INSTRUCTION MANUAL

EP-1/EP-2

Phono Preamp

September, 1993

IM No. 597-0083

BROADCAST ELECTRONICS INC.

4100 NORTH 24th STREET · Phone: (217) 224-9600 · QUINCY, IL 62305

IMPORTANT INFORMATION

EQUIPMENT LOST OR DAMAGED IN TRANSIT

When delivering the equipment to you, the truck driver or carrier's agent will present a receipt for your signature. Do not sign it until you have (a) inspected the containers for visible signs of damage and (b) counted the containers and compared with the amount shown on the shipping papers. If a shortage or evidence of damage is noted, insist that notation to that effect be made on the shipping papers before you sign them.

Further, after receiving the equipment, unpack it and inspect thoroughly for concealed damage. If concealed damage is discovered, immediately notify the carrier, confirming the notification in writing, and secure an inspection report. This item should be unpacked and inspected for damage WITHIN 15 DAYS after receipt. Claims for loss or damage will not be honored without proper notification of inspection by the carrier.

TECHNICAL ASSISTANCE AND REPAIR SERVICE

Technical assistance is available from Broadcast Electronics by letter or prepaid telephone or telegram. Equipment requiring repair or overhaul should be sent by common carrier, prepaid, insured and well protected. Do not mail equipment. We can assume no liability for inbound damage, and necessary repairs become the obligation of the shipper. Prior arrangement is necessary. Contact Customer Service Department for a Return Authorization.

FOR TECHNICAL ASSISTANCE

Phone (217) 224-9600 Customer Service

WARRANTY ADJUSTMENT

Broadcast Electronics, Inc. warranty is included in the Terms and Conditions of Sale. In the event of a warranty claim, replacement or repair parts will be supplied F.O.B. factory. At the discretion of Broadcast Electronics, the customer may be required to return the defective part or equipment to Broadcast Electronics, Inc. F.O.B. Quincy, Illinois. Warranty replacements of defective merchandise will be billed to your account. This billing will be cleared by a credit issued upon return of the defective item.

RETURN, REPAIR AND EXCHANGES

Do not return any merchandise without our written approval and Return Authorization. We will provide special shipping instructions and a code number that will assure proper handling and prompt issuance of credit. Please furnish complete details as to circumstances and reasons when requesting return of merchandise. All returned merchandise must be sent freight prepaid and properly insured by the customer.

REPLACEMENT PARTS

Emergency and Warranty Replacement Parts may be ordered from the address below. Be sure to include equipment model and serial number and part description and part number. Non-Emergency Replacement Parts may be ordered directly from the Broadcast Electronics stock room by Fax at the number shown below.

EMERGENCY AND WARRANTY REPLACEMENT PARTS

Broadcast Electronics, Inc.
4100 N. 24th St., P.O. Box 3606
Quincy, Illinois 62305
Tel: (217) 224-9600
Telex: 25-0142
Fax: (217) 224-9607

NON-EMERGENCY REPLACEMENT PARTS

Fax: (217) 224-9609

PROPRIETARY NOTICE

MODIFICATIONS

Broadcast Electronics, Inc. reserves the right to modify the design and specifications of the equipment in this manual without notice. Any modifications shall not adversely affect performance of the equipment so modified.

EP-1/EP-2
PHONO PREAMP
597-0083

BROADCAST
ELECTRONICS INC

SECTION I

1-1. EQUIPMENT DESCRIPTION.

1-2. The Broadcast Electronics EP Series RIAA equalized phonograph preamplifiers are high-quality units providing extremely low intermodulation and harmonic distortion (see Figure 1). Two models are available. The model EP-1 provides 600 Ohm balanced resistive outputs only. The model EP-2 incorporates output transformers to provide 150 Ohm or 600 Ohm balanced outputs.

1-3. Channel separation of 70 dB allows the EP-1 and EP-2 to operate as individual monophonic preamplifiers with minimal cross-talk. As all input and output connections are routed through filter networks, both the EP-1 and EP-2 exhibit immunity to RF fields as encountered in AM, FM, or TV broadcast service. Both units employ regulated power supplies using a special low-flux transformer and special power supply circuitry to allow a wide range of ac input potentials. Film type capacitors in the audio path minimize non-linearities due to dielectric absorption and other effects found in electrolytic type capacitors. The combination of an LM-394 super matched transistor paired with high symmetrical slew rate operational amplifiers provides low noise performance with minimum transient IMD.

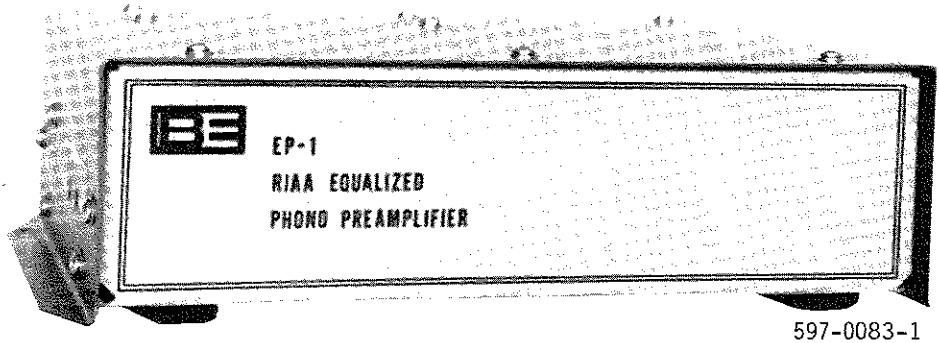

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FIGURE 1. MODEL EP-( ) PHONO PREAMPLIFIER

1-4. SPECIFICATIONS.

1-5. Refer to Table 1 for electrical and physical specifications relative to operation of the models EP-1 and EP-2 phono preamplifiers.

