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 **Regency** COMMUNICATIONS, INC.®



SERVICE MANUAL

UHF TRANSCEIVER

MODELS ARU9PL TRU 152A ←

ARU9PL TRU 152B

S/N 306-A05754

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SECTION 1 - DESCRIPTION

1-1 DESCRIPTION

The TRU152 is a 2-channel, crystal-controlled UHF FM mobile transceiver available in two models, the TRU152A and TRU152B. The TRU152A covers the 450 to 482 MHz band and the TRU152B covers the 482 to 512 MHz band.

Factory radios are pre-tuned, tested and are shipped with crystals for the following frequencies (CH 1 only):

TRU152A - RX: 460.5 MHz, TX: 465.5 MHz
TRU152B - RX: 491.5 MHz, TX: 494.5 MHz

This enables radio checkout before installation and alignment using customer's crystals.

1-2 System Considerations

1-2-1 CTCSS Operation

To increase the versatility of the TRU152, the MA-165 (or MA-164) option may be installed. This will allow operation in a system using Continuous Tone Controlled Squelch System (CTCSS).

1-2-2 CTSTRU152 Base Station Operation

The TRU152 may be used as a base station by powering from the P1405CB power supply. The MA-316 desk top microphone is recommended in this configuration particularly when the CTCSS tone option is employed. Rubber feet are attached to the underside of the radio and two side plugs cover the mobile mounting bracket holes. A complete parts list is included in Section 3-8.

Base station specifications, operation and alignment are identical to the basic TRU152.

1-2-3 Accessories

- *MA- 35 Quick Mount Thumb Bolts
- MA- 48 5W Horn Speaker
- MA- 79 Telephone Handset
- *MA- 84 DC Power Cord
- MA- 87 DC Power Cord w/Cigarette Adaptor
- MA-108A External Speaker, 3.2 ohm
- MA-126 Telephone Handset w/hookswitch
- MA-164 CTCSS (Continuous Tone Controlled Squelch System)
- MA-165 CTCSS Less Message
- *MA-310 Hand-Held Mic
- MA-311 Mounting Bracket
- MA-316 Split Bar Desk Mic
- MA-322 DC Power Cord for P1412
- P1412 12A DC Power Supply

*These accessories are supplied with the TRU152

NOTE: It is important to use the TRU152 with crystal specified as in paragraph 1-4 in order to meet equipment performance specifications.

1-3 SPECIFICATIONS

GENERAL

FREQUENCY RANGE.....	450-482 MHz Band "A"
.....	482-512 MHz Band "B"
CHANNELS.....	2
OPERATING TEMPERATURE RANGE.....	-30°C to +60°C
SIZE (inches).....	6 1/2 W x 2 3/8 H x 10 3/4 D
WEIGHT (including mic).....	4 lbs. 2 ozs.
PRIMARY POWER INPUT @ 13.8 VDC	
TRANSMIT.....	4 Amps*
RECEIVE.....	600 mA*
RECEIVE (SQUELCHED).....	150 mA*
ANTENNA IMPEDANCE.....	50 ohm
CHANNEL SPACING.....	25 KHz

TRANSMITTER

R.F. POWER OUTPUT (min. @ 13.8 VDC).....	15W
SPURIOUS AND HARMONIC SUPPRESSION (min)....	55dB
FREQUENCY STABILITY (-30°C to +60°C).....	+0.005%*
MAX FREQUENCY SPREAD.....	6 MHz
AUDIO FREQUENCY DISTORTION (max).....	10%
MODULATION DEVIATION - ADJUSTMENT RANGE....	0 to +7 KHz
FCC EMISSIONS DESIGNATOR.....	16F3
FCC TRANSMITTER TYPE ACCEPTANCE.....	Parts 2, 21, 90
TX HUM & NOISE	60dB

RECEIVER

SENSITIVITY	
(12dB SINAD).....	.35µV (max)
(20dB QUIETING).....	.5µV (max)
SQUELCH.....	.25µV
SELECTIVITY ADJACENT CHANNEL (EIA SINAD)...	-75dB (min)
INTERMODULATION REJECTION (EIA SINAD).....	-60dB (min)
IMAGE AND SPURIOUS RESPONSE (EIA SINAD)....	-60dB (min)
AUDIO OUTPUT @ 10% DISTORTION.....	5W
FREQUENCY STABILITY (-30°C to +60°C).....	+0.001%*
MAXIMUM FREQUENCY SPREAD.....	6 MHz
MODULATION ACCEPTANCE BANDWIDTH.....	+7.5 KHz
FCC CERTIFICATION.....	Part 15, Subpart C
RX ULT. St N/N	60dB

*Below 0°C ambient temperature, allow one minute warm-up time, and add extra 160 mA for crystal heater current drain.

1-4 CRYSTAL SPECIFICATIONS

Transmit Crystal (Y501, Y502)

A. Regency Part Number:	2328-0000-000
B. Regency Drawing Number:	302-539
C. Type:	Miniature plug-in HC25/U
D. Mode:	Fundamental
E. Max. Equivalent Series Resistance:	25 ohms
F. Load Capacity:	32pF
G. Drive Level:	2mW
H. Make Tolerance (25°C):	+ .0015%
I. Temp Tolerance (0°C to +60°C):	+ .0005% (Ref 25°C)
J. Crystal Frequency:	(TX Frequency)/36
K. Crystal Holder Capacitance, Co	5.5pF <u>+10%</u>

Receive Crystal (Y201, Y202)

A. Regency Part Number:	2329-0000-000
B. Regency Drawing Number:	302-540
C. Type:	Miniature plug-in HC25/U
D. Mode:	Third Overtone
E. Max. Equivalent Series Resistance:	35 ohms
F. Load Capacity:	32pF
G. Drive Level:	2mW
H. Make Tolerance (25°C):	.001%
I. Temp Tolerance (0°C to +60°C):	.001% (Ref 25°C)
J. Crystal Frequency:	(RX Frequency - 10.7 MHz)/9
K. Crystal Holder Capacitance, Co	5.5pF <u>+10%</u>

1-5 EQUIPMENT SUPPLIED

1. TRU152 Radio
2. MA-310 Hand Microphone
3. Hardware Kit TRU152
4. Mobile Mounting Bracket (MA-334)
5. Two (2) Black Anti-Rotation Washers
6. Two (2) Steel Washers
7. Two (2) Mounting Stub-Knobs (MA-35)
8. DC Power Cord w/5A Fuse (MA-84)
9. One (1) RX Tune-up Crystal: 460.5 MHz - TRU152A (2300-5428-908)
491.5 MHz - TRU152B (2300-5428-909)
10. One (1) TX Tune-up Crystal: 465.5 MHz - TRU152A (2300-5428-918)
494.5 MHz - TRU152B (2300-5428-919)

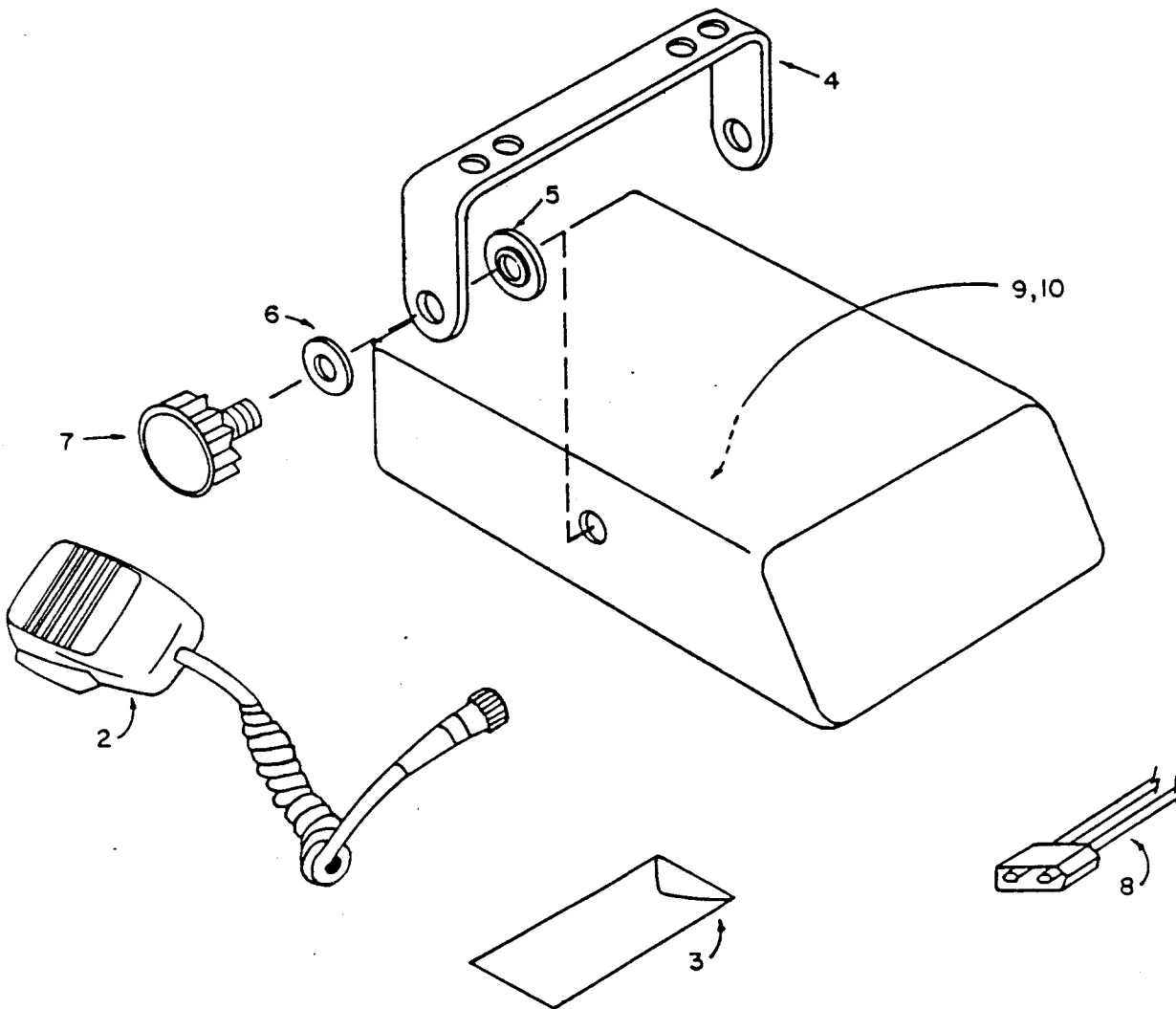


FIGURE 1 - EQUIPMENT SUPPLIED

1-6 EQUIPMENT NOT SUPPLIED

1. Antenna
2. Antenna Feed Cable
3. 13.8V Supply

1-7 OPERATION (Refer to Figure 2 in the following descriptions)

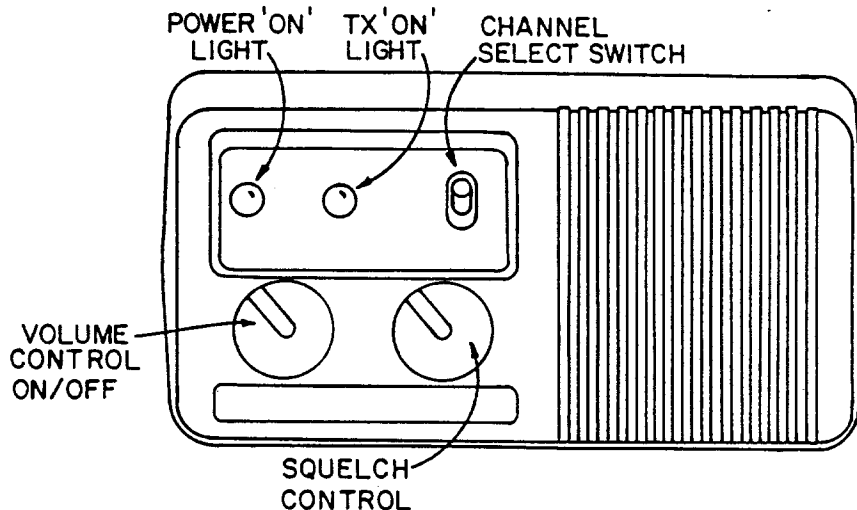


FIGURE 2

On/Off Volume

This control varies the audio output level for the internal speaker. It also varies the level of audio present at the external speaker connection. Clockwise rotation of this control turns the receiver on and increases the volume.

Squelch Control

This control eliminates background noise in the absence of a signal. Full clockwise rotation removes all squelch action. Turning this control counter-clockwise until the noise disappears permits the receiver to be "quiet" until an actual signal is received. Even if the squelch control is set fully counter-clockwise, the receiver will still operate properly and will not be locked-out or prevented from receiving a signal.

Channel Selector Switch

The TRU152 is capable of two-way communication on any one of two discrete frequencies or channels. Selection of the desired channel is accomplished by switching the selector switch to the desired channel position.

Indicator Lamps

The left LED (Light Emitting Diode) on the front panel functions as a pilot lamp indicating whether the unit is turned on or off. The right LED is a Transmit Indicator which glows red whenever the transmitter is keyed (activated).

Microphone

A high impedance ceramic microphone is supplied with the unit. To install the microphone on the radio set, insert the connector plug into its socket with the locating tab toward the top of the radio. The connector is then locked into place by rotating the locking ring $\frac{1}{4}$ turn clockwise.

To transmit a message, it is only necessary to turn the radio set on, press the push-to-talk button on the microphone and speak into the microphone. The Transmit Indicator Lamp will come on to signify that the transmitter is operating. Best results are obtained by holding the microphone about one inch from the lips, inclined at about a 30 degree angle away from the face. Speak clearly in a normal tone of voice across the face of the microphone.

SECTION 2 - SERVICE INFORMATION

2-1 INSTALLATION

WARNING: This unit is designed to operate in 13.8V negative ground systems ONLY.

The TRU152 may be physically oriented any way the customer requires for mounting. All hardware needed for vehicular mounting is included in the TRU152 hardware kit. Mount the microphone hang-up clip. This clip must be grounded if the CTCSS option (MA-164/MA-165) is used. Route the power cable supplied to the vehicle's battery terminals, avoiding proximity to possible noise sources (e.g. alternator, ignition wires, etc.). Remove any excess lengths and connect the RED lead to the positive (+) terminal and the BLACK lead to the negative (-) terminal.

Mount the UHF antenna and route the antenna feed cable to the radio. For best possible system operation this cable should be made as short as possible. This involves cutting the cable and re-installing the connector.

Finally, the antenna should be adjusted to obtain the best possible 50 ohm match at the frequency(s) of operation. This can only be performed by a qualified and fully equipped service technician.

2-2 ALIGNMENT

No alignment is necessary during radio installation. Alignment should only be performed by a qualified technician and is only necessary after new crystal installation.
Heater clip part numbers: Single Assembly - 2830-1420-701
Double Assembly - 2830-1420-702

2-2-1 Crystal Installation

The TRU may be set for one or two-channel operation. In one-channel operation the radio frequency is independent of the f1/f2 switch setting. Refer to Figure 4.

A. Two-channel operation

1. Insert the RX CH1 crystal into the Y201 sockets and the RX CH2 crystal into the Y202 sockets.
Insert the TX CH1 crystal into the Y501 sockets and the TX CH2 crystal into the Y502 sockets.
2. Then carefully ease a crystal heater clip over each of the crystal assemblies pushing downwards gently until a snug fit is observed.

