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**Realistic TRC-423 (21-1513) Service Manual**

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21-1513

**REALISTIC<sup>®</sup>**

# Service Manual

## CB 40-CHANNEL TRANSCEIVER TRC-423

Catalog Number: 21-1513



CUSTOM MANUFACTURED FOR RADIO SHACK, A DIVISION OF TANDY CORPORATION

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# SPECIFICATIONS

## GENERAL

### Description

Transmitter .....	Crystal controlled PLL synthesizer, amplitude modulation
Receiver .....	Crystal controlled double conversion, superheterodyne system
Communicating frequencies .....	40 CB channels (26.965 to 27.405 MHz)
Voltage operation .....	12 – 16V DC (negative only ground)
Temperature and Humidity range .....	– 22°C ~ + 140°F (– 30°C ~ + 60°C) and 10% ~ 90%
Transmitter/Receiver switching .....	Electrical

## STANDARD TEST CONDITIONS

Battery supply voltage .....	13.8V DC
Modulation .....	1000 Hz, 30%
Receiver output power .....	500mW at external SP
Receiver output impedance .....	8 ohms, non-inductive
Ant. load impedance of transmitter .....	50 ohms, non-inductive
Ambient conditions	
Temperature .....	63°F ~ 73°F (17°C ~ 23°C)
Humidity .....	40% ~ 70%

## TRANSMITTER

Description	Nominal	Limit
RF power output .....	4.0 watts	3.6 ~ 4.4 watts
Antenna spurious emission .....	70	50
Modulation capability (positive/negative) .....	+90%/–90%	+80%/–80%
AMC Range at 1 kHz .....	40 dB	30dB
Frequency accuracy .....	0.002%	0.005%
Spurious radiation & Harmonic		
Signal radiation ratio from fundamental .....	–65dB	–60dB
Current consumption		
at no modulation, .....	1000 mA	1200 mA
at 80% modulation .....	1500 mA	1700 mA
Envelope distortion .....	10% max. 1000 Hz, 50% mod.	
Stability against variation of antenna impedance .....	Satisfactory when dummy antenna is varied from 40 ohms to 200 ohms.	

## RECEIVER

Description	Nominal	Limit
Intermediate frequency		
1st IF	10.695 MHz	
2nd IF	455 kHz	
Sensitivity for 500 mW output	0.3 $\mu$ V	1 $\mu$ V
Sensitivity at 10dB (S+N)/N	0.7 $\mu$ V	1.0 $\mu$ V
Adjacent channel rejection	65dB	55dB
Image rejection (1st IF/2nd IF)	70dB	60dB
IF rejection ratio (1st IF/2nd IF)	60dB	45dB
Signal-to-Noise ratio		
at 1 mV input	40dB	35dB
Distortion at 1 mV input,		
30% mod. (500 mW out)	3%	5%
AGC Figure of merit at 50mV input	80dB	70dB
Power output at 1mV input		
Undistorted (10% THD)	4.5W	4.0W
Maximum	5.0W	4.5W
Electrical fidelity compared to 1000 Hz	5.0	4.5
450 Hz	-6dB	-6 $\pm$ 3dB
2500 Hz	-6dB	-6 $\pm$ 3dB
Cross modulation	50dB	40dB
Squelch	60dB	60 $\pm$ 6dB
Current consumption (no signal)	250 mA	300 mA
"S" meter sensitivity to light 3th LED	40dB	40 $\pm$ 6dB
Noise Blanker	20dB	16dB
Automatic noise limiter	16dB	12dB

## PUBLIC ADDRESS

Description	Nominal	Limit
10% THD output power	4W	3.5W
Microphone sensitivity for 4W	5mV	10mV
Current drain at 10% THD power	1000mA	1200mA

## OTHER ITEMS

Fuse	WHT wire: 1 Amp. RED wire: 2 Amp.
General power requirement	12-16V DC
Dimensions	2 lbs 4 ozs (1.03kg)
Weight	(W) 57 $\frac{7}{8}$ " (148mm) $\times$ (H) 11 $\frac{10}{13}$ " (45mm) $\times$ (D) 8 $\frac{1}{4}$ " (210mm)

**Note:** Nominal specs represent the design specs; all units should be able to approximate these — some will exceed and some may drop slightly below these specs. Limit specs represent the absolute worst condition that still might be considered acceptable; in no case should a unit perform to less than within any limit spec.



