

**BELL SYSTEM PRACTICES**  
Teletypewriter Stations

**SECTION P35.301**  
Issue 5, May, 1955  
AT&TCo Standard

## **WIRING DIAGRAMS**

### **NO. 14 TYPE TELETYPEWRITERS**

#### **1. GENERAL**

1.01 This section gives the wiring of the various apparatus units which may be used in 14 type teletypewriter and typing reperforator sets as they are delivered from the factory. It also shows the wiring of a typical assembly involving a base and typing unit.

1.02 This section is being reissued to incorporate changes in Addendum Issue 1 and to show the selector magnet terminal block as an alternate arrangement in place of the selector magnet switch in Figs. 19, 22, 23 and 24.

1.03 Changes in the wiring of these units required to meet various operating conditions are shown in "M" plans in the section covering internal wiring variations in 14-type teletypewriter apparatus.

1.04 Where wire colors are not specified, the wires are black for all the units shown.

1.05 The following figures are included:

#### **2. TYPING UNITS AND TYPING REPERFORATOR UNITS**

- Fig. 1—Nos. 14-A, B, C, and D Typing Units  
(Synchronous Motor)
- Fig. 2—Nos. 14-E and F Typing Units  
(D-C Motor Unit)
- Fig. 3—Nos. 14-G and H Typing Units  
(A-C Series Motor)
- Fig. 4—No. 14-L Typing Unit  
(A-C Series Motor)
- Fig. 5—No. 14-K Typing Unit  
(A-C Series Motor—2-Speed Governor)
- Fig. 6—No. 14-M Typing Unit  
(Synchronous Motor)

- Fig. 7—No. 14-N Typing Unit  
(D-C Shunt Motor)
- Fig. 8—No. 14-P Typing Unit  
(A-C Series Motor)
- Fig. 9—No. 14-R Typing Unit  
(Synchronous Motor)
- Fig. 10—No. 14-S Typing Unit  
(D-C Shunt Motor)
- Fig. 11—No. 14-T Typing Unit  
(A-C Series Motor)
- Fig. 12—No. 14-U Typing Unit  
(Synchronous Motor)
- Fig. 13—No. 14-W Typing Unit  
(D-C Shunt Motor)
- Fig. 14—No. 14-Y Typing Unit  
(A-C Series Motor)
- Fig. 15—No. 14-AA Typing Unit  
(130-Volt D-C Motor Unit)
- Fig. 16—Nos. 14-AB and AF Typing Units  
(Synchronous Motor)
- Fig. 17—No. 14-AD Typing Unit  
(D-C Shunt Motor)
- Fig. 18—No. 14-AE Typing Unit  
(Synchronous Motor)
- Fig. 19—Nos. 14-AG, AH and AP Typing Units and Nos.  
14-M, P, S, T, AG, AH, AJ, AK and AL Typing  
Reperforator Units (Synchronous Motor)
- Fig. 20—Nos. 14-AS and 14-AT Typing Units  
(A-C Series Motor—2-Speed Governor)
- Fig. 21—Nos. 14-AU, 14-AW, 14-AY and 14-BA  
Typing Units (Synchronous Motor)
- Fig. 22—Nos. 14-N, 14-R, 14-U and 14-W Typing  
Reperforator Units and Nos. 14-AJ, AK and  
AR Typing Units (D-C Shunt Motor)
- Fig. 23—Nos. 14-AM and 14-AN Typing Reperforator Units  
and Nos. 14-AL and AM Typing Units  
(A-C Series Motor)
- Fig. 24—Nos. 14-AP and AR Typing Reperforator Units  
(Synchronous Motor)

### 3. BASES

- Fig. 25—Nos. 14-A and S Teletypewriter Bases and No.  
14-N Typing Reperforator Base

- Fig. 26—Nos. 14-B and T Teletypewriter Bases  
 Fig. 27—No. 14-H Teletypewriter Base  
 Fig. 28—No. 14-J Teletypewriter Base  
 Fig. 29—No. 14-K Teletypewriter Base  
 Fig. 30—No. 14-L Teletypewriter Base  
 Fig. 31—No. 14-M Teletypewriter Base  
 Fig. 32—Nos. 14-N and P Teletypewriter Bases  
 Fig. 33—No. 14-R Teletypewriter Base  
 Fig. 34—No. 14-U Teletypewriter Base  
 Fig. 35—Nos. 14-M, U, W, Y and AA Typing Reperforator Bases  
 Fig. 36—No. 14-P Typing Reperforator Base.  
 Fig. 37—No. 14-AB Typing Reperforator Base  
 Fig. 38—Nos. 14-AD and 14-AE Typing Reperforator Bases

#### 4. TYPICAL CIRCUITS

- Fig. 39—No. 14-Type Teletypewriter—Typical Circuit  
 (14-A Typing Unit, 14-B Base)

#### 2. TYPING UNITS AND TYPING REPERFORATOR UNITS

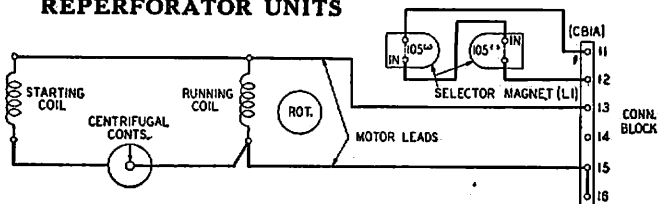


Fig. 1—Nos. 14-A, B, C, and D Typing Units  
 (Synchronous Motor)

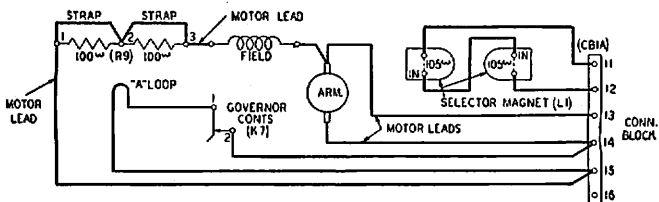
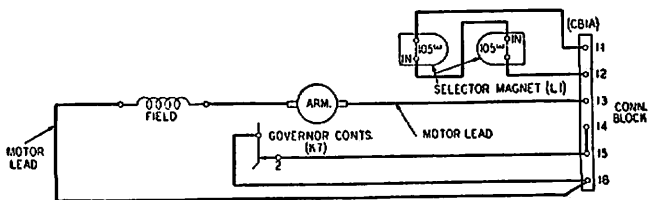
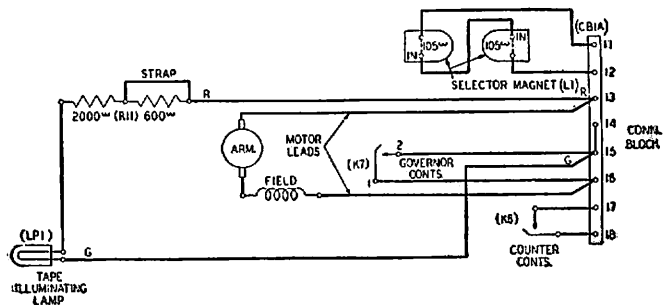


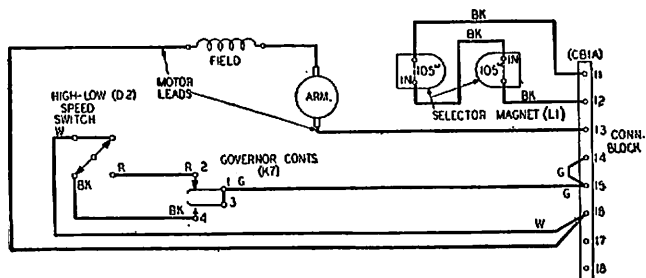
Fig. 2—Nos. 14-E and F Typing Units  
 (D-C Motor Unit)



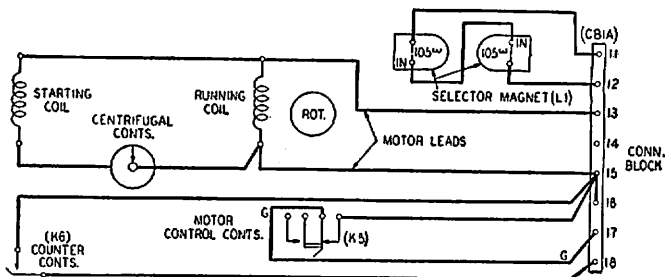
**Fig. 3—Nos. 14-G and H Typing Units  
(A-C Series Motor)**



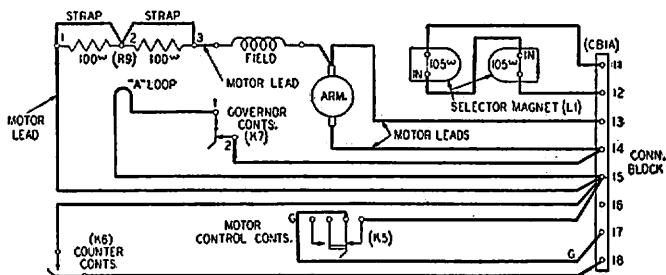
**Fig. 4—No. 14-L Typing Unit  
(A-C Series Motor)**



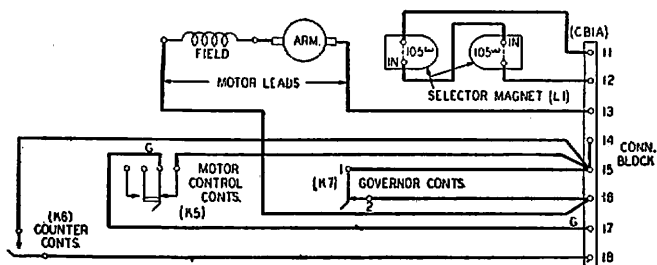
**Fig. 5—No. 14-K Typing Unit (A-C Series Motor—  
2-Speed Governor)**



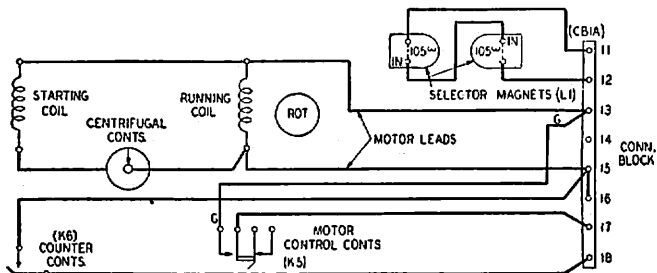
**Fig. 6—No. 14-M Typing Unit  
(Synchronous Motor)**



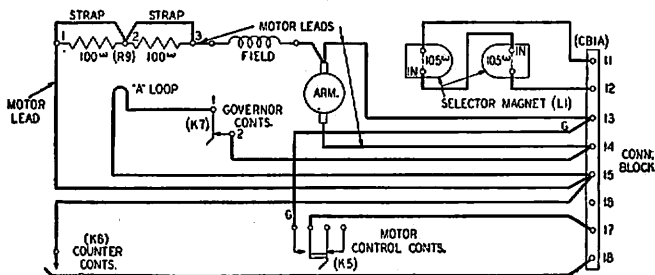
**Fig. 7—No. 14-N Typing Unit  
(D-C Shunt Motor)**



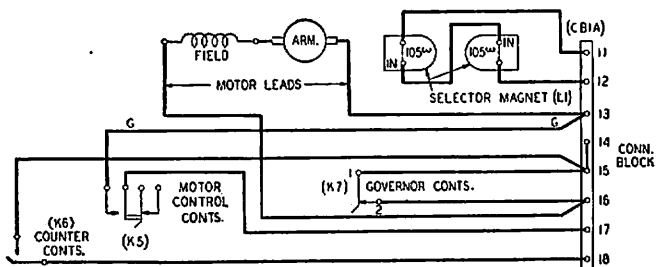
**Fig. 8—No. 14-P Typing Unit  
(A-C Series Motor)**



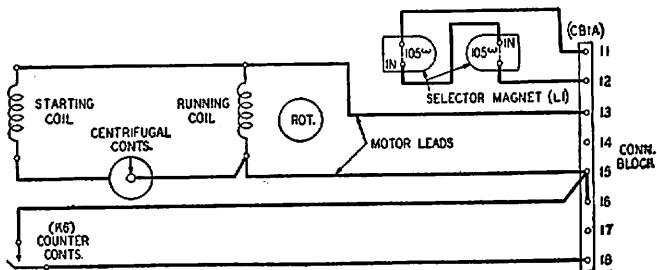
**Fig. 9—No. 14-R Typing Unit  
(Synchronous Motor)**



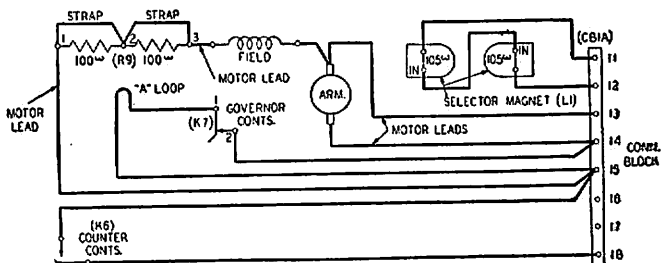
**Fig. 10—No. 14-S Typing Unit  
(D-C Shunt Motor)**



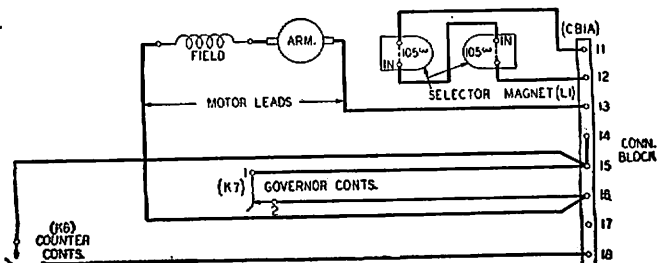
**Fig. 11—No. 14-T Typing Unit  
(A-C Series Motor)**



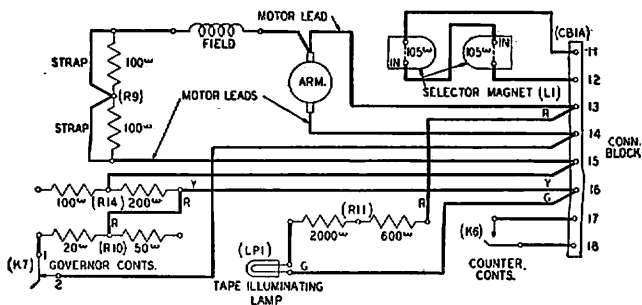
**Fig. 12—No. 14-U Typing Unit  
(Synchronous Motor)**



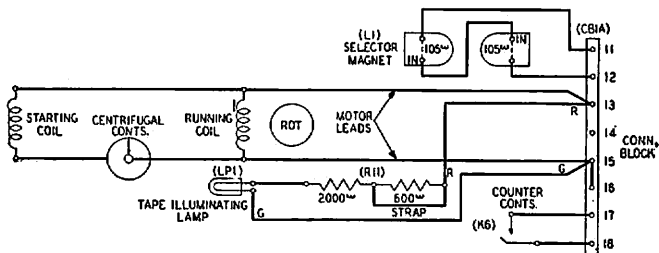
**Fig. 13—No. 14-W Typing Unit  
(D-C Shunt Motor)**



**Fig. 14—No. 14-Y Typing Unit  
(A-C Series Motor)**

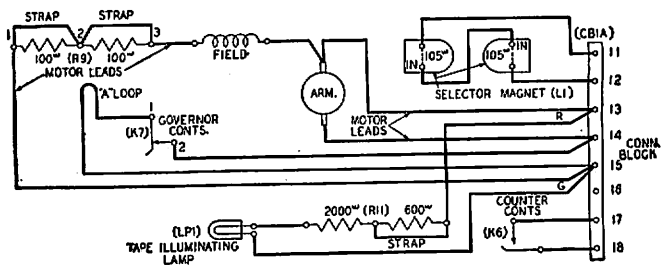


**Fig. 15—No. 14-AA Typing Unit  
(130-Volt D-C Motor Unit)**

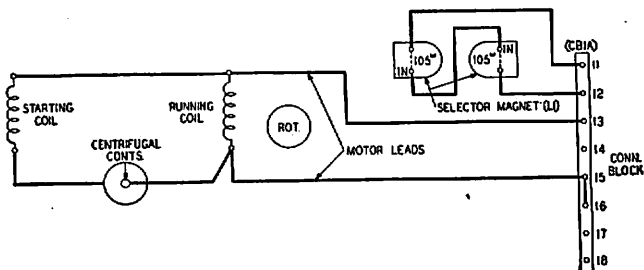


**Fig. 16—Nos. 14-AB and AF Typing Units  
(Synchronous Motor)**





**Fig. 17—No. 14-AD Typing Unit  
(D-C Shunt Motor)**



**Fig. 18—No. 14-AE Typing Unit  
(Synchronous Motor)**

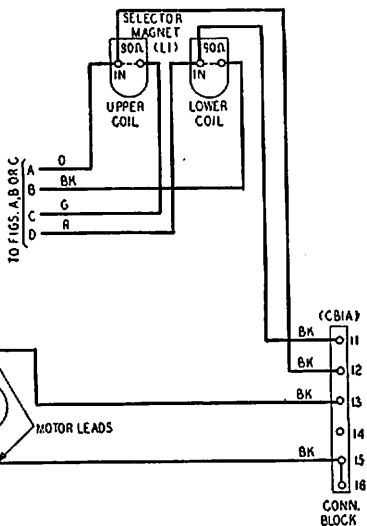
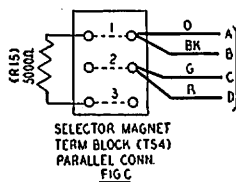
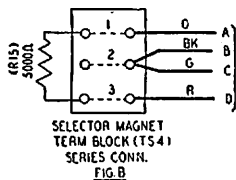
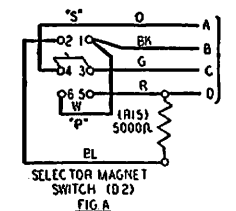
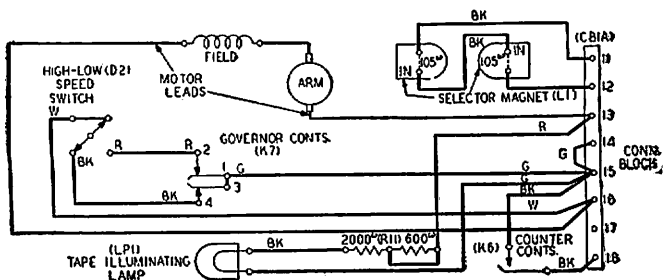
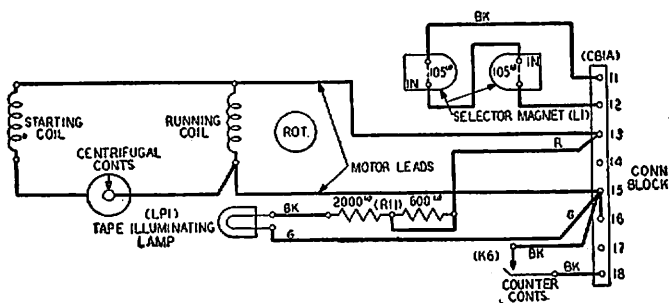


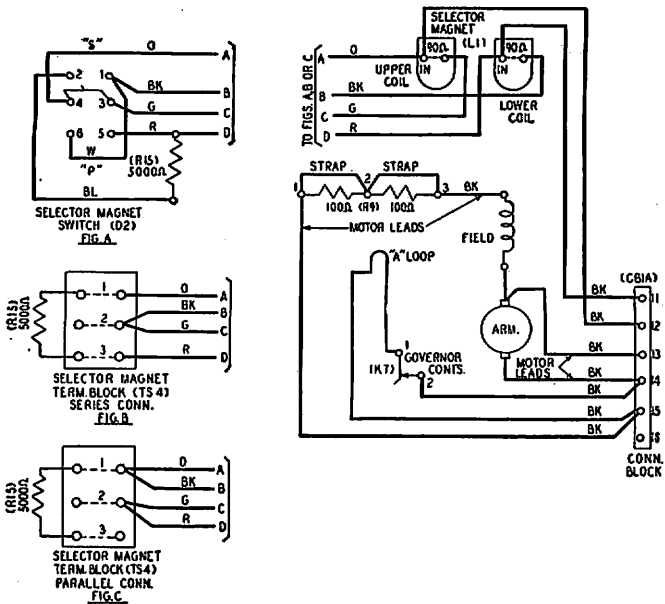
Fig. 19—Nos. 14-AG, AH and AP Typing Units and Nos. 14-M, P, S, T, AG, AH, AJ, AK and AL Typing Reperforator Units (Synchronous Motor)



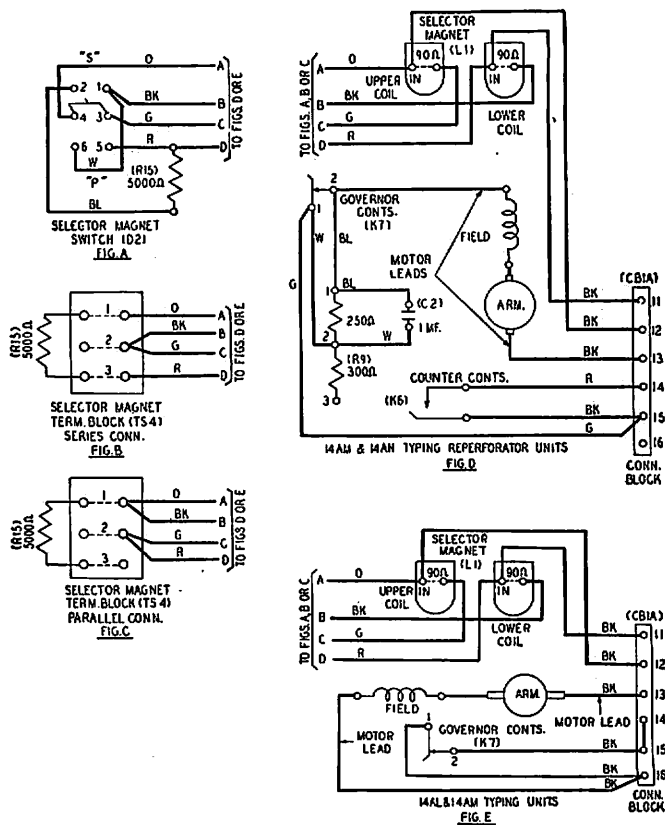
**Fig. 20—Nos. 14-AS and 14-AT Typing Units (A-C Series Motor—2-Speed Governor)**



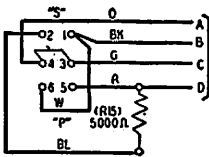
**Fig. 21—Nos. 14-AU, 14-AW, 14-AY and 14-BA Typing Units (Synchronous Motor)**



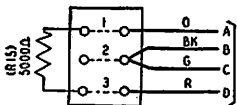
**Fig. 22—Nos. 14-N, 14-R, 14-U and 14-W Typing Reperforator Units and Nos. 14-AJ, AK and AR Typing Units (D-C Shunt Motor)**



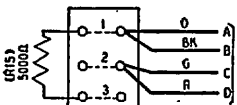
**Fig. 23—Nos. 14-AM and 14-AN Typing Reperforator Units, and Nos. 14-AL and AM Typing Units (A-C Series Motor)**



SELECTOR MAGNET SWITCH (D2)  
FIG. A



SELECTOR MAGNET TERM. BLOCK (TS4) SERIES CONN.  
FIG. B



SELECTOR MAGNET TERM. BLOCK (TS4) PARALLEL CONN.  
FIG. C

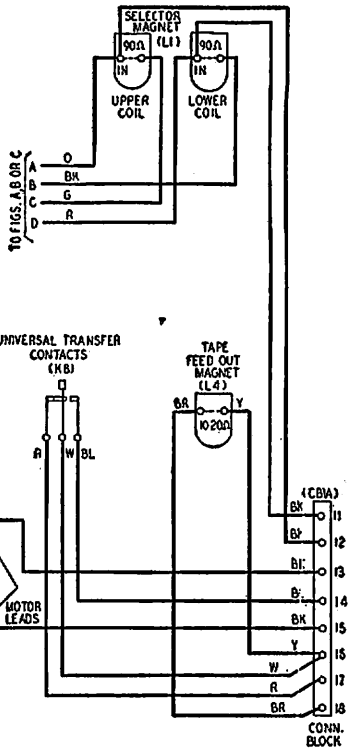
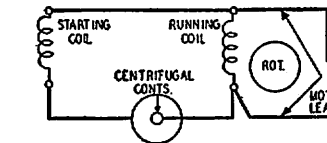


Fig. 24—Nos. 14-AP and AR Typing Reperforator Units (Synchronous Motor)

### 3. BASES

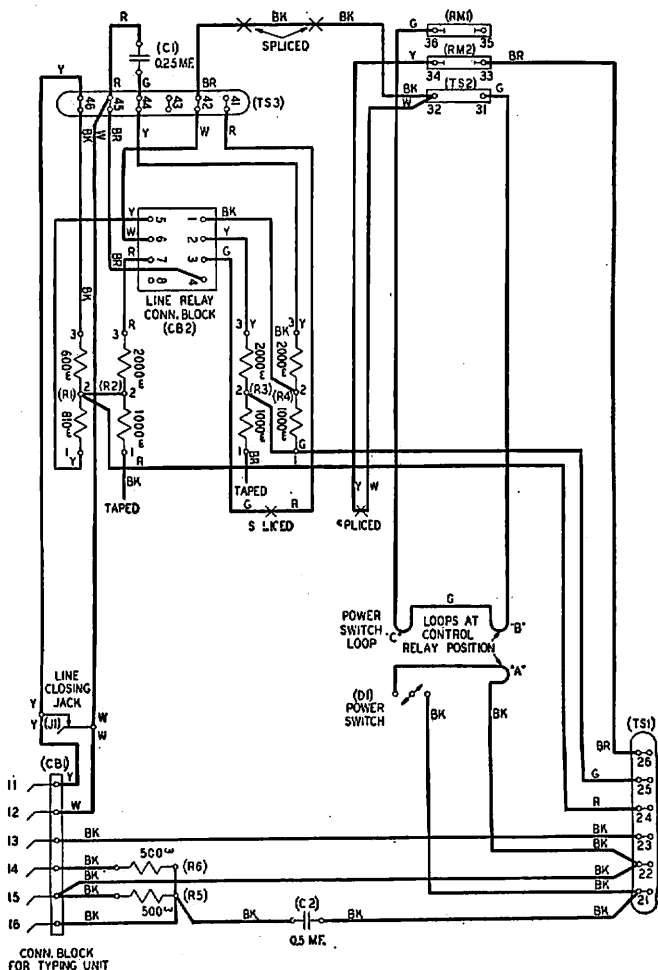


Fig. 25—Nos. 14-A and S Teletypewriter Bases and No. 14-N Typing Reperforator Base

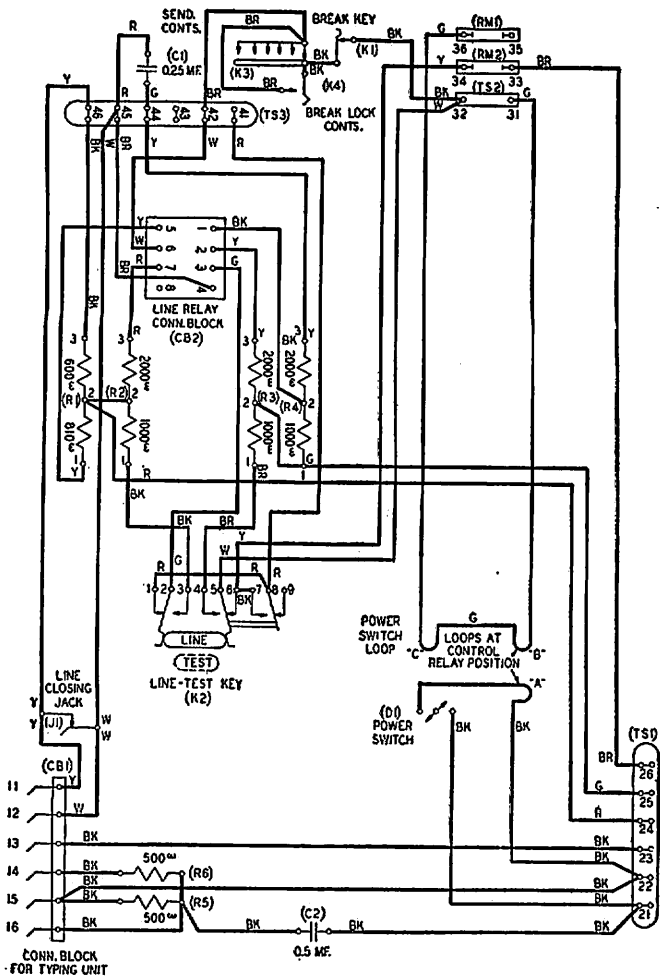


Fig. 26—Nos. 14-B and T Teletypewriter Bases





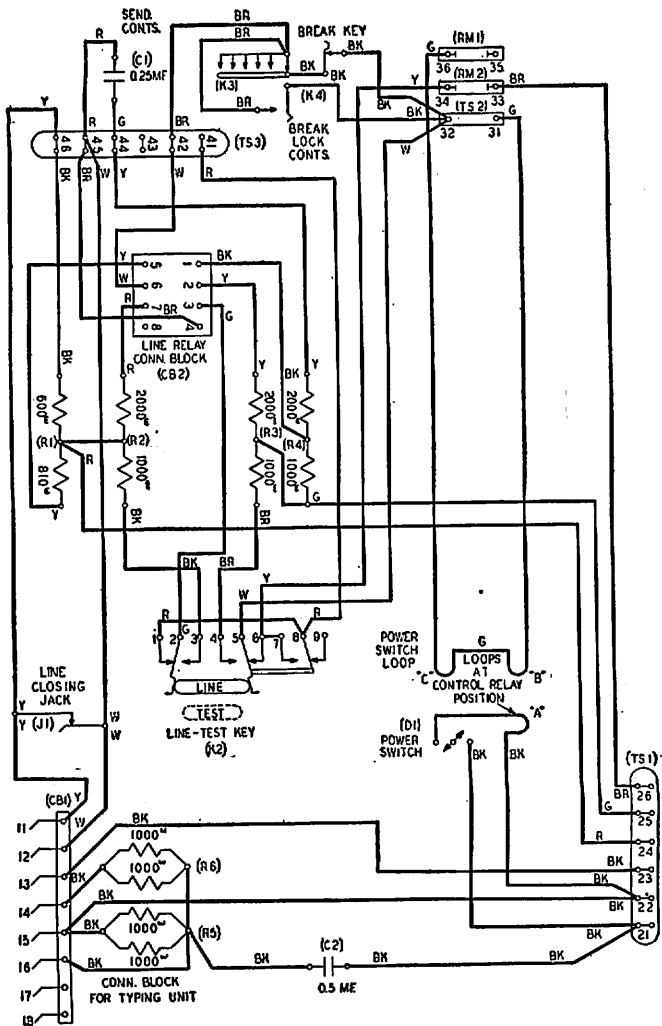


Fig. 27—No. 14-H Teletypewriter Base

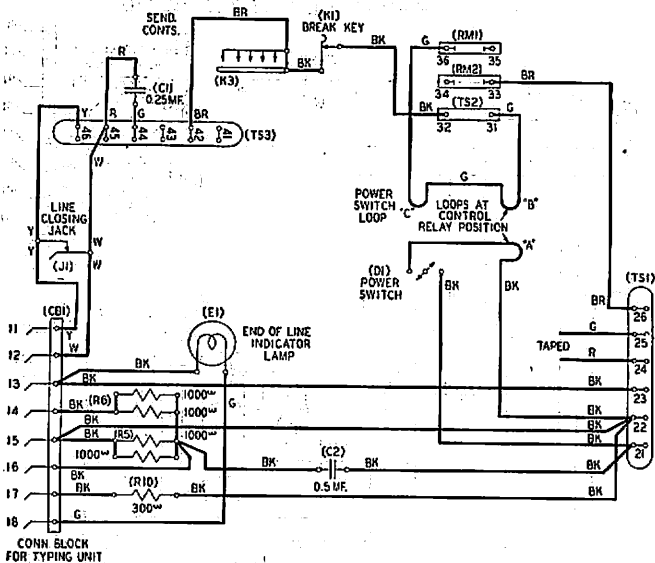


Fig. 28—No. 14-J Teletypewriter Base

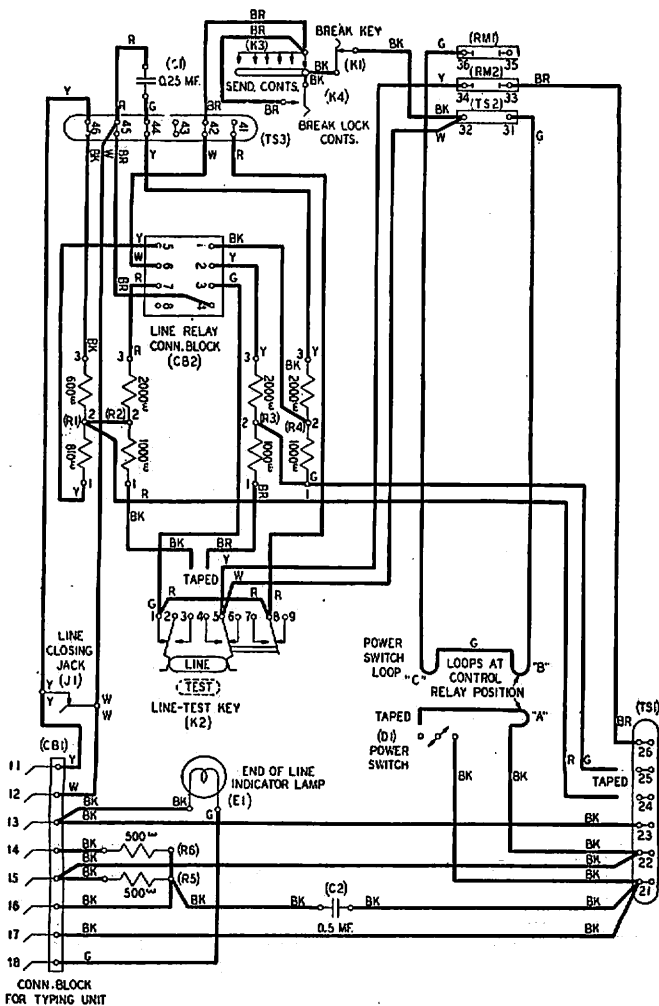


Fig. 29—No. 14-K Teletypewriter Base

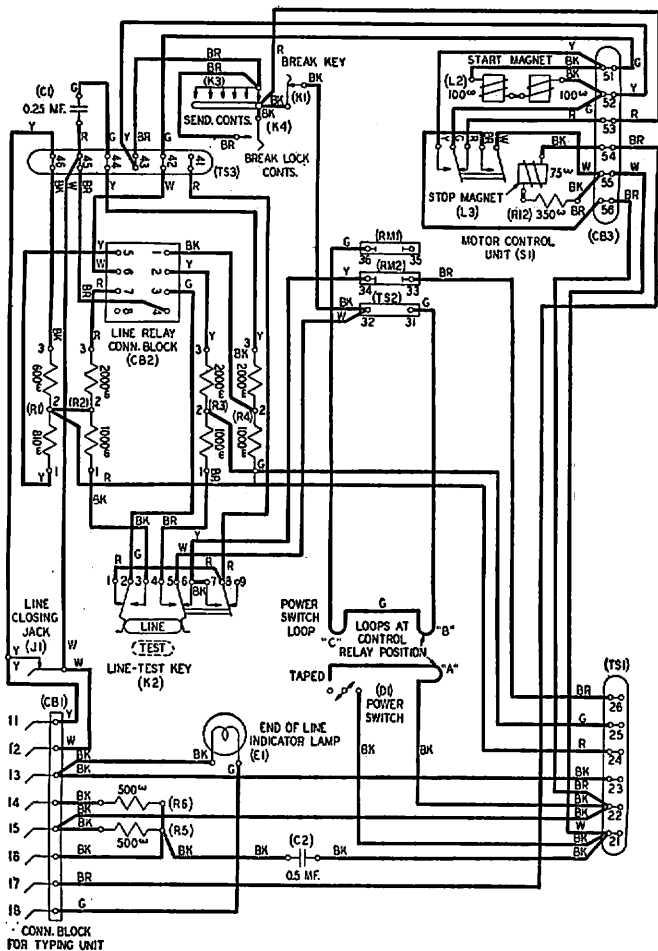


Fig. 30—No. 14-L Teletypewriter Base

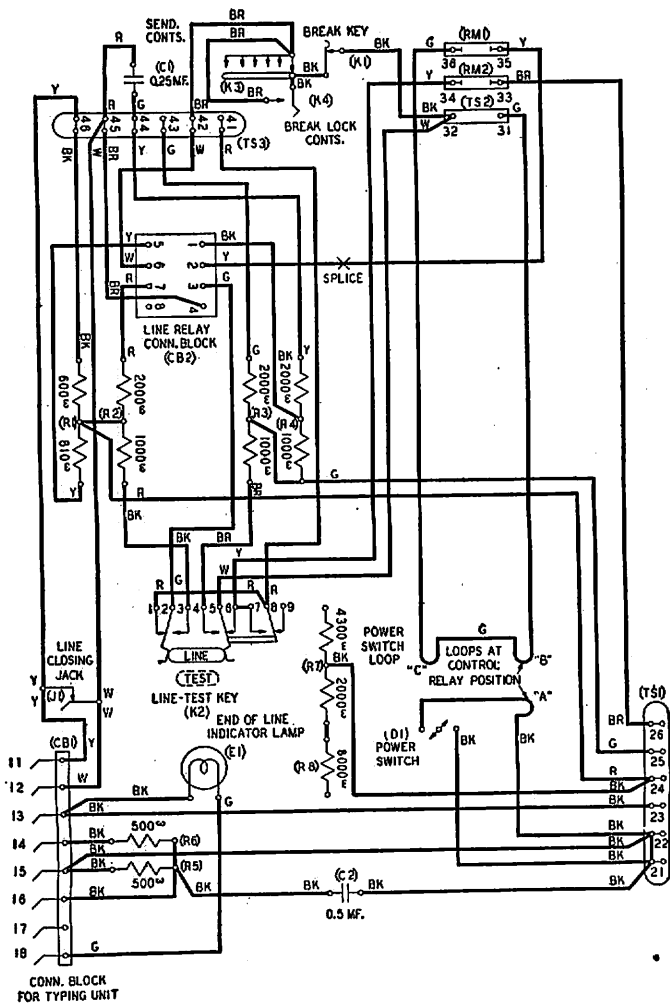


Fig. 31—No. 14-M Teletypewriter Base

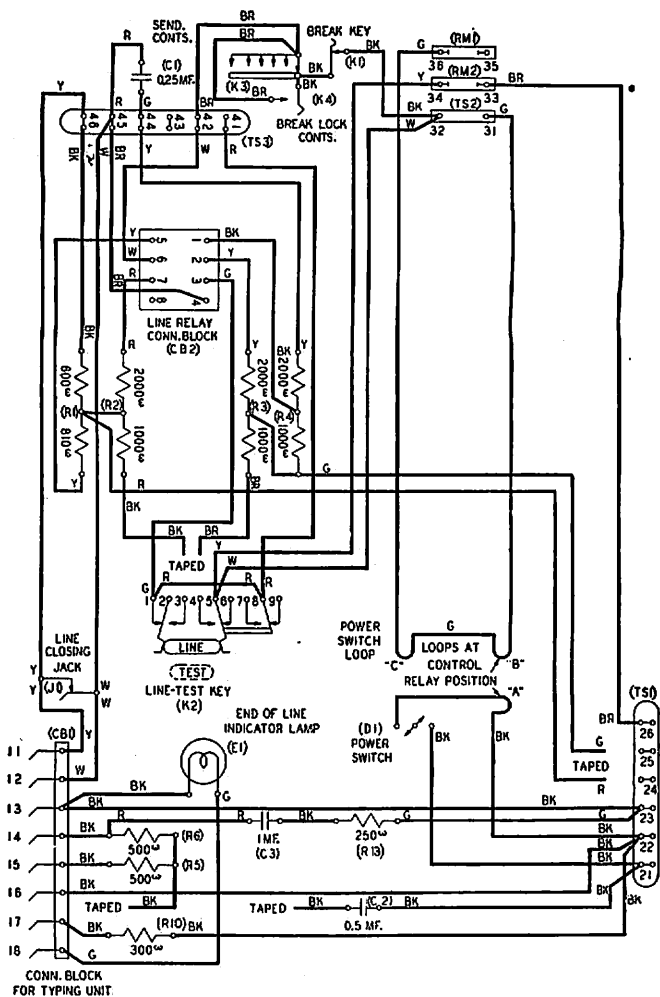


Fig. 32—Nos. 14-N and P Teletypewriter Bases

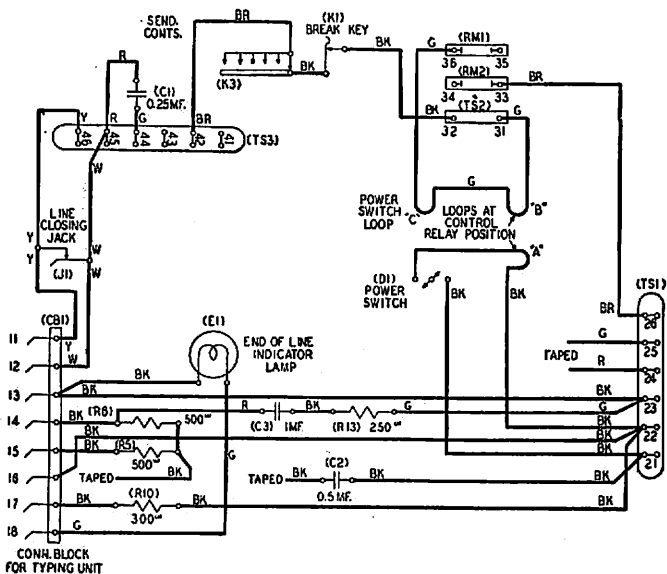


Fig. 33—No. 14-R Teletypewriter Base

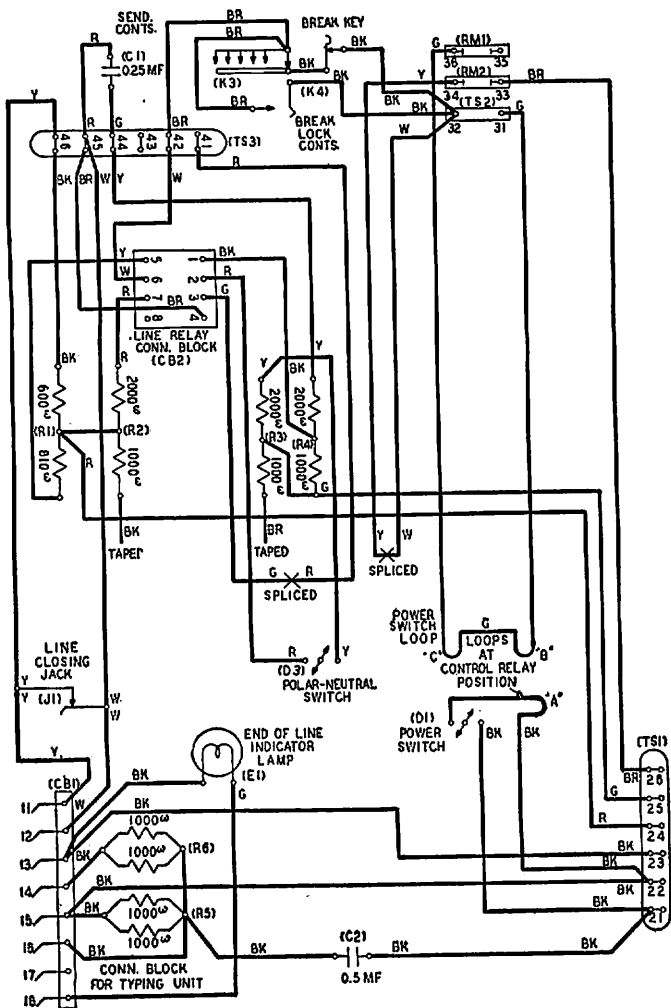


Fig. 34—No. 14-U Teletypewriter Base



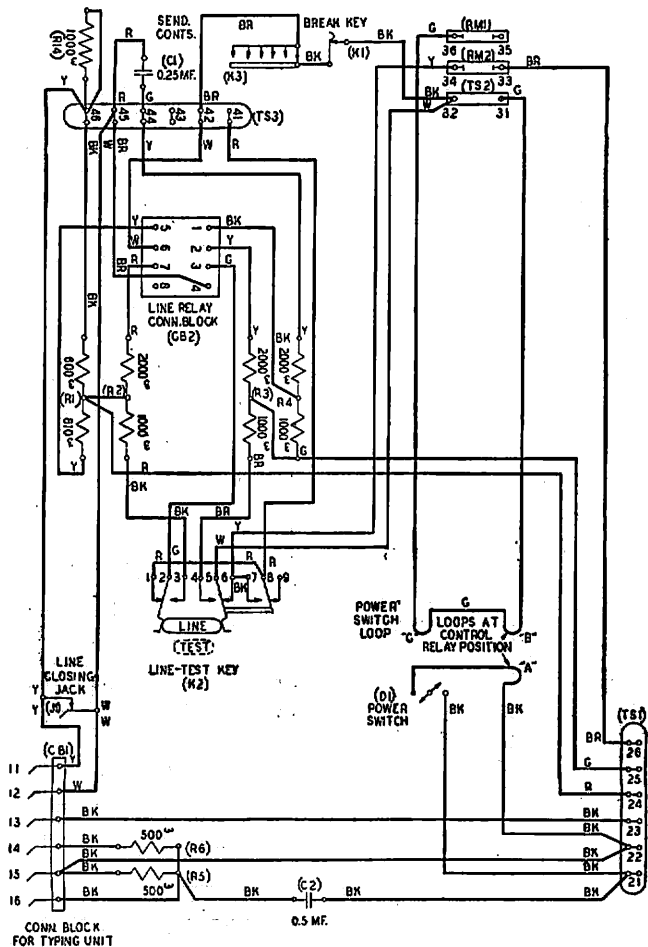


Fig. 35—Nos. 14-M, U, W, Y and AA Typing Reperforator Bases

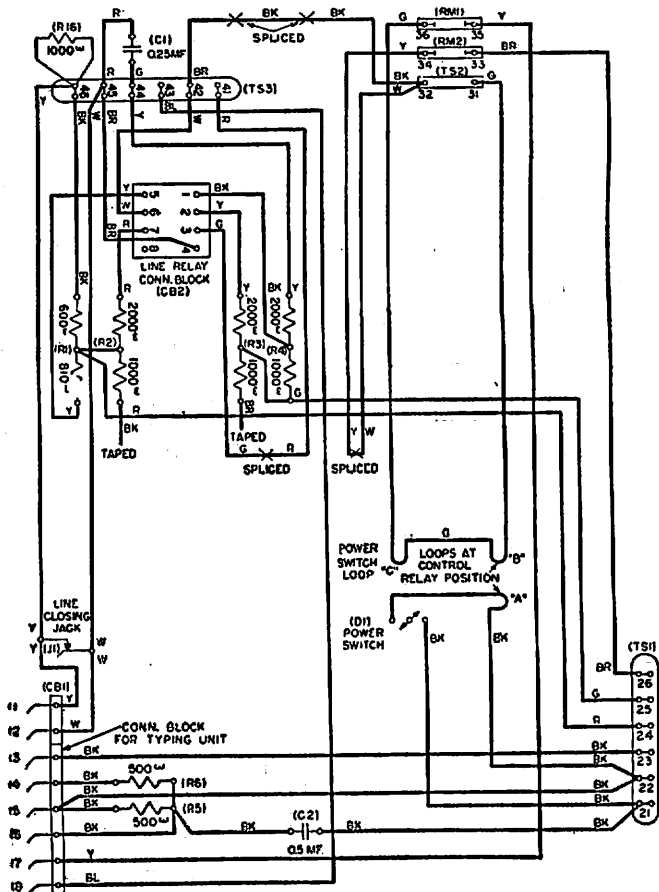


Fig. 36—No. 14-P Typing Reperforator Base

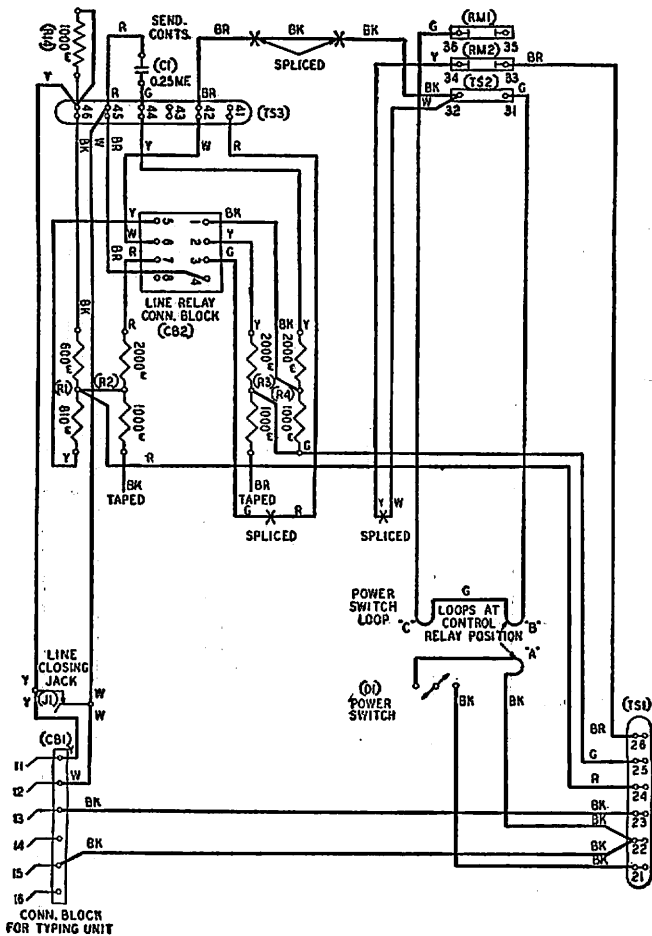


Fig. 37—No. 14-AB Typing Reperforator Base

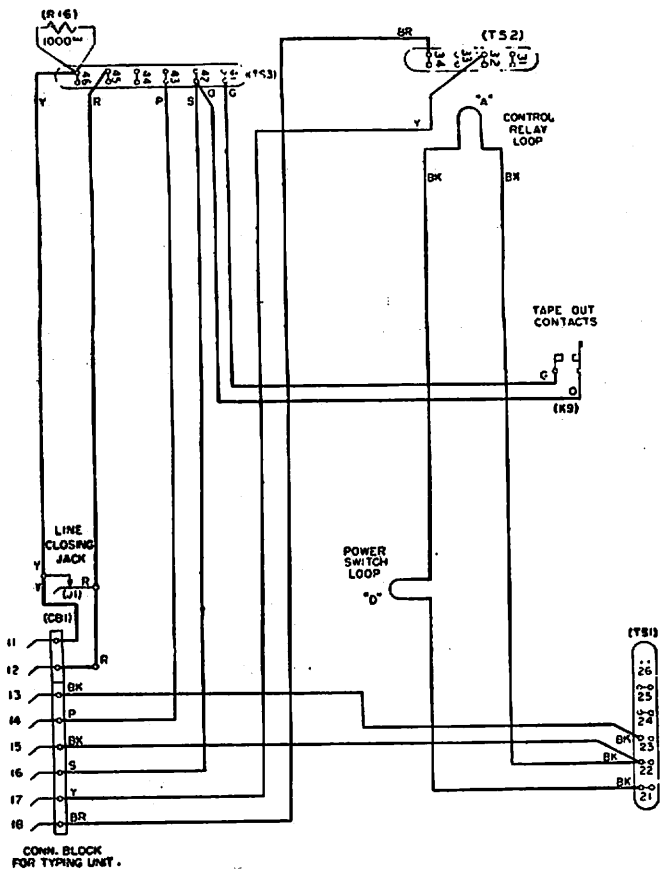
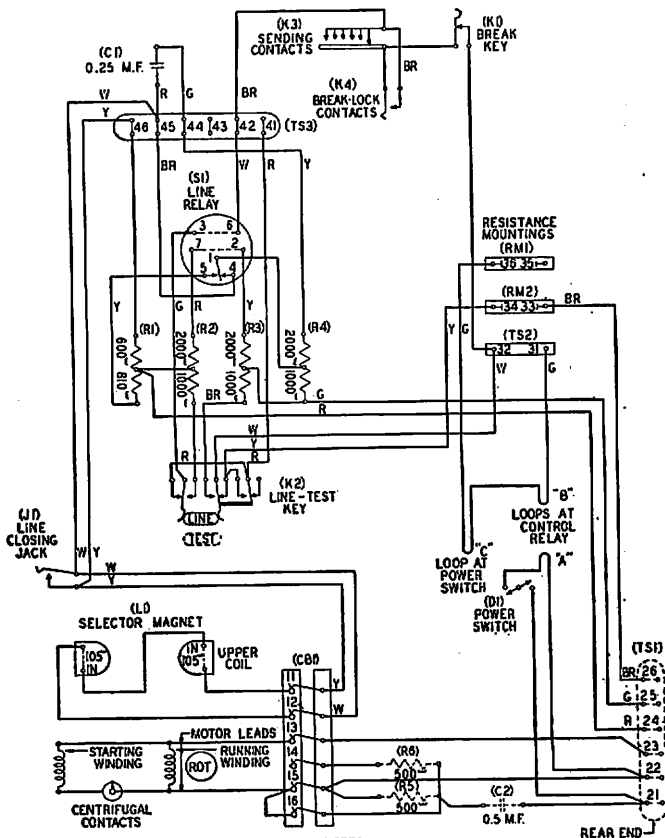


Fig. 38—Nos. 14-AD and 14-AE Typing Reperforator Bases

## 4. TYPICAL CIRCUITS



**NOTES:**

1. ALL WIRES ARE DELTABESTON NO.18 ART SILK COVERED EXCEPT MOTOR LEADS.
2. APPARATUS SHOWN DOTTED IS UNDERNEATH BASE.
3. ALL LEADS NOT OTHERWISE COLORED ARE BLACK

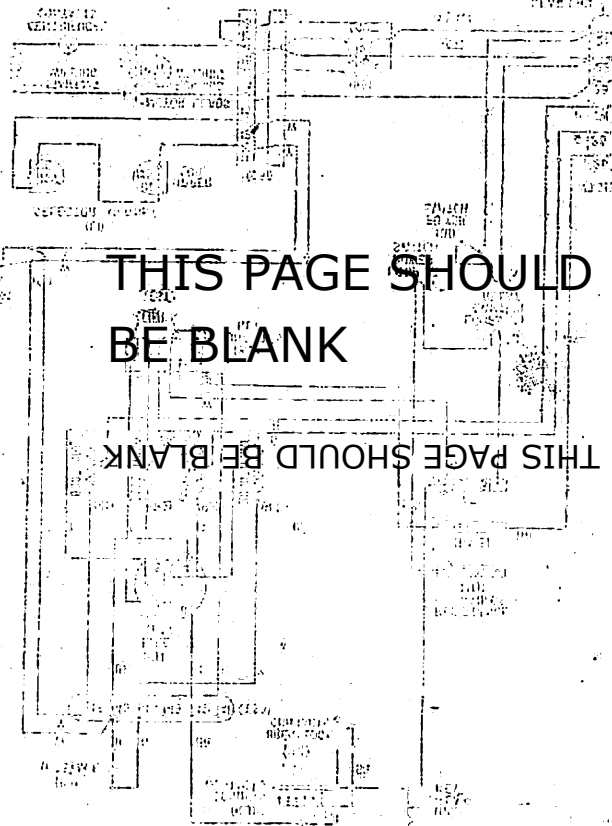
**Fig. 39—No. 14-Type Teletypewriter—Typical Circuit (14-A Typing Unit, 14-B Base)**

572304

UNITED STATES GOVERNMENT  
OFFICE OF THE SECRETARY OF DEFENSE  
WASHINGTON, D. C.

SECRET  
THIS IS A CONFIDENTIAL DOCUMENT

- 1. THE INFORMATION CONTAINED HEREIN IS UNCLASSIFIED
- EXCEPT WHERE SHOWN OTHERWISE
- DATE 11/19/01 BY 60322 UCBAW/SJS



THIS PAGE SHOULD  
BE BLANK

THIS PAGE SHOULD BE BLANK

SECRET

**BELL SYSTEM PRACTICES**  
Teletypewriter and Manual  
Telegraph Station and P.B.X.  
Installation and Maintenance

**SECTION P35.321**  
Issue 1, December, 1933  
Standard

## **WIRING DIAGRAM**

### **NO. 14 DD OR NO. 14 DF TELETYPEWRITER**

#### **1. GENERAL**

- 1.01 This section covers the wiring of the operators' teletypewriters used at TWX switchboards (No. 14 DD or No. 14 DF teletypewriter).
- 1.02 Figure 1 shows the wiring of these machines as they are received from the factory. Figure 1 is based on SD-63873-81, Issue 3-D.

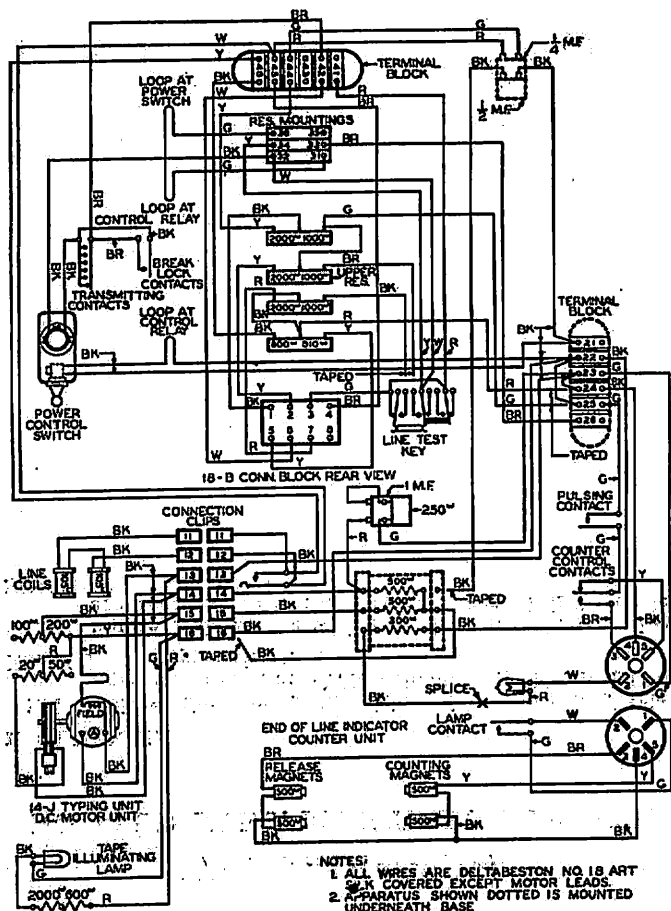


Figure 1

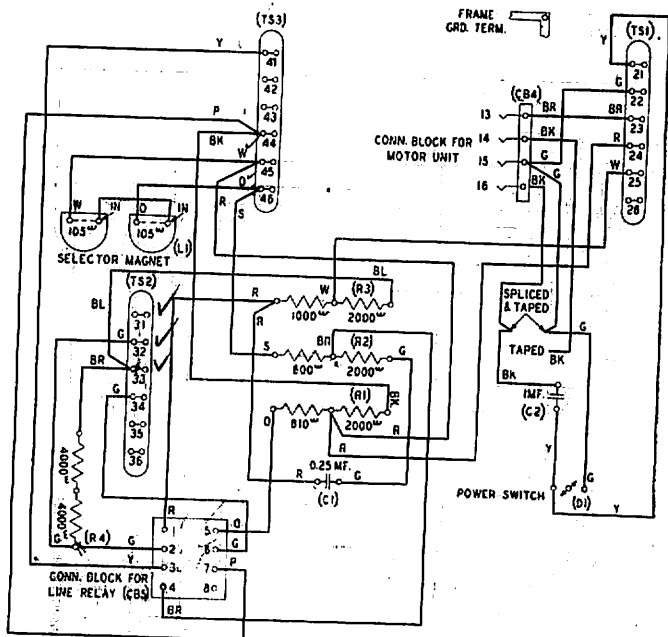
- NOTES:
1. ALL WIRES ARE DELTABESTON NO. 18 ART SW. K COVERED EXCEPT MOTOR LEADS.
  2. APPARATUS SHOWN DOTTED IS MOUNTED UNDERNEATH BASE



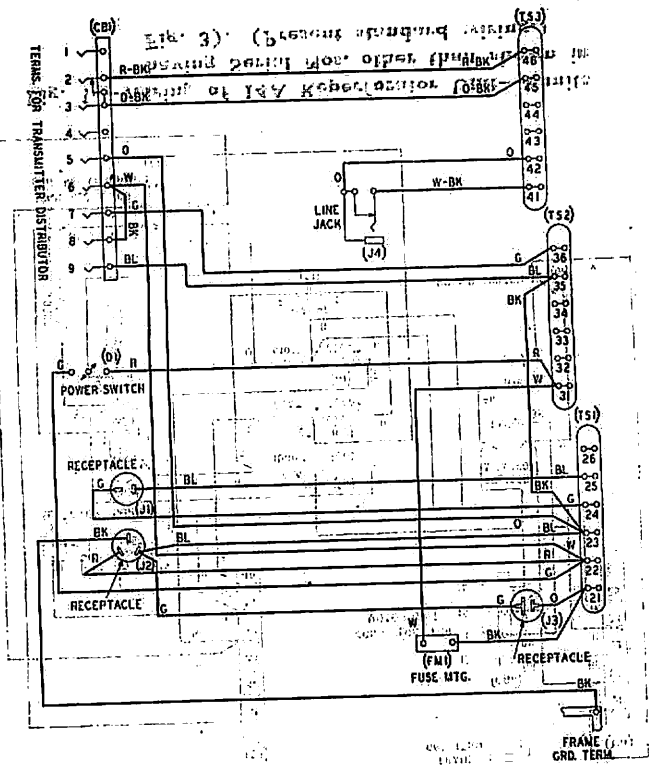
**BELL SYSTEM PRACTICES**  
Teletypewriter and Manual  
Telegraph Station and P.B.X.  
Installation and Maintenance

**SECTION P35.332**  
Issue 2, August, 1938  
AT&T Co. Standard

1.01 This section is reissued to include Figs. 3, 4 and 5.  
Figs. 1, 2 and 4 are based on ES-623851, Issue 1, and  
Figs. 3 and 5 are based on ES-625806, Issue 1.



**Fig. 1—Wiring of 14A Repeater Unit—(units having Serial Nos. other than shown in Fig. 3). (Present standard wiring.)**

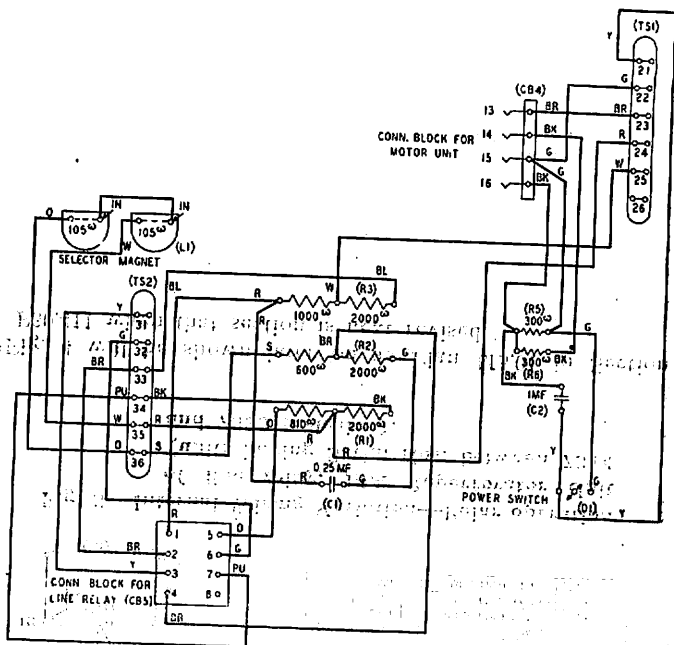


**Fig. 2—Wiring of 14A Reperforator Base Plate.**

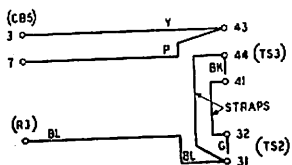
Fig. 2 and 3 are placed on E2-03220, Issue 1  
 Fig. 1, 3 and 4 are placed on E2-03221, Issue 1, and  
 Fig. 5 is placed on E2-03222, Issue 1.

NAVY DEPARTMENT  
 OFFICE DIRECTOR  
 WASHINGTON, D. C.

SECTION 332 333  
 1938

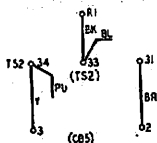


**Fig. 3—Wiring of 14A Reperforator—Units having Serial Numbers between 7314 and 7620 inclusive. (Wiring of earlier sets.)**



COLOR	FROM	TO	CHANGE
Y	3 (CB5)	41 (TS3)	MOVE FROM 41 TO 43
P	7 (CB5)	44 (TS3)	MOVE FROM 44 TO 43
BL	(R3)	33 (TS2)	MOVE FROM 33 TO 31
---	---	---	STRAP 41 (TS3) TO 32 (TS2)
---	---	---	STRAP 44 (TS3) TO 31 (TS2)

**\*Fig. 4—Internal Wiring Variation—Polar operation of line relay, 14A Reperforator Unit (units having Serial Nos. other than shown in Fig. 3).**



COLOR	FROM	TO	CHANGE
Y	3 (CB5)	31	MOVE FROM 31 TO 34 (TS2)
BK	(R1)	34	MOVE FROM 34 TO 33 (TS2)
BR	2 (CB5)	33	MOVE FROM 33 TO 31 (TS2)

**Fig. 5—Internal Wiring Variation—Polar operation of line relay, 14A Reperforator Unit (units having Serial Nos. between 7314 and 7620 inclusive).**

\*Fig. 4 will be shown later on as Plan M5.01 in Section P30.411 when that section is next revised.

**BELL SYSTEM PRACTICES**  
**Teletypewriter and Manual**  
**Telegraph Station and P.B.X.**  
**Installation and Maintenance**

**SECTION P35.331**  
**Issue 4, January, 1949**  
**AT&T Co Standard**

## **WIRING DIAGRAM**

### **14-TYPE TRANSMITTER-DISTRIBUTORS**

#### **1. GENERAL**

1.01 This section covers the wiring of No. 14-type transmitter-distributors. It is reissued to include Figs. 6, 7 and 8. Changes in text are indicated by an arrow.

1.02 The diagrams show the wiring of the machines as they are received from the factory. Figs. 1 to 5 are based on ESX-619352, Issue 7. Fig. 6 is based on ESR-631829, Issue 2. Figs. 7 and 8 are based upon BR-214638, Issue 1.

1.03 The wiring shown in Figs. 1, 2 and 3 for transmitter-distributors which are used at teletypewriter stations, covers the a-c clutch magnet which is adapted for use on either a-c or d-c power supply.

1.04 Figs. 4 and 5 cover the wiring of test message transmitter-distributors which are used in connection with central office apparatus.

1.05 Fig. 6 shows the type of transmitter-distributor which is used at the switching center of an 81-type system. Figs. 7 and 8 are types of transmitter-distributors which are used at an outlying station of an 81-type system.

1.06 Changes in the wiring of these units required to meet various operating features are shown in "M" plans in the section covering internal wiring variations in 14-type teletypewriter apparatus.

1.07 Some of the earlier sets were shipped with a strap across the 350-ohm portion of the resistor in series with the start magnet. This strap should be removed when the start magnet is operated on d-c power, otherwise, the 175-ohm resistor will severely overheat. The 350-ohm resistor should be strapped out when the a-c start magnet is operated on a-c power.

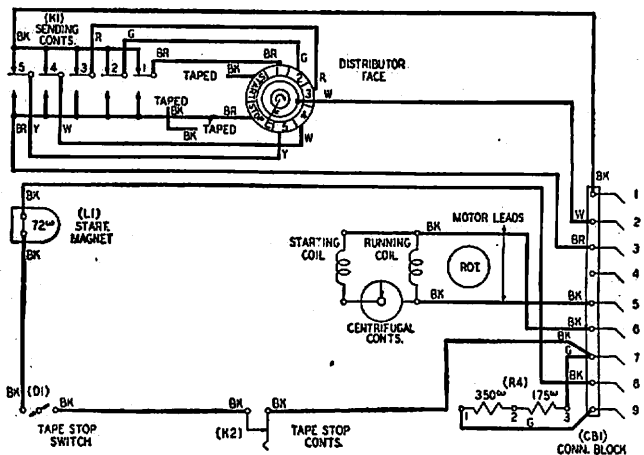


Fig. 1—No. 14-A, B, H, J, Y, AE and AU Transmitter-Distributors (Synchronous Motor)

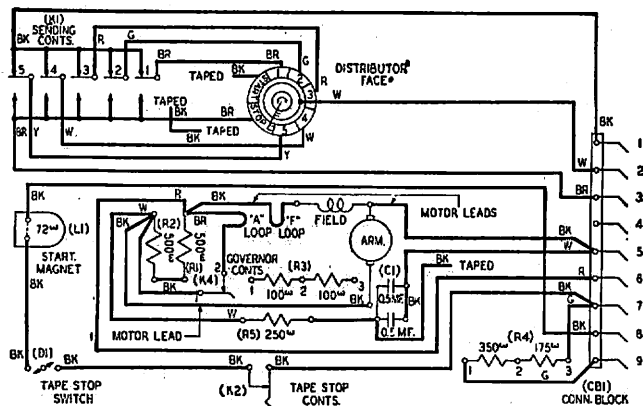
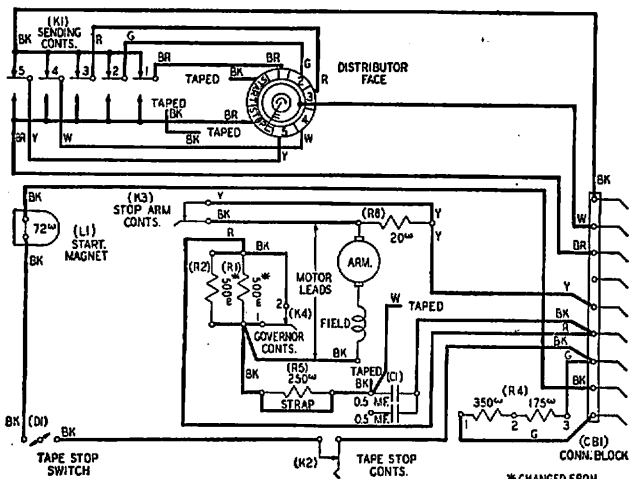
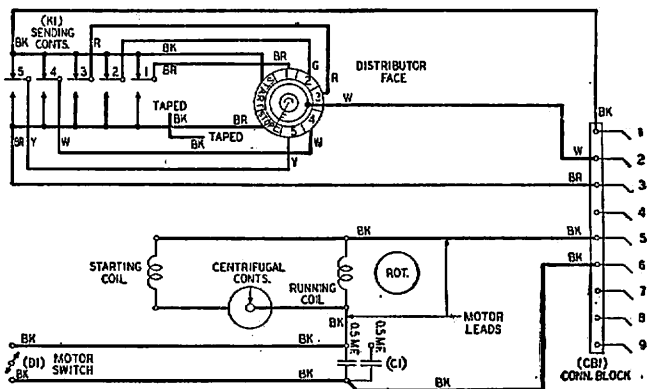


Fig. 2—No. 14-C, K and AF Transmitter-Distributors (D-C Shunt Motor)

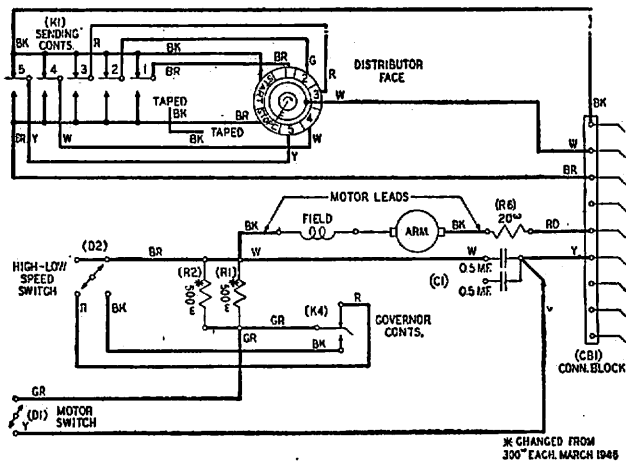


**Fig. 3—No. 14-D, L and BA Transmitter-Distributors (A-C Series Motor)**



**Fig. 4—No. 14-F, G, P and AW Transmitter-Distributors (Synchronous Motor)**

**Test Message Transmitter-Distributor for Central Office Use**



**Fig. 5—No. 14-M and AT Transmitter-Distributors  
(A-C Series Motor)  
Test Message Transmitter-Distributor for Central Office Use**



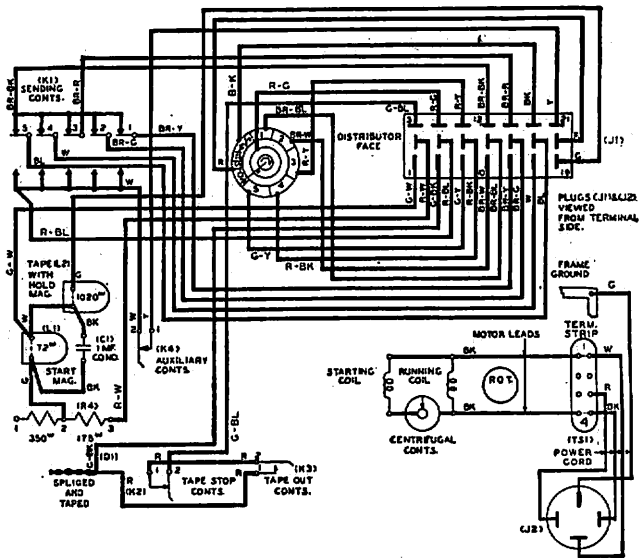


Fig. 6—No. 14-W, BB and BC Transmitter-Distributors

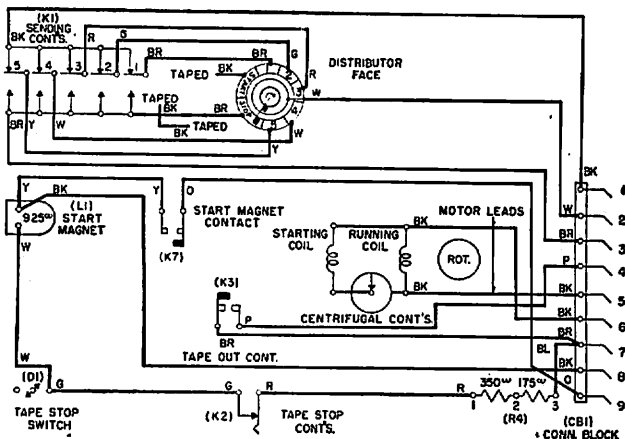


Fig. 7—No. 14 BD and BE Transmitter-Distributors (Synchronous Motor)

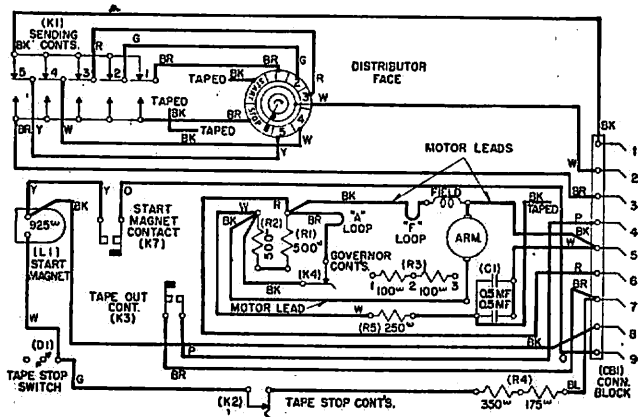


Fig. 8—No. 14 BF and BG Transmitter-Distributors (D-C Shunt Motor)

**BELL SYSTEM PRACTICES**  
**Teletypewriter and Manual Telegraph**  
**Station and P.B.X. Installation**  
**and Maintenance**

**SECTION P35.463**  
**Issue 2, June, 1944**  
**AT&T Co Standard**

# **INSTALLATION OF 87467M 14-TYPE MONITORING TELETYPEWRITER RELAY SWITCHING MECHANISM**

## **1. GENERAL**

1.01 This section covers the installation of the 87467M assembly which is used for switching the No. 14 Monitoring Teletypewriter from polar to neutral operation and for operation in either 60 milliamperere or 20 milliamperere loops.

1.02 The section is reissued to specify the use of a relay per D-94954 when the arrangement for 60-20 mil operation is used.

