Electro-Voice®

ELECTRO-VOICE, INC.
BUCHANAN, MICHIGAN

Specifications and Instructions
Model A20CL Lowboy Amplifier
20-watt Circlotron High-Fidelity Amplifier with Controls

Fig. 1—Model A20CL Lowboy Amplifier

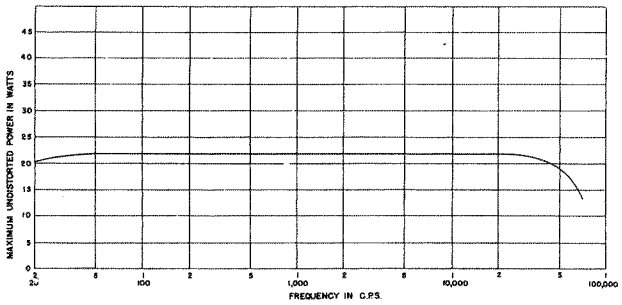


Fig. 2—Maximum Undistorted Power vs. Frequency

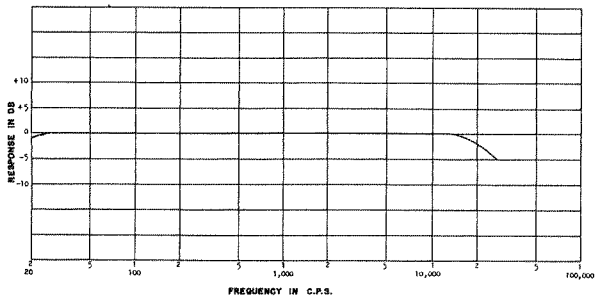


Fig. 3—Frequency Response at 5-watt Level

GENERAL DESCRIPTION — The Electro-Voice Model A20CL is a lowboy styled, self-powered preamplifier, amplifier and music control center for use with ultra-linear ceramic phonograph cartridges, crystal phonograph cartridges, low and high-level magnetic phonograph cartridges, tuner, television, and tape reproducers.

The A20CL is designed with a basic modular height and thus may be stacked in equal height with the Electro-Voice Model A15CL lowboy amplifier and Models 3305 and 3306 lowboy tuners or double stacked to match Models 3303 and 3304 stereophonic tuners. The brushed-brass and rich brown baked enamel finish presents an attractive appearance which will blend with contemporary room decors.

FEATURES — The Model A20CL power amplifier employs the new Wiggins Circlotron circuit. DC output current is removed from the output transformer through the use of a bridge circuit. All switching transients are eliminated through unity coupling between output tubes. The primary impedance of the output transformer is one quarter of that found in conventional amplifier output circuits, allowing an increase in power output at extremes of the frequency spectrum.

A damping factor control permits perfect coupling between the amplifier and loudspeaker system eliminating the usual loss of bass from overdamping or hangover due to underdamping. For the first time, through the use of this control, optimum operation of any speaker system is assured.

The music control center of the A20CL has available an infinite number of variable frequency response curves. Many features such as loudness compensation and continuously variable presence rise have been patterned after precepts laid down in the design of professional equipment.

The 6-position phono-equalizer switch is effective on both the magnetic and ceramic (high-impedance) phono channels. A recording signal, available at the record output jack, is affected by the equalizer circuits, but not by the volume and response varying controls.

SPECIFICATIONS

Power Output:	20 watts rated, 40 watts on peaks See Fig. 2 "Maximum Undistorted Power vs. Frequency"
Frequency Response:	±1 db 20 to 20,000 cps at rated output See Fig. 3 "Frequency Response"
Harmonic Distortion:	Less than 0.5% at rated output
Intermodulation Distortion:	Less than 0.8% at rated output See Fig. 4 "Power vs. Intermodulation Distortion"
Hum and Noise:	75 db below rated output at maximum volume setting 60 db below rated output through magnetic preamplifier
Speaker Output:	4 ohms, 8 ohms, 16 ohms
Record Output:	0.5 V RMS rated, 4 V RMS, maximum from RECORD OUT jack
Record Output Imp.:	50K ohms (to work into 250K ohms minimum load)
Feedback:	Loop feedback: 16 db negative Drive plate: 2 db positive Output circuit: 19 db negative Total 33 db negative

