

RELAYS
MODIFIED 228A PER D-160118
AND ASSOCIATED NO. 18F CONNECTING BLOCK
REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

1.01 This section covers the modified 228A relay per D-160118 and associated No. 18F connecting block. The D-160118 relay is a 228A relay that has been modified with 255A relay parts.

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 Asterisk: Requirements are marked with an asterisk () when to check for them would necessitate the dismantling 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.

2. REQUIREMENTS

2.01 Cleaning

- (a) Contacts shall be clean and free from pits and build-ups. Gauge by eye.
- (b) Pole-pieces shall be clean and free from magnetic particles. Gauge by eye.
- (c) The inside of the cover shall be clean. Gauge by eye.
- (d) The surfaces of the flexible contact springs which bear against each other shall be clean. Gauge by eye.

2.02 Tightness of Relay Terminals, Screws and Nuts

- (a) Fig. 1 (A) - The base plate shall be held firmly to the terminal block by the associated base plate mounting screws. Gauge by feel.
- (b) Fig. 1 (B) - The terminal block shall be held securely to the relay base by the terminal block mounting screws. Gauge by feel.
- (c) Fig. 1 (C) - The mounting posts shall be held securely in the base plate by the associated mounting nuts. Gauge by feel.

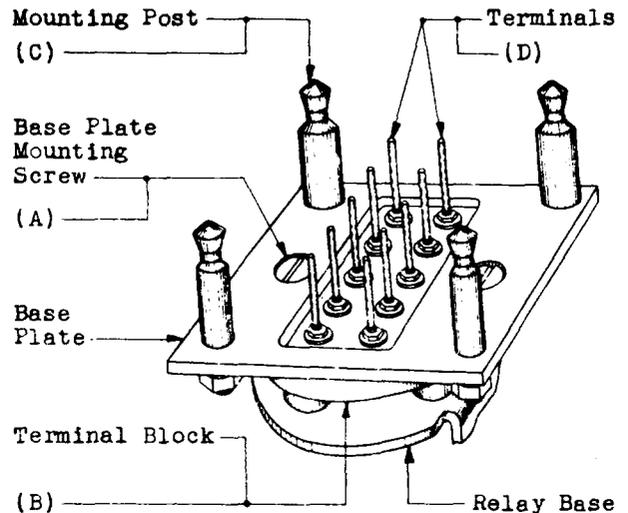


FIG. 1 - Terminal Block Assembly

(d) Fig. 1 (D) - The relay terminals shall be straight and shall be held tightly by the associated lock nuts. Gauge by eye and feel.

2.03 Relay Mounting - Fig. 2 (A) - Relays shall be held securely by the associated connecting block mounting springs. Gauge by feel.

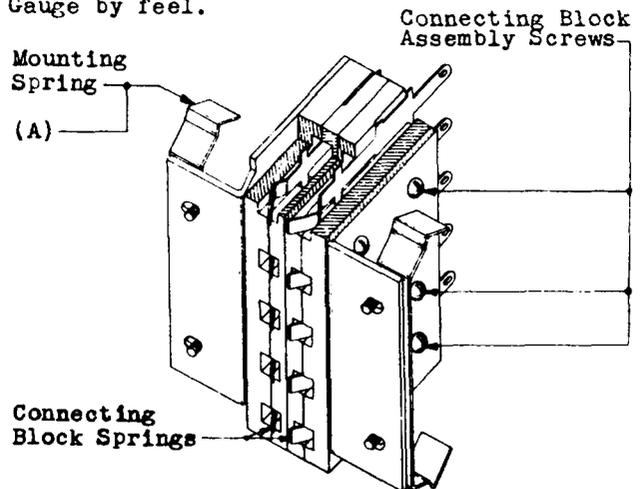
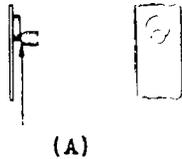


FIG. 2 - 18F Connecting Block

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2.04 Armature and Spool Clearance - The armature shall not touch the inside of the spool. Gauge by eye.