## **2. PROCEDURE**

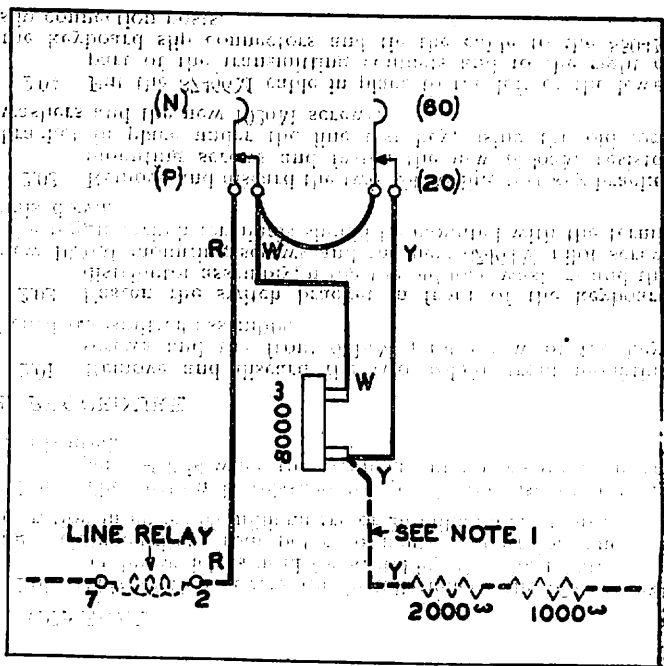
2.01 Remove and discard the two 6746M front mounting screws and the front 6814M pilot screw of the keyboard transmitter assembly.

2.02 Fasten the switch bracket in front of the keyboard distributor assembly, using the old lock washers and the new 1026M mounting screws and the new 87464M pilot screw. The toggle switch terminals should be mounted with the terminals down.

2.03 Remove and discard the two 6746M line test key bracket mounting screws and fasten the new 87465M resistor bracket in place under the line test key, using the old lock washers and the new 1026M screws.

2.04 Put the 87466M cable in place to the left of the lower part of the transmitting contacts and to the right of the keyboard slip connectors and tie the cable to the 8504M slip connection posts.

**2.05 Make wiring connections as shown on Fig. 1.**



**Fig. 1**

**Note 1—**Remove this wire from the No. 2 terminal of the line relay and connect to the 8,000-ohm resistance.

**Note 2—**New wiring and apparatus is shown in solid lines and old wiring and apparatus in dotted lines.

TELEPHONE WORKING  
INSTALLATION OF EXCHANGES  
SECTION 2.05

2.06 When only the polar-neutral switch is required omit Paragraph 2.03 and make wiring connections as shown on Fig. 2.

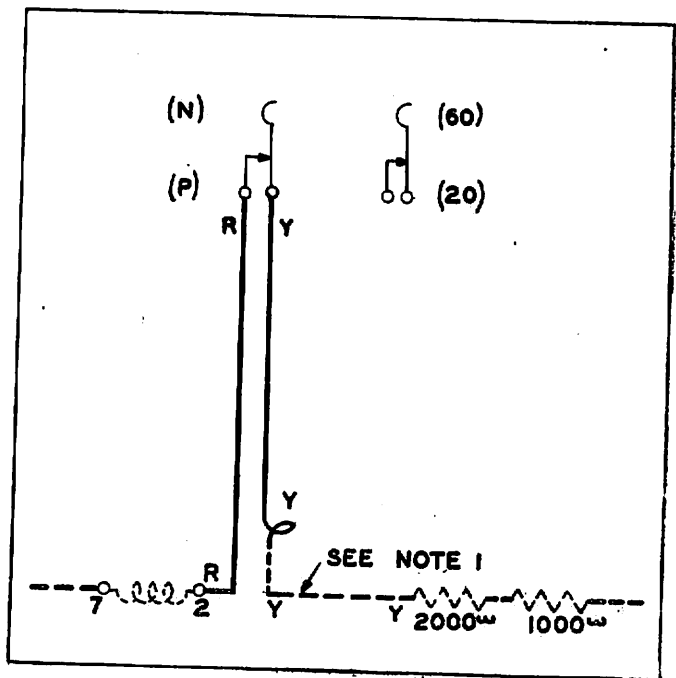


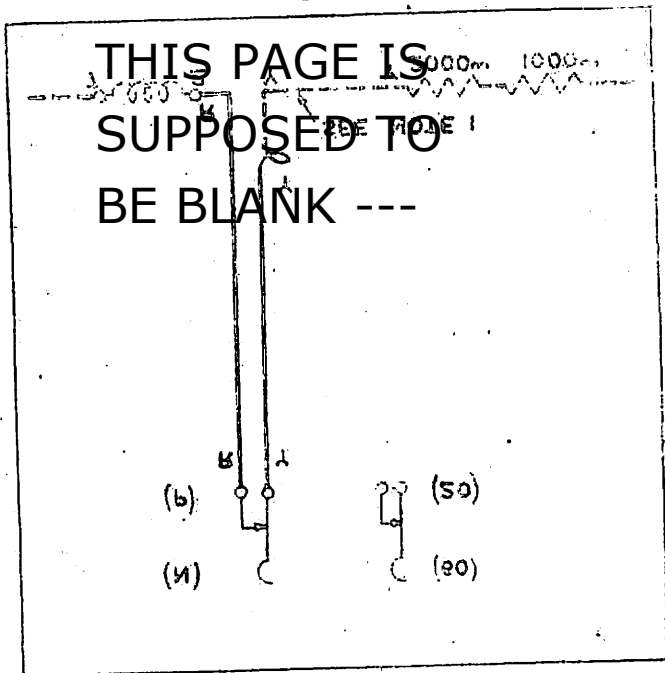
Fig. 2

Note 1—Remove this wire from the No. 2 terminal of the line relay and solder and tape to the yellow wire.

- 2.07 When only the 60-20 milliamperere switching arrangement is required use the wiring of Fig. 1 and add a short on the terminals of the polar-neutral switch.
- 2.08 When only the polar-neutral switch is required equip the teletypewriter with a 215A or a 255A relay.
- 2.09 When the 60-20 mil switch is used equip the teletypewriter with a relay per D-94954 (209 type relay with a special cover adapted to fit under the teletypewriter cover).

- 3:00 special cover applied to it under the relay cover (see Fig. 1).
- 3:00 When the relay has been installed (see Fig. 1) and the relay cover has been applied, the relay should be tested with a 220V AC source.
- 3:00 When only the bolt-neutral switch is required, the relay should be tested with a 220V AC source.
- 3:00 When only the bolt-neutral switch is required, the relay should be tested with a 220V AC source.
- 3:00 When only the bolt-neutral switch is required, the relay should be tested with a 220V AC source.

Fig. 2



on Fig. 2  
 3:00 When only the bolt-neutral switch is required, the relay should be tested with a 220V AC source.

**BELL SYSTEM PRACTICES**  
**Teletypewriter and Manual**  
**Telegraph Station and P.B.X.**  
**Installation and Maintenance**

**SECTION P35.476**  
**Issue 1, April, 1942**  
**AT&T Co. Standard**

**101389M AND 101481M SETS OF PARTS**  
**FOR HANDLING CHADLESS TAPE**  
**NO. 14 TRANSMITTER-DISTRIBUTOR**  
**INSTALLATION**

**1. GENERAL**

- 1.01 This section gives information for the installation of the 101389M and 101481M sets of parts on a 14 Type Transmitter-Distributor.
- 1.02 The 101389M set of parts equips the transmitter-distributor to handle chadless tape as well as fully perforated tape.
- 1.03 The 101481M set of parts provides for the closing of a contact when tape is inserted in the transmitter and which opens when the end of the tape passes through the transmitter. The 101481M set of parts can be installed only on transmitter-distributors equipped with the 101389M set of parts.

**2. PIECE PARTS**

- 2.02 The 101389M and 101481M sets of parts are composed of the following:

1 101389M Set of Parts

5 101715M Terminal (Assembly) each as follows:

1 101713M Terminal

1 101714M Spring

1 20-217A 24000

1 20-217A 24000

1 20-217A 24000

1 20-217A 24000

1 101703M Spring (Assembly) each as follows:

**INSTALLATION**  
**NO. 14 TRANSMITTER-**  
**DISTRIBUTOR**  
**101389M-101481M**

**1 101393M Tape Retaining Lid (Assembly) each as follows:**

- 1 99230M Lid Plate
- 1 35-137M Spring
- 1 36-51M Shaft
- 1 95954M Screw Plate
- 12 95953M Shims
- 1 300-322M Latch
- 1 1164M Screw
- 1 97445M Retainer Lid
- 1 300-320M Shaft
- 1 300-319M Lid Holder
- 2 36-153M Dowel
- 1 97468M Tape Guide Plate
- 1 101441M Cam
- 1 101439M Feed Lever Stop
- 1 2191M Lock Washer
- 1 3649M Washer

**101481M Set of Parts**

- 2 1168M Screw
- 2 3640M Lock Washer
- 2 103-27M Washer
- 1 97448M Contact Pin Guide
- 1 97447M Contact Pin
- 1 97467M Contact Spring (Assembly)
- 2 80342M Screw
- 2 2191M Lock Washer
- 1 97449M Cable

**3. INSTALLATION OF 101389M SET OF PARTS**

- 3.01 Remove and discard retaining lid assembly by removing the two 1159M screws which fasten the lid assembly to the top plate of the transmitter.
- 3.02 Replace the tape guide plate by the new 97468M tape guide plate which has a scribed line and a hole for the tape-out contact pin.
- 3.03 Install the new retaining lid assembly 101393M with the set of parts using the two screws removed in 3.01.



3.04 Remove the transmitter cover, the top plate assembly (held by four 1160M screws), the base plate, the left bracket, and the upper spacing contact assembly held by two 1303M screws.

3.05 Loosen the five spring anchor screws.

3.06 Unhook the 4708M feed lever spring from the spring anchor.

3.07 Remove the two 1169M screws which mount the bracket and remove the contact lever assembly by carefully raising the contact end while lowering the sensing pins out of the guide slots in the lever guide.

3.08 Remove the five contact tongues, keeping them in order so that they may be reassembled in their original relative positions.

Note: This operation is necessary to avoid injury to the insulation by heat in soldering.

3.09 Then proceed as follows:

(a) Unsolder the spring from the contact tongue and discard the spring and anchor assembly.

(b) Clamp edges of tongue, between jaws of a vise, if one is available, with the soldering lug projecting horizontally, free of the vise.

(c) Hook the free loop of the spring of the 101715M terminal assembly over the soldering lug of the tongue.

(d) Solder the new 101715M terminal assembly to the contact tongue, taking care to align the spring to be vertical, and at right angles to the soldering lug of the tongue and to have the curved portion of the anchor facing toward the contact end of the tongue. Apply heat sparingly to avoid annealing the spring. Apply solder sparingly so that no accumulation of it will interfere with the assembly of the pileup.

(e) Remount the five contact tongue assemblies.

3.10 Reassemble the contact lever assembly to the transmitter, carefully passing the tape pins under the lever guide, making sure that each lever is properly positioned in its guide slot. Also, each spring anchor should be inserted carefully behind its wire terminal and the contact end of the lever properly in line with its contact screw.

3.11 Remove the 33-158M screw that clamps the lever guide to the rear transmitter bracket. Mount the new 101439M feed lever up-stop bracket to the lever guide with the projecting

portion of the bracket at the top and toward the front, using the 35-158 screw just removed with a 200-2212M washer under the head of the screw.

- 3.12 Replace the 77074M cam with the new 101441M cam with the surface marked "X" facing downward.
- 3.13 Replace the upper spacing contact assembly, the left bracket, the base plate, the top plate assembly and the transmitter cover.
- 3.14 Check to see that the contacts on the tongues line up properly with the contact screws.

#### 4. INSTALLATION OF 101481M SET OF PARTS

- 4.01 Remove the snap panel, transmitter cover, and top plate assembly.
- 4.02 Holding the top plate assembly so that the bottom side is facing upward, remove and discard the two 1162M screws that clamp the front feed roll bearing. Mount the 97448M contact pin guide on top of the front feed roll bearing with the bent-over portion toward the feed wheel, using the two 1168M screws, 3640M lock washers and 103-27M washers.
- 4.03 Mount the 97467M contact spring assembly with the springs extending horizontally toward the rear to the 77004M bracket, using the two tapped holes at the front of the casting and clamping it in place with the two 80342M screws and 2191M lock washers.
- 4.04 Reinstall the top plate assembly after inserting the 97447M contact pin in its guide with the large end down, holding the pin in place until it rests on the insulator of the contact spring.
- 4.05 Solder the two leads at one end of the 97449M cable to the soldering lugs of the tape-out contact springs, the red lead to the upper spring, the white to the lower.
- 4.06 Run the 97449M cable along the existing cable from the tape stop switch to the slip connector terminal block, tying where necessary.
- 4.07 Connect the two leads at the other end of the 97449M cable to terminals at the slip connector terminal to provide the type of service desired. Where the tape-out contacts are used to stop the transmitter, connect the leads as follows:
  - (a) Transfer the black lead from slip connector Terminal 8 to Terminal 4.
  - (b) Connect the white lead of the 97449M cable to slip connector Terminal 8 and the red lead to Terminal 4.

4.08 Where spark protection is required, for example, when the tape-out contacts are used to stop the transmitter, install an 82378M set of parts normally used for d-c governor spark protection (not furnished with the 101481M set of parts). Where a synchronous motor is used mount the 82378M set of parts to the left of the motor unit, using the two tapped holes provided in the base casting. (Where a series a-c or d-c motor is used some other location for the 82378M set of parts will have to be used.) Connect the two outside terminals of the 82391M condenser (1 mf) to the two terminals of the start magnet using No. 18 or No. 20 Deltabeston wire, taking care to run the wire so as not to interfere with any moving parts.

4.09 Replace the transmitter cover and the snap panel.

## 5. ADJUSTMENTS

5.01 The adjustments for a transmitter-distributor equipped with the 101389M and 101481M sets of parts are covered in the section on requirements and procedures for the 14 Type Transmitter-Distributor.

408 Where spark protection is required, for example, when the tap-out contacts are used to stop the transmitter, install an 825221 set of parts normally used for 4-b-c governor spark protection (and furnished with the 101421 set of parts). Where a synchronous motor is used, install the 825222 set of parts to the left of the motor unit using the two tap-out holes provided in the base casting. (If there is a series set on the motor is used some other location for the 825222 set of parts will have to be used.) Connect the two outside terminals of the 825221 condenser (1 and 2) to the two terminals of the spark magnet using No. 18 or No. 20 Teflon-coated wire, taking care to run the wire so as not to interfere with any moving parts.

409 Replace the transmitter cover and the snap panel.

**ADJUSTMENTS**

501 The adjustments for a transmitter-distributor equipped with the 101421 and 101422 sets of parts are covered in the section on receiver and transmitter adjustments. Transmitter-distributor

**THIS PAGE SUPPOSED TO BE BLANK**

**BELL SYSTEM PRACTICES** SECTION P35.544  
**Teletypewriter and Manual** Issue 1, August, 1948  
**Telegraph Station and PBX** AT&T Co Standard  
**Installation and Maintenance**

**NO. 14 REPERFORATOR-TRANSMITTER  
MAINTENANCE INSPECTION AND TESTS**

**1. GENERAL**

1.01 This section specifies the procedures for carrying out the field maintenance of the No. 14 Reperforator-Transmitter.

1.02 The apparatus requirements and adjusting procedures for any particular item which may require adjusting either on a routine inspection or a trouble visit will be found in the section on "Requirements and Procedures," P35.633.

1.03 Studies consistently show that a high percentage of troubles occur shortly after a routine inspection. Some appear to be due to the methods of carrying out the maintenance work. These instructions have been prepared with the view of avoiding such troubles and it is important that the practices be carefully followed.

1.04 The frequency of routine inspections can best be determined locally. Factors to be considered include daily service hours, speed of service and other local conditions. In general the inspection interval should be the maximum consistent with adequate lubrication.

1.05 The periodic cleaning, lubrication and inspection should be carried out in the order shown. The work should be confined to the items specified except for the correction of any conditions obviously requiring attention. Some items do not require special attention on each routine inspection and are, therefore, not mentioned in this section.

1.06 The materials for carrying out the cleaning work are specified in the section on "Cleaning-General Requirements," P30.010, and the lubricants referred to are those specified in the section on "Lubrication-General Requirements," P30.011.

**2. ROUTINE MAINTENANCE PROCEDURES**

2.01 All work shall be done safely. Do not scatter tools or equipment so as to constitute a hazard. Special attention shall be given to avoiding damage to the customer's property.

**(A) Preparation for Routine**

2.02 Obtain release of equipment as follows:

(a) **Where Spare Units Are Not Provided**, obtain the local customer's permission to routine the apparatus, and wait until any accumulated tape has cleared before removing the unit from service. Advise the testroom that a routine inspection is being made and indicate the length of time the customer will be out of service. If unexpected delay is later encountered advise the testroom.

(b) **Where Spare Units Are Provided**, wait until any accumulated tape has cleared before removing the unit from service.

2.03 While waiting observe operation for any abnormal conditions which should be investigated during the routine.

2.04 Upon release of the machine remove it from service and proceed in accordance with the following:

- (a) Disconnect the source of power.
- (b) Remove the unit from the machine cabinet (or remove the cover), exercising care to avoid damaging parts in close proximity.
- (c) Remove ribbon.
- (d) Remove ribbon guide.
- (e) Remove code punch block.
- (f) Remove cover from sensing contacts.
- (g) Remove and empty the chad box.
- (h) Remove the base plate.

Note: After removing the base plate the mounting screws should be tightened to avoid scratching the top of the work table.

**(B) Cleaning**

2.05 During the inspection observe the condition of the machine but avoid unnecessary dismantling or disturbance of adjustments. In so far as possible operating tests should be used to determine the condition of the machine.

**Caution: When it is necessary to make any adjustment, all adjustments that might be affected shall be checked and, if necessary, corrected in order to minimize the possibility of subsequent trouble.**

- (a) Bent, loose or missing parts, elongated springs and parts out of place or obviously out of adjustment should be investigated and corrective action taken, if necessary.

(b) Worn parts which in the opinion of the repairman will cause trouble before the next scheduled inspection should be replaced. Red or rust colored deposits indicate wear due to lack of lubrication. If on investigation it appears that the parts are not worn sufficiently to require replacement, special care should be taken in lubricating to see that the lubricant reaches the bearing surfaces.

2.06 Cleaning of items other than those listed should not be done unless it appears that whatever dirt may be present is likely to cause trouble by working into bearing surfaces or onto contacts before the next scheduled inspection. The following items should be cleaned during each routine inspection:

- (a) The code punch block, giving special attention to the removal of dirt and paper dust packed around the feed roll and puncher.
- (b) Clean the type.
- (c) With a dry cloth, clean around the base and the code punch unit.

### (C) Lubrication and Inspection

2.07 After all cleaning has been completed, lubricate the machine in the order given. Apply an amount of lubricant **just sufficient for the purpose** so that it will not be necessary to wipe off any excess oil or grease, as this tends to work dirt and grit into the bearing surfaces. Lubricant should not be added to points which are already adequately lubricated.

2.08 Unless otherwise specified, one or two drops of oil at each place indicated will be sufficient. Use oil for all lubrication except where the use of grease or oil-grease-oil is specified.

2.09 A small stiff brush similar to those used to spread mucilage should be used to apply the grease in a thin film at all places requiring grease.

2.10 Oil-grease-oil, when specified, shall be applied as three separate treatments in that order. Neither a lighter grease nor a pre-mixed combination of oil and grease is a satisfactory substitute for oil-grease-oil which takes full advantage of the characteristics of the specified lubricants. The oil furnishes the desired lubrication but the duration of its retention would be limited. The grease serves to hold the oil on the surfaces where it is needed and to replenish the supply as it is dissipated.

2.11 New felt washers and wicks, before being used, should be thoroughly saturated with oil and kneaded by hand. Before assembling wicks excess oil should be removed by

squeezing by hand. Care should be exercised to avoid getting dirt or metal chips on the felt washers.

2.12 Oil both loops of all helical springs that exert a nominal tension of less than 2-1/2 lbs.

2.13 Apply grease to both loops of all helical springs that exert a nominal tension of 2-1/2 lbs. or more.

2.14 Selector Mechanism:

(a) Stop lever—bearing and point of contact with stop arm.

(b) Trip latch—bearing and point of contact.

(c) Bell crank—bearing.

(d) Trip latch plunger—bearing and 2 points of contact.

(e) Armature lever—2 pivot screws.

(f) Selector Arm—2 pivot screws, 2 sword contact points, locking tip, and point of contact with operating screw.

(g) Selector arm detent—bearing and point of contact with selector arm.

(h) Selector levers—at bearing post and at sword pivots—apply between separator plates.

(i) Selector "T" levers—at bearing post and at points of contact with swords and code bars.

(j) Selector Arm locking lever—at pivot. (Check locking lever—locking wedge for adequate minimum clearance.)

(k) Tape feed out lever—4 bearings and point of contact with trip latch plunger.

2.15 Main Shaft.

(a) Remove the range scale rear mounting screw and swing scale to expose top of main shaft. Fill shaft through hole in center of retaining disc. Replace range scale and its rear mounting screw. (Check armature trip-off screw adjustment.)

(b) Locking lever cam felt oiler—saturate.

(c) Selector cam peaks—one drop on each peak.

(d) Selector cam friction washers—saturate by separating the friction discs with a screwdriver and applying oil at several points around the washers.

(e) Main Cam friction washer—saturate.

(f) Main clutch bushing felt wicks—oil through two oil holes on bushing below punch cam.

(g) Main-shaft ball bearings (2)—oil top bearing—grease bottom bearing.

(h) Clutch throwout lever—2 bearings.



- (i) Clutch—oil freely, also cam on driven clutch at point of contact with throwout lever.
- (j) Compression springs (3)—flow oil into prongs under springs.
- (k) Main shaft gear—grease.
- (l) Subshaft drive gear—grease.
- (m) Motor pinion—grease.
- (n) Main bail cam—grease.
- (o) Punch-arm cam—grease.

#### 2.16 Main Bail.

- (a) Main Bail roller—oil-grease-oil.
- (b) Main Bail plunger—fill oil cup and saturate oil wick.
- (c) Main Bail lever—fill oil cup just above terminal block, also oil end of lever in main bail plunger.
- (d) Main Bail—fill groove with oil.
- (e) Main Bail roller guides (2) and main bail guide rollers (2) oil-grease-oil.
- (f) Main Bail adjusting screw—grease end of screw.
- (g) Main Bail spring anchor—grease.
- (h) Main Bail lever spring post felt washers—saturate.

#### 2.17 Pull Bars, Type Bars, and Code Bars.

- (a) Pull bars—one drop of oil on top of each bar.
- (b) Type bar gears—pull each type bar down against platen, and put one drop of oil on top of type bar gear at rear of segment slot.
- (c) Code bar locking lever—grease lever at point of contact with main bail.
- (d) Code bars—slots and posts, one drop to each code bar.

#### 2.18 Ribbon Mechanism.

- (a) Ribbon feed ratchet and feed gears—oil teeth.
- (b) Ribbon feed shaft detent plunger.
- (c) Ribbon feed shaft—2 oil holes.
- (d) Ribbon feed lever—oil hole.
- (e) Ribbon feed lever roller—bearing.
- (f) Ribbon spool shaft (right)—2 bearings.
- (g) Ribbon spool shaft (left)—4 bearings, oil teeth on gears (3).
- (h) Ribbon reverse pawls and links—4 bearings on each side.

(i) Ribbon reverse shafts—2 bearings each.

(j) Ribbon feed shaft detent—grease.

#### 2.19 Platen Shift Mechanism.

(a) Platen shafts (2)—thin film of oil. (Check platen for wear and replace if necessary.)

(b) Shift lever—bearings (2), and point of contact with pull bar and platen frame.

(c) Shift latch—bearing and points of contact with pull bars and shift bail.

(d) Shift bail—bearing, and at platen frame extension.

(e) Shift bail stop screw—grease.

(f) Intermediate ball-bearing, grease at points of contact with shift bail and plunger extension bracket.

#### 2.20 Prepunch Mechanism.

(a) Prepunch arm—bearings (2).

(b) Feed roll—bearings (2) and feed notches.

(c) Feed pawl—bearing.

(d) Prepunch operating ball-bearings (2), grease at eccentric and extension.

(e) Star wheel—grease.

(f) Feed roll detent—bearing and roller.

(g) Feed hole punch—also at point of contact with prepunch arm.

#### 2.21 Reperforating Mechanism.

(a) Punch arm casting roller—oil-grease-oil.

(b) Punch arm casting bearing—fill oil cup.

(c) Punch arm extension—bearing, also at adjusting screw extension.

(d) Code bar bell cranks—at pivot post, drop of oil between separator plates, point of contact at vertical links, and code bar locking lever.

(e) Vertical links—at pivot, and comb.

(f) Vertical link bell cranks—at pivot and point of contact with vertical link, and selector finger bell cranks.

(g) Selector finger bell crank—2 places each.

(h) Selector fingers—guide comb and point of contact with code punches.

(i) Punch bail pivot screws—2 bearings.

(j) Feed pawl bearing.

(k) Feed roll—2 bearings.

- (l) Feed roll detent wheel—grease.
- (m) Feed roll detent—bearing and roller.
- (n) Code punches.
- (o) Code punch retracting bail—bearings (2), and points of contact with code punches.
- (p) Code punch retaining levers—at pivot and point of contact with code punches.
- (q) Tape depressing bail—2 bearings.

#### 2.22 Pivoted Transmitter and Transfer Mechanism.

- (a) Transmitter lid—2 bearings.
- (b) Sensing fingers—bearings, and point of contact with guide plate.
- (c) Transmitter yoke—2 bearings.
- (d) Tape feed lever—2 bearings.
- (e) Tape feed pin lever bearing.
- (f) Feed pin oscillator—bearing and points of contact with feed pin lever and guide.
- (g) Feed pin oscillator lever—bearing and guide comb.
- (h) Selector levers—bearing, and at guide comb 2 places.
- (i) Contact lever—bearing.
- (j) Transmitter stop contact operating plunger.

#### 2.23 Transfer and Slide Lever Mechanism.

- (a) T levers—bearings, and at points of contact with selector levers and transfer slide levers.
- (b) T lever operating bail—2 bearings.
- (c) Transfer slide levers—2 bearings each.
- (d) Contact operating levers—bearings, and grease at point of contact with transfer slide levers.

#### 2.24 Sensing Shaft.

- (a) Sensing shaft bearings—ball bearing in front, fill oil cup in rear.
- (b) Sensing shaft—remove thumb screw from front end of shaft and fill shaft with oil.
- (c) Sensing shaft gear—grease.
- (d) Clutch assembly—oil freely.
- (e) Detent lever—bearing and roller.
- (f) Oscillator lever roller.
- (g) T lever operating bail roller.
- (h) Clutch lever—2 bearings.
- (i) Thin film of grease on bearing surface of all cams.

## 2.25 Distributor shaft.

- (a) Distributor shaft bearings—ball bearings in front, fill oil cup in rear.

Note: Oil cup should be set at a 45 degree angle with open end toward front.

- (b) Distributor shaft—remove thumb screw from front end of shaft and fill shaft with oil.

- (c) Distributor shaft gear—grease.

- (d) Clutch assembly—oil freely.

- (e) Detent lever—bearing and roller.

- (f) Clutch contact operating levers—at bearing and thin film of grease at point of contact with contact insulator.

- (g) Clutch lever—2 bearings.

- (h) Distributing contact levers—bearing, grease point of contact with cams, thin film of grease on point of contact with contact insulator.

- (i) Thin film of grease on bearing surface of all cams.

Note: Remove all oil and grease from distributor contacts and excess oil from associated parts.

## 2.26 Subshaft.

- (a) Subshaft gears—(2) grease.

- (b) Subshaft bearings—(2) fill oil cups.

- (c) Universal contact operating lever—at bearing and apply a thin film of grease to camming surface on main bail plunger.

## 2.27 Contact Insulators.

- (a) Apply a thin film of grease on the insulators of the following contacts at point of contact with their operating levers.

1. Universal contact.

2. Transmitter stop contact.

3. Tape-out contact.

4. Distributing shaft clutch magnet contact.

5. Clutch magnet auxiliary contact.

6. Switching contacts.

7. Tape feed indicator contact arm—bearing points.

## 2.28 Lubricate the motor at yearly intervals and tag the motor to indicate the date of lubrication.

**Caution: Experience indicates that far more trouble has been caused by excessive lubrication of motor bearings than by under lubrication. Therefore, care should be taken that the bearings are not over lubricated.**

(a) To lubricate a motor bearing, press the KS-8319 (or the KS-7461 modified for short stroke) grease gun against the ball oiler and force grease into the oiler by pushing on the plunger of the gun. One stroke of the plunger will deliver sufficient grease (a 1/2-inch strip) to keep the bearing adequately lubricated for a period of from six months to one year depending on local conditions.

2.29 After the lubrication has been completed carefully clean the selecting, sensing and distributor magnet pole faces and their associated armatures with a strip of KS Bond paper or other hard surfaced paper to remove any dirt or lubricant that may be present.

2.30 Check all contacts and clean if necessary.

2.31 Replace the following parts which previously had been removed.

- (a) Sensing contact cover.
- (b) Code punch block.
- (c) Ribbon and ribbon guide.
- (d) Base plate and chad box.

2.32 Connect power to the unit and after it has run at least 10 minutes check the tensions of the main and selector clutches.

#### (D) Tests

2.33 Make tests in accordance with either of the following, as applicable:

- (a) At 81 type switching centers the reperforator-transmitter tests covered in Section P31.155.
- (b) For units not associated with 81 type switching centers the tests covered in Section P31.156, except that the round robin test should be made only when a need is indicated.

2.34 During the course of the testing, observe the unit for:

- (a) Satisfactory type alignment and legibility of copy.
- (b) Normal operation of all mechanical functions.

2.35 Return the machine to its service position, reconnect and advise the attendant that the machine is again ready for service or, if out of hours, place the machine in normal condition for the usual start of service. If service has been interrupted for the inspection period or the inspection has been completed out of hours, advise the testroom that the machine is again ready for service.

(a) To lubricate a motor bearing, press the KS-2310 (or the KS-2301 modified for short stroke) grease gun against the ball roller and force grease into the oiler by pushing on the plunger of the gun. One stroke of the plunger will deliver sufficient grease (a 1/2-inch strip) to keep the bearing adequately lubricated for a period of from six months to one year depending on local conditions.

2.29 After the lubrication has been completed carefully clean the selector, sensing and distributor magnet pole faces and their associated armatures with a strip of KS Bond paper or other hard surfaced paper to remove any dirt or lubricant that may be present.

2.30 Check all contacts and clean if necessary.

2.31 Replace the following parts which previously had been removed:

- (a) Sensing contact cover.
- (b) Code punch block.
- (c) Ribbon and ribbon guide.
- (d) Base plate and end box.

2.32 Connect power to the unit and selector. 10 minutes check the tensions of the main and selector

clutches.

## SUPPOSED TO

(D) Tests

2.33 Make tests in accordance with either of the following as applicable:

- (a) A1 type switching centers for transmitter-transmitter tests covered in Section P31.15.
- (b) For units not associated with A1 type switching centers the tests covered in Section P31.15, except that the round robin test should be made only when a need is indicated.

2.34 During the course of the testing, observe the unit for:

- (a) Satisfactory type alignment and legibility of copy.
- (b) Normal operation of all mechanical functions.

2.35 Return the machine to its service position, reconnected and advise the attendant that the machine is again ready for service or, if out of hours, place the machine in normal condition for the usual start of service. If service has been interrupted for the inspection period or the inspection has been completed out of hours, advise the attendant that the machine is again ready for service.

**BELL SYSTEM PRACTICES**  
**Teletypewriter Stations**

**SECTION P35.550**  
**Issue 1, May, 1952**  
**AT&T Co Standard**

*old*

## **114-TYPE**

# **REPERFORATOR-TRANSMITTER**

## **MAINTENANCE INSPECTION AND TESTS**

### **1. GENERAL**

1.01 This section specifies the procedure for the maintenance of 114-type reperforator-transmitters at a customer's office where complete facilities for routing and testing are not available.

In those installations in which the test-bench facilities are available, it is recommended that these procedures be followed and that check tests similar to those in P35.544 be made after routing.

1.02 The apparatus requirements and adjusting procedures for any particular item which may require adjusting either on a routine inspection or a trouble visit will be found in the section on "Requirements and Procedures", P35.635.

1.03 Studies consistently show that a high percentage of troubles occur shortly after a routine inspection. Some appear to be due to the methods of carrying out the maintenance work. These instructions have been prepared to avoid such troubles and it is important that they be carefully followed.

1.04 The frequency of routine inspections can best be determined locally. Factors to be considered include daily service hours, speed of service and other local conditions. In general, the inspection interval should be the maximum consistent with adequate lubrication.

1.05 The periodic cleaning, lubrication and inspection should be carried out in the order shown. The work should be confined to the items specified except for the correction of any conditions obviously requiring attention. Items which it is felt do not require special attention at each routine are not specified in this section. Also, local experience may indicate the desirability of other changes in the list of items to be checked.

1.06 The materials for carrying out the cleaning and routineing are specified in Section P30.010 "Cleaning, General Requirements" and Section P30.301 "Teletypewriter Tools and Maintenance Supplies", with the following exceptions:

(a) For cleaning of contacts, the use of a 374A tool and KS-6528 linen tape may be found to be desirable.

1.07 The lubricants referred to are those specified in Section P30.011 "Lubrication—General Requirements".

## 2. ROUTINE MAINTENANCE PROCEDURES

2.01 Do all work safely. Do not scatter tools or equipment so as to constitute a hazard. Give special attention to avoiding damage to the customer's property.

### (A) Preparation for Routine

2.02 Obtain release of equipment as follows:

(a) Where spare units are not provided, obtain the local customer's permission to routine the apparatus, and wait until any accumulated tape has cleared before removing the unit from service. Advise the test room that a routine inspection is being made and indicate the length of time the customer will be out of service. If unexpected delay is later encountered advise the test room.

(b) Where spare units are provided, wait until any accumulated tape has cleared before removing the unit from service.

2.03 While waiting, observe operation for any abnormal conditions which should be investigated during the routine. Check the tape produced by the unit for clean punching.

2.04 Upon release of unit proceed as follows:

(a) Remove and empty the chad box drawers.

(b) Disconnect the cable from the unit.

(c) Remove the unit from the machine cabinet, exercising care to avoid damaging parts in close proximity to cabinet surfaces, and mount unit on front of base structure, top side up.

(d) Wipe out the cabinet surface to remove oil and dirt.

### (B) Routine

2.05 To permit a minimum of handling or shifting of the unit during routine, it is recommended that the cleaning and lubrication be performed on a mechanism by mechanism basis rather than first cleaning the entire unit, then relubricating the entire unit.



2.06 During the inspection observe the condition of the machine but avoid unnecessary dismantling or disturbance of adjustments. In so far as possible operating tests should be used to determine the condition of the machine.

**Caution:** When it is necessary to make any adjustment, all adjustments that might be affected should be checked and, if necessary, corrected in order to minimize the possibility of subsequent trouble.

- (a) Bent, loose or missing parts, binds in parts, elongated springs and parts out of place or obviously out of adjustment should be investigated and corrective action taken, if required. Check all terminal wires of cables for loose connections or broken wires.
  - (b) Worn parts which experience indicates may cause trouble before the next scheduled inspection should be replaced. Red or rust-colored deposits indicate wear due to lack of lubrication. If on investigation it appears that the parts are not worn sufficiently to require replacement, special care should be taken in lubricating to see that the lubricant reaches the bearing surfaces.
- 2.07 The procedure suggested for cleaning of contacts throughout the unit is as follows:
- (a) Place a piece of lintless cloth such as KS-2423 twill cloth or KS-6528 linen tape over a burnisher such as a 374A tool.
  - (b) Moisten the cloth with KS-8372 trichloroethylene and pass the cloth back and forth between the contacts.
  - (c) Repeat the operation using a dry cloth.
  - (d) Burnish the contacts.

2.08 Cleaning of items other than those listed should not be done unless it appears that dirt which may be present is likely to cause trouble by working into bearing surfaces or being deposited on contacts before the next scheduled inspection.

Before the start of detailed cleaning, loose deposits of dirt or tape lint should be carefully brushed off the mechanisms and surfaces of the unit.

2.09 IN THE FOLLOWING WHERE LUBRICATION IS SPECIFIED, OIL OR GREASE SHOULD BE APPLIED ONLY IF THE PART IN QUESTION DOES NOT HAVE SUFFICIENT LUBRICATION TO CARRY OVER TO THE NEXT REGULAR INSPECTION PERIOD. WHERE LUBRICATION IS REQUIRED, LUBRICANTS SHOULD BE APPLIED SPARINGLY UNLESS OTHER-

114-TYPE  
REPERFORATOR-  
TRANSMITTER  
MAINTENANCE INSP-  
TION AND TESTS

WISE, SPECIFIED. Excess lubricant may affect operation of contacts or other parts not requiring lubrication, thereby introducing trouble.

In the following list, detailed information on lubrication is not given. The detailed information on items requiring lubrication and the lubrication required on an initial lubrication are given in Part 2 (D). KS-7470 oil should be used for all oil lubrication, except where KS-6232 oil is specified.

## 2.10 Cleaning and Lubrication.

- (a) Remove the range-finder and the magnet cover.
- (b) Clean the range-finder mechanism and check the adjustments of the mechanism (stop-pawl, trip-latch spring and stop-pawl spring adjustments).
- (c) Lubricate the range-finder mechanism. KS-6232 oil.
- (d) Clean the selector mounting-plate.
- (e) Clean the selector-magnet core and armature assembly using KS bond paper or lintless cloth.
- (f) Lubricate the armature lever and selector-arm pivot screws, applying KS-6232 oil sparingly.
- (g) Remove the selector cam-sleeve assembly.
- (h) Replace friction washers, if necessary.
- (i) Lubricate washers—saturate washers with oil and remove excess by pressing washers between two pieces of cloth.
- (j) Fill main-shaft cavity with oil.
- (k) Reinstall selector cam-sleeve assembly.
- (l) Check alignment of selector levers and selector cam-sleeve peaks.
- (m) Check magnet-armature pivot-screw adjustment, selector-magnet-bracket positions, selector-arm operating-screw clearance and locking-lever clearance.
- (n) Reinstall range finder and selector-magnet cover.
- (o) Check trip-off screw adjustment.
- (p) Check engagement of range-finder stop-pawl and selector-cam stop-arm.
- (q) Check adjustment of main-clutch throw-out lever.
- (r) Clean universal contacts and check adjustment of contacts.
- (s) Lubricate selector mechanism.
- (t) Lubricate main clutch and throw-out lever.
- (u) Lubricate receiving-shaft mechanisms.

- (v) Remove code punch block.
- (w) Remove lint from punch block.
- (x) If desired, rinse punch block in clean petroleum spirits.
- (y) Lubricate punch block sparingly at following points, using KS-6232 oil; feed-roll bearings and slots in lower ends of punch pins.
- (z) Remove code-punch-block tape guide if necessary to facilitate cleaning.
- (aa) Wipe out tape passage in guide and clean punch selector fingers and linkages.
- (ab) Clean prepunch mechanism.
- (ac) Clean prepunch tape guide and tape passage in prepunch block using standard cleaning tool.
- (ad) Lubricate prepunch mechanism.
- (ae) Lubricate selector fingers at ends which engage punch pins and at all bearing points.
- (af) Reinstall punch block and tape guide. Lubricate detent star wheel and other parts requiring lubrication.
- (ag) Check punch selector finger—code punch pin alignment.
- (ah) Remove sensing contact guard.
- (ai) Clean transmitter yoke and lid, transmitter mechanism and linkages between sensing pins and sensing contacts.
- (aj) Clean sensing contacts where necessary. Check that springs are not easily shifted sidewise.
- (ak) Check sensing contact spring pileups for contact alignment and "make and follow adjustments".
- (al) Check continuity of sensing contacts for FIGS, LTRS and H as follows:
  - (1) Set up FIGS manually in the sensing contacts and check for continuity without perceptible resistance between terminals 13 and 33 of the Jones plug on the base.
  - (2) Repeat, with LTRS combination and terminals 14 and 33.
  - (3) Repeat, with H combination and terminals 12 and 33.
- (am) Lubricate transmitter mechanism and linkages between sensing pins and sensing contacts. Reinstall sensing contact guard.
- (an) Remove guard for sensing magnet. Clean the magnet armature and core. Check connections to magnet coils. Lubricate the mechanism and fill the oil-cup for the rear bearing. Reinstall the guard.

- (ao) Place unit bottom-side upward.
- (ap) Clean the cavity of the base and wipe out the tape chute between the code punch block and the transmitter mechanism.
- (aq) Check sensing-contact pileup screws for tightness. If screws require tightening, recheck adjustments of sensing contacts after tightening.
- (ar) Remove one screw holding distributor-contact adjusting-screw bridge to mounting structure. Loosen second screw and shift bridge structure out of position to provide access to contacts.
- (as) Clean distributor contacts.
- (at) Clean distributor-contact adjusting-screw bridge and put back in place.
- (au) Clean distributor cam surfaces and distributor contact operating levers.
- (av) Apply oil sparingly to felt lubricators of distributor cam and sensing cam.
- (aw) Lubricate sparingly all bearing points of operating levers associated with cams.
- (ax) Clean distributor-magnet pole-faces. Check connections to magnet coils.
- (ay) Lubricate armature pivot points.
- (az) Clean auxiliary contacts, tape-out contacts, transmitter-stop contacts and universal contacts. Check the pileup screws for tightness. Check adjustments of the contacts.
- (ba) Fill distributor-shaft rear-bearing oil-cup.
- (bb) Apply two to six drops of oil in the sensing and distributor shafts' cavities.
- (bc) Apply oil sparingly to sensing and distributor shaft clutches and to detent mechanisms associated with cams.
- (bd) Check that the inside surface of prepunch chad tube is clean. If necessary chad tube may be removed for cleaning.
- (be) Lubricate all bearing points and gears on underside of base.

### **(C) Check Tests**

2.11 After completion of routine, make the following check tests. The requirements to be met are included for convenience of reference. In the case of any question with respect to requirements the Bell System Practice covering requirements and procedures should be referred to.

- (a) Reinstall the unit on the reperforator transmitter base and connect the Jones plug to the reperforator unit.
- (b) With the unit sending signals to the test room check character of sent signals. The distortion in the signals should not be more than 3%. To facilitate checking and adjusting the individual contacts the following repeated characters should be sent during this test: BLANK, T, CAR RET, SPACE, LINE FEED and E.
- (c) If distorted signals can be supplied locally, or over a line from a distant office, check the receiving margins of the selector in the usual manner. If distorted signals are not available send signals to the selector magnet from a keyboard, reperforator transmitter unit or transmitter distributor meeting the requirement specified in the foregoing test. Determine the orientation range and position the range-finder arm in the middle of the range.
- (d) Using miscellaneous text matter, check that the unit operates satisfactorily both sending and receiving. In this test check for correct functioning of the following:
  - (1) Tape-Out Contacts
  - (2) Transmitter-Stop Contacts
  - (3) Tape-Feed-Indicator Contacts
  - (4) Universal Contacts
  - (5) Tape-Out Switch
- (e) Check alignment of feed holes with respect to code-punch holes.
  - (1) The center lines of the feed holes and the code-punch holes should coincide. Also the center line of the code-punch holes should be at right angles to the edge of the tape.
- (f) Check alignment of the transmitter tape-guide plate and code-punch block.
  - (1) The right edge of the transmitter tape-guide plate should be parallel to the left edge of the code-punch block and the tape slot of the code-punch block should be in line with the tape passage of the tape-guide plate.
- (g) Check adjustment of transmitter tape-guide plate with respect to the code-punch holes.
  - (1) The transmitter pins should be located approximately centrally with respect to the code-punch holes with the transmitter assembly at the center, extreme right or extreme left of its travel.
- (h) Check selector-clutch torque.

- 2.12 Clean selector-magnet pole-faces.  
2.13 Remove excess lubricants and return unit to service.

**(D) Detailed Lubrication**

2.14 Unless otherwise specified, one or two drops of oil at each place indicated in the following list will be sufficient. Use KS-7470 oil and KS-7471 grease for all lubrication except where KS-6232 oil is specifically called for in the list.

2.15 A small stiff brush, such as the R-2119 brush, may be used to apply grease in a thin film at points where grease is specified.

2.16 New felt washers and wicks, before being used, should be thoroughly saturated with oil and, before assembling, the excess oil should be removed by squeezing the washers or wicks between two pieces of cloth.

2.17 Oil both loops of all helical springs which exert a nominal tension of less than 2-1/2 lb.

2.18 Apply grease to both loops of all helical springs that exert a nominal tension of 2-1/2 lb. or more.

2.19 Selector Mechanism.

**NOTE:** Be careful not to get oil between the pole faces of the selector magnet and the magnet armature.

- (a) Armature lever—two pivot screws.
- (b) Selector arm—two pivot screws, two sword contact points, locking tip, and point of contact with operating screw.
- (c) Selector-arm detent—bearing and point of contact with selector arm.
- (d) Range-finder assembly.
  - (1) Trip-latch plunger, bearing, and two points of contact.
  - (2) Bell crank—bearing.
  - (3) Trip latch—bearing and points of contact.
  - (4) Stop lever—bearing and point of contact with stop arm.
- (e) Swords and selector levers—drop oil between separator plates.
- (f) Selector T levers—all points of contact.
- (g) Selector-arm locking-lever—at pivot.
- (h) Selector cam-sleeve—each cam peak.
- (i) Tape feed-out lever—point of contact with trip-latch bell crank.

## 2.20 Receiving Shaft.

Remove range scale. Remove the cam-sleeve retaining disc (left-hand threads) and fill the shaft with oil.

- (a) Locking-lever-cam felt oiler—saturate.
- (b) Selector-cam friction washers (2)—saturate.
- (c) Eccentric-cam oil-hole—4 drops of oil.
- (d) Receiving-shaft ball bearings (2)—grease lower, oil upper.
- (e) Clutch-throwout lever—2 bearings, grease end of lever.
- (f) Clutch—oil freely.
- (g) Receiving-shaft gear—grease.
- (h) Compression springs (2)—allow oil to flow into prongs under springs.
- (i) Universal-contact operating lever—at bearing and apply a thin film of grease to camming surface.
- (j) Reinstall the disc.
- (k) Reinstall the range scale.

## 2.21 Reperforating Mechanism (Code-Punch Bracket).

- (a) Punch lever—fill oil-cup for bearing—oil shoulder screws at both ends—saturate felt washer.
- (b) Punch-arm link at adjusting-screw extension.
- (c) Selector transfer levers—drop oil between separators at both ends and at bearing.
- (d) Vertical stop levers—at juncture with selector levers, at bearing shaft, at juncture with punch-selector fingers.
- (e) Punch-selector fingers at front guide comb and point of contact with punches.
- (f) Punch-bail pilot-screw—2 bearings.
- (g) Feed-pawl bearing.
- (h) Feed roll—2 bearings.
- (i) Feed-roll-detent wheel—grease.
- (j) Feed-roll detent—bearing and roller.
- (k) Code punches.
- (l) Code-punch retracting bail—bearings (2) and points of contact with code punches.
- (m) Tape-feed suppressor at bearing—at point of contact with feed pawl.
- (n) Locking-bail bearings—(2).

- (o) Contact surfaces between locking bail and stop levers—grease.
- (p) Locking-bail retractor at points of contact with locking bail—grease.
- (q) Tape-depressing bail—bearing.

#### 2.22 Pivoted Transmitter and Transfer Mechanism.

- (a) Transmitter lid—bearings (2).
- (b) Sensing fingers—bearings, and point of contact with guide plate.
- (c) Transmitter yoke—bearings (2).
- (d) Tape-feed lever—bearings (2).
- (e) Tape-feed-pin lever bearing.
- (f) Feed-pin oscillator—bearing and points of contact with feed-pin lever and guide.
- (g) Feed-pin-oscillator lever—bearing, and guide comb.
- (h) Transfer-selector levers (Y levers)—bearing, and at guide comb 2 places.
- (i) Contact lever—bearing.
- (j) Transmitter stop-contact operating plunger.

#### 2.23 Transfer and Slide-Lever Mechanism.

- (a) T levers—bearings, and at points of contact with selector levers and transfer-slide levers.
- (b) T lever operating bail (transfer bail)—bearings (2).
- (c) Transfer-slide levers—bearings 2 each.
- (d) Contact-operating levers—bearings, and grease at point of contact with transfer-slide levers.

#### 2.24 Sensing Shaft.

- (a) Sensing-shaft bearings—ball bearing at right, fill oil-cup at left.
- (b) Sensing shaft—remove thumb-screw from right end of shaft and fill shaft with oil.
- (c) Sensing-shaft gear—grease.
- (d) Clutch assembly—oil freely.
- (e) Detent lever at bearing.
- (f) Oscillator-lever roller.
- (g) T lever operating (transfer) bail roller.
- (h) Clutch lever—bearings (2)—grease end.
- (i) Thin film of grease on bearing surface of all cams or oil on lubricating wicks.



## 2.25 Distributor Shaft.

- (a) Distributor-shaft bearings—ball bearing at right, fill oil-cup at left. (NOTE: Oil-cup should be set at a 45° angle with open end toward front.)
- (b) Distributor shaft. Remove thumb-screw from right end of shaft and fill shaft with oil.
- (c) Distributor-shaft gear—grease.
- (d) Clutch assembly—oil freely.
- (e) Detent lever—bearing.
- (f) Clutch contact-operating levers—at bearing and thin film of grease at point of contact with contact insulator.
- (g) Clutch lever—bearings (2)—grease end.
- (h) Distributor-contact levers—bearing, grease point of contact with cams, thin film of grease on point of contact with contact insulator.
- (i) Thin film of grease on bearing surface of all cams or oil on lubricating wicks.

**NOTE:** Remove all oil and grease from distributor contacts and excess oil from associated parts.

## 2.26 Sensing and Distributor Cam-Sleeves Detent.

- (a) Both loops of the detent-lever springs—(4).
- (b) Clutch-detent levers—bearings (2).
- (c) Clutch-detent levers—grease engaging surface with cam (2).
- (d) Detent cams—thin film of grease (2).
- (e) Lubricators—saturate with oil (2).

## 2.27 Sensing and Distributing Drive Shaft.

- (a) Sensing and distributing drive-shaft gears (2)—grease.
- (b) Sensing and distributing drive-shaft bearings (2).

## 2.28 Contact Insulators.

Apply a thin film of grease on the insulators of the following contacts at the point where insulators bear against their operating levers:

- (a) Universal contact.
- (b) Transmitter-stop contact.
- (c) Tape-out contact.
- (d) Distributor-shaft clutch-magnet contact.
- (e) Clutch-magnet auxiliary contact.
- (f) Switching contacts.

**NOTE:** Remove all excess oil and grease after lubrication and check that all contacts are free from oil, dirt or grease.

**2.29** Base (MRXDB1) Main Shaft.

- (a) Main-shaft motor gear—grease.
- (b) Motor pinion—grease.
- (c) Main-shaft ball bearings—grease.
- (d) Main-shaft sensing and distributing drive gears—grease.
- (e) Receiving-shaft drive gears—grease.

**2.30** Lubricate the motor at yearly intervals—tag the motor to indicate the date of lubrication.

**Caution:** Experience indicates that more trouble is caused by over-lubrication of motor bearings than by under-lubrication. Care should be taken that the bearings are not over-lubricated.

- (a) To lubricate a motor bearing, press the grease gun against the ball oiler and force grease into the end bell by pushing on the plunger of the gun. One stroke of the plunger should be sufficient.

**2.31** After lubrication has been completed, clean the selector-magnet pole-face and associated armature with a strip of KS bond paper to remove any dirt or lubricant that may be present.

**2.32** Connect power to the unit and after it has run for at least 10 minutes, check the tension of the selector cam clutch.

**BELL SYSTEM PRACTICES**  
**Teletypewriter and Manual**  
**Telegraph Station and PBX**  
**Installation and Maintenance**

**SECTION P35.601**  
**Issue 3, August, 1949**  
**AT&T Co Standard**

## **14-TYPE**

# **TYPING UNIT AND BASE**

### **LUBRICATION**

#### **1. GENERAL**

- 1.01 This section covers the lubrication of the 14-type typing unit and base.
- 1.02 This section is reissued to add to and revise the procedures.
- 1.03 The oils and grease referred to herein are those specified in Section P30.011, Teletypewriter Apparatus—Lubrication—General Requirements.

#### **2. APPLICATION**

- 2.01 Oil should be applied by means of a KS-8239 oil can, or by one having a slender spout not less than 3" long.
  - (a) In lubricating small parts apply only a single drop of oil so that the oil remains on the part and does not flow off. Too much oil will give unsatisfactory results.
  - (b) Oil cups should be well filled.
- 2.02 Grease should be applied with a KS-7461 or KS-8319 grease gun, toothpick, screwdriver blade, or a R-2119 brush.
- 2.03 After lubricating wipe off excess oil or grease which may have found its way onto surfaces not requiring lubrication, being careful to avoid wiping old oil, grease or dirt into spaces between bearing surfaces.
- 2.04 New felt washers, wicks and fibre gears, before being used, should be thoroughly saturated with oil.
- 2.05 Lubrication intervals shall be as specified in other instructions.

2.06 The main-bail roller and the main-bail guide rollers, marked with (+) in 3.01 and with (#) in 3.02, shall be lubricated first with oil, second with grease and finally again with oil.

### 3. PARTS TO BE LUBRICATED

3.01 The following parts shall be lubricated with oil.

#### (A) General

- (1) Both loops of all helical springs that exert a nominal tension of less than 2-1/2 lbs

#### (B) Typing Unit

- (1) Stop Pawl: (Old Style—2 Bearings)—(New Style—Oil Hole).
- (2) Trip latch: pivot.
- (3) Trip-latch bell-crank pivot.
- (4) Trip plunger.
- (5) Selector cams; drop of oil on each cam peak.
- (6) Locking-cam felt oiler; saturate.
- (7) Pivots of locking lever and selecting levers.
- (8) Selector-sword bearings; drop oil through rear end of slots in separator plates and on sword points.
- (9) Selector "T" lever pivots and all points of contact.
- (10) Code bars; at posts.
- (11) Locking wedge.
- \* (12) Selector arm: Pivots, locking wedge detent pin, sword-contacting surfaces and operating-screw contacting surface.
- \* (13) Selector-arm-stop detent: One drop on bearing surface of stop-detent eccentric.  
\* Holding-magnet selector only.
- (14) Armature bearings: Very sparingly. Be careful that no oil reaches that part of the armature opposite the magnet-core ends or armature stops (if so equipped).
- (15) Main shaft: Remove rear orientation-plate mounting screw, loosen front mounting screw and swing plate to expose top of main shaft. Insert spout of oil can in hole in center of retaining disc and fill shaft with oil. Wipe excess oil from top of retaining disc. If the main shaft is not drilled to allow passage of oil, lubricate the printing clutch and sleeve freely through the two opposite holes located just above the worm gear.
- (16) Main-shaft bearings: Oil liberally the top of each bearing.

- (17) Selector-clutch felt washers: Pry the driving discs apart with a screwdriver and saturate with oil. Do this at two diametrically opposite places at both top and bottom felt washers.
- (18) Main-bail operating-arm spring post: Saturate felt oilers.
- (19) Clutch-throwout lever: Two bearings.
- (20) Main-shaft felt washers located in recess of fibre gear:

Apply oil in the following manner:

1. Place a quantity of oil in the gear recess so that it covers the exposed edge of the friction disc.
  2. Allow the unit to remain idle for at least five minutes.
  3. Turn the motor by hand so that the friction disc will make a few revolutions with respect to the gear in order to facilitate the distribution of oil to the washer.
  4. Remove the excess oil from the recess with a rag so that it will not be thrown out by the operation of the unit.
- (21) Main-shaft-clutch friction disc: Oil upper projections of disc located inside the coil spring.
- (22) Main-bail-cam prongs: Apply oil through the springs.  
Note: Swing the motor back to give access to the rear of the unit.
- + (23) Main-bail roller.
- (24) Main-bail plunger: Fill oil cup.
- (25) Main-bail lever: Two bearings.
- (26) Main bail: Fill groove with oil.
- (27) Square vertical guide posts (old style units): One drop of oil on top of each post.
- + (28) Main-bail guide roller (new style units).
- (29) Main-bail guide (new style units): One drop of oil on each side of roller-contacting surface.
- + (30) Main-bail roller.
- (31) Pull bars: One drop of oil on top of each bar.
- (32) Type-bar gears: Pull each type bar down against the platen. Put one drop of oil on top of type-bar gear at rear slot. Avoid excess oil on these parts.
- (33) Ribbon-feed shaft: Two oil holes.
- (34) Ribbon-feed lever: Oil hole.
- (35) Ribbon-feed-lever roller.
- (36) Ribbon-feed gears: One drop of oil on teeth.
- (37) Ribbon-feed ratchet: One drop of oil on teeth.
- (38) Ribbon-spool shafts: Two bearings each.

- (39) Ribbon-reverse pawls and links: Four bearings on each side of unit.
- (40) Ribbon-reverse shafts: Two bearings each.
- (41) Ribbon-feed-shaft detent plunger.
- (42) Ribbon-feed-lever roller.
- (43) Tape-feed roll: Oil hole.
- (44) Platen shaft: Four bearings.
- (45) Carriage—Frame guide.
- (46) Spacer shaft: Two bearings and gear. Oil through hole in main casting.
- (47) Shift rocker and shift-rocker lever: Two pivot bearings.
- (48) Pull-bar lockout lever: Pivot and two rollers.
- (49) Signal-bell hammer: Pivot.
- (50) Carriage-locking pawl: Pivot bearing.
- (51) Spacer-locking bail: Two pivot bearings.
- (52) Spacer-locking pawl: One pivot bearing.
- (53) Spacer-detent lever: Pivot bearing and roller. Apply oil from right side.
- (54) Spacer-operating lever and roller.
- (55) Spacer-feed pawl.
- (56) Keyboard driving gears: Two oil cups.

**(C) Bell and Break Signal Mechanism**

- (1) Finger arm: Pivot.
- (2) Detent arm: Pivot.
- (3) Contact arm: Pivot.
- (4) Detent-arm extension: One drop of oil in fingerarm fork.

**(D) Mechanical End of Line Indicator Mechanism**

- (1) Worm shaft: Two bearings.
- (2) Release bail: Two bearings.
- (3) Cam-lever roller: Bearing.
- (4) Cam lever: Bearing.
- (5) Feed pawl.

**(E) Motor Control on Upper Case "H" Mechanism**

- (1) Contact lever: Two bearings.
- (2) Latch lever: Two bearings.
- (3) Operating lever: Two bearings.

Note: For lubrication of motor-control unit, see P32.003.

**(F) Base**

- (1) Keyboard-shaft bearings: Two oil cups or
- (2) Receiving only gear bearing: One oil cup.

- (3) Driven clutch: Apply two drops of oil through coils of spring.
  - (4) Intermediate pawl: Pivot.
  - (5) Trip-off pawl: Pivot and surface bearing on trip-off pawl eccentric.
  - (6) Clutch lever: Two bearings.
  - (7) Locking loop: Two bearings.
  - (8) Locking-loop roller: One bearing.
  - (9) Tape-feed-roll lever: Two side bearings.
  - (10) Locking levers: Five or six bearings.
  - (11) Contact levers: Apply one drop of oil on each lever on the side toward the cam cylinder so that it will run down on the pivot bearing.
  - (12) Spacer-bar loop: Three or four bearings.
  - (13) Repeat space or repeat "S" yoke: Apply one drop of oil at each bearing and point of contact.
  - (14) Tape-out bell hammer extension: Point of contact with pin on fibre gear.
  - (15) Tape-out bell hammer: Bearing points.
  - (16) Tape-out bell locking pawl: Pivot bearing.
  - (17) Tape lever: Pivot bearing.
- Note: Item 18 to 23 inclusive should be lubricated with the base turned on its back and the base plate removed.
- (18) Key-lever shaft: Apply one drop of oil on shaft at each of four equidistant points.
  - (19) Universal bar: Two pivots.
  - (20) Selector-bar rollers: Ten bearings.
  - (21) Key levers: Surfaces which rub against selector bars. Oil to be applied to key levers just in front of selector bars so that oil will run down and lubricate surfaces which rub on selector bars.
  - (22) Locking-lever adjusting screw of electric end of line indicator: Face which bears against key lever.
  - (23) Selector bars: At guide brackets.

#### (G) Electric End-of-Line Indicator

- (1) Feed pawl: Pivot.
- (2) Check pawl: Pivot.
- (3) Latch: Pivot.
- (4) Ratchet: Shaft bearing and teeth.
- (5) Contact lever: Pivot.
- (6) Dash-pot-plunger rod: Lubricate very sparingly.
- (7) Release-armature-latch extension.
- (8) Release-armature-extension adjusting screw: Face which bears against check pawl.
- (9) Contact cam: Outer edge.

### (H) Positive-Shift Mechanism

- (1) Shift-lock lever: Pivot bearing and point of contact with carriage-shift plate eccentric screw.
- (2) Figures-locking pawl: Pivot bearing and point of contact with carriage shift plate.

3.02 The following parts shall be lubricated with grease.

#### (A) General

- (1) Both loops of all helical springs that exert an average tension of 2-1/2 lbs. or more.

#### (B) Typing Unit

- (1) Five large gears at rear right of the unit: Apply sparingly.
- (2) Code-bar lock lever: Contact surface with main bail.
- (3) Ribbon-feed-shaft detent.
- (4) Main-bail operating-arm adjusting screw: Contacting surface.
- # (5) Main-bail roller.
- # (6) Main-bail-guide rollers.
- (7) Motor bearings. Depress ball oiler with nozzle of grease gun and lubricate bearing with one stroke of plunger, after which run motor for a few minutes to work out excess grease. After motor has come to rest, wipe off excess grease.

**Caution:** Lubrication intervals, specified in other instructions, should be closely adhered to as too much grease causes starting switch troubles on synchronous motors, commutator troubles and false grounding on DC motors and AC series motors.

**Note:** Replacement bearings should be packed with grease before installation and thereafter lubricated as above.

#### (C) Mechanical End-of-Line Indicator

- (1) Worm shaft.
- (2) Detent drag spring.
- (3) Feed ratchet.
- (4) Cam-lever roller: Surface.

#### (D) Base

- (1) Sending-shaft gear.
- (2) Sending cams: Outer surfaces. Remove all but light film of grease.

3.03 The main-bail roller and the main-bail-guide rollers, lubricated with grease in accordance with 3.02, should again be lubricated with oil.



**BELL SYSTEM PRACTICES**  
Teletypewriter and Manual  
Telegraph Station and P.B.X.  
Installation and Maintenance

**SECTION P35.603**  
Issue 4, August, 1949  
AT&T Co Standard

## **REPERFORATOR—14 AND 20 TYPE LUBRICATION**

### **1. GENERAL**

- 1.01 This section covers the lubrication of 14 and 20 type reperforators.
- 1.02 This section is reissued to add to and revise the procedures.
- 1.03 The oils and grease referred to herein are those specified in general Section P30.011 covering Lubrication of Teletypewriter Apparatus.

### **2. APPLICATION**

- 2.01 Oil should be applied by means of a KS-8239 oil can, or by one having a slender spout not less than 3" long.
  - (a) In lubricating small parts apply only a single drop of oil so that the oil remains on the part and does not flow off. Too much oil will give unsatisfactory results.
- 2.02 Grease should be applied with a KS-7461 or KS-8319 grease gun, toothpick, screwdriver blade or R-2119 brush.
- 2.03 After lubricating, wipe off excess oil or grease which may have found its way onto surfaces not requiring lubrication, being careful to avoid wiping old oil, grease or dirt into spaces between bearing surfaces.
- 2.04 New felt washers, before being used, should be thoroughly saturated with oil.
- 2.05 Lubrication intervals shall be as specified in other instructions.
- 2.06 Parts marked with (+) in 3.01 and with (#) in 3.02 shall be lubricated first with oil, second with grease and finally again with oil.

### 3. PARTS TO BE LUBRICATED

3.01 The following parts shall be lubricated with oil.

- (a) Both loops of all helical springs that exert a nominal tension of less than 2 1/2 lbs.

#### Selector Unit and Main Shaft

- (b) Stop lever: two bearings.
- (c) Trip latch: pivot.
- (d) Trip-latch bell crank: pivot.
- (e) Trip-latch plunger.
- (f) Selector cams: one drop on peak of each cam.
- (g) Locking-cam felt oiler: saturate.
- (h) Locking-lever and selector-lever pivots.
- (i) Selector-sword bearings: drop oil through slots in separator plates.
- (j) Selector-sword points.
- (k) Selector "T" levers: all points of contact.
- (l) Locking wedge.
- (m) Armature bearings: sparingly.

**Caution:** Take care not to get oil on armature opposite magnet-core ends. Clean armature and magnet cores by drawing between them a piece of KS-7187 paper or the equivalent. In same manner clean stopping surfaces of armature front and back stops.

- (n) Armature detent: at bearing.
- (o) Armature-detent pin where it comes in contact with the armature lever.

Note: (n) and (o) are found only on 20-type reperforators.

- (p) Main shaft: front bearing.
- (+) (q) Main shaft: rear bearing.
- (r) Main shaft: remove orientation-plate mounting screw and swing plate to expose end of main shaft. Hold front of reperforator up several inches and fill shaft through hole in center of retaining disc.
- (s) Selector-clutch felt friction washers. Hold driving discs apart with a screwdriver and saturate the felt washers with oil. Do this at two diametrically opposite places on the washers.

**Caution:** Care should be taken to press the screwdriver into the felt washer sufficiently so that it does not burr the driving discs when twisted to separate the discs.

- (+) (t) Clutch throw-out lever: two bearings.
- (u) Main-clutch camming surface.
- (+) (v) Cam roller.

- (w) Main-shaft felt washer. Also oil projections of steel disc which are inside of coiled spring.
- (x) Cam bushing: oil hole.

### **Punch-Arm Shaft**

- (y) Bearing blocks; two oil holes.
- (z) Adjusting screw.

### **Punching Mechanism**

- (aa) Punch block: oil hole.
- (ab) Feed-roll bearing.
- (ac) Detent roller and eccentric.
- (ad) Lock bail: two bearings.
- (ae) Punch hammer: two bearings.
- (af) Transfer levers: all points of contact.
- (ag) Punch levers: all points of contact.
- (ah) Lock-bail roller.
- (ai) Feed pawl.
- (aj) Tape reel: oil hole.
- (ak) Tape-retainer hinge.
- (al) Space out lever guide screws.

3.02 The following parts shall be lubricated with grease.

- (a) Loops of all helical springs that exert a nominal tension of 2-1/2 lbs. or more.
- (#)(b) Cam roller.
- (#)(c) Clutch-throw-out lever: two bearings.
- (d) Gears at rear of unit: apply sparingly.
- (#)(e) Main-shaft rear bearing.
- (f) Motor bearings. Depress ball oiler with nozzle of grease gun and lubricate bearing with one stroke of the plunger, after which run motor a few minutes to work out excess grease. After motor has come to rest wipe off excess grease.

**Caution:** Lubrication intervals, specified in local instructions, should be closely adhered to as too much grease causes starting switch troubles on synchronous motors, commutator troubles and false grounding on d-c motors and a-c series motors.

Note: Replacement bearings should be packed with grease before installation and then be lubricated as above.

3.03 The following parts, lubricated with grease in accordance with 3.02 shall again be lubricated with oil.

- (a) Cam roller.
- (b) Clutch-throw-out lever: two bearings.
- (c) Main shaft: rear bearing.

- (v) Main shaft: for wear. Also oil projections of steel disc which are inside of rolled spring.
- (x) Cam bushing: oil hole.

**Punch-Arm Shaft**

- (y) Bearing blocks: two oil holes.
- (z) Adjusting screw.

**Punching Mechanism**

- (aa) Punch block: oil hole.
- (ab) Feed-roll bearing.
- (ac) Belt on roller and eccentric.
- (ad) Lock ball: two bearings.
- (ae) Link: bottom: two bearings.
- (af) Tension lever: all points of contact.
- (ag) Punch lever: all points of contact.
- (ah) Lock-ball roller.
- (ai) Lock ball.
- (aj) Tape reel: oil hole.
- (ak) Tension spring.
- (al) Spring out lever: knife screws.

**BLANK PAGE**

3.02 The following parts shall be lubricated with grease:  
 (a) Ends of all helical springs that exert a normal tension of 2 1/2 lbs. or more.

- (#1) Cam roller.
- (#2) Clutch-throw-out lever: two bearings.
- (#3) Ends of rest of unit: apply sparingly.
- (#4) Main shaft: rear bearing.
- (#5) Motor bearing: pressure ball often with marks of grease - run and lubricate bearing with one stroke of the pump - after which run motor a few minutes to work out excess grease. After motor has come to rest wipe off excess grease.

**Caution:** Lubrication intervals specified in local instructions should be closely adhered to as too much grease causes starting troubles on synchronous motor, commutator troubles and false grounding on the motor and a-c series motor.

**Note:** Replacement bearings should be packed with grease before installation and then be lubricated as above.

3.03 The following parts lubricated with grease in second case with 3.02 shall again be lubricated with oil.

- (a) Cam roller.
- (b) Clutch-throw-out lever: two bearings.
- (c) Main shaft: rear bearing.

**BELL SYSTEM PRACTICES**

**Teletypewriter and Manual  
Telegraph Station and P.B.X.  
Installation and Maintenance**

**SECTION P35.603**

**Issue 4, August, 1949  
AT&T Co Standard**

**REPERFORATOR—14 AND 20 TYPE  
LUBRICATION**

**1. GENERAL**

- 1.01 This section covers the lubrication of 14 and 20 type reperforators.
- 1.02 This section is reissued to add to and revise the procedures.
- 1.03 The oils and grease referred to herein are those specified in general Section P30.011 covering Lubrication of Teletypewriter Apparatus.

**2. APPLICATION**

- 2.01 Oil should be applied by means of a KS-8239 oil can, or by one having a slender spout not less than 3" long.
  - (a) In lubricating small parts apply only a single drop of oil so that the oil remains on the part and does not flow off. Too much oil will give unsatisfactory results.
- 2.02 Grease should be applied with a KS-7461 or KS-8319 grease gun, toothpick, screwdriver blade or R-2119 brush.
- 2.03 After lubricating, wipe off excess oil or grease which may have found its way onto surfaces not requiring lubrication, being careful to avoid wiping old oil, grease or dirt into spaces between bearing surfaces.
- 2.04 New felt washers, before being used, should be thoroughly saturated with oil.
- 2.05 Lubrication intervals shall be as specified in other instructions.
- 2.06 Parts marked with (+) in 3.01 and with (#) in 3.02 shall be lubricated first with oil, second with grease and finally again with oil.

### 3. PARTS TO BE LUBRICATED

3.01 The following parts shall be lubricated with oil.

- (a) Both loops of all helical springs that exert a nominal tension of less than 2 1/2 lbs.

#### Selector Unit and Main Shaft

- (b) Stop lever: two bearings.
- (c) Trip latch: pivot.
- (d) Trip-latch bell crank: pivot.
- (e) Trip-latch plunger.
- (f) Selector cams: one drop on peak of each cam.
- (g) Locking-cam felt oiler: saturate.
- (h) Locking-lever and selector-lever pivots.
- (i) Selector-sword bearings: drop oil through slots in separator plates.
- (j) Selector-sword points.
- (k) Selector "T" levers: all points of contact.
- (l) Locking wedge.
- (m) Armature bearings: sparingly.

**Caution:** Take care not to get oil on armature opposite magnet-core ends. Clean armature and magnet cores by drawing between them a piece of KS-7187 paper or the equivalent. In same manner clean stopping surfaces of armature front and back stops.

- (n) Armature detent: at bearing.
- (o) Armature-detent pin where it comes in contact with the armature lever.

Note: (n) and (o) are found only on 20-type reperforators.

- (p) Main shaft: front bearing.
- (+) (q) Main shaft: rear bearing.
- (r) Main shaft: remove orientation-plate mounting screw and swing plate to expose end of main shaft. Hold front of reperforator up several inches and fill shaft through hole in center of retaining disc.
- (s) Selector-clutch felt friction washers. Hold driving discs apart with a screwdriver and saturate the felt washers with oil. Do this at two diametrically opposite places on the washers.

**Caution:** Care should be taken to press the screwdriver into the felt washer sufficiently so that it does not burr the driving discs when twisted to separate the discs.

- (+) (t) Clutch throw-out lever: two bearings.

(u) Main-clutch camming surface.

- (+) (v) Cam roller.

- (w) Main-shaft felt washer. Also oil projections of steel disc which are inside of coiled spring.
- (x) Cam bushing; oil hole.

### **Punch-Arm Shaft**

- (y) Bearing blocks; two oil holes.
- (z) Adjusting screw.

### **Punching Mechanism**

- (aa) Punch block: oil hole.
- (ab) Feed-roll bearing.
- (ac) Detent roller and eccentric.
- (ad) Lock bail: two bearings.
- (ae) Punch hammer: two bearings.
- (af) Transfer levers: all points of contact.
- (ag) Punch levers: all points of contact.
- (ah) Lock-bail roller.
- (ai) Feed pawl.
- (aj) Tape reel: oil hole.
- (ak) Tape-retainer hinge.
- (al) Space out lever guide screws.

3.02 The following parts shall be lubricated with grease.

- (a) Loops of all helical springs that exert a nominal tension of 2-1/2 lbs. or more.
- (#)(b) Cam roller.
- (#)(c) Clutch-throw-out lever: two bearings.
- (d) Gears at rear of unit: apply sparingly.
- (#)(e) Main-shaft rear bearing.
- (f) Motor bearings. Depress ball oiler with nozzle of grease gun and lubricate bearing with one stroke of the plunger, after which run motor a few minutes to work out excess grease. After motor has come to rest wipe off excess grease.

**Caution:** Lubrication intervals, specified in local instructions, should be closely adhered to as too much grease causes starting switch troubles on synchronous motors, commutator troubles and false grounding on d-c motors and a-c series motors.

Note: Replacement bearings should be packed with grease before installation and then be lubricated as above.

3.03 The following parts, lubricated with grease in accordance with 3.02 shall again be lubricated with oil.

- (a) Cam roller.
- (b) Clutch-throw-out lever: two bearings.
- (c) Main shaft: rear bearing.

3.03 The following parts lubricated with grease in second gear with 3.02 shall again be lubricated with oil.

- (a) Cam roller.
- (b) Clutch-throw-out lever: two bearings.
- (c) Main shaft: test bearing.

Note: Replacement bearings should be packed with grease before installation and then be lubricated as above.

Caution: Lubrication intervals specified in local instructions should be closely adhered to as too much grease causes starting switch troubles on synchronous motor, commutator troubles and false grounding on d-c motor and a-c series motor.

(1) Motor bearings. Dress ball oiler with nozzle of grease gun and lubricate bearing with one stroke of the plunger after which run motor a few minutes to work out excess grease. After motor has come to rest wipe off excess grease.

- (#) (1) Motor bearings. Dress ball oiler with nozzle of grease gun and lubricate bearing with one stroke of the plunger after which run motor a few minutes to work out excess grease. After motor has come to rest wipe off excess grease.
- (#) (c) Main shaft: test bearing.
- (b) Gears of rest of unit: apply sparingly.
- (#) (d) Clutch-throw-out lever: two bearings.
- (#) (b) Cam roller.

(a) Loops of all helical springs that exert a normal tension of 2-1/2 lbs. or more.

3.02 The following parts shall be lubricated with grease.

- (a) Space out lever guide screws.
- (ak) Tape-retainer hinge.
- (aj) Tape reel: oil head.
- (ai) Feed pawl.
- (aj) Lock-bar roller.
- (ag) Punch levers: all points of contact.
- (ai) Transfer levers: all points of contact.
- (as) Punch hammer: two bearings.
- (ah) Lock ball: two bearings.
- (ac) Dent roller and eccentric.
- (ap) Feed-roll bearing.
- (aa) Punch block: oil hole.

# BLANK PAGE

## Punching Mechanism

- (x) Adjusting screw.
- (y) Bearing blocks: two oil holes.

## Punch-Arm Shaft

- (z) Cam bearing: oil hole.

(w) Main shaft: oil washer. Also oil projections of steel disc which are inside of coiled spring.



