

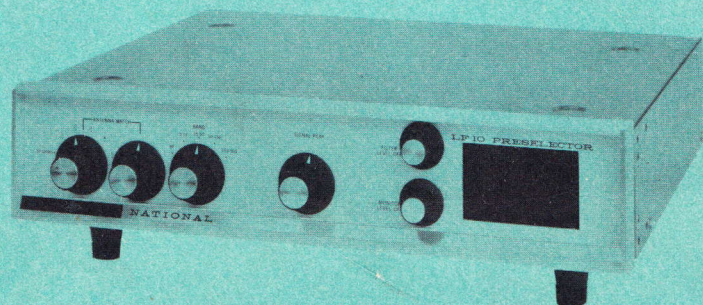


NATIONAL RADIO COMPANY

37 WASHINGTON STREET • MELROSE, MASSACHUSETTS

LF-10

LOW FREQUENCY PRESELECTOR



ONE YEAR GUARANTEE

You now own a product manufactured by one of the world's oldest and most highly respected manufacturers of quality communications equipment. National has manufactured superb communications devices for nearly half a century. Our experience is unequalled. More than 75 per cent of our highly skilled test and assembly people have been with us for more than 25 years — an astonishing record in the relatively young electronics industry. Our people know their business . . . take pride in their fine workmanship — workmanship so outstanding that many National receivers purchased over 30 years ago are still in daily use.

We manufacture most of the components used in our equipment . . . and, in fact, National has been a prime supplier of electronic components to other important electronic manufacturers and government agencies for many years. As a result, we enjoy unusual control of component part quality.

We strongly recommend that you carefully study the instruction manual before attempting to use your new equipment. We are sure you will find that maximum performance will be achieved with complete understanding of its controls and operating features.

Your new National equipment has undergone an intense series of rigid quality control tests. However, as with any complex electronic equipment, it is possible that a defect may appear as a result of rough handling during shipment or through circumstances beyond our immediate control. For this reason, we suggest that you inspect your new equipment for such damage as soon as it is unpacked. In all cases of in-transit damage a claim must be filed against the carrier.

The component parts of this equipment (exclusive of vacuum tubes and transistors) are guaranteed to be free from defective material and workmanship, and repair or replacement will be made on any part found to be defective upon examination, provided that the unit is delivered to your dealer, authorized service agency or to the company, pursuant to the instructions below, within one year from the date of sale to original purchaser. On units returned during the initial 90 day period, National Radio Company, Inc. will absorb the labor cost of installation; for the remainder of the guarantee period the customer will be charged for such cost. The enclosed guarantee card must be returned to National Radio Company, Inc., within ten days from date of purchase in order to validate the guarantee. Naturally, this guarantee does not extend to any product

which has been subjected to misuse, neglect, accident, improper installations, or use in violation of instructions furnished by us. Nor does it extend to units which have been repaired or altered outside of our factory or its authorized agencies, nor to units where the serial number has been removed or defaced.

Should your new National equipment require servicing please do one of the following, whichever is most convenient:

1. Return it to the dealer from whom you purchased it.
2. Bring it to one of our authorized service agencies.
3. Write to the Service Manager, National Radio Company, Inc., 37 Washington Street, Melrose, Mass. and describe the difficulty. State type of unit and serial number. Describe as completely as possible the apparent defect. If we feel that the unit should be returned to the factory we will give you written authorization to ship the unit to us. Notify us that you are returning the unit and ship prepaid and fully insured in the original specially designed shipping carton.

Your unit will receive prompt and careful attention. If, in our judgment the unit is indeed defective, repair or replacement will be made at no cost to you if the unit is returned within 90 days after date of original purchase. Should the unit be returned to us after 90 days from date of purchase but before 365 days have elapsed, again, if in our judgment the unit is indeed defective, National Radio Company will provide a replacement of any such defective part (except vacuum tubes or transistors). If you wish us to install the part, you will be billed only for labor costs involved. At the end of one year, after expiration of guarantee, service will be billed to you at cost of parts and labor only.

This extended guarantee supercedes all previous warranties of National Radio Company, Inc. and is in lieu of all other warranties expressed or implied. Damages arising out of a breach of this guarantee are limited to repair or replacement of the defective part as stated above. We naturally reserve the right to change or improve our products without imposing any obligation upon ourselves to so modify products previously manufactured. Your new National Radio Company equipment is the finest of its type. It was skillfully designed, carefully manufactured and thoroughly tested. We are confident that your choice of our equipment will result in many years of pleasure.



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INSTRUCTION MANUAL

LF-10 LOW FREQUENCY PRESELECTOR

1. GENERAL DESCRIPTION

The LF-10 preselector provides LF/VLF performance equal to that of the HRO-500 in the HF portion of the spectrum. It is recommended for use in critical laboratory or communications applications.

The LF-10 is delivered ready for either rack or table-mounting. Rack-mounting flanges with handles are supplied, and may be removed when the LF-10 is table-mounted under the HRO-500 receiver.

Antenna matching controls are incorporated in the LF-10 to permit use of random length antennas as well as 50 ohm feed lines. Antenna switching circuits are provided to permit use of one antenna for both HF and LF operation or separate antennas if available. Antenna switchover is performed automatically when the LF-10 is in use.

