SECTION 8 - TONE-CODED TALK-THROUGH FACILITY
(With Line Access and Tx Limit Timer)

8.1 MODIFICATION PROCEDURE

This modification provides the base station with a CTCSS tone-controlled Talk-Through and Line Access facility, and a transmitter 'On-time' limiter. The facility includes a Quiet Base over-ride switch, which is mandatory in Australia.

Modification Kit 9585 815 81810

(a) Tone Squelch Talk-Through with Line Access

Interface PC Board	3502 349 97780
Loom, Interface	3502 330 02380
Support, PC Board	2422 015 13088
Module, (Sigtec) CTCSS Decoder	3502 350 04400
Switch, Toggle, DPDT (Defeat)	2422 125 01399
Label (TTR Kit) 814/815	3502 310 38290

(b) Tx Limit Timer

Tx Limit Timer PC Board	3502 349 95280
Loom, Tx Limit Timer	3502 330 05910
Screw, CH HD M3X6 (x2)	2522 002 73098
Washer, Lock S/C M3	2522 613 26005
Washer, Lock, ST 3.2mm x 6 x 0.5	2522 600 85016
Washer, Bak. 1/8 x 1/4 x 1/16	2502 600 61018
Shield & Tape Assy	3502 330 09400

8.1.1 TONE SQUELCH TALK-THROUGH WITH LINE ACCESS

The Interface PC Board and loom are fitted into the Receiver and connected as detailed in (a) below and Figure 8.1. The Transmitter unit is modified as detailed in (b) with Figure 8.2 and the two units are then interconnected as shown in Figure 8.3 using Interconnecting Assembly 9585 814 96000.

(a) Receiver Modification

i. Remove Links 2 (29 - 30), 4 (40 - 41) and 5 (40 - 42) and connect Link 1 (30 - 28) on the Audio Facilities pc board.

ii. Disconnect white wire between Pin 33 on Receiver pc board and Pin 8 on Audio Facilities pc board.

iii. Disconnect violet wire between Pin 26 on Receiver pc board and Pin 13 on Audio Facilities pc board.

iv. Connect loom as shown in Figure 8.1.

v. Sleeve blue wire of Interface Loom.

(b) Transmitter Modification (Refer to Figure 8.2)

i. Add Link 9 between Pin 45 and 61 on Audio Facilities pc board.

ii. Disconnect coax cable from Pin 30 and reconnect to Pin 56 on Audio Facilities pc board.

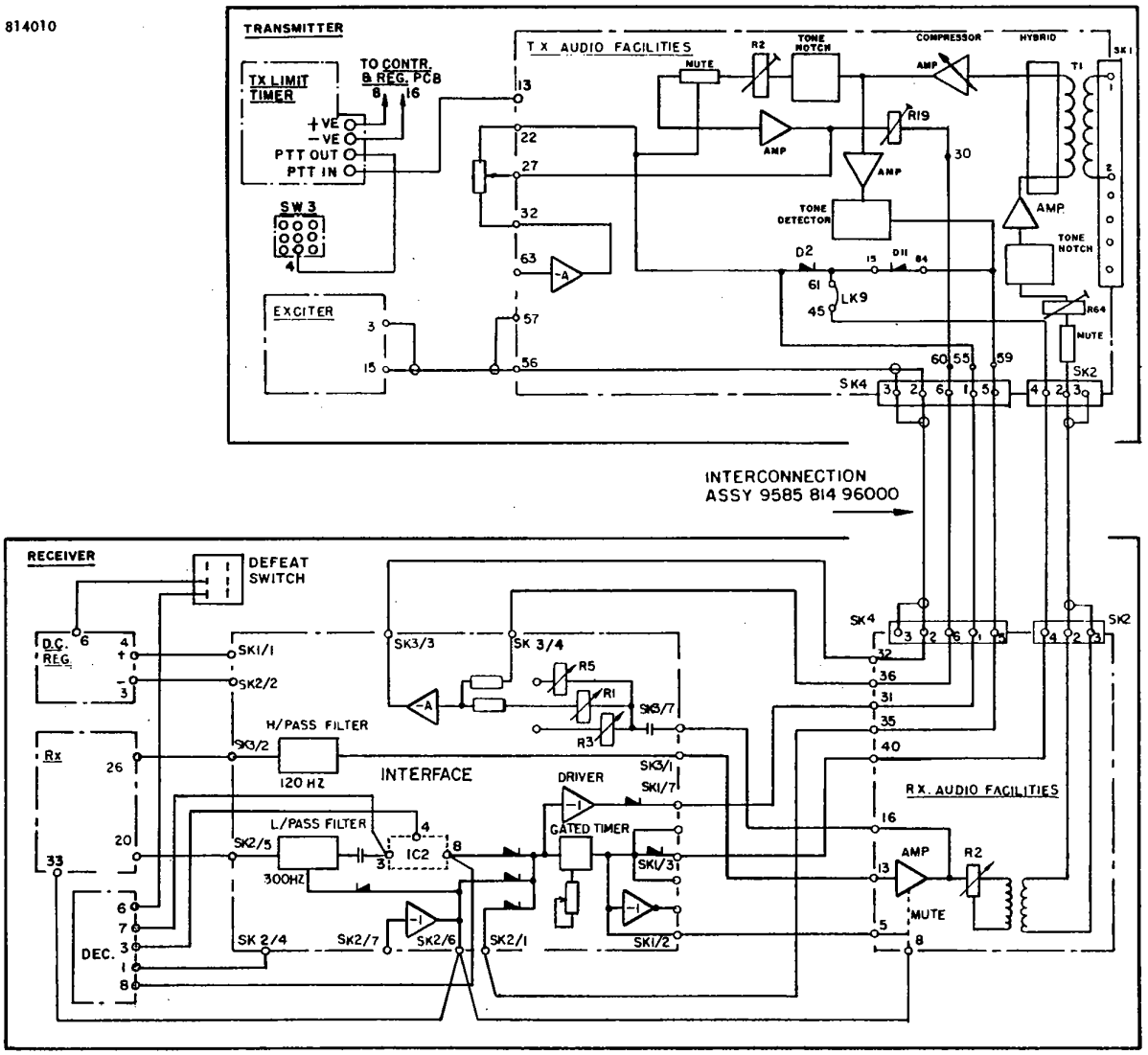


Figure 8.3. FM814 MK3 Interface Interconnection Diagram for Tone Squelch Talk-Through with Line Access (plus Tx 'On-time' Limit Timer)

