

PULSE REPEATING TEST SET

J64722A

1. GENERAL

1.01 This section describes the portable Pulse Repeating Test Set J64722A (SD-64540-01).

1.02 This test set provides facilities for applying percent break requirements to dials, selectors and pulse repeating relays associated with intertoll dialing equipment and for other toll office applications where maintenance of equipment to percent break requirements is necessary. It can be used alone with pulses supplied by the associated dial or it can be used with a pulsing test set J34717A (SD-31481-01) which supplies continuous pulses or trains of 9 pulses.

1.03 Means are provided for applying test conditions and checking the percent break by patching the test set to the test jacks of the equipment under test.

2. EQUIPMENT FEATURES

2.01 The portable test set designated J64722A consists of the following main elements.

- (a) A percent break instrument.
- (b) Five variable potentiometers.
- (c) Lamps to indicate the condition of the circuit under test.
- (d) Keys, relays and resistances for setting up various test conditions.
- (e) A connecting block for mounting a dial.
- (f) Jacks for patching test sets and circuits to be tested.

This equipment is all encased in an aluminum box equipped with a fibre faced wood panel for supporting the equipment. The approximate dimensions of the box are 14" x 9-1/2" x 7-1/2". The apparatus which is exposed to view is shown in figure 1.

2.02 The percent break instrument is a Weston Model 301 d-c milliammeter per KS-7718. It is arranged so that the pointer is at the right hand end of the scale when no current is flowing in the coil. The scale has fifty divisions numbered 0 - 100 from left to right and is designated "Percent Break".

2.03 The potentiometers have a rated resistance of 1500 ohms and are used as follows:

(a) The potentiometer designated ADJ (adjust) is used to set the pointer of the milliammeter to zero on the scale.

(b) The potentiometers designated MAX (maximum) and MIN (minimum) are used when it is necessary to preset the percent break instrument when checking the percent break on a short train of pulses.

(c) The potentiometers designated LK and LP are used with an associated polar relay to control the percent break of the pulses sent out by this set. The LK potentiometer is used where the minimum percent break requirement is used and the LP potentiometer is used where the maximum percent break requirement is used.

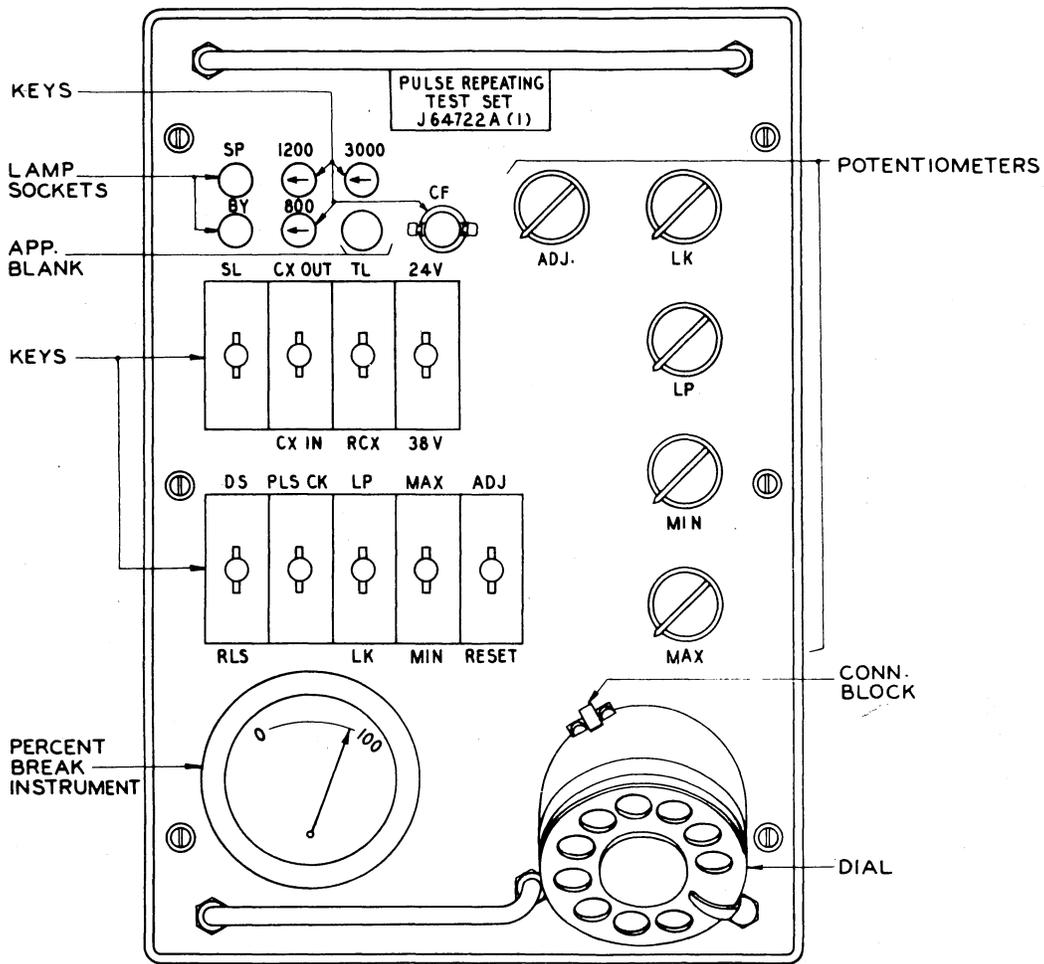
2.04 The BY lamp will light when the LP OUT (loop out) or the SX OUT (simplex out) jack is patched to a busy circuit.

