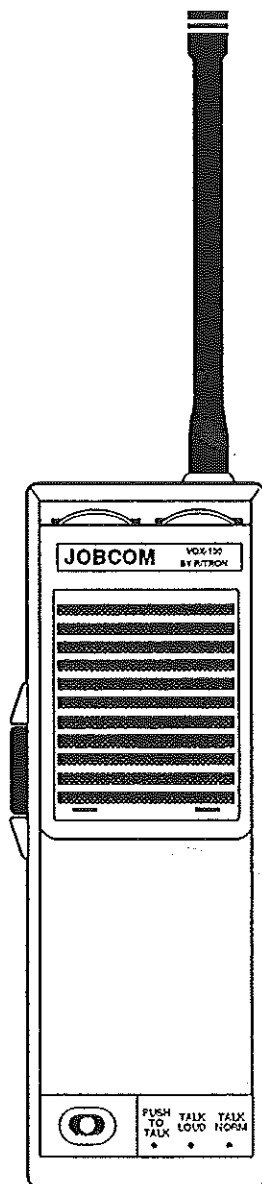


RADIO COMMUNICATIONS
FOR PROFESSIONALS

RITRON, INC.

MAINTENANCE AND OPERATING MANUAL MODEL RT-15H (VOX-100) VHF-FM HANDHELD TRANSCEIVER



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"QUIET-CALL" AND "PAGING QUIET-CALL" ARE TRADEMARKS OF RITRON

505 West Carmel Drive
Carmel, Indiana 46032
Phone: 317/846-1201
FAX: 317/846-4978

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SPECIFICATIONS: RT-15H VHF-FM TRANSCEIVER

GENERAL

FCC ID:	AIE9QZRT-15H
FCC Rule Parts:	22, 74, 90
Frequency Range:	144 to 174 MHz
Channels:	1
Power Supply:	6 Volts nominal, 500 mA/H Nickel-Cadmium battery pack
Battery Drain:	Standby 12 mA nominal Receive 50 mA nominal Transmit 500 mA nominal
Battery Life:	8 Hours (@ 90% Standby, 5% Receive, 5% Transmit)
Dimensions:	7.21" H; 2.6" W; 1.8" D
Weight:	1 Pound
TRANSMITTER	
RF Output:	1 Watt typical @ 6 Volts (.75 Watts minimum)
Frequency Stability:	+/- .001% from -30° to +50° C
Modulation:	Type 16K0F3E, +/- 5 KHz for 100% modulation
Spurious and Harmonics:	More than 45 dB below carrier
Audio Response:	Meets FCC requirements
Output Impedance:	50 Ω
Crystal Specifications:	(Transmit Frequency)/12 Fundamental Mode, Cp = 32 pF Crystal Specification No. 02300003

RECEIVER

Receiving System:	Double-Conversion Superhetrodyne
Audio Output:	300 mW into 8 Ω with less than 10% THD
Frequency Stability:	+/- .001% from -30° to +50° C
Modulation Acceptance:	+/- 7.5 KHz maximum
Spurious Rejection:	Greater than 50 dB
Image Rejection:	Greater than 30 dB
Selectivity:	Greater than 70 dB @ 30 KHz
Intermodulation:	More than 60 dB
Sensitivity:	0.3 μ V maximum for 12 dB SINAD
Squelch Sensitivity:	0.20 μ V to 1.0 uV adjustable 0.40 μ V when in Tone Squelch
Crystal Specification:	(Receive Frequency - 10.7 MHz)/3 Third Overtone, Parallel Mode, Cp = 32 pF Crystal Specification No. 02300004

NOTES

- 1) Specifications are at nominal battery voltage.
- 2) Operating temperature range: -30° to +50° C

REPLACEMENT ITEMS

BP-5NM:	5-Cell, 500 mA/H Nicad Battery Pack with Methode connector (standard)
RHD-10:	Single-muff Headset with Boom Microphone (standard)
RHD-20:	Dual-muff Headset with Boom Microphone (optional)
RSM-23	Remote Speaker/Microphone with PTT (optional)

RT-15H OPERATING INSTRUCTIONS

GENERAL

The RT-15H JOBCOM operates in the VHF-FM communications band. Using an appropriate FITRON headset, the RT-15H may be left in its holster while operated, leaving the user's hands free. Speaking into the headset microphone automatically activates the radio transmitter when "Hands-Free" (VOX) mode is selected.

Because the JOBCOM VOX can transmit on frequencies assigned by the FCC, this radio **MUST BE LICENSED BEFORE USE.**

The RT-15H contains an internal battery pack that might have become discharged during storage and shipment. Before first using the handheld, plug the charger cube into a 110 VAC wall outlet and the charger cord into the JOBCOM's charger jack (labeled CHG on top of the radio case). Make sure the handheld is turned OFF. Allow the batteries at least eight hours to charge fully; the unit may be left to charge indefinitely without damaging the batteries. Thereafter, charge the batteries three to four hours each day before using the portable. Battery pack life averages about one year.

To talk to other stations while using the RT-15H WITHOUT a headset or optional speaker/microphone, press and hold the Push-to-Talk button (see FIG-1 at right for location of radio controls) while speaking into the grille at the front of the handheld. Release the PTT switch to hear a reply.

The volume control knob switches the JOBCOM VOX on and off. Rotate the volume control CW (clockwise) to turn on the unit; further rotation increases the volume.

The user may set the squelch control to extinguish noise between transmissions and, block out unreadable signals. Rotate the squelch knob CW until noise is heard; then set the squelch by rotating the control CCW (counter-clockwise) until noise disappears.

ACCESSORIES

HEADSET & REMOTE SPEAKER/MICROPHONE

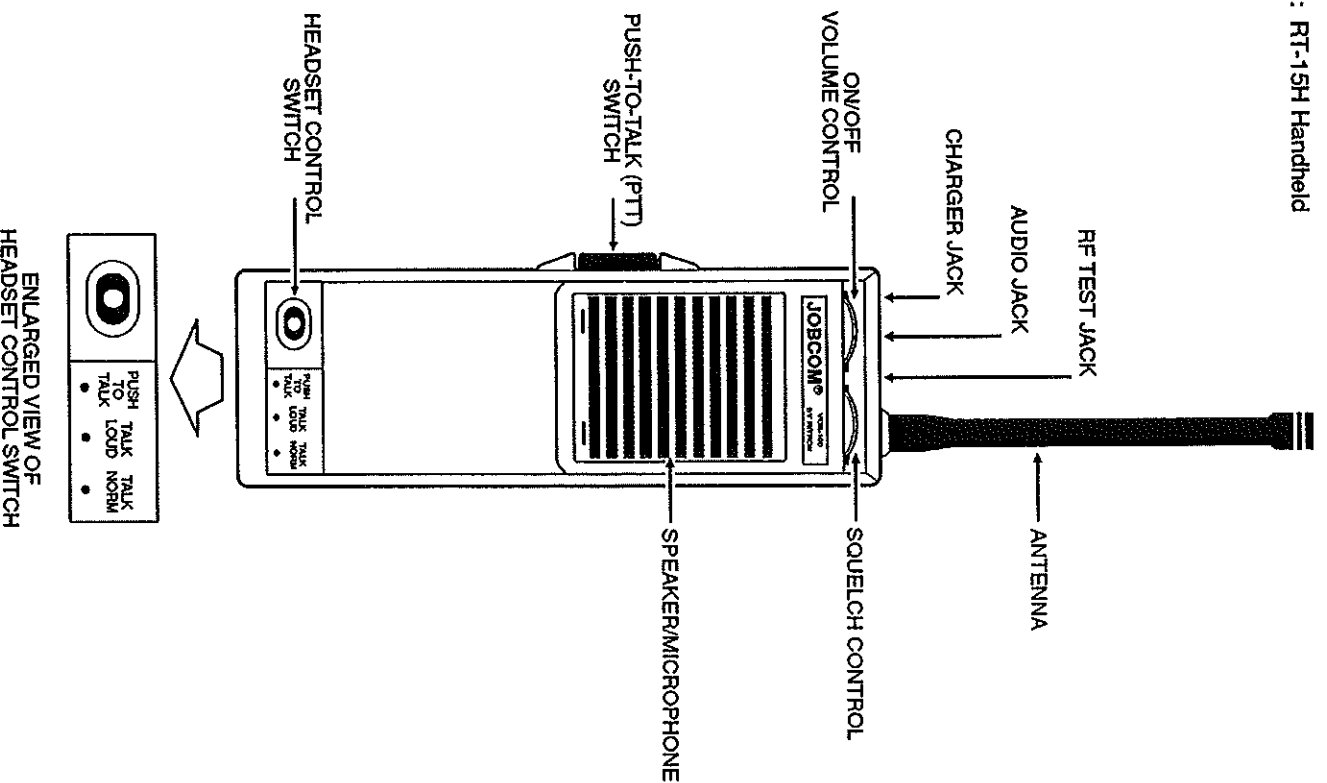
BEFORE operating the RT-15H with a headset (RHD-10 or RHD-23) OR remote speaker/microphone (RSM-23), determine which accessory has been selected with the audio jack program jumper. To access the audio program jumper, which is located on the radio PC board, remove the Phillips head screws from the radio's back panel. Program the handheld for use with the audio accessory to be used, according to FIG-2 on the next page.

CAUTION: With the radio programmed for use with the RSM-23, inserting a headset plug into the AUDIO jack causes the transmitter to be continuously activated! The audio program jumper must be positioned for headset operation to use a headset!

For VOX (Voice Operated Transmit) operation, insert the headset plug into the AUDIO

jack located between the charger and RF test jacks on top of the radio (refer to FIG-1). Plugging in a headset disables the radio's internal speaker/microphone.

FIG-1: RT-15H Handheld



The HEADSET CONTROL SWITCH, located at the bottom-left of the case front, is labeled with three switch settings: PUSH TO TALK, which turns off voice-activated transmitter keying; TALK LOUD, for "Hands-Free" operation in noisy environments where a louder than normal voice is needed and; TALK NORM, for "Hands-Free" operation in environments where a normal voice level is easily heard. If the unit transmits continuously due to loud background noise, the headset control switch should be moved to its PUSH TO TALK position and the transmitter keyed by pressing the Push-to-Talk button. The user may still use the boom microphone to talk to other stations.

