CONTACT NOISE MEASUREMENTS USING 30A LEVEL DISTRIBUTION REGISTER STEP-BY-STEP SYSTEMS

1. GENERAL

1.01 This section describes methods of making contact noise measurements in step-by-step offices using 30A level distribution register, 2B noise measuring set using F1A weighting or 3A noise measuring set using C-message weighting, call-through test set, and other auxiliary equipment.

1.02 This section is reissued to revise the calibration procedure and type of pad required when using the 3A noise measuring set.

1.03 The tests covered are:

A. Contact Noise Measurements with Call-Through Test Set: This test describes the method of making contact noise measurements using the call-through test set.

B. Contact Noise Measurements Without Call-Through Test Set: This test describes the method of making contact noise measurements using a supplementary originating and terminating test set (made up locally).

1.04 It is preferable that the tests be made during periods of reasonably heavy traffic loads in order to obtain a greater distribution of the test calls over the equipment as well as to include in the measurements those noise conditions which are more likely to be typical of those usually heard by subscribers.

1.05 All contacts and connections of the noise measurement equipment should be carefully cleaned to avoid introducing noise from these sources.

1.06 Do not adjust filament voltage while recorder is operating as the resulting noise output from the 2B set will produce false registrations.

1.07 When a 30A level distribution register is first used with a particular 2B noise measuring set, a primary calibration of the noise measuring equipment should be made. This insures that the calibrating tone of the noise measuring set can then be used as a signal source for the routine calibration of the noise measuring equipment.

1.08 The internal calibration circuit of the noise measuring set should be checked at intervals of about six months in accordance with the section on the 2B noise measuring set or on the 3A noise measuring set.

1.09 The primary calibration of the noise measuring equipment should be made at the same time internal calibration is made and every time the equipment is turned on.

1.10 A survey of the contact noise conditions in a step-by-step central office unit consists of measurements on a total of 200 test calls originated and terminated within the unit.

1.11 In selecting originating and terminating lines for contact noise surveys, the objective is to obtain a wide distribution of the test calls over the various frames in the office so as to include as many different contacts as possible. To accomplish this the originating and terminating lines should be well distributed over the line finder and connector frames, respectively. Where both line finders and line switches exist in an office, any one survey should include calls made from only one type of originating equipment. If the tests are made during the relatively busy traffic periods the traffic encountered will also tend to spread the test calls. The following may be used as a guide in selecting the originating and terminating lines.

Originating Lines

For line switch offices choose ten line switches spread uniformly throughout the noncoin groups. No further choice will be required in connection with this particular type of office.

For line finder offices choose ten (noncoin) line finder frames from the floor plan records which will be representative of the total number of this type of frame in the office as regards geographical location, and proceed as in "(a)" or "(b)."

(a) From these frames select ten line finder groups distributed over the upper, middle and the lower portions of the frames.

(b) From the central office records choose ten spare line finder terminals, one from each 200 line group, giving consideration to the different 20 line subgroups.

If a line is chosen in the first 20 line subgroup of a 200 line group, then the next line should be taken from the second 20 line subgroup of the next 200 line group, etc. The following is an example of the line groups and line relays which might be used in such a selection.

LINE GROUP	LOCATION IN LINE FINDER FRAME	LINE RELAYS
3	Lower	119
4	Upper	24
8	Middle	131
12	Lower	146
13	Upper	53
17	Middle	62
21	Lower	78
22	Upper	83
26	Middle	95
29	Middle	07

Terminating Lines

Choose the ten frames of connectors which are representative as regards geographical location of all the frames in the office.

Choose unassigned terminals in connector groups so as to give a distribution with respect to location in the various connector shelves (from top to bottom of frames) involved and the particular bank levels.

1.12 *Form E-3861*

(a) Enter date, office unit, type of originating equipment, and terminating line numbers in proper spaces.

(b) Record DB dial setting and type of weighting network in POT ___ DB and WTG ___ spaces, respectively.

(c) Test calls will be made in groups of ten, one call from each of the ten originating lines to the first terminating line entered on the form. The next ten will be from the ten originating lines to the second terminating line entered on the form, etc.

(d) At the start of each group of ten calls, record the time and all digits of each register of the 30A level distribution register in the proper TIME and START spaces. The >0 and >10 register readings should be entered in the >20 and >30 columns, respectively.

(e) At the completion of the timing interval for each test call, record the last two digits of each register. If no scoring has taken place, record a dash.

(f) At the completion of the tenth call record all digits of each register.

(g) After each group of ten calls enter the net totals for the group in the proper NET spaces on the form.

