INSTRUCTION MANUAL

for

THE NATIONAL NC-2-40D

A NEW UNIVERSAL COMMUNICATIONS RECEIVER

A high performance receiver of advanced design for the 490 to 30000 kilocycle range

NC-2-40D RECEIVER

HIGHLIGHTS . . .

- 490 to 30,000 Kilocycle Range
- 6 General Coverage Ranges
- 5 Amateur Bands with Uniform Bandspread
- All Ranges Have Definite, Accurate Calibration
- Actual Single Dial Control
- Temperature Compensation
- Automatic Voltage Stabilization
- Series Valve Noise Limiter
- New, Flexible Crystal Filter
- 115 and 230 Volt, 50/60 Cycle Operation
- New, Stabilized S-Meter Circuit
- Speaker in Matching Cabinet
- Phonograph Or High Level Microphone Pick-up Jack

National Company, Inc.

THE NC-2-40D COMMUNICATION RECEIVER

SECTION 1. DESCRIPTION

1-1. *General*

The NC-2-40D RADIO RECEIVER is a twelve tube superheterodyne covering the continuous frequency range from 490 to 30,000 kilocycles. This receiver was designed to give the amateur a maximum of bandspreading, and combines mechanical bandspreading on all bands with additional electrical bandspreading of the 10, 11, 20, 40, and 80 meter amateur bands. The NC-2-40D Receiver also incorporates very stable high frequency circuits, due to the high frequency oscillator circuit design developed in the National Laboratories, which eliminates the exasperating detuning effect of the R.F. Gain control, and the even more undesirable motor-boating or fluttering which occurs in most receivers when tuning in strong high frequency signals. Perhaps the best way to prove the exceptional performance of this type of circuit is in the 10 meter band where a line voltage shift from 100 to 120 volts produces less than 1000 cycles change in tuning. This is a variation of less than .003 percent. Frequency drift has been reduced to a minimum through use of temperature compensating capacitors not only in the high frequency oscillator circuits, but in the R.F. and first detector circuits as well.

The sensitivity of the NC-2-40D is particularly high, an input signal of only 1 microvolt providing 1 watt of audio output. R.F. coupling circuits developed in the National Laboratories have made possible the maintenance of full sensitivity up to the highest frequencies covered by the receiver. Moulded polystyrene coil forms are used in all circuits, both R.F. and I.F., thus assuring the freedom from circuit losses or detuning which might otherwise be caused by humidity effects. Variable condenser insulators, tube sockets, etc., are of Isolantite. The chassis of the NC-2-40D is cadmium plated to provide positive grounds and better conductivity as well as a neater appearance. Components in the NC-2-40D are treated as necessary with a fungus-resistant varnish for an added protection against any damage which may result from humidity or temperature.

Each equipment consists of a receiver and speaker built for either relay rack or table mounting and an instruction manual.

The standard NC-2-40D Receiver is designed for operation from a 110/120 volt, or 220/240 volt 50/60 cycle power source.

1-2. *Circuit*

The circuit employed on all bands consists of one stage of radio frequency amplification, a separate first detector and stabilized high frequency oscillator, two intermediate frequency stages, an infinite impedance second detector, a self-balancing phase inverter and audio amplifier, and a push-pull audio output stage.

The second detector utilizes one set of elements of a dual triode; the other set of elements is utilized for a series valve noise limiter. Separate tubes are used in the automatic volume control and beat frequency oscillator circuits. The latter is coupled to the second detector for C.W. reception.

A crystal filter is connected between the first detector and first I.F. amplifier tubes.

All voltages required by the receiver circuits are supplied by a built-in power supply.

1-3. *Tube Complement*

The NC-2-40D is supplied complete with tubes which are tested in the receiver at the time of alignment.

The tubes employed are as follows:

R.F. Amplifier....................6SK7
First Detector....................6K8
H.F. Oscillator....................6J5
First I.F. Amplifier..............6K7
Second I.F. Amplifier............6SK7
Second Detector-Limiter......6SL7GT/G
Automatic Volume Control..........6V6
Beat Frequency Oscillator........6SJ7
Amplifier & Phase Inverter...6SN7GT/G
Push-Pull Audio Output (2)........6V6
Rectifier.........................5Y3G

1-4. *Tuning System*

The master tuning capacitor C-1 and six sets of coils are used to tune the 490 to 30,000 kilocycle range of the receiver. By means of a highly developed band change mechanism, four of these same coil sets are made to spread the 10, 11, 20, 40, and 80 meter amateur bands uniformly over the major portion of the tuning dial (HRO System). All ten ranges are calibrated.

All transformer coils of the R.F. amplifier, first detector and H.F. oscillator stages with their associated padder and air-dielectric trimmer capacitors are mounted in a redesigned rigid aluminum casting which slides the length of the chassis, being moved by the MAIN TUNING control. The various coil assemblies are fitted with heavy contact pins which engage spring contactors mounted immediately under the variable tuning capacitor. This system permits thorough shielding of each individual coil while, at the same time, the coils in use are moved to the best position in the chassis, giving shortest leads to the tubes and master tuning capacitor, and all other coils are completely disconnected from the circuit.

1-5. *Crystal Filter*

Undoubtedly, the most efficient, flexible crystal filter yet designed is used in the NC-2-40D Receiver. Six uniform steps of selectivity, as shown in Dwg. No. 1, and a variable phasing control allow the receiver to be adjusted to almost any operating condition, a highly desirable feature for both short wave communication and broadcast reception. The curves show that any degree of selectivity between that of full single signal operation and wide band broadcast reception is available, the ratio between the two being almost forty to one.

1-6. *Noise Limiter*

The noise limiter of the NC-2-40D Receiver is of the series valve type developed in the National Laboratories. Its effectiveness and superior performance as compared to the more common types of "silencers" were proved in the modernized NC-200 receivers. A threshold control on the front panel permits adjustment of the level at which limiting action starts.

1-7. *Tone Control*

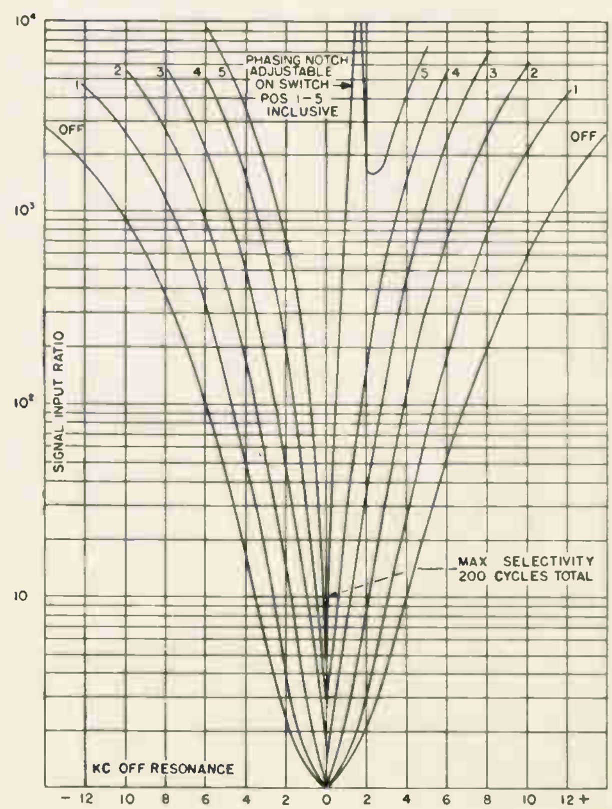
The tone control is used to vary the frequency characteristic of the audio amplifier. The control is particularly helpful when receiving weak signals through interference, as explained in Section 3.

1-8. *Signal Strength Meter*

A 0 to 1 milliammeter, serving as a signal strength meter, is front panel mounted. It is fitted with a scale graduated in S-units from 1 to 9 and in db above S-9 from 0 to 40 db. The circuit, in which the meter is connected, makes possible accurate signal input readings from below 1 microvolt to 1,000 microvolts.

1-9. *Antenna Input*

Antenna input terminals are located at the rear of the receiver chassis near the center. The input circuit is suitable for use with a single wire antenna, a balanced feed-line or a low impedance concentric transmission line. Average input impedance is 500 ohms.



Dwg. No. 1. Typical Selectivity Characteristics

1-10. *Audio Output*

Two audio output circuits are provided:

(1) A headphone jack is mounted on the front panel and is wired so as to silence the loud-speaker when the phone plug is inserted. The correct load impedance for the headphone output is 20,000 ohms, this being the usual impedance of phones having a DC resistance of between 2000 and 3000 ohms. Maximum audio output available at the phone jack is 15 milliwatts.

(2) A five prong speaker socket (X-1) is provided at the rear of the receiver chassis. To this socket are brought the audio output leads. The proper load impedance (total) for the output circuit is 10,000 ohms. Maximum undistorted audio power output available is 8 watts.

1-11. *Power Supply*

The standard NC-2-40D Receiver is designed for operation from a 110/120 volt, or 220/240 volt 50/60 cycle power source. A toggle switch is provided in the dual primary circuit of the power transformer to permit operation from either voltage. Normal power consumption is approximately 100 volt-amps. The built-in power supply delivers all voltages required by the heater and B supply circuits - 4.5 amperes at 6.3 volts and 100 milliamperes at 250 volts, respectively. One side of the AC input line is connected through a 2 ampere and a 1 ampere fuse housed in extractor posts marked 'FUSE'' which are mounted at the rear of the receiver chassis. The 2 ampere fuse is used in the circuit for 115 volt operation. Both 2 and 1 ampere fuses are used for 230 volt operation.

All NC-2-40D Receivers are equipped with a seven prong plug and socket combination to permit portable or emergency operation from batteries. See Section 2-3.

1-12. *Loud Speaker*

The loud-speaker supplied with the table model NC-2-40D Receiver is of the permanent magnet field type having a nominal diameter of 10 inches. A coupling transformer, mounted on the loud-speaker chassis, matches the voice coil to the output impedance of the receiver. A shielded three wire cable and plug is furnished for connection between the loud-speaker and receiver.