2.05 The ADJ RESET key is a nonlocking lever type key. When operated to the ADJ (adjust) position the ADJ potentiometer can be adjusted so that the percent break instrument reads zero. When operated to the RESET position this key permits presetting the percent break instrument as required to measure short trains of pulses originating from sources other than the dial on this test set.

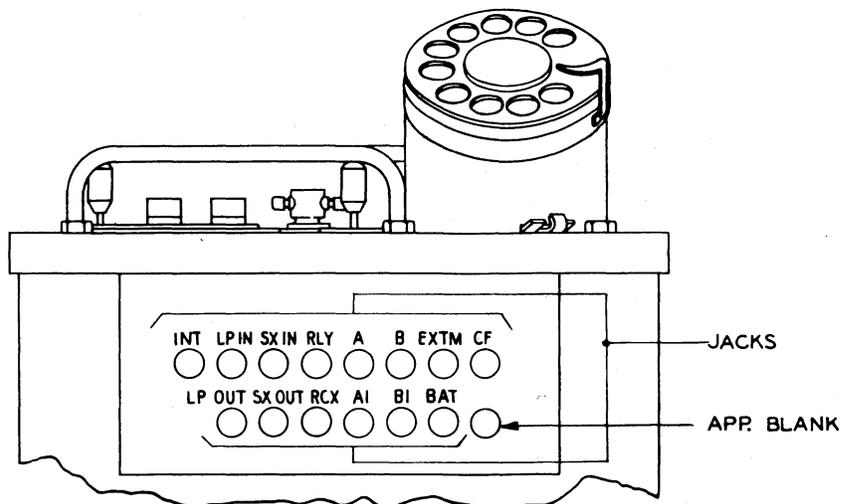
2.06 The battery key is a locking lever type key and should be operated to the 24V, 38V or normal (48V) position depending upon the voltage of the office battery.

2.07 The DS RLS key is a lever type key locking in the DS (distort) position and nonlocking in the RLS (release) position. When operated to the DS position the pulse distorting feature of the circuit is connected so that the pulses sent out will have a predetermined percent break. When testing selectors, using the dial with the test set, the operation of this key to the RLS position will release the selector under test.

2.08 The PLS CK (Pulse Check) key is a locking lever type key. When operated, dial pulses or pulses from the pulsing test set are connected to the percent break instrument. When an SC (short circuit) position is furnished as a part of this key and the key is operated to this position, a short circuit is placed across the tip and ring of the INT jack.



