**TYPE OF EXHIBIT**: INSTRUCTION MANUALS

**FCC PART**: 2.1033 (c)(3)

**MANUFACTURER**: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

**MODEL**: SST-442

**TYPE OF UNIT**: UHF-FM Handheld Transceiver

**FCC ID:** AIERIT13-442

**DATE:** May 11, 2001

Included in this exhibit is a draft of the Maintenance and Operating Manual for RITRON Model Patriot SST-442 UHF-FM Handheld Transceiver.

Specifically, this manual includes a technical description of the SST-442 sufficient to establish compliance with the technical standards of the applicable rule part(s).

This includes, but is not limited to, the following items required under FCC Part 2.1033 (c):

(2) FCC Identifier.
(3) A copy of the installation and operating instructions.
(4) Type of emission.
(5) Frequency range.
(6) Range of operating power, and means to provide variation in operating power.
(7) Maximum power rating.
(8) DC voltage chart.
(9) Tune-up procedure.
(10) A description of all frequency determining and stabilization circuits. A description of the circuits used to suppress spurious radiation, limiting modulation, and limiting power.
(12) Drawing with labels for controls and complete circuit diagrams.

Signed: Michael A. Pickard

Michael A. Pickard - Project Engineer

# PATRIOT

# TWO-WAY RADIO BY RITRON

## *RITRON MODEL SST-442*

## *UHF FM BAND PROGRAMMABLE HANDHELD RADIO*


## MAINTENANCE / REPAIR / OPERATING MANUAL

FOR USE BY AUTHORIZED SERVICE/MAINTENANCE PERSONNEL ONLY

SST-442-MRM REV A

### *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 SST-442 was designed to produce 2 Watts of Transmitter power at nominal battery voltage (+7.2 VDC), throughout the radio's operating frequency range. Measurements are made with the RITRON SST-SRVBD RF service module connected to the radio antenna terminal. The transmitter was designed with close tolerances to prevent RF power output from exceeding specifications and reducing battery life.

### *PCB and Firmware Revisions*

Changes in circuit design, component values, and radio firmware are made occasionally to enhance the performance of the SST-442. In general, the manual will be periodically updated for component value changes without a change in the manual revision level. Always refer to the Schematic Reference Parts List for the most recent component values. Changes in circuit design that require printed circuit board revision, or changes in firmware that significantly alter the operating characteristics of the radio, will be covered in a revised manual.

This manual is updated for the following revisions:

| | |
|---|---|
| SST-442-MRM | Rev A |
| PCB Revision | 1750270A |
| Firmware Revision | v06 |

## GENERAL

| | |
|---|---|
| **FCC ID**: | AIERIT13-442 |
| **FCC Rule Parts**: | 22, 74, 90, 95 |
| **Frequency Range**: | 450 to 470 MHz |
| **Max. Freq. Separation**: | 10 MHz |
| **RF Channels**: | Up to 10 Channels, Independent TX/RX frequencies. |
| **Synthesizer Step Size**: | 12.5 KHz |
| **Frequency Stability**: | +/-2.5 PPM (-30 to +60 C) TX/RX |
| **Tone/Code Signaling**: | CTCSS (Quiet Call)<br>Digital Coded Squelch (Digital Quiet Call) |
| **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 SST-SRVBD test device |
| **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. |

## CONTROLS

| | |
|---|---|
| **Push Button Controls**: | On/Volume Up, Volume Down/Off, PTT, Channel |

**Speaker Beep Indicators:**

| | |
|---|---|
| On/Volume Up: | Radio beeps channel number when turned on, followed by increasing audio to adjust volume. |
| Volume Down/Off: | Decreasing audio to adjust volume, with two tones when 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. |
| PTT: | Programmable for a single “transmit beep”. |
| Channel: | Number of beeps indicates channel. |

## TRANSMITTER

| | | |
|---|---|---|
| **RF Power Output**: | 2 Watts @ +7.2 VDC | |
| | Wide Mode | Narrow Mode |
| **Emission Designator**: | 16K0F3E | 11K0F3E |
| **Deviation**: | +/- 5.00 KHz | +/- 2.50 KHz |
| **FM Hum and Noise**: | -43 dB | -37 dB |
| **Audio Distortion**: | < 3 % | |
| **Spurious & Harmonics**: | -50 dBc | |
| **Audio Response**: | Meets FCC and EIA requirements | |
| **Time-out Timer**: | 60 seconds, programmable | |

## RECEIVER

| | Wide band Models | Narrow band Models |
|---|---|---|
| **Modulation Acceptance**: | +/- 7.0 KHz | +/- 3.75 KHz |
| **Sensitivity: (12 dB SINAD)** | 0.25 µV | 0.25 µV |
| **Adjacent Channel (EIA):** | -60 dB | -50 dB |
| **Spurious Rejection**: | -60 dB | -60 dB |
| **Image Rejection (EIA):** | -70 dB | -70 dB |
| **Intermodulation (EIA):** | -56 dB | -57 dB |
| **Noise Squelch Sensitivity**: | Programmable per channel, 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:** | Low side | |
| **QC/DQC Decode Time:** | per EIA Standards | |

## BATTERY

| | |
|---|---|
| **Battery Pack**: | +7.2 VDC, 800 mAH rechargeable NiCd battery pack standard |
| | +7.2 VDC, 1500 mAH rechargeable MiMH battery pack optional |
| **Battery Drain**: | |
| Standby: | 52 mA |
| Sleep: | 12 mA |
| Avg. Standby with Power Saver: | 24 mA |
| Receive: | 125 mA |
| Transmit: | 850 mA @ 2 Watts |

**Battery Life @ 90/5/5 Duty Cycle with Standard battery pack (800 mAH):**

12.7 Hrs, Battery Saver On
8.4 Hrs, Battery Saver Off

**Battery Life @ 90/5/5 Duty Cycle with High capacity battery pack (1500 mAH):**

23.7 Hrs, Battery Saver On
15.7 Hrs, Battery Saver Off

## GENERAL

RITRON's SST-442 handheld is a small, programmable two-way radio, designed to operate in the 450-470 MHz professional FM communications band. 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” programmed to contain a unique set of operating frequencies and options. Selective signaling options include Quiet Call (CTCSS) and Digital Quiet Call (DCS). Transmitter power, operating bandwidth and battery saver are among the options programmable on a per channel basis.

### *Model Identification*

The SST-442 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*

In 1991 the Institute of Electrical and Electronics Engineers (IEEE), and in 1992 the American National Standards Institute (ANSI) updated the 1982 ANSI standard for safety levels with respect to human exposure to RF energy. Over 120 scientists, engineers, and physicians from universities, government health agencies, and industry, after reviewing the available body of research, developed this updated Standard. In March 1993 the Federal Communications Commission (FCC) proposed the adoption of this updated Standard.

The SST-442 handheld radio is designed to comply with this Standard. To limit your exposure to levels at, or below, the levels in the Standard, please observe the following:

- Use only the antenna(s) available from RITRON for this model. DO NOT attempt to substitute any other antenna.
- Keep talk times as short and infrequent as possible. DO NOT depress the PTT button when not actually wishing to transmit. The radio is equipped with an internal timer to limit continuous transmit times.
- When transmitting, hold the radio in front of the mouth at a distance of at least 4 inches. DO NOT hold the radio in such a manner that the antenna is next to, or touching, exposed parts of the body, especially the face or eyes while transmitting.
- In belt mounted applications, when transmitting, remove the radio from the belt and hold away from the body at least 4 inches.
- When using external headset accessories, hold the unit away from the body at least 4 inches while transmitting.
- DO NOT allow children to operate the radio.

## CHARGING

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

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 BCC-PS). The battery pack may be charged inside or outside of the radio case.

To charge the battery using a drop-in charger (model BCC-PS) - 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.

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

## 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.

## BATTERY REPLACEMENT

To replace the battery in the SST-442:

1. Hold the radio as shown in FIG-1(A)
2. Use your thumbnail to open the Door Latch, as shown in FIG-1(A).
3. Lift and rotate the Battery Access Door to release it as shown in FIG-1(B).
4. Use the Pull-tab to pull the Battery Pack out of the case as shown in FIG-1(C).
5. Insert the replacement Battery Pack as shown in FIG-1(C). Push the Battery in as far as possible.
6. Replace the Battery Access Door. Secure it by closing the Door Latch as shown in FIG-1(A).
7. Be certain to firmly lock the Door Latch, as shown in FIG-1(A).

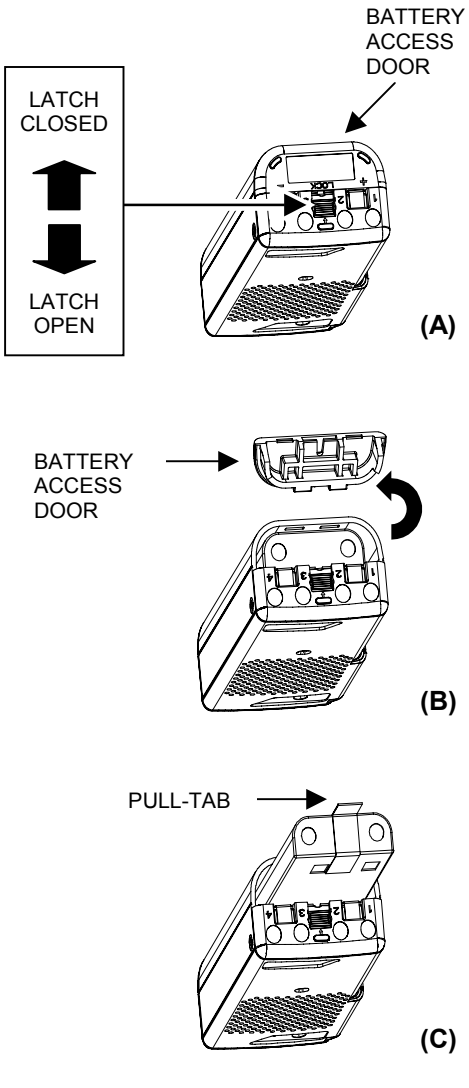



**FIG-1: Battery Replacement**

## BATTERY MAINTENANCE

With daily use and recharging, a battery's service life is about 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.
- Condition battery packs once a month as directed in Battery Conditioning.
- Condition batteries that are run down.
- Charge batteries for 16 hours before storage, and for 16 hours once a month thereafter.
- DO NOT charge batteries in temperatures colder than about 45°F. Charging batteries in temperatures above 95°C. does not harm them, but can reduce charge capacity.

**It is time to purchase a new battery:**

- When the radio's transmitter coverage decreases or does not work at all.
- When the radio quits working after just a few hours of use, even with a full overnight charge.
- 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 CONDITIONING

Due to the extended run time of the SST-442 radio, some users may never fully discharge the battery pack during normal use. Achieve maximum battery life by fully discharging the battery periodically to condition it.

After exposing the battery pack to many cycles of not fully discharging it before recharging, the radio may exhibit reduced battery capacity. This reduced capacity is evident when, after several hours of use, battery voltage drops while the radio is transmitting, causing the radio to emit a dead battery warning tone and shut itself off.

Condition battery packs by the following procedure as either a preventive measure, or if you suspect reduced capacity:

1. Use your radio throughout a normal working day without charging.
2. Press and hold the On/ Volume Up and Volume Down/ Off buttons simultaneously for 8 seconds to place the radio in "open squelch" mode.
3. Release both buttons when you hear the radio beep rapidly; it will then emit a loud "rushing" noise. Press On/ Volume Up to maximize this noise.
4. Put the radio away in a secure place (possibly a desk drawer), where nothing can press against the buttons to accidentally turn it off or cause it to transmit. Allow the radio to run until it shuts off when the battery is completely discharged. A typical battery pack may require up to 8 hours to completely discharge.
5. When the radio has shut off, charge it overnight for 12-14 hours. The battery will be ready for use with renewed 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.

Use only the antenna(s) available from RITRON for the SST-442. Do not attempt to substitute with any other antenna.

### On/Volume Up

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

### Volume Down/Off

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

### Push-To-Talk

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

### Channel Selector

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.

### 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.

### Microphone

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

### Speaker

The speaker allows you to hear calls on your channel.

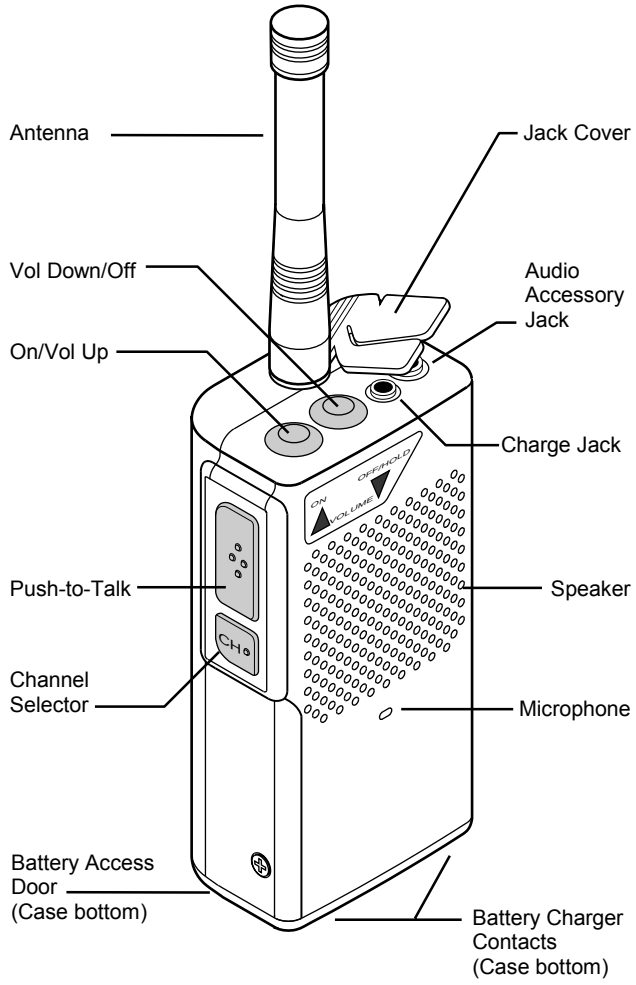



**Fig. 2 Controls and Accessory Connectors**

### 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.

### Battery Access (Case Bottom)

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

### Drop-in Charger Contacts (Case Bottom)

Two charger contacts in the bottom of the SST-442 radio case allow the battery pack to be charged using an optional RITRON drop-in charger (model BCC-PS.)

## RADIO OPERATION

### *On-off/Volume*

To switch on the radio - press the On/Volume Up button. The radio will beep a number of times equal to the current channel number.

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 two tones sound.

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 SST-442 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 SST-442. 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 the message.

### *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.

### *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.

### *Battery Saver*

The handheld has a programmable "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.

### *Transmit*

Normally, you should not transmit until no one is talking on the channel.

