INTERTOLL DIALING

TYPE B CX AND SX SIGNALING CIRCUITS

OVERALL DIALING TRUNK PULSING TEST FROM TOLL TESTBOARDS

1. GENERAL

1.01 This section describes methods of making overall pulsing tests on composite (CX) or simplex (SX) signaling trunks arranged for dial pulsing from a switchboard. These tests cover pulsing from the test jacks located at the toll testboard No. 5, No. 17B, No. 18B, or test and control board No. 8, multiple or nonmultiple types, and thence over a CX or SX signaling circuit or a combination of CX and SX signaling circuits to a distant office. These tests are based on the use of the 2B test set SD-56134-01 (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 179-708-507.

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

1.03 The tests covered are:

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 trunk 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 At the sending end, the 2B test set SD-56134-01 (J64730) and associated pulse repeating adapter circuit are located at the toll testboard or test and control board and control the sending of pulses from this point. Typical layouts for toll testboards showing test connections are illustrated in Fig. 1, 2, 3, and 4.

1.07 At the receiving end, another 2B test set SD-56134-01 (J64730) and associated pulse repeating adapter circuit are located at the CX or SX signaling circuit at the relay rack and the received pulses are measured for percent break. A typical receive test connection is illustrated in Fig. 5.

1.08 It is expected that the tests described in this section will be performed on an end-to-end basis and will include all CX 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 on circuit layouts involving pulse repetition, pulse measurements may be made at intermediate points as a step in the localization of troubles, using the methods described in this section or in Section 179-708-501.

1.09 The tests shall be made only when the office battery measures between 48.5 and 50 volts at each office involved, otherwise deviations in percent break may be encountered.

1.10 When required, the associated intertoll trunk at the receiving end shall be made busy in the approved manner. The trunk shall be restored to service when the tests are completed, except where an out-of-service failure is encountered.

1.11 ***Lettered Steps:*** A letter a, b, c, etc, added to a step number in Part 3 or 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

2.01 2B signaling test set SD-56134-01 (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 3P6F cord assembly (P3E cord, 10 feet long, equipped with 310 or 110 plugs on each end).

Test A

2.05 3P14B cord assembly (P3J cord, length as required, equipped with 241B plugs on each end).

2.06 151B make-busy plug.

Tests C and D

2.07 3P7A cord assembly (P3E cord, 6 feet long, equipped with 310 plugs on each end).

2.08 322A or D-93279 make-busy plug.

Test E

2.09 3W3A cord assembly (W3A cord, 12 feet long, equipped with one 310 plug and one 59 cord tip on the sleeve conductor).

2.10 258C dummy plug.

3. PREPARATION

STEP	ACTION	VERIFICATION
	Transmitting End	
	All Tests	
1	At 2B test set— Operate CONT PLS, PLS, TWD L, TWD D, and MEAS % BK keys to normal position (middle position).	
2	Operate SCALE SEL switch to PPS position.	
3	Operate ADJ % BK switch to M position.	
4	At 2B test set— Insert one end of 2P1D cord into M jack.	
5	Insert one end of 2P3B cord into E jack.	
6	At pulse repeating adapter circuit— Insert other end of 2P1D cord into M1 jack.	
7	Insert other end of 2P3B cord into E1 jack.	
8	At testboard— Connect -48 volt cord of 2B test set to -48 volt jack.	Percent break meter should indicate 100 on black scale. L and D lamps light. Pulses-per-second meter indicates 0.
9a	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.	
10	At testboard— Connect -24 +130 volt cord of 2B test set to -24 +130 volt jack.	Percent break meter should indicate approximately half scale. Pulses-per-second meter should indicate approximately 12 PPS.
11	At pulse repeating adapter circuit— Operate function switch to PC position.	
12	At 2B test set— Adjust ADJ PPS control for meter indication of 12 PPS.	
13	Adjust ADJ % BK control for meter indication of 64% on black scale.	

