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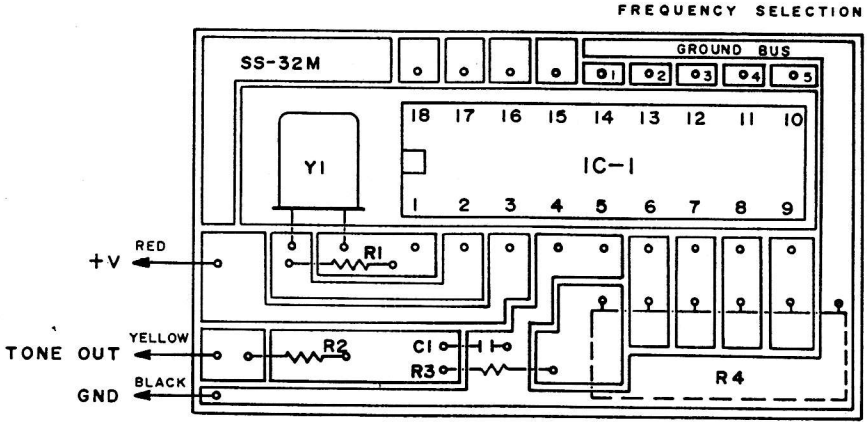
SS-32M INSTRUCTION SHEET



MOUNTING

Mount the unit with the items supplied. If the unit is mounted with silicon seal or any other type of glue, the warranty will be void unless all silicon seal or glue is confined to the bottom of the PCB around the edges only (none in IC-107).

POWER HOOK-UP

Hook +V (red) on the circuit board to a keyed source of +6 to +12VDC, regulated if possible. Hook GND (black) on the PCB to chassis ground in negative ground systems. If positive ground operation is required, interchange GND and +V connections. If polarity is reversed to the unit, IC-107 will be damaged. Be careful of a radio which has multiple grounds, such as a chassis ground and a true vehicle ground. A GE Mastr Pro is a good example. The same holds true of the Motorola HT-200/PT-200 series portables.

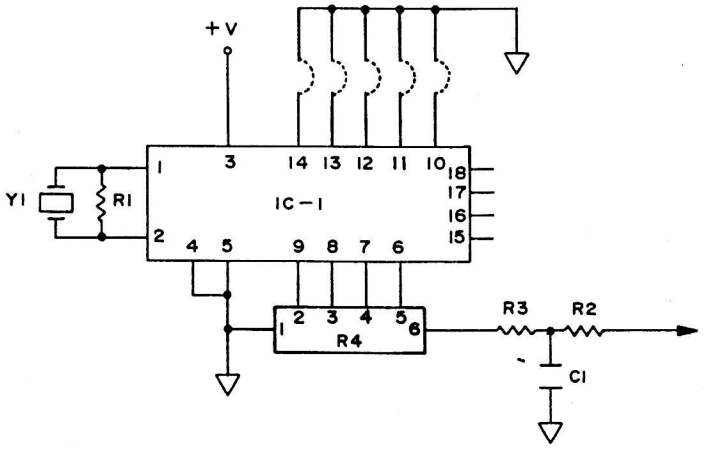
PROGRAMMING

This programmable line of products uses jumpers from the pins of IC-107 to the Ground Buss to select the frequency desired. When the jumpers are in any particular location, the binary code that is presented to IC-107 internally selects which one of the 32 frequencies is to be generated by the encoder. For instance, if 1Z (100.0Hz) is desired, the code required is located on the Programming Chart and the jumpers are added accordingly. For example, the code for 1Z is "01011", thus IC-107 pins 10 and 12 are grounded to the Ground Buss and pins 11, 13, and 14 left unconnected. Special frequencies are also avilable by using a different frequency crystal.

