

IF PEAK 455 KC

NC-2-40D
DWG. NO. 3 SCHEMATIC DIAGRAM

NATIONAL CO. INC.

NATIONAL PAGE 15-19
MODEL NO-2-40D

NATIONAL CO. INC.

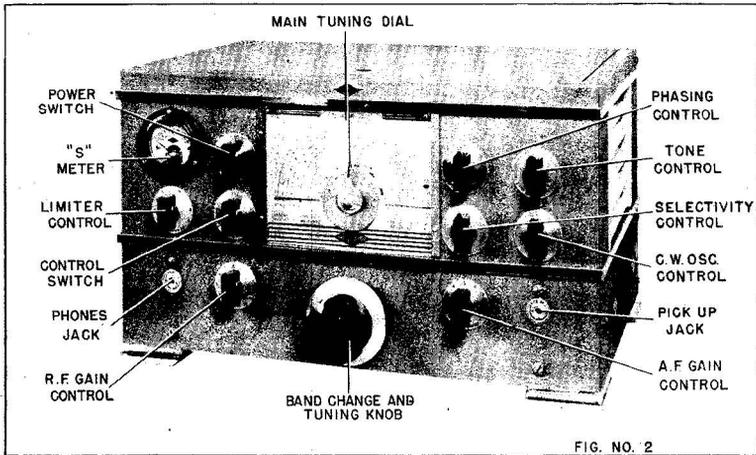


FIG. NO. 2

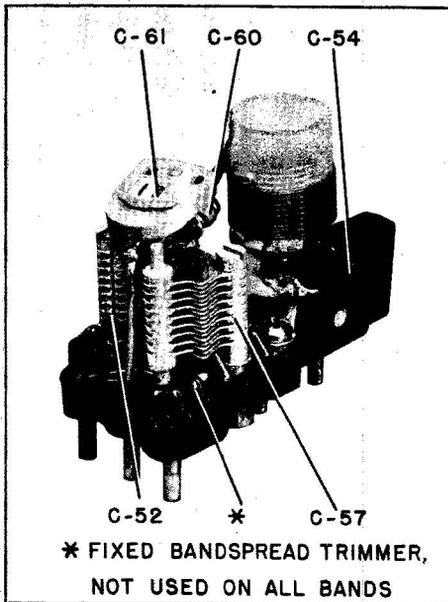
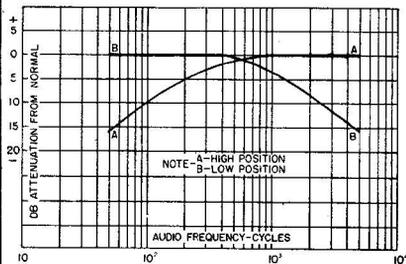


Fig. No. 4. B-3 Coil--Typical H.F. Oscillator Bandspread Coil



Dwg. No. 2. Tone Control Action

NATIONAL CO. INC.

The circuit description, installation, operation, service and test data, and alignment data sections applying to Models NC-2-40C and NC-2-40CS (see page numbers below), also apply to Model NC-2-40D, with the exceptions of the following sections:

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, 20, 40 and 80 meter amateur bands uniformly over the major portion of the tuning dial (HRO System). All ten ranges are calibrated

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 NHU and 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 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.

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.

3-1. Controls

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 band-spread 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.

5-1. General

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 Fig. No. 6.

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.

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.

5-4. Band-Spread Alignment

- (a) H.F. Oscillator

The method of adjusting the H.F. oscillator band-spread trimmer C-57 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

