

PHOTOFACT[®] with

CIRCUITRACE[®]

For Supplier Address See PHOTOFACT Index

NOTE

Repair or adjustment of transmitter circuits must be under supervision of a person with first-or second-class radiotelephone license.

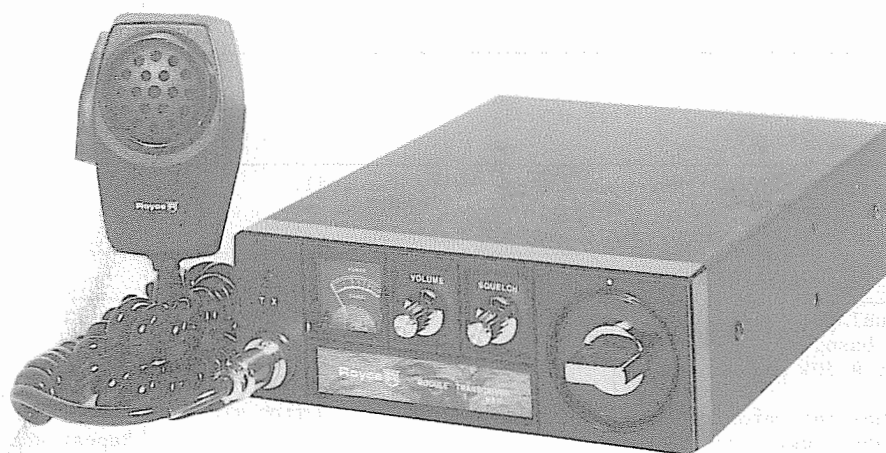
(Refer to FCC Rules and Regulations Part 95, Subpart C & D.)

The frequency of the transmitter should be checked periodically with a secondary frequency standard to insure proper and legal operation.

Best results will be obtained when adjusting the final RF output circuit if the antenna normally used is connected and the chassis is as nearly in the cabinet as possible.

Connect either 50-ohm dummy load or the normally used antenna system.

ROYCE MODEL 1-650



MODEL 1-650

HOWARD W. SAMS & CO., INC. Indianapolis, Indiana 46206

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ALIGNMENT INSTRUCTIONS

CAUTION: Use isolation transformer or observe polarity when connecting test equipment. Maintain line voltage at 120V AC. Allow a 15-minute warm-up period.
Adjustments made with 13.8-volt DC input.
Connect low sides of test equipment to ground unless specified otherwise.
Connect 50-ohm dummy load or antenna before keying transmitter.
Suggested Alignment Tools: GC ELECTRONICS
L403, L404, T201, T401, T402 8728
T101, T102, T601, T602, T603 9440

SYNTHESIZER ALIGNMENT

TEST EQUIPMENT	TRANSCEIVER	ADJUST	REMARKS
Inputs of frequency counter and RF VTVM to T601 secondary.	Ch. 13	T601	Adjust for 37.750MHz at maximum.
Input of frequency counter to T601 secondary.	Ch. 17 Ch. 21 Ch. 1 Ch. 5 Ch. 9		Check for 37.800MHz. Check for 37.850MHz. Check for 37.600MHz. Check for 37.650MHz. Check for 37.700MHz.
Input of frequency counter to Q602 emitter.	Ch. 13 Ch. 14 Ch. 15 Ch. 16		Check for 10.180MHz. Check for 10.170MHz. Check for 10.160MHz. Check for 10.140MHz.
Input of frequency counter to Q603 emitter.	Ch. 13, Xmit Ch. 14, Xmit Ch. 15, Xmit Ch. 16, Xmit		Check for 10.635MHz. Check for 10.625MHz. Check for 10.615MHz. Check for 10.595MHz.

RECEIVER ALIGNMENT

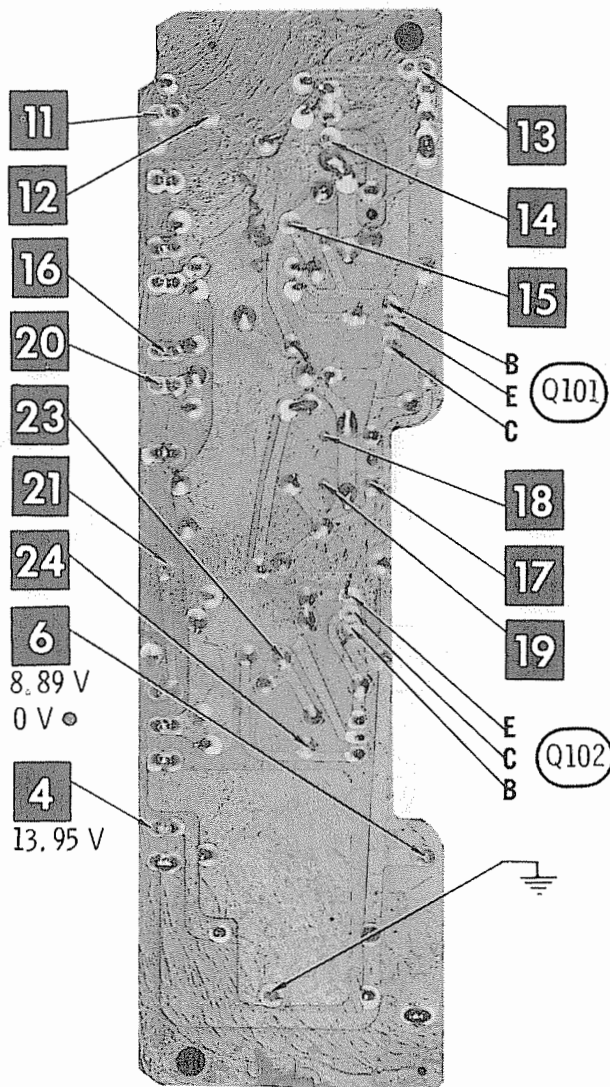
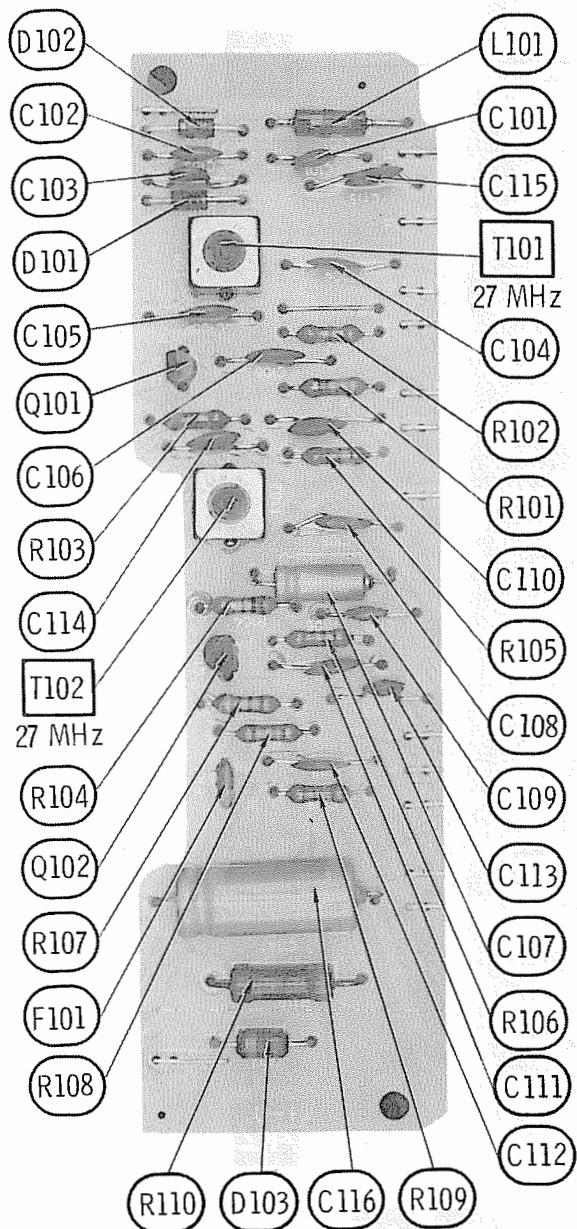
Connect an AC VTVM or AF wattmeter across speaker voice coil.
Adjust volume control to obtain a suitable indication.
Set generator output low enough to prevent AGC limiting.

