RR-454 REPEATER PLUS SPECIFICATIONS

GENERAL

FCC ID No:	AIE9QZRR-454
FCC Rule Parts:	22, 74, 90, 95
DOC Approval No:	1084 193 466I
Emission Designators:	16K0F3, 16K0F2
Frequency Range:	450 - 470 MHz (406 - 420 MHz optional)
RF Channels:	1 (full duplex)
CTCSS Decoder/Encoder:	32 standard EIA tones, switch programmable
Power Requirements:	120 VAC/ 0.5A OR +11 to +15 VDC/1.5 A
Controls:	N/A
Audio Output:	500 mW minimum into 8 Ω
Auxiliary Equipment Connector:	2 internal 10-pin connectors
RF Connector:	SO-239
AC Power Connector:	3-pin socket on rear panel
DC Power Connector:	3-pin connector on front panel
Carrier Dropout Timer:	0.5 to 7.0 seconds, adjustable
Time-Out Timer:	1 to 10 minutes, adjustable
Emergency Battery Charge Current:	0.1 Ampere nominal
Autopatch Provision:	RITRON RP-200 via 10-pin auxiliary connector
AC to Backup Battery Transfer:	Automatic relay cutover
Local Speaker Microphone:	RITRON model RSM-23 or RSM-2X, electret, with 8 Ω speaker and PTT switch
Antenna Impedance:	50 Ω
Dimensions:	5.0" H x 14.4" W x 9.5" D
Weight:	8 lbs. (approximate)

DUPLEXER (BUILT-IN)

High-pass:	1.5 dB typical
Low-pass:	1.8 dB typical
Transmit/Receive Separation:	4.5 - 5.5 MHz standard

TRANSMITTER

RF Output:	1 to 7 Watts, adjustable (0.7 to 5 Watts @ duplexer output)
Frequency Stability:	+/- 2.5 PPM (-30° to +50° C)
Modulation:	Direct FM, +/- 5KHz nominal
Deviation:	0 to +/- 5 kHz, adjustable
Spurious and Harmonics:	-52 dBc minimum
Audio Response:	+1/-3 dB maximum 300 Hz to 3000 Hz
Power Requirements:	+11 to +15 VDC, 1.5 Amps nominal
Accessory Audio Input:	Pre-emphasized Frequency range: 300 to 3000 Hz Signal level: 100 mVp-p for 3 KHz deviation of a 1 KHz tone (internally clipped and filtered)
TX Digital Quiet-Call Input:	Impedance: 470 K nominal Frequency range: 5 to 3000 Hz Signal level: 1 VRMS nominal
Output Impedance:	50 Ω
RF Output Connector:	Coaxial RF Phono Jack

CRYSTAL SPECIFICATIONS

Frequency:	(Transmit Freq) / 36
Type:	Fundamental AT cut, Parallel antiresonant
Load Capacitance:	32 pF
Series Resistance:	25 Ω maximum
RITRON Spec. Number:	02300022

NOTE: Digital Quiet-Call (DQC) is RITRON's tradename for digital coded squelch.

SPECIFICATIONS (CON'T.)

RECEIVER

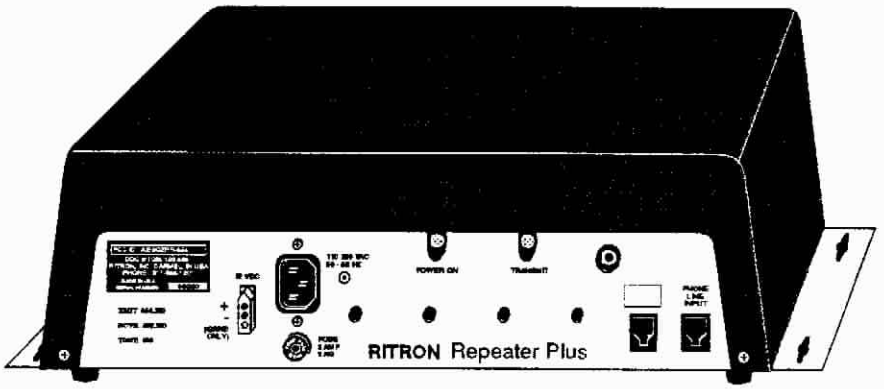
Receiving System:	Double Conversion Superheterodyne
I.F. System:	21.4 MHz/455 KHz
Frequency Stability:	+/-10 PPM (-30° to +50° C)
Sensitivity:	0.25 uV Minimum @ 12 dB SINAD
	0.35 uV Minimum @ 20 dB Quieting
Selectivity:	70 dB Minimum @ +/-25 KHz
Spurious Rejection:	90 dB Minimum
Image Rejection:	80 dB Minimum
Noise Squelch Sensitivity:	0.1 to 0.35 uV, adjustable
Intermodulation Rejection:	70 dB Minimum EIA
Modulation Acceptance:	+/- 5 KHz nominal,
	+/- 7.5 KHz maximum
Audio Frequency Range:	10 to 3000 Hz
Audio or FSK Data Output:	Load impedance: 2 K minimum
	Signal Level: Received 1 KHz tone @
	3 KHz deviation set to produce a
	2.1 Vp-p signal @ J302 pin 1
RF Input Impedance:	50 Ω nominal
RF Connector:	Coaxial Phono Jack

CRYSTAL SPECIFICATIONS

Frequency:	(Receive Freq - 21.4 MHz) / 9
Type:	Third Overtone, Parallel Antiresonant
Load Capacitance:	32 pF Nominal
Series Resistance:	40 Ω Maximum
RITRON Spec. Number:	02300401

GENERAL DESCRIPTION

The RR-454 is a compact, wall-mount UHF repeater that operates in the 450 to 470 MHz communications band. The unit receives messages which are originated by handheld, mobile, or fixed stations on one frequency, and simultaneously re-transmits the message on a second frequency. The unit contains a duplexer which allows a single antenna to be used for simultaneous transmission and reception. This full-duplex operation allows mobile and handheld units to communicate over much greater distances than would be possible without the repeater.



The RR-454 is constructed in a heavy-duty, U-shaped Aluminum chassis. The PC board and internal components are protected by a vacuum-formed plastic cover, which is coated inside with a special RF shielding material, and secured to the chassis by five #6 x 3/8" screws. The power transformer, AC fuse, AC and DC power receptacles, the 4-cavity notch-filter duplexer, and the UHF-type antenna connector mount on the Aluminum chassis. Two hinges hold the printed circuit board, which contains the receiver, transmitter, power supply and signal-processing circuitry, to the chassis rear sidewall. Two #6 screws secure the front edge of the PC board to "L" brackets on the chassis front sidewall. A third screw fastens the PCB to a standoff. With these screws removed, the hinges allow the PC board to be pivoted upward and toward the rear for troubleshooting and/or servicing — these hinges are OFFSET; thus, when the PC board is fully raised, it will remain in the vertical position without additional support.

RWR-10 THEORY (CON'T.)

EXTERNAL SPEAKER AMPLIFIER

The RWR-10 contains a 1/2 Watt audio amplifier, IC602, for monitoring the RX AUDIO with an optional, external 8 Ω speaker. R623 adjusts the amplifier output level to the desired value. IC602 amplifies the Remote RX Audio, P601 pin 6, and applies it to one OUTSIDE contact of the REMOTE CONTROL PHONE jack, P602 pin 5. This audio is referenced to ground, available on P602 pin 2. Note that the amplifier is inhibited when the telephone handset is off-hook, as described above.

HYBRID BALANCE AND AUDIO AMPLIFIER CIRCUITS

The hybrid balance circuit, consisting of T601, T602, IC601 and associated components, separates the transmitted and received signals for processing in the repeater. Telephone audio from the REMOTE CONTROL PHONE Jack, P602 pins 3 and 4, appears across T601 and T602. IC601B then amplifies the telephone audio and applies it to the Remote TX Audio line, P601 pin 1, which routes the audio to the transmitter modulator. R617 sets the output level of IC601B for proper deviation of the transmitter frequency.

The Remote RX Audio from P601 pin 6 appears across R620, which sets the input amplitude to IC601A. De-emphasis is imposed on the audio from 300 to 3000 Hz by C609 and R618. After amplification in IC601A, T601 and T602 couple the audio to the telephone through the REMOTE CONTROL PHONE jack, P602 pins 3 and 4.

A gain balance circuit consisting of R615 and R616 provides an audio path from IC601A to IC601B. R616 is adjusted for equal GAIN over the two paths, and R613 adjusts for correct PHASING. R613 and R616 are adjusted for MINIMUM Remote RX Audio at pin 7 of IC601B.

RF BYPASSING

Several 15 pF disc capacitors and Ferrite beads, on the input and output lines of the RWR-10, improve rejection of radiated RF fields within the repeater enclosure; thus, preventing interference to audio signals in the unit.

RR-454 REPEATER PLUS ALIGNMENT PROCEDURE

The following paragraphs describe the alignment procedures for the duplexer, receiver, transmitter and sub-assemblies used in the RITRON RR-454 Repeater Plus. When any alignment is necessary, it should be done in the order given in this manual, using the test equipment listed below. The "RR-454 Alignment Procedure Reference Diagram" on page 11 is intended for quick reference. (A detailed RR-454 Topside Parts Placement diagram appears on page 38.)

TEST EQUIPMENT REQUIRED

1) Spectrum Analyzer (500 MHz)
2) RF Wattmeter, 10 to 25 Watts full scale
3) RF Signal Generator
4) Deviation Meter
5) Frequency Counter (500 MHz)
6) VTVM or 20K/V VOM
7) Oscilloscope
8) SINAD Meter
9) Audio Signal Generator

PRELIMINARY

1) Disconnect power from the RR-454 repeater.

2) Remove the top cover from the RR-454 chassis. Do this by removing the five #6 x 3/8" mounting screws at the bottom edges of the cover. Lift the cover away.

3) Remove the three #6 x 3/8" screws that secure the front edge of the main PC board to the standoff and chassis "L" brackets.

4) Connect a jumper between J302 pins 3 and 4.

5) Place SW401 lever #6 in the OFF position.

6) Disconnect the duplexer from the transmitter and receiver.

7) Connect a Wattmeter to the transmitter output port (J201).

(9) 8) Rotate power control R218 fully CCW to set transmit power to zero.

POWER SUPPLY

1) Adjust R517 for +12.6 VDC at Z206 (TP58).

2) Adjust R507 for +9 VDC (+/- 0.1 VDC) at Z106 (TP61).

3) Adjust R503 for +13.8 VDC at the positive terminal of the external battery connector (J504).

TRANSMITTER

1) Set C226, C234, C235 and C236 to the half-meshed position.

2) Key the transmitter using one of the following methods:

   a) Ground J302 pin 10 (key line).
   b) Ground P303 pin 5 (remote microphone key).
   c) Ground P304 pin 10 (external PTT).
   d) Connect a RSM-23 hand microphone and press the key button.

3) Connect a DC coupled oscilloscope or a DC Voltmeter to TP10 and tune L201, L202 and L203 for maximum deflection.

4) Connect the meter or scope to TP11 and tune L207, then L204 for a minimum level.

