the spring with the No. 224 spring adjuster until it is at right angles with the face of the commutator, or loosen the spring assembly screw with a No. 206 or a No. 207 offset screw-driver and shift the spring to its mean height with respect to the brush frame.

M-5 Then loosen the commutator brush clamping screw with the No. 220 socket wrench sufficiently to permit the adjustment to be made by tapping the shank of the No. 220 wrench up or down with the handle of the screw-driver. The frame of the brush should not be tapped in making this adjustment as this will be likely to mar the finish or distort some part of the assembly.

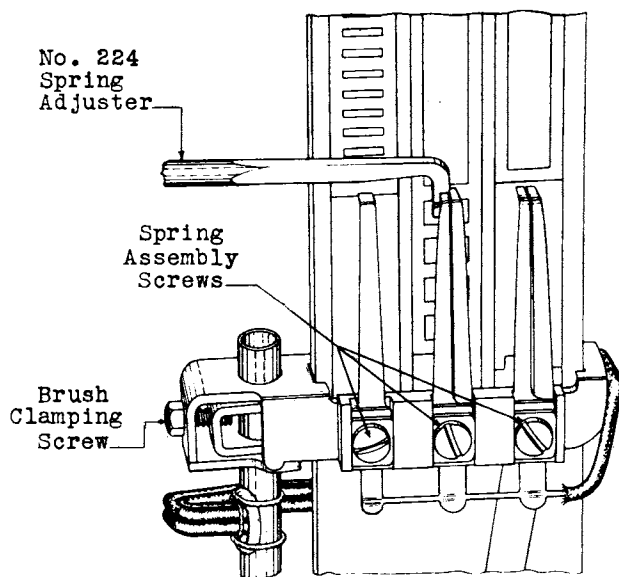
M-6 When adjusting split springs, tension or position each leaf of the spring individually.

M-7 After adjusting either or both leaves of a split spring check the spring for "Clearance" as covered in procedure 3.05.

M-8 If the spring does not meet the requirement for "Vertical Position" for the full width of the contact portion in the case of the "C" spring or for a point approximately in the middle of the contact portion of the

3.09 (Continued)

spring in the case of other springs (of each leaf, in the case of a split spring) it must be corrected.



Adjusting the Front Leaf of a Brush Spring for Angle of Contact and Vertical Position

Fig. 76

M-9 To accomplish this bend the contact portion of the spring with the spring adjuster as shown in Fig. 75 and Fig. 76 as required, but be sure to keep within the $1/64$ " limits as covered in procedure 3.08.

Individual Spring Adjustment

M-10 Where it is impossible to adjust a spring up or down sufficiently to meet a requirement without bending the contact portion of the spring more than $1/64$ " or the thickness of the spring from a right angle with the surface of the commutator, adjust the contact portion of the spring to a right angle with the commutator, as covered in procedure 3.08, loosen the assembly clamping screw with the No. 206 or No. 207 offset screw-driver and move the spring up or down as necessary. When the adjustment is complete securely tighten the assembly screw.

M-11 If a spring has required a considerable amount of adjustment to

meet the requirements for location against the commutator the tension of the spring should be rechecked and re-adjusted if necessary to the readjust limits. Also check for "Spring Clearance" as covered in procedure 3.05 and for the horizontal position of the springs as covered in procedures 3.06 and 3.07 and readjust if necessary.

Special Procedures

Adjustment of "N" Spring of Brushes Used With 5-A, 10-A and D-76821 Commutators

M-12 To check the "N" spring requirement on 5-A, 10-A and D-76821 commutators, apply the No. 104-A gauge on top of the spring and note that the top edge of the gauge coincides with the top edge of the segment within .005".

Adjustment of the "M" and "H" Springs and the "KX" Spring at the "K" Segment of Brushes Used with 2-A, 5-A, 10-A and D-76821 Commutators

M-13 If the "H" or "M" springs are only slightly out of adjustment, they may be adjusted in accordance with paragraphs M-10 and M-11. The "KX" spring on the "K" segment may likewise be adjusted if the brush setting at the "X" segment permits it.

M-14 When either of the "H" or "M" springs, or the "KX" spring at the "K" segment cannot be adjusted in accordance with paragraphs M-10 and M-11, it will be necessary to shift the down stop collar until the desired adjustment is obtained.

M-15 After changing the down stop collar location, it will be necessary to recheck the settings of the "T", "R" and "S" springs. Also check multiple brush reset and trip finger adjustments in accordance with the section covering the apparatus requirements and adjusting procedures for the type of elevator apparatus involved.

Adjustment of "CW" Spring on "W" Segment of 3-T Commutators

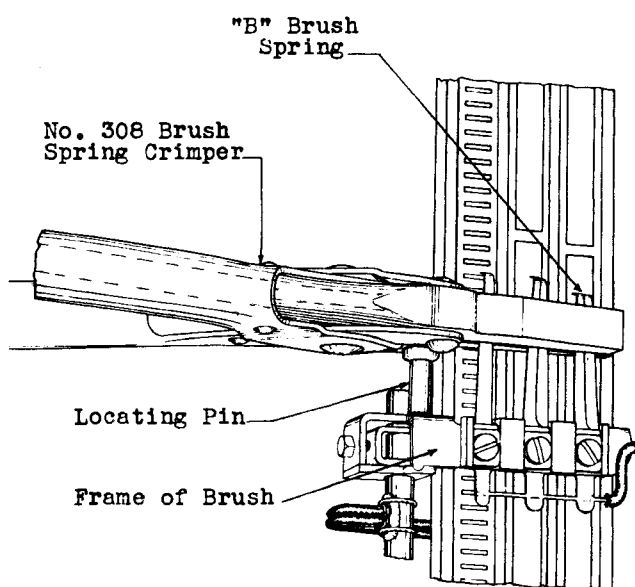
M-16 This requirement is met by raising the down stop collar on the brush rod. After obtaining the proper adjustment in this manner, check for multiple brush reset in accordance with the section covering the apparatus requirements and adjusting procedures for the selector elevator apparatus involved.

