PHILIPS

Level 3 Service Manual

VHF/UHF Portable Radio
Type PRP73

4313 329 13881

The performance figures quoted are subject to normal manufacturing and service tolerances. The right is reserved to alter the equipment described in this manual in the light of future technical development.

WARNING

The Battery Chargers which form part of this equipment are designed to meet relevant safety requirements.

If it is necessary to replace any safety-conscious component (refer to components marked Δ in the Parts List) the quoted item MUST be fitted. Ensure that all insulators or covers are fitted after servicing. Check that all warning labels are in place.

If any re-wiring of the mains input supply cables is necessary, the specified type must be used and alterations to the routeing or connections must *not* be made.

WARNING

Certain semi-conductors used in this equipment contain Beryllium Oxide. If inhaled, dust from this oxide can be toxic. No danger can arise from normal handling but no attempt should be made to tamper with these devices. They should NOT be discarded with industrial or domestic waste.
These devices are detailed 'BeO' in the Parts List.

WARNING

NICAD batteries are used with this equipment. They must not be short-circuited or incinerated. They must be disposed of safely.

VHF/UHF PORTABLE RADIO
TYPE PRP73

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PRODUCT SUPPORT POLICY

INTRODUCTION

This policy, like all other Philips Product Support and Service policies, is aimed at restoring customers' equipment to its operational state in the shortest possible time.

All agreed spare parts and field exchange units (FEUs) for this product family will be held by Central Spares. To obtain spare parts the National Sales Organisations (NSOs) will place orders directly on Consumer Service.

PRODUCT TECHNOLOGY

The technology employed in this product consists of a basic two board design with largely Surface Mounted Devices (SMDs) and special Integrated Circuits (ICs) utilised for compactness and reliability. Flexi-circuits are used for connecting controls and facility socket etcetera.

The product consists of a die-cast frame supporting the printed circuits, controls and display. Access to these items for servicing is obtained by removal of the outer plastic case. Access for programming is through the facility socket.

SERVICE POLICY

There are three levels of service for this product, which are detailed in the following paragraphs.

SURVEY OF SERVICE LEVELS

Service Level 1

Is to achieve a rapid turn-around by:-

(1) Complete changeover of transceiver.

(2) Replacement of batteries, antenna or accessories.

(3) Rectifying/validating and revising programmable software options.
The use of a Programmer (optional for this level) is described in this Service Manual.

Faulty units are to be returned to the individual area's Level 2 Service Facility for repair and return. A fault report should be sent with each faulty unit returned to the Level 2 Repair Facility .

This level of Service should not exceed 20 minutes.

Service Level 2

Level 2 Service includes Level 1, but provides additionally for the fault location and repair of the product via module (PCB) replacement and subsequent re-alignment, re-programming and functional testing to product specification. The level of training and quality control required by Service personnel is under the control of the NSO, and Customer Support as the executing arm in Service matters.

Spare parts available will consist of printed circuit board assemblies, all mechanical parts and selected electrical components, all available from Central Spares.

Also available from Central Spares will be a series of Field Exchange Units (FEU's). Field exchange units will be:-

(1) Radio Frequency Board

(2) Control Board

in a range to match the product variants, as shown in the Parts List, Section 5 of this Service Manual.

The product field fault report form must be completed and returned with the FEU.

Service Level 3

This level of service will be confined to a central repair facility which will support FEU through Consumer Service.

The responsibility for establishing this level of service will be with the NSO. However, should local market conditions demand, it may be handled by a third party (eg. local service provider or service agency). The responsibility will, however, remain with the NSO.

These products will be supported by Philips Telecom, Cambridge to be serviced for a period not ending before 7 years after the last manufactured unit has been commercially transferred out of the Factory.

SERVICE BULLETINS

Service Bulletins will be issued as necessary to inform the NSO's of any matter affecting the serviceability of the equipment in the field.

SECTION 1
GENERAL INFORMATION

INTRODUCTION

The PRP73 is a range of advanced portable transceivers designed for use in handheld and bodyworn applications. It provides a range of features including CTCSS, DTMF and Selcall signalling, channel scanning and voting, dual watch and password protection.

The transceiver is powered from a rechargeable battery unit, which attaches to and forms part of the equipment. The battery may either be removed for charging, or charged whilst attached to the equipment, allowing the transceiver to remain operational. In addition to the standard battery, two other sizes of battery are available, a lightweight version and a high capacity battery, for different duty cycles than those provided by the standard battery.

Two versions of the PRP73 are available, a keypad version and a standard version. The standard version has six function keys on the front panel, two function keys on the side and a 2 x 12 character display. Two rotary controls are provided on the top of the unit for volume control and programmable selection. The function keys are also programmable.

The keypad version comprises all the functions and facilities of the standard equipment, with the addition of a 12-key numeric keypad.

Operation of the PRP73 is controlled by the settings of various software parameters. The operating parameters are stored as data in E^2PROM and this data may be programmed into the transceiver using an external data programmer, allowing the PRP73 to be customised to the requirements of a particular user. Calibration data for the Radio PCB is stored in a separate E^2PROM on that PCB, thus allowing the Radio PCB to work with any Control PCB. Details of how to programme the transceiver are given in the PRP70 Data Programmer User Guide (Publication Ref. TP1807).

SUMMARY OF DATA

Note: ***Typical figures based on normal operating conditions, certain options may modify the figures quoted.***

General

Operation	Single and two-frequency simplex
Modulation	Frequency, with pre-emphasis
Frequency Bands	E0 68-88MHz B5 138-156MHz A9 146-174MHz TR 400-425MHz T4 425-450MHz U0 440-470MHz
Number of channels	Up to 300 arranged in up to 10 channel banks
Channel Spacing	12,5kHz (type S), 20kHz (type R)*, 25kHz (type V) * Not available on E0, B5, T4 and TR Bands
Power Supply	7,2V (nominal) re-chargeable nickel cadmium battery

Typical Battery Endurance

5% Transmit -5% Receive - 90% Standby

	1W UHF	4W UHF
Lightweight Battery	6h 47m	3h 43m
Standard Battery	9h 23m	5h 08m
High Cap. Battery	15h 36m	8h 33m

5% Transmit - 20% Receive - 75% Standby

	1W UHF	4W UHF
Lightweight Battery	5h 31m	3h 18m
Standard Battery	7h 38m	4h 34m
High Cap. Battery	12h 42m	7h 35m

Note: ***These figures are for economised versions with no signalling options.***

Frequency Stability	VHF 5ppm UHF(20/25kHz) 5ppm UHF(12,5kHz) 2,5ppm -30 to +60°C
Overall Dimensions	Height: 169mm Width: 65mm Depth: 38mm (with standard battery) 40mm (with high cap. battery)
Weight	500g (with lightweight battery) 540g (with standard battery) 600g (with high cap. battery)
Environment Protection	IEC529 Class IP54
Electromagnetic Compatibility (EMC)	Conforms with draft European Directive on EMC

Receiver

Switching Bandwidth	Full band coverage without degradation
Sensitivity	Better than 0,35µV for 12dB SINAD
Adjacent Channel Selectivity	Better than 60dB for 12,5kHz Better than 70dB for 20/25kHz
Intermodulation	65dB
Spurious Response Attenuation	70dB
Audio Output	500mW into 16Ω; less than 5% distortion at 350mW

Transmitter

Switching Bandwidth	Full band coverage without degradation
Power Output (into 50Ω)	Aligned in 4 steps between: 0,1W and 1W VHF/UHF low power* 1W and 5W VHF high power (4W E0 Band) 1W and 4W UHF high power * Not available on E0, B5, T4 and TR Bands
Modulation Distortion	Better than 5% with 60% modulation at 1kHz
Spurious Emission	Less than 0,25µW - 100kHz to 1GHz Less than 1µW - 1GHz to 4GHz
Deviation	±2,5kHz for 12,5kHz ±4kHz for 20kHz ±5kHz for 25kHz

Note: All measurements to ETS 300086.

Signalling	Selective calling: EEA* CCIR* ZVEI* DZVEI* * Both ST500 and CML tone sets. CTCSS - 38 tone EIA DTMF.

ASSOCIATED EQUIPMENTS

PRX7001	Desktop Battery Charger
PRX7002	Vehicle 8-Hour Charger Unit
PRX7005	Multi-unit Battery Charger
PRX7010	Vehicle Adaptor Unit

ANCILLARY ITEMS

12NC Number	Description
9525 701 54009	Cloning Kit
9525 701 54010	Lightweight Battery
9525 701 54011	Standard Capacity Battery
9525 701 54012	High Capacity Battery
9525 701 54020	Loudspeaker and Microphone
9525 701 54021	Extended Loudspeaker and Microphone
9525 701 54030	Leather Case and Shoulder Strap
9525 701 54031	Chest Harness
9525 701 54032	Swivel Locking Belt Retainer Kit
9525 701 54033	Belt Clip
9525 701 54034	Wrist Lanyard
9525 701 54181	Programming Kit - Level 1
9525 701 54182	Programming Kit - Level 2
9525 701 54202	Coiled Whip - A9 and B5 Bands
9525 701 54205	Coiled Whip - U0, T4 and TR Bands
9525 701 54200	Coiled Whip - E0 Band
9525 701 54039	'D' Ring Kit

EQUIPMENT VARIATIONS

Part Number	Power	Case	Signalling	Channel Spacing	Band
9525 701 53013	L	Standard	CTCSS	V	U0
9525 701 53017	L	Keypad	CTCSS	V	U0
9525 701 53033	L	Standard	CTCSS	S	U0
9525 701 53037	L	Keypad	CTCSS	S	U0
9525 701 53113	H	Standard	CTCSS	V	U0
9525 701 53117	H	Keypad	CTCSS	V	U0
9525 701 53123	H	Standard	CTCSS	R	U0
9525 701 53127	H	Keypad	CTCSS	R	U0
9525 701 53133	H	Standard	CTCSS	S	U0
9525 701 53137	H	Keypad	CTCSS	S	U0
9525 701 53313	H	Standard	CTCSS	V	T4
9525 701 53317	H	Keypad	CTCSS	V	T4
9525 701 53333	H	Standard	CTCSS	S	T4
9525 701 53337	H	Keypad	CTCSS	S	T4
9525 701 53213	H	Standard	CTCSS	V	TR
9525 701 53217	H	Keypad	CTCSS	V	TR
9525 701 53233	H	Standard	CTCSS	S	TR
9525 701 53237	H	Keypad	CTCSS	S	TR
9525 701 53413	L	Standard	CTCSS	V	A9
9525 701 53417	L	Keypad	CTCSS	V	A9
9525 701 53433	L	Standard	CTCSS	S	A9
9525 701 53437	L	Keypad	CTCSS	S	A9
9525 701 53513	H	Standard	CTCSS	V	A9
9525 701 53517	H	Keypad	CTCSS	V	A9
9525 701 53523	H	Standard	CTCSS	R	A9
9525 701 53527	H	Keypad	CTCSS	R	A9
9525 701 53533	H	Standard	CTCSS	S	A9
9525 701 53537	H	Keypad	CTCSS	S	A9
9525 701 53913	H	Standard	CTCSS	V	E0
9525 701 53917	H	Keypad	CTCSS	V	E0
9525 701 53933	H	Standard	CTCSS	S	E0
9525 701 53937	H	Keypad	CTCSS	S	E0
9525 701 53713	H	Standard	CTCSS	V	B5
9525 701 53717	H	Keypad	CTCSS	V	B5

EQUIPMENT VARIATIONS (Cont'd)

Part Number	Power	Case	Signalling	Channel Spacing	Band
9525 701 53733	H	Standard	CTCSS	S	B5
9525 701 53737	H	Keypad	CTCSS	S	B5

CTCSS TONE FREQUENCIES

Group A				Group B				Group C	
Tone	No.	Tone	No.	Tone	No.	Tone	No.	Tone	No.
77,0	04	151,4	24	71,9	02	146,2	23	67,0	01
88,5	08	162,2	26	82,5	06	156,7	25	74,4	03
100,0	12	173,8	28	94,8	10	167,9	27	79,7	05
107,2	14	186,2	30	103,5	13	179,9	29	85,4	07
114,8	16	203,5	32	110,9	15	192,8	31	91,5	09
123,0	18	218,1	34	118,8	17	210,7	33	97,4	11
131,8	20	233,6	36	127,3	19	225,7	35		
141,3	22	250,3	38	136,5	21	241,8	37		

Table 1.1 - CTCSS Tone Frequencies (All frequencies in Hz)

Note: ***It is recommended that for any one system, all tones employed are taken from the same group.***

SELCALL TONE FREQUENCIES

FUNCTION	CODING CHARACTER	SYSTEM TONE FREQUENCIES						
		Philips ST-500			CML			
		CCIR/EEA Type 0,1	ZVEI Type 2	DZVEI Type 3	CCIR Type 4	EEA Type 5	ZVEI Type 6	DZVEI Type 7
'0' TONE	0	1981	2400	2200	1981	1981	2400	2200
'1' TONE	1	1124	1060	970	1124	1124	1060	970
'2' TONE	2	1197	1160	1060	1197	1197	1160	1060
'3' TONE	3	1275	1270	1160	1275	1275	1270	1160
'4' TONE	4	1358	1400	1270	1358	1358	1400	1270
'5' TONE	5	1446	1530	1400	1446	1446	1530	1400
'6' TONE	6	1540	1670	1530	1540	1540	1670	1530
'7' TONE	7	1640	1830	1670	1640	1640	1830	1670
'8' TONE	8	1747	2000	1830	1747	1747	2000	1830
'9' TONE	9	1860	2200	2000	1860	1860	2200	2000
GROUP TONE	A	1055	970	825	2400	1055	2800	2600
TONE B	B	-	-	-	930	930	810	-
ALARM TONE	C	2400	2800	2600	2247	2247	970	886
TONE D	D	-	-	-	991	991	886	810
REPEAT TONE	E	2110	2600	2400	2110	2110	2600	2400
NO TONE	F	-	-	-	-	-	-	-

Table 1.2 - Selcall Tone Frequencies (All frequencies in Hz)

Note: ***The number of tones sent will normally be dictated by the system with which the equipment is to be used.***

SECTION 2
COMMISSIONING

UNPACKING

On unpacking, each item should be checked against the contents list and thoroughly inspected for any signs of physical damage.

Note: ***The Company, or their authorized agents, must be advised by letter, within ten days of equipment receipt, of any damage or shortages found.***

COMMISSIONING

WARNING

NICAD batteries are used with this equipment. They must not be short-circuited or incinerated. They must be disposed of safely.

Warning Label

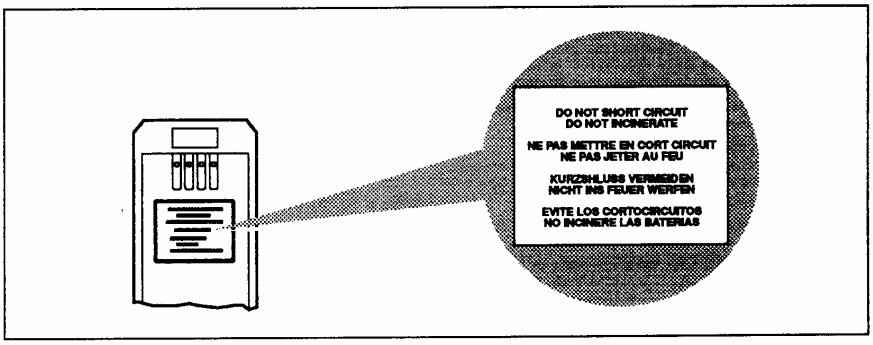


Fig. 2.1 Battery Warning Label

Each battery carries a label giving simple warnings to highlight the dangers of misuse of Nickel Cadmium cells. The batteries must not be incinerated or allowed to short circuit, and they must be disposed of safely.

(1) Charge the battery before use. For full capacity, several charge/discharge cycles may be required.

(2) Fit the antenna (for VHF equipments the antenna must first be cut to length as specified on the enclosed cutting chart).

(3) If required, fit the wrist lanyard/'D' Ring.

(4) If required, fit the belt clip/stud.

(5) Fit the battery.

Charging the Battery

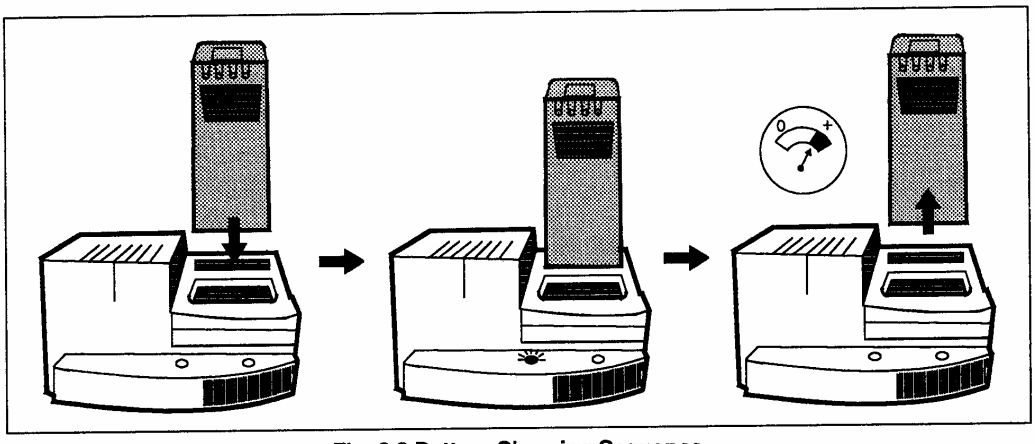


Fig. 2.2 Battery Charging Sequence

The PRP73 is supplied with batteries in their discharged state. Before using the transceiver it is necessary to charge them using one of the approved battery chargers. This takes approximately one hour.

Fitting the Antenna

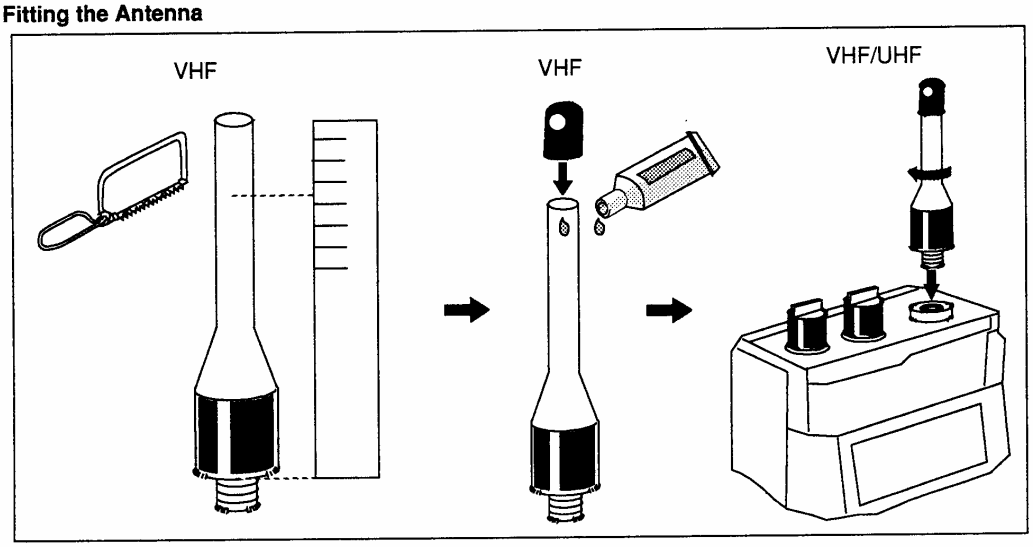


Fig. 2.3 Fitting the Antenna

WARNING
To avoid injury from the high RF voltage available at an unterminated connector, the transceiver should not be operated without an antenna fitted.

The antenna supplied with the transceiver must be fitted to the mounting boss at the top of the tranceiver.

For VHF equipments only:-

(1) Using a suitable hacksaw or cutters, cut the antenna to the length required for the transmitter centre frequency on which the transceiver is to be used, as shown on the cutting chart supplied with the antenna.

(2) Fit the antenna end-cap provided, securing with cyanoacrylate adhesive.

For VHF and UHF equipments:-

(3) Fit the antenna.

Fitting the Wrist Lanyard/'D' Ring

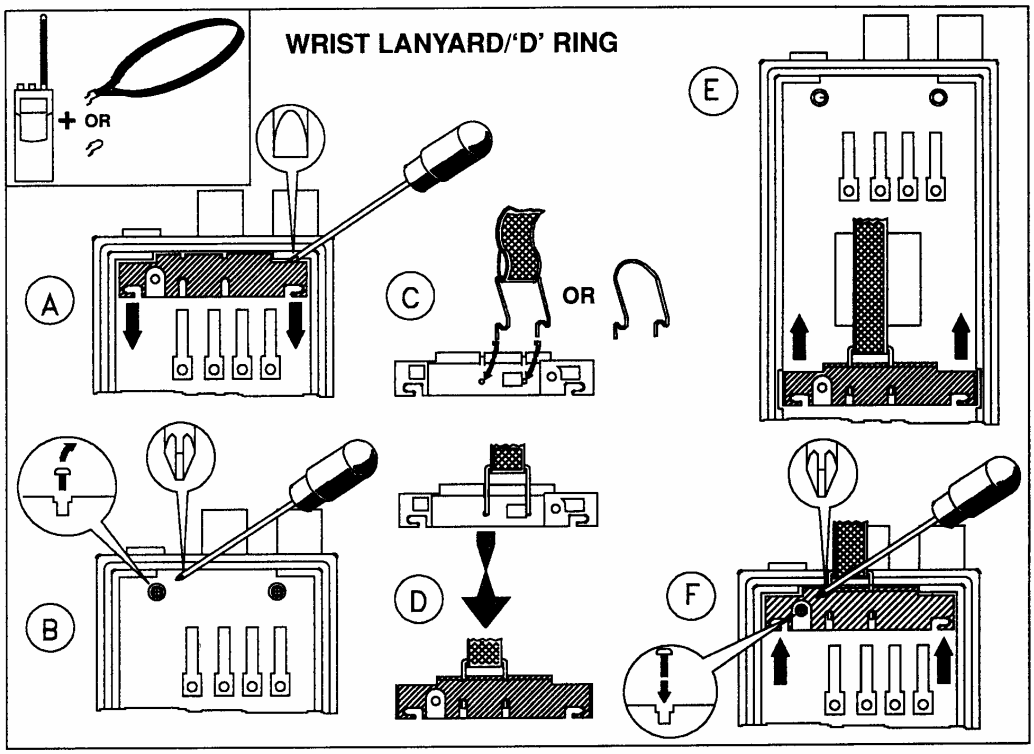


Fig. 2.4 Fitting the Wrist Lanyard/'D' Ring

Each transceiver is supplied with an optional wrist lanyard/'D' Ring. This is fitted by first removing the blanking plate at the top of the rear of the transceiver, then removing the top left screw. Fig. 2.4 shows how the lanyard/'D' Ring locates in the blanking plate, and the complete assembly is then attached to the transceiver and a longer screw used to secure it, if required.

Fitting the Belt Clip/Stud

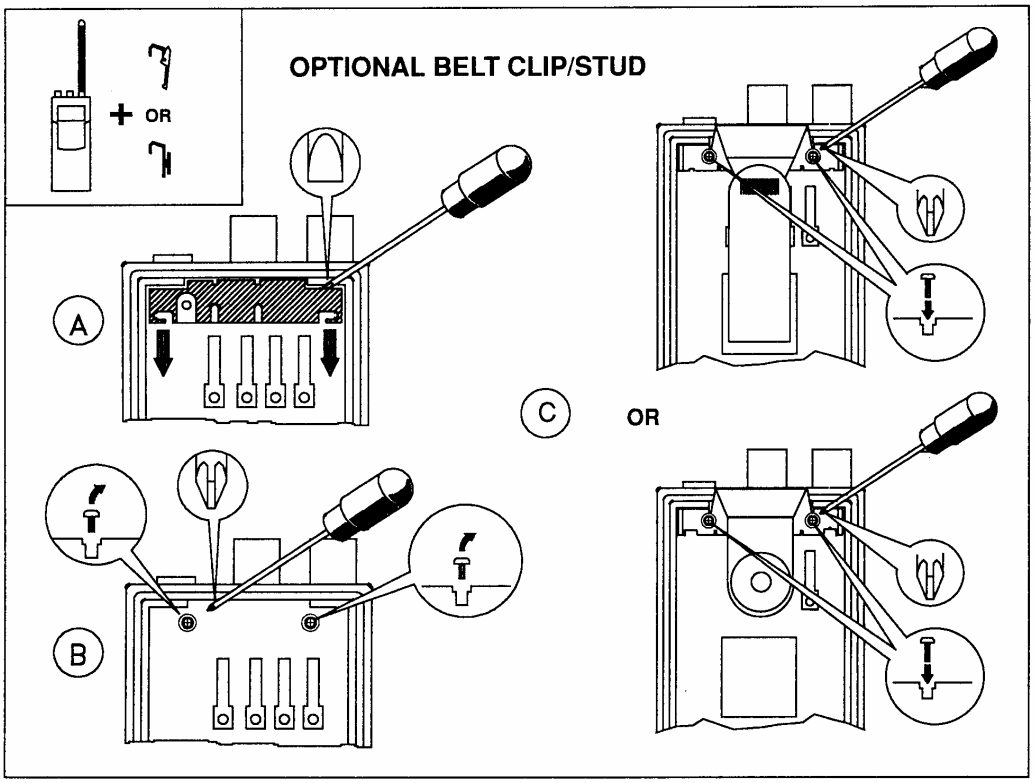


Fig. 2.5 Fitting the Belt Clip/Stud

If required a belt clip or belt stud may be fitted to the transceiver. Either can be fitted in place of the blanking plate at the top, rear of the transceiver. Two long screws are used in place of the short screws normally fitted under the blanking plate.

Fitting a Battery

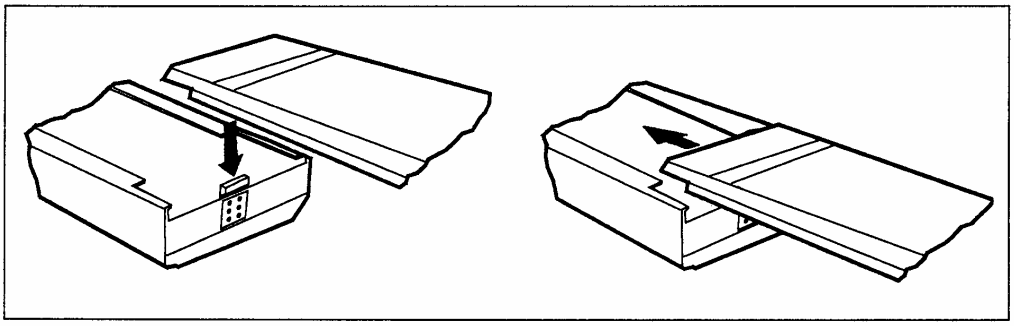


Fig. 2.6 Fitting a Battery

The battery is attached to the transceiver by placing the top of the battery over the spring loaded catch and sliding the battery up the rear cover. When it is fully in position the catch will locate.

LCD DISPLAY

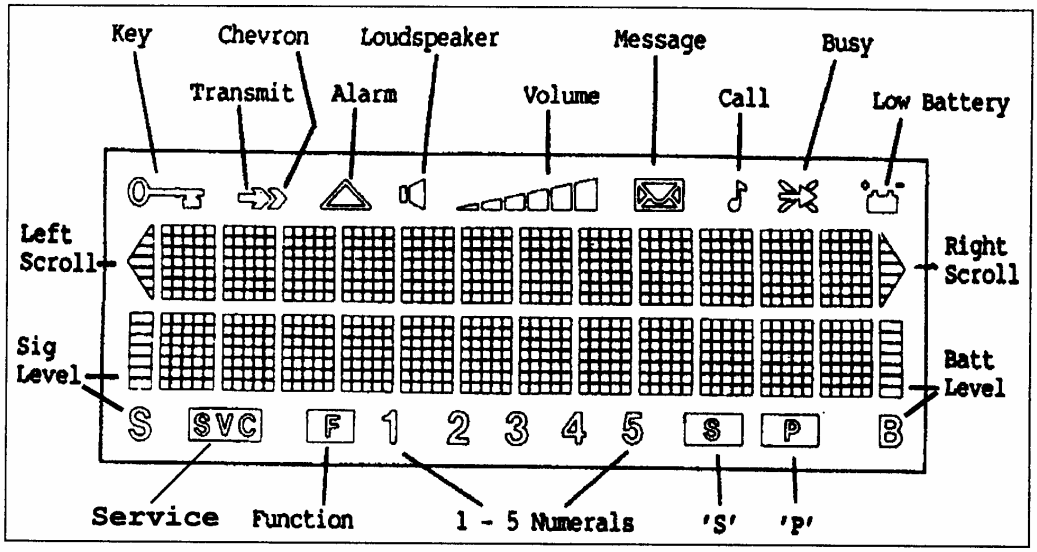


Fig. 2.7 LCD Display

Not all of the flags are used on all transceivers, and the meaning of certain flags may change depending on how the transceiver has been programmed. The following paragraphs detail the normal configuration of the flags, refer to the appropriate Operating Instructions for the use of flags on particular transceivers:-

Key

This symbol shows that the keypad has been locked by the Lock key (an optional feature which may not be present on all transceivers).

Transmit

The transmit flag is turned on whenever the transceiver is transmitting.

Chevron

The chevron flag appears whenever the higher power level for a channel has been selected. The chevron remains on display in both transmit and receive modes.

Volume

The volume flag is a 6-level ramp which gradually grows in size as the volume is increased. As the volume is increased, further sections of the ramp will appear. The lowest section of the ramp will normally always be present when the transceiver is switched on.

Busy

This flag is displayed when the channel is in use by another party and indicates that transmission may not be advisable.

Left Scroll

The left scroll flag is a left-pointing arrow situated to the left of the top line of text on the display. When turned on, it indicates that there is more text to the left of the display, which may be seen by pressing the left arrow key. The flag disappears when there is no more text available.

Right Scroll

The right scroll flag is a right-pointing arrow situated to the right of the top line of text on the display. When turned on, it indicates that there is more text to the right of the display, which may be seen by pressing the right arrow key. The flag disappears when there is no more text available.

Signal Level

The signal level flag is a 7-stage bar graph which indicates the strength of the received signal. When no signal is present none of the segments will show; when a very strong signal is present then all the segments will show.

Battery Level

The battery level flag indicates the state of the battery. A fully-charged battery will result in all seven segments being displayed; only one segment will be displayed when the battery is almost discharged.

While the battery is in the charger unit, the battery level indicator may indicate that the battery is fully charged. This is because the transceiver is measuring the voltage of the charger unit rather than the battery itself. The charger unit has its own indicator which shows when the battery is fully charged.

Low Battery

This flag appears when the battery level is low and indicates that the battery needs recharging. Transmission while the battery is in this state may cause the battery to discharge quickly.

Function

The [F] symbol appears whenever the Function key is pressed, and indicates that the secondary function of the next key pressed will be performed instead of its primary function. The press of any key, including the PTT or a second press of the Function key, clears this flag.

Secure

The [S] symbol appears whenever the transceiver is in the Secure mode (if fitted).

1 - 5 Numerals

The numerals 1 to 5 are used for a customer-specified purpose to indicate the state of various features. Many of the key functions turn a particular feature on and off with a toggling action, and the numeral flags are normally used to indicate the state of up to five of these toggle states. Refer to your supplier for details of which features are linked to each of the numeral flags.

Alarm

The Alarm symbol appears when an Alarm is in progress (if programmed).

Loudspeaker

The Loudspeaker symbol appears to indicate an open channel (if programmed).

Message

The Message symbol appears when a message is available (if programmed).

Call

The Call symbol appears when the transceiver has been called (if programmed).

Priority

The [P] symbol appears when a priority/dual watch channel is being monitored (if programmed).

Service

The [SVC] symbol appears when the transceiver is in service (if programmed).

KEYPAD

The Keypad layout and key functions are described in the PRP73 Operating Instructions; TP2951.

LED

If fitted, the LED flashes whenever the battery is getting low, and is illuminated whenever the transceiver is transmitting. If the battery starts to fail during a transmission the LED will be extinguished periodically.

APPLICATION PACKAGES

The PRP73 functionality depends on the Application Package which has been loaded. A PRP73 may be supplied with a factory default Application Package or with a Standard or Custom Application Package.

Each Application Package is customised with channel and other customer specific information, according to the requirement. A PRP70 Programmer may be used to customise an Application Package.

Details of Application Packages are given in the PRP70 Data Programmer User Guide TP1807.

SECTION 3
TECHNICAL DESCRIPTION

INTRODUCTION

The PRP73 is a range of advanced portable transceivers using the latest modern technnology to achieve a very high performance in a small size. Internally the transceiver consists of two printed circuit board assemblies, the radio PCB and the control PCB. The VHF and UHF versions are described in detail in the following sections.

RADIO PCB	CONTROL PCB
TRANSMITTER RECEIVER FREQUENCY GENERATION ANALOGUE SUPPLY REGULATORS	MAN MACHINE INTERFACE CONTROL SYSTEM AUDIO PROCESSING FACILITY INTERFACE SIGNALLING OPTIONS - CTCSS LOGIC REGULATOR

Fig. 3.1 Transceiver Top Level Block Diagram

RADIO PCB DESCRIPTION

The radio PCB assembly contains the following functional blocks:-

analogue power supplies
frequency generation
transmitter
receiver
calibration memory

These blocks are supported by an analogue Application Specific Integrated Circuit (ASIC). This device is covered under 'IC401 - Radio Support ASIC' in this Section.

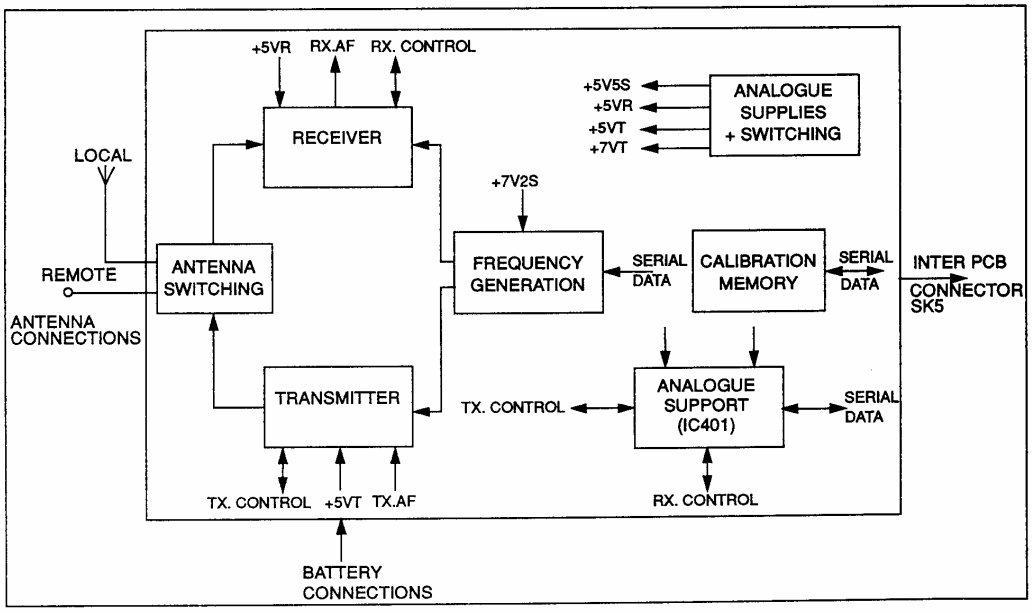


Fig. 3.2 Radio PCB Top Level Diagram

ANALOGUE POWER SUPPLIES

The main transceiver power supply is the 7,2V battery which is connected directly to the radio PCB through the battery contacts on the back of the transceiver. Inductor L503 acts as a fuse with a rating of 4A. The 7,2V supply is routed to the control PCB via SK5-20 and also feeds the following blocks:-

+5V0 analogue supply
+5V5S synthesiser supply
+5V5V VCO supply
+7VT transmitter PA input stage supply
+7V2 transmitter PA output stage
antenna change-over relay (M401)
transmitter power control circuit (see transmitter section)
battery supply monitor circuit

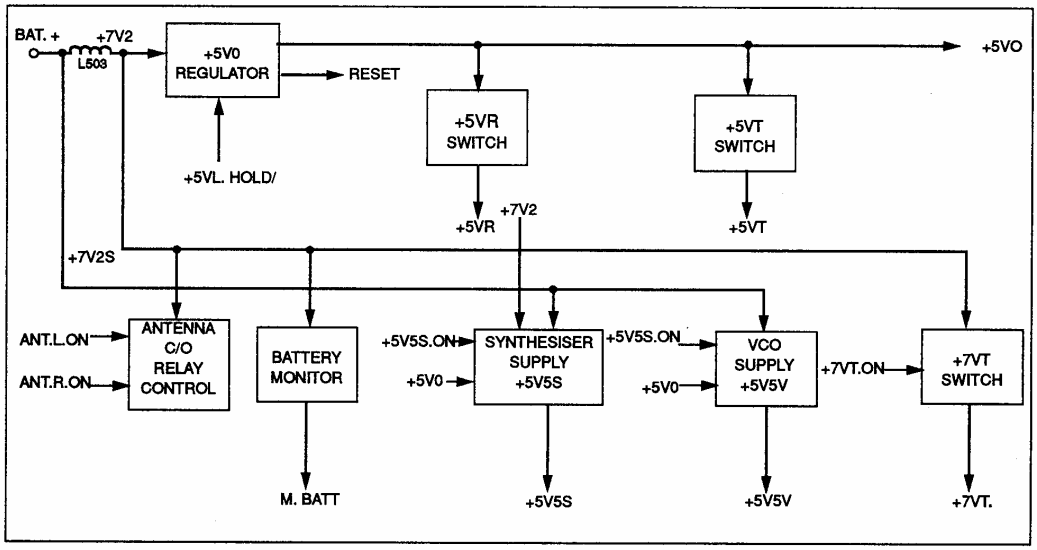


Fig. 3.3 Radio PCB Power Supplies

The +7V2 supply is unswitched and the current drawn by the board in its off state is in the order of a few hundred microamps. The board is enabled when the signal +5VL.HOLD/ from the control PCB is held low. This enables the +5V0 analogue regulator (IC403) which applies a regulated supply to the audio circuits, TCXO, calibration memory and a reference for the synthesiser and VCO regulators. Two switched supplies, +5VT and +5VR, are derived from the +5V0 supply. Transistors TR404 and TR405 perform the switching and are controlled by IC401. IC403 also produces a reset signal (A3.RESET/) which is low when the regulator is out of regulation. This is connected to IC401 and ensures all other circuits are off during power up and power down. Regulator stability is maintained by C422.

The synthesiser and VCO supplies are generated by IC303 in conjunction with the series pass transistors TR314 and TR315. This provides very clean voltages with good isolation from the other supplies within the transceiver. +5V5S is enabled by the +5V5S.ON signal from IC401; +5V5V is enabled when the +5V0 regulator is enabled.

The transmitter +7VT supply is switched by transistors TR410 and TR411 which are controlled by signal +7VT.ON from IC401.

The antenna change-over relay is a latching type and is controlled by a short pulse on the base of transistors TR406 or TR407, depending on whether the local or remote antenna is required.

Battery supply monitoring is derived from the potential divider formed by R442, R443 and R478. Signal M.BATT is multiplexed through IC401 and passes to the control PCB via signal line M.RF to be measured by the processor.

FREQUENCY GENERATION

The frequency generation consists of the following blocks:-

Synthesiser and Prescaler
TX and RX VCO's and buffers
TCXO
TCXO buffer

The synthesiser is a single loop type formed by IC301 and associated loop filter components. It contains a main divider, a reference divider, phase comparator, negative voltage generator and serial control. The serial data is transferred to the synthesiser using the signals SDA.2 (data), SCL.2 (clock) and SY.E (enable). The data consists of main division ratio, reference division ratio and status (which controls loop characteristics).

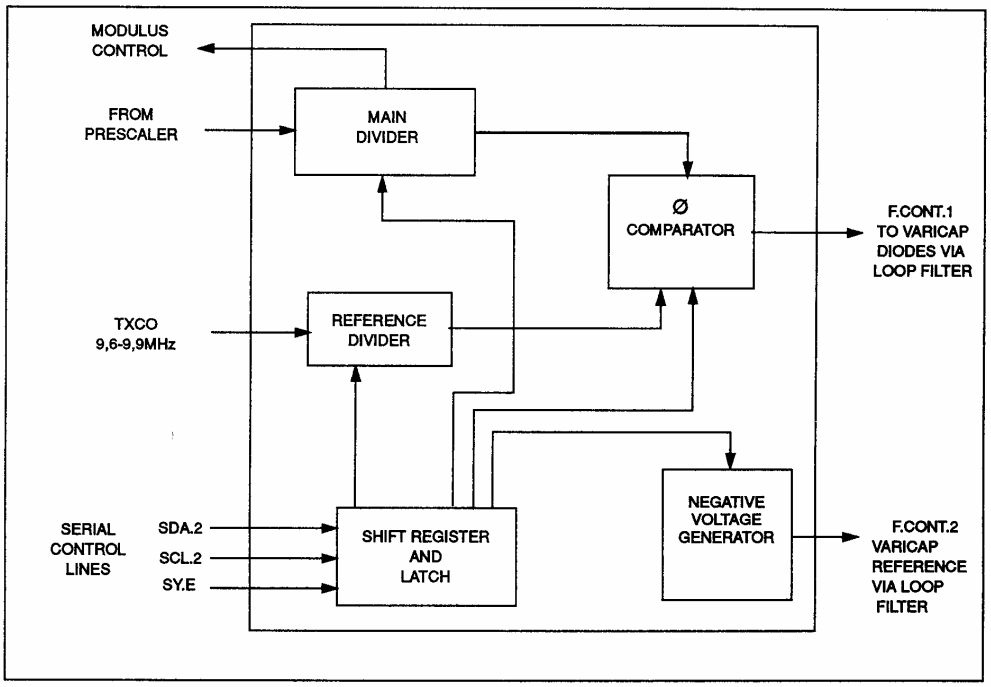


Fig. 3.4 Synthesiser Block Diagram

The reference signal is generated by the Temperature Compensated Crystal Oscillator (TCXO) and is fed via the buffer to the synthesiser IC, where it is divided by the reference divider. The buffered VCO frequency is divided by 64 or 65 in the dual modulus prescaler (IC302) and fed into the synthesiser where it is further divided by the main divider. The outputs of the reference and main dividers are compared in the phase comparator and then filtered in the passive loop filter formed by the resistor and capacitor network connected between signals F.CONT.1 (phase comparator output), F.CONT.2 (negative voltage generator output).

A lock detection signal is provided on pin 14 of IC301 and is converted to a logic signal by transistors TR310 and TR311. The output from TR311 (LOCK/) is fed to the control PCB via SK5-12 as well as to the transmitter PA control circuit.

The heart of the frequency generation is the two Voltage Controlled Oscillators (VCO's), one for the receiver and one for the transmitter. The description that follows covers the transmitter VCO.

The oscillator is formed by a FET (TR305) connected in a Colpitts configuration, the main resonator being L308, which is tuned primarily by D303 (UHF), D303 and D306 (VHF). FET TR308 is used to enable the VCO and its following buffer which is formed by TR306 and TR307. The output from this buffer is fed directly to the transmitter buffer on signal TX.INJECT.BUF as well as to the synthesiser injection buffer formed by TR312. Audio, on signal line MOD.VCO.F, modulates the VCO via diode D304.

On equipments other than 25kHz channel spacing E0 Band, the reference frequency for the synthesiser is generated by the TCXO module (M301) which contains a crystal and an integrated oscillator with temperature compensation to maintain a very close frequency tolerance over the total operating temperature range. In the case of 25kHz channel spacing E0 Band equipments the TCXO module (M301) is replaced by discrete components. The frequency is normally 9,6MHz although an alternative frequency of 9,9MHz should be fitted if 'birdies' are generated on a receiver channel. The TCXO frequency is accurately set to its nominal frequency by a DC voltage generated by a DAC within IC401. The setting of this DAC is determined during the alignment of the transceiver.

To achieve a high performance frequency generation with excellent dynamic and static operating characteristics, two point modulation is employed. This allows the loop cutoff frequency to be set sufficiently high to get fast lock times while achieving a flat modulation response down to low frequencies. The VCO modulation is fed to varicap D304 and TCXO modulation is summed with the TCXO tuning voltage in IC401 and is applied to pin 1 of the TCXO (or the relevant components on 25kHz channel spacing E0 Band equipments). The transmitter deviation and modulation balance are set by two attenuators within IC401. These attenuators are adjusted by the processor on the control PCB.

TRANSMITTER

The transmitter consists of:-

TX Buffer Amplifier
TX Power Amplifier
TX Power Control
Antenna filter and PIN diode change-over
TX Audio Path

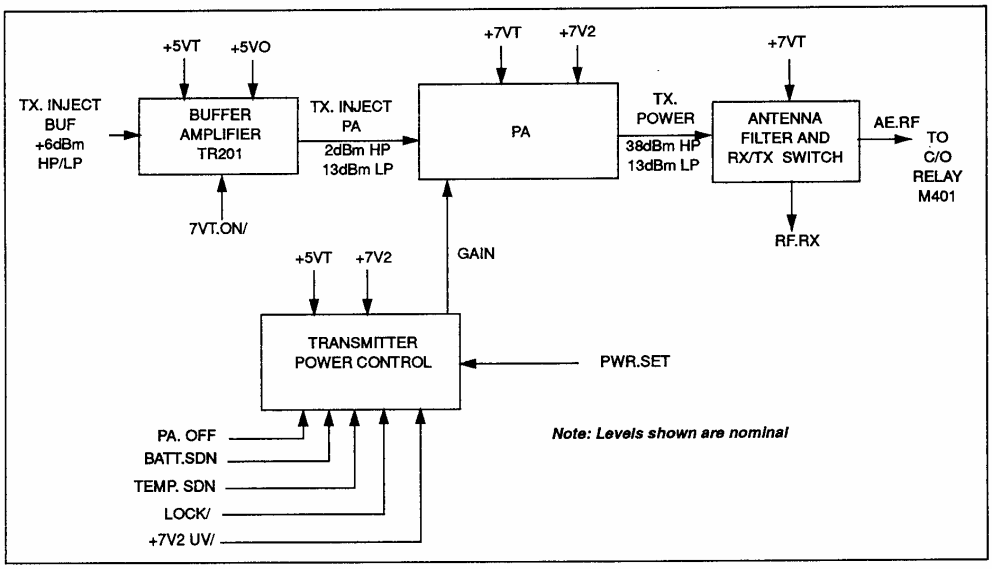


Fig. 3.5 Transmitter Block Diagram

The transmitter buffer amplifier is formed by TR201. A resistive PI attenuator, formed by R224, R225 and R226 on the input, sets the overall stage gain.

The output of the buffer amplifier drives the power amplifier with approximately 2dBm for the high power module and 13dBm for the low power module. Both modules are multistage amplifiers with an un-switched supply on the output stages (+7V2). The output of the PA module, TX.POWER, is fed to the antenna filter for low pass filtering.

The transmitter power control circuit allows IC401 to set the output power using its power control DAC. The output of this DAC is used to control the output pass transistor TR408. The GAIN signal controls the overall gain of the PA module . In order to disable the PA the following signals are provided:-

LOCK/ - disables the PA if the synthesiser goes out of lock

PA.OFF - processor control of PA
TEMP.SDN - temperature shutdown of PA above 100°C
BATT.SDN - voltage shutdown of PA when undervoltage detected

Each of these lines may turn off the PA via TR403 which reduces the GAIN line to 0V. The power rise characteristic is set by the time constant C441, C416, R427 and R431. The power fall characteristic by C441, C416 and R427.

The antenna filter and Tx/Rx change-over switch follows the PA output and is a four section elliptic low pass filter with an insertion loss of about 1,3dB. The PIN diode change-over switch formed by D201 and D202 allows transmitter power to be switched to the antenna output (AE.RF) when +7VT is applied to R217. In receive mode both diodes are turned off allowing the received signal, AE.RF, to reach the receiver input RF.RX.

RECEIVER

The receiver consists of:-

Front-end and mixer
IF amplifier
Noise squelch detector
Receiver audio path

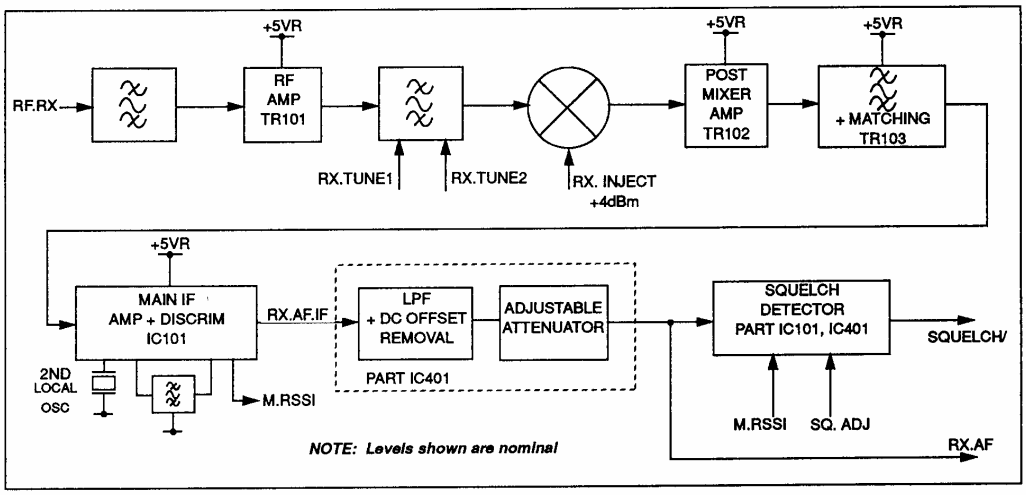


Fig. 3.6 Receiver Block Diagram

The received signal, having passed through the antenna change-over switch as RF.RX, is filtered by a multi-stage bandpass filter which covers a whole radio frequency band. The output of this filter is passed to the RF amplifier (TR101) with a gain of 12dB before passing to a two stage electronically tuneable bandpass filter. This filter, having a narrower bandwidth than the earlier bandpass filter, gives the receiver an image rejection of approximately 80dB. The filter uses high Q ceramic resonators at UHF and inductors at VHF as the main tuning elements, each of which is tuned capacitively with a varicap diode (D103, D104 for VHF and UHF, plus D102, D105 at VHF). To achieve the necessary tuning range, a maximum tuning voltage of approximately 11V is required. A 15V supply on the control board (SK5-4, +HV) is used to generate this high tuning voltage. IC401 produces two 0 - 4V DAC outputs, RX.TUNE1 and RX.TUNE2, which are used to drive two DC amplifier opamps IC102a and IC102b, supplied from +HV. The outputs of the two op-amps drive the tuning varicap diodes.

