SELECTORS, CONNECTORS, AND SELECTOR-CONNECTORS

CORRECTION OF PULSING FAILURES

USING PULSING TEST SET SD-31481-01 (J34717A)

700C, 701A, 701B, 701PK, 702A, 710C, 711A, 711B, 711PK, 740A, 740AX, 740B, 740C, AND 740E PBX

1. GENERAL

1.01 This section describes a general procedure for the correction of pulsing failures encountered in making pulsing tests of selectors, connectors, and selector-connectors with test set SD-31481-01 (J34717A) as covered in Sections 540-120-503 and 540-143-504.

1.02 This section is reissued to include the scope of the 701PK and 711PK PBX and to make other minor revisions to bring the section up to date.

1.03 The procedure attempts to point out the most likely causes of various trouble conditions and methods of correction. The methods presented should not be construed as altering standard requirements for the individual pieces of apparatus affected nor as excluding from consideration any mechanical or electrical adjustments not specifically mentioned.

1.04 The information in this section is based on the assumption that the magnet pulsing tests, as covered in Sections 540-120-503 and 540-143-504, will have been made on any switch on which a failure was encountered under the leak test condition on the over-all pulsing test.

1.05 Troubles should be cleared in the sequence in which they are mentioned in Part 3, i.e., magnet pulsing failures first, other leak pulsing failures second, and loop pulsing failures last, regardless of the order in which these failures are disclosed by the routine tests.

1.06 A complete over-all pulsing test should be made, in accordance with Sections 540-120-503 and 540-143-504, on any switch on which trouble has been cleared, before restoring it to service.

1.07 ***The last page of this section consists of a summary of the detailed information included in Part 3.***

2. APPARATUS

2.01 All of the apparatus listed in the section covering pulsing tests for the type of switch involved.

2.02 Pulsing test set J34717A (SD-31481-01).

2.03 35-type test set and associated cords.

2.04 Relay timing test set J94713A (SD-90418-01).

2.05 Tools and gauges required for testing and adjusting 197- and 198-type switches.

2.06 Tools and gauges required for testing and adjusting the relays in the switch circuits.

3. METHOD

A. Failures Indicated on the Magnet Pulsing Test—Motor Mechanism Trouble—Overstepping and Understepping

3.01 If the switch oversteps or understeps on the magnet pulsing test, it may be due to incomplete operation of the magnet armature during the pulse closure period. Reduction of the armature spring tension or cleaning of the armature backstop may correct this trouble. Do not reduce the tension more than the amount required to meet the test. Reduction of the tension more than the amount required may result in a floating

armature (not resting against the backstop) if the pawl spring tension is excessive, in which case replace the pawl spring. The best operation is generally obtained on switches operating on self-interruptions (line finders, level hunting connectors, etc) when the rotary and vertical armature spring tensions are between 300 and 450 grams. On all other switches, the best operation is generally obtained when the rotary and vertical armature spring tensions are between 100 and 300 grams. Do not increase the tensions of the springs more than necessary to insure proper rotary and vertical operation. Measure the tension at the end of the spring, with the magnet armature in the unoperated position.

3.02 If adjustment of the armature spring tension does not correct the overstepping or understepping condition, check the other adjustable mechanical parts which may affect vertical or rotary action.

(a) For vertical action, include a check of the release link requirements, the double dog spring requirements, the vertical magnet position, and the vertical dog requirements. When the vertical magnet is electrically operated and the shaft manually raised so that the vertical pawl rests against the overthrow stop, the gap between the top of the vertical dog and the under surface of the vertical tooth should be just perceptible. This condition is preferable to the maximum requirements specified. Also, the vertical alignment of the vertical dog should be such that, when the armature is released, the drop in the shaft is negligible rather than near the maximum value specified for this requirement; that is, with the magnet electrically operated, the vertical dog should just be able to re-enter after it is manually pulled free from the vertical ratchet and then released.

(b) For rotary action, include a check of the rotary magnet position, rotary pawl frontstop position, rotary pawl guide position, rotary armature play, and rotary dog requirements.

3.03 If overstepping or understepping still occurs, check the armature assembly and replace, if necessary. For vertical action, include a check for vertical pawl play, vertical armature play, and excessive vertical armature travel. For rotary action, include a check for rotary pawl play. In either case, the trouble may be caused by a bowed armature or an armature not having a flat face.

3.04 If the switch still fails to meet the vertical pulsing test, loosen the upper and lower bearing mounting screws, using the 3-inch C screwdriver, and shift the shaft as far to the rear of the switch as the holes in the shaft bearing permit. Tighten the bearing mounting screws securely and recheck requirements involved.

3.05 If unable to adjust the motor mechanism to eliminate vertical or rotary failures, the difficulty may be overcome by substituting one of the later type magnet heel pieces (approximately 1 inch by 1-1/2 inches) for the existing heel piece (if of the narrower type—approximately 1/2 inch by 1-1/2 inches).

