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.

(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.

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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, screwdriver 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:

(a) Loops—bearings.
(b) Loops—surfaces which engage with key lever combs—oil sparingly.
(c) Key lever shaft—if shaft appears dry apply one drop of oil at four equidistant points.
(d) Indicator gear—bearing and approximately every tenth tooth.
(e) Indicator spring—convolutions.
(f) Idler gear—bearing.
(g) Release rod—bearings.
(h) Release rod bell crank—bearings.
(i) Release rod detent—bearing.
(j) Lamp contact lever—bearing.
(k) Feed roll detent lever—bearing and roller.
(l) Back spacer lever and pawl—bearings—oil sparingly.
(m) Spacer bar loop—bearings.
(n) Spacer bar loop—surface which engages with spacer lever—oil sparingly.
(o) Feed roll—bearings—upper and lower—oil sparingly.
(p) Feed pawl—pivot.
(q) Punches—oil through hole in top of punch block.
(r) Punch hammer bearing—oil through hole in top of punch hammer.
(s) 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.

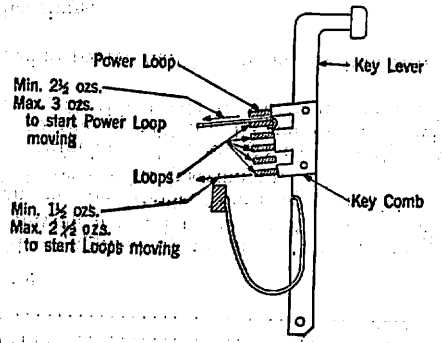

Fig. 1

(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** excepting spacer key lever spring shall measure 1-5/8". The **spacer key lever spring** should measure 2". See Fig. 2.

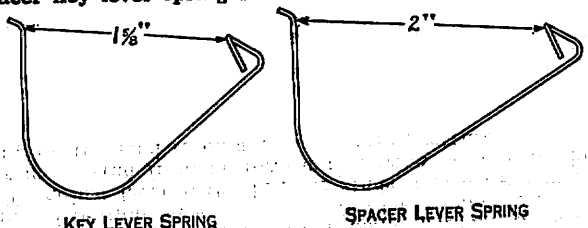

Fig. 2

(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.

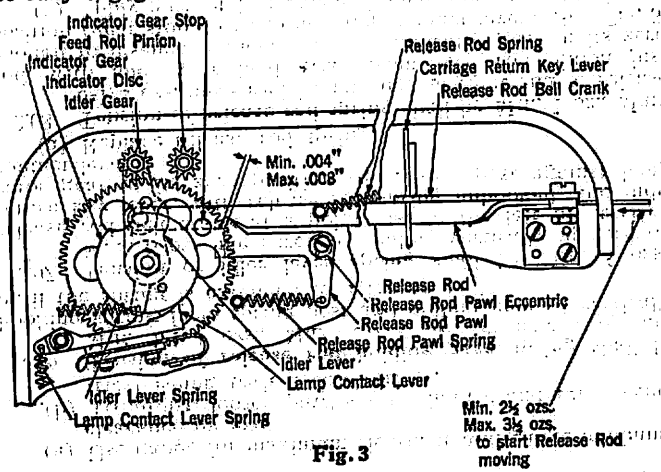

Fig. 3

(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.

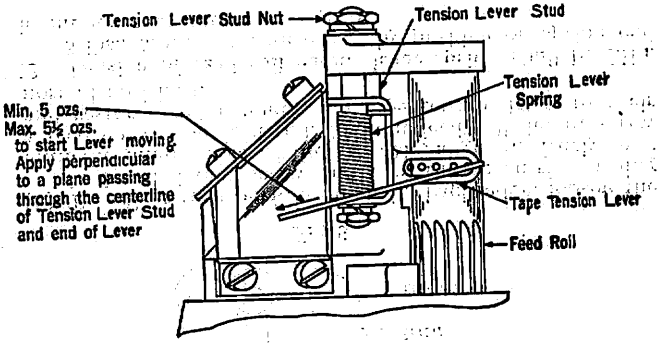

Fig. 4

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.

