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M E S S E N G E R
1 2 2 - 1 2 3 A
1 2 3 B - 1 2 3 S J

CITIZENS RADIO TRANSCEIVER
PART NO. 242-0122-xxx
242-0123-002
242-0123-003
242-0123-004

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MESSENGER 123A BASE STATION
FIGURE I-1



MESSENGER 122 MOBILE SYSTEM
FIGURE I-2

SECTION 1

GENERAL INFORMATION

1.1 SCOPE OF MANUAL

This service manual includes service and alignment instructions for the Messenger 122, 123A, 123B and 123SJ Citizens Radio Transceivers.

1.2 TRANSCEIVER DESCRIPTION

The Messenger 122 is a 23 channel citizens radio transceiver which incorporates a 14 crystal solid state frequency synthesizer to generate the receiver and transmitter channel frequencies.

The Messenger 123A is a Messenger 122 transceiver with a meter circuit, metal cabinet and rotary controls.

Later Messenger 123A models have been adapted to operate from either positive or negative ground supply voltage. The positive/negative ground transceiver, Part No. 242-0123-003, can be divided into three versions with the final version being the Messenger 123SJ, Part No. 242-0123-004.

The first version is an interim model which has a Messenger 123A front panel upper overlay and an exposed positive/negative ground conversion switch with a locking plate. This model had a limited production of approximately 1500 units before it was discontinued and replaced by the Messenger 123B.

The Messenger 123B is the second version of the positive/negative ground transceiver. The Messenger 123B has a new front panel overlay and a submerged positive/negative ground conversion switch on the rear panel.

The Messenger 123SJ is the final version and has the same positive/negative ground conversion switch as the Messenger 123B but it also has a solid state LED, "S"/power meter. The Messenger 123SJ replaces the Messenger 123B. Electrically all three transceivers are identical, the printed circuit board has been isolated from the chassis rail and the switching circuit has been added. Refer to the component layout for the solid state meter circuit board components layout.

With the addition of the 117 VAC power supply, Part No. 239-0125-001, each transceiver converts to a base station transceiver.

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	239-0125-002
DC Voltage In-Converter	239-0120-001
External Speaker	250-0064-001

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

Measurements made per EIA Standard RS-382.

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	23
Dimensions of Enclosure	M122: 5.08 cm high x 15.71 cm wide x 22.86 cm deep (2" high x 6-3/16" wide x 9" deep) M123A: 6.25 cm high x 15.7 cm wide x 24.5 cm deep (2-1/2" high x 6-3/16" wide x 9-5/8" deep)
Unit Weight	M122: Approximately 1.190 kg (2 lb. 10 oz.) M123A: Approximately 1.66 kg (3.66 lb.)
Shipping Weight	M122: Approximately 1.644 kg (3 lb. 10 oz.) M123A: Approximately 2.2 kg (4.85 lb.)
Microphone	High capacity ceramic element. Cyclac case. Push-to-talk switch, hang-up stud.
Compliance	FCC Type Accepted, Rule 95 (D) DOC Type Approved, RSS 136
Metering	(123A): S meter and relative RF output

2.2 RECEIVER

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

Frequency Control	$\pm 0.005\%$ crystal from -30°C to $+50^{\circ}\text{C}$
Spurious Rejection	50 dB (except image of 10 dB) (123A): 42 dB (except image of 12 dB)
Antenna Impedance	50 ohms
Audio Output Power	2.5 watts at 10% distortion at 8 ohms (30 μV , 1000 Hz, 30% modulation)
Speaker Impedance	8 ohms
Tight Squelch	50 microvolts (30 microvolts minimum)
Squelch Sensitivity	Less than 1 dB
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 12 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 $+50^{\circ}\text{C}$
RF Power Output	4 watts maximum at 13.8 VDC
RF Spurious and Harmonic Attenuation	50 dB
Output Impedance	50 ohms
Audio Frequency Response	± 6 dB, 300-3000 Hz (123A): +2, -14 dB, 300-3000 Hz
Modulation	80% minimum, 100% maximum, positive and negative
POWER DEMAND	13.8 volts DC input Receive: Squelched 0.4 ampere Transmit: 1.2 ampere
Circuit Protection	2 ampere fuse
MOUNTING	Mounting bracket furnished with unit

SECTION 3 INSTALLATION

3.1 MOBILE INSTALLATION

3.1.1 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.