PROGRAMMING CHART FOR CTCSS PRODUCTS GROUP A

#	FREQ.	CODE	IC PIN NUMBER 10	11	12	13	14
1	67.0	XZ	0	0	0	0	0
2	71.9	XA	0	0	0	0	1
3	74.4	WA	0	0	0	1	0
4	77.0	XB	0	0	0	1	1
5	79.7	SP	0	0	1	0	0
6	82.5	YZ	0	0	1	0	1
7	85.4	YA	0	0	1	1	0
8	88.5	YB	0	0	1	1	1
9	91.5	ZZ	0	1	0	0	0
10	94.8	ZA	0	1	0	0	1
11	97.4	ZB	0	1	0	1	0
12	100.0	1Z	0	1	0	1	1
13	103.5	1A	0	1	1	0	0
14	107.2	1B	0	1	1	0	1
15	110.9	2Z	0	1	1	1	0
16	114.8	2A	0	1	1	1	1
17	118.8	2B	1	0	0	0	0
18	123.0	3Z	1	0	0	0	1
19	127.3	3A	1	0	0	1	0
20	131.8	3B	1	0	0	1	1
21	136.5	4Z	1	0	1	0	0
22	141.3	4A	1	0	1	0	1
23	146.2	4B	1	0	1	1	0
24	151.4	5Z	1	0	1	1	1
25	156.7	5A	1	1	0	0	0
26	162.2	5B	1	1	0	0	1
27	167.9	6Z	1	1	0	1	0
28	173.8	6A	1	1	0	1	1
29	179.9	6B	1	1	1	0	0
30	186.2	7Z	1	1	1	0	1
31	192.8	7A	1	1	1	1	0
32	203.5	M1	1	1	1	1	1

0 = SHORTED TO GROUND BUSS
1 = N/C



SS-32M PARTS LIST

R1	10Meg 1/8W Resistor 5% Carbon Film	06-1068	.22 ea.
R2	6.8K 1/8W Resistor 5% Carbon Film	06-6828	.22 ea.
R3	1.2K 1/8W Resistor 5% Carbon Film	06-1228	.22 ea.
R4	CSR202 Resistor Network	51-1217	2.30 ea.
C1	.1uf Capacitor CY20 Mono	21-1040	2.00 ea.
Y1	1MHz Crystal (2 Leads)	48-1000	7.50 ea.
IC-1	Custom CMOS IC-107	51-0107	17.50 ea.
1	Printed Circuit Board	84-1027	1.26 ea.
10"	30 AWG PVC Black Wire	30-7025	.10 ft.
10"	30 AWG PVC Red Wire	30-7026	.10 ft.
10"	30 AWG PVC Yellow Wire	30-7028	.10 ft.
2	Clear Mylar Label	54-1008	.05 ea.
2	Group A Freq. Selection Stickers	54-1002	.10 ea.
1	Square Double Sided Tape	75-1002	.05 ea.

The price of the SS-32M is $29.95 each. Your PREPAID order will be sent POSTPAID by AIRMAIL or UPS Blue Label the same day it is received. California residents add 6% sales tax or supply resale card with order.

Communications Specialists, Inc.
426 W. Taft Ave., Orange, CA 92665-4296
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PROCEDURE FOR CONNECTING SUB-AUDIBLE ENCODER TONE TO TRANSMITTER

The encoder tone output is typically connected just prior to the modulator stage. Typical connections would be to the center of the deviation control, to the input of the final audio driver, to the varactor modulator diodes or to the manufacturer's normal connection point. This connection point varies with each different model radio, and you must determine which provides the best results. In a tube type transmitter, the grid of the modulator is often used, or a varactor kit should be used to modulate the crystal directly in a tube type or solid state transmitter, see figure E1. The VARACTOR (transistor base to collector junction of an NPN silicon transistor) changes A.C. voltage into changing capacitance which truely FM modulates the transmitter. No intermoding or distortion of the voice will be noted with this method. Various values of coupling capacitors are shown for different frequency ranges of the transmitter. A higher value of capacitance will increase the deviation level, however if the capacitance is too high, it may be difficult to set the transmitter on frequency. Varactor Kits are available from us for $3.00 each. Use this method if other connection points prove unsuccessful.

DO NOT connect the encoder tone to the microphone input as this invariably causes excessive tone and harmonic distortion due to the frequency response of the transmitter's speech amplifier. The speech amplifier has a typical response of 300Hz to 3000Hz and does not permit the fundamental tone to be transmitted. This is the usual cause of a distorted tone output as monitored on a deviation scope.

The output of our encoder is low Z, so it is capable of driving low Z loads. if you are driving a high Z load such as 100K deviation pot, then a series isolation resistor should be used so the encoder will not load down the normal voice modulation. This resistor value must be determined experimentally, but a 100K resistor would be a good starting point. This value could change from 10K to 1 meg depending on the radio used. If the tone output of the encoder is connected to a point in the transmitter where DC Bias is present, a .33uf to 1uf capacitor may have to be added in series with the encoder to keep this Bias from being upset.

