National Co., The Inc.

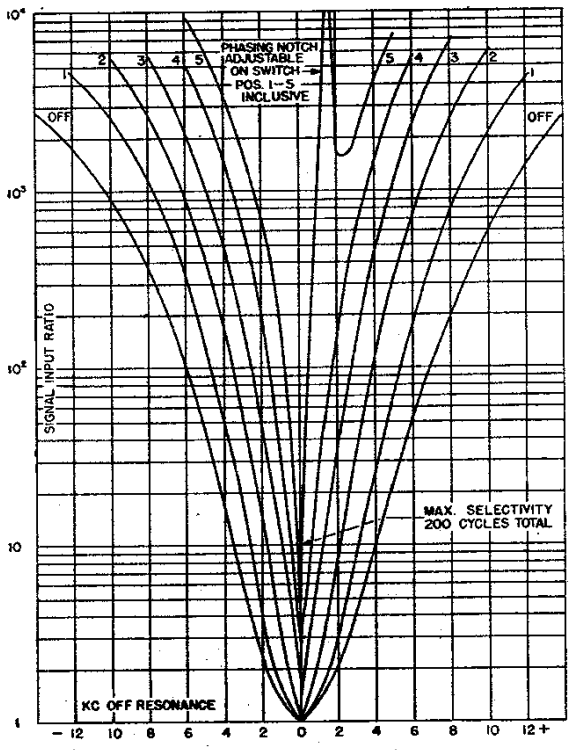
Model: NC-200 Series	Chassis:	Year: Pre 1945
Power:	Circuit:	IF:
Tubes:		
Bands:		

Resources
Riders Volume 14 - NATIONAL 14-26
Riders Volume 14 - NATIONAL 14-27
Riders Volume 14 - NATIONAL 14-28
Riders Volume 14 - NATIONAL 14-29
Riders Volume 14 - NATIONAL 14-30
Riders Volume 14 - NATIONAL 14-31
Riders Volume 14 - NATIONAL 14-32
Riders Volume 14 - NATIONAL 14-33
Riders Volume 14 - NATIONAL 14-34

MODELS NC-200 Series

NATIONAL CO., INC.

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 band 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.



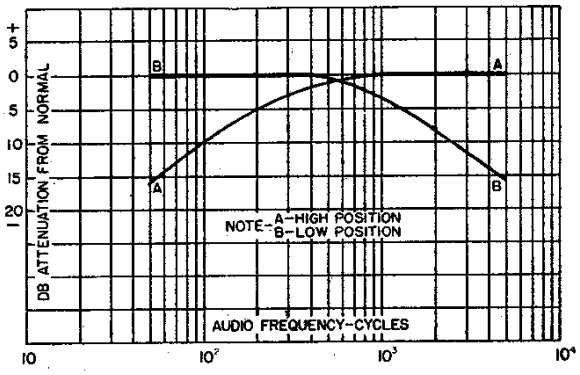
Dwg. No. 1. Typical Selectivity Characteristics

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 bridge circuit, in which the meter is connected, makes possible accurate signal input readings from below 1 microvolt to 1,000 microvolts.

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. 2. Tone Control Action

Tone Control

The tone control is used to vary the frequency characteristic of the audio amplifier as shown in the accompanying curves, Dwg. No. 2. The control is particularly helpful when receiving weak signals through interference, as explained in Section 3.

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.

Power Supply

The standard NC-200 Receiver is designed for operation from a 110/120 volt, 50/60 cycle power source. 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 fuse housed in an extractor post marked "FUSE" which is mounted at the rear of the receiver chassis.

All NC-200 Receivers are equipped with a seven prong plug and socket combination to permit portable or emergency operation from batteries.

