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Royce 1-624 Service Manual

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Royce

Model 1-624

SERVICE MANUAL

1-624 CIRCUIT DESCRIPTION

GENERAL

The 1-624 main chassis utilizes a double-sided P. C. board that comprises Royce's "semi-leadless" chassis. Main board circuitry consists of the r. f. and i. f. stages; audio, transmitter modulator and output stages. The diode matrix switching circuit board (D.M.C.) for the channel readout function, is stacked on the main chassis. The D.M.C. PCB also includes the crystal oscillator module which will be examined further, subsequently.

R. F. SECTION

Incoming r. f. signals from the antenna jack are applied through T101 to the base of the r. f. amplifier 2SC674 (Q101). The input is diode protected against transients. R. F. Gain control transistor Q110 acts as a variable resistance controlling the signal input level to Q101. The output of Q101 is applied to the base of the first mixer 2SC710 (Q102) as is the 37 MHz output from the crystal oscillator unit. The mixing process provides the first i. f. frequency output (10.7 MHz) which, after passing through the 10.7 MHz filter (F101), is applied to the input of the second mixer 2SC711 (Q103). The crystal oscillator unit also provides an output of 10.1 MHz to the input of Q103. The mixing process then completes conversion to the 455 KHz second i. f. which is then applied to the 455 KHz i. f. filters (F102, F103).

A high degree of selectivity is achieved through the use of the dual i. f. filters, hence no tuned circuits are utilized in the three-stage i. f. strip consisting of 2SC711 (Q104, Q105), 2SA562 (Q106). The output of the detector 1S188 (D102) is then applied through a switchable noise gate (ANL function) to provide audio output to the volume control.

AUDIO SECTION

The audio signal from the volume control is applied to the first audio preamp 2SC372 (Q109). Providing the squelch is "off," the output of Q109 is applied to a second audio preamp 2SC735 (Q301). The output of Q301 feeds the audio driver I. C. TA7062P (Q302) which in turn drives the primary of driver transformer ETT-1001 (T2). The output is a push-pull stage consisting of T2 secondary, the audio output (and modulator) transistors 2SD330 (Q303, Q304), and the modulation and output transformer ETT-20015 (T1). In the receive mode, the audio output secondary of T1 drives the speaker via the switching relay NS2-P-DC12V (RL 1-2).

MODULATOR SECTION

The modulator section begins at the microphone input jack. In the transmit mode (pin 3 grounded at mic jack), the switching relay will be activated. The audio input (pin 1 mic jack) is applied to the base of the mic preamp 2SC372 (Q205). The signal then follows a similar progression from Q301 on through to the output as outlined in the AUDIO SECTION, preceding with two exceptions. The audio output winding is disconnected, and the output of the modulation transformer is applied to the transmitter driver and output stages. A negative feedback signal is developed by the "automatic modulation control" circuit from the modulation stage output. Modulation peaks in the output cause A.M.C. amplifier 2SB561 (Q204) to conduct, thus limiting the audio input level. Threshold of the circuit is controlled by the 10 K ohm mini-potentiometer VR201.

TRANSMITTER SECTION

The transmitter section is conventional and straightforward in design. The crystal oscillator unit provides a 27 MHz signal to the input of the predriver 2SC710 (Q201). Class A operation is employed in the Q201 drives the r. f. driver 2SC1018 (Q202) which in turn drives the r. f. final 2SC756 (Q203). Both the driver and final are operated class B. The output circuitry comprises a pi-loading, and low pass filter network (54 MHz). Associated circuitry consists of a tap on the r. f. output, rectified by D201 (1S188) to provide a signal for the r. f. meter, and the transmit-modulation indicator amplifier 2SC735 (Q206). A signal sampling circuit (D601, D602) also provide signal sources for the calibration and SWR meters.

DIODE MATRIX CIRCUIT

The D.M.C. unit performs the singular function of providing the necessary switching to display the channel position on the LED readout. Associated circuitry consists of a voltage regulator 2SD313 (Q401) and brightness switch. For additional particulars on the D.M.C. unit, refer to the board layout and pin functional descriptions.

SQUELCH — A.G.C.

The A.G.C. amplifier 2SC372 (Q108) operates on signals supplied by the detector output. The A.G.C. output is applied to the base of Q102 and Q104. The A.G.C. output also serves as a source for the squelch circuit transistor 2SC372 (Q107) which, when operational, biases Q109 off.

