

*Hughes*

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# TELETYPE

PRINTING TELEGRAPH SYSTEMS

DESCRIPTION AND ADJUSTMENTS  
OF THE  
TAPE TRANSMITTER



# TELETYPE

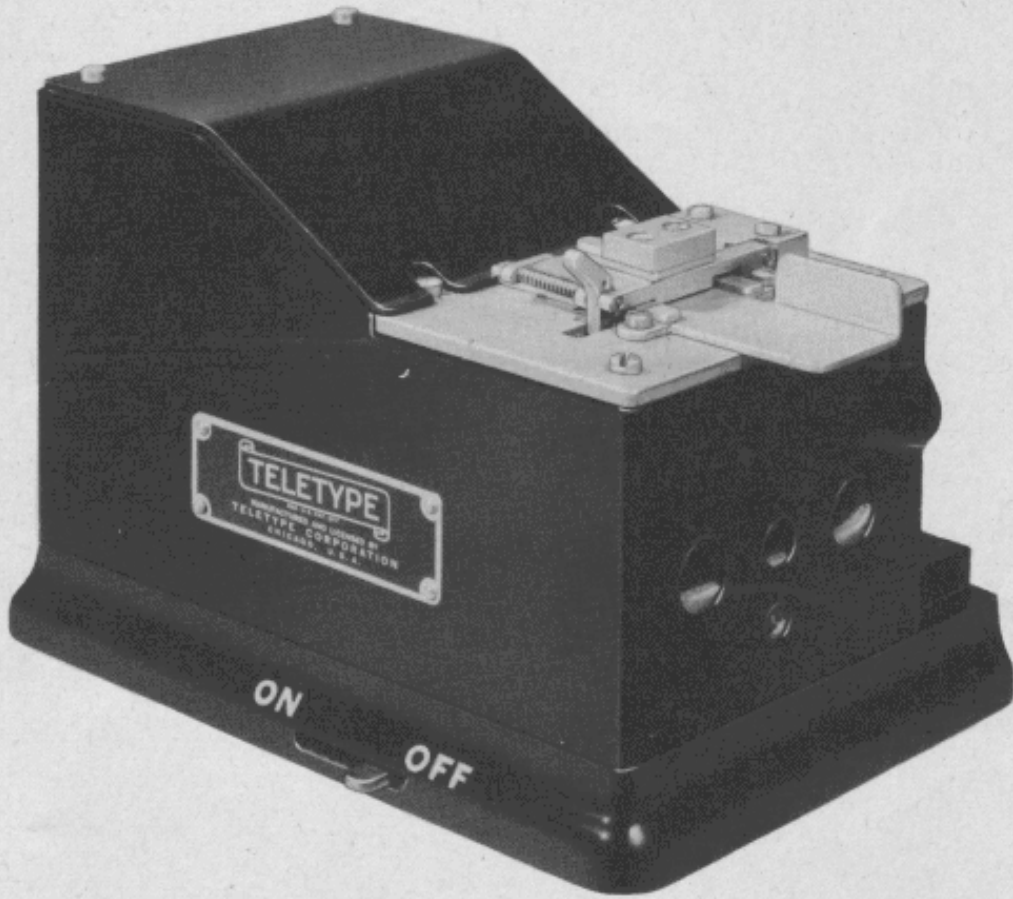
PRINTING TELEGRAPH SYSTEMS

DESCRIPTION AND ADJUSTMENTS  
OF THE  
TAPE TRANSMITTER



THE U.S. PAT. OFF.  
CORPORATION  
SUBSIDIARY OF  
*Western Electric Company*  
CHICAGO, U.S.A.





MND 8

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## DESCRIPTION OF THE TAPE TRANSMITTER

### GENERAL

The tape transmitter is a device used to translate code combinations perforated in a tape, into electrical impulses, and to transmit these impulses to the line.

There are five contact tongues between two sets of contact screws, one set being connected to marking battery, and the other set to spacing battery. In case of "Make-Break" operation, battery is connected to the marking side only. Each contact tongue is mechanically connected to one end of an irregularly shaped lever called contact lever. (See Figure 1). Each contact lever has three extensions and is pivoted on a shaft S.

When a contact lever is in its normal unoperated position, extensions A and C are approximately horizontal. Extension B is normally in a vertical position.

Extension C is curved upward at the end and has a small tape pin projecting vertically upward. The distance between the tape pins corresponds to the lateral spacing of the holes in the perforated tape.

Mounted just below and to the right of extensions B of the contact levers is a pivoted contact lever bail (Figure 1). A magnet is so mounted that when it is energized, it will push a plunger rod against the contact lever bail, moving it to the left, striking the ends of extensions B of the contact levers, thus moving them with it. This movement causes the tape pins in the ends of extensions C, of the contact levers, to be drawn below the surface of the tape guide over which the perforated tape passes. This movement of the contact levers also causes the outer ends of extensions A to move upward. The contact tongues, which are pivotally attached to extensions A will also move upward causing their contacts to be pressed against the upper contact screws.

The contact tongues are so attached to extensions A of the contact levers that after their contacts have touched the upper contact screws, any further travel of the contact lever extensions A will be absorbed by the springs attached to the contact tongues.

