PRIVATE LINE TELEPHONE SERVICE
SAC PRIMARY ALERTING SYSTEM
TESTS AND ADJUSTMENTS

1. GENERAL

1.01 This section discusses the testing and maintenance of the SAC Primary Alerting System. It is reissued to add requirements for missile complex circuits, a conference arrangement at bases, and to make various corrections. A general discussion of the system and its operating features is covered in Section 310-500-100. Unless specifically covered in this section, testing and maintenance procedures should follow the standard procedures for similar 4-wire voice circuits, as covered in Section 310-405-500.

1.02 Special attention must be given to maintaining line continuity on all circuits. An interruption of approximately 20 seconds or more will result in a visual and audible alarm at SAC or a Headquarters location. Standard procedures for office responsibility, protection of special circuits, and other operating routines should be followed, except as supplemented by this section.

1.03 Where customer-provided facilities are used to make up a portion of a circuit, "Loop-back Relays" may provide a convenient means of sectionalizing trouble. Requests for the addition of these devices to a circuit should be passed through normal lines of organization.

2. CIRCUIT LINE-UP REQUIREMENTS

2.01 Circuit order test instructions and transmission tests contained in the standard sections for the types of circuits involved should be followed in the line-up of all Primary Alerting System circuits, except as supplemented in this section.

2.02 On all circuits between SAC, NAF Headquarters, Base, or Missile Complex locations, the net loss at 2700 cycles should not exceed the 1000-cycle net loss by more than 10 db in either circuit direction. In addition, on circuits between a Missile Complex and a Headquarters, the net loss at 2850 cycles should not exceed the 1000-cycle net loss by more than 10 db in the direction toward Headquarters.

3. SAC AND HEADQUARTERS TESTING AND MAINTENANCE

A. General

3.01 At SAC and all Headquarters locations, an over-all operations test can be made by the customer to check operation of all associated line checking circuits, including the line failure lamps, at one time. A separate test will check all acknowledgment lamps at one time.

3.02 On local channels between a serving test-room and SAC or a Headquarters location, the 1000-cycle net loss should be within ±1.0 db of that specified on the Circuit Layout Card. The net loss at 2700 and 2850 cycles should not exceed the 1000-cycle net loss by more than 5 db.

B. Transmission Tests (SD-1G116-01, Figs. 1, 2, 3, 7, 8, 11, 18, 19, 20, 21, and 28 and SD-1G117-01, Fig. 1)

3.03 Tests on the alert transmission path are to be made on an out-of-service basis. Section 310-405-500 should be used, where applicable.

3.04 Test apparatus is required, as shown in Section 310-405-500, Part 5.

3.05 Prepare for testing as follows:

(a) Block the T relay in the operated position in both SD-1G116-01, Fig. 2 equipments. This will disconnect the output of each slow pulse generator from the associated 43A1 telegraph carrier channel.

(b) Block the SW relay of SD-1G116-01, Fig. 1 in the released position. This places the first SD-1G116-01, Fig. 2 under test.

(c) All bridge outlets, SD-1G116-01, Fig. 20, not under test should be terminated in normally assigned 600-ohm equipment or a 600-ohm resistor.

(d) The 89-type resistors in pad sockets A1, A2, and B should be as specified on the Circuit Layout Card.

3.06 Adjust the gain control of the KS-16754, L1 or L3 amplifiers in the first SD-1G116-01, Fig. 2 to minimum.

3.07 At the location of the red telephone set, per SD-1G116-01, Fig. 3, set up the test arrangement shown in Fig. 1. Adjust the oscillator to send 1000-cycle tone at +6.7 dbm.

3.08 Adjust the gain of the KS-16754, L1 or L3 amplifier under test to provide a reading within ±0.1 db of the specified value on the CLR card. Measure levels at all other bridge outlets and at the red handset receiver, as indicated in Fig. 1. Requirements are:

(a) The measured loss of each remaining SD-1G116-01, Fig. 20 outlet shall not deviate more than ±0.3 db from the value obtained at the first outlet.

(b) The transmission level indicated on the measuring set at the "Subscriber's Terminal" should be within ±1.5 db of the value specified on the CLR card.

3.09 Raise and lower the oscillator output by 10 db in one db steps. Record the readings obtained at an SD-1G116-01, Fig. 20 outlet. Requirements are:

(a) Any input higher than normal level should produce an output at the SD-1G116-01, Fig. 20 outlet not more than 2 db higher than that obtained in Paragraph 3.08.

(b) An input lower than normal level should produce a correspondingly lower output level at the SD-1G116-01, Fig. 20 outlet within 2 db. For example, an input 5 db lower than normal (+1.7 dbm) should produce an output at the SD-1G116-01, Fig. 20 outlet of −21 dbm ±2.0 db, for a normal −16 dbm point.

If these requirements cannot be met, the amplifier should be replaced and tests in Paragraphs 3.08 and 3.09 repeated.

3.10 At Headquarters locations only, send 1000-cycle tone at the level specified on the Circuit Layout Card into the SD-1G116-01, Fig. 11 equipment. Read the output at an SD-1G116-01, Fig. 20 outlet. Requirement:

(a) The output obtained should be within ±0.2 db of that obtained in Paragraph 3.08.

If nescessary, change the value of the "C" pad in SD-1G116-01, Fig. 11 to meet this requirement.

3.11 At Headquarters locations only, block the SWA relay operated in SD-1G116-01, Fig. 28. Send 1000-cycle tone at the proper level into the SD-1G117-01, Fig. 1 equipment associated with the alternate circuit to SAC. Connect as shown in Fig. 1. The output measured at an SD-1G116-01, Fig. 20 outlet should be within ±1.5 db of that level obtained in Paragraph 3.08.

Remove the block from the SWA relay.

3.12 In Paragraph 3.05, the SW relay was blocked in the released position. Block it in the operated position. This will interchange the KS-16754, List 1 or L3 amplifiers and associated equipment. Repeat Paragraphs 3.06 through 3.10.

3.13 At the red telephone set location, move the test equipment at the "Subscriber's Terminal" from the SD-1G116-01, Fig. 3 equipment to the SD-1G116-01, Fig. 21 equipment and repeat the test procedures in Paragraphs 3.08 through 3.12. Requirements are:

(a) The measured loss to the bridge outlet should be within ±0.3 db of the value obtained in Paragraph 3.08.

(b) The measured loss at the "Subscriber's Terminal" should be within ±1.5 db of the value obtained in Paragraph 3.08 (b).

Remove the block from both T relays and the SW relay.

3.14 The loudspeakers at Headquarters locations are equipped with an adjustable minimum output level control. This is an internal control and not accessible to the customer. This control should be adjusted, with the external gain control in the maximum counterclockwise position, to provide a loudspeaker output that may be heard over the normal room noise at the customer location.

3.15 Transmission tests on the blocking filters (SD-1G116-01, Figs. 1, 2, 11, and 18) are to be made on an out-of-service basis. Test each blocking filter on a bridging basis, using 600-ohm impedance testing equipment. Adjust the test oscillator for a zero level output, at the frequency given in Table A, and connect it to Terminals 1 and 2 of the blocking filter under test. Connect the TMS to Terminals 3 and 4. See Fig 2. Vary the frequency of the oscillator to obtain a minimum reading. The reading obtained should be lower than −40 dbm.

TABLE A

SD FIG. NO.	QUANTITY		FILTER		FREQUENCY CYCLES
	SAC	HQ	DESIG.	CODE	
1	1	1	A	202E	2635
2	2	2	A	202E	2635
11	–	1	A	202E	2635
11	–	1	B	202F	2465
18	*	*	A	202E	2635
18	*	*	B	202F	2465
			** –	616A	2805

*One Fig. 18 is provided for each operator position.

**Only at Headquarters locations.

3.16 The following tests are made on the nonalert transmission path (SD-1G116-01, Figs. 7, 8, 11, 13, 18, 19, 20, 23, 24, 25, 26, and 27 and SD-1G117-01, Fig. 1).

3.17 Prepare the test arrangement at the operator position to be tested, as indicated in Fig. 3. Connect a second TMS to an assigned SD-1G116-01, Fig. 7 jack appearance. Adjust the oscillator to send 1000-cycle tone at +6.7 dbm.

3.18 Operate the nonlocking TEL key associated with the bridge outlet that is connected to the second TMS. The reading obtained should be within ±1.5 db of the −13 or −16 dbm level specified on the CLR card.

3.19 Send 1000-cycle tone at +4 or −7 dbm, as specified on the CLR card, into the corresponding receive jack on the circuit selected for test in Paragraph 3.20. The reading on the TMS at the operator position should be within ±1.5 db of the level specified on the Circuit Layout Card.

3.20 Repeat tests per Paragraphs 3.17 through 3.19, inclusive, at all operator positions equipped with an SD-1G116-01, Fig. 18.

3.21 The following tests are to be made at Headquarters locations on the nonalert portions of the regular and alternate lines to SAC. The test arrangements shown in Fig. 4A and 4B, respectively, are to be used.

(a) At the serving testroom, transmit 1000-cycle tone at the specified level toward Headquarters on the regular line from SAC. The value obtained at the customer location should be within ±1.0 db of that specified on the CLR card. If the requirement is not met, determine the cause of the variation before making pad adjustments.

(b) Transmit 1000 cycles at +6.7 dbm at the "Subscriber's Terminal" on the regular circuit to SAC. At the serving testroom, connect a transmission measuring set to the first jack-equipped test point on the circuit. The value obtained shall be within ±1.0 db of that specified on the CLR card. If the requirement is not met, determine the cause of the variation before making pad adjustments.

(c) Repeat tests per Paragraph 3.21 (a) and (b) at each customer appearance of the regular line to SAC.

