

7.9 T3000 CTCSS, VOX & Scrambler Options PCB

7.9.1 Introduction

The T3000 CTCSS, VOX and scrambler options PCB is a plug-in module that can be configured in 3 ways:

Product Code	Option	T3020	T3030 Series II	T3035 Series II	T3040 Series II
T3000-4500	CTCSS	x	✓	✓	✓
T3000-4501	VOX	x	✓	✓	✓
T3000-4502	Scrambler	x	✓	✓	✓

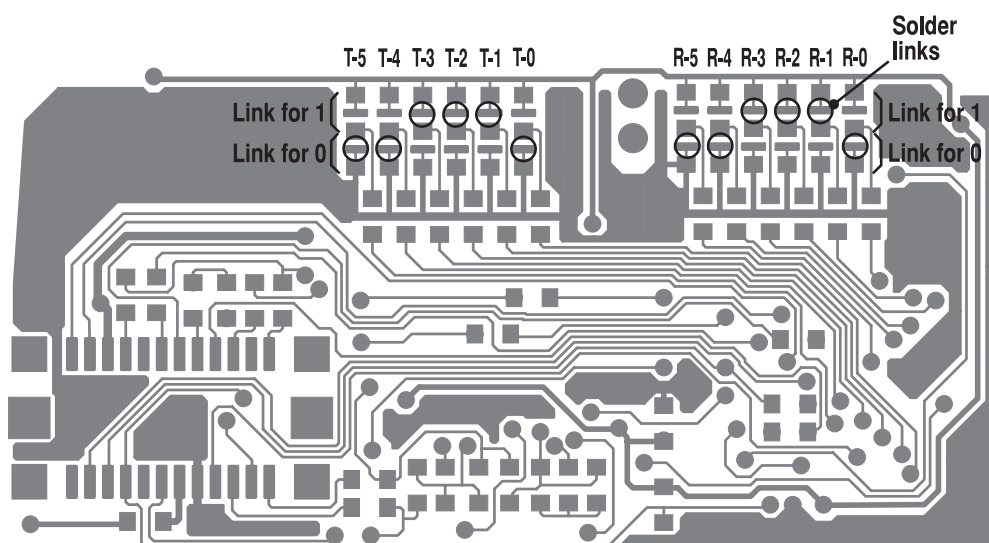
The options PCB plugs into an options connector on the top side of the T3020, T3030, T3035 and T3040 control PCB (IPN 220-01294-0X). Only radios manufactured after 30 March 1996 will support these options.

7.9.2 Link Details - All Options

There are 2 groups of links on the underside of the options PCB, the receive (R) group and the transmit (T) group. Each group contains 6 bits that are pulled logic high or low, by either solder links or zero ohm resistors.

The receive settings are set by links R-0 to R-5 and the transmit settings by links T-0 to T-5. A short to the 5V line represents a '1', and a short to ground represents a '0'.

The following diagram shows the options PCB with links indicated.



T3000 CTCSS, VOX & scrambler options PCB IPN 220-01335-04 (bottom side).
Links for transmit & receive 110.9Hz CTCSS frequency shown.

7.9.3 CTCSS Option PCB

7.9.3.1 Operation

On channels with CTCSS programmed, traffic that does not carry the correct CTCSS signal is screened out, and transmissions carry a CTCSS signal. There are 38 independent receive and transmit tones, set by the T and R solder links.

7.9.3.2 Settings

The following table gives the linking details for the transmit and receive CTCSS frequencies.

Tone Number	R-5 T-5	R-4 T-4	R-3 T-3	R-2 T-2	R-1 T-1	R-0 T-0	CTCSS Frequency (Hz)
1	0	0	0	0	0	0	67
2	0	0	0	0	0	1	71.9
3	0	0	0	0	1	0	74.4
4	0	0	0	0	1	1	77
5	0	0	0	1	0	0	79.7
6	0	0	0	1	0	1	82.5
7	0	0	0	1	1	0	85.4
8	0	0	0	1	1	1	88.5
9	0	0	1	0	0	0	91.5
10	0	0	1	0	0	1	94.8
11	0	0	1	0	1	0	97.4
12	0	0	1	0	1	1	100
13	0	0	1	1	0	0	103.5
14	0	0	1	1	0	1	107.2
15	0	0	1	1	1	0	110.9
16	0	0	1	1	1	1	114.8
17	0	1	0	0	0	0	118.8
18	0	1	0	0	0	1	123
19	0	1	0	0	1	0	127.3
20	0	1	0	0	1	1	131.8
21	0	1	0	1	0	0	136.5
22	0	1	0	1	0	1	141.3
23	0	1	0	1	1	0	146.2
24	0	1	0	1	1	1	151.4
25	0	1	1	0	0	0	156.7
26	0	1	1	0	0	1	162.2
27	0	1	1	0	1	0	167.9
28	0	1	1	0	1	1	173.8
29	0	1	1	1	0	0	179.9
30	0	1	1	1	0	1	186.2
31	0	1	1	1	1	0	192.8

Tone Number	R-5 T-5	R-4 T-4	R-3 T-3	R-2 T-2	R-1 T-1	R-0 T-0	CTCSS Frequency (Hz)
32	0	1	1	1	1	1	203.5
33	1	0	0	0	0	0	210.7
34	1	0	0	0	0	1	218.1
35	1	0	0	0	1	0	225.7
36	1	0	0	0	1	1	233.6
37	1	0	0	1	0	0	241.8
38	1	0	0	1	0	1	250.3

7.9.4 VOX Option PCB

7.9.4.1 Operation

The VOX option operates when the radio is in trunked mode, and is optimised for best results with the radio in handset mode.

