8 Accessories

This Section provides information on T2000 Series II accessories.

The following accessories are covered in this Section:

8.1 T2008 Power Supply

The following topics are covered in this Section:

8.1.1 Operation

The T2008 Power Supply is a mains operated power supply designed to provide the DC supply requirements of the T2000 Series II radios. It uses switch mode technology to control the regulation of the output voltage, which results in a power supply with a higher temperature rating, improved efficiency and greater reliability.

The power supply can either be operated with the radio sitting on top as a desk top unit, or with the radio and power supply detached as two separate units (refer to Section 8.1.5, “Installation”).

The T2008 has protection circuits for overcurrent, overtemperature and overvoltage protection circuitry. Current limiting is included to restrict the peak current to about 9.5A. In addition, a self-restoring thermal shutdown keeps the temperature of the switching transistor within the ‘safe operation area ratings’. The point of thermal shutdown is also dependant on the load current, to allow for a higher duty cycle rating at lower output currents. The output voltage and thermal shutdown points are factory preset.

The power supply also has a limited capability to float charge a lead acid battery under constant voltage conditions (refer to Section 8.1.5, “Installation”).

8.1.2 Performance Specifications

Input

T2000-21, -23, -24:

Voltage	.. 230V ±10% (limits: 207-253V AC)
Frequency	.. 50Hz

T2000-22:

Voltage	.. 115V ±10% (limits: 105-130V AC)
Frequency	.. 60Hz

Power .. 200VA maximum
(mains input +10%, current limited output)

Mains Supply Plug:

T2008-21	.. New Zealand
T2008-22	.. USA
T2008-23	.. UK
T2008-24	.. European

Output

Voltage .. 13.8V DC (adjustable 12.5 to 14.5V)

Current:

Intermittent Operation (T_A = 25°C, input 230V)	.. 6.5A at 33% duty cycle (maximum 2 minutes on)
Peak Rating	.. 8A max. (duration limited by thermal shutdown)
Continuous Rating (T_A = 25°C, input 230V)	.. 4.5A maximum

Voltage Regulation .. ±5%
(supply variation ±10%, currents up to 6A, temp. range -10°C to +60°C)

Protection

Current Limiting (T_A = 25°C) .. 9.5A nominal
(10A secondary fuse available)

Overvoltage .. 16V ±5% by zener transient suppression diode (not self-restoring)

Thermal Overload .. shutdown occurs at approximately 95°C heatsink temperature (7A continuous after 1 hour)
('cold' start @ 25°C, input = 115/230V)

Input:

Primary Fuse:		
T2008-21, -23, -24	..	1A time delayed
T2008-22	..	3A
Thermal Cutout	..	integral with transformer

General

Ripple and Noise 0 to 6.0A, mains voltage ±10%	..	less than 10mVrms
Operating Temperature Range	..	-10°C to +40°C
Weight	..	3.0kg

Dimensions:

Height	..	95mm
Length	..	225mm
Width	..	150mm

8.1.3 Precautions

Caution: Lethal Voltages

The power supply contains voltages that may be lethal. The unit should not be dismantled without first disconnecting the mains supply. Servicing should be carried out only by qualified technicians.

Caution: Ventilation

If the power supply is operated at high output currents and/or a high duty cycle rate for a prolonged period of time (e.g. more than 10 minutes), the heatsink will become very hot. **Do not touch.**

Do not operate the power supply in a sealed cabinet. Ensure that there is an adequate airflow past the unit, and in particular past the heatsink at the back of the unit.

Caution: Mains Supply Cord

If the mains supply cord needs replacing, it must be replaced with a mains supply cord of the same size and type as originally fitted.

Caution: Transmit Power

When using a T2008 and radio at a fixed location, it is advisable to check the maximum allowable transmit power, as defined by the local radio regulatory authority. This is commonly in the range of 1 to 5W, and exceeding this output power may result in prosecution.

Caution: Current Rating

If the duty cycle (33%) of the radio and power supply is likely to be exceeded, then the radio output power must be reduced to ensure that the current drawn from the power supply does not exceed its rating.

It is advisable to check the current drawn from the power supply, regardless of duty cycle, if the radio is operated at full power (25W). Variations in antenna VSWR can result in current drain, which may exceed the rating of the supply.

8.1.4 Circuit Operation

Refer to the diagram to the rear of this Section.

Input Rectifier

The mains supply is connected to the primary of the transformer via the supply cord, input fuse and on/off switch.

A conventional bridge rectifier is used across the secondary winding of the transformer, with both positive and negative leads being isolated from earth. Five PCB mounted smoothing capacitors are used to produce a 23V DC bus from the 18Vrms secondary of the transformer. The ripple on the DC bus is 4V peak to peak, with an output current of 6A.

The front panel LED is illuminated when mains power is applied.

Transistor Switch

Voltage regulation is provided by the complementary Darlington configuration of Q1 and Q2. The switching of this pair is derived directly from IC1 (TL494).

When Q1 is turned on, current flows in inductors L1, L2 and L3 to supply the output. Capacitors C6 and C7 hold the output voltage at a nominal 13.8V. When Q1 turns off, the current flowing in the inductors continues to flow, via diode D1.

C8, C9 and L3 form a common mode filter to suppress conducted noise at the output.

Control Circuit

A pulse width modulating IC (IC1) controls the switching of Q1 and thus the regulation of the output voltage. A voltage divider (R4, R5 and RV1) converts the output voltage to a 5V nominal level. It is then compared to IC1s temperature compensated internal 5V reference. The length of time Q1 is turned on is proportional to the difference between the reference and the output voltage. Feedback compensation is provided by C10, C11, R6 and R7, while R10 improves the transient response for the feedback circuit.

Current Limiting

Current limiting is provided by monitoring the voltage across the current sense resistor (R18). When the current is increased to approximately 9.5A, the voltage on pin 15 of IC1 decreases to a point where the pulse width of the switching waveform decreases. In addition, a 10A fuse is provided in the secondary circuit of the power supply.

Over Voltage

Overvoltage protection is provided by diode D2 and fuse F2. D2 is a 16V zener transient suppression diode that reacts instantly to overvoltage DC or spikes. If an overvoltage condition persists, causing excessive power dissipation in D2, it will become short circuit, causing F2 to blow. F2 will need to be replaced before operation of the power supply is possible. D2 will need to be replaced to restore overvoltage protection.

Thermal Shutdown

Transistor Q3 is mounted on the heatsink and its junction temperature therefore closely follows that of both the heatsink and Q1. Q3 is biased by R12 and RV2. As the temperature of the heatsink increases, the temperature of the base- emitter junction of Q3 also increases, which results in the V_{be} of Q3 decreasing. At 95°C, the base-emitter voltage is exceeded by the biasing voltage, and Q3 switches on. As a result, Q4 turns off, and the 'deadtime pin' (pin 4 of IC1) is pulled high. The 'deadtime' is now 100%, which means Q1 is completely turned off.

8.1.5 Installation

The T2008 power supply is designed to provide the DC supply requirements of the Tait T2000 two way radios. It can be operated either with the radio sitting on top as a desk top unit, or with the radio and power supply detached as two separate units. The bottom case includes two screw recesses for wall mounting. The two way radio then can be mounted in its cradle next to the supply, or operated away from it, e.g. on a desk top, etc.

If the radio and the power supply are operated away from each other, an extension cable for the DC supply would have to be used. To keep the voltage drop of this extension cable reasonably low, the wiring should be of sufficient gauge to carry the required load. It is recommended that a minimum wire size of 1.5mm is used.

The power supply requires a mains supply of 230V nominal 50Hz or 115V nominal 60Hz, as set out in Section 8.1.2.

If the power supply is run at a high duty cycle rate, high continuous output currents and/or high mains input voltage, it will generate a considerable amount of heat. An adequate flow of cooling air past the unit, particularly past the heatsink, is therefore essential for reliable operation. Do not operate the power supply in a completely enclosed cabinet.

Caution: **Do not touch the heatsink after prolonged heavy duty operation. Keep the heatsink away from anything affected by heat (plastics, etc).**

The microphone clip supplied with every power supply may be attached to the side of the top cover with the supplied screws and spacer, which fits between the clip and cover. The hook switch monitor wire should be connected as shown in the wiring diagram.

Float Charging A Lead Acid Battery

The power supply has a limited capability to float charge a lead acid battery under constant voltage conditions. The performance is limited by the way the power supply's continuous output current rating is limited (typically 4.5A at 20°C).

The following diagram shows an external protection circuit, consisting of two diodes with the appropriate ratings (i.e. 10A/50V), to be used when float charging a lead acid battery. This circuit prevents damage to the power supply due to reverse current, or the battery being connected with reverse polarity.

The current limit prevents charging from being excessive, should a discharged battery be connected. The output voltage of the power supply does not compensate for the temperature dependence of lead acid batteries.

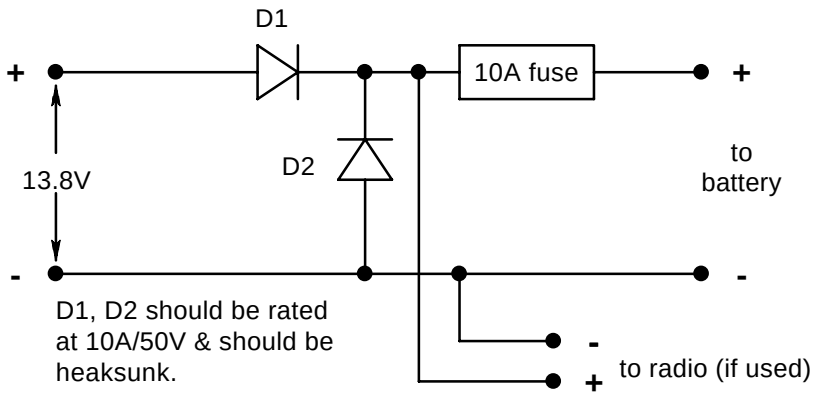


Figure 8.1.1 Float Charging Protection Circuit

8.1.6 Introduction To Servicing

All sub-assemblies within the T2008 power supply (e.g. transformer, PCB/heatsink) are housed in a specially moulded plastic case with no screws. The top and bottom halves of the plastic case are fastened by four self-tapping screws.

