

tuned to tomorrow...



INSTRUCTION BOOK FOR

The National *Horizon 5* PREAMPLIFIER -CONTROL UNIT

The National Horizon 5 preamplifier - control unit introduces a new concept in preamp design. When used in conjunction with the National Horizon 20 amplifier or the National Criterion tuner, no complicated external connections are required. The preamp simply plugs into either unit through an opening in the front panel. Once installed, the compensating controls, selection of inputs and the individual bass and treble controls become an integral part of the tuner or amplifier. If desired, the Horizon 5 preamplifier may be used with other high quality, high fidelity audio equipment. Its exceptionally compact design and ease of mounting make it adaptable to any custom installation. The unusual range of its controls and compensating circuits make it outstanding among units of this type and, when used with the National tuner and amplifier, it affords the ultimate in listening pleasure.

FEATURES

UNIQUE PLUG-IN DESIGN: Preamp becomes an integral part of either the Horizon 20 amplifier or the Criterion AM-FM tuner permitting maximum flexibility of custom installations.

INPUT ADAPTABILITY: Accommodates TV, Tape, Tuner and Phono. When the Selector switch is at TV or Tape, the input circuit gain can be adjusted to accommodate levels from 50 mv. to 5 volts. The Tuner input is fixed to accept a 1-volt output from the Criterion or the majority of high-quality tuners. A switch at the Phono input provides for either 10-mv or 30-mv phonograph cartridges.

OUTPUT IMPEDANCE: About 3000 ohms with 30-db of feedback. The Horizon 5 may be used with output cables up to 50 feet in length permitting a wide variety of custom layouts.

Please use this manual. It has been prepared with the prime purpose of enabling the user to obtain full satisfaction from this product.

NATIONAL COMPANY, INC.,



MALDEN & MELROSE, MASS.

EASE OF MOUNTING: When used with the Horizon 20 or the Criterion the preamp needs only to be plugged in. If installed in a custom wooden cabinet only one cutout is required. Its small size permits mounting in extremely compact installations. For remote operation, an interconnecting cable complete with mating connectors may be procured to carry all the operating and signal voltages between the preamp and tuner or amplifier. This cable is available in 4 or 15-foot lengths.

HARMONIC DISTORTION: Less than 0.2% at 1.5 V output, 0.6% at 10 V output and 1.5% at 15 V output. (Normal output is 1.5 volts).

INTERMODULATION DISTORTION: Less than 0.31% at normal output level measured with a 4 to 1 ratio of 400 to 7000 cycles.

FREQUENCY RESPONSE: Flat within ± 0.25 db from 20 cycles to 30 kilocycles and within ± 1 db to 100 kc. when Bass and Treble controls are in the Flat position.

HUM AND NOISE: Hum level is 70 db or more below 1.5 volt output when using the Tape, TV or Tuner position and 50 db or more below signal level measured at the 10 mv phono position.

EQUALIZER CONTROL: Positions 4 to 10 of the Selector switch provide seven combinations of low-frequency turn over and high-frequency rolloff to compensate for the seven most popular types of re-

ording characteristics including the newly established Record Industry Assoc. of America standard (RIAA).

TONE CONTROLS: Separate Bass and Treble controls are provided. The Bass control provides a maximum of 25 db of boost and 15 db attenuation at 30 cycles per second. The Treble control supplies 12 db boost and 25 db attenuation at 10 kc. A special feature of this control is that with low amounts of boost, the increase takes place near the ends of the audio range to allow cutting off of record scratch and turntable rumble with a minimum effect on the middle frequencies. See Figure 1.

LOUDNESS CONTROL: A fully compensated Loudness control is used so that the listener may enjoy low volume levels without the apparent loss of the low and high frequency ends of the spectrum.

LOUDNESS SWITCH: When absolutely flat response is desired and the Tone controls are set at their Flat positions, the compensating circuits of the Loudness control may be switched out so that this control operates as a conventional volume control.

