SECTION 7
ALIGNMENT

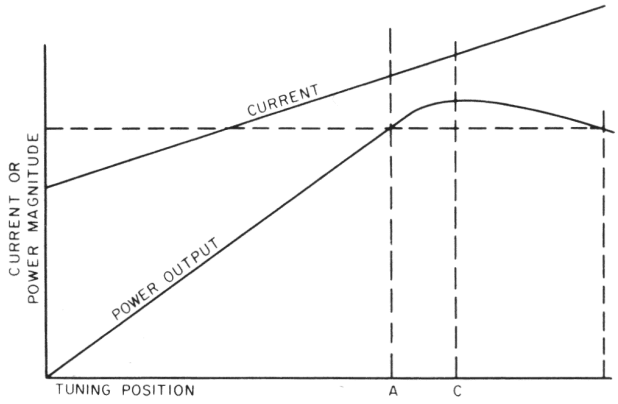
7.1 RECEIVER ALIGNMENT CHART

ALIGNMENT	CONNECTIONS AND SETTINGS	ADJUSTMENTS
455 kHz IF	Connect test equipment as in Section 6.2.2. Set the output of the signal generator for a low level (one that produces about 10 dB signal-to-noise ratio is best).	Peak L6, L5 and L4 for maximum on the AC-VTVM.
1st Mixer	Connect test equipment as in Section 6.2.2. Connect an RF probe to the emitter of Q3.	Adjust L3 starting with the slug at the top of the coil. Tune L3 through the first peak and 1/4 to 1/2 turn past point where oscillator starts on second peak. The injection voltage on the emitter of Q3 should be 0.08 volts RF minimum. Typical is 0.11 volts RF. If injection voltage exceeds 0.15 volts RF, turn slug farther beyond point where oscillator starts. Check oscillator starting on all channels.
RF Amplifier	Connect test equipment as in Section 6.2.2. Set signal generator for 1 microvolt output (30% modulated at 1000 Hz). Set volume control for 0.8 VAC on the AC-VTVM.	Peak L2 and L1 for maximum on the AC-VTVM. Check for clean signal on oscilloscope. Readjust VOLUME control as necessary to maintain 0.8 VAC. Peak L1 for cleanest sine wave, which is best signal-to-noise. Detune L1 about 1 dB from peak on the maximum signal-to-noise side of resonance. Check receiver gain on channels 1, 11 and 21. Adjust L2 and L1 for uniform gain and signal-to-noise. Gain should be uniform on channels 1, 11 and 21.

7.2 TRANSMITTER ALIGNMENT CHART

ALIGNMENT	CONNECTIONS AND SETTINGS	ADJUSTMENTS
Oscillator	Connect test equipment as in Section 6.3.2.	Adjust L10 for oscillator starting on channels 1, 11 and 21. Adjust L10 for absence of distortion (Figure 17). If distortion appears, refer to additional adjustments for distortion at end of this chart.
Driver-Power Amplfier	Connect test equipment as in Section 6.3.2. Set audio generator to zero output.	Adjust*C54 and L16 for peak power output. Adjust L13 for maximum power output. This is a broad adjustment, tune for center of maximum. Adjust L15, L16 and C54 for maximum power output while not exceeding 415 mA of Q14 collector current (meter inserted on series with blue lead). Adjust L15, L16 and C54 for maximum power output with minimum current - see power curve, Figure 18.
Distortion Adjustment	Connect test equipment as in Section 6.3.2. Set audio generator for 1000 Hz. Increase audio input level slowly to point of maximum modulation without clipping.	Readjust L10 and L13 to eliminate distortion. Check for symmetrical waveform and oscillator starting on all channels.

