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IMPORTANT MAINTENANCE/REPAIR INFORMATION

Surface Mount Repair

RITRON surface mount products require special equipment and servicing techniques. Improper servicing techniques can cause permanent damage to the printed circuit boards and/or components, which is not covered by RITRON's warranty. If you are not completely familiar with surface mounted component repair techniques, RITRON recommends that you defer maintenance to qualified service personnel.

Precautions for Handling CMOS Devices

This radio contains complementary metal-oxide semiconductor (CMOS) devices, which require special handling techniques. CMOS circuits are susceptible to damage by electrostatic or high voltage charges. Damage can be latent, with no failure appearing until weeks or months later. For this reason, take special precautions any time you disassemble the radio. Follow the precautions below, which are even more critical in low humidity environments.

1) Storage/transport - CMOS devices that will be stored or transported must be placed in conductive material so that all exposed leads are shorted together. CMOS devices must not be inserted into conventional plastic "snow" or plastic trays of the type that are used for other semiconductors.
2) Grounding - All CMOS devices must be placed on a grounded bench surface. The technician that will work on the radio/CMOS circuit must be grounded before handling the radio. Normally, the technician wears a conductive wrist strap in series with a 100K Ohm resistor to ground.
3) Clothing - Do not wear nylon clothing while handling CMOS circuits.
4) Power off - Remove power before connecting, removing or soldering a PC board that contains CMOS devices.
5) Power/voltage transients - Do not insert or remove CMOS devices with power applied. Check all power supplies to be used for testing CMOS devices, making sure that no voltage transients are present.
6) Soldering - Use a grounded soldering iron for soldering CMOS circuitry.
7) Lead-straightening tools - When straightening CMOS leads, provide ground straps for the tool used.

PC Board Removal - Special Tool

RITRON recommends using a knurled nut tool to remove the slotted knurled nuts that secure the charge and audio jacks on top of the radio. You will need two sizes of this tool, one for each jack size. Mouser Corporation ® is one source, stock number 382-0004 (2.5mm jack) and 382-0006 (3.5mm jack). You can reach Mouser sales and distribution center at 1-800-346-6873.

Properly Attach the Synthesizer Shield

The synthesizer shield should not be removed, unless a component must be replaced. This shield is soldered to the main PC board.

Re-assembly - Speaker Magnet, Battery Voltage on Connector Pin

The speaker magnet will pick up clipped leads and other small metal objects from your bench top. Even tiny objects on the diaphragm will cause the speaker to buzz. Make sure the speaker is free of foreign objects before reassembling the radio.

Radio Transmitter Power Measurements

The JMX-141 was designed to produce a minimum of 1 Watts of Transmitter power at nominal battery voltage (+7.2 VDC), throughout the radio's operating frequency range. Measurements are made with the RITRON 141-SRVBD RF service module connected to the radio antenna terminal.

JMX-141 SPECIFICATIONS

GENERAL	
FCC ID:	AIERIT14-141
FCC Rule Parts:	22, 74, 80, 90
Frequency Range:	148-161 or 161-174 MHz
Max. Freq. Separation:	13 MHz
RF Channels:	Conventional: 4 Channels, Independent TX/RX frequencies.
Synthesizer Step Size:	5 KHz
Frequency Stability:	+/-2.5 PPM (-30 to +60 C) TX/RX
Tone/Code Signaling:	CTCSS (Quiet Call)
Power Supply:	+7.5 VDC, 700 mAH rechargeable NiCd battery pack standard +7.5 VDC, 1500 mAH rechargeable MiMH battery pack optional
Battery Drain:	
Standby:	75 mA
Sleep:	25 mA
Avg. Standby with Power Saver:	45 mA
Receive:	150 mA
Transmit:	600 mA @ 1.4 Watts with 7.2 VDC battery
Battery Life:	**Standard battery (700 mAH) @ 90/5/5 Duty Cycle** 9 Hrs, Battery Saver On **High capacity battery (1500 mAH) @ 90/5/5 Duty Cycle** 18 Hrs, Battery Saver On
Dimensions:	4.75”H x 2.2”W x 1.43”D
Weight:	11.5 oz. with battery pack
Enclosure Material:	Lexan Polycarbonate
Environmental:	Splash resistant and shock and vibration per RITRON Drop Test (6 ft. drop onto concrete on all six sides)
Antenna Fitting:	1/4" - 32 x 1/4" threaded
External RF Test Jack:	Antenna connector with RITRON 141-SRVBD test device

JMX-141 SPECIFICATIONS

GENERAL

Earphone Jack:	3.5 mm, disconnects the internal speaker for external earphone, speaker / microphone, or headset. Also provides cable connection for PC programming.
Microphone/PTT/Chg Jack:	2.5 mm, for external speaker/microphone, headset or RITRON model BC-A wall charger
Push Button Controls:	On/Volume Up Volume Down/Off PTT Channel
Speaker Beep Indicators:	
On/Volume UP	Multiple beeps indicating radio channel when radio is turned on, followed by increasing audio to adjust volume.
Volume Down/Off	Decreasing audio to adjust volume, with single tone when unit is turned off.
Both Volume Buttons	Alternates between Tone Squelch (single beep) and Carrier Squelch (two beeps). If both buttons are held down until the radio beeps repeatedly, squelch will be disabled.
Channel	Number of beeps indicates channel.

RECEIVER Specifications

	Wide band	Narrow band
Modulation Acceptance:	+/- 7.0 KHz	+/- 3.75 KHz
Sensitivity (12 dB SINAD):	0.22 µV (.17 typical)	0.22 uV (.18 typical)
Adjacent Channel (EIA):	-60 dB (-70 typical)	-50 dB (-60 typical)
Spurious Rejection:	-60 dB	-60 dB
Image Rejection (EIA):	-60 dB	-60 dB
Intermodulation (EIA):	-56 dB	-57 dB
Noise Squelch Sensitivity:	Manually adjustable, factory set for 12 dB SINAD	
Frequency Response:	300 - 3000 Hz, de-emphasized	
Audio Output	1 Watt into 8 Ω, with less than 5 % THD @ the earphone jack	
Receiving System:	Dual conversion superheterodyne	
I.F. System:	1st - 43.65 MHz	2nd - 450 KHz
L.O. Injection:	**High** side	

JMX-141 SPECIFICATIONS

TRANSMITTER		
RF Power Output:	1 Watts minimum @ +7.2 VDC 1.4 Watts typical @ 7.2 VDC	
	Wide Mode	Narrow Mode
Emission Designator:	20K0F3E	11K25F3E
Deviation:	+/- 5.00 KHz	+/- 2.50 KHz
FM Hum and Noise:	-50 dB	-44 dB
Audio Distortion:	< 8 %	< 6 %
Spurious and Harmonics:	-50 dBc	
Audio Response:	Meets FCC and EIA requirements	
Time-out Timer:	60 seconds	

INTRODUCTION

GENERAL

RITRON's JMX_141 handheld is a small, programmable two-way radio, designed to operate over one of two sub-bands. The low split covers 148-161 MHz and the high covers 161-174 MHz.

This handheld features push-button operating controls, with the Push-To-Talk and Channel buttons on one side of the radio. The On / Volume Up and Volume Down / Off, volume and monitor controls are on top.

Each radio can be “dealer or factory” programmed to contain a unique set of operating frequencies and options. Separate RX and TX Quiet Call (CTCSS) tones can be programmed per channel. Transmitter deviation can be programmed on a per channel basis.

Inspection

Each radio package should include a radio, antenna, rechargeable battery pack, belt clip and any optional accessories ordered. Examine the equipment immediately after delivery and report any damages to your shipping company.

Model Identification

The JMX-141 model, serial number and FCC Identification are displayed on a label located on the back of the radio beneath the belt clip.

FCC REGULATIONS

Licensing

The FCC requires the radio owner to obtain a station license for his radios before using them to transmit, but does not require an operating license or permit.

The station licensee is responsible for ensuring that transmitter power; frequency and deviation are within the limits specified by the station license. The station licensee is also responsible for proper operation and maintenance of the radio equipment. This includes checking the transmitter frequency and deviation periodically, using appropriate methods.

Safety Standards

The FCC (with its action in General Docket 79-144, March 13, 1985) has adopted a safety standard for human exposure to radio frequency electromagnetic energy emitted by FCC regulated equipment. RITRON follows these safety standards, and recommends that you observe the following guidelines:

- DO NOT hold the radio such that the antenna is very close to or touching exposed parts of the body, especially the face or eyes, while transmitting. Keep the radio vertical, two to three inches away while talking into the microphone.
- DO NOT press the Push-To-Talk except when you intend to transmit.
- DO NOT operate radio equipment near electrical blasting caps or in an explosive atmosphere.
- DO NOT allow children to play with any radio equipment that contains a transmitting device.
- Repair of RITRON products should be performed only by RITRON authorized personnel.

BATTERY CARE

The handheld is powered by a rechargeable battery, which fits into the radio case (see FIG-1).

CHARGING

The battery pack can lose its charge during storage and shipment, and should be fully charged before the radio is used. Thereafter, the battery should be charged overnight after each day of use, to ensure peak radio performance for the next day. Using the cube charger (model BC-A), the battery should charge completely in 12 hours.

Note: A new battery must be cycled (charged and discharged) several times before it will reach its maximum charge capacity.

To charge the battery using a RITRON cube charger - plug the charger cord into the smaller of the two jacks on top of the radio. Then plug the cube into a 110 VAC outlet. The green lamp lights while the battery is charging, and should go off only when the cube is unplugged.

Two charger contacts, visible through the bottom of the radio case, allow the battery to be charged using an optional RITRON drop-in charger (model BCPS-FS). The battery pack may be charged inside or outside of the radio case.

To charge the battery using a drop-in charger (model BCPS-FS) - plug the drop-in charger into a 110 VAC outlet. Set the portable or battery into the charger. Each battery contact must rest on a charger contact pin.

Typically, a battery pack's service life is one year. To ensure maximum service life, follow these guidelines:

- Do not discharge a battery that is already "run down." If the battery cannot power your radio, recharge the battery.
- Do not overcharge a battery. The standard battery should not be left to charge continuously.
- Before storing a battery, charge it for 16 hours. Thereafter, charge the battery for 16 hours once every 30 days.

With daily use and recharging, a battery's service life is about one year. It is time to purchase a new battery:

1) When the radio's transmitter coverage decreases or does not work at all.
2) When the radio quits working after just a few hours of use, even with a full overnight charge.
3) When the battery is more than two years old. The date of manufacture is stamped on every battery. The first two digits indicate the year, the last two digits the week.

BATTERY CARE

BATTERY REPLACEMENT

To take the battery out of the radio, remove the battery door pictured in FIG-1. Use the pull-tab to remove the battery.

Slide the replacement battery into the radio case. Make sure the spring contacts are inserted between the battery and paper insulator. The contacts must not touch the radio PC board.

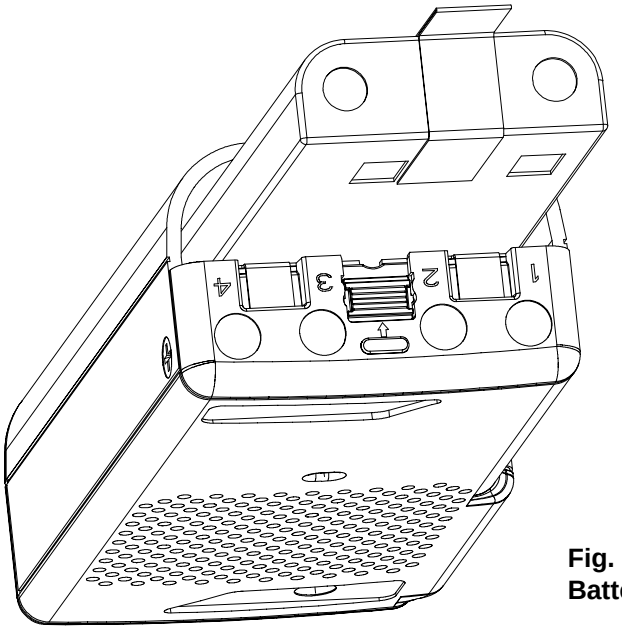


Fig. 1
Battery Replacement

PRECAUTIONS

- Use only RITRON-supplied chargers; other chargers might cause fire, explosion, or other damage to the radio.
- Do not "fast-charge" a brand new battery pack. Otherwise, the battery might be damaged.
- Once the battery has been charged fully using the normal rate, the fast rate may be used thereafter.
- Do not fast-charge a battery pack that is fully charged. This can shorten battery life.
- Do not charge or replace a battery in an explosive atmosphere. Contact sparking can ignite an explosion.
- Do not dispose of a battery in fire. An explosion might result.
- Do not charge the battery in temperatures colder than about 45°F. Electrolyte leakage can occur and ruin the battery.
- Charging in temperatures above approximately 95°F will not harm the battery, but can reduce its charge capacity.

DESCRIPTION OF CONTROLS AND CONNECTORS

Antenna
The flexible antenna radiates and receives radio signals. Before using the radio, be sure the antenna base is threaded fully into the radio's antenna bushing.

VHF and UHF antennas are not interchangeable. Use only the antenna type packaged with the radio. A VHF antenna is pictured in FIG-2. (The UHF antenna is smaller in diameter.)

On/Volume Up
This button switches on the radio, then increases the volume if you continue to press.

Off/Volume Down
This button decreases the volume, then shuts off the radio if you continue to press.

Channel Select
Pressing this button selects the next channel. When the maximum number of channels is reached and you press this button, the radio resets to channel 1.

Speaker
The speaker allows you to hear calls on your channel.

Push-To-Talk Button
The PTT activates the transmitter, and must be held down while you talk into the microphone. Release the PTT button to receive.

