

section 2

installation

2.1 Unpacking.

All the equipment supplied with the 212Z-1 unit is shipped in one carton. Remove all packing material and carefully lift the unit out of the carton. Open the carrying case and remove the lid. Set the lid aside, then turn the unit over on its front panel upon a piece of soft, nonscratch material. Remove the bottom of the case and the bottom plate from the inverted unit by removing the four screws that are visible from the bottom. Inspect the unit for loose screws or bolts. Be certain all controls, such as switches, dials, etc., work properly. All claims for damages should be filed promptly with the transportation company. If a claim for damages is to be filed, the original packing case and material must be preserved.

2.2 Preparing the Amplifier for Operation.

It is suggested that the procedure described below be followed in detail when the amplifier is put into operation for the first time:

- a. Remove the case lid and set it aside.
- b. Turn the unit over on a piece of soft, nonscratch material and remove the bottom part of the case and the bottom plate by removing the four screws that are visible.
- c. Install the batteries. To install the B batteries, lift the battery hold-downs to one side, determine the correct polarity (printed on the hold-down), remove the battery connector nuts, insert the battery, place the hold-down in place so that the battery terminals penetrate the connector straps, engage the hold-down wing bolts and tighten, then screw the battery connector nuts upon the battery terminals tightly. To

install the meter-light battery, pull the hold-down to one side, look at the battery plug to determine which is the best way to insert the battery (plug is polarized by having one pin larger), insert the battery, place the hold-down over the battery, engage the wing bolts and tighten, then plug the battery connector plug into the battery. Refer to figure 7-1.

- d. Replace the bottom cover and bottom of case.
- e. Remove the power cord from the inside of the carrying case and plug it into the receptacle at the rear of the unit but do not connect it to the power line.
- f. Insert microphones into J101 (microphone input no. 1) and J102 (microphone input no. 2). (Check the connections of the microphone plugs before insertion to be sure that they agree with the schematic, figure 7-5.)
- g. Plug a headset into PROGRAM MONITOR jack, J105. (See figure 2-1.)
- h. Turn all the faders and MASTER gain to off.
- i. Turn the POWER switch to ON.
- j. Turn the VU METER switch to BAT. Meter should read in the vicinity of 0, preferably in the red portion of the scale.
- k. Turn METER LIGHT switch S106 to ON. Rotate METER DIM control R144 over its range and observe change of light intensity.
- l. Plug power cord into source of 115 V 50/60 cps current. The unit should automatically switch to a-c operation as indicated by glowing of the A-C OPERATION pilot light. To check this, press INTERLOCK switch S105, and see if the unit remains operative. If the unit does not operate with the interlock switch pressed, check for open circuit between secondary of T103 and K101.
- m. Set TONE switch to OFF, OUTPUT switch to 0, and VU METER to HIGH.