PLAN VIEW



END VIEW

Fig. 1 - Apparatus Arrangement

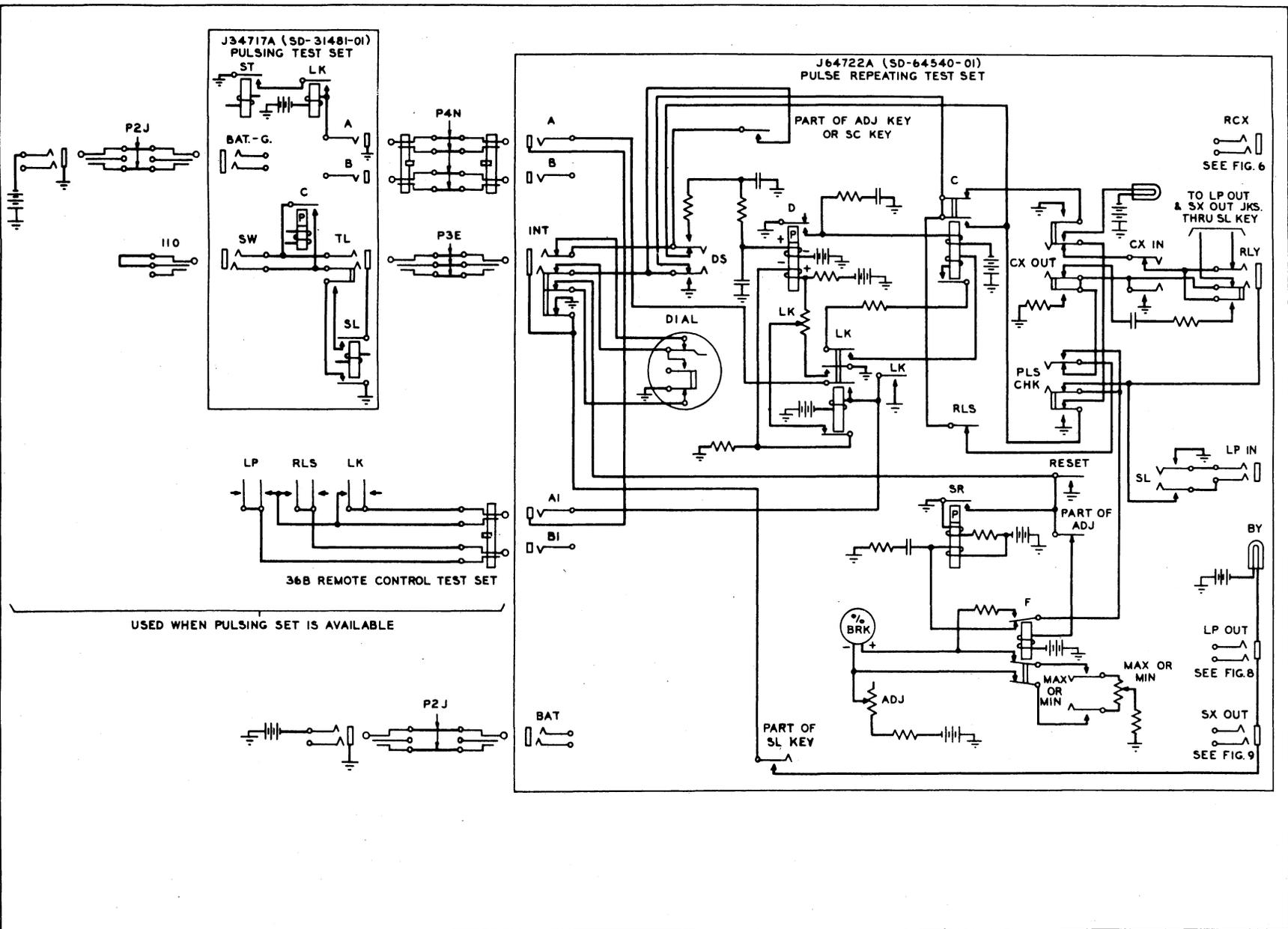


Fig. 2 - General Test Set Arrangement

2.09 The CX OUT CX IN key is a locking lever type key. When operated to the CX OUT (composite out) position the circuit is arranged for transmitting pulses to composite signaling circuits. When operated to the CX IN (composite in) position the circuit is arranged to measure the percent break of the composite signaling circuit relay.

2.10 The SL key is a locking lever type key. When operated, the circuit is arranged to supply pulses to circuits connected to the LP OUT or SX OUT jacks.

2.11 The MAX MIN key is a locking lever type key. When operated to the MAX (maximum) or MIN (minimum) position the percent break instrument can be preset to indicate a value near the expected indication.

2.12 The TL RCX key is a locking lever type key. When operated to the TL position the circuit is arranged for making a simplex test on a circuit associated with a voice frequency repeater. When operated to the RCX (composite relay) position the circuit is arranged for checking composite signaling circuit relays.

2.13 The LP LK key is a locking lever type key. This key is used when the pulses are furnished by a dial or an external source of pulses other than the pulsing test set. When operated to the LP position the pulse distorting feature is connected so that the pulses can be altered for a high percent break test. When operated to the LK position the pulse distorting feature is connected so that the pulses can be altered for a low percent break test.

Note: On some of the first test sets the LP LK key is nonlocking making it necessary to hold it in the operated position.

2.14 The CF (current flow) key is a locking turn button type key. When this key is operated to the CF position and a 35 type test set is connected to the CF jack, current flow requirements can be applied to a pulse repeating relay in a circuit connected to the RLY (relay) jack without changing test connections.

2.15 The 800, 1200 and 3000 keys are locking turn button type keys. These keys are used to insert additional resistance in series with the pulsing relay windings when making loop tests.