(h) If a call is abandoned for any reason or false registrations are introduced between successive calls, these extra registrations should be excluded from the net totals. To avoid confusion later, a suitable notation should be made on the form.

(i) Upon the completion of the 200-call survey obtain the net total for each register for the survey and enter the figures in the TOTAL >20 and >30 columns designated A and B, respectively, at the lower right-hand corner of the form.

(j) The methods of interpreting the results of a 200-call survey to determine the contact noise situation in an office are covered in Section 226-020-000.

1.13 When the 2B noise measuring set is used, the noise levels in dba (db adjusted) are equal to the DB dial setting of the noise measuring set, plus 5, plus the register markings of >0 or >10. Therefore, with the DB dial set on 15, the readings of the >0 and >10 registers will indicate the occurrence of noises greater than 20 and 30 dba, respectively, and should be entered on the form in the >20 and >30 columns.

1.14 When the 3A noise measuring set is used, the noise levels in dbrn (db reference noise) are equal to the DBRN switch setting plus the register markings of >0 or >10. Therefore, with the DBRN switch on 25 the readings of the >0 and >10 registers will indicate the occurrence of noises greater than 25 and 35 dbrn, respectively, and should be entered on the form in the >20 and >30 columns. ←

1.15 ***Lettered Steps:*** A letter a, b, c, etc., added to a step number in Part 3 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. When 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 Table A. The details of each item are covered in the paragraph indicated by the number in parentheses.

TABLE A

APPARATUS	TESTS A	TESTS B
Noise Measuring Set (2.02)	1	1
30A Level Distribution Register	1	1
Call-Through Test Set (2.03)	1	
Supplementary Terminating Set (2.04)	1	
Supplementary Originating and Terminating Set (2.05)		1
Head Telephone Set	1	1
H-Type Pad (2.06)	1	1
600-ohm 2 db T-Type Pad (2.07)	1	1 ←
Cord (2.08)	1	1
Cord (2.09)	1	1
Cord (2.10)	1	1
Cord (2.11)	10	1

2.02 One of the following:

(a) 2B Noise Measuring Set.

(b) 3A Noise Measuring Set.

2.03 Call-through test set J94715B (SD-96063-01), J94715A (SD-90603-01), or J24714A (SD-21069-01) equipped with NM jack.

2.04 Supplementary terminating set is to be made up locally. Fig. 1 shows the schematic and parts necessary for the supplementary terminating set.