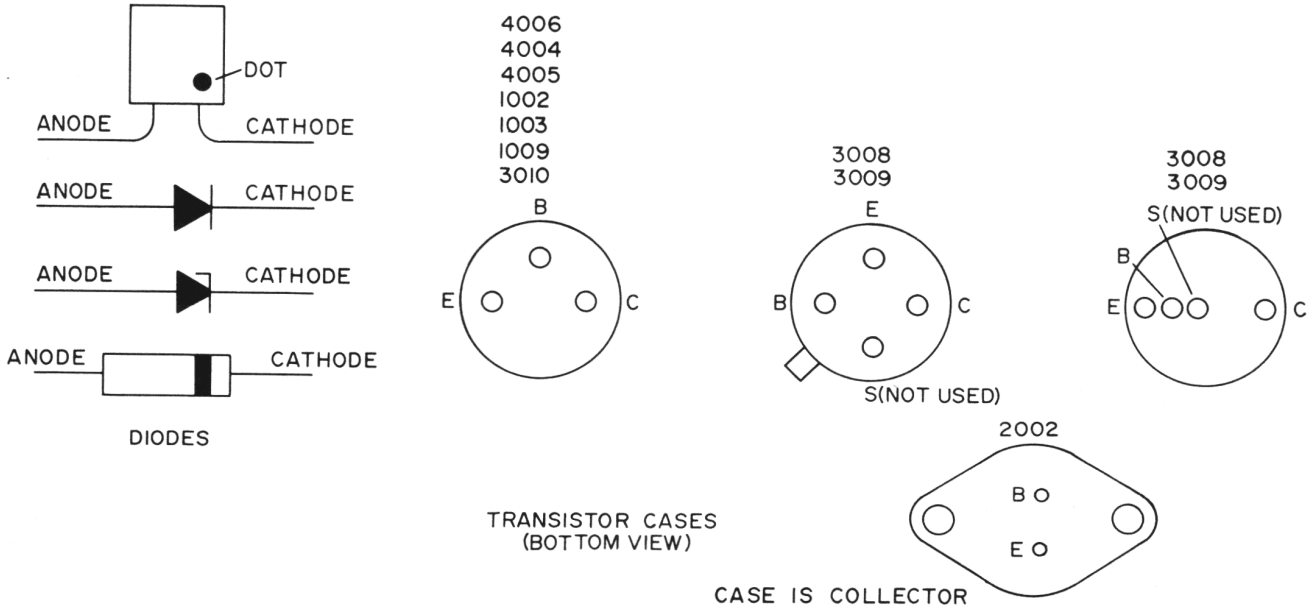
* C54 has been deleted on late models of Messenger 100 and 110 to improve tuning. The value of C52 is changed from 220 pF to 390 pF (see parts list). We recommend that a defective C54 be removed and the value of C52 changed from 220 pF to 390 pF.



TRANSMITTER
CURRENT—POWER CURVE
FIGURE 18

NOTE:

This illustration shows two points (A and B) which give the same power output. One point (B) requires more input current or input power than the other (A) for the same amount of output power. Therefore point A is more efficient than point B. Point C shows the place where maximum efficiency is obtained.



SEMICONDUCTOR CASE DIAGRAMS
FIGURE 19

SECTION 8
PARTS LIST

SCHEMATIC SYMBOL NO.	DESCRIPTION	PART NO.
	BRACKETS	
BKT	Dash mounting bracket	017-1249-001
	CAPACITORS	
C1	100 pF ±5%, N150	510-3016-101
C2	0.001 μF ±20%, 50 volt	510-3002-102
C3	100 pF ±5%, N150	510-3016-101
C4	39 pF ±5%, N750	510-3020-390
C5	180 pF ±5%, N750	510-3020-181
C6	0.01 μF ±80% -20%, 50 volt	510-3003-103
C7	0.01 μF +80% -20%, 50 volt	510-3003-103
C8	0.01 μF +80% -20%, 50 volt	510-3003-103
C9	270 pF ±5%	510-0001-271
C10	270 pF ±5%	510-0001-271
C11	210 pF ±5%, N080	510-3015-211
C12	210 pF ±5%, N080	510-3015-211
C13	0.01 μF +80% -20%, 50 volt	510-3003-103
C14	6.8 μF, 35 volt, tantalum	510-2045-689
C15	150 pF ±5%	510-0001-151
C16	190 pF ±5%, N150, polystyrene	510-1103-191
C17	190 pF ±5%, N150, polystyrene	510-1103-191
C18	0.1 μF +80% -20%, 25 volt	510-3007-104
C19	0.033 μF ±20%, 16 volt, Y5U	510-3010-333
C20	1.0 μF, 35 volt	510-2045-109
C21	1.0 μF, 35 volt	510-2045-109
C22	0.01 μF +80% -20%, 50 volt	510-3003-103
C23	470 μF, 2.5 volt	510-4001-006
C24	150 μF +100%-10%, 25 volt	510-4006-006
C25	6.8 μF, 35 volt, tantalum	510-2045-689
C26	0.047 μF ±20%, 25 volt	510-3010-473
C27	22 μF, 15 volt	510-2003-220
C28	1.0 μF, 35 volt	510-2045-109
C29	6.8 μF, 35 volt, tantalum	510-2045-689
C30	0.22 μF ±20%	510-1004-224
C31	56 μF, 6 volt	510-2001-560
C32	150 μF +100%-10%, 25 volt	510-4006-006
C33	0.022 μF ±20%, 50 volt	510-3002-223
C34	0.022 μF ±20%, 50 volt	510-3002-223
C35	1000 μF +100% -10%, 16 volt	510-4006-005
C36	0.01 μF +80% -20%, 50 volt	510-3003-103
C37	0.01 μF +80% -20%, 50 volt	510-3003-103
C38	0.0047 μF +80%-20%, 500 volt	510-3005-472
C39	0.0047 μF ±20%, 125 VAC	510-3001-472
C40	0.047 μF +80%-20%, 50 volt	510-3003-473
C41	22 pF ±5%, N750	510-3020-220
C42	22 pF ±5%, N750	510-3020-220
C43	150 pF ±5%, N750	510-3020-151
C44	0.0047 μF +80%-20%, 500 volt	510-3005-472
C45	0.0047 μF +80%-20%, 500 volt	510-3005-472
C46	0.001 μF ±20%, 50 volt	510-3002-102
C47	47 pF ±5%, NPO	510-3013-470
C48	33 pF ±5%, N150	510-3016-330
C49	0.0047 μF +80%-20%, 500 volt	510-3005-472
C50	0.001 μF ±20%, 50 volt	510-3002-102
C51	27 pF ±5%, NPO	510-3013-270
C52	390 pF ±5%, 500 volt	510-0004-391
C53	100 pF ±5%, N150	510-3016-101
C55	330 pF ±5%, 500 volt	510-0004-331
C56	0.001 μF ±20%, 50 volt	510-3002-102
C57	6.8 pF ±5%, N750	510-3020-689
C58	0.0047 μF ±10%, 500 volt	510-3061-472
C59	0.047 +80%-20%, 50 volt	510-3003-473
C60	22 μF, 15 volt	510-2003-220
C61	0.01 μF +80%-20%, 50 volt	510-3003-103

