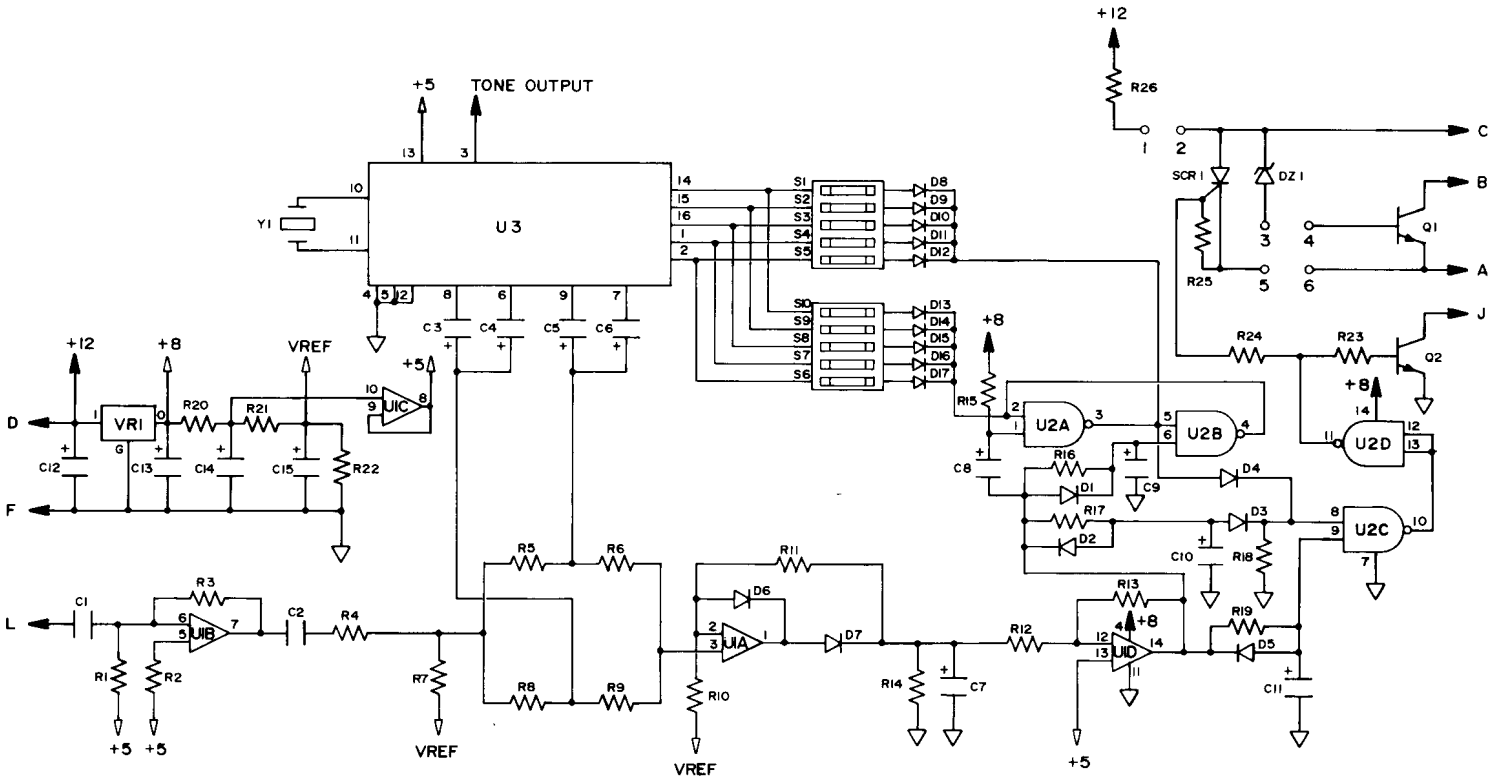


SD-1000 INSTRUCTION SHEET



MODEL SD-1000 TWO-TONE 1000 CALL SEQUENTIAL DECODER

SD-1000 PARTS LIST

REF. DESIG.	CSI NO.	DESCRIPTION	PRICE
R21	06-2428	2.4K 1/8W 5% Carbon Film Resistor	.22 ea.
R23,26	06-3628	3.6K 1/8W 5% Carbon Film Resistor	.22 ea.
R10,25	06-1038	10K 1/8W 5% Carbon Film Resistor	.22 ea.
R20	06-1538	15K 1/8W 5% Carbon Film Resistor	.22 ea.
R24,22	06-2238	22K 1/8W 5% Carbon Film Resistor	.22 ea.
R12	06-1048	100K 1/8W 5% Carbon Film Resistor	.22 ea.
R6,7,9,11	06-1248	120K 1/8W 5% Carbon Film Resistor	.22 ea.
R5,8	06-3348	330K 1/8W 5% Carbon Film Resistor	.22 ea.
R4	06-3648	360K 1/8W 5% Carbon Film Resistor	.22 ea.
R17	06-4748	470K 1/8W 5% Carbon Film Resistor	.22 ea.
R14,15	06-5148	510K 1/8W 5% Carbon Film Resistor	.22 ea.
R1,2,13,16	06-1058	1M 1/8W 5% Carbon Film Resistor	.22 ea.
R18,19	06-1558	1.5M 1/8W 5% Carbon Film Resistor	.22 ea.
R3	06-1068	10M 1/8W 5% Carbon Film Resistor	.22 ea.
C1	21-1030	.01 Mfd 50V 10% Mono. Ceramic capacitor	1.50 ea.