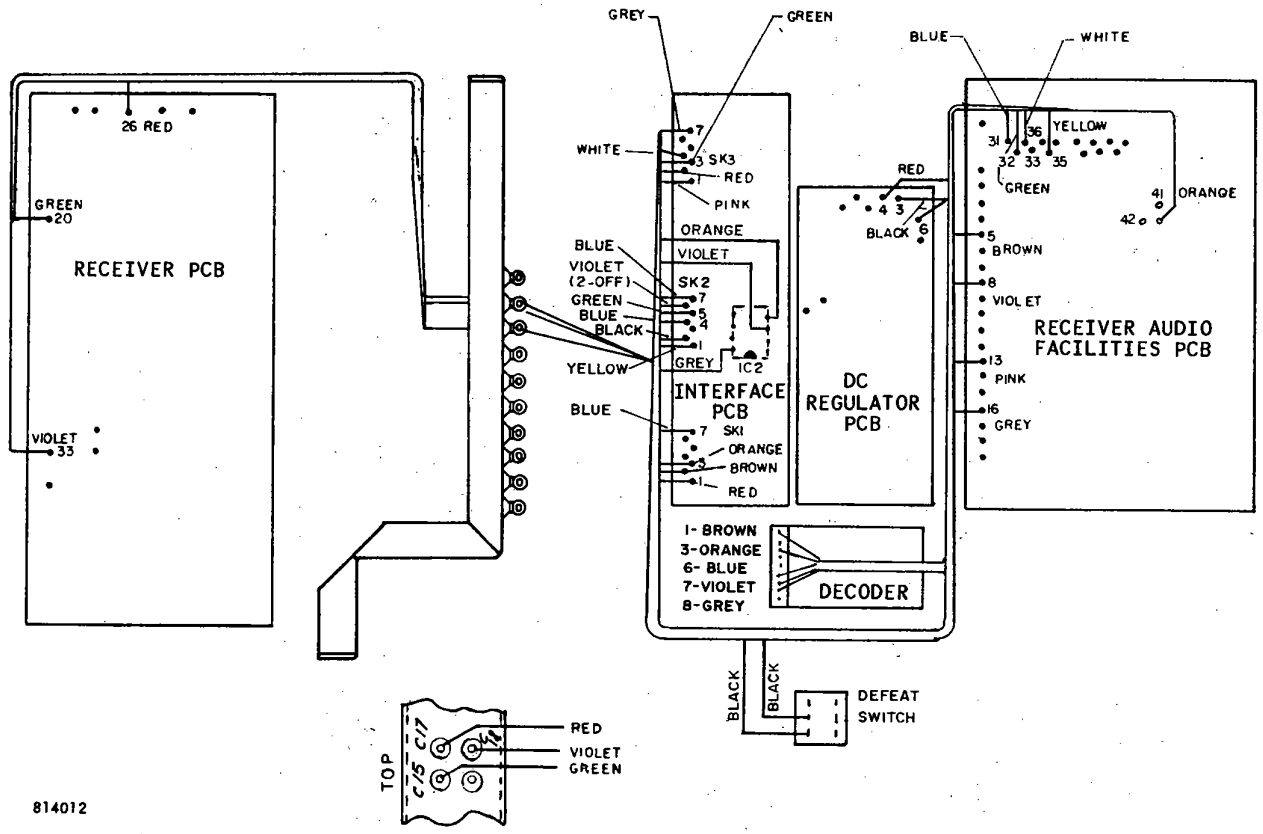


Figure 8.1. FM814 Receiver Modification

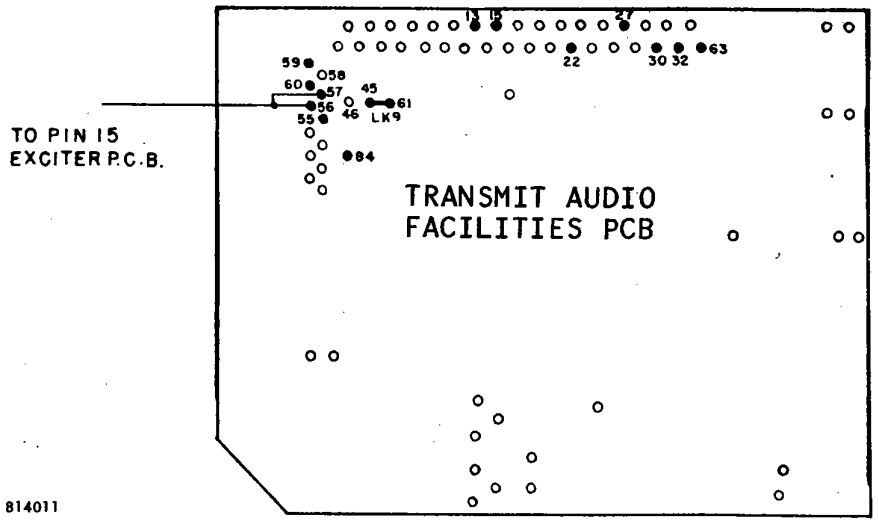


Figure 8.2. FM814 MK3 Transmitter Modification

8.2.1 TALK-THROUGH WITH LINE ACCESS

8.2.1.1 Modulation Alignment

(a) Line Level Adjustment

N.B. For steps i - xii operate PTT via switch connecting SK1/3 and SK1/2 on Tx.

i. Connect audio signal generator to SK1/4 of Tx (-ve to SK1/6)

ii. Set AF signal generator level to -30dBm (Note SK1/4 has high input impedance).

iii. Adjust Line I/P Level pot (Tx front panel) so that AVO just reads 0.5V at P70 (Audio Facility PCB). Decreasing signal generator by 1dB should cause voltage at P70 to fall below 0.3V. (Sets compressor threshold to -30dBm).

iv. Set AF signal generator to the frequency where deviation is maximum (about 3kHz).

v. Adjust R19 on Audio Facility pc board to mid position and set signal generator to -10dBm.

vi. Adjust deviation control R81 on exciter for ±5kHz.

vii. Adjust compressor output pot R19 (Audio Facility) so that deviation is reduced to ±3kHz (AF signal generator at 3kHz and -10dBm). Adjust deviation monitor output level to 0dB ref (no de-emphasis).

viii. Reduce signal generator frequency to 1kHz and note the change in deviation monitor output. If less than 7dB drop in level replace R80 on exciter by short circuit and repeat step vii and viii as a check.

ix. Repeat steps iv to vi.

x. Set signal generator to 1kHz at -10dBm.

xi. Adjust R19 (Audio Facility) for ±3kHz deviation.

xii. Repeat steps ix to xi.

(b) Talk-Through Modulation

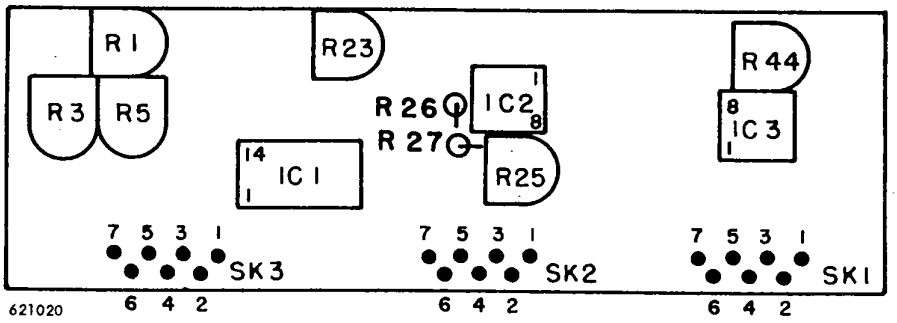


Figure 8.5. Interface Board Adjustment Locations

i. Connect Pin 8 of IC2 (pin 8 of decoder module) on the Interface pc board (3502 349 97780) to SK2/2 (-ve).

ii. Set RF signal generator on frequency and modulate ±3kHz/1kHz. The mute should open and Tx start transmitting.

8.1.2 TX LIMIT TIMER OPTION

The Tx Limit Timer pc board and loom are fitted into the transmitter unit and connected as detailed below and in Figures 8.3 and 8.4.

i. Remove yellow wire connecting Pin 13 of Audio Facilities pc board to Intercom Switch S3.

ii. Fit Timer pc board as shown in Figure 8.4.

iii. Test in accordance with Section 8.2.2.