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

### *Channel Selection*

To change channels - press and release the Channel button. The radio will beep a number of times equal to the current channel number. Pressing the Channel button again will increment the channel and the radio will beep the new channel number. For example, if you select channel 2, the handheld will beep twice. 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.

### *Power On/Self Check "OK"*

When it is first turned on, the radio runs a quick "self test" to confirm basic functions. The radio then beeps the number of times equal to the channel number selected. The radio is then ready to use.

### *Error Tones*

However, if the "self test" detects a diagnostic error, an error tone sounds. Alternating tones (the second is longer and lower pitched) indicate the radio frequency synthesizer is malfunctioning. Turn off the radio and try again. A long, low-pitched tone means the battery voltage is too low to operate the radio. In this case, recharge the battery. If you cannot correct a problem, consult an authorized Ritron service facility or Ritron.

### *Channel Select*

When the Channel button is pressed, the radio beeps a number of times equal to the current channel number. Pressing the Channel button again will increment the channel and the radio will beep the new channel number.

### 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.

### *Recharge Battery Alert*

As the battery voltage approaches the minimum required "operating voltage" the radio will emit a short beep every minute to alert the user that the battery will soon need recharging. Once the battery charge drops below the required "operating voltage," the radio emits a long, low tone and turns itself off. If you turn the radio back on, it will beep again and shut itself off. Recharge the battery.

## OPTIONAL RADIO TONES

The SST-442 can be programmed using the RITRON PC Programmer for optional alert tones.

### *Receive Squelch Tone*

A short tone sounds at the end of each received transmission to indicate that you may transmit.

### *Busy Channel Transmit Inhibit*

If a user is transmitting on your radio frequency without your tone, you will not be allowed to transmit. The radio will beep a series of long, low tones while the PTT is held down (like a busy signal).

### *Transmitter Time Out*

A low tone followed by a higher-pitched tone sounds and the transmitter automatically shuts off if you hold down the PTT button longer than the programmed Time-out. The radio automatically switches to receive mode. Authorized service personnel can turn off this feature.

## 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.

## TROUBLESHOOTING

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

### *GENERAL*

***The radio does not work at all.***

- Make sure 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.)

### *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.)

### *ERROR TONES*

***An error tone sounds when the radio is first turned on.***

- Replace the battery. (Note 1.)
- See "Error Tones" in the Operation section.

***An error tone sounds while you are talking. (and the transmitter shuts off).***

- Refer to “Error Tones”

### *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.)

**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 METHODS

Each SST-442 can be programmed to operate on up to 10 channels. The SST-442 may be programmed using the Push-to-Talk switch or an optional RITRON PC 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

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

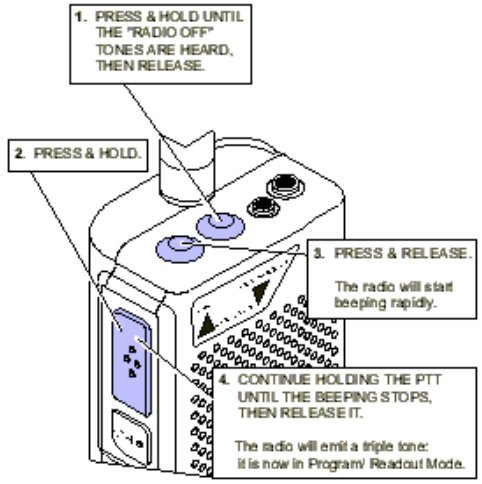



Fig. 3 PLACING THE RADIO IN PTT PROGRAM / READOUT MODE

### *Reading Out a Radio Channel's Contents*

1. Place the radio in Program / Readout mode as described in Fig-3.
2. Press the Channel Selector button to select the radio channel you would like to read out.
3. Press and release the Volume Up button.
4. The radio will emit 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. (See CHANNEL READOUT)
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 Frequency Table 1 on page 13.
7. The second two digits represent the QC (CTCSS) tone frequency as shown in Quiet-Call Tone Code Table 2 on page 13.
8. To read out another channel, follow steps 2 through 7.
9. Turn the radio off to exit Channel Readout mode.

Notes:

1. Ten (10) beeps = the digit zero (0)
2. The radio will beep out "44" as a tone code if it has been programmed for "No Tone".
3. A radio that has been PC-programmed with any frequency not listed in Frequency Table 1, page 13, will emit the error tone on content readout.

**CHANNEL READOUT:**

FREQUENCY CODE

**1st** digit _____ * **2nd** digit _____ *
*# of beeps in series* *# of beeps in series*

TONE CODE

**3rd** digit _____ * **4th** digit _____ ♦
*# of beeps in series* *# of beeps in series*

Notes:

* Pause after entering each digit. The radio will emit a low tone, separating one digit from the next.

♦ The radio sounds a triple beep when PTT channel programming is complete.

### *PTT Programming a Radio Channel*

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

1. Place the radio in Program / Readout mode as described in Fig-3 on page 11.
2. Press the Channel Selector 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.
4. Pause after the digit is entered, a low 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 emit a triple beep confirmation tone to indicate that programming has been accepted.
7. To program another channel, follow steps 2 through 6.
8. Turn the radio off and then on again – the radio is now ready for use.

Notes:

1. To enter the digit zero ( 0 ), press the PTT ten times.
2. Program "44" to enter "No Code" for Quiet Call. You must enter "44" to match radios not having tone codes.
3. An error tone will sound if you attempt to save an incorrect digit. Turn the radio off, check the digits you are attempting to enter, then start over again.
4. If you make a PTT click error, turn the radio off then on, and start over.
5. If the radio does not emit a confirming triple tone when you attempt to enter Program / Readout mode, the radio was dealer customized to disable PTT programming.
6. Refer to the Frequency Table 1 and Tone Code (Quiet Call™) Table 2 on page 13.

**PTT CHANNEL PROGRAMMING:**

FREQUENCY CODE

**1st** digit _____ (# of beeps in series) ⁎ **2nd** digit _____ (# of beeps in series) ⁎

TONE CODE

**3rd** digit _____ (# of beeps in series) ⁎ **4th** digit _____ (# of beeps in series) ♦

Notes:

⁎ Pause after entering each digit. The radio will emit a low tone, separating one digit from the next.

♦ The radio sounds a triple beep when PTT channel programming is complete.

### *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.

### *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.

| Code | Frequency | Description |
|---|---|---|
| 01 | 467.7625 | J |
| 02 | 467.8125 | K |
| 03 | 464.5500 | Yellow Dot |
| 04 | 464.5000 | Brown Dot |
| 05 | 467.8500 | Silver Star |
| 06 | 467.8750 | Gold Star |
| 07 | 467.9000 | Red Star |
| 08 | 467.9250 | Blue Star |
| 09 | 469.2625 | |
| 10 | 462.5750 | White Dot |
| 11 | 462.6250 | Black Dot |
| 12 | 462.6750 | Orange Dot |

**Table 1 – PTT Programming Frequency Table**

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

**Table 2 – Quiet Call Codes and Frequencies**

## COMPUTER SOFTWARE COPYRIGHTS



## PC COMPUTER PROGRAMMING

RITRON's programming kit allows programming of the SST-442 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 SST-442 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 and a minimum of 2MB available on the hard disk drive for installation.

### *Programmable Features*

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

| Feature | Range | Factory Setting | Per Channel |
|---|---|---|---|
| Automatic Inactivity Turn-off | Y - N | Y | - |
| Battery Saver Enable | Y - N | Y | - |
| Battery Saver Off Time (seconds) | 0 – 8 | 1 | - |
| Beep Volume Level (Fixed or Controlled) | F-C | C | - |
| Beep Fixed Level (percent of full volume) | 0 – 100% | 50% | - |
| Busy Channel TX Inhibit | Y - N | N | √ |
| Carrier Only, No Codes | - | - | √ |
| Channel Beep Rate (Slow or Fast) | S – F | S | - |
| Channel Selection Mode (Increment or Enter) | I – E | I | - |
| Digital Tone Invert RX | Y - N | N | √ |
| Digital Tone Invert TX | Y - N | N | √ |
| Digital Quiet Call (DCS) | - | - | √ |
| Disable Monitor | Y - N | N | √ |
| Number of Channels | 0 – 10 | 4 | - |
| Narrow Band Channel | Y - N | N | √ |
| PTT Programming Enabled | Y – N | Y | - |
| Quiet Call (CTCSS) | See Table 2 | - | √ |
| Receive Squelch Tone | Y - N | N | √ |
| Squelch Tightener | 0 - 7 | 0 | √ |
| TX Time-out Enabled | Y – N | Y | - |
| TX Time-out Timer (seconds) | 0 – 255 | 60 | - |
| Turn On To Medium Volume Level | Y - N | Y | - |

### *Descriptions of Features*

Automatic Inactivity Turn-off - The radio automatically shuts itself off if four hours go by without the micro-controller detecting input from the volume, PTT or channel controls.

Battery Saver - Enabling this option allows the radio to go into battery saver mode when the radio remains idle. The power saver begins after eight seconds of inactivity.

Battery Saver Off Time - This is the cycle time that the radio is off in battery saver mode before it checks for a received signal. A long Battery Saver Off Time may cause the user to miss the beginning of the first message when in battery saver mode.

Beep Volume Level - The radio can be programmed for a fixed beep volume or for a beep volume that is adjusted with the Volume controls. If fixed beep volume is selected, the fixed level can be set between 0 – 100%.

Busy Channel Transmit Inhibit - This keeps the radio from broadcasting if the channel is busy, and is often used in conjunction with Disable Monitor. If you press the PTT when the channel is busy with a signal not intended for your radio (not carrying your tone code), this feature sounds a "busy" tone in the speaker and keeps the transmitter turned off.

Channel Beep Rate - The rate at which the channel indicator beeps occur can be set to fast or slow.

Channel Selection Mode - This feature allows the channel selector to increment or enter the channel. The channel number is "beeped out" when the channel button is first pressed. The channel is not changed. In increment mode the radio is changed to the next available channel if the channel button is pressed again within three seconds. In enter mode the user must press the channel button the number of times equal to the channel they wish to select.

Digital Quiet Call RX Invert - The programmed code is inverted for receive mode only.

Digital Quiet Call TX Invert - The code is inverted for transmit mode.

Disable Monitor - This function may be programmed to keep the radio user from listening to other licensees on a shared channel. QC or DQC must be used for this option to have any affect, and the Encode Only feature disabled.

Maximum Number of Channels - The number of channels available on the radio can be set from 1 to 10.

Narrow Band Channel - Any channel can be set to operate in narrow band mode, reducing the transmit deviation to 2.5 KHz.

PTT Programming Mode Enabled - This feature allows channel programming from a table of pre-determined frequencies using the radio PTT switch.

Quiet Call (CTCSS) - Programming a Quiet Call code allows you to screen out transmissions that do not carry your code. Your code is broadcast when you press the PTT to make a call.

Quiet Call Encode Only - The Quiet Call code programmed for the channel is transmitted with your calls. However, no Quiet Call code is programmed for receive mode, allowing all traffic on the channel to be heard.

Receive Frequency - The radio frequency that receives broadcasts from other units.

Receive Squelch Tone - The receiving radio beeps at the end of each received transmission.

Squelch Tightener - This feature reduces distant "co-channel" or other interference for channels that are not programmed with Quiet Call. Carrier squelch is set for maximum sensitivity at the factory, but may be adjusted to mute weak signals

Transmit Frequency - The radio frequency that broadcasts to other units.

Transmit Time Out Timer - This feature automatically shuts off the transmitter (ending your call) if you hold down the PTT button continuously for 60 seconds. The radio sounds a tone when the transmitter shuts off.

Turn On To Medium Volume Level - The volume level is at mid-range when the radio is first turned on. Normally, the volume level is low when the radio is turned on.

## INTRODUCTION

The SST-442 is a four-channel handheld transceiver built on a single multi-layer printed circuit board. Both sides of the main printed circuit board are populated with components, with the bottom side containing only surface mounted components.

The SST-442 is frequency synthesized, with all functions of the radio controlled by microcontroller.

## POWER SUPPLY AND VOLTAGE DISTRIBUTION

The SST-442 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 P302. F301 is a 3A fuse in series with P302 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.

SW301 ON/VOL UP switch is pressed to turn on the SST-442, turning on voltage pass transistor Q304 via R302 and CR303. Q304 supplies power to IC309, a +5 VDC regulator used to power microcontroller IC301. Pin 13 of IC301 turns on Q303, which keeps Q304 turned on after SW301 has been released. Power is removed from the SST-442 by pressing the VOL DN/OFF switch SW302 until a beep is heard from the speaker, at which time Q304 is turned off.

+5 VDC regulator IC309 supplies power directly to microcontroller IC301, bilateral audio gates IC304, reference oscillator Y302, synthesizer IC401, and PTT detect transistor Q302.

The T/R output at Pin 11 of IC301 lets Q101 switch the regulated +5 VDC to the receiver. Pin 11 of IC301 will also turn on Q202, which turns on voltage pass transistor Q204. With Q204 emitter connected to the +VBATT battery supply, the collector output is connected to the emitter of Q202 through voltage divider R202/R203, whose values are selected to limit the TX+V voltage to +6 VDC.

### *Power Strobe*

The SST-442 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 programmable using the PC Programming Kit. The +5V SW power strobe output at Pin 10 of IC301 controls Q306, which switches the regulated +5 VDC to the audio processing circuitry and the synthesizer circuitry. This includes IC303A 2.5 VDC (Vag) for bias on audio processing circuitry, IC303C audio high pass filter, IC308 and IC305A audio low pass filter for sub-audible frequencies, IC305B audio limiting amplifier, IC306 digital potentiometers, IC303B audio summing node amplifier, and IC303D audio low pass filter.

### *Low Battery Voltage Detection*

Battery voltage is measured at A/D input Pin 16 of IC301 through voltage divider R303/R305. 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 +5.2 VDC. This is to protect the microcontroller and its EE memory from corruption due to low supply voltage.

## REFERENCE OSCILLATOR

Reference oscillator Y302 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 27 of IC301 microcontroller. The Y302 pin 4 output is also multiplied up to 43.2 MHz by Q105 and its associated circuitry to provide a receiver 2nd local oscillator signal.

## SYNTHESIZER

The SST-442 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 IC301 and Reference oscillator Y302 are routed to frequency synthesizer IC401 per the following chart:

### *Pin Numbers*

| | IC301 | Y302 | IC401 |
|---|---|---|---|
| Clock | 12 | - | 18 |
| Data | 5 | - | 19 |
| Latch | 20 | - | 17 |
| LD | 12 | - | 2 |
| T/R SW | 11 | - | - |
| REF IN | - | 4 | 20 |
| REF OUT | 27 | - | 1 |
| +5 SW | 10 | - | 12 |
| +5V | 1, 15, 28 | 2 | 5, 14 |

Q404, CR401, C414 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 IC301 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 IC301 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 C429, C427, R419, R420, R418, and C426 transform the Pin 6 output signal to a DC voltage for application to the VCO tuning varactor CR402. 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 R421 tied to Pin 8 of IC401, with the output current programmable to 25, 50 or 100% of maximum.

