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M E S S E N G E R

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CITIZENS RADIO TRANSCEIVERS

MODEL NO. 242-153-2

MODEL NO. 242-320

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SECTION 1 GENERAL INFORMATION

1.1 SCOPE OF THIS MANUAL

This service manual includes servicing and alignment instructions for Messenger 320 and 323 transceivers.

Revision notices will be published as this unit is revised. Insert these notices in order at the back of this service manual.

1.2 FACTORY CUSTOMER SERVICE

A liaison between the customer and the factory is provided by the E. F. Johnson Company Customer Service Department. This department is available for consultation and assistance on technical problems, parts information, and availability of local and factory repair facilities.

If it is necessary to write to the Customer Service Department, please include any information you feel will help solve your problem.

For any of the above requirements contact:

E. F. JOHNSON COMPANY
Customer Service Department
Waseca, Minnesota 56093

1.3 PURCHASE OF PARTS

The authorized Johnson Service Centers stock commonly needed replacement parts. If a part is not available locally it may be ordered from the Customer Service Department. When ordering please supply the following information:

Model number of the unit
Serial number of the unit
Description of the part
Part number of the part

1.4 FACTORY RETURNS

Normally, repair service is available locally through authorized Johnson Citizens Band Radio Service Centers; a

list of these service centers is available upon request from the factory Customer Service Department. Do not return any equipment to the factory without authorization from the Customer Service Department.

1.5 DESCRIPTION

The Messenger 320, Model 242-320, and Messenger 323, Model 242-153 are 5 watt DC input to the final RF stage Citizens Radio transceivers. A 10 crystal 23 channel frequency synthesizer generates both the receiver and transmitter mixing frequencies. The synthesizer output is electronically switched between receive and transmit conditions by diodes.

Supply voltage for operating the transceivers is provided by the vehicle battery in mobile operation or by an AC operated 13.8 volt DC power supply in base station operation.

Specific reference to the Messenger 320 or 323 in this manual is made only where differences exist.

NOTE

The Messenger 320 and 323 are identical except for the external speaker and PA function which are provided by one jack on the Messenger 320 and the following items not included in the Messenger 320:

Crystal filter
J1 - accessory jack
J5 - external speaker jack

1.6 SERIAL NUMBER INTERPRETATION

The E. F. Johnson Company utilizes a white adhesive-backed cloth printed with the unit serial number and attached to the back of the transceiver chassis rail. An alphabetical designator listed on the sticker indicates a major revision. For example: An A in the serial number indicates that the unit includes all the changes specified in revision A. Units with a major revision are referred to by their alphabetical designator in this manual. A unit with revision A is called an A model, with revision B a B model, etc.

SECTION 2 SPECIFICATIONS

Electrical specifications are nominal unless otherwise stated.
 Specifications are for both Messenger 323 and Messenger 320 unless otherwise stated.

2.1 GENERAL

Frequency Range	26.965-27.255 MHz
Channels	23
Dimensions of Enclosure	2 1/2" high x 8" wide x 9 1/2" deep.
Unit Weight	Approximately 5 lbs.
Shipping Weight	Approximately 8 lbs.
Microphone	High capacity ceramic element. Cylolac case. Push-to-talk switch, hang up stud.
Power Requirements	13.8 volt DC input Receive: Squelched, 0.3 amps Transmit: 1.0 amp.
Circuitry	23 transistors, 15 diodes, and 3 thermistors.
Antenna Impedance	50 ohms
Compliance	FCC Type Accepted Part 95 DOT Type Approved RSS 136
Frequency Control	±0.005% crystal from -22° F. to +140° F., transmit and receive

2.2 RECEIVER

Sensitivity	10 dB (S + N)/N ratio with 0.5 microvolts at the antenna terminal (30% modulated 1000 Hz)
Selectivity	5 kHz bandwidth at -6 dB (Messenger 320) 30 kHz bandwidth at -60 dB (Messenger 320) 7 kHz bandwidth at -6 dB (Messenger 323) 19 kHz bandwidth at -60 dB (Messenger 323)

Spurious Rejection	50 dB
Audio Output Power	3 watts at 10% distortion
Speaker Impedance	3.2 ohms
Squelch Range	0.3 to 15 microvolts at the antenna terminal
Squelch Sensitivity	1 dB or less signal change for 40 dB of quieting at 1 microvolt at the antenna terminal
Intermediate Frequencies	4.3 MHz (crystal filter in Messenger 323) and 455 kHz
AGC Characteristics	Flat within ±4 dB from 5 to 500,000 microvolts at the antenna terminal with 14 dB rolloff from 5 to 0.5 microvolts for superior noise quieting
Noise Limiting	Series-type, automatic threshold adjustment and IF clipping
Circuitry	Double conversion superheterodyne

2.3 TRANSMITTER

Emission	6A3
DC Power Input	5 watts maximum
RF Power Output	3.5 watts typical
RF Spurious and Harmonic Attenuation	Better than FCC and DOT requirements
Audio Input Impedance	1000 ohms
Audio Frequency Response	±4 dB, 400-3000 Hz.
Modulation	High level AM, Class B modulator, speech compression, clipping and audio filtering
Circuitry	All transistor solid state

The E. F. Johnson Company reserves the right to change prices or specifications without notice and without incurring obligation.