## 2. Alignment Procedure

STEP	SETTING	CONNECTION	ADJUST	ADJUST FOR
1	Frequency adjustment; MIC: Receive Volume: Optional Squelch: Optional CH Selector: Optional RF Gain: Optional MIC Gain: Optional PA, ANL, NB, CH9: OFF	Frequency counter to output pin 12 of IC502 (Figure 1).	C514	10.240MHz $\pm$ 100Hz
2	RX VCO voltage adjustment; MIC: Receive Volume: Optional Squelch: Optional CH Selector:1 RF Gain: Optional MIC Gain: Optional PA, ANL, NB, CH9: OFF	Connect DC voltmeter between R533 and R534 (Figure 2).	L501	1.5V
3	TX VCO voltage adjustment; MIC: Transmit Volume: Optional Squelch: Optional CH Selector: 1 RF Gain: Optional MIC Gain: Optional PA, ANL, NB, CH9: OFF	Connect DC voltmeter between R533 and R534 (Figure 2).	L501	Indication on DC voltmeter must be 1.0-2.0 Volt. If DC voltmeter does not indicate 1.0-2.0 volt, readjust L501.
4	CPU IC Voltage check; MIC: Receive Volume: Optional Squelch: Optional CH Selector: Optional RF Gain: Optional MIC Gain: Optional PA, ANL, NB, CH9: OFF	Connect DC voltmeter to pin 2 of IC501.		Indication on DC voltmeter must be 4-5.5 volt.
5	CPU frequency check; MIC: Receive Volume: Optional Squelch: Optional CH Selector: Optional RF Gain: Optional MIC Gain: Optional PA, ANL, NB, CH9: OFF	Connect oscilloscope to pin 16 of IC501 (Figure 3).		Check for 300-400kHz of triangle waveform as Figure 4.

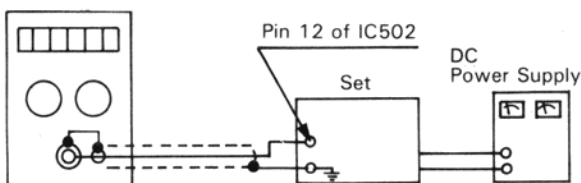


Figure 1

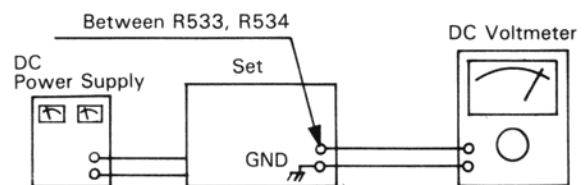


Figure 2

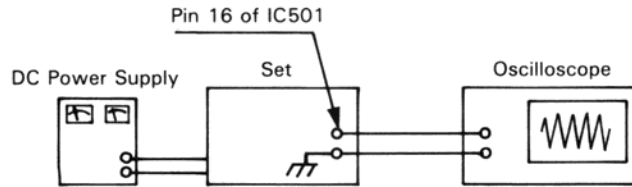


Figure 3

## C. TRANSMITTER SECTION

### 1. Test Equipment Required

- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>a. RF Powermeter (RF SSVM)</li> <li>b. 50 ohm load (non-inductive)</li> <li>c. RF Attenuator</li> <li>d. Oscilloscope</li> <li>e. Audio Generator</li> </ul> | <ul style="list-style-type: none"> <li>f. DC Power supply (13.8 Volt, 3 Amp.)</li> <li>g. Spectrum Analyzer</li> <li>h. Frequency Counter</li> <li>i. Coupler</li> </ul> |
|---|--|