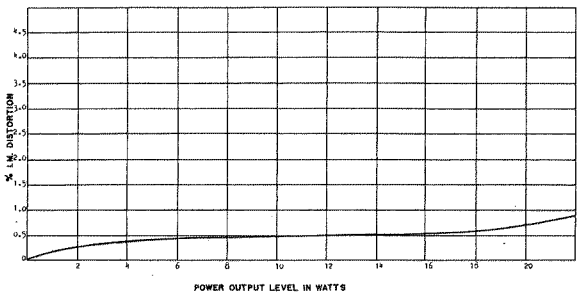
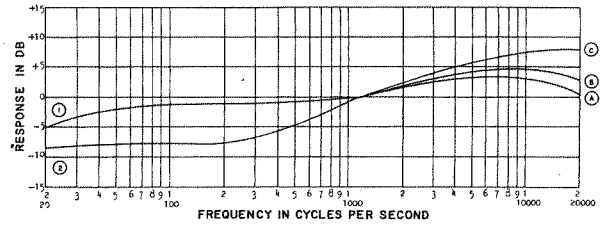


Fig. 4—Power vs. Intermodulation Distortion



KEY:
- 1B RIAA
- 1A LP
- 1C European 500 cycle crossover
- 2C European 300 cycle crossover
- 1A 78-500 cycle crossover
- 2A 78-300 cycle crossover

Fig. 5—Record Equalizer Positions

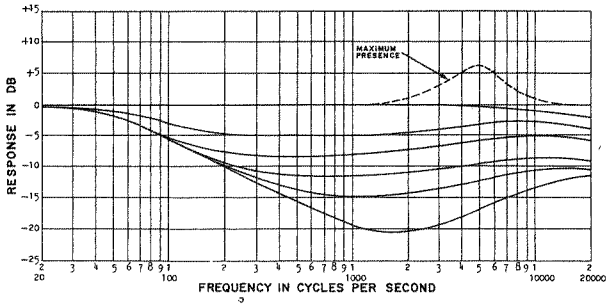


Fig. 6—Loudness Compensation Contours and Presence Rise

Damping factor:	Adjustable between 0.1 and 15. See table for critical damping factors of all E-V speakers.

Inputs:	Sensitivity	Impedance	Maximum Input
High-impedance Phono	0.5 V	6.5 MEG	4 V
Magnetic Phono	12 MV at 1 kc	47 K	150 MV at 1 kc
Tuner	0.5 V	270 K	4 V
Tape	0.5 V	270 K	4 V
TV	0.5 V	270 K	4 V
Auxiliary	0.5 V	270 K	4 V

Controls:

Rear Chassis: Magnetic-Ceramic Phono Switch
2 Hum adjustments

Front Panel:

a. Selector-Record Compensator (10 position)
Phono-Equalizer Positions
RIAA
LP
European 500 cycle crossover
European 300 cycle crossover
78 RPM 500 cycle crossover
78 RPM 300 cycle crossover
See Fig. 5 "Phono-Equalizer Positions"
b. Volume
c. Loudness (continuously variable)
See Fig. 6 "Loudness Compensation Contours and Presence Rise"
d. Presence (continuously variable)
e. Treble
f. Bass—Power switch
See Fig. 7 "Tone Control Curves"

Tone Control Range:	Treble: +15 db to —20 db at 10 kc Bass: +20 db to —15 db at 50 cycles
Tubes:	Total of 8 as follows: 3 12AX7 1 12BH7A 2 6V6GT 2 5Y3GT
Power Consumption:	117V 60 cycle AC at 1.15 amps max.
Size:	15 in. wide x 12 in. deep x 4⅛ in. high
Weight:	20 lb. net, 22½ lb. shipping