PARTS LIST (cont'd)

SCHEMATIC SYMBOL NO.	DESCRIPTION	PART NO.
	CHASSIS PARTS	
CH1	Cabinet assembly Includes:	023-2201-002
	Cabinet Insulator	018-0817-008
	Cabinet shell	017-1431-001
	Captive nut	013-1003-002
CH2	Chassis rail (Messenger 100 only)	017-1430-004
CH2	Chassis rail (Messenger 110 only)	017-1430-006
CH3	Front panel	015-0756-002
CH4	Overlay assembly (Messenger 100 only)	023-2204-002
CH4	Overlay (Messenger 110 only)	559-2025-001
CH5	Dial channel indicator	032-0149-003
CH6	Channel indicator label	559-3006-002
	DIODES	
D1	1N67A	523-1000-067
D2	1N67A	523-1000-067
D3	1N881	523-1000-881
D4	10 volt zener	523-2003-100
D5	1N67A	523-1000-067
D6	1N881	523-1000-881
D7	1N2326	523-1002-326
	ELECTRICAL PARTS	
E1	Printed circuit board	035-0032-001
E2	Heat sink	013-1074-001
E3	Heat sink	017-1432-001
E4	Heat sink clamp	017-1434-001
E5	Insulating spacer (under relay)	018-0518-004
E6	Heat sink, audio (for Q10 and Q11) (on later model 100 and 110)	017-0631-001
E7	Bushing (for Q10 and Q11) (on later model 100 and 110)	018-0781-101
E8	Insulator, Mica (for Q10 and Q11) (on later model 100 and 110)	018-0829-001
	HARDWARE	
H	Screw, 1/4 - 20 x 5/16 hex head CPS (Connects mobile mounting bracket to cabinet assembly)	011-0322-010
H	Screw, #4-40 x 1/4, pad hd. NPS	011-0807-008
H	Screw, #4-40 x 3/16 B.H. NPB (E1 to CH2)	011-0012-006
H	Screw, #4-40 x 3/8 B.H. NPB (Q14)	011-0012-012
H	Screw, #6-32 x 1/4 B.H. NPB (CH3 to CH2)	011-0114-008
H	Screw, #8-32 x 1/4 B.H. NPB (CH1 to CH2)	011-0221-008
H	Screw, #8-18 x 3/8 CPS hex sheetmetal (T2 and L7 to CH2)	011-0823-012
H	Screw, 1/4 - 20 x 5/16 hex head CPS (Connects mobile mounting bracket to cabinet assembly)	011-0322-010
	BULBS	
I1	Light bulb, clear (Messenger 100 only)	549-3001-003
I2	Light bulb, red (Messenger 100 only)	549-3001-004
	JACKS	
J1	Antenna jack	142-0101-002
J2	Terminal bushing	515-4100-001
J3	Jack, external speaker/PA (Messenger 100 only)	515-2001-002
J4	Plug, 11 pin (Messenger 100 only)	515-0005-011
	TRANSFORMERS	
L1	Transformer, 27 MHz input	592-5016-001
L2	Transformer, 27 MHz output	592-5006-002
L3	Transformer, 27 MHz oscillator	592-5006-003
L4	Transformer, 455 kHz input	592-5016-005

