

PULSE REPEATING RELAYS

PULSING REQUIREMENTS TA1 TO TF2

USING PULSE REPEATING TEST SET J64722A

1. GENERAL

1.01 This section covers the conditions and method for applying pulsing requirements TA1 to TF2 to pulse repeating relays. This section also covers the adjusting procedures to be followed where the relays fail to meet the pulse repeating requirements under the conditions described herein. The relays are associated with circuits in the following groups.

Intertoll dialing outgoing or 2-way trunks

Intertoll keypulsing outgoing or 2-way trunks

Intertoll transmission selectors

Master office trunks associated with intertoll dialing

CX or SX signaling circuits associated with intertoll dialing or keypulsing trunks at the intertoll dialing office end or associated with pulse link circuits included in intertoll dialing for through pulsing facilities

Toll switching or outgoing trunks associated with intertoll dialing

Pulse corrector circuits associated with intertoll dialing trunk circuits

1.02 This section is reissued to make minor revisions in Fig. 1 and 2, to add requirements TA6 and TA8 to Table A, to revise Table B including the addition of a number of SD circuit drawings, to specify the use of a 5L dial in 4.11, to describe the application of requirements TA6 and TA8 in Part 5, to add reference to the 280-type relay in Part 6, and to bring the section generally up to date.

1.03 The tests are based upon the use of pulse repeating test set J64722A (SD-64540-01) with or without the use of the pulsing test set J34717A (SD-31481-01).

1.04 Requirements TA, TB, etc, each refer to a particular testing and patching arrangement whereby the pulse repeating test set is connected to the operating winding and to the pulsing contacts of the relay under test. The numerical digit associated with each requirement TA1, TA2, etc, refers in each case to the per cent break of the pulses applied to the relay. Digit "1" represents 64 per cent break, digit "2" represents 59 per cent break, digit "3" represents 58 per cent break, digit "6" represents 29 per cent break, and digit "8" represents 40 per cent break.

1.05 The per cent break values specified in this section are based on office battery limits of 24 to 26 volts for 24-volt battery, 36 to 38 volts for the 38-volt battery, and 48.5 to 50 volts for the 48-volt battery.

Per Cent Break Input to the Relay

1.06 The per cent break input of the pulses applied to the relay under test is controlled by the pulse repeating test set. Pulses at the rate of 12 pps or 6 pps are furnished to the pulse repeating test set by the pulsing test set, where the latter is available. Where the pulsing test set is not available, a dial is used as the source of pulses. For 12 pps a dial adjusted to a speed of 11.9 to 12.1 pps and mounted in the connecting block of the pulse repeating test set should be used. For lower speed a 5-type dial (preferably a 5L type) adjusted to 8 pps and patched into the INT jack of the pulse repeating test set should be used.

1.07 Keys are provided in the pulse repeating test set for the purpose of placing resistances in series with the pulsing input to the relay. These keys are designated 800, 1200, and 3000 and may be operated singly or in combination to control resistances corresponding to these values.

Per Cent Break Output of the Relay

1.08 The pulse repeating test set is also used to measure the output of the relay under test, a per cent break meter reading from zero (0) to one hundred (100) being provided for this purpose.

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2. REQUIREMENTS

2.01 Table A defines the per cent break of the pulses which shall be applied to the relays under test for each of the requirements TA1 to TF2. The table also indicates the jacks in the associated circuit and in the pulse repeating test set which, when patched together, provide the necessary circuit arrangements for applying the pulses.

TABLE A

Require-ments	Jack Providing Access to Relay	Corres Jack in Pulse Rep Test Set	Per Cent Break Input to Relay
TA1	C	RLY	64
TA2	C	RLY	59
TA6	C	RLY	29
TA8	C	RLY	40
TB2	(T (A	SX OUT LP IN	59
TC1	T	(LP OUT (LP IN	64
TD2	T	(SX OUT (LP IN	59
TE3	(TST (PLS	RCX RLY	58
TF2	TEST*	(SX OUT (LP IN	59

* 6-point jack not designated

2.02 When pulses are applied to the pulse repeating relay under conditions described in requirements TA1, TA2, etc., the per cent break output of the relay should meet the requirements specified in the circuit requirements table on the circuit drawing where provided. Where the requirements are not shown on the circuit drawing, the limits given in Table B of this practice should be used.

2.03 Two general types of circuits are installed in the plant. One type has an adjustable biasing resistance for use with pulse repeating requirements, and the circuit drawing specifies that this resistance shall be adjusted to obtain the required per cent break output. The other type, in general, the earlier of the two, does not have this adjustable biasing resistance. If the circuit drawing shows the adjusting biasing resistance and it has been provided in the office, the limits shown on the drawing should be used. If the drawing shows this adjustable biasing resistance and it is not provided in the office, the limits specified in Table B should be used. If the circuit drawing does not show the adjustable biasing resistance, but per cent break output requirements are specified, the requirements on the drawing should be used. If the per cent break output requirements are not specified on the circuit drawing, the limits specified in Table B should be used.

TABLE B

Circuit	Require-ments	Fig. No. Wiring or Strap	Dummy Plug in Jack	Output Per Cent Break Limits	See Note
SD-55080-01	TD2	-	C	57-61	
SD-55086-01	TD2	A	B	57-61	
SD-55087-01	TD2	-	B	55-59	
SD-55088-01	TD2	A	A	55-59	
SD-55109-01	See circuit requirements table				
SD-55130-01	TE3	-	MB	58-62*	
SD-55130-01	TE3	-	MB	60-64	
SD-55275-01	See circuit requirements table				
SD-55301-01	See circuit requirements table				
SD-55379-01	See circuit requirements table				
SD-55415-01	TE3	4	MB	60-64	2
SD-55415-01	TE3	-	MB	58-62*	
SD-55530-01	See circuit requirements table				
SD-64469-01	See circuit requirements table				
SD-64471-01	TD2	T	B	60-64	
SD-64471-01	TD2	S	B	56-61	
SD-64471-01	TD2	R & S	B	58-62	
SD-64471-01	TD2	No Strap		56-61	
SD-64472-01	See circuit requirements table				

*239-type relays

TABLE B (Contd)