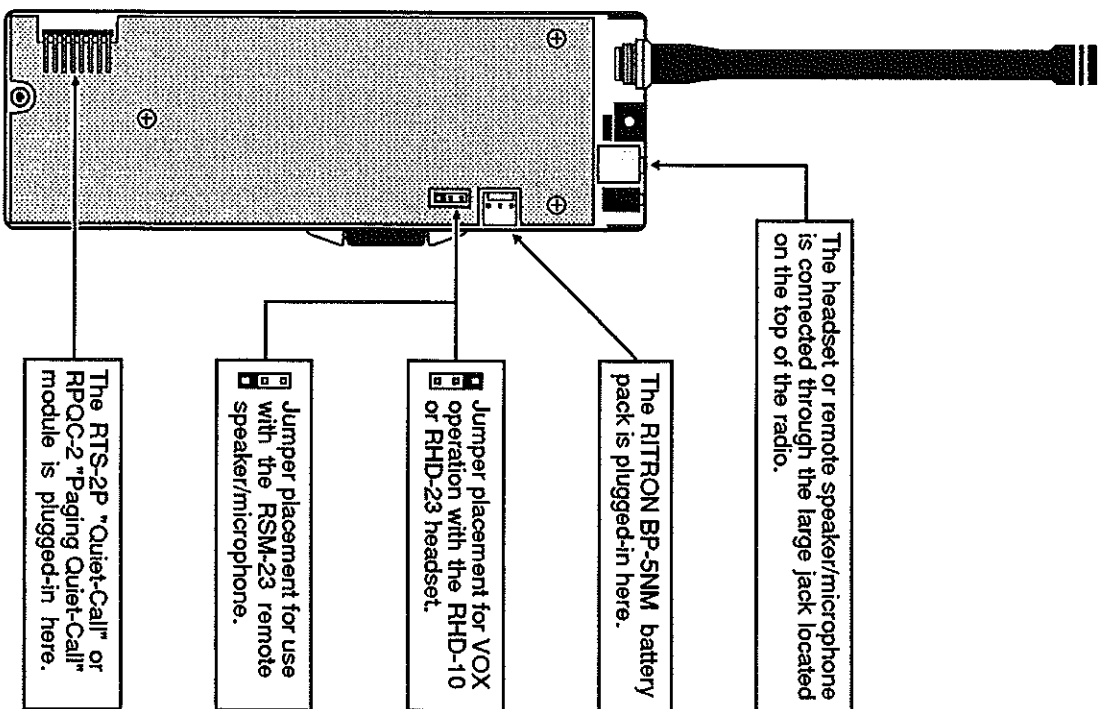


FIG-2: Accessory Connections & Programming

Adjust the headset with the boom microphone positioned as shown in FIG-3 below.

The foam cover may be removed to check microphone position. Be sure to replace the foam cover before using.

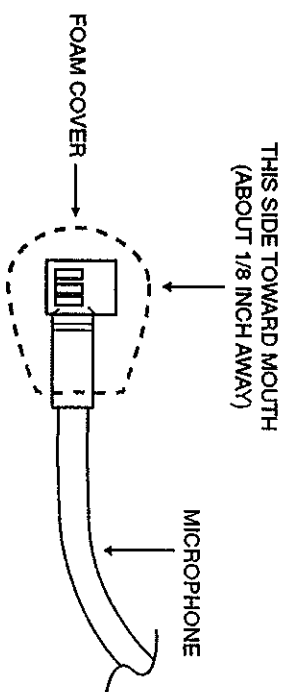


FIG-3: Headset Microphone

Note that the VOX circuit WILL NOT activate the radio transmitter under the following conditions: 1) The receiver is picking up a signal on your channel OR; 2) The squelch control knob is not rotated far enough CCW to eliminate noise.

With the portable in "Hands-Free" mode (headset plugged in, control switch set to LOUD or NORM), the user's transmission ("sidetone" audio) is heard in the headset earpiece. This assures the radio operator that his voice is keying the transmitter. "Sidetone" also alerts the user when background noise is so loud that it keeps the transmitter activated.

To use the RT-15H with a remote speaker/microphone (RSM-23), first position the audio program jumper for operation with the remote speaker/microphone as shown in FIG-2 at left. Inserting a RSM-23 plug into the audio jack disables the radio's internal speaker/microphone. To transmit, press and hold the remote's PTT button and talk into the microphone.

TONE SIGNALING MODULES

If the RT-15H is equipped with a RITRON RTS-2P "Quiet-Call" or RPQC-2 Paging Quiet-Call" module, set tone squelch by rotating the squelch knob fully CCW until the switch "clicks." The tone squelch circuit then passes only "on-frequency" transmissions having the same code as programmed into the tone module. To monitor the channel before transmitting, turn off tone squelch by rotating the squelch control CW.

RTS-2P "Quiet-Call"

The RTS-2P "Quiet-Call" module is a sub-audible tone (CTCSS) encoder/decoder designed for use in RITRON VHF handheld transceivers. The RTS-2P can be programmed to any one of the 38 EIA standard tone frequencies.

PROGRAMMING:

- 1) Refer to the Quiet-Call Codes and Frequencies chart at right and find the tone or NOTONE code desired (NOTONE is explained in the RTS-2P "Theory of Operation" on page 5).

NOTE: All radios intended to communicate with one another **MUST** be set to the same operating frequency and have their RTS-2P tone boards programmed for the same tone frequency.

- 2) Set each of the six levers on the programming switch to the positions given in the Quiet-Call Codes and Frequencies chart. For a "0," set that lever to the "ON" position (lever toward the BOTTOM of the radio). For a "1," set that lever to the "OFF" position (lever toward the TOP of the radio). Refer to FIG-4 at lower-right for switch location and lever identification.

INSTALLATION:

- 1) Open the radio by removing the #4 Phillips head screws from the handheld's rear case panel. Remove the rear case panel from the JOBCOM VOX.
- 2) Unplug the battery. It is not necessary to remove the tone module from the radio to change programming.
- 3) Program the RTS-2P "Quiet-Call" module for the correct tone frequency, as explained above in the "Programming" section above.
- 4) Locate the 8-pin, right-angle connector at the BOTTOM, left-hand side of the JOBCOM VOX PC board.
- 5) Be sure that the paper insulator provided is in place and covers the radio PC board. The insulator prevents the tone board or battery pack from shorting to the radio PC board.
- 6) Install the RTS-2P tone module, component side up, by mating the 8-position socket on the RTS-2P to the 8-pin, right-angle connector on the JOBCOM VOX PC board. Make sure that all eight pins are fully inserted into the socket.
- 7) Replace the rear case panel on the JOBCOM VOX.
- 8) Check that the handheld encodes and decodes the desired tone frequency. The radio is now ready for service with sub-audible tone signaling.

"QUIET-CALL" CODES AND FREQUENCIES

QC Code	Freq	Switch Lever						QC Code	Freq	Switch Lever					
		1	2	3	4	5	6			1	2	3	4	5	6
1	67.0	1	1	1	1	1	1	20	131.8	0	0	1	0	0	1
2	71.9	0	1	1	1	1	1	21	136.5	0	1	1	0	0	0
3	74.4	1	1	1	1	1	0	22	141.3	0	0	1	0	0	0
4	77.0	0	0	1	1	1	1	23	146.2	0	1	0	1	1	1
5	79.7	1	1	1	1	0	1	24	151.4	0	0	0	1	1	1
6	82.5	0	1	1	1	1	0	25	156.7	0	1	0	1	1	0
7	85.4	1	1	1	1	0	0	26	162.2	0	0	0	1	1	0
8	88.5	0	0	1	1	1	0	27	167.9	0	1	0	1	0	1
9	91.5	1	1	1	0	1	1	28	173.8	0	0	0	1	0	1
10	94.8	0	1	1	1	0	1	29	179.9	0	1	0	1	0	0
11	97.4	1	1	1	0	1	0	30	186.2	0	0	0	1	0	0
12	100.0	0	0	1	1	0	1	31	192.8	0	1	0	0	1	1
13	103.5	0	1	1	1	0	0	32	203.5	0	0	0	0	1	1
14	107.2	0	0	1	1	0	0	33	210.7	0	1	0	0	1	0
15	110.9	0	1	1	0	1	1	34	218.1	0	0	0	0	1	0
16	114.8	0	0	1	0	1	1	35	225.7	0	1	0	0	0	1
17	118.8	0	1	1	0	1	0	36	233.6	0	0	0	0	0	1
18	123.0	0	0	1	0	1	0	37	241.8	0	1	0	0	0	0
19	127.3	0	1	1	0	0	1	38	250.3	0	0	0	0	0	0
								NOTONE		1	1	0	0	0	0

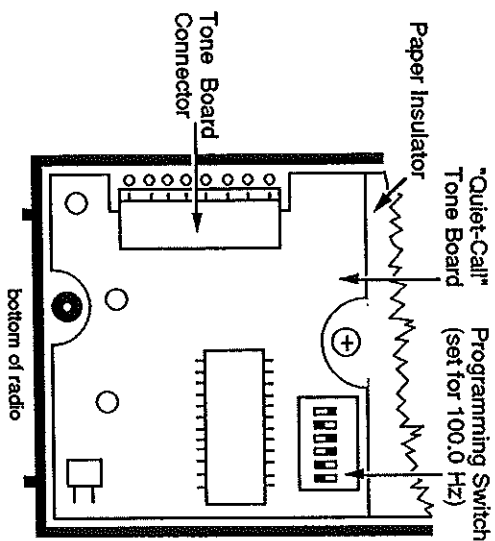


FIG-4: RTS-2P Installed in Handheld

RTS-2P THEORY OF OPERATION:

General: The RTS-2P allows the JOBCOM VOX user to receive and transmit a specially coded signal. Only those radios on the same frequency and programmed with the same tone frequency can receive transmissions. This system, referred to as "Quiet-Call" or CTCSS (Continuous Tone Coded Squelch System), utilizes an encoder/decoder IC that enables the JOBCOM VOX receiver after recognizing a pre-programmed sub-audible tone.

The handheld switched battery voltage line (+V SW) is applied to the RTS-2P at pin 8 of the eight-pin connector (P501). See the RTS-2P schematic on the next page. IC502 supplies +5VDC to IC501, the sub-audible tone encoder/decoder IC. R503 and R506 reverse bias CR105 (CR105 located in JOBCOM VOX receiver) to divert audio through the tone board. The 38 EIA standard tone frequencies are field programmable, using SW501. A ceramic resonator-controlled 1MHz oscillator, Y501, yields a highly accurate and stable sine wave.

Receiver Tone Decode: The JOBCOM VOX receiver applies de-modulated speech and sub-audible tone frequencies to P501 pin 3; the audio then passes through a DC-blocking capacitor, C505, to pins 23 and 24 of IC501 (RX Audio Input and Tone Input, respectively). If the received sub-audible tone matches the programmed tone frequency, then IC501 pin 15 (RX Tone Detect Output) goes to a logic high, "1." This output is integrated by R511 and C510 before reaching IC501 pin 14 (Decode Comparator Input). If the decode is of sufficient duration, IC501 pin 13 (RX Tone Decoder Output) goes low, "0," turning off Q502, and so causing an "open" at P501 pin 4 (RX Mute). The JOBCOM VOX squelch then opens. The C510-R511 time constant network controls the decode response time, while C510 and R510 set the deresponse time.