2.16 The dial connecting block is used for mounting a dial to be tested or the dial which is used as a source of pulses.

2.17 The INT (interrupter) A, B, A1 and B1 jacks are for use in patching to the pulsing test set and the associated 36B test set. External pulsing contacts may also be connected to the INT jack for testing purposes.

2.18 The RCX, RLY, LP OUT, SX OUT and LP IN (loop in) jacks are for use in patching to circuits to be tested.

2.19 The BAT (battery) jack is provided for patching to the battery supply.

2.20 The CF jack is provided for patching to a No. 35 type test set.

2.21 The EXT M (external meter) jack is provided so that an external percent break instrument can be used.

3. CIRCUIT FEATURES

3.01 Figure 2 shows the general arrangement of the test set in simplified form. It also shows connections to the pulsing test set and the associated 36B test set.

3.02 Figures 3 to 9 inclusive show in simplified form the various circuit arrangements possible for making pulsing tests.

Adjustment of Zero Reading

3.03 Several methods of adjusting the zero reading of the percent break instrument are outlined in paragraphs 3.04, 3.05 and 3.06 for the various test conditions encountered.

3.04 When the SC key position is not provided, in which case the ADJ key is arranged to short circuit the tip and ring of the INT jack, the zero adjustment of the percent break instrument can be made with the following circuit arrangements:

(a) When the ADJ and PLS CK keys are operated. The circuit is arranged as shown in figure 3. Connecting ground from a contact of the PLS CK key through the percent break instrument and the ADJ potentiometer to battery.

(b) When the DS key is operated in addition to the ADJ and PLS CK keys.

Note: In this case a short circuit is obtained from the closed contacts of the C relay.

(c) When the ADJ key is operated, the PLS CK key normal and the circuit under test patched to the RLY jack.

(d) When the ADJ and SL keys are operated, the PLS CK key normal and the circuit under test connected to the LP IN jack.

3.05 When the SC key position is provided, in which case the ADJ key is not arranged to short circuit the tip and ring of the INT jack, the zero adjustment of the percent break instrument can be made with the following circuit arrangements.

(a) When there is a dial in the connecting block, no plug in the INT jack

3.05 (Continued)

and the PLS CK key is operated, the ADJ key should be operated.

(b) When there is no dial in the connecting block, the INT jack is not connected to the pulsing test set and the PLS CK key is operated, a short circuiting plug must be in the INT jack. The ADJ key should be in the normal position.

(c) When the INT jack is connected to the pulsing test set and the PLS CK key is operated, a short circuiting plug must be in the SW jack of the pulsing test set (see fig. 2). The ADJ key should be in the normal position.

(d) When any of conditions (a), (b) or (c) are encountered, except that the PLS CK key is normal, the SC key should be operated. The SC key unit is part of the PLS CK key and therefore cannot be used when the PLS CK key is operated.

3.06 When the pulse repeating test set is used as a receiving set in overall testing, the zero adjustment of the percent break instrument can be made by operating the SC key, when provided, or the ADJ key in the pulse repeating test set at the sending end.

Presetting the Percent Break Instrument

3.07 Figure 4 shows the test circuit arranged for presetting the percent break instrument when it is necessary to indicate the percent break of a short train of pulses

such as furnished by a dial. This is necessary since the indicating instrument is highly damped and cannot reach a steady reading in the space of 9 or 10 pulses. For this reason the MAX or MIN key is operated and the associated potentiometer adjusted so that the pointer of the instrument indicates the maximum or minimum value expected during the test. With the PLS CK key operated, the pulses being checked will cause the pointer to move slowly from the point at which it was preset, thus indicating whether the percent break is within the maximum and minimum limits.

3.08 If it is desired to measure the actual percent break of a short train of pulses, the MAX or MIN potentiometer should be moved in the direction the pointer moves until, after a number of trains of pulses has been received, there is no further tendency for the pointer to move, disregarding any slight kicks at the start or end of pulse trains. This reading corresponds to the actual percent break.

3.09 The preset feature is connected to the instrument while a dial on the connecting block is normal and the ADJ key is also normal. In case there is no dial on the connecting block or there is a plug in the INT jack, this feature can be connected by operating the RESET key.