The output of the two tunable bandpass filters is fed to a single balanced mixer where it is mixed with the 1st local oscillator signal, RX.INJECT, to produce an intermediate frequency of 45MHz. Following the mixer is a post-mixer amplifier (TR102) with a gain of 15dB to make up for the mixer and bandpass filter losses. Four poles of crystal filtering follow which forms part of the adjacent channel selectivity. TR103 provides filter matching with a gain of approximately 15dB before IC101, the main IF amplifier, provides the remaining gain requirement as well as providing a second local oscillator and mixer. The 2nd local oscillator runs at 45,455MHz or 44,545MHz and is adjusted to frequency by trimmer C177. The output of the 2nd mixer is followed by the 455kHz limiting amplifier before the signal is demodulated by the quadrature

detector which is aligned by L116. Ceramic filter, M109, provides the balance of the adjacent channel selectivity at 455kHz. IC101 contains a receiver signal strength indicator (RSSI), output on pin 13, that is fed via the IC401 multiplexing switch to the processor ADC on the control PCB.

The demodulated received audio (RX.AF.IF) is fed to a summing junction formed by an op-amp within IC401. A variable DC offset is summed in at this point to nominally reference the recovered audio to +2V5.INT. Any change in the received carrier frequency then appears as a DC offset with respect to +2V5.INT. The signal is then fed to an 8dB adjustable attenuator which is used to set the level of recovered audio to 0,6V pk-pk for 60% system deviation at RX.AF. This signal is fed to the control PCB via SK5-15 and to the noise squelch circuit.

Noise squelch

The demodulated received audio signal, RX.AF, is fed to a 10kHz bandpass noise filter formed by an op-amp within IC101. Filtered noise is passed to a voltage controlled attenuator (TR402) which is controlled by the DAC signal SQ.ADJ from IC401. This attenuator is used to set the level of noise into the gain stage that follows formed by an op-amp within IC401. This gain stage also provides temperature compensation. The output of this stage is fed to a rectifier which produces a DC level in proportion to the noise. A comparator within IC401 compares this with a fixed reference (SQ.REF) and produces an interrupt,SQUELCH/, which is routed to the processor via SK5-10. For high squelch thresholds RSSI is switched to the input of the comparator rather than the rectified noise, and the comparator reference is modified by SQ.REF from the squelch DAC within IC401.

CALIBRATION MEMORY

The tuning DACs within IC401 are controlled by the processor via the serial bus. However, the basic characteristics of the radio hardware need to be known by the processor in order that the best performance is achieved. During alignment all 'electronic' adjustments are optimised and then stored in IC402 which is a 256 byte serially accessed memory (using the I^2C protocol). For frequencies other than those at which the radio was aligned, the processor calculates the 'best fit' value for the DAC using the stored data as its reference.

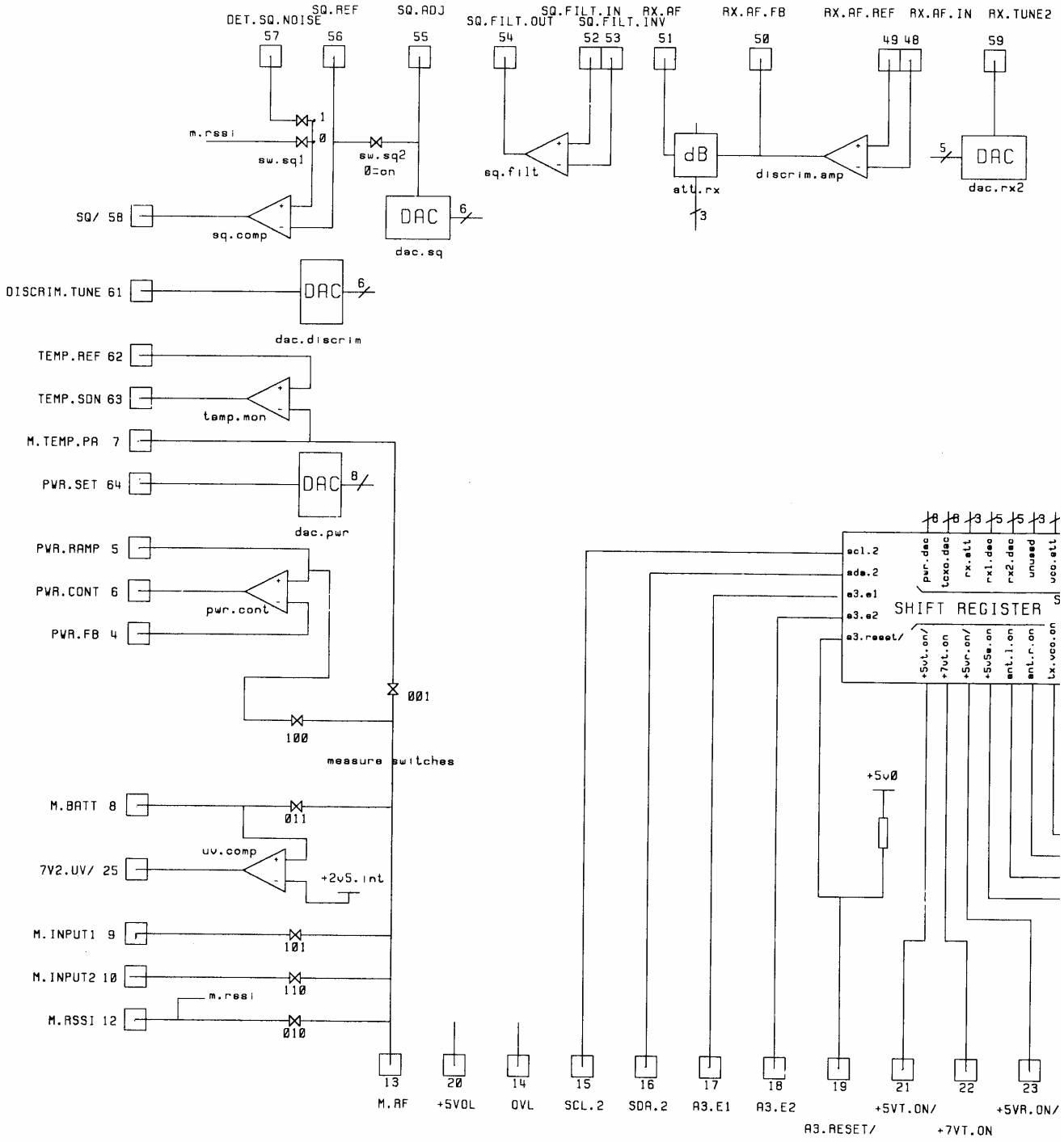
Using the calibration memory in this way allows any Radio PCB to be interchanged with any other Radio PCB; the characteristics of the radio will always be known by the processor and hence the best performance will be obtained.

IC401-Radio Support ASIC

The ASIC contains DACs, attenuators etc and provides the following functional blocks:-

Dual shift register control
TX power setting DAC
Dual front-end tuning DACs
TCXO tuning DAC
Receiver DC offset DAC
Squelch threshold DAC
VCO and TCXO modulation attenuators
Receiver recovered audio attenuator
Squelch circuitry
Modulation path control and switching
DC signal multiplexing

These are covered in the preceding paragraphs.



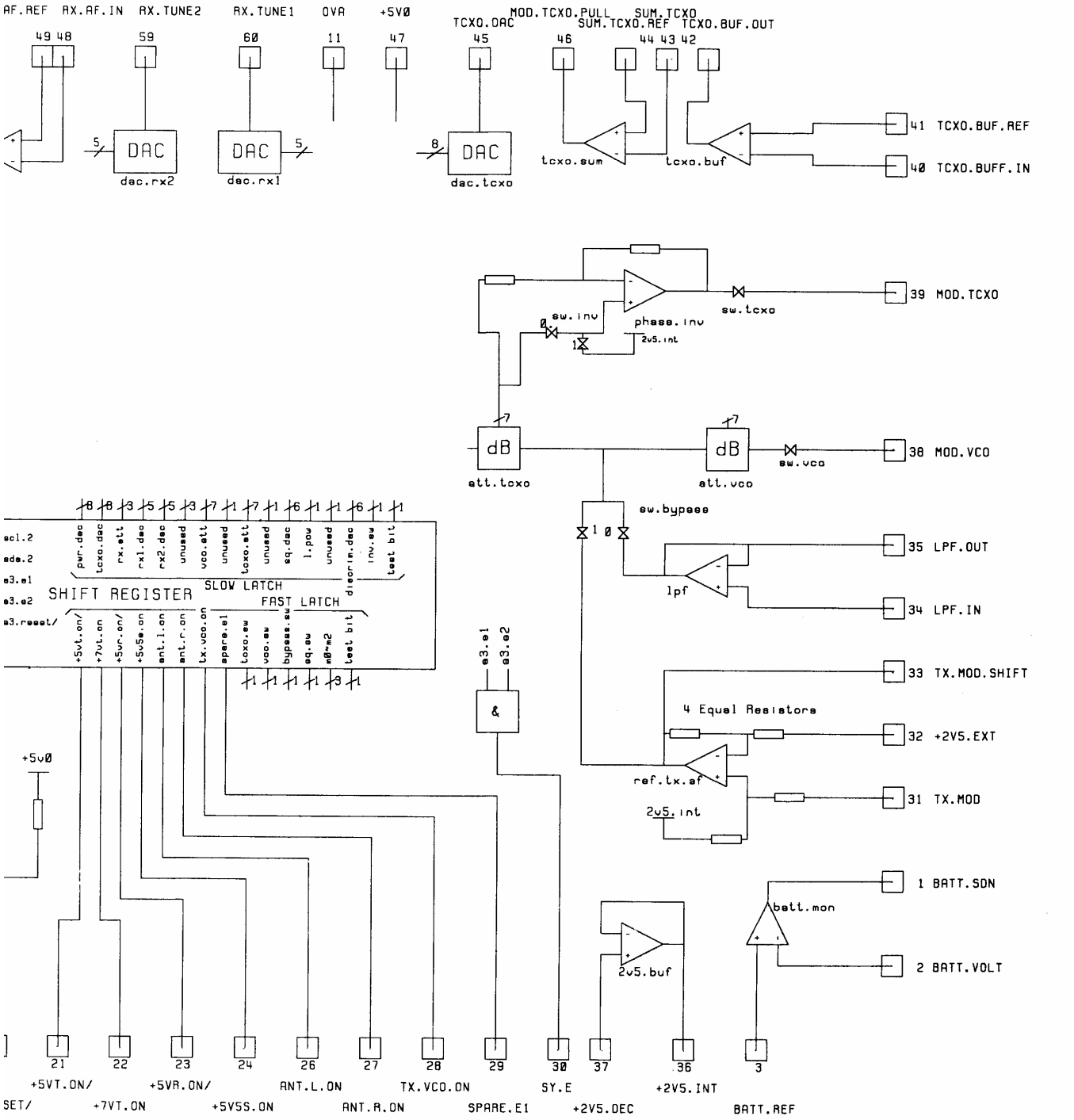


Fig. 3.7 ASIC3 (IC401) Diagram

CONTROL PCB DESCRIPTION

The PRP73 Control PCB consists of the following functional blocks:-

Power Supply and on/off control
Processor Control System
Display and Keypads
Audio Processing
Signalling
Facility Socket Interface

There are two ASICs on the control PCB, IC2 is a logic support device and is included under the processor control system, IC3 is an analogue support device and is included in a separate section.

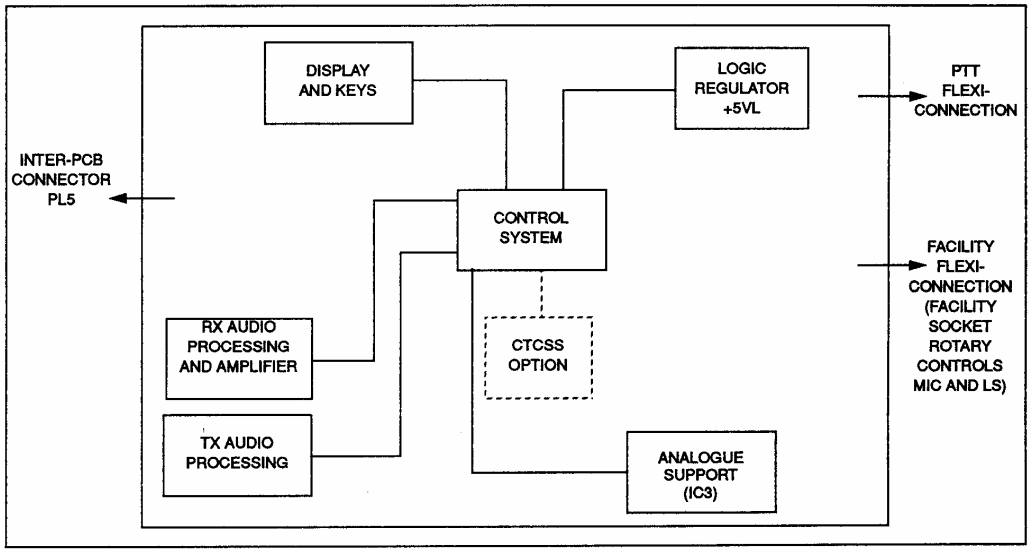


Fig. 3.8 Overall Top Level Control Block Diagram

POWER SUPPLY AND ON/OFF CONTROL

IC14 forms the main logic regulator, generating the +5VL supply. This regulator operates in an identical manner to the analogue (+5V0) regulator on the radio PCB generating a reset signal (RESET/) which controls the state of the logic and of the analogue circuitry during power-up and power-down. Both the +7V2 and +5V0 supplies are used on the control PCB for supplying analogue circuits.

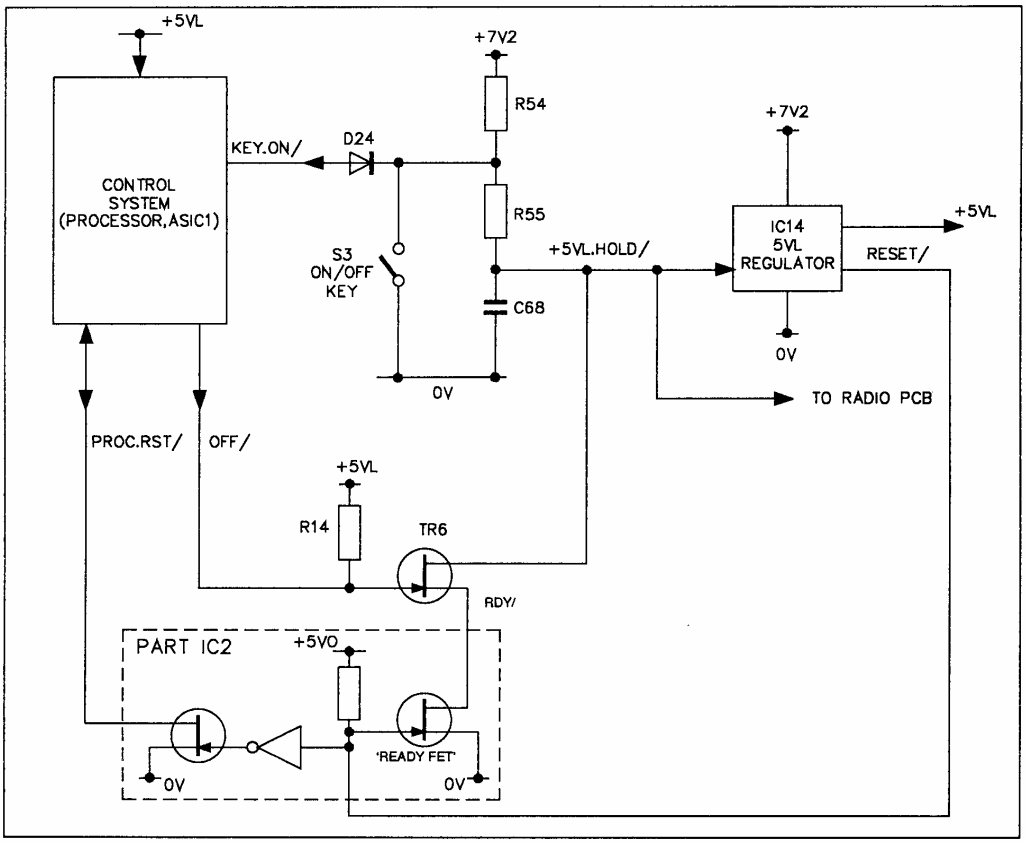


Fig. 3.9 On/Off Circuit

Turning on

The PRP73 may be turned on by either:-

pressing the on/off key (S-3)
by attaching a charged battery (if the transceiver is in the 'on ' state).

When switch S-3 is pressed the +5VL.HOLD/ signal goes low enabling the +5VL regulator (IC14). Whilst the regulator output slews up to 5V, pin 5 (RESET/) remains low, holding the processor, IC2 and IC3 in a reset state. As soon as the +5VL supply is in regulation the RESET/ signal goes high turning the READY FET in IC3 on (ie signal RDY/ will be low). The OFF/ signal from the processor remains tri-state until the processor completes its power up sequence, but resistor R14 pulls the gate of TR6 high so holding the +5VL.HOLD/ low and hence maintaining the power on the +5VL supply. The +5VL.HOLD/ signal also powers up the +5V0 regulator on the Radio PCB via PL5-2.

Alternatively when a battery is attached to the transceiver, capacitor C68 is initially uncharged. This holds the +5VL.HOLD/ signal low for sufficiently long enough to allow a normal power up sequence as described above to start. If an external power supply is used to power the transceiver, the rise time must be short enough to allow an automatic power up. When powering up by this method the processor checks whether the transceiver was previously switched off with the on/off key; if not the transceiver remains powered up, otherwise the processor automatically initiates a power down.

Diode, D24, allows the processor to detect a press of the FUNCTION key during normal operation of the transceiver.

Turning Off

Turning the PRP73 off may be by:-

pressing the on/off key
low battery detection by the processor
low battery detection by the +5VL regulator

Turning off with the on/off key causes the processor to save the off state in the E^2PROM before initiating a power down.

A processor initiated power down, pulls the OFF/ signal low. This turns off TR6, and so releases the +5VL.HOLD/ signal causing both the +5VL and +5V0 regulators to turn off. As the regulators slew down, pin 6 (RESET/) will go low and so holding the processor, IC2 and IC3 in reset until the supply has gone low enough to stop the logic operating.

A low battery detection by the +5VL regulator immediately forces the RESET/ signal low and therefore shuts down the transceiver in a controlled, safe state.

PROCESSOR CONTROL SYSTEM

The processor IC1, forms the centre of the control system. Its main features are:-

large memory addressing capability
high speed bi-directional serial port
UART for RS232 communication
Two Pulse Width Modulators
Static Registers
Three channel ADC

Its operating speed of 8,064MHz, gives an minimum instruction cycle time of around 0,5µs. The total addressable memory capacity is 384K bytes of which 256K is program memory and 128K is 'data' memory. The address bus is AD0- AD7, A8-A17. The address and data are multiplexed: signal ALE indicates whether address or data is present on AD0-AD7.

The memory capability of the PRP73 Control PCB consists of:-

256K of FLASH EPROM for program storage (IC5)
32K of SRAM for volatile data (IC6)
8K of E^2PROM for storage of customisation (IC4)

The addressing of these devices is on the parallel bus each being individually chip selected by IC2 (see later).

The programmable FLASH EPROM is normally treated as a read only device. However, if it is required to change the software in the PRP73 it is possible to download the new code using the RS232 bus. To ensure successful writing of the new code to the FLASH EPROM a 12V DC programming voltage is required.

IC2 consists of :-

Address decoding
Processor and option clock control
Interrupt capture
Serial bus switching

as shown in Fig. 3.10.

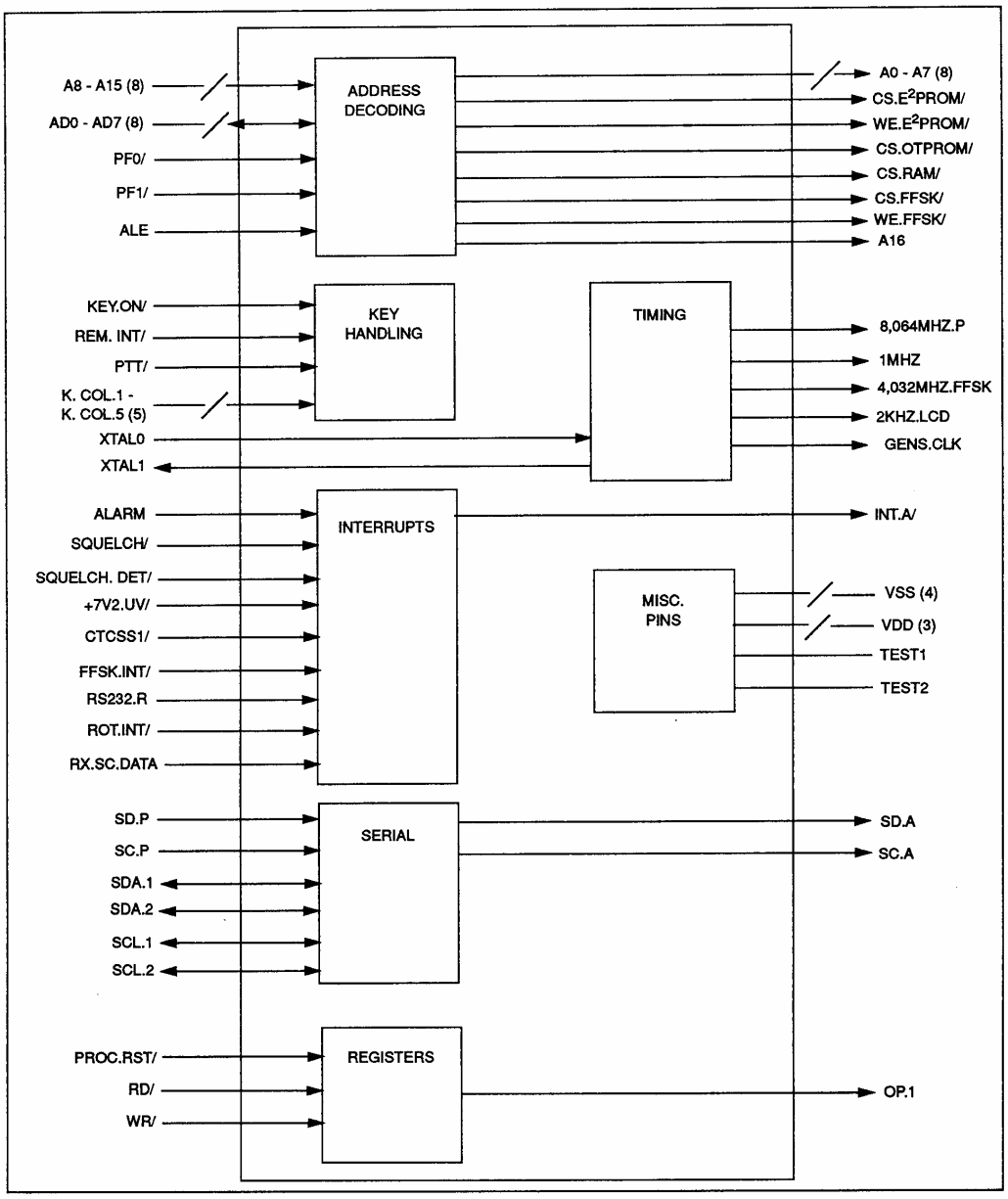


Fig. 3.10 IC2 Overall Block Diagram

IC2 provides the following parallel bus control signals:-

CS.OTPROM/	-	FLASH EPROM chip select
CS.RAM/	-	SRAM chip select
CS.E^{2}PROM/	-	E^{2}PROM chip select
CS.FFSK/	-	FFSK modem chip select
WE.FFSK/	-	FFSK write enable
WE.E^{2}PROM/	-	E^{2}PROM write enable
A16	-	Address line 16 (to access devices above 64K bytes)

to allocate memory, as shown in Fig. 3.11.

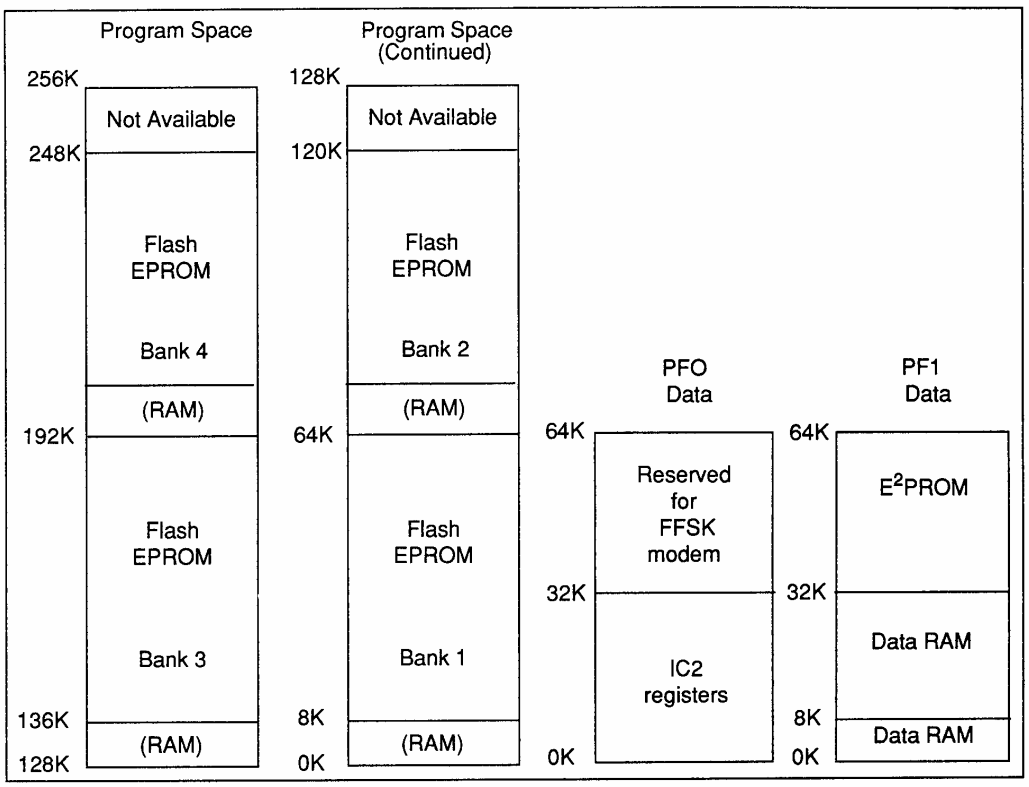


Fig. 3.11 Memory Map

The master clock signal is generated by a Colpitts oscillator running at 8,046MHz based around TR15. TR16 is controlled by the logic output OP.1 (IC2 pin 4) and is used to pull the oscillator frequency by approximately 500ppm. The processor uses data stored in E^2PROM (IC4) to determine whether a sub-harmonic of the clock falls within the current receiver channel. If it does, the processor pulls the clock frequency by changing the state of OP.1 so moving the interfering signal to another frequency.

A flexible screen, fitted over the Control PCB provides additional screening on E0 Band equipments; this reduces general processor and I^2C noise entering the receiver.

The master clock signal is used to derive clock signals for :-

Processor (8,064MHZ.P)
CTCSS encoder/decoder (1MHZ)
High voltage/negative voltage generator (GENS.CLK)
LCD (2KHZ.LCD)

Each of these clock outputs is individually controlled by the processor, allowing them to be either switched off to conserve power or to be switched to alternative frequencies if required.

The processor clock normally runs at 8,064MHz. However, if there is no processing required, the processor will instruct IC2 to remove its clock and so stop the processor to conserve power. The clock will be re-applied if an interrupt is detected by IC2.

The following signals form interrupts to IC2:-

SQUELCH/	- noise or RSSI squelch signal detected
REM.INT/	- accessory detected or remote key pressed
PTT/	- PTT pressed
CTCSS1/	- valid CTCSS tone detected
+7V2.UV/	- 7V2 supply under voltage detection
SPEECH.DET/	- VOX speech detected

ALARM	- Pull alarm activated
K.COL.1 to K.COL.5	- keyboard matrix columns
KEY.ON/	- on/off/function key pressed

As well as these interrupts there are several internally generated interrupts including:-

selcall decode zero crossing detected
I^2C start condition detected
RS232 message received
SYSCLK, system timer clock expired

These interrupts are passed to the processor via the INT.A/ interrupt line , the processor interrogating IC2 as to which interrupt occurred before proceeding with any other processing.

Communication between devices within the PRP73 is carried out using a serial bus structure generated by the processor and switched by IC2 between the radio PCB (Bus 2) and the control PCB (Bus 1). Both buses support two communication protocols, these being:-

the Philips I^2C two wire bi-directional bus
a three wire uni-directional bus.

Both buses use the SDA (data) and SCL (clock), but the three wire bus requires a separate enable signal to support each device.

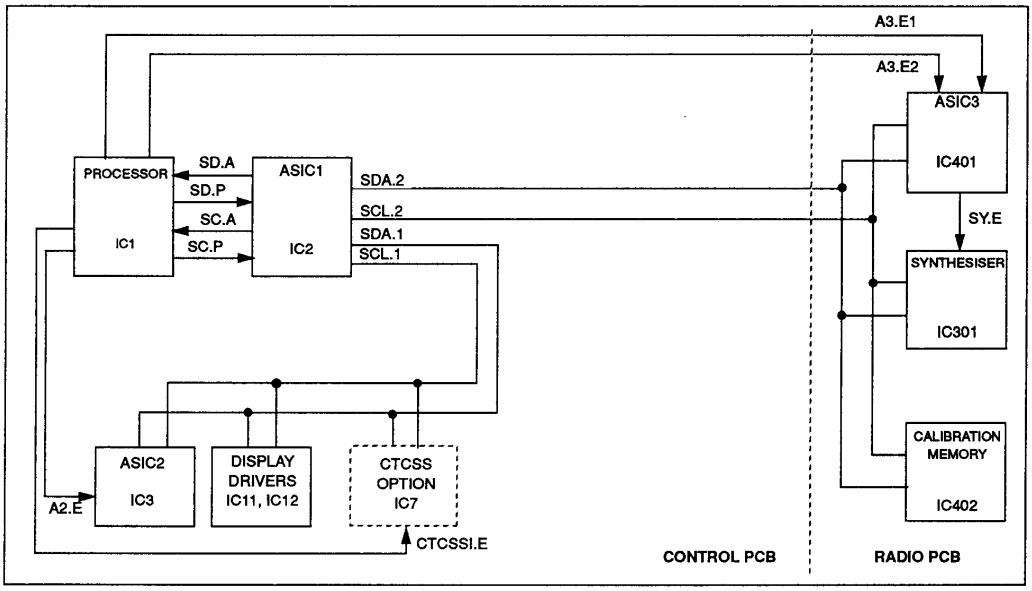


Fig. 3.12 Serial Bus Structure

Bus 1 controls:-

LCD drivers using I^2C protocol
IC3 using three wire protocol (enable is A2.E)
CTCSS encoder/decoder using three wire protocol (enable is CTCSS1.E)

Bus 2 controls:-

ASIC3 (IC401) using three wire protocol (with enables A3.E1 and A3.E2)
Synthesiser using three wire protocol (enable SY.E)
Radio Calibration Memory using I^2C protocol

DISPLAY AND KEYPADS

The display is an LCD with two lines of twelve characters plus a number of 'flags' which are used to indicate various functions. Each character position is made up of a 5x7 matrix of dots, any of which can be individually turned on or off. In order to reduce the number of connections between each LCD segment and the associated drivers the display is multiplexed at 16:1. Each segment is addressed on one of 16 rows and one of 62 columns.

The display is driven by IC11 and IC12. IC12 is a row and column driver and IC11 is a column driver only. Each device is accessible on serial bus 1 using the I^2C protocol.

The display multiplex frequency is set by the clock signal 2KHZ.LCD which is generated by IC2 and fed to both drivers. To achieve a usable contrast with such a high multiplex rate requires approximately 9V of total voltage swing on the LCD. With +5VL as the driver supply, a negative voltage of -4V is needed. This is generated by TR3 and associated components and applied to both drivers on -4V.LCD. Adjustment of the negative voltage allows both contrast and viewing angle to be altered, this being achieved by signal VIEW.ANGLE.LCD which is a 0 to 5V output from a DAC on IC3 and is applied to the base of TR3.

Actuation of the keys on the PRP73 is detected as part of a 5x5 matrix except the PTT and ON/OFF/ FUNCTION keys both of which are single line interrupt signals. Whenever a key is pressed or released in the matrix, IC2 will generate a debounced interrupt on signal INT.A/. The processor then scans the matrix using the K.ROW and K.COL signals to detect which key has changed state.

AUDIO PROCESSING

The audio processing on the control PCB is divided into two sections, Rx audio path and Tx audio path. These operate as follows:-

Receiver Audio Path (see Fig. 3.13)

The received audio is routed from the radio PCB via PL5-15 (AF.RX). This is a DC coupled signal, nominally biased around a mid-rail voltage of 2,5V. However, the exact DC level on this signal will be dependant on the carrier frequency difference between the expected and the actual received signal. The audio level on this signal is approx 1V pk-pk corresponding to peak system deviation.

AF.RX is routed directly to any signalling options and also to IC3 where the path is selected as being direct or via any selected signalling option if audio path filtering is required (eg through the CTCSS high pass filter to removed the received CTCSS tone). The switched signal (RX.SW) is routed to the receiver noise limiter. This limiter is set to soft clip audio signals above approximately 120% peak system deviation and so reduce the effect of ignition noise bursts. The output of the noise limiter is connected to a summing amplifier where alert tones are summed in. The amplifier provides de-emphasis with R41 and C40. The output of the summing amplifier is connected to the electronic volume control within IC3 (signal VOL).

The processed audio is switched to either the internal loudspeaker amplifier on AF.LS.I or the remote loudspeaker amplifier on AF.LS.R. IC13 contains two bridge amplifiers which can drive either the internal and remote loudspeakers with a power of 0,5W rms. It is switched off when not in use by the switch and supply clamp consisting of TR5 and TR13. The loudspeakers each have an impedance of 16Ω.

Transmitter Audio Path (see Fig. 3.13)

The speech signal generated by the internal microphone is fed to the control PCB via flexi circuit 2 to SK4-6. To reduce common ground pickup the microphones (both internal and remote) have their own ground return to a star ground point on the control PCB. The remote microphone becomes live when attached to the PRP73, however, the internal microphone must be disabled under these conditions by TR9. Both microphones have a low impedance supply generated by TR10.

Capacitor C53 and resistor R91 provide microphone shaping, which is followed by the microphone gain control FET TR11. When this FET is enabled by IC3 the microphone gain is reduced by approximately 10dB from its normal setting. Pre-emphasis is provided by C52 and R90. Quad op-amp IC10 makes up the majority of the transmitter audio processing as follows:-

IC10a is a variable gain microphone amplifier controlled by FET TR7. IC10b is an amplifier with a fixed gain of approximately x20. Signal TX.DIRECT is the output from this stage and is fed to IC3 to be switched to:-

the CTCSS high-pass filter to remove low frequency speech

the remote audio processor
direct (straight through)

Having been selected, the audio is fed to TX.LIMITER.IN (except in the case of the remote audio processor when it is fed as TX.HF.MOD to the audio summer further along the processing chain.

From TX.LIMITER.IN the audio is limited by IC10c and then low pass filtered and limited again by IC10d. The output COMP.TX is then fed to the audio summer which is contained within IC3. The same summing junction also allows selcall tones (TONES), CTCSS tones (CTCSS1.TONE) or FFSK audio (FFSK.TX) to be added to the transmitted audio.

The output from the summing amplifier,TX.AF is passed to the radio PCB via SK5-13 for further filtering and level setting before modulating the transmitter. The level of audio on TX.AF is nominally 0,6V pk-pk for 60% system deviation. The output from IC10c is converted to a DC level by active rectifier TR8 and smoothed by C119. The resulting DC voltage is proportional to the speech level and is used to reduce the gain of IC10a using FET TR7 as a voltage controlled resistor. This circuit forms the transmitter audio compressor which gives a low distortion, high clarity speech signal in noisy operating environments.

TR12 is used to derive a speech level and reference for the VOX. A comparator within IC3 uses VOX.LVL as a reference and VOX.IN as the current speech level. The comparator generates an interrupt on SPEECH.DET/ which signals the processor that speech is present. Further adaptive measurements of the current speech or external noise level can be made by the processor measuring the level on VOX.IN.

All signals from the input of IC10a to the transmitter modulator are referenced around a mid-rail supply voltage of 2,5V which is derived by IC3 from VMR.IN and fed to amplifiers as a low impedance signal V.MR.

SIGNALLING OPTIONS

The following options are available:-

Selcall encode/decode
DTMF encode
Toneburst
CTCSS encode/decode (hardware option)

SELCALL

Encode

Selcall encode tones are generated by the tone generator in IC3 in conjunction with the pulse width modulator outputs, PWM.1 and PWM.2 from the processor. Within IC3 the PWM signals at six times the required tone frequency are synthesised into pseudo-sinewaves which appear at pin TONES and are pre-emphasised by C24 and R25 before being summed into the transmitter summing amplifier.

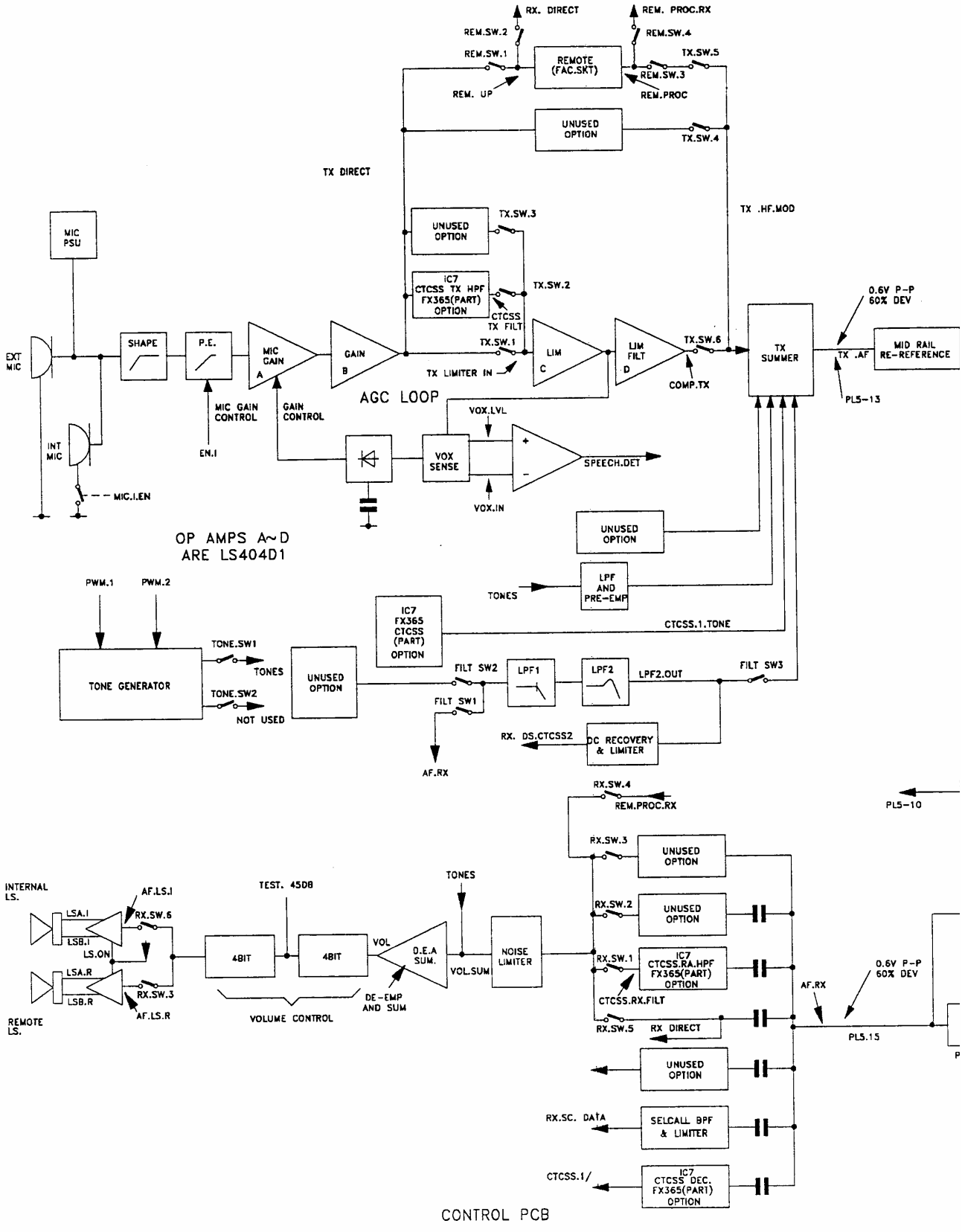
Decode

Receiver audio is fed into bandpass filter formed by R76, R77, R78, C25 and C40 which filters high and low frequency noise from the incoming tones. The output of this filter is fed to the selcall decoder limiter on signal SC.LIMIT.IN where the tone is converted to a logic signal (signal RX.SC.DATA).

This signal is passed to IC2 where every negative edge causes a timer in IC2 to be stored by the processor at the time at which the edge occurred. At the same time an interrupt on INT.A/ signals to the processor that an external event has occurred. The processor then reads the captured time and uses it to determine the incoming tone frequency and hence build a sequence of tones in its memory. When a tone sequence ends, the processor matches it with the identities stored in the E^2PROM and generates a response if there is a valid match.

DTMF

DTMF encode tones are generated using the tone generator in IC3. The two processor PWM outputs run at different frequencies allowing the two tones to be generated. The connection to the transmitter audio path is via the TONES signal (as selcall encode).



TP320/2

Note: Unused options shown are potential variants, shown for completeness only.

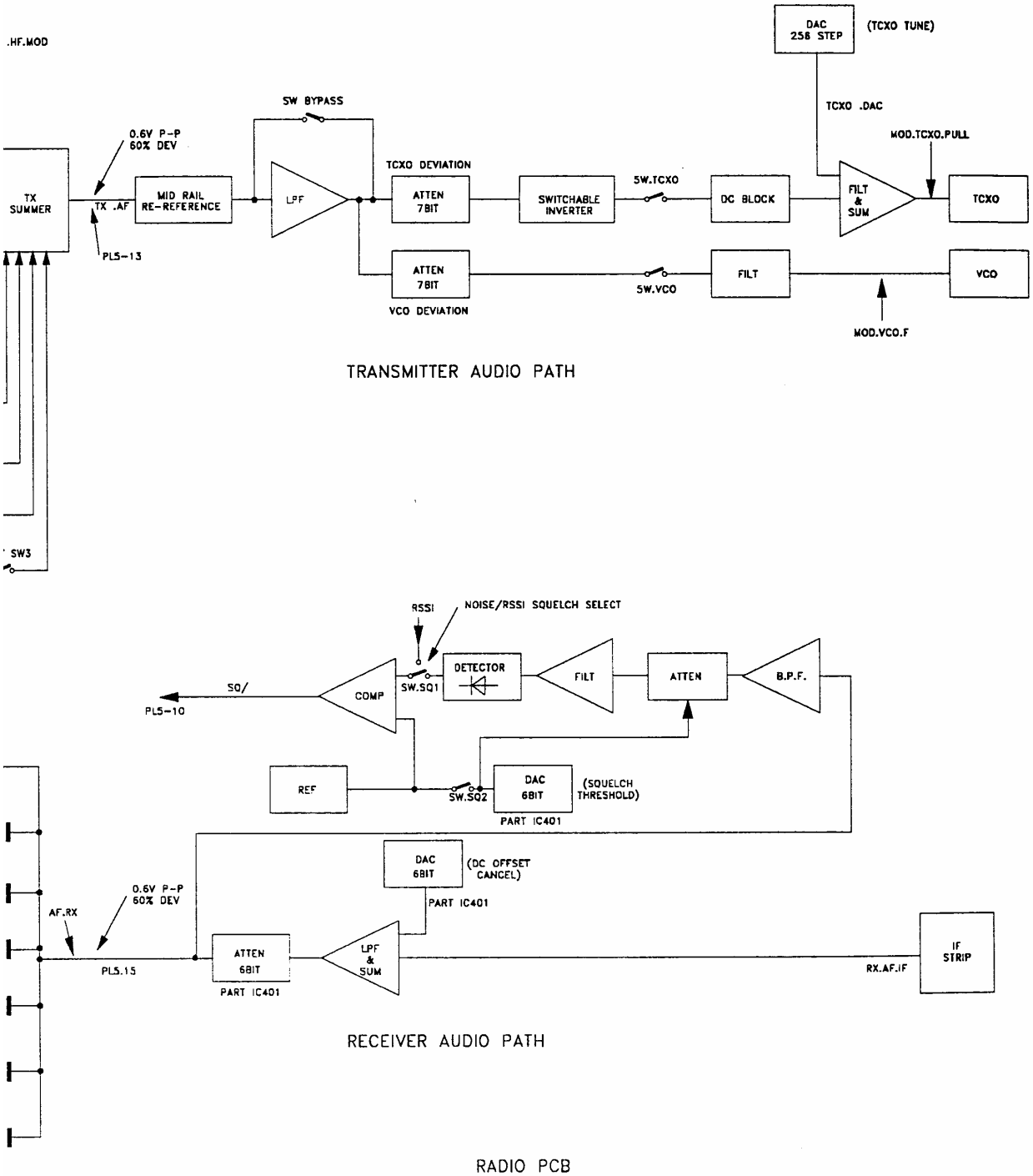


Fig. 3.13 Tx/Rx Audio Path Block Diagram

CTCSS

Hardware option CTCSS is handled by IC7 and associated components. The device is controlled by serial bus 1 using the three wire protocol. The CTCSS encode tone is fed on signal CTCSS1.TONE to the transmitter audio summing amplifier via R28 which sets the relative level of the tone. Reverse Toneburst is generated within the IC giving a 180 degree phase shift, the duration of which is determined by the processor.

Received audio on AF.RX is routed to IC7 for decoding. The device contains a digital decoder which is able to predictively detect a tone in the range 67 to 250 Hz in very low signal to noise ratios. When a tone is detected, signal CTCSS1/ goes low and interrupts the processor via IC2.

IC7 also contains a high pass filter to remove low frequency speech components on the transmit audio path and the received tone on the receive path. This filter is switched into the audio path by IC3 (see audio processing).

TONEBURST

Toneburst is generated by the same mechanism as selcall encode tones.

FACILITY SOCKET INTERFACE

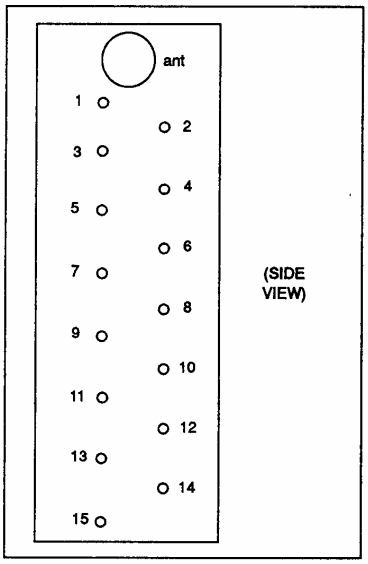


Fig. 3.14 Facility Socket

The facility socket provides the following signals:-

Pin No.	Signal Name	Function
1	+6V8.R	Remote accessory supply output (un-switched)
2	0V.R	Ground
3	MIC.-.R	Remote microphone ground return
4	MIC.+	Microphone live
5	REM.IN.R	Remote accessory identification
6	LSA.R	Remote loudspeaker
7	LSB.R	Remote loudspeaker
8	RS232T.R	RS232 output
9	RS232R.R	RS232 input
10	REM.OUT.R	Remote accessory output
11	PTT.R/	PTT input
12	KEYS.R	Loudspeaker/Microphone Unit keys analogue level

13	ALARM.R	Pull alarm input/FLASH re-programming voltage
14	REM.UP	Un-processed audio to remote audio processor
15	REM.PROC	Processed audio from remote audio processor
coax skt		Remote antenna/RF connection

This socket is used to interface to external accessories including:-

Test Interface Unit
Loudspeaker/Microphone Units
Vehicle Adaptor
Programmer
Cloning cable
Headsets
Remote audio processor (general external option interface)

All accessories are identified by a voltage on pin REM.IN.R of the facility socket. This is set by an external resistor (see table on circuit diagram for resistor/accessory identification). The signal REM.OUT.R is used to control the external alert output from the vehicle adaptor and also to 'mirror' the state of the squelch when used with the remote audio processor option.