All electrical components except the transformer and LED are mounted on either the larger regulator/heatsink PCB or on the smaller mains input PCB.Disassembly

Caution: **Disconnect the unit from the mains supply before attempting to remove the top case.**

⚠ Caution: Lethal Voltages

The power supply contains voltages that may be lethal. The unit should not be dismantled without first disconnecting the mains supply. Servicing should be carried out only by qualified technicians.

⚠ Caution: Ventilation

If the power supply is operated at high output currents and/or a high duty cycle rate for a prolonged period of time (e.g. more than 10 minutes), the heatsink will become very hot. **Do not touch.**

Do not operate the power supply in a sealed cabinet. Ensure that there is an adequate airflow past the unit and in particular past the heatsink at the back of the unit.

⚠ Caution: Mains Supply Cord

If the mains supply cord needs replacing, it must be replaced with a mains supply cord of the same size and type as originally fitted.

To Remove The Top Case

Turn the unit upside down and remove the two self-tapping screws.

Turn the unit back on its feet and remove the two top screws.

Carefully lift the top case away from the unit.

All the sub-assemblies are now easily accessible, and can be lifted out as necessary.

To Replace the Switching Transistor (Q1)

Unsolder the leads of the transistor using solder wick or a solder sucker.

Remove the appropriate screws and carefully lift off the transistor.

Mount the new transistor using a silicon insulating gasket on the underside. Do not use any other insulators (mica, etc) as they are unlikely to fit under Q1 and/or would require thermal compound.

Refit the two screws for Q1 from the copper side of the PCB. Isolate each of these two mounting screws from touching the heatsink with a 3mm length of silicone rubber sleeving. Use spring washers under the two nuts.

Carefully position the PCB onto the heatsink before tightening the two screws/nuts.

Ensure that Q3 sits firmly against the walls in its slot on the heatsink.

Resolder the leads of the transistor.

Reassembly

Reassembly is carried out in the reverse order to disassembly.

8.1.7 Setting Up The Power Supply

Test Equipment Required

- Ammeter: 10A DC
- Voltmeter: 0 - 20V DC
- Load Resistor: 0 - 100Ω, 10A (variable)
- Short circuit plug-in link: IPN 240-04020-62
- Ohmmeter: infinity to 0Ω

Preliminary

Refer to the T2008 circuit and wiring diagrams to the rear of this Section.

Check with the ohmmeter that the heatsink is electrically isolated from the negative output.

Connect the variable load in series with the ammeter across the output terminals (see wiring diagram for the pin configuration of the output plug).

Set the load to maximum resistance (minimum load current).

Connect the DC voltmeter across the power supply output terminals.

The DC output wiring should be of sufficient gauge to carry the load current required. It is recommended that a minimum wire size of 1.5mm is used.

Plug in the mains connector.

Output Voltage

Switch on the power supply.

Set RV1 for an output voltage of 13.8V.

Switch off the power supply.

Thermal Shutdown (TSD)

Before setting up the temperature shutdown, ensure that the power supply is at ambient temperature, i.e. it has not been running recently with any significant load current. The temperature shutdown is based on a heatsink ambient temperature of 25°C.

Disconnect the load resistor.

Insert the plug-in link (1 - 2).

Switch on the power supply.

Set RV2 (TSD) so that the power supply just shuts down.

Switch off the power supply.

Remove the plug-in link.

Output Current Limit

Reconnect the load resistor.

Switch on the power supply.

Decrease the load resistance (current rises) and set it for an output current of approximately 9.5A.

Decrease the load resistance and the voltage output should drop, indicating that current limiting is in progress.

If the power supply is very hot, the current limit circuit may cause the unit to switch off completely. If this occurs, switch off the mains supply and wait approximately one minute. The power supply should now operate normally.

8.1.8 Fault Finding

The checks listed below have been included to provide assistance in locating faults. It is sometimes convenient to disable a complete section of the power supply in order to isolate a fault. If individual sections are isolated the rest of the unit should operate normally (refer to Figure 8.1.2, "Typical Waveforms" for details).

Component Checks

Faulty diodes and transistors can generally be found by a simple ohmmeter check, as follows (an AVO model 8 or equivalent meter should be used for taking the measurements, using only the medium or low resistance ranges):

Set the ohmmeter to the ohms x 1 range.

Measure the forward and reverse resistance of each junction. The resistance in one direction should be low (generally 30 to 100Ω), and the resistance in the other direction should be high. In a faulty transistor or diode, the junctions will usually be either short or open circuited.

Note: Other components in the circuit may affect these readings unless the junctions are isolated.

The collector current drawn by multijunction transistors is a further guide to their operating performance.

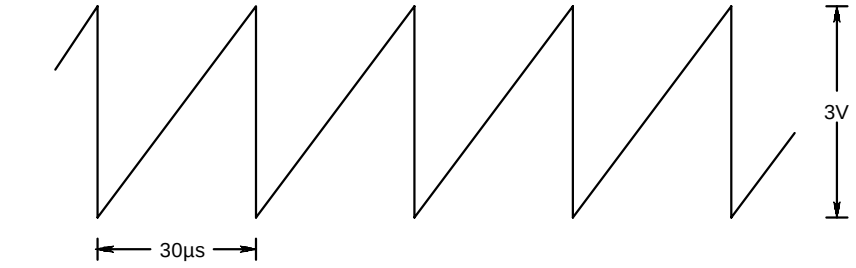
Typical Voltages

The following table shows voltages under normal operating conditions, and those following thermal shutdown:

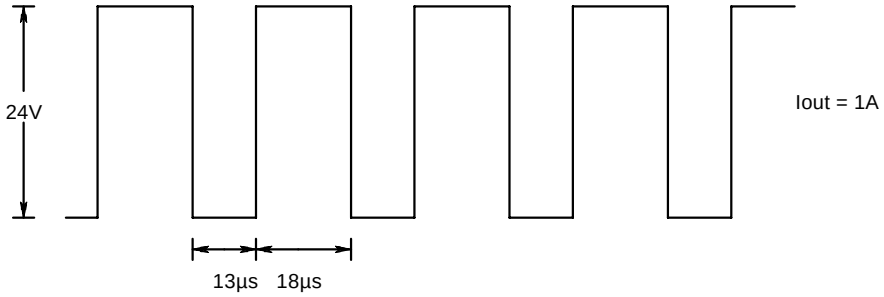
	Normal Operation (V)	**Thermal Shutdown Operating (V)**
output voltage	13.8	0
Q3 base-emitter voltage	0.2 approx.	0.7 approx.
Q4 base-emitter voltage	0.7 approx.	0 approx.
IC1 pin 4 voltage	0	5
IC1 pin 14 (voltage reference)	5	5

Typical Waveforms

The following waveforms can be expected under the stated conditions.



Pin 5 (oscillator - all conditions of current (0A - full current).



Pin11 (feed to switching transistors).
If Iout = 0A (i.e. open circuit), no switching occurs & pin 11 is at 25V DC.

Figure 8.1.2 Typical Waveforms

8.1.9 Repair

The T2008 power supply requires specialised component replacement techniques. Before attempting repair, refer to Section 3.4, “Repair”.

8.1.10 PCB Information

T2008 Parts List (IPN 220-01170-03)

Ref	VAR	IPN	Description
CBR		017-15470-01	CAP CER SURFACE BARRIER 47N 20% 50
C1		020-19220-03	CAP ELECT RADL 2200M 35V 16X31MM
C2		020-19220-03	CAP ELECT RADL 2200M 35V 16X31MM
C3		020-19220-03	CAP ELECT RADL 2200M 35V 16X31MM
C4		020-19220-03	CAP ELECT RADL 2200M 35V 16X31MM
C5		020-19220-03	CAP ELECT RADL 2200M 35V 16X31MM
C6		020-19220-03	CAP ELECT RADL 2200M 35V 16X31MM
C7		020-09470-02	CAP ELECT RADL 470M 16V 10X20MM
C8		017-15470-01	CAP CER SURFACE BARRIER 47N 20% 50
C9		051-00006-06	WIRE LINK T/C
C10		022-05150-01	CAP MYLAR 15N 10% 50V
C11		022-04220-01	CAP MYLAR 2N2 10% 50V
C14		022-05100-01	CAP MYLAR 10N 10% 50V
D1		001-00011-50	(S) DIODE MUR810 8A 100V FAST RECOV
D2		001-00012-91	(S) DIODE 16V TRANSIENT SUPPRESSOR
F1	21	265-00010-45	FUSE 1A CARTRIDGE 6*32MM SLOBLOW
F1	22	265-00010-05	FUSE 3A CARTRIDGE 6*32MM BS4265
F1	23	265-00010-45	FUSE 1A CARTRIDGE 6*32MM SLOBLOW
F1	24	265-00010-45	FUSE 1A CARTRIDGE 6*32MM SLOBLOW
F2		265-00010-07	FUSE 10A CARTRIDGE 6*32MM BS4265
IC1		002-00016-63	(S) IC TL494/594 SMPS PWM CTRL
LED1		008-00012-52	(S) LED 2MM TOWER 5MM BASE RED
L1		056-00010-47	IND FXD 125UH PWR CHOKE TOROIDAL
L2		056-00010-20	IND FXD 25UH PWR CHOKE
PL1		240-00020-68	HEADER 2WAY PCB MTG STD
Q1		000-00022-07	(S) XSTR 2N3772 NPN PWR TO-204
Q2		000-00012-15	(S) XSTR BD234 PNP AF PWR TO126
Q3		000-00011-10	(S) XSTR BC548B/BC547B NPN AF SML SI
Q4		000-00011-10	(S) XSTR BC548B/BC547B NPN AF SML SI
R1		030-53120-20	RES FILM AI 120E 5% 0.4W 4X1.6MM
RV1		042-03470-01	RES PRESET 470E CARBON 10MM FLAT
RB1		001-00011-37	(S) DIODE BRIDGE RECT 50V/25AMP
RV2		042-03470-01	RES PRESET 470E CARBON 10MM FLAT
R2		033-03330-00	RES MP816 PWR FILM 330E 10% 16W TO-2
R3		030-52330-20	RES FILM AI 33E 5% 0.4W 4X1.6MM
R4		030-54680-20	RES FILM AI 6K8 5% 0.4W 4X1.6MM
R5		030-54390-20	RES FILM AI 3K9 5% 0.4W 4X1.6MM
R6		030-54180-20	RES FILM AI 1K8 5% 0.4W 4X1.6MM
R7		030-55100-20	RES FILM AI 10K 5% 0.4W 4X1.6MM
R8		030-54470-20	RES FILM AI 4K7 5% 0.4W 4X1.6MM
R9		030-53120-20	RES FILM AI 120E 5% 0.4W 4X1.6MM
R10		030-55680-20	RES FILM AI 68K 5% 0.4W 4X1.6MM
R11		030-55100-20	RES FILM AI 10K 5% 0.4W 4X1.6MM
R12		030-54330-20	RES FILM AI 3K3 5% 0.4W 4X1.6MM
R13		030-54390-20	RES FILM AI 3K9 5% 0.4W 4X1.6MM
R14		030-55220-20	RES FILM AI 22K 5% 0.4W 4X1.6MM
R15		030-54330-20	RES FILM AI 3K3 5% 0.4W 4X1.6MM
R16		030-53470-20	RES FILM AI 470E 5% 0.4W 4X1.6MM
R17		030-53470-20	RES FILM AI 470E 5% 0.4W 4X1.6MM
R18		039-10018-63	RES WIRE WOUND 0.017E A4M1863 T508
R20		030-56220-20	RES FILM AI 220K 5% 0.4W 4X1.6MM
R21		030-53100-20	RES FILM AI 100E 5% 0.4W 4X1.6MM
SW1		232-00010-21	SWITCH PUSH SPST MAINS ON/OFF
*T1	21	053-00010-53	XFMR T4063A 230V MAINS PROTECTED
*T1	22	053-00010-51	XFMR T4065 115V MAINS T508
*T1	23	053-00010-53	XFMR T4063A 230V MAINS PROTECTED
*T1	24	053-00010-53	XFMR T4063A 230V MAINS PROTECTED

