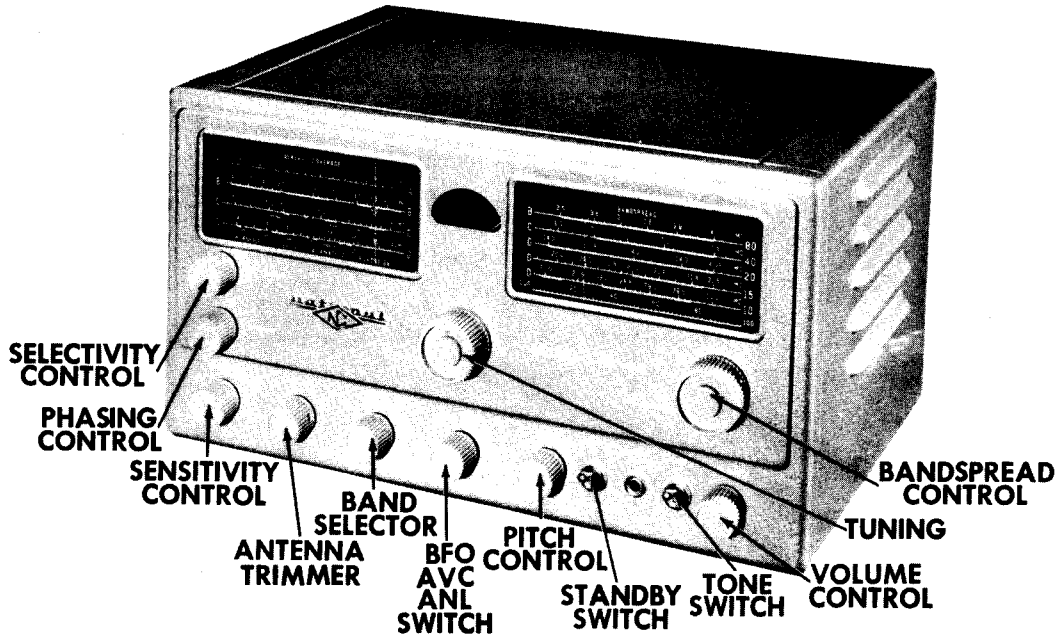


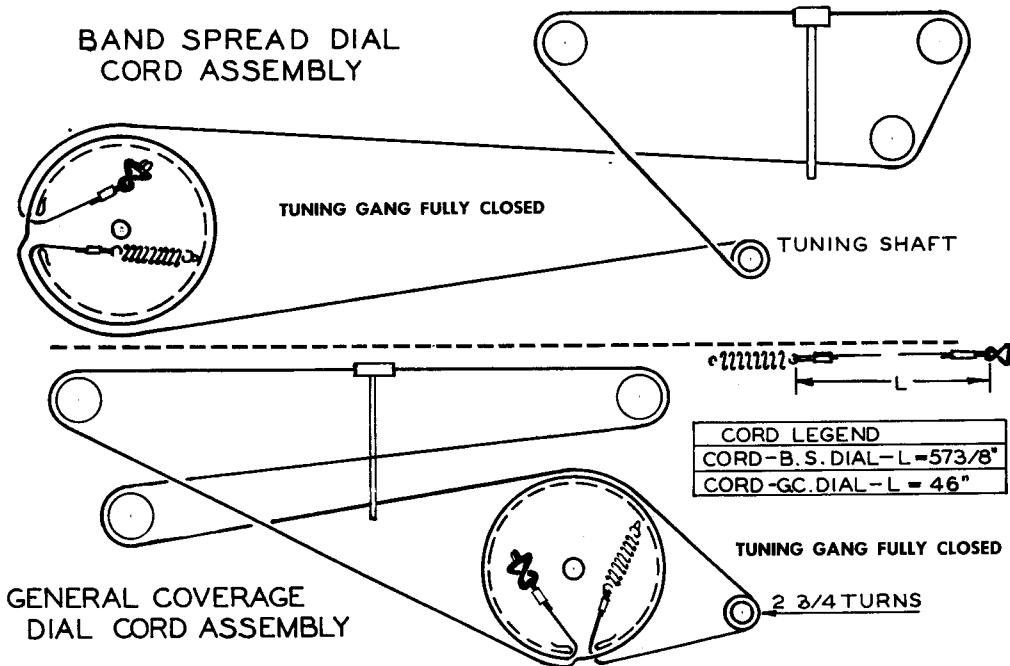


NATIONAL
MODEL NC-98



TRADE NAME	National Model NC-98		
MANUFACTURER	National Co., Inc., 61 Sherman St., Malden 48, Mass.		
TYPE SET	AC Operated Multi-Band Superheterodyne Communications Receiver		
TUBES	Nine		
POWER SUPPLY	105-130 Volts AC - 50/60 Cycles	RATING	.6 Amp. @ 117 Volts AC
TUNING RANGE	Band "A" 540-1600KC Band "B" 1.6 - 4.7MC	Band "C" 4.7 - 14MC Band "D" 14 - 40MC	

