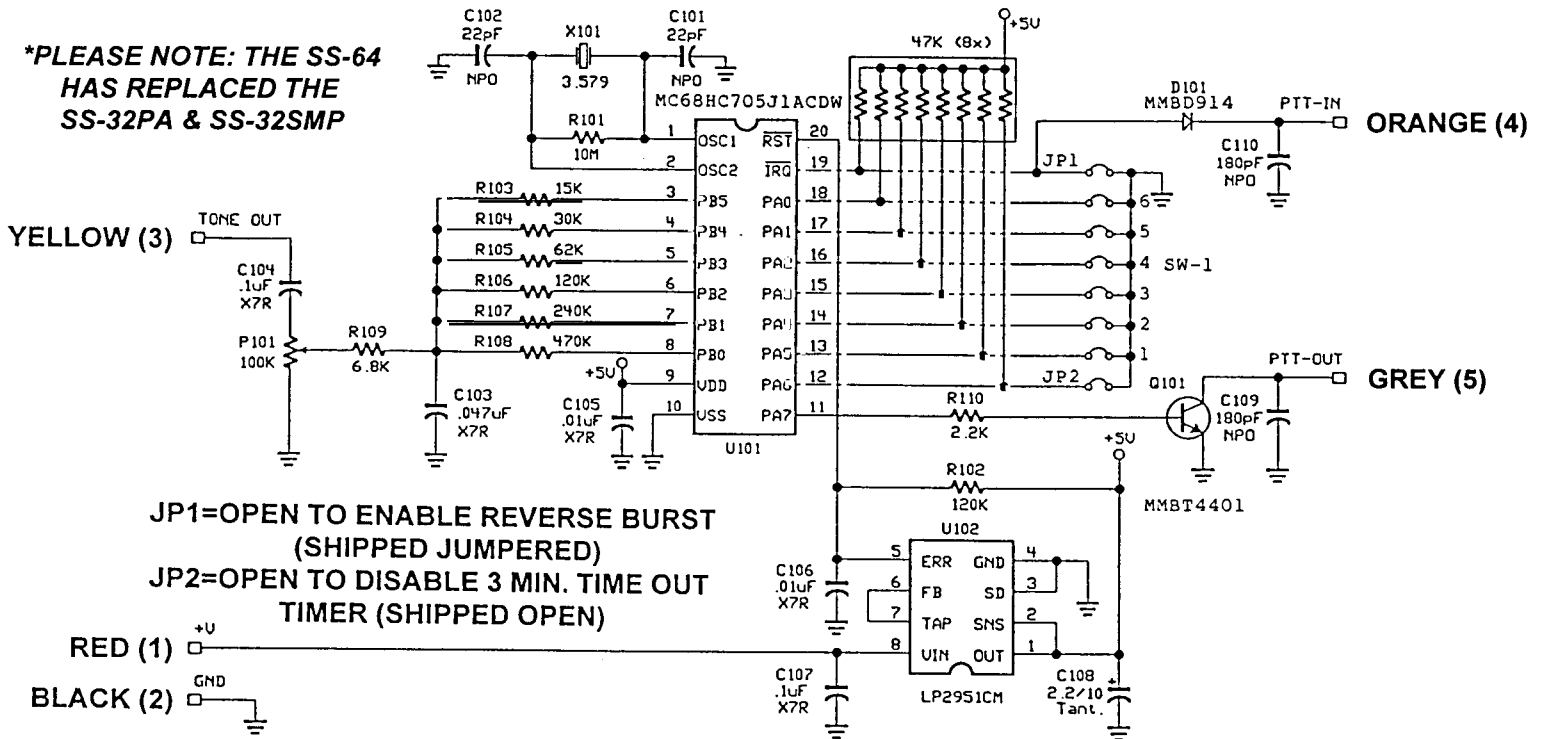
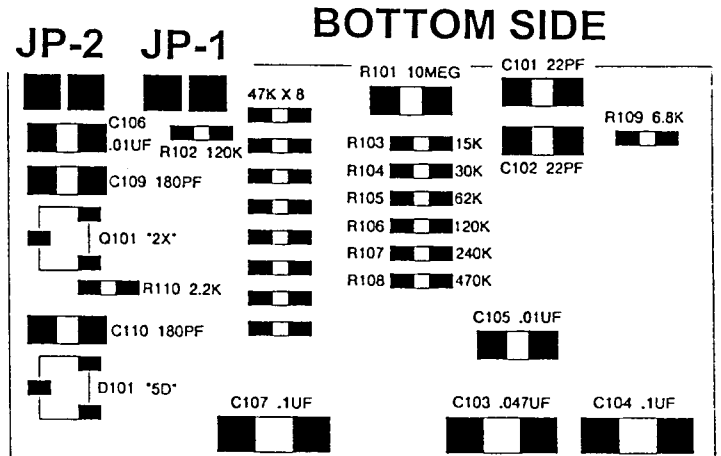
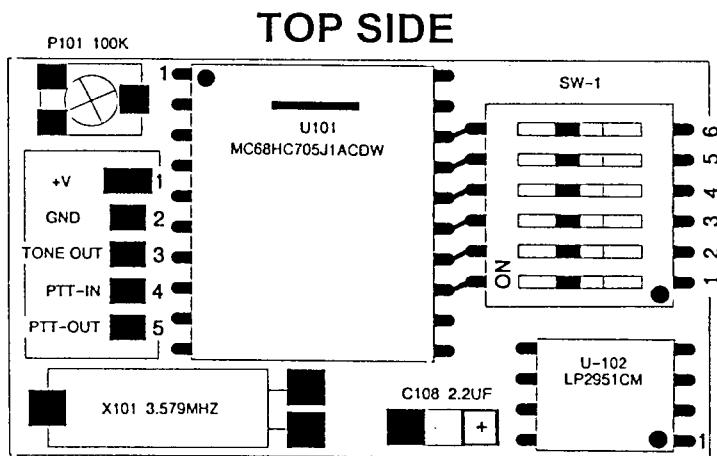