IC3

IC3 consists of number of circuit functions (op-amps, comparators etc) that form the following functions within the transceiver:-

Serial control
Vox detection
Transmitter audio path control
Receiver audio path control
DC signal multiplexing
Viewing angle control DAC
Backlighting control
Selcall decode
AFC DC recovery
Tone generation

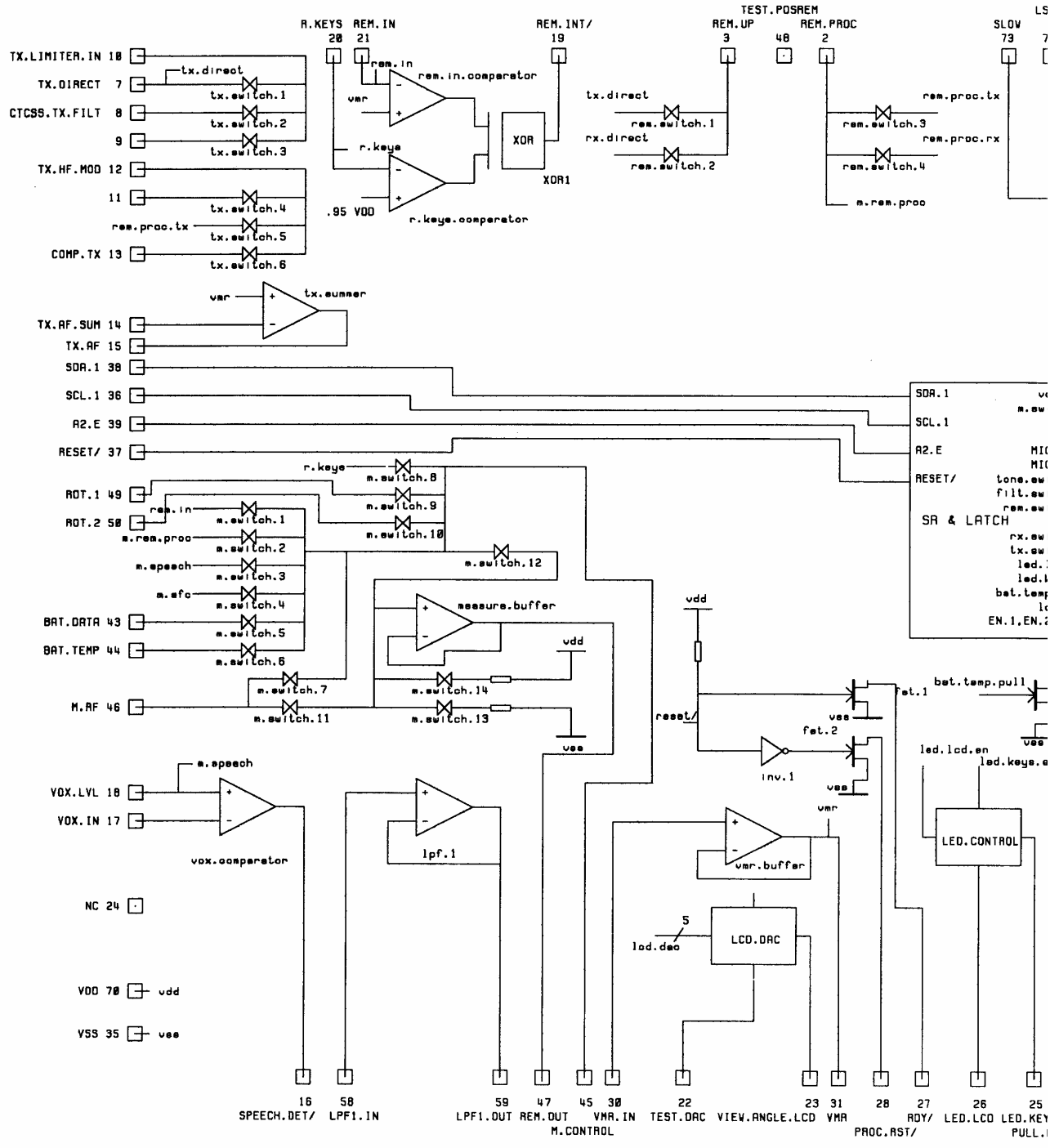
The serial interface for IC3 provides direct processor control using a single 48 bit word of :-

Mic. gain control (EN.1)
LCD viewing angle (VIEW.ANGLE.LCD)
Battery charger control (PULL.BAT.TEMP)
Backlighting LEDs (LED.KEYS, LED.LCD)
Transmitter audio path selection
Receiver audio path selection
Tone generators and routeing
Remote audio path routeing
Microphone enables (MIC.I.EN)
Speaker amplifier enable (LS.ON)
Analogue measure multiplex switches
Digital volume control

The above functions are described in the preceding paragraphs.

IC2 PIN FUNCTIONS

Pin No.	Input/Output	Signal Name	Function
1	I	XTAL1	Clock input
2	O	XTAL0	Clock output
3	-	VSS1	Logic Ground
4	O	OP.1	not used (U0 Band); clock pulling (A9 Band)



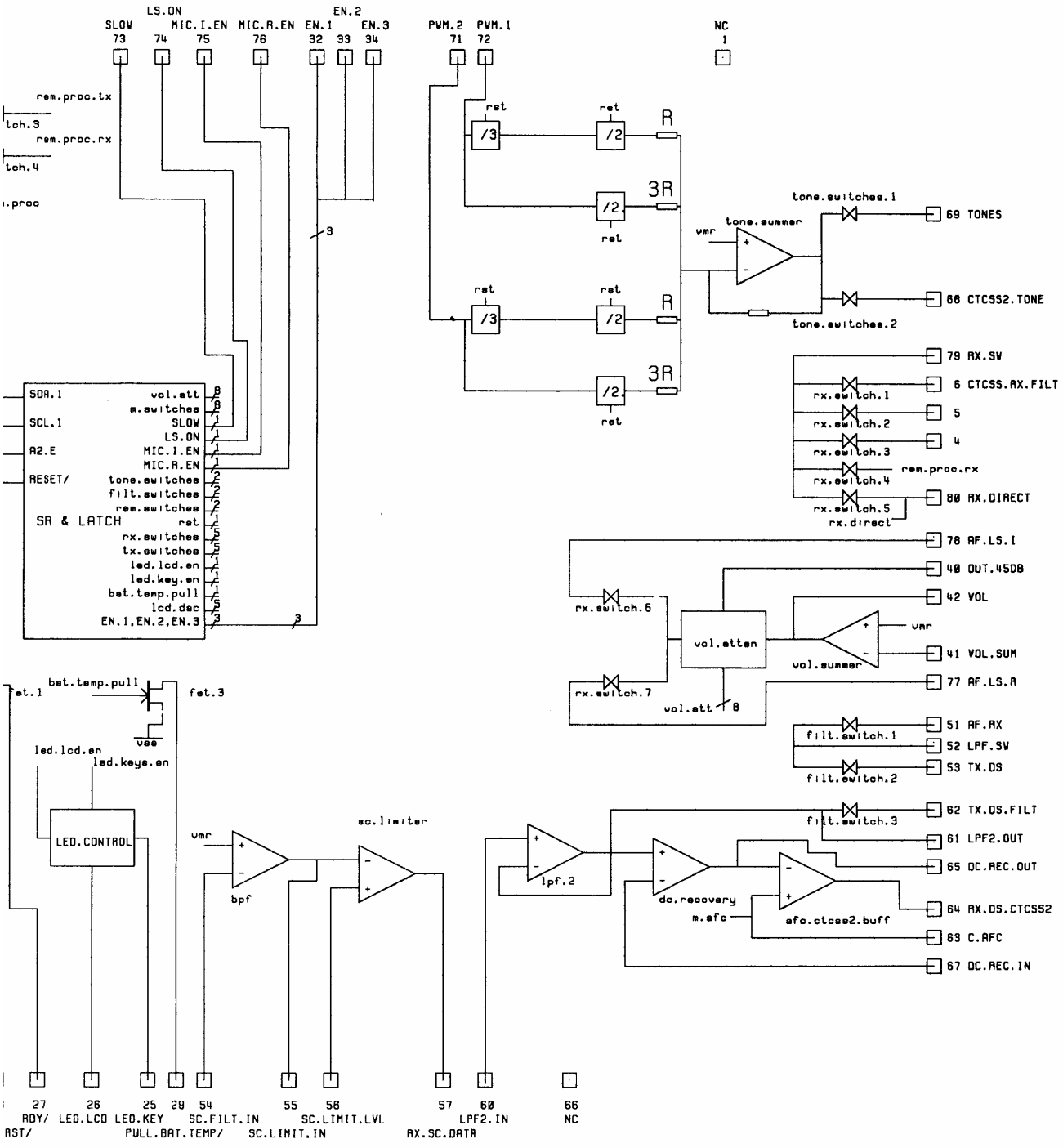


Fig. 3.15 IC3 Block Diagram

IC2 PIN FUNCTIONS (Cont'd)

Pin No.	Input/Output	Signal Name	Function
5	O	SD.A	serial data from ASIC to processor
6	O	GENS.CLK	voltage generators clock
7	O	4,032MHZ.FFSK	FFSK modem clock
8	O	1,000MHZ	CTCSS clock
9	O	2KHZ.LCD	LCD clock
10	O	A16	Address line 16
11	O	CS.OTPROM/	FLASH EPROM chip select
12	O	CS.RAM/	SRAM chip select
13	O	CS.FFSK/	FFSK modem chip select
14	O	CS.EEPROM/	E^2PROM chip select
15	O	WE.EEPROM/	E^2PROM write enable
16	-	VDD1	5V logic supply
17	I	K.COL.1	key matrix column 1
18	I	K.COL.2	key matrix column 2
19	I	K.COL.3	key matrix column 3
20	I	K.COL.4	key matrix column 4
21	I	K.COL.5	key matrix column 5
22	I	KEY.ON/	on/off/function key pressed
23	I	REM.INT/	remote accessory/keypress detected
24	I	FFSK.INT/	FFSK data received
25	I	PTT/	PTT pressed
26	I	CTCSS1/	CTCSS decode tone detected
27	I	+7V2.UV/	7V2 supply under voltage detected
28	I	SPEECH.DET/	VOX speech detected
29	I	SQUELCH/	noise or RSSI squelch detected
30	I	ALARM	pull alarm activated
31	-	VSS2	logic ground
32	O	WE.FFSK/	write enable for FFSK modem
33	O	INT.A/	main interrupt to processor
34	O	SC.A	serial clock from ASIC to processor
35	O	8,064MHZ.P	processor clock
36	-	VSS3	logic ground
37	O	SCL.2	bus 2 serial clock
38	O	SCL.1	bus 1 serial clock
39	O	SDA.2	bus 2 serial data
40	O	SDA.1	bus 1 serial data
41	I/O	AD0	multiplexed address and data
42	I/O	AD1	multiplexed address and data
43	I/O	AD2	multiplexed address and data
44	I/O	AD3	multiplexed address and data
45	I/O	AD4	multiplexed address and data
46	I/O	AD5	multiplexed address and data
47	I/O	AD6	multiplexed address and data
48	I/O	AD7	multiplexed address and data
49	O	A0	de-multiplexed address
50	O	A1	de-multiplexed address
51	O	A2	de-multiplexed address
52	O	A3	de-multiplexed address
53	O	A4	de-multiplexed address
54	O	A5	de-multiplexed address
55	O	A6	de-multiplexed address
56	O	A7	de-multiplexed address
57	I	A8	address
58	I	A9	address
59	I	A10	address
60	I	A11	address

IC2 PIN FUNCTIONS (Cont'd)

Pin No.	Input/Output	Signal Name	Function
61	I	A12	address
62	I	A13	address
63	I	A14	address
64	I	A15	address
65	-	VSS4	logic ground
66	I	ROT.INT/	not used
67	I	ALE	address latch enable
68	I	PF0/	data space PF0 select
69	I	PF1/	data space PF1 select
70	I	WR/	write
71	I	RD/	read
72	-	VDD2	logic supply
73	I	SD.P	serial data from processor
74	I	TEST1	not used
75	I	TEST2	not used
76	I	SC.P	serial clock from processor
77	I	RX.SC.DATQ	received selcall sero crossings
78	I	RS232.R	RS232 received data
79	I	PROC.RST/	main logic reset signal
80	-	VDD3	logic supply

IC3 PIN FUNCTIONS

Pin No.	Input/Output	Signal Name	Function
1	-	NC	not used
2	I	REM.PROC	processed audio from remote
3	O	REM.UP	unprocessed audio to remote
4	I	Not Used	
5	I	Not Used	
6	I	CTCSS.RX.FILT	filtered audio from CTCSS decoder
7	I	TX.DIRECT	clear speech from microphone amp
8	I	CTCSS.TX.FILT	filtered audio from CTCSS encoder
9	I	Not Used	
10	O	TX.LIMITER.IN	input to transmitter audio limiter
11	I	Not Used	
12	O	TX.HF.MOD	compressor bypass
13	I	COMP.TX	compressed and limited tx audio
14	I	TX.AF.SUM	transmitter audio summing junction
15	O	TX.AF	transmitter audio to radio PCB
16	O	SPEECH.DET/	VOX speech deteced
17	I	VOX.IN	VOX speech level
18	I	VOX.LVL	VOX reference level
19	O	REM.INT/	remote accessory or key detected
20	I	R.KEYS	remote keys DC level
21	I	REM.IN	remote accessory DC level
22	-	TEST.DAC	not used
23	O	VIEW.ANGLE.LCD	viewing angle control voltage
24	-	NC	not used
25	O	LED.KEY	voltage source for key backlighting
26	O	LED.LCD	voltage source for LCD backlighting
27	O	RDY/	supply ready
28	O	PROC.RST/	master logic reset
29	O	PULL.BAT.TEMP	battery charger control
30	I	VMR.IN	mid rail reference
31	O	VMR	mid rail output for audio paths

IC3 PIN FUNCTIONS (Cont'd)

Pin No.	Input/Output	Signal Name	Function
32	O	EN.1	mic. gain control
33	-	EN.2	not used
34	-	EN.3	not used
35	-	VSS	analogue ground
36	I	SCL.1	serial clock input
37	I	RESET/	master system reset
38	I	SDA.1	serial data input
39	I	A2.E	serial data enable
40	-	TEST.45DB	not used
41	I	VOL.SUM	volume attenuator summing input
42	I	VOL	volume attenuator output
43	I	BAT.DATA	battery identification DC level
44	I	BAT.TEMP	battery temperature DC level
45	O	M.CONTROL	multiplexed DC level to proc. ADC
46	I	M.RF	multiplexed DC from radio PCB
47	O	REM.OUT	logic and DC analogue output
48	-	TEST.POSREM	not used
49	I	ROT.1	rotary cont. 1 (volume) DC level
50	I	ROT.2	rotary control 2 DC level
51	I	AF,RX	Not Used
52	O	LPF.SW	Not Used
53	I	Not Used	transmitter input
54	I	SC.FILT.IN	input to selcall decoder filter
55	I	SC.LIMIT.IN	input to selcall decoder limiter
56	I	SC.LIMIT.LVL	selcall decoder limiter reference
57	O	RX.SC.DATA	decoded selcall zero crossings
58	I	LPF1.IN	Not Used
59	O	LPF1.OUT	Not Used
60	I	LPF2.IN	Not Used
61	O	LPF2.OUT	Not Used
62	O	Not Used	
63	I	C.AFC AFC	smoothing capacitor
64	O	RX.CTCSS2	Not Used
65	O	DC.REC.OUT	output form receiver DC recovery
66	-	NC	not used
67	I	DC.REC.IN	input to receiver DC recovery
68	O	CTCSS2.TONE	not used
69	O	TONES	selcall encode, dtmf and alert tones
70	-	VDD	analogue supply
71	I	PWM.2	2nd pulse width modulator input
72	I	PWM.1	1st pulse width modulator input
73	O	SLOW	not used
74	O	LS.ON	loudspeaker amplifier enable
75	O	MIC.I.EN	internal microphone enable
76	O	MIC.R.EN	not used
77	O	AF.LS.R	audio for remote loudspeaker amp
78	O	AF.LS.I	audio for internal loudspeaker amp
79	O	RX.SW	switched receiver audio
80	I	RX.DIRECT	unswitched receiver audio

IC401 PIN FUNCTIONS

Pin No.	Input/Output	Signal Name	Function
1	O	BATT.SDN	low battery shutdown for PA
2	I	BATT.VOLT	

IC401 PIN FUNCTIONS (Cont'd)

Pin No.	Input/Output	Signal Name	Function
3	I	BATT.REF	
4	I	PWR.FB	power control feedback
5	I	PWR.RAMP	power control ramp voltage
6	O	PWR.CONT	power control drive
7	I	M.TEMP.PA PA	temperature measure
8	I	M.BATT	battery voltage measure
9	I	M.INPUT1	VCO control voltage measure
10	I	M.INPUT2	nc
11	-	0VA	main analogue ground
12	I	M.RSSI RSSI	voltage measure
13	I	M.RF	Multiplex output to processor
14	-	0VL	shift register ground
15	I	SCL.2	serial clock
16	I	SDA.2	serial data
17	I	A3.E1	serial data enable1
18	I	A3.E2	serial data enable2
19	I	A3.RESET/ ASIC	reset
20	-	+5V0L	shift register supply
21	O	+5VT.ON/	transmitter 5V enable
22	O	+7VT.ON	transmitter 7V enable
23	O	+5VR.ON/	receiver 5V enable
24	O	+5V5S.ON/	synthesiser/VCO 5V enable
25	O	+7V2.UV/	low battery interrupt
26	O	ANT.L.ON	local antenna enable (pulse)
27	O	ANT.R.ON	remote antenna enable (pulse)
28	O	TX.VCO.ON	transmitter VCO enable
29	O	SPARE.E1	nc
30	O	SY.E	synthesiser serial data enable
31	I	TX.MOD TX	modulation from control
32	I	+2V5.EXT	ext mid rail reference
33	O	TX.MOD.SHIFT	re-referenced TX modulation
34	I	LPF.IN TX	mod low pass filter input
35	O	LPF.OUT TX	mod low pass filter output
36	O	+2V5.INT	int. mid rail ref output
37	I	+2V5.DEC	int. mid rail ref input
38	O	MOD.VCO VCO	modulation output
39	O	MOD.TCXO TCXO	modulation output
40	I	TCXO.BUF.IN	nc
41	I	TCXO.BUF.REF	nc
42	O	TCXO.BUF.OUT	nc
43	I	SUM.TCXO	TCXO tune volts summing
44	I	SUM.TCXO.REF	TCXO mod input
45	O	TCXO.DAC	TCXO tuning DAC voltage
46	O	MOD.TCXO.PULL	mod and tune volts to TCXO
47	-	+5V0	main analogue supply
48	I	RX.AF.IN RX AF	buffer amp input
49	I	RX.AF.REF	reference for RX AF amp
50	O	RX.AF.FB	feedback for RX AF amp
51	O	RX.AF RX	AF to control PCB
52	I	SQ.FILT.IN	noise squelch DC amp input
53	I	SQ.FILT.INV	noise squelch DC amp input
54	O	SQ.FILT.OUT	noise squelch DC amp output
55	O	SQ.ADJ	squelch DAC voltage
56	I	SQ.REF	squelch comparator ref
57	I	DET.SQ.NOISE	squelch comp. DC level
58	O	SQ/	squelch interrupt to control

IC401 PIN FUNCTIONS (Cont'd)

Pin No.	Input/Output	Signal Name	Function
59	O	RX.TUNE2	2nd front end filt tuning
60	O	RX.TUNE1	1st front end filt tuning
61	O	DISCRIM.TUNE	RX DC offset tuning volts
62	I	TEMP.REF PA	hi temp shutdown ref volts
63	O	TEMP.SDN PA	hi temp shutdown
64	O	PWR.SET TX	power set DC voltage

SECTION 4
SERVICING

WARNING

Certain semi-conductors used in this equipment contain Beryllium Oxide. If inhaled, dust from this oxide can be toxic. No danger can arise from normal handling but no attempt should be made to tamper with these devices.
They should NOT be discarded with industrial or domestic waste.
These devices are detailed 'BeO' in the Parts List.

CAUTION

Metal Oxide Semiconductors (MOS) are used in this equipment; therefore the following precautions should be strictly observed, otherwise the devices may become damaged.

(a) Device leads should always be in contact with a conductive material to avoid the build-up of static charges.

(b) Soldering iron tips, tools and metal parts of test equipment used in servicing must be grounded.

(c) To avoid transient voltage spikes, devices must not be inserted into, nor removed from, circuits with power applied.

(d) Signals must NOT be applied to integrated circuits in the absence of power supplies to the devices.

(e) Use conductive foam on work surfaces.

DIS-ASSEMBLY (Refer to Fig. 4.1)

(1) Remove the battery.

(2) Remove the Blanking Plate [1] from the Rear Cover Assembly by pushing down and sliding along the battery runners.

(3) Remove the six fixing screws [2] from the Rear Cover Assembly and lift the Rear Cover Assembly from the transceiver.

(4) Unsolder the auxiliary co-axial connector [3] from the Radio PCB and move the cable away from the Frame Assembly.

(5) Unscrew and remove the four pillars [4] which retain the Frame Assembly to the Front Cover.

(6) Carefully lift the Frame Assembly from the Front Cover and disconnect the Flexi-circuit from the connector on the front of the Control PCB, by withdrawing the two tags at either side of the connector to release the Flexi-circuit.

Removal of the Radio PCB

(1) Unscrew and remove the two fixing screws from the top of the Rear Screen covering the Radio PCB, lift and remove the Rear Screen.

(2) Unscrew and remove the seven fixing screws from the Radio PCB and two fixing screws from the PA module.

(3) Insert a small screwdriver into the slot located in the edge of the Frame Assembly, adjacent to the multi-way PCB connector and carefully lever the Radio PCB up to disconnect the PCB connector from the Control PCB, remove the Radio PCB from the Frame Assembly.

Removal of the Control PCB

(1) Remove and discard the label covering the LCD (a new label is required when re-assembling).

(2) Unscrew and remove the four fixing screws around the LCD Assembly, lift the LCD Assembly from the Control PCB.

(3) Unscrew and remove the five remaining screws from the Control PCB and remove the Compression Clamp from the PTT Flexi-circuit.

(4) Lift the Control PCB from the Frame Assembly, carefully easing the screen edges away from the casting on E0 Band equipments, and ensuring the PTT Flexi-circuit is clear of the PCB.

E0 Band Control PCBs

All E0 Band versions have a Flexi PCB screen fitted over the front of the Control PCB. Where it is necessary to fit a replacement Control PCB, a standard Control PCB may be fitted using the following procedure:-

(1) Remove the four LEDs (D5, D6, D11 and D16) that illuminate the numeric keypad.

(2) Using solder braid remove any solder spikes.

(3) Taking care that it is accurately located on the PCB, stick the Flexi PCB screen to the Control PCB.

Note: ***(i)*** ***The LEDs which illuminate the six top keys (On/Off, Up/Down etc.) remain fitted***

(ii) ***Care must be taken not to deform the Flexi PCB screen as this could impair switch operation.***

RE-ASSEMBLY

Re-assembly is the reverse of dis-assembly, the Radio PCB must be fitted to the Frame Assembly first, then the Control PCB. Care must be taken when reconnecting the Flexi-circuit to the Control PCB to ensure that it is correctly aligned before pressing home the tags on the connector.

Special Tools Required

The following is a list of special tools required for dismantling and re-assembling the transceiver.

Tool	Philips Part No.	Torque	Where Used
Pozi Drive Bit Size No. 0	-	1,7kgf-cm	Radio PCB, Control PCB, Battery Contact Screws
Pozi Drive Bit Size No. 2	-	2,3kgf-cm	PA Screws, Rear Cover Screws
Metric Socket Size 5mm AF	-	2,8kgf-cm	Hexagonal Pillars
Special Bit	7513 305 50038	5,7kgf-cm	Volume and Control Potentiometer nuts
Special Bit	7513 305 50039	9,0kgf-cm	Antenna Connector nut
Trimming Tool	FT08053		
Trimming Tool	ST01943		

TEST INFORMATION, EQUIPMENT AND DATA

Test Information

(1) All RF generator levels are in pd from a 50Ω source.

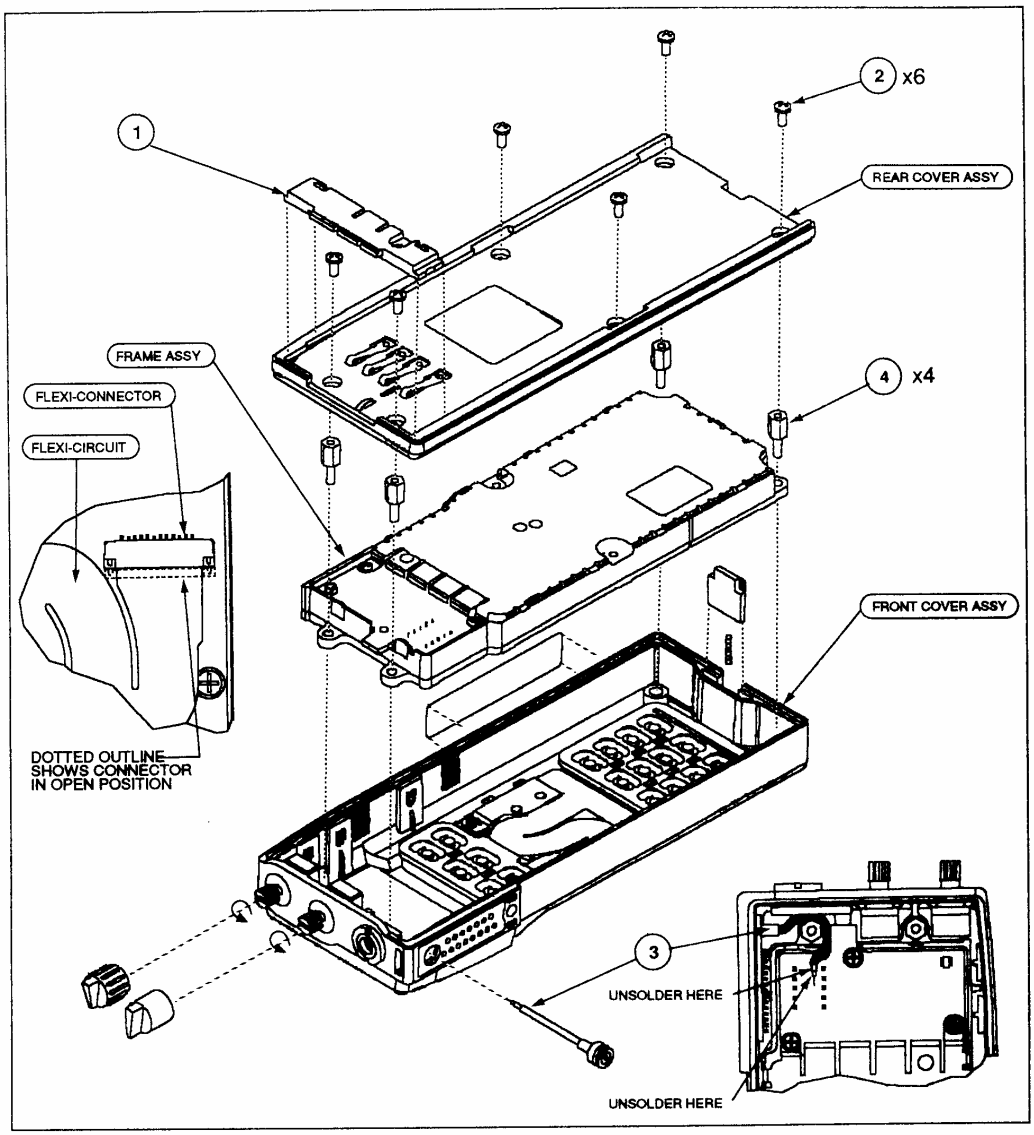


Fig. 4.1 Transceiver Dis-assembly

(2) All measurements are performed at room temperature, 25°C ±5°C.

(3) All tests are carried out at a standard test voltage of 7,2V ±0,05V unless otherwise specified.

(4) Transmitter tests are not to exceed 1 minute transmission in any 5 minute period.

(5) As tests are performed using the customer's data, some tests may give different results, e.g., the frequencies and power settings may be different from those specified.

(6) All connections to the transceiver under test shall be made via the Test Interface Unit, (TIU). RF connections to be made via less than 10cm of low loss coax.

(7) Tests are to be carried out in the order specified.

(8) The receiver rated audio output is 500mW into 16Ω ; less than 5% distortion at 350mW.

(9) Signalling option checks should only be carried out where appropriate.

(10) Psophometrically weighted SINAD measurements are denoted SINADp.

(11) Losses through the loudspeaker isolation transformer in the TIU are approximately 1,5dB, which must be taken into account when making receiver audio power measurements.

(12) All receiver measurements shall be made with the following modulation unless otherwise specified: 1kHz sinewave FM at 60% peak system deviation.

Channel spacing, kHz	Peak sys. dev.,kHz	60 % dev., kHz
12,5	2,5	1,5
20	4,0	2,4
25	5,0	3,0

(13) The accuracy of DC measurements made may be affected by current flowing in the PSU sense leads, this should be taken into account.

Test Equipment

The following is a list of test equipment recommended for functional tests, setting up and fault location. Equivalent types may be used where those recommended are not available, provided that corrections are made for any differences in parameters.

Test Set	**Parameters**		**Suitable Type**
Power supply	Output voltage	5,5V-9V	Coutant LB500
	Output current	2,5A minimum.	Thurlby PL154.
	Current limiting	Adjustable to approximately 0,5A and 2,5A or greater.	
	Voltage sensing	Connected to the sense terminals of the TIU.	
Modulation meter		-	Marconi 2305; Racal 9008A
RF power meter		-	Marconi 6960; Racal 9102; Bird equivalent
RF signal generator	±5kHz deviation		Marconi 2019; Marconi 2022 Farnell SG 1000
Ammeter	Accuracy	±2%	AVO Model 8
	Range	100mA fsd	
		2,5A fsd	
Frequency counter	Accuracy	0,1 ppm or better	Racal 9917
	Readout accuracy	10Hz	
	Frequency	470MHz maximum	
	Input impedance	50Ω	
AF generator	Frequency accuracy	±5%	Levell TG152
	Level accuracy	±2%	
	Waveform	sine	
	Output amplitude	5V pk-pk maximum into 600Ω	

Test Equipment (Cont'd)

Test Set	Parameters	Suitable Type
Distortion analyzer /mV meter		HP333A; Lyons Instruments D10B
Oscilloscope	-	Philips PM2308
'T' Attenuator (RF Signal Sampler)	-	Bird 4275.020
455kHz Oscillator	50mV into 50Ω	
PC	AT/XT compatible	
PRP70 Programmer Kit	(disk and lead)	Level 1; 9525 701 54181 Level 2; 9525 701 54182
Test Interface Unit	with Dummy Battery	9525 701 54008

RADIO TEST INTERFACE UNIT 9525 701 54008 (TIU)

Introduction

The TIU is used for transceiver field testing and alignment (with the Control PCB). The TIU is connected to the radio facility socket. Under external control data is sent, via the RS232 interface, to control the operation of the radio. Modulation can be applied to the transmitter and the receiver audio can be monitored.

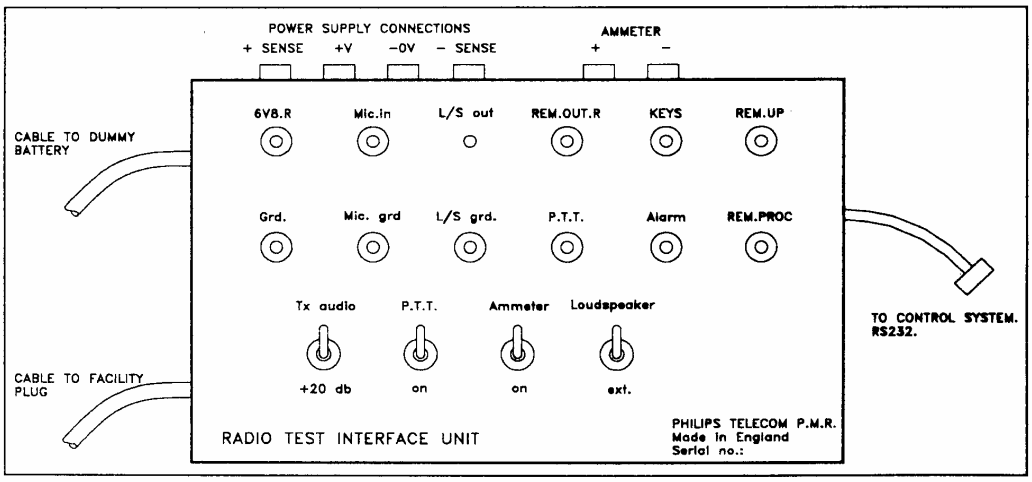


Fig. 4.2 Radio Test Interface Unit

Circuit Description

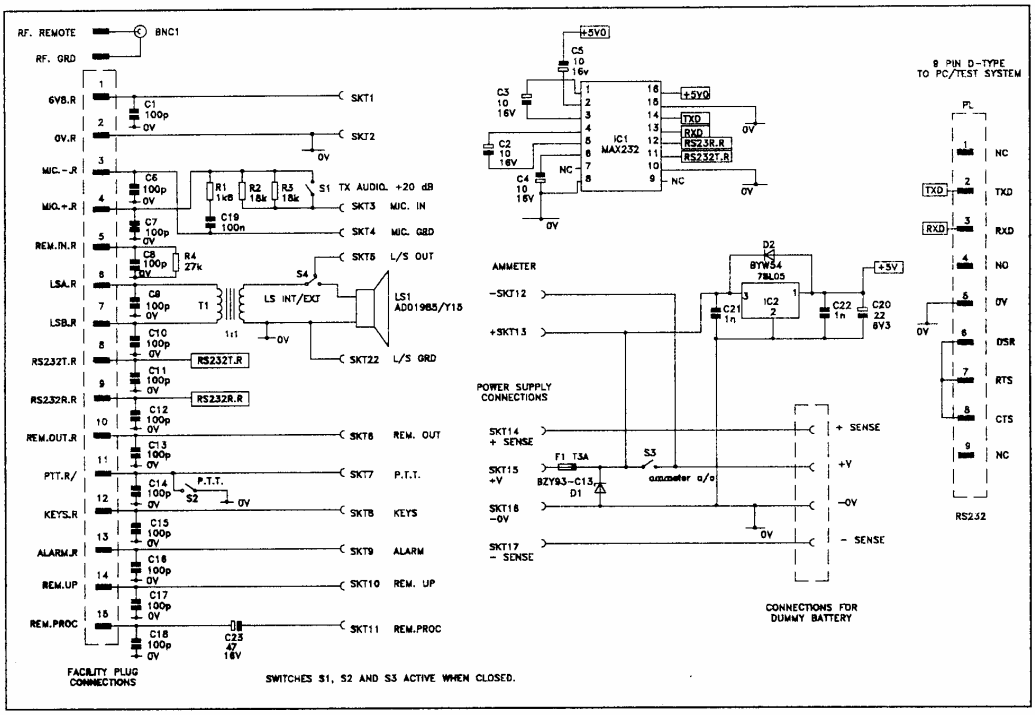


Fig. 4.3 TIU Circuit Diagram

Resistors R1-3 and capacitor C19 provide high frequency roll-off to compensate for the low frequency roll-off in the transceiver.

Transformer T1 converts the balanced loudspeaker transceiver output to an unbalanced (single ended) output suitable for connection to test equipment. A switchable loudspeaker is included for monitoring purposes.

IC1 converts the ±12V data from the test system to 5V data for the transceiver.

D1 is a high power 13V zener diode to provide over voltage protection by causing the fuse to rupture if excessive voltage is applied to the transceiver. Note that for this to be effective, the power supply must be capable of supplying in excess of 5A. Also, D1 ensures that if the power suppply is connected incorrectly to the TIU, neither the unit nor the transceiver are damaged.

Power Supplies

The sense terminals in the power supply ensure that transmitter power problems, due to voltage drops along the power leads, are avoided.

The 7,2V supply must be capable of supplying 5A or greater.

Components

RESISTORS

All 2%, 100mW.

CAPACITORS

C1, C6-18, C21,22 ceramic plate.
C2-5, 23 16V.
C19 5% polyester .
C20 6,3V.

DIODES

D1 BZY93-C13; D2 BYW54

CONNECTORS

SKT1-17, SKT22	4mm sockets.
Transmitter audio in	female BNC
Test system	9 way female 'D' connector (on 1,5m lead)

Note: ***The RF connector is not mounted on the TIU box. Instead it is a female BNC connector mounted on the short length of co-axial cable connected to the facility connector (see 'Miscellaneous').***

INTEGRATED CIRCUITS

IC1 Maxim MAX232; IC2 Nat. Semi. LM78L05.

MISCELLANEOUS

T1	RD Components RS 217-725
LSI	Philips AD01985/Y15 or any small 15Ω loudspeaker.
S1-4	1P2W sub-miniature switches.
F1	T3A 3A fuse.
Co-axial cable	The RF co-axial cable is wired directly into the facility socket. Length 10±1cm Type RG154-U. Termination female BNC (cable mounting).
Facility plug	15 way 3513 904 50271.
Dummy battery	As specified in this Section.

Servicing

The TIU will be serviced locally. Apart from the facility plug, which is peculiar to the PRP73, all the components are commercially available.

DUMMY BATTERY

Introduction

The dummy battery enables a power supply to be connected to the transceiver under test. The circuit (see Fig. 4.4) is built into a PRP73 1,2Ah battery enclosure.

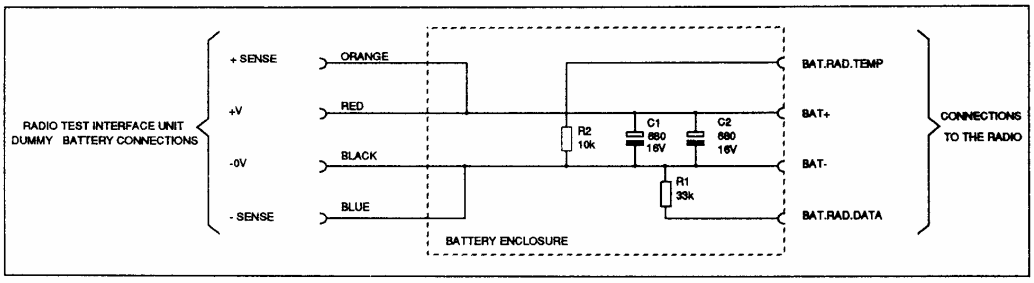


Fig. 4.4 Dummy Battery Circuit

Components

RESISTORS

Both 5%, 100mW.

CAPACITORS

Both 16V.

E^2PROM

Note: ***If either E^2PROM is removed stored data will be lost and the transceiver will require reprogramming.***

The software tests the two E^2PROMs (IC4 and IC402) at switch-on. If the contents of the E^2PROMs are incorrrect the PRP73 will generate a hardware error alert that may be stopped by pressing any key. The LCD will show the following messages depending on the source of the error:-

CTRL EEPROM INVALID - IC4 contents invalid. - In this state the PRP73 will not operate but may be re-programmed using the Programmer. Downloading a new application should remove the error. If this operation fails the device must be replaced and then re-programmed/aligned.

RADIO EEPROM INVALID - IC402 contents invalid. - In this state the PRP73 will not operate but may be re-programmed using the Programmer. Re-aligning the PRP73 should remove the error.

INITIALIZATION

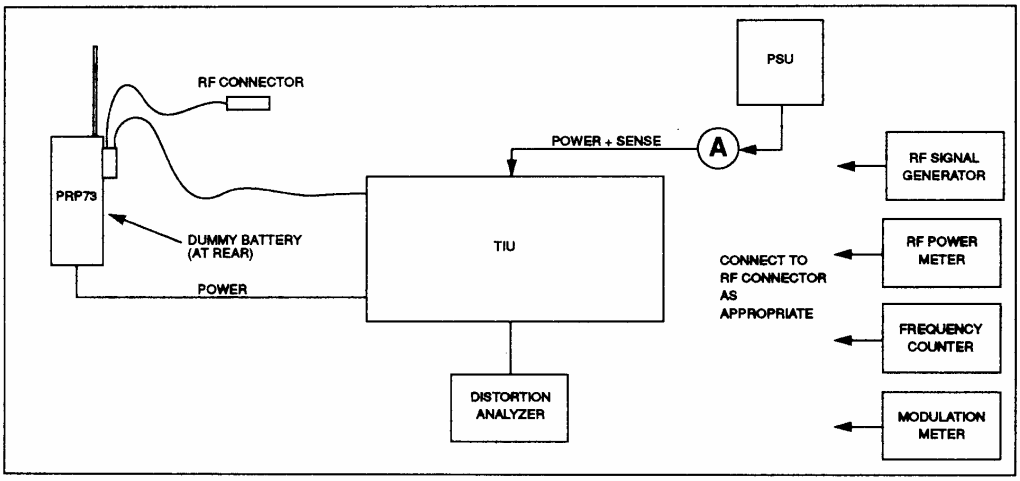


Fig. 4.5 Test Equipment Connections

(1) Connect the PRP73 under test to the Test Interface Unit.

(2) Switch on the power supply, check that the current drawn is less than 100mA.

(3) Reduce the supply voltage to 5,3V ±100mV, check that the current drawn is less than 1,5 mA.

(4) Reset the power supply to the standard test voltage.

RECEIVER TESTS

Sensitivity

For extreme channels check the following sensitivities are achieved with an RF signal at a level of 0,35µV pd, modulated with standard test modulation:-

12dB or greater SINAD; 15dB or greater SINADp

Note: ***Some customer frequencies will be degraded in sensitivity due to clock signals generated within the PRP73.***

Degradation may exist within ±50kHz of harmonics (integer multiples) of the following frequencies:-

(i) ***9,6MHz (or 9,9MHz if alternative TCXO fitted), below 400MHz***

(ii) ***45,455MHz (or 44,545MHz if alternative 2nd LO used)***

Receiver Desensitization Frequencies

Frequencies within ±50kHz of those listed below may be subject to desensitization.

Due to TCXO Frequency = 9,6MHz.

E0-band	B5-band	A9-band
76,80 86,40	144,00 153,60	153,60 163,20 172.80

Due to TCXO Frequency = 9,9MHz.

E0-band	B5-band	A9-band
69,30 79,20	138,60 148,50	148,50 158,40 168,30

Frequencies above 400MHz are not prone to TCXO interference.

Due to Second Local Oscillator = 45,455MHz.

E0-band	B5-band	A9-band	TR-band	U0-band
-	136,365	-	409,095	454,550

Due to Second Local Oscillator = 44,545MHz.

E0-band	B5-band	A9-band	TR-band	T4-band	U0-band
-	133,635	-	400,905	445,450	445,450

Supply Input Power

(1) With no RF input signal, check that the standby current is less than 85mA for all bands. When the following options are fitted (or active) add the specified current listed:-

SELCALL	2mA
CTCSS	4mA

Note: ***The above current will be exceeded if the PRP73 has received RS232 activity since switch-on. If this is the case the PRP73 should be switched off and switched on again before making the above measurement.***

Distortion at Rated Audio Power

(1) Adjust the volume control to maximum.

(2) Check that audio output via the TIU is ≥ 350mW (this figure takes into account losses in the TIU).

Note: ***Balanced output (direct from the facility connector) is ≥ 500mW.***

(3) Set the volume control to one step below maximum. Adjust the test modulation to give a recovered audio level of 250mW ±30mW at the output of the TIU; check that distortion is less than 5%.

Squelch Function

(1) Apply a 12dB SINAD signal on a channel with a 10dB SINAD squelch setting, check that the squelch is open (audio unmuted).

(2) Reduce the RF input level by 5dB, check that the squelch is closed (audio muted).

TRANSMITTER TESTS

RF Output Power

For extreme channels check that the RF power is within ±1dB of the following:-

Version	Power, W	
	Nom.	± 1 dB
LP VHF	1	0,80 - 1,25
LP UHF	1	0,80 - 1,25
HP VHF	5	4,00 - 6,30
HP UHF	4	3,20 - 5,05

Supply Input Power

Check that the current drawn while transmitting is as shown in the table.

Version	Current
LP VHF	700mA max
LP UHF	700mA max
HP VHF	2,5A max
HP UHF	2,3A max

Frequency Error

Check that the transmitter frequency is within ±400Hz of the desired frequency.

Peak System Deviation

Apply a 1kHz sinewave modulation input of 2V ±100mV pk-pk to the TIU with the TX audio switch in the +20dB position, check that the modulation deviation is between 70% and 100%.

Audio Sensitivity

Apply a 1kHz sinewave modulation input of 25mV ±2mV pk-pk to the TIU with the TX audio switch in the +20dB position, check that the modulation deviation is between 20% and 60%.

Total Harmonic Distortion

Apply a 1kHz sinewave modulation input of 40mV ±2mV pk-pk to the TIU with the TX audio switch in the +20dB position, check that the modulation distortion is less than 10%.

SELCALL and DTMF CHECKS

Select an appropriate channel.

Encoder Check

Check that the Selcall encoder generates a tone sequence with a deviation of between 30% and 70% of peak system deviation.

Decoder Check

Modulate the signal generator with a programmed identity, check that the transceiver decodes the identity.

CTCSS OPTION TESTS

Select an appropriate channel.

Encode Tone Deviation

Check that the encode tone deviation is between 10% and 20% of peak system deviation.

Decoder operation.

(1) Modulate the signal generator with an appropriate CTCSS tone at a deviation of 12% ±2% peak system deviation. Set the RF level to 1µV pd.

(2) Check that the audio unmutes.

(3) Remove the signal generator CTCSS tone and check that the audio mutes.

ALIGNING A TRANSCEIVER USING A PROGRAMMER

Equipment and Set-Up

The PRP73 range of transceivers is normally supported with ready-aligned spare circuit boards. Should re-alignment in the field be required, e.g. after component replacement, a Programmer may be used in association with test equipment to provide an electronic alignment set-up. Re-alignment is not needed after customising with new user frequencies. Fig. 4.6 shows the equipment connections.

During alignment with a Programmer the PRP73's Application Package, complete with customisation data is saved. In the event of difficulties after alignment, please contact Customer Services, Philips Telecom - Private Mobile Radio, Cambridge.

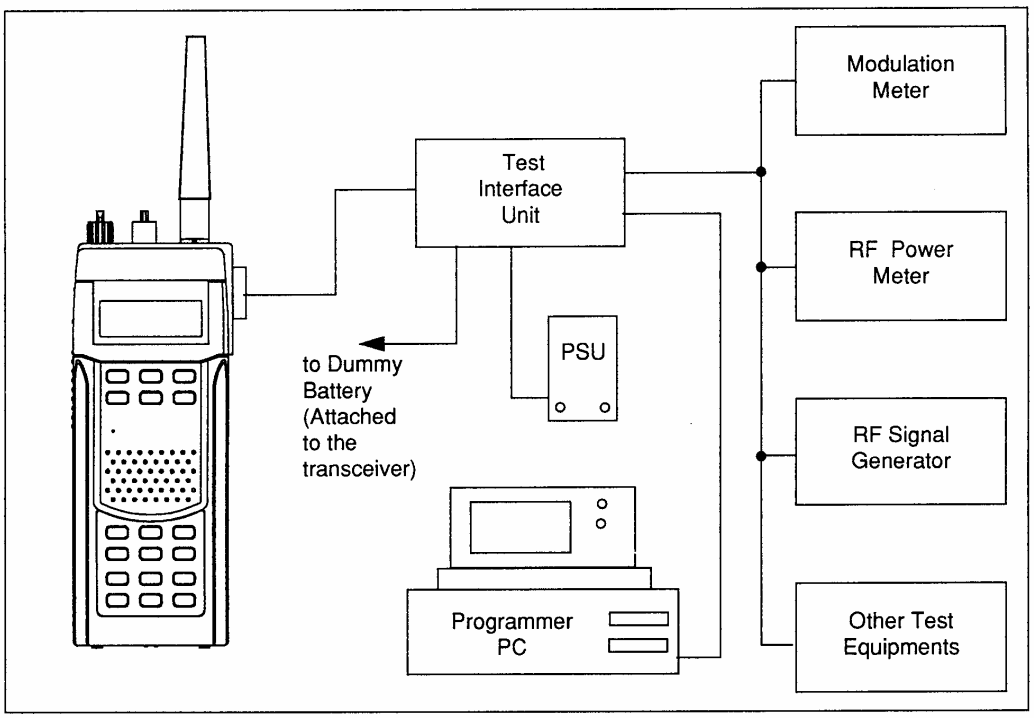


Fig. 4.6 Alignment Test Connections

CAUTION

The alignment option should be selected and used only by technical personnel who have the correct test equipment available. Incorrect adjustment of the radio alignment parameters may result in damage to, or inadequate performance from, the equipment.

Starting the Alignment Option

Connect the transceiver to the serial port via the Test Interface Unit. Start the Programmer by typing PRP70DP (see PRP70 Programmer User Guide TP1807 for detailed description) and press Alt F3 when the initial menu is displayed.

If the programmer is unable to communicate with the radio, the following message will appear:-

```
Radio not connected or not switched on

Press ESC to continue
```

If communication is successful, then this alignment menu will appear.

```
        Alignment  Menu
Transmitter Alignment
Receiver Alignment
Analogue Measure Calibration
Print Alignment Params
Exit
```

The above list shows the options for aligning the complete transceiver. Each option will take the user through a step-by-step series of simple tests. Position the cursor on the appropriate option and press the <ENTER> key or type the initial letter of the option.

The alignment options are summarised below:-

Transmitter Alignment
(All Programmer variants)

- RF Power adjustment (12 screens cover 4 power settings at the centre and each end of the band)
- TCXO (reference oscillator) adjustment
- Deviation/Modulation balance adjustment (6 screens cover TCXO and VCO settings at the centre and each edge of the band)

Receiver Alignment
(All Programmer variants)

- Front-end tracking filter adjustment (6 screens cover two filters aligned at the centre and each edge of the band)
- * Second local oscillator adjustment
- * RX audio level and offset adjustment (3 screens cover quad coil, audio attenuator and discriminator offset adjustments)
- Squelch adjustment (4 screens for 4 thresholds)
- Search threshold adjustment (3 screens for 3 thresholds)

Note: **** These options are only available at Level 3 servicing since the equipment must be opened for internal access.***

Analogue Measure Calibration
(All Programmer variants, but note that these are not for Alignment, but are provided to assist fault finding only)

- VOX speech level
- RX discriminator AFC voltage
- RX RSSI voltage
- Battery temperature sensor
- Battery type sensor
- Battery voltage sensor
- Setting of volume control
- Setting of `channel' control
- R.KEYS pin of facility socket
- REM.IN pin of facility socket
- REM.PROC pin of facility socket

Print Alignment Params
(All Programmer variants)

- Prints the alignment/calibration parameters.

Each alignment stage is described in detail on the appropriate screen. This gives instructions for any equipment to connect, signals to supply, adjustments to be made, results of any measurements made and warnings where any problems are encountered in communicating with the transceiver. Help, which describes the adjustment to be made, is provided for each test. It is recommended that the complete tests for the transmitter or receiver are completed in the order given by the Programmer to ensure the correct results.