Microphone
The microphone converts your voice into electrical impulses, which are carried with your broadcast to receiving radios. Hold the radio about two inches away and talk into the microphone while transmitting. Shouting does not improve the listener's reception.

Audio Accessory Jack
This jack connects speaker audio to optional accessories, such as a remote speaker/microphone or an earphone. For accessories that have a two-plug connector, the smaller plug is inserted into the charge jack.

This jack is also used to program the radio using the optional PC programming kit.

Charge Jack
The battery may be charged through this jack using a standard RITRON wall socket charger cube.

This jack also connects microphone audio to the optional remote speaker/microphone.

Battery Access (Case Bottom)
The battery door on the case bottom may be removed to access the battery. (Refer to the battery section of this manual.)

Drop-in Charger Contacts
Two charger contacts in the bottom of the JMX-141 radio case allow the battery pack to be charged using an optional RITRON drop-in charger (model BCPS-FS).

Jack Cover
This rubber cover seals out dust and moisture, etc. Snap the cover into the audio accessory and charge jack openings when the jacks are not being used.

DESCRIPTION OF CONTROLS AND CONNECTORS

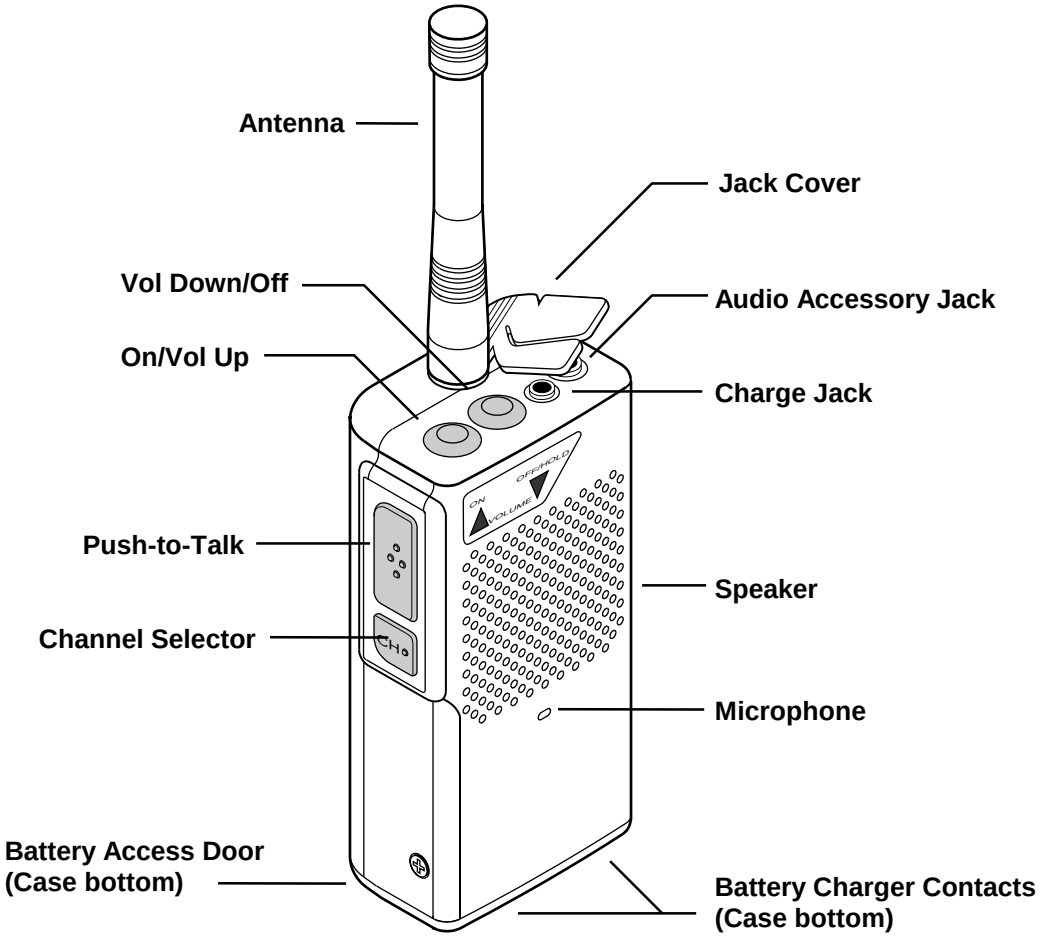


Fig. 2 Controls and Accessory Connectors

Belt Clip Installation

If you are going to attach the belt clip to the handheld, follow these instructions:

1) The belt clip is fastened to the radio case back with the Philips head screw provided. Use the screw included, since a longer screw might damage the radio's electronics.

   Do not use petroleum solvents of any kind on the radio. These can corrode the case.

2) Place the belt clip on top of the radio case back, with the screw hole in the aligned with the hole in the radio case.

3) Using the screw that came with this accessory, attach the clip to the radio.

OPERATION

On-off/Volume

To switch on the radio - press the on/volume up button.

To adjust the volume - press the volume up button until you reach the desired level. You should hear noise and any broadcasts on the channel.

To turn off the radio - press and hold the off/volume down button until a beep sounds.

To determine whether the radio is on - press the volume down button. If the radio is on, noise or activity on the channel is heard.

Receive

To hear calls from other users - adjust the volume as desired. The radio can receive broadcasts while the Push-To-Talk button is not being pressed. Whether or not you hear these broadcasts depends upon the squelch settings.

There are two types of squelch used in the JMX-141 portable. First is carrier squelch. This lets you hear all broadcasts on your channel strong enough for the radio to detect, and silences noise. Second is one of the selective signaling or “tone squelch” formats available on the JMX-141. This allows you to screen out “on-channel” broadcasts that do not carry the correct code programmed for the radio.

Note: It is possible that the beginning of a call might be missed while the radio is in battery saver mode. If this happens, ask the caller to repeat his message.

Monitor

To monitor the channel - press one of the volume control buttons. When you press the volume up or the volume down button, squelch turns off and all radio traffic on the channel (and noise) sounds in the speaker.

Selective Signaling Squelch

To activate tone squelch - simultaneously press both of the volume buttons. Hold for a second or two before releasing. When tone squelch is turned on, the handheld sounds one beep. When carrier squelch is on, the radio emits a "double beep."

Note: If you continue to hold down the volume buttons after the beep (or double beep), the radio will start beeping repeatedly. This means that squelch is turned off. Release the buttons. To restore squelch, press and hold both of the volume buttons until the radio sounds a beep or double beep.

Battery Saver

The handheld has a "battery saver" feature that conserves battery power. The battery saver constantly checks the radio's transmitter, receiver and controls for activity. If a number of seconds pass without the receiver detecting a call, and without the user operating a control, this feature removes power from most of the radio.

During this "off-time," any activity restores full power. Every few fractions of a second, the battery saver applies power to the receiver, checking for broadcasts. It is possible that the first part of an incoming call might go unheard before activity is detected and power restored. If this happens, the caller can repeat his message. Once "radio contact" is made, normal unhurried conversation can follow.

OPERATION

Transmit

To transmit - hold down the Push-To-Talk button and, with the radio a couple of inches away, talk into the microphone. Speak in a normal tone, since talking louder will not improve the listener's reception.

Channel Selection

To read out present channel **-** press and release the channel button. The radio will beep a number of times equal to the present channel number.

To change channels - press and release the channel button within one second after a previous press. The radio will beep a number of times equal to the new channel number. If the highest channel number is selected and you press the channel button, the radio will reset to channel 1. A one-channel radio will beep only once when you press the channel button.

WHAT THE RADIO TONES MEAN

The handheld responds to certain instructions by sounding a beep or series of tones. These tones can tell you whether the radio is working as you expect.

Error Tones in Receive Mode

Synthesizer Unlock – A beep every second indicates the radio frequency synthesizer is malfunctioning. Increment channels until you arrive back on channel. If beeping persists synthesizer is faulty, frequency is outside of authorized range or EE memory is corrupt. Turn off the radio and try again.
Low battery - If a beep occurs every minute then the battery is low. Recharge or replace the battery. The radio will receive with a low battery but may shut down during transmit.
Shut down – The radio will shut down when the battery voltage drops below a predetermined "dead battery" level to protect EE data.

Error Tones in Transmit Mode

Synthesizer Unlock – A beep every second while PTT is pressed indicates the radio frequency synthesizer is malfunctioning. If beeping persists synthesizer is faulty, frequency is outside of authorized range or EE memory is corrupt. Turn off the radio and try again.
Time-out-Timer alert – A rapid beeping occurs when 1 minute of transmission has elapsed. Transmission is terminated. Beeping will stop and the radio will return to receive mode when PTT is released.
Shut down – The radio will shut down when the battery voltage drops below a predetermined "dead battery" level.

Channel Select

When the channel button is pressed, the radio beeps a number of times equal to the channel number selected.

Tone Squelch

When you press and hold both Volume buttons at the same time, a single beep will sound to indicate that tone squelch is on. A "double beep" means that carrier squelch is on.

TROUBLESHOOTING

If you have trouble operating the handheld, review the radio controls and operation sections. If you think the radio is malfunctioning, check the table below.

Problem	Possible Solutions
GENERAL	
The radio does not work at all.	Make sure that the battery is installed correctly, as shown in FIG-1.
	Recharge or replace the battery. (See note 1.)
Operating features do not work exactly As expected.	The radio has been factory or dealer programmed for customized operation.
Reception is poor.	Move to a different location. (Note 2.)
	Confirm that the proper antenna is connected to the radio. (See p. 11, "Antenna.")
You cannot hear calls from other radios.	Turn off tone squelch. (See Note 3.)
	Be certain your radio receives on the same as the caller transmits. (Note 4.)
	Recharge the battery. (Note 1.)
Your calls cannot be heard in other radios.	Make sure that your radio transmits on the receive frequency of the radio(s) you want to call. (Note 4.)
	Recharge the battery. (Note 1.)
Battery	
The battery loses its charge sooner than expected.	Review the battery charging instructions.
	Conserve the battery. (Note 5.)
	If the radio is used in extreme cold, warm the radio under your coat. (Note 6.)
	Replace the battery. (Note 1.)
Error Tones	
An error tone sounds when the radio is first switched on.	See "Error Tones" in the Operation section.
An error tone sounds while you are talking (and the transmitter shuts off).	Refer to “Error Tones”

TROUBLESHOOTING

Problem	Possible Solutions
Tone Coded Squelch	
You cannot screen out calls from users outside of your tone group.	Make sure the channel is programmed with tone squelch. Activate Tone (coded) squelch. (Note 7.)
You cannot hear Tone coded messages while in Tone (coded) squelch.	Confirm that the channel is programmed to detect the same code as the calling radio(s) transmits. (Note 7.)
Others in your tone group cannot hear your tone coded messages.	Verify that you transmit the same code as the radio(s) you call are programmed to detect. (Note 7.)

Notes

1) Try a battery pack from a working radio. If the radio in question works with that pack, the original battery is suspect. Charge the suspect battery as recommended in this manual. Then, if the charged original battery cannot power the handheld, try charging again with another charger. If the battery still doesn't hold a charge, the pack should probably be replaced. However, if the battery appears to be good after you try the second charger, the first charger might be faulty. If you think that an accessory is not operating properly, contact your dealer or RITRON. (Radio accessories come with a 90-day limited warranty.)

2) Reception can often be improved by moving a short distance. This effect is more noticeable inside of buildings. The range of these portables equipped with a standard battery pack is about two miles (line-of-sight).

3) If your radio does not detect calls from other radios on the channel, turn off tone squelch. (Press both Volume buttons at the same time - a double beep means that tone squelch is off.)

4) If you want to hear a call, you must select a channel that is programmed to receive the caller's transmit frequency. If you want to call another unit, you must select a channel that is programmed to transmit the other radio's receive frequency. However, if you use a repeater, your channel must be programmed to work with the repeater's transmit and receive frequencies. (A radio channel can hold two separate operating frequencies, one for Receive, the other for Transmit.)

5) Maximum power drain occurs while the radio transmits, so don't hold down the Push-To-Talk button more than necessary. Battery power is used while the handheld is left on to receive calls. If practical, switch off the unit.

6) In extreme cold, a battery's charge capacity is greatly reduced. If you use the radio in very cold weather, periodically warm the portable underneath your coat if possible. An optional remote speaker/microphone would allow you to keep the radio under your coat while transmitting and receiving.

7) In order for radios to communicate using Quiet Call, they must be programmed with the same tone code. Each code is unique, and your radio will respond only to the code programmed.

   Press and hold both volume buttons at the same time. A single beep means that tone squelch is on. A double beep means that tone squelch is off.

PROGRAMMING THE RADIO

Each JMX-141 may be programmed to operate on up to 4 channels. The JMX-141 may be programmed using its Push-to-Talk switch or an optional RITRON programming kit.

PTT (PUSH-TO-TALK) PROGRAMMING allows you to program any channel to one of the radio frequencies listed in Table 1 and any Quiet Call code listed in Table 2. The radio will transmit and receive on the programmed table frequency and QC code.

PC PROGRAMMING allows you to program any frequency within the band and channel spacing of the radio model. This method also lets you customize the handheld with optional operating features.

PTT (PUSH-TO-TALK) PROGRAMMING

Placing the Radio in PTT Programming Mode

1. Turn off the radio by pressing the Volume Down button until the “radio off” prompt sounds.
2. Press and hold the PTT button.
3. While holding the PTT button, press and hold the Volume On button until a rapid beeping is heard in the speaker.
4. Release the PTT and Volume On buttons. A series of five beeps will sound in the speaker indicating that the radio is in PTT program mode.

Note: If the radio will not enter PTT program mode, this feature has probably been turned off using the optional PC programming kit.

