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Midland 13-867 Service Manual

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SPECIFICATIONS

RECEIVER SECTION:

Sensitivity at 10 db S/N Ratio	: 0.4 uv
Image Rejection Ratio	: 50 db
1st I-F Rejection Ratio at 10.635 MHz	: 55 db
2nd I-F rejection ratio at 455 kHz	: 100 db
Squelch sensitivity at maximum	: 500 uv
Squelch sensitivity at threshold	: 0.3 uv
AGC (input 5,000 uv, output 10 db down)	: 90 db
I-F Response at 6 db down bandwidth	: 5 kHz
Adjacent channel selectivity	: 60 db
Audio output power at maximum (input 60 db)	: 4W
Audio output power at 10% distortion	: 3W
Distortion at input 60 db	: 5%
Audio fidelity (6 db down)	: 350-2,000 Hz
Current drain at no signal	: 200 ma
Current drain at maximum output power	: 800 ma

TRANSMITTER SECTION:

R-F output power	: 3W
Modulation capability	: 90%
Frequency tolerance	: 0.003%
Spurious Rejection Ratio	: 55 db
Current drain at no modulation	: 700 ma
Current drain at maximum modulation	: 1,300 ma

MEASUREMENT CONDITION:

Audio output power	: 0.5W
Audio output load	: 8 ohm
Modulation frequency	: 1,000 Hz
Modulation	: 30%
Antenna impedance	: 50 ohm
Power source	: 13.8VDC