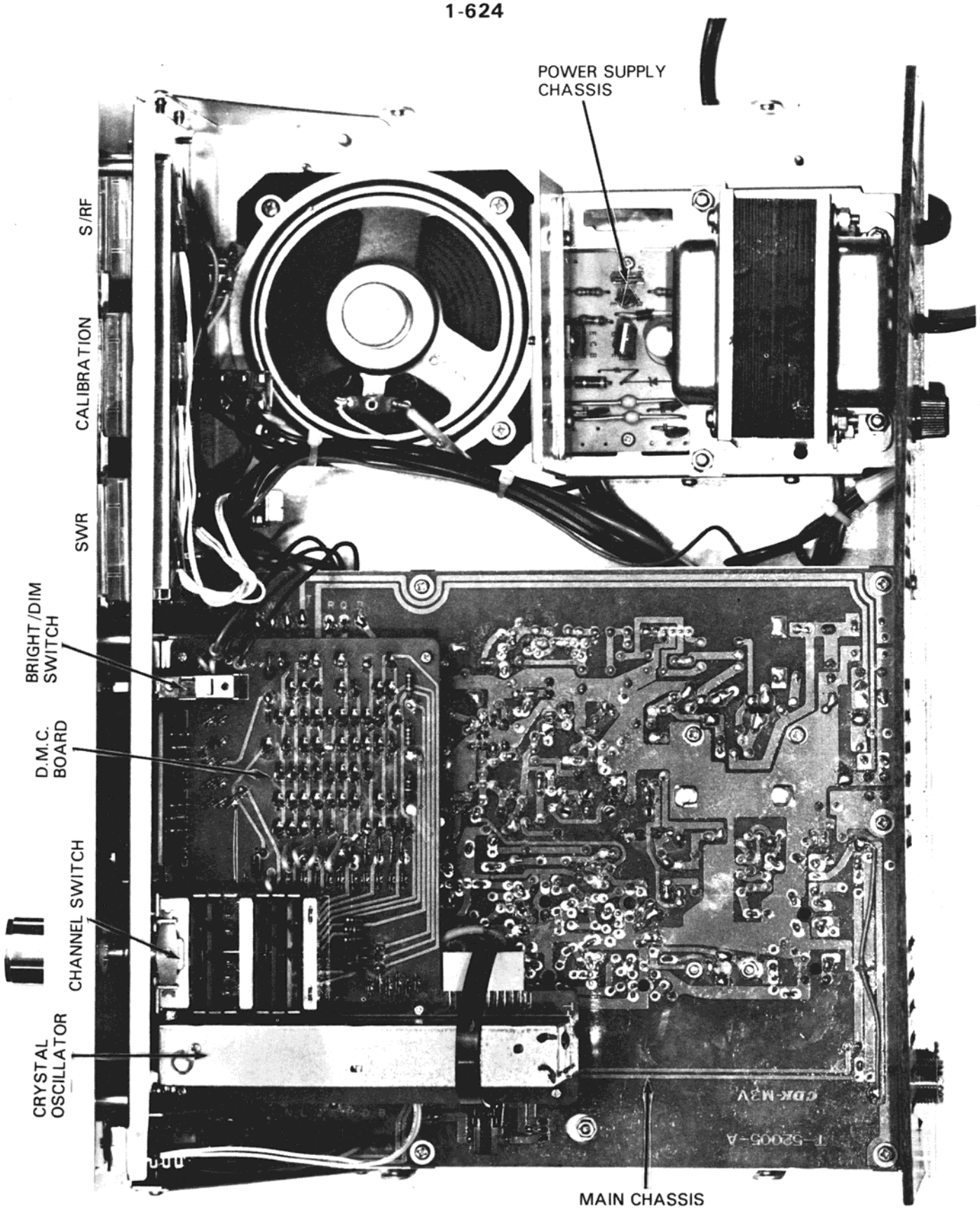

POWER SUPPLY CHASSIS
S/RF
CALIBRATION
SWR
BRIGHT/DIM SWITCH
D.M.C. BOARD
CHANNEL SWITCH
CRYSTAL OSCILLATOR