Adjustment of the "SH" (Sometimes designated "S" or "SC") Spring of Brushes Used with Nos. 3-C, 3-E, 3-R and 3-S Commutators

M-17 Raise the brush rod until the "C" spring is about to break contact with its first segment. The bottom edge

3.09 (Continued)

of the "SH" spring should then be approximately .015" above the bottom edge of its feeder strip. On drawings on which this spring is designated as "S", the hunting "S" spring may be determined by checking the color of the wire attached to the sleeve spring of the hunting multiple brush which has bridging sleeve springs. If necessary adjust in accordance with paragraphs M-10 and M-11.



Crimping the "B" Spring
with the No. 308 Crimper

Fig. 77

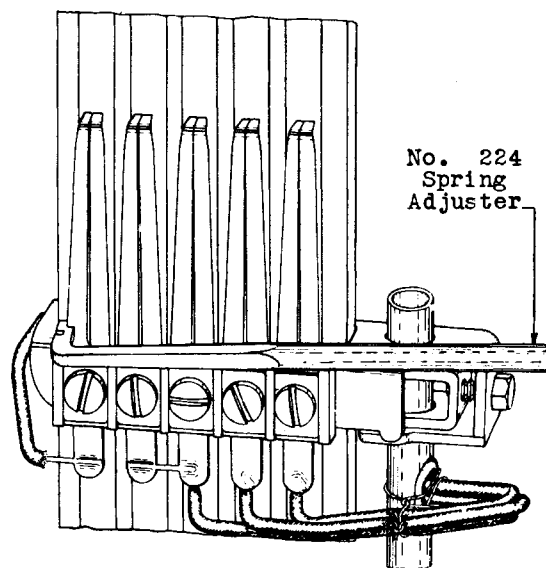
Crimping the "B" Spring of Brushes Used
with the 3-G Commutator

M-18 With the brush in the normal or down position, grasp the No. 308 brush spring crimper loosely in the right hand and introduce the straight jaw between the front spring of the brush and the right-hand side of the

commutator about 1/8" below the contact portion of the spring. Holding the tool so that the jaw is parallel to the surface of the commutator, thrust it to the rear as far as it will go. Then lower it until its locating pin rests on the top of the frame, and its shoulder against the front edge of the commutator as shown in Fig. 77. Holding it so that the jaws are horizontal, close the jaws steadily and firmly until the crimp is formed and the portion of the spring above the crimp lies in the same plane as the portion below it. Then proceed as outlined in paragraphs M-10 and M-11 to meet the location requirement specified.

3.10 Contact Pressure (Rq.2.10)

M-1 Before checking for contact pressure, make sure that the brush assembly is correctly located on the brush rod. Also correct any badly bent or distorted springs as the straightening



Adjusting the Rear Leaf of a
Brush Spring for Tension

Fig. 78

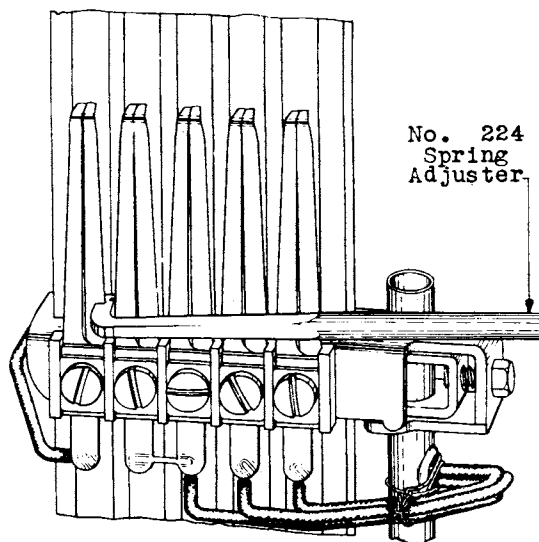
3.10 (Continued)

and adjusting of such springs will be apt to destroy the tension adjustment. Before checking or making readjustments for spring tension it is desirable to raise the brush rod so that the multiple brush is approximately in the center of the bank.

M-2 Check each spring (each leaf in the case of split springs) with the No. 68-B gram gauge applying the tip of the gauge at a point on the spring just below the horizontal portion of the lip of the spring.

M-3 If the spring does not have the proper tension readjust it with the No. 224 spring adjuster applied close to the clamping plate as shown in Fig. 78 and Fig. 79.

M-4 Care must be used in tensioning springs to prevent them from being distorted or thrown out of adjustment. Make a recheck of the spring position adjustments to insure that the springs meet the requirements after the correct tension adjustment has been made.



Adjusting the Front Leaf of a Brush Spring for Tension

Fig. 79

APPROVED:

Bell Telephone Laboratories, Inc.	FAC 8-7-30
Department of Development and Research	GWK 8-7-30