TABLE 1. SPECIFICATIONS
(Sheet 1 of 2)

PARAMETER	SPECIFICATIONS
INPUT IMPEDANCE	47 k Ohms (shunted by 110 pF). Adaptable to other load requirements.
INPUT STAGE OVERLOAD	320 mV @ 1 kHz.
MAXIMUM INPUT SENSITIVITY	1.0 mV Input for 1.0V Output @ 1 kHz.

TABLE 1. SPECIFICATIONS
(Sheet 2 of 2)

PARAMETER	SPECIFICATIONS
OUTPUT IMPEDANCE	EP-1: 600 Ohms, electronic balanced, resistive. EP-2: 150/600 Ohms, balanced, transformer-isolated.
MAXIMUM OUTPUT LEVEL	+21 dBm into 600 Ohms.
FREQUENCY RESPONSE	EP-1: ±0.5 dB of RIAA Curve, 30-20,000 Hz, 6 dB per octave high-pass below 30 Hz. EP-2: ±1.0 dB of RIAA Curve, 30-20,000 Hz, 6 dB per octave high-pass below 30 Hz.
TOTAL HARMONIC DISTORTION	EP-1: Less than 0.01%, 30-20,000 Hz @ +8 dBm. EP-2: Less than 0.20%, 30-20,000 Hz @ +8 dBm.
INTERMODULATION DISTORTION	EP-1: Less than 0.008%, 60 Hz/7 kHz, 4:1 ratio @ +8 dBm.
TRANSIENT INTERMODULATION DISTORTION	EP-1: Less than 0.1% (square/sine wave-method)
SIGNAL-TO-NOISE RATIO	82 dB below reference 10 mV input (unweighted). 88 dB below reference to 10 mV input (A weighted).
EQUIVALENT INPUT NOISE	0.8 uV RMS, 20-20,000 Hz.
GAIN	40-60 dB, continuously variable.
CHANNEL SEPARATION	70 dB or greater, 30-20,000 Hz. (90 dB @ 1 kHz, typical).
AC POWER REQUIREMENTS	97 to 133V AC or 194 to 266V AC, Single Phase, 50/60 Hz, 6W.
AUDIO INPUT TERMINATIONS	RCA phono jacks.
AUDIO OUTPUT TERMINATIONS	Screw-type barrier strip.
MONO/STEREO SWITCHING	Internal jumper.
DIMENSIONS	10.4 inch W X 2.9 inch H X 6.75 inch D (26.5 cm X 7.4 cm X 17.1 cm).
NET WEIGHT	EP-1: 4.5 pounds (2 kg).
AMBIENT TEMPERATURE RANGE	+14°F to +122°F (-10°C to +50°C).
ALTITUDE RANGE	Ø to 7500 feet above Sea Level.
MAXIMUM HUMIDITY	95%, Non-Condensing.

SECTION II

2-1. UNPACKING

2-2. The equipment becomes the property of the customer when the equipment is delivered to the carrier. Carefully unpack the preamplifier. Perform a visual inspection to determine that no apparent damage has been incurred during shipment. All shipping materials should be retained until it is determined that the unit has not been damaged. Claims for damaged equipment must be promptly filed with the carrier or the carrier may not accept the claim.

2-3. The contents of the shipment should be as indicated on the packing lists. If the contents are incomplete, or if the unit is damaged electrically or mechanically, notify both the carrier and Broadcast Electronics, Inc.

2-4. ENVIORNMENTAL REQUIREMENTS

2-5. Table 1 provides environmental conditions which must be considered prior to preamplifier installation.

2-6. INSTALLATION

2-7. Each preamplifier is wired, operated, tested, and inspected at the factory prior to shipment and is ready for installation when received. Installation is accomplished in two steps: 1) placement, and 2) wiring.

2-8. PLACEMENT

2-9. The turntable preamplifier may be mounted in any convenient location within reach of signal and power cables. The signal cable should be as short and direct as possible. The preamplifier should not be mounted directly above heat-generating equipment or in areas of high electrical or magnetic interference. Otherwise no special requirements need be observed.

2-10. WIRING

WARNING

ENSURE PRIMARY POWER IS DEENERGIZED BEFORE ATTEMPTING INSTALLATION.

