

Commander radio ab

MODEL TR-28



5 WATT 40 CHANNEL AM
CITIZENS
BAND TRANSCEIVER
SOLID STATE



WARRANTY POLICY

We warrants each new Commander product sold at list price to be free from defects in material and workmanship under normal use and service for a period of 360 days after delivery to the ultimate user and will replace or repair the product at our option, at no charge should it become defective and which our examination shall disclose to be defective and under warranty.

This warranty shall not apply to any Commander product which has been subject to misuse, neglect, accident, incorrect wiring not of our own installation, or to use in violation of instructions furnished by us, nor extended to units which have been repaired or altered outside of our factory.

This warranty does not cover carrying cases, earphones, batteries, antennas, broken or cracked cabinets, or any other accessory used in connection with this product.

This warranty is in lieu of all other warranties expressed or implied and no representative or person who is authorized to assume for us any other liability in connection with the sale of our products.

Sales receipt must accompany product to validate the date of purchase.

RETURNING THE UNIT FOR SERVICE

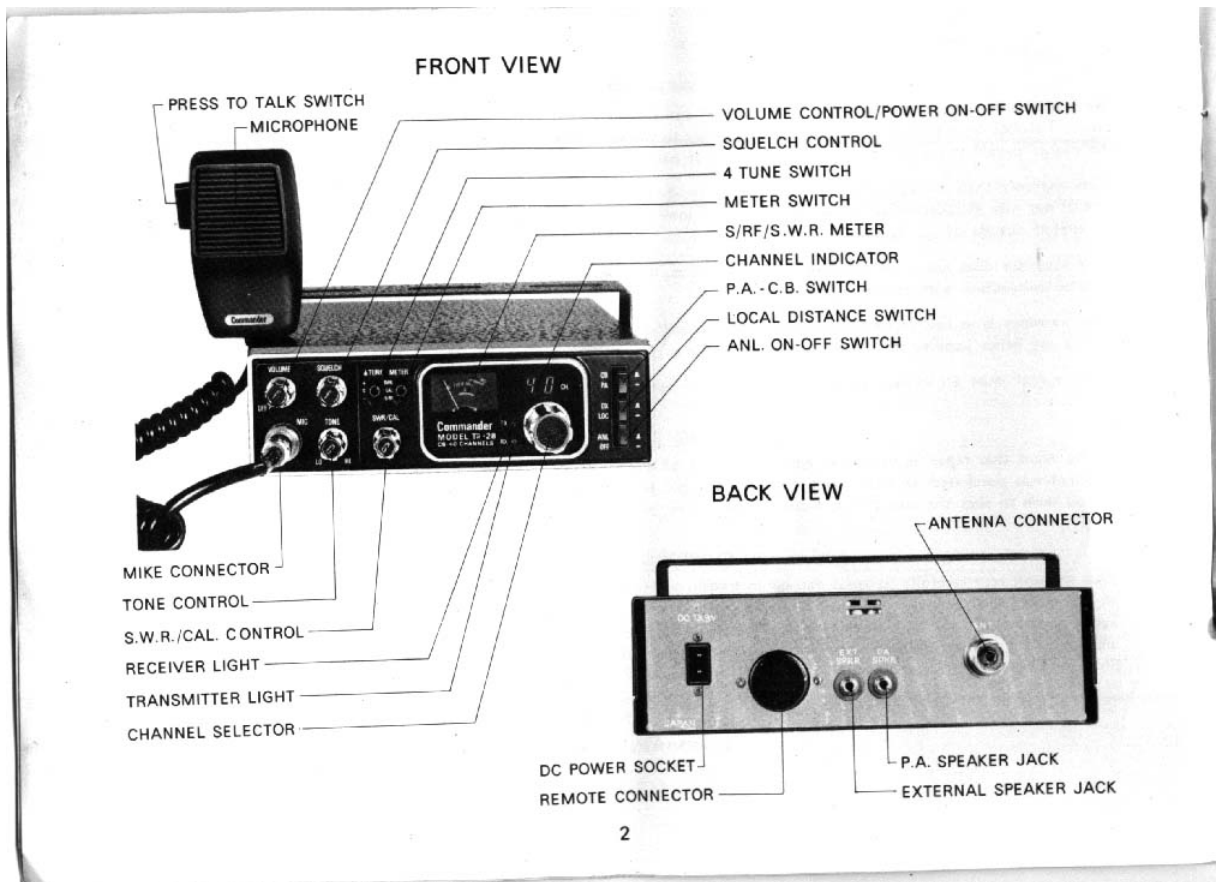
In the event that repair is necessary (either in or out of warranty), we recommend that you return the unit to the store from which it was purchased. In most cases, this will be your fastest and most efficient method of obtaining service.