VOX is enabled/disabled by the AUX ON/OFF function. When VOX is enabled, the radio microphone is turned on continuously, and the presence of speech is monitored. When speech is detected, the PTT is keyed automatically, and the radio transmits. When no speech is detected, the radio is held in receive mode.

When VOX is enabled and the PTT key is pressed, the radio transmits, whether or not speech is present. When the PTT key is released, the presence of speech is again monitored.

The VOX option is selected using the R settings, and the T settings optimise VOX performance for specific environments.

7.9.4.2 Settings

The VOX option is selected using the R settings, which are as follows:

R-5	R-4	R-3	R-2	R-1	R-0
1	1	1	1	1	0

The following table gives the linking details and a brief description for the 3 T settings.

Parameter		T-5	T-4	T-3	T-2	T-1	T-0
Speech Detection Sensitivity: Sets the detection level for the presence of speech. <ul style="list-style-type: none"> Low sensitivity reduces the possibility of noise triggering VOX. High sensitivity allows the VOX to detect the presence of speech more easily. 	high sensitivity				0	0	0
	default				0	0	1
					0	1	0
					0	1	1
					1	0	0
					1	0	1
					1	1	0
	low sensitivity				1	1	1

Parameter		T-5	T-4	T-3	T-2	T-1	T-0
Transmit Release Time-Out: After the VOX determines that speech is not present, a delay holds it in transmit mode for a specified time. <ul style="list-style-type: none"> • A large delay eliminates changing from transmit to receive between words in a sentence. • A small delay allows the VOX to turn off faster. 	small delay		0	0			
	default		0	1			
			1	0			
	large delay		1	1			
Speech Release Level: Sets the release level for the presence of speech. <ul style="list-style-type: none"> • A low level setting in quiet environments helps prevent the VOX from dropping out at the end of words. • A high level setting prevents noise from holding the VOX in transmit mode when speech is not present. 	low level - default	0					
	high level	1					

7.9.5 Scrambler Option PCB

7.9.5.1 Operation

The scrambler option is used in either trunked or conventional mode, and is enabled/disabled by the AUX ON/OFF function. The scrambler uses a simple frequency inversion algorithm that prevents casual eavesdropping by other radio users. After descrambling, the recovered speech suffers from some degradation in clarity.

7.9.5.2 Settings

The scrambler option is selected using the R settings, which are as follows. The T settings have no effect.

R-5	R-4	R-3	R-2	R-1	R-0
1	1	1	1	1	1

7.9.6 Fitting The CTCSS, VOX & Scrambler Options PCB

Refer to Section 3.2, "Disassembly Instructions", and Section 3.3, "Assembly Instructions".

7.9.6.1 Accessing The Control PCB

Unscrew the antenna and remove the battery pack.

Unscrew the 4 shield retaining screws exposed by removing the battery.

Grip the top of the radio firmly and gently pivot the front cover and shield apart, opening at the bottom of the radio. The top side of the control PCB is now exposed.

7.9.6.2 Replacing The Flexible Loom PCB

The flexible loom PCB, connecting the control and RF PCBs, must be replaced by the options flexible loom provided with the options PCB.

Push forward the 2 lugs at each end of the loom connector (P-FLEX) on the control PCB, and withdraw the loom from the connector.

Remove the remaining 4 shield retaining screws, and lift off the shield, guiding the loom through the slot in the shield.

Unclip the rear cover and bottom lid from the chassis, exposing the bottom side of the RF PCB.

On the underside of the RF PCB, insert a thin spike (or an unfolded paper-clip) through the 2 holes on either end of loom connector (SK-FLEXI).

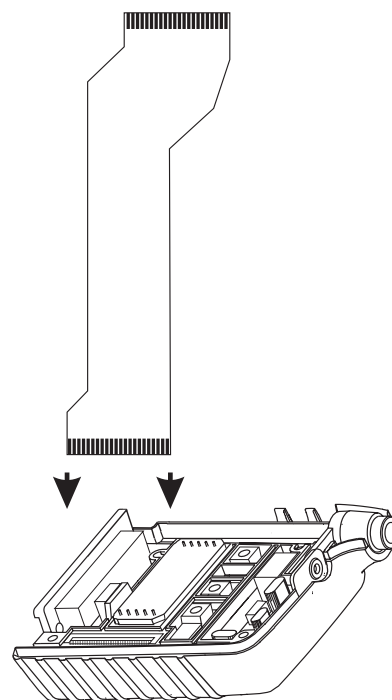
Push down to release the bar holding the loom in place, then turn over the RF PCB and pull the loom free of the loom connector.

Clip the bottom lid and rear cover back onto the chassis, insert the new loom and push down the bar to secure it in place.

The diagram shows the correct orientation of the new loom.

