MF KEYSET CIRCUITS
OUTPUT LEVEL −3 DBM PER FREQUENCY
NO. 3, 3C, AND 3CL TOLL SWITCHBOARDS

1. GENERAL

1.01 This section describes a method of making multifrequency and operation tests in keysets used in No. 3, 3C, and 3CL toll switchboards where the multifrequency distribution system or the keyset circuit, or both, have been modified for the reduced output level of −3 dbm per frequency.

1.02 This section is reissued to provide for the use of the J64717B control set and to clarify and amend the test procedures. Since this reissue covers a general revision, arrows ordinarily used to indicate changes have been omitted.

1.03 The tests covered are:

A. Output Level of Keyset Using 24-Wire Distribution System: This test provides a check of the keyset voltage or power output level.

B. Keyset Wiring, 24-Wire Distribution System: This test checks the MF current supply wiring to each key with respect to all other keys of a keyset connected to the MF current supply using 24-wire distribution system.

C. Output Level of Keyset Using 6-Wire Distribution System: This test provides a check of the keyset voltage or power output level.

D. Keyset Wiring, 6-Wire Distribution System: This test checks the MF current supply wiring to each key with respect to all other keys of a keyset connected to the MF current supply using 6-wire distribution system.

E. Pad Control Feature: This test checks that sufficient voltage is present to give proper pad control relay operation.

F. Operation Test: This test checks the connection, operation, and disconnection of an MF keyset circuit or the MF portion of a combined DC-MF keyset circuit.

1.04 All AC voltmeter readings refer to the average or midpoint position between the maximum and minimum swing of the voltmeter needle.

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

2. APPARATUS

2.01 The apparatus required for each test is shown in two lists, one if the AC voltage test set is to be used and the other if the 12-type transmission measuring set is to be used. The details for each item are covered in the paragraphs indicated by the numbers enclosed in parentheses.

Using AC Voltage Test Set

APPARATUS	TESTS					
	A	B	C	D	E	F
Test Set (2.02)	1	1	1	1	—	—
Test Set (2.03)	—	—	1	1	—	—
Test Set (2.04)	—	—	—	—	1	—
Test Circuit (2.05)	1	1	1	1	—	—
Patching Cord (2.06)	1	1	2	2	—	—
Patching Cord (2.07)	2	2	3	3	—	—
Test Cord (2.08)	—	—	—	—	1	—
Head Telephone Set	—	—	—	—	—	1

Using 12-Type Transmission Measuring Set

APPARATUS	TESTS A	C	D
Test Set (2.09)	1	1	1
Test Set (2.03)	—	1	1
Test Circuit (2.05)	1	1	1
Patching Cord (2.06)	1	2	2
Patching Cord (2.07)	1	2	2

2.02 AC Voltage Test Set J68602AH (SD-64125-01) or AC Relay and Signaling Test Set J68602AJ (SD-63674-01).

2.03 Portable Control Set J64717A (associated with test circuit SD-55056-01, SD-61097-01, SD-61097-02 or SD-63971-01) or Control Test Set J64717B (SD-96490-01). (Used only when testing combined DC-MF Keyset Circuits.)

2.04 No. 35D or 35F Test Set or Weston Model 1 DC Voltmeter.

2.05 Position Test Circuit SD-55056-01, SD-61097-01, SD-61097-02, or SD-63971-01.

2.06 P3E Cord, 6 feet long, equipped with two No. 310 Plugs (3P7A Cord). (Only one cord required in Tests C and D when not using control set.)

2.07 P3F Cord, 6 feet long, equipped with one No. 309 Plug and one No. 310 Plug (3P12E Cord). (One less cord required in Tests C and D when not using control set.)

2.08 No. 893 Cord equipped with two No. 360A Tools and one No. 364 Tool and either one No. 365 Tool or one No. 411A Tool (1W13B Cord).