MAIN CHASSIS

FIG. 1

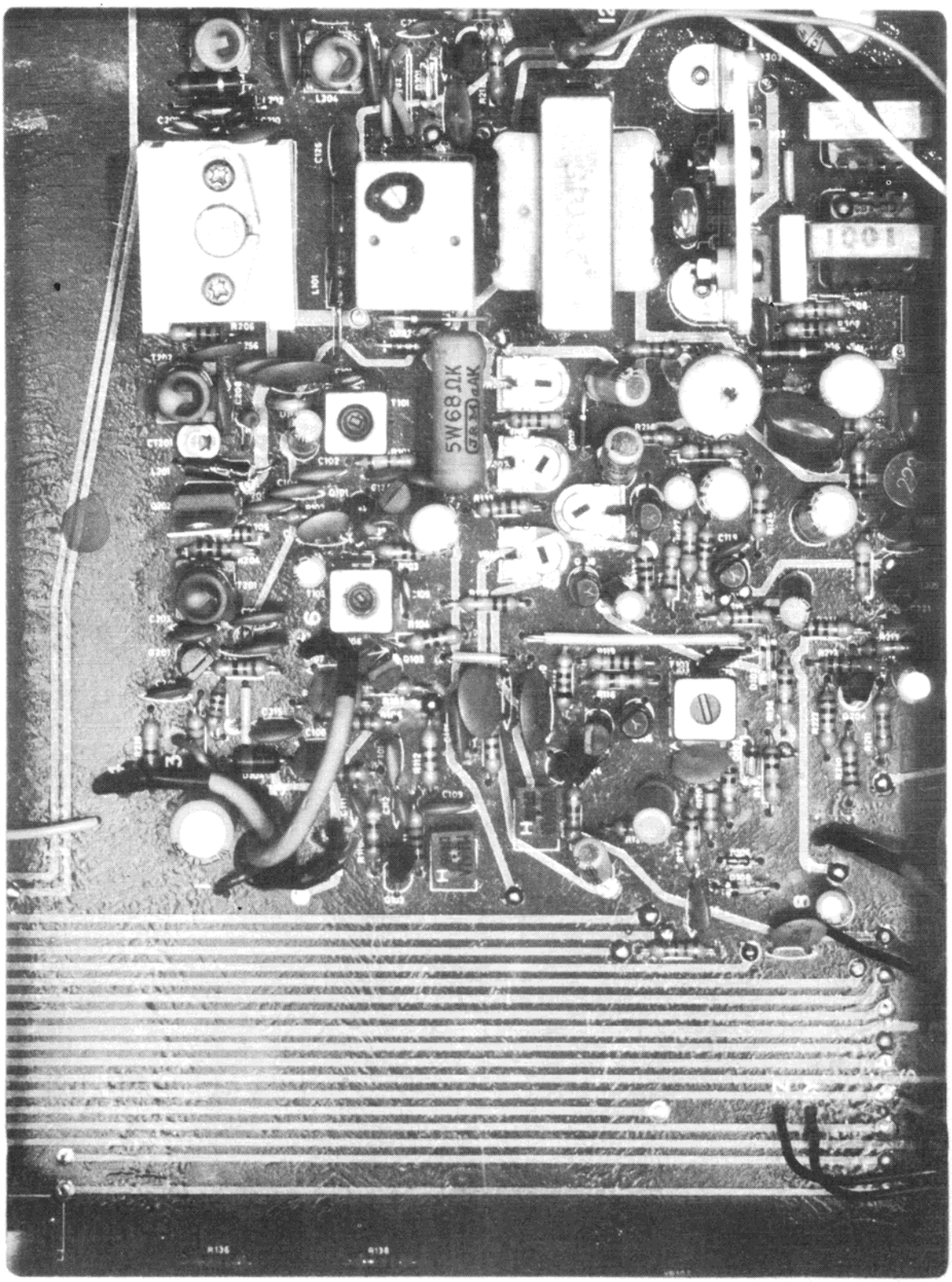
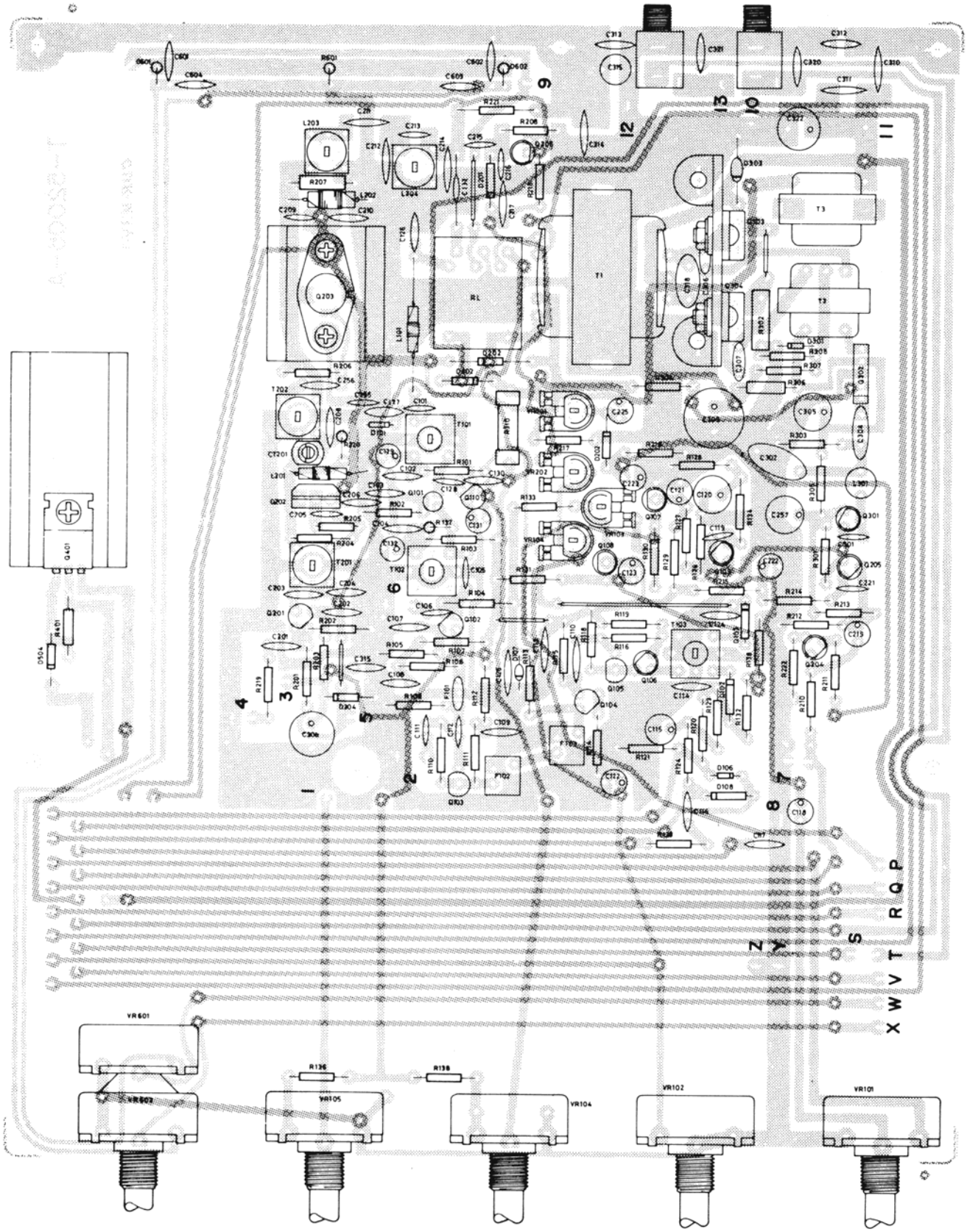
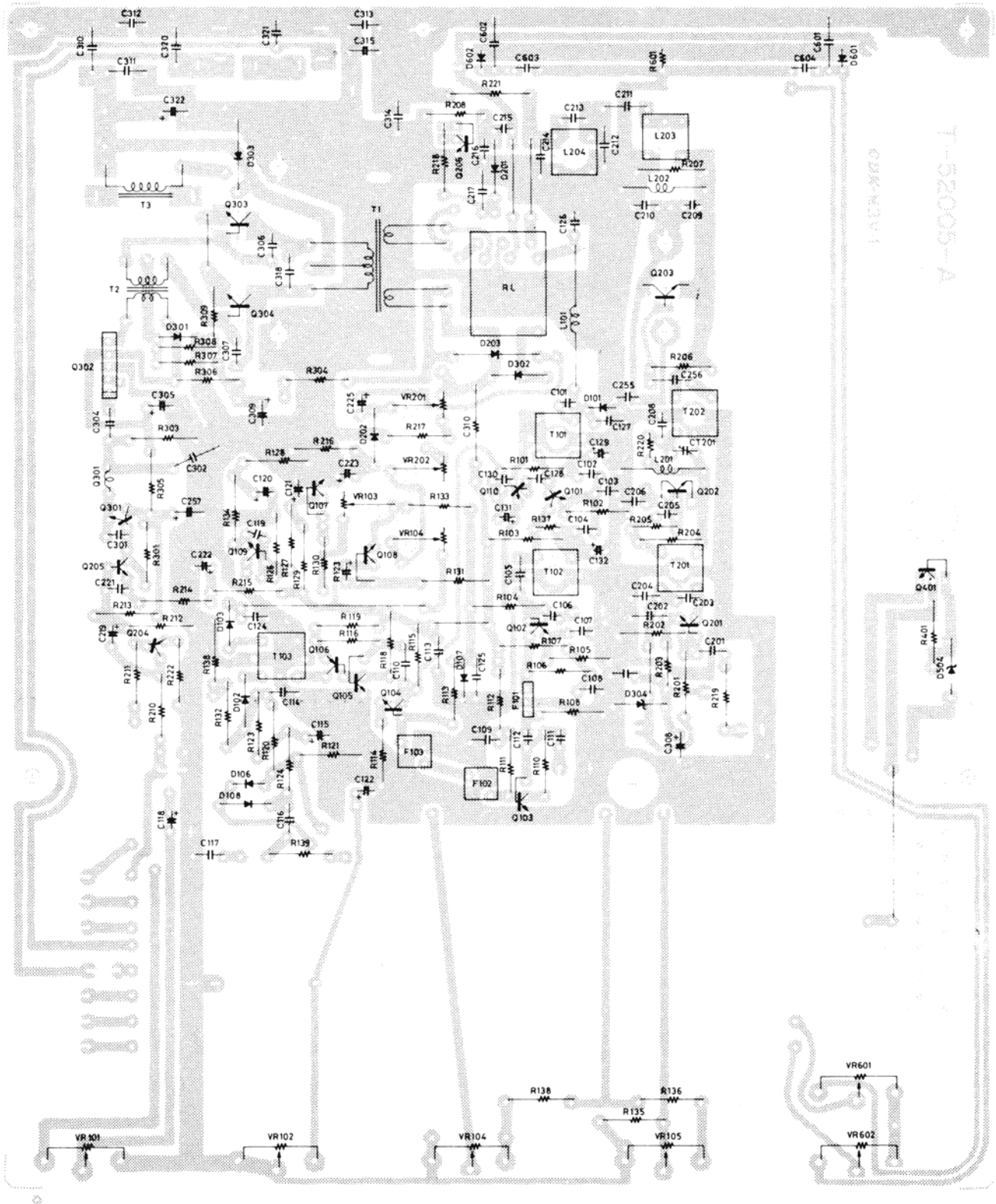