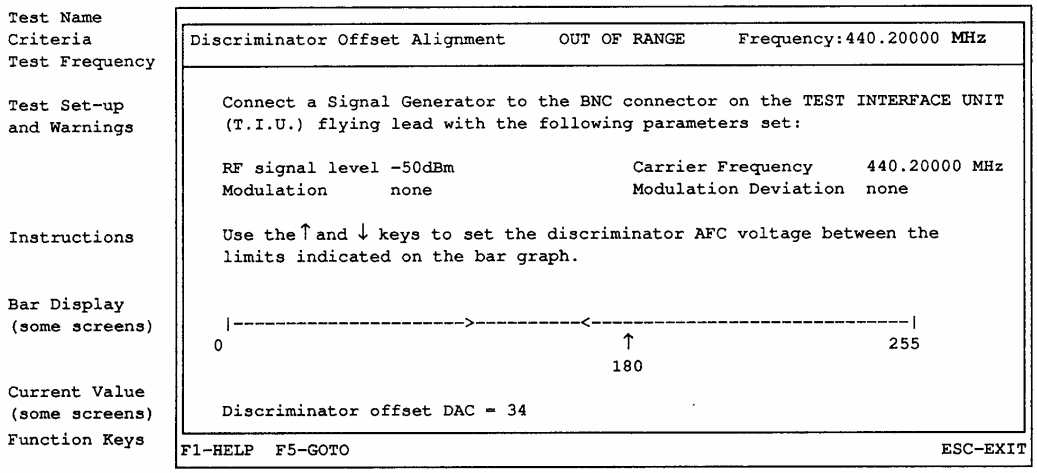
In order to make measurements, the transceiver is directly controlled to be on the required frequencies etc. irrespective of the its customised settings.

Note that all signalling related alignment and checking is undertaken as part of the relevant transmitter or receiver audio option.

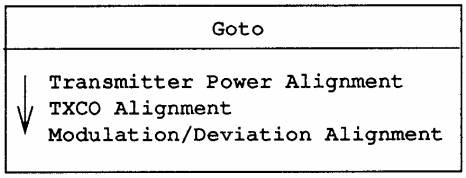
After the alignment of each function, the new settings are stored by the transceiver.

Screen Layout and Keys

All tests are based on a common screen layout, as shown below. Every test has a unique name but, where several similar tests are performed, the actual parameter being established is named. Normally the user will step through all the tests using the <PAGE DOWN> key. This will guarantee they are performed in the correct order.



The <GOTO> key can be used to skip to another test in the same group, by displaying a sub-menu from which a selection can be made.



Place the cursor on the required test and press <ENTER>.

Tests and sub-tests are selected using the <PAGE DOWN> and <PAGE UP> keys or using the goto <F5> key which displays the above window.

Where there is more than one part to a test, each part is selected with the <PAGE DOWN> and <PAGE UP> keys.

The <ESCAPE> key can be used at any time to return to the previous menu.

PROGRAMMING LEAD

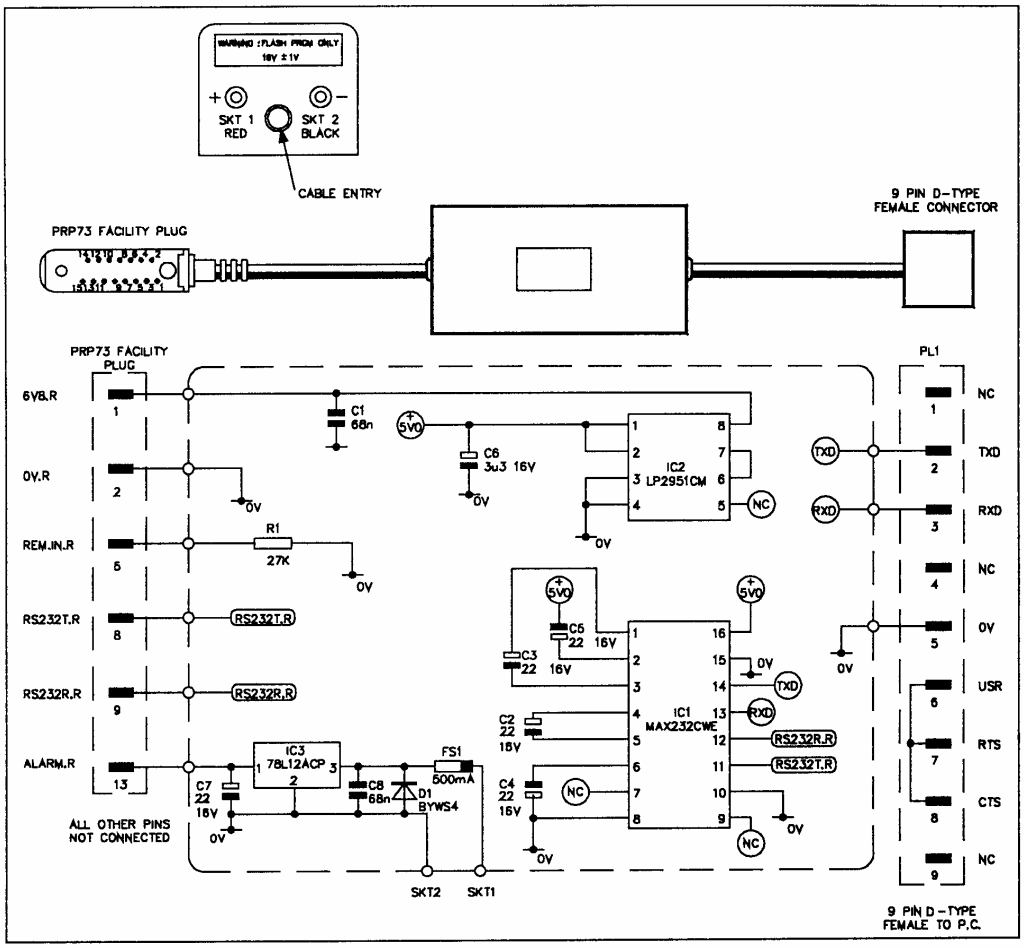


Fig. 4.7 Programming Lead

Test Procedure

(1) Apply 6,8V ±200mV between pin 1 (6V8R) and pin 2 (0V.R) of the Facility Plug.

(2) Check that the voltage on IC1 pin 16 is 5V ±200mV.

(3) Check that the voltage between PL1-2 (TXD) and PL1-5 (0V) is between -9V and -13V.

(4) Remove the supply from pin 1 and pin 2 of the Facility Plug and apply 16V ±1V between SKT1 and SKT2.

(5) Check that the voltage between pin 13 (ALARM.R) AND pin 2 (0V.R) of the Facility Plug is 12V ±600mV.

(6) Remove the supply from SKT1 and SKT2.

(7) Check the resistance between pin 5 (REM.IN) and PIN2 (0V.R) of the Facility Plug is 27k ±5%.

(8) Check that continuity exists between PL1-3 and IC1 pin 13.

(9) Check that continuity exists between PL1-6, PL1-7 and PL1-8.

SECTION 5
PARTS LIST

NOTATION

In the following Parts List, component values are designated as follows:

Capacitors Values given in micro Farads (μF) unless otherwise stated

22	=	22 micro Farad	($F \times 10^{-6}$)
22n	=	22 nano Farad	($F \times 10^{-9}$)
22p	=	22 pico Farad	($F \times 10^{-12}$)

Fractional values are shown thus:

2μ2	=	2,2 micro Farad	=	$(2,2 \times 10^{-6})F$
2n2	=	2,2 nano Farad	=	$(2,2 \times 10^{-9})F$
2p2	=	2,2 pico Farad	=	$(2,2 \times 10^{-12})F$

Resistors Values given in Ohms unless otherwise stated

22	=	22 ohms	
22k	=	22 kilohms	(Ohms x 10^3)
22M	=	22 Megohms	(Ohms x 10^6)

Fractional values are shown thus:

2Ω2	=	2,2 ohms		
2k2	=	2,2 kilohms	=	$(2,2 \times 10^3)$Ohms
2M2	=	2,2 Megohms	=	$(2,2 \times 10^6)$Ohms

ORDERING OF SPARE PARTS

When ordering spares, please quote the description and Part No. of the item and the part number of the sub-assembly on which it is used, together with the equipment 12NC number.

Note: ***The Part Numbers in this Section are generally commercial 12NC for spares stock only.***

ABBREVIATIONS

carbon film	c film	polyester	poly
ceramic	cer	pozidriv	pozi
circuit	cct	surface mounting device	SMD
electrolytic	elec	silicon	Si
linear	lin	steel	st
metal film	m film	tantalum	tant

The right is reserved to fit alternative types of components with equal or improved performance to those quoted in the Parts List.

PARTS LIST

Cct.Ref	Description	Part No.	Remarks
	COMMON COMPONENTS		
	Actuator, PTT	5322 280 91117	
	Boot, Mic	5322 418 40909	
	Bracket, Grounding	5322 405 91543	
	Button 1	5322 414 60794	
	Button 2	5322 414 60795	
	Cloth, Speaker	5322 445 51044	
	Cloth, Vent	5322 445 51043	
	Connector, Antenna	5322 268 90474	
	Connector, 24 Way 87768-024	5322 268 90464	
	Connector, Fem. 20 Way LPC20FDS	5322 267 60323	
	Connector, Co-ax Aux. to Drg.	5322 268 90475	
	Connector, Male 20 Way LPC-20M	5322 265 51331	
	Contact, Battery	5322 290 81491	
	Contact, Battery PCB	5322 290 81492	
	Cover, Rear	5322 447 40932	
	Disc	5322 466 93234	
	Frame, Main	5322 464 90729	
	Gasket, Silicon	5322 466 62023	
	Keypad, Facility	5322 466 93094	
	Knob, Volume Control	5322 414 60808	
	Knob, Channel Control	5322 414 60808	
	Label, Rear Cover	5322 455 21758	
	Label, LCD Window	5322 455 21903	
	Label, Reflective	5322 455 21904	
	Latch, Spring Comp	5322 405 91502	
	Latch, Actuator	5322 405 91531	
	LCD Display	5322 130 91097	
	Lightguide	5322 380 20428	
	Loudspeaker ADO1985/Y15	4822 240 30554	
	Mic Electret WM-54B-T	5322 242 30253	
	Nut, Antenna	5322 505 11126	
	Nut, Pot	5322 505 11127	
	Pad, double-sided, adhesive	5322 466 62296	
	PCB Flexi-Facility Socket	5322 321 61545	
	PCB Flexi	5322 321 61544	
	Pillar M2,5 x 8mm, special	5322 405 91505	
	Plate, Compression	5322 466 93095	
	Potentiometer, 50k 20% lin	5322 100 20854	
	Pressel, PTT	5322 405 91504	
	Relay 2P2W Latch RF3V	5322 280 80769	
	Ring 'O' Rubber	5322 530 51187	
	Screen, Edge	5322 466 93223	
	Screen, Flexi (E0 Band)	5322 466 93221	
	Screen, Flexi (A9 & B5 Bands)	5322 466 93198	
	Screen, Rear	5322 466 93099	
	Seal, Battery Contacts	5322 466 62176	
	Seal, Button	5322 466 62181	
	Seal, Speaker	5322 466 62178	
	Seal, Antenna	5322 466 62179	
	Socket, Facility to Drg	5322 268 90465	
	Spring-Ant Connector	5322 492 71084	
	Spring, grounding	5322 492 71275	
	Spring, Xtal grounding	5322 492 71115	
	Strip, Zebra Display	5322 466 93096	
	Strip, Ground PA	5322 466 93097	
	Screw, pan, pozi, M2 x 4mm	2522 178 20017	4/Battery Contacts
	Screw, pan, pozi, Zn, M2 x 6mm	5322 502 80006	9/PCB RF, 8/PCB Control
	Washer, lock, ext teeth M2,2	4822 530 80653	4/Battery Contacts

Cct.Ref	Description	Part No.	Remarks
	ANTENNAE		
	Antenna, U0, T4 and TR Bands	5322 303 91178	
	Antenna, A9 and B5 Bands	5322 303 91196	
	Antenna, E0 band	5322 303 91198	
	PCB RF		
	PCB Assembly RF High Power 12,5kHz A9 Band	**3513 570 07881**	
	PCB Assembly RF High Power 20kHz A9 Band	**3513 570 07891**	
	PCB Assembly RF High Power 25kHz A9 Band	**3513 570 07901**	
	PCB Assembly RF Low Power 12,5kHz A9 Band	**3513 570 07851**	
	PCB Assembly RF Low Power 25kHz A9 Band	**3513 570 07871**	
	PCB Assembly Low Power PA A9 Band	**3513 570 07911**	
	PCB Assembly RF High Power 12,5kHz B5 Band	**3513 570 08261**	
	PCB Assembly RF High Power 25kHz B5 Band	**3513 570 08271**	
	PCB Assembly RF High Power 12,5kHz E0 Band	**3513 570 08281**	
	PCB Assembly RF High Power 25kHz E0 Band	**3513 570 08291**	
	PCB Assembly RF High Power 12,5kHz U0 Band	**3513 570 06581**	
	PCB Assembly RF High Power 20kHz U0 Band	**3513 570 06591**	
	PCB Assembly RF High Power 25kHz U0 Band	**3513 570 06601**	
	PCB Assembly RF Low Power 12,5kHz U0 Band	**3513 570 06521**	
	PCB Assembly RF Low Power 25kHz U0 Band	**3513 570 06541**	
	PCB Assembly RF High Power 12,5kHz T4 Band	**3513 570 08311**	
	PCB Assembly RF High Power 25kHz T4 Band	**3513 570 08321**	
	PCB Assembly RF High Power 12,5kHz TR Band	**3513 502 55351**	
	PCB Assembly RF High Power 25kHz TR Band	**3513 502 55361**	
	PCB Assembly Low Power PA U0 Band	**3513 570 06571**	
	Semiconductors and IC's		
IC101	IC SMD MC3371D IF	5322 209 31166	
IC102	IC SMD NE532D- YE10015	5322 209 71553	
IC301	IC SMD TBB206G	5322 209 31165	
IC302	IC SMD MC12022SLB	5322 209 31167	
IC303	IC SMD TLC27M2ID	5322 209 61281	
IC304	IC TLO61CD Op Amp	9339 022 70685	
IC401	ASIC SMD SN94923 To Drawing	5322 209 31164	
IC402	IC SMD ST24CO2AM E^2PROM	5322 209 31723	
IC403	IC SMD LP2951CM	5322 209 31184	
TR101	Transistor SMD 2SC3356,NE85633	5322 130 63005	UHF
TR101	Transistor SMD BFR92A	5322 130 60647	VHF
TR102	Transistor SMD BFR92A	5322 130 60647	
TR103	Transistor SMD BFT25	5322 130 44458	
TR201	Transistor SMD BFR93	5322 130 44801	
TR203	Transistor SMD BCW32	5322 130 41719	Low Power, U0 & A9 Bands
TR204	Transistor SMD MRF8372	5322 130 61833	Low Power, U0 & A9 Bands
TR205	Transistor MRF557 Modified	5322 130 63004	Low Power, U0 Band
TR205	Transistor MRF553 Modified	5322 130 63205	Low Power, A9 Band
TR301	Transistor SMD MMBFU310	5322 130 62014	
TR302,303	Transistor SMD BFT25	5322 130 44458	
TR305	Transistor SMD MMBFU310	5322 130 62014	
TR306,307	Transistor SMD BFR93	5322 130 44801	
TR308,309	Transistor SMA 2N7002	5322 130 62379	
TR310,311	Transistor SMD BCW32	5322 130 41719	
TR312	Transistor SMD BFR92A	5322 130 60647	
TR313	Transistor SMD BCW32	5322 130 41719	
TR314,315	Transistor SMD BCW30	5322 130 44335	
TR316	Transistor SMD BCW32	5322 130 41719	
TR317	Transistor SMD BCW32	5322 130 41719	E0 Band, 25kHz
TR401	Transistor SMD BCW32	5322 130 41719	
TR402	Transistor SMD BFR30	5322 130 62056	20kHz, 25kHz
TR402	Transistor SMD BFR31	3513 999 05001	12,5kHz
TR403	Transistor SMA 2N7002	5322 130 62379	

Cct.Ref	Description	Part No.	Remarks
Semiconductors and IC's (Cont'd)			
TR404,405	Transistor SMD BCW30	5322 130 44335	
TR406,407	Transistor SMD BCW32	5322 130 41719	
TR408,409	Transistor SMD BCX51	4822 130 60139	VHF
TR410	Transistor SMD BCW32	5322 130 41719	
TR411	Transistor SMD BCX51	4822 130 60139	
D101	Diode SMD BAS16	5322 130 31928	
D102	Diode SMD 1SV212	5322 130 82986	A9 & B5 Bands
D102	Diode SMD BB619	5322 130 83312	E0 Band
D103	Diode SMD 1SV212	5322 130 82986	UHF, A9 & B5 Bands
D103	Diode SMD BB619	5322 130 83312	E0 Band
D104	Diode SMD 1SV212	5322 130 82986	UHF, A9 & B5 Bands
D104	Diode SMD BB619	5322 130 83312	E0 Band
D105	Diode SMD 1SV212	5322 130 82986	A9 & B5 Bands
D105	Diode SMD BB619	5322 130 83312	E0 Band
D106	Diode SMD BAS70-04	5322 130 81569	
D203	Diode SMD BAS16	5322 130 31928	
D301	Diode SMD 1SV212	5322 130 82986	UHF
D301	Diode SMD 1SV211	5322 130 83313	VHF
D302	Diode SMD 1SV212	5322 130 82986	VHF
D303	Diode SMD 1SV212	5322 130 82986	U0 & T4 Bands
D303	Diode SMD 1SV211	5322 130 83313	VHF
D303	Diode SMD BB515	9322 010 75685	TR Band
D304	Diode SMD 1SV212	5322 130 82986	UHF
D305	Diode SMD BAW56	5322 130 30691	
D306	Diode SMD 1SV212	5322 130 82986	A9 Band
D306	Diode SMD 1SV211	5322 130 83313	E0 Band
D307	Diode SMD 1SV212	5322 130 82986	TR Band
D308	Diode SMD 1SV186	5322 130 83254	E0 Band, 25kHz
D401	Diode SMD BAS70-04	5322 130 81569	
D402	Diode SMD BAV70	5322 130 34331	
D403	Diode SMD BAW56	5322 130 30691	
D404	Diode SMD BAS16	5322 130 31928	
D405	Diode SMD BAV70	5322 130 34331	
D501	Diode SMD BAS16	5322 130 31928	UHF, A9 & B5 Bands
D501	Diode SMD BAS16	5322 130 31928	E0 Band
Resistors			
R101	1k ±2% 0,1W SMD	5322 116 83652	VHF
R101	3k3 ±2% 0,1W SMD	5322 116 83655	UHF
R102	3k3 ±2% 0,1W SMD	5322 116 83655	VHF
R102	10k ±2% 0,1W SMD	5322 116 83658	UHF
R104	100 ±2% 0,1W SMD	5322 116 83642	UHF
R104	47 ±2% 0,1W SMD	5322 116 83639	A9 Band
R105	47 ±2% 0,1W SMD	5322 116 83639	VHF
R105	150 ±2% 0,1W SMD	5322 116 83644	UHF
R106,107	10 ±2% 0,1W SMD	5322 116 83636	
R108	470 ±2% 0,1W SMD	5322 116 83648	VHF
R109	1k ±2% 0,1W SMD	5322 116 83652	
R110	3k3 ±2% 0,1W SMD	5322 116 83655	
R112	47 ±2% 0,1W SMD	5322 116 83639	
R113	680 ±2% 0,1W SMD	5322 116 83649	VHF
R113	1k ±2% 0,1W SMD	5322 116 83652	UHF
R114	47 ±2% 0,1W SMD	5322 116 83639	
R115	10 ±2% 0,1W SMD	5322 116 83636	
R116	10k ±2% 0,1W SMD	5322 116 83658	20kHz, 25kHz
R117	33k ±2% 0,1W SMD	5322 116 83664	12,5kHz
R117	15k ±2% 0,1W SMD	5322 116 83659	20kHz, 25kHz
R118	2k7 ±2% 0,1W SMD	5322 116 83654	12,5kHz
R118	680 ±2% 0,1W SMD	5322 116 83649	20kHz, 25kHz
R119	1k ±2% 0,1W SMD	5322 116 83652	12,5kHz

Cct.Ref	Description				Part No.	Remarks
Resistors (Cont'd)						
R119	5k6	±2%	0,1W	SMD	5322 116 83657	20kHz, 25kHz
R121	3k3	±2%	0,1W	SMD	5322 116 83655	
R122	10	±2%	0,1W	SMD	5322 116 83636	UHF
R122	100	±2%	0,1W	SMD	5322 116 83642	VHF
R123	47k	±2%	0,1W	SMD	5322 116 83666	
R124	39k	±2%	0,1W	SMD	5322 116 83665	20kHz, 25kHz
R124	120k	±2%	0,1W	SMD	5322 116 83672	12,5kHz
R125,126	100k	±2%	0,1W	SMD	5322 116 83671	
R130,131	100k	±2%	0,1W	SMD	5322 116 83671	
R133,134	100k	±2%	0,1W	SMD	5322 116 83671	
R135,136	56k	±2%	0,1W	SMD	5322 116 83667	
R137	1k	±2%	0,1W	SMD	5322 116 83652	
R138	22	±2%	0,1W	SMD	5322 116 83637	
R139	10k	±2%	0,1W	SMD	5322 116 83658	
R141	100k	±2%	0,1W	SMD	5322 116 83671	A9 & B5 Bands
R141	470	±2%	0,1W	SMD	5322 116 83648	E0 Band
R201	3k9	±2%	0,1W	SMD	5322 116 83656	Low Power, U0 & A9 Bands
R203	1k	±2%	0,1W	SMD	5322 116 83652	
R204	680	±2%	0,1W	SMD	5322 116 83649	
R206	120	±2%	0,1W	SMD	5322 116 83643	Low Power, U0 & A9 Bands
R208	390	±2%	0,1W	SMD	5322 116 83647	
R209	22k	±2%	0,1W	SMD	5322 116 83662	
R210	100k	±10%	Thermistor SM		5322 116 30482	
R211	0			Jumper	4822 051 10008	Low Power
R211	10	±2%	0,1W	SMD	4822 051 20109	High Power, UHF, A9 & B5 Bands
R211	2Ω2	±2%	0,1W	SMD	4822 051 10228	High Power, E0 Band
R212	150	±2%	0,1W	SMD	5322 116 83644	Low Power, U0 & A9 Bands
R213	10	±2%	0,1W	SMD	5322 117 10014	Low Power, U0 & A9 Bands
R214	1k	±2%	0,1W	SMD	5322 116 83652	Low Power, U0 & A9 Bands
R215	0			Jumper	4822 051 10008	Low Power
R215	10	±2%	0,1W	SMD	4822 051 20109	High Power, UHF, A9 & B5 Bands
R215	2Ω2	±2%	0,1W	SMD	4822 051 10228	High Power, E0 Band
R216,217	100	±2%	0,1W	SMD	4822 051 20101	
R218	10k	±2%	0,1W	SMD	5322 116 83658	
R219	39	±2%	0,1W	SMD	5322 116 83638	
R221	390	±2%	0,1W	SMD	5322 116 83647	Low Power, U0 & A9 Bands
R222	120	±2%	0,1W	SMD	5322 116 83643	Low Power, U0 & A9 Bands
R223	390	±2%	0,1W	SMD	5322 116 83647	Low Power, U0 & A9 Bands
R224	82	±2%	0,1W	SMD	5322 116 83641	High Power, UHF
R224	68	±2%	0,1W	SMD	5322 116 83792	High Power, VHF
R225	120	±2%	0,1W	SMD	5322 116 83643	High Power, UHF
R225	33	±2%	0,1W	SMD	5322 116 83684	Low Power
R225	180	±2%	0,1W	SMD	5322 116 83793	High Power, VHF
R226	47	±2%	0,1W	SMD	5322 116 83639	UHF
R226	39	±2%	0,1W	SMD	5322 116 83638	High Power, VHF
R226	56	±2%	0,1W	SMD	5322 117 10015	Low Power, VHF
R227	10	±2%	0,1W	SMD	5322 116 83636	Low Power, U0 & A9 Bands
R228	15	±2%	0,1W	SMD	5322 117 10014	VHF
R301	1k	±2%	0,1W	SMD	5322 116 83652	VHF, 12,5kHz
R301	10k	±2%	0,1W	SMD	5322 116 83658	E0 Band, Ref 9,6 LO 25kHz
R303	10	±2%	0,1W	SMD	5322 116 83636	
R304	220	±2%	0,1W	SMD	5322 116 83645	U0 & T4 Bands
R304	180	±2%	0,1W	SMD	5322 116 83793	TR Band
R304	330	±2%	0,1W	SMD	5322 116 83794	VHF
R305	390	±2%	0,1W	SMD	5322 116 83647	
R310	150	±2%	0,1W	SMD	5322 116 83644	UHF
R310	47	±2%	0,1W	SMD	5322 116 83639	VHF
R311,312	1k	±2%	0,1W	SMD	5322 116 83652	
R313	680	±2%	0,1W	SMD	5322 116 83649	
R315	220	±2%	0,1W	SMD	5322 116 83645	
R316	100k	±2%	0,1W	SMD	5322 116 83671	

Cct.Ref	Description				Part No.	Remarks
Resistors (Cont'd)						
R317	3k3	±2%	0,1W	SMD	5322 116 83655	VHF, T4 & TR Bands; U0 Band 20kHz, 25kHz
R317	10k	±2%	0,1W	SMD	5322 116 83658	U0 Band 12,5kHz
R318	3k3	±2%	0,1W	SMD	5322 116 83655	
R319	22	±2%	0,1W	SMD	5322 116 83637	UHF
R319	100	±2%	0,1W	SMD	5322 116 83642	VHF
R320	270	±2%	0,1W	SMD	5322 116 83646	
R321	10k	±2%	0,1W	SMD	5322 116 83658	
R323	10k	±2%	0,1W	SMD	5322 116 83658	
R324	39k	±2%	0,1W	SMD	5322 116 83665	UHF
R324	22k	±2%	0,1W	SMD	5322 116 83662	A9, B5 & E0 Bands
R325	10k	±2%	0,1W	SMD	5322 116 83658	
R326	39	±2%	0,1W	SMD	5322 116 83638	
R328	5k6	±2%	0,1W	SMD	5322 116 83657	
R329,330	3k9	±2%	0,1W	SMD	5322 116 83656	
R331	100	±2%	0,1W	SMD	5322 116 83642	
R332	100k	±2%	0,1W	SMD	5322 116 83671	
R344	68k	±2%	0,1W	SMD	5322 116 83668	
R346	1k	±2%	0,1W	SMD	5322 116 83652	
R347	2k7	±2%	0,1W	SMD	5322 116 83654	
R348	10	±2%	0,1W	SMD	5322 116 83636	
R354	100	±2%	0,1W	SMD	5322 116 83642	
R356	1M	±2%	0,1W	SMD	5322 116 83682	
R357	10k	±2%	0,1W	SMD	5322 116 83658	
R358-360	39k	±2%	0,1W	SMD	5322 116 83665	
R362	120k	±2%	0,1W	SMD	5322 116 83672	
R363	100k	±2%	0,1W	SMD	5322 116 83671	
R364	1k	±2%	0,1W	SMD	5322 116 83652	
R365	10k	±2%	0,1W	SMD	5322 116 83658	
R366	1k	±2%	0,1W	SMD	5322 116 83652	
R367	10k	±2%	0,1W	SMD	5322 116 83658	
R368	120k	±2%	0,1W	SMD	5322 116 83672	
R369	100k	±2%	0,1W	SMD	5322 116 83671	
R370	150k	±2%	0,1W	SMD	5322 116 83673	
R371-373	100k	±2%	0,1W	SMD	5322 116 83671	
R374	33k	±2%	0,1W	SMD	5322 116 83664	
R377	1k	±2%	0,1W	SMD	5322 116 83652	
R379	2k7	±2%	0,1W	SMD	5322 116 83654	
R381	47k	±2%	0,1W	SMD	5322 116 83666	
R382	100k	±2%	0,1W	SMD	5322 116 83671	
R383	10k	±2%	0,1W	SMD	5322 116 83658	
R384	10	±2%	0,1W	SMD	5322 116 83636	VHF
R385	100	±2%	0,1W	SMD	5322 116 83642	
R386	220	±2%	0,1W	SMD	5322 116 83645	
R387	39k	±2%	0,1W	SMD	5322 116 83665	
R388	4k7	±2%	0,1W	SMD	5322 116 83799	VHF & UO Bands
R390	1k8	±2%	0,1W	SMD	5322 116 83798	E0 Band, 25kHz
R391	3k9	±2%	0,1W	SMD	5322 116 83656	E0 Band, 25kHz
R392	68k	±2%	0,1W	SMD	5322 116 82284	E0 Band, Ref 9,6 LO 25kHz
R393	100k	±10%	Thermistor SM		5322 116 30482	E0 Band, Ref 9,6 LO 25kHz
R394	22k	±2%	0,1W	SMD	5322 116 83662	E0 Band, Ref 9,6 LO 25kHz
R395,396	56k	±2%	0,1W	SMD	5322 116 83667	E0 Band, 25kHz
R399	10k	±2%	0,1W	SMD	5322 116 83658	
R401	82k	±2%	0,1W	SMD	5322 116 83669	
R402	100k	±2%	0,1W	SMD	5322 116 83671	12,5kHz
R402	56k	±2%	0,1W	SMD	5322 116 83667	20kHz, 25kHz
R406,407	100k	±2%	0,1W	SMD	5322 116 83671	
R409	390k	±2%	0,1W	SMD	5322 116 83678	
R410	39k	±2%	0,1W	SMD	5322 116 83672	
R412	100k	±2%	0,1W	SMD	5322 116 83671	
R413	10k	±2%	0,1W	SMD	5322 116 83658	20kHz, 25kHz

Cct.Ref	Description				Part No.	Remarks
Resistors (Cont'd)						
R413	3k9	±2%	0,1W	SMD	5322 116 83656	12,5kHz
R414	330k	±2%	0,1W	SMD	5322 116 83677	20kHz, 25kHz
R414	390k	±2%	0,1W	SMD	5322 116 83678	12,5kHz
R416	820	±2%	0,1W	SMD	5322 116 83651	20kHz, 25kHz
R416	1k	±2%	0,1W	SMD	5322 116 83652	12,5kHz
R417	100k	±2%	0,1W	SMD	5322 116 83671	
R418	15k	±2%	0,1W	SMD	5322 116 83659	20kHz, 25kHz
R418	22k	±2%	0,1W	SMD	5322 116 83662	12,5kHz
R422	47k	±2%	0,1W	SMD	5322 116 83666	
R424	10	±2%	0,1W	SMD	4822 051 20109	UHF
R424	47	±2%	0,1W	SMD	5322 116 83639	VHF
R425	10k	±2%	0,1W	SMD	5322 116 83658	
R426	2k7	±2%	0,1W	SMD	5322 116 83654	
R427	10k	±2%	0,1W	SMD	5322 116 83658	
R428	100k	±2%	0,1W	SMD	5322 116 83671	
R429	390	±2%	0,1W	SMD	5322 116 83647	
R430	100k	±2%	0,1W	SMD	5322 116 83671	
R431	1k	±2%	0,1W	SMD	5322 116 83652	
R433,434	100k	±2%	0,1W	SMD	5322 116 83671	
R436,437	100k	±2%	0,1W	SMD	5322 116 83671	
R439	47k	±2%	0,1W	SMD	5322 116 83666	
R440	150k	±2%	0,1W	SMD	5322 116 83673	
R441	1M	±2%	0,1W	SMD	5322 116 83682	
R442,443	100k	±2%	0,1W	SMD	5322 116 83671	
R444	3k9	±2%	0,1W	SMD	5322 116 83656	
R445	22k	±2%	0,1W	SMD	5322 116 83662	UHF
R445	3k9	±2%	0,1W	SMD	5322 116 83656	VHF
R446,447	100k	±2%	0,1W	SMD	5322 116 83671	
R448	39k	±2%	0,1W	SMD	5322 116 83665	
R449	100k	±2%	0,1W	SMD	5322 116 83671	
R450,451	10k	±2%	0,1W	SMD	5322 116 83658	
R452	1k	±2%	0,1W	SMD	5322 116 83652	
R453	1M	±2%	0,1W	SMD	5322 116 83682	
R454	100k	±2%	0,1W	SMD	5322 116 83671	
R455	22k	±2%	0,1W	SMD	5322 116 83662	VHF
R457	390	±2%	0,1W	SMD	5322 116 83647	
R459	1M	±2%	0,1W	SMD	5322 116 83682	
R461	100k	±2%	0,1W	SMD	5322 116 83671	20kHz, 25kHz
R461	68k	±2%	0,1W	SMD	5322 116 83668	12,5kHz
R462,463	100k	±2%	0,1W	SMD	5322 116 83671	
R465,466	100k	±2%	0,1W	SMD	5322 116 83671	
R467	22k	±2%	0,1W	SMD	5322 116 83662	
R468	1k	±2%	0,1W	SMD	5322 116 83652	
R469	100k	±2%	0,1W	SMD	5322 116 83671	
R473	150k	±2%	0,1W	SMD	5322 116 83673	
R474	5k6	±2%	0,1W	SMD	5322 116 83657	20kHz, 25kHz
R475	5k6	±2%	0,1W	SMD	5322 116 83657	
R476	390	±2%	0,1W	SMD	5322 116 83647	
R477	2k7	±2%	0,1W	SMD	5322 116 83654	VHF
R478	390k	±2%	0,1W	SMD	5322 116 83678	
R479,480	100k	±2%	0,1W	SMD	5322 116 83671	
R483	3k3	±2%	0,1W	SMD	5322 116 83655	
R484	100k	±10%	Thermistor SM		5322 116 30482	
R485	150k	±2%	0,1W	SMD	5322 116 83673	
R486	180k	±2%	0,1W	SMD	5322 116 83674	
R503,504	100	±2%	0,1W	SMD	5322 116 83642	
R505-508	390	±2%	0,1W	SMD	5322 116 83647	
R509,510	1k	±2%	0,1W	SMD	5322 116 83652	
R513,514	1k	±2%	0,1W	SMD	5322 116 83652	
R515	39k	±2%	0,1W	SMD	5322 116 83665	
R516,517	1k	±2%	0,1W	SMD	5322 116 83652	

Cct.Ref	Description				Part No.	Remarks
Resistors (Cont'd)						
R518	560	±2%	0,1W	SMD	5322 116 82582	
R519	1k	±2%	0,1W	SMD	5322 116 83652	
Capacitors						
C101	100p	±5%	50V	SMD	4822 122 33744	U0 & T4 Bands
C101	1n	±10%	50V	SMD	5322 126 11578	VHF
C101	3p3	±0p25	50V	SMD	5322 126 12367	TR Band
C102	2p7	±0p25	50V	SMD	5322 126 12137	U0 & T4 Bands
C102	39p	±5%	50V	SMD	4822 122 33775	TR Band
C103	1p	±0p25	50V	SMD	5322 126 12133	U0 Band
C103	39p	±5%	50V	SMD	4822 122 33775	A9 Band
C103	47p	±5%	50V	SMD	4822 122 33777	B5 Band
C103	68p	±5%	50V	SMD	4822 122 32785	E0 Band
C103	1p2	±0p25	50V	SMD	5322 122 33537	T4 & TR Bands
C104	1p5	±0p25	50V	SMD	5322 126 12135	UHF
C104	27p	±5%	50V	SMD	4822 126 11669	A9 Band
C104	33p	±5%	50V	SMD	5322 126 12125	B5 Band
C106	1p5	±0p25	50V	SMD	5322 126 12135	U0 Band
C106	39p	±5%	50V	SMD	4822 122 33775	A9 Band
C106	47p	±5%	50V	SMD	4822 122 33777	B5 Band
C106	6p8	±0p5	50V	SMD	5322 126 12124	E0 Band
C106	1p2	±0p25	50V	SMD	5322 122 33537	T4 & TR Bands
C107	2p7	±0p25	50V	SMD	5322 126 12137	U0 Band
C107	5p6	±0p25	50V	SMD	5322 122 32967	T4 Band
C107	10p	±0p5	50V	SMD	4822 122 33741	TR Band
C107	33p	±5%	50V	SMD	5322 126 12125	A9 & B5 Bands
C107	15p	±5%	50V	SMD	5322 126 12144	E0 Band
C109	1p2	±0p25	50V	SMD	5322 122 33537	UHF
C109	39p	±5%	50V	SMD	4822 122 33775	A9 Band
C109	47p	±5%	50V	SMD	4822 122 33777	B5 Band
C109	10p	±0p5	50V	SMD	4822 122 33741	E0 Band
C110	2p7	±0p25	50V	SMD	5322 126 12137	U0 & T4 Bands
C110	3p3	±0p25	50V	SMD	5322 122 32286	TR Band
C110	27p	±5%	50V	SMD	4822 126 11669	A9 Band
C110	33p	±5%	50V	SMD	5322 126 12125	B5 Band
C111	1p	±0p25	50V	SMD	5322 126 12133	U0 & T4 Bands
C111	1p2	±0p25	50V	SMD	5322 122 33537	TR Band
C112	2p2	±0p25	50V	SMD	5322 126 12123	U0 Band
C112	2p7	±0p25	50V	SMD	5322 126 12137	T4 Band
C112	4p7	±0p5	50V	SMD	5322 126 12139	TR Band
C113	1p	±0p25	50V	SMD	5322 126 12133	UHF
C114	1p	±0p25	50V	SMD	5322 126 12133	U0 & T4 Bands
C114	1p2	±0p25	50V	SMD	5322 122 33537	TR Band
C116	2p7	±0p25	50V	SMD	5322 126 12137	U0 Band
C116	3p3	±0p25	50V	SMD	5322 122 32286	T4 Band
C116	3p9	±0p25	50V	SMD	5322 126 12138	TR Band
C117	100p	±5%	50V	SMD	4822 122 33744	U0 & TR Bands
C117	39p	±5%	50V	SMD	4822 122 33775	T4 Band
C117	1n	±10%	50V	SMD	5322 126 11578	VHF
C118,119	68n	±20%	16V	SMD	5322 126 12129	
C122	1n	±10%	50V	SMD	5322 126 11578	VHF
C123	1p5	±0p25	50V	SMD	5322 126 12135	U0 Band
C123	5p6	±0p25	50V	SMD	5322 122 32967	TR Band
C124	18p	±5%	50V	SMD	4822 122 33757	U0 Band
C124	56p	±5%	50V	SMD	4822 122 33782	A9 & B5 Bands
C124	82p	±5%	50V	SMD	4822 122 33788	E0 Band
C125	39p	±5%	50V	SMD	4822 122 33775	UHF
C125	56p	±5%	50V	SMD	4822 122 33782	VHF
C126	2p2	±0p25	50V	SMD	5322 126 12123	UHF & A9 Bands
C126	3p3	±0p25	50V	SMD	5322 126 12367	B5 Band

Cct.Ref	Description				Part No.	Remarks
Capacitors (Cont'd)						
C126	5p6	±0p5	50V	SMD	5322 126 12141	E0 Band
C127	1p8	±0p25	50V	SMD	5322 126 12136	A9 & B5 Bands
C127	2p2	±0p25	50V	SMD	5322 126 12123	UHF
C127	5p6	±0p5	50V	SMD	5322 126 12141	E0 Band
C128	8p2	±0p5	50V	SMD	5322 126 12142	UHF
C128	3p3	±0p25	50V	SMD	5322 122 32286	A9 Band
C128	4p7	±0p5	50V	SMD	5322 126 12139	B5 Band
C129	1p5	±0p25	50V	SMD	5322 126 12135	UHF
C129	3p9	±0p25	50V	SMD	5322 126 12138	A9 & B5 Bands
C130,131	1n	±10%	50V	SMD	5322 126 11578	VHF
C132	18p	±5%	50V	SMD	4822 122 33757	UHF
C132	56p	±5%	50V	SMD	4822 122 33782	A9 & B5 Bands
C132	82p	±5%	50V	SMD	4822 122 33788	E0 Band
C133	1p5	±0p25	50V	SMD	5322 126 12135	U0 Band
C133	6p8	±0p5	50V	SMD	5322 126 12124	TR Band
C133	8p2	±0p5	50V	SMD	5322 126 12142	A9 Band
C133	12p	±5%	50V	SMD	5322 126 12143	B5 Band
C133	27p	±0p5	50V	SMD	4822 126 11669	E0 Band
C134	4p7	±0p5	50V	SMD	5322 126 12139	UHF & A9 Bands
C134	6p8	±0p5	50V	SMD	5322 126 12124	B5 Band
C134	12p	±5%	50V	SMD	5322 126 12143	E0 Band
C135	4p7	±0p5	50V	SMD	5322 126 12139	UHF
C135	1n	±10%	50V	SMD	5322 126 11578	VHF
C136	100p	±5%	50V	SMD	4822 122 33744	UHF
C136	56p	±5%	50V	SMD	4822 122 33782	VHF
C137	68n	±20%	16V	SMD	5322 126 12129	
C138	3p9	±0p25	50V	SMD	5322 126 12138	U0 Band
C138	5p6	±0p25	50V	SMD	5322 122 32967	T4 & TR Bands
C138	15p	±5%	50V	SMD	5322 126 12144	A9 & B5 Bands
C138	39p	±5%	50V	SMD	5322 126 33775	E0 Band
C139	10p	±0p5	50V	SMD	4822 122 33741	12,5kHz
C139	10n	±10%	50V	SMD	5322 126 11583	20kHz, 25kHz
C140	10n	±10%	50V	SMD	5322 126 11583	
C141	8p2	±0p5	50V	SMD	5322 126 12142	20kHz, 25kHz
C141	18p	±5%	50V	SMD	4822 122 33757	12,5kHz
C142	10n	±10%	50V	SMD	5322 126 11583	
C144	47p	±5%	50V	SMD	4822 122 33777	12,5kHz
C144	10n	±10%	50V	SMD	5322 126 11583	20kHz, 25kHz
C145,146	1n	±10%	50V	SMD	5322 126 11578	VHF
C148	10n	±10%	50V	SMD	5322 126 11583	
C149	68n	±20%	16V	SMD	5322 126 12129	
C150	18p	±5%	50V	SMD	4822 122 33757	
C151	68n	±20%	16V	SMD	5322 126 12129	
C152	18p	±5%	50V	SMD	4822 122 33757	
C156	68n	±20%	16V	SMD	5322 126 12129	
C159	10n	±10%	50V	SMD	5322 126 11583	
C161	220p	±5%	50V	SMD	5322 126 12548	
C162	220p	±5%	50V	SMD	5322 126 12151	
C164	68n	±20%	16V	SMD	5322 126 12129	
C174	1n	±10%	50V	SMD	5322 126 11578	VHF
C175	68n	±20%	16V	SMD	5322 126 12129	
C176	2p7	±0p25	50V	SMD	5322 126 12137	
C177	4p5-20p		variable		5322 125 50574	
C178	2p2	±0p25	50V	SMD	5322 126 12123	
C179	6µ8	±10%	16V	SMD	5322 126 11729	UHF
C179	1	±10%	16V	SMD	5322 124 11275	VHF
C180	100p	±5%	50V	SMD	4822 122 33744	
C181	10p	±0p5	50V	SMD	4822 122 33741	UHF
C181	4p7	±0p5	50V	SMD	5322 126 12139	E0 Band
C182	4p7	±0p5	50V	SMD	5322 126 12139	A9 Band
C182	10p	±0p5	50V	SMD	4822 122 33741	B5 Band

Cct.Ref	Description				Part No.	Remarks
Capacitors (Cont'd)						
C182	18p	±5%	50V	SMD	4822 122 33757	E0 Band
C183	6µ8	±10%	16V	SMD	5322 126 11729	E0 Band
C184	12p	±5%	50V	SMD	5322 126 12143	E0 Band
C200	68n	±20%	16V	SMD	5322 126 12129	
C201	100p	±5%	50V	SMD	4822 122 33744	Low Power, U0 Band
C201	1n	±10%	50V	SMD	5322 126 11578	Low Power, A9 Band
C202	12p	±5%	50V	SMD	5322 126 12143	Low Power, U0 Band
C202	18p	±5%	50V	SMD	4822 122 33757	Low Power, A9 Band
C203	1n	±10%	50V	SMD	5322 126 11578	Low Power, U0 & A9 Bands
C205	100p	±5%	50V	SMD	4822 122 33744	Low Power, U0 Band
C205,206	1n	±10%	50V	SMD	5322 126 11578	Low Power, A9 Band
C207	6p8	±0p5	50V	SMD	5322 126 12124	Low Power, U0 Band
C207	18p	±5%	50V	SMD	4822 122 33757	Low Power, A9 Band
C208	15p	±5%	50V	SMD	5322 126 12144	Low Power, U0 Band
C208	56p	±5%	50V	SMD	5322 122 32661	Low Power, A9 Band
C209	10p	±0p5	50V	SMD	4822 122 33741	A9 & B5 Bands
C209	47p	±0p5	50V	SMD	4822 122 33777	E0 Band
C210	68n	±20%	16V	SMD	5322 126 10893	UHF; High Power, VHF
C211,212	68n	±20%	16V	SMD	5322 126 12129	
C213	68n	±20%	16V	SMD	5322 126 10893	UHF; High Power, VHF
C214	3µ3	±10%	16V	SMD	5322 126 10893	UHF; High Power, VHF
C215	68n	±20%	16V	SMD	5322 126 12129	
C216	3p3	±0p25	50V	SMD	5322 122 32286	UHF
C217	1p2	±0p25	50V	SMD	5322 122 33537	UHF
C217	12p	±5%	50V	SMD	4822 122 33926	A9 & B5 Bands
C218	3p3	±0p25	50V	SMD	5322 122 32286	UHF
C219	5p6	±0p5	50V	SMD	5322 122 32967	UHF
C219	22p	±5%	50V	SMD	5322 122 32658	A9 & B5 Bands
C219	56p	±5%	50V	SMD	5322 122 32661	E0 Band
C221	1p2	±0p25	50V	SMD	5322 122 33537	UHF
C221	3p3	±0p25	50V	SMD	5322 122 32286	A9 & B5 Bands
C221	15p	±5%	50V	SMD	5322 122 33869	E0 Band
C222	1p	±0p25	50V	SMD	5322 122 32447	UHF
C222	4p7	±0p25	50V	SMD	5322 122 32287	A9 & B5 Bands
C222	22p	±5%	50V	SMD	5322 122 32658	E0 Band
C223	1p2	±0p25	50V	SMD	5322 122 33537	UHF
C223	10p	±0p5	50V	SMD	5322 122 32448	A9 & B5 Bands
C223	33p	±5%	50V	SMD	5322 126 32659	E0 Band
C224	1p	±0p25	50V	SMD	5322 122 32447	UHF
C224	2p7	±0p25	50V	SMD	5322 122 31873	A9 & B5 Bands
C224	15p	±5%	50V	SMD	5322 122 33869	E0 Band
C225	5p6	±0p5	50V	SMD	5322 122 32967	UHF
C225	12p	±5%	50V	SMD	4822 122 33926	A9 & B5 Bands
C225	56p	±5%	50V	SMD	5322 122 32661	E0 Band
C226	3p3	±0p25	50V	SMD	5322 122 32286	UHF
C226	22p	±5%	50V	SMD	5322 122 32658	A9 & B5 Bands
C226	47p	±0p5	50V	SMD	5322 122 32452	E0 Band
C227-230	1n	±10%	50V	SMD	5322 126 11578	VHF
C231	68n	±20%	16V	SMD	5322 126 12129	UHF
C231	3µ3	±10%	16V	SMD	5322 126 10893	VHF
C232	3µ3	±10%	16V	SMD	5322 126 10893	
C233,234	10n	±10%	50V	SMD	5322 126 11583	Low Power, U0 Band
C235	100p	±5%	50V	SMD	5322 122 32531	Low Power, U0 Band
C235	3µ3	±10%	16V	SMD	5322 126 10893	High Power, VHF
C236	1	±10%	16V	SMD	5322 124 11275	VHF
C238	1n	±10%	50V	SMD	5322 126 11578	VHF
C239	1p5	±0p25	50V	SMD	5322 126 12135	Low Power, U0 Band
C239	15p	±5%	50V	SMD	5322 126 12144	Low Power, A9 Band
C240	1p5	±0p25	50V	SMD	5322 126 12135	Low Power, U0 Band
C240	6p8	±0p5	50V	SMD	5322 122 32269	Low Power, A9 Band
C241	6p8	±0p5	50V	SMD	5322 122 32269	UHF