THEORY OF OPERATION

THE OUTPUT TRANSFORMER AND CIRCUIT — One requirement of a quality high-fidelity amplifier is that it has an output transformer with negligible leakage reactance. This leakage reactance must be low to avoid the transient distortion ordinarily resulting from collapsing currents, in class AB or B operation, when either output tube is driven past cut-off. The transient distortion will appear as a parasitic oscillation in the wave form at the instant of cut-off. A high value of leakage reactance also will cause the output transformer of a conventional amplifier to lose efficiency at high frequencies. The distributed capacity of the output transformer should be very low in order to minimize high-frequency attenuation and phase shift. The Circlotron circuit configuration avoids many of the limitations imposed by the output transformer and overcomes the inherent disadvantages of conventional push-pull output circuits.

Figure 9 is a simplified version of the Wiggins Circlotron circuit. Two power supplies are used and are indicated as batteries. Each power supply is connected from the plate of one tube to the cathode of the other. The plate current of each tube circulates through both power supplies *without traversing the windings of the output transformer.* Because any pair of opposite points in this configuration is equipotential, the circuit is a balanced bridge under "no-signal" conditions.

The total primary winding of the output transformer presents a load to each of the two output tubes. One half of this load is in the cathode circuit, the other half in the plate circuit; the plate load of one tube is the cathode load of the other. Because each tube looks into the same load as the other, the result is unity coupling between the tubes. Despite the residual leakage reactance in the transformer, no switching transients can occur during the operation of the amplifier, for both halves of the transformer primary have the same signal current flowing through them. Thus, through the use of this circuit, troublesome switching transients, normally found in even high-quality amplifiers, are completely eliminated.

The impedance of the primary winding of the output transformer is one fourth that of the transformers in usual amplifiers. Therefore, the Circlotron transformer has much less distributed capacity and leakage reactance, so that a wide frequency response range is much more easily attained.

Low quiescent current in the Circlotron circuit results in higher efficiency and produces more power without exceeding the dissipation ratings of the tubes.

THE DRIVER CIRCUIT — The gain of the Circlotron output stage is almost unity, thus requiring a high drive voltage. This higher voltage is obtained by means of technique called "boot strapping". By this method the B+ supply to the driver stage is dynamically changed as signal voltage changes allowing linear operation over a much wider range.

VARIABLE DAMPING FACTOR — It is necessary for the amplifier to present the correct effective impedance to the speaker for optimum acoustic performance at low frequencies. This value of critical damping resistance varies widely with different speakers, and is dependent upon flux density, type of enclosure, length of conductor in the air gap, and to some extent, the position of the enclosure in the room. The Electro-Voice damping factor control is variable over a wide range so that an optimum match can be made between the amplifier and any speaker or system. Varying amounts of voltage and current feedback are combined to match the effective impedance while maintaining the *total* feedback at a constant value. The maximum power available from the amplifier is independent of the damping factor, remaining constant at all settings of the control.

INSTRUCTIONS FOR SET-UP AND OPERATION

Immediately upon unpacking the A20CL lowboy amplifier carefully inspect it for physical damage. If damage is evidenced, notify the dealer from whom the unit was purchased, or the transportation company if the unit was shipped to you. Responsibility for shipping damage lies with the carrier and claim should be made for recovery.