C2	21-4730	.047 Mfd 50V 10% Mono. Ceramic capacitor	.76 ea.
C3,4,5,6,8	19-3340	.33 Mfd 35V 10% Tantalum Electrolytic cap.	.36 ea.
C7,9,11,12	19-1050	1Mfd 35V 10% Tantalum Electrolytic cap.	.27 ea.
C10	19-1061	10 Mfd 15V 5% Tantalum Electrolytic cap.	1.80 ea.
D1 TO D17	48-4148	1N4148 75 PRV 100 mA Silicon Diode	.15 ea.
DZ1	48-5231	1N5231b 5.1V 400 mW Zener Diode	.21 ea.
SCR1	48-5060	2N5060 Sensitive Gate SCR	.79 ea.
Q1,2	48-4401	2N4401 Silicon NPN Transistor	.20 ea.
VR1	48-3636	78L08 8V 100 mA Three Terminal Regulator	1.00 ea.
U1	51-0001	LM 324 Quad Operational Amplifier	2.20 ea.
U2	51-4093	4093B CMOS Quad NAND Schmitt Trigger	1.32 ea.
U3	51-0110	IC110 Programmable Encoder/Decoder	18.00 ea.
Y1	48-1000	1Mhz Crystal	7.50 ea.
SW1	40-1014	10 Pole DIP Switch	2.61 ea.
4 ea.	09-4507	7 Pin Sip Socket	.37 ea.
2 ea.	09-4508	8 Pin Sip Socket	.37 ea.
7 ea.	05-1007	Bead Chassis Pin R50-1	.01 ea.
3 ea.	30-7035	Jumper wire	.03 ea.
1 ea.	84-1039	SD-1000 P.C.B.	4.35 ea.
2 ea.	75-1002	Double sided Tape Square	.05 ea.
1 ea.	SD-1KW KIT	Wire kit	.58 ea.