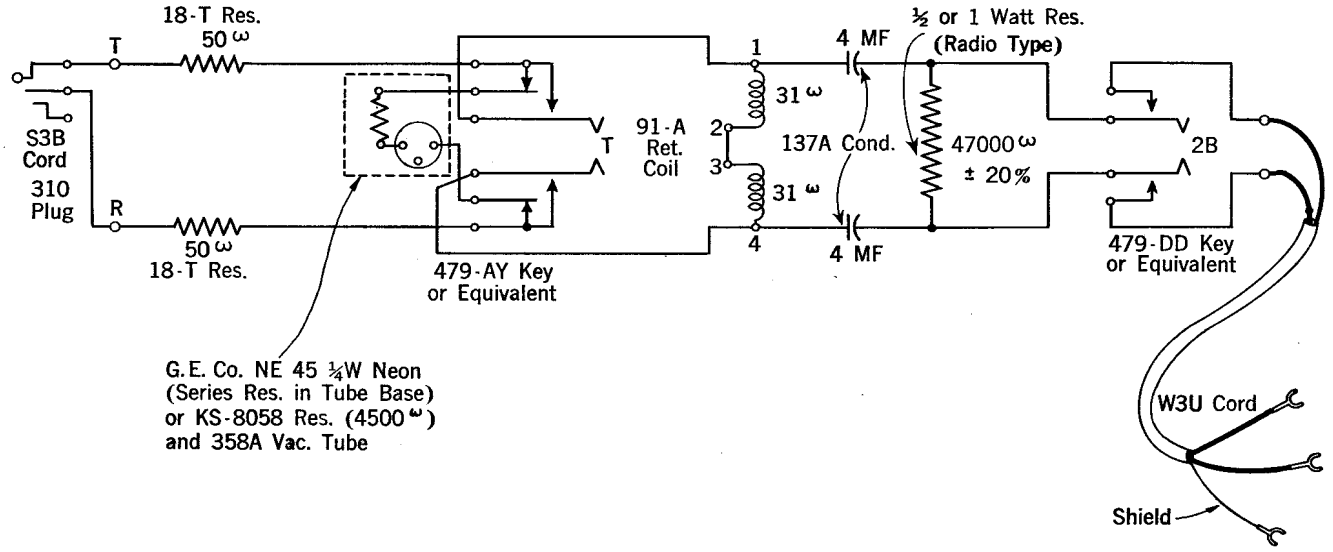

Fig. 1 – Supplementary Terminating Set

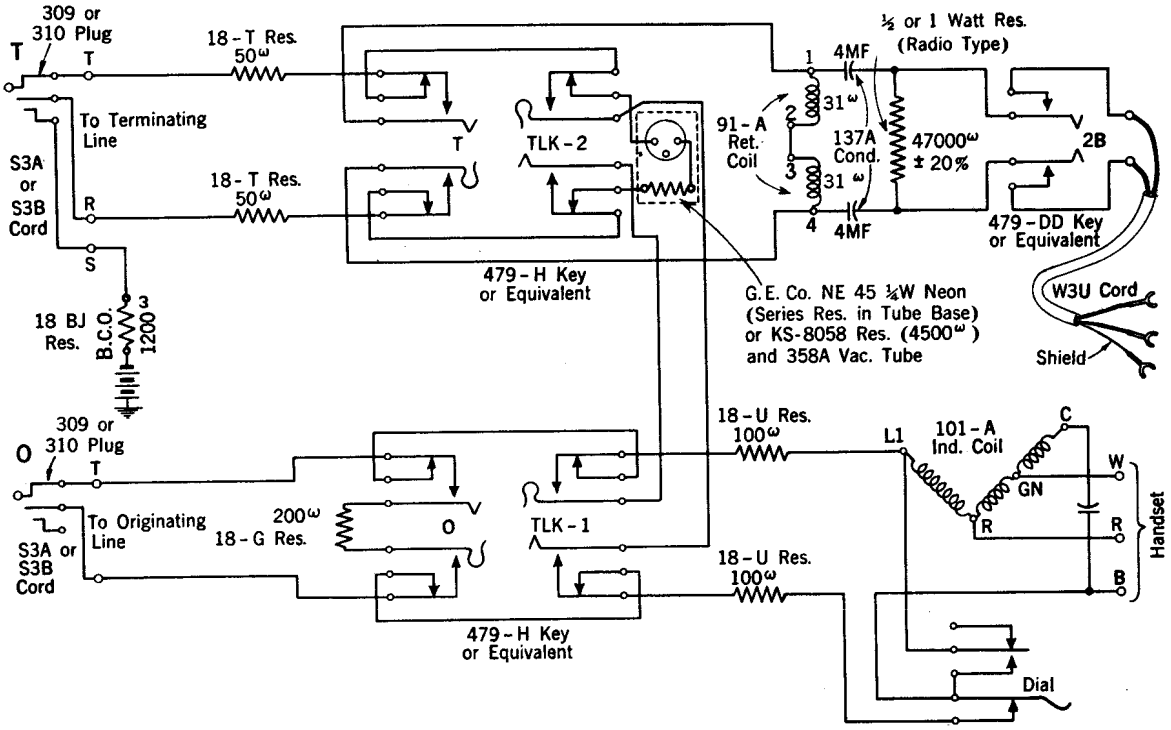

Fig. 2 – Supplementary Originating and Terminating Set

2.05 Supplementary originating and terminating set is to be made up locally. Fig. 2 shows the schematic and parts necessary for the supplementary originating and terminating set. Also twelve jacks must be provided. These jacks may be located at the IDF or other convenient location. Ten of these jacks may be used for the ten originating lines, one for the ten terminating lines in multiple and one for the intercepting trunk.

2.06 One of the following:

(a) 5A attenuator.

(b) H-Type pad to be made up locally. Fig. 3 shows the schematic and parts necessary for the H-type pad.

→**2.07** 600-ohm 2 db T-type pad to be made up locally. Fig. 4 shows the schematic and →parts necessary for the 600-ohm 2 db T-type pad (required only when using 3A noise measuring set).

2.08 Testing cord, W2BP cord, 6 feet long, equipped with one 241A plug and two 35 cord clips (2W15B cord).

2.09 Patching cord, P3N cord, 6 feet long, equipped with one 310 plug and one 241A plug (3P17B cord).

2.10 Testing cord, 839 cord, 6 feet long, equipped with two 360A tools (1W13B cord), a 364 tool, and a KS-6278 connecting clip (for connecting the noise measuring set to ground).

