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 pulse repeating test set SD-64540-01 and where available pulsing test set SD-31481-01. The method of checking the pulse repeating requirements using the 2B signaling test set can be found in Section 179-708-508 and for the 4A signaling test set in Section 179-708-509.

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 Test at No. 5 Toll Testboard (Transmitting End) Using Pulse Repeating and Pulsing Test Sets:*** This test applies continuous pulses to the overall CX or SX signaling circuit and then measures the percent break of the pulse train at the distant end.

*B. **Overall Percent Break Pulsing Test at No. 5 Toll Testboard (Transmitting End) Using Pulse Repeating Test Set Only:*** This test applies pulses, which are generated by a dial that is calibrated to 12 pulses-per-second, to the overall CX or SX signaling circuit and then measures the percent break of the pulse train at the distant end.

*C. **Overall Percent Break Pulsing Test at No. 17B or 18B Toll Testboard (Transmitting End) Using Pulse Repeating and Pulsing Test Sets:*** This test applies continuous pulses to the overall CX or SX signaling circuit and then measures the percent break of the pulse train at the distant end.

*D. **Overall Percent Break Pulsing Test at No. 17B or 18B Toll Testboard (Transmitting End) Using Pulse Repeating Test Set Only:*** This test applies pulses, which are generated by a dial that is calibrated to 12 pulses-per-second, to the overall CX or SX signaling circuit and then measures the percent break of the pulse train at the distant end.

*E. **Overall Percent Break Pulsing Test at Multiple Type No. 8 Test and Control Board (Transmitting End) Using Pulse Repeating and Pulsing Test Sets:*** This test applies continuous pulses to the overall CX or SX signaling circuit and then measures the percent break of the pulse train at the distant end.

*F. **Overall Percent Break Pulsing Test at Multiple Type No. 8 Test and Control Board (Transmitting End) Using Pulse Repeating Test Set Only:*** This test applies pulses, which are generated by a dial that is calibrated to 12 pulses-per-second, to the overall CX or SX signaling circuit and then measures the percent break of the pulse train at the distant end.

*G. **Overall Percent Break Pulsing Test at Nonmultiple Type No. 8 Test and Control Board (Transmitting End) Using Pulse Repeating and Pulsing Test Sets:*** This test applies continuous pulses to the overall CX or SX signaling circuit and then measures

the percent break of the pulse train at the distant end.

H. Overall Percent Break Pulsing Test at Nonmultiple Type No. 8 Test and Control Board (Transmitting End) Using Pulse Repeating Test Set Only: This test applies pulses, which are generated by a dial that is calibrated to 12 pulses-per-second, to the overall CX or SX signaling circuit and then measures the percent break of the pulse train at the distant end.

I. Overall Percent Break Measurements of Continuous Pulses at the Receiving End: This test measures the percent break of the received pulse train which is generated at the sending end by the pulse repeating and pulsing test sets.

J. Overall Percent Break Measurements of 12 Pulses-Per-Second at the Receiving End: This test measures the percent break of the received pulse train which is generated manually at the sending end by a dial on the pulse repeating test set.

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 pulse repeating test set SD-64540-01 is located at the toll testboard or test and control board and controls the sending of pulses from this point. The pulsing test set SD-31481-01, if available, is used as the source of pulses, but if not available, the dial in the pulse repeating test set is used for this purpose. Typical layouts for toll testboards showing test connections are illustrated in Fig. 1, 2, 3, and 4.

1.07 At the receiving end, another pulse repeating test set SD-645540-01 is located at the CX or SX signaling circuit at the relay rack and the received pulses are measured for percent break by means of the percent break instrument associated with this test set. 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 Pulse repeating test set SD-64540-01 (J64722A).

2.02 2P9A cord assembly (P2J cord, 9 feet long, equipped with two 310 plugs).

2.03 3P6F cord assembly (P3E cord, 10 feet long, equipped with two 310 or 110 plugs).

TESTS A, C, E, AND G

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

2.05 4P8A cord assembly (P4N cord, 4 feet long, equipped with two 289A plugs).

2.06 3P7A cord assembly (P3E cord, 6 feet long, equipped with two 310 plugs).

2.07 36B remote control test set.

2.08 310 or 110 plug with tip and ring short-circuited.

2.09 2P9A cord assembly (P2J cord, equipped with two 310 or 110 plugs).

TESTS A AND B

2.10 3P14B cord assembly (P3J cord, equipped with two 241B plugs).

2.11 151B make-busy plug.

TESTS E, F, G, AND H

2.12 3P7A cord assembly (P3E cord, 6 feet long, equipped with two 310 plugs).

2.13 322A or D-93279 make-busy plug.

TESTS I AND J

2.14 3W3A cord assembly (W3A cord, 12 feet long, equipped with one 310 plug and one 59 cord tip on the sleeve conductor).

2.15 258C dummy plug.

3. PREPARATION

SENDING END

All Tests

STEP	ACTION	VERIFICATION
1	At the pulse repeating test set SD-31481-01— Preset ADJ, LK, LP, MIN and MAX variable potentiometers fully counterclockwise.	
2	At the pulse repeating test set— Verify that no dummy plugs are plugged into the jack block located on the bottom end of the test set.	
3	At pulse repeating test set SD-64540-01— Connect one end of 2P9A cord to BAT jack.	
4	At testboard— Connect other end of 2P9A cord to MISC 48V battery jack. ***Note:*** To avoid grounding battery supply, connect cord to test set first and, when disconnecting, remove cord from test set last.	