NATIONAL
MODEL NC-98



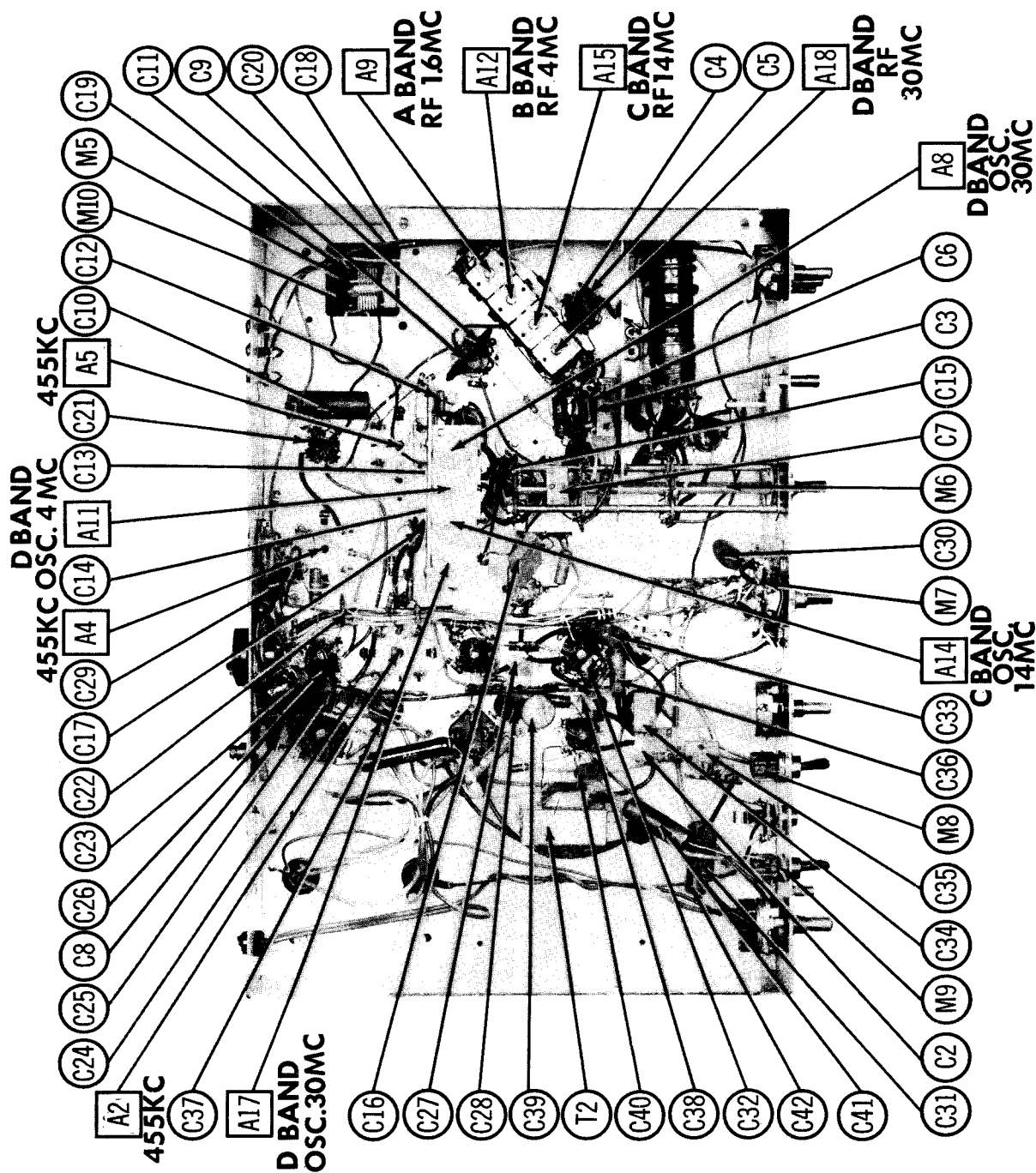
DIAL CORD STRINGING

HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

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CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION

PARTS LIST AND DESCRIPTIONS

CHASSIS—TOP VIEW

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA			NOTES
		NATIONAL PART No.	STANDARD REPLACEMENT	RETMA BASE TYPE	
V1	RF Amplifier	6BA6	6BA6	6BK	
V2	Mixer	6BE6	6BE6	7CH	
V3	Oscillator	6C4	6C4	6BG	
V4	1st. IF Amplifier	6BD6	6BD6	7BK	
V5	2nd. IF Amplifier	6BD6	6BD6	7BK	
V6	Det.-AVC-Limiter	6AL5	6AL5	6BT	
V7	Meter Amp-BFO-	12AX7	12AX7	9A	
V8	Output	6AQ5	6AQ5	7BZ	
V9	Rectifier	5Y3GT	5Y3GT	5T	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP. VOLTS	REPLACEMENT DATA					NOTES
		NATIONAL PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL DUBIER PART No.	ERIE PART No.	
C1A	.20	B235-2	AFB3-36		C027	FP376.5	TYL-3780
C1B	.20						
C1C	.20						
C2	.25	E338-4	PR550/25		BR255	TC36	TVA-1306
C3	.25	F665-44	1469-0002		K082	MCE240	MS-32
C4	.25	K946-2	BPD-01	DD-103	K082	DC-511	5HK-S1
C5	.25	K946-2	BPD-01	DD-103	K082	DC-511	5HK-S1
C6	.25	K946-2	BPD-01	DD-103	K082	DC-511	5HK-S1
C7	.50	J665-57	1469-0005	DD-103	5R5751	MCE245	MS-35
C8	.50	K946-2	P488-1	DD-103	CUB4PI	PT401	4TM-PI
C9	.50	K946-2	P488-1	DD-103	K082	DC-511	5HK-S1
C10	.50	K946-2	P488-1	DD-103	CUB4PI	PT401	4TM-PI
C11	.50	K946-2	P488-1	DD-103	K082	DC-511	5HK-S1
C12	.50	K946-2	P488-1	DD-103	K082	DC-511	5HK-S1
C13	.50	K946-2	P488-1	DD-103	K082	DC-511	5HK-S1
C14	.50	K946-2	P488-1	DD-103	K082	DC-511	5HK-S1
C15	.50	K946-2	P488-1	DD-103	K082	DC-511	5HK-S1
C16	.50	K946-2	P488-1	DD-103	K082	DC-511	5HK-S1
C17	.50	K946-2	P488-1	DD-103	K082	DC-511	5HK-S1
C18	.50	K946-2	P488-1	DD-103	K082	DC-511	5HK-S1
C19	.50	K946-2	P488-1	DD-103	K082	DC-511	5HK-S1
C20	.50	K946-2	P488-1	DD-103	K082	DC-511	5HK-S1
C21	.50	K946-2	P488-1	DD-103	K082	DC-511	5HK-S1
C22	.50	K946-2	P488-1	DD-103	K082	DC-511	5HK-S1
C23	.50	K946-2	P488-1	DD-103	K082	DC-511	5HK-S1
C24	.50	K946-2	P488-1	DD-103	K082	DC-511	5HK-S1
C25	.50	K946-2	P488-1	DD-103	K082	DC-511	5HK-S1
C26	.50	K946-2	P488-1	DD-103	K082	DC-511	5HK-S1
C27	.50	K946-2	P488-1	DD-103	K082	DC-511	5HK-S1
C28	.50	K946-2	P488-1	DD-103	K082	DC-511	5HK-S1
C29	.50	K946-2	P488-1	DD-103	K082	DC-511	5HK-S1
C30	.50	K946-2	P488-1	DD-103	K082	DC-511	5HK-S1
C31	.50	K946-2	P488-1	DD-103	K082	DC-511	5HK-S1
C32	.50	K946-2	P488-1	DD-103	K082	DC-511	5HK-S1
C33	.50	K946-2	P488-1	DD-103	K082	DC-511	5HK-S1
C34	.50	K946-2	P488-1	DD-103	K082	DC-511	5HK-S1
C35	.50	K946-2	P488-1	DD-103	K082	DC-511	5HK-S1
C36	.50	K946-2	P488-1	DD-103	K082	DC-511	5HK-S1
C37	.50	K946-2	P488-1	DD-103	K082	DC-511	5HK-S1
C38A	.50	K946-2	P488-1	DD-103	K082	DC-511	5HK-S1
C38B	.50	K946-2	P488-1	DD-103	K082	DC-511	5HK-S1
C39	.50	K946-2	P488-1	DD-103	K082	DC-511	5HK-S1
C40	.50	K946-2	P488-1	DD-103	K082	DC-511	5HK-S1
C41	.50	K946-2	P488-1	DD-103	K082	DC-511	5HK-S1
C42	.50	K946-2	P488-1	DD-103	K082	DC-511	5HK-S1

* Items C37A, C37B, C37C, R33A and R33B are combined in one unit. When replacing items individually, items C37B and C37C should total 250MMF.