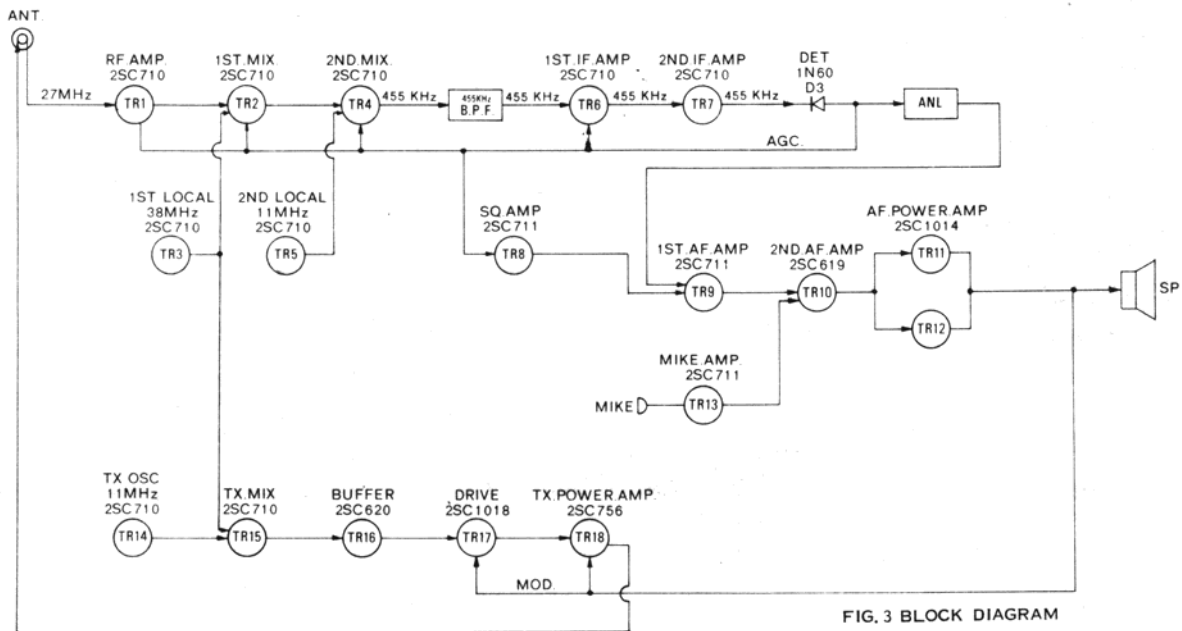
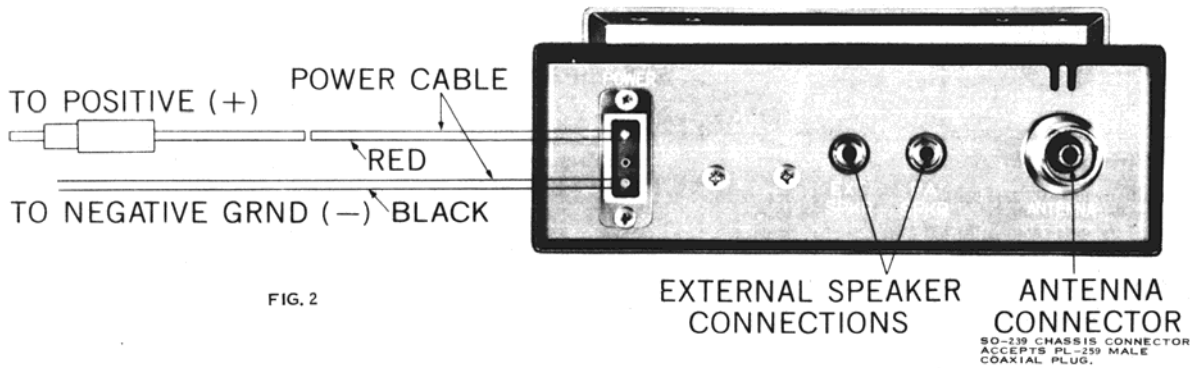
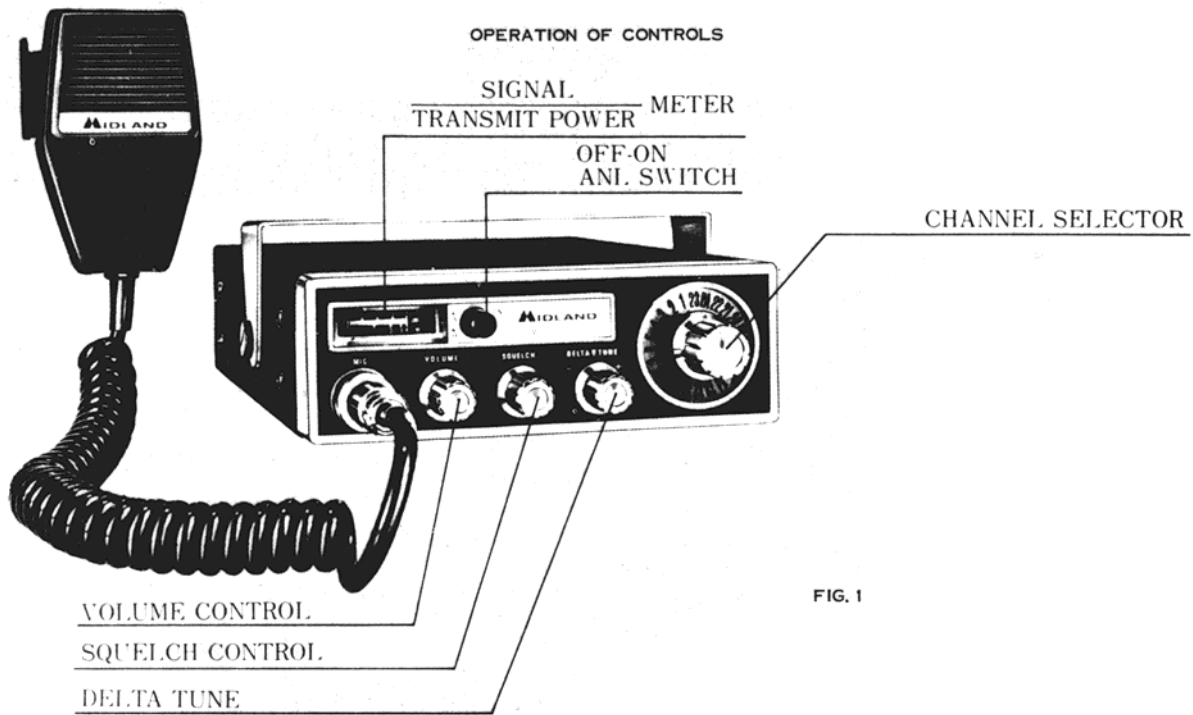
SEMICONDUCTOR COMPLEMENT

