

14-TYPE TRAFFIC AND PLANT REGISTERS REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

1.01 This section covers the requirements and adjusting procedures for the 14-type traffic and plant registers.

1.02 This section is reissued to:

- Redefine "Improved Design" as "MOD 1" and add "MOD 2"
- Add codes 14AD and AE
- Add two new figures, one showing operating pawl of the MOD 2 register and one an overall view of a typical MOD 2 register
- Update 3.001
- Change Fig. 14 and 15 to show revised tool numbers
- Make other changes as required.

Since this is a general revision, arrows ordinarily used to indicate changes have been omitted.

1.03 References 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.

1.04 *Asterisk (*)*: Requirements are marked with an asterisk when to check for them would necessitate dismantling or dismounting of apparatus or would affect the adjustment involved or other adjustments. No check need be made for these requirements unless the apparatus or part is made accessible for other reasons, or its performance indicates that such a check is advisable.

1.05 The 14-type register consists of three configurations. For the purposes of this section, they will be identified as "14-type initial

design," "14-type MOD 1" (identified in previous issues as improved design), and "14-type MOD 2." The basic description and function of the three configurations are as follows.

- (a) The 14-type initial design has a 2-piece flexible pawl which advances the units disc one full step as the register releases (magnet de-energizes).
- (b) The 14-type MOD 1 has a one-piece rigid pawl which advances the units disc one-half step when the register operates and the remaining half step when it releases.
- (c) The 14-type MOD 2 has a new one-piece frame, a new one-piece pawl, and a new armature assembly. The pawl is driven by the armature but is a separate part from it. The units wheel advances one-half step when the register operates and the remaining half step when it releases.

1.06 *Operate*: A register is said to operate if, when current is applied to its winding, the armature moves toward the core until stopped by the operating pawl and normally open contacts close or normally closed contacts open if contacts are provided. The units disc on the MOD 1 and MOD 2 configurations shall advance one-half digit.

1.07 *Nonoperate*: When the nonoperate current is applied, the armature shall not move from its unoperated position.

1.08 *Release*: A register is said to release when the current is reduced from the operate or hold value to the release value and the armature moves away from the core until stopped by the operating pawl. The normally open contacts will open, and the normally closed contacts will close if contacts are provided. The units disc will advance one digit on the initial design model and one-half digit on the MOD 1 and MOD 2.

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1.09 Hold: When the operate current is reduced abruptly to the hold value, the armature shall not move from its operated position.

1.10 To gain access to various parts of the register when checking requirements, it may be necessary to move the register mounting plate forward or to remove the register from the mounting. It also may be necessary to use the 90B cap remover tool.

2. REQUIREMENTS

2.01 Cleaning: Contacts shall be cleaned when necessary in accordance with the section covering cleaning of relays, contacts, and parts. After cleaning contacts, a check shall be made that requirements 2.10 through 2.13 are met.

2.02 Alignment of Number Wheel: Fig. 1, (A)—With the register in the unoperated position, after having been electrically operated and released, the following requirements shall be met.

- (a) The top of any figure on a number wheel shall not lie above the top edge of the window.
- (b) The bottom of any figure on a number wheel shall not lie below the bottom edge of the window.

These requirements are considered met if a satisfactory check is obtained after each of ten consecutive operations of the register.

Gauge by eye through the window.

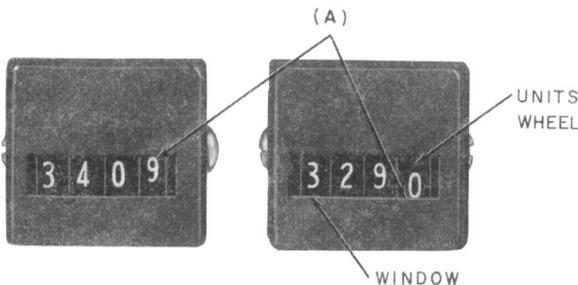


Fig. 1—Alignment of Number Wheels

2.03 Operating Pawl Position

MOD 1 and MOD 2

(a) **Figures 2 and 3:** The top and bottom teeth of the operating pawl shall drop between each pair of star wheel teeth as the register is operated and released ten times.

Gauge by eye.

To check this requirement, electrically operate and release the register. Observe on operation and release that the pawl comes to rest on the surface between the star wheel teeth and also that the units wheel has advanced one-half step on operate and a full step on operate plus release.