3.10 With the test set arranged as shown in Figure 4 but with the PLS CK key operated, the percent break of dials can be measured by mounting them on the dial connecting block of the test set. The off normal contact of the dial and the SR relay keep the preset feature connected to the

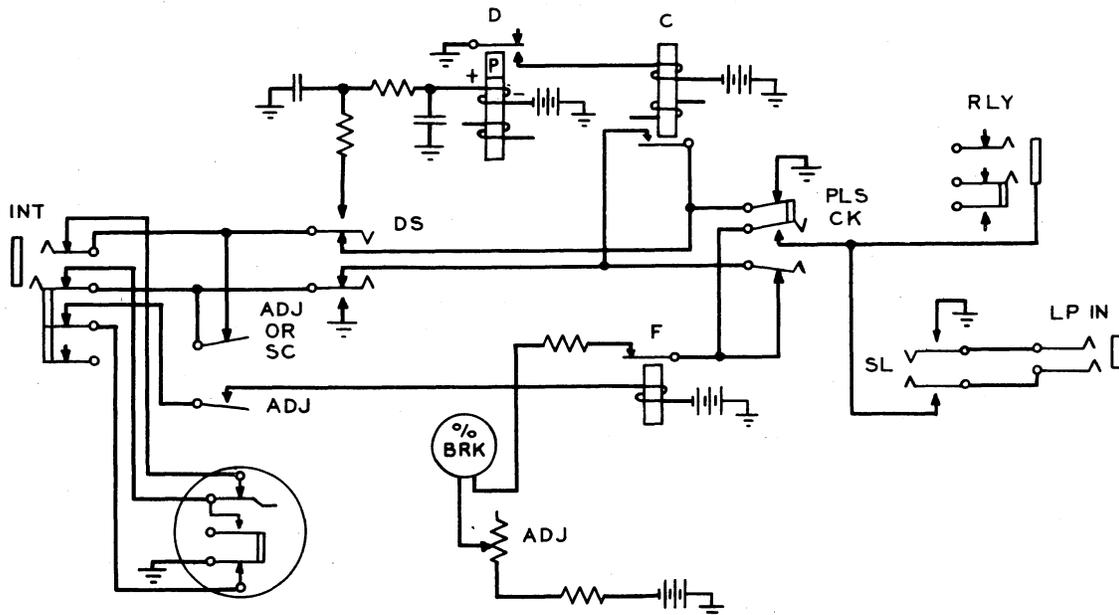


Fig. 3 - Arrangement for Checking Zero Adjustment of the Percent Break Instrument
Keys Operated - ADJ, PLS CK

3.10 (Continued)

percent break instrument at all times except from the beginning of the first break until the dial returns to normal.

3.11 The SR relay provides a delay in the release of the F relay when the pulsing contacts of the dial are opened. This allows the percent break instrument to be transferred to the dial pulse contacts at such a time that any kick produced on the instrument by this transfer will be a minimum.

Continuous Pulse Tests

3.12 The percent break instrument can be used to check the pulses received from a pulsing test set or other source of pulses when patched to the INT jack and the PLS CK key is operated. The circuit is the same as shown in Fig. 3 except that the ADJ key is normal. When it is desired to measure these pulses after distortion by the test set as described in 3.14, the DS key as well as the PLS CK key must be operated.

3.13 The percent break instrument can also be used to check the pulses received from the contacts of relays patched to the RLY and LP IN jacks when the circuit is arranged as covered in 3.04 (c) and (d) respectively.

Pulse Distorting Feature

3.14 When making tests of the pulse repeating relays in various circuits, it is desirable to have control of the percent break applied to the relays under test. The control of the minimum percent break is provided by relays C, D, and LK, potentiometer LK, and key LK as shown in figure 2. The control of the maximum percent break is provided by the same C and D relays used in conjunction with relay LP; potentiometer LP and key LP not shown in figure 2.

3.15 With the DS key operated the pulses from the dial or the pulsing test set are connected to the operating winding of the D relay and the D relay in turn controls the operation of the C relay which supplies the pulses sent to the relay under test. By adjusting the IK or LP potentiometer with the associated LK or LP key operated, it is then possible to transmit pulses of the desired percent break to the relay under test.

3.16 The pulse distortion feature will function on 38 and 48 volt battery but will not function on 24 volt battery.

Relay Tests - General

3.17 The figures showing connections for testing pulse repeating relays show the arrangement for percent break control of