3.1.2 INSTALLATION TOOLS

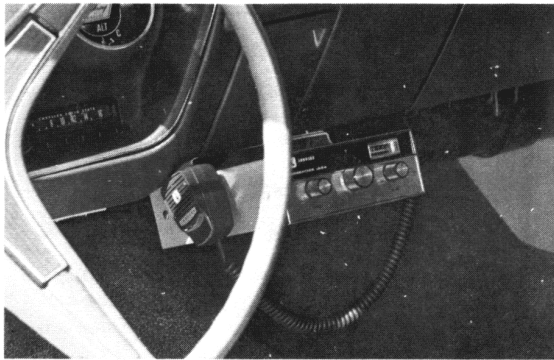
The tools in Table 3-1 should be on hand when installing the transceiver. Other tools might be necessary for special installation conditions.

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.

3.1.3 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				
	<u>Item No.</u>	<u>Qty.</u>	<u>Description</u>	<u>Part Number</u>
	1	1	Dash mounting bracket	017-1249-001
	1	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



**TYPICAL MOBILE INSTALLATION
FIGURE 3-1**

3.1.4 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 122 and 123A transceivers are factory wired for negative ground operation. Serious damage can result if they are 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.

3.2 BASE STATION INSTALLATION

3.2.1 ANTENNA AND TRANSMISSION LINE INSTALLATION

The quality and type of antenna installation determines if a transceiver will operate at its maximum capability.

- a. Select the antenna type and location which fits the particular base station requirement.

1. Make sure the location, height and type of antenna are adequate for the intended use of the base station. (Height must be in accordance with FCC restrictions.)
- b. Select the proper transmission line type for the particular installation requirement.
 1. Connect the transmission line from the antenna to the transceiver. Keep the line as short as possible for maximum efficiency.

3.2.2 AC POWER SUPPLY INSTALLATION

- a. Attach the AC Power Supply, Part No. 239-0125-001, to the transceiver and connect the transceiver for proper base station operation.
 1. Position the transceiver upside down on a flat surface.
 2. Place the power supply on the transceiver, line up the screw holes with captive screws and tighten the screws.
 3. Connect the ground strap from a number 8 screw on the transceiver rear panel to a number 8 screw on the power supply.

3.3 FINAL CHECKOUT

- a. Connect a Bird Model 43 with 10A element or equivalent wattmeter into the transmission line.
- b. Adjust the antenna for best VSWR following the manufacturer's instructions. The transceiver has been aligned at the factory and the output network will not normally require tuning to match it to the antenna. The measured VSWR should be 1.5 to 1 or less.
- c. Check the transmitter power output. Typical power is 3.5 watts.
- d. Check the transmitter frequency with a frequency meter. The maximum allowable tolerance from the center frequency is $\pm 0.005\%$.
- e. Check the modulation. Minimum acceptable is 80% upward and downward. A suggested method is outlined in Section 5.
- f. Give the transceiver a complete operational checkout. Make several contacts with other units in the system and correct any noise suppression problems that may affect transceiver performance.