1. Transistor Complement

TR1	25C710C	: R-F amp. (RX)
TR2	25C710C	: 1st mixer (RX)
TR3	25C710C	: 1st local oscillator (RX) and transmitter oscillator (TX), 37 MHz
TR4	25C710C	: 2nd mixer (RX)
TR5	25C710C	: 2nd Local oscillator (RX), 10 MHz
TR6	25C710C	: 2nd I-F amp. (1st stage)
TR7	25C710C	: 2nd I-F amp. (2nd stage)
TR8	25C711E	: Squelch amp.
TR9	25C711D	: Audio amp. (RX)
TR10	25C619C	: Audio Driver
TR11	25C1014B	: Audio power amp.
TR12	25C1014B	: Audio power amp.
TR13	25C711D	: Mike amp.
TR14	25C710C	: Transmitter oscillator 10MHz
TR15	25C710C	: Transmitter mixer
TR16	25C620C	: Pre-driver (TX)
TR17	25C1018	: Transmitter driver
TR18	25C756-2-4	: Transmitter final

2. Diodes

D1	WG1012	: Protector diode
D2	WG1012	: Protector diode
D3	IN60	: Detector
D4	IN60	: S meter detector
D5	IN60	: R-F power detector
D6	IS2473	: ANL
D7	IN60	: Squelch detector
D8	IN60	: Squelch detector
D9	WG1012	: TX/RX Switching
D10	ZW9-1	: Voltage regulator (RX)
D12	SR1K-1	: Receiver stabilizer
D13	KB-162	: Bias regulator
D14	IN60	: AMC
Microphone		: Dynamic
Dimensions		: 2" (H) x 5-3/4" (W) x 7-1/2" (D)
Weight		: 10 lbs (with mic. stand)



ALIGNMENT OF TRANSMITTER SECTION (SEE FIGS. 4, 5 AND 7)

NOTE: This transceiver meets all requirements of F.C.C. rules and regulations, part 95. In order to operate the transceiver the user must obtain a class D citizens band radio license. However, only those persons who possess a 1st or 2nd class Radio-Telephone license are permitted to repair or adjust a malfunctioning unit (refer to F.C.C. rules and regulations, part 95, subpart C and D).

EQUIPMENT REQUIRED

R-F Output meter 50 ohm, 5 Watts
 Frequency Counter
 DC milliammeter 500 - 1,000 ma
 Power Supply 117 volts, 60Hz
 Field Strength Meter

PROCEDURE

Allow test equipment, and set at least 15 minutes to warm up before starting the alignment.
 R-F Output meter or 50 ohm H-F dummy load must be connected to external antenna jack.

STEP	PRESET TO	CONNECTIONS	ADJUSTMENTS	REMARKS
1	Transmit mode, no modulation	R-F output meter to antenna jack (J1) (see Fig. 2)	L4, 8, 9, 10, 11 & 12 (See Figure 4)	Adjust for a maximum indication on R-F meter
2.	Same as step 1	DC milliammeter connected to test point 1 between D12, and L14. NOTE: Connect + terminal of meter to D12, - terminal to L14. (See Figures 5 and 8.)	L4 (See figure 4)	Adjust L4 to obtain 5 watts of DC input power.
3.	Same as Step 1	With frequency counter check frequency on all channels.		
4.	Same as Step 1	Field strength meter to antenna connector terminals	L1	Adjust L1 to eliminate spurious radiation near 54MHz.

ALIGNMENT OF RECEIVER SECTION (SEE FIGS. 4, 5 AND 7)

EQUIPMENT REQUIRED

Signal generator 455kHz and 27 MHz Band, 1,000Hz, 30% AM, Output Impedance 50 ohm.
 AF Output Meter (VTVM)
 Power Supply 117 volts, 60Hz
 Oscilloscope
 Dummy Load 8 ohm, 5 watts (Resistive)

PROCEDURE

Allow test equipment, and set at least 15 minutes to warm up before starting the alignment.
 Output level: Keep signal generator output low enough to prevent AGC overload (Below 2 volts on output meter).