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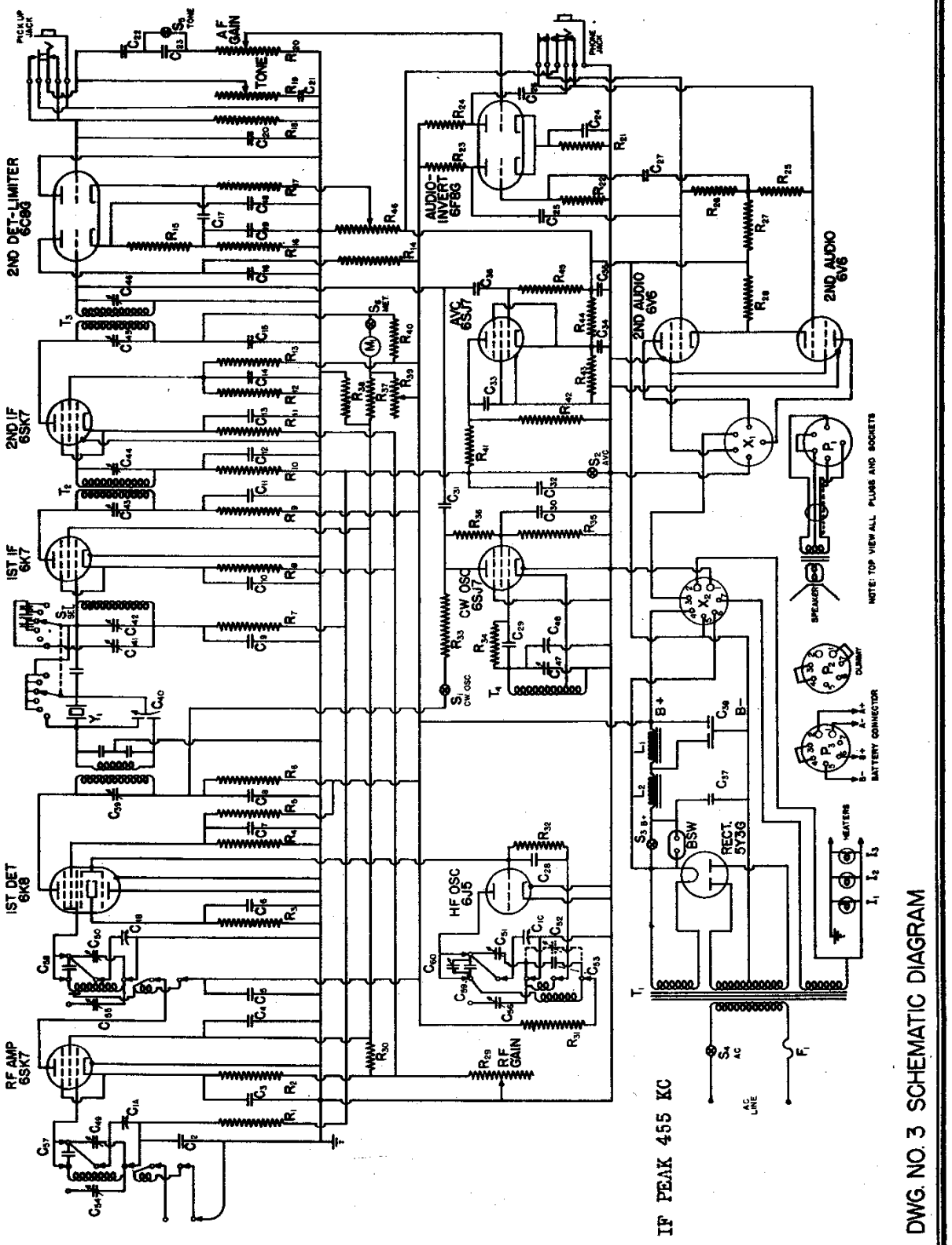

MODELS NC-200 Series

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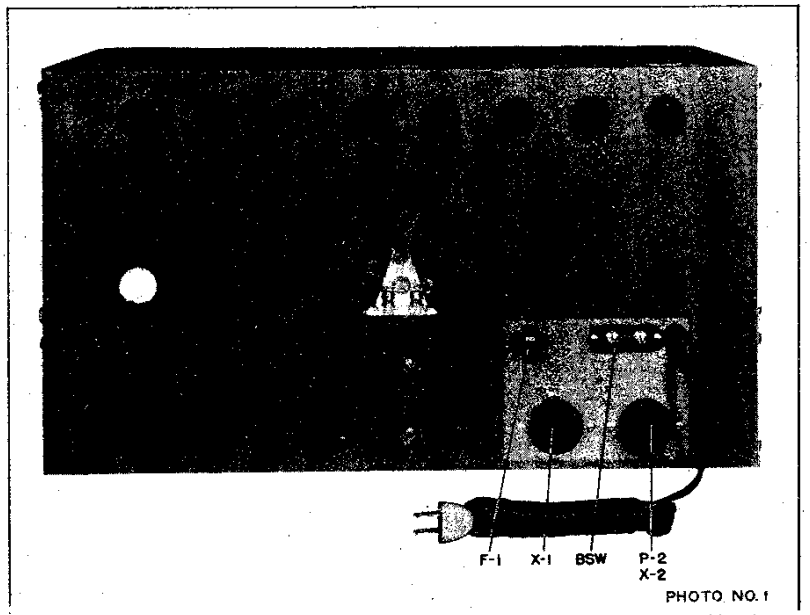

