MIDLAND LMR
LAND MOBILE RADIO

INSTRUCTION MANUAL

DTMF MICROPHONES

70-2103A
70-2104A

INTRODUCTION

The 70-2103A and 70-2104A are Amplified Dynamic Microphones with integral DTMF encoder, audio annunciator and UP/DOWN channel control switches. The 70-2104A also incorporates a field programmable ANI (Automatic Number Identifier) feature capable of automatic and manually activated transmission.

INSTALLATION

The 70-2103A and 70-2104A can be used in place of the standard microphone on all Midland mobile transceivers (the UP/DOWN switches are usable only on SYN-TECH models). To accept the 70-2103A or 70-2104A, the 4-pin microphone jack standard on all mobile transceivers must be replaced by a 6-pin jack P/N 70-159120. Refer to the microphone plug pinout elsewhere in this manual.

CONTROLS AND INDICATORS

PTT Bar – Activates the internal microphone and amplifier and provides a ground on the PTT line to activate the transmitter of the transceiver. On the 70-2104A only, the PTT also activates the ANI function as described below.

Encoder Pad ON/OFF Switch – Switches power to the DTMF encoder circuitry.

UP/DOWN Switches – Provide a ground to activate the UP or DOWN channel control lines of a SYN-TECH transceiver. A single depression of either switch causes a single channel change. Holding either switch down causes a rapid channel change up or down.

Keyboard Switches – When the encoder pad is switched on, pressing any keyboard switch performs two functions:

1) Generates the DTMF tone pair corresponding to that key.
2) Starts a 1 second transmit "hang timer" which in turn applies a ground to the transceiver PTT line.

Red LED Indicator – Lights to indicate that the ON/OFF switch is ON. Lights more brightly to indicate that the PTT line has been pulled low by the DTMF encoder.

Audio Annunciator – An internally mounted piezoelectric element which reproduces the DTMF tones for positive verification of key closure.

OPERATION

To operate as a standard microphone, press the push-to-talk bar and speak across the microphone in a normal or slightly louder than normal voice. Release the PTT bar when the transmission is complete. During the receive mode, channel changes can be made by pressing the UP or DOWN buttons located on the top of the microphone. Rapid channel change occurs when either button is held more than one half second.

To enable the DTMF encoder function, push the slide switch above the encoder pad to the "ON" position. The LED indicator will glow to indicate that the encoder pad is active. Press the keys in the desired sequence to send the DTMF selective calling signal. As each button is pressed the DTMF tones will be heard and the red LED above the switch will be illuminated more brightly, giving positive indication of key closure. The transmitter is automatically keyed when any keyboard button is pressed. The built-in transmitter "hang timer" causes the transmitter to operate continuously if the delay between key strokes is less than one second. When the DTMF transmission is complete, the PTT bar can be pressed for normal voice transmission or the ON/OFF switch can be turned off to prevent accidental key activation. Do not attempt to send a DTMF code sequence while the PTT bar is pressed since distortion of the DTMF signals from background noise may result.

DTMF AUDIO LEVEL ADJUSTMENT

The DTMF audio output level is factory set to provide approximately 4.5 KHz deviation when connected to a SYN-TECH transceiver. The audio level can be changed by adjusting VR1.

ANI OPERATION (70-2104A only)

The ON-OFF switch must be ON to enable all ANI functions. The ANI sequence is automatically sent when the PTT switch is closed if at least 20 seconds have elapsed since the end of the last transmission or since the ON/OFF switch was switched ON. ANI can also be sent at any time by pressing the * or # keys. Microphone audio is automatically muted whenever ANI is being generated.

ANI DIGIT PROGRAMMING (70-2104A only)

Remove the four screws securing the rear cover and remove the cover. The ANI sequence can be set from 1 to 8 digits and is programmed by connection of the color-coded jumper wires on the printed circuit board. Each jumper represents one digit: black is the first digit, labeled A on the board, brown is the second, labeled B, etc. The double pads at the bottom of the board marked 1-9,0,A,B,C,D,*, and # are the connection points for the programming jumper wires. To strap the ANI number 2137AD, for instance, the black jumper must be connected to the pad area marked 2, the brown wire to the pad marked 1, the red jumper to the pad marked 3, and so on. Any unused jumper wires should be removed or insulated on the unsed end.