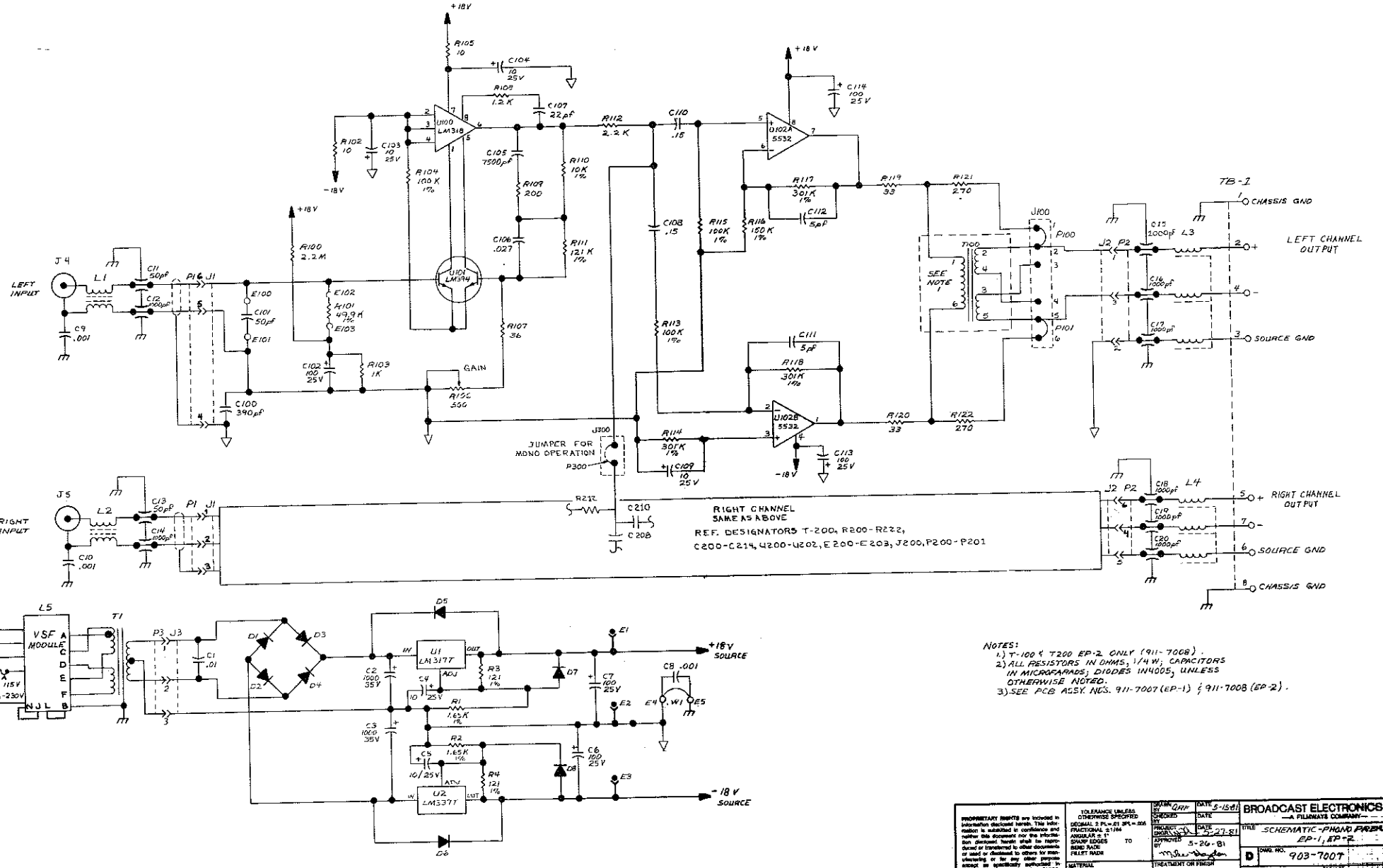
2-11. Set the preamplifier on a work surface.

2-12. Remove the top cover and ensure J100, J200, and J300 are correctly preset for the desired mode of operation (refer to the drawings in Section III).

2-13. Replace the top cover.

2-14. Remove the fuse from the AC LINE VOLTAGE SELECTOR on the preamplifier rear.