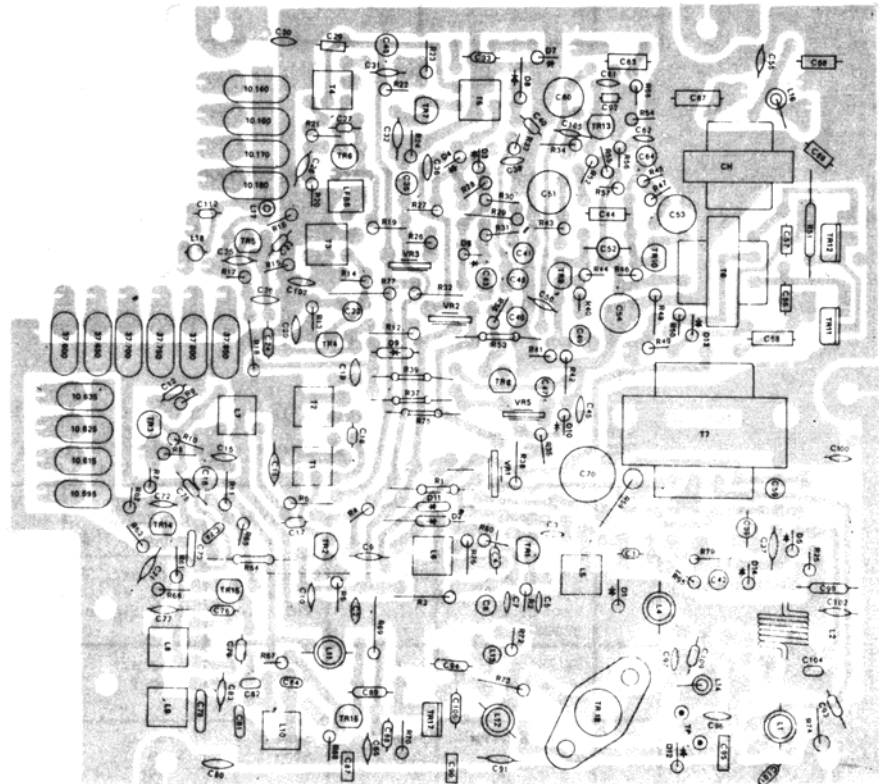
STEP	SIGNAL GENERATOR CONNECTION	SIGNAL GENERATOR FREQUENCY	PRESET CONTROLS TO	OUTPUT METER CONNECTIONS	ADJUSTMENT	REMARKS
1.	High side thru 0.01 mfd CAP. to base of TR4 ground.	455 kHz	Squelch: Min. Vol: Max.	From ext. SP Jack, J4 (See Figure 2)	T3, 4, 5 (See Fig 4)	Adjust for a max. output.
2.	To Ant. connector J1 (See Figure 2)	27.085 MHz (CH 13)	Same as Step 1	Same as Step 1	L5, 6, 7 T1, 2 (See fig. 4)	Adjust for a max. output.
3.	Same as Step 2.	Same as Step 2	Same as Step 1	Same as Step 1	VR3 (See fig. 5)	Adjust for 2 volts output at a signal generator output level of 0.25 uv

TRANSISTOR VOLTAGE CHART

		TX	RX	PA			TX	RX	PA
TR1	B	0.4	1.2	1.1	TR10	B	1.8	1.8	1.8
	C	0	13.5	1.9		C	12.0	12.0	12.0
	E	0	0.5	0.4		E	1.2	1.2	1.2
TR2	B	0.2	1.1	1.1	TR11	B	0.2	0.2	0.2
	C	8.6	8.2	8.0		C	13.8	13.8	13.8
	E	0	0.5	0.5		E	0.04	0.04	0.04
TR3	B	1.3	1.3	1.6	TR12	B	0.2	0.2	0.2
	C	12.8	12.8	12.8		C	13.8	13.8	13.8
	E	2.6	2.6	1.0		E	0.04	0.04	0.04
TR4	B	0.2	1.2	1.1	TR13	B	2.2	4.3	2.3
	C	8.9	8.0	8.0		C	4.7	12.0	12.0
	E	0	0.5	0.5		E	1.6	13.2	2.2
TR5	B	0.25	1.5	0.7	TR14	B	2.3	6.2	4.0
	C	0.7	6.2	3.5		C	11.0	13.5	13.0
	E	0	1.0	0.2		E	2.2	13.5	3.3
TR6	B	0.25	1.2	1.1	TR15	B	-0.75	-0.3	1.0
	C	8.8	8.2	8.0		C	13.8	13.8	13.8
	E	0	0.5	0.5		E	0.3	0.3	0.3
TR7	B	0.9	0.9	0.8	TR16	B	1.5	6.0	2.7
	C	8.5	8.3	8.0		C	13.8	13.0	13.0
	E	0.4	0.3	0.3		E	1.3	13.0	2.2
TR8	B	0.5	0.5	0.5	TR17	B	-1.3	0	0
	C	0.05	6.2	3.2		C	13.8	13.0	1.7
	E	0	0	0		E	0	0	0
TR9	B	0.2	1.2	0.6	TR18	B	-1.6	0	0
	C	12.0	9.0	12.0		C	13.8	13.0	1.5
	E	0	0.6	0		E	0	0	0