A cabinet, finished to match the receiver, houses the loud-speaker for table mounting. The cabinet interior is lined with sound absorbent material to avoid any undesirable mechanical resonance.

A 10 1/2 x 19 inch panel of 1/8 inch steel is used to support the ten inch loud speaker chassis in a relay rack installation.

1-13 *Pick-up Jack*

A pick-up jack mounted on the front panel of the receiver may be used to connect auxiliary apparatus, such as a phonograph pick-up, to the audio system of the NC-2-40D Radio Receiver. This input circuit is high impedance and feeds into the 6SN7GT/G Audio Amplifier-Phase Inverter tube. The TONE and A.F. GAIN controls are operative with this connection.

SECTION 2. INSTALLATION

2-1. *Antenna Recommendations*

When using a single-wire antenna, the lead-in should be connected to one antenna input terminal and the short flexible lead, which is attached to the chassis, should be fastened to the other terminal. The dimensions of the single-wire antenna system are not critical, the recommended length, including lead-in, being from 75 to 100 feet, although any length between 25 and 200 feet may be used.

Feed-lines of doublet systems should be connected to the two input terminals. The flexible lead is not used.

The inner conductor of a concentric transmission line should be connected to one input terminal. The outer conductor and the flexible grounding lead should be connected to the other terminal.

An external ground connection to the chassis may or may not be necessary. It should be used unless it reduces signal strength.

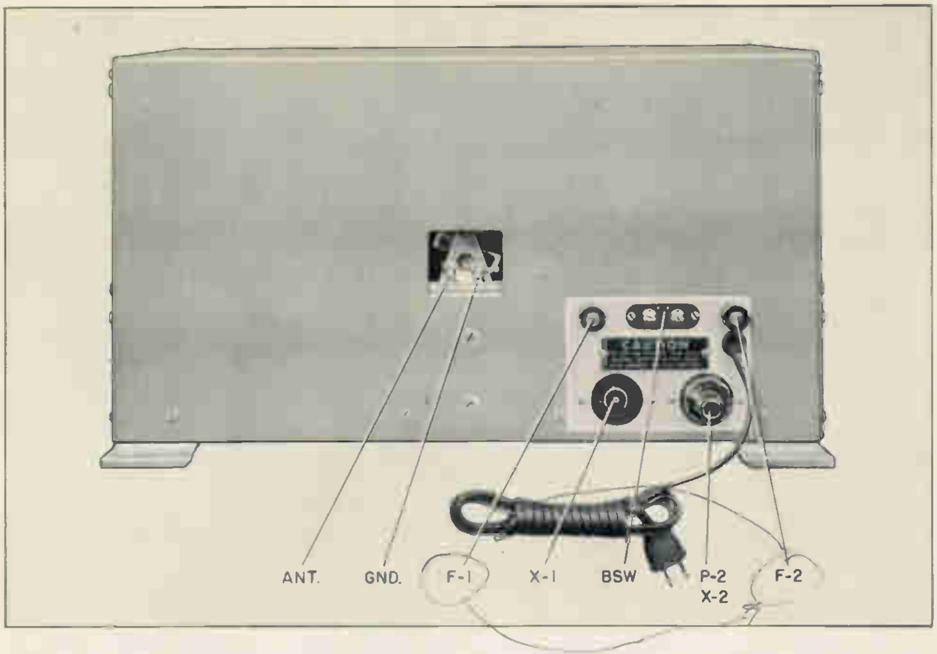


Fig. No. 1. Rear View of Receiver

2-2. AC Operation

After unpacking the NC-2-40D Receiver and loud-speaker from the shipping cases, proceed as follows:

(1) Remove the two coil carriage locking screws on the right hand side of the cabinet before attempting to slide the coil carriage.

(2) Make sure tubes are firmly in their sockets.

(3) Insert the dummy connector plug P-2 in the seven prong socket X-2.

(4) Insert loud-speaker plug P-1 in the five prong audio output socket X-1 of the receiver.

(5) Connect antenna feed line.

(6) Set primary selector switch for line voltage to be used, i.e. 115 or 230.

(7) Plug AC line cord in proper source of supply.

(8) Set controls as recommended in Section 3 for reception of signals.

2-3. Battery Operation

The NC-2-40D may be operated in portable or emergency service by connecting batteries to the terminals of battery connector plug P-3 and inserting it in socket X-2 in place of plug P-2. See Fig. No. 1. For normal operation with somewhat reduced loud-speaker output, a 6 volt heater supply (storage battery) should be connected to terminals 1 and 2 of plug P-3, and a 180 volt B supply should be connected to plug terminals 5 and 6. During battery operation the B+ and BSW switches are operative. Battery economy may be effected during headphones operation by removal of the speaker plug P-1 from socket X-1 which will open the 6V6 B supply without harming the output tubes. A further economy of battery power during headphones operation may be accomplished by removal of the two 6V6 output tubes from their sockets. The AC line switch does not render the Receiver inoperative during battery operation. It is necessary, therefore, to remove the battery plug to effectively disconnect the battery from the Receiver.

Do not attempt to use plug P-2 for battery connection, since the jumper between terminals 1 and 7 would be incorrect.

The recommendations of Section 3, OPERATION, apply to the battery powered NC-2-40D.

2-4. Loud Speaker

If the installation is such that the loud-speaker will be placed close to the receiver, the most desirable position is at the side. Placing the loud-speaker on top of the receiver is not desirable since vibration from the speaker might possibly introduce microphonic noises which would not otherwise be noticeable.

SECTION 3. OPERATION

3-1. *Controls*

The MAIN TUNING control knob is located at the middle of the front panel and operates a three-gang variable capacitor C-1 through a 44 to 1 ratio reduction drive mechanism. The main dial has ten accurately calibrated scales, the scale in use being definitely indicated by band markers appearing at the scale ends. A dial pointer shows the frequency to which the receiver is tuned. The accuracy of the general coverage calibration can be relied upon to be better than plus or minus 1%. Immediately below the pointer is a vernier dial which may be used to accurately log incoming signals.

The tuning system of the NC-2-40D is truly single control; in fact, the MAIN TUNING control referred to above is used for band changing as well as tuning. To select either a general coverage or bandspread coil range, the MAIN TUNING control knob is pulled out about 1/4 inch. When this is done, the dial and capacitor drive mechanism is disengaged and the knob is geared to the coil casting. As the knob is turned, the coil carriage is moved across the chassis until the proper coil pin contacts engage the circuit contactors, as indicated by the scale markers. Approximately one full turn of the MAIN TUNING knob is required to change from one general coverage range to an adjacent general coverage range. Approximately one quarter turn of the knob is required to shift from a general coverage range to the associated bandspread range near the high frequency end. The knob does not turn smoothly between ranges, but only a few minutes is required to become familiar with its action. After the desired range has been selected, the tuning knob is pushed in to its original position, engaging the capacitor drive and disengaging the coil carriage rack.

The LIMITER control, at the left-hand side of the receiver panel, is used to

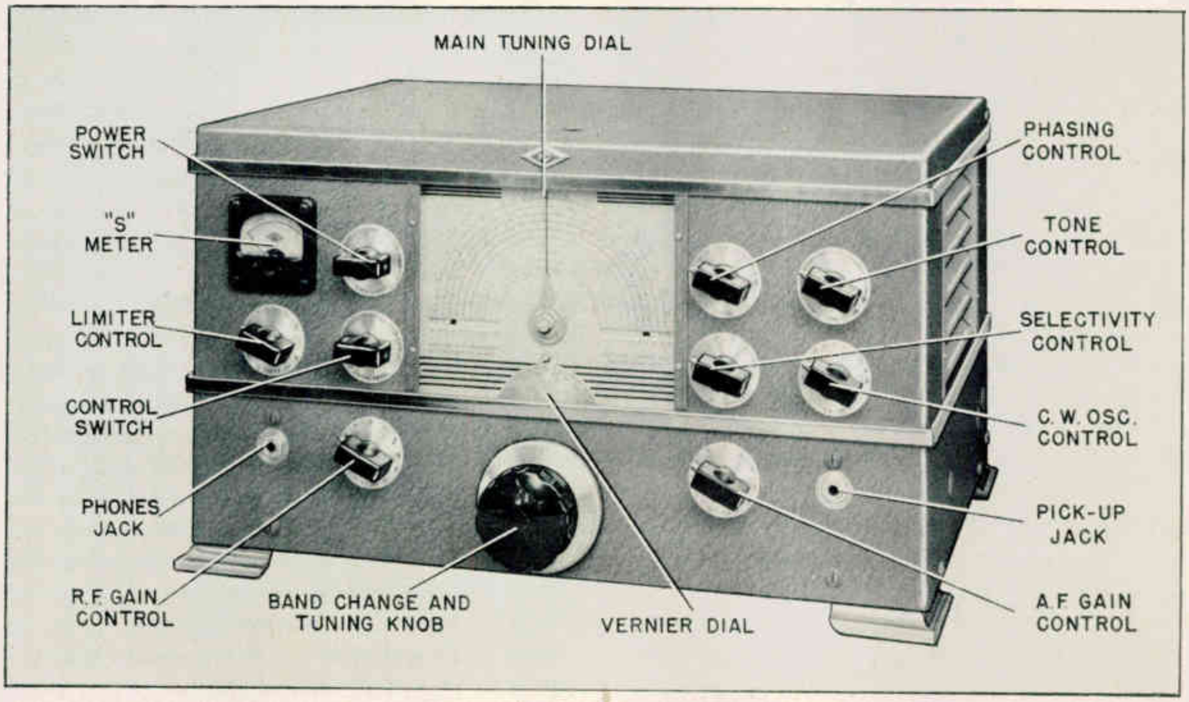


Fig. No. 2. Front View of Receiver

adjust the DC potential applied to the elements of the series valve noise limiter tube. The limiter circuit is thus provided with an adjustable threshold at which limiting starts. Any audio voltages, or peaks, in excess of this threshold are prevented from reaching the audio amplifier. With the LIMITER control set at 0, the limiter circuits will pass all but the strongest audio peak voltages; when the control is set at 10, the threshold is lowered to a point where the audio signal will be distorted due to suppression of the positive peaks.