### *VCO / Buffer Amplifiers*

Q403, L401, CR402 and associated components form the VCO (Voltage Controlled Oscillator), a resonant circuit that oscillates at frequencies from 416 MHz in receive (receive frequency - 43.65 MHz) to 470 MHz in transmit. Varying the voltage at CR402 changes the varactor capacitance, which in turn alters the VCO output frequency.

When in transmit mode a +5 VDC T/RSW signal is applied to Q406, which turns on Q405 to draw current through pin diode CR404 and L403. With CR404 biased on, L402 is effectively shorted to ground, shifting the VCO frequency up 43.65 MHz.

Q401 and Q402 are buffer amplifiers, with Q401 feeding in the input of the synthesizer at Pin 11, the receiver 1st local oscillator and the transmitter pre-amplifier.

### *Oscillator Modulation*

When the SST-442 is in transmit, modulation balance control IC306E passes TX audio through to the VCO modulation input at R416. TX audio is applied to varactor CR403 to modulate the VCO. TX audio is also routed to the Pin 1 input of TCVCXO reference oscillator Y302. Low frequency tones modulate the reference oscillator because the synthesizer is not able to track them.

## DIGITAL POTENTIOMETERS

IC306 contains 6 digital potentiometers programmed by IC301, sharing the same clock and data outputs used by the synthesizer and a separate Digital Pot Latch signal from Pin 8. The digital potentiometers are used in conjunction with IC303B, a summing node amplifier used for modulating the VCO and reference oscillator. IC306A, B, D, E, and F can only be changed through serial programming, and can only be performed by an authorized licensed RF technician.

IC306A is connected through R352 to the Pin 6 input of IC303B. IC306A adjusts the DC output of IC303B to tune the reference oscillator frequency.

IC306B is unused.

Volume control IC306C applies the processed voice band signals at IC303D to audio amplifier IC307 when in receive mode. Depressing the ON/VOL UP switch SW301 increases the setting of IC306C while VOL DN/OFF switch SW302 decreases it.

Transmitter tone deviation control IC306D applies the output of the selective signaling low-pass filter IC308 to the Pin 6 input of IC303B through R350. IC306D is completely closed in receive mode.

Transmitter modulation balance control IC306E is used to apply the Pin 7 output of IC303B to the VCO modulation input. This will set the ratio of the modulating signal applied to the VCO and the reference oscillator. IC306E is completely closed in receive mode.

Transmitter voice deviation control IC306F applies the processed voice band signals at IC303D to the Pin 6 input of IC303B through R349. IC306F is completely closed in receive mode.

## RECEIVER

As mentioned before, Q101 switches the regulated +5 VDC to the receiver. The +VRX receiver voltage is switched at the strobe duty cycle if programmed for power strobe.

### *RF Amplifier*

A received signal from the antenna passes through a low-pass filter (L207, C216, C217, L206, C101, and C202) to the receiver headend. L101 and the associated capacitors form a bandpass filter ahead of low-noise RF amplifier Q102. L101 and C103 provide a notch at the image frequency, 87.3 MHz below the receive frequency. The amplified RF signal is applied to a 2-pole bandpass filter consisting of L103, L104, and associated capacitors. This circuit can be tuned for any 10 MHz band between 450 and 470 MHz.

### *1st Mixer*

The amplified received input signal is applied to the gate of FET mixer Q103. The 1st local oscillator signal from the synthesizer module is applied to the source of Q103. L106, C117 and C118 tune the drain output of Q103 to 43.65 MHz and apply it to YF101, a 43.65 MHz two-pole crystal filter. Q104 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 Y302 is multiplied up to 43.2 MHz by Q105 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 (R114, C130) 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 R112, C123, C124, R110, R111 and R113. The Pin 11 output of the noise amplifier is applied to a biased noise detector CR103, with the output connected to an A/D input of IC301 at Pin 19. The SST-442 is serial programmed to set the squelch threshold and hysteresis.

### *Voice / Tone Conditioning in Receive Mode*

SST-442 audio conditioning filter circuits are shared with the transmitter. The same high-pass filter/amplifier (IC303C and associated components) used in receive voice band conditioning is used in the transmit band. Similarly, the low-pass filter (IC308 and associated components) used for selective signal tone decode filtering is also used for selective signal encoding. Altering circuit configuration with bilateral switches IC304A, B and C permits the use of the same audio filtering system for both transmit and receive modes.

After R114 and C130 remove the 450 KHz element from the demodulated audio output at Pin 9 of IC101, C333 couples the audio signal to bilateral switch IC304C for subaudible tone detection and connection to IC304A for voice band audio processing.

### *Voice Band*

Bilateral switch IC304A passes the received audio signal to the input of IC303C, which along with its associated components for a high-pass filter/amplifier circuit that attenuates audio signals below 300 Hz.

The output of IC303C is applied to the input of IC305B limiting amplifier. Bilateral switch IC304B is switched in receive to insert C351 into the feedback circuit of IC305B, providing de-emphasis of the received audio signal. Bilateral switch IC304B also removes R335 from the Pin 6 input to reduce the gain and prevent limiting.

The output from IC305B is applied to the input of IC303D, which along with its associated components form an 18dB/octave low-pass filter for frequencies above 3000 Hz.

The output of IC303D is connected to IC306C volume control prior to connection to audio amplifier IC307. The output of IC303D is also connected to IC306F voice deviation control, which is completely closed in receive mode to prevent received signals from modulating the VCO and reference oscillators.

Audio frequency tones from Pin 24 of microcontroller IC301 are applied to the Pin 6 input of IC305B to provide the SST-442 alert tones.

### *Sub-Audible*

Bilateral switch IC304C passes the received audio signal to the input of IC305A, which amplifies the signal and applies it to the Pin 2 input of IC308, a 5-pole low-pass filter that attenuates frequencies above 250 Hz.

The output at Pin 5 is applied to an A/D input of IC301 at Pin 18 for tone decoding. An internal digital signal processing routine programmed into microcontroller IC301 is used to decode the correct selective signaling code. The output at Pin 5 of IC308 is also connected to tone deviation control IC306D, which is completely closed in receive mode to prevent received subaudible tone signals from modulating the VCO and reference oscillators.

### *Audio Amplifier*

Receive audio from volume control IC306C is applied to the Pin 2 input IC307, a 1 Watt audio amplifier. C365 couples the Pin 5 output to the internal 8Ω speaker SP301 via audio jack J303.

Microcontroller IC301 Pin 22 switches DC power to the audio amplifier by turning on Q07, which then turns on pass transistor Q308 to apply battery voltage to Pin 6 of the audio amp. CR307 prevents an inadvertent DC voltage at J303 from damaging the audio amplifier.

## ANTENNA SWITCHING / LOW PASS FILTER

A low-pass filter comprised of filter L203, C213, C214, L204, C217, L207, and C216 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 (CR201, CR101) and associated components form the antenna switching circuit. With the SST-442 in receive mode, no voltage is applied to the PIN diodes and they do not conduct. This reverse biases CR201 to prevent the transmitter amplifier from affecting the receiver tuning and removes CR101 from the receiver input. Incoming signals from the antenna pass through the low-pass filter, then L206 and C102 to the receiver headend.

When the SST-442 is switched into transmit mode, transmitter supply voltage is switched on by Q201 and Q202 and applied to R207. Current flows through R207, L205, CR201, L206 and then CR101 to ground, forward biasing the PIN diodes. CR201 passes transmitter RF power to the antenna while CR101 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 SST-442 transmitter is keyed when PTT switch SW304 is depressed. Electret condenser microphone M301 is connected in series to ground with the PTT switch, which when depressed draws current through M301, SW304, CR304 and R307 to turn on pass transistor Q302. Q302 then turns on Q301 to pull the TX Key Pin 2 input of microcontroller IC301 low. The microcontroller T/R output at Pin 11 then goes high to turn on Q202, which turns on pass transistor Q201 to apply +6VDC 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 CR304.

### *+VTX Supply*

With the transmitter enabled as described above, the +VTX voltage from Q201 is applied to transmitter RF amplifiers Q203 and Q204. +VTX supply also forward biases the PIN switching diodes CR201 and CR101 as previously described. The transmitter RF final amplifier Q205 is powered by the battery supply.

The Pin 11 T/R output of microcontroller IC301 can be PC programmed to hold the transmitter on after the PTT switch has been released to allow tone related turn-off codes for squelch tail elimination.

### *Power Amplifier*

Q203, Q204 and associated components amplify the VCO signal and apply it to the input of RF Final amplifier transistor Q205. The collector output of Q205 is matched to the antenna switching circuitry and applied to the antenna through the low-pass filter.

### *Voice / Tone Conditioning in Transmit Mode*

SST-442 audio conditioning filter circuits are shared with the receiver. The same high-pass filter/amplifier (IC303C and associated components) used in receive voice band conditioning is used in the transmitter voice band. Similarly, the low-pass filter (IC308 and associated components) used for sub-audible tone decode filtering is also used for tone encode. Altering circuit configuration with bilateral switches IC304A, B and C permits the use of the same audio filtering system for both transmit and receive modes.

### *Voice Band*

M301 microphone audio is passes through CR304, C334 and is switched by IC304A to the input of IC303C, which along with its associated components form a high-pass filter/amplifier circuit that attenuates audio signals below 300 Hz. The output of IC303C is applied to the input of IC305B limiting amplifier. Bilateral switch IC304B switches R335 in parallel with R336, raising the gain of limiting amplifier IC305B for full limiting of the transmitter voice audio. The output of IC305B is applied to the input of IC303D, which along with its associated components form an 18 dB/octave low-pass filter for frequencies above 3 KHz. The output of IC303D is applied to voice deviation control IC306F, which sets the level of the processed transmitter audio applied to summing node amplifier IC303B used to modulate the VCO and reference oscillator.

### *Sub-Audible*

Microcontroller IC301 generates the sub-audible selective signaling encode waveforms at Pin 21 and applies them to the input of buffer amplifier IC305A. The output of IC305A is applied to the input of IC308, a 5-pole low-pass filter that attenuates frequencies above 250 Hz. C342 and C343 set the corner frequency of the low-pass filter, with C342 switched in by Pin 7 of IC301 to lower the corner frequency for lower tones. The output of IC308 is applied to tone deviation control IC306D, which sets the level of the transmitter sub-audible encode tones applied to summing node amplifier IC303B used to modulate the VCO and reference oscillator.

## MICROCONTROLLER

The SST-442 handheld transceiver is electronically controlled by IC301, an 8-bit microcontroller. IC301 has four 8-bit A/D inputs for processing analog signals.

PIN DESCRIPTION

1 RESET is connected to the SST-442 +5V to start the radio in a known state on power up.

2 TX KEY input is pulled LOW when either the internal or external PTT switch is pressed to initiate transmitter operation.

3 AUDIO GATE ENABLE controls analog switches IC304A and B to configure the shared audio processing circuitry for receive operation when LOW, and for transmitter operation when HIGH.

4 SERIAL DATA INPUT links the microcontroller to communications from an external data terminal via J303 RING connection. This allows programming of the SST-442 EEPROM memory used to store channel frequency and configuration information.

5 DATA output sends serial data to frequency synthesizer IC401 to program frequency information, IC302 EEPROM memory, and to IC306 to set the digital potentiometers.

6 EECLOCK output sends serial data clock pulses to EEPROM IC302 when reading or writing.

7 LOW-PASS CUT-OFF output goes LOW to lower the cut-off frequency of IC308 when the radio is on a channel programmed for a CTCSS tone below 150 Hz. This output is in a tri-state OPEN condition for all other tones.

8 DIGITAL POT LATCH sends a single positive pulse after data has been sent to IC306 to latch the new data and change the digital potentiometers to the new programmed settings.

9 LED output goes LOW when the radio is on channel 1 and is HIGH for all other channels.

10 +5V SW output goes HIGH at a programmable periodic rate to remove the +5VSW supply from various circuits in the radio, thus conserving battery life. In normal transmit or receive mode this output is LOW.

11 T/R SWITCH output is connected to the Synthesizer circuitry to shift the frequency of the VCO oscillator used in both transmit and receive. The output is HIGH in transmit and LOW in receive. T/R output is also used to switch supply voltage to the transmit and receive circuits.

12 CLOCK output sends serial data clock pulses to frequency synthesizer IC401 and digital potentiometers IC306 when programming these devices.

13 +V SW output is HIGH when the radio is turned on, keeping pass transistor Q304 turned on via Q303 to supply power to the radio.

14 GROUND

15 $V_{REFH}$ sets the upper reference level for the A/D and is connected to the regulated +5 VDC.

16 A/D input BATTERY is used to measure the battery voltage for low and dead battery detection. This input also serves as the ON/VOL UP input, and is pulled LOW when SW301 is depressed to turn on the radio and raise the receiver speaker audio level.

17 A/D input VOL DN/OFF is pulled LOW when SW302 is depressed to lower the receiver speaker audio level and turn off the radio. This input also serves as CHANNEL input, and goes to 2.5 VDC when channel selector switch SW303 is pressed to change the radio to the next programmed channel.

18 A/D input TONE DECODE accepts the received QC (CTCSS) and DQC (DCS) waveforms after signal processing for decode analysis.

19 A/D input RSSI is used to measure the output voltage of the noise filter for squelch detection.

20 LATCH output goes LOW to allow serial data to frequency synthesizer IC401 and goes HIGH to latch the data, allowing the synthesizer to execute the new frequency information.

21 TONE ENCODE outputs generate the QC (CTCSS) and DQC (DCS) encode waveforms for signal processing prior to modulating the VCO in transmit mode.

22 AUDIO AMP ENABLE output goes HIGH to apply power to audio amp IC307 for receiver speaker audio or radio alert tones.

23 RX AUDIO GATE ENABLE switches IC304C for receive operation when LOW, and for transmitter operation when HIGH.

24 BEEP output generate the radio alert tones heard in the speaker.

25 See Pin 4

27 REFERENCE OSCILLATOR INPUT has the 3.6 MHz reference signal from the synthesizer.

28 +5 VDC $V_{DD}$ supply voltage.

WARNING!

An authorized RF service technician must perform test and alignment of the SST-442. Do not attempt service of the SST-442 if not completely familiar with the operation of frequency synthesized radio operation. The SST-442 can operate in both Narrow Band (2.5 KHz deviation) and Wide Band (5 KHz deviation) systems.