COMPONENT
LAYOUT

FIG. 4



SCHEMATIC DIAGRAM

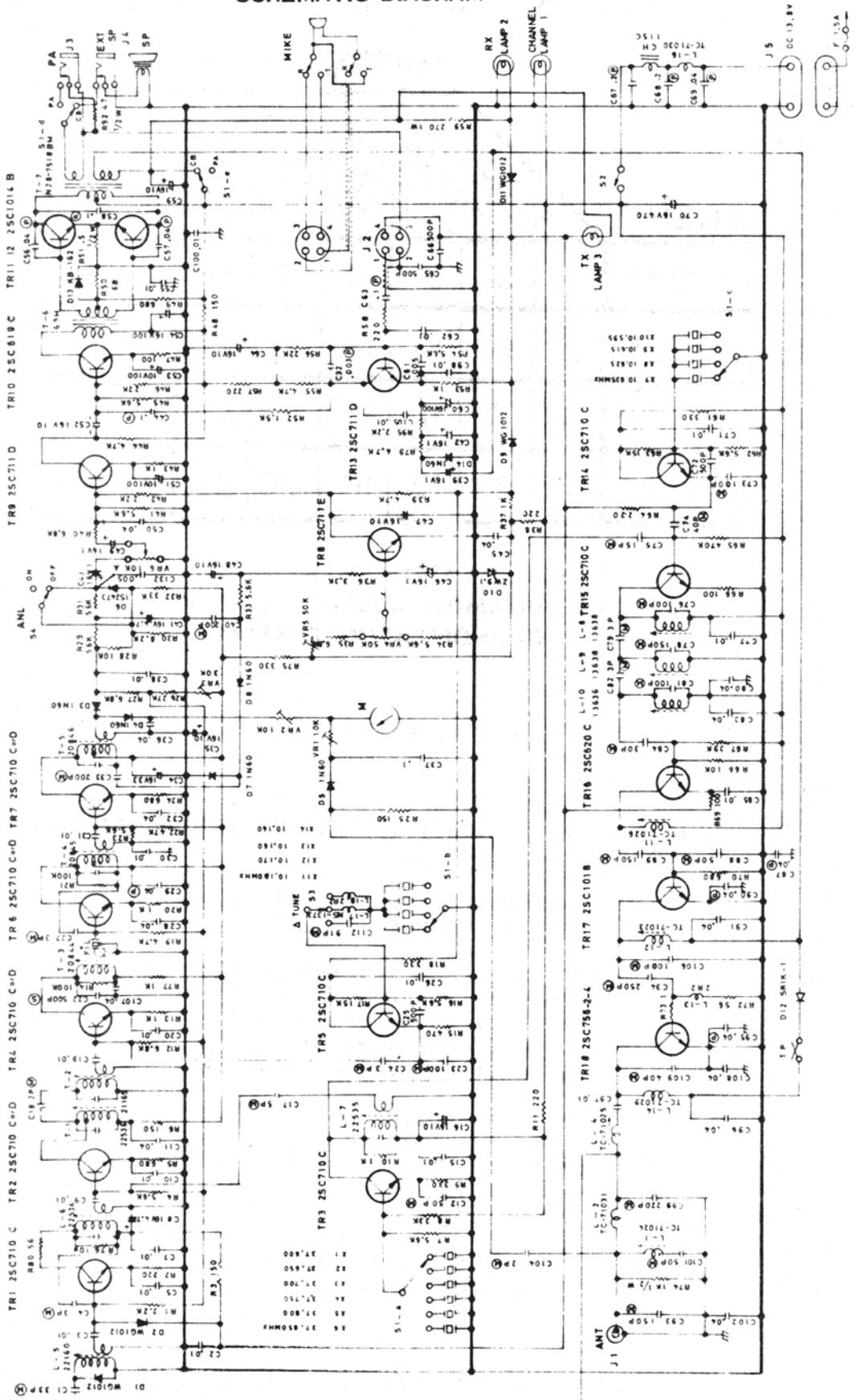


FIG. 5

CRYSTAL COMBINATION CHART

		MASTER CRYSTAL						
TRANSMIT		37.600	37.650	37.700	37.750	37.800	37.850	RECEIVE
10.635	1	5	9	13	17	21	10.180	
10.625	2	6	10	14	18	22	10.170	
10.615	3	7	11	15	19	22A	10.160	
10.595	4	8	12	16	20	23	10.140	

