DC KEY PULSING SENDERS
OPERATION TESTS
USING AUTOMATIC TEST CIRCUIT SD-90424-01
NO. 1 AND NO. 3 TYPE TOLL SWITCHBOARDS AND 15C SWITCHBOARDS
STEP-BY-STEP SYSTEMS

1. GENERAL

1.01 This section describes a method of testing DC key pulsing sender circuits by means of the automatic test circuit SD-90424-01. This section is for use in step-by-step areas for senders associated with Nos. 1, 3, 3B, 3C and 3CL toll switchboards and dial switching "A" board No. 15C.

1.02 This section is reissued to add new features and to change some of the existing tests. Since this is a general revision the arrows ordinarily used to indicate changes have been omitted.

1.03 The tests covered are as follows:

(A) Sender Operation Test: This test checks the operations of the sender in handling the different classes of calls for which it is equipped, including checks of the "H" lead, "SC" lead, sender registration, sender pulsing, keyset release and the ringing and cut through features.

(B) Key Pulsing Relay Test: This test checks the release requirements of the key pulsing relays TS and RS and non-operate test of relays TM and RM.

(C) Stop-Go Test: This test checks the ability of the sender with a stop-go class to stop out pulsing when a battery and ground reversal is given over its "FT" and "FR" leads and to resume pulsing with another reversal.

(D) SR Relay Test: This test checks the non-operate, operate and release requirements of the SR relay in senders arranged to receive DC ringing signals.

(E) AC Relay Test: This test checks the non-operate, operate and release requirements of the AC relay in senders arranged to receive 20-cycle ringing signals.

(F) Trunk Busy Test: This test checks the sender for immediate cut through to release the test circuit upon receiving alternate reversals of battery on the "FT" and "FR" leads representing a trunk busy condition.

(G) Line Busy Test for Repeated Dialing Toll Trains: This test checks the sender for cut through after it has recognized a line busy condition by failing to receive a reversal of battery on the "FT" and "FR" leads.

(H) Preliminary Disconnect Test: This test checks the non-operate, operate and release requirements of the PD relay in the sender.

(I) Reorder Test: This test checks that if a misplaced ST signal is received the sender will route the call to reorder.

(J) Sender Time Out Test: This test checks the sender time out feature which causes the test circuit to be released.

(K) Pulsing Speed and Per Cent Break Test: This test checks the pulsing speed and the per cent break of the impulses sent by the sender for either 10 or 20 pps.

2. APPARATUS

2.01 The apparatus required for each test is shown in the following list. The details for each item are covered in the indicated paragraphs.

Apparatus	A	B	C	D	E	F	G	H	I	J	K
Test Circuit (2.02)	1	1	1	1	1	1	1	1	1	1	1
Test Set (2.03)	-	-	-	-	-	-	-	-	-	-	1
Test Set (2.04)	-	-	-	-	-	-	-	-	-	-	1
Plug (2.05)	-	-	-	-	-	-	-	-	-	-	1
Stop Watch (2.06)	-	-	-	-	-	-	-	-	-	-	1

2.02 Automatic Test Circuit SD-90424-01.

2.03 35-Type Test Set.

2.04 One of the following:

(a) KS-7361 Per Cent Break Meter

(b) J64722A Pulse Repeating Test Set

2.05 No. 310 Plug with the tip and ring short-circuited (No. 349A).

2.06 KS-3008 Stop Watch or equivalent.

3. PREPARATION

PREPARATION FOR TESTS A THROUGH J

STEP	ACTION	VERIFICATION
1	Set all sender selectors on their first terminals.	
2	Operate CL key for the class desired. Note: A different CL key should be operated on each test cycle in order to test the senders on all classes for which the senders are equipped.	
3	If "Complete Number Registration Before Pulsing" test is to be made - Operate RT key. Note: This test can only be made in a class having the maximum number of digits for which the senders are equipped and a number must be registered for each digit. If the time out interval is 30-78 seconds and the sender is equipped with 14 digits the RT key must be operated for all tests where all 14 digits are used.	
4	If "Synchronized Keying and Pulsing" test is to be made - RT key normal. Note: This test can be made in a fixed or variable class with any number of digits. In a fixed class, however, only the keys for the number of digits required by that class should be depressed.	
5	If a variable class with less than the maximum number of digits is being tested it is necessary to simulate the position start key operation by depressing and locking keys 1 and 4 on the numerical key strip following the last regular digit of the call.	
6	Set up a test number containing the number of digits required for the class of call on which the sender is to be tested by depressing a key in each strip of numerical keys. Note: 1254 provides a comprehensive check of the pulsing and register relays. The various combinations of this number, such as 2541, etc., should be used in order to check the register relays for each digit. In order to check certain other leads in the sender not tested with 1254, the following numbers should be used: 2915, 2090, 0538, 8671 and 9807. For more than four digits use these numbers, repeating the last registered digit for each additional digit required.	