FIG 2

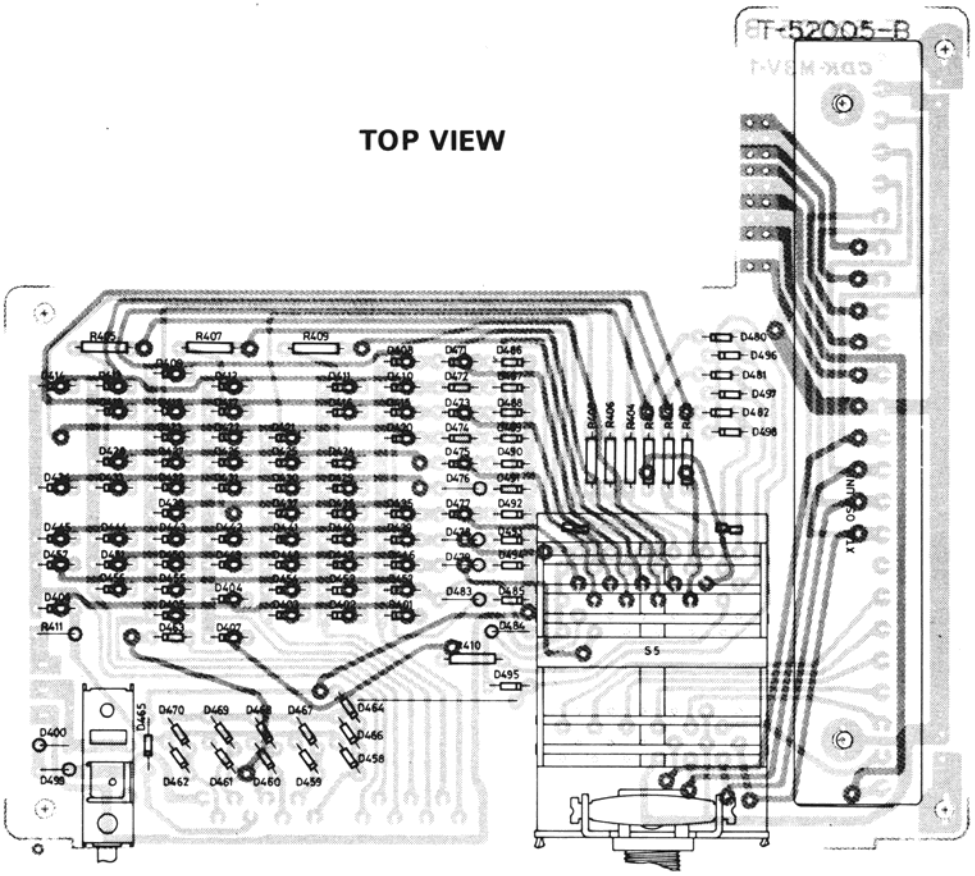
TOP VIEW



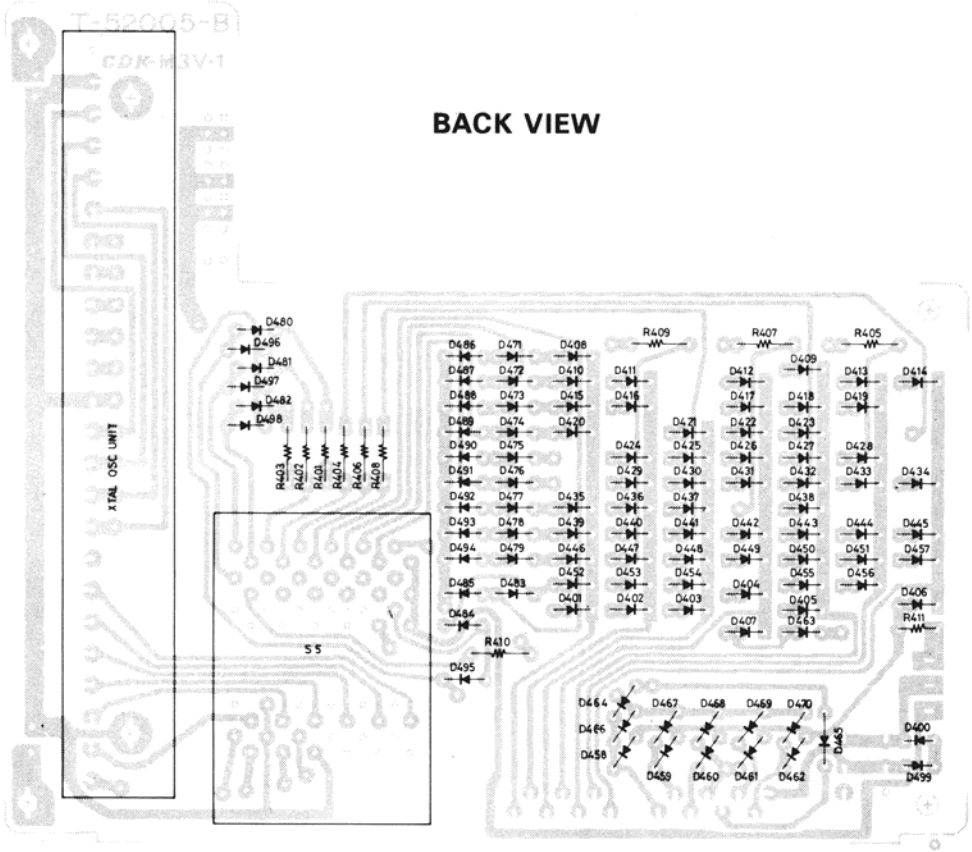
BACK VIEW


T-5205-A
C312
C313
C310
C311
C315
C321
C322
C602
C603
C604
C601
D602
D601
R601
R221
R208
C214
C215
C213
C211
L203
L204
L202
R207
C210
C209
D303
T3
Q303
T1
C306
C318
C126
RL
T2
Q304
Q203
R309
D301
R308
R307
C307
L101
D203
D302
Q302
R306
R304
R206
C256
C305
C225
VR201
C101
D101
C255
C309
C202
R217
C310
T202
C304
R303
R216
C128
C220
CT201
C302
R128
C223
VR202
R101
C129
C102
L201
Q301
R305
C120
C124
C130
Q110
Q101
C103
C206
Q202
C257
VR103
R133
C131
R102
C205
Q301
C119
R137
C104
R205
C301
Q109
Q107
R103
R204
VR104
C222
R134
R127
R130
R123
Q108
C132
T201
Q205
R301
C105
T102
C221
R214
R215
R131
C204
Q401
R213
C106
C203
R212
C124
R119
R104
C107
C202
C128
Q204
R116
Q102
Q201
R107
R202
R401
D103
R105
C201
T103
Q106
R118
C110
R115
C113
C107
C125
R106
R203
R211
R222
C108
D504
Q105
Q104
R201
R210
C116
R113
R112
F101
D304
R219
R108
D102
R132
C115
C109
C112
C111
R123
R120
R121
R114
F103
C308
D106
R126
R111
R110
C122
F102
D108
Q103
C118
C116
C117
R139
VR601
R138
R136
R135
VR101
VR102
VR104
VR105
VR602