TEST EQUIPMENT	TRANSCEIVER	ADJUST	REMARKS
Output of signal generator thru .01uF to Q201 base. 455kHz, 1000Hz @ 30% modulation.	Ch. 13	T201	Adjust for maximum output.
Output of signal generator thru .01uF to antenna jack. 27.115MHz, 1000Hz @ 30% modulation.	Ch. 13	T102, T101	Adjust for maximum output. Repeat above steps, if necessary.

TRANSMITTER ALIGNMENT

Connect an RF wattmeter and 50-ohm, 25-watt dummy load to antenna connector.
NOTE: Be sure to check transmit frequency and power on all active channels after alignment of transmitter.

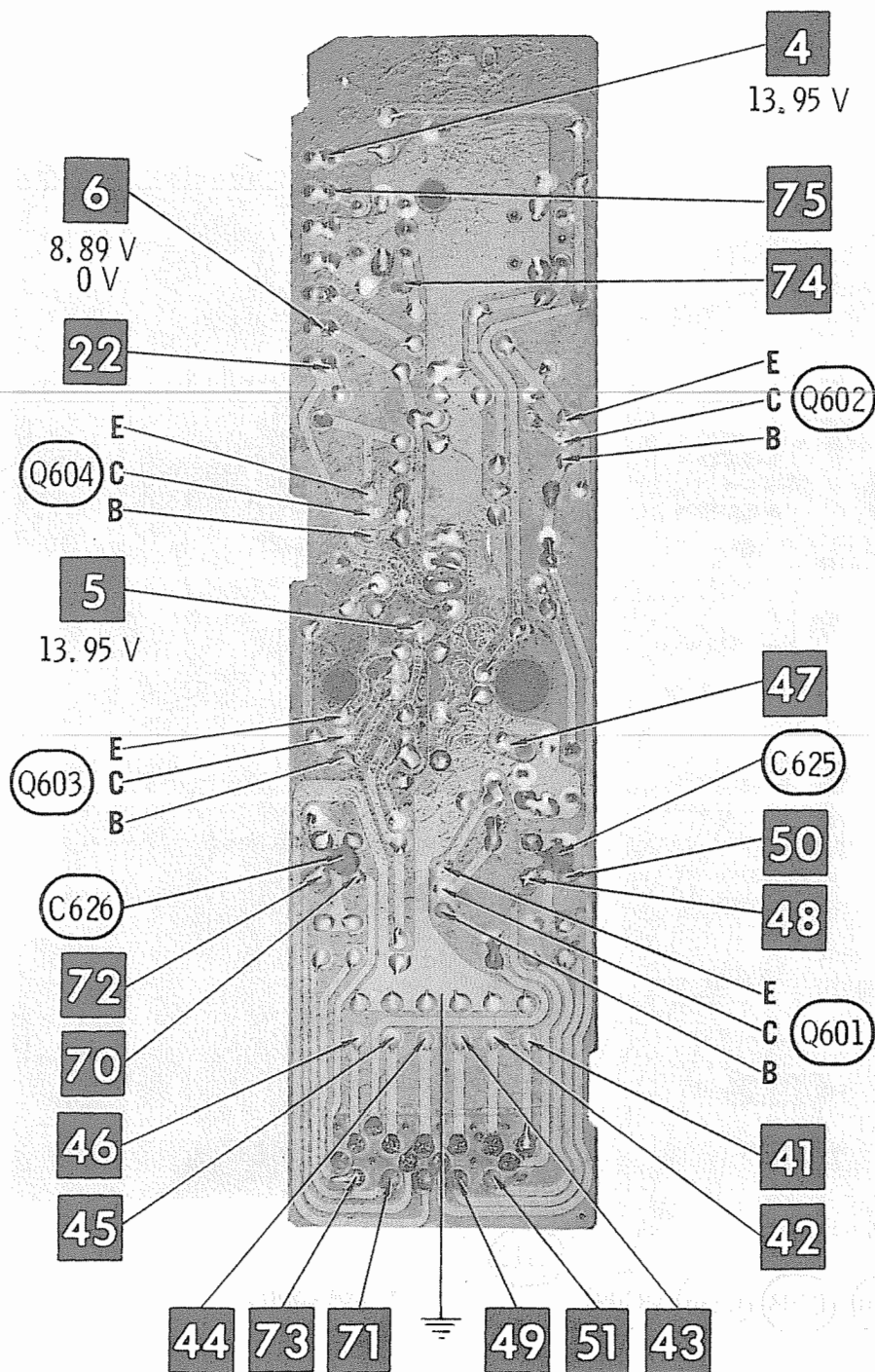
TEST EQUIPMENT	TRANSCEIVER	ADJUST	REMARKS
	Ch. 13	T602, T603, T401, T402, L403, L404	Adjust for maximum.
	Ch. 13	L403, L404	Adjust for 4 watts maximum output.