PARTS LIST AND DESCRIPTIONS (Continued)

CONTROLS

ITEM No.	REPLACEMENT DATA				INSTALLATION NOTES
	RATING RESISTANCE	NATIONAL PART No.	CLAROSTAT PART No.	MALLORY PART No.	
R1A	100K 2	E349-3	A43-10K	R10, 000L	Sensitivity-Wire Wound
R2A	1500 1/2	Not Req.	FS-3	DS-36	Attach to R1A
R3A	500K 1/2	E347-1	FS-3	U-6	Pitch
R4A	1000 1	Not Req.	FS-3	Not Req.	Attach to R2A
R5A	1000 1	Not Req.	FS-3	U-48	Volume
R6A	1000 1	Not Req.	FS-3	U-48	Volume
R7A	1000 1	Not Req.	FS-3	U-48	Volume
R8A	1000 1	Not Req.	FS-3	U-48	Volume
R9A	1000 1	Not Req.	FS-3	U-48	Volume
R10A	1000 1	Not Req.	FS-3	U-48	Volume
R11A	1000 1	Not Req.	FS-3	U-48	Volume
R12A	1000 1	Not Req.	FS-3	U-48	Volume
R13A	1000 1	Not Req.	FS-3	U-48	Volume
R14A	1000 1	Not Req.	FS-3	U-48	Volume
R15A	1000 1	Not Req.	FS-3	U-48	Volume
R16A	1000 1	Not Req.	FS-3	U-48	Volume
R17A	1000 1	Not Req.	FS-3	U-48	Volume
R18A	1000 1	Not Req.	FS-3	U-48	Volume
R19A	1000 1	Not Req.	FS-3	U-48	Volume
R20A	1000 1	Not Req.	FS-3	U-48	Volume
R21A	1000 1	Not Req.	FS-3	U-48	Volume
R22A	1000 1	Not Req.	FS-3	U-48	Volume
R23A	1000 1	Not Req.	FS-3	U-48	Volume
R24A	1000 1	Not Req.	FS-3	U-48	Volume
R25A	1000 1	Not Req.	FS-3	U-48	Volume
R26A	1000 1	Not Req.	FS-3	U-48	Volume
R27A	1000 1	Not Req.	FS-3	U-48	Volume

RESISTORS

ITEM No.	REPLACEMENT DATA				NOTES
	RATING	NATIONAL PART No.	IRC PART No.	REPLACEMENT DATA	
R5	470K 1/2	J569-57	BTS-470K	J569-54	BTS-270K
R6	680 1/2	J569-58	BTS-680	J569-54	BTS-270K
R7	47K 1/2	J569-59	BTS-47K	J569-48	BTS-100K
R8	15K 1/2	J571-39	BTA-15K	J569-48	BTA-47K
R9	680 1/2	J569-60	BTS-680	J569-73	BTS-10Meg
R10	2200 1/2	J569-29	BTS-2200	4R983-1	
R11	47K 1/2	J569-45	BTS-47K	J569-57	BTS-470K
R12	2200 1/2	J569-17	BTS-2200	J571-18	BTA-270
R13	330 1/2	J569-7	BTS-330	J569-27	BTS-1500
R14	150K 1/2	J569-15	BTS-150K	J571-5	BTS-10Meg
R15	2200 1/2	J569-17	BTS-2200	J569-61	BTS-1Meg
R16	150K 1/2	J571-39	BTA-15K	J569-63	BTS-2.2Meg
R17	150K 1/2	J569-51	BTS-150K	J569-35	BTS-680K
R18	220K 1/2	J569-41	BTS-22K	J569-51	BTS-400K
R19	2000 1/2	J569-54	BTS-2000	J571-49	BTA-100
R20	1000 1/2	J569-23	BTS-100K	J569-33	BTS-4700
R21	100K 1/2	J569-43	BTS-680	J572-33	BTS-4700
R22	680 1/2	J569-49	BTS-100K	M4707-3	1 3/4-4-500
R23	100K 1/2	J569-29	BTS-2200	J569-1	BTS-10
R24	2200 1/2	J569-65	BTS-2.2Meg		
R25	2.2Meg	J569-61	BTS-1Meg		
R26	1Meg	J569-61	BTS-1Meg		
R27	1Meg	J569-61	BTS-1Meg		

Note 1: Some models may use a 1500K resistor in this application.