Cct.Ref	Description				Part No.	Remarks
Capacitors (Cont'd)						
C241	1p5	±0p25	50V	SMD	5322 126 10225	A9 & B5 Bands
C241	39p	±5%	50V	SMD	5322 126 32966	E0 Band
C242	8p2	±0p5	50V	SMD	5322 126 12142	Low Power, U0 Band
C242	33p	±5%	50V	SMD	5322 126 12125	Low Power, A9 Band
C243	10p	±0p5	50V	SMD	4822 122 33741	A9 & B5 Bands
C243	1n	±10%	50V	SMD	5322 126 11578	E0 Band
C244	100p	±5%	50V	SMD	4822 122 33744	Low Power, U0 Band
C244	1n	±10%	50V	SMD	5322 126 11578	Low Power, A9 Band
C245	1p2	±0p25	50V	SMD	5322 122 33537	UHF
C245	1p5	±0p25	50V	SMD	5322 126 10225	A9 & B5 Bands
C245	12p	±5%	50V	SMD	5322 126 33926	E0 Band
C246	1p2	±0p25	50V	SMD	5322 122 33537	UHF
C246	12p	±5%	50V	SMD	4822 122 33926	A9 & B5 Bands
C246	39p	±5%	50V	SMD	5322 126 32966	E0 Band
C247	3p3	±0p25	50V	SMD	5322 122 32286	UHF
C248,249	1n	±10%	50V	SMD	5322 126 11578	VHF
C250	100p	±5%	50V	SMD	4822 122 33744	Low Power, U0 Band
C250	1n	±10%	50V	SMD	5322 126 11578	Low Power, A9 Band
C254	1n	±10%	50V	SMD	5322 122 34123	Low Power, U0 Band
C301	27p	±5%	50V	SMD	4822 126 11669	UHF
C301	47p	±5%	50V	SMD	4822 122 33777	A9 Band
C301	82p	±5%	50V	SMD	4822 122 33788	B5 Band
C301	100p	±5%	50V	SMD	4822 122 33744	E0 Band
C302	100p	±5%	50V	SMD	4822 122 33744	UHF
C302	1n	±10%	50V	SMD	5322 126 11578	VHF
C303	4p7	±0p25	50V	SMD	5322 126 12139	U0, T4 & E0 Bands
C303	3p3	±0p25	50V	SMD	5322 122 32286	TR Band
C303	8p2	±0p5	50V	SMD	5322 126 12142	A9 & B5 Bands
C304	4p7	±0p25	50V	SMD	5322 126 12139	UHF & E0 Bands
C304	8p2	±0p5	50V	SMD	5322 126 12142	A9 & B5 Bands
C305	2p2	±0p25	50V	SMD	5322 126 12123	UHF
C305	2p7	±0p25	50V	SMD	5322 126 12137	VHF
C306	100p	±5%	50V	SMD	4822 122 33744	
C306	1n	±10%	50V	SMD	5322 126 11578	VHF
C308	10n	±10%	50V	SMD	3513 999 06089	E0 Band, Ref 9,6 LO 25kHz
C309	1n	±10%	50V	SMD	5322 126 11578	E0 Band
C310	1n	±10%	50V	SMD	5322 126 11578	VHF
C311	100p	±5%	50V	SMD	4822 122 33744	UHF
C311	1n	±10%	50V	SMD	5322 126 11578	VHF
C312	2p2	±0p25	50V	SMD	5322 126 12123	U0 Band
C312	3p9	±0p25	50V	SMD	5322 126 12138	T4 & TR Bands
C312	4p7	±0p25	50V	SMD	5322 126 12139	A9 & B5 Bands
C312	22p	±5%	50V	SMD	4822 122 33761	E0 Band
C313	2p2	±0p25	50V	SMD	5322 126 12123	U0 Band
C313	3p9	±0p25	50V	SMD	5322 126 12138	T4 & TR Bands
C313	10p	±0p5	50V	SMD	5322 126 12125	A9 Band
C313	22p	±5%	50V	SMD	4822 122 33761	B5 Band
C313	18p	±5%	50V	SMD	4822 122 33757	E0 Band
C318	2n2	±10%	50V	SMD	5322 126 12126	
C320	8p2	±0p5	50V	SMD	5322 126 12142	U0 Band
C320	12p	±5%	50V	SMD	5322 126 33926	T4 & TR Bands
C320	100p	±5%	50V	SMD	4822 122 33744	VHF
C321	2p7	±0p25	50V	SMD	5322 126 12137	U0 & T4 Bands
C321	1p	±0p25	50V	SMD	5322 126 12133	TR Band
C321	8p2	±0p5	50V	SMD	5322 126 12142	VHF
C322	1n	±10%	50V	SMD	5322 126 11578	VHF
C323	100p	±5%	50V	SMD	4822 122 33744	UHF
C323	1n	±10%	50V	SMD	5322 126 11578	VHF
C324	100p	±5%	50V	SMD	4822 122 33744	UHF
C324	1n	±10%	50V	SMD	5322 126 11578	VHF
C325	1p	±0p25	50V	SMD	5322 126 12133	UHF & A9 Bands

Cct.Ref	Description				Part No.	Remarks
Capacitors (Cont'd)						
C325	4p7	±0p25	50V	SMD	5322 126 12139	E0 Band
C328-330	1n	±10%	50V	SMD	5322 126 11578	VHF
C331	3p9	±0p25	50V	SMD	5322 126 12138	UHF
C331	15p	±5%	50V	SMD	5322 126 12144	A9 & B5 Bands
C331	33p	±5%	50V	SMD	5322 126 12125	E0 Band
C332	6p8	±0p5	50V	SMD	5322 126 12124	UHF
C332	15p	±5%	50V	SMD	5322 126 12144	A9 & B5 Bands
C332	33p	±5%	50V	SMD	5322 126 12125	E0 Band
C333	10p	±0p5	50V	SMD	4822 122 33741	UHF
C333	100p	±5%	50V	SMD	4822 122 33785	A9 Band
C333	68p	±5%	50V	SMD	4822 122 33785	B5 Band
C333	180p	±5%	50V	SMD	5322 126 12548	E0 Band
C335	1p	±0p25	50V	SMD	5322 126 12133	UHF
C335	2p2	±0p25	50V	SMD	5322 126 12123	A9 & B5 Bands
C335	6p8	±0p5	50V	SMD	5322 126 12124	E0 Band
C338-340	1n	±10%	50V	SMD	5322 126 11578	VHF
C341	47p	±5%	50V	SMD	4822 122 33777	UHF
C341	1n	±10%	50V	SMD	5322 126 11578	VHF
C343	6µ8	±10%	16V	SMD	5322 126 11729	
C344	2n2	±10%	50V	SMD	5322 126 12126	
C345	10n	±10%	50V	SMD	5322 126 11583	
C346	1p	±0p25	50V	SMD	5322 126 12133	UHF, A9 & B5 bands
C346	4p7	±0p25	50V	SMD	5322 126 12139	E0 Band
C347	1p8	±0p25	50V	SMD	5322 126 12136	UHF, A9 & B5 bands
C347	6p8	±0p5	50V	SMD	5322 126 12124	E0 Band
C351	47p	±5%	50V	SMD	4822 122 33777	
C352-354	68n	±20%	16V	SMD	5322 126 12129	
C355	1n	±10%	50V	SMD	5322 126 11578	VHF
C361	100p	±5%	50V	SMD	5322 122 32531	UHF
C361	4n7	±10%	50V	SMD	5322 126 12127	VHF
C362	15p	±5%	50V	SMD	5322 126 12144	UHF
C362	56p	±5%	50V	SMD	4822 122 33782	A9 & B5 Bands
C362	180p	±5%	50V	SMD	5322 126 12548	E0 Band
C363	22n	±10%	50V	SMD	5322 122 32654	
C364	1p2	±0p25	50V	SMD	5322 126 12134	UHF
C364	8p2	±0p5	50V	SMD	5322 126 12142	A9 & B5 Bands
C364	10p	±0p5	50V	SMD	4822 122 33741	E0 Band
C365	6µ8	±10%	16V	SMD	5322 126 11729	
C366	680p	±5%	50V	SMD	5322 126 11009	VHF
C367	4n7	±10%	50V	SMD	5322 126 12127	
C368	47n	±10%	50V	SMD	4822 122 32542	UHF
C368	68n	±20%	16V	SMD	5322 126 12129	A9, B5 & E0 Bands
C369	100p	±5%	50V	SMD	4822 122 33744	
C371,372	1n	±10%	50V	SMD	5322 126 11578	VHF
C373	6µ8	±10%	16V	SMD	5322 126 11729	
C374	68n	±20%	16V	SMD	5322 126 12129	
C375	47n	±10%	50V	SMD	4822 122 32542	
C376	1n	±10%	50V	SMD	5322 126 11578	VHF
C377	330n	±10%	16V	SMD	5322 126 12131	
C378,379	1n	±10%	50V	SMD	5322 126 11578	VHF
C381-383	1n	±10%	50V	SMD	5322 126 11578	VHF
C384,385	100p	±5%	50V	SMD	4822 122 33744	
C386	1n	±10%	50V	SMD	5322 126 11578	VHF
C388	3µ3	±10%	16V	SMD	5322 126 10893	
C389	1	±10%	16V	SMD	5322 124 11275	
C390	4n7	±10%	50V	SMD	5322 126 12127	UHF
C390	1n	±10%	50V	SMD	5322 126 11578	A9, B5 & E0 Bands
C391	22n	±10%	50V	SMD	5322 122 32654	
C392	10p	±0p5	50V	SMD	4822 122 33741	A9 Band
C392	4p7	±0p25	50V	SMD	5322 126 12139	U0 Band
C392	12p	±5%	50V	SMD	5322 126 12143	B5 Band

Cct.Ref	Description				Part No.	Remarks
Capacitors (Cont'd)						
C392	18p	±5%	50V	SMD	4822 122 33757	E0 Band
C393	3µ3	±10%	16V	SMD	5322 126 10893	
C395	68n	±20%	16V	SMD	5322 126 12129	
C396	1p	±0p25	50V	SMD	5322 126 12133	UHF, A9 & B5 Bands; E0 Band, 12,5kHz
C396	10p	±0p5	50V	SMD	4822 122 33741	E0 Band, 25kHz
C397	12p	±5%	50V	SMD	5322 126 12143	E0 Band, 25kHz
C398	22p	±5%	50V	SMD	4822 122 33761	E0 Band, 25kHz
C399	100p	±5%	50V	SMD	4822 122 33744	E0 Band, Ref 9,6 LO 25kHz
C401	390p	±5%	50V	SMD	4822 122 32636	
C402	680p	±5%	50V	SMD	5322 126 11009	
C403	330n	±10%	16V	SMD	5322 126 12131	
C404	100p	±5%	50V	SMD	4822 122 33744	
C405	22n	±10%	50V	SMD	5322 122 32654	
C408	2n2	±10%	50V	SMD	5322 126 12126	
C409,410	1n	±10%	50V	SMD	5322 126 11578	VHF
C411	1	±10%	16V	SMD	5322 124 11275	
C412,413	68n	±20%	16V	SMD	5322 126 12129	
C414	1n	±10%	50V	SMD	5322 126 11578	VHF
C416,417	68n	±20%	16V	SMD	5322 126 12129	
C418,419	100p	±5%	50V	SMD	4822 122 33744	
C420	68n	±20%	16V	SMD	5322 126 12129	
C421	10n	±10%	50V	SMD	5322 126 11583	
C422	3µ3	±10%	16V	SMD	5322 126 10893	
C423	330n	±10%	16V	SMD	5322 126 12131	
C428,429	100p	±5%	50V	SMD	4822 122 33744	
C431	68n	±20%	16V	SMD	5322 126 12129	
C434	39p	±5%	50V	SMD	4822 122 33775	
C437	68n	±20%	16V	SMD	5322 126 12129	
C439,440	47p	±5%	50V	SMD	4822 122 33777	
C441	68n	±20%	16V	SMD	5322 126 12129	
C442	2n2	±10%	50V	SMD	5322 126 12126	
C443	100p	±5%	50V	SMD	4822 122 33744	
C445,446	68n	±20%	16V	SMD	5322 126 12129	
C447	330n	±10%	16V	SMD	5322 126 12131	
C509-511	1n	±10%	50V	SMD	5322 126 11578	
C513-516	1n	±10%	50V	SMD	5322 126 11578	
C518-522	100p	±5%	50V	SMD	4822 122 33744	
C523	47p	±5%	50V	SMD	4822 122 33777	
C524	1n	±10%	50V	SMD	5322 126 11578	
C525	47p	±5%	50V	SMD	4822 122 33777	
C528	1n	±10%	50V	SMD	5322 126 11578	
C529	100p	±5%	50V	SMD	4822 122 33744	
C530-533	1n	±10%	50V	SMD	5322 126 11578	
C3100	4p7	±0p52	50V	SMD	5322 126 12139	E0
Inductors						
L101	Coil, UHF				5322 157 63881	UHF
L101	10nH	±2%	Inductor	SMD	5322 157 70389	A9 & B5 Bands
L101	100nH	±2%	Inductor	SMD	5322 157 70368	E0 Band
L102	910nH	±2%	Inductor	SMD	5322 157 70372	E0 Band
L103	Coil, UHF				5322 157 63881	UHF
L103	10nH	±2%	Inductor	SMD	5322 157 70389	A9 & B5 Bands
L103	150nH	±2%	Inductor	SMD	5322 157 70369	E0 Band
L104	Coil, UHF				5322 157 63881	UHF
L105	4nH	±10%	Inductor	SMD	5322 157 63874	UHF
L105	39nH	±10%	Inductor	SMD	5322 157 63889	A9 & B5 Bands
L105	56nH	±10%	Inductor	SMD	5322 157 63877	E0 Band
L106	56nH	±10%	Inductor	SMD	5322 157 63877	UHF
L106	33nH	±10%	Inductor	SMD	5322 157 63882	A9 & B5 Bands
L106	82nH	±5%	Inductor	SMD	5322 157 70498	E0 Band

Cct.Ref	Description	Part No.	Remarks
Inductors (Cont'd)			
L107	33nH ±10% Inductor SMD	5322 157 63882	A9 Band
L108	33nH ±10% Inductor SMD	5322 157 63882	A9 & B5 Bands
L108	82nH ±5% Inductor SMD	5322 157 70498	E0 Band
L109	100nH ±20% Inductor SMD	5322 157 63093	UHF
L109	330nH ±10% Inductor SMD	5322 157 63887	A9 & B5 Bands
L109	470nH ±20% Inductor SMD	5322 157 63282	E0 Band
L110	330nH ±20% Inductor SMD	5322 157 63887	UHF
L110	330nH ±10% Inductor SMD	5322 157 63887	A9 & B5 Bands
L110	470nH ±20% Inductor SMD	5322 157 63282	E0 Band
L111	1µ5 ±10% Inductor SMD	5322 157 63876	12,5kHz
L111	3µ3 ±10% Inductor SMD	5322 157 63883	20kHz, 25kHz
L112	56nH ±10% Inductor SMD	5322 157 63877	
L116	300 Coil SMD Adj.	5322 156 90084	
L117	1µ5 ±10% Inductor SMD	5322 157 63876	
L118	39nH ±10%	5322 157 63889	UHF & A9 Bands
L118	150nH ±2% Inductor SMD	5322 157 70369	E0 Band
L201	100nH ±20% Inductor SMD	5322 157 63093	UHF & B5 Bands
L201	82nH ±5% Inductor SMD	5322 157 63296	A9 Band
L201	220nH ±5% Inductor SMD	5322 157 70498	E0 Band
L202	Coil, UHF	5322 157 63881	UHF
L202	Coil, VHF	5322 216 81953	VHF
L204	100nH ±20% Inductor SMD	5322 157 63093	UHF; High Power, VHF
L205	100nH ±20% Inductor SMD	5322 157 63093	
L206	100nH ±20% Inductor SMD	5322 157 63093	UHF; High Power, VHF
L207	Coil, UHF	5322 157 63881	UHF
L208	Coil, UHF	5322 157 63881	UHF
L208	Coil, VHF	5322 216 81953	VHF
L209	Coil, UHF	5322 157 63881	UHF
L209	Coil, VHF	5322 216 81953	VHF
L210	330nH ±10% Inductor SMD	5322 157 62137	UHF
L210	1µ5 ±10% Inductor SMD	5322 157 63876	A9 & B5 Bands
L210	3µ3 ±10% Inductor SMD	5322 157 63883	E0 Band
L211	Coil, UHF	5322 157 63881	UHF
L211	Coil, VHF	5322 216 81953	VHF
L212	Coil, UHF	5322 157 63881	UHF
L212	Coil, VHF	5322 216 81953	VHF
L213	8nH ±5% Inductor SMD	5322 157 70497	Low Power, U0 Band
L213	39nH ±10% Inductor SMD	5322 157 63889	Low Power, A9 Band
L214	100nH ±20% Inductor SMD	5322 157 63093	Low Power, U0 & A9 Bands
L215	4nH ±10% Inductor SMD	5322 157 63874	Low Power, U0 Band
L215	22nH ±10% Inductor SMD	5322 157 63875	Low Power, A9 Band
L216	10nH ±2% Inductor SMD	5322 157 70389	Low Power, A9 Band
L217	100nH ±20% Inductor SMD	5322 157 63093	Low Power, U0 & A9 Bands
L218	8nH ±5% Inductor SMD	5322 157 70497	Low Power, U0 Band
L218	18nH ±10% Inductor SMD	5322 157 70017	Low Power, A9 Band
L219	4nH ±10% Inductor SMD	5322 157 63874	UHF
L301	330nH ±10% Inductor SMD	5322 157 62137	UHF
L301	1µ5 ±10% Inductor SMD	5322 157 63876	A9 & B5 Bands
L301	3µ3 ±10% Inductor SMD	5322 157 63883	E0 Band
L302	330nH ±10% Inductor SMD	5322 157 62137	UHF
L302	1µ5 ±10% Inductor SMD	5322 157 63876	A9 & B5 Bands
L302	3µ3 ±10% Inductor SMD	5322 157 63883	E0 Band
L303	22nH ±10% Inductor SMD	5322 157 63875	A9 Band
L303	27nH ±10% Inductor SMD	5322 157 70388	B5 Band
L303	68nH ±2% Inductor SMD	5322 157 70367	E0 Band
L305	47nH ±10% Inductor SMD	5322 157 63891	UHF
L305	100nH ±10% Inductor SMD	5322 157 61694	A9 Band
L305	150nH ±10% Inductor SMD	5322 157 61807	B5 Band
L305	220nH ±5% Inductor SMD	5322 157 62129	E0 Band
L306	22nH ±10% Inductor SMD	5322 157 63875	UHF
L307	330nH ±10% Inductor SMD	5322 157 62137	UHF

Cct.Ref	Description	Part No.	Remarks
Inductors (Cont'd)			
L307	1µ5 ±10% Inductor SMD	5322 157 63876	A9 & B5 Bands
L307	3µ3 ±10% Inductor SMD	5322 157 63883	E0 Band
L308	8nH ±5% Inductor SMD	5322 157 70497	U0 & T4 Bands
L308	10nH ±2% Inductor SMD	5322 157 70389	TR Band
L308	33nH ±10% Inductor SMD	5322 157 63882	A9 Band
L308	39nH ±10% Inductor SMD	5322 157 63889	B5 Band
L308	100nH ±2% Inductor SMD	5322 157 70368	E0 Band
L309	330nH ±10% Inductor SMD	5322 157 62137	UHF
L309	1µ5 ±10% Inductor SMD	5322 157 63876	A9 & B5 Bands
L309	3µ3 ±10% Inductor SMD	5322 157 63883	E0 Band
L312	33nH ±10% Inductor SMD	5322 157 63882	UHF
L312	120nH ±10% Inductor SMD	5322 157 62136	A9 Band
L312	150nH ±10% Inductor SMD	5322 157 61807	B5 Band
L312	270nH ±5% Inductor SMD	5322 157 70371	E0 Band
L313	33nH ±10% Inductor SMD	5322 157 63882	UHF
L313	120nH ±10% Inductor SMD	5322 157 62136	A9 Band
L313	150nH ±10% Inductor SMD	5322 157 61807	B5 Band
L313	270nH ±5% Inductor SMD	5322 157 70371	E0 Band
L314	470 ±10% Inductor SMD	5322 157 70387	
L315	15nH ±10% Inductor SMD	5322 157 63888	UHF
L315	33nH ±10% Inductor SMD	5322 157 63882	A9 & B5 Bands
L315	68nH ±2% Inductor SMD	5322 157 70367	E0 Band
L317,318	22nH ±10% Inductor SMD	2422 535 95058	E0 Band, 25kHz
L401	100nH ±20% Inductor SMD	5322 157 63093	
L503,504	22nH ±10% Inductor SMD	5322 157 63875	
L506	100nH ±20% Inductor SMD	5322 157 63093	
L508	100nH ±20% Inductor SMD	5322 157 63093	
L510,511	100nH ±20% Inductor SMD	5322 157 63093	
L513,514	100nH ±20% Inductor SMD	5322 157 63093	
Miscellaneous			
M103	Ceramic Resonator 530MHz 3x4	5322 242 81178	U0 Band
M103	Ceramic Resonator 496MHz 3x4	5322 242 81459	T4 & TR Bands
M104	Ceramic Resonator 530MHz 3x4	5322 242 81178	U0 Band
M104	Ceramic Resonator 496MHz 3x4	5322 242 81459	T4 & TR Bands
M106	Xtal Filter 45MHz, 12,5kHz	5322 242 81175	12,5kHz
M106	Xtal Filter 45MHz, 25kHz	5322 242 81176	20kHz, 25kHz
M107	Xtal Filter 45MHz, 12,5kHz	5322 242 81175	12,5kHz
M107	Xtal Filter 45MHz, 25kHz	5322 242 81176	20kHz, 25kHz
M108	Xtal Resonator 45,455MHz	5322 242 81173	45,455MHz LO
M108	Xtal Resonator 44,545MHz	5322 242 81174	44,545MHz LO
M109	Ceramic Filter 455kHz	5322 242 81172	12,5kHz
M109	Ceramic Filter 455kHz	5322 242 81169	20kHz
M109	Ceramic Filter 455kHz CFZM455C	5322 242 81171	25kHz
M206	MHW707-2 'BeO'	5322 209 31174	High Power, U0 & T4 Bands
M206	MHW707-1 'BeO'	5322 209 32329	High Power, TR Band
M206	MHW607-2 'BeO'	5322 209 32021	High Power, A9 Band
M206	PA Module MHW607-1 'BeO'	9322 050 62682	High Power, B5 Band
M206	PA Module MHW105 'BeO'	5322 219 82643	High Power, E0 Band
M301	TCXO 9,6MHz 2,5ppm	5322 219 82585	Ref 9,6 LO 12,5kHz
M301	TCXO 9,6MHz 4,0ppm	5322 219 82578	Ref 9,6 LO 20kHz, 25kHz
M301	TCXO 9,9MHz 2,5ppm	5322 219 82579	Ref 9,9 LO 12,5kHz
M301	TCXO 9,9MHz 4,0ppm	5322 219 82581	Ref 9,9 LO 20kHz, 25kHz
M302	Ceramic Resonator 510MHz 4x4	5322 242 81177	U0 Band
M302	Ceramic Resonator 474MHz 4x4	5322 242 81458	T4 & TR Bands
M302	Xtal, 9,6MHz	5322 242 81472	E0 Band, Ref 9,6 LO 25kHz
M302	Xtal, 9,9MHz	5322 242 81473	E0 Band, Ref 9,6 LO 25kHz

PCB ASSEMBLY CONTROL

PCB Assembly Control+CTCSS **3513 570 06561**

Semiconductors and IC's

IC1	IC SMD MB89T715APF	5322 209 31178	
IC2	ASIC SMD CF30249	5322 209 31172	
IC3	ASIC SMD SN94922 To Drawing	5322 209 31171	
IC4	IC SMD AT28C64-15SI E^2PROM	5322 209 31177	
IC5	EPROM Assy to 4313 327 80144	3513 506 11254	
IC6	IC SMD UPD43256A	4822 209 62688	
IC7	IC SMD FX365LG	4822 209 63705	CTCSS
IC10	IC SMD LS404 Op Amp	5322 209 31179	
IC11	IC SMD PFC8579T LCD DRVR	5322 209 31186	
IC12	IC SMD PFC8578T LCD DRVR	5322 209 31185	
IC13	IC SMD TDA7073AT	5322 209 32077	
IC14	IC SMD LP2951CM	5322 209 31184	
TR1	Transistor SMA 2N7002	5322 130 62379	
TR2	Transistor SMD BCW32	5322 130 41719	
TR3	Transistor SMD BCW30	5322 130 44335	
TR4,5	Transistor SMD BCW32	5322 130 41719	
TR6	Transistor SMA 2N7002	5322 130 62379	
TR7	Transistor SMD BFT46	5322 130 44797	
TR8	Transistor SMD BCW30	5322 130 44335	
TR9	Transistor SMA 2N7002	5322 130 62379	
TR10	Transistor SMD BFT46	5322 130 44797	
TR11	Transistor SMA 2N7002	5322 130 62379	
TR12	Transistor SMD BCW30	5322 130 44335	
TR13	Transistor SMD BSR31,T1	5322 130 63008	
TR14	Transistor SMA 2N7002	5322 130 62379	
TR15	Transistor SMD BCW32	5322 130 41719	
TR16	Transistor SMD BFR93	5322 130 44801	
D1	Diode SMD BAS16	5322 130 31928	CTCSS
D2	Diode SMD BAS16	5322 130 31928	
D4	Diode SMD BZX84C15	5322 130 33662	
D5,6	LED SMD PY1102W-TR	5322 130 82395	
D7	Diode SMD BAS16	5322 130 31928	
D9	Diode SMD BAV99	5322 130 34337	
D10	Diode SMD BAS16	5322 130 31928	
D11-16	LED SMD PY1102W-TR	5322 130 82395	
D17	Diode SMD BAV99	5322 130 34337	
D18,19	Diode SMD BAS16	5322 130 31928	
D20	Diode SMD BAV99	5322 130 34337	
D21,22	Diode SMD BAS16	5322 130 31928	
D23	Diode SMD BAV99	5322 130 34337	
D24-26	Diode SMD BAS16	5322 130 31928	

Resistors

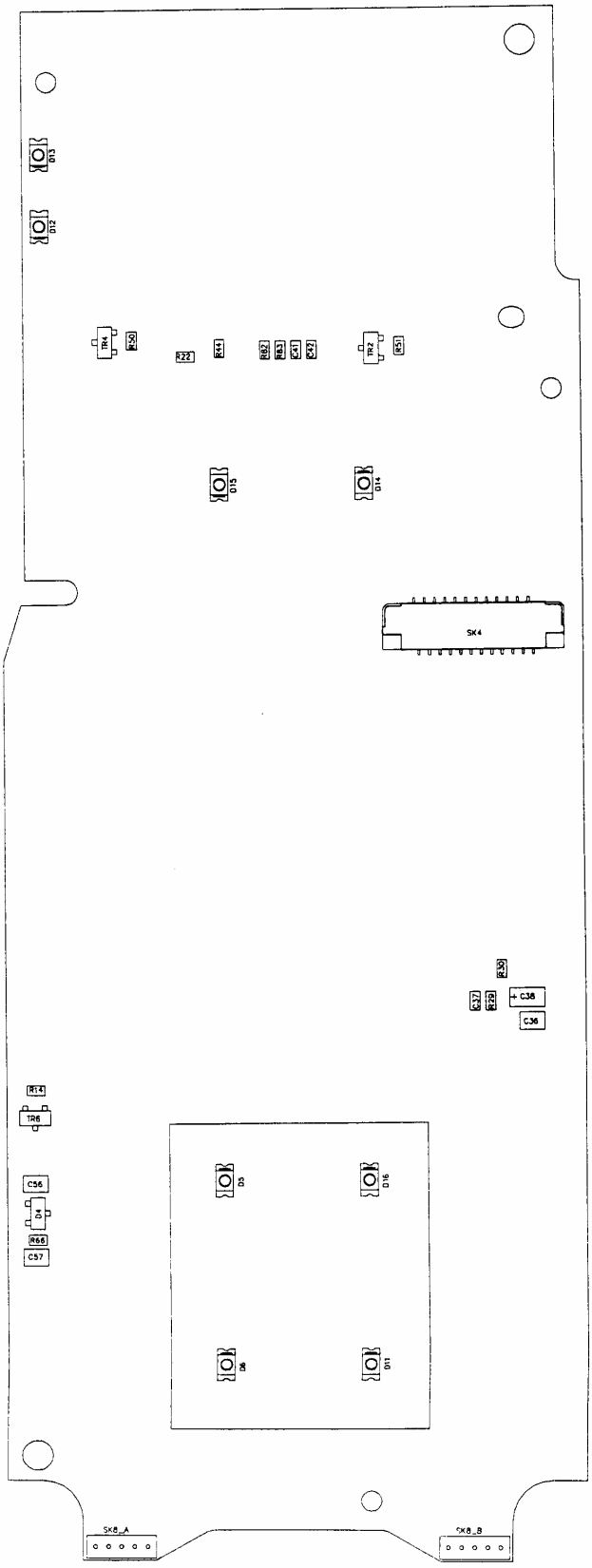
R1	100	±2%	0,1W	SMD	5322 116 83642	
R2,3	1k	±2%	0,1W	SMD	5322 116 83652	
R4	3k9	±2%	0,1W	SMD	5322 116 83656	
R5	10k	±2%	0,1W	SMD	5322 116 83658	
R6,7	1k	±2%	0,1W	SMD	5322 116 83652	
R8	100	±2%	0,1W	SMD	5322 116 83642	
R9-12	1k	±2%	0,1W	SMD	5322 116 83652	
R13	3k9	±2%	0,1W	SMD	5322 116 83658	
R14	100k	±2%	0,1W	SMD	5322 116 83671	
R15	1M	±2%	0,1W	SMD	5322 116 83682	CTCSS
R16	150k	±2%	0,1W	SMD	5322 116 83673	
R17	1k	±2%	0,1W	SMD	5322 116 83652	
R18	2M2	±2%	0,1W	SMD	5322 116 83683	CTCSS
R19	390k	±2%	0,1W	SMD	5322 116 83678	CTCSS
R22	10k	±2%	0,1W	SMD	5322 116 83658	
R23	56k	±2%	0,1W	SMD	5322 116 83667	

Cct.Ref	Description				Part No.	Remarks
Resistors (Cont'd)						
R25	18k	±2%	0,1W	SMD	5322 116 83665	
R26	1M	±2%	0,1W	SMD	5322 116 83656	
R27	47k	±2%	0,1W	SMD	5322 116 83666	
R28	680k	±2%	0,1W	SMD	5322 116 83681	CTCSS
R31-35	18k	±2%	0,1W	SMD	5322 116 83661	
R36	3k9	±2%	0,1W	SMD	5322 116 83656	
R37	100k	±2%	0,1W	SMD	5322 116 83671	
R38	100	±2%	0,1W	SMD	5322 116 83642	
R39	10k	±2%	0,1W	SMD	5322 116 83658	
R41	1M	±2%	0,1W	SMD	5322 116 83682	
R42	68k	±2%	0,1W	SMD	5322 116 83668	
R43-46	10	±2%	0,1W	SMD	5322 116 83636	
R47	100k	±2%	0,1W	SMD	5322 116 83671	
R48	0			Jumper	4822 051 10008	
R49	1k	±2%	0,1W	SMD	5322 116 83652	
R50,51	10	±2%	0,1W	SMD	5322 116 83636	
R52	1k	±2%	0,1W	SMD	5322 116 83652	
R53	100k	±2%	0,1W	SMD	5322 116 83671	
R54	10k	±2%	0,1W	SMD	5322 116 83658	
R55	39k	±2%	0,1W	SMD	5322 116 83665	
R56	3k9	±2%	0,1W	SMD	5322 116 83656	
R57	1k5	±2%	0,1W	SMD	5322 116 83797	
R58	1k	±2%	0,1W	SMD	5322 116 83652	
R59	680	±2%	0,1W	SMD	5322 116 83649	
R60	0			Jumper	4822 051 10008	
R61	3k9	±2%	0,1W	SMD	5322 116 83656	
R62	10k	±2%	0,1W	SMD	5322 116 83658	
R63	10	±2%	0,1W	SMD	5322 116 83636	
R64,65	100	±2%	0,1W	SMD	5322 116 83642	
R66	390	±2%	0,1W	SMD	5322 116 83647	
R67	22k	±2%	0,1W	SMD	5322 116 83662	
R68	100k	±2%	0,1W	SMD	5322 116 83671	
R69	0			Jumper	4822 051 10008	
R70,71	100k	±2%	0,1W	SMD	5322 116 83671	
R73-75	47k	±2%	0,1W	SMD	5322 116 83666	
R76	56k	±2%	0,1W	SMD	5322 116 83667	
R77	680k	±2%	0,1W	SMD	5322 116 83681	
R78	270k	±2%	0,1W	SMD	5322 116 83676	
R79	1M	±2%	0,1W	SMD	5322 116 83682	
R80,81	390k	±2%	0,1W	SMD	5322 116 83678	
R82,83	270k	±2%	0,1W	SMD	5322 116 83676	
R84	10k	±2%	0,1W	SMD	5322 116 83658	
R85,86	390k	±2%	0,1W	SMD	5322 116 83678	
R87	10k	±2%	0,1W	SMD	5322 116 83658	
R88	1M	±2%	0,1W	SMD	5322 116 83682	
R89	390k	±2%	0,1W	SMD	5322 116 83678	
R90	3k9	±2%	0,1W	SMD	5322 116 83656	
R91	10k	±2%	0,1W	SMD	5322 116 83658	
R92	100k	±2%	0,1W	SMD	5322 116 83671	
R93	3k9	±2%	0,1W	SMD	5322 116 83656	
R94	100k	±2%	0,1W	SMD	5322 116 83671	
R95	18k	±2%	0,1W	SMD	5322 116 83661	
R96	390k	±2%	0,1W	SMD	5322 116 83678	
R97	120k	±2%	0,1W	SMD	5322 116 83672	
R98	390k	±2%	0,1W	SMD	5322 116 83678	
R99	39k	±2%	0,1W	SMD	5322 116 83665	
R100	100	±2%	0,1W	SMD	5322 116 83642	
R101	33k	±2%	0,1W	SMD	5322 116 83664	
R102	220k	±2%	0,1W	SMD	5322 116 83675	
R103	270k	±2%	0,1W	SMD	5322 116 83676	
R104,105	33k	±2%	0,1W	SMD	5322 116 83664	

Cct.Ref	Description				Part No.	Remarks
Resistors (Cont'd)						
R106	56k	±2%	0,1W	SMD	5322 116 83667	
R107	33k	±2%	0,1W	SMD	5322 116 83664	
R108	1M	±2%	0,1W	SMD	5322 116 83682	
R109	100k	±2%	0,1W	SMD	5322 116 83671	
R110	2k7	±2%	0,1W	SMD	5322 116 83654	
R111-115	1k	±2%	0,1W	SMD	5322 116 83652	
R116	220k	±2%	0,1W	SMD	5322 116 83675	
R117	120k	±2%	0,1W	SMD	5322 116 83672	
R118	3k9	±2%	0,1W	SMD	5322 116 83656	
R119	1k	±2%	0,1W	SMD	5322 116 83652	
R120,121	100k	±2%	0,1W	SMD	5322 116 83671	
R122	39k	±2%	0,1W	SMD	5322 116 83665	
R123	100k	±2%	0,1W	SMD	5322 116 83671	
Capacitors						
C1	100p	±5%	50V	SMD	4822 122 33744	
C2	68n	±20%	16V	SMD	5322 126 12129	
C3	1n	±10%	50V	SMD	5322 126 11578	
C4	100p	±5%	50V	SMD	4822 122 33744	
C5	39p	±5%	50V	SMD	4822 122 33775	
C6	100p	±5%	50V	SMD	4822 122 33744	CTCSS
C7,8	68n	±20%	16V	SMD	5322 126 12129	CTCSS
C10	68n	±20%	16V	SMD	5322 126 12129	CTCSS
C18-20	68n	±20%	16V	SMD	5322 126 12129	
C21	68n	±20%	16V	SMD	5322 126 12129	CTCSS
C22,23	68n	±20%	16V	SMD	5322 126 12129	
C24	2n2	±10%	50V	SMD	5322 126 12126	
C25	1	±10%	16V	SMD	5322 124 11275	
C27	220p	±5%	50V	SMD	5322 126 12151	
C29	68n	±20%	16V	SMD	5322 126 12129	
C30	1n	±10%	50V	SMD	5322 126 11578	
C31	68n	±20%	16V	SMD	5322 126 12129	
C33	1n	±10%	50V	SMD	5322 126 11578	
C34	68n	±20%	16V	SMD	5322 126 12129	
C35	680p	±5%	50V	SMD	5322 126 11009	
C39	68n	±20%	16V	SMD	5322 126 12129	
C40	680p	±5%	50V	SMD	5322 126 11009	
C41	4n7	±10%	50V	SMD	5322 126 12127	
C42	10n	±10%	50V	SMD	5322 126 11583	
C43	15n	±10%	50V	SMD	4822 122 33128	
C44	470p	±5%	50V	SMD	5322 122 32268	
C45	68n	±20%	16V	SMD	5322 126 12129	
C46	1n	±10%	50V	SMD	5322 126 11578	
C47	1	±10%	16V	SMD	5322 124 11275	
C48,49	330n	±10%	16V	SMD	5322 126 12131	
C50	100p	±5%	50V	SMD	4822 122 33744	
C51	1n	±10%	50V	SMD	5322 126 11578	
C52	3n9	±5%	50V	SMD	5322 126 10465	
C53	10n	±10%	50V	SMD	5322 126 11583	
C54	39p	±5%	50V	SMD	4822 122 33775	
C55	1	±10%	16V	SMD	5322 124 11275	
C56,57	68n	±20%	16V	SMD	5322 126 12129	
C58	39p	±5%	50V	SMD	4822 122 33775	
C59-61	1n	±10%	50V	SMD	5322 126 11578	
C62	100p	±5%	50V	SMD	4822 122 33744	
C63	1n	±10%	50V	SMD	5322 126 11578	
C64-66	68n	±20%	16V	SMD	5322 126 12129	
C67	3µ3	±10%	16V	SMD	5322 126 10893	
C68-70	68n	±20%	16V	SMD	5322 126 12129	
C71,72	1n	±10%	50V	SMD	5322 126 11578	

Cct.Ref	Description				Part No.	Remarks
Capacitors (Cont'd)						
C73,74	68n	±20%	16V	SMD	5322 126 12129	
C75-77	100p	±5%	50V	SMD	4822 122 33744	
C78	68n	±20%	16V	SMD	5322 126 12129	
C79	1	±10%	16V	SMD	5322 124 11275	
C80,81	68n	±20%	16V	SMD	5322 126 12129	
C82-85	1n	±10%	50V	SMD	5322 126 11578	
C86,87	39p	±5%	50V	SMD	4822 122 33775	
C88,89	100p	±5%	50V	SMD	4822 122 33744	
C90,91	1n	±10%	50V	SMD	5322 126 11578	
C92	10n	±10%	50V	SMD	5322 126 11583	
C93-95	1n	±10%	50V	SMD	5322 126 11578	
C96	100p	±5%	50V	SMD	4822 122 33744	
C97-100	1n	±10%	50V	SMD	5322 126 11578	
C101	33p	±5%	50V	SMD	5322 126 12125	
C102-106	100p	±5%	50V	SMD	4822 122 33744	
C107	39p	±5%	50V	SMD	4822 122 33775	
C108	1n	±10%	50V	SMD	5322 126 11578	
C109	39p	±5%	50V	SMD	4822 122 33775	
C110	18p	±5%	50V	SMD	4822 122 33757	
C111	68n	±20%	16V	SMD	5322 126 12129	
C112	1	±10%	16V	SMD	5322 124 11275	
C114	680p	±5%	50V	SMD	5322 126 11009	
C115	68n	±20%	16V	SMD	5322 126 12129	
C118	3n9	±5%	50V	SMD	5322 126 10465	
C119	1	±10%	16V	SMD	5322 124 11275	
C120	68n	±20%	16V	SMD	5322 126 12129	
C121	10n	±10%	50V	SMD	5322 126 11583	
C123	10n	±10%	50V	SMD	5322 126 11583	
C125,125	39p	±5%	50V	SMD	4822 122 33775	
C126	100p	±5%	50V	SMD	4822 122 33744	
C127	1n	±10%	50V	SMD	5322 126 11578	
C130	1n	±10%	50V	SMD	5322 126 11578	
C131	100p	±5%	50V	SMD	4822 122 33744	
C132	10n	±10%	50V	SMD	5322 126 11583	
C133	1n	±10%	50V	SMD	5322 126 11578	
C134	1p8	±0p25	50V	SMD	5322 126 12136	
C135	10n	±10%	50V	SMD	5322 126 11583	
Inductors						
L1-3	100nH	±20%	Inductor	SMD	5322 157 63093	
L5	470	±10%	Inductor	SMD	5322 157 70387	
Miscellaneous						
SK4	Connector, 24 Way 87768-024				5322 268 90464	
XL1	Crystal 8,064MHz				5322 242 81182	
	Screen, Flexi				5322 466 93198	A9 & U0 Bands
					COVERS	
	Cover, Front, Numeric Keypad				5322 447 40934	
	Cover, Front No Numeric Keypad				5322 447 40935	
					BATTERIES	
	Battery, Nicad Lightweight				5322 138 10477	Marked L
	Battery, Nicad Standard				5322 138 10478	Marked S
	Battery, Nicad High Capacity				5322 138 10479	Marked H

Cct.Ref	Description	Part No.	Remarks
		ACCESSORIES	
	Programming Lead Assembly	5322 219 82634	



TP320/5

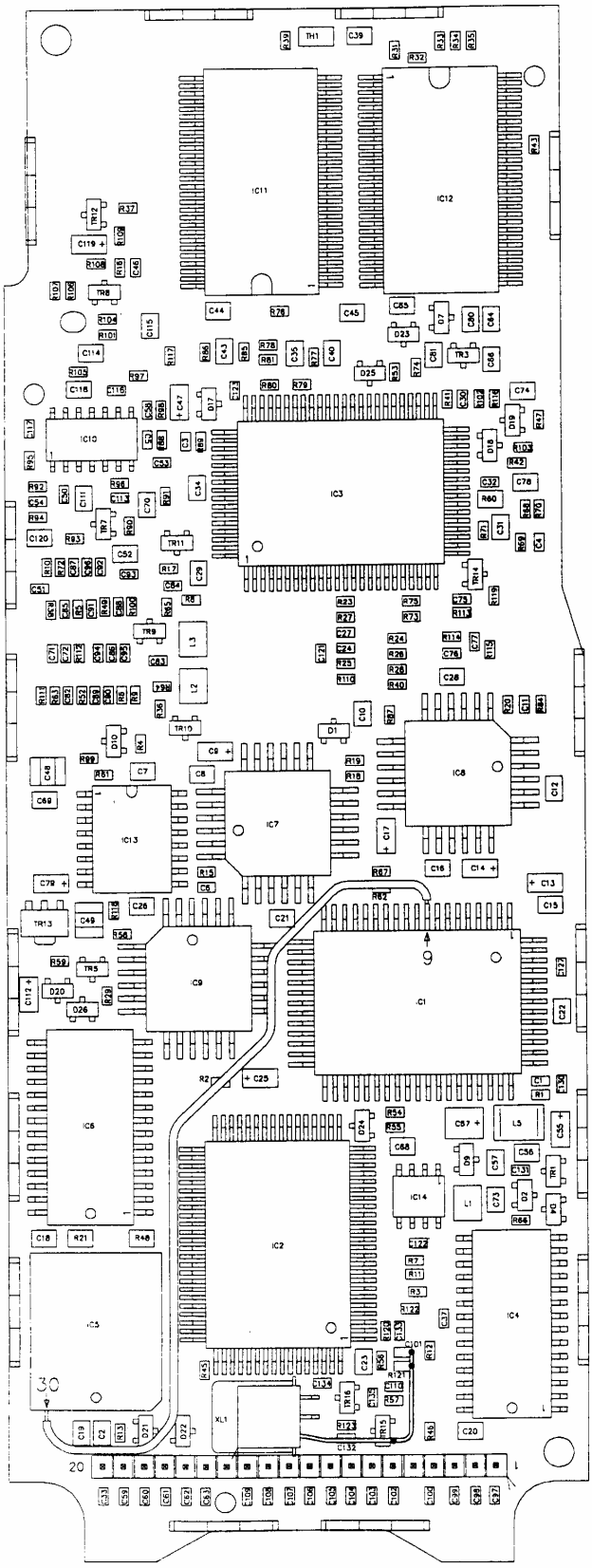
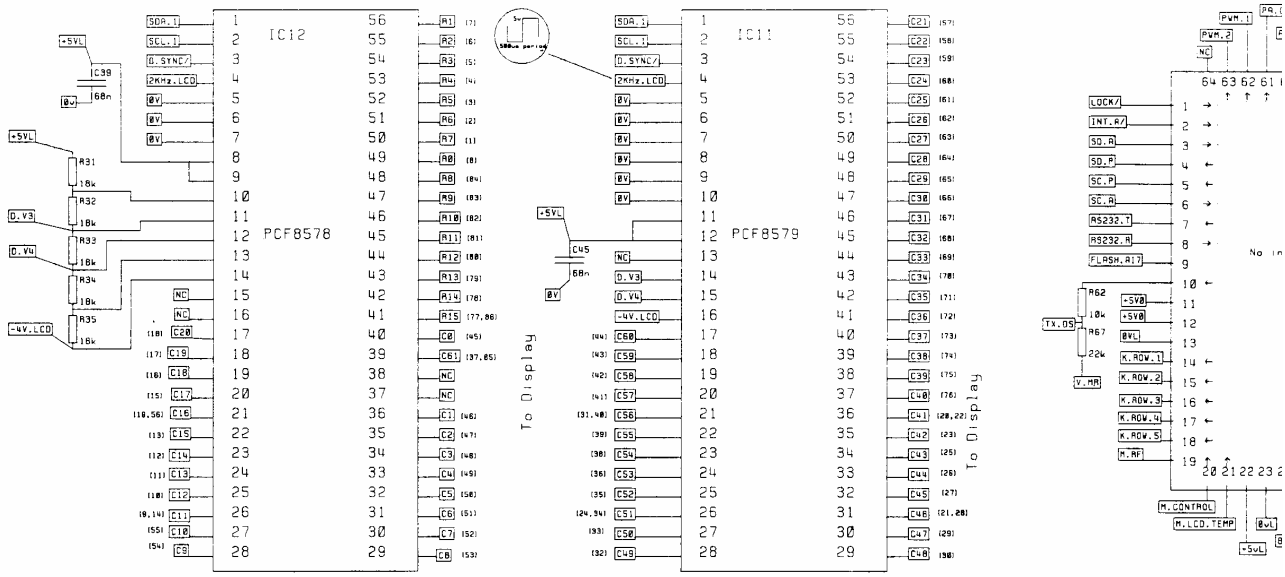


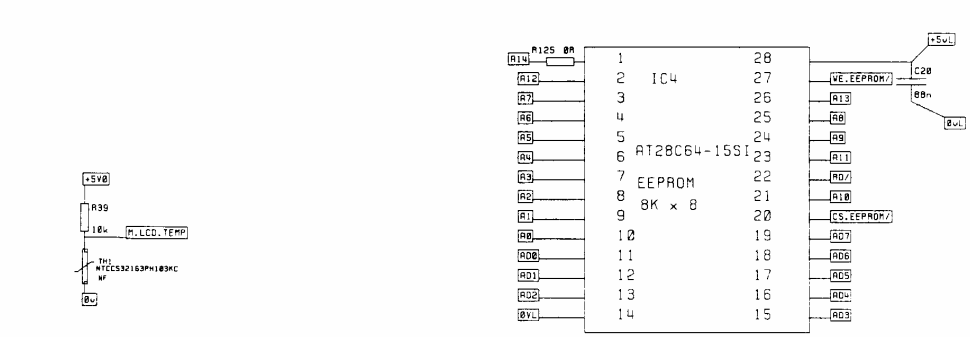
FIG. 6.1 CONTROL PCB LAYOUT DIAGRAM



Note: Row & Column numbers correspond with LCD glass tracking

No.s in brackets are LCD 'pin' numbers.