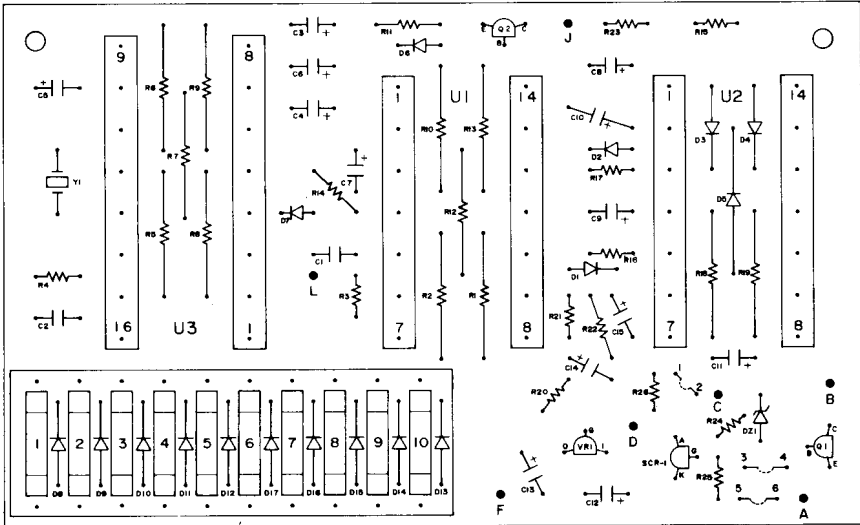


Figure 2

SD-1000 INSTRUCTION SHEET

DESCRIPTION

The SD-1000 is a Two Tone sequential Decoder, which can be programmed by means of DIP switches, to decode any of 930 Two Tone calls and 31 single tone or Group calls.

The SD-1000 employs a custom IC which contains an EEPROM (electrically erasable, programmable, read-only memory). The custom IC may be factory programmed with 32 tones for use in most common paging formats. Any tone between 250 Hz and 3 KHz ($\pm .2$ Hz) can be placed in any of 32 memory locations.

OUTPUT OPTIONS

The SD-1000 has the following output options: a squelch output, which may be latched high or low; the call light output, which can be latched low only; and the horn switch output, which provides a momentary low for the duration of the "B" tone. When the SD-1000 is operated in Group Call, the horn switch output will remain low for the duration of the "A" tone minus 6 seconds.

CONFIGURING THE OUTPUT

There are 6 jumper pads located in the lower right corner of the SD-1000. See Fig 2. The pads are numbered 1 to 6. Three output configurations (see OUTPUT OPTIONS) may be installed by adding or deleting jumper wires between the 6 pads. The following chart will aid in configuring the output.

OPTION	REMOVE JUMPER	INSTALL JUMPER	OUTPUT TERMINAL
latched high	N/A	1 to 2, 3 to 4 & 5 to 6	B
latched low	5 to 6, 3 to 4	4 to 5, 1 to 2	B
SCR latched low	1 to 2	5 to 6	C
momentary low	N/A	N/A	J

PROGRAMMING THE CODE

The following instructions refer to the Tone Location Table and Programming Example Figure 1. (separate page).

Position the SD-1000 so that the DIP switch appears as shown in Figure 1. Notice the word "ON" in the upper left corner of the dip switch. When any switch is moved to "ON," a logical 0 is generated at that switch. For example, if switches 1 to 5 were all moved to "ON," the logical code would be 00000. If only switch 1 were moved to "ON," the code would be 01111. To program the SD-1000, complete the following steps:

- 1.) Locate tone "A" frequency in the Tone Location Table.
- 2.) Find the bit pattern that corresponds to tone "A."
- 3.) Set DIP switches 1 to 5 to match the tone "A" bit pattern.
- 4.) Repeat steps 1 through 3 for tone "B" using switches 6 to 10.

Note: The column in Figure 1. labeled Frequency is user defined. Any tone between 250 Hz and 3 KHz can be factory programmed in any of 32 tone locations.