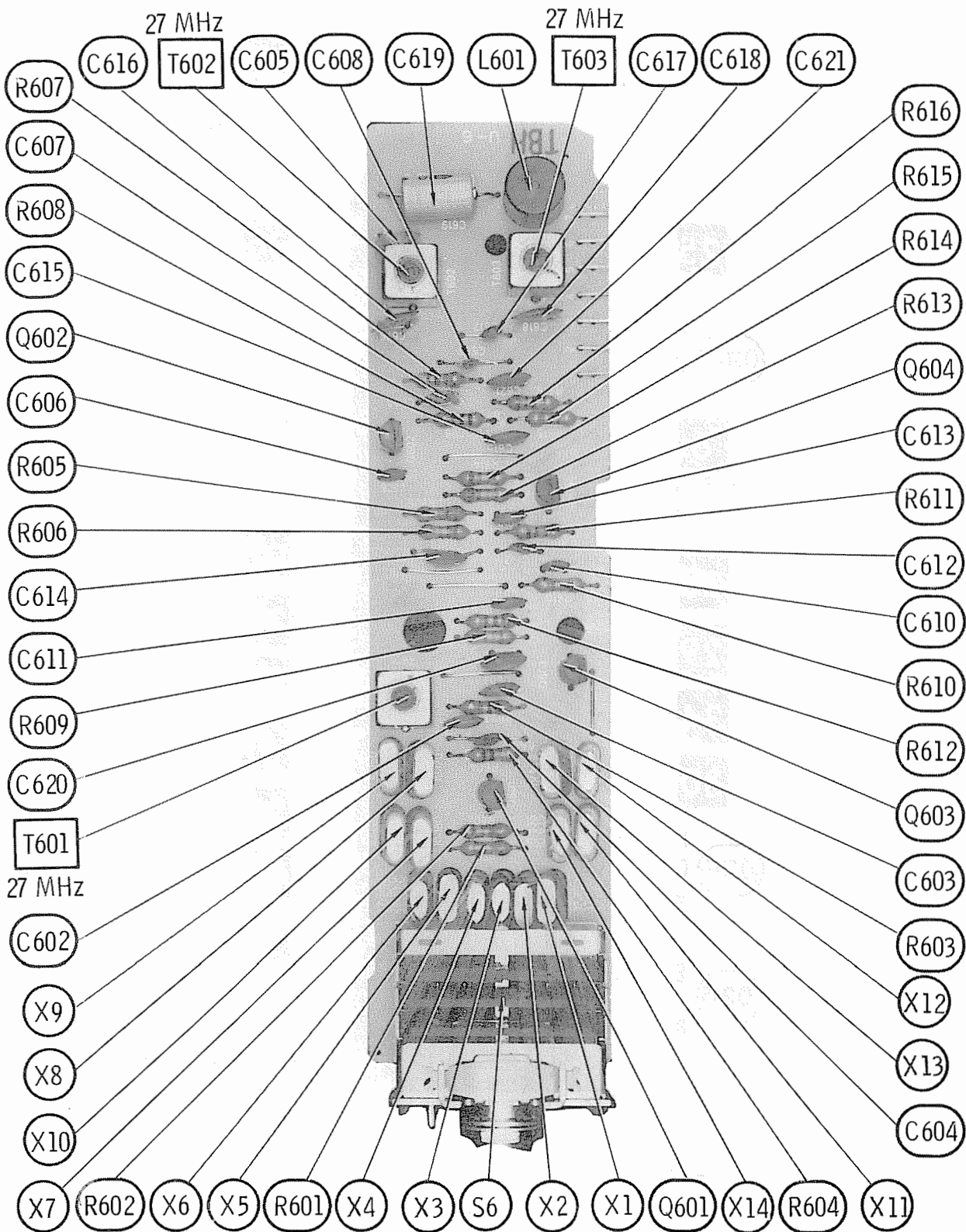
• TRANSMIT

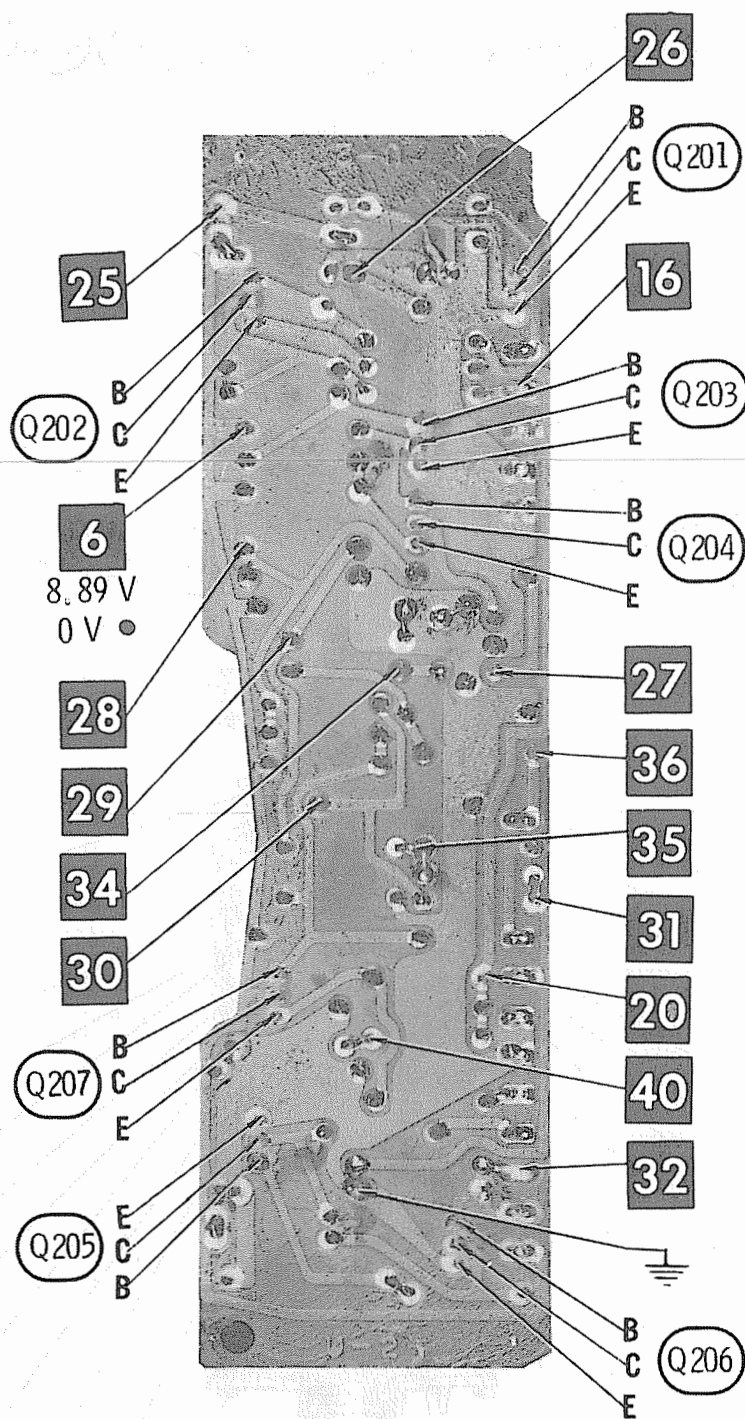
ROYCE MODEL 1-650

RF BOARD (U-1)

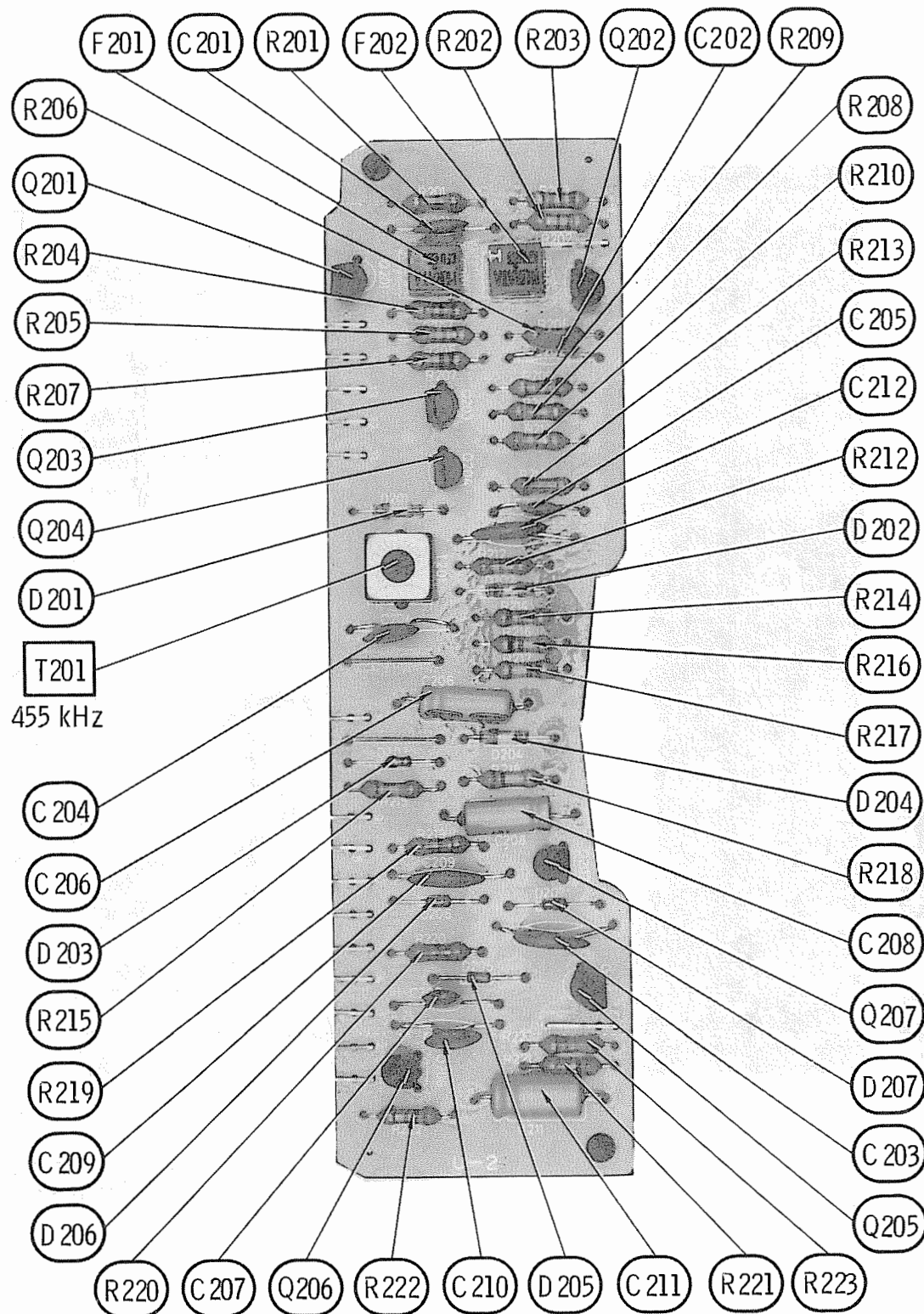


OSC BOARD (U-6)





REC IF & SQUELCH BOARD (U-2)