How to Find Out What Is Already Programmed

1. Place the radio in PTT programming mode as described above.
2. Press the Channel button to select the radio channel you would like to read out.
3. Press the Volume Up button.
4. The radio will sound a series of beeps, pause, and then begin another series. Four series of beeps will be heard, with each series representing a digit. The number of beeps in a series is equal to the digit. (10 beeps = the digit 0)
5. Write down each digit while the radio pauses. List the digits in the order that you hear them.
6. The first two digits represent the frequency as shown in Table 1.
7. The second two digits represent the QC (CTCSS) tone frequency as shown in Table 2.

Note: If you are unable to read out a channel, it has probably been programmed using the PC programming kit to a frequency not contained in Table 1.

PROGRAMMING THE RADIO

PTT Programming the Radio

Four valid digits must be entered for the radio to accept PTT programming. The first two digits entered is the frequency code from Table 1, followed by the two digits for the QC code from Table 2.

1. Place the radio in PTT programming mode as described above.

2. Press the Channel button to select the radio channel you would like to program.

3. Enter the first digit by pressing the PTT button the number of times equal to the digit's value. (To enter the digit 0, press the PTT ten times.)

4. Pause after the digit is entered, a tone will sound indicating that the digit has been accepted.

5. Enter the second, third and fourth digits using the same method as the first digit.

6. Press the Volume Up button to enter the new channel programming. The radio will sound a confirmation tone to indicate that programming has been accepted.

PTT Programming Mistakes

Invalid Entries	An error tone means that you tried to save an invalid entry. No programming changes are made in this case. A triple tone will sound next indicating that the radio is still in programming mode, and ready for an entry.
PTT Entry Mistakes	If you press the PTT five times when you intended four, for example, or if you just lose count, do not press the Volume Up button to store the entry. Instead, start over by turning the radio off and placing the radio in programming mode again.

Return To Normal Operation

After you finish programming, turn the radio off and then on again. The radio will beep when it is ready for normal operation.

PROGRAMMING THE RADIO

Table 1 – PTT Programming Frequency Table

Code	Frequency	Description	Code	Frequency	Description
01	154.600	green dot	11	151.775	
02	154.570	blue dot	12	151.805	
03	151.625	red dot	13	151.835	
04	151.955	purple dot	14	151.895	
05	151.925		15	154.490	
06	154.540		16	151.655	
07	154.515		17	151.745	
08	154.655		18	151.865	
09	151.685		19	----------	
10	151.715		20	----------	

Table 2 – Quiet Call Codes and Frequencies

QC Code	Freq (Hz)	QC Code	Freq (Hz)	QC Code	Freq (Hz)	QC Code	Freq (Hz)
01	67.0	16	114.8	31	192.8	46	189.9
02	71.9	17	118.8	32	203.5	47	196.6
03	74.4	18	123.0	33	210.7	48	199.5
04	77.0	19	127.3	34	218.1	49	206.5
05	79.7	20	131.8	35	225.7	50	229.1
06	82.5	21	136.5	36	233.6	51	254.1
07	85.4	22	141.3	37	241.8		
08	88.5	23	146.2	38	250.3		
09	91.5	24	151.4	39	69.4		
10	94.8	25	156.7	40	159.8		
11	97.4	26	162.2	41	165.5		
12	100.0	27	167.9	42	171.3		
13	103.5	28	173.8	43	177.3		
14	107.2	29	179.9	44	No Tone		
15	110.9	30	186.2	45	183.5		

COMPUTER SOFTWARE COPYRIGHTS

PROGRAMMING THE RADIO USING A PC COMPUTER

RITRON's programming kit allows programming of the JMX-141 model radios using a PC compatible computer. An adapter cable connects the radio to a computer's serial communications port. Once the cable is hooked up, the user inserts the diskette provided into his computer's floppy disk drive and loads a software program.

This program transfers data between radio and computer memory, and includes on-screen instructions and help. Radio data may be saved to the computer's hard disk in order to program other radios.

The PC Programming Kit Includes:

1) Ritron Transceiver programming software, which is contained on 3.5" diskettes.

2) Installation instructions and a registration form.

3) Ritron PC to radio adapter cable, which is terminated at one end with a DB-25F connector, at the other end with a modular plug. The DB-25 plugs into the computer's serial port, the modular plug into the SST-SRVBD modular jack.

4) An adapter for use with JMX-141 portables. This adapter mates the modular plug to a 3.5 mm plug, for connection to the handheld audio jack.

The PC Programming Kit Requires:

A PC compatible computer with Windows 95 or later. The computer must have an RS-232 serial port available. A hard disk drive is recommended.

Programmable Features

The following features may be programmed on a per channel basis, or will affect all channels together.

Feature	Range	Standard Setting	Per Channel
Carrier Only, No Tones or Codes	-	-	√
Wide Band Channel	Yes - No	Yes	√
Quiet Call (CTCSS)	See Table 2	-	√

JMX-141 THEORY OF OPERATION

INTRODUCTION

The JMX-141 is a four-channel handheld transceiver built on a double sided circuit board. Both sides of the main printed circuit board are populated with components, with the bottom side containing only surface mounted components.

The JMX-141 is frequency synthesized, with all functions of the radio controlled by a microcontroller.

POWER SUPPLY AND VOLTAGE DISTRIBUTION

The JMX-141 is powered by an internal 6-cell rechargeable battery pack. The battery pack supplies power to the radio via two contact terminals that are connected to the PCB through P301. F301 is a 3A fuse in series with P301 for short circuit protection. The battery pack may be charged through 2.5 mm charge jack J301 via CR302 and F301. Zener diode CR301 prevents the batteries from discharging through the charger accessory, stops a reverse voltage from being applied to the battery pack through J301, and prevents a high voltage from being applied to the radio circuitry.

SW302 ON/VOL UP switched is pressed to switch on the JMX-141, turning on voltage pass transistor Q303 via R307. Q302 supplies power to IC301, a +5 VDC regulator used to power microcontroller IC302. Pin 23 of IC302 turns on Q303, which keeps Q302 turned on after SW302 has been released. Power is removed from the JMX-141 by pressing the VOL DN/OFF switch SW304 until a beep is heard from the speaker, at which time Q303 is turned off.

+5 VDC regulator IC301 supplies power directly to microcontroller IC302, audio circuits IC201 & IC102, reference oscillator Y301, synthesizer IC401, and PTT detect transistor Q301.

The RXEN output at Pin 11 of IC302 lets Q104 & Q105 switch the regulated +5 VDC to the receiver. Pin 11 of IC302 will also turn on Q402 & Q407 enabling the receive VCO.

Power Strobe

The JMX-141 handheld includes a power strobe feature, which reduces battery current drain by periodically removing voltage from part of the radio. The strobe off cycle time is one second. The RX+V power strobe output of the Q104 collector switches the regulated +5 VDC to the receiver RF, IF and audio processing circuitry. Pin 11 of IC302 will also turn on Q402 & Q407 enabling the receive VCO. Receive audio amplifiers switched include IC102b & c 300 Hz high pass filters, IC102d buffer amp and IC102 a 250 Hz CTCSS low pass filter.

Low Battery Voltage Detection

Battery voltage is measured at A/D input Pin 28 of IC302 through voltage divider R308/R309. The radio will emit a periodic beep if low battery voltage is detected, and will turn the radio off if the battery voltage drops below +5.3 VDC. This is to protect the microcontroller and its EE memory from corruption due to low supply voltage.

REFERENCE OSCILLATOR

Reference oscillator Y301 is a 1.5 ppm temperature controlled, voltage controlled oscillator (TCVCXO) operating at 14.4 MHz. The Pin 4 output of the TCVCXO provides a reference for the frequency synthesizer IC401 at Pin 20. IC401 is programmed to provide an output at Pin 1 that is ¼ of the reference (3.6 MHz), which is applied as a reference oscillator to Pin 7 of IC302 microcontroller. The Y301 pin 4 output is also multiplied up to 43.2 MHz by Q106and its associated circuitry to provide a receiver 2nd local oscillator signal.

SYNTHESIZER

The JMX-141 radio is built around a common phase-locked loop (PLL) that consists of a voltage-controlled oscillator (VCO) and a frequency synthesizer. The PLL generates both the receiver 1st local oscillator and transmitter carrier signals. Control signals from microcontroller IC302 and Reference oscillator Y301 are routed to frequency synthesizer IC401 per the following chart:

Pin Numbers

	Clock	Data	Latch	LD	REF IN	REF OUT	+5SW	+5V
IC302	17	15	23	28	-	7	5	-
Y301	-	-	-	-	4	-	-	2
IC401	18	19	17	2	20	1	12	5, 14

Q403, C408 and associated components provide a filtered supply for the VCO oscillator and buffer amplifiers.

Prescaler Divider / Synthesizer Controller

IC401 contains both a prescaler and synthesizer controller. The prescaler squares and divides the VCO output present at pin 11 by either 64 or 65, determined by a synthesizer controller logic signal. The exact number of times the prescaler is instructed to change divisors is determined by the channel frequency.

IC401 contains a digital phase detector that works as follows: when an operating channel is changed or the receive/transmit mode switched, a new synthesizer operating frequency is selected. Microcontroller IC302 clocks new data into IC401 internal buffer in synchronization with clock pulses. The channel information is stored in EE memory of IC302 and is loaded into RAM when the channel is selected.

Once new data is loaded into the buffer, a single pulse from IC302 appears at IC401 to instruct the synthesizer controller to latch and execute the new data. IC401 utilizes internal circuitry to determine whether the present VCO output frequency is correct by comparing the phase and frequency of the VCO signal at Pin 11 to the 14.4 MHz reference oscillator at Pin 20. IC401 produces an output signal at Pin 6, a single-ended phase/frequency detector output, proportional to the phase difference between the two input signals.

The loop filter C421, C422, R413, R412 and C420 transform the Pin 6 output signal to a DC voltage for application to the VCO tuning varactors CR403 through CR406. The synthesizer system is “locked” when the phase and frequency of both the reference and the divided VCO signal are the same.

The maximum amount of current this output can sink or source is determined by the value of R415 tied to Pin 8 of IC401, with the output current programmable to 25, 50 or 100% of maximum.

VCO / Buffer Amplifiers

Q406, L404, CR405 & CR406 and associated components form the receive VCO (Voltage Controlled Oscillator), a resonant circuit that oscillates at frequencies from 192 MHz in receive (receive frequency +43.65 MHz) to 204 MHz. Varying the voltage at CR405 & 6 changes the varactor capacitance, which in turn alters the VCO output frequency.
Q404, L402, CR403 & CR404 and associated components form the transmit VCO (Voltage Controlled Oscillator), a resonant circuit that oscillates at frequencies from 148 MHz in receive (receive frequency +43.65 MHz) to 161 MHz. Varying the voltage at CR403 & 4 changes the varactor capacitance, which in turn alters the VCO output frequency. Audio from the modulating circuitry modulates CR401's capacitance which in turn FM modulates the VCO. Varactor CR402 is biased by the tuning voltage to keep FM deviation flat across the transmit band.

Q401 is a buffer amplifier feeding the input of the synthesizer at Pin 11, the receiver 1st local oscillator and the transmitter pre-amplifier.

JMX-141 THEORY OF OPERATION

RECEIVER

As mentioned before, Q104 switches the regulated +5 VDC to the receiver. The RX+V receiver voltage is switched at the strobe duty cycle.

RF Amplifier

A received signal from the antenna passes through a low-pass filter (L208, L209, C216, C218, C219, L210, C217 and C220) to the receiver headend. L101 and L102 and the associated capacitors form a bandpass filter ahead of low-noise RF amplifier Q101. L103 and L104 form a band pass filter and match to the JFET mixer.

1st Mixer

The amplified received input signal is applied to the gate of FET mixer Q102. The 1st local oscillator signal from the synthesizer module is applied to the source of Q102. L105, C114 and C115 tune the drain output of Q102 to 43.65 MHz and apply it to YF101, a 43.65 MHz two-pole crystal filter. Q103 and associated components amplify the 43.65 MHz IF signal and apply it to the input of the 2nd mixer at Pin 16 of IC101.

FM Receiver Subsystem

A multi-function integrated circuit, IC101 and associated components for the FM-receiver subsystem. The subsystem performs the following functions: 1) 2nd mixer, 2) 2nd IF amplifier, 3) FM detector, and 4) noise amplifier.

The Pin 4 output of 14.4 MHz reference oscillator Y301 is multiplied up to 43.2 MHz by Q106 and associated components. This signal is applied to the 2nd local oscillator input at Pin 1 of IC101. The 43.65 MHz signal at Pin 16 and the 2nd local oscillator are mixed, with the resulting 450 KHz output signal appearing at Pin 3. This signal is filtered by a 450 KHz 6-pole ceramic filter YF102 and applied to the input of the limiting IF amplifier at Pin 5. IC101 Pin 6 is the de-coupled input to the IF amplifier, Pin 7 the limited IF output signal. An internal quadrature detector, whose center frequency is determined by 450 KHz quadrature coil T101, detects the FM IF signal. One input of the quadrature detector is connected internally to the IF signal at Pin 7, while the other input is the phase-shifted signal from T101 at Pin 8.

Demodulated audio appears at Pin 9, where a low-pass filter (R127, C136) removes spurious quadrature output prior to application to the voice/tone conditioning audio circuitry. Demodulated audio from Pin 9 is applied to the Pin 10 input of a noise filter/amplifier consisting of R125, R126, R122, R123 C130 and C131. The Pin 11 output of the noise amplifier is applied to a biased noise detector CR101, with the output connected to pin 12 of IC101. The squelch hysterisis is about 2 dB.

Voice / Tone Conditioning in Receive Mode

After R127 and C136 remove the 450 KHz element from the demodulated audio output at Pin 9 of IC101, C134 couples the audio signal to IC102a for subaudible tone 250 Hz low pass filtering and C143 couples to IC102 b & c for voice 300 Hz high pass filtering.

