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Midland 13-871 Service Manual

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MIDLAND
COMMUNICATIONS COMPANY[®]

13-871

23 Channel Mobile
AM Transceiver
5 Watts-AM



SPECIFICATIONS:

Semi-conductor	: 29 Transistors, 1 I.C., 33 diodes
Frequency Range	: 23 channel CB transmit and receiver
Modes of operation	: High-level class B AM
Power Source	: 12-16 Volt DC
Temperature Range	: -20°C to +50°C
Microphone	: Push-to-talk dynamic type
Power Input	: 5 Watts
Audio Modulation	: High-level class B, push-pull
Audio Output	: 3 Watts
Spurious Response	: More than 50dB
Output Impedance	: 50 ohm
Sensitivity	: 0.5 μ V @6dB S/N
Selectivity	: 40dB down \pm 10KHz
Plate Tune	: \pm 900Hz or more
Speaker	: 8 ohm
Intermediate frequencies	: 1st - 10MHz 2nd - 455KHz
Controls	: On/Off, volume, squelch, public address H.E.L.P. selector, channel selector, Noise limiter, plate tune

MIDLAND
COMMUNICATIONS COMPANY[®]
110W. 12TH Street. North Kansas, Missouri 64116 U. S. A.

GENERAL OFFICE: Phone: 842-0511-Area Code 816

Printed in Japan

1. CIRCUIT DESCRIPTION

1-1-1 TRANSMITTER :

Transmitter consists of a crystal controlled synthesizer, a crystal controlled carrier oscillator, a mixer, a buffer, a driver and a power amplifier. The signal from the synthesizer fed to Q-17, the buffer amplifier and after being amplified by Q-18, it is driven into Q-19 the final power amplifier.

1-1-2 MODULATION

The audio signal which comes from the microphone pass through relay then into Q-11. Q-11 drives it to the push-pull circuit of Q-13 and Q-14. It then passes through the modulation transformer T-10 which modulates Q-18 and Q-19.

1-2 RECEIVER

1-2-1 RF AMPLIFIER

The RF signal which passes through the relay from the antenna is fed into L-1 which provides the 10MHz trap and then into T-1 which provides the impedance match. The RF amplifier, Q-1, raises the RF signal. After being tuned by T-2 it is fed into the base of the mixer, Q-2, which mixes the RF signal and the signal from the synthesizer through C-7.

1-2-2 1st IF AMPLIFIER

The 1st IF signal is fed into the base of the mixer Q-3 through T-3 and T-4, which are double tuned transformers which eliminate undesirable frequencies such as image frequencies. The frequency from L-3 through C-12 is injected into the base of the mixer Q-3 and mixed with frequency fed into the base of Q-3 through T-3 and T-4.

1-2-3 2nd IF AMPLIFIER

After the output is filtered through the ceramic filter, it is applied to the base of Q-4. Q-4 and IC-1 amplify the 455KHz signal to a level suitable for detection.

1-3 AUDIO

The output of the 2nd IF amplifiers is applied to the detector diodes D-7, D-8 and the filtering circuit. The detected audio output is coupled into the base of Q-10 through the noise limiter. The amplified audio signal by Q-10 is coupled by C-56, R-42, C-57 and VR6 (the gain setting potentiometer) to the volume control VR-7. It is then coupled to Q-11 through relay and C-60. The amplified audio signal at Q-11 passes to Q-12 through C-66, L-18 and R-49 (high pass filter). It is then amplified and driven Q-12 into the input transformer, T-9, which drives the push-pull amplifier, Q-13 and Q-14. The output transformer T-10 is coupled by the relay to the speaker.

1-4 AGC

The 455KHz signal coming through C-26 is rectified by D-6. This rectified voltage is the bias of the base of Q-7, which is controlled by VR-5. Then it controls the collector voltage of Q-7. The AGC voltage is provided by the collector voltage of Q-7 through R-31. The AGC voltage is adjusted by VR-5 and controls Q-1, Q-3 and Q-4. The additional AGC circuit (D-2 and D-3) is employed in this model to obtain the better AGC performance.

1-5 SQUELCH

The squelch circuit consists of a rectifier, squelch amplifiers and a squelch control (VR-2) which changes the operating bias of Q-8 and Q-9. The voltage of the emitter of Q-10 is raised and Q-10 is tuned off when the squelch control is set to make Q-10 conduct. When a strong signal, enough to override the set level by VR-2, the rectified output of D-5 goes to a slightly positive direction which cuts off Q-9. Then the voltage across R-36 drops to 0 and this means the voltage between the base and the emitter of Q-9 drops to 0 also. No bias between the base and emitter of Q-9 cuts Q-9 off and Q-10 conducts. The potentiometer VR-1 is for the adjustment of level squelch sensitivity.