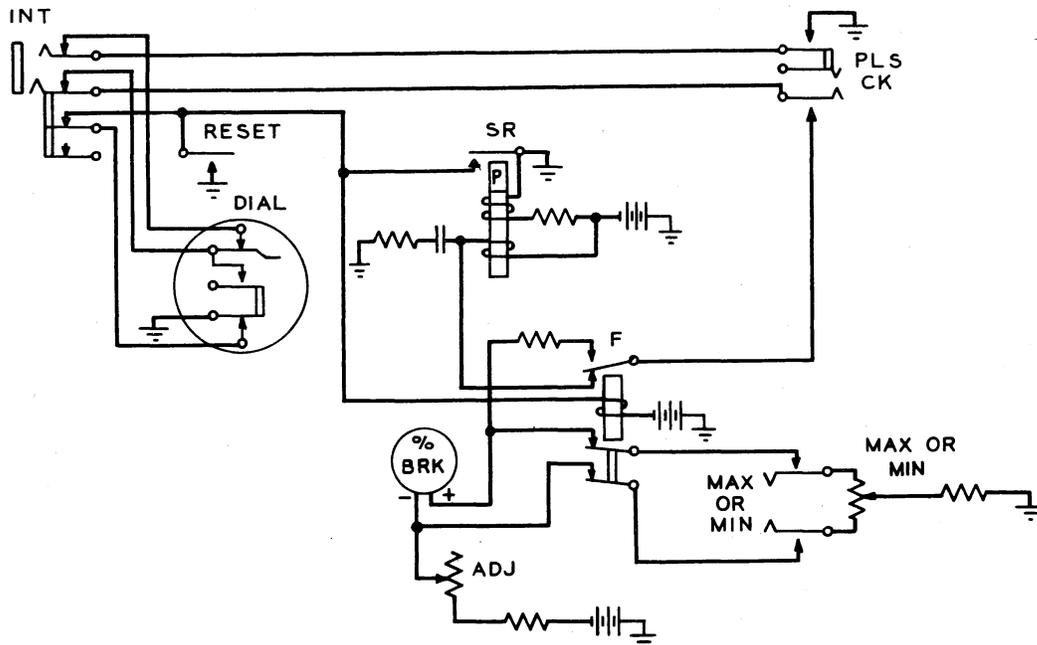


Fig. 4 - Arrangement for Connecting Preset Feature

3.17 (Continued)

the pulses. When a dial is used as a source of pulses, it is necessary to connect the preset feature as covered in 3.07.

Relay Connected to RLY Jack

3.18 A pulse repeating relay having its winding connected to the tip and ring of a test jack and supplying ground to the sleeve of the test jack, when the relay contacts are closed, may be tested by arranging the circuit as shown in figure 5. The pulses for operating the relay under test are supplied over the tip and ring of the RLY jack. The pulses from the contact of the relay under test are received on the sleeve of the RLY jack and measured on the percent break instrument.

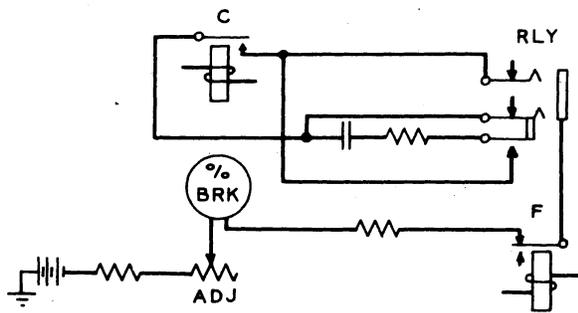


Fig. 5 - Arrangement for Checking Pulse Repeating Relays
Keys Operated - DS and LK or LP

Testing Relays in CX Signaling Circuits

3.19 A pulse repeating relay in a composite signaling circuit may be tested by arranging the circuit as shown in figure 6. The RCX and RLY jacks of the test set should be patched to the TST and PLS jacks, respectively, of the composite signaling circuit. A make busy plug should also be plugged into the MB jack of the composite signaling circuit in order to clear the relay windings.

3.20 Battery and ground, under control of the C relay, are connected to the winding of the CX relay under test. The contact of the CX relay is connected to the percent break instrument for measurement.

3.21 When it is desired to make overall pulsing tests of CX relays, the circuit should be arranged at the sending end as shown in Fig. 7. The RLY jack of the test set should be patched to the PLS jack of the composite signaling circuit. This arrangement connects battery and ground, alternately, under control of the C relay to the bridge point of the CX relay. The con-

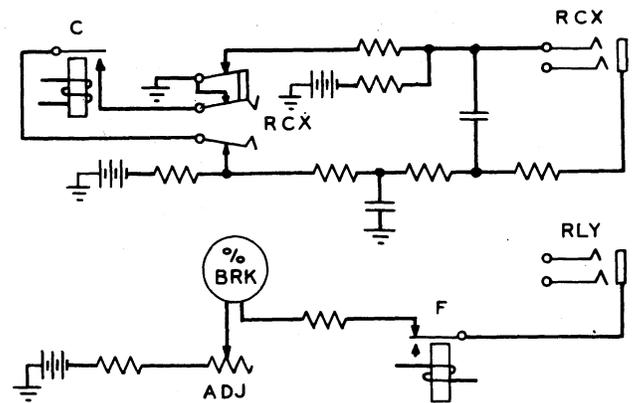


Fig. 6 - Arrangements for Checking CX Relays
Keys Operated - DS, LK or LP, RCX

tact of the CX relay is connected to the percent break instrument. The CX relay should not operate at this time. To measure the percent break at the distant or receiving end of an overall test, the circuit should be arranged as shown in Fig. 7 except that the CX IN key should be operated at the receiving end thus restoring the CX OUT contacts. This connects ground to the bridge point of the CX relay and the percent break instrument will indicate the percent break of the CX relay contacts.