TOP VIEW

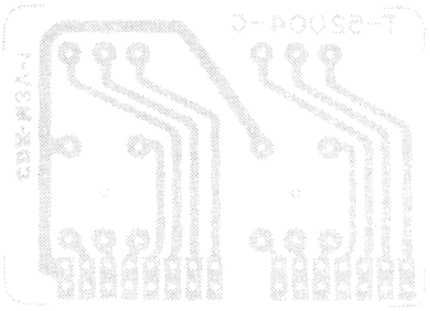


BACK VIEW

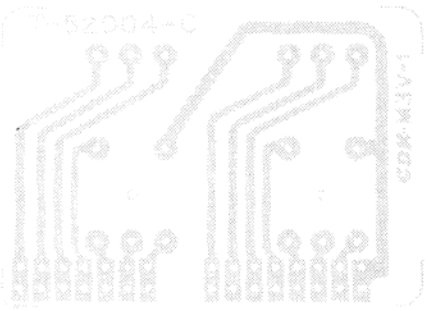


DISPLAY BOARD

FRONT VIEW

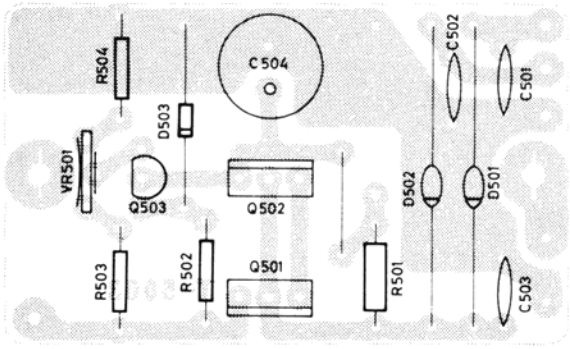


BACK VIEW

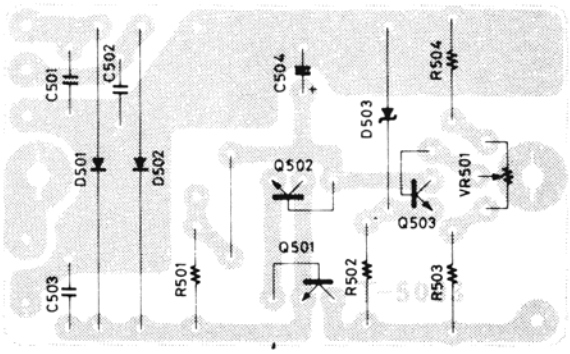


POWER SUPPLY PCB

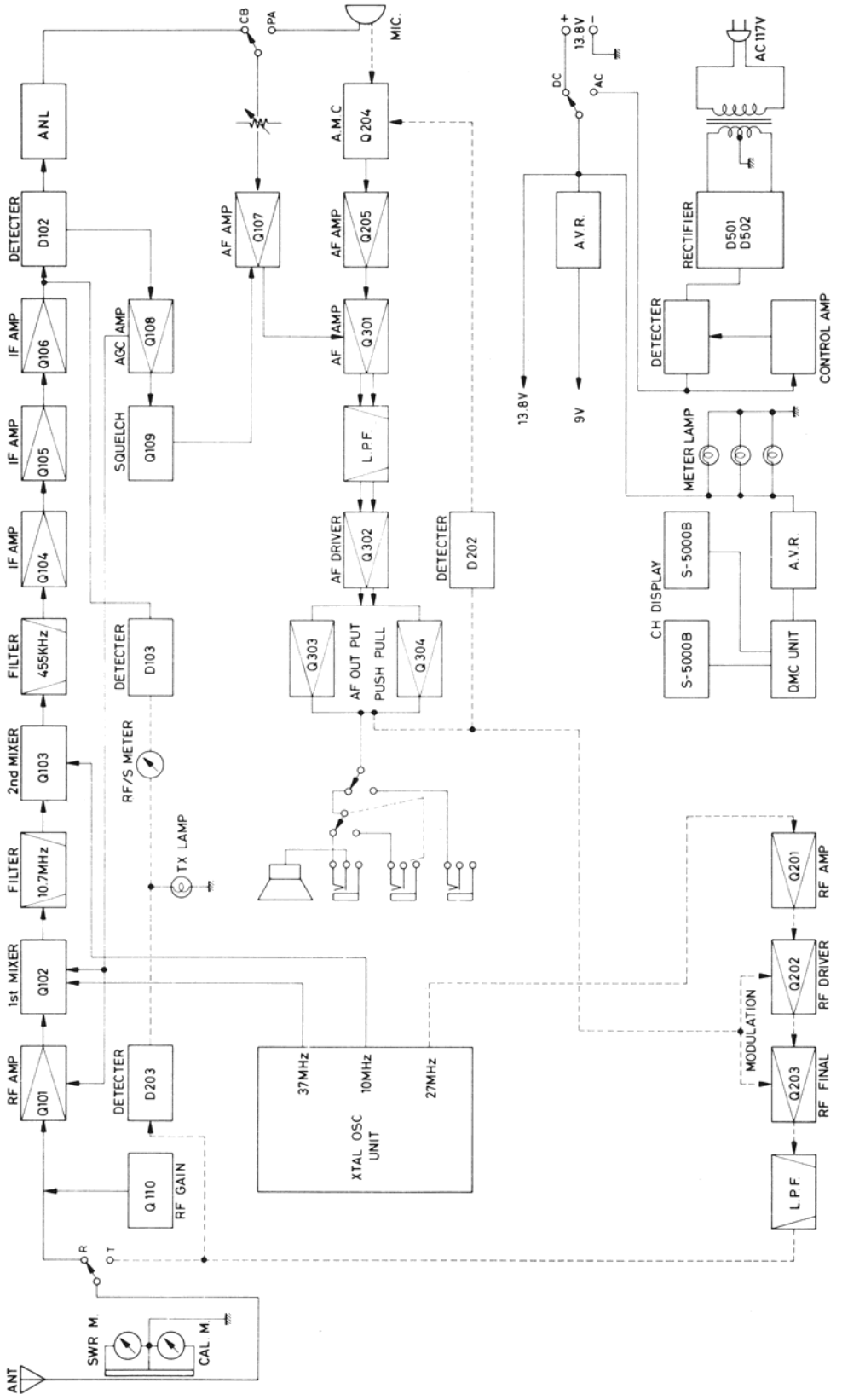
TOP VIEW



BACK VIEW



BLOCK DIAGRAM



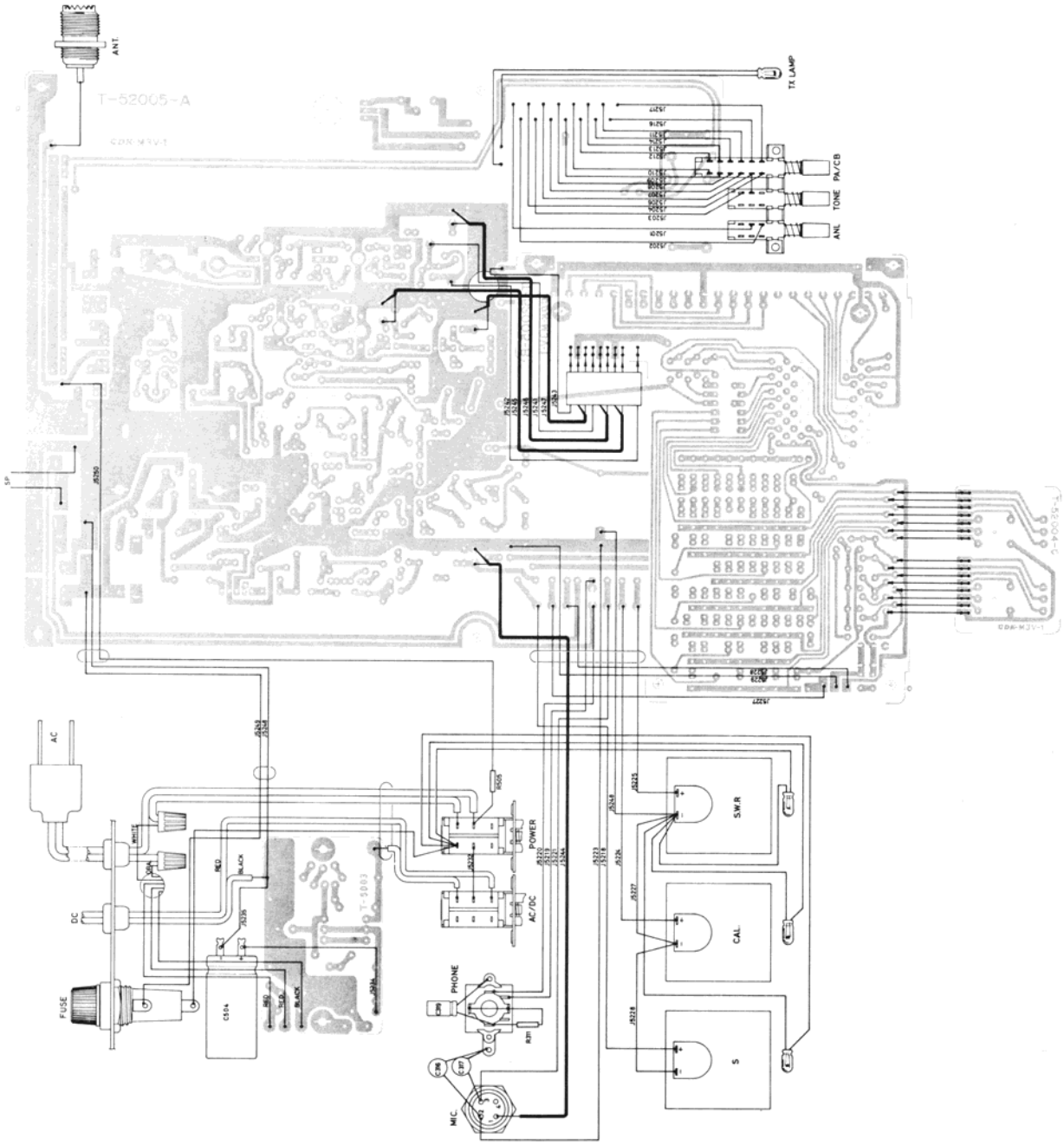
1-624 Voltage Chart

	RX			TX		
	Vb	Vc	Ve	Vb	Vc	Ve
Q101	2.6	7.6	1.8			
Q102	1.3	8.7	.9			
Q103	.7	4.2	0			
Q104	1.3	2.8	.6			
Q105	.7	4.8	0			
Q106	4.8	0	5.4			
Q107	.7	.1	0 (Squelch On)			
	0	7.4	0 (No Squelch)			
Q108	2.7	9.3	2.0			
Q109	0	8.8	0 (Squelch On)			
	1.1	6.0	.5 (No Squelch)	1.2	5.0	1.2
Q110	.1	0	0 (r.f. gain max.)			
	.8	.1	0 (r.f. gain min.)			
Q201	2.2	13.6	9.4	1.7	13.6	1.4
Q202					12	
Q203					12	
Q204						0
Q205	4.2	6.0	9.3	4.3	4.5	3.6
Q206	.1	13.6	0	.9	3.6	0
Q301	6.0	10.2	5.3	4.5	10.4	3.9
Q303	.7	13.7	.1	.7	13.7	.1
Q304	.7	13.7	.1	.7	13.7	.1
Q501	14.5	18.6	13.8			
Q502	15.1	18.6	14.5			
Q503	8.3	15.1	7.7			
Q504	7.0	13.8	7.6			

