# 218B RELAYS
# AND ASSOCIATED NO. 26B CONNECTING BLOCK
# REQUIREMENTS AND ADJUSTING PROCEDURES

## 1. GENERAL

1.01 This section covers the No. 218B relay and the associated No. 26B connecting block.

1.02 This section is reissued primarily to delete the requirement for parallelism of contact spring and stop spring and to amplify the electrical requirements. Detailed reasons for reissue will be found at the end of the section.

1.03 Reference shall be made to Section 020-010-711 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 the 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 Operate means that under the specified operating conditions, the armature should make contact with the contact spring sufficiently to cause the associated relays to function.

Caution: Before making any adjustment of the relay, verify that 35 volts ±5 per cent and 135 ±2 cycles are being supplied.

## 2. REQUIREMENTS

2.01 Cleaning: Contacts and other parts of the relay shall be cleaned when necessary in accordance with Section 069-306-801.

2.02 Tightness of Assembly of No. 26B Connecting Block: All springs in a given assembly shall be held in their relative positions to one another and the connecting block frame by being securely fastened at their bases.

Gauge by feel.

*2.03 Spring Position for No. 26B Connecting Block With Two Spring Assemblies: Fig. 1

(a) Contact springs No. 1 and No. 6 shall make contact with springs No. 3 and No. 7, respectively, when the relay is removed from the block.

Gauge by eye.

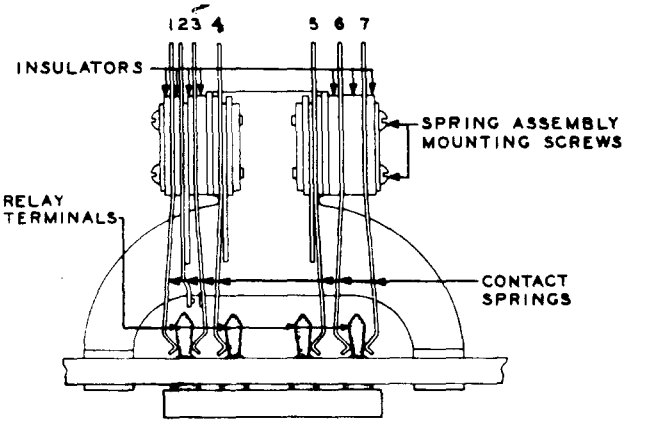


Fig. 1 - No. 26B Connecting Block With Two Spring Assemblies

(b) Contact spring No. 2 shall not make contact with spring No. 3 when the relay is inserted into the block but it shall make before the relay terminals leave the block spring when the relay is withdrawn.

Gauge by eye.

*2.04 Spring Position for No. 26B Connecting Block with Four Spring Assemblies: Fig. 2 (A) - There shall be a clearance between the upper and lower springs in a spring assembly, measured at the parts that make contact with the relay terminals, with the relay removed from the block, but the clearance shall be

Max 1/16 inch

Gauge by eye.

2.05 Relay Mounting: The relay terminals shall be straight and shall be held securely by the associated connecting block.

Gauge by eye and feel.

*2.06 Sponge Rubber Pads: The sponge rubber pads shall be soft and shall support the relay clear of its base.

Gauge by feel and eye.

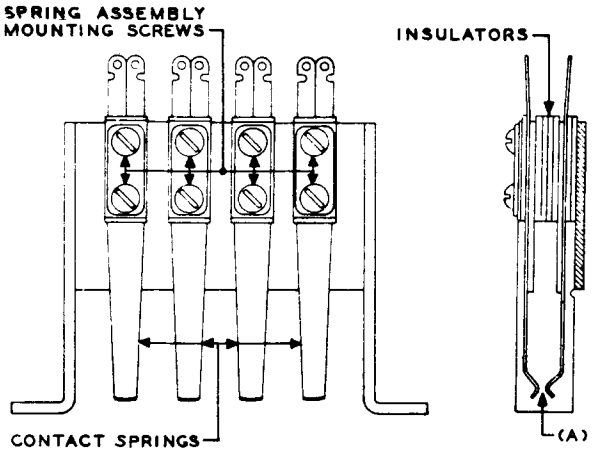


Fig. 2 - No. 26B Connecting Block With Four Spring Assemblies

2.07 Contact Alignment: Fig. 3(A) - Contacts shall line up so that the point of contact falls wholly within the boundary of the opposing contact.