5) Adjust R218 fully clockwise.

6) Connect the meter or scope to TP13 and adjust FL201 for a minimum level.

7) Tune C226, C235, C236 and C234 for maximum power as seen on the Wattmeter (at least 7 Watts).

8) If necessary, re-tune L204, L207 and FL201 to get 7 Watts, minimum.

9) Adjust L221 to set the TX frequency (+/- 200 Hz).

10) Un-key the transmitter and disconnect the Wattmeter.

11) If not already done, align the duplexer as described in the duplexer alignment section.

12) Connect the duplexer to the repeater TX (J201) and RX (J101) ports and the Wattmeter to the duplexer antenna port.

13) Key the transmitter. Re-tune C235, C236 and C234 for maximum power (5 Watts minimum at duplexer port).

14) Make sure that all spurious harmonics are at least 52 dBc.

15) Set SW401 lever #6 to the ON position.

16) Set SW401 to the correct CTCSS frequency. With the transmitter keyed, adjust R426 for +/- 600 Hz of transmitted deviation.

17) Apply a 1 KHz, 1 VRMS tone to the remote TX audio input port (P303 pin 1) and adjust R227 to give 4.75 KHz of deviation as seen on the modulation meter.

RECEIVER

1) Set SW401, lever #6 to the OFF position.

2) Disconnect the duplexer at the RX port (J101) and connect an RF generator.

3) Adjust R130 fully CCW to open carrier squelch.

4) Connect a SINAD measuring device to TP 60.

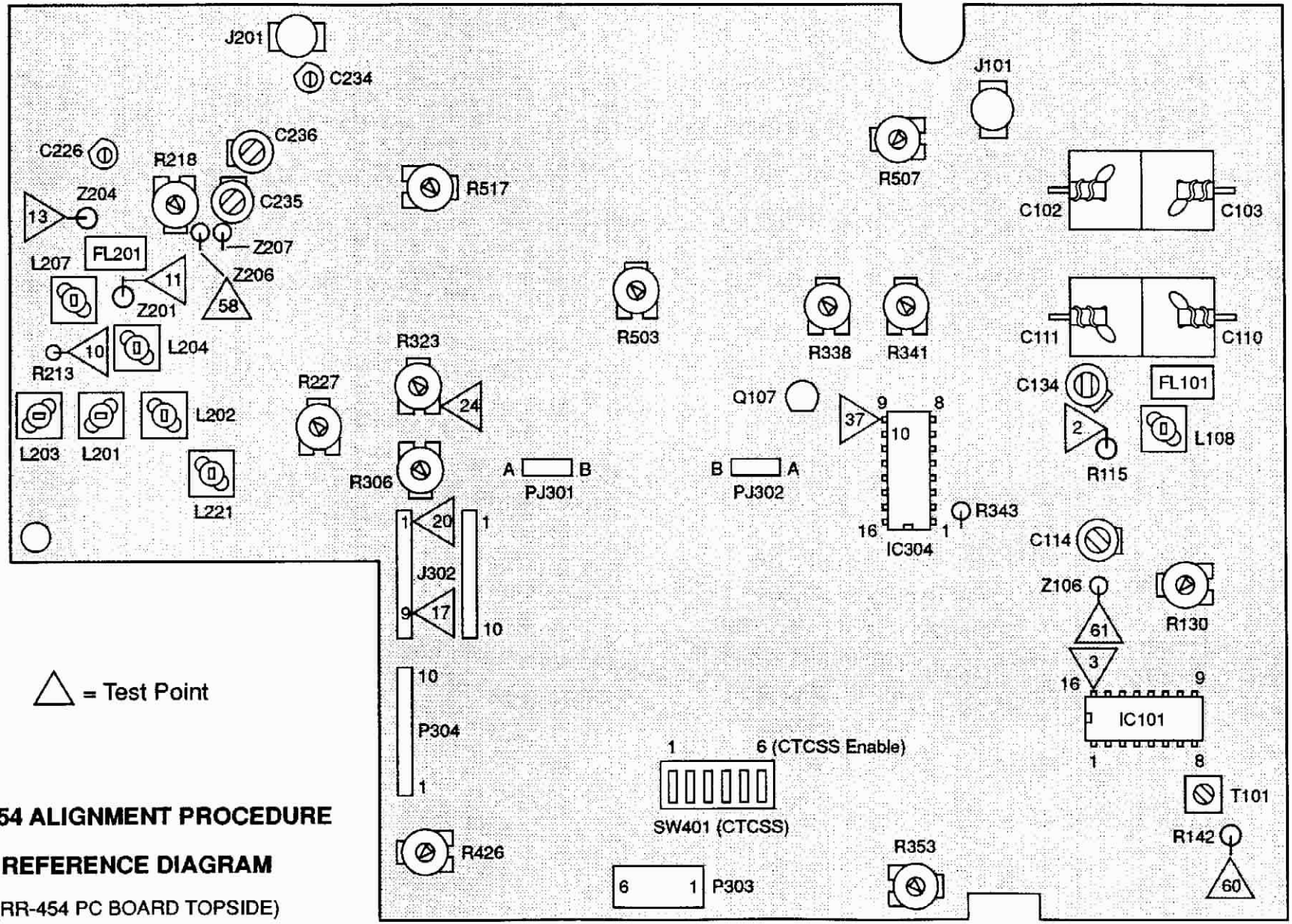
5) Connect a DVM to TP2 and adjust L108 and FL101 for maximum voltage (+0.9 to 1.1 VDC).

6) Connect an oscilloscope (probe on 10 x) to IC101 pin 16.

7) Connect the other channel of the oscilloscope to the tone output of the signal generator. Place the oscilloscope in xy mode.

8) Set the signal generator to the input frequency of the repeater, modulated with a 30 Hz tone at 20 KHz of deviation. Set the level high enough to observe the passband on the oscilloscope.

9) Tune C102, C103, C110 and C111 for maximum amplitude of the passband. Reduce the generator level as needed to keep Q106 from saturating.

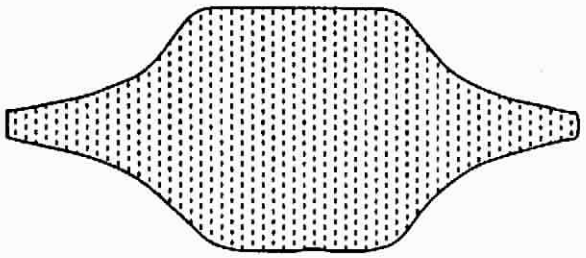


RR-454 ALIGNMENT PROCEDURE

REFERENCE DIAGRAM

(RR-454 PC BOARD TOPSIDE)

10) Tune C134 for the maximum amplitude and flattest response. After this adjustment, do not re-tune C134.



PASSBAND

11) Re-tune C102, C103, C110 and C111 for maximum amplitude of the passband.

12) Remove the scope probe from IC101 pin 16.

13) Inject a 1 KHz tone at 7.5 KHz deviation and adjust C114 for best SINAD, reducing the signal level as needed.

14) Reduce the deviation to 3 KHz and increase the generator level to full-quieting. Then connect an oscilloscope to TP24.

15) Adjust T101 for maximum amplitude of the 1 KHz signal. The waveform should be symmetrical and undistorted.

16) Re-adjust C102, C103, C110 and C111 for best sensitivity. Sensitivity should be .25 µV or better.

17) Increase the input signal by 3 dB. Then increase the deviation until the SINAD meter returns to 12 dB. This deviation is the acceptance bandwidth of the receiver. 7.5 KHz is the minimum. Less than 7.5 KHz indicates that the "IF" was misaligned or that the L.O. frequency is incorrect.

18) Disconnect the RF signal generator from J101 and connect the duplexer receiver cable to J101.

19) Re-adjust C102, C103, C110 and C111 for best sensitivity. Sensitivity should be better than .32 µV.

20) Set the signal generator level to a minimum (-127 dBm).

21) With R130 fully CCW (unsquelched), attach a Voltmeter or oscilloscope to the collector of Q107. The Voltmeter should read 0 Volts.

22) Adjust R130 CW until the collector of Q107 goes high.

23) Increase the signal level slowly. Squelch should break between 6 and 12 dB SINAD.

24) Decrease the signal level from the "breakpoint." You should have at least 2 dB of hysteresis.

25) With a full-quieting 1 KHz signal (-70 dBm) applied, adjust R323 for 2.1 Vp-p at J302 pin 1.

26) Remove the repeat disable jumper between J302 pins 3 and 4.

27) Connect the duplexer to the RX port (J101).

28) With the generator output padded (10 W = +40 dBm), inject a 1KHz tone at 3KHz of deviation on the RX frequency. Make sure that this tone is a full-quieting signal.

29) Adjust R306 to produce +/- 3 KHz of repeat deviation as shown on a service monitor modulation meter. The meter must be set to the repeater TX frequency.

30) Reduce the generator signal level to 12 dB SINAD and make sure desense is within specification. To do this, disable the transmitter with the shorting plug and find the 12 dB Sinad point. Increase the generator level by 1 dB and remove the shorting plug. The Sinad should remain at 12 dB or better. The following guidelines should be followed when measuring desense:

    Normal or inverted split/no amplifier: < 0.5 dB
    Normal split with amplifier: < 1.5 dB
    Inverted split with amplifier: < 2 dB

31) Set SW401, lever #6 to the ON position and verify that the unit decodes the correct CTCSS tone.

HANG TIME

1) If the repeater is used in a Telenexus, leased-line, or modem system, set PJ302 to position A.

2) If the repeater will be used with PATRIOT RTX handhelds and an RP-200, set PJ302 to position B. Adjust R338 for about 5 seconds of hang time.

3) If the repeater is to be used in a standard repeater system, set PJ302 to position B and set the hang time to about 1 second.

TIME OUT TIMER

1) Connect an oscilloscope to TP 37 (IC304 pin 9) and adjust R341 to obtain a 44 ms period. This will set the hang time to about 3 minutes.

2) Other delay times can be obtained by connecting to another pin on IC304.

PJ301 SETTINGS FOR STANDARD, TELENEXUS AND MODEM APPLICATIONS

1) If the repeater will be used in a telenexus or standard repeater system, set PJ301 to position "A."

2) If the repeater will be used in a modem application, set PJ301 to "B."

DUPLEXER

1) Pivot the PC board on its hinges to a vertical position to reach the four adjusting screws and locknuts on the duplexer tubes.

2) Unplug the two RF cables that connect the Transmitter and the Receiver to the Duplexer.

3) Connect a UHF Signal Generator to the antenna connector (UHF) on Repeater Plus rear panel.

4) Connect a Spectrum Analyzer to the Duplexer cable removed from the TRANSMITTER; then connect a 50 Ω load to the Duplexer cable removed from the RECEIVER. Note that each cable terminates in a MALE phono plug.

5) Tune the Signal Generator to the receiver INPUT frequency.

6) Tune the Spectrum Analyzer to the receiver INPUT frequency.

7) Carefully loosen the tuning screw locking nuts on the two TRANSMIT cavities.

IMPORTANT: The tuning screws are made of Aluminum. Do not replace these with steel or brass screws!

