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LOUDSPEAKER SETS

106-TYPE

IDENTIFICATION, INSTALLATION, MAINTENANCE, AND CONNECTIONS

1. GENERAL

APPLICATION

1.01 This section provides identification, installation, maintenance, and connection information for the 106-type loudspeaker set.

- Single or multiline telephone sets
- 301 and 301A Switching Systems (106C [MD] or F recommended)
- 5A and 5B key equipment (106A and B [MD], D or E recommended)
- Other applications where suitable.

1.02 This section is reissued to:

- Clarify power connections
- Add new Fig. 9 and 12
- Revise Fig. 8, 10, 11, 13, and 14
- Revise Table A.

ORDERING GUIDE

- Set, Loudspeaker, 106D
- Set, Loudspeaker, 106E
- Set, Loudspeaker, 106F

1.03 This issue of the section is based on the following drawings:

SD-95279-01, Issue 11D—106A, B, and C Loudspeaker Sets (all MD)
SD-95279-02, Issue 2B—106D, E, and F Loudspeaker Sets

Associated Apparatus (Order Separately)

- Unit, Power, 33A (when 24 or 48 volts dc is not available from station supply). See 3.07.

If this section is to be used with equipment or apparatus reflecting later issue(s) of the drawing(s), reference should be made to the SDs and CDs to determine the extent of the changes and the manner in which the section may be affected.

◆ *Replaceable Components*

2. IDENTIFICATION

PURPOSE

- This loudspeaker circuit provides a transistorized audio frequency amplifier of moderate power and a loudspeaker which may be disconnected if it is desired to use only the amplifier.

- Lamp, 2Y (48V dc)
- Lamp, A1 (24V dc)
- Lamp, 2T (12 and 30V dc)
- Amplifier, List 1, KS-16728 (106A, B or C [MD] only)◆

NOTICE

Not for use or disclosure outside the
Bell System except under written agreement

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COLOR

- Moss green enamel with chrome bezel and aluminum grill.

DESIGN FEATURES (Refer to Table A for a summary of features and options which are determined by specific wiring in the loudspeaker sets.)

All 106-Type Loudspeaker Sets (Fig. 1)

- Offer three input impedances: 1.5, 600, and 2400 ohms
- Supply a maximum 1/2 watt of power to the internal 3.2 ohm speaker
- Provide facilities for disconnecting loudspeaker for use as an amplifier only
- Amplify telephone conversations up to 66 db
- Require approximately 0.130 ampere at 24 volts dc
- Require 0.088 ampere at 48 volts dc (106D, E, F)
- Require 0.120 ampere at 48 volts dc (106A, B, C [MD])
- Operate from one of three voltage sources, 24 or 48 volts dc, or a combination of 12 and 30 volts dc.

106A, B, and C (MD) Loudspeaker Sets

- Contain a plug-in amplifier assembly, an automatic output level control (AOLC) circuit board used on the 106B and C only and a separate terminal board, TB1.

106A (MD) Set (Fig. 2)

- Is not equipped with an AOLC circuit.
- Uses one screwdriver-adjusted internal chassis gain control (R7) and one front panel volume control (R6). The front panel volume control varies the level of audio input before amplification.
- Is replaced by the 106D set.

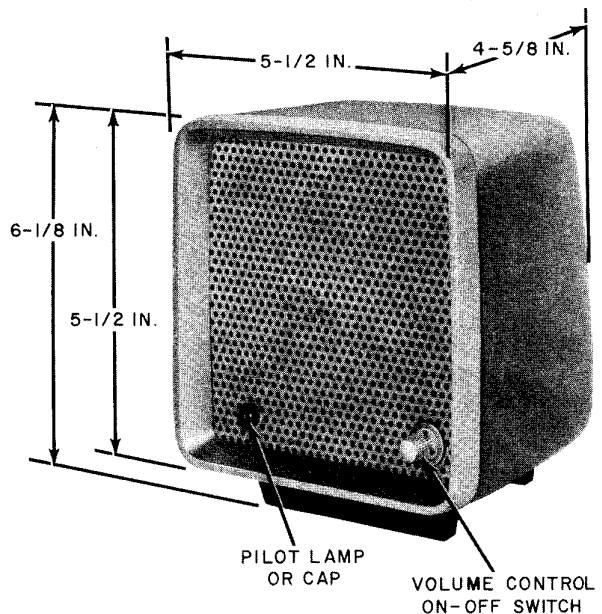


Fig. 1—106-Type Loudspeaker Set

- May be replaced by the 106E set with the AOLC circuit disabled and Z wiring installed. See 5.02.

106B (MD) Set (Fig. 2)

- Uses two screwdriver-adjusted internal controls, chassis gain (R7) and output level (R14), and one front panel volume control (R6) which varies the level of audio input before amplification.
- Is equipped with an AOLC circuit (permanently wired).
- Is replaced by the 106E set.

106C (MD) Set (Fig. 3)

- Is equipped with an AOLC circuit (permanently wired).
- Uses one screwdriver-adjusted internal control, chassis gain (R7), and one front panel volume control (R17). The front panel volume control varies the level of output audio after amplification.

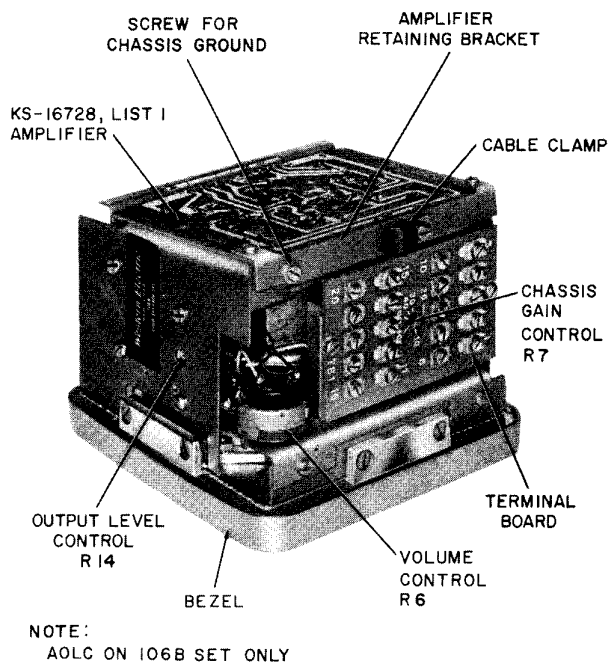


Fig. 2—106A (MD) or 106B (MD) Loudspeaker Set, Cover Removed

- Is primarily intended for use with 301 and 301A Switching Systems.
- Is replaced by the 106F set.

106D, E, and F Loudspeaker Sets (Fig. 4 and 5)

- Use a one-piece die cast chassis to mount a single printed circuit board which contains both amplifier circuitry and connection terminals.
- Use a single pilot lamp, with appropriate wiring options, for all power supply voltages.

106D Set

- Is not equipped with an AOLC circuit.
- Uses one screwdriver-adjusted internal chassis gain control (R26) and one front panel volume control (R25). The front panel volume control varies the level of audio input before amplification.