PHOTO NO. 1

Model NC-200 TG and Model NC-200 TGM are the same except that the latter does not have the amateur band spread feature. Model NC-200 RG same as Model NC-200 TG except that the NC-200 RG is for rack mounting.

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-200 Radio Receiver. This input circuit is high impedance and feeds into the 6F8G Audio Amplifier-Phase Inverter tube. The TONE and AF GAIN controls are operative with this connection.

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.

Battery Operation

The NC-200 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 Dwg. No. 3. 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. The jumper between terminals 3 and 4 (of P-3) completes the plate and screen supply circuits of the 6V6 output tubes. It may be omitted, with greater battery economy, when operation with head-phones only is desired. A suggested refinement is to connect a switch between terminals 3 and 4, thus permitting the 6V6 B supply to be opened at will. Alternatively, removal of speaker plug P-1 from socket X-1 will open the 6V6 B supply in the same manner, without harming the output tubes. A further economy of battery power may be effected by removing the 6V6 tubes from their sockets.

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

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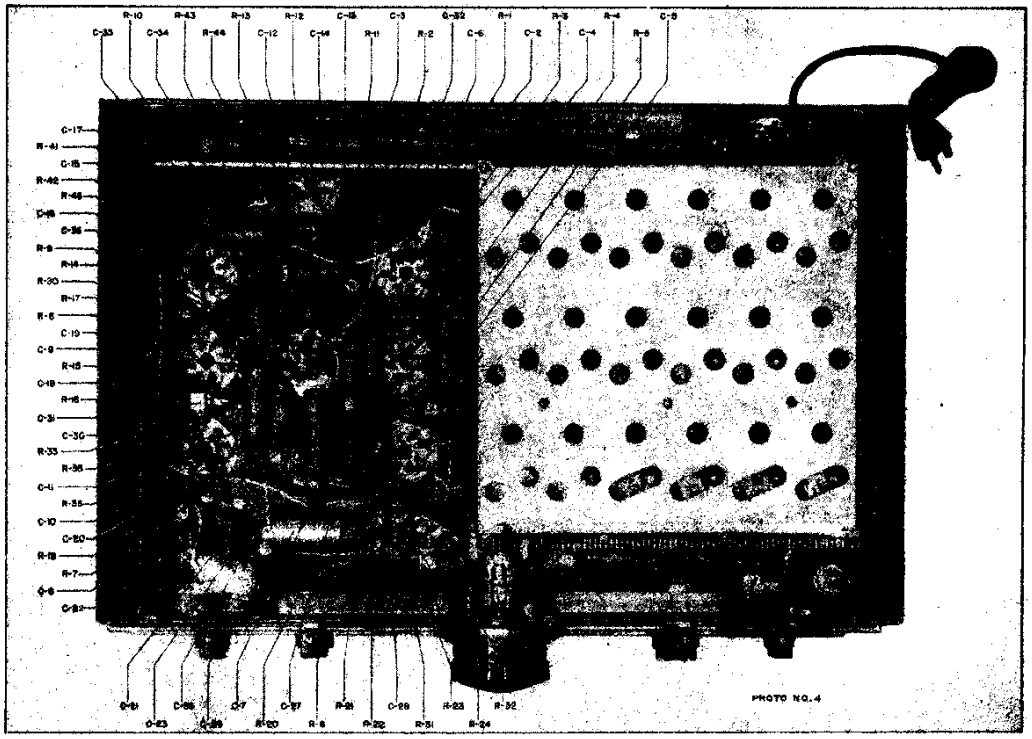
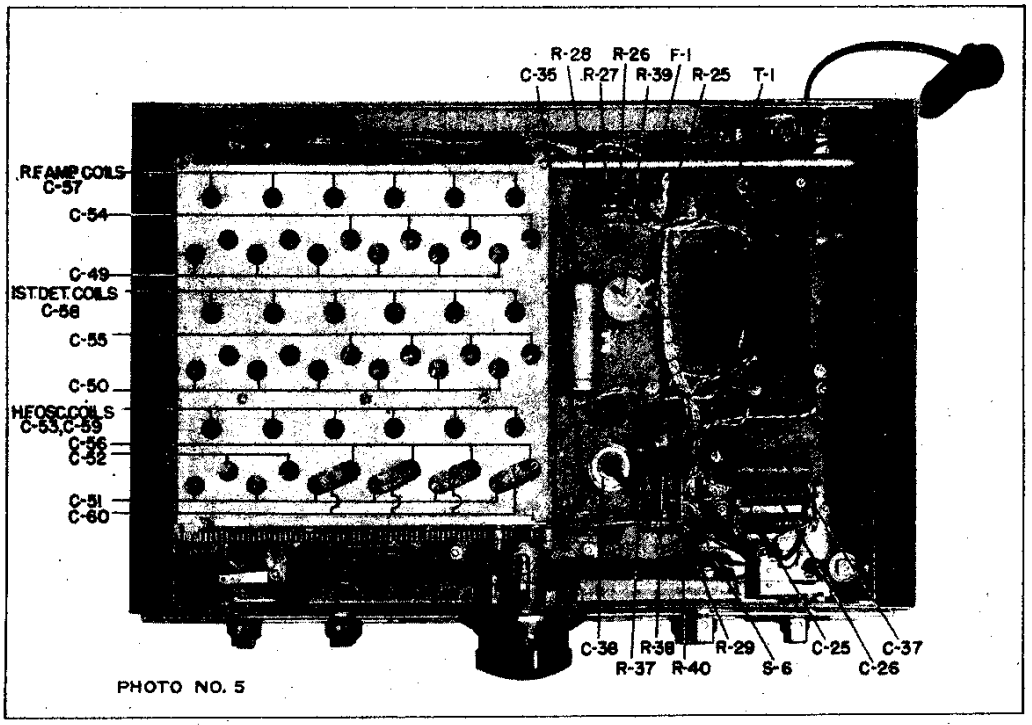




The two bottom views above show the NC-200 Receiver with the coil carriage at the extreme ends of its travel. It will be noted that such construction makes all components readily accessible for test or replacement.