ANI DIALING SPEED ADJUSTMENT (70-2104A only)

The ANI dialing speed may be adjusted by VR2 over a range of 10-40 pulses per second. It is factory set at 10 PPS.

MULTIPLE ANI GENERATION (70-2104A only)

The 70-2104A as supplied generates a single ANI sequence when activated by PTT or the *or # keys. The ANI function can be strapped to generate from 2 to 9 consecutive sequences by installing a jumper between points "X" and "Y" and moving the jumper connecting the points marked S and C to connect points M and C. VR3 can then be adjusted to produce the desired number of ANI sequences.

AUTO-ANI DELAY (70-2104A only)

The ANI sequence is activated by the PTT switch, but circuitry is included to prevent ANI from occurring during a 20 second interval following the last transmission. This interval can be shortened or extended by decreasing or increasing the values of R14 and/or C9. To cause ANI to occur at every transmission, C9 should be removed.

ANI PREFIX ENABLE (70-2104A only)

When the ANI is activated by pressing the * or # keys, the * or # is muted so that only the ANI code is sent. If it is desirable to send the * or # prior to the ANI code, cut the path marked "A" on the top of the printed circuit board.

ANI DEFEAT (70-2104A only)

To defeat activation of the ANI sequence by either * or #, remove D1 or D2 respectively. The * or # can then be used in the ANI sequence or in a manually generated signalling sequence. NOTE: If the * or # is used in the ANI sequence, it cannot be used to initiate the ANI sequence. To defeat ANI activation by the PTT switch, remove D35.

TRANSMITTER HANG TIMER ADJUSTMENT

A one second transmitter hang timer is activated every time a key is pressed to allow continuous transmission while a code sequence is being sent. To lengthen or shorten the timer period, the values of C5 and/or R12 can be increased or decreased.

ANNUNCIATOR LEVEL CHANGE

The audio output level of the DTMF annunciator circuitry can be raised or lowered by increasing or decreasing the value of C1.

SINGLE TONE GENERATION

By addition of a jumper wire between pins 1 and 15 (marked "T" and "N" on the PCB bottom views) of IC1 (70-2103A) and IC4 (70-2104A), single tones may be generated by simultaneously pressing any two keys in the same column or row. The tone frequency generated will be the one associated with the row or column in which the two buttons were pressed. This function is not normally used for selective signalling but may be useful for transmitter testing. The standard DTMF row and column frequencies are reproduced below.

Row 1	697 Hz	Column 1	1209 Hz
Row 2	770 Hz	Column 2	1336 Hz
Row 3	852 Hz	Column 3	1477 Hz
Row 4	941 Hz	Column 4	1633 Hz