A three-inch monitoring loudspeaker is built into the LF-10 with a separate monitoring audio channel to permit independent monitoring of a line being fed by the receiver output. The monitoring speaker and its audio channel may be used in place of a separate loudspeaker in both LF and HF operation.

Provisions for an audio filter are also incorporated in the LF-10. A filter channel with its own level control is provided to permit installation of readily available audio filters of any desired frequency and bandwidth. The optional audio filter, if used, will operate on both LF and HF frequency ranges of the HRO-500, and may be controlled from the front panel of the LF-10. In addition, filter output may be mixed with normal audio output to provide any desired degree of audio selectivity.

2. INSTALLATION

2.1 TABLE-TOP INSTALLATION:

As delivered, the LF-10 may be table-top mounted, either by itself or directly beneath the HRO-500 receiver. The top cover of the LF-10 is dimpled to allow the HRO-500 to be placed directly on top of the LF-10 and to prevent the HRO-500 from sliding on the preselector cover. It may be desirable to remove the front leg extensions of the HRO-500 and LF-10 to allow the LF-10 and HRO-500 combination to take up a minimum of space. The small rubber feet should be replaced using the 8-32 x 1/2" long screws supplied with the LF-10 hardware package.

2.2 RACK-MOUNT INSTALLATION:

The LF-10 rack-mount plates are designed to mount in a 3 1/2" x 19" RETMA rack space. For rack-mount installation, remove the LF-10 foot channels and feet by removing the four 10-32 screws which attach the foot channels to the LF-10 chassis. Assemble the rack-mount plates and the handles to the LF-10 using the screws supplied with the LF-10. Four 10-32 x 1/2" long screws and cup washers are supplied in the LF-10 hardware package for use in mounting the LF-10 to the rack.

2.3 POWER CONNECTIONS:

Connect the small coaxial cable terminated with RCA type phono plugs between the LF OUTPUT jack on the rear apron of the LF-10 and the LO FREQ IN jack, (J-3), on the rear apron of the HRO-500 receiver.

At frequencies below 500 Kcs, ignition, power, and atmospheric interference may be excessive unless the equipment is properly grounded. To avoid excessive noise, a separate ground connection should be run from the chassis of the HRO-500 receiver or LF-10 preselector to the ground system in the building or vehicle in which the unit is being located.

2.4 ANTENNA CONNECTIONS:

CAUTION

WHEN USING THE LF-10 FOR LOW FREQUENCY RECEPTION, THE HRO-500 RF AMPLIFIER IS STILL ACTIVE. DO NOT CONNECT ANY ANTENNA DIRECTLY TO THE HRO-500 HF ANTENNA INPUT JACK. THIS WILL CAUSE INTERFERENCE IN THE LF RANGE FROM UNWANTED SIGNALS IN THE HF PORTIONS OF THE FREQUENCY SPECTRUM.

The LF-10 incorporates provisions for a separate LF antenna system as well as the HF antenna system for high frequency operation of the HRO-500 receiver. Antenna connections are made as follows, depending on whether or not a separate HF antenna is used for HF operation of the HRO-500 receiver.

As seen in Figure 1, if only one antenna is to be used for both HF and LF reception, plug the antenna into the LF-10 jack marked LF ANTENNA INPUT. Plug an interconnecting cable (not supplied) from the jack marked LF ANTENNA OUTPUT on the rear apron of the LF-10 to the ANTENNA jack, (J-1), on the rear apron of the HRO-500 receiver.

As seen in Figure 2, when separate HF and LF antennas are used, the LF antenna is connected to the jack on the rear apron of the LF-10 marked LF ANTENNA INPUT, and the HF antenna is connected to the jack on the LF-10 marked HF ANTENNA INPUT.

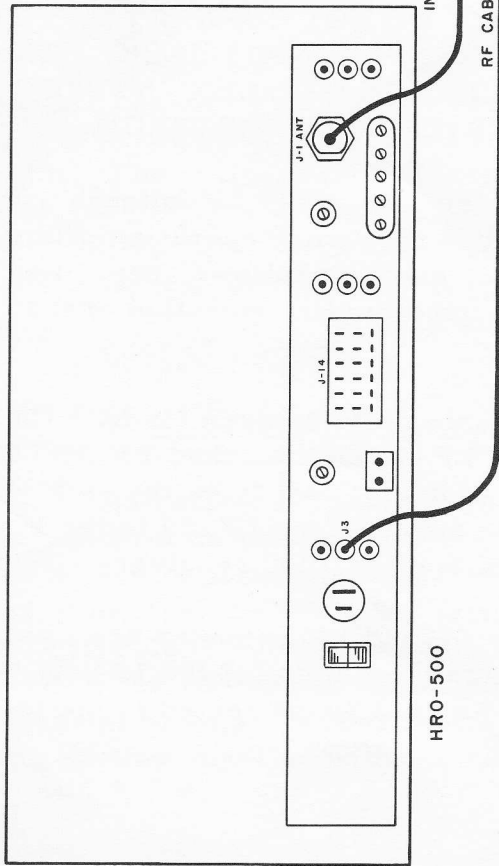
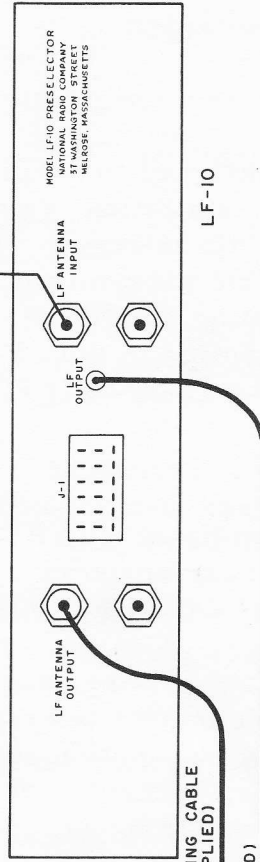


