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M E S S E N G E R

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CITIZENS RADIO TRANSCEIVER
PART NO. 242-0120-xxx
242-0121-xxx

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SECTION 1 GENERAL INFORMATION

1.1 SCOPE OF MANUAL

This service manual includes service and alignment instructions for the Messenger 120 Citizens Radio Transceiver. (A Messenger 121 Service Manual Addition is included at the back of this manual.)

Revision and addition notices will be published as this set is modified or changed. As notices are received, insert them in order at the back of this service manual.

1.2 MESSENGER 120 DESCRIPTION

The Messenger 120 is a 5 channel citizens radio transceiver which includes a selective calling section.

The set can operate on any five of the 23 citizens radio channels. The transmitter section is capable of a 4 watt power output.

An incoming call from a station in the system alerts the operator of a called station by both sight (call light) and sound (alerting tone).

The selective calling section permits units in your system to stand by with squelch controls set at full sensitivity, but with receivers silenced until a call is received from a system unit. The system unit must be another Messenger 120 or a transceiver equipped with a Johnson Tone-Alert V operating on the system channel and tone frequency.

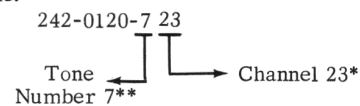
The selective calling section is a reedless single tone alerting device which is not compatible with reed type devices.

The set comes fully equipped for operation in any vehicle with a 12 VDC negative ground electrical system, and the simple addition of the accessory 117 VAC power supply, Part No. 239-0125-001, converts it into an ideal

base station radio. Positive ground operation is possible by adding the accessory In-Converter, Part No. 239-120-001.

The transceiver part number includes the tone number of the selective calling section and the operating channel of the transceiver.

Example:



* Indicates channel number.

Example: Part No. 519-0011-323
 -023 are receive and transmit crystals for channel 23.

**Refer to Table 6-2 for tone numbers and frequencies.

1.3 ACCESSORIES

Refer to Table 1-1 for a list of available accessories which can be purchased as extra cost items.

TABLE 1-1
 EXTRA COST ACCESSORIES

Description	Part Number
117 VAC Power Supply	239-0125-001
DC Voltage In-Converter	239-0120-001
External Speaker	250-0064-001
Receive Crystals	519-0011-301/323*
Transmit Crystals	519-0011-001/023*

*Last two digits indicate channel.

1.4 SERIAL NUMBER INTERPRETATION

The transceiver serial number is printed on a white adhesive backed cloth which is attached to the back of the transceiver rear panel. Each serial number contains an alphabetical designator which indicates a major revision; an "A" serial number prefix indicates that the transceiver includes changes specified in revision A.

1.5 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 you write to the Customer Service Department, please include any information that may be helpful in solving your problem. Contact:

E. F. Johnson Company
Customer Service Department
Waseca, Minnesota 56093
Phone: (507) 835-2050

1.6 FACTORY RETURNS

A warranty registration card is attached to the accessory package, and should be filled out and mailed as soon as possible to validate your warranty.



Normally, repair service is available locally through authorized Johnson Citizens Radio Service Centers; a list of these service centers is packed with each unit when it leaves the factory. Copies are available upon request from the factory Customer Service Department. Do not return any equipment to the factory without authorization from the Customer Service Department. Return accessories used with the transceiver, such as power supply or DC voltage In-Converter.

1.7 REPLACEMENT PARTS

The authorized Johnson Service Centers stock commonly needed replacement parts. When a part is not available locally it can 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.

SECTION 2 SPECIFICATIONS

2.1 GENERAL

All electrical specifications are nominal.

Test conditions:

- a. Standard test voltage: 13.8 VDC negative ground.
- b. Audio levels are given in dB on an AC VTVM calibrated for 0 dB = 0.775 volts.
- c. Input values to the microphone are given as the level to a 6800 pF $\pm 5\%$ capacitor in series between the audio oscillator and the microphone input.
- d. All microvolts are at the antenna terminal and numbers are 1/2 the microvolts into a 50 ohm 6 dB pad.

Frequency Range	26.965 - 27.255 MHz
Channels	5
Dimensions of Enclosure	2" high x 6.2" wide x 9" deep (5.1 cm h., 15.8 cm w., 22.8 cm d.)
Unit Weight	Approximately 2 lb., 12 oz (1.24kg)
Shipping Weight	Approximately 3 lb., 12 oz (1.7kg)
Microphone	High capacity ceramic element. Cyclac case. Push-to-talk switch, hang-up stud.
Circuitry	20 transistors, 14 diodes and 1 thermistor.
Compliance	Meets requirements for FCC type acceptance, part 95 (D); DOC type approval, RSS 136.