STEP	ACTION	VERIFICATION
Test A		
14	At MISC jacks— Connect RIGHT CONN cord into CORD T and R jacks of dialing and supervisory circuit (SD-64595-01, SD-64881-01) from voltmeter test circuit.	
15	At dialing and supervisory circuit— Connect one end of 3P14B cord to sleeve of TEST jack of trunk to be used as talking path.	
16	At test and out of service jacks— Touch the tip side of 3P14B cord to sleeve of TEST jack of trunk to be used as talking path.	Busy lamp lights if trunk is busy.
17b	Repeat Step 16 for other trunk to be used.	
18	At idle trunk— Insert 151B short circuit plug into OS jack.	
19	Connect other end of 3P14B cord into TEST jack.	
20	At voltmeter testing circuit— Operate TEL ON CORDS and TALK keys.	
21	At dial and supervisory circuit— Operate DIAL key.	
22	Dial attendant number at distant toll office.	
23	Restore DIAL key.	
24	Inform attendant at distant office of the trunk number to be tested.	
25	At voltmeter testing circuit— Restore TEL ON CORDS key.	
26	At test and out of service jacks— Disconnect 3P14B cord from TEST jack.	
27	At voltmeter testing circuit— Operate TEL ON CORDS key.	
28	At test and out of service jacks— Connect cord A or B of voltmeter testing circuit into TEST jack.	Talking path is reestablished to attendant.

STEP	ACTION	VERIFICATION
29	Touch tip of 3P14B cord to sleeve of TEST jack of trunk to be tested.	
30b	If trunk is busy— Repeat Step 29 for other trunks to be tested.	Busy lamp lights.
31	At idle trunk— Insert 3P14B cord into TEST jack of trunk to be tested.	
32	At dial and supervisory circuit— Operate DIAL key.	
33	Connect one end of 3P6F cord into PLS jack.	
34	At pulse repeating adapter circuit— Connect other end of 3P6F cord to an S jack.	
35	Operate function switch to TC position.	
Test B		
36	At positional circuit— Operate TALK key of an idle cord circuit.	
37	At test and out of service jacks— Touch the tip of rear cord to sleeve of TEST jack of trunk to be used for talking path.	No sound is heard when trunk is idle and clicking is heard if trunk is busy. ***Note:*** If supervision lamp is provided, lamp lights when trunk is busy.
38b	If trunk is busy— Repeat Step 37 for another usable trunk.	
39	At idle trunk— Insert plug of cord circuit into TEST jack.	
40	At positional circuit— Operate DIAL key to rear position.	
41	Dial attendant number at distant toll office.	
42	Restore DIAL key.	
43	Inform attendant at the distant office of the trunk number to be tested.	
44	With front plug of same cord circuit— Touch tip of cord to sleeve of trunk to be tested.	No sound is heard when trunk is idle and clicking is heard when trunk is busy.

STEP	ACTION	VERIFICATION
45c	If tests are done on No. 18B testboard in No. 11 bridged supervision type office— A rear cord of a different cord circuit for the talking path must be used.	
46c	Restore TALK key of cord circuit and operate another TALK key for another cord circuit.	
47c	At new cord circuit— Touch the tip of rear cord to sleeve of trunk to be tested.	No sound is heard when trunk is idle and clicking is heard if trunk is busy. ***Note:*** If supervision lamp is provided, lamp lights when trunk is busy.
48b	If trunk is busy— Repeat Step 47c for other trunks to be tested.	
49c	Insert plug of rear cord into TEST jack of idle trunk.	
50c	Operate DIAL key.	
51c	Restore TALK key.	
52c	At first cord circuit used— Operate TALK key.	Talking connection reestablished.
53c	At second cord circuit— Operate TALK key.	
54	At idle trunk— Insert plug of front cord circuit into TEST jack.	
55	At positional circuit— Operate DIAL key to front position.	
56	At toll testboard— Connect one end of 3P6F cord to the signal jack of trunk to be tested.	
57	At pulse repeating adapter circuit— Connect other end of 3P6F cord into S jack.	
58	Operate function switch to TC position.	
Test C		
59	At test and control board— Operate TEL ON C CDS and TALK keys.	