Voice Band

IC102b & c along with its associated components form a high-pass filter/amplifier circuit that attenuates audio signals below 300 Hz. IC102d and IC103 form a variable gain amplifier controlled by IC302. De-emphasis is realized in R150, R152 and C148. Alert tones are added via R151 and C145 from IC302 pin 13.

Sub-Audible

After being filtered by a 250 Hz third order low pass filter the CTCSS signal is read by IC302 pin 27 A/D port. An internal discrete Fourier transform looks for the wanted tone. Decode bandwidth is about +/-2 Hz.

Audio Amplifier

Receive audio from volume control IC102d is applied to the Pin 2 input IC104, a 1 Watt audio amplifier. C154 couples the Pin 5 output to the internal 8Ω speaker SP301 via audio jack J302.

Microcontroller IC302 Pin 14 switches DC power to the audio amplifier by turning on Q108, which then turns on pass transistor Q107 to apply battery voltage to Pin 6 of the audio amp. CR102 prevents an inadvertent DC voltage at J302 from damaging the audio amplifier.

ANTENNA SWITCHING / LOW PASS FILTER

A low-pass filter comprised of filter L209, L210, C216, C217, C219 and C220 removes harmonics from the transmitter output before applying the RF signal to the antenna. Received signals pass through the low-pass filter before entering the receiver RF amplifier circuitry.

Two PIN diodes (CR202, CR103) and associated components form the antenna switching circuit. With the JMX-141 in receive mode, no voltage is applied to the PIN diodes and they do not conduct. This reverse biases CR202 to prevent the transmitter amplifier from affecting the receiver tuning . Incoming signals from the antenna pass through the low-pass filter, then L206 to the receiver headend.

When the JMX-141 is switched into transmit mode, transmitter supply voltage is switched on by Q304 and Q305 and applied to R214. Current flows through R214, L207, CR202, L206 and then CR203 to ground, forward biasing the PIN diodes. CR202 passes transmitter RF power to the antenna while CR203 shunts the receiver RF amplifier input to ground. L206 provides sufficient impedance to isolate the transmitter power from the receiver RF amplifier.

TRANSMITTER

Keying

The JMX-141 transmitter is keyed when PTT switch SW301 is depressed. Electret condenser microphone M301 is connected in series to ground with the PTT switch, which when depressed draws current through M301, SW301, CR303 and R303 to turn on pull up transistor Q301. Q301 then pulls pin 1 input of microcontroller IC302 high. The microcontroller transmit enable output at Pin 12 (TXEN) then goes high to turn on Q304 , which turns on pass transistor Q305 to apply +7VDC to the transmitter as described previously. The transmitter can also be keyed through J301 with an audio accessory that inserts a microphone and PTT switch in series to ground, drawing current through CR303.

The Pin 12 TXEN output of microcontroller IC302 can hold the transmitter on after the PTT switch has been released to allow tone related turn-off codes for squelch tail elimination.

Power Amplifier

Q201, Q202 and associated components amplify the VCO signal and apply it to the input of RF Final amplifier Q203 at Pin 1. The output of Q203 is matched to the antenna switching circuitry and applied to the antenna through the low-pass filter.

Voice and CTCSS processing

Microphone voice goes through PTT switch SW301 and CR303 before being amplified by IC201a. R222 and C224 form a pre-emphasis network. Limiting occurs in the output of IC201b. IC201c & d form a fifth order low pass filter with corner frequency of 3 kHz. Sub-audible tones enter from IC302 pin 13 (TONEOUT) after voice limiting. CTCSS tones are generated by the pulse width modulated (PWM) output pin 13 of the microcontroller. The 8 bit PWM output operates at 7.2 kHz. A simple RC filter consisting of R226 and C226 are sufficient to suppress higher order frequency components. The fifth order 3kHz low pass filter further attenuates the 7.2 kHz components. The FM deviation is set by R237. Single point modulation of the VCO is used. The transmit loop bandwidth of the synthesizer is about 70 Hz. The loop is damped enough to keep the CTCSS deviation from 67 to 250 Hz between 500 and 1000 Hz in wide band mode.

JMX-141 THEORY OF OPERATION

MICROCONTROLLER

The JMX-141 handheld transceiver is electronically controlled by IC302, an 8-bit flash programmable microcontroller. IC302 has A/D inputs and PWM outputs for processing analog signals. Radio characteristics are stored in internal EE memory. It's RS232 port is used in programming the radio's personal characteristics such as frequencies and tones.

PIN	DESCRIPTION
1	PTT input is pulled HIGH when either the internal or external PTT switch is pressed to initiate transmitter operation.
2	CHANNEL SELECT gets pulled low when activated.
3	NC
4	+5 VDC V_{CC} supply voltage.
5	GROUND
6	NC
7	XTAL1 is 3.6 MHz reference input from IC401.
8	NC
9	VOLUP gets pulled low when activated.
10	VOLDN gets pulled low when activated.
11	RXEN goes high to enable receiver.
12	TXEN goes high to enable transmitter.
13	TONE OUT generates the QC (CTCSS) waveforms via an 8 bit PWM prior to modulating the VCO in transmit mode. Also generates alert tones heard on the speaker.
14	SQUELCH output goes high to apply power to audio amp IC104 for receiver speaker audio or radio alert tones.
15	DATA output sends serial data to frequency synthesizer IC401 to program frequency information. Also used for flash programming (MOSI)
16	VOL1 is the LSB in receiver audio gain. Also used in flash programming (MISO).
17	SCK output sends serial data clock pulses to frequency synthesizer.
18	AVCC supplies +5VDC.
19	NC
20	AREF supplies the reference level for the A/D and is connected to the regulated +5 VDC.
21	AGND supplies A/D ground.
22	NC
23	ON ENABLE/ ENB output is HIGH when the radio is turned on, keeping pass transistor Q302 turned on via Q303 to supply power to the radio. Also used to latch data into IC401 when driven low momentarily.
24, 25, 26	AUDIO GAIN BITS control an analog switch IC103 to set audio gain on received audio.
27	CTCSS IN is an A/D input sampling the CTCSS waveform at 1000 to 1700 Hz. A discrete Fourier transform is subsequently performed on the desired frequency.
28	LOCKDET is an A/D input used to measure the battery voltage for low and dead battery detection. When the input falls below about 2.1 volts the battery is dead. This input also serves as the synthesizer lock detect. Unlock occurs when pulled to +5VDC by Q406.
29	/RESET is held low to start the radio in a known state on power up.
30, 31	SERIAL DATA PORT links the microcontroller to communications from an external data terminal via J302 RING connection. This allows programming of the JMX-141 EE memory used to store channel frequency and configuration information.
32	CARDET gets pulled low when a RF carrier is detected by the IC101.

JMX-141 ALIGNMENT PROCEDURE

An authorized RF service technician must perform test and alignment of the JMX-141. Do not attempt service of the JMX-141 if not completely familiar with frequency synthesized radio operation. The JMX-141 can operate in either Narrow Band (2.5 KHz deviation) or Wide Band (5 KHz deviation) systems. No receiver or transmitter alignment is necessary. Only four manual adjustments are possible.

RECOMMENDED TEST EQUIPMENT

1) 0 to +15 VDC, 2A current-limited power supply
2) RF Communications Test Set (to 470 MHz) with:
   - FM Deviation Meter
   - RF Wattmeter
   - Frequency Counter (to 470 MHz)
   - SINAD Measuring Device
3) Oscilloscope (to 20 MHz)
4) VTVM or DMM
5) RITRON PC Programming Kit
6) RITRON 141-SRVBD Test Module

RADIO PREPARATION

1) Remove the JMX-141 from the case. See assembly diagram for assistance.
2) Install the RITRON 141-SRVBD test assembly and serial programming cable as follows:
   a) Remove the JMX-141 antenna from the radio.
   b) Plug the 141-SRVBD into the 2.5 mm and 3.5 mm jacks on top of the radio.
   c) Screw the 141-SRVBD antenna nut fully into the JMX-141 antenna connector.
   d) Set the jumper on the 141-SRVBD assembly to the “VHF” position.
   e) Connect the serial programming cable from the PC computer (with the RITRON PC programming kit software installed) to the 141-SRVBD test assembly
3) Connect the FM communications test set to the BNC connector on the 141-SRVBD test assembly.
4) Apply power (7.5 VDC) and turn on the radio to place it in operating mode.

JMX-141 ALIGNMENT PROCEDURE

REFERENCE FREQUENCY

1) Make sure that the unit has been switched on and is at room temperature (approximately +25° C)
2) Set the RF communications test set to the transmit mode.
3) Press the PTT button to transmit
4) Transmitter frequency error should be less than +/- 200 Hz.
5) Adjust the trimmer cap in the rectangular reference frequency oscillator YF301 if not within 4).

JMX-141 ALIGNMENT PROCEDURE

TRANSMITTER VOICE DEVIATION

Transmitter voice deviation has been set at the factory and should not require adjustment. If adjustment is needed perform the following.

1) Set the RF communications test set to the transmit mode.
2) Set audio filtering from <20 Hz to 3kHz.
3) Set to FM demod with +/- peak deviation.
4) Select channel with no CTCSS tone programmed.
5) Connect audio source to 2.5 mm microphone input set to 1 kHz and 100 mV RMS .
6) The JMX-141 should start transmitting when a 2.5 mm microphone cable plug is connected to the audio generator with a DC path to ground. An attenuator pad can be inserted if a DC path to ground is not present in the generator. Adjust generator accordingly.
7) Adjust R237 for peak deviation of 2000+/-50 Hz on narrow band channels or +/-4000+/-100 Hz on wide band.
8) Stop transmitting by disconnecting cable.
9) Check other channels as needed.

NOTE: CTCSS tone deviation is automatically set to be within 500 to 1000 Hz after this adjustment on wide band tone enabled channels. Maximum voice and tone deviation on CTCSS wide band channels will then be 4500 to 5000 Hz. Narrow band tone deviation will be 250 to 500 Hz with overall deviation of 2250 to 2500 Hz.

RECEIVER SQUELCH LEVEL

The JMX-141 receiver is factory tuned for a frequency range of 148-161 or 161-174 MHz. The JMX-141 receiver is configured from the factory for narrow band operation. The 43.650 MHz first IF has a +/-6.0 kHz bandwidth. The 450 kHz second IF has a minimum +/- 4.5 kHz 6 dB bandwidth. With a +/-1.5 ppm reference oscillator the first LO frequency error will be less than 300 Hz. Acceptable wideband deviation (+/-5 kHz) demodulation occurs provided the transmitter has a comparable stability. When a channel is set to narrow band the hardware in the receiver stays the same but the CTCSS decode algorithm compensates for the lower deviation.

1) Select a channel.
2) Adjust squelch pot R131 fully clockwise.
3) Set communications test set generator to yield 12 dB SINAD with +/-1.5 kHz deviation with a 1 kHz tone on desired frequency.
4) Adjust squelch pot R131 fully counter clockwise.
5) Turn R131 slowly clockwise until squelch opens.
6) Reduce generator level until radio squelches.
7) Increase generator level until audio opens. Confirm squelch hysteresis is 2- 4 dB.

NOTE: Under +/-3.0 kHz deviation the squelch opening level will be around 2 dB higher. The squelch will open at lower levels in very cold temperatures. If squelch opens with no signal under extremely cold temperatures place JMX-141 inside your coat and warm it up a bit. If continued use in very cold temperatures will be happening adjust squelch slightly higher.

SST-444 VOLTAGE CHART

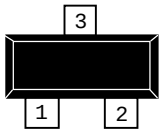
Measurement Conditions

Supply voltage at 7.5 VDC, radio in operating mode, volume control at minimum, power strobe enabled, transmitter set for full power.

IMPORTANT: Because the JMX-141 portable is constructed with grounding sub-planes, use a system ground in the same proximity as the circuit being measured. All readings indicated as GND are true system ground.

KEY: All measurements are in VDC unless indicated otherwise.

