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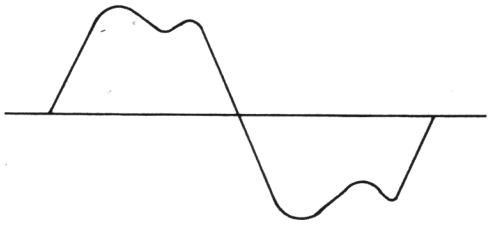
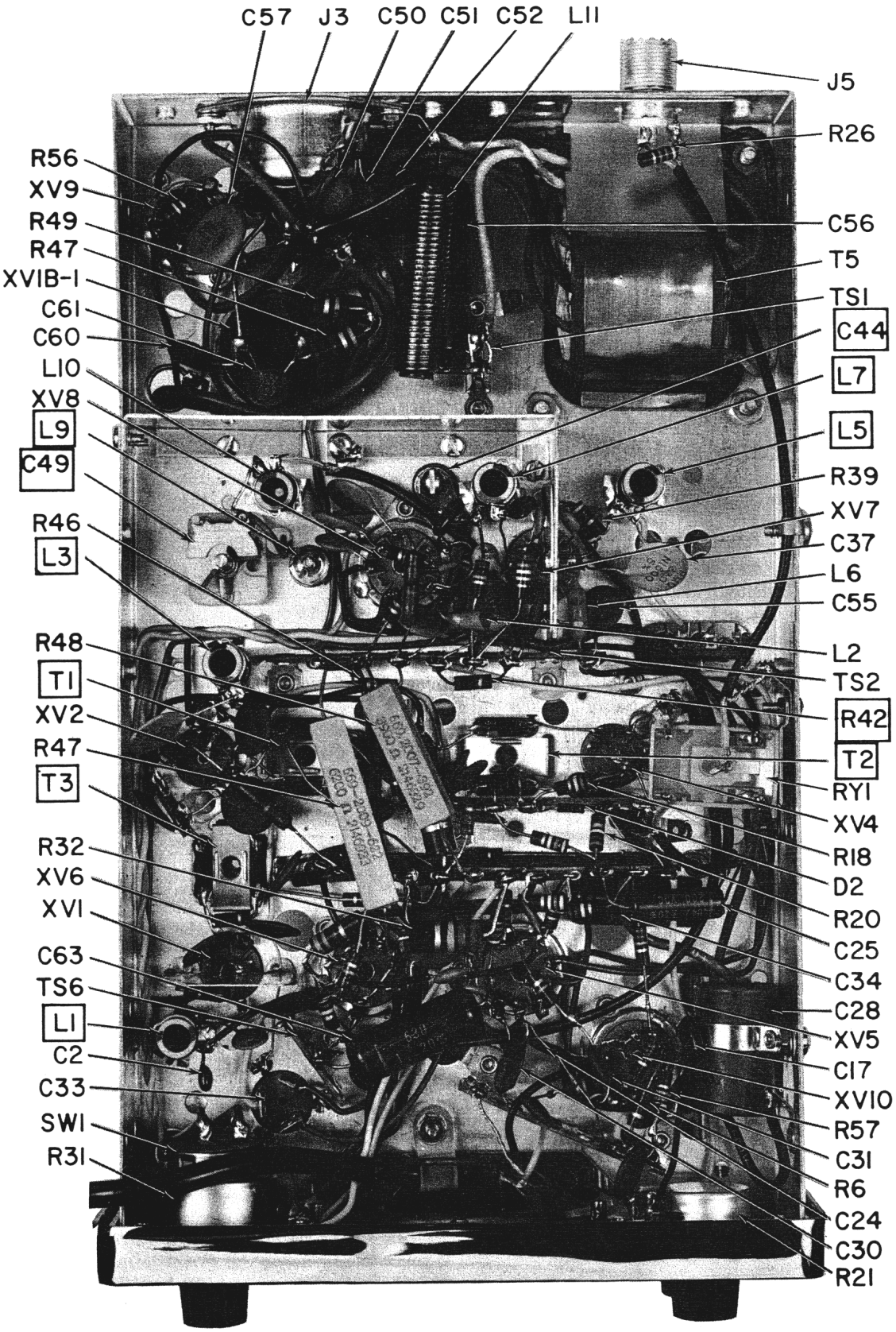
SECTION 6
ALIGNMENT

