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MIDLAND ELECTRONICS COMPANY®

13-870D

23 Channel AM- Mobile Transceiver

SPECIFICATION

SEMICONDUCTORS	: 18 Transistors, 1 IC, 12 Diodes	**TYPE OF EMISSION**	: A3
FREQUENCY RANGE	: 23 channel CB Transmit and receive	**POWER SOURCE**	: 13.8V DC
		TEMPERATURE RANGE	: -20°C ~ +50°C
		MICROPHONE	: Push to talk dynamic type
TRANSMITTER			
POWER INPUT	: 5W	**MODULATION**	: Automatic level control for Over Modulation
POWER OUTPUT	: 3W		
FREQUENCY TOLERANCE	: Less than ±0.005% at -20°C ~ +50°C	**SPURIOUS AND HARMONICS**	: More than 50dB Attenuation
		ANTENNA IMPEDANCE	: 50 ohm
MODULATION SENSITIVITY	: Less than 5mV at microphone terminal	**CURRENT DRAIN**	: Less than 1A at Carrier output Less than 1.5A at Full modulation
MODULATION RESPONSE	: +3dB -8dB at 300Hz ~ 3000Hz		
MODULATION QUALITY	: Less than 10% distortion at 1,000Hz		
RECEIVER			
SENSITIVITY	: Less than 1μV Input for 0.5W output and 10dB S + N/N	**IMAGE REJECTION**	: More than 40dB
		AGC	: 5μV ~ 50K μV
SQUELCH SENSITIVITY	: Less than 1μV (threshold)	**AUDIO OUTPUT**	: More than 2W
SELECTIVITY	: More than 40dB down at ±10KHz	**CURRENT DRAIN**	: Less than 300mA at no signal
DELTA TUNE	: ±1.5KHz		

MIDLAND ELECTRONICS COMPANY®

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GENERAL OFFICE: Phone:474-5080-Area Code 816

Printed in Japan

ALIGNMENT PROCEDURE

1. SYNTESIZER ALIGNMENT

Alignment	Connections	Adjustment		Normal bias Level with respect to ground		
				Vc	Vb	Ve
37MHz Oscillator Q3	Frequency Counter to Q3 Emitter through 5pf capacitor	Top of L101 keep output frequency within a tolerange of 0.003% at channels 1, 5, 9, 13, 17, 21	No crystal	13.8	1.72	1.15
			With crystal	13.3	1.58	1.8
Mixer Q17	HF millivoltmeter to T104, Signal Generator to Secondary terminal of base of Q17 with 0.1 volt output at 27.0MHz no modulation	Top of T103, T104 for Peak output at HF millivoltmeter	No input carrier	13.1	2.9	2.3
			With input carrier	12.8	2.8	2.5
10MHz Oscillator Q16	Frequency counter to Secondary terminal of T104	Top of T102 keep output frequency (27MHz) within a tolerance of 0.003% at each channel	No crystal	12.5	2.8	2.4
			With crystal	12.0	2.7	4.7

2. RECEIVER ALIGNMENT

Alignment	Connections	Adjustment		Nominal bias level respect to groung (no signal)		
				Vc	Vb	Ve
455KHz IF Transformer	Signal Generator to 2nd mixer I.C. #2 lead through a 0.1μF capacitor Generator frequency 455KHz ±0.2%, Channel Selector to vacant channel	Top of Z2, Z3 and Z4 keep reducing the generator output to maintain an output level below 0.5 Watt. (volume control fully clock wise)	Q6	9.1	0.95	0.4
			Q7	9.0	1.35	0.8
			Ic	8.8	2.9	2.6
2nd Local Oscillator Q5	Frequency counter to secondary terminal of T3	Top of T3 Check frequency Ch1, 5, 9, 13, 17 21 11.090MHz Ch2,6,10,14,18,22 11.080MHz Ch3,7,11,15,19 11.070MHz Ch4,8,12,16,20,23 11.050MHz	No Crystal	8.8	1.3	0.7
			With Crystal	8.8	1.3	1.2
10.6MHz IF Transformer	Signal generator to 1st mixer, Q2 base. Signal generator frequency 10.6MHz channel selector to any working	Top of Z1-A, and Z1-B with a low level signal generator input for maximum output	Q2	9.0	1.0	0.5
RF Coil	Channel setting to 11 Signal generator to antenna connector	Signal generator for peak at 27.085MHz top of T1 and T2 with a low level Signal generator input for maximum output	Q1	9.0	1.05	0.5

