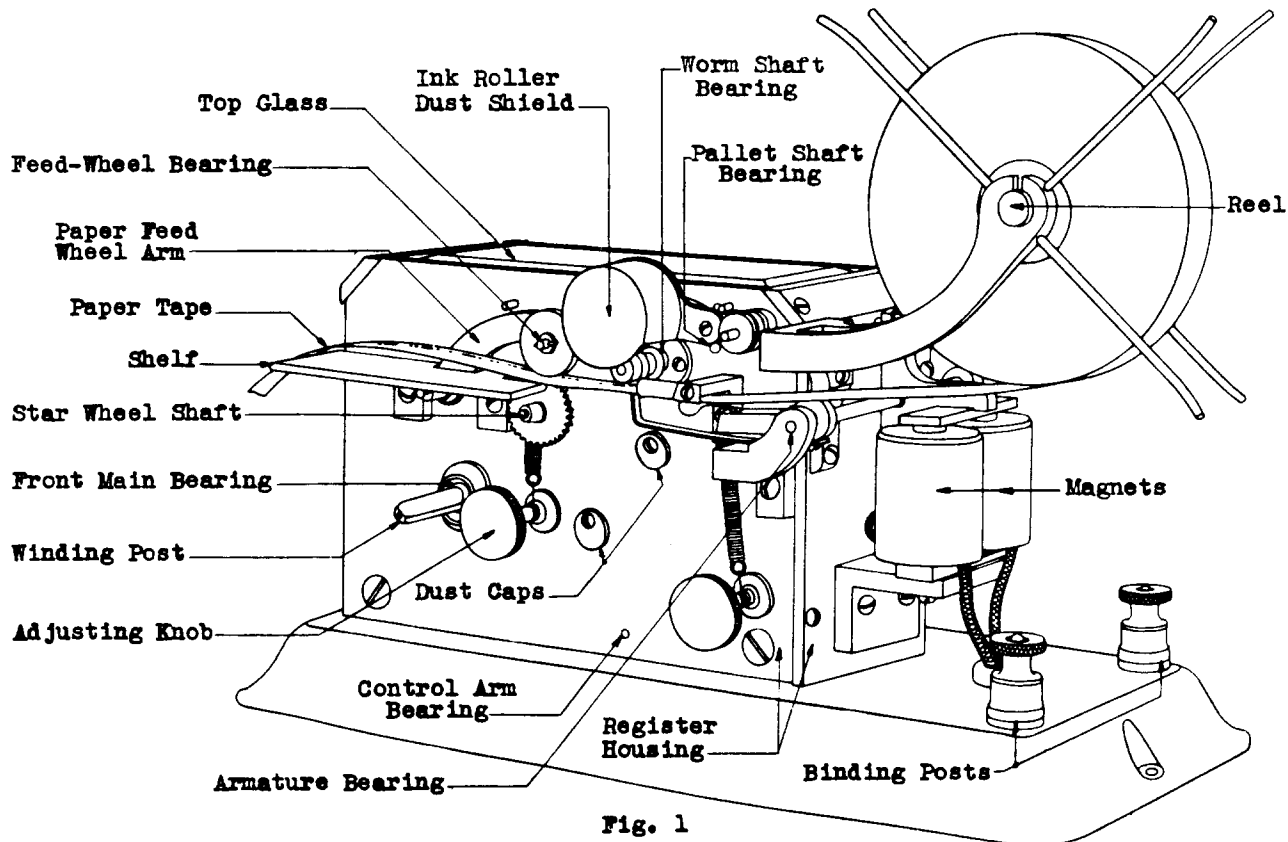


BUNNELL INK WRITING REGISTER (PEN REGISTER) REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

- 1.01 This section covers the Bunnell Ink Writing Register.
- 1.02 Reference shall be made to Section 020-010-711, covering General Requirements and Definitions for additional information necessary for the proper application of the requirements listed herein.
- 1.03 Part 1 "General" and Part 2, "Requirements" form part of the Western Electric Co. Inc. Installation Department Handbook.
- 1.04 One Drop of Oil for the purposes of this section is the amount of oil released from a piece of No. 22 B&S Gauge bare tinned copper wire after it has been dipped 1/2" into the oil and quickly removed.
- 1.05 Operate-Operated Position Operate means that, when the specified Test or Readjust operate current is applied, the armature shall move so that it touches the stop pins or the stop pin nearer the armature. This is also the operated position of the armature.