The R.F. GAIN knob is located below and to the right of the LIMITER knob. It is used to adjust the amplification of the R.F. amplifier and two I.F. amplifier tubes. Amplification increases as the control is turned clockwise towards 10.

A CONTROL SWITCH is mounted above the R.F. GAIN control knob. In the AVC position, the automatic volume control circuits are in operation and the S-meter is switched on; in the MVC position, automatic volume control and the S-meter are turned off; in the CWO position, the beat frequency oscillator is turned on and automatic volume control and S-meter are turned off.

The POWER SUPPLY control knob is directly above the CONTROL SWITCH. In the counterclockwise position, OFF, the receiver is turned off, the primary circuit being opened by the AC line switch; in the mid-position, B+ OFF, the AC line switch is turned on but the B supply circuits are incomplete since the B+ switch is open; in the clockwise position, B+ ON, the B+ switch is closed, completing the B supply circuit. The B+ OFF position may thus serve as a stand-by switch for rendering the receiver inoperative, as may be required during transmission periods.

The PRIMARY SELECTOR SWITCH of the power transformer is mounted on the receiver chassis to the right of the power transformer. This switch selects the proper circuit arrangement of the dual primary for operation from either 115 or 230 volt power source. There is a shield provided to prevent unintentional throwing of the switch.

The A.F. GAIN control knob is located to the right of the MAIN TUNING control. It is used to adjust the audio amplification of the receiver. Audio amplification increases as the control is turned towards 10 on the scale.

The PHASING and SELECTIVITY knobs, located above the A.F. GAIN knob, control the action of the crystal filter. When the SELECTIVITY control is set at OFF, the crystal is switched out of the circuit. With the crystal switched out, the phasing control has little influence on receiver performance. With the SELECTIVITY control knob set at any point between 1 and 5, inclusive, the crystal filter is in operation, selectivity increasing as the knob is advanced to 5. See Fig. No. 2. The PHASING control is then used to balance the crystal bridge circuit and eliminate interfering signals or heterodynes. See Sections 3-2 and 3-3.

The C.W. OSC. control knob located to the right of the PHASING control is used for varying the frequency of the beat oscillator. At 0 on the C.W. OSC. scale, the beat oscillator is tuned to the intermediate frequency. See Section 3-3.

A TONE control knob is located above the C.W. OSC. knob and is used to vary the frequency characteristic of the audio amplifier as previously described.

A BSW terminal panel is mounted at the rear of the receiver chassis. The terminals are connected in parallel with the B+ switch. If external (remote) stand-by control is desired, it can be accomplished by connecting a switch or relay to these terminals.

3-2. *Phone Reception*

After the equipment is properly installed, in accordance with Section 2, it is placed in operation by turning the POWER SUPPLY switch to B+ ON. The LIMITER control should be set at 0. The CONTROL SWITCH should be set at AVC. The PHASING knob should be set at 0; the SELECTIVITY at OFF; the TONE control should be set to give the desired audio characteristic; the R.F. GAIN control should be advanced to some point between 8 and 10, depending upon receiving conditions; the A.F. GAIN control should be set at the point providing the desired audio volume. The receiver is now adjusted for the reception of phone signals and will tune to the frequency indicated by the MAIN TUNING dial. The C.W. OSC. knob has no influence on receiver performance under these conditions.

With the CONTROL SWITCH set in the AVC position, as recommended, the R.F. GAIN knob should be advanced as far as receiving conditions permit, or until background noise becomes objectionably loud. Audio output should be adjusted entirely by means of the A.F. GAIN knob. The operator must remember that automatic volume control action will be restricted unless the R.F. GAIN knob is fully advanced.

The CONTROL SWITCH may be set at MVC, in which case the operator must be careful not to advance the R.F. GAIN knob to a point where I.F. or audio amplifier overload occurs. Such overload is indicated by distortion. In general, the A.F. GAIN control may be set about halfway on, i.e., at 5 and the audio output adjusted by means of the R.F. GAIN control.

If a signal is weak and partially obscured by background noise and static, best signal-to-noise ratio will be obtained by turning the TONE control towards the LOW position. The most effective setting must be determined by trial as too much attenuation of high audio frequencies will impair the intelligibility of speech.

When a signal is accompanied by static peaks or noise pulses of high intensity and short duration, the best signal-to-noise ratio will be obtained by advancing the LIMITER control towards 10. The best setting must be determined by trial as too much limiter action will impair audio quality. If static peaks and noise pulses are extremely strong or if they are of fairly long duration, the effectiveness of the limiter will be best with the CONTROL SWITCH in the MVC position. In such cases both R.F. GAIN and LIMITER controls must be carefully adjusted for optimum signal-to-noise ratio.

The selectivity of the receiver may be adjusted by means of the crystal filter. The normal setting of the SELECTIVITY control in phone reception is at one of the positions affording broad selectivity. Positions 1 or 2 are recommended. Selectivity may be progressively increased by turning the SELECTIVITY control to positions 3, 4 or 5 although advancing the control too far will increase selectivity to a degree where phone signals become unintelligible.

The PHASING control is used to eliminate or attenuate heterodynes functioning only when the SELECTIVITY control is at some position other than OFF. The normal setting of the PHASING control in phone reception is at 0 on the scale. If, after a signal has been tuned in, an interfering signal causes a heterodyne or whistle, the PHASING control should be adjusted until the interference is reduced to a minimum. The setting of the PHASING control which provides maximum attenuation of the heterodyne will depend upon the pitch of the heterodyne whistle. If the beat note is above 1000 cycles, the optimum PHASING control setting will be near 0; if the beat note is 300 or 400 cycles, the optimum PHASING control setting will be near one end of the scale or the other, depending upon whether the interfering signal has a higher or lower frequency than the desired signal.

It is recommended that the TONE control be set in the HIGH position when using the crystal filter in phone reception. The resulting attenuation of low audio frequencies tends to compensate for the side-band cutting action of the crystal filter.

3-3. *C.W. Reception*

The initial adjustment of the receiver for C.W. reception is as described in Section 3-2, except that the CONTROL SWITCH must be in the CWO position. The C.W. OSC. control should be set at mid-scale.

The sensitivity of the receiver should be adjusted by means of the R.F. GAIN control, care being taken not to advance the control to the point where strong signals will cause I.F. or audio amplifier overload, as indicated by excessive thumping.

The action of the TONE and LIMITER controls will be similar to that described under Section 3-2. When receiving C.W. signals, it will be possible to advance both TONE and LIMITER controls considerably further than is possible in phone reception, since audio distortion is relatively unimportant.

Turning the C.W. OSC. control, which is a variable air capacitor, will change the characteristic pitch of the receiver background noise. This control enables the operator to vary at will the audio beat note of any C.W. signal to a preferred tone. The pitch will become higher as the beat frequency oscillator is detuned from the I.F. amplifier. With the C.W. OSC. control set at 2 or 3 (on either side of 0), the characteristic pitch of the receiver background noise will be in the neighborhood of 2000 cycles. Under these conditions, the audio beat note of any C.W. signal will show a broad peak at approximately 2000 cycles. This peak will appear on "one side of the carrier" only and the other side, where the audio beat note is around 2000 cycles, will be considerably weaker. This characteristic, known as "semi-single signal", is helpful in receiving weak signals through interference.

As stated in Section 3-2, the selectivity of the receiver may be adjusted by means of the crystal filter, the action of the SELECTIVITY and PHASING controls in C.W. reception being similar to that described. It is possible, however, to utilize the full range of crystal filter selectivity in C.W. reception. Maximum selectivity is obtained with the SELECTIVITY control set at 5. With this setting the single-signal effect, outlined above, becomes very pronounced; in other words, the audio beat note is very sharply peaked at a definite audio frequency which is determined by the setting of the C.W. OSC. control. The operator may have difficulty in finding the audio peak when first attempting to use the crystal filter. After a signal has been accurately tuned to give peak response, the R.F. GAIN control may need to be retarded in order to prevent I.F. or audio overloading. With the receiver tuned to "crystal peak", an interfering signal may be attenuated by proper setting of the PHASING knob since this control does not appreciably affect the desired signal.

3-4. *Measurement of Signal Strength*

To make a measurement of signal strength by means of the S-meter, the R.F. GAIN control must be advanced to 10, and the CONTROL SWITCH set at the AVC position. The crystal filter should be turned OFF by means of the SELECTIVITY control; the PHASING knob set at 0. The TONE, LIMITER and A.F. GAIN controls do not affect the meter reading.

Tuning the receiver to a signal will cause the meter to read, indicating the signal input in S-units or in decibels above the S-9 level.

Measurement of the signal strength of C.W. signals cannot be made with the beat frequency oscillator in operation.

SECTION 4. SERVICE AND TEST DATA

4-1. *Tube Failures*

Failure of a vacuum tube in the receiver may reduce the sensitivity, produce intermittent operation, or cause the equipment to be completely inoperative. In such cases, all tubes should be checked either in an analyzer or similar tube testing equipment, or by replacement with tubes of proven quality. All tubes should be marked as they are removed from the receiver so that they may be returned to their original sockets thereby reducing the necessity for realignment.

Individual tubes of the same type will vary slightly in their characteristics and it is well to remember this fact when replacements become necessary. Even though the circuit is designed to reduce the effect of such variations to a minimum, the high frequency oscillator and I.F. tubes should be selected with some care. A replacement high frequency oscillator should be checked in the receiver to make sure that the inter-electrode capacities are the same as those of the tube originally employed. This is easily determined by noting any change in dial calibration, particularly in the amateur bandspread ranges.

