

## JACKS

99, 215, 216, 217, 218, 219, 220, 221, 223, 225, 226, 227, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 250, 259, 260, 267, 274, 280, 281, 284, 285, 289, 290, 291, 293, 297, 300, 303, 309, 324, 326, 327, 353, 355, 360, 361, 363, 364, 372, 375, 382, 387, 394, 396, 410, 411, 438, 440, 443, 446, 449, 454, 456, 458, 460, 462, 469, 476, 482, 484 AND 485 TYPES  
**REQUIREMENTS AND ADJUSTING PROCEDURES**

### 1. GENERAL

1.01 This section covers the jacks enumerated above.

1.02 This section is reissued primarily to add information for the 215-, 217-, 219-, 220-, 221-, 223-, 225-, 226-, 227-, 230-, 231-, 232-, 233-, 234-, 235-, 236-, 237-, 238-, 241-, 243-, 244-, 245-, 250-, 259-, 260-, 274-, 284-, 285-, 290-, 291-, 293-, 297-, 300-, 309-, 324-, 326-, 327-, 353-, 355-, 360-, 361-, 372-, 375-, 382-, 387-, 394-, 396-, 410-, 411-, 438-, 440-, 443-, 446-, 449-, 454-, 456-, 458-, 460-, 462-, 469-, 476-, 482-, 484-, and 485-type jacks and to revise the 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 No requirements or adjusting procedures are specified for the 281- or 363-type jacks. If the 281A jack does not operate satisfactorily in service, replace it with a 438C jack. If the 363-type jack does not operate satisfactorily in service, replace it with a new 363-type jack.

### 2. REQUIREMENTS

Note: For application of the requirements to jacks, refer to Table A.

2.01 Sleeve Wear: The No. 155A gauge shall not fully enter the sleeve in any rotated position of the gauge.

\*2.02 Assembly Screw Tightness: Assembly screws shall be sufficiently tight to hold the springs securely in position. Gauge by feel.

\*2.03 Cleaning: Contacts shall be cleaned, when necessary, in accordance with Section 022-186-811. Other parts shall be cleaned in accordance with approved procedures.

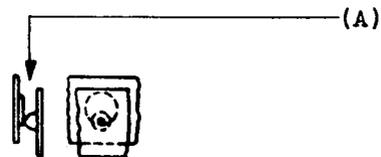


Fig. 1 - Contact Alignment

\*2.04 Contact Alignment: Fig. 1(A) - The contacts shall line up so that the point of contact falls wholly within the boundary of the opposing contact at all times during contact. Gauge by eye.

\*2.05 Tightness of Contact: The contact riveted in the frame shall be tight. Gauge by feel.

2.06 No. 156A Gauge Variation: With the No. 156A gauge inserted into the No. 111A gauge or its equivalent and turned to the position where the needle of the gauge is farthest to the right, no portion of the needle shall be to the right of the green line.

(a) To check the No. 156A gauge with the No. 111A gauge, insert the gauge into the gauging hole and revolve the gauge through at least one revolution, taking care not to exert either sidewise or lengthwise pressure on the gauge.

2.07 No. 157A Gauge Variation: With the No. 157A gauge inserted into the No. 128A gauge or its equivalent and turned to the position where the needle of the gauge is farthest to the right, no portion of the needle shall be to the right of the green line.

(a) To check the No. 157A gauge with the No. 128A gauge, insert the gauge into the gauging hole and revolve the gauge through at least one revolution, taking care not to exert either sidewise or lengthwise pressure on the gauge.





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\*2.08 Spring Position: Fig. 2(A)

- (a) With the No. 154A gauge fully inserted into the jack, the tip spring crimp shall rest between the annular lines on the gauge. Gauge by eye.
- (b) With the No. 156A gauge fully inserted into the jack, the tip and ring spring crimps shall rest on the gauge between the annular lines on the tip and ring segments. Gauge by eye.