PRINTED CIRCUITS: Printed circuitry is used to take full advantage of the latest electronic techniques, resulting in complete uniformity of manufacturing. Figure 2 illustrates the compact design made possible by use of the printed circuitry.

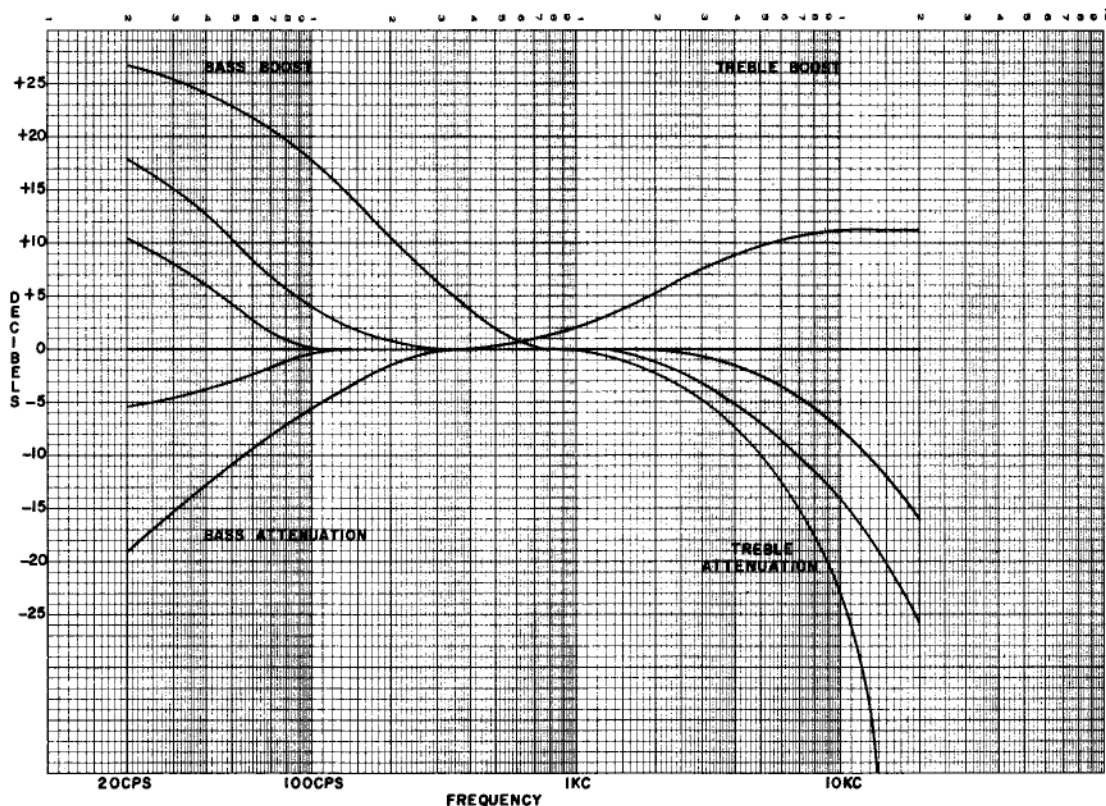


Figure 1. Tone Control Characteristics

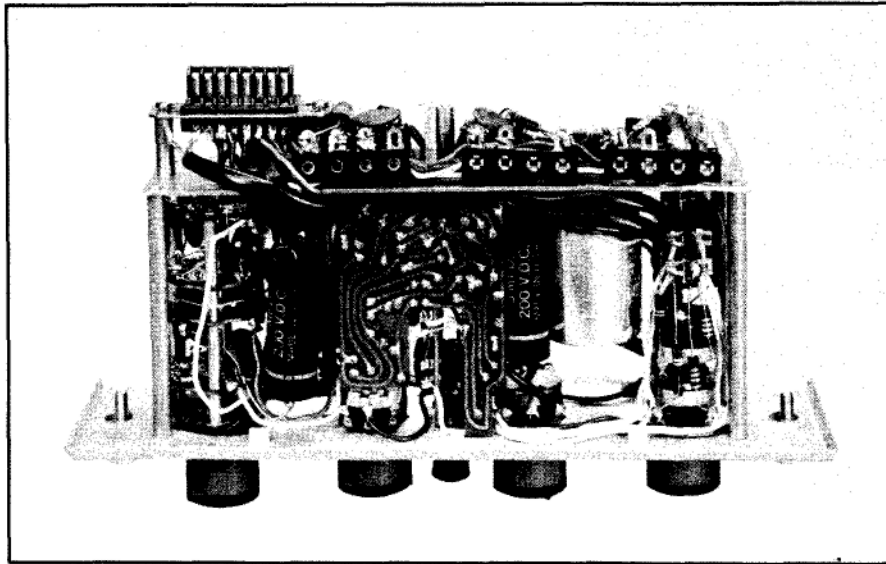


Figure 2. Interior View of Preamplifier

PREPARING TO OPERATE

Examine the preamp immediately after unpacking to make certain that no apparent damage has been incurred during shipment.

A metal mounting strip with two woodscrews is sup-

plied to facilitate cabinet installation. Make sure you have these items before discarding the packing material.

INSTALLATION IN THE CRITERION TUNER OR HORIZON 20 AMPLIFIER

When plugged into either the Criterion Tuner or the Horizon 20 amplifier the Horizon 5 preamp becomes an integral part of the unit providing for selection of program material, as well as all the compensation and tone control features of the preamp. Before installing the preamp into either of these units it is first necessary to remove the jumper plug located inside the preamp compartment behind the removable blank panel. Loosen the thumbscrews at each end of the panel and remove the panel. This procedure automatically actuates the safety interlock switch so that no hazardous voltages are present at the plug. Reach into the preamp compartment, remove the two Phillips head screws, and withdraw the jumper plug. In order to assure proper alignment between the plug on the preamp and the mating jack on the tuner or amplifier, it is