3.06 If still unable to adjust the motor mechanism to eliminate vertical or rotary understepping, it may be due to a sluggish release of the vertical or rotary magnet, caused by shorted turns. Substitution of magnet coils may be necessary to disclose this condition.

B. Failures Indicated Under the Leak Condition on the Over-All Pulsing Test—Vertical Failure, Rotary Failure, Premature Cut-in, Overstepping, and Understepping

3.07 If the test failure is the type indicated by the switch cutting in on one of the lower levels, and the switch motor mechanism has passed the magnet test, the C relay may be failing to meet the test requirements. The C relay may have excessive spring tension, excessive front contact follow, excessive residual, or excessive heel gap. Proceed as in 3.08 or 3.09, as the case may be.

3.08 Where a relay timing test set is available, readjust the C relay to meet the readjust timing requirements. The timing requirements of the C relay shall be met with the switch cover on. To meet the timing requirements, it may be necessary to work toward the minimum values specified for those adjustments which affect the holding time, retaining as much of the residual as possible. Also, an occasional relay which meets the readjust timing requirement may fail to hold long enough to permit the switch to pass the

leak A over-all pulsing test and it will be necessary to make further adjustments which increase the holding time. If it is impossible to make the C relay meet the pulsing tests without exceeding the limits of the readjust timing requirements, the A relay may be too slow in releasing. If so, proceed as in 3.11 through 3.14.

3.09 If a timing test set is not available, it may be necessary to completely readjust the C relay in accordance with the mechanical and electrical requirements. In this case, it may be necessary to work toward the minimum values specified for those adjustments which affect the holding time, retaining as much of the residual as possible. If it is impossible to make the C relay meet the pulsing tests without exceeding the readjust requirements, the A relay may be too slow in releasing. If so, proceed as in 3.11 through 3.14.

3.10 If the test failure is the type indicated by the switch failing to rotate beyond one of the lower numbered terminals during rotary pulsing, and the switch motor mechanism has passed the magnet test, the E relay may be failing to meet the test requirements. The probable relay conditions causing the failure, and the adjusting procedures to be followed, are the same as described for the C relay in 3.07 through 3.09.

3.11 If the switch still cuts in on one of the lower levels or fails to rotate beyond one of the lower numbered terminals after the C or E relay has been checked in accordance with 3.07 through 3.10, or if the switch oversteps or understeps during vertical or rotary pulsing, the A relay may be too slow in releasing or chatter may be present on the back contact of the A relay. Slow release may be due to insufficient spring tension, insufficient front contact follow, insufficient residual, insufficient heel gap, or sluggish performance due to binding of the armature lever, stud, or hinge. Chatter may be due to insufficient spring tension or lack of stud gap. In either case, the pulses delivered by the A relay may be too short to permit complete operation of the magnet armature, or to allow the C or E relay to hold during the pulse closure period.

3.12 If necessary, readjust the A relay in accordance with the mechanical and electrical requirements. In some cases, it may be necessary to work toward the maximum value specified for the residual or heel gap.

3.13 If unable to adjust the A relay to meet the test, it may be due to a sluggish release of the relay caused by shorted turns. Substitution of the relay coil may be necessary to disclose this condition.

3.14 If the C or E relay still fails to hold on the pulsing tests, it may be due to a defective relay coil. Substitution of the C or E relay coil may be necessary to disclose this condition.

C. Failures Indicated Under the Loop Condition on the Over-All Pulsing Test—Failure of B Relay to Hold—Fall-Down

3.15 If the test failure is the type indicating that the B relay is not holding during pulsing, such as fall-down of the switch, the B relay may be failing to meet the test requirements. The B relay may have excessive spring tension, excessive front contact follow, excessive residual, or excessive heel gap. Proceed as in 3.16 or 3.17, as the case may be.

3.16 Where a relay timing test set is available, readjust the B relay to meet the readjust timing requirements. In the case of unmodified 222-type relays, to meet the timing requirements it may be necessary to work toward the minimum values specified for those adjustments which affect the holding time, retaining as much of the residual as possible. Also, an occasional relay which meets the timing requirements may fail to hold on the loop over-all pulsing test, and it will be necessary to make adjustments which increase the holding time. If necessary to change the residual, the mechanical requirements of the relay, such as armature travel and contact follow, shall be rechecked. If the B relay still fails to hold on the over-all pulsing test, proceed as in 3.18 through 3.21.

3.17 If a timing test set is not available, it may be necessary to completely readjust the B relay in accordance with the mechanical and electrical requirements. If may be necessary to work toward the minimum values specified for those adjustments which affect the holding time, retaining as much of the residual as possible.

If the B relay still fails to hold on the over-all pulsing test, proceed as in 3.18 through 3.21.