FIGURE 1



CONNECTIONS FOR USE WITH SINGLE LF ANTENNA

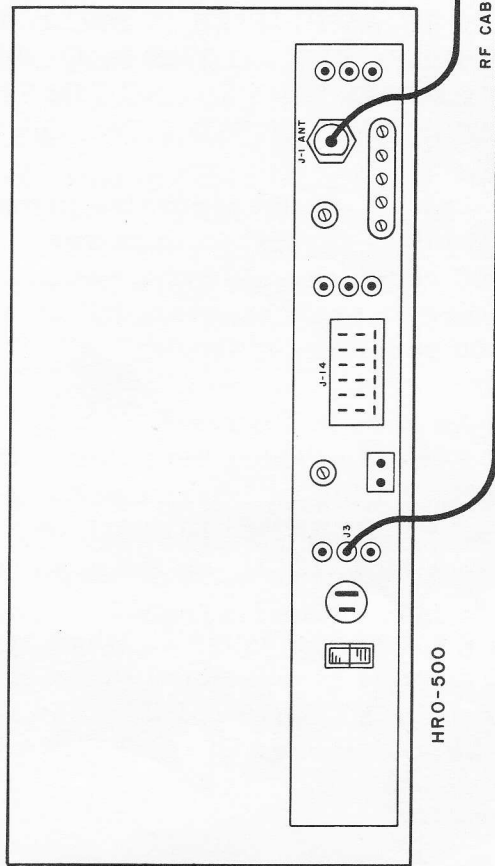
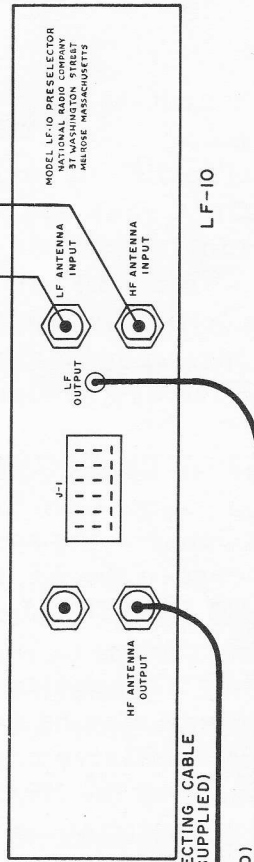


FIGURE 2



CONNECTIONS FOR USE WITH 2 SEPARATE ANTENNAS

2.4 ANTENNA CONNECTIONS: (CONTINUED)

The LF-10 jack marked HF ANTENNA OUTPUT is then connected to the ANTENNA jack, (J-1) of the HRO-500 receiver.

Appropriate switching of these antennas between the HRO-500 receiver and the LF-10 preselector is performed by the LF-10 preselector BANDSWITCH.

2.5 SPEAKER CONNECTIONS:

HRO-500 receivers with serial numbers beginning with 75-1335 are wired to feed the AUDIO MONITORING channel of the LF-10 preselector. All receivers with serial numbers lower than 75-1335 must be modified for use with the LF-10 AUDIO MONITORING channel. This modification may either be made internally or externally, by connecting a 6" wire from Pin 16 on the POWER OUTPUT socket, (J-14), to the hot 3.2 ohm audio output terminal, (J-10), on the rear apron of the HRO-500 receiver.

3. OPERATION

3.1 GENERAL:

When the HRO-500 receiver is used with the LF-10 preselector, the HRO-500 BANDSWITCH is placed in the 0-1.5 Mc position, and the SYNTHESIZER TUNE control is adjusted so that 0.0 (Megacycles) appears in the horizontal synthesizer window of the HRO-500 receiver. The MAIN TUNING DIAL of the HRO-500 receiver now reads frequency directly in kilocycles across the 5 Kc to 500 Kc low frequency band. The preselector in the HRO-500 receiver is not used when the LF-10 preselector is being used.

If the HRO-500 receiver is to be used for HF operation, the BANDSWITCH of the LF-10 must be placed in the HF position to connect the proper antenna to the HF ANTENNA INPUT of the HRO-500. When the LF-10 preselector BANDSWITCH is rotated from the HF position clockwise to any of the four LF bands, power is connected to the LF-10 RF circuits and the proper antenna is connected to the LF-10 RF stage.

