TM 11-4035

DEPARTMENT TECHNICAL MANUAL

INTERPHONE AMPLIFIERS BC-605-A, -C, -D -AM, -CM, AND -DM

REPAIR INSTRUCTIONS

R DEPARTMENT • SEPTEMBER 1945

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Washington 25, D. C., 9 September 1945

TM 11-4035, Interphone Amplifiers BC-605-A, -C, -D, -AM, -CM and -DM, Repair Instructions, is published for the information and guidance of all concerned.

[AG 300.7 (30 Jul 45)]

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Refer to FM 21-6 for explanation of distribution formula.

CONTENTS

WARNING

HIGH VOLTAGE

is used in the operation of
this equipment

DEATH ON CONTACT

may result if safety precautions
are not observed

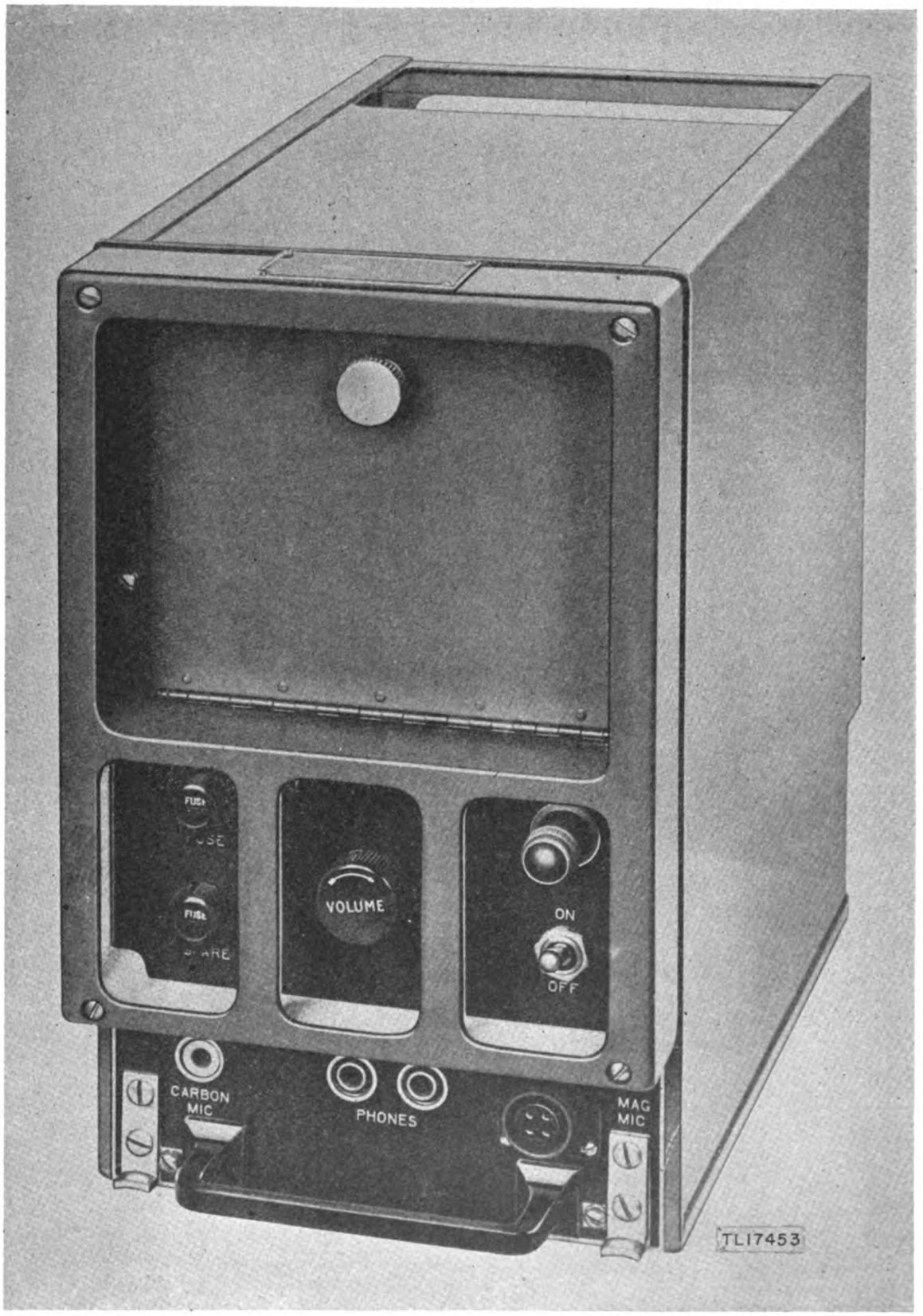


Figure 1. Interphone Amplifier BC-605-(*), front view.

SECTION I

DESCRIPTION OF INTERPHONE AMPLIFIERS BC-605-A, -C, -D, -AM, -CM, AND -DM*

1. Brief Description of Interphone Amplifier BC-605-(*)

a. PURPOSE. Interphone Amplifier BC-605-(*) (figs. 1 and 1a) is a major unit of Radio Set SCR-538-(*). The interphone amplifier is an audio-frequency amplifier which provides interphone communication between occupants of a vehicle having no radio transmitter. Official nonenclature followed by (*) is used to indicate all models of the item of equipment included in this Technical Manual. Thus Interphone Amplifier BC-605-(*) represents Interphone Amplifiers BC-605-A, -C, -D, -AM, -CM, and -DM, which are treated together in this manual.

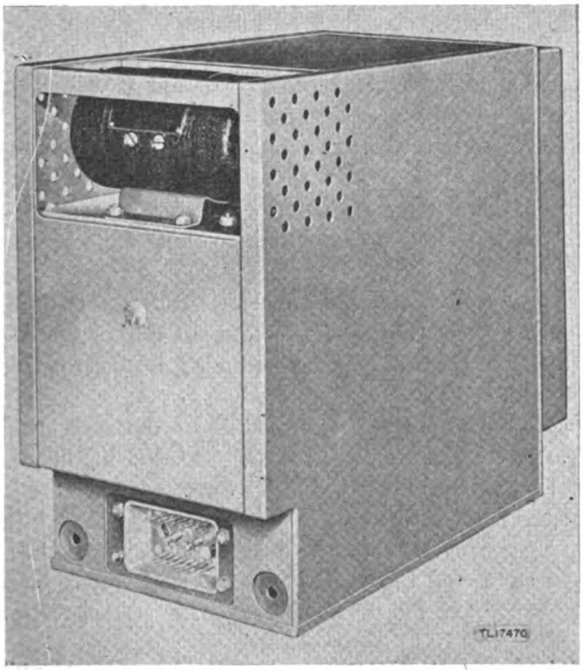


Figure 1a. Interphone Amplifier BC-605-(*), oblique rear view.

* See TM 11-600 for installation, operation, and other maintenance data on this equipment.

b. PERFORMANCE CHARACTERISTICS.

Frequency range.....200 to 5,000 cycles
Audio power output.....2 watts
Battery drain, 12-volt supply .....4 amperes
Battery drain, 24-volt supply .....3 amperes

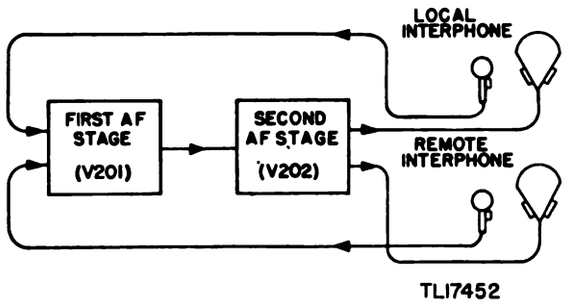


Figure 2. Interphone Amplifier BC-605-(*), block diagram.

2. Condensed Circuit Analysis (fig. 2)

The microphone introduces the audio-frequency (a-f) speech signal into the first a-f stage (V201) where it is amplified and then fed to the second a-f stage (V202) by resistor-capacitor coupling. The signal is then further amplified in the second a-f stage. The stage (V202) applies the fully amplified signal to the local and remote interphone output lines. A tube chart is shown below.

Circuit designation	JAN designation	VT No.	Function
V201	1619	VT-164	First a-f amplifier
V202	1619	VT-164	Second a-f amplifier

SECTION II

DIFFERENCES BETWEEN MODELS

3 Operational Differences

The major operational differences between the models Interphone Amplifiers BC-605-A, -C, -D, -AM, -CM, and -DM are as follows:

a. RELAY S201 (figs. 3 and 4). Some Interphone Amplifiers BC-605-A, -C, and -D have been modified so that, when used in Radio Set SCR-538-AM, -CM, and -DM, Radio Receivers BC-603-AM, -CM, and -DM are disabled by relay S201 during interphone operation. These modified amplifiers are designated BC-605-AM, -CM, and -DM. This prevents signals from the radio receiver from interfering with the interphone circuits.

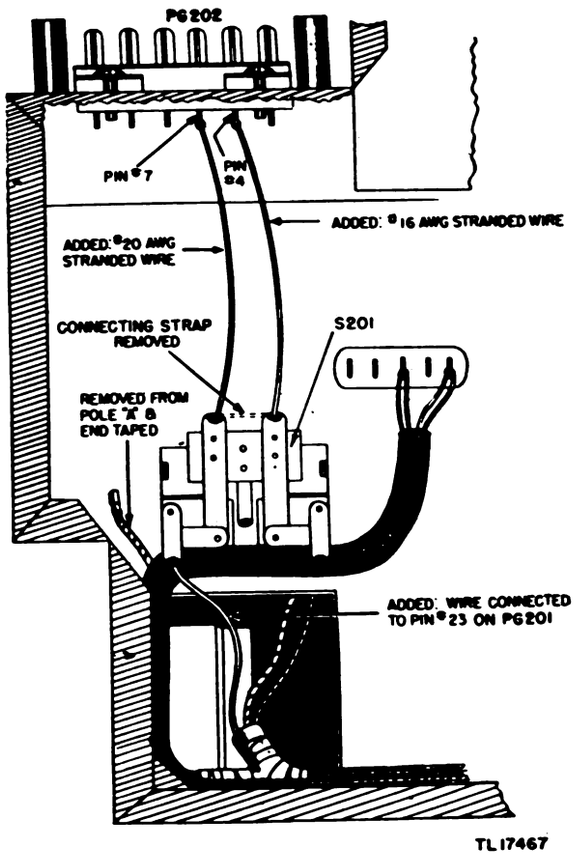


Figure 3. Interphone Amplifiers BC-605-AM -CM and -DM, modification for receiver disabling.

b. PILOT LAMP E201. In some models of the amplifier, lamp E201 is connected across the filament string, so that it operates at 12 volts even when a 24-volt supply is used; in the other models, this lamp operates at 24 volts on a 24-volt supply.

4. Design Differences

The major design differences between the interphone amplifier models are as follows:

a. RELAY S201 (figs. 3 and 4). The difference described in paragraph 3*a* above, between the BC-605-A, -C, -D and BC-605-AM, -CM, and -DM models, was made by changing connections to dynamotor starting relay S201 as follows:

(1) The connecting strap that was soldered between spring contact terminals B and C of relay S201 has been removed.

(2) The wire that was connected to fixed contact terminal A of the relay has been removed from that terminal, and the end of this wire has been taped to prevent shorting to anything within the chassis assembly.

(3) Fixed contact terminal A of the relay was then connected to pin 23 of Plug PG201 in the M models with a No. 20 gauge stranded, insulated wire (stock No. 13520.9).

(4) Spring contact terminal B of the relay has been connected to pin 7 of plug PG202 in the M models with another No. 20 gauge stranded, insulated wire (stock No. 1350.9).

(5) Spring contact terminal C of the relay has been connected to pin 4 of plug PG202 with a No. 16 gauge stranded, insulated wire (stock No. 13816.5).

b. RELAY S201. Dynamotor starting relay S201 has been changed from the type AO to the improved type BO in some models.

c. PILOT LAMP E201. The change described in paragraph 3*b* above, for the later models of the amplifier, was made as follows: The connection between lamp socket ES201 and fuse mounting FM201 has been opened, and ES201 has been connected instead to the common connection between resistors R213, R202, and R214.