6.1 RECEIVER ALIGNMENT CHART

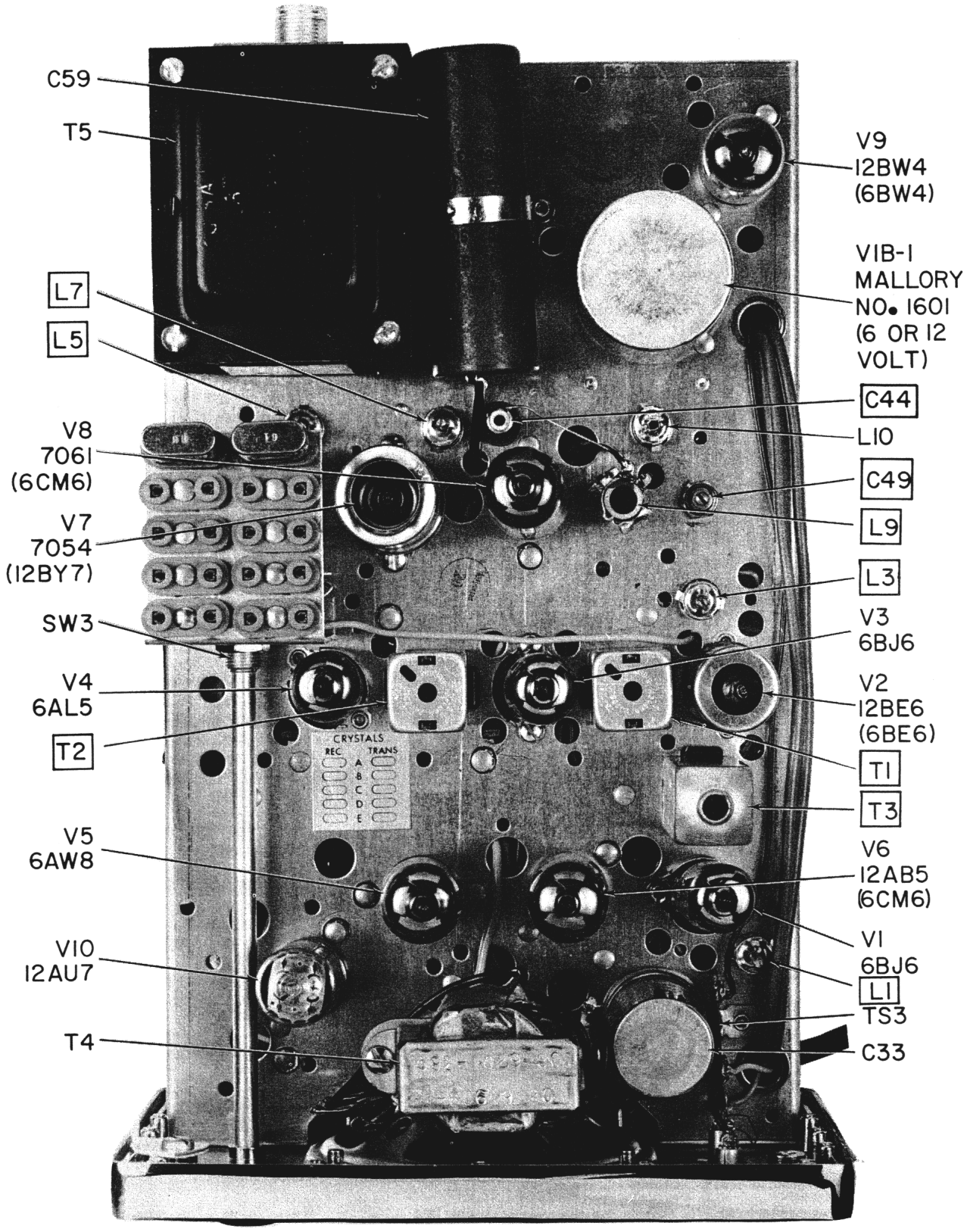
ALIGNMENT	CONNECTIONS AND SETTINGS	ADJUSTMENTS
	NOTE: Crystals for channels 1, 12 and 22 should be available for performing the receiver alignment.	
455 kHz IF	Connect test equipment as in Section 4.2.1 except connect signal generator thru a .1 μF capacitor to pin 1, XV2 (See Figure 3). Set signal generator at 455 kHz ±.01% modulated 30% at 400 Hz.	Adjust top and bottom cores of T1 and T2 for maximum audio output. Keep signal generator output low so diode load voltage does not exceed 1.5 volts during final adjustment.
Receiver Crystal Oscillator Adjustment.	Check crystal oscillator frequency (26.650 MHz) by coupling the oscillator to a frequency meter or to calibrated crystal oscillator having .001% accuracy and a receiver.	Zero beat the Messenger crystal oscillator (within ±100 Hz) against the alignment frequency meter or oscillator by adjusting L3.
RF Alignment	Connect test equipment as in Section 4.2.1. Set the channel selector to channel 1. Set the signal generator to 26.965 MHz (channel 1), modulated 30% at 400 Hz.	Tune the top core (primary) of T3 from the core out position inward to the SECOND peak, tuning for maximum audio output. The second peak is stronger than the first peak. The core will be approximately 9/16" from the top of the can when tuned to the second peak. During this and following adjustments keep signal generator output low so diode load does not exceed 2 volts.
	Set channel selector to channel 22. Set signal generator to 27.225 MHz (channel 22) modulated 30% at 400 Hz.	Tune bottom core of T3 (secondary) from the core out position inward, tuning for maximum audio output. The core is tuned from the core out position to avoid tuning on the crystal oscillator image or image frequencies lower than the signal frequencies.
Antenna	Repeat above RF alignment steps.	
	Set channel switch to channel 12. Set signal generator to 27.105 MHz (channel 2), modulated as above.	
	Adjust antenna input to 1 microvolt at the input to the 6 dB 50 ohm pad.	Repeat above RF alignment steps.
		Tune the core of L1 from the core out position for maximum audio output.