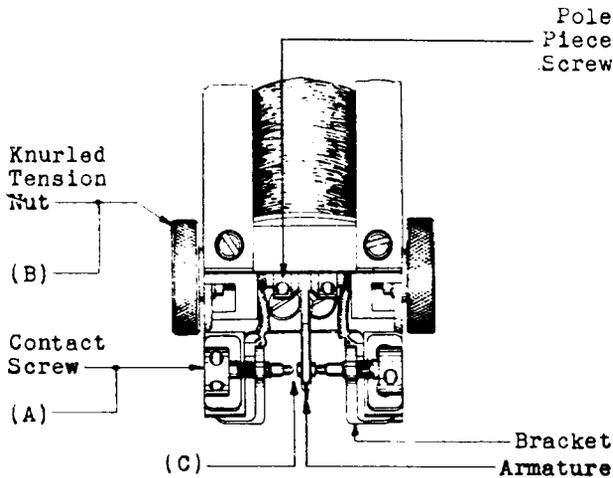
2.05 Contact Alignment - Fig. 3 (A) - Contacts shall line up so that the point of contact falls wholly within the boundary of the opposing contact. Gauge by eye.



(A)
FIG. 3 - Contact Alignment

2.06 Flexible Contact Spring Alignment - The tips of the flexible contact springs shall be approximately flat, shall bear upon each other at the top and bottom edges and shall make at least a line contact for a minimum of 25% of the distance across the 3/16" width. Gauge by eye.

2.07 Tightness of Contact Screws - Fig.4(A) Contact screws shall be sufficiently tight in their bracket to hold any adjusted position. Gauge by feel.



(A)
FIG. 4 - Tightness of Contact Screw and Pole Piece Knurled Tension Nuts and Contact Travel.

*2.08 Tightness of Pole-Piece Screw Knurled Tension Nuts - Fig.4 (B) The knurled tension nuts shall be sufficiently tight to hold the pole-piece screws in the adjusted position but not too tight to be readily adjusted. Gauge by feel.

2.09 Contact Travel - Fig. 4 (C) The contact travel, that is the distance the armature can travel in passing from a position against one contact screw to a position against the opposite contact screw, shall be: Min. .003", Max. .005"
Use the No. 74D gauge.

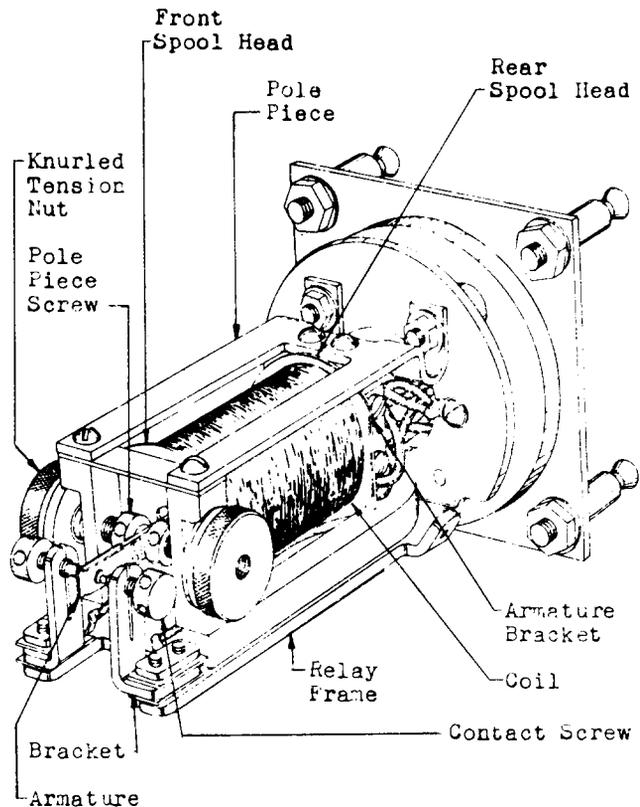


FIG. 5 - Designation of Parts

2.10 Electrical Requirements: The relay shall meet the electrical test and re-adjust requirements covered by the section covering the testing equipment.