Tests A, C, E, and G

5	At pulsing test set SD-31481-01— Connect one end of 2P9A cord to BAT-G jack.	
6	At testboard— Connect other end of 2P9A cord to MISC 48V battery jack.	

STEP	ACTION	VERIFICATION
7	At pulsing test set— Connect one end of 4P8A cord to jacks A and B.	
8	At pulse repeating test set— Connect other end of 4P8A cord to jacks A and B.	
9	Connect one end of 6 foot 3P7A cord to INT jack.	
10	At pulsing test set— Connect other end of 6 foot 3P7A cord to TL jack.	
11	At pulse repeating test set— Connect cable from 36B remote control test set into jacks A1 and B1.	
12	At pulse repeating test set—. Check percent break meter for zero current setting of 100.	
13a	If meter does not indicate 100— Rotate zero adjuster screw on face of meter until pointer indicates 100 and then slightly rotate adjuster screw in opposite direction without disturbing meter pointer.	
14b	If pulse repeating test set is not equipped with SC key— Operate ADJ key.	
15c	If pulse repeating test set is equipped with SC key— At pulsing test set— Insert 310 plug, that has tip and ring short-circuited, into SW jack.	
16	Operate PR key.	
17d	If pulsing test set does not have PR key— Operate CHK PLS key.	
18	At pulse repeating test set— Operate DS and CHK PLS keys.	
19	At 36B remote control test set— Momentarily operate LP key.	

STEP	ACTION	VERIFICATION
20	At pulse repeating test set— Rotate ADJ potentiometer for percent break indication of 0.	
21e	If Step 14b was performed— At pulse repeating test set— Release ADJ key.	Percent meter will indicate output of pulse repeating test set.
22f	If Step 15c was performed— At pulsing test set— Remove 310 plug from SW jack.	Percent break meter will indicate output of pulse repeating test set.
23	At pulse repeating test set— Adjust LP potentiometer for percent break meter indication of 64.	
24	Restore PLS CK key.	
Tests B, D, F, and H		
25	At pulse repeating test set— Check percent break meter for zero current setting of 100.	
26a	If meter does not indicate 100— Rotate zero adjuster screw on face of meter until pointer indicates 100 and then slightly rotate adjuster screw in opposite direction without disturbing meter pointer. ***Note:*** Before starting tests, verify that dial in connector block of pulse repeating test set has been adjusted to a speed of 12 pps.	
27	At pulse repeating test set— Operate LP, DS, and PLS CK keys.	
28g	If ADJ key is nonlock type— Operate and hold ADJ key.	Percent break meter will move toward 0.
29	Rotate ADJ potentiometer for percent break meter indication of 0.	
30	Release ADJ key.	
31	Operate MAX key.	
32	Rotate MAX potentiometer for percent break meter indication of 64.	
33	Dial 0.	Meter pointer may rise or fall during return of dial.

STEP	ACTION	VERIFICATION
	Note: Rotate LP potentiometer in clockwise direction to compensate for fall of meter pointer and counterclockwise to compensate for a rise of meter pointer.	*Note:* Disregard possible slight kick of meter pointer at beginning and ending of dialing operation.
34	Dial 0 several times and adjust LP potentiometer for meter pointer indication of 64.	Meter pointer should not have a tendency to rise or fall.
35	Restore PLS CK key.	
Tests A and B		
36	At MISC jacks— Connect RIGHT CONN cord into CORD T and R jacks of dialing and supervisory circuit (SD-64595-01, SD-64881-01, SD-64595-01) from voltmeter test circuit.	
37	At dialing and supervisory circuit— Connect one end of 3P14B cord into Test T and R jacks.	
38	At test and out of service jacks— Touch the tip side of the 3P14B cord to sleeve of TEST jack of trunk to be used as talking path.	Busy lamp lights if trunk is busy.
39h	If trunk is busy— Repeat Step 38 for other trunk to be used.	
40	At idle trunk— Insert 151B short circuit plug into OS jack.	
41	Connect other end of 3P14B cord into TEST jack.	
42	At voltmeter testing circuit— Operate TEL ON CORDS and TALK keys.	
43	At dial and supervisory circuit— Operate DIAL key.	
44	Dial attendant number at distant toll office.	
45	Restore DIAL key.	
46	Inform attendant at distant office of the trunk number to be tested.	
47	At voltmeter testing circuit— Restore TEL ON CORDS key.	

STEP	ACTION	VERIFICATION
48	At test and out of service jacks— Disconnect 3P14B cord from TEST jack.	
49	At voltmeter testing circuit— Operate TEL ON CORDS key.	
50	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.
51	Touch tip of 3P14B cord to sleeve of TEST jack of trunk to be tested.	
52h	If trunk is busy— Repeat Step 51 for other trunks to be tested.	Busy lamp lights.
53	At idle trunk— Insert 3P6F cord into TEST jack of trunk to be tested.	
54	At dial and supervisory circuit— Operate DIAL key.	
55	Connect one end of 3P6F cord into PLS jack.	
56	At pulse repeating test set— Connect other end of 3P6F cord into LP OUT jack.	
57	Operate SL key.	
Tests C and D		
58	At positional circuit— Operate TALK key of an idle cord circuit.	
59	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.
60h	If trunk is busy— Repeat Step 59 for another usable trunk.	
61	At idle trunk— Insert plug of cord circuit into TEST jack.	
62	At positional circuit— Operate DIAL key to rear position.	
63	Dial the attendant number at distant toll office.	