6.2 TRANSMITTER ALIGNMENT CHART

ALIGNMENT	CONNECTIONS AND SETTINGS	ADJUSTMENTS
Transmitter Crystal Oscillator Adjustment.	Connect test equipment as in Section 4.3.1. Set channel selector to channel 12 (27.105 MHz).	Press microphone push-to-talk switch. Check transmitter frequency (27.105 MHz) with a frequency meter or calibrated crystal oscillator and a receiver. Zero beat the transmitter oscillator ±100 Hz against the frequency meter by adjusting the oscillator grid coil, L5. Adjust the oscillator plate coil, L7, for maximum negative voltage on the PA grid. Typical is - 18 volts, minimum - 13 volts.
Preliminary Power Amplifier (PA) Adjustment	Connect test equipment as in Section 4.3.1 (See Figure 4). Adjust the Pi- L output network for maximum power output while keeping PA plate current at 22 mA or less, whichever gives most output. It will save time to make a rough adjustment before neutralizing the PA. After neutralizing, make the final PA adjustment. The PA is aligned by simultaneous adjustment of the PA plate tuning, L9, and PA plate coupling, C49.	Adjust L9 for a dip in PA plate current (resonance). Adjust C49 for the desired PA plate current at the dip. Coupling will increase as the capacity of C49 is decreased. Make the last adjustment that of tuning L9 for a dip in PA plate current.
Power Amplifier Neutralization	Normally neutralization is only needed when V8 has been replaced. Connect test equipment as in Section 4.3.1.  CLIPPED AUDIO WAVEFORM FIGURE 6	Key the transmitter and note the PA grid voltage as L9 is tuned through resonance. If the PA grid voltage increases when L9 is backed out of the coil, the value of C44 is too small. Increase the capacity of C44 one-half turn at a time (clockwise) and repeat above test If the PA grid voltage increases as L9 is turned further into the coil, the value of C44 is too large. Decrease the capacity of C44 one-half turn and repeat this test. At the proper setting of C44, the PA grid voltage will rise equally but only slightly or not at all on each side of resonance. The setting of C44 affects the PA plate tuning. Therefore, the following final PA adjustment should be made.
Final Power Amplifier (PA) Adjustment	Connect test equipment as in Section 4.3.1.	Re-adjust the PA tuning and coupling controls, L9 - C49, as in the Preliminary PA adjustments earlier in this chart. Make the last adjustment that of tuning L9 for the dip in PA plate current, while keeping the PA plate current at the desired value. The RF line current is typically 230 mA, minimum 200 mA.



