PULSING TESTS AND REQUIREMENTS FOR REPEATING TIE TRUNKS EQUIPPED PER SD65718 AND SD66799 UTILIZING THE NORTHEAST 26B PULSE TEST SET

1. GENERAL

1.01 This practice describes the pulsing test and requirements to be used on initial installation and maintenance of Dial repeating tie trunk terminals equipped per SD65718 and SD66799. They agree with the drawing basic requirements (F2 & F5) with modification to provide test values and simplified connections.

1.02 The tests and their application are:

A. Required local terminal pulsing tests of incoming and pulse correcting relays.

a. Test values and arrangements for installation and initial trouble report. (Paragraph 4.01)

b. Readjust values and arrangements for repeated trouble reports. (Paragraph 4.02)

B. Overall pulsing tests for point to point services.

a. Terminal to terminal - physical facilities (Paragraph 5.01)

b. Terminal to terminal - carrier facilities (Paragraph 5.02)

C. Section pulsing tests for C.C.S.A. (Common Control Switching Arrangements) and long haul carrier services.

a. Local terminal outgoing A relay. (Paragraph 6.01)

b. Terminal to near end test board. (Paragraph 6.02)

c. Near end test board to terminal. (Paragraph 6.03)

1.03 Before any pulsing tests are attempted, all wiring, cross-connecting and strapping should be completed. The (R) relay bias strapping should be made in accordance with SD65718-01 note #117 or SD66799-01 note #201 from the loop resistance information furnished on the service order or T.C.L.R. card. If the (R) relay does not function properly or there is reason to believe that the loop resistance information given is incorrect, verification may be made by measuring the individual cable pairs (terminal to terminal) with a Wheatstone bridge. If 24V4 equipment is used, this test may readily be made by inserting dummy plugs in the outgoing T Jack and the incoming R jack and short circuiting plugs in the associated mon. jacks (out). The Test Board or Local Test Bureau may then read the loop resistance of the transmit and receive cable pairs individually with a Wheatstone bridge. If the Test Bureau is involved on physical facilities, readings should be taken to both terminals and added to obtain total loop. If 24V4 equipment is not used, the short circuit should be applied at the cable terminal.

If the verified loop resistance varies from that shown on the order by more than 50 ohms, the controlling tester should report the difference to the Facility Engineer who made the circuit design so that the records may be corrected and if necessary the transmission design changed.

1.04 Transmission tests should be completed before attempting over all pulsing tests.

2. TESTING APPARATUS

2.01 The following is required at the terminal location:

1 - model TTS26B Pulse Signaling Test Set.

1 - P3E cord (3P6E cord or equivalent) 8 feet long E/W two No. 310 plugs (straight T & R connection).

1 - P3E cord (3P6E cord or equivalent) 8 feet long E/W two No. 310 plugs with one end reterminated to reverse tip and ring (reversed T & R connection).

1 - 2W16A cord 9 ft. long E/W a No. 310 plug at one end and spade clips on tip and sleeve of the other end.

1 - W1AP strapping cord.

1 - W2W cord 10 feet long E/W a No. 310 plug at one end and 1 - 360 B tool and 1 - 360C tool with KS 6278 clips on tip and ring of the other end.

1 - 35 type test set with associated cords (for relay check).

3. TEST SET PREPARATION

STEP	ACTION	VERIFICATION
1.)	Turn the SPARK SUPPRESSION switch (lower right) to the "off" position and the FUNCTION switch to the "Send and Rec." position.	
2.)	Connect Pulse Signaling Test Set Battery jack to 48 volt supply using the 2W16A cord (Battery on tip and ground on sleeve). Note: To avoid possible grounding of the battery supply, insert plug in the Test Set before connecting the spade clips and remove plug from Test Set after disconnecting the spade clips.	
3.)	Turn the PULSES PER SEC. switch to the desired speed. This also turns the set on.	Verify that meter read 100 (no current position). If it does not, adjust by means of screw driver and set screw on meter to obtain 100 reading.
4.)	Turn the SEND turn button switch (lower left) to the "RT on 1 and 2" position.	
5.)	Operate the SEND & TEST key switch (left of 3 knife switches) to the down or "SEND OSC." position.	
6.)	A-Set the METER CIRCUIT switch to "% Break Thru Meter Rly." position for all sections except 4.02. B-Set the Meter circuit switch to "% Break Direct" position for section 4.02.	