3.2 PRELIMINARY SETTINGS:

1. ANTENNA MATCH CONTROLS: both fully counter-clockwise.
2. BANDSWITCH: to appropriate LF band.
3. FILTER LEVEL: OFF
4. MONITOR LEVEL: OFF

3.3 DETAILED USE OF LF-10 CONTROLS:

3.3.1 BANDSWITCH:

The BANDSWITCH controls power to the RF portion of the LF-10, automatically switches antennas between the LF-10 preselector and HRO-500 receiver, and selects the proper LF tuning range of the LF-10 preselector. In the HF position, power is removed from the RF portion of the LF-10 preselector, and the following antenna switching functions take place depending on whether separate HF and LF antennas are being used or whether only one antenna is being used for operation in both HF and LF spectrums. If separate HF and LF antennas are connected to the LF-10, the HF antenna is automatically connected to the HRO-500 ANTENNA input when the LF-10 BANDSWITCH is in the HF position. As soon as the BANDSWITCH is rotated clockwise to any of the other positions, the LF antenna is internally connected to the RF stage of the LF-10 preselector and the HF antenna is disconnected from the HRO-500 receiver. If only one antenna is connected to the LF-10 preselector for both HF and LF reception, it is bandswitched to the ANTENNA input of the HRO-500 receiver when the LF-10 BANDSWITCH is placed in the HF position. When the LF-10 BANDSWITCH is rotated clockwise to any of the other positions, the LF antenna is disconnected from the HRO-500 receiver and internally connected to the RF stage of the LF-10 preselector.

3.3.2 PEAK:

The 5 Kc to 500 Kc tuning range of the LF-10 preselector is covered in four bands, with a frequency relationship of 5-15 (5-15 Kc; 50-150 Kc) on two bands and 15-50 (15-50 Kc; 150-500 Kc) on the other two bands. The PEAK control is used to adjust the tuned circuits of the LF-10 for maximum signal strength of incoming LF signals. When the PEAK control is fully counter-clockwise, the PEAK control is at the lower frequency of the band in use. The PEAK control is adjusted for maximum signal strength or background noise.

3.3.3 ANTENNA MATCH CONTROLS:

The ANTENNA MATCH controls are used together to match the terminal impedance of the antenna being used to the input impedance of the RF stage in the LF-10 preselector. When the ANTENNA MATCH switch is in its fully counter-clockwise position, the input impedance of the LF-10 preselector matches a 50 ohm antenna. The ANTENNA MATCH controls are adjusted by turning each through its range for maximum signal strength.

3.3.4 FILTER LEVEL:

The LF-10 preselector incorporates an optional sharp audio filter with a separate audio channel for this filter. The FILTER LEVEL control works in conjunction with the HRO-500 AUDIO GAIN control and may be used for HF operation of the HRO-500 as well as LF operation with the LF-10 preselector. If the optional sharp audio filter is installed, and it is desired to process the audio output of the HRO-500 receiver through the filter, the AUDIO GAIN control of the HRO-500 receiver is turned fully counter-clockwise. The FILTER LEVEL control is then rotated clockwise from the OFF position to process all audio from the HRO-500 through the filter. The HRO-500 output level will depend upon the setting of the FILTER LEVEL control. If use of the sharp audio filter is not desired, the FILTER LEVEL control is rotated fully counter-clockwise to the OFF position and normal audio may be fed to the loudspeaker or line with the AUDIO GAIN control of the HRO-500 receiver. It will be noted that in the OFF position, the LF-10 FILTER LEVEL control switch removes power from the FILTER audio channel amplifier.

3.3.5 MONITOR LEVEL:

If the HRO-500 receiver and LF-10 preselector are being used to feed a circuit without separate monitoring facilities, the MONITOR LEVEL control may be rotated clockwise from the OFF position to feed the HRO-500 audio output to the built-in monitoring speaker in the LF-10 preselector. The monitor channel will monitor actual HRO-500 output, thus monitoring either the flat or filter channel depending on which is in use. The MONITOR LEVEL control switch removes power from the monitor channel circuits when the MONITOR LEVEL control is in the OFF position.

The monitoring loudspeaker in the LF-10 may be used at any time in conjunction with the MONITOR LEVEL control for monitoring of the HRO-500 receiver output, if a separate loudspeaker is not available. Proper level setting of the MONITOR LEVEL control depends upon the setting of either the FILTER LEVEL control of the LF-10 or the AUDIO GAIN control of the HRO-500 receiver.

4. THEORY OF OPERATION

4.1 GENERAL:

The RF SECTION consists of two high-gain, low noise NPN type transistors preceded by a double-tuned RF circuit to provide excellent selectivity against unwanted signals. The two stage amplifier provides sufficient gain to bring the AM sensitivity up to 2 uv for the HRO-500 and LF-10 combination in the 5-500 Kc frequency spectrum.

4.1 GENERAL: (CONTINUED)

The FILTER AMPLIFIER uses a PNP type transistor as an audio preamplifier to overcome filter insertion loss. Output from the filter channel is returned to the HRO-500 final audio stages.

The MONITOR AMPLIFIER also uses a PNP type transistor for amplification of the audio output of the HRO-500. The preamplifier transistor drives a pair of PNP type power transistors, used in a single-ended, push-pull configuration, to provide monitoring speaker power independently of the setting of the HRO-500 AUDIO GAIN control.

4.2 THE RF AMPLIFIER:

The RF SECTION consists of four bandswitched pairs of tuned circuits, the antenna matching circuits and a transistor amplifier. Each pair of tuned circuits is individually mounted in shielded cans. All coils with the exception of Band 1 employ mutual inductance coupling. On Band 1, (5-15 Kc), common impedance coupling is obtained across resistor R-1, which also serves as a load for the coils to provide the bandwidth needed.

In all coils, links are used to couple the 50 ohm antenna and RF amplifier base to the tuned circuits. The turns ratio and coil spacing have been carefully chosen to provide proper bandwidth and proper impedance transformation from the antenna to the first RF stage.

