INTERTOLL DIALING
TYPE B CX, DX, AND SX SIGNALING CIRCUIT
OVERALL DIALING TRUNK PULSING TEST
USING 2B TEST SET SD-56134-02 (J64730)
ON 2-WAY TRUNK TEST JACK

1. GENERAL

1.01 This section describes a method of applying pulsing tests to dialing trunks from 2-way trunk circuit SD-64469-01 and over a type CX, DX, and SX signaling circuit to a distant office. This test will be performed using 2B test set SD-56134-02 (J64730) and associated pulse repeating adapter circuit. The method of checking the pulse repeating requirements using the pulse repeating test set SD-64540-01 and, where available, the pulsing test set SD-31481-01 can be found in Section 179-708-501.

1.02 Whenever this section is reissued, the reason for reissue will be listed in this paragraph.

1.03 The tests covered are:

A. Overall Percent Break Pulsing (at Transmitting End) Using 2B Test Set: This test applies continuous pulses to the overall signaling circuit so that the distant end can measure the percent break of the CX, DX, or SX circuit. If troubles are encountered and built-up circuit arrangements of one or more steps of pulse repetition are involved, this test is used to apply pulses to the intermediate office.

B. Overall Percent Break Measurements of Continuous Pulses (at Receiving End) Using 2B Test Set: This test measures the percent break of the overall CX, DX, or SX signaling circuit. The pulses are generated at the transmitting end by the 2B test set and are continuous pulses.

1.04 The test equipment specified in this section is designed to apply proper marginal tests (simulated critical circuit conditions) when the circuit under test and the test equipment have an applied voltage of 48.5 to 50. In those offices where power plants are normally operated at more than 50 volts, the battery voltage should be reduced and maintained within the required limits while the tests are being made.

1.05 The methods involve the sending of dialing pulses of a definite percent break from one end of a CX, DX, or SX signaling circuit and of measuring the percent break of the pulses received at the distant end of the trunk. Limits are set for the character of the received pulses and if these limits are exceeded, a trouble condition is indicated.

1.06 The same testing procedures are employed whether the CX, DX, or SX signaling circuits consist of a single pulsing link from one office to an adjacent office or of two or more links joined together in a tandem arrangement and involving pulse repetition at one or more intermediate offices.

1.07 Ordinarily, it is expected that the tests described in this section will be performed on an end-to-end basis and will include all CX, DX, and SX pulsing facilities which are permanently wired together and in which no switching points are involved. However, where it is found that the percent break limits are exceeded, pulse measurements may be made at intermediate points as a step in the localization of trouble, using the method described in paragraph 5.06. Typical layouts of terminal, toll, and intermediate offices showing test connections are illustrated in Fig. 1 and 2.

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1.08 A tester is required at both ends of the trunk under test.

1.09 At the transmitting end, the 2B test set SD-56134-02 and associated pulse repeating adapter circuit are located at the 2-way trunk circuit at the relay rack and controls the sending of pulses from the T test jack at this point.

1.10 The pulses are repeated by the P relay in the 2-way trunk SD-64469-01 over the same path as pulses which come from the intertoll selectors. The pulses are not repeated by the P relay in the associated outgoing trunk circuit.

1.11 At the receiving end, another 2B test set SD-56134-02 and associated pulse repeating adapter circuit are located at the signaling circuit at the relay rack, or at the circuit patching bay. The received pulses are measured for percent break by means of the percent break meter in this test set.

1.12 The associated intertoll trunk shall be removed from service in the approved manner at each originating office. Care should be exercised not to send a seizure forward on any trunk which might seize equipment in a distant office prior to opening the E lead. The trunk circuits should be restored to service when the tests are completed, except where an out-of-service failure is encountered.

1.13 On all circuits provided with earth potential compensation, the limits given in this section assume that the EPC lead is properly wired and has continuity.

1.14 It is necessary that talking connections be established between the two testers, which may be accomplished by means of talking trunk circuits to the testboards at each office and, therefore, over an intertoll trunk.