Gauge by eye.

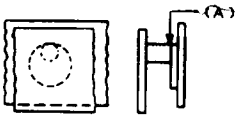


Fig. 3 - Contact Alignment

2.08 Core Airgap: Fig. 4(A)

(a) The airgaps between the armature and each core shall be

Min 0.014 inch
Max 0.020 inch

Use the Nos. 91A and 91B gauges.

(b) The airgaps between the armature and each core shall be approximately equal.

Gauge by eye.

2.09 Backstop Gap: Fig. 4(B) - The gap between the armature and backstop screw shall be

0.004 inch

Gauge by eye.

*2.10 Contact Separation: Fig. 5(A) - The separation between the contact on the

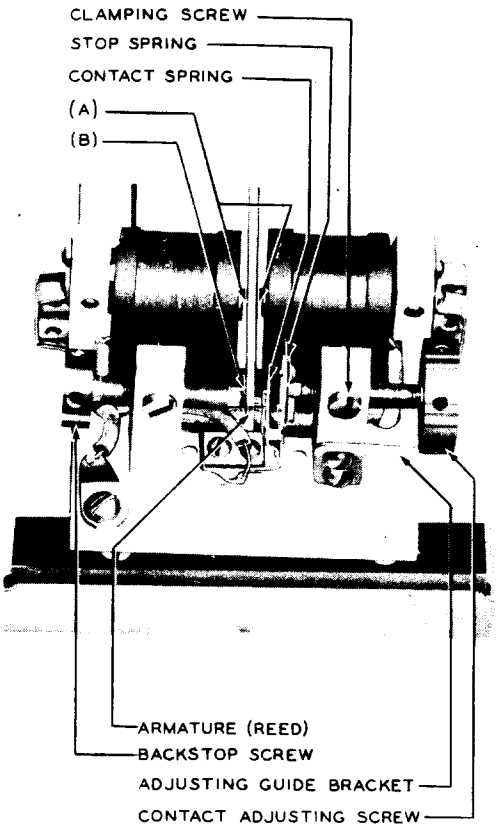


Fig. 4 - Core Airgap

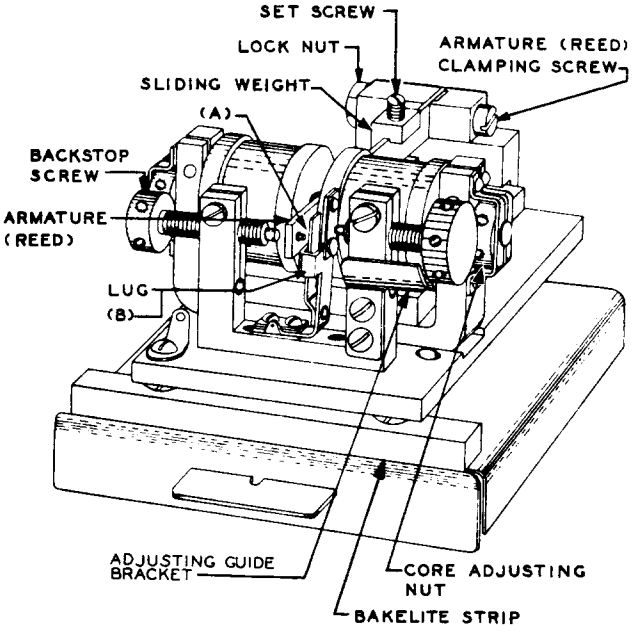


Fig. 5 - Contact Separation

armature and the contact on the spring shall be at least three divisions on the head of the contact adjusting screw. The contact separation shall be considered satisfactory if the contacts do not make before the contact adjusting screw has been turned in three full divisions on the head of the screw. If the separation is checked in this manner and is found satisfactory, the screw shall be turned back three divisions from the point where the contact spring breaks contact with the armature.