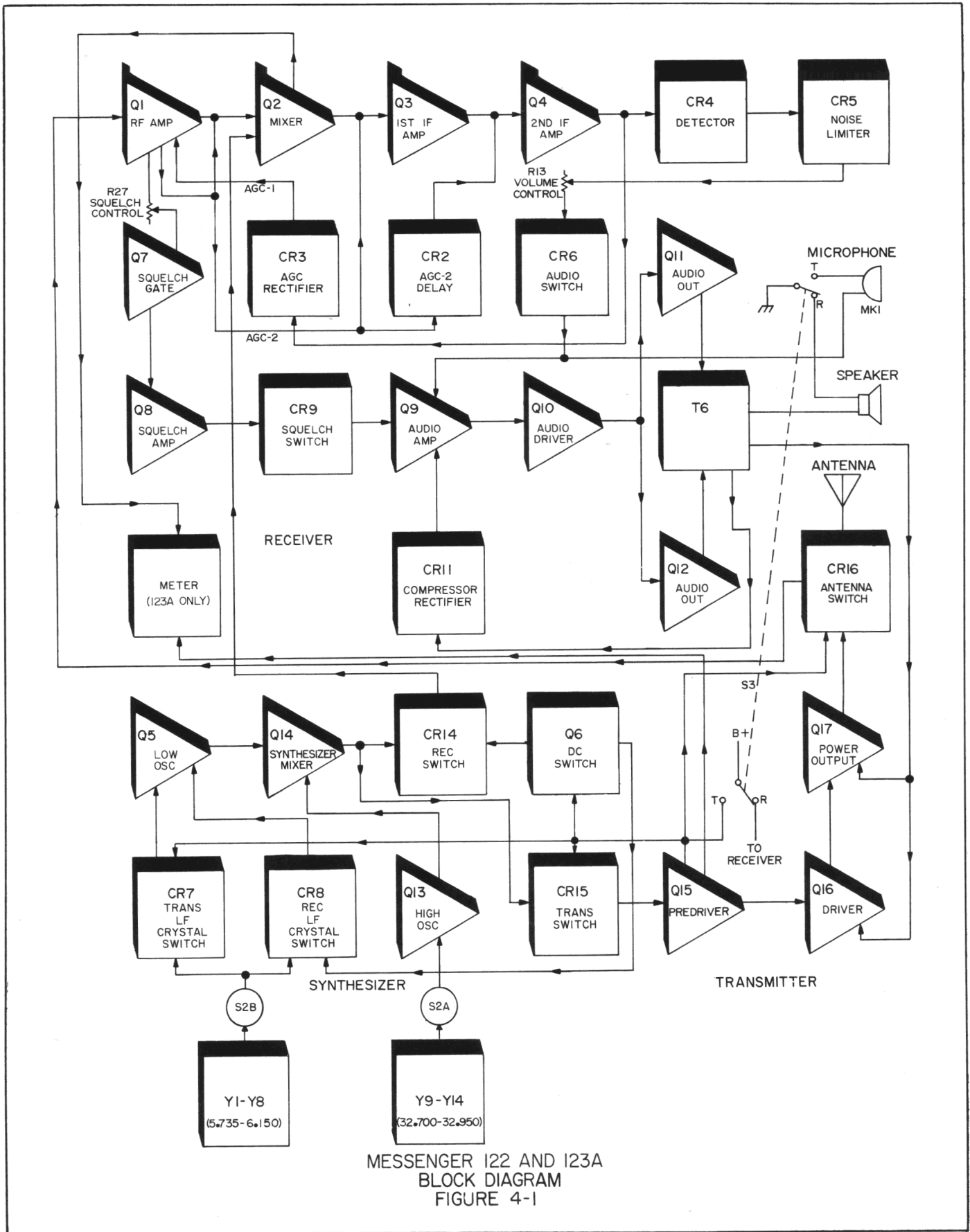
3.4 NOISE SUPPRESSION

Vehicle electrical noise of some sort is a problem in almost all new mobile radio installations.

- a. Before beginning any special noise suppression steps, be sure that the vehicle is well tuned. Clean and tighten all electrical connections, including alternator, battery, regulator and coil connections. Perform the following maintenance steps as necessary:
 1. Solder crimped spark plug and distributor leads.
 2. Clean and regap or replace spark plugs and ignition points.
 3. Check and clean alternator rings and brushes.
 4. Retune the engine every 10,000 miles or twice a year, whichever occurs first.
- b. Ordinarily several sources of noise are present in any vehicle, with the strongest covering the others. Drive to a relatively quiet location (free of man-made electrical interference such as noisy power lines, industrial noise or other vehicles).
- c. Test for ignition noise with a weak signal or no signal on channel. Vehicle may be standing still. Ignition noise will be present at all engine speeds and, if severe, may make a normally readable signal unreadable. Ignition noise is a "popping" sound which varies with engine speed. It stops immediately when the ignition key is turned off with the engine at a fast idle.
- d. A "whining" noise which varies with engine speed and continues with the ignition turned off with the vehicle coasting in gear is characteristic of the alternator.
 1. Check and clean the alternator rings and brushes.
- e. An irregular "clicking" sound which disappears at a slow idle is characteristic of the voltage regulator.
 1. Tighten loose nuts and bolts, and bond large areas such as the fenders and exhaust pipe to the frame with heavy lengths of braid.
- f. Irregular popping noises which vary with road surfaces indicate static discharge at any of several locations in the vehicle.
 1. Tighten loose nuts and bolts, and bond large areas such as the fenders and exhaust pipe to the frame with heavy lengths of braid.
- g. The E. F. Johnson Company offers a noise suppression kit, Part No. 250-0801-001, which can be ordered from the Johnson dealer or distributor. This kit is useful in reducing noise from the voltage regulator and the alternator or generator. The Champion Spark Plug Company offers, free of charge, an excellent publication on noise suppression, "Giving Two-Way Radio Its Voice".

To obtain this publication, write to:

Automotive Technical Services Department
Champion Spark Plug Company
Toledo, Ohio 43601



MESSENGER 122 AND 123A
BLOCK DIAGRAM
FIGURE 4-1