**BELL SYSTEM PRACTICES**

Teletypewriter and Manual  
Telegraph Station and P.B.X.  
Installation and Maintenance

**SECTION P35.610**

**Issue 4, April, 1949**

**AT&T Co Standard**

**14 TYPE TYPING UNIT**

**REQUIREMENTS AND PROCEDURES**

**Table of Contents**

**Paragraphs**

1. General	1.01 to 1.03
2. Lubrication	2.01
3. Requirements and Procedures	3.01 to 3.70
Alignment of Type	3.69
Carriage and Shift Mechanism	3.02 to 3.03
Carriage	3.20 to 3.22
Carriage Locking-Toe	3.37
Carriage Locking-Pawl Spring	3.34
Carriage-Return Spring	3.33
Carriage Spring-Bracket Toe	3.36
Positive Carriage-Shift	3.23 to 3.26
Rear Capstan-Nut	3.39
Shift-Rocker	3.32
Shift-Rocker-Lever Post	3.35
Governor	3.06
Main-Shaft Mechanism	3.07
Clutch-Throw-out-Lever Spring	3.03
Main-Bail	3.70
Main-Bail-Cam Friction-Clutch	3.61
Main-Bail Spring	3.67
Main-Shaft-Clutch Teeth and Spring	3.02, 3.04 & 3.05
Selector-Cams	3.01
Selector-Clutch Torque	3.62
Motor	3.05

**Table of Contents****Paragraphs**

Orientation Range and Distortion Tolerances .....	See Section P30.002
<b>Ribbon Mechanism</b>	
Ribbon-Check-Pawl and Spring .....	3.51 & 3.52
Ribbon-Feed-Lever Spring .....	3.11
Ribbon-Feed-Pawl and Spring .....	3.53 & 3.54
Ribbon-Feed-Shaft Safety-Spring .....	3.49
Ribbon-Feed-Shaft Detent-Plunger .....	3.50
Ribbon-Guide .....	3.41
Ribbon-Reverse-Pawl Link .....	3.47
Ribbon-Reverse Pawls and Spring .....	3.48 & 3.55
Ribbon-Reverse Shaft .....	3.46
Ribbon-Spools .....	3.56
Ribbon-Spool Brackets .....	3.43
Ribbon-Spool Cups .....	3.42
Ribbon-Spool Shafts and Springs .....	3.44 & 3.45
Selecting Mechanisms .....	See Section P32.001
<b>Spacer Mechanism</b>	
Spacer Detent-Lever Spring .....	3.08
Spacer Feed-Pawl and Spring .....	3.07 & 3.09
Spacer Locking-Pawl and Spring .....	3.17 to 3.19
Spacer Locking-Bail Spring .....	3.12
Spacer Operating-Lever Spring .....	3.10
<b>Tape Mechanism</b>	
Exit and Swivel Tape-Chute .....	3.28 & 3.29
Tape Feed-Roll and Spring .....	3.30 & 3.31
Tape Guides .....	3.27
Push Tape Feed .....	See Section P35.701
<b>Type-Bars, Pull-Bars and Springs</b>	
Pull-Bar Guide .....	3.15
Pull-Bar Lockout-Lever .....	3.40
Pull-Bar Springs .....	3.14 & 3.57
Type-Bars and Pull-Bars .....	3.38 & 3.16
<b>Miscellaneous</b>	
Bell and Break-Signal .....	3.64
Code-Bar Lock-Lever Spring .....	3.58

Function-Bar Spring-Bracket .....	3.13
Mechanical End-of-Line Indicator .....	3.66
Mechanical Motor Control .....	See Section P35.701
Mechanism for Preventing Printing and Spacing .....	See Section P35.701
Monitoring Range Scale .....	See Section P35.613
Platen .....	3.68
Remote Signal-Bell Contacts .....	3.63
Signal-Bell and Hammer .....	3.60 & 3.59
Upper Case Blank Contacts .....	3.65

## 1. GENERAL

1.01 This section contains the apparatus requirements and adjusting procedures for the maintenance of teletypewriter typing units of the 14 type.

1.02 This section is reissued to eliminate the paragraphs dealing with the selector mechanism (covered in Section P32.001), to eliminate the general instructions and cleaning procedure previously contained in the P sections giving requirements and procedures and now contained in Section P30.012, and to make other revisions.

1.03 In addition to requirements listed herein the 14 Typing Unit shall meet requirements of the following sections.  
 P30.002—Orientation Test and Distortion Tolerance  
 P30.012—Teletypewriter—General Requirements  
 P82.001—Selecting Mechanisms

## 2. LUBRICATION

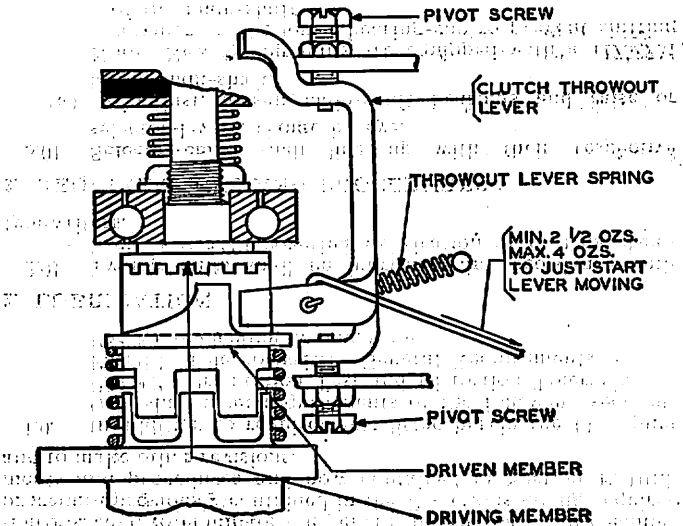
2.01 Typing units shall be lubricated in accordance with Section P35.601 covering Lubrication of 14 Type Teletypewriters.

## 3. REQUIREMENTS AND PROCEDURES

3.01 Selector-cams shall line up with their respective selector-levers. Gauge by eye.

(a) To adjust, loosen main-shaft bearings and raise or lower main-shaft.

Note: New typing units are equipped with a 117387M retainer on the lower bearing-cap to prevent shifting of the main-shaft.



**Fig. 1**

**3.02 Main-shaft clutch teeth** shall clear each other by Min. .010", Max. .020" when clutch is fully cammed out of engagement. **Fig. 10**

(a) To adjust, reposition clutch-throw-out lever pivot-screws making sure that the throw-out lever is free in its bearings, without perceptible end play when pivot-screw lock-nuts are tightened.

**3.03 Clutch-throw-out-lever spring** shall have a tension of Min. 2-1/2 oz., Max. 4 oz. measured at right angles to the throw-out lever, when the clutch teeth are fully engaged and the clutch-throw-out lever is resting against the low part of the driven clutch-member. **Fig. 1**

**3.04 Main-shaft-clutch spring** shall have a tension of Min. 24 oz., Max. 30 oz. to separate the clutch-teeth on 60 speed operation. With the teeth of the driven clutch-member resting against the teeth of the driving clutch-member but not engaged, hook the scale over the throw-out-cam on the driven

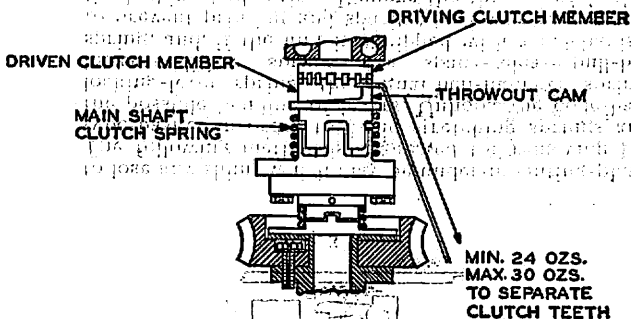


Fig. 2

clutch-member and pull down as nearly in line with the shaft as possible. On some units operated at 75 speed a heavy tension spring is used. When this heavy spring is in a unit the tension shall be Min. 34 oz., Max. 44 oz. Fig. 2

3.05 Clutch driven-member, after being pulled manually to position of extreme disengagement, shall start and slide until it engages with or touches the driving-member teeth when the clutch-spring is opposed by a force of not less than 10 ozs.

(a) To gauge, pull driven member to operated position with tension specified in 3.04, gradually reduce tension and permit driven-member to slide until it touches driving-member. The gauge reading should not go below 10 ozs.

(b) To adjust, clean and lubricate clutch. If sliding surfaces of driven-member and bushing on which it slides are not smooth and polished, replace these parts or return typing unit to shop for replacement.

Note: Failure to receive first character after a period of idleness may be caused by sticking of main-shaft-clutch parts. If trouble of this nature is reported it may be checked for by observing typing of first character received directly from associated keyboard after main-shaft of typing-unit has been at rest for at least 10 minutes, power disconnected.

3.06 Motors and governors shall conform to requirements of Section P32.004 covering Teletypewriter Motor-Units and the adjustment of governor contacts, except those with

regard to the speed and position of the motor which shall be as specified below.

(a) Motor-pinion and main-shaft-gears shall engage with minimum backlash without bind throughout a complete revolution of the main-shaft. Gauge by eye and feel.

(1) To adjust, reposition motor on mounting-plate.

(b) There should be clearance between motor and ribbon feed-lever when main-bail is up and motor and motor-plate are moved forward to their normal operating position. Gauge by eye.

(c) **Motor speed:** See Section P30.020. For synchronous motors no speed check is required unless it is suspected that the power frequency is off.

Note: For adjustments 3.07 to 3.14 inclusive, bell break-signal-mechanism, code-bar assembly and type-basket should be removed to make the parts accessible. Code-bar assembly is removed by unscrewing the two screws at rear of pull-bar-guide and moving "T" levers to the right by pushing ends of sword-levers to the left. The screws should be replaced so as not

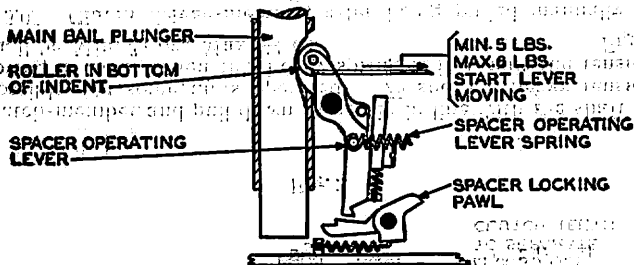


Fig. 3

to lose any shims which may be under mounting-plate. The following method is suggested for removing the type-basket in order to avoid stretching springs and the possible bending of levers. Unhook the code-bar-locking-lever spring, the signal-bell-hammer spring, letters-pull-bar spring, the space-release-pull-bar spring, and, if the unit is equipped with a mechanism to prevent printing and spacing on lower case blank, the locking-bail spring. Remove the three type-basket

assembly mounting-screws. Remove the right ribbon-spool-bracket front mounting-screw, loosen the rear mounting-screw, and swing the basket so that the ribbon-spool-cup will not interfere with the basket. Remove the bell-and-break signal mechanism. Hold the pull-bars out of engagement with the pull-bar-guide (as an aid in holding the pull-bars out of engagement with the pull-bar-guide, use a piece of wire or string around the upper ends of the pull-bars). Disengage lower end of function pull-bars from mechanism on base, and slide the assembly upward. Care should be taken that the pull-bar toes are not jammed against the spacer locking-ball or the signal-bell-hammer.

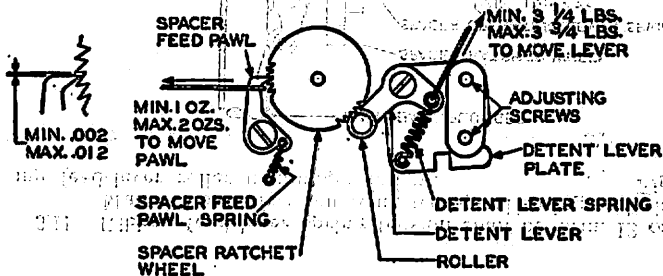


Fig. 4

3.07 **Spacer feed-pawl** shall clear face of all teeth in ratchet by Min. .002", Max. .012" when roller of spacer operating-layer is in bottom of indent of main-bail plunger and when detent-roller is snugly bottoming between two teeth of ratchet. Gauge by eye.

Fig. 4

(a) To adjust, loosen the left front motor-plate mounting-screw and remove the two rear screws that hold the motor-plate to the base. Remove the keyboard drive assembly and swing the motor out so as to gain access to the detent-lever-plate adjusting-screws. Reposition detent-lever-plate on main-casting to meet requirements.

3.08 **Spacer detent-lever spring** tension shall be Min. 3-1/4 lbs., Max. 3-3/4 lbs.

Fig. 4

3.09 **Spacer feed-pawl spring** tension shall be Min. 1 oz., Max. 2 ozs.

Fig. 4

3.10 **Spacer operating-lever spring tension** shall be Min. 5 lbs., Max. 6 lbs. for units equipped with a horizontal spring, or Min. 3 lbs., Max. 6 lbs. for units equipped with a vertical spring, when the spacer operating-lever roller is in the bottom of the indent of the main-bail and the spacer locking-pawl is not engaged with the spacer operating-lever. Horizontal spring illustrated in Fig. 3.

Fig. 3

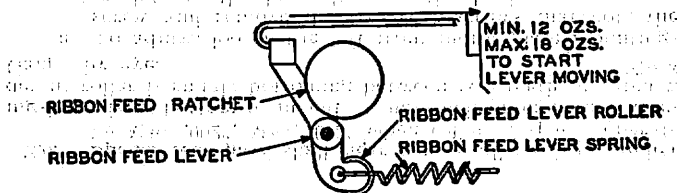


Fig. 5

3.11 **Ribbon feed-lever spring tension** shall be Min. 12 ozs., Max. 18 ozs. after removing feed-pawl spring and placing feed-lever roller in plunger indent.

Fig. 5

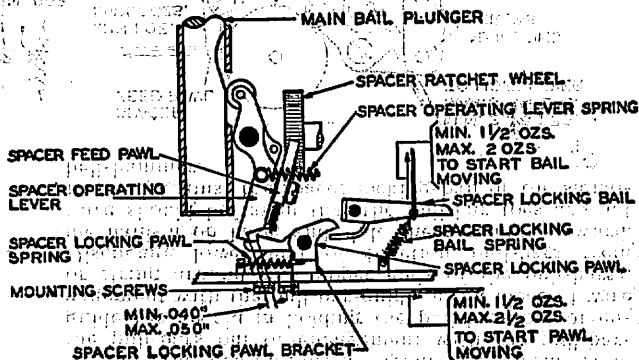


Fig. 6



3.12 **Spacer locking-bail spring tension** shall be Min. 1-1/2 ozs., Max. 2 ozs. when spacer locking-pawl is held away from locking-bail. (See Fig. 6) On typing units equipped with an 84641M mechanism, the spring tension shall be Min. 7-1/2 ozs., Max. 8-1/2 ozs. measured in the upper loop of the spring by pulling vertically upward to position length. This mechanism provides for printing and spacing on upper-case blank and prevents printing and spacing on lower-case blanks (see Section P35.612).

Fig. 6

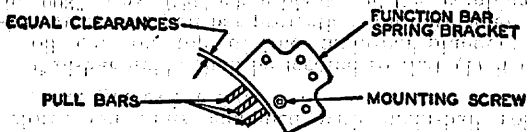


Fig. 7

3.13 **Function-Bar Spring-Bracket:** Two end pull-bars supported by function-bar bracket-plates shall have an equal amount of play in the segment. Gauge by eye. Fig. 7

Note: This need be checked only when plates are moved.

- (a) To adjust, reposition function-bar bracket-plates by rotating them on their mounting-screws.

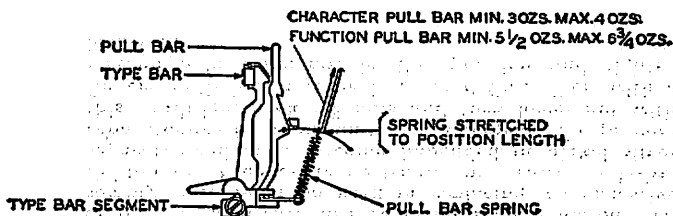


Fig. 8

3.14 **Pull-Bar Springs:** Tension of character pull-bar springs shall be Min. 3 ozs., Max. 4 ozs. and tension of function pull-bar springs shall be Min. 5-1/2 ozs., Max. 6-3/4 ozs. Fig. 8

Note: Place main-bail in its highest position and remount type-basket with three screws through base, making

sure that all pull-bar springs are in place. Reassemble springs which were removed for removal of type-basket. Reassemble the bell-and-break signal mechanism, and remove tie from tops of pull-bars. Place main-bail in its lowest position, slip slots in pull-bar-guide over proper pull-bars and when the assembly is almost in place engage "T" levers in notches of code-bars. Reassemble any shims which may have been removed from between pull-bar-guide and frame casting.

**Caution:** If code-bars are removed from code-bar assembly, care must be used in replacing, as excessive tightening of code-bar post-nuts may cause code-bar separator-collars to become imbedded in nickel silver separator-washers on units so equipped. To prevent this condition, back off nuts and turn lower-nut with fingers until lock-washer is pressed flat. Then with a wrench hold lower-nut in this position and tighten lock-nut.

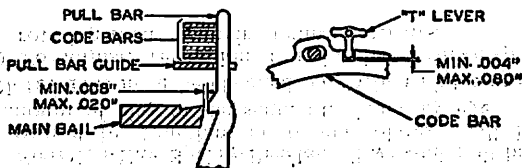


Fig. 9

Note: On units equipped with main-bail rollers and roller guides see 3.70.

3.15 Pull-bar guide shall be located so that (1) it clears the oil cup on top of the main-bail-plunger; (2) the main-bail clears the pull-bar projections on unselected pull-bars, by Min. .008", Max. .020" when blank and ltrs. combinations are set up in turn and main-bail play is taken up so as to make the clearance a minimum; (3) there is Min. .004", Max. .080", clearance between the end of the No. 1 T lever and the bottom of the slot in the code-bar, measured at the point of closest approach. Also check to see that there is clearance between the ends of the Nos. 2, 3, 4 and 5 T levers and their respective code-bars. Gauge by eye.

Fig. 9

(a) To adjust, reposition pull-bar guide. If necessary to adjust check 3.16.

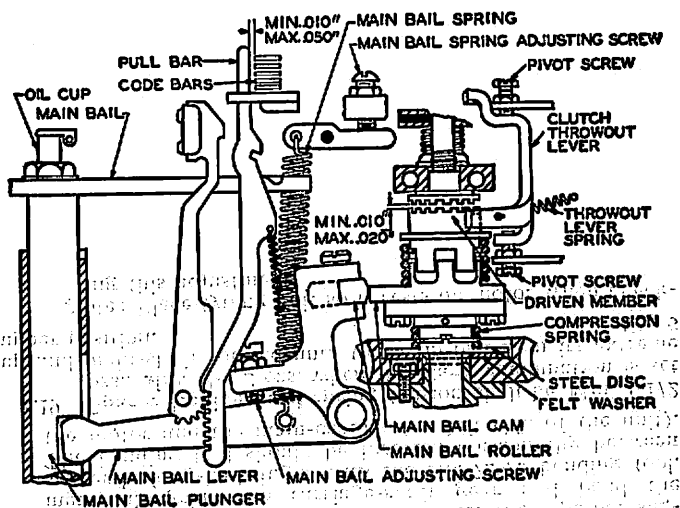


Fig. 10

3.16 **Pull-bars**, except the selected one, shall clear inner edge of code-bars by Min. .010", Max. .050" when blank and letters combinations are set up in turn, main-bail-roller is on high part of main-bail-cam and play in the main-bail and the pull-bars is taken up to make clearance minimum.

Fig. 10

Note: Before making any readjustment to meet this requirement check 3.15.

(a) To adjust, reposition main-bail adjusting-screw.

Note: If code-bars and pull-bars are not concentric it may be necessary to shift the type-bar segment and main-bracket on the base-plate.

3.17 **Spacer locking-pawl** shall clear the operating-lever by Min. .040", Max. .050", when Fig. 6 is selected and spacer operating-lever roller is on high part of main-bail-plunger.

Fig. 6

(a) To adjust, reposition locking-pawl block on base.

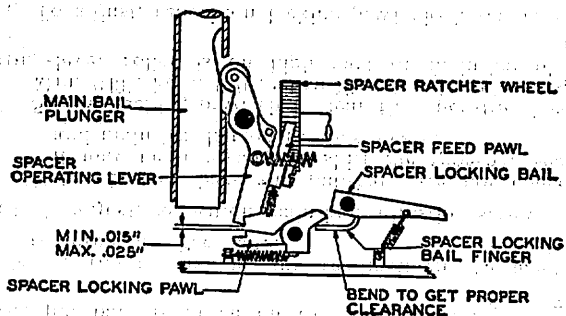


Fig. 11

3.18 **Spacer locking-pawl** shall clear spacer operating-lever by Min. .015", Max. .025" when the locking-pawl is in its unoperated position (so as not to prevent spacing). **Fig. 11**

(a) To adjust, hold the spacer locking-bail by means of the No. 72574 holding tool inserted under the type-bar segment, alongside the carriage-shaft gear and bend the spacer-locking-bail-finger with the No. 72575 bending tool. The bending tool should be inserted horizontally between the motor and the main-casting (on left side of the unit).

3.19 **Spacer locking-pawl spring tension** shall be Min. 1-1/2 ozs., Max. 2-1/2 ozs. when the blank combination is set up and main-shaft rotated until the main-bail is in its extreme upper position. **Fig. 6**

Note: Place typing unit so it rests on motor when checking this adjustment.



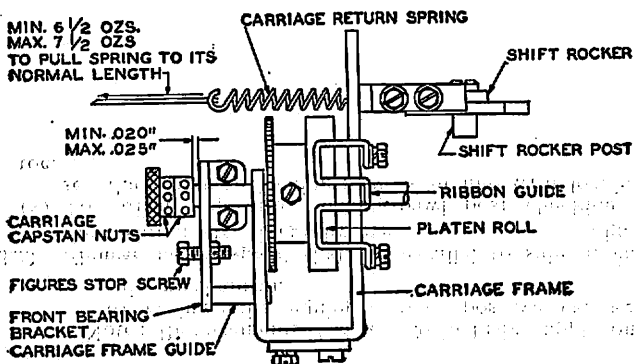


Fig. 12

3.20. Carriage shall shift freely without bind from the Ltrs. to the Figs. position at all positions of the spacing-gear when the carriage-locking-pawl is operated and carriage is moved slowly by hand. Gauge by feel.

(a) To adjust, reposition platen-shaft front-bearing-bracket and if necessary free or replace shift-rocker, shift-rocker-lever and lockout-bearings. For identification of part see Fig. 12.

Fig. 12

Note: After making this adjustment, position the carriage-bracket locating-plate so that the three projections make contact with the bracket. The carriage-bracket can then be removed and reassembled without further adjustment.

3.21. Carriage locking-pawl should set fully on the carriage locking toe when carriage is in the Ltrs. position and the play of the pawl is taken up in either direction.

(a) To adjust, position the locking-pawl post by means of its lock-nut.

### 3.22 Carriage-Stops Adjustment

(1) With the carriage in the Figs. position, the figure 2 should print in the middle of the platen-roll. Gauge by eye.

(a) To adjust, position figures stop-screw.

(2) With the carriage in the **Ltrs.** position the letter **W** should print in the middle of the platen-roll. Gauge by eye.

(a) To adjust, loosen the carriage locking-toe mounting-screw and position the carriage locking-toe.

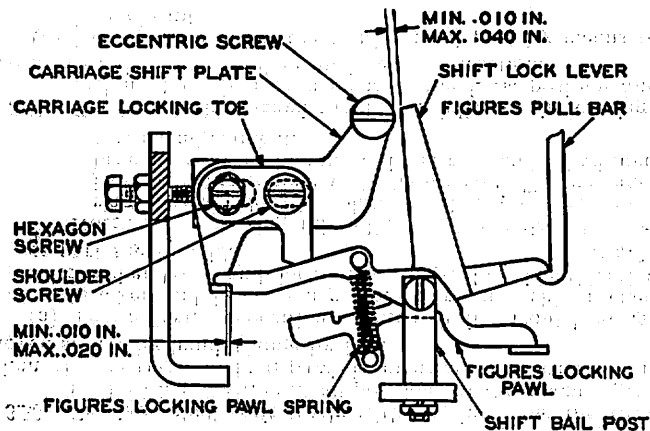


Fig. 13

CHIEF CLERK'S OFFICE

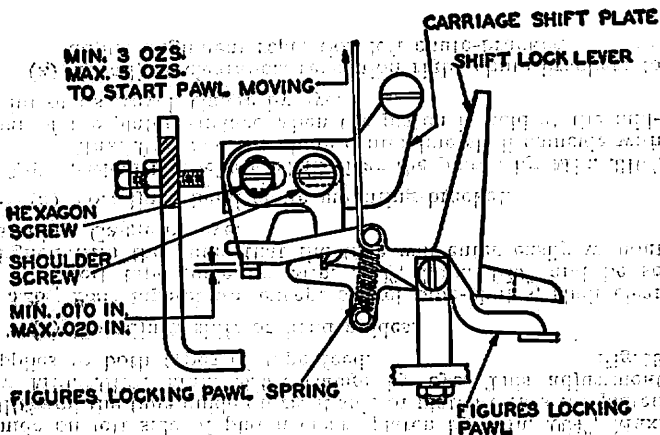
**Note:** Requirements 3.23 to 3.26 inclusive apply only to typing-units equipped with positive carriage-shift mechanism.

**3.23** Figures locking-pawl shall be parallel to side of carriage shift-plate. Gauge by eye. **Fig. 13**

(a) To adjust, reposition locking-pawl post checking to see that carriage locking-pawl is in line with locking-toe.

CHIEF CLERK'S OFFICE

CHIEF CLERK'S OFFICE



**Fig. 14**

**3.24 Carriage shift-plate projection shall clear (1) shoulder of the figures locking-pawl by Min. .010", Max. .020" when the carriage is in the Figs. position and the locking-pawl is held down against the shift-plate projection; (2) lower edge of the figures locking-pawl by Min. .010", Max. .020" when the carriage is moved from Figs. to Ltrs. position. Figs. 13 and 14**

(1) To adjust, loosen (slightly) hexagon and shoulder-screws which clamp carriage shift-plate and locking-toe, reposition shift-plate first horizontally and then vertically, tighten shoulder-screw and recheck horizontal adjustment. Check carriage locking-toe position 3.22 and tighten hexagon screw.

**3.25 Carriage shift-plate eccentric-screw shall clear the shift lock-lever by Min. .010", Max. .040" when the carriage is in the Figs. position, Figs. combination set up and the main-shaft rotated until main-bail is in its highest position (pull upward on bail to insure it has reached highest position).**

**Fig. 13**

(1) To adjust, reposition eccentric-screw.

3.26 Figures locking-pawl spring tension shall be Min. 3 ozs., Max. 5 ozs., when the carriage is in the Ltrs. position and the Figs. pull bar is in its operated position. Fig. 14

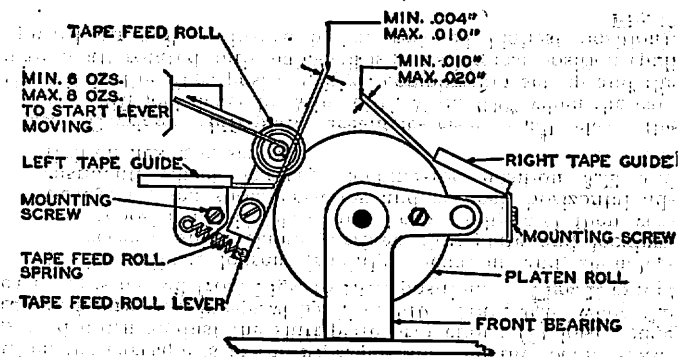


Fig. 15

3.27 Tape-guides shall be in line with each other and be so located that printing is in middle of tape, the tape-guide on left side of platen clears platen by Min. .004", Max. .010" and the tape guide on right side of platen clears the platen by Min. .010", Max. .020". Gauge by eye. This adjustment applies to both types of tape feed. Fig. 15

(a) To adjust, shift or bend guides.

3.28 Exit tape-chute, except swivel tape-chutes, shall clear left tape-guide by Min. .010", Max. .020" and be so aligned with the guide that the tape will enter easily without catching. Gauge by eye.

(a) To adjust, bend chute mounting-bracket.

3.29 Swivel tape-chute, shall clear the platen by Min. .010", Max. .020" and the chute center line shall coincide with that of the platen surface when the platen is held at the mid-point of its travel. Gauge by eye.

(a) To adjust clearance, reposition right chute-bracket; to adjust alignment reposition left chute-bracket.



3.30 **Tape feed-roll** shall be located so that both knurls rest against platen and the roller-gear engages the carriage-gear so as to drive reliably with minimum backlash. Gauge by eye.

(a) To adjust, check platen for swelling and replace if necessary.

3.31 **Tape feed-roll spring tension** shall be Min. 6 ozs., Max. 8 ozs., on pull-tape-feed typing-units, and Min. 10 ozs., Max. 14 ozs. on push-tape-feed typing units, measured at the feed-roll-shaft as the feed-roll leaves the platen. **Fig. 15**

3.32 **Shift-rocker** shall be parallel to platen-shaft. Gauge by eye. **Fig. 12**

(a) To adjust, reposition shift-rocker post.

3.33 **Carriage-return spring tension** shall be Min. 6-1/2 ozs., Max. 7-1/2 ozs. measured when the carriage is in Ltrs. position. **Fig. 12**

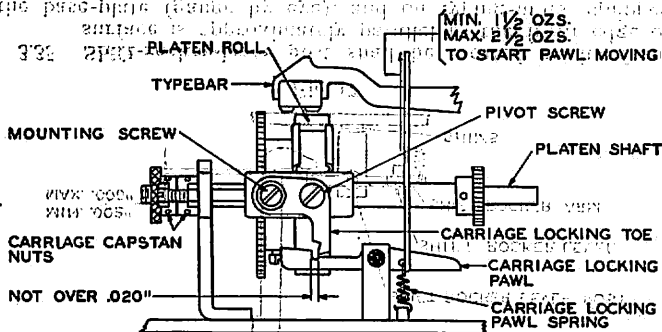


Fig. 16

3.34 **Carriage locking-pawl spring tension** shall be Min. 1-1/2 ozs., Max. 2-1/2 ozs. measured when the carriage is held back far enough to have clearance between the carriage locking-pawl and the carriage locking-toe. **Fig. 16**

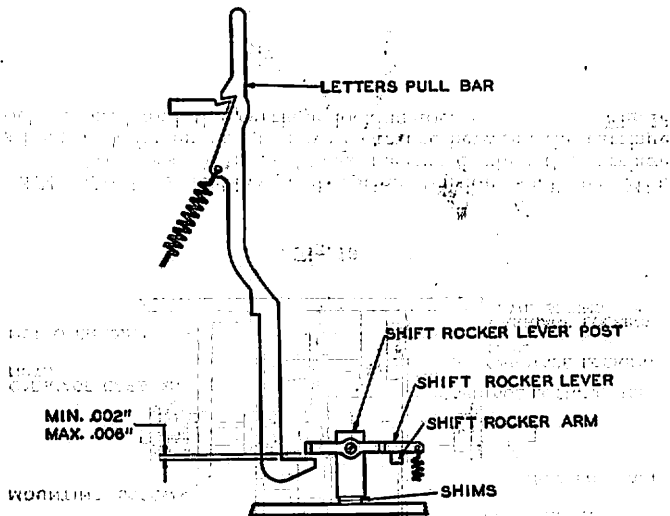


Fig. 17

3.35 **Shift-rocker-lever post** shall be located so its front surface is approximately parallel to the front edge of the base-plate (gauge by eye), and on typing-units equipped with a nonadjustable shift-rocker, so that the shift-rocker-lever clears Ltrs. pull-bar-toe by Min. .002", Max. .006", when the carriage is in the Figs. position and the Ltrs. pull-bar is just selected and about to move upward.

Fig. 17

(a) To obtain clearance, raise or lower shift-rocker-lever post by means of shims 8896M (.004") under post.

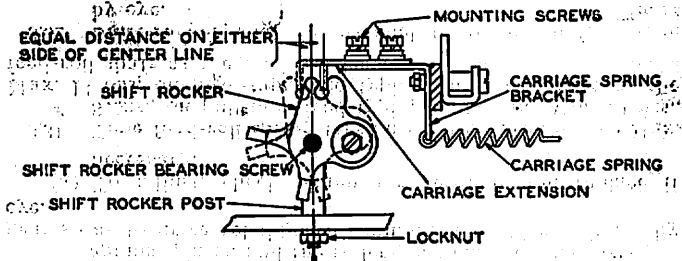


Fig. 18

3.36 **Carriage spring-bracket-toe** shall travel an equal distance on either side of a vertical line passing through the shift-rocker bearing-screw when the carriage is moved from **Ltrs.** to **Figs.** position. Gauge by eye. **Fig. 18**

(a) To adjust, reposition carriage spring-bracket-toe.

3.37 **Carriage travel adjustment.** On units equipped with an adjustable shift-rocker, the carriage locking-toe shall overtravel the locking-pawl notch by not more than .020" when **Ltrs.** combination is set up and the main-bail is in its highest position. (Pull upward on bail to insure this.) Gauge by eye. **Fig. 16**

Note: If unit is to **unshift on Space**, it shall meet the same requirement when **Space** combination is set up.

(a) To adjust, loosen shift-rocker hexagon-screw and readjust shift-rocker.

3.38 **Type-bars, and pull-bars** shall be free in their segment slots with a minimum amount of side play. Gauge by feel.

(a) To check freeness of a type-bar, move it down so that the pallet rests lightly on the platen-roll. Then, when the type-bar is released, it should return to its normal position against the type-bar back-stop. If necessary, the sides of the type-bar may be lapped on a fine stone to prevent binding in the segment slot.

(b) To remove a type-bar, remove the carriage-spring, the ribbon from the guide, and the two screws from the carriage front-bracket. Lift off the carriage assembly. Move the type-bar forward and downward until the teeth on the type-bar are disengaged from those on the pull-bar. The type-bar may then be unhooked from the fulcrum-rod and removed.

(c) To replace a type-bar, hook it over the fulcrum-rod. If the teeth are meshed properly, the type-bar will rest against the type-bar-backstop when the top of its pull-bar is in line with the other pull-bars. If the type-bar does not rest against the type-bar-backstop, move the type-bar downward again until the teeth are out of mesh and then raise the pull-bar as many teeth as is necessary to permit the type-bar to resume its correct position. Replace the carriage making sure that the bracket is against the positioning-plate, and tighten the bracket mounting-screws.

3.39 Rear capstan-nut shall clear the carriage front bearing-bracket by Min. .020", Max. .025" when the carriage is latched in the Ltrs. position. Fig. 12

(a) To adjust, reposition capstan-nuts using the 6617M tommy.

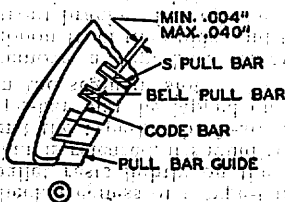
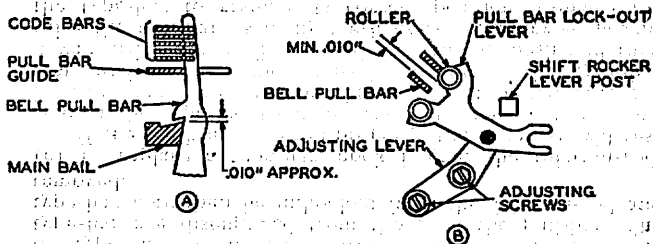


Fig. 19

3.40 Pull-bar lockout-lever shall meet the following requirements:

(a) With the platen in the Figs. position, select the Blank combinations and rotate the main-shaft until the main-bail is in its uppermost position. Adjust the pull-bar lockout-lever so that the S pull-bar clears the code-bars by Min. .004" Max. .040". With the platen in the Ltrs. position there should be Min. .004" Max. .040" between the Bell pull-bar and the code-bars. Reposition the pull-bar lockout-lever if necessary. Figs. 19C and 20C

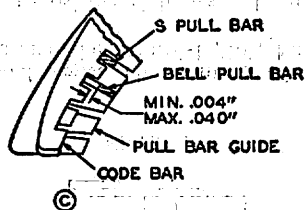
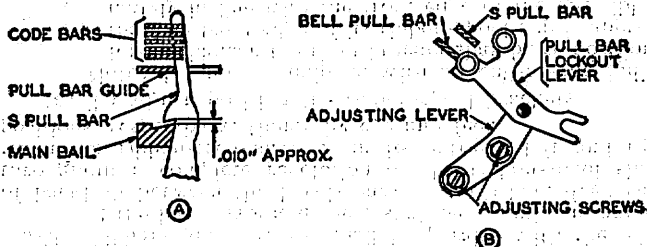
(b) Note: Substitute J for S on units arranged to ring the bell on upper case J instead of S.

(c) With the platen in the Figs. position select the Bell combination and rotate the main-shaft until the main-bail is moved to within approximately .010" from the Bell

pull-bar notch. There should be at least .010" clearance between the Bell pull-bar and the lock-out-lever roller with the play of the platen-shaft, shift-rocker and lockout-lever taken up in a direction to make this clearance a minimum. Gauge by eye.

**Figs. 19A and 19B**

**Note:** As an increase in pull-bar clearance also increases the load on the platen-shift spring, the platen-shift mechanism should be checked (manually) for correct operation.



**Fig. 20**

**3.41 Ribbon-guide** shall meet the following requirements.

(1) Clear the top of platen by Min. .040", Max. .050".

(a) To adjust, position the ribbon-guide by means of its mounting-screws.

(2) Clear the side of platen by Min. 3/16", Max. 7/32" as gauged by eye.

(a) To adjust, bend the guide.

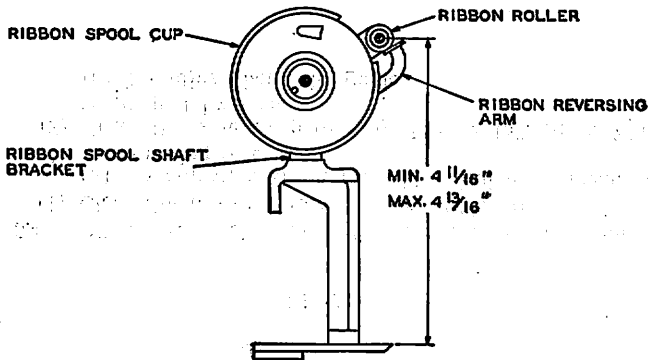


Fig. 21

3.42 **Ribbon-spool cups.** The centers of the ribbon-spool cup rollers shall be Min.  $4\frac{11}{16}$ " , Max.  $4\frac{13}{16}$ " from the base-plate. **Fig. 21**

(a) To adjust, reposition ribbon-spool cups.

3.43 **Ribbon-spool bracket** shall be parallel with the edges of the base-plate and there shall be a minimum amount of backlash between the bevel-gears on the ribbon-feed shaft throughout a complete revolution of the ribbon-spool shafts when the ribbon-feed shaft is in its extreme left and right positions, respectively. Gauge by eye and feel.

(a) To adjust, position the ribbon-spool brackets.

Note: If unit is equipped with an end-of-line indicator mechanism the right bracket shall be so positioned that the front edge of its ribbon-spool cup is approximately in line with the front edge of the left ribbon-spool cup and the gear backlash obtained by positioning the gear on right ribbon-spool shaft.

3.44 **Ribbon-spool shafts** shall have perceptible end play, but not more than .004". Gauge by eye and feel.

(a) To adjust, reposition spool-shaft gears.

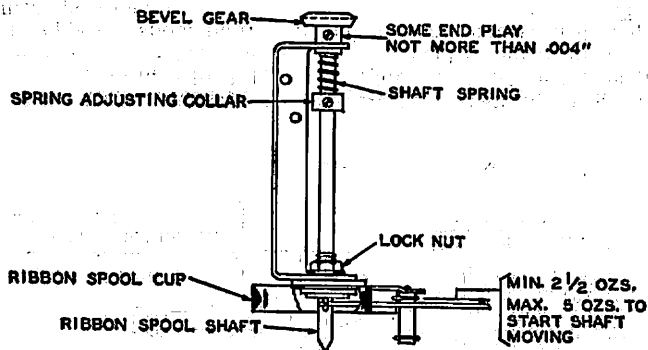


Fig. 22

3.45 **Ribbon-spool shaft springs.** The resistance to turning caused by the ribbon-spool-shaft springs shall be Min. 2-1/2 ozs., Max. 5 ozs. measured by pulling on the pin, with ribbon-feed shaft disengaged from ribbon-spool shaft. Fig. 22

(a) To adjust, move spring collar longitudinally on shaft.

3.46 **Ribbon-reverse shafts** shall (1) clear their respective ribbon-spool cups by Min. .005", Max. .025" when the reverse-arms are held against the ribbon-spool shaft-bracket so as to make the clearance a minimum and (2) have not more than .004" end play as gauged by eye and feel.

(a) To adjust clearance, reposition ribbon-reverse-arms; to adjust end play, reposition collar at rear bearing of bracket.

Note: If clearance is changed check 3.48.

3.47 **Ribbon-reverse pawl links** shall not bind on their shoulder-screws.

(a) To adjust, reposition ribbon-reverse-levers at rear end of reverse-shafts and check 3.48.

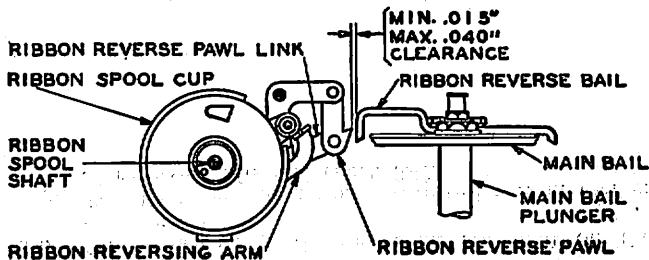


Fig. 23

3.48 Ribbon-reverse pawls shall clear the ribbon-reverse bail by Min. .015", Max. .040" when the associated ribbon-reversing arm is against its ribbon-spool cup. Fig. 23

(a) To adjust, reposition reversing-arms on their shafts and recheck 3.46.

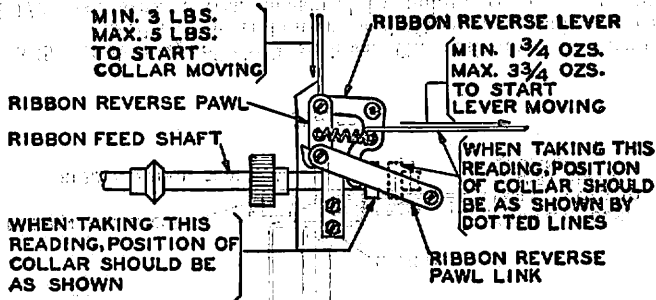


Fig. 24

3.49 Ribbon-feed-shaft safety-springs shall exert a pressure of Min. 3 lbs., Max. 5 lbs. measured on the ribbon-reverse pawls when the feed-shaft is held in engagement with the opposite spool-shaft gear and the main-bail is in its uppermost position. Fig. 24



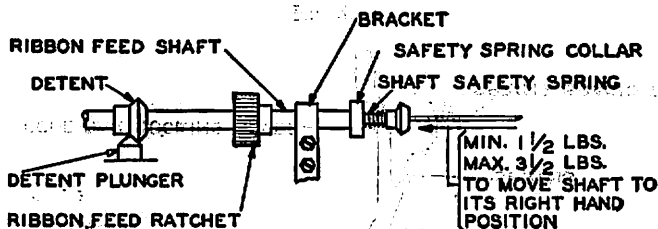


Fig. 25

3.50 Ribbon-feed-shaft detent-plunger shall press against the detent so that it requires a force of Min. 1-1/2 lbs., Max. 3-1/2 lbs. to push the detent over the plunger when the ribbon-feed and check-pawls are held clear of the ratchet.

Fig. 25

3.51 Ribbon-check-pawl (top end) shall clear the pull-bar guide by Min. 3/64", Max. 5/64" gauged by eye.

(a) To adjust, reposition check-pawl.

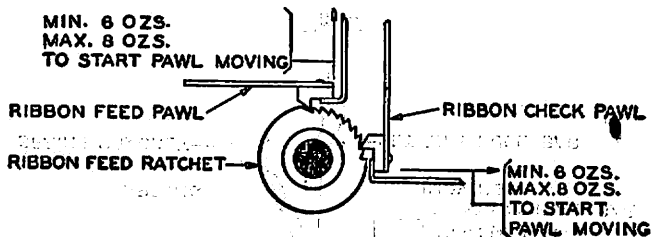


Fig. 26

3.52 Ribbon-check-pawl spring tension shall be Min. 6 ozs., Max. 8 ozs.

Fig. 26

(a) To adjust, bend spring.

3.53 Ribbon-feed-pawl position shall be such that the ratchet will be moved one or two teeth for each operation of the main-bail.

(a) To adjust, position the ribbon-feed-pawl by means of its mounting-screw.

3.54 Ribbon-feed-pawl spring tension shall be Min. 6 ozs., Max. 8 ozs.

Fig. 26

(a) To adjust, bend spring.

3.55 Ribbon-reverse-pawl spring tension shall be Min. 1-3/4 ozs., Max. 3-3/4 ozs., with ribbon-feed-shaft-collar moved away from ribbon-reverse-lever as shown dotted. Fig. 24

3.56 Ribbon-spools shall be tight on their shaft so as not to slide off.

(a) To adjust, spread slot in end of shaft.

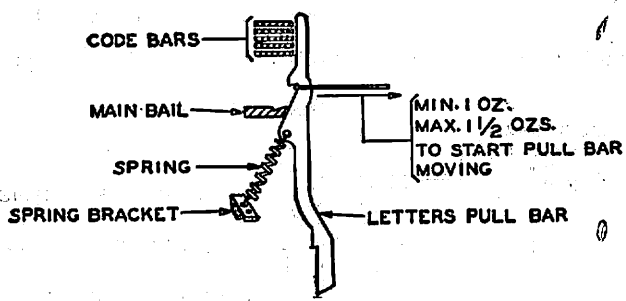


Fig. 27

3.57 "Ltrs" pull-bar spring tension shall be Min. 1 oz., Max. 1-1/2 ozs., measured when the main-bail is in the "down" position. Fig. 27

(a) To adjust, reposition spring-bracket.

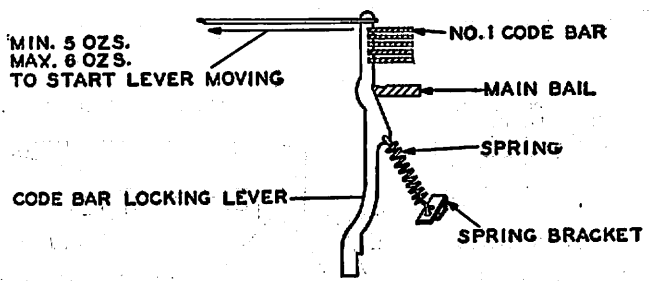
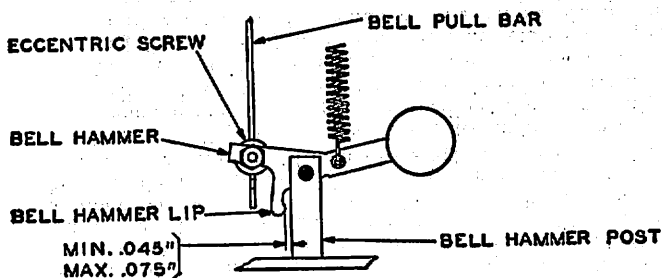


Fig. 28

3.58 **Code-bar lock-lever spring tension** shall be Min. 5 ozs., Max. 6 ozs., measured when main-bail is in the extreme upward position. **Fig. 28**

(a) To adjust, reposition spring-bracket.



**Fig. 29**

3.59 **Signal-bell hammer lip** shall clear bell-hammer post by Min. .045", Max. .075", when the platen is in **Figs.** position and the bell selection has been set up and motor rotated by hand and bail lifted by hand until bell pull-bar has reached its uppermost position. End of bell pull-bar-toe shall be in alignment with outer side of eccentric on bell-hammer. Gauge **Fig. 29** by eye.

(a) To adjust clearance, reposition eccentric-screw. To adjust alignment, reposition bell-hammer post.

3.60 **Signal-bell** should be positioned so as to obtain the most satisfactory tone. It should also be positioned to provide at least .010" clearance between the bell and all brackets and screws, and at least .004" between the bell and the tape-chute or platform.

(a) Adjust by means of its mounting-screw.

MAIN BAIL ROLLER  
 HELD AWAY

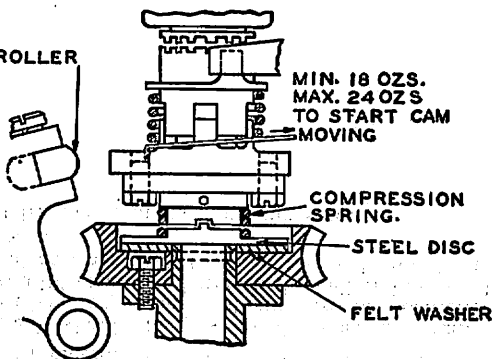


Fig. 30

3.61 **Main-Bail-Cam Friction-Clutch Torque:** After motor has been run for at least 10 minutes a pull of Min. 18 ozs., Max. 24 ozs. applied to main-bail-cam, perpendicular to radius, shall move cam in a direction opposite normal rotation when motor is running, selector-magnet is operated and main-bail-roller is held away from its cam. **Fig. 30**

Note: This measurement requires considerable care, and need be checked only when it is thought that cam is not being brought up to speed as the clutch engages.

(a) To check, remove tape-reel and gear-guard, hold main-bail-roller away from cam by pressing upon lid of oil cup at top of the main-bail-plunger, block magnet-armature in operated position so that main-clutch will not engage; hook scale into screw hole and pull in direction reverse to normal rotation until cam just starts to move. **Fig. 30**

Note: Pulling too far will tend to make main-clutch engage and give a greater reading, therefore only a slight backward motion of cam should be given.

Caution: It is important to keep clutch stop-arm against driven-jaw to prevent main-clutch engaging and winding scale around main-shaft so either keep armature operated to avoid tripping clutch stop-arm, or block or clamp clutch stop-arm so that main-clutch cannot engage.

(b) To adjust, replace compression-spring, steel-disc and felt-washer of clutch. If torque is too high, lubricate clutch and recheck before replacing parts.

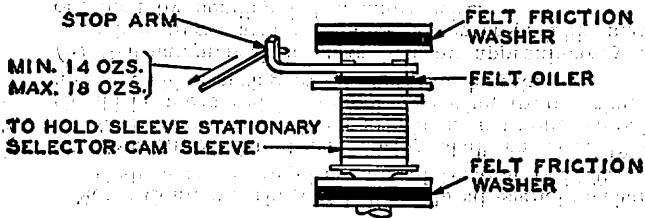


Fig. 31

**3.62 Selector-Clutch Torque:** After clutch has been freshly lubricated and motor has been run for at least 10 minutes a pull of Min. 14 ozs., Max. 18 ozs. applied tangentially to the selector stop-arm, when the motor is running, shall hold the selector cam-sleeve from rotating when the selector stop-arm is held just clear of its stop.

Fig. 31

(a) To adjust, replace felt friction-washers, add spring adjusting-washers, replace spring or, on units equipped with 119541M adjustable capstan-nut, readjust nut.

Note: Replacing the felt washers will usually be satisfactory since the spring holds its adjustment over long periods. Before replacing spring, consideration should be given to the addition of washer-shims 96763M (.012"), 96764M (.016") or 96765M (.020") around the shoulder of the 72515M nut at the end of the spring nearest the bearing.

(1) To replace felt washers; remove range-finder assembly, detach locking-lever spring and remove retaining-disc noting that it has a left-hand thread and unscrews to right (clockwise); remove outer felt-washer, cam-sleeve assembly, cam-sleeve disc, and inner felt-washer, holding selector-levers away from shaft and rotating cam-sleeve disc until notch in its edge registers with points of selector-levers. Replace the felt washers with new washers that have been lubricated with oil.

(2) To remove friction-clutch spring on holding-magnet units proceed as in (1), then loosen top and bottom shaft bearing-brackets and position main-shaft downward and remove clutch driving-disc and spring. After replacement of parts recheck 3.01 and 3.02.

**Caution:** The following adjustment should not be made without first attempting to meet clutch torque requirements by replacing clutch-washers as directed in (1).

(3) On units equipped with adjustable, clutch-spring parts (119541M) the tension may be adjusted to compensate for variations in spring tension. This can be done by turning the capstan-nut with the blade of a 3" screwdriver. Turning the nut in a counter-clockwise direction, as viewed from the top end of shaft, increases the tension.

**3.63 Remote signal-bell contacts on typing units so equipped shall meet the following requirements:**

(a) Contact-lever shall fully engage the heel of the bell pull-bar and clear its side by at least .010" when the Bell combination is set up and the motor has been rotated by hand until the pull-bar bail is in its extreme upper position. Gauge by eye.

(1) To adjust, reposition contact-bracket.

(b) Contact-lever shall clear the insulator on the upper contact-spring by not more than .006" when the contact-lever is held against the bell pull-bar after the motor has been rotated by hand until the pull-bar bail is in its extreme lower position.

(1) To adjust, bend upper contact-spring.

(c) Contact-gap shall be Min. .025", Max. .030" when contact-lever is held clear of the upper contact-spring, and it shall require Min. 1-1/2 ozs., Max. 2 ozs. pressure at the end of the lower contact-spring to move the spring from its stiffener.

(1) Gauge gap by eye and tension by feel.

(2) To adjust gap, bend stiffener; to adjust tension bend spring.

Note: It may be necessary to remove contact assembly to make this adjustment, in which case contact adjustments may be checked before reassembling in typing-unit.

**3.64 Bell and break signal mechanism on units so equipped shall meet the following requirements:**

Note: Contact springs of bell and break-signal mechanism shall meet the requirements of Section P35.620.

(a) Tension of detent-arm spring shall be Min. 18 ozs., Max. 22 ozs. when finger-arm is against upper stop. This should be measured by unhooking spring from spring-post and stretching spring to its operating length.

(b) Bell-hammer shall clear bell by approximately .010" when finger-arm is against lower stop. This may be obtained by bending bell-hammer wire.

(c) When assembled on a standard 14 teletypewriter base the contact-arm shall clear ends of contact-spring covers by at least .020" with play in contact-arm taken up in a direction to make this clearance minimum.

(1) Gauge clearances by eye.

3.65 **Upper case blank contact mechanism 86563M** on typing-units so equipped shall meet the following requirements:

(a) Bracket assembly and contacts shall be adjusted in accordance with 3.63.

(b) Blank-pull-bar projection shall clear all edges of blank-pull-bar lever by at least .030" when the carriage is in the **Ltrs. position**. Gauge by eye.

(1) To adjust, bend blank-pull-bar lever.

3.66 **Mechanical end-of-line indicator 87593M** on typing-units so equipped shall meet the following requirements:

(a) Worm-shaft shall not bind but shall have just perceptible end play. Gauge by eye and feel.

(1) To adjust, unfasten shaft-spring from contact-bracket, loosen collar set-screw and reposition collar.

(b) Worm-shaft spring shall have sufficient drag to eliminate back-lash of the worm-shaft.

(c) Front lamp contact-spring shall press against its stiffener with a pressure of Min. 3 ozs., Max. 4 ozs. measured by pushing perpendicular to the spring at the contact-point when the contacts are in the unoperated position.

(1) To adjust, remove spring from pileup and bend it.

(d) Rear lamp contact-spring shall clear the front spring-contact by Min. .015", Max. .025" when the front spring is resting against its stiffener.

(1) To adjust, bend rear spring.

(e) Front lamp contact-spring shall clear the lower edge of its stiffener by Min. .010", Max. .020" when the worm-follower rests in the groove at the end of the worm.

(1) To adjust, reposition contact-bracket.

(f) Worm-follower bail shall not bind, shall have just perceptible end play and shall close the lamp contacts when Min. 62 characters, Max. 66 characters have been received.

(1) To adjust, reposition collar and recheck (e).

- (g) Worm-follower spring tension shall be Min. 1-1/2 ozs., Max. 3-1/2 ozs., measured by pulling parallel to the spring at the end of the worm-follower as the follower comes in contact with the rear contact-spring, holding the bail so that the follower-pin clears the worm.
- (h) Release-bail spring tension shall be Min. 7 ozs., Max. 11 ozs., measured by pulling vertically upward at the edge of the release-bail near the spring-hole as the bail starts to move from its unoperated position.
- (i) Feed-pawl spring tension shall be Min. 3 ozs., Max. 5-1/2 ozs., measured by pulling in line with the spring at the spring-hole near the end of the feed-pawl as the pawl starts to move, when the feed-lever roller is on the high part of its cam.
- (j) Cam-lever spring tension shall be Min. 28 ozs., Max. 38 ozs., measured on the feed-lever at the spring-hole as the lever starts to move when the feed-lever roller is on the low part of its cam.

**3.67 Mail-Bail Spring:** Typing-units shall type characters without embossing the back of the copy of single copy work or the last copy of multiple copy work except that embossing of punctuation marks is permissible.

Note: On typing-units operated at 75 speed it may be necessary to increase this tension to minimize irregular spacing. On some machines it will not be possible to get even spacing at this speed.

- (a) To adjust, back off main-bail spring adjusting-screw counterclockwise, with typing-unit running, until machine fails to type, then turn adjusting-screw clockwise until satisfactory copy is obtained.
- 3.68 Platens** which are cracked, broken or badly pitted by type shall be replaced by new or repaired platens.
- 3.69 Alignment of Type:** Character (upper and lower case) shall type evenly on all sides and appear vertical, centrally spaced, and not noticeably out of line horizontally with respect to letter "N".
- Note: The "N" type-bar and pallet on each typing-unit is aligned at the factory to serve as a master for use in aligning other type-bars and pallets.
- (a) To check, type a series of characters between the letter "N" as NANBNCN, etc. In case of doubt on any character, type character at least 6 times between two letter "N's".



(b) To adjust proceed as described below. If many require adjusting check position of "N" type-pallet with other type and reposition "N" so as to make minimum readjustment of other pallets.

(c) If type requires raising or lowering an appreciable amount (more than a few thousands of an inch) type-pallet should be unsoldered. To do this, pull type-bar forward slightly and place a small block behind it to hold it forward from other bars. Then heat type-pallet with an electric soldering copper until solder just begins to melt. Take soldering copper away and move pallet up or down slightly as required. After solder has reset, remove block and let type-bar return to normal position, but do not use it for printing until solder is thoroughly set. For very small vertical adjustments a peener (78586M) may be used to squeeze type-bar slightly in the crook just below type-pallet. Peening inside of crook lowers characters and peening outside raises them.

(d) To straighten type so sides of letter will be vertical and upper case character will print properly when compared with lower case character, hold type-bar at top of its straight shank with parallel jaw pliers (78590M) and grasping top of bar with short nose pliers, correct bend in bar to right or left as required. If any type prints with improper spacing from "N", and if one side of character prints heavier than other side, hold type-bar as above and twist top of bar slightly in a direction to correct fault. Three-pronged pliers (78589M) may be used to bend type-bar to secure this adjustment where twisting will not answer or where some bending is required to make type-bars lie properly spaced when against leather stop. If any part of a character prints faintly after above alignment has been completed use double cutter (78587M) to cut into type-pallet just back of low part of type so as to raise low portion.

(e) After finishing type alignment, a piece of cardboard should be placed on platen and pallets which were unsoldered should be moved down against cardboard and have their slots refilled with solder where required, using a small brush to remove excess solder.

Note: While these adjustments may be made with standard repairman's tools, the adjustments can be more readily accomplished using tools referred to. These tools are not usually included in the repairman's tool kit.

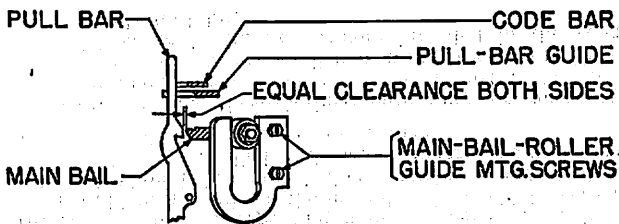


Fig. 32

3.70 Main-bail on units equipped with roller-guides shall not bind throughout its entire travel.

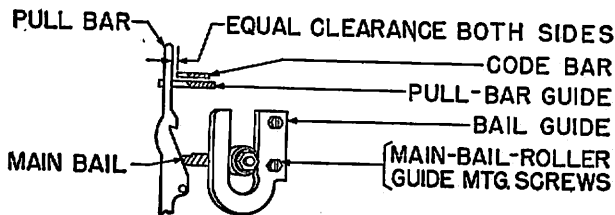
(a) To check, rotate main-shaft until the main-bail is in its highest position. Swing motor out of the way and remove ribbon-feed-lever spring and main-bail spring allowing bail to drop. Block all pull-bars out of the path of the main-bail. (A convenient way to do this is to place a length of rosin core wire solder between the pull-bars and code-bars.) Then with a finger under the main-bail lever raise the main-bail slowly to its highest position and release. There should be no evidence of bind on the upward travel and the bail should fall freely of its own weight to its lowest position when released.

(b) To adjust, restore spring and so position the pull-bar-guide that its mounting-screws are in the middle of the elongated-slots, then loosen the mounting-screws of both main-bail roller-guides. (1) With the blank combination set up and the main-bail opposite the unselected pull-bar-humps, shift the right roller-guide to obtain the same clearance between the main-bail and the Ltrs. and Figs. pull-bar-humps. Tighten the right roller-guide mounting-screw friction tight. (2) With the main-bail in its lowest position, adjust the main-bail adjusting-screw to give some clearance between pull-bars and code-bars. Shift the right roller-guide around its friction tight top mounting-screw to obtain approximately the same clearance between the code-bars and Ltrs. and Figs. pull-bars. Tighten the right roller-guide bottom mounting-screw friction tight and recheck (1). Then fully tighten both right roller-guide mounting-screws after making any necessary readjustments. Position

left roller-guide so that check conditions covered in (a) are met and then tighten both of its mounting-screws.

**Figs. 32 and 33**

Note: If this adjustment is made check 3.15, 3.16 and 3.40.



**Fig. 33**

(a) left roller-guide so that check conditions covered in (a) are met and then tighten both of its mounting-screws. Fig. 32 and 33  
 Note: If this adjustment is made check 315, 316 and 340.

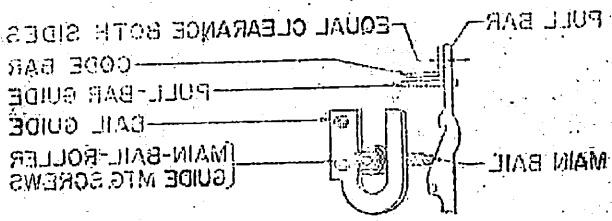


Fig. 33

BLANK PAGE

**BELL SYSTEM PRACTICES ADDENDUM P35.631**  
**Teletypewriter and Manual Issue 2, August, 1949**  
**Telegraph Station and P.B.X. AT&T Co Standard**  
**Installation and Maintenance**

**14 TAPE-TYPE  
TRANSMITTER-DISTRIBUTOR  
REQUIREMENTS AND PROCEDURES**

**1. GENERAL**

- 1.01 This addendum supplements Section P35.631, Issue 5.  
1.02 It is issued to add requirements and procedures for the stop magnet and stop magnet contacts for the 14BD and 14BE Transmitter-Distributors.  
1.03 Issue 2 of this addendum in addition provides new information for adjusting spacing-contact gaps and spring pressures in the 14W Transmitter-Distributor, when use is made of the upper contacts in the electrical circuit.  
1.04 The changes which this addendum makes in the paragraphs of Section P35.631, Issue 5, are tabulated below:

<u>Addendum P35.631 Issue 2</u>		<u>Section P35.631 Issue 5</u>
<u>New Section Title</u>	Replaces	<u>Old Title</u>
Par. 1.05	Replaces	Par. 1.05
Note	Replaces existing note preceding	Par. 4.03
Note	Addition just before	Par. 4.03
Par. 4.03 and (a)	Replaces	Par. 4.03 and (a)
Note	Remove existing note following	Par. 4.03
Par. 4.03 (b)	Addition to follow	Par. 4.03 (a)

**Addendum  
P35631  
Issue 2**

**Section  
P35631  
Issue 5**

Par. 4.07	Replaces	Par. 4.07
Note	Addition to follow	Par. 4.07
Par. 4.07A to	Addition to follow new	Par. 4.07
Par. 4.07E	note following	Par. 4.07
Par. 4.14	Replaces	Par. 4.14
Note under		Note under
Par. 4.15(a)	Replaces	Par. 4.15(a)
Par. 4.26A	Addition to follow	Par. 4.26
Par. 4.27A	Addition to follow	Par. 4.27
Par. 4.30	Replaces	Par. 4.30
Par. 4.31	Replaces	Par. 4.31
Par. 4.32	Replaces	Par. 4.32
Par. 4.32A	Addition to follow	Par. 4.32
Par. 4.50	Replaces	Par. 4.50
Fig. 5 (Revised)	Replaces	Fig. 5
Fig. 22	Add to section	

**2. ADDED AND REPLACING PARAGRAPHS**

2.01 The paragraphs given below are written so they can be added directly to the existing text of Section P35631, Issue 5, May 1948, in the locations indicated by the Table in Paragraph 1.04 of this Addendum.

**Added and Replacing Paragraphs**

1.05 (Replaces) **Auxiliary Features:** The following features have been incorporated in certain new-style transmitter-distributors and may be found also on modified old-style transmitter-distributors:

- TP83844 Set of Parts for a-c governor spark protection, 20-ohm resistor and contacts. (4.07, 4.49, Fig. 18)
- TP84593 Set of Parts for closing a contact during the stop pulse. (4.56-4.59)
- TP106916 Tape-Stop Magnet and Feed Lever Set of Parts. Auxiliary magnet to stop tape feed and permit brush-arm to rotate. (This includes the TP97460 Tape-Stop Magnet.) (4.60-4.63)
- TP101389 Set of Parts for chadless tape. (4.17, 4.20, 4.21, 4.26, 4.28, 4.31)
- TP101481 Set of Tape-Out Mechanism Parts. (4.40-4.45)

TP102520 Tape-Stop Rod (with crook in end). (4.37)

TP104720 Tape-Stop Assembly (delayed start). (4.38, 4.39)

Stop-start mechanism in which a pivoted stop arm is held latched in the stop position by the armature extension. (4.08, 4.11)

Note: (Replaces existing note just preceding Par. 4.03).

4.03-4.07 cover requirements for the stopping and starting mechanism in which the stop arm is an extension of the magnet armature.

Note: (Added just preceding Par. 4.03.) Requirement 4.03 applies only to units equipped with the new style single-core universal stop magnet.

4.08 (Replaces) Stop-Magnet yoke ends clear the armature by approximately the same amount and by Min. .010", Max. .020" when the armature is held in its operated position (against the core, either manually or electrically).

Note: (Delete existing note following Par. 4.03.)

(a) (Replaces) To adjust for equal clearance ("A" and "B" in Fig. 2 equal), use TP8896 shims between the magnet bracket and the top and bottom of the yoke. Fig. 2

(b) (Add) to adjust the armature-yoke gap ("A" and "B" of Fig. 2) for Min. .010", Max. .020", use TP8896 shims between the magnet core and the magnet yoke. Fig. 2

4.07 (Replaces) Stop-arm spring tension on machines equipped with the TP83844 set of parts (stop-arm contact assembly near the cam end of the stop-arm—See Fig. 18 for location of parts), shall be minimum 2-3/4 oz., maximum 3-3/4 oz., measured as in Fig. 5, Item (B). The contact spring shall be held away from the stop-arm when this tension is measured. Figs. 5 & 18

(a) To adjust, replace stop-arm spring with TP10581 spring.

Note: (Add) The requirements of 4.07A through 4.07E apply to the 14BD and 14BE Transmitter-Distributors. These machines are equipped with a 925-ohm, 115-volt d-c stop magnet and a stop magnet contact located directly above the stop magnet. The contact is actuated by the magnet armature.

4.07A (Add) Stop-arm spring tension on machines equipped with the TP118842 contact assembly (stop-

magnet contact located directly above the magnet. See Fig. 22 for location of parts) shall be Min. 5 oz, Max. 7 oz, regardless of the type of motor used. Measure as indicated in Fig. 5, holding off the long contact spring. On units having a-c governed motors with the TP83844 sets of parts, the contact spring of that assembly should also be held away from the stop arm during the measurement of stop-arm spring tension. Figs. 5 & 22

4.07B (Add) Contact springs and stop spring shall be in line and vertical to the base casting. Gauge by eye.

Fig. 22

(a) To adjust, loosen the spring-assembly mounting screws and move the springs into proper position. Tighten the mounting screws.

4.07C (Add) Short Contact Spring: With the armature held against the magnet core, the short contact spring shall bear against the stop spring with perceptible pressure.

(a) To adjust, bend the short contact spring.

4.07D (Add) Long Contact Spring: It shall require Min. 1 oz, Max. 1-1/2 oz to break the contact, with the armature held against the magnet core and an 8 oz scale hooked over the contact spring at the contact point, pulling at a right angle to the spring. Fig. 22

(a) To adjust, bend the long contact spring.

4.07E (Add) Contact gap shall be Min. .015", Max. .020", with the stop arm on the low part of the stop cam (armature released). When the armature is held against the magnet core there shall be some clearance between the insulator and the long contact spring and the armature.

(a) To adjust, loosen the upper bracket mounting screws and move the upper contact bracket into the proper position. Tighten the mounting screws. It may also be necessary to bend the contact springs.

4.14 (Replaces) Feed wheel shaft shall be free in its bearings with minimum end-play when detent is held away from the ratchet.

Note: (Replaces Note following Par. 4.15(a).) If, when the tape-retaining lid is latched, contact between the retaining lid and the front raised portion of the tape guide is made only at one end of the lid, it may have been bent and should either be straightened or replaced.

4.26A (Add) Tape pins on the 14W Transmitter-Distributor shall be .020" below a straight edge placed across the



top edges of the tape-guide channel when the retaining lid is raised and the operating-lever roller is on the low part of its cam. Fig. 12

(a) This requirement is met when a .020" wire gauge rubs lightly between the top of the pin and the straight edge. Tolerance to .025" is not permitted for these transmitter-distributors.

(b) To adjust, reposition lower (marking) contact screws.

4.27A (Add) For 14W Transmitter-Distributor the contact tongues shall clear the associated upper (spacing) contact screws by .006" when the operating-lever roller is on the low part of its cam. This requirement is met if a slight drag is felt when a .006" gauge is introduced. In checking this requirement, the gauge should be removed from the nest and care must be exercised to insure that the gauge is held parallel to the contact surfaces. Tolerance to .008" is not permitted for these transmitter-distributors. Fig. 12

(a) To adjust, reposition upper (spacing) contact screws.

4.30 (Replaces) Contact-lever springs on units equipped with a retaining-lid plate having individual holes to clear tape pins shall have a tension of Min. 3 oz, Max. 4 oz, measured as in Fig. 12 at (A), without tape, as the lower (marking) contacts break, with the operating-lever roller on the low part of its cam. Gauge lower-contact break with lamp, buzzer or ohmmeter. Fig. 12

(b) To adjust, reposition contact-lever spring anchors.

4.31 (Replaces) Contact-lever springs on units equipped with a retaining-lid plate having either 2 or 5 slots to clear tape pins shall have a tension of Min. 6 oz, Max. 7 oz, measured as in Fig. 12, Item (B), as the lower (marking) contacts break, with the operating lever on the low part of its cam. Gauge lower-contact break with lamp, buzzer or ohmmeter. Fig. 12

(a) To adjust, reposition contact-lever spring anchors.

4.32 (Replaces) The amount of pull, applied as in Fig. 12, required to break the circuit through the lower contacts shall not differ by more than 3/4 oz from the pull which just permits the lower contacts to make. Fig. 12

(a) To adjust, remove the contact lever, clean lever and guide slot, and if necessary stone down burrs on lever and in guide slot. If bind has not been removed, replace the contact lever by a new one. Check alignment of contact-lever spring, and if it is sufficiently out of line

with the plane of the contact lever to cause a side pull so that the lever binds in its slot; resolder the spring, taking care not to damage the spring or the terminal block by too much heat. Replace contact lever and check adjustments 425 to 431, incl and 432, if applicable.

4.32A. (Add) For the 14W Transmitter-Distributor it shall require minimum 40 grams, maximum 75 grams pressure applied with the 68B gauge at the end of the contact tongue adjacent to the contact to break a circuit through the upper (spacing) contacts when the operating-lever roller is on the low part of the operating cam and blank tape is in place in the transmitter. Gauge upper (spacing) contact break with lamp, buzzer or ohmmeter.

Fig. 11

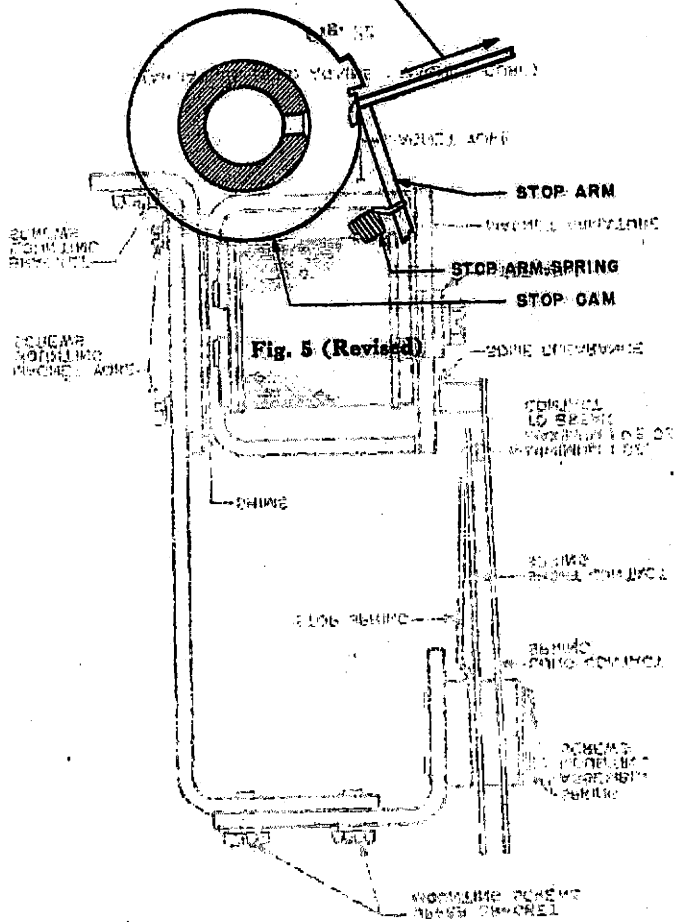
(a) If the minimum requirement is not met, adjust as follows: Loosen the two screws holding the insulating strip to which the contact-lever spring anchors are fastened. Remove one screw and insert between the fibre strip and its mounting, two washers (TP7002). Replace this screw and repeat with the screw at the other end of the strip. The displacement of the insulating strip obtained by the use of these washers as shims tends to increase the spring tension and hence the contact pressure and may raise the pressure sufficiently.

(b) If the shimming of the insulating strip does not increase the upper (spacing) contact pressure sufficiently, special attention may need to be given to the soldering of the contact-lever springs to the back end of the contact tongues. Referring to Fig. 12, the contact-lever spring is shown slanted. This is proper when the contact-lever spring anchor is held in place by its terminal screw. With the contact-lever assembly removed from the unit, however, the upper end of the spring should be soldered in such a way that the spring is at right angles to the surface of the spring-anchor end of the contact tongue and hence would be vertical if the contact tongue were held in a position corresponding to Fig. 12. Then when the parts are assembled and the contact-lever spring is anchored in place, the pull to the left tends to rotate the tongue in a clockwise direction and to increase the upper (spacing) contact pressure.

Fig. 12

4.50 (Replaces) Motor and governor shall conform to the requirements of Section P32.004, covering 15-type teletypewriter motor units, except the requirement on motor position and speed, which shall be as specified in 4.01 and 4.52 of this section, and except the governor-speed adjusting-bracket requirement which shall be disregarded.

PULL TO START ARM MOVING:  
 (A) 5 TO 7 OZS. WITH 55689M  
 SPRING.  
 (B) 2 3/4 TO 3 3/4 OZS. WITH  
 80581M SPRING.