## 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 SST-SRVBD Test Module

## RADIO PREPARATION

1) Make sure the radio battery is fully charged.
2) Install the RITRON SST-SRVBD test assembly and serial programming cable as follows:
   a) Remove the SST-442 antenna from the radio.
   b) Plug the SST-SRVBD into the 2.5 mm and 3.5 mm jacks on top of the radio.
   c) Screw the SST-SRVBD antenna nut fully into the SST-442 antenna connector.
   d) Set the jumper on the SST-SRVBD assembly to the “UHF” position.
   e) Connect the serial programming cable from the PC computer (with the RITRON PC programming kit software installed) to the SST-SRVBD test assembly
3) Connect the FM communications test set to the BNC connector on the SST-SRVBD test assembly.
4) Turn on the radio to place it in operating mode.
5) From the PC Programmer on-screen menu, select “Tune Radio” to display the Alignment screen.
6) Set the RF Communications Test set to the Alignment Frequency indicated on the Alignment screen.
7) Press the appropriate “Select” button on the Alignment screen to make the following adjustments:

| SELECT | Alignment |
|---|---|
| Frequency | Transmit frequency |
| Mod Bal | Modulation balance |
| Tone | QC/DQC tone encode deviation wide and narrow band |
| Voice | Voice deviation with no tone wide and narrow band |
| | Voice deviation with tone wide and narrow band |

8) After you have completed alignment of the SST-442, turn the radio off. This will remove the test frequencies and return to operation on the customer’s programmed frequencies.

## REFERENCE FREQUENCY

1) Make sure the unit has been switched on and is at room temperature (approximately +25° C)
2) Select “Frequency” from the PC Programmer “Alignment” screen.
3) Set the RF communications test set to the Alignment Frequency on the Alignment screen.
4) Press the “Tune” button on the Alignment screen to activate the transmitter.
5) Transmitter frequency error should be less than +/- 500 Hz.
6) If frequency adjustment is required, press the left arrow on the tuning bar to lower the frequency or the right arrow to raise the frequency.
7) Press the “Save” button to store the new alignment setting or “Cancel” to leave setting unchanged.

## MODULATION BALANCE

Transmitter modulation balance has been set at the factory and should not require adjustment.

1) Select “Mod Bal” from the PC Programmer “Alignment” screen.
2) Set the RF communications test set to the Alignment Frequency on the Alignment screen.
3) Press the “Tune” button on the Alignment screen to activate the transmitter.
4) Check the de-modulated waveform for a 20 Hz square wave.
5) If adjustment of the modulation balance is required, press the left arrow on the tuning bar to flatten the top of the waveform or the right arrow to reduce overshoot.
6) Press the “Save” button to store the new alignment setting or “Cancel” to leave setting unchanged.

## TRANSMITTER TONE DEVIATION

Transmitter tone deviation has been set at the factory and should not require adjustment.

1) Select “Tone” from the PC Programmer “Alignment” screen.
2) Set the RF communications test set to the transmit frequency on the screen.
3) Select either “Wide Band” or “Narrow Band” by pressing the desired option button.
4) Press the “Tune” button on the Alignment screen to activate the transmitter.
5) If adjustment of the tone deviation is required, press the left arrow on the tuning bar to lower deviation or the right arrow to raise deviation.
6) Press the “Save” button to store the new alignment setting or “Cancel” to leave setting unchanged.

## TRANSMITTER VOICE DEVIATION

Transmitter voice deviation has been set at the factory and should not require adjustment.

1) Select “Voice” from the PC Programmer “Alignment” screen.
2) Set the RF communications test set to the transmit frequency on the screen.
3) Select “Voice Only - Wide Band“, “Voice Only - Narrow Band”, “Voice & Tone – Wide Band”, or “Voice & Tone – Narrow Band” by pressing the desired option button.
4) Press the “Tune” button on the Alignment screen to activate the transmitter.
5) If adjustment of the voice deviation is required, press the left arrow on the tuning bar to lower deviation or the right arrow to raise deviation.
6) Press the “Save” button to store the new alignment setting or “Cancel” to leave setting unchanged.

## RECEIVER SENSITIVITY AND SQUELCH

The SST-442 receiver is factory tuned for a frequency range of 460 - 470 MHz. The SST-442 receiver is configured from the factory for Wide Band operation, with a Narrow Band Model available as an option. The SST-442 receiver bandwidth is configured on a per radio basis, it cannot be switched on a per channel basis.

The receiver may be tuned to any 10 MHz frequency band between 450-470 MHz.

1) Program the radio to a receive frequency in the middle of the desired 10 MHz band.
2) Set the RF communications test set generator to a frequency exactly 87.3 MHz below the programmed receive frequency at a RF level of approximately –40 dB. Modulate the RF signal with a 1 KHz tone at 3 KHz deviation for wide band, 1.5 KHz deviation for low band.
3) Connect an 8-Ohm speaker to the 3.5mm audio jack on the SST-SRVBD test assembly.
4) Adjust L101 for the minimum received signal at this image frequency.
5) Set the RF Communications Test Set’s generator to the programmed receive frequency at a RF level of –120 dB. Modulate the RF signal with a 1 KHz tone at 3 KHz deviation for wide band, 1.5 KHz deviation for low band.
6) Adjust L103 and L104 for the best receiver SINAD as measured across the 8-Ohm speaker.
7) Check receiver sensitivity at the lowest and highest operating frequencies and make slight adjustment to L103 and L104 to balance between the two, if necessary.

## RECEIVER NOISE SQUELCH

The noise squelch sensitivity is set at the factory for a 12dB SINAD signal. Using the PC Programmer, squelch sensitivity can be adjusted on a per channel basis by adjusting the “Squelch Tightener” number to between 0-7. The higher number will require a stronger received signal to open squelch.

1) Select “Channel” from the PC Programmer “Edit” menu on the main screen.
2) Select the channel to be set and press “Edit” button.
3) Set the RF communications test set to the transmit frequency on the screen.
4) Enter a Squelch Tightener number between 0-7.
5) Press the “OK” button on the Channel Edit screen to return to the Channel List screen.
6) Select any other channels to be set.
7) Press the “OK” button on the Channel List screen to return to the Main screen.
8) Select “Program Radio” from the PC Programmer “Radio” menu to save all setting changes.

## SYNTHESIZER

The synthesizer is preset at the factory for operation between 460 and 470 MHz. There is no manual adjustment to center the control voltage, with all adjustment performed by the factory selection of fixed capacitor C413. Do not attempt to adjust the synthesizer control unless a key component in the synthesizer has been replaced. Key components do not include the Y302 reference frequency TCVCXO or IC401 synthesizer IC. Synthesizer alignment errors cause poor operation at temperature extremes.

Should adjustment of the VCO control voltage be necessary, the radio must first be disassembled and powered up at 7.5 VDC. The following procedure defines testing of the VCO control voltage:

1) Select the channel that has the lowest receive frequency.
2) Connect a VTVM, DVM or oscilloscope to Test Point 1 and measure the VCO control voltage. This voltage should be no less than 1.5 VDC.
3) Select the channel that has the highest receive frequency and measure Test Point 1. The control voltage should be no higher than 4.5 VDC.
4) a) If adjustment of the VCO control voltage is required, remove the synthesizer shield top.
   b) Replace C413 with a capacitor value that allows VCO control voltages between 1.5 and 4.5 VDC for the operating frequencies desired. Decreasing the value of C413 will raise the operating frequency of the VCO while increasing the value will lower the VCO frequency.
   c) Replace the top of the synthesizer shield.

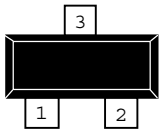
### *Measurement Conditions*

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 SST-442 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

| REF | PIN | TX | RX | SB | DESCRIPTION |
|---|---|---|---|---|---|
| CR101 | 1 | 0.7 | 0.0 | 0.0 | TX/RX switching |
| | 2 | NC | NC | NC | |
| | 3 | GND | GND | GND | |
| CR102 | 1 | GND | GND | GND | Voltage clamp |
| | 2 | GND | GND | GND | |
| | 3 | 0.0 | 0.0 | * | |
| CR103 | 1 | GND | GND | GND | Noise detection |
| | 2 | 0.0 | → | * | → amplified receiver |
| | 3 | 0.0 | < 0.5 | * | noise |
| CR201 | 1 | 1.4 | 0.0 | 0.0 | TX/RX switching |
| | 2 | NC | NC | NC | |
| | 3 | 0.7 | 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 | Reverse voltage |
| | A | 2.2 | 4.8 | 4.8 | protection |
| CR303 | 1 | 6.8 | 6.8 | 6.8 | Turn-on detection |
| | 2 | 4.2 | 4.2 | 4.2 | |
| | 3 | 6.1 | 6.1 | 6.1 | |
| CR304 | 1 | 2.0 | 4.7 | 4.7 | PTT switching |
| | 2 | 2.2 | 4.7 | 4.7 | |
| | 3 | 2.4 | 5.0 | 5.0 | |
| CR305 | 1 | GND | GND | GND | Voltage clamp |
| | 2 | 5.0 | 5.0 | 5.0 | |
| | 3 | 0.0 | 0.0 | 0.0 | |
| CR306 | 1 | 2.4 | 2.4 | 2.4 | Voltage clamp |
| | 2 | NC | NC | NC | |
| | 3 | 2.4 | 2.4 | 2.4 | |
| CR307 | C | 7.5 | 7.5 | 7.5 | Reverse volt protection |
| | A | 0.0 | → | * | → RX audio amp out |
| CR401 | 1 | 5.0 | 5.0 | * | Biasing |
| | 2 | 4.8 | 4.8 | * | |
| | 3 | NC | NC | NC | |
| CR402 | 1 | GND | GND | GND | VCO tuning |
| | 2 | NC | NC | NC | |
| | 3 | → | → | * | → 1.5 – 4.5 VDC VCO tuning voltage |
| CR403 | 1 | GND | GND | GND | VCO modulation |
| | 2 | NC | NC | NC | |
| | 3 | 2.4 | 2.4 | * | |
| CR404 | 1 | 0.8 | 0.0 | * | TX/RX VCO switching |
| | 2 | NC | NC | NC | |
| | 3 | 0.0 | 4.8 | * | |
| IC101 | 1 | 0.0 | 4.7 | * | RX FM-IF subsystem |
| | 2 | NC | NC | NC | |
| | 3 | 0.0 | 3.8 | * | |
| | 4 | 0.0 | 4.7 | * | |
| | 5 | 0.0 | 3.8 | * | |
| | 6 | 0.0 | 3.8 | * | |
| | 7 | 0.0 | 3.8 | * | |
| | 8 | 0.0 | 4.7 | * | |
| | 9 | 0.0 | 2.0 | * | |
| | 10 | 0.0 | 0.6 | * | |
| | 11 | 0.0 | 2.4 | * | |
| | 12 | 0.0 | 0.0 | * | |
| | 13 | NC | NC | NC | |
| | 14 | NC | NC | NC | |
| | 15 | GND | GND | GND | |
| | 16 | 0.0 | 1.7 | * | |
| IC301 | 1 | 5.0 | 5.0 | 5.0 | Microcontroller |
| | 2 | 0.0 | 5.0 | 5.0 | |
| | 3 | 5.0 | 0.0 | 0.0 | |
| | 4 | 0.0 | 0.0 | 0.0 | |
| | 5 | 0.0 | 0.0 | 0.0 | |
| | 6 | 0.0 | 0.0 | 0.0 | |
| | 7 | 0.0 | 0.0 | 0.0 | |
| | 8 | 0.0 | 0.0 | 0.0 | |
| | 9 | → | → | → | → 0.0 V on Channel 1 |
| | 10 | 0.0 | 0.0 | * | else 5.0 VDC |
| | 11 | 5.0 | 0.0 | 0.0 | |
| | 12 | 5.0 | 5.0 | * | |
| | 13 | 5.0 | 5.0 | 5.0 | |
| | 14 | GND | GND | GND | |
| | 15 | 5.0 | 5.0 | 5.0 | |
| | 16 | 4.2 | 4.2 | 4.2 | |
| | 17 | 5.0 | 5.0 | 5.0 | |
| | 18 | 2.4 | 2.4 | * | |
| | 19 | 0.0 | 0.5 | * | |
| | 20 | 5.0 | 5.0 | 5.0 | |
| | 21 | → | 2.4 | * | → 0-5 VDC tone |
| | 22 | 0.0 | 5.0 | 0.0 | encode waveform |
| | 23 | 0.0 | 0.0 | 0.0 | |
| | 24 | NC | NC | NC | |
| | 25 | 0.0 | 0.0 | 0.0 | |
| | 26 | NC | NC | NC | |
| | 27 | → | → | → | → 3.6 MHz clock signal |
| | 28 | 5.0 | 5.0 | 5.0 | |
| IC302 | 1 | GND | GND | GND | EEPROM |
| | 2 | GND | GND | GND | |
| | 3 | GND | GND | GND | |
| | 4 | GND | GND | GND | |
| | 5 | 0.0 | 0.0 | 0.0 | |
| | 6 | 0.0 | 0.0 | 0.0 | |
| | 7 | GND | GND | GND | |
| | 8 | 5.0 | 5.0 | 5.0 | |

| REF | PIN | TX | RX | SB | DESCRIPTION |
|---|---|---|---|---|---|
| IC303 | 1 | 2.4 | 2.4 | * | Audio processing |
| | 2 | 2.4 | 2.4 | * | |
| | 3 | 2.4 | 2.4 | * | |
| | 4 | 5.0 | 5.0 | * | |
| | 5 | 2.4 | 2.4 | * | |
| | 6 | 2.4 | 2.4 | * | |
| | 7 | 2.4 | 2.4 | * | |
| | 8 | 2.4 | 2.4 | * | |
| | 9 | 2.4 | 2.4 | * | |
| | 10 | 2.4 | 2.4 | * | |
| | 11 | GND | GND | GND | |
| | 12 | 2.4 | 2.4 | * | |
| | 13 | 2.4 | 2.4 | * | |
| | 14 | 2.4 | 2.4 | * | |
| IC304 | 1 | 0.0 | 0.0 | * | Audio signal switching |
| | 2 | 2.4 | 2.4 | * | |
| | 3 | 2.4 | 2.4 | * | |
| | 4 | 2.4 | 2.4 | * | |
| | 5 | 0.0 | 2.5 | * | |
| | 6 | GND | GND | GND | |
| | 7 | GND | GND | GND | |
| | 8 | GND | GND | GND | |
| | 9 | 5.0 | 0.0 | 0.0 | |
| | 10 | 5.0 | 0.0 | 0.0 | |
| | 11 | 5.0 | 0.0 | 0.0 | |
| | 12 | 2.4 | 2.4 | * | |
| | 13 | NC | NC | NC | |
| | 14 | 0.0 | 2.4 | * | |
| | 15 | 0.0 | 2.4 | * | |
| | 16 | 5.0 | 5.0 | 5.0 | |
| IC305 | 1 | 2.4 | 2.4 | * | Audio processing |
| | 2 | 2.4 | 2.4 | * | |
| | 3 | 2.4 | 2.4 | * | |
| | 4 | GND | GND | GND | |
| | 5 | 2.4 | 2.4 | * | |
| | 6 | 2.4 | 2.4 | * | |
| | 7 | 2.4 | 2.4 | * | |
| | 8 | 5.0 | 5.0 | * | |
| IC306 | 1 | 2.0 | 2.0 | * | Audio signal level |
| | 2 | NC | NC | NC | control |
| | 3 | GND | GND | GND | |
| | 4 | 0.0 | 2.5 | * | |
| | 5 | 2.4 | 2.4 | * | |
| | 6 | 2.4 | 2.4 | * | |
| | 7 | 2.4 | 2.4 | * | |
| | 8 | 0.0 | 0.0 | * | |
| | 9 | 5.0 | 5.0 | * | |
| | 10 | GND | GND | GND | |
| | 11 | NC | NC | NC | |
| | 12 | 0.0 | 0.0 | * | |
| | 13 | 2.4 | 2.4 | * | |
| | 14 | 2.4 | 2.4 | * | |
| | 15 | 2.4 | 2.4 | * | |
| | 16 | 2.4 | 2.4 | * | |
| | 17 | 2.4 | 2.4 | * | |
| | 18 | NC | NC | NC | |
| | 19 | 5.0 | 5.0 | * | |
| | 20 | 5.0 | 5.0 | * | |
| IC307 | 1 | NC | NC | NC | Audio amplifier |
| | 2 | 0.0 | 0.0 | 0.0 | |
| | 3 | GND | GND | GND | |
| | 4 | GND | GND | GND | |
| | 5 | 0.0 | 3.7 | 0.0 | |
| | 6 | 0.0 | 7.5 | 0.0 | |
| | 7 | 0.0 | 3.7 | 0.0 | |
| | 8 | NC | NC | NC | |