7.) Set the FUNCTION switch to the "Cal. Meter" position. Adjust the METER CAL. control until the meter reads 0 % on the scale.

8.) Set the FUNCTION switch to the "Adj. % Break" position.

The meter will now indicate the % break output of the Test Set. This may be varied by movement of the ADJ. % BREAK Control.

4. REQUIRED LOCAL TERMINAL PULSING TESTS. (2 & 4 WIRE). (SEE PART 3 FOR PREPARATION).

4.01 Test of incoming and pulse correcting relays using test values and arrangements. For new installations this test should be made before contacting the distant end or test board. When tie trunks are in service, call distant end or test board to have circuit made busy.

STEP	ACTION	VERIFICATION
9.)	(See Part 3 for steps #1-8. Note Step #6-A.) Patch the B jack of the Tie Trunk to the REC. LOOP jack of the Pulse Signaling Test Set using the modified 3P6E or equivalent (Reversed T & R) cord.	
10.)	Patch the D jack of the Tie Trunk to the LINE jack of the Pulse Signaling Test Set using the standard 3P6E or equivalent (straight T & R) cord.	
11.)	Strap Terminals #7 & 8 of the Tie Trunk B jack using the W1AP cord or equivalent.	
12.)	Set the SEND Switch to "Line E & M" (M-B & G) position (#3).	
13.)	Set the RECEIVE Switch to "Rec. Loop" position (#2).	
14.)	Set the PULSES PER SEC. Switch to "12".	
15.)	Set the FUNCTION Switch to "Off-Hook" position.	Meter should read 0 % break. If it does not, adjust the METER CAL. control to obtain 0 % reading.
16.)	Set the FUNCTION Switch to "On-Hook" position.	Meter should read 100% break.

STEP	ACTION	VERIFICATION
17.)	Set the FUNCTION Switch to "Adj. % Break" position	By means of the ADJ % Break Control obtain meter reading of 60% break.
18.)	Set the FUNCTION Switch to "Send & Rec." position.	a.) For 2 wire circuits per SD65718-01, Iss. 13-14 (J58824BC-2) meter should read 54-62%, ideal 58%. b.) For 2 wire circuits per SD65718-01, Iss. #12 or earlier (J58824BC-1) meter should read 48-56%, ideal 52%. c.) For 4 wire circuits per SD65718-01, Iss. 13-14 (J58824BC-2) and SD66799-01 with 24V4 meter should read 54-62%, ideal 58%. d.) For 4 wire circuits per SD65718-01, Iss. #12 or earlier (J58824BC-1) with SD65789-01 meter should read 54-62%, ideal 58%.
19.)	If the meter reading is not within the requirements given in Step #18 verification, provide or remove straps on B and C resistors to decrease or increase the % break reading as nearly as possible to the ideal given. If sufficient change cannot be achieved by varying the shunt resistance, proceed to Paragraph 4.02. After completing Paragraph 4.02 retest per Paragraph 4.01. If requirements still cannot be met, there is indication of trouble in the D1 Network or other components of the circuit.	
20.)	If both current flow and percent break requirements cannot be met, check the (R) and (LU) relays as provided in the drawing relay requirement tables.	
21.)	After the requirement of step #18 has been satisfied set the PULSES PER SEC. Switch to "6".	
22.)	Set the FUNCTION Switch to "Off-Hook" position.	Meter should read 0% break. If it does not, adjust the METER CAL. Control to obtain 0% reading. (Meter should be checked for 0% because of possible changes in battery voltage).