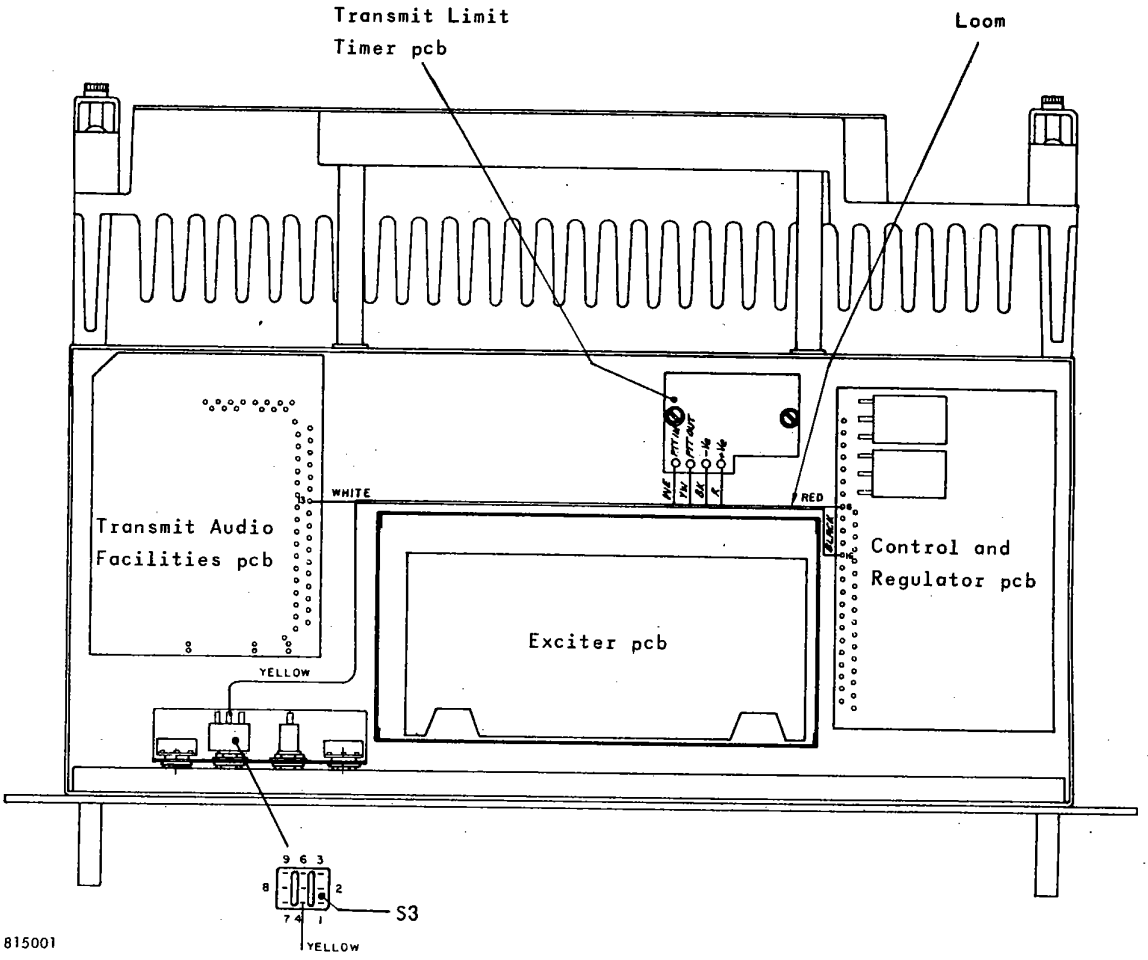


Figure 8.4. Tx Limit Timer Interconnecting Diagram

8.2 ALIGNMENT PROCEDURE

Test Equipment Required

(a) RF signal generator
(b) Modulation Monitor
(c) 50W RF Power Meter
(d) Sampling Pad
(e) Audio Signal Generator (600 ohm)
(f) RMS Voltmeter (dBm)
(g) 600 ohm Resistor

b) Tone Decoder Checks

i. Connect the AF signal generator to SK2/5 and set level to 100mV rms at the required tone frequency.

ii. Adjust R23 on Interface pc board to give a level of 75mV rms at pin 7 of the decoder module.

iii. Check that the logic and PTT delay functions act as follows:

- Pin 8 of IC2 goes low (less than 0.5V) when the input frequency is within ±2% of the decoder frequency. Do not remove the input signal.
- SK1/7 goes high (about 12V).
  (Note SK2/1,6 & 7 should all be open circuit at this time).
- SK1/2 to SK1/5 go high (about 12V).

8.2.1.3 Functional Checks

NOTE: It is assumed that all RF alignment and RF checks have been carried out and that the mute has been adjusted to the desired position. It will be necessary to have the CTCSS switch in the defeat position to do this.

a) With the CTCSS switch in the normal position check the functional aspects of the TTR/LA as follows:

i. Modulate RF signal generator with carrier only. Check that the transmitter does not operate.

ii. Connect 1kHz at -10dBm to SK1/4 of the transmitter.

iii. Modulate the RF signal generator with the decode frequency at 0.5kHz deviation. Check that:-

(a) the transmitter operates
(b) 1kHz modulation does not appear at the output of the modulation monitor.

iv. Operate line PTT (i.e. short Tx socket pins SK1/2 and SK2/3) and check that the 1kHz signal, from line, appears on the modulation monitor, i.e., line PTT overrides talk-through audio.

v. Remove line PTT (SK1/2 to SK2/3).

vi. Adjust R44 on interface board so that the transmitter remains on for approximately 5 seconds after the tone modulated signal is removed.

vii. Check that the receiver mute prevents noise being transmitted for the duration of the extended talk-through transmission. (Use CRO to observe output of modulation monitor).

8.2.2 TX LIMIT TIMER

i. Turn the timer off by rotating R10 fully anticlockwise.

ii. Key the transmitter and wait the required limit time, then turn R10 clockwise until the timer trips (PTT off).

iii. Release and key the transmitter again and check the timer trip period. Adjust if necessary.

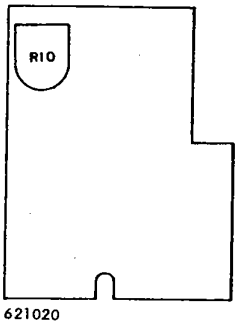


Figure 8.6 R10 Location

iii. Set R1 on Interface pc board to give ±3kHz deviation on deviation monitor.

iv. Check talk-through response by keeping deviation of signal generator fixed at ±3kHz and vary modulation frequency from 300 to 3kHz. Output level from deviation monitor (no de-emphasis) should not vary more than +1, -3dB. Repeat for fixed deviations of ±4kHz and ±5kHz.

v. Adjust Line O/P Level pot (Rx front panel) to give -6dBm onto SK1/1 of the Tx audio facilities pcb with ±3kHz/1kHz on RF signal generator.

vi. Remove the connection between Pin 8 of IC2 and SK2/2 (-ve) on the interface board.

8.2.1.2 Tone Decoder Alignment

The C1111 Decoder is a stand alone module which is wired directly into the TTR/LA board (3502 349 97780) as a replacement for the decoder IC (IC2).

a) Tone Decoder Programming

i. Programme the decoder to the required tone frequency by bridging the the appropriate pc board tracks with solder as shown in the table below.