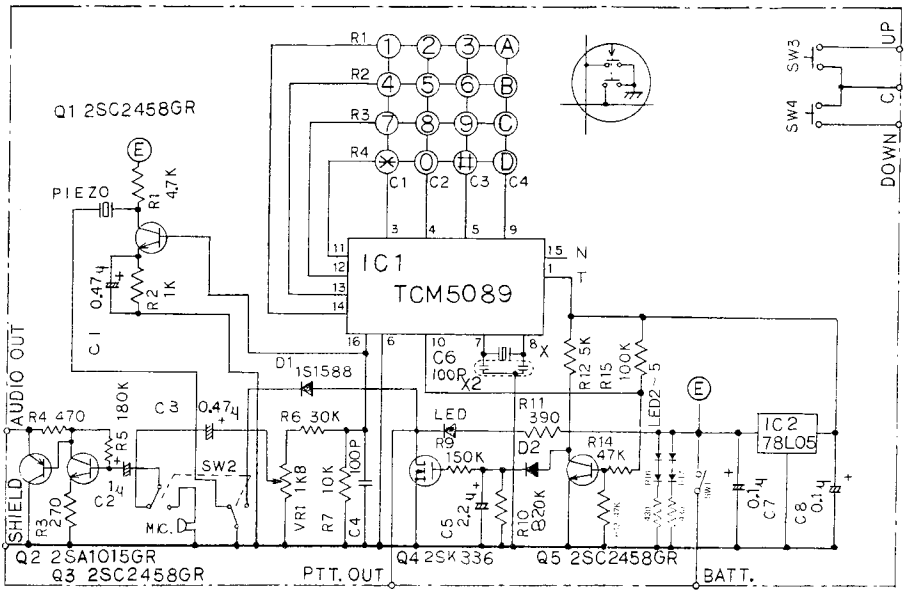
SPECIFICATIONS

Output:	-8 dBm ± 3 dB/600 ohms
DTMF Tone Distortion:	10% maximum
DTMF Tone Accuracy:	±1%
DTMF Twist:	3 dB maximum
Interdigit Hang Time:	1 second
Operating Voltage:	7 — 10 VDC
Operating Current:	42 mA quiescent, 45 mA active (Light Current 20mA)
Internal Adjustments:	DTMF audio level
Keyboard:	16 digit
Case Material:	Cycolac
Cord:	Neoprene, 7 ft., shielded 6 wire
Connector:	Standard 6 pin
Operating Temperature:	-30 to +60 °C

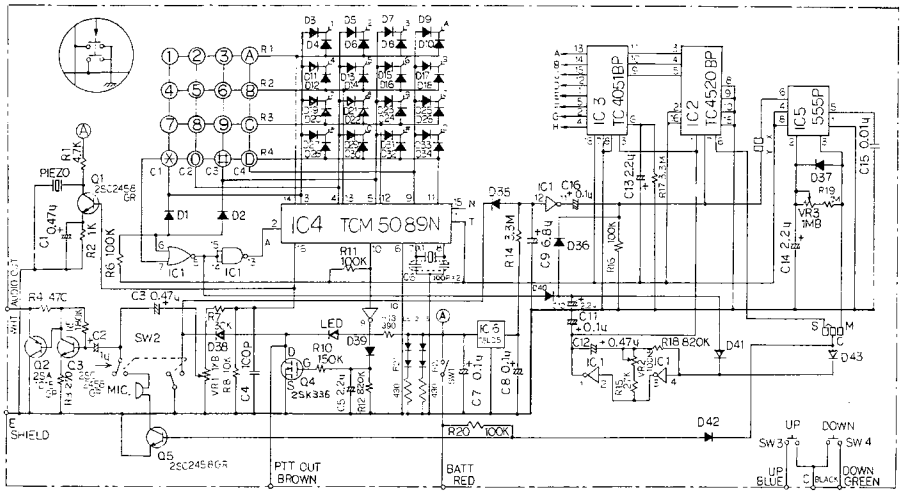
70-2104A only:

DTMF On/Off Ratio:	50/50
DTMF Dialing Speed:	Adjustable 10-40 PPS
Internal Adjustments:	ANI dialing speed
	ANI repeat control