### 2. Alignment procedure

STEP	SETTING	CONNECTION	ADJUST	ADJUST FOR
1	RF Driver stage; MIC: Transmit Volume: Optional Squelch: Optional CH Selector: 19 RF Gain: Optional MIC Gain: Turn to counter-clockwise PA, ANL, NB, CH9: OFF	Connect RF Powermeter to base of Q302 (Figure 4).	L301 L302	Adjust for maximum indication on the RF Powermeter.
2	RF Power stage ; MIC: Transmit Squelch: Optional Volume: Optional CH Selector: 19 RF Gain: Optional MIC Gain: Turn to counter-clockwise PA, ANL, NB, CH9: OFF	Connect dummy load and RF power meter to the EXT-ANT. Jack on the set (Figure 5).	L303 L304 L305 L306	Adjust for maximum indication on the RF power-meter (4 watts). If indication is not in 4 watts range, go back to step 1 and readjust L303, L304, L305, L306
3	Modulation adjustment ; MIC: Transmit Volume: Optional Squelch: Optional CH Selector: 19 RF Gain: Optional MIC Gain: Fully clockwise PA, ANL, NB, CH9: OFF	Connect audio generator (1kHz) to pin 4 of microphone connector (Figure 6). Connect dummy load and oscilloscope through coupler to RF powermeter. Connect RF powermeter to EXT-ANT jack on the set. Adjust audio signal level to obtain 80%-90% modulation level.	RV202	Check for proper modulation pattern on the oscilloscope.



STEP	SETTING	CONNECTION	ADJUST	ADJUST FOR
4	Second harmonic check; MIC: Transmit Volume: Optional Squelch: Optional CH Selector: 19 RF Gain: Optional MIC Gain: Turn to counter-PA, ANL, NB, CH9: OFF	Connect RF powermeter with dummy load to spectrum analyzer through coupler/-40dB attenuator to EXT-ANT. Jack on the set (Figure 7).		At no modulation compare the level of fundamental frequency to the level of harmonic frequency. Suppression of the 2nd harmonic frequency level must be lower than-60dB. Check for the other channels.
5	Frequency check; MIC: Transmit Volume: Optional Squelch: Optional Channel selector: 19 RF Gain: Optional MIC Gain: Turn to counter-clockwise PA, ANL NB, CH9: OFF	Connect dummy load and frequency counter through coupler to RF powermeter. Connect RF powermeter to EXT-ANT. Jack on the set. (Figure 8).	C514	Make sure that the indication of the transmitter frequency is $27.185\text{MHz} \pm 300\text{Hz}$ on the frequency counter.
6	TX Power LED adjustment; MIC: Transmit Volume: Optional Squelch: Optional Channel Selector: 1 RF Gain: Optional MIC Gain: Turn to counter-clockwise PA, ANL, NB, CH9: OFF	Connect dummy load and frequency counter through coupler to RF power meter. Connect RF power meter to EXT-ANT jack on the set (Figure 6).	RV301	Adjust so that 3rd LED light up at 4 watts RF output power.