NO.	FREQUENCY (Hz)	PROGRAMME INPUTS X	Y	1	2	4	8
1	C0 67.0	-	-	-	-	-	-
2	B0 71.9	-	B	-	-	-	-
3	C1 74.4	-	-	B	-	-	-
4	A0 77.0	B	B	-	-	-	-
5	C2 79.7	-	-	-	B	-	-
6	B1 82.5	-	B	B	-	-	-
7	C3 85.4	-	-	B	B	-	-
8	A1 88.5	B	B	B	-	-	-
9	C4 91.5	-	-	-	-	B	-
10	B2 94.8	-	B	-	B	-	-
11	C5 97.4	-	-	B	-	B	-
12	A2 100.0	B	B	-	B	-	-
13	B3 103.5	-	B	B	B	-	-
14	A3 107.2	B	B	B	B	-	-
15	B4 110.9	-	B	-	-	B	-
16	A4 114.8	B	B	-	-	B	-
17	B5 118.8	-	B	B	-	B	-
18	A5 123.0	B	B	B	-	B	-
19	B6 127.3	-	B	-	B	B	-
20	A6 131.8	B	B	-	B	B	-
21	B7 136.5	-	B	B	B	B	-
22	A7 141.3	B	B	B	B	B	-
23	B8 146.2	-	B	-	-	-	B
24	A8 151.4	B	B	-	-	-	B
25	B9 156.7	-	B	B	-	-	B
26	A9 162.2	B	B	B	-	-	B
27	BA 167.9	-	B	-	B	-	B
28	AA 173.8	B	B	-	B	-	B
29	BB 179.9	-	B	B	B	-	B
30	AB 186.2	B	B	B	B	-	B
31	BC 192.8	-	B	-	-	B	B
32	AC 203.5	B	B	-	-	B	B
33	BD 210.7	-	B	B	-	B	B
34	AD 218.1	B	B	B	-	B	B
35	BE 225.7	-	B	-	B	B	B
36	AE 233.6	B	B	-	B	B	B
37	BF 241.8	-	B	B	B	B	B
38	AF 250.3	B	B	B	B	B	B

"B" = Solder bridge required.

"-" = No Solder bridge required.

iii. Disconnect the 15k load on SK3/5 and connect to SK3/6 instead. Adjust R3 for maximum level. The level at SK3/6 should measure between 210mV and 280mV rms.

iv. Disconnect the 15k resistor from SK3/6 and connect a 1k8 resistor between SK3/3 and SK2/2 (-ve). Adjust R1 for maximum level. The level at SK3/3 should measure between 240mV and 370mV rms.

v. Disconnect the AF generator from SK3/7 and connect to SK3/4 instead (1kHz at 500mV). The level at SK3/3 (the 1k8 load connected) should measure between 90mV and 135mV rms.

vi. Disconnect 1k8 load and AF generator.

8.3.2.2 **High Pass Filter**

i. Connect AF generator to SK3/2.

ii. Connect rms voltmeter to SK3/1.

iii. Adjust AF generator for 3kHz and 500mV RMS output. The level at SK3/1 should measure between 450mV and 550mV rms.

iv. Using the output level at 3kHz (as in iii. above) as a reference level of 0dB, change the input frequency and check that the resulting output level varies according to the table below:-

Input Frequency at SK3/2	Output Level Specification (relative to O/P level at 3kHz)
3000Hz	0dB set as reference point
500Hz	0 to +2.5dB
300Hz	⤈ +1dB
150Hz	⤈ -11dB

v. Disconnect the AF generator from SK3/2.

8.3.2.3 **Low Pass Filter**

i. Connect the AF generator to SK2/5 and set level to 60Hz and 100mV rms.

ii. Connect rms voltmeter to pin 9 of IC1/d and check that the level measures between 400 and 500mV rms.

iii. Set the input level and frequency according to the table below and check that the measured output meets the specification listed in the table:

Input Frequency	Output Level Specification (relative to O/P level at 60Hz)
60Hz	0dB set as reference point
150Hz	⤈ -4.5dB
300Hz	⤈ -14dB

iv. Disconnect AF generator from SK2/5.

8.3.2.4 **Decode Action**

Refer to 8.2.1.2 & 8.2.1.3 for Tone Decoder Alignment details.

8.3 INTERFACE PC BOARD

8.3.1 CIRCUIT DESCRIPTION

For systems requiring tone lock operation of talk-through (T/T) it is necessary to insert the High Pass Filter Section, IC1/b and IC1/c in the speech path to attenuate the sub-audible tone received from a transmitting mobile. The High Pass Filter attenuates frequencies below 300Hz at a rate of 80dB/decade. The output of this filter section, SK3/1, is directed to the transmitter's line output and also to SK3/7 (indirectly) on the interface board. This latter signal is combined with any incoming audio received from the line (SK3/4) and the combined output at SK3/3 is fed into the exciter.

The input to the tone lock decoder, SK2/5 is connected to the unde-emphasized output of the receiver. A low pass filter, IC1/d, at the input of the decoder module, attenuates speech frequencies to prevent decoder 'drop-out'. The roll-off frequency occurs at 120Hz and attenuates at a rate of 40dB/decade.

When the decoder detects tone, its output (pin 8 of decoder module) goes low. If SK2/1 and SK2/6 are both high, or open circuit, transistor TR3 turns off. As a result, the output of IC3 pin 3 goes high and supplies transmit voltage at SK1/2 to SK1/5. Furthermore the dc output at SK1/7 is used to clamp off the line audio section. Mute voltage is normally connected to SK2/6 to inhibit the transmitter if the received signal strength is below the mute setting. Talk-through operation can be overridden by the line by connecting the line press-to-talk (PTT) input to SK2/1 on the interface board.

Once the carrier with sub audio tone disappears, the decoder resets (after a delay of several hundred mSecs) and transistor, TR3, conducts once more. However, transmit voltage remains at SK1/2 to SK1/5 for up to 13 secs. (depending on the setting of R44) since the last time TR3 was off. This delay is introduced to minimize transmitter drop-out as a result of momentary loss of carrier.

NOTE: IC1/d is biased 'off' when no RF carrier is being received to prevent the decoder responding to noise.

8.3.2 ALIGNMENT PROCEDURE

Test Equipment Required

i. Audio generator 600 ohm, 50Hz to 3kHz range at least.
ii. 12V power supply.
iii. RMS voltmeter
iv. CRO
v. 1k8 resistor
vi. 15k resistor
vii. AF frequency counter

8.3.2.1 Combining Amplifier

i. Connect an Audio generator to SK3/7 and set to 1kHz and 500mV rms output.

ii. Connect a 15k resistor between SK3/5 and SK2/2 (-ve) and adjust RV5 for maximum output. The level at SK3/5 should measure between 210mV and 280mV rms.