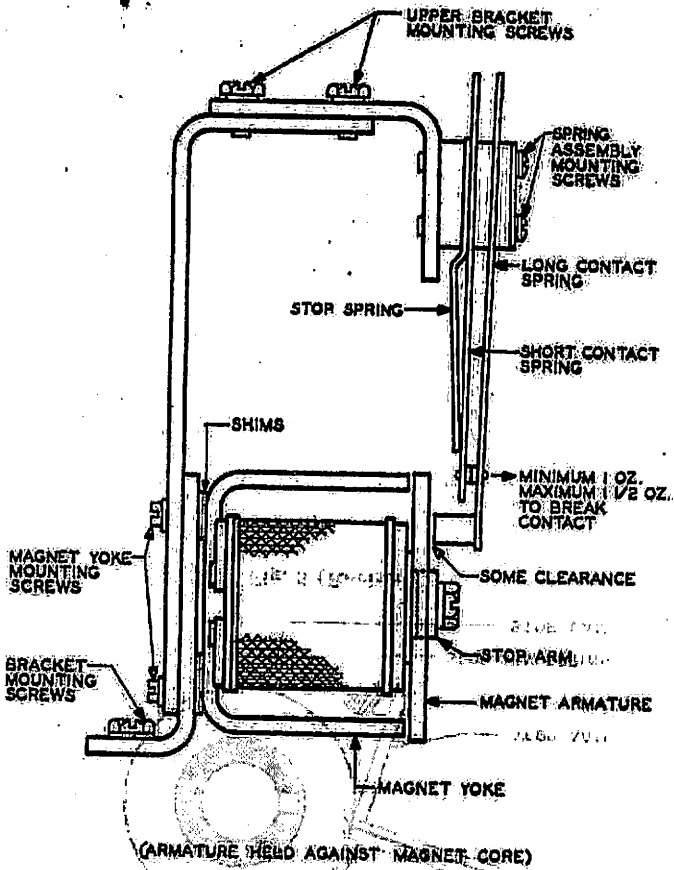


Fig. 22

100% ...  
 200 ...  
 300 ...  
 400 ...  
 500 ...  
 600 ...  
 700 ...  
 800 ...  
 900 ...  
 1000 ...

**BELL SYSTEM PRACTICES**  
Teletypewriter and Manual  
Telegraph Station and P.B.X.  
Installation and Maintenance

**SECTION P35.631**  
Issue 5, May, 1948  
AT&T Co Standard

## **TRANSMITTER-DISTRIBUTOR NO. 14—STATION TYPE REQUIREMENTS AND PROCEDURES**

### **1. GENERAL**

1.01 This section contains the apparatus requirements and adjusting procedures for the maintenance of No. 14 type station teletypewriter transmitter-distributors. Test message transmitter-distributors are covered in a section of the "A" series of the Bell System Practices.

1.02 This section is reissued to remove the information on woven wire brushes and to add or revise the requirements and procedures marked with the arrows.

1.03 The following shall be observed in applying requirements and procedures:

- (a) Use appropriate gauges for dimensional measurements.
- (b) Use the following scales for tension measurements, as the tension values specified are in most cases not absolute values but readings to be obtained on these scales when used in the positions described.

**Note:** The off-zero no-load readings of the 138-55M and 138-58M scales, when held in certain positions, should be disregarded. These off-zero values are compensated for in the limits specified.

<u>Scale</u>	<u>Tension Range</u>
68B or 70D	20 to 25 grams (for 4.43 only)
138-55M	8 ozs. or less
138-58M	8 ozs. to 32 ozs.

- (c) Before readjusting a part, loosen locking device (clamping screw, lock nut, etc.). Reset locking device after adjustment is completed.

- (d) After readjusting a part, check adjustment of related parts which may have been disturbed.
- (e) Parts dismantled to facilitate checking or readjustment shall be reassembled after operation is completed.
- (f) Springs which are outside tension limits specified and for which no adjustment is provided shall be replaced.
- (g) All contacts shall meet squarely and contact points shall fall wholly within the circumference of the opposing contact except contacts having same diameter, whose centers shall not be out of alignment more than 25 per cent. of their diameter.
- (h) Names of parts as used in this section are in some cases not the same as those used in the parts bulletin. For ordering use only the parts bulletin names.

1.04 Table of Contents	Paragraphs
GENERAL .....	1.01-1.05
CLEANING .....	2.01
LUBRICATION .....	3.01
REQUIREMENTS AND PROCEDURE	
A-C Operation of Stop Magnet .....	4.04
Armature Air Gap .....	4.03, 4.60
Armature Pivot Shaft .....	4.11
Armature Spring Tension .....	4.06, 4.07, 4.61
Auto-Stop Contact Springs .....	4.34
Auto-Stop Lever .....	4.36, 4.37
Auto-Stop Lever Spring .....	4.35
Auxiliary Contacts .....	4.56, 4.59
Auxiliary Contact Gap .....	4.58
Auxiliary Contact Spring .....	4.59
Blocking Plate .....	4.62
Carbon Brushes .....	4.46
Clutch Lever Pivot .....	4.08
Clutch Lever Spring .....	4.10
Contact Lever .....	4.32
Contact Lever Springs .....	4.29, 4.30, 4.31
Contact Screws .....	4.25-4.27
Contact Springs .....	4.55
Contact Tongues .....	4.25
Detent Lever Spring .....	4.13
Distributor Segments .....	4.44
Distributor Segment Lacquer .....	4.45
End of Tape Stop Contacts .....	4.40-4.43
External Circuit Control (Auxiliary Contacts) .....	4.56-4.59

## Table of Contents (Cont'd)

	Paragraphs
Feed Lever Adjusting Screw .....	4.22
Feed Lever Spring .....	4.33
Feed Lever Stop .....	4.28
Feed Pawl .....	4.22, 4.23
Feed Pawl Spring .....	4.12
Feed Wheel Detent .....	4.20
Feed Wheel Shaft .....	4.14
Governor .....	4.50
Governor Guard .....	4.51
Governor Spark Protection Contacts ..	4.59
Magnet Bracket .....	4.09, 4.63
Main Shaft Clutch .....	4.48
Main Shaft Position .....	4.02
Motor .....	4.50
Motor Pinion .....	4.01
Mounting Plate Slip Connections .....	4.53-4.55
Operating Cam .....	4.02, 4.47
Operating Lever Adjusting Screw .....	4.23
Retaining Lid Latch .....	4.15
Retaining Lid Latch Spring .....	4.18
Retaining Lid Plate .....	4.16, 4.17, 4.21
Slip Connection Contacts .....	4.53
Speed .....	4.52
Stop Arm .....	4.04, 4.05
Stop Arm Contacts .....	4.49
Stop Arm Spring .....	4.06, 4.07
Stop Magnet Yoke .....	4.03, 4.09
Tape Guide .....	4.10
Tape Pins .....	4.26
Tape Space .....	4.16, 4.17, 4.21
Tape Stop Magnet .....	4.03, 4.60-4.63
Tape Stop Pin .....	4.40-4.43
Tape Stop Pin Guide .....	4.40
Tape Stop Rod .....	4.38, 4.39
Tape Transmitter Contacts .....	4.24
Variable Features .....	1.05

1.05 **Variable Features.** The following features have been incorporated in certain new style transmitter-distributors and may be found also on modified old style transmitter-distributors:

83844M Set of Parts for a-c governor spark protection, 20 ohm resistor and contacts (4.07, 4.49, Fig. 18)

84593M Set of Parts for closing a contact during the "stop pulse" (4.56-4.59)

- 106916 Tape Stop Magnet and Feed Lever Set of Parts. Auxiliary magnet to stop tape feed and permit brush arm to rotate. (This includes the 97460M Tape Stop Magnet.) (4.60-4.63)
  - 101389M Set of Parts for chadless tape (4.17, 4.20, 4.21, 4.26, 4.28, 4.31)
  - 10148M Set of Tape-Out Mechanism Parts (4.40-4.43)
  - 102520M Tape Stop Rod (with crook in end) (4.37)
  - 104720M Tape Stop Assembly (delayed start) (4.38, 4.39)
- Stop-start mechanism in which a pivoted stop arm is held latched in the stop position by the armature extension (4.08-4.11)

## 2. CLEANING

- 2.01 Transmitter-distributors shall be cleaned in accordance with Sections P30.010 and P35.542.

**Caution:** Cleaning shall be performed only when motor is at rest.

## 3. LUBRICATION

- 3.01 Transmitter-distributors shall be lubricated in accordance with Sections P35.602 and P35.542.

## 4. REQUIREMENTS AND PROCEDURES

**Caution:** Do not rotate distributor main shaft in a counterclockwise direction, viewed from above, as this will mutilate the distributor brushes.

**Note:** To prevent mutilation, brushes may be lifted from distributor face by removing the brush holder arm assembly from the shaft. When replacing brush holder arm, make certain it is pressed firmly down in place while tightening its mounting screw, then check brush tension.

- 4.01 Motor pinion shall engage main shaft gear with minimum backlash without bind throughout a complete revolution of main shaft gear. Gauge by eye and feel.

(a) To adjust, reposition motor.

- 4.02 Operating cam shall clear the operating lever as in Fig. 1, when operating lever roller is about to rise up on high part of its cam and all play in the lever is taken up in a direction to make this clearance a minimum. When the play in the operating lever is taken up in a direction to make the clearance a maximum, this clearance shall not exceed .040".

(a) To adjust, loosen the main shaft bearing cap screws and raise or lower the main shaft. Tighten the screws.



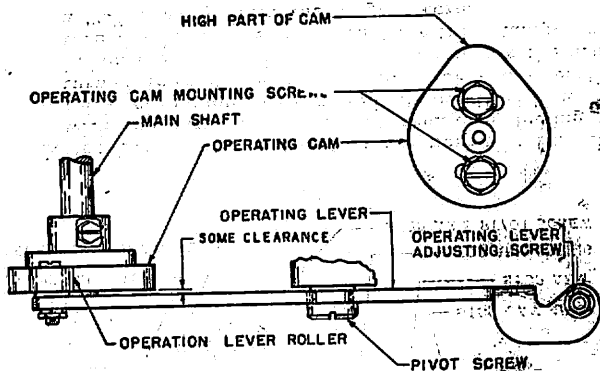
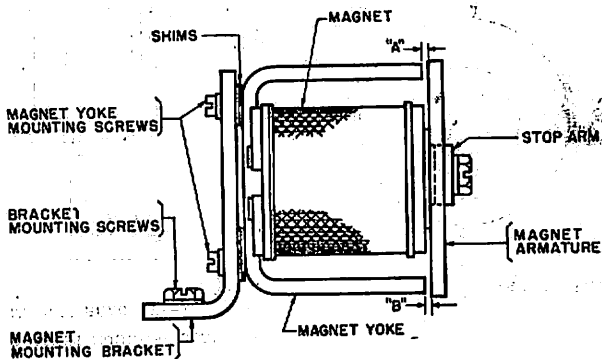


Fig. 1



"A" & "B" TO BE APPROX. EQUAL, .010" MIN., .020" MAX.

Fig. 2

Note: 4.03-4.07 cover requirements for the stopping and starting mechanism in which the stop arm is an extension of the magnet armature—that is of transmitter-distributors other than the 14AP, 14AR and 14AS.

4.03 Stop magnet yoke ends shall clear the armature by approximately the same amount and by Min. .010", Max. .020" when the armature is held in its operated position (against the core, either manually or electrically).

TRANSMITTER-  
DISTRIBUTOR  
14 TYPE  
REQUIREMENTS AND  
PROCEDURES

Note: Requirement 4.03 applies only to units equipped with the new-style single-core universal stop magnet.

- (a) To adjust, use 8896M shims between magnet bracket and top and bottom of yoke. See Fig. 2.

4.04 Stop arm shall clear the stop cam lug by Min. .004", Max. .012" (see Fig. 3) when the magnet armature is held in its operated position.

- (a) To adjust, reposition magnet bracket. When a universal magnet is used make sure magnet yoke ends are parallel to the armature face and do not extend beyond the armature edges.

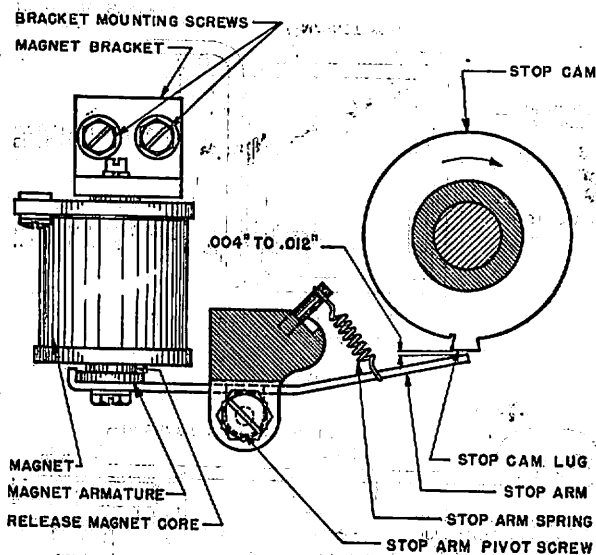


Fig. 3

Note: Transmitter-distributors are normally furnished with the face of the 84115M armature, having the thick chromium plating and stamped with a "C", turned toward the magnet core for d-c operation. When the magnet is to be operated on a-c the armature should be reversed so that the face stamped with a "C" is away from the magnet core.

Note: If magnet hums when energized with a-c, turn bracket slightly to decrease the clearance between the armature and that part of the center pole encircled by the copper slug.

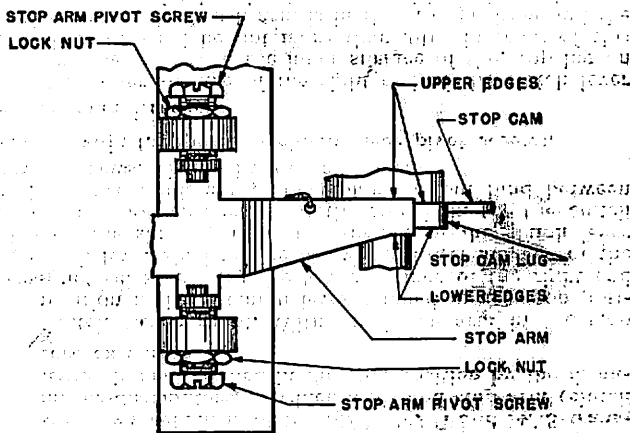


Fig. 4

4.05 Stop arm shall project above upper edge and below lower edge of the stop cam lug, as in Fig. 4 when engaging lug, and have slight vertical play without bind between pivot bearing screws. Gauge by eye and feel.

(a) To adjust, reposition stop arm pivot screws.

4.06 Stop arm spring tension on machines equipped with a-c synchronous motors or d-c motors shall be Min. 5 oz., Max. 7 oz., measured as in Fig. 5(A).

4.07 Stop arm spring tension on units equipped with a-c series motors and with 83844M<sup>2</sup> set of parts for a-c governor spark protection, including 4703M spring, shall be Min. 1 oz., Max. 1-3/4 oz., measured as in Fig. 5(B).

REPRODUCTION OF THIS DOCUMENT IS PROHIBITED

TRANSMITTER-  
DISTRIBUTOR  
14 TYPE  
REQUIREMENTS AND  
PROCEDURES

PULL TO START ARM MOVING:  
 (A) 5 TO 7 OZS. WITH 55669M  
 SPRING, (B) 1 TO 1-3/4 OZS.  
 WITH 4703M SPRING.

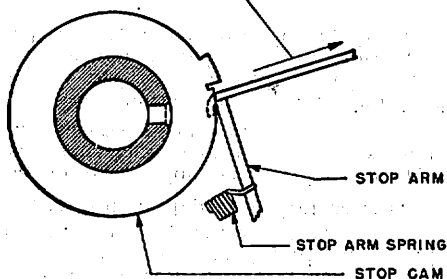


Fig. 5

**Note: 4.08-4.11 cover requirements for the stopping and starting mechanism of the 14AP, 14AR and 14AS transmitter-distributors, in which a pivoted stop arm (clutch lever) is held latched in the stop position by the armature extension.**

**4.08 Clutch Lever Pivot.** With the brush arm in the stop position and the clutch lever latched in the stop position (magnet released), (a) the lower surface of the right end of the clutch lever shall not be below the lower surface of the stop lug on the shaft, (b) the top surface of the clutch lever shall clear the bottom surface of the stop hub, (c) the clutch lever shall have minimum vertical play without bind between the pivot screws. Gauge by eye and feel:

(1) To adjust, reposition **clutch lever pivot screws.**

#### **4.09 Magnet Bracket**

- (a) The inner surface of the right end of the clutch lever shall be even with the inner surface of the stop lug on the shaft or shall be not more than .010" in front of this surface when the brush arm is in the stop position and the clutch lever is latched in the stop position. Gauge by eye.
- (b) There shall be a clearance of Min. .002", Max. .006" between the left surface of the front end of the armature extension and the clutch lever when the magnet armature is held against the cores and the armature extension is in its unlatched position against the clutch lever.

(1) To adjust, remove clutch lever spring, loosen magnet bracket mounting screws and position magnet bracket.

4.10 **Clutch Lever Spring.** It shall require a pull of Min. 12 ozs., Max. 16 ozs., applied perpendicularly to the left end of the clutch lever to start the clutch lever moving forward from its latched position when the clutch lever is not touching the stop lug and the magnet is latched in its unoperated position.

4.11 **Armature Pivot Shaft.** It shall require a horizontal push of Min.  $3/4$  oz., Max.  $1-1/4$  ozs. applied perpendicularly to the front end of the armature extension to just start the armature moving toward the core when the magnet armature is in its unoperated position and the clutch lever is held to remove pressure from the end of the armature extension.

(1) To adjust, loosen lock nut at lower end of armature pivot shaft and rotate shaft by means of the hexagonal portion of the shaft.

4.12 **Feed pawl spring** shall have a tension of Min. 1 oz., Max. 2 ozs., when the pawl is vertical and in its uppermost position.

(a) To gauge, place main shaft in its stop position, then remove the tape transmitter top plate, taking care not to bend tape pins, and gauge as in Fig. 6.

(b) To adjust, loosen pawl screw and reposition feed pawl spring clockwise to increase tension and counterclockwise to decrease tension. Check to insure that there is clearance between the feed pawl spring and the feed wheel ratchet, when the feed pawl is in its extreme upward position.

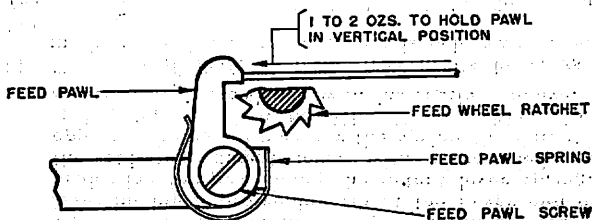


Fig. 6

4.13 **Detent lever spring tension** shall be Min. 12 ozs., Max. 15 ozs., measured as in Fig. 7, when tape transmitter top plate is held upside down in a horizontal plane and detent roller is in hollow between two ratchet teeth.

Note: The above requirement applies to the 300-315 detent lever having a protruding rib at the lower end of the projection for positioning the detent lever spring. For the old-style detent lever with a rounded surface opposite the round boss for the spring the detent lever spring tension shall be Min. 15 ozs., Max. 18 ozs., measured in accordance with instructions above.

4.14 **Feed wheel shaft** shall be free in its bearings with minimum end play when detent is held away from the ratchet.

(a) To adjust, loosen feed wheel shaft bearing mounting screws and position bearings. See Fig. 7.

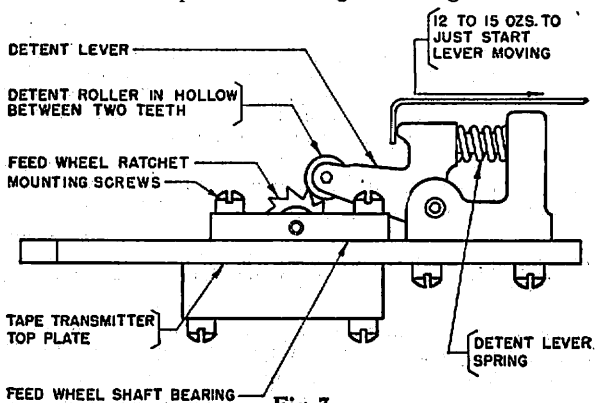


Fig. 7

4.15 With the retaining lid held against the front guide rail on the tape guide plate the retaining lid latch shall operate fully under its own spring tension. The latch shall not close fully under these conditions when a .003" thickness gauge is placed between the retaining lid and the front guide rail.

(a) To adjust, add or remove 72069M shims between the latch wearing strip and the top plate.

Note: If, when the tape retaining lid is latched, contact between the retaining lid and the front raised portion of the tape guide is made only at one end of the lid, it may have been bent and should either be straightened or replaced.

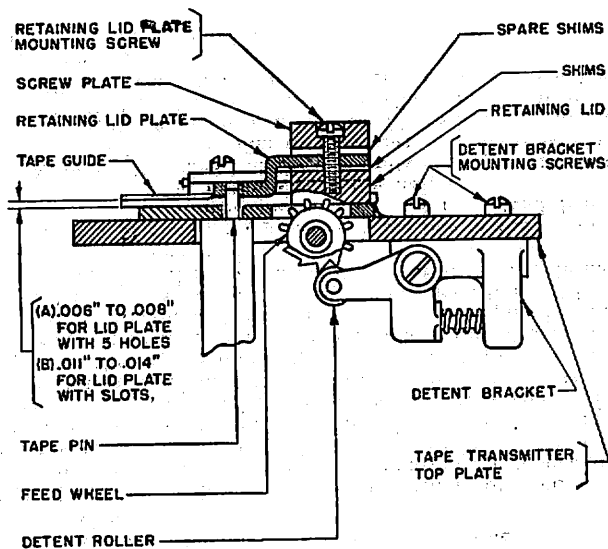


Fig. 8

4.16 **Retaining lid plate** having individual holes to clear tape pins shall clear tape guide by Min. .006", Max. .008", as in Fig. 8(A), when the retaining lid is latched closed and the play taken up in a direction to make this clearance a minimum.

- (a) To adjust, add or remove 72137M shims between the retaining lid and the retaining lid plate.

Note: Spare shims are provided between the retaining lid plate and the screw plate.

4.17 **Retaining lid plate** having slots, either 2 or 5, to clear tape pins shall clear tape guide by Min. .011", Max. .014", as in Fig. 8(B), when the retaining lid is latched closed and the play taken up in a direction to make this clearance a minimum.

- (a) Adjust as in 4.16, using 95953M shims.

(b) When spliced chadless tape is used the retaining lid plate shall clear the tape guide by .014" to .016". Under this condition a check should be made for closure of the spacing contacts with blank tape in the transmitter. See 4.27.

4.18 **Retaining lid latch spring tension** shall be Min. 1-1/2 ozs., Max. 7 ozs., measured by pulling at right angles to the top of the formed upper end of the latch with the horizontal latch surface approximately flush with the top of the top plate—not latched.

**Note:** Reassemble tape transmitter top plate, taking care that feed pawl is in vertical position and, if the transmitter-distributor is equipped with the 101481M set of parts, that the 97447M contact pin is in place.

4.19 **Tape guide** shall clear the edges of tape, leaving perforations properly centered, by approximately equal amounts, as in Fig. 9, when tape is engaged by feed wheel and operating lever is on high part of its cam. Gauge by eye.

**Note:** Perforations are properly centered if No. 1 and No. 5 perforations are equally distant from the two edges of the tape.

(a) To adjust, reposition tape guide. If tape binds in guide it is an indication that the tape used does not meet requirements for maximum width.

**Note:** Before making adjustments 4.20 to 4.32, back-off all contact screws (Fig. 11). These adjustments must be made in the order given, because all are inter-related and a change in one will affect all others. If one adjustment is changed, all others should be checked.

4.20 **Feed wheel detent.** Tape perforations of tape freshly perforated with "letters" combination and checked for correct spacing with perforation gauge 95960M, shall center over tape pins, as in Fig. 9, when detent roller rests in the hollow between two ratchet teeth, and the right edges of the code perforations shall just clear the edges of the pins when the play in the tape is taken up to the left. Gauge by eye.

**Note 1:** If tape can be pivoted about pin of feed wheel far enough, without wrinkling, for an edge of a pin to be covered by the edge of a code hole, it is an indication that the tape used does not meet requirements for minimum width.

**Note 2:** If chadless tape is used, the lids of the set of five perforations over the pins should be folded back so that they do not obstruct the holes.

**Note 3:** Standard Bell System units use tape with centers of feed holes in line with centers of code holes. However, if advanced feed hole tape is to be accommodated by Bell System transmitter-distributors the adjustments here given should be followed, using advanced feed hole tape.

(a) To adjust, reposition detent bracket.



FEED WHEEL RATCHET

DETENT BRACKET  
MOUNTING SCREWS

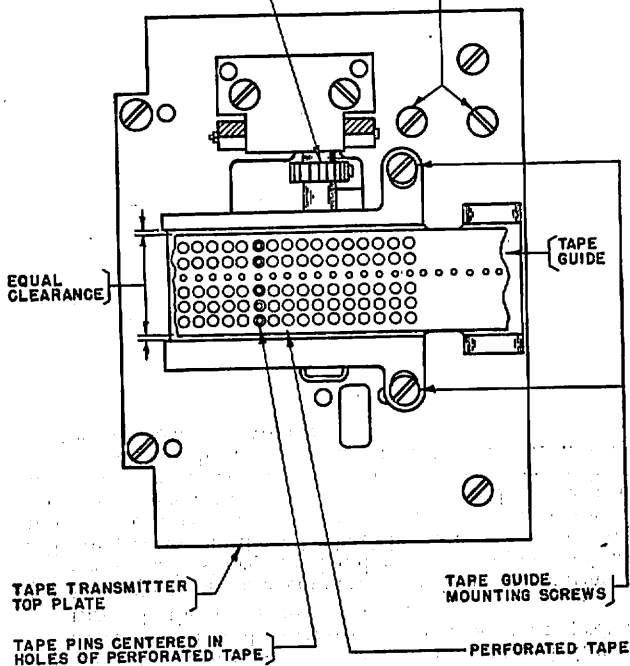


Fig. 9

#### 4.21 Retaining Lid Plate

(a) On units equipped with a plate having individual holes to clear the pins, the edges of the plate shall be parallel to the tape guide and the tape pin holes shall center over the tape pins.

(b) On units equipped with a plate having two slots to clear the five pins, the edges of the lid shall be parallel to the tape guide and the edges of the slots shall clear the hinged lids of chadless tape when the lids are raised by the tape pins and the play in the tape is taken up in a direction to make the clearance a minimum.

(c) On units equipped with a plate having five slots instead of holes, the slots shall center over the tape pins and shall be parallel to the tape guide, and if used with chadless tape the hinged lids with "letters" perforations shall be equi-distant from but shall not touch the edges of the slots, throughout the length of the slots, when all play of the tape is taken up first to the front, then to the rear. Gauge by eye.

(d) To adjust for (a), (b) or (c) reposition retaining lid plate.

4.22 **Feed pawl** shall just engage first tooth above the center of the feed wheel ratchet when the tape pins are flush with the surface of the tape guide on which the tape rests. Gauge by eye and feel.

Note: This is necessary to prevent tape from being torn by being moved forward when tape pins protrude through the holes in the tape.

(a) To adjust, operate contact lever bail by rotating the main shaft slowly by hand and reposition **feed lever adjusting screw** until feed wheel just starts to move when tops of the tape pins are flush with the surface of the tape guide on which the tape rests. See Fig. 10. Check that when the brush arm is in the stop position, the feeding of the wheel has been completed and the detent has been bottomed between two teeth.

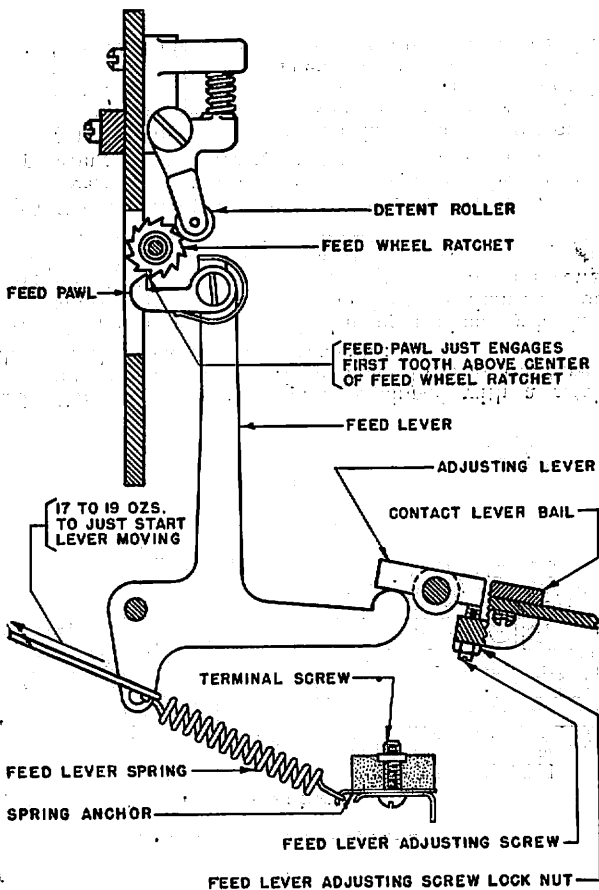


Fig. 10

4.23 Feed pawl face shall clear ratchet teeth face by not more than .010" when operating lever roller is on the high part of its cam.

- (a) To adjust, reposition operating lever adjusting screw.  
See Fig. 12.

#### 4.24 Tape transmitter contacts shall be clean.

- (a) Contacts may be cleaned with the 88993M contact burnisher.

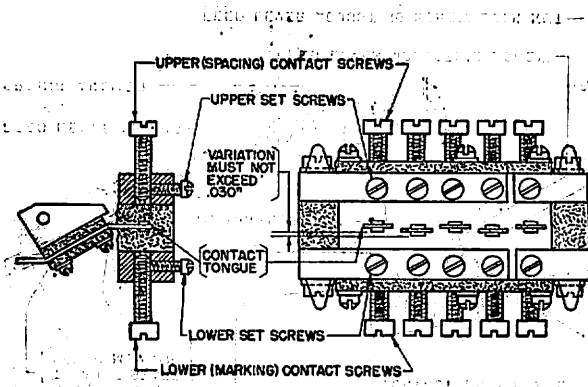


Fig. 11

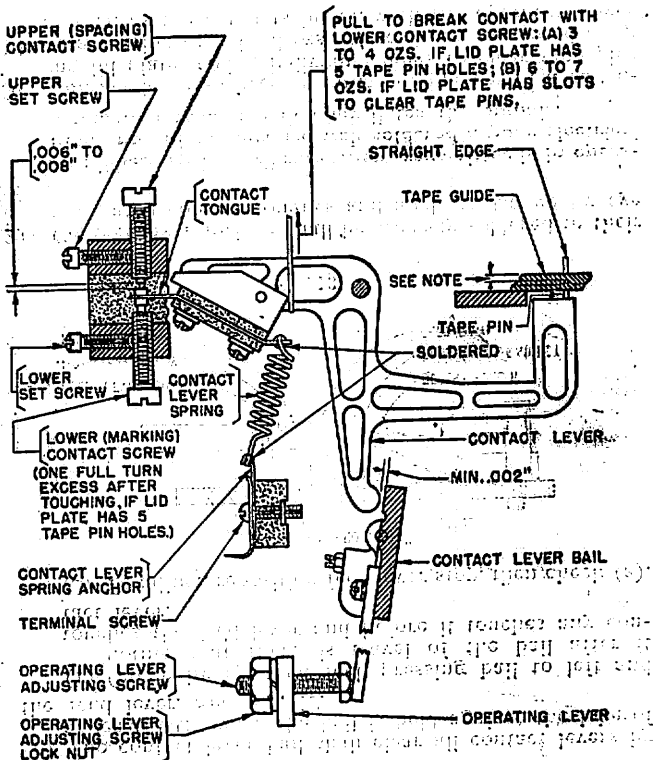
4.25 Contact tongues on units equipped with a retaining lid plate having individual holes to clear the tape pins shall meet the following requirements:

- (a) Contact tongue plane shall be approximately horizontal, and any one tongue shall not be more than .030" out of alignment with any other tongue when contact screws are backed off, as in Fig. 11. Gauge by eye.

(1) To adjust, bend tongues

- (b) Contact tongues shall make contact with the associated lower contact screws with perceptible follow when the operating lever roller is on low part of its cam.

(1) To gauge and adjust, using lamp, buzzer or ohm-meter, reposition lower contact screws until they just touch tongues when operating lever roller is on low part of its cam. Then give contact screws one full turn in a direction to increase the follow. See Fig. 12.



NOTE: .020 TO .025 IF LID PLATE HAS SLOTS TO CLEAR TAPE PINS.

Fig. 12

4.26 Tape pins on units equipped with a retaining lid plate having either 2 or 5 slots to clear tape pins shall be Min. .020", Max. .025" below a straight-edge placed across the top edges of the tape guide channel when the retaining lid is raised and the operating lever roller is on the low part of its cam. See Fig. 12.

(a) To adjust, reposition lower contact screws con-

TRANSMITTER-  
DISTRIBUTOR  
14 TYPE  
REQUIREMENTS AND  
PROCEDURES

4.27 Contact tongues shall clear the associated upper contact screws by Min. .006", Max. .008", as in Fig. 12, when the operating lever roller is on low part of its cam.

(a) To adjust, reposition upper contact screws:

4.28 On units equipped with a feed lever stop proceed as follows:

(a) The lower surface of the tip of the feed pawl shall be approximately .020" below the tip of the second tooth above the center of the feed wheel ratchet when the operating lever is on the low part of the operating cam. See Fig. 13.

(1) Gauge by eye.

(b) The contact lever bail shall clear all contact levers by at least .002" when the bail is held against the lobe of the feed lever. See Fig. 12.

(1) Gauge by eye and feel, pressing bail to left and noting that there is travel of the bail after it touches the feed lever and before it touches any contact lever.

(2) To adjust, reposition feed lever stop, then check (a).

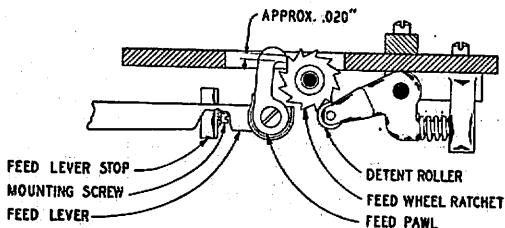


Fig. 13

4.29 Contact lever springs shall be securely soldered to their associated contact tongues and anchors. Gauge by eye and feel.

Note: These springs vibrate when transmitter is in operation, and unless ends are well soldered a poor electrical connection results which mutilates the signals.

4.30 Contact lever springs on units equipped with a retaining lid plate having individual holes to clear tape pins shall have a tension of Min. 3 ozs., Max. 4 ozs. measured as in Fig. 12 at (A), as the contacts break, with the operating lever

roller on the low part of its cam. Gauge contact break with lamp, buzzer or ohmmeter.

(a) To adjust, reposition contact lever spring anchors.

4.31 **Contact lever springs** on units equipped with a retaining lid plate having either 2 or 5 slots to clear tape pins shall have a tension of Min. 6 ozs., Max. 7 ozs., measured as in Fig. 12, at (B), as the contacts break, with the operating lever on the low part of its cam. Gauge contact break with lamp, buzzer or ohmmeter.

(a) Adjust as for 4.30.

4.32 The amount of pull, applied as in Fig. 12, required to break the circuit and the pull required to permit the **tape contacts** just to make, shall not differ by more than  $3/4$  oz.

(a) To adjust, remove the **contact lever**, clean lever and guide slot, and if necessary stone down burrs on lever and in guide slot. If bind has not been removed, replace the contact lever by a new one. Check alignment of contact lever spring, and if it is sufficiently out of line to tend to cause the lever to **bind** in its slot resolder the spring, taking care not to damage the spring or the terminal block by the application of too much heat. Replace lever and check adjustments 4.25 to 4.31, incl.

4.33 **Feed lever spring** tension shall be Min. 17 ozs., Max. 19 ozs., measured as in Fig. 10, when the operating lever roller is on low part of its cam.

(a) To adjust, reposition spring anchor.

4.34 **Auto-stop contact springs** shall meet the following requirements when the contact spring post is held clear of the springs. See Fig. 14.

(a) Fiber insulator on right spring shall clear the contact spring bracket by Min. .015", Max. .020".

(b) Contact gap shall be Min. .015", Max. .020".

(1) To adjust (a) bend right spring; to adjust (b), bend left spring.

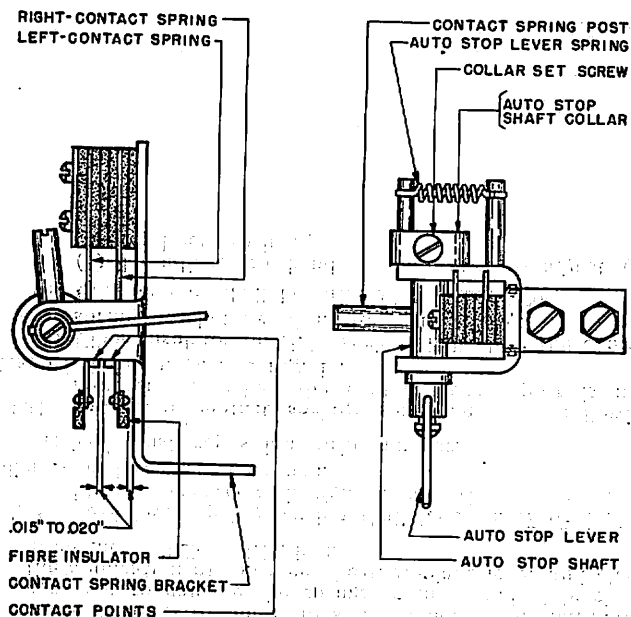


Fig. 14

4.35 **Auto-stop lever spring** on older units equipped with a stop lever as shown in Fig. 14 shall exert a tension of Min. 2-1/2 ozs., Max. 3-1/2 ozs., when extended to an over-all length of approximately 3/4" and shall be in a horizontal position when auto-stop contact spring post is in a horizontal position.

(a) To adjust position, loosen collar set screw, hold auto-stop shaft so that contact spring post is in a horizontal position, and reposition auto-stop shaft collar.

4.36 **Auto-stop lever end**, on units equipped with stop lever of type screwed into a clevis clamp block, shall be approximately 1/2" below the horizontal position when the contacts are held closed by the contact spring post.

(a) To adjust, reposition stop lever by means of the clevis clamp, making sure auto-stop shaft protrudes through clamp approximately 1/16".



4.37 **Auto-stop lever, 102520M Tape Stop Rod**, having the end bent back to form a crook shall be positioned with the crook at an angle of approximately  $45^\circ$  with the horizontal, sloping downward toward the right away from the transmitter-distributor. Gauge by eye.

(a) To adjust, reposition stop lever.

Note: 4.38 and 4.39 apply to units equipped with the 104720 tape stop assembly. (Delayed action)

4.38 When the **tape stop rod** is lowered until the switch just closes, there shall be a clearance between the lower post on the shaft collar and the post on the mounting bracket of Min. .030", Max. .080". Check closing of switch with buzzer, lamp or ohmmeter.

(a) To adjust, with a .055" gauge held between the lower post on the shaft collar and the mounting bracket post, and with the eccentric set screw loosened, move the high part of the eccentric downward against the switch plunger until the switch opens. Then move the eccentric upward until the switch just closes and tighten set screw, taking care that there is no bind between the eccentric and the sides of the bracket.

4.39 The **tape stop rod** shall be approximately horizontal when the end of the rod is raised until the switch just opens. Gauge by eye.

(a) To adjust, position rod on its shaft by means of its clamping screw.

Note: 4.40 to 4.43, inclusive, apply to units equipped with the 101481M set of tape-out mechanism parts.

4.40 On units equipped with end of **tape stop pin** shall clear the shoulder of the tape guide plate by Min. .010", Max. .020", when the side play of the pin is taken up in a direction to make this clearance a minimum. See Fig. 15. On units equipped with a 111627 tape guide plate (having cut-out opposite the tape stop pin) the same limits apply but as measured with a straight-edge laid across the front edge of the guide. The end of the tape stop pin shall enter the hole in the retaining lid without binding when the lid is closed.

(a) To adjust, loosen to friction tight the feed wheel shaft bearing mounting screws and reposition the **stop pin guide**. Note that requirement 4.14 is met before tightening the screws.

TRANSMITTER-  
DISTRIBUTOR  
14 TYPE  
REQUIREMENTS AND  
PROCEDURES

4.41 End of **tape stop pin** shall be within  $.005''$  of a straight-edge placed across the top of the tape guide plate. See Fig. 15.

(a) To adjust, bend upper contact spring.

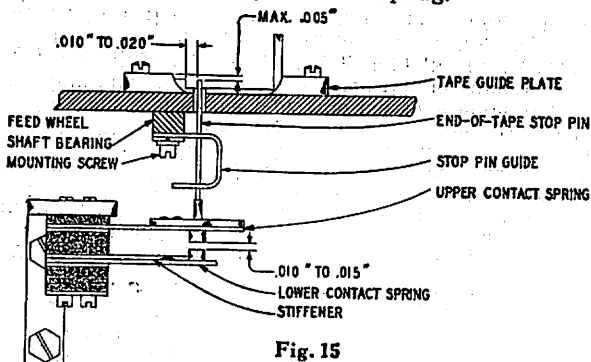


Fig. 15

4.42 **Contact gap** shall be Min.  $.010''$ , Max.  $.015''$ , when the lower contact spring is resting against its stiffener.

(a) To adjust, bend the lower contact spring stiffener.

4.43 **Contact Pressure.** It shall require a pressure of Min. 20, Max. 25 grams, applied at the contact point of the lower contact spring, to open the contacts when a piece of tape is in the guide and the tape retaining lid is closed. Use a 68B or 70D gram gauge. Gauge contact break with lamp, buzzer or ohmmeter. On units using spliced chadless tape this pressure may be reduced to Min. 10, Max. 15 grams and a check made for reliable contact closure by six repeat runs on a short length of tape.

(a) To adjust, bend the lower contact spring.

Note: Remove the tape and recheck 4.42.

4.44 **The distributor segments and ring** shall be flat and free from grooves and irregularities. Gauge by eye.

(a) If resurfacing is required proceed as follows:

Note: If the top surfaces of the segments are worn down to within  $.015''$  of the top of the disc replace the disc assembly instead of resurfacing.

(1) Remove the brush holder arm assembly and carefully place a clean cloth under the distributor face and between the wires to prevent particles from dropping into the distributor gears and bearings.

(2) If necessary, take out the three 2191M lockwashers while resurfacing the face to avoid striking the heads of the 8539M mounting screws.

(3) If the grooves and raised portions are prominent start the resurfacing with the coarse side of the 101424M tool and rub with a lateral circular motion (not rotation around the center of the disc) bearing substantially and evenly against the segments and ring, and continue with the coarse sanding until the grooves are removed and the segments are even at adjacent ends.

(4) For final dressing use the face of the tool having the fine sandpaper, continuing only until the marks resulting from the coarse sandpaper disappear.

(5) Before removing the cloth brush out the slots between the segments and clean off the commutator disc in accordance with Section P35.542.

(6) Turn the distributor on its side and carefully remove the cloth taking care not to drop particles into the distributor mechanism, and then inspect to see that the bearings and gears are clean.

**4.45 Distributor Segment Lacquer:** If the ends and sides of the distributor segments and ring are lacquered or enameled, the lacquer or enamel shall provide continuous coating over these surfaces. Gauge by eye.

(a) If the lacquer or enamel has become chipped or burned by arcing, so that repainting is required, proceed as follows:

(1) Remove the brush holder arm and commutator disc but do not disconnect the wires from the segments.

(2) Remove old lacquer or enamel by scraping lightly with a knife blade using care not to mar the metallic surface. (Paint remover or No. 3500 lacquer thinner may be used at locations approved for such use. Do not use it at subscriber's premises.) It is not necessary that all of the old coating be removed, but merely that any loose particles be removed.

(3) Before applying a new coat of lacquer, clean the edges and ends of the segments thoroughly with an approved cleaning fluid and wipe off any residue with a piece of cloth on the end of a blade using care to avoid scarring the segments.

(4) Using the flat end of a toothpick or a small camel's hair brush such as Devoe and Reynolds No. 251 brush (artist's show card No. 2) dipped 1/16 inch into RM646971 lacquer and wiped lightly over the edge of

the container, apply a light but thoroughly covering coat of the lacquer to the ends of each segment, preferably from the underside of the commutator disc making sure that the space between the segments is not bridged with the lacquer.

(5) Proceed with application of lacquer, one slot at a time. Before proceeding to the next slot immediately wipe off with a clean KS-2423 cloth any excess lacquer which may have worked onto the top surface of the segments:

**Caution:** In wiping off the excess apply the cloth lightly to avoid the removal of lacquer from the top edges of the ends of the segments and avoid spreading any of it on top surfaces.

(6) Next coat the inner and outer sides of segments and the outer edge of the inner ring.

(7) Allow the lacquer to dry for 5 to 10 minutes, then apply a second coat of lacquer. The unit can be placed in service within 15 minutes after the final application.

(8) Western Electric Company's No. 3500 lacquer thinner may be used as a thinner if required. It may be used also on a KS-2423 cloth to wipe off any excess lacquer on the contacting surface of the segments. This thinner, however, should not be used at subscriber's premises.

(9) Replace commutator disc and brush holder arm and restore the unit to normal.

4.46 **Carbon-tipped brushes** shall meet the following requirements:

(a) The brush springs shall not be kinked, twisted, nor bent to a contour appreciably different from that of new brushes; that is, they shall be provided with a bend so that the carbon portion will rest on the face at an angle of approximately 75 degrees. Gauge by eye.

(b) Brush sides shall be at right angles to brush holder. See Fig. 16(A).

(c) The trailing edge of the brushes shall make contact with the segments at a point in line with the line impressed on the commutator disc when the stop cam lug is against the end of the stop arm.

(d) The brushes shall remain within the edges of the rings throughout a complete revolution of the main shaft.

(e) It shall require a pull of Min. 2-1/2 ozs., Max. 3-1/2 ozs., applied as in Fig. 16(B), just to break contact between brush and commutator ring. Gauge contact break with lamp, buzzer or ohmmeter.

(f) With the brushes resting on the commutator with a pressure of 2-1/2 to 3-1/2 ozs., contact shall be made over at least 3/4 of the lower surface of the carbon brush. Gauge by eye, removing the brush holder arm assembly and noting polished area of brush face after running motor for 2 minutes with magnet energized.

(1) To adjust, loosen brush holder clamp screw and loosen clamping screw so that the brush springs are friction tight; any brush having a kink or sharp bend in the spring shall be replaced; position the brush holder and the brush springs to meet requirements (b), (c) and (d); tighten brush spring clamp screw; rotate brush holder to meet requirement (e); tighten brush holder clamp screw; place a flat piece of "0000" sandpaper approximately 1" x 2", sand side up, on the distributor disc and, with the brushes pressing against the face with a pressure of approximately 3-1/2 ozs., rotate the motor by hand back and forth to draw the brushes across the sandpaper two or three times to meet requirement (f). Clean commutator and brushes carefully with a piece of KS-2423 cloth to remove sand and loose carbon dust. Check requirement (e). If requirement (d) cannot be met by adjusting brush holder, loosen face mounting screws and take up play between face and screws in the proper direction. If face cannot be shifted far enough, replace face by a new one.

**Caution:** To avoid hazard of sharp leading ends of brush springs, after final adjustment these ends shall be bent down and under the brush holders.

**Note:** Brush should be replaced by the time the carbon tip is worn so that approximately 1/16" of carbon remains.

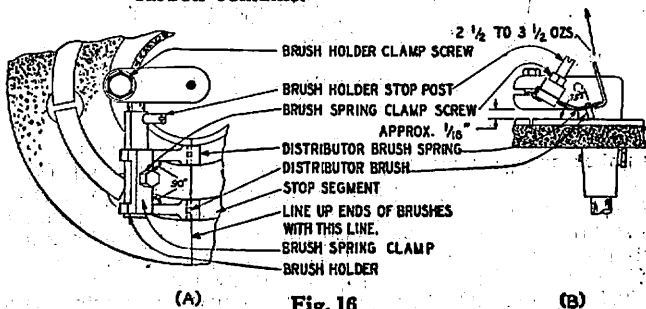


Fig. 16

TRANSMITTER-  
DISTRIBUTOR  
14 TYPE  
REQUIREMENTS AND  
PROCEDURES

4.47 **Operating cam** shall be so positioned that the No. 5 transmitter contact tongue is just leaving lower (marking) contacts when the main shaft has been rotated until the trailing edge of the distributor brush has passed onto the stop segment by Min.  $1/32''$ , Max.  $1/16''$ . Gauge by eye, using lamp, buzzer or ohmmeter to check contact break.

(a) To adjust, reposition operating cam. Check requirement 4.23.

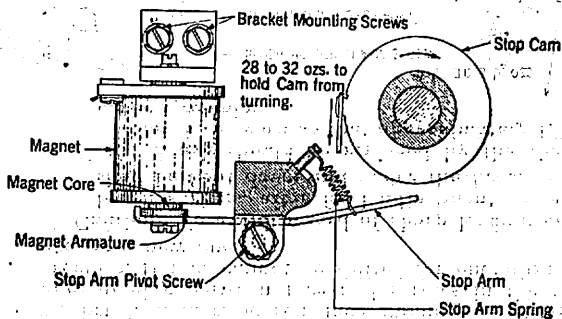


Fig. 17

4.48 **Main Shaft Clutch.** Run the motor for at least 10 minutes, after the clutch has been freshly lubricated and with the magnet armature released—brush stationary. Stop motor and insert orange stick in the cut-out of bakelite insulator below outside edge of slot between segments 1 and 2 of the distributor disc. This acts as a stop to prevent rotation of brush beyond this point as motor is started. Start motor. A pull of 32 ozs. applied to the stop cam lug, as in Fig. 17, with the motor running, shall move the cam in a direction opposite to normal rotation. A pull of 28 ozs. applied under the same conditions shall not move the cam.

**Caution:** Care should be taken not to pull the stop cam far enough to cause a brush to pass over the slot between segments thus avoiding possible damage to brush.

**Note:** Before increasing tension, examine felt washers to make sure they are not glazed.

(a) To adjust, turn adjustable clutch disc clockwise, viewed from above, to increase tension, and counterclockwise to decrease tension. Hold friction nut 77012M with the

99772M spanner wrench while tightening and loosening the 77140M lock nut.

**Caution:** Tighten lock nut securely to prevent change in torque during operation. Do not strip threads. Check requirement after tightening lock nut.

4.49 86960M stop arm contacts of 83844M set of parts on 14D and L transmitter-distributors shall meet the following requirements:

(a) Contact pressure shall be Min. 2 ozs., Max. 2-3/4 ozs., measured at the end of the outside spring. See Fig. 18(A).

(1) To adjust, bend contact springs, making sure the fiber extension of the outside spring is not touching the stop arm; shift contact bracket if necessary to obtain a clearance and then check (b).

(b) Contact gap shall be Min. .015", Max. .020", when stop lever armature is held against magnet cores. See Fig. 18(B).

(1) To adjust, reposition contact bracket. Check requirement (a).

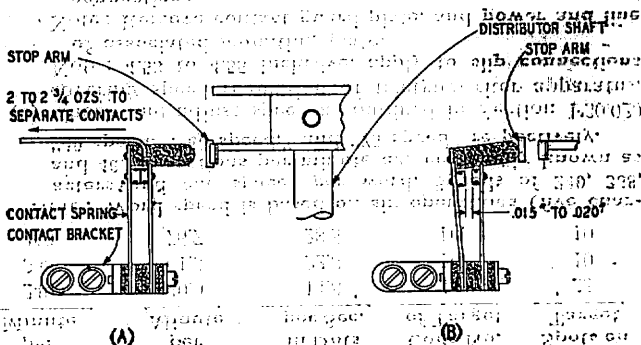


Fig. 18.

4.50 Motor and governor shall conform to requirements of Section P36.640 covering 15 type teletypewriter motor units, except the requirement on motor position and speed which shall be as specified in 4.01 and 4.52 of this section, and except governor speed adjusting bracket requirement, which shall be disregarded.

4.51 **Governor guard** shall clear the upper outside edge of the target by at least .062".

4.52 **Speed.** The speed of the main (sending) shaft shall be 240 revolutions per minute for 40 speed, 368 revolutions per minute for 60 speed, and 460 revolutions per minute for 75 speed. The target information for checking speed of governed motors is as follows:

<u>Operations per Minute</u>	<u>Words per Minute</u>	<u>Line Freq. in Dots per Sec.</u>	<u>Code No. of Target</u>	<u>Black Spots on Target</u>
240	40.0	14.8	1J	23
368	61.3	22.8	1G	10
460	76.7	28.5	1G	10

Note: Word speed is based on six operations (five characters and one space) per word. Speeds of 240, 368, and 460 operations per minute are commonly known as "40 speed," "60 speed," and "75 speed" respectively.

(a) Check and adjust speed as outlined in Section P30.020 covering speed regulation of teletypewriter apparatus. Note: 4.53 to 4.55 inclusive, apply to slip connections of associated mounting plate.

Note: Remove contact guard plate, and power and line connections.

4.53 With the transmitter-distributor removed, the slip connection contacts shall be closed with a pressure of Min. 16 ozs., Max. 32 ozs., measured by pulling upward at the crimp in the upper spring. To gauge contact break, use lamp, buzzer or ohmmeter.

(a) To adjust, bend upper contact springs near the clamped portion.

4.54 With the transmitter-distributor removed, the crimped ends of the extreme right and extreme left upper contact springs shall be in a horizontal plane and the crimped ends of the remaining upper springs shall be within 1/64" of this plane and not above it. The plane referred to shall be so located that the transmitter-distributor can be inserted in its proper position. To gauge, place a straight-edge across the two end springs and check that the remaining springs are within 1/64" of the straight edge. Check to see that the associated transmitter-distributor can be firmly seated in place without interference from the springs.

4.55 When the transmitter-distributor is in place, the contact between the upper and lower contact springs shall be broken. To gauge, use lamp, buzzer or ohmmeter.



Note: 4.56 to 4.59, inclusive, apply to units equipped with the 84593M set of parts for controlling an external circuit.

4.56 It shall require a pull of minimum 3 ozs., maximum 4 ozs., applied as in Fig. 19(A) to break the auxiliary contacts when the operating lever roller is on the high part of the cam. Gauge contact break with a lamp, buzzer or ohm-meter.

(a) To adjust, bend the long contact spring.

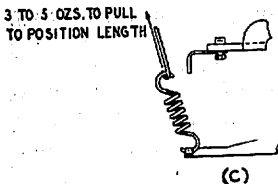
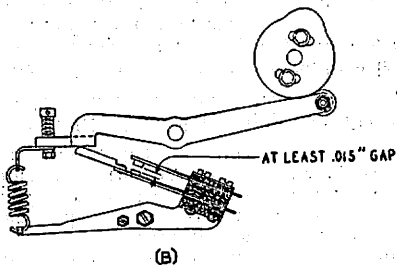
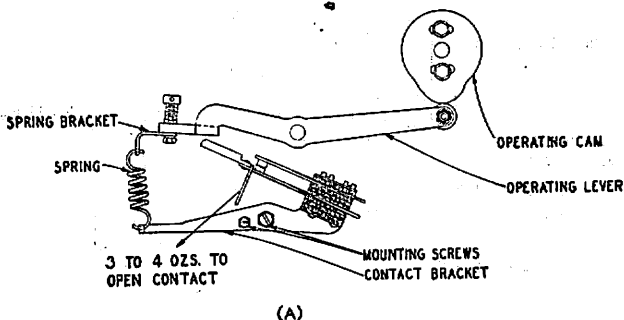


Fig. 19

4.57 The **auxiliary contacts** shall break when the brush has just left the stop segment. Turn motor by hand and gauge contact break with a lamp, buzzer or ohmmeter.

(a) To adjust, reposition the contact bracket.

4.58 When the operating lever roller is on the low part of the cam, the **contact gap** shall be at least  $.015''$ . See Fig. 19(B).

(a) To adjust, bend the heavy contact spring.

4.59 The tension of the **auxiliary contact operating lever spring** shall be Min. 3 ozs., Max. 5 ozs., when the operating lever roller is on the high part of the cam. To measure, rest the transmitter-distributor on its left side, unhook the spring from the bracket on the operating arm, and pull to position length. See Fig. 19(C).

**Note:** 4.60 to 4.63, inclusive, apply to units equipped with the 97460M tape stop magnet.

4.60 **Armature Air Gap.** When the armature is released, the air gap, measured at the top edge of the core, shall be Min.  $.030''$ , Max.  $.040''$ . See Fig. 20.

(a) To adjust, reposition armature backstop screw.

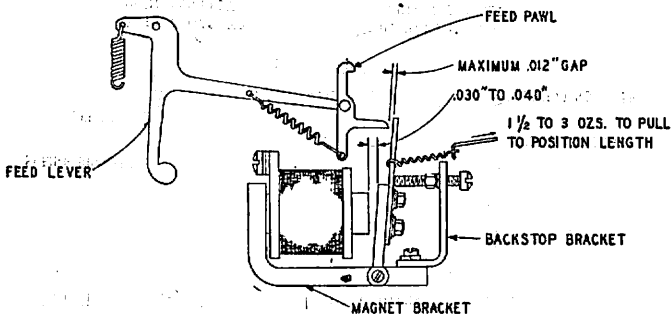


Fig. 20

4.61 **Armature Spring Tension.** When the armature is released, the armature spring tension shall be Min.  $1\text{-}1/2$  ozs., Max. 3 ozs. To measure tension, unhook spring from backstop bracket and pull to position length as in Fig. 20.

4.62 **Blocking Plate.** With the magnet energized and with the operating lever roller on the low part of the cam—the feed pawl in its extreme upward position—the clearance between the top edge of the blocking plate and the bottom surface of the feed pawl extension shall be Min. .004", Max. .010", when all play is taken up to make this clearance a minimum. See Fig. 21.

(a) To adjust, position blocking plate.

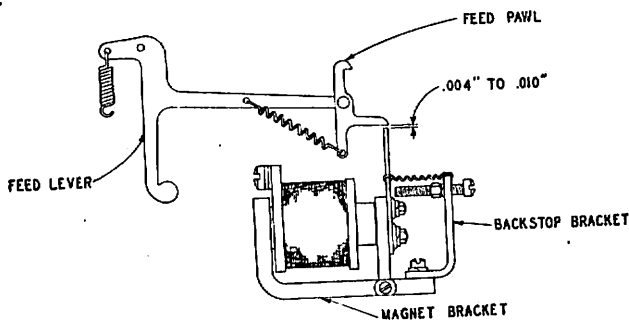


Fig. 21

4.63 **Magnet Bracket Position.** With the armature released there shall be some clearance, not more than .012", at the point of minimum clearance between the end of the feed pawl extension and the side of the blocking plate as the feed lever is moved downward, and no interference between these parts as the feed lever is moved upward after completing a downward stroke. See Fig. 20. To gauge, turn motor by hand and determine points of minimum clearance as the feed lever is lowered and raised.

(a) To adjust, relocate the magnet bracket by means of its mounting screws.

ST 1960  
L 1000  
L 1000

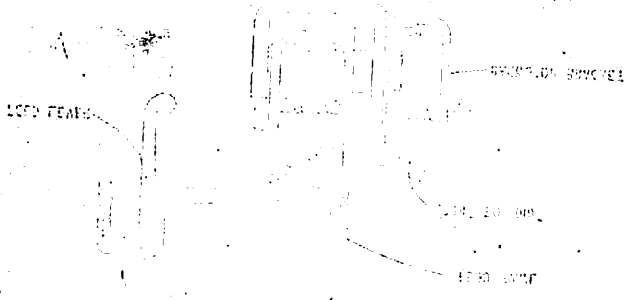
RECEIVED  
FEBRUARY 17 1960  
U.S. AIR FORCE  
HEADQUARTERS  
WASHINGTON

(a) To insure the accuracy of the information reported in this report, the following information is being furnished to you for your information:

The information reported in this report is based on the information furnished to the reporting agency by the reporting agency's personnel. The information reported in this report is based on the information furnished to the reporting agency by the reporting agency's personnel. The information reported in this report is based on the information furnished to the reporting agency by the reporting agency's personnel.

# BLANK PAGE

FORM 100-1



(b) To insure the accuracy of the information reported in this report, the following information is being furnished to you for your information:



**BELL SYSTEM PRACTICES**  
Teletypewriter and Manual  
Telegraph Station and P.B.X.  
Installation and Maintenance

**SECTION P35.632**  
Issue 1, November, 1945  
AT&T Co Provisional

## **TRANSMITTER DISTRIBUTOR**

### **NO. 14 — STATION TYPE**

### **REQUIREMENTS AND PROCEDURES**

### **OPERATION AT 100 SPEED**

#### **1. GENERAL**

1.01 This section outlines special apparatus requirements and adjusting procedures for the maintenance of No. 14 station type transmitter distributors arranged for 100 wpm operation.

1.02 The information contained herein will be included in the standard P sections when it has been fully tested in the field.

1.03 For requirements and procedures not covered herein reference should be made to standard P sections covering No. 14 station type transmitter distributors.

#### **2. REQUIREMENTS AND PROCEDURES**

2.01 **Operating lever spring (74701M)** tension shall be min. 3-1/2 ozs., max. 6-1/2 ozs. when the operating lever is on the low part of its cam.

(a) To check, rest unit on its left side, unhook spring from the bracket and pull downward to position length.

(b) To adjust, reposition bracket.

2.02 **Bail spring (42661M)** tension shall be min. 2 ozs., max. 3 ozs.

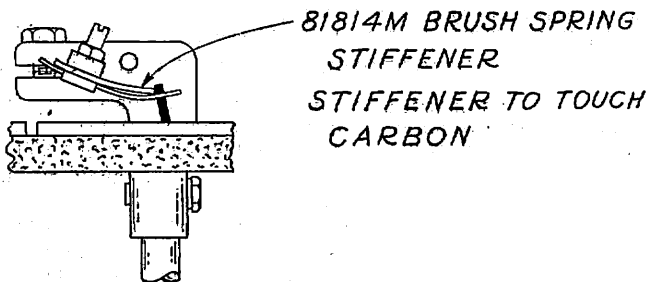
(a) To check, rest unit on its left side, unhook spring from the bail arm and pull upward to position length.

2.03 **Main shaft clutch torque:** A pull of 36 ozs. shall move the cam in a direction opposite to normal rotation and a pull of 32 ozs. shall not move the cam under conditions outlined in P36.631.

2.04 **Brush stiffeners:** The brush stiffeners shall be clamped in the brush holder directly on top of the carbon brushes with their ends against the carbon projections on the top of the brushes. The brush stiffeners shall be straight and flat before being clamped over the brushes. (See Fig. 1.)

The provision of the stiffeners will not change the other requirements covered in the P Section covering requirements and procedures for No. 14 station type transmitter-distributors.

Note: In some cases it may be necessary to scrape solder away from the carbon projections so that the stiffeners will properly butt against them.



**Fig. 1**

**BELL SYSTEM PRACTICES**  
Teletypewriter and Manual  
Telegraph Station and P.B.X.  
Installation and Maintenance

**SECTION P35.633**  
Issue 2, August, 1950  
AT&T Co Standard

# REPERFORATOR-TRANSMITTER UNITS

## 14F AND 14G

### REQUIREMENTS AND PROCEDURES

Table of Contents	Paragraph
<b>1. GENERAL</b>	1.01-1.06
<b>2. REQUIREMENTS AND PROCEDURES</b>	
Cleaning	Section P30.010
Clutch Release-Rod	2.07
Clutch Release-Rod Spring	2.08
Code-Bar Bell-Cranks	2.15
Code-Bar Locking-Lever Spring	2.38
Code-Punch Bail	2.56
Code-Punch-Bail-Arm Stud (Preliminary)	2.59
Code-Punch-Bail-Arm Stud (Final)	2.87
Code-Punch-Bail-Pivot-Bracket (Preliminary)	2.55
Code-Punch-Bail-Pivot (Final)	2.58
Code-Punch Die-Plate Alignment	2.60
Code-Punch Feed-Pawl	2.63
Code-Punch Feed-Pawl Spring	2.90
Code-Punch Feed-Roll	2.61
Code-Punch Feed-Roll Detent (Preliminary)	2.62
Code-Punch Feed-Roll Detent (Final)	2.88
Code-Punch Feed-Roll-Detent Spring	2.89
Code-Punch-Retractor Springs	2.95
Code-Punch Tape-Guide	2.93
Distributor and Sensing-Clutch Detent- Lever Spring	2.139
Distributor and Sensing-Clutch Throtout-Lever Springs	2.138
Distributor-Clutch Release-Contact	2.131

Table of Contents—(Continued)	Paragraph
Distributor-Clutch Release-Contact-Lever Spring .....	2.130
Distributor-Contacts .....	2.128
General Requirements .....	Section P30.012
Holding-Magnet-Selector .....	Section P32.001
Intermediate-Bail .....	2.47
Intermediate-Bail Adjusting-Screw .....	2.49
Lubrication .....	Section P35.544
Main-Bail .....	2.11
Main-Bail Adjusting-Screw (Preliminary) .....	2.13
Main-Bail Adjusting Screw (Final) .....	2.14
Main-Bail-Cam-Clutch Torque .....	2.141
Main-Bail-Plunger Extension-Bracket ...	2.48
Main-Bail Spring (Preliminary) .....	2.42
Main-Bail Spring (Final) .....	2.140
Main-Shaft-Clutch Spring .....	2.04
Main-Shaft Clutch Throw-out-Lever ...	2.02
Main-Shaft Clutch Throw-out-Lever Spring .....	2.03
Motor Position and Gear Mesh .....	2.05
Motor Unit .....	Section P32.004
Orientation Tests and Distortion Tolerances .....	Section P30.002
Pivoted-Transmitter Backstop-Screw ....	2.112
Pivoted-Transmitter Bracket .....	2.96
Pivoted-Transmitter Lid-Latch .....	2.102
Pivoted-Transmitter Lid-Latch Spring ..	2.101
Pivoted-Transmitter Pilot-Screws .....	2.97
Pivoted-Transmitter Tape-Guide-Plate ..	2.99
Platen-Frame Extension .....	2.51
Platen-Frame Spring .....	2.44
Prepunch Feed-Pawl Eccentric (Preliminary) .....	2.78
Prepunch Feed-Pawl Eccentric (Final)..	2.81
Prepunch Feed-Pawl Release-Lever Spring .....	2.86
Prepunch Feed-Pawl Spring .....	2.85
Prepunch Feed-Roll Bearings .....	2.74
Prepunch Feed-Roll Detent (Preliminary) .....	2.77
Prepunch Feed-Roll Detent (Final) .....	2.80



**Table of Contents—(Continued)**

**Paragraph**

Prepunch Feed-Roll Detent-Lever Spring .....	2.84
Prepunch Operating-Bail .....	2.79
Prepunch Operating-Bail Spring .....	2.83
Prepunch Retaining-Bracket .....	2.73
Prepunch Tape-Guide .....	2.71
Prepunch Tape-Guide Spring .....	2.72
Prepunch Tape-Tension-Lever Spring ..	2.76
Prepunch Tape-Tension-Lever Stud .....	2.75
Pull-Bar Contact-Assembly .....	2.41
Pull-Bar Contact Mounting-Plate .....	2.39
Pull-Bar Guard .....	2.40
Pull-Bar Guide .....	2.12
Pull-Bar Spring, Left Function .....	2.37
Pull-Bar Springs .....	2.10
Pull-Bars Supported by Function-Bar Spring-Supports .....	2.09
Punch-Arm-Shaft Oiler .....	2.68
Ribbon Check-Pawl .....	2.33
Ribbon Check-Pawl Pressure .....	2.34
Ribbon Feed-Lever Spring .....	2.32
Ribbon Feed-Pawl .....	2.35
Ribbon Feed-Pawl Pressure .....	2.36
Ribbon Feed-Shaft Detent-Plunger Spring .....	2.31
Ribbon Feed-Shaft Safety-Spring, Right and Left .....	2.29
Ribbon Guide .....	2.94
Ribbon Reverse-Arm Shafts, Left and Right .....	2.25
Ribbon Reverse-Arms, Left and Right ..	2.24
Ribbon Reverse-Pawl-Links .....	2.28
Ribbon Reverse-Pawl Spring, Right and Left .....	2.30
Ribbon Reverse-Pawls .....	2.27
Ribbon-Spool Brackets .....	2.19
Ribbon-Spool Cups .....	2.18
Ribbon-Spool Drive-Shaft, Left .....	2.21
Ribbon-Spool Drive-Shaft Driving-Gear, Left .....	2.22
Ribbon-Spool-Shaft Compression-Springs, Left and Right .....	2.23
Ribbon-Spool-Shafts, Left and Right .....	2.20
Ribbon-Spools .....	2.26
Selector-Cams .....	2.01
Selector-Clutch Torque .....	2.142

REPERFORATOR-TRANSMITTER UNITS  
14F AND 14G  
REQUIREMENTS AND  
PROCEDURES

<b>Table of Contents—(Continued)</b>	<b>Paragraph</b>
Selector-Finger Bell-Crank Spring .....	2.92
Selector-Fingers Retaining-Bracket .....	2.57
Sensing-Contact-Assembly-Comb Alignment .....	2.144
Sensing-Contact Operating-Bails (Old Style Bracket) .....	2.117
Sensing-Contact Operating-Bails (New Style Bracket) .....	2.118
Sensing-Contact Spring .....	2.145
Sensing-Contact Spring-Pileup Alignment .....	2.146
Sensing-Contact and Spring-Tang Alignment .....	2.143
Sensing and Distributing-Clutch Magnet-Mechanism .....	2.64
Sensing and Distributing-Clutch Magnet Release Spring .....	2.65
Sensing and Distributing-Clutch Springs..	2.70
Sensing and Distributing Driving - Clutch	2.67
Sensing-Shaft Rear Bearing Oil-Cup ....	2.69
Shift-Bail Bracket .....	2.46
Shift-Bail Spring .....	2.50
Shift-Bail Upstop-Screw .....	2.52
Shift-Latch Spring .....	2.54
Shift-Lever .....	2.43
Shift-Lever Spring .....	2.53
Stop-Screw, Figs. ....	2.45
Sub-Shaft Bearing-Brackets .....	2.66
Tape-Depressing Bail .....	2.100
Tape-Depressing Bail-Spring .....	2.91
Tape-Feed-Indicator Contact-Assembly .	2.147
Tape-Feed-Lever .....	2.109
Tape-Feed-Lever-Extension Spring .....	2.110
Tape-Feed-Pin Oscillating-Lever- Extension Spring .....	2.111
Tape-Feed-Pin-Oscillator .....	2.107
Tape-Feed-Pin-Oscillator Backstop- Screw .....	2.98
Tape-Feed-Pin-Oscillator Spring .....	2.108
Tape-Guide Blades .....	2.113
Tape-Holding-Lever Spring .....	2.103
Tape-Out Contacts .....	2.133
Tape-Out Mechanism (Manual) .....	2.06
Tape-Out Sensing-Lever Spring .....	2.132
Tape Stripper-Plate .....	2.82

## Table of Contents—(Continued)

## Paragraph

Transfer-Bail-Extension and Lower Transfer-Slide-Bar Eccentric-Shaft (Final) .....	2.126
Transfer-Bail and Slide-Assembly (Preliminary) .....	2.123
Transfer-Bail and Slide-Assembly (Final)	2.125
Transfer-Bail Spring .....	2.127
Transfer-Lever Bail (Old Style Bracket)	2.116
Transfer-Lever Bail (New Style Bracket)	2.122
Transfer Slide-Bar Eccentric-Shaft, Lower (Old Style Bracket) .....	2.114
Transfer Slide-Bar Eccentric-Shaft, Lower (New Style Bracket) .....	2.119
Transfer Slide-Bar Eccentric-Shaft- Collar, Lower (Old Style Bracket) .....	2.115
Transfer Slide-Bar Eccentric-Shaft- Collars, Lower (New Style Bracket) ...	2.121
Transfer Slide-Bar-Shaft Collars, Upper (New Style Bracket) .....	2.120
Transfer T-Lever Eccentric-Shaft .....	2.124
Transmitter Auxiliary-Contact .....	2.129
Transmitter Stop-Contact .....	2.134
Universal Contact-Lever Spring .....	2.136
Universal Contacts .....	2.135
Vertical-Link Bell-Crank Separator Plates, Lower .....	2.17
Vertical-Link Pivot Screw .....	2.16
Y-Lever Guide-Plate .....	2.105
Y-Lever Pivot-Shaft .....	2.104
Y-Lever Spring .....	2.106

### 1. GENERAL

1.01 This section contains the apparatus requirements and adjusting procedures for the maintenance of the 14F and 14G reperforator transmitter units.

1.02 This section is reissued to incorporate new developments, revised arrangements of paragraphs and figures and improved adjustments and replaces the adjusting information in P98.036 and P98.038. The changes are too numerous and extensive to allow the use of margin indicating arrows.

1.03 All adjustments apply to both 14F and 14G units except where otherwise specified. The 14F reperforator transmitter differs from the 14G only in that it is equipped with control contacts operated by special pull bars.

**1.04 Selecting a Character or Function:** When the instructions for making an adjustment specify the setting up of a certain character or function, the following method should be followed: Rotate the motor fan counterclockwise, as viewed from the fan, until the selector armature locking lever is about to drop off the long high part of the locking cam. Hold or release the selector armature to move the selector arm extension to the operated (MARKING) or unoperated (SPACING) side in accordance with the first selecting impulse of the code combination to be set up. With the selector arm in this position, rotate the motor fan until the top (No. 1) selector sword has been positioned and the locking lever is on the peak of the locking cam. Position the selector arm in accordance with the second impulse of the code combination to be set up and repeat the procedure followed in positioning the top (No. 1) selector sword. Position all of the selector swords following the foregoing procedure. When all swords have been positioned and the main shaft clutch has been engaged, further rotation of the motor fan will cause the unit to select the character to perform the functions which have been set up.

**1.05 To Move the Motor Unit:** To facilitate some adjustments, the motor unit should be moved in the following manner: Remove the gear guard. Remove the right-hand and the rear left-hand motor unit base plate mounting screws, loosen the left-hand front mounting screw, and swing the motor unit to the left.

**Note:** After all adjustments have been completed which are facilitated by moving the motor, the motor should be swung back into position and the gear guard replaced.

**1.06** Special tools and gauges for the reperforator transmitter will be required as follows:

505A Contact Spring  
Adjusting Tool

507A Contact Spring  
Adjusting Tool

68B or 70D Gram Gauge

TP121550 Bending Tool

TP103534 Bending Tool

TP99391 Gauge

For bending and gauging the sensing contact springs.

For bending the distributor contact springs.

For twisting the vertical link bracket.

For gauging pull bar contacts on 14F Units.

## 2. REQUIREMENTS AND PROCEDURES

2.01 Selector cams should line up with their respective selector levers.

- (a) Gauge by eye while selector cam is rotated through at least one revolution.
- (b) To adjust, loosen the upper and lower main shaft bearing cap mounting screws and raise or lower the shaft. Tighten the upper bearing cap mounting screws and position the bearing retainer on the lower bearing cap so that the bridge of the retainer rests against the upper face of the ball bearing, and clears the lower bearing cap. Tighten the lower bearing cap mounting screws.

2.02 Main-Shaft Clutch Throw-Out Lever: There should be Min. .010", Max. .020" clearance between the clutch teeth when the clutch driven member is fully cammed out of engagement.

Fig. 1

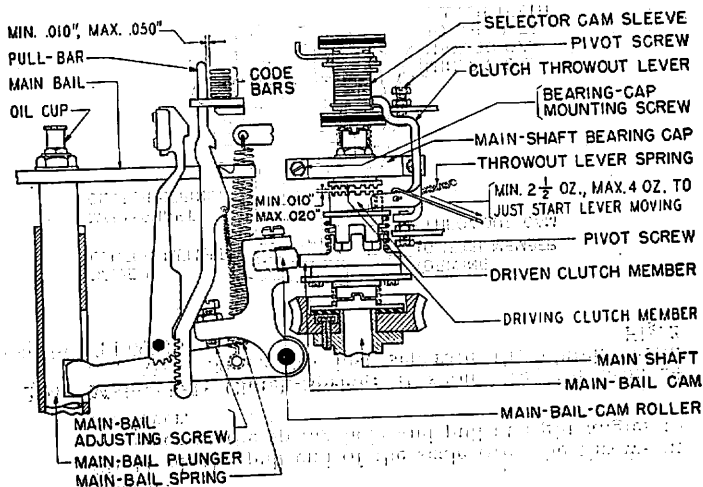


Fig. 1

- (a) Adjust the clutch throw-out-lever pivot screws to meet the above requirement. The throw-out lever should be free on its bearings without perceptible end play when the pivot-screw lock-nuts are tightened.

REPERFORATOR-TRANS-  
MITTER UNITS  
14F AND 14G  
REQUIREMENTS AND  
PROCEDURES

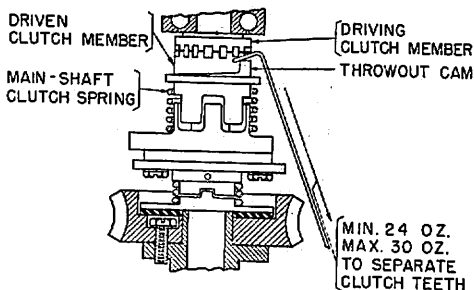
2.03 **Main-Shaft Clutch Throw-Out-Lever Spring:** It should require Min. 2-½ oz., Max. 4 oz. to start the throw-out-lever moving. **Fig. 1**

(a) To gauge:

(1) Position the main shaft so that the throw-out lever is resting against the low part of the clutch driven member.