STEP	ACTION	VERIFICATION
60	At test and out of service jacks— Touch tip of RIGHT CONN cord to sleeve of TEST jack of trunk for talking path.	
61b	If trunk is busy— Repeat Step 60 for another trunk to be used.	
62	At idle trunk— Connect RIGHT CONN cord into TEST jack.	
63	At test and control board— Operate DIAL key.	
64	Dial attendant number at distant office.	
65	Restore DIAL key.	
66	Inform attendant at the distant office of the trunk number to be tested.	
67	At test and out of service jacks— Insert a 322A or D-93279 plug into OS jack of trunk for talking path.	
68	At test and control board— Restore TEL ON C CDS key.	
69	At test and out of service jacks— Touch tip of A, B, or C cord to sleeve of TEST jack of trunk to be tested.	
70b	If trunk is busy— Repeat Step 69 for other trunks to be tested.	
71	At test and out of service jacks— Connect one end of 3P7A cord to TEST jack of trunk under test.	
72	At pulsing test patch circuit— Connect other end of 3P7A cord to TRK jack.	
73	At test and control board— Connect cord A, B, or C into DIAL jack of pulsing test patching circuit.	
74	Operate DIAL key.	
75	At pulsing test patching circuit— Connect one end of 10-foot cord to PLS jack.	
76	At pulse repeating adapter circuit— Connect other end of 3P6F cord into S jack.	

STEP	ACTION	VERIFICATION
77	Operate function switch to TC position.	
78	At test and control board— Restore DIAL key.	
79	At pulsing test patching circuit— Remove A, B, or C cord from DIAL jack.	
80	At test and control board— Operate TEL ON C CDS key.	
Test D		
81	At test and control board— Operate TALK key.	
82	At test and out of service jacks— Touch tip of AUX cord to sleeve of TEST jack of trunk for talking path.	
83b	If trunk is busy— Repeat Step 82 for another trunk to be used.	
84	At idle trunk— Insert AUX cord into TEST jack.	
85	At test and control board— Operate DIAL key.	
86	Dial attendant number at distant office.	
87	Restore DIAL key.	
88	Inform attendant at distant office of the trunk number to be tested.	
89	At test and out of service jacks— Insert a 322A or D-93279 plug into OS jack of trunk for talking path.	
90	Remove AUX cord from idle trunk.	
91	Touch tip of AUX cord to sleeve of TEST jack of trunk to be tested.	
92b	If trunk is busy— Repeat Step 91 for other trunks to be tested.	
93	At idle trunk— Connect one end of 3P6F cord to TEST jack.	

STEP	ACTION	VERIFICATION
94	At pulsing test patch circuit— Connect other end of 3P6F cord to TRK jack.	
95	At pulse test jack circuit— Insert AUX cord into DIAL jack.	
96	At test and control board— Operate DIAL key.	
97	At pulse test jack circuit— Connect one end of 3P6F cord into PLS jack.	
98	At pulse repeating adapter circuit— Connect other end of 3P6F cord into S jack.	
99	Operate function switch to TC position.	
100	At test and control board— Restore DIAL key.	
101	At pulse test jack circuit— Remove AUX cord from DIAL jack.	
102	At test and out of service jacks— Connect AUX cord into TEST jack of talking trunk.	Talking connection is reestablished.
Receiving End		
Test E		
103	At 2B test set— Operate CONT PLS, PLS, TWD L, TWD D, and MEAS % BK keys to normal position (middle position).	
104	Operate SCALE SEL switch to PPS position.	
105	Operate ADJ % BK switch to M position.	
106	At 2B test set— Insert one end of 2P1D cord into M jack.	
107	Insert one end of 2P3B cord into E jack.	
108	At pulse repeating adapter circuit— Insert other end of 2P1D cord into M1 jack.	
109	Insert other end of 2P3B cord into E1 jack.	
110	At testboard— Connect -48 volt cord of 2B test set to -48	Percent break meter should indicate 100 on black scale.

STEP	ACTION	VERIFICATION
	volt jack.	L and D lamps light. Pulses-per-second meter indicates 0.
111a	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 pulses-per-second meter until pointer indicates 0.	
112	At testboard— Connect -24 +130 volt cord of 2B test set to -24 +130 volt jack.	Percent break meter should indicate approximately half scale. Pulses-per-second meter should indicate approximately 12 PPS.
113	At pulse repeating adapter circuit— Connect one end of 3P6F cord into S jack.	
114	At signaling circuit— Connect other end of 3P6F cord to PLS jack.	
115d	If PLS jack is not provided— At signaling circuit— Disconnect E lead at terminal strip.	
116d	At pulse repeating adapter circuit— Disconnect 3P6F cord from A1 jack.	
117d	Connect 310 plug of 3W3A cord into S jack.	
118d	At signaling circuit— Connect other end of 3W3A cord to E Lead.	
119e	When measurements are made at intermediate point of auxiliary pulse link circuit not equipped with pulse repeating relay— At CX signaling circuit— Ground F lead.	