LCD Drivers 1 & 2



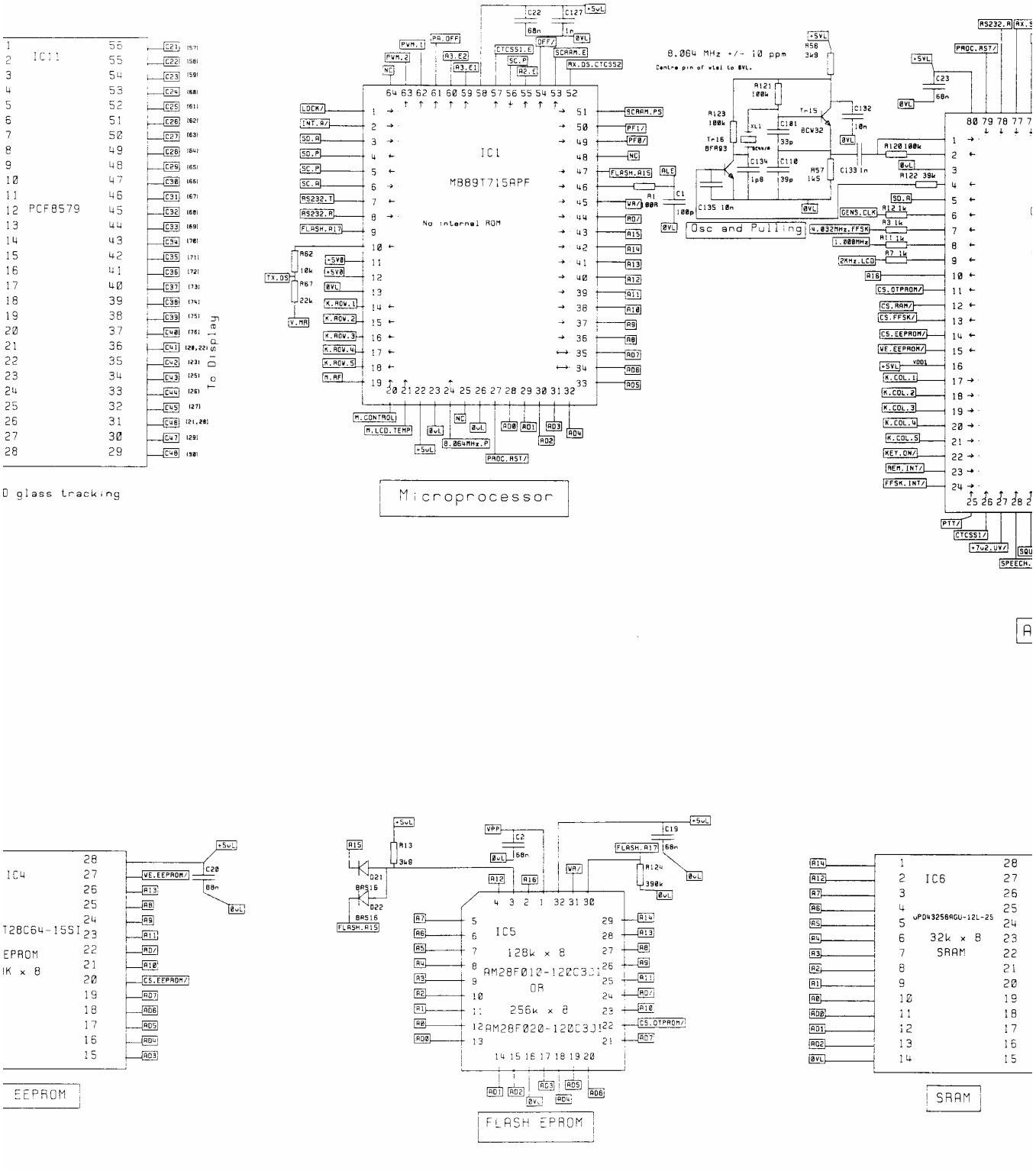


FIG. 6.2 CONTI
DISPL
CIRCU

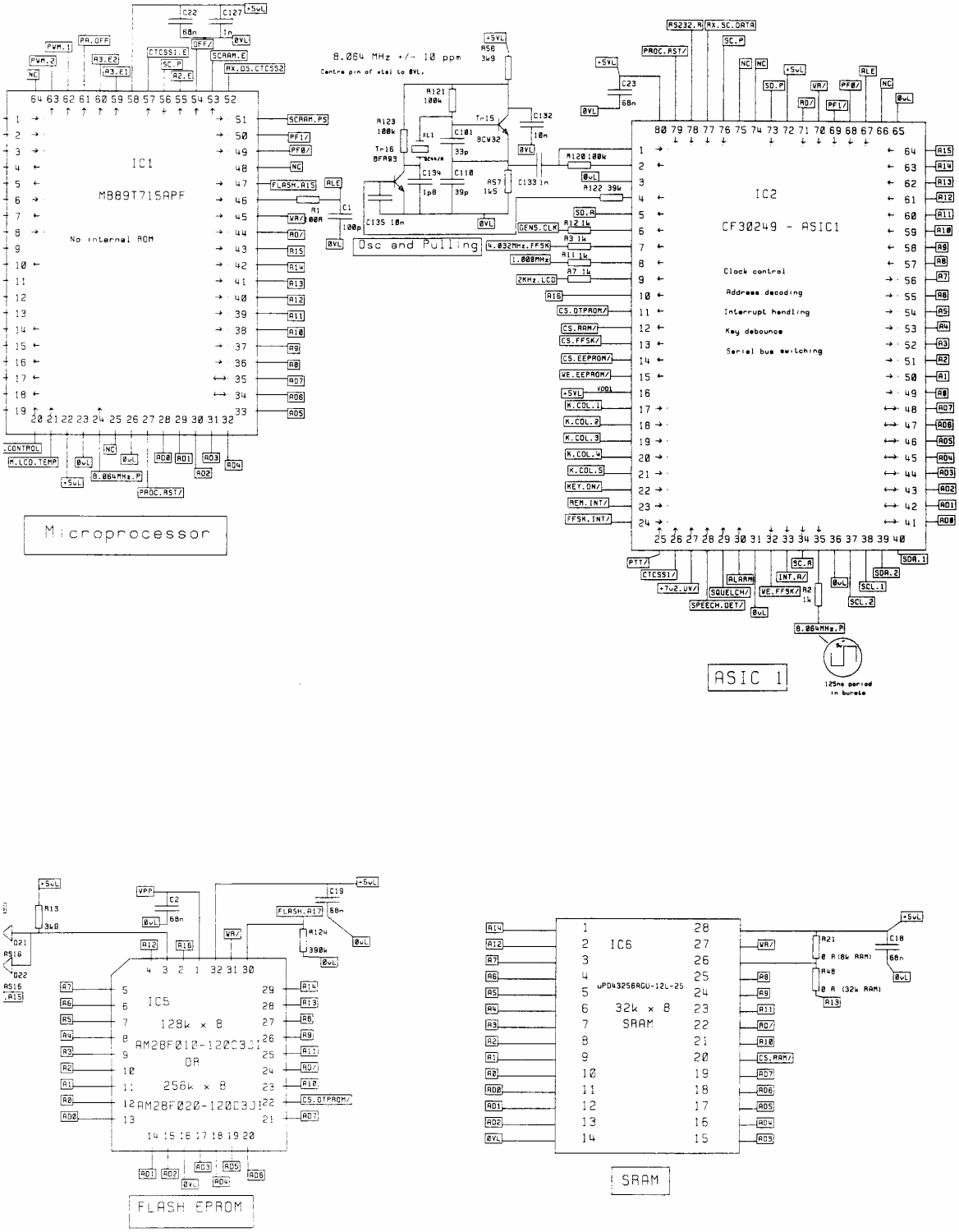


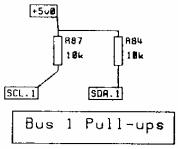
FIG. 6.2 CONTROL PCB
DISPLAY AND CONTROL SYSTEM
CIRCUIT DIAGRAM

Accessory Table (X=don't care)

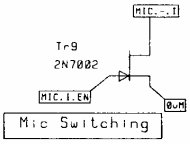
Remote Accessory	REM.IN	A.KEYS
Remote Audio Proc	1k8	O/C
VA (ignition on)	4k7	X
Fist Mice/Headset	12k	X
TIU/P.Lead/Clone A	27k	O/C
Clone Donor	39k	O/C
VA (ignition off)	100k	X
Ext Antenna only	39k	0V
Ext LS only	1k8	0V
Keyfill (74)	27k	0V

BAT.TEMP Voltage Table

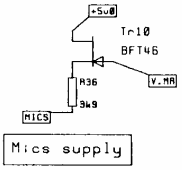
Charger State	BAT.TEMP voltage
No Charger	T+0.6V
Charging	5V
Charge complete	5V, 2 secs, 1V



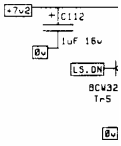
Bus 1 Pull-ups

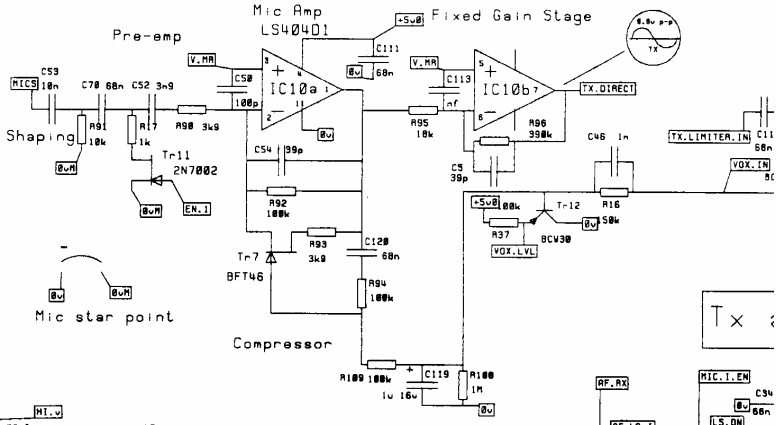


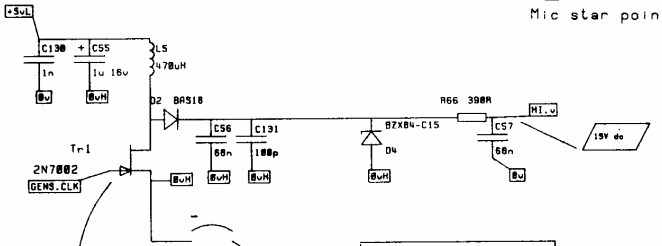
Mic Switching



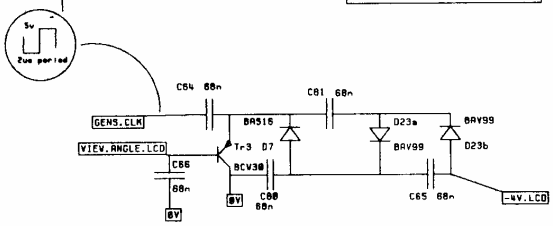
Mics supply



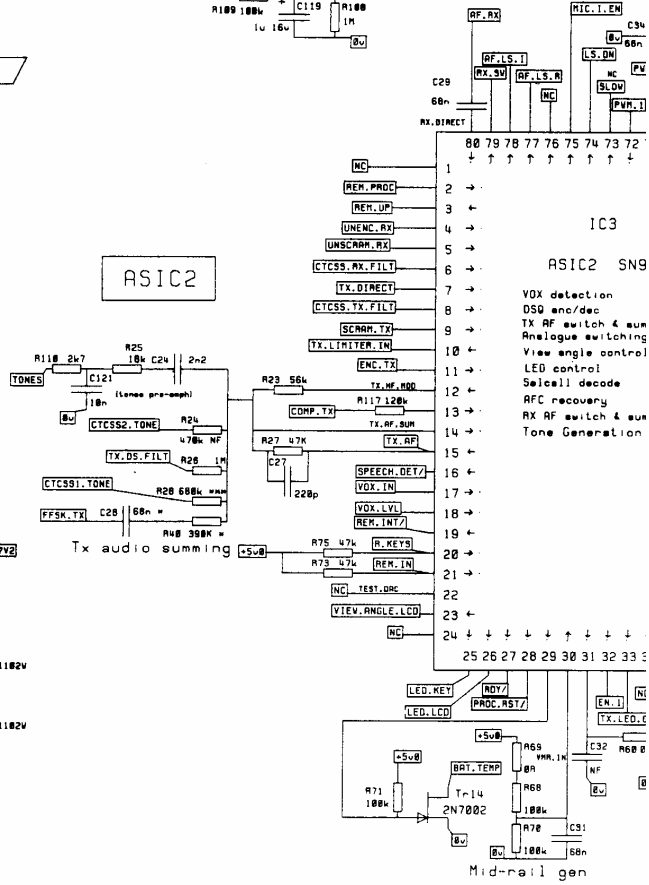


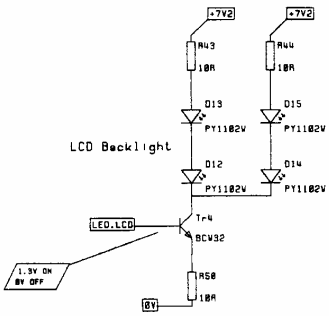


High Voltage Gen.

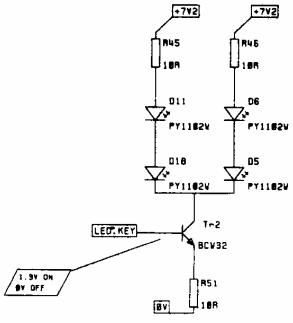


LCD Neg. Voltage Gen.





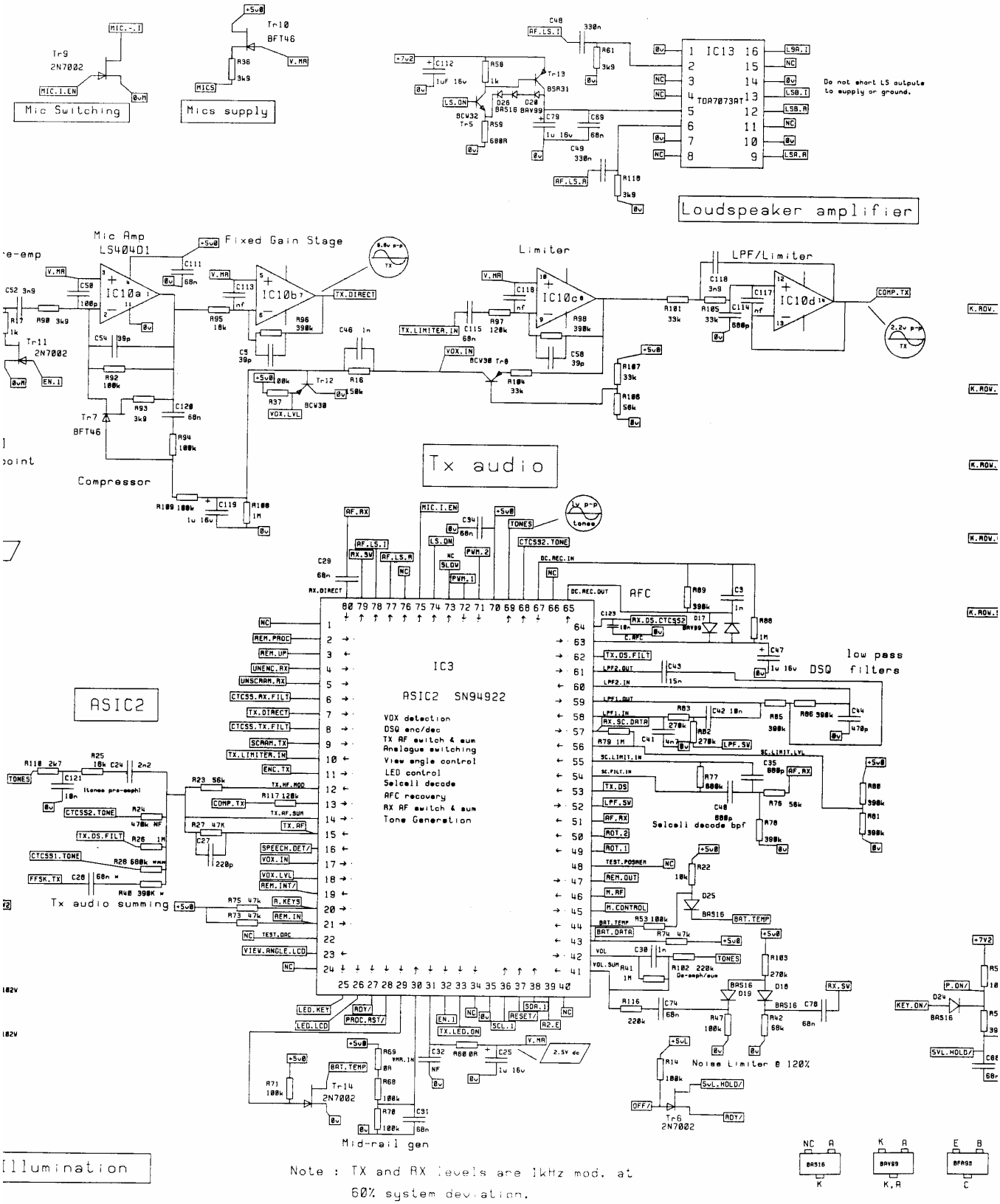
LCD & six key illum



Numeric Keypad Illumination

Note : TX and RX leve
60% system dev

TP320/5



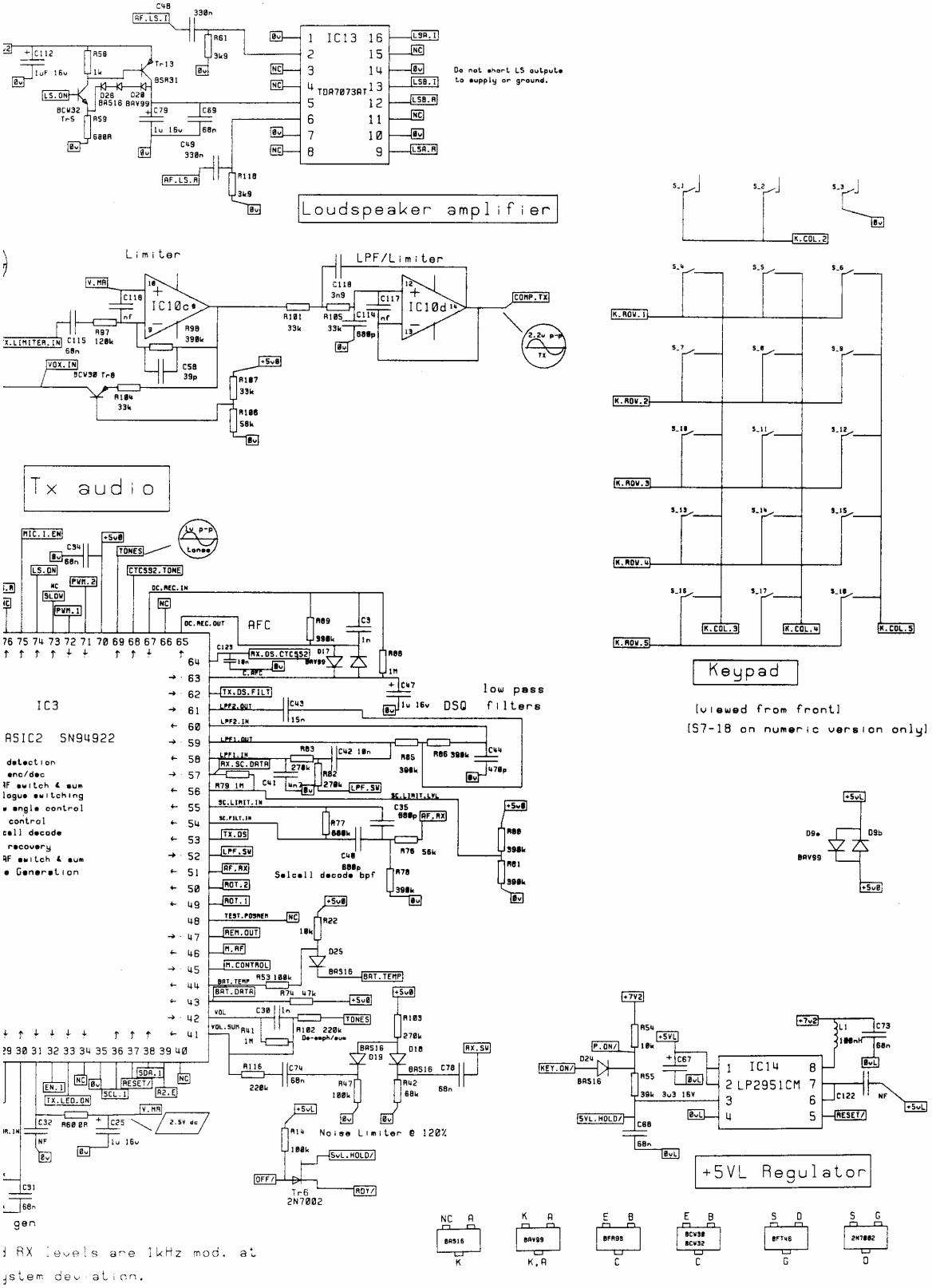


FIG. 6.3 CONTROL PCB KEYPAD AND AUDIO CIRCUIT DIAGRAM

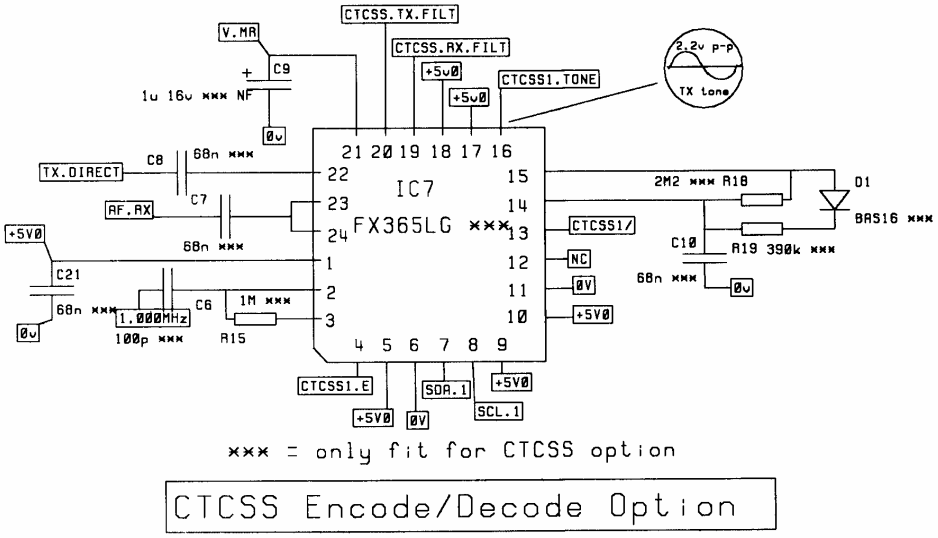
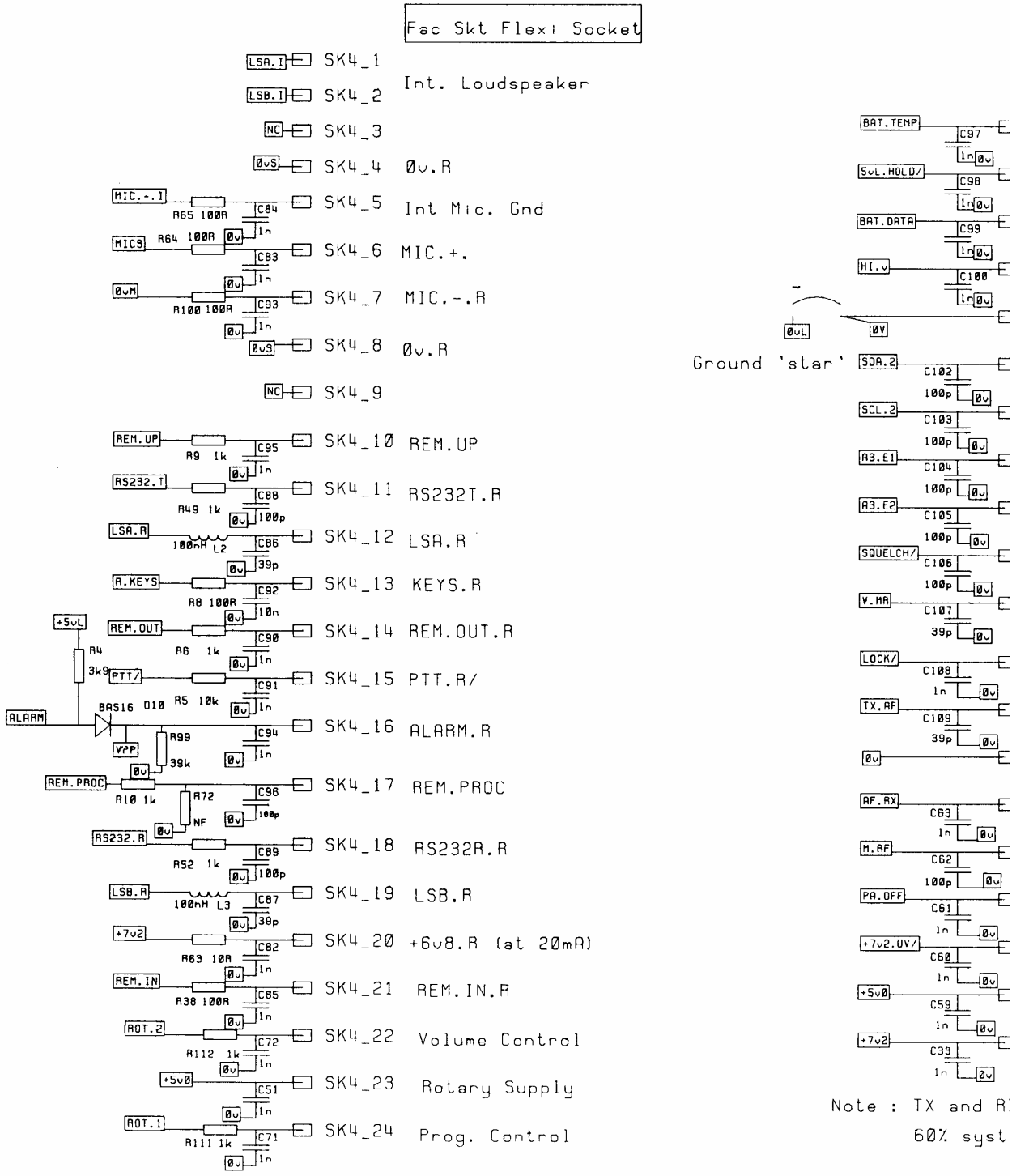
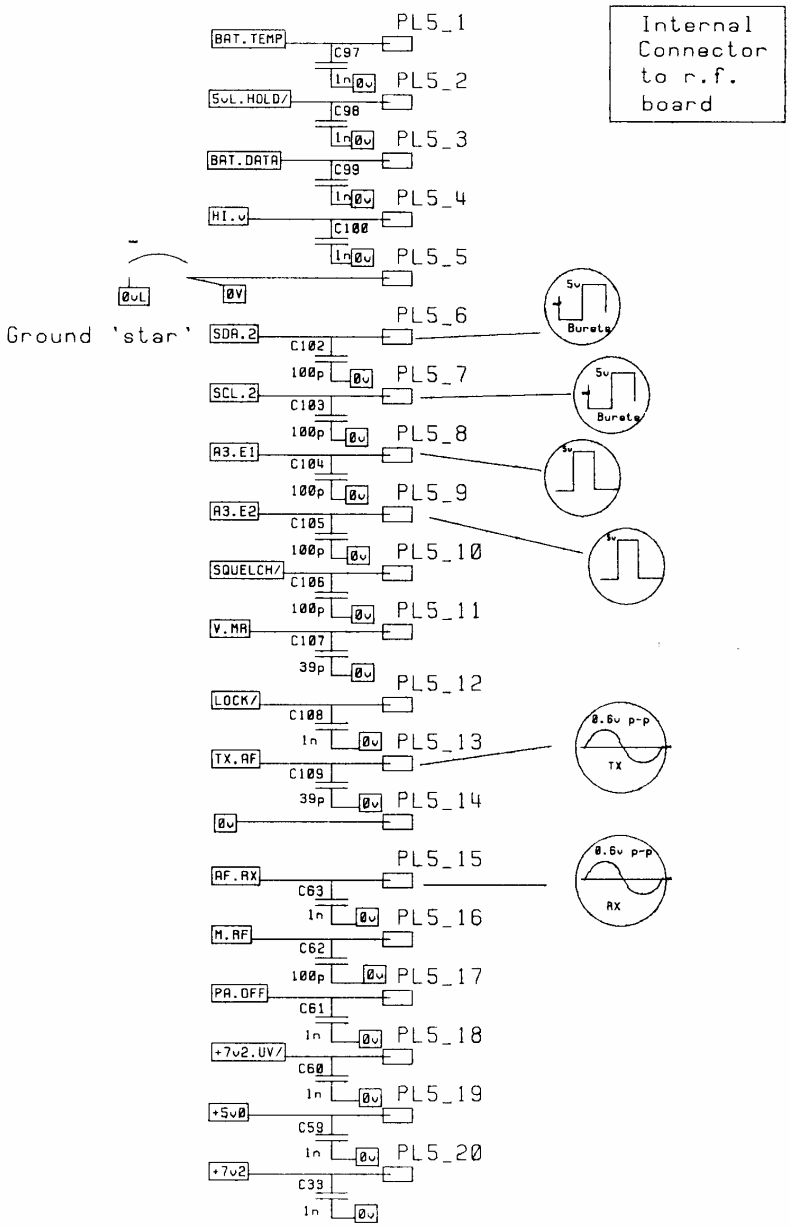
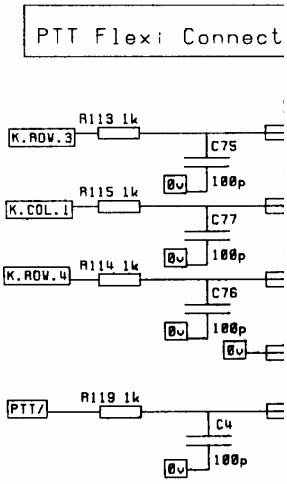


FIG. 6.4 CONTROL PCB SIGNALLING OPTIONS CIRCUIT DIAGRAM



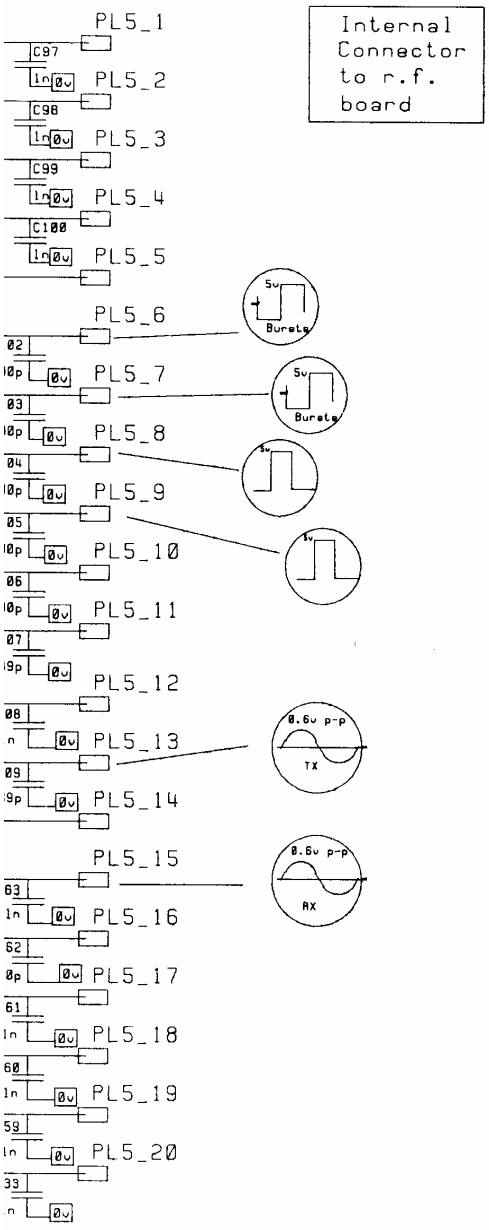
ocket





Note : TX and RX levels are 1kHz mod. at 60% system deviation.

FIG



and RX levels are 1kHz mod. at
% system deviation.

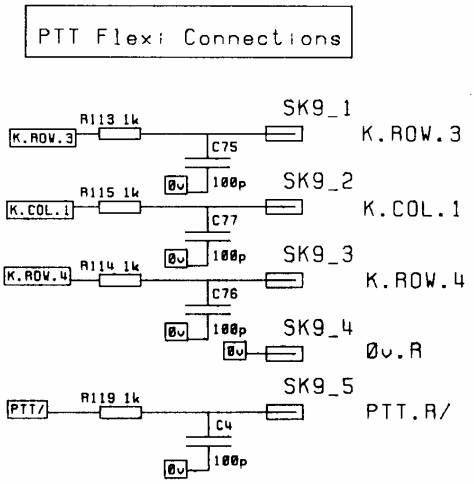
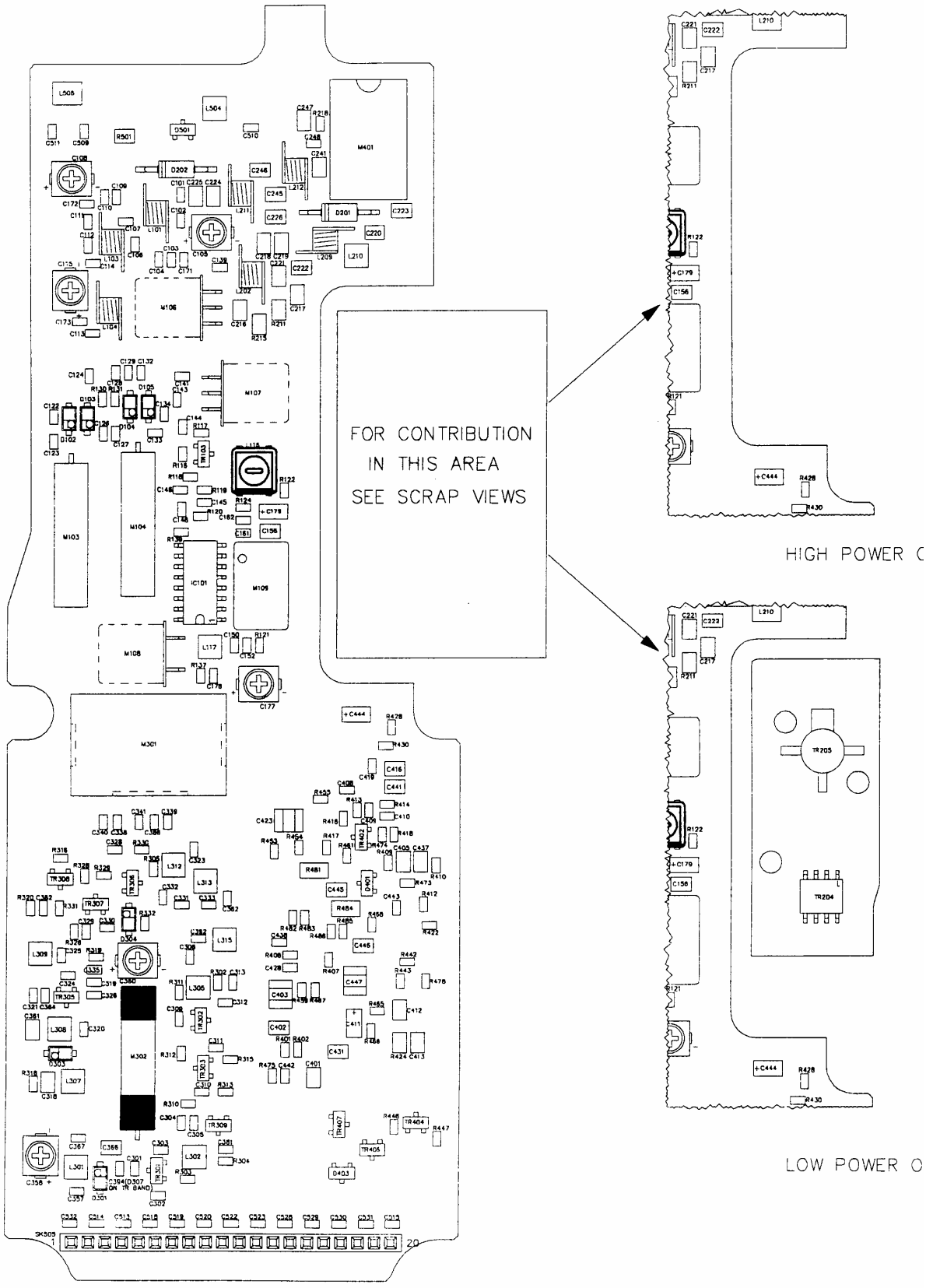


FIG. 6.5 CONTROL PCB CONNECTORS CIRCUIT DIAGRAM



TP320/5

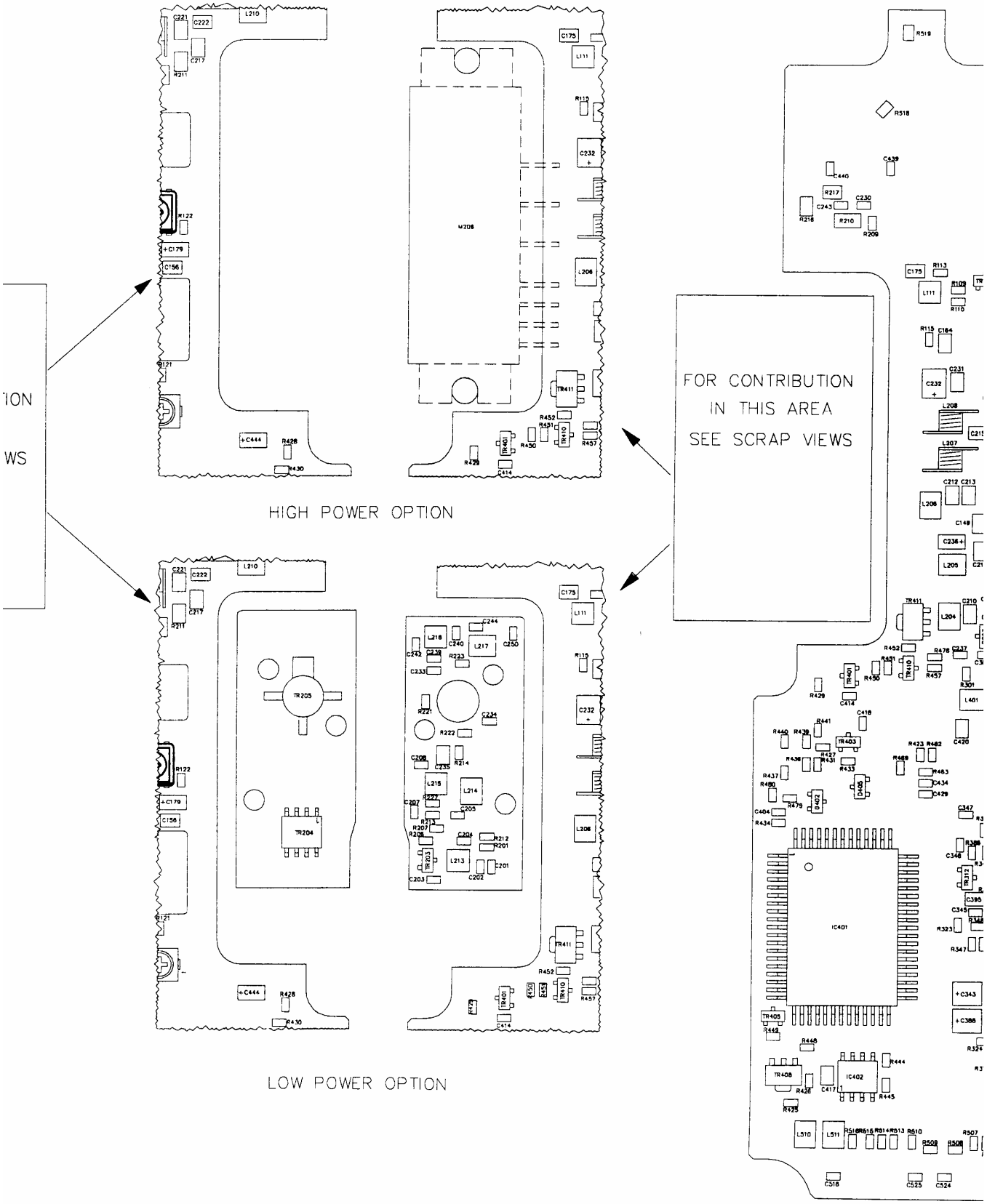


FIG. 6.6 RADIO PCB, UHF
LAYOUT DIAGRAM

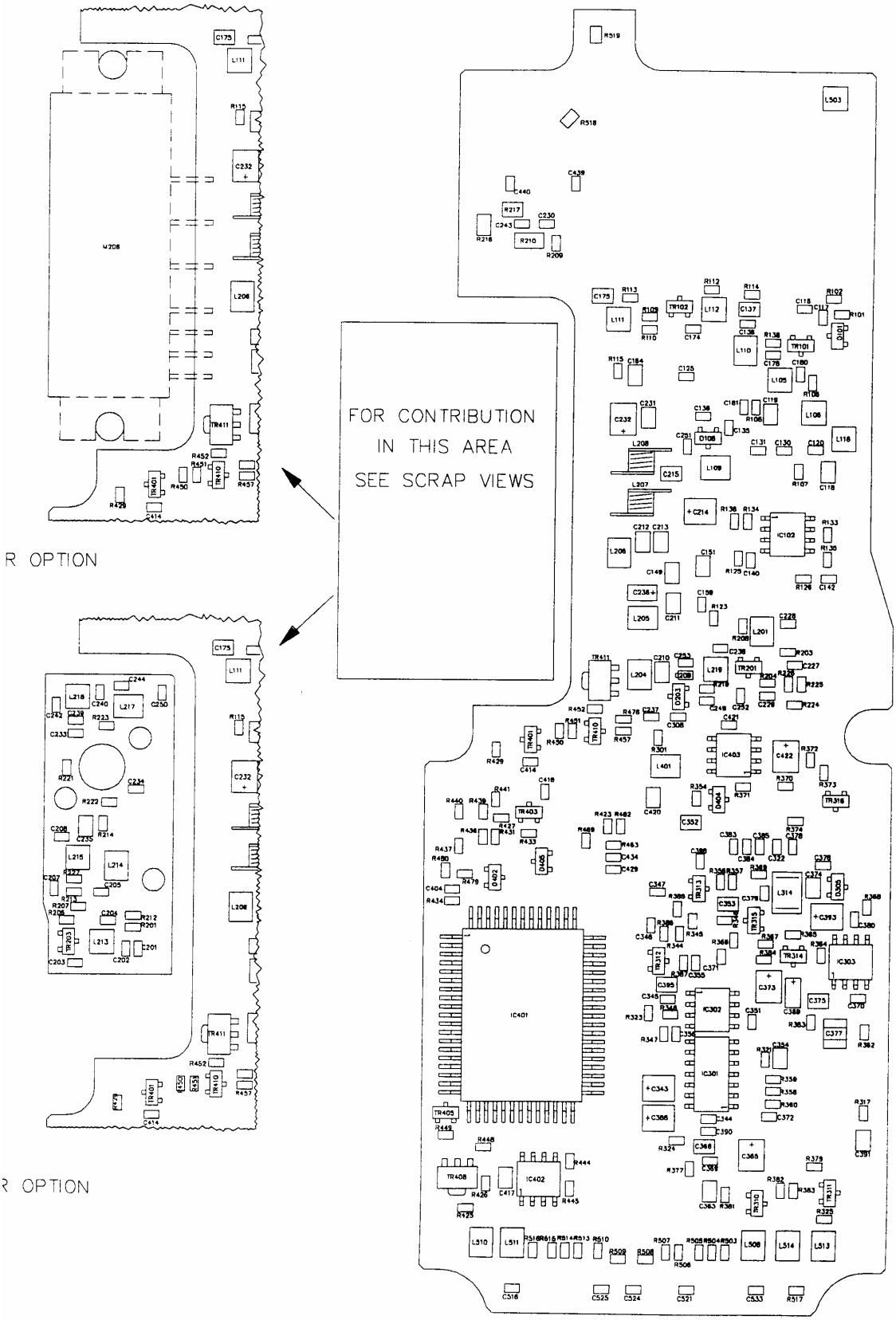
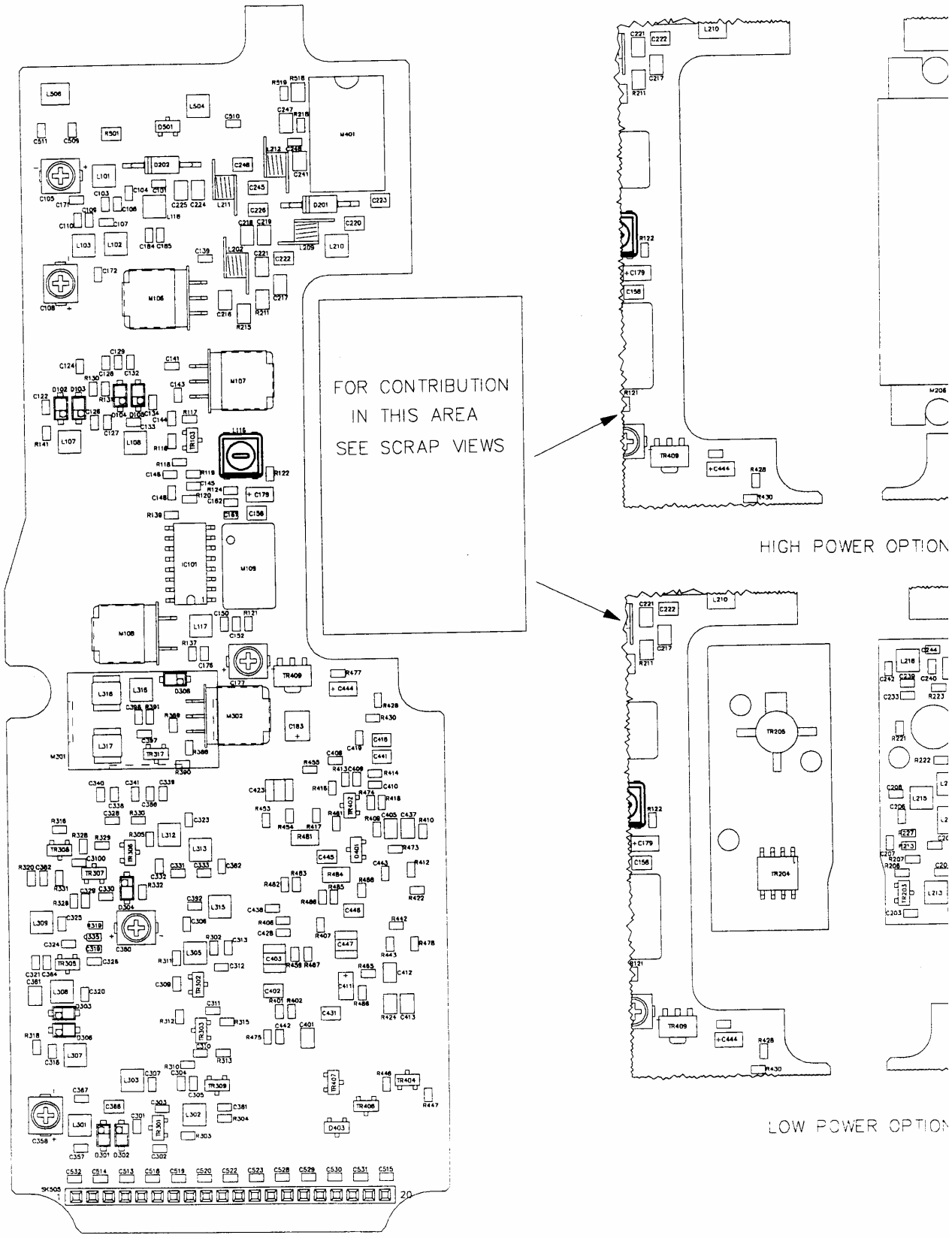


FIG. 6.6 RADIO PCB, UHF LAYOUT DIAGRAM



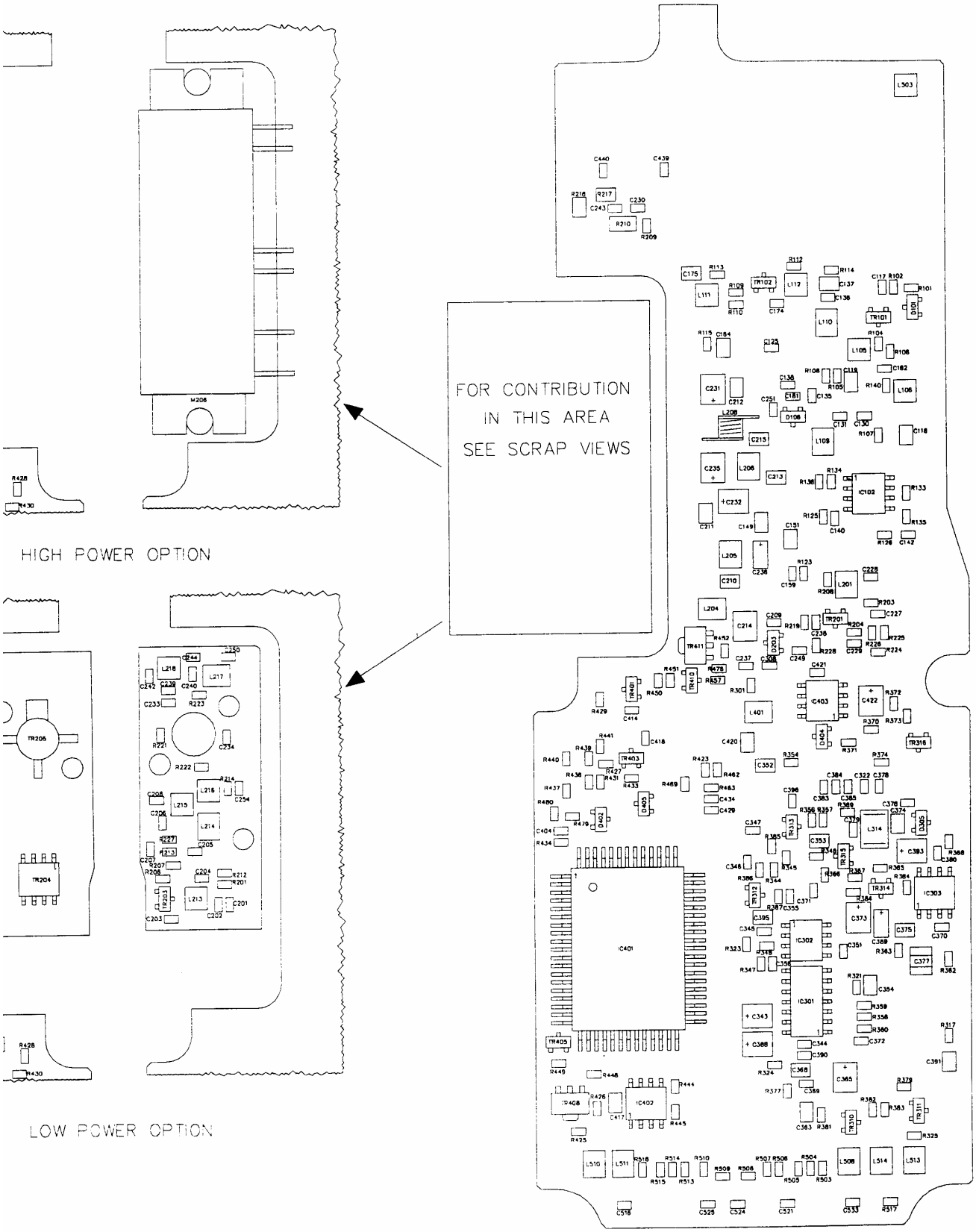
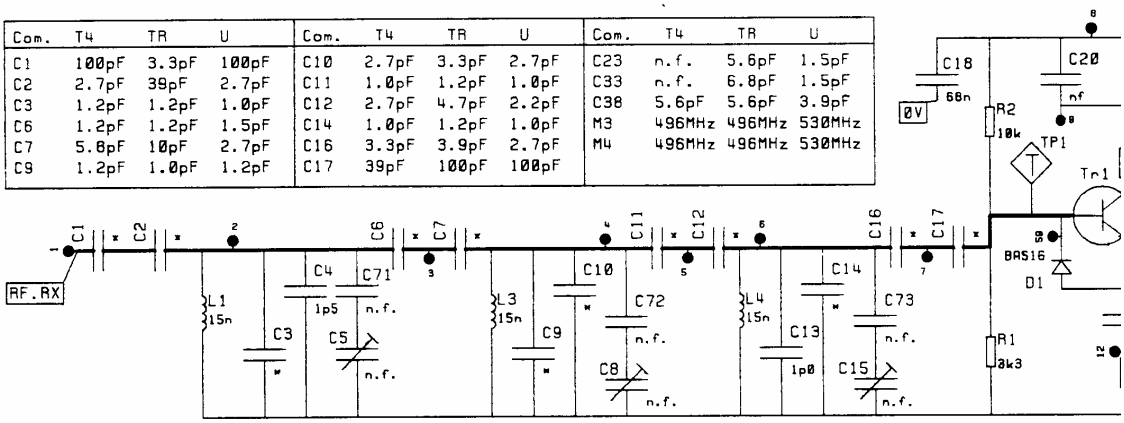
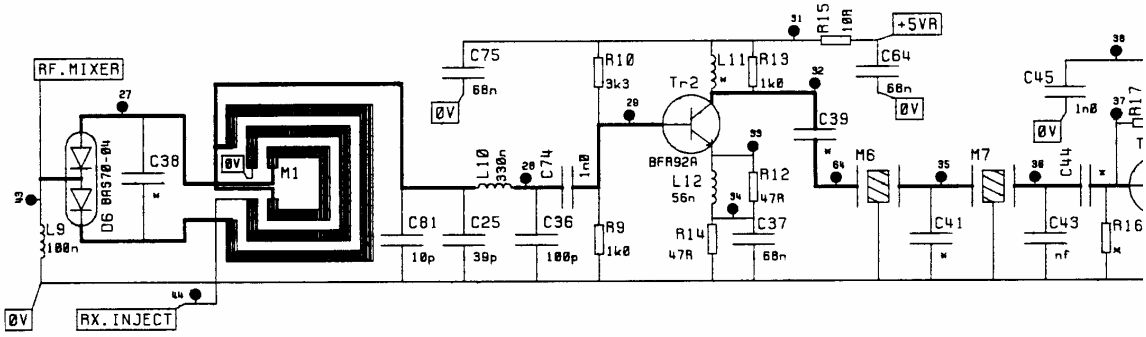
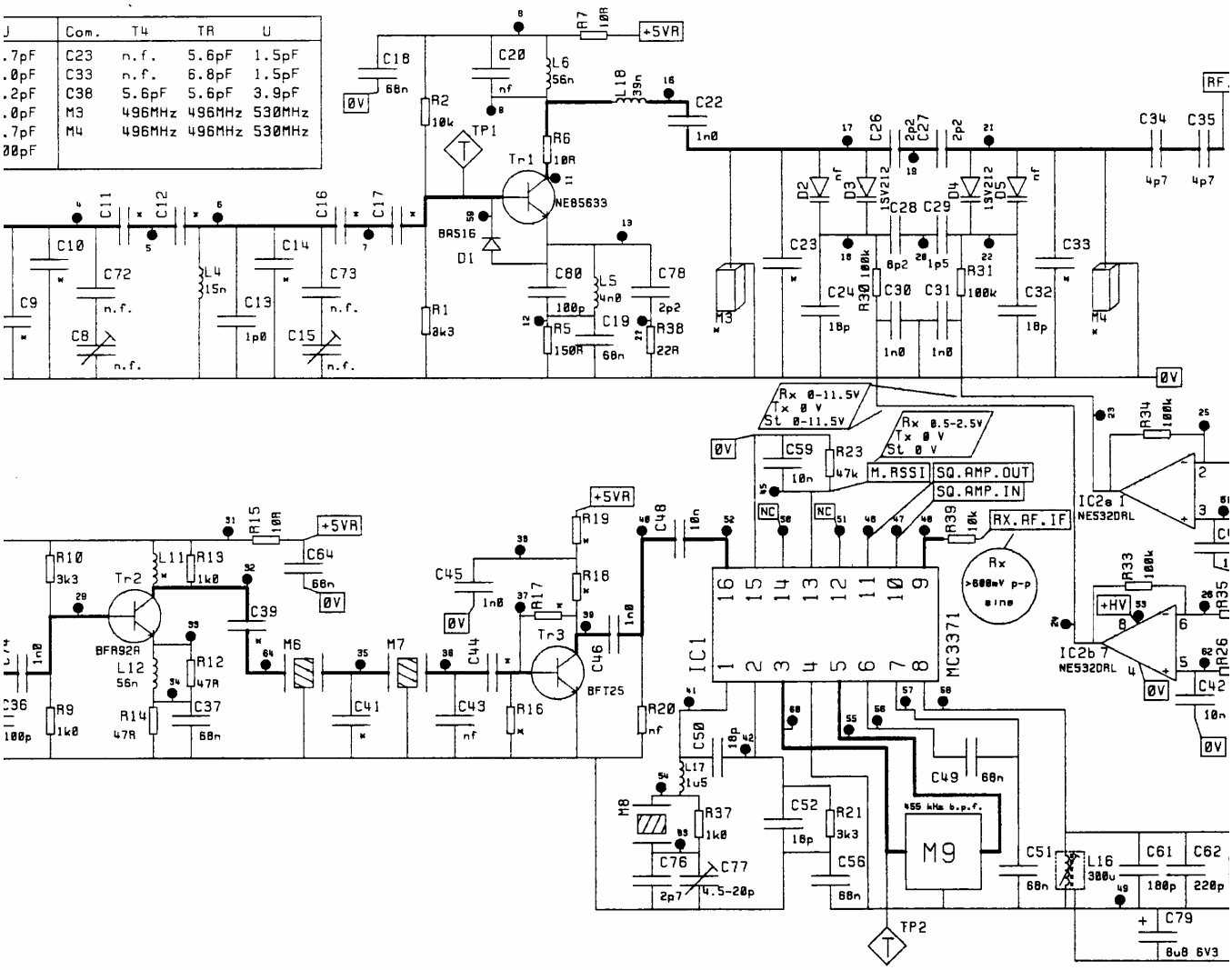