To the right of the tape pins is a feed wheel with small pins projecting around its periphery. These feed wheel pins project through an opening in the tape guide and mesh with the smaller holes, called feed holes, in the perforated tape. As the feed wheel is rotated, the tape is caused to move from right to left, over the tops of the tape pins.

### FEED MECHANISM

Pivoted on the shaft S with the five contact levers is a sixth lever, (Figure 2) called the feed lever. When the vertical extension B of the feed lever is moved by the operation of the contact lever bail, the outer end of the horizontal extension C, of the feed lever, moves downward. Attached to the end of extension C of the feed lever, is a feed pawl, which, when moved downward, engages a tooth on a feed wheel ratchet. This feed wheel ratchet is on the same shaft as the feed wheel. Thus, the downward movement of the feed pawl causes the feed wheel to rotate the distance of one tooth on the feed wheel ratchet. Pressing in the hollow between two teeth of the feed wheel ratchet is a detent which insures an even movement of the feed wheel (Figure 2).

The position of the feed pawl is such that when the magnet is operated, the downward movement of the feed lever does not cause the feed pawl to engage with the feed wheel ratchet until the five tape pins have been withdrawn below the tape guide. This insures that the tape shall not feed while the tape pins are projecting through the tape, thus preventing tearing of the tape.



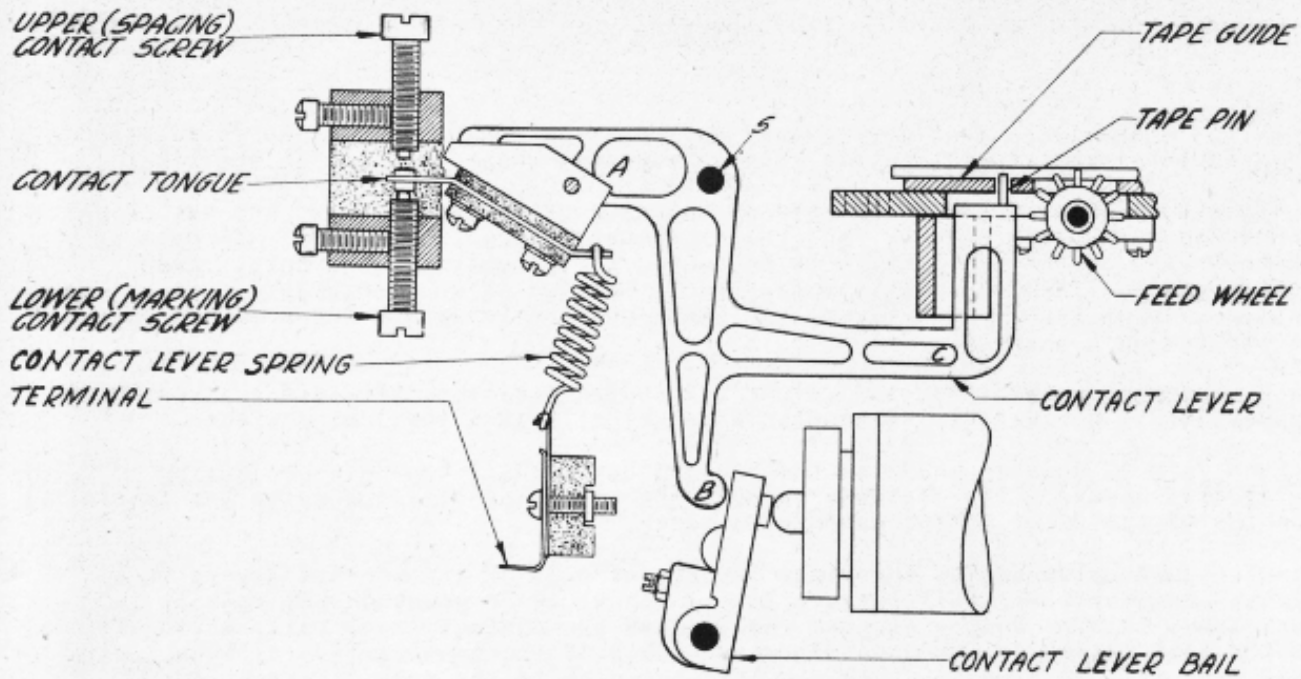


FIGURE 1

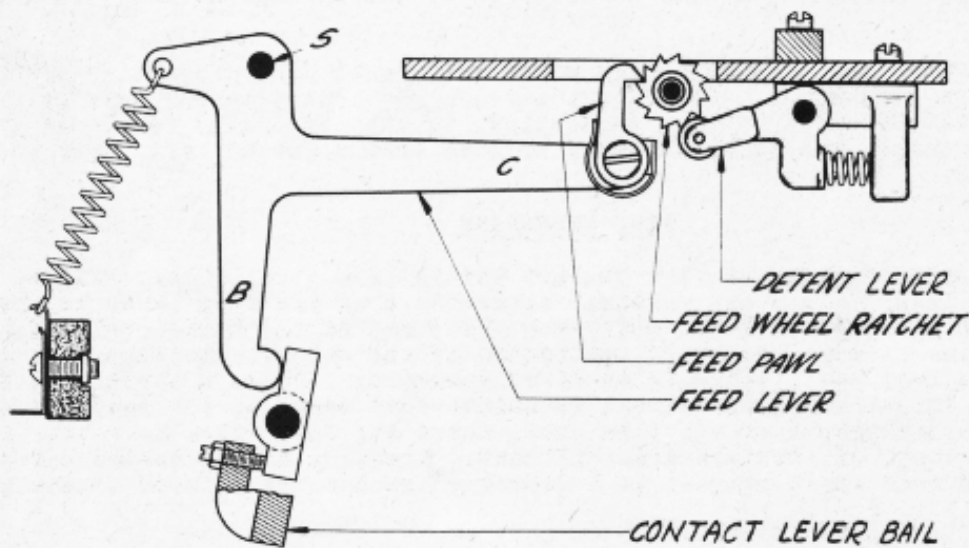


FIGURE 2

SETTING UP THE COMBINATION

When the transmitter magnet is deenergized, the springs attached to the contact tongues exert a downward pull on extensions A of the contact levers. This downward pull causes extensions C of the contact levers to move upward and the tape pins are pressed against the tape (Figure 1).

Where a hole has been perforated in the tape, the corresponding tape pin will project through the hole, thereby allowing additional movement of the contact lever. This additional movement of the contact lever enables the contact tongue attached to extension A of the contact lever to move its contact from the upper or spacing contact screw, to the lower or marking contact screw (Figure 1).

Where there is no hole in the tape, the corresponding tape pin will be blocked and the corresponding contact tongue will remain with its contact against the upper or spacing contact screw.

It is readily seen from the foregoing that where there is a hole in the tape, the corresponding contact tongue is moved down so that its contact is against the lower or marking contact screw and a negative or a marking impulse is sent to the line. Where a tape pin is blocked by the tape, the corresponding contact tongue remains up with its contact resting against the upper or spacing contact screw and a positive or a spacing impulse is sent to the line.