REVISIONS			
REV.	DESCRIPTION	DATE	APPRVD
A	PER ECN #	7-10-81	JDS
B	PER ECN 3145	10-26-82	JDS

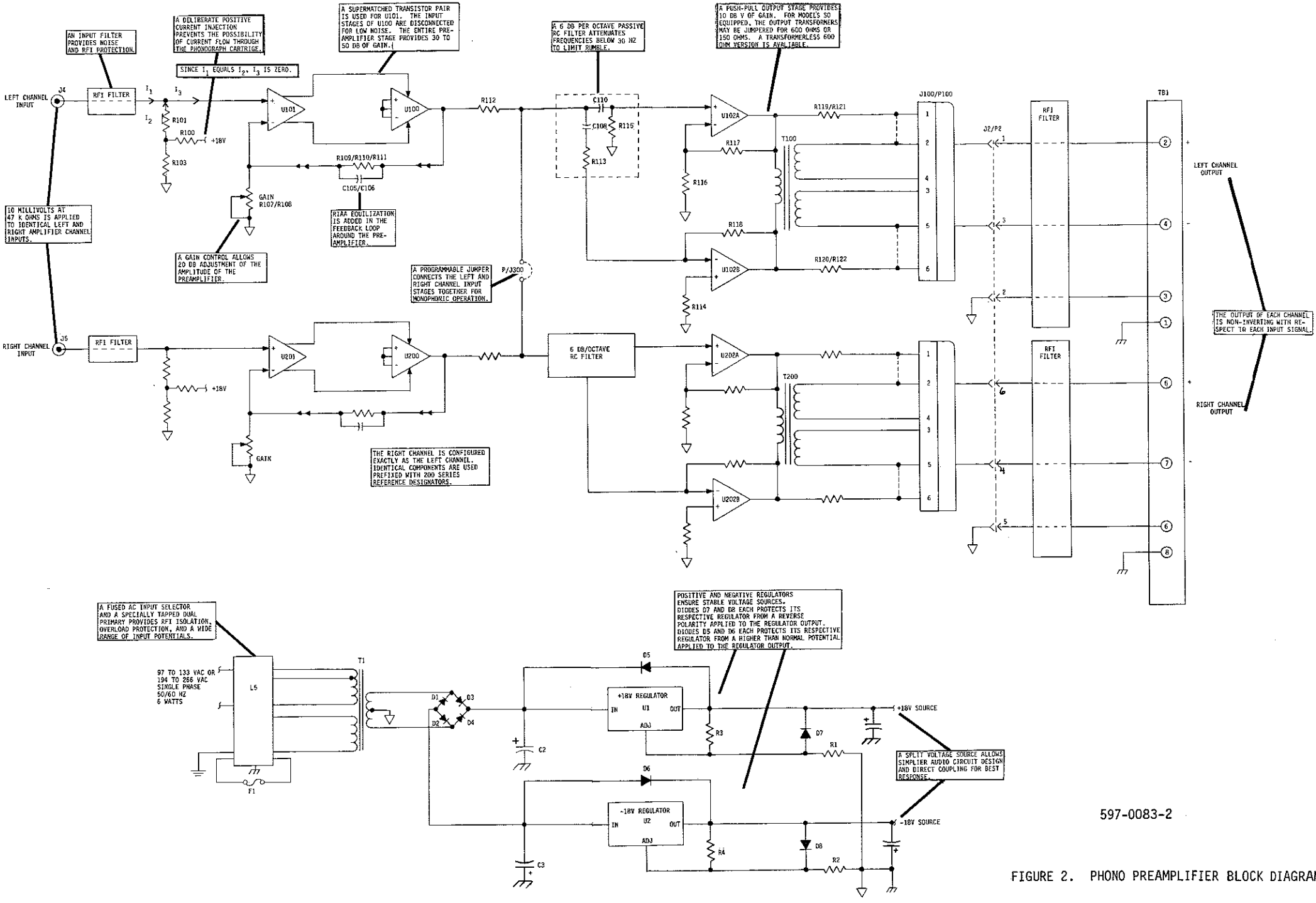


NOTES:
1.) T-100 & T200 EP-2 ONLY (911-7008).
2.) ALL RESISTORS IN OHMS, 1/4 W; CAPACITORS IN MICROFARADS; DIODES IN4005, UNLESS OTHERWISE NOTED.
3.) SEE PCB ASSY. NOS. 911-7007 (EP-1) & 911-7008 (EP-2).

TOLERANCE UNLESS OTHERWISE SPECIFIED
DECIMALS: 2 PL = ±.01, 3PL = ±.005
FRACTIONAL ±1/64
ANGULAR ± 1°
SHARP EDGES TO
BEND RADII
FILLET RADII
MATERIAL —
TREATMENT OR FINISH —

DRAWN QRP DATE 5-15-81
BY
CHECKED DATE
BY
PROJECT ENGR. DATE 5-27-81
APPROVED BY 5-26-81

BROADCAST ELECTRONICS
—A FILLMORE COMPANY—
TITLE: SCHEMATIC-PHONO PREAMP EP-1, EP-2
SIZE D DWG. NO. 903-7007
SCALE
SHEET 1 OF 1



597-0083-2

FIGURE 2. PHONO PREAMPLIFIER BLOCK DIAGRAM

2-15. Ensure the primary ac line voltage with which the preamplifier will be used is visible on the AC LINE VOLTAGE SELECTOR circuit board (100 V, 115/120 V, 220 V, or 230/240 V).

2-16. If the ac line voltage must be changed, remove the AC LINE VOLTAGE SELECTOR circuit with a small pair of needle nose pliers. Reinsert the circuit board so that the correct ac line voltage is visible when the circuit board is inserted into the receptacle.

2-17. Two fuses are shipped with the preamplifier. A 1/8 Ampere fuse is required for 115 volt operation and a 1/16 Ampere fuse is required for 230 volt operation. Both fuses must be slow-blow types.

2-18. Install the correct fuse for operation at the desired ac line voltage.

2-19. Connect the turntable ground wire to TB1-1 or TB1-8.

2-20. Wire the preamplifier output circuit with two conductor jacketed shielded wire.

2-21. All phonograph cartridges require a specific input impedance in parallel with a capacitive load for proper operation. If either input requirement is disregarded, considerable degradation of fidelity will result.

2-22. A resistive input impedance of 47 k Ohms is generally standard. This value is built into the phono preamplifier input circuit. The capacitive load however, differs from one phonograph cartridge to another. The cartridge manufacturer's specifications must be consulted to obtain this data.

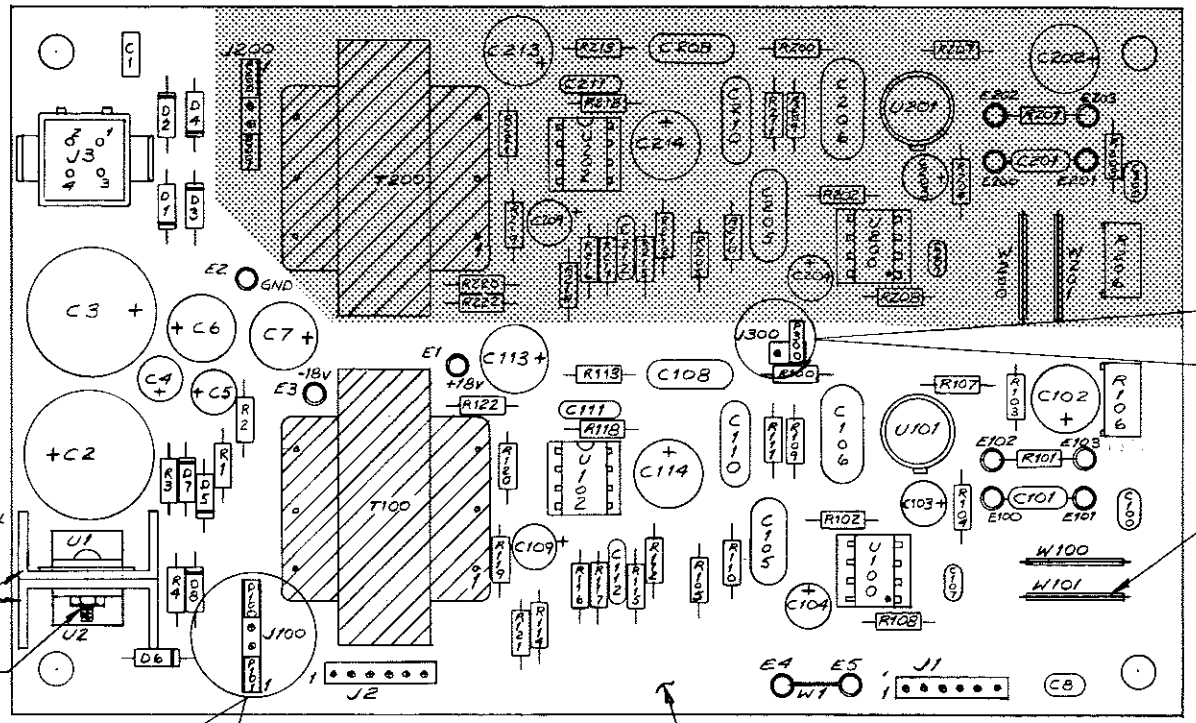
2-23. An input capacitance of 110 pF is provided by the preamplifier input circuit. For each channel, the remainder of the capacitive load must be made up by the tone arm capacitance, the capacitance-per-foot of the audio input cabling, and if required, a lumped capacitance added across each input. The following example reflects a typical installation:

An input capacitance of 110 pF is provided by the preamplifier input circuit.	110 pF
Add the value of the tone arm capacitance obtained from manufacturer's data.	+ 14 pF 124 pF
Subtract the required cartridge capacitive load obtained from manufacturer's data.	-275 pF 151 pF
The remainder must be made up of the input cable capacitance or by a capacitor added across each audio input.	
Subtract the capacitance of three feet of cable (including connectors) at 35 pF/ft.	-105 pF 46 pF
The remainder must be added across each audio input across terminals E100 and E101, and E200 and E201 on the circuit board inside the unit.	

2-24. MONO OPERATION. If the preamplifier is internally jumpered for monophonic operation, either the right or left input may be used. The unused input should be shorted to ground at the preamplifier input. In mono operation, the preamplifier will output two identical mono signals, one from the right channel and one from the left channel.

2-25. Gain controls in each channel allow adjustment of the preamplifier output amplitude. Access to these adjustments is made through the side of the chassis and are marked. Use tuning tool or small flat-blade screwdriver.

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
A	PER ECN #	7-7-81	JDS
B	PER ECN 3145	10-26-81	JDS



USE TRANSISTOR PAD (B.E. #409-7403) BETWEEN U1 AND HEATSINK. ALSO ADD THIN FILM OF THERMAL COMPOUND (B.E. # 700-0028) TO BOTH SIDES OF PAD & BETWEEN U2 AND HEATSINK.

PROGRAMABLE JUMPER POSITION FOR EP-2 (911-7008) W/TRANSFORMERS @ 600Ω OUTPUT (2 PLCS)

DETAIL B

PROGRAMABLE JUMPER POSITION FOR EP-2 (911-7008) W/TRANSFORMERS @ 150Ω OUTPUT (2 PLCS)

DETAIL A

NOTES

1. TRANSFORMERS USED ON EP-2 (911-7008) ONLY.
2. SEE B/M #911-7008 (EP-2) #911-7007 (EP-1)
3. SEE SCHEM. #D-903-7007
4. SHADED COMPONENTS USED ON RIGHT CHANNEL ONLY.

TOLERANCE UNLESS OTHERWISE SPECIFIED
DECIMAL 2 PL = .01 3PL = .005
FRACTIONAL ±1/64
ANGULAR ± 1°
SHARP EDGES TO
BEND RADII
FILLET RADII
MATERIAL

DRAWN BY [illegible] DATE 5-19-81
CHECKED BY DATE
PROJECT ENGR. DATE 6-01-81
APPROVED BY 5-19-81
TREATMENT OR FINISH

BROADCAST ELECTRONICS INC.
—A FILMWAYS COMPANY—

TITLE PCB ASSEMBLY, EP-1 & EP-2 PHONO PREAMP

C DWG. NO. 911-7007 & 911-7008 P.V. B

EP-1 & EP-2 PRE AMP SCALE 2/1 SHEET 1 OF 1

SECTION III

3-1. THEORY OF OPERATION

3-2. The theory of operation for the EP-1 and EP-2 phonograph preamplifiers is presented in Figure 2.

3-3. MAINTENANCE

WARNING

DISCONNECT POWER PRIOR TO SERVICING

3-4. Maintenance of the phono preamplifier falls into the category of good housekeeping and is limited to whatever cleaning may be necessary and checking the performance level of the equipment.

3-5. On a regular basis, clean the equipment of accumulated dust, check for overheated components, and tighten loose hardware as required. Ensure the audio input and output connections are secure.

3-6. COMPONENT REPLACEMENT

3-7. The circuit board used in the phono preamplifier is a double-sided board with plated through-holes. Because of the plated through-holes, solder fills the holes by capillary action. These conditions require that defective components be removed carefully to avoid damage to the board.

3-8. On all circuit boards, the adhesive securing the copper track to the board melts at almost the same temperature as solder. A circuit board track can be destroyed by excessive heat or lateral movement during soldering. Use of a small iron with steady pressure is required for circuit board repairs.

3-9. To remove a component from a double sided circuit board, cut the leads from the body of the defective component while the device is still soldered to the board.

3-10. Grip each component lead, one at a time, with long nose pliers. Turn the board over and touch the soldering iron to the lead at the solder connection. When the solder begins to melt, push the lead through the back side of the board and cut off the bent outer end of the lead. Each lead may now be heated independently and pulled out of each hole. The holes may be cleared of solder by carefully re-heating with a low wattage iron and removing the residual solder with a soldering vacuum tool.

3-11. Install the new component and apply solder from the bottom side of the board. If no damage has been done to the plated-through holes, soldering of the top side is not required.

WARNING

MOST SOLVENTS WHICH WILL REMOVE ROSIN FLUX ARE VOLATILE AND TOXIC BY THEIR NATURE AND SHOULD BE USED ONLY IN SMALL AMOUNTS IN A WELL VENTILATED AREA, AWAY FROM FLAME, INCLUDING CIGARETTES AND A HOT SOLDERING IRON.

OBSERVE THE MANUFACTURER'S CAUTIONARY INSTRUCTIONS.

3-12. After soldering, remove flux with a cotton swab moistened with a suitable solvent. Rubbing alchol is highly diluted and is not effective. Solvents are available in electronic supply houses which are useful.

3-13. The board should be checked to ensure the flux has been removed and not just smeared about. Rosin flux is not normally corrosive, but rosin will absorb enough moisture in time to become conductive and cause problems.