3. TRANSMITTER ALIGNMENT

Alignment	Connections	Adjustment		Nominal bias Level with respect to ground		
				Vc	Vb	Ve
Driver	Dummy load to antenna socket Power output indicator across load. Milliammeter (500mA) between 13.8V and Choke2 (T.P.) for check Final collector current	Top of T6 and T7 for maximum final collector current	Q18	13.8	1.43	0.8
			Q19	8.5	0.25	0.18
Output		Top of L3,L4 and L1 for maximum output and minimum collector current Collector current must be less than 381mA at any channel	Q20	13.1		

4. MODULATION ALIGNMENT

Connection: Audio oscillator to Microphone terminal through 600Ω resistor

Dummy load to antenna socket.
Power output indicator across load.
Synchronized osilloscope to dummy load.

Adjustment: 1. Audio oscillator output, 50mV VR3, maximum point
Adjust UR7 not for negative crip at carrier enverope

2. Decrease audio oscillator output down to 5mV or less.

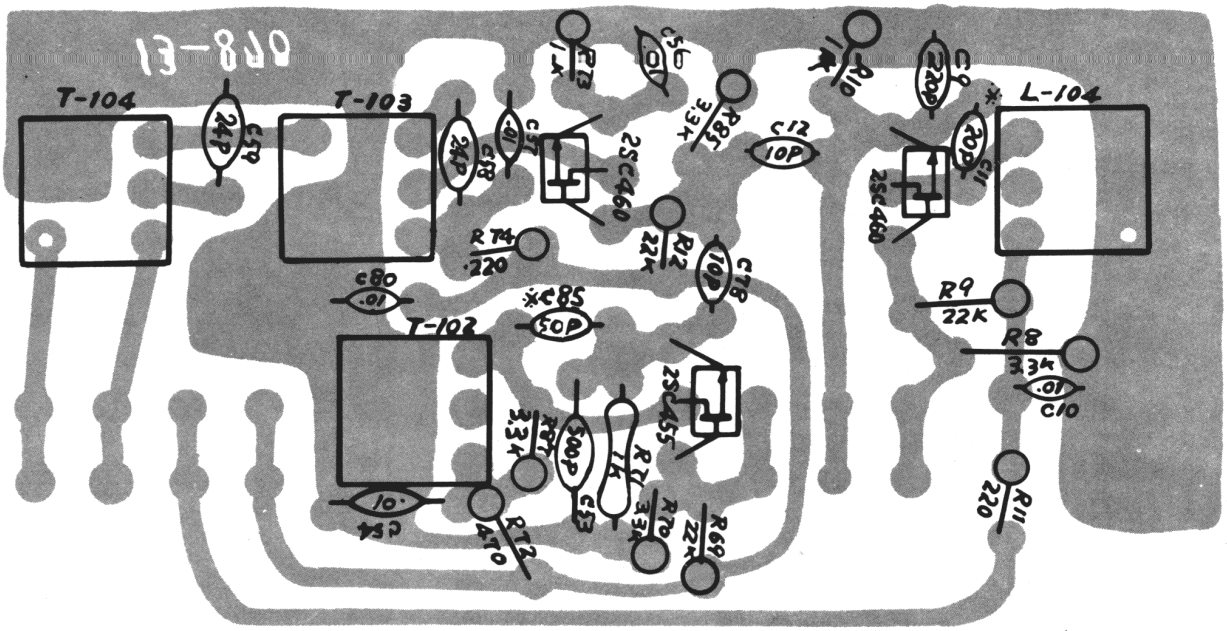
Carrier envelope must be 50% modulation or more.