| REF | PIN | TX | RX | SB | DESCRIPTION |
|---|---|---|---|---|---|
| IC308 | 1 | 2.4 | 2.4 | * | Tone low pass filter |
| | 2 | 2.4 | 2.4 | * | |
| | 3 | GND | GND | GND | |
| | 4 | 5.0 | 5.0 | * | |
| | 5 | 2.4 | 2.4 | * | |
| | 6 | 2.4 | 2.4 | * | |
| | 7 | 5.0 | 5.0 | * | |
| | 8 | 3.2 | 3.2 | * | |
| IC309 | 1 | 7.5 | 7.5 | 7.5 | +5 VDC voltage |
| | 2 | GND | GND | GND | regulator |
| | 3 | 7.5 | 7.5 | 7.5 | |
| | 4 | NC | NC | NC | |
| | 5 | 5.0 | 5.0 | 5.0 | |
| 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 | → | → | * | → 1.5 – 4.5 VDC VCO |
| | 7 | GND | GND | GND | tuning voltage |
| | 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 | 5.0 | 5.0 | * | |
| | 19 | 0.0 | 0.0 | * | |
| | 20 | 2.2 → | 2.2 → | * | → 14.4 MHz reference |
| Q 101 | 1 | 5.0 | 4.3 | * | RX +V switching |
| | 2 | 5.0 | 5.0 | * | |
| | 3 | 0.0 | 4.7 | * | |
| Q 102 | 1 | 0.0 | 0.7 | * | RX RF amplifier |
| | 2 | GND | GND | GND | |
| | 3 | 0.0 | 3.0 | * | |
| Q 103 | 1 | 0.0 | 4.7 | * | RX mixer |
| | 2 | 0.0 | 0.0 | * | |
| | 3 | 0.0 | 1.8 | * | |
| Q 104 | 1 | 0.0 | 0.7 | * | RX IF amplifier |
| | 2 | GND | GND | GND | |
| | 3 | 0.0 | 1.2 | * | |
| Q 105 | 1 | 0.0 | 0.7 | * | RX 2nd LO |
| | 2 | GND | GND | GND | multiplier/amp |
| | 3 | 0.0 | 4.6 | * | |
| Q 201 | 1 | 6.8 | 7.5 | 7.5 | TX +V switching |
| | 2 | 7.5 | 7.5 | 7.5 | |
| | 3 | 7.0 | 0.0 | 0.0 | |
| Q 202 | 1 | 5.0 | 0.0 | 0.0 | TX +V switching |
| | 2 | 4.3 | 0.0 | 0.0 | |
| | 3 | 6.8 | 7.5 | 7.5 | |
| Q 203 | 1 | 0.7 | 0.0 | 0.0 | TX RF amplifier |
| | 2 | GND | GND | GND | |
| | 3 | 5.6 | 0.0 | 0.0 | |

| REF | PIN | TX | RX | SB | DESCRIPTION |
|---|---|---|---|---|---|
| Q 204 | 1 | 0.2 | 0.0 | 0.0 | TX RF driver amplifier |
| | 2 | GND | GND | GND | |
| | 3 | 7.0 | 0.0 | 0.0 | |
| Q 205 | 1 | GND | GND | GND | TX RF Final amplifier |
| | 2 | 0.0 | 0.0 | 0.0 | |
| | 3 | 7.5 | 7.5 | 7.5 | |
| Q 301 | 1 | 5.0 | 0.0 | 0.0 | PTT detection |
| | 2 | GND | GND | GND | |
| | 3 | 0.0 | 5.0 | 5.0 | |
| Q 302 | 1 | 4.3 | 5.0 | 5.0 | PTT detection |
| | 2 | 5.0 | 5.0 | 5.0 | |
| | 3 | 5.0 | 0.0 | 0.0 | |
| Q 303 | 1 | 5.0 | 5.0 | 5.0 | Battery +V switching |
| | 2 | 4.3 | 4.3 | 4.3 | |
| | 3 | 6.8 | 6.8 | 6.8 | |
| Q 304 | 1 | 6.8 | 6.8 | 6.8 | Battery +V switching |
| | 2 | 7.5 | 7.5 | 7.5 | |
| | 3 | 7.5 | 7.5 | 7.5 | |
| Q 306 | 1 | 4.3 | 4.3 | 5.0 | +5V switching |
| | 2 | 5.0 | 5.0 | 5.0 | |
| | 3 | 5.0 | 5.0 | * | |
| Q 307 | 1 | 0.0 | 5.0 | 0.0 | Audio amplifier enable |
| | 2 | 0.0 | 4.3 | 0.0 | |
| | 3 | 7.5 | 6.8 | 7.5 | |
| Q 308 | 1 | 7.5 | 6.8 | 7.5 | Audio amplifier +V |
| | 2 | 7.5 | 7.5 | 7.5 | switching |
| | 3 | 0.0 | 7.5 | 0.0 | |
| Q 401 | 1 | 0.7 | 0.7 | * | VCO buffer amplifier |
| | 2 | GND | GND | GND | |
| | 3 | 2.9 | 2.9 | * | |
| Q 402 | 1 | 0.7 | 0.7 | * | VCO buffer amplifier |
| | 2 | GND | GND | GND | |
| | 3 | 2.8 | 2.8 | * | |
| Q 403 | 1 | 2.3 | 2.3 | * | VCO oscillator |
| | 2 | 1.6 | 1.6 | * | |
| | 3 | 4.3 | 4.3 | * | |
| Q 404 | 1 | 4.7 | 4.7 | * | VCO voltage |
| | 2 | 4.3 | 4.3 | * | de-coupling |
| | 3 | 5.0 | 5.0 | * | |
| Q 405 | 1 | 0.0 | 4.3 | * | TX/RX VCO switching |
| | 2 | 4.3 | 4.3 | * | |
| | 3 | 4.2 | 0.0 | * | |
| Q 406 | 1 | 0.0 | 4.3 | * | TX/RX VCO switching |
| | 2 | GND | GND | GND | |
| | 3 | 4.3 | 0.0 | * | |

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: May 11, 2001

| Ref | Ritron PN | Description | X | Y | Theta | Loc |
|---|---|---|---|---|---|---|
| **CAPACITORS** | | | | | | |
| C101 | 151103A3 | 3.3pf NPO 0805 CHIP CAPACITOR | 1065 | 3824 | 270 | Top |
| C102 | 151104A7 | 4.7PF 0805 50V CHIP CAP. | 949 | 3929 | 180 | Top |
| C103 | 15110120 | 12PF NPO 0805 50V CHIP CAP | 791 | 4059 | 90 | Top |
| C104 | 15180101 | 100pF CAPACITOR, CHIP, 0402, COG, 5% | 649 | 3620 | 180 | Top |
| C105 | 151106A8 | 6.8PF NPO 0805 50V CHIP | 1016 | 3682 | 270 | Top |
| C106 | 15110180 | 18PF NPO 0805 50V CHIP | 920 | 3790 | 180 | Top |
| C107 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 734 | 3620 | 180 | Top |
| C108 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 675 | 3519 | 90 | Top |
| C109 | 151106A8 | 6.8PF NPO 0805 50V CHIP | 637 | 3994 | 270 | Top |
| C110 | 151103A3 | 3.3pf NPO 0805 CHIP CAPACITOR | 557 | 3993 | 270 | Top |
| C111 | 151103A3 | 3.3pf NPO 0805 CHIP CAPACITOR | 516 | 4099 | 180 | Top |
| C112 | 151103A3 | 3.3pf NPO 0805 CHIP CAPACITOR | 382 | 4099 | 180 | Top |
| C113 | 15110100 | 10PF NPO 0805 50V CHIP CAP | 476 | 3993 | 270 | Top |
| C114 | 151108A2 | 8.2PF NPO 0805 50V CHIP | 275 | 4059 | 90 | Top |
| C115 | 15110150 | 15PF 0805 NPO 50V CHIP CAP | 380 | 3786 | 0 | Top |
| C116 | 15182103 | .01uF CAPACITOR, CHIP, 0402,Z5U,5/10/20 | 276 | 3382 | 180 | Top |
| C117 | 15110150 | 15PF 0805 NPO 50V CHIP CAP | 199 | 3598 | 180 | Top |
| C118 | 15110470 | 47PF NPO 0805 50V CHIP | 160 | 3491 | 90 | Top |
| C119 | 15181472 | .0047uF CAPACITOR, CHIP, 0402, X7R,5/10% | 485 | 3367 | 270 | Top |
| C120 | 151108A2 | 8.2PF NPO 0805 50V CHIP | 407 | 3548 | 0 | Bottom |
| C121 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 138 | 947 | 90 | Bottom |
| C122 | 152B6106 | 10uF 10V 3.4 X 2.8 CHIP TANTALUM | 451 | 1669 | 0 | Bottom |
| C123 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 450 | 946 | 90 | Bottom |
| C124 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 319 | 904 | 90 | Bottom |
| C125 | 15119104 | .1uF X7R 0805 25V CERAMIC CHIP CAP | 350 | 1364 | 0 | Bottom |
| C126 | 15119104 | .1uF X7R 0805 25V CERAMIC CHIP CAP | 441 | 1542 | 0 | Bottom |
| C127 | 15119104 | .1uF X7R 0805 25V CERAMIC CHIP CAP | 61 | 2203 | 0 | Bottom |
| C128 | 15119104 | .1uF X7R 0805 25V CERAMIC CHIP CAP | 217 | 2114 | 270 | Bottom |
| C129 | 15119104 | .1uF X7R 0805 25V CERAMIC CHIP CAP | 392 | 1802 | 0 | Bottom |
| C130 | 15182103 | .01uF CAPACITOR, CHIP, 0402,Z5U,5/10/20 | 571 | 904 | 90 | Bottom |
| C131 | 15110330 | 33PF NPO 0805 50V CHIP | 38 | 1263 | 0 | Bottom |
| C132 | 15110330 | 33PF NPO 0805 50V CHIP | 64 | 1156 | 270 | Bottom |
| C133 | 15119104 | .1uF X7R 0805 25V CERAMIC CHIP CAP | 61 | 2123 | 0 | Bottom |
| C134 | 15182103 | .01uF CAPACITOR, CHIP, 0402,Z5U,5/10/20 | 39 | 1635 | 90 | Top |
| C135 | 15110220 | 22PF NPO 0805 50V CHIP CAP | 171 | 1533 | 180 | Bottom |
| C201 | 15180330 | 33pF CAPACITOR, CHIP, 0402, C0G, 5% | 1524 | 2585 | 0 | Top |
| C202 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 871 | 3384 | 270 | Bottom |
| C203 | 15180101 | 100pF CAPACITOR, CHIP, 0402, COG, 5% | 1004 | 3248 | 90 | Bottom |
| C204 | 151105A6 | 5.6PF NPO 0805 50V CHIP CAPACITOR | 1466 | 2357 | 0 | Top |
| C205 | 15119104 | .1uF X7R 0805 25V CERAMIC CHIP CAP | 1517 | 267 | 270 | Top |
| C206 | 15110150 | 15PF 0805 NPO 50V CHIP CAP | 1572 | 239 | 270 | Top |
| C207 | 151108A2 | 8.2PF NPO 0805 50V CHIP | 1571 | 3084 | 270 | Top |
| C208 | 15180101 | 100pF CAPACITOR, CHIP, 0402, COG, 5% | 1375 | 2883 | 90 | Top |
| C209 | 15180101 | 100pF CAPACITOR, CHIP, 0402, COG, 5% | 977 | 3530 | 180 | Top |
| C210 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 1277 | 3493 | 270 | Bottom |
| C211 | 15110150 | 15PF 0805 NPO 50V CHIP CAP | 1278 | 3267 | 90 | Top |
| C212 | 15180330 | 33pF CAPACITOR, CHIP, 0402, C0G, 5% | 977 | 3481 | 180 | Top |
| C213 | 151106A8 | 6.8PF NPO 0805 50V CHIP | 1682 | 3881 | 90 | Top |
| C214 | 15110120 | 12PF NPO 0805 50V CHIP CAP | 1682 | 3881 | 180 | Top |
| C215 | 151108A2 | 8.2PF NPO 0805 50V CHIP | 1614 | 4120 | 180 | Top |
| C216 | | Factory Select | 1439 | 4093 | 90 | Top |
| C217 | 151101A8 | 1.8PF 0805 50V CHIP CAP. | 1035 | 4136 | 90 | Top |
| C218 | 15110101 | 100PF NPO 0805 50V CHIP CAP | 953 | 4136 | 90 | Top |
| C219 | 151104A7 | 4.7PF 0805 50V CHIP CAP. | 1682 | 3881 | 180 | Top |
| C301 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 774 | 817 | 180 | Bottom |
| C302 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 275 | 522 | 270 | Top |
| C303 | 152B4226 | 22uF 6.3V 3.4 X 2.8 CHIP TANTALUM CAP | 199 | 647 | 180 | Top |