When tone detection occurs, high-pass-filtered received audio (sub-audible tones removed) appears at IC501 pin 19 (RX Audio Output) and travels to P501 pin 2 (Processed Audio), the input of the JOBCOM VOX de-emphasis network, volume control and audio amplifier.

The RTS-2P can route received audio to the handheld audio amplifier without using the tone-coded squelch function. Rotating the JOBCOM VOX squelch control knob clockwise grounds P501 pin 7 (Monitor Input), turning off Q501 and establishing a logic "high" on IC501 pin 18. IC501 pin 13 then switches "low," enabling the RX audio path. Programming NOTONE with SW501 also produces a "low" at IC501 pin 13, directing audio through the RTS-2P.

Transmitter Tone Encode: The tone encode sequence begins when the JOBCOM VOX applies a voltage (TX +VDC > 2V) to P501 pin 1, turning on Q503 and pulling "low" IC501 pin 17 (TX Enable Input). The programmed tone frequency is generated at IC501 pin 16 (TX Tone Output), then passes through a coupling capacitor, C508, to P501 pin 6 (TX CTCSS Tone) at the handheld modulation circuit input.

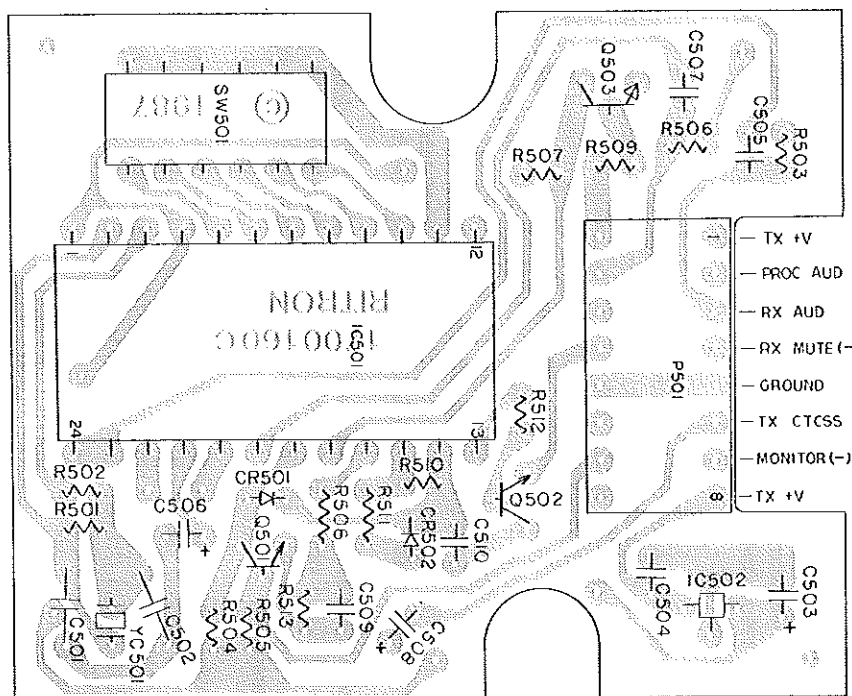
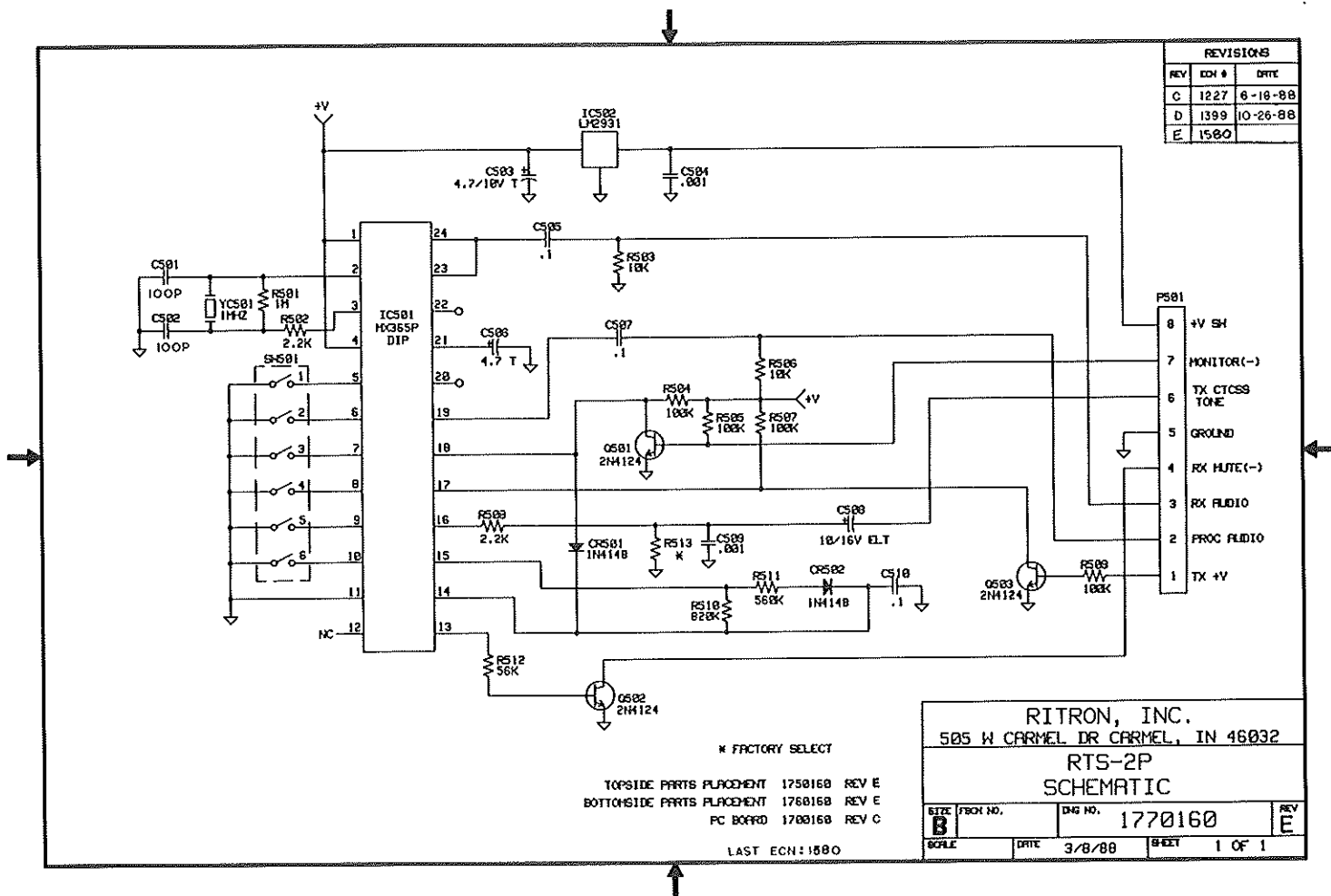
RPQC-2 "Paging Quiet-Call"

RITRON's "Paging Quiet-Call" (two-tone sequential) option allows the JOBCOM VOX to operate as a "talk-back" tone and voice pager. With "Paging Quiet-Call" (PQC) installed, the RT-15H can receive an individual page (64 codes available) from a RITRON Repeater Plus/RP-200 Paging Terminal, Telephone/Paging Transceiver System, Base Station (VHF only), or PQC/Touch Tone equipped portable.

RPQC-2 equipped handhelds also respond to a special All-Call code, in addition to their individual DIP switch-programmed codes. This feature allows a single page to be heard by all units at the same time. Using All-Call, the JOBCOM VOX can page all on-frequency pagers and PQ equipped radios that are within range and in paging mode.

The RPQC-2 may be programmed to encode and decode any of the RITRON "Quiet-Call" tones listed in the next section. "Quiet-Call" (CTCSS) enables the handheld to "receive" only transmissions from other radios programmed with the same "Quiet-Call" tone, screening out transmissions from other users on the same channel.

For more information about the RPQC-2, refer to the RPQC-2 Maintenance and Operating Manual (RITRON publication no. 1451074).



SCHEMATIC 1770160 REV E
 P.C. BOARD 1700160 REV C
 TOP SIDE PARTS PLACEMENT 1750160 REV E

TOLERANCES (UNLESS SPECIFIED)				REVISIONS		RITRON, INC. 505 W. CARMEL DR CARMEL IN 46032		
DECIMAL	1	2	3	NO	DATE	BY	RTS-2P	
FRACTIONAL	1	2	3	1			BOTTOMSIDE	
ANGULAR	1	2	3	1			PARTS PLACEMENT	
				2			DRAWN BY	SCALE 4X
				3			CHECKED	MATERIAL
				4			DATE	DWG NO
				5			TRACED	REV
							APP'D	1760160 E

LAST ECN:1580

RT-15H THEORY OF OPERATION

GENERAL

The RT-15H is a single channel VHF transceiver with voice actuated transmitter capability. The internal speaker functions as a microphone/speaker during transmission and reception, and a 3.5mm jack allows the use of a boom microphone headset for VOX (voice activation of the transmitter). An internal program jumper can configure the 3.5mm jack for use with a remote speaker/microphone (RSM-23), if desired.

POWER SOURCE

Five "AA," 500 milli-Ampere Hour, rechargeable Nickel-Cadmium cells connected in series power the RT-15H. Power is supplied to the unit through F301 and SW102 (the on/off switch combined with the volume control). CR301 prevents the battery pack from discharging through the charger, and prevents a reversed voltage from being applied to the battery pack through "CHG" jack J301. CR302 causes F301 to blow if battery connections are accidentally reversed. IC301, a +5VDC voltage regulator, supplies regulated voltage to the receiver circuitry through Q303 and to IC201 (VOX and limiting speech amplifier).

RECEIVE/TRANSMIT SWITCHING

With the PTT switch released, regulated +5 VDC is applied to the receiver circuitry via Q303, which is turned on by R304. Incoming radio frequency signals from the antenna pass through a low-pass filter (C311, C310, C309, L304, C308, C307, L303, C306) and L302, and are applied to the input of the receiver RF amplifier.

When the Push-To-Talk switch (SW301) is pressed, R303 draws current from the +6.0 VDC line through the base-emitter junction of Q301 and Q302 to turn them on. Q302 clamps off Q303 and removes the supply voltage from the receiver circuits. Q301 supplies voltage to the transmitter circuits.

The voltage applied to transmitter circuitry is also connected to the antenna switching circuit of L301, R301, L302 and CR101. Because CR101 is a PIN type RF signal switching diode, its impedance with DC current flowing through it is much lower than its impedance with no DC current applied. When biased on by the transmitter supply voltage, CR101 acts as a short, protecting the input to the receiver RF amplifier. L302 is selected so that its reactance is absorbed in the design of the low-pass filter.