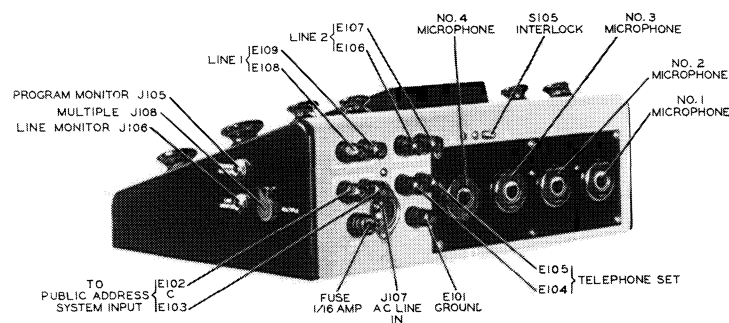


Figure 2-1. 212Z-1 Remote Amplifier, Connections

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- n. Advance fader no. 1 to half scale.
- o. Talk into microphone no. 1 and advance MASTER gain control while listening into headset. (Adjust HEADSET LEVEL control.)
- p. Return fader no. 1 to 0 and advance fader no. 2. Talk into microphone no. 2 while listening into headset.
- q. Return fader no. 2 to 0; plug microphones into channels no. 3 and no. 4.
- r. Repeat steps n through p with microphones and faders no. 3 and no. 4.
- s. Return faders and MASTER gain to 0, place TONE switch in ON position, place OUTPUT switch in the LINE 1 position, and plug the headset into the LINE MONITOR jack.
- t. Advance the MASTER gain control and listen for 400-cps tone in headset.
- u. Reduce MASTER gain and change VU METER switch to NORMAL position. Advance MASTER gain until 0 shows on the meter.
- v. Change OUTPUT switch to LINE 2 position.
- w. Remove headset cord tips from plug and attach them to LINE 2 binding posts. Tone should be heard.
- x. Change OUTPUT switch to LINE 1 and attach headset cord tips to LINE 1 posts. Tone should be heard.
- y. Attach headset cord tips to PA posts (E102 and E103). Adjust R155.
- z. Jumper LINE 1 terminals to LINE 2 terminals and connect headset cord tips to TEL posts. Switch OUTPUT to LINE 1. Tone should be heard. Change OUTPUT switch to LINE 2. Tone should be heard.
- aa. Remove a-c cord from receptacle. Amplifier should remain in operation on battery power.
- ab. If the amplifier appears normal, remove jumper wires from LINE 1 and LINE 2 posts and replace headset tips in phone plug.

NOTE

If any circuit involving a transistor appears dead, remove the back of the unit, gain access

to the transistors, and carefully remove and reinsert the transistor. Be sure the power is off when removing or inserting transistors. This procedure breaks down any thin film of oxidation that may have formed between the transistor pin and socket prong.

2.3 Permanent Installation.

The 212Z-1 can be used as an economical, permanently installed studio console. In this application, it is likely that the carrying case would be entirely removed. To do this, remove the lid, turn the unit face downward upon some nonscratch material, and remove the four screws that hold the bottom of the case and the bottom of the unit in place. Set the bottom of the case aside and using the screws just removed, fasten the bottom of the unit back in place. Rubber feet can be added, if necessary.

2.4 Multiple Input.

If four microphone channels are not enough, another 212Z-1 can be added by connecting the two 212Z-1 units together at the MULTIPLE jacks with a patch cord. In this type operation, the MASTER gain control of the unit connected to the audio lines should be used to control both units, and the MASTER gain of the other unit should be turned to OFF. This setup would give eight input channels and faders all controlled by the one MASTER gain control. Both units would have to be connected to the 115 V power source and energized.

2.5 Input Power Change.

When received, the 212Z-1 is connected for 115-volt, 50- to 60-cps operation. If 230-volt, 60-cps input power is used with the 212Z-1, connect the input power transformer as shown in figure 2-2B. Figure 2-2A shows the 212Z-1 connected for 115-volt, 50- to 60-cps operation.