If you wish to ship the unit to our main service center, please read the instructions which follow.

SHIPPING INSTRUCTIONS

Pack the unit very carefully to avoid damage in transit, preferably in its original carton. If the original carton is not available, use a sturdy carton with at least 3 inches of shredded paper or excelsior around the unit. In the latter case, wrap the unit in paper first to avoid particles of packing material getting into it. Include with the unit a letter explaining exactly what difficulties you have encountered (remember to add extra First Class postage and indicate on the outside of the carton that First Class Mail is enclosed). Ship by prepaid express if possible and mark ELECTRONIC EQUIPMENT-FRAGILE. Clearly address the carton as follows:

SERVICE DIVISION
COMMANDER RADIO AB
Box 5155
200 71 MALMO



Description

Transceiver

The TR-28 Citizens Band Transceiver is fully solid state with 40 channels capability utilizing a Phase Locked Loop (PLL) System for Frequency Synthesis. The dual conversion Super-Heterodyne Receiver has Automatic Noise Limiting (ANL), and Variable Squelch Control providing less than one microvolt sensitivity for noise-free operation. A full 4W maximum output with up to 100% modulation is provided when used on 13.8V DC nominal power source.

Controls

All necessary controls are located on front panel, they include: ON-OFF switch-Volume Control, TONE Control, Variable Squelch Control, P.A. Switch, Automatic Noise Limiter (ANL) Switch, Local - DX Switch, Delta Tune Switch, S/RF/S.W.R. Switch, Microphone Connector, and Channel Selector with LED Channel Indicator. Also located on the rear panel are the external speaker, the P.A. Speaker, Remote connector and the antenna connector.

Power Supply

The TR-28 will operate on any 12V DC electrical system with either positive or negative ground.

Antenna Requirement

This transceiver will operate with any standard 52 ohm ground-plane, vertical, mobile whip, long wire or other CB antenna.

A vertical antenna is best suited for mobile use. A non-directional antenna must be used for best results in any case. The base loaded whip antenna will normally provide effective communication. For greater range and more reliable operation, a full quarter-wave whip should be used. Either of these antennas use the metal car body as a ground plane and the shield of the base lead as well as the metal case of the transceiver should be grounded.

Specifications

General

Channels	40 Channels
Frequency Range	26,965 to 27,405 MHz
Power Requirement	DC 13.8 Volt nominal
Antenna Impedance	50 ohms
Frequency Tolerance	±0.005%
Frequency Control	PLL (Phase-Locked Loop) System
Operating Temperature Range	-10°C to +55°C
Microphone	Dynamic 500 ohm
Built-in Speaker	Dynamic 3.5" (90mm)
Dimensions	205 x 195 x 60 m/m
Weight	5.3 lbs. (2.4 Kg)

Transmitter

Power Output	4W
Modulation	80-100%
Harmonic Spurious Emissions	-60dBorLess

Receiver

Maximum Sensitivity	1uV
Sensitivity at 10 dB S/N	1uV
Selectivity	6 dB at 6KHz, 30 dB at 11KHz, 60 dB at 40KHz
Audio Output Power	More than 3W at 10% distortion
P.A. Output Power	More than 3W

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Mounting Instructions

Location

A location in the car or truck should be chosen carefully for convenience of operation and noninterference with normal driving functions. Mounting may be under the dash or instrument panel or any place a secure installation can be made.