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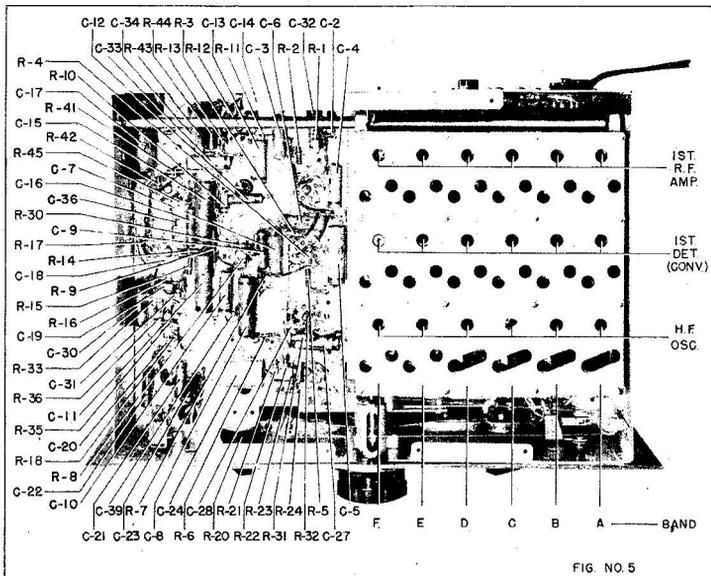


FIG. NO. 5

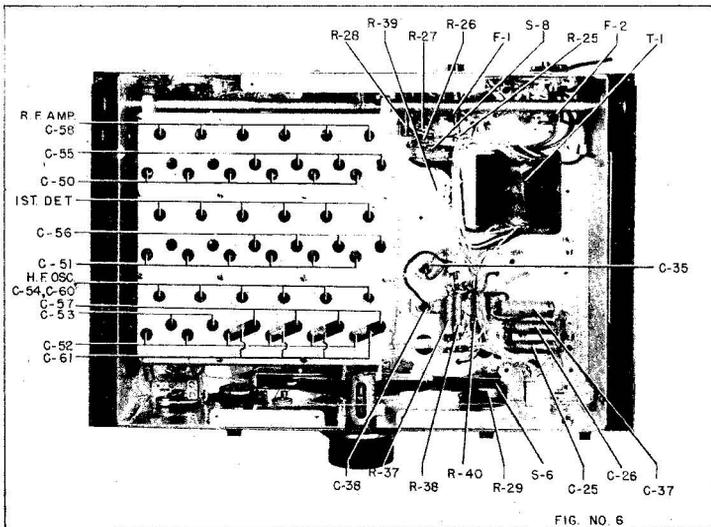


FIG. NO. 6

Band-spread Alignment (cont'd)

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-59 and C-58 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-611 (See Fig. No. 6) 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 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.

5-5. S-Meter Adjustment

The S-meter balancing resistor R-39, shown in Fig. 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 WVC, and disconnect the antenna leads; adjust R-39 until the S-meter reads zero.

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 28 to 30 mc. (10 meter) band-spread. To make the adjustment, simply remove the tuning knob and set the 1/4" hex-head screw as may be required. The screw is self-locking.