<u>Circuit</u>	<u>Require- ments</u>	<u>Fig. No. Wiring or Strap</u>	<u>Dummy Plug in Jack</u>	<u>Output Per Cent Break Limits</u>	<u>See Note</u>
SD-64473-01		See circuit requirements table			
SD-64474-01		See circuit requirements table			
SD-64475-01	TA1	-	-	56-61	
SD-64482-01		See circuit requirements table			
SD-64484-01	TA1	-	-	56-61*	
SD-64484-01	TA1	-	-	57-59	
SD-64485-01		See circuit requirements table			
SD-64487-01		See circuit requirements table			
SD-64531-01		See circuit requirements table			
SD-64538-01		See circuit requirements table			
SD-64574-01	TD2	A or H	C	55-59	
SD-64584-01	TD2	A or B	C	55-59	
SD-64606-01	TD2	A or B	C	55-59	
SD-64630-01	TD2	T or R	C	57-61	
SD-64644-01	TD2	T or R	C	57-61	
SD-64645-01	TD2	T or R	C	55-59	
SD-64645-02	TD2	T or R	C	57-61	
SD-64646-01	TD2	-	C	55-59	
SD-64649-01	TD2	T or R	C	57-61	
SD-64662-01	TA1	-	-	56-61	
ES-64663-01	TA1	-	-	56-61	
ES-64666-01	TD2	-	B	61-65	
ES-64678-01	TA1	-	-	56-61	
ES-64679-01	TD2	-	B	61-65	
SD-64680-01		See circuit requirements table			
SD-64680-01	TA1	-	-	56-61	
SD-64682-01	TE3	-	MB	60-64	4
SD-64824-01		See circuit requirements table			
SD-64832-01	TD2	Fig. D or E	-	-	
SD-64832-01	TD2	Strap E	B	56-61	
SD-64832-01	TD2	Strap F	B	58-62	
SD-64832-01	TD2	Strap G	B	60-64	
SD-64832-01	TD2	Strap H	B	56-61	
ES-64856-01	TD2	-	B	58-62	
SD-64899-02	TD2	-	B	56-61	
SD-95028-01	TE3	-	MB	62-72	
SD-95028-02	TE3	-	MB	62-72	
SD-95028-03	TE3	-	MB	62-72	
SD-95029-01	TE3	-	MB	62-72	
SD-95029-02	TE3	-	MB	62-72	
SD-95048-01	TE3	-	MB	55-68	
SD-95048-01	TE3	-	MB	62-72*	
SD-95051-01	TE3	-	MB	55-68*	2 & 3
SD-95051-01	TE3	-	MB	62-72	
SD-95053-01	TE3	-	MB	55-68	1
SD-95060-01		See circuit requirements table			
SD-95067-01	TE3	-	PLS	57-59	
SD-95095-01		See circuit requirements table			
SD-95311-01		See circuit requirements table			

*239-type relays

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TABLE B (Contd)

Notes

1. Check SD circuit requirements table, charts, or circuit notes for further information to make proper break limit tests.
2. The pulse repeating relay should be checked in accordance with adjustment A or B, as covered in the section for the particular relay involved.
3. Strap ring and sleeve of TST jack of SD-95051-01, if "K" option is not provided.
4. Supplementary check with test panel for 209-type relays may be necessary where circuit conditions are severe.

3. APPARATUS

3.01 The apparatus required for applying each requirement is shown in the following list. The details for each item are covered in the indicated paragraphs.

Apparatus	Requirements					
	TA	TB	TC	TD	TE	TF
Pulse repeating test set J64722A (SD-64540-01)	1	1	1	1	1	1
Pulsing test set J34717A (SD-31481-01)	1	1	1	1	1	1
P2J cord (2P9A cord) (a)	1	1	1	1	1	1
P2J cord (2P9A cord)* (b)	1	1	1	1	1	1
P4N cord (4P8A cord)* (c)	1	1	1	1	1	1
-P3E cord (3P7A cord)* (d)	1	1	1	1	1	1
No. 36B (remote control) test set	1	1	1	1	1	1
-No. 310 plug (T and R shorted)* (e)	1	1	1	1	1	1
P3E cord (3P6F cord) (f)	1	1			2	
P3H cords (5P3A cord) (g)		1				1
P3H cords (6P4B cord) (h)			1	1		
No. 258C (dummy plug)			1	1	1	
-5-type dial and cord (i)	1					

* Used if pulsing test set is available

- (a) P2J cord, 9 feet long, equipped with two No. 310 plugs (2P9A cord).
- (b) P2J cord, 9 feet long, equipped with two No. 310 plugs (2P9A cord).
- (c) P4N cord, 4 feet long, equipped with two No. 289B plugs (4P8A cord).
- (d) P3E cord, 6 feet long, equipped with two No. 310 plugs (3P7A cord).

- (e) No. 310 plug, with tip and ring short-circuited.
- (f) P3E cord, 10 feet long, equipped with two No. 310 plugs (3P6F cord).
- (g) Two P3H cords, 10 feet long, equipped with two No. 310 plugs (black shell and red shell) and a No. 240B plug (5P3A cord).
- (h) Two P3H cords, 10 feet long, each equipped with two No. 310 plugs and a No. 240C plug (6P4B cord).
- (i) 5L-type dial and S3B cord, 10 feet long, equipped with one No. 310 plug and two No. 131 cord tips (3W1A cord). Connect the white (tip) conductors to the B terminal of the 5-type dial and connect the black (ring) conductors to the Y terminal of the dial.

4. TEST SET PREPARATION

With Pulse Repeating and Pulsing Test Sets

4.01 Connect pulse repeating test set BAT jack to a 48-volt battery supply jack using a P2J cord.

Note: To avoid grounding of the battery supply leads connect cord to the test set first and when disconnecting, remove cord from test set last.

4.02 Connect pulsing test set BAT G jack to a 48-volt battery supply jack using a P2J cord (see note, 4.01).

4.03 Patch pulsing test set A and B jacks to the pulse repeating test set A and B jacks using the P4N cord.

4.04 Patch pulsing test set TL jack to the pulse repeating test set INT jack using the 6-foot P3E cord.

4.05 Insert plug of No. 36B (remote control) test set into pulse repeating test set A1 and B1 jacks.

4.06 Operate the pulsing test set PR key, if provided; otherwise operate the CHK PLS key. Operate the pulse repeating test set DS and PLS CK key and momentarily operate the remote control set LK key.

4.07 Check that the pulse repeating test set per cent break meter reads 100 on the scale. (This is the no-current position.) If necessary, bring the reading to 100 by means of the zero adjusting screw on the meter, then back off the screw slightly.