(d) At the serving testroom, transmit 1000-cycle tone at the specified level toward Headquarters on the alternate line from SAC. The value obtained at the customer location should be within ±1.0 db of that specified on the CLR card. If the requirement is not met, determine the cause of the variation before making pad adjustments.

(e) Transmit 1000-cycle tone at +6.7 dbm at the "Subscriber's Terminal" on the alternate circuit to SAC. At the serving testroom, connect a TMS to the first jack-equipped test point on the circuit. The value obtained should be within ±1.0 db of that specified on the CLR card. If the requirement is not met, determine the cause of the variation before making pad adjustments.

(f) Repeat test per Paragraph 3.21 (d) and (e) at each customer appearance of the alternate line to SAC.

C. 43A1 Carrier Telegraph Channel Tests

3.22 With reference to Drawing SD-1G116-01, each 43A1 telegraph carrier channel unit should be arranged as shown in Table B. The LP CUR control should be adjusted fully clockwise.

Adjustment of the SEND LEV controls of the 43A1 Send Circuits and the REC GAIN controls of the slow pulse 43A1 monitor receiving circuits is to be made on an out-of-service basis. It is assumed that 1000-cycle transmission requirements have been met, as covered in Paragraphs 3.03 through 3.13.

TABLE B

SD-1G116-01 FIG.	NETWORK		SWITCH POS		*EQUIP. TUBE SOCKETS
	SEND	REC	SEND	REC	
1	—	454M	—	L+	V3, V4, V5
2	453M	—	HM	—	V1, V2
6	—	454L	—	H+	V3, V4, V5
		** 454AB	—	H+	V3, V4, V5
11	453L	454M	LM	L+	V1, V2, V3, V4, V5

* Tubes shall be removed from sockets not listed.

** Used only at Headquarters locations.

Apparatus required is:

1 — Transmission Measuring Set
1 — KS-14510 or equivalent Volt-ohmmeter

3.23 Prepare for the tests as follows:

(a) Connect a TMS to a bridge outlet at the first jack appearance at the specified −13 or −16 level point. See Fig. 5.

(b) Block the SW relay in the released position.

(c) In the first SD-1G116-01, Fig. 2 block the U and S relays in the operated position. This will result in the transmission of a steady 2670-cycle mark signal.

3.24 Adjust the SEND LEV control on the associated SEND TRSG unit to give a reading on the TMS that is 20 db lower than the specified 1000-cycle level on the CLR card.

3.25 Adjust the BRDG REC 43A1 Receiving Unit as follows:

(a) Arrange the voltmeter to read 150V dc. Connect the negative terminal to the ground Pin Jack G and the positive terminal to the LP Pin Jack of the BRDG REC 43A1 Receiving Unit. See Fig. 5.

(b) Adjust the REC GAIN control to the maximum counterclockwise position. Observe the minimum reading of the voltmeter. It should be approximately 10 volts.

(c) While observing the voltmeter, slowly adjust the REC GAIN control in the clockwise direction to the point where the voltage suddenly increases to approximately 120 volts or more. This is the final REC GAIN adjustment for this unit.

3.26 In Paragraph 3.23 (b), the SW relay was blocked in the released position. Change this by blocking the SW relay in the operated position.

3.27 Repeat Paragraph 3.25 with respect to the SP GEN REC 43A1 Receiving Unit.

3.28 Make final SEND LEV controls as follows:

(a) Block the SW relay in the released position.

(b) Observe that the TMS reading is the same value as obtained in Paragraph 3.24. Then adjust the SEND LEV control on the SEND TRSG 43A1 Unit of the first SD-1G116-01, Fig. 2, to obtain a reading on the TMS that is −15 ±0.1 db of the cycle level specified on the CLR card.

(c) Remove the relay blocking tools from the U and S relays in the first SD-1G116-01, Fig. 2, Paragraph 3.23 (c).

(d) Block the U and S relays in the operated position in the second SD-1G116-01, Fig. 2.

(e) Reverse the condition of (a) and block the SW relay in the operated position.

(f) Adjust the SEND LEV control on the 43A1 SEND TRSG Unit, associated with the second SD-1G116-01, Fig. 2, to give a reading on the transmission measuring set equal to that obtained in (b).

(g) Remove the blocking tools from U, S, and SW relays which were placed in (d) and (e).

3.29 With relays MB and MS operated and relays SW and SZ released, short leads T2 and R2 of the first SD-1G116-01, Fig. 2, at Terminals 21 and 22 of the unit terminal strip C associated with the SW relay. Requirements are:

(a) Relay MB should release within approximately 5 seconds and give an alarm.

(b) Relay SW will then operate.

(c) Within the next 3 seconds, relay MB should operate, followed by the operation of relay SZ.

(d) Relay MS should release within approximately 5 seconds after the MB relay reoperated. The alarm indication will remain and the No. 1 GEN FAIL Lamp will be on.

3.30 Remove the short from leads T2 and R2 which was placed in Paragraph 3.29. The MS relay should then operate within approximately 3 seconds. This will remove the alarm indication. Relays SW and SZ will remain operated. Short Terminals 11 and 12 on Unit Terminal Strip C, leads T2 and R2 to the second SD-1G116-01, Fig. 2. Requirements are:

(a) Relay MB should release within approximately 5 seconds and give an alarm.

(b) Relay SW will then release.

(c) Within the next three seconds relay MB should operate, followed by the release of relay SZ.

(d) Relay MS should release within approximately 5 seconds after the MB relay reoperated. The alarm indication will remain and the No. 2 GEN FAIL Lamp will be on.

3.31 Remove the short placed in Paragraph 3.30. The MS relay should then operate within approximately 3 seconds and remove the alarm indication.

3.32 The 43A1 Receiving Unit of the Slow Pulse Receive Circuits (SD-1G116-01, Figs. 6 and 11) is not to be operated at maximum gain. The tests to adjust the REC GAIN control are to be made on an out-of-service basis. This test is to be made on circuit order, routine, or trouble basis, as required. It is assumed that transmission levels of the associated line facilities in both directions of transmission are within the required transmission limits and pulses are being received. Fig. 6A shows the test arrangement to be used.

1 — KS-14510 or equivalent Volt-Ohmmeter
1 — Transmission Measuring Set
1 — Attenuator — 5A

3.33 Adjust the REC GAIN control of the unit under test to maximum clockwise. Arrange the voltmeter to read 60 volts dc. Connect the negative terminal to Pin Jack G and the positive terminal to Pin Jack LP of the unit under test. Slow pulses should be indicated at the rate of one per 3 seconds. The meter should indicate approximately 25 to 35 volts. When a slow pulse is received the meter will indicate its presence but will not indicate the maximum voltage of the pulse due to the short duration.

3.34 At a convenient jack appearance, connect an attenuator in series with the receive line ahead of the 43A1 Unit under test. Adjust the attenuator loss to 12 db, corrected for any deviation in the facility levels from the specified value.

Observe the slow pulse indications on the voltmeter, which are at the rate of one every 3 seconds, while turning the REC GAIN control of the 43A1 Unit under test in the counterclockwise direction in small increments. Determine the control position at which the slow pulses just drop out (no voltmeter indication). Then adjust the REC GAIN control, in small increments, in the clockwise direction until slow pulses are again observed on the voltmeter. This is the final REC GAIN control setting. Remove the attenuator from the circuit under test.

3.35 At Headquarters locations, block the AD relay in SD-1G116-01, Fig. 11, in the operated position. This will transmit a steady 2430-cycle mark signal from the equipment. Connect a TMS to the first jack-equipped test point on the circuit. See Fig. 6B. Adjust the SEND LEV control to produce a reading on the TMS that is 15 ±0.1 db lower than the 1000-cycle level specified on the CLR card.

3.36 The 43A1 Unit associated with the SD-1G117-01 equipment of the alternate line to SAC should be adjusted as described in Part 4C of this section.

D. Fast Pulse Generator Tests (SD-1G116-01, Fig. 2 and SD-1G120-01, Fig. 1)

3.37 The pulse speed, or frequency, and the per cent break adjustments are made by strapping resistors in associated resistor networks.

3.38 Tests are made during nonalert periods with customer permission.

Test apparatus required is:

1 — SD-96362-01 Pulse Checking Test Set
1 — 1W3A Cord or Equivalent

3.39 Per cent break is adjusted as follows:

(a) Connect −48-volt battery and ground to the test set.

(b) With the lever-type key in the normal position, adjust the CAL rheostat to obtain zero on the per cent break meter scale.

(c) Connect the spade-type tip of the 1W3A cord to binding post P. Connect the 347A plug to the fast pulse generator TST jack.

(d) Operate the lever-type key to the PCB position and observe the per cent break meter reading. The reading should be between 49 and 51 per cent. To meet this requirement, strap resistors R and S as described on the drawing.

3.40 Pulse speed is adjusted as follows:

(a) Adjust the CAL rheostat per Paragraph 3.39 (b).

(b) Operate the SCALE key to the 20 position.

(c) Operate the lever-type key to the PPS position and observe the 0-20 pulses per second scale. The reading should be between 4.8 and 5.2 pulses per second. Strap resistors L, M, and N as described on the drawing, to obtain the proper reading.

(d) Recheck Paragraph 3.39 if changes are made in Paragraph 3.40 (c).

E. Fast Pulse Receiver Tests (SD-1G116-01, Figs. 6 and 11)

3.41 This test uses SD-1G120-01, Figs. 1, 2, and 5 test circuit, which is part of the initial installation at SAC and Headquarters. The Figs. 2 and 5, test jacks, are mounted in bays containing fast pulse receivers. Test apparatus required is:

1 — SD-25707-01 Timing Test Set

3 — 3P15A Patch Cords

3.42 This test must be made during a nonalert period, after obtaining customer permission. Adjust the MIL SEC switch on the test set to the 0-5000 position and the REC switch to the fifth clockwise position. Make the following patches with 3P15A patch cords:

(a) 48V BAT jack to 48V jack on test set.