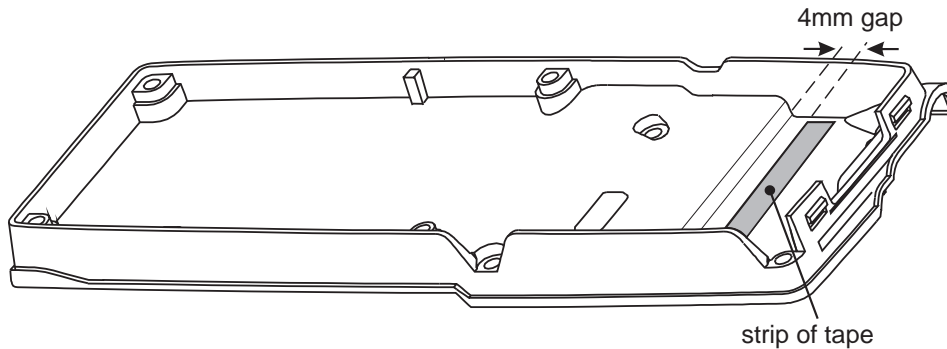
Reposition the shield on the RF PCB, guiding the new loom through the slot, and screw the shield to the RF PCB.

On the control PCB, push forward the 2 lugs on P-FLEX, slide the loom into the connector, and push the lugs back to secure the loom.



7.9.6.3 Shield Modification

Position the 42mm length of 9x3mm foam tape on the shield, as shown.

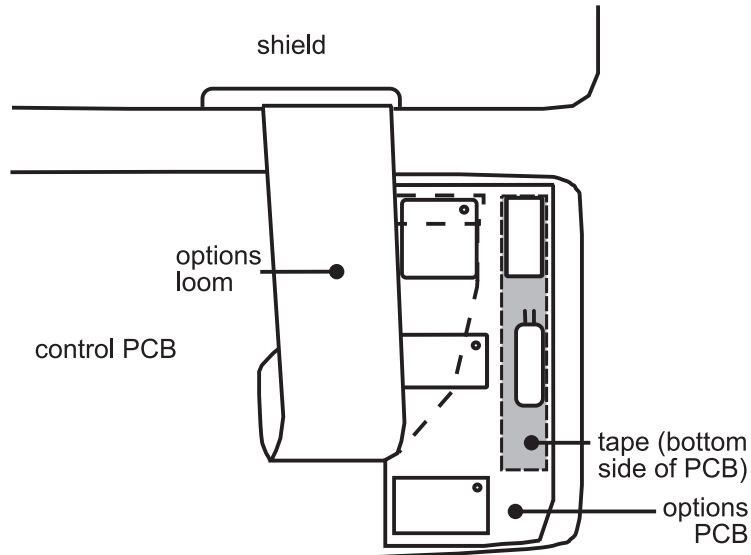


7.9.6.4 Mounting The Options PCB

Position the 30mm length of 6x3mm foam tape on the bottom side of the options PCB, as shown in the diagram below.

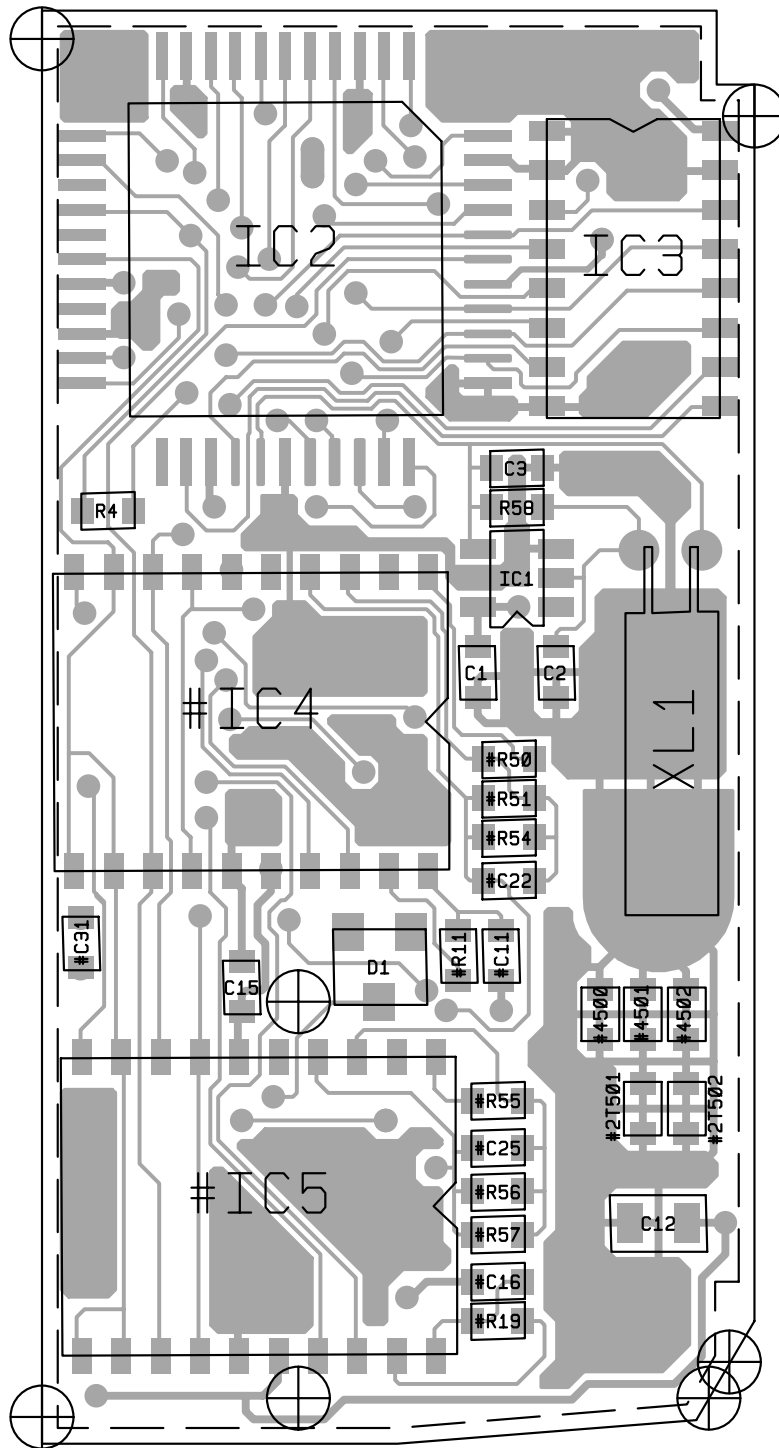
Plug the options PCB onto the OPTIONS plug on the control PCB. The loom should sit flat under the options PCB.