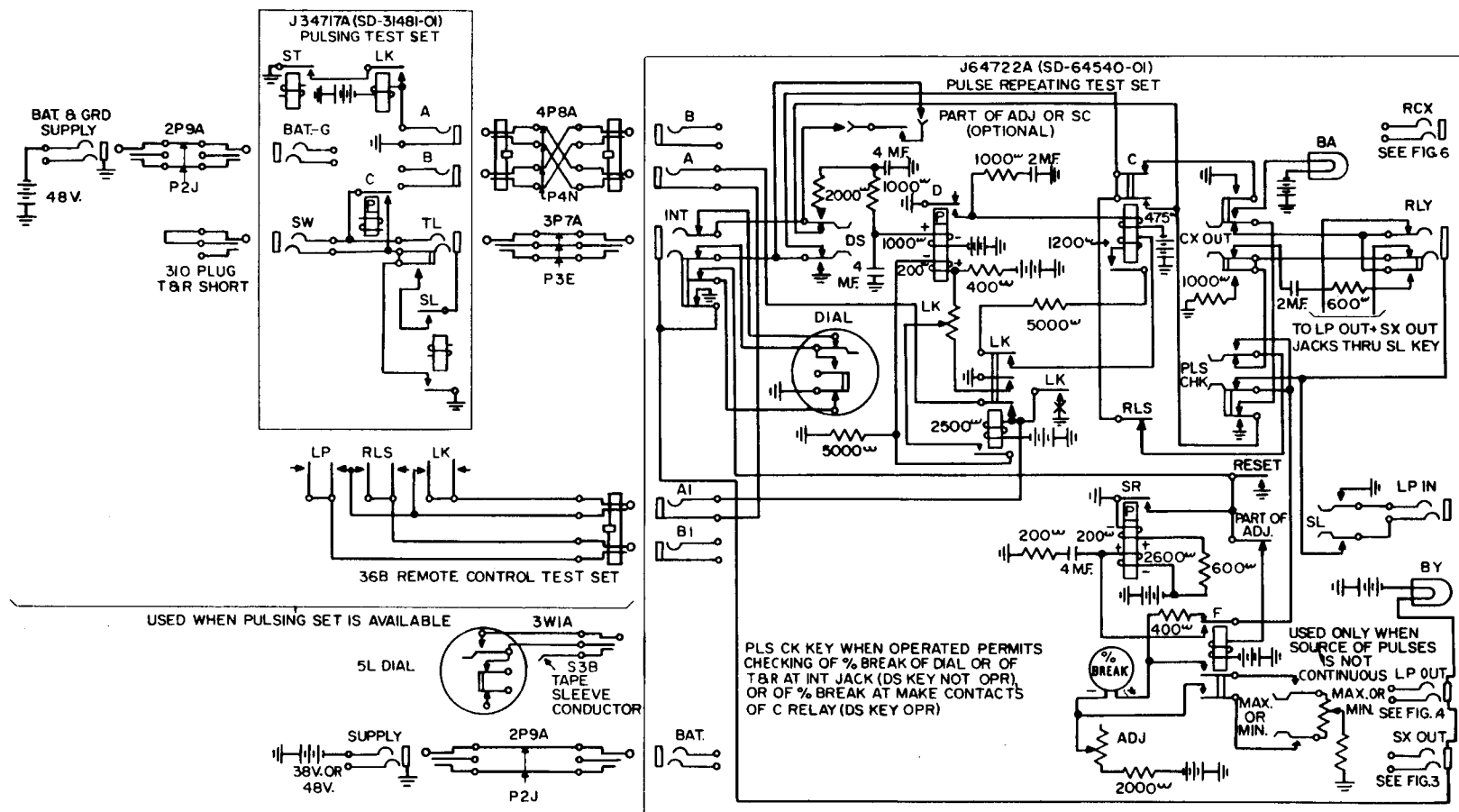


Fig. 1 - General Test Set Arrangement for Applying Requirements TA1 to TF2

Next, check the per cent break meter zero readings. (This is the full-current position.) To check the reading, if the test set is not equipped with an SC key, operate the ADJ key; if the test set is equipped with an SC key, insert the No. 310 short-circuited plug into the pulsing test set SW jack. Set the ADJ potentiometer so that the per cent break meter reads zero

Note: The zero reading of the meter should be checked from time to time as described above to guard against the possibility of getting inaccurate readings due to changes in office battery voltage.

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- 4.08 Release the pulse repeating test set
ADJ key or remove the No. 310 plug
from the pulsing test set SW jack.
- 4.09 The per cent break meter will now read
the output of the pulse repeating
test set.

With Pulse Repeating Test Set Only

- 4.10 Connect pulse repeating test set BAT jack to a 38- or 48-volt battery supply jack, using a P2J cord. For No. 9C offices operate the 38V key. (See note, 4.01.)
- 4.11 With a dial which has been previously adjusted to a speed 11.9 to 12.1 pps inserted in the connecting block of the pulse repeating test set, operate the PLS CK and "DS" keys. Where 8 pps requirement is desired, a 5L-type dial (adjusted to 8 pps) attached to the S3B cord and plugged into the INT jack should be used. Operate the PLS CK, DS, and RESET keys.
- 4.12 Operate the ADJ key. Set the potentiometer so that the per cent break meter reads zero. (See note, 4.07.) Release the ADJ key.

5. METHODS OF CHECKING REQUIREMENTS

Requirement TA1, TA2, TA6, or TA8

→ (See Fig. 2)

- 5.01 Check that the circuit to be tested is idle. Make it busy in the approved manner; then using the 10-foot P3E cord, patch the pulse repeating test set RLY jack to the C jack associated with the pulsing relay to be tested.

With Pulse Repeating and Pulsing Test Sets

- 5.02 Adjust the LK potentiometer so that the per cent break meter reads 64 per cent for requirement TA1, 59 per cent for requirement TA2, or with the 6 pps key operated 29 per cent for requirement TA6. Restore the PLS CK key in the pulse repeating test set. Check the zero setting as described in 4.07 and 4.08. Continuous pulses are now being applied to the relay under test and the per cent break meter will read in accordance with the per cent break output of the relay contacts. This reading should fall within the limits given in the circuit requirement table or Table B, Part 2 of this section. If the reading does not fall within the limits specified, the relay or its biasing resistance is in need of adjustment.