2.11 Patching cord, P2B cord, 3 feet long, equipped with two 310 plugs (2P4A cord).

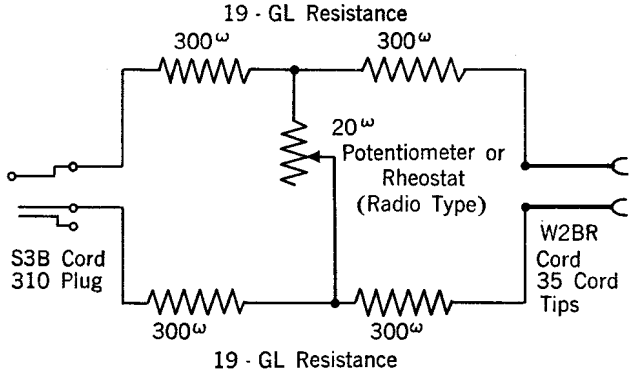

Fig. 3 – H-Type Pad

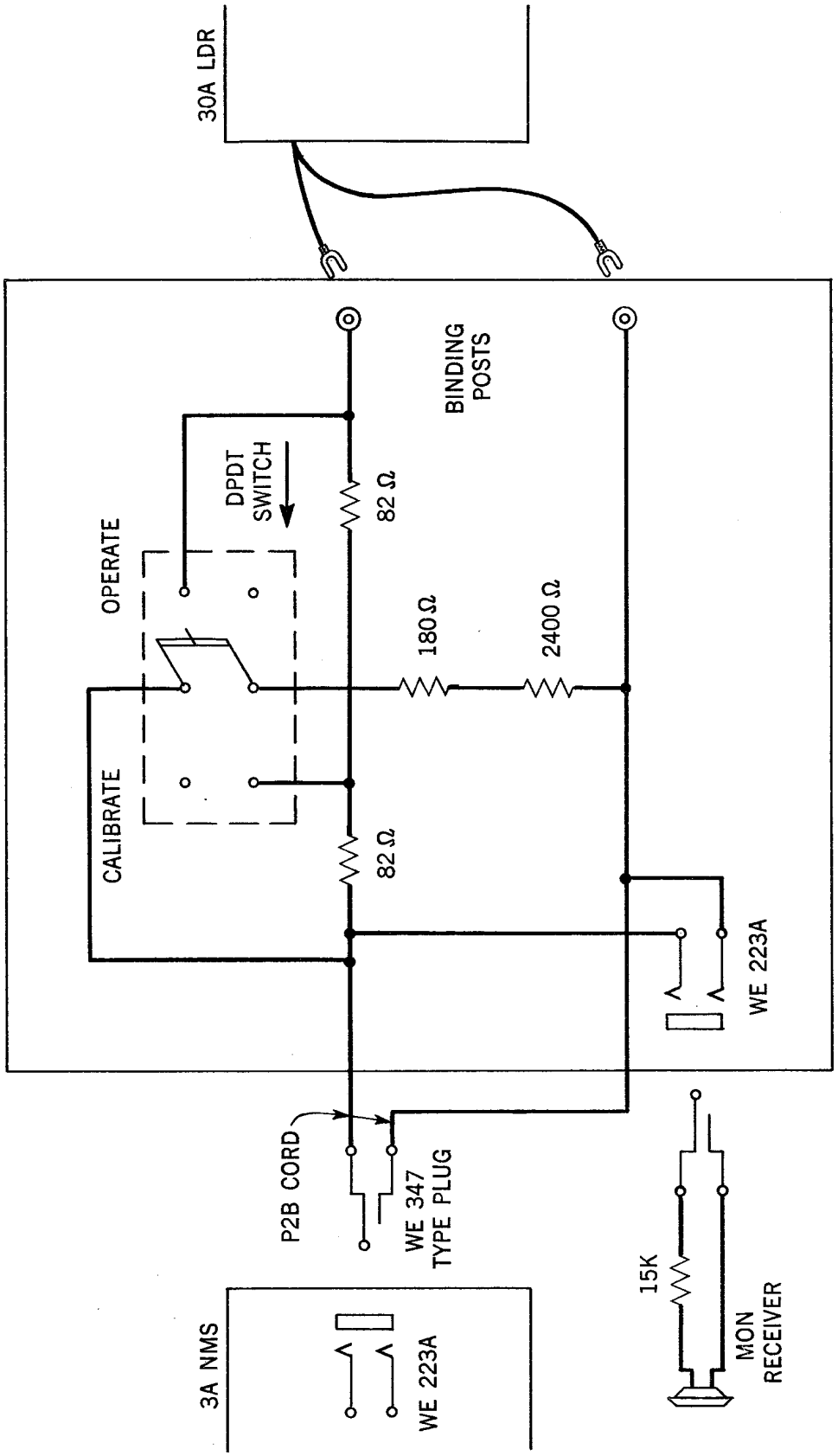

Fig. 4 – 600-Ohm, 4-Db, H-Pad

3. PREPARATION

STEP	ACTION	VERIFICATION
Tests A and B		
	Using the 2B Noise Measuring Set — Primary and Routine Calibration	
1	Connect input cord of 30A level distribution register (LDR) to EXT and GND binding posts of 2B noise measuring set (NMS), Fig. 5.	
2	At 30A LDR — Plug power cord into 115-volt, 60-cycle outlet.	
3	At 2B NMS — Connect monitoring receiver to MON REC and GND binding posts, Fig. 5.	
4	Connect GND binding post on jack field side to central office frame ground using 1W13B cord, Fig. 5.	
5	At 30A LDR — Operate power switch to POWER position.	
6	Operate CONT MEAS key to OFF position. ***Note:*** Allow set to warm up about ten minutes.	
7	At 2B NMS — Operate F1A-HA1 — 144 key to F1A-HA1 position.	
8	Pull FIL key out. ***Note:*** Allow set to warm up about one minute.	
9	Operate K3 key to normal position.	
10	After one-minute warmup period — Operate K1 key to FIL position.	
11	Observe meter.	Meter needle coincides with red line on scale.
12a	If requirement of Step 11 is not met — Adjust FIL RHEO rheostat to obtain this requirement.	
13	Operate K1 key to PLATE position.	
14	Observe meter.	Meter needle coincides with or is above red line on scale.
15b	If requirement of Step 14 is not met — Replace plate batteries to obtain this requirement.	