2.11 Contact Spring Tension: Fig. 5(B) - The tension of the contact spring against the lug on the stop spring, measured at the top of the contact spring as it leaves the lug shall be

Min 15 grams

Use the No. 70H gauge.

*2.12 Tightness of Clamping Screws: The clamping screws shall be sufficiently tight to hold the contact adjusting and backstop screws, the armature, and the cores in their adjusted position.

Gauge by feel.

2.13 Tightness of Sliding Weight: The setscrew or the armature weight spring shall be sufficiently tight to hold the sliding weight in any adjusted position.

Gauge by feel.

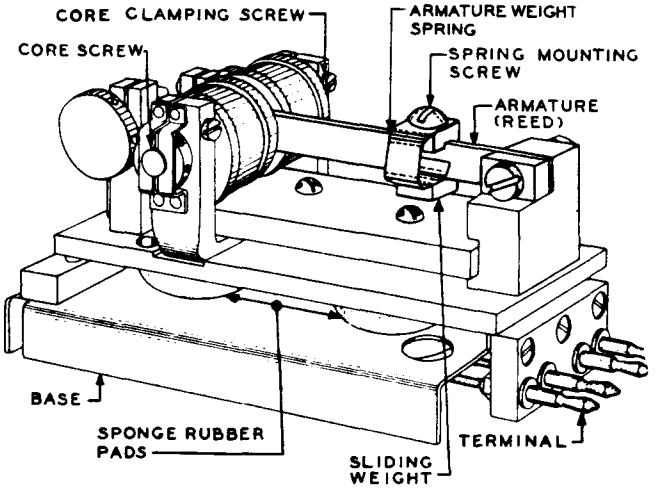


Fig. 6 - Relay Equipped With Armature Weight Spring

2.14 Electrical Requirements

(a) Except as specified in (b), (c), and (d), all relays shall meet the electrical requirements specified on the circuit requirements tables.

(b) When the relay is used in a toll or telegraph circuit in a toll office and an ac voltage test set is used, but ac voltage requirements are not shown in the circuit requirements table, the ac voltage requirements in Table A shall be used.

(c) When the relay is used in a toll or telegraph circuit in a toll office and an ac voltage test set is not available, the relay shall meet the following ac current requirements at 135 cycles.

Test Operate - 0.00025 ampere ac
Readjust Operate - 0.00022 ampere ac

(1) The relay shall be tested and readjusted by means of the standard testing and adjusting circuit if installed; if such a circuit is not installed, the relay shall be tested or readjusted by means of the circuit shown in Fig. 7. The potentiometer arm shall be set so as to give a meter setting of 0.017 ampere for test or 0.015 ampere for readjust. These values are equivalent to 0.00025 ampere for test and 0.00022 ampere for readjust.

(d) When the relay is used in a circuit other than a toll or telegraph circuit, the operation of the relay shall be checked by observing the operation of the circuit in which it is used when 135-cycle current is being received over the line.

(e) The cover of the relay may be either on or off when applying the electrical requirements.

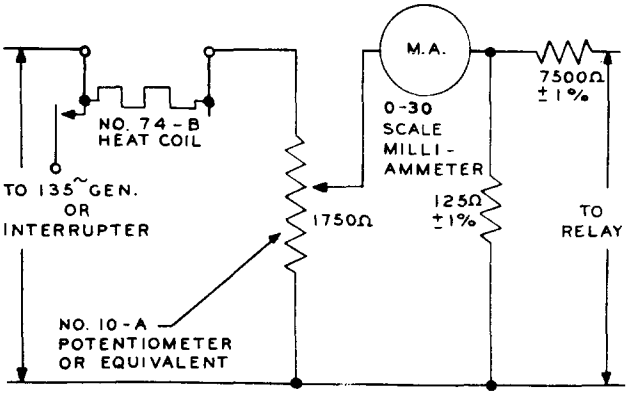


Fig. 7 - Schematic of Relay Test Circuit

Table A - AC Voltage Requirements

| Relay Code | Type of Circuit | Series Connected | Frequency in Cycles | AC Test and Readjust Requirements<br>Meter Settings Volts Across T and R Leads<br>Test Operate | <br><br>Readjust Operate | *Shunt Resistance |
|---|---|---|---|---|---|---|
| 218B | Ringers and Signaling Circuits | Retardation Coil and Capacitors | 135 | **0.45 | ***0.40 | 30 |
| | | | | Volts Across Relay Winding and 7500 Ohms<br>Test Operate | <br>Readjust Operate | |
| | | 7500 Ohms ±1 Per Cent | 135 | 2.05 | 1.8 | 225 |