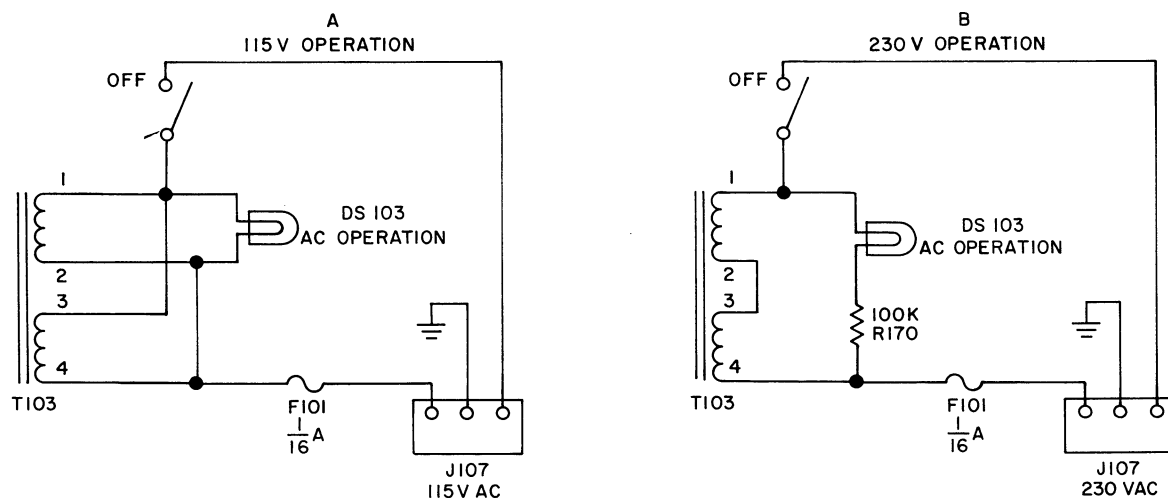


Figure 2-2. 115V/230V Input Power Change, Schematic Diagram

section 3

operation

3.1 Setting Up for Remote Operation.

3.1.1 CONNECTIONS. Refer to figure 2-1.

a. If two lines are available, connect the program line to LINE 1 terminals at the rear of the unit. Connect the talk-back line to LINE 2 terminals and the telephone headset to the TEL terminals.

b. Plug the microphones into the microphone receptacles at the rear of the unit.

c. Plug headset into PROGRAM MONITOR jack at the side of the unit.

d. If a public address system is to be used in conjunction with the 212Z-1, connect it to the PA terminals at the rear of the unit, after first setting the PA LEVEL control in the extreme CCW position. This is a 500-ohm connection. E102 is ground side.

e. Connect an external ground to the GRD terminal at the rear of the unit, if hum troubles are encountered.

f. If headphones are provided for a guest announcer or for program director, plug them into LINE MONITOR jack at the side of the unit.

g. Plug the power cord into the power receptacle at the rear of the unit and connect it to a 115 V 50/60 cps receptacle.

3.1.2 PREBROADCAST ADJUSTMENTS.

3.1.2.1 SETTING LINE LEVEL. (See figure 3-1.)

a. Turn all microphone fader and MASTER gain controls to OFF.

- b. Throw POWER switch to ON.
- c. Turn OUTPUT control to LINE 1.
- d. Turn VU METER control to NORMAL.
- e. Turn TONE switch to ON.
- f. Advance MASTER gain control until the meter indicates 0 on the scale.
- g. Communicate with the studio via the telephone handset to confirm line level. If only one line is being used, see paragraph 3.2.3 for alternate talk-back method.
- h. Turn TONE control to OFF.
- i. Talk into a microphone and advance its associated fader control while observing the VU METER. Advance the fader until the peaks of the voice tones produce approximately 0 indication on the meter scale.

NOTE

After the line level has been set once, the ideal range in which to operate the fader controls is between 20 and 32, and the ideal range in which to operate the MASTER gain control is around position 16. An attempt should be made to adjust the controls to reach these ranges, but any setting will do, so long as there is sufficient range for adjustment.

- j. Adjust HEADSET LEVEL control.
- k. Contact the studio via the telephone handset for confirmation of line level and quality of transmission.

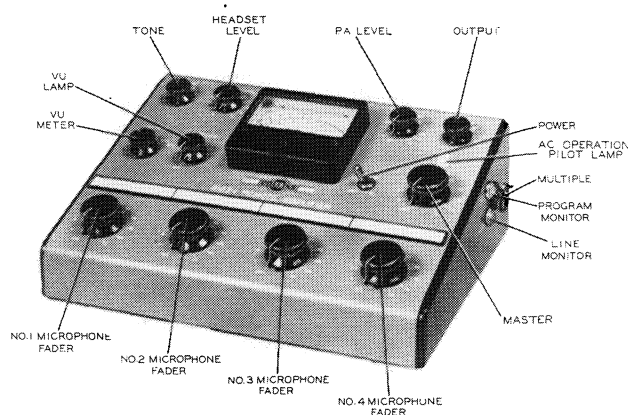


Figure 3-1. 212Z-1 Remote Amplifier, Controls

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If only one line is being used, see paragraph 3.2.3 for alternate talk-back method.

1. Repeat the above procedure for any other microphone and channels being used on the job.

- m. Return the microphone faders to OFF and await the program cue on the telephone handset.

3.2 Operating Procedures.

3.2.1 BROADCAST PROGRAM.

- a. Condition the equipment for broadcasting as indicated in paragraph 3.1.