(b) FP MEAS jack to TST 1 jack on test set.

(c) FP TST jack to FP TST jack on the fast pulse receiver to be tested.

3.43 Make the tests as follows:

(a) Operate the test set BAT key to the ON position. After approximately 15 seconds, adjust the ADJ-0 control to obtain a zero meter reading.

(b) Operate TST key to CAL and adjust the CAL control to obtain full-scale deflection on the meter. Recheck the calibration preceding each test.

(c) Operate the TST key to the OPR position. This will start the fast pulse generator. The meter pointer will advance until the fast pulse receiver operates. This should occur between 800 and 900 milliseconds. This will indicate that the receiver operated on the fifth pulse. Adjust the AC (Fig. 6) or V (Fig. 11) control as required, to obtain this reading.

(d) If the required reading cannot be obtained by adjusting the AC (Fig. 6) or V (Fig. 11) control, try replacing the cold cathode 313CC tube V4 (Fig. 6) or V5 (Fig. 11).

F. Long Pulse Receiver Tests (SD-1G116-01, Fig. 6)

3.44 This test uses SD-1G120-01, Figs. 3, 4, and 5 test circuit which is a part of the initial installation at SAC and Headquarters. The Figs. 4 and 5 test jacks are mounted in bays containing long pulse receivers. Tests are made during nonalert periods, with customer permission. Test apparatus required is:

1 — SD-25707-01 Timing Test Set

3 — 3P15A Patch Cords

3.45 Adjust the MIL SEC switch on the test set to the 0-5000 position. Adjust the REC switch to the fifth clockwise position. Make the following patches with 3P15A patch cords.

(a) 48V BAT jack to 48V jack on test set.

(b) LP MEAS jack to TST 1 jack on test set.

(c) LP TST jack to LP TST jack on the long pulse receiver to be tested.

3.46 Make the tests as follows:

(a) Operate the test set BAT key to the ON position. After approximately 15 seconds, adjust the ADJ-0 control to obtain a zero meter reading.

(b) Operate TST key to CAL and adjust the CAL control to obtain full-scale deflection on the meter. Recheck the calibration preceding each test.

(c) Operate the TST key to the OPR position. This will start the transmission of a marking pulse. The meter pointer will advance until the long pulse receiver operates. This should occur between 500 and 1000 milliseconds. Failure to meet this requirement may be due to a defective 313CC cold cathode tube, V5.

G. Slow Pulse Receiver Tests (SD-1G116-01, Fig. 6)

3.47 The following tests are to be made on an in-service basis. The purpose is to determine if pulses are being received via the 43A1 carrier telegraph channel and if false pulses will give an alarm. Normally, false pulses would

be the result of line noise, crosstalk, etc, at the receiving frequency of the 43A1 channel. Test apparatus required is:

1 — KS-14510 or equivalent volt = ohmmeter.

3.48 Arrange the test meter to read 150 volts dc. Connect the negative terminal to ground. Connect the positive terminal to SP IN Pin Jack on the panel under test. The meter will normally indicate approximately 7 volts for a period of approximately 3 seconds. Then, when a slow pulse is received, the voltage increases to approximately 120 volts. The voltmeter is too slow to measure this peak voltage. However, it will indicate when a slow pulse is received.

3.49 After determining that slow pulses are being received, connect the positive terminal of the voltmeter to pin jack SP OUT. Observe that slow pulses are being received. Next, momentarily operate the nonlocking SP TST key just before the next slow pulse is due. The pulse should be blocked, as indicated by the absence of a meter deflection. This tests the blocking circuit, consisting of tubes V2B and V3. If three legitimate slow pulses are missed, the A relay will release and give a CONT ALM at the customer location.

Caution: If the SP TST KEY is held operated for approximately one-half second, the associated long pulse receiver will operate and signal the operator. If it remains operated 10 seconds or longer, it will give a line failure alarm.

H. Tube Failure Alarm Tests (SD-1G116-01, Figs. 1, 6, and 15)

3.50 Normally, each 429A tube in SD-1G116-01, Figs. 1 and 6, is conducting approximately 2.8 seconds out of each 3-second slow pulse cycle. During the 0.2-second interval the tube is nonconducting, due to reception of a slow pulse. At this time, the plate voltage rises to a maximum. These voltage spurts keep the associated alarm relay operated. If a tube fails or becomes nonconducting, the alarm relay will not release. For this reason the SD Fig. 15, tube alarm is provided. Test apparatus required is:

1 — Tube Extractor, KS-14428 or equivalent

3.51 Remove the 429A tube from the socket on the receiving panel to be tested. The tubes are designated as follows:

SD FIG.	ASSOC. WITH	DESIG.
1	BRDG MONITOR	V2
1	SP GEN MONITOR	V4
6	—	V1

Requirements: Approximately 1 second after a tube is removed, the red neon ALM lamp on the receiving panel should start flashing and a visual and audible equipment room alarm will result.

Replace the tube in the socket. In a few seconds, after the heater has reached operating temperature, the tube will start operating and remove the alarm indications.

4. BASE AND MISSILE SITE TESTING AND MAINTENANCE

A. General

4.01 The general operating features of the Base and Missile Complex in the Primary Alerting System are covered in Section 310-500-100. In addition, certain operating and testing features are provided at these locations. A dc continuity checking circuit is provided on the receive pair of all 4-wire stations at each base and missile complex. If a continuity failure occurs, it will interrupt the output of the slow pulse repeater at the associated base or missile complex. This will result in an alarm at SAC or the associated Headquarters location.

4.02 If there is more than one location at a base, all locations must operate an ACK key before a base acknowledgment signal is transmitted. When an ACK key is operated, it will operate an associated lamp at all other locations. When the last ACK key has been operated at a base, all ACK lamps at all wing locations will be extinguished. This will indicate that the base acknowledgment signal has been transmitted.

B. Transmission Tests (SD-1G117-01, and SD-69358-01, Figs. 1, 2, 6, 7, 12, and 13)

4.03 The following tests are in addition to the normal circuit order and routine tests for circuits of this type. They may also be used for

trouble testing. All tests in this part are to be made on an out-of-service basis.

4.04 Tests shall be made on each 4-wire line from each telephone set to the first jack-equipped test point in the serving Central Office. In addition, tests shall be made from the serving Central Office to other receiving only points or to the demarcation strip serving other receiving only points, as applicable. Reference is made to Section 310-405-500, where applicable. Testing apparatus required is:

1 — Variable Frequency Oscillator
1 — Transmission Measuring Set
1 — Induction Coil

Other items listed, as required.

4.05 Set up the test arrangement per Fig. 7 at a telephone location on a 4-wire line. Adjust the oscillator to send 1000-cycle tone at +6.7 dbm.

4.06 At the serving Central Office, measure at the first jack-equipped test point from the base. The measured value should be within ±1.0 db of the value specified on the CLR card.

4.07 Transmit 1000-cycle tone from the serving testroom toward the base or missile site at the specified level. The measured value at the handset location should be within ±1.0 db of the value specified on the Circuit Layout Card.

4.08 Repeat the test Paragraphs 4.05 through 4.07 at all other locations at the same base.

4.09 Using the test arrangements shown in Fig. 8, transmit 1000-cycle tone at the level specified on the CLR card. Record the measurement obtained at the serving testroom. Next, send 2850-cycle tone at the same level used above. The measurement obtained at the serving testroom should be within 5 db of the 1000-cycle tone level.

4.10 At the serving testroom, transmit 1000-cycle tone toward the base or missile site at the level specified for the test jack to be used. Record the value obtained at the base or missile site. Next, transmit 2850 cycles at the same level used above. The above, obtained at the base or missile site, should be within 5 db of the 1000-cycle tone level.

4.11 The tests listed in Paragraphs 4.12 and 4.13 require that both circuits to a base be out of service. The tests are written assuming both circuits to a base go through the same serving testroom. Where this is not the case, the other testroom must assist in making the tests. Use the test arrangement shown in Fig. 7.

4.12 At the base location, transmit 1000-cycle tone +6.7 dbm. Momentarily depress the "Line Grp" key associated with the handset and circuit under test. 1000-cycle tone should be present on both circuits at the serving testroom. The measured value of the tone on each circuit should be approximately 3.5 db lower than the level specified on the Circuit Layout Cards.

4.13 At the serving testroom, transmit 1000-cycle tone at the specified level toward the base. The value obtained at the handset should be approximately 3.5 db lower than the value obtained in Paragraph 4.10. Next, transmit 1000-cycle tone at the specified level on the other PAS circuit. The value obtained at the handset should be approximately the same as that obtained on the first circuit.

4.14 The loudspeakers at base and missile site locations are equipped with an adjustable minimum output level control. This is an internal control and not accessible to the customer. This control should be adjusted, with the external gain control in the maximum counterclockwise position, to provide a loudspeaker output that may be heard over the normal room noise at the customer location.

4.15 At locations where amplifiers per SD-69358-01, Fig. 17, are provided, the gain should be checked as follows, using the test arrangement in Fig. 9:

(a) Where KS-16754, List 2 or 4 amplifiers are used, transmit 1000-cycle tone at the specified level into the amplifier. Adjust the gain of the amplifier to provide the specified output level. Refer to the CLR card for proper transmission levels.

(b) Where KS-16754, List 1 or 3 amplifiers are used, adjust the gain control to the maximum counterclockwise position. Transmit 1000-cycle tone at the specified level into the amplifier. Adjust the gain control clockwise to give the specified level at the output of the

TABLE C

SD FIG. NO.	FILTER		FREQUENCY CYCLES	NOTES
	DESIG.	CODE		
1	A	202E	2635	
1	B	202F	2465	
6	C	202E	2635	
6	D	616A	2805	
6	E	202F	2465	At missile sites only.
6	E	616A	2805	At bases with associated missile sites.