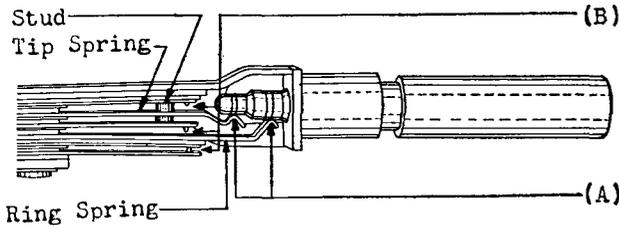


Fig. 2—Spring Position

\*2.09 Contact Separation: Fig. 2(B)

- (a) With the No. 157A gauge fully inserted into the jack and rotated through one complete revolution, the normally closed contacts shall remain open and the normally open contacts shall remain closed. Gauge by eye.
- (b) With the No. 156A gauge fully inserted into the jack and rotated through one complete revolution, the normally closed contacts shall remain open and the normally open contacts shall remain closed. Gauge by eye.
- (c) The separation between the normally open contacts shall be  
Min 0.012 inch  
Use the No. 74D gauge.
- (d) With the No. 157A gauge fully inserted into the jack, the separation between the normally closed contacts shall be  
Min 0.012 inch  
Use the No. 74D gauge.
- (e) With the No. 157A gauge fully inserted into the jack, the separation between the normally closed contacts shall be  
0.008 inch  
Use the No. 74D gauge.
- (f) With the No. 156A gauge fully inserted into the jack, the separation between the normally closed contacts shall be  
Min 0.012 inch

Use the No. 74D gauge.

\*2.10 Spring Tension

- (a) With the No. 157A gauge fully inserted into the jack, the pressure of the tip spring on the tip of the gauge shall be  
Min 500 grams  
Max 1200 grams  
Use the No. 158A gauge as shown in Fig. 3.
- (b) The tension of the tip spring against the inside contact spring shall be  
Min 90 grams  
Use the No. 70J gauge at the crimp.
- (c) With the No. 157A gauge fully inserted into the jack, the pressure of the tip spring on the tip of the gauge shall be  
Max 1200 grams  
Use the No. 158A gauge.
- (d) The tension of the tip spring shall be sufficient to hold the spring which makes contact with it against the stud in the frame or the insulators between the spring and the frame. Gauge by eye and feel.
- (e) With the No. 156A gauge fully inserted into the jack, the pressure of the tip and ring springs on the gauge for each spring shall be  
Min 500 grams  
Max 1200 grams  
Use the No. 158A gauge.

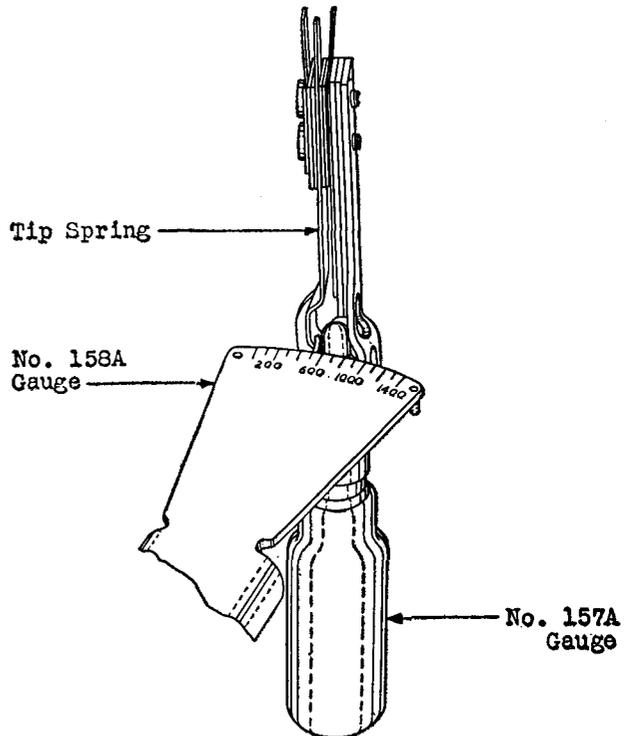


Fig. 3—Checking Spring Tension

(f) When the pressure exerted by the ring spring is removed from the spring stud, the normally closed contact nearest the frame shall not open. Gauge by eye. ←

(l) Check this requirement by moving the ring spring with the fingers until there is a clearance between the ring spring and the spring stud and observe that the normally closed contact remains closed.