1-6 H.E.L.P. Circuit

The H.E.L.P. circuit consists of a direct current amplifier, a multivibrator, a bistable multivibrator or flip-flop circuit and the switching circuit. The H.E.L.P. selector switch slides to Auto position and Q-10 is cut off by the squelch control. This means the potential at the collector of Q-8 increases and the voltage between the base and emitter of Q-21 increases also. Increasing bias of the base of Q-21 conducts Q-21 and cuts Q-22 off. Cutting Q-22 off increases the potential at the collector of Q-22. Then the potential at the base of Q-23 or Q-24 increases and the multivibrator consisting of Q-23 and Q-24 starts to operate. The output of this multivibrator is pulse wave. The output conditions of the bistable multivibrator consisting of Q-25 and Q-26 are maintained only as long as the input conditions are maintained. But, when the operation of the multivibrator changes by the negative pulse through C-117 and D-22 or D-23. If Q-25 is cut off and Q-26 is conducting, a negative pulse at the collector of Q-25 will drop the potential at the collector of Q-25 and cause a switchover. This means that Q-25 and Q-26 repeat cutting off-conducting alternately by a negative pulse. If Q-25 is cut off and Q-26 is conducting, the potential at the collector of Q-25 is more positive than the potential at the collector of Q-26. Then Q-29 is conducting and Q-28 is cut off. This means that the MNL channel circuit is operating and the channel-9 circuit stops to operate. If Q-25 is conducting and Q-26 is cut off, the MNL channel circuit stops to operate and the channel-9 circuit is operating. This switching continues in this manner with the rapidity of turnover until the channel-9 signal or the MNL channel signal is caught. If the channel-9 or the MNL channel is caught, the multivibrator circuit stops to operate and the channel-9 or the MNL channel signal is able to be caught.

ALIGNMENT PROCEDURE
OSCILLATOR ALIGNMENT

ALIGNMENT	CONNECTIONS	ADJUSTMENT	NOMINAL BLAS LEVEL RESPECT TO GROUND			
			Vc	Vb	Ve	
17MHz Oscillator Q5	Frequency counter to the test terminal 2. Slide the H.E.L.P. selector switch to MNL position	CV1 for frequency tolerance 0.003% at CH1, 5, 13, 17 and 21.	No crystal	13.5V	2.9V	2.2V
			With crystal	13.4	2.9	2.6
9MHz Oscillator Q6	Slide the H.E.L.P. selector switch to MNL. position. Frequency counter to the test terminal 3.	Check for frequency tolerance 0.003% at CH1, 2, 3 and 4.	No crystal	8.4	1.3	4.0
			With crystal	7.3	4.6	3.9
10MHz Oscillator Q15	Frequency counter to the test terminal 4. Slide the H.E.L.P. selector switch to MNL. position.	Check transmit frequency for frequency tolerance 0.005% at CH1, 2, 3 and 4.	No crystal	13.3	4.6	3.9
			With crystal	12.9	4.4	3.9
9MHz Oscillator Q20	Slide the H.E.L.P. selector switch to CH-9 position. Frequency counter to the test terminal 3.	Check frequency for frequency tolerance 0.003% at all channels.	No crystal	8.9	3.1	2.4
			With crystal	8.4	2.7	3.8

RECEIVER ALIGNMENT

ALIGNMENT	CONNECTIONS	ADJUSTMENT	NOMINAL BIAS LEVEL RESPECT TO GROUND			
			Vc	Vb	Ve	
455kHz IF Transformer	Signal generator to T.P.1 through 0.1 mfd capacitor, generator frequency 455KHz $\pm 0.2\%$ channel selector to vacant channel	Top of T5, 6, 7 and 8 keep reducing the generator output to maintain the output level below 1/2 Watt (volume control fully clockwise)	Q3	8.4V	1.2V	0.6V
			Q4	8.7	1.2	1.1
			IC1	#8 9.0	#3&5 1.4	#1&7 8.5
10MHz IF Transformer	Signal generator to 1st mixer Q2, base signal generator frequency 10.020MHz, Channel selector to channel 11.	Top of T3, 4 and L3 with a low level signal generator input for maximum output	Q2	8.5	1.6	0.9
RF Coil	Channel setting 11 signal generator to antenna connector.	Signal generator tune for peak at 27.085MHz. Top of T1, 2, and L2 with a low level signal generator input for maximum output.	Q1	6.7	1.1	0.5
10MHz Trap Coil	Signal generator to antenna connector. Signal generator frequency 10.020MHz channel selector to channel 11.	Signal generator tune for peak at 10.020MHz. Top of L1 with a high level signal generator input for minimum output.				
AGC	DC voltmeter to AGC line or printed circuit board	VR5 for DC 1.2 volt at DC voltmeter	Q7	7.1	0.7	0