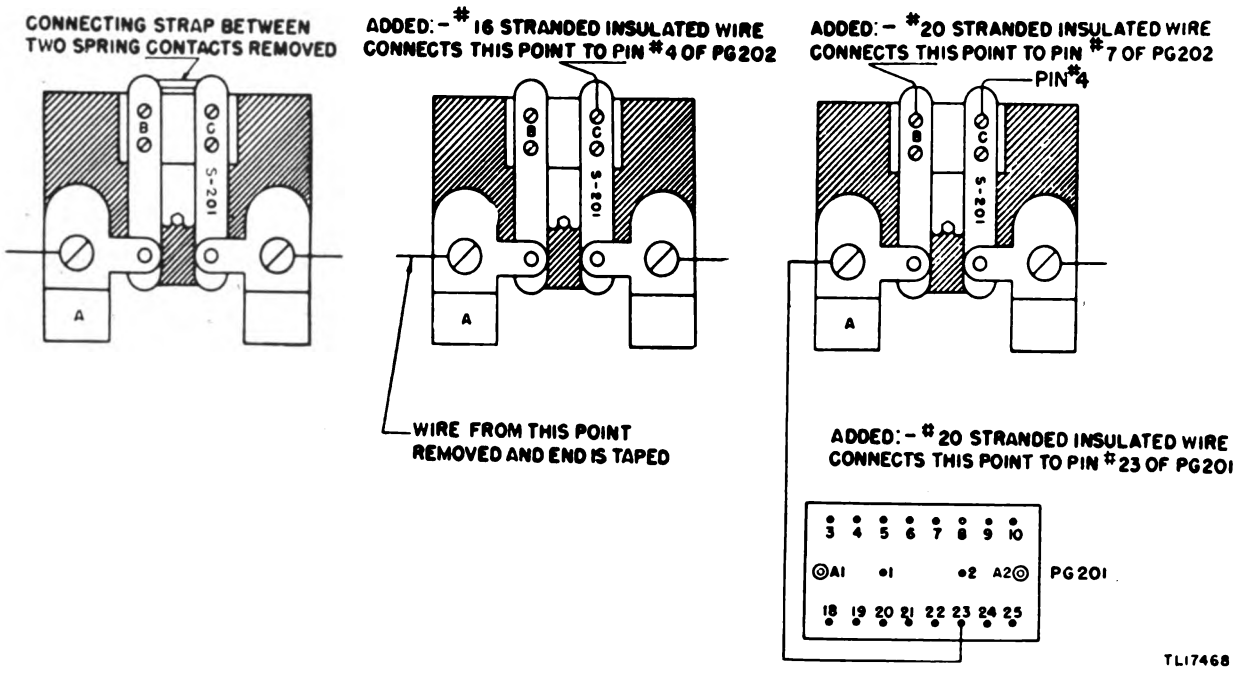


Figure 4. Interphone Amplifiers BC-605-AM, -CM, and -DM, wiring diagram of changes.

SECTION III

INITIAL REPAIR PROCEDURES

Note: Before making any repairs or adjustments, all authorized Modification Work Orders should be applied. See FM 21-6 for list of applicable Modification Work Orders.

5. Test, Tool, Inspection, and Cleaning Equipment

The test, tool, inspection, and cleaning equipment required for the repair of interphone Amplifier BC-605-(*) is listed in table I below.

Table I. Test, tool, inspection, and cleaning equipment

Item	Description
Signal generator	Pure sine wave audio output. Output voltage variable from zero to at least 1 volt. Frequency range at least 200 to 5,000 cycles.
Test set	Any model of Test Set I-56-(*) or equivalent, consisting of the following equipment: voltmeter, ohmmeter, output meter, milliammeter, capacity tester, and tube checker including tube short-circuit tester. Includes Test Cord CD-144-(*). Voltmeter range up to 300 volts in several scales, dc and ac; 1,000 ohms per volt. Ohmmeter range up to at least 1 megohm. Output meter range up to 300 volts in several scales; 1,000 ohms per volt.
Voltohmmeter*	Type I-107 electronic meter or equivalent. Voltmeter range up to 300 volts in several scales, dc and ac. Ohmmeter ranges up to at least 10 megohms.
A-c vacuum tube voltmeter	Scales up to 300 volts ac. Calibrated in peak volts.
Oscilloscope*	
Magnetic microphone type T33 or T45*	Magnetic microphone with push-to-talk button. Type T-33: hand type. Type T-45: throat type.
Carbon microphone T17 or T30*	Carbon microphone with push-to-talk button. Type T-17: hand type. Type T-30: throat type.
Headset	Type HS-18, HS-23, or HS-30. Includes plug PL55 or equivalent.
Test capacitor	0.5 microfarad, 400 volts dc, with small clips, and flexible insulated leads 6 inches long.
Resistor	100 ohms, 2 watts, wire-wound, with small clips and flexible insulated leads 6 inches long.
Resistor	2,000 ohms, 5 watts, wire-wound, with small clips and flexible insulated leads 6 inches long.
Adapter FT-384-(*)* (fig. 16)	Plug connector to fit plug PG201, for testing Interphone Amplifier BC-605-(*) when no other means of connection to the amplifier is available. Complete with battery leads and pin jacks for output meter prods.
Cords CD-786	Standard cord for testing Interphone Amplifier BC-605-(*).
Test cord A	Special cord for use in signal tracing. 1. Connect a 3-foot, shielded, two-conductor, No. 22 gauge, flexible, insulated, stranded, copper cable to the two plug terminals that correspond with pin receptacles B and C of jack J202. Strip the insulation at the free end of the cable for connection to the output binding posts of the signal generator. Connect at one end a four-prong plug, such as that on magnetic Microphone T-33 or T-45, for insertion into jack J202. 2. Connect a short single-conductor No. 22 gauge, flexible, insulated, stranded copper wire to the plug terminal that corresponds with pin receptacle D of jack J202. Strip the insulation at the free end of this wire. 3. Insert a jumper into the plug between the two terminals that correspond with pin receptacles A and B of jack J202.
Test cord B	8-foot cord for connecting battery source to plug PG201 pins No. 1 and 2. Comprises cord CO-212, two battery clips at one end and at the other end, two alligator nose clips to fit on 5/32-inch diameter terminal pins of PG201. Connect clips marked + to inner wire of cord and clips marked — to outer wire.

Item	Description
Assortment of hand tools	Burnishing tool.
	Pliers, heavy.
	Pliers, long-nose.
	Cutters, side.
	Screw driver, 3½-inch cabinet size.
	Wrench, socket, for 9/16-inch diameter hex. nut; to fit over toggle switch.
	Mallet, rubber, small.
	Soldering iron, electric 100 or 150 watts.
Vacuum tube extractor	
Mirror	Dental, ½-inch diameter maximum.
Flashlight or light probe	Small size.
Test rod	Bakelite or equivalent.
	Not more than ¼-inch diameter round, about 6 inches long.
Solvent, Dry-cleaning	
Camel's-hair brush	Small size (¼ inch diameter, round) for use with dry-cleaning solvent (SD).
Toothbrush	Hard, for use with dry-cleaning solvent (SD).
Clean cloths	For use with dry-cleaning solvent (SD).
Air gun	Complete with source of clean, dry compressed air, pressure not exceeding 30 pounds per square inch at nozzle.
Sandpaper	Assorted grades.
Paint brushes	Assortment.
Touch-up lacquer	Quick-drying, clear.
Touch-up paint	Quick-drying, colors to match painted surfaces.

* This item will be issued only when specially requested.

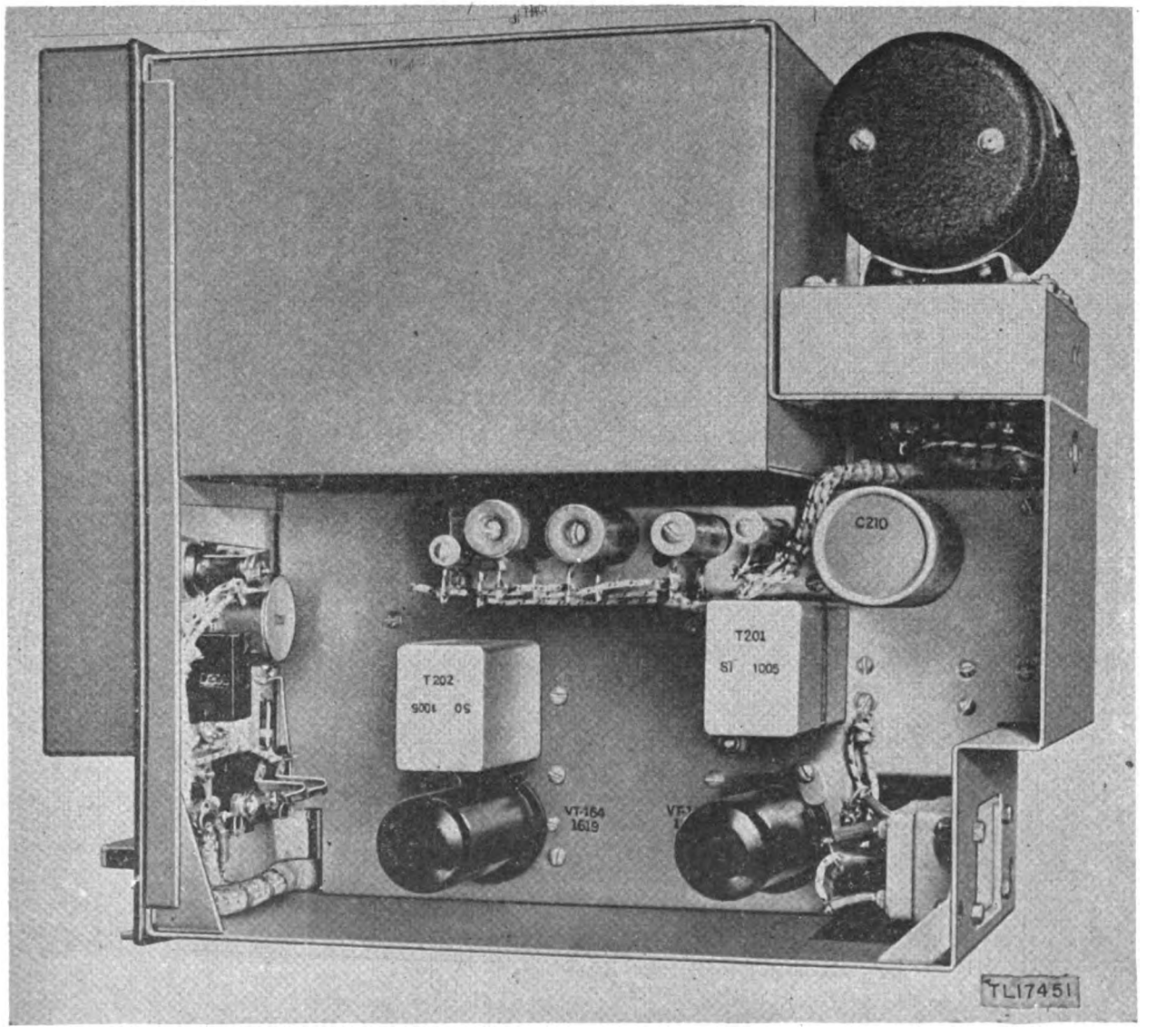


Figure 5. Interphone Amplifier BC-605-(*), right-side interior view.

6. Removal of Tubes

a. Remove the dust cover as directed in paragraph 7 of this section.

b. Release each tube (fig. 5) for removal by loosening the screw in the locking tab at the base, and push the locking tab aside. Remove the tube, either by pulling it straight out from its socket or by using a tube extractor.

Note. Immediately upon removal of each tube, label it clearly. If good, the tube must eventually be replaced in the socket from which it was taken.

7. Removal of Chassis Parts

The removal of the cover, dynamotor, fuses, pilot lamp, and magnetic microphone jack cap is described in this paragraph.

a. PRELIMINARY. Place the receiver, panel downward, on a smooth surface. Turn the Dzus fastener, at the rear of the cover (fig. 1a), one-quarter revolution counterclockwise, and then slide the cover off.