UP TO AND INCLUDING REV. 'D' MAIN BOARD

REV. 'G' MAIN BOARD

3. Jumper JU501 must be in.

Cut jumper JU403.
Jumpers JU501 and
JU404 must be IN.

4. The radio is now ready for alignment.

B. Two-channel operation (with talk-around channel)

Where the receive frequencies are the same for both channels, only one receive crystal may be used if the following procedure is observed.

1. Insert RX crystal into the Y201 sockets, as usual, leaving Y202 sockets empty.
2. Insert the TX crystals in the Y501 and Y502 sockets, as usual.

UP TO AND INCLUDING REV. 'D' MAINBOARD

REV. 'G' MAIN BOARD

3. Short out CR201.

Cut jumper JU404 only.
Jumpers JU403 and
JU501 must be IN.

4. Snip out or remove R201.

Snip out or remove
CR202.

5. Carefully ease crystal heater clips over the crystal assemblies until a snug fit is observed.

C. One-channel operation

1. Insert the RX crystal into the Y201 sockets and the TX crystal into the Y501 socket.
2. Carefully ease crystal heater clips over the Y201 and Y501 assemblies, pushing downwards gently until a snug fit is observed.

UP TO AND INCLUDING REV. 'D' MAIN BOARD

REV. 'G' MAIN BOARD

3. Cut jumper JU501.

Cut jumper JU501 only.
JU403 and JU404 must
be IN.

4. The radio is now ready for alignment.

2-2-2 Transmitter Alignment

1. Test Set-Up (See Figure 3)

A. Equipment

1. TRU152 Transceiver
2. HP 410 DC VTVM
3. DC Power Supply with Ammeter, 13.8 VDC 10 Amps DC
4. VOM Simpson 260
5. AC VTVM
6. Audio Oscillator
7. Mic matching network (See Figure 3)
8. 500 MHz Thruline Wattmeter, 40dB Power Pad
and 25W Element
9. Spectrum Analyzer
10. Deviation Meter*
11. Frequency Counter*
12. Small blade and hex tuning tools and
Phillips screwdriver
13. Band Reject Filter
14. PTT Switch
15. Oscilloscope

*Can be replaced with Cushman or similar equipment.

2. Initial Conditions

- A. Insert crystals in appropriate sockets for CH1 and CH2 (See Figure 4) and carefully push the U-shaped heatsink over the crystal pair.
- B. Insert external power connector and set power supply (#3) to 13.8 VDC as indicated on VOM (#4).
- C. Insert external antenna connector and connect spectrum analyzer (#9) to pad (#8).
- D. Insert external PTT connector (#14).
- E. Insert mic matching network (#7).
- F. Preset variables as per Table I.

3. Tune-Up Procedure (The PTT switch must be keyed for all tests.)

A. Exciter Tuning

1. Monitor test point M5 with DC VTVM (#2) on 10V scale. Check that this voltage is $8.3 \pm 0.3V$. (NO MS ON "G" BOARD)
2. Monitor test point M6 with DC VTVM (#2) on 10V scale. Check that this voltage is $5.0 \pm 0.3V$ for both channels.
3. Monitor test point M7 with DC VTVM (#2) on 10V scale. Tune L501 for a peak reading and tune L502 for a minimum reading. This should be $4.5 \pm 1.0V$ on both channels.
4. Monitor test point M8 with DC VTVM (#2) on 10V scale. Check that this voltage is $7.0 \pm 1.0V$ on both channels. Re-tune L501 and L502, if necessary, for a minimum reading.
5. Monitor test point M9 with DC VTVM (#2) on 10V scale. Tune L504 and L505 alternately for a minimum reading of $7.0 \pm 1.0V$ on both channels.
6. Monitor test point M10 with DC VTVM (#2) on 50V scale. Tune L509 and L510 alternately for a minimum reading of $10.0 \pm 0.5V$ on both channels.

Note: For 2-channel operation, the test point voltages for each channel should be within 0.2V of each other. This applies to M8 through M10. A difference of voltage readings between channels at M6 or M7 is representative of crystal activity variations which may lead to modulation distortion.

B. P.A. Tuning

1. Monitor test point M11 with DC VTVM (#2) on 1V scale. Tune C303 and C546 for a minimum reading of $0.35 \pm 0.1V$ on both channels.
2. Monitor output wattmeter (#8) and tune C307, C314, and C317 for maximum power. This should be $17 \pm 2W$.

C. Frequency Adjustment

1. Connect the counter (#11) to the output of the pad (#8) and set C501 for the CH1 frequency ± 100 Hz. Set C502 for the CH2 frequency ± 100 Hz.

D. Deviation Adjustment

1. Connect the deviation meter (#10) to the pad (#8).
2. Set the audio generator (#6) for 1 KHz tone and 150mV AC as indicated on the AC VTVM (#5).
3. Adjust R562 for +4.5 KHz +200 Hz deviation as measured on the deviation meter (#10).
4. Check modulation sensitivity by reducing the audio generator output until the deviation is +3.0 KHz. Measure the audio generator input voltage on the AC VTVM. This level should be less than 20mVrms, typically 13mVrms.

4. Measurements

A. Harmonic Output Rejection Measurement

1. Connect the spectrum analyzer (#9) to the pad (#8) via the band reject filter (#13). Set the spectrum analyzer and the band reject filter for maximum carrier indication at the 0dB reference line.
2. Then adjust the band reject filter (#13) for a minimum carrier attenuation of 30dB. Check the second harmonic level and the crystal spurs ($f_0 + \approx 13$ MHz) on the spectrum analyzer. These levels should be greater than 55dB down.

B. Crystal Heater Measurement

1. Connect DC VTVM (#2) between junction of R542 and Q507 and Gnd (-). Then set DC VTVM to 50V scale.
2. DC VTVM (#2) should read 13.6 VDC. Cool thermistor R541 below 0°C. DC VTVM (#2) should read less than 1V and crystal heater resistor R542/R542 should begin to heat.
3. DC VTVM should read 13.6 VDC when R541 warms to above 0°C.

2-2-3 Receiver Alignment

1. Test Set-Up (See Figure 5)

A. Equipment

1. TRU152 Transceiver
2. Voltmeter - Simpson 260
3. DC Power Supply with mA 13.8 VDC 1A
4. Voltmeter - high input impedance
5. UHF FM Signal Generator HP8640B
6. AC Voltmeter (RMS)
7. Hex Tuning Tool
8. Small Blade Screwdriver
9. Small Blade Tuning Tool - non-metallic
10. Frequency Counter
11. Sub-Audible Tone Generator
12. Low Frequency Oscilloscope
13. 3.2 ohm Resistive Speaker Load
14. Sinadder or Distortion Meter with 1000 Hz band Eliminator Filter

2. Preset Conditions

- A. Set input DC volts at 13.8 VDC as measured on DC VOM (#2).
- B. Preset variable coils and helical can screws to position indicated in Table I. Tuning points are illustrated in Figure 6.
- C. Set sq. control (R104) fully clockwise.

3. Tune-Up Procedure

- A. Tune radio "ON" and set volume control to minimum volume on RX. Note that the power supply current drain is 150 \pm 20mA (with MA-165 option installed - 180 \pm 20mA).
- B. Turn volume control to middle position.
- C. Set UHF Signal Generator (#5) for 0dBm at 10.7000 MHz. Set tone generator (#11) to give an RF deviation of \pm 3 KHz at 1 KHz tone. Adjust L408 for maximum audio output on AC Voltmeter (#6).
- D. Set UHF generator (#5) output level to give approximately 12dB SINAD reading on Sinadder (#14).
- E. Tune L406 and L407 for best SINAD reading reducing generator output level as necessary to maintain approximately 12dB SINAD.
- F. Set UHF generator (#5) to CW at an output level for approximately 20dB quieting. Adjust L408 for 3.8 \pm 2.0 VDC at M12 on DC voltmeter (#4). NOTE: This reading will be extremely erratic and hard to set. Any drift after setting may be ignored.
- G. Plug the appropriate crystal in Y201 position and set freq. selector to CH1.
- H. Adjust L203 and L204 for minimum voltage at M2. This reading should be 6.5 \pm 0.5 VDC.
- I. Adjust L206, 207, and 208 for minimum voltage at M3. This reading should be 7.5 \pm 0.3 VDC.
- J. Connect UHF generator to radio antenna connector and set frequency to the channel frequency desired.
- K. Set generator level for 12dB SINAD output.
- L. Adjust L201 for 3.8V \pm 0.2V at M12. (REC. FREQ. ADJ.)
- M. Finally, adjust L401 through L405 for the best SINAD reading, reducing the generator output as necessary to maintain 12dB SINAD in Sinadder (#14).
- N. For two-channel operation, plug the second crystal into Y202 position; set the channel selector switch to CH2.
- O. Repeat Steps H through M. Note that for close channel spacing, i.e. 2 MHz, the settings should be identical between CH1 and CH2, whereas for wide channel spacing, i.e. 6 MHz, adjust the variables to get the lowest identical reading for both channels.

FIGURE 3 - INTERCONNECTION DIAGRAM - TRU152 TRANSMITTER TUNE-UP

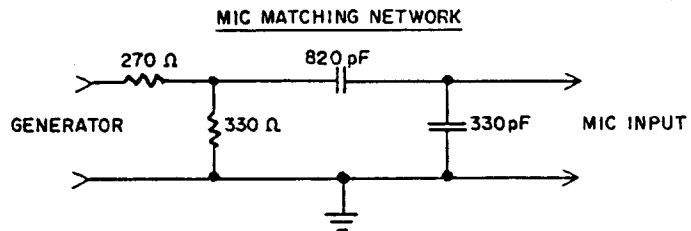
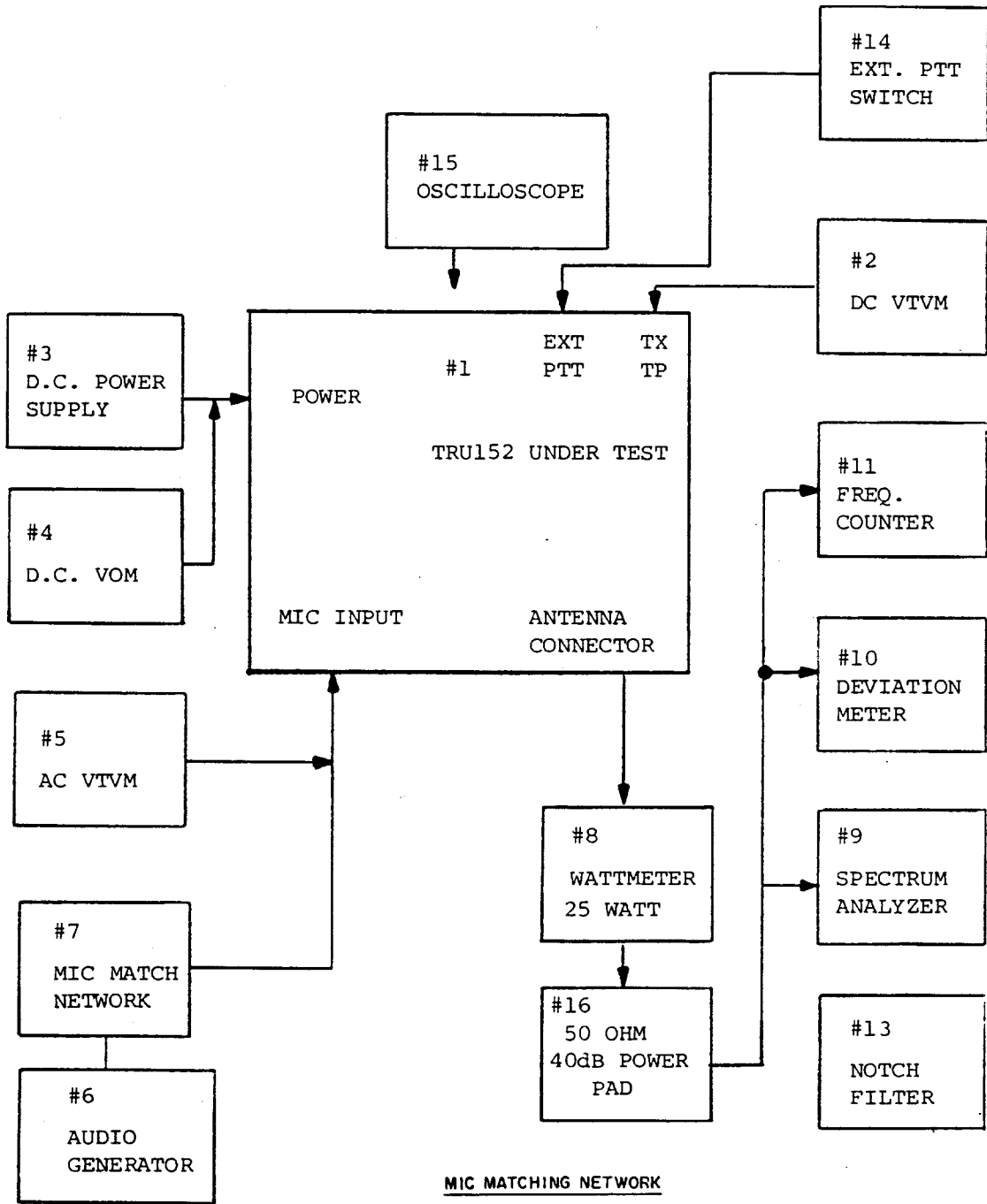


FIG. 4 TX TEST POINTS-TRU 152, REV 'G' MAIN BOARD.