The ANTENNA MATCH switch is a 6-position selector switch. It works in conjunction with the ANTENNA MATCH capacitor to match any antenna impedance. In its fully counter-clockwise position, it connects the antenna to the 50 ohm links on the antenna coils. In all other positions, it matches the antenna impedance by selecting a parallel combination of one or more capacitors in series between the antenna and the high impedance taps on the antenna coils. This provides maximum sensitivity for a wide range of antenna lengths and impedances. Resistor R-12 serves as a conductive discharge path for the high impedance antenna positions.

A 5-position BANDSWITCH connects the tuned circuits to the RF amplifier and also serves as an antenna switch for the HRO-500 and the LF-10 combination. Sections S1 C and S1 D, also serve as shorting switches for the unused coils when a frequency higher than 15 Kcs is desired.

The ganged capacitors, C-7 and C-8, tune each set of coils to the desired frequency while the ANTENNA MATCH capacitor, (C-6), tunes out any reactance presented by the antenna.

4.2 THE RF AMPLIFIER (CONTINUED)

The RF amplifier, (Q-1), is operated as a high gain common-emitter amplifier transistor. The amplified signal appears across the collector resistor, (R-7).

AGC is applied to the emitter of the RF amplifier, (Q-1), through the AGC amplifiers, (Q-3 and Q-4). When no signal is received at the antenna terminals of the LF-10, the AGC voltage from the HRO-500 is about +1.9 volts. This voltage is applied to the base of the AGC amplifier, (Q-3), through the resistors R-3 and R-4, causing the AGC amplifier, (Q-4), to saturate and present a very low impedance in the RF amplifier emitter return path. When a signal appears at the RF amplifier, the HRO-500 AGC voltage drops toward zero. Transistors Q-3 and Q-4 conduct less heavily causing the collector voltage and collector impedance of transistor Q-4 to rise. This increase in voltage and impedance reduces the RF stage gain and increases degeneration to reduce distortion at high input signal levels. Resistors R-2, R-3, R-4, and R-8 have been chosen to provide the proper gain-reduction slope.

The signal across resistor R-7 is capacitively coupled to the base of transistor Q-2, which operates as an emitter follower stage to match the 20K output impedance of transistor Q-1 to the 1K input impedance of the HRO-500 LF INPUT. Since emitter followers are inherently degenerative, transistor Q-2 contributes no distortion to the signal. Resistors R-9 and R-10 provide the proper forward bias for transistor Q-2. The output signal is developed across the emitter resistor, (R-11), and is capacitively coupled to the HRO-500 through capacitor C-16.

4.3 THE FILTER CHANNEL:

The filter amplifier uses a PNP type transistor to amplify the detector output of the HRO-500. The amplified signal is transformer-coupled to the optional audio filter. The filter is terminated by a 560 ohm resistor, (R-19) and coupled back to the audio input of the HRO-500. The filter channel may be used whenever a narrow audio bandwidth is desired. The LF-10 is designed to accept a wide range of UTC type TGT or TGR audio filters with a seven pin base. Filters of various bandwidths may be purchased from local distributor stock or by writing to the Service Manager, National Radio Company, 37 Washington Street, Melrose, Massachusetts 02176.

4.4 THE AUDIO CHANNEL:

The audio preamplifier uses a PNP type transistor in a circuit similar to the filter amplifier and the audio preamplifier in the HRO-500 receiver.

4.4 THE AUDIO CHANNEL: (CONTINUED)

Input is obtained from the 3.2 ohm audio output of the HRO-500 on Pin 16 of the HRO-500 POWER OUTPUT socket, (J-14). The audio preamplifier output is transformer coupled to the monitor power output transistors.

The monitor output amplifier consists of a matched pair of power transistors in a single-ended push-pull configuration. The driver transformer, (T-7), provides audio voltages phased so that transistors Q-7 and Q-8 are driven 180 degrees out of phase. When transistor Q-7 is conducting heavily on a voltage peak, transistor Q-8 is conducting very lightly and when Q-8 is conducting heavily, Q-7 is conducting very lightly. Potential #65 is, therefore, either driven positively above or below its resting point of half the supply voltage (+6 volts). This change is coupled through capacitor to the monitor speaker.

Resistors R-27, R-28, R-29, R-30, R-31, and R-32 provide the required forward bias for transistors Q-7 and Q-8 so that they draw about 50 ma resting current for minimum cross-over distortion. Resistor R-33 and Capacitor C-23 provide decoupling. A separate audio ground return eliminates cross channel coupling in the LF-10.

5. TEST AND ALIGNMENT

5.1 EQUIPMENT REQUIRED

1. Signal generator covering the range from 5 Kc to 500 Kc with a properly terminated and calibrated output or a stable audio generator covering 5 Kc to 500 Kc with an external attenuation pad.
2. Standard audio output meter.
3. HRO-500 receiver.
4. Suitable alignment tools for adjustment of coils and capacitors.