2.2 RECEIVER

Sensitivity	10 dB (S+N)/N ratio with 0.5 microvolt (30% modulation at 1000 Hz).
Selectivity (EIA 2 signal generator method)	6 kHz bandwidth at -6 dB 30 kHz bandwidth at -60 dB

Frequency Control	$\pm 0.005\%$ crystal from -30°C to $+60^{\circ}\text{C}$
Spurious Rejection	50 dB (except image of 10 dB)
Antenna Impedance	50 ohms
Audio Output Power	2.5 watts at 10% distortion at 8 ohms
Speaker Impedance	8 ohms
Squelch Range	1 to 50 microvolts
Squelch Sensitivity	10 dB or less signal change for 40 dB of quieting at 1 microvolt
Squelch Noise Immunity	Highly immune to impulse-type noise.
Intermediate Frequency	455 kHz
AGC Characteristics	Flat within ± 6 dB from 100,000 to 5 microvolts with 15 dB rolloff from 5 to 0.5 microvolt for superior noise quieting.
Noise Limiting	Series-type, automatic threshold adjustment and IF clipping.
Circuitry	All solid state single conversion.

2.3 TRANSMITTER

Emission	6A3
Frequency Control	$\pm 0.005\%$ crystal from -30°C to $+60^{\circ}\text{C}$
RF Power Output	4 watts maximum at 13.8 VDC
RF Spurious and Harmonic Attenuation	Better than FCC and DOC requirements.
Output Impedance	50 ohms
Audio Input Impedance	1000 ohms

Specifications
Messenger 120

Audio Frequency Response ± 4 dB 400-3000 Hz

Modulation High level AM, class B modulator, speech compression, clipping and audio filtering.

Circuitry All solid state

2.4 SELECTIVE CALLING TONE-ALERT

Tone Channels One. Ten available with plug in tone frequency determining elements.

Sensitivity 0.5 microvolt

Tone Frequencies 750, 825, 895, 985, 1095, 1210, 1280, 1420, 1545 or 1615 Hz

Call Time Approximately 4 seconds. After 3 seconds the "call" light comes on and tone sounds for remaining 1 second.

Tone Channel Bandwidth 50 Hz $\pm 20\%$ at rated voltage.

Circuitry Solid state (no reeds)

2.5 VOLTAGE REQUIREMENT

13.8 volts DC input (11-15 VDC Limit)
Receive: Squelched 0.4 ampere
Transmit: 1.3 ampere

Circuit Protection 2 ampere fuse

2.6 MOUNTING

Mobile mounting bracket is furnished with each unit.

2.7 MINIMUM PERFORMANCE

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

2.7.1 RECEIVER

Sensitivity 8 dB (S + N)/N ratio with 1 microvolt input, modulated 30% with a 1 kHz signal.

Output Level 0 dB minimum across voice coil with 1 microvolt input, modulated 30% with a 1 kHz signal.

External Speaker Output 0 dB minimum across 8 ohms with 1 microvolt input, modulated 30% with a 1 kHz signal.

AGC Rolloff Output change from 1000 to 1 microvolt 18 dB minimum, 22 dB maximum, modulated 30% with a 1 kHz signal.

Tight Squelch 30 microvolts minimum.

Threshold of Noise Limiting 20% modulation minimum, 40% modulation maximum, with input 30 microvolts at 1000 Hz.

2.7.2 TRANSMITTER

Power Output 3 watts minimum on channel 11.

Total Supply Current 970 milliamperes maximum, no modulation.

Audio Input Level -38 dB or less into a 6800 pF series capacitor for 50% modulation at 1000 Hz.

2.7.3 SELECTIVE CALL

Transmitted Tone Frequency Error ± 2 Hz maximum from nominal tone frequency at room temperature. (Adjust L101.)

% Modulation of Transmitted Tone Not less than 70% or more than 100% on positive and negative peaks.

Modulation Capability At 1000 Hz not less than 80% and not more than 100% on positive and negative peaks with input 16 dB above that required for 50% modulation at 1000 Hz.

Waveform The modulated waveform shall be free of all spurious signals when observed on a high frequency oscilloscope. Audio distortion shall be minimal below 70% modulation.

Bandwidth Adjust R113 (Bandwidth) for triggering within 7 seconds by a 1.5 microvolt signal modulated 30% at 25 Hz greater than the nominal tone frequency. Triggering shall not occur at 35 Hz greater than the nominal tone frequency.

Time to Trigger When a 30 μ V signal modulated 30% at required tone frequency (± 2 Hz) is received for a 4 second period, the call light should turn on after 3 seconds $\pm 10\%$ and the tone should be heard for the remaining 1 second.