4. METHOD

A. Overall Percent Break Pulsing Test at No. 5 Toll Testboard (Transmitting End) Using the 2B Test Set

36c	When operator at distant office requests a steady state closure to obtain 0 setting on percent break meter— At 2B test set— Operate TWD L key to OFF HK.	
37d	When operator at distant office indicates zero setting has been obtained and requests continuous	

STEP	ACTION	VERIFICATION
	pulses— At 2B test set— Operate TWD L key to normal position.	
38d	Operate PLS key to LINE position.	At 2B test set— Percent break meter should indicate 0 on black scale.
39e	When operator at distant office reports that measurements have been obtained and measurements of other trunks are desired— At dial and supervisory circuit— Restore DIAL key.	
40e	At test and out of service jacks— Remove 3P14B cord from TEST jack of trunk that was tested.	
41e	Repeat PREPARATION Steps 29 through 32 and METHOD Steps 36c through 39e of Test A.	
42	At conclusion of test— Remove all cords and restore all keys.	

B. Overall Percent Break Pulsing Test No. 17B or 18B Toll Testboard (Transmitting End) Using the 2B Test Set

59d	When operator at distant office requests a steady state closure to obtain 0 setting on percent break meter— At 2B test set— Operate TWD L key to OFF HK.	
60e	When operator at distant office indicates zero setting has been obtained and requests continuous pulses— At 2B test set— Operate TWD L key to normal position.	
61e	Operate PLS key to LINE position.	At 2B test set— Percent break meter should indicate 0 on black scale.
62f	When operator at distant office reports that measurements have been obtained and measurements of other trunks are desired— At positional circuit— Restore DIAL key.	

STEP	ACTION	VERIFICATION
63f	At test and out of service jacks— Remove cord circuit from TEST jack of trunk that was tested.	
64f	Repeat PREPARATION Steps 44 through 55 and METHOD Steps 59d through 63f of Test B.	
65	At conclusion of test— Remove all cords and restore all keys.	
C.	**Overall Percent Break Pulsing Test at Multiple Type No. 8 Test and Control Board (Transmitting End) Using 2B Test Set**	
81c	When operator at distant office requests a steady state closure to obtain 0 setting on percent break meter— At 2B test set— Operate TWD L key to OFF HK.	
82d	When operator at distant office indicates zero setting has been obtained and requests continuous pulses— At 2B test set— Operate TWD L key to normal position.	
83d	Operate PLS key to LINE position.	At 2B test set— Percent break meter should indicate 0 on black scale.
84e	When operator at distant office reports that measurements have been obtained and measurements of other trunks are desired— At test and out of service jacks— Remove cord circuit from TEST jack of trunk that was tested.	
85e	Repeat PREPARATION Steps 69 through 71 and METHOD Steps 81c through 84e of Test C.	
86	At conclusion of test— Remove all cords and restore all keys.	
D.	**Overall Percent Break Pulsing Test at Nonmultiple Type No. 8 Test and Control Board (Transmitting End) Using the 2B Test Set**	
103c	When operator at distant office requests a steady state closure to obtain 0 setting on percent break meter—	

STEP	ACTION	VERIFICATION
	At 2B test set— Operate TWD L key to OFF HK.	
104d	When operator at distant office indicates zero setting has been obtained and requests continuous pulses— At 2B test set— Operate TWD L key to normal position.	
105d	Operate PLS key to LINE position.	At 2B test set— Percent break meter should indicate 0 on black scale.
106e	When operator at distant office reports that measurements have been obtained and measurements of other trunks are desired— At test and out of service jacks— Remove cord circuit from TEST jack of trunk that was tested.	
107e	Repeat PREPARATION Steps 91 through 94 and METHOD Steps 103c through 106e of Test D.	
Receiving End		
E.	**Overall Percent Break Measurements of Continuous Pulses at the Receiving End**	
120	At pulse repeating adapter circuit— Operate function switch to CX position.	
121	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.
122	Request steady closure from transmitting end.	At 2B test set— Percent break meter indicates 100 on black scale.
123f	If percent break meter does not indicate 100 in Step 122— At 2B test set— Adjust CAL % BK control for meter reading of 100 on black scale.	
124	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.