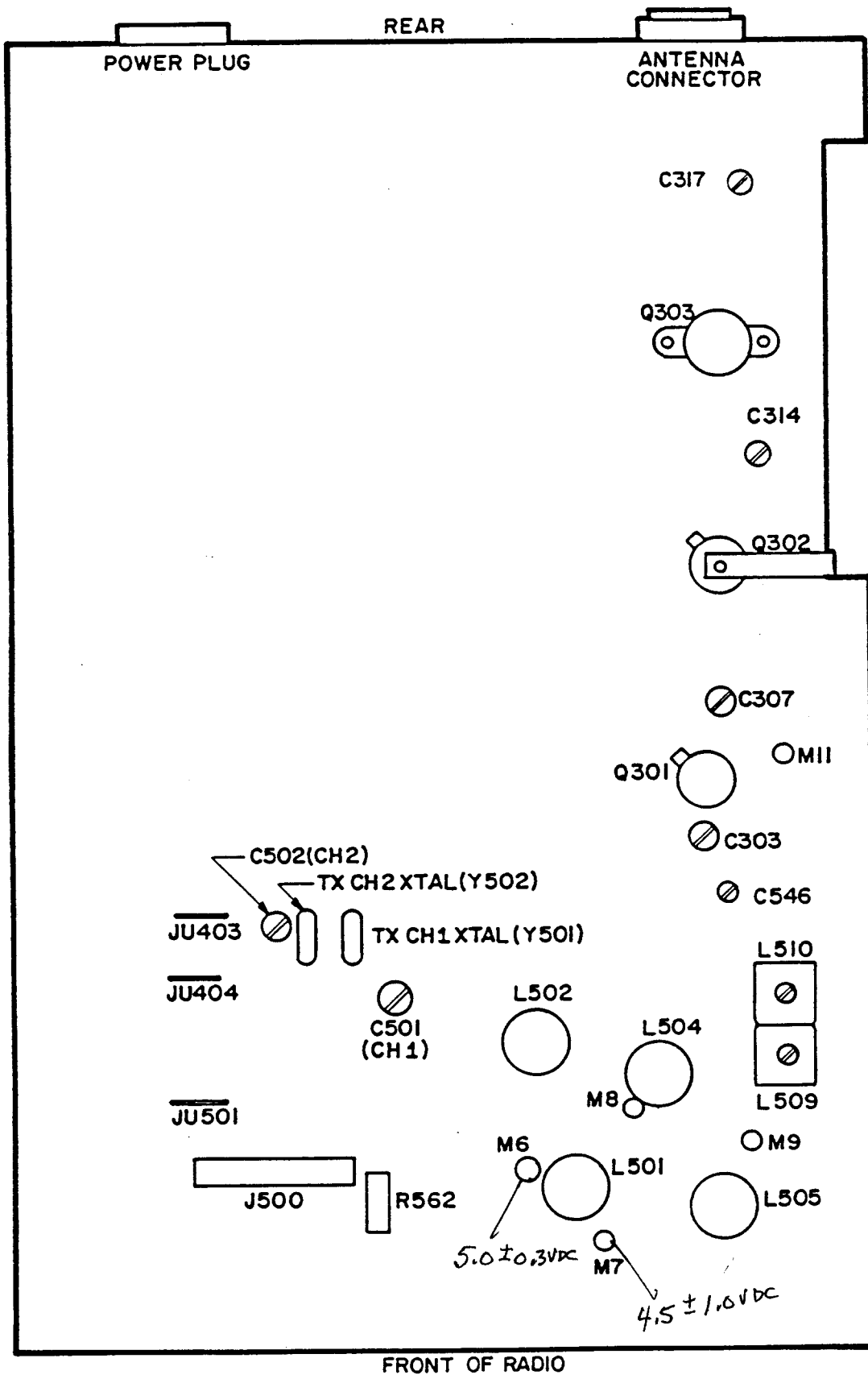


FIG. 4 TX TEST POINTS - TRU152, UP TO AND INCLUDING REV. 'D' MAIN BOARD

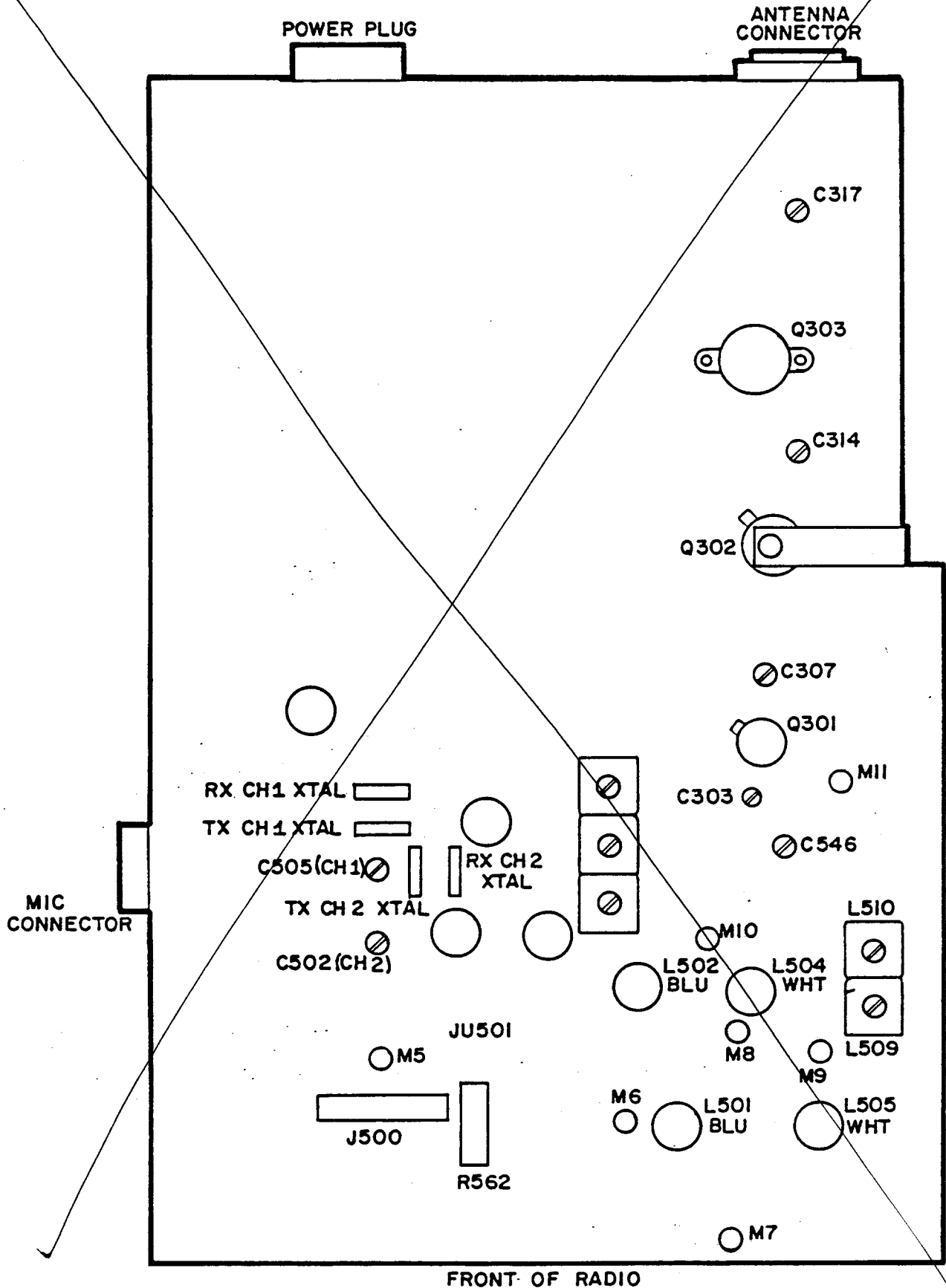


FIGURE 5 - TEST EQUIPMENT INTERCONNECTION DIAGRAM
 TRU152 RECEIVER ALIGNMENT

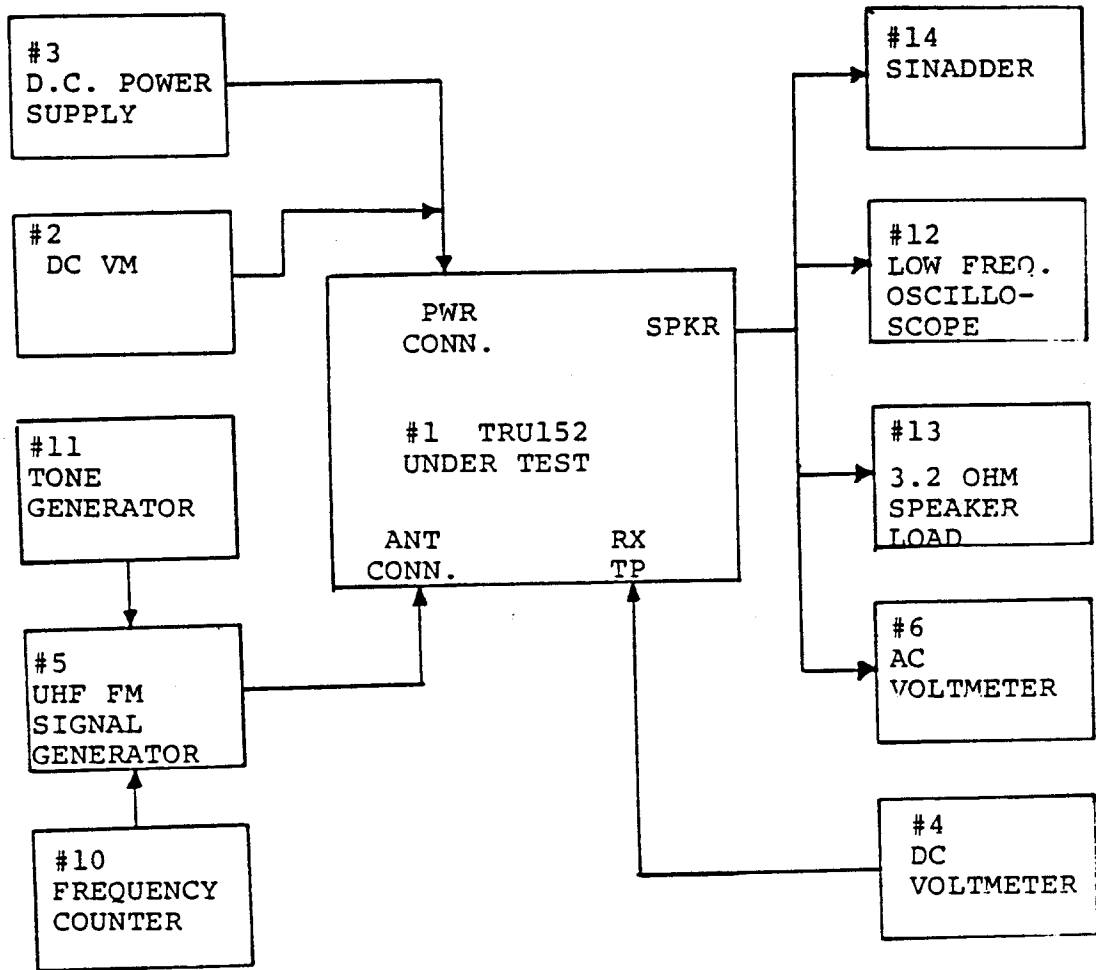


FIG. 6 RX TEST POINTS -TRU 152, REV 'G' MAIN BOARD

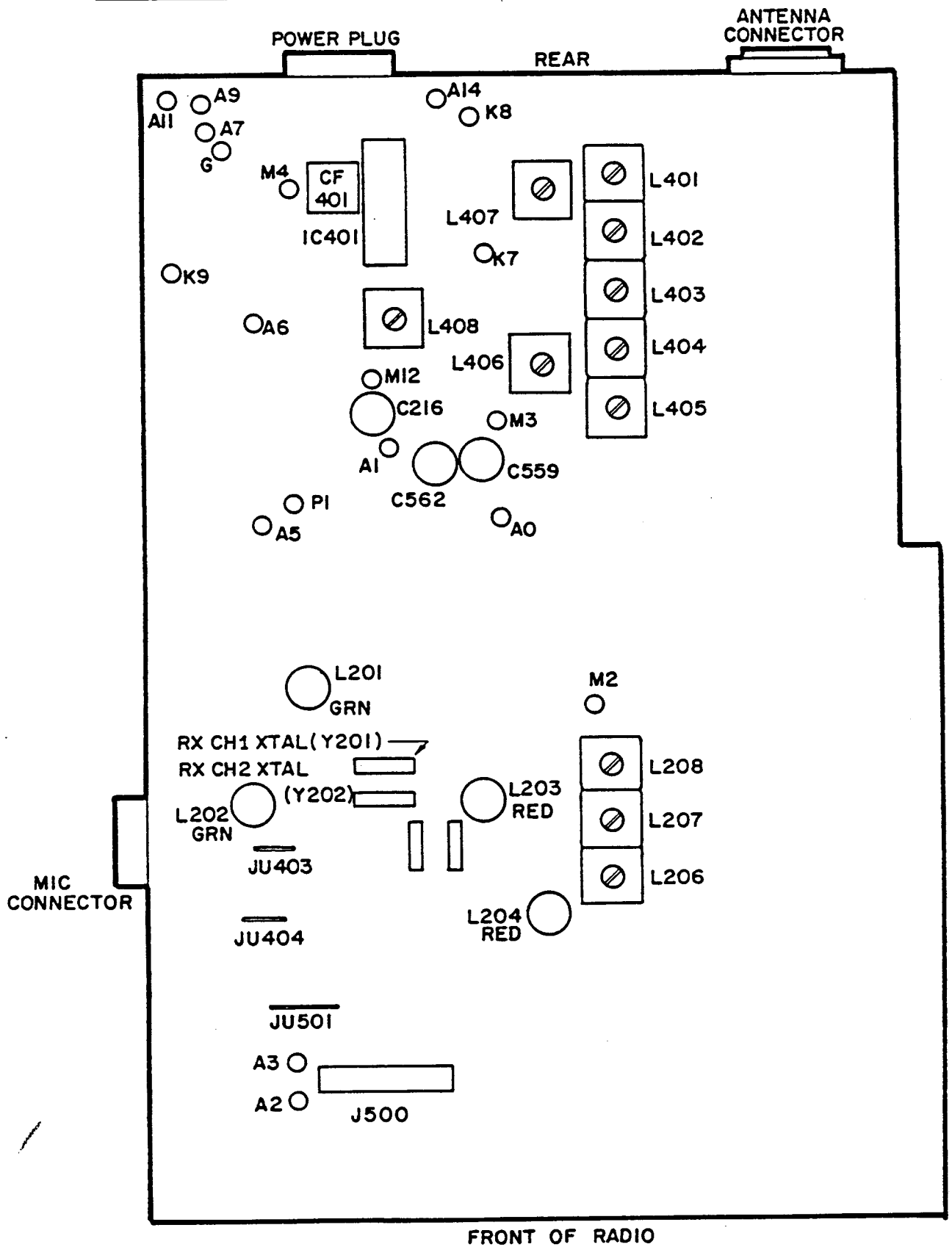


FIG. 6 RX TESTS POINTS-TRU 152, UP TO AND INCLUDING REV 'D' MAIN BOARD

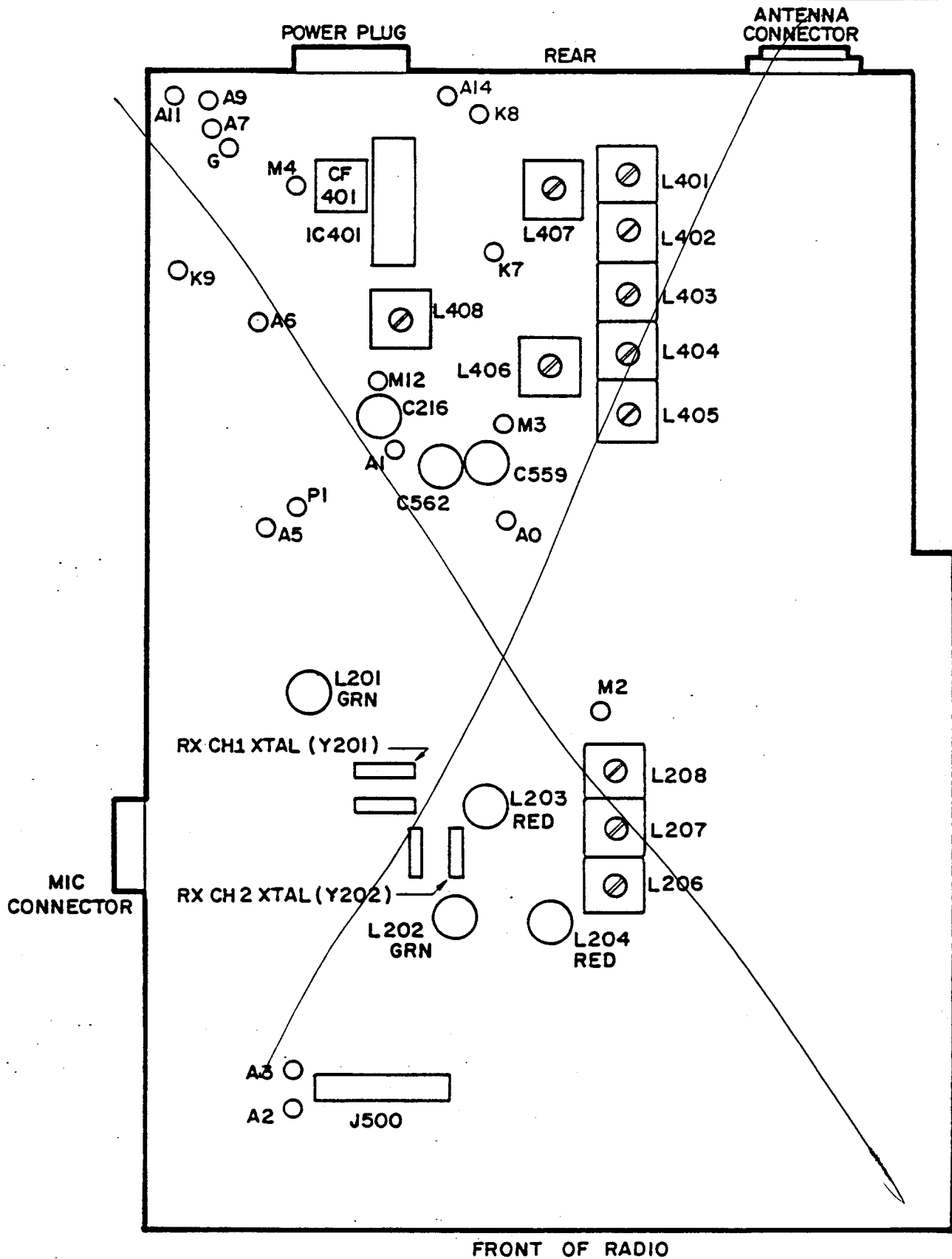


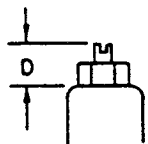
TABLE I
PRESET ADJUSTMENTS

RECEIVER

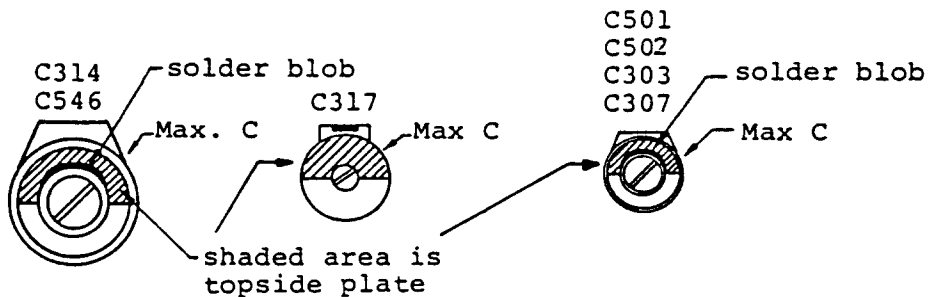
VARIABLE	BAND A			BAND B			DIMENSIONS
	FREQ. (MHz)	450	465	482	482	495	
L201, 202	16	12	9.25	9.25			Turns from top
L203	4.5	4.5	4.5	4.0	3.5	3.0	"
L204	4.5	4.5	4.5	4.0	3.5	3.0	"
L406	3.5	3.5	3.5	3.5	3.5	3.5	"
L407	2.5	2.5	2.5	2.5	2.5	2.5	"
L206-L208	0.22"	0.23"	0.27"	0.17"	0.18"	0.2"	Dimension "D"
L401-L405	0.23"	0.25"	0.3"	0.18"	0.2"	0.22"	Dimension "D"

TRANSMITTER

VARIABLE	BAND A			BAND B			DIMENSIONS
	FREQ. (MHz)	450	465	482	482	495	
L501	14	13.5	13				Turns from top
L502	13.5	13.0	12				"
L504	9.5	8.5	7				"
L505	7.5	7.0	5				"
L509, L510	0.23"	0.25"	0.3"	0.18"	0.2"	0.22"	Dimension "D"
C501, C505	50	50	50				% of max. cap.
C303	50	50	50				"
C307	50	50	40				"
C314	0	0	0				"
C546	25	25	10				"
C317	50	50	40				"



L401-L405
L206-L208
L509, L510



2-3 INITIAL TESTS

Note that the green "ON" light comes on when the radio is turned "ON". Rotate the squelch knob fully clockwise and listen for normal squelch and unsquelched operation. While unsquelched, rotate volume control clockwise to ensure adequate volume is obtained.

To transmit, remove the microphone from the "hang-up" clip, monitor to be sure the channel is clear and press the push-to-talk switch on the microphone. Check that the red "TX" light comes on. Talk to base or other mobile station so they are able to check the clarity of your voice transmission. Have the other station transmit back in order to check your receiver for clear, undistorted reception.

2-4 CIRCUIT DESCRIPTION

The function of each stage or section is explained in conjunction with the Block Diagram (Figure 7) and Schematic Diagram (Figure 8).

2-4-1 General

In the receive mode the antenna is connected to the receiver and primary power is supplied to the receiver only. When the push-to-talk button on the microphone is pressed, the Transmit-Receive solid state switch (CR301/302) switches the antenna from the receiver to the transmitter and the transmitter is activated.

The channel select switch determines the correct channel by "diode steering" the appropriate crystal.

Regulated +8V is supplied only to the more critical circuitry and is derived from the primary power source by the CR504/Q509 Zener/transistor combination.

Below an ambient of 0°C crystal heaters are activated by Q507 and thermistor R541 to maintain TX crystal frequency within +5 ppm. As the heater is shared by the RX crystals, RX frequency stability is also maintained.

2-4-2 Receiver

The received signal from the antenna is passed via JU301 through a 5-pole helical filter, L401 through L405, to Q401, where it is mixed down to 10.7 MHz by a low-side injection source.

The L.O. is derived from a third overtone crystal output which is tripled in Q202 and then filtered in a 3-pole helical, L206, 7, and 8.

The 10.7 MHz output from the mixer is passed by the narrow-band crystal filter XF401 and XF402 to the IF subsystem chip, IC401. Inside it is mixed again with the second L.O. of 10.245 MHz (Y401). The resultant 455 KHz is further filtered by CF401 (a ceramic filter) then amplified, limited and detected with a quadrature detector, L408.