3. ADJUSTING PROCEDURES

3.001 List of Tools, Gauges, Materials and Test Apparatus

<u>Code No.</u>	<u>Description</u>
<u>Tools</u>	
43	3/16" and 1/4" Hex. Double-End Flat Wrench
or	
417A	1/4" and 3/8" Hex. Double-End Flat Wrench
46	3/8" Hex. Socket Wrench
340	Adjusting Key
403A	5/32" and 3/16" Hex. Double-End Socket Wrench
484A	Magnetic Shunt
485A	Smooth Jaw Pliers

3.001 (Continued)

<u>Code No.</u>	<u>Description</u>
-	3" Cabinet Screwdriver
-	4" Regular Screwdriver
-	KS-6320 Orange Stick
-	KS-6854 3-1/2" Screwdriver

Gauges

70E	150-0-150 Gram Gauge
74D	Thickness Gauge Nest

Materials

-	D-98063 Cloth
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Test Apparatus

111A2	Relay Test Panel
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3.002 Remagnetization of Relays - A tool has been provided for remagnetizing the permanent magnets of relays used in telegraph equipment and detailed procedures for using this tool are covered in Section 040-231-811. When the permanent magnet has been dismounted from the relay for any reason, remagnetize the magnet after reassembly before readjusting the relay. Permanent magnets may also be remagnetized if the performance of the relay indicates that such action is advisable.

3.01 Cleaning (Rq. 2.01)

(1) Contacts - Clean the contacts and other parts when necessary in accordance with Section 069-306-801, covering cleaning of relay contacts and parts.

(2) Cover - Remove the cover screws with the 3" cabinet screwdriver. Clean the inside of the cover by wiping it with a piece of clean dry D-98063 cloth.

3.02 Tightness of Relay Terminals, Screws and Nuts (Rq.2.02)3.03 Relay Mounting (Rq.2.03)

(1) If a relay is not held securely by the associated connecting block mounting springs remove the relay from the mounting and determine whether the mounting posts, base plate, terminal block or mounting springs are loose.

(2) If a mounting post is loose, tighten the nut holding it to the base plate using the 46 wrench.

(3) If the base plate is loose, tighten the screws holding it to the terminal block using the 4" regular screwdriver.

(4) If the terminal block is loose, remove the base plate mounting screws and remove the base plate. Tighten the screws holding the terminal block to the relay base using the 4" regular screwdriver. Remove the cover screws with the 3" regular screwdriver and remove the cover. If the lock nuts for the two top mounting screws are loose, tighten them with the 43 or 417A wrench. Replace the cover, tightening the screws securely. Reassemble the base plate to the relay and tighten the base plate mounting screws securely. Take care in reassembling the base plate to the relay to see that the terminal designations stamped on the base plate and on the terminal block are in the same corresponding position and that the mounting posts having the larger diameter are on the right hand side as viewed from the rear of the relay.

(5) If neither the mounting posts, block mounting screws, nor the screws holding the base plate to the terminal block and the terminal block to the relay base are loose, tension the mounting springs as required using the 485A pliers.

(6) If the relay terminals do not make good contact with the connecting block springs, correct as follows: Remove the relay from the connecting block and remove the connecting block from its mounting by removing the connecting block mounting screws with the 3" cabinet screwdriver. Then remove the connecting block assembly screws using the 3" cabinet screwdriver. With the block unassembled, adjust the tip of the particular spring or springs at fault as required with the 485A pliers, reassemble the block and fasten it securely to its mounting.

(7) If the relay terminals are bent or the lock nuts are loose, straighten the relay terminals with the 485A pliers and tighten loose lock nuts with the 403A wrench. In tightening the nuts, exercise care not to twist the connecting wires from the terminals.