- 1.06 Unoperated or Normal Position is the position of the armature, when the armature air-gap is within the specified limits, no current is applied to the windings of the magnets and the armature back stop pin is resting against the register housing.
- 1.07 All tests, readjustments and inspections shall be made without removing the glass covers from the registers.



2. REQUIREMENTS

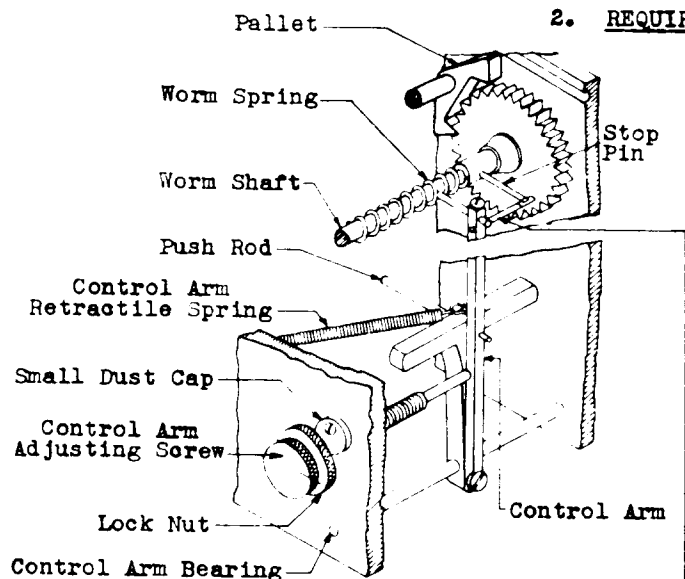


Fig. 2

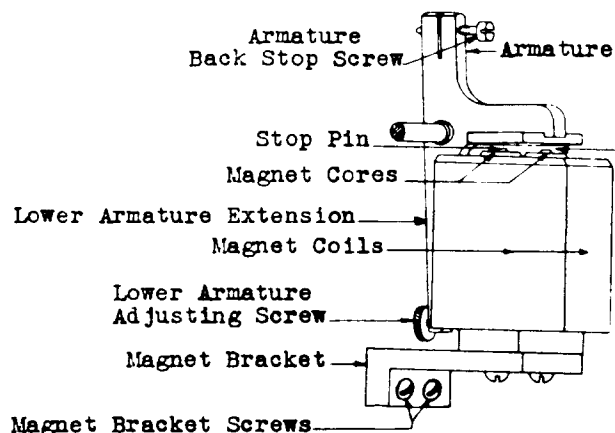


Fig. 3

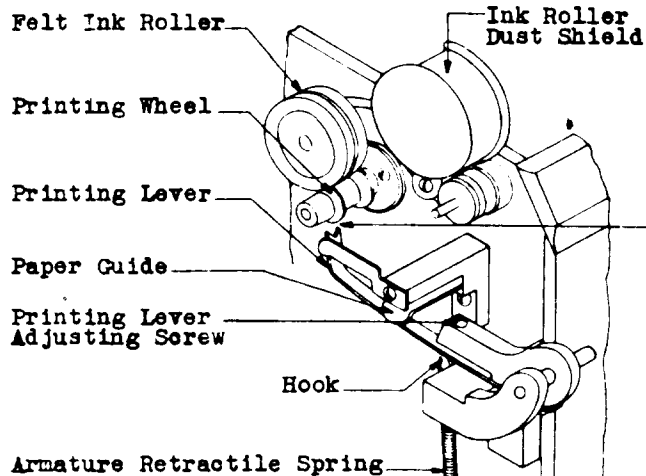


Fig. 4

2.01 Cleaning All parts of the register outside of the motor housing shall be clean and free from oil and dust.

2.02 Lubrication

(a) The bearings shall be adequately lubricated with KS-6232 oil. When lubrication is necessary one drop of oil shall be applied to each of the following points.