MODELS NC-200 Series

NATIONAL CO., INC.

ALIGNMENT DATA

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-200 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 Photo 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 band-spread trimmer capacitors. Variable series padding capacitors are used in all H.F. oscillator band-spread circuits. These capacitors are identified on Photo No. 5.

Adjustment of general coverage circuits affects the alignment of the band-spread circuits. On the other hand, band-spread 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 9. 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) Band Spread 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.

I.F. Amplifier Alignment

The intermediate frequency of the NC-200 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 crystal filter and on each I.F. transformer. These capacitors are designated by symbol numbers C-39 and C-41 to C-46, inclusive, on Photo 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 should be retarded after 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 and C-43 to C-46,

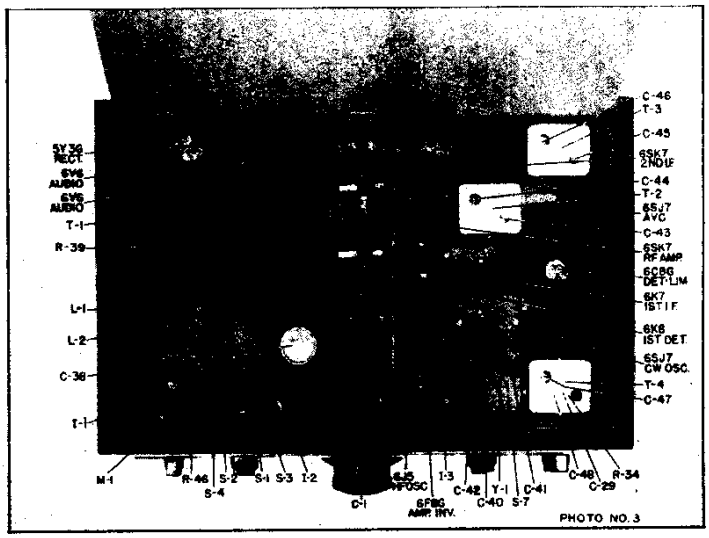
inclusive, should each be carefully adjusted to give a maximum reading on the output meter. The order in which the adjustments are made is not important. While making I.F. amplifier adjustments, it will be necessary to retard the attenuator of the signal generator if the readjustment increases I.F. amplifier 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.