The following diagram shows the CTCSS, VOX and scrambler options PCB mounted in a radio.



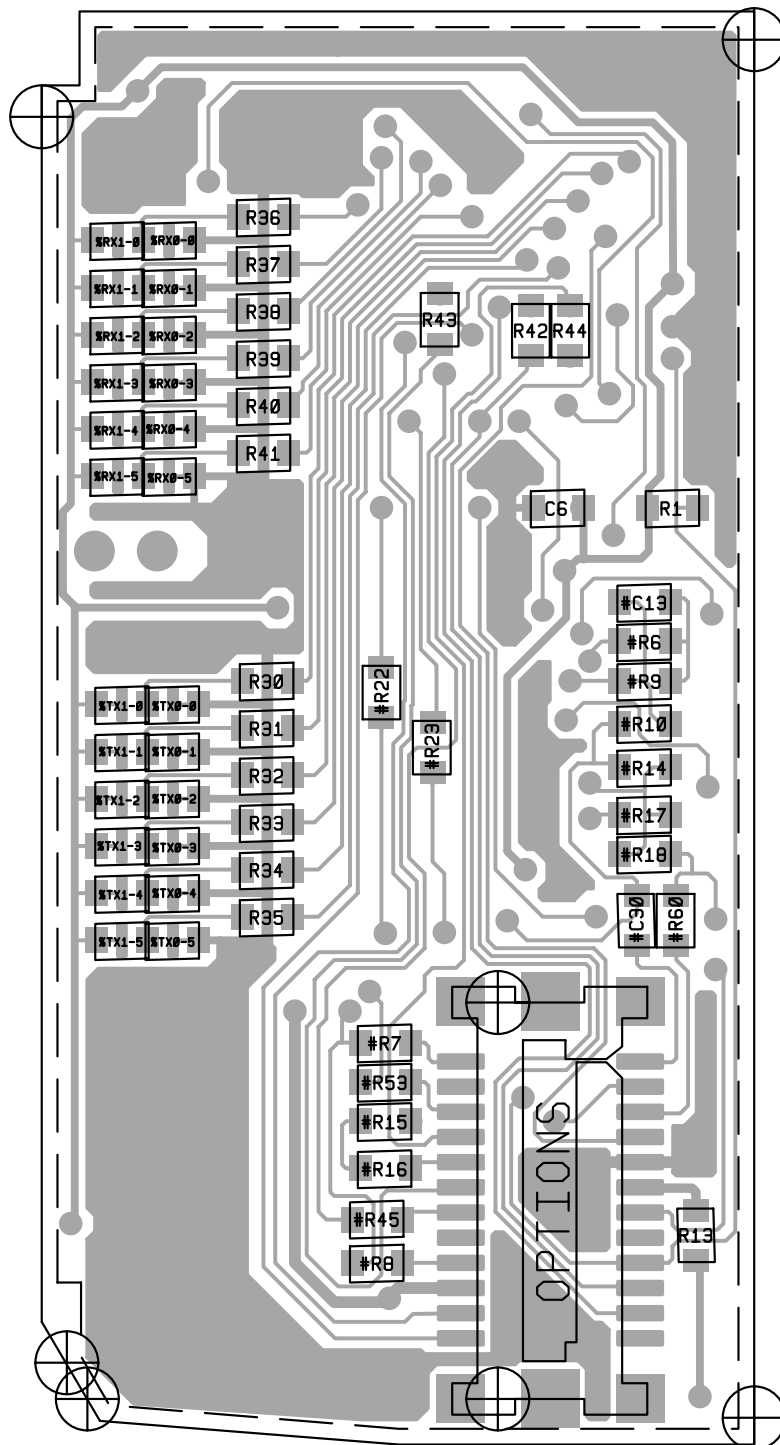
Parts List (IPN 220-01335-04)