With Pulse Repeating Test Set Only

- 5.03 Operate the MAX and LK keys. Set the MAX potentiometer so that per cent break meter reads 64 per cent for requirement TA1, 59 per cent for requirement TA2, or 40 per cent for requirement TA8. Dial zero and note whether meter reading tends to rise or fall during the return of the dial, disregarding a possible slight kick at the beginning or end of the pulse train. If the reading shows a tendency to drop, turn the LK potentiometer knob in a clockwise direction, and if the reading tends to rise, turn

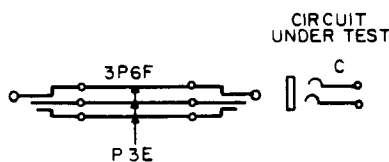
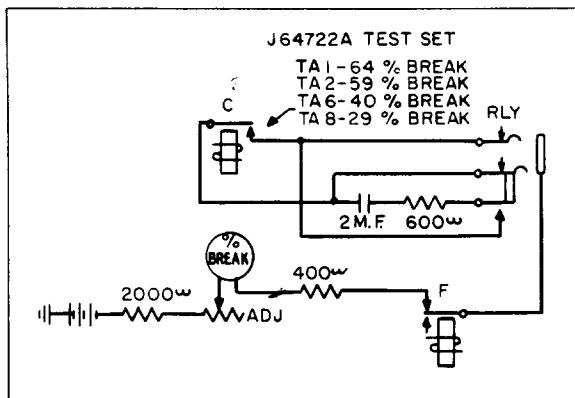


Fig. 2 - Patching Arrangement for Applying
Requirements TA1, TA2, TA6, or TA8
Keys Operated - DS, LK

the knob in a counterclockwise direction. By a series of trials in dialing zero, adjust the LK potentiometer so that the readings show little or no deflection during the return of the dial from the preset value.

5.04 Operate MIN key and adjust MIN potentiometer so that per cent break meter reads in accordance with the lower limits of per cent break output given in the circuit requirements table or in Table B, Part 2 of this section.

5.05 Operate the MAX key and adjust the MAX potentiometer so that the per cent break meter reads in accordance with the upper limits of per cent break output given in the circuit requirements table or in Table B, Part 2 of this section. Restore the MAX key.

5.06 Restore the PLS CK key. Check the zero setting as described in 4.12.

5.07 With the key in the MAX position, dial zero several times, observing each time whether the per cent break meter pointer tends to rise, fall, or remain stationary. Disregard a possible slight kick of the pointer at the beginning or at the end of each pulse train.

5.08 The pointer should either remain stationary or should show a tendency to fall. If it shows a tendency to rise, the indication is that the per cent break output of the relay is above the specified upper limits and the relay or its biasing resistance is in need of adjustment.

5.09 Operate the MIN key and dial zero several times observing each time whether the pointer of the per cent break meter tends to rise, fall, or remain stationary. Disregard a possible slight kick of the pointer at the beginning or ending of each pulse train.

5.10 The pointer should either remain stationary or show a tendency to rise. If it shows a tendency to fall, the indication is that the per cent break output of the relay is below the specified lower limits and the relay or its biasing resistance is in need of adjustment.

5.11 If it is desired to obtain the actual per cent break output of the relay instead of determining whether the output is within specified upper and lower limits as just described, dial zero several times, each time readjusting slightly the MIN potentiometer in the direction indicated by the rising or falling pointer of the per cent break meter during the return of the dial. After a number of trials, a setting of the MIN potentiometer will be found which will allow the pointer to remain stationary, or nearly so, during the return of the dial, except for possible slight kicks at the beginning or at the end of the pulse trains. The reading of the meter under this condition corresponds to the actual per cent break output of the relay.

5.12 At the conclusion of the tests restore all keys and remove all plugs. Restore the associated circuit to service.

Requirement TB2 (See Fig. 3)

5.13 Insert the red shell plug of the P3H cord attached to the No. 240B plug into the pulse repeating test set SX OUT jack. Insert the No. 240B plug into the T jack associated with the pulsing relay to be tested. The black shell plug is not used for this test. If the trunk is busy, the BY lamp will light, in which case the plug may either be removed in order to proceed with other tests, or it may be left in the jack and the test delayed until the lamp is extinguished.

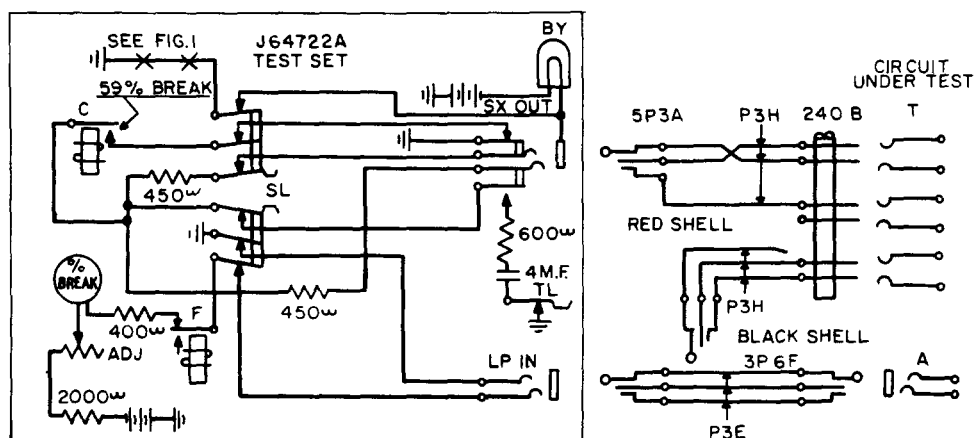


Fig. 3 - Patching Arrangements for Applying Requirement TB2 Keys Operated - DS, LK, SL

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- 5.14 Operate the SL key. Disregard the lighting of the BY lamp.
- 5.15 Using a P3E cord, 10 feet long, patch the pulse repeating test set LP IN jack to the A jack associated with the pulsing relay to be tested.

With Pulse Repeating and Pulsing Test Set

- 5.16 Adjust the LK potentiometer so that the per cent break meter reads 59 per cent. Restore the pulse repeating test set PLS CK key. Check the zero setting as described in 4.07 and 4.08. Continuous pulses are now being applied to the relay under test and the per cent break meter will read in accordance with the per cent break output of the relay. This reading should fall within the limits given in the circuit requirements table or in Table B, Part 2 of this section. If the reading does not fall within the limits specified, a failure is indicated and the relay or its biasing resistance is in need of adjustment.