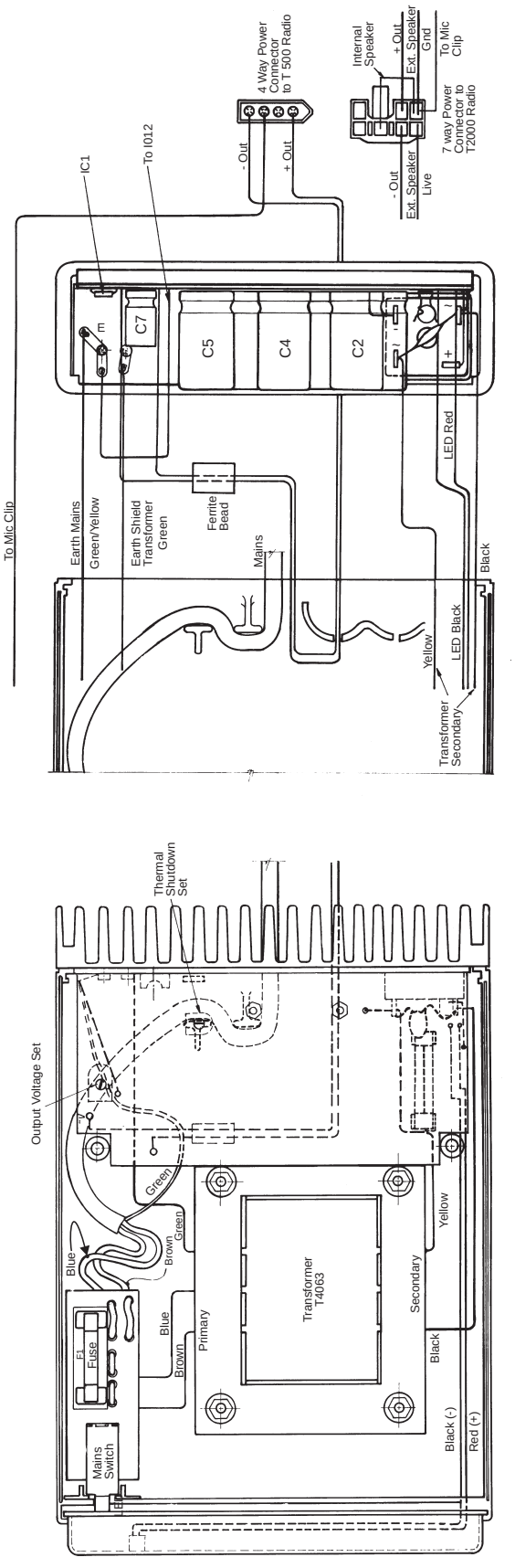
T2008 Mechanical & Miscellaneous Parts

IPN	Description
065-00010-20	BEAD FERRITE BALUN 4B1 PHILIPS
200-00010-03	WIRE T/C 0.9MM
201-00030-02	WIRE #1 T/C WIRE 7/0.2MM PVC RED LED WIRING-330MM
201-00030-04	WIRE #1 T/C WIRE 7/0.2MM PVC YELLOW INTERNAL SPEAKER LINK (REFER TO WIRING DIAG.)
201-00030-05	WIRE #1 T/C WIRE 7/0.2MM PVC GREEN C8 & C9 WIRING TO HEATSINK
201-00030-10	WIRE #1 T/C WIRE 7/0.2MM PVC BLACK
201-00030-10	WIRE #1 T/C WIRE 7/0.2MM PVC BLACK
	LED WIRING - 330MM, MIC CLIP - 300MM.
205-00010-03	CABLE TWIN CYCLE FLEX 2/7/0.2MM BLACK
205-00010-06	CABLE TWIN AUTO 153 2/28/0.3 RED & BLACK
220-01170-03	PCB T508-21
232-00010-21	SWITCH PUSH SPST MAINS ON/OFF
240-00026-19	PLUG HOUSING 7-POS CONN 172495-1
240-00026-20	PLUG RECEPTL 7-POS CONN 172773-1
240-02010-75	SKT RECEPTL T2000 172775-1
240-04021-63	CONN 2WAY 24AWG (BLACK) INLINE HRMAPHR.
252-00010-02	CLIP MIC MTG
265-00010-07	FUSE 10A CARTRIDGE 6*32MM BS4265
302-05220-00	(L) BRKT HEAT TRANSFER T508/T2008
303-03031-00	CASE 1 PR TOP/BTTM PLASTIC COMPL
308-13064-01	HSINK A1M1755 DCAST T508/2008
316-06442-00	PNL FRT A3A697 COMPL T2008 PWR SUPPLY
319-30055-00	SPACER A4M2615 MIC MTG T2008
340-00010-06	FUSE CLIP PCB MTG 6.3MM CARTRIDGE FUSE
340-00011-52	COVER INSULATING FUSEHLDR PCB MTD
345-00040-08	SCREW M3*12MM PAN POZI ST BZ Q1 MOUNTING AND PCB TO HEATSINK
349-00010-28	SCREW NO6X1/2 PAN POZI TYPE 25
349-00010-33	SCREW SLFTAP NO 6*3/4IN TYPE AB PAN PZI BZ FOR WALL MOUNTING
349-00010-40	SCREW SELFTAP NO 8X3/8IN AB PAN SLOT BZ
349-00010-40	SCREW SELFTAP NO 8X3/8IN AB PAN SLOT BZ
349-00020-30	SCREW TAPTITE M3X6MM PAN PZI BZ EARTH PCB TO HEATSINK MOUNTING X 2
349-00020-31	SCREW TAPTITE M3X10MM PAN POZI BZ
349-00020-45	SCREW TAPTITE M4X20MM PAN POZI BZ BRIDGE RECTIFIER MOUNTING
352-00010-08	NUT M3 COLD FORM HEX ST BZ Q1 MOUNTING
353-00010-10	WASHER M3 FLAT 7MM*0.6MM ST BZ
353-00010-12	WASHER M3 SPRING BZ Q1 MOUNTING
353-00010-24	WASHER M4 FLAT ST BZ A4M1957
353-00010-24	WASHER M4 FLAT ST BZ A4M1957 BRIDGE RECTIFIER MOUNTING
356-00010-04	TAG SOLDER 3MM HEAVY DUTY EARTH MAINS EARTH TAG TO HEATSINK
356-00010-05	TAG SOLDER 4MM LONG M6144/4.2
362-00010-09	GASKET SIL INSULATING TO-3 Q1
365-00011-54	LABEL WHITE RW1556/2 90*24MM SPECIAL ADHESV
365-00100-03	LABEL BLANK 10.8X30MM S/A METLSD POLYES
365-00100-04	LABEL BLANK 30X6.7MM S/A METALLISED POLYES
365-00100-07	LABEL BLANK 47X30MM S/A METLSD POLYES
365-00100-20	LABEL WHITE S/A 28X11MM QUIKSTIK RW718/4
365-01372-00	LABEL POWER CORD CODE/WARNING
369-00010-05	FOOT PLASTIC 10MM SQ SELF ADHESIVE BLACK
369-00010-14	TIE CABLE NYLON 100*2.6MM
369-00020-25	SPONGE RUBBER 3/8 INCH SQ SKELLERUP S3 TOP CASE 2 X 56MM
369-00020-45	TAPE AL FOIL S/A 3M NO 425
399-00010-10	RUBBER BAND NO 33 MAINS PLUG
399-00010-51	BAG PLASTIC 75*100MM
399-00010-59	BAG PLASTIC 225*300MM
400-00010-30	SLEEVING 3MM PVC 2X 3.5MM
400-00010-30	SLEEVING 3MM PVC
	2X5MM OVER M3X12MM PAN POZI SCREWS.
400-00020-03	SLEEVING 1MM SIL RUBBER D1 WIRING
400-00020-05	SLEEVING 1.5MM SIL RUBBER LED WIRES, Q1
409-20008-01	USER GUIDE T2008 PWR SUPPLY
410-00010-36	PKG POLY FOAM 2 PCS T508 A1M1860
410-01038-01	PKG SLEEVE CARD T2008 KIWI P.O.
410-01087-00	CRTN T508/T2008PS OUTER (5 X UNITS)
T2008-21 VARIANT PARTS	
240-00010-18	PLUG 3 PIN MLDED ON 2.4M 0.75MM2 230V MAINS NEW ZEALAND MAINS SUPPLY PLUG (T2008-21)
T2008-22 VARIANT PARTS	
240-00010-19	PLUG US 3PIN MOULDED ON 2.4M FLEX 120V 10A USA MAINS SUPPLY PLUG (T2008-22)
T2008-23 VARIANT PARTS	
240-00010-22	PLUG MLDED 3PIN ON 2.0M 5AMP 240V MAINS UK MAINS SUPPLY PLUG (T2008-23)
T2008-24 VARIANT PARTS	
240-00010-20	(L) PLUG EURO SAFETY PLUG WITH 2.5M CABLE EUROPEAN MAINS SUPPLY PLUG (T2008-24)