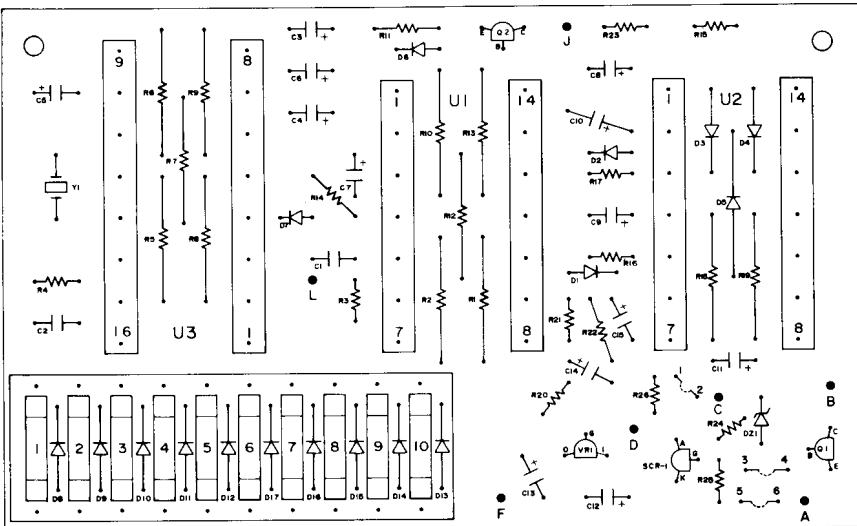


Figure 2

AUDIO INPUT

Connect the audio input (pin L) to a point in the radio which provides at least 15 mV of de-emphasized audio. Select a point where the audio level is not effected by the volume control setting. The high side of the volume control is usually a good source of de-emphasized audio.

POWER CONNECTIONS

Connect a positive 10 to 16 VDC source to the "D" pin, and connect the supply return or ground to the "F" pin.

If the SD-1000 is to be operated from a positive ground power supply, the above connections must be reversed. The "D" pin is connected to ground, and the "F" pin is connected to the negative supply terminal.

Note: The polarity of the horn switch (J), call light (C), and squelch output (B) connections, must be kept positive with respect to the negative pin "F." When a positive ground power supply is used, the J, C, and B outputs should be connected to series loads which come from ground.

HORN SWITCH

To sound a horn on decode, connect the "J" pin of the SD-1000 to the low side of an external relay which controls the horn. Do not connect "J" directly to the vehicle horn relay.

Follow these precautions for the protection of Q1.

1) limit the collector load current to 100 mA. 2) When operating relays, install a power diode across the relay coil with the cathode at the positive supply terminal.

CALL LIGHT

When the SD-1000 decodes a valid Two-Tone Code the SCR output, pin "C," will latch low.

Note: SCR1 cathode must be jumpered via pads 5 and 6 to pin "A." Pin "A" must be grounded in order for SCR1 to operate.

A low current lamp or LED can be connected between pin "C" and the positive supply for use as a call light.

To avoid damage to the 2N5060 SCR, it is recommended that the maximum current in the call light circuit be limited to 200 mA. An external relay or power transistor can be used to switch higher currents.

SQUELCH OUTPUT

The squelch output, available at pin "B," can be placed in parallel with the squelch switch in a radio. When the SD-1000 decodes, the radio's squelch will be enabled. The squelch control transistor Q1, can be programmed to latch high or low as needed. See "configuring The Output."

Note: The Reset/Monitor pin "A" must be grounded for Q1 to operate.

RESET/MONITOR

When Reset/Monitor pin "A" is ungrounded, the SD-1000 is placed in the monitor mode. Q1 will go high and enable the squelch output pin "B." If the cathode of SCR1 is jumpered to pin "A," the call light output will go high. The Reset/Monitor pin can be connected to a microphone hanger which is grounded through the microphone. Each time the microphone is removed from the hanger, the radio's squelch will be enabled and the call light will turn off.

CTCSS ENCODER FEATURE

The SD-1000 is also a CTCSS encoder. A 4 volt peak to peak 32 step sinewave output is provided at pin 3 of IC 110. A pad on the foil side of the P.C. board (pin 3 of U3) can be used to connect the CTCSS output. When the first sixteen addresses of IC 110 are factory programmed with the same sub-audible tone, grounding pin 2 of U3 will cause the IC 110 to shift to a CTCSS tone. If pin 2 of U3 is tied to the P.T.T. in a radio, when the radio is keyed, the SD-1000 will output sub-audible tone. See Figure 3 for circuit details.