necessary to loosen the two slotted hex-head screws which position the jack on the tuner or amplifier whichever is used. The bottom cover of the Horizon 20 has two cutouts to permit accessibility to these screws. On the tuner, it is necessary to remove the cabinet. The proper procedure is to loosen the two screws approximately 1/2 turn. Now, slip the preamp into the compartment and secure the two thumbscrews. These screws must be tightened all the way to insure closing of the interlock switch. Tighten the two aligning screws. The multiconnector on the rear of the preamp distributes all of the functional input and output circuits to the jacks at the rear of the tuner or amplifier, as the case may be. Inter-unit cabling may be carried out as outlined in the instruction manuals accompanying these equipments.

CABINET INSTALLATION

Mounting the Horizon 5 preamp into a wooden cabinet or panel is extremely simple. Only one 2 by 8 3/8 inch horizontal cutout is required. Use care in laying out the cutout making sure that the lines are straight and square with the sides of the cabinet. Slide the preamp through the cutout until the ends of the thumbscrews touch the wood. Using the thumbs press the ends of the screws into the wood firmly enough to make a mark on the wood surface. Remove the preamp and drill the two holes just marked using

a no. 14 drill.

Refer to figure 3 for the proper method of securing the mounting strip. The strip supplied is marked Front along one edge. This edge must be flush with the front surface of the cabinet. The tabs protruding from the ends of the strip must point upwards toward the top of the cutout. Four screwholes are provided. If the cabinet is constructed of stock 3/8 inch or thicker, the two front holes are used to secure the strip to the bottom edge of the cutout. If the stock is