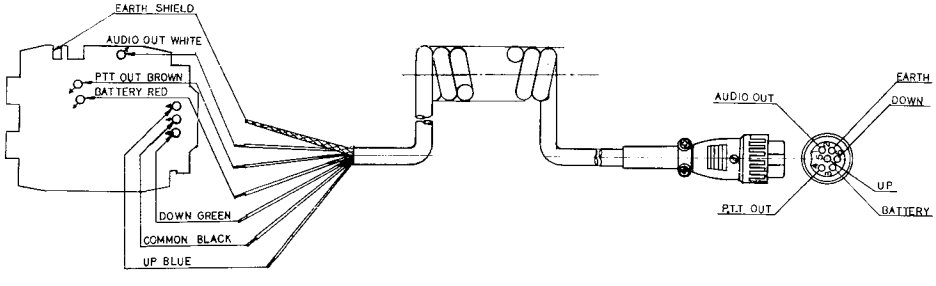
70-2103A SCHEMATIC DIAGRAM

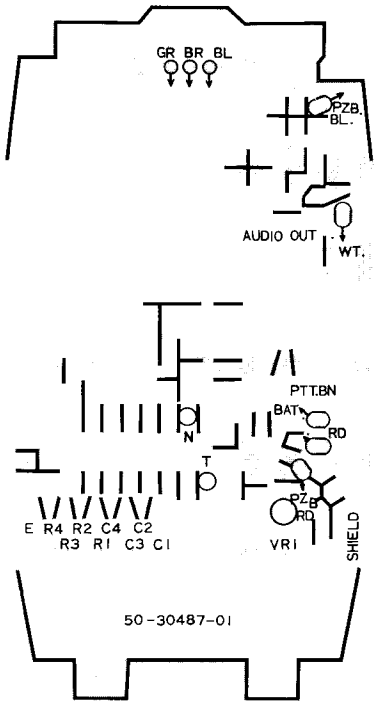


70-2104A SCHEMATIC DIAGRAM

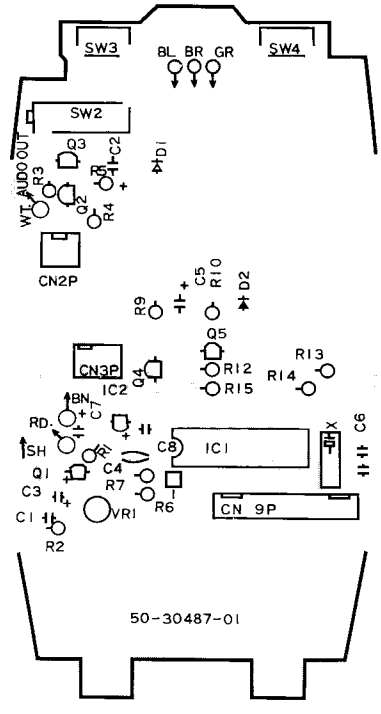


70-2103A/2104A CONNECTOR PINOUT

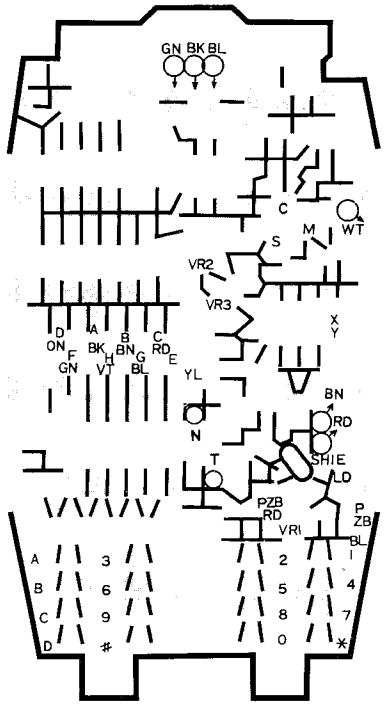




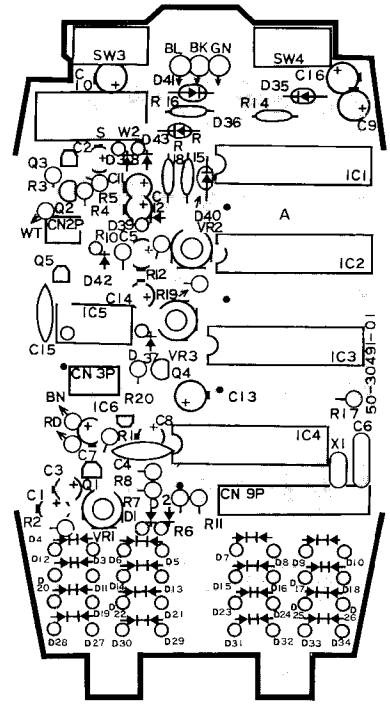
70-2103A PCB BOTTOM VIEW



70-2103A PCB TOP VIEW

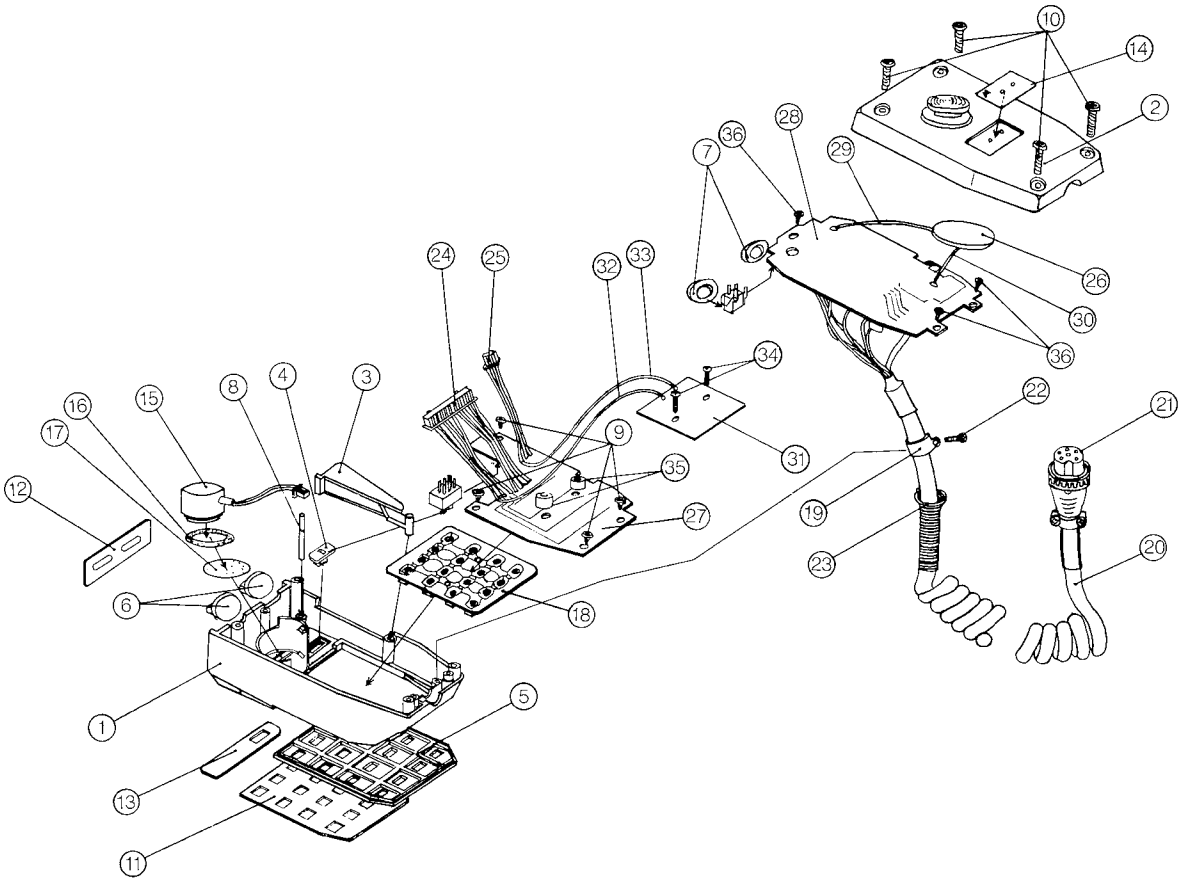


70-2104A PCB BOTTOM VIEW



70-2104A PCB TOP VIEW

70-2103A/2104A EXPLODED VIEW



PARTS LIST

MODEL 70-2103A, 2104A

REF. NO.	DESCRIPTION	Q'TY	PART NO.
1	FRONT CASE	1	70-010097
2	REAR CASE	1	70-010098
3	SWITCH KNOB (PTT)	1	70-110018
4	SWITCH KNOB (ON-OFF)	1	70-110019
5	KEY BOARD	1	70-038050
6	PUSH BUTTON	1	70-110020
7	CUSHION	1	70-157087
8	STOPPER	1	70-157088
9	SCREW PANHEAD 2 x 4	4	70-151437
10	SCREW PANHEAD 3 x 16	4	70-151438
11	NAME PLATE (KEY BOARD)	1	70-020098
12	NAME PLATE (UP, DOWN)	1	70-020099
13	NAME PLATE (ON, OFF)	1	70-020100
14	NAME PLATE (REAR)		
	70-2103A	1	70-038051
	70-2104A	1	70-038061
15	MIC. CARTRIDGE	1	70-038017
16	PACKING	1	
17	SCREEN	1	70-020102
18	RUBBER SWITCH	1	70-038052
19	CORD RETAINER	1	70-157090
20	CURL CORD	1	70-034131
21	CONNECTOR	1	70-159164
22	SCREW PAN HEAD 2.3 x 8	1	70-151439
23	SPRING	1	70-152048
24	CONNECTOR LEAD (9p)	1	70-159280