TRANSMITTER ALIGNMENT

ALIGNMENT	CONNECTIONS	ADJUSTMENT	NOMINAL BIAS LEVEL RESPECT TO GROUND			
			Vc	Vb	Ve	
Synthesizer	HF millivoltmeter to test point 4. Channel selector to channel 11. (Slide the H.E.L.P. selector switch to MNL. position.)	Top of T11, 12, 13 and 14 for peak output (frequency 27.085MHz) at HF millivoltmeter.	Q16	8.9V	16.6V	0.9V
Driver	Dummy load to antenna socket. Power output indicator across load milliammeter (500~800mA) between test point 5 lead for check final collector current.	Top of L9, T15 and T16 for maximum final collector current	Q17	8.6	1.7	1.1
			Q18	13.4		
Output		Top of L12, 13 and 15 for maximum output and minimum collector current Collector current must be less than 373mA at any channel.	Q19	13.4		

MODULATION ALIGNMENT

Connections: Audio oscillator to microphone terminal through 2KΩ frequency 1KHz, with millivoltmeter
 Dummy load to antenna socket
 Power output indicator across load

Adjustment: Synchronized oscilloscope to dummy load
 Audio oscillator output 30mV
 Adjust VR9 not for negative clip at carrier envelope.
 Decrease audio oscillator output down to 3mV or less (20dB decrease).
 Carrier envelope must be 50% modulation or more.

NOMINAL BIAS LEVEL RESPECT TO GROUND (Audio Section) Measured at No signal

		Vc	Vb	Ve
Q8	Unsquench	0.2V	0.7V	0.1V
	Squelch	4.8	0	0
Q9	Unsquench	9.0	0.1	1.5
	Squelch	9.0	4.6	4.0
Q10	Unsquench	5.6	2.1	1.5
	Squelch	8.9	2.1	4.0

	Vc	Vb	Ve
Q11	5.8V	2.2V	1.5V
Q12	12.7	1.5	0.8
Q13	13.6	0.7	0
Q14	13.6	0.7	0

TIGHT SQUELCH ALIGNMENT

Connections: Signal generator to antenna connector (frequency 27MHz)
 Channel selector to any working channel
 Adjustment: Fully turn the squelch control clockwise.
 Signal generator output up to 1000microvolt.
 Adjust VR5 for just hearing signal.

H.E.L.P. CIRCUIT ALIGNMENT

NOMINAL BIAS LEVEL RESPECT TO GROUND
 Measured at No signal

The H.E.L.P. switch at any position (Receiver)

		Vc	Vb	Ve
Q21	Unsquelch	1.9V	0.06V	0
	Squelch	0	0.6	0
Q22	Unsquelch	0	0.64	0
	Squelch	6.0	0.01	0
Q23	Unsquelch	9.0	0	0
	Squelch	8.0 ~ 4.6	0.8 ~ -0.8	0.5 ~ 0
Q24	Unsquelch	9.0	0	0
	Squelch	4.6 ~ 8.0	-0.8 ~ 0.8	0 ~ 0.5

The H.E.L.P. selector switch to M.N.L. position (Receiver)

		Vc	Vb
Q25	Unsquelch	11.8V	0V
	Squelch	11.8	0
Q26	Unsquelch	0	0.7
	Squelch	0	0.7
Q27	Unsquelch	13.7	0
	Squelch	13.7	0
Q28	Unsquelch	7.35	0
	Squelch	7.35	0
Q29	Unsquelch	0.1	0.7
	Squelch	0.1	0.7

The H.E.L.P. selector switch to AUTO position (Receiver)