1.15 ***Lettered Steps:*** A letter a, b, c, etc, added to a step number in Parts 3 and 4 of this section, indicates an action which may or may not be required, depending on local conditions. The condition under which a lettered step or a series of lettered steps should be made is given in the ACTION column, and all steps governed by the same condition are designated by the same letter within a test. Where a condition does not apply, all steps designated by that letter should be omitted.

2. APPARATUS

All Tests (Transmitting and Receiving)

2.01 2B signaling test set SD-56134-02 (J64730) and associated pulse repeating adapter circuit.

2.02 2P1D cord assembly (P2A cord, length as required equipped with 347C plugs on each end).

2.03 2P3B cord assembly (P2A cord, length as required equipped with 347D plugs on each end).

2.04 Operator telephone set.

Test A (Transmitting)

2.05 5P3A cord assembly (two 3PH cords equipped with two 310 plugs and one 240B plug) for use with auxiliary trunk circuits equipped with 447A T jacks or 5P3A cord assembly (P3H cord equipped with two 310 plugs and one 240C plug) for use with auxiliary trunk circuits equipped with 448A T jacks.

Test B (Receiving)

2.06 3P6F cord assembly (P3E cord, 10 feet long equipped with 310 or 110 plugs on each end).

2.07 Modified 3P6F cord assembly (Fig. 3) (P3E cord, 10 feet long equipped with 310 or 110 plugs on each end).

2.08 3W3A cord assembly (W3A cord, 10 feet long equipped with 310 plug on one end and 59 cord tips on the ring and sleeve leads of the other end).

2.09 Grounding strap (meter lead wire with alligator clips on each end).

3. PREPARATION

STEP	ACTION	VERIFICATION
Test A (Transmitting End)		
1	Establish talking path to receiving end at testboard or circuit patch bay.	
2	At 2B test set— Operate CONT PLS, PLS, TWD L, TWD D, and MEAS % BK keys to normal position (middle position).	
3	Operate SCALE SEL switch to PPS position.	
4	Operate ADJ % BK switch to M position.	
5	At equipment bay— Connect -48 volt cord of the 2B test set to -48 volt jack on testboard.	Percent break meter should indicate 100 on black scale. L and D lamps light. Pulses-per-second meter indicates 0.
6a	If percent break meter does not indicate 100— At 2B test set— Rotate zero adjust screw on face of meter until pointer indicates 100. Rotate zero adjust screw on face of pulses-per-second meter until pointer indicates 0.	
7	At 2B test set— Connect -24 +130 volt cord to -24 +130 volt jack on testboard.	Percent break meter should indicate approximately half scale. Pulses-per-second meter should indicate approximately 12 PPS.
8	At 2B test set— Operate CONT PLS key to DIAL PLS.	Percent break meter should indicate 0 on black scale. Pulses-per-second meter should indicate 0.
Test B (Receiving End)		
9	Establish talking path to transmitting end at testboard or circuit patch bay.	
10	At 2B test set— Operate CONT PLS, PLS, TWD L, TWD D, and MEAS % BK keys to normal position (middle position).	
11	Operate SCALE SEL switch to PPS position.	
12	Operate ADJ % BK switch to M position.	
13	At 2B test set— Insert one end of 2P1D cord into M jack.	

STEP	ACTION	VERIFICATION
14	Insert one end of 2P3B cord into E jack.	
15	At pulse repeating adapter circuit— Insert other end of 2P1D cord into M1 jack.	
16	Insert other end of 2P3B cord into E1 jack.	
17	Connect one end of 3P6F cord to S jack.	
18	At pulse repeating adapter circuit— Operate function switch to CX position.	
19b	If tests are being performed at equipment bay— At 2B test set— Connect -48 volt cord to -48 volt jack on testboard.	Same as verification for Step 5.
20b	At 2B test set— Connect -24 +130 volt cord to -24 +130 volt jack on testboard.	Same as verification for Step 7.
21b	At signaling circuit— Connect other end of 3P6F cord to PLS jack.	
22c	If pulses are being received at the equipment bay and PLS jack is not provided— At signaling circuit— Disconnect E lead at terminal strip.	
23c	At pulse repeating adapter circuit— Disconnect 3P6F cord from S jack.	
24c	Connect 310 plug of 3W3A cord to S jack.	
25c	At signaling circuit— Connect ring lead of other end of 3W3A cord to E lead.	
26d	If pulses are to be received at circuit patching bay— At 2B test set— Connect -48 volt cord to -48 volt jack at circuit patch bay.	
27d	Connect -24 +130 volt cord to -24 +130 volt jack on circuit patch bay.	
28d	At pulse repeating adapter circuit— Connect one end of modified 3P6F cord to S jack.	