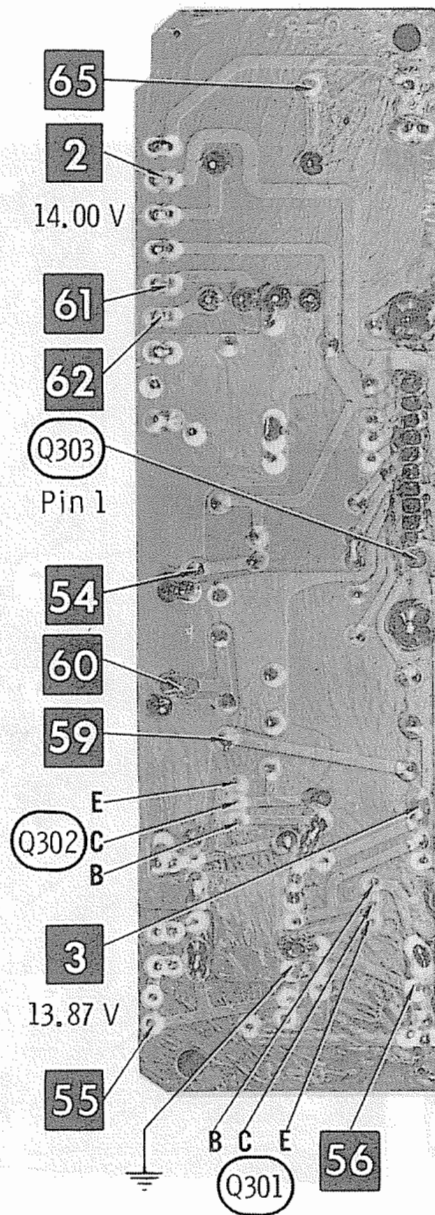
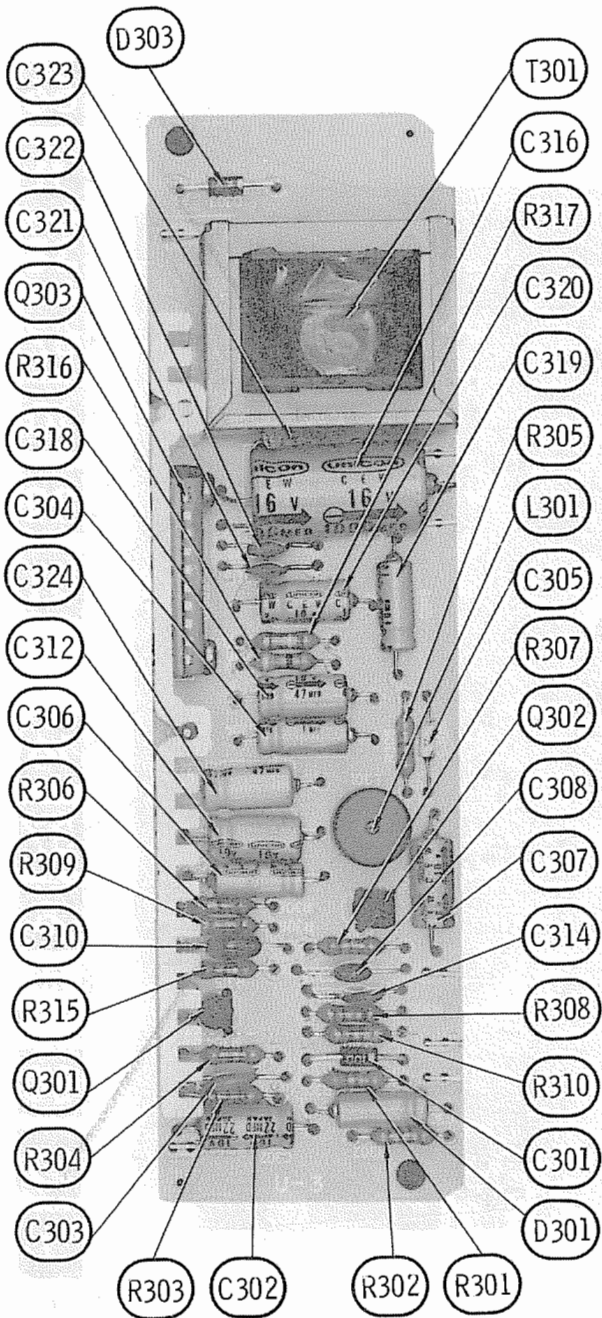


REC IF & SQUELCH BOARD (U-2)