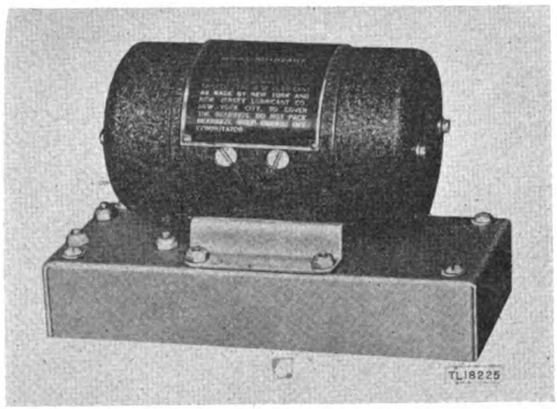
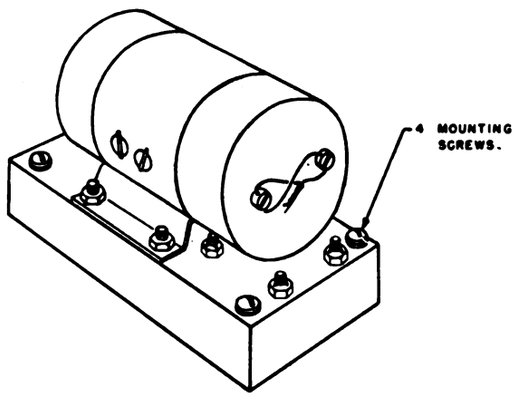


Figure 6. Dynamotor DM-34-(*) or DM-36-(*).



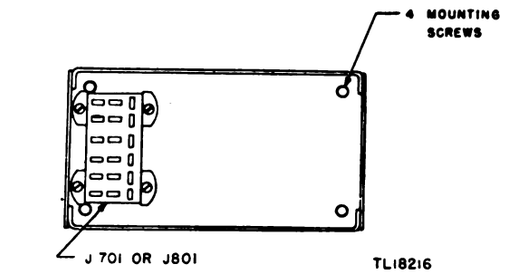


Figure 8. Dynamotor DM-34-(*) or DM-36(*), location of mounting bolts.

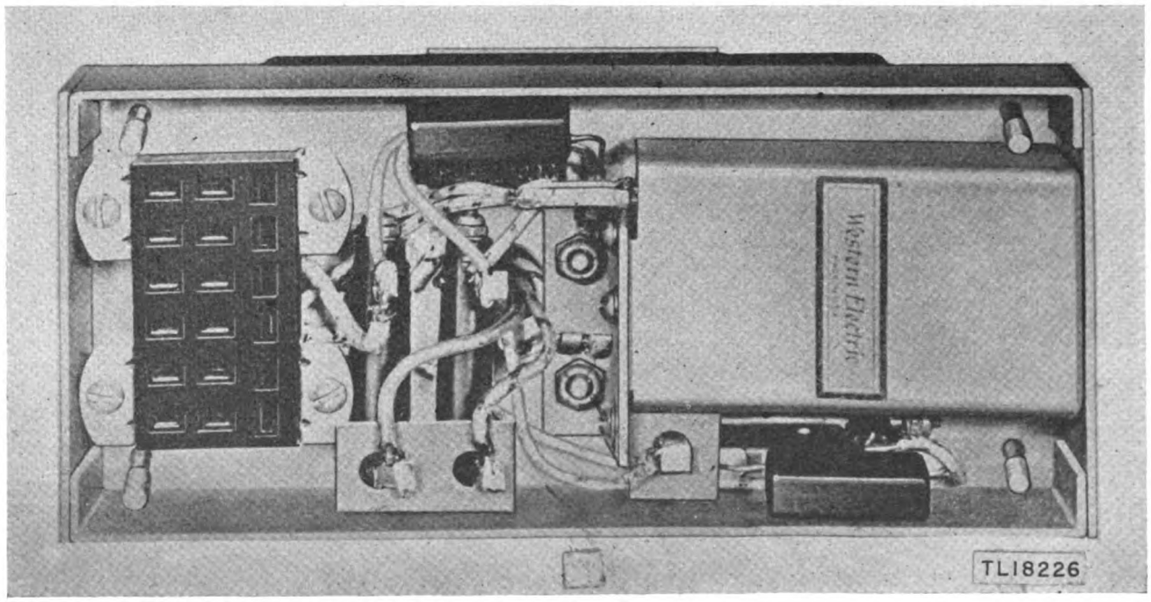


Figure 7. Dynamotor DM-34-(*) or DM-36-(*), sub-base view.

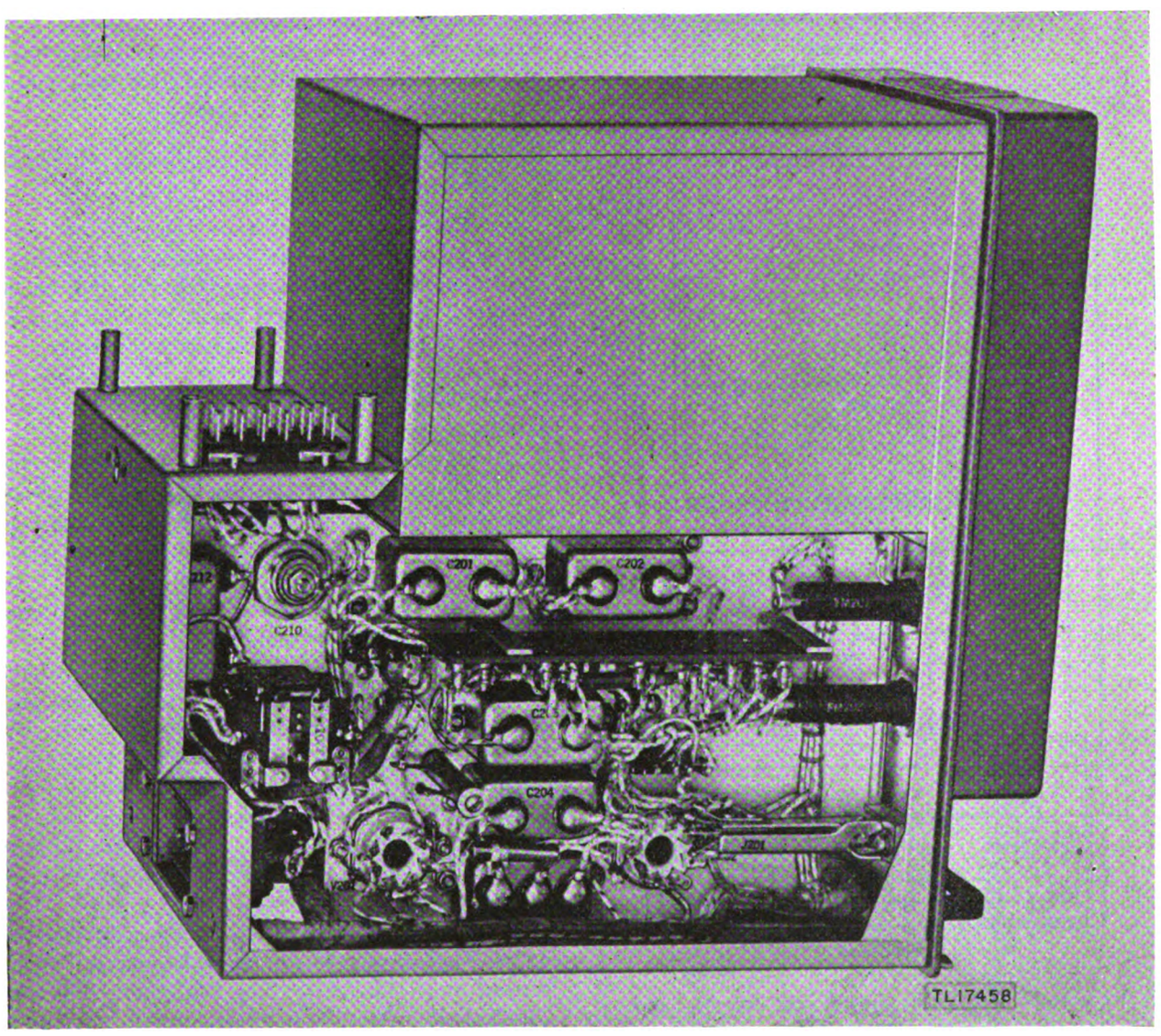


Figure 9. Interphone Amplifier BC-605-(*), left-side, interior view.

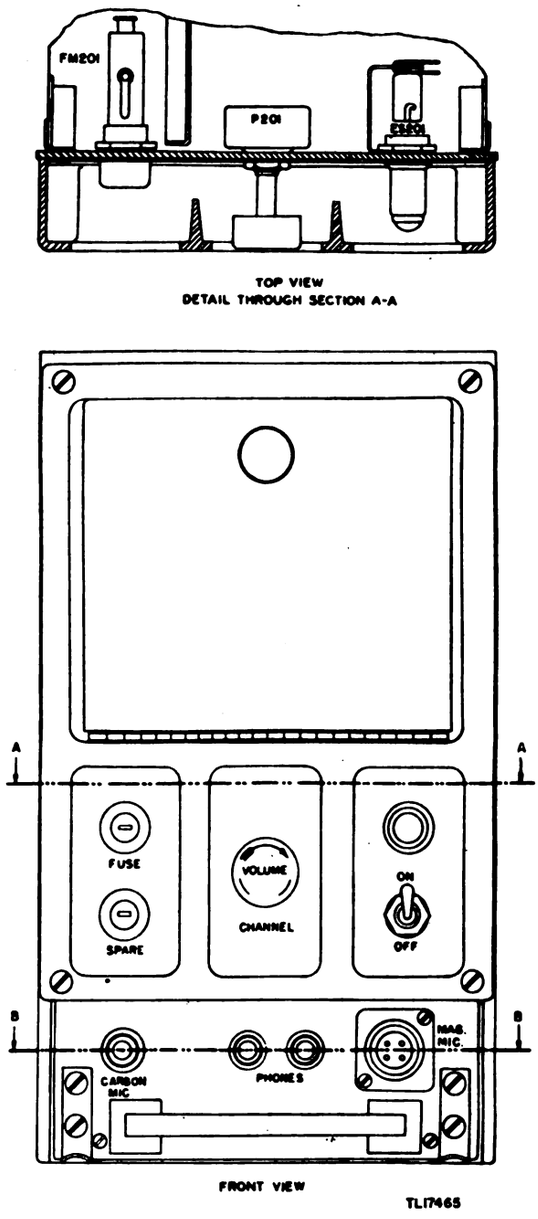


Figure 10. Interphone Amplifier BC-605-(*), panel apparatus location.

b. DYNAMOTOR REMOVAL. Release the four mounting bolts in the corners of the dynamotor sub-base (fig. 8) and pull the dynamotor (figs. 6 and 7) up from the dynamotor plug PG202 (fig. 9, upper left).

c. FUSE REMOVAL. Two fuses, labeled FUSE and SPARE respectively, are located within the panel guard (figs. 1 and 10). Remove the fuses by inserting a screw driver in the slotted fuse holders and turning counterclockwise; the fuses can then be easily extracted from their mountings. Do not subject the fuse holder to excessive force, since it is made of a brittle plastic and may break.

d. PILOT LAMP REMOVAL. Unscrew the jewel assembly of the pilot lamp on the front panel (figs. 1 and 10), and remove the bayonet-base lamp by pushing it in, turning counterclockwise, and pulling out.

e. MAGNETIC MICROPHONE JACK CAP (*fig. 10*). Remove the magnetic microphone jack cap by turning it in a counterclockwise direction, and pull it out.

8. Cleaning, Inspecting, and Lubricating of Chassis Assembly

a. GENERAL. With the easily removable parts out of the amplifier, clean all remaining parts and inspect for mechanical damage as directed below. Repair or replace damaged parts, referring to Section IX when special procedures are necessary.

b. CLEANING AND INSPECTING. (1) Remove the dust cover and see that the circuit label is firmly secured to the bottom.

(2) Clean the dust cover, inside and out, and the front panel, using dry-cleaning solvent (SD). Scrape off mud, tar, or other adhering foreign matter. Touch up with paint or lacquer where necessary.

Caution: Do not use water or a water-moistened cloth on any part of the amplifier.

(3) Clean and inspect plug PG201 (figs. 1a and 11). Make sure there is a little play of the plug in its mounting. Clean the pins carefully with dry-cleaning solvent (SD), using the small camel's-hair brush. Remove corrosion on the pins with a burnishing tool. Avoid scratching the insulation. If the plug is damaged or the pins are bent, broken, or badly pitted or worn, replace the plug as directed in paragraph 10.

(4) Clean and inspect dynamotor plug PG 202 on the chassis (fig. 9), in the same manner as described in (3) above, with one exception: this plug (PG202) must be tight in its mounting.

(5) Blow out dust, loose dirt, sand, or gravel from the interior of the amplifier, and remove mud or other foreign matter. Be careful not to cause damage when using a cloth to wipe parts. If corrosion is found, clean as completely as possible, taking care not to leave rust, metal scrapings, or filings in the chassis assembly. Lacquer all parts that have been scraped clean. If the operation of parts has been affected by corrosion, replace the parts.

