

INSTRUCTIONS
for
MICROPHONE PRE-AMPLIFIER

TYPE 41-B

(MI-4205-D)

(MI-4205-E)



RCA Victor Division
RCA Manufacturing Company, Inc.
Camden, N. J., U. S. A.

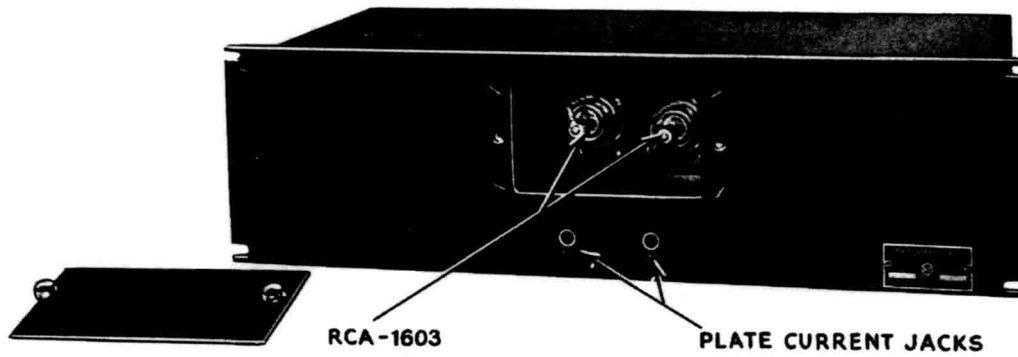


Figure 1—Front view of microphone pre-amplifier, Type 41-B, with tube compartment cover removed

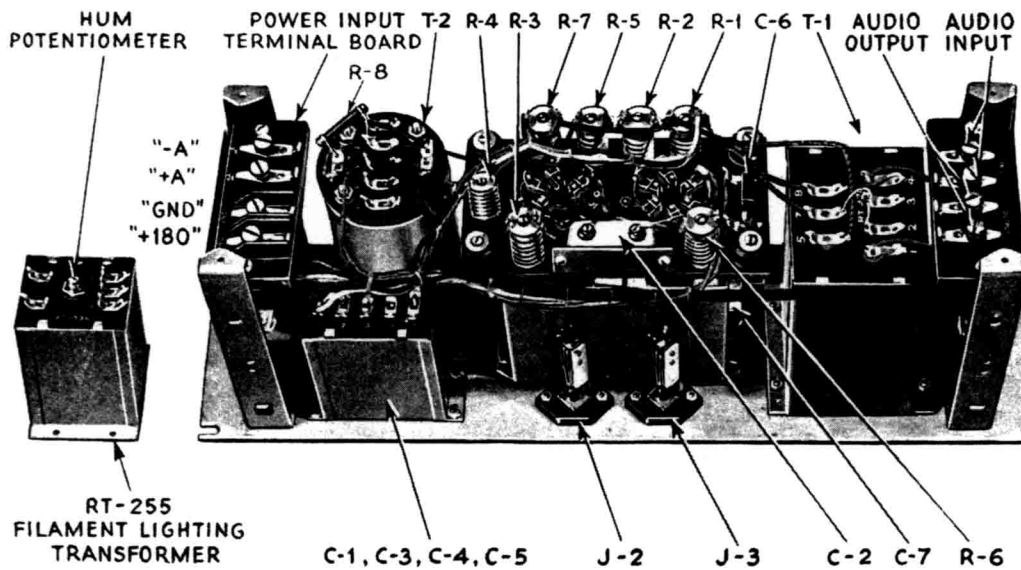


Figure 2—Interior view of microphone pre-amplifier, Type 41-B, with filament lighting transformer, Type RT-255

OPERATING INSTRUCTIONS FOR MICROPHONE PRE-AMPLIFIER TYPE 41-B (MI-4205-D) (MI-4205-E)

PART I—INTRODUCTION

The Type 41-B microphone pre-amplifier is a two-stage amplifier utilizing two RCA-1603 Radiotrons operating as triodes. The tubes are resistance-capacity coupled with transformer coupled input and output circuits. This amplifier is designed to operate at low levels and to feed into a studio voltage amplifier, thus taking the place of the usual microphone amplifier. It is designed especially for use with the velocity microphone, Type 44-A, operating from a 250-ohm microphone circuit and into a load of either 250 ohms or 500 ohms. A total gain of 42 db. may be obtained in the amplifier.