- (1) Armature bearings (2).
- (2) External bearings accessible by raising dust caps. (7 small and 1 large).
- (3) Front main bearing (1).
- (4) The control arm bearings (2).
- (5) Star wheel shaft bearings (2).
- (6) Paper feed-wheel bearing (1).
- (7) Worm shaft bearings (2). (One under dust shield).
- (8) Pallet shaft bearings (2).

(b) After turnover it is recommended that the bearings be lubricated at intervals of one year. This interval may be extended if periodic inspections have indicated that local conditions are such as to insure that requirement (a) will be met during the extended interval.

2.03 Record of Lubrication During the period of installation a record shall be kept by date of the lubrications of the bearings and this record shall be turned over to the Telephone Company with the equipment. If no lubrication has been done it shall be so stated.

2.04 Inking Frequent inspections of the marks on the tape should be made and, when necessary, sufficient ink should be applied to permit the printing wheel to make distinct marks on the tape. Use a medicine dropper or a small camel hair brush.

2.05 Control Arm Adjustment The control arm shall be set so that it engages the stop pin on the worm shaft, on the second revolution of the shaft after the armature is released.

2.06 Armature Air-Gap When the armature is in the unoperated position, the air-gap measured between the armature and the stop pins on both cores of the magnets, shall be:

Test - Min. .012", Max. .018"

Readjust - Min. .013", Max. .017"

Use the No. 73-D and 74-D gauges.

2.07 Printing Lever Adjustment

(a) The printing wheel shall not mark the tape when a .007" gauge is placed in the smaller air-gap between the armature and the stop pin and the armature is operated electrically as specified in paragraph 1.05.

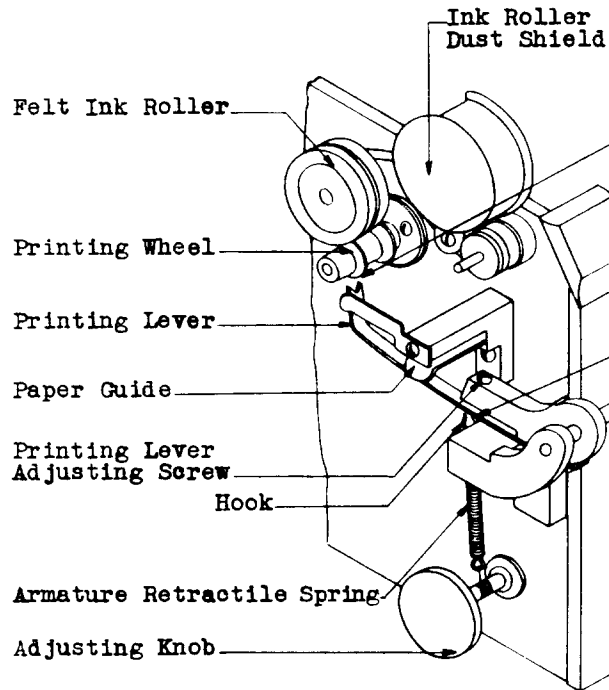


Fig. 5

2.07 (Continued)

(b) The printing wheel shall mark the tape when a .004" gauge is placed in the smaller air-gap between the armature and the stop pin and the armature is operated electrically as specified above. Use the No. 74-D gauge.

2.08 Armature Retractable Spring Tension The tension of the armature retractile spring measured at the hook on the printing lever, shall be:

Test - Min. 200 grams,
Max. 300 grams

Readjust - Min. 225 grams,
Max. 275 grams

Use the 79-B gauge.