STEP	ACTION	VERIFICATION
64	Restore DIAL key.	
65	Inform attendant at the distant office of the trunk number to be tested.	
66	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.
67i	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.	
68i	Restore TALK key of cord circuit and operate another TALK key for another cord circuit.	
69i	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.
70h	If trunk is busy— Repeat Step 69i for other trunks to be tested.	
71i	Insert plug of rear cord into TEST jack of idle trunk.	
72i	Operate DIAL key.	
73i	Restore TALK key.	
74i	At first cord circuit used— Operate TALK key.	Talking connection reestablished.
75i	At second cord circuit— Operate TALK key.	
76	At idle trunk— Insert plug of front cord circuit into TEST jack.	
77	At positional circuit— Operate DIAL key to front position.	
78	At toll testboard— Connect one end of 3P6F cord to the signal jack of trunk to be tested.	

STEP	ACTION	VERIFICATION
79	At pulse repeating test set— Connect other end of 3P6F cord into LP OUT jack.	
80	Operate SL and CX OUT keys.	BY lamp lights.
Tests E and F		
81	At test and control board— Operate TEL ON C CDS and TALK keys.	
82	At test and out of service jacks— Touch tip of RIGHT CONN cord to sleeve of TEST jack of trunk for talking path.	
83h	If trunk is busy— Repeat Step 82 for another trunk to be used.	
84	At idle trunk— Connect RIGHT CONN 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 the 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	At test and control board— Restore TEL ON C CDS key.	
91	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.	
92h	If trunk is busy— Repeat Step 91 for other trunks to be tested.	
93	At test and out of service jacks— Connect one end of 3P7A cord to TEST jack of trunk under test.	
94	At pulsing test patch circuit— Connect other end of 3P7A cord to TRK jack.	

STEP	ACTION	VERIFICATION
95	At test and control board— Connect cord A, B, or C into DIAL jack of pulsing test patching circuit.	
96	Operate DIAL key.	
97	At pulsing test patching circuit— Connect one end of 3P6F 10-foot cord to PLS jack.	
98	At pulse repeating test set— Connect other end of 3P6F cord into LP OUT jack.	
99	Operate SL key.	
100	At test and control board— Restore DIAL key.	
101	At pulsing test patching circuit— Remove A, B, or C cord from DIAL jack.	
102	At test and control board— Operate TEL ON C CDS key.	Talking path at far end is reestablished.
Tests G and H		
103	At test and control board— Operate TALK key.	
104	At test and out of service jacks— Touch tip of AUX cord to sleeve of TEST jack of trunk for talking path.	
105h	If trunk is busy— Repeat Step 104 for another trunk to be used.	
106	At idle trunk— Insert AUX cord into TEST jack.	
107	At test and control board— Operate DIAL key.	
108	Dial attendant number at distant office.	
109	Restore DIAL key.	
110	Inform attendant at distant office of the trunk number to be tested.	

STEP	ACTION	VERIFICATION
111	At test and out of service jacks— Insert a 322A or D-93279 plug into OS jack of trunk for talking path.	
112	Remove AUX cord from idle trunk.	
113	Touch tip of AUX cord to sleeve of TEST jack of trunk to be tested.	
114h	If trunk is busy— Repeat Step 113 for other trunks to be tested.	
115	At idle trunk— Connect one end of 3P6F cord to TEST jack.	
116	At pulsing test patch circuit— Connect other end of 3P6F cord to TRK jack.	
117	At pulse test patch circuit— Insert AUX cord into DIAL jack.	
118	At test and control board— Operate DIAL key.	
119	At pulse test jack circuit— Connect one end of 3P6F cord into PLS jack.	
120	At pulse repeating test set— Connect other end of 3P6F cord into LP OUT jack.	
121	Operate SL key.	
122	At test and control board— Restore DIAL key.	
123	At pulse test jack circuit— Remove AUX cord from DIAL jack.	
124	At test and out of service jacks— Connect AUX cord into TEST jack of talking trunk.	Talking connection is reestablished.

RECEIVING END

Tests I and J

125	At pulse repeating test set SD-64540-01— Connect one end of 2P9A cord to BAT jack.	

STEP	ACTION	VERIFICATION
126	At signaling circuit— Connect other end of 2P9A cord to 48-volt supply jack. ***Note:*** To avoid grounding battery supply, connect cord to test set first and, when disconnecting, remove cord from test set last.	
127	At pulse repeating test set— Check percent break meter for zero current setting of 100.	
128a	If meter does not indicate 100— Rotate zero adjuster screw on face of meter until pointer indicates 100 and then slightly rotate adjuster screw in opposite direction without disturbing meter pointer.	
129	Insert 258C dummy plug into INT jack of pulse repeating test set.	
130	Connect one end of 3P6F cord into RLY jack.	
131	At signaling circuit— Connect other end of 3P6F cord to PLS jack.	
132j	If PLS jack is not provided— At signaling circuit— Disconnect E lead at terminal strip.	
133j	At pulse repeating test set— Disconnect 3P6F cord from RLY jack.	
134j	Connect 310 plug of 3W3A cord into RLY jack.	
135j	At signaling circuit— Connect other end of 3W3A cord to E lead.	
136k	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.	