After alignment of the I.F. amplifier has been completed, the C.W. OSC. control should be set at 0 at which setting the CW. oscillator should be at zero beat with the test signal. If zero beat does not occur at 0, readjust capacitor C-47 of transformer T-4, as shown in Photo No. 3.

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.



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-51 should be decreased to make correction. Conversely, low dial readings are corrected by increasing the capacity of trimmer C-51.

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 range 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-50 and C-49, 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 oscil-

lator, 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-51 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.

Band-Spread Alignment

(a) H.F. OSCILLATOR

The method of adjusting the H.F. oscillator band-spread trimmer C-56 of any range 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 band-spread trimmers C-58 and C-57 of the first detector and R.F. Amplifier circuits is the same as that described under Section 5-3 (b).

(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-60 (see Photo 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 band-spread series 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 band-spread H.F. oscillator circuits are accurately tuned.

S-Meter Adjustment

The S-meter balancing resistor R-39, shown in Photo No. 3, is used to obtain zero meter reading in the absence of signal input to the receiver. The adjustment is as follows: Set the R.F. GAIN control at 10, CONTROL SWITCH at MVC, and disconnect the antenna leads; adjust R-39 until the S-meter reads zero.

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 28 to 30 mc. (10 meter) band-spread. To make the adjustment, simply remove the tuning knob and set the ¼" hex-head screw as may be required. The screw is self-locking.

Stage Gain Measurements

The sensitivity measurements listed below are made with the 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	50,000 ± 10,000 Microvolts
Sec. Det. Grid	Over 1 volt

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. Except as noted, the R.F. GAIN knob is set at 9, 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	25 A*
R.F. Amp. Screen	80 B
R.F. Amp. Plate	230 B
First Det. Grid	0
First Det. Cathode	1 A
First Det. Screen	80 B
First Det. Plate	225 B
H.F. Osc. Grid	C
H.F. Osc. Cathode	0
H.F. Osc. Plate	90 B
First I.F. Grid	0
First I.F. Cathode	3 A
First I.F. Cathode	25 A*
First I.F. Screen	80 B
First I.F. Plate	225 B
Sec. I.F. Grid	0
Sec. I.F. Cathode	5 A
Sec. I.F. Cathode	25 A*
Sec. I.F. Screen	95 B
Sec. I.F. Plate	225 B
Sec. Det. Grid	0
Sec. Det. Cathode	8 A
Sec. Det. Plate	225 B
Limiter Grid	−3 A
Limiter Cathode	4.5 A
Limiter Cathode	0 #
Limiter Plate	0
AVC Grid	−25 A†
AVC Cathode	−45 A†
AVC Screen	0 †
AVC Plate	0 †
B.F. Osc. Grid	C
B.F. Osc. Cathode	0 §
B.F. Osc. Screen	10 A§
B.F. Osc. Plate	25 A§
Amp.-Inv. Grids	0
Amp.-Inv. Cathode	4.5 A
Amp.-Inv. Plates	115 B
Audio Grids	−20 A
Audio Cathodes	−40 A
Audio Screens	230 B
Audio Plates	215 B
B+ Common	230 B
B− Common	−50 B

A — 0 to 50 volt meter scale
B — 0 to 250 volt meter scale
C — Accurate measurement cannot be made
* — R.F. GAIN knob set at 0
# — LIMITER knob set at 10
† — CONTROL SWITCH knob set at AVC
§ — CONTROL SWITCH knob set at CWO

The Power Output Tubes used in the NC-200 Radio Receiver may be the metal type 6V6 or the glass type 6V6GT/G. It is necessary, however, to provide glass type 6V6GT/G output tubes with metal shields to avoid oscillation in the audio amplifier. The recommended shield is Goat type G1222K with type G1004 connector.