#### TRANSMITTER SWITCH

There is a switch in the base of the transmitter, the operation of which opens or closes the circuit of the transmitter magnets (See Figure 10). If the transmitter is stopped by opening this switch, the tape pins will be in their upper position, and if there is no tape in the transmitter the all-marking or letters signal will be sent to the line continuously. If there is tape in the transmitter when the switch is opened, that combination which is in position above the pins will be sent to the line continuously.

Reviewing the operation of the transmitter:

Assuming that we have the combination which corresponds to the letter "B", we have the following sequence of operations:

The tape for the above combination will have perforations corresponding to the first, fourth and fifth tape pins. The first, fourth and fifth tape pins will pass through these perforations, while the second and third tape pins will be held down by the tape. The contact levers corresponding to the tape pins that have passed through the tape will move their contact tongues downward, making contact with the lower or marking contact screws. The contact levers corresponding to the tape pins which have not passed through the tape will not move, so that their contact tongues will remain up with their contacts against the upper or spacing contact screws.

#### ADJUSTMENTS OF THE TAPE TRANSMITTER

The following adjustments are arranged in a sequence that would be followed if a complete readjustment of the transmitter were undertaken. This fact should be kept in mind when a single adjustment is to be made:

The spring tension values given in this bulletin were derived from measurements made with Teletype spring scales. These scales are calibrated for use in a vertical "pull" position. When used in any other position, the reading is an indicated value. Therefore, in order to obtain the proper spring value readings, the spring scales which are included in the Teletype parts bulletin tool list should be used.

In all the figures of this bulletin, fixed pivot points are designated by solid black circles.

Before adjusting, remove the following parts: front snap panel, back panel, top cover and the top plate.

#### Feed Pawl Spring Tension Adjustment (Figure 3) - See Note (A)

Apply the push end of an 8 oz. scale to the front face of the feed pawl and push in a horizontal direction. It should require 2 to 3 ozs. to hold the feed pawl in a vertical position.

(A) This requirement should be checked with the top plate removed.

NOTE: After making a single adjustment, check related adjustments.



To adjust, loosen the feed pawl mounting screw and rotate the spring clockwise to increase the tension or counterclockwise to decrease the tension. Tighten the mounting screw.

NOTE: There should be at least .025" clearance between the feed pawl spring and the feed wheel ratchet, when the feed pawl is in its normal position.