Caution: When an air hose is used, be sure that

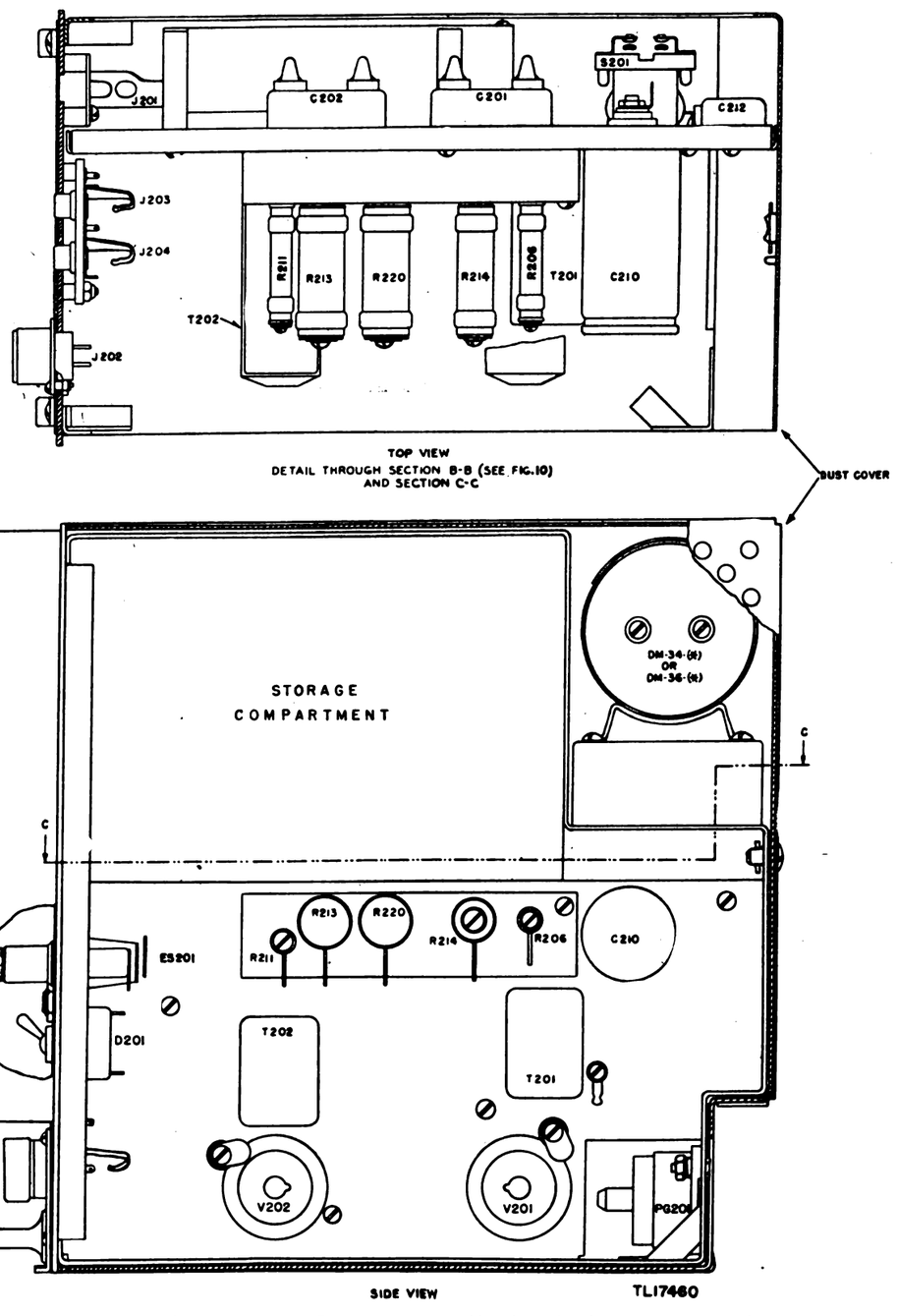


Figure 11. Interphone Amplifier BC-605(*), right-side view showing apparatus location.

water which may have condensed in it is blown out before applying the air stream to the chassis assembly.

(6) Clean the vacuum tube sockets and their pin receptacles with dry-cleaning solvent (SD), using the small camel's-hair brush. Check the tightness of the pin contacts by plugging in a suitable tube. Clean the contacts with fine sandpaper to remove corrosion, oxidation, and dirt. Make sure the sockets are mounted securely. If the pin receptacles of a socket are bent or broken or if the socket is otherwise defective, replace the socket.

(7) Clean all accessible electrical connections and grounding screws with dry-cleaning solvent (SD), using a toothbrush. Inspect for loose or broken connections and solder or tighten them as necessary.

(8) Check all accessible mechanical fastenings, such as screws and bolts, and tighten as necessary, being careful not to use excessive force.

(9) Clean the pilot lamp socket (fig. 10), applying dry-cleaning solvent (SD) generously with the small camel's-hair brush.

(10) Clean the relay S201 (figs. 9 and 11) with dry-cleaning solvent (SD), using the small camel's-hair brush. Closely examine the relay contacts for burning or pitting. Remove slight burns and pits by burnishing. See paragraph 10 if the relay contacts are *badly* burned or pitted.

(11) Remove the cardboard cover of the electrolytic capacitor (C210) (fig. 5), scrape corrosion from the can, and clean the can with dry-cleaning solvent (SD), using the toothbrush. Check for pinholes or other holes in the can; if any are found, replace the capacitor. Immediately after cleaning, lacquer the entire can, allow it to dry, and replace the cardboard cover over the capacitor.

(12) Make sure that all parts of the chassis assembly are thoroughly clean and no hard deposits remain. Then apply the compressed air stream to remove any remaining dirt or foreign matter.

(13) Inspect for broken parts. Look and smell for evidence of excessive heating as indicated by burned resistors or melted wax. If such defects are found, locate the causes by reference to section IV. Replace faulty parts, referring to section IX when special procedures are necessary.

c. LUBRICATION. The chassis assembly does not require lubrication.

9. Cleaning, Inspecting, and Testing of Removed parts

a. VACUUM TUBES. (1) *Cleaning.* Handle the tubes with care and clean with dry-cleaning solvent (SD), using the small camel's-hair brush. Remove remaining dirt and foreign matter from the pins and bases of the tubes.

Caution: Each tube, if found to be good, must eventually be returned to the socket from which it was taken. It is important that tubes, even of the same type, shall not be interchanged.

(2) *Inspecting.* Inspect each tube for mechanical and other obvious defects. Discard defective tubes. Make sure each tube is of the type specified.

(3) *Testing.* Test each tube in the tube checker unit of Test Set I-56-(*) in accordance with instructions furnished with the tube checker. Do not neglect the short-circuit test.

b. DYNAMOTOR. Clean, inspect, lubricate, and repair, when required, in accordance with instructions contained in TB SIG 134 or Repair Instructions for Dynamotors, Section R-434.01 (the latter may be obtained from fourth and fifth echelon Signal Corps shops). Test dynamotors for proper operation with dynamotor Test Set I-199 (or equivalent). If dynamotor is found defective, replace it with one known to be in good operating condition.

c. FUSES. (1) *Cleaning.* Clean the two fuses (FU-24) with dry-cleaning solvent (SD), removing all dirt and corrosion from contacts.

(2) *Inspecting.* Make sure the fuses are firmly held in their holders and are in good mechanical condition. Check the number of fuses in the spare parts bag attached to the receiver. There should be eight running spares; if any are missing, replenish the supply.

(3) *Testing.* Test the continuity of each fuse. Discard open or defective fuses and replace with fuses known to be good.

d. PILOT LAMP. (1) *Cleaning.* Clean the pilot lamp and its jewel assembly, with dry-cleaning solvent (SD), using the small camel's-hair brush.

(2) *Inspecting.* Reject the pilot lamp if the inside of the glass is blackened. Inspect the jewel assembly for chips, breaks, and tightness in its holder. Replace the jewel assembly if defective. Make sure there are two spare lamps in the spare parts bag.

(3) *Testing.* Test the lamp across a 12-volt supply. Replace the lamp if defective.

10. Repair or Replacement of Parts Found Faulty

a. MECHANICALLY DEFECTIVE PARTS. Repair or replace mechanically defective parts such as those badly bent, worn, cracked, or broken. Re-

placement parts of different manufacture or appearance may be used if they have the same electrical characteristics as the parts they replace.

b. Electrically Defective Parts. Repair or replace parts that are obviously defective electrically, such as those with deeply pitted, badly burnt, or worn contacts and pins; burnt, cracked, or deeply scored insulation; and burnt coils. Before removing wires to replace a part, identify the wires by tags.

c. Repair of Defective Parts. Restore defective parts to satisfactory condition if facilities, time, and the repair instructions permit, but undertake no extensive repairs of parts. See section VIII for typical examples of repairs that may be undertaken and for specific repair procedures.

SECTION IV

PRELIMINARY TROUBLE-SHOOTING PROCEDURES

11. Resistance Measurements at Terminals

a. RESISTANCE OF DYNAMOTORS DM-34-(*) OR DM-36-(*). Due to variations in methods of manufacturing, widely varying terminal-to-terminal resistance measurements are found in various dynamotors of the same type. In many cases, shorted turns in choke coils and armature windings are not revealed by continuity tests. For these reasons, the customary ohmmeter continuity tests cannot be relied upon to indicate the true operating condition of a dynamotor. Therefore, test the operation of the dynamotor with a dynamotor Test Set I-199 (or equivalent) to determine its operating condition. Reference to TB SIG 134 or Repair Instructions for Dynamotors, Section R-434.01, and to figures 12, 13, and 14 will prove helpful if repairs are required.

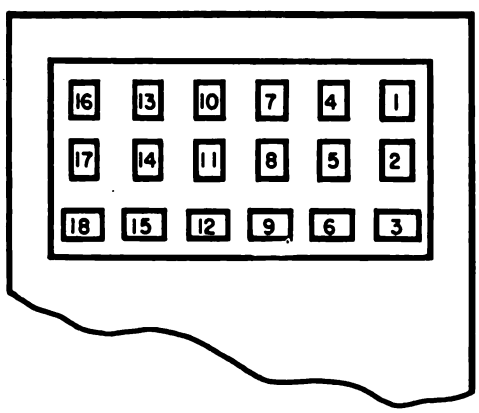


Figure 12. Dynamotor DM-34-(*) or DM-36-(*), sub-base view of jack J701 or J801.

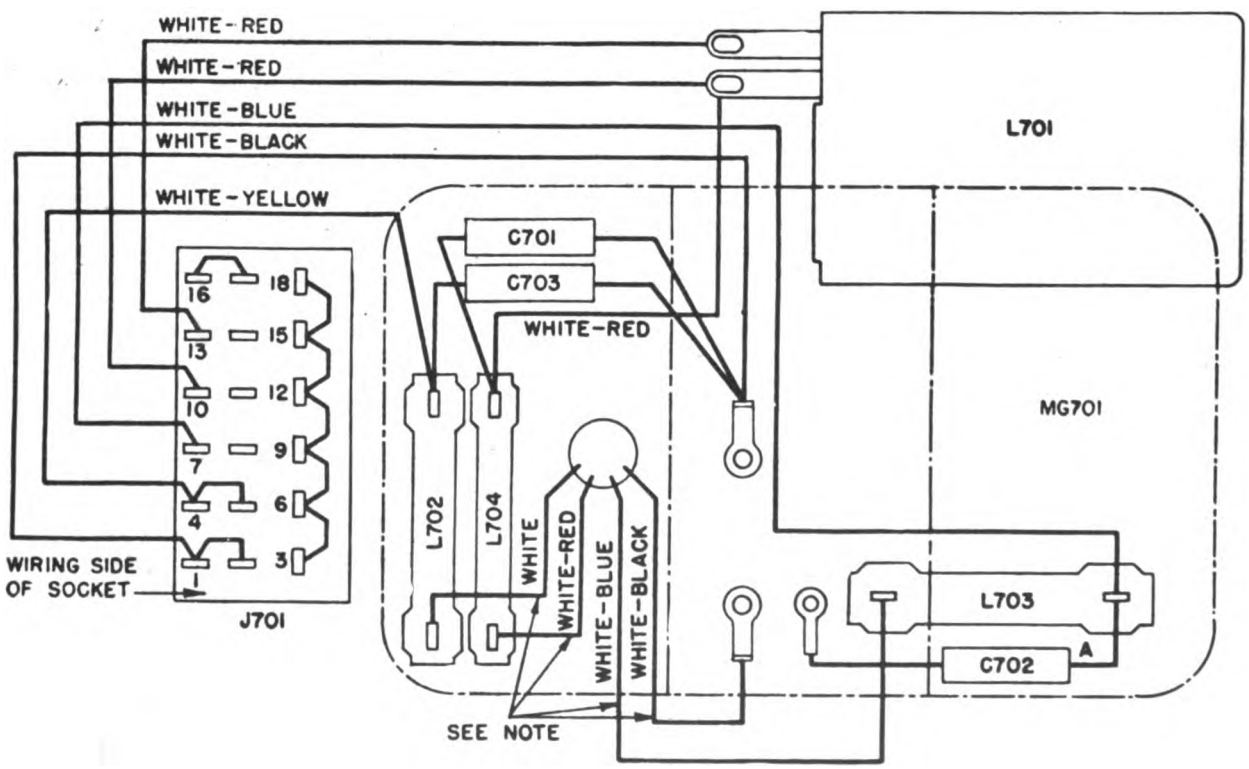


Figure 13. Dynamotor DM-34-(*), wiring diagram.