PARTS LIST (cont'd)

SCHEMATIC SYMBOL NO.	DESCRIPTION	PART NO.
L5	Transformer, 455 kHz interstage	592-5016-006
L6	Transformer, 455 kHz output	592-5016-007
T1	Transformer, audio driver	592-1007-003
T2	Transformer, audio output - modulation	592-1013-001
	CHOKES AND COILS	
L7	Audio filter choke (18 mH)	542-5007-001
L8	RF choke (13 μH)	542-3003-001
L9	RF choke (13 μH)	542-3003-001
L10	Oscillator coil	592-5014-001
L11	RF choke (13 μH)	542-3003-001
L12	RF choke (13 μH)	542-3003-001
L13	Driver coil	592-5014-002
L14	RF choke (13 μH)	542-3003-001
L15	Series output coil	542-1005-010
L16	Pi output coil	542-1005-004
	SPEAKER	
LS	Speaker	589-1002-002
	MICROPHONE	
M1	Microphone	023-2708-001
	MECHANICAL PARTS	
MP1	Bulb, holder (Messenger 100 only)	018-0844-002
MP2	Knob (Messenger 100 only)	547-0001-004
MP2	Knob (Messenger 110 only)	022-1755-001
MP3	Rubber grommet	574-0002-007
MP4	Cable clamp	572-0001-003
MP5	Clamp, heat sink: for D7	017-1288-001
MP6	Fiber washer (under C35)	029-0333-001
	JUMPER PLUGS	
P4	11 pin jumper plug (Messenger 100 only)	023-1659-002

SCHEMATIC SYMBOL NO.	DESCRIPTION	PART NO.
	TRANSISTORS	
Q1	3012 RF amplifier	576-0003-012
Q2	3009 oscillator	576-0003-009
Q3	3009 mixer	576-0003-009
Q4	3010 IF	576-0003-010
Q5	3010 IF	576-0003-010
Q6	1002 squelch	576-0001-002
Q7	3017 audio	576-0003-017
Q8	1013 audio	576-0001-013
Q9	1013 audio	576-0001-013
Q10	2002 audio output	576-0002-002
Q10	Quick-disconnect lead assembly	597-0005-001
	12 volt battery cable assembly	023-1652-001 -002
	Includes:	
	Fuse 1.0 amp	534-0002-019
	Fuse, 2 ampere	534-0003-024
	Fuseholder for 1/4 dia x 1-1/4 L. fuse	534-1004-005
	Quick-disconnect lead assembly	597-0003-001
	Quick-disconnect lead assembly	597-0003-005
Q11	2002 audio output	576-0002-002
Q12	4006 RF oscillator	576-0004-006
Q13	4004 RF driver	576-0004-004
Q14	4005 final output (Messenger 100 only)	576-0004-005
Q14	4011 RF power output (Messenger 110 only)	576-0004-011
	RESISTORS	
R1	33 ohms ±10%, 1/2 watt (Messenger 100 only)	569-1004-330
R2	62 ohms ±5%, 1/2 watt	569-1003-620
R3	2700 ohms ±10%, 1/2 watt	569-1004-272
R4	470 ohms ±10%, 1/2 watt	569-1004-471

PARTS LIST (cont'd)