3-14. PARTS LISTS AND DRAWINGS

3-15. The following parts lists and drawings are contained in this section as aids to maintenance:

PARTS LISTS

TITLE	NUMBER
EP-1/EP-2 Preamplifier Chassis Mounted Parts	903-0020/-0021
EP-1/EP-2 Circuit Board Assembly	911-7007/-7008

DRAWINGS

TITLE	NUMBER
Integrated Circuit Terminal Designations	839-0083-3
Schematic Diagram, EP-1/EP-2 Phono Preamp	D903-7007
Assembly Diagram, EP-1/EP-2 Phono Preamp	C911-7007/-7008

TABLE 2. EP-1/EP-2 PREAMPLIFIER CHASSIS MOUNTED PARTS - 903-0020/-0021

REF. NO.	DESCRIPTION	PART NO.	QTY.
C9,C10	Capacitor, Mica, 0.001 uF ±5%, 100V	041-1032	2
C11,C13	Capacitor Assembly Consisting of:		
	Washer, Kapton, 0.12 ID X 0.81 OD	409-1817	4
	Washer, Nylon, 0.14 ID X 0.25 OD	423-6007	2
C12,C14, C15 THRU C20	Capacitor, Ceramic Feed-Thru, 1000 pF ±20%, 500V	088-1033	8
F1 (115V)	Fuse, 250V, 1/8 Ampere, Slow-Blow, Type MDL	334-0051	2
J4,J5	Jack, RCA Phono	417-0135	2
	Insulators for J4, J5		
----	Shoulder Washer, Nylon, 0.25 ID	407-0014	2
----	Fiber Washer, 0.26 ID X 0.50 OD X 0.030 THK	423-1009	2
L1,L2	RF Choke, Bi-Filar Wound 6.5 turns of two No. 32 AWG enameled wires, 7.2 inches long, twisted 6 turns per inch on a BE P/N 360-0010 torroid form	360-0016	2
L3,L4	RF Choke, Tri-Filar Wound 6.5 turns of three No. 32 AWG enameled wires, 7.2 inches long, twisted 6 turns per inch on a BE P/N 360-0010 torroid form	360-0017	2
L5	Fuse/Line Filter, Modified 120/240V	360-6504	1
P1,P2	Housing, Plug, 6-Pin	417-0601	2
----	Contact, Crimp, for P1, P2	417-8766	12
P3	Housing, Plug, 4-Pin	418-0053	3
----	Contact, Crimp, for P3	417-0053	3
T1	Transformer, Power Primary: Dual 115V, 50/60 Hz Secondary: Dual 22.9V at 0.122 Ampere	376-0122	1
TB1	Barrier Strip, 8 Terminal	412-0015	1
----	Foot, Rubber	403-0001	4
----	Circuit Board Assembly, EP-1	911-7007	1
----	Circuit Board Assembly, EP-2	911-7008	1

TABLE 3 EP-1/EP-2 CIRCUIT BOARD ASSEMBLY - 911-7007/-7008
(Sheet 1 of 3)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C1	Capacitor, Mylar Film, 0.01 uF ±10%, 100V	030-1043	1
C2,C3	Capacitor, Electrolytic, 1000 uF, 35V	024-1000	2
C4,C5	Capacitor, Electrolytic, 10 uF, 25V	023-1076	2
C6,C7	Capacitor, Electrolytic, 100 uF, 25V	023-1084	2
C8	Capacitor, Mylar Film, 0.001 uF, 100V	030-1033	1
C100	Capacitor, Mica, 390 pF ±5%, 100V	042-3922	1
C101	Capacitor, Mica, 50 pF ±5%, 500V	040-5013	1
C102	Capacitor, Electrolytic, 100 uF, 25V	023-1084	1
C103,C104	Capacitor, Electrolytic, 10 uF, 25V	023-1076	2
C105	Capacitor, Polystyrene, 7500 pF ±1%, 50V	037-7540	1
C106	Capacitor, Polystyrene, 0.027 uF ±1%, 50V	037-2741	1
C107	Capacitor, Mica, 22 pF ±5%, 50V	040-2213	1
C108	Capacitor, Mylar Film, 0.15 uF ±10%, 100V	030-1533	1
C109	Capacitor, Electrolytic, 10 uF, 25V	023-1076	1
C110	Capacitor, Mylar Film, 0.15 uF ±10%, 100V	030-1533	1
C111,C112	Capacitor, Ceramic Disc, 5 pF ±0.5 pF, 500V, NPO	001-5004	2
C113,C114	Capacitor, Electrolytic, 100 uF, 25V	023-1084	2
C200	Capacitor, Mica, 390 pF ±5%, 100V	042-3922	1
C201	Capacitor, Mica, 50 pF ±5%, 50V	040-5013	1
C202	Capacitor, Electrolytic, 100 uF, 25V	023-1084	1
C203,C204	Capacitor, Electrolytic, 10 uF, 25V	023-1076	2
C205	Capacitor, Polystyrene, 7500 pF ±1%, 50V	037-7540	1
C206	Capacitor, Polystyrene, 0.027 uF ±1%, 50V	037-2741	1
C207	Capacitor, Mica, 22 pF ±5%, 50V	040-2213	1
C208	Capacitor, Mylar Film, 0.15 uF ±10%, 100V	030-1533	1
C209	Capacitor, Electrolytic, 10 uF, 25V	023-1076	1
C210	Capacitor, Mylar Film, 0.15 uF ±10%, 100V	030-1533	1
C211,C212	Capacitor, Ceramic Disc, 5 pF ±0.5 pF, 500V, NPO	001-5004	2
C213,C214	Capacitor, Electrolytic, 100 uF, 25V	023-1084	2
D1 THRU D8	Diode, Silicon, 600V, 1 Ampere	203-4005	8
J1,J2	Header, 6-Pin	417-0006-1	2
J3	Receptacle, 4-Pin	418-0255	1