A transceiver is usually placed under the dashboard where the ventilation is adequate. Should it be mounted elsewhere, care should be taken to avoid areas of excessive heat which may damage components.

For optimum performance of your equipment, install and handle with care. The finest equipment will not perform efficiently if installed and operated improperly. If at any time it becomes necessary to remove the cabinet, be careful not to disturb any coil assemblies as they may affect critical calibration within the transceiver.

Mounting Bracket

The adjustable mounting bracket has pre-drilled holes for easy mounting under the dashboard.

Microphone

Install the microphone bracket in an easy to reach location where the cord will not interfere with operation of the vehicle.

Power Connections

Note: This transceiver may be installed and used in any 12 volt DC negative or positive ground system vehicle.

A negative ground system is generally identified by the - battery terminal being connected to the vehicle motor block, but if you cannot determine the polarity system of your vehicle, it is suggested that you contact your vehicle dealer for definite information.

When connecting the power cords it may be desirable to connect one lead to the ignition switch accessory terminal so that the transceiver is automatically turned off when the ignition switch (key) is turned off. Alternately, the power lead may be connected to an available terminal on the fuse block or even to a point in the wiring harness. Care must be taken, however, to guard against a short circuit condition so when in doubt, please contact your vehicle dealer for specific information regarding your vehicle.

Negative Ground System

For a negative ground system connect the red DC power cord from the transceiver to the positive or + battery terminal or other convenient point and connect the black power lead to the chassis or vehicle frame or - battery terminal.

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Positive Ground System

For a positive ground system connect the black DC power cord from the transceiver to the negative or - battery terminal or other convenient point and connect the red power lead to the chassis or vehicle frame or + battery terminal.

Ignition Interference

Engine ignition interference should not be a problem and vehicles equipped with standard broadcast radios will have enough suppression to eliminate ignition interference. If interference is present, any skilled auto radio repairman should be able to eliminate it. Take precautions when installing the antenna; make sure the coaxial cable is away from spark plugs, ignition wires, and the ignition coil.

Carefully read all previous instructions in this Owner's Guide.

Make sure the power connection is properly made and an antenna is connected to the antenna output connector. (Do not transmit without connecting an antenna). Attach the press-to-talk microphone. Make sure the PA-CB switch is in the CB position.

To turn the set on, turn the Volume control knob clockwise until a click is heard; then continue turning the Volume control clockwise until a rushing noise is heard in the speaker.

Turn the channel selector switch to obtain desired channel to be used.

Note: LED Channel Indicator will display channel.

To adjust the squelch control: When no signals are present, adjust the squelch control clockwise until the receiver is

quieted. Incoming signals will automatically release the squelch, enabling you to receive normally. Practice will determine the best setting for this control. Setting the control to the minimum position may allow weak unintelligible signals through to the speaker. Setting the control too high may not allow weaker signals to be heard. Set the LOC - DX switch in the DX (Distance) position.

Set the Δ Tune switch in the 0 (Zero) position.

You are now ready to receive signals or transmit to another station.

To transmit press and hold the press-to-talk switch on the microphone. Hold the microphone several inches from your mouth and speak in a normal tone of voice. It is not necessary to shout, shouting will probably only cause distortion of your transmitted signal and voice. Release the press-to-talk switch to receive.

Function of Controls and Switches

When using the transceiver as a public address amplifier:

Connect a PA speaker to the PA jack on the rear panel.

Place the CB-PA switch in the PA position. Turn the power on.

Depress the push-to-talk switch on the microphone and speak into the microphone. Your voice will be heard from the PA speaker.

Volume Control and Off-On Switch

The volume control varies the sound output of the loudspeaker when receiving. It also functions as an OFF-ON switch. Clockwise rotation increases volume.