**FOLLOW STEPS LISTED BELOW
TO DETERMINE CORRECT SELECTION
OF INOPERATIVE CRYSTAL**

STEPS TO FOLLOW IN USING CRYSTAL CHART

1. Select channel number (1-23) which does not function properly.
2. Is the transmit or receive mode or both not functioning properly on that channel.
3. If transmit is (dead) not functioning properly, move to the extreme left-hand side of chart under (Transmit). Crystal frequency found is crystal to replace. Move to extreme right hand side of channel number if receive mode is not functioning properly.
4. If for example channels 1,2,3, and 4 do not function on either the transmit or receive mode. Move to top of chart under (master Crystal). Crystal frequency found is crystal to replace. In this instance crystal frequency 37.600 MHz.
5. To order the crystal desired refer to the parts list section of this manual under the crystal heading.

NOTE: Crystals must be placed in designated crystal sockets for unit to operate properly.

COMPONENT SYMBOL LAYOUT

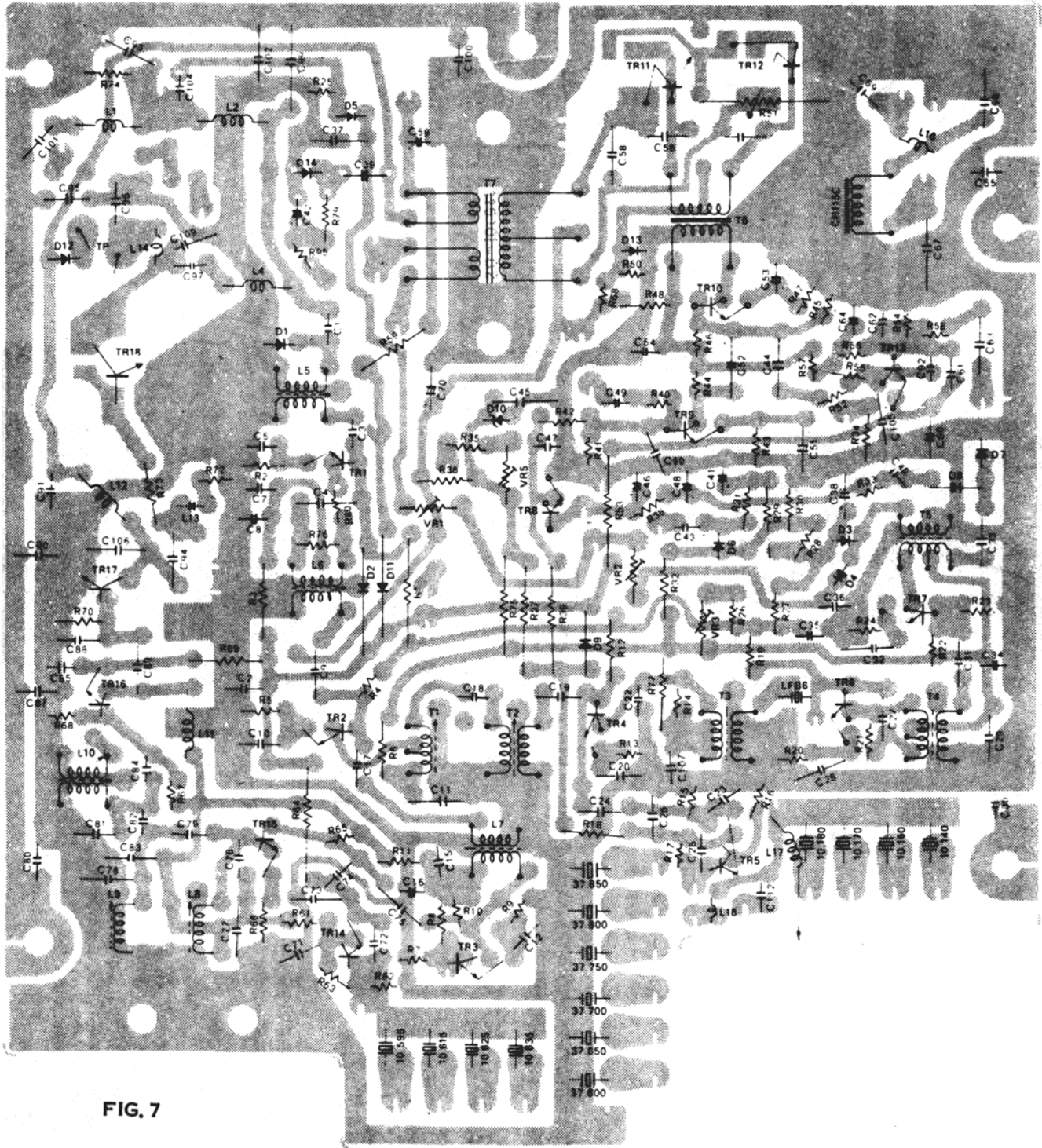


FIG. 7

REPLACEMENT PARTS LIST

MODEL NO. 13-867

<u>REF. NO.</u>	<u>DESCRIPTION</u>	<u>PART NO.</u>	<u>LIST PRICE</u>
<u>CASE PARTS</u>			
	Panel, Front	13-010173	\$ 2.72
	Case, Bottom	13-010174	2.54
	Case, Top	13-010175	2.54
	Plate, Function	13-020488	.46
	Plate, Name/Feature	13-020489	.46
	Plate, "S/W" Meter	13-020465	.46
	Plate, FCC	13-020490	.46
	Lens, Channel Disc	13-020466	.46
	Knob, Volume/Squelch Delta Tune	13-110136	.74
	Knob, Channel Selector	13-115072	.74
	Disc, Channel Number	13-115064	.96
	Mount-Bracket, Mobile	13-158234	.96
<u>MISCELLANEOUS</u>			
FIL	Filter, Ceramic	13-179026	4.20
	Microphone	13-038048	12.62
SP	Speaker	13-060080	2.72
	Meter	13-200039	4.90
J1	Connector, Antenna	13-159126	1.90
J2	Connector, Microphone	13-159127	4.40
J3,4	Jack, Ext. Spk.	13-153092	.46
J5	Connector, DC Power	13-159128	1.66
	Plug & Cord, DC Power	13-034055	1.90
	Holder, Fuse	13-159130	.46
	Fuse, 1.5A	13-204003	.46
PL1,2,3	Lamp, Pilot	13-201034	.96
	Hanger, Microphone	13-158233	.46
