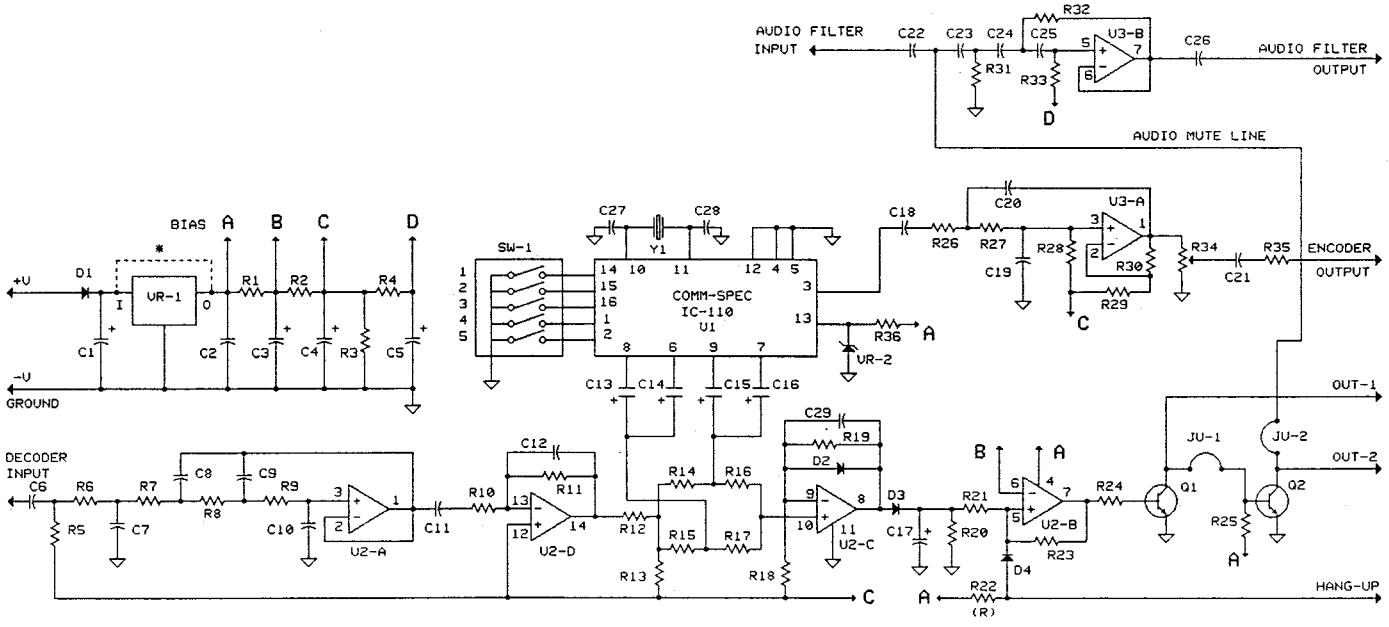
TS-32P INSTRUCTION SHEET

COMMUNICATIONS SPECIALISTS, INC.
426 WEST TAFT AVENUE • ORANGE, CA 92665-4296
(714) 998-3021 • FAX (714) 974-3420
Entire U.S.A. (800) 854-0547 • FAX (800) 850-0547