(2) Hook the pull end of the scale over the throw-out lever at the spring hole and pull at right angles to the lever.

2.04 **Main-Shaft Clutch-Spring:** It should require Min. 24 oz., Max. 30 oz., to just separate the clutch teeth. (Spring TP6993.) **Fig. 2**



**Fig. 2**

(a) To gauge:

(1) Turn the main-shaft until the throw-out lever is resting against the low part of the clutch driven member.

(2) With the base plate removed, insert the pull end of the scale through the cable hole in the base and hook it over the throw-out cam on the driven clutch member and pull as shown in Fig. 2. Replace the base plate.

**Fig. 2**

2.05 **Motor Position and Gear Mesh:**

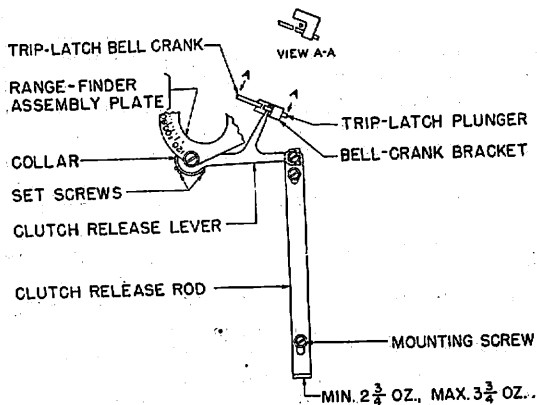
(a) With the motor base plate eccentric stop approximately in the center of its adjustment and the base plate resting against the stop, a horizontal center line through the

main shaft gear should coincide approximately with a horizontal line through the center of the pinion.

- (1) To adjust, add or remove shims between the motor feet and the base plate using the same number of shims under each motor foot. Shims not used should be retained beneath their respective mounting screw lock washers to prevent the screws from protruding beneath the base plate.
- (b) There should be a barely perceptible amount of backlash between the motor pinion and the main shaft gear throughout one complete revolution of the gear.
  - (1) To adjust, loosen the motor mounting screws and align the motor on the base plate.

Note: The gear play may be refined by pivoting the motor base plate about the left-hand screw and adjusting the eccentric stop.

2.06 **Manual Tape-Out Mechanism:** The round tip of the clutch-release lever should be approximately midway between the trip latch plunger and the bracket. The clutch release lever should not limit the upper range movement of the indicator arm on the range finder scale. **Fig. 3**



**Fig. 3**

- (a) To adjust, loosen the screws in the collar under the clutch release lever and raise or lower the lever by means of the collar. Tighten the screws.

REPERFORATOR-TRANS-  
MITTER UNITS  
14F AND 14G  
REQUIREMENTS AND  
PROCEDURES

- 2.07 **Clutch release-rod** should slide freely on its mounting screws. **Fig. 3**
- Gauge by eye and feel.
  - To adjust, loosen the lock-nut on the front mounting screw and raise the screw. Tighten the lock-nut.
- 2.08 **Clutch Release Rod Spring:** It should require Min. 2-3/4 oz., Max. 3-3/4 oz. to start the rod moving. **Fig. 3**
- Gauge by applying the push end of the scale to the end of the clutch release rod, parallel to it.

2.09 **Pull-Bars Supported by Function-Bar Spring Brackets.**

**Note:** In order to follow the procedure in this paragraph and 2.10 it will be necessary to remove the type basket as follows:

- Remove the pull-bar mounting plate assembly (Type "14F" only).
- Unhook the code bar locking lever spring. Set unit on its back supports and remove the base plate.
- Remove the three code-punch bracket mounting screws.
- Remove the sensing and distributor clutch detent lever bracket assembly by removing its two mounting screws.
- Remove the three type basket assembly mounting screws.
- Unhook the punch bail arm spring located behind the punch arm link.
- Remove the ribbon spools and the ribbon.
- Remove the code-punch block assembly rear mounting screw.
- Remove the front mounting screw of the right ribbon spool bracket. Loosen the rear mounting screw and swing the bracket so that the ribbon spool cup will not interfere with the removal of the type basket.
- Lift the code-punch bracket assembly and the punch block assembly out of the unit.
- With the pull-bars out of engagement with the pull-bar guide, loop a piece of string or wire around the top of the pull-bars and lift the assembly upward and out of the unit.

Pull-bars supported by function-bar spring brackets should be free, without bind and should have approximately equal clearance between the corresponding edges of the function-bar spring brackets. **Fig. 4**



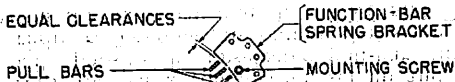


Fig. 4

- (a) To adjust, loosen the function-bar spring bracket mounting screw and align the bracket. Tighten the screw.

2.10 **Pull-Bar Springs:** (Type basket removed per 2.09.) It should require Min. 3 oz., Max. 4 oz. to stretch springs of pull-bars, having associated type bars, to position length. It should require Min. 5-1/2 oz., Max. 6-3/4 oz. to stretch springs of pull-bars, not having associated type bars, to position length. If trouble is experienced due to "contact bounce," it may be necessary to select other springs of same code number, whose tensions are toward the high limit, not to exceed 6-3/4 oz.

Fig. 5

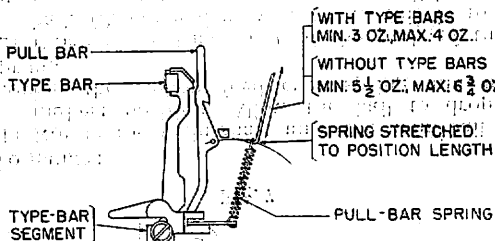


Fig. 5

- (a) To gauge, unhook the pull-bar springs from the pull-bars and hook the pull end of the scale through the spring eye and pull vertically.
- (b) To adjust, replace the spring. Function pull-bar springs located to the right and left side are adjusted as in Paragraphs 2.37 and 2.38.

**Note:** Remount the type basket by reversing the procedure in note in Paragraph 2.09.

2.11 **Main-Bail** (Motor moved out of the way). The main-bail should not bind throughout its entire travel.

Figs. 6, 7

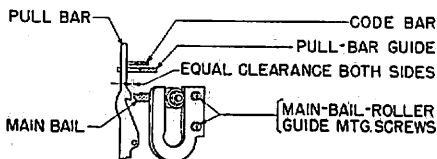


Fig. 6

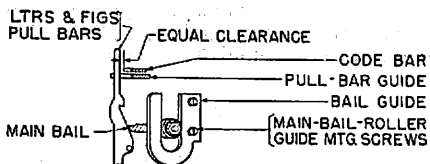


Fig. 7

## (a) To gauge:

(1) Rotate the main-shaft until the main-bail is in its highest position. Allow the bail to drop by removing the ribbon feed-lever spring and main-bail spring.

(2) Block all pull-bars out of the path of the main-bail. (A convenient way to do this is to place a length of solder wire between the pull-bars and the code-bars.)

(3) Place a finger under the main-bail lever and slowly raise the main-bail to its highest position and release.

(4) There should be no evidence of bind on the upward travel and the bail should fall freely to its lowest position when released. The universal contacts may prevent the bail from falling to its lowest position in which case, the contacts should be removed.

(5) Rehook the main-bail and ribbon feed-lever springs.

## (b) To adjust:

(1) Position the pull-bar guide so that its mounting screws are in the middle of the elongated slots and loosen the mounting screws of both main-bail roller-guides.

(2) With the blank combination set up and the main-bail opposite the unselected pull-bar humps, shift the right roller-guide to obtain the same clearance between the main-bail and the LTRS and FIGS pull-

bar humps. Tighten the right roller-guide top mounting screw friction-tight.

(3) With the main-bail cam roller on the high part of its cam, adjust the main-bail adjusting-screw to give some clearance between the pull-bars and the code-bars. Shift the right roller-guide around its friction-tight top mounting screw to obtain approximately the same clearance between the code-bars and the LTRS and FIGS pull-bars. Tighten the right roller-guide bottom mounting screw friction-tight and recheck adjusting step (2) above. Tighten both right roller-guide mounting screws after adjustments.

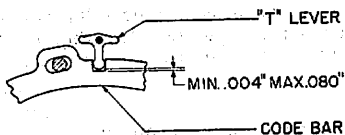
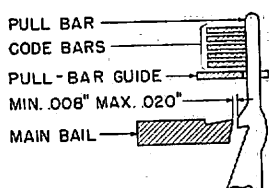
(4) Remove the main-bail spring and hold the ribbon feed-lever roller away from the main-bail plunger. Position the left roller-guide so that the main-bail is free throughout its travel and tighten the mounting screws. Check freeness of the main-bail by raising it to its uppermost position manually and releasing it. It should fall of its own weight to its lowest position. Replace the main-bail spring. Replace universal contacts.

(5) If it has been necessary to make the above adjustment, check requirements in Paragraphs 2.12 and 2.13.

## 2.12 Pull-Bar Guide: (Motor moved out of the way)

(a) There should be a Min. .008", Max. .020" clearance between main-bail and the projections on the unselected pull-bars. The oil cup on the main-bail plunger should clear the pull-bar guide. **Fig. 8**

(b) There should be Min. .004", Max. .080" clearance between the end of the No. 1 "T" lever and the bottom of the slot in the code-bar. All other levers should have some clearance. **Fig. 8**



**Fig. 8**

REPERFORATOR-TRANS-  
MITTER UNITS  
14F AND 14G  
REQUIREMENTS AND  
PROCEDURES

- (1) To gauge:
1. The "BLANK" and "LTRS" combinations should be set up in turn and the main-bail positioned opposite the pull-bar hump and the play of the main-bail taken up in the direction to make the clearance a minimum.
- (2) To adjust (a) and (b):
1. Align the pull-bar guide by loosening its mounting screws and moving the bar within its enlarged mounting holes. Tighten the screws.
- Note: When preceding requirements cannot be met, it may be necessary to readjust the main-bail roller guides. (See Paragraph 2.11.)

**2.13 Main-Bail Adjusting-Screw: (Preliminary Adjustment)**  
 (Motor moved out of the way.) There should be Min. .010", Max. .050" between the unselected pull-bars and the outer projections on the code-bars.

Fig. 1

- (a) To gauge:
- (1) Set up "BLANK" and "LTRS" combinations in turn, have the main-bail roller on the high part of its cam and the play in the main-bail and pull-bars taken up to make the clearance a minimum.

- (b) To adjust:
- (1) Loosen the main-bail adjusting-screw lock-nut and position the screw. Tighten the lock-nut.

**2.14 Main - Bail Adjusting - Screw: (Final Adjustment)**  
 (Motor moved out of the way.) There should be at least .010" clearance between the front edges of the code-bars and the adjacent edges of the code-bar bell cranks.

Fig. 9

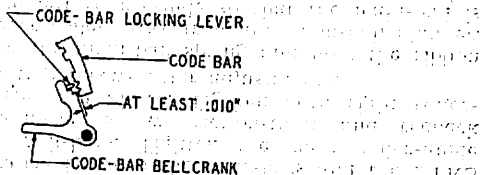


Fig. 9

- (a) To gauge:  
 The code-bars should be positioned for "LTRS" selection with the main-bail roller on the high part of its cam (main-bail down).

(b) To adjust:

Keeping within the previously specified limits of .010" to .050" between the pull-bars and the code-bars as specified in Paragraph 2.13, readjust the main-bail adjusting screw to obtain the .010" clearance specified herein. Move the motor back in place and check 2.05 (b). Fig. 1

## 2.15 Code-Bar Bell Cranks

(a) The code-bars should move freely between the code-bar bell-crank separator plates. Fig. 10

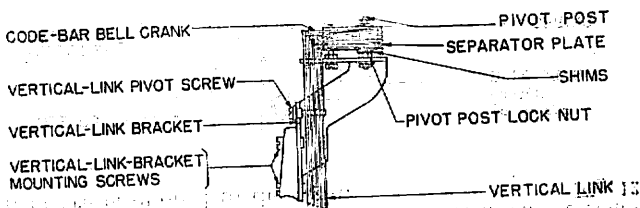


Fig. 10

(1) To adjust:

Make certain that the vertical-link bracket is mounted approximately in a vertical position and align the code-bar bell cranks with the code-bars by shifting the vertical-link bracket up or down. When necessary, add or remove shims between the lower separator plate and the shoulder on the pivot post.

(b) There should be .010" to .030" clearance between the right ends of the code-bars and the adjacent edges of the associated code-bar bell cranks when the code-bars are positioned for "Blank" selection and with the locking lever resting against the code-bars. Fig. 11

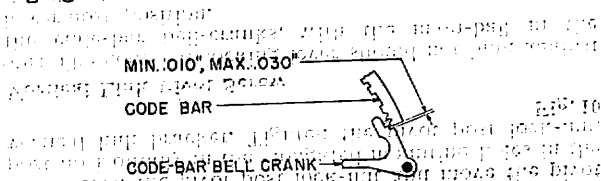


Fig. 11

REPERFORATOR-TRANS-  
MITTER UNITS  
14F AND 14G  
REQUIREMENTS AND  
PROCEDURES

(1) To adjust:

Loosen the pivot post lock-nut and move the pivot post horizontally in the elongated mounting holes in the vertical link bracket. Tighten the pivot post lock-nut.

**Fig. 10**

## 2.16 Vertical Link Pivot Screw

Note: The code-bar locking lever should not bind against the code-bar bell-cranks, with the main-bail in the lowermost position.

If binding is encountered and cannot be removed by adjustment, it may be necessary to replace the selector-fingers with new style selector fingers (TP117257).

(a) The left-end surfaces of the punch selector-fingers should be in approximate alignment with the left vertical edge of the punches, when the code bars are positioned to the right (LTRS combination) and the code-bar bell-cranks are resting against the code-bars. Fingers and punches should meet squarely and at full surface when in operation.

**Fig. 12**

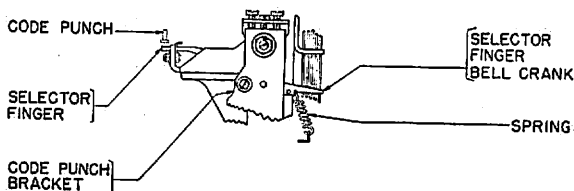
(1) To adjust:

Position the vertical-link pivot screw in its elongated mounting hole.

**Fig. 10**

(b) The left-end surface of all the punch selector-fingers should be approximately in line and at right angles to the front surface of the code-punch bracket when the code-bars are positioned to the right.

**Fig. 12**



**Fig. 12**

(1) To adjust:

With the TP103534 bending tool, twist that portion of the vertical link bracket which mounts the vertical link pivot screw. Hold the adjusting tool parallel with the base while twisting. Recheck (a).

**Fig. 10**

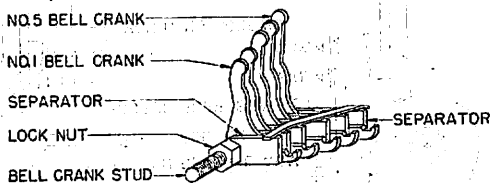
**Caution:** Care should be exercised when bending the vertical-link bracket to avoid disturbing other parts of the bracket.

**Note:** When the foregoing requirements have been met, the following checks should be made.

(c) With alternate combinations for "R" (2-4) and "Y" (1-3-5) set up on the code-bars and the punch-arm roller on the high part of its cam, there should be a clearance of at least .020" between the left end surface of the unselected punch selector-fingers and the right end of the punches.

(d) With the code-bars in the "Blank" combination selection and the code-bar locking lever against the code-bars, the left end of the punch-selector fingers should be drawn not more than half-way through their guide slots in the punch-bail. When these checks cannot be met, readjust (a) or (b) or both.

2.17 Lower vertical-link bell-crank separator-plates should meet the following requirements with the main-bail in its lowermost position. **Fig. 13**



**Fig. 13**

- (a) Separator plates without extension should be approximately in line with each other horizontally.
- (b) Separator plate with extension should have Min. .005", Max. .020" clearance between the top edge of the No. 1 bell crank and the bottom side of the extension at the closest point and there should be some clearance between the bottom side of the extension and the top edge of the other four-bell cranks.
- (c) Vertical parts of the bell cranks should be retained by at least 1/3 their width within their guide slots when the horizontal end is held against the separator-plate extension.

- (1) To adjust, loosen the lock-nut on the bell-crank stud while holding the stud to prevent its loosening. Position the separator plates. If necessary, bend the plate extension to meet the requirements. Tighten the nut. Do not loosen the stud.

### 2.18 Ribbon-Spool Cups:

- (a) The center of the left ribbon-spool cup-roller should be Min.  $5\frac{7}{16}$ " , Max.  $5\frac{9}{16}$ " from the surface of the boss on which the pivoted sensing unit is mounted. Fig. 14

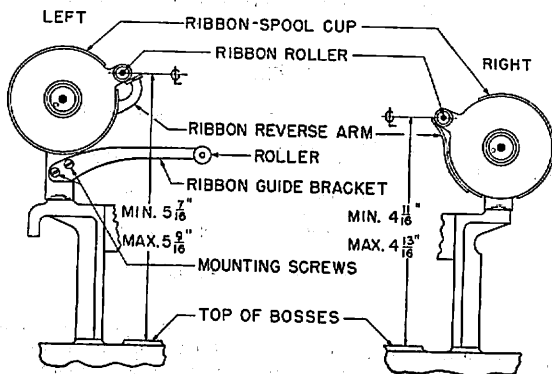


Fig. 14

- (b) The center of the right ribbon-spool cup-roller should be Min.  $4\frac{11}{16}$ " , Max.  $4\frac{13}{16}$ " from the surface of the boss on which the code-punch assembly is mounted. Fig. 14

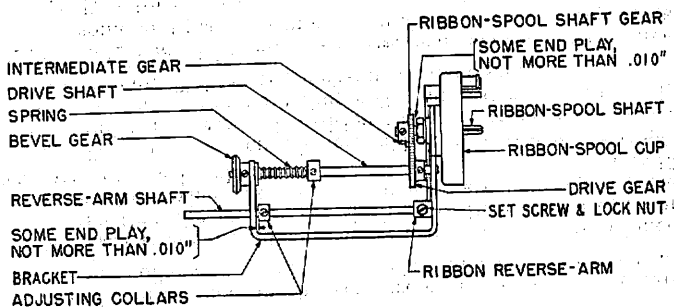
- (1) To adjust, loosen the ribbon-cup lock-nut and rotate the cup. Tighten the lock-nut.

2.19 **Ribbon-Spool Brackets:** Both left and right ribbon-spool cups should be in line and the right and left ribbon drive-shaft bevel gears should have a minimum amount of end play without binding when they are in mesh with their respective ribbon-feed-shaft bevel gears. Figs. 15, 16

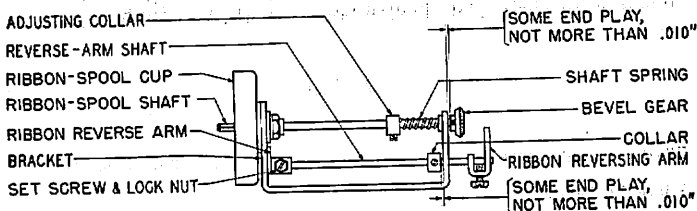
- (a) To adjust, loosen the right and left ribbon-spool bracket lock-nuts and mounting screws and align the brackets. Tighten the mounting screws and the lock-nuts.



2.20 **Left and right ribbon-spool shafts should have some end play, not more than .010".** **Figs. 15, 16**



**Fig. 15**



**Fig. 16**

(a) To adjust, loosen the ribbon-spool shaft-gear set screw and position the gears. Tighten the set screws making sure that they rest upon the flat surface of the shafts.

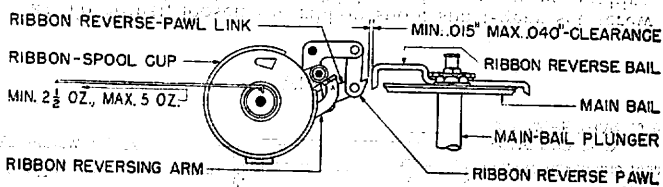
2.21 **Left ribbon-spool drive shaft should protrude approximately the same distance through the bevel gear as it does through the front of the ribbon-spool bracket.** **Fig. 15**

(a) To adjust, loosen the ribbon-spool drive-shaft-bevel-gear set screw and position the gear. Tighten the set screw.

2.22 **Left ribbon-spool drive-shaft driving-gear should mesh fully with the intermediate gear.** **Fig. 15**

- (a) To adjust, loosen the driving-gear set-screw and position the gear. Tighten the set screw.  
Note: The intermediate-gear should run freely in mesh with the driving gear and the ribbon-spool shaft gear.

**2.23 Left and Right Ribbon-Spool-Shaft Compression Springs:** It should require Min. 2-1/2 oz., Max. 5 oz. to just start the ribbon-spool shafts moving. See Fig. 15 for location of parts and Fig. 17 for method of checking. **Figs. 15, 17**



**Fig. 17**

- (a) To gauge: With the ribbon-feed shaft gear disengaged from the left ribbon-spool drive-shaft gear, hook the pull end of the scale over the pin on the ribbon-spool shaft located inside the cup and pull at right angle to a line passing through the centers of the pin and the ribbon-spool shaft.

- (b) To adjust, loosen the set screw on the spring adjusting collar and position the collar. Tighten the set screw.

**2.24 Left and right ribbon-reverse arms** should be positioned so that the end of the shafts are flush with the front of the brackets when the adjusting collars are held against the rear arm of the brackets. **Fig. 15**

- (a) To adjust, loosen the left ribbon-reverse-arm lock-nut and set screw and position the arm. It may be necessary to move the adjusting collar in order to make this adjustment. Tighten the lock-nut and set screw.

**2.25 Left and right ribbon-reverse arm shafts** should have some end play, not more than .010". **Fig. 15, 16**

- (a) To adjust, loosen the set screw in the adjusting collars and position the collars. Locate the set screws so that they are easily accessible. Tighten the set screws.

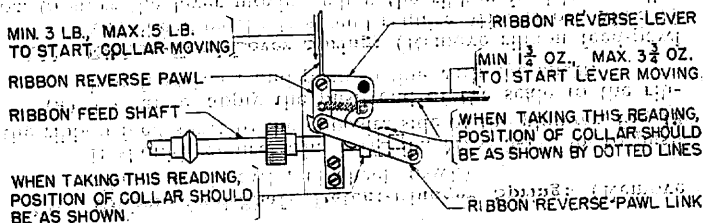
2.26 **Ribbon spools** should be sufficiently tight on their shafts to insure that they will not slide off in service. **Figs. 15, 16**

(a) To adjust, spread the prongs of the ribbon-spool shafts.

2.27 **Ribbon Reverse-Pawls:** There should be Min. .015", Max. .040" clearance between both right and left ribbon reverse-pawls and the ribbon reverse-bail when the ribbon reverse-arms are resting against the ribbon spool-cups (unoperated position) and the ribbon reverse-bail is opposite the ribbon reverse-pawls. **Fig. 17**

(a) To adjust, loosen the ribbon reverse-arm set screw and position the arm. Tighten the screws.

2.28 **Ribbon-reverse-pawl links** should not bind on their shoulder screws. **Figs. 18, 16**



**Fig. 18**

(a) To adjust, loosen the lock-nuts and set screws on the ribbon-reversing arms located at the rear end of the ribbon-reverse-arm shaft and position the arms back and forth. Tighten the screws and lock-nuts and recheck 2.27.

2.29 **Left and Right Ribbon-Feed-Shaft Safety-Springs:** With the main-bail in its uppermost position and the ribbon-feed shaft held in its left-hand position, it should require Min. 3 lb., Max. 5 lb. to just start the spring collar moving when the push end of the scale is applied to the upper end of the right-hand ribbon-reverse pawl and pushed vertically downward. Check the left safety spring with the ribbon-feed shaft held in its right-hand position and the scale applied to the left-hand ribbon-reverse pawl. See Fig. 18 for position of gauge and Fig. 19 for location of spring. **Figs. 18, 19**

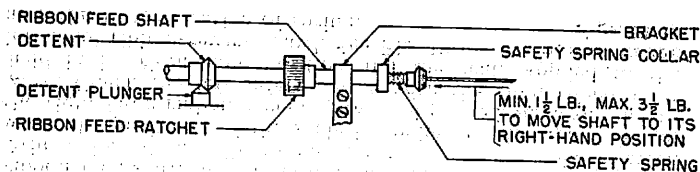


Fig. 19

**2.30 Right and Left Ribbon-Reverse-Pawl Spring:** It should require Min. 1-3/4 oz., Max. 3-3/4 oz. to start the right ribbon-reverse lever moving when the collar on the ribbon-feed shaft is moved away from the ribbon-reverse lever. **Fig. 18**

(a) To gauge, hook the pull end of the scale over the spring post of the ribbon-reverse lever and pull in line with the spring. Check the left ribbon-reverse pawl in the same manner.

**2.31 Ribbon-Feed-Shaft Detent-Plunger Spring:** (Remove ribbon feed-pawl and check pawl.)

It should require Min. 1-1/2 lb., Max. 3-1/2 lb. to push the ribbon feed-shaft to the opposite side of the plunger. **Fig. 19**

(a) To gauge, apply the push end of the scale to the ribbon feed-shaft and push in line with the shaft.

**2.32 Ribbon-Feed-Lever Spring:** (Remove ribbon feed-pawl and check pawl.) It should require Min. 12 oz., Max. 18 oz. to start the lever moving when the ribbon-feed-lever roller is in the plunger indent. **Fig. 20**

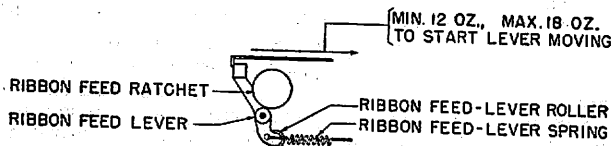
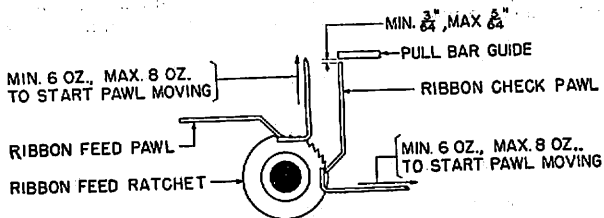


Fig. 20

(a) To gauge, hook the scale over the top of the ribbon feed lever and pull horizontally toward the front of the unit. **Replace ribbon feed-pawl and check-pawl.**

2.33 **Ribbon check-pawl** (top end) should clear the lower surface of the pull-bar guide by Min.  $3/64"$ , Max.  $5/64"$  as gauged by eye. **Fig. 21**



**Fig. 21**

(a) To adjust, loosen the check-pawl mounting screw and position the check-pawl.

2.34 **Ribbon Check-Pawl Pressure:** It should require Min. 6 oz., Max. 8 oz. to just pull the check pawl away from the ribbon-feed ratchet when the ratchet is positioned so that its tooth does not prevent free movement of the pawl. **Fig. 21**

(a) To gauge, hook the pull end of the scale under the engaging end of the check-pawl and pull horizontally toward the front of the unit.

(b) To adjust, change the curvature of the ribbon check-pawl. Do not crimp.

2.35 **Ribbon-feed pawl** should be positioned so that the ratchet will be moved one or two teeth for each revolution of the main shaft. **Fig. 21**

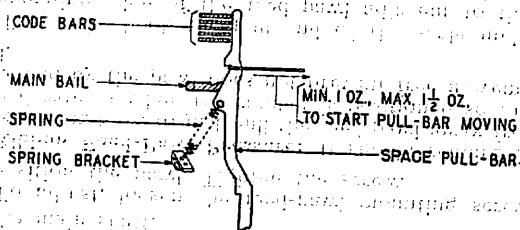
(a) To adjust, loosen the feed-pawl mounting screw and position the pawl. Tighten the screw.

2.36 **Ribbon Feed-Pawl Pressure:** It should require Min. 6 oz., Max. 8 oz. to just pull the feed pawl away from the ribbon-feed ratchet when the ratchet is positioned so that the tooth engaged by the pawl does not prevent free movement of the pawl. **Fig. 21**

(a) To gauge, hook the pull end of the scale under the engaging edge of the feed pawl adjacent to the feed ratchet. Pull vertically at right angle to the spring.

(b) To adjust, change the curvature of the ribbon feed-pawl. Do not crimp.

**2.37 Left Function Pull-Bar Spring:** It should require Min. 1 oz., Max. 1-1/2 oz. to just start the pull-bar moving when the main bail is in its lowest position. **Fig. 22**

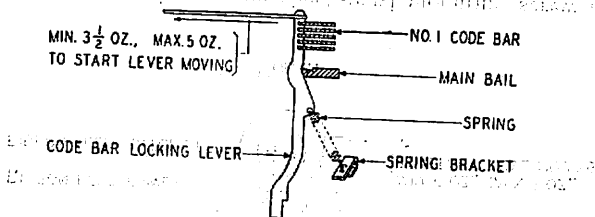


**Fig. 22**

(a) To gauge, hook the pull end of the scale over the "unshift on space" pull-bar just below the lobe and pull horizontally at right angle to the bar.

(b) To adjust, loosen the left function pull-bar spring-bracket lock-nut and position the bracket. Tighten the lock-nut.

**2.38 Code-Bar Locking - Lever Spring:** It should require Min. 3-1/2 oz., Max. 5 oz. to just start the lever moving when the main-bail is in its uppermost position and the code-bar bell cranks are held away from the locking lever. **Fig. 23**



**Fig. 23**

(a) To gauge, hook the pull end of the scale over to locking lever just above the No. 1 code bar and pull horizontally at right angle to the locking lever.

(b) To adjust, loosen the code-bar locking-lever spring-bracket lock-nut and position the bracket. Tighten the nut.

2.39 **Pull-Bar-Contact Mounting-Plate:** The following requirements should be met with the pull-bars resting against the code-bars but not selected.

- (a) The toes of the pull-bar hooks should be close as possible to .442" above the contact-mounting plate. Fig. 24

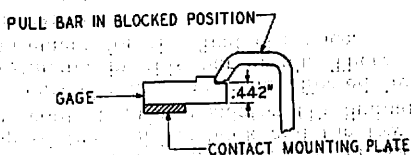


Fig. 24

- (1) Gauge with the TP99391 gauge.
  - (2) To adjust, add or remove shims between the pull-bar-contact mounting plate and the mounting posts.
- (b) The toes of the two end and one middle pull-bar hooks should be as close as possible to .620" in front of the contact mounting plate. Fig. 25

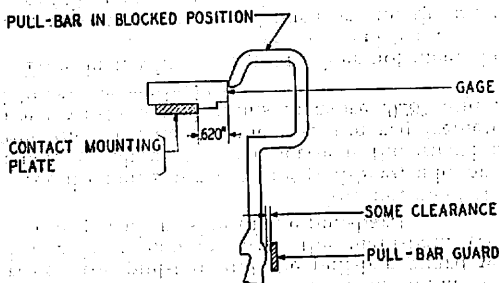


Fig. 25

- (1) Gauge with the TP99391 gauge.
- (2) To adjust, loosen the nuts securing the mounting plate and position the plate. Tighten the nuts.

2.40 **Pull-bar guard** should meet the following requirements with the main-bail in its lowest position; (Type "F" only). Fig. 25

- (a) With the type bars resting against the back stop, it should not be possible to manually disengage the pull-bars from their guide slots.
- (b) With the type bars held against the platen, there should be some clearance between the pull-bars and the pull-bar guard.
- (c) The same clearance should be obtained for pull-bars not having associated type-bars.

(1) To check this adjustment, raise the pull-bar by hand to a point where there is a minimum clearance between the pull-bar and the pull-bar guard when the pull-bar is in contact with the main-bail. (Shift the platen to permit raising of the pull-bar.)

(2) To adjust. When the guard does not meet the above requirements for the **end pull-bars**, add or remove washers or shims located between the guard and the frame on the side not meeting the requirement. (The correct washers and shims measure .028" and .004" in thickness respectively.)

(3) To adjust. When the guard does not meet the above requirements for the **middle pull-bars**, loosen one guard mounting screw and push or pull the guard until the requirement is met. Tighten the mounting screw.

#### 2.41 Pull-Bar Contact-Assembly:

Note: To insure uniformity in checking the adjustments the pull-bars should be blocked out of selection by the No. 1 code bar only. To do this, select the pull-bar and, by manually holding it out of selection, move the No. 1 code bar into the path of the pull-bar. The contact pressure should be measured with the scale held in a vertical position. The scale should engage the spring directly in front of the contact point.

- (a) There should be approximately .020" clearance between the tip of the pull-bar hook and the low flat surface of the long contact spring insulator. (Preliminary) **Fig. 26**

Note: This clearance may be affected by subsequent adjustments in this paragraph. There is no fixed requirement for the final clearance.

- (1) To gauge:

The pull-bar should be in the selected position with some clearance between it and the main bail.

- (2) To adjust:

Bend the long contact spring for minimum clearance at this point and then obtain the .020" by bending the upper contact spring.



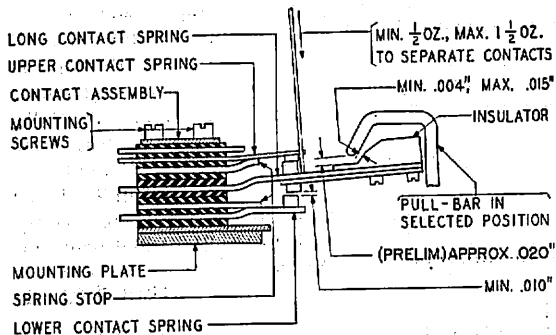


Fig. 26

(b) There should be Min. .004", Max. .015" clearance between the lower sloping surface of the long contact spring insulator and the adjacent surface of the pull-bar hook. The insulator should be aligned centrally with the pull-bar.

Fig. 26

(1) To gauge:

The pull-bar should be in the selected position with play taken up by pressing lightly downward on the pull-bar.

(2) To adjust:

Loosen the contact assembly mounting screws and

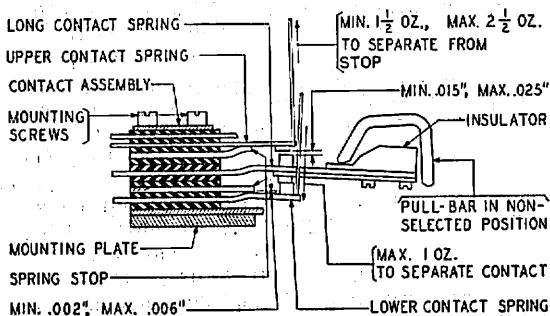


Fig. 27

REPERFORATOR-TRANS-  
MITTER UNITS  
14F AND 14G  
REQUIREMENTS AND  
PROCEDURES

reposition the assembly. Tighten screws. When the above requirements cannot be met, adjust the pull-bar contact mounting plate per Paragraph 2.39.

Note: Restore the pull-bar to its non-selected position.

- (c) There should be Min. .015", Max. .025" clearance between the long spring contact and the upper spring contact. **Fig. 27**

(1) To gauge:

The pull-bar should be resting against the No. 1 code bar in the non-selected position and the upper contact spring should be against its stop.

(2) To adjust:

Bend the upper contact spring stop. To reduce "bounce" or "chatter," of the "H" pull-bar contact, adjust toward the maximum clearance.

- (d) It should require Min. 1-1/2 oz., Max. 2-1/2 oz. to separate the upper contact spring from its stop. **Fig. 27**

(1) To gauge:

The pull-bar should be in its non-selected position and resting against the No. 1 code bar. Hook the scale under the upper spring at the contact and pull vertically.

(2) To adjust:

Bend the upper contact spring. To reduce "bounce" or "chatter," of the "H" pull-bar contact, adjust toward the maximum tension. Recheck requirement (b).

- (e) It should require Min. 1/2 oz., Max. 1-1/2 oz. to separate the long spring contact from the upper spring contact. **Fig. 26**

(1) To gauge:

Pull-bar should be in the selected position. Apply the push end of the scale to the long contact spring at the contact and exert pressure downward.

(2) To adjust:

Bend the long contact spring and recheck requirement (c).

- (f) There should be Min. .002", Max. .006" clearance between the lower contact spring and its stop. **Fig. 27**

(1) To gauge:

The pull-bar should be in its non-selected position and resting against the No. 1 code bar.

(2) To adjust:

Bend the lower contact spring stop.

(g) It should require Max. 1 oz. to separate the lower spring contact from the long spring contact. Fig. 27

(1) To gauge:

The pull-bar should be in the non-selected position.

Apply the push end of the scale to the lower contact spring at the contact and exert a downward pressure.

(2) To adjust:

Bend the lower contact spring and recheck requirement (f).

(h) With the pull-bar in its selected position, check that there is at least .010" clearance between the lower spring contact and the long spring contact. Gauge by eye. Fig. 26

**Note: The bending of springs and stops sets up stresses which tend to cause changes in permanent adjustments. To stabilize the adjustments, each pileup of springs should be operated either manually or under power at least 20 times and then rechecked and readjusted as required.**

#### 2.42 Main-Bail Spring: (Preliminary Adjustment) (Final 2.140).

(a) It should require 14 to 15 lb. pull to start the adjustment lever moving. Fig. 28

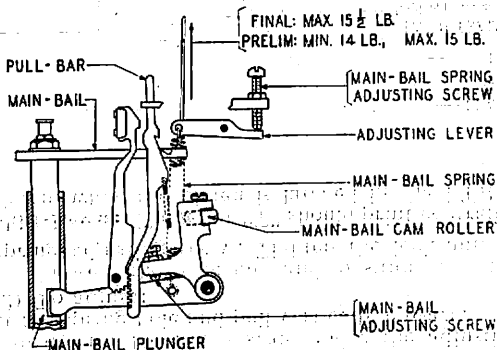


Fig. 28

REPERFORATOR-TRANS-  
MITTER UNITS  
14F AND 14G  
REQUIREMENTS AND  
PROCEDURES

(1) To gauge:

The main shaft should be in its stop position. (Main-bail down.) Hook the scale under the adjusting lever at the spring hole and pull vertically upward.

(2) To adjust:

Loosen the lock-nut and position the main-bail spring adjusting screw. Tighten the lock-nut.

2.43 **Shift-Lever:** The letter "T" should print centrally on the platen, when the platen is latched in the LTRS (rear) position.

Fig. 29

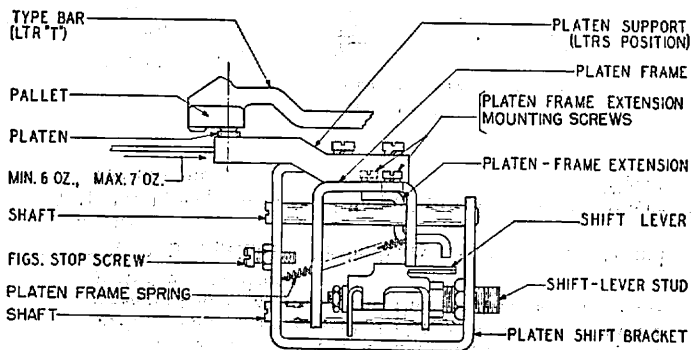


Fig. 29

(a) To adjust, loosen the shift lever stud lock-nut and position the stud. Tighten the lock-nut.

2.44 **Platen-Frame Spring:** It should require Min. 6 oz., Max. 7 oz. to just start the platen frame moving. The main-shaft should be in its stop position and the platen in its latched (LTRS-rear) position.

Fig. 29

(a) To gauge, apply the push end of the scale to the front end of the platen support and push horizontally toward the rear of the unit.

2.45 **Figs. Stop Screw:** The figure 5 should print directly in front of and in line with the letter "T" (printed in 2.43) when the platen frame is unlatched and resting against the FIGS stop screw (forward position).

Fig. 30

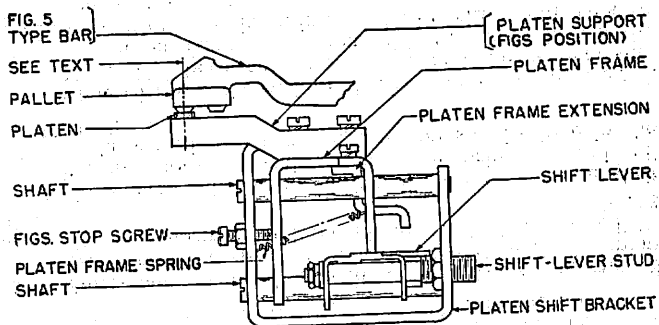


Fig. 30

(a) To adjust, loosen the FIGS stop screw lock-nut and position the screw. Tighten the lock-nut.

2.46 **Shift-Bail Bracket:** The front surface should be parallel to the front edge of the recessed portion of the base. **Fig. 31**

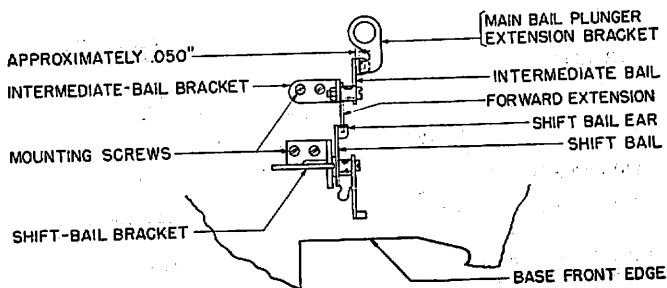


Fig. 31

(a) To adjust, loosen the shift-bail bracket mounting screws and position the bracket. Tighten the screws.

2.47 **Intermediate bail forward extension** should engage the center of the ear on the shift bail. **Fig. 31**

(a) To adjust, loosen the intermediate-bail bracket mounting screws and position the bail. Tighten the screws.

REPERFORATOR-TRANS-  
MITTER UNITS  
14F AND 14G  
REQUIREMENTS AND  
PROCEDURES

2.48 **Main-Bail-Plunger Extension Bracket:** The left edge of the operating surface on the main-bail-plunger extension should clear the side of the intermediate bail by approximately .050".

Fig. 31

(a) To adjust, loosen the main-bail-plunger extension bracket lock nut and reposition the bracket. Tighten the nut.

Fig. 32

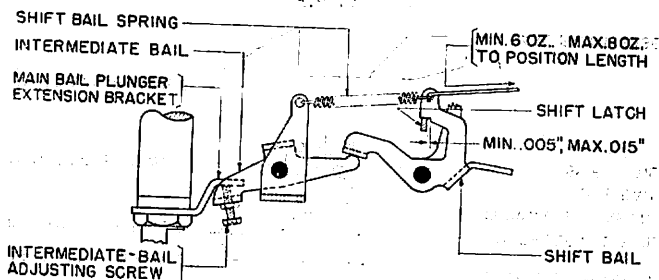


Fig. 32

2.49 **Intermediate-Bail Adjusting Screw:** The shift bail should overtravel the shift latch by Min. .005", Max. .015" with the main-shaft in its stop position and the play in the shift latch taken up in a direction to make the clearance a minimum.

Fig. 32

(a) To adjust, loosen the intermediate-bail adjusting-screw lock-nut and position the screw. Tighten the nut.

2.50 **Shift-Bail Spring:** It should require Min. 6 oz., Max. 8 oz. to pull the spring to position length with the main shaft in its stop position and the platen latched in the LTRS position.

Fig. 32

(a) To gauge, unhook the shift-bail spring from the shift bail and hook the scale through the spring eye and pull horizontally until the spring eye is opposite its hole in the shift bail.

2.51 **Platen-Frame Extension:** There should be Min. .010", Max. .020" between the shift bail and the vertical surface of the platen-frame extension with the main bail in its uppermost position, the platen in the FIGS position and the shift bail latched on the shift latch.

Fig. 33A

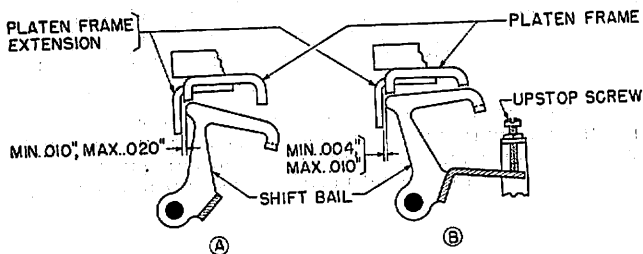


Fig. 33

(a) To adjust, loosen the platen-frame-extension mounting screws and reposition the extension by means of its elongated left mounting hole. Tighten the screws. Fig. 29

2.52 **Shift-Bail Upstop-Screw:** There should be Min. .004", Max. .010" clearance between the vertical surface of the platen-frame extension and the shift bail, with the main bail in its uppermost position, the platen in the LTRS position and the shift latch unlatched. Fig. 33B

(a) To adjust, loosen the shift-bail upstop-screw lock-nut and position the screw. Tighten the nut.

2.53 **Shift-Lever Spring:** It should require Min. 1 oz., Max. 1-1/2 oz. to just start the lever moving with the platen frame held clear of the lever. Fig. 34

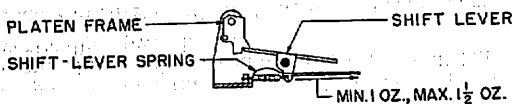


Fig. 34

(a) To gauge, hook the pull end of the scale around the shift lever at the spring hole and pull horizontally in line with the spring.

2.54 **Shift-Latch Spring:** It should require Min. 1/4 oz., Max. 1 oz. to start the shift latch moving with the main-shaft in the stop position. Fig. 35

REPRODUCED FROM  
NAVY DOCUMENTS  
FILE AND FOR  
WILLIAM R. GIBBS  
RELEASED UNDER E.O. 12958

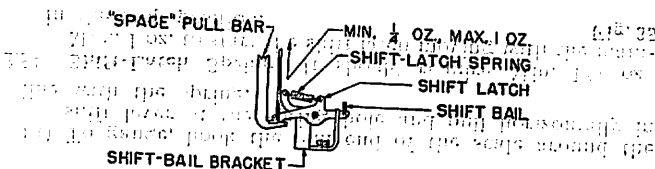


Fig. 35

(a) To gauge, hook the pull end of the scale under the end of the shift latch, just above the space pull-bar toe, and pull vertically upward.

2.55 **Code-Punch-Bail-Pivot Bracket:** (Preliminary Adjustment.) (Final 2.58.)

The lower surface of the punch-bail-pivot bracket should be Min. .080", Max. .090" above and parallel to the surface of the code-punch bracket on which it mounts.

Fig. 36

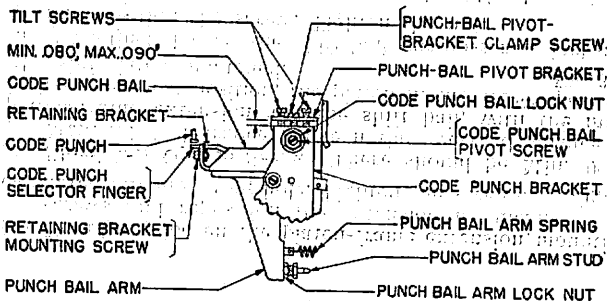


Fig. 36

(a) To adjust, loosen the front punch-bail-pivot-screw lock-nut and the punch-bail-pivot-bracket clamp screw and position the bracket by means of the right and left tilt adjusting screws. Tighten the lock-nut and the clamp screw.

2.56 **Code-Punch Bail:**

(a) The No. 1 and No. 5 code-punch selector fingers should be centered with respect to the No. 1 and No. 5 code punches and the code-punch bail should have some end play but not more than .004".

Fig. 37



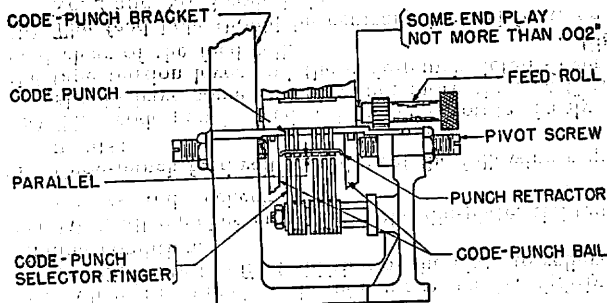


Fig. 37

(1) To adjust:

Position the code-punch-bail-pivot screws.

(b) The punch-retractor should float freely within the bail with the punch-retractor springs removed. Fig. 37

(1) To adjust:

Bend both legs of the punch-retractor near the cross brace and parallel to it. Replace the springs.

2.57 **Selector-Fingers Retaining Bracket:** The code-punch selector fingers should have Min. .006", Max. .015" up and down play in their slots in the retaining bracket. Fig. 36

(a) To adjust, loosen the selector-finger retaining-bracket mounting screws and position the bracket. Tighten the screws.

2.58 **Code-Punch-Bail-Pivot-Bracket:** (Final Adjustment.) (Preliminary 2.55.)

A line across the top of the code-punch-selector fingers should be parallel to a line across the bottom of the code punches. Fig. 37

(a) To gauge:

Insert a piece of tape into the punch block and back off the punch bail arm stud until the punch pins, when presented against the tape, barely emboss the tape. Punches 1 and 5 should emboss the tape equally.

(b) To adjust:

Loosen the punch-bail-pivot-bracket clamp screw and position the bracket by raising or lowering the right and

left tilting screws equally until the position is reached where the punch-bail-pivot bracket is parallel and the 1 and 5 punches emboss the tape equally. Tighten the clamping screw.

**2.59 Code-Punch Bail-Arm Stud:** (Preliminary Adjustment.) (Final 2.87.)

All code punches should just perforate the tape when the LTRS combination is set up and the motor is rotated manually.

(a) To adjust, loosen the punch-bail-arm-stud lock-nut and turn the stud in or out of the punch-bail arm. Tighten the lock-nut.

**2.60 Code-Punch Die-Plate Alignment**

**Caution:** The two top screws that hold the spring-arm bracket and die plate to the code-punch block assembly, should not be tampered with.

**Note:** The loosening of the screws that hold the spring-arm bracket and die plate to the code-punch block assembly, permits shifting of the die plate with respect to the punch-block casting and results in sticking code punches. If after thoroughly cleaning the code-punch block assembly, it is noted that the code punches stick, the die-plate position is probably out of alignment. The following procedure to realign the die plate should be followed:

(a) Operate all code-punches manually to engage the punches in the die-plate.

(b) Loosen and retighten (friction-tight) the two screws in the spring-arm and die-plate.

(c) Release the code-punches and observe that they are free and return to their lowermost position without hesitation.

(d) When the punches do not move freely, lightly tap the die-plate to effect shifting of the plate to relieve the binding condition.

(e) With all punches engaged in the die-plate, tighten the screws and recheck (c).

**2.61 Code-punch feed roll** should meet the following requirements:

(a) The code-punch feed roll should rotate freely and should have some end play, not more than .002" when the tape tension lever and the code-punch detent-lever are held clear of the feed roll.

**Fig. 37**

(b) The feed hole should be centrally located between the No. 2 and No. 3 code holes.

(1) To gauge, place a length of tape, in which the feed holes have been perforated, into the die block and engage the feed holes on the pins on the feed wheel. Select the letter "I" and perforate the tape. Remove the tape from the die block and gauge by eye.

Note: The above is a factory adjustment and should not require readjustment unless the shim pileup has been disturbed or a new feed roll is to be installed. If it is necessary to readjust, the following procedure should be followed:

- (a) Unhook the feed roll detent-lever spring.
- (b) Remove the two code punch-block assembly-mounting screws.
- (c) With the "Blank" combination selected and the punch-arm on the high part of its cam, hold the feed pawl clear and remove the code-punch-block assembly from the punch mechanism. Avoid damaging the punch pins when removing them from the punch retractor.
- (d) Hold the punch-block assembly so that the support plate is upward and remove the two shoulder screws and the two support-plate mounting screws. Remove the support plate, being careful not to pull out the punch pins.
- (e) Place the proper number of shims on each side of the feed roll to obtain an end play of not over .002". The shims should be slipped on the shaft by means of the slot. Avoid bending or kinking the shims.
- (f) Place the feed roll with the shims in the die block with the wide ends toward the die pins and the straight side toward the bottom of the die block.
- (g) Replace the support plate and the two mounting screws. Tighten the screws and recheck the location of the feed hole in relation to the code holes as specified, when the No. 2 and No. 3 code punches are operated manually. If the feed hole is not centered between the No. 2 and No. 3 code punch holes, shift one or more shims from one side to the other.
- (h) The tape should be held in the die block so that the edges of the tape are parallel with the sides of the block. If the feed roll is rotated so that the left edge of the die plate is midway between two

REPERFORATOR-TRANS-  
MITTER UNITS  
14F AND 14G  
REQUIREMENTS AND  
PROCEDURES

feed-hole perforations, the No. 2 and No. 3 punch pins will perforate their holes in line with the feed holes. This will aid in gauging the position of the feed roll.

- (i) With the "Blank" combination selected, manually rotate the motor until the punch-arm roller is on the high part of its cam. Place the punches of the code-punch assembly in their lowermost position, move the detent roller clear of the feed-roll ratchet and hold the feed pawl so that it passes through its slot in the block assembly.
- (j) Engage the punches and the guide shoulder screws of the punch-block assembly in the retractor slots and replace the front punch-block mounting screw friction-tight.
- (k) Hold the pivoted transmitter against the punch block and locate the block, within the limits of its mounting holes, parallel to the edge of the pivoted transmitter guide plate. (It may be necessary to move the ribbon guide out of the way.) Replace the rear screw and tighten both mounting screws.
- (l) Rehook the feed-roll detent-lever spring. Check the following adjustments:

**Paragraph Number**

**Paragraph Heading**

2.63	Code-Punch Feed-Pawl
2.88	Code-Punch Feed-Roll Detent (Final Adj.)
2.93	Code-Punch Tape Guide
2.94	Ribbon Guide
2.96	Pivoted-Transmitter Bracket
2.97	Pivoted-Transmitter Pilot Screws
2.98	Tape-Feed-Pin Oscillator Backstop Screw
2.99	Pivoted-Transmitter Tape-Guide Plate
2.100	Tape-Depressing Bail

**2.62 Code-Punch Feed-Roll Detent: (Preliminary Adjustment.) (Final 2.88.)**

When a length of tape containing ten feed holes to the inch (check with the TP95960 Tape Gauge) is placed in the code-punch die-block and the code-punch feed-roll detent is resting in an indent between two teeth on the ratchet, the left edge of a feed hole should be visible at the left edge of the die block when the feed holes in the tape are engaged with the pins on the feed roll.

**Fig. 38**

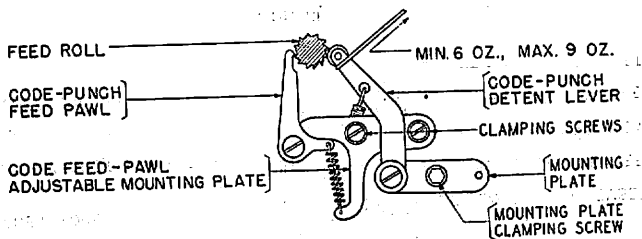


Fig. 38

(a) To adjust, loosen the detent-lever mounting-plate clamping screws and position the plate. Tighten the screws.

2.63 **Code-punch feed-pawl** (preliminary adjustment) should rest on the bottom of the first notch below the horizontal center line of the feed roll with the punch-arm roller on the lowest part of its cam. **Fig. 38**

(a) To adjust, loosen the code feed-pawl adjustable mounting plate clamping screws and position the plate by means of the elongated left-hand mounting hole. Tighten the screws.

## 2.64 Sensing and Distributing Clutch Magnet Mechanism:

Note: Adjustments (a) and (b) need not be made unless the shims or magnet have been disturbed.

(a) The clutch armature levers should have some end play not to exceed .006". **Fig. 39B**

(1) To adjust, add or remove shims between the armature levers.

(b) The armature when operated should rest against the magnet cores evenly.

(1) To gauge, hold a light background behind the armature cores. **Fig. 39A**

(2) To adjust, add or remove shims between the magnet cores and the magnet yoke.

(c) With the driving clutch members positioned in the center of their elongated holes (preliminary) and the armatures held in the operated position, there should be Min. .010", Max. .040" clearance between the high part of the driven clutches and their respective clutch-throwout levers. The armatures should be parallel to the shafts and with the armatures in the unoperated positions, the clutch-

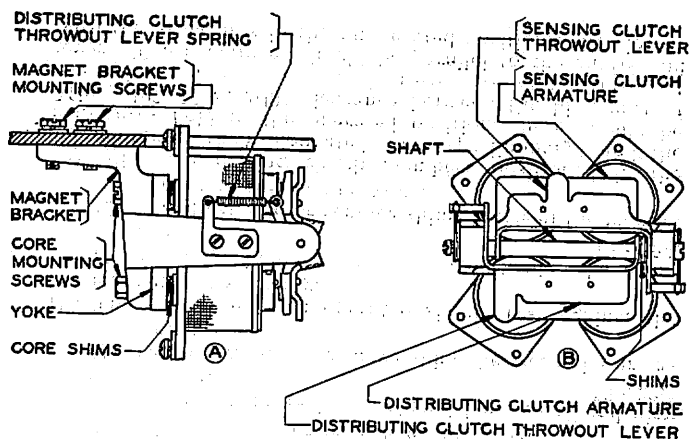


Fig. 39

throwout levers should disengage their clutches with approximately .005" clearance between the clutch teeth.

Figs. 40, 41

- (1) To adjust, loosen the clutch-magnet bracket-mounting screws and position the bracket. Tighten the screws. (It may be necessary to loosen the clutch driving members mounting screws and position the members by means of their elongated mounting holes.)

Figs. 39A, 40

FRONT OF UNIT

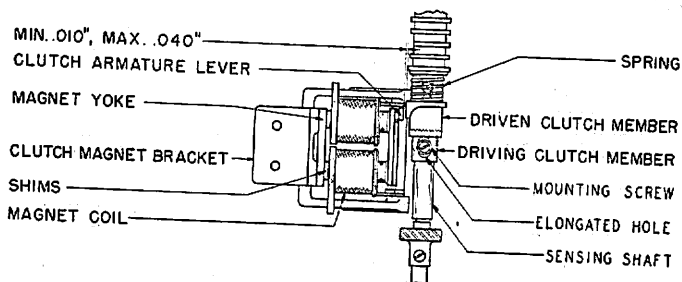


Fig. 40

## 2.65 Sensing and Distributing Clutch-Magnet Release Springs:

(a) When a clutch-magnet release-spring (TP120682) has been installed on each clutch-magnet, the spring should rest against the top insulators of each set of magnet coils.

(1) To adjust, bend the legs of the release spring.

(b) With the throwout lever springs removed, and the armature held lightly against the center leaf of the release spring but not compressing the release spring, there should be Min. .008", Max. .012" between the magnet core and the armature.

(1) To adjust, bend the center leaf spring.

Note: Check that the operating edges of the leaf extensions are parallel to their respective armatures.

(c) It should require at least 12 oz. to push the armature against the core.

(1) To gauge, apply the push end of the scale in a horizontal direction to the outer edge of the armature approximately in the middle. Replace the throwout lever springs.

2.66 **Sub-Shaft Bearing Brackets:** The sub-shaft should be free on its bearing with a minimum amount of end play. The gears at both ends should have a minimum amount of backlash throughout a complete revolution of the sub-shaft.

(a) To adjust, loosen the mounting screws of the sub-shaft mounting brackets and position the brackets. To adjust gear play between gears at left end of shaft, add or remove shims located between bearing brackets and base casting.

## 2.67 Sensing and Distributing Driving Clutch.

**Caution:** To avoid damage to the mechanism, check that there is clearance between the clutch members before applying power.

There should be Min. .005", Max. .015" clearance between the teeth of the driving and driven clutch members. Fig. 41

(a) Operate the unit under power, stop the cam assemblies by releasing the clutch throwout levers and then stop the motor.

(b) To adjust, loosen the driving clutch mounting screw and reposition the driving member by means of its elongated mounting hole. Tighten the screw.

## FRONT OF UNIT

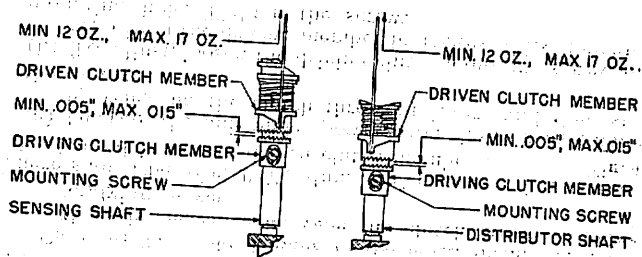


Fig. 41

2.68 **Punch-Arm Shaft Oiler:** The lid on the oil cup on the upper end of the punch-arm shaft should open to the left.

- (a) To adjust, loosen the punch-arm shaft set screw and reposition the shaft. Tighten the set screw.

2.69 **Sensing-Shaft Rear-Bearing Oil Cup:** The lid on the oil cup on the rear bearing of the sensing shaft should open from the front of the unit and the clearance between the hexagonal portion of the oil cup and the lock-nut should not exceed  $1/16$ ".

- (a) To adjust, loosen the hexagonal lock-nut on the oil cup and position the cup. Tighten the lock-nut.

2.70 **Sensing and Distributing-Clutch Spring:** It should require Min. 12 oz., Max. 17 oz. to just separate the teeth with the unit resting on its rear supports and the teeth on the driving clutch member resting on the teeth of the driven clutch member, but not engaged.

Fig. 41

- (a) To gauge, hook the pull end of the scale over the raised portion of the clutch driven members and pull in line with the shafts.

2.71 **Prepunch tape guide** should be positioned so that the TP99947 die-block cleaning tool when threaded through the tape guide, will not snag at the entrance to the die block. The rear of the guide should line up with the rear of the slot in the die block.

- (a) To adjust, loosen the tape guide mounting screws and align the guide. Tighten the screws.



2.72 **Prepunch tape-guide spring** should be positioned so that its curved tip is centered on the tape at a point opposite the cut-out portion of the tape guide. The tension of the spring should hold the tape firmly toward the rear wall of the die-block slot without buckling.

(a) To adjust for center alignment, loosen the spring mounting screws and position the spring. To adjust the tension, bend the spring. Tighten the mounting screws.

2.73 **Prepunch Retaining-Bracket:**

(a) There should be some clearance, not more than .002", between the top of the feed-hole punch and the prepunch arm, when the feed-hole punch is at its highest point of travel.

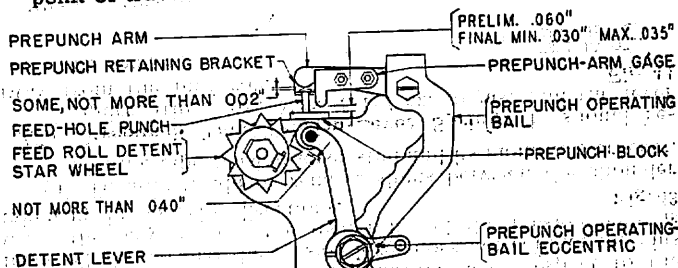


Fig. 42

(b) To adjust, loosen the prepunch retaining-bracket mounting screws and reposition the bracket. Tighten the screws.

(c) There should be no bind in the entire length of travel of the feed-hole punch.

(1) To check, remove the prepunch operating bail spring and feel for bind.

(2) To adjust, align the guide and die-plate assembly as required.

2.74 **Prepunch Feed-Roll Bearings:** The feed roll should be free in its bearings with some end play, not more than .004", with the feed-roll detent, the feed pawl, and the tape-tension lever held clear of the feed roll.

Fig. 43

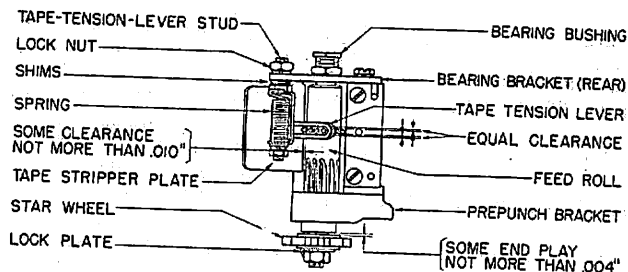


Fig. 43

(a) To adjust for freeness, loosen the rear bearing bracket mounting screws and reposition the bracket. Tighten the mounting screws. To adjust for end play, loosen the rear-bearing bushing lock-nut and reposition the bearing. Tighten the nut.

**2.75 Prepunch Tape-Tension-Lever Stud:** The tape-tension lever should be centrally located with respect to the feed-roll pins so that the tension lever does not contact the pins when the play in both the feed roll and the tension lever is taken up in opposite directions.

Fig. 43

(a) To adjust, add or remove shims between the shoulder on the tape-tension-lever stud and its mounting bracket.

**2.76 Prepunch Tape-Tension-Lever Spring:** It should require Min. 5 oz., Max. 5-1/2 oz. to just pull the lever away from the feed roll.

Fig. 44

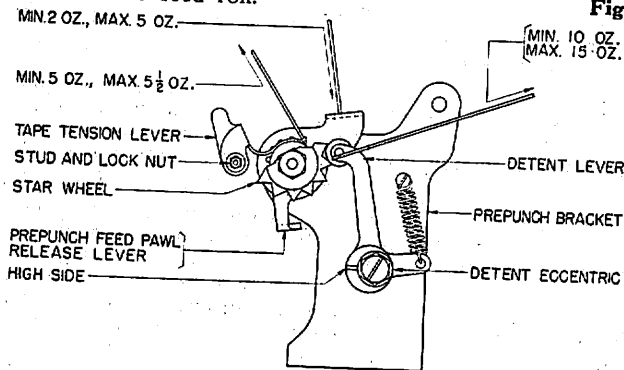


Fig. 44

(a) To gauge, hook the pull end of the scale under the tension lever at right-hand end of the slot and pull at a right-angle to the lever.

(b) To adjust, hold the tape-tension-lever stud with a wrench and loosen the lock-nut. Rotate the stud in either direction as required. Tighten the lock-nut while still holding the stud to avoid slipping.

**2.77 Prepunch Feed-Roll Detent:** (Preliminary Adjustment.) (Final 2.80.)

The high side of the detent eccentric should be positioned toward the left with the slot horizontal. **Fig. 44**

(a) To adjust, loosen the detent-eccentric mounting screw and rotate the eccentric. Tighten the screw.

**2.78 Prepunch Feed-Pawl Eccentric:** (Preliminary Adjustment.) (Final 2.81.)

The feed pawl should rest in the bottom of the first notch below the horizontal center line of the feed roll with the punch-arm roller on the low part of its cam. **Fig. 45**

(a) To adjust, loosen the feed-pawl eccentric mounting screw and rotate the eccentric. Make certain the high side of the eccentric is to the left. Tighten the screw.

**2.79 Prepunch-Operating Bail:**

(a) A piece of unperforated tape should be held friction-tight in the prepunch block by means of the feed-hole punch when the punch-arm roller is on the high part of its cam.

(1) To adjust, loosen the prepunch operating-bail-eccentric mounting screw and rotate the eccentric. Tighten the screw.

(b) There should be approximately .060" preliminary clearance between the end of the prepunch arm gauge and the prepunch block. **Fig. 42**

(1) To adjust, loosen the prepunch-arm-gauge mounting nuts and position the gauge. Tighten the nuts.

(c) With the tape removed there should be Min. .030", Max. .035" clearance between the end of the prepunch-arm gauge and the prepunch block with the punch-arm roller on high part of cam. **Fig. 42**

(1) To adjust, loosen the prepunch operating-bail-eccentric mounting screw and reposition the eccentric. The high part of the eccentric should be positioned above the center of a horizontal line through the eccentric.

2.80 **Prepunch Feed-Roll Detent: (Final Adjustment.) (Preliminary 2.77.)**

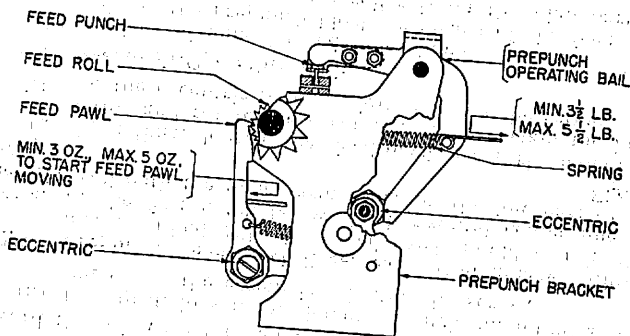
There should be ten feed holes to the inch of tape  $\pm .007''$  in a 4" length of tape when the tape has been perforated under power.

- (a) Gauge with the TP95960 tape gauge. **Fig. 44**  
 (b) To adjust, loosen the feed-roll-detent eccentric mounting screw and rotate the eccentric, keeping the high side toward the left.

2.81 **Prepunch Feed-Pawl Eccentric: (Final Adjustment.) (Preliminary 2.78.)**

(a) With a length of unperforated tape inserted into the prepunch block and the motor rotated by hand until the tape has been punched and the punch has just withdrawn from the tape, the feed pawl should just engage a tooth of the feed-roll ratchet. Check each tooth for one complete revolution of the feed roll.

**Fig. 45**



**Fig. 45**

- (1) Gauge by manually rotating the feed roll counter-clockwise with the detent roller riding on the star wheel.  
 (b) Hold the detent roller clear of the star wheel and rotate the feed roll clockwise just far enough to take up the play between the feed pawl and a tooth of the feed-roll ratchet without lifting the feed-pawl operating bail.

Hold the star wheel in this position and allow the detent roller to contact the star wheel and measure the clearance between the lower surface of the notch in the star wheel and the detent roller; this clearance should be Max. .040".

Fig. 42

(c) Rotate the motor slowly by hand and note that the feed pawl rotates the feed roll and that the detent roller safely engages a notch in the feed-roll ratchet. When checked under power the feed holes in the tape should not be burred.

Fig. 45

(1) To adjust, loosen the feed-pawl-eccentric clamping screw and reposition the eccentric, keeping the high side toward the left. Tighten the screw.

2.82 **Tape Stripper Plate:** There should be some clearance, not more than .010" between the upper edge of the tape stripper plate and the feed roll. Check throughout one complete revolution of the feed roll.

Fig. 43

(a) To adjust, loosen the stripper-plate mounting screws and position the plate. Tighten the screws.

2.83 **Prepunch Operating-Bail Spring:** It should require Min. 3-1/2 lb., Max. 5-1/2 lb. to start the prepunch arm moving with the punch-arm roller on the low part of its cam and the prepunch operating-bail lower extension held against the operating-bail eccentric.

Fig. 45

(a) To gauge, hook the pull end of the scale over the spring post on the bail and pull horizontally in line with the spring.

2.84 **Prepunch Feed-Roll Detent-Lever Spring:** It should require Min. 10 oz., Max. 15 oz. to just start the detent roller moving away from the star wheel.

Fig. 44

(a) To gauge, hook the pull end of the scale over the detent lever at the roller and pull at right angles to the spring.

2.85 **Prepunch Feed-Pawl Spring:** It should require Min. 3 oz., Max. 5 oz. to start the feed pawl moving away from the feed-roll ratchet with the main shaft in the stop position.

Fig. 45

(a) To gauge, apply the push end of the scale to the recessed portion of the feed pawl just above the spring and push in line with the spring.

2.86 **Prepunch Feed-Pawl Release-Lever Spring:** It should require Min. 2 oz., Max. 5 oz. to just start the lever moving.

Fig. 44

(a) To gauge, apply the push end of the scale to the top of the release lever and push downward.

REPERFORATOR-TRANS-  
MITTER UNITS  
14F AND 14G  
REQUIREMENTS AND  
PROCEDURES

**2.87 Code-Punch Bail-Arm Stud:** (Final Adjustment.) (Preliminary 2.59.)

The code punches should punch a full lid with a minimum amount of tear. **Fig. 36**

(a) To gauge, energize the selector magnet and run out a length of tape under power by operating the clutch release lever.

(b) To adjust, loosen the lock-nut on the punch-bail arm stud located under the base and position the stud. Tighten the nut.

**2.88 Code-Punch Feed-Roll Detent:** (Final Adjustment.)

(Preliminary 2.62.) The centers of the punch holes and the center of the feed hole should lie in a straight line when a length of tape has been run out as in 2.87. **Fig. 38**

(a) To adjust, loosen the feed-roll detent mounting-plate clamping screw and reposition the mounting plate by moving up or down. Recheck the code-punch feed pawl adjustment (2.63).

**2.89 Code-Punch Feed-Roll Detent Spring:** It should require Min. 6 oz., Max. 9 oz. to start the detent roller moving away from the feed-roll ratchet. **Fig. 38**

(a) To gauge, hook the pull end of the scale over the detent lever at the roller and pull at right angles to the upper portion of the lever.

**2.90 Code-Punch Feed-Pawl Spring:** It should require Min. 3-1/2 oz., Max. 6 oz. to start the pawl moving away from the feed-roll ratchet. **Fig. 46**

(a) To adjust, manually position the feed roll so that the tooth of the ratchet will not interfere with the free movement of the pawl, hook the pull end of the scale over the pawl at the spring hole and pull in line with the spring.

**2.91 Tape Depressing-Bail Spring:** It should require Min. 1/2 oz., Max. 2 oz. to extend the spring to position length with the tape depressing-bail resting against the transmitter plate. **Fig. 46**

(a) To gauge, unhook the spring from the bail, hook the pull end of the scale through the spring eye and pull vertically upward.

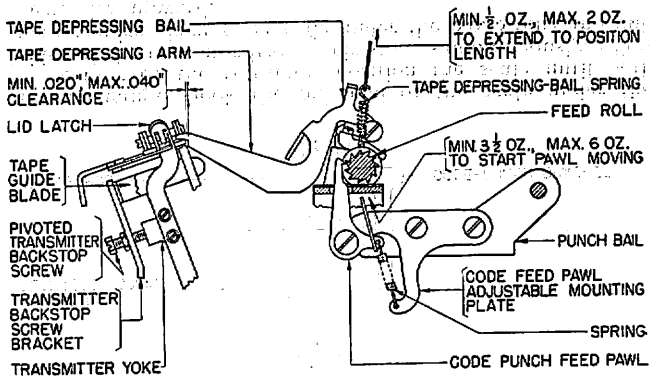


Fig. 46

2.92 **Selector-Finger Bell-Crank Spring:** It should require Min. 2-1/4 oz., Max. 3-1/4 oz. to start each bell crank moving, when the code-punch tape guide has been removed and the main shaft is in the stop position. **Fig. 12**

(a) To gauge, hook the pull end of the scale under the bell crank at the spring hole and pull vertically upward. Replace the tape guide.

2.93 **Code-Punch Tape Guide:** The tape should enter the code-punch block without buckling and a centerline through the tape code holes of the LTRS combination should be at right angles to the edges of the tape. **Fig. 47**

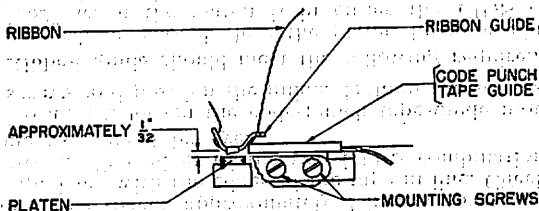


Fig. 47

REPERFORATOR-TRANSMITTER UNITS  
14F AND 14G  
REQUIREMENTS AND  
PROCEDURES

(a) To gauge, perforate a series of LTRS combinations in a length of tape. Open all flaps in the tape on two LTRS perforations spaced approximately 2 inches apart and fold the tape back with the edges of the tape in line. Check that the two trailing edges of the two LTRS combinations are in line as gauged by eye.

(b) To adjust, loosen the code-punch tape-guide mounting screws and position the guide. Tighten the screws.

**2.94 Ribbon guide** should meet the following requirements:

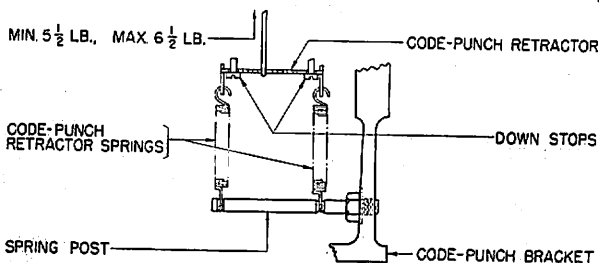
(a) The ribbon should clear the platen by approximately  $1/32''$  when the platen is in either the FIGS or the LTRS position. The guide should be centered over the platen. **Fig. 47**

(1) To adjust, loosen the ribbon-guide mounting screws and position the guide. Before tightening the screws, check (b).

(b) When fraction type pallets are used it may be necessary to reposition the ribbon guide to insure printing the entire character.

(1) To adjust, add or remove washers between the ribbon guide and the tape guide.