(g) With the ring spring operated, its inside contact spring shall rest against the spring stud. Gauge by eye and feel.

(h) With the No. 157A gauge fully inserted into the jack, the pressure of the sleeve spring on the sleeve of the gauge shall be ↗

Min 500 grams  
Max 1200 grams

Use the No. 158A gauge

(i) With the No. 156A gauge fully inserted into the jack, the pressure of the tip and ring springs on the gauge, for each spring, shall be

Min 500 grams  
Max 1400 grams

Use the No. 158A gauge. ↘

**\*2.11 Contact Pressure**

(a) With the No. 157A gauge fully inserted into the jack, the contact pressure of the normally open contacts shall be

Min 65 grams

Use the No. 70J gauge and measure at the crimp.

(b) The contact pressure of the tip and ring contacts, which are normally closed, shall be

Tip spring - Min 100 grams  
Ring spring - Min 80 grams

Use the No. 70J gauge at the crimp.

(l) When checking this requirement, hold away any outside contact springs, as required, to prevent the outside springs interfering with the spring being checked.

(c) The contact pressure of the outside break contact (contacts associated with other than tip and ring springs) or contacts when the jack is equipped with more than one break contact measured individually, shall be

Min 55 grams

Use the No. 70J gauge at the end of the spring.

(l) When checking the contacts adjacent to the ring spring on jacks having two outside break contacts, hold away the outside spring, as required, to prevent it from interfering with the spring being checked.

(d) The contact pressure between the normally closed contact making contact with the tip spring shall be ↗

Min 100 grams

Use the No. 70J gauge at a point adjacent to the contact.

(e) The contact pressure between the normally closed contacts shall be

Min 65 grams

Use the No. 70J gauge at a point adjacent to the contacts.

(f) With the No. 156A gauge fully inserted into the jack, the contact pressure between the normally open contacts operated by the tip or ring springs shall be

Min 65 grams

Use the No. 70J gauge at a point adjacent to the contacts.

(g) The contact pressure between the normally closed contacts shall be

Min 35 grams

Use the No. 70J gauge at a point adjacent to the contacts. In this instance, the requirement shall be met after all other tests which involve operation of the contact springs are made.

(h) With the No. 157A gauge fully inserted into the jack, the contact pressure of the normally open contacts shall be

Min 35 grams

Use the No. 70J gauge at a point adjacent to the contacts. ↘

**\*2.12 Contact Follow**

(a) When the tip spring is operated, the follow of the inside contact spring shall be

Min 0.010 inch

Gauge by eye.

(b) The follow of the springs normally making contact with the tip and ring springs shall be

Min 0.010 inch

Gauge by eye.

**2.13 Butt**

(a) It shall be possible to fully insert the No. 154A gauge into the jack. It will be satisfactory to rotate this gauge in an effort to insert it into the jack, but the pressure applied shall not exceed that which can be exerted with the gauge held between the thumb and index finger.

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(b) It shall be possible to fully insert the No. 124B gauge into the jack. It will be satisfactory to rotate this gauge in an effort to insert it into the jack but the pressure applied shall not exceed that which can be exerted with the gauge held between the thumb and index finger.