25	CONNECTOR LEAD (3p)	1	70-159279
26	PIEZO BUZER	1	70-086017
27	SWITCH P.C. BOARD	1	70-038054
28	P.C. BOARD 70-2103A	1	70-070136
	70-2104A	1	70-070139
29	ϕ1.2 LEAD	1	70-034132
30	ϕ1.2 LEAD	1	70-034133
31	LED P.C. BOARD 70-2103A	1	70-038057
	70-2104A	1	70-038057
32	ϕ0.8 LEAD BLACK	1	70-038059
33	ϕ0.8 LEAD RED	1	70-038060
34	SCREW PANHEAD 2 x 8	2	70-151425
35	SPACER	2	70-038053
36	SCREW PAN HEAD 2 x 6	3	70-151626
	70-2103A P.C. BOARD ASS'Y		
IC1	TCM5089N	1	70-076181
IC2	78L05A	1	70-076182
Q1	2SC2458GR	1	70-080030
Q2	ZSA1015GR	1	70-080025
Q3	2SC2458GR	1	70-080030
Q4	2SK583	1	70-080158
Q5	2SC2458GR	1	70-080030
D1	IS1588	1	70-085060
D2	IS1588	1	70-085060
LED	(RED) DR5532K	1	70-202020
LED	(GREEN) SEL2410E	4	70-202030
LAMP SPACER SLS-34		4	70-038058
VR1	1KΩ B	1	70-164042
R1	CARBON 4.7KΩ 1/8W	1	70-140018
R2	CARBON 1KΩ 1/8W	1	70-140011
R3	CARBON 270Ω 1/8W	1	70-140010
R4	CARBON 470Ω 1/8W	1	70-140007
R5	CARBON 180KΩ 1/8W	1	70-140139
R6	CARBON 30KΩ 1/8W	1	70-140169
R7	CARBON 10KΩ 1/8W	1	70-140021
R9	CARBON 150KΩ 1/8W	1	70-140170
R10	CARBON 820KΩ 1/8W	1	70-140172
R11	CARBON 390Ω 1/4W	1	70-140038
R12	CARBON 5KΩ 1/8W	1	70-140171
R13	CARBON 47KΩ 1/8W	1	70-140027
R14	CARBON 47KΩ 1/8W	1	70-140027
R15	CARBON 100KΩ 1/8W	1	70-140042
R16	CARBON 430Ω 1/4W	1	70-141185