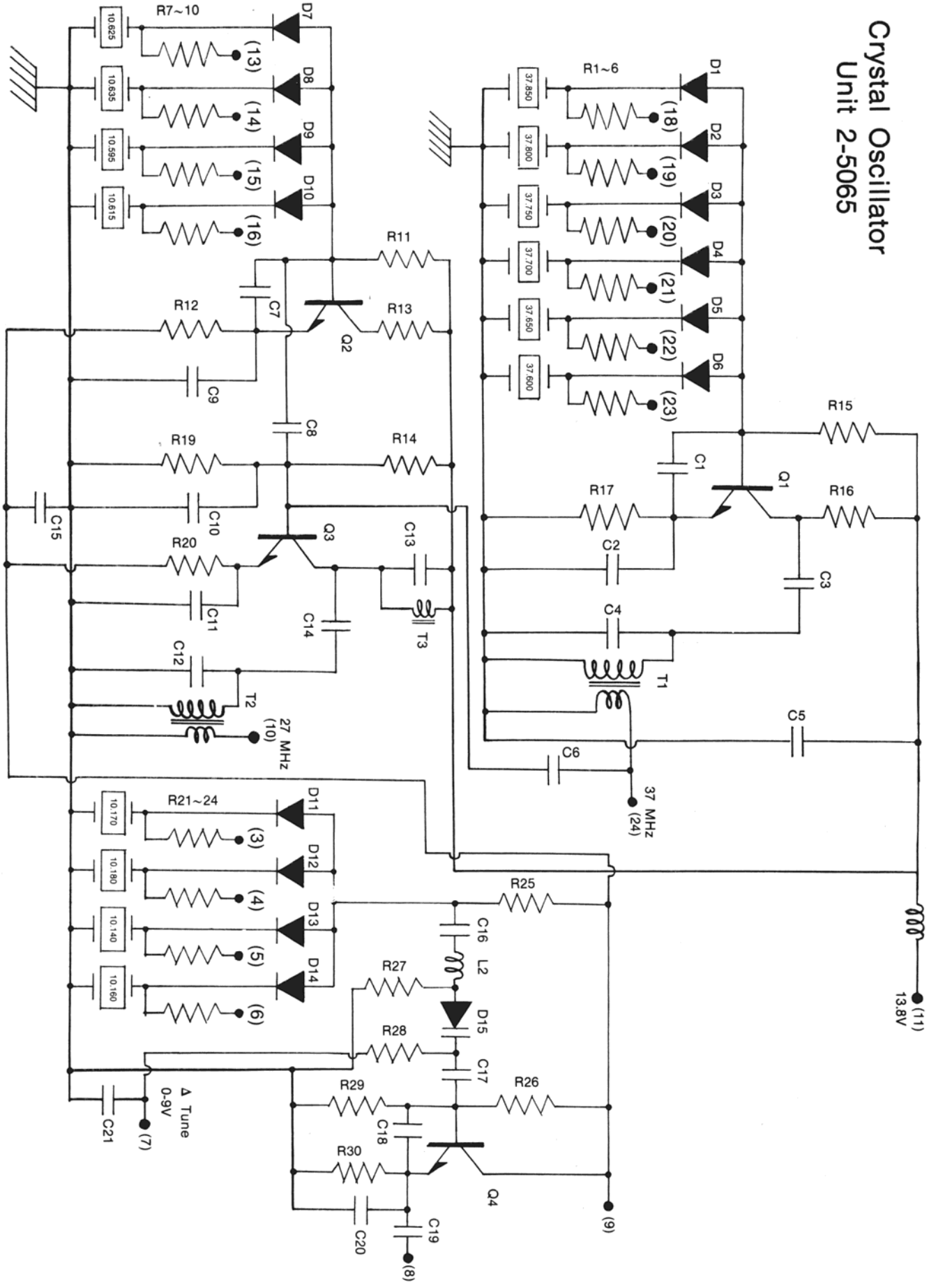
Q302

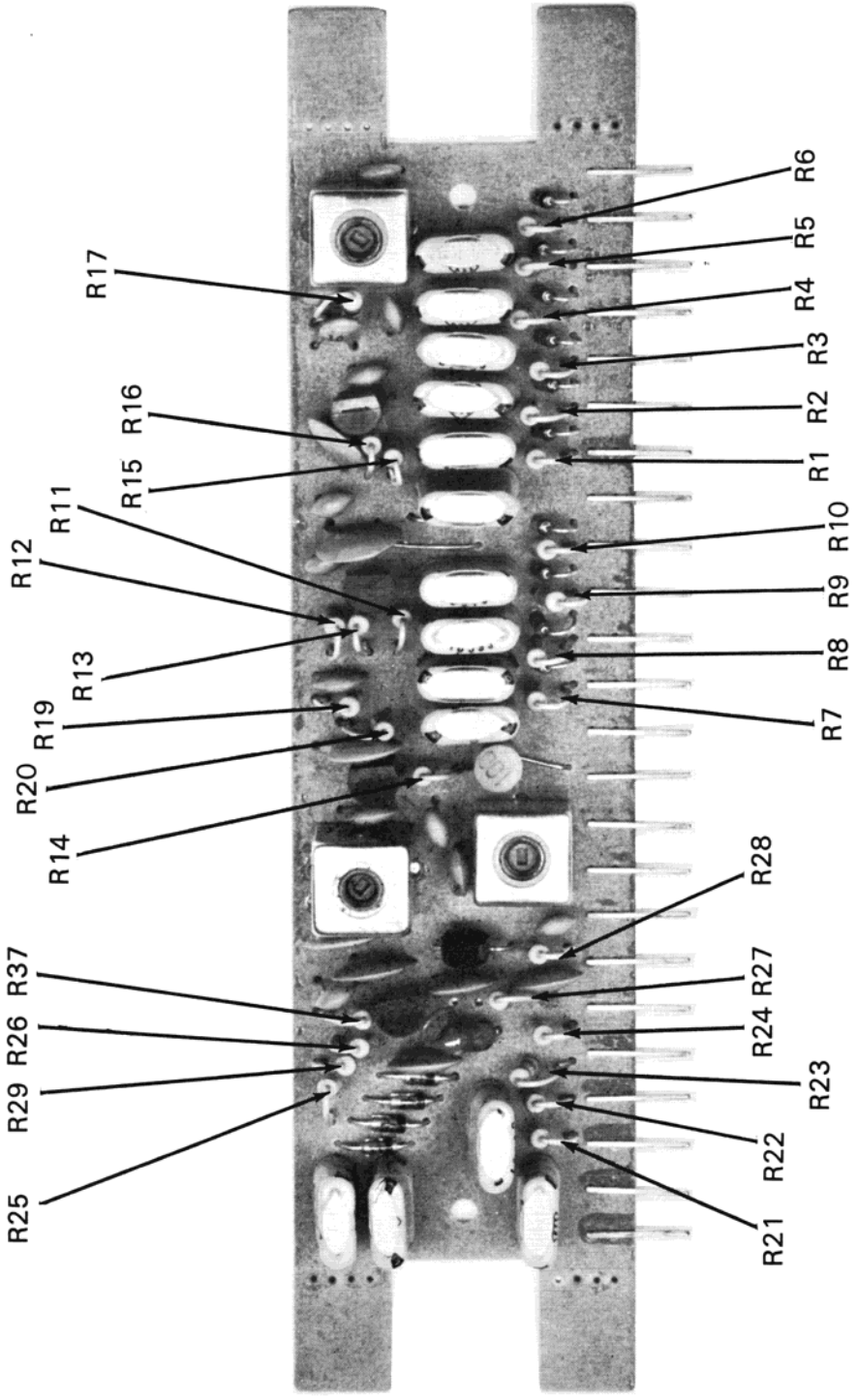
Mode	1	2	3	4	5
RX	.8	.2	0	12.2	11.8
TX	.8	.2	0	12.2	11.8