*These shunts facilitate the testing or readjusting of a group of relays by stabilizing the test circuit output and making it unnecessary to re-establish the test circuit output voltage for each relay. When a test circuit that is not equipped with the resistance specified, is used, the voltage value must be re-established for each relay tested or readjusted.

**When this requirement is not met, remove the relay and readjust it in the relay adjusting circuit, unless otherwise specified, using requirements for "Volts Across Relay Winding and 7500 Ohms."

***This value is for use only when the relay is readjusted in the ringer in which it is used.

## 3. ADJUSTING PROCEDURES

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

| Code or Spec No. | Description |
|---|---|
| **Tools** | |
| 1A | Listening Stick |
| → 45B (or the replaced 45) | 5/16-inch Hex. Socket Wrench |
| 206 | 30-degree Offset Screwdriver |
| 207 | 90-degree Offset Screwdriver |
| 259 | Spring Adjuster |
| 265C (or the replaced 265B) | Contact Burnisher |
| 300 | Spring Adjuster |
| 340 | Adjusting Key |
| 363 | Spring Adjuster |
| 485A | Smooth-jaw Pliers |
| KS-6854 | 3-1/2-inch Screwdriver |
| - | 4-inch Regular Screwdriver |
| - | 3-inch Cabinet Screwdriver |
| **Gauges** | |
| → 70H | 0-30 Gram Gauge |
| 91A | 0.014-inch Nonmagnetic Thickness Gauge |
| 91B | 0.020-inch Nonmagnetic Thickness Gauge |
| **Test Apparatus** | |
| J68602W (or the replaced 523A or 546A Test Panels) | 20- and 135-cycle Ringer Test Panel |
| or | |
| J68602AJ | Portable AC Relay and Signaling Test Set |
| **Materials** | |
| → P-294035 | Spring |
| → P-294036 | Screw |

3.01 Cleaning (Rq 2.01)

(1) Clean the contacts in accordance with Section 069-306-801. Check that the backstop gap, contact separation, and electrical requirements are still met.

3.02 Tightness of Assembly of No. 26B Connecting Block (Rq 2.02)

(1) To tighten loose spring assembly mounting screws, use the No. 206 or No. 207 offset screwdriver.

3.03 Spring Position for No. 26B Connecting Block With Two Spring Assemblies (Rq 2.03)

3.04 Spring Position for No. 26B Connecting Block With Four Spring Assemblies (Rq 2.04)

(1) No. 26B Connecting Block With Two Spring Assemblies: If the contacts do not make when the relay is removed from the block, apply the No. 259 or the No. 300 spring adjuster close to the point where the springs leave the spring assembly insulators as shown in Fig. 8 and then give the spring a slight twist to the left or right, as required.

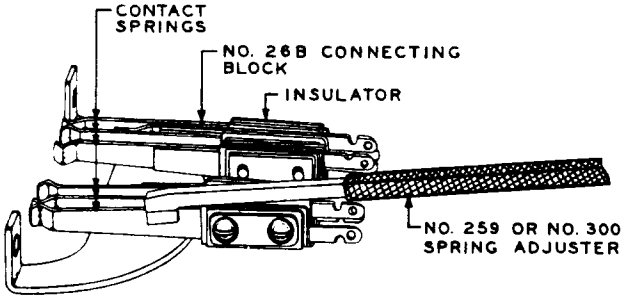


Fig. 8 - Method of Adjusting Connecting Block Springs

(2) No. 26B Connecting Block With Four Spring Assemblies: If the clearance between the springs is too great, decrease it by applying the No. 259 or the No. 300 spring adjuster close to the point where the springs leave the spring assembly insulators and then give the spring a slight twist up or down, as required.