- b. Operate the equipment in the usual fashion according to good station practices.

- c. If a public address system is being used, orient the microphones to prevent acoustical feedback and make the public address compatible with the broadcast pickup.

3.2.2 PUBLIC ADDRESS OPERATION.

- a. After the line level has been established, turn the OUTPUT control to 0. This cuts the program to the line but allows the audio to drive the PA input.

- b. Advance the PA LEVEL control until a workable signal is delivered to the public address system.

- c. Use the gain control of the public address system to control the gain of the system; however, in an emergency, the PA LEVEL control can be used.

- d. Return the OUTPUT switch to LINE.

3.2.3 TALK BACK WITH ONE-LINE OPERATION.

- a. If only one telephone line is being used, talk back to studio previous to broadcast can be accomplished with just the one line, by switching to LINE 2 position of the OUTPUT control and using the handset. If a handset is not available:

- b. Set MASTER gain at position 16.

- c. Plug headset into LINE MONITOR jack.

- d. Set the OUTPUT control to LINE 1.

- e. Advance the fader control associated with microphone being used, and talk to the studio.

- f. The answer from the studio can be received with the OUTPUT control as is (in LINE 1 position), or it can be set to 0 for the answer.

3.2.4 EMERGENCY SWITCH TO LINE 2.

Should LINE 1 go dead or develop trouble of any nature, the program can be immediately switched to LINE 2 (providing this line is suitable).

Turn the OUTPUT control to LINE 2 position. This will connect the program to LINE 2 and at the same time, will connect the telephone handset to LINE 1 and the LINE MONITOR jack. All program monitoring will have to be done at the PROGRAM MONITOR jack. Talk back can be had by switching the OUTPUT control to 0. This, of course, is going out on the program line and provision must be made first at the studio to prevent it from being aired.

3.2.5 EMERGENCY SWITCH TO BATTERY OPERATION.

Should the a-c power source fail for any reason,

such as power failure, blown fuse, or power plug accidentally removed, the amplifier will be automatically switched to battery operation utilizing self-contained batteries, and the A-C OPERATION pilot lamp will go out. Should this occur, it is wise to determine the fault and correct it as soon as possible to conserve battery power; however, a fresh set of batteries should last through a period of 75 hours. A spare fuse should always be carried in the clip provided on the lid of the carrying case. See paragraph 5.5 of section 5 of this book for fuse replacement instructions.

To check whether the unit has returned to a-c operation, check to see that the A-C OPERATION pilot lamp is glowing, then press the INTERLOCK switch at the rear of the unit and if the operation has not switched back to a-c operation, there will be an interruption in the program audio.

3.3 Description of Operating Controls.

3.3.1 FADERS.

The faders (four in number) control the output of the individual microphones. These should be set to give good range of adjustment; somewhere in the range of 20 to 32 on the panel scale is ideal. Set all faders not in use at OFF.

3.3.2 MASTER GAIN CONTROL.

The MASTER gain control controls the over-all program level. Set to give a good range of adjustment; somewhere near position 16 on the panel scale is ideal.

3.3.3 TONE.

In the ON position, the TONE control turns on the tone oscillator and connects it for use in setting up line level previous to broadcast.

3.3.4 HEADSET LEVEL.

The HEADSET LEVEL control adjusts the level of audio delivered to the PROGRAM MONITOR jack.

3.3.5 PA LEVEL.

This control adjusts the audio output to the public address system (if used).

3.3.6 OUTPUT SWITCH.

(Refer to figure 4-1.) The OUTPUT selector switch in LINE 1 position connects the audio to LINE 1 and connects the TEL (telephone) circuit to LINE 2. In the LINE 2 position, the OUTPUT selector switch connects the audio to LINE 2 and connects the TEL (telephone) circuit to LINE 1. In the 0 position, a load resistor is connected across the program audio and the audio is disconnected from both lines, but the telephone circuit is connected to LINE 2.