RECEIVER

The RT-15H contains a single-channel, crystal-controlled, dual-conversion, super-heterodyne FM receiver. A signal from the RF test jack (J302) or the attached antenna passes through a low-pass filter (C311, C310, C309, L304, C308, C307, L303, C306) and L302, and is applied to the emitter of common-base RF amplifier (Q101) via a single-section filter (L101, L102 and C102). A second filter (L103 and C105) further reduces the RF bandwidth and couples the amplified signal to the first mixer (Q102).

Q103 and associated parts form the receiver first local oscillator, a crystal-controlled, Clapp type. A parallel circuit, L105 and C132, selects the third harmonic of the oscillator, which C135 injects into the mixer base. L107 and C109 tune the collector of mixer transistor Q102 to 10.7 MHz. C111 couples the mixer output into a two-pole monolithic crystal filter (YF101) centered at 10.7 MHz. The 10.7 MHz IF signal is applied to the input of a balanced mixer at pin 16 of IC101, a multifunction FM IF integrated circuit. IC101 pins 1 and 2, Y101, and feedback capacitors C114 and C115 form the second local oscillator with an output of 10.245 MHz. The mixer then provides a 455 KHz 2nd IF signal at pin 3 of IC101. A 455 KHz, 6-pole ceramic filter (YF102) connects the 2nd mixer output to the limiting IF amplifier (pin 5, IC101). The output of the limiter (pin 7, IC101) drives a multiplier, both internally and through a quadrature coil (T101), to detect FM on the carrier.

The recovered audio present at pin 9 is fed through a low-pass filter (R118 and C124), de-emphasized by R119 and C139, attenuated through the volume control (R120), and applied to IC102, a 0.3 Watt audio amplifier. CR105 gates recovered audio from pin 9 to the RTS-2P or RPQC-2 tone module option, when installed. C129 connects the audio output from IC102 pin 5 through J304A and PTT switch SW301A to the 8 Ω speaker (SP101). However, inserting the headset plug into J304 routes audio to the earphone rather than to the speaker.

An 8 KHz noise-amplifier/bandpass filter consists of an "on-chip" inverting operational amplifier, IC101 pins 10 and 11, and associated parts. The amplifier/filter output drives a biased noise detector, CR103 and CR104, the output of which connects to a Schmitt trigger (IC101 pins 12 and 14). Noise output from the detector applied to pin 12 causes the open-collector at pin 14 to go "low," whereas a lack of noise "opens" pin 14. An "on-channel" carrier reduces the detected noise and allows pin 14 to be pulled "high" through R110.

In order to mute the audio applied to the speaker and minimize battery drain, Q104, Q105 and Q106 switch power to the audio amplifier under the control of the squelch output at IC101 pins 13 and 14. The signal at pin 14 must be "high" to turn on Q105, then Q106, which applies supply voltage to audio amplifier IC102. Inversely, pin 13 of IC101 goes "high" in the presence of noise to switch on Q104, which keeps Q105 and Q106 turned off. Pin 13 is "opened" by an on-channel carrier, which disables "Hands-Free" transmitter keying at Q403.

R124, the squelch control, and R123 set the threshold of the squelch action. SW103 is a SPST switch incorporated into the squelch control. When R124 is turned fully COUNTER-CLOCKWISE into its "click" position, SW103 is "opened", enabling tone squelch (if a tone module is installed). Turning R124 CLOCKWISE from its "click" position will close SW103 to disable tone squelch, and parallels R123 with R138 to increase the authority of R124 for expanded squelch range.

TRANSMITTER AUDIO

NO HEADSET CONNECTED

An amplifier, limiter and low-pass filter (Q205, IC201A, Q206 and associated components) limit the amplitude and frequency components of the voice signal prior to application to modulator diode CR201. C401 prevents RF from causing oscillation in the audio/modulator circuitry.

With no headset plugged into J304, Q205 and its associated circuitry amplify and pre-emphasize the audio signals from speaker/microphone SP101. IC201A and associated components limit the amplitude of the audio, while Q206 and associated circuitry provide a -12 dB/octave characteristic for frequencies above 3 KHz. The deviation control, R216, sets the amount of audio applied to the modulator circuit (C204, R202 and CR201), setting the maximum carrier deviation.

With no headset connected to the radio, "transmitter-audio" operation functions as described above, regardless of the headset control switch setting.

HEADSET CONNECTED

To select "Hands-Free" operation, insert the HEADSET/MICROPHONE plug into J304, which disconnects speaker SP101 and amplifier Q205 from the limiter/filter circuitry. The electret-condenser microphone contained in the headset is now connected to the input of limiter IC201A.

With the HEADSET plugged into the radio, the resulting current flow through R401, R402, J304B and the boom microphone of the headset turns on Q401. With PJ401 in position "A," voltage reaches R407 and R408, which sets the reference voltage at the non-inverting input of IC201B. SW401, in conjunction with a voltage divider, R405 and R414 or R415, applies the limiter output from IC201A to the input of audio detector CR401, C404 and Q402.

Audio from the limiter turns on detector Q402, the base-emitter current proportional to the amount of audio present. The collector of Q402 pulls the inverting input of IC201B "low," with the output of IC201B going "high" when the collector output of Q402 drops below the reference set at the non-inverting input of IC201B. The "high" output at IC201B turns on Q405, which turns on Q301 and Q302 to place the transceiver in TRANSMIT mode.

The HEADSET CONTROL SWITCH (SW401) provides three operating settings:

- 1) PUSH-TO-TALK (press and hold the radio PTT to transmit - "Hands-Free" operation is disabled).
- 2) TALK LOUD (low sensitivity for high-noise areas; requires that the user talk in a louder than normal voice to activate the transmitter).

- 3) TALK NORM (high sensitivity for low-noise areas; a normal tone of voice will key the transmitter).

The sensitivity of the VOX circuitry can be increased or decreased by changing resistor values as shown below:

TO CHANGE SENSITIVITY OF VOX CIRCUIT

	<u>Decrease Sensitivity</u>	<u>Increase Sensitivity</u>
--	-----------------------------	-----------------------------

TALK LOUD only:	Increase value of R415	Decrease value of R415
-----------------	------------------------	------------------------

TALK NORM only:	Increase value of R414	Decrease value of R414
-----------------	------------------------	------------------------

TALK LOUD & TALK NORM:	Decrease value of R405	Increase value of R405
------------------------	------------------------	------------------------

Q403 and associated parts prevent "Hands-Free" transmitter keying in the presence of receiver audio. Pin 13 of IC101 connects to the base of Q403 through R410. When an on-channel signal is received or the squelch control is "open," pin 13 of IC101 "opens," turning off Q403 and so disabling audio detector Q402.

Q404 and associated circuitry prevent "Hands-Free" transmitter keying when the radio is first switched on. The initial "charge current" through C406 and R411 turns on Q404 momentarily. The collector of Q404 pulls the base of Q405 "low," preventing it from turning on Q301 and keying the transmitter until C406 is charged.

C242, C243, R221 and R222 feed the output of the speech amplifier at Q206 to the input of audio amplifier IC102. This provides "sidetone" audio for the headset earpiece, allowing the user to hear his own voice in the headset. Applying sidetone to the headset lets the user confirm that his message is being transmitted and, easily determine whether his transmitter is staying keyed due to loud background noise.

REMOTE SPEAKER/MICROPHONE CONNECTED

Inserting the REMOTE SPEAKER/MICROPHONE plug into J304 disconnects speaker SP101 and amplifier Q205 from the limiter/filter circuitry. Pressing the remote PTT switch draws current through the internal electret-condenser microphone, with the resulting current flow through R401 and R402 turning on Q401. With PJ401 in position "B," this supplies voltage to the base of Q405 through R404, turning Q405 on to activate the transmitter. The voltage from Q401 also switches on Q104 via CR108 and R130 to turn off the audio amplifier.

TRANSMITTER RF

A Clapp crystal oscillator, Q201 and associated components, generates and controls the transmitter frequency. C203, in series with "transmit" crystal Y201, adjusts the crystal to the proper frequency, while C202 limits the authority of C203. Frequency stability over a -30° to +50° C temperature range is achieved with the temperature coefficients of C202, C205, C207 and C208. CR201, C204 and R202 form a voltage-variable capacitance diode modulator that varies the oscillator frequency in accordance with the audio from the speech-amplifier circuitry. R201 applies tone signaling, if used, directly to CR201.

L202, C209, C210, L203, C211 and C213 select the third harmonic of the crystal frequency and match it into the base of the first doubler, Q202. L204, C214, C215, L205, C216 and C217 tune the collector of Q202 to the sixth harmonic of the crystal frequency and match it into the base of the second doubler, Q203.

The coupled, resonant circuits of L206, C220, C223, L207, C224 and C225 tune the collector of Q203 to the 12th harmonic of the crystal frequency and match it into the base of the final amplifier, Q204, which amplifies the signal to approximately 1 Watt.

L208, C227 and C305 match the output of Q204 to 50 Ω . An elliptic-function, low-pass filter (C306, C307, L303, C308, C309, L304 and C310) removes harmonics and applies the RF output through blocking capacitor C311 and RF test jack J302 to the antenna connector.

RT-15H ALIGNMENT PROCEDURE

TEST EQUIPMENT NEEDED

- 1) 0 to 10 VDC, 1 Amp current-limited power supply, with a current meter.
- 2) RF Wattmeter, 5 Watts full-scale.
- 3) RF FM Signal Generator (144 to 174 MHz).
- 4) FM Deviation Meter.
- 5) Frequency Counter (to 174 MHz).
- 6) VTVM or DMM.

RADIO PREPARATION

- 1) Remove the antenna from its threaded fitting.
- 2) Open the radio by removing the two #4 screws from the rear panel.
- 3) Disconnect the battery pack.
- 4) Remove the three #4 mounting screws; then, remove the printed-circuit board from the radio case.
- 5) Connect the power supply to the radio through the "CHG" jack and set the voltage to 6.7 VDC.

RECEIVER

- 1) Connect the radio to an RF signal generator through the 2.5mm jack at the top of the circuit board.
- 2) Install the "receive" crystal and tune the signal generator to the "receive" frequency.
- 3) Frequency-modulate the RF signal generator with a 1-KHz tone at 3-KHz deviation.
- 4) Increase the output level of the RF signal generator until the 1-KHz tone is heard in the handheld speaker.
- 5) Tune L105 for MAXIMUM received signal strength.
- 6) Alternately tune L101 and L103 for MAXIMUM received signal strength, lowering the output of the signal generator as required.

- 7) Increase the output of the RF signal generator for a "full-quieting" signal in the unit; and adjust T101 for MAXIMUM audio response. Decrease the output of the RF signal generator to 0.3 micro-volts; and "fine-tune" L101, L103 and L105 for MAXIMUM sensitivity using the QUIETING or SINAD measurement technique.