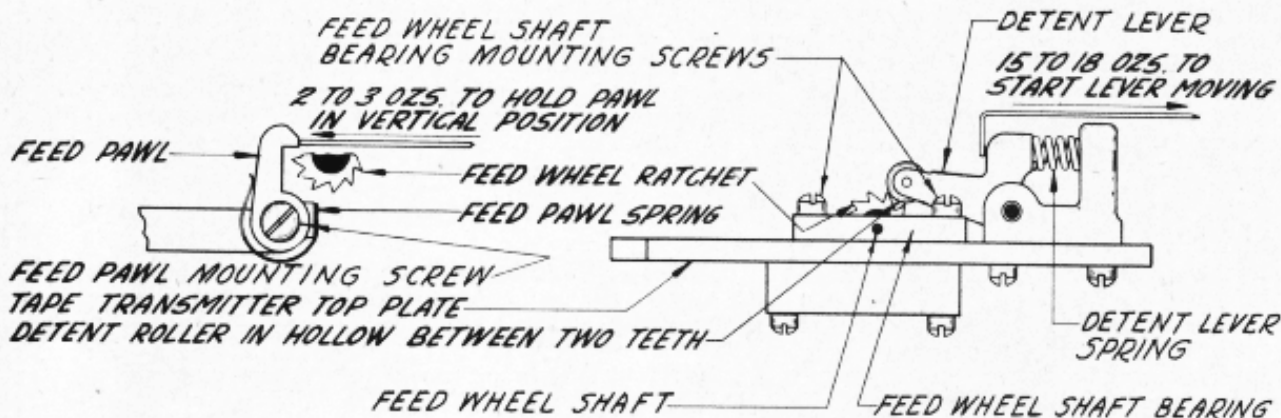


FIGURE 3

FIGURE 4

Plunger Pin Tension

NOTE: This adjustment applies to transmitters equipped with magnet coils having a plunger and spring in each coil.

Apply the push end of a 12 lb. scale, held in a vertical position to the top of the plunger pin. It should require 5 to 6 lbs. to push the plunger pin down even with the surface of the plunger.

Detent Lever Spring Tension (Figure 4) - See Note (A)

Make sure that the detent roller is resting in the hollow between two teeth on the feed wheel ratchet. Hold the tape transmitter top plate upside-down and in a horizontal plane. Hook a 32 oz. scale over the end of the detent lever and pull horizontally against the tension of the spring. It should require 15 to 18 ozs. to start the detent lever moving.

Feed Wheel Shaft End Play Adjustment - See Note (A)

The feed wheel shaft should be free in its bearings without binding and should have some end play, not more than .002".

To adjust, loosen the bearing mounting screws and position the bearings; tighten the mounting screws (Figure 4).

Tape Space (Figure 6)

The space for the passage of tape between the retaining lid plate and the tape guide should be .006" to .008".

To adjust, add or remove shims under the retaining lid plate.

REPLACE THE TOP PLATE. WHEN DOING THIS, SEE THAT THE FEED PAWL IS IN A VERTICAL POSITION.

(A) These requirements should be checked with the top plate removed.

NOTE: After making a single adjustment, check related adjustments.



Tape Guide Position (Figure 5)

Engage a piece of perforated tape that has been checked for the standard spacing of ten holes to the inch with the tape feed wheel. There should be equal clearance between the edges of the tape and the tape guide.

To adjust, loosen the tape guide mounting screws and position the guide; tighten the mounting screws.

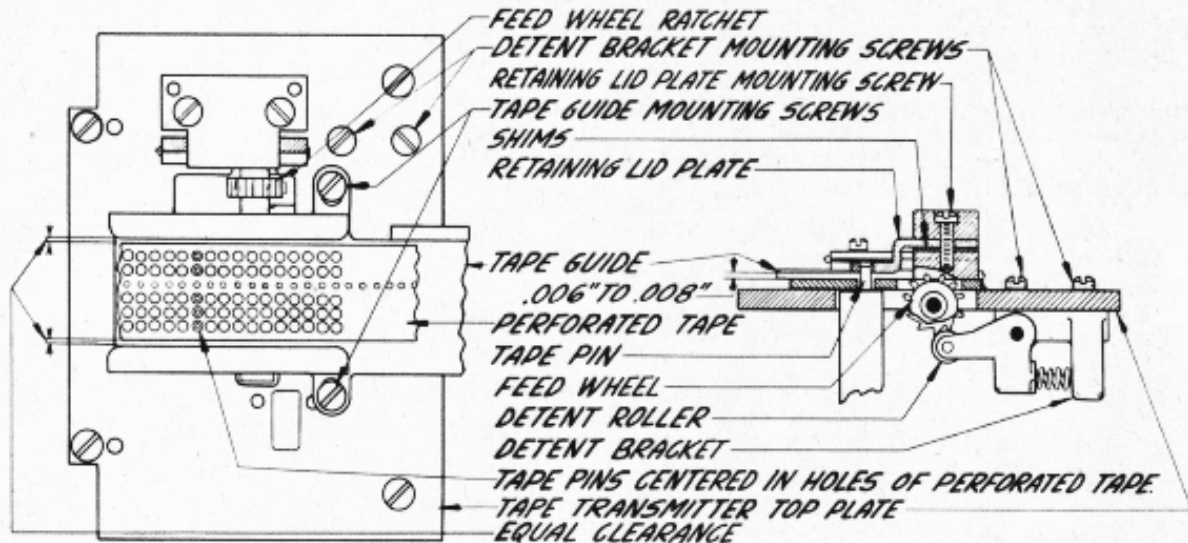


FIGURE 5

FIGURE 6

**NOTE:** LOOSEN THE CONTACT SCREWS SET SCREWS AND BACK OFF ALL CONTACT SCREWS BEFORE MAKING THE FOLLOWING ADJUSTMENTS. THESE ADJUSTMENTS SHOULD BE MADE IN THE ORDER GIVEN AS THEY ARE ALL INTER-RELATED AND A CHANGE IN ONE ADJUSTMENT WILL AFFECT OTHER ADJUSTMENTS. THEREFORE, IF IT BECOMES NECESSARY TO CHANGE ONE ADJUSTMENT, ALL SUCCEEDING ADJUSTMENTS IN THIS GROUP SHOULD BE CHECKED.