STEP	ACTION	VERIFICATION
29d	At circuit patch bay— Connect other end of modified 3P6F cord to SIG LINE or DSL jack. ***Note:*** In some offices the F lead is wired through the DSL jack to ground.	
30e	If F lead is not grounded through DSL jack— Connect the F lead to ground with grounding strap.	

4. METHOD

A. Overall Percent Break Pulsing (at Transmitting End) Using 2B Test Set

9	At 2B test set— Insert one end of 2P1D cord into M jack.	
10	Insert one end of 2P3B cord into E jack.	
11	At pulse repeating adapter circuit— Insert other end of 2P1D cord into M1 jack.	
12	Insert other end of 2P3B cord into E1 jack.	
13	At pulse repeating adapter circuit— Operate function switch to PC position.	
14	At 2B test set— Adjust the ADJ PPS control for meter indication of 12 PPS.	
15	Adjust ADJ % BK control for meter indication of 59% on black scale.	
16	At pulse repeating adapter circuit— Operate function switch to TB, TD, TF position.	
17b	If 2-way trunk to be tested is equipped with 447A T jacks— At pulse repeating adapter circuit— Insert 310 plug of 5P3A cord into S jack.	
18b	At 2-way trunk circuit under test— Insert 240B plug of 5P3A cord into T jack. ***Note:*** If BY lamp of trunk being tested is lighted, the test may be delayed until lamp extinguishes or move to other trunks that are to be tested.	

STEP	ACTION	VERIFICATION
19c	If 2-way trunk to be tested is equipped with 448A jacks— At pulse repeating adapter circuit— Insert 310 plug of 5P3B cord into S jack.	
20c	At 2-way trunk circuit under test— Insert 240C plug of 5P3B cord into T jack. ***Note:*** If BY lamp of trunk being tested is lighted, the test may be delayed until lamp extinguishes or move to other trunks that are to be tested.	
21d	When craftperson at receiving end requests steady closure to obtain zero setting— At 2B test set— Operate TWD L key to OFF HK.	
22e	When receiving end indicates zero setting has been obtained and requests continuous pulses— At 2B test set— Operate TWD L key to normal position.	
23e	Operate PLS key to LINE position.	At 2B test set— Percent break meter should indicate 0 on black scale.
24f	When craftperson at receiving end reports that measurements have been obtained and measurements of other trunks are desired— Repeat PREPARATION Steps 2 through 8 and METHOD Steps 9 through 23e.	
25g	If test in reverse direction is desired— At 2B test set— Operate PLS key to normal.	
26g	Operate MEAS % BK key to LINE.	
27g	Perform PREPARATION Steps 10 through 30e and METHOD Steps 31 through 35m of Test B.	
28h	If no other tests are to be performed— Disconnect all test connections and restore all keys to normal.	