Channel Selector

Tuning the receiver and transmitter is simultaneous by rotating the 40-channel selector switch. Set the switch to a desired channel from 1 to 40.

The channels are readout on the LED display.

Squelch Control

The squelch control quiets the receiver when signals are not being received and allows for a noiseless standby operation. It functions only in the receiver volume when signals are being received. To adjust: When no signals are present, rotate the squelch control clockwise until the receiver is quieted. Incoming signals will automatically release the squelch. Careful adjustment is necessary because setting too far to the right will not allow weaker signals to be heard.

TONE CONTROL

Clockwise rotation increases treble tone, and counter-clockwise reduces treble tone so you will get more bass tone.

LOC-DX SWITCH

Set the LOCAL-DISTANCE switch to the local position to reduce strong signals. For weaker signals, set the switch knob to DX (distance) position.

ANL Switch

The automatic noise limiter is designed to reduce excessive noise such as ignition, motor and electrical interference. In the "on" position, it operates to extract this noise and gives you a clear signal.

DELTA TUNE

This is an electrical fine tuning to pull in off-center stations. This adjusts receiver frequency 3 KHz to permit clear reception of CB rigs transmitting off the center of their frequency.

METER

A combination meter on the front panel provides:

- (1) Constant visual monitoring of incoming "signal strength" when receiving. (Meter switch must be in S/RF position for this)
- (2) On transmit, with the meter switch in the down position-S/RF, the meter indicates the relative output power when the microphone button is pushed.
- (3) "Talk Power" level indicating modulation strength when speaking into the microphone.
- (4) Standing wave ratio (SWR) should indicate minimum reading.

SWR-CAL-S/RF SWITCH

Leave this switch in the down position (S/RF) for normal meter operation. To measure the SWR (standing wave ratio) of the antenna system, switch to the "CAL" position and adjust the control (SWR/CAL) until the meter needle is aligned with the calibration line on the meter face. Then switch to "SWR" to read the SWR.

Note: The SWR should be as low as possible. This indicates how well the antenna and feed line are matched to the 50 ohm

output of the transceiver. An SWR of up to 1.5 : 1 is acceptable. If the SWR reads more than 2 : 1, the antenna match is poor and danger to the final amplifier exists due to mismatch.

TX and RX LIGHT

Lighted indicators for transmit (red) and receive (green) keep you visually informed.

Public Address Switch

In the PA position, your transceiver is converted to a public address system by adding an external speaker. A convenient pin jack on the rear panel is provided for connection to any standard 8 ohm PA speaker.

P.A. Speaker

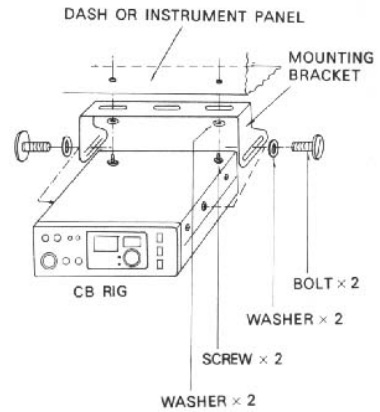
A convenient P.A. jack on the rear panel is provided for connection to any standard 8-ohm, 5-watt P.A. speaker. The type plug used on the speaker cord is a subminiature phone-type 3.5 mm (1/8"). To avoid acoustical feedback the speaker should face away from the microphone.

External Speaker

A 3.5 mm (1/8") external speaker jack is provided on the rear panel for the connection of a standard 8-ohm external

speaker. Occasionally, the only available location for mounting the transceiver is such that the sound from the built-in speaker is muffled by carpeting or some obstruction in the vehicle. In this case, an external speaker is connected and the built-in speaker is automatically disconnected.