TABLE 3. EP-1/EP-2 CIRCUIT BOARD ASSEMBLY - 911-7007/-7008
(Sheet 2 of 3)

REF. DES.	DESCRIPTION	PART NO.	QTY.
J100,J200	Header, 6-Pin	417-0006-1	2
P100,P101, P200,P201, P300	Programmable Jumper	340-0004	5
R1,R2	Resistor, 1.65 k Ohm ±1%, 1/4W	103-1641	2
R3,R4	Resistor, 121 Ohm ±1%, 1/4W	100-1231	2
R100	Resistor, 2.2 Meg Ohm ±5%, 1/4W	100-2273	1
R101	Resistor, 49.9 k Ohm ±1%, 1/4W	103-4951	1
R102	Resistor, 10 Ohm ±5%, 1/4W	100-1023	1
R103	Resistor, 1 k Ohm ±5%, 1/4W	100-1043	1
R104	Resistor, 100 k Ohm ±1%, 1/4W	103-1062	1
R105	Resistor, 10 Ohm ±5%, 1/4W	100-1023	1
R106	Potentiometer, 500 Ohm ±10%, 1/2W	178-5030	1
R107	Resistor, 36 Ohm ±5%, 1/4W	100-3623	1
R108	Resistor, 1.2 k Ohm ±5%, 1/4W	100-1243	1
R109	Resistor, 200 Ohm ±5%, 1/4W	100-2033	1
R110	Resistor, 10 k Ohm ±1%, 1/4W	100-1051	1
R111	Resistor, 121 k Ohm ±1%, 1/4W	103-1261	1
R112	Resistor, 2.2 k Ohm ±5%, 1/4W	100-2243	1
R113	Resistor, 100 k Ohm ±1%, 1/4W	103-1062	1
R114	Resistor, 301 k Ohm ±1%, 1/4W	103-3061	1
R115	Resistor, 100 k Ohm ±1%, 1/4W	103-1062	1
R116	Resistor, 150 k Ohm ±1%, 1/4W	103-1561	1
R117,R118	Resistor, 301 k Ohm ±1%, 1/4W	103-3061	2
R119,R120	Resistor, 33 Ohm ±5%, 1/4W	100-3323	2
R121,R122	Resistor, 270 Ohm ±5%, 1/4W	100-2733	2
R200	Resistor, 2.2 Meg Ohm ±5%, 1/4W	100-2273	1
R201	Resistor, 49.9 k Ohm ±1%, 1/4W	103-4951	1
R202	Resistor, 10 Ohm ±5%, 1/4W	100-1023	1
R203	Resistor, 1 k Ohm ±5%, 1/4W	100-1043	1
R204	Resistor, 100 k Ohm ±1%, 1/4W	103-1062	1
R205	Resistor, 10 Ohm ±5%, 1/4W	100-1023	1
R206	Potentiometer, 500 Ohm ±10%, 1/2W	178-5030	1

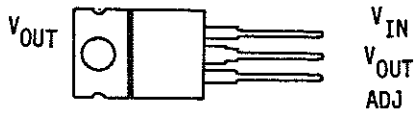
TABLE 3. EP-1/EP-2 CIRCUIT BOARD ASSEMBLY - 911-7007/-7008
(Sheet 3 of 3)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R207	Resistor, 36 Ohm ±5%, 1/4W	100-3623	1
R208	Resistor, 1.2 k Ohm ±5%, 1/4W	100-1243	1
R209	Resistor, 200 Ohm ±5%, 1/4W	100-2033	1
R210	Resistor, 10 k Ohm ±1%, 1/4W	100-1051	1
R211	Resistor, 121 k Ohm ±1%, 1/4W	103-1261	1
R212	Resistor, 2.2 k Ohm ±5%, 1/4W	100-2243	1
R213	Resistor, 100 k Ohm ±1%, 1/4W	103-1062	1
R214	Resistor, 301 k Ohm ±1%, 1/4W	103-3061	1
R215	Resistor, 100 k Ohm ±1%, 1/4W	103-1062	1
R216	Resistor, 150 k Ohm ±1%, 1/4W	103-1561	1
R217,R218	Resistor, 301 k Ohm ±1%, 1/4W	103-3061	2
R219,R220	Resistor, 33 Ohm ±5%, 1/4W	100-3323	2
R221,R222	Resistor, 270 Ohm ±5%, 1/4W	100-2733	2
T100,T200 [EP-2 Only]	Transformer, Audio Output, Line, 2.5 mW, 50 Hz to 16 kHz ±0.1 dB Primary: Z= 600 Ohm R= 60 Ohm dc Dual Secondary: Z= 150 Ohm R= 30 Ohm dc	371-0008	2
U1	Integrated Circuit, LM317T, Positive Voltage Regulator, 1.2V to 37V, 1.5 Ampere, TO-220 Case	227-0317	1
U2	Integrated Circuit, LM337T, Negative Voltage Regulator, 1.2V to 37V, 1.5 Ampere, TO-220 Case	227-0337	1
	Mounting Parts for U1, U2:		
----	Nut, Nylon, 4-40	421-6901	1
----	Screw, Nylon, 4-40 X 11/32 inch	420-6130	1
----	Insulator, Transistor Mounting, TO-220 Case	409-7403	1
----	Heat Sink, TO-220 Package	455-7805	2
U100	Integrated Circuit, LM318P, High Speed Operational Amplifier, 8-Pin DIP	221-0318	1
U101	Integrated Circuit, LM394H, NPN, Silicon Supermatched Transistor Pair, 6-Pin round package	226-0394	1

TABLE 3. EP-1/EP-2 CIRCUIT BOARD ASSEMBLY - 911-7007/-7008
(Sheet 4 of 4)