**2.95 Code-Punch Retractor-Springs:** It should require Min.  $5-1/2$  lb., Max. 8 lb. to start the retractor moving away from the down stops when the punch-arm roller is on the low part of its cam and the selector fingers are in the spacing (extreme right) position. **Fig. 48**



**Fig. 48**

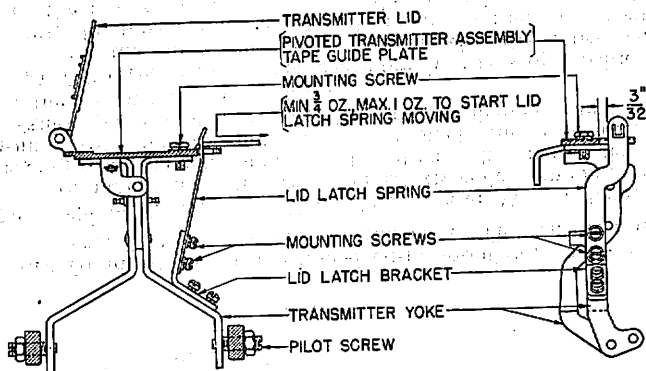
(a) To gauge, hook the pull end of the scale under the center of the retractor, position the scale until both sides of the retractor leave their stops simultaneously. (This may require placing the scale under the No. 3 pin) and pull vertically upward.



2.96 **Pivoted-Transmitter Bracket:** When the pivoted transmitter is held against the code-punch block, the channel on the pivoted transmitter should be approximately in the same horizontal plane as the tape channel in the code-punch block. Gauge by eye.

(a) To adjust, increase or decrease the number of shims between the pivoted transmitter bracket and the base casting.

2.97 **Pivoted-Transmitter Pilot Screws:** With the sensing shaft in its stop position, the pins in the feed-pin oscillator should be in line with the feed holes in the tape at the point where the tape emerges from the code-punch block. The pivoted transmitter should have a minimum amount of end play without bind. **Fig. 49**



**Fig. 49**

(a) To adjust, loosen the lock-nuts on the pilot screws and position the screws.

**Caution:** Do not raise or lower the transmitter lid unless the sensing shaft is in its stop position.

2.98 **Tape-Feed-Pin-Oscillator Backstop Screw:** With the sensing-cam sleeve in the stop position, place a length of tape, which has ten holes to the inch, in the pivoted transmitter. Operate the sensing-cam sleeve slowly until the tape-feed pins leave and are just about to re-enter the tape-feed holes. Under this condition the feed pins should be centered directly beneath the feed holes in the tape. **Fig. 50**

UNCLASSIFIED  
 AUTHORITY: 50 U.S.C. 1552  
 DATE: 08-01-2010  
 BY: 60322  
 RTR/SW/ML/10/08/10

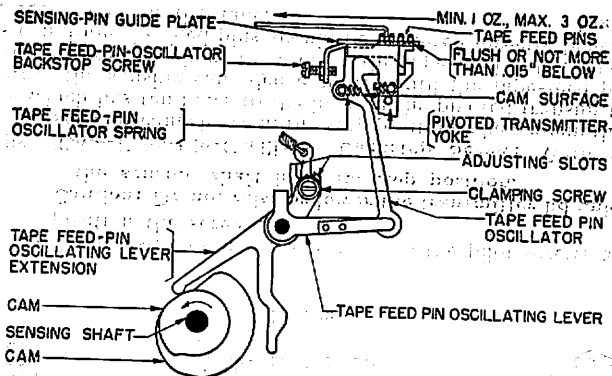


Fig. 50

- (a) To adjust, loosen the tape-feed-pin-oscillator backstop-screw lock-nut and position the screw. Tighten the nut.

**2.99 Pivoted-Transmitter Tape-Guide Plate:** With a length of tape, perforated with the LTRS code combination, emerging from the code-punch block and with the pivoted sensing-unit tape-guide touching the punch block, the transmitter tape-guide plate should be adjusted on the pivoted frame to meet the following requirements:

- (a) With the sensing-cam assembly in the stop position and the tape-feed holes engaged with the tape-feed pins, the tape should not buckle against either the front or the rear edges of the tape-guide channel. **Fig. 49**

- (b) The five sensing pins should line up approximately in the center of the code holes in the LTRS perforated tape, between the hinged edge and the trailing edge and from front to rear.

- (1) To gauge:

- (a) Move the pivoted transmitter to its midway position, (between its extreme left and right-hand position) raise the tape retaining lid and raise the lids of the perforations over the pins.

- (b) Block down the tape-out sensing-pin (rear) and tape holding-pin (front) by inserting a .065" or .070" gauge between the upper prong of their associated "Y" levers and the end of the slot in the guide comb.

- (c) Release the sensing-shaft clutch lever and turn the motor by hand until the "Y" levers of the five sensing pins are about ready to drop off their cams. In this position, the five sensing pins will have raised slightly above the surface of the tape guide plate and permit checking the requirement.
- (2) To adjust:

Loosen the pivoted-transmitter assembly tape-guide plate mounting screws and move the plate from left to right or from front to rear as required while re-checking the foregoing requirements. Check to see that the sensing pins do not touch the edges of their code holes when the pivoted transmitter is (1) one space away from the die block, (2) in its midway position and (3) in the extreme left-hand position. Gauge by rotating the motor slowly by hand and observing the sensing pins when they are lifting up the flaps in the tape. Remove the .065" and .070" gauges. **Fig. 49**

**2.100. Tape Depressing Bail:** With the transmitter lid closed and latched, the tape depressing arm which rides on the pivoted transmitter when the transmitter is not in its left-hand (latched) position, should pass midway between the lid latch spring and the locating stud of the transmitter lid. **Fig. 46**

- (a) To adjust, bend the blade of the tape depressing bail.

**2.101 Pivoted-Transmitter-Lid Latch Spring:** With the transmitter lid up, it should require Min. 3/4 oz., Max. 1 oz. to start the flat surface of the latch spring moving away from the tape guide plate. **Fig. 49**

- (a) To gauge, hook the pull end of the scale through the latch spring adjacent to, and just above the tape-guide plate and pull at right angles to the spring.

- (b) To adjust, bend the lid-latch spring bracket. Care should be exercised to prevent bending the pivoted-transmitter frame.

**2.102 Pivoted-transmitter lid-latch** should be latched by the latch spring with no appreciable play between the lid and the guide plate. There should be a clearance of approximately 3/32" between the left edge of the latch spring and the edge of the slot in the tape-guide plate. **Fig. 49**

- (a) To adjust, loosen the lid-latch-spring mounting screws and reposition the spring by means of its enlarged mounting holes. Tighten the screws.

**2.103 Tape Holding-Lever Spring:** It should require Min. 2 oz., Max. 4 oz. to just start the tape-holding lever moving.

(a) To gauge, unlatch and raise the transmitter lid. Rotate the sensing-cam sleeve until the tape-holding lever is in the indent of its cam. Hold the pivoted transmitter in a vertical position and apply the push end of the scale to the pin in the tape-holding lever at the sending unit guide plate and push vertically downward.

**2.104 Y-Lever Pivot Shaft:** With the cam-follower tip on each Y lever resting firmly on the high part of its associated cam, the tip of the sensing finger which is withdrawn the least distance into the sensing-mechanism guide plate should be just flush with or not more than .005" below the surface of the tape channel in the guide plate. Gauge by eye with the pivoted transmitter against the die block, in the center and against left stop.

Fig. 51

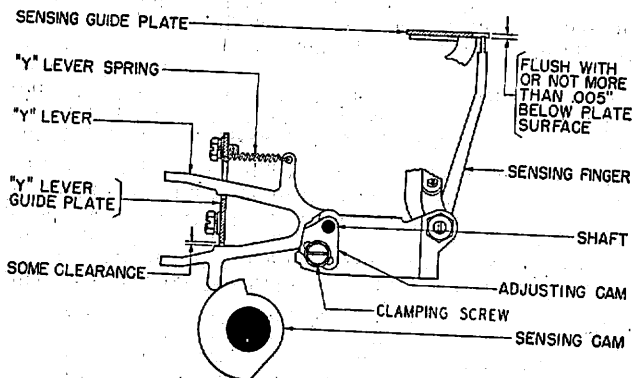


Fig. 51

(a) To adjust, loosen the Y-lever pivot-shaft adjusting cams clamping screws located at each end of the shaft and reposition the adjustable cams. Tighten the clamping screws.

**2.105 Y-Lever-Guide Plate:**

(a) With the cam follower tips of the Y-levers resting on the high part of their associated cams, there should be some clearance between the top edge of the lower arm of the Y-lever and the top of the associated slot.

Fig. 51

(b) To adjust, position the Y-lever guide plate on its mounting screws in the transfer assembly casting.

(c) The following requirements should be met after the above adjustment has been made:

(1) With the cam-follower tips on the Y-levers opposite the low part of the associated cam and the Y-lever springs unhooked, the Y-levers and sensing pins should move freely in their guides. Rehook the Y-lever springs.

(2) With the cam-follower tips on the Y-levers opposite the low part of their associated cams, the lower edge of the upper arm of the Y-lever should rest firmly in the bottom of the associated guide slot in the guide plate.

Fig. 52

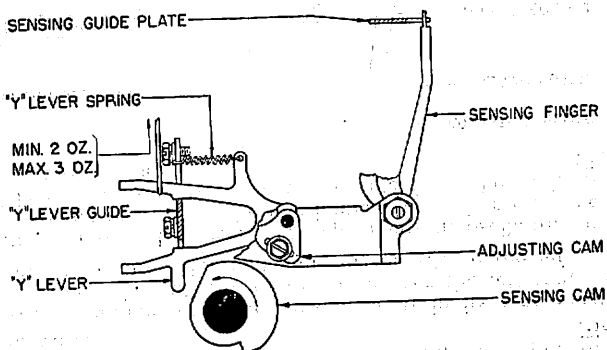


Fig. 52

(3) When the clearance between the top edge of the lower arm of the Y-levers and the top edge of the associated slot is reduced to zero by hand, the sensing pins should not become disengaged from the sensing-pin guide plate.

Note: If any of the foregoing requirements cannot be met, the Y-lever guide plate should be readjusted.

**2.106 Y-Lever Spring:** With the upper arm of the Y-lever resting firmly in the bottom of its slot, it should require Min. 2 oz., Max. 3 oz. to start the "Y" lever moving upward.

Fig. 52

(a) To gauge, hook the pull end of the scale under the "Y" lever adjacent to the left side of the lever guide and pull upward.

### 2.107. Tape Feed-Pin Oscillator:

(a) The top surface of the tape feed-pin oscillator in which the tape feed-pins mount should rise to a point flush with or not more than .015" below the lower surface of the tape guide channel in the sensing-pin guide plate at any point during the feeding motion from right to left, when the cam-follower tip of the tape feed-pin oscillating-lever extension is riding firmly on the low part of its cam. **Fig. 50**

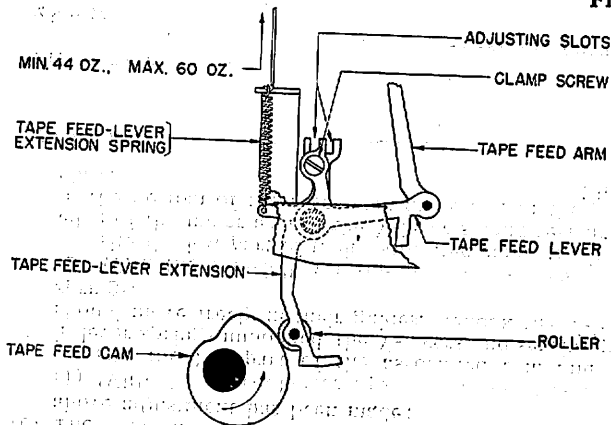
(b) The tips of the tape feed-pins should clear the tape as the oscillator moves from left to right on the return portion of the tape-feeding cycle when the cam-follower tip on the tape feed-pin oscillating-lever extension is on the high part of its cam.

(1) To adjust, loosen the tape feed-pin oscillating-lever extension clamping screw and position the lever by means of the adjusting slots.

**2.108 Tape Feed-Pin Oscillator Spring:** It should require Min. 1 oz., Max. 3 oz. to start the tape feed-pin oscillator moving. **Fig. 50**

(a) To gauge, with the sensing shaft in its stop position, hook the pull end of the scale over the left tape feed-pin in the oscillator and pull horizontally to the left.

**2.109. Tape-Feed Lever:** The tape feed-pin oscillator should start moving to the left immediately after the tape-pin feed-lever-extension roller starts to ride from the high to the low part of its cam. **Fig. 53**



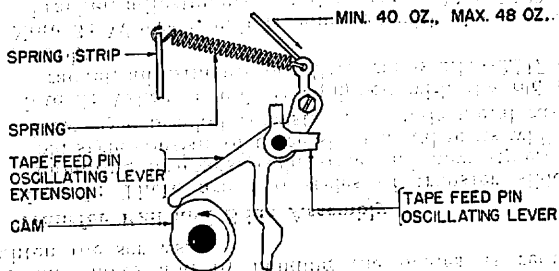
**Fig. 53**

(a) To adjust, engage the sensing-shaft clutch and rotate the motor by hand until the tape feed-lever extension just starts to move. Change the angular relation between the tape-feed lever and the tape feed-lever extension by loosening the clamping screw and moving the lever in its adjusting slot until the tape-feed lever just starts to move to the left. Tighten the screw. Recheck requirements and readjust if necessary.

**2.110 Tape-Feed-Lever Extension Spring:** It should require Min. 44 oz., Max. 60 oz. to extend the spring to position length with the sensing-cam sleeve in its stop position and the tape-feed-lever extension cam-roller resting on its cam. **Fig. 53**

(a) To gauge, unhook the upper end of the tape-feed-lever extension spring, hook the pull end of the scale through the spring eye and pull upward to position length. Rehook spring.

**2.111 Tape Feed-Pin Oscillating-Lever Extension Spring:** It should require Min. 40 oz., Max. 48 oz. to just start the oscillating lever extension moving when the cam-follower tip of the extension is resting firmly on the high part of its cam. **Fig. 54**



**Fig. 54**

(a) To gauge, apply the push end of the scale to the extension at the spring hole and push to the right as nearly in line with the spring as possible.

**2.112 Pivoted Transmitter Backstop Screw:** There should be Min. .020", Max. .040" clearance between the latch on the tape-depressing arm and the adjacent latching edge on the transmitter plate with the pivoted transmitter positioned against its backstop screw and the latch on the tape-depressing bail engaged with the transmitter. **Fig. 46**

(a) To adjust, loosen the backstop-screw lock-nut and position the screw. It may be necessary to bend the backstop-screw bracket to obtain this clearance. Tighten the lock-nut.

2.113 **Tape-guide blades** should pass between the tape-out and the No. 1 and between the No. 4 and No. 5 sensing fingers without touching the sensing fingers or the underside of the transmitter frame, as the transmitter pivots from right to left. **Fig. 46**

(a) To adjust, loosen the tape-guide-blade mounting screws and position the blades by means of their enlarged mounting holes and by bending the blades as required. Tighten the screws.

#### Transfer Bail and Slide Assembly

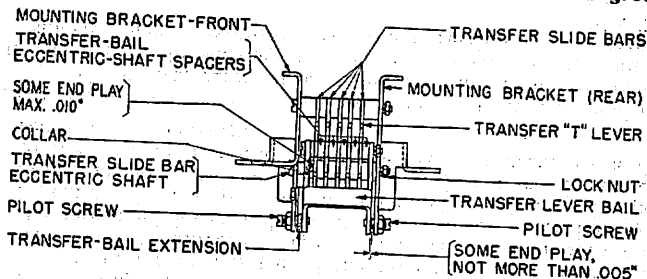
Note 1: There are two styles of transfer slide-bar mounting brackets. (Old style and new style.) The old style consists of three sheet metal parts while the new style bracket consists of a single metal casting.

Note 2: Where a unit is equipped with the old style bracket, adjustments per Paragraphs 2.114-2.117 shall apply.

Note 3: Where a unit is equipped with the new style bracket, adjustments per Paragraphs 2.118-2.122 shall apply.

Note 4: To check or adjust any of the transfer assembly features per Paragraphs 2.114-2.122 the transfer bail and slide assembly should be removed from the base casting.

2.114 **Lower Transfer-Slide-Bar Eccentric Shaft:** (Old style bracket) (transfer bail and slide assembly removed). The high part of the eccentric shaft should extend forward. **Fig. 55**



**Fig. 55**



(a) To adjust, loosen the eccentric-shaft lock-nut located on the rear of the shaft and reposition the shaft. Tighten the nut.

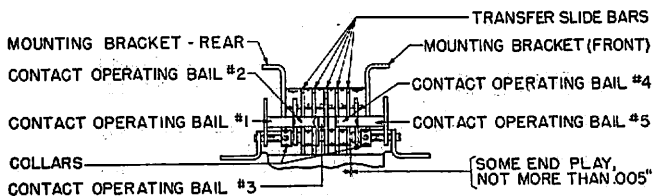
2.115 **Lower Transfer-Slide-Bar Eccentric Shaft Collar:** (Old style bracket) (transfer bail and slide assembly removed). The transfer slides should be perpendicular to their shafts, and move freely in their guides. There should be some end play, not more than .010", between the collar on the lower eccentric shaft and the adjacent slide bar when the play is taken up in a direction away from the collar. **Fig. 55**

(a) To adjust, loosen the collar set screws and position the collar. Tighten the screws.

2.116 **Transfer-Lever Bail:** (Old style bracket) (transfer bail and slide assembly removed). With the bail spring unhooked, the transfer levers should line up centrally with their associated transfer slide bars and the bail should rotate freely on its bearing screws with some end play, not more than .005". **Fig. 55**

(a) To adjust, loosen the lock-nuts on the pilot screws and position the screws. Tighten the nuts.

2.117 **Sensing-Contact Operating-Bails:** (Old style bracket) (transfer bail and slide assembly removed). The sensing-contact operating bails should line up centrally with the associated camming projections on the transfer slide bars. The bails should rotate freely on their shaft with some end play, not more than .005". **Fig. 56**



**Fig. 56**

(a) To adjust, loosen the set screw in one of the set-collars and position the collar against the aligned sensing-contact operating bail. Tighten the set screw. Loosen the set screw and position the other collar for specified clearance, when the play of the levers is taken up against the first collar. Tighten the screw and rehook the spring.

REPERFORATOR-TRANS-  
MITTER UNITS  
14F AND 14G  
REQUIREMENTS AND  
PROCEDURES

**2.118 Sensing-Contact Operating-Bails:** (New style bracket) (transfer bail and slide assembly removed). The sensing contact operating bails should be centrally located between the casting supports and the bails should rotate freely on their shaft with some end play, not more than .005". **Fig. 57**

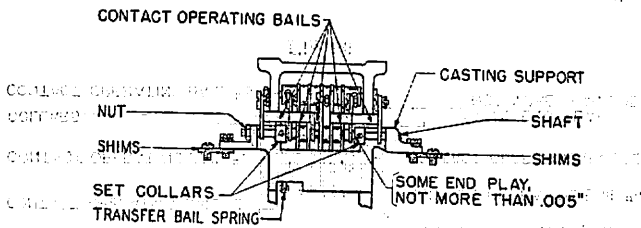


Fig. 57

(a). To adjust, loosen the set screws of one of the collars and centrally locate the entire assembly along its shaft. Tighten the screws on the collar. Loosen the set screws and position the other collar for the specified clearance when the play in the bails is taken up in a direction toward the previously adjusted collar. Tighten the set screws.

**2.119 Lower Transfer Slide-Bar Eccentric-Shaft:** (New style bracket) (transfer bail and slide assembly removed). With the transfer-bail spring unhooked and the lower slide-bar eccentric-shaft collars loose on the shaft, the high part of the lower transfer slide-bar eccentric-shaft should extend down. **Fig. 58**

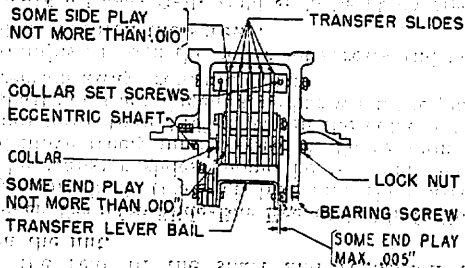


Fig. 58

(a) To adjust, loosen the eccentric-shaft lock-nut located on the rear of the shaft and position the shaft. Tighten the nut.

**2.120 Upper Transfer Slide-Bar-Shaft Collars:** (New style bracket) (transfer bail and slide assembly removed). The transfer slides should line up with their associated sensing-contact operating bails and there should be some end play, not more than .010". **Fig. 58**

(a) To adjust, loosen the set screws of both collars and reposition one collar so that the transfer slides each line up with their associated contact-operating bail when all the slides are held against this collar. Tighten its set screws. Reposition the other collar so that the slide bars move freely and have the specified end play. Tighten its set screws.

**2.121 Lower Transfer Slide-Bar Eccentric-Shaft Collars:** (New style bracket) (transfer bail and slide assembly removed). The transfer slide bars should be perpendicular to their shaft, move freely in their guides and there should be some end play, not more than .010" between the collar on the lower eccentric shaft and the adjacent slide bar when the play is taken up in a direction away from the collar. **Fig. 58**

(a) To adjust, loosen the collar set screws and position the collar. Tighten the screws.

**2.122 Transfer-Lever Bail:** (New style bracket) (transfer bail and slide assembly removed). With the bail spring unhooked, the transfer levers should line up centrally with their associated slide bars and the bail should rotate freely on its bearing screws with some end play. Max. .005". **Fig. 58**

(a) To adjust, loosen the bearing-screws lock-nuts and position the screws. Tighten the nuts and rehook the spring.

**2.123 Transfer Bail and Slide Assembly:** (Preliminary Adjustment.) (Final 2.125.) Rotate the sensing-shaft to its stop position and mount the transfer bail and slide assembly (previously removed) on the base casting. Position the assembly so that the "T" levers line up centrally with the "Y" levers and that there is approximately equal distance between the "T" and "Y" levers on the No. 1 and No. 5 sets of levers. **Fig. 59**

**2.124 Transfer T-Lever Eccentric Shaft:** Loosen the transfer-bail extension adjusting clamp screw. With a piece of tape perforated with the "Y" code combination inserted in the transmitter so that the "Y" character will be selected, trip the sensing-shaft clutch and rotate the motor by hand until the transfer-bail extension roller is on the high part of its cam.

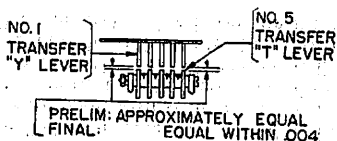


Fig. 59

Hold the roller against the cam and press the transfer bail to the right, manually, until the transfer slides move against their stops. **Do not jam.** Under this condition, at least one slide lever should be moved upward against its stop and at least one which is moved downward should also be against its stop. Tighten the transfer-bail extension clamp screw.

Fig. 60

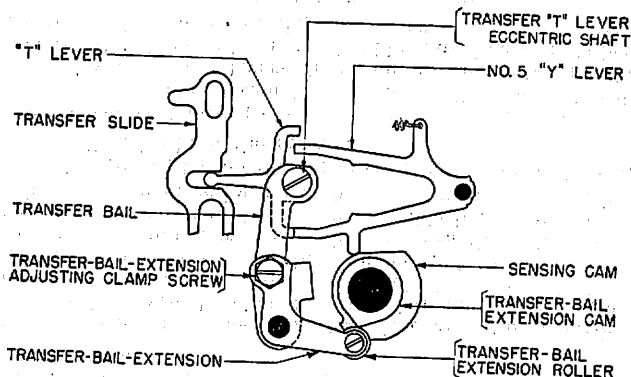


Fig. 60

- (a) To adjust, loosen the transfer "T" lever eccentric-shaft lock-nut and position the shaft, keeping the high part of the eccentric shaft to the right. Tighten the nut.

### 2.125 Transfer Bail and Slide Assembly: (Final Adjustment.) (Preliminary 2.123.)

- (a) With the "R" code combination set up on the "Y" transfer levers and the transfer-bail extension roller on the high part of its cam, there should be equal clearance, within .010", between the "T" lever and the "Y" levers when measured between the top prongs of the No. 4 set of levers and the bottom prongs of the No. 5 set of levers.

Fig. 61

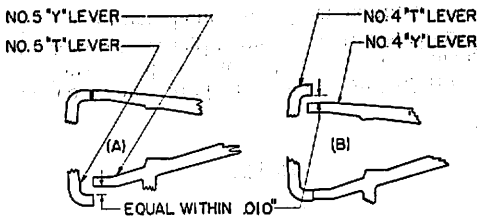


Fig. 61

- (1) To adjust, add or remove shims equally under the three legs of the transfer-bail assembly bracket.
- (b) With the sensing shaft in its stop position, there should be equal clearance, within .004" between the ends of the "T" and "Y" levers when measured between the top prongs of the No. 1 and No. 5 sets of levers. Fig. 59

(1) To adjust, loosen the transfer-bail bracket mounting screws and position the bracket. Tighten the screws.

#### 2.126 Transfer-Bail-Extension and Lower Transfer-Slide-Bar Eccentric Shaft: (Final Adjustment.)

- (a) Insert a length of tape perforated with the "R" code combination in the pivoted transmitter, trip the sensing clutch and rotate the motor by hand until the transfer-bail extension roller is on the high part of its cam and the "R" combination is set up on the "Y" levers. There should be some clearance, not more than .006" between the ends of the upper prongs of the No. 1 and the No. 5 "T" and "Y" levers when the play in the transfer slides is taken up in a direction to make this clearance a maximum. Fig. 61A

(1) To adjust, loosen the transfer-bail extension clamp screw and position the extension by means of its elongated hole. Tighten the screw. Fig. 60

- (b) Insert a length of tape perforated with the "BLANK" code combination in the pivoted transmitter, trip the sensing clutch and rotate the motor by hand until the transfer-bail extension-roller is on the high part of its cam. With the play in the transfer slides taken up in a direction to make the clearance a maximum, there should be some clearance, not more than .010", between the closest set of "T" and "Y" levers. If necessary, loosen the lock-nut and refine the "T" lever eccentric shaft adjustment (2.125) keeping the

REPERFORATOR-TRANS-  
MITTER UNITS  
14F AND 14G  
REQUIREMENTS AND  
PROCEDURES

high part of the shaft to the right. Tighten the nut and recheck. (a) **Fig. 61A**

2.127 **Transfer-Bail Spring:** It should require Min. 9 oz., Max. 11 oz. to just start the bail moving when the sensing shaft is in the stop position.

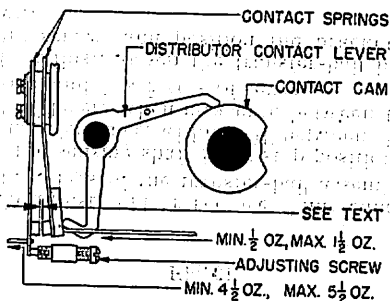
(a) To gauge, rotate the sensing contact levers out of the way and apply the push end of the scale to one of the spacers on the transfer "T" lever eccentric shaft and push horizontally to the right. **Fig. 60**

2.128 **Distributor contacts** should meet the following requirements with the distributor contact levers on the high part of their cams.

Note 1: The TP121550 bending tool should be used for adjusting the contact springs.

Note 2: Bakelite tips should be centrally aligned with their respective operating levers and opposing contacts should be centrally aligned with each other.

(a) It should require Min. 1/2 oz., Max. 1-1/2 oz. to just start the short contact springs moving away from the contact levers. **Fig. 62**



**Fig. 62**

- (1) To gauge, apply the push end of the scale to the lower end of each short contact spring and push horizontally at right angles to the spring.
- (2) To adjust, bend the short contact springs.

(b) There should be Min. .015", Max. .020" gap between the contact points. **Fig. 62**

(1) To adjust, position the adjusting screws.

Note: When a 1A TTY Test Set is available the contact gap in (b) of Paragraph 2.128 may be checked in the following manner:

(a) With the light image of the STOP impulse lined up with the zero mark on the stop segment of the stroboscope test scale, adjust the stop contact gap of the unit by means of its adjusting screw so that the end of the light image lines up with the 142 mark (plus or minus one division) on the stop segment scale. Adjust the line transmitting contacts gap by means of the adjusting screws until their light images are equal within plus or minus one division of the length of their respective segments on the stroboscope scale.

(b) With the START pulse zero indication on the stroboscope scale in line with the end of the STOP impulse light image, see that the beginning and ends of the light images of all five transmitting contact images are within five divisions of their segment length on their respective stroboscope scale lengths. If the signals do not meet these requirements, refine the contact gap adjustment.

Note: In order to meet the above requirements the contact gap may be reduced to a minimum of .010" if necessary, or increased to exceed the .020" maximum limit of adjustment.

(c) With the pull end of the scale hooked over the end of the long contact springs, and pulled horizontally to the left, it should require Min. 4-1/2 oz., Max. 5-1/2 oz. to start the contact springs moving away from the adjusting screws. **Fig. 62**

(1) To adjust, bend the long contact springs and recheck requirement (b).

(d) It should require Min. 8 oz., Max. 10 oz. to start a lever moving with the short contact spring held clear of the lever. **Fig. 63**

(1) To gauge, hook the pull end of the scale over the contact lever just above its lower hooked portion and pull away from the contact spring.

(2) To adjust, loosen the nut holding the spring bracket to the casting and position the bracket. Tighten the nut.

REPERFORATOR-TRANS-  
MITTER UNITS  
14F AND 14G  
REQUIREMENTS AND  
PROCEDURES

COMMERCIAL  
 REPAIR SERVICE  
 1000 10th St  
 COLUMBIA, MD  
 (410) 278-1000

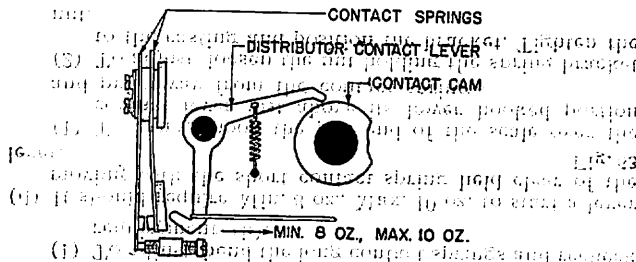


Fig. 63

2.129 Transmitter auxiliary contact should meet the following requirements:

Note: Bakelite tips should be centrally aligned with their respective operating levers and opposing contact should be centrally aligned with each other.

(a) It should require Min. 1/2 oz., Max. 1-1/2 oz. to just separate the short spring contact from the long spring contact when the bakelite tip of the long contact spring is resting against the transmitter auxiliary contact lever and the lever is resting against the high part of its cam. Fig. 64

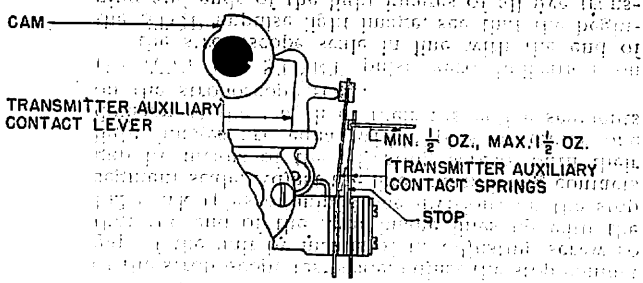


Fig. 64

(1) To gauge, trip in (p) of the sensing clutch and rotate the motor by hand until the contact lever operates the long contact spring. Hook the pull end of the scale behind the short contact spring at the contact and pull horizontally to the right.



(2) To adjust, bend either on both sides of the short contact spring making sure to maintain a slight clearance between the springs and their stops. Fig. 65

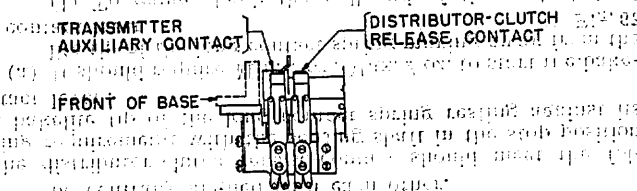


Fig. 65

(b) With the bakelite tip of the long contact spring resting against the transmitter auxiliary contact lever and the lever resting on the low part of its cam, it should require Min. 1-1/2 oz., Max. 2-1/2 oz. to move the bakelite tip away from the auxiliary lever. Fig. 66

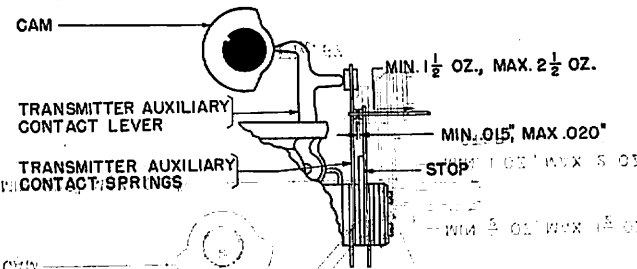


Fig. 66

(1) To gauge, hook the pull end of the scale behind the long contact spring at the contact point and pull horizontally to the right.

(2) To adjust, bend the long contact spring.

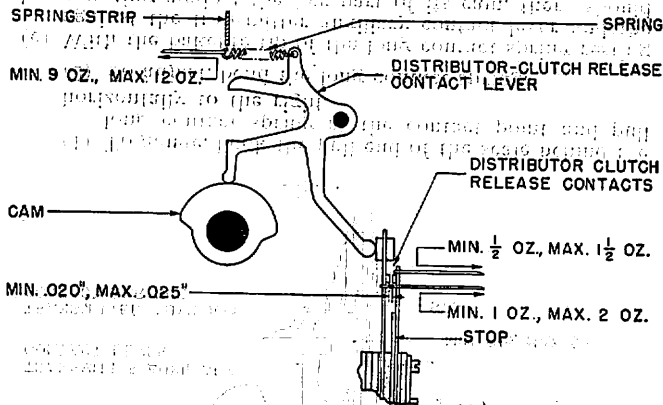
(c) With the bakelite tip of the long contact spring resting against the transmitter auxiliary contact lever and the lever resting against the low part of its cam, there should be a gap of Min. .015", Max. .020" between the two sets of contacts. Fig. 66

(1) To adjust, bend the short contact spring stop.

Recheck (a)

REPERFORATOR-TRANS-  
MITTER UNITS  
14F AND 14G  
REQUIREMENTS AND  
DRAWINGS

**2.130 Distributor - Clutch Release - Contact - Lever Spring:** It should require Min. 9 oz., Max. 12 oz. to pull the spring to position length with the distributor-clutch-release contact lever resting on the high part of its cam. **Fig. 67**



**Fig. 67**

(a) To gauge, unhook the spring from the spring strip and hook the pull end of the scale through the spring eye and pull toward the spring-mounting hole. Rehook the spring.

**2.131 Distributor-Clutch Release-Contact:**

Note: Bakelite tips should be centrally aligned with their respective operating levers and opposing contacts should be centrally aligned with each other.

The distributor-clutch release-contact should meet the following requirements with the sensing shaft in the stop position and bakelite tip of the long contact spring resting against its contact lever:

(a) It should require Min. 1 oz., Max. 2 oz. to start the bakelite tip of the long contact spring moving away from the contact lever. **Fig. 67**

(1) To gauge, hook the pull end of the scale behind the long contact spring at the contact and pull to the right.

(2) To adjust, bend the long contact spring.

(b) There should be Min. .020", Max. .025" gap between the contact points. **Fig. 67**

(1) To adjust, bend the stop adjacent to the short contact springs.

(c) It should require Min. 1/2 oz., Max. 1-1/2 oz. to just start each short contact spring moving away from its stop. **Fig. 67**

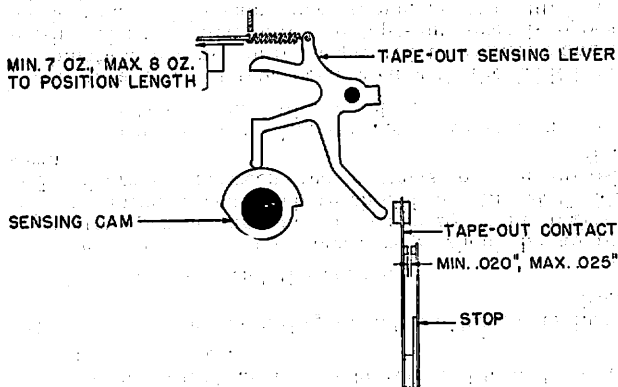
(1) To gauge, hook the pull end of the scale behind the short contact springs at the contact and pull to the right.

(2) To adjust, bend the short contact springs. Recheck (b).

(d) There should be some clearance between the short contact springs and their stops when the contact levers are opposite the low part of the cam and the contacts are closed. **Fig. 67**

(1) If there is no clearance, refine (b).

2.132 **Tape-Out Sensing-Lever Spring:** It should require Min. 7 oz., Max. 8 oz. to pull the spring to position length with the tape-out sensing lever on the high part of its cam. **Fig. 68**



**Fig. 68**

(a) To gauge, unhook the tape-out sensing-lever spring from the spring bracket, hook the pull end of the scale through the spring eye and pull to position length.

### 2.133 Tape-Out Contacts

- (a) Remove the tape chute.

Note 1: Bakelite tips should be centrally aligned with their operating levers and opposing contacts should be centrally aligned with each other.

Note 2: The tape-out contact assembly, together with its mounting bracket may be removed to make adjustment (b & c).

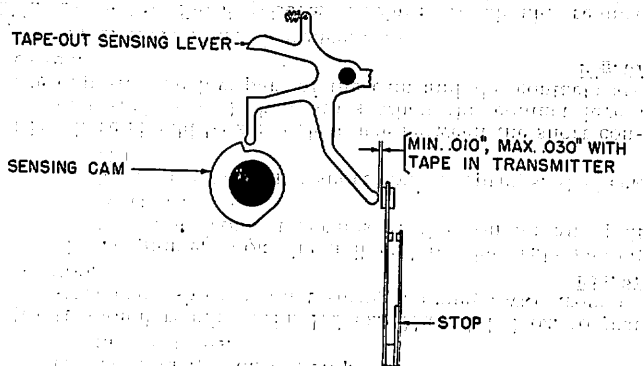
- (b) The short contact spring should rest lightly against its stop. **Fig. 68**

(1) To adjust, bend the spring.

- (c) The long and short contact springs should be approximately parallel and at approximately right angles to their mounting bracket. There should be Min. .020", Max. .025" clearance between the contacts of the opposing springs. **Fig. 68**

(1) To adjust, bend the springs or short spring stop. Replace the mounting bracket.

- (d) With a piece of tape perforated with the LTRS combination, inserted into the pivoted transmitter, and the sensing shaft rotated until the tape-out lever is opposite the low part of its cam, there should be Min. .010", Max. .030" clearance between the insulator on the long contact spring and the tip of the tape-out lever. **Fig. 69**



**Fig. 69**

(1) To adjust, loosen contact mounting bracket screws and position the bracket as required. Tighten screws and replace the tape chute. Check that with the tape removed from the transmitter, the contacts are closed and that the short springs are not resting against their stop.

### 2.134 Transmitter-Stop Contact (Tape Chute Off)

Note: Bakelite tips should be centrally aligned with their operating levers and opposing contacts should be centrally aligned with each other.

- (a) With the short contact spring tensioned against its backstop and aligned so that it is parallel to its mounting bracket, it should require Min. 1/4 oz., Max. 1/2 oz. to just open the contacts.

Fig. 70

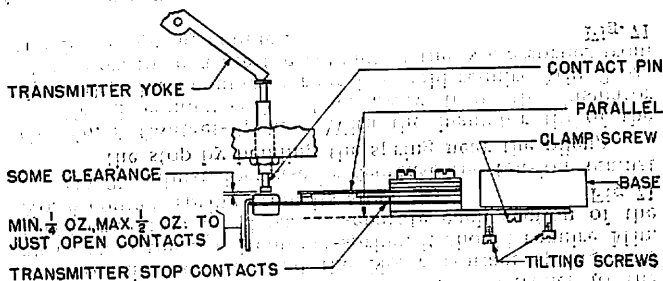


Fig. 70

(1) To gauge, hook the pull end of the scale over the end of the long contact spring and pull at right angles to the spring mounting.

(2) To adjust, bend the long contact spring.

- (b) With a length of perforated tape emerging from the code-punch mechanism and engaged in the pivoted transmitter, the contact should be closed with some clearance between the insulated tip on the long contact spring and the lower end of the contact pin when the next to the last character on the tape is being sensed by the selector pins. With the last character in the tape being sensed, the contacts should be open and there should be Min. .010" clearance between the contacts.

Fig. 70

REPERFORATOR-TRANSMITTER UNITS  
14F AND 14G  
REQUIREMENTS AND PROCEDURES

- (1) To adjust, loosen the contact-assembly bracket clamp screw and position the bracket by means of one of the two tilting screws. Tighten the clamp screw and remount the tape chute.

### 2.135 Universal Contacts

Note 1: Bakelite tips should be centrally aligned with their operating levers and opposing contacts should be centrally aligned with each other.

Note 2: When measuring the tension values in the following requirements, the scale should be applied beside the spring contact and at a right angle to the spring. These springs are bifurcated and requirements apply to each side of the spring.

Note 3: To facilitate adjustment, the universal contact assembly and its bracket may be removed from the base casting.

- (a) **No. 4 Contact-Spring:** With its stop parallel to the mounting surface and the No. 5 contact spring held away from the No. 4 contact-spring, it should require Min. 1-1/2 oz., Max. 2-1/2 oz. to separate each section of the No. 4 contact-spring from its stop.

Fig. 71

- (1) To adjust, increase or decrease the tension against the stop by bending the spring near the pileup.

- (b) **No. 5 Contact-Spring:** With the insulator tip of the No. 2 contact-spring held away from the insulator tip of the No. 5 contact-spring, it should require Min. 2 oz., Max. 3 oz. to separate the contact of the No. 5 spring from the No. 4 spring contact.

Fig. 71

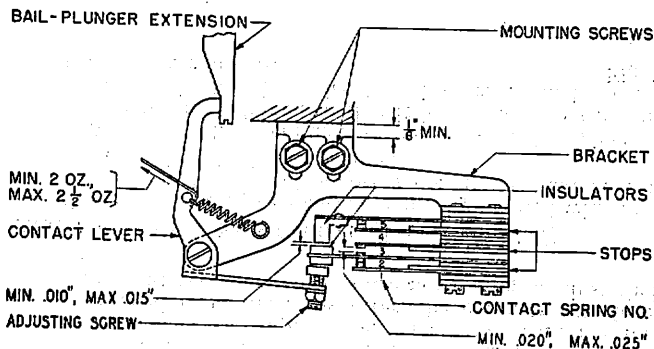


Fig. 71

- (1) To adjust, bend the No. 5 contact-spring near the pileup.
- (c) **No. 1 Contact-Spring:** With its stop parallel to the mounting surface and the No. 2 contact held away from the No. 1 contact, it should require Min. 1-1/2 oz., Max. 2-1/2 oz. to separate the No. 1 contact spring from its stop. **Fig. 71**
- (1) To adjust, increase or decrease the tension against the stop by bending the spring near the pileup.
- (d) **No. 2 Contact-Spring:**
- (1) With the No. 5 contact-spring tip insulator blocked away from the No. 2 contact-spring tip insulator and, if necessary, the No. 3 spring-contact held away, it should require Min. 2 oz., Max. 3 oz. to separate the No. 2 and No. 1 contacts. **Fig. 71**
- (a) To adjust, bend the No. 2 spring.
- (2) With the No. 5 spring returned to its unoperated position, there should be a clearance of Min. .010", Max. .015" between the No. 5 and No. 2 contact-spring tip insulators.
- (a) To adjust, bend the No. 2 contact-spring between the contact and the tip insulator.
- (e) **No. 3 Contact-Spring:**
- (1) It should require Min. 1 oz., Max. 2 oz. to separate the No. 3 contact-spring from its stop. **Fig. 71**
- (a) To adjust, increase or decrease the tension against the stop by bending the spring near the pileup.
- (2) When the No. 2 and No. 1 spring-contacts are making, there should be a clearance of Min. .020", Max. .025" between the No. 3 and No. 2 spring-contacts.
- (a) To adjust, increase or decrease the clearance by simultaneously bending the No. 3 contact-spring and its stop. Recheck (e1).
- Note: Remount the universal contact assembly on the base bracket. There should be at least 1/8" clearance between the top edge of the universal contact bracket and the milled section on the base casting. **Fig. 71**
- (f) **No. 5 Spring-Contact Clearance (Operated Position)**
- (1) With the contact-lever of the universal contact assembly on the high camming surface of the bail-plunger extension, there should be a clearance of Min.

.020", Max. .025" between the No. 5 and No. 4 spring-contacts. **Fig. 71**

- (a) To adjust, reposition the universal-contact adjusting screw. (Operated Position)
- (g) **Contact Bracket:**

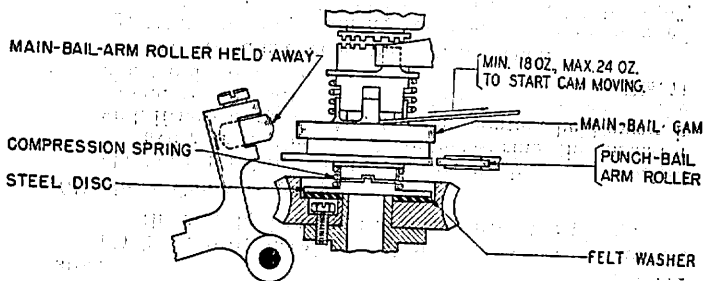
(1) Rotate the motor by hand until the bail rises to within .020" to .080" of the notch in the pull-bars. The No. 4 and No. 5 spring-contacts should just make at this point.

(a) To adjust, raise or lower the universal contact-bracket in its slotted mounting holes. (Determine with a test lamp and recheck (f).)

**2.136 Universal Contact-Lever Spring:** It should require Min. 2 oz., Max. 2-1/2 oz. to pull the spring to position length when the universal contact lever is resting on the high camming surface of the bail-plunger extension. **Fig. 71**

(a) To gauge, unhook the universal contact-lever spring from the contact-lever and hook the pull end of the scale through the spring eye and pull in line with the spring hole to position length. Rehook spring.

**2.137 Punch-Bail-Arm Spring:** It should require Min. 6 lb., Max. 7 lb. to start the punch bail-arm roller moving away from its cam when the roller is resting on the low part of the cam. **Fig. 72**



**Fig. 72**

- (a) To gauge, hook the pull end of the scale over the punch-bail arm at the roller and pull at right angles to the arm.



2.138 **Distributor and sensing-clutch throwout-lever springs** should meet the following requirements with the throw-out levers on the low part of the clutch cam and the clutch teeth engaged. **Fig. 39**

(a) It should require Min. 3 oz., Max. 5 oz. to just start the lower throwout lever moving.

(1) To gauge, apply the push end of the scale to the bottom edge of the lower armature and push as nearly horizontal as possible.

(b) It should require Min. 5 oz., Max. 7 oz. to just start the upper throwout lever moving.

(1) To gauge, hook the pull end of the scale over the upper throwout-lever spring arm at the spring and pull as nearly horizontal as possible.

2.139 **Distributor and Sensing-Clutch Detent-Levers Spring:**

It should require Min. 1-3/4 oz., Max. 3 oz. to just start each detent lever moving.

(a) To gauge, hook the pull end of the scale over the detent levers at the rollers and pull at right angles to the levers.

2.140 **Mail-Bail Spring: (Final Adjustment) (Preliminary 2.42)**

Note: The force with which the type bars strike the platen, is regulated by the main-bail spring adjusting screw.

(a) With the motor running, send alternate LTRS and FIGS signals to the reperforator transmitter unit. Loosen the main-bail spring adjusting screw lock-nut and back off the main-bail spring adjusting screw until the platen fails to return to the LTRS position. Then, turn the adjusting screw in a clockwise direction until the platen just changes from the LETTERS and FIGURES positions without failure. Turn the adjusting screw an additional 1-1/2 turns clockwise and tighten the lock-nut. **Fig. 28**

(b) With the main shaft clutch disengaged, hook the scale under the main-bail spring tension adjusting lever at the spring hole and pull in line with the spring.

(1) It should require Max. 15-1/2 lb. to start the lever moving.

2.141 **Main-Bail Cam Clutch-Torque:**

Note: The clutch-torque should be measured after the motor has been running at least 10 minutes with the main-bail cam remaining stationary.

REPERFORATOR-TRANS-  
MITTER UNITS  
14F AND 14G  
REQUIREMENTS AND  
PROCEDURES

(a) Press downward on the main bail so as to move the main-bail roller away from its cam. At the same time, hold the cam lever roller and the punch-bail arm roller away from their cams.

(1) Hook the scale in the screw hole on top of the main-bail cam and pull at a right angle to the radius. It should require Min. 18 oz., Max. 24 oz. to start the cam moving opposite to its normal direction of rotation.

Fig. 72

### 2.142 Selector Clutch Torque:

Note 1: For field maintenance purposes, the torque may drop to 12 oz. Min. before readjustments or replacements of parts are required.

Note 2: The clutch torque should be measured after the motor has been running at least 10 minutes with the selector cam sleeve remaining stationary.

(a) Hook and pull end of the scale over the selector cam sleeve stop arm. It should require Min. 14 oz., Max. 18 oz. to hold the cam sleeve stationary.

Fig. 73

(1) The clutch torque depends upon the condition of the felt friction washers and the friction clutch spring. When the torque requirement cannot be met, shims may be added at the lower end of the friction clutch spring to increase the spring pressure. However, it may be necessary to replace the friction washers if they are worn or have become hardened.

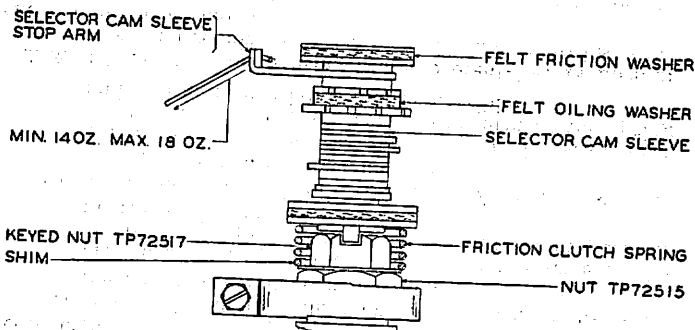


Fig. 73

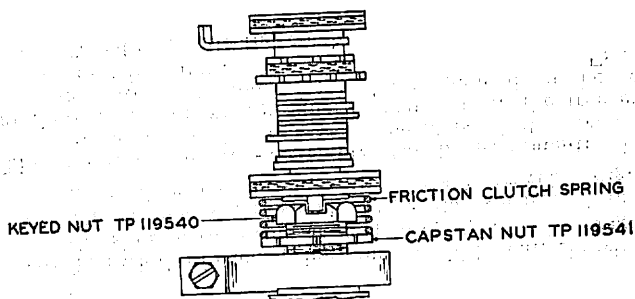
### Shim Parts

TP96763 shim (.012" thick)

TP96764 shim (.016" thick)

TP96765 shim (.020" thick)

(2) When the unit is equipped with a keyed nut and capstan nut, the pressure of the clutch may be increased or decreased by turning the capstan nut with a screwdriver. **Fig. 74**



**Fig. 74**

Note 3: When the unit is not equipped with a keyed nut (TP119540) and a capstan nut (TP-119541) and new felt friction washers and shims do not allow the requirement to be met, a keyed nut (TP119540) and capstan nut (TP119541) should be installed to replace the keyed nut (TP72517) and nut (TP72515).

### Sensing Contacts (2.143-2.147)

Note 1: To facilitate checking the sending control-contacts, the entire assembly may be removed from the base to the extent of the slack in the cable connected to the contact terminals.

**Caution:** The sensing contact assembly is pre-heated and the clamping screws tightened under pressure at the factory. When for any reason the screws become loosened, they should be tightened with a torque of 20 inch pounds. This may be accomplished by applying a 5 pound pull at the end of a 4" offset screwdriver.

REPERFORATOR-TRANS-  
MITTER UNITS  
14F AND 14G  
REQUIREMENTS AND  
PROCEDURES

Note 2: The 505A and 507A adjusting tools should be used for bending the sensing contact springs. The 68B or 70D gram gauge should be used for checking the spring tensions of sensing contact springs.

### 2.143 Sensing-Contact and Spring-Tang Alignment:

- (a) The alignment of all contacts should be within the limits indicated in Fig. 75 as gauged by eye. Fig. 75

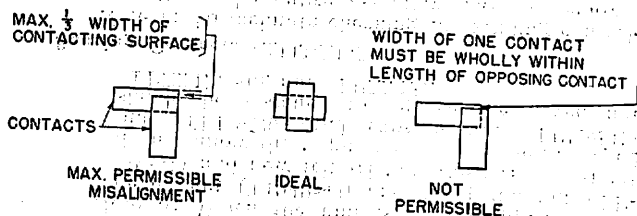


Fig. 75

- (b) The width of each spring tang should lie entirely within the slots in the comb as gauged by eye. Fig. 76

- (c) The spring studs should clear the springs through which they pass in all positions of stud travel. Fig. 76

### 2.144 Sensing - Contact - Assembly Comb Alignment:

The spring tangs should rest in the slots of the comb so that there is approximately equal clearance from the free end of the tang to the bottom of the slot as gauged on the two end springs with tangs.

- (a) To adjust, shift the comb.

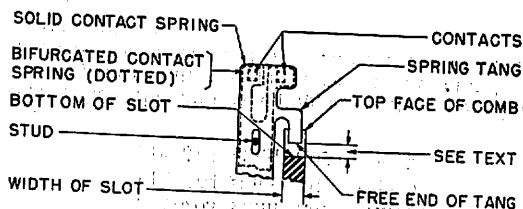


Fig. 76

## 2.145 Sensing-Contact Springs:

- (a) All contact springs should be tensioned toward the narrow end of the comb so that they exert some tension against the adjacent contact spring, comb, etc.
- (b) Unless otherwise specified, the tension should be measured with the springs in the normal unoperated position.
- (c) Both sections of the bifurcated springs should be in alignment with each other so that the contacts on the bifurcated springs make or break with their opposing contacts at approximately the same time.
- (d) A spring which is tensioned against the comb, or an opposing spring or a stud, should register the required tension just as the tang leaves the comb, just as the contacts break or just as it leaves the stud.
- (e) When gauging tensions on solid springs, the gauge should be applied near the end of the springs just in front of the contacts.
- (f) When checking tension on swingers, the gauge should be applied at the end of both parts of the bifurcated springs just above the contacts.
- (g) There should be a clearance between adjacent springs, whether in operated or unoperated position, of at least .008" as gauged by eye.
- (h) Refer to Fig. 77 for position and number of contacts which apply in the following adjustments:
  - (1) The tangs of the heavy contact springs (Nos. 1, 3, 5, 6, 8, 9, 11 and 12) should be in alignment with the main body of the springs before starting adjustments.
    - (a) To adjust, bend the tangs.
  - (2) It should require Min. 30 grams, Max. 50 grams to just move the tang away from the comb. On springs 5, 8 and 11, the opposing springs should be held clear by pressing the right-hand stud to the left.
    - (a) To adjust, bend the contact springs.
  - (3) Contact spring No. 2 should be tensioned toward the right so that its stud is in contact with the No. 4 spring and it should require Min. 6 grams, Max. 12 grams to move the spring to a point where its stud just leaves the No. 4 spring.
    - (a) To adjust, bend the No. 2 spring.
  - (4) If spring 10 only

(4) It should require Min. 18 grams, Max. 25 grams to just move the No. 4 spring contact clear of its opposing contact with the stud of the No. 2 spring resting against the No. 4 spring.

(a) To adjust, bend the No. 4 spring.

(5) It should require Min. 18 grams, Max. 25 grams to just move the No. 7 spring contact clear of its opposing contact (No. 8) and there should be some clearance, not more than .003" between the stud of the No. 7 spring and the No. 4 spring.

(a) To adjust, bend and bow the No. 7 spring. If further refinements are necessary, the tang on the No. 8 spring may be bent slightly and the tension rechecked.

Note: When making the foregoing adjustment, some clearance should be maintained between the No. 10 spring and the stud on the No. 7 spring. Hold the No. 10 spring away by hand.

(6) It should require Min. 18 grams, Max. 25 grams to just move the No. 10 spring contact clear of its opposing contact (No. 11) and there should be some clearance, not more than .003", between the stud of the No. 7 spring and the No. 10 spring.

(a) To adjust, bend and bow the No. 10 spring. If further refinements are necessary, the tang on the No. 11 spring may be bent slightly.

#### 2.146 Sensing-Contact Spring-Pileup Alignment:

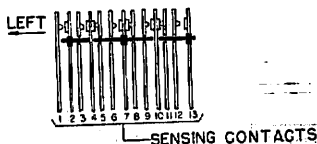
(a) (Preliminary) There should be Min. .010", Max. .015" gap between the stud on the No. 13 spring and the No. 10 spring on the No. 1 and No. 5 contact-pileup assemblies, with the transfer-slides in the spacing (lower) position and the slots in all the contact operating-bail-eccentrics in a vertical position (high side up or down whichever gives the fullest engagement between the end of the plunger and the curvature of the eccentric).

(1) To adjust, loosen the two eccentric-stop mounting screws and rotate the eccentrics away from the brackets. Loosen the contact-bracket mounting screws and shift the bracket. Tighten the mounting screws. Rotate the eccentrics so that they touch the bracket and tighten the eccentric mounting screws. This is a preliminary adjustment.

(b) The right-hand stud on each pileup should be centrally aligned with its associated contact-bail eccentric.

- (1) To adjust, align each contact pileup by means of its mounting screws and enlarged holes in the mounting plate.
- (c) There should be Min. .005", Max. .015" clearance between the stud of the No. 13 contact spring and the No. 10 contact spring on each of pileups 2, 3 and 4.
- (1) To adjust, reposition the contact-bail eccentrics.
- (d) With the transfer slides in their SPACING (lower) position, spring No. 13, in each pileup should require Min. 18 grams, Max. 25 grams to move, just as the stud leaves the slide lever eccentric.
- (1) To adjust, bend and bow the No. 13 spring.
- (e) With the slide levers in their SPACING (lower) position, adjacent spring contacts Nos. 1 and 2, 3 and 4, 6 and 7, 9 and 10, 12 and 13, should make contact when a .035" gauge is inserted between the transfer slide eccentrics and their respective studs. The same spring contacts should not make contact when a .025" gauge is inserted between the transfer slide eccentrics and their respective studs.

**Fig. 77**



**Fig. 77**

- (1) To adjust, bend the tangs on springs Nos. 1, 3, 6, 9 and 12 and recheck the requirements per Paragraphs 2.145 (h) (2), (h) (3), (h) (4), (h) (5) and (h) (6).
- (f) With the slide levers in their spacing (lower) position, there should be at least .008" clearance between the contacts of the light contact springs and the contacts of their associated left-hand heavy springs. With the slide levers in the marking (upper) positions, there should be at least .008" clearance between the contacts of the light springs and the contacts of their associated right-hand heavy springs.
- (g) With the slide levers in the marking position, move the heavy left-hand contact springs away from their stops or from the light springs and note that there is some follow of the light contact springs.

REPERFORATOR-TRANS-  
MITTER UNITS  
14F AND 14G  
REQUIREMENTS AND  
PROCEDURES

### 2.147. Tape-Feed Indicator-Contact Assembly:

(a) The formed portion of the tape-contact lever which follows the tape loop, between the prepunch and the code-punch mechanisms, should be slightly to the front of the tape feed holes or approximately in the center of the tape.

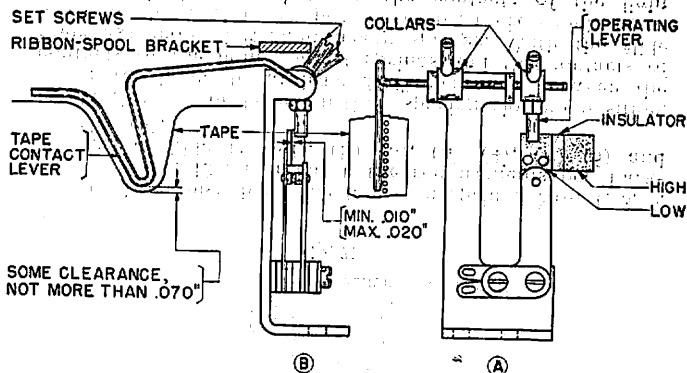


Fig. 78

(b) With the tape held against the tape guides, there should be some clearance, not more than .070" between the tape and the formed part of the tape-contact lever at the bottom of the loop.

Fig. 78B

(1) To adjust for requirements (a) and (b), position the collar on the tape contact lever between the ears of the contact bracket. The set-screw post in the ribbon-spool bracket for controlling the clearance between the lever and the tape, and also to clamp the tape contact-lever in the collar. The collar also acts as a front stop against the inside of the bracket front ear to control the central position of the tape contact-lever on the tape. (When necessary, bend the tape contact-lever for proper clearance between the tape and the lever.)

(c) With the tape-lever arm in its central position on the tape and the contact spring operating lever on the low part of the insulator on the long contact spring, there should be Min. .010", Max. .020" clearance between the contact spring operating lever and the insulator.

Fig. 78B



- (1) To adjust, loosen the rear collar set-screw post so that the collar will be friction-tight on the tape contact lever. The collar holding the contact spring operating lever can then be positioned to give proper clearance between the operating lever and the insulator. Tighten the set screw.
- (d) When the tape-contact lever is pushed to its rearmost position and the contact-spring operating lever is on the high part of the insulator on the long contact spring, there should be at least .015" gap between the contacts of the long and short springs.
- (1) To adjust, bend the short heavy contact spring. Recheck (c).
- (e) It should require Min. 2 oz., Max. 3 oz. to just separate the contacts with the tape-contact lever in the center of the tape.
- (1) To gauge, apply the push end of the scale to the insulator on the long contact spring at a point between the rivets and push horizontally at right angles to the spring.
- (2) To adjust, bend the long contact spring.

- (1) To adjust, loosen the nut which sets screw post so that the roller will be inclined on the contact lever. The roller holding the contact spring clearance between the operating lever and the insulator. Tighten the set screw.
- (2) When the tape-contact lever is pushed to its rearmost position and the contact spring operating lever is on the left part of the insulator on the long contact spring, there should be an equal gap between the contacts of the long and short springs.
- (1) To adjust bend the short heavy contact spring. (c) Backcheck (c).
- (2) It should remain flat. It should be just square to the contacts with the tape-contact lever in the center of the tape.
- (1) To adjust, apply the bush end of the scale to the insulator on the long contact spring at a point between the rivets and push horizontally at right angles to the spring.
- (2) To adjust, bend the spring at right angles.

**BLANK PAGE**

REPERATOR-TRANS-  
MITTER UNITS  
TAP AND JAG  
REQUIREMENTS AND  
PROCEDURES

P32.833  
Page 81  
83 pages

**BELL SYSTEM PRACTICES**  
Teletypewriter and Manual  
Telegraph Station and P.B.X.  
Installation and Maintenance

**SECTION P35.634**  
Issue 1, August, 1950  
AT&T Co Provisional

# REPERFORATOR TRANSMITTER UNITS 14D AND 14E

## REQUIREMENTS AND PROCEDURES

### 1. GENERAL

1.01 This section provides the requirements and procedures for the maintenance of the 14D and 14E reperforator transmitter units.

1.02 The 14D unit is comparable to the 14F unit and the 14E unit is comparable to the 14G unit. Except as otherwise specified herein, the entire BSP Section P35.633 covering requirements and procedures for the 14F and 14G reperforator transmitters, shall apply to the 14D and 14E reperforator transmitters.

### 2. REQUIREMENTS AND PROCEDURES

Note: The following subject matter in BSP Section P35.633 applies only to the 14F and 14G reperforator transmitters and should not be used for the 14D and 14E units.

- Tape-Feed-Pin Oscillator Spring
- Tape-Feed-Lever Extension Spring
- Tape-Feed-Pin Oscillating Lever Spring
- Tape-Feed-Indicator Contact Assembly

Note: For the 14D and 14E units, the requirements and procedures outlined herein in Paragraphs 2.01 to 2.03 inclusive, replace the corresponding material of BSP P35.633.

**2.01 Tape-Feed-Pin Oscillator Pressure-Stop Spring:** With the sensing shaft in its stop position, it should require Min. 3/4 oz., Max. 1-3/4 oz. to start the feed-pin oscillator moving.

Fig. 1

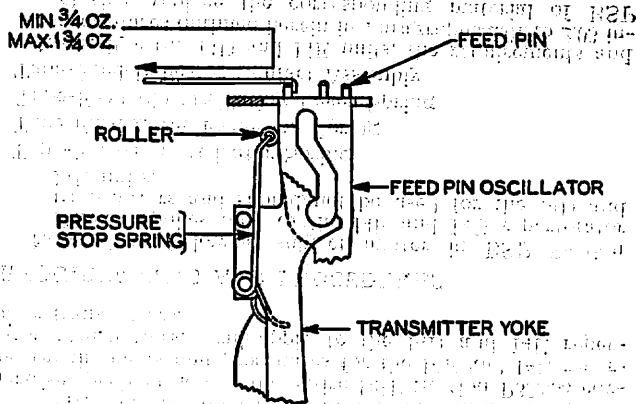


Fig. 1

(a) To gauge, hook the pull end of the scale over the left-hand feed pin in the tape feed pin oscillator and pull to the left.

(b) To adjust, bend the oscillator pressure stop spring. The spring roller should be approximately at right angles to the front of the unit.

**2.02 Tape-Feed-Lever Extension Spring:** It should require Min. 44 oz., Max. 52 oz. to extend the feed-lever extension spring to position length when the tape-feed-lever roller is resting on its cam and the sensing cam is in its stop position.

Fig. 2

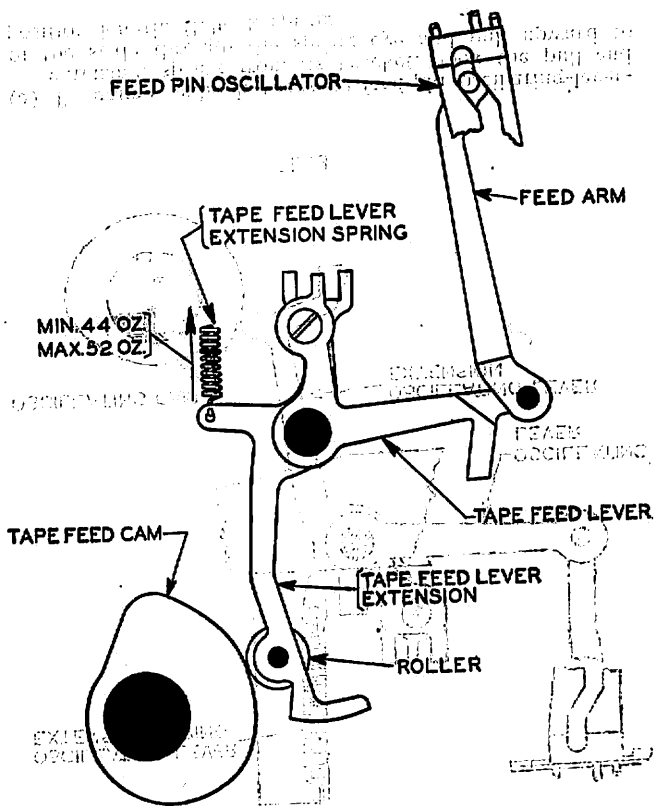


Fig. 2

(a) To gauge, unhook the upper end of the tape-feed-lever extension spring from its bracket, hook the pull end of the scale through the spring eye and pull upward to position length. Rehook spring.

**2.03 Tape-Feed-Pin Oscillating-Lever Extension Spring:**

It should require Min. 28 oz., Max. 34 oz. to extend the oscillating-lever extension spring to position length when

the cam follower tip of the oscillating-lever extension is resting firmly on its cam.

Fig. 3

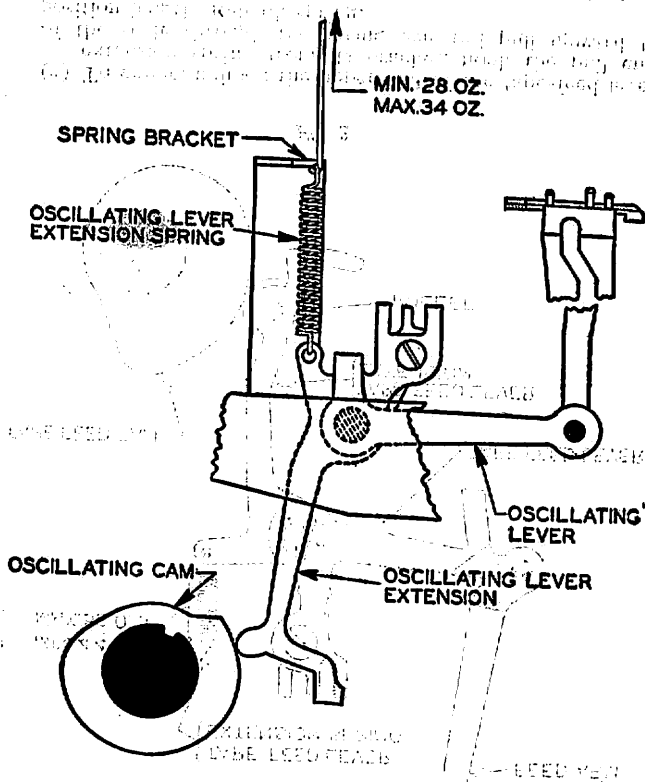


Fig. 3

(a) To gauge, unhook the tape-feed-pin oscillating-lever-extension spring from its bracket, hook the pull end of the scale through the spring eye and pull upward to position length. Rehook spring.

**BELL SYSTEM PRACTICES**  
Teletypewriter and Manual  
Telegraph Station and P.B.X.  
Installation and Maintenance

**SECTION P35.640**  
Issue 2, October, 1947  
AT&T Co Standard

## PERFORATORS

### 14A, 13B

## REQUIREMENTS AND PROCEDURES

### 1. GENERAL

1.01 This section contains the apparatus requirements and adjusting procedures for the maintenance of the 14A (black finish) and 13B (green finish) perforators.

1.02 This section is reissued to bring up to date the general arrangement of material, to add Paragraphs 3.27, 3.28 and 3.29 giving requirements and procedures for perforators equipped with the 92288M set of parts (repeat feature) and to add or revise the requirements and procedures marked with the arrows.

1.03 These perforators as supplied for Bell System use have punch blocks which provide tape perforations in which the center of the feed holes is in line with the center of the code holes.

1.04 The following shall be observed in applying requirements and procedures:

- (a) Use appropriate gauges for dimensional measurements.
- (b) Use the following scales for tension measurements, as the tension values specified are in most cases not absolute values but readings to be obtained on these scales when used in the positions described.

Note: The off-zero no-load readings of the 138-55M and 138-58M scales, when held in certain positions, should be disregarded. These off-zero values are compensated for in the limits specified.

Scale	Tension Range
138-55M	8 ounces or less
138-58M	8 ounces to 32 ounces
82711M	2 lbs. to 4 lbs.
4841M	4 lbs. to 12 lbs.

PERFORATORS  
14A, 13B  
REQUIREMENTS AND  
PROCEDURES

P35.640

Page 1

- (c) Before readjusting a part, loosen locking device (clamping screw, lock nut, etc.). Reset locking device after adjustment is completed.
- (d) After readjusting a part, check adjustment of related parts which may have been disturbed.
- (e) Parts dismantled to facilitate checking or readjustment shall be reassembled after operation is completed.
- (f) Springs which are outside tension limits specified and for which no adjustment is provided shall be replaced.
- (g) All contacts shall meet squarely and contact points shall fall wholly within the circumference of the opposing contact except contacts having same diameter, whose centers shall not be out of alignment more than 25 per cent of their diameter.
- (h) Names of parts as used in this section are in some cases not the same as those used in the parts bulletin. For ordering use only the parts bulletin names.

## 1.05 TABLE OF CONTENTS

	Paragraph No.
GENERAL	1.01 to 1.05
LUBRICATION	2.01 to 2.05
REQUIREMENTS AND PROCEDURES..	3.01 to 3.29
General	3.01
Loop Springs	3.02
Key Lever Springs	3.03
Loops	3.04
Release Rod Holding Pawl	3.05
Release Rod Holding Pawl Spring	3.06
Idler Lever Spring	3.07
Release Rod Spring	3.08
Lamp Contact Lever Spring	3.09
Tape Tension Lever	3.10
Feed Roll Detent—Preliminary Setting	3.11
Feed Roll Detent Lever Spring	3.12
Back Spacer Pawl Spring	3.13
Back Spacer Lever Spring	3.14
Feed Pawl	3.15
Feed Pawl Spring	3.16
Punch Bars	3.17
Punch Magnet Contacts	3.18
Punch Magnet Plunger	3.19
Punch Hammer Spring	3.20
Magnet Yoke Suspension	3.21
Tape Guide Spring	3.22
Feed Role Detent—Final Setting	3.23
Indicator Spring	3.24
Indicator Lamp	3.25



## TABLE OF CONTENTS (Cont'd)

## Paragraph No.

Tape Reel Tension Spring.....	3.26
Contact and Break Assembly.....	3.27
Contact Springs .....	3.28
Relay .....	3.29

## 2. LUBRICATION

- 2.01 Oil should be applied by means of an oil can, preferably one having a slender spout not less than 3" long.
- 2.02 Grease should be applied with a toothpick, screw-driver blade or similar instrument.
- 2.03 Apply just sufficient oil or grease to properly lubricate the parts so that it will not be necessary to wipe off excess oil or grease, as this tends to work dirt and grit into bearing surfaces.
- 2.04 The following parts shall be adequately lubricated with oil:
- Loops—bearings.
  - Loops—surfaces which engage with key lever combs—oil sparingly.
  - Key lever shaft—if shaft appears dry apply one drop of oil at four equidistant points.
  - Indicator gear—bearing and approximately every tenth tooth.
  - Indicator spring—convolutions.
  - Idler gear—bearing.
  - Release rod—bearings.
  - Release rod bell crank—bearings.
  - Release rod detent—bearing.
  - Lamp contact lever—bearing.
  - Feed roll detent lever—bearing and roller.
  - Back spacer lever and pawl—bearings—oil sparingly.
  - Spacer bar loop—bearings.
  - Spacer bar loop—surface which engages with spacer lever—oil sparingly.
  - Feed roll—bearings—upper and lower—oil sparingly.
  - Feed pawl—pivot.
  - Punches—oil through hole in top of punch block.
  - Punch hammer bearing—oil through hole in top of punch hammer.
  - Punch bars—where they pass through retaining slots in punch hammer and at pivot bearings.

- (t) Bell cranks—at bearings and where they engage loop extensions.
  - (u) Plunger rod—where it passes through magnet bracket.
  - (v) Punch magnet yoke—where it enters solenoid—oil sparingly.
  - (w) Tape reel bearing—oil sparingly through hole in top of hub.
  - (x) Tape tension lever bearing—sparingly.
  - (y) All steel springs, except punch hammer spring, shall have both loops sparingly lubricated with oil.
- 2.05 Punch hammer spring shall have both loops lubricated with grease.

### 3. REQUIREMENTS AND PROCEDURES

3.01 **General:** Moving parts shall operate smoothly and be free from binding.

**Note:** Disconnect power to make the following adjustments.

3.02 **Loop Springs:** Pressure of power loop spring shall be Min. 2-1/2 ozs., Max. 3 ozs. and the pressure of all other loop springs shall be Min. 1-1/2 ozs., Max. 2-1/2 ozs., measured by pulling on the corresponding loop at a point adjacent to a key lever comb when the key levers are in a vertical position, as shown in Fig. 1.

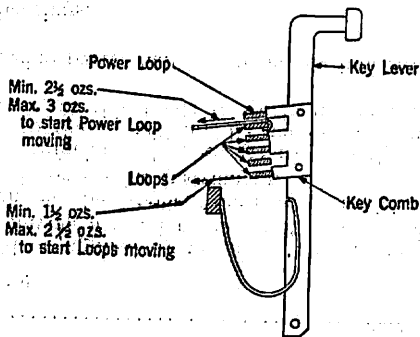


Fig. 1

- (a) To adjust, remove loop springs and spread or compress the ends to obtain required pressure.

3.03 The opening between ends of all key lever springs<sup>†</sup> excepting spacer key lever spring shall measure 1-5/8". The spacer key lever spring should measure 2". See Fig. 2.

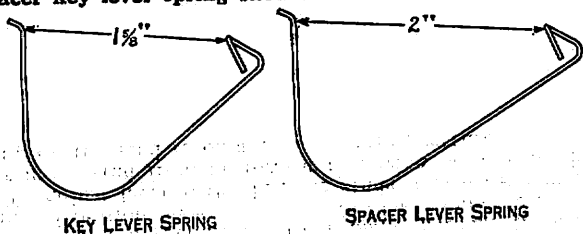


Fig. 2

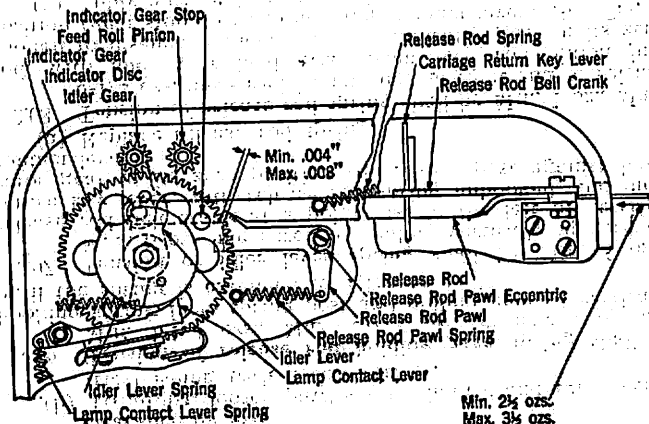
(a) To adjust, bend springs.