STEP	ACTION	VERIFICATION
23.)	Set the FUNCTION Switch to "On-Hook" position.	Meter should read 100% break.
24.)	Set the FUNCTION Switch to "Adj. % Break" position.	By means of the ADJ. % BREAK Control obtain meter reading of 30% break.
25.)	Set the FUNCTION Switch to "Send & Rec." position.	a.) For 2 wire circuits per SD65718-01 Iss. #13-14 (J58824BC-2) meter should read 33-41%, ideal 37%. b.) For 2 wire circuits per SD65718-01 Iss. 12 or earlier (J58824BC-1) meter should read 29-37%, ideal 33%. c.) For 4 wire circuits per SD65718-01 Iss. #13-14 (J58825BC-2) and SD66799-01 with 24V4, meter should read 32-40%, ideal 36%. d.) For 4 wire circuits per SD65718-01 Iss. #12 or earlier (J58824BC-1) with SD65789-01, meter should read 32-40%, ideal 36%.
26.)	If the meter reading is not within the requirements provided in Step #25 verification, proceed immediately to Paragraph 4.02. After completing Paragraph 4.02 satisfactorily, retest per Paragraph 4.01. If requirements still cannot be met there is indication of trouble in the D1 Network or other components of the circuit.	
27.)	If tie trunk was made busy call distant end or test board to release busy. Remove the strap from the B jack and all cords used in test.	

4.02 Test of incoming and pulse correcting relays using readjust values and arrangements. For new installations and initial trouble reports this test should not be made unless the requirements of Paragraph 4.01 cannot be met. It should be used for repeated trouble reports in place of Paragraph 4.01.

STEP	ACTION	VERIFICATION
9.)	(See Part 3 for Steps #1-8. Note Step #6-B) Call distant end or test board to have circuit made busy.	Tie trunk (R), (B1), (B2) and others will operate.
10.)	Insert a dummy plug in the Tie Trunk B jack.	Tie Trunk (B1) & (B2) will be held locally.
11.)	Patch the D jack of the Tie Trunk to the LINE jack of the Pulse Signaling Test Set using the standard 3P6E or equivalent (straight T & R) cord.	
12.)	Strap terminals #7 & #8 of the Tie Trunk B jack using the W1AP cord or equivalent.	
13.)	Set the SEND Switch to "Line E & M" (M-B & G) position (#3).	
14.)	Set the RECEIVE Switch to "Rec. Loop" position (#2).	
15.)	Set the PULSES PER SEC. Switch to "6".	
16.)	Set the METER CIRCUIT Switch to "% Break Direct" position.	
17.)	Plug the W2W cord into the Pulse Signaling Test Set REC. LOOP jack connect the ring cord clip to the Top #2 contact of the (TO) relay and the tip cord clip to the Top #2 contact of the (LU1) relay.	
18.)	Insulate the Top #1 & 2 contacts of the (LU1) relay.	
19.)	Remove the D-1 network from the circuit by insulating the appropriate contact-bottom #4 & #5 (B-2) or bottom #3 & 4 (TO) as required.	
20.)	Set the FUNCTION Switch to "Off-Hook" position. (No "On-Hook" verification can be made with this test.)	Meter should read 0% break. If it does not, adjust the METER CAL. Control to obtain 0% reading.
21.)	Set the FUNCTION Switch to "Adj. % Break" position.	By means of the ADJ. % Break Control obtain meter reading of 30% break.
22.)	Set the FUNCTION Switch to "Send & Rec." position.	Meter should read 35-39% break.