8) While keeping the locking nut snug, adjust one of the transmit tuning screws to achieve minimum transmission of the receive frequency as seen on the spectrum analyzer. This is best accomplished by turning the screw clockwise, just beyond the point of minimum transmission, and then backing the screw out counter-clockwise as you tighten the locking nut. Repeat this procedure for the other transmit tuning screw. You should be able to adjust the transmit filter so that the receiver frequency notch is at least 60 dB down and within 100 KHz of the desired notch.

9) Reverse the transmitter and receiver connections and tune the signal generator to the transmit frequency.

10) Carefully loosen the locking nuts on the two receive cavities.

11) While maintaining the locking nut snug, adjust one of the receive tuning screws to achieve minimum transmission of the transmit frequency. Use the same method as described in step 8. Repeat for the other screw. Again, the notch should be 60 dB down and within 100 KHz of the desired notch.

12) Disconnect the Spectrum Analyzer and the 50 Ω load from the Duplexer cables; then, reconnect the Duplexer cables to the Transmitter and to the Receiver.

13) Disconnect the Signal Generator from the rear panel antenna connector.

NOTE: The duplexer assembly should not be repaired in the field. All ports will measure DC short circuited to ground. Any repairs should be made at RITRON, INC.

CTCSS PROGRAMMING

1) Determine the CTCSS tone frequency to be programmed.

2) Set SW401 lever 6 (an on/off power switch for the tone circuitry) to the ON position.

3) Set SW401 levers 1 through 5 to program the desired tone frequency, as indicated in the CTCSS PROGRAMMING CHART below.

1 = Lever ON (closed) 0 = Lever OFF (open)

RR-454 CTCSS PROGRAMMING CHART

Code	Freq. (Hz)	Levers 1----5	Code	Freq. (Hz)	Levers 1----5
XZ	67.0	11111	2B	118.8	10111
XA	71.9	01111	3Z	123.0	00111
WA	74.4	11110	3A	127.3	10110
XB	77.0	01110	3B	131.8	00110
SP	79.7	11101	4Z	136.5	10101
YZ	82.5	01101	4A	141.3	00101
YA	85.4	11100	4B	146.2	10100
YB	88.5	01100	5Z	151.4	00100
ZZ	91.5	11011	5A	156.7	10011
ZA	94.8	01011	5B	162.2	00011
ZB	97.4	11010	6Z	167.9	10010
1Z	100.0	01010	6A	173.8	00010
1A	103.5	11011	6B	179.9	10001
1B	107.2	01001	7Z	186.2	00001
2Z	110.9	11000	7A	192.8	10000
2A	114.8	01000	M1	203.5	00000

4) Set the CTCSS encode level, by adjusting R426 for approximately 600 Hz of deviation, as indicated on the deviation meter. Combined deviation (voice and sub-audible) must not exceed 5 KHz.

RWR-10 ALIGNMENT PROCEDURE

To align the RWR-10 remote unit, begin with the "Test Equipment Required" and "Preliminary" sections on page 9.

NOTE: After the RWR-10 has been installed, it might need fine-tuning, depending upon the application.

1) Plug a DTMF-style telephone with a standard modular plug into the RR-454 modular jack NEXT TO the jack labeled PHONE LINE INPUT.

2) Using the RF signal generator set to the repeater receive frequency, radiate a 1 KHz signal at 3 KHz deviation to the RR-454, with the appropriate CTCSS tone.

CAUTION: To prevent damage to the RF Generator, DO NOT connect the Signal Generator to the RR-454 antenna connector.

3) Turn on the repeater by plugging in its AC power cord or DC supply connector. The repeater is NOT equipped with an on/off switch.

BE CERTAIN THAT THE RR-454 ANTENNA CONNECTOR IS PROPERLY TERMINATED WITH A 50 Ω LOAD.

4) With the telephone handset OFF-HOOK, use a small standard screwdriver or a tuning tool, to make the potentiometer adjustments described below.

5) Adjust R620 for the desired audio-tone level in the handset receiver when it is off-hook.

6) Adjust Gain Balance R616 and Phase Balance R613 for a null in the REMOTE TX AUDIO signal, as seen with an oscilloscope attached to the REMOTE TX AUDIO line (P601 pin 1), with NO microphone signal input.

7) Speak loudly or whistle into the handset microphone, and adjust R617 for 3 to 5 KHz deviation of the transmitted signal, as monitored by a Deviation Meter set to the transmit frequency.

8) OPTIONAL - With the handset ON-HOOK, adjust R623 for the desired audio level in an external 8 Ω speaker across the outside contact pair of the REMOTE CONTROL PHONE 6-position modular jack.

RITRON RR-454 ACCESSORY & REMOTE CONNECTOR PINS

SIGNALING PLUG P304 (FOR RDQC-2, ETC.):

Pin	Function	Signal Input/Output Levels
1	Spare Pin	No Connection
2	TX RDQC (Encoder Out)	1.2 VRMS
3	Ext. Decode	Open = No tone detected Ground = valid decode
4	Spare Pin	No Connection
5	Ground	0 VDC
6	Spare Pin	No Connection
7	+9 VDC	Regulated +9 VDC for RDQC-2
8	RX AUDIO	0.38 VRMS
9	Spare Pin	No Connection
10	Ext. PTT	Open = No PTT Ground = PTT

ACCESSORY CONNECTOR J302 (FOR TELENEXUS, AUTOPATCH, ETC.):

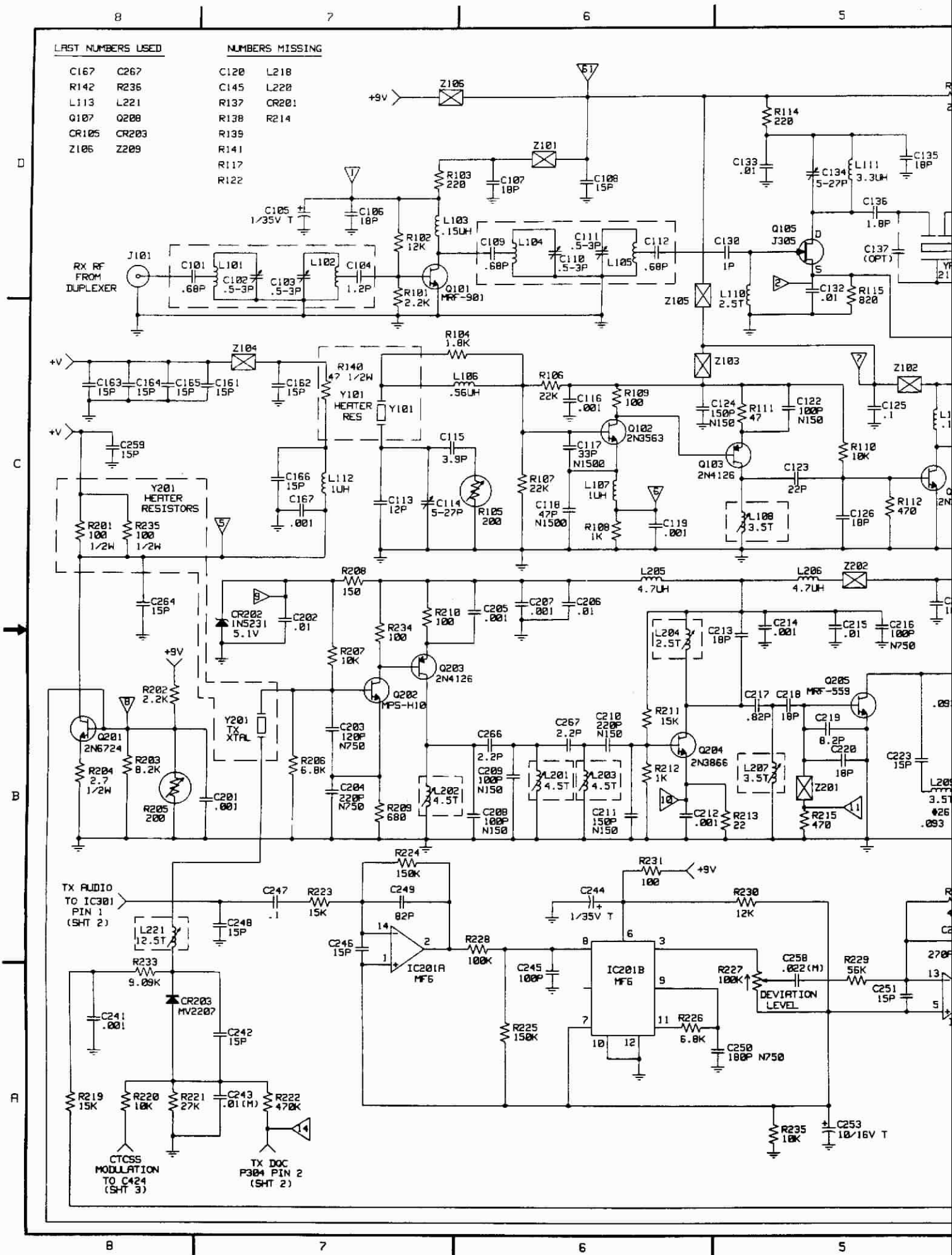
Pin	Function	Signal Input/Output Levels
1	Received Audio	0.775 VRMS
2	Spare Pin	No Connection
3	Ground	0 VDC
4	Repeat Disable	Open = Normal Repeat Ground = Repeat Disabled