STEP	ACTION	VERIFICATION
125g	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.
126h	If another trunk is to be tested— Repeat PREPARATION Steps 114 through 119e and METHOD Steps 122 through 127i of Test E.	
127i	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 or SX relay at the receiving end will usually be found to differ from the percent break input applied at the sending end. This difference represents the total distortion introduced by the pulsing relay A in the trunk circuit, 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 or SX relay is between the MIN and MAX limits shown in Column A, Table A, when the following conditions prevail on the line:

(1) 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.

(2) For circuits which are not 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.

(3) 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 relay is between the MIN and MAX limits given in Column B, Table A.

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:

(1) 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.

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

(3) 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 sending office of the A relay alone or at the receiving office of the CX or SX relay alone, following in each case the methods covered in the Division 040 sections 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 toll testboard and the CX signaling circuit at any of these intermediate points. Trouble conditions may also be localized by making pulsing tests between the CX or SX signaling circuits in different offices, following the methods described in the sections on the overall testing of CX or SX signaling circuits. The latter sections also cover in detail procedures for the location and the clearing of trouble conditions on CX or SX signaling circuits.

5.07 After the percent measurement has been obtained on one CX or SX signaling trunk as described above, pulses may be measured over another trunk by transferring the 10-foot P3E cord to the PLS jack of another CX or SX signaling circuit. When the tests are concluded, all test connections should be removed and all keys restored to normal.