		Vc	Vb
Q25	Unsquelch	11.8 or 0V	0.7 or 0V
	Squelch	0 ~ 11.8	0 ~ 0.7
Q26	Unsquelch	11.0 or 8	0.7 or 0
	Squelch	0 ~ 11.0	0 ~ 0.7
Q27	Unsquelch	13.7 or 0.1	0.7 or 0
	Squelch	0.1 ~ 13.7	0 ~ 0.7
Q28	Unsquelch	7.4 or 0.1	0.7 or 0
	Squelch	0.1 ~ 7.4	0 ~ 0.7
Q29	Unsquelch	8.5 or 0.1	0.7 or 0
	Squelch	0.1 ~ 8.5	0 ~ 0.7

The H.E.L.P. selector switch to CH9 position (Receiver)

		Vc	Vb
Q25	Unsquench	0V	0.7V
	Squelch	0	0.7
Q26	Unsquench	11.0	0
	Squelch	11.0	0
Q27	Unsquench	0.1	0.8
	Squelch	0.1	0.8
Q28	Unsquench	0.1	0.7
	Squelch	0.1	0.7
Q29	Unsquench	8.4	0
	Squelch	8.4	0

Transmitter

	H.E.L.P. Switch position	Vc	Vb
Q27	MNL	13.4V	0.2V
	AUTO	13.4	0.2
	CH 9	0.1	0.8

H.E.L.P. SCANNING ALIGNMENT

- Connections: Channel setting 11
Signal generator to antenna connector
- Adjustment: Slide the H.E.L.P. selector switch to AUTO position.
Signal generator tune for peak at 27.085MHz.
Signal generator output up to 500 microvolt.
Turn the squelch control until signal is reduced.
Adjust VR10 for just scanning.

CH	Frequency	1st RX & TX OSC FREQ.		2nd TX OSC FREQ.	2nd RX OSC FREQ.
1	26.965	26.965	- 16.965	= 10.000	= 9.545 + .455
2	26.975	26.975	- 16.965	= 10.010	= 9.555 + .455
3	26.985	26.985	- 16.965	= 10.020	= 9.565 + .455
4	27.005	27.005	- 16.965	= 10.040	= 9.585 + .455
5	27.015	27.015	- 17.015	= 10.000	= 9.545 + .455
6	17.025	27.025	- 17.015	= 10.010	= 9.555 + .455
7	27.035	27.035	- 17.015	= 10.020	= 9.565 + .455
8	27.055	27.055	- 17.015	= 10.040	= 9.585 + .455
9	27.065	27.065	- 17.065	= 10.000	= 9.545 + .455
10	27.075	27.075	- 17.065	= 10.010	= 9.555 + .455
11	27.085	27.085	- 17.065	= 10.020	= 9.565 + .455
12	27.105	27.105	- 17.065	= 10.040	= 9.585 + .455
13	27.115	27.115	- 17.115	= 10.000	= 9.545 + .455
14	27.125	27.125	- 17.115	= 10.010	= 9.555 + .455
15	27.135	27.135	- 17.115	= 10.020	= 9.565 + .455
16	27.155	27.155	- 17.115	= 10.040	= 9.585 + .455
17	27.165	27.165	- 17.165	= 10.000	= 9.545 + .455
18	27.175	27.175	- 17.165	= 10.010	= 9.555 + .455
19	27.185	27.185	- 17.165	= 10.020	= 9.565 + .455
20	27.205	27.205	- 17.165	= 10.040	= 9.585 + .455
21	27.215	27.215	- 17.215	= 10.000	= 9.545 + .455
22	27.225	27.225	- 17.215	= 10.010	= 9.555 + .455
Vacant	27.235	27.235	- 17.215	= 10.020	= 9.565 + .455
23	27.255	27.255	- 17.215	= 10.040	= 9.585 + .455