MOUNTING — The A20CL is designed to operate in either horizontal or vertical position and is supplied with felt feet to prevent marring the surface on which it is placed. Because the A20CL is designed for convenient front installation, no knob extensions are required for panel mounting. The panel cutout should be approximately 14⅝" by 3 13/16". Small variations of these dimensions are permissible for they will be covered by the 3/16" overhang of the A20CL front panel. Remove the felt feet from the A20CL bottom plate before installation. For permanent mounting, the four mounting clips provided may be used. The clips are engaged in the slots on the A20CL bottom plate as shown in Fig. 10. Then, after placing the A20CL in position, use a screwdriver to rotate the clips 90° and fasten to the mounting board with the screws provided. Reasonable ventilation is required, and the unit should not be operated in small, completely enclosed spaces. The clips may also be used for permanent horizontal mounting. Under unusual conditions of very restricted ventilation, the tube and component cover may be removed to assist cooling.

PREPARATION FOR USE — Make certain that all tubes are firmly seated in the proper sockets as marked. Connect the loudspeaker or other load to the amplifier. Matching to any load between approximately 3 and 20 ohms may be obtained from the screw terminals on the rear apron of the amplifier. Use the terminal marked "COMMON" and either "4", "8", or "16", whichever is nearest the load impedance. *It is not permissible to connect either of the output terminals to any chassis-ground; to do so will short out the critical damping control.* If a ground connection is required it should be made directly to the chassis.

The A20CL has available a RECORD OUT jack unaffected by tone and volume controls for connection to tape recorders. The impedance of this output is 50K ohms, and should work into a minimum load of 250K ohms for flat response down to 20 cycles. Maximum shielded cable length for this connection is 5 ft.; longer cables will result in slight attenuation of high frequencies.

Connect input devices to the appropriate jacks on the rear of the amplifier. The AUX input may be used for an additional tuner, tape recorder, or other audio source.

To use this unit with a magnetic tape mechanism without employing the tape machine electronic components, connect the tape head directly to the magnetic input. Place the compensator in the RIAA position and turn the bass control to the "3 o'clock" position. This will provide a playback curve flat ±1½ db for tape speeds of 7½ and 15 inches per second. If the tape machine incorporates a preamplifier, connection should be made to the tape input jack.

ADJUSTMENTS — The hum balance controls on the A20CL should be adjusted with the power amplifier connected, the input selector on phono and the phono pickup connected to the proper input. Adjust the ceramic hum control for minimum hum with the volume control advanced to the extreme clockwise position and the MAGNETIC-CERAMIC phono switch in the CERAMIC position. Then place the switch in the MAGNETIC position and adjust the magnetic hum control to minimum hum. Because the ceramic hum adjustment affects all channels, it should be made regardless of the type of cartridge to be used. The magnetic adjustment need be made only if a magnetic cartridge is used.