The entire unit is mounted on a panel which is slotted to provide for mounting on standard speech input equipment racks. The tubes are mounted horizontally and readily accessible for inspection or replacement.

PART II—EQUIPMENT

The following equipment is supplied by the manufacturer:

- 1 Type 41-B amplifier as herein described.
- 1 Type RT-255 filament lighting transformer.

The following are required for the proper operation of the amplifier unit:

- 2 RCA-1603* Radiotrons. (RCA-77's may be used but are not recommended for best results.)
- 1 Plate supply voltage source, 180 volts DC.
- 1 Filament supply voltage source, 5.8 to 7.5 volts at the amplifier terminals.
- 1 AC power supply source, 105–125 volts, 25–60 cycles. Necessary only if Type RT-255 filament lighting transformer is to be used.

PART III—SPECIFICATIONS

Input impedance—To operate from a circuit of.....	250 ohms
Output impedance—To operate into a circuit of.....	250 or 500 ohms
Gain.....	42 db.
Plate voltage.....	180 v. DC
Plate current drain.....	4.4 ma.
Filament voltage (across amplifier terminals).....	6.3 v. DC or AC (5.8 to 7.5 v.)
Filament current drain.....	0.6 amp. (0.55 to 0.71 amp.)
Bias supply.....	None required, self-biased
Tubes used.....	2 Radiotrons RCA-1603*
Unit Dimensions.....	$\left\{ \begin{array}{l} 19 \text{ inches wide} \\ 5\frac{3}{4} \text{ inches high} \\ 7\frac{3}{4} \text{ inches deep} \end{array} \right.$

The input transformer is designed to operate from an impedance of 250 ohms, and the 500-ohm output transformer is tapped to provide for connection into a load of either 250 or 500 ohms. The amplifiers are wired for the 250-ohm output connection when shipped.

The amplifier is designed for operation at a nominal filament voltage of 6.3 requiring 0.6 ampere from the filament supply. The plate power supply should be at 180 volts DC and the plate current drain will be approximately 4.4 milliamperes. The plate voltage may be supplied from batteries, or obtained from a rectified source providing it is properly filtered. The filament voltage may be ob-

* NOTE.—The Radiotrons RCA-1603 have the same electrical and physical characteristics as the Radiotrons RCA-77 except that their Microphonic action is less and the signal-to-hiss ratio is better.

tained from batteries or from a 105–125-volt, 25–60-cycle AC source using the Type RT-255 filament lighting transformer.

Jacks are provided for plugging in meters to measure Radiotron plate currents. The jacks are of the type used with a standard tip-and-sleeve type of plug (radio phone plug).

Feed-back problems (cross-talk, howling, etc.) have been minimized by suitable filters in the plate circuits to provide stability when operating from a plate supply in common with other amplifiers. The input transformer is mounted in an individual metal container and the output transformer and plate isolating reactor are mounted in another metal container to prevent external interference and undesired pickup.

PART IV—INSTALLATION AND OPERATION

(a) Installation

In selecting the location for the Type 41-B pre-amplifier, careful consideration should be given to microphonics as well as inductive coupling from stray fields. Special precautions have been taken in the design of the amplifier to guard against the possible pick-up by the input transformer of stray AC fields, but, considering the low audio level at which this amplifier is required to operate, it is not desirable to mount it adjacent to a circuit carrying AC power voltage or adjacent to a filament or plate power rectifier. The tube socket mounting board is shock-mounted, but the pre-amplifier should be located where the mechanical vibration is not liable to be excessive. (Amplifiers which seem to be excessively microphonic should be carefully inspected to see that the tube socket mounting board is flexibly mounted, and various tubes should be tried in the amplifier in order that those selected for this use will have the lowest microphonic content.)

CAUTION.—In handling the amplifier it should never be set on its back side when the cover has been removed, as the resistors may become seriously damaged. When the amplifier is to be inspected, it should be laid upon its side or upon the front panel, care being taken not to scratch the panel.

The amplifier should be mounted on the rack and secured in place by two screws on each side of the panel. With all power turned "off" connect the input and output leads to the terminal strip at the right of the panel when viewed from the rear, and connect the external ground, filament, and plate supplies to the terminal strip at the left of the unit when viewed from the rear.