2.09 Paper Feed-Wheel Pressure The pressure of the paper feed-wheel against the star wheel, measured at the hook on the paper feed-wheel arm shall be:

Test - Min. 65 grams,
Max. 85 grams

Readjust - Min. 70 grams,
Max. 85 grams

Use the No. 79-C gauge.

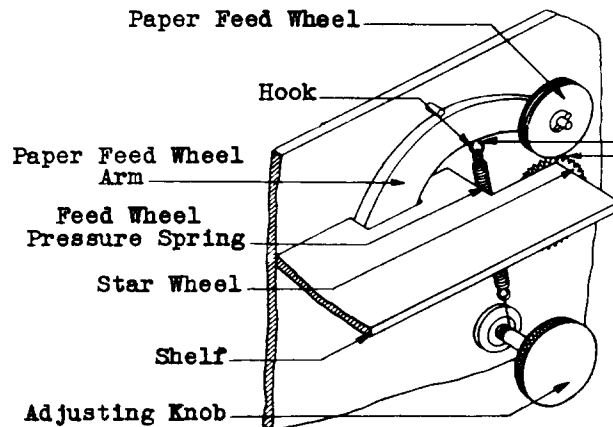


Fig. 6

2.10 Operation With a potential of min. 45 volts, max. 50 volts D.C. applied across a series circuit consisting of the magnet and 200 ohms, non-inductive resistance or a potential of min. 21 volts, max. 25 volts D.C. applied across the windings of the magnets, the register shall be capable of recording dial pulses of the following speeds:

Test - Min. 8 pulses per sec.
Max. 11 pulses per sec.

Readjust - Min. 9-1/2 pulses per sec.
Max. 11-1/2 pulses per sec.

2.11 Speed The mechanism shall be capable of driving the paper tape at a speed of min. 1-1/4" per second, measured as the tape passes between the star wheel and the paper feed-wheel.

Note: Two complete cycles of unwinding and rewinding the register shall be made prior to testing the requirement for speed. After being rewound again, the mechanism shall be capable of driving the paper tape at the speed specified.

3. ADJUSTING PROCEDURES

3.001

TOOLS

<u>Code No.</u>	<u>Description</u>
KS-6854	Screwdriver
-	3-inch Cabinet Screwdriver
-	Ink Dropper (Glass Medicine Dropper) or a small Camel Hair Brush

GAUGES

73-D	.013" - .017" Thickness Gauge
74-D	Thickness Gauge Nest
79-B	0-1000 Gram Push-Pull Tension Gauge
79-C	0-200 Gram Push-Pull Tension Gauge

MATERIALS

KS-2423	Cloth
KS-6232	Oil
-	No. 22 B&S Gauge Bare Tinned Copper Wire
-	Bunnell & Co. Register Ink or Foote Pierson & Co. Register Ink
-	Toothpicks - Hardwood - Flat at one end and pointed at the other.
-	Blotting Paper

3.01 CLEANING (Rq.2.01)

M-1 Clean all external parts of the register with a piece of KS-2423 cloth taking care to remove any oil, dust, lint particles, etc. that have accumulated outside of the motor housing. Do not remove the glass covers or attempt to clean any parts inside of the housing.

3.02 LUBRICATION (Rq.2.02)

M-1 Turn the register on its side when lubricating the bearings to insure that the oil enters the bearings, and to prevent it from running down the side of the register housing.

M-2 Apply the oil to each of the bearings having no dust caps.

M-3 To lubricate the bearings having small dust caps, loosen the screws holding the small dust caps sufficiently to permit them to be turned aside thereby exposing the ends of the shafts. Use the KS-6854 screwdriver for this purpose. Apply the oil to each bearing, replace the dust caps, and tighten the screws. Wipe off the oil outside of the dust caps with a piece of KS-2423 cloth.

M-4 To oil the rear main bearing, remove one of the screws which holds the large dust cap in place and loosen the other sufficiently to permit the cap to be turned aside. Apply the oil between the shaft and the housing and replace the dust cap.