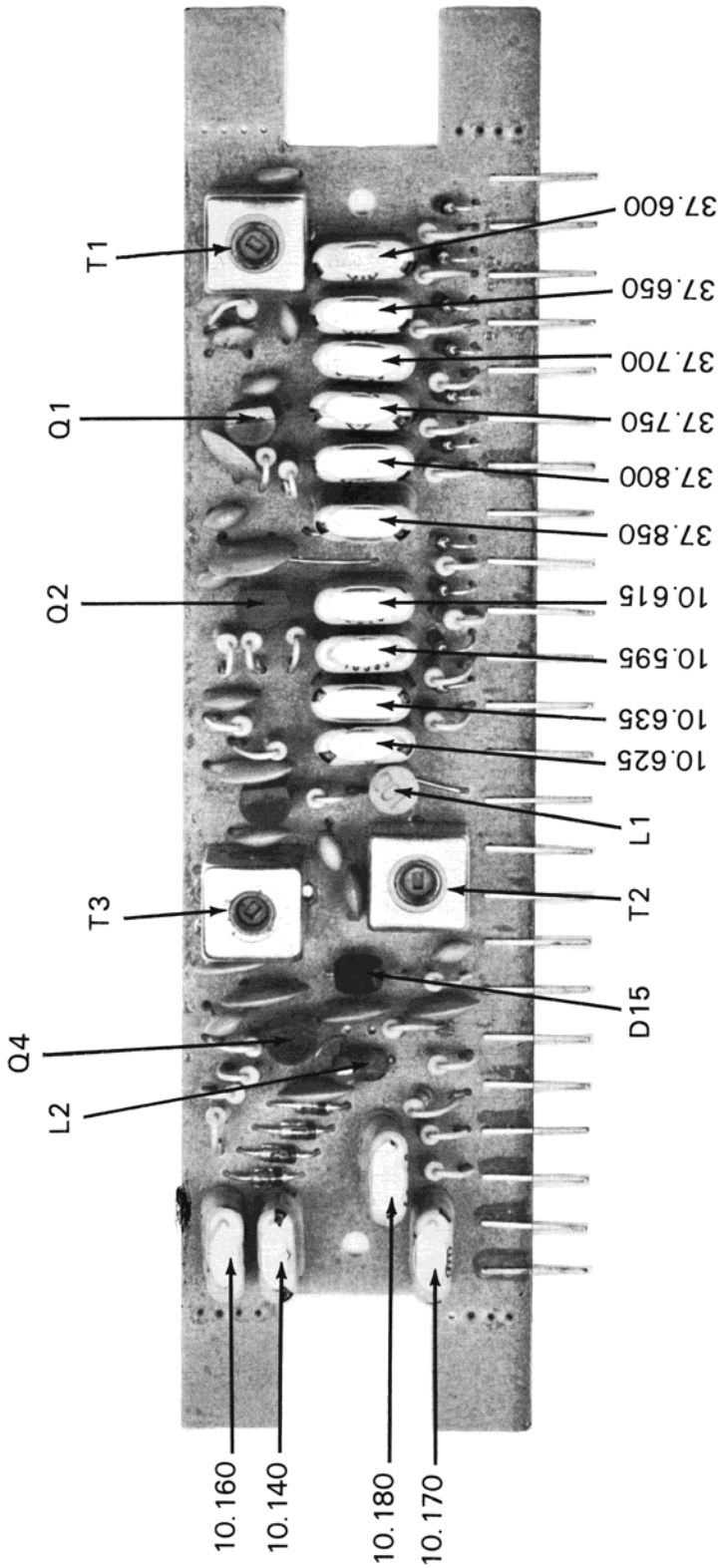
WIRING DIAGRAM

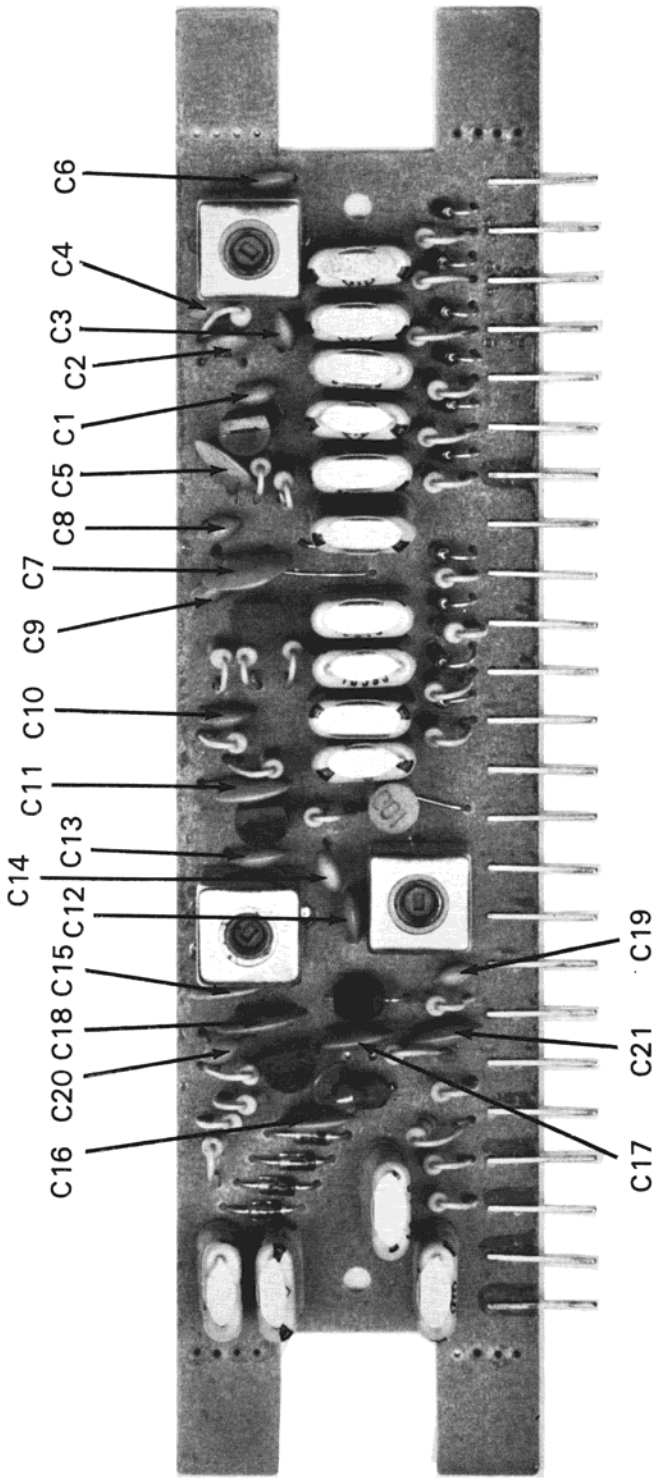


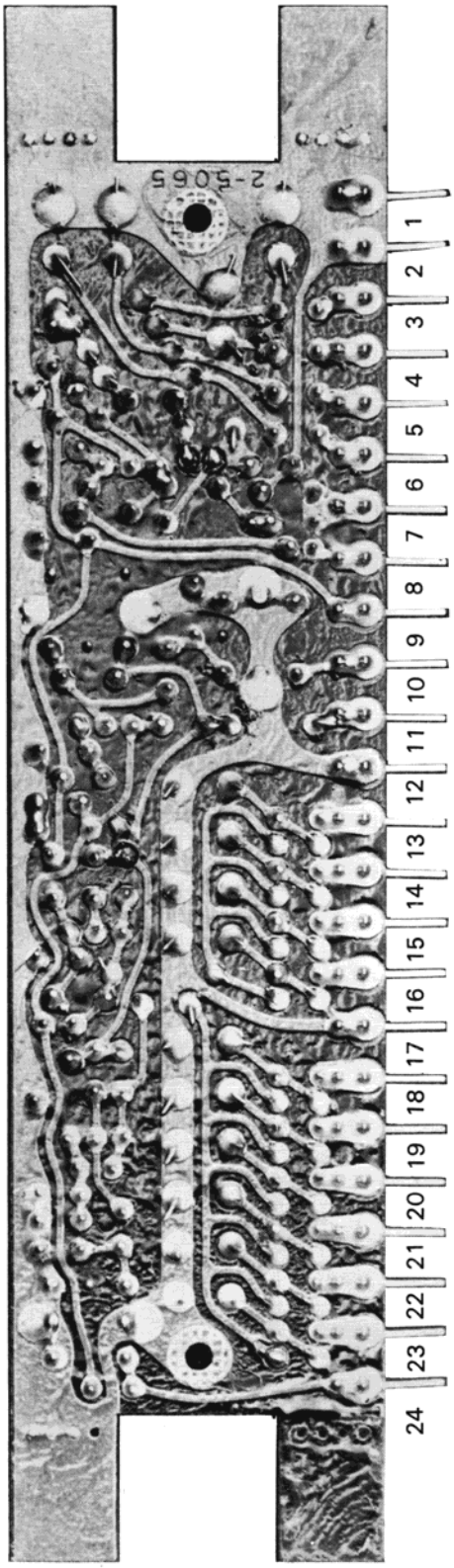
Crystal Oscillator
Unit 2-5065




R17
R16
R15
R12
R11
R13
R19
R20
R14
R25
R29
R26
R37
R21
R22
R23
R24
R27
R28
R7
R8
R9
R10
R1
R2
R3
R4
R5
R6


37.600
37.650
37.700
37.750
37.800
37.850
10.615
10.595
10.635
10.625
L1
T2
D15
T1
Q1
Q2
T3
Q4
L2
10.160
10.140
10.180
10.170


C6
C4
C3
C2
C1
C5
C8
C7
C9
C10
C11
C13
C14
C12
C15
C18
C20
C16
C19
C21
C17


2-5065
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22
23
24

CRYSTAL FREQUENCY CHART

(A) Group 6 pcs.	(B) Group 4 pcs. (Transmitting)	(C) Group 4 pcs. (Receiving)
X^1 37.60 MHz	X^7 10.635 MHz	X^{11} 10.18 MHz
X^2 37.65 MHz	X^8 10.625 MHz	X^{12} 10.17 MHz
X^3 37.70 MHz	X^9 10.615 MHz	X^{13} 10.16 MHz
X^4 37.75 MHz	X^{10} 10.595 MHz	X^{14} 10.14 MHz
X^5 37.80 MHz		
X^6 37.85 MHz		

CHANNEL	FREQUENCY (MHz)	COMBINATION (Transmit)	COMBINATION (Receive)
1.	26.965	$X^1 - X^7$	$X^1 - X^{11}$
2.	26.975	$X^1 - X^8$	$X^1 - X^{12}$
3.	26.985	$X^1 - X^9$	$X^1 - X^{13}$
4.	27.005	$X^1 - X^{10}$	$X^1 - X^{14}$
5.	27.015	$X^2 - X^7$	$X^2 - X^{11}$
6.	27.025	$X^2 - X^8$	$X^2 - X^{12}$
7.	27.035	$X^2 - X^9$	$X^2 - X^{13}$
8.	27.055	$X^2 - X^{10}$	$X^2 - X^{14}$
9.	27.065	$X^3 - X^7$	$X^3 - X^{11}$
10.	27.075	$X^3 - X^8$	$X^3 - X^{12}$
11.	27.085	$X^3 - X^9$	$X^3 - X^{13}$
12.	27.105	$X^3 - X^{10}$	$X^3 - X^{14}$
13.	27.115	$X^4 - X^7$	$X^4 - X^{11}$
14.	27.125	$X^4 - X^8$	$X^4 - X^{12}$
15.	27.135	$X^4 - X^9$	$X^4 - X^{13}$
16.	27.155	$X^4 - X^{10}$	$X^4 - X^{14}$
17.	27.165	$X^5 - X^7$	$X^5 - X^{11}$
18.	27.175	$X^5 - X^8$	$X^5 - X^{12}$
19.	27.185	$X^5 - X^9$	$X^5 - X^{13}$
20.	27.205	$X^5 - X^{10}$	$X^5 - X^{14}$
21.	27.215	$X^6 - X^7$	$X^6 - X^{11}$
22.	27.225	$X^6 - X^8$	$X^6 - X^{12}$
23.	27.255	$X^6 - X^{10}$	$X^6 - X^{14}$

I-624 Alignment Instruction

RECEIVER

A. Inject at the ant. jack a 27.115MHz signal (±.002% ;30% modulation at 1KHz).
B. Connect an audio voltmeter and oscilloscope across on 8 ohm load and plug into external speaker jack.