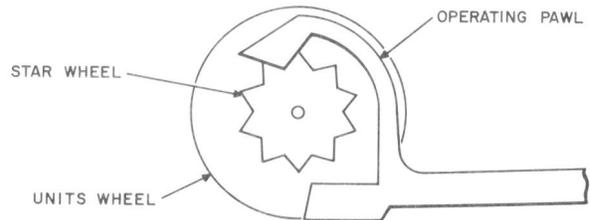


Fig. 2—Operating Pawl in Unoperated Position (MOD 1)

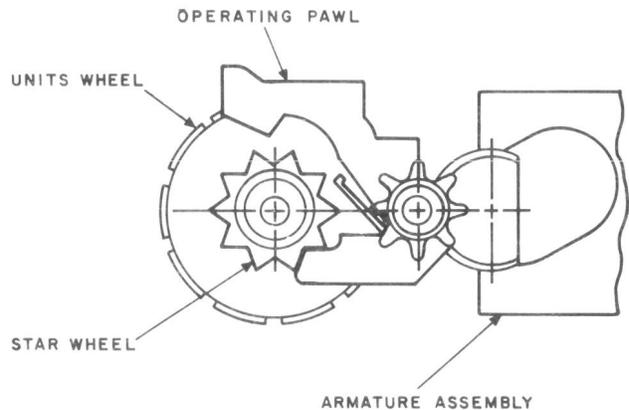


Fig. 3—Operating Pawl in Unoperated Position (MOD 2)

(b) **Figure 4:** With the register in the nonoperate position, the operating pawl shall not project over the side of the star wheel more than 0.015 inch when the endplay in the number discs is taken up to the left and the endplay in the armature is taken up to the right as viewed from the front.

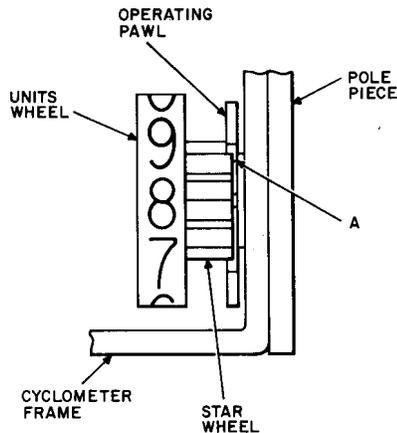


Fig. 4—Alignment of Operating Pawl (MOD 1 and MOD 2)

Initial Design

(a) **Figure 5, (A):** The operating pawl shall drop behind each ratchet tooth as the register is operated and released ten times.

Gauge by eye.

To check this requirement, electrically operate and release the register. Observe on release that the pawl comes to rest on the surface between the ratchet teeth and also that the units wheel has advanced one step.

Note: The pawl may, but need not, rest at the corner of the tooth as shown at (A) in Fig. 5.

(b) **Figure 6, (A):** With the register in the unoperated position and with the play in the number wheels taken up to the left, not more than 1/4 the width of the operating pawl shall extend beyond the right-hand edge of the ratchet teeth. This requirement shall be met on all teeth of the ratchet wheel.

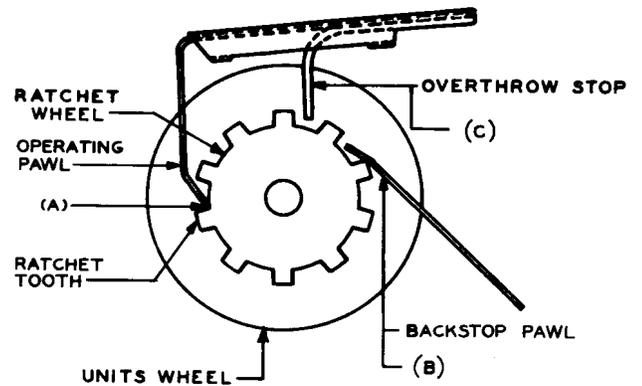


Fig. 5—Backstop Pawl, Operating Pawl, and Overthrow Stop in Unoperated Position of Register (Initial Design)

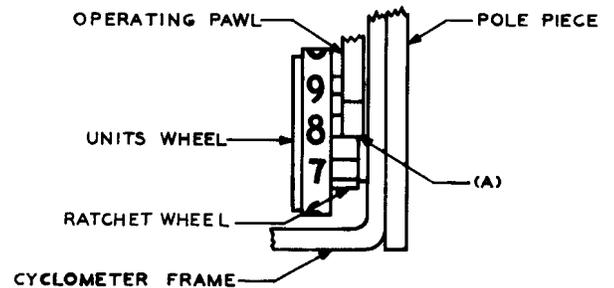


Fig. 6—Alignment of Operating Pawl (Initial Design)

Gauge by eye.