5. AUDIO AND SQUELCH SECTION

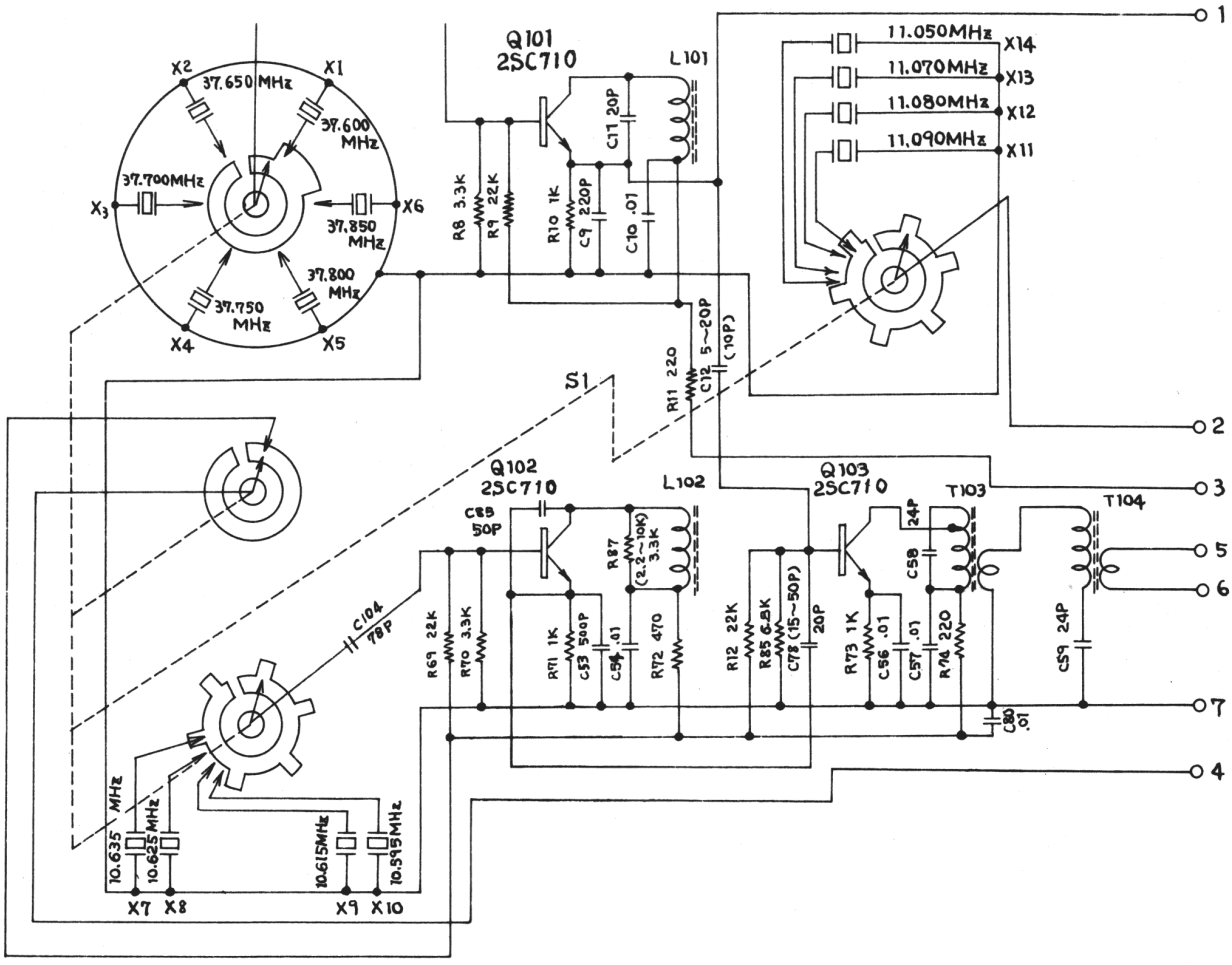
Normal bias level with respect to ground.
Measured at no signal.

		Vc	Vb	Ve
Q10	Unsquelch	0.1V	0.68V	0
	Squelch	8.0V	0.1V	0
Q11	Unsquelch	9.1V	0.05V	2.2V
	Squelch	6.0V	4.5V	4.3V
Q12	Unsquelch	12V	2.7V	2.2V
	Squelch	13.8V	2.8V	4.3V
Q8		8.7V	0.75V	0.2V
Q13		12.5V	1.5V	0.9V
Q14		0.2V	13V	13.2V
Q15		0.2V	13V	13.2V

SYNTHESIZER PARTS LOCATION



SYNTHESIZER SCHEMATIC DIAGRAM



PARTS LIST

CABINET MATERIALS

REF. NO.	DESCRIPTION	MIDLAND PART NUMBER	LIST PRICE	REMARKS
	Case Top, L/Trim	13-010012	$ 3.28	
	Case, Bottom	13-013013	3.54	
	Panel, Front	13-010170	1.90	
	Disc, Channel Indicator	13-020015	1.66	