Contacts

The contacts should require very little attention since no current is flowing through the contacts at the time when the contact tongues are leaving the contact screws. When the periodic inspection is made, the contacts should be cleaned with a contact burnisher.

Detent Bracket Position (Figures 5 and 6)

When a piece of tape perforated with the "letters" combination is engaged by the feed wheel pins, the tape pins should be in the centers of the code perforations in the tape.

To adjust, loosen the detent bracket mounting screws and position the detent bracket; tighten the mounting screws.

**NOTE:** After making a single adjustment, check related adjustments.

Retaining Lid Plate Adjustment (Figure 6)

With the retaining lid plate latched, the tape pins should be centrally located with respect to the holes in the retaining plate.

To adjust, loosen the retaining lid plate mounting screws and position the plate; tighten the mounting screws.

Feed Pawl Adjustment (Figure 7)

When the magnet yoke is slowly operated by hand, the feed pawl should engage the first tooth above the center of the feed wheel ratchet at the instant that the tape pins are flush with the top surface of the tape guide.

To make this adjustment, first loosen the feed lever adjusting screw lock nut, then press the magnet yoke in slowly by hand until the feed pawl just engages the ratchet. Position the adjusting screw so that the above requirement is met; tighten the lock nut.

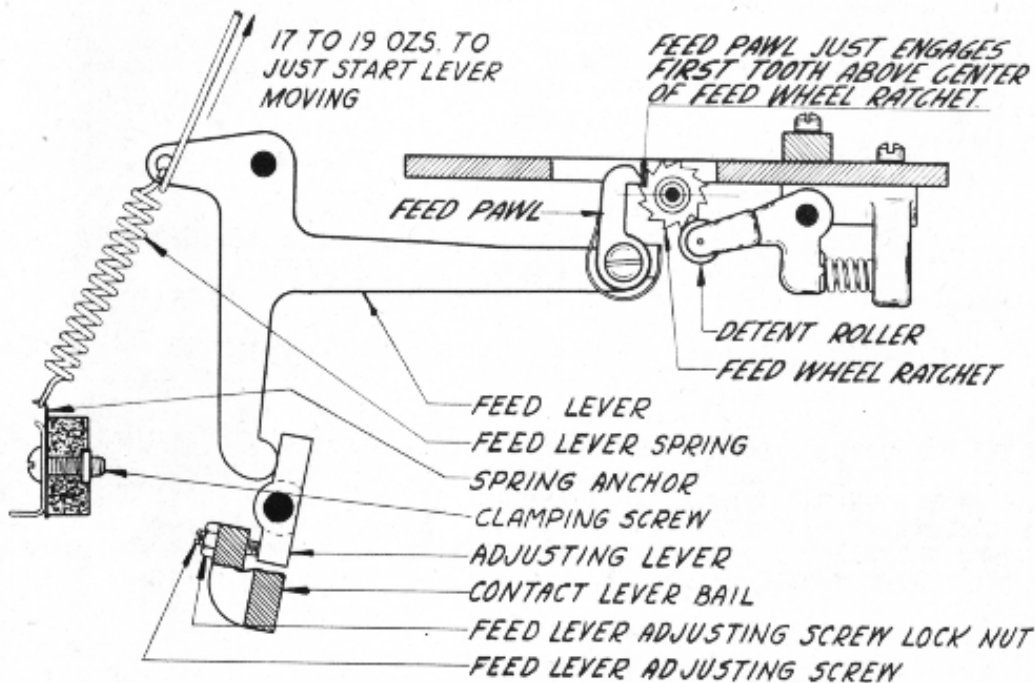


FIGURE 7

Magnet Plunger Rod Adjustment

Move the magnet yoke slowly by hand until it reaches the end of its travel.

The travel of the magnet plunger rod should be sufficient to cause the feed pawl to rotate the ratchet far enough to carry the ratchet tooth beyond the center of the detent roller, thus finishing the stepping of the feed wheel.

To adjust, loosen the magnet plunger rod lock nut and position the rod; tighten the lock nut. (See Figure 9 for location of parts).

Backstop Buffer Adjustment

The feed pawl should just fail to engage any second tooth above the horizontal center of the ratchet when the magnet yoke is operated by hand.

NOTE: After making a single adjustment, check related adjustments.



To adjust, loosen the backstop buffer lock nut and back off the buffer until the feed pawl just engages the second tooth above the horizontal center of the ratchet. Then turn the buffer in one complete turn and tighten the lock nut. Operate the transmitter by hand several times. (See Figure 9 for location of parts).

NOTE: As the relation between the tape pins and the feed pawl has previously been determined, the height to which the feed pawl is set will also determine the amount the tape pins will project through the tape. It is, therefore, important that the feed pawl be set as high as possible without engaging the second tooth.