TABLE 2-1
 TRANSISTOR COMPLEMENT

<u>TRANSISTOR</u>	<u>TYPE</u>	<u>FUNCTION</u>	<u>E. F. J. PART NUMBER</u>
Q1	3008	Receiver RF Amplifier	576-0003-008
Q2	3008	Receiver First Mixer	576-0003-008
Q3	3008	Receiver Second Mixer	576-0003-008
Q4	3010	First IF Amplifier	576-0003-010
Q5	3010	Second IF Amplifier	576-0003-010
Q6	3010	AGC Amplifier	576-0003-010
Q7	3010	AGC Amplifier	576-0003-010
Q8	3008	Receiver Oscillator	576-0003-008
Q9	1002	Squelch Amplifier	576-0001-002
Q10	1003	Squelch Amplifier	576-0001-003
Q12	3008	Synthesizer LF Oscillator	576-0003-008
Q13	3008	Synthesizer Mixer	576-0003-008
Q14	1003	Meter Amplifier	576-0001-003
Q15	3008	Synthesizer HF Oscillator	576-0001-008
Q16	1003	First Audio Amplifier	576-0001-003
Q17	1009	Audio Driver	576-0001-009
Q18	2002	Audio Output	576-0002-002
Q19	2002	Audio Output	576-0002-002
Q20	3008	Transmitter Oscillator	576-0003-008
Q21	3008	Transmitter Mixer	576-0003-008
Q22	4004	Transmitter RF Amplifier	576-0004-004
Q23	4004	Transmitter RF Driver	576-0004-004
Q24	4005	Transmitter RF Output	576-0004-005

TABLE 2-2
 DIODE COMPLEMENT

<u>DIODE</u>	<u>TYPE</u>	<u>FUNCTION</u>	<u>E. F. J. PART NUMBER</u>
D1	1N67A	AGC Rectifier	523-1000-067
D2	1N67A	Detector	523-1000-067
* D3	1N67A	Noise Limiter Temperature Compensation	523-1000-067
* D4	1N67A	Noise Limiter Temperature Compensation	523-1000-067
D5	1N881	Noise Limiter	523-1000-881
D6	1N881	Synthesizer Receiver Output Switch	523-1000-881
D7	1N67A	Squelch Gate	523-1000-067
D13	1N881	Synthesizer Transmitter Output Switch	523-1000-881
D14	FD111	Meter Rectifier	523-0006-002
D15	FD111	Meter Rectifier	523-0006-002
D16	1N881	RY1 Coil Suppressor	523-1000-881
D17	1N881	Audio Compressor Rectifier	523-1000-881
D18	1N2326	Audio Output Temperature Compensation	523-1002-326
DZ1	10V, 2 watt	Receiver B+ Regulator	523-2004-100
DZ2	10V, 1 watt	Synthesizer B+ Regulator	523-2003-100

* Replaced with thermistor in late model transceivers.

2.4 SPECIFICATIONS (Minimum Performance)

The specifications listed in this section are absolute service minimums. Receiver RF input values are given at input to a 6 dB 50 ohm pad.

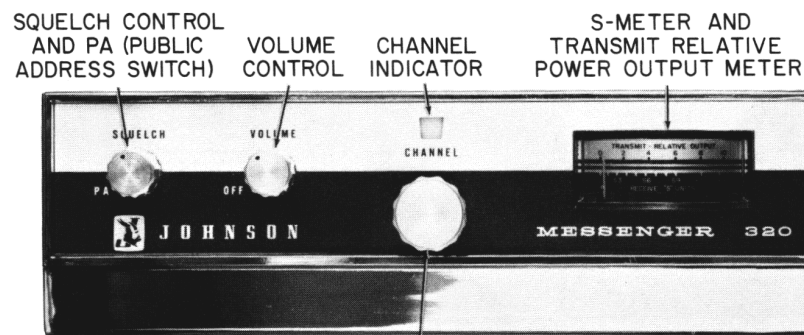
2.4.1 RECEIVER

IF Bandwidth	6 kHz minimum at -6 dB points (Messenger 323). 9 kHz maximum at -7 dB points (Messenger 323). 5 kHz minimum at -6 dB points (Messenger 320). 9 kHz maximum at -6 dB points (Messenger 320).
Audio Gain	+4 dB output with -48 dB input, 1000 Hz.
Synthesizer Injection	50 mV minimum, 300 mV maximum.
Across Band receiver change in Gain	±3 dB (channels 1 through 23, 1μV, modulation 30% at 1000 Hz)
AGC Rolloff	6 dB minimum, 18 dB maximum.
S+N/N	8 dB minimum (1 μV, modulation 30% at 1000 Hz).