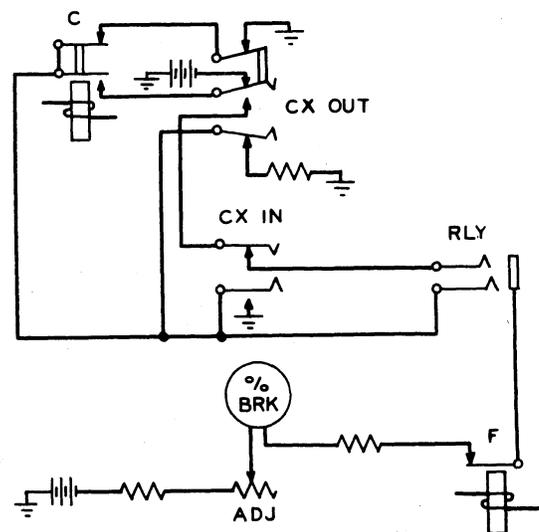


Fig. 7 - Arrangement for Overall Test of CX Relays
Keys Operated - DS, LP or LK, CX OUT

Relays Connected to LP OUT, and LP IN Jacks

3.22 Figure 8 shows the test circuit arranged to test a pulse repeating relay in a circuit connected to the LP OUT and LP IN jacks. The pulses are applied to the tip and ring of the LP OUT jack on a loop basis and the pulses from the contact of the relay under test are received on the LP IN jack.

3.23 The BY lamp indicates when the LP OUT jack is patched to a busy circuit before the SL key is operated.

3.24 Additional resistances may be connected in series with the pulse repeating relay winding by operating the 800, 1200 or 3000 keys singly or in combination.

3.25 This arrangement may also be used for making overall pulsing tests of trunk circuits from a test board to a CX signaling circuit at a distant office. In such cases the LP OUT jack is connected through test position circuits to the outgoing trunk multiple of the circuit under test and the percent break of the pulses received at the distant end is measured by another pulse repeating test set in a manner similar to that described in 3.21.

Relays Connected to SX OUT and LP IN Jacks

3.26 Figure 9 shows the test circuit arranged to test a selector or a pulse repeating relay connected to the SX OUT and LP IN jacks. The pulses are applied to the tip and ring of the SX OUT jack on a simplex basis. When testing a pulse repeating relay, the pulses from the contact of the relay are received on the LP IN jack. When testing a selector, the operation of the selector is observed as pulses are applied.

3.27 The BY lamp will light when the SX OUT jack is patched to a busy circuit before the SL key is operated.

3.28 This arrangement may also be used for making overall pulsing tests from a two way trunk selector level to a CX signaling circuit at a distant office. In such cases, the SX OUT jack is connected to the test jack of the two way trunk circuit under test and the percent break is measured at the distant end by operating the CX IN key of a pulse repeating test set (see figure 7) and patching the RLY jack to the PLS jack of the CX signaling circuit.