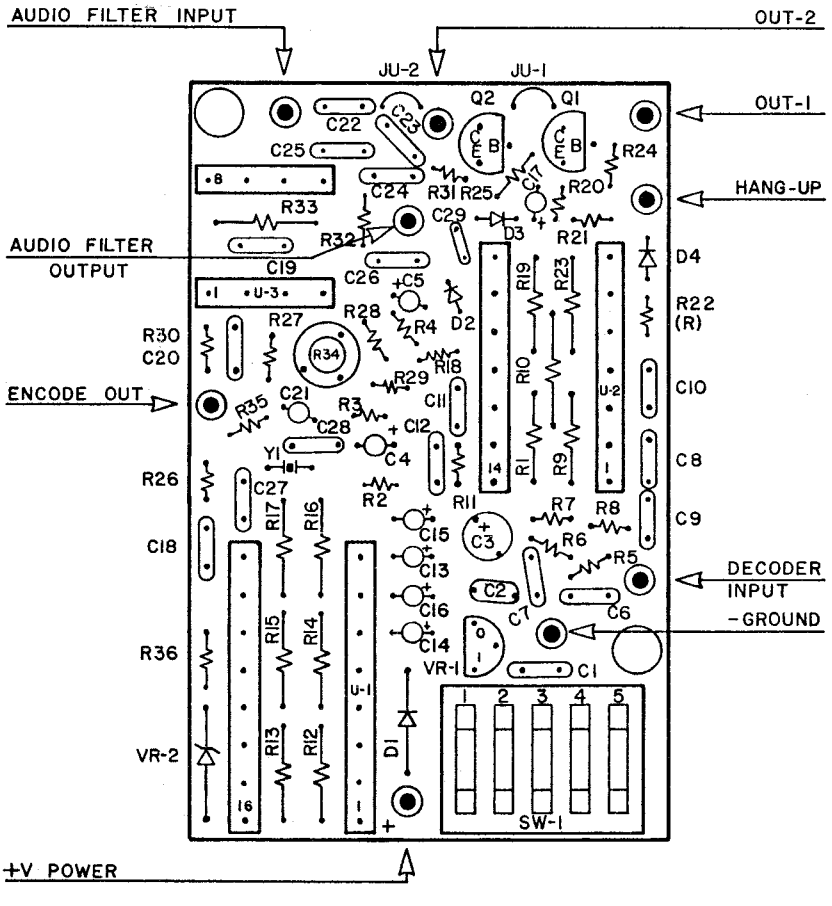


DIP SWITCH PROGRAMMING

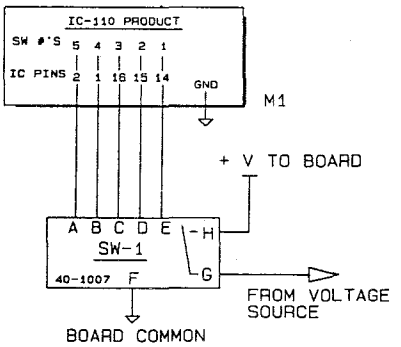
(FOR CTCSS PRODUCTS)

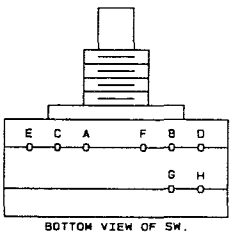
#	FREQ.	CODE	SWITCH NUMBER* 5	4	3	2	1
1	67.0	XZ	0	0	0	0	0
2	71.9	XA	0	0	0	0	1
3	74.4	WA	0	0	0	1	0
4	77.0	XB	0	0	0	1	1
5	79.7	SP	0	0	1	0	0
6	82.5	YZ	0	0	1	0	1
7	85.4	YA	0	0	1	1	0
8	88.5	YB	0	0	1	1	1
9	91.5	ZZ	0	1	0	0	0
10	94.8	ZA	0	1	0	0	1
11	97.4	ZB	0	1	0	1	0
12	100.0	1Z	0	1	0	1	1
13	103.5	1A	0	1	1	0	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

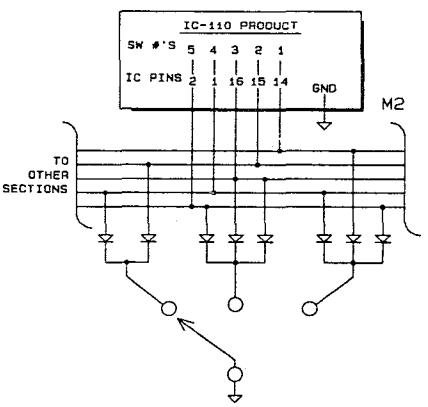
*CLOSED = 0 (ON)
OPEN = 1 (OFF)