Symbol	Function	Type	Rating
CAPACITORS			
C1A	R.F. Amplifier Tuning.....	Air	.225 mfd. max.
C1B	First Detector Tuning.....	Air	.225 mfd. max.
C1C	H.F. Oscillator Tuning.....	Air	.225 mfd. max.
C2	R.F. Grid Filter.....	Mica	.005 mfd., 300 v.d.c.w.
C3	R.F. Cathode By-pass.....	Paper	.1 mfd., 400 v.d.c.w.
C4	R.F. Screen By-pass.....	Paper	.1 mfd., 400 v.d.c.w.
C5	R.F. B+ By-pass.....	Paper	.1 mfd., 600 v.d.c.w.
C6	First Det. Cathode By-pass.....	Paper	.1 mfd., 400 v.d.c.w.
C7	First Det. Screen By-pass.....	Paper	.1 mfd., 400 v.d.c.w.
C8	First Det. B+ By-pass.....	Paper	.1 mfd., 600 v.d.c.w.
C9	First I.F. Grid Filter.....	Paper	.01 mfd., 600 v.d.c.w.
C10	First I.F. Cathode By-pass.....	Paper	.1 mfd., 400 v.d.c.w.
C11	First I.F. B+ By-pass.....	Paper	.1 mfd., 600 v.d.c.w.
C12	Sec. I.F. Grid Filter.....	Paper	.01 mfd., 600 v.d.c.w.
C13	Sec. I.F. Cathode By-pass.....	Paper	.1 mfd., 400 v.d.c.w.
C14	Sec. I.F. Screen By-pass.....	Paper	.1 mfd., 400 v.d.c.w.
C15	Sec. I.F. B+ By-pass.....	Paper	.1 mfd., 600 v.d.c.w.
C16	Sec. Det. Plate By-pass.....	Paper	.01 mfd., 600 v.d.c.w.
C17	Sec. Det. to Limiter Audio Coupling.....	Paper	1. mfd., 200 v.d.c.w.
C18	Sec. Det. Cathode By-pass.....	Ceramic	.00025 mfd., 500 v.d.c.w.
C19	Sec. Det. I.F. By-pass.....	Mica	.001 mfd., 500 v.d.c.w.
C20	Limiter Output By-pass.....	Ceramic	.00025 mfd., 500 v.d.c.w.
C21	Tone Control.....	Paper	.01 mfd., 600 v.d.c.w.
C22	Limiter to Inverter-Audio Coupling.....	Paper	.01 mfd., 600 v.d.c.w.
C23	Tone Control.....	Mica	.001 mfd., 500 v.d.c.w.
C24	Inverter-Audio Cathode By-pass.....	Elec.	10 mfd., 50 v.d.c.w.
C25	Inverter-Audio to Output Coupling.....	Paper	.1 mfd., 400 v.d.c.w.
C26	Inverter-Audio to Output Coupling.....	Paper	.1 mfd., 400 v.d.c.w.
C27	Inverter-Feedback Coupling.....	Paper	.1 mfd., 400 v.d.c.w.
C28	H.F. Oscillator Grid.....	Ceramic	.00025 mfd., 500 v.d.c.w.
C29	Beat Oscillator Grid.....	Mica	.001 mfd., 500 v.d.c.w.
C30	Beat Oscillator Screen By-pass.....	Paper	.1 mfd., 400 v.d.c.w.
C31	Beat Osc. to Sec. Det. Coupling.....	Ceramic	2 mfd., 500 v.d.c.w.
C32	AVC Output By-pass.....	Paper	.1 mfd., 400 v.d.c.w.
C33	AVC Plate By-pass.....	Paper	.1 mfd., 400 v.d.c.w.
C34	AVC Cathode By-pass.....	Paper	.1 mfd., 400 v.d.c.w.
C35	B minus By-pass.....	Elec.	40 mfd., 200 v.d.c.w.
C36	AVC to Sec. Det. Coupling.....	Ceramic	.00005 mfd., 500 v.d.c.w.
C37	Power Supply Filter.....	Paper	.1 mfd., 600 v.d.c.w.
C38	Power Supply Filter.....	Elec.	8 and 9 mfd., 475 v.d.c.w.
C39	Crystal Filter Input Tuning.....	Air	6 to 85 mfd.
C40	Crystal Filter Bypassing Control.....	Air	5 and 5 mfd.
C41	Crystal Filter Compensating.....	Ceramic	2 to 6 mfd.
C42	Crystal Filter Output Tuning.....	Air	6 to 85 mfd.
C43	T-2 Primary Tuning.....	Air	6 to 85 mfd.
C44	T-2 Secondary Tuning.....	Air	6 to 85 mfd.
C45	T-3 Primary Tuning.....	Air	6 to 85 mfd.
C46	T-3 Secondary Tuning.....	Air	6 to 85 mfd.
C47	T-4 Tuning.....	Air	6 to 85 mfd.
C48	C.W. Osc. Control.....	Air	1 to 10 mfd.