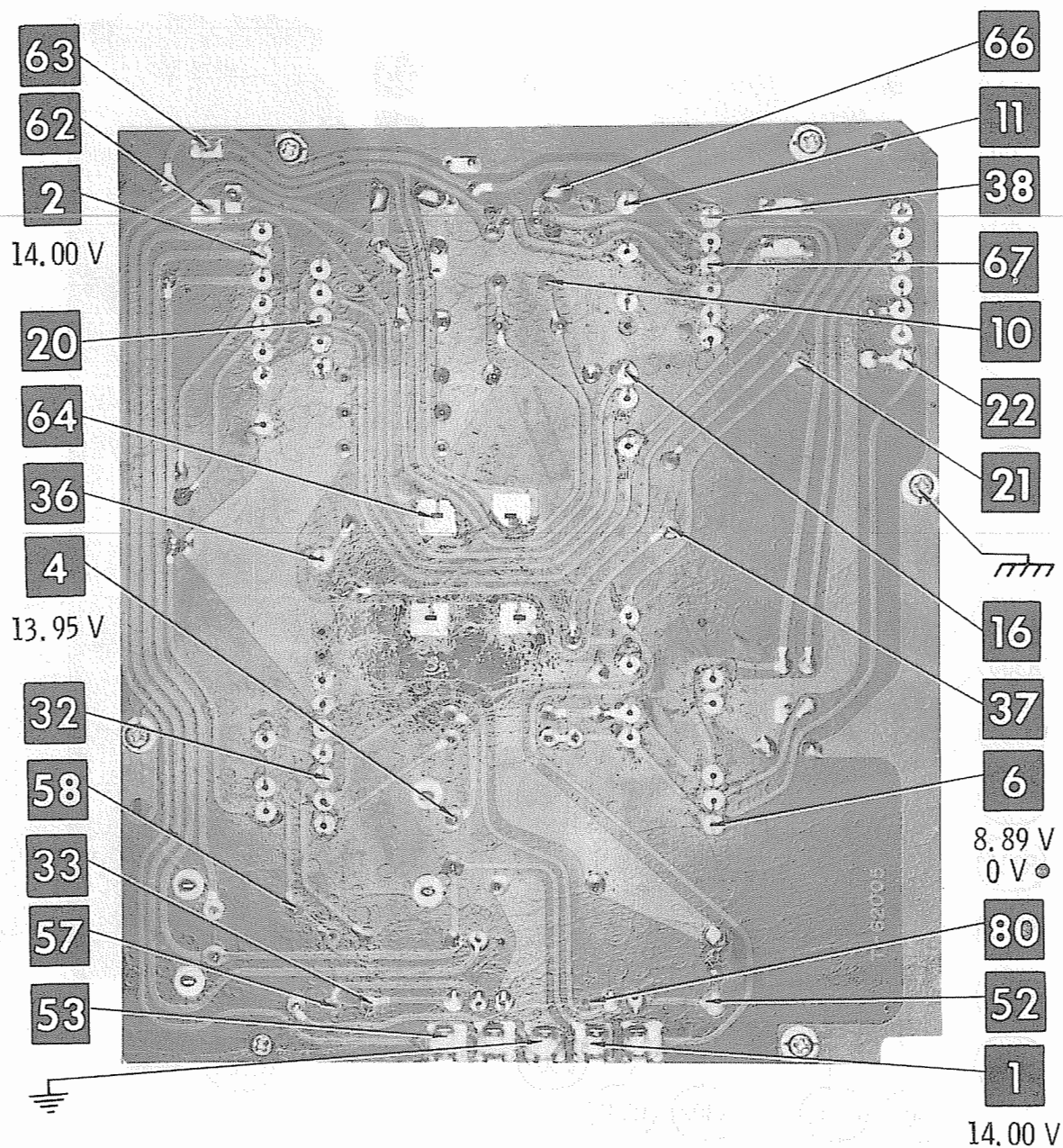


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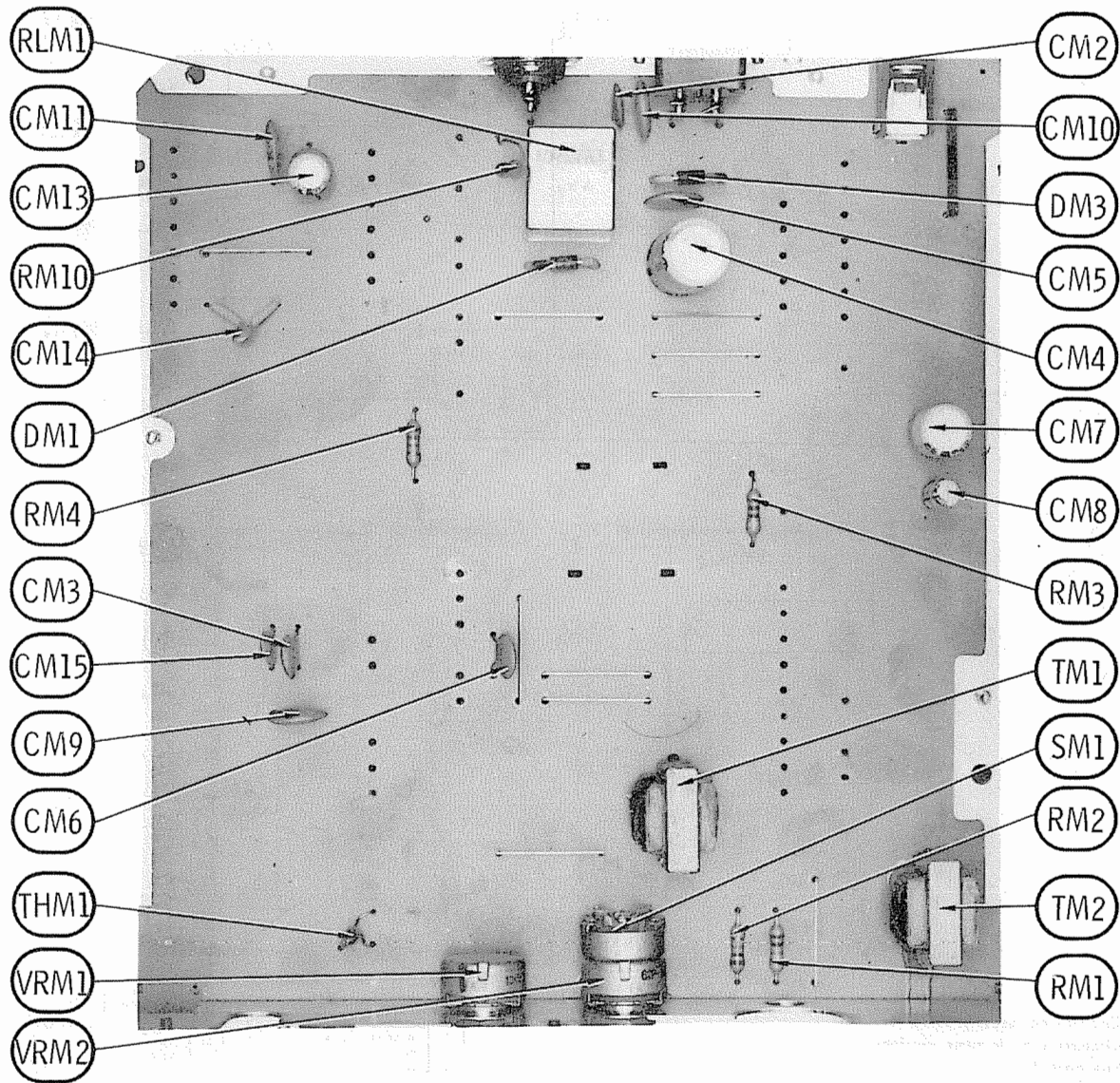
ROYCE MODEL 1-650



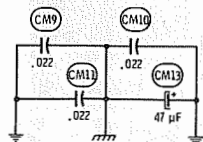
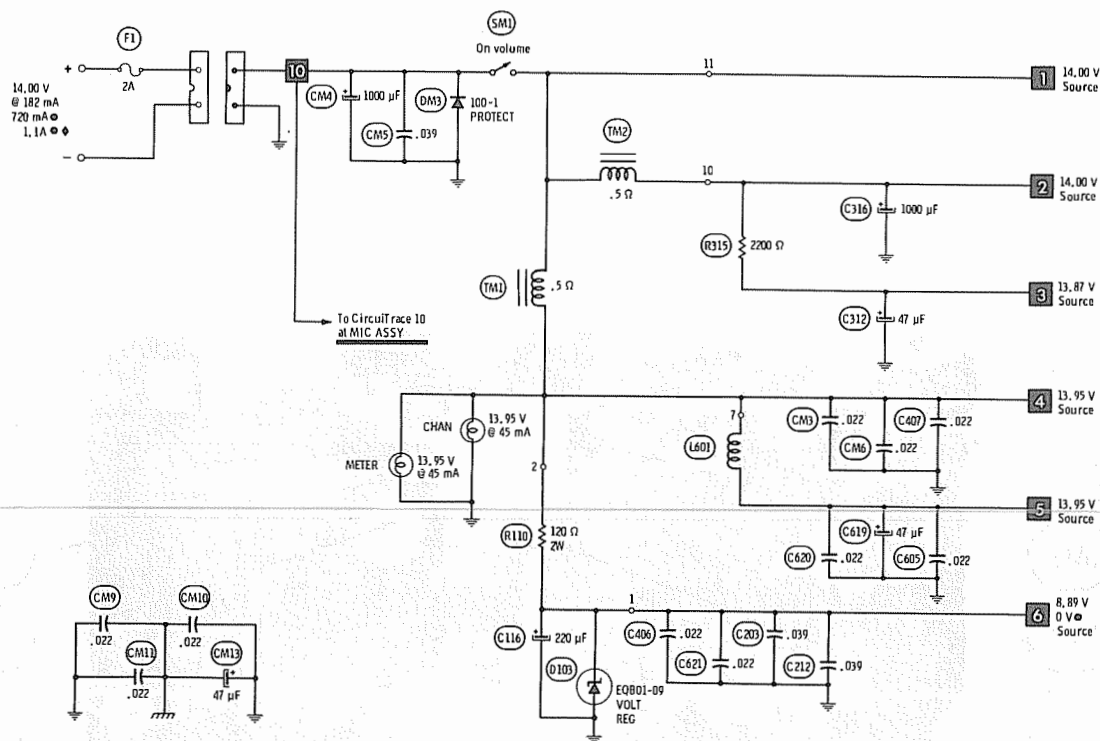
AUDIO BOARD (U-3)



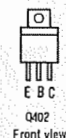
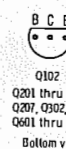
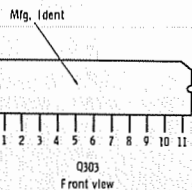
MOTHER BOARD



MOTHER BOARD



Terminal Guides



—X— Circuitry not used in some versions

--- Circuitry used in some versions

⊙ See ports list

⊕ Ground

⏏ Chassis

Measurements with switching as shown unless noted:

⊠ Squelch fully clockwise ⊠ 100% modulation

⊙ Transmit

Supply voltage maintained as shown at input.

Voltages measured with digital meter, no signal.

Controls adjusted for normal operation.

Arrow at control indicates direction of advance.

Terminal identification may not be found on unit.

Resistors are 1/2W or less, 5% unless noted.