5.2 INITIAL CONTROL SETTINGS:

MONITOR LEVEL	OFF POSITION
FILTER LEVEL	OFF POSITION
BANDSWITCH	5-15 KC POSITION
MAIN TUNING	5 KC POSITION
ANTENNA MATCH SWITCH	50 OHM POSITION
ANTENNA MATCH TUNING	MID-RANGE POSITION

5.2.1 HRO-500 INITIAL CONTROL SETTINGS:

FUNCTION SWITCH	SSB POSITION
MAIN TUNING	AS INDICATED
BANDWIDTH	5 KC POSITION
BANDSWITCH	0-1.5 MC POSITION
SYNTHESIZER TUNE	0.0 MC POSITION
RF GAIN	FULL CLOCKWISE
AF GAIN	AS NEEDED
AGC THRESHOLD	ON
REJECTION TUNE	OFF

5.3 PRESELECTOR ALIGNMENT:

Check to see that all LF-10 and HRO-500 controls are set as indicated in Section 5.2. Connect the signal generator or audio oscillator with an attenuation pad to the 50 ohm LF antenna INPUT, (J-3), of the LF-10 preselector. Match the signal generator output properly to present a 50 ohm resistive source to the preselector LF antenna terminal. Connect the audio output meter to the 3.2 ohm and GND terminals of J-10 on the rear apron of the HRO-500 receiver. Then, align the LF-10 preselector according to Figure #3. The MONITOR LEVEL control may be advanced to permit audible alignment in addition to the power output indication on the power output meter.

Adjust all circuits for maximum output as indicated by the audio output meter or HRO-500 S-meter. Reduce the signal generator input as required to avoid overloading. The HRO-500 S-meter may be used as an overload indicator by maintaining the S-meter at or below mid-scale. Repeat the adjustments at each end of each band as required to achieve proper tracking.

FIGURE 3.

SET HRO-500 BANDSWITCH TO BAND 1, (0.0 - 1.5 Mc.).

SET HRO-500 SYNTHESIZER TUNE TO READ 0.0 Mc.

LF-10 BAND	HRO-500 MAIN TUNING	LF-10 PEAK (see note)	SIGNAL GENERATOR	ADJUST FOR MAXI- MUM INDICATED AUDIO OUTPUT
<u>BAND 1</u>				
5-15 KC	5 KC	A	5 KC	T1 A, T1 B
5-15 KC	15 KC	B	15 KC	C-9
<u>BAND 2</u>				
15-50 KC	15 KC	A	15 KC	T2 A, T2 B,
15-50 KC	50 KC	B	50 KC	C-10
<u>BAND 3</u>				
50-150 KC	50 KC	A	50 KC	T3 A, T3 B,
50-150 KC	150 KC	B	150 KC	C-11
<u>BAND 4</u>				
150-500 KC	150 KC	A	150 KC	T4 A, T4 B,
150-500 KC	500 KC	B	500 KC	C-12

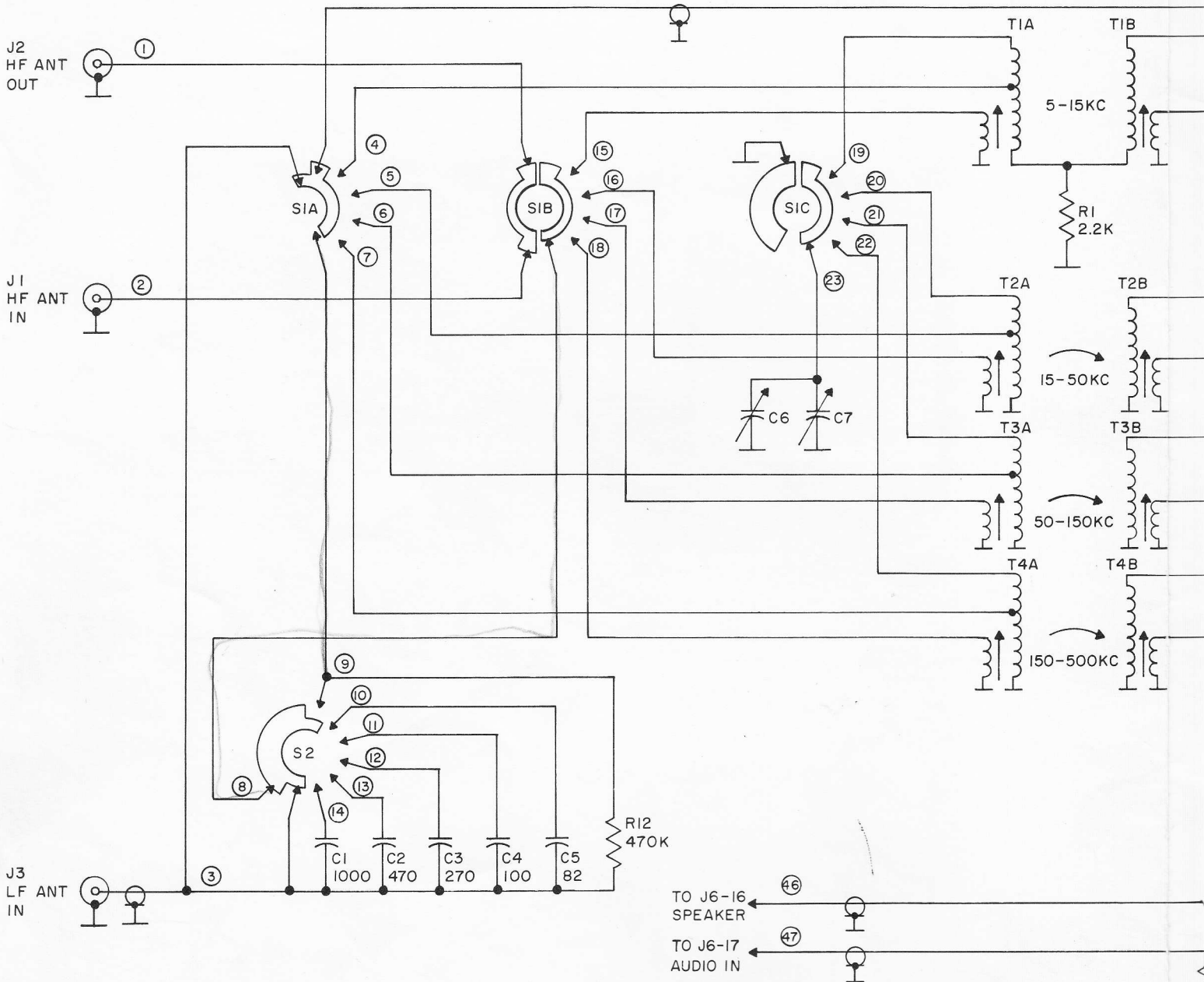
Note: Position A is 10° from the fully counterclockwise rotation of the peak control.
Position B is 10° from the fully clockwise rotation of the peak control.