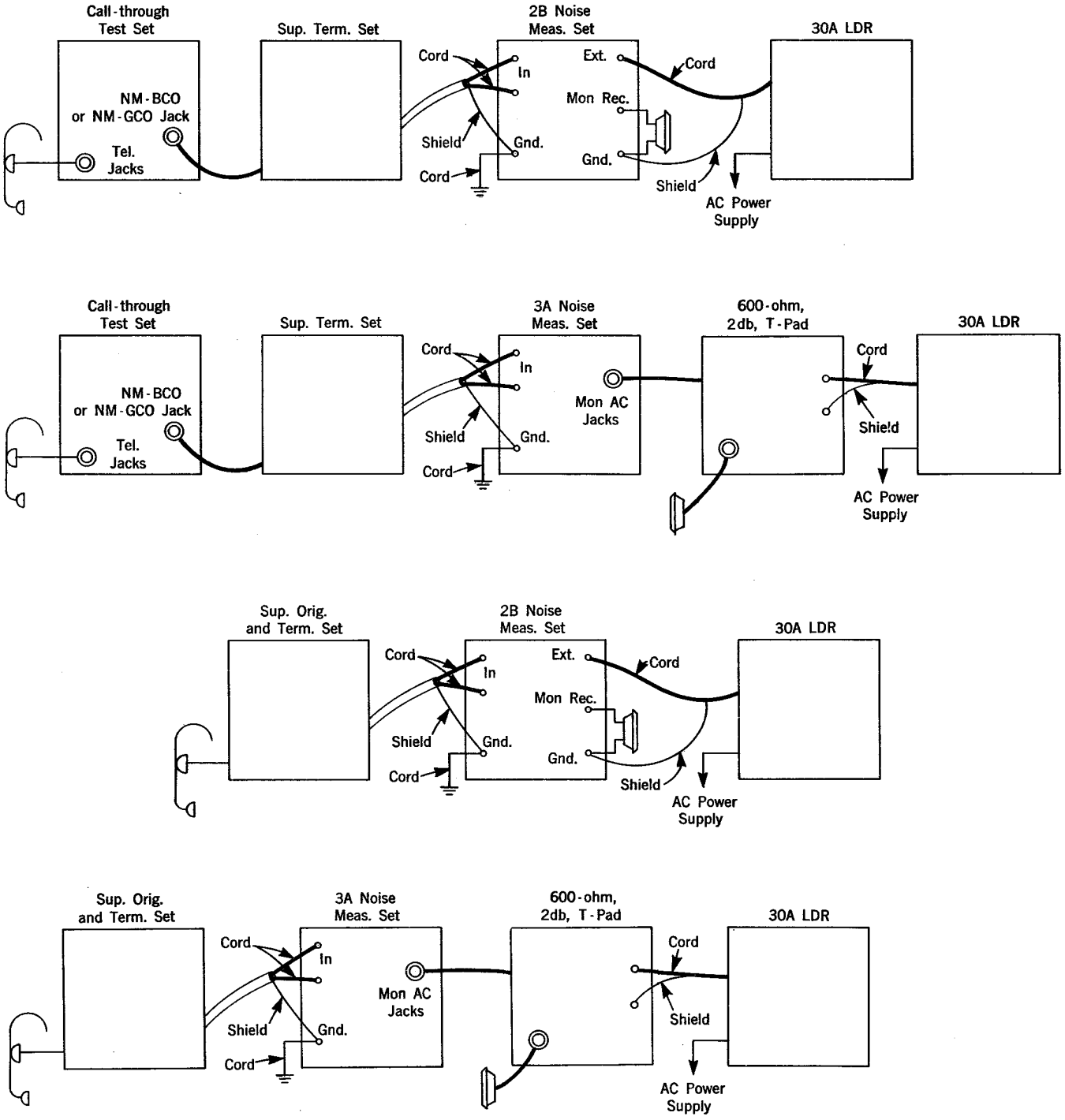

Fig. 5 – Connections of Test Sets

STEP	ACTION	VERIFICATION
16	Restore K1 key to normal position.	
17	Set DB dial on 30 position.	
18	Insert input plug, attached to set, into CAL jack.	
19	Observe meter.	Meter reads 10.
20c	If requirement of Step 19 is not met — Adjust CAL ADJ potentiometer to obtain this requirement.	
21	After the ten-minute warmup period for the 30A LDR — At 2B NMS — Operate K1 key to FIL position.	
22	Observe meter.	Meter needle coincides with red line on scale.
23	At 30A LDR — Observe MONITOR lamp.	One plate of MONITOR lamp glows brightly.
24	Operate and release CHECK key.	MONITOR lamp plate dim while key is operated.
25d	If requirements of Steps 23 and 24 are not met — Adjust ADJ CAL >10 potentiometer to obtain these requirements.	
Primary Calibration		
26	At 2B NMS — Restore K1 key to normal.	
27	While observing meter adjust CAL ADJ potentiometer.	Meter needle coincides with red line on scale.
28	Remove input plug from CAL jacks and insert into LINE jacks.	
29e	If using 5A attenuator — Connect IN jacks of 5A attenuator to 1MW 600-ohm maintenance jack using 3P17B cord.	
30e	Connect OUT jacks of 5A attenuator to 2B NMS IN binding posts using 2W15B cord.	
31f	If using H-type pad — Connect one cord to 1MW 600-ohm maintenance jack.	