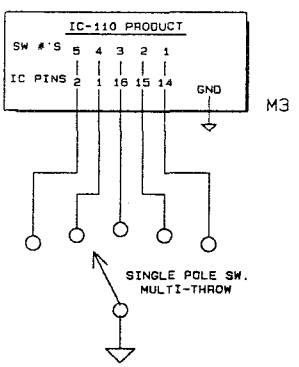


DESIG.	CSI.NO.				DESCRIPTION	PRICE
RESISTORS.....						
R36	06-4708	470 ohm	1/8w	5%	Carbon film resistor	.22 ea.
R35	06-1228	1.2K	1/8w	5%	Carbon film resistor	.22 ea.
R2	06-2228	2.2K	1/8w	5%	Carbon film resistor	.22 ea.
R10,18	06-5628	5.6K	1/8w	5%	Carbon film resistor	.22 ea.
R1,3	06-1038	10K	1/8w	5%	Carbon film resistor	.22 ea.
R13,24,25	06-1038	10K	1/8w	5%	Carbon film resistor	.22 ea.
R22	06-4738	47K	1/8w	5%	Carbon film resistor	.22 ea.
R26,27	06-6838	68K	1/8w	5%	Carbon film resistor	.22 ea.
R4,14,15	06-1048	100K	1/8w	5%	Carbon film resistor	.22 ea.
R29,30	06-1048	100K	1/8w	5%	Carbon film resistor	.22 ea.
R12	06-1148	110K	1/8w	5%	Carbon film resistor	.22 ea.
R21	06-1248	120K	1/8w	5%	Carbon film resistor	.22 ea.
R19	06-1548	150K	1/8w	5%	Carbon film resistor	.22 ea.
R32	06-2248	220K	1/8w	5%	Carbon film resistor	.22 ea.
R7,9,16	06-4748	470K	1/8w	5%	Carbon film resistor	.22 ea.
R17,20,31	06-4748	470K	1/8w	5%	Carbon film resistor	.22 ea.
R8	06-5648	560K	1/8w	5%	Carbon film resistor	.22 ea.
R5,6,23	06-1058	1m	1/8w	5%	Carbon film resistor	.22 ea.
R28,33	06-1058	1m	1/8w	5%	Carbon film resistor	.22 ea.
R11	06-2758	2.7m	1/8w	5%	Carbon film resistor	.22 ea.
R34	18-5020	5K	1/8w	5%	Potentiometer	1.39 ea.
CAPACITORS.....						
C28	21-1800	18pf	50v	10%	Ceramic capacitor CN-15	.21 ea.
C10,12	21-2210	220pf	50v	10%	Ceramic capacitor CN-15	.18 ea.
C27,29	21-4710	470pf	50v	10%	Ceramic capacitor CN-15	.29 ea.
C22,24,25	21-1520	1500pf	50v	10%	Ceramic capacitor CW-15	.15 ea.
C7,8,9	21-3320	3300pf	50v	10%	Ceramic capacitor CW-15	.15 ea.
C6,19,20,23	21-1030	.01uf	50v	10%	Ceramic capacitor CW-15	.14 ea.
C1,2,11,18,26	21-2240	.22uf	50v	10%	Ceramic capacitor CZ-15	.23 ea.
C13,14,15	19-1050	1uf	35v	10%	Tantalum electrolitic	.21 ea.
C16,17	19-1050	1uf	35v	10%	Tantalum electrolitic	.21 ea.
C3,4,5	23-1000	10uf	16v	20%	Aluminium electrolitic	.30 ea.
C21	23-1003	1uf	50v	20%	Aluminium electrolitic	.34 ea.
SEMICONDUCTORS.....						
D1,2,3,4	48-4148	1N4148			Silicon diode	.15 ea.
Y1	48-3276	32.768 khz			Crystal	.60 ea.
Q1	48-4401	2N4401			Silicon transistor	.21 ea.
Q2	48-0042	MPSA42			Silicon transistor	.30 ea.
U1	51-0110	IC-110			Comm-Spec. micro-ckt.	18.00 ea.
U2	51-0001	LM324N			Integrated circuit	.90 ea.
U3	51-0062	TL062N			Integrated circuit	2.20 ea.
VR1	48-3636	78L08			Regulator ckt.	1.00 ea.
VR2	48-5231	1N5231			5.1v 400mw Zener diode	.20 ea.
SW1	40-1005	5pos DIP			Switch	2.45 ea.
MISC. PARTS.....						
2	09-4504				4 pin strip sockets	.35 ea.
2	09-4507				7 pin strip sockets	.37 ea.
2	09-4508				8 pin strip sockets	.38 ea.
9	05-1007				Bead chassis pins	.05 ea.
1	84-1045				Printed circuit board	6.00 ea.
1	TS-32W KIT				Wire Kit	1.20 ea.
1	40-1007	33 pos. sw.			Binary Sw. (Not included)	17.95 ea.