	Socket, Crystal	13-159129	.46
	Holder, Lamp	13-158235	.46
	Heatsink-Plate, Final Transmit Trans.	13-089068	.74
	Heatsink-Plate, Audio Output Transistor	13-089069	.74
	Mount, Anl Switch	13-158253	.74
<u>SWITCHES AND CONTROLS</u>			
S1	Switch, Channel Selector	13-180069	7.30
S3	Switch, Delta Tune	13-180072	2.72
S4	Switch, ANL	13-183159	1.44
VR1,2	Control, Sensitivity (10 ohm)	13-164072	.74
VR3	Control, Sensitivity (30K ohm)	13-164073	.74
VR4	Control, Squelch (50K ohm)	13-160085	1.44
VR5	Control, Sensitivity (50K ohm)	13-164038	.74
VR6 or S2	Control, Volume (10K ohm)	13-160084	2.30

REPLACEMENT PARTS LIST

MODEL NO. 13-867

<u>REF. NO.</u>	<u>DESCRIPTION</u>	<u>PART NO.</u>	<u>LIST PRICE</u>
<u>CRYSTALS</u>			
X1	37.600MHz	13-128149	\$ 7.54
X2	37.650MHz	13-128150	7.54
X3	37.700MHz	13-128151	7.54
X4	37.750MHz	13-128152	7.54
X5	37.800MHz	13-128153	7.54
X6	37.850MHz	13-128154	7.54
X7	10.635MHz	13-128159	4.70
X8	10.625MHz	13-128160	4.70
X9	10.615MHz	13-128161	4.70
X10	10.595MHz	13-128162	4.70
X11	10.180MHz	13-128155	4.70
X12	10.170MHz	13-128156	4.70
X13	10.160MHz	13-128157	4.70
X14	10.140MHz	13-128158	4.70
<u>COILS AND TRANSFORMERS</u>			
L1	Coil, RF	13-176345	.74
L2	Coil, RF	13-176346	.46
L4	Coil, RF	13-176347	.74
L5	Coil, RF	13-176348	.96
L6	Coil, RF	13-176349	.96
L7	Coil, RF	13-176350	.96
L8,9	Coil, RF	13-176351	.96
L10	Coil, RF	13-176352	.96
L11	Coil, RF	13-176353	.74
L12	Coil, RF	13-176354	.74
L13	Coil, RF	13-176355	.46
L14	Coil, RF	13-176356	.46
L16	Coil, RF	13-176357	.74
L17	Coil, RF	13-176358	.74
L18	Coil, RF	13-176355	.46
T1	IFT, 1st	13-090242	.96
T2	Transformer, IF	13-090243	.96
T3	IFT, 2nd	13-090244	.96
T4	Transformer, IF	13-090245	.96
T5	Transformer, IF	13-090246	.96
T6	Transformer, AF Input	13-096136	1.44
T7	Transformer, AF Output	13-096137	1.90
CH	Choke, Line Filter	13-178126	.96
<u>TRANSISTORS</u>			
TR1-7, 14, 15	2SC710	09-302012	2.40
TR8,9,13	2SC711	09-302107	2.40
TR10	2SC619	09-302058	2.40
TR11,12	2SC1014	09-302046	2.79
TR16	2SC620	09-302165	2.40
TR17	2SC1018	09-302102	7.26
TR18	2SC756	09-302166	5.78