PARTS LIST

Symbol	*Function*	*Type*	*Rating*
	CAPACITORS		
C_{1a}	R.F. Amplifier Tuning	Air	225 mmf. max.
C_{1b}	First Detector Tuning	Air	225 mmf. max.
C_{1c}	H.F. Oscillator Tuning	Air	225 mmf. max.
C_2	R.F. Grid Filter	Mica	.005 mfd., 300 v. d.c. w.
C_3	R.F. Cathode By-pass	Paper	.1 mfd., 400 v. d.c. w.
C_4	R.F. Screen By-pass	Paper	.1 mfd., 400 v. d.c. w.
C_5	R.F. B+ By-pass	Paper	.1 mfd., 600 v. d.c. w.
C_6	First Det. Cathode By-pass	Paper	.1 mfd., 400 v. d.c. w.
C_7	First Det. Screen By-pass	Paper	.1 mfd., 400 v. d.c. w.
C_8	First Det. B+ By-pass	Paper	.1 mfd., 600 v. d.c. w.
C_9	First I.F. Grid Filter	Paper	.01 mfd., 600 v. d.c. w.
C_{10}	First I.F. Cathode By-pass	Paper	.1 mfd., 400 v. d.c. w.
C_{11}	First I.F. B+ By-pass	Paper	.1 mfd., 600 v. d.c. w.
C_{12}	Sec. I.F. Grid Filter	Paper	.01 mfd., 600 v. d.c. w.
C_{13}	Sec. I.F. Cathode By-pass	Paper	.1 mfd., 400 v. d.c. w.
C_{14}	Sec. I.F. Screen By-pass	Paper	.1 mfd., 400 v. d.c. w.
C_{15}	Sec. I.F. B+ By-pass	Paper	.1 mfd., 600 v. d.c. w.
C_{16}	Sec. Det. Plate By-pass	Paper	.01 mfd., 600 v. d.c. w.
C_{17}	Sec. Det. to Limiter Audio Coupling	Paper	.1 mfd., 200 v. d.c. w.
C_{18}	Sec. Det. Cathode By-pass	Ceramic	.00025 mfd., 1,000 v. d.c. w.
C_{19}	Sec. Det. I.F. By-pass	Mica	.001 mfd., 500 v. d.c. w.
C_{20}	Limiter Output By-pass	Ceramic	.00025 mfd., 1,000 v. d.c. w.
C_{21}	Tone Control	Paper	.01 mfd., 600 v. d.c. w.
C_{22}	Limiter to Inverter-Audio Coupling	Paper	.01 mfd., 600 v. d.c. w.
C_{23}	Tone Control	Mica	.001 mfd., 500 v. d.c. w.
C_{24}	Inverter-Audio Cathode By-pass	Elec.	10 mfd., 50 v. d.c. w.
C_{25}	Inverter-Audio to Output Coupling	Paper	.1 mfd., 400 v. d.c. w.
C_{26}	Inverter-Audio to Output Coupling	Paper	.1 mfd., 400 v. d.c. w.
C_{27}	Inverter Feedback Coupling	Paper	.1 mfd., 400 v. d.c. w.
C_{28}	H.F. Oscillator Grid	Ceramic	.0001 mfd., 1,000 v. d.c. w.
C_{29}	Beat Oscillator Grid	Mica	.001 mfd., 500 v. d.c. w.
C_{30}	Beat Oscillator Screen By-pass	Paper	.1 mfd., 400 v. d.c. w.
C_{31}	Beat Osc. to Sec. Det. Coupling	Bakelite	1 mmf., 400 v. d.c. w.
C_{32}	AVC Output By-pass	Paper	.1 mfd., 400 v. d.c. w.
C_{33}	AVC Plate By-pass	Paper	.1 mfd., 400 v. d.c. w.
C_{34}	AVC Cathode By-pass	Paper	.1 mfd., 400 v. d.c. w.
C_{35}	B Minus By-pass	Elec.	8 mfd., 200 v. d.c. w.
C_{36}	AVC to Sec. Det. Coupling	Ceramic	.00005 mfd., 1,000 v. d.c. w.
C_{37}	Power Supply Filter	Paper	.1 mfd., 600 v. d.c. w.
C_{38}	Power Supply Filter	Elec.	8 and 8 mfd., 475 v. d.c. w
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	Ceramic	2 to 6 mmf.
C_{42}	Crystal Filter Output Tuning	Air	6 to 85 mmf.
C_{43}	T-2 Primary Tuning	Air	6 to 85 mmf.
C_{44}	T-2 Secondary Tuning	Air	6 to 85 mmf.
C_{45}	T-3 Primary Tuning	Air	6 to 85 mmf.