SS-64 MICROMINIATURE CTCSS ENCODER

***PLEASE NOTE: THE SS-64 HAS REPLACED THE SS-32PA & SS-32SMP**



JP1=OPEN TO ENABLE REVERSE BURST (SHIPPED JUMPERED)
 JP2=OPEN TO DISABLE 3 MIN. TIME OUT TIMER (SHIPPED OPEN)



PARTS LIST

DESIG.	CSI NO.	DESCRIPTION
C101,102	22-2200	22pf,NPO,50V,10% 0805 Mono. Chip Cap.
C103	22-4730	.047uf,X7R,50V,10% 1206 Mono. Chip Cap.
C104,107	22-1040	.1uf,X7R,50V,10% 1206 Mono. Chip Cap.
C105,106	22-1030	.01uf,X7R,50V,10% 0805 Mono. Chip Cap.
C108	19-2226	2.2uf,10V,20% Tantalum Chip Cap. "A" case
C109,110	22-1810	180pf,NPO,50V,10% 0805 Mono. Chip Cap.
D101	48-9140	MMBD914LT1 Si Diode, SOT-23
P101	18-1046B	100K, Chip Trimmer Pot. EVN5ESX50B15
Q101	48-4401B	MMBT4401LT1,NPN,Si,SOT-23 Transistor
R101	06-1066	10Meg, 1/8w, 5%, 0805 Chip Resistor
R102,106	06-1243	120K, 1/16w, 5%, 0603 Chip Resistor
R103	06-1533	15K, 1/16w, 5%, 0603 Chip Resistor
R104	06-3033	30K, 1/16w, 5%, 0603 Chip Resistor
R105	06-6233	62K, 1/16w, 5%, 0603 Chip Resistor

DESIG.	CSI NO.	DESCRIPTION
R107	06-2443	240K, 1/16w, 5%, 0603 Chip Resistor
R108	06-4743	470K, 1/16w, 5%, 0603 Chip Resistor
R109	06-6823	6.8K, 1/16w, 5%, 0603 Chip Resistor
R110	06-2223	2.2K, 1/16w, 5%, 0603 Chip Resistor
8 ea.	06-4733	47K, 1/16w, 5%, 0603 Chip Resistors
U101	51-6805-	MC68HC705J1ACDW, CMOS Micro-processor, 20P-SOIC
U102	48-2951	LP2951CM Low Dropout Regulator
X101	48-3835	AT38, 3.579545 MHz Crystal
SW-1	40-1001	6 Position Half-Pitch Dip Switch
	84-6005	SS-64 Printed Circuit Board
	09-8730	5 pin header, JST S5B-ZR
	01-1064	5 lead cable assembly with plug
	75-1002	Double Sided Tape Squares
	56-1001	CSI Tuning Tool-orange



COMMUNICATIONS SPECIALISTS, INC.