BOTTOM VIEW
MESSENGER I
FIGURE 7



NOTE: TUBE TYPES SHOWN IN ( ) ARE USED ON 6 VOLT DC MODEL

TOP VIEW
MESSENGER I
FIGURE 8

SECTION 7

PARTS LIST

SCHEMATIC SYMBOL NO.	DESCRIPTION	PART NO.
	BRACKET	
BKT1	Crystal mounting	016-1454-001
BKT2	Crystal hold-down assembly	023-1384-001
BKT4	Panel support, left hand	017-1121-002
	CAPACITORS	
C1	0.001 μF ±20% 600 VW ceramic disc	510-3061-102
C2	22 pF ±10% dipped mica 500 VW	510-0005-220
C3	0.01 μF +80% -20% 500 VW ceramic disc	510-3005-103
C5	Same as C3	
C6	Same as C3	
C7	680 pF ±10% 300 VW dipped mica	510-0006-681
C8	330 pF ±5% 1000 VW N1500 disc ceramic	510-3041-331
C9	0.01 μF +80% -20% 500 VW ceamic disc	510-3005-103
C11	Same as C9	
C13	Same as C9	
C14	100 pF ±10% 500 VW dipped mica	510-0005-101
C15	0.01 μF +80% -20% 500 VW ceramic disc	510-3005-103
C16	Same as C15	
C17	150 pF ±10% dipped mica 500 VW	510-0005-151
C18	0.01 μF +80% -20% 500 VW ceramic disc	510-3005-103
C19	Same as C18	
C20	150 pF ±10% dipped mica 500 VW	510-0005-151
C21	Same as C20	
C22	0.01 μF +80% -20% 500 VW ceramic disc	510-3005-103
C23	0.0033 μF ±10% 1000 VW ceramic disc	510-3061-332
C24	0.005 μF GMV 600 VW ceramic disc	510-3157-502
C25	0.047 μF 200 VW paper tubular	510-9004-001
C26	0.01 μF +80% -20% 500 VW ceramic disc	510-3005-103
C27	Same as C26	
C28	Dual, 4 μF 350 VW and 8 μF 150 VW electrolytic	510-4051-001
C29	0.001 μF ±20% 600 VW ceramic disc	510-3061-102
C30	0.01 μF +80% -20% 500 VW ceramic disc	510-3005-103
C31	0.005 μF GMV 600 VW ceramic disc	510-3157-502
C32	0.01 μF +80% -20% 500 VW ceramic disc	510-3005-103
C33	15/10/10 μF 300/150/25 VW electrolytic	022-1541-001
C34	0.1 μF 400 VW paper	510-9005-001
C35	0.003 ±20% 500 VW ceramic disc	510-3004-332
C36	0.0033 μF ±10% 1000 VW ceramic disc	510-3061-332
C37	330 pF ±5% 1000 VW N1500 disc ceramic	510-3041-331
C38	22 pF ±5% 1000 VW N1500 disc ceramic	510-3041-220
C39	0.001 μF ±20% 600 VW ceramic disc	510-3061-102
C40	10 pF ±5% 1000 VW N1500 disc ceramic	510-3041-100
C41	220 pF ±10% 500 VW dipped mica	510-0005-221
C42	0.01 μF +80% -20% 500 VW ceramic disc	510-3005-103
C43	0.001 μF ±20% 600 VW ceramic disc	510-3061-102
C44	Variable, 1-7.5 pF tubular ceramic less hardware	512-1002-004
C45	0.001 μF ±20% 1500 VW ceramic disc	510-3158-102