R17	CARBON 430Ω 1/4W	1	70-141185
C1	TANT 0.47μF 35V	1	70-138106
C2	TANT 1μF 10V	1	03-003038
C3	TANT 0.47μF 35V	1	70-130106
C4	CERA 100pF 50V	1	70-132040
C5	TANT 2.2μF 10V	1	70-130591
C6	CERA CSC 100P x 2	1	70-135115
C7	TANT 0.1μF 25V	1	70-135102
C8	TANT 0.1μF 25V	1	70-135102
X1	CERA-LOCK CSA3.58M	1	70-135104
SW1	SLIDE SW SSS 322	1	70-183041
SW2	PUSH SW SPJ322	1	70-183042
SW3	TACT SW	1	70-183043
SW4	TACT SW	1	70-183043
C2P	CONNECTOR 2P	1	70-159161
C3P	CONNECTOR 3P	1	70-159277
C9P	CONNECTOR 9P	1	70-159278
PZB	PIEZO BUZER	1	70-086017
	70-2104A P.C. BOARD ASS'Y		
IC1	TC4572BP	1	70-076183
IC2	TC4520BP	1	70-076184
IC3	TC4051BP	1	70-076185
IC4	TCM5089N	1	70-076181
IC5	NE555P	1	70-076186
IC6	78L05A	1	70-076182
Q1	2SC2458GR	1	70-080030
Q2	2SA1015GR	1	70-080025
Q3	2SC2458GR	1	70-080030
Q4	2SK583	1	70-080158
Q5	2SC2458GR	1	70-080030
D1–43	IS1588	43	70-085060
LED	(RED) DR5532K	1	70-202020
LED	(GREEN) SEL2410E	4	70-202030
LAMP SPACER SLS-34		4	70-038063
VR1	1KΩB	1	70-164042
VR2	100KΩ B	1	70-164043
VR3	1MΩ B	1	70-164044
R1	CARBON 4.7KΩ 1/8W	1	70-140018
R2	CARBON 1KΩ 1/8W	1	70-140011
R3	CARBON 270Ω 1/8W	1	70-140010
R4	CARBON 470Ω 1/8W	1	70-140007
R5	CARBON 180KΩ 1/8W	1	70-140139
R6	CARBON 100KΩ 1/8W	1	70-140042
R7	CARBON 30KΩ 1/8W	1	70-140169