If tone distortion continues to be a problem, then a capacitor can be placed on the tone output to provide additional filtering where required, see figure E2. This is most noticeable in phase modulators since the frequency response seems to be quite poor at the low end of the audio range. If you are using a deviation scope, then little spikes will be riding on the sine wave output, and this will sound like a buzz. The additional filtering will cure the problem. True FM modulators do not have this problem and are very easy to work with and interface very well with sub-audible encoders. These modulators can be identified quite easily since the audio is fed into a varactor which is often connected in parallel with the crystal. If the purity of the encoder output is in question, look at the output of the encoder with an oscilloscope.

Most UHF transmitters interface quite well with sub-audible encoders. This is primarily due to the high multiplication factor from the modulator to the final amplifier stage. Because of the lower number of multiplication stages in low band transmitters, sufficient deviation level can sometimes be difficult to obtain.

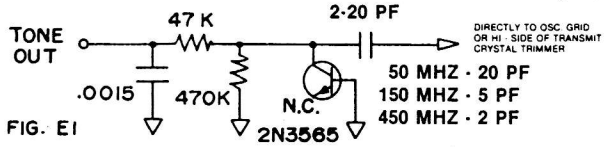


FIG. E1

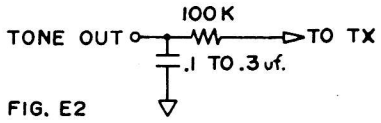


FIG. E2

MULTI-TONE APPLICATIONS

By adding a little additional circuitry, our programmable line of products may be frequency programmed by remote means. Since these products all use DC signals for switching, any number of tones may be switched in or out without being concerned with additional lead length, or stray capacitance affecting the frequency. This is a typical problem associated with tunable or reed type units.

There are a number of ways of changing frequencies from a remote location. The easiest way is to use a 33 position binary switch (available from us) which connects on the circuit board. Thus all 32 tones may be accessed by rotating through all positions on the switch, with the first position on the switch being the off condition (see figure M1). When connections are made in this manner, position ONE will be the off condition, and the path from "G" to "H" will be open thereby removing power from the programmable board. Position TWO would be 67.0Hz (Group A), position THREE would be 71.9Hz, and so on up to position 33 which would be 203.5Hz.

The other method for adding additional frequencies is to use a single pole rotary switch with as many positions as the number of different frequencies required. Using this method, a diode for line isolation must be used in each leg of the program code which requires a "0" or a ground for programming (see figure M2). In this example, three frequencies are required to operate a three site repeater system. The sub-audible tones required to access all three sites are 5Z (151.4Hz), 4B (146.2Hz), and YZ (82.5Hz). The frequency code is located on the programming chart for each of the three frequencies and these codes are converted to the appropriate diode array for each frequency. For example, position number two on the rotary switch must be 146.2Hz. This corresponds to "10110" on the program chart. By looking at this code, it is determined that 2 diodes will be required on the locations containing a "0", and no connection is required in the locations containing a "1". Thus the lines from pin 11, and pin 14, on IC-107 are pulled to ground through the series diodes when the rotary switch is in position number two. This method works quite well where space is a factor, and is best when only a few frequencies are required.

FIGURE - M1

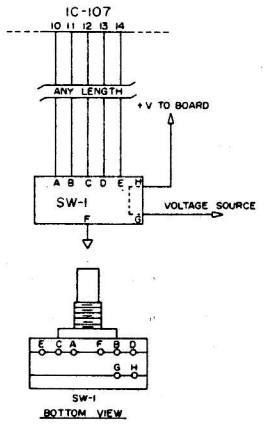
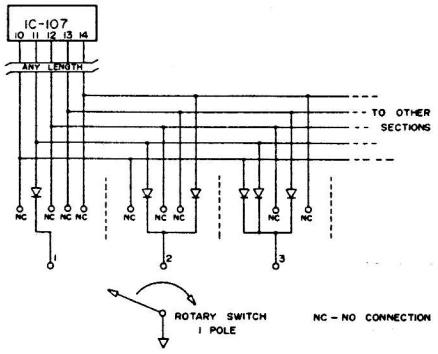


FIGURE - M2



RF INTERFERENCE

Although our encoders are not susceptable to RF, care must be taken when locating the unit, and how the wires are routed. In most cases of RF interference it has been found that the RF is coupled into the leads of the encoder and then fed back into the radio itself where the RF upsets the bias conditions in the transmitter. This causes distortion and other unusual effects. But under these conditions it will be noted that the encoder is still working properly. This is most common in portable hand held radios, since often the circuitry is compromised slightly to achieve the small size required. Often a small by-pass capacitor such as a 100pf in the radio's circuit board works quite well. Also, keeping all leads as short as possible or re-routing the wires helps.