2.04 Backstop Pawl Position (Initial Design Only): Fig. 5, (B)—The backstop pawl shall drop freely between two ratchet teeth after operation and release of the register.

Gauge by eye.

To check this requirement, insert one end of a toothpick above the cyclometer frame crosspiece between the operating pawl and the coil spring. Push the armature toward the core as far as possible. Quickly remove the toothpick, and observe that the units wheel has advanced one step. Reinsert

the toothpick, and slowly push the armature toward the core. Observe that there is a backward movement of the units wheel.

2.05 Overthrow Stop Position (Initial Design Only): Fig. 5, (C)—The overthrow stop shall drop into its position between two ratchet teeth after operation and release of the register and prevent free forward rotation of the units wheel.

Gauge by eye.

To check this requirement, manually attempt to rotate the units wheel in a forward direction after operation and release of the register. Note that it cannot be advanced to the next position.

Check at each ratchet tooth.

***2.06 Freedom of Operation**

(a) The armature shall not bind on its bearings.

Gauge by feel.

(b) The operating pawl (Fig. 7, 8, and 9) shall not touch the cyclometer frame or the side or top of the units wheel either in the operated or unoperated position of the register. This requirement shall be met on every ratchet or star wheel tooth.

Gauge by eye.

(c) **Figure 7, (A):** (Initial Design Only)—The ends of the distance rod shall not bind against the sides of the pole piece.

Gauge by eye and feel.

To check this requirement, hold the armature free of the distance rod with the KS-6320 orange stick. Grasp the center portion of the distance rod with the KS-8511 tweezers, and observe whether the distance rod moves freely from side to side and toward and away from the core.

2.07 Number Wheel Endplay: There shall be at least 0.004-inch endplay between the number wheels and the frame.

Gauge by eye and feel.

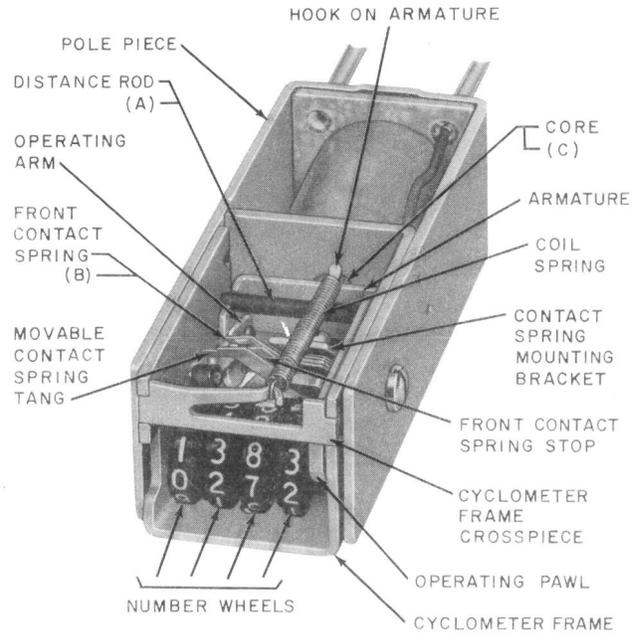


Fig. 7—14-Type Register Having Normally Open Contacts (Initial Design)

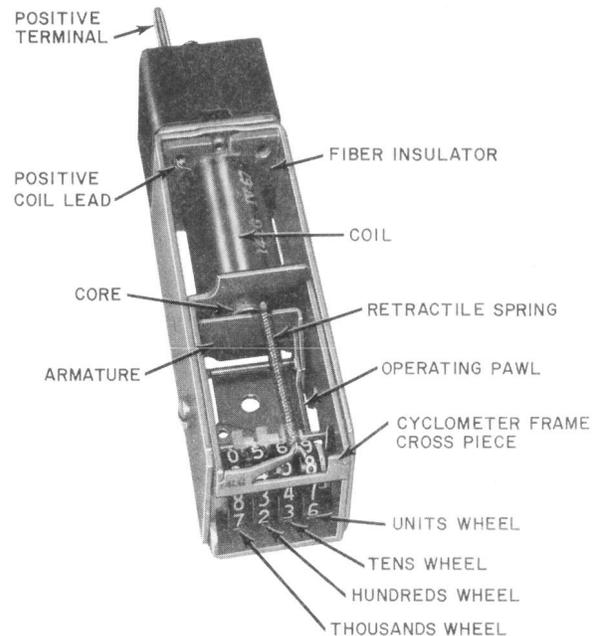


Fig. 8—14-Type Register With Cover Removed (MOD 1, 14LG Register Shown)