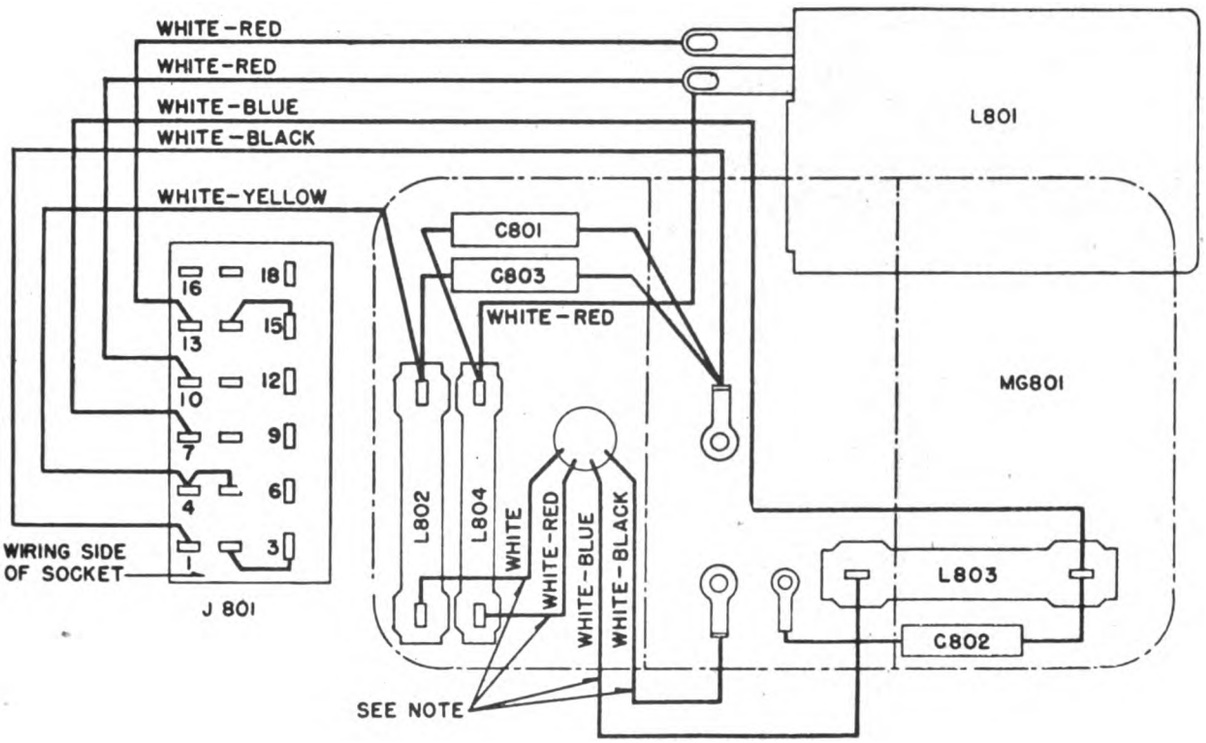


Figure 14. Dynamotor DM-36-(*), wiring diagram.

b. Internal Resistance of Interphone Amplifier BC-605-(*). (1) *Resistance at terminals of plugs PG201 and PG202.* Measure the pin-to-chassis resistance at each terminal of plugs PG201 and PG202. See figure 15 for the required ohmmeter readings.

Caution: The minus (—) lead of the ohmmeter must be connected to the amplifier chassis while taking these readings; otherwise, the electrolytic capacitor (C210) may pass current and cause the ohmmeter to give false readings.

(2) *Resistances at tube socket terminals.* Measure the pin-to-chassis resistance at each terminal of tube sockets marked V201 and V202 (fig. 15). The resistance at each terminal should correspond with that shown in figure 15.

(3) *Resistance at power input terminals.* (*a*) Measure the resistance between power input terminals 1 (battery plus (+)) and 2 (battery minus (—)) of plug PG201. Thrown the ON-OFF switch first to the ON position and then the OFF position; in both positions the ohmmeter should show an open circuit.

(*b*) Measure the resistance between pin 1 of plug PG201 and pin 18 of plug PG202; the ohmmeter should indicate an open circuit.

(4) *Trouble.* Trouble is indicated when the ohmmeter readings differ more than ±10 percent from those referred to above for corresponding terminals of the amplifier. Higher ohmmeter readings indicate open or partially open circuits and lower ohmmeter readings indicate a partial or complete short circuit. Locate the causes of open or short circuits as directed in section VI, and repair or replace defective parts as directed in section VIII.

12. Replacement of Removed Parts

a. Vacuum Tubes. Insert tested vacuum tubes in the tube sockets of the amplifier in accordance with the tube chart in paragraph 2 (the VT and

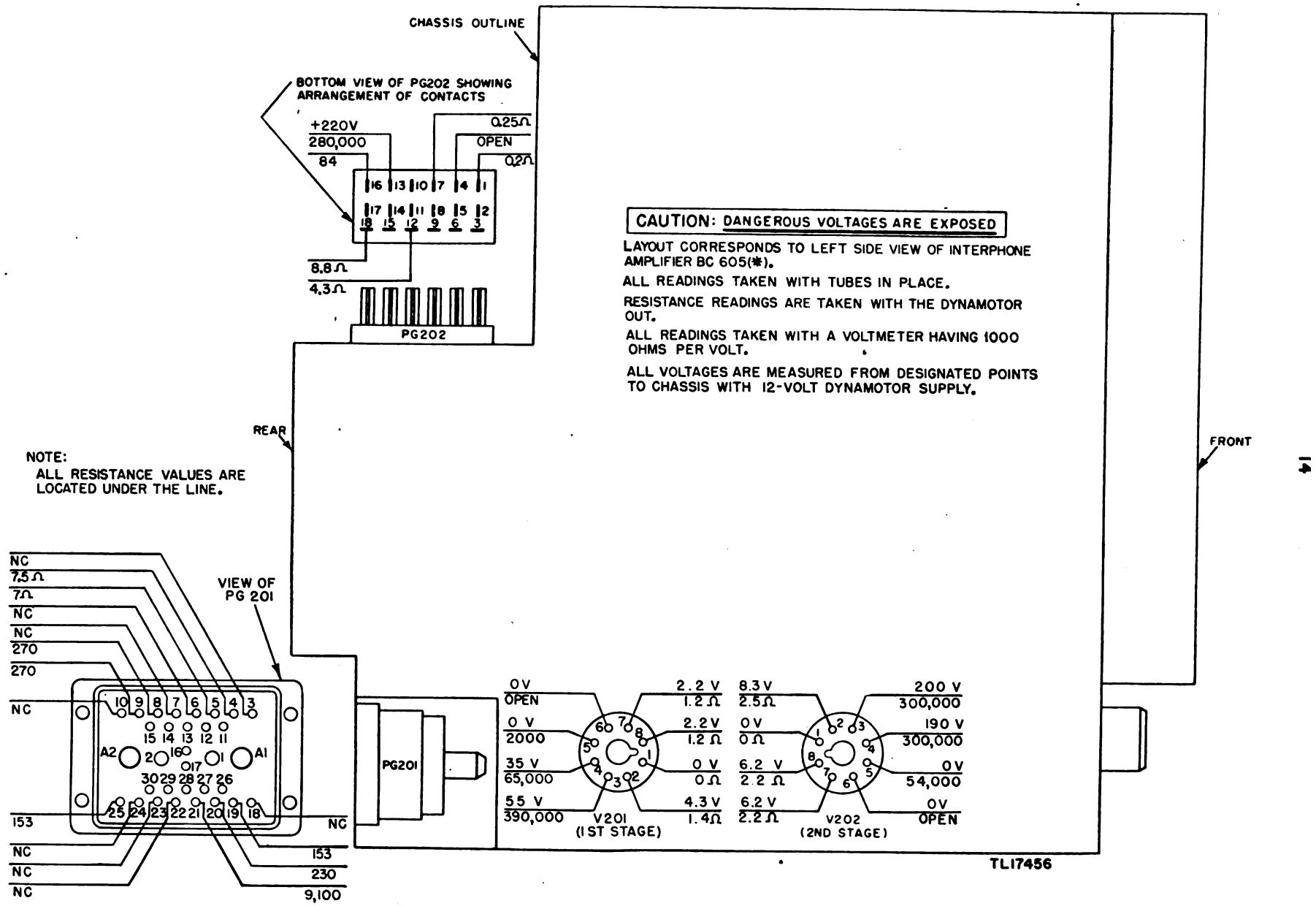


Figure 15. Interphone Amplifier BC-605-(*), resistance-voltage diagram.

JAN designations of the tubes are stamped on the chassis near the sockets).

Note. Each of the *original* tubes found to be good must be returned to the socket from which it was taken. Tighten the tube locking tab at the base of each tube with a screwdriver (fig. 5).

b. DYNAMOTOR. Replace the dynamotor by plugging it into plug PG202 (fig. 9, upper left). Press down firmly; avoid any twisting or tilting motion. Securely tighten the four mounting bolts at the corners of the dynamotor sub-base (fig. 8).

c. FUSES. Replace the fuses in the two fuse mountings labeled FUSE and SPARE, respectively, on the front panel (figs. 1 and 10). Turn the fuses in with a screwdriver but avoid excessive force.

d. PILOT LAMP. Insert a tested pilot lamp in the pilot lamp socket on the front panel (figs. 1 and 10) and turn clockwise. Then install the jewel assembly over the pilot lamp.

13. Voltage and Operational Tests

a. Throw the ON-OFF switch on the front panel (figs. 1 and 10) to the OFF position.

b. Check the voltage of the battery source carefully to make sure it corresponds with the rated voltage of the specific dynamotor used with this amplifier. Any deviation of the battery voltage from the voltage rating of the dynamotor will result in incorrect d-c (*f* below) and signal voltages. Dynamotor DM-34-(*) should be operated with a 12-volt source, and Dynamotor DM-366-(*) with a 24-volt source.

c. Connect the plus (+) terminal of the battery source to pin 1 of plug PG201 and the minus (—) terminal to pin 2 of plug PG201, using one of the following methods:

(1) Connect Cord B (table I) directly between the battery and pins 1 and 2 of plug PG201.

(2) Connect Cord CD-786 (table I) between the amplifier and Mounting FT-237-(*), checking to make sure the latter is connected to the battery source with proper regard to the polarity.

(3) Plug Adapter FT-384-(*) (fig. 16 and table I) into plug PG201 and connect the adapter battery leads of the proper polarity to the battery source.

d. Throw the ON-OFF switch to ON. Check to make sure the pilot lamp on the front panel is now *on.* Wait about a minute for the tubes to heat up. While waiting, look, smell, and listen for any trouble in the amplifier.

Note. Locate the causes of any trouble as directed in this section, and repair or replace defective parts as outlined in section VIII. (This instruction applies throughout this section).

e. Plug a jumper into the magnetic microphone jack (figs. 1 and 10) to bridge terminals A and B. This should start the dynamotor. Again look, smell, and listen for trouble in the amplifier.