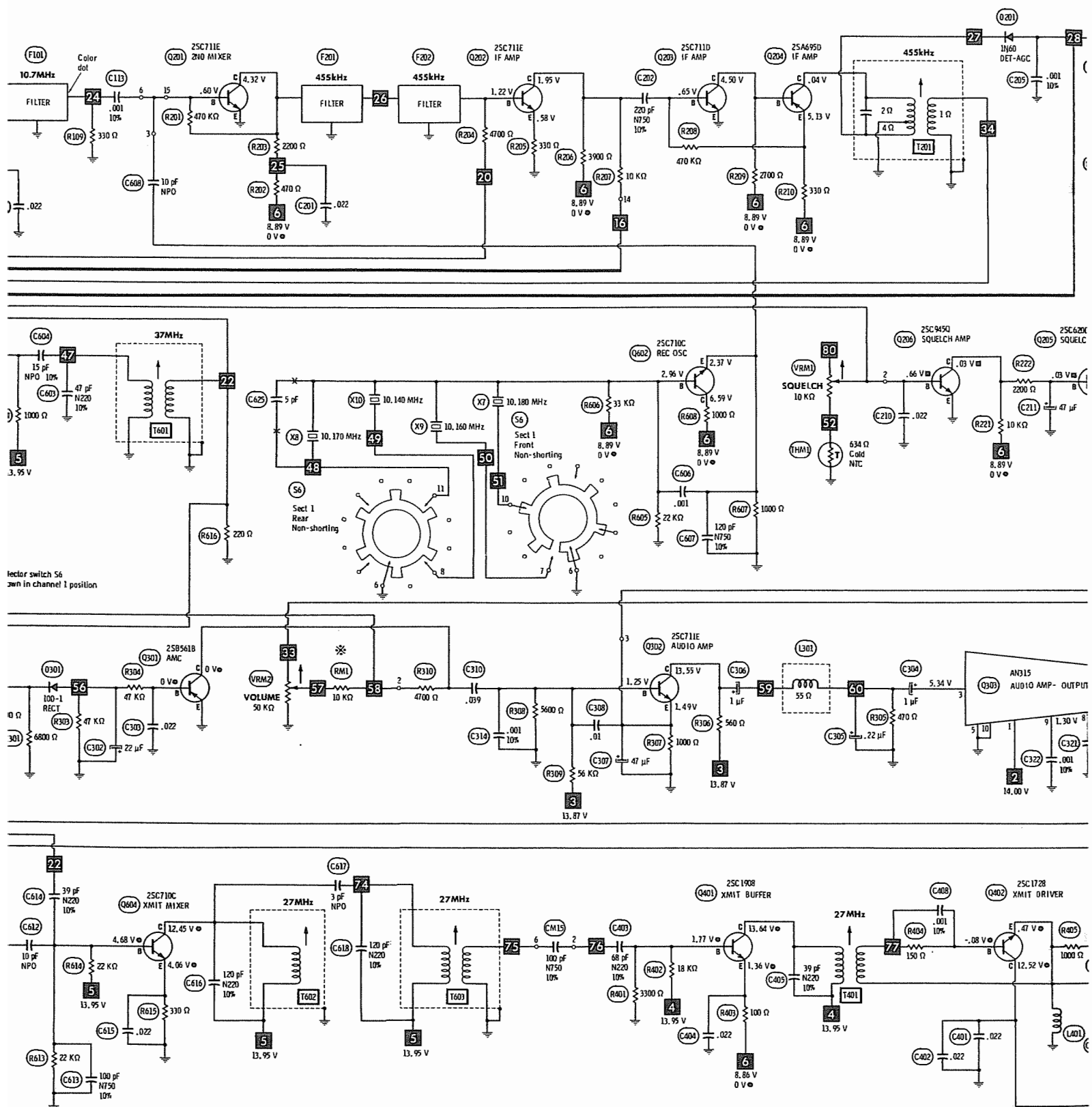
Value in () used in some versions.

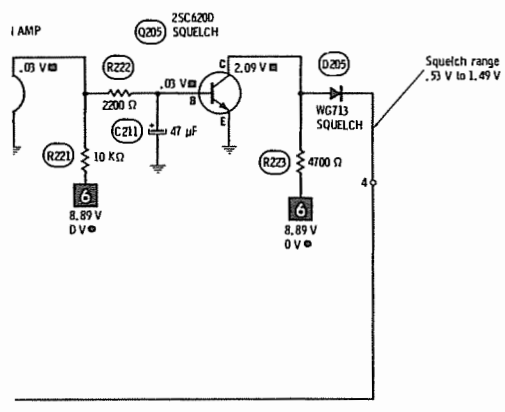
A PHOTOFACIT STANDARD NOTATION SCHEMATIC

WITH CIRCUITRACE

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Chan	Crystal Complement	Chan	Crystal Complement	Chan	Crystal Complement	Chan	Crystal Complement
1	X1, X7, X11	7	X2, X9, X13	13	X4, X7, X11	19	X5, X9, X13
2	X1, X8, X12	8	X2, X10, X14	14	X4, X8, X12	20	X5, X10, X14
3	X1, X9, X13	9	X3, X7, X11	15	X4, X9, X13	21	X6, X7, X11
4	X1, X10, X14	10	X3, X8, X12	16	X4, X10, X14	22	X6, X8, X12
5	X2, X7, X11	11	X3, X9, X13	17	X5, X7, X11		
6	X2, X8, X12	12	X3, X10, X14	18	X5, X8, X12	23	X6, X10, X14





PARTS LIST AND DESCRIPTION

(When ordering parts, state Model, Part Number, and Description.)

PARTS LI

(When orderin

MODULES/PLUG-IN BOARDS

ITEM No.	PART NAME	MFGR. PART No.	NOTES
U-1	RF		
U-2	Rec IF & Squelch		
U-3	Audio		
U-4	Transmitter		
U-6	Oscillator		

CAPACIT

ITEM No.	
C101	82
C102	220
C103	22
C104	.001
C105	.001
C106	.001
C108	.001
C109	22
C110	.001
C111	.001
C112	.001
C113	.001
C114	33
C115	.001
C201	.001
C202	220
C203	.001
C204	.001
C205	.001
C207	.001
C209	.001
C210	.001
C212	.001
C303	.001
C308	.001
C310	.001
C314	.001
C321	.001
C322	.001
C401	.001
C402	.001
C403	68
C404	.001
C405	39
C406	.001
C407	.001
C408	.001
C409	82
C410	22
C411	22
C412	10
C413	22
C414	39
C415	2
C416	10
C417	.001
C418	.001
C419	10
C602	47
C603	47
C604	10
C605	.001
C606	.001
C607	10
C608	10
C610	.001
C611	82
C612	10
C613	10
C614	39
C615	10
C616	10
C617	3
C618	10
C620	.001
C621	.001
C625	5
C626	5
CM1	.001
CM2	.001
CM3	.001
CM5	.001
CM6	.001
CM9	.001
CM10	.001
CM11	.001
CM14	1
CM15	1

SEMICONDUCTORS (Select replacement transistor for best results)