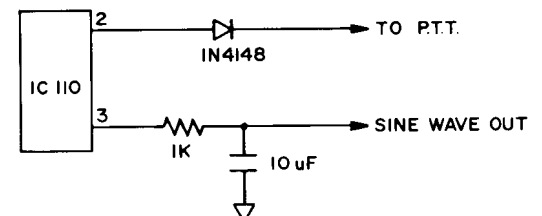
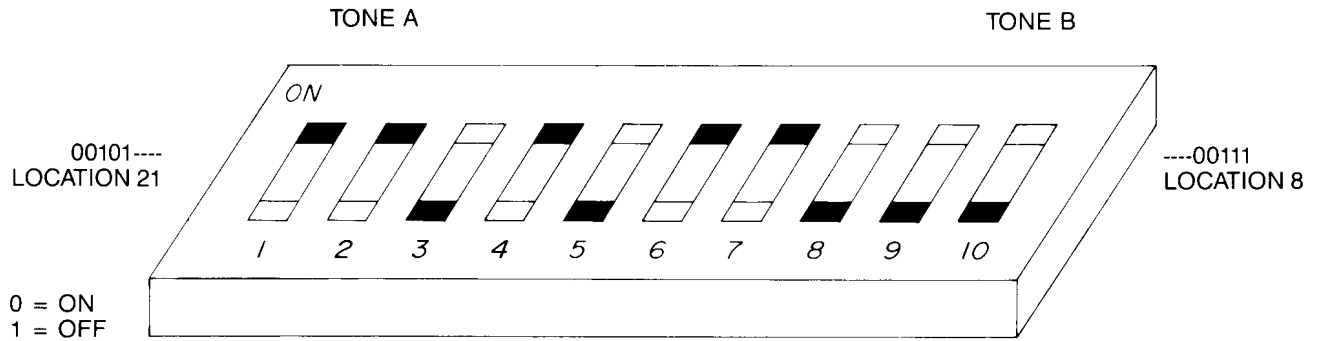


Figure 3

SD-1000 PROGRAMMING EXAMPLE



TONE LOCATION TABLE

LOCATION SWITCH NUMBER	TONE A 1, 2, 3, 4, 5	TONE B 6, 7, 8, 9, 10	SD-1000A FREQ. (MOT. 1, 2, 3)
1	0 0 0 0 0	0 0 0 0 0	330.5 Hz
2	1 0 0 0 0	0 0 0 0 1	349.0 Hz
3	0 1 0 0 0	0 0 0 1 0	368.5 Hz
4	1 1 0 0 0	0 0 0 1 1	389.0 Hz
5	0 0 1 0 0	0 0 1 0 0	410.8 Hz
6	1 0 1 0 0	0 0 1 0 1	433.7 Hz
7	0 1 1 0 0	0 0 1 1 0	457.9 Hz
8	1 1 1 0 0	0 0 1 1 1	483.5 Hz
9	0 0 0 1 0	0 1 0 0 0	510.5 Hz
10	1 0 0 1 0	0 1 0 0 1	539.0 Hz
11	0 1 0 1 0	0 1 0 1 0	569.1 Hz
12	1 1 0 1 0	0 1 0 1 1	600.9 Hz
13	0 0 1 1 0	0 1 1 0 0	634.5 Hz
14	1 0 1 1 0	0 1 1 0 1	669.9 Hz
15	0 1 1 1 0	0 1 1 1 0	707.3 Hz
16	1 1 1 1 0	0 1 1 1 1	746.8 Hz
17	0 0 0 0 1	1 0 0 0 0	788.5 Hz
18	1 0 0 0 1	1 0 0 0 1	832.5 Hz
19	0 1 0 0 1	1 0 0 1 0	879.0 Hz
20	1 1 0 0 1	1 0 0 1 1	928.1 Hz
21	0 0 1 0 1	1 0 1 0 0	1092.4 Hz
22	1 0 1 0 1	1 0 1 0 1	288.5 Hz
23	0 1 1 0 1	1 0 1 1 0	296.5 Hz
24	1 1 1 0 1	1 0 1 1 1	304.7 Hz
25	0 0 0 1 1	1 1 0 0 0	313.0 Hz
26	1 0 0 1 1	1 1 0 0 1	953.7 Hz
27	0 1 0 1 1	1 1 0 1 0	979.9 Hz
28	1 1 0 1 1	1 1 0 1 1	1006.9 Hz
29	0 0 1 1 1	1 1 1 0 0	1034.7 Hz
30	1 0 1 1 1	1 1 1 0 1	1063.2 Hz
31	0 1 1 1 1	1 1 1 1 0	SPARE
32	1 1 1 1 1	1 1 1 1 1	SPARE