STEP	ACTION	VERIFICATION
4.	**METHOD**	
A.	**Overall Percent Break Pulsing Test at No. 5 Toll Testboard (Transmitting End) Using Pulse Repeating and Pulsing Test Sets**	
58	Operator at distant office will request a steady state closure to obtain 0 setting on percent break meter.	
59	At pulse repeating test set— Operate SC key.	
60b	If SC key is not provided— Operate ADJ key.	Tester at distant end confirms 0 setting has been obtained.
61	Release SC or ADJ key.	Pointer on percent break meter should be steady and indicate 100.
	Note: Continuous pulses of 64 percent break are being transmitted to receiving end.	***Note:*** If the pointer is unsteady or does not indicate 100, a trouble is indicated.
62l	If another trunk is to be tested— Restore DIAL key.	
63l	At test and out of service jacks— Remove 3P14B cord from TEST jack of trunk that was tested.	
64l	Repeat PREPARATION Steps 51 through 54 and METHOD Steps 58 through 62l of Test A.	
65	At conclusion of test— Remove all cords and restore all keys.	
B.	**Overall Percent Break Pulsing Test at No. 5 Toll Testboard (Transmitting End) Using Pulse Repeating Test Set Only**	
58	Operator at distant office will request transmission of pulses.	
59	At pulse repeating test set— Dial 0 several times.	Operator at distant end will indicate that an accurate reading has been obtained.
60l	If another trunk is to be tested— Restore DIAL key.	
61l	At test and out of service jacks— Remove 3P14B cord from TEST jack of trunk that was tested.	

STEP	ACTION	VERIFICATION
62l	Repeat PREPARATION Steps 51 through 54 and METHOD Steps 58 through 60l of Test B.	
63	At conclusion of test— Remove all cords and restore all keys.	
C. Overall Percent Break Pulsing Test at No. 17B or 18B Toll Testboard (Transmitting End) Using Pulse Repeating and Pulsing Test Sets		
82	Operator at distant office will request a steady state closure to obtain 0 setting on percent break instrument.	
83	At pulse repeating test set— Operate SC key.	
84b	If SC key is not provided— Operate ADJ key.	Operator at distant end confirms 0 setting has been obtained.
85	Release SC or ADJ key.	Continuous pulses at 64 percent break are being transmitted to the distant end.
86l	If another trunk is to be tested— Restore DIAL key.	
87	At test and out of service jacks— Remove 3P14B cord from TEST jack of trunk that was tested.	
88l	Repeat PREPARATION Steps 66 through 77 and METHOD Steps 82 through 87 of Test C.	
89	At conclusion of test— Remove all cords and restore all keys.	
D. Overall Percent Break Pulsing Test at No. 17B or 18B Toll Testboard (Transmitting End) Using Pulse Repeating Test Set Only		
82	Operator at distant office will request transmission of pulses.	
83	At pulse repeating test set— Dial 0 several times.	Operator at distant end will indicate that an accurate reading has been obtained.
84l	If another trunk is to be tested— Restore DIAL key.	
85l	At test and out of service jacks— Remove cord circuit from TEST jack of trunk that was tested.	

STEP	ACTION	VERIFICATION
86l	Repeat PREPARATION Steps 66 through 77 and METHOD Steps 82 through 84l of Test D.	
87	At conclusion of test— Remove all cords and restore all keys.	

E. Overall Percent Break Pulsing Test at Multiple Type No. 8 Test and Control Board (Transmitting End) Using Pulse Repeating and Pulsing Test Sets

105	Operator at distant office will request a steady state closure to obtain 0 setting on percent break instrument.	
106	At pulse repeating test set— Operate SC key.	
107b	If SC key is not provided— Operate ADJ key.	Operator at distant end confirms 0 setting has been obtained.
108	Release SC or ADJ key.	Continuous pulses at 64 percent break are being transmitted to the distant end.
109l	If another trunk is to be tested— At test and out of service jacks— Remove 3P14B cord from TEST jack of trunk that was tested.	
110l	Repeat PREPARATION Steps 92 through 94 and METHOD Steps 105 through 109l of Test E.	
111	At conclusion of test— Remove all cords and restore all keys.	

F. Overall Percent Break Pulsing Test at Multiple Type No. 8 Test and Control Board (Transmitting End) Using Pulse Repeating Test Set Only

105	Operator at distant office will request transmission of pulses.	
106	At pulse repeating test set— Dial 0 several times.	Operator at distant end will indicate that an accurate reading has been obtained.
107l	If another trunk is to be tested— At test and out of service jacks— Remove cord circuit from TEST jack of trunk that was tested.	