3.3.7 VU METER CONTROL AND METER.

The VU METER is a standard vu meter with a type A scale. In the NORMAL position of the selector switch, the output of the amplifier is connected through the pad to the OUTPUT switch and 0 on the meter indicates a line level of +1 VU. In the HIGH position, the output of the amplifier is connected directly to the OUTPUT switch. Zero on the meter indicates a line level of +6 VU. In the BAT position of the VU METER switch, the meter is used to indicate B voltage. Plus 1.0 to 0.5 on the meter indicates normal voltage.

3.3.8 VU LAMP. This control adjusts the degree of illumination afforded by the meter lamp.

3.3.9 POWER SWITCH. This toggle switch turns the power on in both battery operation and in a-c operation.

3.3.10 LINE MONITOR JACK. This jack is permanently connected to LINE 1. Whenever the OUTPUT control is set at LINE 1, this jack can be used to monitor the program as it appears on the line. This jack is also useful in energizing a second set of headsets for guest or program director.

3.3.11 PROGRAM MONITOR. This jack is intended for use in monitoring the program by the announcer or operator.

3.3.12 MULTIPLE JACK. This jack is used to patch two or more 212Z-1 amplifiers together so that more microphone inputs and faders can be utilized.

3.3.13 A-C OPERATION PILOT LAMP. This lamp is connected across the primary of the power transformer and indicates that the a-c power is reaching the transformer.