Substitution of new tubes in the I.F. amplifier may possibly alter overall gain and selectivity characteristics. Instructions for realignment are given in detail in Section 5-2.

One other point should be checked when trying the new high frequency oscillator; a fairly strong steady signal should be tuned in, preferably on some frequency above 10 mc.; the beat frequency oscillator should be turned off; jarring the receiver, or lightly tapping the tube, should not show any evidence of noise in the output.

4-2. Circuit Failures

Even though all component parts of the receiver have an ample factor of safety, failure may occur in individual cases. Excluding tubes, the most common failure will probably be due to some defect in a capacitor or resistor. Measurement of voltage in accordance with Section 4-4 will no doubt show where failure has occurred. A by-pass capacitor which has failed may cause overload of associated resistors. These resistors should be checked for any change in resistance. An open capacitor, often the cause of loss of sensitivity or oscillation, may be checked by temporarily connecting a good capacitor across it. Intermittently poor connections can usually be located by lightly tapping each part with a piece of insulating material.

4-3. Stage Gain Measurements

The sensitivity measurements listed below are made with equipment set up as specified in Section 5-1. The CONTROL SWITCH should be set at MVC, the A.F. GAIN at 10, the SELECTIVITY at OFF and the PHASING at 0. The signal generator should be adjusted to deliver a test signal of 455 plus or minus 2 kc. either modulated or unmodulated. The high output lead should be attached to the grid of the tube specified in the table below and the ground lead connected to the receiver chassis.

With 1 milliwatt output at the phone jack, the test signal should be within the limits specified below.

Terminal	Test Signal
First Det. Grid...	50 ± 10 Microvolts
First I.F. Grid...	250 ± 50 Microvolts
Sec. I.F. Grid....	50000 ± 10000 Microvolts
Sec. Det. Grid....	Over 1 volt

4-4. Voltage Tabulation

All measurements of voltages should be made with the equipment connected for normal operation with AC supply of 115 volt, 50/60 cycle or 230 volt, 50/60 cycle. Except as noted, the R.F. GAIN knob is set at 10, the LIMITER knob set at 0 and the CONTROL SWITCH knob set at MVC. A DC Voltmeter of 1000 ohms per volt sensitivity should be used. The following table must not be considered as a list of the actual operating voltages since loading effects of the measuring instrument will disturb many of the circuits and alter normal voltage distribution. All voltages are measured between specified terminal and chassis.

Tube Terminal	DC Volts ± 15%
R.F. Amp. Grid...........	0
R.F. Amp. Cathode.........	3 A
R.F. Amp. Cathode.........	19 A*
R.F. Amp. Screen..........	65 B
R.F. Amp. Plate...........	190 B
First Det. Grid...........	0
First Det. Cathode.........	1 A
First Det. Screen..........	55 B
First Det. Plate...........	185 B
H.F. Osc. Grid.............	C
H.F. Osc. Cathode..........	0
H.F. Osc. Plate............	85 B
First I.F. Grid...........	0
First I.F. Cathode.........	4 A
First I.F. Cathode.........	19 A*
First I.F. Screen.........	65 B
First I.F. Plate..........	185 B
Sec. I.F. Grid............	0
Sec. I.F. Cathode..........	5 A
Sec. I.F. Cathode..........	19 A*
Sec. I.F. Screen..........	70 B
Sec. I.F. Plate...........	185 B
Sec. Det. Grid............	0
Sec. Det. Cathode.........	6 A
Sec. Det. Plate...........	• 185 B
Limiter Grid..............	-6 A
Limiter Cathode...........	4.5 A
Limiter Cathode...........	0 D
Limiter Plate.............	0
A.V.C. Grid...............	-26 AE
A.V.C. Cathode............	-45 AE
A.V.C. Screen.............	0 E
A.V.C. Plate..............	0 E
B.F. Osc. Grid............	C
B.F. Osc. Cathode.........	0 F
B.F. Osc. Screen..........	10 AF
B.F. Osc. Plate...........	22 AF
Amp.-Inv. Grids...........	0
Amp.-Inv. Cathode.........	4 A
Amp.-Inv. Plates..........	90 F

Tube Terminal	DC Volts ± 15%
Audio Grids...............	-25 A
Audio Cathodes............	-45 A
Audio Screens.............	190 B
Audio Plates..............	180 B
B+ Common.................	195 B
B- Common.................	-60 B

Legend

A -- 0 to 50 voltmeter scale.
B -- 0 to 250 voltmeter scale.
C -- Accurate measurement cannot be made.
D -- LIMITER knob set at 10.
E -- CONTROL SWITCH knob set at AVC.
F -- CONTROL SWITCH knob set at CWO.
* -- R.F. GAIN knob set at 0.

SECTION 5. ALIGNMENT DATA

5-1. *General*

All circuits are carefully aligned, before shipment, using precision crystal oscillators which insure close conformability to the dial calibration. No readjustment will be required, therefore, unless the receiver is tampered with or damaged.

To determine the necessity for realignment, the receiver should first be carefully checked against its normal performance as described in Section 3. In no case should realignment be attempted unless tests indicate that such realignment is necessary. Even then, it must be remembered that the NC-2-40D is a communications receiver and should not be serviced or realigned by any individual who does not have a complete understanding of the functioning of the equipment and who has not had previous experience adjusting a similar type of receiver.

The coil group which is plugged into the circuit at any time is the one directly underneath the three gang master tuning capacitor. The coil nearest the front panel of the receiver is in the H.F. oscillator circuit, the middle coil is in the first detector circuit and the coil nearest the antenna input terminal panel is in the R.F. amplifier circuit. See Fig. No. 5.

All coils have individual general coverage trimmer capacitors. The H.F. oscillator circuits of broadcast ranges E & F have, also, general coverage variable series padding capacitors. All coils of ranges A, B, C and D have bandspread trimmer capacitors. Variable series padding capacitors are used in all H.F. oscillator bandspread circuits. These capacitors are identified on Fig. No. 5.

Adjustment of general coverage circuits affects the alignment of the bandspread circuits. On the other hand, bandspread circuit adjustments have little effect on general coverage circuit alignment. This fact must be kept in mind when any high frequency circuit is adjusted. A screw driver having a metal shaft may be used to make adjustments in the high frequency circuits but capacity effects will be noticeable, and the shaft should not touch any part of the aluminum casting.

Before proceeding with the alignment of any circuit of the receiver, the equipment must be set up as specified in Section 2, except that the antenna lead-in or transmission line must be disconnected. An output meter having a 20,000 ohm resistive load should be connected to the phone output jack. The POWER SUPPLY knob should be set at B+ON and the R.F. GAIN knob set at 10. The TONE control knob should be set at N and the LIMITER knob should be retarded to 0.

Alignment of the equipment may be divided into three major steps:

(1) I.F. Amplifier Alignment
(2) General Coverage Alignment
  (a) H.F. Oscillator
  (b) First Detector and R.F. Amplifier
  (c) Tracking of H.F. Circuits
(3) Bandspread Alignment
  (a) H.F. Oscillator
  (b) First Detector and R.F. Amplifier
  (c) Tracking of H.F. Circuits

The circuits MUST be tuned in the above order when complete alignment is necessary.

5-2. *I.F. Amplifier Alignment*

The intermediate frequency of the NC-2-40D Receiver is 455 kilocycles, plus or minus 2 kilocycles. The exact frequency is determined by the quartz crystal resonator Y-1.