Contact Tongues Alignment (Figure 8)

The surfaces of the contacts should be parallel to each other.

Adjust by bending the contact tongues.

NOTE: After the tongues have been straightened, they should not be staggered more than .030". This staggering may be corrected by bending the contact tongues, taking care to keep the contact surfaces parallel.

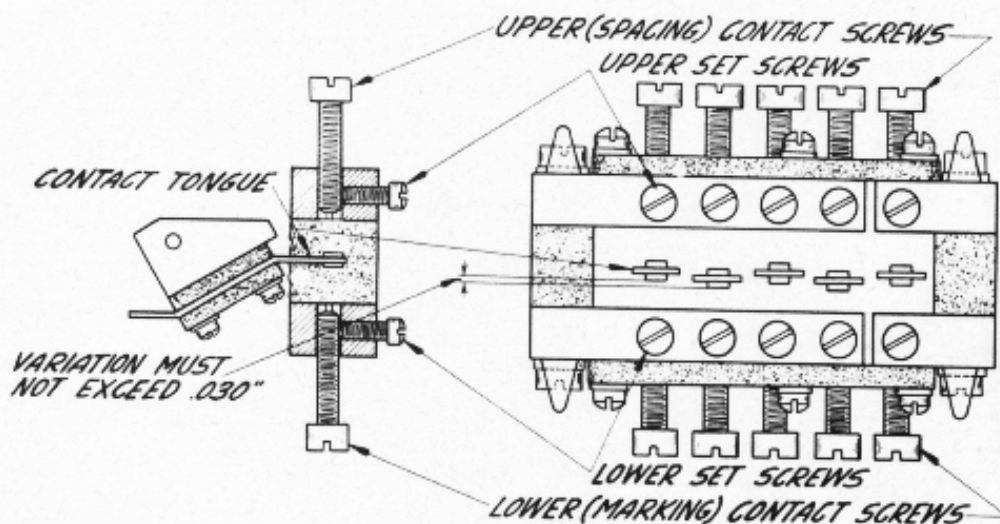


FIGURE 8

Lower Contact Screw Adjustment (Figure 9)

NOTE: In order to check this adjustment, it will be necessary to remake it.

With the contact screws set screws loosened, turn up the lower contact screws until they just touch their respective contacts. When this point is determined, advance the contact screws one full turn and tighten the set screws. Then, operating the transmitter by hand, all five contact tongues should leave their lower contacts at the same time. If necessary, refine the adjustment of the lower contact screws.

When all five lower contact screws have been adjusted, there should be approximately .020" clearance between the contact levers and the contact levers bail. If the contact levers touch the bail, the contact tongues cannot be making good contact with the lower contact screws. This clearance can be measured by pressing the magnet yoke in slowly and noting the point where the tape pins just start to move downward. There should then be approximately .020" clearance between the backstop buffer and the buffer bracket.

NOTE: After making a single adjustment, check related adjustments.



Upper Contact Screw Adjustment (Figure 9)

There should be .008" clearance between the upper contact screws and their respective contacts.

To adjust, loosen the upper contact screws set screws and position the upper contact screws. Tighten the set screws.

Contact Lever Spring Tension Adjustment (Figure 9)

Hook an 8 oz. scale under the upper horizontal portion of the contact lever, as close as possible to the contact tongue pivotal mounting, and pull vertically upwards. It should require 2 to 2-3/4 ozs. to just break contact. Use a test lamp to determine when the contacts break.

To adjust, loosen the contact lever spring anchor terminal screws and position the anchors; tighten the terminal screws.

NOTE: The contact lever springs vibrate slightly when the transmitter is in operation and unless the ends are well soldered, a poor electrical connection results and signals are mutilated.