3.04 There shall be from .002" to .030" clearance between the loops and the loop stop (except in the case of the power loop) when the Blank key lever is fully depressed.

(a) Gauge minimum clearance by eye, maximum by means of thickness gauge.

(b) To adjust, position the loop stop by means of shims.

3.05 Clearance between release rod holding pawl and holding surface of notch in release rod shall be Min. .004", Max. .008", with CAR RET key held in the depressed position and the indicator gear held in a position which allows the pawl to fully engage notch in release rod. See Fig. 3,



Min. 2 1/2 ozs.  
Max. 3 1/2 ozs.  
to start Release Rod moving

Fig. 3

- (a) Use gauge for maximum clearance and gauge minimum clearance by eye.
- (b) To adjust, loosen pawl screw slightly and turn eccentric bushing with a screwdriver.
- 3.06 Tension of release rod holding pawl spring shall be Min. 1-1/4 ozs., Max. 2-1/2 ozs. measured by unhooking spring from spring post and pulling upward vertically until the spring is extended to a length of 1".
- 3.07 Tension of idler lever spring shall be Min. 5 ozs., Max. 8 ozs. measured by pulling vertically upward on release rod bell crank at a point just to the left of carriage return key lever, with release rod spring unhooked, and indicator gear in its zero position (gear stop post against lamp contact lever).
- (a) Replace release rod spring.
- 3.08 Tension of release rod spring shall be Min. 1 oz., Max. 3-1/2 ozs. measured by pushing on right end of release rod, with idler gear held away from feed roll pinion just enough to disengage them and with indicator gear in its zero position (gear stop post against lamp contact lever). See Fig. 3.
- (a) Apply push end of gauge through hole in right side of base casting.

**Note: Turn perforator upside-down for 3.09.**

- 3.09 Tension of lamp contact lever spring shall be Min. 6-1/2 ozs., Max. 7-1/2 ozs. measured by unhooking spring from spring post and pulling vertically upward until the spring is extended to a length of 1-7/8 inches.
- (a) Gauge, using care that the spring does not touch the casting or the power terminal.
- 3.10 Tape tension lever shall bear against feed roll with a pressure of Min. 5 ozs., Max. 5-1/2 ozs. measured at end of lever and perpendicular to a plane passing through center line of tension lever stud and end of tension lever.
- (a) To adjust lever with old style studs it is necessary to remove stud from perforator and wind or unwind the spring on the stud to obtain the desired pressure.

(b) To adjust lever with new style studs loosen nut at upper end of stud with a 138-36M wrench and turn stud to the right to increase and to the left to decrease the spring pressure. Tighten nut. See Fig. 4.

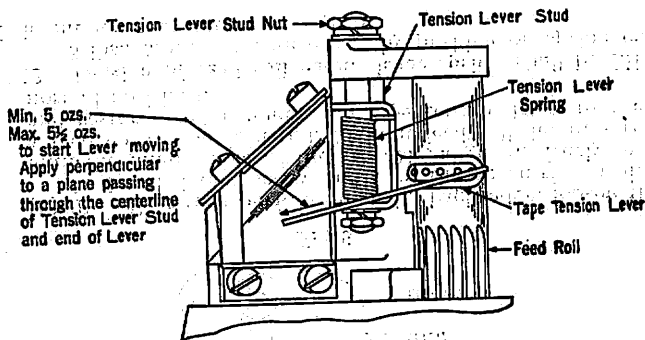


Fig. 4

**3.11 Feed roll detent—preliminary setting (See also 3.23).**

The distance from the center of the feed punch to the center of a feed pin on the feed roll shall be approximately .600" when the punch hammer is held in the operated position.

(a) To check this distance block punch hammer in operated (forward) position, hold tape tension lever away from feed roll and insert the 73517M gauge in the punch block so that the projection of the gauge stops against the feed punch. See Fig. 5. With the gauge in this position a feed pin on the feed roll should line up with the middle hole of the gauge.

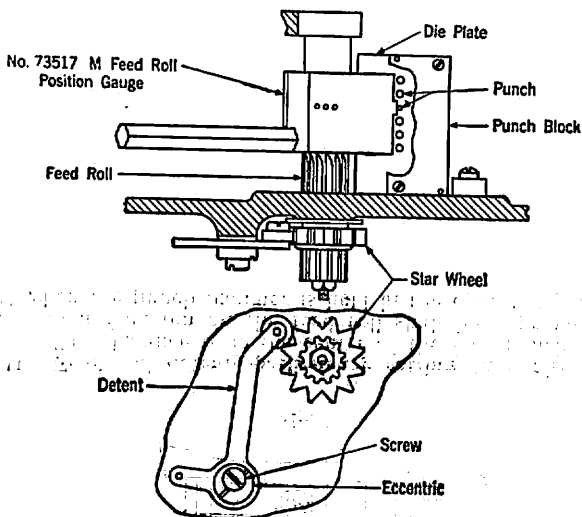


Fig. 5

(b) To adjust turn perforator on its back edge, loosen the feed roll detent screw and turn the eccentric bushing until the middle hole of the 73517M gauge fits freely over a feed pin of the feed roll. Tighten feed roll detent screw and restore feed hammer and tape tension lever to their normal positions.

3.12 Tension of feed roll detent lever spring shall be Min. 3 lbs., Max. 4 lbs. measured by pushing on spring end of detent lever as shown in Fig. 6.

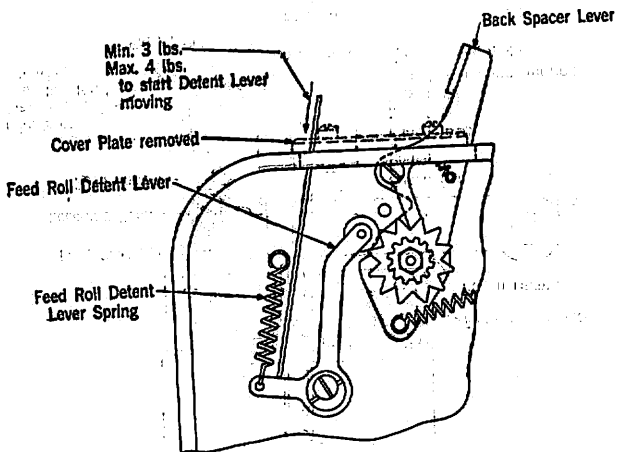


Fig. 6

(a) Remove the cover plate for the back spacer lever opening and insert gauge through this opening in front of base casting. Hold back spacer lever in its operated position and apply push end of gauge against detent lever in a direction parallel with spring and as close to the spring as possible.

3.13 Tension of back spacer pawl spring shall be Min. 1-1/4 ozs., Max. 2 ozs., measured at end of pawl when back spacer lever is in its released position. See Fig. 7.

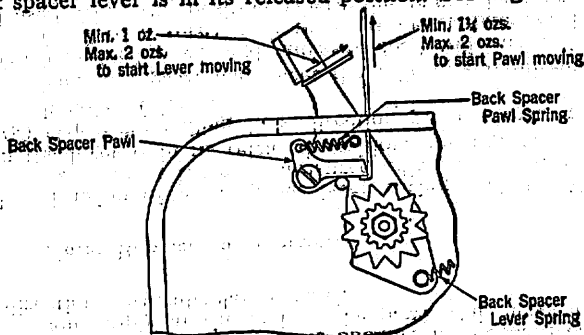


Fig. 7

PERFORATORS  
14A, 13B  
REQUIREMENTS AND  
PROCEDURES

- (a) Insert gauge through the opening in the base casting and apply at the end of the pawl. Pull upward in a direction perpendicular to pawl.

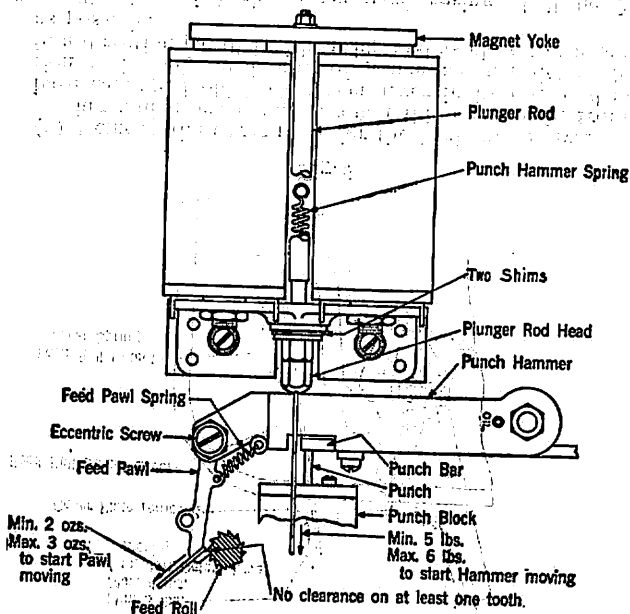
**Note: Replace cover plate.**

3.14 Tension of back spacer lever spring shall be Min. 1 oz., Max. 1-1/2 ozs., measured adjacent to cover plate when the lever is in its released position. See Fig. 6.

- (a) Gauge by pulling in a direction perpendicular to the handle of lever.

3.15 The feed pawl shall meet the following requirements:

- (a) The feed pawl shall advance feed roll one full step (1/12 of a turn) each time the punch hammer is released from the position where the punch bars are just touching the punches in the punch block. See Fig. 8.



**Fig. 8**



(b) The feed pawl shall engage a tooth on the feed roll ratchet without over-travel when the punch hammer is in the position where the punch bars are just touching the punches.

(1) Gauge by eye.

(2) To adjust, first set feed pawl eccentric screw so that the pawl is in its most forward position. Then turn eccentric screw until feed pawl will just meet requirements.

3.16 Tension of feed pawl spring shall be Min. 2 ozs., Max. 3 ozs. when the feed pawl is resting normally against feed roll, measured at notch of pawl and in a direction parallel with spring. See Fig. 8.

3.17 The following adjustment applies only to perforators equipped with punch bar bell cranks which have the longer arm cut away to form a neck. Punch bars shall move without bind in the punch hammer and shall overtravel the left edges of the punches by Max.  $1/32$ " when all key levers are in their normal positions (not depressed).

(a) Gauge by eye.

(b) To adjust, bend the neck of the associated bell cranks to either the right or left as required.

3.18 The travel of contact lever from the point where the punch magnet contacts close to the fully operated position shall be approximately  $.040$ " measured at the point where contact lever engages with the power loop. The fully operated position of the lever shall be taken as the mean position obtained when the Blank key and FIGS key are separately depressed.

(a) Gauge by eye.

(b) To adjust, determine the key lever which gives the contact spring the least travel. With this key lever depressed, turn the contact screw just enough to close the contacts, then give the contact screw one additional turn and tighten the lock nut.

(c) To adjust for shallower touch than provided by (b) turn in contact screw approximately one additional turn. The limiting position for this adjustment is that at which the punch bars reliably clear the right edge of the punches when the blank key lever is depressed until the contacts just close.

(d) When the letters key lever is fully depressed, check to see that there is at least  $.002$ " clearance between the power loop and the loop stop.

**Note: Connect power.**

3.19 The travel of the **punch magnet plunger** shall be such that the punches are driven through the tape sufficiently to punch all holes cleanly when the letters key lever is depressed.

(a) To adjust, insert tape between the die plates of the punch block, loosen the lock nut and back off the plunger rod head until perforations in the tape just fail, then advance until all holes are punched cleanly when the letters key is depressed. Advance the plunger rod head  $1/3$  turn additional and tighten lock nut against head.

**Note:** If the perforator operation appears sluggish due to slow release of the magnet, inspect the anti-freeze washers in the cavity of the magnet solenoids and replace, if worn.

**Caution:** Do not take apart defective punch blocks. If satisfactory punching cannot be obtained replace entire punch block assembly.

**Note:** Disconnect power.

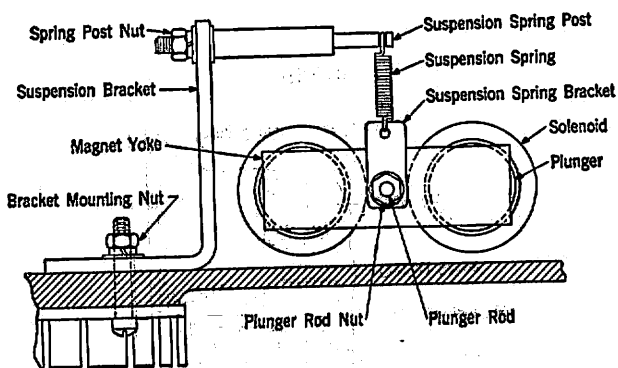
3.20 Tension of **punch hammer spring** shall be Min. 5 lbs., Max. 6 lbs. measured with the punch hammer in the released position.

(a) Apply gauge to punch hammer just above the plunger rod head and in a line parallel with the spring. See Fig. 8.

3.21 **Magnet Yoke Suspension:** With the perforator resting in its normal position and the magnet yoke in its unoperated position the yoke suspension spring shall exert an upward tension, in a vertical line passing through the center line of plunger rod, just sufficient to carry the plungers away from the bottom of the solenoids.

(a) Gauge by eye.

(b) To adjust, position the suspension spring bracket so that it is perpendicular to magnet yoke. Position the suspension bracket by loosening bracket mounting nut so that the center line of spring is vertical and in line with suspension spring bracket. Then tighten bracket mounting nut. To increase or decrease spring tension, loosen spring post nut and move spring post up or down. (It is important that spring post should not be raised any higher than necessary to meet the above requirement.) Tighten spring post nut. See Fig. 9.



**Fig. 9**

3.22 The tape guide spring shall be positioned so that it holds the tape firmly against the side of the guide block adjacent to the No. 1 punch without buckling the tape.

- (a) To check, insert tape between die plates of punch block and press edge of tape against the spring and note that as tape is released the spring moves it securely against the die block guide.
- (b) To adjust, bend tape guide spring.

**Note: Connect power.**

3.23 **Feed Roll Detent—Final Setting** (See 3.11). Perforations in tape shall be evenly spaced, 10 to the inch, with an allowable variation of  $\pm .007$ " in a 4" length.

- (a) To check, perforate a series of nine "blank" and one "letters" combinations seven or eight times, place the tape on top of a 95960M gauge, then hold tape and gauge up to a light background and align a No. 3 code hole in the tape with the hole 1-1/2 inches from the left end of the gauge. Gauge holes shall be visible through all No. 3 code holes to the right of the point of alignment and the code hole above the large hole at the right end of the gauge shall fall entirely within the circumference of the gauge hole.

**Note: Disconnect power.**

(b) To adjust, turn perforator on its back edge, loosen feed roll detent screw and turn eccentric bushing upward if holes in tape are too far apart and downward if too close together. See Fig. 5.

Note: If adjustment is changed in 3.23, recheck 3.15.

Note: Replace indicator gear for 3.24.

3.24 Tension of indicator spring shall be such as to reliably restore indicator to its zero position after indicator has been advanced one step and released, and after it has been advanced sixty-five steps and released.

(a) To adjust, turn bottom side of perforator upward, loosen nut on indicator disc and turn disc in a clockwise direction to increase tension and in a counter-clockwise direction to decrease tension. The correct tension can usually be obtained by advancing the indicator gear to its 65th position, winding spring until it is tight and then unwinding it one complete turn of the disc and tightening nut. If spring is wound too tightly it will stick and not restore indicator to its zero position.

Note: Connect power.

3.25 The indicator lamp shall light on the 64th or 65th character perforated from zero. See Fig. 10.

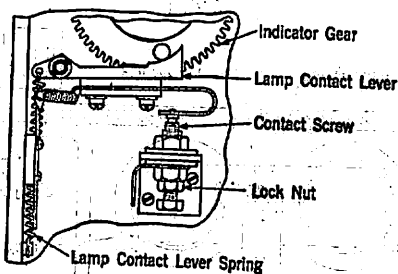


Fig. 10

(a) To adjust, return indicator gear to its starting position (pin on the gear resting against end of the lamp contact lever) by operating the release rod by hand. Adjust the lamp contact screw so that when a character key lever is operated 65 times, the lamp lights on the 65th character. Then move screw in 1/4 turn additional. Recheck operation of contact.

Note: In operation, the indicator gear is not always fully returned to its starting position, therefore, it is satisfactory if lamp lights on the 64th or 65th character.

3.26 Tension of tape reel tension spring shall be Min. 1-1/2 ozs., Max. 2-1/4 ozs. measured by pulling on the lever at the right angle bend to the rear of the pivot screw and toward the rear right corner of the base.

(a) Gauge, after loosening the three tape reel assembly mounting screws and removing the tape reel assembly.

Note: Adjustments 3.27 to 3.29 inclusive, apply only to perforators equipped with the 92288 set of parts to provide the repeat feature. Disconnect power before making these adjustments.

3.27 Contact and Break Assembly: The spring hole in the spring arm shall be in the plane of the rear surface of the magnet plunger yoke when the plunger is in the middle of its travel.

(a) To adjust, position the contact break assembly by means of its mounting screws.

(b) If the perforator is equipped with a magnet yoke suspension, the suspension spring shall appear to be vertical as viewed from the front of the perforator and the tension should be sufficient to just balance the weight of the armature.

(c) To adjust, position the spring arm by means of its mounting screws.

3.28 Contact Springs: With magnet operated, 2 to 3 ozs. shall be required to just open the contact points.

(a) Measure by hooking scale over the contact spring at the contact point and pulling at right angles to the spring.

(b) To adjust, bend the rear contact spring.

(c) There should be .015" to .020" clearance between the contact points when the armature is in the unoperated position.

(1) To adjust, bend front contact spring and recheck 3.28.

3.29 **Relay:** There should be .002" to .010" clearance between the pole piece and the armature with the armature stop nut backed off and the contact springs held away from the armature.

**Note:** To obtain this clearance it may be necessary to back off the armature stop nut all the way and pull the armature away from the pole piece.

- (a) To adjust, reposition armature.
- (b) There should be .012" to .015" clearance between the armature and the stop nut when the armature is held against the pole piece.
  - (1) To adjust, position the stop nut.
- (c) It should require 1-1/2 to 1-3/4 ounces to start the contact spring moving away from the fibre on the magnet spool when the armature contact spring is held off and an 8-ounce scale is hooked over the back stop contact spring at the contact point and pulled at right angles to the contact spring.
  - (1) To adjust, bend back stop contact spring.
- (d) It should require 1 to 1-1/2 ounces to start the contact spring moving away from the fibre stud on the armature when the armature is held against the pole piece and the push end of an 8-ounce scale applied to the armature contact spring at the contact point and pushed at right angles to the contact spring.
  - (1) Adjust by bending armature contact spring.
- (e) There should be some clearance, not more than .002" between the armature contact spring and the fibre stud on the armature when the armature is held against the stop nut.
  - (1) To adjust, bend stop nut on back stop contact spring. Recheck back stop contact spring tension.
- (f) There should be .006" to .010" clearance between the contact points when the armature is held against the pole piece.

**BELL SYSTEM PRACTICES**  
Teletypewriter and Manual  
Telegraph Station and P.B.X.  
Installation and Maintenance

**SECTION P35.650**  
Issue 2, April, 1949  
AT&T Co Standard

## 14 TYPE REPERFORATORS

### REQUIREMENTS AND PROCEDURES

	Table of Contents	Paragraphs
GENERAL		1.01-1.03
LUBRICATION		2.01
REQUIREMENTS AND PROCEDURES		3.01-3.32
Base		
Inner Motor-Unit Slip-Connector Springs		3.31
Outer Motor-Unit Slip-Connector Springs		3.30
Main-Shaft Mechanism		
Clutch-Throwout-Lever Spring		3.05
Main-Shaft Clutch Teeth		3.04
Main-Shaft Clutch Spring		3.06, 3.07
Punch Operating-Lever-Cam Friction-Clutch		3.08
Selector-Clutch Torque		3.01
Motor-Unit		
Motor		3.02
Motor-Pinion		3.03
Motor and Governor		3.32
Orientation		
Orientation Range and Distortion Tolerance		See Section P30.002
Punch Mechanism		
Punch-Arm Shaft		3.09
Punch-Hammer		3.12
Punch-Hammer Spring		3.27
Punch Lever		3.17
Punch-Unit Bracket		3.10
Space-out Lever		3.28
Space-out-Lever Spring		3.29
Selector Mechanisms		See Section P32.001
Tape Mechanism		
Feed-Pawl		3.23
Feed-Pawl Spring		3.24
Feed-Roll		3.18
Feed-Roll Detent (Prelim. and Final)		3.22 and 3.25

Table of Contents (Cont'd)	Paragraphs
Feed-Roll-Detent Spring	3.19
Tape-Guide	3.26
Tape-Stripper Plate	3.20
Tape-Tension Lever	3.15
Tape-Tension-Lever Spring	3.21
Transfer Mechanism	
Lock-Bail Spring	3.16
Lock-Bail Wedge	3.13 and 3.14
Transfer-Levers	3.11

## 1. GENERAL

1.01 This section contains the apparatus requirements and adjusting procedures for the maintenance of reperforators of the 14 type.

1.02 This section is reissued to eliminate the material dealing with the selector mechanism (covered in Section P32.001), to eliminate the general instructions previously contained in the P sections giving requirements and procedures and now contained in Section P30.012, and to add or revise the requirements and procedures.

1.03 In addition to requirements listed herein the 14 type reperforator shall meet requirements of the following sections:

- P30.002—Orientation Tests and Distortion Tolerances
- P30.012—Teletypewriter—General Requirements
- P32.001—Selector Mechanisms

## 2. LUBRICATION

2.01 Reperforators shall be lubricated in accordance with Section P35.603 covering Lubrication of 14 and 20 Type Reperforators.

## 3. REQUIREMENTS AND PROCEDURES

3.01 **Selector-Clutch Torque:** After clutch has been freshly lubricated and motor has been run for at least 10 minutes a pull of Min. 14 ozs., Max. 18 ozs. applied tangentially to the selector stop-arm, when the motor is running, shall hold the selector cam-sleeve from rotating when the selector stop-arm is held just clear of its stop. **Fig. 1**



MIN. 14 OZS.  
 MAX. 18 OZS.  
 TO HOLD SLEEVE  
 STATIONARY

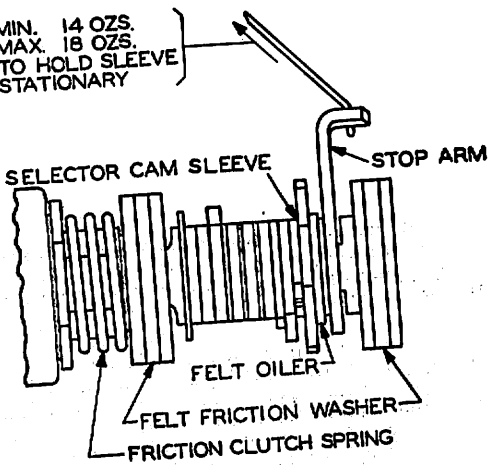


Fig. 1

(a) To adjust, replace felt friction-washers, add or remove spring adjusting-washers, replace spring or on units equipped with a 119541M adjustable capstan-nut, readjust nut.

NOTE: Replacing the felt washers will usually be satisfactory since the spring holds its adjustment over long periods. Before replacing spring, consideration should be given to the addition of washer-shims, 96763M (.012"), 96764M (.016") or 96765M (.020"), around the shoulder of the 72515M nut at the end of the spring nearest the bearing.

(1) To replace felt washers; remove the range-finder assembly, remove the mounting-post nut and loosen the shoulder-screw that mounts the space-out lever and swing the space-out lever to one side, detach locking-lever spring and remove retaining-disc noting that it has a left-hand thread and unscrews to the right (clockwise); remove outer felt-washer, cam-sleeve assembly, cam-sleeve disc, and inner felt-washer, holding selector-levers away from the shaft and rotating cam-sleeve disc until notch in its edge registers with points of the selector-levers. Replace the felt washers with new washers that have been saturated with oil as specified in Section P35.603.

14 TYPE  
 REPERFORATORS  
 REQUIREMENTS AND  
 PROCEDURES

- (2) To remove friction-clutch spring or add adjusting washers, proceed as in (1) and remove clutch driving-disc and spring.

**CAUTION:** The following adjustment should not be made without first attempting to meet clutch torque requirements by replacing clutch-washers as directed in (1).

- (3) On units equipped with adjustable clutch-spring parts (119541M) the tension may be adjusted to compensate for variations in spring tension. This can be done by turning the capstan-nut with the blade of a 3" screwdriver. Turning the nut in a counter-clockwise direction, as viewed from the selector end of the shaft, increases the tension.

3.02 **Motor** shall be located so that the axis of the pinion-shaft lies in the mid-plane of the main-shaft gear.

(a) Gauge by eye.

(b) To adjust, loosen motor mounting-screws and reposition motor on its mounting-plate, keeping the edges of the motor-base and the mounting-plate parallel.

3.03 **Motor-pinion** and main-shaft gear shall not bind and there shall be barely perceptible backlash between them at the closest point in their revolution.

(a) Gauge bind by feel and backlash by eye, holding pinion and moving main-shaft gear.

(b) To adjust, loosen right motor-plate mounting-screw and the lock-nut of the motor-plate adjusting-screw, slightly loosen other two motor-plate mounting-screws, start motor and carefully readjust vertical position of motor-plate adjusting-screw until gear noise is a minimum. Tighten motor-plate mounting-screws and adjusting-screw lock-nut and recheck backlash.

**CAUTION:** In making this adjustment with the motor running care should be taken to avoid damaging the main-shaft gear or overloading the motor as the result of too close mesh between the gear and pinion.

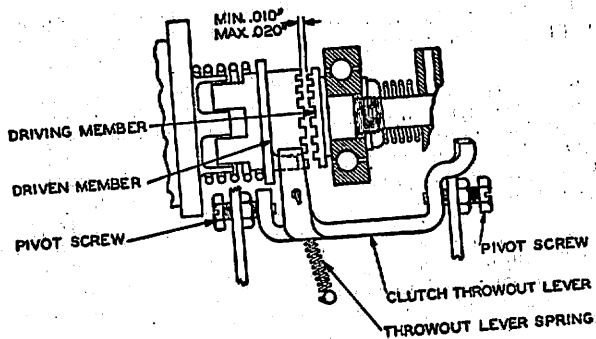


Fig. 2

3.04 **Main-shaft clutch teeth** shall clear each other by Min. .010", Max. .020" when clutch is fully cammed out of engagement. Fig. 2

(a) To adjust, reposition clutch-throwout lever pivot-screws making sure that the throwout lever is free in its bearings, without perceptible end play when pivot-screw lock-nuts are tightened.

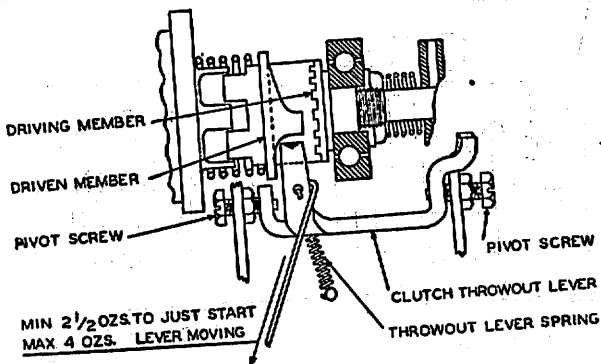


Fig. 3

3.05 **Clutch-throwout-lever spring** shall have a tension of Min. 2-1/2 oz., Max. 4 oz. measured at right angles to

the throwout lever, at the spring-hole, when the clutch-teeth are fully engaged and the clutch-throwout lever is resting against the low part of the driven clutch-member.

NOTE: Remove large chad-chute. Fig. 3

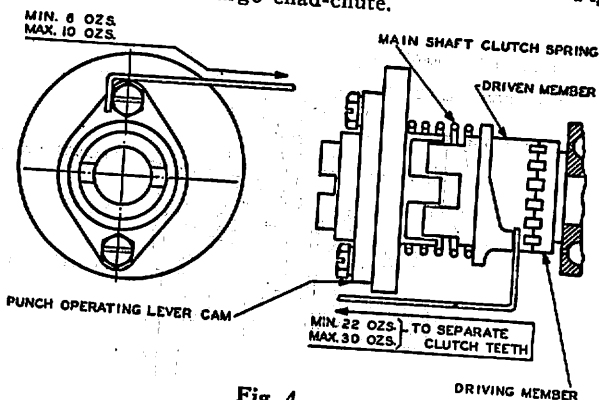


Fig. 4

3.06 **Main-shaft clutch spring** shall have a tension of Min. 22 oz. Max. 30 oz. to separate the clutch-teeth. With the teeth of the driven clutch-member resting against the teeth of the driving clutch-member, but not engaged, hook the scale over the throwout-cam on the driven clutch-member and pull as nearly in line with the shaft as possible.

Fig. 4

3.07 **Clutch driven-member**, after being pulled manually to position of extreme disengagement, as in 3.06, shall start and slide until it engages with or touches the driving-member teeth as the force opposing the clutch-spring is reduced to not less than 10 oz. For identification of parts see Fig. 4.

(a) To adjust, clean and lubricate clutch. If sliding surface of driven-member and bushing on which it slides are not smooth and polished, replace these parts.

NOTE: Failure to receive first character after a period of idleness may be caused by sticking of main-shaft-clutch parts. If trouble of this nature is reported it may be checked for by observing punching of the first character received after main-shaft has been at rest for at least 10 minutes, with power disconnected.

NOTE: Replace large chad-chute.

3.08 **Punch Operating-Lever-Cam Friction-Clutch.** A 10 oz. pull applied to the punch operating-lever-cam-screw perpendicular to the plane passing through the two cam mount-

ing-screws, with motor running, selector magnet operated and punch operating-lever held away from its cam, shall move cam in a direction opposite to that of normal rotation. A pull of 6 oz. applied under the same conditions shall not so move the cam.

Fig. 4

(a) This measurement requires considerable care, and observations should be made only when it is thought that cam is not keeping in speed with main-shaft. If necessary to check this feature, hold punch-operating-lever away from cam, block magnet-armature in operated position, so main-clutch will not engage, hook scale over the top screw of cam and pull in a direction reverse to normal rotation until cam just starts to move.

NOTE: Pulling too far will tend to make main clutch engage and give a greater reading, therefore only a slight backward motion of the cam should be given.

CAUTION: It is important to keep clutch stop-arm against driven jaw to prevent main-clutch engaging and winding scale around main-shaft; so either keep armature operated to avoid tripping clutch stop-arm, or block or clamp clutch stop-arm so that main-clutch cannot engage.

3.09 Punch-arm shaft shall turn freely with just perceptible end play and the end of the shaft shall be flush with the front of the front bearing-block when the punch-arm is held against the front bearing-block.

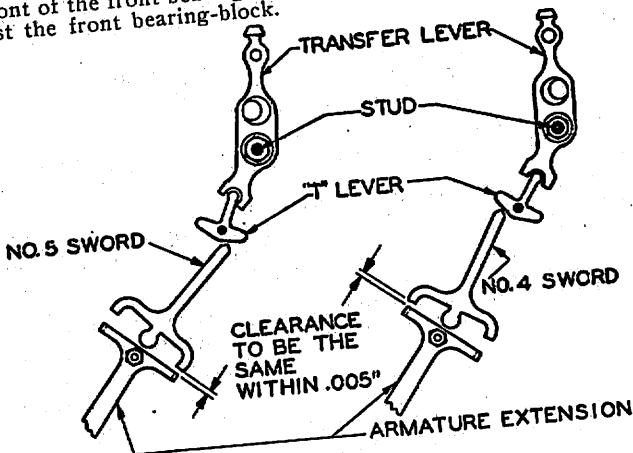


Fig. 5

- (a) Gauge by eye and feel.
- (b) To adjust position of shaft, remove punch-hammer spring and reposition punch-arm by means of its set screws. To adjust end play of shaft reposition rear bearing-bracket-collar by means of its set screws. Reassemble punch-hammer spring.

3.10 **Punch-Unit Bracket.** Clearance between engaging surfaces of the No. 5 sword and the armature extension with the armature unoperated shall be the same within .005" as that between the No. 4 sword and the armature-extension with the armature operated when the No. 4 transfer-lever is in its left (spacing) position, the No. 5 transfer-lever is in its right (marking) position and the selector cam-sleeve in the stop position.

Fig. 5

- (a) To adjust, loosen two punch-unit-bracket mounting-screws and reposition unit, using rear screw as a pivot.

3.11 **Transfer-levers** shall be positioned so that their forked arms line up in the same vertical planes with the corresponding selector "T" levers. For identification of parts see Fig. 5.

Fig. 5

- (a) Gauge by eye.
- (b) To adjust, loosen transfer-lever-stud lock-nuts and reposition stud.

3.12 **Punch-hammer travel** shall be such that punches are driven through tape sufficiently to punch all holes clearly each time hammer is operated.

- (a) Gauge by punching tape several times with **LTRS** combination set up.
- (b) To adjust, back off punch-hammer adjusting-nut until punches fail to perforate tape when **LTRS** combination is set up and main-shaft is rotated, advance adjusting nut slowly until all holes are just punched clean, and then advance nut an additional 1/4 turn. For identification of parts see Fig. 9.

Fig. 9

**CAUTION: Do not take apart defective punch-blocks. If satisfactory punching cannot be obtained replace entire punch-block assembly. The rust preventive should be removed from the replacing block before it is assembled to the perforator.**

3.13 **Lock-bail wedge** shall be seated firmly between at least two transfer-levers, with the "Y" combination set up and the main-shaft rotated until the punch-hammer is in its extreme upward position. For identification of parts see Fig. 6.

- (a) Gauge by eye and feel.  
 (b) To adjust, reposition lock-bail eccentric-shaft.

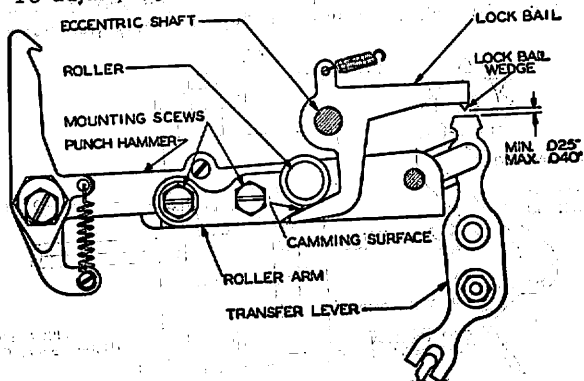


Fig. 6

3.14 Lock-bail wedge shall clear the transfer levers by Min. .025", Max. .040" when the main-shaft is in its stopped position and the transfer-levers are held in center of their travel. Fig. 6

- (a) To adjust, loosen roller-arm mounting-screws and reposition roller-arm. Tighten mounting-screws.

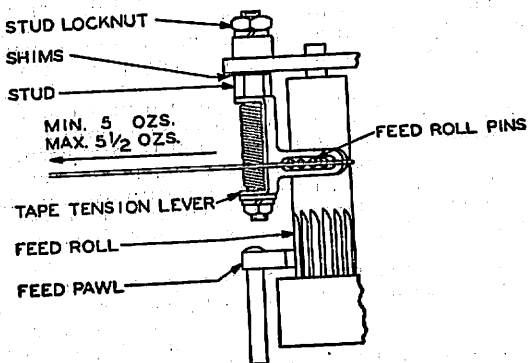


Fig. 7

3.15 **Tape-tension lever** shall not touch tape feed-roll-pins when play in both feed-roll and tension-lever is taken up in opposite directions.

(a) Gauge by eye.

(b) To adjust, reposition tape-tension-lever stud by adding or removing shims between the stud and the mounting-bracket.

**Fig. 7**

3.16 **Lock-bail spring** tension shall be Min. 6 oz., Max. 10 oz. measured at center of the lock-bail locking edge as the bail starts to move when the main-shaft is in the "stop" position.

(a) Gauge by pulling vertically upward.

3.17 **Punch lever** shall be free of bind and in alignment with their respective punch-block tape-pins when the punch-hammer is in its unoperated (lower) position.

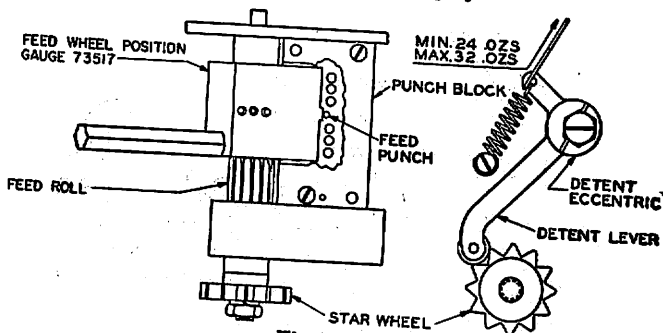
(a) Gauge by eye.

(b) To adjust, loosen punch-hammer-pivot-screw lock-nuts and relocate hammer by repositioning pivot-screws. In locating pivot-screws make sure that punch-hammer is free in its bearings with just perceptible end play and then tighten pivot-screw lock-nuts.

3.18 **Feed-roll** shall rotate freely and have not more than .004" end play when tape-tension-lever, feed-pawl and feed-roll-detent-lever are held clear of the roll.

(a) Gauge by feel.

(b) To adjust, reposition feed-roll bearing-plate to eliminate bind and add or remove shims between punch-block and feed-roll bearing-plate to adjust end play.



**Fig. 8**

3.19 **Feed-roll-detent spring** tension shall be Min. 24 ozs., Max. 32 ozs. measured behind spring-hole in the detent-lever as the detent-roller starts moving from the star-wheel.

(a) Gauge by pulling in line with the spring.



3.20 **Tape-stripper-plate** upper edge shall clear the feed-roll by not more than .010" throughout a complete revolution of the feed-roll.

(a) Gauge by eye.

(b) To adjust, loosen tape-stripper-plate mounting-screws and reposition plate.

3.21 **Tape-tension-lever spring:** The tape-tension-lever shall bear against feed-roll with a pressure of Min. 5 oz., Max. 5-1/2 oz. measured at end of lever and perpendicular to a plane passing through center of tension-lever-stud and end of lever.

(a) To adjust, loosen tape-tension-lever-stud lock-nut and rotate stud clockwise or counterclockwise to increase or decrease spring tension respectively.

3.22 **Feed-Roll Detent—Preliminary Setting—**(Final Setting Par. 3.25)—Distance from center of feed-punch to the punch-arm roller is on a high part of its cam.

(a) To check, hold tape-tension lever away from feed-roll and insert feed-wheel position gauge 73517M in punch-block so that projection of gauge stops against feed-punch. With gauge in this position a feed-roll pin should line up with the middle hole in the gauge.

(b) To adjust, loosen feed-roll detent-lever-screw and turn eccentric bushing until middle hole of gauge fits freely over feed-roll pin. Tighten feed-roll-detent-screw, remove gauge, and restore tape-tension lever to its normal position.

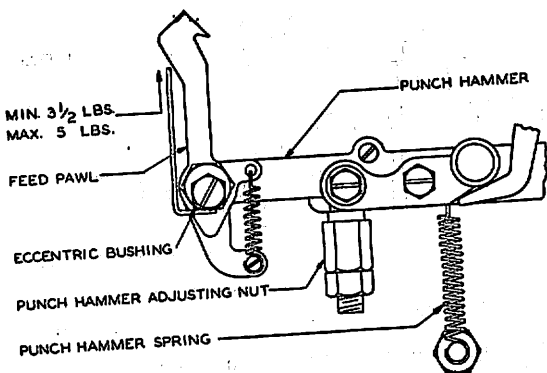


Fig. 9

3.23 Feed-pawl shall engage the next feed-roll ratchet tooth when the main-shaft has been rotated until the selected punch-levers clear the punch-pins by not more than .020".

(a) To adjust, reposition feed-pawl eccentric.

Fig. 10

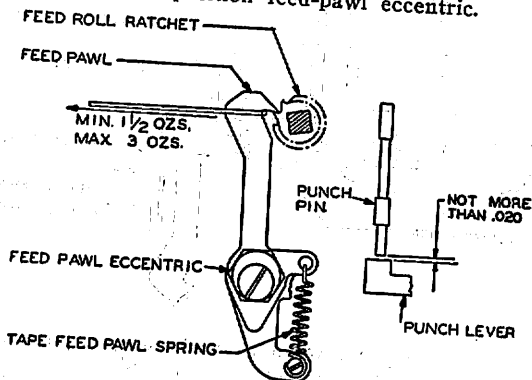


Fig. 10

3.24 Feed-pawl spring tension shall be Min. 1-1/2 oz., Max. 3 oz. measured at feed-pawl notch as pawl starts to

move.

3.25 Feed-Roll Detent—Final Setting (Preliminary Setting Par. 3.22)—Perforations in tape shall be evenly spaced, 10. to the inch, with an allowable variation of  $\pm .007$ " in a 4" length.

Fig. 10

(a) To check, perforate a series of nine "blank" and one LTRS combinations seven or eight times, place the tape on top of a 95960M gauge, then hold tape and gauge up to a light background and align a No. 3 code hole in the tape with the hole 1-1/2 inches from the left end of the gauge. Gauge holes shall be visible through all No. 3 code holes to the right of the point of alignment and the code hole above the large hole at the right end of the gauge shall fall entirely within the circumference of the gauge hole.

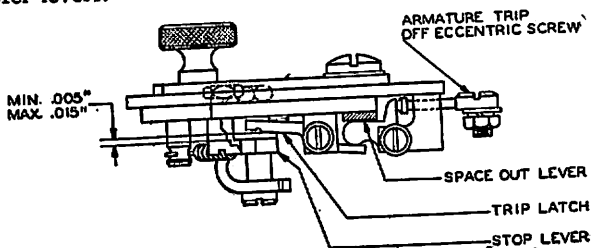
(b) To adjust, loosen feed-roll-detent screw and reposition eccentric bushing.

NOTE: If feed-roll-detent eccentric is changed, re-check 3.23.

3.26 Tape-guide shall be positioned so that tape may be readily inserted into punch-block.

- (a) Gauge by inserting tape.
- (b) To adjust, loosen guide mounting-screws and reposition guide.

3.27 **Punch-hammer spring** tension shall be Min. 3-1/2 lbs., Max. 5 lbs., measured at feed-pawl eccentric-bushing as the punch-hammer starts to move when the main-shaft clutch is disengaged and the lock-bail is held away from the transfer-levers. **Fig. 9**



**Fig. 11**

3.28 **Space-out lever** shall not bind and shall hold trip-latch so that it clears the stop-lever by Min. .005", Max. .015" when the space-out lever is in its "down" position. **Fig. 11**

- (a) Gauge minimum by eye and maximum with wire gauge.
- (b) To eliminate bind, reposition space-out lever guide-post. To adjust clearance, bend lower end of space-out lever.

3.29 **Space-out-lever spring** tension shall be Min. 5 oz., Max. 8 oz., measured on top of the manual space-out lever as lever starts to move.

- (a) Gauge by pushing down on lever.

3.30 **Outer motor-unit slip-connector springs** shall have a tension of Min. 2 lbs., Max. 4 lbs., measured at the end of the springs just below the head of the motor-block terminal-screw as the springs break contact with the terminal-screw when the motor-unit is mounted in its proper position.

- (a) To gauge, remove chad-drawer and guide.
- (b) To adjust, remove motor and bend springs.

3.31 **Inner motor-unit slip-connector spring** ends shall be within .015" of a straightedge laid across the two outer slip-connector springs (adjusted in accordance with 3.30) when the motor is removed from the base.

- (a) To adjust, bend springs.

3.32 Motor and governor shall conform to requirements of Section P32.004 covering 15 Type Teletypewriter Motor-Units and the adjustment of governor contacts.

NOTE: Receiving main shaft of reperforator may be caused to run free by holding manual space-out lever depressed.

1. The motor and governor shall conform to the requirements of Section P32.004 covering 15 Type Teletypewriter Motor-Units and the adjustment of governor contacts.

2. The receiving main shaft of the reperforator may be caused to run free by holding the manual space-out lever depressed.

3. The motor and governor shall conform to the requirements of Section P32.004 covering 15 Type Teletypewriter Motor-Units and the adjustment of governor contacts.

4. The receiving main shaft of the reperforator may be caused to run free by holding the manual space-out lever depressed.

5. The motor and governor shall conform to the requirements of Section P32.004 covering 15 Type Teletypewriter Motor-Units and the adjustment of governor contacts.

6. The receiving main shaft of the reperforator may be caused to run free by holding the manual space-out lever depressed.

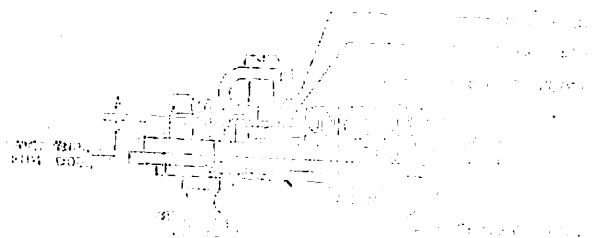
7. The motor and governor shall conform to the requirements of Section P32.004 covering 15 Type Teletypewriter Motor-Units and the adjustment of governor contacts.

8. The receiving main shaft of the reperforator may be caused to run free by holding the manual space-out lever depressed.

9. The motor and governor shall conform to the requirements of Section P32.004 covering 15 Type Teletypewriter Motor-Units and the adjustment of governor contacts.

10. The receiving main shaft of the reperforator may be caused to run free by holding the manual space-out lever depressed.

FIG. 1



1. The motor and governor shall conform to the requirements of Section P32.004 covering 15 Type Teletypewriter Motor-Units and the adjustment of governor contacts.

2. The receiving main shaft of the reperforator may be caused to run free by holding the manual space-out lever depressed.

3. The motor and governor shall conform to the requirements of Section P32.004 covering 15 Type Teletypewriter Motor-Units and the adjustment of governor contacts.

4. The receiving main shaft of the reperforator may be caused to run free by holding the manual space-out lever depressed.

5. The motor and governor shall conform to the requirements of Section P32.004 covering 15 Type Teletypewriter Motor-Units and the adjustment of governor contacts.

6. The receiving main shaft of the reperforator may be caused to run free by holding the manual space-out lever depressed.

7. The motor and governor shall conform to the requirements of Section P32.004 covering 15 Type Teletypewriter Motor-Units and the adjustment of governor contacts.

8. The receiving main shaft of the reperforator may be caused to run free by holding the manual space-out lever depressed.

9. The motor and governor shall conform to the requirements of Section P32.004 covering 15 Type Teletypewriter Motor-Units and the adjustment of governor contacts.

10. The receiving main shaft of the reperforator may be caused to run free by holding the manual space-out lever depressed.

**BELL SYSTEM PRACTICES**  
Teletypewriter and Manual  
Telegraph Station and P.B.X.  
Installation and Maintenance

**ADDENDUM P35.651**  
Issue 1, July, 1947  
AT&T Co-Standard

# TYPING REPERFORATOR UNITS AND BASES

## 14 TYPE

### REQUIREMENTS AND PROCEDURES

#### 1. GENERAL

1.01 This addendum supplements Section P35.651, Issue 5, outlining the requirements and procedures for the maintenance of 14 type typing reperforator units and bases.

1.02 This addendum is issued to provide revised requirements for selector arm, stop lever of range finder, spring of new style feed pawl, platen-latch overtravel, bell pull bar-bell hammer alignment, remote signal bell contacts, and tape out alarm mechanism.

1.03. The following paragraphs in Section P35.651, Issue 5 are affected:

#### Addendum P35.651, Issue 1

Par. 4.12(a)	Add to
Par. 4.22	Replaces
Par. 4.69	Add to
Par. 4.76	Replaces
Par. 4.85	Add to
Par. 4.92(c)	Replaces
Par. 4.92(d)	Replaces
Note (2)	Add to
Par. 5.01(b)	Replaces
Par. 5.01(c)	Add to
Par. 5.01(d)	Add to

#### Section P35.651, Issue 5

Par. 4.12(a)
Par. 4.22
Par. 4.69
Par. 4.76
Par. 4.85
Par. 4.92(c)
Par. 4.92(d)
Par. 4.92(d)
Par. 5.01(b)
Par. 5.01
Par. 5.01

4.12 (Add) (a) when the play in the detent is taken up to make this clearance a minimum.

4.22 (Replaces) Stop lever shall overtravel trip latch by some, not more than .006" as in Fig. 12 of P35.651.

TYPING REPERFORATOR  
UNITS AND BASES  
14 TYPE  
REQUIREMENTS AND

ADDENDUM  
P35.651

4.69 (Add) On units having new style feed-pawls, with spring hole .500" to right of bearing hole, feed pawl spring shall have a tension of min. 7 ozs., max. 10 ozs., measured as pawl starts to move when pulling horizontally to left at a point just above pawl hub. See Fig. 40 of P35.651.

4.76 (Replaces) Platen travel and latching: Vertical extension of shift bell crank shall overtravel rear shoulder of shift lever by not more than .015" when, starting with platen in forward ("figures") position, "letters" selection set up, main shaft rotated until main bail roller is on low part of its cam, and main bail lifted by hand to its highest position. See Fig. 43 of P35.651.

4.85 (Add) With bell pull bar selected and main bail at its highest position, tip of bell pull bar toe shall be in line with outside surface of bell hammer. To check hold bell hammer spring away and sight along side of bell hammer.

4.92 (Replaces) (c) Contact gap shall be min. 0.15", max. 0.25" when contact lever is held clear of upper contact spring.

4.92 (Replaces) (d) Lower contact spring pressure against its stiffener, shall be min. 2-1/2 ozs., max. 3-1/2 ozs., measured at end of lower contact spring.

(Add)

NOTE (2): When contacts are closed there shall be some clearance between lower contact spring and end of stiffener.

5.01 (Replaces) (b) Tape-out lever spring shall have a tension of min. 3 ozs., max. 4-1/2 ozs., measured at right angle to front edge of locking pawl at pawl spring hole with locking pawl spring removed and bell operating post rotated out of way when locking pawl just butts against bell hammer extension. See Fig. 11 of P35.620 for location of parts.

5.01 (Add) (c) Locking pawl spring tension shall be min. 1/2 oz., max. 1-1/2 ozs., measured in line with the spring by hooking gauge in spring hole of pawl, when locking pawl is relieved of tension of tape lever spring and is resting against front face of hammer extension. See Fig. 11 of P35.620, Issue 1, for location of parts.

5.01 (Add) (d) There shall be some clearance, not more than .008" between the bell hammer and the bell operating post on the gear wheel as the post passes the lever when the bell hammer is held in its locked position by the locking pawl. See Fig. 9 of P35.620, Issue 1, for location of parts.

*R. B. Smith*  
**BELL SYSTEM PRACTICES** ..... **SECTION P35.651**  
**Teletypewriter and Manual** ..... **Issue 5, October, 1946**  
**Telegraph Station and P.B.X.** ..... **AT&T Co Standard**  
**Installation and Maintenance**

## **TYPING REPERFORATOR UNITS AND BASES**

### **14 TYPE**

## **REQUIREMENTS AND PROCEDURES**

### **I. GENERAL**

1.01 This section contains the apparatus requirements and adjusting procedures for the maintenance of 14 type typing reperforator units and bases. It is reissued to include information from Section P35.610 so this section is now complete for typing reperforator units and to make other minor changes and corrections. Changes or additions of consequence are indicated with an asterisk (\*).

1.02 The following shall be observed in applying requirements and procedures.

- (a) Use appropriate gauges for dimensional measurements.
- (b) Use the following Teletype scales for tension measurements as the tension values specified are not absolute values but readings to be obtained on these scales when used in the positions called for.

<u>Teletype Scale</u>	<u>Tension Range</u>
138-55M	8 ozs. or less
138-58M	8 ozs. to 32 ozs.
82711M	32 ozs. to 64 ozs.
4841M	4 lbs. to 12 lbs.
2727M	12 lbs. to 25 lbs.

(c) Before readjusting a part, loosen locking device (clamping screw, lock nut, etc.). Reset locking device after adjustment is completed.

(d) After readjusting a part, check adjustment of related parts which have been disturbed.

**TYPING REPERFORATOR  
UNITS AND BASES**

**14 TYPE**

**REQUIREMENTS AND**

(e) Parts dismantled to facilitate checking or readjustment shall be reassembled after operation is completed, reassembling any dismantled locating shims in original position.

(f) Springs which are outside tension limits shown and for which no adjustment is provided shall be replaced.

(g) Refer to ordering information for part names and numbers since designations used herein are in some cases abbreviated to save space.

(h) Contact points shall fall wholly within the circumference of the opposing contact except in case of contacts having the same diameter. In those cases contact centers shall not be out of alignment by more than 25% of their diameter.

1.03 To remove cover, raise lid, shift platen to rear ("letters") position and grasp lid at each side close to hinge using both hands. Lift vertically upward taking care to avoid snagging the platen push rod. In replacing cover, make sure that the platen is in the "letters" position and then lower the cover vertically and carefully into place grasping it as aforementioned.

1.04 To remove reperforator unit, remove the two thumb screws, grasp the rear motor gear guard handle and the left side handle, lift rear of base plate to clear left rear positioning stud and rotate the unit counterclockwise about its right front stud until the handle on the right side becomes accessible. Then move the right hand to this handle and raise the unit straight upward. To replace the unit reverse this procedure.

1.05 To determine condition of contacts "open" or "close" use a test lamp, buzzer or the volt-ohm-milliammeter.

1.06 Table of Contents Paragraph

GENERAL .....	1.01 to 1.06
CLEANING .....	2.01
LUBRICATION .....	3.01
REQUIREMENTS AND PROCEDURES—	
TYPING REPERFORATOR UNITS .....	4.01 to 4.105

#### Bell Mechanism

Pullbar Lockout Lever .....	4.32
Bell Hammer Post .....	4.85
Bell Hammer Eccentric Screw .....	4.86
Bell .....	4.87, 4.88



## Main Shaft and Main Bail Mechanism

Selector Cams .....	4.01
Main Shaft Clutch Throw-Out Lever .....	4.02
Clutch Throw-Out Lever Spring .....	4.03
Main Shaft Clutch Spring .....	4.04
Main Shaft Clutch .....	4.05
Main Bail .....	4.30
Pullbar Guide .....	4.31
Main Bail Adjusting Screw .....	4.60
*Main Bail Spring .....	4.84
Main Bail Cam Friction Clutch Torque .....	4.99
Selector Clutch Torque .....	4.100

## \*MOTORS AND GOVERNORS .....

4.06

## Platen Assembly and Shift Mechanism

Shift Rocket Post .....	4.72
Shift Rocket Lever Post .....	4.73
*Shift Bell Crank .....	4.74
Shift Bell Crank Guide .....	4.75
Platen Travel .....	4.76
Platen and Type Character Alignment .....	4.75, 4.77
Platen Shaft Spring .....	4.78
Platen Yield Spring .....	4.79
Shift Lever Spring .....	4.80
*Platen .....	4.103

## Punch Mechanism

Punch Arm .....	4.53
Punch Selector Finger and Punch Pin Alignment .....	4.54, 4.61
Punch Bail .....	4.54
*Code Bar Bell Cranks .....	4.59
*Vertical Lever Pivot Screw .....	4.61
Punch Selector Finger Backstop .....	4.62
Punch Bell Crank Springs .....	4.63
Punch Arm Spring .....	4.64
Punch Travel .....	4.65

## Range Finder Mechanism

Stop Lever .....	4.22
Trip Latch Spring .....	4.23
Stop Lever Spring .....	4.24
*Tape Feed-out Lever .....	4.26

## Ribbon Mechanism

Ribbon Feed Lever .....	4.06(b)
*Ribbon Spool Cups .....	4.33

*Ribbon Spool Shaft End Play .....	4.34
*Ribbon Spool Brackets .....	4.35
*Ribbon Spool Shaft Springs .....	4.36
*Left Ribbon Reverse Arm .....	4.37
Left Ribbon Reverse Shaft End Play.....	4.38
Right Ribbon Reverse Shaft End Play .....	4.39
Right Ribbon Reverse Arm .....	4.40
Ribbon Reverse Pawl Links .....	4.41
Ribbon Spool Engagement on Shaft .....	4.42
Ribbon Feed Shaft Tension Spring .....	4.43
Ribbon Feed Shaft Detent Plunger Spring ....	4.44
Ribbon Feed Lever Spring .....	4.45
Ribbon Check Pawl .....	4.46
Ribbon Check Pawl Spring .....	4.47
Ribbon Feed Pawl .....	4.48
Ribbon Feed Pawl Spring .....	4.49
Ribbon Reverse Pawl Spring .....	4.50
Ribbon Guide .....	4.83
Ribbon .....	4.104

### Selecting Mechanism

Selector Cam and Lever Alignment .....	4.01
*Selector Lever Springs .....	4.07
*Code Bars and "T" Levers—Freedom of Movement .....	4.08
*Sword Separator Plate Leaf Spring .....	4.09
Armature Lever End Play .....	4.10
*Selector Armature and Magnet Alignment ....	4.11
*Selector Arm .....	4.12
Selector Sword Travel .....	4.13
Locking Wedge .....	4.14
Locking Lever Spring .....	4.15
Selector Arm Stop Detent .....	4.16
Selector Arm Stop Detent Spring .....	4.17
Selector Magnet Bracket Adjusting Arm.....	4.18
*Selector Magnet Bracket .....	4.19
Selector Arm Operating Screw .....	4.20
Selector Arm Spring .....	4.21
Armature Trip-Off Screw .....	4.25
*Armature Lever Spring .....	4.27
Pull Bar Guide ("T" Lever-Clearance in Code Bar Slots) .....	4.31
Orientation Range and Distortion Tolerances..	4.105

### Tape Mechanism

Feed Roll .....	4.55
Tape Tension Lever .....	4.56

Feed Roll Detent—Preliminary Setting .....	4.57
Feed Pawl Eccentric—Preliminary Setting.....	4.58
*Feed Roll Detent—Final Setting .....	4.66
Feed Roll Detent Spring .....	4.67
*Feed Pawl Eccentric—Final Setting .....	4.68
Feed Pawl Spring .....	4.69
Tape Stripper Plate .....	4.70
*Tape Tension Lever Spring .....	4.71
Tape Guide .....	4.81
Tape Guide Spring .....	4.82
Tape Platform .....	4.88

**Type Basket Mechanism**

Function Bar Bracket Plates .....	4.28
Character and "Figs." Pull Bar Springs .....	4.29
"Letters" Pull Bar Spring .....	4.51
*Code Bar Lock Lever Spring .....	4.52
Main Bail Adjusting Screw (Pull Bar to Code Bar Clearance) .....	4.60
Pull Bar Guard .....	4.95(b)
Type Bars and Pull Bars—Freedom of Movement .....	4.101
*Alignment of Type .....	4.102

**Optional Features**

*Backspace Mechanism .....	4.89
Mechanical End of Line Indicator .....	4.90
Tape Feed-Out Magnet .....	4.91
Remote Signal Bell Contacts .....	4.92
*Clutch Throw-Out Lever Contacts .....	4.93
*Platen Shift Contacts "Make Type" .....	4.94(a) to (e)
*Platen Shift Contacts "Break Type" .....	4.94(a), (f) to (h)
Pull Bar Contacts .....	4.95
Universal Contacts "Make Type" (Old Style)..	4.96
*Universal Contacts "Make Type" (New Style)..	4.97
*Universal Contacts "Transfer Type" .....	4.98

REQUIREMENTS AND PROCEDURES— TYPING REPERFORATOR BASES .....	5.01
---	------

**2. CLEANING**

2.01 If necessary, typing units shall be cleaned in accordance with Section P30.010, covering Cleaning Teletypewriter Apparatus.

TYPING REPERFORATOR  
UNITS AND BASES  
14 TYPE  
REQUIREMENTS AND  
DESCRIPTIONS

### 3. LUBRICATION

3.01 Typing units shall be lubricated in accordance with Section P35.604 covering lubrication of typing reperforators.

### 4. REQUIREMENTS AND PROCEDURES FOR TYPING REPERFORATOR UNITS

4.01 Selector cams shall line up with their respective selector levers. Gauge by eye while selector cam sleeve is rotated through at least one complete revolution.

(a) To adjust, loosen main shaft bearing brackets and raise or lower shaft.

#### 4.02 Main Shaft Clutch Throw-Out Lever:

(a) Main shaft clutch teeth shall clear each other by min. .010", max. .020" as in Fig. 1 when clutch is fully cammed out of engagement.

(b) Clutch throw-out lever shall be free in its bearings without perceptible end play.

(1) To adjust, reposition clutch throw-out lever pivot screws.

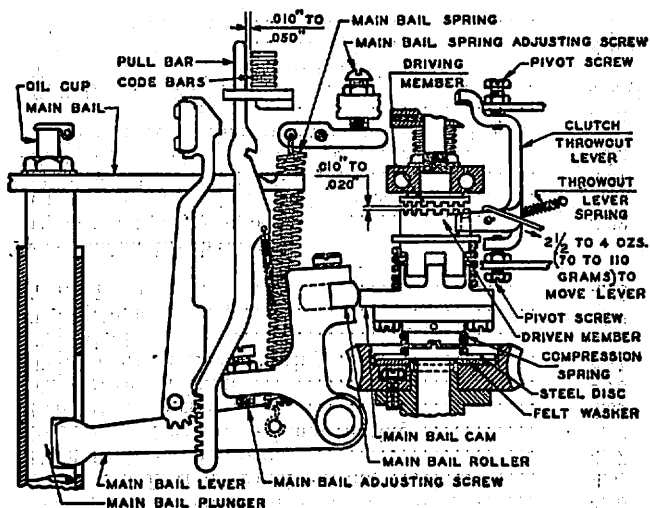


Fig. 1

4.03 **Clutch Throw-Out Lever Spring** shall have a tension of min. 2-1/2 ozs., max. 4 ozs. measured at right angles to the throw-out lever as in Fig. 1 with clutch teeth fully engaged.

4.04 **Main shaft clutch spring:** A pull of 30 ozs. applied to driven jaw of clutch as in Fig. 2 shall separate clutch teeth when tips of teeth are resting against each other. A pull of 24 ozs. similarly applied shall not separate clutch teeth.

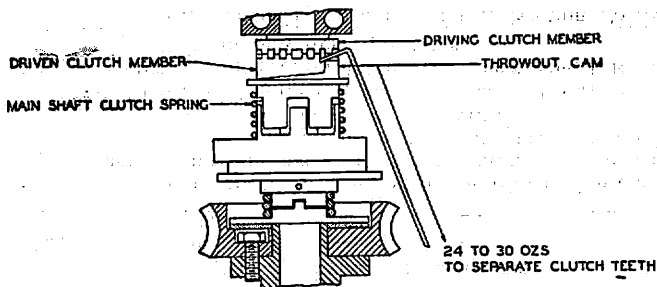


Fig. 2

4.05 **Main shaft clutch driven member,** after being pulled manually to position of extreme disengagement, shall start and slide until it engages with or touches the driving member teeth when the clutch spring is opposed by a force of not less than 10 ozs.

- (a) To gauge, pull driven member to operated position with 30 oz. tension as in 4.04, gradually reduce tension and permit driven member to slide until it touches driving member. The gauge reading should not go below 10 ozs.
- (b) To adjust, clean and lubricate clutch. If sliding surfaces of driven member and bushing on which it slides are not smooth and polished, replace these parts or return typing unit to shop for replacement.

**Note:** Failure to receive first character after a period of idleness may be caused by sticking of main shaft clutch parts. If trouble of this nature is reported it may be checked for by observing typing of first character received after main shaft of typing unit has been at rest for at least 10 minutes, power disconnected.

TYPING REPERFORATOR  
UNITS AND BASES  
14 TYPE  
REQUIREMENTS AND

4.06 **Motors and governors** shall meet the requirements of Section P36.640 covering 15 type teletypewriter motor units and Section P31.190 covering governors except those with regard to position of the motor and its speed which shall be as follows:

(a) Motor pinion and main shaft gear shall engage with minimum backlash and without bind throughout a complete revolution of the main shaft. Gauge by eye and feel.

(1) To adjust, reposition motor on mounting plate.

(b) **Ribbon feed lever** shall clear the motor when the main bail is in its uppermost position and motor and motor plate are in their normal operating position. Gauge by eye.

\* (c) **Speed:** The free speed of receiving shaft in revolutions per minute, corresponding to operations per minute with the shaft running free is:

<u>Operations per Minute</u>	<u>Words per Minute</u>	<u>Code No. of Target</u>	<u>Black Spots on Target</u>	<u>Free Speed of Receiving Shaft in R.P.M.</u>
AC or DC Governed Motors				
368.0	61.3	1G	10	420.6
460.0	76.7	1G	10	525.7
60 Cycle AC Synchronous Motors				
367.5	61.2	—	—	420.0
459.4	76.6	—	—	525.0

Note: Word speed is based on 6 operations (five characters and one space) per word. Nominal speeds of 368 and 460 operations per minute are commonly known as 60 and 75 speed respectively.

(1) Check and adjust speed of governed motors as outlined in Section P30.020 covering Speed Regulation of Teletypewriter Apparatus.

Note: If speed is variable, refer to Section P31.190 covering adjustment of governor contacts.

\*4.07 **Selector lever springs** shall have a tension of min. 6 ozs., max. 10 ozs. measured as in Fig. 3 when letters combination has been set up, main shaft has been rotated until main bail is in its highest position, and the swords have been moved manually to their "spacing" position.

(a) To adjust replace selector lever springs unless difficulty can be traced to impaired movement of associated selector lever or sword and impairment corrected.

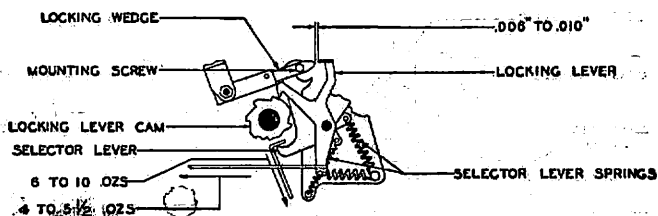


Fig. 3

4.08 Code bars and "T" levers shall move freely without bind.

(a) To check, rotate the main shaft until the main bail is in its lowest position, rest the unit on its left side, hold the swords away from their "T" levers, then raise the code bars to their marking position and observe their movement when released.

(b) If any impairment of motion is noted, check for binds at the "T" lever and code bar bearings, between code bars and code bar bell crank separator plates (see 4.59), and between adjacent code bars, then take steps necessary to eliminate difficulty.

Note: Old units may have separator washers of nickel silver (will not be attracted by a magnet) into which the separator collars may be imbedded if retaining nuts are drawn up too tightly. In these cases a retaining nut should be placed directly over the top separator washer and drawn up as tightly as possible with fingers. The lockwasher then should be placed over the first nut and followed by the lock nut which should be drawn up with one wrench while the bottom nut is prevented from turning with another wrench. Where only the new steel separator washers are used in the assembly, the lockwasher may be placed directly over the top separator washer and the assembly held in place with only one nut which may be drawn up by means of a wrench. In no case should the separator washers and collars rotate when the code bars are in operation.

Note: Remove range finder assembly for adjustments 4.09 to 4.24, inclusive.

TYPING REPERFORATOR  
UNITS AND BASES

14 TYPE

REQUIREMENTS AND  
PROCEDURES

4.09 **Sword separator plate leaf springs**, except those of top and bottom plates, shall press lightly against their respective swords.

\*Note: If necessary to check, remove separator plates and check to see that leaf spring end is min. .050", max. .060" away from plane of plate as gauged by eye. See Fig. 4.

(a) To adjust, bend leaf spring at narrow portion.

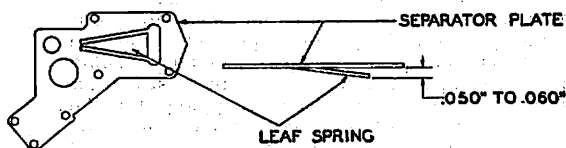


Fig. 4

4.10 **Armature lever** shall have a minimum amount of end play without bind as gauged by eye and feel when armature lever and selector arm springs are unhooked. See Fig. 5.

(a) To adjust, reposition top armature lever pivot screw.

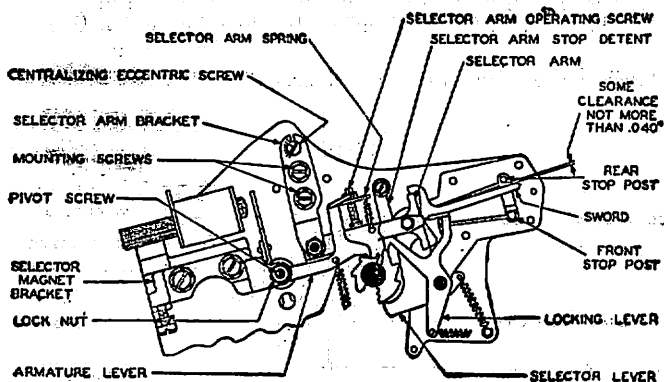


Fig. 5



\*4.11 Selector armature when in its operated position shall touch both magnet cores at approximately the centers of their pole faces and the cores shall be centrally located with respect to the armature as gauged by eye.

Note: If this requirement is not met, excessive negative internal bias will probably be encountered in operating test.

(a) If necessary to check, remove selector magnet bracket assembly from unit and hold it in a position where its armature rests against the pole-pieces by its own weight, then sight around pole-pieces against a light background.

**Caution: Make sure armature and pole faces are free of oil and dirt.**

(b) To adjust, reposition magnet core assembly.

Note: With proper adjustment, at least 3-1/2 lbs., applied at right angles to armature edge midway between cores, should be required to pull armature away from cores when .020 ampere is flowing to the magnet coils. (Coils in series shunted by 5000-ohm resistance.) This electrical check need not be made for .060 ampere operation (coils in parallel).

\*4.12 Selector Arm: See Fig. 6.

(a) Selector arm shall clear the armature lever by min. .008" and its stop detent by min. .010".

(b) Selector arm shall have barely perceptible end play without bind as gauged by eye and feel with the armature lever, selector arm and stop detent springs unhooked.

(1) To adjust, reposition lower selector arm pivot screw for clearance, then upper screw for end play.

Note: It may be necessary to remove the selector arm and magnet brackets to readjust the lower pivot screw.

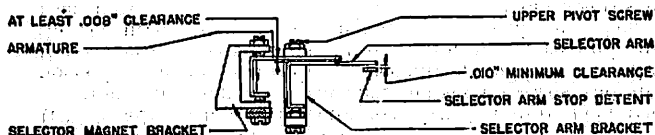


Fig. 6

4.13 Selector swords shall clear both stop posts by approximately equal amounts, not more than .040", measured as in Fig. 5 after removing locking lever and selector arm springs, placing associated selector lever on peak of its cam,

TYPING REPERFORATOR  
UNITS AND BASES  
14 TYPE  
REQUIREMENTS AND  
PROCEDURES

placing the sword arm against the armature extension end, and moving the armature slowly from its unoperated or operated position to a point where the extension arm just clears the sword arm. When checking clearance to front stop post unhook armature lever spring from spring arm.

Note: Use No. 1 sword in gauging and adjusting, then check remaining swords.

- (a) To adjust, loosen selector arm bracket until held friction tight; equalize clearance between swords and stop posts by turning centralizing eccentric, making sure that the selector arm stop detent does not interfere and that the eccentric indicating line is adjacent to scale on bracket; then move bracket closer or further away from swords by inserting the 90783M wrench into one of the two holes provided and turning wrench.

4.14 **Locking wedge** shall clear locking lever by min. .006", max. .010" as in Fig. 3 when lever is resting on the long high part of its cam and end of wedge is held in line with lever.

- (a) To adjust, reposition locking wedge.

4.15 **Locking lever spring** shall have a tension of min. 4 ozs., max. 5-1/2 ozs. measured as in Fig. 3 when lever starts to move from high part of its cam.

4.16 **Selector arm stop detent:** Locking lever shall clear sides of locking wedge by equal amounts within .003" as gauged by eye when armature lever is in its operated and unoperated positions. See Fig. 7.

Note: Make sure that selector arm operating screw does not interfere with selector arm.

- (a) To adjust, reposition detent by means of its eccentric post.

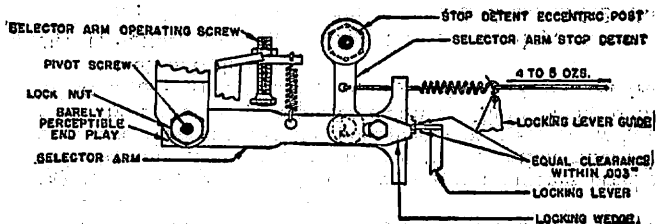


Fig. 7

4.17 **Selector arm stop detent spring** shall have a tension of min. 4 ozs., max. 5 ozs. measured as in Fig. 7 when stretched to position length.

4.18 **Selector magnet bracket adjusting arm:** Armature lever shall clear its cam by min. .060", max. .065" as in Fig. 8 when locking lever has just dropped off the long high part of its cam, the cam is held back against the locking lever, and the selector arm is held in its operated position by the locking lever.

Note: On units operated at 75 speed the clearance shall be min. .058", max. .062".

(a) To adjust, loosen selector magnet bracket and selector magnet bracket adjusting arm until held friction tight, then reposition selector magnet bracket by inserting and turning 90783M wrench in hole above adjusting arm end.

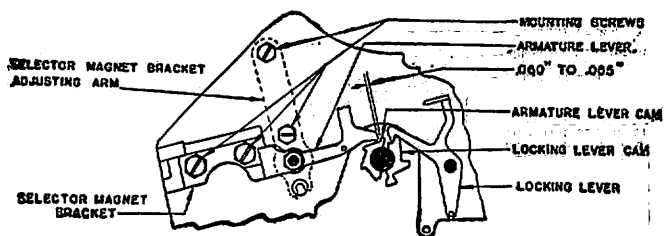


Fig. 8

4.19 **Selector magnet bracket:** With the selector magnet energized and the main shaft in a position to give the greatest throw to the armature lever, the clearance between selector arm and its operating screw shall be .004" to .006" greater when armature lever is on a peak of its cam as in Fig. 9A than when opposite an indent as in Fig. 9B.

\*(a) To adjust, deenergize the magnets, hold cam sleeve with the armature lever resting on a peak of its cam, turn main shaft to the position where it gives the greatest throw to the selector arm operating screw, loosen selector magnet bracket mounting screws and reposition bracket by means of its adjusting screw until the armature just touches its pole face, then give the screw an additional 1/10 turn

counterclockwise. Energize the magnets and if the selector arm does not clear its operating screw, back off the operating screw to provide at least .006" clearance, then recheck requirements; if difference in clearances exceeds .006" turn magnet bracket adjusting screw clockwise, if less than .004" turn screw counterclockwise.

Note: Avoid lost motion due to loose fitting screw threads.

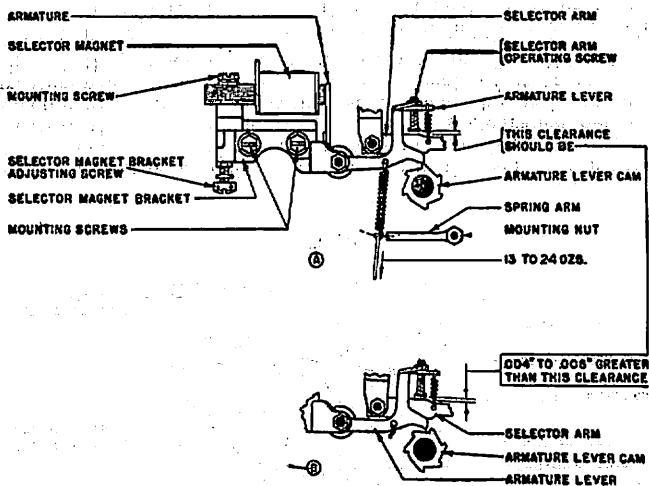


Fig. 9

4.20 **Selector arm operating screw:** Selector arm shall clear its operating screw by min. .003", max. .006" as in Fig. 10 when magnet is energized, selector arm is in its operated (marking) position and armature lever is between peaks of its cam.

(a) To adjust, reposition operating screw.

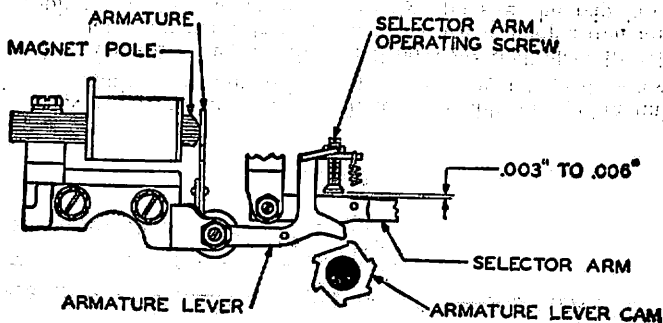


Fig. 10

4.21 **Selector arm spring** shall have a tension of min. 1-1/4 ozs., max. 1-3/4 ozs. measured as in Fig. 11 when armature lever is on a high part of its cam and selector arm stop detent spring is unhooked.