8.3.4 COMPONENT SCHEDULE

RESISTORS

R1	22k, 30%,Lin. Pot Preset	2120 357 01223
R2	82k, 5%,¼W, Carb.F.	2120 101 46823
R3	10k, 30%,Lin. Pot Preset	2120 357 01103
R4	15k, 5%,¼W, Carb.F.	2120 101 46153
R5	10k, 30%,Lin. Pot Preset	2120 357 01103
R6	15k, 5%,¼W, Carb.F.	2120 101 46153
R7	220k,5%,¼W, Carb.F.	2120 101 46224
R8	220k,5%,¼W, Carb.F.	2120 101 46224
R9	100k,5%,¼W, Carb.F.	2120 101 46104
R10	6k8, 5%,¼W, Carb.F.	2120 101 46682
R11	1k8, 5%,¼W, Carb.F.	2120 101 46182
R12	47k, 2%,0.4W, Metal.F.	2322 151 44703
R13	470k,5%,¼W, Carb.F.	2120 101 46474
R14	220k,2%,0.4W, Metal.F.	2322 151 42204
R15	27k, 2%,0.4W, Metal.F.	2322 151 42703
R16	820k,5%,¼W, Carb.F.	2120 101 46824
R17	390k,2%,0.5W, Metal.F.	2322 152 43904
R18	120k,2%,0.4W, Metal.F.	2322 151 41204
R19	1m5,10%,0.33W, Carb.F.	2322 211 12155
R20	150k,5%,¼W, Carb.F.	2120 101 46154
R21	100k,5%,¼W, Carb.F.	2120 101 46104
R22	560k,5%,¼W, Carb.F.	2120 101 46564
R23	22k,30%,Lin. Pot Preset	2120 357 01223
R24	15k, 5%,¼W, Carb.F.	2120 101 46153
R28	22E,5%,¼W, Carb.F.	2120 101 46229
R29	10k, 5%,¼W, Carb.F.	2120 101 46103
R31	3k3, 5%,¼W, Carb.F.	2120 101 46332
R32	22k, 5%,¼W, Carb.F.	2120 101 46223
R33	100k,5%,¼W, Carb.F.	2120 101 46104
R34	100k,5%,¼W, Carb.F.	2120 101 46104
R35	100k,5%,¼W, Carb.F.	2120 101 46104
R36	33k, 5%,¼W, Carb.F.	2120 101 46333
R37	2k7, 5%,¼W, Carb.F.	2120 101 46272
R38	10k, 5%,¼W, Carb.F.	2120 101 46103
R39	150k,5%,¼W, Carb.F.	2120 101 46154
R40	56k, 5%,¼W, Carb.F.	2120 101 46563
R41	22k, 5%,¼W, Carb.F.	2120 101 46223
R42	5k6, 5%,¼W, Carb.F.	2120 101 46562
R43	1k, 5%,¼W, Carb.F.	2120 101 46102
R44	500k,10%,1W, Pot Cermet	2113 391 00515
R45	5k6, 5%,¼W, Carb.F.	2120 101 46562
R46	10k, 5%,¼W, Carb.F.	2120 101 46103
R47	100k,5%,¼W, Carb.F.	2120 101 46104
R48	820E,5%,¼W, Carb.F.	2120 101 46821

INTEGRATED CIRCUIT

IC1	Intgrd Circt. LM3900	9332 633 30112
IC2	Intgrd Circt. NE567V	9332 391 50112
IC3	Intgrd Circt. NE555V	9332 243 90112

CAPACITORS

C1	4u7,20%,35V, Tant.	2020 004 90001
C2	1u, 20%,35V, Tant.	2020 004 90037
C3	1u, 20%,35V, Tant.	2020 004 90037
C4	15n,10%,100V,Pest.	2020 300 85153
C5	100n,20%,35V,Tant.	2020 004 90034
C6	47p,2%,,100V,Cer.Pl.	2222 680 58479
C7	100p,2%,100V,Cer.Pl.	2222 680 58101
C8	5n11,1%,63V, Psty.	2222 424 45112
C9	5n11,1%,63V, Psty.	2222 424 45112
C10	5n11,1%,63V, Psty.	2222 424 45112
C11	5n11,1%,63V, Psty.	2222 424 45112
C12	5n11,1%,63V, Psty.	2222 424 45112
C13	5n11,1%,63V, Psty.	2222 424 45112
C14	4u7,20%,35V,Tant.	2020 004 90001
C15	47n,10%,100V,Pest.	2020 300 85473
C16	18n,1%,63V, Psty.	2222 424 41803
C17	1n5,1%,125V, Psty.	2222 425 41502
C18	180p,1%,500V,Psty.	2222 427 41801
C19	1u, 20%,35V, Tant.	2020 004 90037
C22	1u, 20%,35V, Tant.	2020 004 90037
C25	10u, 20%,25V,Tant.	2020 004 90058
C27	1n,10%,100V, Cer.Pl.	2222 630 08102
C28	10n,10%,100V,Pest.	2020 300 85103
C29	22u,20%,16V, Tant.	2020 004 90041
C30	1n,10%,100V, Cer.Pl.	2222 630 08102