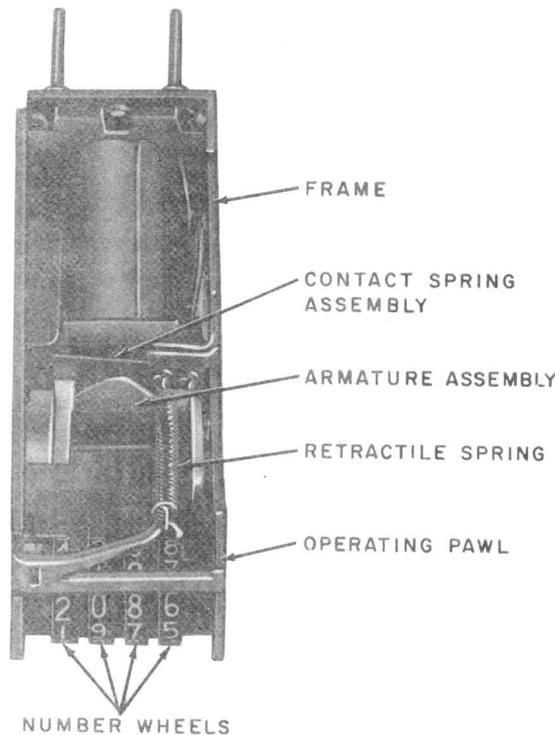


Fig. 9—14-Type Register With Cover Removed (MOD 2)

2.08 Register Mounting and Alignment: Fig. 10, (A)—Register shall be mounted approximately level and shall be fastened securely to the mounting plate.

Gauge by eye and feel.

To check this requirement, apply light pressure to the register in the horizontal and vertical directions. Do not attempt to turn the register.

2.09 Register Cover Assembly Fit: Fig. 10, (B)—The register cover assembly shall be held firmly in position on the register but shall be removable with the 90B cap remover.

Gauge by feel.

2.10 Contact Make (Registers Having Normally Open or Normally Closed Contacts): The contacts shall operate while the tip of the operating pawl is on the top of the ratchet tooth (initial design only). When the armature is fully operated,

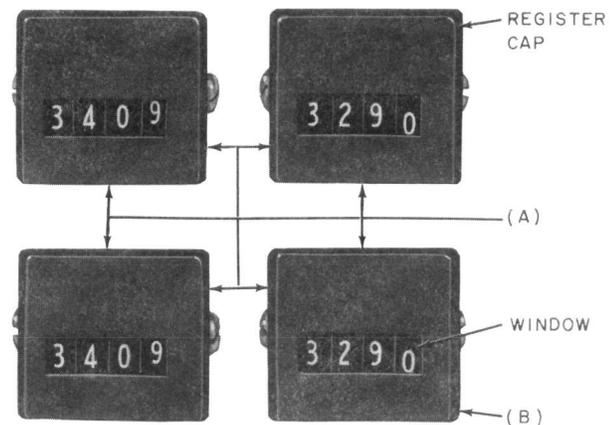


Fig. 10—Register Mounting and Alignment

normally open and normally closed contacts shall close or open, respectively (MOD 1 and MOD 2).

Gauge by eye.

To check this requirement, insert one end of a toothpick above the cyclometer frame crosspiece between the operating pawl and the coil spring. While pushing the armature with the toothpick, brace the hand against adjacent registers in order to accurately control armature movement. Stop moving the armature when the contacts just make or just break, and note the position of the operating pawl with respect to a ratchet tooth or whether the armature has moved to the limit of its travel.

***2.11 Tension of Front Contact Spring** (Registers Having Normally Open Contacts): Fig. 7, (B)—With the armature in the unoperated position, the tension of the front contact spring against its stop shall be

Min 8 grams

Use the 70F gauge applied between the end of the front contact spring and its contact.