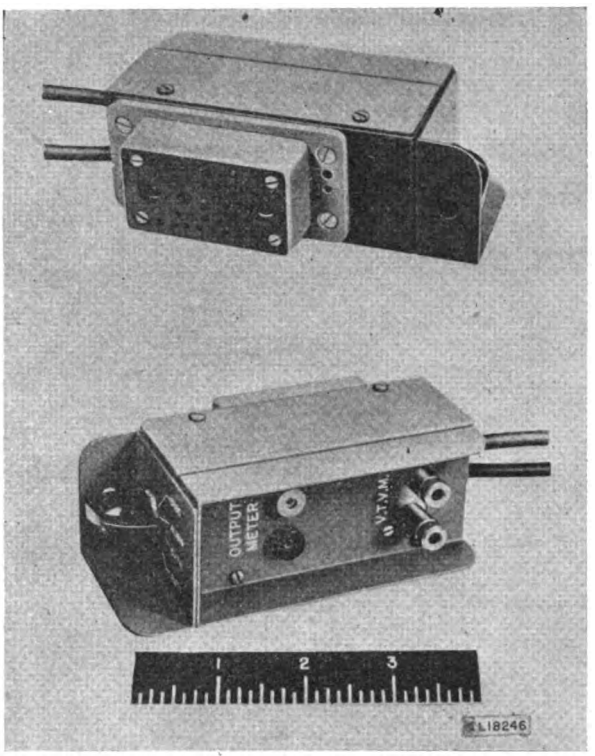


Figure 16. Adapter FT-384-(*), front and back views.

Caution: Dangerous voltages are exposed in the amplifier when the dynamotor is running. Do not run the dynamotor any more than necessary since it is designed for intermittent operation: 5 minutes on and 15 minutes off.

f. Measure the pin-to-chassis voltages at each receptacle of the tube sockets marked V201 and V202 (fig. 15), using a 1,000 ohm-per-volt meter. See figure 15 for the required voltage readings. Voltage readings differing more than ±10 per cent from those in figure 15 indicate trouble.

g. Plug Headset HS-18, HS-23, or HS-30 (table I) into the jack labeled PHONES on the front panel (figs. 1 and 10). There should be only a faint hum audible in the headset.

h. Remove the jumper from the magnetic microphone jack. Plug magnetic Microphone T-33 or T-45 into the magnetic microphone jack. Press the push-to-talk button on the magnetic microphone; this should start the dynamotor. Turn the VOLUME control (P201) (figs. 1 and 10) clockwise to maximum volume. Speak into the magnetic microphone, first softly and then loudly, and listen to the sidetone to determine whether distortion is present. (Sidetone is part of the audio output that is fed into the speaker's own headset.)

i. Remove the magnetic microphone plug from its jack. Plug carbon Microphone T-17 or T-30 into the carbon microphone jack J201 (figs. 1 and 10). Perform the same operational test with the carbon microphone as with the magnetic microphone, as described above.

j. Remove the carbon microphone plug from its jack. The amplifier is now in operating condition for the tests that follow, which must be made in the order given.

SECTION V

ALIGNMENT PROCEDURE

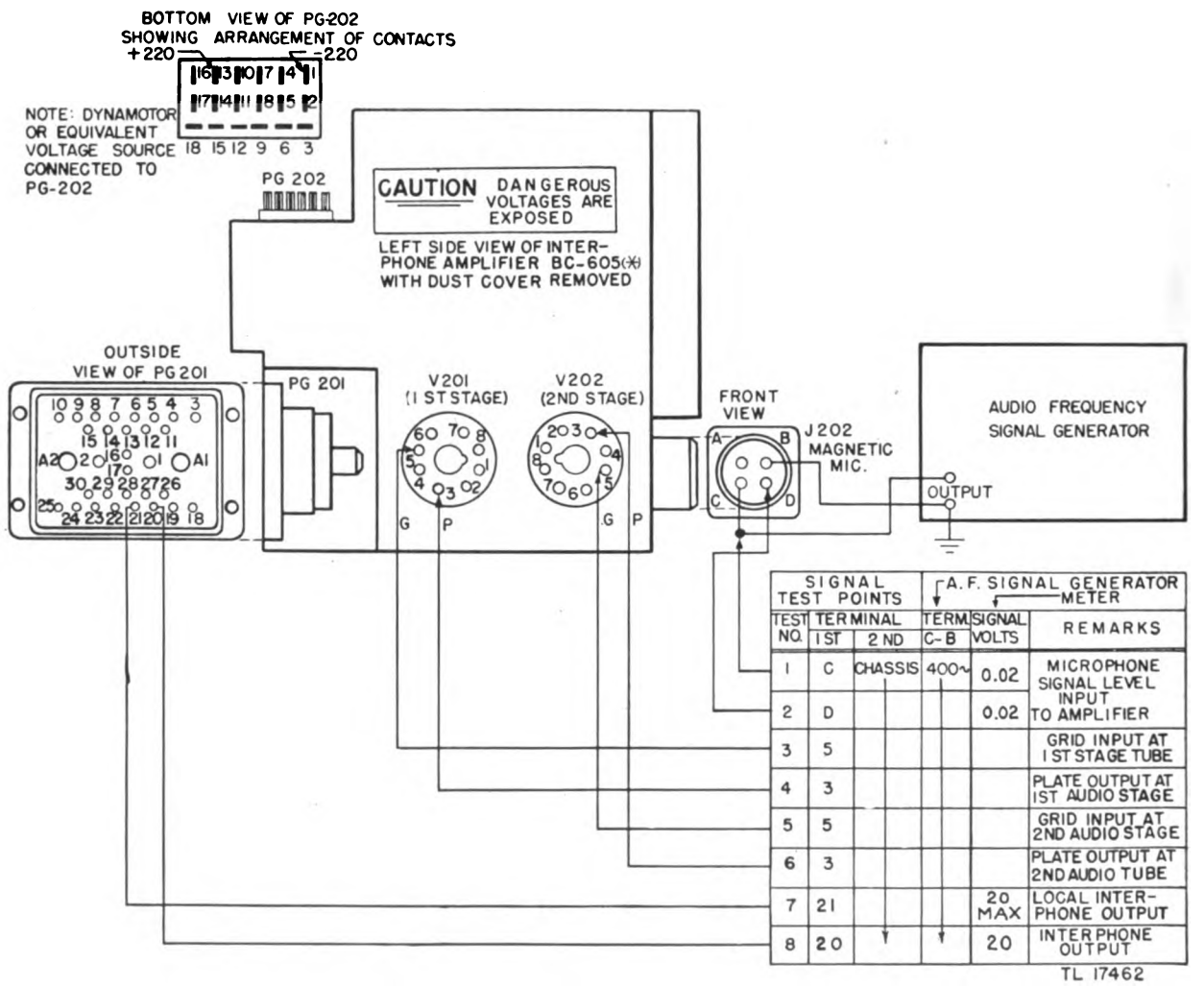
(NOT APPLICABLE)

SECTION VI

DETAILED TROUBLE-SHOOTING PROCEDURES

14. Detailed Trouble Location

a. SIGNAL TRACING. Faulty stages in the amplifier may be found by means of the following methods of signal tracing and signal substitution. See figure 17. Connect a 100-ohm, 2-watt resistor across the output terminal of the a-f signal generator. Connect a 2,000-ohm, 5-watt resistor between the chassis and the terminal of the VOLUME control (P201) which is connected to the interphone output pin 20 of plug PG201. To locate this terminal of P201, connect an ohmmeter between pin 20 of PG201 and each terminal of P201 in succession; use the terminal that gives an ohm reading of zero. Connect the output of the a-f signal generator (table I) to the amplifier (fig. 17) using test cord A (table I). Insert the test cord plug into the magnetic microphone jack (J202). Receptacle B of the magnetic microphone jack is now connected to the grounded output terminal of the signal gen-



SIGNAL TEST POINTS			A.F. SIGNAL GENERATOR METER		
TEST NO.	TERMINAL 1ST	TERMINAL 2ND	TERM. C-B	SIGNAL VOLTS	REMARKS
1	C	CHASSIS	400~	0.02	MICROPHONE SIGNAL LEVEL INPUT TO AMPLIFIER
2	D			0.02	
3	5				GRID INPUT AT 1 ST STAGE TUBE
4	3				PLATE OUTPUT AT 1ST AUDIO STAGE
5	5				GRID INPUT AT 2ND AUDIO STAGE
6	3				PLATE OUTPUT AT 2ND AUDIO TUBE
7	21			20 MAX	LOCAL INTER-PHONE OUTPUT
8	20			20	INTERPHONE OUTPUT

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Figure 17. Interphone Amplifier BC-605 (*), signal tracing chart.

erator and receptacle C is connected to the ungrounded output terminal. Receptacles A and B of J202 are connected to each other; hence the dynamotor starts as soon as the test cord plug is inserted into the jack (J202) as directed above.

Caution: Do not run the dynamotor any more than necessary.

(1) *Preparations for test.* (*a*) Connect the ground lead of the vacuum tube voltmeter or oscilloscope to the amplifier chassis. To the ungrounded lead connect a test prod or probe with a test capacitor in series.

Caution: See the instruction book for the particular meter or oscilloscope used to determine whether the capacitor mentioned above would upset the readings. In some cases, it may be permissible to take readings without the capacitor.

(*b*) With the voltmeter or oscilloscope connected across the signal generator, set the generator output voltage at 0.1 peak volts.

(2) *Faulty stage location.* (*a*) *Use of test prod or probe.* Place the test prod or probe of the voltmeter or oscilloscope on each terminal listed in the table of figure 17 in succession and see that the prescribed readings are obtained. If any of the readings differ by more than ±20 percent from those specified in the table of figure 17, the fault lies in the stage indicated by the following chart:

Signal voltage differs by more than ± 20 percent

Test No.	Faulty stage or components	See figures 15 and—
3	T201, R203, R218, R204	18
4	V201, R217, R208, C203.2, C203.1, R219, R207, C204	18
5	C204, R215, C203.3, V202	19
6	C211, R210, C206, V202, T202	19
7	T202, P201, R216	19
8	Pin 20 on PG201	19

(*b*) *Local interphone output.* Turn the VOLUME control of the local interphone output counterclockwise to minimum volume. Place the high-side voltage test lead on terminal 21 of plug PG201. Turn the VOLUME control slowly clockwise to maximum volume. The voltmeter or oscilloscope reading should increase smoothly. If the reading jumps during the increase in volume, the VOLUME control is defective; in that case, replace it with one known to be good and repeat the check as above.

b. Alternative Signal Tracing Method Using Output Meter. (1) *Preparations for test.* (*a*) Connect the grounded output terminal of the a-f signal generator to the amplifier chassis. To the ungrounded output terminal of the signal generator connect a series 0.5-microfarad, 400-volt, d-c capacitor and to this connect a test prod. With the output meter (table I) connected between the grounded terminal and the test prod of the signal generator, raise the generator output voltage from zero until a minimum measurable reading not less than 0.1 volt at 400 cycles per second is obtained on the 3-volt scale of the output meter. Change to a scale that will read at least 80 volts, and connect the output meter to PHONES jack J203 or J204 on the front panel, using Test Cord CD-144-(*) from Test Set I-56-(*) (table I).

(*b*) Turn the VOLUME control clockwise to maximum, and watch to see that the pointer on the output meter does not go off scale.

(2) *Faulty stage location.* Place the test prod of the signal generator on terminal C of the magnetic microphone jack. An output meter reading of approximately 50 to 80 volts indicates that there is no major defect in the amplifier and that it is ready for the over-all tests described in section VII. If the output meter reading is not within the 50 to 80 volts prescribed above, remove the test prod from the amplifier and proceed as follows:

(*a*) If the output meter shows a reading on the 3-volt scale, noise, hum, or howl is indicated and reference should be made to sections VI and VIII.

(*b*) If the output meter shows no reading, *continue* with the following procedure as outlined in table IV.

Table IV. Alternative signal tracing method using output meter.