MOBILE INSTALLATIONS



PARTS LIST

No.	Part No.	Description	Q'ty						
1	TR1	FET.	2SK19 or 2SK61	1	27	L7	"	N-47B	1
			2SK33		28	L8	"	N-50C	1
			JF1033B		29	L9,10	B.P.F. Coil	T-52	2
2	TR2,3,4,5,15	Transistor	2SC839 or 2SC710	5	30	L11	"	T-58	1
3	TR6,8,12	"	2SC945 or 2SC1815	3	31	L12	DRIVE Coil	N-1801S	1
4	TR7,14	"	2SA564 or 2SA495	2	32	L13	RF Choke Coil	N-1943	1
			2SA733		33	L14,19,20	File and Trap Coil	N-2000	3
5	TR9,16	"	2SC815 or 2SC620	2	34	L15	RF Choke Coil	N-1726	1
6	TR10,11,18	"	MJE200 or 2SC1096	3	35	L16	FIL Coil	N-1753	1
7	TR13	"	2SD327	1	36	L17,18	"	N-1752	2
8	TR17	"	2SC2028 or 2SC1018	1	37	L23	Micro Inductor	3.3uH	1
9	TR19	"	2SC756 or 2SC2034	1	38	FL-1	Ceramic Filter	CFU-455H	1
10	IC1	IC	TA7066P	1	39	VR1	Semi Fixed Resistor	EVN-JOA 50K	1
11	D1,2,3,4,14,15,25	Diode	1S953 or 1N4448	7	40	VR2,3,4,5	"	EVN-JOA 100K	4
			WG713		41	VR6	"	EVN-JOA 20K	1
12	D5,6,7,8,9,10,11,12,18,19,20,21,22	"	1S188AM	13	42	VR7	"	EVN-JOA 5K	1
13	D13	"	WG713	1	43	VR8	Variable Resistor	10KAS L:20	1
14	D16	"	KB-162	1	44	VR9,10	"	50KBN L:20	2
15	D17,24	"	SR1K-1	2	45	VR11	"	10KBN L:20	1
16	D23	Zener Diode	MZ309 or RD9.1E	1	46	R1,59,90	Carbon Resistor	10K 1/4W	3
17		LED	TLR102 (RED)	1	47	R2,11,17	"	100K "	3
18		"	TLG102 (GREEN)	1	48	R3,44,45,64,52,70,68,72	"	100 "	8
19		LED Display	TLR303 (RED)	2	49	R4,35	"	330 "	2
20		P.L.L. Unit		1	50	R5,8,40,81,76	"	6.8K "	5
21		REMOTE CONTROL ASS'Y		1	51	R6	"	1.5K "	1
22	L1	Ant Coil	T-60	1	52	R7,12,75,79,80,85,86,91,92,93,94,95,96,97,98,99,100,101,102,103,104	"	560 "	21
23	L2,3	RF Coil	T-63	2					
24	L4	1st IFT	T-56	1	53	R9,24,33,38,46,51,55,58,73	"	1K "	9
25	L5	"	T-57	1					
26	L6	2nd IFT	N-50A	1	54	R10,15,23,25,31,36,39,67	"	4.7K "	8