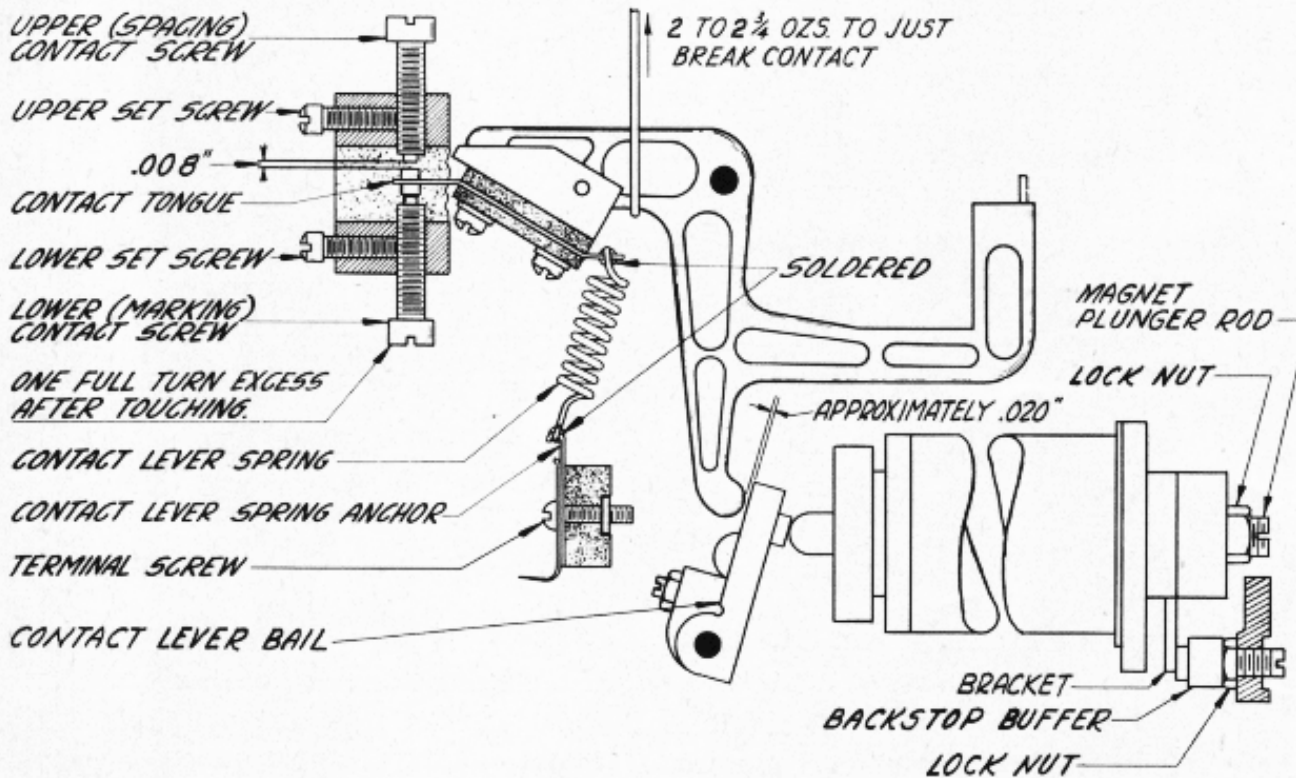


FIGURE 9

Feed Lever Spring Tension Adjustment (Figure 7)

With the feed pawl in its unoperated position, hook a 32 oz. scale under the feed lever at the spring hole, and pull in line with the spring. It should require 17 to 19 ozs. to just start the lever moving.

To adjust, loosen the spring anchor clamping screw and slide the anchor up or down. Tighten the clamping screw.

(REPLACE THE BACK COVER, TOP COVER AND FRONT SNAP PANEL)

NOTE: After making a single adjustment, check related adjustments.



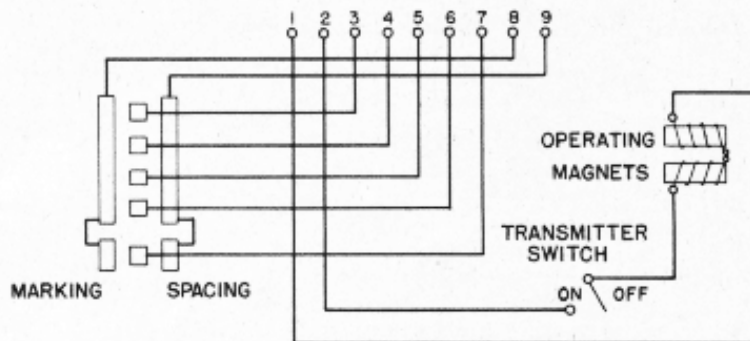


FIGURE 10

LUBRICATION SPECIFICATION

The oil and grease specified in the supplement furnished with this bulletin should be used to lubricate the transmitter.

Unless otherwise specified, one or two drops of oil at each of the places indicated will be sufficient.

1. Oil both loops of all helical springs except the contact lever springs.
2. Contact tongue pivotal mountings - bearings.
3. Contact levers - bearings.
4. Feed pawl - bearing.
5. Feed lever - bearing.
6. Feed wheel shaft - bearings.
7. Detent roller - bearing.
8. Detent lever - bearing.
9. Magnet plunger rod - bushing.
10. Contact lever bail - bearings.
11. Retaining lid - bearings.

NOTE: Excessive use of oil must be avoided, especially on the contact lever bearings and the contact spring pivotal mounting bearings, as the oil would tend to creep to the contacts, causing trouble.

CHANGES IN LUBRICATION SPECIFICATIONS  
WHICH APPLY TO ALL TELETYPE APPARATUS

The following lubricants have been standardized for use on all types of Teletype apparatus. These lubricants supersede those referred to in preceding Teletype specifications. The lubricants can be ordered from Teletype as follows:

88970	1 Qt. of KS-7470 Oil
88971	1 Gal. of KS-7470 Oil
88973	1 Lb. of KS-7471 Grease
* 88975	KS-8319 Grease Gun
* 97116	4-oz. Tube of KS-7471 Grease

The above grease is recommended instead of oil for lubricating motors equipped with ball bearings. The 88975 grease gun should be used for injecting grease into the bearings of Teletype ball bearing motors. The gun may be used also for applying grease to other parts of the apparatus and no other grease container need be carried. If this grease gun is not available, the oil listed in the foregoing should be substituted for lubricating ball bearing motors.