↗ (g) With the jack unoperated, the stud in the long spring of the outer transfer shall not rest on the long spring of the inner transfer. There shall also be a clearance between the long spring of the inner transfer and the stud in the tip spring.  
 ↘

**\*2.14 Spring Clearance**

(a) With the No. 125B gauge fully inserted into the jack and a pressure applied to give the tip and ring springs the maximum deflection permitted by the clearance between the gauge sleeve and the jack sleeve, there shall be a clearance between the springs not intended to make contact of

Min 0.010 inch  
 Gauge by eye.

(b) With the No. 125B gauge inserted into the jack so that the ring spring rests approximately on the center of the dead collar and with a pressure applied to give the ring spring the maximum deflection permitted by the clearance between the jack sleeve and the gauge sleeve, there shall be a clearance between the springs not intended to make contact of

Min 0.010 inch  
 Gauge by eye.

**\*2.15 Stud Clearance**

(a) With the jack unoperated, there shall be a clearance between the outside contact spring and the stud on the tip spring. Gauge by eye and feel.

(b) With the jack unoperated, there shall be a clearance between the outer spring stud and the ring spring. There shall also be a clearance between the outer spring stud and the outside contact spring when there are two auxiliary break contacts associated with the ring spring. Gauge by eye.

↗ (c) With the No. 157A gauge fully inserted into the jack, the tip and sleeve springs shall not rest on the stud at their respective points. Gauge by eye.

(d) With the No. 157A gauge fully inserted into the jack, the tip spring shall not rest on the inside stud. Gauge by eye.

(e) With the No. 157A gauge fully inserted into the jack, the contact spring nearest to the frame shall not rest on the stud in the frame. The clearance shall be  
 Min 0.008 inch

Use the No. 74D gauge.

↗ (f) With the jack unoperated, the stud in the outside contact spring shall not rest on the tip spring. Gauge by eye and feel.  
 ↘

**\*2.16 Contact Sequence**

(a) The normally closed contact of the transfer combination operated by the ring spring shall break before the normally open contact of the combination makes by

Min 0.006 inch  
 Gauge by eye.

↗ (b) When the tip spring is operated, the normally closed contacts shall break before the normally open contacts make by

Min 0.006 inch  
 Gauge by eye.

(c) When the tip spring is operated, all normally open contacts shall make before any normally closed contact breaks, thus effecting a momentary condition of all contacts being closed. Gauge by eye.

(d) When the ring spring is operated, the normally closed contacts of the spring equipped with the stud shall break before the normally closed contacts of the outside springs break by

Min 0.006 inch  
 ↘ Gauge by eye.

**3. ADJUSTING PROCEDURES**

**3.001 List of Tools, Gauges, and Materials**

<u>Code or Spec No</u>	<u>Description</u>
<u>Tools</u>	
485A	Smooth Jaw Pliers
→544A	1/4-in. Hex. Offset Socket Wrench
KS-3093	Bristle Brush
KS-6015	6-in. Duck-bill Pliers
KS-7782	Parallel Jaw Pliers
-	3-in. Cabinet Screwdriver
→-	4-in. Regular Screwdriver
<u>Gauges</u>	
70J	0- to 150-gram Gauge
74D	Thickness Gauge Nest
111A	Plug Gauge

Gauges

124B	Butt Test Plug
125B	Cross Test Plug
128A	Plug Gauge
154A	Spring Test Plug
155A	Sleeve Limiting Gauge
156A	Spring Test Plug
157A	Spring Test Plug
158A	0- to 1400-gram Gauge

Material

KS-2423 Cloth

3.002 To remove the jacks from the switchboard, unsolder all leads and remove the mounting screw or screws with the 3-inch cabinet screwdriver.

3.01 Sleeve Wear (Rq 2.01)

- (1) If the No. 155A gauge enters the sleeve to the stop shoulder, replace the jack.

3.02 Assembly Screw Tightness (Rq 2.02)

- (1) Tighten loose assembly screws with the 4-inch regular screwdriver or the No. 544A socket wrench.
- (2) If this does not clamp the spring pile-up securely, remove the assembly screws and add a fibre insulator, as required, underneath the top terminal or clamping plate.
- (3) Replace the assembly screws, tightening them securely.