2.12 Contact Separation

(a) **Normally Open Contacts:** With the armature in the unoperated position, the separation between contacts shall be

Min 0.010 inch

Gauge by eye.

To check this requirement, raise the outer end of the movable contact spring with a toothpick until the contacts close. Check that the outer end of the spring moves at least 0.010 inch.

(b) **Normally Closed Contacts:** With the armature in the operated position, the separation between contacts shall be

- Max 0.010 inch
- Min 0.005 inch

Gauge by eye.

To check this requirement, electrically operate the register. Raise the outer end of the back contact spring with a toothpick until the contacts close. Check that the outer end of the spring moves at least 0.010 inch.

***2.13 Contact Pressure** (Registers Having Normally Closed Contacts): With the armature on the unoperated position, the contact pressure shall be

- Min 8 grams

Use the 70F gauge.

2.14 Operating Arm Clearance (Registers Having Normally Closed Contacts): With the endplay of the armature taken up to the right, as viewed from the front of the register, there shall be clearance between the back contact spring and the adjacent portion of the operating arm in all positions of the armature.

Gauge by eye.

To check this requirement, insert a toothpick above the cyclometer frame crosspiece adjacent to the operating pawl. Tilt the toothpick so that its inner end passes under the distance rod to the right corner of the armature and its outer end rests on the crosspiece. Using the contact spring

mounting bracket as a fulcrum, move the outer end of the toothpick to the left to take up armature endplay to the right. Then push the toothpick against the armature to operate it and the end of the operating arm.

2.15 Coil Spring Clearance: Fig. 11, (A)—The coil spring shall not touch the register cover assembly.

Gauge by eye.

To check this requirement, place a short straight edge (132Y gauge) across the top of both sides of the pole piece to simulate the inside surface of the cover assembly. Make sure that neither end of the straight edge rests on the adjacent register.

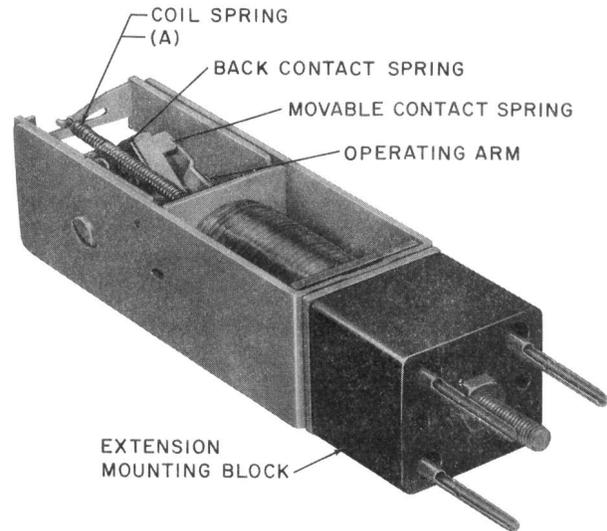


Fig. 11—14-Type Register Having Normally Closed Contacts and Extension Mounting Block for Mounting in Place of 5- and 12-Type Registers

***2.16 Coil Spring Tension:** With the armature in the operated position, the tension of the coil spring shall be as follows:

ARMATURE COIL SPRING TENSION - GRAMS						
MESSAGE REGISTER	INITIAL DESIGN		MOD 1		MOD 2	
	MAX	MIN	MAX	MIN	MAX	MIN
14B		65		65		40
14C		65		100		40
14D	75	55	75	45		40
14E				35		40
14F		65		70		40
14G				70		40
14H				70		40
14J				70		40
14K				70		40
14M				35		40
14P		65		70		40
14R		65		70		40
14S		65		70		40
14T	75	55	90	70		40
14U		55		70		40
14W		65		70		40
14AA		55		70		40
14AD				35		40
14AE						40
14LA		65		65		40
14LB		65		100		40
14LC	75	55	75	45		40
14LD				70		40
14LE				70		40
14LF				70		40
14LG		65		65		40
14LH		65		70		40
14LJ		55		70		40
14LK				35		40
14LL				70		40
14LM		55		40		40
14LN		65		65		40
14LP				70		40
14LR				70		40
14LS				70		40
14LT				70		40
14LU		65		70		40
14LW		65		70		40
14LY		65		70		40

Use the 70J gauge.