TRANSMITTER

NOTE: Activate the Push-to-Talk switch to make the following adjustments:

- 1) Back the cores 1/8" out the top of the following coils: L202, L203, L204, L205, L206 and L207.
- 2) Install the "transmit" crystal.
- 3) Connect the radio to an RF Wattmeter through the 2.5mm RF test jack at the top of the circuit board.
- 4) Adjust C227 so the capacitor plates are half-meshed.
- 5) Adjust L202 and L203 for maximum CURRENT draw as indicated on the power-supply meter.
- 6) Adjust L204 for a "dip" in the CURRENT draw as indicated on the power-supply meter.
- 7) Adjust L205 for maximum CURRENT draw as indicated on the power-supply meter.
- 8) Adjust L206 and L207 for a maximum POWER indication on the Wattmeter.
- 9) "Fine-tune" L206, L207 and C227 for maximum POWER output.
- 10) Adjust C203 for the EXACT operating frequency as indicated on the frequency counter.
- 11) Apply a loud 1-KHz tone to the speaker/microphone (SP101), and adjust R216 for +/- 5 KHz deviation, MAXIMUM, as indicated on the deviation meter. Now plug the "Hands-Free" headset into the 3.5mm stereo jack at the top-center of the circuit board and apply a loud 1-KHz tone to the boom microphone. Check for 5 KHz deviation (if sub-audible tone is used, the combined voice and tone deviation should equal +/- 5 KHz, MAXIMUM).

RT-15H DC VOLTAGES

RECEIVER

Conditions: receiver unswitched; volume control at minimum; no RF signal input; PTT switch in "receive" position; battery voltage = 6.0 VDC ("charge" voltage = 6.7 VDC). Measurements taken with a VTVM.

DEVICE	PIN	VDC	DEVICE	PIN	VDC
Q101	E	0.0	IC101	1	4.5
	B	0.7		2	4.3
	C	4.2		3	4.6
Q102	E	0.0		4	4.9
	B	0.5		5	0.9
	C	2.7		6	0.9
Q103	E	2.6		7	1.0
	B	2.1		8	4.9
	C	4.9		9	2.1
Q104	E	0.0		10	1.9
	B	0.0		11	2.0
	C	0.7		12	1.5
Q105	E	0.0		13	0.0
	B	0.7		14	1.3
	C	0.1		15	0.0
Q106	E	6.0		16	2.0
	B	5.3	IC102	1	1.3
	C	6.0		2	0.0
				3	0.0
				4	0.0
				5	3.0
				6	6.0
				7	2.8
				8	1.3

TRANSMITTER

Conditions: dummy load connected to the RF test jack; PTT switch in "transmit" position; no headset plugged into audio jack; battery voltage = 6.0 VDC ("charge" voltage = 6.7 VDC). *Measurements made with a 10 K Ω resistor in series with the VTVM test lead.

DEVICE	PIN	VDC	DEVICE	PIN	VDC
Q201	E	2.2*	IC201	1	2.5
	B	0.8*		2	2.3
	C	6.0		3	2.0
Q202	E	0.0		4	0.0
	B	-0.8*	IC301	5	0.0
	C	6.0		6	1.2
Q203	E	0.0		7	0.0
	B	-1.9*		8	5.0
	C	5.2		1	5.0
Q204	E	0.0		2	0.0
	B	0.0		3	6.0
	C	6.0	Q205		
Q205	E	0.0			
	B	0.6			
	C	2.7			
Q206	E	3.7			
	B	0.7			
	C	0.0			
Q301	E	6.0			
	B	5.3			
	C	6.0	Q302		
Q302	E	6.0			
	B	5.3			
	C	6.0	Q303		
Q303	E	5.0			
	B	6.0			
	C	0.0			

VOX

Conditions: receiver squelched; no RF signal input; headset plugged into audio jack; SW401 in TALK NORM position; loud 1 KHz tone applied to headset microphone; battery voltage = 6.0 VDC ("charge" voltage = 6.7 VDC). Measurements taken with a 10 K Ω resistor in series with the VTVM test lead.

DEVICE	PIN	VDC	DEVICE	PIN	VDC
Q401	E	5.0	IC201	1	2.4
	B	4.3		2	2.4
	C	5.0		3	1.9
Q402	E	0.0		4	0.0
	B	0.1		5	3.6
	C	0.0		6	0.0
Q403	E	0.0		7	4.2
	B	0.6		8	5.0
	C	0.0			
Q404	E	0.0			
	B	0.0			
	C	0.7			
Q405	E	0.0			
	B	0.7			
	C	0.1			

RT-15H TEST POINTS: Δ (SHOWN ON SCHEMATIC)

Δ 1 RECEIVER RF HEADEND +V

TEST POINT 1 measures 4.2 VDC with the radio in "receive," and 0 VDC in "transmit."

Δ 2 RECEIVER LOCAL OSCILLATOR INJECTION

With a full-quieting, "receive" signal applied to the handheld, L105 tunes for a DC voltage "dip" at TEST POINT 2 when the local oscillator is properly adjusted (VOLTAGE "DIPS" FROM APPROXIMATELY 3.8 VDC TO 2.7 VDC).

Δ 3 RECEIVER IF +V

TEST POINT 3 reads 5.0 VDC with the portable in "receive," and 0 VDC in "transmit."

Δ 4 RECEIVER SQUELCH OPERATION

With a full-quieting, "receive" signal applied to the handheld, TEST POINT 4 shows approximately 1.3 VDC. With no "receive" signal present, TP 4 measures 0 VDC (SQUELCH CIRCUIT ENABLED).

Δ 5 DE-EMPHASIZED AUDIO

With a full-quieting "receive" signal, modulated with a 1 KHz tone at 3 KHz deviation present, TEST POINT 5 displays the 1 KHz tone, 0.5 Volts peak-to-peak, at a 2 VDC level. With no "receive" signal present, TP5 measures 2 VDC with "noise" present (SQUELCH CIRCUIT DISABLED).

Δ 6 RECEIVER AUDIO OUTPUT

With a full-quieting "receive" signal, modulated with a 1 KHz tone at 3 KHz deviation applied, TEST POINT 6 displays the 1 KHz tone, clipped at 4 Volts peak-to-peak, with the volume control turned full ON (SQUELCH CIRCUIT DISABLED AND NO HEAD-SET INSTALLED).

Δ 7 SWITCHED +V

TEST POINT 7 reads 6 VDC with the handheld in either "receive" or "transmit."

Δ 8 GROUND

TEST POINT 8 measures 0 VDC with the radio in either "receive" or "transmit."

Δ 9 SUB-AUDIBLE TONE INPUT

Inject a 100 Hz, 2.2 Volts peak-to-peak, sub-audible tone signal at TEST POINT 9. This produces 600 to 800 Hz deviation at the transmitter output frequency.

Δ10 TX +V

TEST POINT 10 shows 6 VDC with the portable in "transmit," and 0 VDC in "receive."

Δ11 TRANSMITTER OSCILLATOR/TRIPLER

With the handheld in "transmit," L202 and L203 tune for a DC voltage "dip" at TEST POINT 11 (MEASUREMENT MUST BE MADE THROUGH A 2.2 MΩ RESISTOR).

Δ12 TRANSMITTER DOUBLER

With the radio in "transmit," L204 and L205 tune for a DC voltage "dip" at TEST POINT 12 (MEASUREMENT MUST BE MADE THROUGH A 2.2 MΩ RESISTOR).

Δ13 TRANSMITTER FINAL

With the portable in "transmit," L211 and L207 tune for a maximum RF signal at TEST POINT 13 as seen through an RF detector.

Δ14 SPEECH AMPLIFIER OUTPUT

With the handheld in "transmit," inject a 1 KHz tone signal, 10 mV peak-to-peak, at TEST POINT 6. TEST POINT 14 then displays the 1 KHz signal at about 4 Volts peak-to-peak (NO HEADSET PLUGGED INTO J304).

Δ15 AUDIO DETECTOR

With the headset connected, and the HEADSET CONTROL in the NORM position, speak into the HEADSET microphone. TEST POINT 15 drops from 5 VDC to about 1 VDC. With a full-quieting, received signal present, TP15 remains at 5 VDC, regardless of voice applied to the microphone.

Δ16 AUDIO DETECTOR REFERENCE LEVEL

With the headset connected, PJ401 in position "A," and the HEADSET CONTROL in the NORM position, TEST POINT 16 measures 1.5 VDC with NO speech applied to the microphone, and 4 VDC with speech applied to the microphone. With the headset removed, TP16 reads 0 VDC.

Δ17 "HANDS-FREE" KEYING OUTPUT

With the headset connected, PJ401 in position "A," and the HEADSET CONTROL in the NORM position, TEST POINT 17 reads 0 VDC with speech applied to the headset microphone, and +6 VDC with NO speech applied to the microphone. With the headset removed, TP17 measures +6 VDC until the PTT switch is pressed, at which time TP17 measures 0 VDC.

Δ18 SPEECH AMP LIMITER

With the unit in TRANSMIT, apply a loud 1 KHz tone to speaker/microphone SP101. The 1 KHz tone appears at TEST POINT 18, clipped at 4 V peak-to-peak (NO HEADSET INSTALLED).

Δ19 VOX OUTPUT

With the HEADSET installed and PJ401 in position "A," place SW401 in the NORM position. Apply a loud 1 KHz tone to the headset MICROPHONE. TEST POINT 19 reads 4 VDC with the tone, and 0 VDC without.