2.09 No. 12 Type Transmission Measuring Set.

3. PREPARATION

STEP	ACTION	VERIFICATION
	Tests A, B, C, and D	
	AC Voltmeter Calibration	
1	Connect any 1000-cycle, 600-ohm, 1 MW supply (0 db output) to L jack, T and R jacks, or T1 and R1 jacks, depending on source of tone and type of set being calibrated, of AC voltage test set, and with SH or LSH key, as provided, and 4 key operated, turn zero adjusting screw until AC voltmeter reads 0.70 volt on 4-volt scale	*Note:* AC voltmeter needle may not point to zero when at rest.
	No. 12 Type Transmission Measuring Set Calibration	
2	After checking that meter needle points to arrow, connect any 1000-cycle, 600-ohm, 1 MW Supply (0 db output) to 12-type set and adjust CAL potentiometer until meter reads 0 db	

4. METHOD

STEP	ACTION	VERIFICATION
	A. Output Level of Keyset Using 24-Wire Distribution System	
	Using AC Voltage Test Set	
3	Using P3E or P3F cord, as required, connect D jack of AC voltage test set to D jack of position test circuit	

STEP	ACTION	VERIFICATION
4a	If position test circuit is equipped with MT jack — Insert plug of idle switchboard cord into MT jack	
5	Operate TALK key of another idle switchboard cord circuit	
6b	If switchboard is equipped with 49-type jacks — Insert front or rear plug of cord circuit selected in Step 5 into L jack of AC voltage test set	
7c	If switchboard is equipped with 92-type jacks — Insert front or rear plug of cord circuit selected in Step 5 into a spare multiple jack	
8c	Using P3F cord, connect L jack of AC voltage test set to another jack of spare multiple selected in Step 7c	
9	Operate and hold KP key associated with cord connected to L jack	Momentary kick of AC voltmeter pointer indicates presence of KP tone signal
10	Operate SH or LSH key, as provided, of AC voltage test set	
11	Operate and hold 4 key of AC voltage test set	Reading of 0.55 to 0.75 volt on 4-volt scale of AC voltmeter
12	Release KP key	
13	Operate and release, successively, 0 to 9 and ST keys	Reading of 0.55 to 0.75 volt on 4-volt scale of AC voltmeter ***Note:*** Unsteady or variable reading may indicate false key contact closures or crosses.
14d	If keyset wiring test is to be made — Proceed to Test B	
15	Remove all cords and restore all keys	
Using 12-Type Transmission Measuring Set		
16	Insert front or rear plug of an idle switchboard cord circuit into MEAS 109 or MEAS 110 jack, as required, of 12-type test set	
17	Operate TALK key	
18a	If position test circuit is equipped with MT jack — Insert plug of another idle switchboard cord into MT jack	
19	Using P3E or P3F cord, as required, connect DIAL 110 jack of 12-type test set to D jack of position test circuit	

STEP	ACTION	VERIFICATION
20	Operate and hold KP key associated with cord connected to MEAS jack of 12-type test set	Reading of 0.0 db to 1.6 db on 12-type test set
21	Release KP key	
22	Operate and release, successively, 0 to 9 and ST keys	Reading of 0.0 db to 1.6 db on 12-type test set
23	Remove all cords and restore all keys	

B. Keyset Wiring, 24-Wire Distribution System

3	Using P3E or P3F cord, as required, connect D jack of AC voltage test set to D jack of position test circuit	
4a	If position test circuit is equipped with MT jack — Insert plug of idle switchboard cord into MT jack	
5	Operate TALK key of another idle cord circuit	
6b	If switchboard is equipped with 49-type jacks — Insert front or rear plug of cord circuit selected in Step 5 into L jack of AC voltage test set	
7c	If switchboard is equipped with 92-type jacks — Insert front or rear plug of cord circuit selected in Step 5 into a spare multiple jack	
8c	Using P3F cord, connect L jack of AC voltage test set to another jack of spare multiple selected in Step 7c	
9	Operate and release KP key associated with cord connected to L jack	
10	Operate SH or LSH key, as provided, of AC voltage test set	
11	Operate and hold 4 key of AC voltage test set	
12	Simultaneously operate two keys as indicated in the following table:	Readings on the 4-volt scale of AC voltmeter as indicated in the following table:

0-1	0.60 to 0.80
1-2	0.80 min
2-3	0.80 min
3-4	0.60 to 0.80
4-5	0.80 min
5-6	0.80 min
6-7	0.60 to 0.80
7-8	0.80 min
8-9	0.80 min
3-6	0.80 min
1-8	0.80 min
0-9	0.80 min
2-7	0.60 max
ST-9	0.80 min

STEP	ACTION	VERIFICATION
13	Remove all cords and restore all keys *Note:* The conditions indicated by the different voltmeter readings are shown in the following table: 0.7 = 4 frequencies — probable variable meter indication 0.8 = 3 frequencies — occasional variable meter indication 0.6 = 2 frequencies — one common frequency cancelled — steady	