METHOD AT RECEIVING END

B. Overall Percent Break Measurements of Continuous Pulses (at Receiving End) Using 2B Test Set

STEP	ACTION	VERIFICATION
31	At 2B test set— Operate MEAS % BK key to LINE.	Pulses-per-second meter should indicate 0 on black scale. Percent break meter should indicate 0 on black scale.
32	Request steady closure from transmitting end.	At 2B test set— Percent break meter indicates 100 on black scale.
33a	If percent break meter does not indicate 100 in Step 32— At 2B test set— Adjust CAL % BK control for meter reading of 100 on black scale.	
34	Request pulses from transmitting end.	At 2B test set— Percent break meter should indicate between MIN and MAX percent break as prescribed in Table A, Column A for circuit conditions given in 5.02.
35m	If circuit conditions are not as favorable as those indicated in 5.02 but are within working limits of circuit drawing— At 2B test set— Observe percent break meter.	Percent break meter should indicate between MIN and MAX percent break as prescribed in Table A, Column B. ***Note:*** If percent break meter is outside of limits specified in Table A, Column B, a definite trouble is indicated. When analyzing cause of pulsing irregularities, conditions in 5.05 should be taken into account.
36n	If tests of other trunks are desired— Perform PREPARATION Steps 13 through 30e and METHOD Steps 31 through 35m of Test B.	
37h	If test in reverse direction is desired— At 2B test set— Perform PREPARATION Steps 1 through 8 and METHOD Steps 9 through 24f of Test A.	
38i	If no other tests are to be performed— Disconnect all test connections and restore all keys to normal.	

5. OVERALL CIRCUIT REQUIREMENTS

5.01 The percent break output of the CX, DX, or SX relay at the receiving end will usually be found to differ from the percent break input applied at the transmitting end. This difference represents the total distortion introduced by the pulsing relay P in the 2-way trunk, by the circuit networks, by the line or cable, by the relay at the receiving end and, where pulse repetition is involved, by the relay at the intermediate office and the pulse repeating relay when provided in the auxiliary pulse link circuit.

5.02 Observe that the percent break output at the CX, DX, or SX relay is between the MIN and MAX limits shown in Column A, Table A when the following conditions prevail on the line:

(a) For circuits which are arranged for earth potential compensation, the earth potential to be not more than 20 percent of the maximum indicated on the circuit drawing for the working limits. Except that on circuits adjusted for a nominal earth potential, the earth potential shall not vary from that nominal earth potential more than an amount equal to 20 percent of the maximum indicated on the circuit drawing for the working limits.

(b) For circuits which are not arranged for ground potential compensation, the ground potential to be not more than 20 percent of the maximum indicated on the circuit drawing for the working limits.

(c) The insulation resistance to be not less than three times that of the working limits shown on the circuit drawing.

5.03 If the conditions which prevail on the line at the time of the test are not as favorable as those indicated in 5.02 but are within the working limits shown on the circuit drawing, observe that the percent break output at the CX, DX, or SX relay is between the MIN and MAX limits given in Column B, Table A.

CIRCUIT ANALYSIS

5.04 If the percent break output is outside of the limits specified in Column B, Table A, a definite trouble condition is indicated.

5.05 When analyzing the cause of pulsing irregularities, the following considerations should be taken into account:

(a) The usual pulsing performance of the circuit as shown by the records of previous tests in comparison with the results obtained in the present test.

(b) General weather conditions prevailing at the time of the test. The insulation resistance or the loop resistance may be affected by changes in the humidity or temperature, particularly where open wire lines are involved.

(c) Magnetic disturbances may cause changes in the ground potential of a circuit, affecting the pulsing performance in various degrees.

5.06 In order to further analyze possible trouble conditions, pulsing tests may be made at the transmitting office of the P relay alone or at the receiving office of the CX or SX relay alone, following in each case the methods covered in appropriate sections of Division 040 of the Bell System Practices on pulse repeating relays. Where the circuit layout involves pulse repetition at one or more intermediate points, the pulsing tests covered in this section may be made between the 2-way trunk and the signaling circuit at any of these intermediate points. Trouble conditions may also be localized by making pulsing tests between CX or SX signaling circuits in different offices, following the methods described in Section 179-708-502 on the overall testing of CX and SX signaling circuit. The section also covers in detail procedures for the location and clearing of trouble conditions on CX and SX signaling circuits.