Note: SD Fig. 6 is used only on circuits from a base ***and*** missile site to a Headquarters location.

amplifier. Refer to the CLR card for proper transmission levels. To check that the amplifier is working as specified, raise and lower the 1000-cycle tone input level 10 db, in one db steps. For any input higher than normal, the amplifier output should not raise more than 2 db. For any input lower than normal, the amplifier output should be correspondingly lower within 2 db.

4.16 Transmission tests of the blocking filters (SD-1G117-01, Figs. 1 and 6) are to be made on an out-of-service basis. Test each blocking filter on a bridging basis, using 600-ohm impedance testing equipment. Adjust the test oscillator for a zero level output, at the frequency given in Table C, and connect it to Terminals 1 and 2 of the filter under test. Connect the measuring set to Terminals 3 and 4. See Fig. 2. Vary the oscillator frequency slightly to obtain the minimum reading. The reading obtained should be lower than −40 dbm.

C. 43A1 Carrier Telegraph Channel Tests (SD-1G117-01, Fig. 1)

4.17 Arrange each 43A1 carrier telegraph channel unit, depending on its location, as shown below.

4.18 The dc voltage across Terminals 5 and 8 on the 43A1 unit should be adjusted to 20 volts, plus or minus 0.5 volt, with normal supply voltage, by strapping resistors R34, R35, and R36 as required. Adjust the LP CUR control fully clockwise.

All other tests and adjustments, with the exception of the SEND LEV and REC GAIN controls, that are covered in the following para-

LOCATION	NETWORK		SWITCH POS.		*EQUIP TUBE SOCKETS
	SEND	REC	SEND	REC	
Base	453L	454M	LM	L+	V1, V2, V3, V4, V5
Missile Site	453AB	454M	LM	L+	V1, V2, V3, V4, V5

*Verify that socket V6 is not equipped

Test apparatus required:

1 — KS-14510 or equivalent Volt-ohmmeter

graphs, should be in accordance with the sections covering 43A1 carrier telegraph terminals. Adjustment of the 43A1 transmitting level assumes that the transmission tests specified in Paragraphs 4.03 through 4.10 have been made and the requirements met. The following test is to be made on an ***out-of-service*** basis.

4.19 Proceed as follows:

(a) At the base or missile site location of the circuit under test, block the LP relay in the operated position. This will result in the transmission of a steady mark signal.

(b) At the serving testroom, connect a transmission measuring set at the same test point used in Paragraph 4.06. The measured value should be 15 ±0.2 db below the 1000-cycle value specified on the CLR card. To meet this requirement, adjust the SEND LEV control on the 43A1 panel at the base or missile site. See Fig. 10.

(c) Remove the block from the LP relay which was placed in (a).

4.20 The 431A Receiving Unit is not to be operated at maximum gain. The test to adjust the REC GAIN control is to be made on an ***out-of-service*** basis. This test is to be made on circuit order, routine, or trouble basis, as required. It is assumed that the receiving transmission levels are within the required transmission limits and slow pulses are being received.

4.21 Set the KS-14510 Volt-ohmmeter to read 150V dc. Connect the negative terminal to Pin Jack G and the positive terminal to Pin Jack LP of the 43A1 unit under test. Adjust the REC GAIN control maximum clockwise. Observe that the voltmeter indicates that slow pulses are being received at the rate of one every three seconds. Between pulses, the meter will indicate approximately 10 volts. When a 260 MS slow pulse is received, the meter will indicate its presence but will not indicate the maximum voltage of the pulse, due to its short duration.

4.22 In the serving testroom, adjust an attenuator for 12 db loss, corrected for any deviation in the facility levels from the specified value. See Fig. 10. After adjusting the attenuator, connect it in series with the receive line of the circuit under test at a convenient jack appearance.

4.23 While observing the slow pulse indications on the voltmeter, turn the REC GAIN control of the 431A unit under test in the counterclockwise direction by a small increment at a time. Determine the REC GAIN control position at which the slow pulses just drop out (no voltmeter indication) the continuity failure alarm should operate at SAC or Headquarters. Adjust the REC GAIN control, slowly by a small increment at a time, in the clockwise direction until slow pulses are again observed on the voltmeter. This is the final REC GAIN control setting.

D. Fast Pulse Generator Tests (SD-1G117-01, Fig. 1)

4.24 Test apparatus required is:

1 — SD-96362-01 Pulse Checking Test Set
1 — 1W3A Cord or equivalent

4.25 Per cent break is adjusted as follows:

(a) Connect negative 48-volt battery and ground to the test set.

(b) With the level-type key in the normal position, adjust the CAL rheostat to obtain a zero reading on the per cent break meter scale.

(c) Connect the spade-type tip of the 1W3A cord to binding post P on the test set. Connect the 347A plug to the fast pulse generator A TST jack. The reading should be between 49 and 51 per cent. Strap resistors R6 and R7, as required, to meet the requirement.

4.26 Pulse speed is adjusted as follows:

(a) Adjust the CAL rheostat per Paragraph 4.25 (b).

(b) Operate the SCALE key to the 20 position.

(c) Operate the lever-type key to the PPS position and observe the 0-20 pulses per second scale. The reading should be between 4.8 and 5.2 per second. Strap resistors R2, R3, and R4, as described on the drawing, to obtain the required reading.

4.27 Recheck Paragraph 4.25 if a change of resistor strapping is made in Paragraph 4.26.

E. Fast Pulse Receiver Tests (SD-1G117-01, Fig. 1)

4.28 The fast pulse receiver is adjusted to operate on the fifth fast pulse received. A test circuit is provided as a part of the base equipment. Test apparatus required is:

1 — Test cord equipped with a 347A Plug, or one 165C Open Plug

4.29 Hold the nonlocking B TST key operated and insert the open plug into the fast pulse generator A TST jack. Observe the A relay and determine the number of pulses required to operate it. This can be determined by listening to the operation of the pulsing P2 relay and counting the pulses. Remove the open plug from the TST jack, to stop the test cycle. Adjust the P control, as required, to obtain operation of relay A on the fifth pulse. Failure to meet this requirement may be due to a defective cold cathode tube V3.

4.30 Repeat a test cycle per Paragraph 4.29, except to remove the open plug from the generator TST jack immediately after the A relay operates. The relay should remain operated for approximately 2 seconds. Failure to do so may be due to a defective cold cathode tube V4.

F. Tests of Transmission of Fast and Long Pulse Signals

4.31 The following tests must be made on an out-of-service basis with the base 4-wire line terminated at the serving testroom:

(a) Momentarily connect a ground to the H relay, released contact 4. The H relay should operate in approximately 2 seconds, to end the transmission of a fast pulse acknowledgment signal. The H relay should remain operated for approximately 1.5 seconds.

(b) Momentarily connect a ground to the H relay, released contact 6. The H relay should operate in approximately 1.5 seconds, to end the transmission of the long pulse line signal.

(c) If the H relay fails to operate within the approximate time intervals specified in (a) and (b), try replacing the cold cathode tube V5.

G. Slow Pulse Repeater Tests (SD-1G117-01, Fig. 1)

4.32 Make tube tests and replacements on the same basis as specified for the associated 43A1 carrier telegraph terminal.

5. ROUTINE TESTS

5.01 The tests listed in Table D are to be made on a routine basis, in addition to those specified in Section 310-405-500. Unless otherwise specified, the listed references are a part of this section.

TABLE D

TEST	PARA REFERENCES	INTER-VAL
43A1 Send Level		
for SD-1G116-01, Fig. 2	3.23 - 3.28	A
for SD-1G116-01, Fig. 11	3.35	Q
for SD-1G117-01, Fig. 1		Q
43A1 REC GAIN		
for SD-1G116-01, Fig. 1	3.23 - 3.28	A
for SD-1G116-01, Figs. 6 and 11	3.32 - 3.34	Q
for SD-1G117-01, Fig. 1	4.20 - 4.23	Q
1000-cycle net loss		
Serving testroom to base or missile site	4.05 - 4.08	Q
Serving testroom to SAC or Headquarters location	3.02	Q
Frequency Response		
Serving testroom to base or missile site	4.09 - 4.11	A
Serving testroom to SAC or Headquarters location	3.02	A
Net loss of alert transmission path at SAC and Headquarters	3.03 - 3.13	A
Gain of SD-69358-01, Fig. 17 Amplifier	4.15	Q

A = Annual Q = Quarterly

6. IN-SERVICE TESTS

6.01 In-service tests are designed to uncover any circuit impairments which, if not corrected before the next schedule routine, may cause a circuit failure. They should be made on a weekly basis. All level measurements are to be made on a high-impedance bridging basis, so as not to interrupt circuit continuity or transmission levels.

6.02 Table E lists the in-service tests to be made, where to make them, and test requirements.

TABLE E

LOCATION TO MAKE TEST	TEST TO BE MADE	REQUIREMENT
Testroom serving base or missile site	Measure 43A1 carrier pulse level from SAC or Headquarters	−15 ±3.0 db of 1000-cycle level specified on Circuit Layout Card
Testroom serving SAC or Headquarters location	Measure 43A1 carrier pulse level from base, missile site, or Headquarters	−15 ±3.0 db of 1000-cycle level specified on Circuit Layout Card
SAC or Headquarters location	Measure received slow pulse length	Minimum of 170 MS

6.03 Test equipment required is:

1 — Brush recorder or equivalent
1 — High-impedance TMS

6.04 Pulse length measurements may be made by connecting the input of the recorder to the LP Pin Jack of the 43A1 carrier telegraph channel in the SD-1G116-01, Fig. 6 of the circuit under test. Set the recorder drive for maximum speed. Start the recorder and record several pulses. Read the pulse length from the recorder chart. Requirements are shown in Table E.