If AC filament operation from the Type RT-255 filament lighting transformer is to be used, the transformer should be mounted at least three feet from the Type 41-B pre-amplifier in order to avoid any inductive coupling to the input circuit or to the low level microphone circuit. If trouble from excessive hum is encountered, the filament transformer should be oriented so that the minimum disturbance is obtained.

Insert the Radiotrons RCA-1603 in their sockets and attach the clip leads to the contacts at the tops of the tubes.

The wiring to the "+180" and "GND" terminals (plate supply) may be a No. 19 A. W. G., rubber-covered, shielded, twisted pair insulated for 200 volts. In wiring to the "+A" and "-A" terminals (filament supply), No. 14 A. W. G., rubber-covered, shielded leads, insulated for 200 volts, may be used. When the filament supply is obtained from an AC source a shielded twisted pair should be used.

(b) Wiring for AC Filament Operation

If AC filament operation from the Type RT-255 filament lighting transformer is to be used, proceed as follows:

Connect the "GND" terminal of the amplifier to a suitable ground and to the arm of the hum adjusting potentiometer incorporated with the Type RT-255 transformer assembly. (The "GND" terminal must not be connected to either "+A" or "-A" terminals.) The terminals numbered "1" and "2" on the Type RT-255 transformer should be connected to the 105-125-volt, 25-60 cycle, AC line. The transformer terminals numbered "3" and "5" are to be connected to the "+A" and "-A" terminals of the Type 41-B amplifier.

(c) Wiring for DC Filament Operation

If DC filament operation is to be used, proceed as follows:

Connect the amplifier "GND" terminal to the station ground and to either the "+A" or "-A" terminal, *but this connection must agree with the ground connection made in the power supply system.*

It is recommended that the positive plate lead and one side of the DC filament supply be run through power control switches and individual fuses, as such switches and fuses are not provided in this amplifier.

(d) Audio Wiring

The input and output leads should be connected to the amplifier as indicated, and in no case should they be run adjacent to or in the conduit with any power supply circuits. The leads need not be larger than No. 19 A. W. G. and should be a shielded, twisted pair insulated for 200 volts. The Type 41-B amplifier is normally connected for a 250-ohm circuit, but a 500-ohm output connection may be provided by moving the lead from terminal "4" on the output transformer, T-2, to terminal "5" on this transformer.

Be careful to see that the clip leads to the Radiotron caps are separated from each other as far as possible in order to avoid undesirable feed-back effects.

(e) Current Measurements

The plate current of the first stage should be approximately 0.82 milliampere and that of the second stage should be approximately 3.62 milliamperes. If the plate current readings obtained vary greatly from these values, new tubes should be tried in the circuits. The plate currents may be measured by means of the Type 15-B meter panel or similar unit providing the meter-to-plug connections are properly made.

(f) Phasing

When more than one microphone is used in a single pick-up, it is possible that the output of the various microphone circuits may not be in phase when fed into a common circuit. The microphone circuits include the microphones themselves, microphone pre-amplifiers, microphone attenuators (mixers) and the necessary connecting lines. The output of the microphone attenuators (mixers) when fed into the overall attenuator (mixer) must be in phase, or varying degrees of distortion will result, depend-

ing upon the relative placement of the microphones. If two microphones are placed close together, the result will be practically zero output if their circuits are out of phase at the overall mixer.

For this reason each unit of all RCA Victor speech input equipment is carefully wired in accordance with a definite wiring color scheme in order that they will always be in phase when the inter-unit connections have been made according to a uniform plan; *i. e.*, where the “±” connection of *one* microphone is connected to a certain input terminal of its pre-amplifier, then the “±” connection of *all* microphones must be connected to a corresponding terminal of their respective pre-amplifiers, and so on through the system up to the overall mixing control.

In set-ups in which velocity microphones are used, it is possible to phase them by turning those out of phase through 180 degrees. This is not possible with any pressure operated microphone.

It is particularly important that the phasing problem be borne in mind when inspecting, testing, repairing or replacing any unit or component thereof, and care be taken to see that the internal connections of the various units are made strictly in accordance with their wiring diagrams.

(g) Operation

With the amplifier properly connected and the current readings correct, the amplifier is ready for operation.