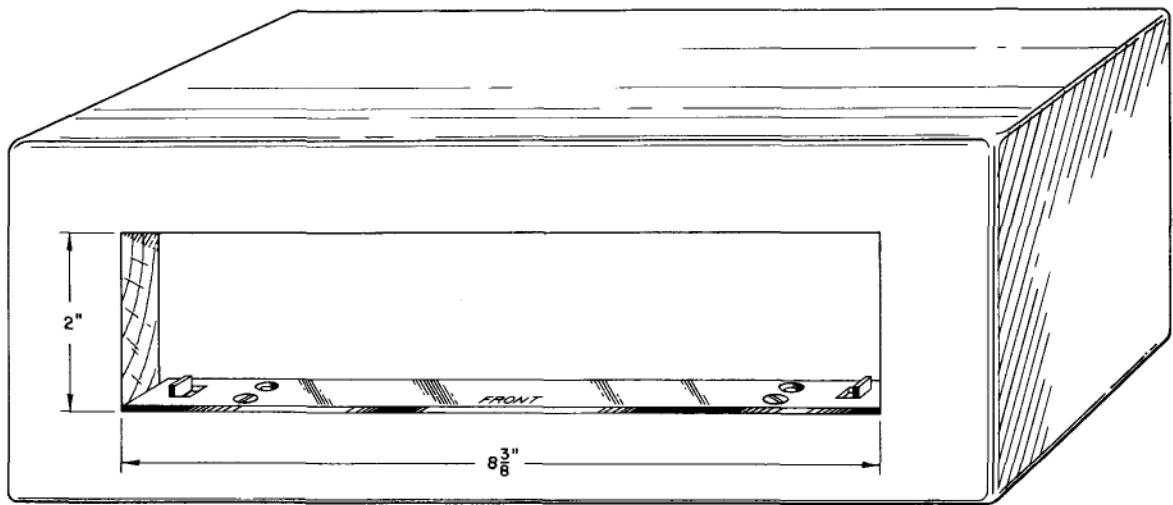


Figure 3. Method of Mounting Preamp in Custom Cabinet

1/4 inch thick or less, a strip of wood at least 1/2 inch thick should be fastened along the inside of the cutout flush with the bottom edge. This will supply sufficient thickness to hold the screws and the two rear holes of the mounting strip may be used.

Once the mounting strip is secured to the cabinet draw the ends of the connecting cable through the cutout from inside the cabinet and connect to the

preamp. Slide the preamp through the cabinet with the top of the panel tilted toward you. When the slots in the bottom of the tuner engage the studs in the mounting strip, release the top of the panel. The two thumbscrews may then be turned into the no. 14 holes. Turn slowly to allow the screws to cut their own threads in the wood.

ELECTRICAL CONNECTIONS

The National Horizon 5 preamp is equipped with a 16 contact multiconnector which carries all supply and signal voltages. When plugged into either the Criterion tuner or the Horizon 20 amplifier all interconnections are made automatically. If operation remote from either unit is desired a four or fifteen-foot

cable with a mating connector at either end is available. It is only necessary to plug one end into the preamp and the other into the amplifier or tuner. Connection to other pieces of equipment in the high fidelity system should be made in accordance with the instructions furnished with the equipment.

INITIAL ADJUSTMENTS

Two high level input adjustments and a phono sensitivity slide switch are located on the bottom of the preamp. These are provided to allow for variations in output level of different audio devices that may be used with the preamp. If the preamp is plugged into either the Criterion Tuner or the Horizon 20 amplifier these adjustments become available through holes provided in these units. With the TV tuner and tape reproducer connected and operating the two input level adjustments may be set so that the loudspeaker output is the same for TV, Tape and Tuner without resetting the Loudness control. Volume controls if any, on these units may be left at a predetermined setting and program material switched at will without changes of output level. R4 sets the TV level and R3 sets the Tape level.