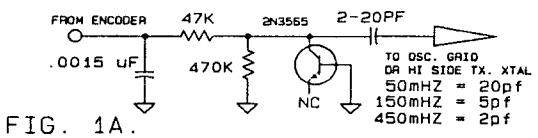


FIG. 1A.

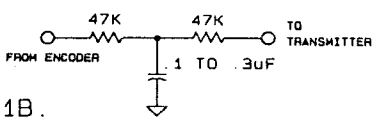


FIG. 1B.

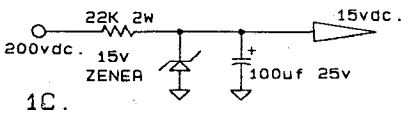


FIG. 1C.

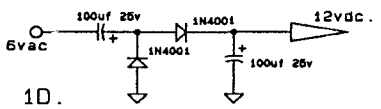


FIG. 1D.

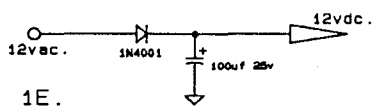


FIG. 1E.

TS-32P Hook-Up Instructions

Mounting

Mount unit with hardware supplied. When using a 90 degree angle bracket against the printed circuit board, be sure to use the two fiber spacers provided between the angle bracket and the printed circuit board. If this is not done, the bracket will short out the foils on the printed circuit board.

Power Hook-Up

Connect the TS-32P +V pin to +9 to +18Vdc. continuous. It is preferable to use +12Vdc as a supply voltage. Connect the TS-32P ground to chassis ground in negative ground systems. If positive ground is required, interchange ground and +V connections and also make proper provisions for returning microphone hang-up to +V instead of ground. If polarity is reversed to the unit, it will not operate but will not be damaged. Use the following as a guide for obtaining proper operating voltage.

Mobiles, 12v negative ground--standard hook-up.
Mobiles, 12v positive ground--reverse board +V and ground connections, return microphone hang-up to +V instead of ground.
Tube Type Bases--use appropriate figure 1C, 1D, or 1E.

Tone Output

This output supplies 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 TS-32P 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.

Hang - Up

In normal operation, the hang-up lead is grounded by the microphone hookswitch until the microphone is removed from the hanger. Ungrounding the hang-up pin allows the switching circuit to unmute the receiver for monitoring of the channel prior to transmitting. Resistor R22 (47K) is cut out if +V is supplied to the hang-up terminal with the microphone off the hanger and no voltage if it is hung-up as in the RCA types of radios. Some microphones have the hang-up wire in the microphone cord going to the rear mounting of the microphone, so no extra hang-up hookswitch is required.

Decoder Input

Hook tone input on board directly to the discriminator of the receiver, forward of any metering resistance going to the discriminator jack. Some receivers provide amplified audio which is used to drive factory installed tone decoders. If your receiver has such an amplifier in it may be used. In tube type receivers, a shielded wire may be necessary.