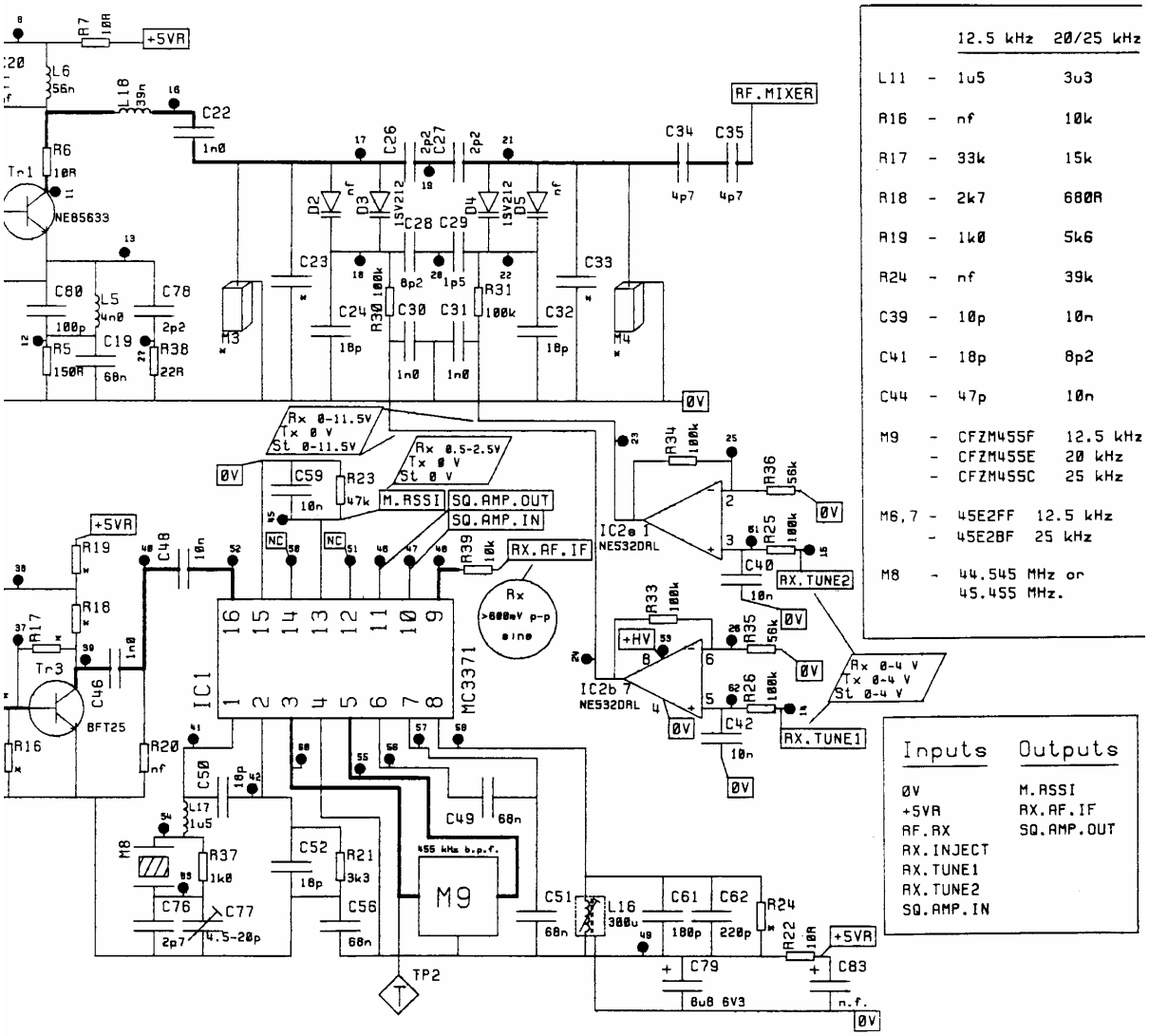
FIG. 6.6A RADIO PCB, VHF LAYOUT DIAGRAM

Com.	T4	TR	U	Com.	T4	TR	U	Com.	T4	TR	U
C1	100pF	3.3pF	100pF	C10	2.7pF	3.3pF	2.7pF	C23	n.f.	5.6pF	1.5pF
C2	2.7pF	39pF	2.7pF	C11	1.0pF	1.2pF	1.0pF	C33	n.f.	6.8pF	1.5pF
C3	1.2pF	1.2pF	1.0pF	C12	2.7pF	4.7pF	2.2pF	C38	5.6pF	5.6pF	3.9pF
C6	1.2pF	1.2pF	1.5pF	C14	1.0pF	1.2pF	1.0pF	M3	496MHz	496MHz	530MHz
C7	5.6pF	10pF	2.7pF	C16	3.3pF	3.9pF	2.7pF	M4	496MHz	496MHz	530MHz
C9	1.2pF	1.0pF	1.2pF	C17	39pF	100pF	100pF				









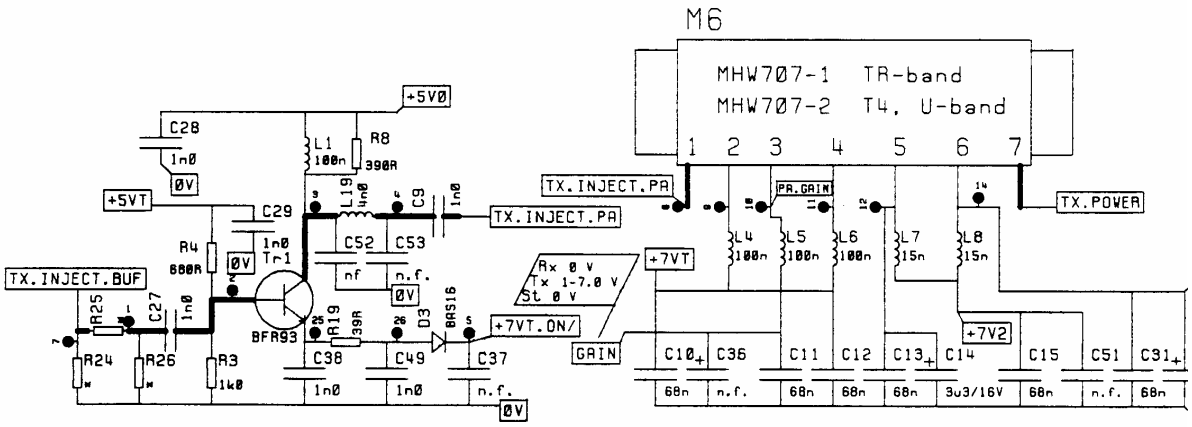
		12.5 kHz	20/25 kHz
L11	-	1u5	3u3
R16	-	nf	10k
R17	-	33k	15k
R18	-	2k7	680R
R19	-	1k0	5k6
R24	-	nf	39k
C39	-	10p	10n
C41	-	18p	8p2
C44	-	47p	10n
M9	-	CFZM455F	12.5 kHz
	-	CFZM455E	20 kHz
	-	CFZM455C	25 kHz
M6,7	-	45E2FF	12.5 kHz
	-	45E2BF	25 kHz
M8	-	44.545 MHz or 45.455 MHz.	

Inputs	Outputs
0V	M.RSSI
+5VR	RX.AF.IF
RF.RX	SQ.AMP.OUT
RX.INJECT	
RX.TUNE1	
RX.TUNE2	
SQ.AMP.IN	

Add 100 to all component numbers.

Highest component numbers							
C	L	R	Tr	D	IC	M	ICT
83	18	39	3	6	2	9	64

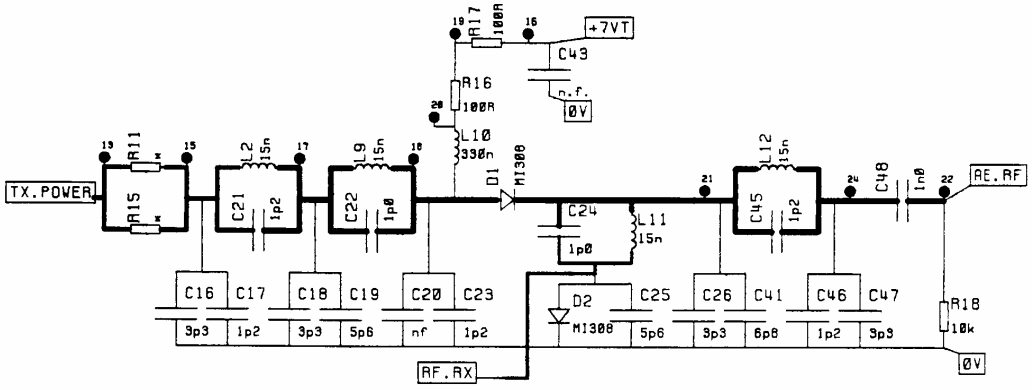
FIG. 6.7 RADIO PCB, UHF RECEIVER CIRCUIT DIAGRAM



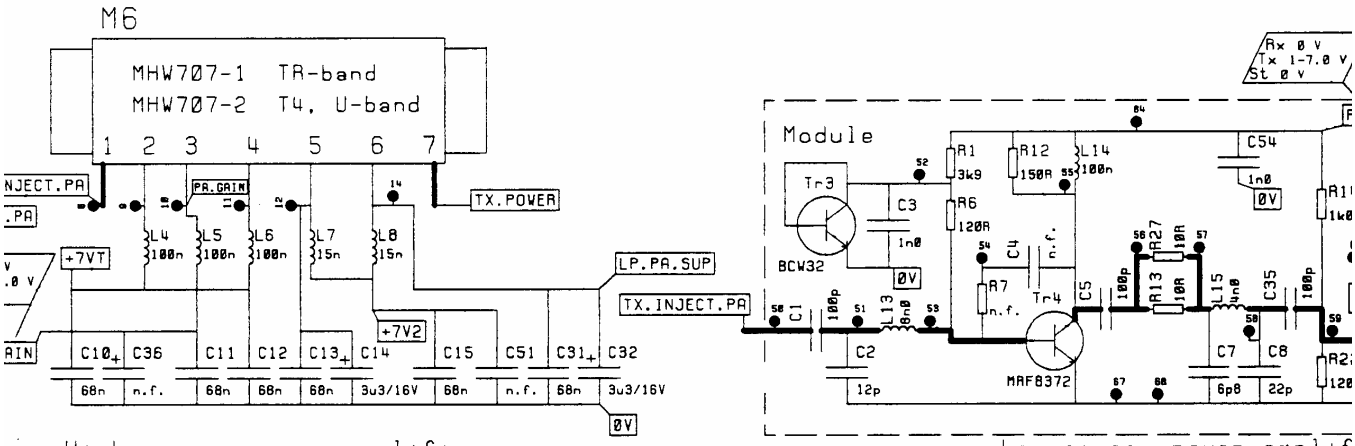
Buffer

High power, power amplifier

*	HP	LP
R11	10	0
R15	10	0
R24	82	n.f.
R25	120	22
R26	47	n.f.

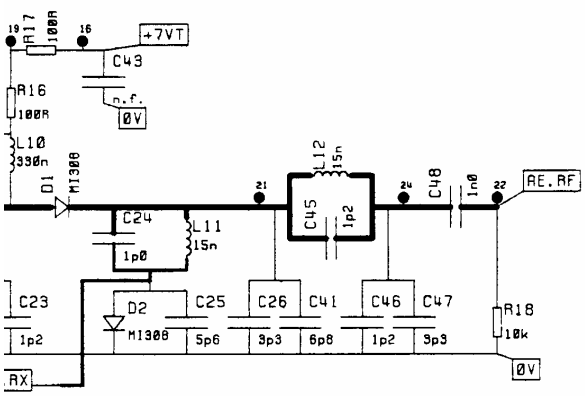


Aerial filter & Rx/Tx switch

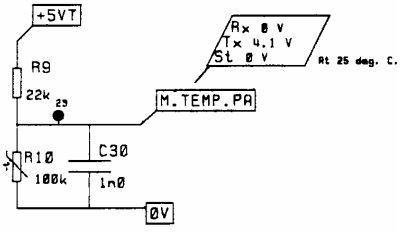


High power, power amplifier

Low power, power amplif

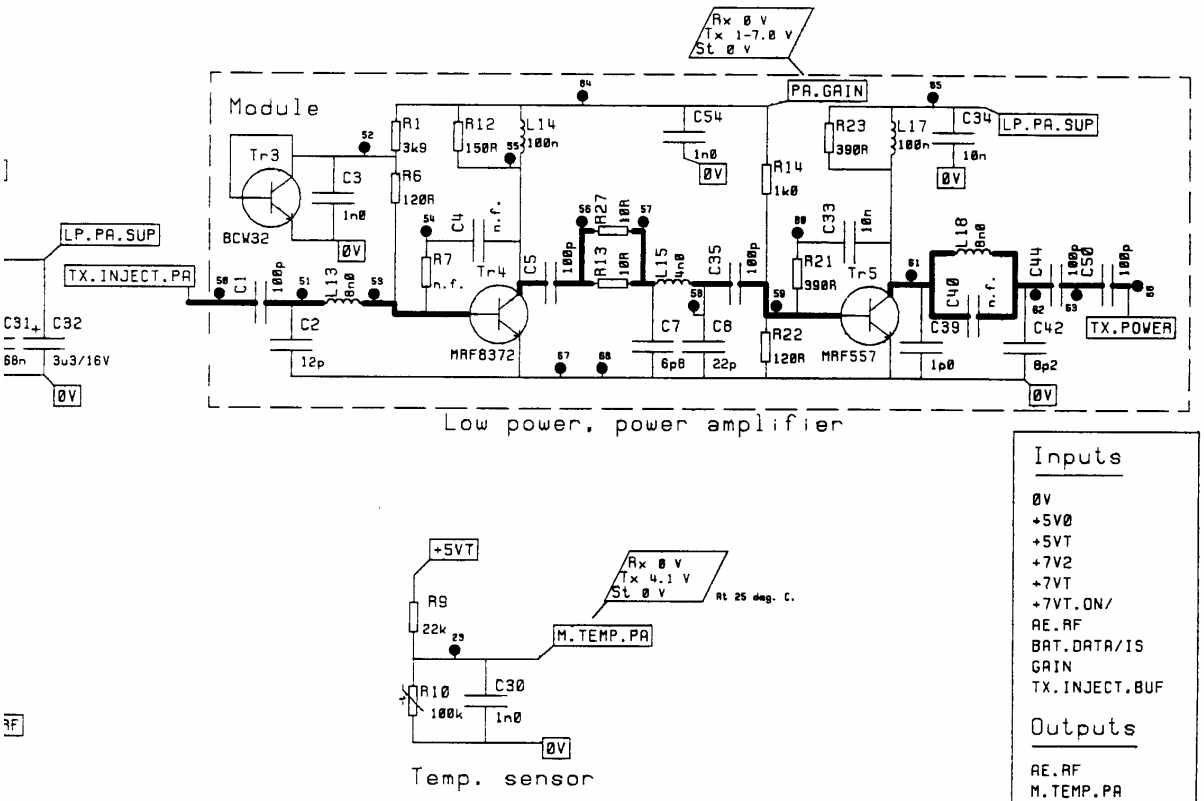


& Rx/Tx switch



Temp. sensor

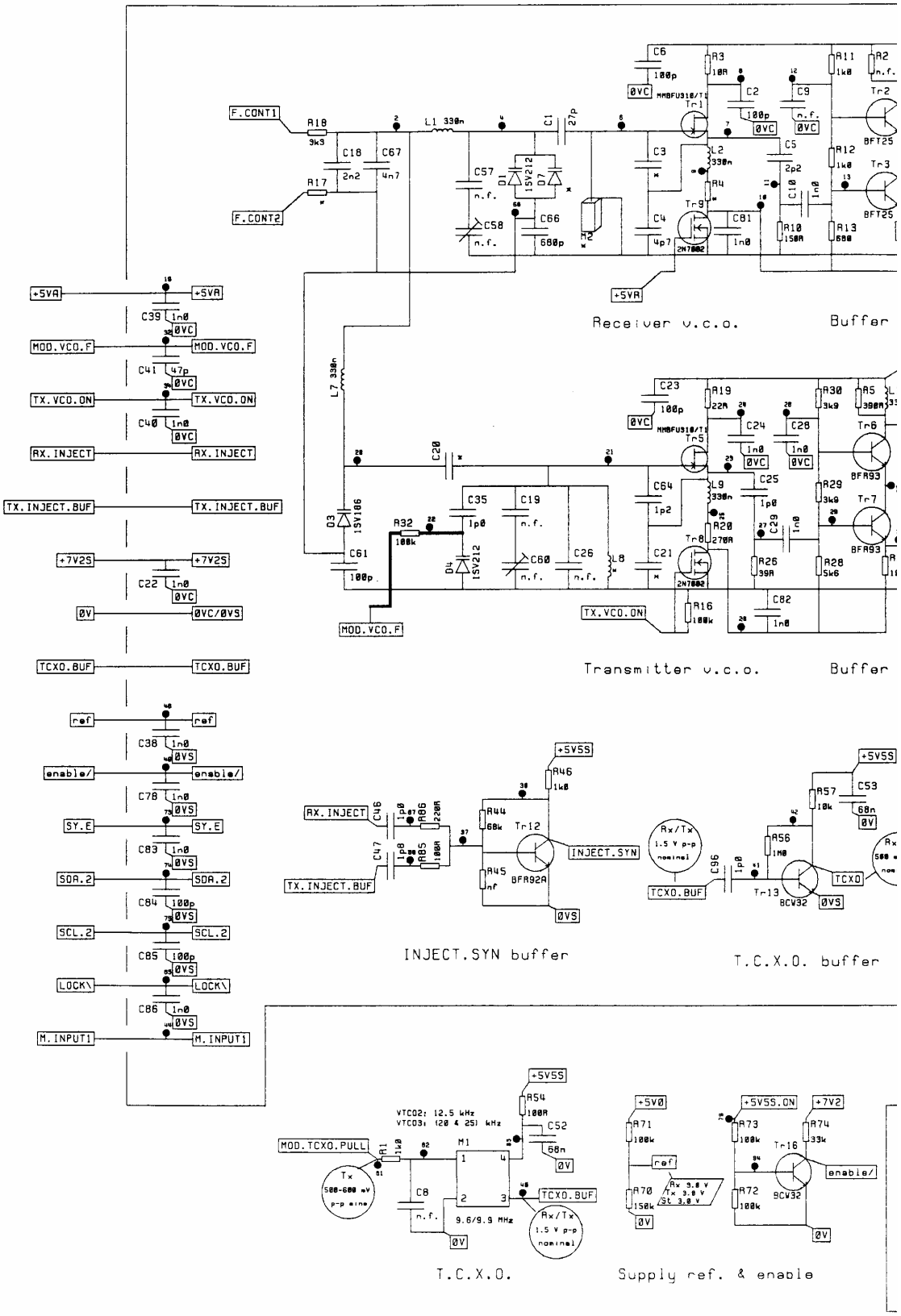
Add 200 to all component numbe

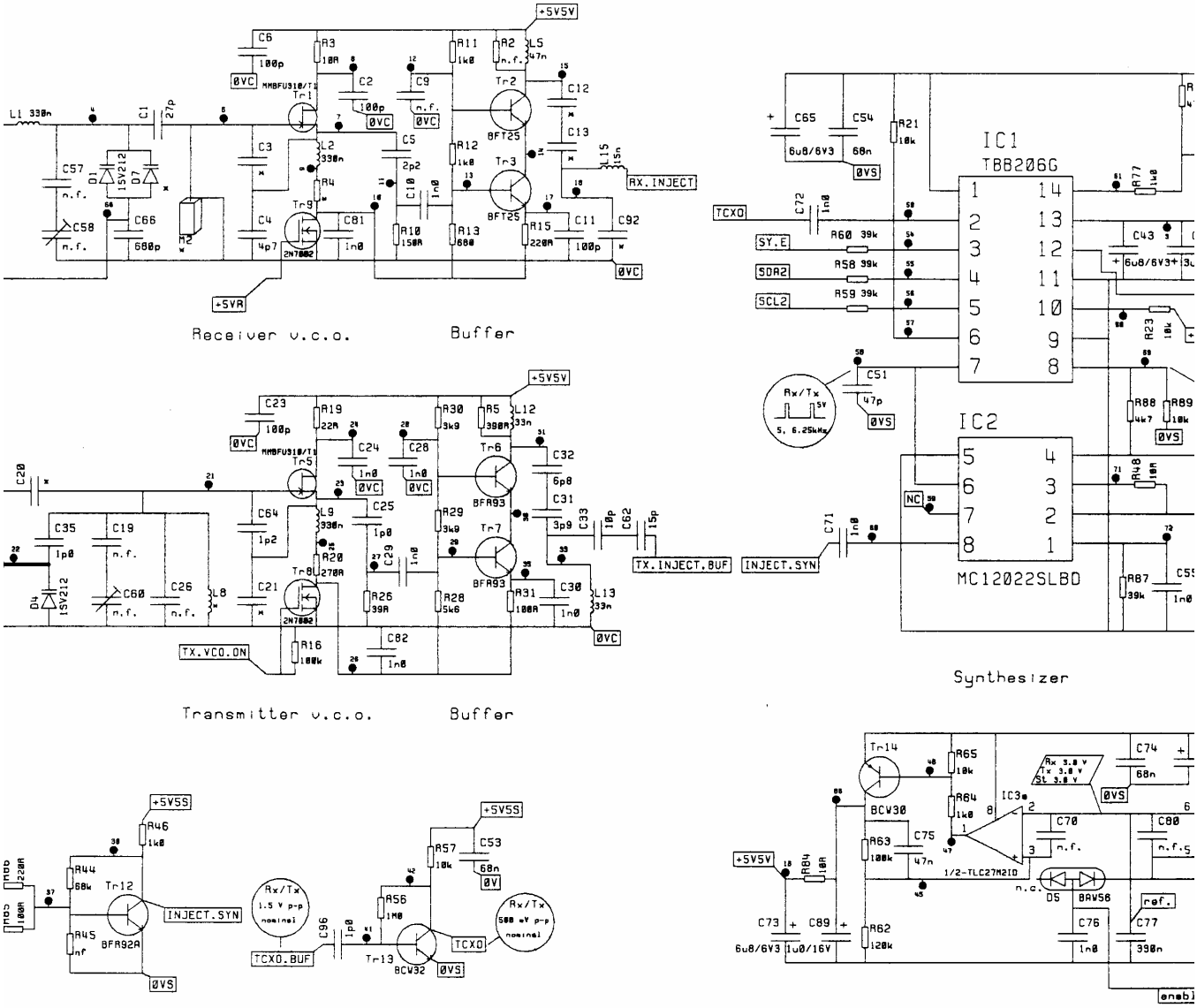


Add 200 to all component numbers.

Highest component numbers							
C	L	R	Tr	D	IC	M	ICT
53	19	27	5	3	0	6	69

FIG. 6.8 RADIO PCB, UHF TRANSMITTER CIRCUIT DIAGRAM

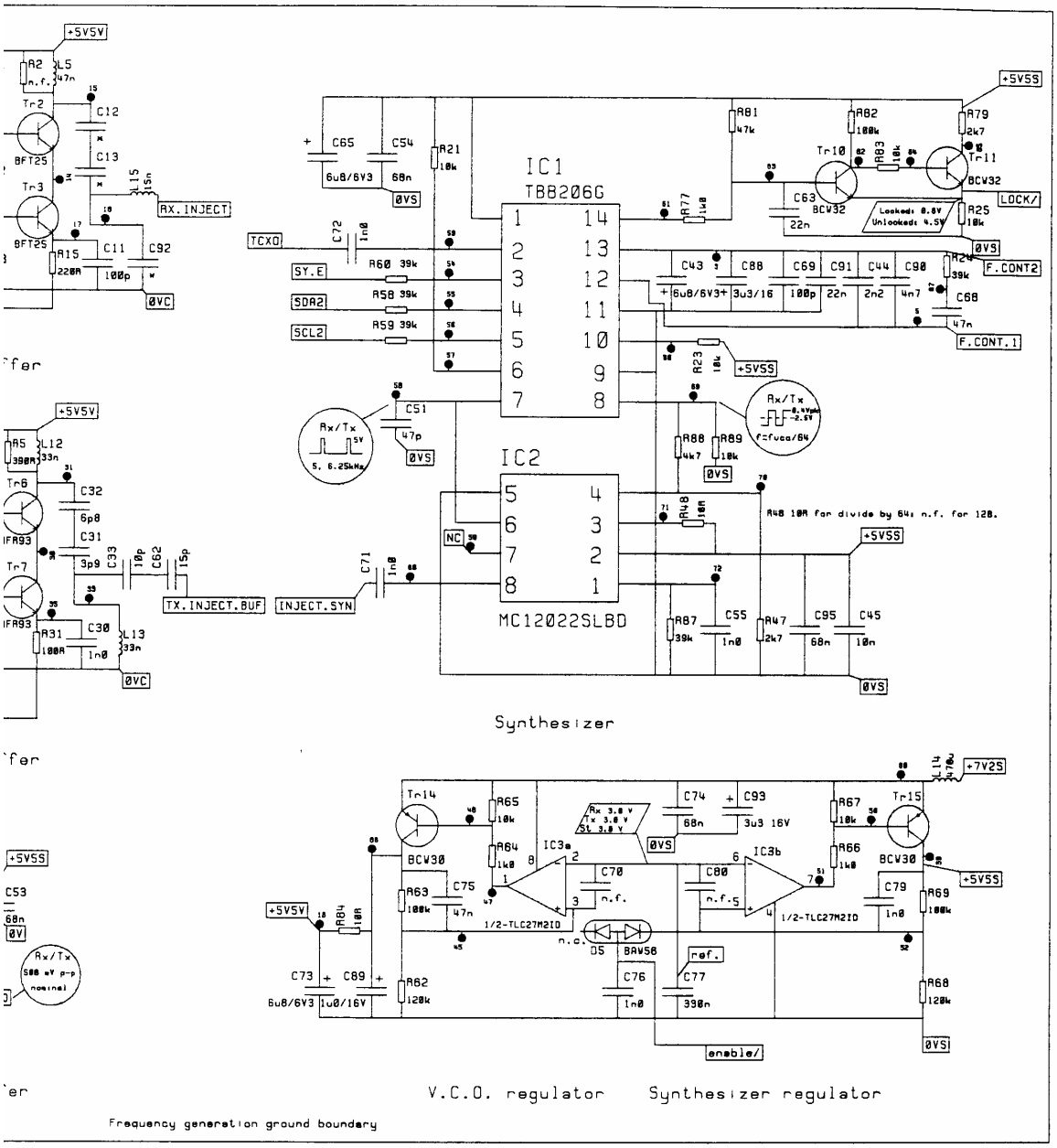




Com.	T4	TR	U	Com.	T4	TR	U(12.5kH
C3	4.7pF	3.3pF	4.7pF	R4	220R	180R	220R
C12	2.7pF	3.9pF	2.2pF	R17	3.3k	3.3k	10k
C13	3.9pF	3.9pF	2.2pF	D3	1SV212	BB515	1SV212
C20	12pF	12pF	8.2pF	D7	n.f.	1SV212	n.f.
C21	2.7pF	1.0pF	2.7pF	L8	8.2nH	10nH	8.2nH
C92	n.f.	n.f.	4.7pF	M2	474MHz	474MHz	510MHz

Add 300 to all component numbe

FIG.



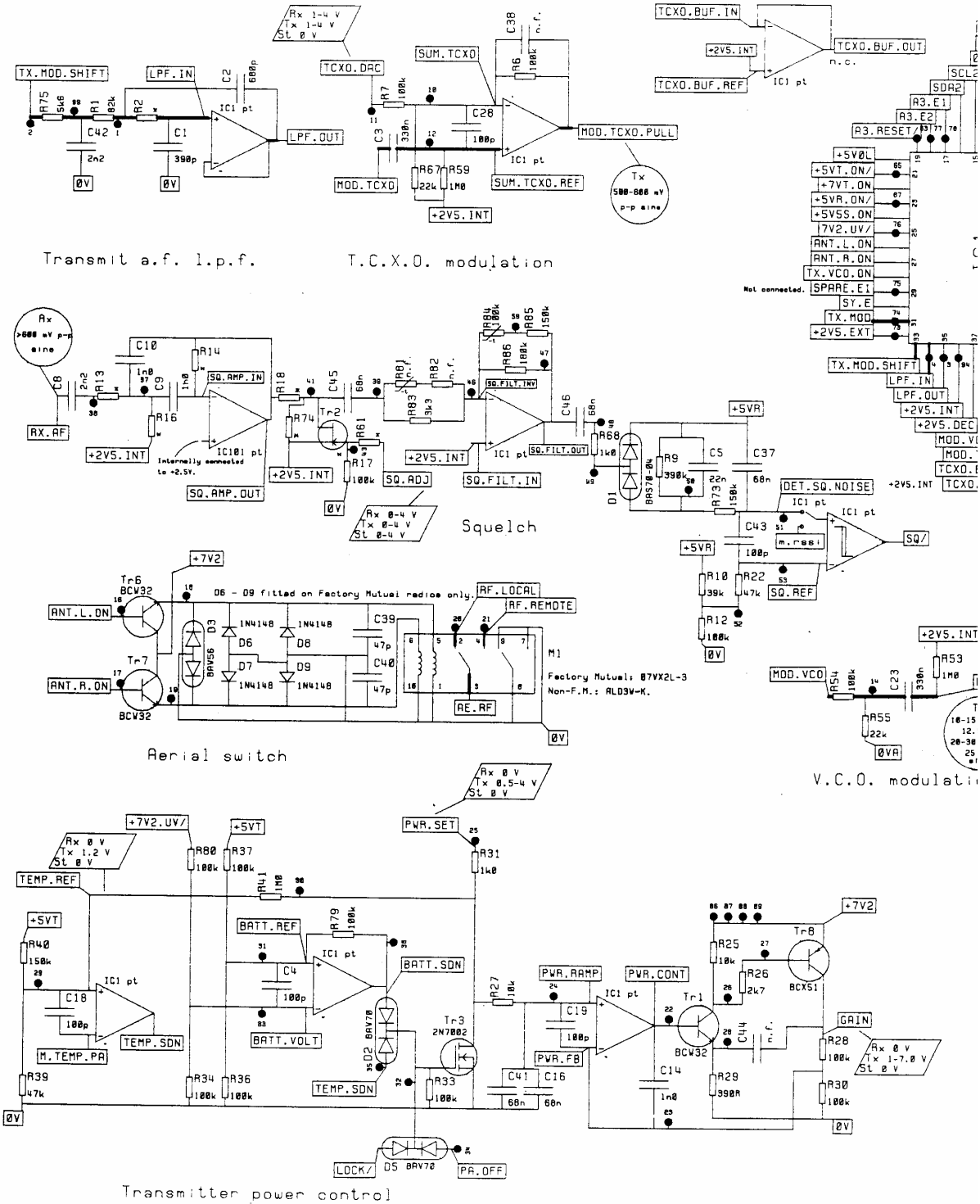
Com.	T4	TR	U	Com.	T4	TR	U(12.5kHz)	U(20/25kHz)
C3	4.7pF	3.3pF	4.7pF	R4	220R	180R	220R	220R
C12	2.7pF	3.9pF	2.2pF	R17	3.3k	3.3k	10k	3.3k
C13	3.9pF	3.9pF	2.2pF	D3	1SV212	BB515	1SV212	1SV212
C20	12pF	12pF	8.2pF	D7	n.f.	1SV212	n.f.	n.f.
C21	2.7pF	1.0pF	2.7pF	L8	8.2nH	18nH	8.2nH	8.2nH
C92	n.f.	n.f.	4.7pF	M2	474MHz	474MHz	510MHz	510MHz

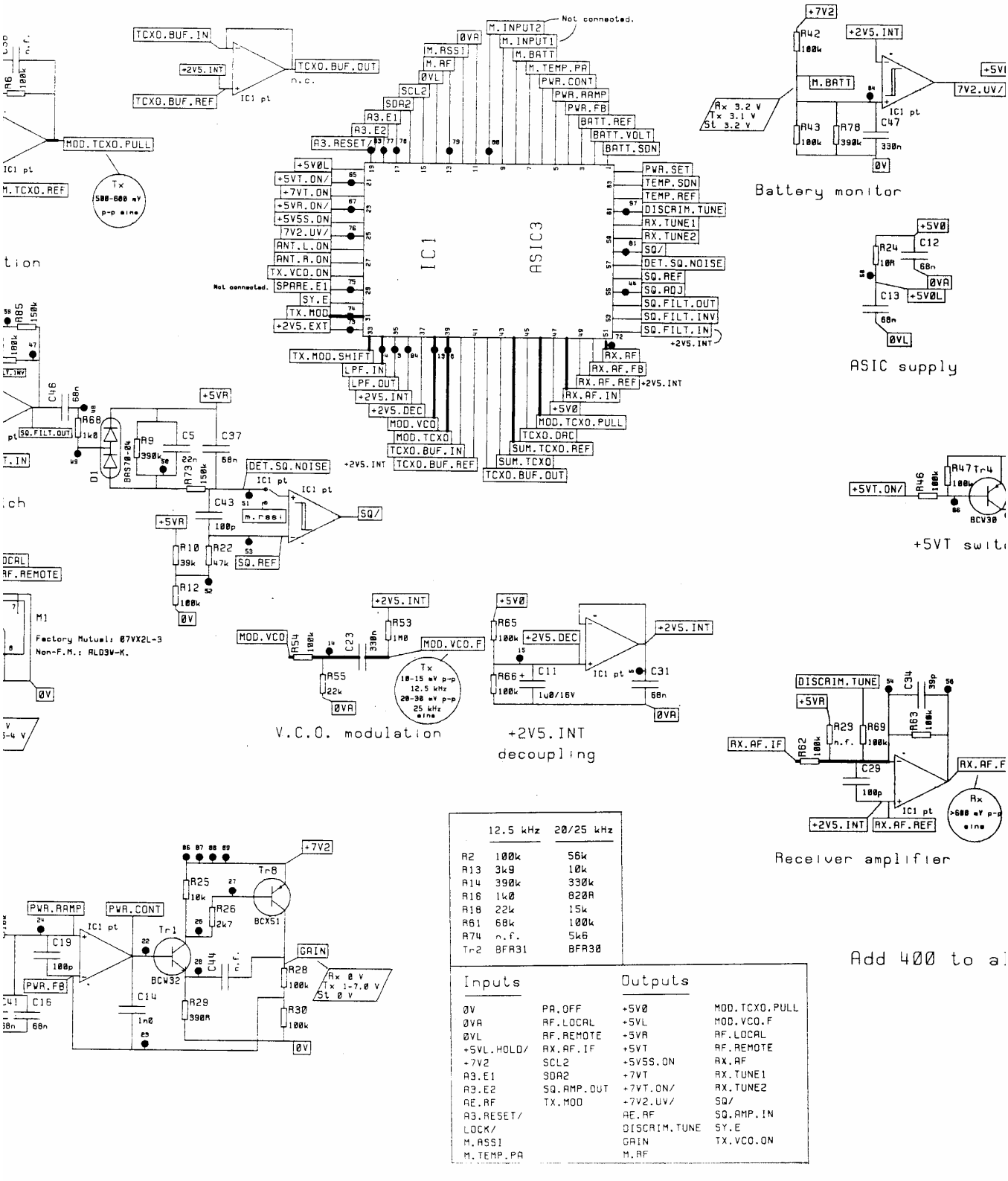
Inputs	Outputs
0V	LOCK\
+5V0	RX.INJECT
+5VR	TX.INJECT.BUF
+5V5S.ON	
+7V2	
+7V2S	
MOD.TCXO.PULL	
MOD.VCO.F	
SCL2	
SDA2	
SY.E	
TX.VCO.ON	

Add 300 to all component numbers.

Highest component numbers							
C	L	R	Tr	D	IC	M	ICT
96	15	89	16	7	4	2	88

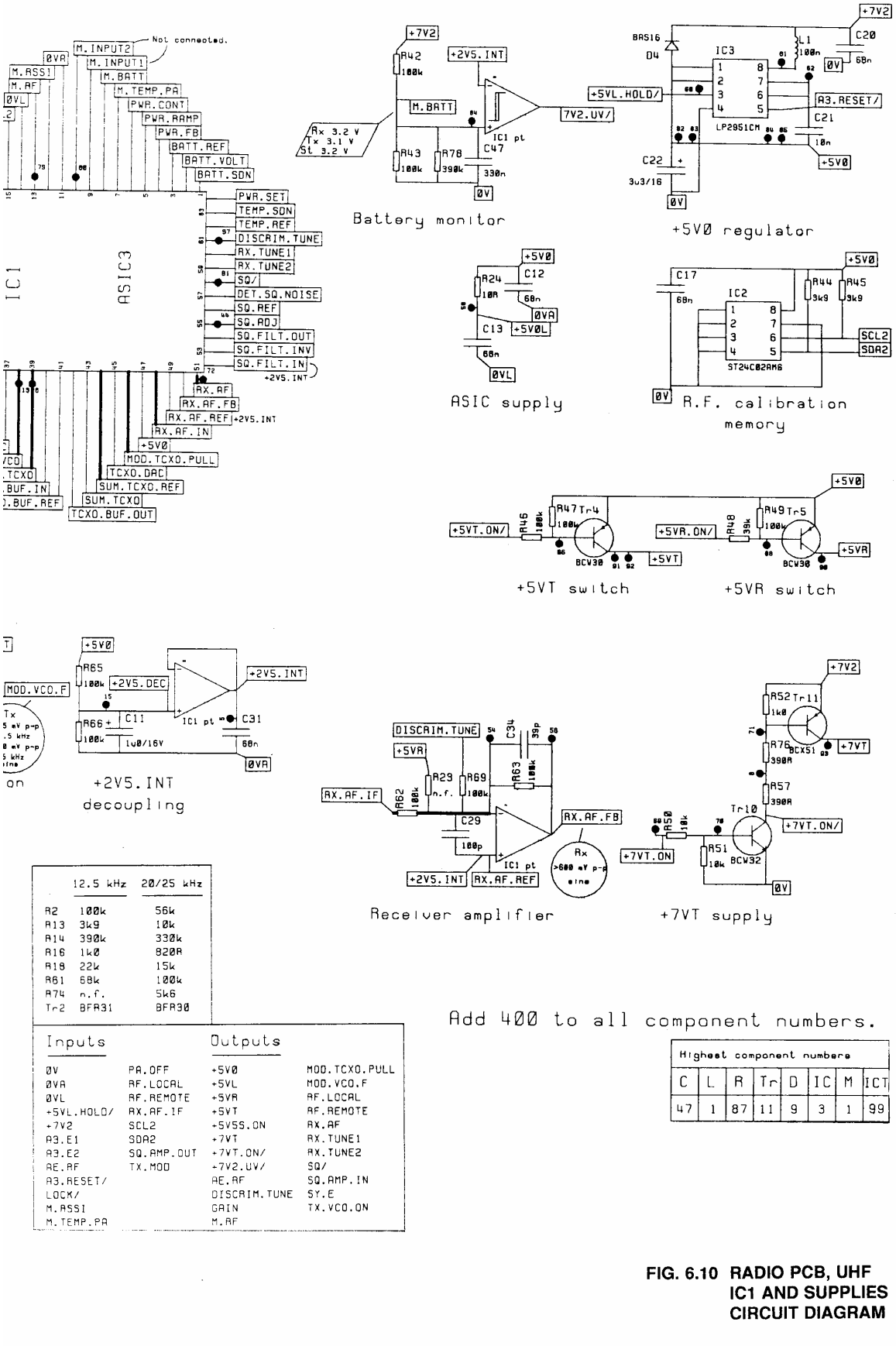
FIG. 6.9 RADIO PCB, UHF FREQUENCY GENERATION CIRCUIT DIAGRAM





	12.5 kHz	20/25 kHz
R2	100k	56k
R13	3k9	10k
R14	390k	330k
R16	1k0	820R
R18	22k	15k
R61	68k	100k
R74	n.f.	5k6
Tr2	BFR31	BFR30

Inputs		Outputs	
0V	PA.OFF	+5V0	MOD.TCXO.PULL
0VA	RF.LOCAL	+5VL	MOD.VCO.F
0VL	RF.REMOTE	+5VR	RF.LOCAL
+5VL.HOLD/	RX.AF.IF	+5VT	RF.REMOTE
+7V2	SCL2	+5V5S.ON	RX.AF
A3.E1	SDA2	+7VT	RX.TUNE1
A3.E2	SQ.AMP.OUT	+7VT.ON/	RX.TUNE2
AE.RF	TX.MOD	+7V2.UV/	SQ/
A3.RESET/		AE.RF	SQ.AMP.IN
LOCK/		DISCRIM.TUNE	SY.E
M.ASSI		GAIN	TX.VCO.ON
M.TEMP.PA		M.RF	



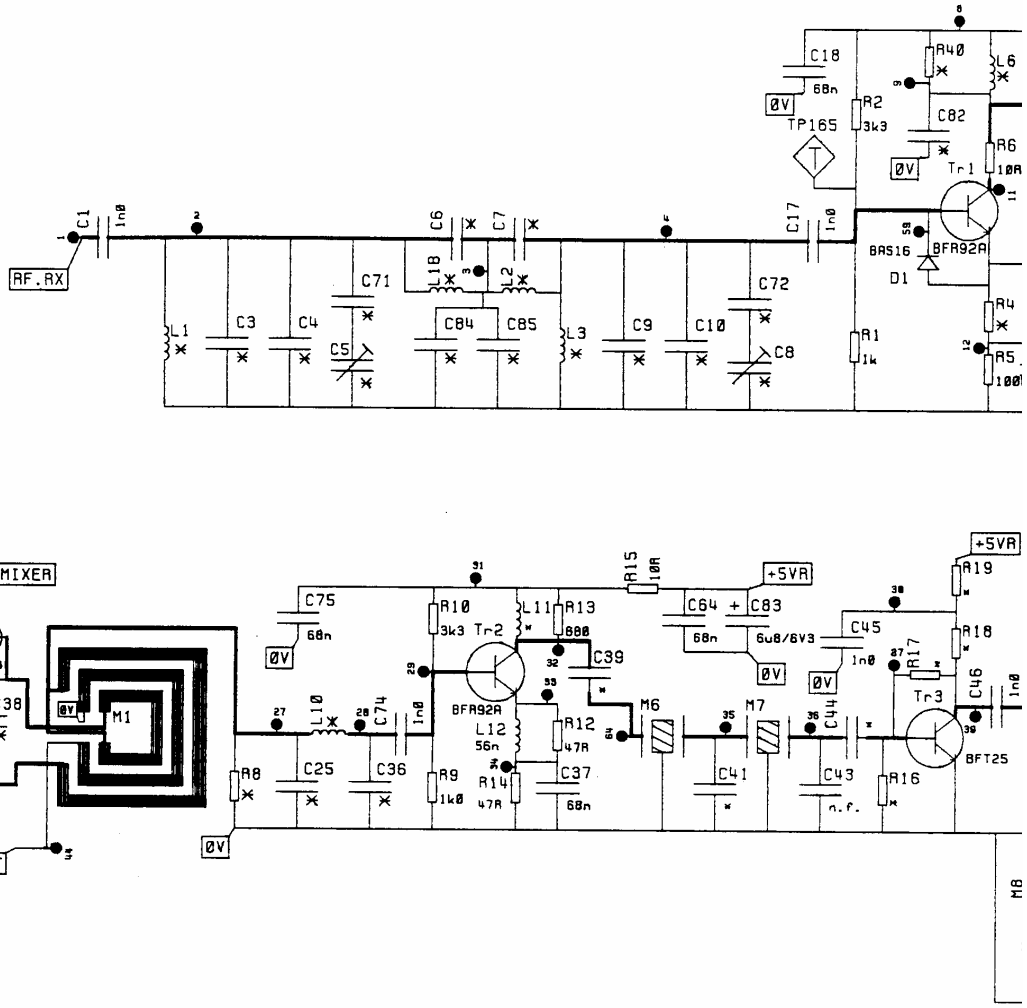
	12.5 kHz	20/25 kHz
R2	100k	56k
R13	3k9	10k
R14	390k	330k
R16	1k0	820R
R18	22k	15k
R61	68k	100k
R74	n.f.	5k6
Tr2	BFR31	BFR30

Inputs		Outputs	
0V	PA.OFF	+5V0	MOD.TCXO.PULL
0VA	RF.LOCAL	+5VL	MOD.VCO.F
0VL	RF.REMOTE	+5VR	RF.LOCAL
+5VL.HOLD/	RX.AF.IF	+5VT	RF.REMOTE
+7V2	SCL2	+5V5S.ON	RX.AF
A3.E1	SDA2	+7VT	RX.TUNE1
A3.E2	SQ.AMP.OUT	+7VT.ON/	RX.TUNE2
AE.AF	TX.MOD	+7V2.UV/	SQ/
A3.RESET/		AE.AF	SQ.AMP.IN
LOCK/		DISCRIM.TUNE	SY.E
M.ASSI		GAIN	TX.VCO.ON
M.TEMP.PA		M.RF	

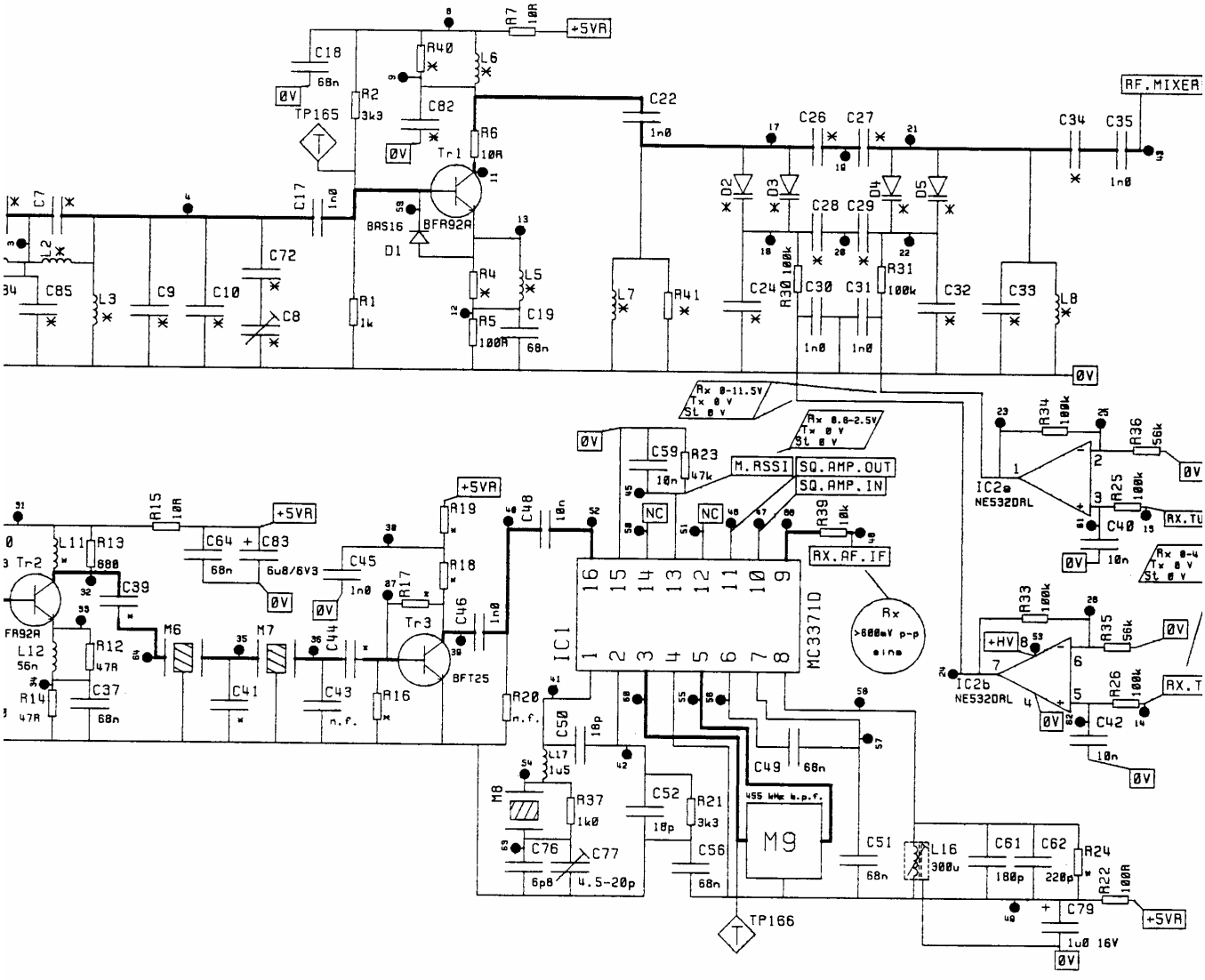
Add 400 to all component numbers.