Step No.	Operation	Signal generator voltage	Output meter reading desired	If desired output meter reading is not obtained, following parts may be faulty.	See figures No.
1	Remove output meter test cord from PHONES jack. Connect output meter to output terminals of signal generator. Increase generator voltage to 1 volt.	1 volt.			
2	Disconnect output meter from signal generator. Plug output meter into PHONES jack.	1 volt.			
3	Place test prod of signal generator on terminal 20 of PG201.	Slightly under 1 volt.	Slightly under 1 volt	If reading is considerably lower, trouble in T202, C211, P201, R216, J203, or J204.	19 and 15.
4	Place test prod on terminal 21 of PG210.	1 volt	1 volt	If reading is considerably lower, trouble in T202, C211, P201, R216, J203, or J204.	19 and 15.
5	Place test prod on terminal 3 of second stage (V202).	1 volt	Approx. 0.8 volt.	If reading is considerably lower, trouble in C211, or T202.	19 and 15.
6	Place test prod on terminal 5 of second stage (V202).	1 volt	8 volts or more.	If reading is less than 8 volts, trouble in C203.3, R208, R215, or C204.	19, 18 and 15.
7	Place test prod on terminal 3 of first stage (V201).	1 volt	8 volts or more.	If reading is less than 8 volts, trouble in R217, C203.2, R208, R207, R219, or C203.1.	18 and 15.
8	Decrease signal generator voltage to 0.1 volt, proceeding as described in step No. 1.	0.1 volt.			
9	Place test prod on terminal of first stage (V201).	0.1 volt	24 volts or more.	If reading is less than 24 volts, trouble in R203, T201, R218, R204, C201, or J202.	18 and 15.
10	Place test prod on junction of R201 and C201.	0.1 volt	8 volts or more.	If reading is less than 8 volts, trouble in R201, C201, R204, T201, R203, or J201.	18 and 15.
11	Place test prod on terminal D of J202.	0.1 volt	35 volts or more.	If reading is less than 35 volts, trouble in T201 or J202.	18 and 15.
12	Place test prod on terminal C of J202.	0.1 volt	35 volts or more.	If reading is less than 35 volts, trouble in T201 or J202.	18 and 15.

SECTION VII

FINAL TESTING

15. Noise Tests

The noise tests described in this paragraph include mechanical and electrical methods for tracing noise (sounds heard when no signal is impressed on the amplifier).

a. LISTENING FOR NOISE. (1) Plug Headset HS-30, HS-23, or HS-18 into PHONES J203 or J204 on the front panel of the amplifier.

(2) Connect output meter of Test Set 1-56-(*) (table I) to Test Cord CD-144-(*), also part of Test Set 1-56-(*), and insert the test cord plug into the remaining PHONES jack.

(3) Set the output meter scale to cover a range of at least 0-100 volts.

(4) Connect together pin receptacles A and B of MAG MIC jack J202 on the front panel. This starts the dynamotor.

(5) Turn VOLUME control clockwise to maximum.

(6) Listen for noise in the headset while watching the output meter. If noise is heard and the output meter shows an appreciable reading, trouble is indicated as follows:

(*a*) Dynamotor hum indicates 'dried-out' or open electrolytic capacitor C210, or faulty capacitor C203.2, C203.1, or C202.

(*b*) Crackling sound may be due to faulty insulation or poor electrical connections of the circuits in the amplifier.

(*c*) Intermittent thump or click may be caused by grid blocking possibly because of open or very-high-resistance grid return circuit.

(*d*) Hissing sound may be caused by defective tube. Try other known good tubes in place of those already in the amplifier even though the tube checker indicated that the latter tubes were good.

(*e*) Sustained note may be caused by fault in any of the windings in T201 and T202.

(*f*) Bell-like sound may be caused by defective (microphonic) tube. Try other known good tubes as described in (*d*) above.

b. MISCELLANEOUS NOISE TESTS. (1) Hit the frame of the amplifier with a rubber mallet (table I) and listen for noise in the headset. This noise may be due to any loose electrical connections or faulty tubes. If the noise is traced to a tube, reject the tube and replace it with a known good one.

(2) Gently tap various parts of the amplifier with a small, hard, nonconducting rod. The noise will be loudest when the faulty part of the circuit is struck. Remove jumper from MAG MIC jack.

16. Sensitivity and Distortion Tests

a. Plug into the CARBON MIC jack, Microphone T-17 or T-30, or into MAG MIC jack, Microphone T-33 or T-45.

b. Press push-to-talk button on the microphone and speak into the microphone with various degrees of loudness.

c. Listen for sound as heard in the headset. The voice should be heard clearly with no distortion at all levels. If the amplifier does not reproduce satisfactorily at all voice levels, see sections VI and VIII for procedures designed to eliminate the trouble.

17. Moistureproofing, Fungiproofing, and Refinishing

a. REFINISHING. Scrape, burnish, and lacquer or paint all corroded spots in the amplifier. In addition, touch up any other spots that require it.

b. MOISTUREPROOFING AND FUNGIPROOFING. For general procedure, see TB SIG 13. For specific information pertaining to Interphone Amplifier BC-605-(*), see changes No. 2, TM 11-600.

18. Over-all Test Requirements Check

a. Inspect all contact points on relays and jacks, and remove any spray material that might have passed under the masking tape.

b. Inspect and, if necessary, clean pin receptacles of the tube sockets.

c. See that the contact-pin board in PG201 is still slightly loose in its mounting. Also inspect and, if necessary, clean all contact pins of all plugs and jacks in the amplifier.

d. Because moistureproofing and fungiproofing may result in impairment of the functioning of the

amplifier, it is necessary to recheck its over-all performance characteristics.

e. Repeat the tests outlined in paragraphs 15 and 16 above and then continue with paragraph 19 below.

19. Operational Check

Plug Headset HS-18, HS-23, or HS-30 into the PHONES jack, remove the screw cap from the MAG MIC jack, and plug magnetic Microphone T-33 or T-45 into this jack. Throw the ON-OFF switch to the ON position; the pilot lamp should light.

a. Press the microphone push-to-talk button. The characteristic dynamotor hum may be faintly heard in the headset. Now talk into the microphone; the sidetone heard must be free from disturbing distortion and noise. Remove the magnetic microphone by pulling its plug from the MAG MIC jack. Plug a carbon microphone, such as Microphone T-17 or T-30, into the CARBON MIC jack, and repeat speech test procedure.

b. VOLUME control, P201, is checked by turning knob from extreme counter-clockwise position to full clockwise position. The volume of the sidetone heard should increase without a crackling noise. If crackling is heard, replace VOLUME control.

c. Output volume may be checked by connecting the output meter of Test Set I-56-(*) between terminal 20 of plug PG201 and the chassis. Set output meter on scale approximately 0-100 volts and shout loudly into the microphone. The output meter should indicate between 60 and 80 volts.

d. If any of the tests in *a, b,* and *c* above indicate trouble, see sections IV and VI for location of faulty stage or part.

SECTION VIII

INDIVIDUAL STAGE AND CIRCUIT REPAIR DATA

20. General

This section presents information and data for the repair of individual stages and circuits and for location of parts. Schematic diagrams are shown for each stage and are preceded by a parts list which includes circuit designation, stock number, name, value, and function.

21. Parts List for First A-F Amplifier, V201 (fig. 18)

Figure 18. Interphone Amplifier BC-605-(*), first a-f stage schematic diagram.

Ref. symbol	Signal Corps stock No.	Name of part and description	Function
T201	2C6494A/T2	Input transformer	Impresses voice signal on grid of V201.
R218	3Z6030-12	Resistor, 300-ohm, ½-watt	Carbon microphone input shunt.
R203	3Z4550	Resistor, 100,000-ohm, ½-watt.....	Input transformer load.
R204	3Z4525	Resistor, 1,000-ohm, ½-watt.....	Carbon microphone coupling.
R217	3Z4608	Resistor, 100,000-ohm, 1-watt.....	Preamplifier plate.
C204	3DA500-27	Capacitor, type DYRT-6050, 0.5-mf, 600-v dc.	Interstage coupling.
R208	3Z4529	Resistor, 10,000-ohm, ½-watt.....	Preamplifier plate filter.
C203.2	3DA100-29	Capacitor, type DYRT-6111, 1 of 3 sections, 0.1-mf, 600-v dc.	Preamplifier plate filter.
R205	3Z4801/A25	Resistor, 1¾ inch, type Z, 1.25-ohm, ±5%	Preamplifier bias.
C203.1	Same as C203.2 above.	Capacitor, same as C203.2 above.....	First audio screen by-pass.
R219	3Z6670-1	Resistor, 70,000-ohm, ½-watt.....	Preamplifier screen shunt.
R207	3Z6725-5	Resistor, 250,000-ohm, 1-watt.....	Preamplifier screen.
C201	3DA500-27	Capacitor, type DYRT 0.5-mf, 600-v dc.	Carbon microphone coupling.
R201	3Z6010-18	Resistor, 100-ohm, ½-watt	Carbon microphone series.
R202	3Z6020-7	Resistor, 200-ohm, ½-watt	Carbon microphone filter.
C202	3DA500-27	Capacitor, type DYRT 0.5-mf, ½-watt.....	Carbon microphone filter.
J201	2Z5575	Jack, WE 249B, with nickel-plated sleeve.....	Carbon microphone.
C203.1	3DA100-29	Capacitor, type (DYRT-6111, 1 of 3) sections, 0.1-mf, 600-v dc.	Screen grid filter.

22. Parts List for Second A-f Amplifier, V202 (fig. 19)

Ref. symbol	Signal Corps stock No.	Name of part and description	Function
C204	3DA500-27	Capacitor, type DYRT-6050, 0.5-mf, 600-v dc.	Interstage coupling.
R209	3Z4549	Resistor, 40,000-ohm, ½-watt.....	Amplifier grid.
R215	3Z4529	Resistor, 10,000-ohm, ½-watt	Amplifier bias.
C203.3*	3DA100-29	Capacitor, type DYRT-6111, 1 of 3 sections, 0.1-mf, 600-v dc.	Amplifier bias filter.
C211	3DA5-14	Capacitor, type 1W, 0.005-mf, ± 10%, 300-v dc.	Amplifier output filter.
T202	2C4403A/T3	Transformer, WE drawing number KS-8714..	Output transformer.
P201	2Z7288-3	Potentiometer, type CP, 50,000-ohm, B taper, ½-inch long shaft, nickel-plated parts as per IRC drawing ESL-680243-6.	Output transformer volume control.
R218	3Z4529	Resistor, 10,000-ohm, ½-watt.....	Local output.
J203	2C4403A/J1	Jack, per WE drawing ESO-678686-1.....	Headset.
J204	2C4403A/J1	Jack, per WE drawing ESO-678686-1.....	Headset.
R210	3Z6610	Resistor, 10,000-ohm, 2-watt.....	Amplifier screen.
C206	3DA500-27	Capacitor, type DYRT-6050, 0.5-mf, 600-v dc.	Screen by-pass.
R214	3Z4802-1	Resistor, 2-inch, type T, 2-ohm, ± 3%.....	Filament series.
R206	3Z4801-1	Resistor, 1¾-inch, type Z, 1-ohm, ± 5%.....	Amplifier bias.
C210	3DB2.6020	Capacitor, TLA-6020 2-mf, 600-v dc.....	H. U. filter.

* Capacitor C203.3 is the third section of the 3-section capacitor. The other two sections (C203.2 and C203.1) are used in the first a-f stage.

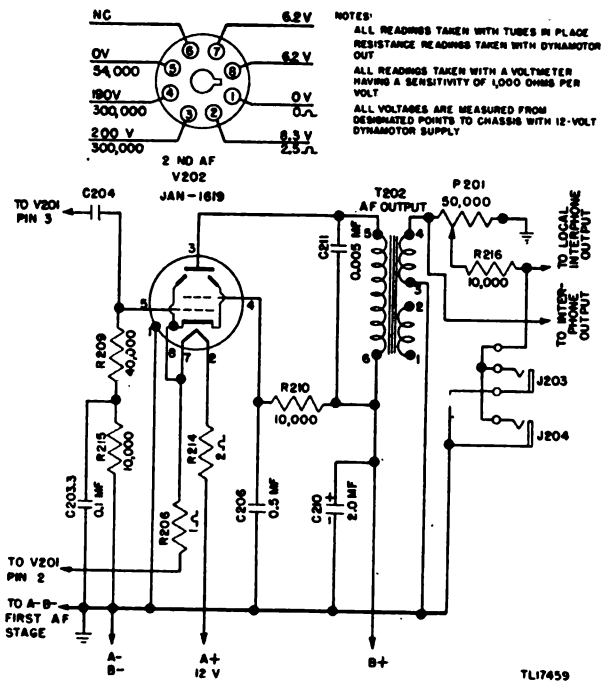

Figure 19. Interphone Amplifier BC-605-(*), second a-f stage schematic diagram.