Ref Var	IPN	Description	Ref Var	IPN	Description
C1	018-16100-01	CAP 0603 CHIP 100N +80-20% Y5V 16V	R36	038-15100-00	RES 0603 CHIP 10K 1/16W +5%
C2	018-12330-00	CAP 0603 CHIP 33P 50V NPO +-5%	R37	038-15100-00	RES 0603 CHIP 10K 1/16W +5%
C3	018-12150-00	CAP 0603 CHIP 15P 50V NPO +-5&	R38	038-15100-00	RES 0603 CHIP 10K 1/16W +5%
C6	018-16100-01	CAP 0603 CHIP 100N +80-20% Y5V 16V	R39	038-15100-00	RES 0603 CHIP 10K 1/16W +5%
#C11	CTCSS 018-16100-01	CAP 0603 CHIP 100N +80-20% Y5V 16V	R40	038-15100-00	RES 0603 CHIP 10K 1/16W +5%
#C11	VOX 018-16100-01	CAP 0603 CHIP 100N +80-20% Y5V 16V	R41	038-15100-00	RES 0603 CHIP 10K 1/16W +5%
#C11	SCRAM 018-16100-01	CAP 0603 CHIP 100N +80-20% Y5V 16V	R42	038-15100-00	RES 0603 CHIP 10K 1/16W +5%
C12	015-27100-10	CAP CER 0805 CHIP 1M +80-20% Y5V 16V	R43	038-15100-00	RES 0603 CHIP 10K 1/16W +5%
#C13	CTCSS 038-12100-00	RES 0603 CHIP 10E 1/16W +5%	R44	038-15100-00	RES 0603 CHIP 10K 1/16W +5%
C15	018-16100-01	CAP 0603 CHIP 100N +80-20% Y5V 16V	#R50	CTCSS 038-16100-00	RES 0603 CHIP 100K 1/16W +5%
#C16	SCRAM 018-16100-01	CAP 0603 CHIP 100N +80-20% Y5V 16V	#R50	SCRAM 038-16470-00	RES 0603 CHIP 470K 1/16W +5%
#C16	VOX 018-16100-01	CAP 0603 CHIP 100N +80-20% Y5V 16V	#R51	CTCSS 038-16470-00	RES 0603 CHIP 470K 1/16W +5%
#C22	CTCSS 018-13150-00	CAP 0603 CHIP 150P 50V NPO +-5%	#R51	SCRAM 038-16100-00	RES 0603 CHIP 100K 1/16W +5%
#C22	SCRAM 018-13150-00	CAP 0603 CHIP 150P 50V NPO +-5%	#R53	VOX 038-11470-00	RES 0603 CHIP 4E7 1/16W +5%
#C25	SCRAM 018-13150-00	CAP 0603 CHIP 150P 50V NPO +-5%	#R53	SCRAM 038-11470-00	RES 0603 CHIP 4E7 1/16W +5%
#C30	CTCSS 018-16100-01	CAP 0603 CHIP 100N +80-20% Y5V 16V	#R54	CTCSS 038-16220-00	RES 0603 CHIP 220K 1/16W +5%
#C31	VOX 018-16100-01	CAP 0603 CHIP 100N +80-20% Y5V 16V	#R55	SCRAM 038-16220-00	RES 0603 CHIP 220K 1/16W +5%
D1	001-10000-70	(S) DIODE SMD BAV70 DUAL SWITCH SOT	#R56	SCRAM 038-16100-00	RES 0603 CHIP 100K 1/16W +5%
IC1	002-74900-40	(LSH) IC SMD TC7S04F SINGLE INV GATE	R58	038-17100-00	RES 0603 CHIP 1M 1/16W +-5%
IC2	002-18937-10	(LSH) IC SMD Z89371-16FSC OTP DSP 44	#R60	SCRAM 038-11470-00	RES 0603 CHIP 4E7 1/16W +5%
IC3	002-74917-30	(LSH) IC SMD 74HC173D 4BIT DTYPE REGI	XL1	274-01063-00	(L) XTAL 3.579545MHZ MINITURE CYLINDR
#IC4	CTCSS 002-11454-80	(LSH) IC SMD MC145480DW PCM CODEC F		038-10000-00	RES 0603 CHIP ZERO OHM SET CTCSS, VOX & SCRAMBLER OPTIONS