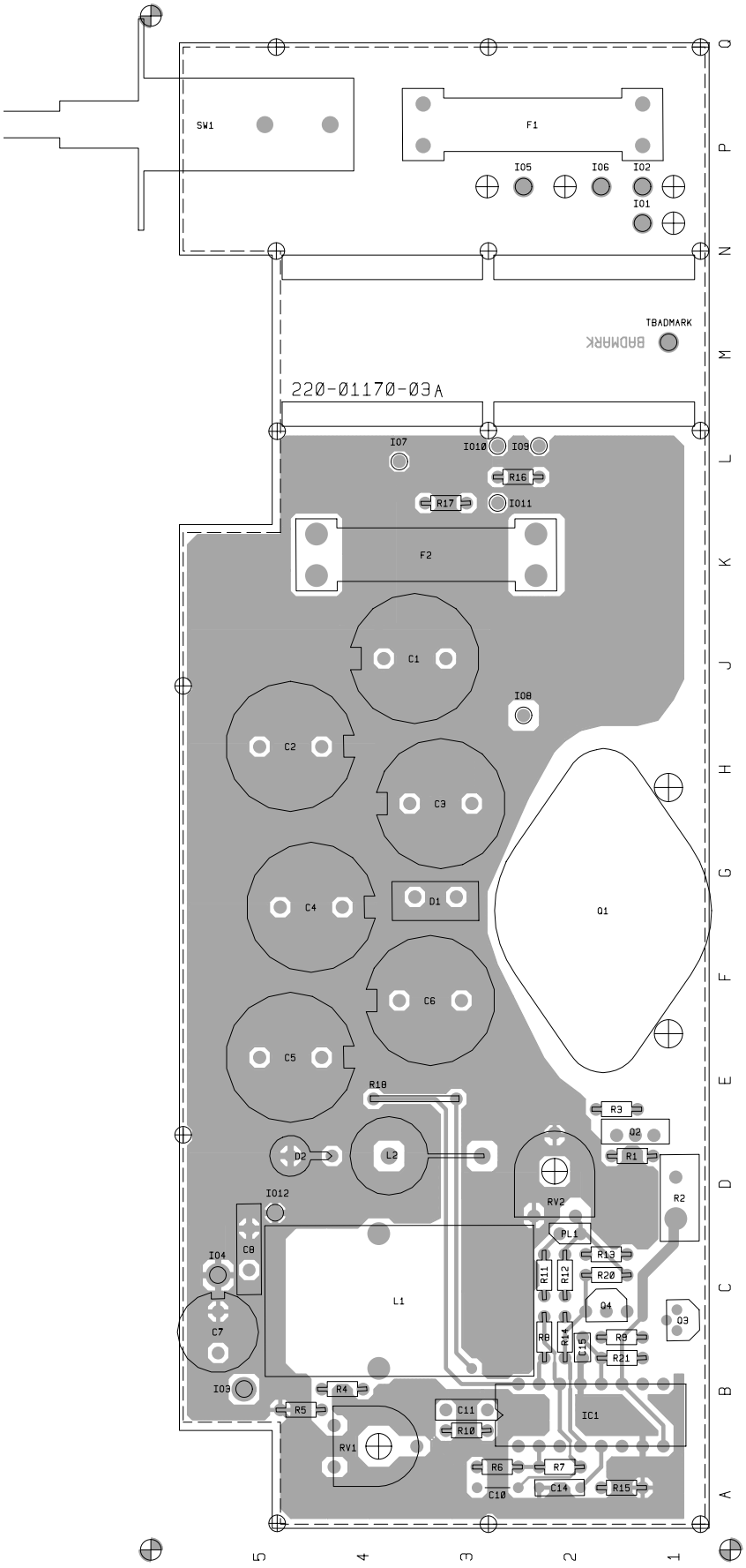
T2008 Grid Reference Index (IPN 220-01170-03)

Device	PCB	Circuit
C1	1:J4	1-E7
C2	1:H5	1-E7
C3	1:H3	1-F7
C4	1:G5	1-F7
C5	1:E5	1-F7
C6	1:F3	1-J7
C7	1:C5	1-K7
C8	1:C5	1-L7
C10	1:A3	1-E4
C11	1:B3	1-F3
C14	1:A2	1-G1
C15	1:C2	1-G4
D1	1:G3	1-J7
D2	1:D5	1-K6
F1	1:P1	1-B7
F2	1:K5	1-G7
IC1	1:B3	1-G2
IO1	1:N1	1-A7
IO2	1:P1	1-A7
IO3	1:B5	1-L7
IO4	1:C5	1-L6
IO5	1:P3	1-B8
IO6	1:P2	1-B6
IO7	1:L4	1-D8
IO8	1:J3	1-D6
IO9	1:L2	1-D6
IO10	1:L3	1-D5
IO11	1:L3	1-D5
IO12	1:D5	1-L7
LED1		1-C5
L1	1:B4	1-J7
L2	1:D4	1-K7
PL1	1:D2	1-D2
		1-D1
		1-D0
Q1	1:G2	1-H7
Q2	1:E2	1-H7
Q3	1:C1	1-E1
Q4	1:C2	1-F2
RB1		1-D7
R1	1:D1	1-H7
RV1	1:B4	1-J6
RV2	1:D2	1-E1
R2	1:D1	1-H5
R3	1:E2	1-H7
R4	1:B4	1-J7
R5	1:B4	1-J6
R6	1:A3	1-E4
R7	1:A2	1-E3
R8	1:C2	1-E3
R9	1:C2	1-F2
R10	1:B3	1-F3
R11	1:C2	1-E2
R12	1:C2	1-E2
R13	1:C2	1-E2
R14	1:C2	1-F2
R15	1:A2	1-G1
R16	1:L3	1-D6
R17	1:L3	1-D5
R18	1:E4	1-J6
R20	1:C2	1-F1
R21	1:B1	1-G4
SW1	1:P5	1-A7
*T1		1-B7