6.05 Bridge the high-impedance TMS across the line and read the 43A1 carrier telegraph tone level. Requirements are shown in Table E.

6.06 The received pulse length may be affected by any of the following conditions:

(a) Transmission levels to the distant location.

(b) Improper adjustment of the 43A1 telegraph carrier channel units at either end of the circuit.

(c) Aging tubes in the 43A1 telegraph carrier channels, slow pulse repeater, or slow pulse receiver.

(d) Low power supply voltages to the equipment.

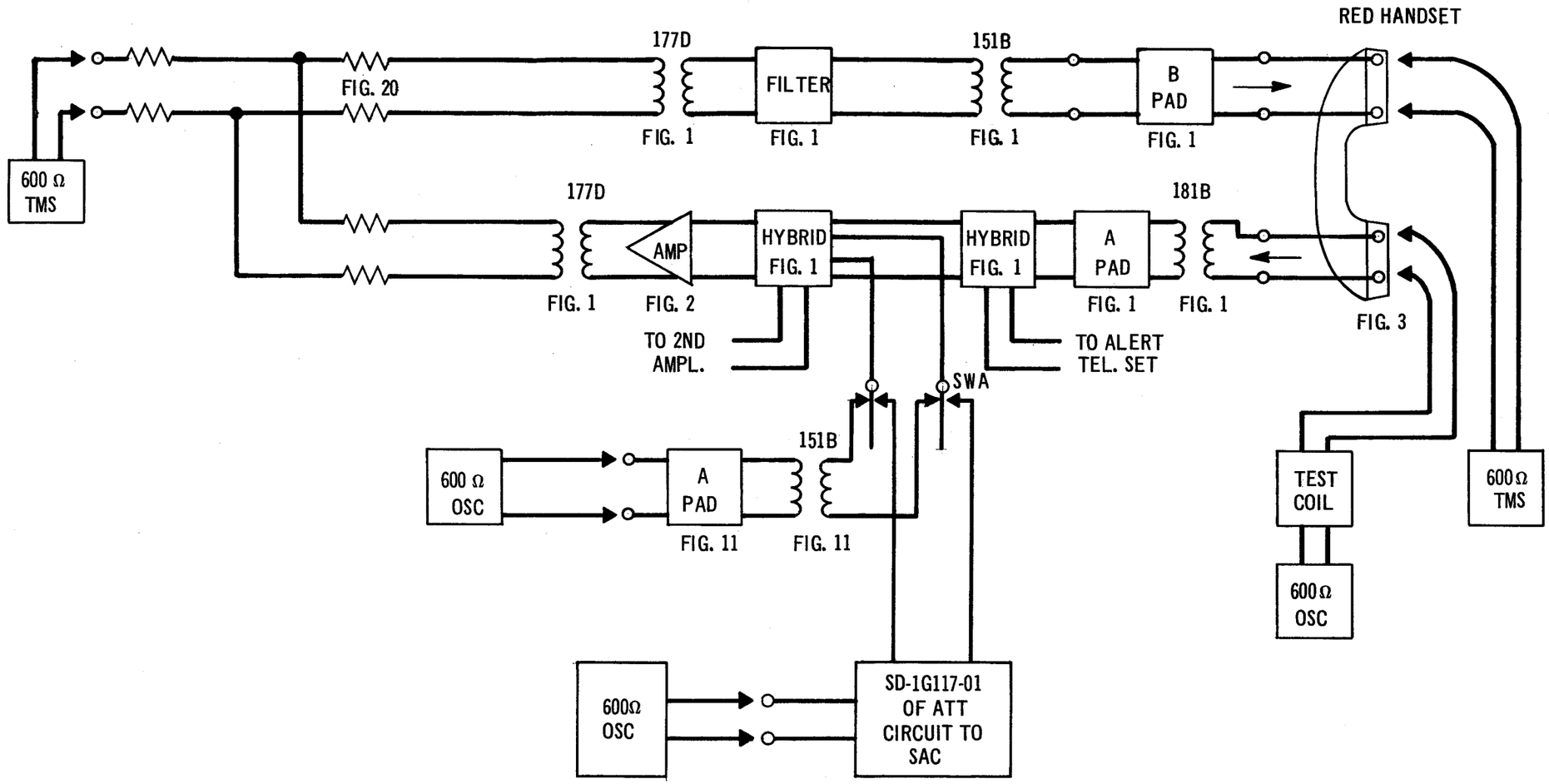


Fig. 1 — Transmission Tests — Red Telephone Positions Per SD-1G116-01

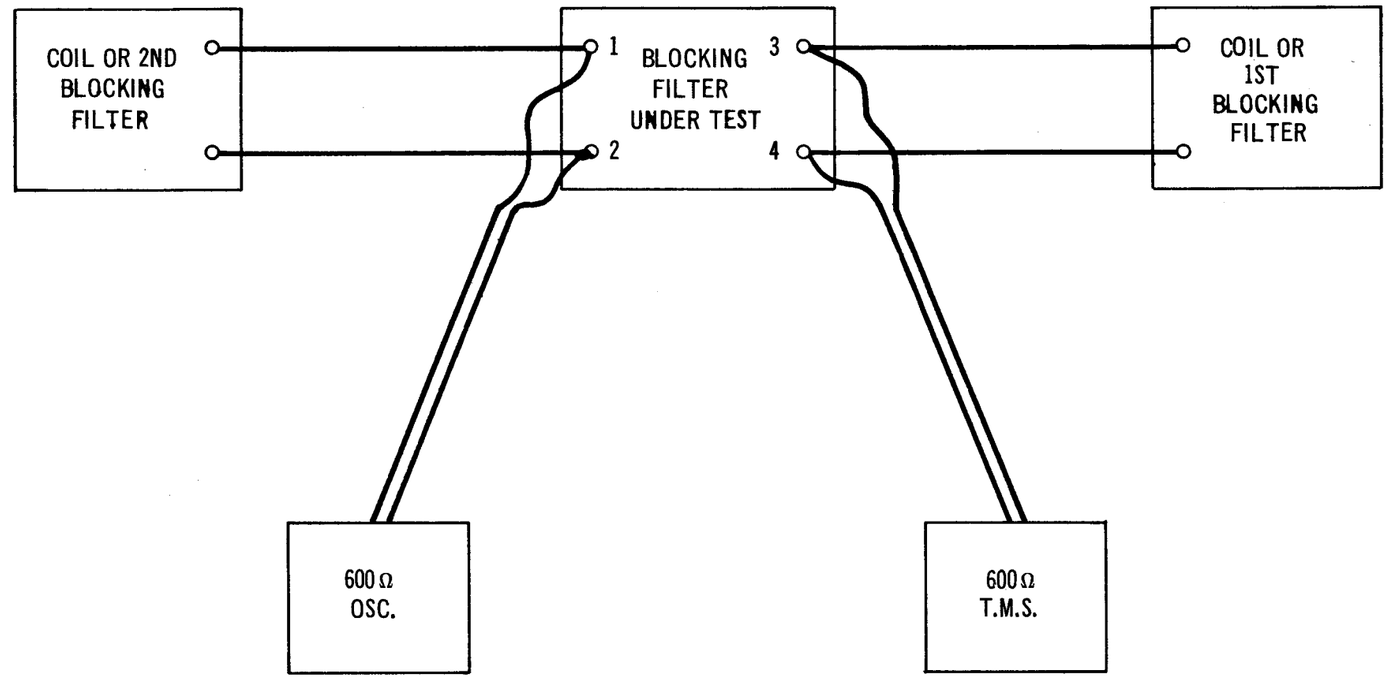


Fig. 2 – Transmission Tests — Blocking Filters Per SD-16116-01

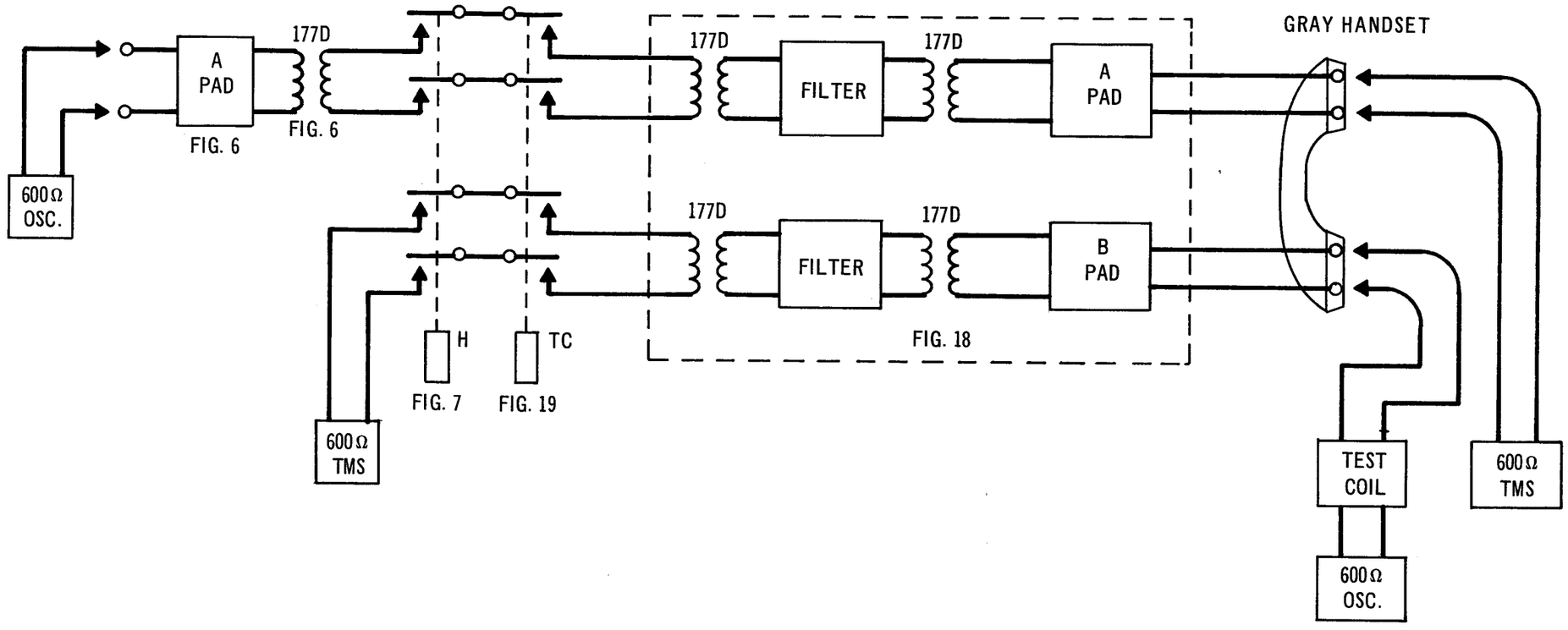
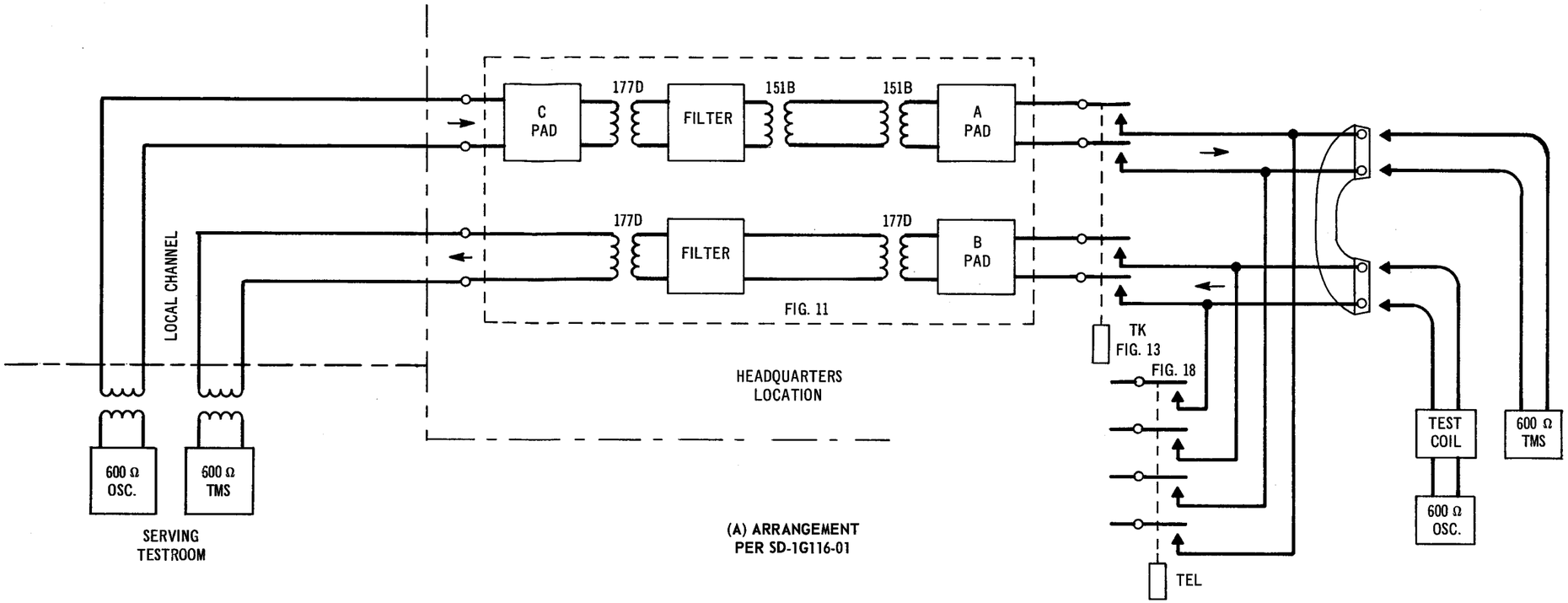
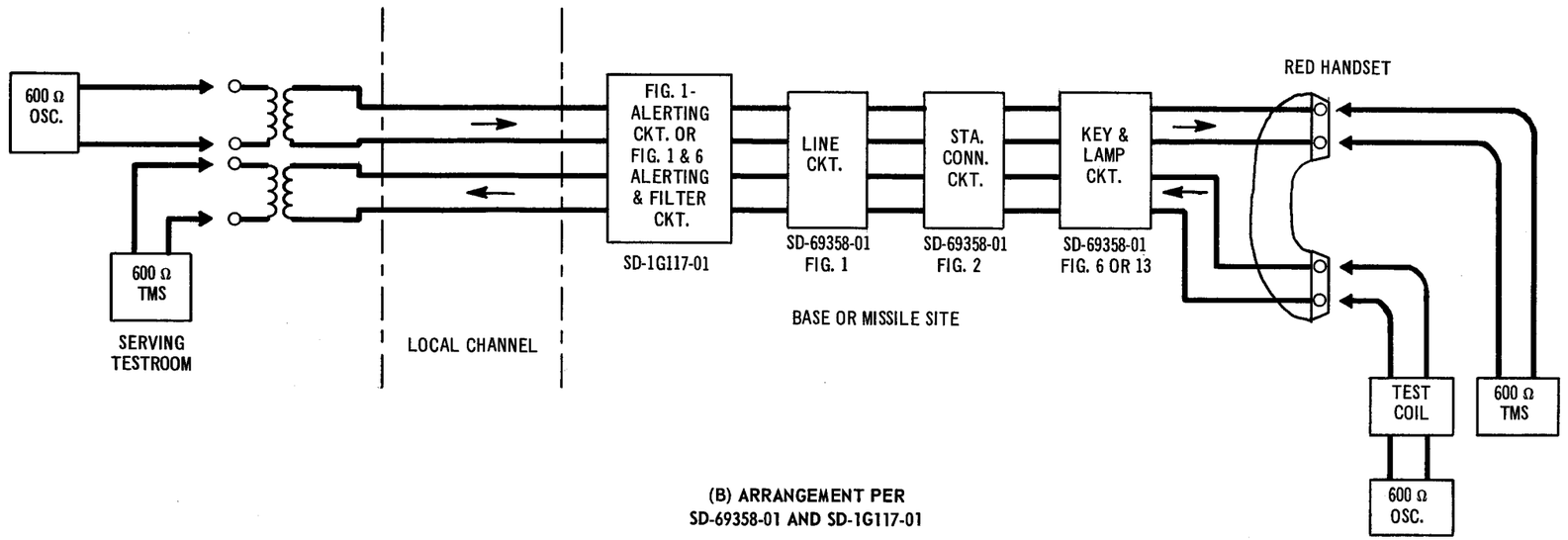