The phono input slide switch makes it possible to use either a 10 millivolt or a 30 millivolt phono pick-

up with the Horizon 5. If the pickup being used has a 30 mv output (Audak, Pickering etc. types), slide the switch toward the front panel. If the pickup is of the 10-mv. variety (GE reluctance type) slide the switch toward the rear of the preamp. Setting this switch provides the proper gain and input impedance for the pickup involved and must be properly set if optimum phono reproduction is expected. Once the foregoing adjustments have been made it should not be necessary to change them unless the associated input equipment is changed.

Phono pickups of the crystal and ceramic types may be connected to either the TV or Tape inputs. These types of cartridges normally have outputs between 0.5 and 1.0 volt. When the above pickups are used, the input level should be set using the level adjustment corresponding to the input used.

OPERATING INSTRUCTIONS

Once the Horizon 5 preamp is plugged into either the tuner or amplifier the operation is the same for either case. Assuming that a complete installation will consist of a TV tuner, a tape reproducer, an AM-FM tuner and a phonograph as the audio source, the controls of the preamp function as follows:

SELECTOR: This switch selects any of the four above mentioned program sources. In addition, positions 4 through 10 provide seven different curves of record equalization. The Selector switch should be set at the position corresponding to the recording characteristics of the record being played.

Mfr.	Record Speed RPM	Switch Setting	Mfr.	Record Speed RPM	Switch Setting
Allegro	33	LP	London	33	FFRR
American Rec. Society	33	AES	Lyrichord	33	LP
Angel	33	RIAA	Mercury	33	AES
Audiophile	78	FFRR		45	AES
Bach Guild	33	LP		78	AES
Blue Note	33	AES	MGM	33	NARTB
Capitol	33	AES		45	NARTB
	45	RIAA		78	NARTB
	78	AES	Oceanic	33	LP
Capitol-Soria	33	AES	Oxford	33	LP
Cetra-Soria	33	LP	Period	33	NARTB
Coliseum	33	LP	Philharmonia	33	AES
Columbia	33	LP	Rachmaninoff Society	33	LP
	45	NARTB	RCA Victor	33	RIAA
	78	78 Noisy		45	RIAA
Concert Hall	33	LP		78	RIAA
Cook	33	RIAA	Remington	33	NARTB
Coral	33	AES	Renaissance	33	RIAA
	78	AES	Telefunken	78	FOR
Decca	33	AES	Tempo	33	LP
	45	AES	Urania	33 (old)	LP
	78	AES		33 (new)	AES
Dial	33	LP	Vanguard	33	LP
Esoteric	33	AES	Vox	33	LP
Handel Society	33	LP	Westminister	33	LP
Haydn Society	33	LP		33	AES

LOUDNESS CONTROL: Once the program material has been selected the desired listening level is set by means of the Loudness control. When used with the Loudness switch On, (Out position) the loudspeaker level may be reduced to a minimum and the automatic compensation feature of the control will provide the exact amount of bass and treble boost to maintain listening pleasure.

LOUDNESS ON-OFF SWITCH: There may be occasions when it will be desired to reproduce an input signal with absolutely flat response regardless of audio level. Under these circumstances the Loudness switch is turned Off (pushed in) and the tone controls set at Flat. The compensation circuits of the Loudness control are eliminated and the preamp output is a completely faithful reproduction of the input signal.

BASS CONTROL: Starting from the Flat position this control will boost the low frequencies up to 25 db at its maximum clockwise rotation and attenuate the lows as much as 15 db at its maximum counterclockwise position. When starting from the Flat position, increase in boost or attenuation occurs first at the ends of the audio range to maintain flat response in the middle frequency range.

TREBLE CONTROL: The Treble control provides 12-db boost at its maximum clockwise position and 25-db attenuation at maximum counterclockwise rotation. Starting from the Flat position, attenuation occurs first at the extreme high frequency end of the range. This permits reduction of surface noise from old recordings without affecting the range under 10 kc.