With Pulse Repeating Test Set Only

- 5.17 Operate the MAX and LK keys. Set the MAX potentiometer so that the per cent break meter reads 59 per cent. Dial zero and note whether the meter reading tends to rise or fall during the return of the dial, disregarding a possible slight kick at the beginning or end of the pulse train. If the reading shows a tendency to drop, turn the LK potentiometer knob in a clockwise direction, and if reading tends to rise, turn knob in a counterclockwise direction. By a series of trials in dialing zero, adjust the LK potentiometer so that the reading shows little or no tendency to rise or fall during the return of the dial from the preset value.
- 5.18 Operate the MIN key and adjust the MIN potentiometer so that the per cent break meter reads in accordance with the lower limits of per cent break output given in the circuit requirement table or in Table B, Part 2 of this section.
- 5.19 Operate the MAX key and adjust the MAX potentiometer so that the per cent break meter reads in accordance with the upper limits of per cent break output given in the circuit requirement table or in Table B, Part 2 of this section.
- 5.20 Restore the PLS CK key. Check the zero setting as described in 4.12.
- 5.21 With the key in MAX position, dial zero several times, observing each time whether the pointer of the per cent break meter tends to rise, fall, or remain stationary. Disregard a possible slight kick of pointer at beginning or at the end of each pulse train.
- 5.22 The pointer should either remain stationary or it should show a tendency to fall. If it shows a tendency to rise, the

indication is that the per cent break output of the relay is above the specified upper limits and the relay or its biasing resistance is in need of adjustment.

- 5.23 Operate the MIN key and dial zero several times, observing each time whether the pointer of the per cent break meter tends to rise, fall, or remain stationary. Disregard a possible slight kick of the pointer at the beginning or at the end of each pulse train.

- 5.24 The pointer should either remain stationary or should show a tendency to rise. If it shows a tendency to fall, the indication is that the per cent break output of the relay is below the specified lower limits and the relay or its biasing resistance is in need of adjustment.

- 5.25 If it is desired to obtain the actual per cent break output of the relay instead of determining whether the output is within the specified upper and lower limits as just described, dial zero several times, each time readjusting slightly the MIN potentiometer in the direction indicated by the rising or falling pointer of the per cent break meter during the return of the dial. After a number of trials, a setting of the MIN potentiometer will be found which will allow the pointer to remain stationary, or nearly so, during the return of the dial, except for possible slight kicks at the beginning or at the end of the pulse trains. The reading of the meter under this condition corresponds to the actual per cent break output of the relay.

- 5.26 At the conclusion of the tests restore all keys and remove all plugs.

Requirement TC1 (See Fig. 4)

- 5.27 Insert the red shell plug of the P3H cord attached to the No. 240C plug into the pulse repeating test set LP OUT jack and insert the black shell plug into the LP IN jack. Insert the No. 240C plug into the T jack associated with the relay to be tested. If the trunk is busy, the BY lamp will light, in which case the No. 240C plug may either be removed in order to proceed with other tests, or it may be left in the jack and the test delayed until the lamp is extinguished.

- 5.28 Operate the SL key. Disregard the lighting of the BY lamp.
- 5.29 Insert a No. 258C plug into the jack specified for this purpose on the circuit requirements table or as specified in Table B.

With Pulse Repeating and Pulsing Test Sets

- 5.30 Adjust the LK potentiometer so that the per cent break meter reads 64 per cent. Restore the pulse repeating test set PLS CK key. Check the zero setting as de-

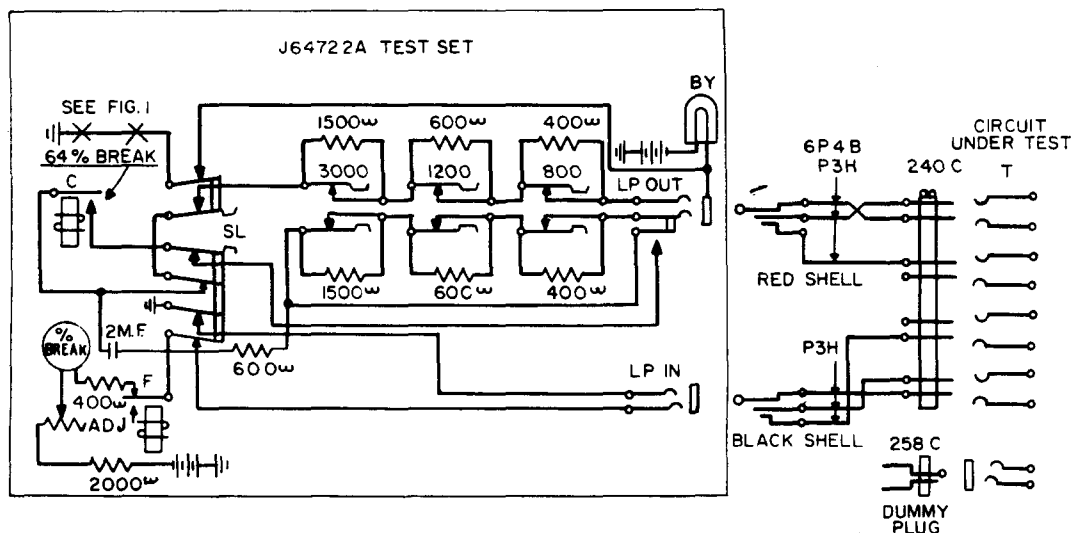


Fig. 4 - Patching Arrangements for Applying Requirements TC1
Keys Operated - DS, LK, SL

scribed in 4.07 and 4.08. If it is desired to simulate loop resistance, operate the keys designated 800, 1200, or 3000, singly or in combination, corresponding to the loop resistance for which the circuit under test is strapped. Continuous pulses are now being applied to the relay under test and the per cent break meter will read in accordance with the present break output of the relay. This reading should fall within the limits given in the circuit requirement table or in Table B, Part 2 of this section. If the reading does not fall within the limits specified, a failure is indicated and the relay or its biasing resistance is in need of adjustment.

With Pulse Repeating Test Set Only

5.31 Operate the MAX and LK keys. Set the MAX potentiometer so that the per cent break meter reads 64 per cent. Dial zero and note whether the reading of the meter tends to rise or to fall during the return of the dial. Disregard a possible slight kick at the beginning or end of the pulse train. If the reading shows a tendency to drop, turn the LK potentiometer knob in a clockwise direction, and if the reading tends to rise, turn the knob in a counterclockwise direction. By a series of trials in dialing zero adjust the LK potentiometer so that the readings show little or no tendency to rise or fall during the return of the dial from the preset value.

5.32 Operate the MIN key and adjust the MIN potentiometer so that the per cent break meter reads in accordance with the lower limits of per cent break output given in the circuit requirement table or in Table B, Part 2 of this section.

5.33 Operate the MAX key and adjust the MAX potentiometer so that the per cent break meter reads in accordance with the upper limits of per cent break output given in the circuit requirement table or in Table B, Part 2 of this section.