REPLACEMENT PARTS LIST

MODEL NO. 13-867

<u>REF. NO.</u>	<u>DESCRIPTION</u>	<u>PART NO.</u>	<u>LIST PRICE</u>
<u>DIODES</u>			
D1,2,9,11	WG1012	09-306134	\$.74
D3,4,5,7, 8,14	1N60	09-306019	.60
D6	1S2473	09-306244	.74
D10	Diode, ZW9.1 Zenor	13-085042	1.44
D12	SR1K-1	09-306245	.74
D13	Varistor, KB-162	09-306233	.46

RESISTORS

ALL RESISTORS NOT SHOWN ON THIS PARTS LIST ARE CARBON, 1/4 WATT.
FOR SPECIFIC VALUES CONSULT SCHEMATIC DIAGRAM.

R51	Wire Wound, .5ohm, 1/2 Watt	77-302508	.46
R59	Solid, 270 ohm, 1 Watt	77-204271	.40
R74	Solid, 1K ohm, 1/2 Watt	77-202102	.30
R92	Solid, 47 ohm, 1/2 Watt	77-202470	.30

CAPACITORS

ALL CAPACITORS NOT SHOWN ON THIS PARTS LIST ARE MICA TYPE, 50WV.
FOR SPECIFIC VALUES CONSULT SCHEMATIC DIAGRAM.

STYROL CAPACITORS

C22	500PF, 50V	78-351501	.76
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CERAMIC CAPACITORS

C11,28,32,36, 45,80,83, 91,96,102, 107,108	.04uF, 25V	13-131004	.26
C2,3,5,7,9, 10,15,19, 20,26,30, 31,38,50,55, 62,71,77,85, 97,98,100,105	.01uF, 25V	13-131001	.26
C25,65,66, 72	500PF, 50V	78-151501	.26
C37	.1uF, 12V	13-131009	.26
C61,132	.005uF, 50V	78-151502	.26

REPLACEMENT PARTS LIST

MODEL NO. 13-867

<u>REF. NO.</u>	<u>DESCRIPTION</u>	<u>PART NO.</u>	<u>LIST PRICE</u>
<u>MYLAR CAPACITORS</u>			
C29,56,57, 69,87,90, 95	.04uF,50V	78-651403	\$.38
C44,52,58, 63	.17F,50V	78-651104	.38
C67,68	.2uF,50V	78-651204	.38
C92	.001uF,50V	78-651102	.38
<u>ELECTROLYTIC CAPACITORS</u>			
C8,41	4.7uF,16V	77-337475	.96
C16,35,47, 48,59,64	10uF,16V	77-337106	.96
C34	33uF,16V	77-337336	.96
C39,42,43, 46,49	1uF,16V	77-337105	.96
C54,60	100uF,16V	77-337107	.96
C70	470uF,16V	77-337477	.96

HOW AND WHERE TO ORDER REPLACEMENT PARTS

NOTE: To eliminate error and speed delivery of replacement parts, always include the following information on your order:

1. Complete identification of merchandise for which the part is wanted.
 - A. Name Item
 - B. Model Number
 - C. Serial Number

2. Best possible identification of the part itself.
 - A. Part Number
 - B. Part Name
 - C. Quantity
 - D. If necessary, return old part as sample.

3. Customer should use address listed below when ordering replacement parts.

MIDLAND ELECTRONICS COMPANY
 Parts Department
 110 West 12th Street
 North Kansas City, Missouri 64116