STEP	ACTION	VERIFICATION
23.)	If the meter reading is not within the requirements provided in Step #22 verification, adjust the spring tension of the (TO) relay as required to bring it as nearly as possible to 37%. If the reading is low, decrease the spring tension. If it is high, increase the spring tension. When any adjustment is made check the (TO) relay current flow requirements (test values) as provided in the drawing relay requirement tables. (The readjust values need not be met.)	Note: Meter reading must be made with cover on (TO) relay.
24.)	If both current flow and percent break requirement still cannot be met, check the (R) and (LU) relays as provided in the drawing relay requirement tables.	
25.)	After the requirement of Step #22 has been satisfied set the PULSES PER SEC. Switch to "12".	
26.)	Set the FUNCTION Switch to "Off-Hook" position.	Meter should read 0% break. If it does not, adjust the METER CAL. Control to obtain 0% reading.
27.)	Set the FUNCTION Switch to "Adj. % Break" position.	By means of the ADJ. % BREAK Control obtain meter reading of 60% break.
28.)	Set the FUNCTION Switch to "Send & Rec." position.	Meter should read 58-62% break.
29.)	If the meter reading is not within the requirements given in Step #28 verification, provide or remove straps on B and C resistors to decrease or increase the % break reading as nearly as possible to 60%. If sufficient change cannot be achieved by varying the shunt resistance, adjust the spring tension of the (TC) relay. Decrease the spring tension to decrease the % break reading or increase the spring tension to increase the % break reading. When any adjustment is made, check the (TC) relay current flow requirements (test values) as provided in the drawing relay requirement tables. (The readjust values of the tables need not be met.)	Note: Meter reading must be made with cover on (TC) relay.
30.)	If both current flow and percent break requirements cannot be met, check the (R) and (LU) relays as provided in the drawing relay requirement tables.	

STEP	ACTION	VERIFICATION
31.)	If any adjustment or resistance change was required in Steps #29 or 30, repeat steps #20 to 24.	
32.)	To check all components of the circuit Test (or retest) per Paragraph 4.01.	
33.)	Call distant end or test board to release busy if no further tests are required. Remove strap from B jack, dummy plug from B jack and all cords used in test.	

5. OVERALL PULSING TEST. (SEE PART 3 FOR PREPARATION - USE 12 P.P.S. ONLY.)

5.01 Terminal to terminal pulsing test - physical facilities (2 or 4 wire).

STEP	ACTION	VERIFICATION
9.)	(See Part 3 for Steps #1-8. Note Step #6-A) At near end terminal patch the Tie Trunk A jack to the SEND LOOP - 1 jack of the Pulse Signaling Test Set using the standard 3P6E or equivalent (straight T & R) cord.	
10.)	At far end terminal patch the B jack of the Tie Trunk to the REC. LOOP jack of the Pulse Signaling Test Set using the modified 3P6E or equivalent (reversed T & R) cord.	
11.)	At far end strap terminals #7 & 8 of the Tie Trunk B jack using the W1AP cord or equivalent.	
12.)	At far end terminal set the RECEIVE Switch to "Rec. Loop" position (#2).	
13.)	At near end terminal set the SEND Switch to "Send Loop - Rec. Loop" position (#2).	
14.)	At far end terminal set the FUNCTION Switch to "Send & Rec." position.	
15.)	At near end terminal set the FUNCTION Switch to "Off-Hook" position.	Far end terminal meter should read 0% break. If not adjust the far end METER CAL. Control, to obtain 0% reading.
16.)	At near end terminal set FUNCTION Switch to "On-Hook" position.	Far end terminal meter should read 100% break.

STEP	ACTION	VERIFICATION
17.)	At near end terminal set FUNCTION Switch to "Adj. % break position.	By means of the ADJ. % BREAK Control obtain meter reading of 60% break.
18.)	At near end terminal set FUNCTION Switch to "Send & REC" position.	Far end terminal meter should read as follows: a.) For 2 wire circuits per SD65718-01, Iss. #13-14 (J58824BC-2) meter should read 54-62%. b.) For 2 wire circuits per SD65718-01, Iss. #12 or earlier (J58824BC-1) meter should read 48-56%. c.) For 4 wire circuits per SD65718-01, Iss. #13-14 (J58824BC-2) and SD66799-01 with 24V4 meter should read 54-62%. d.) For 4 wire circuits per SD65718-01, Iss. #12 or earlier (J58824BC-1) with SD65789-01 meter should read 54-62%.
19.)	Observe near end (R) relay while (A) relay is pulsing. It should not open its back contact. If it does, check (R) relay bias strapping. (See Paragraph 1.03). If strapping is proper for loop resistance and (R) still moves with the (A) relay pulsing, provide options given in Note #117-C of drawing SD65718-01 or note #108-B of drawing SD66799-01.	
20.)	Repeat Steps #9-19 in reverse direction.	
21.)	Upon completion of test restore circuits to normal idle condition by removing the strap from the B jack and all cords used in the test.	