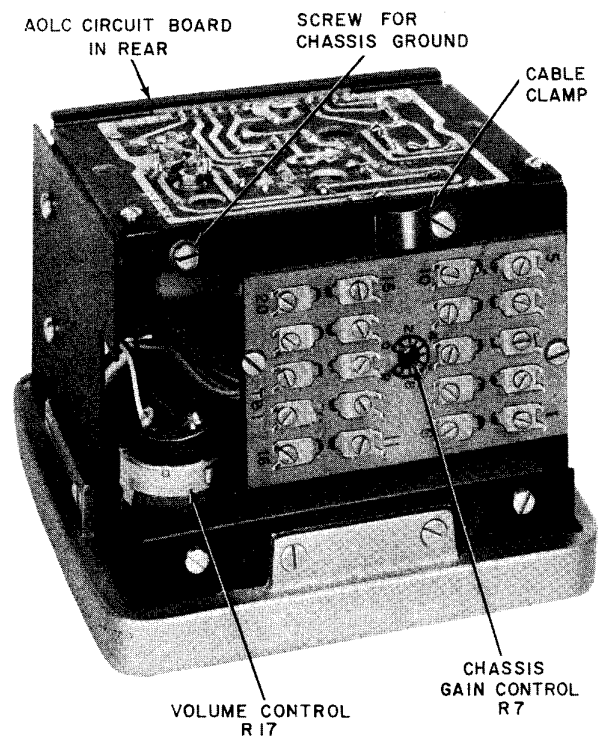


Fig. 3—106C (MD) Loudspeaker Set, Cover Removed

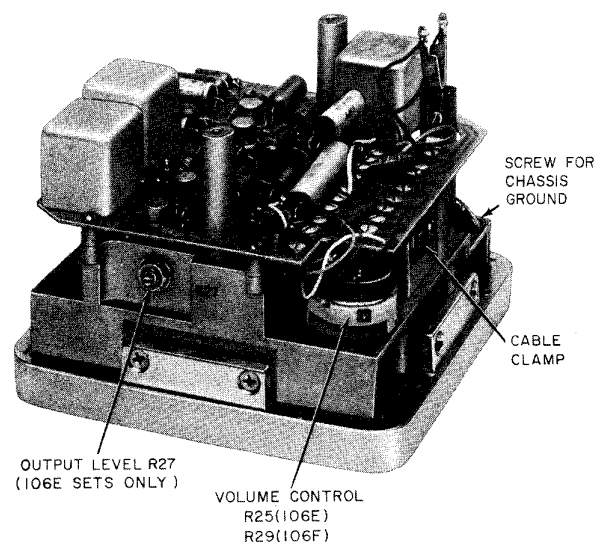


Fig. 4—106D, E, or F Loudspeaker Set, Cover Removed

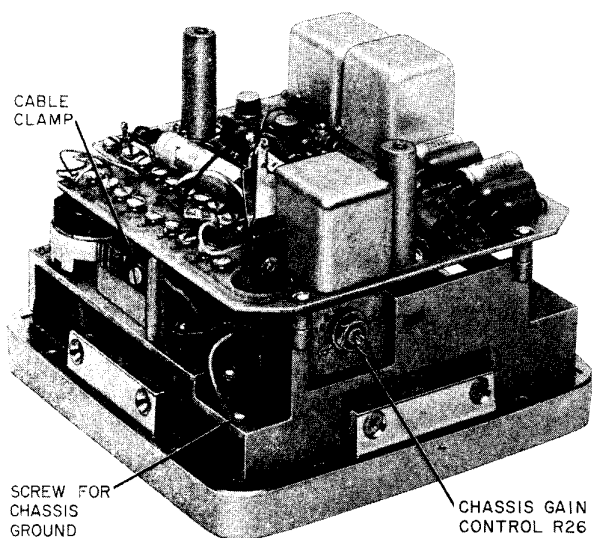


Fig. 5—106D, E, or F Loudspeaker Set, Cover Removed

- Replaces the 106A (MD) set.

106E Set

- Is wired with an adjustable AOLC circuit that may be disabled. AOLC maintains a fixed level of audio output to cope with input level variations of up to 35 db.
- Uses two screwdriver-adjusted internal controls, chassis gain (R26) and output level (R27), and one front panel volume control (R25) to vary audio levels. The front panel volume control varies the level of input audio before amplification.
- Replaces the 106B (MD) set.
- May replace the 106A (MD) or 106D set when AOLC circuit is disabled and Z wiring is installed. See 5.02.

106F Set

- Is equipped with an AOLC circuit (permanently wired).
- Uses one screwdriver-adjusted internal chassis gain control (R26) and one front panel volume control (R29). The front panel

volume control varies the level of audio output after amplification.

- Contains a minimum audibility level option (P) which may be enabled. This option, if enabled, prevents the external volume control from completely squelching audio.
- Is intended for use with 301 and 301A Switching Systems. (See CD-/SD-69440 for the connections and adjustments.)
- Replaces the 106C (MD) set.

3. INSTALLATION

PLANNING

3.01 Aid the customer in selecting an installation location that is comparatively quiet. Avoid locations near noisy machinery.

3.02 To minimize audio feedback when the loudspeaker set is used with a telephone, be sure that the set location is at least 3 feet from the telephone. (Push-to-talk handset may be required to prevent feedback.)

3.03 The loudspeaker may be panel mounted (Fig. 6). The cover is designed to hold the set in place, provided the panel is not over 3/16 inch thick. Loudspeaker with frame assembly is installed from front side of panel. Cover mounts on set at rear of panel. The edges of frame and cover act as a clamp on the panel when cover screws are tightened. If space is limited, the feet may be removed. Figure 7 illustrates the area to be cut out of the panel prior to installation.

INSTALLING

3.04 Select power and feature options desired (refer to Table A). Connect or remove straps as described in Part 5.

3.05 For panel installations, refer to Fig. 7. Cut out area using suitable tools and install set as shown in Fig. 6.

3.06 Connect leads as shown in Fig. 8. Match the impedance of the incoming line to the appropriate loudspeaker terminals.

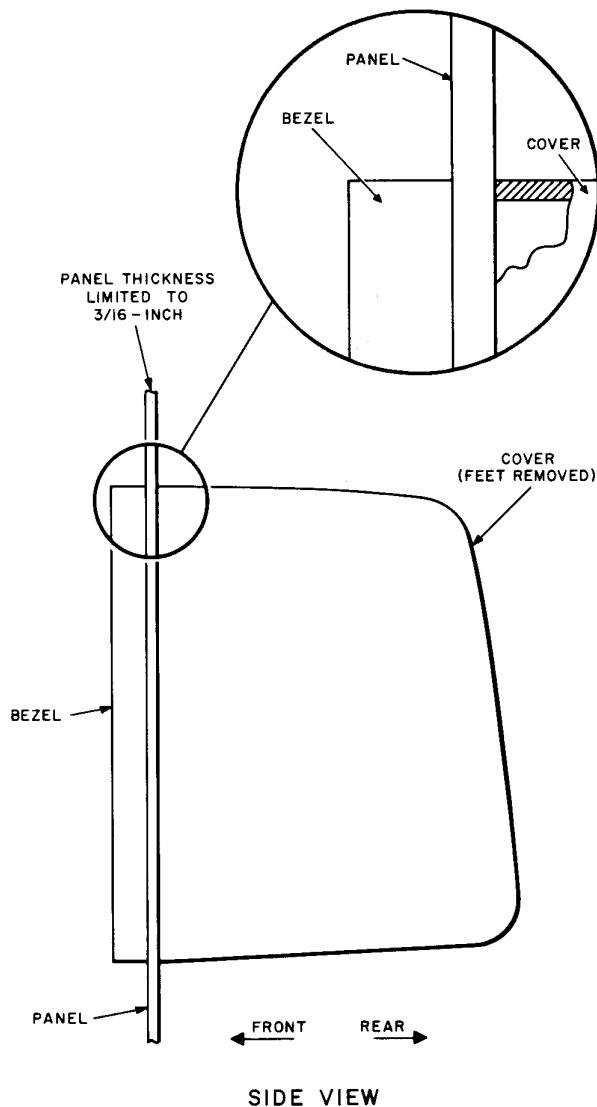


Fig. 6—106-Type Loudspeaker Set, Panel Mounted

3.07 Power connections are shown in Fig. 9. Loudspeakers are factory-wired to operate on 48 volts dc (X option). When 24-volt dc operation is desired, W option wiring must be installed. When station power supply is not available, a 33A power unit may be used to power the loudspeaker. This unit is a compact supply which operates on 117 volts ac and provides a combination of 12 and 30 volts dc (V option) to power the loudspeaker.