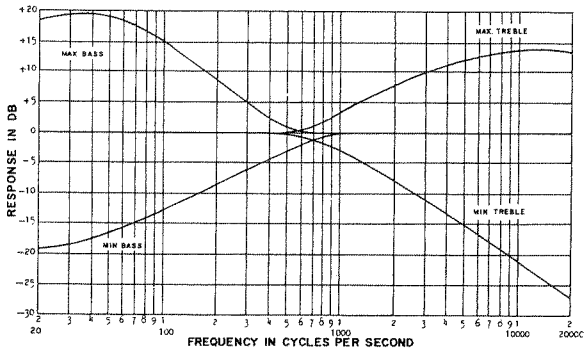


Fig. 7—Tone Control Curves

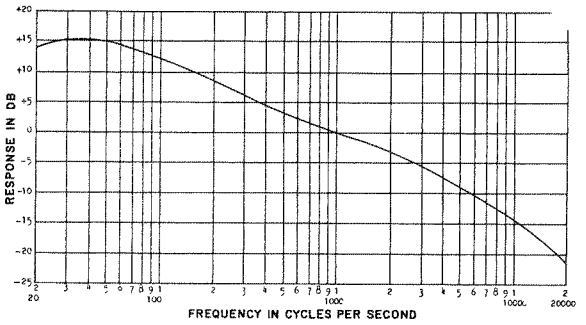


Fig. 8—Magnetic Channel Response in RIAA Position

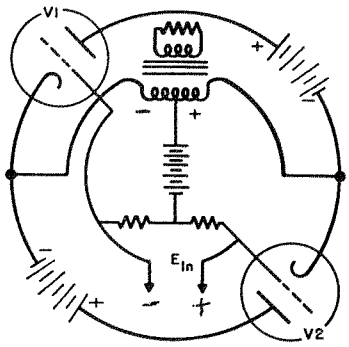


Fig. 9—Simplified Schematic Circlotron Circuit

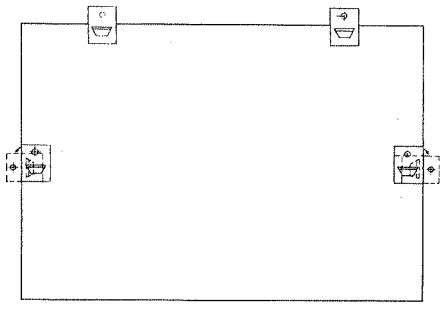


Fig. 10—Affixing Mounting Clips

OPERATION — The A20CL has two power receptacles on the rear of the chassis. The receptacle marked HOT has power available at all times, and the socket marked SWITCHED is energized only when the A20CL power switch is turned on. Neither socket is fused.

The Loudness control provides compensation for the relative insensitivity of the human ear to low and high frequencies at lower listening levels. The volume control should be set to the desired listening level, and the loudness control switch adjusted to most pleasing musical balance.

The Presence control is especially valuable in defining vocal artists from an orchestral accompaniment background. When used at full near position a rise at 5000 cps is introduced, which emphasizes the projection of the human voice. With maximum presence and the treble control at minimum setting, the apparent band width is extended while allowing reduction of the high-frequency components of record scratch and AM selective fading.

Complete equalization for any phonograph cartridge is included in the A20CL preamplifier. Therefore, *no external load resistance should be placed across the magnetic cartridge terminals.* The magnetic preamplifier has been designed to accommodate either low or high-voltage output magnetic pickups.

MICROPHONE INPUT — To use the A20CL with any Hi-Z dynamic microphone, connect the microphone to the MAG input with the magnetic-ceramic switch set in the magnetic position. Turn the playing selector to EUR 500, the bass control to the "9 o'clock" position, and the treble control to maximum clockwise rotation. This will result in reproduction flat ±1.5 db with a sensitivity of 7 millivolts.

SERVICE — The 1½-ampere fuse located on the amplifier is of the "slo-blo" 3AG type and in the event of a component failure, should be replaced with an identical 1½-ampere type. The fuse will not blow in normal operation. In the event of repeated failure: (a) make certain amplifier is mounted and connected in accordance with these instructions, (b) check tubes for possible shorts and replace if necessary, or (c) refer to the dealer from whom purchased for instructions. Access to tubes may be gained by removing the three screws located on the back flange of the top cover assembly. This cover may then be removed. *Caution:* Disconnect line cord from 115-volt source before removing top assembly as high voltage is present in chassis when unit is energized. Do not attempt to operate the amplifier without all tubes in place. In the event that the amplifier is returned to the factory for service, please include a note stating the nature of the defect.

CAUTION NOTES

1. Do not operate amplifier in an overloaded condition for a period of time, since this will substantially shorten the life of the output tubes.
2. Do not attempt to operate the amplifier from a power source other than 105-125V 60 cycle AC.
3. Do not apply power to amplifier unless *all* tubes are in sockets.
4. Do not remove top or bottom covers without first removing line cord from power source.