SECTION 4
Principles of Operation

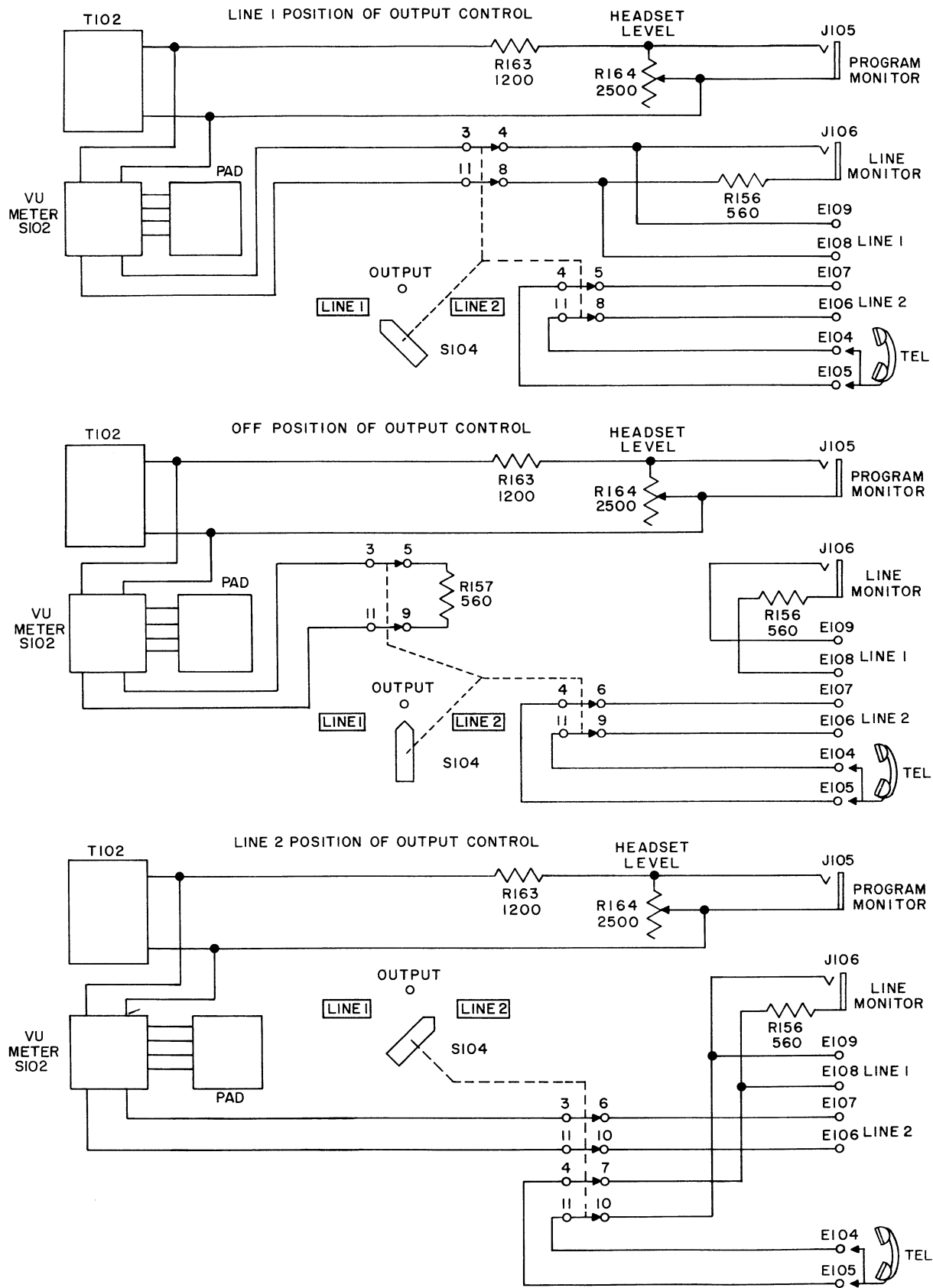


Figure 4-1. Output Circuits, Simplified Schematic

principles of operation

4.1 Mechanical Details.

The case of the 212Z-1 is constructed along horizontal lines rather than vertical lines. The control panel is the surface and slopes gently from the rear toward the front. Aluminum, or aluminum alloys, are used for panel, cabinet, and constructional parts. A parts layout is printed upon the inside of the bottom plate.

The controls are symmetrically arranged around the output meter. The mixing controls have a blank identification strip above them which can be filled in to suit the requirements. The strip is removed easily and inverted, allowing preset marking to be made on one side. The cover of the carrying case is hinged to the case bottom by means of a special hinge that allows the cover to be removed.

4.2 Electrical Details.

4.2.1 GENERAL. Semiunitized-type construction is employed in the 212Z-1 Remote Amplifier. Printed circuits are employed where advantageous. A signal entering the 212Z-1 receives amplification from five audio stages. The input stage consists of four completely separate input stages, each with its own transistor and fader. In addition, there is a tone oscillator, an a-c power supply, and a battery power supply. See the block diagram, figure 1-1. PNP-type transistors are used throughout the audio amplifier portion of this unit.

4.2.2 AUDIO AMPLIFIER. (See figure 7-5.) Each fader for the four input channels has its own transistor channel amplifier stage preceding it. No input transformers are employed, the low impedance input characteristic of the 2N422 transistors being suitable for coupling to microphones of 30- to 600-ohm impedance. The input coupling capacitors are of 50-uf value (as are all other interstage coupling capacitors). A-c negative feedback is obtained by tapping down on the emitter-region series resistance with the bypass capacitor (C102, in the case of Q101). The feedback occurs across the unbypassed portion (R103 for Q101). The output of the individual channel amplifier is coupled into its associated ladder-type fader. After passing through 1100-ohm build-out resistors, the outputs of the faders are combined and passed through TONE selector switch S101 and coupling capacitor C113 to the base connection of Q105, the input amplifier transistor.

A-c negative feedback similar to that used on the channel amplifiers is employed on Q105. The output of Q105 is coupled to interstage amplifier Q106, a 2N422 transistor, through capacitor C116.

In addition to feedback in the emitter series resistor, Q106 employs further feedback in the nature of a 33K resistor, R130, connected from the collector connection to the base connection. The output of Q106 is coupled to MASTER gain control AT105 through capacitor C118.

MASTER gain control AT105 is a ladder-type fader similar to those used for the channel faders. The input to AT105 is bridged by MULTIPLE jack J108.

MULTIPLE jack J108 is provided so that additional 212Z-1 Remote Amplifiers can be patched (through their MULTIPLE jacks) to the 212Z-1 to gain more input channels and faders. All of the additional input channels are then routed through the one MASTER gain control.

The output of the MASTER gain control is coupled to driver transistor Q107 through coupling capacitor C119. Q107 has a-c negative feedback applied to the emitter similar to that of Q105, except that different values of resistance are used to obtain a higher value of feedback.