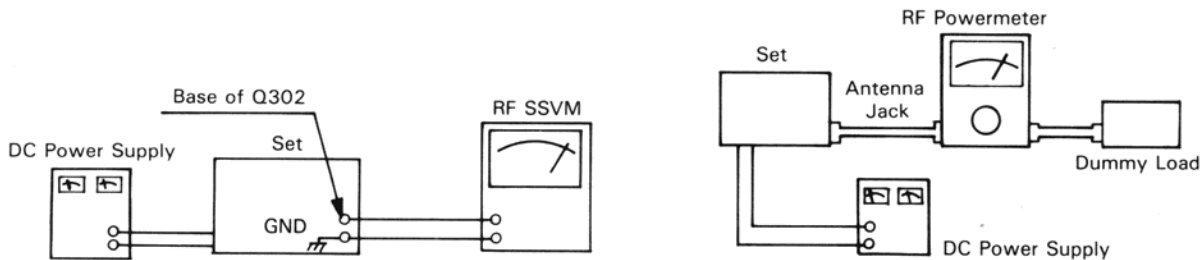


Figure 4

Figure 5

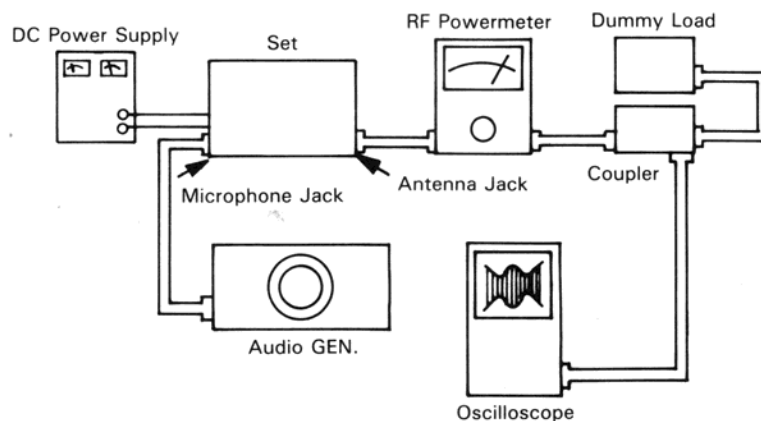


Figure 6

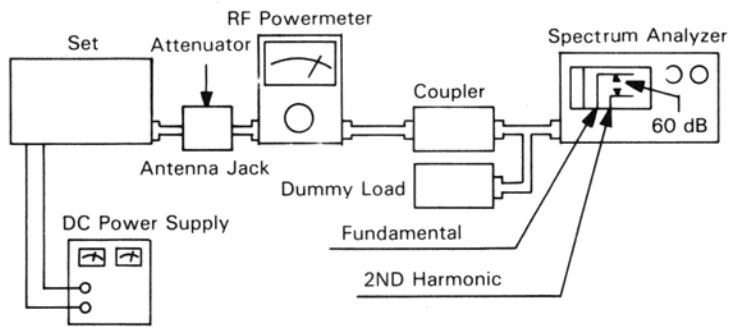


Figure 7

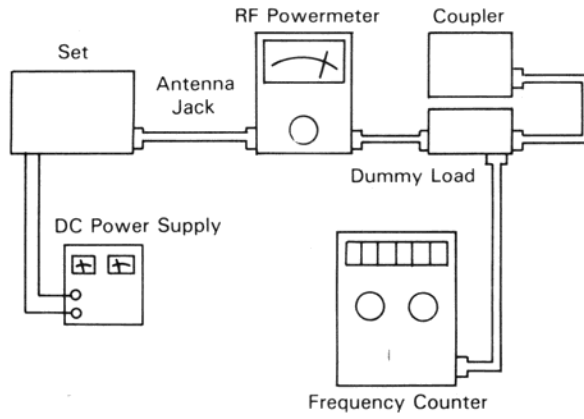


Figure 8

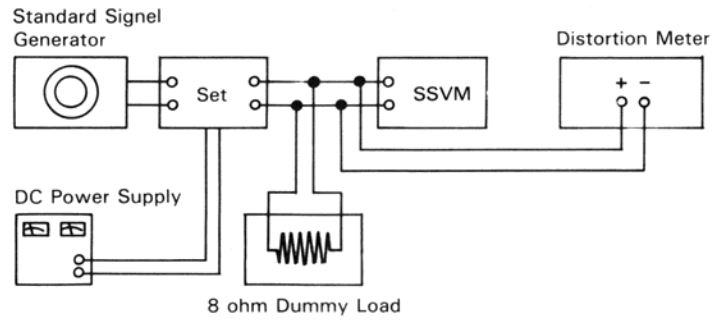


Figure 9



# CHANNEL FREQUENCY GENERATION TABLE

## RECEIVE

VCO FREQUENCY = N x 5 (kHz)

## TRANSMIT

VCO FREQUENCY = N x 2.5 (kHz)