SECTION 3 INSTALLATION

3.1 CRYSTAL AND OVERLAY INSTALLATION

3.1.1 After unpacking the Messenger 120 Transceiver, insert the required operating channel crystals and add the necessary channel numbers.

- a. Unscrew the two cabinet locking bracket screws and remove the locking brackets.
- b. Carefully slide the chassis out of the cabinet.
- c. The crystal sockets are marked R, T, R, T... across the crystal block. Since crystal socket pairs are located in order from left to right (from front of transceiver) as the channel buttons, insert the appropriate R and T crystal into the pair which corresponds to the required channel selector button.
- d. Carefully reinstall the chassis in its cabinet. Press the speaker towards the bottom of the printed circuit board so that it will enter the cabinet. Replace the cabinet locking brackets.

3.1.2 To add or change channel numbers on the overlay, proceed as follows:

- a. Units shipped from the factory have the overlay temporarily installed. To remove this overlay, remove the cabinet from the chassis and push the overlay out from behind the front panel. If you have already permanently installed the overlay, remove it similarly (but this might necessitate regluing it later).
- b. Channel numbers are on an adhesive backed card. Remove the numbers you need from the card. You might find it helpful to fold or tear the card at the number you need when removing it. A tweezers might also be helpful when removing numbers.
- c. Remove the backing from the permanent overlay. Install the numbers on the back of the overlay. Check to be sure that they read right from the front.

- d. Carefully push the overlay into place on the transceiver front panel. Replace the cabinet.

3.2 MOBILE INSTALLATION

3.2.1 ANTENNA

A good antenna installation is essential for satisfactory transceiver performance. Select the desired antenna location and refer to the installation instructions included with the antenna.

3.2.2 INSTALLATION TOOLS

The tools in Table 3-1 should be on hand when installing the transceiver. Other tools might be necessary for special installation conditions.

TABLE 3-1 INSTALLATION TOOLS	
<u>Tool</u>	<u>Use</u>
Center punch	Mark mounting screw holes.
3/8" drill	Drill mounting screw holes.
3/8" drill bit	Antenna mounting hole.
13/64" drill bit	Transceiver mounting bracket holes.
6" flat blade screwdriver	Microphone hanger screws.
6" adjustable wrench	Mounting bracket screws and antenna mounting nuts.
Combination pliers	Tap connector.

3.2.3 ITEMS SUPPLIED FOR TRANSCEIVER INSTALLATION

Check the items in Table 3-2 against the items supplied in the accessory package.

TABLE 3-2 ITEMS SUPPLIED FOR TRANSCEIVER INSTALLATION				
	Item No.	Qty.	Description	Part Number
	1	1	Dash mounting bracket	017-1249-001
		1	Hardware package for dash mounting bracket	023-2615-001
			Includes:	
	2	2	Screws, #10-32 x 5/8	011-0229-020
	3	2	Nuts, #10-32	012-0109-002
	4	2	Lockwashers, #10	029-0001-003
	5	2	Screws, 1/4 x 20 x 5/16	011-0322-010
	6	2	Washers, cushion	018-0822-001
	7	1	Cable, 13.8 VDC battery, fused	023-1652-001
			Includes:	
		Fuseholder for 1/4 dia x 1/4 L fuse	534-1004-005	
		Fuse, 2 ampere	534-0003-024	
		Quick-disconnect lead assembly	023-2558-001	
		29" wire #18, stranded, red	071-0912-042	
		Marker, fuse value (2 amp)	559-3009-002	
	8	1	Lead assembly, negative for AC power supply	597-0001-011
	9	1	Microphone holder	537-9004-002
	10	1	Tap connector package	023-2209-001
	1	1	Overlay package assembly	023-2930-001
			Includes:	
			Instruction envelope	559-4030-001
			Number card	559-3015-001

*Later models use a ground strap, Part No. 017-1714-001 (Refer to Figure 3-2)

3.2.4 TRANSCEIVER

Install the transceiver in a location with best operating convenience and maintenance accessibility in mind.

- a. Select the desired transceiver location, drill dash mounting bracket holes and mount the bracket with the provided hardware. Avoid installing the transceiver in the direct air stream of the vehicle heater. Temperatures in this area can measure up to 150°F and can cause component failure.
- b. Refer to instructions printed on the hardware envelope.
- c. Connect the power cable to the accessory terminal

of the vehicle ignition switch or another 12 VDC source, using the tap connector.

1. Refer to installation instructions printed on the tap connector envelope.

CAUTION

The Messenger 120 Transceiver is factory wired for negative ground operation. Serious damage can result if it is installed in a positive ground vehicle without using an E. F. Johnson In-Converter, Part No. 239-0120-001.

- d. Connect the antenna transmission line to the transceiver antenna connector.