3.04 Armature and Spool Clearance (Rq.2.04)3.05 Contact Alignment (Rq. 2.05)

(1) Armature Movement - If the armature does not clear the inside of the spool, correct as follows:

(2) First remove the relay from the connecting block. Remove the cover screws using the 3" cabinet screwdriver and remove the cover.

(3) Loosen the knurled tension nuts and back off the pole-piece screws on each side as far as they will go using

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3.04-3.05 (Continued)

the 340 adjusting key or KS-6854 screwdriver. This is done in order to insure that the armature will assume its normal mechanical position. The armature in its "normal mechanical position" should be in an approximate central position with respect to the pole-piece screws and the holes in the front and rear spoolhead, with the relay held in a horizontal or vertical position.

(4) Back off the contact screws on each side sufficiently to give the armature free play in the slot in the spoolhead. Use the 340 adjusting key.

(5) To center the armature between the pole-piece screws, loosen the two screws that hold the armature bracket to the pole-piece and the two screws that hold the armature bracket and rear spool head to the relay frame. Use the 3" cabinet screwdriver. Shift the armature bracket to the left or right as required and when the proper position is obtained, tighten the two screws that hold the armature bracket to the pole-piece. Then shift the coil so that the armature is approximately centered with the hole in the rear spool head and tighten the two screws. To center the armature in the hole in the front spool head, loosen the two screws that hold the front spool-head to the relay frame. Use the 3" cabinet screwdriver, exercising care not to damage the armature. Shift the spool to the left or right as required and then tighten the screws.

(6) To center the armature vertically, first slightly loosen the screws holding the armature to its support using the 3" cabinet screwdriver. Then move the armature up or down as may be necessary to bring the contacts into proper vertical alignment. After making this adjustment note that there is a clearance between the armature and the slot in the spool at the top and bottom. Tighten the armature clamping screws securely.

(7) After the above adjustments have been completed, check to insure that all screws which hold the spool, armature and contact brackets to the base of the relay are tight. If they are not, tighten them using the 3" cabinet screwdriver. When finally adjusted, the armature should be approximately central with respect to the slot in the coil through which it protrudes and with respect to the pole-piece bracket and should not strike on any part of the spool. Remount cover, tightening the cover screws securely.

(8) If the pole-pieces appear dirty, clean them as outlined in 3.01.

(9) Contact Alignment - To align contacts vertically, remove the relay from the connecting block and remove the cover screws using the 3" cabinet screwdriver and remove the cover. Then position the armature up or down as outlined in (6).

(10) Note that the contact screws are approximately in line with each other as gauged by eye. If they are not adjust the contact screw brackets to the right or left as required using the 485A pliers. Then realign the contacts, if necessary, as covered in (9).

(11) To align the contacts from front to rear, loosen the screws holding the armature to its support as outlined in (6) and then move the armature forward or backward as required. If it is impossible to align the contacts in this manner, loosen the screws holding the contact screw bracket to the base of the relay using the 3" cabinet screwdriver. Then move the bracket until the contacts line up properly. In making this adjustment, it is desirable to set the contact screw bracket so that the contact screws strike the contacts on the armature as near the center as possible.

(12) After the adjustment is completed, firmly retighten all screws loosened. Remount cover, tightening the screws securely. Then readjust as covered in 3.09.

3.06 Flexible Contact Spring Alignment (Rq.2.06)

(1) If the tips of the flexible contact springs do not rest against each other properly, remove the relay from the connecting block. Remove the cover screws using the 3" cabinet screwdriver and then remove the cover.

(2) Place the 484A magnetic shunt across the front end of the yoke directly above the pole-piece as shown in FIG.6. Back off the contact screws equally to give about .012" contact travel. Use the 340 adjusting key.

(3) Check that the flexible springs rest against each other in line with the armature with a pressure of 20 to 70 grams, measured at the contact of one spring with the other spring held so that it cannot follow its mate. Use the 70E gauge to measure the tension and hold the other spring with the flat end of the KS-6320 orange stick. If the springs do not have the proper tension replace the armature as covered in (4).