NC = No connection
GND = Ground
* = Voltage is strobed in Power Saver mode
→ = See note in right column



SOT-23

JMX-141 VOLTAGES

DEVICE	PIN	Transmit	Receive	Standby	DESCRIPTION
CR101	1	0.1	0.9	0.65	squelch noise rectifier
	2	GND	GND	GND	
	3	0.15	0.45	0.3	
CR102	C	7.5	7.5	7.5	Voltage clamp
	A	0.0	0.0	0.0	
CR301	C	7.5	7.5	7.5	Over voltage protection
	A	GND	GND	GND	
CR302	C	7.5	7.5	7.5	Charging rectification
	A	1.4	4.65	4.65	
CR303	1	0.7	4.65	4.65	PTT switching
	2	1.4	4.65	4.65	
	3	0.79	4.9	4.9	
CR304	1	NC	NC	NC	VolUp voltage clamp
	2	6.7	6.7	6.7	
	3	4.9	4.9	4.9	
CR305	1	0	0	0	Serial port Voltage clamp
	2	5.0	5.0	5.0	
	3	0.25	0.25	0.25	

JMX-141 VOLTAGE CHART

DEVICE	PIN	Transmit	Receive	Standby	DESCRIPTION
CR401	C	2.2	2.2	2.2	Mod Biasing
	A	GND	GND	GND	
CR402	C	4.9	4.9	4.9	Mod compensation biasing
	A	→	→	→	→ 1.0 – 4.5 VDC TX VCO tuning voltage
CR403	C	→	→	→	→ 1.0 – 4.5 VDC TX VCO tuning voltage
	A	0	0	0	
CR404	C	→	→	→	→ 1.0 – 4.5 VDC TX VCO tuning voltage
	A	GND	GND	GND	
CR405	C	→	→	→	→ 1.0 – 4.5 VDC RX VCO tuning voltage
	A	0	0	0	
CR406	C	→	→	→	→ 1.0 – 4.5 VDC RX VCO tuning voltage
	A	GND	GND	GND	
IC101	1	0.0	4.7	*	RX FM-IF subsystem
	2	NC	4.2	NC	
	3	0.0	4.4	*	
	4	0.0	4.7	*	
	5	0.0	4.3	*	
	6	0.0	4.3	*	
	7	0.0	4.3	*	
	8	0.0	4.7	*	
	9	0.0	2.1	*	
	10	0.0	0.75	*	
	11	0.0	1.0	*	
	12	0.0	0.9	*	
	13	NC	0	*	
	14	0.0	4.9	*	
	15	GND	GND	GND	
	16	0.0	1.7	*	
IC102	1	*	2	*	RX audio filter
	2	*	2	*	
	3	*	1.9	*	
	4	*	4.75	*	
	5	*	2	*	
	6	*	2	*	
	7	*	2	*	
	8	*	2	*	
	9	*	2	*	
	10	*	2	*	
	11	GND	GND	GND	
	12	*	2	*	
	13	*	2	*	
	14	*	2	*	
IC103	1	*	2	*	audio gain controller
	2	*	2	*	
	3	*	2	*	
	4	*	2	*	
	5	*	→	*	→ 0 to set gain weight, 5=off
	6	*	→	*	→ 0 to set gain weight, 5=off
	7	*	2	*	
	8	GND	GND	GND	
	9	*	2	*	
	10	*	2	*	
	11	*	2	*	

	12	*	→	*	→ 0 to set gain weight, 5=off
	13	*	→	*	→ 0 to set gain weight, 5=off
	14	*	2	*	
	15	*	2	*	
	16	*	4.8	*	
IC104	1	*	1.3	*	audio power amp
	2	*	0	*	
	3	*	0	*	
	4	*	GND	*	
	5	*	3.7	*	
	6	*	7.5	*	
	7	*	3.7	*	
	8	*	1.3	*	
IC201	1	2	2	*	TX audio filter
	2	2	2	*	
	3	2	2	*	
	4	4.9	4.9	*	
	5	2	2	*	
	6	2	2	*	
	7	2	2	*	
	8	2	2	*	
	9	2	2	*	
	10	2	2	*	
	11	GND	GND	GND	
	12	2	2	*	
	13	2	2	*	
	14	2	2	*	
IC301	1	7.5	7.5	*	5 V regulator
	2	GND	GND	*	
	3	7.5	7.5	*	
	4	NC	NC	*	
	5	5.0	5.0	*	
IC302	1	5.0	0.0	0.0	Microcontroller
	2	5.0	5.0	5.0	
	3	NC	NC	NC	
	4	5.0	5.0	5.0	
	5	GND	GND	GND	
	6	NC	NC	NC	
	7	2.1	2.2	2.1	
	8	NC	NC	NC	
	9	5	5	5	
	10	5	5	5	
	11	0	5	*	
	12	5	0	0	
	13	*	*	*	
	14	0	5	0	
	15	*	*	*	
	16	→	→	→	→ 0 when gain bit is set, 5=off
	17	*	*	*	
	18	5	5	5	
	19	NC	NC	NC	
	20	5.0	5.0	5.0	
	21	GND	GND	GND	
	22	NC	NC	NC	
	23	5	5	5	
	24	→	→	→	→ 0 when gain bit is set, 5=off
	25	→	→	→	→ 0 when gain bit is set, 5=off
	26	→	→	→	→ 0 when gain bit is set, 5=off
	27	2	2	2	
	28	→	→	→	→ 3v nominal, 40% of VBATT

	29	5	5	5	
	30	0.2	0.2	0.2	
	31	0.2	0.2	0.2	
	32	4.6	0	*	
IC401	1	→	→	→	→ 3.6 MHz clock signal
	2	5.0	5.0	*	Frequency synthesizer
	3	NC	NC	NC	
	4	NC	NC	NC	
	5	5.0	5.0	5.0	
	6	→	→	*	→ 1.0 – 4.5 VDC VCO tuning voltage
	7	GND	GND	GND	
	8	2.2	2.2	*	
	9	NC	NC	NC	
	10	2.4	2.4	*	
	11	2.4	2.4	*	
	12	5.0	5.0	*	
	13	NC	NC	NC	
	14	5.0	5.0	5.0	
	15	0.0	0.0	*	
	16	NC	NC	NC	
	17	5.0	5.0	5.0	
	18	*	*	*	
	19	*	*	*	
	20	2.2 →	2.2 →	*	→ 14.4 MHz reference signal

JMX-141 VOLTAGE CHART

DEVICE	PIN	Transmit	Receive	Standby	DESCRIPTION
Q 101	1	0	.7	*	RX RF amplifier
	2	GND	GND	GND	
	3	0.0	2.7	*	
Q 102	1	0.0	4.7	*	RX mixer
	2	0.0	2.1	*	
	3	0.0	0	*	
Q 103	1	0.0	0.7	*	RX IF amplifier
	2	0.0	0.0	*	
	3	0.0	3.9	*	
Q 104	1	5	4.2	*	RX pass switch
	2	5	5.0	*	
	3	2	4.8	*	
Q 105	1	0.0	5	*	RX switch
	2	GND	GND	GND	
	3	5	0	*	
Q 106	1	0.0	1.4	*	RX 2nd LO multiplier/amp
	2	0	1.1	*	
	3	2	4.3	*	
Q 107	1	0	6.8	*	audio amp pass switch
	2	0	7.5	*	
	3	0	7.5	*	
Q 108	1	0.0	5	*	audio amp switch
	2	GND	GND	GND	
	3	0	0	*	
Q 109	1	0	0.7	*	1st LO buffer amp
	2	0	0.0	*	
	3	0	3.2	*	
Q 201	1	0	0.65	0	TX buffer 1
	2	0	GND	0	
	3	0	5.9	0	
Q 202	E	GND	0.0	0.0	TX buffer 2
	B	.4	0.0	0.0	
	C	6.9	0	0	
Q 203	E	-0.1	0.0	0.0	TX RF final amplifier
	B	GND	GND	GND	
	C	7.5	7.5	7.5	

SST-444 VOLTAGE CHART

DEVICE	PIN	Transmit	Receive	Standby	DESCRIPTION
Q 301	1	4.3	5	*	PTT buffer
	2	5	5	*	
	3	5	0	*	
Q 302	1	4.3	4.3	4.3	ON pass switch
	2	5.0	5.0	5.0	
	3	5.0	5	5	
Q 303	1	5.0	5.0	5.0	ON buffer amp
	2	GND	GND	GND	
	3	0	0	0	
Q 304	1	5.0	0	0	TX ON buffer amp
	2	GND	GND	GND	
	3	0	7.5	7.5	
Q 305	1	6.8	7.5	7.5	TX strobe
	2	7.5	7.5	7.5	
	3	7.3	0	0	
Q 401	1	1	1	*	VCO buffer amplifier
	2	0.25	0.25	*	
	3	4.1	4.1	*	
Q 402	1	0.7	0.7	*	VCO buffer amplifier switch
	2	GND	GND	GND	
	3	0.1	0.1	*	
Q 403	1	4.9	4.9	4.9	super filter
	2	4.1	4.1	4.1	
	3	5	5	5	
Q 404	1	4.1	4.1	*	TX oscillator
	2	1.3	3.3	*	
	3	GND	GND	GND	
Q 405	1	0.7	0	*	TX oscillator ON
	2	GND	GND	GND	
	3	0.1	3.2	*	
Q 406	1	4.1	4.1	*	RX oscillator
	2	3.3	1.3	*	
	3	GND	GND	GND	
Q 407	1	0	0.7	*	RX oscillator ON
	2	GND	GND	GND	
	3	3.2	0.1	*	
Q 408	1	5	5	*	RX oscillator ON
	2	5	5	*	
	3	→	→	*	→40% of battery voltage

JMX-141 SCHEMATIC REFERENCE PARTS LIST

NOTE: This parts list reflects the most current component values. If a component value given in the schematic differs from this list, the parts list should be considered the most current.

Last Update: July 27, 2000

Ref	Ritron PN	Description	X	Y	Theta	Loc
CAPACITORS						
C101	15110470	47PF NPO 0805 50V CHIP	588	-569	0	Bottom
C102	15110560	56PF NPO 0805 50V CHIP CAPACITOR	527	-489	0	Bottom
C103	15110101	100PF NPO 0805 50V CHIP CAP	408	-547	270	Bottom
C104	15110560	56PF NPO 0805 50V CHIP CAPACITOR	447	-413	0	Bottom
C105	15110470	47PF NPO 0805 50V CHIP	225	-366	90	Top
C106	15181331	330pF CAPACITOR, CHIP, 0402, X7R, 5/10%	364	-583	0	Top
C107	15110330	33PF NPO 0805 50V CHIP	127	-458	180	Bottom
C108	15110680	68PF NPO 0805 50V CHIP CAPACITOR	272	-659	0	Top
C109	15110101	100PF NPO 0805 50V CHIP CAP	420	-659	0	Top
C110	15110220	22PF NPO 0805 50V CHIP CAP	380	-765	270	Top
C111	15179103	.01UF X7R 0603 25V CHIP CAPACITOR	530	-129	270	Top
C112	15181331	330pF CAPACITOR, CHIP, 0402, X7R, 5/10%	184	-135	0	Bottom
C113	15119104	.1uF X7R 0805 25V CERAMIC CHIP CAP	211	-114	270	Bottom
C114	15180150	15pF CAPACITOR, CHIP, 0402, COG, 5%	441	-101	0	Bottom
C115	15180470	47pF CAPACITOR, CHIP, 0402, COG, 5%	186	-114	270	Top
C116	15179103	.01UF X7R 0603 25V CHIP CAPACITOR	286	-171	180	Top
C118	15119104	.1uF X7R 0805 25V CERAMIC CHIP CAP	243	-215	270	Bottom
C119	15181331	330pF CAPACITOR, CHIP, 0402, X7R, 5/10%	432	-185	270	Top
C120	15181102	.001uF CAPACITOR, CHIP, 0402, X7R, 5/10%	30	-301	90	Bottom
C121	15180100	10pF CAPACITOR, CHIP, 0402, COG, 5%	193	-313	270	Bottom
C122	15180150	15pF CAPACITOR, CHIP, 0402, COG, 5%	84	-287	180	Bottom
C123	15119104	.1uF X7R 0805 25V CERAMIC CHIP CAP	628	-227	270	Top
C124	15179103	.01UF X7R 0603 25V CHIP CAPACITOR	226	-262	90	Bottom
C125	15180470	47pF CAPACITOR, CHIP, 0402, COG, 5%	171	-275	270	Bottom
C126	15119104	.1uF X7R 0805 25V CERAMIC CHIP CAP	299	-279	270	Bottom
C127	15119104	.1uF X7R 0805 25V CERAMIC CHIP CAP	380	-279	270	Bottom
C128	15119104	.1uF X7R 0805 25V CERAMIC CHIP CAP	151	-297	180	Top
C129	152B6106	10uF 10V 3.4 X 2.8 CHIP TANTALUM	91	-309	0	Top
C130	15181102	.001uF CAPACITOR, CHIP, 0402, X7R, 5/10%	374	-240	90	Top
C131	15181102	.001uF CAPACITOR, CHIP, 0402, X7R, 5/10%	417	-227	180	Top
C132	15119104	.1uF X7R 0805 25V CERAMIC CHIP CAP	288	-227	90	Top
C133	152B6106	10uF 10V 3.4 X 2.8 CHIP TANTALUM	182	-241	0	Top
C134	15119104	.1uF X7R 0805 25V CERAMIC CHIP CAP	514	-252	0	Top
C136	15179103	.01UF X7R 0603 25V CHIP CAPACITOR	391	-249	0	Bottom
C137	15119104	.1uF X7R 0805 25V CERAMIC CHIP CAP	445	-207	90	Top
C138	15179103	.01UF X7R 0603 25V CHIP CAPACITOR	548	-229	270	Top
C139	15119104	.1uF X7R 0805 25V CERAMIC CHIP CAP	585	-197	270	Top
C140	15119104	.1uF X7R 0805 25V CERAMIC CHIP CAP	976	-236	270	Top
C141	15119104	.1uF X7R 0805 25V CERAMIC CHIP CAP	1033	-249	270	Top
C142	15119104	.1uF X7R 0805 25V CERAMIC CHIP CAP	812	-249	270	Top
C143	15119104	.1uF X7R 0805 25V CERAMIC CHIP CAP	521	-252	180	Bottom
C144	15119104	.1uF X7R 0805 25V CERAMIC CHIP CAP	1084	-236	0	Top
C145	152BD226	CAP,22 UF, 10V, 3.4X2.8 B TANT	695	-233	270	Bottom
C146	15119104	.1uF X7R 0805 25V CERAMIC CHIP CAP	495	-218	90	Bottom
C147	15179103	.01UF X7R 0603 25V CHIP CAPACITOR	507	-174	90	Bottom
C148	15119104	.1uF X7R 0805 25V CERAMIC CHIP CAP	609	-177	180	Bottom
C149	152B6106	10uF 10V 3.4 X 2.8 CHIP TANTALUM	780	-131	270	Bottom
C150	15179103	.01UF X7R 0603 25V CHIP CAPACITOR	689	-103	90	Bottom
C151	15119104	.1uF X7R 0805 25V CERAMIC CHIP CAP	1091	-102	90	Bottom
C152	15119104	.1uF X7R 0805 25V CERAMIC CHIP CAP	891	-140	270	Bottom
C153	15119104	.1uF X7R 0805 25V CERAMIC CHIP CAP	994	-907	90	Bottom
C154	1503212	220MF 10V ELT CAPACITOR, 5mm HEIGHT	855	-896	180	Top
C155	15119104	.1uF X7R 0805 25V CERAMIC CHIP CAP	729	-179	90	Bottom