| Ref | Ritron PN | Description | X | Y | Theta | Loc |
|---|---|---|---|---|---|---|
| C304 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 1261 | 4590 | 90 | Bottom |
| C305 | 15180101 | 100pF CAPACITOR, CHIP, 0402, COG, 5% | 1027 | 405 | 0 | Top |
| C306 | 15180101 | 100pF CAPACITOR, CHIP, 0402, COG, 5% | 613 | 402 | 270 | Top |
| C307 | 15182103 | .01uF CAPACITOR, CHIP, 0402,Z5U,5/10/20 | 20 | 4621 | 270 | Top |
| C309 | 15182103 | .01uF CAPACITOR, CHIP, 0402,Z5U,5/10/20 | 582 | 1865 | 90 | Bottom |
| C310 | 15119104 | .1uF X7R 0805 25V CERAMIC CHIP CAP | 1106 | 328 | 0 | Top |
| C311 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 1229 | 2967 | 90 | Bottom |
| C312 | 15182103 | .01uF CAPACITOR, CHIP, 0402,Z5U,5/10/20 | 544 | 4622 | 270 | Top |
| C313 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 169 | 3033 | 270 | Top |
| C314 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 1280 | 2589 | 180 | Bottom |
| C315 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 1280 | 2271 | 180 | Bottom |
| C316 | 15182103 | .01uF CAPACITOR, CHIP, 0402,Z5U,5/10/20 | 826 | 2291 | 180 | Top |
| C317 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 704 | 2321 | 0 | Bottom |
| C318 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 826 | 2371 | 180 | Top |
| C319 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 704 | 2360 | 0 | Bottom |
| C320 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 1280 | 2403 | 180 | Bottom |
| C321 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 1280 | 2496 | 180 | Bottom |
| C322 | 15180101 | 100pF CAPACITOR, CHIP, 0402, COG, 5% | 1280 | 2311 | 180 | Bottom |
| C323 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 1280 | 2771 | 180 | Bottom |
| C324 | 15119104 | .1uF X7R 0805 25V CERAMIC CHIP CAP | 969 | 2221 | 0 | Top |
| C325 | 15180101 | 100pF CAPACITOR, CHIP, 0402, COG, 5% | 1280 | 2672 | 180 | Bottom |
| C326 | 15180101 | 100pF CAPACITOR, CHIP, 0402, COG, 5% | 1280 | 2628 | 180 | Bottom |
| C327 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 1280 | 2350 | 180 | Bottom |
| C328 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 655 | 2408 | 0 | Top |
| C329 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 634 | 2471 | 270 | Bottom |
| C330 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 704 | 2612 | 0 | Bottom |
| C331 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 704 | 2690 | 0 | Bottom |
| C332 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 704 | 2729 | 0 | Bottom |
| C333 | 152A6475 | 4.7UF 10V A-SIZE TANTALUM CHIP CAP | 493 | 2701 | 180 | Top |
| C334 | 15119104 | .1uF X7R 0805 25V CERAMIC CHIP CAP | 82 | 2765 | 180 | Bottom |
| C335 | 15180101 | 100pF CAPACITOR, CHIP, 0402, COG, 5% | 366 | 2880 | 270 | Bottom |
| C336 | 15181332 | .0033uF CAPACITOR, CHIP, 0402, X7R,5/10% | 454 | 3156 | 90 | Bottom |
| C337 | 152B6106 | 10uF 10V 3.4 X 2.8 CHIP TANTALUM | 724 | 3558 | 270 | Bottom |
| C338 | 15180101 | 100pF CAPACITOR, CHIP, 0402, COG, 5% | 254 | 3144 | 90 | Top |
| C339 | 15119104 | .1uF X7R 0805 25V CERAMIC CHIP CAP | 245 | 2964 | 270 | Top |
| C340 | 15111333 | .033MFD X7R 0805 50V CHIP CAP | 331 | 2665 | 270 | Bottom |
| C341 | 15182103 | .01uF CAPACITOR, CHIP, 0402,Z5U,5/10/20 | 585 | 2328 | 270 | Bottom |
| C342 | 15110821 | 820PF NPO 0805 50V CHIP CAP | 638 | 2982 | 180 | Bottom |
| C343 | 15111102 | .001MF X7R 0805 50V CHIP CAP | 637 | 3063 | 180 | Bottom |
| C344 | 15181472 | .0047uF CAPACITOR, CHIP, 0402, X7R,5/10% | 179 | 2432 | 0 | Top |
| C345 | 15181472 | .0047uF CAPACITOR, CHIP, 0402, X7R,5/10% | 264 | 2432 | 0 | Top |
| C346 | 152A8105 | 1MFD 16V ~3.2 X 1.6~ CHIP TANTALUM | 614 | 2232 | 90 | Top |
| C347 | 15180180 | 18pF CAPACITOR, CHIP, 0402, COG, 5% | 286 | 2500 | 90 | Top |
| C348 | 15119473 | .047uF X7R 0805 25V CHIP CAPACITOR | 474 | 2595 | 0 | Top |
| C349 | 15111333 | .033MFD X7R 0805 50V CHIP CAP | 82 | 2657 | 90 | Bottom |
| C350 | 15180101 | 100pF CAPACITOR, CHIP, 0402, COG, 5% | 493 | 3156 | 90 | Bottom |
| C351 | 15181222 | .0022uF CAPACITOR, CHIP, 0402, X7R,5/10% | 35 | 2641 | 270 | Top |
| C352 | 15180100 | 10pF CAPACITOR, CHIP, 0402, COG, 5% | 436 | 3228 | 90 | Top |
| C353 | 15182103 | .01uF CAPACITOR, CHIP, 0402,Z5U,5/10/20 | 594 | 3131 | 180 | Bottom |
| C354 | 15181221 | 220pF CAPACITOR, CHIP, 0402, X7R, 5/10% | 379 | 2436 | 90 | Bottom |
| C355 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 250 | 2413 | 180 | Bottom |
| C356 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 188 | 2434 | 90 | Bottom |
| C357 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 125 | 2415 | 180 | Top |
| C358 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 585 | 2498 | 90 | Bottom |
| C359 | 15180100 | 10pF CAPACITOR, CHIP, 0402, COG, 5% | 450 | 2573 | 270 | Bottom |
| C360 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 464 | 2283 | 270 | Top |
| C361 | 15180101 | 100pF CAPACITOR, CHIP, 0402, COG, 5% | 459 | 2139 | 90 | Bottom |
| C362 | 15119104 | .1uF X7R 0805 25V CERAMIC CHIP CAP | 981 | 752 | 270 | Bottom |
| C363 | 152B6106 | 10uF 10V 3.4 X 2.8 CHIP TANTALUM | 1231 | 427 | 0 | Top |
| C364 | 152B6106 | 10uF 10V 3.4 X 2.8 CHIP TANTALUM | 1075 | 455 | 90 | Bottom |
| C365 | 01503212 | 220MF 10V ELT CAPACITOR, 5mm HEIGHT | 1493 | 5509 | 0.399 | Top |
| C366 | 15119104 | .1uF X7R 0805 25V CERAMIC CHIP CAP | 1509 | 720 | 180 | Bottom |
| C367 | 15119104 | .1uF X7R 0805 25V CERAMIC CHIP CAP | 1357 | 814 | 90 | Bottom |
| C368 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 220 | 2695 | 270 | Bottom |

| Ref | Ritron PN | Description | X | Y | Theta | Loc |
|---|---|---|---|---|---|---|
| C369 | 15180101 | 100pF CAPACITOR, CHIP, 0402, COG, 5% | 664 | 2454 | 90 | Top |
| C370 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 297 | 2861 | 180 | Top |
| C371 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 704 | 2651 | 0 | Bottom |
| C372 | 15111103 | .01MF X7R 0805 50V CHIP | 444 | 719 | 270 | Bottom |
| C373 | 15119104 | .1uF X7R 0805 25V CERAMIC CHIP CAP | 364 | 2322 | 270 | Bottom |
| C374 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 566 | 2583 | 90 | Bottom |
| C401 | 15180101 | 100pF CAPACITOR, CHIP, 0402, COG, 5% | 1566 | 1966 | 270 | Top |
| C402 | 151104A7 | 4.7PF 0805 50V CHIP CAP. | 1640 | 194 | 90 | Top |
| C403 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 1680 | 1828 | 90 | Top |
| C404 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 1066 | 1850 | 180 | Top |
| C405 | 15180101 | 100pF CAPACITOR, CHIP, 0402, COG, 5% | 1353 | 2013 | 180 | Top |
| C406 | 151101A5 | 1.5PF NPO 0805 50V CHIP | 1182 | 1785 | 270 | Top |
| C407 | 151104A7 | 4.7PF 0805 50V CHIP CAP. | 1463 | 1604 | 0 | Top |
| C408 | 151104A7 | 4.7PF 0805 50V CHIP CAP. | 1572 | 1634 | 270 | Top |
| C409 | 15119104 | .1uF X7R 0805 25V CERAMIC CHIP CAP | 980 | 1766 | 90 | Top |
| C410 | 151104A7 | 4.7PF 0805 50V CHIP CAP. | 1355 | 158 | 270 | Top |
| C411 | 15180101 | 100pF CAPACITOR, CHIP, 0402, COG, 5% | 1262 | 130 | 270 | Top |
| C412 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 1047 | 1788 | 90 | Top |
| C413 | 151102A7 | 2.7pf NPO 0805 CHIP CAPACITOR | 1462 | 1441 | 270 | Top |
| C414 | 152B6106 | 10uF 10V 3.4 X 2.8 CHIP TANTALUM | 722 | 1625 | 0 | Top |
| C415 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 1535 | 969 | 270 | Top |
| C416 | 15180101 | 100pF CAPACITOR, CHIP, 0402, COG, 5% | 1731 | 1114 | 270 | Top |
| C417 | 15180101 | 100pF CAPACITOR, CHIP, 0402, COG, 5% | 1538 | 1356 | 90 | Top |
| C418 | 15180101 | 100pF CAPACITOR, CHIP, 0402, COG, 5% | 677 | 1121 | 180 | Top |
| C419 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 678 | 1213 | 180 | Top |
| C420 | 15181102 | .001uF CAPACITOR, CHIP, 0402, X7R, 5/10% | 678 | 1260 | 180 | Top |
| C421 | 15180101 | 100pF CAPACITOR, CHIP, 0402, COG, 5% | 1053 | 1576 | 180 | Top |
| C422 | 15110100 | 10PF NPO 0805 50V CHIP CAP | 1119 | 1512 | 180 | Top |
| C423 | 151101A0 | 1.0PF NPO 0805 50V CHIP | 1256 | 1400 | 0 | Top |
| C424 | 151108A2 | 8.2PF NPO 0805 50V CHIP | 1187 | 1252 | 270 | Top |
| C425 | 15180101 | 100pF CAPACITOR, CHIP, 0402, COG, 5% | 1069 | 937 | 90 | Top |
| C426 | 15111222 | .0022uF X7R 0805 50V CHIP CAPACITOR | 832 | 922 | 180 | Top |
| C427 | 152AB334 | .33MF 35V ~3.2X1.6~ CHIP TANTALUM | 812 | 1015 | 0 | Top |
| C428 | 15180101 | 100pF CAPACITOR, CHIP, 0402, COG, 5% | 855 | 1473 | 270 | Top |
| C429 | 15111333 | .033MFD X7R 0805 50V CHIP CAP | 1029 | 1015 | 0 | Top |
| C430 | 15180101 | 100pF CAPACITOR, CHIP, 0402, COG, 5% | 971 | 1460 | 270 | Top |
| C431 | 15182103 | .01uF CAPACITOR, CHIP, 0402,Z5U,5/10/20 | 687 | 1393 | 180 | Top |
| C432 | 15180101 | 100pF CAPACITOR, CHIP, 0402, COG, 5% | 766 | 1100 | 180 | Top |
| C433 | 15180101 | 100pF CAPACITOR, CHIP, 0402, COG, 5% | 932 | 1460 | 90 | Top |
| C434 | 15180101 | 100pF CAPACITOR, CHIP, 0402, COG, 5% | 1101 | 1264 | 0 | Top |
| C435 | 15180101 | 100pF CAPACITOR, CHIP, 0402, COG, 5% | 687 | 1355 | 180 | Top |
| **DIODES** | | | | | | |
| CR101 | 48D100A2 | MA4CP101A PIN DIODE, SOT-23 | 1178 | 3820 | 90 | Top |
| CR102 | 48E1005G | MMBD-352LT1 SCHOTTKY DIODE SOT23 | 906 | 3682 | 270 | Top |
| CR103 | 48A1005C | MMBD7000, DUAL DIODES IN SERIES, SOT-23 | 366 | 2119 | 0 | Bottom |
| CR201 | 48D100A2 | MA4CP101A PIN DIODE, SOT-23 | 1302 | 3991 | 0 | Top |
| CR301 | 48B61012 | 1N4742A ZENER DIODE, 12V 1W DL-41 MELF | 991 | 604 | 90 | Top |
| CR302 | 48AA01SA | DIODE, 1A, 50V, SMT, D0214AC CASE | 1154 | 630 | 90 | Top |
| CR303 | 48A1005B | MMBD6100, DUAL DIODES, COM CATHODE, SOT2 | 363 | 431 | 90 | Top |
| CR304 | 48A100A3 | MMBD2835, DUAL DIODES, COM ANODE, SOT-23 | 65 | 4089 | 0 | Top |
| CR305 | 48A1005C | MMBD7000, DUAL DIODES IN SERIES, SOT-23 | 615 | 2821 | 0 | Bottom |
| CR306 | 48A1005C | MMBD7000, DUAL DIODES IN SERIES, SOT-23 | 462 | 2949 | 90 | Bottom |
| CR307 | 48AA01SA | DIODE, 1A, 50V, SMT, D0214AC CASE | 1290 | 630 | 90 | Top |
| CR401 | 48A1005C | MMBD7000, DUAL DIODES IN SERIES, SOT-23 | 695 | 1808 | 90 | Top |
| CR402 | 48C1004E | MMBV-105G DIODE VVC, SOT-23 | 1155 | 1115 | 180 | Top |
| CR403 | 48C1004G | MMBV-2101L DIODE VVC SOT-23 | 1119 | 1400 | 180 | Top |
| CR404 | 48A1004D | MMBV3401 PIN/UHF DIODE SOT-23 | 1552 | 1239 | 270 | Top |
| **FUSE** | | | | | | |
| F301 | 06000040 | WIRE; #40AWG TINNED BUS (INCHES) | 754 | 603 | 270 | Bottom |