55	R13,14,32,62	"	3.3K	"	4	80	C7	Silvered Mica Capacitor	25PF	1
56	R16,21	"	680	"	2	81	C9	"	1PF	1
57	R18,22	"	150	"	2	82	C11,12	Ceramic Capacitor	0.02uF	2
58	R19,43	"	27K	"	2	83	C13,92	Silvered Mica Capacitor	2PF	2
59	R20,42,56	"	5.6K	"	3	84	C16,95	"	10PF	2
60	R26,82	"	47K	"	2	85	C18	Styroll Capacitor	500PF	1
61	R27,49	"	220K	"	2	86	C24,57	Mylar Capacitor	0.04uF	2
62	R28	"	120K	"	1	87	C25,94	Silvered Mica Capacitor	30PF	2
63	R29,30,61,63,78	"	33K	"	5	88	C27,51	Ceramic Capacitor	500PF	2
64	R34	"	2.2K	"	1	89	C29,41	Mylar Capacitor	0.005uF	2
65	R37,66	"	18K	"	2	90	C30	Tantalum Capacitor	16V-0.47uF	1
66	R47,74	"	68	"	2	91	C31,54,59	Mylar Capacitor	0.01uF	3
67	R48	"	1	1/2W	1	92	C34,36	Electrolytic Capacitor	16V-4.7uF	2
68	R50,77	"	15K	1/4W	2	93	C37,46	"	16V-220uF	2
69	R53,69	"	10	"	2	94	C38,56	Mylar Capacitor	0.001uF	2
70	R54	"	22	"	1	95	C39,45,55	Electrolytic Capacitor	6V-33uF	3
71	R57,60	"	22K	"	2	96	C40,42,43,50	Mylar Capacitor	0.1uF	4
72	R65,83	"	220	"	2	97	C47	Electrolytic Capacitor	16V-1000uF	1
73	R71,89	"	10	1/2W	2	98	C48,49	Mylar Capacitor	0.02uF	2
74	R84	"	56	1/4W	1	99	C53,61	lectrolytic Capacitor	16V-47uF	2
75	C1,64	Ceramic Capacitor	0.001uF		2	100	C60,91	"	16V-1uF	2
76	C2,10	Silvered Mica Capacitor	20PF		2	101	C44,65,71	Ceramic Capacitor	200PF	3
77	C3,5,8,17,28,33, 66,69,72,76,90, 93,120,121,125, 126,127	Ceramic Capacitor	0.01uF		17	102	C67,118	Silvered Mica Capacitor	3PF	2
78	C4,32,52,58,62, 63,97	Electrolytic Capacitor	16V-10uF		7	103	C68,70,82,117	"	100PF	4
79	C6,14,15,19,20, 21,22,23,262,35,74,75, 79,80,83,84,87,88,96, 98,100,102,103,104,105, 107,108,109,110,112,113, 114,115,116	Ceramic Capacitor	0.04uF		41	104	C73	"	70PF	1
						105	C77,85,86	"	300PF	3
						106	C78	"	150PF	1
						107	C89	"	200PF	1
						108	C106	"	60PF	1
						109		Transformer	In Put (E-19)	1
						110		"	Out Put (E-35)	1
						111		"	Choke (E-19)	1
						112	L21,22	Choke Coil	N1724S	2
						113		P.C.B. (Main)	GT4056B40	1

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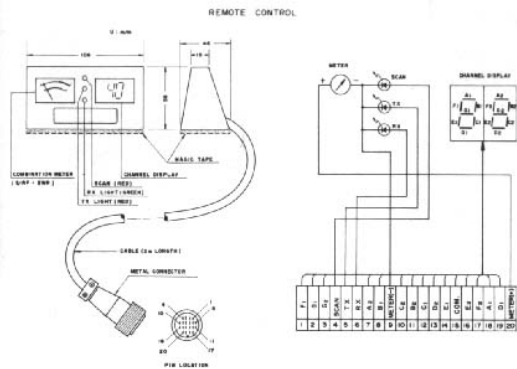
114	" (Display)	DG130D	1	147	Mounting Bracket	3-1078	1
115	" (SW)	1218SW	1	148	Heat Sink TX	3-1080	1
116	Rotaly Switch	8φ L:25 18 Channel	1	149	" RX	4-2036	1
117	Push Switch	MB3-5982	1	150	Mic Hunger		1
118	Push Switch Button	#4302-802	3	151	Shield Case	h-20	1
119	Slide Switch	SME2-3-11.5 or SL223-04	2	152	Shield Plate	SRT-104-103	4
120	Relay	MH4P-14	1	153	P.L.L. Bracket		2
121	Earphone Jack	3.5φ	2	154	Power Socket Holder		1
122	Power Socket		1	155	Wire		1 kit
123	Power Cord Ass'y		1	156	Screw Washer and Nut		1 kit
124	10P Plug	3021-10P L:80	1				
125	Ant Connector	MRU	1				
126	Ant Connector Rug		1				
127	Mic Socket	SM144S	1				
128	Mic Socket Rug		1				
129	Microphone with Plug		1				
130	Speaker	92	1				
131	Meter	250uA 5W	1				
132	Meter Lamp	14V-80mA	1				
133	Front Plate		1				
134	Display Color Filter		1				
135	Wool Paper (SP Net)	98	1				
136	" (Ribbon)	15 x 180	4				
137	Rubber Bushing (Meter Lamp)	5	1				
138	Busing (Bracket)	6 x 18 x 4t	2				
139	Meter Cushion		2				
140	Front Panel	2-1224	1				
141	Channel Knob	3-1075	1				
142	VR Knob	3-1077	4				
143	Chassis Ass'y	2-1186	1				
144	Front Sub Chassis	3-1099	1				
145	Case Top	2-1189	1				
146	Case Bottom	2-1188	1				