Tuning capacitors are provided on the

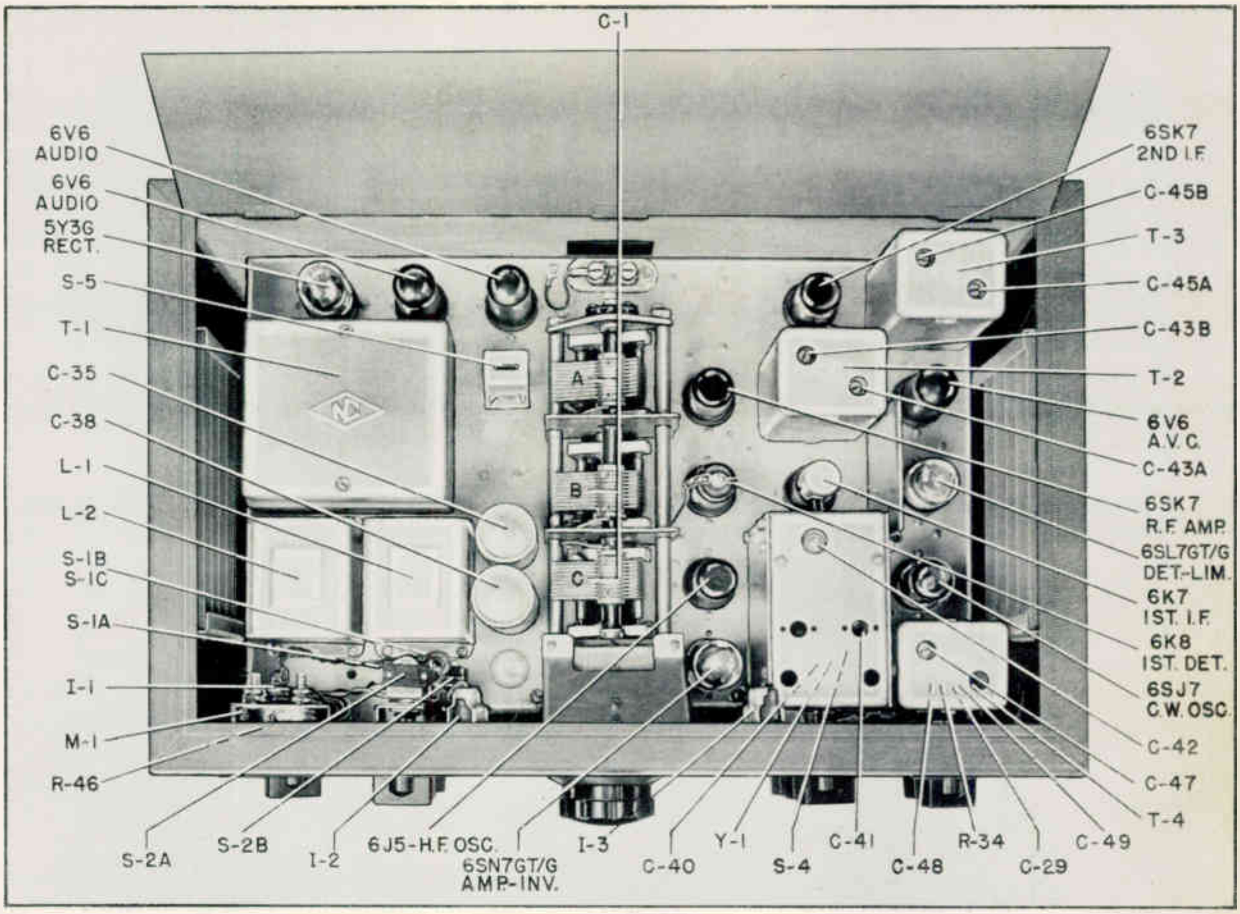


Fig. No. 3. Top View of Receiver

crystal filter and on each I.F. transformer. These capacitors are designated by symbol numbers C-39, C-41, C-42, C-43A, C-43B, C-45A and C-45B on Figs. Nos. 3 and 4.

The high output lead of an accurately calibrated signal generator should be connected to the grid terminal of the first detector tube and the grounded lead to any convenient point on the chassis. The flexible lead need not be disconnected from the grid of the tube. Connection is made directly from the output jack of the signal generator, the dummy antenna being omitted. The CONTROL SWITCH of the receiver should be in the CWO position and the modulation of the signal generator turned off to provide a steady C.W. test signal. The PHASING control of the receiver should be set at 0 and the SELECTIVITY control at 5. The A.F. GAIN control should be fully advanced.

Adjust the output attenuator of the signal generator to provide a signal of approximately 100 microvolts and vary the tuning control of the signal generator slowly between the frequencies of 453 and 457 kilocycles. At some frequency between these limits the I.F. amplifier of the receiver will show a very sharply peaked response, as indicated on the output meter. The output attenuator of the signal generator has been tuned to the I.F. peak in order to avoid I.F. or audio overload; the C.W. OSC. control must be set to provide an audio beat note in the middle of the audio range (between 400 and 1000 cycles).

The I.F. tuning capacitors, C-39, C-43A, C-43B, C-45A and C-45B, should each be carefully adjusted to give a maximum reading on the output meter. The order in which the adjustments are made is not important. While making I.F. amplifier adjustments, it will be necessary to retard the attenuator of the signal generator if the readjustment increases I.F. amplifier gain to the point where overload occurs.

The crystal filter SELECTIVITY knob should then be set at 1 and the signal generator detuned between 3 and 4 kilocycles either side of the crystal frequency. Capacitor C-42 should be tuned for maximum output meter reading. After this adjustment is made, the SELECTIVITY knob should be set at OFF and the signal generator retuned to exact crystal frequency. Compensator capacitor C-41 should then be adjusted for maximum reading on the output meter.

The performance of the I.F. amplifier and audio circuits may be checked against the stage gain data in Section 4-3 after alignment has been completed. Selectivity may be checked against the curves of Dwg. No. 1.

The quartz crystal resonator Y-1 may be checked at the conclusion of I.F. amplifier alignment as follows: The SELECTIVITY control should be set at 5 and the signal generator tuned to the crystal frequency. The output meter reading should be noted. When the SELECTIVITY knob is turned to OFF, the meter reading should decrease 1 to 2 db. provided the PHASING knob is at 0. An increase in meter reading can, in most cases, be traced to an improper adjustment in the I.F. amplifier, since the crystal resonator is mounted in a sealed holder, and it is rather unlikely that trouble will be had from that source.

5-3. *General Coverage Alignment*

(a) H.F. Oscillator

Alignment is effected as follows: With the coil range to be aligned connected in the circuit and with the receiver controls set as recommended in Section 5-1, the MAIN TUNING dial should be set near the high frequency end of the range. A signal generator should be connected to the antenna input terminals through a standard IRE dummy antenna and accurately tuned to deliver a signal of the same frequency as that indicated by the receiver dial setting. If, when this signal is tuned in, the dial reading is too high, the capacity of the H.F. oscillator general coverage circuit trimmer C-52 should be decreased to make correction. Conversely, low dial readings are corrected by increasing the capacity of trimmer C-52.

It is imperative that the high frequency oscillator circuits operate at a higher frequency than that of the first detector and R.F. amplifier circuits. This can be checked by tuning in the image signal, which should appear at a dial reading approximately 910 kilocycles below that of the real signal. The image signal should be considerably weaker if the R.F. amplifier is correctly aligned and a stronger test signal may be required before the image can be found. If the image does not appear at the lower frequency dial setting, the H.F. oscillator circuit is incorrectly adjusted and the capacity of the H.F. oscillator trimmer capacitor in question must be decreased until the real signal and image signal appear at the proper points on the dial.

(b) First Detector and R.F. Amplifier.

With the signal generator adjusted to deliver a modulated signal near the high frequency limit of the band to be checked, the receiver should be tuned to give maximum output, as indicated by the output meter. The first detector and R.F. amplifier trimmer capacitors C-51 and C-50 respectively, should then be varied until the output meter reads maximum. On the highest frequency bands, adjustment of the first detector and R.F. amplifier trimmers may change the calibration of the high frequency oscillator, necessitating retuning of the MAIN TUNING dial. If these trimmers should require considerable realignment, it may be necessary to readjust the high frequency oscillator trimmer C-52 in order to maintain correct calibration.

A very simple and quick method of first detector and R.F. trimmer alignment may be used if a signal generator is not available. This method consists of setting the trimmers at the adjustment which provides maximum circuit or background noise. It will be found that trimmer settings under this method are sufficiently sharp to provide good alignment, although the adjustment must be made with care to avoid alignment to the image frequency.

(c) Tracking of H.F. Circuits

After the H.F. oscillator, first detector and R.F. amplifier trimmers have been properly set at the high frequency limit of the range, the receiver should be tuned to a frequency toward the low frequency end. Tracking at any point up to the low frequency limit may be checked by adjusting the signal generator to the proper frequency and testing the settings of the first detector and R.F. amplifier trimmers for maximum gain. Calibration may be checked also at these points. After such a test, all trimmers checked should be reset at the high frequency end of the band since their settings are most critical at this point.

Errors in tracking near the low frequency limit of the band can be caused by defects in any of three circuit elements.

(1) The tuning capacitor section.

(2) The circuit inductance.

(3) The H.F. oscillator series padding capacitor.

In order to determine if one or more sections of the master tuning capacitor C-1 are the cause of any mistracking present, it is necessary to make the check described above on two or more different bands. If the same tracking error appears on all bands, the master tuning capacitor is definitely at fault. The error should be corrected by permanently bending the rotor or stator plates to provide the proper capacity.

If the tracking error appears only in the R.F. amplifier or first detector stage and on only one band, the inductance of the tuned circuit of the stage is incorrect. Should the tracking checks indicate that the H.F. oscillator circuit of a particular band is at fault, either the inductance of the circuit, the series padding capacitor or both may be responsible.

After any change or readjustment is made to any high frequency circuit inductance or series padding capacity, it will be necessary to realign the associated trimmer at the high frequency limit of the coil range. Tracking should then be rechecked.

5-4. *Band-Spread Alignment*

(a) H.F. Oscillator

The method of adjusting the H.F. oscillator bandspread trimmer C-53 of any band is the same as that described under Section 5-3 (a) above. As stated previously (Section 5-1), the adjustment of the general coverage trimmers must not be altered at this time.

(b) First Detector and R.F. Amplifier

The method of adjusting the bandspread trimmers C-59 and C-62 of the first detector and R.F. Amplifier circuits is the same as that described under Section 5-3.

(c) Tracking of H.F. Circuits

After steps (a) and (b) have been completed, the MAIN TUNING control should be turned to the low frequency band limit, and the accuracy of the dial reading checked. If the dial reading is too low, the capacity of the series padding capacitor C-54 (See Fig. No. 5) should be increased until the dial reading is correct, and vice versa. The MAIN TUNING control should then be reset at the high frequency band limit, and step (a) repeated. Recheck the low frequency dial reading and repeat the whole procedure if necessary.

The detector and R.F. amplifier stages have fixed bandspread padding capacitors. These circuits will, therefore, track properly with the H.F. oscillator stage provided that the general coverage circuits are properly aligned and that the bandspread H.F. oscillator circuits are accurately tuned.

5-5. *S-Meter Adjustment*

The revised S-meter circuit in the NC-2-40D insures the stability of the zero meter reading and requires no electrical adjustment. A check of the S-meter pointer zero setting can be made by turning off the receiver. If the S-meter does not read true zero the panel screw-adjustment should be used to correct any inaccuracy.

5-6. *Band Indicator Adjustment*

An adjustment for centering the band indicator markers in the horizontal slots of the dial face is located in back of the MAIN TUNING knob. It is recommended that the MAIN TUNING knob be pulled out to engage the band changing mechanism, and turned clockwise to the last position before the stop. The red band marker should then indicate 27.0 to 30.0 mc. (10 and 11 meter) bandspread. To make the adjustment, simply remove the tuning knob and set the 1/4 inch hexhead screw as may be required. The screw is self-locking.