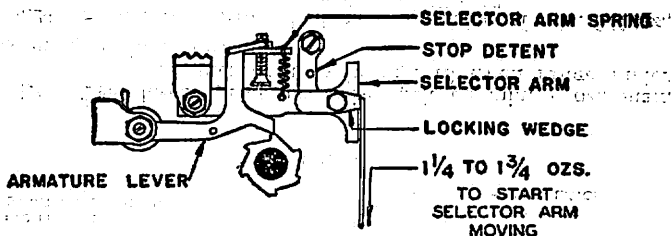


Fig. 11

4.22 **Stop lever** shall overtravel trip latch min. .004", max. .006" as in Fig. 12.

(a) To adjust, reposition stop lever eccentric screw.

TYPING REPERFORATOR  
UNITS AND BASES  
14 TYPE  
REQUIREMENTS AND  
PROCEDURES

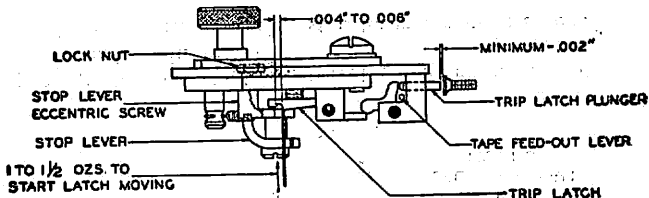


Fig. 12

4.23 Trip latch spring pressure shall be min. 1 oz., max. 1-1/2 ozs. measured as in Fig. 12 when range finder assembly is held horizontal.

4.24 Stop lever spring shall have a tension of min. 3/4 oz., max. 1-1/4 ozs. measured as in Fig. 13.

Note: Check 4.22 before measuring this tension.

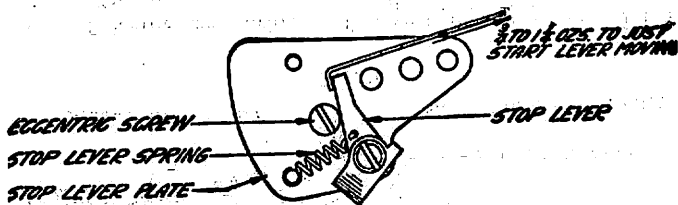


Fig. 13

Note: Reassemble range finder assembly on typing unit taking care not to jam trip latch plunger trip-off screw.

4.25 Armature Trip-off Screw: Stop lever shall clear its trip latch by max. .002" when armature is unoperated and stopping edge of the lever is directly opposite the trip latch latching surface (Fig. 14); and the trip latch plunger shall have min. .002" end play as in Fig. 12 when the armature is operated and the stop lever is clear of the trip latch latching surface.

(a) To adjust, reposition armature trip-off screw.

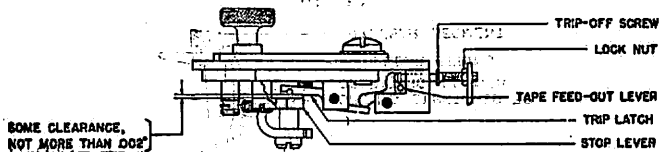


Fig. 14

\*4.26 Tape feed-out lever shall be free to rotate with a minimum amount of end play:

(a) To adjust, reposition the tape feed-out lever adjusting collar.

\*4.27 Armature lever spring shall have a tension of min. 13 ozs., max. 24 ozs. measured as in Fig. 9A when the armature lever is on a high part of its cam.

(a) To adjust, reposition spring arm.

Notes:

1. As a preliminary setting for 60 speed operation the spring tension should be adjusted to between 14 and 16 ozs. For 75 speed operation the tension should be adjusted to between 16 and 18 ozs.
2. The spring tension should then be further adjusted (within 13 to 24 ozs.) to minimize the internal bias of the selector. To do this it is necessary to determine distortion tolerances while receiving biased test signals as described in Section P30.002 or P30.003.
3. If biased test signals are not available the spring tension should be refined (within 13 to 24 ozs.) to give the maximum orientation range while receiving miscellaneous signals, preferably in the circuit in which it is to be used.
4. If a holding magnet is changed from a .020 ampere circuit (coils in series) to a .060 ampere circuit (coils in parallel) or vice versa, it will usually be necessary to readjust the armature spring tension to obtain maximum bias and distortion tolerances.

\*Note: For adjustments 4.28 and 4.29 the type basket should be removed to make the parts accessible. To do this proceed as follows: Unhook springs associated with code bar locking lever, letters pullbar, space

TYPING REPERFORATOR  
UNITS AND BASES  
14 TYPE  
REQUIREMENTS AND  
DRAWINGS

pullbar, and bell hammer. Remove the three type basket assembly mounting screws. Remove the front mounting screw of the right ribbon spool bracket; loosen rear mounting screw, and swing the bracket so that ribbon spool cup will not interfere with the type basket assembly. Remove the vertical lever bracket mounting screws and remove the vertical lever assembly. Then, using a piece of string or wire tie the pullbars out of engagement with their guide and slide the type basket assembly upward and out of the unit.

4.28 **Function Bar Bracket Plates:** Two end pullbars supported by function bar bracket plates shall clear the plates as in Fig. 15. Gauge by eye.

Note: This need be checked only when plates are moved.

(a) To adjust, reposition function bar bracket plates.

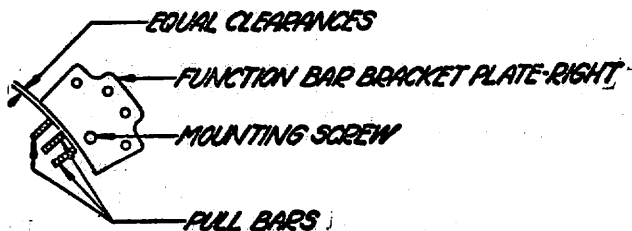


Fig. 15

4.29 **Character pullbar spring tension** shall be min. 3 ozs., max. 4 ozs. and "Figs." pullbar spring tension shall be min. 5-1/2 ozs., max. 6-3/4 ozs. See Fig. 16.

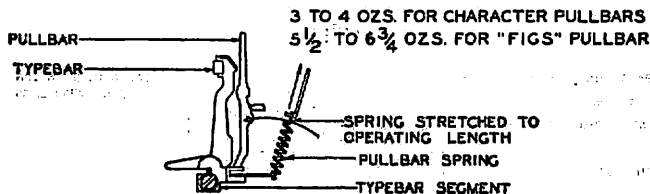


Fig. 16



Note: See 4.51 and 4.52 for function pullbar operating requirements.

Note: To replace type basket reverse procedure described for its removal.

4.30 Main bail of units equipped with roller guides shall not bind throughout its entire travel.

(a) To check, rotate main shaft until the main bail is in its highest position. Swing motor out of the way and remove ribbon-feed lever spring and main bail spring allowing bail to drop. Block all pullbars out of the path of the main bail. (A convenient way to do this is to place a length of rosin core wire solder between the pullbars and code bars.) Then with a finger under the main bail lever raise the main bail slowly to its highest position and release. There should be no evidence of bind on the upward travel and the bail should fall freely of its own weight to its lowest position when released.

(b) To adjust, restore spring and so position the pullbar guide that its mounting screws are in the middle of the elongated slots, then loosen the mounting screw of both main bail roller guides. (1) With the blank combination set up and the main bail opposite the unselected pullbar humps as in Fig. 17, shift the right roller guide to obtain the same clearance between the main bail and the "letters" and "figures" pullbar humps. Tighten the right roller guide top mounting screw friction tight. (2) With the main bail

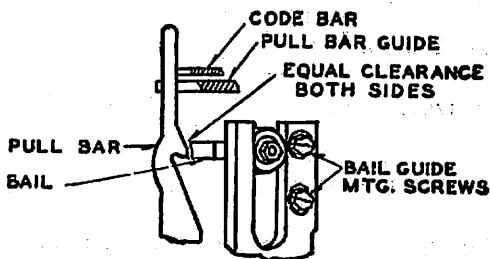


Fig. 17

in its lowest position as in Fig. 18 adjust the main bail adjusting screw to give some clearance between pullbars and code bars. Shift the right roller guide around its friction

TYPING REPERFORATOR  
UNITS AND BASES

14 TYPE

REQUIREMENTS AND  
SPECIFICATIONS

tight top mounting screw to obtain approximately the same clearance between the code bars and "letters" and "figures" pullbars. Tighten the right roller guide bottom mounting screw friction tight and recheck (1). Then fully tighten both right roller guide mounting screws after making any necessary readjustments. Position left roller guide so that check conditions outlined in (a) are met and then tighten both of its mounting screws.

Note: If this adjustment is made check 4.31, 4.32 and 4.60.

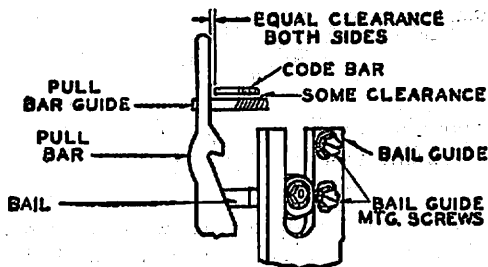


Fig. 18

4.31 Pullbar guide: See Fig. 19.

(a) Oil cup on the top of the main bail plunger shall clear the pullbar guide.

(b) Main bail shall clear the projections on unselected pullbars by min. .008", max. .020" when "blank" and "letters" combinations are set up in turn and main bail play is taken up to make this clearance a minimum.

(c) No. 1 (top) "T" lever shall clear the bottom of the notch in the No. 1 code bar by min. .004", max. .080" at the point of minimum clearance. All other "T" levers shall have some clearance at the bottom of the notches in their associated code bars at the point of minimum clearance.

(1) To adjust, reposition pullbar guide.

Notes:

1. If requirements cannot be met it may be necessary to readjust main bail roller guides per 4.30 (b).

2. If adjustment is made check 4.32, 4.59 and 4.60.

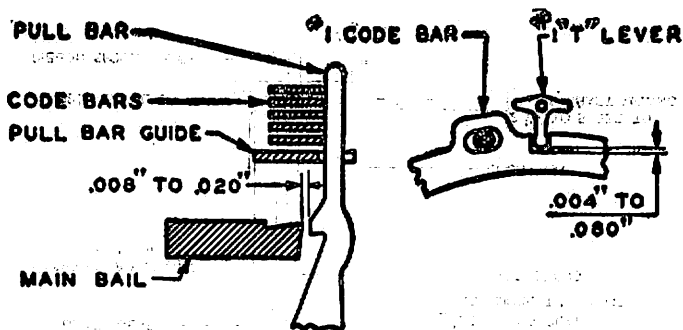


Fig. 19

4.32 Pullbar lockout lever: See Figs. 20 and 21.

(a) "Bell" pullbar shall clear the lockout lever roller of the "S" pullbar by min. .010", max. .040" and "S" pullbar shall clear the code bars by min. .004", max. .020" when platen is in "figures" position, "S" combination setup and main shaft rotated until the main bail is approximately .010" below its notch in the "bell" pullbar.

(b) "Bell" pullbar shall clear the code bars by min. .004", max. .020" when the platen is in "letters" position, "S" combination is set up and main shaft rotated until the main bail is approximately .010" below its notch in the "S" pullbar.

(1) To adjust, reposition pullbar lockout lever adjusting lever.

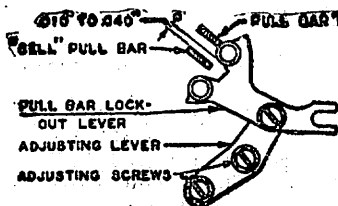


Fig. 20

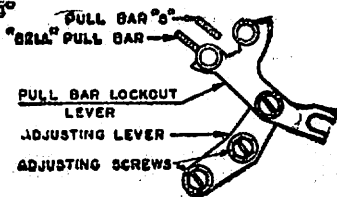


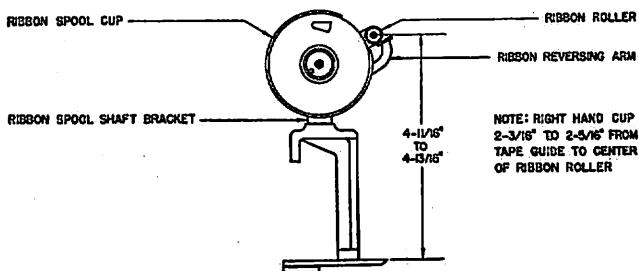
Fig. 21

TYPING REPERFORATOR  
UNITS AND BASES  
14 TYPE  
REQUIREMENTS AND  
PROCEDURES

**\*4.33 Ribbon spool cups:** See Fig. 22.

- (a) Center of left ribbon spool cup roller shall be min.  $4-11/16"$ , max.  $4-13/16"$ , from the base plate.
- (b) Center of right ribbon spool cup roller shall be min.  $2-3/16"$ , max.  $2-5/16"$  from the top surface of the tape guide.

(1) To adjust, reposition ribbon spool cups.

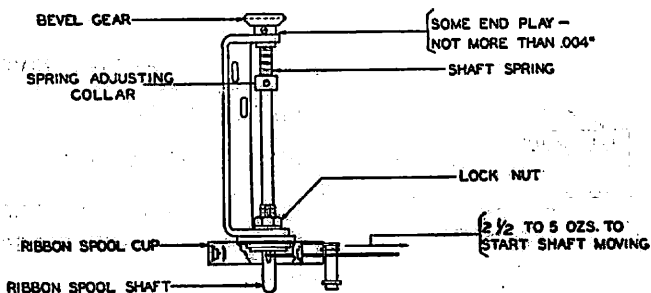


**Fig. 22**

**4.34 Ribbon spool shafts** shall have perceptible end play, but not more than  $.004"$ . See Fig. 23.

- (a) To adjust, reposition ribbon spool shaft gears.

\*Note: If the unit is equipped with an end-of-line indicator mechanism the required end play in the right-hand ribbon spool shaft should be obtained by positioning the rear collar on the right-hand ribbon spool shaft.



**Fig. 23**

\*4.35 **Ribbon spool brackets** shall be parallel with the edges of the base plate and there shall be a minimum amount of backlash between the bevel gears on the ribbon feed shaft throughout a complete revolution of the ribbon spool shafts when the ribbon feed shaft is in its extreme left and right positions, respectively.

(a) To adjust, position the ribbon spool brackets.

Note: If unit is equipped with an end-of-line indicator mechanism the right bracket shall be so positioned that the front edge of its ribbon spool cup is approximately in line with the front edge of the left ribbon spool cup and the gear backlash obtained by positioning the gear on right ribbon spool shaft.

\*4.36 **Ribbon spool shaft springs:** The resistance to turning caused by the ribbon spool shaft springs shall be min. 2-1/2 ozs., max. 5 ozs. measured as in Fig. 23 by pulling on the pin with ribbon feed shaft disengaged from ribbon spool shaft.

(a) To adjust, move spring collar longitudinally on shaft.

4.37 **Left ribbon reverse arm:**

\* (a) Left ribbon reverse arm shaft shall clear the ribbon spool cup by min. .005", max. .025" (Fig. 24) when the reverse arm is held against the ribbon spool bracket to make this clearance a minimum.

(b) Left ribbon reverse arm pawl shall clear the ribbon reverse bail by min. .015", max. .025" (Fig. 25) when the reverse arm is against the spool cup and the bail is opposite the pawl.

(1) To adjust, reposition reverse arm.

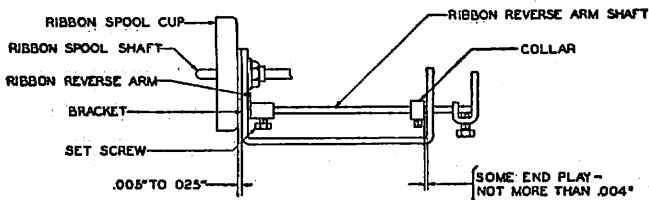


Fig. 24

4.38 **Left ribbon reverse arm shaft** shall have perceptible end play not to exceed .004". See Fig. 24.

(a) To adjust, reposition shaft collar.

TYPING REPERFORATOR  
UNITS AND BASES  
14 TYPE  
REQUIREMENTS AND

4.39 **Right ribbon reverse arm shaft** shall clear the ribbon spool cup by not more than .004" when its collar is held against the ribbon spool bracket to make the clearance a maximum.

(a) To adjust, reposition shaft collar.

4.40 **Right ribbon reverse arm:**

(a) The rear of the right ribbon reverse arm ribbon slot shall be in line with or slightly behind the rear flange of the roller on the spool cup.

(b) **Right ribbon reverse pawl** shall clear the ribbon reverse bail by min. .015", max. .025" when the reverse arm is against the spool cup and the bail is opposite the pawl.

(1) To adjust, reposition reverse arm.

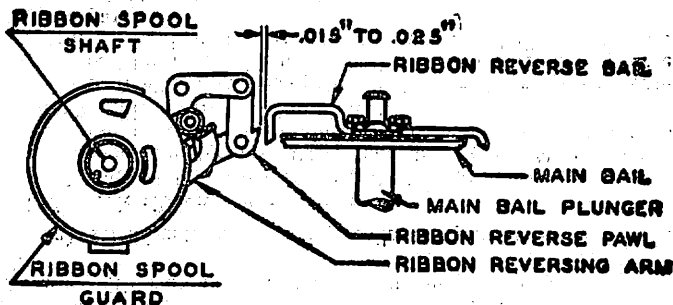


Fig. 25

4.41 **Ribbon reverse pawl links** shall not bind on their shoulder screws.

(a) To adjust, reposition levers on rear ends of shafts and recheck 4.37 and 4.40.

4.42 **Ribbon spools** shall be sufficiently tight on their shafts to insure that they will not slide off in service.

(a) To adjust, spread slot in end of shaft.

4.43 **Ribbon feed shaft tension springs** shall exert a pressure of min. 3 lbs., max. 5 lbs. measured on the ribbon reverse pawls as in Fig. 26 when the feed shaft is held in

engagement with the opposite spool shaft gear and the main bail is in its uppermost position.

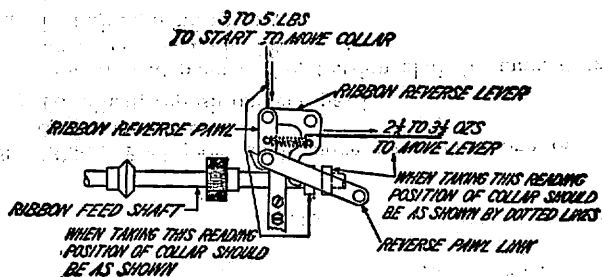


Fig. 26

4.44 Ribbon feed shaft detent plunger spring shall so press the plunger against the detent that it requires a force of min. 1-1/2 lbs., max. 3-1/2 lbs. to push the detent over the plunger as in Fig. 27 when the ribbon feed and check pawls are held clear of the bracket.

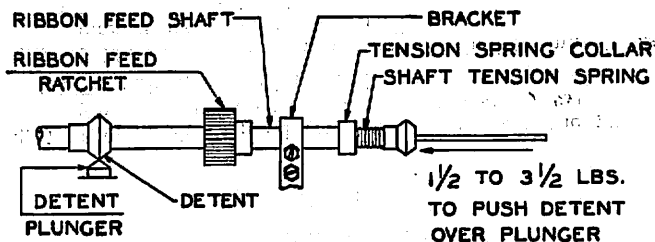


Fig. 27

4.45 Ribbon feed lever spring tension shall be min. 12 ozs., max. 18 ozs. measured as in Fig. 28 after removing ribbon feed pawl spring and placing feed lever roller in plunger indent.

TYPING REPERFORATOR  
UNITS AND BASES  
14 TYPE  
REQUIREMENTS AND  
PROCEDURES

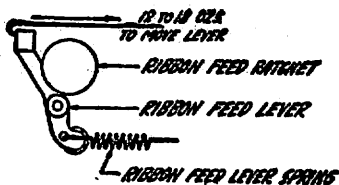


Fig. 28

- 4.46 Ribbon check pawl (top end) shall clear the pullbar guide by min.  $3/64$ " , max.  $5/64$ " gauged by eye.
- (a) To adjust, reposition check pawl.
- 4.47 Ribbon check pawl spring tension shall be min. 6 ozs., max. 8 ozs. measured as in Fig. 29.
- (a) To adjust, bend spring.

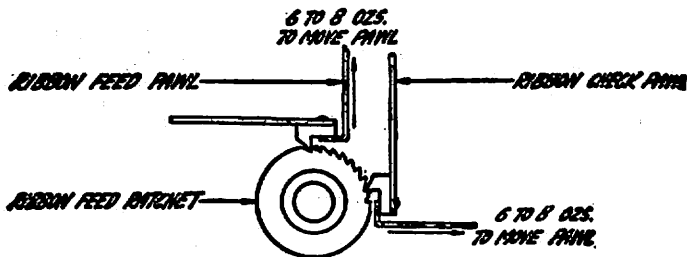


Fig. 29

- 4.48 Ribbon feed pawl shall move its ratchet one or two teeth at a time.
- (a) To adjust, reposition feed pawl.
- 4.49 Ribbon feed pawl spring tension shall be max. 8 ozs., measured as in Fig. 29.
- (a) To adjust, bend spring.
- 4.50 Ribbon reverse pawl spring tension shall be min.  $2-1/2$  ozs., max.  $3-1/2$  ozs. measured as in Fig. 26 with ribbon feed shaft collar moved away from ribbon reverse lever as shown dotted.



4.51 "Letters" pullbar spring tension shall be min. 1 oz., max. 1-1/2 ozs. when measured as in Fig. 30 with the main bail in its lowest position.

- (a) To adjust, reposition left function pullbar spring bracket.

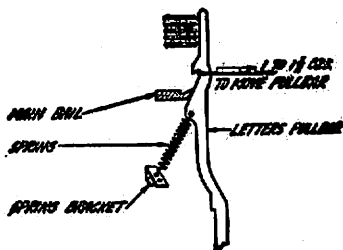


Fig. 30

4.52 Code bar lock lever spring tension shall be min. 3-1/2 ozs., max. 5 ozs. when measured as in Fig. 31 with the main bail in its highest position and the code bar bell cranks held away from the code bar locking lever.

- (a) To adjust, reposition right function pullbar spring bracket.

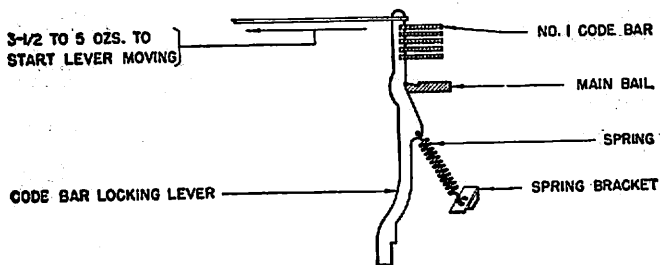


Fig. 31

4.53 Punch arm shall be centrally located in its bracket and have end play not to exceed .005". See Fig. 32.

- (a) To adjust end play, reposition front pivot screw; to adjust location, reposition rear pivot screw.

TYPING REPERFORATOR  
UNITS AND BASES  
14 TYPE  
REQUIREMENTS AND  
PROCEDURES

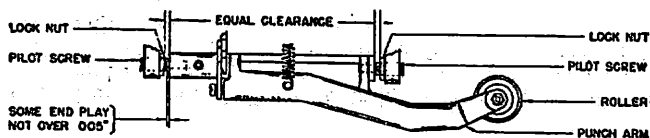


Fig. 32

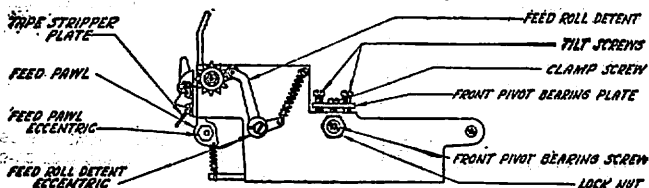


Fig. 33

Notes:

1. Punch arm is located when assembled and it is seldom necessary to relocate it.
2. New units have a hole in the main shaft bracket for access to the rear pivot screw; however, older units may not have this hole and in these cases it will be necessary to remove the main bracket from the base plate to adjust rear pivot screw.

4.54 **Punch Bail:** See Figs. 33 and 34.

- (a) The rear edge of the No. 1 (rear) selector finger and the front edge of the No. 5 (front) selector finger shall be within the outer edges of their respective punch pins when "letters" combination is set up and the main shaft is rotated until the selector fingers just touch the pins.

(b) All selector fingers shall clear their respective punch pins by approximately the same amount when "letters" combination is set up and the main shaft is rotated until the selector fingers are about to contact the pins.

(c) Punch bail shall have some end play not to exceed .005" as gauged by eye.

- (1) To adjust, loosen front pivot bearing screw locknut and proceed as follows. To meet requirement (a), keep clamp screw fixed and rotate front pivot bearing plate by means of the tilt screws. To meet requirement (b), loosen clamp screw and raise or lower front bearing plate as required by turning each tilt screw an equal amount in the direction required. To meet requirement (c) reposition front pivot bearing screw.

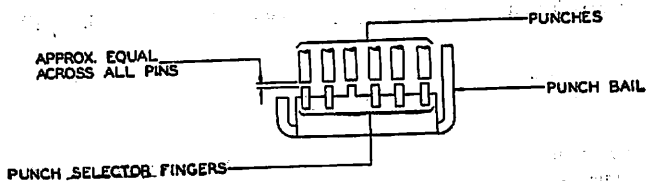


Fig. 34

4.55 Feed roll shall rotate freely and have end play not to exceed .004", when its detent, feed pawl and tape tension lever are held clear of the roll. See Fig. 35.

- (a) To eliminate bind, reposition rear bearing bracket; to adjust end play, reposition bearing bushing.

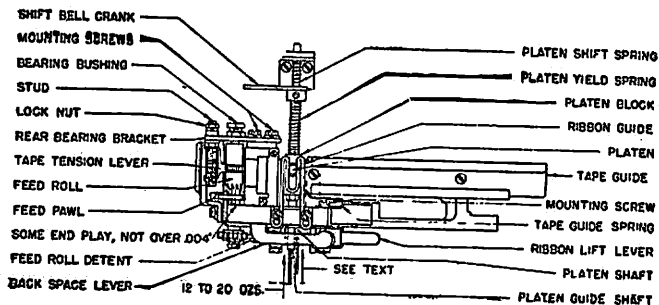


Fig. 35

4.56 Tape tension lever shall be located centrally over the feed roll pins and not touch them when the play in the feed roll and the tension lever is taken up in opposite directions. See Fig. 36.

- (a) To adjust, reposition lever stud by adding or removing shims.

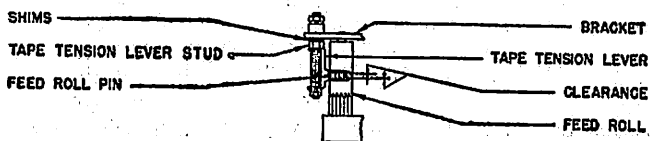


Fig. 36.

4.57 **Feed roll detent—preliminary setting.** (See 4.66)  
Centers of feed punch and feed roll pin shall be approximately .600" apart when the punch bail is in its operated position. See Fig. 37.

(a) To adjust to position feed roll by means of its detent eccentric that the feed pin centers in the middle hole of the 73517M feed wheel position gauge when the latter is inserted in the punch block with its projection against the feed punch.

Note: Center of eccentric head should be to the left of the screw body.

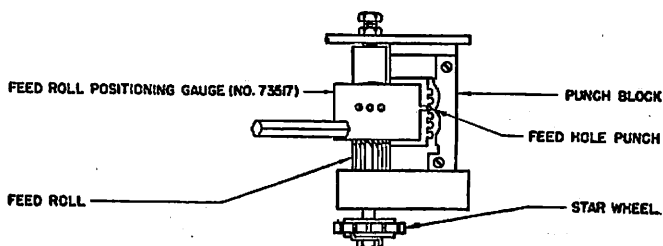


Fig. 37

4.58 **Feed pawl eccentric—preliminary setting.** (See 4.68)  
Feed pawl shall bottom in the feed roll tooth which is just below the horizontal center line of the roll when the punch rocker arm roller is on the low part of its cam.

(a) To adjust, reposition feed pawl eccentric keeping center of eccentric head to left of screw body.

\*4.59 **Code bar bell cranks:**

(a) Bell cranks and their separator plates shall be in horizontal planes.

- (b) Bell cranks and associated code bars shall line up and move freely between separator plates.
- (c) Bell cranks shall engage the top ends of their vertical levers fully and not interfere with the vertical levers associated with bell cranks above and below.
- (d) Bell cranks shall clear the adjacent right ends of associated code bars by min.  $.010''$ , max.  $.030''$ , when blank combination is set up and main shaft is rotated until new style two-step bell cranks are in a position where this clearance is a minimum as in Fig. 38 (approximately  $1/32''$  clearance between bell crank step and code bar). In the case of the older one-step bell cranks, this requirement shall be met when main shaft is rotated until the locking lever rests on the code bars as in Fig. 39.

(1) To adjust, reposition vertical lever bracket to obtain horizontal plane for bell crank movement, add or remove shims on bell crank pivot beneath bottom separator plate to raise or lower bell cranks, and reposition bell crank pivot post in its slot to position bell cranks horizontally. Before making these adjustments check 4.31 and if any of these adjustments are made check 4.08, 4.61 and 4.62.

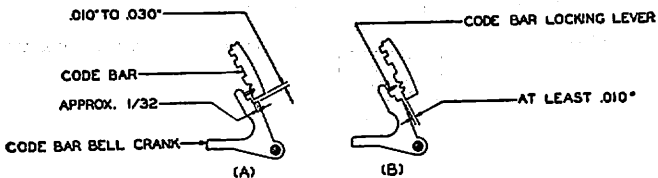


Fig. 38

#### 4.60 Main bail adjusting screw:

- (a) Unselected pullbars shall clear inner edges of code bars by min.  $.010''$ , max.  $.050''$ , as in Fig. 1 when "blank" and "letters" combinations are set up in turn, main bail roller is on the high part of its cam, and play in main bail and pullbars is taken up to make this clearance a minimum.

(b) Front edges of code bars shall clear the adjacent edges of associated **code bar bell cranks** by at least  $.010''$  as in Figs. 38 and 39 when "letters" combination is set up and main bail roller is on the high part of its cam.

Note: Before making any adjustment to meet these requirements check 4.31 and 4.59.

(1) To adjust, reposition main bail adjusting screw.

Note: If requirements cannot be met it may be necessary to readjust main bail roller guides per 4.30 (b).

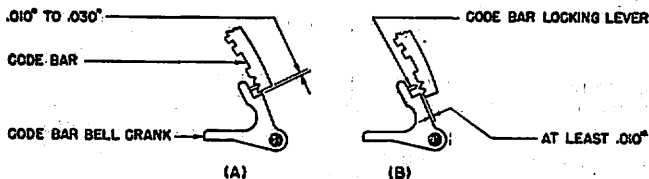


Fig. 39

\*4.61 Right edges of the punch engaging projections on the punch selector fingers shall be in approximate alignment with the right edges of the punch pins when "letters" combination is set up, main shaft is rotated until the code bar bell cranks are resting on the code bars, and all play in associated parts is taken up by pressing lightly toward the left on the right ends of the selector fingers. See Fig. 40.

(a) To adjust, reposition vertical lever pivot screw in its slot in the vertical lever bracket. If this adjustment is made check 4.62.

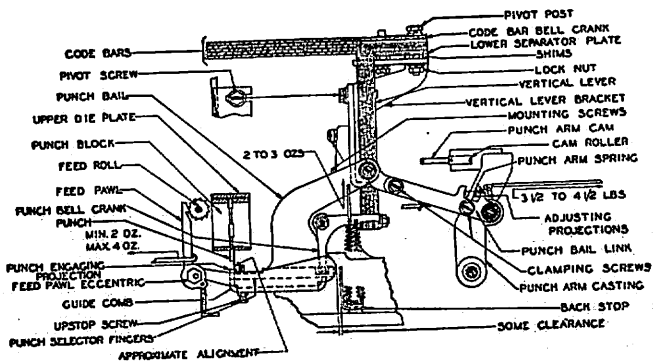


Fig. 40

#### 4.62 Punch selector finger backstop:

(a) Left ends of punch selector fingers shall engage their guide comb at the left end of the punch bail by not less than one-half the thickness of the comb when held to the right against the backstop.

(b) Right ends of punch selector fingers shall clear the backstop when main bail is in its lowest position. See

Fig. 40.

(1) To adjust, reposition backstop.

4.63 Punch bell crank springs shall have a tension of min. 2 ozs., max. 3 ozs., measured when the unit is in the stop position by pulling vertically upward on the bell crank at the spring and noting when the bell crank starts to move. See Fig. 40.



4.64 **Punch arm spring** shall have a tension of min. 3-1/2 lbs., max. 4-1/2 lbs., measured at the spring post in line with the spring as the roller starts moving away from the low part of its cam. See Fig. 40.

4.65 **Punch Travel:** Punches shall punch holes in tape cleanly when "letters" combination is set up and the typing reperforator is operated under power.

**Note:** By cleanly is meant a well-defined hinged lid, with no fibrous edges, and no appreciable tear at the hinged portion of the feed hole. A slight tear at the hinged portion of the code perforations is permissible.

(a) **To adjust:** Remove tape from under tension lever and carry it over the top of the lever so it can be fed by hand, back off main bail spring adjusting screw until the spring lever touches the casting, back off punch bail upstop screw, adjust punch bail link (see Fig. 40) by means of its projections so the feed hole is just punched through the tape cleanly when "letters" selection is set up and the unit is operated under power.

**\*Note:** Feed punch pin is approximately .010" shorter than punch pins.

**Caution:** Avoid excessive punch pin travel, otherwise the operating bail might jam excessively when the upstop screw is adjusted.

Restore main bail spring adjusting screw to its former setting and advance punch bail upstop screw (see Fig. 40) in small steps (tighten lock nut each time) until feed punch fails to perforate tape when operated under power. Turn back upstop screw in 1/12 turn steps (tighten lock nut each time) until feed punch clearly embosses but does not fully punch the tape, then back off upstop screw an additional 1/6 turn and lock it in this position. Check that feed holes are punched cleanly.

**Caution:** Do not take defective punch blocks apart. If satisfactory punching cannot be obtained replace block assembly.

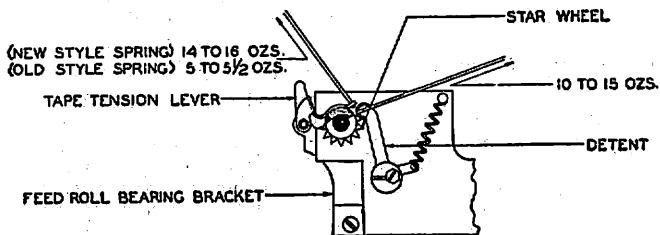
TYPING REPERFORATOR  
UNITS AND BASES  
14 TYPE  
REQUIREMENTS AND

**4.66 Feed Roll Detent—Final Setting (See 4.57).** Perforations in tape shall be evenly spaced, 10 to the inch, with an allowable variation of  $\pm .007$ " in a 4" length.

\*(a) To check, perforate a series of nine "blank" and one "letters" combinations seven or eight times, bend back the lids of all No. 3 code holes, place the tape on top of a 95960M gauge, then hold tape and gauge up to a light background and align a No. 3 code hole in the tape with the hole 1-1/2 inches from the left end of the gauge. Gauge holes shall be visible through all No. 3 code holes to the right of the point of alignment and the code holes above the large hole at the right end of the gauge shall fall entirely within the circumference of the gauge hole.

(b) To adjust, reposition feed roll detent eccentric and check 4.68.

**4.67 Feed roll detent spring shall have a tension of min. 10 ozs., max. 15 ozs., measured at right angles to the detent lever at the roller as the roller starts moving from the star wheel. See Fig. 41.**



**Fig. 41**

**4.68 Feed Pawl Eccentric—Final Setting (See 4.58).** Feed pawl shall advance the feed roll one full step for each downward stroke of the pawl with the tape removed and the motor rotated by hand. See Fig. 40.

\*(a) To check, hold detent clear of star wheel during a complete down stroke of feed pawl. If when the detent is allowed to reengage, the tips of the star wheel teeth are

not rotated in either direction by more than .010" as gauged by eye the adjustment is correct. Check in at least three places on star wheel.

(b) To adjust, reposition feed pawl eccentric.

4.69 **Feed pawl spring** shall have a tension of min. 2 ozs., max. 4 ozs., measured as the pawl starts to move when pulling horizontally to the left at a point just above the pawl hub. See Fig. 40.

4.70 **Tape stripper plate** upper edge shall clear the feed roll by not more than .010" throughout one complete revolution of the feed roll.

(a) To adjust, reposition stripper plate.

\*4.71 **Tape tension lever spring** shall hold the lever against the feed roll with a pressure of min. 14 ozs., max. 16 ozs. when the new style 110974M spring is used (or min. 5 ozs., max. 5-1/2 ozs., when the old style 84023M spring is used) measured at the end of the lever, perpendicular to a plane passing through the center of the tension lever stud and end of the lever. See Fig. 41.

(a) To adjust, reposition stud clockwise to increase and counterclockwise to decrease the tension.

4.72 **Shift rocker post** sides shall be parallel to the platen shaft as gauged by eye. See Fig. 42A.

(a) To adjust, reposition post.

4.73 **Shift rocker lever post** front surface shall be approximately parallel to the front edge of the base plate.

(a) To adjust, reposition post.

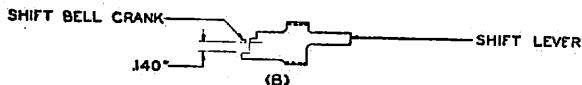
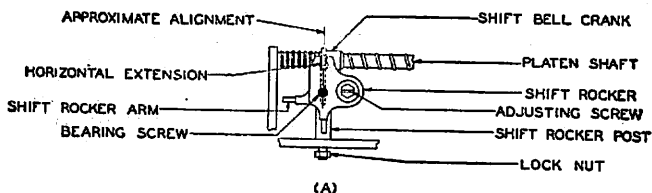


Fig. 42

TYPING REPERFORATOR  
UNITS AND BASES  
14 TYPE  
REQUIREMENTS AND

\*4.74 **Shift bell crank horizontal extension** shall be in approximate alignment with vertical center line through the shift rocker bearing screw as in Fig. 42A when the platen shaft is so held that the front face of the downward extension of the shift bell crank is opposite the mark on the top surface of the shift lever as in Fig. 42B.

Note: Older shift levers that are not marked can be marked by scribbling a .140" line to the rear of the forward shoulder as indicated in Fig. 42B.

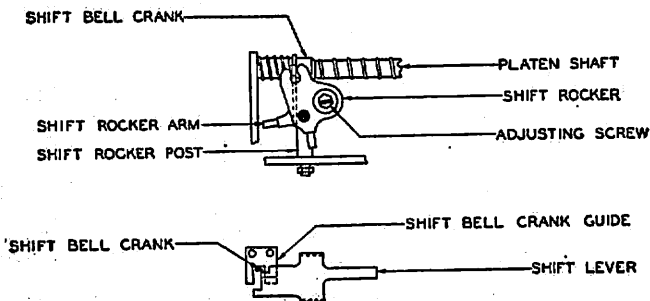
(a) To adjust, bend horizontal extension of shift bell crank.

**4.75 Shift bell crank guide:**

(a) Platen assembly shall shift freely.

(b) Printing face of the platen shall be approximately horizontal.

(1) To adjust, reposition shift bell crank guide. See Fig. 43.



**Fig. 43**

**4.76 Platen travel and latching:** Shift lever rear shoulder shall just engage the vertical extension of the shift bell crank when, starting with the platen in the forward ("figures") position, "letters" selection is set up, the main shaft is rotated until the main bail roller is on the low part of its cam, and the main bail is lifted by hand to its highest position. See Fig. 43.

(a) To adjust, loosen shift rocker adjusting screw and reposition shift rocker with respect to the shift rocker arm.

**4.77 Platen and Type Character Alignment:** When in both "figures" and "letters" the platen shall be approximately centrally located with respect to the type pallet characters.

(a) To adjust, add or remove shims on platen shaft between the front collar and the platen block.

**4.78 Platen shift spring** shall exert a pressure of min. 5 ozs., max. 7-1/2 ozs., measured with the platen in the "letters" position by pressing toward the rear on the front end of the platen shaft until the platen assembly extension starts to move away from the rear shoulder of the shift latch. See Fig. 35.

**4.79 Platen yield spring** shall exert a pressure of min. 12 ozs., max. 20 ozs., measured on the front end of the platen guide shaft by pressing toward the rear until the platen block starts to move on the platen shaft when the platen shaft is held in the extreme rear position. See Fig. 35.

**4.80 Shift lever spring** shall have a tension of min 1/2 oz., max. 1 oz., measured as the shift lever starts to move when a downward pressure is applied on the lever in line with the right edge of the platen shaft and the shift bell crank extension is held clear of the shift lever shoulder (to the rear).

**4.81 Tape guide** shall be so positioned that tape may be readily inserted into punch block.

**4.82 Tape guide spring** edge shall be parallel to the upper edge of the punch unit casting and its curved pressure tip shall engage the tape opposite the guide cutout. The spring shall press the tape firmly against the rear side of the guide without buckling the tape.

(a) To adjust, reposition and bend spring.

**4.83 Ribbon guide:** Ribbon shall (a) be centrally located with respect to all type pallets, (b) be held approximately 1/32" above the tape, and (c) show no tendency to curl at its rear edge.

(1) To adjust, reposition ribbon guide from front to rear to obtain (a) bend guide adjacent to casting to obtain

(b), and bend forward end of lower part of guide to obtain (c).

**\*4.84 Main bail spring tension:**

(a) Platen shall move from "figures" position to "letters" position without failure.

(b) Characters and punctuation marks shall be typed clearly without embossing tape.

(c) Main bail spring tension shall not exceed 15-1/2 lbs. measured as spring adjusting lever starts to move away from its adjusting screw when pulling upwards on the spring adjusting lever from a point directly below the spring with the main bail in its lowest or stop position.

(1) To adjust, with motor running send alternate "letters" and "figures" slowly, back off the main bail spring adjusting screw until platen just fails to return to "letters" position, tighten adjusting screw without failure, then tighten adjusting screw an additional 1-1/2 turns and tighten its lock nut, check typing requirement and increase spring tension if necessary but not above specified maximum.

4.85 Left edge of "bell" pullbar shall clear the bell hammer eccentric screw by approximately 1/8" when the main bail is in its lowest position.

(a) To adjust, reposition bell hammer post on base plate.

\*4.86 Bell hammer lip shall clear the bell hammer post by min. .020", max. .040" when the "bell" pullbar is selected, the main bail is in its highest position, and the "bell" typebar is held with its type pallet against the platen. See Fig. 44.

(a) To adjust, reposition bell hammer eccentric screw keeping high part of eccentric to the rear.

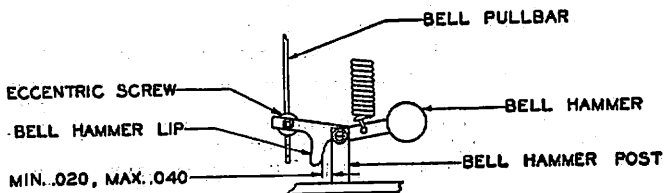


Fig. 44

4.87 Bell shall be so positioned to obtain most satisfactory tone and shall clear the left ribbon spool bracket, the carrying handle on the left side of the unit and the bell bracket mounting screws, by min. .010". Also see 4.88.

(a) To adjust, reposition bell on its mounting bracket.

4.88 **Tape platform** shall clear bell by min. .004" and the front side of its rear vertical lip shall clear and be approximately parallel to the rear edge of the tape.

(a) To adjust, reposition platform.

\*4.89 **Back space mechanism:**

(a) Ribbon lift lever spring tension shall require min. 28 ozs., applied as in Fig. 45 to start the lift lever to move.

(b) Back space lever spring tension shall require min. 1 oz., max. 2-1/2 ozs., applied as in Fig. 46 to start the back space lever to move.

(c) Back space feed pawl spring tension shall require min. 1/2 oz., max. 1-1/2 ozs., applied as in Fig. 46 to start the feed pawl to move.

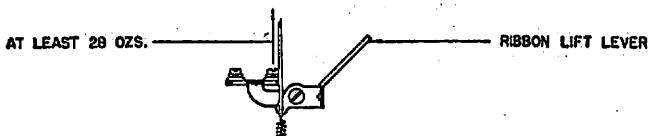


Fig. 45

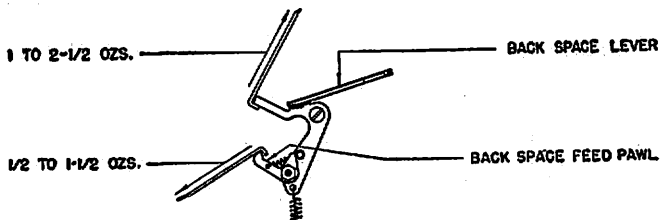


Fig. 46

Note: The following check shall be made on all units equipped with the back space mechanism.

The unit shall be capable of back spacing a length of tape containing 72 characters of regular text matter with one "letters" combination after each nine characters by

TYPING REPERFORATOR  
UNITS AND BASES  
14 TYPE  
REQUIREMENTS AND  
PROCEDURES

consecutively depressing the back space lever 72 times. The tape should not buckle or be damaged by the back space operation. It may be necessary to refine punch travel adjustment (4.65) and to remove dirt and burrs from parts.

#### 4.90 Mechanical End-of-Line Indicator:

(a) Worm shaft shall not bind but shall have just perceptible end play. Gauge by eye and feel with shaft spring detached from the contact bracket. See Fig. 47.

(1) To adjust, reposition collar.

(b) Front lamp contact spring shall press against its stiffener with a pressure of min. 3 ozs., max. 4 ozs. measured by pushing perpendicular to the spring at the contact point when the contacts are in the unoperated position. See Fig. 47.

(1) To adjust, remove spring from pileup and bend it.

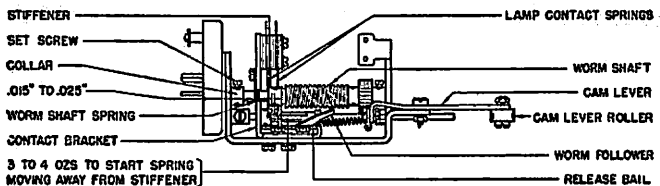


Fig. 47

(c) Rear lamp contact spring shall clear the front spring contact by min.  $.015''$ , max.  $.025''$  when the front spring is resting against its stiffener. See Fig. 47.

(1) To adjust, bend rear spring.

(d) Front lamp contact spring shall clear the lower edge of its stiffener by min.  $.010''$ , max.  $.020''$  when the worm follower rests in the groove at the end of the worm. See Fig. 48.

(1) To adjust, reposition contact bracket.

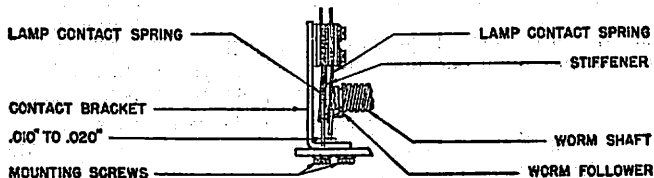


Fig. 48



(e) Worm follower bails shall not bind, shall have just perceptible end play and shall close the lamp contacts when min. 62 characters, max. 66 characters have been received.

(1) To adjust, reposition adjusting bracket (old arrangement) or collar on ribbon reverse shaft and adjusting bracket (new arrangement) and re-check (d).

(f) Worm follower spring tension shall be min. 1-1/2 ozs., max. 3-1/2 ozs. measured by pulling parallel to the spring at the end of the worm follower as the follower comes in contact with the rear contact spring, so holding the bail that the follower pin clears the worm. See Fig. 49.

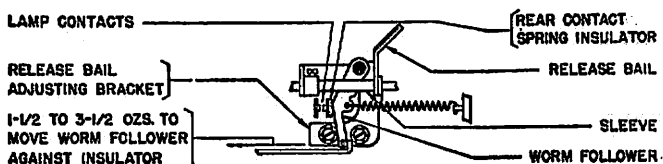


Fig. 49

(g) Release bail spring tension shall be min. 7 ozs., max. 11 ozs. measured by pulling vertically upward at the edge of the release bail near the spring hole as the bail starts to move from its unoperated position. See Fig. 50.

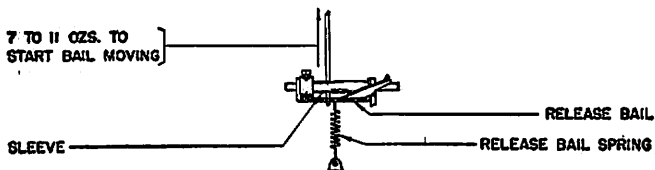


Fig. 50

(h) Feed pawl spring tension shall be min. 3 ozs., max. 5-1/2 ozs. measured as the pawl starts to move when pulling in line with the spring at the end of the feed pawl with the feed lever roller on the high part of its cam. See Fig. 51.



Fig. 51

(i) Cam lever spring tension shall be min. 28 ozs., max. 38 ozs. measured on the cam lever near the spring hole as the lever starts to move when the cam lever roller is on the low part of its cam. See Fig. 52.

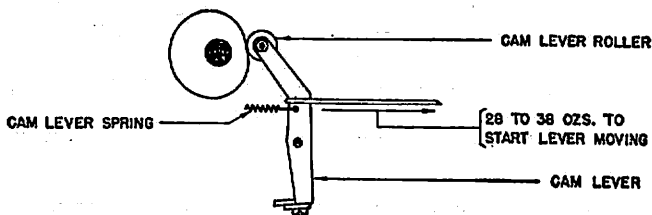


Fig. 52

#### 4.91 Tape Feed-Out Magnet:

(a) Tape feed-out magnet yoke shall be in line with the magnet bracket and the clearance between the magnet coil terminals and the magnet yoke shall be equal on both sides.

(1) Align by means of the magnet mounting screw. Recheck after tightening the screw.

(b) Armature face shall be flush against magnet core and yoke and in line with them when the tape feed-out lever is fully operated.

(1) Adjust by means of the armature mounting screws.

(c) Spring bracket base shall be parallel to the axis of the magnet coil.

(1) Align by means of the mounting screws.

(d) Armature spring shall require min. 3/4 oz., max. 1-1/4 ozs. to stretch the spring to position length as measured with the scale held horizontally.

#### 4.92 Remote Signal Bell Contacts:

(a) Contact lever shall fully engage the heel of the "bell" pullbar and clear its side by min. .010" when the "bell" pullbar is selected and the main bail is in its highest position. Gauge by eye.

(1) To adjust, reposition contact bracket.

(b) Contact lever shall clear the insulator on the upper contact spring by max. .006" when the contact lever is held against the bell pullbar and the main bail is in its lowest position.

(1) To adjust, bend upper contact spring.

(c) Contact gap shall be min. .025", max. .030" when the contact lever is held clear of the upper contact spring.

(1) To adjust, bend stiffeners.

(d) Lower contact spring pressure against its stiffener shall be min. 1-1/2 ozs., max. 2 ozs. measured at the end of the lower contact spring.

(1) To adjust, bend contact spring.

Note: If contact gap or spring tension requirements are in question remove contact assembly from unit to check and readjust.

**\*4.93 Clutch Throwout Lever Contact Mechanism:**

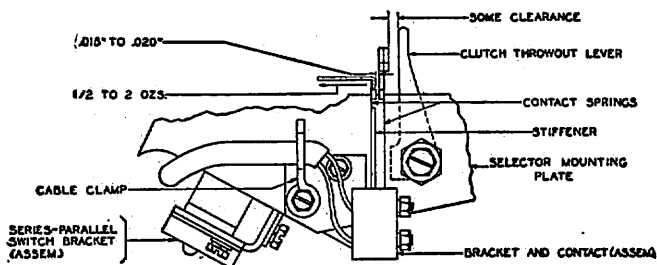
(a) Short contact springs shall have min. 1/2 oz., max. 2 ozs., pressure against their stiffeners measured as in Fig. 53.

(1) To adjust, bend short contact springs.

Note: It may be more convenient to remove bracket and spring assembly from unit to make this and the following adjustment.

(b) Contact gap shall be min. .015", max. .020", measured as in Fig. 53.

(1) To adjust, bend long contact springs.



**Fig. 53**

(c) Contact pressure of min. 1/2 oz. measured at the end of the short contact springs shall be obtained with clutch throwout lever on the high part of its cam; and the clutch throwout lever shall clear the insulator on the long contact spring as shown in Fig. 53, when the main shaft is in the stop position.

(1) To adjust, reposition contact bracket but if latter requirement cannot be met it may be necessary to readjust contact springs and stiffeners.

#### \*4.94 Platen Shift Contacts:

(a) Contact operating arm shall engage the bakelite tip on the long spring approximately in its center.

(1) To adjust, reposition contact bracket.

Note: Following contact adjustments can be checked and corrected only by removing the contact and bracket assembly. This should be done only when contacts are obviously out of adjustment.

(b) "Letters Make" type platen contact upper (long) spring shall be straight, approximately parallel to the insulator cover and the spun projections of its contact points shall clear the cover by max. .010".

(1) To adjust, bend spring.

(c) "Letters Make" type platen contact lower (short) springs shall be straight, rest against their stiffeners throughout the length of the stiffeners.

(1) To adjust, bend spring.

(d) "Letters Make" type platen contact gap shall be min. .015", max. .020".

(1) To adjust, bend lower spring stiffeners and check to see that both contact make and break approximately simultaneously when upper contact spring is operated and released.

(e) "Letters Make" type platen contact pressure shall be min. 1 oz., max. 2 ozs.

(1) To measure, insert a .040" wire gauge between dust shield and press it toward the mounting screws until the lower contacts clear their stiffeners by min. .004", max. .010", then pull downward with scale hooked on lower contact springs at contact points.

(2) To adjust, bend lower springs.

(f) "Figures Make" type platen contact upper (short) springs shall be straight and rest against their stiffeners throughout the length of the stiffeners when lower contact spring is held off.

(1) To adjust, bend springs.

(g) "Figures Make" type platen contact upper (short) springs shall clear the insulator cover by min. .010", max. .020" when lower contact spring is held off.

(1) To adjust, bend stiffeners and check to see that both pairs of contacts break and make approximately simultaneously when lower contact spring is operated and released.

(h) "Figures Make" type platen contacts shall open when a downward pull of min. 1 oz., max. 3 ozs. is applied on the lower contact spring at the contacts.

(1) To adjust, bend lower spring.

#### 4.95 Pullbar Contacts

(a) Toes of all pullbar hooks shall be as close as possible to .442" above and .620" in front of the mounting plate when the pullbars are resting against the code bars.

(1) Check two end and one middle pullbar using 99391M gauge as in Figs. 54 and 55.

(2) To adjust, add or remove shims between switching contact plate and mounting posts for first requirement and utilize clearance in mounting holes in plate and brackets to meet second requirement.

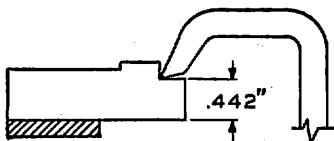


Fig. 54

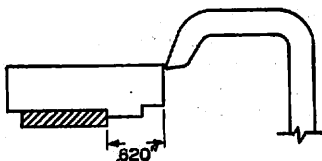


Fig. 55

(b) Pullbar guard shall clear all pullbars by min. .015" when associated typebars are held against the platen with the main bail in its lowest position; and it shall prevent the manual disengagement of all pullbars from their guide slots when typebars are resting against the backstop.

(1) Check end pullbars first and, if necessary, add or remove washers from between guard and backstop.

(If washers which are .028" thick do not give close enough results replace one washer with required num-

ber of 8896M shims, .004" thick.) After requirements are met on end pullbars, position guard by means of its mounting slots to obtain requirements on center pullbars.

(c) Pullbar contact assemblies shall be centrally located with respect to the pullbars; and the toes of contact hooks of all selected pullbars, except those which are not opposite the pullbar stripper, shall clear the sloping surfaces of the contact spring insulators by min. .004", max. .015", as in Fig. 56 when play is taken up by pressing lightly on the pullbars to make this clearance a minimum. Under the same conditions the clearance in the case of the pullbars which are out of range of the stripper shall be min. .035", max. .050".

(1) To adjust, shift contact assemblies. If requirements cannot be met in this manner recheck switching contact plate adjustments covered in (a).

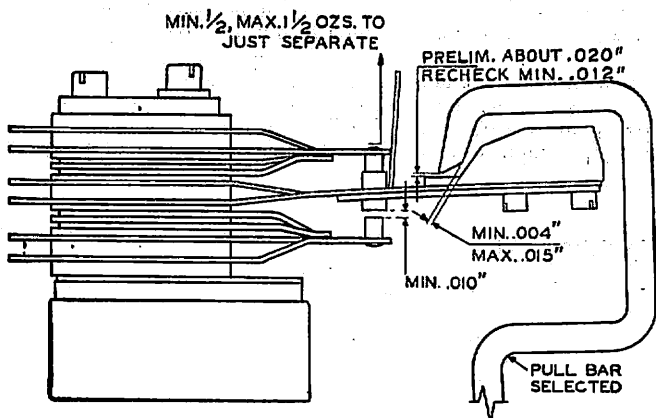


Fig. 56

(d) Upper contact gap shall be min. .015", max. .025" as in Fig. 57 when associated pullbar is not selected and resting on the No. 1 code bar.

(1) To set up condition select pullbar in question and rotate main shaft until pullbar falls into code bar slots, then hold pullbar and code bar locking lever out of the way and shift No. 1 code bar. Make sure upper contact spring has some pressure against its stiffener.

TYPING REPERFORATOR  
UNITS AND BASES  
14 TYPE  
REQUIREMENTS AND

- (2) To adjust, bend the upper contact stiffener with a 98055M tool.

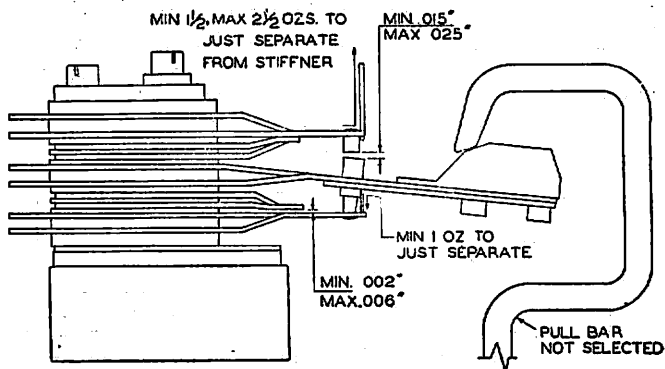


Fig. 57

(e) Upper contact spring shall require min. 1-1/2 ozs., max. 2-1/2 ozs. to start it moving away from its stiffener measured as in Fig. 57 with upper contact open.

(1) To adjust, bend upper contact spring with a 98055M tool.

(f) Middle contact spring contact shall bear on upper contact spring contact by min. 1/2 oz., max. 1-1/2 ozs., and the flat surface of its insulator shall clear the pullbar hook tip, preliminary adjustment—about .020", recheck adjustment—min. .012", when the associated pullbar is fully selected. See Fig. 56.

(1) To adjust, bend middle contact spring with 98055M tool, bend near pileup insulators to increase or decrease contact pressure and bend near contact to meet latter requirement. Then recheck 4.95 (d) and (e).

(g) Lower contact spring shall clear the stiffener by min. .002", max. .006" when associated pullbar is not selected and rests on the No. 1 code bar as shown in Fig. 57 and described in 4.95 (d) (1) and lower contact gap shall be min. .010" when pullbar is fully selected as in Fig. 56.

(1) To adjust, bend lower contact stiffener with 98055M tool.

(h) Lower contact spring contact shall bear on middle contact spring contact by min. 1 oz., measured as in Fig.



57 with associated pullbar not selected and resting on the No. 1 code bar as described in 4.95 (d) (1).

- (1) To adjust, bend lower contact spring with 98055M tool.

Note: Bending the contact spring and stiffeners originates stresses which tend to cause changes in adjustments. To stabilize adjustment, operate each contact at least 20 times. To do this, operate the contacts under power or lift the pullbars manually and allow them to fall to their normal position. Recheck 4.95 (d) to (h) and make refinements where necessary.

**4.96 Old Style "Make" Universal Contact Mechanism:** (Contact springs are mounted horizontally and have application only on units having old style square bail guide post.)

(a) Contact operating lever shall clear the fully selected "Q" pullbar by min. .020", max. .060" when the lever is held in contact with the bail by its spring and the play in the lever is taken up in a direction to make this clearance a minimum. The contact operating lever shall also clear the extension on the casting that mounts the old style square bail guide post by min. .020" when the main bail is in its lowest position and play in the lever taken up to make this clearance a minimum.

- (1) To adjust, reposition contact lever bracket.

(b) Upper contact springs shall be straight and make contact with their stiffeners throughout their entire length.

- (1) To adjust; bend springs and, if necessary, their stiffeners, then check to see both pairs of contacts close and open approximately simultaneously when lever contact spring is operated and released.

(c) Contact gap shall be min. .015", max. .020" when main bail is in its lowest position.

- (1) To adjust, bend lower contact spring.

(d) Contact operating lever shall allow the contacts to just make when lever is in contact with the bail and main shaft rotated until the bail rises to within min. .020", max. .080", of the notches of all the pullbars.

- (1) To adjust, reposition contact operating lever pivot screw.

(e) Contact pressure shall be min. 1-1/2 ozs., max. 2-1/2 ozs., measured with the push end of a scale that is held as nearly vertical as possible and applied on the

bakelite end of the lower contact spring when main bail is in its highest position.

**\*4.97 New Style "Make" Universal Contact Mechanism:**  
(Contact springs are mounted vertically.)

(a) Contact operating lever extension shall be approximately midway between the No. 1 and No. 2 pullbars when bail is at its highest and lowest positions.

(1) To adjust, reposition contact assembly bracket.

(b) Short contact springs shall be straight and make contact with their stiffeners throughout their entire length.

(1) To adjust; bend springs and, if necessary, their stiffeners, then check to see that both pairs of contacts close and open approximately simultaneously when long contact spring is operated and released.

(c) Contact gap shall be min. .015", max. .020", when main bail is in its lowest position.

(1) To adjust, bend long contact spring.

(d) Contact operating lever shall clear the top of the insulator on the end of the long contact spring by min. .025", max. .035", when a pullbar having pullbar contact is selected and main shaft is rotated until the associated top pullbar contacts just close. If unit has no pullbar contacts the operating lever shall clear the insulator by approximately 1/8" when main bail is in its lowest position.

(1) To adjust, reposition operating lever mounting block keeping its top surface horizontal.

(e) Contact operating lever spring shall require min. 4 ozs., max. 6 ozs., to pull it to position length when unhooked from the lever and the lever held against the long contact spring insulator.

**\*4.98 "Transfer" Universal Contact Mechanism:**

(a) Contact operating lever extension shall be approximately midway between the No. 1 and No. 2 pullbars when bail is at its highest and lowest positions.

(1) To adjust, reposition contact assembly bracket.

(b) Outer contact spring stiffeners shall be parallel to side of the mounting bracket. ("Outer" means farthest from mounting bracket.)

(1) To adjust, bend outer spring stiffeners and check to see that both pairs of contacts break and make approximately simultaneously when middle contact spring is operated and released.

(c) Outer contact springs shall require min. 1/2 oz., max. 1 oz. applied at their ends to move them away from

their stiffeners when middle contact spring is held off.

(1) To adjust, bend outer springs.

(d) Middle contact springs shall be so tensioned that outer contact springs clear their stiffeners by max. .006" when operating lever is held away from middle contact spring.

(1) To adjust, bend middle contact spring.

(e) Contact gap between middle and inner spring contacts shall be min. .015", max. .020", when middle contacts are making with outer contacts.

(1) To adjust, bend inner spring stiffeners and check to see that both pairs of contacts make and break approximately simultaneously when middle contact spring is operated and released.

(f) Inner contact springs shall require min. 1/2 oz., max. 1 oz., applied at their ends to move them away from their stiffeners.

(1) To adjust, bend inner springs.

(g) Contact operating lever shall clear the top of the insulator on the end of the middle contact spring by min. .025", max. .035" when a pullbar having pullbar contacts is selected and main shaft is rotated until the associated top pullbar contacts just close. If unit has no pullbar contacts the operating lever shall clear the insulator by approximately 1/8" when main bail is in its lowest position.

(1) To adjust, reposition operating lever mounting block keeping its top surface horizontal.

(h) Contact operating lever spring shall require min. 4 ozs., max. 6 ozs., to pull it to position length when unhooked from the lever and the lever held against the middle contact spring insulator.

**4.99 Main Bail Cam Friction Clutch Torque:** After motor has been run for at least 10 minutes a pull of 24 ozs. applied to main bail cam as in Fig. 58 shall move cam in a direction opposite normal rotation when motor is running, selector magnet is operated and main bail roller is held away from its cam. A pull of 18 ozs. applied under the same conditions shall not move cam.

Note: This measurement requires considerable care, and need be checked only when it is thought that cam is not being brought up to speed as the clutch engages.

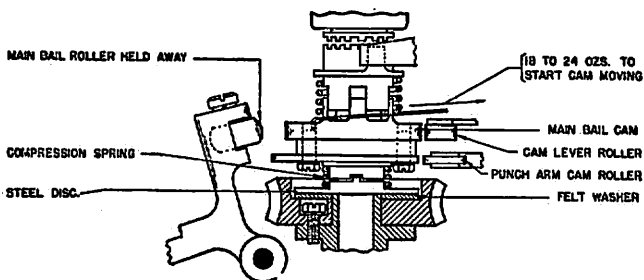


Fig. 58

(a) To check, remove tape reel and gear guard, hold main bail roller away from cam by pressing upon lid of oil cup at top of the main bail plunger, block magnet armature in its operated position so that main clutch will not engage, hook scale into screw hole as in Fig. 57 and pull in the direction reverse to normal rotation until cam just starts to move.

**Notes:**

- \*1. On older units 82440M screws may fill hole in main bail cam; in these cases replace screws with 74986M screws.
2. Pulling too far will tend to make main clutch engage and give a greater reading, therefore only a slight backward motion of cam should be given.

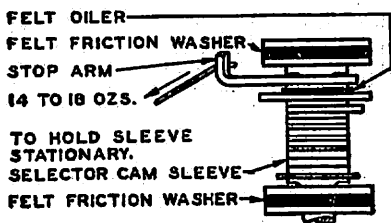
**Caution:** It is important to keep clutch stop arm against driven jaw to prevent main clutch engaging and winding scale around main shaft so either keep armature operated to avoid tripping clutch stop arm, or block or clamp clutch stop arm so that main clutch cannot engage.

- (b) To adjust, replace compression spring and/or felt washer of clutch.

Note: If torque is too high, lubricate clutch and recheck before replacing parts.

**4.100 Selector Clutch Torque:** After motor has been run for at least 10 minutes and clutch has been freshly lubricated a pull of 18 ozs. applied as in Fig. 59 when motor is running shall hold selector cam sleeve from rotating when selector arm is held just clear of its stop. A pull of 14 ozs. similarly applied shall not hold sleeve from rotating.

- (a) To adjust, recondition or replace felt friction washers, add spring adjusting washers, or replace spring as follows:



**Fig. 59**

Note: Reconditioning of washers by removing them and kneading with the fingers to soften them, or their replacement by new washers will usually be satisfactory in most cases since the spring holds its adjustment over long periods. Before replacing spring, consideration should be given to the addition of shims 96763M, 96764M or 96765M around the shoulder of the 72515M nut at the end of the spring nearest the bearing.

(1) To recondition felt washers: remove range finder assembly, detach locking lever spring and remove retaining disc, noting that it has a left-hand thread and unscrews to the right (clockwise); remove outer felt washer, cam sleeve assembly cam sleeve disc, and inner felt washer, holding selector levers away from shaft and rotating cam sleeve disc until notch in its edge registers with points of selector levers; knead felt washers with fingers and saturate with oil as specified in Section P35.604. Avoid getting dirt or metal chips in washer and bearing surfaces.

(2) To remove clutch spring or add adjusting washers, proceed as in (1), then remove top and bottom bearing brackets, main shaft, clutch driving disc and spring.

#### **4.101 Type bars and pullbars shall be free of bind.**

(a) To adjust, so bend type bars individually that they do not exert appreciable pressure on sides of slots. Check to see that foreign material is not impeding movement and if bind cannot be relieved in this manner, replace type bar as follows: Remove ribbon and ribbon guide; remove the platen guide shaft from platen block; push the platen block to the rear and rotate it clockwise out of path of type bars; move type bar forward and downward as far as it will go and lift its pivoted end from type bar segment; in case it cannot be readily disengaged or if it is located at extreme left-hand end, back off left type bar bearing rod retaining screw, not to exceed one full turn, to facilitate disengagement; hook replacement bar over bearing rod, lapping it with 87698M carborundum stone if necessary to relieve bind in segment slots; mesh type bar and pullbar teeth so that type bar rests against its back stop and top of pullbar is in line with tops of other pullbars and reassemble.

**\*4.102 Alignment of Type:** Characters shall be inked evenly and not be noticeably out of line or misspaced with respect to the character "N". Type bars shall lie evenly spaced against the backstop when unit is not printing.

(a) To check, type a series of characters between the letter "N" as "NANBNCN", etc. In case of doubt about any character, type character at least six times between two letter "N"s.

Note: On some early units it may be found that characters do not space reliably on a repeated test. This condition can be corrected completely only by extensive modifications to provide the following features which are standard on later units.

- (1) Main bail roller guides.
- (2) Latest main bail and punch cams, 101435M and 95460M, respectively.
- (3) Resilient backstop brackets, 103341M.

(b) To adjust, proceed as described in the following in cases where only a few type require adjustment. However, if many type appear to require adjustment it is well to first check the possibility of readjusting "N" to minimize the readjustment effort on other type.

(1) To correct spacing bend type bar in its straight shank in the direction required and then straighten character as described in (2). The type bar may be bent using two pliers, one to hold type bar near the type bar segment and the other to apply the bending force; or by using the 78589M three-prong pliers with the single prong on the side toward which the bend is to be made.

(2) To straighten type so that sides of character will be vertical and upper case character will be spaced the same as the lower case character bend top of type bar at its junction with the straight shank. This can be done by holding type bar shank at point of bend with one pliers while applying bending force on top of type bar with another pliers. 78590M parallel pliers are recommended for holding shank and short nose pliers for applying bending force.

(3) To bring type into horizontal alignment shift type pallet. To do this pull type bar forward and place a block behind it to hold it forward from other type bars. Heat type pallet with an electric soldering copper until solder is melted and then reposition pallet as required. After solder is thoroughly reset remove block and recheck alignment.

(4) To correct uneven inking of characters twist type bar, peen type pallet, or unsolder and tip pallet as required. If one side of type prints light or fails to print, twist type bar proceeding as described in (2) except applying a twisting force instead of bending

force. Special pliers may be used to cut or peen type just back of face position that is printing light; these are the 78587M two-side cutting pliers and 78588M one-side cutting pliers. If inking discrepancy is at top or bottom of character, pallet may be unsoldered as described in (3) and tipped into required position.

Note: If type pallets have been unsoldered in the alignment procedure they should be held down on top of a piece of cardboard placed over the ribbon guide and their slots refilled with solder. Brush off any excess solder.

\*4.103 **Platens** which are worn should be replaced. In the case of the newer two-piece platen it is probable that only the plastic insert will need replacement and in some cases the insert may be turned over to obtain additional life.

4.104 **Ribbons** which are worn or defective shall be replaced with new ribbons (Bell System #6141 ribbon Black Record Heavy, is recommended).

4.105 **Orientation Range and Distortion Tolerances:** Typing units shall be capable of meeting the teletypewriter station orientation range and distortion tolerance requirements given in P30.002 or P30.003.

## 5. REQUIREMENTS AND PROCEDURES FOR TYPING REPERFORATOR BASES

5.01 **Base unit** shall conform to Section P35.620 except as regards tape-out lever and its spring which shall conform to the following:

(a) **Tape-out lever** shall clear the tape reel wooden filler piece by min.  $7/32''$ , max.  $9/32''$ , when the locking pawl is touching the front face of the bell hammer extension and the play of the bell hammer is taken up in a direction away from the bell.

(1) To adjust, reposition adjusting clamp making sure that the locking pawl bushing has no appreciable end play between the shoulder on the shaft and the adjusting clamp after clamping screw is tightened.

(b) **Tape-out lever spring** shall have a tension of min. 3 ozs., max.  $4-1/4$  ozs., measured at right angle to the front edge of the locking pawl at the pawl spring hole with the locking pawl spring removed and the bell operating post rotated out of the way when the locking pawl just butts against the bell hammer extension. See Fig. 11 Section P35.620 for location of parts.



**BELL SYSTEM PRACTICES**  
Teletypewriter and Manual  
Telegraph Station and P.B.X.  
Installation and Maintenance

**SECTION P35.652**  
Issue 1, November, 1945  
AT&T Co Provisional

## **TYPING REPERFORATOR UNITS AND BASES 14 TYPE**

### **REQUIREMENTS AND PROCEDURES OPERATION AT 100 SPEED**

#### **1. GENERAL**

1.01 This section outlines special apparatus requirements and adjusting procedures for the maintenance of No. 14 typing reperforator units and bases for wpm operation.

1.02 The information contained herein will be included in the standard P sections when it has been fully tested in the field.

1.03 For requirements and procedures not covered herein reference should be made to standard P sections covering No. 14 typing reperforator units and bases.

#### **2. LUBRICATION**

2.01 The following typing reperforator unit and base parts shall be lubricated with oil in addition to those listed in other sections:

##### **Typing Reperforator Units**

- (a) Felt washer on selector cam assembly located between the armature lever cam and stop arm (saturate).
- (b) Felt wick in selector arm spring (saturate).
- (c) Felt wick in locking lever spring (saturate).
- (d) Felt wick in armature lever spring (saturate).

Note: Above felt wicks were not included in early 100 wpm sets of parts.

### **Bases (Sending and Receiving)**

- (e) Felt washers between cams on the transmitting cam sleeve assembly (saturate).

## **3. REQUIREMENTS AND PROCEDURES—TYPING REPERFORATOR UNITS**

3.01 **Main shaft clutch spring (110878M):** A pull of 64 ozs. shall separate the clutch teeth and a pull of 52 ozs. shall not separate the clutch teeth under conditions outlined for measuring the regular spring.

3.02 **Sword separator plate leaf springs,** except on front and rear plates, shall be bent min. .050", max. .060", away from plane of plates.

3.03 **Locking lever spring (2605M)** tension shall be min. 7 ozs., max. 10 ozs., measured in the same manner as the regular spring.

Note: 2605M spring was not furnished in early 100 wpm sets of parts. This spring with a 74553M wick should be used to obtain a more stable locking action.

3.04 **Selector arm stop detent spring (110880M)** shall be min. 6-3/4 ozs., max. 7-3/4 ozs., measured in the same manner as the regular spring.

3.05 **Armature lever spring** tension shall be min. 22 ozs., max. 26 ozs., measured and adjusted as outlined for normal operation.

Note: Early 100 wpm sets of parts did not include a 73611M wick for this spring. The wick should be used to stabilize the spring action.

3.06 **Selector arm spring (114107M)** tension shall be min. 1-3/4 ozs., max. 2-1/4 ozs. measured in the same manner as the regular spring.

Note: 110879M spring was furnished in early 100 wpm sets of parts. This heavier spring which gives a tension between 2-3/4 and 3-1/4 ozs. should be replaced by the later 114107M spring and its 93729M wick to obtain more satisfactory operation.

3.07 **Trip latch spring (110872M)** pressure shall be min. 3 ozs., max. 3-1/2 ozs., measured in the same manner as the regular spring.

3.08 **Selector clutch torque:** A pull of 22 ozs. shall hold the cam sleeve from rotating and a pull of 18 ozs. shall not hold the cam sleeve from rotating under conditions outlined for normal operation.

#### 4. REQUIREMENTS AND PROCEDURES — TYPING REPERFORATOR BASES (SENDING AND RECEIVING)

##### 4.01 Short contact springs:

(a) Sending contact gaps shall be min. .020", max. .025", (with exception of start-stop contact gap which may be min. .015", max. .025") when associated contact levers are on the high part of their cams.

(b) Short contact springs shall require a horizontal pressure of min. 4 ozs., max. 8 ozs., applied directly behind their contacts to move them away from their stiffeners when associated contact levers are on the high part of their cams.

(1) To adjust, bend short contact springs and their stiffeners using the 72003M tool. If this adjustment is made check sending contact pressure as specified in P35.620.

4.02 Lock loop roller shall clear the highest part of its cam by min. .020", max. .060", when lock loop is held against its backstop screw.

(a) To adjust, reposition backstop screw.