| Ref | Ritron PN | Description | X | Y | Theta | Loc |
|---|---|---|---|---|---|---|
| **INTEGRATED CIRCUITS** | | | | | | |
| IC101 | 31030003 | MC3371D SUBSYSTEM IC, SO-16 | 314 | 1158 | 270 | Bottom |
| IC301 | 314G0306 | MCU, 28 PIN, SOIC, SST/JMX 4 SERIES v06 | 992 | 2546 | 0 | Bottom |
| IC302 | 31210005 | EEPROM, 512X8, 24C04 | 989 | 2501 | 180 | Top |
| IC303 | 310K0004 | LMV324MT RAIL TO RAIL QUAD OP AMP | 474 | 2442 | 180 | Top |
| IC304 | 311K0003 | SWITCH,ANALOG,TRIPLE SPDT,4053,TSSOP-16 | 226 | 2683 | 0 | Top |
| IC305 | 310K0003 | LMV358MM DUAL OP AMP, GP LV R/R TSSOP | 404 | 3120 | 0 | Top |
| IC306 | 310K0001 | DS1806E 6 PROG POTS 10K OHM 20-PIN TSSOP | 242 | 2185 | 0 | Top |
| IC307 | 31010004 | LM386MX-1 AUDIO AMP SO-8 | 1331 | 583 | 90 | Bottom |
| IC308 | 310K0002 | MAX7410 5TH ORDER SW CAP BUTTERWORTH LPF | 407 | 2946 | 0 | Top |
| IC309 | 310E0002 | REGULATOR,LDO,LP2980,5V,W ENABLE,SOT-25 | 162 | 504 | 0 | Top |
| IC401 | 313K0005 | SYNTHESIZER, MC145193, TSSOP | 891 | 1265 | 180 | Top |
| **JACKS** | | | | | | |
| J301 | 02100001 | 2.5MM PC-MT JACK; ANT-CHGR | 1178 | 4668 | 0 | Top |
| J303 | 02100053 | 3.5MM STEREO JACK; PANEL MOUNT | 1560 | 4646 | 0 | Top |
| **INDUCTORS** | | | | | | |
| L101 | 01850201 | 1.5T SW COIL W/5MM SHIELD & ALUM CORE | 721 | 4291 | 90 | Top |
| L102 | 18110151 | CHIP INDUCTOR .15uhy | 629 | 3722 | 270 | Top |
| L103 | 01850201 | 1.5T SW COIL W/5MM SHIELD & ALUM CORE | 484 | 4291 | 270 | Top |
| L104 | 01850201 | 1.5T SW COIL W/5MM SHIELD & ALUM CORE | 204 | 4292 | 270 | Top |
| L105 | 18433103 | 3T AIRCOIL, SMT, 8.0nH, .120 X .145 | 332 | 3901 | 0 | Top |
| L106 | 18110102 | CHIP INDUCTOR 1.0uhy | 280 | 3474 | 0 | Top |
| L107 | 18433101 | 1T AIRCOIL, SMT 2.5nH, .120 X .145 | 480 | 3492 | 180 | Top |
| L108 | 18110681 | CHIP INDUCTOR .68uhy | 51 | 1658 | 180 | Bottom |
| L201 | 18414104 | 4.5T AIRCOIL #24AWG .0625ID RHH SMT | 1399 | 2474 | 180 | Top |
| L203 | 18414104 | 4.5T AIRCOIL #24AWG .0625"ID RHH SMT | 1478 | 2880 | 180 | Top |
| L204 | 18433102 | 2T AIRCOIL SMT 5.0nH .120 X .145 | 1591 | 3250 | 90 | Top |
| L205 | 18110103 | CHIP INDUCTOR 10uhy | 1386 | 3262 | 90 | Top |
| L206 | 18414108 | 8.5T AIRCOIL #24AWG .0625"ID RHH SMT | 1143 | 3523 | 180 | Top |
| L207 | 18433102 | 2T AIRCOIL SMT 5.0nH .120 X .145 | 1737 | 3765 | 0 | Top |
| L208 | 18414104 | 4.5T AIRCOIL #24AWG .0625"ID RHH SMT | 1695 | 4001 | 90 | Top |
| L209 | 18414104 | 4.5T AIRCOIL #24AWG .0625"ID RHH SMT | 1479 | 3945 | 180 | Top |
| L210 | 18110102 | CHIP INDUCTOR 1.0uhy | 1335 | 3804 | 90 | Top |
| L211 | 18414105 | 5.5T AIRCOIL #24AWG .0625"ID RHH SMT | 1093 | 3979 | 90 | Top |
| L212 | 18433102 | 2T AIRCOIL SMT 5.0nH .120 X .145 | 932 | 4343 | 0 | Top |
| L401 | 18433208 | 8T AIRCOIL, SMT, 8.80 nH, .159 X .056 | 1376 | 1418 | 270 | Top |
| L402 | 18414109 | 9.5T AIRCOIL #24AWG .0625"ID RHH SMT | 1352 | 118 | 0 | Top |
| L403 | 18110820 | INDUCTOR, CHIP 82nH | 1548 | 109 | 270 | Top |
| L404 | 18110101 | CHIP INDUCTOR 0.1uhy | 1205 | 966 | 270 | Top |
| L405 | 18110101 | CHIP INDUCTOR 0.1uhy | 753 | 1485 | 0 | Top |
| **MICROPHONE** | | | | | | |
| M301 | 05500037 | MICROPHONE; ELECTRET, MINIATURE | 0 | 0 | 0 | Bottom |
| **CONNECTORS** | | | | | | |
| P201 | 25500700 | CONTACT, PCB MNT, ANTENNA,SST | 896 | 4550 | 90 | Top |
| P302 | 21310021 | HEADER, 2 PIN SIDE ENTRY SHROUDED | 754 | 737 | 0 | Top |
| **TRANSISTORS** | | | | | | |
| Q101 | 4801002A | MMBT3906 PNP, SOT23 | 675 | 3405 | 270 | Top |
| Q102 | 482100V0 | TRANSISTOR, NPN, UHF, SOT-23, PBR-941 | 734 | 3828 | 0 | Top |
| Q103 | 4841006U | MMBFJ309LT1, N-CHAN, RF, SOT23 | 340 | 3639 | 270 | Top |
| Q104 | 4821003B | MMBT918LT1 VHF SOT23 (3B) | 270 | 3548 | 0 | Bottom |
| Q105 | 4821003B | MMBT918LT1 VHF SOT23 (3B) | 38 | 1374 | 180 | Bottom |
| Q201 | 480100DH | BCW68GLT1 .8AMP PNP SOT-23 | 908 | 3268 | 90 | Bottom |
| Q202 | 4801001Q | MMBT5088, NPN, SOT-23 | 766 | 3268 | 270 | Bottom |
| Q203 | 482100V0 | TRANSISTOR, NPN, UHF, SOT-23, PBR-941 | 1453 | 2248 | 270 | Top |
| Q204 | 48280001 | BFG135 WB SOT-223 1W TRANSISTOR | 1699 | 291 | 50 | Top |
| Q205 | 04801013 | MRF-630 3 W UHF AMP TRAN. NPN | 1469 | 3543 | 0 | Top |

| Ref | Ritron PN | Description | X | Y | Theta | Loc |
|---|---|---|---|---|---|---|
| Q301 | 48010R02 | MUN2211T1, NPN, INT 10K/10K BIAS, "8A", | 1133 | 2987 | 90 | Bottom |
| Q302 | 4801002A | MMBT3906 PNP, SOT23 | 1094 | 3124 | 90 | Bottom |
| Q303 | 4801001Q | MMBT5088, NPN, SOT-23 | 583 | 519 | 0 | Top |
| Q304 | 480100DH | BCW68GLT1 .8AMP PNP SOT-23 | 445 | 668 | 0 | Top |
| Q306 | 480100DH | BCW68GLT1 .8AMP PNP SOT-23 | 1222 | 2259 | 90 | Top |
| Q307 | 4801001Q | MMBT5088, NPN, SOT-23 | 964 | 615 | 0 | Bottom |
| Q308 | 480100DH | BCW68GLT1 .8AMP PNP SOT-23 | 1162 | 669 | 0 | Bottom |
| Q401 | 482100V0 | TRANSISTOR, NPN, UHF, SOT-23, PBR-941 | 1470 | 1919 | 270 | Top |
| Q402 | 482100V0 | TRANSISTOR, NPN, UHF, SOT-23, PBR-941 | 1289 | 1920 | 270 | Top |
| Q403 | 482100V0 | TRANSISTOR, NPN, UHF, SOT-23, PBR-941 | 1460 | 1714 | 270 | Top |
| Q404 | 4801001Q | MMBT5088, NPN, SOT-23 | 837 | 1766 | 270 | Top |
| Q405 | 4801006A | MUN2111T1, PNP, INT 10K/10K BIAS, SC-59 | 1634 | 1376 | 270 | Top |
| Q406 | 48010R02 | MUN2211T1, NPN, INT 10K/10K BIAS, "8A", | 1691 | 1234 | 0 | Top |
| **RESISTORS** | | | | | | |
| R101 | 47180103 | 10K OHM, RESISTOR, CHIP, 0402,1/16W,5% | 579 | 3344 | 90 | Top |
| R102 | 47180103 | 10K OHM, RESISTOR, CHIP, 0402,1/16W,5% | 734 | 3581 | 180 | Top |
| R103 | 47180102 | 1K OHM RESISTOR, CHIP,0402, 1/16W,5% | 773 | 3709 | 270 | Top |
| R104 | 47180392 | 3.9K OHM RESISTOR, CHIP, 0402, 1/16W, 5% | 829 | 3810 | 270 | Top |
| R105 | 47180561 | 560 OHM RESISTOR, CHIP, 0402, 1/16W, 5% | 714 | 3519 | 270 | Top |
| R106 | 47180152 | 1.5K OHM RESISTOR, CHIP, 0402, 1/16W,5% | 475 | 3610 | 270 | Top |
| R107 | 47180152 | 1.5K OHM RESISTOR, CHIP, 0402, 1/16W,5% | 388 | 3484 | 180 | Bottom |
| R108 | 47180223 | 22K OHM RESISTOR, CHIP, 0402, 1/16W, 5% | 251 | 3450 | 180 | Bottom |
| R109 | 47180101 | 100 OHM RESISTOR, CHIP, 0402,1/16W,5% | 167 | 3450 | 180 | Bottom |
| R110 | 47180154 | 150K OHM RESISTOR, CHIP, 0402, 1/16W,5% | 411 | 946 | 270 | Bottom |
| R111 | 47180122 | 1.2K OHM RESISTOR, CHIP, 0402, 1/16W,5% | 529 | 904 | 270 | Bottom |
| R112 | 47180224 | 220K OHM RESISTOR, CHIP, 0402, 1/16W, 5% | 349 | 966 | 180 | Bottom |
| R113 | 47180123 | 12K OHM RESISTOR, CHIP, 0402, 1/16W,5% | 489 | 946 | 90 | Bottom |
| R114 | 47180152 | 1.5K OHM RESISTOR, CHIP, 0402, 1/16W,5% | 551 | 966 | 0 | Bottom |
| R115 | 47180104 | 100K OHM, RESISTOR, CHIP, 0402,1/16W,5% | 153 | 2174 | 270 | Bottom |
| R116 | 47180103 | 10K OHM, RESISTOR, CHIP, 0402,1/16W,5% | 153 | 2089 | 90 | Bottom |
| R117 | 47180393 | 39K OHM RESISTOR, CHIP, 0402, 1/16W, 5% | 117 | 1676 | 90 | Top |
| R118 | 47180103 | 10K OHM, RESISTOR, CHIP, 0402,1/16W,5% | 49 | 1509 | 0 | Bottom |
| R119 | 47180102 | 1K OHM RESISTOR, CHIP,0402, 1/16W,5% | 49 | 1470 | 180 | Bottom |
| R120 | 47180681 | 680 OHM RESISTOR, CHIP, 0402, 1/16W, 5% | 78 | 1635 | 90 | Top |
| R201 | 47180103 | 10K OHM, RESISTOR, CHIP, 0402,1/16W,5% | 790 | 3384 | 90 | Bottom |
| R202 | 47180471 | 470 OHM RESISTOR, CHIP, 0402, 1/6W, 5% | 669 | 3248 | 270 | Bottom |
| R203 | 47180181 | 180 OHM RESISTOR, CHIP, 0402, 1/16W, 5% | 897 | 3151 | 90 | Bottom |
| R205 | 47180103 | 10K OHM, RESISTOR, CHIP, 0402,1/16W,5% | 1357 | 2228 | 90 | Top |
| R206 | 47180152 | 1.5K OHM RESISTOR, CHIP, 0402, 1/16W,5% | 1318 | 2228 | 90 | Top |
| R207 | 47100470 | 47 OHM 0805 CHIP RES. | 1438 | 2678 | 270 | Top |
| R208 | 47180222 | 2.2K OHM RESISTOR, CHIP, 0402, 1/16W, 5% | 1605 | 2718 | 180 | Top |
| R209 | 47180271 | 270 OHM RESISTOR, CHIP, 0402, 1/16W, 5% | 1720 | 271 | 180 | Top |
| R210 | 47180221 | 220 OHM RESISTOR, CHIP, 0402, 1/16W, 5% | 1277 | 3581 | 270 | Top |
| R211 | 47180181 | 180 OHM RESISTOR, CHIP, 0402, 1/16W, 5% | 1217 | 3726 | 180 | Top |
| R212 | 47180102 | 1K OHM RESISTOR, CHIP,0402, 1/16W,5% | 879 | 4148 | 90 | Top |
| R301 | 47180103 | 10K OHM, RESISTOR, CHIP, 0402,1/16W,5% | 536 | 686 | 90 | Top |
| R302 | 47100471 | 470 OHM 0805 CHIP RES. | 475 | 479 | 270 | Top |
| R303 | 47180104 | 100K OHM, RESISTOR, CHIP, 0402,1/16W,5% | 316 | 546 | 90 | Top |
| R304 | 47180102 | 1K OHM RESISTOR, CHIP,0402, 1/16W,5% | 623 | 639 | 270 | Top |
| R305 | 47180104 | 100K OHM, RESISTOR, CHIP, 0402,1/16W,5% | 409 | 547 | 270 | Top |
| R306 | 47180103 | 10K OHM, RESISTOR, CHIP, 0402,1/16W,5% | 621 | 1865 | 90 | Bottom |
| R307 | 47180103 | 10K OHM, RESISTOR, CHIP, 0402,1/16W,5% | 995 | 3143 | 90 | Bottom |
| R308 | 47180103 | 10K OHM, RESISTOR, CHIP, 0402,1/16W,5% | 1086 | 334 | 5180 | Top |
| R309 | 47180103 | 10K OHM, RESISTOR, CHIP, 0402,1/16W,5% | 1257 | 2891 | 270 | Bottom |
| R310 | 47180104 | 100K OHM, RESISTOR, CHIP, 0402,1/16W,5% | 704 | 2191 | 0 | Bottom |
| R311 | 47180104 | 100K OHM, RESISTOR, CHIP, 0402,1/16W,5% | 504 | 4622 | 270 | Top |
| R312 | 47180103 | 10K OHM, RESISTOR, CHIP, 0402,1/16W,5% | 704 | 2230 | 0 | Bottom |
| R313 | 47180104 | 100K OHM, RESISTOR, CHIP, 0402,1/16W,5% | 1206 | 2376 | 270 | Top |
| R314 | 47180472 | 4.7K OHM RESISTOR, CHIP, 0402, 1/16W, 5% | 1260 | 2375 | 270 | Top |
| R315 | 47180102 | 1K OHM RESISTOR, CHIP,0402, 1/16W,5% | 709 | 2834 | 90 | Bottom |
| R316 | 47180103 | 10K OHM, RESISTOR, CHIP, 0402,1/16W,5% | 761 | 2506 | 90 | Top |
| R317 | 47180103 | 10K OHM, RESISTOR, CHIP, 0402,1/16W,5% | 800 | 2506 | 90 | Top |
| R318 | 47180104 | 100K OHM, RESISTOR, CHIP, 0402,1/16W,5% | 704 | 2520 | 180 | Bottom |

