

PRELIMINARY SERVICE INFORMATION ON
RCA VICTOR DE LUXE AUTOMATIC RADIO-
PHONOGRAPH MODEL D 22-1

- - - - -

GENERAL DESCRIPTION

The RCA Victor Model D-22-1 is an instrument of deluxe quality and performance. It consists of a thirteen tube, five band radio receiver, a six tube, high level power output amplifier and a three tube dynamic amplifier. An automatic phonograph is part of the assembly. Home recording facilities are provided so that records may be made of a radio-program or by means of a microphone which is included with the equipment. The high level of sound energy obtainable from the output of the instrument is capably handled by two of the new Super-Sensitive, twelve-inch, dynamic loudspeakers. The important features which make this instrument outstanding are as follows:

Dynamic Amplifier:

Limitations imposed by present methods of disc recording necessitate a constricted range of sound intensity which may be recorded. The minimum intensity of sound which may be recorded is determined by unavoidable record surface noise which would mask the recorded sound if such sound approaches the intensity of the noise. The maximum sound intensity which may be recorded is determined by the thickness of the record groove wall into which the record cutting stylus makes an impression of the original sound. The depth of cutting is, therefore, regulated so that the stylus will not break over into the adjacent groove. It is because of these two upper and lower limits that the sound reproduction cannot be identical to the original sound which is produced in the recording studio. To prevent the recorded sound from exceeding the limiting intensities, the recording control engineer regulates the recording amplifiers accordingly.

The dynamic amplifier of this reproducing instrument is designed to compensate for the recording limitations of intensity range. It serves to restore the original intensity relations of the recorded sound by varying the amplification of the reproducing amplifier in direct accordance with the average intensity value of the sound. Thus, when there is a prevailing rise in the intensity of the recorded sound, the dynamic amplifier increases in gain accordingly, and conversely when, there is a prevailing tendency toward a decrease of the recorded sound, the dynamic amplifier decreases in gain. The functions of the dynamic amplifier are particularly advantageous in the reproduction of symphonic and certain other types of music where very great ranges of sound intensity are encountered. The dynamic amplifier causes the very loud or fortissimo and the very soft or pianissimo, passages to be reproduced in their natural relations, although they have been somewhat suppressed in the actual recording.

Power Amplifier:

In order that the dynamic amplifier may bring about its designed purpose, the amplifier and reproducing system into which it works must have an undistorted range of amplification consistent with the degree of volume expansion provided in the dynamic amplifier. The power

amplifier is, therefore, designed to have a maximum output of 25 watts. This unusually high level is obtainable from four RCA-2A3 Radiotrons which are arranged in a parallel push pull Class "A" system. The two twelve-inch loudspeakers faithfully reproduce the amplified sound at all intensities from the minimum to the maximum.

ELECTRICAL CIRCUITS

The circuits of this instrument are arranged so that for the radio function, the incoming signal is amplified and detected in the normal process and is then transmitted to the power output amplifier through a driver stage which is part of the radio chassis. The phonograph function is accomplished through a system which includes the dynamic amplifier, a separate driver stage and the same power amplifier as used for radio. These circuits are controlled by means of a ganged rotary switch which is attached to the motor board in the record playing compartment. An indicating system of pilot lamp behind an engraved window, readily displays to the operator the position of the change-over switch. It is to be noted that the dynamic amplifier works only in conjunction with the phonograph function. A control is included so that "dynamic amplification" may be eliminated if desired by the listener. The following features of electrical design are of particular importance:

Dynamic Amplifier:

The purpose of this unit has been previously described. Electrically, it consists of an RCA-6L7 operating as audio expander amplifier, an RCA-6C5 operating as an audio amplifier which in turn feeds an RCA-6C5 operating as an audio rectifier. The audio signal obtained from the magnetic pick-up is boosted by the input transformer and then fed to the paralleled inputs of the RCA-6L7 expander and the RCA-6C5 amplifier. Compensation filters are associated with the input transformer circuit to correct the frequency response of the reproducing system so as to compensate for the recording characteristic. The signal from the input transformer is supplied to the first control grid of the RCA-6L7 through the manual volume control potentiometer (R-218) and is simultaneously applied through the expander control (R-204) to the control grid of the first RCA-6C5. The signal applied to this latter tube is first amplified and then fed to the RCA-6C5 audio rectifier stage. This latter stage rectifies the audio signal by operating as a diode. Its output is of the nature of a pulsating direct current, the amount varying in direct relation with the average value of intensity of the audio signal. The pulsating voltage due to rectification in the RCA-6C5 appears across resistor (R-207) and is applied through a delay filter (R-202 and C-203), to an auxiliary control grid of the RCA-6L7. The value of the bias on this auxiliary control grid determines the amplification of the RCA-6L7 expander stage. The gain of the dynamic amplifier is therefore automatically regulated by the average intensity of the audio signal.

Power Amplifier:

The power amplifier unit contains four RCA-2A3 Radiotrons and a single RCA-5Z3 rectifier Radiotron. The amplifier tubes are arranged in push-pull parallel and are operated with fixed bias. Their grids

are coupled to the radio chassis directly through a coupling transformer (T-3). The same grids are coupled to the phonograph driver stage (RCA-6D5) through another transformer (T-102). There are two power transformers in the power supply system, one supplying the high voltage necessary for the plate circuits, and the other supplying the heater voltages needed on the tubes of the power amplifier and dynamic amplifier. The home recording indicator lamps are supplied from the plate circuit of the power amplifier stage. The high level of audio energy from the output stage is delivered to the two heavy duty Super-Sensitive electro-dynamic loudspeakers through a step-down matching transformer. Suitable switching is incorporated in the voice coil circuit for connecting in the pickup as a cutting head for home recording.

NOTE: - Refer to the C-15-3 Service Notes for further information as to radio operation and circuits.

IMPORTANT SERVICE DATA
ON THE
DYNAMIC AMPLIFIER

It is essential that the correct voltages and currents exist at the RCA-6L7 audio expander in order that the expanding function may take place in the proper manner. A screw driver adjustment (located at the front of dynamic amplifier base near 6C5 tube and accessible from top through hole in base) is accordingly provided for regulating the fixed bias of the 6L7 auxiliary grid so that the plate current may be adjusted to the correct value under a no signal condition. This current should be adjusted to a value of 0.10-0.13 ma with no signal input to the dynamic amplifier and with a normal voltage of 275 volts appearing across the resistance-divider system (R-211, R-210, R-209 and R-208).

A substitute method for adjusting the RCA-6L7 no signal characteristic is by means of a voltmeter having an internal resistance of 600,000 ohms (600 volt range - 1000 ohms per volt-meter). This voltmeter should be used to set the plate (of the 6L7) to chassis voltage. The plate voltage, as indicated by the specified meter should be adjusted to exactly 195 volts, with a power line supply voltage of 115 volts.

An indication of the operation of the dynamic amplifier may be obtained by playing a record which has predominating loudness. Such a record is Victor Red Seal Record No. 8651 - "Die Fledermaus" - Overture. The plate current during the playing of such a record should increase from the static value of 0.10-0.13 ma to a minimum of 0.55 ma. Variations of the Radiotron (RCA-6L7) in the audio expander stage may affect operation of the circuit. Several tubes of such type should therefore be tried when correct performance is not obtainable from a single tube.

NOTE #1: - If excessive hum, that is hum in excess of normal test limits, is encountered, it is recommended that a different RCA-6L7 be tried in the expander unit. If this does not reduce the hum to a low enough value try reversing the power line supply cord plug and/or the power amplifier supply plug to obtain a condition of minimum hum. The continuity of ground connections between chassis, expander unit and power amplifier should be of very low resistance to maintain minimum hum.

NOTE #2: - For other information we suggest you read over the instructions accompanying the D-22-1 very carefully. Proper manipulation of the two phonograph tone controls will, of course, give well-balanced reproduction of various types of recordings. The low frequency tone control is the left-hand control (when facing the cabinet) in the playing compartment, and for maximum lows should, be in the full counter-clockwise position. The high frequency tone control is the right hand control and for maximum highs should be in the full clockwise position.