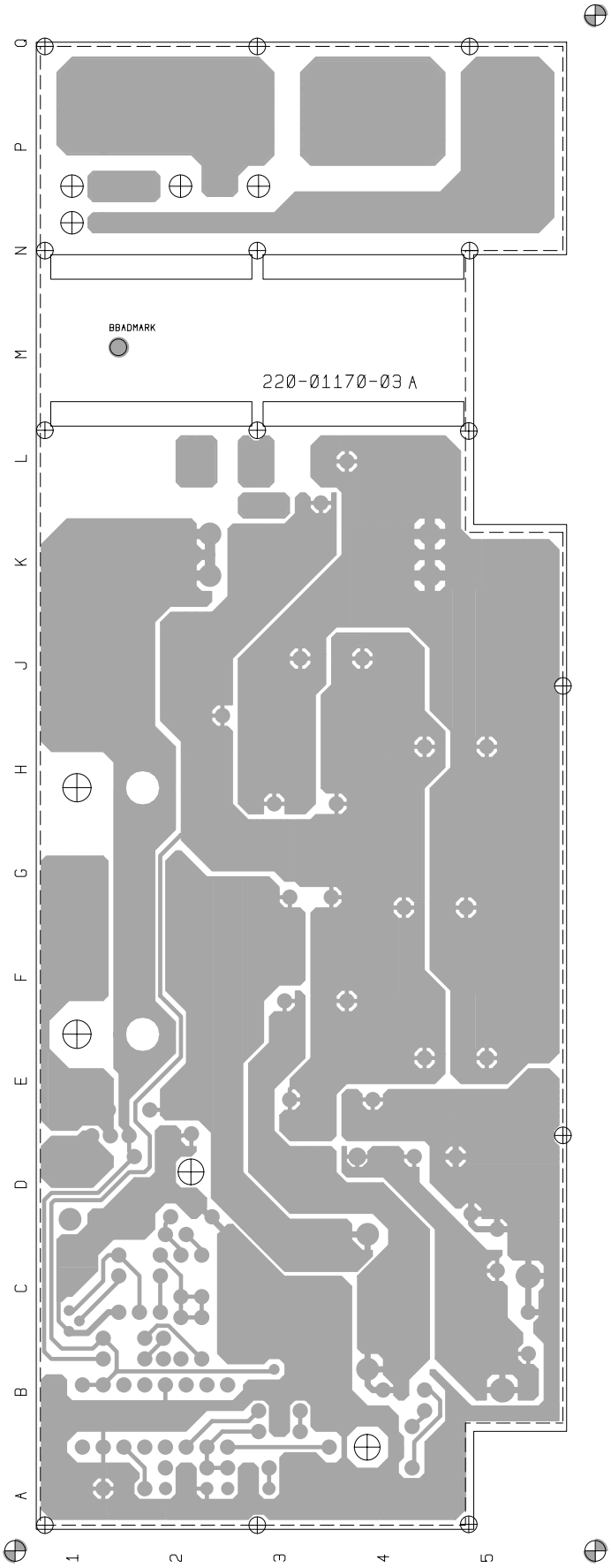
Device	PCB	Circuit



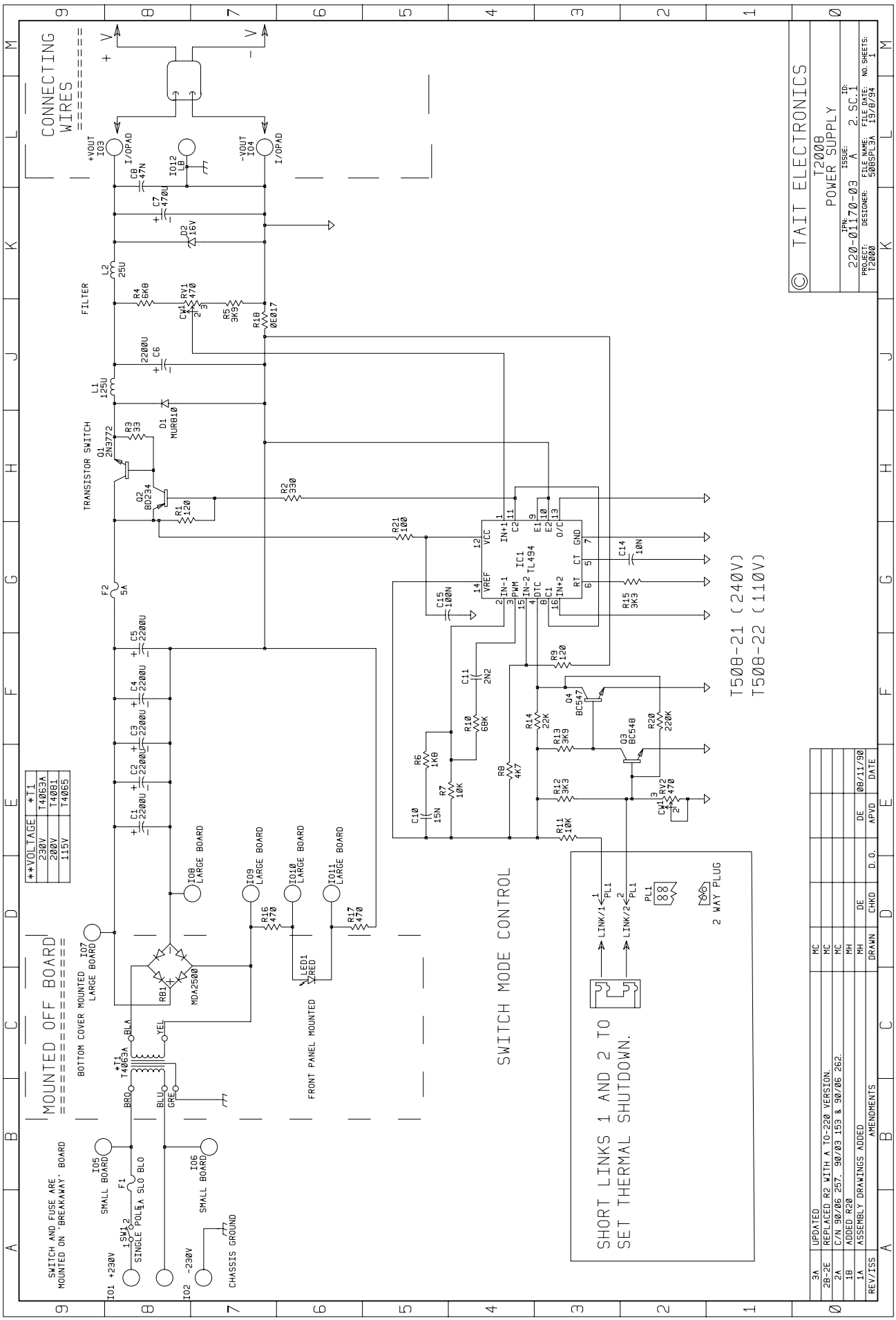
T2008 Power Supply Wiring Diagram (IPN 220-01170-02 shown)



T2008 Power Supply PCB Layout - Top Side (IPN 220-01170-03)



T2008 Power Supply PCB Layout - Bottom Side (IPN 220-01170-03)


CONNECTING WIRES
+ V
- V
+VOUT IO3 I/OPAD
-VOUT IO4 I/OPAD
IO12 LB
C8 47N
C7 470U
D2 16V
FILTER
L2 25U
R4 6K8
RV1 470
R5 3K9
R18 0E017
C6 2200U
L1 125U
D1 MUR810
TRANSISTOR SWITCH
Q1 2N3772
R3 39
Q2 BD234
R1 120
R2 330
R21 100
F2 5A
C5 2200U
C4 2200U
C3 2200U
C2 2200U
C1 2200U
IC1 TL494
C15 100N
C14 10N
R15 3K3
R9 120
C11 2N2
R10 68K
R14 22K
R13 3K9
R20 220K
Q4 BC547
Q3 BC548
R6 1K8
R7 10K
R8 4K7
R12 3K3
RV2 470
C10 15N
R11 10K
**VOLTAGE | *T1
230V | T4063A
200V | T4081
115V | T4065
MOUNTED OFF BOARD
SWITCH AND FUSE ARE MOUNTED ON 'BREAKAWAY' BOARD
BOTTOM COVER MOUNTED
IO7 LARGE BOARD
IO8 LARGE BOARD
IO9 LARGE BOARD
IO10 LARGE BOARD
IO11 LARGE BOARD
RB1 MDA2500
R16 470
R17 470
LED1 RED
FRONT PANEL MOUNTED
*T1 T4063A
BLA
YEL
BRO
BLU
GRE
IO5 SMALL BOARD
F1 1A SLO BLO
SW1 SINGLE POLE
IO1 +230V
IO2 -230V
IO6 SMALL BOARD
CHASSIS GROUND
SWITCH MODE CONTROL
SHORT LINKS 1 AND 2 TO SET THERMAL SHUTDOWN.
LINK/1
LINK/2
PL1
2 WAY PLUG
T508-21 (240V)
T508-22 (110V)
© TAIT ELECTRONICS
T2008
POWER SUPPLY
IPN: 220-01170-03
ISSUE: A
ID: 2. SC.1
PROJECT: T2000
DESIGNER: MH
FILE NAME: 508SPL3A
FILE DATE: 19/8/94
NO.SHEETS: 1
REV/ISS | AMENDMENTS | DRAWN | CHKD | D.O. | APVD | DATE
3A | UPDATED | MC
2B-2E | REPLACED R2 WITH A TO-220 VERSION. | MC
2A | C/N 90/06 257. 90/03 153 & 90/06 262. | MC
1B | ADDED R20 | MH | DE | DE | 08/11/90
1A | ASSEMBLY DRAWINGS ADDED | MH | DE

8.2 Connection To External Devices

8.2.1 Introduction

The spare external pin in the T2000 power connector (refer to Figure 8.4.1) may be wired to any of the option connections tabled in Section 5.9, "Options Interface Specifications". The most commonly used connections (hush, horn, emergency and auxiliary), are explained below.

The T2010 and T2015 can be programmed to have channel selection controlled via S15 on the T2000 logic PCB.

8.2.2 Applications

Hush

An active +5V signal is supplied to this line each time the PTT is pressed or a valid transmission is received (i.e. audio is heard), and is commonly used to mute a car radio. It may be connected directly to some modern stereo systems, otherwise an interface device will be required. This signal is sometimes referred to as the 'external mute'.

Horn

This is used in a Selcall system where an external alert has been programmed. An active +5V signal is supplied to this line when the radio goes into the external alert cycle. This signal will either be pulsed, steady or ringing, depending on the radio model and programming.

Emergency

This is used to put the radio into emergency mode for a Selcall system and is activated when the input is switched to ground.

Auxiliary

An active +5V signal is switched to this line when the front panel **auxiliary** key (T2010, T2015 & T2020 models) or **function** key Fn (trunked models) is active. This is programmable with both latching and momentary operation available.

8.2.3 Connections

The spare external pin in the power connector is connected to an option by linking the appropriate option pin to the EXTERNAL pin on options connector S14 (refer to Section 5.9, “Options Interface Specifications”).

The recommended linking method is to crimp a short length of 7/0.2mm PVC wire between the appropriate connections on a 16-way Micromatch plug (IPN 240-00026-24), which can then be plugged onto the options connector.

8.2.4 T2010 & T2015 BCD Selection

The front panel keys do not function when the T2010 or T2015 is programmed for channel selection control via the BCD lines.

Access to the BCD lines is via S15 on the logic PCB. Refer to Section 5.9, “Options Interface Specifications” details.

8.3 T2000-500 & T2000-600 1-7W Versions

This Section describes how to convert a T2000-500 or T2000-600 radio to operate between 1 and 7W.

Note: T2000-500 and T2000-600 1 to 7W radios are currently type approved only in Australia and Germany.

The following topics are covered in this Section:

8.3.1 Components Required

To convert a T2000-500 and T2000-600 to low power, the following components are required:

	Description	IPN	Quantity
Low Power Common Parts	56Ω SRF16 resistor	030-02560-20	2
	T2000-500/600 replacement transistor PCB	220-01287-00	1
	radio type label	-	1
	appropriate type approval label	-	1
T2000-500 Low Power Parts	5p6 NP0 500V GRM42-2 chip capacitor	015-01560-06	2
	22p NP0 500V GRM42-2 chip capacitor	015-02220-06	3
T2000-600 Low Power Parts	4p7 NP0 500V GRM42-2 chip capacitor	015-01470-06	1
	5p6 NP0 500V GRM42-2 chip capacitor	015-01560-06	1
	18p NP0 500V GRM42-2 chip capacitor	015-02180-06	2

8.3.2 Fitting

1 Refer to Figure 8.3.1.

Remove L315, L316, L317 and *R319 from the top side of the PA.

Crush and remove the ferrite bead which forms part of L314, so that only the wire link remains.