3.05 Relay Mounting (Rq 2.05)

(1) If the relay is not held securely by its associated connecting block, remove the relay and increase the tension of the contact springs with the No. 259 or No. 300 spring adjuster in accordance with 3.03 (1) or (2).

(2) If the relay terminals are bent so that they do not make contact properly, replace the terminal.

3.06 Sponge Rubber Pads (Rq 2.06)

(1) Note whether or not the four sponge rubber pads are in good condition. If they have deteriorated to such an extent that the relay rests on its supporting base, it may result in the relay failing to operate on the specified operating current after mechanical adjustments have been made or after it has been placed in the circuit. In this case, replace the pads.

3.07 Contact Alignment (Rq 2.07)

(1) To align the contacts, remove the relay from the connecting block, loosen the locknut on the armature clamping screw with the No. 45B wrench, and with the 4-inch regular screwdriver, loosen the armature clamping screw sufficiently to permit shifting the armature. Move the armature as required until the contacts are properly aligned and tighten the clamping screw and locknut securely. Exercise care not to bend the armature or twist the relay. If necessary, reset the sliding weight in accordance with 3.14.

3.08 Core Airgap (Rq 2.08)

(1) If the armature is bent, it should be replaced.

(2) To adjust the core airgaps, loosen the core, contact adjusting, and backstop clamping screws with the 3-inch cabinet screwdriver just enough to permit the turning of the core adjusting nut, contact, and backstop adjusting screws with the No. 340 adjusting key. Back off the cores as far as possible. Turn in the contact adjusting screw with the No. 340 adjusting key until the contact just makes with the armature. Then back off the contact adjusting screw until the contact just breaks. Turn in the backstop screw with the No. 34C adjusting key until the contact just makes. Then back off the backstop screw until the contact just breaks. Where a test set or test panel is provided, use it to determine when the contact makes and breaks.

Caution: In the use of the Nos. 91A and 91B gauges, exercise care to prevent moving the armature. Hold the gauge loosely between the thumb and index finger, and do not force it between the armature and the cores.

(3) Insert the No. 91A gauge between the armature and the left-hand core, as viewed from the contact end, and turn this core in with the No. 340 adjusting key until the gauge can freely be withdrawn and inserted. This establishes the left-hand airgap. Use the No. 91B gauge to insure that the maximum gap is not exceeded, then securely tighten the clamping screw for the left-hand core.

(4) Insert the No. 91A gauge between the armature and the right-hand core and turn this core in with the No. 340 adjusting key until the gauge can freely be

withdrawn and inserted. This establishes the right-hand airgap. Use the No. 91B gauge to insure that the maximum gap is not exceeded, then securely tighten the clamping screw. Readjust the backstop gap, the contact separation, and if necessary, reset the sliding weight as covered in 3.14.

3.09 Backstop Gap (Rq 2.09)
3.10 Contact Separation (Rq 2.10)

(1) To make these adjustments, connect the relay to the adjusting equipment, if provided; if not, adjust the relay in a spare circuit if available or in the circuit in which it is used, when removed from service. With the relay connected in this manner, the making or breaking of contacts will be indicated by the operation of the equipment in the adjusting circuit or the operation of apparatus associated with the relay in the circuit when making the following adjustments.

(2) Backstop Gap: Loosen the clamping screws for the backstop and contact adjusting screws with the 3-inch cabinet screwdriver just enough to permit turning the backstop and contact adjusting screws with the No. 340 adjusting key. Turn the contact adjusting screw in until the contacts just make, then slowly turn this screw back just enough to open the contacts.

(3) Exercise care not to turn the contact adjusting screw back too far, since the contact separation adjustment is made from the position of the contact adjusting screw as left after making the backstop gap adjustment.

(4) Turn the backstop screw in until it just touches the armature and causes the armature to come in contact with the contact spring, then turn back the backstop screw 1/4 of a turn, leaving a separation of 0.004 inch between the armature and the screw. Tighten the backstop clamping screw securely.

(5) Contact Separation: With the contact adjusting screw in the position left in (2), turn it back three divisions on the milled head, as measured by the adjusting guide bracket.