PARTS LIST (cont'd)

SCHEMATIC SYMBOL NO.	DESCRIPTION	PART NO.
C46	0.01 μF +80% -20% 500 VW ceramic disc	510-3005-103
C47	0.001 μF ±20% 1500 VW ceramic disc	510-3158-102
C48	Same as C47	
C49	Variable, 3.5-65 pF	148-0009-004
C50	0.005 μF GMV 600 VW ceramic disc	510-3157-502
C51	0.002 μF ±20% 125 VAC ceramic disc	510-3001-202
C52	Same as C51	
C53	0.01 μF +80% -20% 500 VW ceramic disc	510-3005-103
C54	0.01 μF +80% -20% 500 VW ceramic disc	510-3005-103
C55	0.005 μF GMV 600 VW ceramic disc	510-3157-502
C56	0.5 μF ±20% VW paper	022-1409-001
C57	0.003 μF ±20% 4000 VW ceramic disc	510-3080-302
C59	80 μF 450 VW electrolytic with mounting strap	510-4019-004
C60	0.005 μF GMV 600 VW ceramic disc	510-3157-502
C61	Same as C60	
C62	Same as C60	
C63	0.1 μF 400 VW paper	510-9005-001
C64	0.01 μF +80% -20% 500 VW ceramic disc	510-3005-103
C65	0.005 μF GMV 600 VW ceramic disc	510-3157-502
C70	10 pF ±10% 500 VW dipped mica	510-0005-100
C74	0.01 μF +80% -20% 500 VW ceramic disc	510-3005-103
C112	0.005 μF GMV 600 VW ceramic disc	510-3157-502
	CHASSIS PARTS	
CH2	Front panel, with jewels and 4 speaker mtg. nuts	023-1410-001
CH3	Cabinet assembly	023-1380-002
CH4	Screen	017-1097-001
CH5	Recessed socket mounting shell	515-6003-002
	DIODES	
D1	Silicon diode type 1138	523-0011-001
D2	Silicon diode type 1N881	523-1000-881
	TUBE SHIELDS	
E1	7 pin medium snap-on	510-4019-005
E2	9 pin 2 1/16" snap-on	022-1218-004
E6	Socket bottom shield (7 pin socket)	133-0280-001
	FUSES	
F1	2 amp medium lag fuse Buss type AGC-2	534-0003-024
F2	Same as F1	
F3	9 amp medium lag fuse Buss type SFE-9	534-0004-090
	GROMMET	
G1	Rest button, 7/8 OD x 3/8 H chocolate brown	022-1475-001
G2	1/4 I.D. x 3/8 slot diameter	574-0002-005
	HARDWARE	
	Sheet metal screw #4 - 1/4 pan head NPS	011-0807-008
	Thread cutting screw 8-32 x 5/16 binding head CPS	011-0801-010
	Sheet metal screw #8 x 3/8 binding head CPS	011-0811-012
	Tension type locknut #6 Palnut	012-0504-001
	Speednut, push-on, 5/32 diameter stud	022-1614-001
	LAMPS	
I1	Neon lamp NE2H	549-3003-001
I2	Same as I1	

PARTS LIST (cont'd)