5.02 Terminal to terminal pulsing test - carrier facilities. Test is the same as Paragraph 5.01 except that the test board at one of the carrier terminals is controlling. This test need not be made if tests per Paragraphs 6.02 and 6.03 are completed satisfactorily.

6. SECTION PULSING TESTS. FOR USE WHERE LONG LINES OR CARRIER TEST BOARDS ARE INVOLVED. (SEE PART 3 FOR PREPARATION - USE 12 P.P.S. ONLY)

6.01 Test of local terminal outgoing (A) relay. (2 or 4 wire). For new installations this test should be made before contacting the Test Board.

STEP	ACTION	VERIFICATION
9.)	(See Part 3 for Steps #1-8. Note Step #6-A) Patch the C jack of the Tie Trunk to the REC. E & M jack of the Pulse Signaling Test Set using the modified 3P6E or equivalent (reversed T & R) cord.	Circuit is made busy to both ends.
10.)	Patch the A jack of the Tie Trunk to the SEND LOOP-1 jack of the Pulse Signaling Test Set using the standard 3P6E or equivalent (straight T & R) cord.	
11.)	Set the RECEIVE Switch to "B" & G-M" position (#4).	
12.)	Set the SEND Switch to "Send Loop - Rec. Loop" position (#2).	
13.)	Set the FUNCTION Switch to "Off-Hook" position.	Meter should read 0% break. If it does not adjust the METER CAL. Control to obtain 0% reading.
14.)	Set the FUNCTION Switch to "On-Hook" position.	Meter should read 100% break.
15.)	Set the FUNCTION Switch to "Adj. % Break" position.	By means of the ADJ. % BREAK Control obtain meter reading of 60% break.
16.)	Set the FUNCTION Switch to "Send & Rec." position.	a.) For 2 wire circuits per SD65718-01, Iss. #13-14 (J58824BC-2) meter should read 51-59% break. b.) For 2 wire circuits per SD65718-01, Iss. #12 or earlier (J58824BC-1) meter should read 51-59% break. c.) For 4 wire circuits per SD65718-01, Iss. #13-14 (J58824BC-2) and SD66799-01 with 24V4 meter should read 60-68% break. d.) For 4 wire circuits per SD65718-01, Iss. #12 or earlier (J58824BC-1) with SD65789-01 meter should read 60-68% break. Note: There are no pulse requirements for the (A) relay therefore, this value is given only to provide a quick check. No attempt to adjust to it should be made.

STEP	ACTION	VERIFICATION
17.)	If requirement of Step #16 is not met, check the (A) relay in accordance with the drawing relay circuit requirement tables.	
18.)	Upon completion of test remove cords from the jacks of the Tie Trunk.	