Observe the plate current of the second stage while a signal is being fed into the amplifier. If the plate current changes with the application of signal voltage it is an indication that this stage is being overloaded and that, therefore, steps should be taken to reduce the input signal voltage. In this case, the microphone may be moved farther from the source of sound, or, if possible, the volume of sound emanating from the source should be reduced, or, if a mixer is used ahead of the pre-amplifier, its control may be adjusted so as to reduce the input voltage to the pre-amplifier.

If desired the gain of the 41-B Amplifier (MI-4205E) may be reduced 8 db. by moving the green lead (connecting the grid cap of the second stage to terminal No. 3 on R-9) from terminal No. 3 to terminal No. 2 on R-9. Also the green lead on C-2 side of R-6 should be disconnected at R-6 and soldered to terminal No. 2 on R-9.

(h) Maintenance

With a stable source of plate and filament voltages, this amplifier will give satisfactory service over a long period of time. If the amplifier becomes unstable or noisy, Radiotrons should be checked and replaced by removing the access door which is held in place in the front panel by two thumb screws. The tube socket, and Radiotron cap contacts should be cleaned with carbon tetrachloride or crocus cloth at least once every three months to insure noiseless operation.

PART V—LOCATION OF TROUBLES

(a) Filaments Do Not Light

If both tubes fail to light it may generally be supposed that the filament supply circuit is open or defective. Check the setting of all filament power supply switches and the condition of all fuses in this circuit.

If one tube should fail to light while the other does, the tube which fails to light is probably burned out, its socket contacts are not properly made, or there is a defect in the wiring to its socket.

(b) No Plate Current in Either Stage

If no plate current reading can be obtained in either stage, check the setting of all plate power supply switches and the condition of all fuses in this circuit. Also, measure the plate supply voltage at the amplifier terminal board to see that power is available and that its polarity is correct. This test should be made between the “GND” and “+180” terminals in every case. If the foregoing steps do not disclose the defect, the amplifier wiring should be carefully checked.

(c) No Plate Current in One Stage

If a plate current reading can be obtained in one stage but not in the other, place a new tube in the non-operating stage. If this procedure does not remedy the trouble, check the amplifier wiring and test for open bias resistors, open plate resistors, open output transformer primary, or open plate filter reactor.

(d) Excessive Plate Current

Excessive plate current readings may be due to defective tubes, defective by-pass capacitors C-1, C-3, C-4, C-5 and C-7, defective coupling capacitor C-2, defective or short-circuited plate loading resistors R-2, R-4, R-5, R-8 and R-10, or failure to properly attach the grid caps on the Radiotrons.

All of these failures, with the exception of the failure of C-1, C-3, C-4 and/or C-7, can be checked by measuring the plate current on the proper jack. To check the failure of C-1, C-3, C-4 and C-7, it will be necessary to check the total plate current drain in the B+ supply against the plate currents of each tube.

(e) No Signal At Output Terminals

If no signals can be obtained at the output terminals, measure the Radiotron plate currents, see that the tubes are lit and that their grid caps are in place, and, if necessary, replace the tubes with others known to be in good operating condition.

If the trouble is not disclosed as a result of the above tests, use a pair of head phones, connected through two 0.5 mfd. capacitors to a pair of test leads, to determine in what part of the circuit the signal is lost. These phones may be connected across the following points in the order given and signals should be heard: Input terminals; primary of the input transformer T-1, terminals “1” and “4”; secondary of the input transformer T-1, terminals “5” and “6”; grid cap on first tube and ground;