32f	Connect other cord to 2B NMS IN binding posts.	

STEP	ACTION	VERIFICATION
33	At 2B NMS — Observe meter.	Meter reads 10.
34g	If requirement of Step 33 is not met — Adjust keys on 5A attenuator or potentiometer on H-type pad to obtain this requirement.	
35	Operate K1 key to FIL position.	
36	At 30A LDR — Observe MONITOR lamp.	One plate of MONITOR lamp glows brightly.
37	Operate and release CHECK key.	MONITOR lamp plate dim while key is operated.
38h	If requirements of Steps 36 and 37 are not met — Adjust CAL ADJ potentiometer at 2B NMS to obtain these requirements.	
39	At 2B NMS — Restore K1 key to normal.	
40	Remove input plug from LINE jacks and insert into CAL jacks.	
41	Observe the meter reading and record on instruction card in 30A LDR.	
42e	If using 5A attenuator — Remove cord from 5A attenuator and 1MW 600-ohm maintenance jack.	
43e	Remove cord from 5A attenuator and 2B NMS.	
44f	If using H-type pad — Remove cord from 1MW 600-ohm maintenance jack.	
45f	Remove other cord from 2B NMS.	
Routine Calibration		
46	At 30A LDR — Operate and hold CAL >0 key.	
47	Observe MONITOR lamp.	One plate of MONITOR lamp glows dimly.
48	Operate and release CHECK key.	MONITOR lamp extinguished while key is operated.
49i	If requirements of Steps 47 and 48 are not met — Adjust ADJ CAL >0 potentiometer to obtain these requirements.	
50	Release CAL >0 key.	