Note 2: Some models may use a 27K resistor in this application.

Items R33A, R33B, C35A, C35B and C35C are combined in one unit.

TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA			
	PRI	SEC. 1	SEC. 2	SEC. 3	NATIONAL PART No.	Stancor PART No.	Merit PART No.	Thordorson PART No.
T1	117VAC	60VCT	5VAC	6.3VAC	K318-5	PC-8422Q	P-3151	P9912Q12
	② .6A	.076ADC	② 2A	② 3A			②	

① Drill new mounting holes.

② Tape 6.3V center tap.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	REPLACEMENT DATA				NOTES
	IMPEDANCE	NATIONAL PART No.	Stancor PART No.	Merit PART No.	
T2	4.0K 3 to 42	K-313-3	A-2830	S-3X	

PARTS LIST AND DESCRIPTIONS (Continued)

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA				NOTES
		DC RES.	NATIONAL PART No.	MEISSNER PART No.	MILLER PART No.	
L1	Ant. Coil	3.50	SB:1517			Band A-Freq. Range 540 - 1600KC
		PRI	SEC.			
		40	1.20			Band B-Freq. Range 1.6MC - 4.7MC
		40	.50			Band C-Freq. Range 4.7MC - 14MC
		40	.50			Band D-Freq. Range 14MC - 40MC
		28	2.80			Band A-Freq. Range 540 - 1600KC
		28	1.80			Band B-Freq. Range 1.6MC - 4.7MC
		28	.10			Band C-Freq. Range 4.7MC - 14MC
		60				Band D-Freq. Range 14MC - 40MC
L4	Osc. Coil	1.60	SB:1520			Band A-Freq. Range 540 - 1600KC
L5	Osc. Coil	1.20	SB:1573-1	14-1073	BC-381	Band B-Freq. Range 1.6MC - 4.7MC
L6	Osc. Coil	1.20	SB:1574-1			Band C-Freq. Range 4.7MC - 14MC
L7	Osc. Coil	.20	SB:1575-1			Band D-Freq. Range 14MC - 40MC
L8	Osc. Coil	.10	SB:1576-1			Band A-Freq. Range 540 - 1600KC
L9	Input IF	200	Q242-2			Band B-Freq. Range 1.6MC - 4.7MC
L10	Crystal	9.50	SB:2641			Band C-Freq. Range 4.7MC - 14MC
L11	Output IF	200	Q242-2			Band D-Freq. Range 14MC - 40MC
L12	Detector	200	Q242-1			975 Microhenries
L13	BFO Coil	4.20	SB:2642			Tapped at 2.90; Core part no. D186-5.

* Enlarge chassis hole and use adaptor plate.