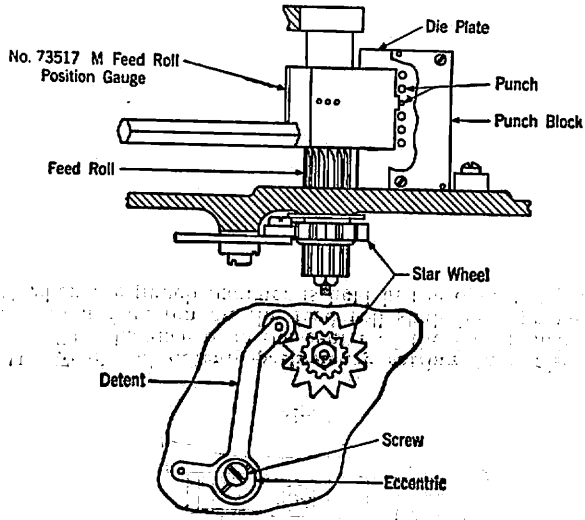

Fig. 5

(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.

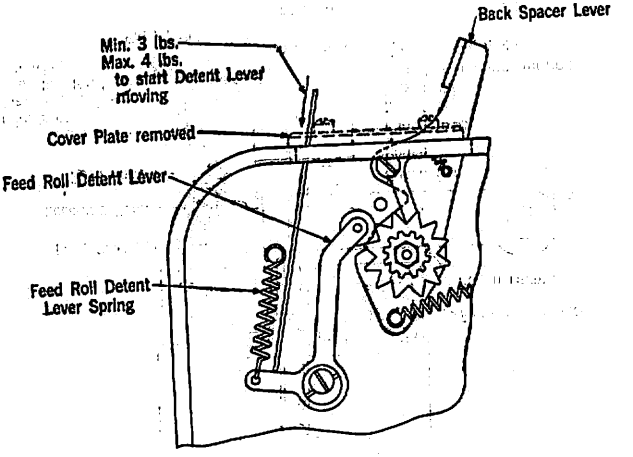

Fig. 6

(a) Remove the cover plate for the back space 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.

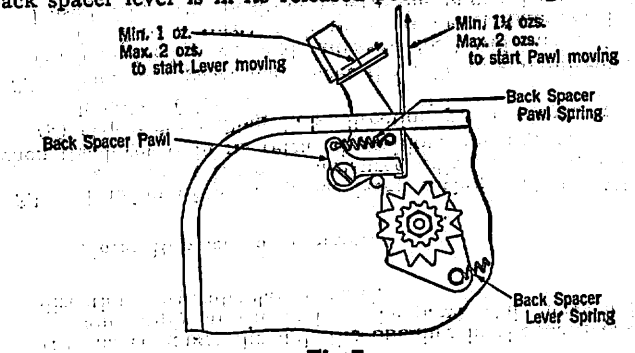

Fig. 7

(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 un-operated 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.

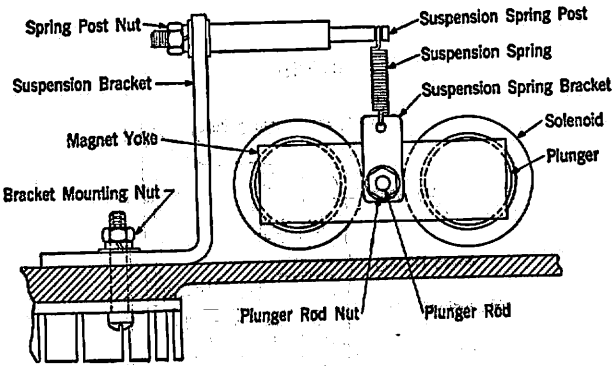

Fig. 9

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 ± .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.

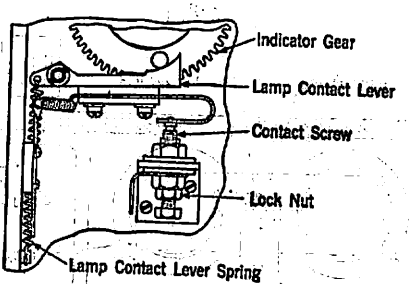

Fig. 10

(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.

(d) 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.