SELECTOR

REF. NO.	DESCRIPTION	MIDLAND PART NUMBER	LIST PRICE	REMARKS
	Knob, Volume	13-110032	$ .96	
	Knob, Squelch	13-110033	1.44	
	Knob, Channel Selector	13-110034	1.44	

MISCELLANEOUS

REF. NO.	DESCRIPTION	MIDLAND PART NUMBER	LIST PRICE	REMARKS
	Microphone	13-038042	$13.00	
	Cable, Power Supply w/Fuse Holder	13-034042	1.60	
	Speaker, 8 OHM/3 WATT	13-060004	2.54	
	Board, Main P/C	13-070088	2.19	
	Board, Synthesized P/C	13-070024	1.80	
	Control, Volume w/squelch	13-160012	3.78	
VR1	Control, Sensitivity (50K)	13-164038	.86	
VR3	Control, Sensitivity (5K)	13-164040	.86	
VR6	Control, Sensitivity (100K)	13-164039	.86	
S1	Switch, Channel Selector	13-180052	8.02	
S2,4	Switch, Delta Tune, PA/CB/ANL	13-180019	1.44	
	Meter, RFD	13-200009	7.80	
	Lamp, Pilot 16V/40MA	13-201015	.74	

HARDWARE

REF. NO.	DESCRIPTION	MIDLAND PART NUMBER	LIST PRICE	REMARKS
	Heatsink-Plate, F/Transistor Q14 & Q15	13-089031	$ .46	
	Heatsink-Plate, F/Transistor Q20	13-089032	.46	
	Heatsink, F1 Transistor Q19	13-089034	.46	
	Jack, Microphone	13-153076	.96	
	Jack, P.A.	13-153077	.74	
	Jack, External Antenna (DO-239)	13-153078	1.90	
	Jack, External Speaker	13-153079	.96	
	Post, Ground Terminal	13-156066	.46	
	Spacer, P.A. or C.B. Switch	13-156067	.46	
	Mount, Bracket, Auto	13-158026	1.66	
	Connector, F/Synthesizer Board	13-158028	.46 ea.	
	Mount, Bracket, Meter & Mic. Jack	13-158172	.74	
	Chassis, Main	13-015019	4.20	
	Mount, Delta Tune Switch	13-158228	.46	

COILS & TRANSFORMERS

REF. NO.	DESCRIPTION	MIDLAND PART NUMBER	LIST PRICE	REMARKS
T1	Coil, Receive Antenna	13-176041	$ .74	
T2	Coil, RF Amplifier	13-176048	.74	
T3	Coil, Receive Oscillator	13-170146	.96	
T4	Transformer, Audio Driver	13-096031	1.44	
T5	Transformer, Audio Output & Modulation	13-096099	3.54	
T6	Coil, Transmit Oscillator	13-176049	.74	
T7	Coil, Buffer Load	13-176050	.74	
T102	Coil, Transmit Oscillator (Syn.)	13-170148	.96	
T103	Coil, Oscillator (Synthesizer)	13-170147	.74	
T104	Coil, Oscillator (Synthesizer)	13-176051	.74	
L1	Coil, Antenna Peaking	13-176037	.96	
L3	Coil, Loading	13-176038	.74	
L4	Coil, Loading	13-176039	.74	
L5	Coil, Loading	13-176040	.46	
Z1A	Coil, IFT-1 1st	13-090163	.74	
Z1B	Coil, IFT-1 2nd	13-090164	.74	
Z2	Coil, IFT (455 KHz)	13-090144	.74	
Z3	Coil, IFT (455 KHz)	13-090145	.96	
Z4	Coil, IFT (455 KHz)	13-090146	.96	
CH1	Choke, Power Filter	13-178012	.96	
CH2	Coil, Choke (.22 MH)	13-178013	1.12	
CH3	Coil, Choke (5.6 MH)	13-178014	.46	
CH4	Coil, Choke (2.2μH)	13-178125	.74	
L101	Coil, Master Oscillator	13-170021	.96	
LO	Coil, Choke (.85 MH)	13-178074	.46	