#IC4	VOX 002-11454-80	(LSH) IC SMD MC145480DW PCM CODEC F		220-01298-01	(L) PCB FLEXI T3000 OPTIONS LOOM
#IC4	SCRAM 002-11454-80	(LSH) IC SMD MC145480DW PCM CODEC F		220-01335-04	PCB T3000-4500 CTCSS OPTION BOARD
#IC5	SCRAM 002-11454-80	(LSH) IC SMD MC145480DW PCM CODEC F		369-00020-49	TAPE SA TESAMOLL 9*3
#IC5	VOX 002-11454-80	(LSH) IC SMD MC145480DW PCM CODEC		369-00020-50	TAPE SA TESAMOLL 6*3
OPTION	240-10000-02	CONN SMD 24WAY (SKT/CAP)			
R1	038-15150-00	RES 0603 CHIP 15K 1/16W +-5%	Note:	CTCSS = CTCSS option	
R4	038-15100-00	RES 0603 CHIP 10K 1/16W +-5%		VOX = VOX option	
#R6	CTCSS 038-15470-00	RES 0603 CHIP 47K 1/16W +-5%		SRAM = Scrambler options	
#R6	VOX 038-15470-00	RES 0603 CHIP 47K 1/16W +-5%			
#R6	SCRAM 038-15470-00	RES 0603 CHIP 47K 1/16W +-5%			
#R7	CTCSS 038-15270-00	RES 0603 CHIP 27K 1/16W +-5%			
#R8	SCRAM 038-11470-00	RES 0603 CHIP 4E7 1/16W +-5%			
#R9	CTCSS 038-16470-00	RES 0603 CHIP 470K 1/16W +-5%			
#R9	VOX 038-11470-00	RES 0603 CHIP 4E7 1/16W +-5%			
#R9	SCRAM 038-11470-00	RES 0603 CHIP 4E7 1/16W +-5%			
#R10	CTCSS 038-14470-00	RES 0603 CHIP 4K7 1/16W +-5%			
#R10	VOX 038-15100-00	RES 0603 CHIP 10K 1/16W +-5%			
#R10	SCRAM 038-15100-00	RES 0603 CHIP 10K 1/16W +-5%			
#R11	CTCSS 038-15100-00	RES 0603 CHIP 10K 1/16W +-5%			
#R11	VOX 038-15100-00	RES 0603 CHIP 10K 1/16W +-5%			
#R11	SCRAM 038-15100-00	RES 0603 CHIP 10K 1/16W +-5%			
R13	038-11470-00	RES 0603 CHIP 4E7 1/16W +-5%			
#R15	SCRAM 038-11470-00	RES 0603 CHIP 4E7 1/16W +-5%			
#R17	SCRAM 038-15270-00	RES 0603 CHIP 27K 1/16W +-5%			
#R17	VOX 038-15270-00	RES 0603 CHIP 27K 1/16W +-5%			
#R18	SCRAM 038-15100-00	RES 0603 CHIP 10K 1/16W +-5%			
#R18	VOX 038-15100-00	RES 0603 CHIP 10K 1/16W +-5%			
#R19	SCRAM 038-15100-00	RES 0603 CHIP 10K 1/16W +-5%			
#R19	VOX 038-15100-00	RES 0603 CHIP 10K 1/16W +-5%			
#R22	CTCSS 038-15150-00	RES 0603 CHIP 15K 1/16W +-5%			
#R22	CTCSS 038-15150-00	RES 0603 CHIP 15K 1/16W +-5%			
#R22	VOX 038-15150-00	RES 0603 CHIP 15K 1/16W +-5%			
#R23	SCRAM 038-15150-00	RES 0603 CHIP 15K 1/16W +-5%			
#R23	VOX 038-15150-00	RES 0603 CHIP 15K 1/16W +-5%			
R30	038-15100-00	RES 0603 CHIP 10K 1/16W +-5%			
R31	038-15100-00	RES 0603 CHIP 10K 1/16W +-5%			
R32	038-15100-00	RES 0603 CHIP 10K 1/16W +-5%			
R33	038-15100-00	RES 0603 CHIP 10K 1/16W +-5%			
R34	038-15100-00	RES 0603 CHIP 10K 1/16W +-5%			
R35	038-15100-00	RES 0603 CHIP 10K 1/16W +-5%			