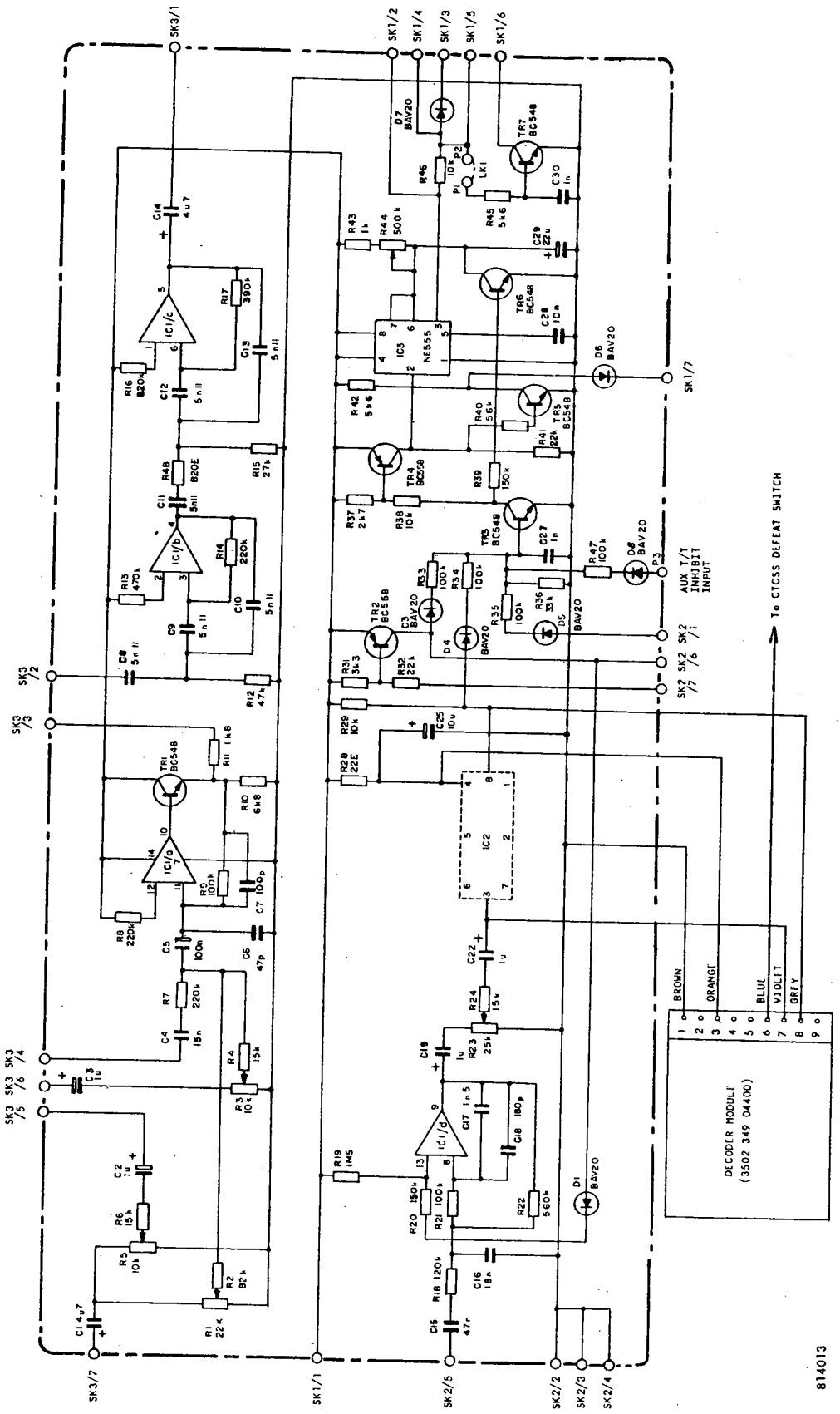
SEMICONDUCTORS

TR1	Transistor, BC548C	9331 976 70112
TR2	Transistor, BC558	9331 977 30112
TR3	Transistor, BC548C	9331 976 70112
TR4	Transistor, BC558	9331 977 30112
TR5	Transistor, BC548C	9331 976 70112
TR5	Transistor, BC548C	9331 976 70112
TR7	Transistor, BC548C	9331 976 70112
D1	Diode, BAV20	9331 892 00112
D2	Diode, BZX79-C5V1	9331 177 20112
D3	Diode, BAV20	9331 892 00112
D4	Diode, BAV20	9331 892 00112
D5	Diode, BAV20	9331 892 00112
D6	Diode, BAV20	9331 892 00112
D7	Diode, BAV20	9331 892 00112
D8	Diode, BAV20	9331 892 00112