Test Equipment	Test Point	Adjust	Remarks
1. RF signal generator (low range to avoid audio saturation)	Inject at ant. jack	Channel sel to 13	
		T-101, T-102, T-103	Max. output with vol. control at max, squelch control at min. output should be more than 500mw (2.0 v/8 ohm) with gen. voltage at 1uV; S & N/N=more than 10dB on all channels

AGC RESPONSE

Set the output voltage of a signal generator at 50000uV and adjust the volume control so that the voltmeter output is 500mW (2.0v/8 ohms). Then, lower the output voltage of the generator so that the voltmeter output is 10dB down. The output voltage of the signal generator should be under 5uV at this time.

SQUELCH

Set squelch control to maximum. Set signal generator to 500uV, and adjust VR103 so that squelch opens at 500uV signal level.

S-METER ADJUSTMENT

A. Set RF signal generator to 100uV. Adjust VR104 until meter indicates "S-9".

DELTA TUNE

A. Set the output voltage of a signal generator at 1uV.
B. Set the Delta Tune control at the center and the squclch control at minimum.
C. Set the Volume Control so that 500mW may be attained on the voltmeter output. Then, with the Delta Tune control at the "+" side, vary the frequencies of the signal generator until the maximum voltmeter output is attained. Read the frequency variance of the signal generator. Do the same thing for the "−" side. Ascertain that the frequency variation is within ± 1KHz to 2KHz.

AUDIO POWER CHECK

With a generator output of 1mV and squelch control at minimum, audio output should be more than 4W(5.7v/8 ohm) at maximum position of volume control.

TRANSMITTER

A. Power Supply —13.8VDC.

B. Use a suitable power meter, non-inductive dummy load and oscilloscope connected to antenna jack.

Test Equipment	Test Point	Adjust	Remarks
1. Power Meter	antenna jack	T-201, T-202, L-203, L-204	Adjust for maximum output power.
2. Freq. Counter	across dummy load	———	Check all channels ± 800Hz
3. A.F. Oscillator with AF voltmeter in shunt (1KHz 10mV)	Inject at mic input	VR-201	—90% modulation on oscilloscope
		———	Reduce AF oscillator output to 5mV; modulation ≥ 50%

C. With 0% modulation and carrier power 3.5 to 4 Watts, adjust VR202 until meter reads between S9 and S10.

VOLTAGE ADJUSTMENT OF AC POWER SECTION

Set the output voltage of AC power section at 13.8 volts by adjusting VR501.

SPECIFICATIONS 1-624

GENERAL

1.	Semiconductor	: 25 Transistors, 133 Diodes and 1 IC
2.	Frequency Range	: 26.965 MHz – 27.255 MHz
3.	Mode of Operation	: AM
4.	Controls	: Calibration Control
		: Fine Tune Control
		: RF Gain Control
		: Squelch Control
		: Volume Control
5.	Switches	: Channel Selector Switch
		: ANL-OFF Push Switch
		: Tone Hi-Lo Push Switch
		: PA-CB Push Switch
		: AC-DC Push Switch
		: Power ON-OFF Push Switch
		: Bright-Dim Push Switch
6.	Connectors and Jacks	

Front	Rear
: Microphone Connector	: Antenna Connector
: Headphone Jack	: EXT. Speaker Jack
	: PA Speaker Jack
	: Fuse-3A
	: DC Cord
	: AC Cord

7.	Indicators	: Digital Channel Indicator
		: TX Lamp
		: SIGNAL/TRANSMIT POWER METER
		: SWR Meter
		: Calibration Meter
8.	Speaker	: 3-1/2 inches, 8 ohms
9.	Microphone	: Dynamic Microphone, 500 ohms
10.	Power Supply	: 13.8 VDC Positive or Negative ground, 117 VAC
11.	Dimensions	: 14-1/16(W) x 5-7/16(H) x 10-5/8(D)
12.	Weight	: 13 Lbs. 8 Ozs.

RECEIVER

1.	Sensitivity at S/N 10 dB	: 0.5uV
2.	Selectivity	: 5 KHz
3.	AGC Figure of Range	: 80 dB
4.	Squelch Range	: 0.5uV – 500uV
5.	Audio Output Power	: 4 watts
6.	Distortion Input 1000uV	: 6%
7.	Audio Frequency Response	: 400 – 2000Hz
8.	Spurious Response	: More than 45 dB spurious signal is required to produce the same amount of audio output as the desired receive signal.
9.	IF Frequency	: 1st . . . 10.595 . . . 10.635 MHz – 2nd . . . 455KHz
10.	Current Drain No Audio	: 800 mA

TRANSMITTER

1.	RF Output Power	: 4 watts
2.	Modulation Capability	: Up to 98%
3.	Harmonic Suppression	: More than 50 dB
4.	Current Drain	: 1500 mA

1-624 PARTS LIST

REF. #	DESCRIPTION	PART #
	SEMICONDUCTORS	Where Part Numbers not given order by MODEL number and DESCRIPTION.
Q101	2SC674 transistor	
Q102	2SC710 transistor	
Q103	2SC711 transistor	
Q104	2SC711 transistor	
Q105	2SC711 transistor	
Q106	2SA562 transistor	
Q107	2SC372 transistor	
Q108	2SC372 transistor	
Q109	2SC372 transistor	
Q110	2SC710 transistor	
Q201	2SC710 transistor	
Q202	2SC101B transistor	
Q203	2SC756 transistor	
Q204	2SB561 transistor	
Q205	2SC372 transistor	
Q206	2SC735 transistor	
Q301	2SC735 transistor	
Q302	TA7062P I.C.	
Q303, 304	2SD330 transistor	
Q401	2SD313 transistor	
Q501	2SD313 transistor	
Q502	2SD330 transistor	
Q503	2SC711 transistor	
D101	10D-1 diode	
D102	1S188 diode	
D103	1S188 diode	
D106	1S2075K diode	
D107	HV-46 diode	
D108	1S188 diode	
D201	1S188 diode	
D202	10D-1 diode	
D203	10D-1 diode	
D301	SV-9 diode	
D302	10D-1 diode	
D303	U05-B diode	
D304	EQB01-09 diode (zener)	
D501, 502	U05-B diode	
D503	EQA01-08R diode (zener)	
D504	EQA01-08R diode (zener)	
	COILS — INDUCTORS	
L101	r.f. coil (49169)	2-0162
L201	r.f. coil (49170)	2-0166
L202	r.f. coil (4056)	2-0169
L203	r.f. coil (49168)	2-0163
L204	r.f. coil (49166)	2-0164
L301	coil (LF5-223K)	2-0165
T101	r.f. transformer (15089)	2-0049
T102	r.f. transformer (15061)	2-0045
T103	r.f. transformer (15090)	2-0050
T201	r.f. transformer (20105)	2-0062
T202	r.f. transformer (49167)	2-0161
T1	modulation transformer (20015)	2-0156
T2	driver transformer (1001)	2-0033
T3	choke transformer (1002)	2-0030
T501	power transformer (20014)	2-0059

REF. #	DESCRIPTION	PART #
	CASE PARTS	
	main cabinet (wood)	
	front panel (aluminum)	
	decoration plate (woodgrain)	
	decoration plate (plastic)	
	back cover	
	bottom chassis cover	
	cabinet feet	
	channel knob	
	volume knob	
	power on-off knob (round)	
	ANL knob (square)	
	bright-dim push knob (round)	
	CONTROLS	
VR101	volume control (50K)	
VR102	squelch control (10K)	
VR103	semi-fixed resistor (5K)	
VR104, 105	Δtune, R.F. Gain control (10K)	
VR104	semi-fixed resistor (20K)	
VR201	semi-fixed resistor (10K)	
VR202	semi-fixed resistor (50K)	
VR501	semi-fixed resistor (200Ω)	
VR601, 602	calibration control (5K)	
	ANL/TONE switch	
	PA-CB switch	
	Bright-dim switch	
	DC-AC/POWER switch	
	channel switch	
	MISCELLANEOUS	
	relay (NS2-P-DC12V)	
	455 KHz i.f. filter (CFU-455H)	
	10.7 MHz i.f. filter (SFE 10.7 MA)	
	S/RF meter	
	calibration meter	
	SNR meter	
	meter-tx lamp	
	headphone jack	
	mic jack	5-501
	antenna jack	5-502
	ext. spkr./PA jack	5-503
	fuse socket	
	a.c. cord	
	d.c. cord	
	heatsink 2SC756)	
	heatsink (2SD330 audio)	
	heatsink (2SD313 power supply)	
	speaker	
	Stanley seven-segment readout	
	crystal oscillator unit	
	RESISTORS — CAPACITORS	
	Refer to schematic for specific values	