6. RECORDS

6.01 The required record of this routine should be entered on the proper form.

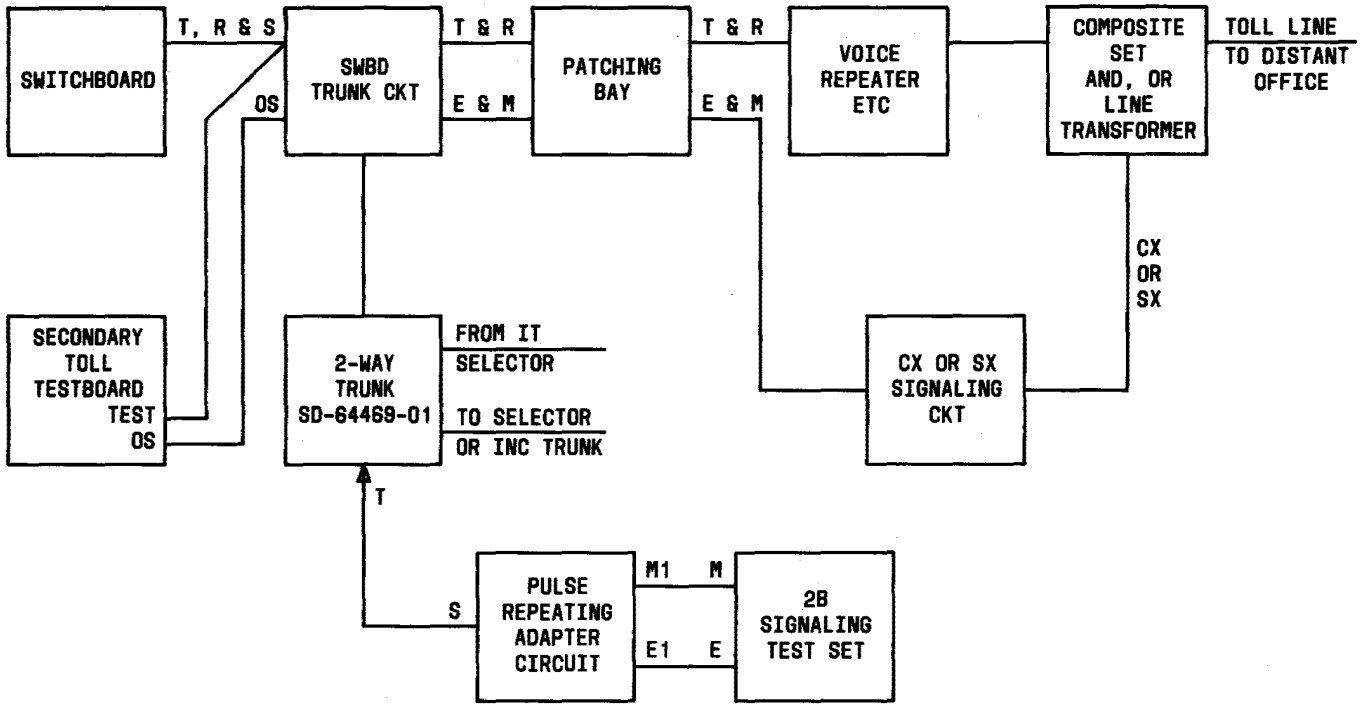

Fig. 1—Typical Layout of Intertoll Trunk Showing Connections for Transmitting Dial Pulses