SCHEMATIC SYMBOL NO.	DESCRIPTION	PART NO.
	JACKS	
J3	9-pin connector, male	515-0005-109
J5	Antenna jack SO239	515-3003-001
	KNOBS	
K1	Skirted knob, black 1/4 x 7/16 with 8-32 x 3/16, headless setscrew	022-1755-001
	CHOKES AND COILS	
L1	Coil assembly	023-1700-021
L2	R. F. choke, 6.8 μH	022-1832-001
L3	Coil assembly	023-1700-015
L4	R. F choke, 20 μH ±10%	022-1549-001
L5	Coil assembly, crystal oscillator grid	023-1700-017
L6	R. F. choke, 6.8 μH	022-1832-001
L7	Coil assembly	023-1700-031
L8	R. F. choke, 20 μH ±10%	022-1549-001
L9	Coil assembly	023-1700-024
L10	Coil assembly, P. A. L Section	023-1700-623
L11	R. F. choke assembly, 28 μH 10 amp	023-1539-001
	SPEAKER	
LS1	Speaker, 3 1/2", 3.2 ohm VC, transformer bracket, 4 speed nuts	589-1004-002
	MICROPHONE	
M1	Ceramic Hi Z, PTT switch, 5 ft. coiled cord, hanger stud	589-0003-001
M2	Microphone holder	537-9004-002
	MECHANICAL PARTS	
MP2	Jewel, faceted amber and holder for NE-2 bulb	023-1375-004
MP4	Jewel, faceted red and holder for NE-2 bulb	023-1375-002
MP5	Transmitter identification card FCC form 452 C	022-1598-004
MP7	Cable clamp, 1/4 diameter	572-0001-003
MP8	Warning tag	022-1704-001
MP9	Mounting clip for IF transformer	572-1004-001
MP10	Channel identification label	559-4004-001
	RESISTORS	
R1	1 megohm ±10% 1/2 watt carbon	569-1004-105
R2	10,000 ohm ±10% 1/2 watt carbon	569-1004-103
R3	150 ohm ±10% 1/2 watt carbon	569-1004-151
R4	22,000 ohm ±10% 1/2 watt carbon	569-1004-223
R5	2200 ohm ±10% 1/2 watt carbon	569-1004-222
R6	1 megohm ±10% 1/2 watt carbon	569-1004-105
R8	22,000 ohm ±10% 1/2 watt carbon	569-1004-223
R9	680 ohm ±10% 1/2 watt carbon	569-1004-681
R10	820 ohm ±10% 1/2 watt carbon	569-1004-821
R11	12,000 ohm ±10% 2 watt carbon	569-1008-123
R12	2200 ohm ±10% 1/2 watt carbon	569-1004-222
R13	150 ohm ±10% 1/2 watt carbon	569-1004-151
R15	2200 ohm ±10% 1/2 watt carbon	569-1004-222
R16	1 megohm ±10% 1/2 watt carbon	569-1004-105
R17	270,000 ohm ±10% 1/2 watt carbon	569-1004-274
R18	Same as R17	
R19	470,000 ohm ±10% 1/2 watt carbon	569-1004-474
R20	820,000 ohm ±10% 1/2 watt carbon	569-1004-824
R21	Potentiometer, 1 megohm ±30% 1/8 watt log taper A	022-1647-001
R22	4.7 megohm ±10% 1/2 watt carbon	569-1004-475
R23	220,000 ohm ±10% 1/2 watt carbon	569-1004-224
R24	220,000 ohm ±10% 1/2 watt carbon	569-1004-224

PARTS LIST (cont'd)