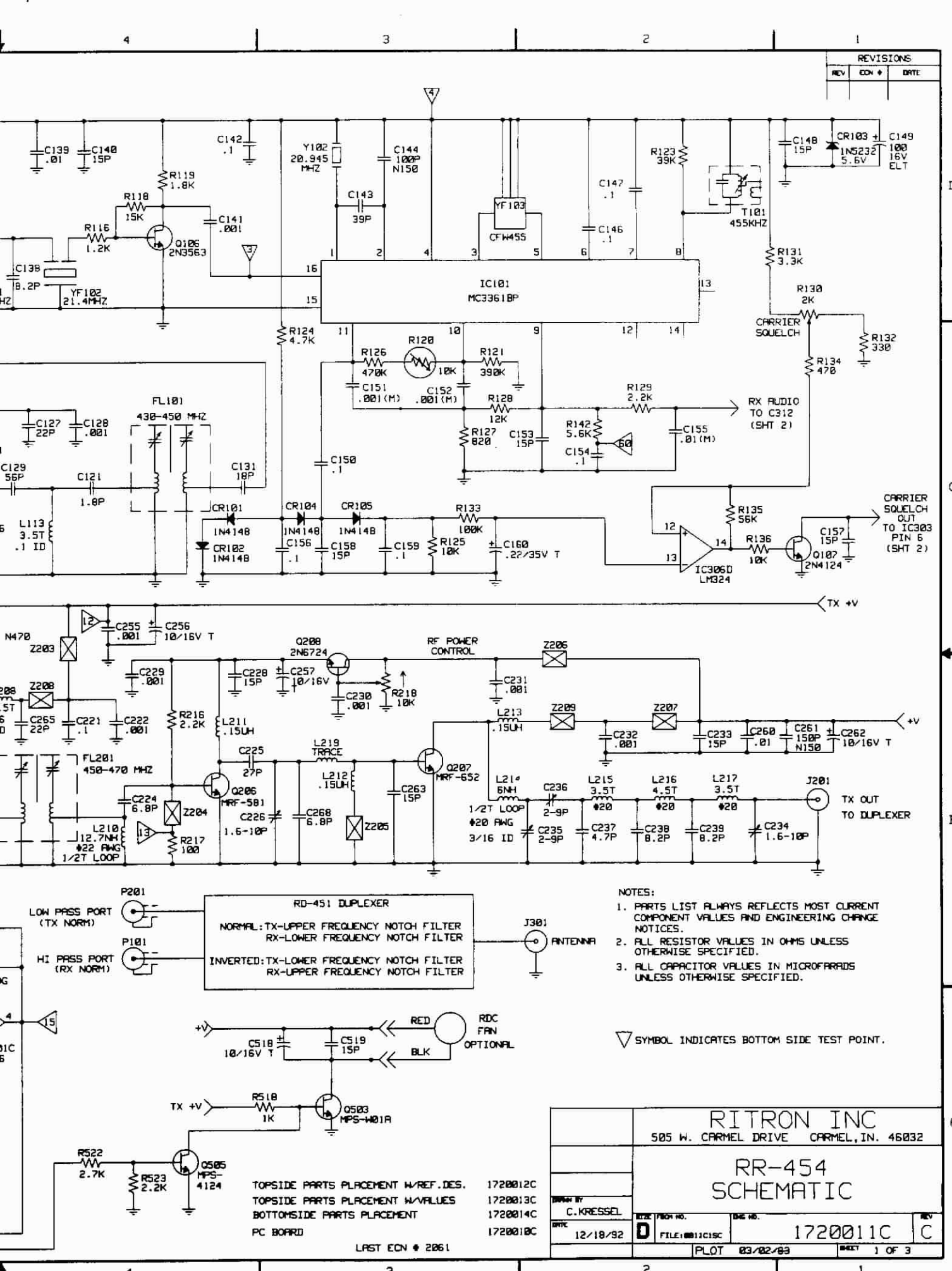
ACCESSORY CONNECTOR J302 (CON'T.):

5	+12 VDC	Accessory Supply, Reg. +12 VDC
6	_____	Carrier Squelch
7	CTCSS Encode Disable	_____
8	Tone Squelch Enable	Open = No Tone Detected Ground = Valid Tone Received
9	Transmit Audio Input	0.25 VRMS
10	Key	Open = No Transmit Ground = Transmit

REMOTE PLUG P303 (FOR RWR-10):

Pin	Function	Signal Input/Output Levels
1	Remote TX Audio	1.0 VRMS
2	Ground	0 VDC
3	+12 VDC	Remote Supply, Reg. +12 VDC
4	Monitor	Open = Monitor Ground = No Monitor
5	Remote Key	Open = No Transmit Ground = Transmit
6	Remote RX Audio	0.5 VRMS


LAST NUMBERS USED
C167 C267
R142 R236
L113 L221
Q107 Q208
CR105 CR203
Z106 Z209
NUMBERS MISSING
C120 L218
C145 L220
R137 CR201
R138 R214
R139
R141
R117
R122
RX RF FROM DUPLEXER
J101
+9V
+V
Z101
Z102
Z103
Z104
Z105
Z106
Z201
Z202
Y101 HEATER RES
Y201 HEATER RESISTORS
Y201 TX XTAL
Q101 MRF-901
Q102 2N3563
Q103 2N4126
Q105 J305
Q201 2N6724
Q202 MPS-H10
Q203 2N4126
Q204 2N3866
Q205 MRF-559
CR202 1N5231 5.1V
CR203 MV2207
IC201A MF6
IC201B MF6
DEVIATION LEVEL
TX AUDIO TO IC301 PIN 1 (SHT 2)
CTCSS MODULATION TO C424 (SHT 3)
TX DQC P304 PIN 2 (SHT 2)



NOTES:

1. PARTS LIST ALWAYS REFLECTS MOST CURRENT COMPONENT VALUES AND ENGINEERING CHANGE NOTICES.
2. ALL RESISTOR VALUES IN OHMS UNLESS OTHERWISE SPECIFIED.
3. ALL CAPACITOR VALUES IN MICROFARADS UNLESS OTHERWISE SPECIFIED.

▽ SYMBOL INDICATES BOTTOM SIDE TEST POINT.