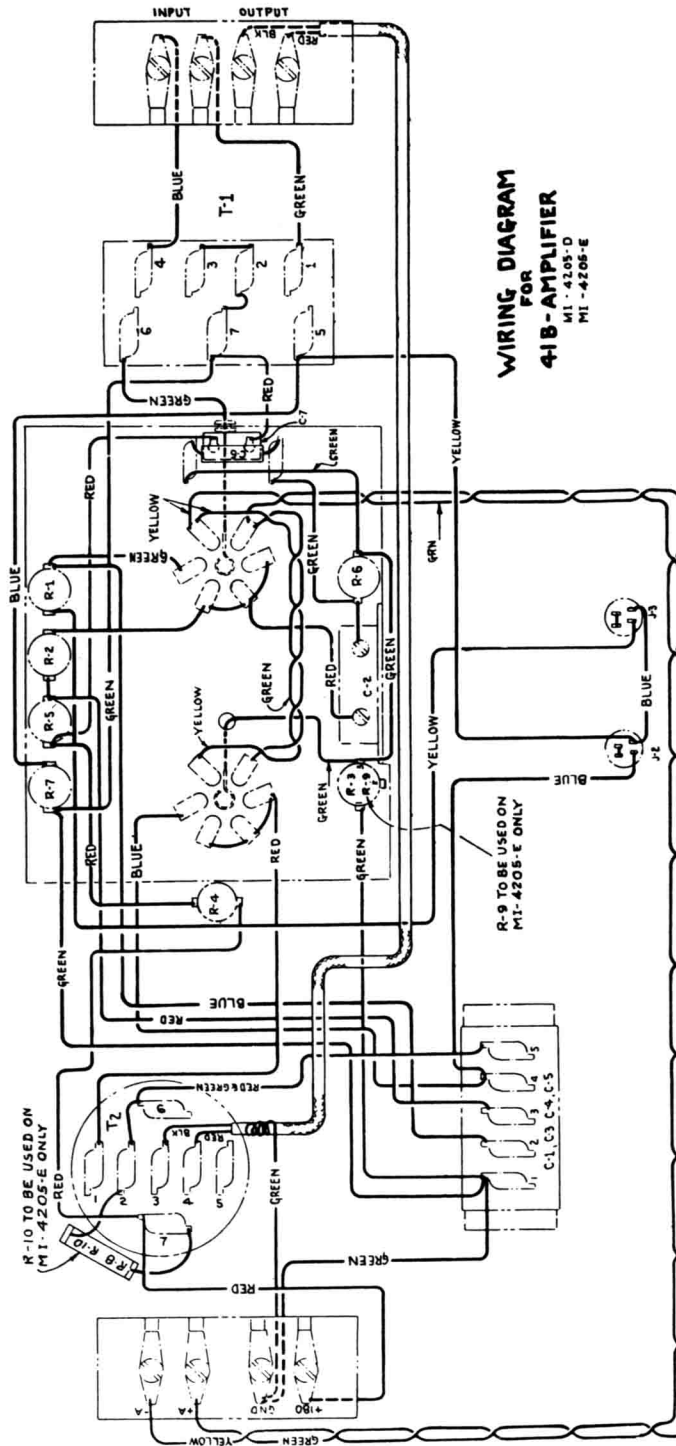


Figure 3—Wiring of Type 41-B microphone pre-amplifier (P-705556)