6. PARTS LIST

PART	DESCRIPTION	NATIONAL RADIO PART NUMBER
<u>SOCKETS, JACKS & PLUGS</u>		
J-1, J-2, J-3, J-4	Coaxial Connector, Antenna	A-51479
J-5	Jack, Phono	A-11998
J-6	Power Plug, Jones 18T (chassis)	B-51840
	Plug, 18T, Male (cable)	B-51265
	Plug, 18T, Female (cable)	B-51841
	Plug, Phono, Male (cable)	A-11153
<u>POTENTIOMETERS</u>		
R-10, R-22	Monitor Level, Filter Level	B-51844-1
<u>COILS AND TRANSFORMERS</u>		
T-1A	Antenna 5-15 KC (Band 1)	B-51897
T-1B	Base 5-15 KC (Band 1)	B-51898
T-2A	Antenna 15-50 KC (Band 2)	B-51894
T-2B	Base 15-50 KC (Band 2)	B-51893
T-3A	Ant. 50-150 KC (Band 3)	B-51892
T-3B	Base 50-150 KC (Band 3)	B-51891
T-4A	Ant. 150-500 KC (Band 4)	B-51889
T-4B	Base 150-500 KC (Band 4)	B-51890
T-5	Filter Driver	B-51649-2
T-6	Optional Audio Filter	See Section 4.3
T-7	Monitor Driver	B-51649-3
<u>SWITCHES</u>		
S-1	Band Switch Assembly	C-51864
S-2	Antenna Match	B-51865
S-3, S-4	Power (Part of Gain Control)	B-51844-1
<u>KNOBS</u>		
	Band, Antenna, Main Tuning	NPS-9-F-2-L-A
	Monitor, Filter Level	NPS-7-F-2-L-A

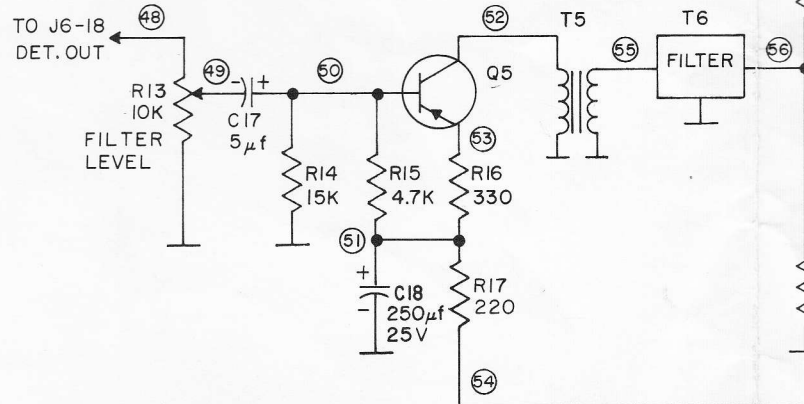
PART	DESCRIPTION	NATIONAL RADIO PART NUMBER
<u>FIXED CAPACITORS</u>		
C-14	10 uf, 25v, Electrolytic	A-51007-8
C-15	0.15 uf, 200v, Paper	NCEP-154-M-2
C-13, C-16	0.33 uf, 200v, Paper	NCEP-334-M-2
C-17, C-19	5 uf, 25v, Electrolytic	A-51007-5
C-18, C-22	250 uf, 25v, Electrolytic	A-51846-1
C-20, C-21	50 uf, 25v, Electrolytic	A-51007-12
C-23	100 uf, 25v, Electrolytic	A-51007-14
<u>VARIABLE CAPACITORS</u>		
C-6	Antenna Peak	C-51862
C-7	Main Tuning (Front)	C-51861-2
C-8	Main Tuning (Rear)	C-51861-1
<u>TRIMMERS</u>		
C-9, C-10, C-11, and C-12	Trimmer Bracket Assembly	B-51304-6
<u>TERMINAL BOARDS</u>		
	Filter Amplifier	B-51666
	Monitor Amplifier	B-51665
	RF Amplifier	B-51660
<u>TRANSISTORS</u>		
Q-1, Q-2	Transistor 2N3391A-GE	
Q-3, Q-4	Transistor 2N3654-GE (Alternate 16L43-GE)	
Q-5, Q-6	Transistor 2N2429-AMPEREX	
Q-7, Q-8	Transistor T1-3027-TEXAS INSTRUMENT	