The demodulated audio signal (IC401, Pin 10) is passed to both the audio amplifier circuits and the noise operated squelch circuit. The squelch control, R104, adjusts the signal level to the following bandpass squelch filter. The filter's output voltage IC401, Pin 13, is rectified by CR406 /CR407, and then fed to the DC squelch switch, IC401, Pin 14. When the squelch switch is closed this voltage is approximately 0.7 VDC, the squelch switch output (IC401, Pin 16) is 0 VDC and Q403 is "OFF", allowing DC voltage flow to IC402, Pin 2. This biases IC402 "OFF" thus squelching the receiver output. With open squelch or with sufficient carrier present, the voltage at Pin 14 of IC401 is less than 0.7VDC and the squelch switch output at Pin 16, IC401 goes to +8 VDC biasing Q403 "ON". This back-biases CR401, allows normal IC402 biasing and thus the receiver becomes unsquelched.

The demodulated audio from IC401, Pin 10 is passed through the R429-C443-C421 de-emphasis network, and Q402 buffer amplifier to the volume control pot R103. The output from R103 feeds IC402, a 5W audio amplifier.

2-4-3 Transmitter

Audio speech is converted from air pressure variations to an electrical signal by the microphone. Signal pre-emphasis results from the natural increase in microphone output level with frequency. This signal is then amplified and limited by IC501 such that total system deviation does not exceed 5 KHz. Following the limiter is a 4-pole active low-pass filter which suppresses audio sideband splatter of the transmitted signal. The processed microphone signal is finally fed to transistor Q502 which phase modulates the carrier frequency. C516 and R516 form a network which removes the pre-emphasis inherent in phase modulators in order that correct FM modulation is obtained.

The transmit crystal selected by the channel switch is the reference for the transmit carrier frequency.

The oscillator output, running at the crystal's fundamental frequency, ≈ 13 MHz, passes through the phase modulator, described above, and is applied to a times three multiplier. A high Q two-pole filter subsequently removes any unwanted harmonics. The output at ≈ 52 MHz is then processed by a similar times four multiplier and high Q 2-pole filter to deliver ≈ 160 MHz.

A final times three multiplier converts the carrier to ≈ 480 MHz where the remaining unwanted harmonics are eliminated by a 2-pole helical filter. Amplification then follows in the P.A. driver to provide the necessary level of 20dBm to drive the power amplifier.

The class C power amplifier transistors (Q301, Q302, Q303) further amplify the carrier signal to the required 15W output power which then passes through the Transmit/Receive Switch and low-pass harmonic filter at a 50 ohm impedance to the antenna connector.

2-5 TROUBLESHOOTING

PROBLEM: No power; green "ON" light will not light.

SOLUTION: 1. Check +13.8 VDC power plug in rear of unit.
2. Check fuse in +13.8 VDC power line.
3. Check ON/OFF switch.

PROBLEM: Failure to transmit. (No transmit light.)

SOLUTION: Check to insure hand mic connection is securely made.

PROBLEM: Failure to transmit. (Transmit light comes on.)

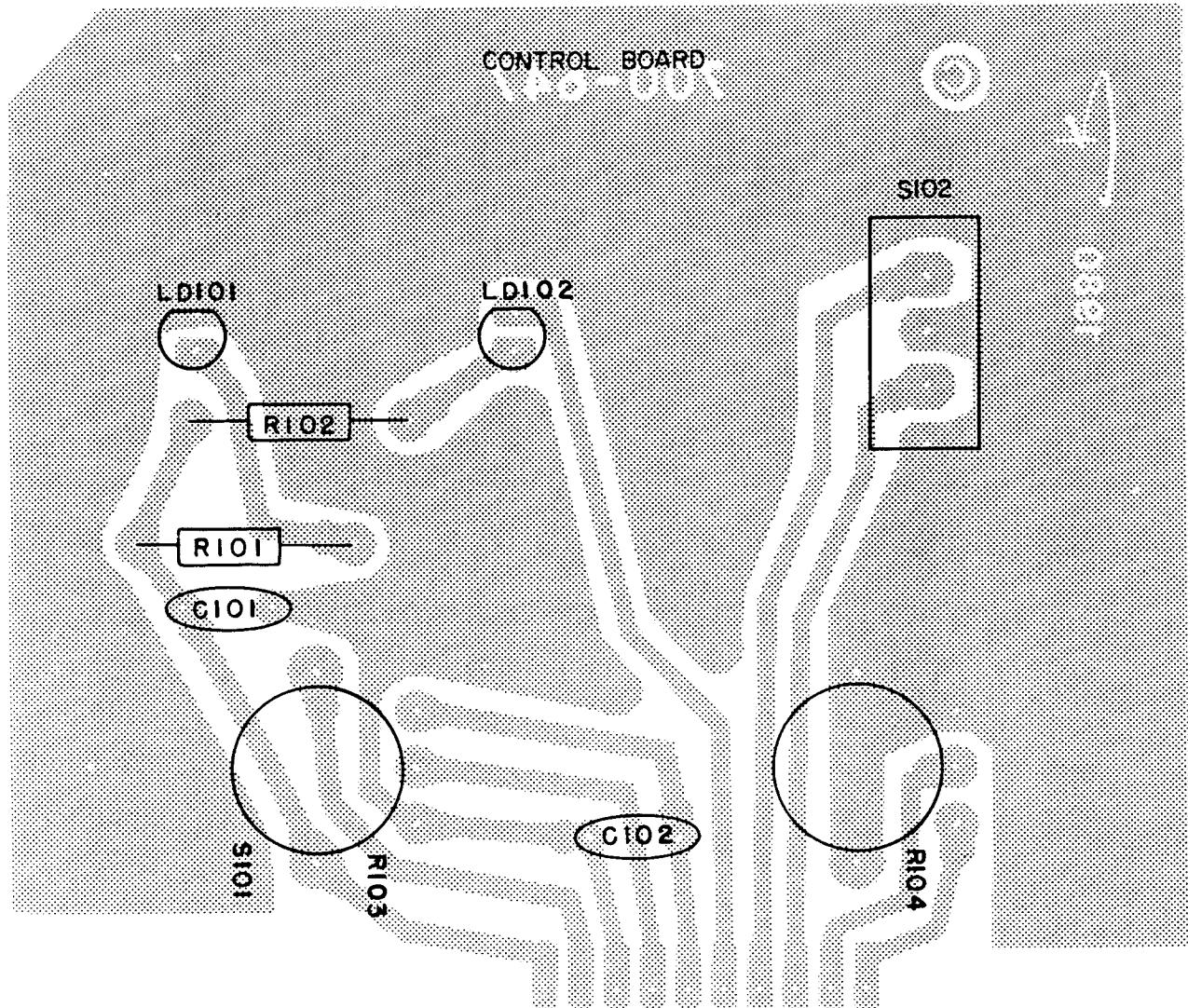
SOLUTION: 1. Check antenna connection.
2. Check for proper voltage indications through transmitter train as shown on voltage overlay.

PROBLEM: Failure to receive.

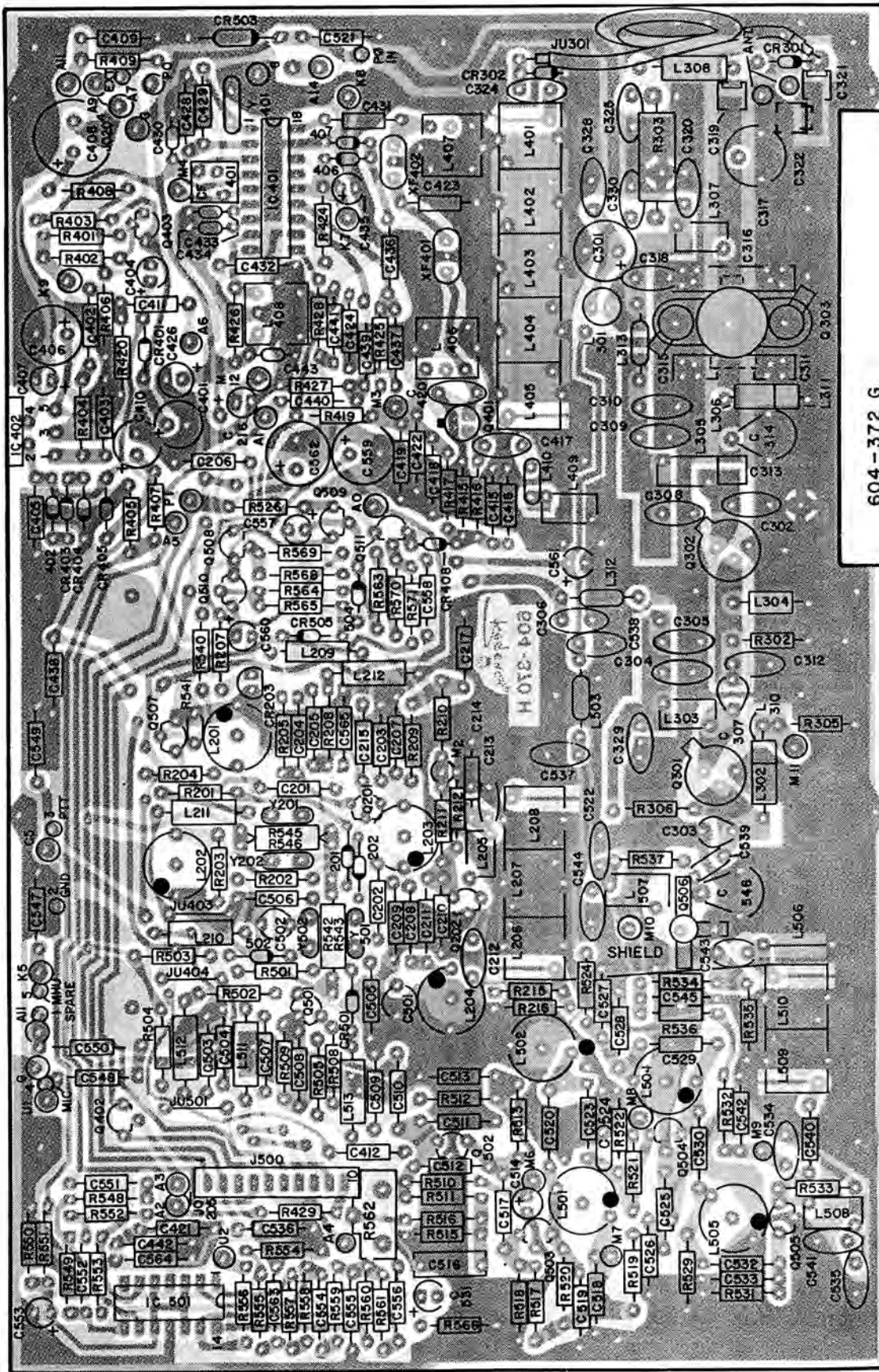
SOLUTION: 1. Check antenna connection.
2. Check speaker connections.
3. Check for proper voltage indications through receiver train as per voltage overlay.