RITRON INC
505 W. CARMEL DRIVE CARMEL, IN. 46032

RR-454
SCHEMATIC

DRAWN BY: C.KRESSEL
DATE: 12/18/92
SIZE: D
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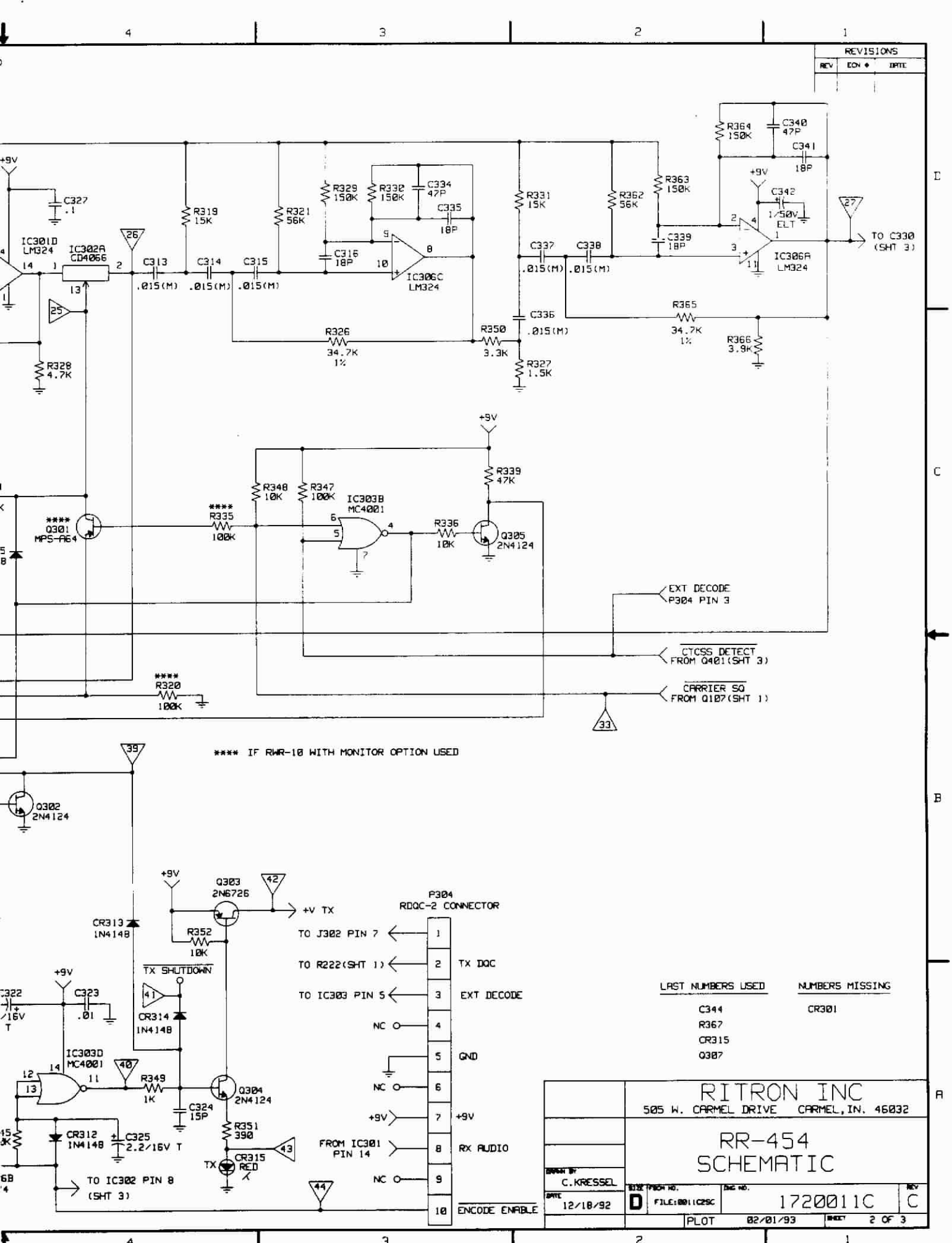
FILE: 1720011C.SC
DWG NO. 1720011C
REV: C
PLOT 03/02/93
SHEET 1 OF 3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C327 .1
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IC302A CD4066
R319 15K
R321 56K
R329 150K
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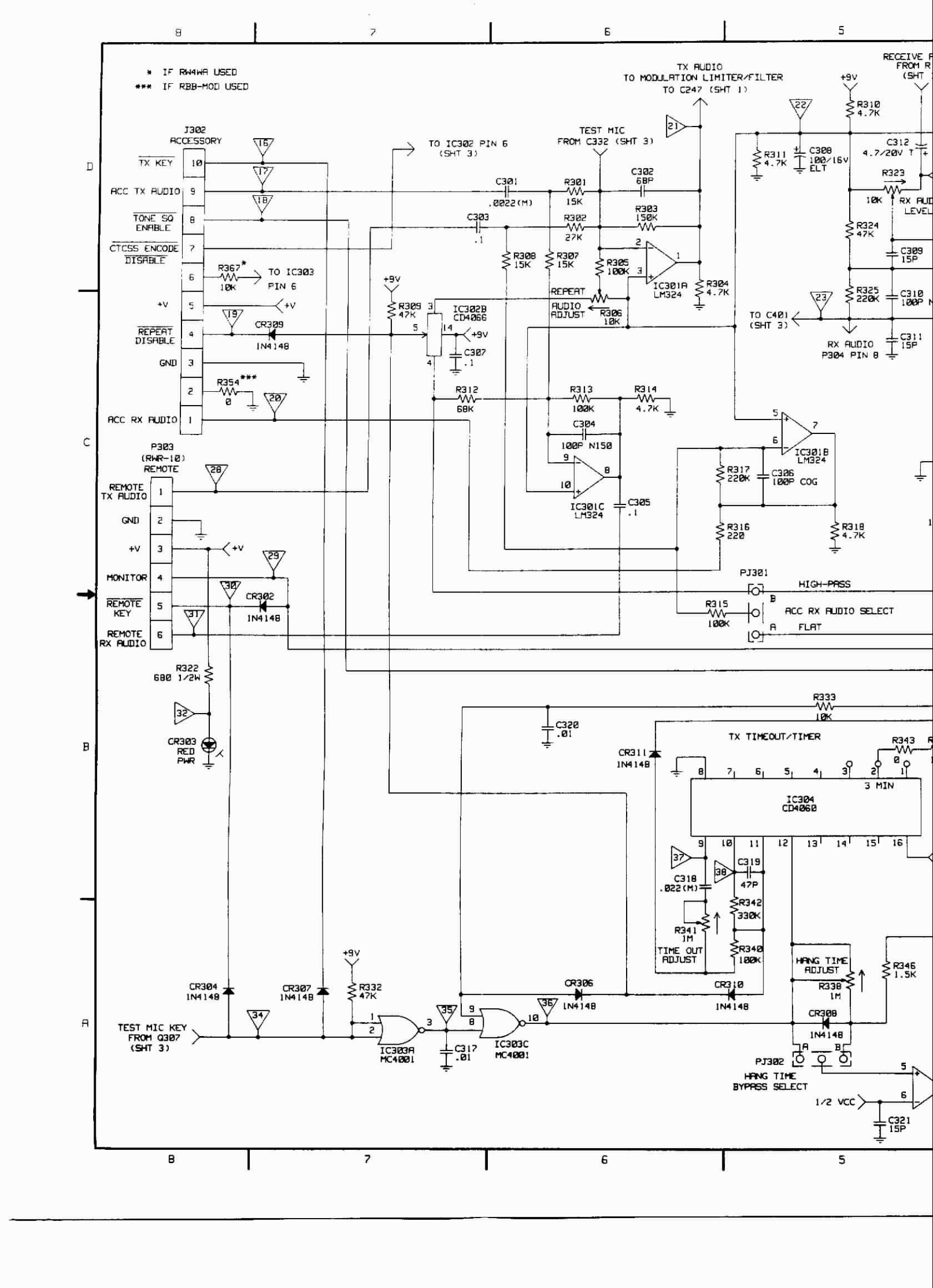
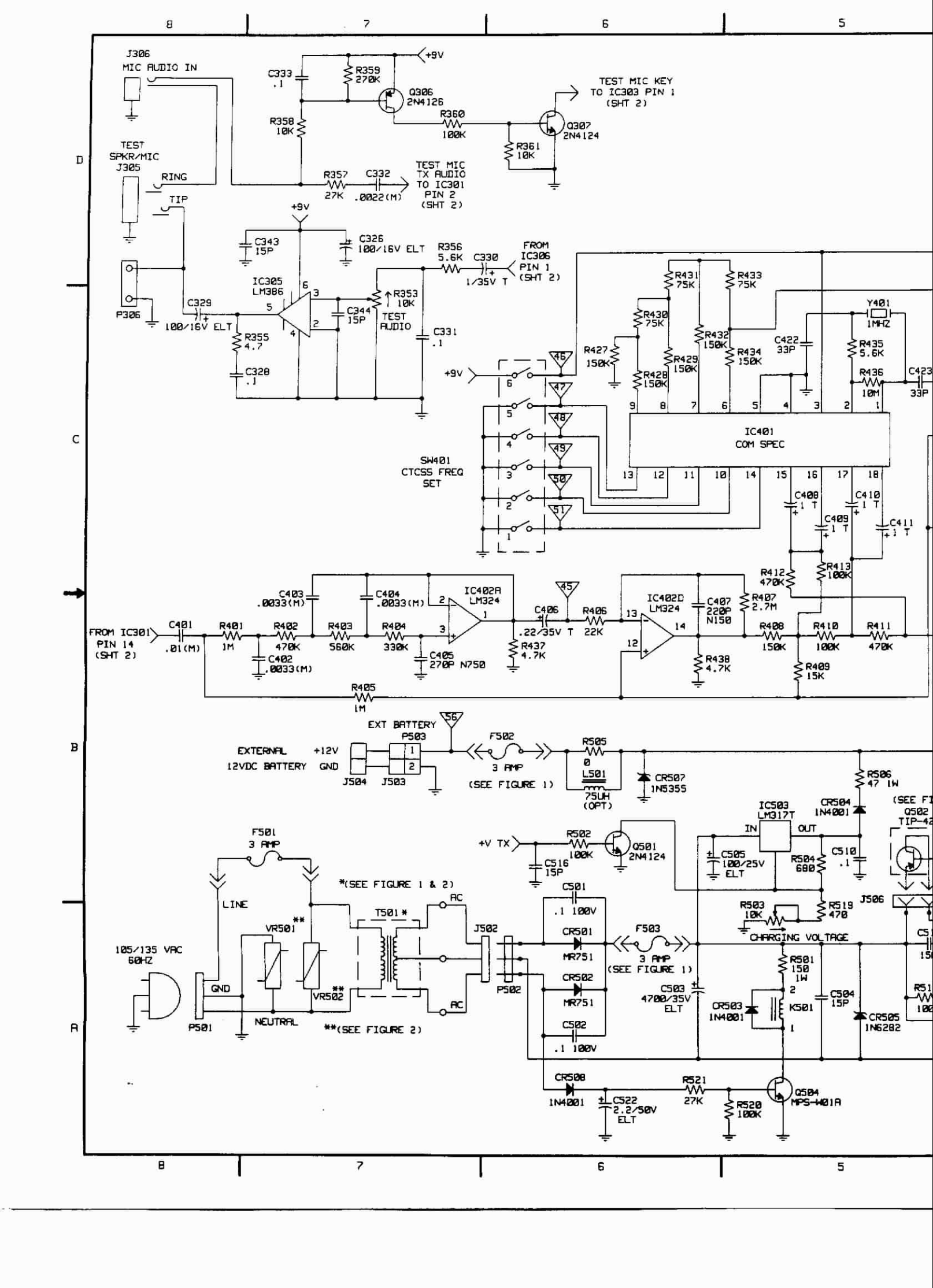
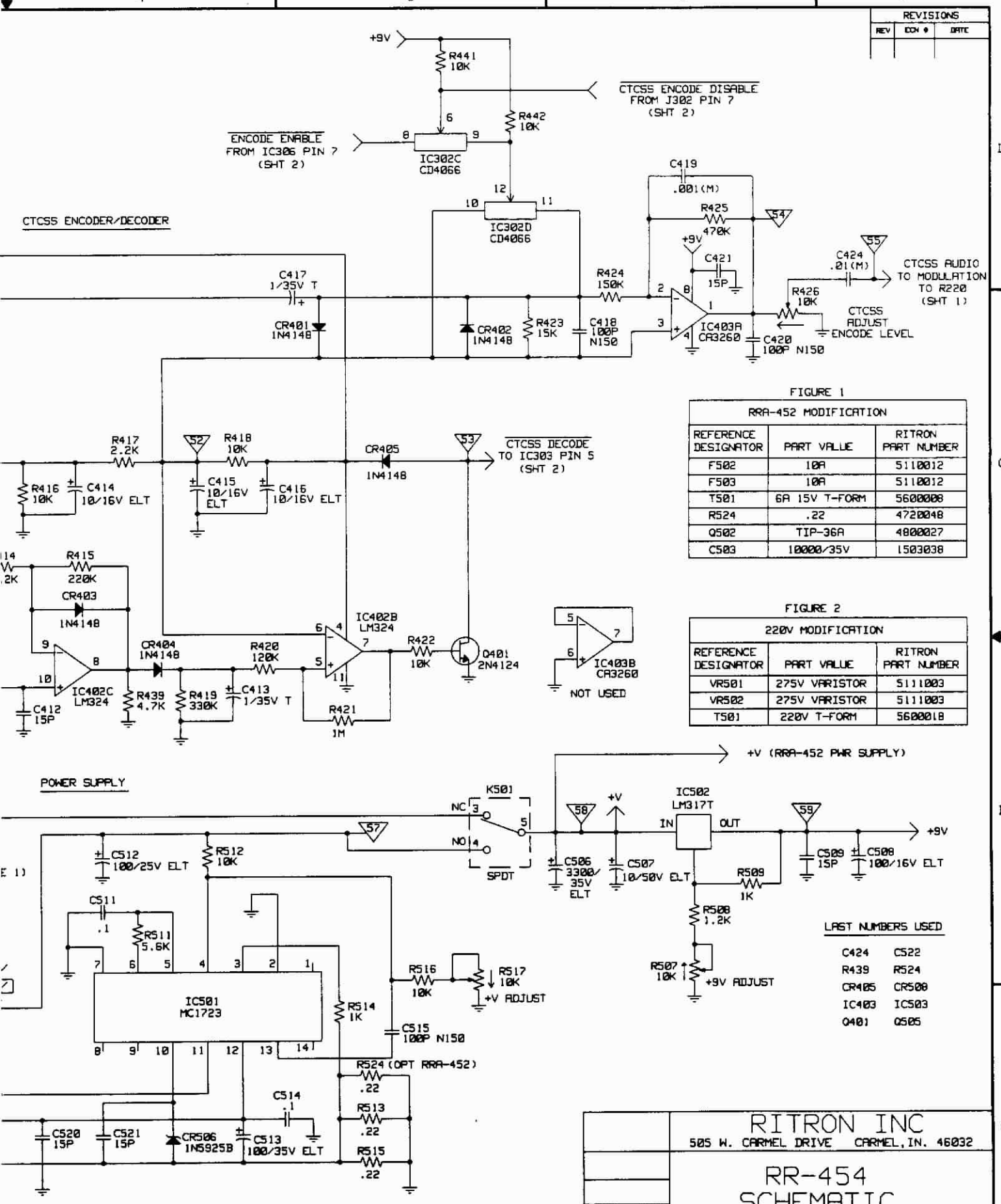
C334 47P
C335 18P
C316 18P
IC306C LM324
R331 15K
R362 56K
R363 150K
R364 150K
C340 47P
C341 18P
C342 1/50V ELT
IC306A LM324
TO C330 (SHT 3)
C313 .015(M)
C314 .015(M)
C315 .015(M)
C337 .015(M)
C338 .015(M)
C339 18P
C336 .015(M)
R326 34.7K 1%
R350 3.3K
R327 1.5K
R365 34.7K 1%
R366 3.9K
R328 4.7K
R339 47K
R348 10K
R347 100K
IC303B MC4001
**** R335 100K
**** Q301 MPS-A64
R336 10K
Q305 2N4124
EXT DECODE P304 PIN 3
CTCSS DETECT FROM Q401(SHT 3)
CARRIER SQ FROM Q107(SHT 1)
**** R320 100K
**** IF RWR-10 WITH MONITOR OPTION USED
Q302 2N4124
Q303 2N6726
+V TX
CR313 1N4148
R352 10K
TX SHUTDOWN
CR314 1N4148
C322 /16V T
C323 .01
IC303D MC4001
R349 1K
Q304 2N4124
C324 15P
R351 390
CR315 RED
TX
CR312 1N4148
C325 2.2/16V T
TO IC302 PIN 8 (SHT 3)
P304 RDQC-2 CONNECTOR
TO J302 PIN 7
TO R222(SHT 1)
TO IC303 PIN 5
NC
GND
FROM IC301 PIN 14
RX AUDIO
ENCODE ENABLE
TX DQC
EXT DECODE
+9V
LAST NUMBERS USED
C344
R367
CR315
Q307
NUMBERS MISSING
CR301
RITRON INC
505 W. CARMEL DRIVE CARMEL, IN. 46032
RR-454
SCHEMATIC
DRAWN BY C.KRESSEL
DATE 12/18/92
SIZE D
FSCM NO.
FILE:8011C2SC
DWG NO. 1720011C
REV C
PLOT 02/01/93
SHEET 2 OF 3