To check this requirement, apply the gauge to the hook on the armature to which the coil spring is attached. Move the armature to its operated position with the gauge. Then slowly release the tension,

and measure the coil spring tension just as the armature leaves its operated position. On registers equipped with contact springs, prevent the operating arm from engaging the contact spring tang while measuring coil spring tension. Do this by lifting the contact spring having the tang using the KS-6320

orange stick. To avoid affecting the spring adjustment, do not lift the spring more than necessary.

2.17 Coil Spring Lug Position

(a) **Figure 12, (A):** The front of the coil spring lug shall not extend further than the rear face of the cyclometer frame crosspiece nor backward further than 7/32 inch from the same face.

Gauge by eye.

(b) **Figure 12, (B):** The offset portion of the lug shall be approximately straight except at the outer portion to which the coil spring is attached.

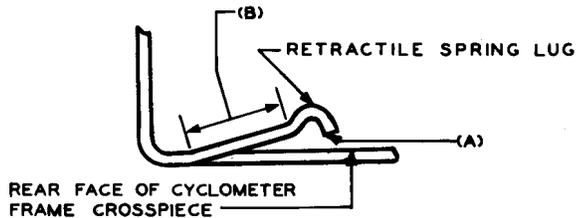


Fig. 12—Coil Spring Lug Position

Gauge by eye.

***2.18 Operated Armature Gap:** Fig. 7, (C)—With the armature in the operated position, the gap between the surface of the armature and the core at the nearest point shall be

Min 0.004 inch

Use the 92P gauge.

To check the operated armature gap, electrically operate the register and insert the 92P (0.003 inch) gauge between the armature and core. The gauge should fit loosely.

2.19 Electrical Requirements: The register shall meet the electrical requirements specified on the circuit requirements table. The requirements specified shall be applied in the following order: Operate, Hold, Release, and Nonoperate. The specified operate current and, if specified, the

release current shall be applied ten consecutive times, and on each cycle of operate and release, the units wheel shall advance one step.

2.20 100 Operation Test (Applies After Turnover Only): The units wheel shall advance 100 consecutive times when the operate value specified on the circuit requirements table is applied with the interruptions furnished by the register testing equipment as provided in the office. This requirement shall be met with the register cap in place.

Note: Where no test equipment is available, it will be satisfactory to substitute for the 100 operate value a sufficient number of times to cause three number wheels to turn. The number of applications shall not be less than ten.

3. ADJUSTING PROCEDURES

3.001 List of Tools, Gauges, Test Apparatus, and Materials

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
46	3/8-inch single-end socket wrench
90B	Cap remover
138	Adjuster
270	Spring adjuster
KS-6015	Pliers
KS-6320	Orange stick
KS-8511	Tweezers
—	3-inch C screwdriver
—	6-1/2 inch B long-nose pliers
GAUGES	
70F	10-0-10 gram gauge
70J	0-150 gram gauge

CODE OR SPEC NO.	DESCRIPTION
GAUGES	
92P	0.003-inch nonmagnetic thickness gauge
132Y	0.062-inch thickness gauge
KS-6909	Gauge nest
TEST APPARATUS	
35 type	Test set
—	Register testing equipment as provided in the office
MATERIALS	
—	Toothpicks, hardwood, flat at one end and pointed at the other

3.002 *Removing Register From Mounting:*

Unsolder the leads, tagging them if the register is equipped with contact springs. Remove the register mounting nut with the 46 wrench or the mounting screws with the 3-inch C screwdriver. In remounting the register, check that requirement 2.08 is met.

3.01 *Cleaning:* (Reqt 2.01)—Clean the contacts in accordance with the section covering cleaning of relay contacts and parts. After cleaning, check that requirements 2.10 through 2.13 are met.

3.02 *Alignment of Number Wheels:* (Reqt 2.02)

3.03 *Operating Pawl Position:* (Reqt 2.03)

3.04 *Backstop Pawl Position:* (Reqt 2.04)

3.05 *Overthrow Stop Position:* (Reqt 2.05)

3.06 *Freedom of Operation:* (Reqt 2.06)

3.07 *Number Wheel Endplay:* (Reqt 2.07)

- (1) If these requirements are not met, replace the register.

3.08 *Register Mounting and Alignment:* (Reqt 2.08)—If the register is not securely fastened to the mounting plate, tighten the mounting nut or screw as required with the 46 wrench or 3-inch C screwdriver. If the register is not satisfactorily aligned, loosen the mounting nut or screws and

shift the register as required. Then tighten the mounting nut or screws securely.