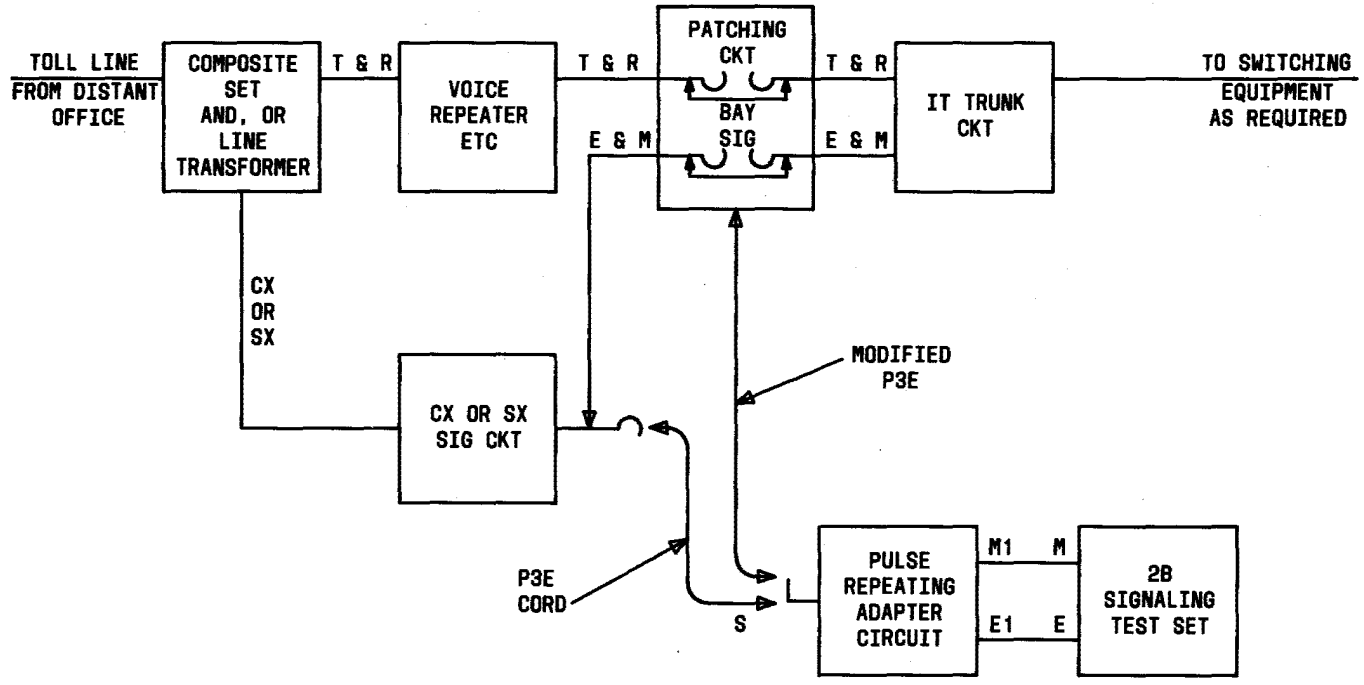

Fig. 2—Typical Layout of Intertoll Trunk Showing Connections for Percent Break Measurements

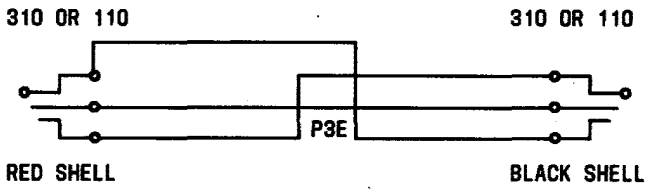

Fig. 3—Modified 3P6F Patch Cord

TABLE A

PERCENT BREAK OUTPUT AT CX OR SX RELAY
(INPUT AT TRANSMITTING END, 59 PERCENT)

	A		B	
	CIRCUITS WORKING UNDER FAVORABLE CONDITIONS WITH RESPECT TO WORKING LIMITS		CIRCUITS WORKING UNDER UNFAVORABLE CONDITIONS WITH RESPECT TO WORKING LIMITS	
	MIN	MAX	MIN	MAX
(a) Circuit arrangements involving a single link	56	62	53	65
(b) Circuit arrangements involving two links				
(1) Auxiliary pulse link circuit not equipped with pulse repeating relay	55	63	51	67
(2) Auxiliary pulse link circuit equipped with pulse repeating relay	56	62	53	65
(c) Circuit arrangements involving three or more links				
(1) Auxiliary pulse link circuits not equipped with pulse repeating relay	54	64	50	68
(2) All auxiliary pulse link circuits equipped with pulse repeating relay	56	62	53	65
(3) Auxiliary pulse link circuits, some equipped, some not equipped with pulse repeating relays	55	63	52	66