REF. NO.	DESCRIPTION	PART NO.	LIST PRICE	REMARKS
CASE PARTS				
	Grille, Front Die-Cast	13-010145	\$ 5.62	
	Case, Top	13-010146	2.72	
	Case, Bottom	13-010147	3.28	
	Plate, Front function	13-020415	1.44	
	Knob, Volume Control	15-110119	.96	
	Knob, Squelch Control	13-110120	1.44	
	Knob, Channel Selector	13-115050	1.44	
	Disc, Channel Selector	13-115051	1.66	
	Lens, Transmit/Help (Red)	13-020416	.46	
	Lens, Modulation (Amber)	13-020417	.46	
MISCELLANEOUS				
RL1-5	Speaker, 8 ohm/3 Watt	13-060068	\$ 3.54	
	Microphone	13-038034	12.20	
	Lamp, Pilot	13-201015	1.66	
	Fuse, 2 amp.	13-204004	.46	
	Holder, Fuse	13-159100	.74	
	Socket, Crystal	13-159029	.20	
RL1	Meter, "S" /RF	13-200034	5.94	
	Relay	13-105012	6.52	
HARDWARE				
J1	Bracket, Auto Mount	13-158206	\$ 1.90	
	Jack, Microphone	13-153066	2.30	
	Plug, P.A. Jack	13-159086	.46	
	Jack, P. A.	13-153072	1.44	
	Hanger, Microphone	13-158185	.74	
	Washer, Auto Mount Bracket	13-151245	.46	
	Insulator, Channel Selector Switch	13-157128	.46	
	Connector, Antenna	13-159046	3.78	
J2	Jack, External Speaker	13-153067	1.90	
	Heatsink, 2SC778	13-089054	.46	
	Heatsink, 2SC777	13-089055	.74	
CONTROLS				
VR1,10	Sensitivity (50K ohm) (2 Leg)	13-164038	\$.74	
V2,7	Squelch and Volume 5K ohm x 2	13-160075	3.54	
VR3	Sensitivity (2K ohm) (2 Leg)	13-164028	.86	
VR4	Sensitivity (100K ohm) (2 Leg)	13-164039	.79	
VR5,6	Sensitivity (10K ohm) (3 Leg)	13-164061	.74	
VR9	Sensitivity, (5K ohm) (2 Leg)	13-164040	.86	

REF. NO.	DESCRIPTION	PART NO.	LIST PRICE	REMARKS
SWITCHES				
S1	Automatic Noise Limiter (ANL)	13-183131	\$ 1.66	
S2	PA/CB	13-183132	1.44	
S3	Delta Tune	13-183132	1.44	
S4	Scanning Function (Ch.9/MNL/Auto)	13-183131	1.66	
S5	Channel Selector	13-180065	7.94	
CRYSTALS				
CRYSTAL FREQUENCY IS GIVEN FOR DESCRIPTION ONLY. ALL CRYSTALS ARE PLUG-IN TYPE.				
X1	16.965MHz	13-128233	\$ 4.20	
X2	17.015MHz	13-128234	4.20	
X3	17.065MHz	13-128235	4.20	
X4	17.115MHz	13-128236	4.20	
X5	17.165MHz	13-128137	4.20	
X6	17.215MHz	13-128238	4.20	
X7	10,000MHz	13-128239	4.20	
X8	10.010MHz	13-128240	4.20	
X9	10.020MHz	13-128241	4.20	
X10	10.040MHz	13-128242	4.20	
X11,15	9.545MHz	13-128243	4.20	
X12	9.555MHz	13-128244	4.20	
X13	9.565MHz	13-128245	4.20	
X14	9.585MHz	13-128246	4.20	
COILS AND TRANSFORMERS				
T 1	Coil, HF (507S-A2)	13-090209	\$.74	
T 2	Coil, HF (508S-B1)	13-090210	.74	
T 3, 4	Coil, IFT (42K10-E)	13-090217	1.90	
T 5	Coil, IFT (A086AD)	13-090218	.74	
T 6, 7	Coil, IFT (EIA-227B)	13-090219	.96	
T 8	Coil, IFT (EIA-146D)	13-090220	.96	
T 9	Transformer, Audio Input	13-096104	.96	
T 10	Transformer, Audio Output	13-096105	2.30	
T 11	Coil, HF (507S-1Y)	13-090211	.74	
T 12	Coil, HF (507S-2Y)	13-090212	.74	
T 13	Coil, HF (507S-3Y)	13-090213	.74	
T 14	Coil, HF (507S-Z)	13-090214	.74	
T,15	Coil, HF (505S-T1)	13-090215	.74	
T 16	Coil, HF (505S-K1)	13-090216	.74	
	Filter, 455KHz Ceramic	13-179023	4.00	
L 1, 12	Coil, HF (505S-L1)	13-090204	.74	
L 2, 3	Coil, HF (507S-C1)	13-090205	.74	
L 4,7,8,14,19, 20, 21, 22, 23	150UH Micro Inductor	13-178104	.46	
L 5	3.3UH Micro Inductor	13-178105	.46	
L 6	22 UH Micro Inductor	13-178106	.46	
L 9	Coil, HF (507S-Z1)	13-090206	.74	
L 10	33UH Micro Inductor	13-178107	.46	
L 11	2.2UH Choke	13-178108	.46	
L 13	Coil, HF (505S-M1)	13-090207	.74	
L 15	Coil, HF (506S-P1)	13-090208	.96	
L 16	.85UH Choke	13-178074	.46	
L 17	Choke, Line Filter	13-178109	1.44	
L 18	Coil, L05	13-178110	.96	
L 24	.22UH Choke	13-178098	.46	