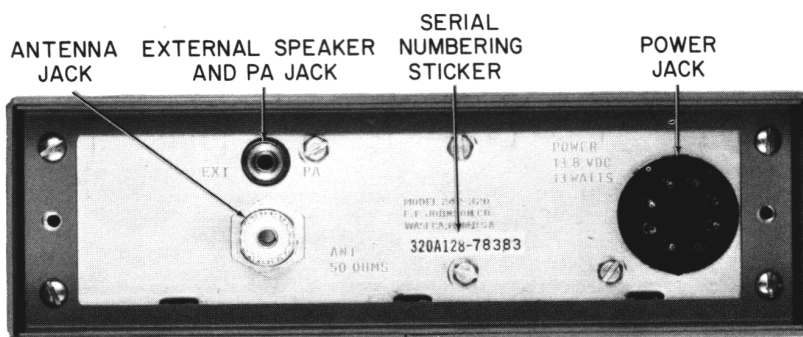
Squelch	Squelch 30 μV minimum.
Noise Immunity	Audio output increase with pulse noise; 5 dB maximum.

2.4.2 TRANSMITTER

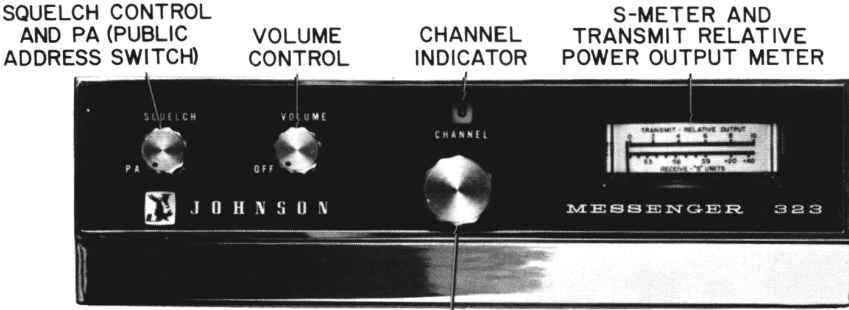
Power Input	5 watts maximum (Supply 13.00 V, TP3 to TP2, 410 mA).
Power Output	2.8 watts minimum. 4.0 watts maximum.
Modulation	70% minimum upward. 80% minimum downward. (20 dB above 50% modulation at 1000 Hz)
Waveform	Free of all spurious signals when observed on a high frequency oscilloscope.
Power Output Balance	0.5 watts maximum change in Power Output, channels 1 thru 23.
Output Frequency	±0.002% maximum deviation at 25° C. ±0.005% maximum deviation from -30° C. to +60° C.
Spurious Signals	50 dB minimum.



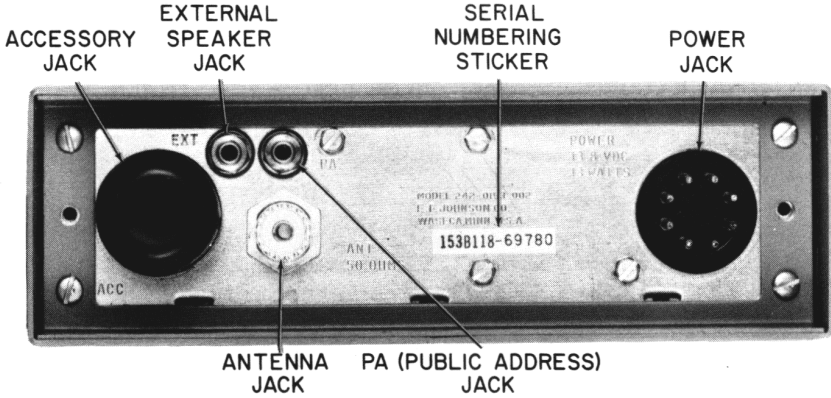
CHANNEL SELECTOR
MESSENGER 320
(FRONT VIEW)
FIGURE 2-1



MESSENGER 320
(REAR VIEW)
FIGURE 2-2



CHANNEL SELECTOR
MESSENGER 323
(FRONT VIEW)
FIGURE 2-3



MESSENGER 323
(REAR VIEW)
FIGURE 2-4