5.34 Restore the PLS CK key. Check the zero reading as described in 4.12. If it is desired to simulate loop resistance, operate the keys designated 800, 1200, or 3000, singly or in combination, corresponding to the loop resistance for which the circuit under test is strapped.

5.35 With the key in MAX position dial zero several times, observing each time whether the pointer of the per cent break meter tends to rise, fall, or remain stationary. Disregard a possible slight kick of the pointer at the beginning or at the end of each pulse train.

5.36 The pointer should either remain stationary or it should show a tendency to fall. If it shows a tendency to rise, the indication is that the per cent break output of the relay is above the specified upper limits and the relay or its biasing resistance is in need of adjustment.

5.37 Operate the MIN key and dial zero several times, observing each time whether the pointer of the per cent break meter tends to rise, fall, or remain stationary. Disregard a possible slight kick of the pointer at the beginning or end of each pulse train.

5.38 The pointer should either remain stationary or it should show a tendency to rise. If it shows a tendency to fall, the indication is that the per cent break output

of the relay is below the specified lower limits and the relay or its biasing resistance is in need of adjustment.

5.39 If it is desired to obtain the actual per cent break output of the relay instead of determining whether the output is within the specified upper and lower limits as just described, dial zero several times, each time readjusting slightly the MIN potentiometer in the direction indicated by the rising or falling pointer of the per cent break meter during the return of the dial. After a number of trials, a setting of the MIN potentiometer will be found which will allow the pointer to remain stationary or nearly so during the return of the dial except for possible slight kicks at the beginning or at the end of the pulse trains. The reading of the meter under this condition corresponds to the actual per cent break output of the relay.

5.40 At the conclusion of the test restore all keys and remove all plugs.

Requirement TD2 (See Fig. 5)

5.41 Insert the red shell plug of the P3H cord attached to the No. 240C plug into the pulse repeating test set SX OUT jack, and insert the black shell plug into the LP IN jack. Insert the No. 240C plug into the T jack associated with the relay to be tested. If the circuit is busy, the BY lamp will light, in which case the No. 240C plug may either be removed in order to proceed with other tests, or it may be left in the jack and the test delayed until the lamp is extinguished.

5.42 Operate the SL key. Disregard the lighting of the BY lamp.

5.43 Insert a No. 258C plug into the jack specified for this purpose on the circuit requirement table or as specified in Table B.

With Pulse Repeating and Pulsing Test Sets

5.44 Adjust the LK potentiometer so that the per cent break meter reads 59 per cent. Restore the pulse repeating test set PLS CK key. Check the zero setting as described in 4.07 and 4.08. Continuous pulses are now being applied to the relay under test and the per cent break meter will read in accordance with the per cent break output of the relay. This reading should fall within the limits given in the circuit requirement table or in Table B, Part 2 of this section. If the reading does not fall within the limits specified, a failure is indicated and the relay or its biasing resistance is in need of adjustment.

With Pulse Repeating Test Set Only

5.45 Operate the MAX and LK keys. Set the MAX potentiometer so that the per cent break meter reads 59 per cent. Dial zero and note whether the reading of the meter tends to rise or fall during the return of the dial, disregarding a possible slight kick at the beginning or end of the pulse train. If the reading shows a tendency to drop, turn the LK potentiometer knob in a clockwise direction and if the reading tends to rise, turn the knob in a counterclockwise direction. By a series of trials in dialing zero adjust the LK potentiometer so that the readings show little or no tendency to rise or fall during return of the dial from the preset value.

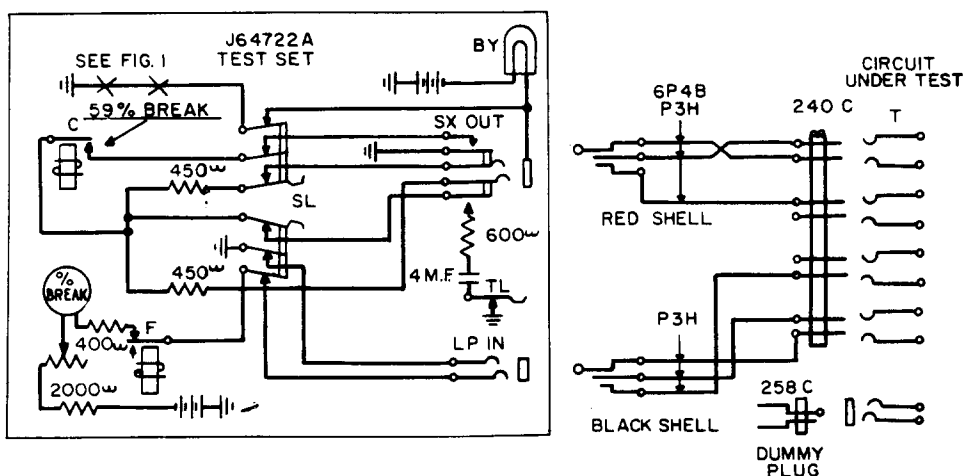


Fig. 5 - Patching Arrangement for Applying Requirement TD2
Keys Operated - DS, LK, SL

- 5.46 Operate the MIN key and adjust the MIN potentiometer so that the per cent break meter reads in accordance with the lower limits of per cent break output given in the circuit requirements table or in Table B, Part 2 of this section.
 - 5.47 Operate the MAX key and adjust the MAX potentiometer so that the per cent break meter reads in accordance with the upper limit of per cent output given in the circuit requirements table or in Table B, Part 2 of this section.
 - 5.48 Restore the PLS CK key. Check the zero reading as described in 4.12.
 - 5.49 With the key in the MAX position, dial zero several times, observing each time whether the pointer of the per cent break meter tends to rise, fall, or remain stationary. Disregard a possible slight kick of the pointer at the beginning or end of each pulse train.
 - 5.50 The pointer should either remain stationary or show a tendency to fall. If it shows a tendency to rise, the indication is that the per cent break output of the relay is below the specified upper limits and the relay or its biasing resistance is in need of adjustment.
 - 5.51 Operate the MIN key and dial zero several times observing each time whether the pointer of the per cent break meter tends to rise, fall, or remain stationary. Disregard a possible slight kick of the pointer at the beginning or end of each pulse train.
 - 5.52 The pointer should either remain stationary or it should show a tendency to rise. If it shows a tendency to fall, the indication is that the per cent break output of the relay is below the specified lower limits, and the relay or its biasing resistance is in need of adjustment.
 - 5.53 If it is desired to obtain the actual per cent break output of the relay instead of determining whether the output is within the specified upper and lower limits as just described, dial zero several times, each time readjusting slightly the MIN potentiometer in the direction indicated by the rising or falling pointer of the per cent break meter during the return of the dial. After a number of trials a setting of the MIN potentiometer will be found which will allow the pointer to remain stationary, or nearly so, during the return of the dial except for possible slight kicks at the beginning or end of the pulse trains. The reading of the meter under this condition corresponds to the actual per cent break output of the relay.
 - 5.54 At the conclusion of the tests restore all keys and remove all plugs.
- Requirement TE3 (See Fig. 6)
- 5.55 Check that the associated trunk is idle. If idle, make it busy in the approved manner.
 - 5.56 Insert a No. 258C plug into the MB jack associated with the relay to be tested.
 - 5.57 Using a F3E cord, 10 feet long, batch the pulse repeating test set RCX jack to the TST jack associated with relay to be tested.
 - 5.58 Using a F3E cord, 10 feet long, patch the pulse repeating test set RLY jack to the PLS jack associated with relay to be tested.