Note: In case the tip of the blade of the 4-inch regular screwdriver is too thick to engage the slot in the assembly screws, select a screwdriver which has a narrower blade or file the blade down slightly to fit the slot in the screw.

3.03 Cleaning (Rq 2.03)

- (1) Clean the contacts as outlined in Section 022-186-811.
- (2) Brush the jacks off with the KS-3093 bristle brush until all loose dust and dirt is removed. When necessary to disassemble the spring assembly, wipe all parts off with the KS-2423 cloth.

3.04 Contact Alignment (Rq 2.04)

- (1) If the contacts do not line up satisfactorily, loosen the spring assembly

screws with the 4-inch regular screwdriver or the No. 544A socket wrench and attempt to line up the contacts by shifting the springs until each contact point lies wholly within the opposing contact, preferably as near the center as possible. Tighten the assembly screws securely. After aligning the contact, check that Requirements 2.06 to 2.16, inclusive, are met. If the contacts cannot be lined up in this manner, replace the jack.

3.05 Tightness of Contact (Rq 2.05)

- (1) If the contact riveted in the frame is loose, replace the jack.

- 3.06 No. 156A Gauge Variation (Rq 2.06)
- 3.07 No. 157A Gauge Variation (Rq 2.07)
- 3.08 Spring Position (Rq 2.08)
- 3.09 Contact Separation (Rq 2.09)
- 3.10 Spring Tension (Rq 2.10)
- 3.11 Contact Pressure (Rq 2.11)
- 3.12 Contact Follow (Rq 2.12)
- 3.13 Butt (Rq 2.13)
- 3.14 Spring Clearance (Rq 2.14)
- 3.15 Stud Clearance (Rq 2.15)
- 3.16 Contact Sequence (Rq 2.16)

- (1) Adjust the springs for spring tension, ← contact pressure, spring clearance, stud clearance, or contact sequence with the KS-7782 or KS-6015 pliers applied at the rear of the spring where it leaves the insulators as shown in Fig. 4. In those cases where there is insufficient spring separation to permit the use of the KS-7782 or KS-6015 pliers, loosen the spring assem-