* IF RW4WA USED
*** IF RBB-MOD USED
J302 ACCESSORY
TX KEY
ACC TX AUDIO
TONE SQ ENABLE
CTCSS ENCODE DISABLE
+V
REPEAT DISABLE
GND
ACC RX AUDIO
R367* 10K
TO IC303 PIN 6
R354*** 0
CR309 1N4148
TO IC302 PIN 6 (SHT 3)
TEST MIC FROM C332 (SHT 3)
C301 .0022(M)
R301 15K
C302 68P
C303 .1
R302 27K
R303 150K
R308 15K
R307 15K
R305 100K
IC301A LM324
R304 4.7K
REPEAT AUDIO ADJUST
R306 10K
R309 47K
IC302B CD4066
C307 .1
TX AUDIO TO MODULATION LIMITER/FILTER TO C247 (SHT 1)
R310 4.7K
R311 4.7K
C308 100/16V ELT
C312 4.7/20V T
R323 10K
RX AUDIO LEVEL
R324 47K
C309 15P
R325 220K
C310 100P
C311 15P
TO C401 (SHT 3)
RX AUDIO P304 PIN 8
R312 68K
R313 100K
R314 4.7K
C304 100P N150
IC301C LM324
C305 .1
IC301B LM324
R317 220K
C306 100P COG
R316 220
R318 4.7K
P303 (RWR-10) REMOTE
REMOTE TX AUDIO
GND
+V
MONITOR
REMOTE KEY
REMOTE RX AUDIO
CR302 1N4148
PJ301
HIGH-PASS
R315 100K
ACC RX AUDIO SELECT
FLAT
R322 680 1/2W
CR303 RED PWR
C320 .01
R333 10K
TX TIMEOUT/TIMER
CR311 1N4148
R343
3 MIN
IC304 CD4060
C319 47P
C318 .022(M)
R342 330K
R341 1M
TIME OUT ADJUST
R340 100K
HANG TIME ADJUST
R346 1.5K
R338 1M
CR308 1N4148
PJ302
HANG TIME BYPASS SELECT
1/2 VCC
C321 15P
CR304 1N4148
CR307 1N4148
R332 47K
TEST MIC KEY FROM Q307 (SHT 3)
IC303A MC4001
C317 .01
IC303C MC4001
CR306 1N4148
CR310 1N4148


J306
MIC AUDIO IN
C333
.1
R359
270K
+9V
Q306
2N4126
R358
10K
R360
100K
Q307
2N4124
R361
10K
TEST MIC KEY
TO IC303 PIN 1
(SHT 2)
TEST
SPKR/MIC
J305
RING
TIP
R357
27K
C332
.0022(M)
TEST MIC
TX AUDIO
TO IC301
PIN 2
(SHT 2)
+9V
C343
15P
C326
100/16V ELT
R356
5.6K
C330
1/35V T
FROM
IC306
PIN 1
(SHT 2)
IC305
LM386
R353
10K
TEST
AUDIO
C344
15P
C331
.1
P306
C329
100/16V ELT
R355
4.7
C328
.1
R431
75K
R433
75K
R430
75K
R432
150K
R434
150K
R427
150K
R429
150K
R428
150K
Y401
1MHZ
C422
33P
R435
5.6K
R436
10M
C423
33P
+9V
SW401
CTCSS FREQ
SET
IC401
COM SPEC
C400
1 T
C410
1 T
C409
1 T
C411
1 T
R412
470K
R413
100K
C403
.0033(M)
C404
.0033(M)
IC402A
LM324
C406
.22/35V T
R406
22K
IC402D
LM324
C407
220P
N150
R407
2.7M
FROM IC301
PIN 14
(SHT 2)
C401
.01(M)
R401
1M
R402
470K
R403
560K
R404
330K
C405
270P N750
R437
4.7K
R438
4.7K
R408
150K
R410
100K
R411
470K
R409
15K
C402
.0033(M)
R405
1M
EXT BATTERY
P503
F502
R505
0
L501
75UH
(OPT)
CR507
1N5355
EXTERNAL
12VDC BATTERY
+12V
GND
J504
J503
3 AMP
(SEE FIGURE 1)
R506
47 1W
IC503
LM317T
CR504
1N4001
IN
OUT
C505
100/25V
ELT
R504
680
C510
.1
F501
3 AMP
+V TX
R502
100K
Q501
2N4124
C516
15P
C501
.1 100V
R503
10K
R519
470
CHARGING VOLTAGE
*(SEE FIGURE 1 & 2)
LINE
T501*
AC
J502
VR501
**
105/135 VAC
60HZ
CR501
MR751
F503
3 AMP
(SEE FIGURE 1)
R501
150
1W
GND
VR502
**
CR502
MR751
C503
4700/35V
ELT
CR503
1N4001
K501
C504
15P
CR505
1N6282
P501
NEUTRAL
**(SEE FIGURE 2)
P502
C502
.1 100V
CR508
1N4001
C522
2.2/50V
ELT
R521
27K
R520
100K
Q504
MPS-A01A


REVISIONS
REV
ECN #
DATE
CTCSS ENCODER/DECODER
+9V
R441 10K
R442 10K
CTCSS ENCODE DISABLE FROM J302 PIN 7 (SHT 2)
ENCODE ENABLE FROM IC306 PIN 7 (SHT 2)
IC302C CD4066
IC302D CD4066
C419 .001(M)
R425 470K
C421 15P
C424 .01(M)
CTCSS AUDIO TO MODULATION TO R220 (SHT 1)
R426 10K
CTCSS ADJUST ENCODE LEVEL
C417 1/35V T
CR401 1N4148
CR402 1N4148
R423 15K
C418 100P N150
R424 150K
IC403A CA3260
C420 100P N150
R417 2.2K
R418 10K
CR405 1N4148
CTCSS DECODE TO IC303 PIN 5 (SHT 2)
R416 10K
C414 10/16V ELT
C415 10/16V ELT
C416 10/16V ELT
R415 220K
CR403 1N4148
IC402B LM324
CR404 1N4148
R420 120K
R422 10K
Q401 2N4124
IC402C LM324
R439 4.7K
R419 330K
C413 1/35V T
R421 1M
C412 15P
IC403B CA3260
NOT USED
FIGURE 1
RRA-452 MODIFICATION
REFERENCE DESIGNATOR | PART VALUE | RITRON PART NUMBER
F502 | 10A | 5110012
F503 | 10A | 5110012
T501 | 6A 15V T-FORM | 5600008
R524 | .22 | 4720048
Q502 | TIP-36A | 4800027
C503 | 10000/35V | 1503038
FIGURE 2
220V MODIFICATION
REFERENCE DESIGNATOR | PART VALUE | RITRON PART NUMBER
VR501 | 275V VARISTOR | 5111003
VR502 | 275V VARISTOR | 5111003
T501 | 220V T-FORM | 5600018
POWER SUPPLY
+V (RRA-452 PWR SUPPLY)
K501
NC
NO
SPDT
IC502 LM317T
IN
OUT
+9V
C512 100/25V ELT
R512 10K
C506 3300/35V ELT
C507 10/50V ELT
R509 1K
R508 1.2K
R507 10K
+9V ADJUST
C509 15P
C508 100/16V ELT
C511 .1
R511 5.6K
IC501 MC1723
R516 10K
R517 10K
+V ADJUST
R514 1K
C515 100P N150
R524 (OPT RRA-452) .22
R513 .22
R515 .22
C514 .1
C520 15P
C521 15P
CR506 1N5925B
C513 100/35V ELT
LAST NUMBERS USED
C424 C522
R439 R524
CR405 CR508
IC403 IC503
Q401 Q505
RITRON INC
505 W. CARMEL DRIVE CARMEL, IN. 46032
RR-454 SCHEMATIC
DRAWN BY C.KRESSEL
DATE 12/18/92
SIZE D
FSCM NO.
DWG NO. 1720011C
REV C
FILE:0011C3SC
PLOT 12/18/92
SHEET 3 OF 3

PC BOARD	1720010C
SCHEMATIC	1720011C
TOPSIDE PARTS PLACEMENT W/REF.DES.	1720012C
TOPSIDE PARTS PLACEMENT W/VALUES	1720013C