MISCELLANEOUS

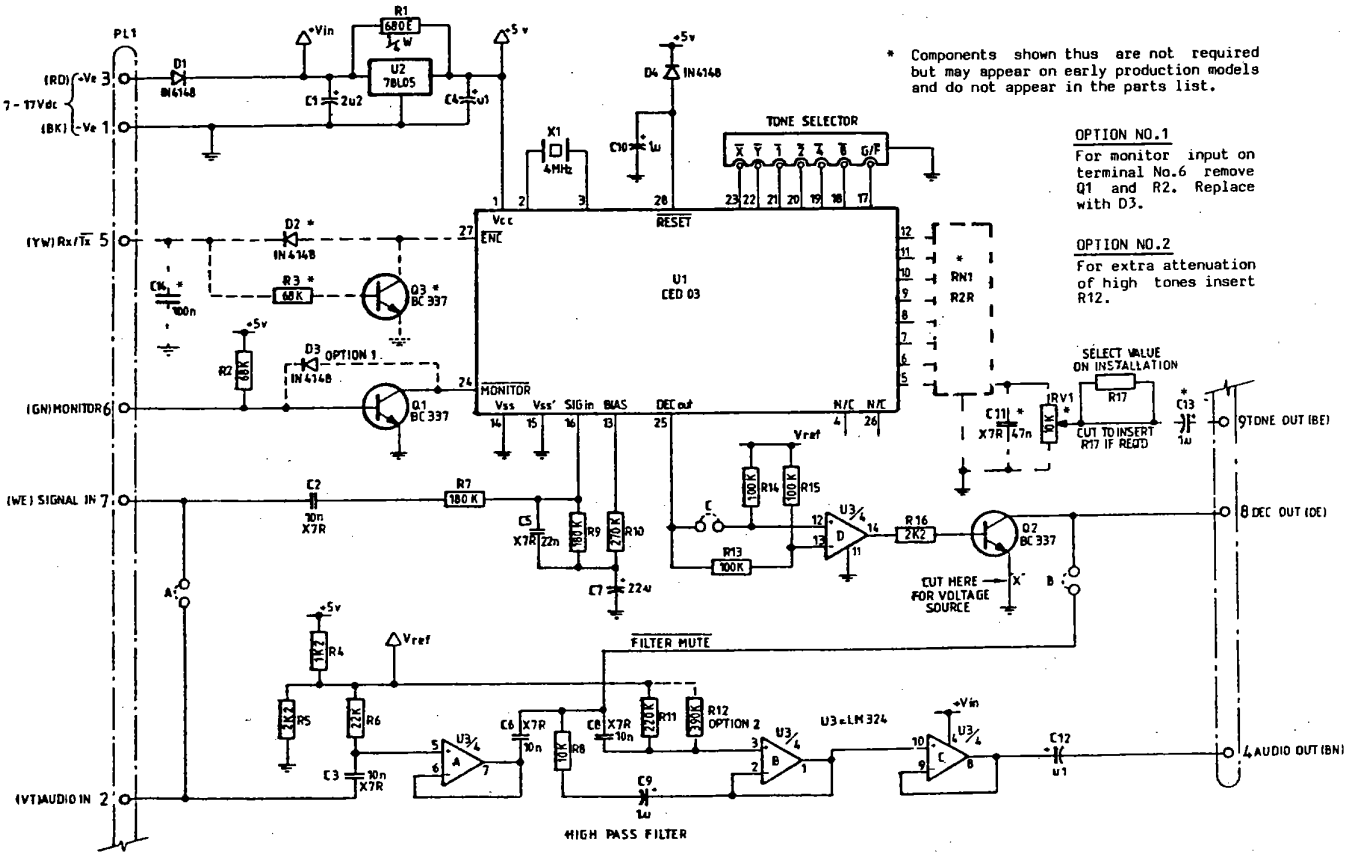
	PCB Interface 814/815	3502 309 92470

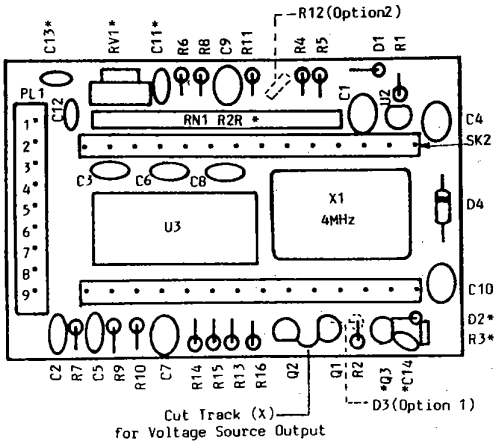
8.3.3 CIRCUIT DIAGRAM



8.4 MODULE C1111 (3502 350 04400)

8.4.1 MODULE USING CED-03 IN POSITION U1

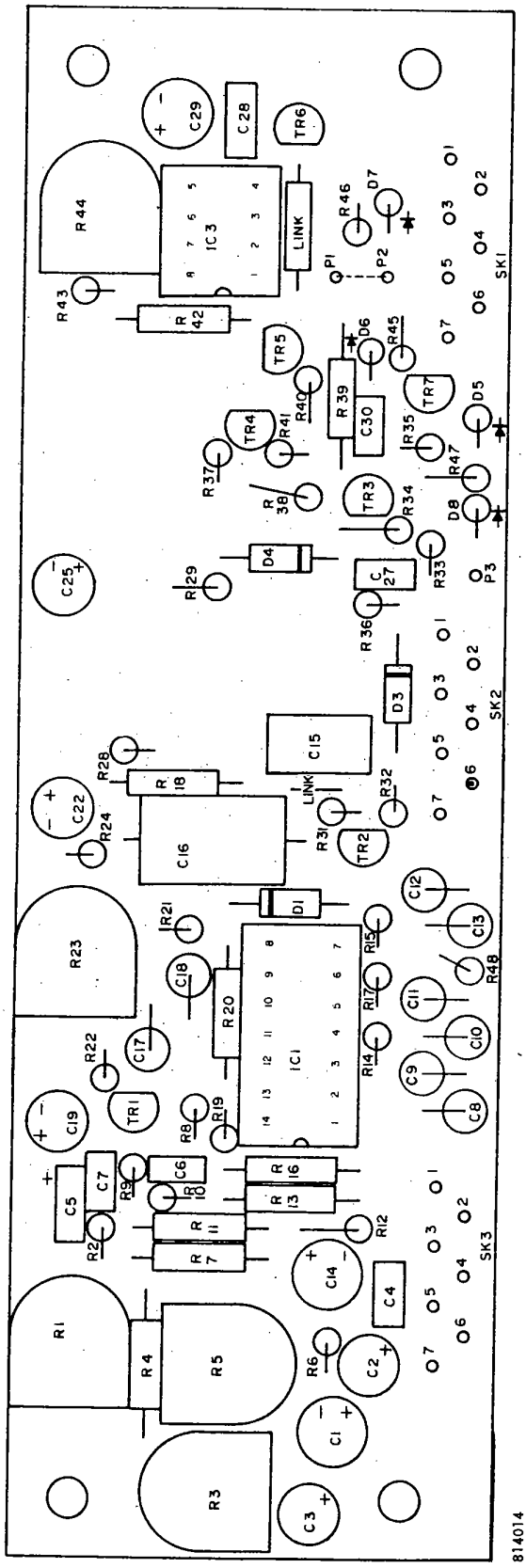




R1	Res. 680E 5% 25W Carb.F.	
R2	Res. 68k 5% 1/8W Carb.F.	
R4	Res. 1k2 5% 1/8W Carb.F.	
R5	Res. 2k2 5% 1/8W Carb.F.	
R6	Res. 22k 5% 1/8W Carb.F.	
R7	Res. 180k 5% 1/8W Carb.F.	
R8	Res. 10k 5% 1/8W Carb.F.	
R9	Res. 180k 5% 1/8W Carb.F.	
R10	Res. 270k 5% 1/8W Carb.F.	
R11	Res. 220k 5% 1/8W Carb.F.	
R12	Res. 390k 5% 1/8W Carb.F.	(Option 2)
R13	Res. 100k 5% 1/8W Carb.F.	
R14	Res. 100k 5% 1/8W Carb.F.	
R15	Res. 100k 5% 1/8W Carb.F.	
R16	Res. 2k2 5% 1/8W Carb.F.	
C1	Cap. 2u2 25V Tant.	
C2	Cap. 10n 5% Cer. X7R AVX/SR205C1030AA	
C3	Cap. 10n 5% Cer. X7R AVX/SR205C1030AA	
C4	Cap. 0u1 16V Tant.	
C5	Cap. 22n 5% Cer. X7R AVX/SR205C2230AA	
C6	Cap. 10n 5% Cer. X7R AVX/SR205C1030AA	
C7	Cap. 22u 10V Tant.	
C8	Cap. 10n 5% Cer. X7R AVX/SR205C1030AA	
C9	Cap. 1u0 16V Tant.	
C10	Cap. 1u0 16V Tant.	
C12	Cap. 0u1 16V Tant.	

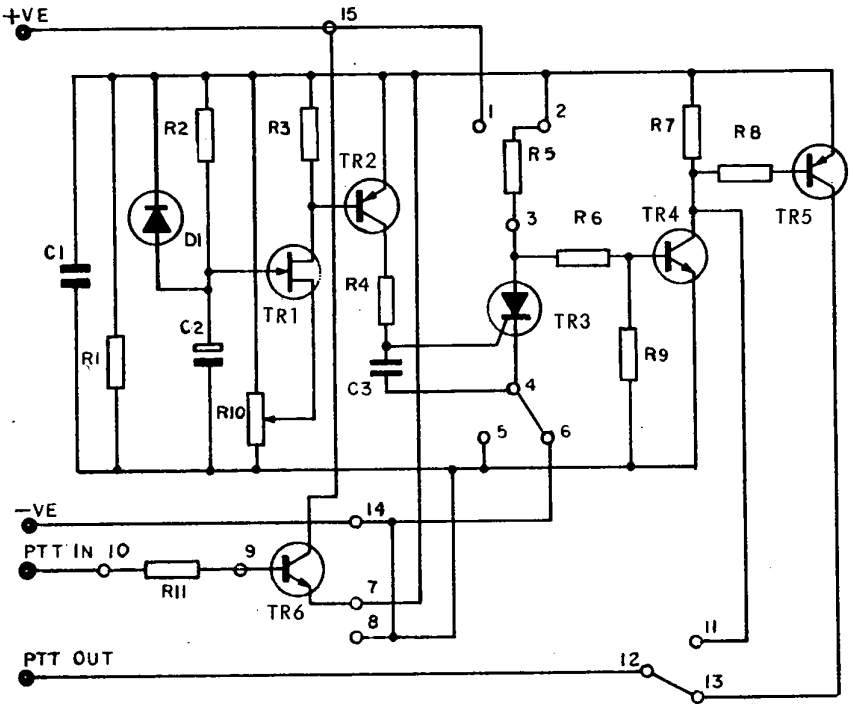
U1	Intgrd Circt. CED03	
U2	Intgrd Circt. 78L05ACZ	
U3	Intgrd Circt. LM324	
Q1	Transistor BC337	
Q2	Transistor BC337	
X1	Crystal 4MHz HC18O Qtz.	
PL1	Plug 9 Pin .1 SIL PANDUIT/HFSS100-9	
SK1	Socket 9 Pin .1 SIL PANDUIT/CE100F24-9	
D1	Diode 1N4148	
D3	Diode 1N4148	(Option 1)
D4	Diode 1N4148	

8.3.5 PC BOARD COMPONENT LOCATION



8.5 TX LIMIT TIMER PC BOARD

8.5.1 CIRCUIT DIAGRAM



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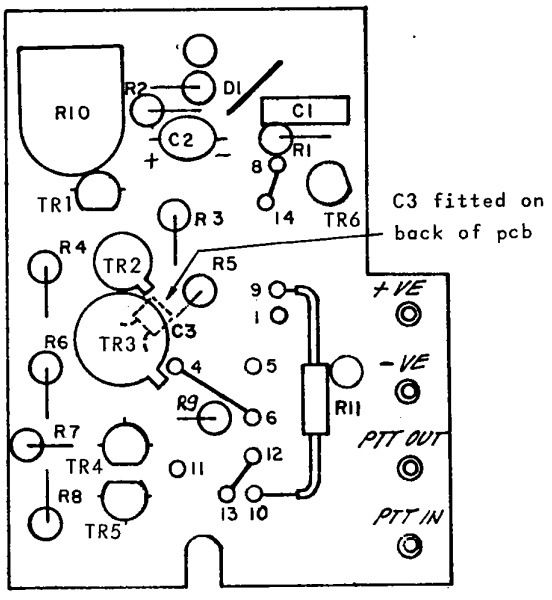
For adjustment of R10 see Section 8.2.2.