PROBLEM: Low power out/weak reception.

SOLUTION: Check antenna for good connection and verify that it has an impedance of 50 ohm.



CONTROL BOARD
PARTS PLACEMENT



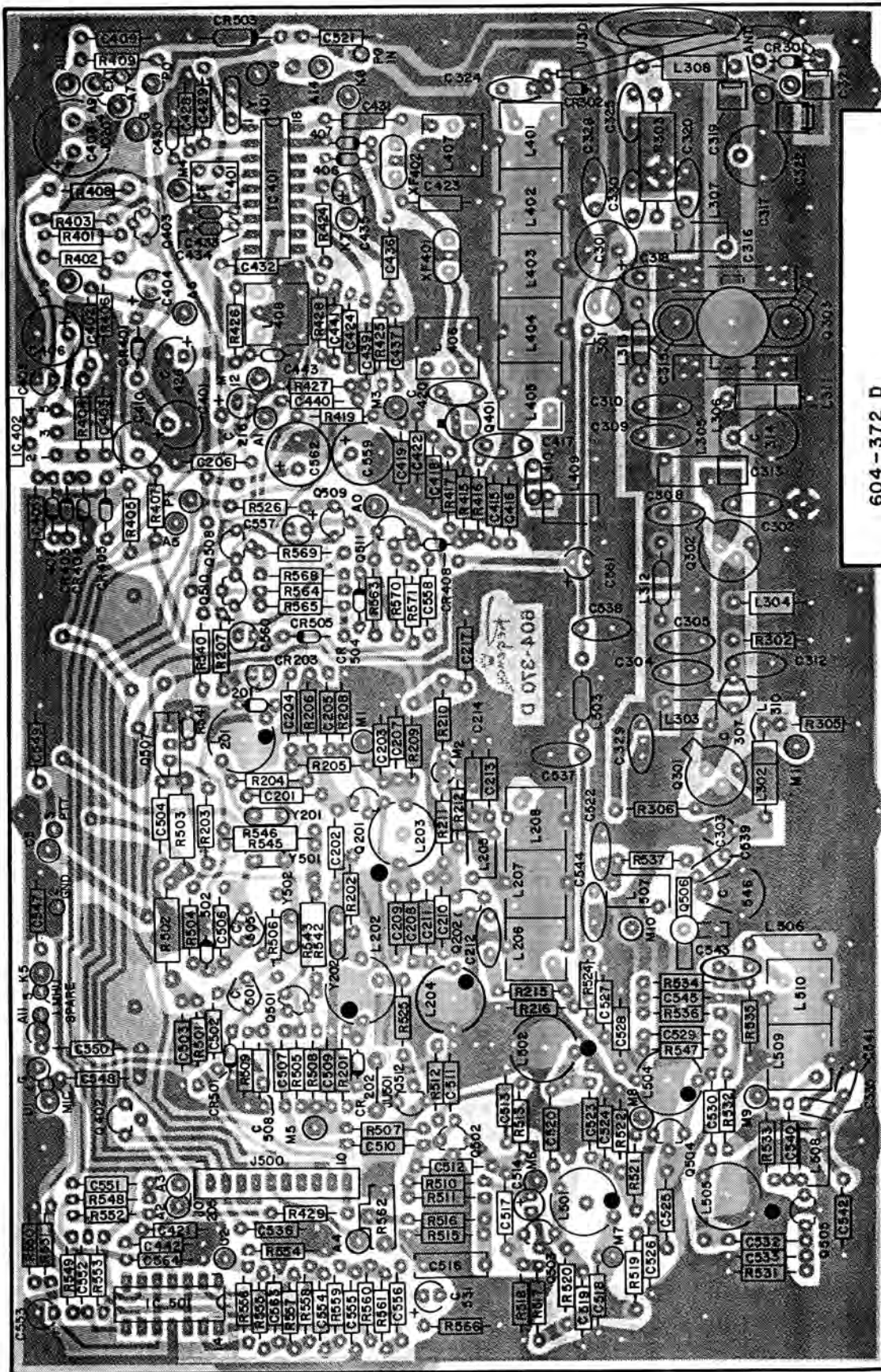
604-372 G

MAIN BOARD
PARTS PLACEMENT
REV G

NOTE

Grey shaded area indicates
bottom side of board.

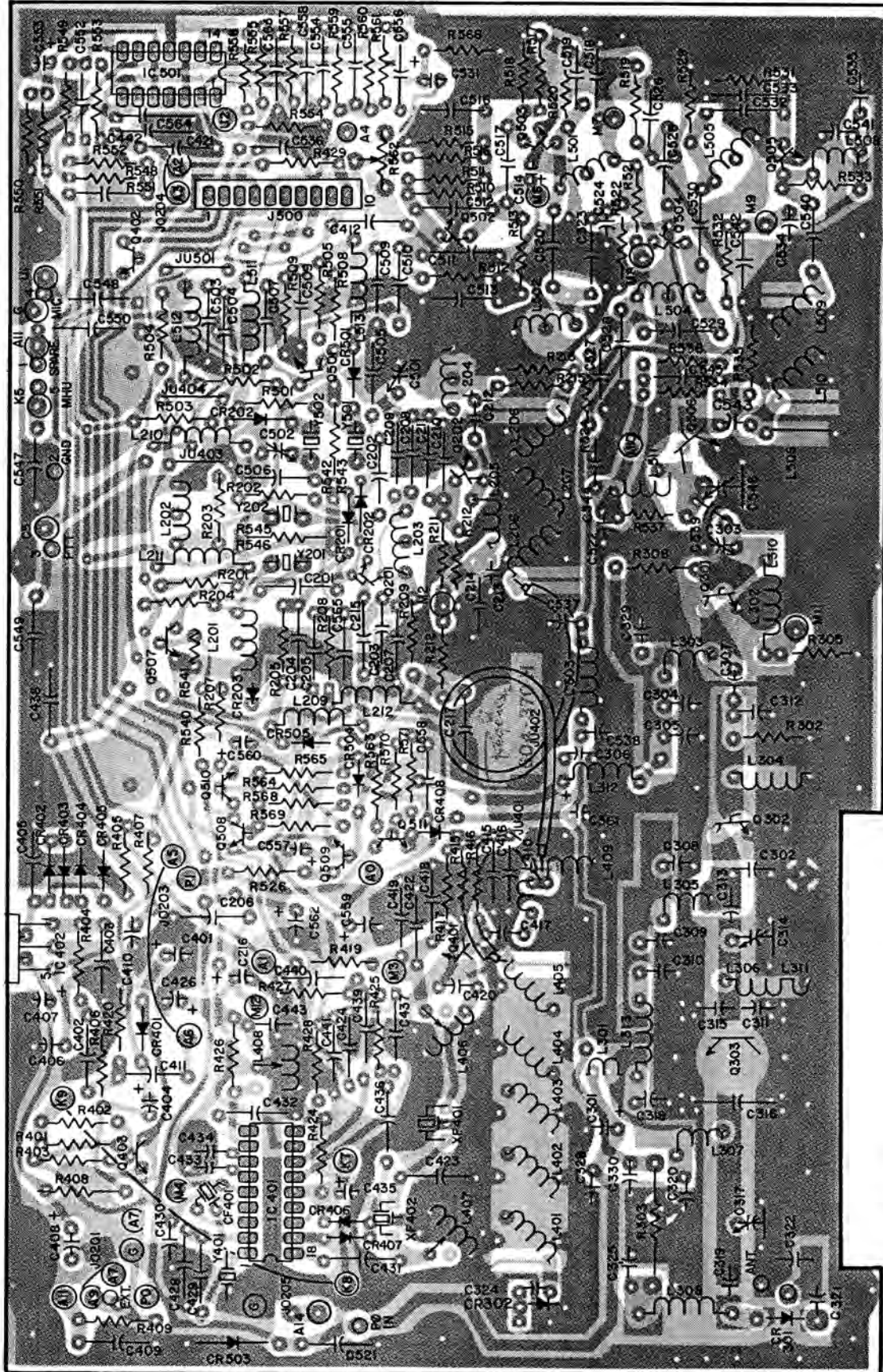
Blue area indicates
component side of board.



604-372 D

NOTE
 Grey shaded area indicates
 bottom side of board.
 Blue area indicates
 component side of board.