Fig. 3 – Transmission Tests — Gray Telephone Positions Per SD-1G116-01

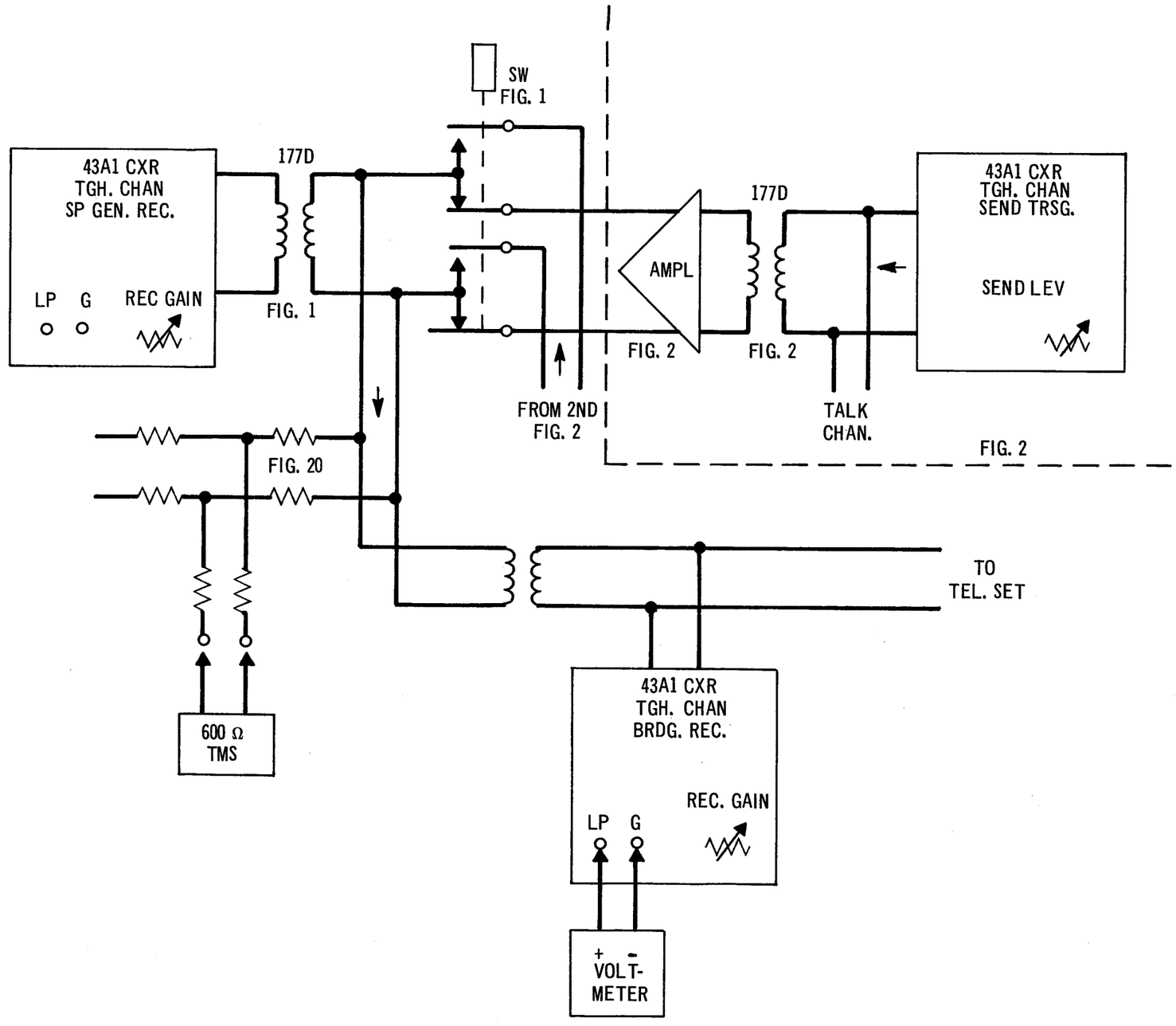


(A) ARRANGEMENT PER SD-1G116-01



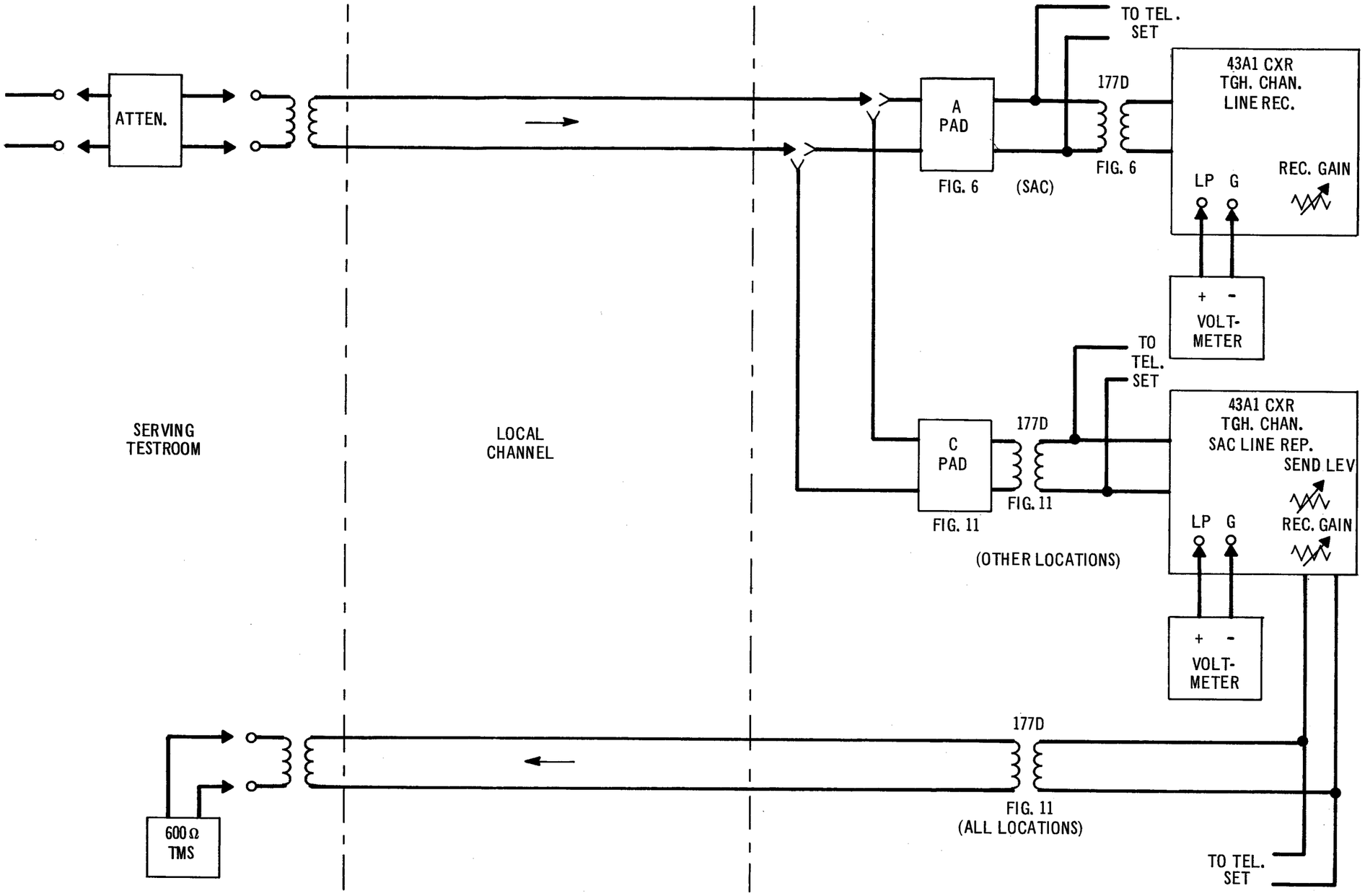
(B) ARRANGEMENT PER SD-69358-01 AND SD-1G117-01

Fig. 4 – Transmission Tests—Headquarters Locations



NOTE – FIGS. PER SD-1G116-01

Fig. 5 – Transmission Tests — 43A1 Carrier Telegraph Channels—SAC and Headquarters Locations



NOTE – ALL FIGS. PER SD-16116-01

Fig. 6 – Transmission Tests — 43A1 Carrier Telegraph Channels — SAC and Headquarters