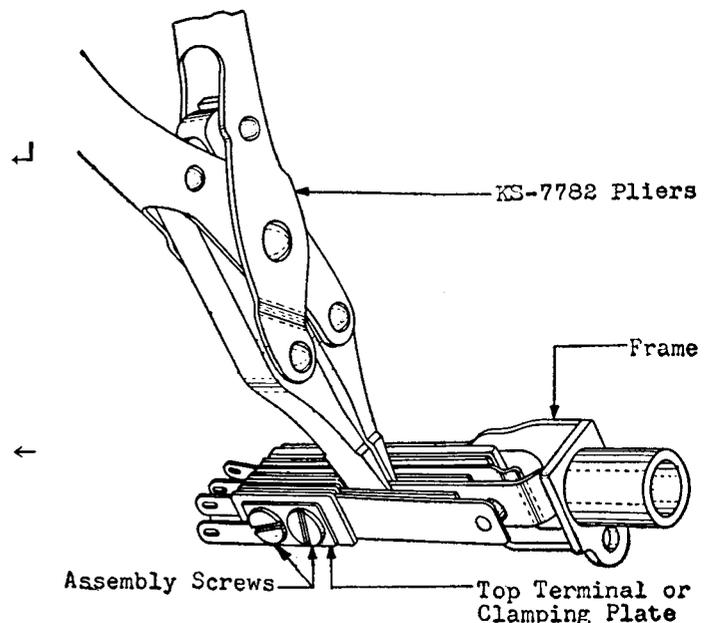


Fig. 4—Method of Adjusting Spring Tension and Contact Pressure

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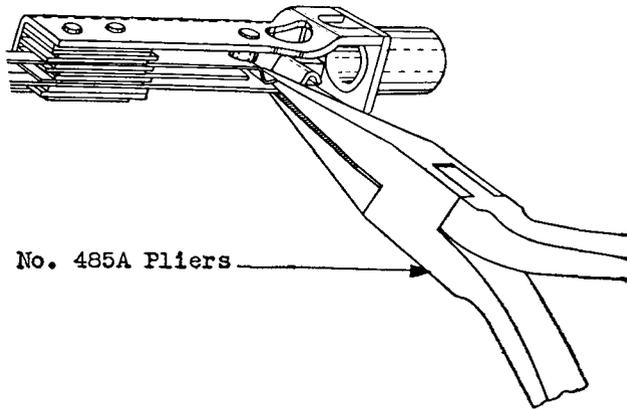


Fig. 5—Method of Adjusting for Contact Separation or to Correct for Butt

bly screws with the 4-inch regular screwdriver or the No. 544A socket wrench until the springs can be adjusted, or if necessary, remove the spring assembly and adjust the springs. See (2). If the assembly is removed, wipe off the parts with the KS-2423 cloth. Adjust tip or ring springs for contact separation or to correct for butt with the No. 485A pliers applied to the front of the spring just behind the crook in the spring as shown in Fig. 5. Adjust contact springs for contact separation or contact follow at the rear of the spring where it leaves the insulators.

→ (2) To remove the spring assembly from the frame, remove the assembly screws with the 4-inch regular screwdriver or the No. 544A socket wrench. Lift the spring assembly off the frame, taking care to keep the springs and insulators assembled on the bushings. If necessary to disassemble further, care should be taken not to lose any of the parts and to note the order in which the parts are removed. To reassemble the jack, place the spring assembly on the jack frame and replace the assembly screws, tightening them securely.

↳ (3) In order to insure that the contact follow requirement can be met on the earlier 216- and 218- type jacks (jacks with insulators between the contact spring and jack frame), proceed as follows. With the exception of (c) these procedures will also apply to earlier Nos. 216 and 218 jacks which have had the insulators between the

frame and contact spring cut off but which have not had the stud P-355048 inserted in the hole in the frame.

- (a) Remove the spring assembly. See (2).
- (b) Wipe off the parts with the KS-2423 cloth.
- (c) Cut off the insulators between the frame and contact spring to the length of the spacing insulators.
- (d) Insert a stud P-355048 in the hole in the frame.
- (e) Reassemble the jack. See (2).
- (f) Check all requirements.

(4) If the crimps at the end of the tip and ring springs do not lie between the annular lines on the No. 156A gauge, replace the jack.

(5) After adjusting a jack to meet any of the Requirements 2.06 to 2.16, make sure that the jack meets all of these requirements which are applicable.

REASONS FOR REISSUE

1. To add information for the 215-, 217-, 219-, 220-, 221-, 223-, 225-, 226-, 227-, 230-, 231-, 232-, 233-, 234-, 235-, 236-, 237-, 238-, 241-, 243-, 244-, 245-, 250-, 259-, 260-, 274-, 284-, 285-, 290-, 291-, 293-, 297-, 300-, 309-, 324-, 326-, 327-, 353-, 355-, 360-, 361-, 372-, 375-, 382-, 387-, 394-, 396-, 410-, 411-, 438-, 440-, 443-, 446-, 449-, 454-, 456-, 458-, 460-, 462-, 469-, 476-, 482-, 484-, and 485-type jacks.
2. To reword the cleaning requirement and procedure (2.03 and 3.03).
3. To revise the requirement and the method of checking for spring tension in the No. 267A jack [2.10(f) and 2.10(f)(1)].
4. To add the No. 544A socket wrench and the 4-inch regular screwdriver to the list of tools (3.001).
5. To delete the D-98063 cloth from the list of material (3.001).
6. To add information for contact sequence in the procedures [3.06 to 3.16(1)].