MAIN BOARD
 PARTS PLACEMENT
 REV D



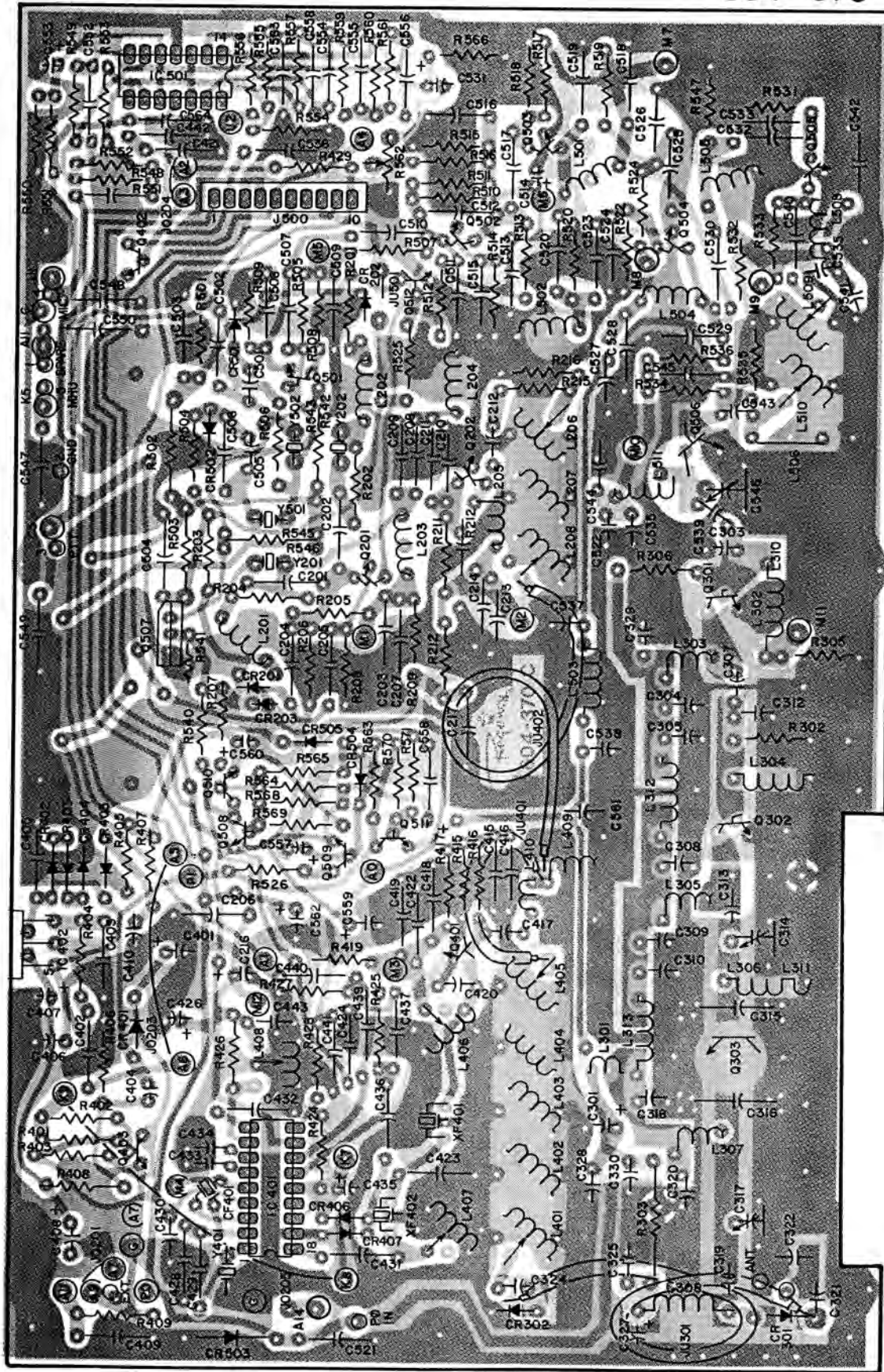
604-373 H

NOTE

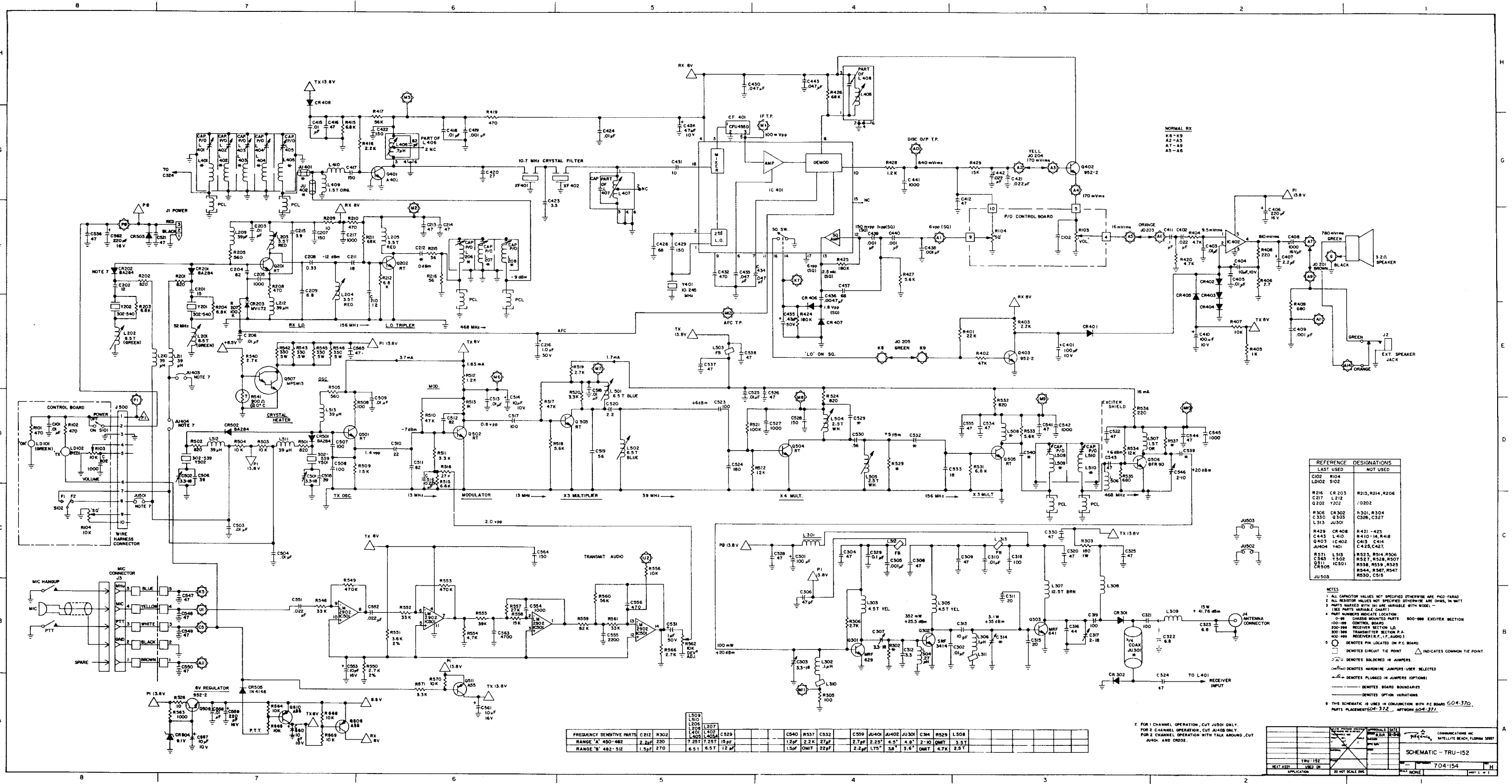
Grey shaded area indicates bottom side of board.

Blue area indicates component side of board.

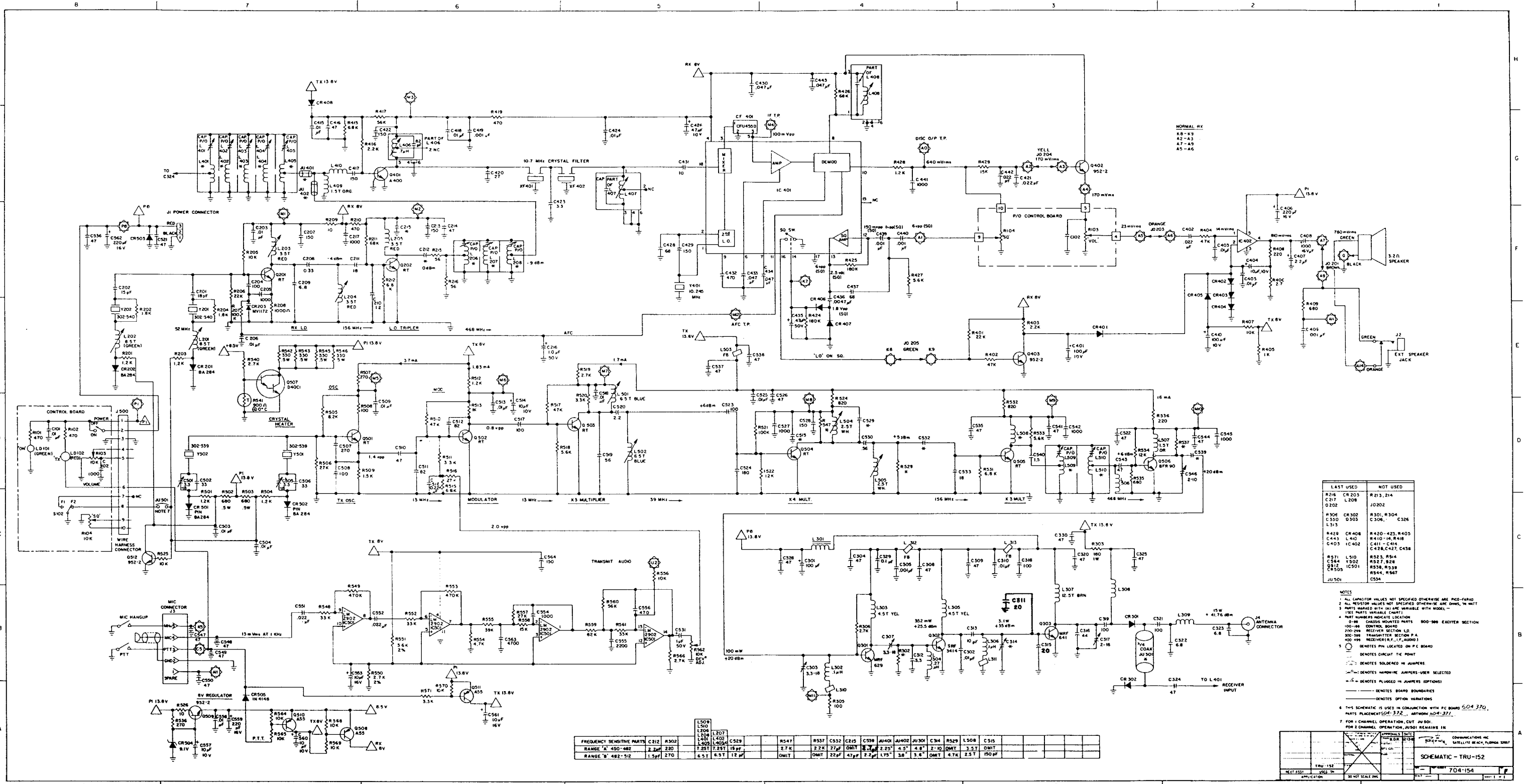
MAIN BOARD
PARTS OVERLAY
REV H



MAIN BOARD
PARTS OVERLAY
REV C



FREQUENCY SENSITIVE PARTS	C212	R302	L207	C540	R537	C532	C539	J401	J402	J301	C34	R529	L508
RANGE 'A' 450-482	2.2pF	250	4.02	1.2pF	2.2K	27pF	2.7pF	2.25"	4.5"	4.8"	2-10	OMIT	3.5T
RANGE 'B' 482-512	1.5pF	270	6.5T	6.5T	12pF	1.5pF	OMIT	22pF	2-2"	1.7"	3.8"	3.6"	OMIT



LAST USED	NOT USED
R216 CR 203	R213, 214
C217 L208	J0202
Q102	
R306 CR 302	R301, R304
C350 D303	C306, C326
L313	
R428 CR 408	R420-423, R405
C443 L40	R410-14, R418
C403 IC 402	C411-C414
	C428, C427, C438
R571 L510	R523, R514
C564 Y502	R527, R28
R511 IC501	R534, R539
JU501	R54, R567
	C534

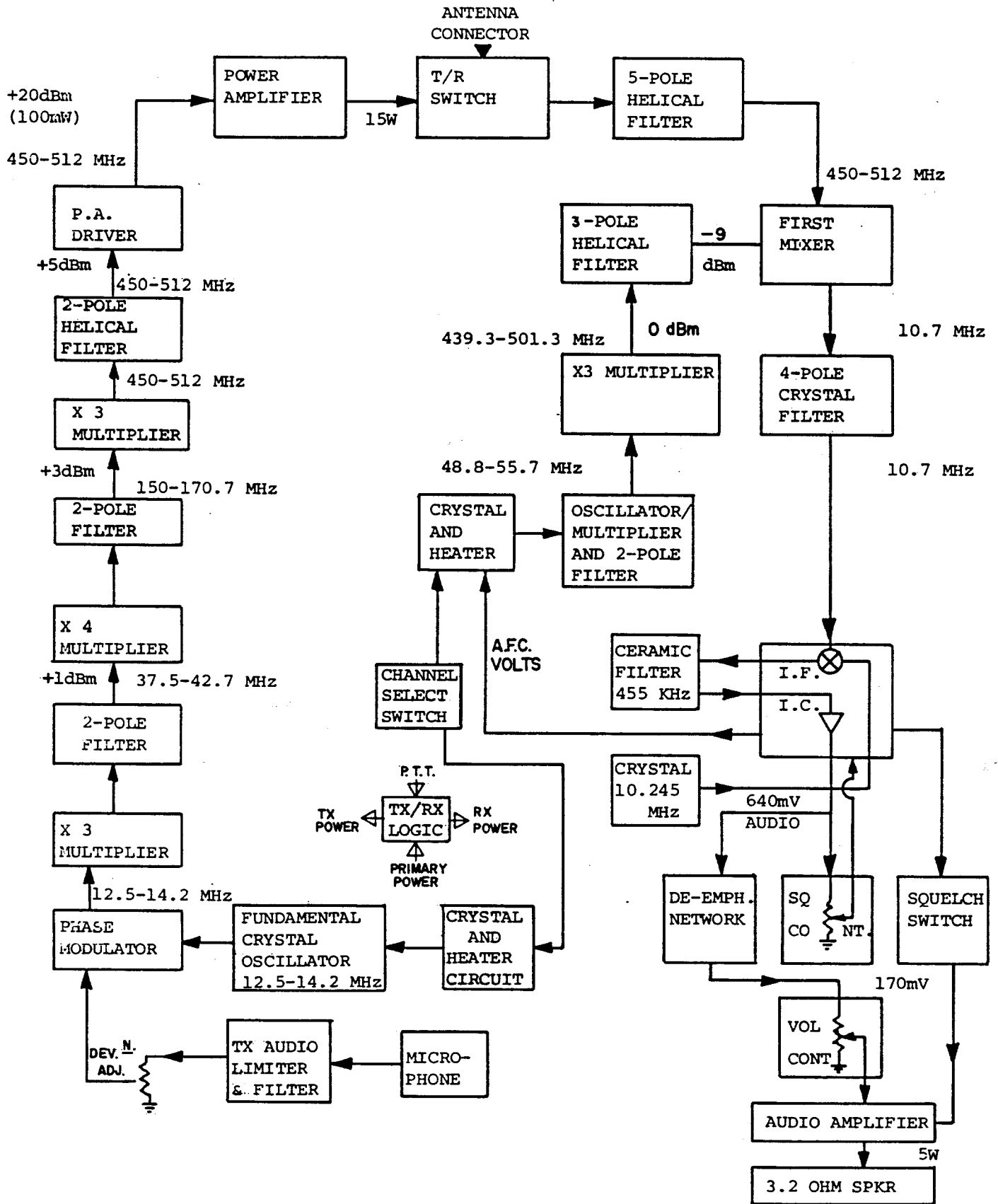
- NOTES
1. ALL CAPACITOR VALUES NOT SPECIFIED OTHERWISE ARE PICO-FARAD
 2. ALL RESISTOR VALUES NOT SPECIFIED OTHERWISE ARE OHMS, UNLESS NOTED OTHERWISE
 3. PARTS MARKED WITH (S) ARE VARIABLE WITH MODEL - (SEE PARTS VARIABLE CHART)
 4. NET NUMBER INDICATES LOCATION
 5. Q-106 CHASSIS MOUNTED PARTS 800-986 EXCITER SECTION
 6. 100-88 CONTROL BOARD
 7. 200-298 RECEIVER SECTION L.D.
 8. 300-398 TRANSMITTER SECTION P.A.
 9. 400-498 RECEIVER PART, I.F. AMPLIFIER
 10. DENOTES PIN LOCATED ON P.C. BOARD
 11. DENOTES CIRCUIT THE POINT
 12. DENOTES SOLDERED IN JUMPERS
 13. DENOTES HARDWARE AMPERS USER SELECTED
 14. DENOTES PLUGGED IN JUMPERS (OPTIONAL)
 15. DENOTES BOARD BOUNDARIES
 16. DENOTES OPTION VARIATIONS

FREQUENCY SENSITIVE PARTS	C212	R502	L509	L508	L507	L506	L505	L504	L503	L502	L501
RANGE 'A' 450-482	2.2µF 220	7.25T 18µF	6.5T 6.5T 12µF	3.3K	3.3K	3.3K	3.3K	3.3K	3.3K	3.3K	3.3K
RANGE 'B' 482-512	1.5µF 270	6.5T 6.5T 12µF									

TRU-152	REV. 152	COMMUNICATIONS INC.
704-154		

USE THE OTHER SCHEMATIC!

FIG 7 TRU152 BLOCK DIAGRAM



2-7 - MA-165 INSTALLATION INSTRUCTIONS IN TRU152

1. Install appropriate MA-165 board jumpers for CTCSS frequency band desired - see tone jumper table below. Jumper locations are in service manual.
2. Remove JO204 (A2-A3 jumper) from TRU152.
3. Plug the following jumpers from the option board to the main board. (Jumper part #'s called out on 7011-4028-800 for the MA-165.)

NC-103

<u>RED</u>	Red	JO602	(13.8V)	to P1
<u>BLK</u>	Black	JO610	(Ground)	to G
<u>GRY</u>	White	JO609	(MHU)	to K5
<u>GRN</u>	Orange	JO603	(Audio in)	to A2
<u>ORG</u>	Grey	JO608	(Squelch)	to K7
<u>WHT</u>	Yellow	JO604	(Audio out)	to A3
<u>YEL</u>	Brown	JO601	(CTCSS Tone)	to U2

4. Attach the option board to the main board using two (2) screws, (2811-3185-600).
5. Make adjustments and set up as per service manual on MA-165. Service manual also has Schematic.
6. Finally, apply 4" of adhesive rubber insulating strip (1601-0688-360) to the top shield to avoid the possibility of the option board shorting out to the shield.