3.18 If the B relay still fails to hold on the over-all pulsing test after it has been checked in accordance with 3.15 through 3.17, the A relay may have excessive spring tension, excessive armature travel, excessive residual, excessive heel gap, insufficient front contact follow, or it may be sticking on the backstop. The A relay may be sluggish in operation due to binding of the armature lever, stud, or hinge, or to shorted turns.

3.19 If necessary, readjust the A relay in accordance with the mechanical and electrical requirements. It may be necessary to work toward the maximum front contact follow which can be obtained while still meeting the contact separation and other mechanical requirements.

3.20 If the 222-type B relay is still unable to meet the test, or if it would be necessary to practically eliminate the residual in order to meet the test, substitute a B relay armature of the 1:1 ratio type.

3.21 Inability to meet the test may be due to a defective coil on the A or B relay. Substitution of both coils may be necessary to disclose this condition unless the A relay coil has already been replaced in meeting the leak condition in 3.13. If necessary to substitute a 222-type B relay coil, replace the entire relay with a 248-type.

D. Slow Release of C Relay—Vertical Kick

3.22 If the test failure is the type indicating that the C relay is not releasing quickly enough after the first digit, such as a vertical kick of the shaft or vertical stepping on the second digit, the relay may have insufficient spring tension, insufficient front contact follow, insufficient residual, or insufficient heel gap.

3.23 If a relay timing test set is available, check the C relay by the timing requirements and readjust as necessary to meet these requirements. In the absence of a timing test set, it may be necessary to completely readjust the relay in accordance with the mechanical and electrical requirements.

E. Understepping

3.24 If the switch is understepping during vertical or rotary pulsing after having met the leak condition, the A relay may be too fast in releasing and the open period of the pulses which it delivers may be too short to permit complete release of the magnet armature. The A relay may have excessive spring tension, excessive front contact follow, excessive residual, or excessive heel gap. If necessary, readjust the A relay in accordance with the mechanical and electrical requirements.

3.25 Understepping may be due to insufficient tension in the armature spring of the vertical or rotary magnet (see 3.01), or to sticky substance on the overthrow stop. It may also be due to shorted turns on the vertical or rotary magnet coils. Substitution of magnet coils may be necessary to disclose this latter condition, unless the substitution has already been made in meeting the magnet pulsing test, as in 3.06.

3.26 Understepping may also be caused by a weak pawl spring. Replacement of the pawl spring may be necessary to disclose this condition. Usually it will be indicated as a probable defect by the fact that, after correction of a leak failure involving readjustment of the A relay or of the magnet, the switch fails on the loop requirement although it had previously met the loop test.

SUMMARY SHEET	Paragraph
A. Magnet Pulsing Test — Motor Mechanism Trouble — Overstepping and Understepping	
(1) Check magnet armature spring tensions. Clean armature backstop. Replace pawl spring if armature floats.	3.01
(2) Vertical action. Check vertical magnet position, and release link, double dog spring, and vertical dog requirements.	3.02(a)
(3) Rotary action. Check rotary magnet position, rotary pawl frontstop position, rotary pawl guide position, rotary armature play, and rotary dog requirements.	3.02(b)
(4) Check armature assembly. Replace if necessary.	3.03
(5) Shift the shaft as far to the rear of switch as possible.	3.04
(6) Substitute wide magnet heel piece for old type.	3.05
(7) Replace magnet coils if necessary.	3.06
B. Failures on Leak—Over-All Pulsing Test	
(1) Vertical Failure — Premature Cut-in, Overstepping, and Understepping.	
(a) Check C relay; timing test; slower release.	3.07 through 3.09
(b) Check A relay; faster release; replace coil if necessary.	3.11 through 3.13
(c) Replace C relay coil if necessary.	3.14
(2) Rotary Failure — Premature Cut-in, Overstepping, and Understepping	
(a) Check E relay; timing test; slower release.	3.10
(b) Check A relay; faster release; replace coil if necessary.	3.11 through 3.13
(c) Replace E relay coil if necessary.	3.14
C. Failures on Loop — Over-All Pulsing Test — Failure of a B Relay to Hold — Fall-Down	
(1) Check B relay; timing test; slower release.	3.15 through 3.17
(2) Check A relay; greater front contact follow; slower release.	3.18 and 3.19
(3) Substitute 1:1 ratio armature on 222-type B relay.	3.20
(4) Replace coils of A and 248-type B relays if necessary. Replace 222-type B relay with 248-type if necessary.	3.21
D. Slow Release of C Relay — Vertical Kick	
(1) Check C relay; timing test; faster release.	3.22 and 3.23
E. Understepping	
(1) Check A relay; slower release.	3.24
(2) Check magnet armature spring tension. Clean overthrow stop. Replace magnet coils if necessary.	3.25
(3) Replace weak pawl spring.	3.26