23. Parts List for Power Control Circuit (fig. 20)

Ref. symbol	Signal Corps stock No.	Name of part and description	Function
S201	2C6494A/R3	Relay, AO, per Allied drawing ESO-680329-1. Coil resistance 80-ohms, ± 5%.	Earlier model per S201 below (interchangeable).
S201	2G1617A/R2	Relay, BO, per Allied drawing ESO-680329-5. Coil resistance 75-84 ohms.	Dynamotor starting.
C212	2C6494A/C5	Capacitor, type AVL, electrolytic, 4-mf, 50-v dc.	Dynamotor relay filter.
R213	3Z4814	Resistor, 2-inch, type B, 14-ohm, ± 5%.....	Filament series.
R220	3Z4814	Resistor, 2-inch, type B, 14-ohm, ± 5%.....	Filament, 24-v operation.
R211	3Z4880	Resistor, 1¾-inch, W-L type Z, 80-ohm ± 10%	Dynamotor relay series.
F201	3Z1924	Fuse, FU-24, 4 AG, 15-a.....	Fuse.
D201	2C1617A/S3	DPST switch per H & H drawing ESO-676800-7.	Power supply.
PG-201	2C1617A/P1	Plug per Cann drawing ESO-677409-21.....	External connections.
PG-202	2Z7228	Plug, Jones P-318-Ab.....	Dynamotor.
J202	2Z1617A/R1	Jack, receptacle No. AN-3102-14S-2S, including Cap No. 9760-14G less chain as per Amph drawing ESO-680353-3.	Magnetic microphone.

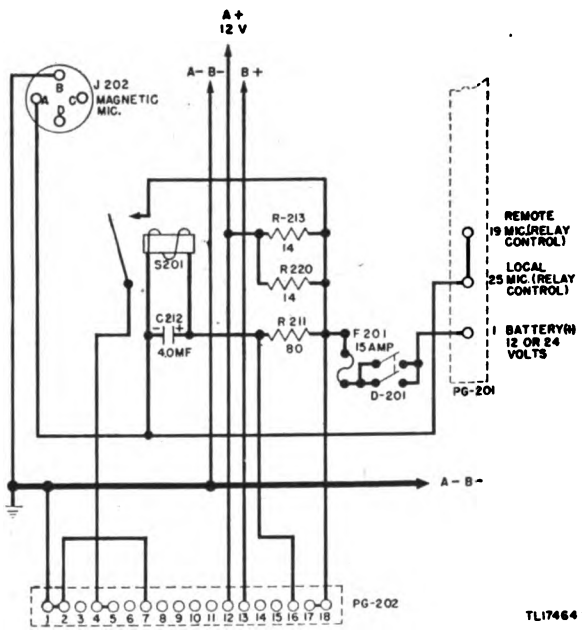

Figure 20. Interphone Amplifier BC-605-(*), power controls.

SUPPLEMENTARY DATA

24. Method of Replacement of Parts Requiring Special Techniques

a. RELAY S201 OR BO. See figures 10 and 11. Carefully unsolder and label all wiring to the relay. Wires are identified to prevent confusion when relay is replaced. Then remove the relay from the chassis.

b. PLUG PG201 AND PG202. See figures 10 and 11. Replace: broken, bent, or worn pins; cracked or burnt insulation; very loose, or badly burnt or pitted pins. See figure 21 for instruction for removal of a *typical* plug and associated wiring.

Caution: Label each wire as removed to prevent confusion when plug is replaced.

25. Special Techniques for Servicing

a. RELAY S201. This relay is located as shown in figure 11. Adjustment and service must be made carefully because the relay can very easily be thrown out of alignment.

(1) *Contacts.* Burnish, taking care not to distort flatness and parallelism of contact surfaces. Push the armature of the relay to closed position Notice that the relay contact surfaces touch just before the end of the armature travel.

(2) *Spring.* The spring must be so adjusted that it will hold the armature in the open position against vibration. Pick up the amplifier and shake it to see that the relay stays open.

(3) *Other troubles.* Replace relay if there is any deep nick on it. Replace if coil is burnt or contacts are badly burnt, blackened, pitted, or loosely mounted.

b. TRANSFORMER T201 OR T202. See figure 11. Replace transformer for any of the following reasons: internal shorts or opens; audio howl due to defective coil; and intermittent noisy or unreliable operation.

c. ELECTROLYTIC CAPACITOR C210. Noise test may show much hum and voice distortion. Check this capacitor for capacitance (2 mf). Replace if capacitance is low, leakage high, or if short circuit is indicated.

Note. When testing capacitor with an ohmmeter, apply the lead of proper polarity to the proper terminal (that is, plus to plus and minus to minus).

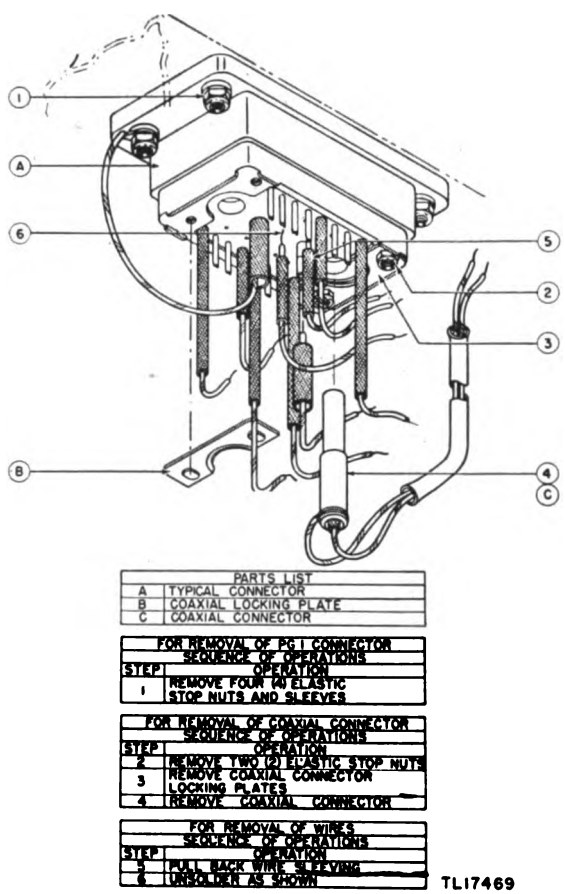

Figure 21. Removal of Typical Terminal Plug.

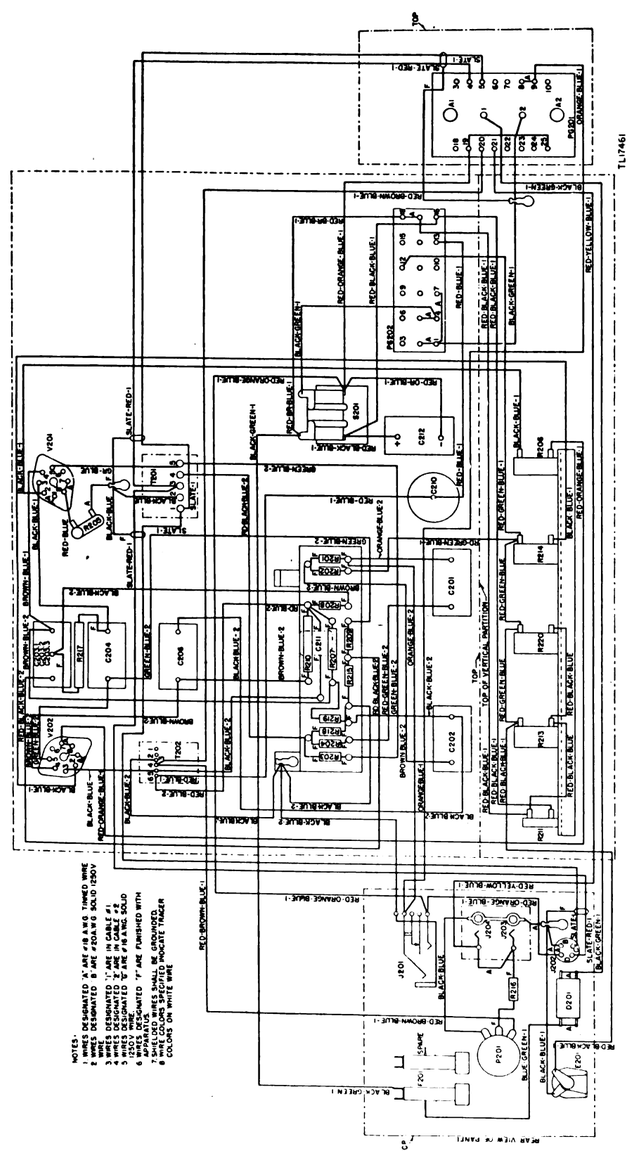

Figure 22. Interphone Amplifier BC-605-(*), wiring diagram.

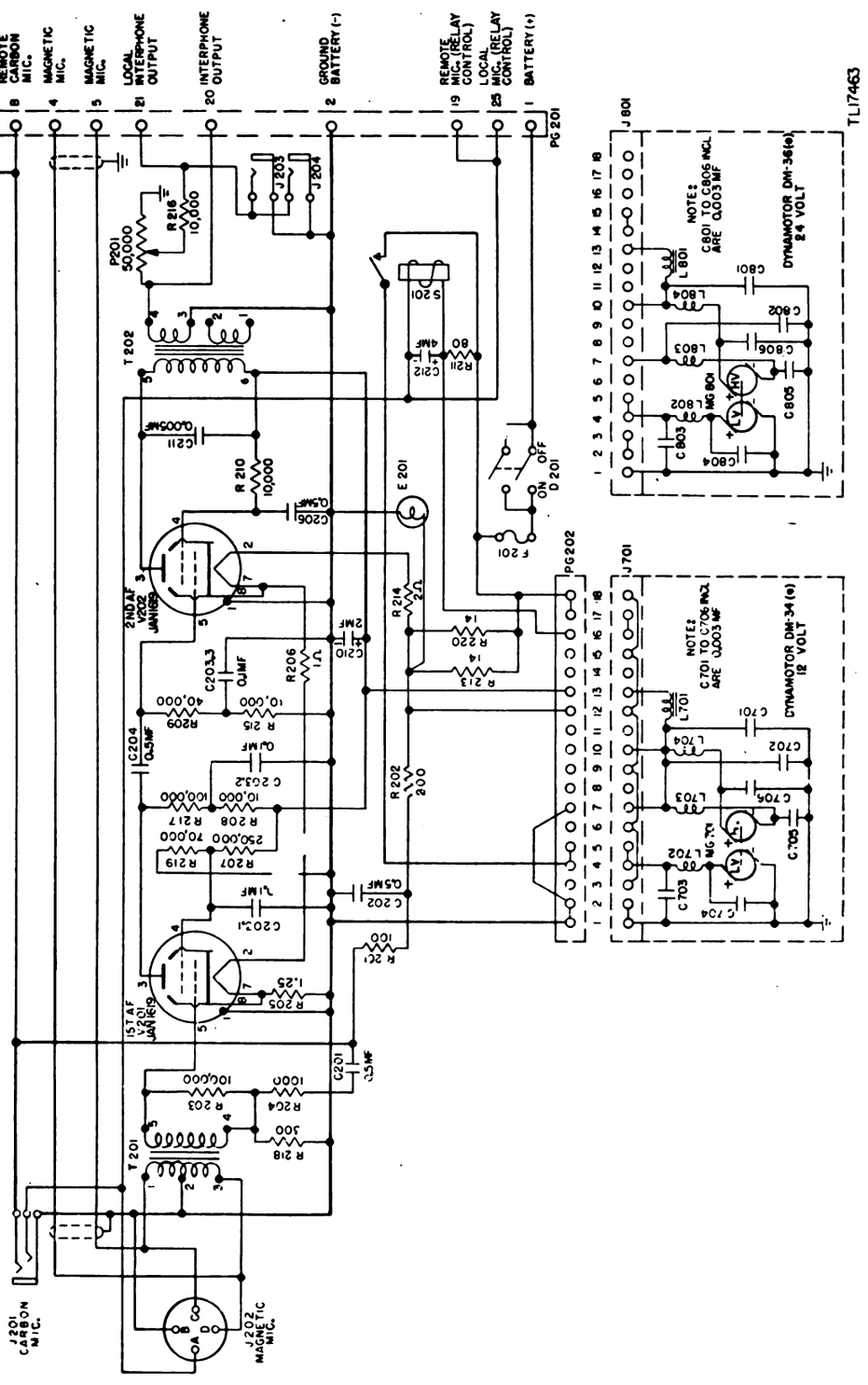

Figure 23. Interphone Amplifier BC-605-(*), schematic diagram.

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