STEP	ACTION	VERIFICATION
7	If it is desired to pass all busy senders which remain busy longer than the predetermined time interval - Operate APB key.	
8	If "Automatic Ringing" test is to be made - Operate AR key.	
9	If "Cancel Automatic Ring on Immediate Cut Through" test is to be made - Operate CAR key.	
10	If "No Ring" test is to be made - AR-CAR key normal, operate OR key to the "NO" position when test circuit is arranged for DC ringing only or operate NOR key if the test circuit is arranged for DC and 20-cycle ringing.	
PREPARATION FOR TEST K		
11	Operate PT key.	
12	If 20 pps - Operate APB FP key.	
13	Depress 9 on D1 key.	
14	Operate any CL key.	
15	Operate L key.	
16	Operate ST key.	Test blocks - ON lamp lights.
17	Insert No. 349A plug into MB jack of sender being tested.	Sender pulses continuously and the 1 lamp flashes once for each 10 pulses.
18	Connect the per cent break meter (KS-7361) or the pulse repeating test set (J64722A) to the PT jack. Note: If the per cent break meter (KS-7361) is used, a No. 35-type test set is connected so as to supply battery and ground to the pulse circuit and to regulate the current passing through the meter. If the pulse repeating test set is used (J64722A), battery and ground is connected to the set and the PLS CK key operated.	

4. METHOD

STEP	ACTION	VERIFICATION
	(A) Sender Operation Test	
11	Operate ST key.	When test cycle is complete - EC and TA lamps light - Audible alarm sounds.
12	Restore ST key to normal and if no other tests are to be made restore all operated keys to normal.	EC and TA lamps extinguished - Audible alarm silenced - Test circuit restores to normal.
	(B) Key Pulsing Relay Test	
11	perate TRT and RT keys.	
12	epress test number 0538. (If more than 4 digits use 8 for each additional digit.)	
13	Operate ST key.	When test cycle is complete - EC and TA lamps light - Audible alarm sounds.
14	Restore ST key to normal.	EC and TA lamps extinguished - Audible alarm silenced - Test circuit restores to normal.
15	Restore TRT key to normal and operate the RRT key.	
16	Depress test number 2090. (If more than 4 digits use 0 for each additional digit.)	
17	Operate ST key.	When test cycle is complete EC and TA lamps light - Audible alarm sounds.
18	Restore ST, RRT and RT keys to normal.	EC and TA lamps extinguished - Audible alarm silenced - Test circuit restores to normal.
	(C) Stop-Go Test	
11	If this test is included in a test where the complete number registration is made the same number must be registered for each digit.	
12	Operate SG key.	
13	Operate ST key.	When test cycle is complete - EC and TA lamps light - Audible alarm sounds.
14	Restore ST and SG keys to normal.	EC and TA lamps extinguished - Audible alarm silenced - Test circuit restores to normal.