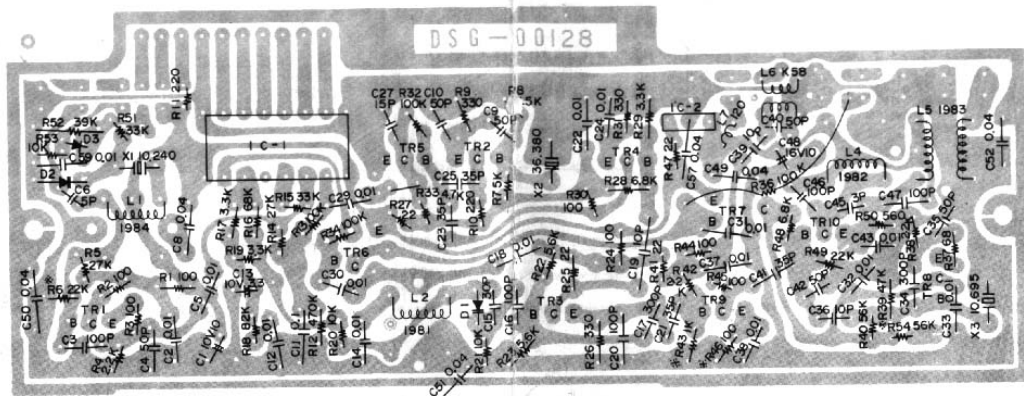
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P.L.L UNIT PARTS LIST