<u>CTCSS TONE</u>	<u>JU601</u>	<u>JU602</u>	<u>JU603</u>	<u>JU604</u>
67 - 114.8	OUT	OUT	OUT	OUT
110.9 - 192.4	IN	OUT	IN	OUT
192.4 - 250.3	OUT	IN	OUT	IN

SECTION 3 - TRU152A PARTS LIST

3-1 CONTROL BOARD

<u>LOCATION</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>	<u>SCHEMATIC ZONE</u>
<u>CAPACITORS</u>			
C101	CD .01mF 80-20 50V	1502-0103-007	D-8
C102	CD .001mF +8-2 50V	1503-0102-003	D-8
<u>RESISTORS</u> (All resistors are $\frac{1}{2}$ W 5% unless otherwise noted)			
R101	470 ohm $\frac{1}{2}$ W 10%	4701-0471-004	D-8
R102	470 Ohm $\frac{1}{2}$ W 10%	4701-0471-004	D-8
R103	10K (A) W/SW	4750-5194-701	D-8
R104	10K (L)	4750-5194-601	C-8
<u>DIODES</u>			
LD101	LED grn	4810-1299-300	D-8
LD102	LED red NC7200	4810-1282-905	D-8
S101	Part of R103		
S102	SW slide SPDT	5113-5154-001	C-8
<u>P.C. BOARD</u>	700-647	1700-7064-700	

<u>LOCATION</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>	<u>SCHEMATIC ZONE</u>
<u>CAPACITORS</u> (All caps in pF unless otherwise noted.)			
C201	20, TC, 5%, 50V, NPO	1538-0200-508	F-7
C202	15, TC, 5%, 50V NPO	1538-0180-508	F-8
C203	.01uF, TC, 30% 25V, Y5R	1538-0103-804	F-7
C204	82, TC, 5%, 50V, GP	1538-0820-509	F-7
C205	1000, TC, 10% 50V, Y5P	1538-0102-601	F-7
C206	.01uF, TC 30% 25V, Y5R	1538-0103-804	E-7
C207	150, TC 10% 50V, Y5P	1538-0151-601	F-7
C208	0.33, Mud, 10%	1510-0338-900	F-7
C209	6.8, TC 10% 50V, NPO	1538-0689-608	F-7
C210	12, TC, 5% 50V, NPO	1538-0120-508	E-7
C211	18, TC 5% 50V, NPO	1538-0180-508	E-7
C212	2.2, CD +.25pF, NPO	1500-0229-205	F-6
C213	47, RD, 5%, 50V, NPO	1524-0470-002	F-6
C214	47, TC 5% 50V, GP	1538-0470-524	F-6
C215	Not used		
C216	1uF, Elect., 50V	1513-0010-004	E-6
C217	1000, TC 10% 50V, Y5P	1538-0102-601	F-7
<u>RESISTORS</u> (All resistors are in ohms, carbon film, 1/4W 5% unless otherwise noted.)			
R201	820	4704-0821-032	E-8
R202	820	4704-0821-032	E-8
R203	6.8K	4704-0682-032	E-7
R204	6.8K	4704-0682-032	E-7
R205	560	4704-0561-032	F-7
R206	Not used		
R207	100K	4704-0104-032	E-7
R208	470	4704-0471-032	E-7
R209	10	4704-0100-032	F-7
R210	470	4704-0471-032	F-6
R211	68K	4704-0683-032	F-6
R212	6.8K	4704-0682-032	F-6
R213	Not used		
R214	Not used		
R215	56	4704-0560-032	F-6
R216	56	4704-0560-032	F-6
<u>COILS</u>			
L201	variable, green, 8.5T	1800-3191-405	E-7
L202	variable, green, 8.5T	1800-3191-405	E-8
L203	variable, red, 3.5T	1800-3152-002	F-7
L204	variable, red, 3.5T	1800-3152-002	F-7
L205	fixed, red, 3.5T	1803-5125-906	F-6
L206	helical, 7.25T green	1800-5433-707	F-6
L207	helical, 7.25T green	1800-5433-707	F-6

<u>LOCATION</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>	<u>SCHEMATIC ZONE</u>
L208	helical, 7.25T green	1800-5433-707	F-6
L209	1uH choke	1803-3268-210	E-7
L210	39uH choke	1803-3268-201	E-7
L211	39uH choke	1803-3268-201	E-7
L212	39uH choke	1803-3268-201	E-7
<u>DIODES</u>			
CR201	diode, pin, BA284	4815-3296-601	E-7
CR202	diode, pin, BA284	4815-3296-601	E-8
CR203	diode, varicap, MV1172	4809-0000-001	E-7
<u>TRANSISTORS</u>			
Q201	NPN, Red Top	4801-0000-035	F-7
Q202	NPN, Red Top	4801-0000-035	F-6

3-3 RECEIVER

<u>LOCATION</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>	<u>SCHEMATIC ZONE</u>
<u>CAPACITORS</u> (All caps in pF unless otherwise noted.)			
C401	100uF, Elect, 10V	1513-0101-001	E-3
C402	.022uF, TC, 30% 25V, Y5R	1538-0223-805	F-2
C403	.01uF, TC, 30% 25V, Y5R	1538-0103-804	F-2
C404	10uF, Elect, 10V	1513-0100-001	F-2
C405	.01uF, TC, 30% 25V, Y5R	1538-0103-804	F-2
C406	220uF, Elect, 16V	1513-3254-711	F-2
C407	2.2uF, Tant, 25V 20%	1515-0229-005	F-2
C408	1000uF, Elect, 16V	1513-3254-717	F-2
C409	1000, TC, 10% 50V, Y5P	1538-0102-601	E-2
C410	100uF, Elect, 10V	1513-0101-001	E-2
C411	0.1uF, TM, 20% 50V, X7R	1539-0104-706	F-2
C412	47, TC, 5% 50V, GP	1538-0470-524	G-4
C413	Not used		
C414	Not used		
C415	.01uF, TC, 30% 25V, Y5R	1538-0103-804	G-7
C416	47, TC, 5% 50V, GP	1538-0470-524	G-7
C417	150, CD, 10%, 50V, Y5P	1523-0151-002	G-7
C418	.01uF, TC, 30% 25V, Y5R	1538-0103-804	G-6
C419	1000, TC, 10% 50V, Y5P	1538-0102-601	G-6
C420	27, CD, 10% 50V, NPO	1500-0270-650	G-3
C421	.022uF, TC, 30% 25V, Y5R	1538-0223-805	G-6
C422	150, TC, 10% 50V, Y5P	1538-0151-601	G-6
C423	3.3, TC, 10% 50V, NPO	1538-0339-608	G-6
C424	.01uF, TC, 30% 25V, Y5R	1538-0103-804	G-5
C425	Not used		
C426	47uF, Elect, 10V	1513-0470-001	G-5
C427	Not used		
C428	68, TC, 5% 50V, NPO	1538-0680-509	F-5
C429	150, TC, 10% 50V, Y5P	1538-0151-601	F-5
C430	.047uF, TM, 20% 50V, Z5U	1539-0473-708	H-5
C431	10, TC, 5%, 50V, NPO	1538-0100-508	G-5
C432	470, TC, 10% 50V, Y5P	1538-0471-601	F-5
C433	.047uF, TM, 20% 50V, Z5U	1539-0473-708	F-5
C434	.047uF, TM, 20% 50V, Z5U	1539-0473-708	F-5
C435	0.47uF, Elect, 50V	1513-3302-005	E-4
C436	4700, TC, 10% 25V, Y5R	1538-0472-604	E-4
C437	68, TC, 5% 50V, NPO	1538-0680-509	F-4
C438	1000, TC, 10% 50V, Y5P	1538-0102-601	F-4
C439	1000, TC, 10% 50V, Y5P	1538-0102-601	F-4
C440	1000, TC, 10% 50V, Y5P	1538-0102-601	F-4
C441	1000, TC, 10% 50V, Y5P	1538-0102-601	G-4
C442	.022uF, TC, 30% 25V, Y5R	1538-0223-805	G-3
C443	.047uF, TM, 20% 50V, Z5U	1539-0473-708	H-4

<u>LOCATION</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>	<u>SCHEMATIC ZONE</u>
<u>RESISTORS</u> (All resistors are in ohms, carbon film $\frac{1}{2}$ W 5% unless otherwise noted.)			
R401	22K	4704-0223-032	E-3
R402	47K	4704-0473-032	E-3
R403	2.2K	4704-0222-032	E-3
R404	4.7K	4704-0472-032	F-2
R405	1.0K	4704-0102-032	E-2
R406	2.7	4704-0279-032	F-2
R407	10K	4704-0103-032	E-2
R408	220	4704-0221-032	F-2
R409	680	4704-0681-032	E-2
R410	Not used		
R411	Not used		
R412	Not used		
R413	Not used		
R414	Not used		
R415	6.8K	4704-0682-032	G-7
R416	2.2K	4704-0222-032	G-6
R417	56K	4704-0563-032	G-6
R418	Not used		
R419	470	4704-0471-032	G-6
R420	4.7K	4704-0472-032	F-2
R421	Not used		
R422	Not used		
R423	Not used		
R424	180K	4704-0184-032	E-4
R425	180K	4704-0184-032	F-4
R426	68K	4704-0683-032	H-4
R427	5.6K	4704-0562-032	F-4
R428	1.2K	4704-0122-032	G-4
R429	15K	4704-0153-032	G-3
<u>COILS</u>			
L401	helical, 7.25T, green	1800-5433-707	G-7
L402	helical, 7.25T, green	1800-5433-707	G-7
L403	helical, 7.25T, green	1800-5433-707	G-7
L404	helical, 7.25T, green	1800-5433-707	G-7
L405	helical, 7.25T, green	1800-5433-707	G-7
L406	variable, IF	1800-6055-902	G-6
L407	variable, IF	1800-6055-902	G-5
L408	variable, 455 KHz	1800-6055-801	H-4
L409	fixed, 1.5T, orange	1803-5125-907	G-7
L410	fixed, blue	1800-5197-006	G-7
<u>DIODES</u>			
CR401	diode, IN4148	4805-1241-200	E-3
CR402	diode, IN4148	4805-1241-200	F-2
CR403	diode, IN4148	4805-1241-200	F-2
CR404	diode, IN4148	4805-1241-200	E-2
CR405	diode, IN4148	4805-1241-200	F-2
CR406	diode, IN4148	4805-1241-200	E-4
CR407	diode, IN4148	4805-1241-200	E-4
CR408	diode, IN4148	4805-1241-200	H-7

<u>LOCATION</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>	<u>SCHEMATIC ZONE</u>
<u>TRANSISTORS</u>			
Q401	NPN, A402	4801-3432-300	G-6
Q402	NPN, SPS 952-2	4801-0000-016	G-3
Q403	NPN, SPS 952-2	4801-0000-016	E-3
<u>INTEGRATED CIRCUITS</u>			
IC401	IF, Sub System	3130-6056-500	G-4
IC402	Audio, TDA 2003	3130-5407-602	F-2
<u>CRYSTALS/ FILTERS</u>			
Y401	Crystal 10.245 MHz	2301-3151-601	F-5
CF401	Filter, CFU 455 D2	2700-3209-500	G-5
XF401	Filter, 2P, 10.7 MHz	2705-3232-200	G-6
XF402	Filter, 2P, 10.7 MHz	2705-3232-200	G-5
<u>JUMPERS</u>			
JU401	Coax, RG 316/U 2.25"	6042-0000-007	G-7
JU402	Coax, RG 316/U 4.5"	6042-0000-007	G-7
JU403	22G buss wire 0.7"	6022-0000-001	D-7
JU404	22G buss wire 0.7"	6022-0000-001	D-7

3-4 TX EXCITER

<u>LOCATION</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>	<u>SCHEMATIC ZONE</u>
<u>CAPACITORS</u> (All caps in pF unless otherwise noted.)			
C501	3.3-18, variable	1517-3445-500	D-7
C502	3.3-18, variabe	1517-3445-500	D-7
C503	.01uF, TC, 30% 25V, Y5R	1538-0103-804	C-7
C504	.01uF, TC, 30% 25V, Y5R	1538-0103-804	C-7
C505	27, TC, 5% 50V, NPO	1538-0270-508	D-7
C506	27, TC, 5% 50V, NPO	1538-0270-508	D-7
C507	390, TM, 5% 50V, NPO	1539-0391-501	D-7
C508	100, TM, 10% 50V, NPO	1539-0101-601	D-7
C509	.01uF, TC, 30% 25V, Y5R	1538-0103-804	D-6
C510	12, TC, 5% 50V, NPO	1538-0120-508	D-6
C511	82, TC, 5% 50V, GP	1538-0820-524	D-6
C512	82, TC, 5% 50V, GP	1538-0820-524	D-6
C513	.01uF, TC, 30% 25V, Y5R	1538-0103-804	D-6
C514	10uF, Elect, 10V	1513-0100-001	D-6
C515	22, TC, 10% 50V, NPO	1538-0220-608	D-6
C516	.22uF, MY	1508-3300-302	D-6
C517	100, TC, 5% 50V, GP	1538-0101-524	D-6
C518	.01uF, TC, 30% 25V, Y5R	1538-0103-804	E-5
C519	56, TC, 5%, NPO	1538-0560-509	D-5
C520	2.2, TC, 10% 50V, NPO	1538-0229-608	D-5
C521	47, TC, 5% 50V, GP	1538-0470-524	F-7
C522	47, RD, 5% 50V	1524-0470-002	D-3
C523	100, TM, 10% 50V, NPO	1539-0101-601	D-5
C524	180, SM, 5% 50V, DM15	1504-0181-505	D-5
C525	.01uF, TC, 30% 25V, Y5R	1538-0103-804	E-5
C526	47, TC, 5% 50V	1538-0470-524	E-4
C527	1000, TC, 10% 50V, Y5P	1538-0102-601	D-4
C528	150, TC 10% 50V, Y5P	1538-0151-601	D-4
C529	15, TC, 5% 50V, NPO	1538-0150-508	D-4
C530	.56, Mud, 10%	1510-0568-900	D-4
C531	1uF, Elect, 50V	1513-0010-004	B-5
C532	27, TC, 5% 50V, NPO	1538-0270-508	D-4
C533	18, TC, 5% 50V, NPO	1538-0180-508	D-4
C534	47, RD, 5% 50V, NPO	1524-0470-002	D-3
C535	47, RD, 5% 50V, NPO	1524-0470-002	D-3
C536	47, TC, 5% 50V, GP	1538-0470-524	F-8
C537	47, RD, 5% 50V, NPO	1524-0470-002	E-5
C538	47, RD, 5% 50V, NPO	1524-0470-002	E-5
C539	2.7, CD \pm .25pF, 500V,NPO	1500-0279-205	D-2
C540	1.5, Mud, 10%	1510-0159-900	D-3
C541	47, RD, 5% 50V, NPO	1524-0470-002	D-3
C542	1000, TC, 10% 50V, Y5P	1538-0102-601	D-3
C543	47, RD, 5% 50V, NPO	1524-0470-002	D-3
C544	47, RD, 5% 50V, NPO	1524-0470-002	D-2
C545	1000, TC, 10% 50V, Y5P	1538-0102-601	D-2
C546	2-10, variable	1517-0000-043	D-2
C547	47, TC, 5% 50V, GP	1538-0470-524	B-7
C548	47, TC, 5% 50V, GP	1538-0470-524	B-7
C549	47, TC, 5% 50V, GP	1538-0470-524	B-7

<u>LOCATION</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>	<u>SCHEMATIC ZONE</u>
C550	47, TC, 5% 50V, GP	1538-0470-524	B-7
C551	.022uF, TC, 30% 25V, Y5R	1538-0223-805	B-7
C552	.022uF, TC, 30% 25V, Y5R	1538-0223-805	B-6
C553	10uF, Elect. 16V	1513-0100-002	B-7
C554	1000, TC, 10% 50V, Y5P	1538-0102-601	B-6
C555	2200, TC, 20% 50V, Y5R	1538-0222-706	B-5
C556	470, TC, 10% 50V, Y5P	1538-0471-601	B-5
C557	10uF, Elect. 10V	1513-0100-001	A-7
C558	.01uF, TC, 30% 25V, Y5R	1538-0103-804	A-7
C559	220uF, Elect, 16V	1513-3254-711	A-7
C560	10uF, Elect, 10V	1513-0100-001	A-7
C561	10uF, Elect, 16V	1513-0100-002	A-6
C562	220uF, Elect, 16V	1513-3254-711	F-8
C563	4700, TC, 10% 25V, Y5R	1538-0472-604	C-6
C564	150, TC, 10% 50V, Y5P	1538-0151-601	B-6
C565	47, C, 5% 50V, GP	1538-0470-524	E-6
C566	15, TC, 5% 50V, NPO	1538-0150-508	D-7

RESISTORS (All resistors are in ohms, carbon film, 1/4W
5%, unless otherwise noted.)