3.08 D station wire, or equivalent, may be used for input connections. Secure the incoming

wiring under the cable clamp located in the loudspeaker.

3.09 The 106A, B, and C (MD) are factory-equipped with a 2Y pilot lamp for use with 48 volts dc. For 24-volt dc operation, remove the 2Y pilot lamp and install an A1 lamp. For operation with a 33A power unit, remove the 2Y pilot lamp and install a 2T lamp.

3.10 The 106D, E, and F sets are equipped with an A1 lamp connected for 48-volt dc operation. Refer to Fig. 9 for connections and strapping for other voltages.

TESTS AND ADJUSTMENTS

3.11 Adjust the 106A (MD), 106D or 106E (with AOLC disabled) as follows.

- (1) Call terminating test line or test center to have line terminated.
- (2) Remove loudspeaker set cover.
- (3) Turn chassis gain control (R7 or R26) completely counterclockwise (minimum gain).
- (4) Turn front volume control (R6 or R25) completely clockwise (maximum gain).
- (5) Turn chassis gain control (R7 or R26) clockwise to a point just before crosstalk or noise is heard.
- (6) Have test center apply signal to line, or dial 1000 Hz test tone.
- (7) Adjust front volume control (R6 or R25) to loudness desired.
- (8) If a customer requests a maximum volume level which is lower than previous adjustments:
 - (a) Turn front volume control (R6 or R25) to maximum gain setting.
 - (b) Adjust chassis gain control (R7 or R26) counterclockwise to maximum volume level desired by customer.

Front volume control (R6 or R25) may now be used to control loudness up to maximum setting.

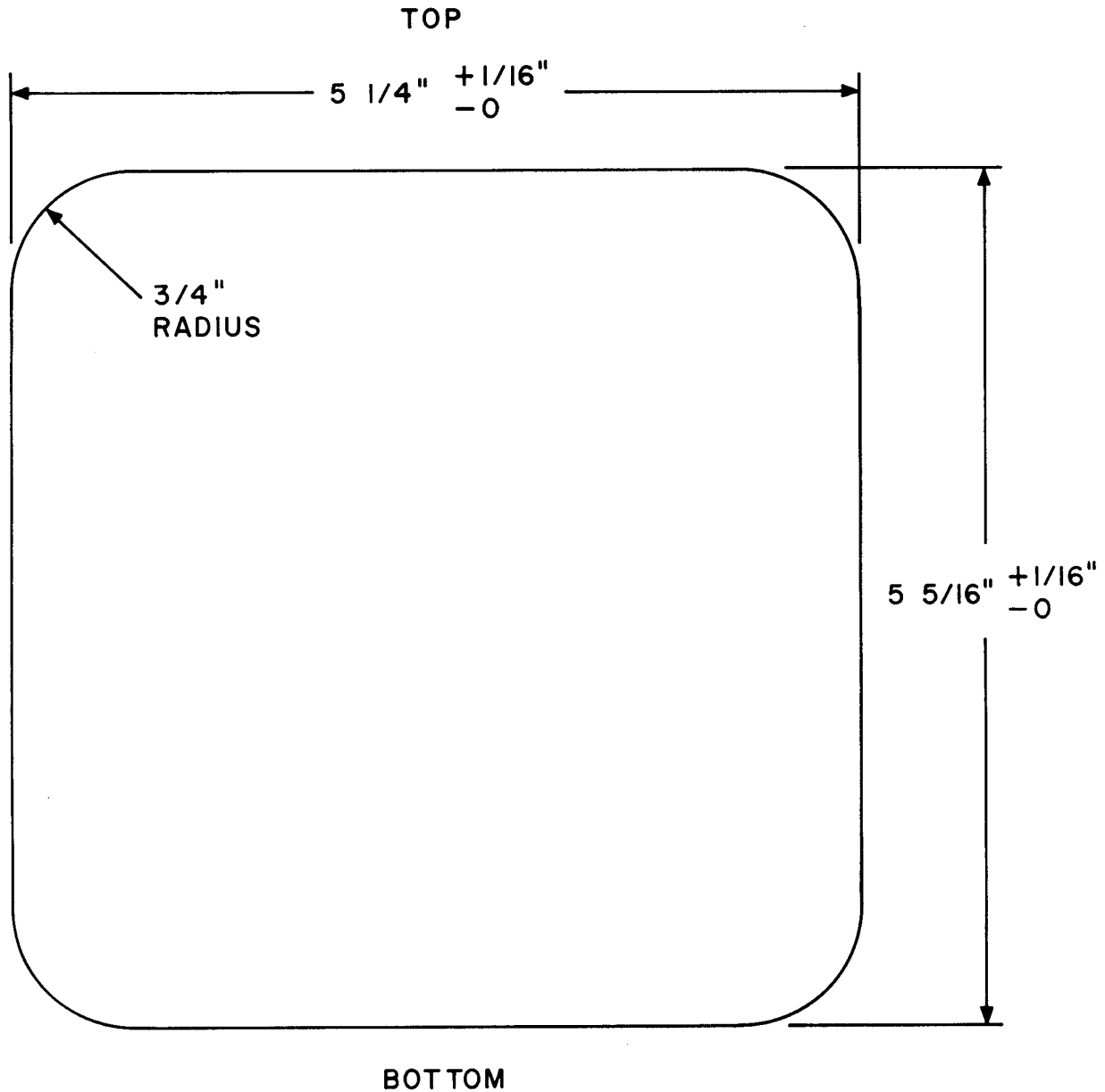


Fig. 7—Panel Cutout Template

- (9) Terminate test call.
- (10) Make a test call on line to test loudspeaker set for voice transmission; repeat Step 8 if necessary.
- (11) Replace cover.
- 3.12 Adjust the 106B (MD) or 106E (with AOLC) sets as follows.
 - (1) Call terminating test line or test center and have line terminated.
 - (2) Remove loudspeaker set cover.