STEP	ACTION	VERIFICATION
	(D) SR Relay Test	
11	Operate AR key.	
12	If senders are arranged to receive DC and 20-cycle ringing signals - Operate NOR key.	
13	If senders are arranged to receive DC ringing signals only - Operate OR key to the "NO" position.	
14	Operate ST key.	When test cycle is complete - EC and TA lamps light - Audible alarm sounds.
15	Restore ST, AR and NOR or OR keys to normal.	EC and TA lamps extinguished - Audible alarm silenced - Test circuit restores to normal.
16	If senders are arranged to receive DC and 20-cycle ringing signals - Operate OR key.	
17	If senders are arranged to receive DC ringing signals only - Operate OR key to the "O" position.	
18	Operate ST key.	When test cycle is complete - EC and TA lamps light - Audible alarm sounds.
19	Restore ST and OR keys to normal.	EC and TA lamps extinguished - Audible alarm silenced - Test circuit restores to normal.
	(E) AC Relay Test	
11	Operate NOR key.	
12	Operate ST key.	When test cycle is complete - EC and TA lamps light - Audible alarm sounds.
13	Restore ST and NOR keys to normal.	EC and TA lamps extinguished - Audible alarm silenced - Test circuit restores to normal.
14	Operate OR key.	
15	Operate ST key.	When test cycle is complete - EC and TA lamps light - Audible alarm sounds.
16	Restore ST and OR keys to normal.	EC and TA lamps extinguished - Audible alarm silenced - Test circuit restores to normal.

STEP	ACTION	VERIFICATION
	(F) Trunk Busy Test	
11	This test can only be included in the "Complete Number Registration Before Pulsing" test and all ringing keys should be in their unoperated positions.	
12	Operate TKB key.	
13	Operate ST key.	TKB lamp lights momentarily - When test cycle is complete - EC and TA lamps light - Audible alarm sounds.
14	Restore ST and TKB keys to normal.	EC and TA lamps extinguished - Audible alarm silenced - Test circuit restores to normal.
	(G) Line Busy Test for Repeated Dialing Toll Trains	
11	This test may be included with any registration test and all ringing keys should be in their unoperated positions.	
12	Operate ST key.	After the registration tests are completed the sender times for one second and cuts through to release the test circuit - When test cycle is complete - EC and TA lamps light - Audible alarm sounds.
13	Restore ST key to normal.	EC and TA lamps extinguished - Audible alarm silenced - Test circuit restores to normal.
	(H) Preliminary Disconnect Test	
11	Operate a CL key representing a variable or fixed class having the maximum number of digits for which the senders are equipped.	
12	Operate PD and RT keys.	
13	Depress key zero for each digit.	
14	Operate ST key.	When test cycle is complete - EC and TA lamps light - Audible alarm sounds.
15	Restore ST, CL, PD and RT keys to normal.	EC and TA lamps extinguished - Audible alarm silenced - Test circuit restores to normal.
	(I) Reorder Test	
11	Operate RO key.	
12	Depress 1 and 4 in D1 key. (Simulates misplaced "ST" pulse.)	

STEP	ACTION	VERIFICATION
13	Operate ST key.	When test cycle is complete - EC and TA lamps light - Audible alarm sounds.
14	Restore ST and RO keys to normal.	EC and TA lamps extinguished - Audible alarm silenced - Test circuit restores to normal.
	(J) Sender Time Out Test	
11	Operate TO key.	
12	If sender is arranged to receive 20-cycle ringing signal the FL key may be operated so that the reorder flash may be observed.	
13	Operate ST key.	If FL key is operated - FL lamp will flash.
14	If FL key is operated it is necessary to restore it to normal during the sender time out period.	When test cycle is complete - EC and TA lamps light - Audible alarm sounds.
15	Restore TO and ST keys to normal.	EC and TA lamps extinguished - Audible alarm silenced - Test circuit restores to normal.
	(K) Pulsing Speed and Per Cent Break Test	
19	Using a stop watch (or equivalent) observe that the 1 lamp flashes 57 to 66 times per minute for 10 pps or 96 to 126 times per minute for 20 pps.	
20	The per cent break meter should read between 59.5 and 67.5 for 10 pps or between 62 and 70 for 20 pps.	
21	Remove plug from PT jack.	
22	Operate and restore CA key.	Selector steps to next terminal and SC lamp lights if terminal is equipped and sender is idle.
23	Remove the No. 349A plug from MB jack of sender just tested and insert in MB jack of sender selected for the next test. (Insert the plug in the MB jack only when sender is idle.)	
24	Insert the plug of the per cent break meter or pulse repeating test set in the PT jack of sender to be tested.	
25	Proceed as in Steps 19 through 25 until all senders have been tested.	
26	Remove the plugs from the PT and MB jacks and restore all keys to normal.	Test circuit restores to normal.