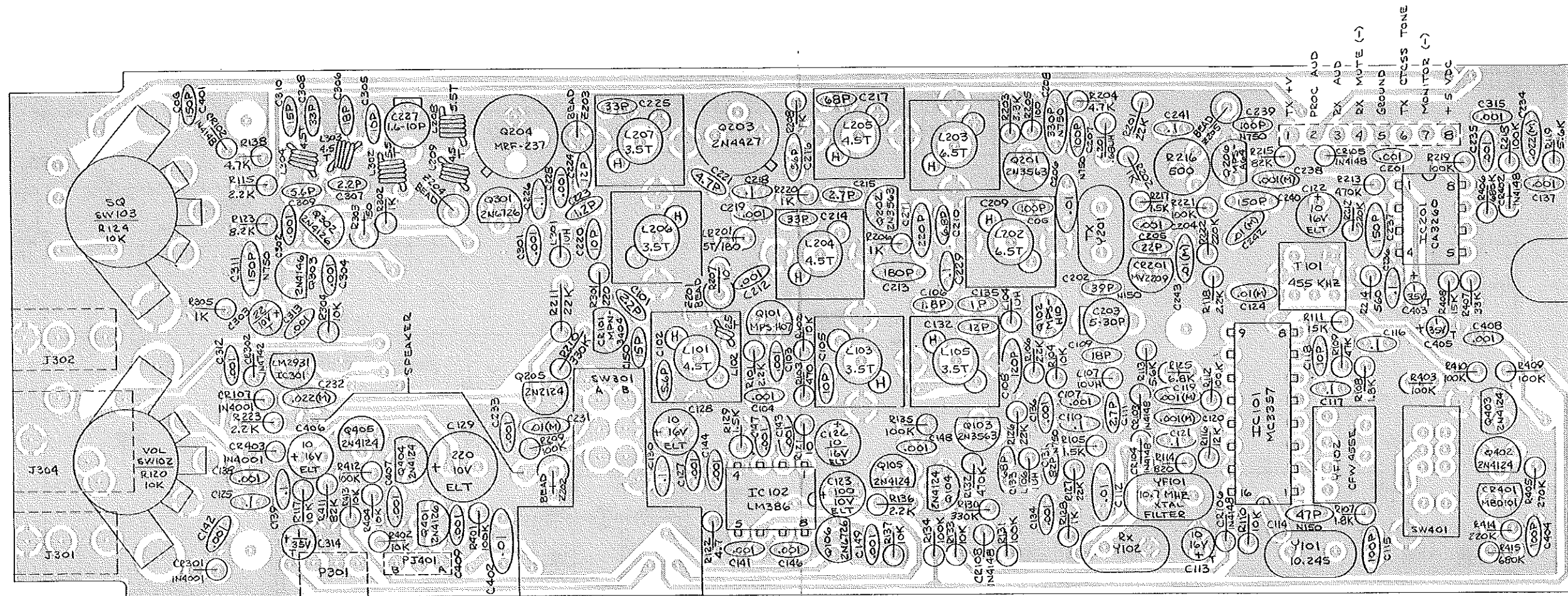
RT-15H SCHEMATIC REFERENCE PARTS LIST

NOTE: This parts list reflects the most current component values (ECN 2088). If a component value given in the schematic differs from that in the parts list, the parts list should be considered correct.

REF #	DESCRIPTION	RITRON #	REF #	DESCRIPTION	RITRON #
B 301	5-CELL PACK KWIK KIT AA NICAD	04000035	C 211	220PF N750 CERDIS CAP 50V .32X.2 R	01510731
BC30	CHARGER CUBE; W/2.5MM PLUG BC-A	04000012	C 212	.001MF Y5P CERDIS CAP 50V .100 R M	01516239
C 101	2.2PF NP0 CERDIS CAP 50V .16X.1 R	01510007	C 213	180PF N750 CERDIS CAP 50V .28X.2 R	01510730
C 102	5.6PF NP0 CERDIS CAP 50V .160X.1 R	01510012	C 214	33PF NP0 CERDIS CAP 50V .200X.1 R	01510021
C 103	.001MF Y5P CERDIS CAP 50V .100 R M	01516239	C 215	2.7PF NP0 CERDIS CAP 50V .160X.1 R	01510008
C 104	.001MF Y5P CERDIS CAP 50V .100 R M	01516239	C 216	56PF N150 CERDIS CAP 50V .24X.2 R	01510124
C 105	10PF NP0 CERDIS CAP 50V .160X.1 R	01510015	C 217	68PF N150 CERDIS CAP 50V .28X.2 R	01510125
C 106	1.8PF NP0 CERDIS CAP 50V .16X.1 R	01510006	C 218	.1MF X7R MLCER CAP 50V .100 R K	01515463
C 107	.001MF Y5P CERDIS CAP 50V .100 R M	01516239	C 219	.001MF Y5P CERDIS CAP 50V .100 R M	01516239
C 108	120PF N750 CERDIS CAP 50V .24X.2 R	01510728	C 220	10PF NP0 CERDIS CAP 50V .160X.1 R	01510015
C 109	18PF NP0 CERDIS CAP 50V .160X.1 R	01510018	C 221	4.7PF NP0 CERDIS CAP 50V .160X.1 R	01510011
C 110	.1MF X7R MLCER CAP 50V .100 R K	01515463	C 223	1.2PF P100 CERDIS CAP 50V .16X.1 R	01508004
C 111	2.7PF NP0 CERDIS CAP 50V .160X.1 R	01510008	C 224	12PF NP0 CERDIS CAP 50V .160 X.1 R	01510016
C 112	.01MF Y5V CERDIS CAP 25V .200 R Z	01516451	C 225	33PF NP0 CERDIS CAP 50V .200X.1 R	01510021
C 113	10MF TANT CAP 6.3V(J) .1" R 20%	01502020	C 226	.1MF X7R MLCER CAP 50V .100 R K	01515463
C 114	47PF N150 CERDIS CAP 50V .24X.2 R	01510123	C 227	1.6-10PF VARTEF CAP 100V .24 X.2 R	01550010
C 115	100PF N750 CERDIS CAP 50V .24X.2 R	01510727	C 228	.001MF Y5P CERDIS CAP 50V .100 R M	01516239
C 116	.1MF X7R MLCER CAP 50V .100 R K	01515463	C 229	.1MF X7R MLCER CAP 50V .100 R K	01515463
C 117	.1MF X7R MLCER CAP 50V .100 R K	01515463	C 231	.01MF MYLAR CAP 100V .200" R 10%	01501050
C 118	10PF NP0 CERDIS CAP 50V .160X.1 R	01510015	C 232	.022MF MYLAR CAP 100V .200 R 10%	01501051
C 119	.001MF MYLAR CAP 100V .125" R 10%	01501040	C 233	.001MF Y5P CERDIS CAP 50V .100 R M	01516239
C 120	.001MF MYLAR CAP 100V .125" R 10%	01501040	C 234	.022MF MYLAR CAP 100V .200 R 10%	01501051
C 121	.1MF X7R MLCER CAP 50V .100 R K	01515463	C 235	.001MF Y5P CERDIS CAP 50V .100 R M	01516239
C 122	10MF ELT CAP 16V .1" .2"X.46" R	01503006	C 236	.1MF X7R MLCER CAP 50V .100 R K	01515463
C 123	100MF ELT CAP 10V .08" .2"X.45" R	01503110	C 237	150PF N750 CERDIS CAP 50V .28X.2 R	01510729
C 124	.01MF MYLAR CAP 100V .200" R 10%	01501050	C 238	.001MF MYLAR CAP 100V .125" R 10%	01501040
C 125	.1MF X7R MLCER CAP 50V .100 R K	01515463	C 239	100PF N750 CERDIS CAP 50V .24X.2 R	01510727
C 126	10MF ELT CAP 16V .1" .2"X.46" R	01503006	C 240	150PF N750 CERDIS CAP 50V .28X.2 R	01510729
C 127	.001MF Y5P CERDIS CAP 50V .100 R M	01516239	C 241	.1MF X7R MLCER CAP 50V .100 R K	01515463
C 128	10MF ELT CAP 16V .1" .2"X.46" R	01503006	C 242	.01MF MYLAR CAP 100V .200" R 10%	01501050
C 129	220MF ELT CAP 10V .12" .32"X.48" R	01503018	C 243	.01MF MYLAR CAP 100V .200" R 10%	01501050
C 130	.1MF X7R MLCER CAP 50V .100 R K	01515463	C 301	.001MF Y5P CERDIS CAP 50V .100 R M	01516239
C 131	82PF N750 CERDIS CAP 50V .2 X.2 R	01510726	C 302	.001MF Y5P CERDIS CAP 50V .100 R M	01516239
C 132	12PF NP0 CERDIS CAP 50V .160 X.1 R	01510016	C 303	22MF TANT CAP 10V(A) .1" R 20%	01502015
C 133	68PF N150 CERDIS CAP 50V .28X.2 R	01510125	C 304	.001MF Y5P CERDIS CAP 50V .100 R M	01516239
C 134	.001MF Y5P CERDIS CAP 50V .100 R M	01516239	C 305	10PF NP0 CERDIS CAP 50V .160X.1 R	01510015
C 135	1PF P100 CERDIS CAP 50V .160 X.1 R	01508003	C 306	18PF NP0 CERDIS CAP 50V .160X.1 R	01510018
C 136	.001MF Y5P CERDIS CAP 50V .100 R M	01516239	C 307	2.2PF NP0 CERDIS CAP 50V .16X.1 R	01510007
C 137	.001MF Y5P CERDIS CAP 50V .100 R M	01516239	C 308	33PF NP0 CERDIS CAP 50V .200X.1 R	01510021
C 138	.001MF Y5P CERDIS CAP 50V .100 R M	01516239	C 309	5.6PF NP0 CERDIS CAP 50V .160X.1 R	01510012
C 139	.1MF X7R MLCER CAP 50V .100 R K	01515463	C 310	15PF NP0 CERDIS CAP 50V .160X.1 R	01510017
C 141	.001MF Y5P CERDIS CAP 50V .100 R M	01516239	C 311	150PF N750 CERDIS CAP 50V .28X.2 R	01510729
C 142	.001MF Y5P CERDIS CAP 50V .100 R M	01516239	C 312	.001MF Y5P CERDIS CAP 50V .100 R M	01516239
C 143	.001MF Y5P CERDIS CAP 50V .100 R M	01516239	C 313	.001MF Y5P CERDIS CAP 50V .100 R M	01516239
C 144	.001MF Y5P CERDIS CAP 50V .100 R M	01516239	C 314	1MF TANT CAP 35V(V) .1" 20%	01502007
C 146	.001MF Y5P CERDIS CAP 50V .100 R M	01516239	C 315	.001MF Y5P CERDIS CAP 50V .100 R M	01516239
C 147	.001MF Y5P CERDIS CAP 50V .100 R M	01516239	C 401	150PF COG MLCER CAP 100V .100 R K	01515029
C 148	.001MF Y5P CERDIS CAP 50V .100 R M	01516239	C 402	.01MF Y5V CERDIS CAP 25V .200 R Z	01516451
C 149	.001MF Y5P CERDIS CAP 50V .100 R M	01516239	C 403	1MF TANT CAP 35V(V) .1" 20%	01502007
C 150	15PF NP0 CERDIS CAP 50V .160X.1 R	01510017	C 404	100PF N750 CERDIS CAP 50V .24X.2 R	01510727
C 201	.001MF Y5P CERDIS CAP 50V .100 R M	01516239	C 405	1MF TANT CAP 35V(V) .1" 20%	01502007
C 202	39PF N150 CERDIS CAP 50V .2X.2 R	01510122	C 406	10MF ELT CAP 16V .1" .2"X.46" R	01503006
C 203	5-30PF VARCER CAP 250V .2 X.24 R	01550006	C 407	.001MF Y5P CERDIS CAP 50V .100 R M	01516239
C 204	.001MF Y5P CERDIS CAP 50V .100 R M	01516239	C 408	.001MF Y5P CERDIS CAP 50V .100 R M	01516239
C 205	22PF NP0 CERDIS CAP 50V .160X.1 R	01510019	C 409	.001MF Y5P CERDIS CAP 50V .100 R M	01516239
C 206	.01MF Y5V CERDIS CAP 25V .200 R Z	01516451	CR101	MPN-3404 PIN DIODE	04810027
C 207	100PF N750 CERDIS CAP 50V .24X.2 R	01510727	CR102	1N4148; DIODE/GENERAL PURPOSE	04810001
C 208	330PF N750 CERDIS CAP 50V .35X.2 R	01510733	CR103	1N4148; DIODE/GENERAL PURPOSE	04810001
C 209	100PF COG MLCER CAP 50V .100 R K	01515027	CR104	1N4148; DIODE/GENERAL PURPOSE	04810001
C 210	6.8PF NP0 CERDIS CAP 50V .160X.1 R	01510013	CR105	1N4148; DIODE/GENERAL PURPOSE	04810001
			CR106	1N4148; DIODE/GENERAL PURPOSE	04810001