ITEM No.	TYPE No.	MFGR. PART No.	REPLACEMENT DATA							
			GENERAL ELECTRIC PART No.	IR WORKMAN PART No.	MALLORY PART No.	MOTOROLA PART No.	RAYTHEON PART No.	RCA PART No.	SPRAGUE PART No.	SYLVANIA PART No.
D101	100-1	1-001	GE-504A	5A4D	PTC201	HEPRO052	RE 49	SK3030	RT-213	ECG116
D102	100-1		GE-504A	5A4D	PTC201	HEPRO052	RE 49	SK3030	RT-213	ECG116
D103	EQ801-09		GEZ0-9.1	Z1209	ZB9.1A	HEPZ0412	RE 114	SK3060	RT-240	ECG139
D201	1N60		1N60	1N60	PTC206	HEPR9135	RE 47	SK3088	RT-263	ECG109
D202	1N60		1N60	1N60	PTC206	HEPR9135	RE 47	SK3088	RT-263	ECG109
D203	1S2075K		GE-300	D200	PTC214	HEPRO602	RE 52	SK3100	RT-218	ECG177
D204	1N60		1N60	1N60	PTC206	HEPR9135	RE 47	SK3088	RT-263	ECG109
D205	WG713		GE-300	D200	PTC214	HEPRO602	RE 52	SK3100	RT-218	ECG177
D206	HV-23				PTC301					
D207	HV-23				PTC301					
D301	10D-1		GE-504A	5A4D	PTC201	HEPRO052	RE 49	SK3030	RT-213	ECG116
O303	100-1		GE-504A	5A4D	PTC201	HEPRO052	RE 49	SK3030	RT-213	ECG116
O401	1N60		1N60	1N60	PTC206	HEPR9135	RE 47	SK3088	RT-263	ECG109
DM1	10D-1		GE-504A	5A4D	PTC201	HEPRO052	RE 49	SK3030	RT-213	ECG116
DM3	10D-1		GE-504A	5A4D	PTC201	HEPRO052	RE 49	SK3030	RT-213	ECG116
LEDM1										
Q101	2SC1856M		GE-20	TR-24	PTC132	HEPS0015	RE 13	SK3018	RT-107A	ECG123A
Q102	2SC710C		GE-211	(IR)2SC710	PTC115	HEPS0016	RE 13	SK3018	RT-308	ECG123A
Q201	2SC711E		GE-62	(IR)2SC372	PTC121	HEPS0024	RE 192	SK3124	RT-304	ECG199
Q202	2SC711E		GE-62	(IR)2SC372	PTC121	HEPS0024	RE 192	SK3124	RT-304	ECG199
Q203	2SC7110		GE-62	(IR)2SC644	PTC121	HEPS0024	RE 192	SK3124	RT-304	ECG199
Q204	2SA695D		GE-67	TR-88	PTC103	HEPS5013	RE 18	SK3025	RT-126A	ECG294
Q205	2SC620D		GE-20	(IR)2SC644	PTC125	HEPS0015	RE 13	SK3020	RT-107A	ECG123A
Q206	2SC945Q		GE-212	(IR)2SC945	PTC121	HEPS0015	RE 192	SK3124	RT-107A	ECG199
Q207	2SC945Q		GE-212	(IR)2SC945	PTC121	HEPS0015	RE 192	SK3124	RT-107A	ECG199
Q301	2SB561B		GE-21	(IR)2SC945	PTC103	HEPS0019	RE 26	SK3114	RT-126A	ECG159
Q302	2SC711E		GE-62	(IR)2SC372	PTC121	HEPS0024	RE 192	SK3124	RT-304	ECG199
Q303	AN315									
Q401	2SC1908E		GE-20	TR-21	PTC136	HEPS0015	RE 9	SK3124	RT-107A	ECG107
Q402	2SC1728				PTC180		RE 204		RT-310	ECG302
Q403	2SC756A		GE-46		PTC158		RE 206		RT-182	ECG282
Q601	2SC710C		GE-211	(IR)2SC710	PTC115	HEPS0016	RE 13	SK3018	RT-308	ECG123A
Q602	2SC710C		GE-211	(IR)2SC710	PTC115	HEPS0016	RE 13	SK3018	RT-308	ECG123A
Q603	2SC710C		GE-211	(IR)2SC710	PTC115	HEPS0016	RE 13	SK3018	RT-308	ECG123A
Q604	2SC710C		GE-211	(IR)2SC710	PTC115	HEPS0016	RE 13	SK3018	RT-308	ECG123A

ELECTROLYTIC CAPACITORS

ITEM No.	RATING	REPLACEMENT DATA			
		MFGR. PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.
C107	10 16V		PC10-25	VTT10A25	EV-1222
C116	220 16V		PC250-25	VTT220G16	EV-1240
C206	.33 50V			TDC334M050EL	SD50-R339
C208	1 50V		PC1-50	VTT1B63	EV-1615
C211	47 10V		PC50-16	VTT47D16	EV-1226
C301	1 50V		PC1-50	VTT1B63	EV-1615
C302	22 10V		PC25-25	VTT22A16	EV-1224
C304	1 50V		PC1-50	VTT1B63	EV-1615
C305	.22 50V			TOC224M050EL	SD50-R229
C306	1 50V		PC1-50	VTT1B63	EV-1615
C307	47 10V		PC50-16	VTT47D16	EV-1226
C312	47 10V		PC50-16	VTT47D16	EV-1226
C316	1000 16V		WBR1000-16	TC1501C	TVA-1163
C318	47 10V		PC50-16	VTT47D16	EV-1226
C319	10 16V		PC10-25	VTT10A25	EV-1222
C320	47 10V		PC50-16	VTT47D16	EV-1226
C323	1 25V		PC1-50	TT25X1	EV-1315
C324	47 10V		PC50-16	VTT47D16	EV-1226
C619	47 16V		PC50-16	VTT47D16	EV-1226
CM4	1000 16V		WBR1000-16	TC1501C	TVA-1163
CM7	220 16V		PC250-25	VTT220G16	EV-1240
CM8	1 50V		PC1-50	VTT1B63	EV-1615
CM13	47 16V		PC50-16	VTT47D16	EV-1226

* Not norm

PARTS LIST AND DESCRIPTION (CONTINUED)

(When ordering parts, state Model, Part Number, and Description.)

CAPACITORS

ITEM No.	RATING	MFR. PART No.	REPLACEMENT DATA			
			CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.
C101	82 10% N750		DTN-470		CN7482	10TCU-Q82
C102	220 10% N750		*		*	10TCU-T47
C103	22 10% N220		*		*	10TCR-Q22
C104	.022		DC-253	MGP025	TA125	TG-S25
C105	.022		DC-253	MGP025	TA125	TG-S25
C106	.022		DC-253	MGP025	TA125	TG-S25
C108	.022		DC-253	MGP025	TA125	TG-S25
C109	22 10% N220		*		*	10TCR-Q22
C110	.022		DC-253	MGP025	TA125	TG-S25
C111	.022		DC-253	MGP025	TA125	TG-S25
C112	.022		DC-253	MGP025	TA125	TG-S25
C113	.001 10%		DD-102		GP210	10TS-D10
C114	33 10% N220		*		*	10TCR-Q33
C115	.022		DC-253	MGP025	TA125	TG-S25
C201	.022		DC-253	MGP025	TA125	TG-S25
C202	220 10% N750		DTN-220	N220	CN7322	10TCU-T22
C203	.039		UK50-333		MAG50133	
C204	.022		DC-253	MGP025	TA125	TG-S25
C205	.001 10%		DD-102		GP210	10TS-D10
C207	.01 10%			WMF1S1	ENF1A11D	1PB-S10
C209	.039		UK50-333		MAG50133	
C210	.022		DC-253	MGP025	TA125	TG-S25
C212	.039		UK50-333		MAG50133	
C303	.022		DC-253	MGP025	TA125	TG-S25
C308	.01		UK50-1D3		MAG5011	
C310	.039		UK50-333		MAG50133	
C314	.001 10%		DD-102		GP210	10TS-D10
C321	.001 10%		DD-102		GP210	10TS-D10
C322	.001 10%		DD-102		GP210	10TS-D10
C401	.022		DC-253	MGP025	TA125	TG-S25
C402	.022		DC-253	MGP025	TA125	TG-S25
C403	68 10% N220		*		*	10TCR-Q68
C404	.022		DC-253	MGP025	TA125	TG-S25
C405	39 10% N220		*		*	10TCR-Q39
C406	.022		DC-253	MGP025	TA125	TG-S25
C407	.022		DC-253	MGP025	TA125	TG-S25
C408	.001 10%		DD-102		GP210	10TS-D10
C409	82 10% N220		*		*	10TCR-Q82
C410	22 10% N220		*		*	10TCR-Q22
C411	220 10% N750		DTN-220	N220	CN7322	10TCU-T22
C412	100 10% N750		DTN-100	N100	CN7310	10TCU-T10
C413	220 10% N750		DTN-220	N220	CN7322	10TCU-T22
C414	39 10% N220		*		*	10TCR-Q39
C415	2 NPO		DTZ-2R2	NP02P2	CND522	10TCC-V22
C416	120 10% N750		DTN-120			10TCU-T12
C417	.022		DC-253	MGP025	TA125	TG-S25
C418	.022		DC-253	MGP025	TA125	TG-S25
C419	10 NPO		DTZ-10	NP010	CN0410	10TCC-Q10
C602	47 10% N220		*		*	10TCR-Q47
C603	47 10% N220		*		*	10TCR-Q47
C604	15 10% NPO		DTZ-15	NP015	CN0415	10TCC-Q15
C605	.022		DC-253	MGP025	TA125	TG-S25
C606	.001		DD-102		GP210	10TS-D10
C607	120 10% N750		DTN-120			10TCU-T12
C608	10 NPO		DTZ-10	NP010	CN0410	10TCC-Q10
C610	.001					
C611	82 10% N750		DTZ-10	NP010	CN7482	10TCU-Q82
C612	10 NPO		DTN-100	N100	CN0410	10TCC-Q10
C613	100 10% N750		*		CN7310	10TCU-T10
C614	39 10% N220		*		*	10TCR-Q39
C615	.022		DC-253	MGP025	TA125	TG-S25
C616	120 10% N220		*		*	10TCR-T12
C617	3 NPO		DTZ-3R3	NP03P3	CN0533	10TCC-V33
C618	120 10% N220		*		*	10TCR-T12
C620	.022		DC-253	MGP025	TA125	TG-S25
C621	.022		DC-253	MGP025	TA125	TG-S25
C625	5		DTZ-4R7	NP04P7	CN0547	10TCC-V47
C626	5		DTZ-4R7	NP04P7	CN0547	10TCC-V47
CM1	.039		UK50-333		MAG50133	
CM2	.022		DC-253	MGP025	TA125	TG-S25
CM3	.022		DC-253	MGP025	TA125	TG-S25
CM5	.039		UK50-333		MAG50133	
CM6	.022		DC-253	MGP025	TA125	TG-S25
CM9	.022		DC-253	MGP025	TA125	TG-S25
CM10	.022		DC-253	MGP025	TA125	TG-S25
CM11	.022		DC-253	MGP025	TA125	TG-S25
CM14	10 N220		*		*	10TCR-Q10
CM15	100 10% N750		DTN-100	N100	CN7310	10TCU-T10