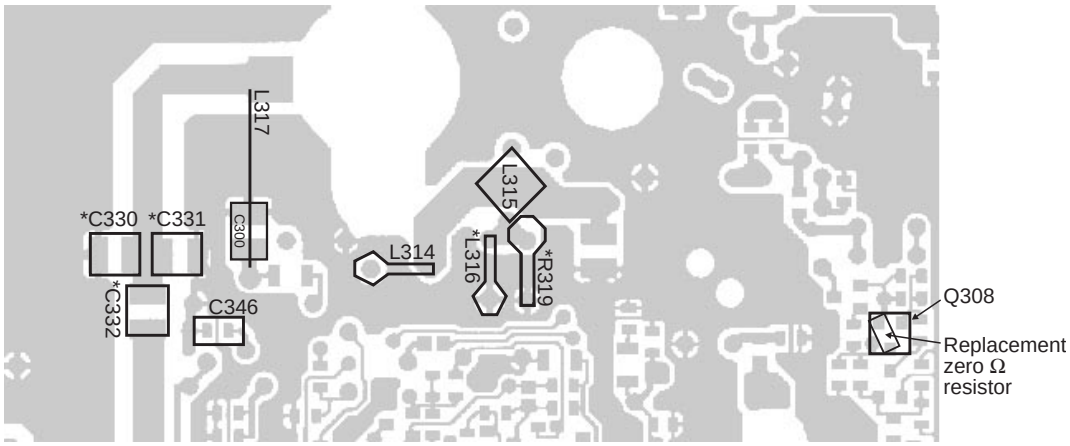


Figure 8.3.1 T2000-500/600 PA - Top Side

2 Refer to Figure 8.3.2.

Remove the following components from the bottom side of the PA:
C323, *C324, C325, *C327, *C329 and Q306.

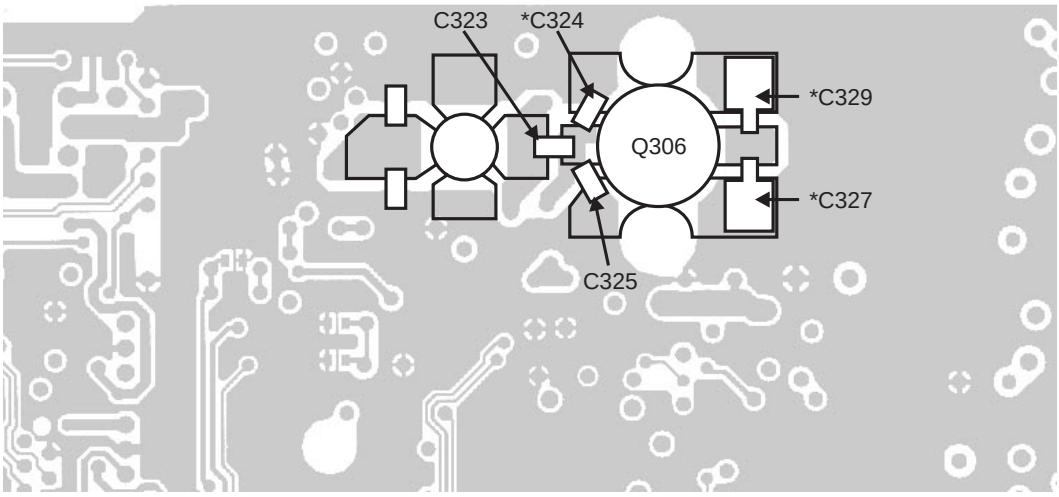


Figure 8.3.2 T2000-500/600 PA - Bottom Side

3 Remove the output matching capacitors, *C330, C331 and *C332 from the top side of the PA (shown in Figure 8.3.1).

Solder the replacement capacitors in the original positions, as follows:

	T2000-500	**T2000-600**
*C330	5p6	-
C331	5p6	4p7
*C332	22p	5p6

4 Replacement Transistor Fitting

Refer to Figure 8.3.3.

a Tin the underside of the replacement transistor PCB.

Place the PCB as shown, and sweat-solder into position, soldering the centre strip first, followed by the other strips.

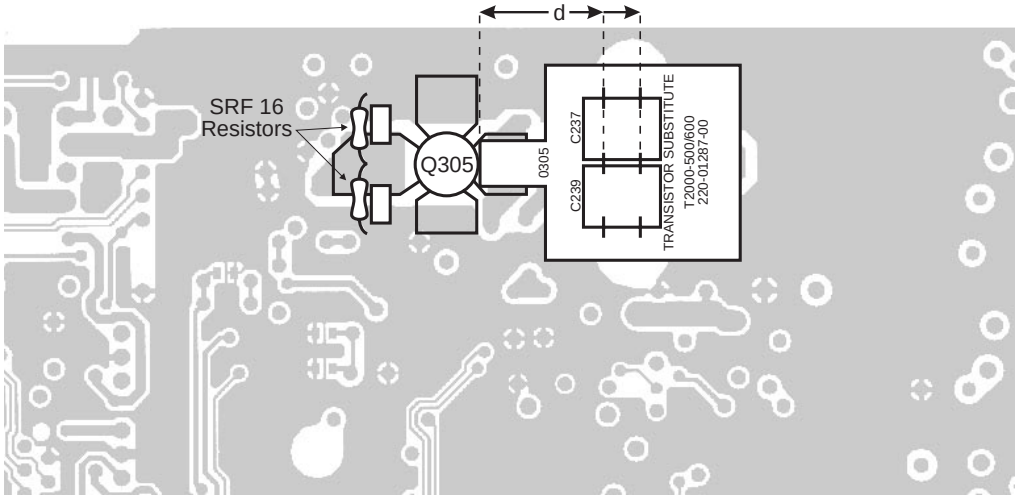


Figure 8.3.3 T2000-500/600 PA - Bottom Side

b Solder the chip capacitors onto the replacement transistor PCB, in the positions shown. Refer to the table below for capacitor values and the distance 'd'.

	T2000-500	T2000-600
Capacitor Value	22p	18p
Distance (d)	14.5mm*	11.5mm

* d is 13mm if Q305 is a BLW81 transistor

Note: The distance 'd' shown in Figure 8.3.3 is measured from the edge of the transistor top cap to the centre of the capacitors.

c Solder the 2 SRF16 resistors in the positions shown. Keep the leads as short as possible and ensure the resistors do not cause a short circuit.

5 Replace the radio type label and type approval certificate number label on the heatsink fins with the new type label and corresponding type approval certificate number label.

8.3.3 Set-Up

1 Adjust RV324 to set the required output power level.

Note: If the output power is set to 1W for RF control purposes, program the radio for high power and adjust RV324 for 1W.

2 Seal RV324 with permanent adhesive so that the power cannot be readjusted.

8.3.4 Specifications

Frequency Range:

T2000-500	.. 400 to 470MHz
T2000-600	.. 450 to 520MHz
Supply Voltage	.. 0.8 to 16V DC
Power Output	.. adjustable 1 to 7W
Temperature Range	.. -30°C to +60°C
Stability (power output set to >1W)	.. transmitter stable into 5:1 VSWR (all phase angles)

8.4 T2000-05 Remote Speaker Kit

The T2000-05 remote speaker kit provides a 4Ω external speaker for T2010, T2015 and T2030 models.

8.4.1 Components Required

The T2000-05 kit contains the following components:

Quantity	Description
1	T2000 speaker complete with mounting bracket and thumb screws
2	M4 self tapping screws
2	'U' type captive nuts for self tapping screws
5m	speaker wire complete with receptacles and speaker socket

8.4.2 Fitting

1 Choose a suitable mounting position for the speaker.

With the speaker fitted to the mounting bracket, check that it does not interfere with the operation of any of the vehicle controls.

2 Fix the speaker mounting bracket securely in the chosen location with suitable fasteners. Two M4 self tapping screws and 'U' type captive nuts have been supplied for this purpose.

Caution: **Check before drilling that the drill will not damage any components or wiring behind the panel.**

a If drilling directly into metal, drill two 3.5mm holes in the appropriate locations and secure the bracket with the supplied M4 self tapping screws.

b If mounting the bracket to any other material, such as plastic, drill two 4.5mm holes and attach the bracket with the M4 screws and captive nuts. Slide a captive nut over the edge of the panel to align with each hole, ensuring that the screw will pass through the larger hole to thread into the smaller hole.

c If neither of the above methods is appropriate, M4 screws, nuts and shakeproof washers are equally suitable.

3 Attach the speaker to the mounting bracket with the thumbscrews.

4 Refer to Figure 8.4.1.

Remove the existing internal speaker link and insert the three speaker wire receptacles into the appropriate power connector holes, as shown.

If the internal speaker is not required, cut the internal speaker ground link.

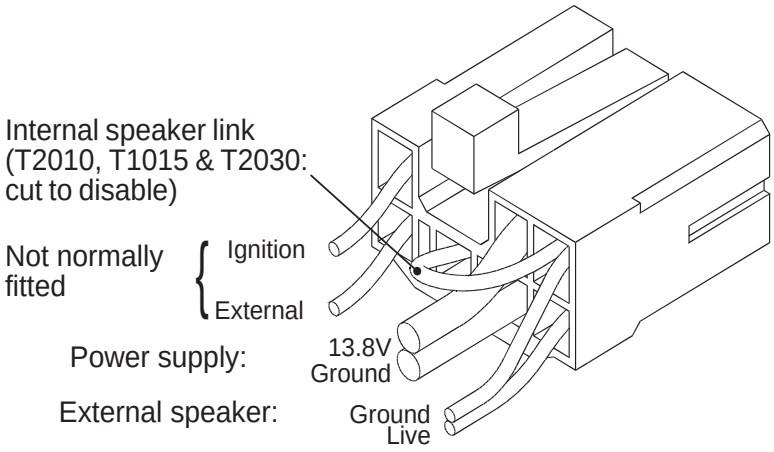


Figure 8.4.1 T2000 Power Connector

5 Plug the speaker into the socket provided on the speaker wire, neatly loop any excess wire and secure with a cable tie.

Peel the protective plastic off the "Tait" label on the front of the speaker.

8.5 T2000-06 Desktop Microphone Kit

8.5.1 Introduction

The T2000-06 desktop microphone has an internal omni-directional dynamic element, pre-amplifier and compressor loop. The microphone output is adjustable by a potentiometer (R11) which is accessible through a hole in the bottom of the case.

The desktop microphone has a switch provided for hookswitch monitoring, which can be locked if required.

8.5.2 Fitting

The T2000-06 has grommets for both Series I and II radios fitted to the microphone cord.

1 Remove the Series I grommet from the microphone cord.

2 Fit the desktop microphone lead to the T2000 control head microphone socket, then push the grommet in place.

8.5.3 T2000-06 Set-Up

Both the desktop microphone and the T2000 radio have an internal compressor and it is advisable that the T2000 compressor be disabled to avoid the possibility of 'hunting'.

This can be done either by disabling the T2000 compressor or by adjusting the output level at the desktop microphone.