6. RECORDS

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

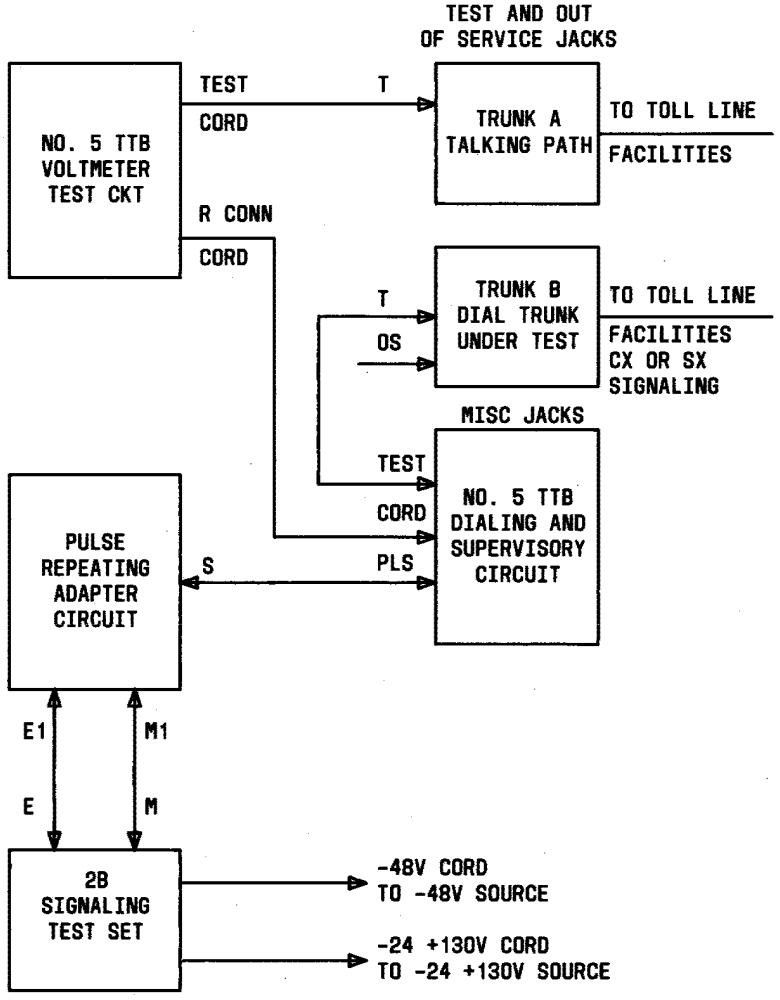

Fig. 1—Transmitting From No. 5 TTB

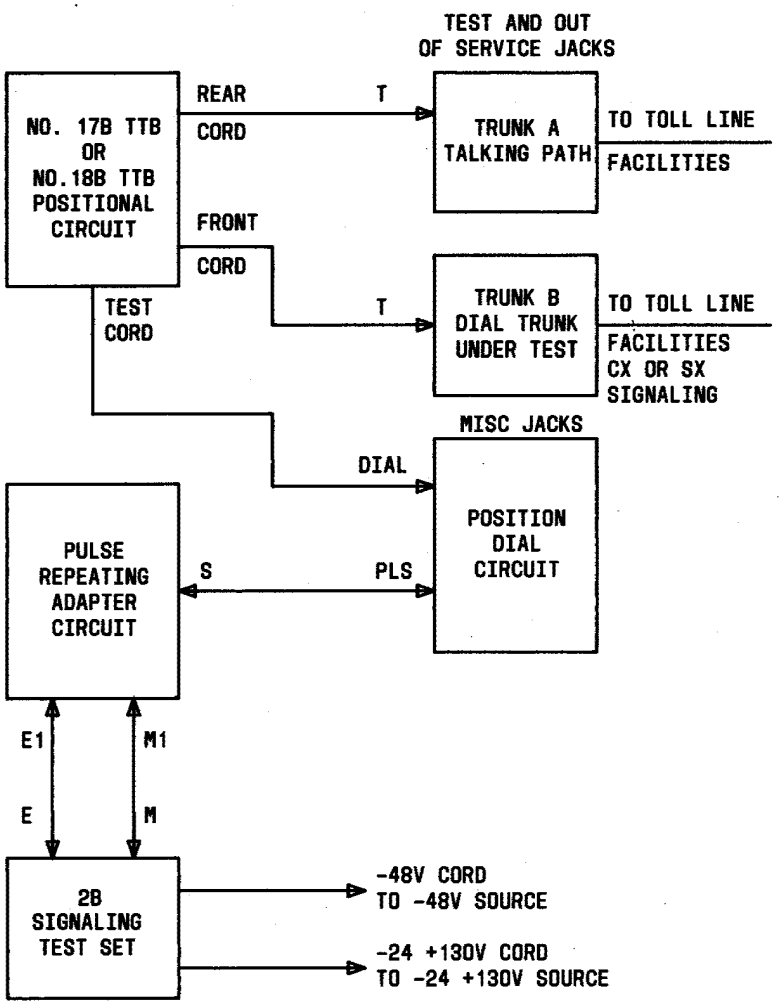

Fig. 2—Transmitting From No. 17B or No. 18B TTB

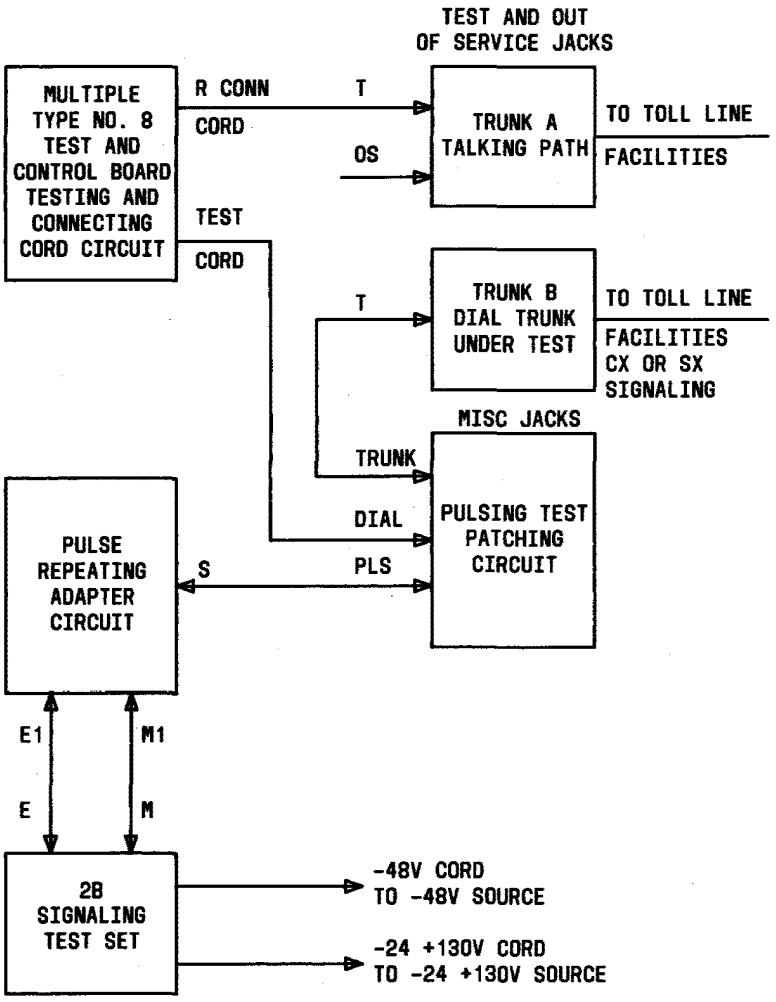

Fig. 3—Transmitting From Multiple Type No. 8 Test and Control Board

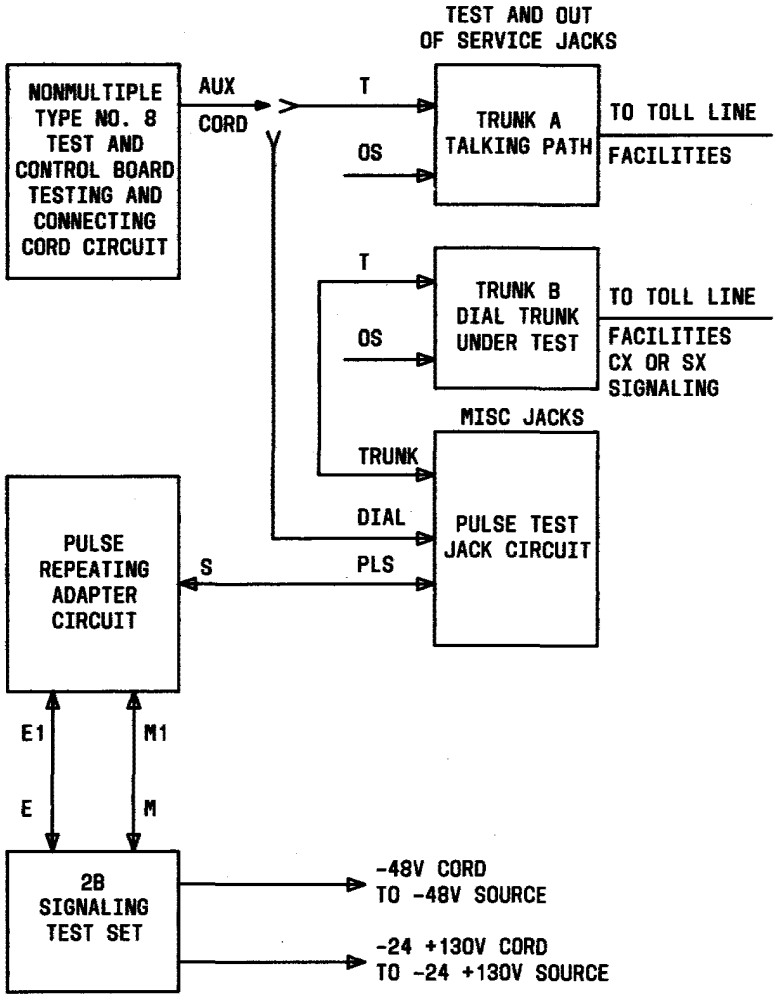