REF #	DESCRIPTION	RITRON #	REF #	DESCRIPTION	RITRON #
CR107	1N4001 DIODE 50 VOLT/1AMP	04810003	Q 401	2N4126 PNP GP AUDIO TO-92	04800011
CR108	1N4148; DIODE/GENERAL PURPOSE	04810001	Q 402	MPS-4124 NPN LOW NOISE AUD.	04800006
CR201	MV 2109 VARI CAP	04810011	Q 403	MPS-4124 NPN LOW NOISE AUD.	04800006
CR301	1N4001 DIODE 50 VOLT/1AMP	04810003	Q 404	MPS-4124 NPN LOW NOISE AUD.	04800006
CR302	1N4742 1/2W 12V ZENER	04820015	Q 405	MPS-4124 NPN LOW NOISE AUD.	04800006
CR401	DIODE/SCHOTTKY; MBD101 OR 1N6263	04810010			
CR402	1N4148; DIODE/GENERAL PURPOSE	04810001	R 101	2.2K OHM 5% 1/4W CF	04700137
CR403	1N4001 DIODE 50 VOLT/1AMP	04810003	R 102	10K OHM 5% 1/4W CF	04700145
F 301	WIRE; #40AWG TINNED BUS (INCHES)	06000040	R 103	470 OHM 5% 1/4W CF	04700129
IC101	MC3357P FM IF SUBSYSTEM	03131010	R 104	10K OHM 5% 1/4W CF	04700145
IC102	LM386N-3; AUDIO PWR AMP	03131009	R 105	1.5K OHM 5% 1/4W CF	04700135
IC201	CA3260AE DUAL BI-MOS OP AMP	03131017	R 106	2.2K OHM 5% 1/4W CF	04700137
IC301	LM2931; 5VDC REGULATOR	03131019	R 107	1.8K OHM 5% 1/4W CF	04700136
J 301	2.5MM PC-MT JACK; ANT&CHRG	02100001	R 108	1.8K OHM 5% 1/4W CF	04700136
J 302	2.5MM PC-MT JACK; ANT&CHRG	02100001	R 109	47K OHM 5% 1/4W CF	04700153
J 303	3-POSITION POLARIZED CONNECTOR	02100113	R 110	10K OHM 5% 1/4W CF	04700145
J 304	3.5MM STEREO JACK; PANEL MOUNT	02100053	R 111	15K OHM 5% 1/4W CF	04700147
L 101	4.5T SW VARIABLE COIL CUT	01850054	R 112	100K OHM 5% 1/4W CF	04700157
L 102	2.5T AIRFCW COIL .05 A L	01870952	R 113	5.6K OHM 5% 1/4W CF	04700142
L 103	3.5T CBJVSW COIL .25 R R	01850043	R 114	820 OHM 5% 1/4W CF	04700132
L 104	1 UH MOL FCW COIL .250 A	01800213	R 115	2.2K OHM 5% 1/4W CF	04700137
L 105	3.5T CBJVSW COIL .25 R R	01850043	R 116	15K OHM 5% 1/4W CF	04700147
L 106	1 UH MOL FCW COIL .250 A	01800213	R 117	10K OHM 5% 1/4W CF	04700145
L 107	10 UH MOL FCW COIL .250 A	01800225	R 118	2.2K OHM 5% 1/4W CF	04700137
L 201	.68 UH MOL FCW COIL .250 A	01800211	R 119	5.6K OHM 5% 1/4W CF	04700142
L 202	6.5T CBJVSW COIL .25 R R	01850046	R 120	10K AUDIO TAPER W/SWITCH	04750010
L 203	6.5T CBJVSW COIL .25 R R	01850046	R 121	10 OHM 5% 1/4W CF	04700108
L 204	4.5T CBJVSW COIL .25 R R	01850044	R 122	4.7 OHM 5% 1/4W CF	04700104
L 205	4.5T CBJVSW COIL .25 R R	01850044	R 123	8.2K OHM 5% 1/4W CF	04700144
L 206	3.5T CBJVSW COIL .25 R R	01850043	R 124	10K LINEAR TAPER W/SWITCH	04750011
L 207	3.5T CBJVSW COIL .25 R R	01850043	R 125	6.8K OHM 5% 1/4W CF	04700143
L 208	5.5T AIRFCW COIL .1 A L	01870955	R 126	22K OHM 5% 1/4W CF	04700149
L 209	4.5T AIRFCW COIL .09 A L	01870954	R 127	22K OHM 5% 1/4W CF	04700149
L 301	1 UH MOL FCW COIL .250 A	01800213	R 128	1K OHM 5% 1/4W CF	04700133
L 302	5.5T AIRFCW COIL .1 A L	01870955	R 129	560 OHM 5% 1/4W CF	04700130
L 303	4.5T AIRFCW COIL .09 A L	01870954	R 130	330K OHM 5% 1/4W CF	04700163
L 304	4.5T AIRFCW COIL .09 A L	01870954	R 131	100K OHM 5% 1/4W CF	04700157
LR201	5T RES FCW COIL .250 AR .L8K	01800129	R 132	470K OHM 5% 1/4W CF	04700165
M 301	VHF REG/LEN 150-160 YEL AFM-150Y	01200051	R 133	10K OHM 5% 1/4W CF	04700145
P 301	3-POSITION POLARIZED HEADER	02100114	R 134	100K OHM 5% 1/4W CF	04700157
P 302	8-POSITION METHODE HEADER	02100115	R 135	100K OHM 5% 1/4W CF	04700157
PJ401	3 PIN STRAIGHT HEADER	02100024	R 136	2.2K OHM 5% 1/4W CF	04700137
PJ401	2 PIN SHORTING PLUG	02100075	R 137	10K OHM 5% 1/4W CF	04700145
Q 101	MPS-H07A NPN VHF AGC AMP	04800003	R 138	4.7K OHM 5% 1/4W CF	04700141
Q 102	MPS-H10 NPN RF AMPLIFIER	04800016	R 201	22K OHM 5% 1/4W CF	04700149
Q 103	MPS3563 NPN RF AMPLIFIER	04800002	R 202	1K OHM 5% 1/4W CF	04700133
Q 104	MPS-4124 NPN LOW NOISE AUD.	04800006	R 203	3.3K OHM 5% 1/4W CF	04700139
Q 105	MPS-4124 NPN LOW NOISE AUD.	04800006	R 204	4.7K OHM 5% 1/4W CF	04700141
Q 106	2N6726 PNP PWR TRAN	04800018	R 205	100 OHM 5% 1/4W CF	04700121
Q 201	MPS3563 NPN RF AMPLIFIER	04800002	R 206	1K OHM 5% 1/4W CF	04700133
Q 202	MPS3563 NPN RF AMPLIFIER	04800002	R 207	10 OHM 5% 1/4W CF	04700108
Q 203	2N4427 NPN RF AMP TO-5	04801000	R 208	1K OHM 5% 1/4W CF	04700133
Q 204	MRF-237 NPN VHF AMP TO-39 4T	04801002	R 209	100K OHM 5% 1/4W CF	04700157
Q 205	MPS-4124 NPN LOW NOISE AUD.	04800006	R 210	330K OHM 5% 1/4W CF	04700163
Q 206	MPS-A64 PNP DARLINGTON	04800008	R 211	22K OHM 5% 1/4W CF	04700149
Q 301	2N6726 PNP PWR TRAN	04800018	R 212	220K OHM 5% 1/4W CF	04700161
Q 302	2N4126 PNP GP AUDIO TO-92	04800011	R 213	470K OHM 5% 1/4W CF	04700165
Q 303	2N4126 PNP GP AUDIO TO-92	04800011	R 214	560 OHM 5% 1/4W CF	04700130
			R 215	82K OHM 5% 1/4W CF	04700156
			R 216	500 OHM MINI-TRIMMER	04750037
			R 217	1.5K OHM 5% 1/4W CF	04700135
			R 218	100K OHM 5% 1/4W CF	04700157
			R 219	100K OHM 5% 1/4W CF	04700157
			R 220	1K OHM 5% 1/4W CF	04700133
			R 221	100K OHM 5% 1/4W CF	04700157
			R 222	220K OHM 5% 1/4W CF	04700161
			R 223	2.2K OHM 5% 1/4W CF	04700137