The output of Q107 is coupled to the output amplifier by means of a transformer, T101. Transformer T101 has an impedance ratio of 40 to 1 primary to 1/2 secondary.

Two type 2N44 transistors are employed in the output amplifier in a push-pull arrangement. Each transistor employs negative feedback from its collector to its base through a 47K resistor. The output of this stage employs a transformer, T102.

One winding of output transformer T102 provides a 500-ohm impedance output for exciting an auxiliary public address system. R155, a potentiometer, provides a means of setting the maximum audio level obtainable from this winding. The other winding on T102 provides audio at 600-ohm impedance for the program lines and the program monitor jack. Program monitor jack J105 is connected to this winding through isolation resistor R163 and HEADSET LEVEL control R164. The program audio connects to VU METER switch S102. With the VU METER switch set to OFF, NORMAL, or BAT, the program audio is connected through a 3-db pad consisting of R158, R159, R160, R161, and R162 to OUTPUT selector switch S104. With the VU METER switch set at HIGH, the program audio is connected directly to OUTPUT selector switch S104.

OUTPUT selector switch S104 in LINE 1 position (refer to figure 4-1), connects the audio to LINE 1

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and connects the TEL (telephone) binding posts E104-E105 to LINE 2. In LINE 2 position, the OUTPUT selector switch connects the audio to LINE 2 and connects the TEL binding posts to LINE 1. In the 0 position of the OUTPUT switch, a load resistor, R157, is connected across the program audio and the audio is disconnected from both lines, but the TEL binding posts are connected to LINE 2. The LINE MONITOR jack, J106, is always bridged across the LINE 1 output binding posts.

4.2.3 VU METER. The VU meter is a rectifier-type Simpson 142 VU meter. This instrument conforms to the standards adopted by the major networks and reads directly in volume units (on steady tone numerically equal to db above a 1-mw reference level). In the NORMAL position of the selector switch, the output of the amplifier is connected through a pad to the OUTPUT switch, and 0 on the meter indicates a line level of +1 VU. In the HIGH position, the output of the amplifier is connected directly to the OUTPUT switch. Zero on the meter indicates a line level of +6 VU. In the BAT position of the VU METER switch, the meter is used to indicate B voltage. Plus 1.0 to 0.5 on the meter indicates normal voltage.

4.2.4 TONE OSCILLATOR. Line levels are most easily set up by means of a steady audio tone, therefore the 212Z-1 includes a built-in tone oscillator as a standard feature. This tone oscillator employs a type 2N422 transistor, Q110, in a 400-cps audio circuit. When the TONE switch is placed in the ON position, the channel faders and amplifiers are disconnected from input transistor Q105 and the output

of the tone oscillator is connected in their place. At the same time, B voltage is applied to tone oscillator Q110 and oscillation results.

4.2.5 POWER SUPPLY. The 212Z-1 includes two power supplies, an a-c power supply and a battery power supply. The a-c power supply consists of power transformer T103, diode rectifiers CR101 and CR102 (both are type 1N63), and a filter. The filter is a combination RC and LC filter with very high values of C. The positive side of the power supply is grounded and the negative side is high. The a-c-to-battery changeover relay coil is connected across the a-c power supply output so that whenever the coil is excited, the relay connects the a-c power supply output to the amplifier. Whenever the coil is not excited either through a-c line failure, blown fuse, power supply failure, or through lack of a-c line facilities, the relay will connect the battery power supply to the amplifier. CR103, a 1N48 diode, is used as a blocking diode to accelerate automatic changeover on a-c power failure by preventing the discharge of the large filter capacitors through K101. The relay also switches the meter lights from a transformer winding to a dry battery whenever the a-c source fails. The meter lights are adjustable by rheostat R144 and may be turned off by S105. They are interlocked by POWER switch S103, but not by the case interlock, S105. The meter light battery is a 4.5-volt, C type battery.

Two 22-1/2-volt B batteries are connected in parallel to supply the battery source of B power. They are connected only under the following condition: no a-c line excitation, carrying case open, and POWER switch on.