(4) Loosen the screws holding the armature to its support using the 3" cabinet screwdriver. Remove the armature. Insert the replacing armature, positioning

3.06 (Continued)

it, so that it clears the slot in the coil through which it protrudes and so that the contacts are in alignment (see 3.04 and 3.05). Tighten the armature clamping screws securely.

- (5) After (3) or (4) adjust as covered in 3.09.

3.07 Tightness of Contact Screws (Rq.2.07)

(1) If the contact screws are not sufficiently tight in the bracket, remove the cover screws with the 3" cabinet screwdriver and remove the cover. Then remove the screw from the bracket and force the two parts of the bracket together sufficiently with the 485A pliers to insure that the screw will hold any adjusted position and then replace the screw. Use the 340 adjusting key to remove and replace the contact screws. Replace the cover, tightening the screws securely. Readjust the relay as covered in 3.09.

3.08 Tightness of Pole-Piece Screw Knurled Tension Nuts (Rq.2.08)

(1) Remove the cover screws with the 3" cabinet screwdriver and remove the cover. Tighten the knurled tension nuts by turning with the fingers. Adjust the knurled tension nuts to hold the pole-piece screw in position but not sufficiently tight to prevent advancing the pole-piece screw without loosening the tension nut. Replace the cover, tightening the screws securely.

3.09 Contact Travel (Rq.2.09)3.10 Electrical Requirements (Rq.2.10)Adjusting Contact Travel Without Readjustment of Pole-piece Screws

- (1) This method of adjustment makes use of a magnetic shunt which is placed on the relay during contact screw adjustment so as to free the armature from the influence of the permanent magnetic field.
- (2) The procedures covered herein are, in general, for use in readjusting the contact screws after these screws have been backed off to permit cleaning and burnishing the contacts or for any other reason. These procedures may also be applied in case where a check of the contact travel indicates that the contact travel requirement is not satisfactorily met. In all other cases when necessary, readjust the relay as covered in (7) to (16) inclusive.
- (3) Remove the cover screws with the 3" cabinet screwdriver and remove the

cover. Insert the relay in the connecting block of the testing equipment and place the 484A magnetic shunt across the front end of the yoke directly above the pole-piece as shown in Fig. 6. This should result in freeing the armature from magnetic influence sufficiently to cause it to assume a position approximately midway between the pole-piece screws provided the contact screws do not interfere. Connect battery to the contacts by means of the testing equipment. If the armature rests against either contact under this condition, back off the contact screw until it clears the armature.

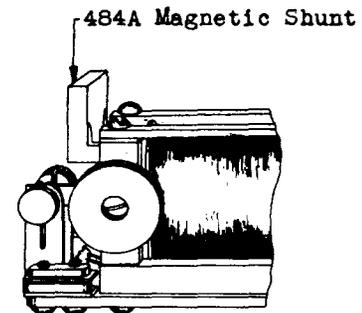


FIG. 6

(4) Remove the .005" blade from the 74D thickness gauge nest and place it between the front ends of the flexible contact springs. Allow the gauge to be held in position by the tension of the springs. Turn in one contact screw until it just touches the armature contact as indicated by the testing equipment and then back it off until it just breaks with the armature contact. Repeat the operation with the other contact screw. Remove the gauge from between the flexible contact springs.

(5) Remove the 484A magnetic shunt from the relay and apply the bias requirement as covered in the section covering the particular type of testing equipment used. If the relay meets the test requirement but not the readjust requirement correct as follows. Using the two 340 adjusting keys, turn both contact screws simultaneously by equal amounts in the same direction of rotation as viewed from the front of the relay until the relay meets the readjust bias requirement. In this manner the normal position of the armature with respect to the contact screws is changed without changing the total contact travel. Then check the sensitivity requirement and if the requirement is not met, readjust as covered in (7) to (16) inclusive.