STEP	ACTION	VERIFICATION
51	At 2B NMS — Set DB dial on 25 position.	
52	At 30A LDR — Note the readings of >0 and >10 registers.	
53	Operate and hold 50 SEC MEAS key.	Both plates of MONITOR lamp light.
54	Release 50 SEC MEAS key. *Note:* Allow recorder to operate until stopped automatically by electric timer.	
55	After recorder has stopped — Note readings of >0 and >10 registers.	Registrations of each register should have increased by 50.
56j	If requirements of Step 55 are not met — Adjust ADJ TIMING >0 and/or ADJ TIMING >10 potentiometer to obtain these requirements. *Note:* These controls are quite sensitive. First adjust one control to score 50 registrations on its associated register and then adjust the control so that the second register will operate in synchronism with the first.	
57	At 2B NMS — Set DB dial on 30 position.	
58	Restore K1 key to normal.	
59	Observe meter.	Meter reading should be the same reading recorded on instruction card in 30A LDR. *Note:* This reading should be checked every two hours while measurements are being made.
60k	If requirement of Step 59 is not met — At 2B NMS — Adjust CAL ADJ potentiometer to obtain this requirement.	
61	Remove input plug from CAL jacks and insert in LINE jacks.	
62	Set DB dial on 15 position.	
63	Operate K1 key to FIL position.	
Using 3A Noise Measuring Set —		
64	At 30A LDR — Plug power cord into 115-volt, 60-cycle outlet.	
65	Operate power switch to POWER position.	

STEP	ACTION	VERIFICATION
66	Operate CONT MEAS key to OFF position. *Note:* Allow set to warm up about ten minutes.	
67	Calibrate 3A NMS as described in section covering this test set.	
68	After ten-minute warmup period for 30A LDR — Connect input cord of 30A LDR to binding posts of 600-ohm, 2 db, T-Pad, Fig. 4.	
69	At 2 db T-Pad — Operate switch to CALIBRATE position.	
70	Connect plug of 600-ohm, 2 db, T-Pad to AC MON jack of 3A NMS, Fig. 4.	
71	Connect monitoring receiver to jack of 600-ohm, 2 db, T-Pad, Fig. 4.	
72	Plug C-message weighting network into 3A NMS.	
73	At 3A NMS — Connect GND binding post to central office frame ground using 1W13B cord, Fig. 5.	
74	At 3A NMS — Set FUNCTION switch on CAL position.	
75	Set DBRN switch on 80 position. *Note:* Meter needle may go off scale depending on setting of CAL potentiometer. To avoid possible damage to the meter, lower the reading to some point on scale by adjusting CAL potentiometer.	
76	At 30A LDR — Observe MONITOR lamp.	One place of MONITOR lamp glows brightly.
77	Operate and release CHECK key.	MONITOR lamp dim while key is operated.
78m	If requirements of Steps 76 and 77 are not met — Adjust ADJ CAL >10 potentiometer to obtain these requirements.	
79	At 30A LDR — Operate and hold CAL >0 key.	
80	Observe MONITOR lamp.	One plate of MONITOR lamp glows dimly.

STEP	ACTION	VERIFICATION
81	Operate and release CHECK key.	MONITOR lamp extinguished while key is operated.
82n	If requirements of Steps 80 and 81 are not met — Adjust ADJ CAL >0 potentiometer to obtain these requirements.	
83	Release CAL >0 key.	
84	At 3A NMS — Set DBRN switch on 75 position.	
85	At 30A LDR — Note the readings of >0 and >10 registers.	
86	Operate and hold 50 SEC MEAS key.	Both plates of MONITOR lamp light.
87	Release 50 SEC MEAS key. *Note:* Allow recorder to operate until stopped automatically by electric timer.	
88	After recorder has stopped — Note readings of >0 and >10 registers.	Registrations of each register should have increased by 50.
89o	If requirements of Step 88 are not met — Adjust ADJ TIMING >0 and/or ADJ TIMING >10 potentiometer to obtain these requirements. *Note:* These controls are quite sensitive. First adjust one control to score 50 registrations on its associated register and then adjust the control so that the second register will operate in synchronism with the first.	
90	Set DBRN switch on 25 position.	
91	Set FUNCTION switch to 600 or 900 as required.	
→ 92 →	At 2 db T-Pad — Operate switch to OPERATE position.	

STEP	ACTION	VERIFICATION
Test A		
93	Originating connections — At IDF — Cross-connect unassigned subscriber lines to be used for survey to TL jack terminal strip.	
94	Connect TS jacks to ten TL jacks using 2P4A patching cords.	
95	Terminating connections — At IDF — Remove intercepting trunk straps from selected connector terminals.	
96	Cross-connect connector terminals to ten test set lines.	
97	At supplementary terminating set — Connect plug-ended cord to NM-BCO or NM-GCO jack of call-through test set.	
98	Connect shielded cord to IN and GND terminals of NMS as shown in Fig. 5.	
Test B		
99	Originating connections — At IDF — Cross-connect ten unassigned subscriber lines to be used for survey to ten originating jacks.	
100	Terminating connections — At IDF — Cross-connect intercepting trunk to intercepting trunk jack.	
101	Remove intercepting trunk straps from selected connector terminals.	
102	Cross-connect ten connector terminals in multiple to terminating jacks.	
103	Connect intercepting jack to terminating jack using 2P4A patching cord. ***Note:*** The terminating lines should be extended to intercepting trunk at all times, except while tester is observing these lines.	
104	At supplementary originating and terminating set — Connect shielded cord to IN and GND terminals of NMS as shown in Fig. 5.	