SCHEMATIC SYMBOL NO.	DESCRIPTION	PART NO.
R25	10,000 ohm ±10% 1/2 watt carbon	569-1004-103
R26	47,000 ohm ±10% 1/2 watt carbon	569-1004-473
R27	10,000 ohm ±10% 1/2 watt carbon	569-1004-103
R28	470,000 ohm ±10% 1/2 watt carbon	569-1004-474
R29	47,000 ohm ±10% 1/2 watt carbon	569-1004-473
R30	2700 ohm ±10% 1/2 watt carbon	569-1004-272
R31	Potentiometer, 15,000 ohm ±10% 2 watt wirewound linear (switch 10A 15 VDC)	022-1932-001
R32	12,000 ohm ±10% 2 watt carbon	569-1008-123
R33	100,000 ohm ±10% 1/2 watt carbon	569-1004-104
R34	470,000 ohm ±10% 1/2 watt carbon	569-1004-474
R35	Same as R34	
R36	330 ohm ±10% 1 watt carbon	569-1006-331
R37	6200 ohm ±5% 10 watt wirewound	569-2009-622
R38	47,000 ohm ±10% 1/2 watt carbon	569-1004-473
R39	470 ohm ±10% 1/2 watt carbon	569-1004-471
R40	390,000 ohm ±10% 1/2 watt carbon	569-1004-394
R41	10,000 ohm ±10% 1/2 watt carbon	569-1004-103
R42	1 megohm ±10% 1/2 watt carbon	569-1004-105
R43	10,000 ohm ±10% 1/2 watt carbon	569-1004-103
R46	100 ohm ±5% 1/2 watt wirewound	569-2002-101
R47	150 ohm ±10% 1 watt carbon	569-1006-151
R48	3900 ohm ±5% 7 watt wirewound	569-2007-392
R49	150 ohm ±10% 1 watt carbon	569-1006-151
R54	10,000 ohm ±10% 1/2 watt carbon	569-1004-103
R55	56,000 ohm ±10% 1/2 watt carbon	569-1004-563
R56	220,000 ohm ±10% 1/2 watt carbon	569-1004-224
R57	47,000 ±10% 1/2 watt carbon	569-1004-473
R58	1 megohm ±10% 1/2 watt carbon	569-1004-105
R61	470,000 ohm ±10% 1/2 watt carbon	569-1004-474
R74	10,000 ohm ±10% 1/2 watt carbon	569-1004-103
	RELAY	
RY1	SPDT, DC coil 290 ohms	567-0013-002
	SHIELDS	
SH1	Power supply	017-1122-001
SH2	Antenna	016-1568-001
SH3	Contact shield, 7 pin socket	016-1461-001
SH4	Contact shield, 9 pin socket	016-1579-001
	SHAFT	
	Shaft 5 13/16 L. Centralab Series 70	
	SWITCHES	
SW1	Power (part of squelch control R31)	
SW2	PTT (on microphone M1)	
SW3	Channel 5 position, 2 circuit, phenolic, bushing 3/8 L.	022-1615-001
	TRANSFORMERS	
T1	455 KC I. F. transformer	022-1756-001
T2	Same as T1	
T3	27 MC transformer	022-1623-001
T4	Modulation and output transformer	022-1616-001
T5	Universal vibrator transformer	592-3024-001

PARTS LIST (cont'd)

SCHEMATIC SYMBOL NO.	DESCRIPTION	PART NO.
	TERMINAL STRIPS	
TS1	2 terminal strip	586-1004-002
TS2	9 terminal strip, 2 grounded	586-1001-034
TS3	4 terminal strip, 1 grounded	586-1001-023
TS4	11 terminal strip	586-1004-011
TS5	6 terminal strip, 2 grounded	586-1001-028
TS6	3 terminal strip, 1 grounded	586-1001-020
TS7	2 terminal strip, 1 grounded, mounting foot trimmed	022-1690-002
TS9	6 terminal strip, 2 grounded	586-1001-028
	ELECTRON TUBES	
V1	Type 6BJ6	022-1562-002
V2	Type 12BE6	022-1563-002
V3	Type 6BJ6	022-1562-002
V4	Type 6AL5	022-0786-002
V5	Type 6AW8A	022-1565-003
V6	Type 12AB5	022-1566-002
V7	Type 7054/8077	022-1619-002
V8	Type 7061	022-1568-002
V9	Type 12BW4	022-1569-002
V10	Type 12AU7	022-0916-002
	VIBRATOR	
VIB-1	Full wave, interrupting, 12.6 V 3A	022-1570-001