◆ TABLE A ◆

FEATURE AND OPTION SUMMARY

FEATURE	LOUDSPEAKER 106-TYPE	OPTIONS*	REFERENCE PARA.	REMARKS
AOLC	B, E		5.02(a)	Factory wired, Fig. 10, 13, Ⓚ wiring
AOLC	C, F		5.02(a)	Factory wired, Fig. 11, 14
No AOLC	A, D		5.02(a)	Factory wired, Fig. 10, 13 Ⓛ wiring
No AOLC	E		5.02(a)	Fig. 13, Ⓛ wiring
48-Volt Supply	A, B, C, D, E, F	X, C	3.07, 5.01	Fig. 9 Option C factory wired.
24-Volt Supply	A, B, C, D, E, F	W, C		
12-Volt and 30-Volt Supply	A, B, C, D, E, F	V		
Internal Speaker Connected	A, B, C, D, E, F	F	5.02(c)	Factory wired, Fig. 10, 11, 13, 14
External Speaker Connected and Internal Speaker Disabled	A, B, C, D, E, F	R	5.02(c)	Fig. 8. Remove option F.
Front Panel On-Off Switch (S1) Connected	A, B, C, D, E, F	T	5.02(h)	Factory wired, Fig. 10, 11, 13, 14
Front Panel On-Off Switch (S1) Disabled	A, B, C, D, E, F	S	5.02(h)	Fig. 10, 11, 13, 14
Front Volume Control Normal Operation	A, B, D, E	J, K		Factory wired, Fig. 8.
Front Volume Control Audio Cut-off at Minimum Setting	A, B, D, E	N	5.02(d)	Fig. 10, 13 Remove option K.
Front Volume Control Disabled	A, B, D, E	M	5.02(e)	
Front Volume Control Minimum Audio Level	F	P	5.02(b)	Fig. 14. Enabled by cutting strap between terminals 23 and 24.
Remote Volume Control	A, B, D, E	H	5.02(f)	Fig. 8. Remove options J and K.
Remote Volume Control Cut-off	A, B, D, E	G	5.02(g)	

* These options are described in the paragraph referenced, but appear only on the official SD-95279-01 and SD-95279-02.

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- (3) Turn chassis gain control (R7 or R26) completely counterclockwise (minimum gain).
- (4) Turn front volume control (R6 or R25) completely clockwise (maximum gain).
- (5) Turn output level control (R14 or R27) completely clockwise (maximum output level).
- (6) Turn chassis gain control (R7 or R26) clockwise to a point just before crosstalk or noise is heard.
- (7) Turn front volume control (R6 or R25) completely counterclockwise for minimum gain.
- (8) Have test center apply signal to line, or dial 1000 Hz test tone.
- (9) Turn front volume control (R6 or R25) clockwise until there is no noticeable increase in volume.

Note: If output level becomes too high during this adjustment, it should be reduced by turning output level control (R14 or R27) counterclockwise.

- (10) Adjust output level control (R14 or R27) to loudness desired.
- (11) Terminate test call.
- (12) Make a test call on line to test loudspeaker set for voice transmission; repeat Step 9 if necessary.
- (13) Replace cover.
- (14) Front volume control (R6 or R25) may be used to raise weak input signals to preset output level.

3.13 Adjust the 106C (MD) or 106F set as follows.

- (1) Call terminating test line or test center and have line terminated.
- (2) Remove loudspeaker set cover.
- (3) Turn chassis gain control (R7 or R26) completely counterclockwise (minimum gain).

- (4) Turn front volume control (R17 or R29) completely clockwise (maximum volume).
- (5) Turn chassis gain control (R7 or R26) clockwise to a point just before crosstalk or noise is heard.
- (6) Turn front volume control (R17 or R29) completely counterclockwise (minimum volume).
- (7) Have test center apply signal to line, or dial 1000 Hz test tone.
- (8) Adjust front volume control (R17 or R29) to loudness desired.
- (9) Terminate test call.
- (10) Make a test call on line to test loudspeaker set for voice transmission; readjust chassis gain control (R7 or R26) if required.
- (11) Replace cover.
- (12) Front volume control (R17 or R29) may be used to control output level as desired.

3.14 Adjust the 106C (MD) or 106F set used with the 301 and 301A Switching Systems as described in CD-/SD-69440-01 and CD-/SD-1D161-01, respectively.

4. MAINTENANCE

4.01 Circuit schematics are provided in Fig. 10, 11, 12, 13, 14.

4.02 The loudspeaker set should be free of dirt and scratches. The exterior of the set may be cleaned with a soft, damp cloth. Avoid excessive moisture when cleaning grill as this may damage the loudspeaker cone.

4.03 Inspect volume control for smooth, free movement over entire range of operation. If found defective, replace set.

4.04 If pilot lamp does not light, check that base of lamp is properly positioned in the socket, and voltage is present. If properly positioned and lamp still does not light, replace lamp. Replace lamp from front by removing jewel and using 553A lamp extractor.

Note: If pilot lamp is not lighted, optimum operation of set may be affected (106D and E only). See 3.09 and 3.10 for lamp selection.

4.05 If loudspeaker set does not operate, proceed as follows.

- (1) Check at terminal strip that:
 - Strap is across terminals 18 and 19, unless external load or speaker is used
 - Input signal is present
 - Power supply voltage and polarity correct.
- (2) On 106D, E and F sets, if Step 1 checks OK, replace complete loudspeaker set.
- (3) On 106A, B or C (MD) sets, if Step 1 checks OK, replace KS-16728, List 1 amplifier as follows:

Caution: *Do not remove or insert amplifier with power on.*

- Remove two screws and amplifier retaining bracket.
 - Pull amplifier out of pin-jack socket.
 - Insert new amplifier.
 - Replace amplifier retaining bracket and screws.
- (4) If Steps 1 and 2 do not clear trouble, replace complete loudspeaker set.

5. CONNECTIONS



Straps across terminals 6 and 7 (option J) and 8 and 9 (option K) are furnished on 106A, B (MD) and 106D, E sets, but not on 106C (MD) and 106F sets. Straps across 16 and 17 (option C) and 18 and 19 (option F) are furnished on all 106-type sets. Verify and tighten these straps. Do not remove them unless specified below.

Power Supply Options

5.01 Connect power supply options as shown in Fig. 9. When using 24 or 48V dc (option W or X), verify that there is a strap between terminals 10 and 15. Determine the ground polarity of the power supply and connect terminal 10 for negative ground or ungrounded supply, or terminal 13 (option W) or 12 (option X) for a positive ground supply, to the amplifier chassis ground screw (Fig. 2, 3, 4, and 5). When a combination of 12 and 30 volts dc (option V) is used, be sure to remove the strap between terminals 16 and 17 and add strap between 12 and 13.



Polarity of the ground lead must be carefully observed. If the polarity of the grounded lead from the power supply is uncertain, it should be determined by voltmeter measurement.

Feature Options

5.02 The following feature options are available in the 106-type loudspeaker sets.

- (a) **Automatic Output Level Control—106B and C (MD), E and F:** Loudspeaker sets are supplied with factory-wired AOLC (Y wiring in 106B and E) circuit. The 106A and 106D sets (Z wiring) do not have AOLC.

To disable AOLC on the 106E: (1) Cut wire between terminal E3 and potentiometer R27. (2) Cut strap between terminals 21 and 22. (3) Connect Z wiring strap between terminals 18 and 25. On early production sets where terminal 25 is not provided, rotate potentiometer R27 maximum clockwise. See Fig. 13.

- (b) **Minimum Audibility Level (Option P) 106F Only:** When enabled, prevents total audio cutoff. To enable, cut the strap between terminals 23 and 24 (Fig. 14).

- (c) **External Speaker (Option R, Internal Speaker Disabled)—All 106-Type Sets:** All sets are factory-wired with the internal speaker connected for operation (option F). If an external speaker is to be used, the internal speaker must be disabled. Remove strap between terminals 18 and 19. Connect external speaker to terminals 18 and 20 (Fig. 8).