4. METHOD

STEP	ACTION	VERIFICATION
	A. Contact Noise Measurements with Call-Through Test Set	
	Note: In the event a subscriber should direct a call to one of the terminating test lines in error during the interval between the release of one test and the placing of another test call, as indicated by the lighting of the neon lamp in the supplementary terminating set, remove the plug from the NM-GCO or NM-BCO jack and restore TLK key to normal, thereby permitting the call to go to the intercepting operator. Wait a few minutes for the intercepting operator to handle the call before reconnecting to the NM-GCO or NM-BCO jack.	
99	At supplementary terminating set — Operate T and 2B keys to normal.	
100	At call-through test set — Operate TLK-HLD keys to normal.	
101	Operate TR keys to TR positions.	
102	Plug headset into TEL jacks.	
103	Restore first TR key to normal.	
104	Operate first TLK-HLD key to TLK position.	Dial tone heard.
105	Dial first terminating number entered on Form E-3739.	Ringing current heard. At supplementary terminating set — Neon lamp lights.
106	After one full ringing cycle — At supplementary terminating set — Operate T key.	Ringing current silenced. Neon lamp extinguished.
107	At call-through test set — Operate TLK-HLD key to HLD position.	
108	At supplementary terminating set — Operate 2B key.	
109	At 30A LDR — Operate and hold 50 SEC MEAS key.	Both plates of MONITOR lamp light.
110	Release 50 SEC MEAS key. *Note:* Allow recorder to operate until stopped automatically by electric timer.	
111	After recorder has stopped — Note readings of >0 and >10 registers on Form E-3739.	

STEP	ACTION	VERIFICATION
112	At supplementary terminating set — Restore T and 2B keys to normal.	
113	At call-through test set — Restore TLK-HLD key to normal.	
114	Operate succeeding TLK-HLD key to TLK position.	
115	Repeat Steps 105 through 114 until a group of ten calls has been completed.	
116	Operate TR key to TR position.	
117	Restore succeeding TR to normal.	
118	Operate first TLK-HLD key to TLK position.	Dial tone heard.
119	Dial succeeding terminating number entered on Form E-3739.	Ringing current heard. At supplementary terminating set — Neon lamp lights.
120	Repeat Steps 106 through 119 for each group of ten calls.	
121	Disconnect all test sets and restore all keys to normal.	

B. Contact Noise Measurements Without Call-Through Test Set

Note: In the event a subscriber should direct a call to the terminating test lines during the interval between the release of one test call and the placing of another test call, as indicated by the lighting of the neon lamp in the supplementary originating and terminating set, remove the plug-ended T cord from the jack associated with the terminating lines and patch this jack to the intercepting trunk. Wait a few minutes for the intercepting operator to handle the call before removing the patching cord and reconnecting the T cord to the jack. The TLK-1 and TLK-2 keys provide means for talking to the subscriber with the T cord in the jack.

105	At jack location — Remove 2P4A patching cord from intercepting jack and terminating jack.	
106	At supplementary originating and terminating set — Operate all keys to normal.	
107	Connect T cord to terminating jack.	

STEP	ACTION	VERIFICATION
108	Connect O cord to first originating jack.	Dial tone heard.
109	Dial first terminating number entered on Form E-3739.	Ringing current heard. Neon lamp lights.
110	After one full ringing cycle — Operate T key.	Ringing current silenced. Neon lamp extinguished.
111	Operate O key.	
112	Operate 2B key.	
113	At 30A LDR — Operate and hold 50 SEC MEAS key.	Both plates of MONITOR lamp light.
114	Release 50 SEC MEAS key. *Note:* Allow recorder to operate until stopped automatically by electric timer.	
115	After recorder has stopped — Note readings of >0 and >10 registers on Form E-3739.	
116	At supplementary originating and terminating set — Restore T, O, and 2B keys to normal.	
117	Remove O cord and insert into succeeding originating jack.	
118	Repeat Steps 109 through 117 until a group of ten calls has been completed.	
119	Connect O cord to first originating jack.	
120	Dial succeeding terminating number entered on Form E-3739.	Ringing current heard. Neon lamp lights.
121	Repeat Steps 110 through 120 for each group of ten calls.	
122	Disconnect all test sets and restore all keys to normal.	
123	At jack location — Connect intercepting jack to terminating jack.	