8.5.2 COMPONENT SCHEDULE & LOCATION

	PCB Tx Limit Timer	3502 300 52320
C1	10n,10%,100V, Cap Pest.	2020 300 85103
C2	15u,20%,25V, Cap Tant.	2020 004 90062
C3	100n,20%,50V, Cer.D/M	2022 552 01751
R1	1kΩ,5%,¼W, Carb.F.	2120 101 46102
R2	3m3,10%, .33W, Carb.F.	2322 211 12335
R3	1kΩ,5%,¼W, Carb.F.	2120 101 46102
R4	3k9,5%,¼W, Carb.F.	2120 101 46392
R5	1kΩ,5%,¼W, Carb.F.	2120 101 46102
R6	3k3,5%,¼W, Carb.F.	2120 101 46332
R7	10k,5%,½W, Carb.F.	2120 101 46103
R8	3k3,5%,¼W, Carb.F.	2120 101 46332
R9	3k3,5%,¼W, Carb.F.	2120 101 46332
R10	10k,30%,Lin, Pot Preset Carb.	2120 357 01103
R11	4k7,5%,¼W, Carb.F.	2120 101 46472
D1	Diode, BAV20	9331 892 00112
TR1	Transistor, 2N3819	9330 791 30112
TR2	Transistor, BC178	9330 760 20112
TR3	Transistor, BTX18-200	9330 071 00112
TR4	Transistor, BC548C	9331 976 70112
TR5	Transistor, BC558	9331 977 30112
TR6	Transistor, BC548C	9331 976 70112



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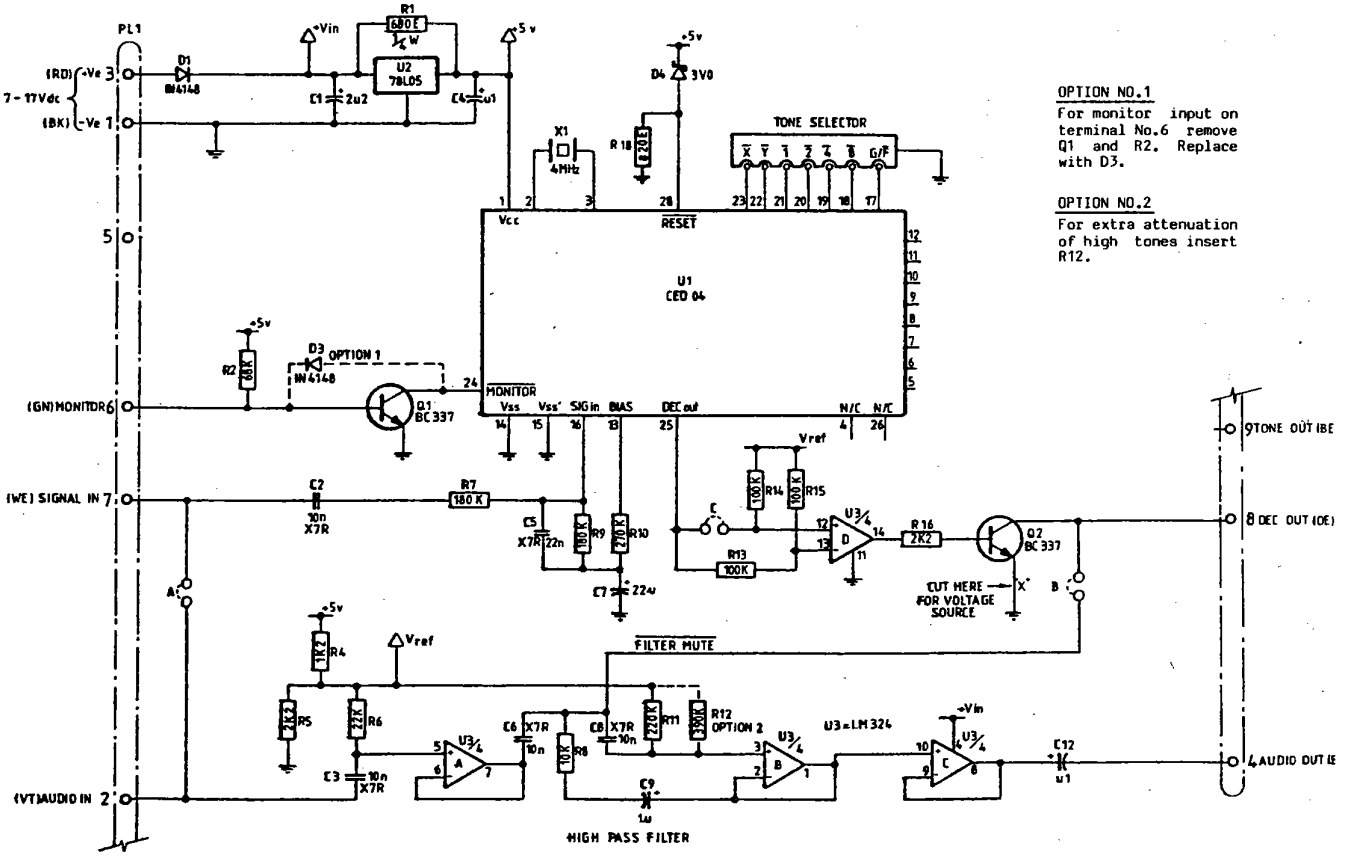
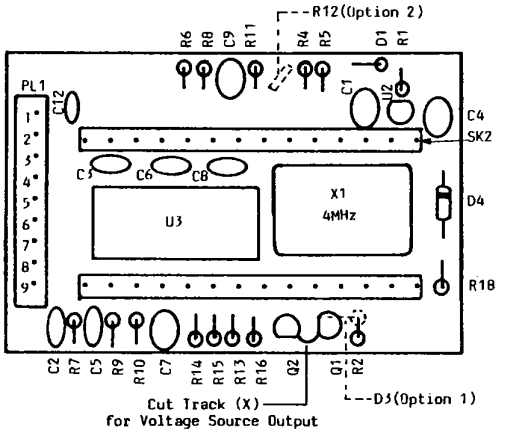
8.4.2 MODULE USING CED-04 IN POSITION U1



R1	Res. 680E 5% 25W Carb.F.
R2	Res. 68k 5% 1/8W Carb.F.
R4	Res. 1k2 5% 1/8W Carb.F.
R5	Res. 2k2 5% 1/8W Carb.F.
R6	Res. 22k 5% 1/8W Carb.F.
R7	Res. 180k 5% 1/8W Carb.F.
R8	Res. 10k 5% 1/8W Carb.F.
R9	Res. 180k 5% 1/8W Carb.F.
R10	Res. 270k 5% 1/8W Carb.F.
R11	Res. 220k 5% 1/8W Carb.F.
R12	Res. 390k 5% 1/8W Carb.F. (Option 2)
R13	Res. 100k 5% 1/8W Carb.F.
R14	Res. 100k 5% 1/8W Carb.F.
R15	Res. 100k 5% 1/8W Carb.F.
R16	Res. 2k2 5% 1/8W Carb.F.
R18	Res. 820E 5% 1/8W Carb.F.
C1	Cap. 2u2 25V Tant.
C2	Cap. 10n 5% Cer. X7R AVX/SR205C1030AA
C3	Cap. 10n 5% Cer. X7R AVX/SR205C1030AA
C4	Cap. 0u1 16V Tant.
C5	Cap. 22n 5% Cer. X7R AVX/SR205C2230AA
C6	Cap. 10n 5% Cer. X7R AVX/SR205C1030AA
C7	Cap. 22u 10V Tant.
C8	Cap. 10n 5% Cer. X7R AVX/SR205C1030AA
C9	Cap. 1u0 16V Tant.
C10	Not Used
C12	Cap. 0u1 16V Tant.



U1	Intgrd Circt. CED04
U2	Intgrd Circt. 78L05ACZ
U3	Intgrd Circt. LM324
Q1	Transistor BC337
Q2	Transistor BC337
X1	Crystal 4MHz HC18O Qtz.
PL1	Plug 9 Pin .1 SIL PANDUIT/HFSS100-9
SK1	Socket 9 Pin .1 SIL PANDUIT/CE100F24-9
D1	Diode 1N4148
D3	Diode 1N4148 (Option 1)
D4	Diode Zener BZX79C/3V0