C156	15119104	.1uF X7R 0805 25V CERAMIC CHIP CAP	299	-253	90	Bottom
C157	15179103	.01UF X7R 0603 25V CHIP CAPACITOR	444	-121	0	Bottom
C158	15181331	330pF CAPACITOR, CHIP, 0402, X7R, 5/10%	240	-144	0	Bottom
C201	15119104	.1uF X7R 0805 25V CERAMIC CHIP CAP	1700	-144	90	Top
C202	15181331	330pF CAPACITOR, CHIP, 0402, X7R, 5/10%	1626	-145	90	Top
C203	15180100	10pF CAPACITOR, CHIP, 0402, COG, 5%	1499	-150	0	Bottom
C204	15181331	330pF CAPACITOR, CHIP, 0402, X7R, 5/10%	1767	-142	270	Top
C206	15181331	330pF CAPACITOR, CHIP, 0402, X7R, 5/10%	1251	-124	90	Bottom
C207	15180390	39pF CAPACITOR, CHIP, 0402, COG, 5%	1251	-115	90	Bottom
C208	15181331	330pF CAPACITOR, CHIP, 0402, X7R, 5/10%	1328	-114	0	Top
C209	15119104	.1uF X7R 0805 25V CERAMIC CHIP CAP	1234	-104	90	Bottom
C210	151102A2	2.2PF NPO 0805 50V CHIP CAP	-193	-891	0	Top
C211	15119104	.1uF X7R 0805 25V CERAMIC CHIP CAP	1130	-639	90	Top
C212	15110471	470PF NPO 0805 50V CHIP	1781	-610	180	Top
C213	15110220	22PF NPO 0805 50V CHIP CAP	1208	-783	270	Bottom
C214	15110471	470PF NPO 0805 50V CHIP	1155	20.1618		Top
C216	15110471	470PF NPO 0805 50V CHIP	994	-700	90	Bottom
C217	151106A8	6.8PF NPO 0805 50V CHIP	1041	-474	0	Bottom
C218	15110470	47PF NPO 0805 50V CHIP	1075	-700	270	Bottom
C219	15110470	47PF NPO 0805 50V CHIP	823	-647	270	Bottom
C220	15110150	15PF 0805 NPO 50V CHIP CAP	1074	-320	270	Bottom
C221	15119104	.1uF X7R 0805 25V CERAMIC CHIP CAP	533	-410	180	Bottom
C222	15180150	15pF CAPACITOR, CHIP, 0402, COG, 5%	1059	-399	270	Bottom
C223	15179103	.01UF X7R 0603 25V CHIP CAPACITOR	1092	-411	0	Bottom
C224	15119104	.1uF X7R 0805 25V CERAMIC CHIP CAP	990	-411	270	Bottom
C225	15180150	15pF CAPACITOR, CHIP, 0402, COG, 5%	1139	-430	0	Bottom
C227	152BD226	CAP,22 UF, 10V, 3.4X2.8 B TANT	1650	-428	90	Top
C228	15179103	.01UF X7R 0603 25V CHIP CAPACITOR	1465	-432	90	Bottom
C229	15181102	.001uF CAPACITOR, CHIP, 0402, X7R, 5/10%	1664	-429	270	Bottom
C230	15179103	.01UF X7R 0603 25V CHIP CAPACITOR	1593	-405	0	Bottom
C231	15181102	.001uF CAPACITOR, CHIP, 0402, X7R, 5/10%	1447	-410	270	Bottom
C232	15179103	.01UF X7R 0603 25V CHIP CAPACITOR	1503	-387	0	Bottom
C233	152BD226	CAP,22 UF, 10V, 3.4X2.8 B TANT	1379	-430	180	Top
C234	151804A7	4.7pF CAPACITOR, CHIP, 0402, COG, 5%	1623	-135	0	Bottom
C235	15179103	.01UF X7R 0603 25V CHIP CAPACITOR	1593	-411	180	Bottom
C236	15181102	.001uF CAPACITOR, CHIP, 0402, X7R, 5/10%				
C237	15181102	.001uF CAPACITOR, CHIP, 0402, X7R, 5/10%				
C301	15181102	.001uF CAPACITOR, CHIP, 0402, X7R, 5/10%	904	-392	0	Top
C302	15181102	.001uF CAPACITOR, CHIP, 0402, X7R, 5/10%	1284	-195	90	Bottom
C303	15179103	.01UF X7R 0603 25V CHIP CAPACITOR	520	-283	270	Top
C304	15179103	.01UF X7R 0603 25V CHIP CAPACITOR	165	-266	0	Top
C305	152A8105	1MFD 16V ~3.2 X 1.6~ CHIP TANTALUM	1315	-157	270	Bottom
C306	15119104	.1uF X7R 0805 25V CERAMIC CHIP CAP	1764	-157	180	Bottom
C307	15181102	.001uF CAPACITOR, CHIP, 0402, X7R, 5/10%	1437	-180	90	Top
C308	15119104	.1uF X7R 0805 25V CERAMIC CHIP CAP	1569	-186	90	Top
C309	152B6106	10uF 10V 3.4 X 2.8 CHIP TANTALUM	701	-154	270	Bottom
C310	15119104	.1uF X7R 0805 25V CERAMIC CHIP CAP	839	-154	90	Bottom
C311	15181102	.001uF CAPACITOR, CHIP, 0402, X7R, 5/10%	1466	-204	90	Bottom
C312	15181102	.001uF CAPACITOR, CHIP, 0402, X7R, 5/10%	1414	-204	90	Bottom
C313	15181102	.001uF CAPACITOR, CHIP, 0402, X7R, 5/10%	1365	-204	90	Bottom
C314	15181102	.001uF CAPACITOR, CHIP, 0402, X7R, 5/10%	1319	-204	90	Bottom
C315	15181102	.001uF CAPACITOR, CHIP, 0402, X7R, 5/10%	1351	-211	0	Bottom
C316	15179103	.01UF X7R 0603 25V CHIP CAPACITOR	1351	-215	0	Bottom
C317	15181102	.001uF CAPACITOR, CHIP, 0402, X7R, 5/10%	193	-170	90	Top
C318	15119104	.1uF X7R 0805 25V CERAMIC CHIP CAP	1360	-222	180	Bottom
C319	15180100	10pF CAPACITOR, CHIP, 0402, COG, 5%	1190	-229	180	Bottom
C320	15181102	.001uF CAPACITOR, CHIP, 0402, X7R, 5/10%	1351	-229	0	Bottom
C321	15180150	15pF CAPACITOR, CHIP, 0402, COG, 5%	577	-356	0	Bottom
C322	15181102	.001uF CAPACITOR, CHIP, 0402, X7R, 5/10%	736	-266	0	Top
C323	152BD226	CAP,22 UF, 10V, 3.4X2.8 B TANT	953	-126	180	Bottom
C324	15119104	.1uF X7R 0805 25V CERAMIC CHIP CAP	963	-129	270	Top
C325	15179103	.01UF X7R 0603 25V CHIP CAPACITOR	1521	-205	90	Bottom
C326	15181102	.001uF CAPACITOR, CHIP, 0402, X7R, 5/10%	1576	-204	90	Bottom
C327	15181102	.001uF CAPACITOR, CHIP, 0402, X7R, 5/10%	1618	-204	90	Bottom
C328	15181102	.001uF CAPACITOR, CHIP, 0402, X7R, 5/10%	1632	-212	180	Bottom
C329	15181102	.001uF CAPACITOR, CHIP, 0402, X7R, 5/10%	1643	-239	270	Bottom
C330	15181102	.001uF CAPACITOR, CHIP, 0402, X7R, 5/10%	1685	-239	270	Bottom

C331	15181102	.001uF CAPACITOR, CHIP, 0402, X7R, 5/10%	1632	-216	180	Bottom
C332	15181102	.001uF CAPACITOR, CHIP, 0402, X7R, 5/10%	1602	-239	270	Bottom
C333	15179103	.01UF X7R 0603 25V CHIP CAPACITOR	1314	-237	270	Bottom
C334	15181102	.001uF CAPACITOR, CHIP, 0402, X7R, 5/10%	1517	-239	270	Bottom
C335	15179103	.01UF X7R 0603 25V CHIP CAPACITOR	1372	-237	270	Bottom
C336	15181331	330pF CAPACITOR, CHIP, 0402, X7R, 5/10%	1427	-238	90	Bottom
C337	15181102	.001uF CAPACITOR, CHIP, 0402, X7R, 5/10%	1476	-239	270	Bottom
C338	15181102	.001uF CAPACITOR, CHIP, 0402, X7R, 5/10%	1559	-239	270	Bottom
C339	15181331	330pF CAPACITOR, CHIP, 0402, X7R, 5/10%	1803	-218	270	Bottom
C340	15181331	330pF CAPACITOR, CHIP, 0402, X7R, 5/10%	1798	-489	90	Bottom
C341	15181102	.001uF CAPACITOR, CHIP, 0402, X7R, 5/10%	1648	-220	0	Bottom
C342	15181102	.001uF CAPACITOR, CHIP, 0402, X7R, 5/10%	1655	-248	270	Top
C343	15181331	330pF CAPACITOR, CHIP, 0402, X7R, 5/10%	1217	-238	90	Bottom
C344	15181331	330pF CAPACITOR, CHIP, 0402, X7R, 5/10%	1794	-352	0	Bottom
C345	15181331	330pF CAPACITOR, CHIP, 0402, X7R, 5/10%	1760	-191	270	Top
C346	15110471	470PF NPO 0805 50V CHIP	1766	-168	0	Bottom
C347	15181331	330pF CAPACITOR, CHIP, 0402, X7R, 5/10%	1792	-128	0	Bottom
C401	15180100	10pF CAPACITOR, CHIP, 0402, COG, 5%	1636	-297	0	Top
C402	15110100	10PF NPO 0805 50V CHIP CAP	1700	-306	270	Top
C403	15110220	22PF NPO 0805 50V CHIP CAP	1616	-306	270	Top
C404	15181331	330pF CAPACITOR, CHIP, 0402, X7R, 5/10%	1350	-320	270	Top
C406	15181102	.001uF CAPACITOR, CHIP, 0402, X7R, 5/10%	1454	-346	270	Top
C408	152BD226	CAP,22 UF, 10V, 3.4X2.8 B TANT	799	-369	180	Top
C409	15179103	.01UF X7R 0603 25V CHIP CAPACITOR	842	-276	0	Top
C410	15180150	15pF CAPACITOR, CHIP, 0402, COG, 5%	1377	-381	270	Top
C411	151801A0	1.0pF CAPACITOR, CHIP, 0402, COG, 5%	1420	-372	0	Top
C412	15110560	56PF NPO 0805 50V CHIP CAPACITOR	1277	-375	180	Top
C413	15181331	330pF CAPACITOR, CHIP, 0402, X7R, 5/10%	958	-375	180	Top
C414	15119104	.1uF X7R 0805 25V CERAMIC CHIP CAP	1756	-349	270	Top
C415	15181331	330pF CAPACITOR, CHIP, 0402, X7R, 5/10%	1729	-333	270	Top
C416	15180100	10pF CAPACITOR, CHIP, 0402, COG, 5%	1566	-361	270	Top
C417	151804A7	4.7pF CAPACITOR, CHIP, 0402, COG, 5%	1678	-350	270	Top
C418	15110220	22PF NPO 0805 50V CHIP CAP	1634	-377	270	Top
C419	15110220	22PF NPO 0805 50V CHIP CAP	1309	-350	180	Top
C420	15111333	.033MFD X7R 0805 50V CHIP CAP	976	-361	270	Top
C421	15111333	.033MFD X7R 0805 50V CHIP CAP	867	-340	0	Top
C422	152AB334	.33MF 35V ~3.2X1.6~ CHIP TANTALUM	884	-327	90	Top
C423	15181331	330pF CAPACITOR, CHIP, 0402, X7R, 5/10%	1183	-302	0	Top
C424	15119104	.1uF X7R 0805 25V CERAMIC CHIP CAP	1190	-280	90	Top
C425	15179103	.01UF X7R 0603 25V CHIP CAPACITOR	1668	-291	0	Top
C426	15119104	.1uF X7R 0805 25V CERAMIC CHIP CAP	1624	-268	0	Top
C427	15181102	.001uF CAPACITOR, CHIP, 0402, X7R, 5/10%	956	-276	180	Top
C428	151801A0	1.0pF CAPACITOR, CHIP, 0402, COG, 5%	1270	-313	180	Top
C429	15181102	.001uF CAPACITOR, CHIP, 0402, X7R, 5/10%	1050	-342	90	Top
C430	15181331	330pF CAPACITOR, CHIP, 0402, X7R, 5/10%	1339	70.1518		Top
C431	15181102	.001uF CAPACITOR, CHIP, 0402, X7R, 5/10%	759	-296	0	Top
C432	151804A7	4.7pF CAPACITOR, CHIP, 0402, COG, 5%	1162	-319	270	Top
C433	15180100	10pF CAPACITOR, CHIP, 0402, COG, 5%	1256	-317	0	Top
C434	15180100	10pF CAPACITOR, CHIP, 0402, COG, 5%	1162	-311	90	Top
C435	15181102	.001uF CAPACITOR, CHIP, 0402, X7R, 5/10%	736	-287	270	Top
C436	15181331	330pF CAPACITOR, CHIP, 0402, X7R, 5/10%	917	-311	0	Top
C437	15181331	330pF CAPACITOR, CHIP, 0402, X7R, 5/10%	1718	-269	90	Top
C438	151801A0	1.0pF CAPACITOR, CHIP, 0402, COG, 5%	1256	-323	0	Top
C439	15181331	330pF CAPACITOR, CHIP, 0402, X7R, 5/10%	321	-361	180	Bottom