\* Instructions for Filling the Grease Gun

1. Unscrew the lubricant tube from the cap casting of the grease gun.
2. Insert fresh lubricant through the open end of the tube with the fingers. Apply gradually to eliminate air pockets.
3. Tamp the lubricant down solidly in the tube by pounding the closed end solidly against the palm of the hand. Continue to add lubricant until the tube is completely filled and the metal follower rests against the perforated tube cover.
4. Fill the cap casting with lubricant flush to the bottom side of the tube threads.
5. Screw the lubricant tube into the cap casting part way only. Then insert a pencil or rod through the perforated tube cover and exert pressure against the metal follower so as to expel any entrapped air past the tube threads. When lubricant begins to ooze through the threads, tighten the lubricant tube securely in the cap casting.
6. Operate the handle back and forth for several strokes or until lubricant is pumped from the nozzle. The gun is then ready for use. If the lubricant does not flow from the nozzle in a solid stream, it is an indication that all air has not been expelled from the lubricant tube. Invert the gun and pound the cap casting end against the palm of the hand to jar the lubricant into the pump cylinder.

\* Instructions for Lubricating Motor Ball Bearings

The motor bearings are packed with grease before the motor leaves the factory and under ordinary operating conditions need no additional lubrication for



approximately two months. At the regular lubricating intervals one or two strokes of the plunger of the gun should apply sufficient grease to each bearing. To lubricate, press the nozzle of the gun against the ball oiler and force the grease into the hole by pushing on the plunger of the gun. Care should be taken that the bearings are not overloaded. Overloading will result in the grease oozing out of the end castings and being forced into the motor or being thrown on other parts of the mechanism. After lubricating, the motor should be run for a few minutes and then any excess grease that has been forced out of the ends of the castings should be wiped off. Each time that the gun is used for lubricating a motor bearing, the plunger should first be depressed slightly to make sure that grease will be delivered.

ADJUSTMENTS FOR THE TAPE TRANSMITTER (X-13)  
DESIGNED TO USE CHADLESS TAPE  
(To be used in conjunction with Bulletin 103, Issue 2)

Page 3

Feed Pawl Spring Tension Adjustment (Figure 3)

Change the spring tension values in the text and in Figure 3 to read 1 to 2 ozs. instead of 2 to 3 ozs.

Page 4

Tape Space (Figure 6)

Change values in text and Figure 6 to read .012" to .014" instead of .006" to .008".

Page 5

Detent Bracket Position (Figures 5 and 6)

Add the following to the first sentence: "when the tape retaining lid is latched over the tape."

Page 6

Insert the following adjustment after "Feed Pawl Adjustment."

Feed Lever Upstop Adjustment

With the magnet plunger in the unoperated position and the detent roller resting in an indent between two ratchet teeth, there should be .030" to .050" clearance between the face of the feed pawl and the face of the first tooth above the horizontal center line of the feed wheel ratchet. To adjust, position the feed lever upstop (located above the right-hand end of the feed lever) by means of its mounting screw. Tighten the mounting screw.

Magnet Plunger Rod Adjustment

Change the second sentence to read as follows: "With the detent roller in the indent between two teeth of the ratchet, there should be .010" to .020" clearance between the face of a tooth on the ratchet wheel and the face of the feed pawl. Check this clearance throughout a revolution of the ratchet.

Backstop Buffer Adjustment

Omit entire adjustment.



Page 7

Lower Contact Screw Adjustment (Figure 9)

Omit entire adjustment text and substitute the following: "With the magnet plunger in the unoperated position, place a straightedge across the top of the tape guide directly over the pins. There should be a clearance of .020" to .025" between the bottom of the straightedge and the top of each tape pin. The contact lever bail must not restrict the upward motion of the contact lever when this measurement is being made.

To adjust, loosen the set screws of the upper and lower contact screws and back off the upper contact screws. Then adjust the lower contact screws to meet the requirement. Tighten the lower contact screw set screws.

Insert the following adjustment after "Lower Contact Screw Adjustment (Figure 9)."

Backstop Buffer Adjustment

With the magnet plunger resting against its backstop buffer there should be .005" to .015" clearance between the contact lever bail and the lobe of the contact lever having the least clearance. To adjust, loosen the backstop buffer lock nut and adjust the buffer. Tighten the lock nut.

\* \* \*

CHANGES AND ADDITIONS  
TO BULLETIN 108 (ISSUE 2)  
DESCRIPTION AND ADJUSTMENTS  
OF THE FIVE UNIT TAPE PERFORATOR  
AND  
BULLETIN 167 (ISSUE 1)  
DESCRIPTION AND ADJUSTMENTS  
TAPE PERFORATOR (FIVE UNIT)

PAGE 5, Bulletin 108  
PAGE 5, Bulletin 167

LOOP STOP SHIMS ADJUSTMENT

Add the following to the first sentence in this adjustment:

"----- except in the case of the power loop."

PAGE 9, Bulletin 108  
PAGE 7, Bulletin 167

PUNCH MAGNET CONTACT SCREW ADJUSTMENT

Add the following additional requirement to this adjustment:

"When the LETTERS keylever is fully depressed, there should be at least .002" clearance between the power loop and the loop stop."

\* \* \*