Requirement TE3 (See Fig. 6)

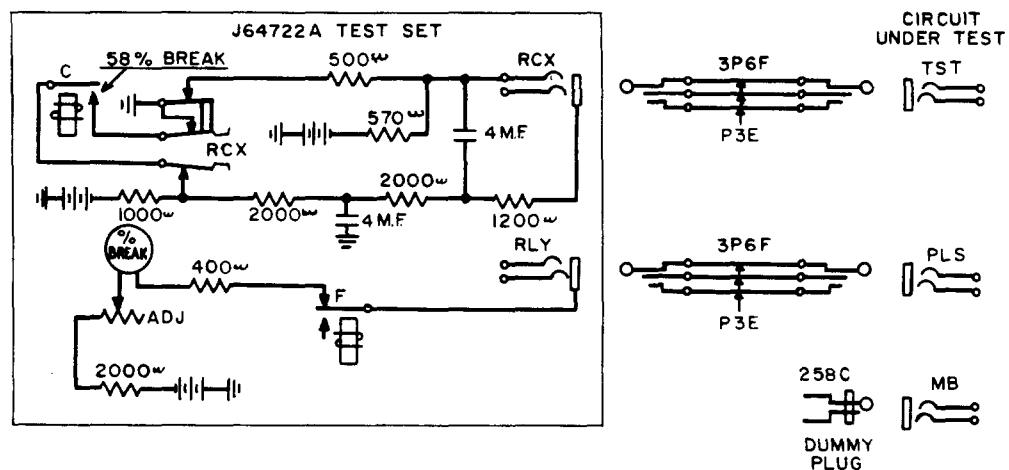


Fig. 6 - Pulsing Arrangement for Applying Requirement TE3
Keys Operated - DS, LK, RCX

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5.59 Operate the RCX key.

With Pulse Repeating and Pulsing Test Sets

5.60 Adjust the LK potentiometer so that the per cent break meter reads 58 per cent. Restore the pulse repeating test set PLS CK relay. Check the zero reading as described in 4.07 and 4.08.

Note: Where difficulty is met in obtaining a zero setting, it may be due to the fact that the connecting circuit does not place a solid ground on the armature of the relay. In this case, ground the F lead of the circuit for the purpose of this test.

5.61 Continuous pulses are now being applied to the relay under test and the per cent break meter will read in accordance with the per cent break output of the relay. This reading should fall within the limits given in the circuit requirement table or in Table B, Part 2 of this section. If the reading does not fall within the limits specified, a failure is indicated and the relay or its biasing resistance is in need of adjustment.

With Pulse Repeating Test Set Only

5.62 Operate the MAX and LK keys. Set the MAX potentiometer so that the per cent break meter reads 58 per cent. Dial zero and note whether the reading of the meter tends to rise or fall during the return of the dial, disregarding a possible slight kick at the beginning or end of the pulse train. If the reading shows a tendency to drop, turn the LK potentiometer knob in a clockwise direction and if the reading tends to rise, turn the knob in a counterclockwise direction. By a series of trials in dialing zero, adjust the LK potentiometer so that the reading shows little or no tendency to rise or to fall during the return of the dial from the preset value.

5.63 Operate the MIN key and adjust the MIN potentiometer so that the per cent break meter reads in accordance with the lower limits of per cent break output given in the circuit requirement table or in Table B, Part 2 of this section.

5.64 Operate the MAX key and adjust the MAX potentiometer so that the per cent break meter reads in accordance with the upper limits of per cent break output given in the circuit requirement table or in Table B, Part 2 of this section. Restore the PLS CK key. Check the zero setting as described in 4.12. (See note, 5.60.)

→5.65 With the key in the MAX position dial zero several times, observing each time whether the pointer of the per cent break

meter tends to rise, fall, or remain stationary. Disregard a possible slight kick of the pointer at the beginning or end of each pulse train.

5.66 The pointer should either remain stationary or it should show a tendency to fall. If it shows a tendency to rise, the indication is that the per cent break output of the relay is above the specified upper limits, and the relay or its biasing resistance is in need of adjustment.

5.67 Operate the MIN key and dial zero several times, observing each time whether the pointer of the per cent break meter tends to rise, fall, or remain stationary. Disregard a possible slight kick of the pointer at the beginning or end of each pulse train.

5.68 The pointer should either remain stationary or it should show a tendency to rise. If it shows a tendency to fall, the indication is that the per cent break output of the relay is below the specified lower limits, and the relay or its biasing resistance is in need of adjustment.

5.69 If it is desired to obtain the actual per cent break output of the relay instead of determining whether the output is within the specified upper and lower limits as just described, dial zero several times, each time readjusting slightly the MIN potentiometer in the direction indicated by the rising or falling pointer of the per cent break meter during the return of the dial. After a number of trials, a setting of the MIN potentiometer will be found which will allow the pointer to remain stationary, or nearly so, during the return of the dial except for possible slight kicks at the beginning or at the end of the pulse train. The reading of the meter under this condition corresponds to the actual per cent break output of the relay.

5.70 At the conclusion of the tests restore all keys and remove all plugs. Restore the associated circuit to service.

Requirement TF2 (See Fig. 7)

5.71 Insert the red shell plug of the P3H cord attached to the No. 240B plug into the pulse repeating test set SX OUT jack and insert the black shell plug into the LP IN jack. Insert the No. 240B plug into the selector test jack associated with the relay to be tested. If the selector is busy the BY lamp will light, in which case the No. 240B plug may either be removed in order to proceed with other tests or it may be left in the test jack and the test delayed until the lamp is extinguished.