3.03 RECORD OF LUBRICATION (Rq.2.03)
(No Procedure)3.04 INKING (Rq.2.04)

M-1 To check the marking on the tape, observe the operation of the register under service conditions and note that the printing wheel makes distinct marks on the tape, which do not smudge easily or require an excessive length of time for drying. If the register fails to meet the requirement and there is a question of the register being in the proper adjustment, press upward against the printing lever with a force sufficient to simulate the operating conditions.

M-2 If the ink roller should require more ink, raise the ink roller dust shield and, with an ink dropper or a small camel hair brush, apply J. H. Bunnell & Co. or Foote-Pierson & Co. register ink until the printing wheel will make a distinct mark on the tape. Then replace the ink roller dust shield.

M-3 If too much ink should be applied, remove the paper tape, raise the ink roller dust shield, operate the armature manually and, while the roller is rotating, wipe off the excess ink with a piece of blotting paper.

3.05 CONTROL ARM ADJUSTMENT (Rq.2.05)

M-1 To check for the setting of the control arm, operate the armature manually by tapping it quickly. Observe

3.05 (Continued)

the operation of the control arm and note that it intercepts the stop pin on the worm shaft on the second revolution of the shaft after the armature is released.

M-2 To adjust the control arm, place the flat end of a toothpick between the star-wheel and the shelf, loosen the lock nut on the control arm adjusting screw with the fingers and turn the screw in (clockwise) until the control arm begins to move. Then, with one hand, hold the armature operated and with the other turn the control arm adjusting screw out (counter clockwise) until the arm has passed over two turns and is resting between the second and the third turns of the worm spring. Allow the armature to restore to normal and turn the control arm adjusting screw in (clockwise) until the guide just touches the worm spring. Tighten the lock nut as tightly as possible with the fingers and remove the toothpick from the star-wheel when the adjustment is completed.

3.06 ARMATURE AIR-GAP (Rq.2.06)

M-1 When checking the armature air-gap requirement, block the mechanism by inserting a toothpick between the star-wheel and the shelf and then, with the feeler gauges check the clearance between the armature and the stop pins on both cores.

M-2 Turn the armature back stop screw in (clockwise) or out (counter-clockwise) as required to meet the specified requirement. If it is found that the cores are not in the proper position to permit the requirements to be met by this method, it will be necessary to reposition them.

M-3 To reposition the cores, back off the armature back stop screw and place the .017" side of the No. 73-D gauge between the armature and the stop pin nearer the armature. Turn the armature back stop screw to the right until the gauge is held snugly. Then remove the gauge and, with the 3-inch cabinet screwdriver, loosen the magnet bracket screws. Locate both magnets so that the gauge fits snugly between the armature and the stop pin on either magnet core and tighten the magnet bracket screws.

3.07 PRINTING LEVER ADJUSTMENT (Rq.2.07)

M-1 In order to secure the best operation of the register, the ad-

justment of the printing lever should be held within the specified limits. The register should be operated electrically in the actual operating circuit. These adjustments should be made in the following manner.

M-2 Non-Mark Requirement Place the .007" blade of the No. 74-D gauge between the armature and the stop pin nearer the armature and operate the armature electrically. The mechanism should operate, moving the tape, but the printing wheel should not mark the tape.

M-3 If the tape does not move it is an indication that there is too much clearance between the adjusting screw on the lower armature extension and the push rod which actuates the control arm. When this is the case, reduce this clearance by turning the knurled adjusting screw out from the armature extension (counter-clockwise) with a screwdriver until the control arm just releases the mechanism when the armature is operated against the gauge. If it is necessary to change the position of the adjusting screw as specified above, take care to insure that there is still a clearance between the adjusting screw and the push rod when the armature is in its unoperated position.

M-4 If the printing wheel marks the tape on the above test, remove the tape from under the paper feed wheel and the paper guide and with the KS-6854 screwdriver turn the printing lever adjusting screw out (counter-clockwise). Give the adjusting screw only a very slight turn, after which replace the tape and repeat the test. If the printing wheel still marks the tape, repeat the adjustment taking care to prevent moving the printing lever adjusting screw any farther than is absolutely necessary in order to meet the non-mark requirement.