R8	CARBON 10KΩ 1/8W	1	70-140021
R10	CARBON 150KΩ 1/8W	1	70-140170
R11	CARBON 100KΩ 1/8W	1	70-140042
R12	CARBON 820KΩ 1/8W	1	70-140172
R13	CARBON 390Ω 1/4W	1	70-140038
R14	CARBON 3.3MΩ 1/8W	1	70-140150
R15	CARBON 27KΩ 1/8W	1	70-140025
R16	CARBON 100KΩ 1/8W	1	70-140042
R17	CARBON 3.3MΩ 1/8W	1	70-140150
R18	CARBON 820KΩ 1/8W	1	70-140172
R19	CARBON 1MΩ 1/8W	1	70-140032
R20	CARBON 100KΩ 1/8W	1	70-140072
R21	CARBON 430Ω 1/4W	1	70-141185
R22	CARBON 430Ω 1/4W	1	70-141185
C1	TANT 0.47μF 35V	1	70-138106
C2	TANT 1μF 10V	1	03-003038
C3	TANT 0.47μF 35V	1	70-138106
C4	CERA 100pF 50V	1	70-132040
C5	TANT 2.2μF 10V	1	70-135091
C6	CERA 30pF x2	1	70-135103
C7	TANT 0.1μF 25V	1	70-135102
C8	TANT 0.1μF 25V	1	70-135102
C9	TANT 6.8μF 10V	1	70-138148
C10	TANT 2.2μF 10V	1	70-138149
C11	TANT 0.1μF 25V	1	70-135102
C12	TANT 0.47μF 35V	1	70-138106
C13	TANT 2.2μF 10V	1	70-135091
C14	TANT 2.2μF 10V	1	70-135091
C15	CERA 0.01μF 50V	1	70-131260
C16	TANT 0.1μF 25V	1	70-135102
SW1	SLIDE SW SSS322	1	70-183041
SW2	PUSH SW SPJ322	1	70-183042
SW3	TACT SW	1	70-183043
SW4	TACT SW	1	70-183043
C2P	CONNECTOR 2P	1	70-159161
C3P	CONNECTOR 3P	1	70-159277
C9P	CONNECTOR 9P	1	70-159278
X1	CERA LOCK CSA 3.58M	1	70-135104
PZB	PIEZO BUZER	1	70-086017

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