Method 1

1 Disable the internal T2000 compressor by solder shorting the pads labelled 'ALC disable' on the logic PCB.

2 Observe the waveform at TP606 with an oscilloscope, and whistle into the microphone at close range.

Adjust the output level of the microphone until the waveform is just below clipping.

Method 2

1 Leave the T2000 internal compressor enabled.

2 Set the transmitter average deviation by whistling into the microphone at the required distance from the microphone.

3 Adjust the output level at the microphone to approximately 80% deviation (±4kHz for wide band or ±2kHz for narrow band).

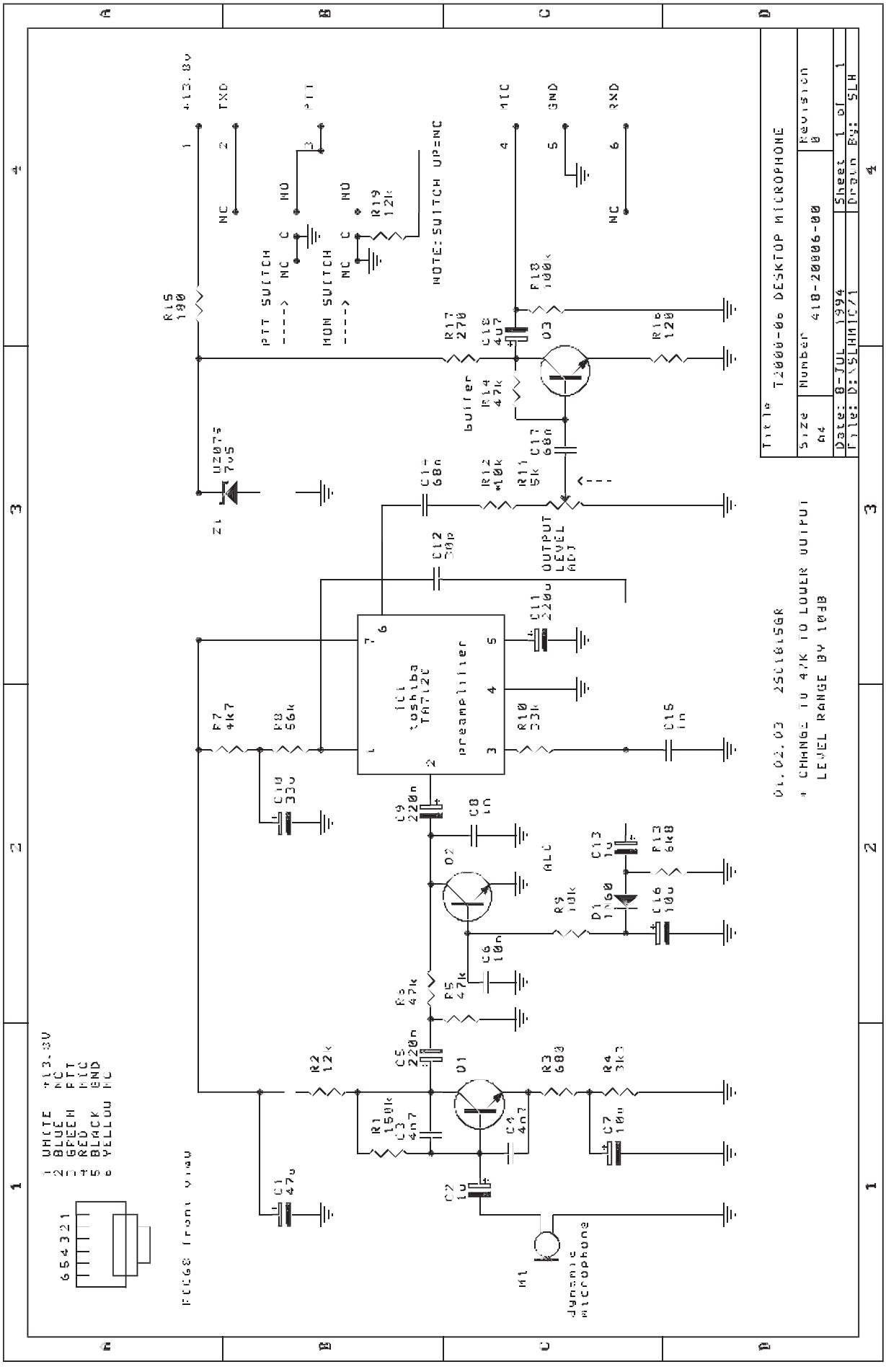
8.5.4 Sensitivity

Under some conditions, the microphone may pick up excessive background noise. In this situation, the output can be reduced using ***either*** of the procedures described below:

1 Change the value of R12 from 10kΩ to 47kΩ (refer to the circuit diagram). This will result in a 10dB output reduction.

2 Fit a 2K2 pot parallel with the microphone element.

Adjust the output level to suit.


T2000-06 DESKTOP MICROPHONE
418-20006-00
Date: 8-JUL 1994
Sheet 1 of 1
Drawn By: SLH
Title
Size
Number
Revision
PTT SWITCH
MOM SWITCH
NOTE: SWITCH UP=NC
+13.8V
TXD
PTT
MIC
GND
RXD
Buffer
OUTPUT LEVEL ADJ
ALC
Preamplifier
Toshiba TA7120
2SC1623GR
LEVEL RANGE BY 10dB
WHITE +13.8V
BLUE NC
GREEN PTT
RED MIC
BLACK GND
YELLOW PC
Front view
Dynamic Microphone

8.6 T2000-07 DTMF Microphone Kit

The T2000-07 DTMF microphone has an omni-directional dynamic element and internal DTMF tone generator. The DTMF tone level is adjustable by an internal potentiometer (VR1) which is accessible when the rear case is removed.

The DTMF microphone is intended for use with all T2000 Series II radios.

8.6.1 Fitting

The T2000-07 has grommets for both Series I and II radios fitted to the microphone cord.

1 Remove the Series I grommet from the microphone cord.

2 Fit the DTMF microphone lead to the T2000 control head microphone socket, then push the grommet in place.

8.6.2 Operation

1 The microphone LED is used to indicate 'key pressed'. The LED is on for normal operation and is off when a DTMF key is pressed.

2 The PTT switch changes the microphone input to the radio from DTMF tone to the dynamic microphone. This is to prevent the microphone signals distorting the DTMF tones.

3 The operation of a DTMF key automatically operates the transmitter PTT and holds it on for a short time after the release of the DTMF key. This is to hold the transmitter on during interdigital pauses.

8.6.3 T2000-07 Set-Up

Remove the microphone back cover and set the DTMF tone level to approximately 80% deviation (±4kHz for wide band or ±2kHz for narrow band).

DTMF Sidetone (T2010 & T2015 only)

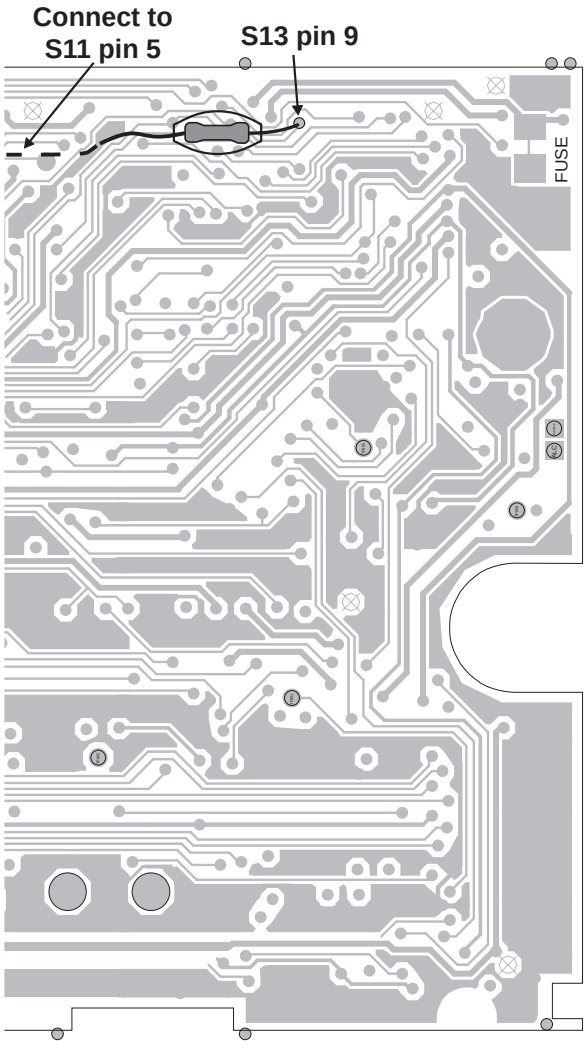
The DTMF tone output is also fed into the receive data line and can be used to provide a sidetone.