REF. NO.	DESCRIPTION	PART NO.	LIST PRICE	REMARKS
TRANSISTORS				
Q 1, 2, 3, 4, 5, 6, 13, 16, 17, 20	2SC710	09-302012	\$ 2.40	
Q 7, 8, 9, 10, 11	2SC458	09-302020	.96	
Q 12, 21, 22, 23, 24, 25, 26, 27, 28, 29	2SC619	09-302058	2.40	
Q13, 14	2SC1014	09-302046	2.79	
Q 18	2SC777	09-302050	5.94	
Q 19	2SC778	09-302051	8.20	
DIODES				
D 1-8, 10, 14, 17, 20-23	09-306020	09-306020	\$.60	
D 9	1S-84	09-306112	.96	
D 11, 12, 19	BZ090	09-306180	1.66	
D 13	1S1212	09-306110	.60	
D 15	MV-3	09-306114	.74	
D 16	1S-180	09-306062	.96	
D 18	10D-4	09-306149	.74	
D 24-31, 33	CD-84857	09-306111	.74	
D 32	1S-1052	09-306195	.74	
INTEGRATED CIRCUIT				
IC-1	NJ703N	09-308019	\$ 2.72	
RESISTORS				
All resistors not shown on this parts list are carbon or solid type resistors, 1/8 watt. For specific values consult schematic diagram.				
R 56	Solid, 560 ohm/¼ Watt	77-201561	\$.26	
R 57	Oxide-Film, 1 ohm/1 Watt	77-604108	.88	
R 58	Solid, 220 ohm/½ Watt	77-202221	.30	
R 71	Solid, 3.3K ohm/½ Watt	77-202332	.30	
R 79, 80	Solid, 2.2 ohm/¼ Watt	77-202229	.30	
CAPACITORS				
All capacitors not shown on this parts list are ceramic disc, 50 WV. For specific values consult schematic diagram.				
MYLAR CAPACITORS				
C 17, 19, 27, 49, 50, 52, 67	.05MF/50V	78-651503	\$.38	
C 29, 30, 68	1MF/50V	78-651105	.38	
C 56	.04MF/50V	78-651403	.38	
C 71, 72	.02MF/50V	78-651203	.38	
ELECTROLYTIC CAPACITORS				
C 47, 48, 58	10MF/16V	77-337106	\$.96	
C 53, 62, 114	1MF/16V	77-337105	.96	

REF. NO.	DESCRIPTION	PART NO.	LIST PRICE	REMARKS
C 54, 137 C 55, 61, 65, 69 C 109 C 115, 116	47MF/16V 220MF/16V 1000MF/16V 4.7MF/16V	77-337476 77-337227 77-337108 77-337475	\$.96 .96 .96 .96	
STYROL CAPACITORS				
C 14	1500PF/25V	13-139002	\$.76	
MICA CAPACITORS				
C 1 C 2, 90 C 7, 36, 40, 79, 83 C 11 C 12, 45, 48, 133 C 21, 24, 26, 89, 131 C34, 37, 46, 96, 129 C 41 C 42, 94 C 43, 107, 117, 128 C57, 132 C 76, 99, 103 C 77 C 80 C 82, 84 C 104 C 91 C 106	400PF/50V 30PF/50V 1.5PF/50V 1.5PF/50V 2PF/50V 10PF/50V 100PF/50V 56PF/50V 78PF/50V 200PF/50V 500PF/50V 170PF/50V 150PF/50V 5PF/50V 1PF/50V 220PF/50V 130PF/50V 65PF/50V	78-551401 78-551300 78-551200 78-551159 78-551209 78-551100 78-551101 78-551560 78-551780 78-551201 78-551501 78-551171 78-551151 78-551508 78-551108 78-551221 78-551131 78-551650	\$.30	
TRIMMERS				
CV 1 CV 2	40PF 10PF	13-123028 13-123017	\$.96 .96	