DIODES:

CR101	48A1005C	MMBD7000, DUAL DIODES IN SERIES, SOT-23	329	-212	270	Top
CR102	48AA01SA	DIODE, 1A, 50V, SMT, D0214AC CASE	818	-113	180	Top
CR202	48DB0003	PIN DIODE, SOD-323, BA782S or BA591	1005	-775	270	Top
CR203	48DB0003	PIN DIODE, SOD-323, BA782S or BA591	540	-651	180	Bottom
CR301	48B61012	1N4742A ZENER DIODE, 12V 1W DL-41 MELF	1105	-415	90	Top
CR302	48AA01SA	DIODE, 1A, 50V, SMT, D0214AC CASE	673	-410	90	Top
CR303	48A100A3	MMBD2835, DUAL DIODES, COM ANODE, SOT-23	356	-408	90	Bottom
CR304	48A1005C	MMBD7000, DUAL DIODES IN SERIES, SOT-23	1232	-172	0	Bottom
CR305	48A1005C	MMBD7000, DUAL DIODES IN SERIES, SOT-23	1345	-176	90	Top
CR401	48CB0001	VARACTOR DIODE, SOD-323, BB729S, BB153	1521	-377	90	Top

CR402	48CB0001	VARACTOR DIODE, SOD-323, BB729S, BB153	1093	-375	180	Top
CR403	48CB0001	VARACTOR DIODE, SOD-323, BB729S, BB153	1162	-358	0	Top
CR404	48CB0001	VARACTOR DIODE, SOD-323, BB729S, BB153	1162	-366	0	Top
CR405	48CB0001	VARACTOR DIODE, SOD-323, BB729S, BB153	1314	-338	90	Top
CR406	48CB0001	VARACTOR DIODE, SOD-323, BB729S, BB153	1404	5	9.929	Top
WIRE JUMPER:						
F301	6000040	WIRE; #40AWG TINNED BUS (INCHES)	866	-412	270	Bottom
INTEGRATED CIRCUITS:						
IC101	31030001	MC3361BD SO-16 IF SUBSYSTEMS	211	-268	90	Top
IC102	310K0004	LMV324MT RAIL TO RAIL QUAD OP AMP	859	-219	0	Top
IC103	31124066	MC14066 QUAD ANALOG SWITCH SO-14	835	-204	0	Bottom
IC104	31010004	LM386MX-1 AUDIO AMP SO-8	887	-108	180	Bottom
IC201	310K0004	LMV324MT RAIL TO RAIL QUAD OP AMP	1372	-409	0	Top
IC301	31040003	REGULATOR, 50ma LDO, TPS76050DBVR	1109	-158	180	Bottom
IC302	314L0001	MCU, AT90S2333-4AC FLASH 32 PIN TQFP	1492	-224	0	Top
JACKS:						
J301	2100001	2.5MM PC-MT JACK; ANT-CHGR	1190	-61	0	Top
J302	2100053	3.5MM STEREO JACK; PANEL MOUNT	1572	-83	0	Top
INDUCTORS:						
L101	1870954	4.5T AIRFCW COIL .09 a L	687	-47	3590	Top
L102	1870954	4.5T AIRFCW COIL .09 a L	407	-338	180	Top
L103	1870955	5.5T AIRFCW COIL .1 a L	26	-563	270	Top
L104	1870954	4.5T AIRFCW COIL .09 a L	231	-126	0	Top
L105	18110102	CHIP INDUCTOR 1.0uhy	512	-115	270	Top
L106	1870954	4.5T AIRFCW COIL .09 a L	280	-133	270	Top
L107	18110102	CHIP INDUCTOR 1.0uhy	72	-276	90	Bottom
L201	18110101	CHIP INDUCTOR 0.1uhy	1661	-159	90	Top
L202	18110101	CHIP INDUCTOR 0.1uhy	1167	-124	90	Top
L203	1870953	3.5T AIRFCW COIL .07 a L	1366	-120	6.519	Top
L205	1870955	5.5T AIRFCW COIL .1 a L	1712	-817	9.036	Top
L206	1870953	3.5T AIRFCW COIL .07 a L	1349	-882	8.047	Top
L208	1870955	5.5T AIRFCW COIL .1 a L	732	-711	45	Top
L209	1870954	4.5T AIRFCW COIL .09 a L	1045	-578	135	Top
L210	1870804	COIL,4.5T,0.150 ID,#26AWG,LHH CW	903	-468	0	Top
L401	18110101	CHIP INDUCTOR 0.1uhy	1452	-318	180	Top
L402	18112470	INDUCTOR, CHIP, 47NH, 2%	1564	-348	90	Top
L403	18110102	CHIP INDUCTOR 1.0uhy	1463	8	3.46	Top
L404	18112470	INDUCTOR, CHIP, 47NH, 2%	1162	-333	270	Top
L405	18110102	CHIP INDUCTOR 1.0uhy	1043	-309	0	Top
MICROPHONE:						
M301	5500037	MICROPHONE; ELECTRET, MINIATURE	0	0	0	Bottom
PLUGS:						
P201	25500700	CONTACT, PCB MNT, ANTENNA,SST	956	-105	90	Top
P301	21310021	HEADER, 2 PIN SIDE ENTRY SHROUDED	866	-399	0	Top
TRANSISTORS:						
Q101	48210E2P	BFS17A, VHF, SOT-23 LOW NOISE	113	-482	90	Top
Q102	4841006U	MMBFJ309LT1, N-CHAN, RF, SOT23	431	-111	180	Bottom
Q103	4821003B	MMBT918LT1 VHF SOT23 (3B)	393	-161	180	Top
Q104	4801002A	MMBT3906 PNP, SOT23	345	-199	0	Bottom
Q105	48010R02	MUN2211T1, NPN, INT 10K/10K BIAS, 8A,	86	-198	0	Bottom
Q106	4821003B	MMBT918LT1 VHF SOT23 (3B)	133	-300	270	Bottom
Q107	480100DH	BCW68GLT1 .8AMP PNP SOT-23	1031	-141	0	Bottom
Q108	48010R02	MUN2211T1, NPN, INT 10K/10K BIAS, 8A,	1226	-139	180	Bottom
Q109	4821003B	MMBT918LT1 VHF SOT23 (3B)	478	-136	180	Bottom
Q201	4821003B	MMBT918LT1 VHF SOT23 (3B)	1615	-150	180	Bottom

Q202	482300FA	BFQ17, VHF, SOT89 RF DRIVER	1315	-146	90	Top
Q203	4801032	MRF-553 VHF RF PWR TRANSISTOR	1538	-104	0	Top
Q204	4801002A	MMBT3906 PNP, SOT23	1153	-124	90	Bottom
Q301	4801002A	MMBT3906 PNP, SOT23	531	-389	270	Bottom
Q302	480100DH	BCW68GLT1 .8AMP PNP SOT-23	1481	-162	270	Bottom
Q303	4801001Q	MMBT5088 NPN, SOT-23	1624	-166	270	Bottom
Q304	48010R02	MUN2211T1, NPN, INT 10K/10K BIAS, 8A,	1353	-253	180	Bottom
Q305	480100DH	BCW68GLT1 .8AMP PNP SOT-23	853	-128	180	Top
Q401	4821003B	MMBT918LT1 VHF SOT23 (3B)	1611	-332	270	Top
Q402	4801001Q	MMBT5088 NPN, SOT-23	1048	-286	90	Top
Q403	4801001Q	MMBT5088 NPN, SOT-23	725	-348	0	Top
Q404	4841006T	MMBFJ310T1 NFET GP SOT-23	1662	-363	180	Top
Q405	4801001Q	MMBT5088 NPN, SOT-23	701	-306	90	Top
Q406	4841006T	MMBFJ310T1 NFET GP SOT-23	1020	-325	0	Top
Q407	4801001Q	MMBT5088 NPN, SOT-23	875	-289	180	Top
Q408	4801002A	MMBT3906 PNP, SOT23	1707	-281	180	Top

RESISTORS:

R101	47180332	3.3K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	223	-502	270	Top
R102	47180102	1K OHM RESISTOR, CHIP,0402, 1/16W,5%	121	-379	0	Top
R103	47180271	270 OHM RESISTOR, CHIP, 0402, 1/16W, 5%	280	-553	270	Top
R104	47180470	47 OHM RESISTOR, CHIP, 0402, 1/16W, 5%	280	-613	270	Bottom
R106	47180470	47 OHM RESISTOR, CHIP, 0402, 1/16W, 5%	473	-129	270	Top
R107	47180470	47 OHM RESISTOR, CHIP, 0402, 1/16W, 5%	530	-119	90	Bottom
R108	47180332	3.3K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	573	-119	270	Bottom
R109	47180100	10 OHM RESISTOR, CHIP,0402, 1/16W 5%	270	-152	0	Top
R110	47180223	22K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	383	-150	0	Top
R111	47180472	4.7K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	291	-160	90	Top
R112	47180151	150 OHM RESISTOR, CHIP, 0402, 1/16W,5%	374	-185	270	Top
R113	47180152	1.5K OHM RESISTOR, CHIP, 0402, 1/16W,5%	403	-176	180	Top
R114	47180103	10K OHM, RESISTOR, CHIP, 0402,1/16W,5%	243	-199	90	Bottom
R115	47180103	10K OHM, RESISTOR, CHIP, 0402,1/16W,5%	188	-199	270	Bottom
R116	47180472	4.7K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	84	-313	90	Bottom
R117	47180152	1.5K OHM RESISTOR, CHIP, 0402, 1/16W,5%	30	-313	90	Bottom
R118	47180103	10K OHM, RESISTOR, CHIP, 0402,1/16W,5%	226	-275	90	Bottom
R119	47180391	390 OHM RESISTOR, CHIP, 0402, 1/16W, 5%	297	-269	180	Bottom
R120	47180100	10 OHM RESISTOR, CHIP,0402, 1/16W 5%	463	-266	270	Top
R121	47180473	47K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	215	-306	90	Top
R122	47180154	150K OHM RESISTOR, CHIP, 0402, 1/16W,5%	332	-240	270	Top
R123	47180224	220K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	320	-248	180	Top
R124	47180391	390 OHM RESISTOR, CHIP, 0402, 1/16W, 5%	230	-229	270	Top
R125	47180223	22K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	418	-240	270	Top
R126	47180152	1.5K OHM RESISTOR, CHIP, 0402, 1/16W,5%	416	-231	0	Top
R127	47180152	1.5K OHM RESISTOR, CHIP, 0402, 1/16W,5%	406	-248	0	Top
R128	47180394	390K OHM RESISTOR, CHIP, 0402, 1/6W, 5%	85	-229	270	Top
R129	47180223	22K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	163	-225	180	Top
R130	47180104	100K OHM, RESISTOR, CHIP, 0402,1/16W,5%	42	-229	270	Top
R131	47270103	VARIABLE RESISTOR 10K SEALED	159	-209	270	Top
R132	47180332	3.3K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	35	-202	270	Top
R133	47180223	22K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	487	-231	90	Top
R134	47180394	390K OHM RESISTOR, CHIP, 0402, 1/6W, 5%	516	-214	270	Top
R135	47180153	15K OHM RESISTOR, CHIP, 0402, 1/16W,5%	496	-221	0	Top
R136	47180332	3.3K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	564	-210	90	Top
R137	47180472	4.7K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	628	-211	90	Top
R138	47180472	4.7K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	505	-196	90	Top
R139	47180102	1K OHM RESISTOR, CHIP,0402, 1/16W,5%	936	-246	0	Top
R140	47180473	47K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	1062	-221	180	Top
R141	47180152	1.5K OHM RESISTOR, CHIP, 0402, 1/16W,5%	704	-248	270	Top
R142	47180103	10K OHM, RESISTOR, CHIP, 0402,1/16W,5%	935	-252	180	Top
R143	47180473	47K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	1051	-206	180	Top
R144	47180104	100K OHM, RESISTOR, CHIP, 0402,1/16W,5%	1099	-201	270	Bottom
R145	47180473	47K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	1033	-201	90	Bottom
R146	47180223	22K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	624	-217	90	Bottom
R147	47180103	10K OHM, RESISTOR, CHIP, 0402,1/16W,5%	569	-210	90	Bottom
R148	47180472	4.7K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	789	-236	90	Top
R149	47180332	3.3K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	833	-236	90	Top