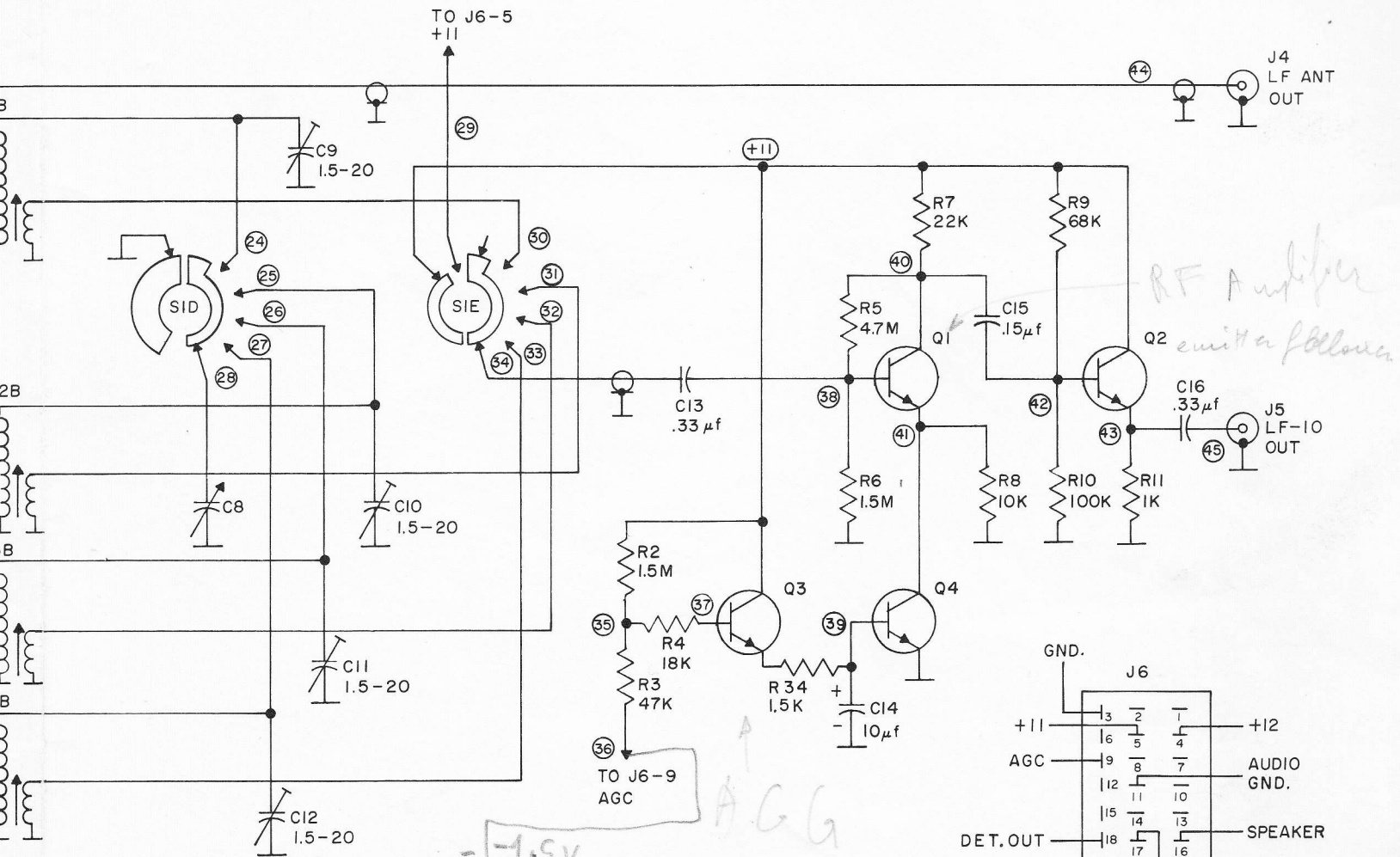
PART	DESCRIPTION	NATIONAL RADIO PART NUMBER
	<u>MISCELLANEOUS</u>	
	Top Cover	D-51664
	Rack Mounting Plate (each)	B-51842
	Handle	B-51777-2
	Foot Mounting	A-51812
	Foot Extension	A-51798
	Grille, Speaker	B-51863
	Speaker	C-51878
	Front Panel	C-51663
	Shield, Coil	B-51871



NOTES:

1. ALL RESISTORS IN OHMS; 1/2W $\pm 10\%$ UNLESS OTHERWISE NOTED
2. ALL CAPACITORS IN pf; 50V $\pm 10\%$ UNLESS OTHERWISE NOTED
3. ALL SWITCHES SHOWN IN FULL CCW POSITIONS
 BAND SWITCH - HF POSITION
 ANTENNA MATCH - 50 Ω POSITION
 MONITOR LEVEL - OFF
 FILTER LEVEL - OFF
4. ALL CHOKES IN μh $\pm 10\%$ UNLESS OTHERWISE NOTED
5. ALL VOLTAGES INDICATED ARE $\pm 10\%$





RF Amplifier
emitter follower

-1.5V
+1V pld
per
Provide

AGC

Amplifier control
gain