5.72 Operate the SL key. Disregard the lighting of the BY lamp.

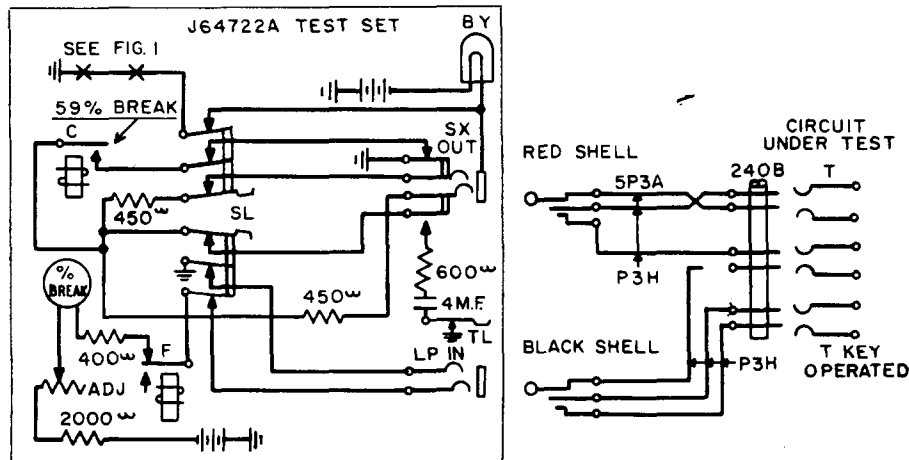


Fig. 7 - Pulsing Arrangement for Applying Requirement TF2
Keys Operated - DS, LK, SL

- 5.73 Operate the T key associated with the selector.

With Pulse Repeating and Pulsing Test Sets

- 5.74 Adjust the LK potentiometer so that the per cent break meter reads 59 per cent. Restore the pulse repeating test set PLS CK key. Check the zero setting as described in 4.07 and 4.08. Continuous pulses are now being applied to the relay under test and the per cent break meter will read in accordance with the per cent break output of the relay. This reading should fall within the limits given in the circuit requirements table. If the reading does not fall within the limits specified, a failure is indicated, and the relay or its biasing resistance is in need of adjustment.

With Pulse Repeating Test Set Only

- 5.75 Operate the MAX and LK keys. Set the MAX potentiometer so that the per cent break meter reads 59 per cent. Dial zero and note whether the meter reading tends to rise or fall during the return of the dial disregarding a possible slight kick at the beginning or end of the pulse train. If the reading shows a tendency to drop turn the LK potentiometer knob in a clockwise direction and if the reading tends to rise, turn the knob in a counterclockwise direction. By a series of trials in dialing zero adjust the LK potentiometer so that the readings show little or no tendency to rise or fall during the return of the dial from the preset value.

- 5.76 Operate the MIN key and adjust the MIN potentiometer so that the per cent break meter reads in accordance with the lower limits of per cent break output given in the circuit requirements table.

- 5.77 Operate the MAX key and adjust the MAX potentiometer so that the per cent break meter reads in accordance with the upper limits of per cent break output given in the circuit requirements table.

- 5.78 Restore the pulse repeating test set PLS CK key. Check the zero setting as described in 4.12.

- 5.79 With the key in the MAX position dial zero several times observing each time whether the pointer of the per cent meter tends to rise, fall, or remain stationary. Disregard a possible slight kick of the pointer at the beginning or end of each pulse train.

- 5.80 The pointer should either remain stationary or show a tendency to fall. If it shows a tendency to rise, the indication is that the per cent break output of the relay is above the specified upper limits and the relay or its biasing resistance is in need of adjustment.

- 5.81 Operate the MIN key and dial zero several times, observing each time whether the per cent break meter pointer tends to rise, fall, or remain stationary. Disregard a possible slight kick of the pointer at the beginning or end of each pulse train.

5.82 The pointer should either remain stationary or show a tendency to rise. If it shows a tendency to fall, the indication is that the per cent break output of the relay is below the specified lower limits and the relay or its biasing resistance is in need of adjustment.

5.83 If it is desired to obtain the actual per cent break output of the relay instead of determining whether the output is within the specified upper and lower limits as just described, with the MIN key operated, dial zero several times, each time readjusting slightly the MIN potentiometer in the direction indicated by the rising or falling pointer of the per cent break meter during the return of the dial. After a number of trials a setting of the MIN potentiometer will be found which will allow the pointer to remain stationary, or nearly so, during the return of the dial except for possible slight kicks at the beginning or end of the pulse trains. The reading of the meter under this condition corresponds to the actual per cent break output of the relay.

5.84 At the conclusion of the tests restore all keys and remove all cords.

6. ADJUSTING PROCEDURES

6.01 If the pulse repeating requirements are not met, check the relay under test as covered in the section and in the circuit requirement table for the particular type of relay involved and readjust the relay as required.

6.02 If the per cent break then is not within the specified limits, change the strapping of the adjustable biasing resistance, as required, if this arrangement is provided in the circuit.

6.03 If an adjustable biasing resistance is not provided in the circuit, some improvement in pulsing usually can be obtained by making further minor adjustments in the relay, while still keeping within specified mechanical and current flow requirements. Where a voltage compensation arrangement

comprising the use of a No. 8E resistance lamp is provided in the circuit, the per cent break output of the relay may in many cases be improved by substituting a No. 12E resistance lamp for the No. 8E resistance lamp.

Note: In the case of SD-64484-01, the substitution of a No. 12E lamp for a No. 8E lamp must be accompanied by a wiring change in the circuit as covered in the circuit notes of the circuit.

6.04 In the case of 239- or 280-type relays:

- (a) A lower per cent break will result when the contact travel is adjusted
→ toward the minimum specified value or when the pole pieces are adjusted with the magnetic bias to the left.
- (b) A higher per cent break will result when the contact travel is adjusted
→ toward the maximum specified value or when the pole pieces are adjusted with the magnetic bias to the right.

6.05 For 239-type relays which are equipped with solid armatures the best pulsing performance is usually obtained when the contact travel is adjusted at a point approximately midway between the maximum and minimum limits.

6.06 In the case of 221- and similar-type relays:

- (a) A lower per cent break will result when the residual airgap and spring tension
→ are adjusted toward the minimum values.
- (b) A higher per cent break will result when the residual airgap and spring tension
→ are adjusted toward the maximum values.

6.07 Any change in the adjustment of 209-type relays must be followed by a recheck with the test panel or circuit for the particular relay involved.

6.08 If all the requirements cannot be met, replace the relay under test with a new one and repeat the test.

6.09 After readjustments, test the circuit with its associated circuits for proper operation.