CRITICAL DAMPING FACTOR CONTROL SETTINGS

Model	Inf. Baffle	Skylark	Baronet	Aristocrat	Empire	Regency	Centurion	Georgian	Patrician	Klipsch
SP8B	1.0		2.0							
SP8C		5.0								
SP12B	2.5			4.0						
SP12	1.0			2.0						
12TRXB	2.5			4.0						
12TRX	1.0			2.0						
12BW	2.5			4.0						
12W	1.0			2.0						
12WK										10.0
SP15B	1.0				2.0	2.0				
SP15	.5				1.0	1.0				
15TRXB	1.0				2.0	2.0				
15TRX	.5				1.0	1.0				
15BW	1.0				2.0	2.0				
15W	.5				1.0	1.0				
15BWK							10.0			10.0
15WK							10.0	10.0		10.0
18W	1.0									
18WK									10.0	10.0

PARTS LIST

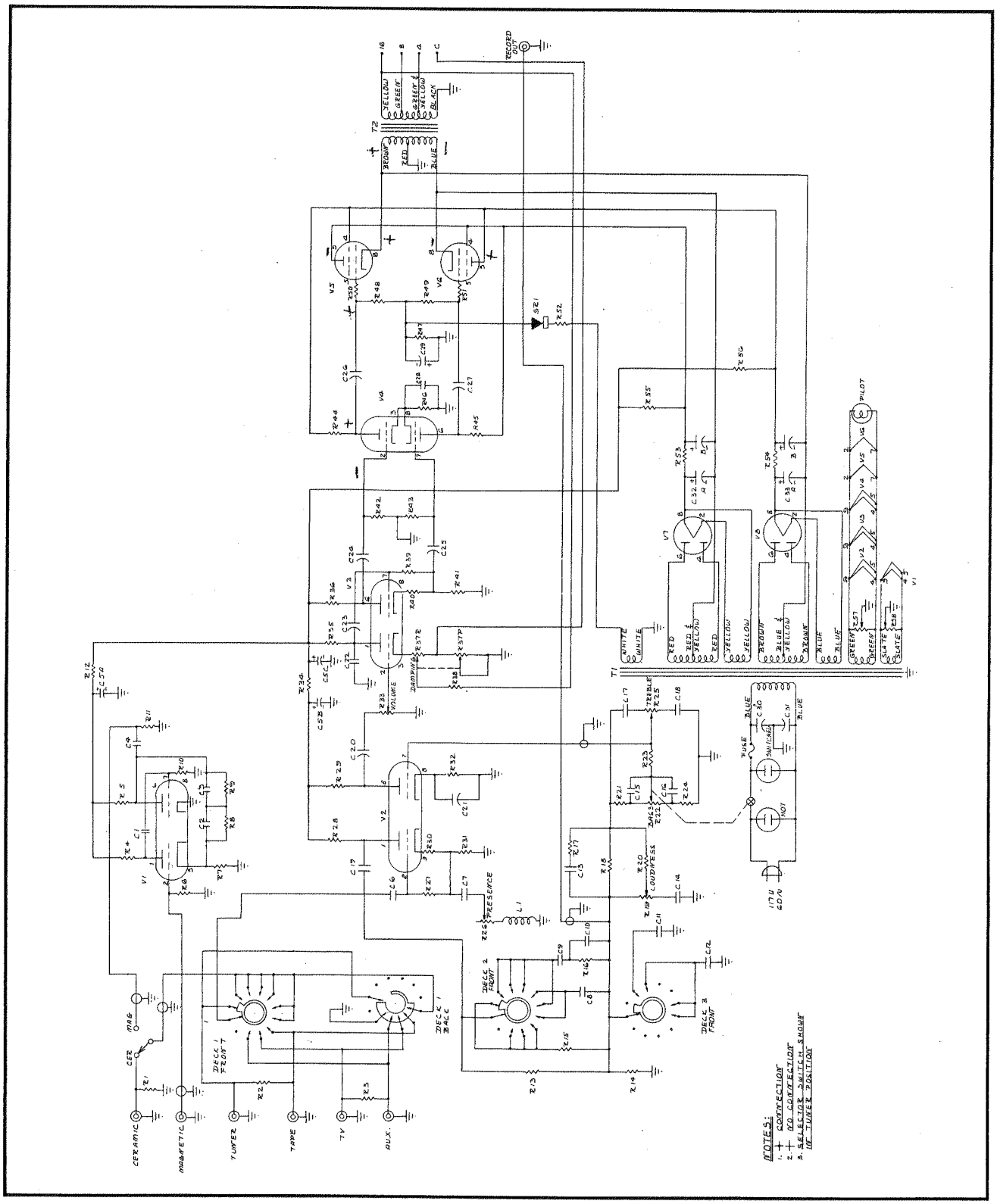
Key	Description	Part No.
C1	Capacitor, .01 MFD, 500 V, Ceramic	4252
C2	Capacitor, .005 MFD, 500 V, Ceramic	42002
C3	Capacitor, .002 MFD, 500 V, Ceramic	4259
C4	Capacitor, .01 MFD, 500 V, Ceramic	4252
C5A, C5B, C5C	Capacitor, 20-20-20 MFD, 350 V, Electrolytic	42045
C6	Capacitor, .01 MFD, 500 V, Ceramic	4252
C7	Capacitor, .0068 MFD, 400 V, Plastic Tubular	4262
C8	Capacitor, .001 MFD, 500 V, Ceramic	4258
C9	Capacitor, .01 MFD, 500 V, Ceramic	4257
C10	Capacitor, 500 MMF, 500 V, Ceramic	42003
C11	Capacitor, 500 MMF, 500 V, Ceramic	42003
C12	Capacitor, 800 MMF, 500 V, Ceramic	4253
C13	Capacitor, 270 MMF, 500 V, Ceramic	4255
C14	Capacitor, .0068 MFD, 400 V, Plastic Tubular	4262
C15	Capacitor, .01 MFD, 500 V, Ceramic	4257
C16	Capacitor, .001 MFD, 500 V, Ceramic	4258
C17	Capacitor, 200 MMF, 500 V, Ceramic	4256
C18	Capacitor, .002 MFD, 500 V, Ceramic	4259
C19	Capacitor, .047 MFD, 400 V, Plastic Tubular	4243
C20	Capacitor, .047 MFD, 400 V, Plastic Tubular	4243
C21	Capacitor, .022 MFD, 400 V, Plastic Tubular	4260
C22	Capacitor, 100 MMF, 500 V, Ceramic	4281