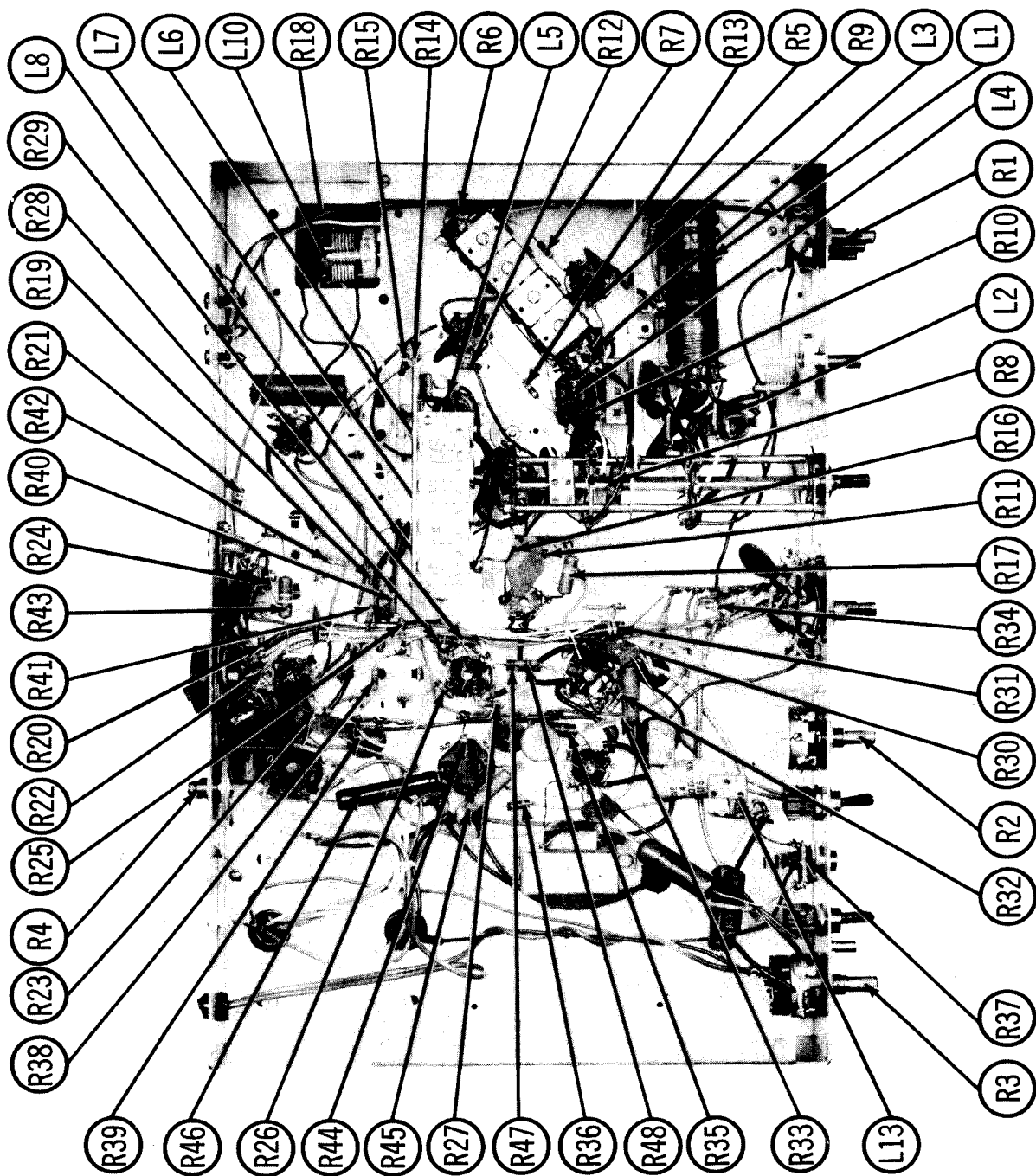
FILTER CHOKE

ITEM No.	RATINGS				REPLACEMENT DATA			
	TOTAL DIRECT CURRENT	D. C. RESISTANCE	INDUCTANCE (1000 μ)	1000 μ	NATIONAL PART No.	Stancor PART No.	Merit PART No.	Thordorson PART No.
L4	.076A	2600	8 Hy.		K317-1	C-1708	C-2995	C-8X

① Drill one new mounting hole.

MISCELLANEOUS

ITEM No.	PART NAME	NATIONAL PART No.	REPLACEMENT DATA				NOTES
			F136-11	F136-11	P-705-2	P-706-2	
M1	Dial Light						#47, Bayonet
M2	Dial Light						#47, Bayonet (meter)
M3	Tuning Cap.						Main tuning - 13-454MMF, 13-454MMF
M4	Tuning Cap.						Bandspread - 10-37MMF, 10-37MMF
M5	Crystal						Filter - Selectivity
M6	Switch						Band
M7	Switch						Reception
M8	Switch						Toggle - Receiver - Standby
M9	Switch						Toggle - Tone
M10	Switch						Selectivity
M11	Crystal Filter Unit						Includes phasing trimmer, M10, M5, C18, C19, R18, L10
M12	Meter						
A9	Trimmer Cap.						RF (2.2-4MMF) Band A
A10	Trimmer Cap.						RF (2.2-4MMF) Band B
A11	Trimmer Cap.						RF (2.2-4MMF) Band C
A12	Trimmer Cap.						RF (2.2-4MMF) Band D
A13	Trimmer Cap.						Osc. (6-20MMF) Band A
A14	Trimmer Cap.						Osc. (2.5-6MMF) Band B
A15	Trimmer Cap.						Osc. (6-20MMF) Band C
A16	Trimmer Cap.						Osc. (2.5-6MMF) Band D
A17	Trimmer Cap.						Ant. Phasing (5-50MMF) 2 used
	Knob						Tuning & bandspread
	Knob						7 used
	Knob						SA9305
	Knob						SB2844



CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION

MODEL NC-98

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Only qualified technicians thoroughly familiar with communications type receivers should attempt alignment of this receiver. Alignment should not be attempted until a thorough check of receiver performance against normal performance has been made. With main tuning gang fully closed, slide dial pointer to coincide with the last low frequency mark on the "C" scale. With the band spread tuning capacitor fully closed, set band spread dial pointer to coincide with the "O" Index mark on the log scale. Allow a 15 minute warm-up period for receiver and test equipment. Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

IF ALIGNMENT

The IF frequency is 455KC $\pm$ 2KC. The crystal used in the crystal filter determines the exact IF frequency. Connect speaker (or 40 resistor) across speaker terminals on rear chassis apron.

Pre-set the front panel controls as follows:

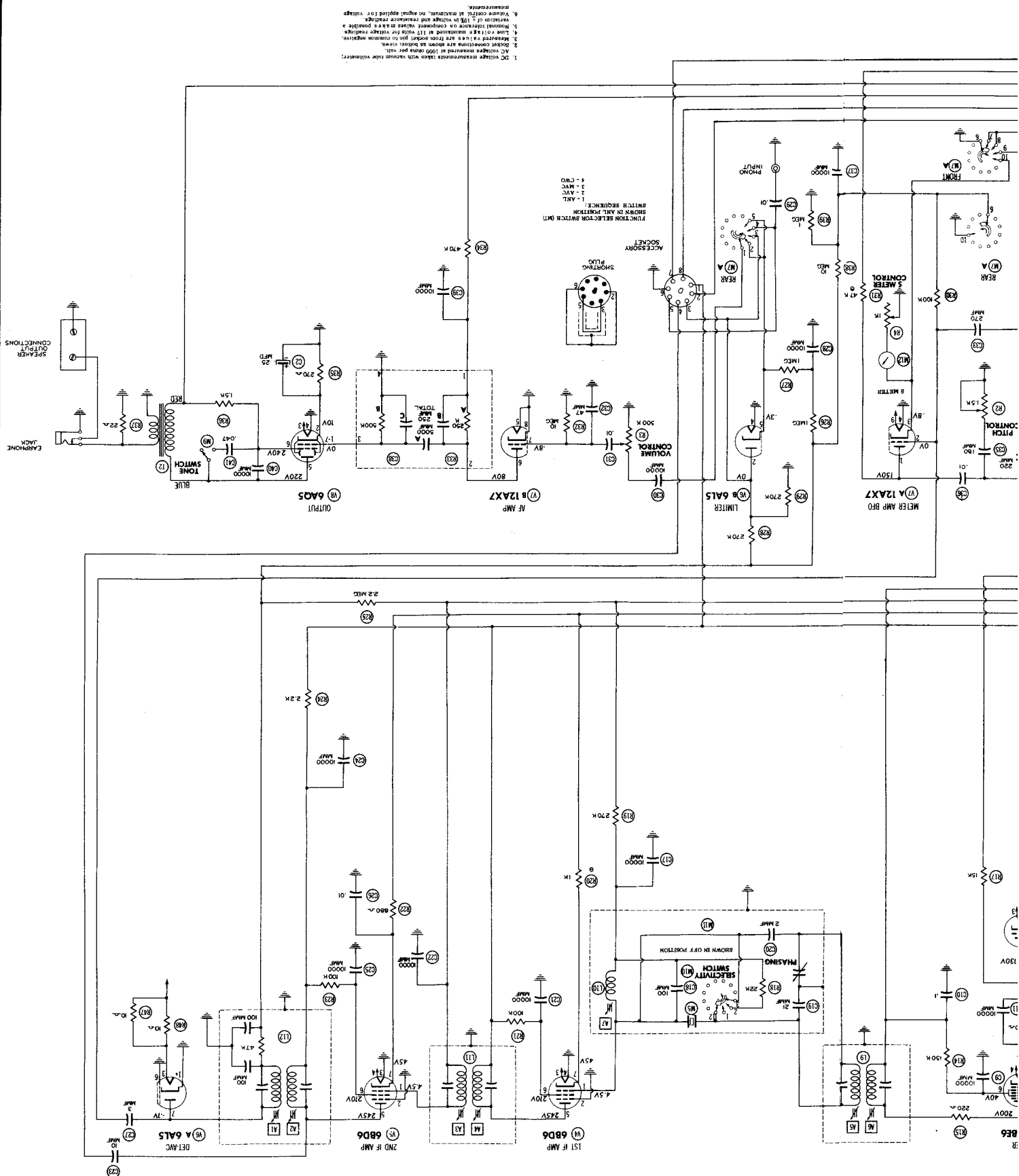
- Switch selectivity to "Off" position.
- Adjust phasing control so that red dot is at top of knob.
- Turn sensitivity control maximum clockwise.
- Turn reception switch to "AVC" position.
- Place "Receive-standby" switch in "Receive" position.
- Turn the AC - "Off-Volume" control fully clockwise.
- Remove the antenna from the antenna terminals and turn the "Meter Adjust" control (rear chassis apron) until the "S" meter (front panel) reads zero.
- Switch the reception switch from position in Step d to "CWO".
- Change the selectivity switch from position in Step a. to position 2.