TRANSMIT FREQUENCY = VCO FREQUENCY x 2

CHANNEL	BCD INPUT TO IC-1								RECEIVE		TRANSMIT		
	D1 (1F)	D2 (1A)	D3 (1G)	D4 (1E)	D5 (1B)	D6 (2C)	D7 (2N)	D8 (2F)	N	VCO FREQUENCY (MHz)	N	VCO FREQUENCY (MHz)	TRANSMIT FREQUENCY (MHz)
1	1	1	1	1	0	1	1	1	3254	16.27	5393	13.4825	26.965
2	1	0	0	0	0	1	1	1	3256	16.28	5395	13.4875	26.975
3	1	0	0	1	0	1	1	1	3258	16.29	5397	13.4925	26.985
4	0	1	0	1	0	1	1	1	3262	16.31	5401	13.5025	27.005
5	0	0	0	1	1	1	1	1	3264	16.32	5403	13.5075	27.015
6	0	0	0	0	1	1	1	1	3266	16.33	5405	13.5125	27.025
7	—	0	1	1	0	1	1	1	3268	16.34	5407	13.5175	27.035
8	0	0	0	0	0	1	1	1	3272	16.36	5411	13.5275	27.055
9	0	0	0	1	0	1	1	1	3274	16.37	5413	13.5325	27.065
10	0	0	1	0	0	0	1	1	3276	16.38	5415	13.5375	27.075
11	1	1	1	1	0	0	1	1	3278	16.39	5417	13.5425	27.085
12	1	0	0	0	0	0	1	1	3282	16.41	5421	13.5525	27.015
13	1	0	0	1	0	0	1	1	3284	16.42	5423	13.5575	27.115
14	0	1	0	1	0	0	1	1	3286	16.43	5425	13.5625	27.125
15	0	0	0	1	1	0	1	1	3288	16.44	5427	13.5675	27.135
16	0	0	0	0	1	0	1	1	3292	16.46	5431	13.5775	27.155
17	—	0	1	1	0	0	1	1	3294	16.47	5433	13.5825	27.165
18	0	0	0	0	0	0	1	1	3296	16.48	5435	13.5875	27.175
19	0	0	0	1	0	0	1	1	3298	16.49	5437	13.5925	27.185
20	0	0	1	0	0	1	0	1	3302	16.51	5441	13.6025	27.205
21	1	1	1	1	0	1	0	1	3304	16.52	5443	13.6075	27.215
22	1	0	0	0	0	1	0	1	3306	16.53	5445	13.6125	27.225
23	1	0	0	1	0	1	0	1	3312	16.56	5451	13.6275	27.255
24	0	1	0	1	0	1	0	1	3308	16.54	5447	13.6175	27.235
25	0	0	0	1	1	1	0	1	3310	16.55	5449	13.5225	27.245
26	0	0	0	0	1	1	0	1	3314	16.57	5453	13.6325	27.265
27	—	0	1	1	0	1	0	1	3316	16.58	5455	13.6375	27.275
28	0	0	0	0	0	1	0	1	3318	16.59	5457	13.6425	27.285
29	0	0	0	1	0	1	0	1	3320	16.60	5459	13.6475	27.295
30	0	0	1	0	0	0	0	1	3322	16.61	5461	13.6525	27.305
31	1	1	1	1	0	0	0	1	3324	16.62	5463	13.6575	27.315
32	1	0	0	0	0	0	0	1	3326	16.63	5465	13.6625	27.325
33	1	0	0	1	0	0	0	1	3328	16.64	5467	13.6675	27.335
34	0	1	0	1	0	0	0	1	3330	16.65	5469	13.6725	27.345
35	0	0	0	1	1	0	0	1	3332	16.66	5471	13.6775	27.355
36	0	0	0	0	1	0	0	1	3334	16.67	5473	13.6825	27.365
37	—	0	1	1	0	0	0	1	3336	16.68	5475	13.6875	27.375
38	0	0	0	0	0	0	0	1	3338	16.69	5477	13.6925	27.385
39	0	0	0	1	0	0	0	1	3340	16.70	5479	13.6975	27.395
40	0	0	1	0	0	0	1	0	3342	16.71	5481	13.7025	27.405