* Not normally in distributor's stock. Available thru distributor on order to manufacturer.

PARTS LIST AND DESCRIPTION (CONTINUED)

(When ordering parts, state Model, Part Number, and Description.)

CONTROLS (All wattages 1/2 watt, or less, unless listed)

ITEM No.	FUNCTION	RESISTANCE	REPLACEMENT DATA				
			MFR. PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	MALLORY PART No.	TRW PART No.
VRM1	Squelch	10K	4-210				
VRM2	Volume/Switch	50K	4-112				

RESISTORS (Power and Special)

ITEM No.	RATING	REPLACEMENT DATA		ITEM No.	RATING	REPLACEMENT DATA	
		WORKMAN PART No.	MFR. PART No.			WORKMAN PART No.	MFR. PART No.
NTC	634 Col'd NTC		TD5-135				

COILS (RF-IF)

ITEM No.	FUNCTION	REPLACEMENT DATA			REMARKS
		PART No.	OTHER IDENTIFICATION	MILLER PART No.	
L101	RF Choke		ETC49169		
L301	RF Choke (22mH)		2-0080		
L401	RF Choke		ETC49170		
L402	RF Choke		ETC4056		
L403	Final Tank (27MHz)				
L404	Final Tank (27MHz)				
L601	RF Choke (22mH)		2-0080		
T101	Rec Ant (27MHz)		ETC15089		
T102	Rec RF (27MHz)		ETC15061		
T201	IF (455kHz)		ETC15090		
T401	Xmit Buffer (27MHz)		ETC20105		
T402	Xmit Driver (27MHz)		ETC49167		
T403	Final Load (27MHz)		ETC49168		
T404	Pi Filter (27MHz)		ETC49166		
T601	Synth Osc (37MHz)		ETC15063		
T602	Xmit Osc (27MHz)		ETC15064		
T603	Harmonic Suppressor (27MHz)		ETC15063		

FILTER CHOKE

ITEM No.	RATINGS			REPLACEMENT DATA			NOTES
	CURRENT (Measured)	DC RES.	INDUCTANCE (0 CURRENT 1000~)	MFR. PART No.	THORDARSON PART No.	TRIAD PART No.	
TM1	1.1A	.5	10mH	2-0031			
TM2	200mA	.5	10mH	2-0031			

PARTS LIST AND DESCRIPTION (CONTINUED)

(When ordering parts, state Model, Part Number, and Description.)

TRANSFORMER (Audio Output)

ITEM No.	IMPEDANCE		REPLACEMENT DATA			NOTES
	PRI.	SEC.	MFGR. PART No.	THORDARSON PART No.	TRIAD PART No.	
T301	4.5	8	62017 (1)			(1) Number on unit.

SPEAKER

ITEM No.	TYPE	REPLACEMENT DATA		NOTES
		MFGR. PART No.	QUAM PART No.	
SP1	3" PM, 8 Ohms	5-103	30A05Z8R	

ROYCE MODEL 1-650

FUSE DEVICES

ITEM No.	DESCRIPTION	REPLACEMENT DATA						
		PART No.		BUSS PART No.		LITTELFUSE PART No.		WORKMAN PART No.
		DEVICE	HOLDER	DEVICE	HOLDER	DEVICE	HOLDER	DEVICE
F1	2A, Fast Acting			AGC2	HDJ	312002	150145	FG2-2

MICROPHONE

ITEM No.	REPLACEMENT DATA				CONNECTION DATA						
	MFGR. PART No.	GC PART No.	GC NOISE CANCEL	GC POWER	GC CONNECTOR	GC Red	GC Shield	GC Yellow	GC Blue	GC White	GC Black
MIC		18-032	18-034	18-010	18-092	1	2	3	NC	NC	2

PARTS LIST AND DESCRIPTION (CONTINUED)

(When ordering parts, state Model, Port Number, and Description.)

CRYSTALS

ITEM No.	CRYSTAL FREQUENCY IN MHz	MFGR. PART No.	CTS KNIGHTS PART No.	CHANNEL	ITEM No.	CRYSTAL FREQUENCY IN MHz	MFGR. PART No.	CTS KNIGHTS PART No.	CHANNEL
X1	37.600		DA14W37.600	1,2,3,4	X8	10.170		DC115W10.170	2,6,10,14,18,22
X2	37.650		DA14W37.650	5,6,7,8	X9	10.160		DC115W10.160	3,7,11,15,19
X3	37.700		DA14W37.700	9,10,11,12	X10	10.140		DC115W10.140	4,8,12,16,20,23
X4	37.750		DA14W37.750	13,14,15,16	X11	10.635		DB80W10.635	1,5,9,13,17,21
X5	37.800		DA14W37.800	17,18,19,20	X12	10.625		DB80W10.625	2,6,10,14,18,22
X6	37.850		DA14W37.850	21,22,23	X13	10.615		DB80W10.615	3,7,11,15,19
X7	10.180		DC115W10.180	1,5,9,13,17,21	X14	10.595		DB80W10.595	4,8,12,16,20,23

MISCELLANEOUS

ITEM No.	PART NAME	PART No.	NOTES
F101	Filter		10.7kHz (SFE10.7MA)
F201	Filter		455kHz (CFU455H)
F202	Filter		455kHz (CFU455H)
M1	Meter	5-215	S/RF
RLM1	Relay	4-607	Xmit/Rec
S6	Switch	4-405	Channel Selector

CABINETS & CABINET PARTS (When ordering specify model, chassis & color)

ITEM	PART No.	ITEM	PART No.
Main Case	3-144	Microphone Hanger	3-428
Front Panel	3-239	Knob, Channel Selector	3-330
Mounting Bracket	3-412	Knob (2 Used)	3-312

WIRING DATA

General-use Hook-up Wire	Use BELDEN No. 8530 (Solid) Available in 13 Colors
	8524 (Stranded) Available in 13 Colors
Shielded Antenna Lead	Use BELDEN No. 8214 Lowest-loss (RG-8/U Type)
	8237 Low-loss (RG-8/U)
	8240 (Solid) Miniature (RG-58/U)
	8259 (Stranded) Miniature (RG-58A/U)
Coiled Microphone Cable	Use BELDEN No. 8497 3-Conductor (1 shielded for Press-to-Talk) Neoprene
Bonding Strap	Use BELDEN No. 8661 (3/8 inch)