SECTION 6. **PARTS LIST**

Symbol	Function	Type	Rating
	CAPACITORS		
C-1	Main Tuning	Air	225 mmf. max./sec.
C-1A	R.F. Amp. Tuning	Air	Part of C-1
C-1B	1st Det. Tuning	Air	Part of C-1
C-1C	H.F. Osc. Tuning	Air	Part of C-1
C-2	R.F. Grid Filter	Mica	0.005 mfd., 300 vdcw
C-3	R.F. Cathode Bypass	Paper	0.1 mfd., 400 vdcw
C-4	R.F. Screen Bypass	Paper	0.1 mfd., 400 vdcw
C-5	R.F. B+ Bypass	Paper	0.1 mfd., 600 vdcw
C-6	1st Det. Cathode Bypass	Paper	0.1 mfd., 400 vdcw
C-7	1st Det. Screen Bypass	Paper	0.1 mfd., 400 vdcw
C-8	1st Det. B+ Bypass	Paper	0.1 mfd., 600 vdcw
C-9	1st I.F. Grid Filter	Paper	0.01 mfd., 600 vdcw
C-10	1st I.F. Cathode Bypass	Paper	0.1 mfd., 400 vdcw
C-11	1st I.F. B+ Bypass	Paper	0.1 mfd., 600 vdcw
C-12	Sec. I.F. Grid Filter	Paper	0.01 mfd., 600 vdcw
C-13	Sec. I.F. Cathode Bypass	Paper	0.1 mfd., 400 vdcw
C-14	Sec. I.F. Screen Bypass	Paper	0.1 mfd., 400 vdcw
C-15	Sec. I.F. B+ Bypass	Paper	0.1 mfd., 600 vdcw
C-16	Sec. Det. Plate Bypass	Paper	0.01 mfd., 600 vdcw
C-17	Sec. Det. to Limiter Audio Coupling	Paper	1.0 mfd., 200 vdcw
C-18	Sec. Det. Cathode Bypass	Ceramic	250 mmf., 500 vdcw
C-19	Sec. Det. I.F. Bypass	Mica	0.001 mfd., 500 vdcw
C-20	Limiter Output Bypass	Ceramic	250 mmf., 500 vdcw
C-21	Tone Control	Paper	0.01 mfd., 600 vdcw
C-22	Limiter to Inverter Audio Coupling	Paper	0.01 mfd., 600 vdcw
C-23	Tone Control	Mica	0.001 mfd., 500 vdcw
C-24	Inverter-Audio Cathode Bypass	Elec.	10 mfd., 50 vdcw
C-25	Inverter-Audio to Output Coupling	Paper	0.1 mfd., 400 vdcw
C-26	Inverter-Audio to Output Coupling	Paper	0.1 mfd., 400 vdcw
C-27	Inverter-Feedback Coupling	Paper	0.1 mfd., 400 vdcw
C-28	H.F. Osc. Grid	Ceramic	250 mmf., 500 vdcw
C-29	Beat Osc. Grid	Mica	0.001 mfd., 500 vdcw
C-30	Beat Osc. Screen Bypass	Paper	0.1 mfd., 400 vdcw
C-31	Beat Osc. to Sec. Det. Coupling	Ceramic	2 mmf., 500 vdcw
C-32	AVC Output Bypass	Paper	0.1 mfd., 400 vdcw
C-33	AVC Plate Bypass	Paper	0.1 mfd., 400 vdcw
C-34	AVC Cathode Bypass	Paper	0.1 mfd., 400 vdcw
C-35	B- Bypass	Elec.	40 mfd., 200 vdcw
C-36	AVC to Sec. Det. Coupling	Ceramic	50 mmf., 500 vdcw
C-37	Power Supply Filter	Paper	0.1 mfd., 600 vdcw
C-38	Power Supply Filter	Elec.	8+8 mfd., 475 vdcw
C-39	Crystal Filter Input Tuning	Air	6 to 85 mmf.
C-40	Crystal Filter Phasing Control	Air	5 and 5 mmf.
C-41	Crystal Filter Compensating	Mica	5-30 mmf.
C-42	Crystal Filter Output Tuning	Air	6-85 mmf.
C-43	T-2 Tuning	Air	6-85 mmf./sec.
C-43A	T-2 Primary Tuning	Air	Part of C-43