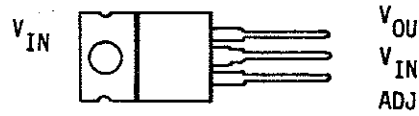
REF. DES.	DESCRIPTION	PART NO.	QTY.
U102	Integrated Circuit, NE5532AFE, Dual Low-Noise, Operational Amplifier, 8-Pin DIP	221-5532	1
U200	Integrated Circuit, LM318P, High Speed, Operational Amplifier, 8-Pin DIP	221-0318	1
U201	Integrated Circuit, LM394H, NPN, Silicon Supermatched Transistor Pair, 6-Pin Round Package	226-0394	1
U202	Integrated Circuit, NE5532AFE, Dual Low-Noise, Operational Amplifier, 8-Pin DIP	221-5532	1
XU100, XU102, XU200, XU202	Socket, Integrated Circuit, 8-Pin DIP	417-0804	4
----	Blank Circuit Board	511-7007	1

LM317T
POSITIVE VOLTAGE
REGULATOR



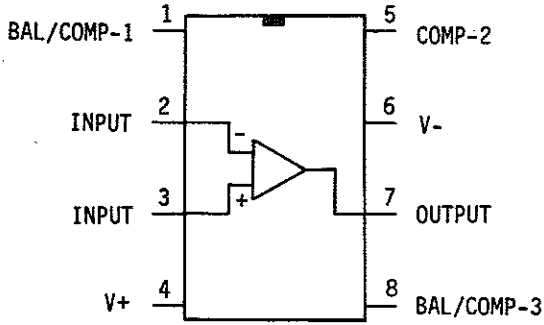
FRONT VIEW

LM337T
NEGATIVE VOLTAGE
REGULATOR



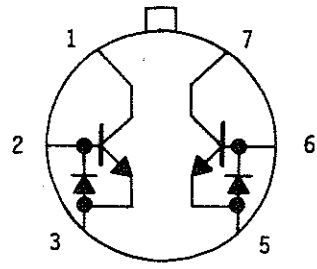
FRONT VIEW

LM318P
HIGH SPEED
OPERATIONAL AMPLIFIER



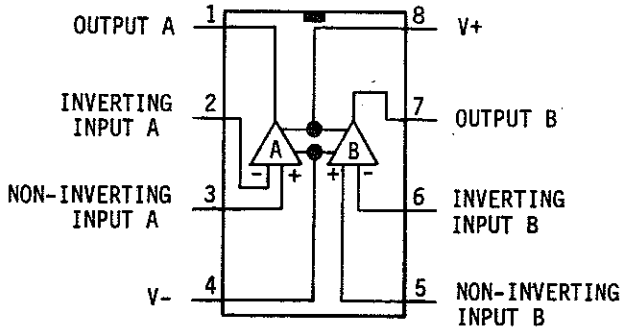
TOP VIEW

LM394H
NPN TRANSISTOR
SUPERMATCHED PAIR



TOP VIEW

NE5532 AFE
DUAL LOW NOISE
OPERATIONAL AMPLIFIER



TOP VIEW

597-0083-3

INTEGRATED CIRCUIT TERMINAL DESIGNATIONS

PRODUCT WARRANTY

LIMITED TWO YEAR

While this warranty gives Purchaser specific legal rights, which terminate two (2) years (one year on turntable, cartridge and blower motors) from the date of shipment, Purchaser may also have other rights which vary state to state.

Broadcast Electronics, Inc. ("Seller") hereby warrants cartridge machines, consoles, and other new Equipment manufactured by Seller against any defects in material or workmanship at the time of delivery thereof, that develop under normal use within a period of two (2) years (one year for turntable, cartridge and blower motors) from the date of shipment, as such term is defined herein. Other manufacturer's and suppliers' Equipment and services, if any, including electronic tubes, solid state devices, transmission line, antennas, towers, related equipment and installation and erection services, shall carry only such manufacturer's or suppliers' standard warranty. This warranty extends to the original user and any subsequent purchaser during the warranty period. Seller's sole responsibility with respect to any equipment or parts not conforming to this warranty is to replace such equipment or parts upon the return thereof F.O.B. Seller's factory or authorized repair depot within the period aforesaid.

In the event of replacement pursuant to the foregoing warranty, only the unexpired portion of the warranty from the time of the original purchase will remain in effect for any such replacement. However, the warranty period will be extended for the length of time that Purchaser is without the services of the Equipment due to its being serviced pursuant to this warranty. The terms of the foregoing warranty shall be null and void if the Equipment has been altered or repaired without specific written authorization of Seller, or if Equipment is operated under environmental conditions or circumstances other than those specifically described in Seller's product literature or instruction manual which accompany the Equipment. Seller shall not be liable for any expense of any nature whatsoever incurred by the original user without prior written consent of Seller.

Seller shall not be liable to Purchaser for any and all incidental or consequential damages for breach of either expressed or implied warranties. However, some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to Purchaser. All express and implied warranties shall terminate at the conclusion of the period set forth herein. Any card which is enclosed with the equipment will be used by Seller for survey purposes only.

If the Equipment is described as used, it is sold as is and where is. If the contract covers equipment not owned by Seller at this date, it is sold subject to Seller's acquisition of possession and title.

EXCEPT AS SET FORTH HEREIN, AND EXCEPT AS TO TITLE, THERE ARE NO WARRANTIES, OR ANY AFFIRMATIONS OF FACT OR PROMISES BY SELLER, WITH REFERENCE TO THE EQUIPMENT, OR TO MERCHANTABILITY, FITNESS FOR A PARTICULAR APPLICATION, SIGNAL COVERAGE, INFRINGEMENT, OR OTHERWISE, WHICH EXTEND BEYOND THE DESCRIPTION OF THE EQUIPMENT ON THE FACE HEREOF.

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