- (d) **Front Volume Control Arranged to Cut Off All Audio at Minimum Setting (Option N)—106A and B (MD) D and E:** Enable cutoff option by strapping terminals 5 and 10 together (Fig. 10 and 13).
- (e) **Front Volume Control Disabled (Option M, On-Off Switch Normal)—106A and B (MD) D and E:** To disable volume control, remove strap between terminals 8 and 9. Strap together terminals 7 and 8 (Fig. 10 and 13).
- (f) **Remote Volume Control (Option H, Front Volume Control Disabled)—106A and B (MD) D and E:** To use a remote volume control, remove straps from between terminals 6 and 7, and 8 and 9. Connect the lead from the movable contact of the remote volume control to terminal 8. Connect the other two leads to terminals 5 and 6 for desired direction of rotation (Fig. 8).
- (g) **Remote Volume Control Arranged to Cut Off All Audio at Minimum Setting (Option G)—106A and B (MD), D and E:** To use remote cutoff, remove straps from between terminals 6 and 7, and 8 and 9. Connect lead from movable contact of remote volume control to terminal 8. Connect the other two leads to terminals 6 and 10 for desired direction of rotation (Fig. 8).

- (h) **On-Off Switch Disabled (Option S)—All 106-Type Sets:** All sets are factory-wired with the on-off switch connected for operation (option T). To remove switch from circuit, disconnect negative or common lead from terminal 14 and connect to terminal 10 (option S), (Fig. 10, 11, 13, and 14).

Line Connections

- 5.03** The loudspeaker may be connected directly across the line at the connecting block serving the telephone set with which the loudspeaker is used.
- 5.04** If the loudspeaker is to be left on at all times and line noise is objectionable, the loudspeaker input leads can be connected to the inside of the telephone set. Connections are to the receiver circuit which is under control of the line switch and off-normal dial contacts (see Table B).
- 5.05** See Section 512-316-400 for connections to 5A and 5B key equipment. See CD-SD-69440-01 for No. 301 Switching System connections. For detailed information on wiring options and features, refer to SD-95279-01 and SD-95279-01.

**TABLE B
TELEPHONE SET CONNECTIONS**

TELEPHONE SET	FROM TEL. SET TERM.	TO LOUDSPEAKER SET INPUT TERMINAL
200 Series	W of Dial	1
	R of Line Switch	4
332, 334	BB of Dial	1
	R of Ind. Coil	4
302, 304, 305, 306, 354, 356, 401, 402, 410, 411, 412, and all 440 and 460 Types	W of Dial	1
	R of Ind. Coil	4
500, 2500, 600, 2600, 700, 800, 2700, and 2800 Series	R of Network	1
	GN of Network	4