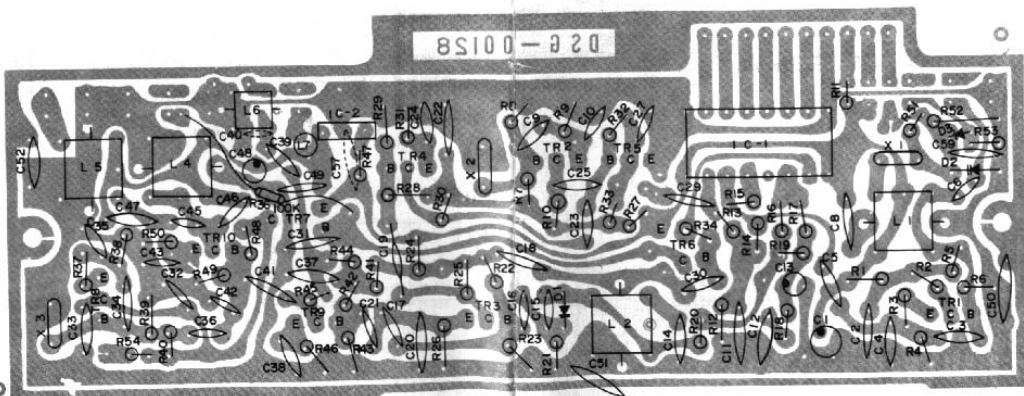
No.	Parts No.	Description	Q'ty
1		P.C.B DSG-00128	1
2	TR1,2,3,4,5 8,9,10	Transistor 2SC710 or 2SC829	8
3	TR7,6	Transistor 2SA564 or 2SA733	2
4	IC1	IC SM5104F,G or MN6040A	1
5	IC2	IC uA78L062WV	1
6		IC socket 0-583529-1	1
7	D1,2	Diode ITT310	2
8	D3	Diode 1S953	1
9	X1	Crystal 10.240MHz	1
10	X2	Crystal 36.380MHz	1
11	X3	Crystal 10.695MHz	1
12	L7	Micro inductor coil LF1-120μH	1
13	L1	Coil T69 (NS1984)	1
14	L2	Coil T66 (NS1981)	1
15	L4	Coil T67 (NS1982)	1
16	L5	Coil T68 (NS1983)	1
17	L6	Coil K58	1
18	C1	Tantalum Capacitor 10V-10μF	1
19	C13	" " 10V-3.3μF	1
20	C48	" " 16V-10μF	1
21	C58	Electrolytic Capacitor 16V-1000 μF	1
22	C2,5,12,18,22, 24,26,29,30,31, 32,33,37,38,59	Ceramic Capacitor 0.01μF	15
23	C8,49,50,51,52, 53,55,56,57	Ceramic Capacitor 0.04μF	9
24	C3,20,46,47,16	Silvered mica Capacitor 100pF	5
25	C4,9,10,35,40, 42	Silvered mica Capacitor 50pF	6
26	C6	" " " 5pF	1
27	C15	" " " 33pF	1
28	C34,17	" " " 300pF	2
29	C19,36,39	" " " 10pF	3
30	C21,23,25,41	" " " 35pF	4
31	C27	" " " 15pF	1
32	C45	" " " 3pF	1
33	C54	" " " 400pF	1
34	C11	Semi conductive ceramic Capacitor 0.1μF/25V	1
35	C14,43	Mylar Capacitor 0.01μF	2
36	R1,2,3,24,30,44, 45,46	Carbon Resistor 100 ohm 1/8W	8
37	R4,38,42	" " 2.2K " " "	3
38	R5	" " 27K " " "	1
39	R6,49	" " 20K " " "	2
40	R7	" " 5K " " "	1
41	R8	" " 1.5K " " "	1
42	R9,26,31	" " 330 " " "	3
43	R10,11	" " 220 " " "	2
44	R12	" " 470K " " "	1
45	R13,32,34,36	" " 100K " " "	4
46	R39,14	" " 47K " " "	2
47	R15,51	" " 33K " " "	2
48	R16	" " 68K " " "	1
49	R17,19,29	" " 3.3K " " "	3
50	R18	" " 82K " " "	1

51	R20,21,53	Carbon Resistor	10K ohm 1/8W	3
52	R22,23	" "	5.6K " " "	2
53	R25,27,41,47	" "	22 " " "	4
54	R28,48	" "	6.8K " " "	2
55	R33	" "	4.7K " " "	1
56	R37	" "	68 " " "	1
57	R40,54	" "	56K " " "	2
58	R43	" "	1K " " "	1
59	R50	" "	560 " " "	1
60	R52	" "	39K " " "	1
61	R55	" "	10 " " "	1
62		Case Top		1
63		Case Button		1
64		F Pin		9
65		Test Pin		2
66		Tapping Screw	⌀2φx4	6
67		Fiber		1
68		Wire		4
69		RF Cable		1
70		10P Plug		1
71		10P Jack		1
72		Inspection Seal		1
73		Twist Wire		1





P.L.L. UNIT I BACK VIEW



P.L.L. UNIT I FRONT VIEW

PLL UNIT I CIRCUIT DIAGRAM

- IC1 SM5104F
(MM55104)
(M16040A)
- IC2 MC78L06AV
(F78L06)
- X1 10.240MHz
- X2 36.380MHz
- X3 10.695MHz

- TR1 2SC829 (2SC710)
- 2 "
- 3 "
- 4 "
- 5 2SA564 (2SA733)
- 7 2SA564 (2SA733)
- 8 2SC829 (2SC710)
- 9 "
- 10 "
- D 1:2 1T13/10
- 3 1S953