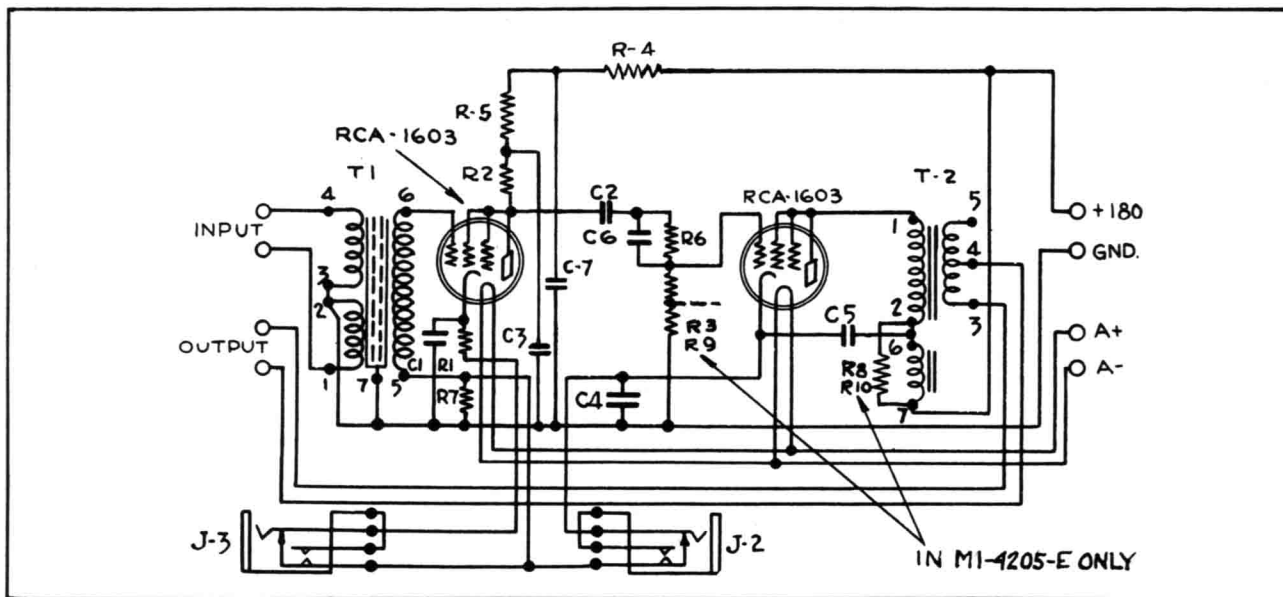


Figure 4—Schematic wiring diagram of Type 41-B microphone pre-amplifier (K-821135)

grid cap on second tube and ground; primary of the output transformer, T-2, terminals "1" and "2"; secondary of output transformer, T-2, terminals "3" and "4" (or "3" and "5" if 500-ohm output connection is used); and, finally, the output terminals of the amplifier. A capacitor charging click may be expected when testing from the Radiotron grid caps to ground.

By following the above routine test it should be possible to localize the trouble. It is well to note that trouble arising from the fixed parts of the circuit, except transformers, is usually accompanied by changes in plate current, bias voltage, or both.

In testing for signals across the input terminals, input transformer, and grid of the first tube to ground, some other source of signal should be used in place of the microphone, such as the output of a phonograph, in order that the signal may be heard in an ordinary pair of headphones.

(f) Noisy Operation

Special care should be taken first to ascertain that the noise is not originating in the line or input circuit, or in the power supply equipment. Leakage or dirty cells in the plate battery or defects in the charging equipment may cause noisy operation. Loose switch or fuse contacts in both plate and filament circuits may likewise result in noisy operation.

Atmospheric conditions may cause a deposit to form on the contacts of the tubes and tube sockets which may ultimately result in noise in the amplifier output. See Section IV (h).

(g) Improper Audio Frequency Response

If capacitor C-6 is short-circuited the high frequency response will be reduced. If resistor R-6 is open the low frequency response will be greatly reduced. If resistor R-10 is open, the low frequency response at 30 cycles will be slightly increased. If the reactor between terminals 6 and 7 in T-2 is open,

there will be a decrease in gain and the low frequency response will be decreased.

PART VI—REPLACEMENT PARTS

The following parts list is included to provide proper identification when ordering replacement parts. When ordering specify the item as called for in Figure 4 followed by description and reference drawing. Items are also identified in Figures 1, 2 and 3.

Item	Description	Cat. No.
C-2	Capacitor—0.2 mfd. (CP-120).....	15642
C-1	Capacitor—10.0 mfd. }	15732
C-3	Capacitor—1.0 mfd. }	
C-4	Capacitor—1.0 mfd. }	
C-5	Capacitor—2.0 mfd. }	
C-6	Capacitor—150 mmfd.....	15731
C-7	Capacitor—1.0 mfd.....	15789
J-2	Plate current jack (special W. E. No. 303-A) and mounting	15645
J-3	Plate current jack (special W. E. jack No. 303-A) and mounting	15645
R-1	Resistor—2,250 ohms.....	15413
R-2	Resistor—50,000 ohms.....	15423
R-3	Resistor—200,000 ohms (for MI 4205-D only)	15733
R-4	Resistor—same as R-2.....	15423
R-5	Resistor—same as R-2.....	15423
R-6	Resistor—200,000 ohms.....	15733
R-7	Resistor—1,000 ohms.....	15734
R-8	Resistor—70,000 ohms (for MI 4205-D only)	15946
R-9	Resistor—200,000 ohms tapped at 80,000 ohms (for MI 4205-E only)	17010
R-10	Resistor—120,000 ohms (for MI 4205-E only)	43012
RT-255	Filament lighting transformer	15378
T-1	Input trans. (RT-376).....	15970
T-2	Output trans. and reactor (RT-222).....	15644
—	Tube socket	15381