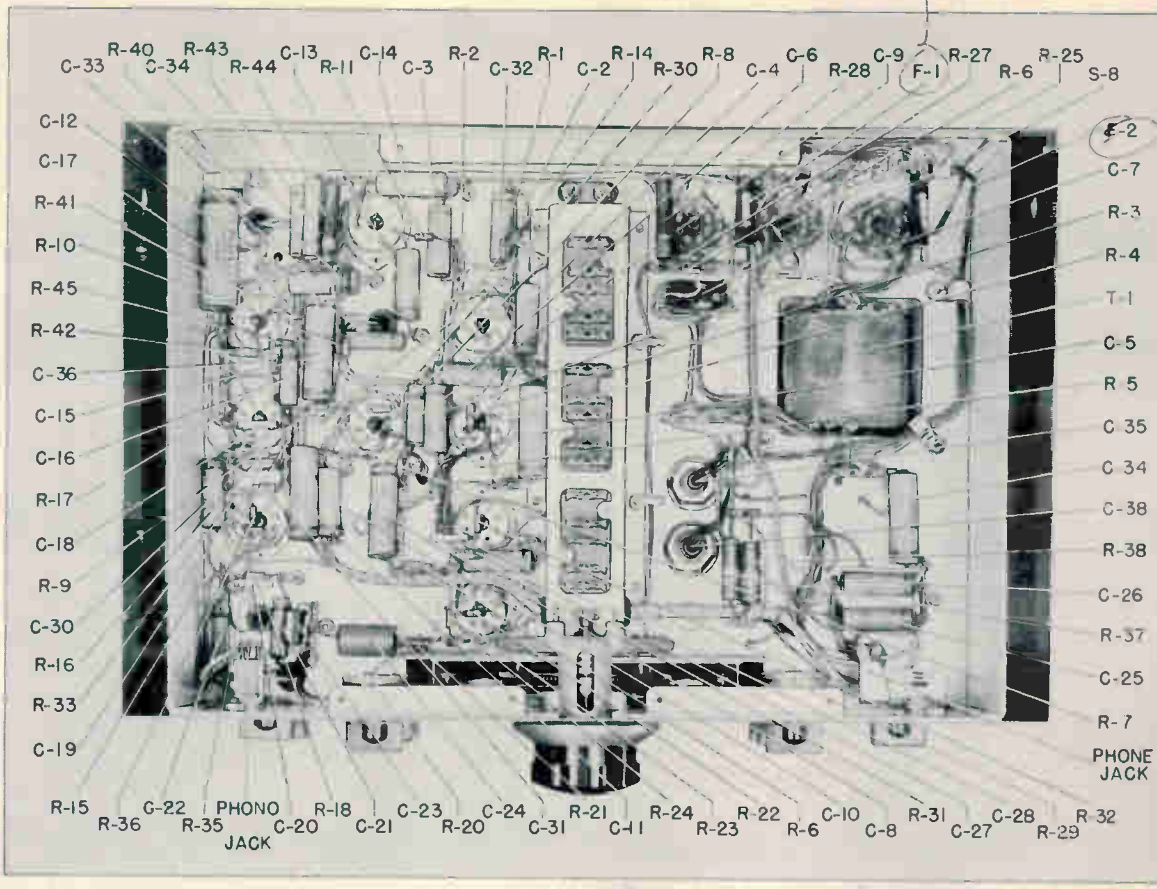


Fig. No. 4. Bottom View of Receiver with Coil Carriage Removed

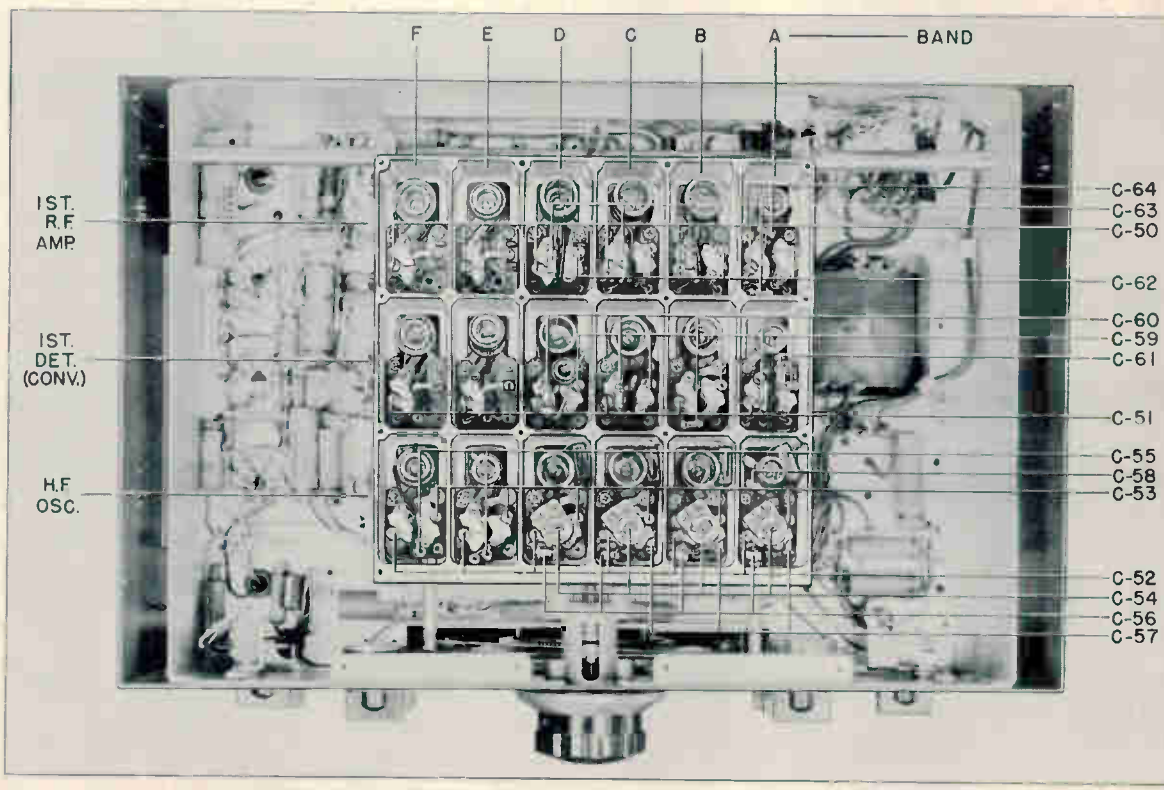


Fig. No. 5. Bottom View of Receiver with Coil Carriage Cover Removed

SECTION 6. **PARTS LIST (*Continued*)**

Symbol	*Function*	*Type*	*Rating*
	CAPACITORS (*Continued*)		
C-43B	T-2 Secondary Tuning..................	Air	Part of C-43
C-44	Not Used		
C-45	T-3 Tuning............................	Air	6-85 mmf./sec.
C-45A	T-3 Primary Tuning....................	Air	Part of C-45
C-45B	T-3 Secondary Tuning..................	Air	Part of C-45
C-46	Not Used		
C-47	T-4 Tuning............................	Air	6-85 mmf.
C-48	C.W. Osc. Control.....................	Air	1-10 mmf.
C-49	C.W. Osc. Compensating................	Ceramic	10 mmf., 500 vdcw
C-50	Gen. Coverage R. F. Amp. Trimmer, All Bands............................	Air	
C-51	Gen. Coverage 1st Det. Trimmer, All Bands	Air	
C-52	Gen. Coverage H. F. Osc. Trimmer, All Bands............................	Air	
C-53	A, B, C, D Bands Bandspread H. F. Osc. Trimmer...............................	Air	See Note No. 2
C-54	A, B, C, D Bands Bandspread H. F. Osc. Padder................................	Ceramic	2.5 to 6 mmf.
C-55	A Band Gen.Cov. H. F. Osc. Padder......	Mica	750 mmf., 500 vdcw
	B Band Gen. Cov. H. F. Osc. Padder.....	Mica	0.003 mfd., 500 vdcw
	C Band Gen. Cov. H. F. Osc. Padder.....	Mica	0.0017 mfd., 500 vdcw
	D Band Gen. Cov. H. F. Osc. Padder.....	Mica	900 mmf., 500 vdcw
	E Band Gen. Cov. H. F. Osc. Padder.....	Ceramic	500 mmf., 500 vdcw
	F Band Gen. Cov. H. F. Osc. Padder.....	Ceramic	250 mmf., 500 vdcw
C-56	A Band Bandspread H. F. Osc. Padder....	Ceramic	29 mmf., 500 vdcw
	B Band Bandspread H. F. Osc. Padder....	Ceramic	12 mmf., 500 vdcw
	C Band Bandspread H. F. Osc. Padder....	Ceramic	18 mmf., 500 vdcw
	D Band Bandspread H. F. Osc. Padder....	Ceramic	35 mmf., 500 vdcw
C-57	A,B,C Bands Bandspread H.F. Osc. Fixed Trimmer.........................	Ceramic	10 mmf., 500 vdcw
C-58	A Band General Coverage H. F. Osc. Feedback Compensating.................	Ceramic	29 mmf., 500 vdcw
C-59	A, B, C, D Bands 1st Det. Bandspread Trimmer...............................	Air	
C-60	A Band, 1st Detector Bandspread Padder.	Ceramic	38 mmf., 500 vdcw
	B Band, 1st Detector Bandspread Padder.	Ceramic	15.5 mmf., 500 vdcw
	C Band, 1st Detector Bandspread Padder.	Ceramic	21 mmf., 500 vdcw
	D Band, 1st Detector Bandspread Padder.	Ceramic	38.5 mmf., 500 vdcw
C-61	A Band 1st Detector Gen. Coverage Coupling...............................	Ceramic	16 mmf., 500 vdcw
C-62	A, B, C, D Bands R. F. Amp. Bandspread Trimmer...............................	Air	
C-63	A Band R. F. Amp. Bandspread Padder....	Ceramic	38 mmf., 500 vdcw
	B Band R. F. Amp. Bandspread Padder....	Ceramic	15.5 mmf., 500 vdcw
	C Band R.F. Amp. Bandspread Padder.....	Ceramic	21 mmf., 500 vdcw
	D Band R. F. Amp. Bandspread Padder.....	Ceramic	38.5 mmf., 500 vdcw

PARTS LIST (*Continued*) **SECTION 6.**

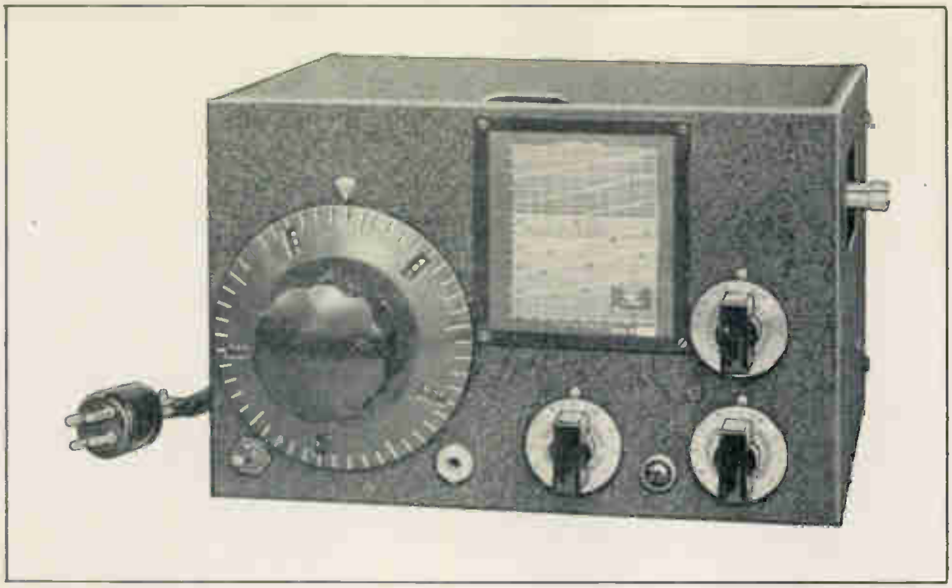
Symbol	*Function*	*Type*	*Rating*
	CAPACITORS (*Continued*)		
C-64	A Band Gen. Cov. R. F. Amp. Padder.....	Mica	900 mmf., 500 vdcw
C-65	Crystal Filter Bridge..................	Ceramic	50 mmf., 500 vdcw
C-66	Crystal Filter Bridge..................	Ceramic	50 mmf., 500 vdcw
C-67	Phasing Compensating...................	Mica	5-30 mmf.
	RESISTORS		
R-1	R. F. Grid Filter......................	Fixed	470,000 Ohms, 1/2 w.
R-2	R. F. Cathode Bias.....................	Fixed	470 Ohms, 1/2 w.
R-3	1st Det. Cathode Bias..................	Fixed	220 Ohms, 1/2 w.
R-4	1st Det. Screen Bleeder................	Fixed	100,000 Ohms, 1/2 w.
R-5	1st Det. Screen Dropping...............	Fixed	47,000 Ohms, 1/2 w.
R-6	1st Det. Plate Filter..................	Fixed	2,200 Ohms, 1/2 w.
R-7	1st I. F. Grid Filter..................	Fixed	22,000 Ohms, 1/2 w.
R-8	1st I. F. Cathode Bias.................	Fixed	See Note No. 1, 1/2 w.
R-9	1st I. F. Plate Filter.................	Fixed	2,200 Ohms, 1/2 w.
R-10	Sec. I. F. Grid Filter.................	Fixed	470,000 Ohms, 1/2 w.
R-11	Sec. I. F. Cathode Bias................	Fixed	See Note No. 1, 1/2 w.
	Not Used		
	Not Used		
R-14	Sec. Det. Plate Filter.................	Fixed	2,200 Ohms, 1/2 w.
R-15	Sec. Det. I. F. Filter.................	Fixed	4,700 Ohms, 1/2 w.
R-16	Sec. Det. Load.........................	Fixed	22,000 Ohms, 1/2 w.
R-17	Limiter Input..........................	Fixed	100,000 Ohms, 1/2 w.
R-18	Limiter Output.........................	Fixed	47,000 Ohms, 1/2 w.
R-19	Tone Control...........................	Comp. Var.	500,000 Ohms, 1 w.
R-20	A.F. Gain Control......................	Comp. Var.	500,000 Ohms, 1 w.
R-21	Inv.-Audio Cathode Bias................	Fixed	1,000 Ohms, 1/2 w.
R-22	Inverter Grid..........................	Fixed	470,000 Ohms, 1/2 w.
R-23	1st Audio Plate........................	Fixed	47,000 Ohms, 1/2 w.
R-24	1st Audio Plate........................	Fixed	47,000 Ohms, 1/2 w.
R-25	Output Grid............................	Fixed	220,000 Ohms, 1/2 w.
R-26	Output Grid............................	Fixed	220,000 Ohms, 1/2 w.
R-27	Inv. Feedback Coupling.................	Fixed	220,000 Ohms, 1/2 w.
R-28	Output Cathode Bias....................	Fixed	220 Ohms, 2 w.
R-29	R. F. Gain Control.....................	W.W. Var.	10,000 Ohms, 1 1/2 w.
R-30	R. F. Gain Bleeder.....................	Fixed	47,000 Ohms, 1/2 w.
R-31	H. F. Osc. B+ Dropping.................	Fixed	47,000 Ohms, 1 w.
R-32	H. F. Osc. Grid........................	Fixed	47,000 Ohms, 1/2 w.
R-33	Beat Osc. Plate Filter.................	Fixed	220,000 Ohms, 1/2 w.
R-34	Beat Osc. Grid.........................	Fixed	47,000 Ohms, 1/2 w.
R-35	Beat Osc. Screen Bleeder...............	Fixed	100,000 Ohms, 1/2 w.
R-36	Beat Osc. Screen Dropping..............	Fixed	100,000 Ohms, 1/2 w.
R-37	B+ Voltage Divider.....................	Fixed	22,000 Ohms, 2 w.
R-38	B+ Voltage Divider.....................	Fixed	22,000 Ohms, 2 w.
R-39	Not Used		
R-40	2nd I. F. Plate Filter.................	Fixed	1,000 Ohms, 1/2 w.