C23	Capacitor, .022 MFD, 400 V, Plastic Tubular	4260
C24	Capacitor, .022 MFD, 400 V, Plastic Tubular	4260
C25	Capacitor, .022 MFD, 400 V, Plastic Tubular	4260
C26	Capacitor, .1 MFD, 600 V, Plastic Tubular	4241
C27	Capacitor, .1 MFD, 600 V, Plastic Tubular	4241
C28	Capacitor, .01 MFD, 500 V, Ceramic	4252
C29	Capacitor, 50 MFD, 100 V, Electrolytic	4242
C30	Capacitor, .047 MFD, 400 V, Plastic Tubular	4243
C31	Capacitor, .047 MFD, 400 V, Plastic Tubular	4243
C32A, C32B	Capacitor, 40-40 MFD, 500 V, Electrolytic	4247
C33A, C33B	Capacitor, 40-40 MFD, 500 V, Electrolytic	4247
R1	Resistor, 22 MEG, Carbon	4606
R2	Resistor, 270K, Carbon	4669
R3	Resistor, 270K, Carbon	4669
R4	Resistor, 120K, Carbon	4670
R5	Resistor, 120K, Carbon	4670
R6	Resistor, 47K, Carbon	4668
R7	Resistor, 2.2K, Carbon	4676
R8	Resistor, 1.2 MEG, Carbon	4656
R9	Resistor, 120K, Carbon	4670
R10	Resistor, 12 MEG, Carbon	4672
R11	Resistor, 1.2 MEG, Carbon	4656
R12	Resistor, 33K, Carbon	4665
R13	Resistor, 390K, Carbon	46028
R14	Resistor, 47K, Carbon	4668
R15	Resistor, 330K, Carbon	4685
R16	Resistor, 390K, Carbon	46028
R17	Resistor, 150K, Carbon	4603
R18	Resistor, 1.2 MEG, Carbon	4656
*R19	Potentiometer, 250K, Linear	C46086
R20	Resistor, 27K, Carbon	4651
R21	Resistor, 120K, Carbon	4670
*R22	Potentiometer, 1 MEG, A Taper, w/Switch	Z4686
R23	Resistor, 120K, Carbon	4670
R24	Resistor, 12K, Carbon	4649
*R25	Potentiometer, 1 MEG, A Taper	Q4686
*R26	Potentiometer, 25K, Inverse A Taper	P4686
R27	Resistor, 1.8 MEG, Carbon	4673
R28	Resistor, 47K, Carbon	4668
R29	Resistor, 180K, Carbon	4671
R30	Resistor, 1.2K, Carbon	4658
R31	Resistor, 4.7K, Carbon	4675
R32	Resistor, 1.8K, Carbon	4677
*R33	Potentiometer, 250K, A Taper	B46086
R34	Resistor, 33K, Carbon	4665