| Ref | Ritron PN | Description | X | Y | Theta | Loc |
|---|---|---|---|---|---|---|
| R319 | 47180471 | 470 OHM RESISTOR, CHIP, 0402, 1/6W, 5% | 704 | 2768 | 180 | Bottom |
| R320 | 47180471 | 470 OHM RESISTOR, CHIP, 0402, 1/6W, 5% | 638 | 2917 | 0 | Bottom |
| R321 | 47180103 | 10K OHM, RESISTOR, CHIP, 0402,1/16W,5% | 760 | 2951 | 180 | Bottom |
| R322 | 47180393 | 39K OHM RESISTOR, CHIP, 0402, 1/16W, 5% | 274 | 3069 | 270 | Bottom |
| R323 | 47180823 | 82K OHM RESISTOR, CHIP, 0402, 1/16W, 5% | 371 | 3070 | 270 | Bottom |
| R324 | 47180224 | 220K OHM RESISTOR, CHIP, 0402, 1/16W, 5% | 313 | 3070 | 270 | Bottom |
| R325 | 47180104 | 100K OHM, RESISTOR, CHIP, 0402,1/16W,5% | 416 | 3156 | 90 | Bottom |
| R326 | 47180183 | 18K OHM RESISTOR, CHIP, 0402, 1/16W, 5% | 585 | 2413 | 270 | Bottom |
| R327 | 47180183 | 18K OHM RESISTOR, CHIP, 0402, 1/16W, 5% | 624 | 2328 | 90 | Bottom |
| R328 | 47180103 | 10K OHM, RESISTOR, CHIP, 0402,1/16W,5% | 477 | 2791 | 270 | Bottom |
| R329 | 47180153 | 15K OHM RESISTOR, CHIP, 0402, 1/16W,5% | 179 | 2391 | 180 | Top |
| R330 | 47180100 | 10 OHM RESISTOR, CHIP,0402, 1/16W 5% | 664 | 2369 | 90 | Top |
| R331 | 47180104 | 100K OHM, RESISTOR, CHIP, 0402,1/16W,5% | 264 | 2392 | 0 | Top |
| R332 | 47180154 | 150K OHM RESISTOR, CHIP, 0402, 1/16W,5% | 207 | 2501 | 90 | Top |
| R333 | 47180473 | 47K OHM RESISTOR, CHIP, 0402, 1/16W, 5% | 246 | 2500 | 90 | Top |
| R334 | 47180273 | 27K OHM RESISTOR, CHIP, 0402, 1/16W, 5% | 566 | 2588 | 90 | Top |
| R335 | 47180102 | 1K OHM RESISTOR, CHIP,0402, 1/16W,5% | 43 | 2774 | 270 | Top |
| R336 | 47180104 | 100K OHM, RESISTOR, CHIP, 0402,1/16W,5% | 4 | 2774 | 270 | Top |
| R337 | 47180103 | 10K OHM, RESISTOR, CHIP, 0402,1/16W,5% | 532 | 3156 | 270 | Bottom |
| R338 | 47180224 | 220K OHM RESISTOR, CHIP, 0402, 1/16W, 5% | 397 | 3228 | 90 | Top |
| R339 | 47180394 | 390K OHM RESISTOR, CHIP, 0402, 1/6W, 5% | 468 | 2366 | 270 | Bottom |
| R340 | 47180104 | 100K OHM, RESISTOR, CHIP, 0402,1/16W,5% | 340 | 2436 | 90 | Bottom |
| R341 | 47180104 | 100K OHM, RESISTOR, CHIP, 0402,1/16W,5% | 250 | 2455 | 0 | Bottom |
| R342 | 47180184 | 180K OHM RESISTOR, CHIP, 0402, 1/16W, 5% | 63 | 2395 | 270 | Bottom |
| R343 | 47180564 | 560K OHM RESISTOR, CHIP, 0402, 1/16W, 5% | 741 | 3130 | 0 | Top |
| R344 | 47180104 | 100K OHM, RESISTOR, CHIP, 0402,1/16W,5% | 21 | 2428 | 270 | Bottom |
| R345 | 47180104 | 100K OHM, RESISTOR, CHIP, 0402,1/16W,5% | 125 | 2455 | 180 | Bottom |
| R346 | 47180102 | 1K OHM RESISTOR, CHIP,0402, 1/16W,5% | 742 | 3092 | 180 | Bottom |
| R348 | 47180473 | 47K OHM RESISTOR, CHIP, 0402, 1/16W, 5% | 411 | 2573 | 270 | Bottom |
| R349 | 47180823 | 82K OHM RESISTOR, CHIP, 0402, 1/16W, 5% | 29 | 2146 | 0 | Top |
| R350 | 47180564 | 560K OHM RESISTOR, CHIP, 0402, 1/16W, 5% | 29 | 2198 | 0 | Top |
| R352 | 47100225 | 2.2M 0805 CHIP RESISTOR | 44 | 2406 | 0 | Top |
| R353 | 47180103 | 10K OHM, RESISTOR, CHIP, 0402,1/16W,5% | 486 | 2166 | 180 | Top |
| R354 | 47180102 | 1K OHM RESISTOR, CHIP,0402, 1/16W,5% | 847 | 653 | 180 | Bottom |
| R355 | 47180103 | 10K OHM, RESISTOR, CHIP, 0402,1/16W,5% | 912 | 772 | 90 | Bottom |
| R356 | 47180273 | 27K OHM RESISTOR, CHIP, 0402, 1/16W, 5% | 1181 | 765 | 0 | Bottom |
| R357 | 47180102 | 1K OHM RESISTOR, CHIP,0402, 1/16W,5% | 1183 | 534 | 270 | Bottom |
| R358 | 47180103 | 10K OHM, RESISTOR, CHIP, 0402,1/16W,5% | 250 | 2374 | 180 | Bottom |
| R359 | 47180100 | 10 OHM RESISTOR, CHIP,0402, 1/16W 5% | 1601 | 741 | 270 | Bottom |
| R362 | 47180100 | 10 OHM RESISTOR, CHIP,0402, 1/16W 5% | 507 | 2622 | 180 | Bottom |
| R401 | 47180221 | 220 OHM RESISTOR, CHIP, 0402, 1/16W, 5% | 1517 | 2006 | 90 | Top |
| R402 | 47180101 | 100 OHM RESISTOR, CHIP, 0402,1/16W,5% | 1640 | 1828 | 270 | Top |
| R403 | 47180272 | 2.7K OHM RESISTOR, CHIP, 0402, 1/16W, 5% | 1450 | 2013 | 180 | Top |
| R404 | 47180102 | 1K OHM RESISTOR, CHIP,0402, 1/16W,5% | 1452 | 1825 | 180 | Top |
| R405 | 47180101 | 100 OHM RESISTOR, CHIP, 0402,1/16W,5% | 1153 | 1900 | 270 | Top |
| R406 | 47180272 | 2.7K OHM RESISTOR, CHIP, 0402, 1/16W, 5% | 1193 | 1900 | 270 | Top |
| R407 | 47180470 | 47 OHM RESISTOR, CHIP, 0402, 1/16W, 5% | 1086 | 1788 | 270 | Top |
| R408 | 47180470 | 47 OHM RESISTOR, CHIP, 0402, 1/16W, 5% | 1067 | 1726 | 180 | Top |
| R409 | 47180271 | 270 OHM RESISTOR, CHIP, 0402, 1/16W, 5% | 1636 | 1655 | 90 | Top |
| R410 | 47180153 | 15K OHM RESISTOR, CHIP, 0402, 1/16W,5% | 1266 | 162 | 5180 | Top |
| R411 | 47180153 | 15K OHM RESISTOR, CHIP, 0402, 1/16W,5% | 1363 | 1694 | 270 | Top |
| R412 | 47180102 | 1K OHM RESISTOR, CHIP,0402, 1/16W,5% | 1271 | 1827 | 180 | Top |
| R413 | 47180472 | 4.7K OHM RESISTOR, CHIP, 0402, 1/16W, 5% | 677 | 1903 | 0 | Top |
| R414 | 47180103 | 10K OHM, RESISTOR, CHIP, 0402,1/16W,5% | 1634 | 1531 | 270 | Top |
| R415 | 47180102 | 1K OHM RESISTOR, CHIP,0402, 1/16W,5% | 1641 | 1068 | 90 | Top |
| R416 | 47180104 | 100K OHM, RESISTOR, CHIP, 0402,1/16W,5% | 1138 | 1576 | 0 | Top |
| R417 | 47180102 | 1K OHM RESISTOR, CHIP,0402, 1/16W,5% | 938 | 937 | 90 | Top |
| R418 | 47180473 | 47K OHM RESISTOR, CHIP, 0402, 1/16W, 5% | 938 | 1022 | 90 | Top |
| R419 | 47180822 | 8.2K OHM RESISTOR, CHIP, 0402, 1/16W, 5% | 718 | 906 | 0 | Top |
| R420 | 47180103 | 10K OHM, RESISTOR, CHIP, 0402,1/16W,5% | 718 | 946 | 180 | Top |
| R421 | 47180392 | 3.9K OHM RESISTOR, CHIP, 0402, 1/16W, 5% | 1101 | 1303 | 0 | Top |
| R422 | 47180100 | 10 OHM RESISTOR, CHIP,0402, 1/16W 5% | 894 | 1461 | 90 | Top |
| R423 | 47180474 | 470K OHM RESISTOR, 0402, 1/16W, 5% | 850 | 1100 | 180 | Top |

**SPEAKER**

| | | | | | | |
|---|---|---|---|---|---|---|
| SP301 | 05500045 | SPEAKER, 45MM, 1W, LOW PROFILE SST/RTX | 0 | 0 | 0 | Bottom |

**SWITCHES**

| | | | | | | |
|---|---|---|---|---|---|---|
| SW301 | 05100042 | SWITCH SPST MOMENTARY MINI PC 260GM | 268 | 4587 | 180 | Top |
| SW302 | 05100042 | SWITCH SPST MOMENTARY MINI PC 260GM | 788 | 4588 | 180 | Top |
| SW303 | 05100046 | SWITCH, TACT LO PROFILE RT ANGLE 160gf | 82 | 3097 | 270 | Top |
| SW304 | 05100046 | SWITCH, TACT LO PROFILE RT ANGLE 160gf | 82 | 3948 | 270 | Top |

**TRANSFORMER**

| | | | | | | |
|---|---|---|---|---|---|---|
| T101 | 05600018 | 455KHZ IF TRANSFORMER (5MM) | 128 | 1822 | 180 | Top |

**CRYSTAL**

| | | | | | | |
|---|---|---|---|---|---|---|
| Y302 | 23050003 | TCVCXO, 14.400 MHz, 1.5 PPM, VC=30 PPM/V | 146 | 837 | 90 | Top |

**FILTERS**

| | | | | | | |
|---|---|---|---|---|---|---|
| YF101 | 02301403 | 43.650 MHz Crystal Filter +/-6.0KHz UM-1 | 44 | 3524 | 90 | Top |
| YF102 | 02301013 | FILTER,CERAMIC,450KHz,+/-7.5KHz,6 POLE | 249 | 1614 | 90 | Top |

**HARDWARE**

| | |
|---|---|
| 1750270A | PCB, ML4 FR4 5UPM, .062 MIX, SST-442 |
| 25602500 | CRYSTAL SUPPORT, RUBBER PAD, SMALL/UM-1 |
| 06001010 | #24 AWG STRANDED WIRE; RED (INCHES) |
| 06001011 | #24 AWG STRANDED WIRE; BLACK INCHES |
| 06001023 | #28 AWG STRANDED WIRE;GREEN INCHES |
| 06001029 | #28 AWG STRANDED WIRE; BLUE INCHES |
| 25105500 | SHIELD, SST-PLUS SYNTHESIZER |
| 25603000 | FOAM, MOUNTING, SPEAKER,SST |
| 25603900 | SPACER, MIC FOAM, SST |
| 25605700 | MICROPHONE HOLDER, SST-PLUS |

**ANTENNA**

| | |
|---|---|
| AFS-450 | ANTENNA UHF MOLDED, 450-470 REG LEN SST |

**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 |

**BELT CLIP**

| | |
|---|---|
| 25201600 | BELT CLIP, PLASTIC, SST BLACK |
| 2811B600 | SCREW 6-32 X 1/4" PHTRST |

| Ritron PN | Description |
|---|---|

**SST-442 MODELS ONLY**

**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 |
| 14200100 | LABEL, FCC SERIAL, SST-442 |

**BATTERY PACK AND INSULATOR**

| | |
|---|---|
| BPS-6N-SC | BATTERY,RECHG,7.2V NiCd,BLUE ,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 |

**PACKING MATERIALS**

| | |
|---|---|
| 14210004 | LOW BATTERY NOTICE LABEL |
| 14312006 | SHIPPING CARTON, CARDBOARD,SST |
| 14321002 | FOAM INSERT, PACKING, SST/MINI |
| 14500025 | OWNER'S MANUAL, 14x/44x SERIES, JMX/SST |
| 14540006 | WARRANTY REGISTRATION CARD |

**JMX-442 MODELS ONLY**

**CASE LABELS**

| | |
|---|---|
| 14220002 | LABEL, CONTROLS, JMX |
| 14222035 | LABEL, NAMEPLATE, JMX |
| 14290002 | BLANK LABEL, .75" X .25" GLOSSY WHITE |
| 14200037 | LABEL SST/JMX MFG DATE CODE |
| 14200101 | LABEL, FCC SERIAL, JMX-442 |

**BATTERY PACK AND INSULATOR**

| | |
|---|---|
| BPJS-6N | BATTERY, YELLOW, RECHG,7.2V NiCd 700 mAH |
| BC-A | BATTERY CHARGER, 120VAC-5.5VDC 100mA |
| 14230088 | LABEL, BATTERY, BPS-6N-SC, SST |
| 25300600 | INSULATOR, BATTERY, FIBRE, SST |
| 25606000 | FOAM SUPPORT, BATTERY JMX SERIES |
| 25601600 | BATTERY SHIM; ASSEMBLY ~X~ SERIES |

**PACKING MATERIALS**

| | |
|---|---|
| 14210004 | LOW BATTERY NOTICE LABEL |
| 14313012 | BOX, CHIPBOARD, SMALL, 4 COLOR, JMX |
| 14352004 | INSERT, CORREGATED CARDBOARD, JMX |
| 14500025 | OWNER'S MANUAL, 14x/44x SERIES, JMX/SST |
| 14540006 | WARRANTY REGISTRATION CARD |
| 14610006 | JOBCOM BROCHURE |