REMOVAL FROM CASE

The Horizon 5 is enclosed in a metal enclosure which serves a two-fold purpose. It acts as a protective dust cover and, at the same time, serves as a highly effective shield to prevent unwanted signal pickup. To remove the cover, first remove the 6-32 Phillips head screw at the rear of the cover and slip

off the cover. When placing the preamp back into its enclosure, replace the insulating paper liner, then slide on the metal cover. The cover and paper liner must be replaced right side up so that the two input input controls and the phono slide switch line up with their cutouts.

MAINTENANCE

The critical circuits employed, plus the extremely compact design, demand the attention of a trained serviceman for any corrective measures other than changing tubes. Both tubes are accessible upon re-

moval of the cover. The Tube Socket Voltage table will aid the serviceman in locating any trouble in the preamp but, in replacing any components, the tolerance ratings should be exactly duplicated.

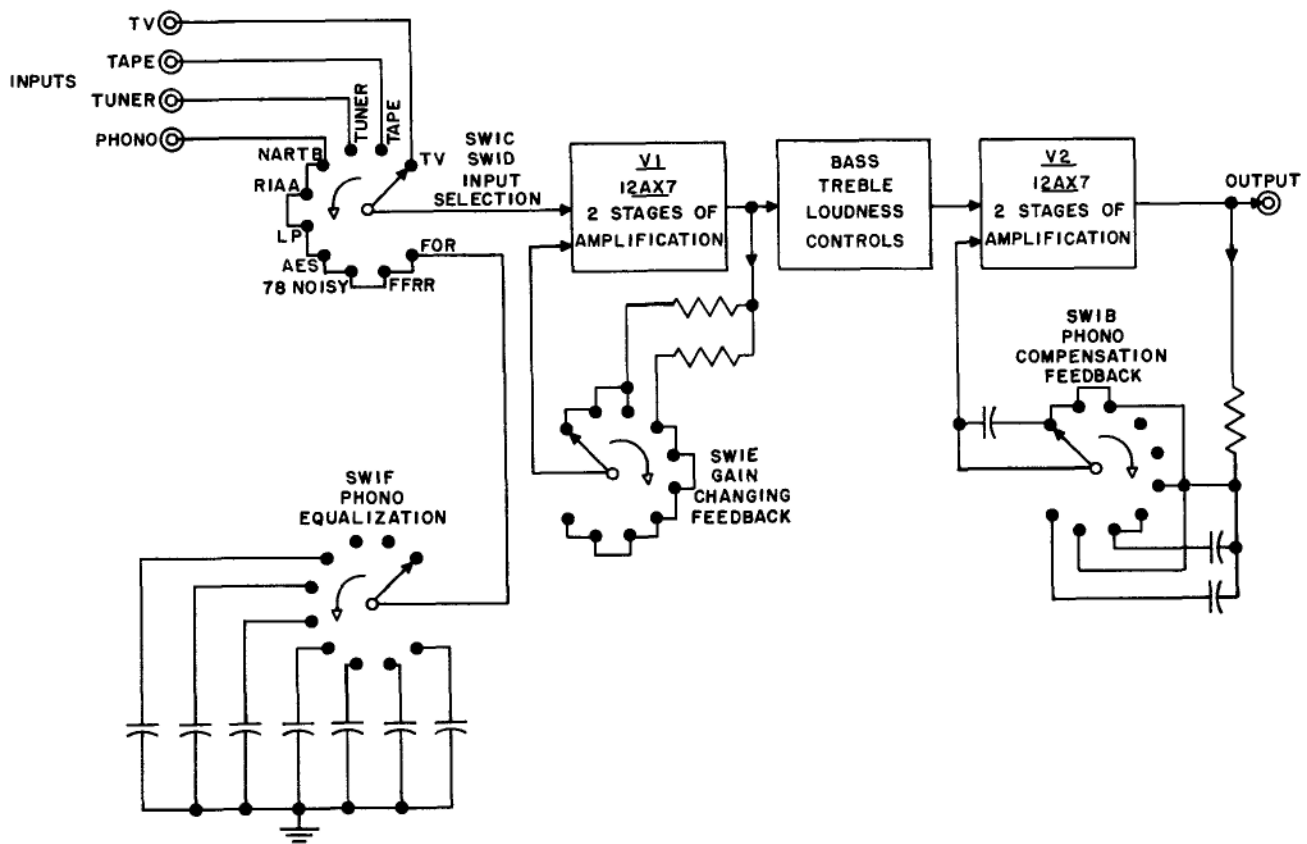


Figure 4. Functional Block Diagram

TABLE 1. TUBE SOCKET VOLTAGES

CONDITIONS

All voltages measured between tube pin and chassis except as noted.
 Selector Switch at Tape.
 VTVM used for all measurements.
 117 VAC, 60 cycle input.
 No input signal.
 Tolerance $\pm 10\%$, all readings DC except as noted.

TUBE	PIN								
	1	2	3	4	5	6	7	8	9
V1	150	0	0.9	32 (6.3AC*)	32 (6.3AC*)	100	-1**	5.6	32 (6.3AC*)
V2	130	0	0.8	32 (6.3AC*)	32 (6.3AC*)	130	0	1.1	32 (6.3AC*)

*Measured between pin 4 or 5 and 9.

**Measured between pin 7 and 8.

PARTS LIST

SYMBOL	DESCRIPTION	NATIONAL CO. PART NO.	SYMBOL	DESCRIPTION	NATIONAL CO. PART NO.
E1	Knob, 1", (4 used)	SB:2819	R37	Variable, dual, 2 megohm	T014-1
E2	Knob, (on Push-Pull switch)	T678-1		each section, special tapers,	
E3	Printed Circuit	T018-1		with SPST switch (SW4)	
P1	Plug, 16 contact, Amphenol	T448-2		IRC type Q18-139XX	
R3	Variable, 500,000 ohms, C	T013-1	SW1	Rotary switch, 10 position,	T016-1
R4	taper, IRC type RQ13-133	T013-1	SW2	Grigsby-Allison type 7945-	