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DIP SWITCH TONE CHART (SW-1)

TONE	#1	#2	#3	#4	#5	#6
33.0*	OFF	ON	ON	OFF	OFF	OFF
35.4*	ON	ON	ON	OFF	OFF	OFF
36.6*	OFF	OFF	OFF	ON	OFF	OFF
37.9*	ON	OFF	OFF	ON	OFF	OFF
39.6*	OFF	ON	OFF	ON	OFF	OFF
44.4*	ON	ON	OFF	ON	OFF	OFF
47.5*	OFF	OFF	OFF	ON	ON	OFF
49.2*	ON	OFF	OFF	ON	ON	OFF
51.2*	OFF	ON	OFF	ON	ON	OFF
53.0*	ON	ON	OFF	ON	ON	OFF
54.9*	OFF	OFF	ON	ON	ON	OFF
56.8*	ON	OFF	ON	ON	ON	OFF
58.8*	OFF	ON	ON	ON	ON	OFF
63.0*	ON	ON	ON	ON	ON	OFF
67.0	OFF	OFF	OFF	OFF	OFF	OFF
69.4*	ON	ON	ON	OFF	ON	OFF
71.9	OFF	OFF	OFF	OFF	OFF	ON
74.4	ON	OFF	OFF	OFF	OFF	OFF
77.0	OFF	OFF	OFF	OFF	ON	ON
79.7	OFF	ON	OFF	OFF	OFF	OFF
82.5	ON	OFF	OFF	OFF	OFF	ON
85.4	ON	ON	OFF	OFF	OFF	OFF
88.5	ON	OFF	OFF	OFF	ON	ON
91.5	OFF	OFF	ON	OFF	OFF	OFF
94.8	OFF	ON	OFF	OFF	OFF	ON
97.4*	ON	OFF	ON	OFF	OFF	OFF
100.0	OFF	ON	OFF	OFF	ON	ON
103.5	ON	ON	OFF	OFF	OFF	ON
107.2	ON	ON	OFF	OFF	ON	ON
110.9	OFF	OFF	ON	OFF	OFF	ON
114.8	OFF	OFF	ON	OFF	ON	ON
118.8	ON	OFF	ON	OFF	OFF	ON
123.0	ON	OFF	ON	OFF	ON	ON
127.3	OFF	ON	ON	OFF	OFF	ON
131.8	OFF	ON	ON	OFF	ON	ON
136.5	ON	ON	ON	OFF	OFF	ON
141.3	ON	ON	ON	OFF	ON	ON
146.2	OFF	OFF	OFF	ON	OFF	ON
151.4	OFF	OFF	OFF	ON	ON	ON
156.7	ON	OFF	OFF	ON	OFF	ON
159.8*	OFF	ON	ON	OFF	ON	OFF
162.2	ON	OFF	OFF	ON	ON	ON
165.5*	ON	OFF	ON	OFF	ON	OFF
167.9	OFF	ON	OFF	ON	OFF	ON
171.3*	OFF	OFF	ON	OFF	ON	OFF
173.8	OFF	ON	OFF	ON	ON	ON
177.3*	ON	ON	OFF	OFF	ON	OFF
179.9	ON	ON	OFF	ON	OFF	ON
183.5*	OFF	ON	OFF	OFF	ON	OFF
186.2	ON	ON	OFF	ON	ON	ON
189.9*	ON	OFF	OFF	OFF	ON	OFF
192.8	OFF	OFF	ON	ON	OFF	ON
196.6*	OFF	OFF	OFF	OFF	ON	OFF
199.5*	ON	ON	ON	ON	OFF	OFF
203.5	OFF	OFF	ON	ON	ON	ON
206.5*	OFF	ON	ON	ON	OFF	OFF
210.7	ON	OFF	ON	ON	OFF	ON
218.1	ON	OFF	ON	ON	ON	ON
225.7	OFF	ON	ON	ON	OFF	ON
229.1*	ON	OFF	ON	ON	OFF	OFF
233.6	OFF	ON	ON	ON	ON	ON
241.8	ON	ON	ON	ON	OFF	ON
250.3	ON	ON	ON	ON	ON	ON
254.1*	OFF	OFF	ON	ON	OFF	OFF