6.02 Terminal to near end test board. (2 or 4 wire at 12 P.P.S.)

STEP	ACTION	VERIFICATION
9.)	(See Part 3 for Steps #1-8. Note Step #6-A) At the test board location make the necessary connections and arrangements to receive pulses from the terminal with the equipment normally used for this purpose. (Connection usually made to M lead of converter.) If necessary, provide busy to distant end.	
10.)	At the terminal end patch the A jack of the Tie Trunk to the SEND LOOP-1 jack of the Pulse Signaling Test Set using the standard 3P6E or equivalent (straight T & R cord.)	Circuit is made busy locally.
11.)	At the terminal end set the SEND Switch to "Send Loop - Rec. Loop" position (#2).	
12.)	At the terminal end set the FUNCTION Switch to "Off-Hook" position.	At test board end meter should read 0% break. If it does not adjust the proper test board meter control to obtain 0% reading.
13.)	At the terminal end set the FUNCTION Switch to "On-Hook" position.	Test board meter should read 100% break.
14.)	At the terminal end set the FUNCTION Switch to "Adj. % Break" position.	By means of the ADJ. % BREAK Control obtain a reading of 60% break on the terminal meter.
15.)	At the terminal end set the FUNCTION Switch to "Send & Rec." position.	Test board meter should read as follows: a.) For 2 wire circuits per SD65718-01, Iss. #13-14 (J58824BC-2) meter should read 49-61% break. b.) For 2 wire circuits per SD65718-01, Iss. #12 or earlier (J58824BC-1) meter should read 49-61% break.

STEP	ACTION	VERIFICATION
		c.) For 4 wire circuits per SD65718-01, Iss. #13-14 (J58824BC-2) and SD66799-01 with 24V4 meter should read 58-70% break.
		d.) For 4 wire circuits per SD65718-01, Iss. #12 or earlier (J58824BC-1) with SD65789-01 meter should read 58-70% break.
16.)	If requirement of Step #15 is not met and the test of Paragraph 6.01 was completed satisfactorily, the trouble is probably in the carrier converter.	
17.)	Observe Terminal (R) relay while (A) relay is pulsing. It should not open its back contact. If it does, check (R) relay bias strapping. (See Paragraph 1.03). If strapping is proper for loop resistance and (R) still moves with the (A) relay pulsing, provide options given in Note #117-C of drawing SD65718-01 or note #108-B of drawing SD66799-01.	
18.)	Upon completion of test remove all cords to restore equipment to normal.	

6.03 Near end test board to terminal. (2 or 4 wire at 12 P.P.S.)

STEP	ACTION	VERIFICATION
9.)	(See Part 3 for Steps #1-8. Note Step #6-A) At the test board location make the necessary connections and arrangments to send pulses to the terminal with the equipment normally used for this purpose. (Connection usually made to E lead of converter.) If necessary provide busy to distant end.	
10.)	At the terminal end patch the B jack of the Tie Trunk to the REC. LOOP jack of the Pulse Signaling Test Set using the modified 3P6E or equivalent (reversed T & R) cord.	
11.)	At the terminal end strap #7 & 8 of the Tie Trunk B jack using the W1AP cord or equivalent.	

STEP	ACTION	VERIFICATION
12.)	At the terminal end set the RECEIVE Switch to "Rec. Loop" position (#2).	
13.)	At the terminal end set the FUNCTION Switch to "Send & Rec." position.	
14.)	At the test board send an Off-Hook signal to the terminal.	Terminal meter should read 0% break. If it does not adjust the METER CAL. Control to obtain 0% reading.
15.)	At the test board send an On-Hook signal to the terminal.	Terminal meter should read 100% break.
16.)	At the test board send a steady pulse (12 P.P.S.) at 60% break.	Terminal meter should read as follows: a.) For 2 wire circuits per SD65718-01, Iss. #13-14 (J58824BC-2) meter should read 54-62%. b.) For 2 wire circuits per SD65718-01, Iss. #12 or earlier (J58824BC-1) meter should read 48-56%. c.) For 4 wire circuits per SD65718-01, Iss. #13-14 (J58824BC-2) and SD66799-01 with 24V4 meter should read 54-62%. d.) For 4 wire circuits per SD65718-01, Iss. #12 or earlier (J58824BC-1) with SD65789-01 meter should read 54-62%.
17.)	If the requirement of Step #16 is not met and the test of Paragraph 4.01 was completed satisfactorily the trouble is probably in the carrier converter.	
18.)	Upon completion of test remove all cords to restore equipment to normal. Remove the strap from the Tie Trunk B jack.	