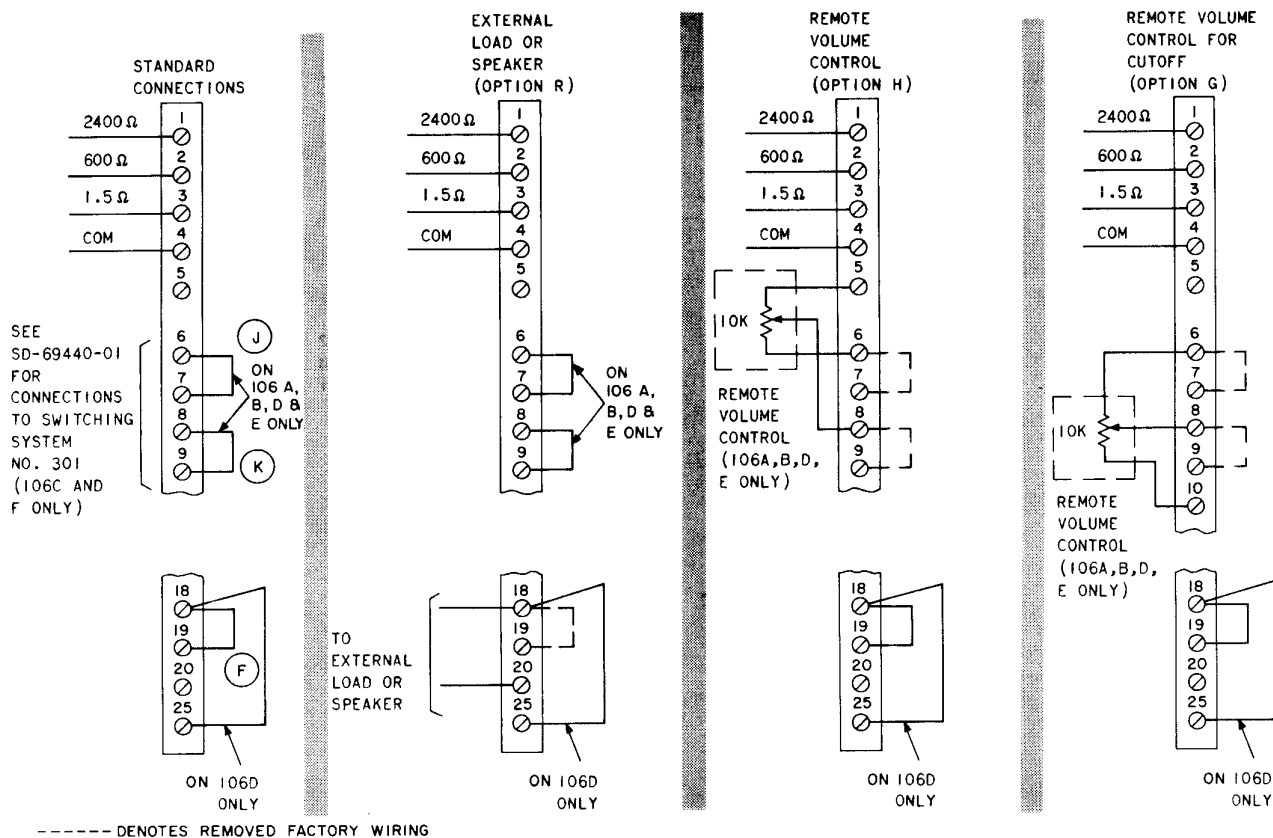


Fig. 8—Connections for 106-Type Loudspeaker Set—Feature Options

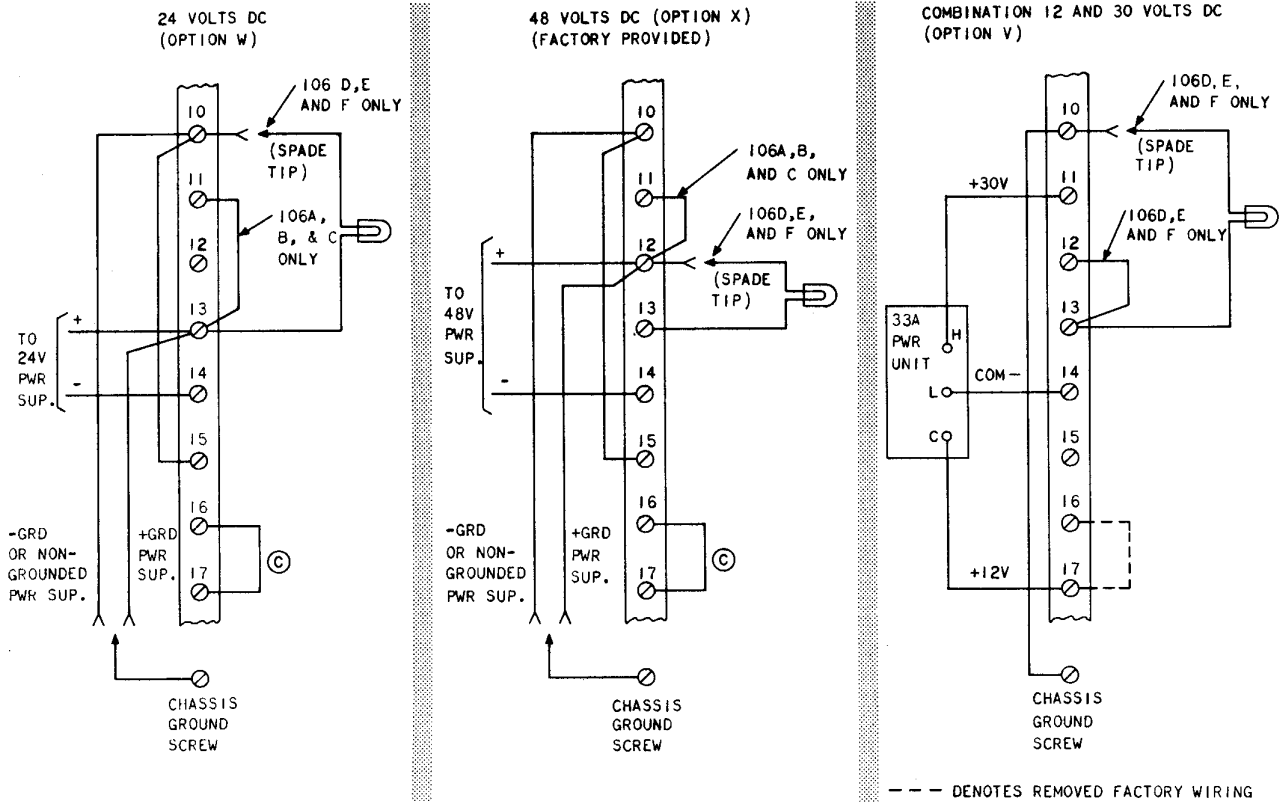


Fig. 9—Connections for 106-Type Loudspeaker Set—Power Supply Options

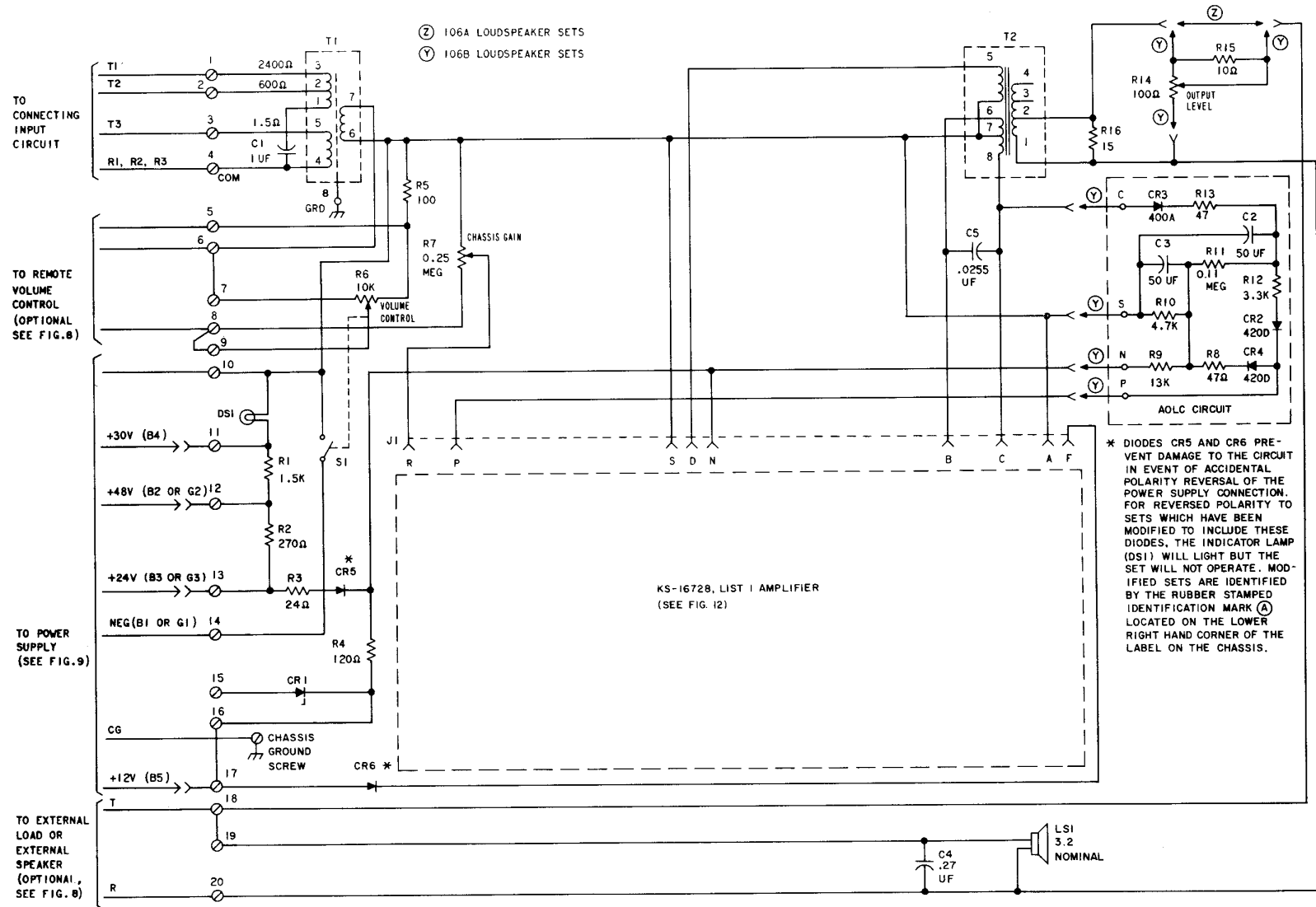


Fig. 10—Schematic—106A (MD) and B (MD) Loudspeaker Sets

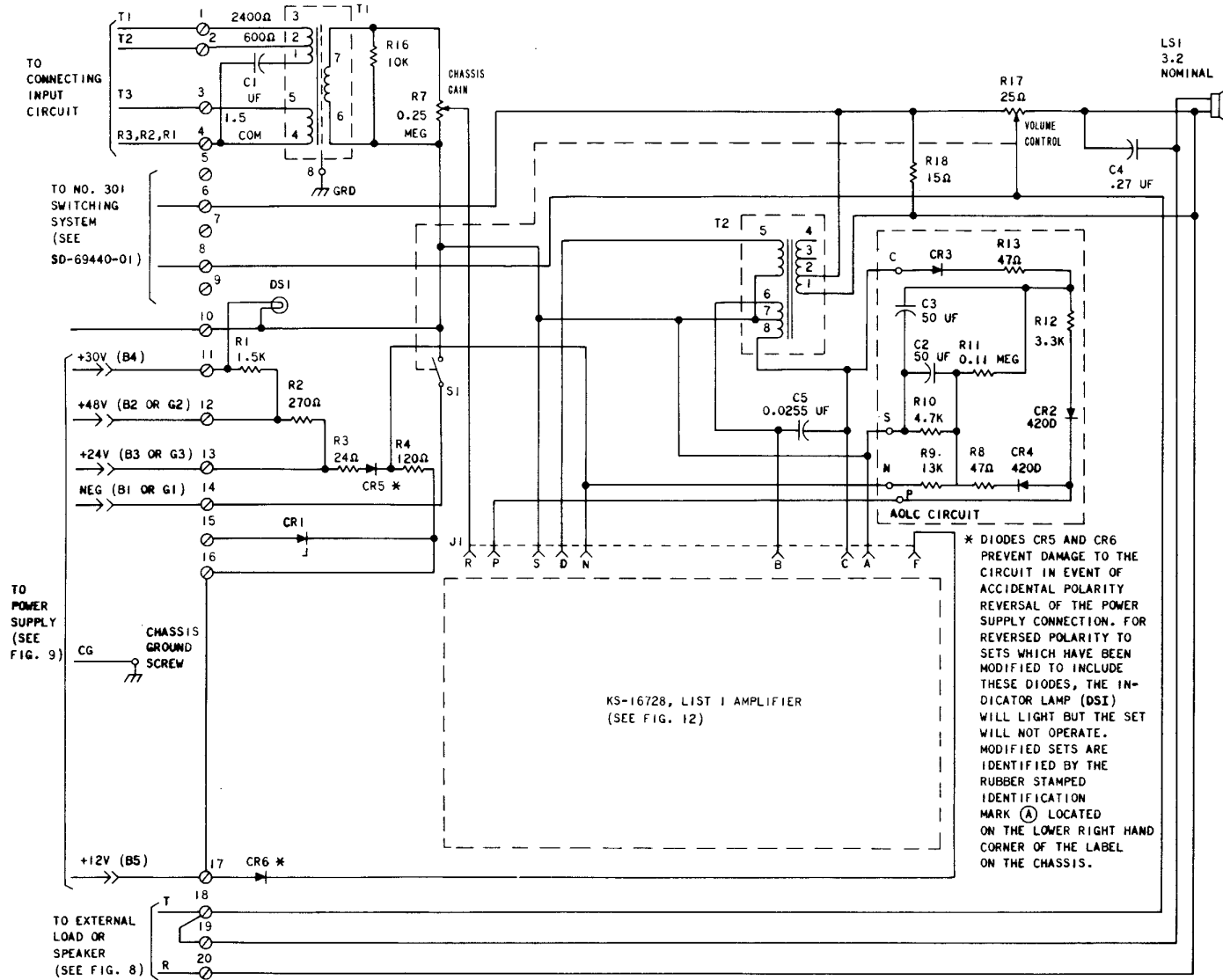
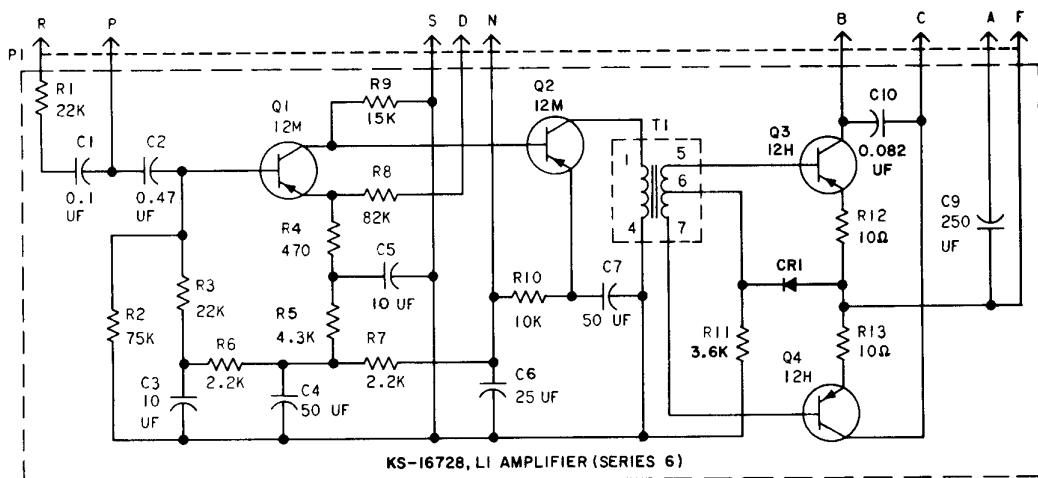
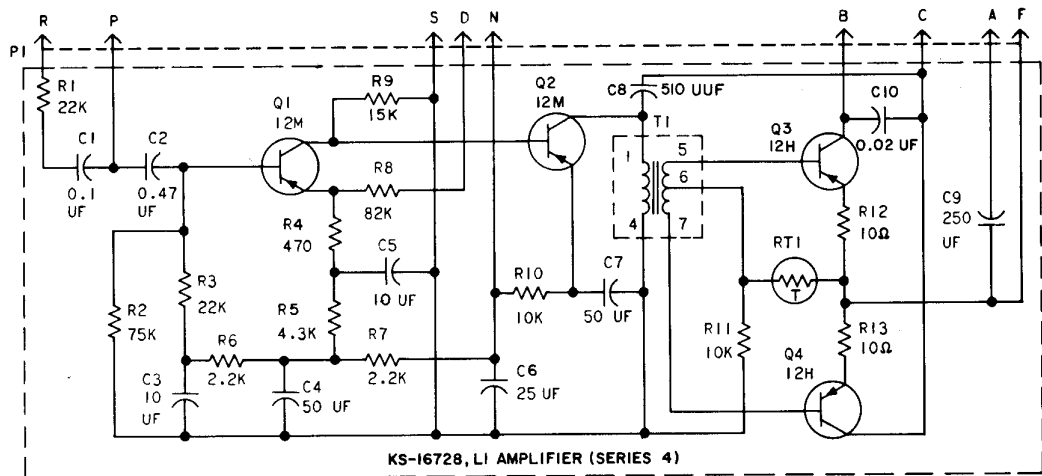


Fig. 11—Schematic—106C (MD) Loudspeaker Set

THE KS-16728, LIST 1 AMPLIFIER WAS MANUFACTURED IN SERIES 1 THROUGH 6. SCHEMATICS OF SERIES 4 AND 6, WHICH ARE FOUND IN MOST 106A, B, AND C LOUDSPEAKER SETS, ARE SHOWN BELOW.



NOTE:

- WHEN REPLACING A SERIES 4 AMPLIFIER WITH EITHER A SERIES 5 OR A SERIES 6, MAKE THE FOLLOWING CHANGES TO THE LOUDSPEAKER SET CIRCUIT (SEE FIG. 10 AND 11):
1. REMOVE CAPACITORS C4 AND C5.
 2. REMOVE RESISTOR R16 (106A OR B) OR R18 (106C).
 3. CHANGE RESISTOR R10 FROM 4700 OHMS TO 6200 OHMS.