3.09 *Register Cover Assembly Fit:* (Reqt 2.09)—Adjust the lugs at both sides of the cover assembly, as required, with the KS-6015 pliers.

3.10 *Contact Make:* (Reqt 2.10)—Apply the KS-6015 pliers to the overhanging portion of the contact spring mounting bracket, as shown in Fig. 13, and bend the bracket as follows. If the contacts make before the operating pawl tip engages the top surface of a ratchet tooth, bend the bracket slightly upward. If the contacts make after the pawl tip leaves the top surface of a ratchet tooth, bend the bracket slightly downward. Check that requirement 2.19 is met.

3.11 *Tension of Front Contact Spring:* (Reqt 2.11)—To increase the front contact spring tension, apply the 270 spring adjuster as far back on the spring as possible, as shown in Fig. 13, and bend the spring downward toward its stop. Take care not to tilt the spring. Check that requirement 2.19 is met.

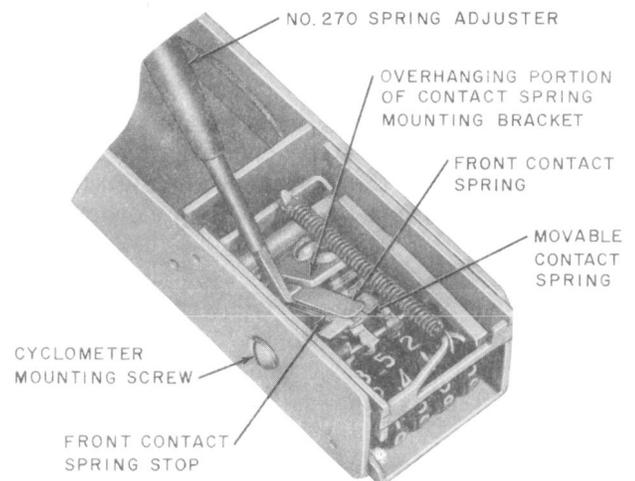


Fig. 13—Method of Adjusting Tension of Front Contact Spring

3.12 *Contact Separation:* (Reqt 2.12)

- (1) ***Normally Open Contacts:*** To increase the contact separation, bend the movable

contact spring downward using the 270 spring adjuster, taking care not to tilt the spring. In order to facilitate meeting the electrical requirements, it is desirable to keep the contact separation below 0.020 inch. Check that requirement 2.19 is met.

(2) **Normally Closed Contacts:** To increase the contact separation, apply the KS-6015 pliers to the overhanging portion of the contact spring mounting bracket and bend the bracket slightly downward. In order to facilitate meeting the electrical requirements, it is desirable to keep the contact separation below 0.020 inch. Check that requirement 2.19 is met.

3.13 Contact Pressure: (Reqt 2.13)—To increase the contact pressure, bend the movable contact spring downward using the 270 spring adjuster. Take care not to tilt the spring. Check that requirement 2.19 is met.

3.14 Operating Arm Clearance: (Reqt 2.14)—If the requirement is not met, apply the KS-6015 pliers to the offset portion of the operating arm and bend the arm away from the back contact spring. Make sure that the arm after adjusting does not touch the cyclometer frame.

3.15 Coil Spring Clearance: (Reqt 2.15)

(1) If the coil spring touches the 132Y gauge and this is due to a defective spring, replace the spring. If the spring seems satisfactory, adjust the coil spring lug slightly downward as required.

(2) To adjust the lug downward, place the B long-nose pliers over the lug and the lower side of the cyclometer frame crosspiece, as shown in Fig. 14, and compress the pliers.

(3) If the lug has been adjusted too far downward, insert the 3-inch C screwdriver between the lug and the cyclometer frame crosspiece and pry the lug upward, as shown in Fig. 15.