TONE LOCATION TABLE

LOCATION SWITCH NUMBER	TONE A 1, 2, 3, 4, 5	TONE B 6, 7, 8, 9, 10	SD1000 C FREQ. (MOT. A, B, Z)
1	0 0 0 0 0	0 0 0 0 0	358.9 Hz
2	1 0 0 0 0	0 0 0 0 1	398.1 Hz
3	0 1 0 0 0	0 0 0 1 0	441.6 Hz
4	1 1 0 0 0	0 0 0 1 1	489.8 Hz
5	0 0 1 0 0	0 0 1 0 0	543.3 Hz
6	1 0 1 0 0	0 0 1 0 1	602.6 Hz
7	0 1 1 0 0	0 0 1 1 0	668.3 Hz
8	1 1 1 0 0	0 0 1 1 1	741.3 Hz
9	0 0 0 1 0	0 1 0 0 0	822.2 Hz
10	1 0 0 1 0	0 1 0 0 1	912.0 Hz
11	0 1 0 1 0	0 1 0 1 0	371.5 Hz
12	1 1 0 1 0	0 1 0 1 1	412.1 Hz
13	0 0 1 1 0	0 1 1 0 0	457.1 Hz
14	1 0 1 1 0	0 1 1 0 1	507.0 Hz
15	0 1 1 1 0	0 1 1 1 0	562.3 Hz
16	1 1 1 1 0	0 1 1 1 1	623.7 Hz
17	0 0 0 0 1	1 0 0 0 0	691.8 Hz
18	1 0 0 0 1	1 0 0 0 1	767.4 Hz
19	0 1 0 0 1	1 0 0 1 0	851.1 Hz
20	1 1 0 0 1	1 0 0 1 1	944.1 Hz
21	0 0 1 0 1	1 0 1 0 0	346.7 Hz
22	1 0 1 0 1	1 0 1 0 1	384.6 Hz
23	0 1 1 0 1	1 0 1 1 0	426.6 Hz
24	1 1 1 0 1	1 0 1 1 1	473.2 Hz
25	0 0 0 1 1	1 1 0 0 0	524.8 Hz
26	1 0 0 1 1	1 1 0 0 1	582.1 Hz
27	0 1 0 1 1	1 1 0 1 0	645.7 Hz
28	1 1 0 1 1	1 1 0 1 1	716.1 Hz
29	0 0 1 1 1	1 1 1 0 0	794.3 Hz
30	1 0 1 1 1	1 1 1 0 1	881.0 Hz
31	0 1 1 1 1	1 1 1 1 0	569.1 Hz
32	1 1 1 1 1	1 1 1 1 1	979.9 Hz