1 Refer to the diagram on the following page.

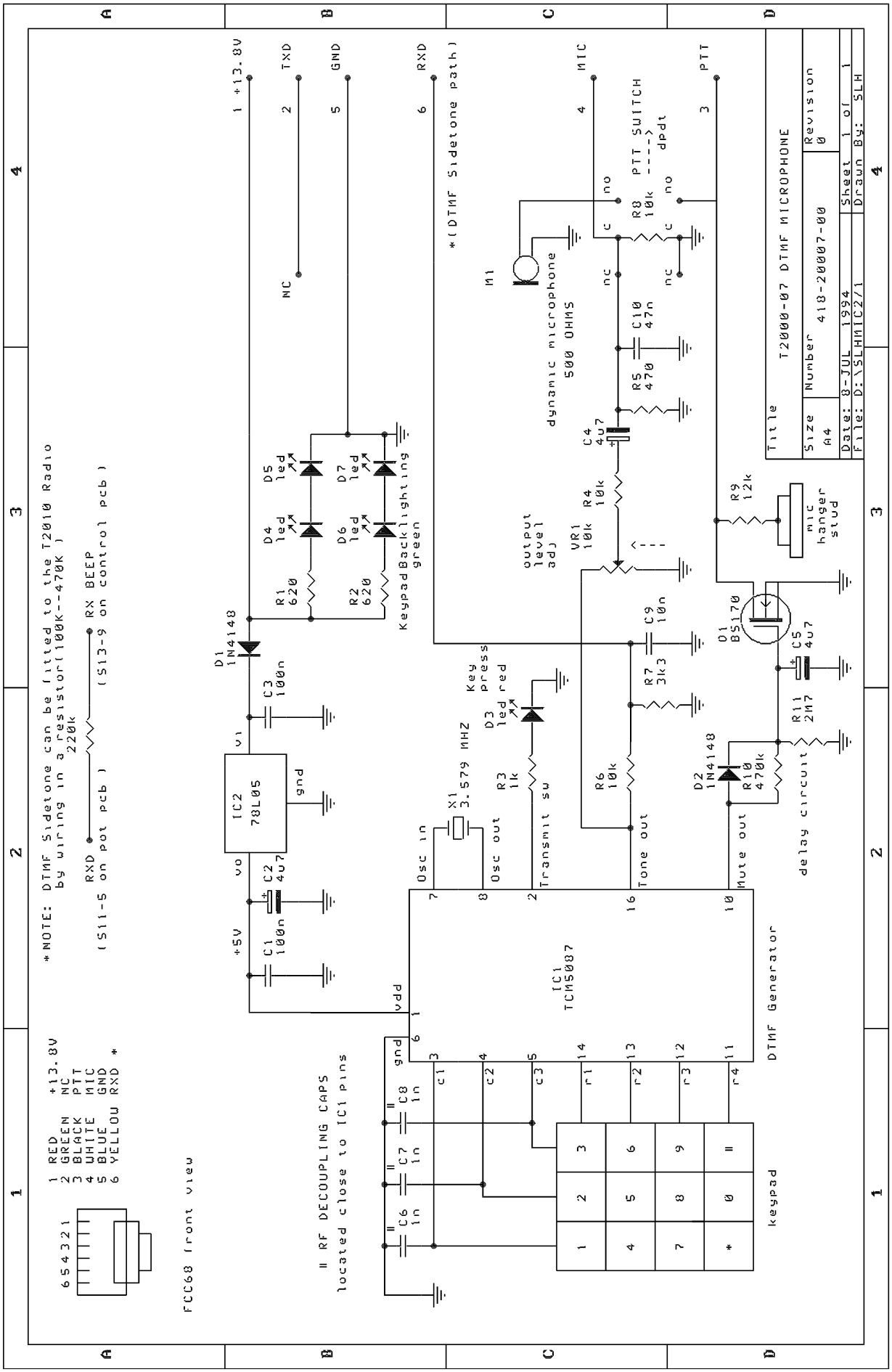
Solder a resistor to S13 pin 9 (RX-BEEP) on the bottom side of the T2010 control PCB.

The value of the resistor adjusts the sidetone level and is between 100kΩ and 470kΩ, typically 220kΩ.

2 Slide a length of silicone sleeving over the resistor, and connect a wire between the resistor and S11 pin 5 (RXD) on the pot PCB, as shown.



T2010 & T2015 Logic PCB - Bottom Side


*NOTE: DTMF Sidetone can be fitted to the T2010 Radio
by wiring in a resistor(100K--470K)
220k
RXD
(S11-5 on pot pcb)
RX BEEP
(S13-9 on control pcb)
1 RED +13.8V
2 GREEN NC
3 BLACK PTT
4 WHITE MIC
5 BLUE GND
6 YELLOW RXD *
654321
FCC68 front view
= RF DECOUPLING CAPS
located close to IC1 pins
1 +13.8V
2 TXD
5 GND
6 RXD
*(DTMF Sidetone path)
4 MIC
3 PTT
NC
M1
dynamic microphone
500 OHMS
R8 10k PTT SWITCH ----> dpdt
C10 47n
R5 470
C4 4u7
R4 10k
VR1 10k
output level adj
R9 12k
mic hanger stud
D1 1N4148
C3 100n
D4 led
D5 led
D6 led
D7 led
R1 620
R2 620
Keypad Backlighting green
IC2 78L05
vi
vo
gnd
C2 4u7
C1 100n
+5V
vdd
X1 3.579 MHZ
Osc in
Osc out
D3 led red
Key press
R3 1k
Transmit sw
R6 10k
Tone out
C9 10n
R7 3k3
Q1 BS170
C5 4u7
D2 1N4148
R10 470k
Mute out
R11 2M7
delay circuit
IC1 TCM5087
DTMF Generator
C6 1n
C7 1n
C8 1n
gnd
c1
c2
c3
r1
r2
r3
r4
keypad
1 2 3
4 5 6
7 8 9
* 0 =
Title T2000-07 DTMF MICROPHONE
Size A4
Number 418-20007-00
Revision 0
Date: 8-JUL 1994
File: D:\SLH\IC271
Sheet 1 of 1
Drawn By: SLH

8.7 T2000-34 Selcall Kit

The T2000-34 kit provides selective tone calling (Selcall) facilities for T2010 and T2015 model T2000 Series II radios.

The Selcall kit consists of a small module and a 5MHz crystal that are fitted to the radio's logic PCB. This option allows selective individual or group calls within a fleet of radios, on channels that have Selcall programmed. Selcall parameters and features are set up and enabled during programming. Both Sigtec and International group formats are supported by the T2000-34 PCB.

Refer to Section 8.7.3, "Programming" for a list of user-selected features. The following topics are covered in this Section:

8.7.1 Components Required

The T2000-34 kit contains the following components:

Quantity	Description
1	T2000-34 Selcall module
1	5MHz crystal with insulator

8.7.2 Fitting

Refer to Figure 8.7.1 and Section 7.10, "T2010 & T2015 HC05 Logic PCB".

1 Remove the top cover of the radio by unscrewing the four cover screws, unscrew the logic PCB and fold-out.

2 Unplug the connecting looms, if required.

3 Place the Selcall module flat on the logic PCB, as shown in Figure 8.7.1, with the component side facing upwards.

Solder the leads on the bottom side of the PCB and trim as necessary.

4 Fit the supplied 5MHz crystal flat on the PCB in location '#X502' as follows:

Peel the protective backing off the self-adhesive foam tape on the underside of the crystal.

Insert the crystal leads into the holes provided and press the crystal down onto the PCB.

Solder the leads on the underside of the PCB and trim as necessary.

5 Reconnect any looms that were unplugged in step 2.

Refit the logic PCB to the radio and secure with the three retaining screws.

Refit the top cover and secure with the four retaining screws.

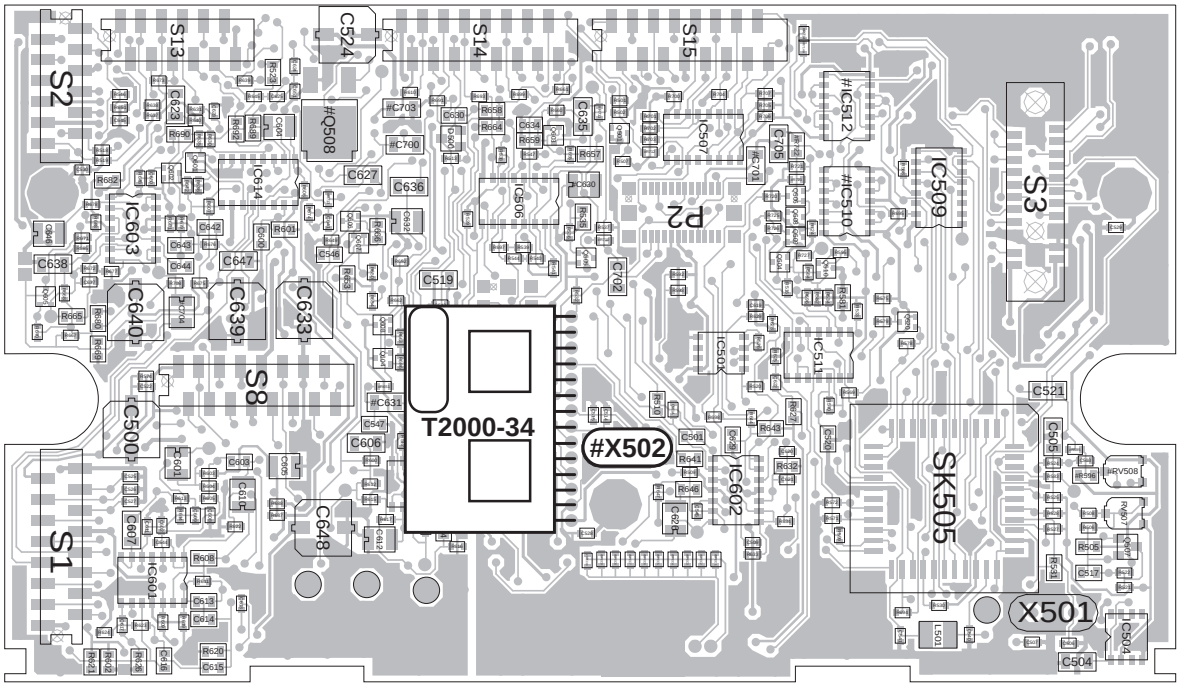


Figure 8.7.1 T2000-34 Selcall PCB Mounting - T2010 & T2015 Logic PCB (top side)

8.7.3 Programming

The radio must now be reprogrammed to set the various Selcall parameters listed in the following table. Refer to the manual supplied with the T2000-20 programming kit for details.

Parameter	Selection
Tone Set	CCIR, EIA, EEA, ZVEI-1, ZVEI-2, ZVEI-3, DZVEI, PZVEI
Tone Frequencies	16 tones corresponding to the International Standard for the selected tone set, plus 'no tone'
Tone Period	20*, 33, 40, 50*, 60*, 70 & 100ms
Lead-In Delay	between 0 & 5100ms in 20ms steps
Lead-In Tone	any of the 16 valid tones, or 'no tone'
Decode Sequence	individual or group decode
Encode	preset
Group Decode Format	Sigtec or International
Auto Acknowledge	enabled or disabled
Group Dialling	enabled or disabled

Parameter	Selection
Deferred Calling	enabled or disabled
ANI Sequence	leading, trailing or random encoding
Emergency Sequence	enabled or disabled
Alert	internal and external durations
Tone Blanking	standard

* These tone periods are not defined by international standards. Wherever possible, use the international standard tone periods.