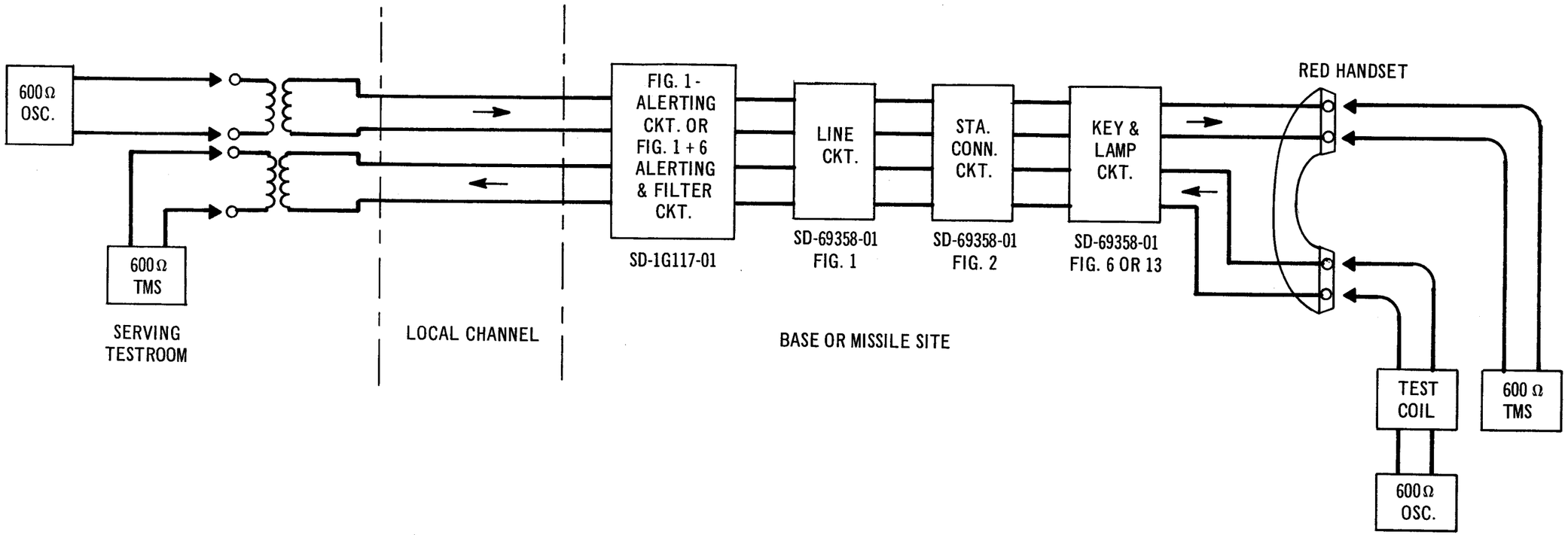


Fig. 7 – Transmission Tests — Telephone Positions — Base or Missile Locations

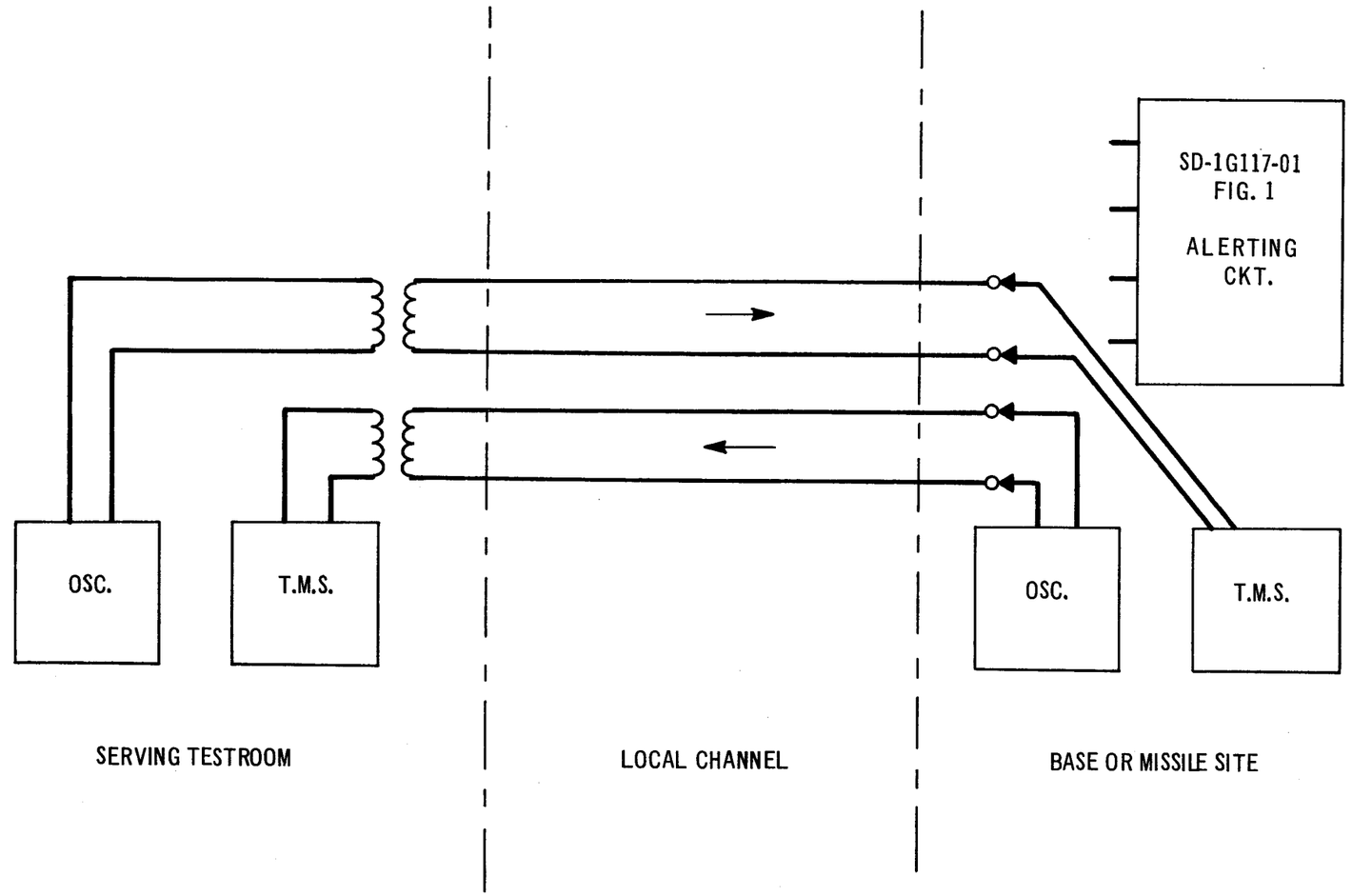


Fig. 8 – Transmission Tests — Local Channels

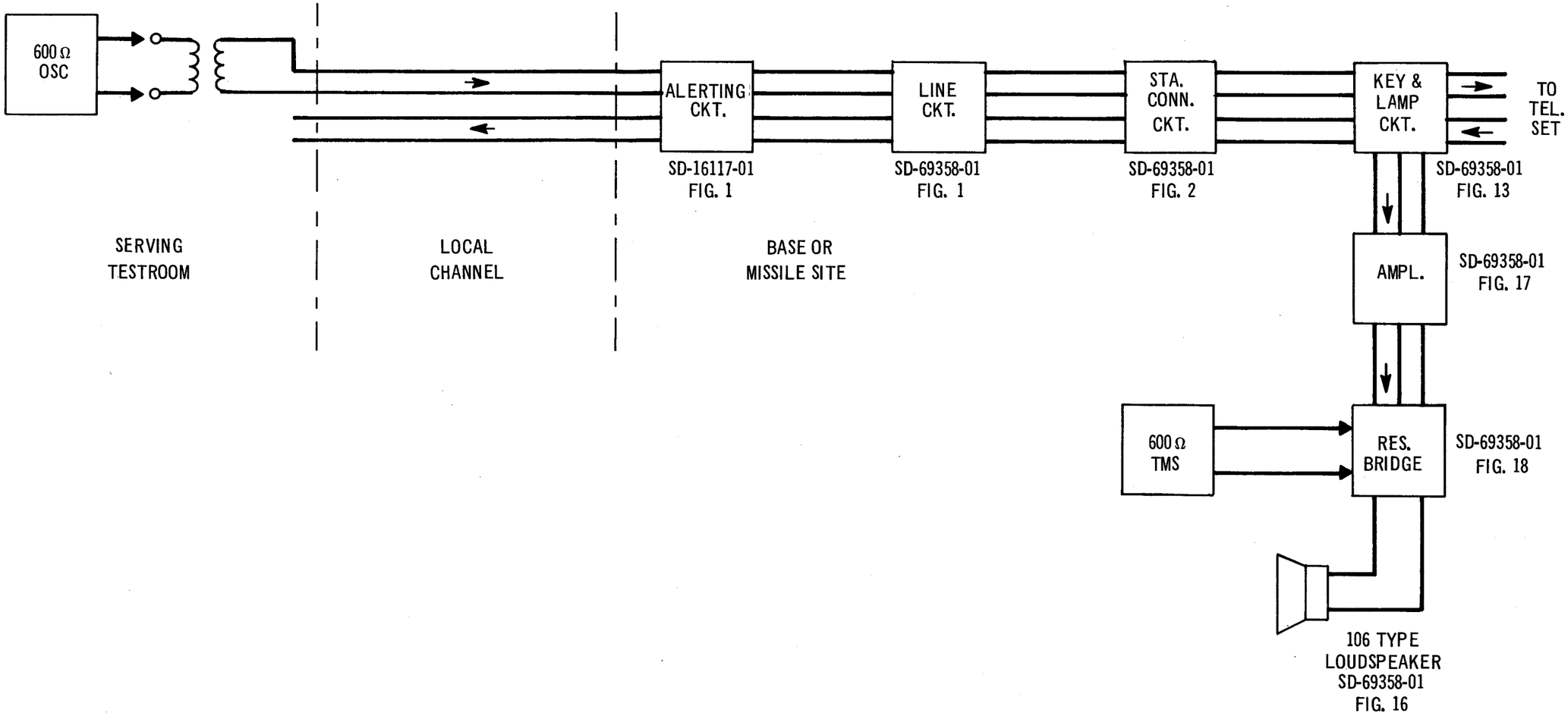


Fig. 9 – Transmission Tests — Distribution Amplifiers — Base and Missile Locations

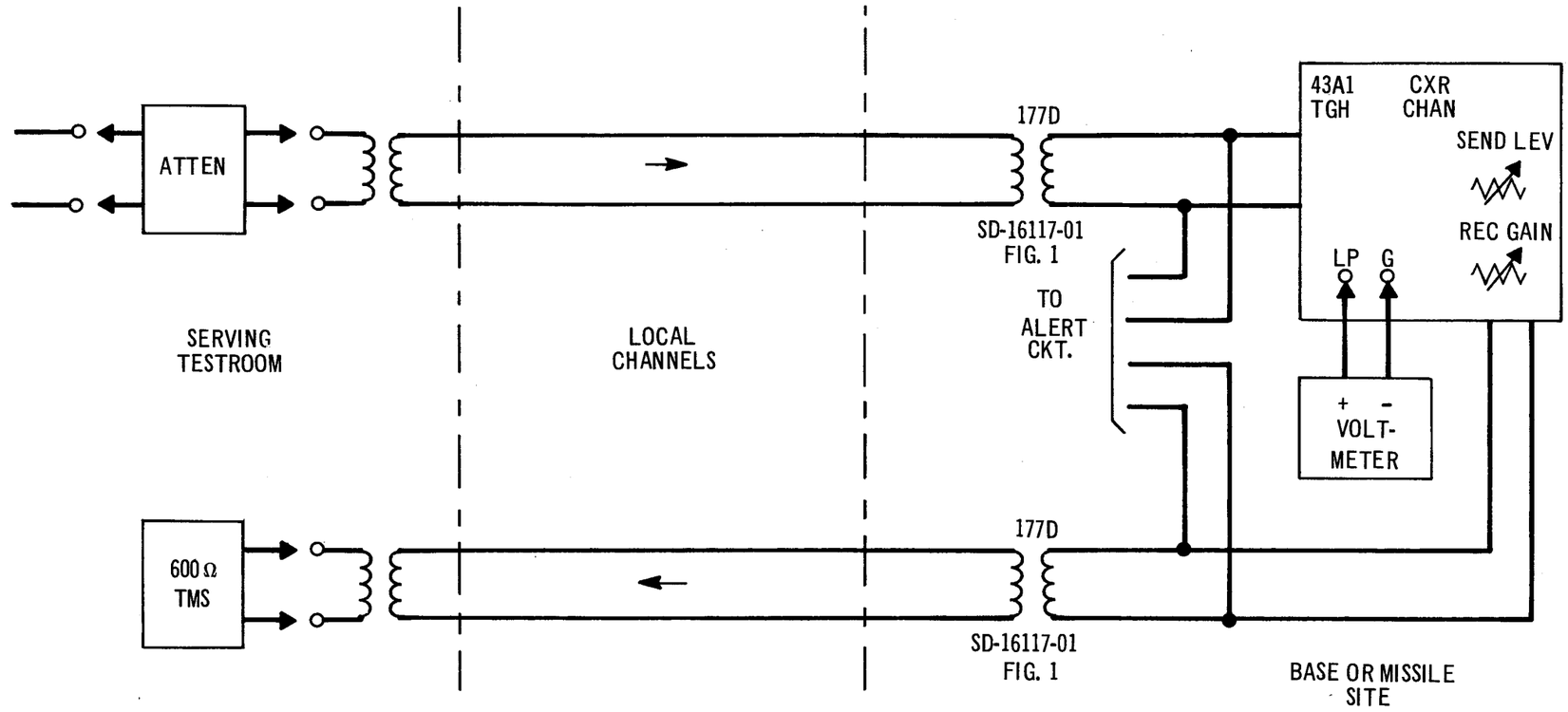


Fig. 10 – Transmission Tests — 43A1 Carrier Telegraph Channels — Base or Missile Locations