SCHEMATIC SYMBOL NO.	DESCRIPTION	PART NO.
R5	680 ohms ±10%, 1/2 watt	569-1004-681
R6	1,000 ohms ±10%, 1/2 watt	569-1004-102
R7	1,000 ohms ±10%, 1/2 watt	569-1004-102
R8	5,600 ohms ±10%, 1/2 watt with SPST switch	569-1004-562
R9	10,000 ohms ±10%, 1/2 watt	569-1004-103
R10	Potentiometer, 10,000 ohms (Messenger 100 only)	562-0010-002
R10	Potentiometer, 10,000 ohms (Messenger 110 only)	562-0010-005
R11	6,800 ohms ±10%, 1/2 watt	569-1004-682
R12	Potentiometer, 5000 ohms (Messenger 100 only)	562-0007-006
R12	Potentiometer, 5,000 ohms (Messenger 110 only)	562-0007-018
R13	470 ohms ±10%, 1/2 watt	569-1004-471
R14	Thermistor, 8,000 ohms	569-3001-001
R15	1,000 ohms ±10%, 1/2 watt	569-1004-102
R16	3,300 ohms ±10%, 1/2 watt	569-1004-332
R17	5,600 ohms ±10%, 1/2 watt with SPST switch	569-1004-562
R18	470 ohms ±10%, 1/2 watt	569-1004-471
R19	1,500 ohms ±10%, 1/2 watt	569-1004-152
R20	2.2 ohms ±10% 1/2 watt wirewound	569-2003-229
R21	22 ohms ±10% 1/2 watt	569-1004-220
R22	510 ohms ±5% 1/2 watt	569-1003-511
R23	5,100 ohms ±5%, 1/2 watt	569-1003-512
R24	51 ohms ±5%, 1/2 watt	569-1003-510
R25	120 ohms ±10%, 1/2 watt	569-1004-121
R26	47 ohms ±10%, 1/2 watt	569-1004-470
R27	47,000 ohms ±10%, 1/2 watt	569-1004-473
R28	100 ohms ±10%, 1/2 watt	569-1004-101

SCHEMATIC SYMBOL NO.	DESCRIPTION	PART NO.
	RELAY	
RY	DPDT PC mount	567-0011-001
	SWITCH	
S1	Crystal (Messenger 110 only)	583-2008-003
	WIRE	
W1	Wire harness assembly (Messenger 100 only)	023-2206-001
W1	Wire harness assembly (Messenger 110 only)	023-2381-001
	CRYSTALS	
	Crystals, receive	519-0011-301 -323*
	Crystals, transmit	519-0011-001 -023*

* The last 3 digits of the crystal part no. indicate the channel number. Thus a part no. 519-0011-301 is a receiver crystal for channel 1; part no. 519-0011-001 is the corresponding transmitter crystal.

	CRYSTAL BLOCK	
XY	Crystal block (10 position)	126-0110-001
	P.E.C.	
Z1	RF (Messenger 100 only)	544-0003-011
Z1	RF (Messenger 110 only)	544-0003-001
Z2	Mixer	544-0002-001
Z3	1st IF	544-0003-003
Z4	2nd IF	544-0002-004
Z5	Noise limiter	544-0002-015
Z6	Audio (Messenger 100 only)	544-0002-006
Z6	Audio (Messenger 110 only)	544-0002-026

PARTS LIST (cont'd)

ACCESSORY PACKAGE ITEMS

SCHEMATIC SYMBOL NO.	DESCRIPTION	PART NO.
	MESSENGER 100	
	Operating Manual	002-0028-001
	Part 95 Rules - Citizens Radio Service	022-1635-001
	FCC Form 505 - License Application Form	022-1636-001
	FCC Identification Card	022-1598-004
	Warranty Registration Card	041-0419-014
	Microphone holder (with extra 1/4" dia. hole)	537-9004-002
	Screws for microphone holder (#4 sheet metal)	011-0807-006
	Channel number stickers	022-2327-001
	Screws for dash mtg. bracket 10-32	011-0229-020
	Nuts for dash mtg. bracket 10-32	012-0109-002
	Internal tooth lockwashers #10	029-0001-003
	12 V. Battery Cable assembly	023-1652-001
	Reduced Schematic	022-2435-001
	Tap Connector Package	023-2209-001

SCHEMATIC SYMBOL NO.	DESCRIPTION	PART NO.
	MESSENGER 110	
	Operating Manual	002-0061-001
	Part 95 Rules - Citizens Radio Service	022-1635-001
	FCC Form 505 - License Application Form	022-1636-001
	FCC Identification Card	022-1598-004
	Warranty Registration Card	041-0419-014
	Microphone holder (with extra 1/4" dia. hole)	537-9004-002
	Screws for microphone holder (#4 sheet metal)	011-0807-006
	Screws for dash mtg. bracket 10-32	011-0229-020
	Nuts for dash mtg. bracket 10-32	012-0109-002
	Internal tooth lockwashers #10	029-0001-003
	12 V. Battery Cable assembly	023-1652-001
	Reduced Schematic	564-3000-110
	Screw, 1/4 - 20 x 3/8 hex head (Contains captivated Lockwasher, 1/4 external tooth)	011-0322-012

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.