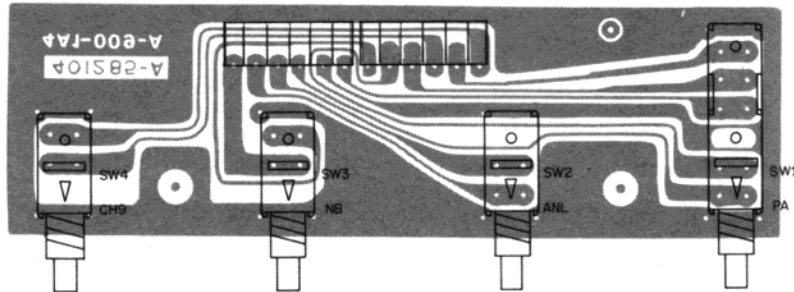
# TROUBLESHOOTING

SYMPTOM	PROBABLE CAUSE	REMEDY
Unit does not work at all	<ol style="list-style-type: none"> <li>1. Defective power switch VR102</li> <li>2. Blown fuse</li> <li>3. Broken DC power cord</li> <li>4. Defective IC501 or IC502</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace</li> <li>2. Replace</li> <li>3. Replace</li> <li>4. Replace</li> </ol>
No output from speaker at all	<ol style="list-style-type: none"> <li>1. Defective external speaker Jack</li> <li>2. Poor connection on microphone connector</li> <li>3. Defective push switch on microphone</li> <li>4. Defective internal speaker</li> <li>5. Defective D112, VR101, VR102, RV201 IC201 or other components</li> </ol>	<ol style="list-style-type: none"> <li>1. Repair or Replace</li> <li>2. Repair or Replace</li> <li>3. Repair or Replace</li> <li>4. Replace</li> <li>5. Replace the defective components</li> </ol>
No noise on speaker	<ol style="list-style-type: none"> <li>1. Measure all the voltage of Q100, Q101, Q102, Q103, Q104, 105, 106, 107, 108, Q109, 110, 111, and IC201 with voltage chart on the page 20</li> <li>2. Defective squelch circuit components (RV201, VR201, IC201, Q203, Q204, Q205, Q510, Q511)</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace</li> <li>2. Replace</li> </ol>
Squelch does not work	<ol style="list-style-type: none"> <li>1. Defective VR201, RV201, Q203, Q204, Q205, Q510, Q511</li> <li>2. Improperly adjusted RV201</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace defective components</li> <li>2. Readjust</li> </ol>
No modulation	<ol style="list-style-type: none"> <li>1. Defective microphone</li> <li>2. Poor Audio output and defective modulation microphone amplifier components (Q201, Q202, IC201, VR202)</li> <li>3. Defective microphone connector component</li> <li>4. Defective ALC Circuit (Q206, Q207, Q208, D205, D206)</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace</li> <li>2. Replace the defective component(s)</li> <li>3. Replace</li> <li>4. Replace the defective component(s)</li> </ol>
LED meter does not work	<ol style="list-style-type: none"> <li>1. Defective D303, D304, D305, D306</li> <li>2. Defective IC301</li> <li>3. Defective D111, D302, RV101, RV301</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace</li> <li>2. Replace</li> <li>3. Replace</li> </ol>
LED Display does not work	<ol style="list-style-type: none"> <li>1. Defective orange wire fuse</li> <li>2. Defective LED501, IC501, IC502</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace</li> <li>2. Replace</li> </ol>
P.A does not work	<ol style="list-style-type: none"> <li>1. Defective VR202, SW1</li> <li>2. Defective Q201, Q202, Q203, Q204, Q205, Q501, D504, IC501, IC502</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace</li> <li>2. Replace</li> </ol>
Channel selector does not work	Defective IC501, SW5, SW6, SW7, SW8	Replace
RF gain does not work	Defective VR101, D101, D102, D103, D105, D106	Replace
ANL does not work	<ol style="list-style-type: none"> <li>1. Defective SW2</li> <li>2. Defactive D110</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace</li> <li>2. Replace</li> </ol>
NB does not work	<ol style="list-style-type: none"> <li>1. Defective SW3</li> <li>2. Defective D112, D113, Q108, Q109, Q110, Q111</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace</li> <li>2. Replace</li> </ol>
CH9 does not work	<ol style="list-style-type: none"> <li>1. Defective SW4</li> <li>2. Defective D502, Q501, IC501, IC502</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace</li> <li>2. Replace</li> </ol>

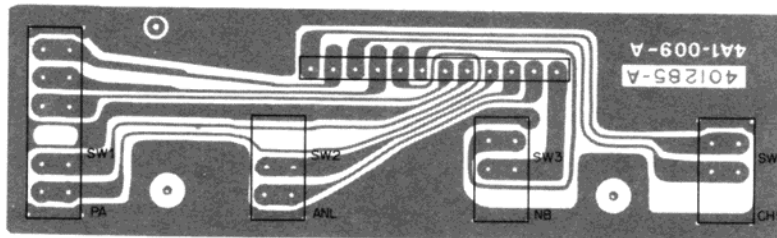
# PRINTED CIRCUIT BOARD (TOP/BOTTOM VIEWS)