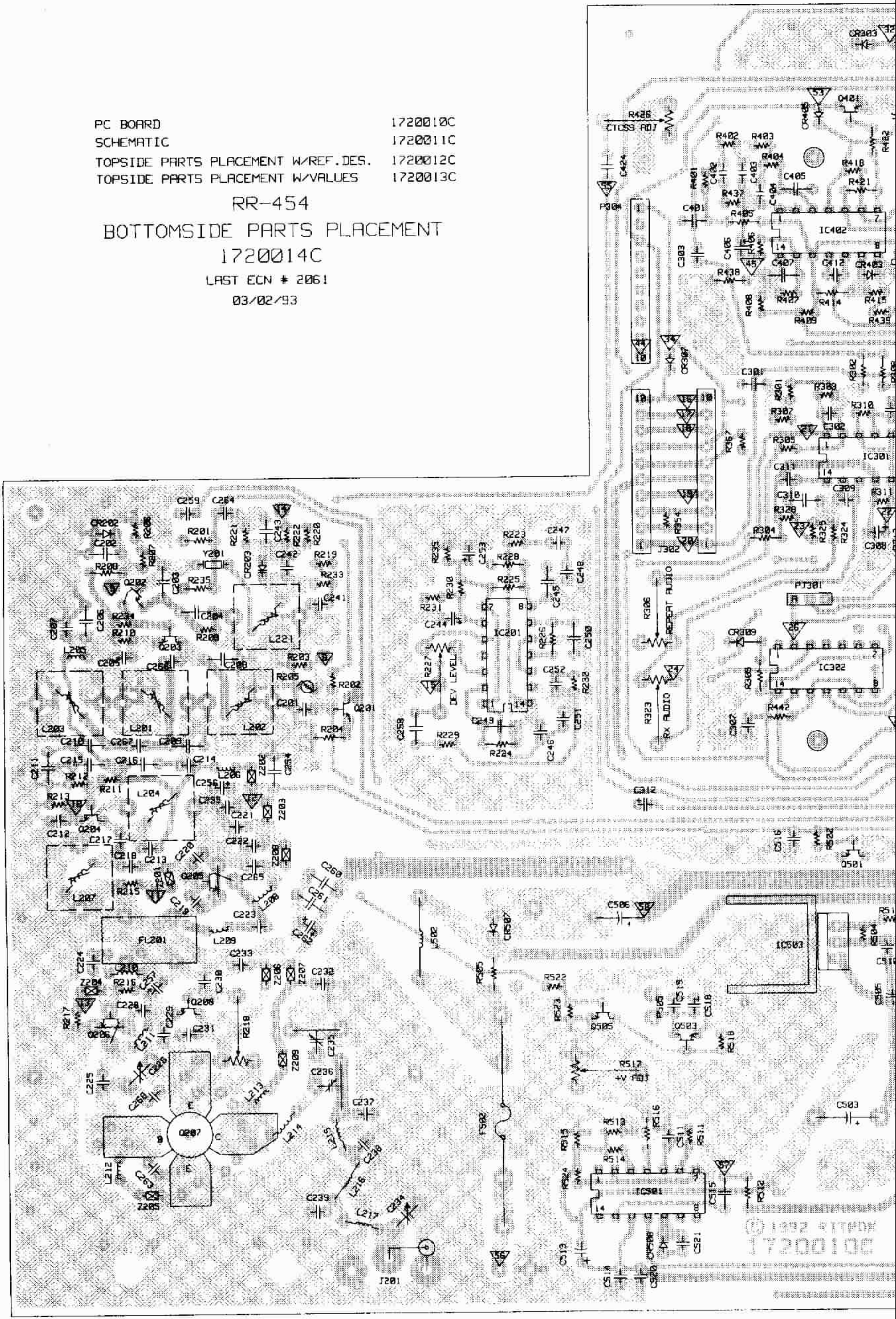
RR-454

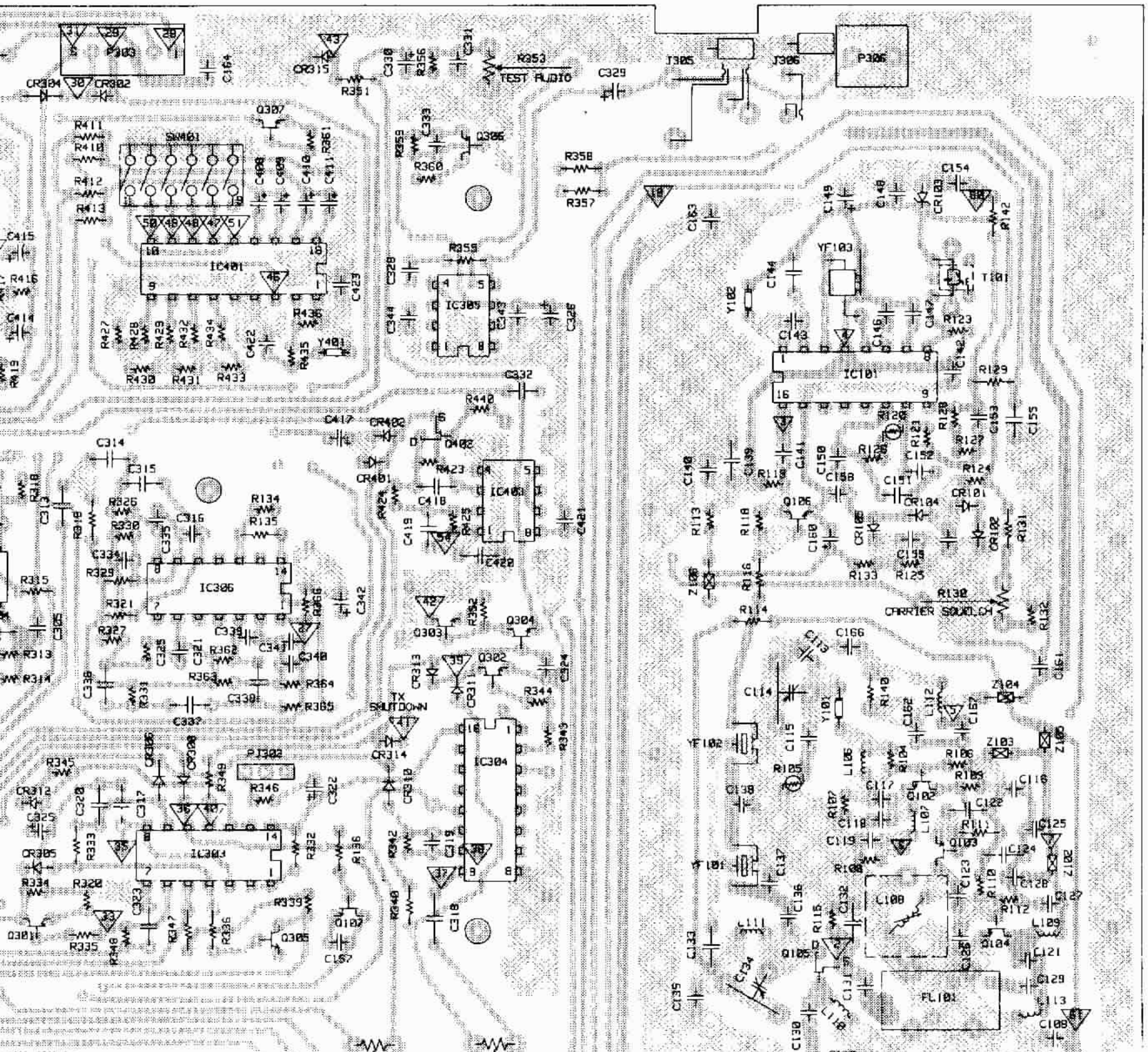
BOTTOMSIDE PARTS PLACEMENT

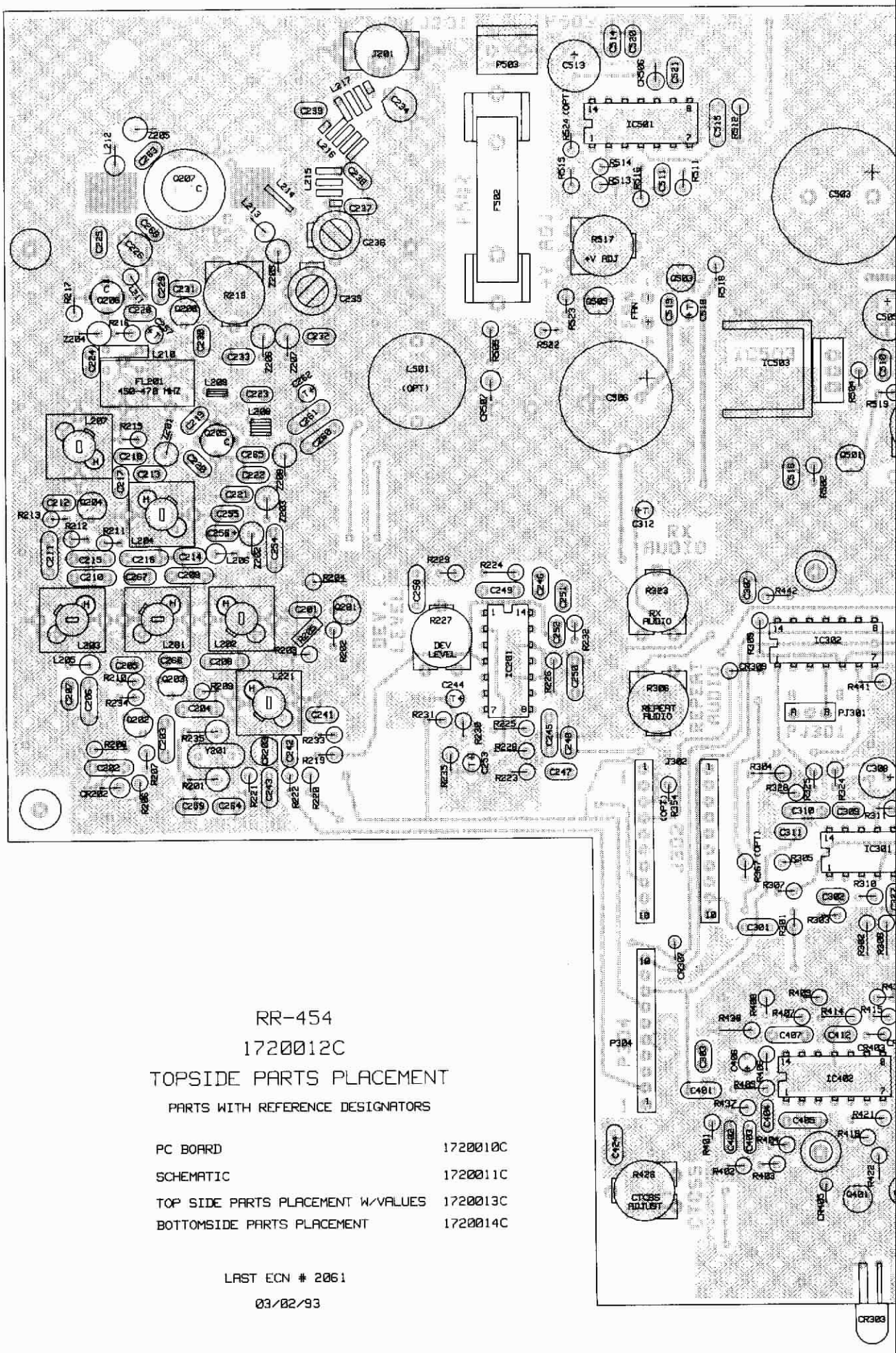
1720014C

LAST ECN # 2061

03/02/93




TEST AUDIO
CARRIER SQUELCH
TX SHUTDOWN
HANG TIME
TIME OUT
CHARGING VOLTAGE
+12V
GND
IC101
IC303
IC304
IC306
IC309
IC401
IC403
IC502
SW401
K501
FL101
P303
P306
P502
J101
J305
J306
F503