3.16 Coil Spring Tension: (Reqt 2.16)

3.17 Coil Spring Lug Position: (Reqt 2.17)

3.18 Operated Armature Gap: (Reqt 2.18)

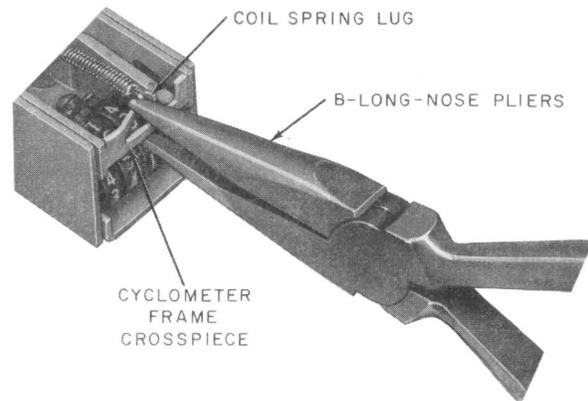


Fig. 14—Method of Adjusting Coil Spring Lug Downward on 14-Type Register

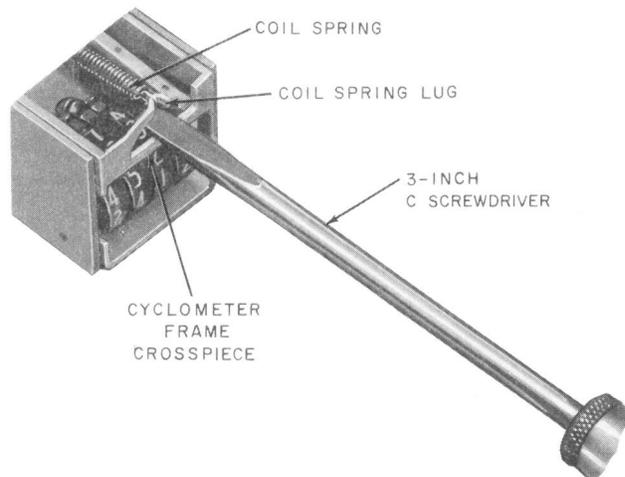


Fig. 15—Method of Adjusting Coil Spring Lug Upward on 14-Type Register

(1) If these requirements are not met, replace the register.

3.19 Electrical Requirements: (Reqt 2.19)

(1) If the register fails to meet the electrical requirements, this may be due to the tension of the coil spring and in the case of registers equipped with contact springs, excessive contact separation may also be a factor. If the register fails to meet the operate or hold requirement, decrease the tension of the coil spring by adjusting

the coil spring lug toward the armature with the 138 adjuster. Apply the adjuster to the middle of the lug, as shown in Fig. 16. If the register is equipped with contact springs, it may be necessary to also decrease the contact separation. In this case reduce the contact separation following procedures similar to those covered in 3.12(1) or (2). If the register fails to meet the release or nonoperate requirement, increase the tension of the coil spring by adjusting the lug toward the rear surface of the cyclometer frame crosspiece. If the electrical requirements still are not met, adjust the operated armature gap as described in (2).

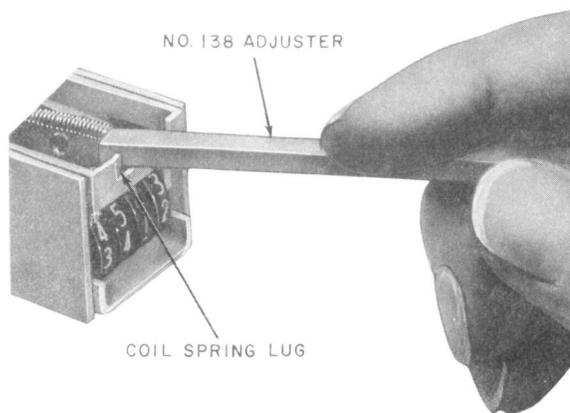


Fig. 16—Method of Adjusting Coil Spring Tension

(2) To adjust the operated armature gap (initial design and MOD 1), use the 3-inch C screwdriver to loosen the cyclometer mounting screws (Fig. 13) just enough so that the cyclometer can be moved either toward or away from the core. Then slide the cyclometer away from the core until all the play in the outward direction is taken up. When adjusting a register, insert the 0.010-inch feeler of the KS-6909 gauge between the armature and core. Place the KS-6320 orange stick over the distance rod, and at the middle of the armature, push the armature against the gauge and core. Hold the armature in this position, and tighten the cyclometer mounting screws. When tightening these screws, take up a little on each screw until both are sufficiently tight to secure the cyclometer in place.

(3) If the electrical requirements still are not met, adjust the coil spring tension as covered in (1). If the requirements still cannot be met, replace the coil spring. If this does not correct the condition, replace the register.

3.20 100 Operation Test: (Reqt 2.20)—If the register meets all other requirements but fails to meet the 100 operation test or substitute test, replace the register.