(6) If it has not been necessary to adjust the backstop gap, adjust for the contact separation as follows: Loosen the clamping screw for the contact adjusting screw with the 3-inch cabinet screwdriver just enough to permit turning the contact adjusting screw with the No. 340 adjusting key. Turn the contact adjusting screw in until the contacts just make, then turn the contact adjusting screw back slowly until the contacts just open. Now turn the screw back three divisions of the milled head, as measured by the adjusting guide bracket.

(7) Tighten the clamping screw for the contact adjusting screw securely.

3.11 Contact Spring Tension (Rq 2.11)

(1) If the long straight portion of the contact spring is not approximately parallel to the stop spring, apply the No. 363 spring adjuster to the contact spring and adjust as required. Extreme care should be exercised in this operation, as excessive bending will cause incorrect contact spring tension.

(2) If the contact spring tension requirement is not met, loosen the clamping screw for the contact adjusting screw with the 3-inch cabinet screwdriver and back the contact adjusting screw away from the stop spring with the No. 340 adjusting key. Clean between the contact spring and the lug with the No. 265C contact burnisher equipped with a No. 266B contact burnisher blade to remove any dirt at this point. If, with the contact adjusting screw backed away, the contact separation is more than 1/16-inch, as gauged by eye (the thickness of the armature is approximately 1/16 inch), adjust the stop spring with the No. 485A pliers over the rivets on the stop spring at the point where the contact and stop springs are attached until the separation is approximately 1/16 inch. If the contact separation is less than 1/16 inch or after adjusting the separation to 1/16 inch, turn in the adjusting screw until the contacts just make and then back the screw away three divisions on the adjusting screw. Check the spring tension with the No. 70H gauge as outlined in 2.11. If below 15 grams, adjust the contact spring for increased tension with the No. 363 spring adjuster, applying the tool just above the crook in the spring and giving it a slight twist in the counterclockwise direction, that is, toward the lug. After adjusting the spring, again set the contact separation for three divisions on the adjusting screw and then check the spring tension for 15 grams. Adjust the spring as required until the requirement is met with the specified contact separation.

3.12 Tightness of Clamping Screws (Rq 2.12)
3.13 Tightness of Sliding Weight (Rq 2.13)

(1) To tighten the clamping screws, use the 3-inch cabinet screwdriver. To tighten the setscrew, use the KS-6854 screwdriver. On relays where the sliding weight is held in position by a spring and the sliding weight does not hold its adjusted position, replace the spring.

3.14 Electrical Requirements (Rq 2.14)

(1) With the above mechanical adjustments, the relay should meet the electrical requirements if the sliding weight is located properly, the sponge rubber pads are in good condition, and the ringing supply is of the proper frequency (135 cycles). On relays on which it is difficult to properly position the sliding weight because of an armature burred by the setscrew, remove the setscrew with the KS-6854 screwdriver and substitute a P-294035 spring and a P-294036 screw, using the 4-inch regular screwdriver (see Fig. 6).

(2) A mark is placed on the armature for the approximate setting of the sliding weight on new relays as the final factory adjustment and may be used as a reference line in case the readjustment of the sliding weight is necessary. On relays not marked in this manner the approximate setting of the sliding weight on the armature may be obtained as follows: Connect the relay to the testing equipment. Adjust the voltage across the relay in accordance with 2.14(b) or the current through the relay to 0.00022 ampere ac. In case no testing equipment is provided, operate the relay electrically under circuit conditions and loosen the setscrew on the sliding weight with the KS-6854 screwdriver so that the weight will chatter. Then change the position of the sliding weight until the noise made by the chattering weight reaches a maximum as determined by means of the No. 1A listening stick. Hold the end of the listening stick against the frame of the relay as shown in Fig. 9 while the ear is applied to the diaphragm of the listening stick.