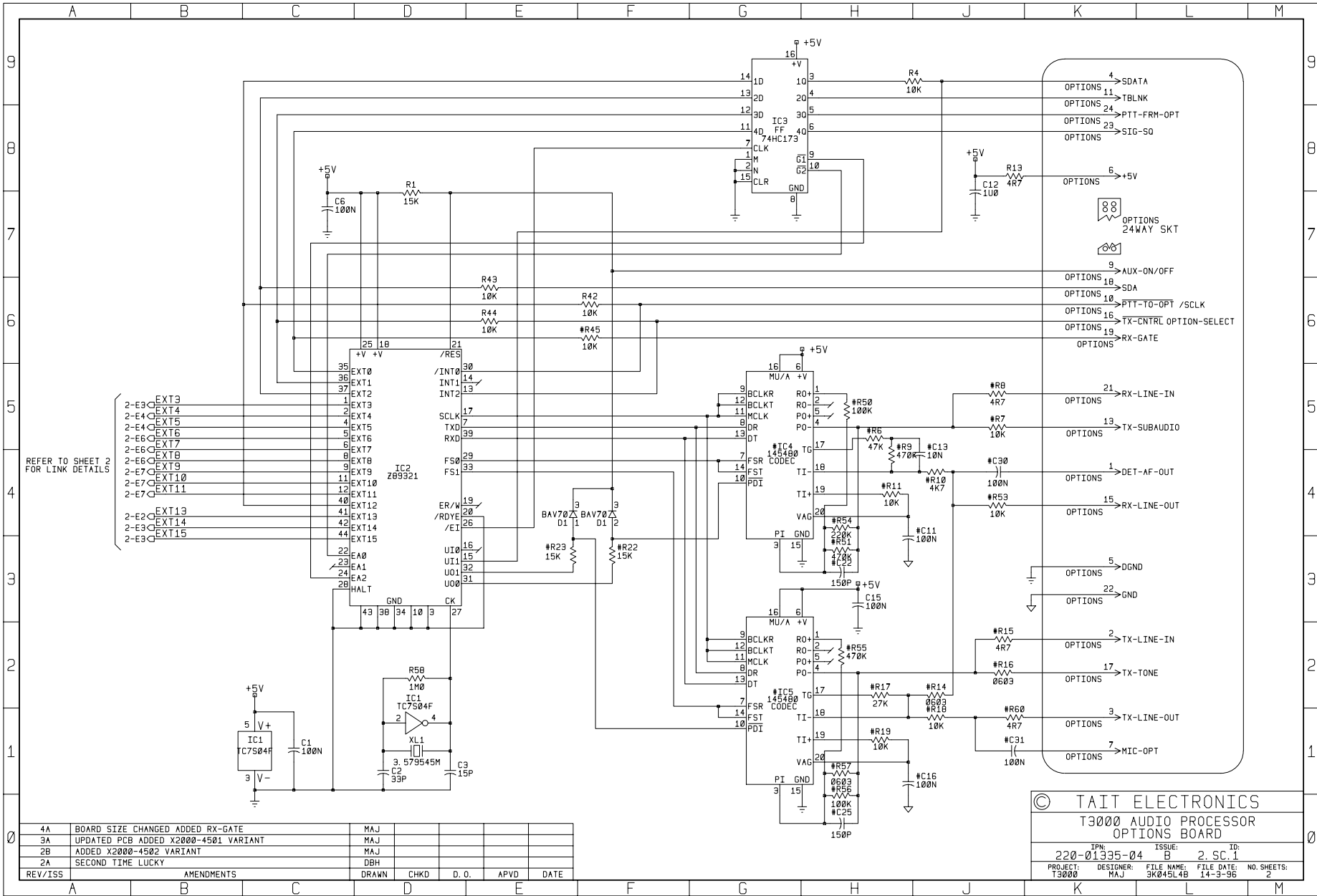
220-01335-04 A

T3000 VOX, CTCSS & Scrambler Options PCB (IPN 220-01335-04) - Top Side



220-01335-04 A

T3000 VOX, CTCSS & Scrambler Options PCB (IPN 220-01335-04) - Bottom Side

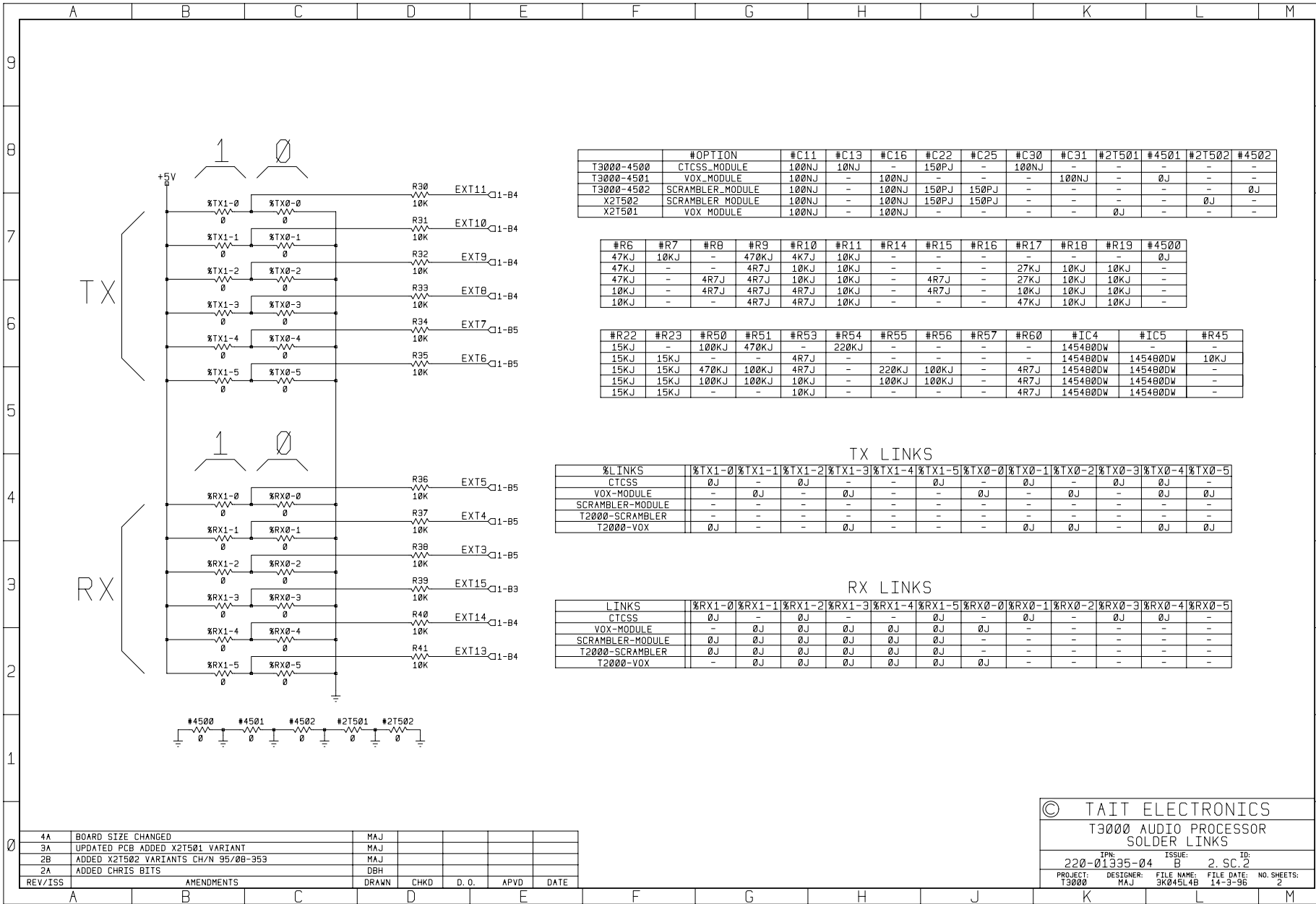


REFER TO SHEET 2 FOR LINK DETAILS

4A	BOARD SIZE CHANGED ADDED RX-GATE	MAJ				
3A	UPDATED PCB ADDED X2000-4501 VARIANT	MAJ				
2B	ADDED X2000-4502 VARIANT	MAJ				
2A	SECOND TIME LUCKY	DBH				
REV/ISS	AMENDMENTS	DRAWN	CHKD	D. O.	APVD	DATE