STEP	ACTION	VERIFICATION
108l	Repeat PREPARATION Steps 92 through 94 and METHOD Steps 105 through 107l of Test F.	
109	At conclusion of test— Remove all cords and restore all keys.	
G. Overall Percent Break Pulsing Test at Nonmultiple Type No. 8 Test and Control Board (Transmitting End) Using Pulse Repeating and Pulsing Test Sets		
128	Operator at distant office will request a steady state closure to obtain 0 setting on percent break instrument.	
129	At pulse repeating test set— Operate SC key.	
130b	If SC key is not provided— Operate ADJ key.	Operator at distant end confirms 0 setting has been obtained.
131	Release SC or ADJ key.	Continuous pulses of 64 percent break are being transmitted to the distant end.
132l	If another trunk is to be tested— At test and out of service jacks— Remove 3P14B cord from TEST jack of trunk that was tested.	
133l	Repeat PREPARATION Steps 113 through 116 and METHOD Steps 128 through 132l of Test G.	
134	At conclusion of test— Remove all cords and restore all keys.	
H. Overall Percent Break Pulsing Test at Nonmultiple Type No. 8 and Control Board (Transmitting End) Using Pulse Repeating Test Set Only		
128	Operator at distant office will request transmission of pulses.	
129	At pulse repeating test set— Dial 0 several times.	Operator at distant end will indicate that an accurate reading has been obtained.
130l	If another trunk is to be tested— At test and out of service jacks— Remove cord circuit from TEST jack of trunk that was tested.	

STEP	ACTION	VERIFICATION
131l	Repeat PREPARATION Steps 113 through 116 and METHOD Steps 128 through 130l of Test H.	
132	At conclusion of test— Remove all cords and restore all keys.	
I. Overall Percent Break Measurements of Continuous Pulses at the Receiving End		
140	At pulse repeating test set— Operate CX IN key.	
141	Request steady closure from sending end.	
142m	If pulse repeating test set percent break meter does not indicate 0— At pulse repeating test set— Rotate ADJ potentiometer for indication of 0 on percent break meter.	
143	Request pulses from sending end.	At pulse repeating 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.
144n	If circuit conditions are not favorable as those indicated in 5.02 but are within working limits of circuit drawing— At pulse repeating 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 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.
145l	If another trunk is to be tested— Repeat PREPARATION Steps 131 through 136k and METHOD Steps 141 through 146o of Test I.	
146o	If no other tests are to be performed— Disconnect all test connections and restore all keys to normal.	
J. Overall Percent Break Measurements of 12 Pulses Per Second at the Receiving End		
140	At pulse repeating test set— Operate CX IN key.	

STEP	ACTION	VERIFICATION
141	Request steady closure from sending end.	
142m	If pulse repeating test set percent break meter does not indicate 0— At pulse repeating test set— Rotate ADJ potentiometer for indication of 0 on percent break meter.	
143	Operate MIN key.	
144	Momentarily operate RESET key.	
145	Adjust MIN potentiometer for expected percent break meter indication as prescribed in Table A, Column A, for circuit conditions given in paragraph 5.02.	
146n	If circuit conditions are not as favorable as those indicated in paragraph 5.02 but are within working limits of circuit drawing— At pulse repeating test set— Adjust MIN potentiometer for expected percent break meter indication as prescribed by Table A, Column B.	
147	Restore MIN key.	
148	Operate MAX key.	
149	Momentarily operate RESET key.	
150	Adjust MAX potentiometer for expected percent break meter indication as prescribed in Table A, Column A, for circuit conditions given in paragraph 5.02.	
151n	If circuit conditions are not as favorable as those indicated in paragraph 5.02 but are within working limits of circuit drawing— At pulse repeating test set— Adjust MAX potentiometer for expected percent break meter indication as prescribed in Table A, Column B.	
152	Request sending end to dial 0 until accurate meter reading has been recorded. ***Note:*** RESET key must be momentarily operated after each dialing operation.	Percent break meter pointer should remain stationary or show a tendency to fall. ***Note:*** • If meter pointer has tendency to rise, the indication is that the percent break of the

STEP	ACTION	VERIFICATION
		pulses is above the limit set up on the MAX potentiometer. • Disregard possible slight kick of meter pointer at beginning and ending of dialing operation.
153p	If meter pointer rises or falls when Step 152 is performed and actual percent break output is desired— Request sending end to dial 0 until measurement of rise or fall of meter pointer is completed. ***Note:*** RESET key must be momentarily operated after each dialing operation.	At pulse repeating test set— Meter pointer will rise or fall. ***Note:*** Disregard possible slight kick of meter pointer at the beginning and ending of dialing operation.
154p	At pulse repeating test set— Rotate MAX potentiometer so meter pointer moves in same direction indicated by rise or fall of pointer during dialing operation.	
155	Record meter reading.	
156	Restore MAX key.	
157	Operate MIN key.	
158	Momentarily operate RESET key.	
159	Request sending end to dial 0 until accurate meter reading has been recorded. ***Note:*** RESET key must be momentarily operated after each dialing operation.	Percent break meter pointer should remain stationary or show a tendency to rise. ***Note:*** • If meter pointer has tendency to fall, the indication is that the percent break of the pulses is below the limit set on the MIN potentiometer. • Disregard a possible slight kick of meter pointer at beginning and ending of dialing operation.
160p	If meter pointer rises or falls when Step 159 is performed and actual percent break output is desired— Request sending end to dial 0 until measurement of rise or fall of meter pointer is completed. ***Note:*** RESET key must be momentarily operated after each dialing operation.	At pulse repeating test set— Meter pointer will rise or fall. ***Note:*** Disregard possible slight kick of meter pointer at beginning and ending of dialing operation.