R150	47180472	4.7K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	570	-199	90	Bottom
R151	47180104	100K OHM, RESISTOR, CHIP, 0402,1/16W,5%	495	-199	90	Bottom
R152	47180103	10K OHM, RESISTOR, CHIP, 0402,1/16W,5%	569	-187	90	Bottom
R153	47180103	10K OHM, RESISTOR, CHIP, 0402,1/16W,5%	800	-144	0	Bottom
R154	47180100	10 OHM RESISTOR, CHIP,0402, 1/16W 5%	1068	-898	90	Bottom
R155	47180152	1.5K OHM RESISTOR, CHIP, 0402, 1/16W,5%	1131	-139	90	Bottom
R156	47180103	10K OHM, RESISTOR, CHIP, 0402,1/16W,5%	442	-126	0	Bottom
R157	47180332	3.3K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	538	-126	180	Bottom
R158	47180271	270 OHM RESISTOR, CHIP, 0402, 1/16W, 5%	240	-140	180	Bottom
R159	47180223	22K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	1062	-225	0	Top
R201	47180103	10K OHM, RESISTOR, CHIP, 0402,1/16W,5%	1154	-116	0	Bottom
R202	47180470	47 OHM RESISTOR, CHIP, 0402, 1/16W, 5%	1512	-152	270	Top
R204	47180103	10K OHM, RESISTOR, CHIP, 0402,1/16W,5%	1623	-140	0	Bottom
R205	47180332	3.3K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	1746	-145	0	Bottom
R206	47180151	150 OHM RESISTOR, CHIP, 0402, 1/16W,5%	1499	-146	0	Bottom
R207	47180152	1.5K OHM RESISTOR, CHIP, 0402, 1/16W,5%	1344	-130	180	Top
R208	47180391	390 OHM RESISTOR, CHIP, 0402, 1/16W, 5%	1828	-217	270	Top
R209	47180100	10 OHM RESISTOR, CHIP,0402, 1/16W 5%	1264	-110	90	Top
R210	47180100	10 OHM RESISTOR, CHIP,0402, 1/16W 5%	1213	-110	90	Top
R211	47180100	10 OHM RESISTOR, CHIP,0402, 1/16W 5%	1743	-123	270	Top
R212	47100221	220 ohm 0805 CHIP RESISTOR	1811	-718	90	Top
R213	47100471	470 OHM 0805 CHIP RES.	1115	-868	270	Top
R214	47180271	270 OHM RESISTOR, CHIP, 0402, 1/16W, 5%	1004	-943	270	Top
R215	47180152	1.5K OHM RESISTOR, CHIP, 0402, 1/16W,5%	831	-363	270	Bottom
R216	47180472	4.7K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	662	-412	180	Bottom
R217	47180472	4.7K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	1271	-419	180	Bottom
R218	47180472	4.7K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	1133	-421	180	Bottom
R219	47180104	100K OHM, RESISTOR, CHIP, 0402,1/16W,5%	1133	-417	180	Bottom
R220	47180104	100K OHM, RESISTOR, CHIP, 0402,1/16W,5%	1111	-399	270	Bottom
R222	47180391	390 OHM RESISTOR, CHIP, 0402, 1/16W, 5%	1139	-425	180	Bottom
R223	47180223	22K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	1245	-432	270	Bottom
R225	47180332	3.3K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	1300	-432	90	Bottom
R226	47180332	3.3K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	715	-262	180	Bottom
R227	47180103	3.3K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	1395	-424	90	Bottom
R228	47180332	3.3K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	1343	-424	270	Bottom
R229	47180223	22K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	1392	-433	180	Bottom
R230	47180223	22K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	1609	-429	90	Bottom
R232	47180223	22K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	1502	-420	90	Bottom
R233	47180223	22K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	1502	-410	90	Bottom
R235	47180472	4.7K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	1607	-397	90	Bottom
R236	47180472	4.7K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	1663	-397	90	Bottom
R237	47270103	VARIABLE RESISTOR 10K SEALED	1628	-403	90	Top
R238	47180104	100K OHM, RESISTOR, CHIP, 0402,1/16W,5%	1509	-393	270	Top
R239	47180151	150 OHM RESISTOR, CHIP, 0402, 1/16W,5%	1269	30.9418		Top
R240	47180223	22K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	1154	-112	180	Bottom
R241	47180103	10K OHM, RESISTOR, CHIP, 0402,1/16W,5%	1455	-393	90	Top
R301	47180223	22K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	425	-388	90	Bottom
R302	47180103	10K OHM, RESISTOR, CHIP, 0402,1/16W,5%	513	-399	0	Bottom
R303	47180103	10K OHM, RESISTOR, CHIP, 0402,1/16W,5%	513	-403	0	Bottom
R304	47180103	10K OHM, RESISTOR, CHIP, 0402,1/16W,5%	1383	-171	90	Bottom
R305	47180103	10K OHM, RESISTOR, CHIP, 0402,1/16W,5%	1328	-171	270	Bottom
R306	47180103	10K OHM, RESISTOR, CHIP, 0402,1/16W,5%	236	-850	180	Top
R307	47180152	1.5K OHM RESISTOR, CHIP, 0402, 1/16W,5%	1526	-173	90	Bottom
R308	47180153	15K OHM RESISTOR, CHIP, 0402, 1/16W,5%	1725	-173	270	Top
R309	47180103	10K OHM, RESISTOR, CHIP, 0402,1/16W,5%	1780	-173	270	Top
R310	47180473	47K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	1730	-175	180	Bottom
R311	47180271	270 OHM RESISTOR, CHIP, 0402, 1/16W, 5%	1705	-486	270	Bottom
R312	47180102	1K OHM RESISTOR, CHIP,0402, 1/16W,5%	1410	-200	0	Top
R313	47180103	10K OHM, RESISTOR, CHIP, 0402,1/16W,5%	1496	-187	90	Top
R314	47180103	10K OHM, RESISTOR, CHIP, 0402,1/16W,5%	329	-374	270	Bottom
R315	47180103	10K OHM, RESISTOR, CHIP, 0402,1/16W,5%	321	-366	0	Bottom
R316	47180151	150 OHM RESISTOR, CHIP, 0402, 1/16W,5%	1648	-225	180	Bottom
R317	47180103	10K OHM, RESISTOR, CHIP, 0402,1/16W,5%	1229	-246	0	Bottom
R318	47180332	3.3K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	756	-129	270	Top
R319	47100000	ZERO OHM 0805 CHIP RES.	1357	-141	90	Bottom
R320	47100000	ZERO OHM 0805 CHIP RES.	969	-230	90	Bottom
R321	47100000	ZERO OHM 0805 CHIP RES.	858	-251	90	Bottom

R322	47100000	ZERO OHM 0805 CHIP RES.	1024	-251	90	Bottom
R323	47100000	ZERO OHM 0805 CHIP RES.	504	-230.5	218	Top
R325	47180470	47 OHM RESISTOR, CHIP, 0402, 1/16W, 5%	1251	-214	0	Top
R326	47180470	47 OHM RESISTOR, CHIP, 0402, 1/16W, 5%	1250	-240	180	Top
R327	47180470	47 OHM RESISTOR, CHIP, 0402, 1/16W, 5%	1385	-247	180	Top
R328	47180103	10K OHM, RESISTOR, CHIP, 0402,1/16W,5%	1779	-244	90	Bottom
R330	47180152	1.5K OHM RESISTOR, CHIP, 0402, 1/16W,5%				
R401	47180391	390 OHM RESISTOR, CHIP, 0402, 1/16W, 5%	1612	-321	90	Top
R402	47180102	1K OHM RESISTOR, CHIP,0402, 1/16W,5%	720	-359	180	Top
R403	47180223	22K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	1429	-381	270	Top
R404	47180104	100K OHM, RESISTOR, CHIP, 0402,1/16W,5%	958	-380	180	Top
R405	47180104	100K OHM, RESISTOR, CHIP, 0402,1/16W,5%	1735	-376	90	Top
R406	47180104	100K OHM, RESISTOR, CHIP, 0402,1/16W,5%	1045	-364	90	Top
R407	47180100	10 OHM RESISTOR, CHIP,0402, 1/16W 5%	1729	-321	270	Top
R408	47180103	10K OHM, RESISTOR, CHIP, 0402,1/16W,5%	1497	-334	90	Top
R409	47180472	4.7K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	1676	-321	270	Top
R410	47180472	4.7K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	1269	-360	90	Top
R411	47180152	1.5K OHM RESISTOR, CHIP, 0402, 1/16W,5%	1114	-349	90	Top
R412	47100472	4.7K OHM 0805 CHIP RES.	976	-348	90	Top
R413	47180103	10K OHM, RESISTOR, CHIP, 0402,1/16W,5%	984	-335	180	Top
R414	47100000	ZERO OHM 0805 CHIP RES.	993	-297	0	Top
R415	47180223	22K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	1183	-297	0	Top
R416	47180151	150 OHM RESISTOR, CHIP, 0402, 1/16W,5%	1170	-289	180	Top
R417	47180223	22K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	1446	2	6.59	Top
R418	47180223	22K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	1598	-279	270	Top
R419	47180223	22K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	1122	20.0	427	Top
R420	47180223	22K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	1017	80.0	227	Top
R421	47180151	150 OHM RESISTOR, CHIP, 0402, 1/16W,5%	1359	40.6	527	Top
R422	47180223	22K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	670	-288	270	Top
R423	47180472	4.7K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	1296	-327	180	Top
R424	47180152	1.5K OHM RESISTOR, CHIP, 0402, 1/16W,5%	1194	-347	180	Top
R425	47180151	150 OHM RESISTOR, CHIP, 0402, 1/16W,5%	917	-306	0	Top
R426	47180223	22K OHM RESISTOR, CHIP, 0402, 1/16W, 5%	691	-278	270	Top
SPEAKER:						
SP301	5500045	SPEAKER, 45MM, 1W, LOW PROFILE SST/RTX	1191	-551	3.371	Top
SWITCHES:						
SW301	5100046	SWITCH, TACT LO PROFILE RT ANGLE 160gf	97	-784	270	Top
SW302	5100042	SWITCH SPST MOMENTARY MINI PC 260GM	280	-142	180	Top
SW303	5100046	SWITCH, TACT LO PROFILE RT ANGLE 160gf	97	-163	270	Top
SW304	5100042	SWITCH SPST MOMENTARY MINI PC 260GM	800	-140	180	Top
TRANSFORMER:						
T101	5600018	455KHZ IF TRANSFORMER (5MM)	370	-304	0	Top
OSCILLATOR & FILTERS:						
Y301	23050003	TCVCXO, 14.400 MHz, 1.5 PPM, VC=30 PPM/V	498	-361	270	Top
YF101	2301403	43.650 MHz Crystal Filter +/-6.0KHz UM-1	84	-120	270	Top
YF102	2301022	FILTER,CERAMIC, 450KHz,+/-4.5KHz,6 POLE	237	-334	180	Top
FERRITE BEADS:						
Z201	18360001	BEAD; FERRITE SURFACE MOUNT	1067	-108	180	Top
Z202	18360001	BEAD; FERRITE SURFACE MOUNT	1472	-654	180	Top

HARDWARE

1350380D	PCB, DFSR4, 5UPM, .060 MIX, JMX-141
25602500	CRYSTAL SUPPORT, RUBBER PAD, SMALL/UM-1
06001021	#28 AWG STRANDED WIRE; RED (INCHES)
06001023	#28 AWG STRANDED WIRE;GREEN INCHES
06001026	#28 AWG STRANDED WIRE; BLACK INCHES

06001029	#28 AWG STRANDED WIRE; BLUE INCHES
25105500	SHIELD, JMX-141 SYNTHESIZER
25603000	FOAM, MOUNTING, SPEAKER
25603900	SPACER, MIC FOAM
25605700	MICROPHONE HOLDER
25900700	ADHESIVE, MTG, MIC HOLDER
2811H401	SCREW #4-40 X .25 LG TRIM HEAD PHILLIPS

JMX-141 CASE ASSEMBLY PARTS LIST

Ref	Ritron PN	Description
MAIN CASE ASSEMBLY		
	13250000	CASE W/INSERT, PLASTIC, SST BLACK
	13578000	DOOR, BATTERY, PLASTIC, SST 2-PC
	13588000	LATCH, BATTERY DOOR, PLASTIC SST 2-PC
	25106400	BATTERY DOOR HINGE RETAINER
	25201500	RETAINER, PLASTIC, PTT, SST
	25400600	BUSHING, THREADED, PLATED, ANTENNA SS
	25603300	GRILLE CLOTH, SPEAKER, SST
	25603400	DUAL JACK PLUG, RUBBER,SST
	25606200	HINGE, BATTERY DOOR, SST
	25800500	ACTUATOR, RUBBER,PTT,SST
	25800600	ACTUATOR, RUBBER, TACT, SST
	02802026	NUT; KNURLED; M4PO.5;/2.5MM JACK
	02802027	NUT; KNURLED; M6PO.5/3.5MM JACK
	28112401	SCREW 4-40 X 1/4" PHFLST
	28233G03	KNURLED NUT, ANTENNA, JMX
CASE BOTTOM ASSEMBLY		
	13564000	CASE, BOTTOM, PLASTIC, SST 2-PC
	2142D021	CONNECTOR, CABLE ASSEMBLY, 2-POS, SST+
	25400800	SPRING CONTACT, BATTERY, SST W/O TABSC
	25400900	CONTACT BATTERY SST-PLUS (POLARIZED)
	25604800	SPACER, PCB, FOAM, SST 2-PC
CASE LABELS		
	14220001	LABEL, CONTROLS, SST
	14222029	LABEL, NAMEPLATE, SST
	14290002	BLANK LABEL, .75" X .25" GLOSSY WHITE +
	14200037	LABEL SST/JMX MFG DATE CODE
	14200095	LABEL FCC SERIAL JMX-141
BELT CLIP		
	25201600	BELT CLIP, PLASTIC, SST BLACK
	2811B600	SCREW 6-32 X 1/4" PHTRST
BATTERY PACK AND INSULATOR		
	BPJS-6N	BATTERY, RECHG, 7.2V NiCd, YELLOW , SST
	14230088	LABEL, BATTERY, BPS-6N-SC, SST
	25300600	INSULATOR, BATTERY, FIBRE, SST
	25606000	FOAM SUPPORT, BATTERY JMX SERIES
	25601600	BATTERY SHIM; ASSEMBLY ~X~ SERIES
ANTENNA		
	AFS-150	ANTENNA VHF MOLDED, 150-160 REG LEN SST
PACKING MATERIALS		
	14210004	LOW BATTERY NOTICE LABEL
	14312006	SHIPPING CARTON, CARDBOARD,SST
	14321002	FOAM INSERT, PACKING, SST/MINI
	14500008	MANUAL, OWNERS, JMX/SST
	14500016	USER MANUAL JMX-141
	14540006	WARRANTY REGISTRATION CARD