SCHEMATIC SYMBOL NO.	DESCRIPTION	PART NO.
	POWER CABLES	
W18	117 VAC line cord assembly	023-1391-001
W19	12 VDC battery cable assembly	023-1393-001
	SOCKETS	
XV1	7 pin miniature, mica filled, shielded	515-1020-007
XV2	Same as XV1	
XV3	Same as XV1	
XV4	Same as XV1	
XV5	9 pin miniature, mica filled	022-0976-001
XV6	Same as XV5	
XV7	9 pin miniature, mica filled, shielded	022-1207-001
XV8	9 pin miniature, mica filled	022-0976-001
XV9	Same as XV8	
XV10	Same as XV8	
X-VIB-1	4 pin black phenolic Amphenol 77MIP4	022-1571-001
XY1, 10	Crystal	515-5201-001
	CRYSTALS	
Y1	Receive crystal	519-0010-101/123*
Y2	Transmit crystal	519-0010-001/023*

* Dash number determined by channel.

SCHEMATIC SYMBOL NO.	DESCRIPTION	PART NO.
	SUPPLEMENT TO PARTS LIST MODEL 242-126 FOR 117 VAC	
E9	Strain relief bushing	574-0003-002
T5	Power transformer, 115 VAC	022-1661-001
W21	117 VAC line cord assembly	023-1416-001
	SUPPLEMENT TO PARTS LIST MODEL 242-127 FOR 117 VAC AND 6 VDC	
T5	Universal vibrator transformer, 6 VDC, 117 VAC	022-1620-001
V2	Electron tube, type 6BE6	022-1204-001
V6, 8	Electron tube, type 6CM6	022-1621-001
V7	Electron tube, type 12BY7	022-1567-001
V9	Electron tube, type 6BW4	022-1622-001
VIB1	Vibrator, full wave, interrupting, 6 V Mallory 1601	022-1570-002
W19	6 VDC battery cable assembly	023-1392-001
C10	Capacitor, 15 pF ±10% 500 VW dipped mica	510-0005-150
C41	Capacitor, 150 pF ±10% 500 VW dipped mica	510-0005-151
F4	20 amp, medium lag fuse	543-0004-200
FH	Fuseholder for 022-1590-006	534-1004-005
	SUPPLEMENT TO PARTS LIST MODEL 242-129 FOR 117 VAC AND 24 VDC	
C58	Capacitor, .003 μF ±20% 4 K VW ceramic disc	510-3080-302
C66	510-1004-105	
C66	Capacitor, 1 μF ±20% 250 V	510-1004-105

SCHEMATIC SYMBOL NO.	DESCRIPTION	PART NO.
	SUPPLEMENT TO PARTS LIST MODEL 242-129 FOR 117 VAC AND 24 VDC (cont'd)	
C67	Capacitor, .005 μF ceramic disc	510-3157-502
R47, 49	Resistor, 330 ohm ±10% 2 W carbon	022-7037-010
R59	Resistor, 68 ohm ±10% 2 W carbon	569-1008-680
R60	Resistor, 10,000 ohm ±10% 1/2 W carbon	569-1004-103
T5	Universal Vibrator transformer, 117 VAC, 24 VDC	022-1662-001
VIB1	Vibrator, 12 V 5 amp full wave, interrupting, Mallory G1501	022-1687-001
W19	24 VDC battery cable assembly	023-1394-001
F5	4 amp, medium lag fuse	534-0004-040
FH	Fuseholder for 022-1590-001	534-1004-001
	SUPPLEMENT TO PARTS LIST MODEL 242-138 FOR 117 VAC 230 VAC AND 12 VDC	
J3	11 pin plug	515-0005-011
T5	Vibrator transformer	022-1663-001
W18	230 VAC line cord assembly	023-1425-001
W18	117 VAC line cord assembly	023-1430-001
W19	12 VDC battery cable assembly	023-1424-001

** Some earlier models (below approximately serial #32,000) used either 022-1556-001 or 022-1557-001 with no R58. If R58 is not present, replace with 022-1556-001. If R58 is present, replace with 022-1756-001.

NOTE:

The value of many components used in Johnson equipment are being changed to coincide with Electronic Industries Association (EIA) standard values. These value changes are being made where performance of the unit is not affected by the change. Orders for a particular part number may be filled with either a new or old value part, depending upon availability.