R29	Variable, 500,000 ohms, C	T013-1	SW3	4MLW-4	
R31	taper, IRC type RQ13-133	T013-2	SW4	Slide Switch, DPDT, Muter	T017-1
	Variable, 1 megohm,	T013-2		Co. type 4603	
	special taper, IRC type	T013-3		Switch, Pushbutton, 4PST,	T015-1
	Q18-137XX			Oak Mfg. Co. type 170	
	Variable, 250,000 ohms,			Switch, part of R37	
	special taper, IRC type				
	Q18-130XX				

Standard Form Warranty

Adopted by the Radio Manufacturers Association, Inc.

This equipment is warranted to be free from defective material and workmanship and repair or replacement will be made of any part which under normal installation, use and service discloses defect, provided the unit is delivered by the owner to the manufacturer or through the authorized radio dealer or wholesaler from whom purchased, intact, for examination, with all transportation charges prepaid to the factory, within ninety days from the date of sale to original purchaser, and provided that such examination discloses in the manufacturer's judgment that it is thus defective.

This warranty does not extend to any radio products which have been subjected to misuse, neglect, accident, incorrect wiring, improper installation, or to use in violation of instructions furnished by the manufacturer, nor extend to units which have been repaired or altered outside of the factory, nor to cases where the serial number thereof has been removed, defaced or changed, nor to accessories used therewith of other manufacture.

Any part of a unit approved for remedy or exchange hereunder will be remedied or exchanged by the authorized radio dealer or wholesaler without charge to the owner.

This warranty is in lieu of all other warranties expressed or implied and no representative or person is authorized to assume for the manufacturer any other liability in connection with the sale of their radio products.

National Company, Inc. reserves the right to make any change in design or to make addition to, or improvements in, its products without imposing any obligations upon itself to install them in its products previously manufactured.

Figure 5. Schematic Diagram