Fig. 4—Transmitting From Nonmultiple Type No. 8 Test and Control Board

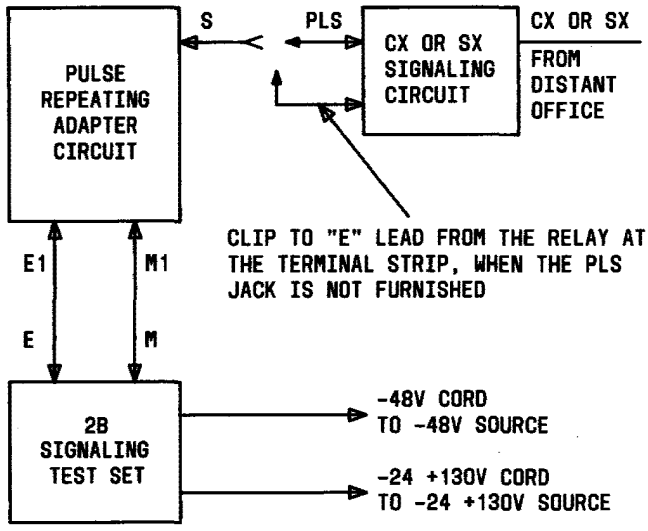

Fig. 5—Receiving at the Signaling Equipment

TABLE A

PERCENT BREAK OUTPUT AT CX OR SX RELAY
(INPUT AT SENDING END, 64 PERCENT)

	A CIRCUITS WORKING UNDER FAVORABLE CONDITIONS WITH RESPECT TO WORKING LIMITS		B 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