TONE LOCATION TABLE

LOCATION SWITCH NUMBER	TONE A 1, 2, 3, 4, 5	TONE B 6, 7, 8, 9, 10	SD-1000B FREQ. (MOT. 4, 5, 6)
1	0 0 0 0 0	0 0 0 0 0	321.7 Hz
2	1 0 0 0 0	0 0 0 0 1	339.6 Hz
3	0 1 0 0 0	0 0 0 1 0	358.6 Hz
4	1 1 0 0 0	0 0 0 1 1	378.6 Hz
5	0 0 1 0 0	0 0 1 0 0	399.8 Hz
6	1 0 1 0 0	0 0 1 0 1	422.1 Hz
7	0 1 1 0 0	0 0 1 1 0	445.7 Hz
8	1 1 1 0 0	0 0 1 1 1	470.5 Hz
9	0 0 0 1 0	0 1 0 0 0	496.8 Hz
10	1 0 0 1 0	0 1 0 0 1	524.6 Hz
11	0 1 0 1 0	0 1 0 1 0	553.9 Hz
12	1 1 0 1 0	0 1 0 1 1	584.8 Hz
13	0 0 1 1 0	0 1 1 0 0	617.4 Hz
14	1 0 1 1 0	0 1 1 0 1	651.9 Hz
15	0 0 1 1 0	0 1 1 1 0	688.3 Hz
16	1 1 1 1 0	0 1 1 1 1	726.8 Hz
17	0 0 0 0 1	1 0 0 0 0	767.4 Hz
18	1 0 0 0 1	1 0 0 0 1	810.2 Hz
19	0 1 0 0 1	1 0 0 1 0	855.5 Hz
20	1 1 0 0 1	1 0 0 1 1	903.2 Hz
21	0 0 1 0 1	1 0 1 0 0	1122.5 Hz
22	1 0 1 0 1	1 0 1 0 1	1153.4 Hz
23	0 1 1 0 1	1 0 1 1 0	1185.2 Hz
24	1 1 1 0 1	1 0 1 1 1	1217.8 Hz
25	0 0 0 1 1	1 1 0 0 0	1251.4 Hz
26	1 0 0 1 1	1 1 0 0 1	1285.8 Hz
27	0 1 0 1 1	1 1 0 1 0	1321.2 Hz
28	1 1 0 1 1	1 1 0 1 1	1357.6 Hz
29	0 0 1 1 1	1 1 1 0 0	1395.0 Hz
30	1 0 1 1 1	1 1 1 0 1	1433.4 Hz
31	0 1 1 1 1	1 1 1 1 0	569.1 Hz
32	1 1 1 1 1	1 1 1 1 1	979.9 Hz

TONE LOCATION TABLE

LOCATION SWITCH NUMBER	TONE A 1, 2, 3, 4, 5	TONE B 6, 7, 8, 9, 10	SD-1000D FREQ. (GE. A, B, C)
1	0 0 0 0 0	0 0 0 0 0	682.5 Hz
2	1 0 0 0 0	0 0 0 0 1	592.5 Hz
3	0 1 0 0 0	0 0 0 1 0	757.5 Hz
4	1 1 0 0 0	0 0 0 1 1	802.5 Hz
5	0 0 1 0 0	0 0 1 0 0	847.5 Hz
6	1 0 1 0 0	0 0 1 0 1	892.5 Hz
7	0 1 1 0 0	0 0 1 1 0	937.5 Hz
8	1 1 1 0 0	0 0 1 1 1	547.5 Hz
9	0 0 0 1 0	0 1 0 0 0	727.5 Hz
10	1 0 0 1 0	0 1 0 0 1	637.5 Hz
11	0 1 0 1 0	0 1 0 1 0	652.5 Hz
12	1 1 0 1 0	0 1 0 1 1	607.5 Hz
13	0 0 1 1 0	0 1 1 0 0	787.5 Hz
14	1 0 1 1 0	0 1 1 0 1	832.5 Hz
15	0 0 1 1 0	0 1 1 1 0	877.5 Hz
16	1 1 1 1 0	0 1 1 1 1	922.5 Hz
17	0 0 0 0 1	1 0 0 0 0	967.5 Hz
18	1 0 0 0 1	1 0 0 0 1	517.5 Hz
19	0 1 0 0 1	1 0 0 1 0	562.5 Hz
20	1 1 0 0 1	1 0 0 1 1	697.5 Hz
21	0 0 1 0 1	1 0 1 0 0	667.5 Hz
22	1 0 1 0 1	1 0 1 0 1	712.5 Hz
23	0 1 1 0 1	1 0 1 1 0	772.5 Hz
24	1 1 1 0 1	1 0 1 1 1	817.5 Hz
25	0 0 0 1 1	1 1 0 0 0	862.5 Hz
26	1 0 0 1 1	1 1 0 0 1	907.5 Hz
27	0 1 0 1 1	1 1 0 1 0	952.5 Hz
28	1 1 0 1 1	1 1 0 1 1	532.5 Hz
29	0 0 1 1 1	1 1 1 0 0	577.5 Hz
30	1 0 1 1 1	1 1 1 0 1	622.5 Hz
31	0 1 1 1 1	1 1 1 1 0	742.5 Hz
32	1 1 1 1 1	1 1 1 1 1	SPARE

FIGURE 1