TRIMMER

REF. NO.	DESCRIPTION	MIDLAND PART NUMBER	LIST PRICE	REMARKS
CV1	Trimmer, Antenna	13-123008	$ .74	

INTEGRATED CIRCUIT

REF. NO.	DESCRIPTION	MIDLAND PART NUMBER	LIST PRICE	REMARKS
IS	Integrated Circuit CA-3028	09-308003	$ 5.46	

FILTER

REF. NO.	DESCRIPTION	MIDLAND PART NUMBER	LIST PRICE	REMARKS
FIL	Filter, Ceramic	13-179007	$ 4.00	

CRYSTALS (ALL CRYSTALS LISTED ARE WIRE-IN TYPE)
CRYSTAL FREQUENCY

REF. NO.	DESCRIPTION	MIDLAND PART NUMBER	LIST PRICE	REMARKS
X1	37.600 MHz	13-128071	$ 4.38	
X2	37.650 MHz	13-128072	4.38	
X3	37.700 MHz	13-128073	4.38	
X4	37.750 MHz	13-128074	4.38	
X5	37.800 MHz	13-128075	4.38	
X6	37.850 MHz	13-128084	4.38	
X7	10.635 MHz	13-128083	4.38	
X8	10.625 MHz	13-128082	4.38	
X9	10.615 MHz	13-128081	4.38	
X10	10.595 MHz	13-128080	4.38	
X11	11.090 MHz	13-128079	4.38	
X12	11.080 MHz	13-128078	4.38	
X13	11.070 MHz	13-128077	4.38	
X14	11.050 MHz	13-128076	4.38	

TRANSISTORS

REF. NO.	DESCRIPTION	MIDLAND PART NUMBER	LIST PRICE	REMARKS
Q1				
Q2, Q18, Q101, Q102, Q103	2SC710	09-302012	$ 2.40	
Q5, Q6, Q7, Q8 Q10, Q11, Q12, Q13	2SC372	09-302039	2.10	
Q14, 15	2SB367	09-301075	2.95	
Q19	2SC 776	09-302068	5.66	
Q20	2SC 1239	09-302169	10.60	

DIODES

REF. NO.	DESCRIPTION	MIDLAND PART NUMBER	LIST PRICE	REMARKS
D2, 3, 4, 1, 5, 6, 10	IN34A	09-306020	$ .60	
D7	IN960B	09-306247	1.90	
D8	1S84	09-306248	.96	
D9, D12	10D4	09-306149	.74	
D11	IS1212	09-306110	.60	

THERMISTOR

REF. NO.	DESCRIPTION	MIDLAND PART NUMBER	LIST PRICE	REMARKS
TH2, 3	Thermistor TD-C213	09-307058	$ .46	
TM4	Thermistor TD-A025	09-307059	.46	

RELAY

REF. NO.	DESCRIPTION	MIDLAND PART NUMBER	LIST PRICE	REMARKS
RL	Relay	13-105001	$ 7.64	

RESISTORS

ALL RESISTORS NOT SHOWN ON THIS PARTS ARE CARBON, 1/2 WATT.
10% TOLERANCE, SEE SCHEMATIC FOR SHECIFIC VALUES.

REF. NO.	DESCRIPTION	MIDLAND PART NUMBER	LIST PRICE	REMARKS
R68	Resistor, Wire-wound 3.3 OHM/1 Watt	77-304109	$ .64	

CAPACITORS

ALL CAPACITORS NOT SHOWN ON THIS PARTS LIST ARE CERAMIC DISC. MYLAR, OR MICA,
10% TOLERANCE, 50 WV. SEE SCHEMATIC FOR SPECIFIC VALUES.

ONLY ELECTROLYTIC CAPACITORS ARE SHOWN ON THIS PARTS LIST.

REF. NO.	DESCRIPTION	MIDLAND PART NUMBER	LIST PRICE	REMARKS
C17, 41, 42, 46, 87, 93	Electrolytic, 10 MF/15V	77-331106	$ .76	
C97	Electrolytic 10 MF/10V	77-336106	.76	
C35, 44	Electrolytic, 50 MF/15V	77-331506	.76	
C48, 23	Electrolytic, 100 MF/15V	77-331107	.76	
C49	Electrolytic, 1000 MF/15V	77-331108	.96	
C50, C102, C103	Electrolytic, 200 MF/15V	77-331207	.76	
C94	Electrolytic, 220 MF/10V	77-336221	.76	