REF #	DESCRIPTION	RITRON #	REF #	DESCRIPTION	RITRON #
R 224	2.2 K Ω 5% 1/8 W CF	L4700837	HD27	TERMINAL; 2100031/2100042	02100046
R 301	220 OHM 5% 1/4W CF	04700125	HD28	10MM SHIELD CAN AURA	02500003
R 302	1K OHM 5% 1/4W CF	04700133	HD29	10MM SHIELD CAN AURA	02500003
R 303	150 OHM; 1/2W; 5% CF RESISTOR	04710022	HD30	10MM SHIELD CAN AURA	02500003
R 304	10K OHM 5% 1/4W CF	04700145	HD31	10MM SHIELD CAN AURA	02500003
R 305	1K OHM 5% 1/4W CF	04700133	HD32	10MM SHIELD CAN AURA	02500003
R 401	100K OHM 5% 1/4W CF	04700157	HD33	10MM SHIELD CAN AURA	02500003
R 402	10K OHM 5% 1/4W CF	04700145	HD34	10MM SHIELD CAN AURA	02500003
R 403	100K OHM 5% 1/4W CF	04700157	HD35	10MM SHIELD CAN AURA	02500003
R 404	10K OHM 5% 1/4W CF	04700145	HD36	10MM SHIELD CAN AURA	02500003
R 405	270K OHM 5% 1/4W CF	04700162	HD37	SPRING STRIP ANT CONN	02500009
R 406	680K OHM 5% 1/4W CF	04700167	HD38	TO-5 INSULATOR THERMALLOY	02600001
R 407	33K OHM 5% 1/4W CF	04700151	HD39	PTT SWITCH COVER/GASKET REV A	02800038
R 408	15K OHM 5% 1/4W CF	04700147	HD40	PCBINSULATOR CLASSIC	25300400
R 409	100K OHM 5% 1/4W CF	04700157	HD41	HEADSET CONTROL COVER	02800092
R 410	100K OHM 5% 1/4W CF	04700157	HD42	CRYSTAL SUPPORT	02800114
R 411	100K OHM 5% 1/4W CF	04700157	HD43	CRYSTAL SUPPORT	02800114
R 412	100K OHM 5% 1/4W CF	04700157	HD44	CRYSTAL SUPPORT	02800114
R 413	10K OHM 5% 1/4W CF	04700145	HD45	CRYSTAL SUPPORT	02800114
R 414	220K OHM 5% 1/4W CF	04700161	HD46	4-40; 1/4" PHILLIPS FLAT	02801003
R 415	680K OHM 5% 1/4W CF	04700167	HD47	4-40 X 1" PHIL FLAT	02801004
SP101	SPEAKER 2"RND/ALNICO	05500001	HD48	4-40; 1/4" PHILLIPS PAN	02801005
SW301	MINATUTURE PTT SWITCH-BRK/MAKE	05100032	HD49	SCREW 4-40 7/8" PHIL FLAT	28112400
SW401	DP3T SWITCH ALCO#MHS233K	05100039	HD50	#4-40 X 7/8" PPHMS / STEEL	02801027
T 101	455KHZ IF XFORMER/ZAMCO	05600002	HD51	7/16"-28 UNEF HEX LCKNT	02802001
Y 101	10.245MHZ 2ND LO XTAL	02300005	HD52	4-40 PRESS NUT/BRASS IN-X	02802002
Y 102	XTAL VHF RT RECEIVE REV	02300004	HD53	4-40 SPECIAL PRESSNUT	02802008
YF101	10.7MHZ 2 POLE MONO FILT	02301001	HD54	4-40 SPECIAL PRESSNUT	02802008
YF102	455KHZ CERAMIC FILTER (6 POLE)	02301009	HD55	BANK-LOK MULTIVANE INSERT	02802020
Z 201	BEAD FAIR-RITE 2643000301	01801003	HD56	BANK-LOK MULTIVANE INSERT	02802020
Z 202	FAIR-RITE BEAD ON AXIAL LEADS	01801029	HD57	VOX HDSET KHM-7603C	05500033
Z 203	FAIR-RITE BEAD ON AXIAL LEADS	01801029	HD58	22 AWG SOLID BLACK PVC; INCHES	06001093
Z 204	FAIR-RITE BEAD ON AXIAL LEADS	01801029	HD59	24 AWG SOLID PURPLE PVC; INCHES	06001066
Z 205	FAIR-RITE BEAD ON AXIAL LEADS	01801029	HD60	PVC HEAT SHRINK; 2"DIA/WHITE 8ML; IN	06002002
HARDWARE			HD61	PLATED ANTENNA BUSHING 5/16" 32TP	06201003
HD01	SPKR BACKING/2"DIA W/1"C (REV F)	01400053	HD62	LOW BATTERY NOTICE LABEL	14210004
HD02	RT-WEDGE; REGULAR CASE	01400084	HD63	NAMEPLATE; FRONT VOX-100	14222005
HD03	PTT SWITCH BUTTON BLACK	25201300	HD65	FREQUENCY DOTS	14230008
HD04	SPKR GRILL CLOTH; 2" DIA	01400105	HD66	JOB COM SERVICE PHONE NO. LABEL	14230024
HD05	YELLOW TRIM STRIP/.310" X 7.500"	01400565	HD67	MALE TERMINAL	21202001
HD06	YELLOW TRIM STRIP/.310" X 7.500"	01400565	HD68	MALE TERMINAL	21202001
HD07	LABEL RT-15H BATTERY/TONE BD REVA	14210008	HD69	MALE TERMINAL	21202001
HD09	HANDS-FREE NAMEPLATE	01400610	HD70	PUSH IN FASTENER NYLON BLK .140 DIA	25200500
HD10	RHD-10 LABEL FOR VOX HEADSET	01400619	HD71	PUSH IN FASTNER NYLON BLK .105 DIA	25200600
HD11	NEW CLASSIC CASE KNOB	01403333	HD72	PUSH IN FASTNER NYLON BLK .105 DIA	25200600
HD12	NEW CLASSIC CASE KNOB	01403333	HD73	.125" PORON SPACER	25602000
HD13	NEW CLASSIC BACK PANEL	01403340	HD74	LABEL "RETURN FOR SERVICE"	01400676
HD14	NEW CLAS.FRT./15H OVAL CUT-OUT	01403342			
HD15	PLASTIC BAG 4"*6"*.002"	01410001			
HD16	FOAM INSERT; VOX	01410053			
HD17	BOX FOR FOAM PCKAGING INSERT	14313001			
HD18	USERS MANUAL	01451159			
HD19	JOB COM WARRANTY/REG CARD	01450063			
HD20	JOB COM SERV. REQUEST CARD REV C	01450064			
HD21	FCC LICENSING MANUAL	01450066			
HD22	JOB COM 4-COLOR STMFFER	01450092			
HD24	MAINTENANCE MANUAL	01451064			
HD25	TERMINAL; 2100031/2100042	02100046			
HD26	TERMINAL; 2100031/2100042	02100046			



SCHEMATIC 1770110 REV L
P.C. BOARD 1700110 REV J
BOTTOM SIDE PARTS PLACEMENT 1760110 REV G

TOLERANCES		REVISIONS		RITRON, INC.	
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LAST ECN 1633

NOTES:

1. TO CHANGE SENSITIVITY OF VOX CIRCUIT-

DECREASE SEN

OLD ONLY INCREASE VALUE OF R415

COOD ONLY	INCREASE VALUE OF R413
NORM ONLY	INCREASE VALUE OF R414

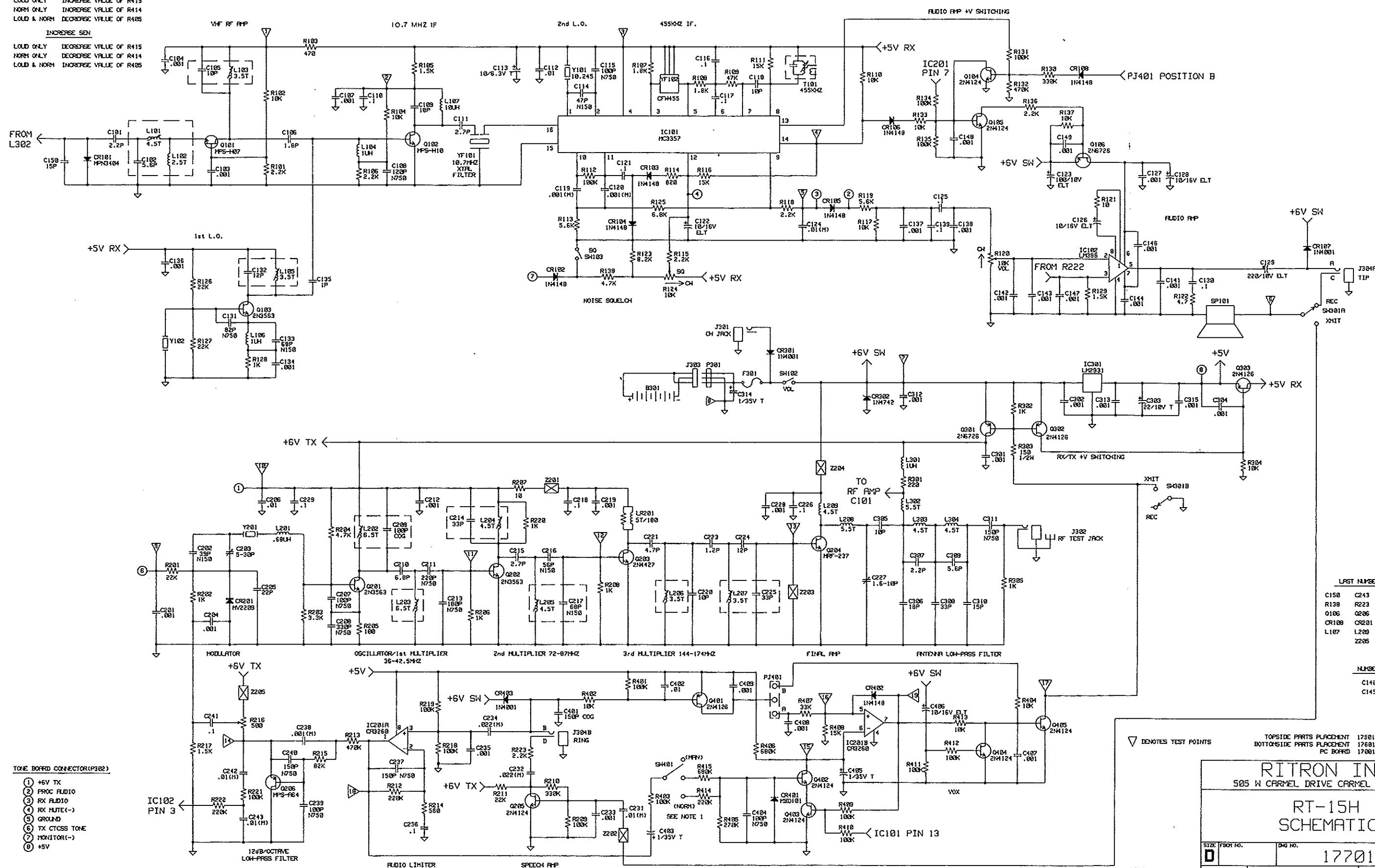
NORTH ONLY	INCREASE VALUE OF R414
LOUD & NORTH	DECREASE VALUE OF R4B5

INCREASE SEN

1.000 ONLY DEGREE VALUE OF SALE

LOAD ONLY	DECREASE VALUE OF R415
NORM ONLY	DECREASE VALUE OF R414

NORM ONLY	DECREASE VALUE OF R414
LOUD & NORM	INCREASE VALUE OF R435



REVISIONS		
REV	EDN #	DATE

LAST NUMBERS USED			
C150	C243	C315	C409
R138	R223	R304	R415
Q106	Q206	Q303	Q405
CR108	CR201	CR302	CR403
L107	L209		
	Z205		

NUMBERS OMITTED	
C140	C222
C145	C230

▽ DENOTES TEST POINTS

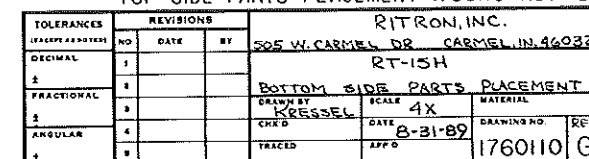
TOPSIDE PARTS PLACEMENT 1750110 REV L
BOTTOMSIDE PARTS PLACEMENT 1760110 REV G
PC BOARD 1700110 REV J

RITRON INC
505 W CARMEL DRIVE CARMEL IN 46032

RT-15H
SCHEMATIC

SIZE	FORM NO.	DWG NO.	REV.
D		1770110	L

LAST EON #1533	DATE	11/27/89	PLOT	11/27/89
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LAST ECN:1633