Continued on next page

PARTS LIST (*Continued*)

Symbol	Function	Type	Rating
	CAPACITORS (*Continued*)		
C_{46}	T-3 Secondary Tuning	Air	6 to 85 mmf.
C_{47}	T-4 Tuning	Air	6 to 85 mmf.
C_{48}	C.W. Osc. Control	Air	1 to 10 mmf.
C_{49}	Gen. Cov. R.F. Amplifier Trimmer	Air	See Note No. 1
C_{50}	Gen. Cov. 1st Det. Trimmer	Air	See Note No. 1
C_{51}	Gen. Cov. H.F. Osc. Trimmer	Air	See Note No. 1
C_{52}	Gen. Cov. H.F. Osc. Padder	Air	See Note No. 1
C_{53}	Gen. Cov. H.F. Osc. Padder	Mica	See Note No. 1
C_{54}	Band-Spread R.F. Amplifier Trimmer	Air	See Note No. 1
C_{55}	Band-Spread 1st Det. Trimmer	Air	See Note No. 1
C_{56}	Band-Spread H.F. Osc. Trimmer	Air	See Note No. 1
C_{57}	Band-Spread R.F. Amp. Padder	Ceramic	See Note No. 1
C_{58}	Band-Spread 1st Det. Padder	Ceramic	See Note No. 1
C_{59}	Band-Spread H.F. Osc. Padder	Ceramic	See Note No. 1
C_{60}	Band-Spread H.F. Osc. Padder	Ceramic	2 to 6 mmf.
	RESISTORS		
R_1	R.F. Grid Filter	Fixed	500,000 Ohm, ½ w.
R_2	R.F. Cathode Bias	Fixed	500 Ohm, ½ w.
R_3	First Det. Cathode Bias	Fixed	250 Ohm, ½ w.
R_4	First Det. Screen Bleeder	Fixed	100,000 Ohm, ½ w.
R_5	First Det. Screen Dropping	Fixed	50,000 Ohm, ½ w.
R_6	First Det. Plate Filter	Fixed	2,000 Ohm, ½ w.
R_7	First I.F. Grid Filter	Fixed	20,000 Ohm, ½ w.
R_8	First I.F. Cathode Bias	Fixed	See Note No, 2, ½ w.
R_9	First I.F. Plate Filter	Fixed	2,000 Ohm, ½ w.
R_{10}	Sec. I.F. Grid Filter	Fixed	500,000 Ohm, ½ w.
R_{11}	Sec. I.F. Cathode Bias	Fixed	See Note No, 2, ½ w.
R_{12}	Sec. I.F. Screen Bleeder	Fixed	100,000 Ohm, ½ w.
R_{13}	Sec. I.F. Screen Dropping	Fixed	70,000 Ohm, ½ w.
R_{14}	Sec. Det. Plate Filter	Fixed	2,000 Ohm, ½ w.
R_{15}	Sec. Det. I.F. Filter	Fixed	5,000 Ohm, ½ w.
R_{16}	Sec. Det. Load	Fixed	25,000 Ohm, ½ w.
R_{17}	Limiter Input	Fixed	50,000 Ohm, ½ w.
R_{18}	Limiter Output	Fixed	50,000 Ohm, ½ w.
R_{19}	Tone Control	Comp. Var.	500,000 Ohm, 1 w.
R_{20}	A.F. Gain Control	Comp. Var.	500,000 Ohm, 1 w.
R_{21}	Inverter-Audio Cathode Bias	Fixed	1,000 Ohm, ½ w.
R_{22}	Inverter Grid	Fixed	500,000 Ohm, ½ w.
R_{23}	First Audio Plate	Fixed	50,000 Ohm, ½ w.
R_{24}	First Audio Plate	Fixed	50,000 Ohm, ½ w.
R_{25}	Output Grid	Fixed	250,000 Ohm, ½ w.
R_{26}	Output Grid	Fixed	250,000 Ohm, ½ w.
R_{27}	Inverter Feedback Coupling	Fixed	250,000 Ohm, ½ w.
R_{28}	Output Cathode Bias	Fixed	200 Ohm, 2 w.
R_{29}	R.F. Gain Control With Switch	W. W. Var.	10,000 Ohm, 1½ w.
R_{30}	R.F. Gain Bleeder	Fixed	50,000 Ohm, ½ w.