## LED DISPLAY PCB

Top View

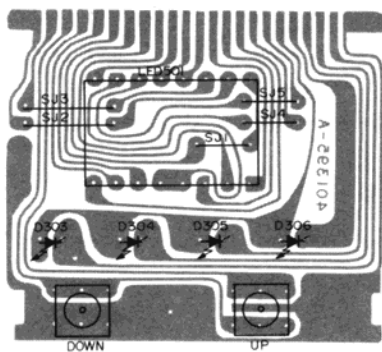


Bottom View

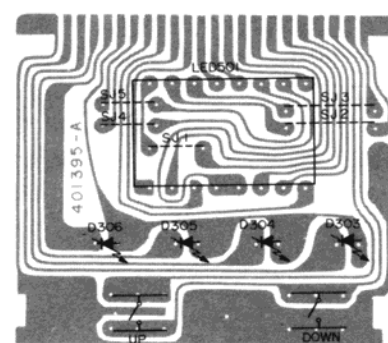


## SWITCH PCB

Top View

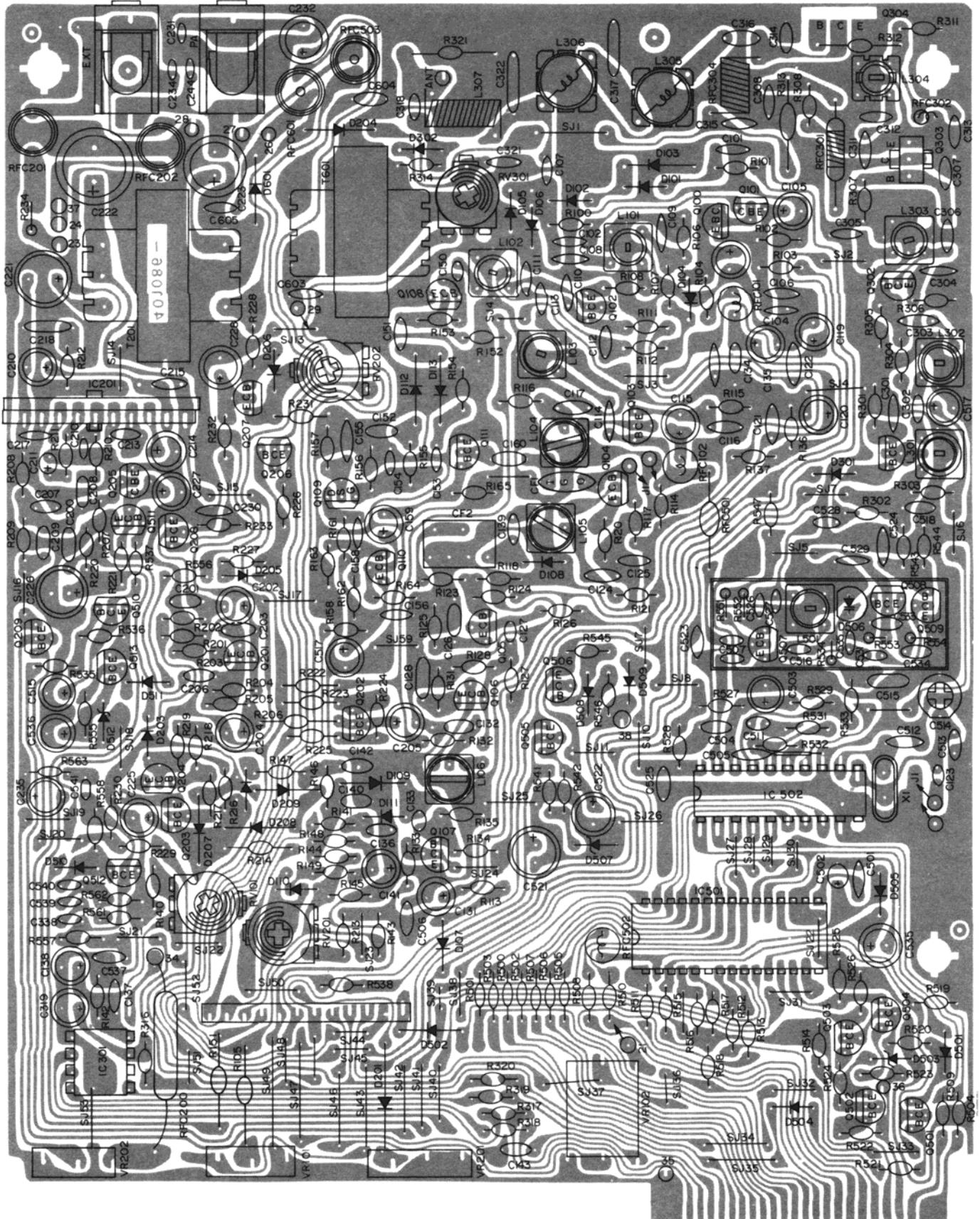