PARTS LIST (Continued)

Symbol	Function	Type	Rating
CAPACITORS (Continued)			
C49	C.W. Osc. Compensating.....	Ceramic	10 mmf., 500 v.d.c.w.
C50	Gen. Cov. R.F. Amplifier Trimmer.....	Air	See Note No. 1
C51	Gen. Cov. 1st Det. Trimmer.....	Air	See Note No. 1
C52	Gen. Cov. H.F. Osc. Trimmer.....	Air	See Note No. 1
C53	Gen. Cov. H.F. Osc. Padder.....	Air	See Note No. 1
C54	Gen. Cov. H.F. Osc. Padder.....	Mica	See Note No. 1
C55	Band-Spread R.F. Amplifier Trimmer.....	Air	See Note No. 1
C56	Band-Spread 1st Det. Trimmer.....	Air	See Note No. 1
C57	Band-Spread H.F. Osc. Trimmer.....	Air	See Note No. 1
C58	Band-Spread R.F. Amplifier Padder.....	Ceramic	See Note No. 1
C59	Band-Spread 1st Det. Padder.....	Ceramic	See Note No. 1
C60	Band-Spread H.F. Osc. Padder.....	Ceramic	See Note No. 1
C61	Band-Spread H.F. Osc. Padder.....	Mica	3 to 30 mmf.
C62	Gen. Cov. R.F. Amplifier Padder.....	Mica	900 mmf., 500 v.d.c.w.*
C63	Gen. Cov. 1st Det. Series Padder.....	Ceramic	16 mmf., 500 v.d.c.w.*
C64	Gen. Cov. H.F. Osc. Padder.....	Ceramic	20 mmf., 500 v.d.c.w.*
RESISTORS			
R1	R.F. Grid Filter.....	Fixed	500,000 Ohm, 1/2 w.
R2	R.F. Cathode Bias.....	Fixed	500 Ohm, 1/2 w.
R3	First Det. Cathode Bias.....	Fixed	250 Ohm, 1/2 w.
R4	First Det. Screen Bleeder.....	Fixed	100,000 Ohm, 1/2 w.
R5	First Det. Screen Dropping.....	Fixed	50,000 Ohm, 1/2 w.
R6	First Det. Plate Filter.....	Fixed	2,000 Ohm, 1/2 w.
R7	First I.F. Grid Filter.....	Fixed	20,000 Ohm, 1/2 w.
R8	First I.F. Cathode Bias.....	Fixed	See Note No. 2, 1/2 w.
R9	First I.F. Plate Filter.....	Fixed	2,000 Ohm, 1/2 w.
R10	Sec. I.F. Grid Filter.....	Fixed	500,000 Ohm, 1/2 w.
R11	Sec. I.F. Cathode Bias.....	Fixed	See Note No. 2, 1/2 w.
R12	Sec. I.F. Screen Bleeder.....	Fixed	100,000 Ohm, 1/2 w.
R13	Sec. I.F. Screen Dropping.....	Fixed	70,000 Ohm, 1/2 w.
R14	Sec. Det. Plate Filter.....	Fixed	2,000 Ohm, 1/2 w.
R15	Sec. Det. I.F. Filter.....	Fixed	5,000 Ohm, 1/2 w.
R16	Sec. Det. Load.....	Fixed	25,000 Ohm, 1/2 w.
R17	Limiter Input.....	Fixed	100,000 Ohm, 1/2 w.
R18	Limiter Output.....	Fixed	50,000 Ohm, 1/2 w.
R19	Tone Control.....	Comp. Var.	500,000 Ohm, 1 w.
R20	A.F. Gain Control.....	Comp. Var.	500,000 Ohm, 1 w.
R21	Inverter-Audio Cathode Bias.....	Fixed	1,000 Ohm, 1/2 w.
R22	Inverter Grid.....	Fixed	500,000 Ohm, 1/2 w.
R23	First Audio Plate.....	Fixed	50,000 Ohm, 1/2 w.
R24	First Audio Plate.....	Fixed	50,000 Ohm, 1/2 w.
R25	Output Grid.....	Fixed	250,000 Ohm, 1/2 w.
R26	Output Grid.....	Fixed	250,000 Ohm, 1/2 w.
R27	Inverter Feedback Coupling.....	Fixed	250,000 Ohm, 1/2 w.
R28	Output Cathode Bias.....	Fixed	200 Ohm, 2 w.
R29	R.F. Gain Control.....	W.W. Var.	10,000 Ohm, 1 1/2 w.
R30	R.F. Gain Bleeder.....	Fixed	50,000 Ohm, 1/2 w.
R31	H.F. Osc. B+ Dropping.....	Fixed	50,000 Ohm, 1 w.