M-5 Mark Requirement Place the .004" blade of the No. 74-D gauge between the armature and the stop pin nearer the armature and again operate the armature as specified in M-1. The mechanism should operate and the printing wheel should produce a distinct mark on the tape. If the printing wheel fails to mark the tape, remove the tape from under the paper feed-wheel and the paper guide and turn the printing lever adjusting screw in (clockwise). As in the first case give the screw only a very slight turn before replacing the tape and again repeating the test. If it is necessary to adjust the printing

3.07 (Continued)

lever in order to meet the "mark" requirement recheck the "non-mark" requirement to insure that the adjustment previously made has not been destroyed.

M-6 After meeting the mark requirement, remove the gauge and with the armature electrically operated, check that there is clearance between the head of the adjusting screw on the lower armature extension and the motor housing.

3.08 ARMATURE RETRACTILE SPRING TENSION (Rq.2.08)

M-1 To check the tension of the armature retractile spring attach the No. 79-B gram gauge to the printing lever at the hook to which the retractile spring is attached, and pull in a direction directly opposing the pull of the spring. The gauge should register at least the specified minimum tension but not more than the specified maximum tension at the instant the printing lever starts to move from its position of rest. Before making any measurements with a No. 79 type gram gauge hold it in the vertical position to obtain the zero reading. This is equal to the weight of the plunger of the gauge. For measuring spring tensions where the gauge is held in the vertical position, the true reading is equal to the indicated reading less the zero reading.

M-2 The tension of the retractile spring may be adjusted by turning the knurled adjusting knob. The spring cord should be wound on this knob in such a manner that turning the knob to the right will increase the tension of the spring and turning the knob to the left will reduce it.

3.09 PAPER FEED-WHEEL PRESSURE (Rq.2.09)

M-1 To check the pressure of the paper feed-wheel against the star wheel, attach the No. 79-C gram gauge to the paper feed-wheel arm at the hook to which the retractile spring is attached and pull in a direction directly opposing the pull of the spring. The gauge should register at least the specified minimum tension but not more than the specified maximum tension at the instant the feed-wheel breaks contact with the driving wheel. Before making any measurements with the gauge, obtain the zero reading in the manner covered in

paragraph M-1 of procedure 3.08.

M-2 The tension of the retractile spring may be adjusted by turning the knurled adjusting knob. The spring cord should be wound on this knob in such a manner that turning the knob in a clockwise direction will increase the tension of the spring and turning it counter-clockwise will reduce it.

3.10 OPERATION (Rq.2.10)

M-1 The register should be checked for operation without removing it from the circuit. When checking this requirement use a dial known to give pulses within the specified limits and where possible use one which approaches the maximum limit rather than the minimum limit. The dial to be used should be checked with a dial tester to determine that it pulses within the specified limits. The test should then be made in the following manner:

M-2 Dial the digit zero. The register should follow the dial pulses, making 10 distinct marks on the tape. Failure to respond properly to the dial pulses will be indicated if the marks are run together in one or more places or if one or more of the marks is faint, noticeably shortened or entirely missing.

M-3 If the marks are run together in one or more places it indicates that the armature is sluggish in restoring, in which case increase the armature retractile spring tension slightly. If, on the other hand, one or more of the marks is faint, shortened or missing it indicates either that the printing lever is improperly adjusted or that the armature retractile spring tension or the armature air-gap are above their maximum limits. To determine whether the printing lever is at fault, recheck its adjustment as specified in procedure 3.07. If the adjustment of the printing lever is correct, reduce the armature retractile spring tension and the armature air-gap slightly toward their minimum values.

M-4 Whenever it is necessary to change the armature retractile spring tension or the armature air-gap in making the above adjustment for operation a recheck of these requirements must be made in order to insure that they are within their specified limits.

3.10 (Continued)

M-5 If a register cannot be made to function properly by adjusting it according to the specified procedures

it is recommended that the matter be referred to a supervisor for further action.