SECTION 6. **PARTS LIST (*Continued*)**

Symbol	*Function*	*Type*	*Rating*
	RESISTORS (*Continued*)		
R-41	AVC Plate Filter	Fixed	470,000 Ohms, 1/2 w.
R-42	AVC Plate	Fixed	15,000 Ohms, 1/2 w.
R-43	AVC Voltage Divider	Fixed	2,700 Ohms, 2 w.
R-44	AVC Cathode Bias	Fixed	560 Ohms, 2 w.
R-45	AVC Grid	Fixed	4,700,000 Ohms, 1/2 w.
R-46	Limiter Control	W.W. Var.	10,000 Ohms, 1 1/2 w.
	MISCELLANEOUS		
CF-1	1st I. F. Transformer	Air Tuned	
near edge F-1	A.C. Line Fuse	Glass Encl.	2 Amp., 250 Volt
near center F-2	A.C. Line Fuse	Glass Encl.	1 Amp., 250 Volt
I-1	S-Meter Lamp	No. 40	6-8 V., 0.15 A.
I-2	Dial Lamp	No. 47	6-8 V., 0.15 A.
I-3	Dial Lamp	No. 47	6-8 V., 0.15 A.
J-1	Phone Jack	Multi-Ckt.	For 1/4" dia. plug
J-2	Pick-up Jack	Multi-Ckt.	For 1/4" dia. plug
L-1	Power Supply Filter Choke	Potted	17 h., 100 ma.
L-2	Power Supply Filter Choke	Potted	17 h., 100 ma.
M-1	Signal Strength Meter	'S" Scale	0 to 1 ma.
P-2	Dummy Plug for AC Operation	Molded	7 Prong
P-3	Battery Connector Plug	Molded	7 Prong
S-1	Control Switch	Rotary	Two Gang 250 V., 1 A.
S-1A	C.W. Osc. Switch	SPST	Part of S-1
S-1B	AVC Switch	SPST	Part of S-1
S-1C	S-Meter Switch	SPST	Part of S-1
S-2	Power Supply Switch	Rotary	Two Gang 250 V., 1 A.
S-2A	AC Switch	SPST	Part of S-2
S-2B	B+Switch	SPST	Part of S-2
S-3	Tone Control Switch	Rotary	Part of R-19
S-4	Selectivity Control Switch	Rotary	2 Section, Ganged
S-5	T-1 Primary Selection Switch	Toggle	DPDT, 250 V., 3 A.
T-1	Power Transformer	150 Watt	115/230 V., 60 cycle
T-2	2nd I. F. Transformer	Air Tuned	455 kc.
T-3	Det. Input Transformer	Air Tuned	455 kc.
T-4	Beat Osc. Transformer	Air Tuned	455 kc.
X-1	Audio Output Socket	Bakelite	5 Prong
X-2	Battery Connector Socket	Bakelite	7 Prong
Y-1	Crystal Resonator	Quartz	455 kc.

Note No. 1:- Resistors R-8 and R-11 are individually chosen to meet the circuit requirements of each receiver.

Note No. 2:- Gen. Coverage H. F. Osc. Padder, E & F Bands.



THE NATIONAL 1-10A VHF RECEIVER

DESCRIPTION

The 1-10A Receiver is an improved superregenerative receiver covering all wave lengths from 1 to 11 meters. The natural advantages inherent in a superregenerative receiver make the 1-10A one of the most compact and reliable receivers for use on these wave lengths. Plug-in type coils, so located that they are readily accessible for interchanging, are used to cover the frequency range of the receiver. The "HRO" type micrometer dial calibrated from 0 to 500 provides precision tuning.

CONTROLS

Band Tuning; Audio Gain; Regeneration; R. F. Trimmer.

TUBES

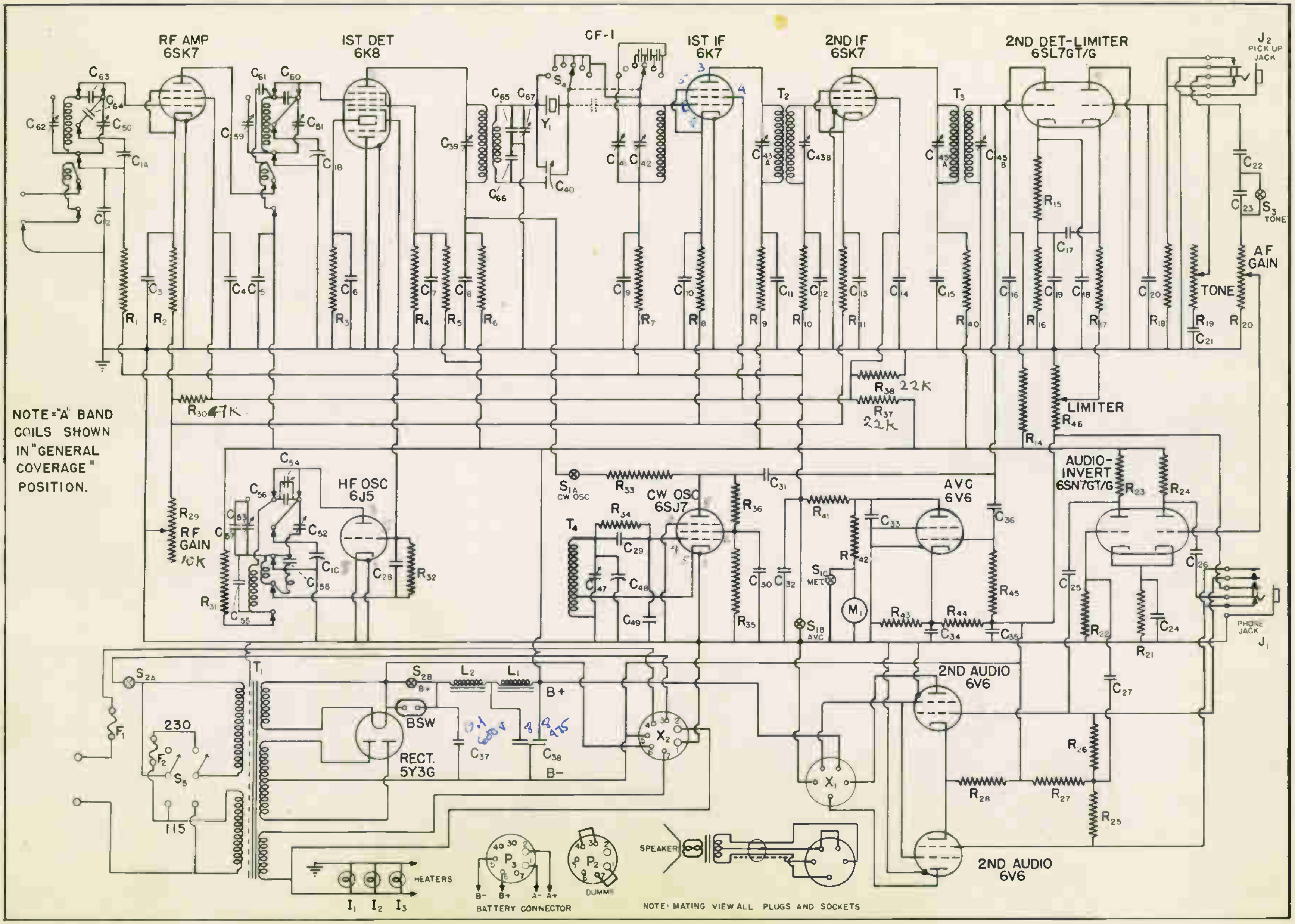
R. F. Amplifier....................................954
Detector...955
First Audio..6J5
Second Audio.......................................6V6

FREQUENCY RANGE

28 to 280 megacycles.

ADDITIONAL UNITS

National Company Type 5886 Power Supply.
National Company Type MCS 8 inch PM Dynamic Loud-speaker.



Dwg. No. 2. NC-2-40D Receiver Schematic Diagram

World's Largest Distributor of Short Wave Receivers

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INVOICE

№ 2422

YOUR ORDER

SHIPPED VIA exp. coll

DATE SHIPPED 7-23-47

TERMS:

ORDERED	SHIPPED	B. O.	DESCRIPTION	EACH	TOTAL
1	1		New NC240DT & speaker in unopened factory cartons		241.44
credit for NC100X & speaker (applies only to NC240DT, credit on any other model would have been as per letter)					110.00
			paid		131.44

Thanks. Send to me for anything. Refer any customers to me.

New B+ filt conds Sept 2, 1960

Examine shipment when received. If damaged notify transportation agency and get their written acknowledgement. Return no merchandise without our permission. Refer to this invoice number.

THE NATIONAL NC-2-40D RECEIVER

Price List

•

NC-2-40DT RECEIVER, table mounting gray finish, complete with tubes, crystal filter, noise limiter, 115 and 230 volt, 50/60 cycle built-in power supply.

NC-2 TSG 10″ PM Loudspeaker in matching cabinet for the above receiver.

NC-2-40DR RECEIVER, same as above but with receiver and loudspeaker mounted on individual 1/8″ steel standard rack panels 10 1/2″ high, gray wrinkle finish.

NC-2 RS Loudspeaker same as NC-2 TSG but mounted on individual 1/8″ steel standard rack panel 10 1/2″ high, gray wrinkle finish.

Prices on Application

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National Co., Inc., Malden, Mass., U.S.A.

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