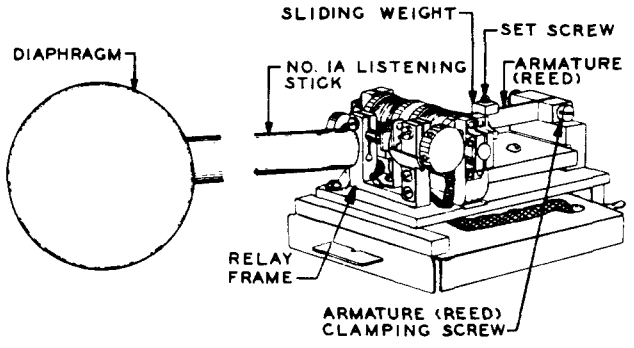


Fig. 9 - Method of Obtaining Approximate Setting of Sliding Weight on Relays With Weights Positioned by Setscrews

(3) If a satisfactory adjustment cannot be made in this manner, adjust the sliding weight as covered in (4) to (6), inclusive. See (8) to (10), inclusive, for adjustment when no adjusting equipment is available.

(4) Readjust the contact separation for three divisions. Apply minimum 135-cycle current to the relay. Slowly increase the current or voltage until the relay just operates. Note the amount of current or voltage required to operate the relay.

(5) If the weight is equipped with a setscrew, loosen the setscrew on the sliding weight with the KS-6854 screwdriver. Move the weight approximately 1/8 inch in either direction. Check the contact separation and adjust if necessary in accordance with 3.10(6). Measure the operating current or voltage again as described in (4), beginning with a small current or voltage and increasing it slowly until the relay just operates. If the operate current or voltage is less than before, it indicates that the weight was moved in the proper direction. Repeat this operation until the relay operates satisfactorily on 0.00022 ampere ac or less or in accordance with 2.14(b) by shifting the sliding weight in smaller amounts as the relay becomes more sensitive.

(6) Most relays when adjusted in this manner will operate well below the required current or voltage. After each adjustment of the sliding weight, check the contact separation and adjust in accordance with 3.10(6). Tighten the setscrew on the sliding weight, if the weight is so equipped, after each adjustment sufficiently to prevent the weight from shifting. Care must be exercised in tightening the setscrew in order not to bend the armature. If necessary, replace the setscrew as outlined in (1). By the above method of adjusting, it is possible to tune the armature to 135 cycles and thus obtain maximum sensitivity of the relay.

(7) If it is not possible to adjust the relay in this manner, change the core airgap slightly in accordance with 3.08. It is desirable that the gaps on either side of the armature be as nearly equal as practicable. However, it may be necessary to vary this slightly.

(8) In offices where testing equipment is not installed, insert the relay in the connecting block of the circuit which represents the most severe service condition, or the connecting block of the circuit in which it is used, with the circuit removed from service. With the sliding weight set on the scribe marks, if provided on the armature, observe the operation of the relay by means of the operation of the associated apparatus in

the circuit when 135-cycle current is being received over the line.

(9) If the relay fails to function satisfactorily as indicated by the operation of associated apparatus in the circuit, check the contact separation and adjust, if necessary, as outlined in 3.10(6). Loosen the setscrew on the sliding weight, if the weight is so equipped, with the KS-6854 screwdriver and move the weight slightly in either direction. Again observe the operation of the relay as described in (8). If the operation of the relay is more nearly satisfactory as indicated by the operation of associated apparatus in the circuit, it indicates that the weight was moved in the proper direction. Repeat this operation until the relay operates satisfactorily, shifting the weight by smaller amounts as the relay becomes more sensitive.

(10) After each adjustment of the sliding weight, check the contact separation and adjust in accordance with 3.10(6). Tighten the setscrew on the sliding weight after each adjustment sufficiently to prevent the weight from shifting. Care must be excercised in tightening the setscrew not to bend the armature. If necessary replace the setscrew as outlined in (1). By the above method of adjusting, it is possible to tune the armature to 135 cycles and thus obtain maximum sensitivity of the relay. When the relay is exactly tuned to the signaling frequency (135 cycles), the current required to operate the relay is of a minimum value.

REASONS FOR REISSUE

1. To add a caution (1.05).
2. To omit the requirement for parallelism of contact spring and stop spring.
3. To revise Figs. 4, 5, 6, and 7.
4. To revise the list of tools, gauges, test apparatus, and materials (3.001).
5. To revise the procedure for the core airgap (3.08).
6. To revise the procedure for contact spring tension (3.11).
7. To revise the procedure covering the electrical requirements (3.14).