Bottom View

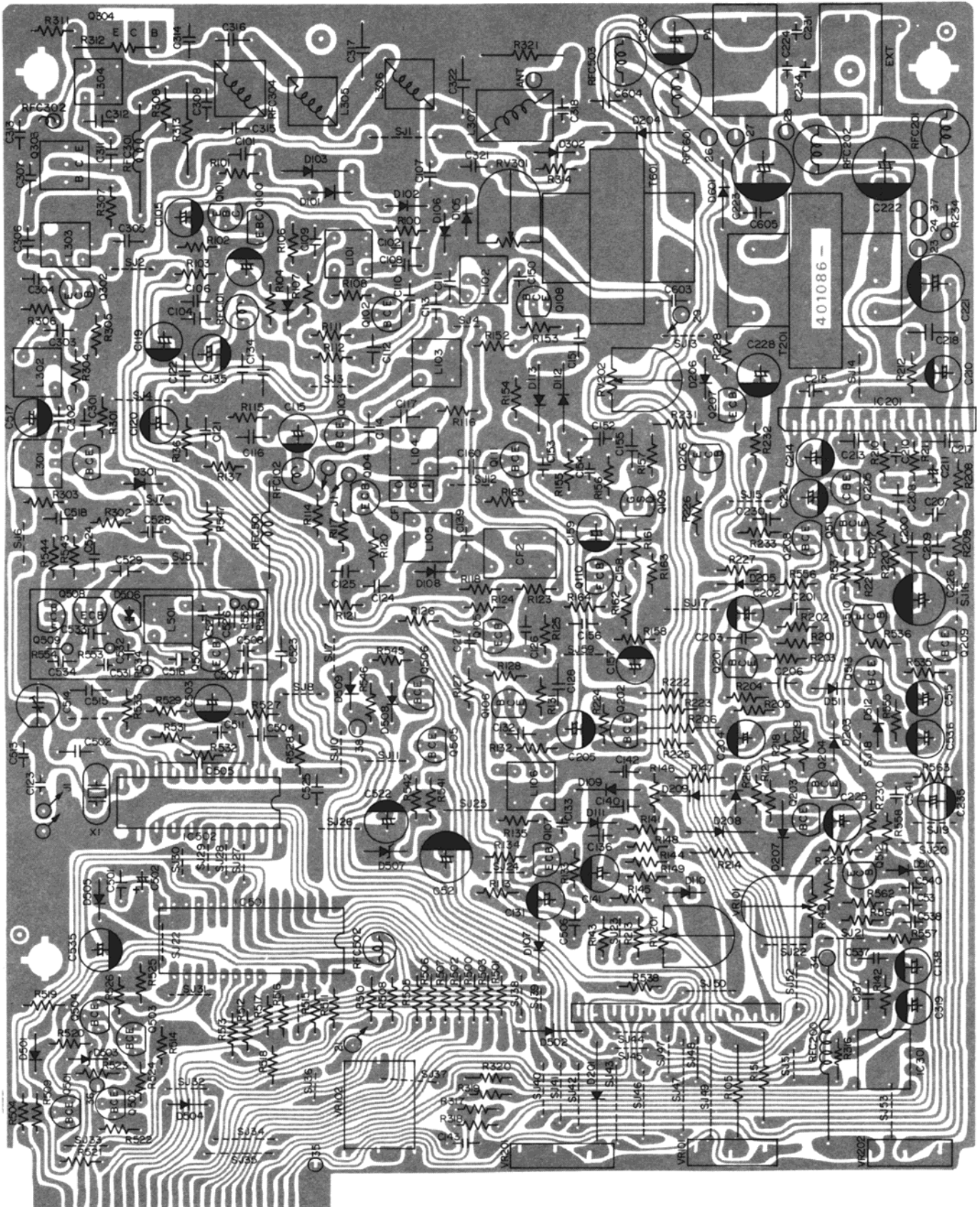


# Top View

# MAIN PCB



# Bottom View





# WIRING DIAGRAM

DC POWER CORD  
 BLK WIRE : GROUND  
 WHT WIRE : 1A FUSE  
 RED WIRE : 2A FUSE