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-53 used in E and F bands only. C-54 to C-61, inclusive, used in A, B, C, and D bands only.

Symbol	Function	Type	Rating
RESISTORS (Continued)			
R32	H.F. Osc. Grid.....	Fixed	50,000 Ohm, 1/2 w.
R33	Beat Osc. Plate Filter.....	Fixed	250,000 Ohm, 1/2 w.
R34	Beat Osc. Grid.....	Fixed	150,000 Ohm, 1/2 w.
R35	Beat Osc. Screen Bleeder.....	Fixed	100,000 Ohm, 1/2 w.
R36	Beat Osc. Screen Dropping.....	Fixed	100,000 Ohm, 1/2 w.
R37	B+ Voltage Divider.....	Fixed	20,000 Ohm, 2 w.
R38	B+ Voltage Divider.....	Fixed	20,000 Ohm, 2 w.
R39	S-Meter Adjustment.....	W.W. Var.	1,000 Ohm, 1 w.
R40	S-Meter Bridge.....	Fixed	1,000 Ohm, 1/2 w.
R41	AVC Plate Filter.....	Fixed	500,000 Ohm, 1/2 w.
R42	AVC Plate.....	Fixed	500,000 Ohm, 1/2 w.
R43	AVC Voltage Divider.....	Fixed	1,500 Ohm, 2 w.
R44	AVC Cathode Bias.....	Fixed	5,000 Ohm, 2 w.
R45	AVC Grid.....	Fixed	5,000,000 Ohm, 1/2 w.
R46	Limiter Control.....	W.W. Var.	10,000 Ohm, 1 1/2 w.
MISCELLANEOUS			
F1	AC Line Fuse.....	Glass Encl.	2 Amp.
F2	AC Line Fuse.....	Glass Encl.	6 v., .15 a.
I1	Dial Lamp.....	No. 47	6 v., .15 a.
I2	Dial Lamp.....	No. 47	6 v., .15 a.
I3	Dial Lamp.....	No. 47	6 v., .15 a.
L1	Power Supply Filter Choke.....	Potted	17 h., 100 ma.
L2	Power Supply Filter Choke.....	Potted	17 h., 100 ma.
M1	Signal Strength Meter.....	"S" Scale	0 to 1 ma.
P1	1nd Speaker Connector Plug.....	Molded	5 Prong
P2	Bummy Plug for AC Operation.....	Molded	7 Prong
P3	Battery Connector Plug.....	Molded	7 Prong
S1	Control Switch.....	Two Gang	SFST 250 v., 1 a.
S2	Control Switch.....	Two Gang	SFST 250 v., 1 a.
S3	Power Supply Switch.....	Two Gang	SFST 250 v., 1 a.
S4	Tone Control Switch.....	Pt. of R-19	SFST
S5	Tone Control Switch.....	Pt. of R-20	SFST
S6	S-Meter Switch.....	Pt. of S-2	Section
S7	Selectivity Control Switch.....	Rotary	2 Section, Ganged
S8	T-1 Primary Selection Switch.....	Toggle	BPT, 250 v., 3 a.
T1	Power Transformer.....	150 Watt	115 Volt, 60 Cycle, 230 Volt, 60 Cycle
T2	I.F. Transformer.....	Air Tamed	455 kc.
T3	I.F. Transformer.....	Air Tamed	455 kc.
T4	Beat Osc. Transformer.....	Air Tamed	455 kc.
X1	Audio Output Socket.....	Bakelite	5 Prong
X2	Battery Connector Socket.....	Bakelite	7 Prong
Y1	B Connector (BSW).....	Bakelite	2 Connector
Z1	Crystal Resonator.....	Quartz	455 kc.

Note No. 2. Resistors R3 and R11 may have values between 300 and 8000 Ohm 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.

* These Capacitors used on the A band only.