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 T3000 AUDIO PROCESSOR
 OPTIONS BOARD

IPN: 220-01935-04 ISSUE: B 2. SC.1
 PROJECT: T3000 DESIGNER: MAJ FILE NAME: 3K045L4B FILE DATE: 14-3-96 NO. SHEETS: 2



	#OPTION	#C11	#C19	#C16	#C22	#C25	#C30	#C31	#2T501	#4501	#2T502	#4502
T3000-4500	CTCSS_MODULE	100NJ	10NJ	-	150PJ	-	100NJ	-	-	-	-	-
T3000-4501	VOX_MODULE	100NJ	-	100NJ	-	-	-	100NJ	-	0J	-	-
T3000-4502	SCRAMBLER_MODULE	100NJ	-	100NJ	150PJ	150PJ	-	-	-	-	-	0J
X2T502	SCRAMBLER_MODULE	100NJ	-	100NJ	150PJ	150PJ	-	-	-	-	-	0J
X2T501	VOX_MODULE	100NJ	-	100NJ	-	-	-	-	0J	-	-	-

#R6	#R7	#R8	#R9	#R10	#R11	#R14	#R15	#R16	#R17	#R18	#R19	#4500
47KJ	10KJ	-	470KJ	4K7J	10KJ	-	-	-	-	-	-	0J
47KJ	-	-	4R7J	10KJ	10KJ	-	-	-	27KJ	10KJ	10KJ	-
47KJ	-	4R7J	4R7J	10KJ	10KJ	-	4R7J	-	27KJ	10KJ	10KJ	-
10KJ	-	4R7J	4R7J	10KJ	10KJ	-	4R7J	-	10KJ	10KJ	10KJ	-
10KJ	-	-	4R7J	4R7J	10KJ	-	-	-	47KJ	10KJ	10KJ	-

#R22	#R29	#R50	#R51	#R53	#R54	#R55	#R56	#R57	#R60	#IC4	#IC5	#R45
15KJ	-	100KJ	470KJ	-	220KJ	-	-	-	-	1454800W	-	-
15KJ	15KJ	-	-	4R7J	-	-	-	-	-	1454800W	1454800W	-
15KJ	15KJ	470KJ	100KJ	4R7J	-	220KJ	100KJ	-	4R7J	1454800W	1454800W	-
15KJ	15KJ	100KJ	100KJ	10KJ	-	100KJ	100KJ	-	4R7J	1454800W	1454800W	-
15KJ	15KJ	-	-	10KJ	-	-	-	-	4R7J	1454800W	1454800W	-

TX LINKS

%LINKS	%TX1-0	%TX1-1	%TX1-2	%TX1-3	%TX1-4	%TX1-5	%TX0-0	%TX0-1	%TX0-2	%TX0-3	%TX0-4	%TX0-5
CTCSS	0J	-	0J	-	-	-	0J	-	0J	-	0J	-
VOX-MODULE	-	0J	-	0J	-	-	0J	-	0J	-	0J	0J
SCRAMBLER-MODULE	-	-	-	-	-	-	-	-	-	-	-	-
T2000-SCRAMBLER	-	-	-	-	-	-	-	-	-	-	-	-
T2000-VOX	0J	-	-	0J	-	-	-	0J	0J	-	0J	0J

RX LINKS

LINKS	%RX1-0	%RX1-1	%RX1-2	%RX1-3	%RX1-4	%RX1-5	%RX0-0	%RX0-1	%RX0-2	%RX0-3	%RX0-4	%RX0-5
CTCSS	0J	-	0J	-	-	0J	-	0J	-	0J	0J	-
VOX-MODULE	-	0J	0J	0J	0J	0J	0J	-	-	-	-	-
SCRAMBLER-MODULE	0J	0J	0J	0J	0J	0J	-	-	-	-	-	-
T2000-SCRAMBLER	0J	0J	0J	0J	0J	0J	-	-	-	-	-	-
T2000-VOX	-	0J	0J	0J	0J	0J	0J	-	-	-	-	-

4A	BOARD SIZE CHANGED	MAJ				
3A	UPDATED PCB ADDED X2T501 VARIANT	MAJ				
2B	ADDED X2T502 VARIANTS CH/N 95/00-353	MAJ				
2A	ADDED CHRIS BITS	DBH				
REV/ISS	AMENDMENTS	DRAWN	CHKD	D. O.	APVD	DATE

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 T3000 AUDIO PROCESSOR
 SOLDER LINKS

IPN: 220-01935-04 ISSUE: B ID: 2. SC. 2
 PROJECT: T3000 DESIGNER: MAJ FILE NAME: 3K045L4B FILE DATE: 14-3-96 NO. SHEETS: 2