RR-454

1720012C

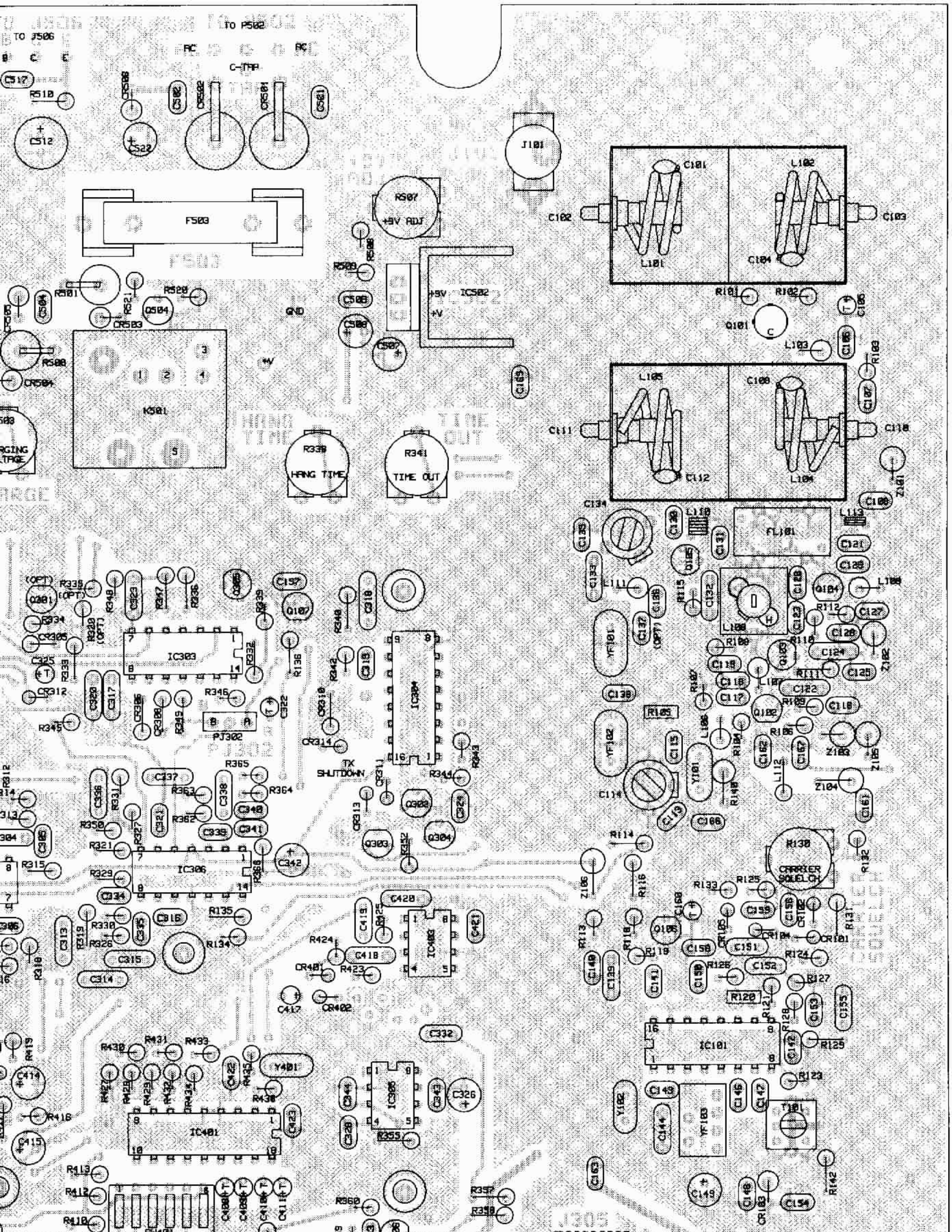
TOPSIDE PARTS PLACEMENT

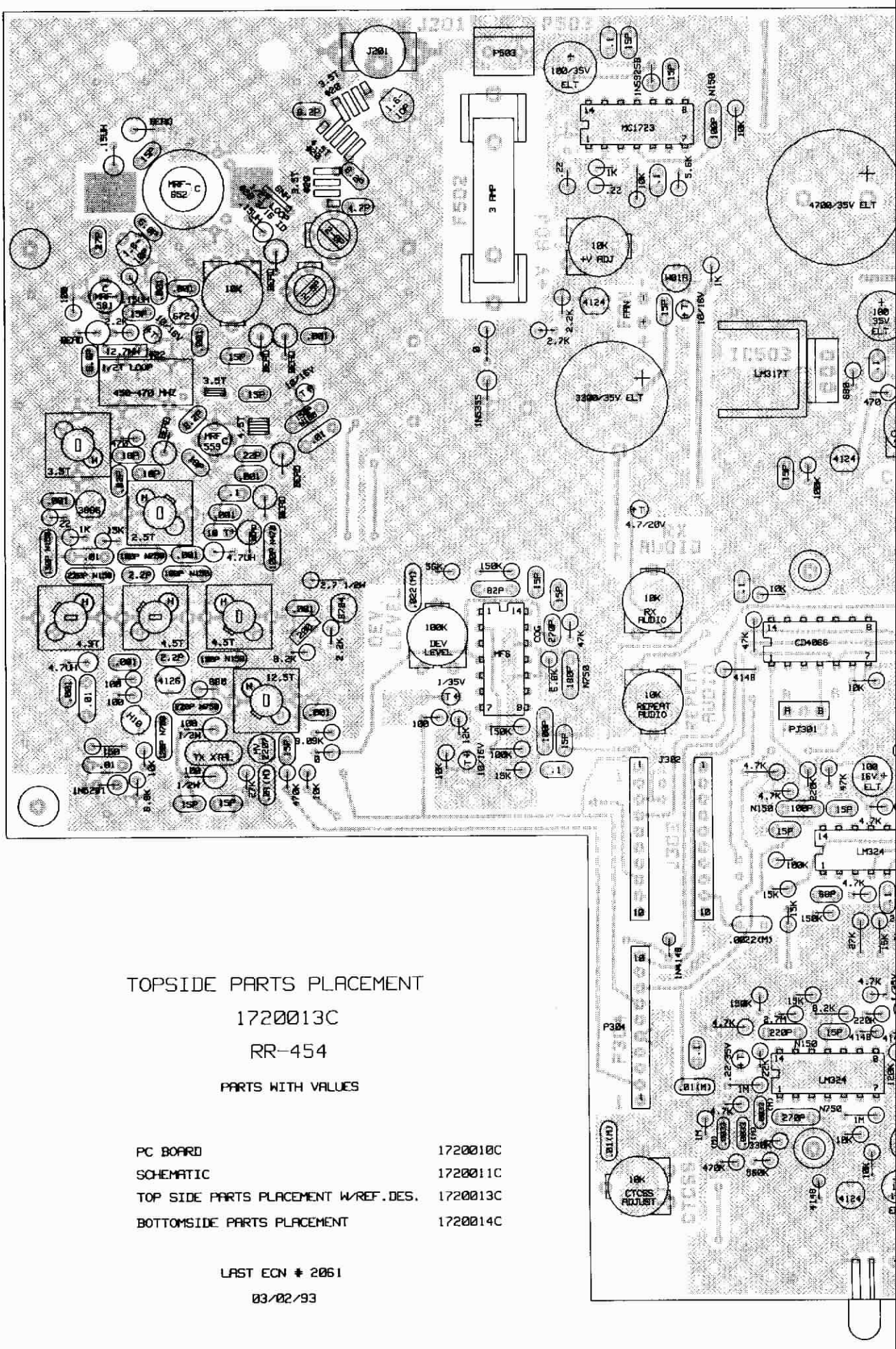
PARTS WITH REFERENCE DESIGNATORS

PC BOARD	1720010C
SCHEMATIC	1720011C
TOP SIDE PARTS PLACEMENT W/VALUES	1720013C
BOTTOMSIDE PARTS PLACEMENT	1720014C

LAST ECN # 2061

03/02/93


TO J506
TO P502
C-TAP
F503
+5V ADJ
IC502
GND
K501
HANG TIME
TIME OUT
J101
C101
L102
C102
C103
L101
C104
Q101
L105
C108
C111
C112
L104
C110
FL101
IC303
IC304
PJ302
TX SHUTDOWN
IC306
IC403
IC101
CARRIER SQUELCH
Y401
IC305
IC401
SW401
YF103
T101
J305
J306
P306
P303
TEST AUDIO
CR315



TOPSIDE PARTS PLACEMENT

1720013C

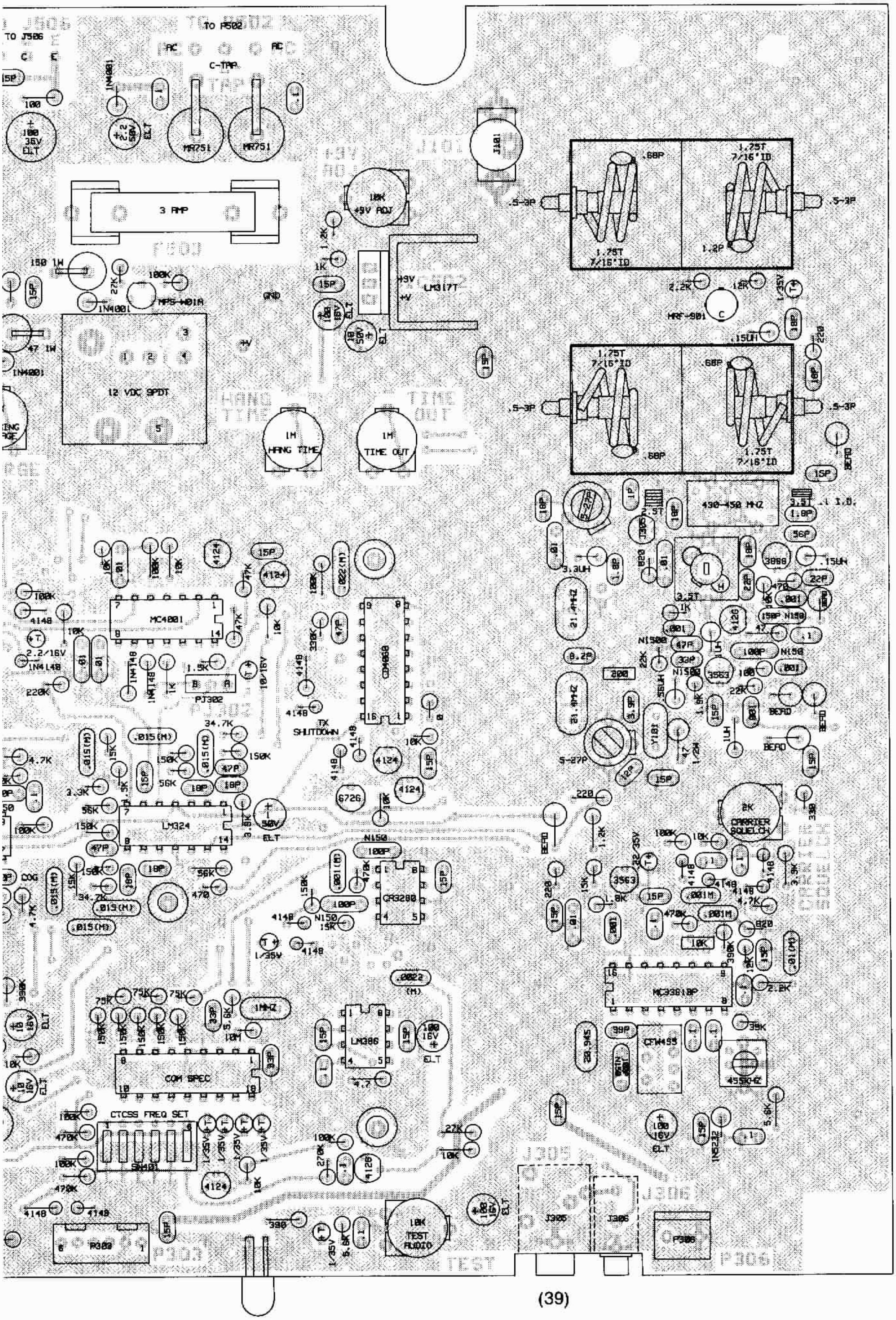
RR-454

PARTS WITH VALUES

PC BOARD	1720010C
SCHEMATIC	1720011C
TOP SIDE PARTS PLACEMENT W/REF.DES.	1720013C
BOTTOMSIDE PARTS PLACEMENT	1720014C

LAST ECN # 2061

03/02/93



TO J506
TO P502
C-TAP
MR751
MR751
3 AMP
10K +9V ADJ
LM317T
12 VDC SPDT
1M HANG TIME
1M TIME OUT
1.75T 7/16"ID
MRF-901
430-450 MHZ
MC4001
CD4060
TX SHUTDOWN
PJ302
LM324
21.4MHZ
2K CARRIER SQUELCH
CA3280
MC3361BP
CFW455
455KHZ
LM386
COM SPEC
CTCSS FREQ SET
SW401
10K TEST AUDIO
J305
J306
P306
P303