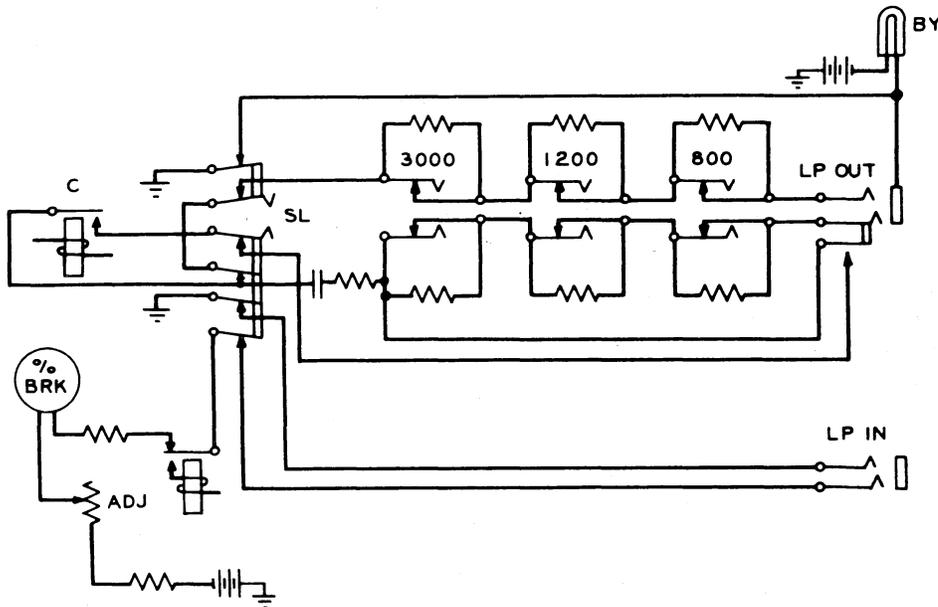


Fig. 8 - Arrangement for Checking Relays
 Connected to Jacks LP OUT and LP IN
 Keys Operated - DS, LP or LK, SL

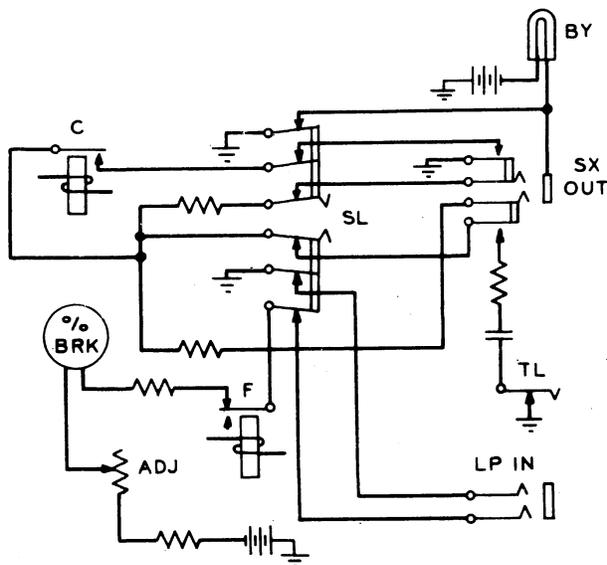


Fig. 9 - Arrangement for Checking Relays and Selectors Connected to Jacks SX OUT and LP IN
Keys Operated - DS, LP or LK, SL

4. OPERATING FEATURES

4.01 The test set is arranged to use a dial or a pulsing test set per J34717A as the source of pulses. Other sources of pulses may be used when convenient. When the J34717A set is used, the 36B remote control test set must also be used. The LP, RLS and LK keys of the 36B test set will then be used in place of the corresponding keys on the pulse repeating test set. It is desirable to use the pulsing test set, whenever available, for the source of pulses.

4.02 The test set is arranged to be used with a battery supply of 24, 38 or 48 volts. The percent break of the test pulses can be controlled in the test set only when a 38 or 48 volt battery is used.

4.03 The test set is arranged for adjusting the zero setting of the percent break instrument by means of the ADJ potentiometer.

4.04 The source of pulses is connected to the pulse distorting feature by operating the DS key. The percent break of the pulses can be controlled by operating the LP or LK key, and adjusting the associated potentiometer. The percent break can be read on the percent break instrument while the PLS CK key is operated.

4.05 The feature for presetting the percent break instrument is normally connected when a dial on the connecting block is in its normal position and there is no plug in the INT JACK. When it is desired to measure short trains of pulses connected to the INT, RLY or LP IN jacks the RESET key must be operated in order to connect the preset feature.

4.06 The preset feature is not required when measuring the percent break of continuous pulses, therefore the dial should be removed or a plug inserted in the INT jack.

4.07 A busy lamp BY is provided to indicate when the test set is patched to a busy circuit.

4.08 The test set is arranged so that a suitable instrument may be patched to the EXTM jack and used in place of the test set instrument for measuring percent break. The external instrument can be used only for checking continuous pulses as the preset feature is not adapted for use with instruments having full scale deflection current different than the test set instrument or having a protective resistance external to this circuit.

4.09 A 35 type test set can be patched to the CF jack of the test set. Operation of the CF key then connects the 35 type test set to the tip and ring of the RLY jack so that current flow tests can be applied to the relay under test, providing the associated circuit is so arranged.

4.10 Jacks are provided for patching the test set to circuits containing pulse repeating relays. Test pulses are thereby furnished to the relay under test and the contact pulses received for measurement of percent break.

5. MAINTENANCE FEATURES

5.01 The panel is fastened to the casing by means of six screws. By removing these screws the panel and equipment can be removed and therefore made accessible for maintenance.

6. CIRCUIT AND CIRCUIT DESCRIPTION

6.01 Drawing SD-64540-01 shows the circuit arrangement of the test set. A detailed circuit description will be found in the associated CD sheet.