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1. IMFD	High side to mixer stator lug (mid-section) on main tuning gang. Low side to chassis.	Approx. 455KC (Unmod)	"A"	Tuning gang fully open	Across speaker terminals (rear chassis apron)		Adjust pitch control for audible beat in speaker. Slowly vary signal generator between 453 and 457KC until output meter shows a very sharply peaked response. It may be necessary to back off the sensitivity control or attenuate the signal generator output to obtain this peak. The peak indicates the frequency of the crystal and IF alignment should be made at this frequency.
2. "	"	Exact frequency determined in step 1 (400 μ Mod)	"	"	"	A1, A2, A3, A4, A5, A6	Turn "Reception" switch to "AVC" and "Selectivity" switch to "Off". Adjust in order given until maximum output is obtained.
3. "	"	Tune 2KC higher than frequency determined in step 1.	"	"	"	A7	Change selectivity switch to position 1. Adjust for maximum output.

RF ALIGNMENT

The oscillator operates on the high side on the "A", "B" and "C" bands and on the low side on the "D" band. Place the band spread dial pointer at "Set" on the log scale.

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
4. 300 Ω carbon resistor	High side thru 300 Ω to ungrounded antenna terminal. Low side to chassis.	1.6MC (400 μ Mod)	A	1.6MC	Across speaker terminals	A8, A9	Adjust in order given for maximum output.
5. "	"	0.6MC	"	0.6MC	"	A10	Adjust for maximum output. Repeat steps 4 and 5.
6. "	"	4.0MC	B	4.0MC	"	A11, A12	Adjust in order given for maximum output.
7. "	"	1.6MC	"	1.6MC	"	A13	Adjust for maximum output. Repeat steps 6 and 7.
8. "	"	14.0MC	C	14.0MC	"	A14	Adjust for maximum output. If two peaks occur use the one closest to MINIMUM capacity.
9. "	"	"	"	"	"	A15	Adjust for maximum output. If two peaks occur use the one closest to maximum capacity.
10. "	"	5.0MC	"	5.0MC	"	A16	Adjust for maximum output. Repeat steps 8, 9 and 10.
11. "	"	30MC	D	30.0MC	"	A17	Adjust for maximum output. If two peaks occur use the one closest to maximum capacity.
12. "	"	"	"	"	"	A18	Adjust for maximum output. If two peaks occur use the one closest to MINIMUM capacity.
13. "	"	15.0MC	"	15.0MC	"	A19	Adjust A19 fully counter clockwise, then clockwise until second peak occurs. Adjust for maximum output on second peak. Repeat steps 11, 12 and 13.



Item	Time	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
BB46	1.5846g	210	00	110	110	1415KΩ	148KΩ	10KΩ		
BB6	47KΩ	220Ω	00	110	110	10KΩ	10KΩ	30Ω		
9C4	130KΩ	1N	110	00	00	120KΩ	47KΩ	00		
BD06	1.846g	00	110	00	00	1800Ω	180KΩ	11KΩ		
BD06	1.9346g	270KΩ	00	110	110	1800Ω	1100KΩ	11KΩ		
6A15	150KΩ	1Meg	700Ω	00	00	2.546g	500KΩ	500KΩ		
12AX7	150KΩ	1Meg	700Ω	00	00	00	1720KΩ	1046g	00	110
6A5	500KΩ	270Ω	110	00	00	110KΩ	17.33KΩ	500KΩ		
6Y30T	1N	70KΩ	1N	810	1N	00	00	70KΩ		

RESISTANCE READINGS

CD SELECTOR SWITCH (MS)
WV IN BAND A POSITION
TCH SEQUENCE:
1 - BAND A 40-1000KC
2 - BAND B 1.6-4.7MC
3 - BAND C 4.7-14MC
4 - BAND D 14-40MC