Audio Filter

Cut audio path in receiver and hook-up input and output wires in series with that broken path. The discriminator, where the input to the tone decoder is hooked and the center of the volume control in some receivers, are good locations. Receivers that incorporate factory installed tone decoders have high-pass filters in them or on the tone deck. Hook-up should be where that filter would have been connected. Use shielded wire if hum is present in the audio after filter installation.

Receiver Muting

The TS-32P has two options for muting the receiver audio. One is to use the high pass audio filter. This is achieved by **not** cutting JU-1 or JU-2. The receiver audio is then passed through the filter. When the correct CTCSS frequency is decoded, OUT-2 switches off and un-grounds the "mute" line. Thus allowing filtered audio to be received.

The second method is to use one of the two open collector transistors, OUT-1 or OUT-2. The OUT-1 transistor saturates when a correct tone is decoded. This transistor can be used to drive a small (12vdc type) relay. A pull-up resistor can be connected to OUT-1 to provide a voltage output to mute some types of receivers. When using OUT-1, JU-1 and JU-2 should be cut.

The OUT-2 transistor is capable of switching high voltages and can be used to control tube type or solid-state receivers. With JU-I in and JU-2 cut, the OUT-2 collector is **ON** and can be used to hold most squelch transistors at ground until the decoder has detected a correct CTCSS frequency. If OUT-2 is being used with a tube type radio, then a 1 Meg resistor should be used from the plate of squelch tube.

Out 1 JU-1 out	OUT-1 switches On to ground upon receipt of proper tones
Out 2 JU-1 in	OUT-2 switches Off (ungrounds) upon receipt of proper tones.

Multi-Tone Applications

There are a number of ways of changing tone frequencies from a remote location. The easiest is to use a 33 position binary coded switch (Part #.BS-1). The switch is connected to the TS-32P in parallel with the 5 pole D.I.P switch. The D.I.P. switch may be left on the board but must be switched to **ALL** switches "open". Shown in fig.M1. Another way is to use a Diode Matrix. This requires a single pole rotary switch that grounds for each tone channel needed. To program a tone frequency a diode is used for each **"0"** in the tone chart, an example is shown in fig. M2. The last procedure requires custom programming of the IC-110, but will take up the least amount of space in the radio. The hook-up is shown in fig. M3. This last method allows for only six tones but this will fill the majority of applications. The needed tones are programmed into locations 32,31,30,28, and 16. These are unique because they use a **single ground** on **one** switch line to access them.

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Copy this chart and use it to indicate changes made on your customized IC-110s

Tone Frequency	Crystal Selection	Address
___ ___ ___ ___ . ___		0 1
___ ___ ___ ___ . ___		0 2
___ ___ ___ ___ . ___		0 3
___ ___ ___ ___ . ___		0 4
___ ___ ___ ___ . ___	32.768 KHz	0 5
___ ___ ___ ___ . ___		0 6
___ ___ ___ ___ . ___		0 7
___ ___ ___ ___ . ___		0 8
___ ___ ___ ___ . ___		0 9
___ ___ ___ ___ . ___		1 0
___ ___ ___ ___ . ___		1 1
___ ___ ___ ___ . ___		1 2
___ ___ ___ ___ . ___		1 3
___ ___ ___ ___ . ___		1 4
___ ___ ___ ___ . ___		1 5
___ ___ ___ ___ . ___		1 6
___ ___ ___ ___ . ___		1 7
___ ___ ___ ___ . ___		1 8
___ ___ ___ ___ . ___		1 9
___ ___ ___ ___ . ___		2 0
___ ___ ___ ___ . ___		2 1
___ ___ ___ ___ . ___		2 2
___ ___ ___ ___ . ___		2 3
___ ___ ___ ___ . ___		2 4
___ ___ ___ ___ . ___		2 5
___ ___ ___ ___ . ___		2 6
___ ___ ___ ___ . ___		2 7
___ ___ ___ ___ . ___		2 8
___ ___ ___ ___ . ___		2 9
___ ___ ___ ___ . ___		3 0
___ ___ ___ ___ . ___		3 1
___ ___ ___ ___ . ___		3 2

Identifier_____

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