3.09-3.10 (Continued)

(6) If upon removal of the shunt as covered in (5) the bias in either direction exceeds the test limit, it may be due to an error in setting the contact screws. Carefully repeat (3) and (4) and if the bias still exceeds the test limit it is an indication that the pole-piece screws are not properly located or that other readjustment is required. In this case clean the relay as covered in procedure 3.01 and readjust the relay as covered in (7) to (16).

Adjustment When Change in Pole-piece Screw Position is Necessary

(7) Remove the cover screws with the 3" cabinet screwdriver and remove the cover. With the relay inserted in the connecting block of the testing equipment, loosen the tension nuts and back off the pole-piece screws as far as possible with the KS-6854 screwdriver or 340 adjusting key. The knurled tension nut should be set so that the pole-piece screw may be adjusted without changing the position of the knurled tension nut. Place the 484A magnetic shunt across the front end of the yoke directly above the pole-pieces as shown in Fig. 6.

(8) Connect battery to the contacts of the relay with the testing equipment. Remove the .005" blade from the 74D thickness gauge nest and place it between the front ends of the flexible contact springs. Allow the gauge to be held in position by the tension of the springs. Turn in one contact screw until it just touches the armature contact as indicated by the testing equipment. Then back off the contact screw until it just breaks with the armature contact. Repeat this operation with the other contact screw. Remove the gauge from between the flexible contact springs and remove the magnetic shunt.

(9) Bias - Adjust the tension nuts as covered in 3.08. To adjust the relay for zero bias turn one pole-piece screw in with the 340 adjusting key or KS-6854 screwdriver until it strikes the armature and moves the armature sufficiently to just rest against the contact screw on the side opposite to that on which the pole-piece is being advanced. Then back off the pole-piece screw 1/2 turn. Turn in the other pole-piece screw until the relay meets the bias requirement. Check that the sensitivity requirement is met.

(10) Sensitivity - If the relay fails to meet the sensitivity requirement, adjust the pole-piece screws with the 340 adjusting key, taking care to maintain zero bias, until the sensitivity require-

ment is met.

(11) If it is impossible to adjust the relay for bias and sensitivity by turning the pole-piece screws, it may be an indication that the contact screws have not been set properly. Repeat the adjustment outlined in (7) and (8) and readjust for bias and sensitivity. If the relay still fails to meet these requirements, the trouble may be due to lack of symmetry in the armature and pole-pieces. Repeat (7) and (8) and make the bias adjustment by turning in the pole-piece screw opposite the one previously turned in, to obtain the pole gap setting. If the relay still fails to meet these requirements, it may be due to the difference in the height of the armature stop pins in which case it will be necessary to replace the armature.

(12) Contact - Apply the contact requirement. If the requirement is not met, it may be an indication of dirty contacts, large contact separation, poor connection in contact circuit, unsatisfactory overall adjustment or weak magnets on the relay. Remagnetize weak magnets as covered in 3.002. Clean the contacts as covered in procedure 3.01. Repeat the adjustments outlined in (7) and (8) and readjust for bias and sensitivity.

(13) If the contact closure is still not steady (chattering contacts) it may indicate that either the pressure between the flexible armature springs is insufficient or excessive or a poor contact at some point in the electrical path between the relay terminal and the contact point. Check the pressure between the flexible armature springs, covered in procedure 3.06, and make adjustments as required. Then adjust for contact travel, bias and sensitivity as outlined in (7) to (11) inclusive.

(14) Place the 484A magnetic shunt on the relay and repeat (3), (4) and (5) as an additional check on the mechanical condition of the relay. If in (5), upon removal of the shunt, the bias now exceeds the test limit, or if after correcting the bias the sensitivity requirement is not met it is usually an indication that the armature is defective and requires replacement after which readjust the relay as outlined in (7) to (13) inclusive. Then repeat the tests outlined in this paragraph.

(15) Final Check - Replace the cover on the relay and tighten the screws securely. Then check to insure that the relay meets its electrical requirements.