C. Output Level of Keyset Using 6-Wire Distribution System

Using AC Voltage Test Set

3	Using P3E or P3F cord, as required, connect D jack of AC voltage test set to D jack of position test circuit	
4a	If position test circuit is equipped with MT jack — Insert plug of idle switchboard cord into MT jack	
5	Operate TALK key of another idle cord circuit	
6b	If switchboard is equipped with 49-type jacks — Insert front or rear plug of cord circuit selected in Step 5 into L jack of AC voltage test set	
7c	If switchboard is equipped with 92-type jacks — Insert front or rear plug of cord circuit selected in Step 5 into a spare multiple jack	
8c	Using P3F cord, connect L jack of AC voltage test set to another jack of spare multiple selected in Step 7c	
9d	If keyset is combined DC-MF type — Operate control key of control set to BAL	
10d	Using P3E or P3F cord, as required, connect jack 1 of control set to jack 1 or L, as provided, of position test circuit	
11d	Operate control key to TST	
12d	Operate LD key of AC voltage test set	
13	Operate and hold KP key associated with cord connected to L jack of AC voltage test set	Momentary kick of AC voltmeter needle indicates presence of KP tone signal
14d	Restore LD key of AC voltage test set	
15	Operate SH or LSH key, as provided, of AC voltage test set	

STEP	ACTION	VERIFICATION
16	Operate and hold 4 key of AC voltage test set	Readings on the 4-volt scale of AC voltmeter as follows: (a) When keyset and distribution circuit modified — Reading of 0.55 to 0.75 volt (b) When only keyset circuit modified — Reading of 0.70 to 0.90 volt (c) When only distribution circuit modified — Reading of 0.75 to 0.95 volt
17	Release KP key	
18	Operate and release, successively, 0 to 9 and ST keys	Readings on the 4-volt scale of AC voltmeter as follows: (a) When keyset and distribution circuit modified — Reading of 0.55 to 0.75 volt (b) When only keyset circuit modified — Reading of 0.70 to 0.90 volt (c) When only distribution circuit modified — Reading of 0.75 to 0.95 volt *Note:* Unsteady or variable reading may indicate false key contact closures or crosses.
19e	If keyset wiring test is to be made — Proceed to Test D	
20	Remove all cords and restore all keys	

Using 12-Type Transmission Measuring Set

	Note: This test can be made only where the keyset and distribution circuits have been modified for the reduced level.	
21a	If position test circuit is equipped with MT jack — Insert plug of idle switchboard cord into MT jack	
22	Using P3E or P3F cord, as required, connect DIAL 110 jack of 12-type test set to D jack of position test circuit	
23d	If keyset is combined DC-MF type — Operate control key of control set to BAL	
24d	Using P3E or P3F cord, as required, connect jack 1 of control set to jack 1 or L, as provided, of position test circuit	

STEP	ACTION	VERIFICATION
25d	Operate control key to TST	
26d	Operate DIAL-SLV key of 12-type test set to DIAL	
27	Insert front or rear plug of an idle switchboard cord circuit into MEAS 109 or MEAS 110 jack, as required, of 12-type test set	
28	Operate TALK key of cord circuit selected in Step 27	
29	Operate and hold KP key associated with cord selected in Step 27	If keyset is not combined DC-MF type — Reading of 0.0 db to 1.6 db on 12-type test set
30d	Restore DIAL-SLV key of 12-type test set	Reading of 0.0 db to 1.6 db on 12-type test set
31	Release KP key	
32	Operate and release, successively, keyset keys 0 through 9 and ST key	Readings of 0.0 db to 1.6 db on 12-type test set
33e	If keyset wiring test is to be made — Proceed to Test D	
34	Remove all cords and restore all keys	

D. Keyset Wiring, 6-Wire Distribution System

Using AC Voltage Test Set

3	Using P3E or P3F cord, as required, connect D jack of AC voltage test set to D jack of position test circuit
4a	If position test circuit is equipped with MT jack — Insert plug of idle switchboard cord into MT jack
5	Operate TALK key of another idle switchboard cord circuit
6b	If switchboard is equipped with 49-type jacks — Insert front or rear plug of cord circuit selected in Step 5 into L jack of AC voltage test set
7c	If switchboard is equipped with 92-type jacks — Insert front or rear plug of cord circuit selected in Step 5 into a spare multiple jack
8c	Using P3F cord, connect L jack of AC voltage test set to another jack of spare multiple selected in Step 7c
9d	If keyset is combined DC-MF type — Operate control key of control set to BAL