STEP	ACTION	VERIFICATION
161p	At pulse repeating test set— Rotate MIN potentiometer so meter pointer moves in same direction as indicated by rise or fall of meter pointer during dialing operation.	
162	Record meter reading.	
163l	If test of other trunks is desired— Repeat PREPARATION Steps 131 through 136k and METHOD Steps 141 through 162 of Test J.	
164o	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.

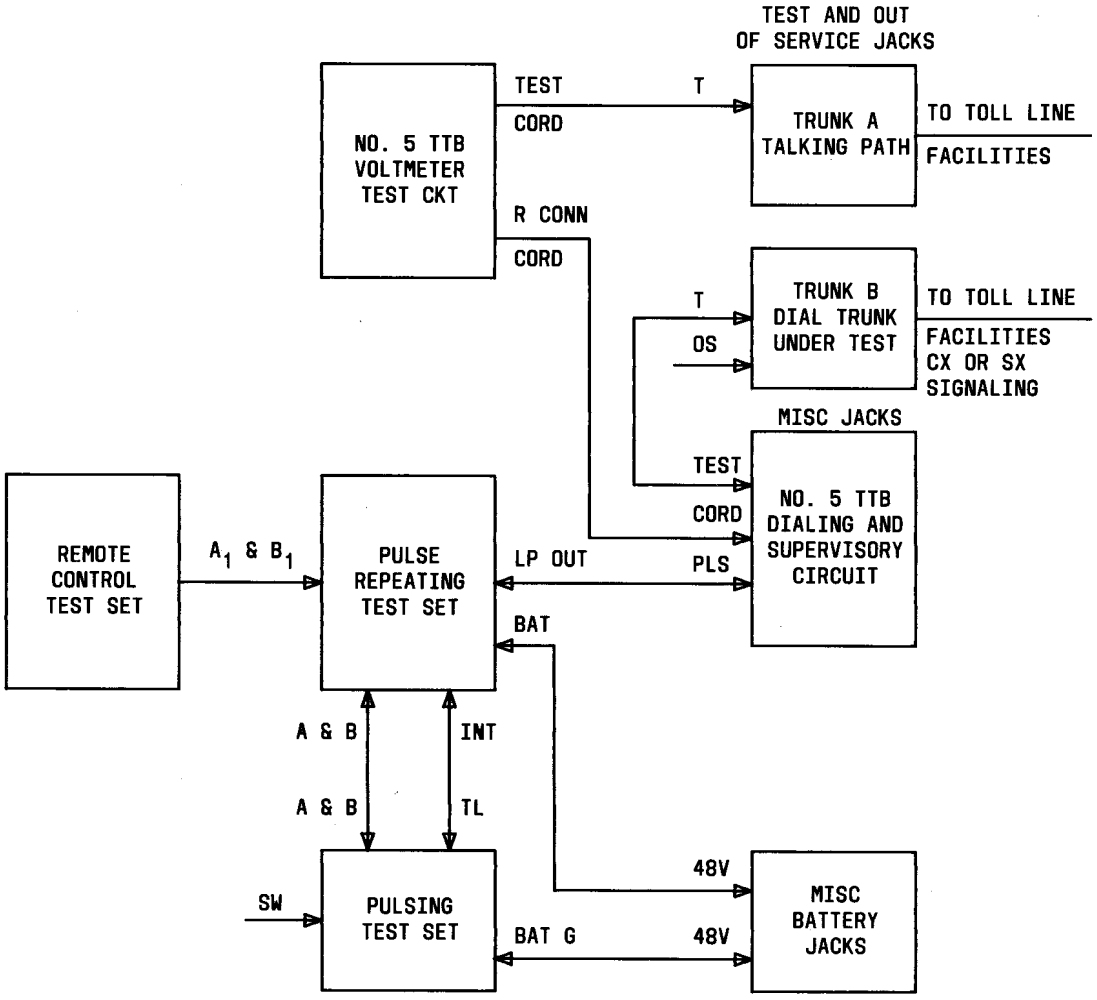

Fig. 1—Sending From No. 5 TTB

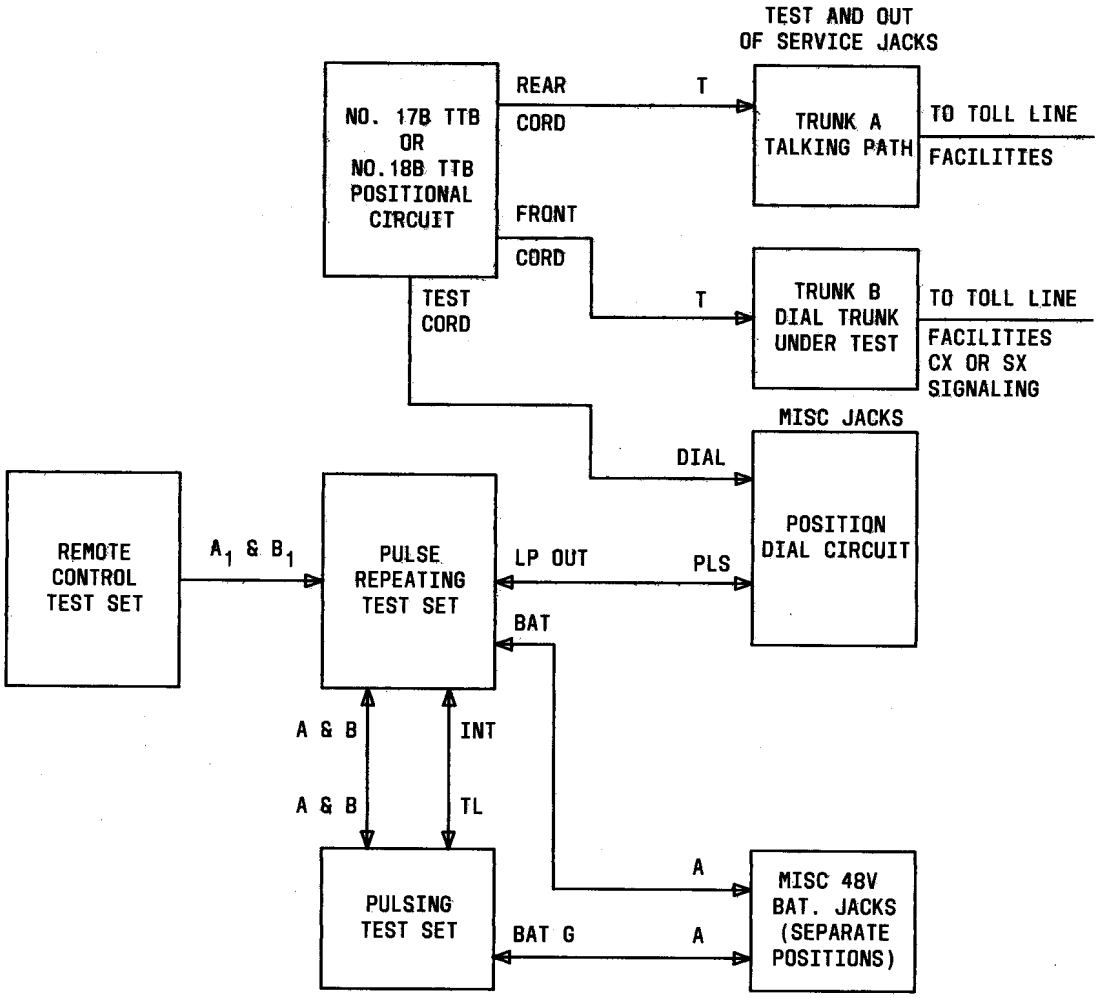

Fig. 2—Sending From No. 17B or No. 18B TTB

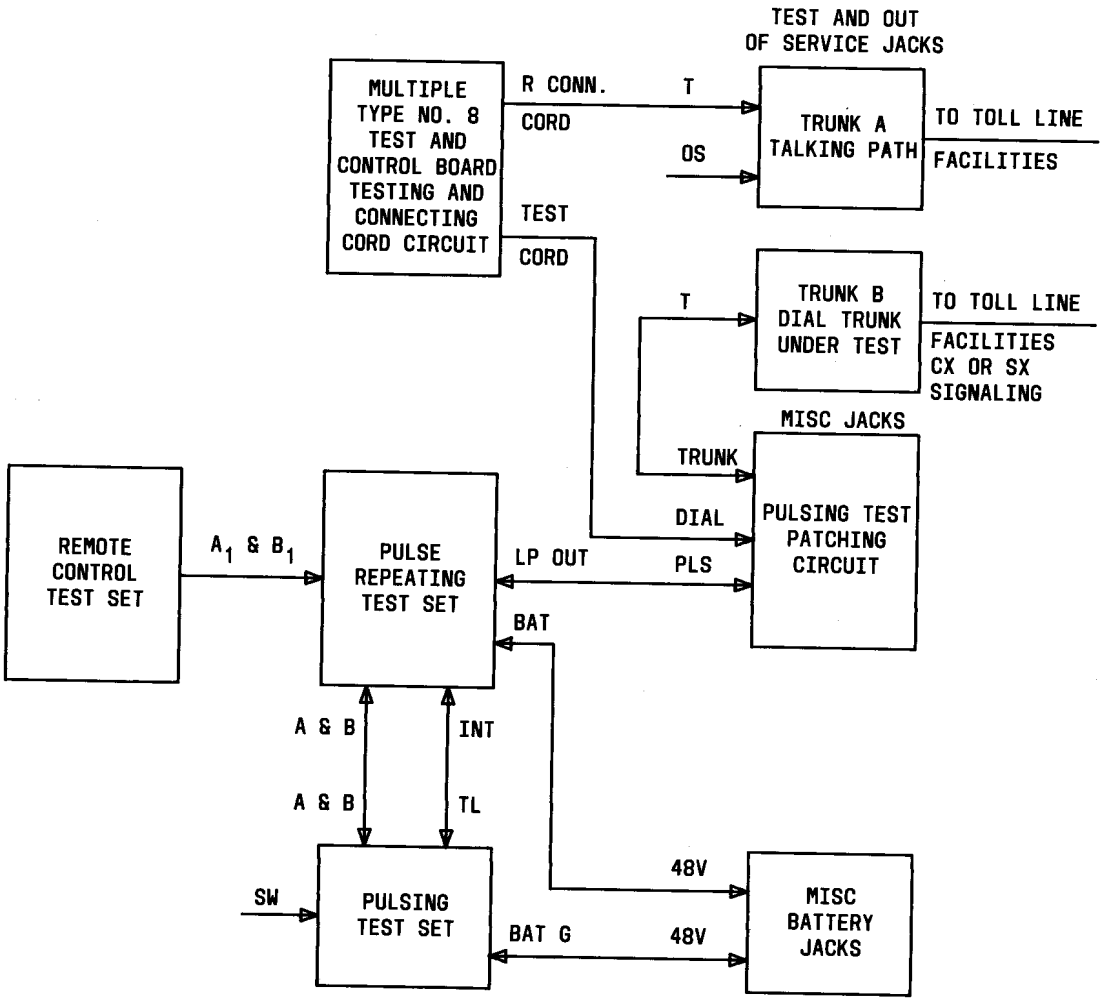