* Non EIA Standard tones

SS-64 SPECIFICATIONS

# Tones	64
Tone Accuracy	Better than + or - .025Hz
Tone Stability	Crystal Controlled
Output Z	15K ohms AC coupled
Output level	Adjustable from 0 to 2V
Output distortion	Less than 1%
Start-up time	Less than 10ms
Tone programming	By 6 Position Dip Switch
RF immunity	Totally immune to RF
Squelch tail elimination (on or off by jumper)	175ms reverse phase burst followed by 175ms of no tone
TX PTT output	Open collector transistor
Time out timer (on or off by jumper)	3 minutes
Temperature range	-30° C to +65° C
Supply requirements	+5.0 to +28.0 VDC @ 6.3ma
Size	.66" x 1.08" x .21"
	17 x 27 x 5mm

The Communications Specialists Model SS-64 Miniature 64 Tone CTCSS Encoder is a microprocessor based product used for encoding subaudible tones. The SS-64 is compatible with continuous tone controlled squelch systems (CTCSS) used in land mobile radio such as 'Private Line', 'Channel Guard', and 'Quiet Channel'. Because of its small size and low power consumption, advanced engineering has resulted in a product that is ideal for mobile and portable two-way FM radio installations. Simple field programming by dip switch allows the user to set the CTCSS tone frequency. Squelch tail elimination is achieved by the use of a 'reverse phase burst' at the end of each transmission if enabled by jumper.

1. CTCSS TONE PROGRAMMING

The CTCSS tone is programmed with dip switch SW-1. Use the sharp end of the CSI tuning tool supplied to adjust switch configuration. A total of 64 different subaudible tones can be selected. The table indicates how to program a CTCSS tone. In the case where the table indicates "OFF", that particular dip switch location should be left OFF. In the case where the table indicates "ON", that particular dip switch location should be left ON. Please note that tones marked with a * are not EIA standard tones, and should only be used for special applications, and may not work in harmony with adjacent EIA standard tones.

2. INSTALLATION INSTRUCTIONS

Installation of the SS-64 should be done by a qualified two-way radio technician. When installing the SS-64, be careful not to twist or bend the printed circuit board as this can damage the surface mount components. In addition, use static protection techniques while handling the unit. Be sure that all power is removed before installing or programming the SS-64. The following paragraphs describe each of the external connections on the SS-64.

+VOLTAGE (RED) (PIN 1)

This wire should be connected directly to a filtered source of continuous positive DC voltage in the range of +5.0 VDC to +28.0 VDC. This connection should be made "downstream" from the power switch, and the power supply filter components in the radio set. If a regulated source of DC voltage is available, it may be used. Using a quiet and stable source of DC voltage inside the radio set will reduce the possibility of picking up power supply noise. You may also use keyed +V as the SS-64 starts encoding in less than 10ms (if Reverse Burst is NOT needed).

GROUND (BLACK) (PIN 2)

The Ground wire should be connected to a location inside the radio set which will supply a DC power ground return to the SS-64. To eliminate ground loops and power supply noise, the ground return to the SS-64 should be the same power supply ground used in the transmit audio stages.

CTCSS OUTPUT (YELLOW) (PIN 3)

This output generates the CTCSS encode tone. The most common place to connect this line is just prior to the modulation stage in the transmitter. Typical connections would be to the center of the deviation pot, to the varactor diode in the modulator circuit, or to the manufacturer's suggested connection point. This connection point can vary from radio to radio. Do NOT connect the CTCSS Output to the microphone input as the microphone audio stages will distort and attenuate the CTCSS signal.

Since the CTCSS Output on the SS-64 is low impedance, you may have to install a series resistor to reduce the loading effects of the CTCSS Output depending on the interface impedance. This is evident in the case of connecting to the center of a 100K deviation pot. In this case, a 100K series resistor will compensate for the impedance difference. In addition, a slight adjustment of the voice deviation may be required to compensate for the CTCSS Output circuit loading.

3. ADJUSTMENTS

The CTCSS Output Adjustment, P101, is the only adjustment required on the SS-64. This control sets the level of the CTCSS Output. The supplied CSI tuning tool should be used to make the adjustment on the SS-64 PCB. To adjust the CTCSS Output level to the correct deviation, key the PTT switch on the microphone, and while watching a deviation scope tuned to the transmit output frequency, carefully adjust the CTCSS Output Adjustment. The deviation level of the CTCSS Output should be set to 0.75 kHz (750 Hz). A deviation scope on a service monitor is best for adjusting the CTCSS deviation. The CTCSS waveform on the scope will appear as a sine wave. If the CTCSS signal appears distorted, this indicates that the interface connection is incorrect, and must be changed to a more suitable location.