R35	Resistor, 270K, Carbon	4669
R36	Resistor, 27K, Carbon	4651
*R37P, *R37R	Potentiometer, Dual 1 OHM, 2W — 1.8K, Linear	D46086
R38	Resistor, 27K, Carbon	4651
R39	Resistor, 1.2 MEG, Carbon	4656
R40	Resistor, 470 OHM, Carbon	4654
R41	Resistor, 27K, Carbon	4651
R42	Resistor, 470K, Carbon	4650
R43	Resistor, 470K, Carbon	4650
R44	Resistor, 12K, 2W, Carbon	4679
R45	Resistor, 12K, 2W, Carbon	4679
R46	Resistor, 1.2K, Carbon	4658
R47	Resistor, 47K, Carbon	4668
R48	Resistor, 470K, Carbon	4650
R49	Resistor, 470K, Carbon	4650
R50	Resistor, 120 OHM, Carbon	4607
R51	Resistor, 120 OHM, Carbon	4607
R52	Resistor, 1.2K, Carbon	4658
R53	Resistor, 100 OHM, 2W, Carbon	4655
R54	Resistor, 100 OHM, 2W, Carbon	4655
R55	Resistor, 33K, 1W, Carbon	4666
R56	Resistor, 33K, 1W, Carbon	4666
*R57	Potentiometer, 500 OHM, Linear	R4686
*R58	Potentiometer, 500 OHM, Linear	R4686
F1	Fuse, 1½ Amp, 3AG Slo-Blo	20171
V1	Tube, 12AX7	4311
V2	Tube, 12AX7	4311
V3	Tube, 12AX7	4311
V4	Tube, 12BH7A	4312
V5	Tube, 6V6GT	4313
V6	Tube, 6V6GT	4313
V7	Tube, 5Y3GT	4314
V8	Tube, 5Y3GT	4314
*T1	Transformer, Power	15022
*T2	Transformer, Output	15023
*L1	Choke, Presence	1596
*SR1	Rectifier, Selenium, 10MA	5914

Tolerances: Capacitors ±20%, Resistors ±10% unless otherwise indicated. Resistors are ½ watt unless indicated.

Note: 1K = 1,000 OHMS 1 MEG = 1,000,000 OHMS

These parts are available from electronic parts dealers, excepting those marked with an asterisk(*) which may be ordered from Electro-Voice.

Schematic Diagram Model A20CL Lowboy Amplifier



WARRANTY

The Electro-Voice Model A20CL Lowboy amplifier is guaranteed against defects in workmanship and material.

ELECTRO-VOICE, INC. / BUCHANAN, MICHIGAN