R501	820	4704-0821-032	C-7
R502	820	4704-0821-032	C-7
R503	10K	4704-0103-032	C-7
R504	10K	4704-0103-032	C-7
R505	560	4704-0561-032	D-7
R506-507	Not used		
R508	100	4704-0101-032	D-7
R509	1.5K	4704-0152-032	D-7
R510	47K	4704-0473-032	D-6
R511	3.3K	4704-0332-032	D-6
R512	1.5K	4704-0152-032	E-6
R513	1K	4704-0102-032	D-6
R514	Not used		
R515	6.8K	4704-0682-032	D-6
R516	27K	4704-0273-032	D-6
R517	47K	4704-0473-032	D-6
R518	5.6K	4704-0562-032	D-6
R519	2.7K	4704-0272-032	F-5
R520	3.3K	4704-0332-032	D-5
R521	100K	4704-0104-032	D-5
R522	12K	4704-0123-032	D-5
R523	Not used		
R524	820	4704-0831-032	D-4
R525	Not used		
R526	10	4704-0100-032	A-7
R527-R530	Not used		
R531	6.8K	4704-0682-032	D-3
R532	820	4704-0821-032	D-3
R533	5.6K	4704-0562-032	D-3
R534	12K	4704-0123-032	D-3
R535	680	4704-0681-032	D-3

<u>LOCATION</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>	<u>SCHEMATIC ZONE</u>
R536	220	4704-0221-032	D-3
R537	2.2K	4704-0222-032	D-3
R538	Not used		
R539	Not used		
R540	2.7K	4704-0272-032	E-7
R541	thermistor KB23J1	5300-0000-001	D-7
R542	330 comp ½W 10%	4700-0331-044	D-7
R543	330 comp ½W 10%	4700-0331-044	D-7
R544	Not used		
R545	330 comp ½W 10%	4700-0331-044	D-7
R546	330 comp ½W 10%	4700-0331-044	D-7
R547	Not used		
R548	33K	4704-0333-032	B-7
R549	470K	4704-0474-032	B-7
R550	2.7K 2%	4704-0272-022	B-6
R551	3.6K 2%	4704-0362-022	B-6
R552	33K	4704-0333-032	B-6
R553	470K	4704-0474-032	B-6
R554	4.7K	4704-0472-032	B-6
R555	39K	4704-0393-032	B-6
R556	10K	4704-0103-032	B-5
R557	27K	4704-0273-032	B-6
R558	15K	4704-0153-032	B-6
R559	82K	4704-0823-032	B-5
R560	56K	4704-0563-032	B-5
R561	33K	4704 0333-032	B-5
R562	10K, variable	4751-3407-101	B-5
R563	1000	4704-0102-032	D-3
R564	10K	4704-0103-032	A-6
R565	10K	4704-0103-032	A-7
R566	2.7K	4704-0272-032	B-5
R567	Not used		
R568	10K	4704-0103-032	A-7
R569	10K	4704-0103-032	A-7
R570	10K	4704-0103-032	A-6
R571	3.3K	4704-0332-032	A-6

DIODES

CR501	Pin, BA284	4815-3296-601	C-7
CR502	Pin, BA284	4815-3296-601	C-7
CR503	Rect, 3A, 3A100	4806-0000-005	F-8
CR504	Zener, 9.1V, IN5239B	4808-0000-029	A-7
CR505	Sil, IN4148	4805-1241-200	A-7

COILS

L501	variable, 6.5T, blue	1800-3191-407	D-5
L502	variable, 6.5T, blue	1800-3191-407	D-5
L503	Ferrite bead w/lead	2502-3293-901	E-5
L504	variable, 2.5T, white	1800-3152-009	D-4
L505	variable, 2.5T, white	1800-3152-009	D-4
L506	22 ga buss	6022-0000-001	D-3
L507	Fixed, 1.5T, orange	1803-5125-907	D-3

<u>LOCATION</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>	<u>SCHEMATIC ZONE</u>
L508	Fixed, 3.5T, red	1803-5125-906	D-3
L509	helical, 7.25T green	1800-5433-707	D-3
L510	helical, 7.25T green	1800-5433-707	D-3
L511	39uH choke	1803-3268-201	D-7
L512	39uH choke	1803-3268-201	D-7
L513	39uH choke	1803-3268-201	D-7

TRANSISTORS

Q501	NPN, red top	4801-0000-035	D-7
Q502	NPN, red top	4801-0000-035	D-6
Q503	NPN, red top	4801-0000-035	D-5
Q504	NPN, red top	4801-0000-035	D-4
Q505	NPN, red top	4801-0000-035	D-3
Q506	NPN, BFR 90	4804-3437-301	D-3
Q507	Darlington, MPSW13	4814-3449-700	E-7
Q508	PNP, MPS A55	4801-0000-001	A-7
Q509	NPN, SPS 952-2	4801-0000-016	A-7
Q510	PNP, MPS A55	4801-0000-001	A-7
Q511	PNP, MPS A55	4801-0000-001	A-6

INTEGRATED CIRCUITS

IC501	LM 2902N	3130-3157-637	B-5/6/7
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MISCELLANEOUS

J500	Connector, 10 pin, PC Mount	2105-3299-204	D/C-8
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<u>LOCATION</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>	<u>SCHEMATIC ZONE</u>
<u>CAPACITORS</u> (All caps are in pF unless otherwise noted.)			
C301	100uF, Elect, 16V	1513-0101-002	C-4
C302	.01mF, CD 100V, Y5P	1501-0103-031	B-3
C303	3.3-18, variable	1517-3445-500	B-4
C304	47, RD, 5% 50V, NPO	1524-0470-002	C-4
C305	1000 CD, +80-20, Z5U	1501-0102-005	C-4
C306	47, RD, 5% 50V, NPO	1524-0470-002	C-4
C307	18, CD, 10% 50V, NPO	1500-0180-650	B-4
C308	47, RD, 5% 50V, NPO	1524-0470-002	C-4
C309	47, RD, 5% 50V, NPO	1524-0470-002	C-3
C310	.01uF, CD, 50V, Z5U	1503-0103-007	C-3
C311	20, Chip Mica, 5% 500V	1553-5488-407	B-3
C312	3.3, CD, 10% 500V, NPO	1500-0399-905	B-4
C313	10, Chip, 10% 50V	1540-0100-606	B-3
C314	variable, 2-10pF	1517-0000-043	B-3
C315	20, Chip Mica, 5% 500V	1553-5488-407	B-3
C316	44, Undwd	1522-5418-302	B-3
C317	variable, 2-18	1517-0000-041	B-3
C318	100, CD, 50V	1523-0101-002	C-3
C319	100, Chip, 10% 50V	1540-0101-606	B-3
C320	47, RD, 5% 50V, NPO	1524-0470-002	C-3
C321	100, Chip, 10% 50V	1540-0101-606	B-3
C322	6.8 Mica, 5%	1522-0689-006	B-2
C323	6.8, CD, 5% 500V, NPO	1524-0470-002	A-2
C324	47, RD, 5% 50V, NPO	1524-0470-002	A-2
C325	47, RD, 5% 50V, NPO	1524-0470-002	C-3
C326	Not used		
C327	Not used		
C328	47, RD, 5% 50V, NPO	1524-0470-002	C-4
C329	0.1uF, Rad Mon, Z5U	1518-0104-004	C-4
C330	47, RD, 5% 50V, NPO	1524-0470-002	C-3

RESISTORS (All resistors are in ohms unless otherwise noted.)

*R301	5.6, Comp, 5%, 2W	4710-0569-031	C-3
R301	5.6 WW 5% 2W	4710-0569-031	C-3
R302	220, comp, 10%, 1/4W	4700-0221-042	B-4
R303	180, comp, 10%, 1W	4700-0181-045	C-3
R304	Not used		
R305	100, carb film 5% 1/4W	4704-0101-032	A-4
R306	2.7K, carb film 5% 1/4W	4704-0272-032	B-4

COILS

L301	choke bead	2502-3254-101	C-4
L302	0.1uH choke, 17N4R10	1802-0108-008	B-4
L303	Fixed, 4.5T, yellow	1803-5125-902	B-4
L304	0.27uH choke, 17NR27	1802-0278-008	B-4
L305	Fixed, 4.5T, yellow	1803-5125-902	B-4

*All models manufactured after 8/6/85.

<u>LOCATION</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>	<u>SCHEMATIC ZONE</u>
L306	0.1uH choke, 17NR10	1802-0108-008	B-3
L307	Fixed, 12.5T, brown	1803-5125-903	B-3
L308	1.0uH choke	1803-3268-210	B-3
L309	16 ga buss	6016-0000-001	B-2
L310	Ferrite bead	2502-0000-001	A-4
L311	Ferrite bead	2502-0000-001	B-3
L312	Ferrite bead w/lead	2502-3293-901	C-4
<u>DIODES</u>			
CR301	Pin, UM9484	4815-3408-600	B-3
CR302	Pin, UM9484	4815-3408-600	A-3
<u>TRANSISTORS</u>			
Q301	MRF 629, -1	4804-3402-301	B-4
Q302	MRF 630, -2	4804-3402-302	B-4
Q303	MRF 641	4804-3269-803	B-3
<u>MISCELLANEOUS</u>			
JU301	Coax, RG 316/U, 4.8"	6042-0000-007	B-3

3-6 PART VARIATIONS - TRU152B

The parts list for the TRU152B is exactly the same as for the TRU152A except for the following changes:

<u>LOCATION</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>	<u>SCHEMATIC ZONE</u>
C212	1.5pF, CD, +0.25pF, 500V	1500-0159-205	F-6
C307	3.3-18pF variable	1517-3445-500	B-4
C314	Not used		
C529	12pF, T, 5% 50V, NPO	1538-0120-508	D-4
C539	2.2pF, CD, NPO	1500-0229-205	D-2
C532	22pF, TC, 5% 50V, NPO	1538-0220-508	D-4
<u>RESISTORS</u>			
R302	270 ohm comp, 10% 1/4W	4700-0271-042	B-4
R529	4.7K carb film, 5% 1/4W	4704-0472-032	D-4
R537	Not used		
R547	Not used		
<u>COILS</u>			
L508	Fixed, 2.5T violet	1803-5125-901	D-3
L509	Helical 6.5T white	1800-5433-704	D-3
L510	Helical 6.5T white	1800-5433-704	D-3
L206	Helical 6.5T white	1800-5433-704	F-6
L207	Helical 6.5T white	1800-5433-704	F-6
L208	Helical 6.5T white	1800-5433-704	F-6
L401	Helical 6.5T white	1800-5433-704	G-7
L402	Helical 6.5T white	1800-5433-704	G-7
L403	Helical 6.5T white	1800-5433-704	G-7
L404	Helical 6.5T white	1800-5433-704	G-7
L405	Helical 6.5T white	1800-5433-704	G-7
<u>JUMPERS</u>			
JU401	Coax, RG 316/U 1/75"	6042-0000-007	G-7
JU402	Coax, RG 316/U 3.8"	6042-0000-007	G-7
JU301	Coax, RG 316/U 3.6"	6042-0000-007	B-3

3-7 MECHANICAL PARTS LIST - TRU152

<u>QUANTITY</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>
<u>FINAL ASSEMBLY</u>		
1	Case bottom	1411-7053-008
1	Case top	1411-7052-903
1	Speaker	1301-3299-603
4	Push-on fasteners	2853-3275-901
6 in.	Green wire, speaker	6024-1288-404
6 in.	Black wire, speaker	6024-1288-404
2	Speaker wire connectors	2107-0000-001
1	Top shield	2508-5438-400
1	Bottom shield	2508-6428-500
8	Screws, bottom shield	2808-0250-023
4	Screws, case	2816-3298-702
1	Screw, case to control head	2809-0312-012
2	Knob, mounting	2402-5148-702
2	Washer, metal	2840-3191-909
2	Washer, plastic	2844-6070-701
1	Bracket, mobile mounting	1400-6074-000
<u>RADIO CHASSIS</u>		
1	Chassis	1403-7060-303
1	Power connector, J1	2109-5120-403
1	Phono plug, J2	2101-3262-400
1	Mic connector, J3	2105-0000-023
1	Antenna connector, J4	2105-0000-020
1	Retainer, power connector	1400-1325-400
2	Pins, power connector	2107-3244-102
2	Rivet, for retainer	2880-0156-001
1	Heatsink, tru angle	5400-3446-000
1	Exciter shield	2508-3451-000
2	Screws, heatsink to chassis	2807-3298-001
1	Heatsink, Q302	5400-3407-201
1	Bracket, TO5 heatsink	1400-1449-300
2	Screw, bracket	2803-0250-001
2	Screw, Q303	2803-0250-001
1	Screw, IC402	2803-0250-001
1	Kepnut, IC402	2852-0440-001
7	Screw, main board to chassis	2811-3185-600
	Thermal compound, white	1602-0000-001
2	Crystal clip	2830-1420-702
8	Crystal sockets	2106-5131-800
1	Shield can assy, 2-pole	2508-5427-306
1	Shield can assy, 3-pole	2508-5427-307
1	Shield can assy, 5-pole	2508-5427-311
10	Screws, hel. cans, 10-32 x 1/2"	2807-1435-000
10	Lockwasher, helical cans	2851-1032-001
33	Option pins, test point pins	2107-0000-003
2	Solder lugs, Q303	2102-1464-800

<u>QUANTITY</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>
1	Jumper JO201	7027-5003-101
1	Jumper JO203	7027-5003-302
1	Jumper JO204	7027-5003-401
1	Jumper JO205	7027-5003-501
2.5 in.	Wire, ant connector	6016-0000-001
1.5 in.	Wire, 20 ga red	6020-1288-303
1.5 in.	Wire, 20 ga black	6020-1288-303
2 in.	Wire, green, phono	6024-1288-404
1.5 in.	Wire, black, gnd	6024-1288-404
1.5 in.	Wire, yellow, mic	6024-1288-404
1.5 in.	Wire, white, PTT	6024-1288-404
1.5 in.	Wire, blue, MHU	6024-1288-404
1.5 in.	Wire, brown, spare	6024-1288-404
1	P.C. Board, main, 604-370	1700-6437-000
1.25 in.	Sleeving, Ant. wire	3101-0000-020

FRONT PANEL

1	Bracket	1400-7060-600
4	Screws (cont. head to chassis)	2808-0250-023
1	Front panel	1411-7061-302
2	Knobs, (Vol, Sq.)	2402-6067-203
5	Screws 4 x 1/4 PPH	2808-0250-030
2	Screws 4 x 1/4 AB (Bracket)	2811-3185-600
1	Screw 5 x 3/8	2816-3229-601
1	Washer, mylar (slide switches)	2844-1315-302
1	P.C. Board, 700-647	1700-7064-700

EXTERNAL

1	5 Amp fuse	5106-0000-008
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3-8 CBSTRU152 BASE STATION

<u>QUANTITY</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>
4	Rubber foot	1402-3291-202
2	Plastic side plug	2104-1325-901

SECTION 4 - SERVICE BULLETINS

END OF DOCUMENT