Fig. 3—Sending From Multiple Type No. 8 Test and Control Board

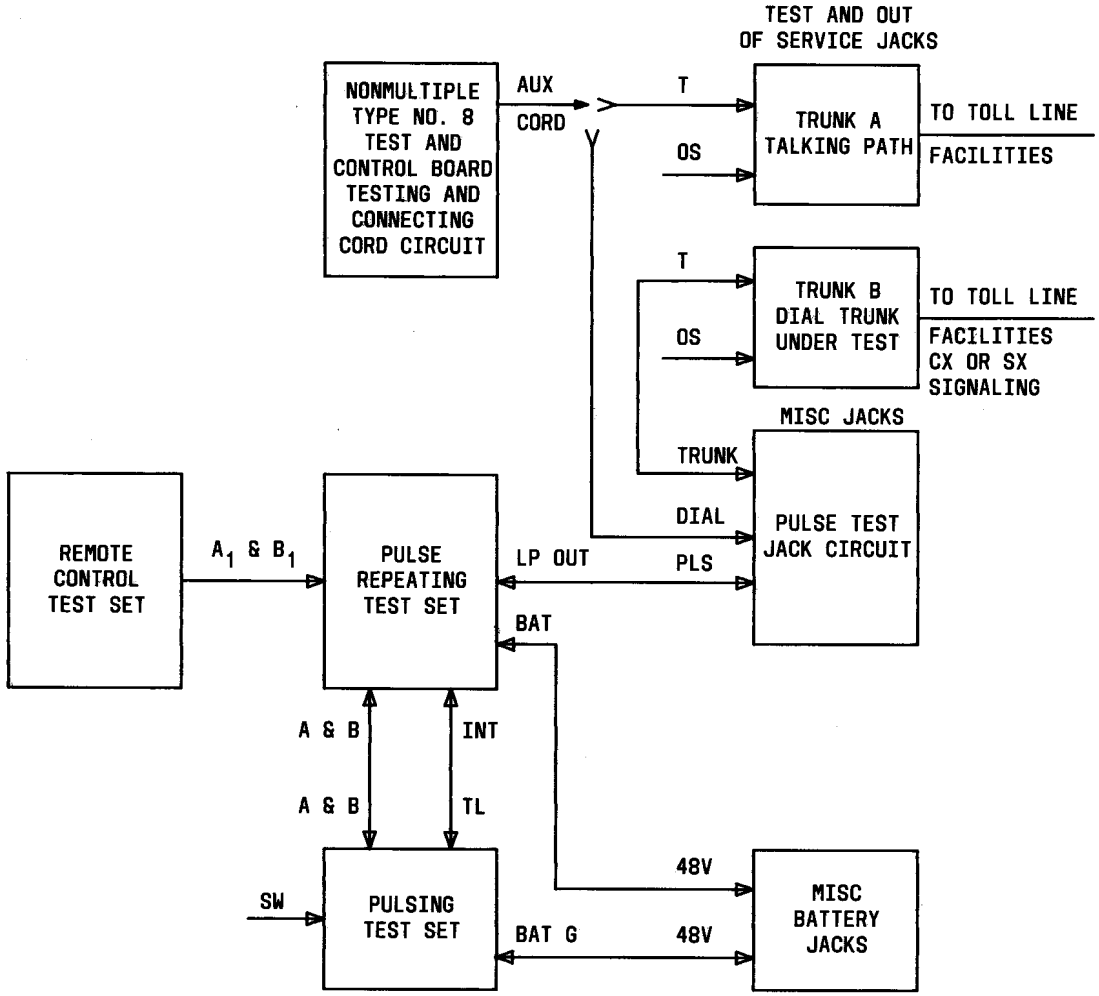

Fig. 4—Sending From Nonmultiple Type No. 8 Test and Control Board

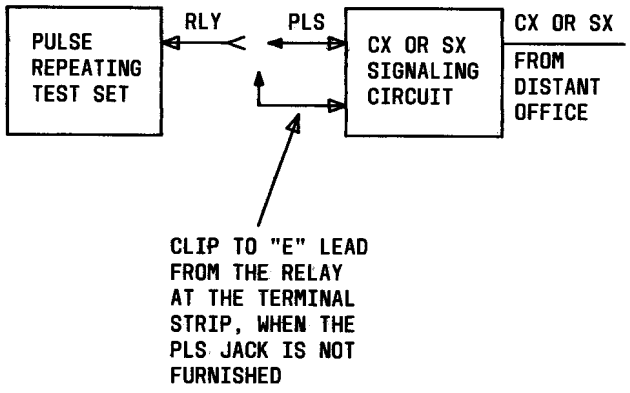

Fig. 5—Receiving at the Signaling Equipment

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