STEP	ACTION	VERIFICATION
10d	Using P3E or P3F cord, as required, connect jack 1 of control set to jack 1 or L, as provided, of position test circuit	
11d	Operate control key to TST	
12d	Operate LD key of AC voltage test set	
13	Operate and hold KP key associated with cord connected to L jack of AC voltage test set	Momentary kick of AC voltmeter needle indicates presence of KP tone signal
14	Release KP key	
15	Operate SH or LSH key, as provided, of AC voltage test set	
16d	Restore LD key	
17	Operate and hold 4 key of AC voltage test set	
18	Simultaneously operate two keys as follows: 1-3, 1-4, 1-8, 2-4, 2-9, 3-5, 3-9, 4-7, 5-8, and 6-9	AC voltmeter reads zero while each pair of keys is operated
19	Operate and release ST key	
20	Remove all cords and restore all keys	
Using 12-Type Transmission Measuring Set		
21a	If position test circuit is equipped with MT jack — Insert plug of idle switchboard cord into MT jack	
22	Using P3E or P3F cord, as required, connect DIAL 110 jack of 12-type test set to D jack of position test circuit	
23d	If keyset is combined DC-MF type — Operate control key of control set to BAL	
24d	Using P3E or P3F cord, as required, connect jack 1 of control set to jack 1 or L, as provided, of position test circuit	
25d	Operate control key to TST	
26d	Operate DIAL-SLV key of 12-type test set to DIAL	
27	Insert front or rear plug of an idle switchboard cord circuit into MEAS 109 or MEAS 110 jack, as required, of 12-type test set	
28	Operate TALK key of cord circuit selected in Step 27	
29	Operate and hold front or rear KP key associated with cord selected in Step 27	If keyset is not combined DC-MF type — Deflection on 12-type test set meter

STEP	ACTION	VERIFICATION
30d	Restore DIAL-SLV key of 12-type test set	Deflection on 12-type test set meter
31	Release KP key	
32	Simultaneously operate two keyset keys as follows: 1-3, 1-4, 1-8, 2-4, 2-9, 3-5, 3-9, 4-7, 5-8, and 6-9	Observe that no reading is obtained on 12-type test set meter while each pair of keys is operated
33	Operate and release ST key	
34	Remove all cords and restore all keys	

Note: The following chart shows the combination of the frequencies for each key and the corresponding connection of each frequency to the "Tip" or "Ring" toward the cord circuit.

	KEYS										
FREQUENCY	0	1	2	3	4	5	6	7	8	9	KP	ST
700 cycles (0)		T	T		R			T				
900 cycles (1)		R		T		R			T			
1100 cycles (2)			R	R			R			T	R	
1300 cycles (4)	T				T	T	T					
1500 cycles (7)	R							R	R	R		R
1700 cycles (10											T	T

When two digit keys are depressed, and both a T and R appear in a horizontal line opposite any one of the component frequencies, a short circuit of the output will result. For example, a simultaneous depression of keys 5 and 8 will produce an output short via the 900-cycle connection

E. Pad Control Feature

1	Using the 15-volt scale of the 35-type test set or the 3-volt scale of the Weston Model 1 DC voltmeter, measure the potential to ground at the test points indicated in the table below for the particular keyset under test	Reading of 1.5 to 2 volts

KEYSET	TOLL SWBD. NO.	TEST POINTS "F" RELAY SPRINGS	BLOCK RELAYS OPERATED
SD-55309-01	3(MF)	1T and 1B	—
SD-55079-01	3C(MF)	1T and 1B	—
SD-56031-01	3C-3CL (DC-MF)	8T and 8B	"MF"
SD-56031-03	3CL(MF)	8T and 8B	"R"
SD-56100-01	3(DC-MF)	8T and 8B	"MF"

STEP	ACTION	VERIFICATION
	F. Operation Test	
1	Connect head telephone set to telephone jacks of position under test	
2	Insert front or rear plug of idle switchboard cord circuit into jack of outgoing trunk arranged for MF keypulsing	Cord supervisory lamp lights
3	Operate TALK key	
4	Operate KP key associated with cord connected to trunk	KF or KR lamp lights S lamp lights
5	Key the number of a test line circuit	
6	Operate and release ST key	KF or KR lamp extinguished S lamp extinguished
7a	If trunk used in test has controlled ringing — Operate RING key of cord circuit	
8	Observe visual signals	Cord supervisory lamp flashes under control of test line
9	Remove all cords and restore all keys	