OPTIONAL HOOKUPS

1. REVERSE BURST OPTION

When the PTT switch is keyed on the microphone, the SS-64 will key the transmitter and immediately begin generating the programmed CTCSS tone for transmission. The SS-64 will continue to generate the CTCSS tone for as long as the PTT switch is pressed. Upon release of the PTT switch, the SS-64 will continue to key the transmitter for approximately 350ms. During this time, the SS-64 will generate a reverse phase burst for 175ms, then no tone for 175ms which will mute the decoding unit at the other end of the transmission medium. At the end of the 350ms period, the SS-64 will unkey the transmitter. If activated by JP-2 an internal Transmit Time-out-timer will limit transmissions to 3 minutes, thus eliminating problems with stuck microphones and the like.

2. PROGRAMMING THE TWO JUMPERS

This section describes how to program the SS-64 to suit the needs of your radio system. These programming features are designed to be programmed by the installing technician. The SS-64 may be programmed before or after it is installed in the associated radio set. The SS-64 is programmed by installing 'solder bridges' across JP-1 or JP-2 on the SS-64 printed circuit board. A low wattage soldering iron with a small tip should be used to place a small solder bridge across the jumper pads. When programming the unit, be careful not to damage the SS-64 printed circuit board. The SS-64 comes from the factory with JP-1 "IN" and JP-2 "OUT". See the Parts Layout diagram for the location of the jumper straps.

	ON	OFF		ON	OFF
REVERSE BURST	JP-1 "OUT"	JP-1 "IN"	3 MINUTE TIMER	JP-2 "IN"	JP-2 "OUT"

3. TRANSMIT TIME-OUT-TIMER

The Transmit Time-out-timer is used to limit the duration of a continuous transmission to a maximum length of 3 minutes. The Transmit Time-out-timer is DISABLED when received from the factory. ADD JUMPER JP-2 TO ENABLE the Time-out-timer. The Time-out-timer is only used when REVERSE BURST IS ENABLED as it opens transistor Q101 allowing PTT Output on Pin 5 to go high, dropping PTT control to the transmitter. CTCSS tone is still available on Pin 3 during Time-out.

4. REVERSE BURST WIRING

PTT INPUT (ORANGE) (PIN 4) THIS LEAD MUST BE GROUNDED TO ENCODE TONE IF JUMPER JP-1 IS OUT

PTT OUTPUT (GREY) (PIN 5)

The PTT Input detects a transmit condition by sensing a 'pull to ground' on the PTT line of the radio set. This information is used by the SS-64 to determine transmit status. The PTT Output is an open collector transistor that pulls to ground to key the transmitter during CTCSS transmission.

To install the PTT Input and PTT Output lines, cut the PTT line on the radio set at the microphone connector, and insert the PTT Input and PTT Output on the SS-64 in series with the transmitter's PTT line. The SS-64 will now control the transmit PTT line. As an alternative to simplify the installation, the PTT Input line and the PTT Output line can be left unconnected. This will enable the SS-64 encoder at all times. If this arrangement is used, be sure that jumper JP-1 is "IN". A reverse phase burst will not be sent.

MULTIPLE TONE APPLICATIONS

Multiple tone applications may be easily handled by using 1N4148 or equivalent silicon diodes for isolation.

- Select desired tone frequency.
- Where an "ON" occurs in the tone chart, solder the NON-BANDED end of a silicon diode to the correct pin on SW-1. Alternating between U101 and SW-1 for pin attach points helps make soldering easier. Use a VERY small soldering tip as it is VERY easy to short adjacent pins together. If that should happen, use solder wick and start the process over.
- Hook all the BANDED ends of the diodes just installed together and pull to ground to select that particular tone.
- Repeat above for all the tones.
- It is easier to solder a ribbon cable (.050" spacing is standard) to SW-1 first and then run it over to where the diodes are located.
- Make sure all 6 dip switch positions are switched "OFF". Dip switch positions or diode groups may be switched while the SS-64 is encoding. As soon as the switch is made, the new tone will be generated.

QUICK START INSTRUCTIONS

- Red wire to +V
- Black wire to ground
- Yellow wire to modulator
- Orange and Grey wires (UNUSED IF REVERSE BURST OPTION IS NOT SELECTED)
- Make sure that JP-1 is still "IN"
- Set mod level with P101