Fig. 12—Schematics—KS-16728 List 1 Plug-In Amplifier, Series 4 and 6

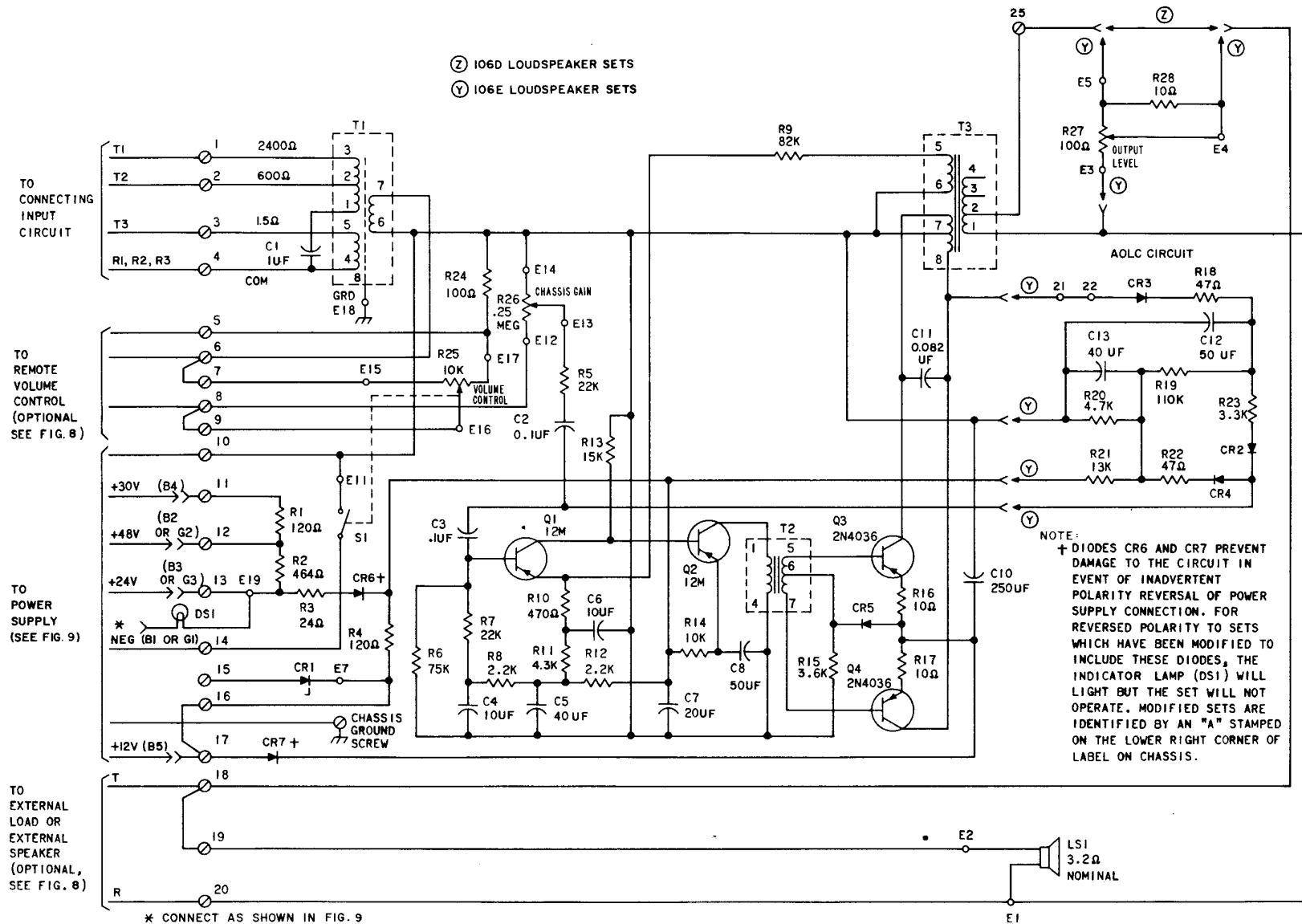


Fig. 13—Schematic—106D and E Loudspeaker Sets

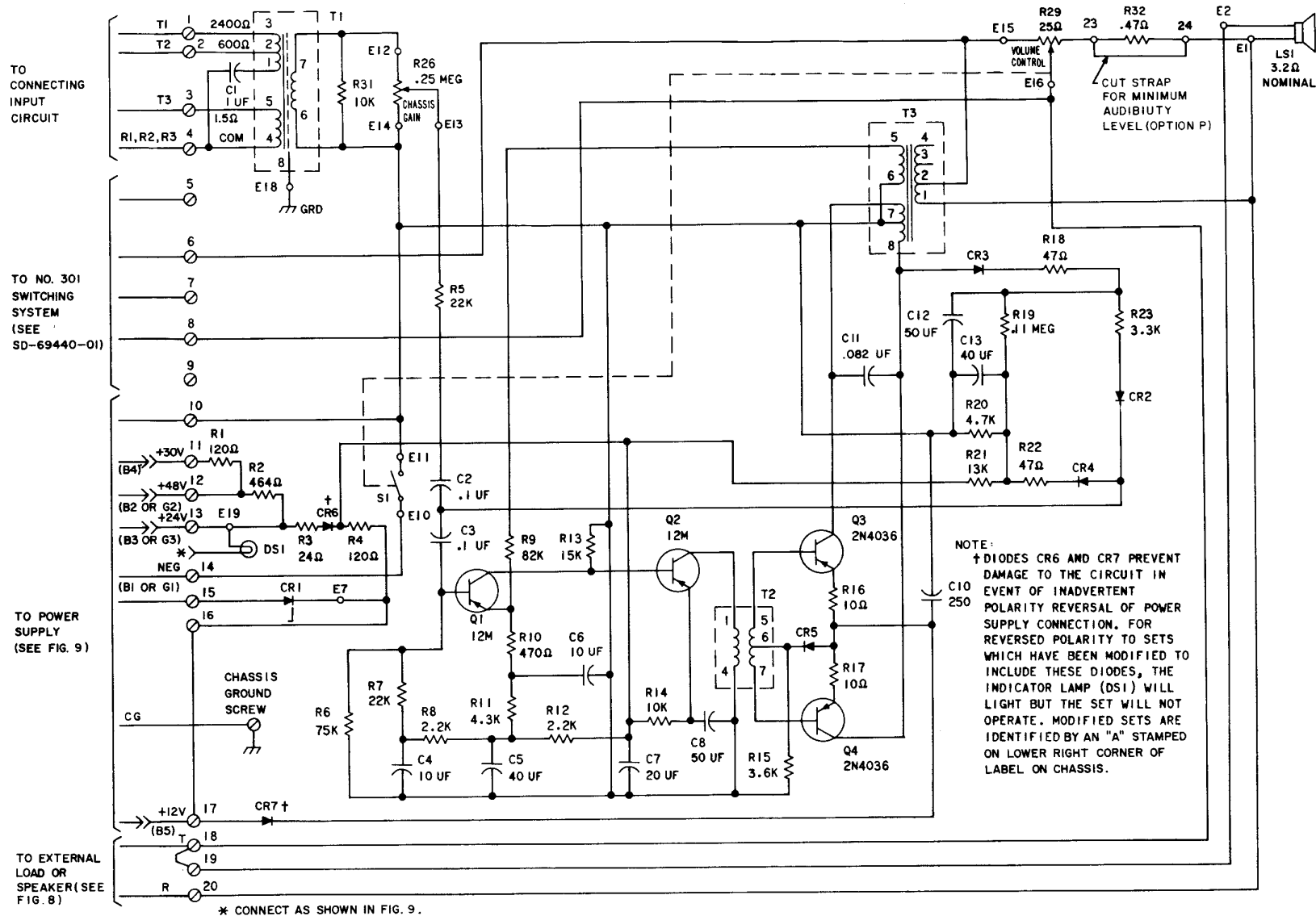


Fig. 14—Schematic—106F Loudspeaker Set