PARTS LIST (*Continued*)

Symbol	Function	Type	Rating
	RESISTORS (*Continued*)		
R_{31}	H.F. Osc. B+ Dropping	Fixed	50,000 Ohm, 1 w.
R_{32}	H.F. Osc. Grid	Fixed	50,000 Ohm, ½ w.
R_{33}	Beat Osc. Plate Filter	Fixed	250,000 Ohm, ½ w.
R_{34}	Beat Osc. Grid	Fixed	50,000 Ohm, ½ w.
R_{35}	Beat Osc. Screen Bleeder	Fixed	100,000 Ohm, ½ w.
R_{36}	Beat Osc. Screen Dropping	Fixed	100,000 Ohm, ½ w.
R_{37}	B+ Voltage Divider	Fixed	20,000 Ohm, 2 w.
R_{38}	B+ Voltage Divider	Fixed	20,000 Ohm, 2 w.
R_{39}	S-Meter Adjustment	W. W. Var.	1,000 Ohm, 1 w.
R_{40}	S-Meter Bridge	Fixed	1,000 Ohm, ½ w.
R_{41}	AVC Plate Filter	Fixed	500,000 Ohm, ½ w.
R_{42}	AVC Plate	Fixed	500,000 Ohm, ½ w.
R_{43}	AVC Voltage Divider	Fixed	1,500 Ohm, 2 w.
R_{44}	AVC Cathode Bias	Fixed	500 Ohm, 2 w.
R_{45}	AVC Grid	Fixed	5,000,000 Ohm, ½ w.
R_{46}	Limiter Control	W. W. Var.	10,000 Ohm, 1½ w.
	MISCELLANEOUS		
F_1	AC Line Fuse	Glass Encl.	2 Amp.
I_1	S-Meter Lamp	No. 40	6 v., .15 a.
I_2	Dial Lamp	No. 47	6 v., .15 a.
I_3	Dial Lamp	No. 47	6 v., .15 a.
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_1	Loud Speaker Connector Plug	Molded	5 Prong
P_2	Dummy Plug for AC Operation	Molded	7 Prong
P_3	Battery Connector Plug	Molded	7 Prong
S_1, S_3	Control Switch	Two Gang	SPST 250 v., 1 a.
S_2, S_4	Power Supply Switch	Two Gang	SPST 250 v., 1 a.
S_5	Tone Control Switch	Part of R-19	SPST
S_6	S-Meter Switch	Part of R-29	SPST
S_7	Selectivity Control Switch	Rotary	2 Section, Ganged
T_1	Power Transformer	150 Watt	115 Volt, 60 Cycle
T_2	I.F. Transformer	Air Tuned	455 kc.
T_3	I.F. 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. Capacitor rating is different in each coil range and is individually adjusted as circuit conditions may require. Definite rating cannot be listed. C-52 used in E and F ranges only. C-54 to C-60, inclusive, used in A, B, C and D ranges only.

Note No. 2. Resistors R-8 and R-11 may have values between 300 and 5,000 ohms since they are chosen to meet the circuit requirements of the particular receiver. The resistance values are determined after careful laboratory test and cannot be changed without impairing performance.

NOTICE—Due to the exigencies of the War Program, the manufacturer may have found it necessary to employ substitute, interchangeable parts in certain receivers. Such parts do not impair performance in any way, but should replacement become necessary it is suggested that the type indicated in the Parts List be obtained, if possible.