Highest component numbers							
C	L	R	Tr	D	IC	M	ICT
47	1	87	11	9	3	1	99

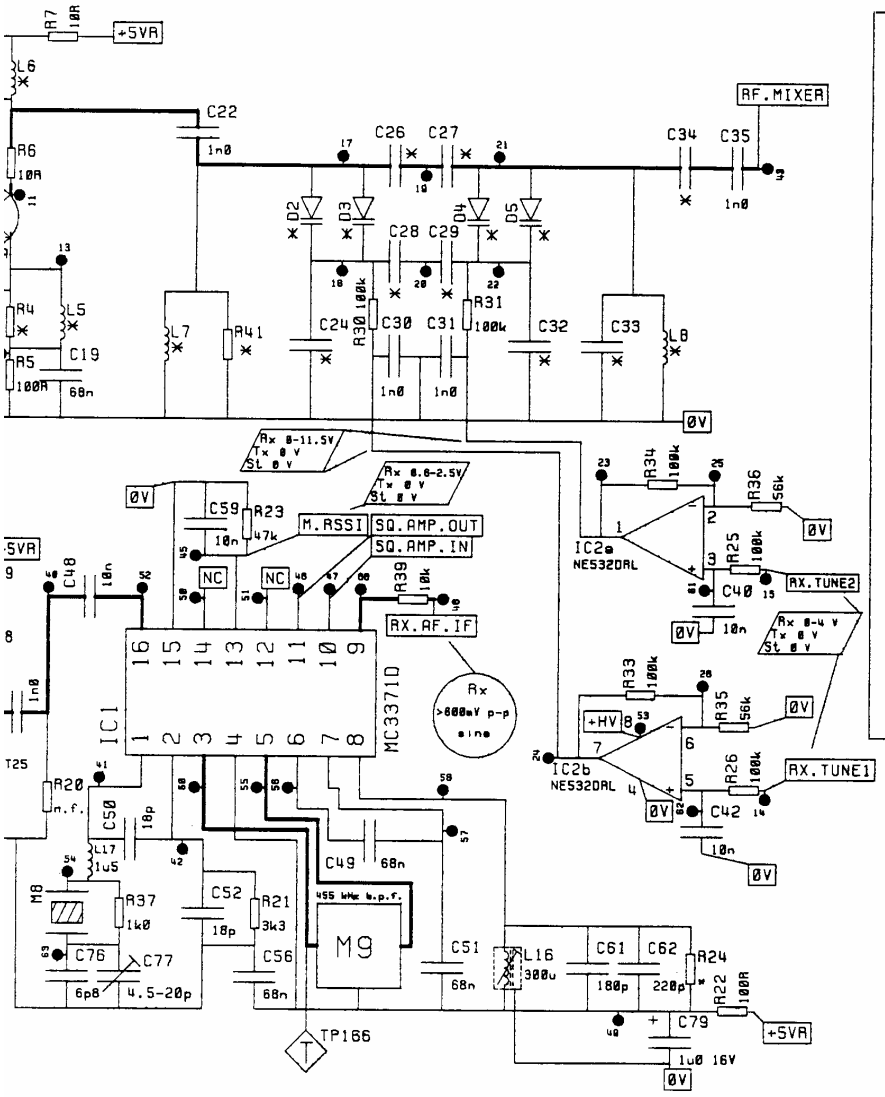
FIG. 6.10 RADIO PCB, UHF IC1 AND SUPPLIES CIRCUIT DIAGRAM



TP320/5



Add 100 to all component numbe



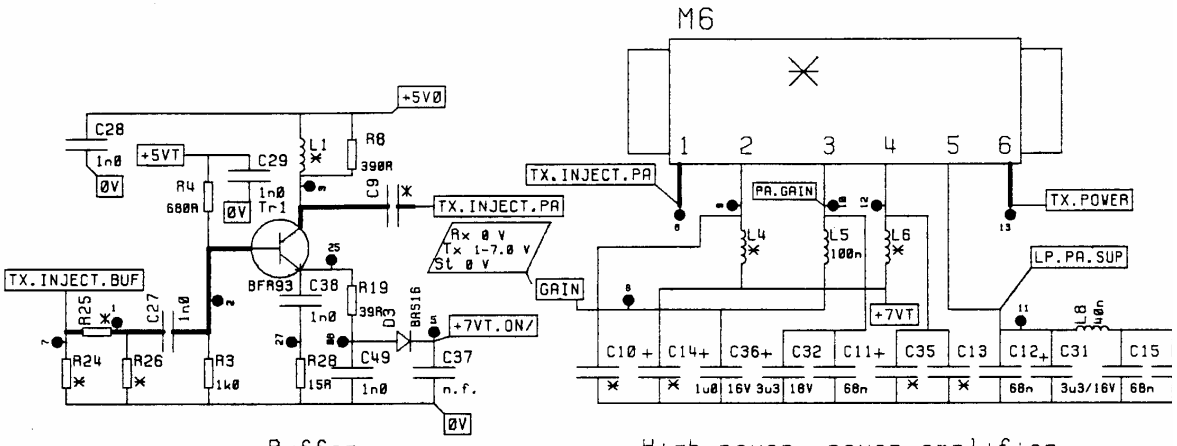
	12.5 kHz	20/25 kHz
L11 -	1u5	3u3
R16 -	n.f.	10k
R17 -	33k	15k
R18 -	2k7	680R
R19 -	1k0	5k6
R24 -	120k	39k
C39 -	10p	10n
C41 -	18p	8p2
C44 -	47p	10n
M6,7 -	45E2FF	12.5 kHz
-	45E2BF	20/25 kHz
M8 -	44.545 MHz or 45.455 MHz.	
M9 -	CFZM455F	12.5 kHz
-	CFZM455E	20 kHz
-	CFZM455C	25 kHz

Inputs	Outputs
0V	M.RSSI
+5VR	RX.AF.IF
RF.RX	SQ.AMP.OUT
RX.INJECT	
RX.TUNE1	
RX.TUNE2	
SQ.AMP.IN	
+HV	

Add 100 to all component numbers.

Highest component numbers						
C	L	R	Tr	D	IC	M
83	17	41	3	6	2	9

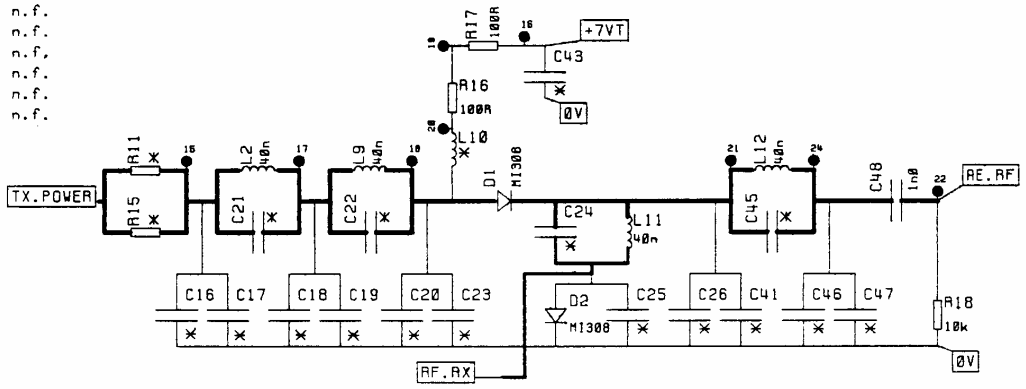
FIG. 6.11 RADIO PCB, VHF RECEIVER CIRCUIT DIAGRAM



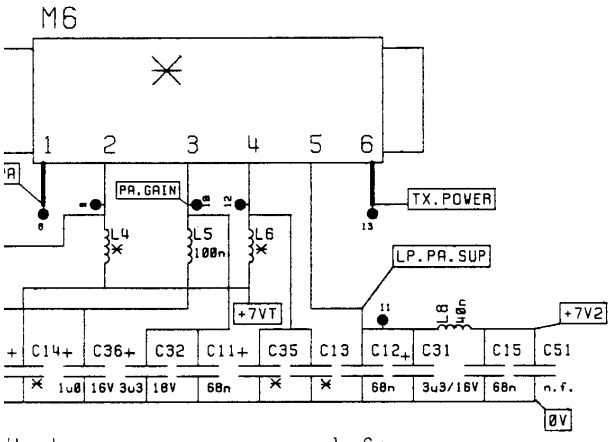
Buffer

High power, power amplifier

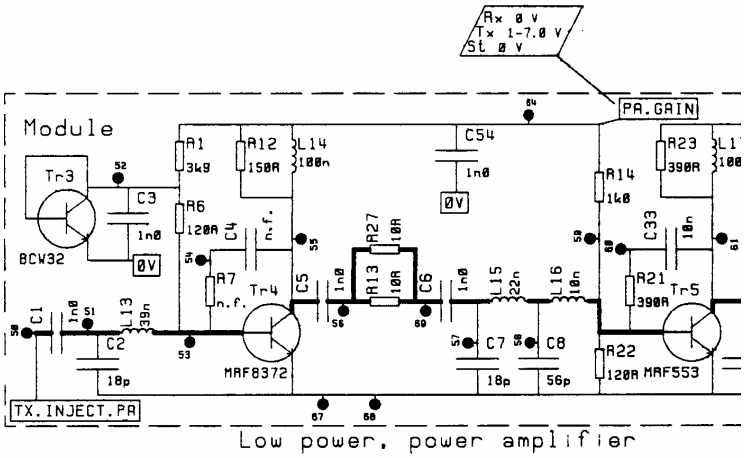
*	HP	LP
R24	68	n.f.
R25	18Ø	33
R26	39	56
C1Ø	68n	n.f.
C13	68n	n.f.
C14	3u3/16V	n.f.
C35	3u3/16V	n.f.
L4	1ØØn	n.f.
L6	1ØØn	n.f.



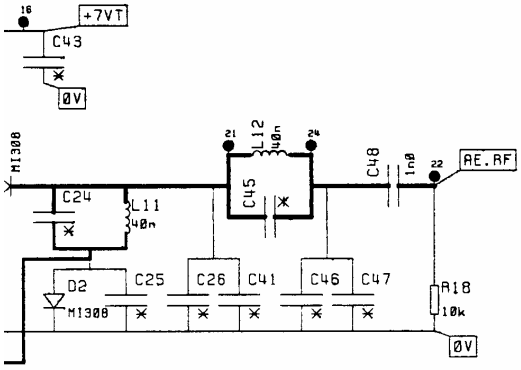
Aerial filter & Rx/Tx switch



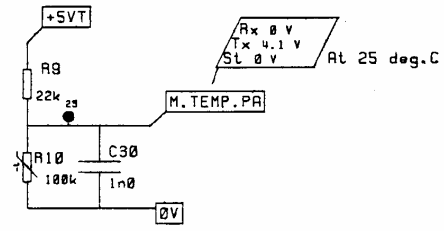
High power, power amplifier



Low power, power amplifier

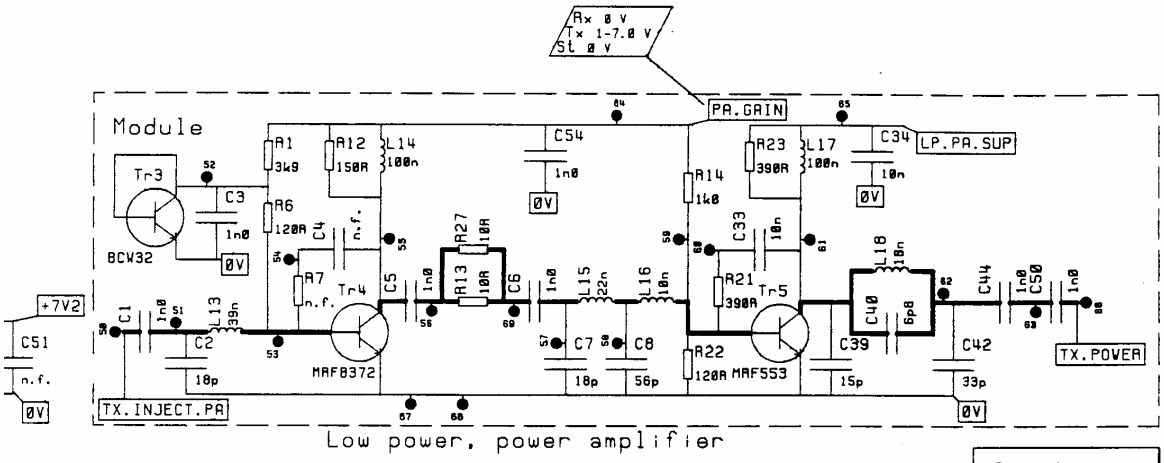


Rx/Tx switch

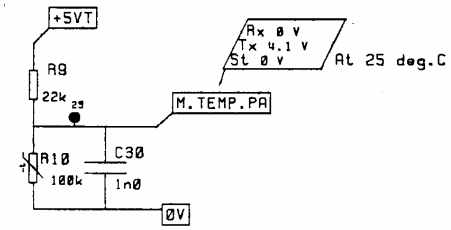


Temp. sensor

Add 200 to all component numbe



Low power, power amplifier



Temp. sensor

Inputs

ØV
+5VØ
+5VT
+7V2
+7VT
+7VT.ON/
AE.RF
BAT.DATA/IS
GRIN
TX.INJECT.BUF

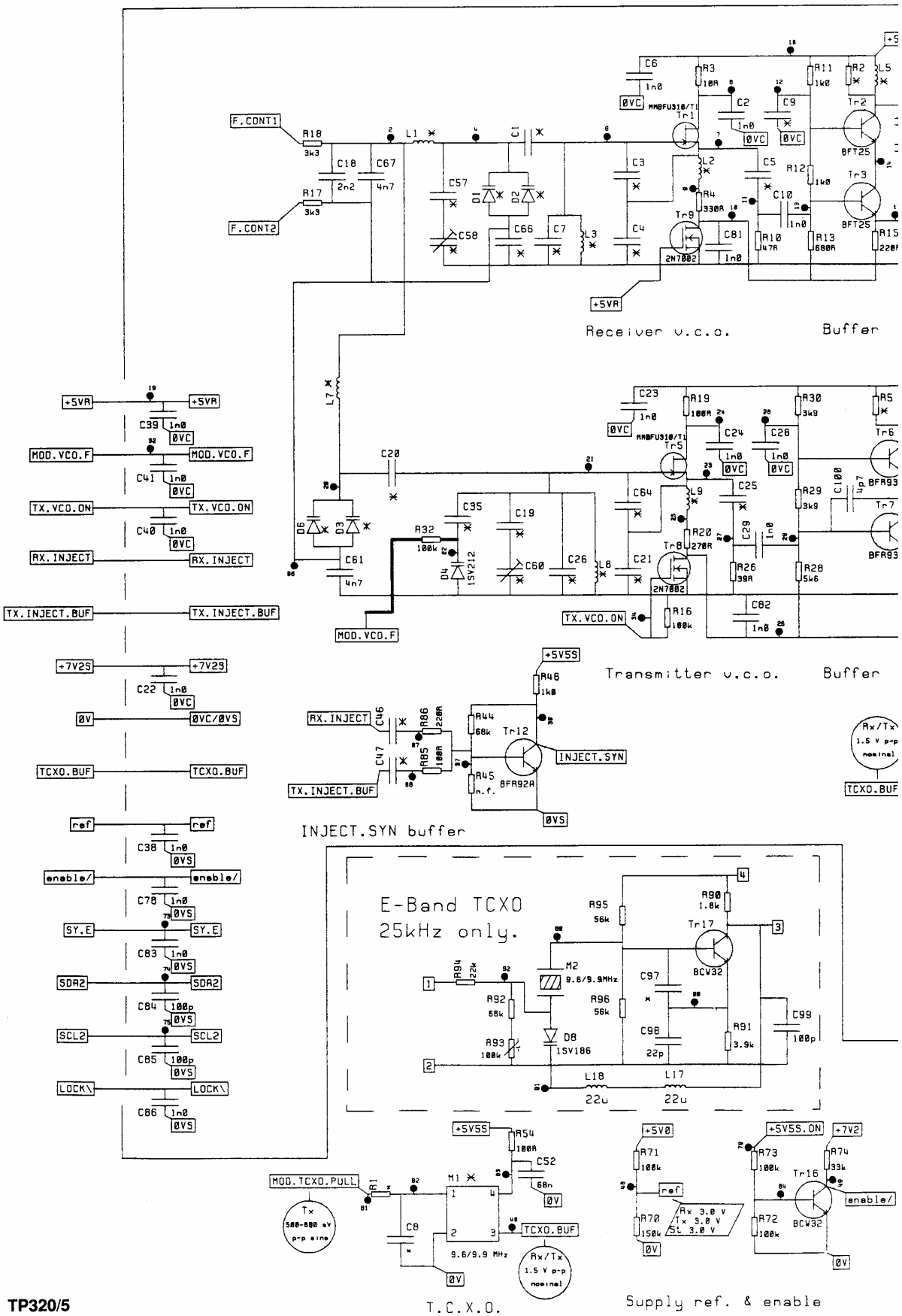
Outputs

AE.RF
M.TEMP.PA
RF.RX

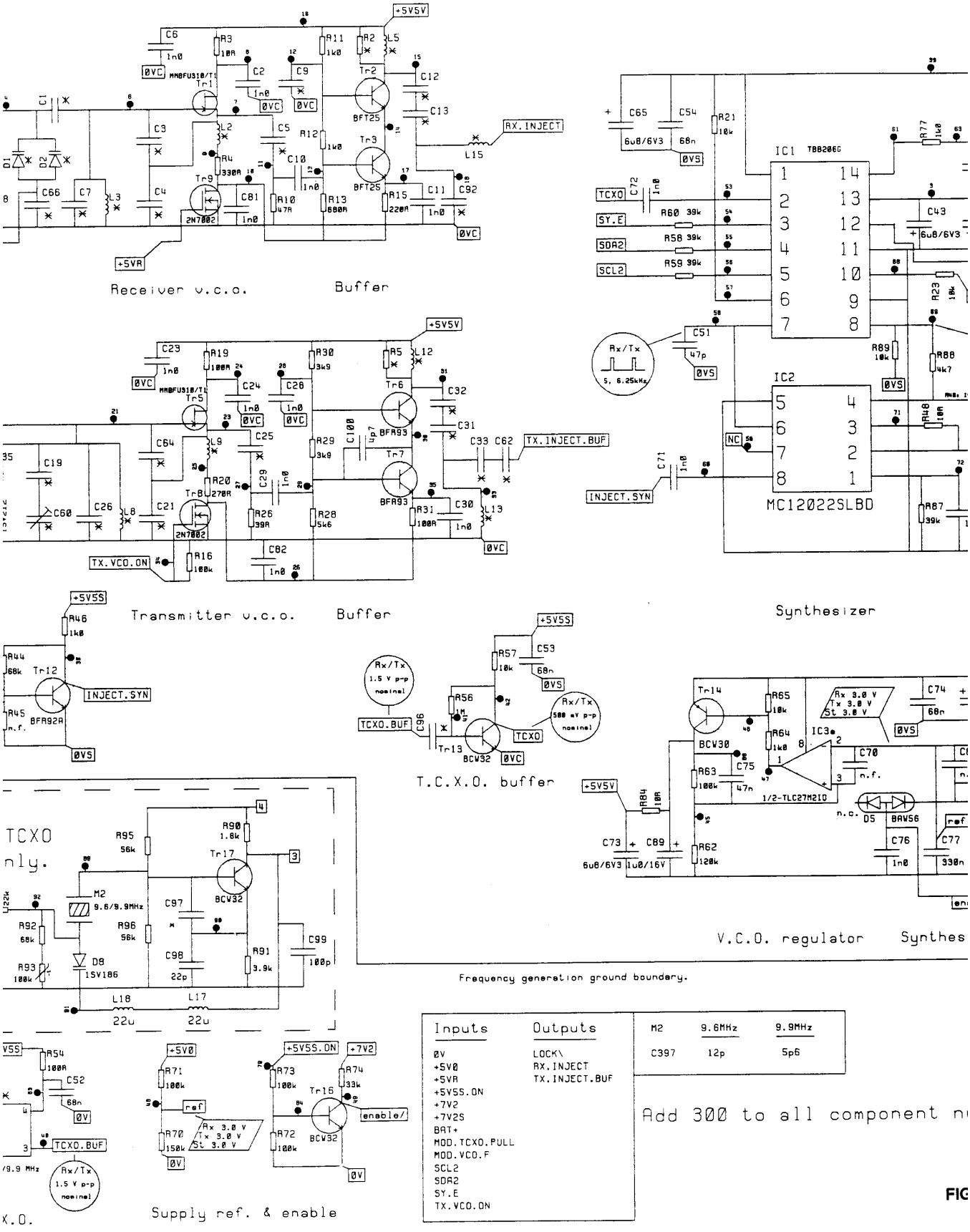
Add 200 to all component numbers.

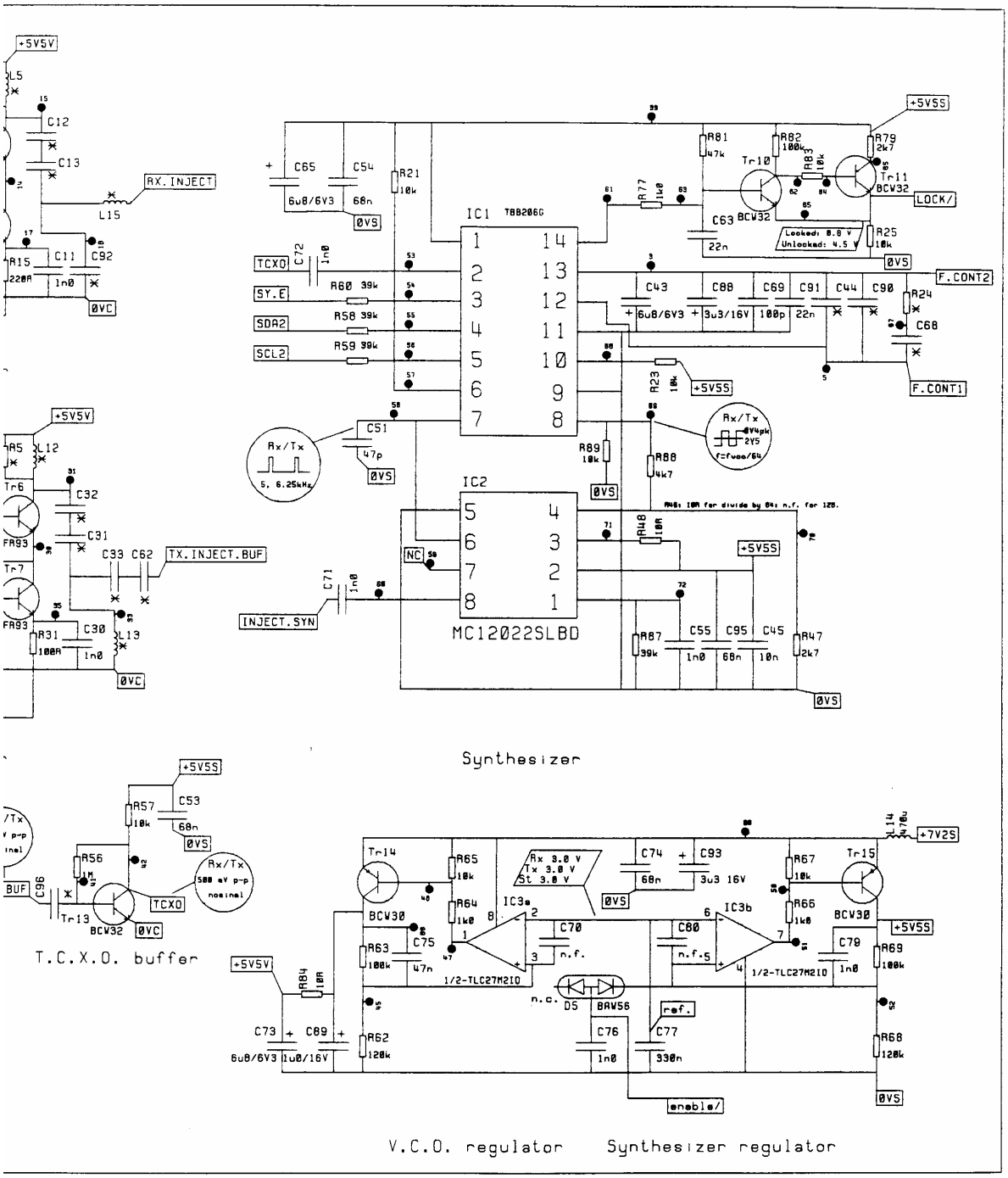
Highest component numbers						
C	L	R	Tr	D	IC	M
54	19	28	5	3	Ø	6

FIG. 6.12 RADIO PCB, VHF TRANSMITTER CIRCUIT DIAGRAM



TP320/5





Frequency generation ground boundary.

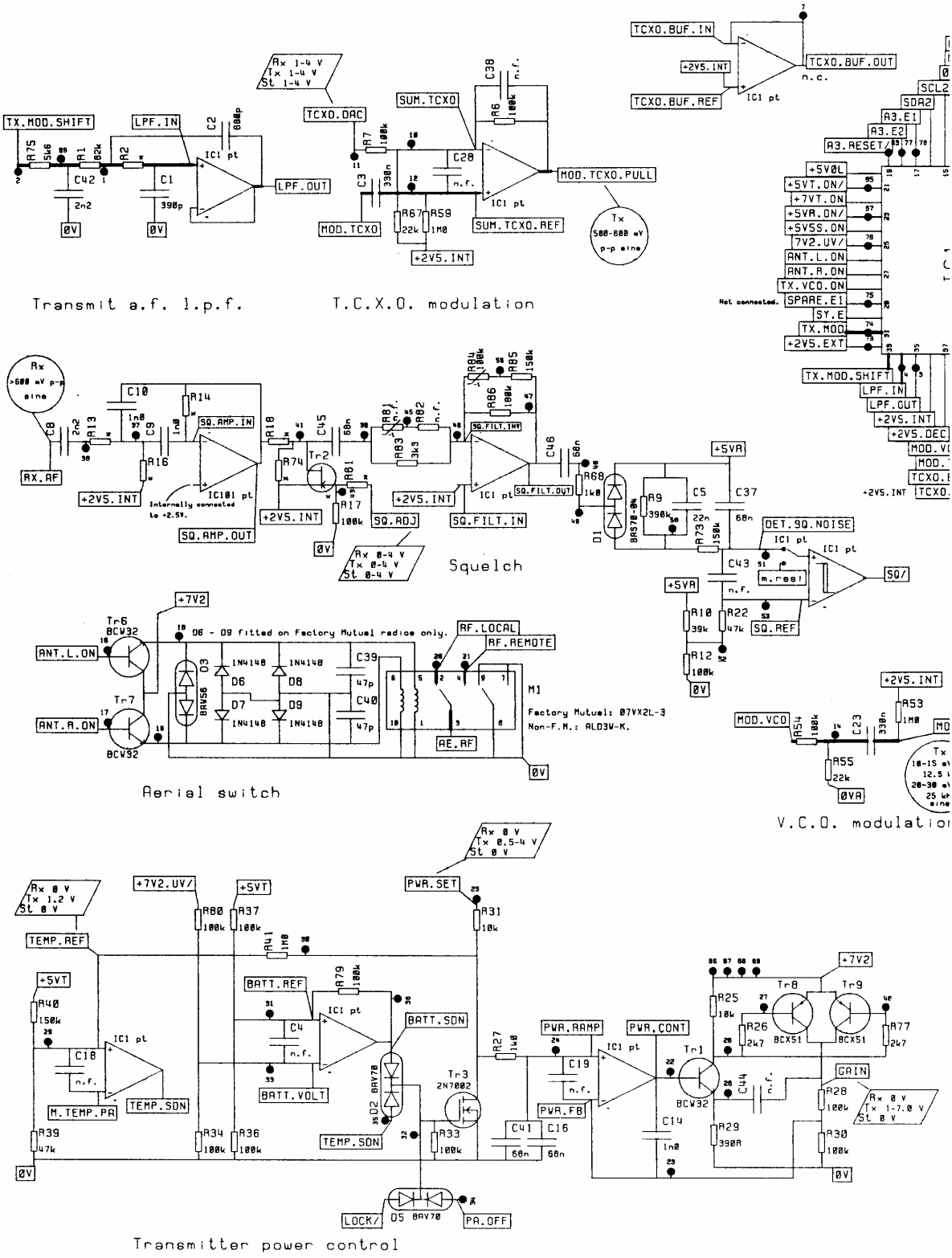
Inputs	Outputs
ØV	LOCK\
+5V0	RX.INJECT
+5VR	TX.INJECT.BUF
+5V5S.ON	
+7V2	
+7V2S	
BAT+	
MOD.TCXO.PULL	
MOD.VCO.F	
SCL2	
SDA2	
SY.E	
TX.VCO.ON	

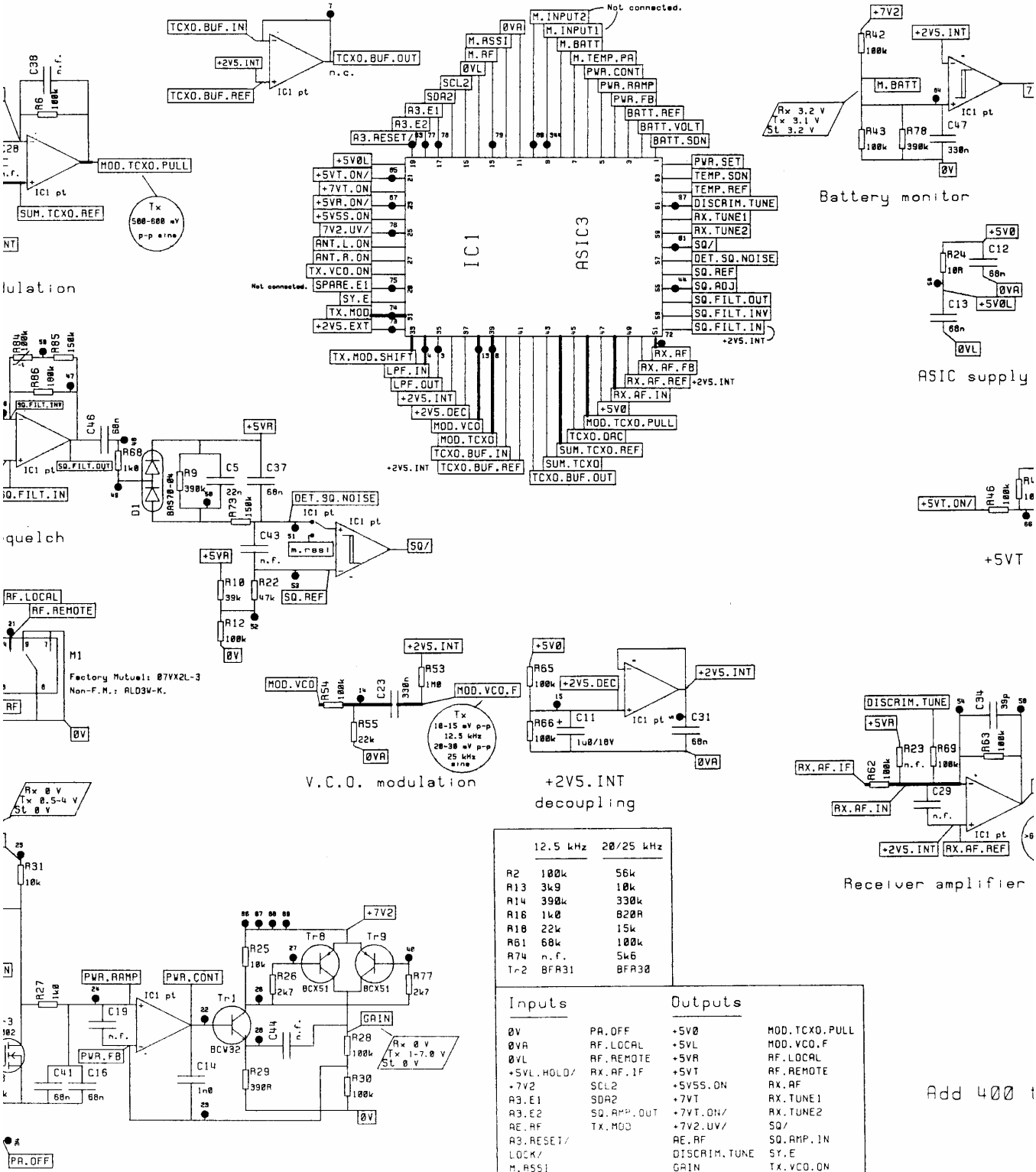
M2	9.6MHz	9.9MHz
C397	12p	5p6

Add 300 to all component numbers.

Highest component numbers						
C	L	R	Tr	D	IC	M
100	18	96	16	8	4	2

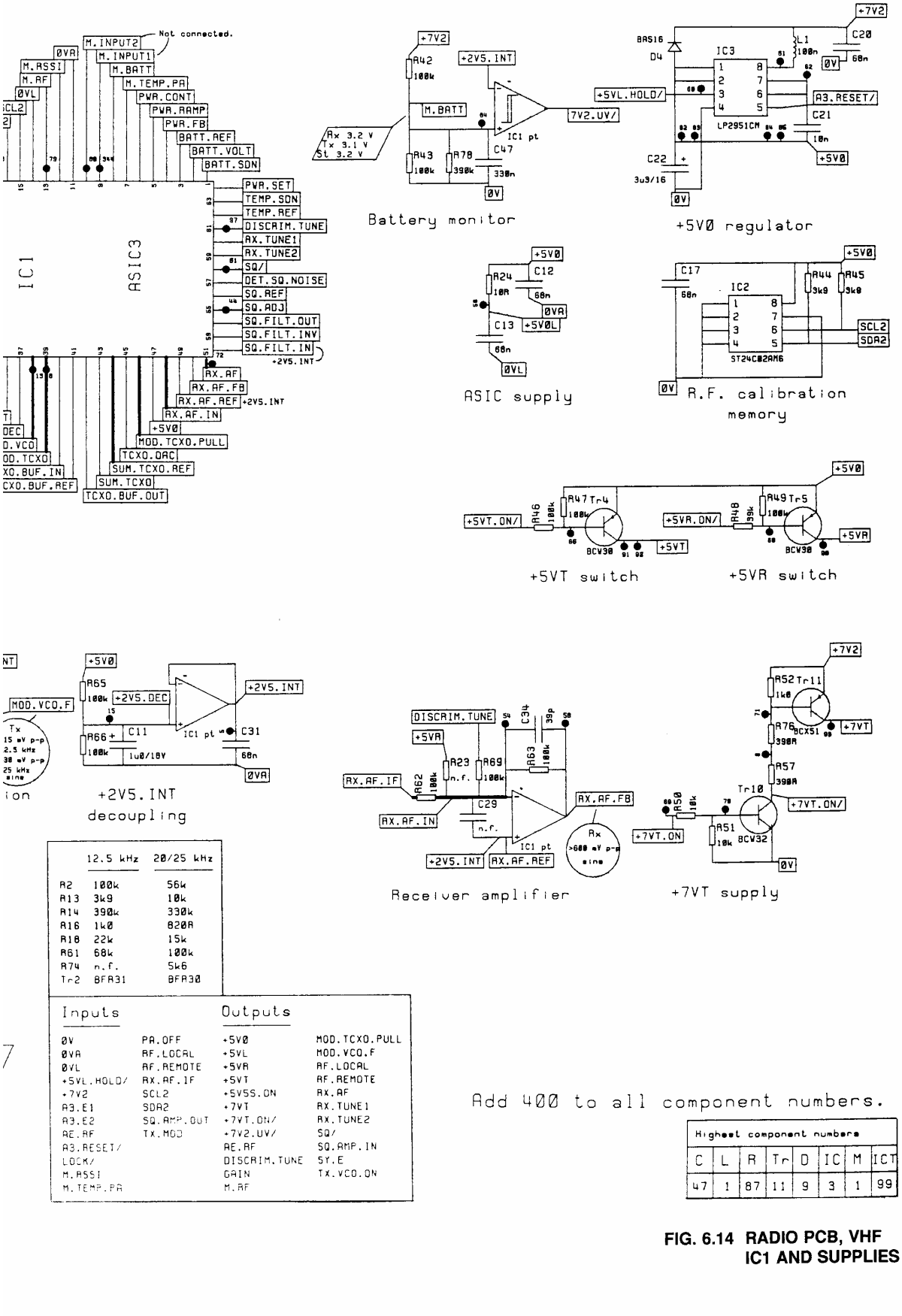
FIG. 6.13 RADIO PCB, VHF FREQUENCY GENERATION CIRCUIT DIAGRAM





	12.5 kHz	20/25 kHz
R2	100k	56k
R13	3k9	10k
R14	390k	330k
R16	1kØ	820R
R18	22k	15k
R61	68k	100k
R74	n.f.	5k6
Tr2	BFR31	BFR30

Inputs		Outputs	
ØV	PA.OFF	+5VØ	MOD.TCXO.PULL
ØVA	RF.LOCAL	+5VL	MOD.VCO.F
ØVL	RF.REMOTE	+5VR	RF.LOCAL
+5VL.HOLD/	RX.AF.IF	+5VT	RF.REMOTE
+7V2	SCL2	+5V5S.ON	RX.AF
A3.E1	SDA2	+7VT	RX.TUNE1
A3.E2	SQ.AMP.OUT	+7VT.ON/	RX.TUNE2
AE.AF	TX.MOD	+7V2.UV/	SQ/
A3.RESET/		AE.AF	SQ.AMP.IN
LOCK/		DISCRIM.TUNE	SY.E
M.ASSI		GAIN	TX.VCO.ON
M.TEMP.PA		M.RF	

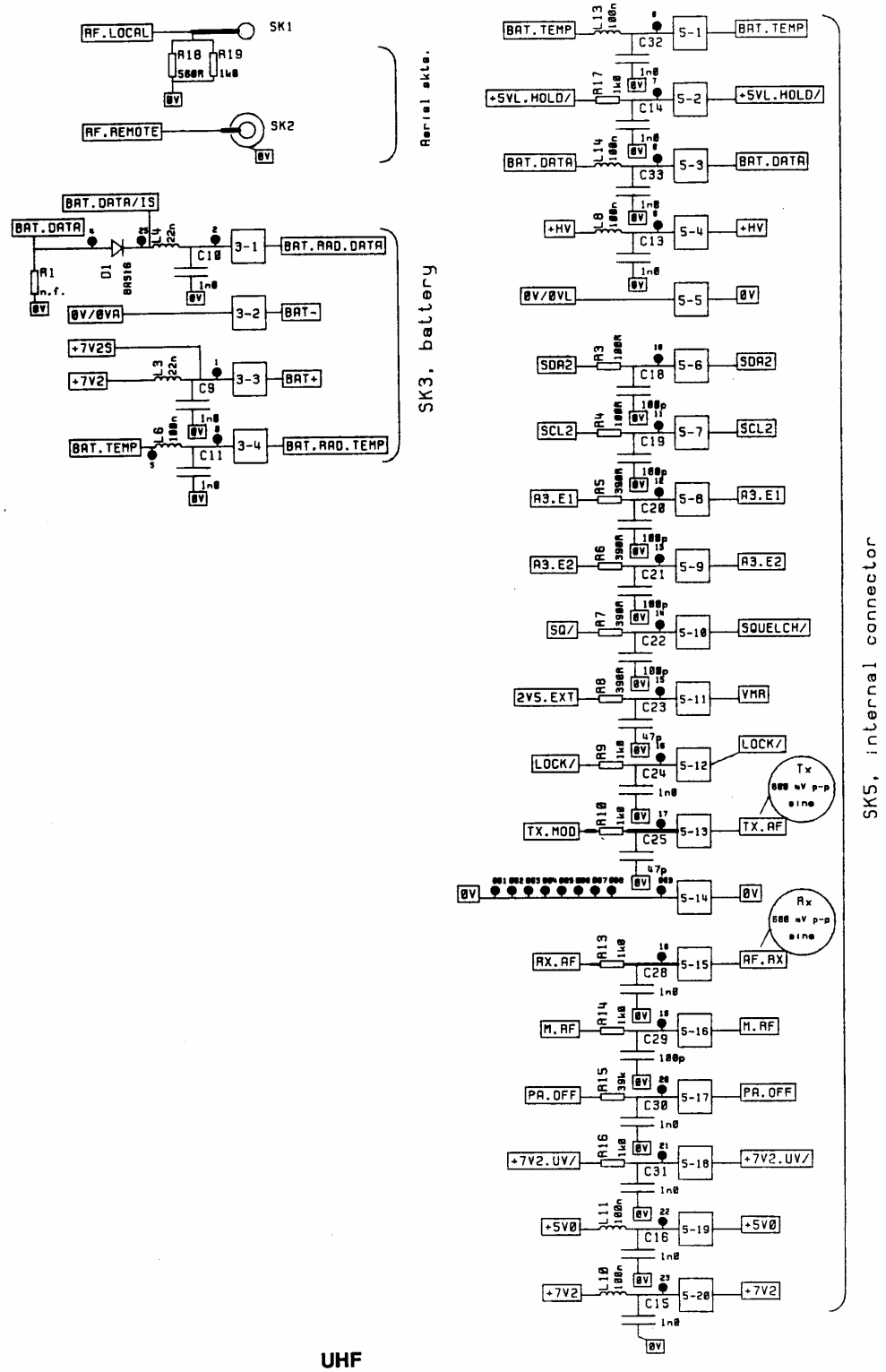


	12.5 kHz	20/25 kHz
R2	100k	56k
R13	3k9	10k
R14	390k	330k
R16	1k0	820R
R18	22k	15k
R61	68k	100k
R74	n.f.	5k6
Tr2	BFR31	BFR30

Inputs		Outputs	
0V	PA.OFF	+5V0	MOD.TCXO.PULL
0VA	RF.LOCAL	+5VL	MOD.VCO.F
0VL	RF.REMOTE	+5VR	RF.LOCAL
+5VL.HOLD/	RX.AF.IF	+5VT	RF.REMOTE
+7V2	SCL2	+5V5S.ON	RX.AF
A3.E1	SDA2	+7VT	RX.TUNE1
A3.E2	SQ.AMP.OUT	+7VT.ON/	RX.TUNE2
AE.AF	TX.MOD	+7V2.UV/	SQ/
A3.RESET/		AE.AF	SQ.AMP.IN
LOCK/		DISCRIM.TUNE	SY.E
M.ASSI		GAIN	TX.VCO.ON
M.TEMP.PA		M.AF	

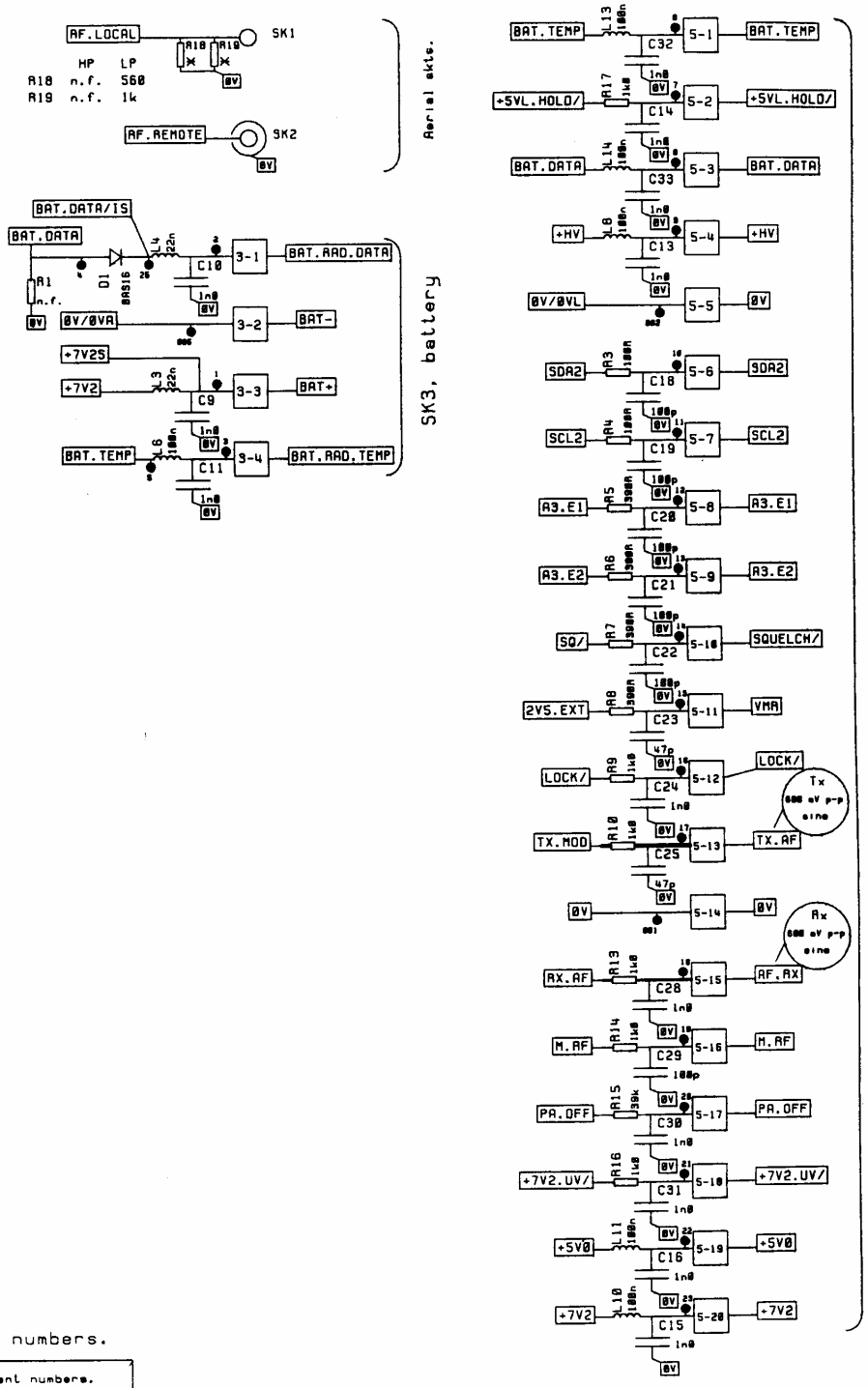
Highest component numbers							
C	L	R	Tr	D	IC	M	ICT
47	1	87	11	9	3	1	99

FIG. 6.14 RADIO PCB, VHF IC1 AND SUPPLIES



UHF

TP320/5



Add 500 to all component numbers.

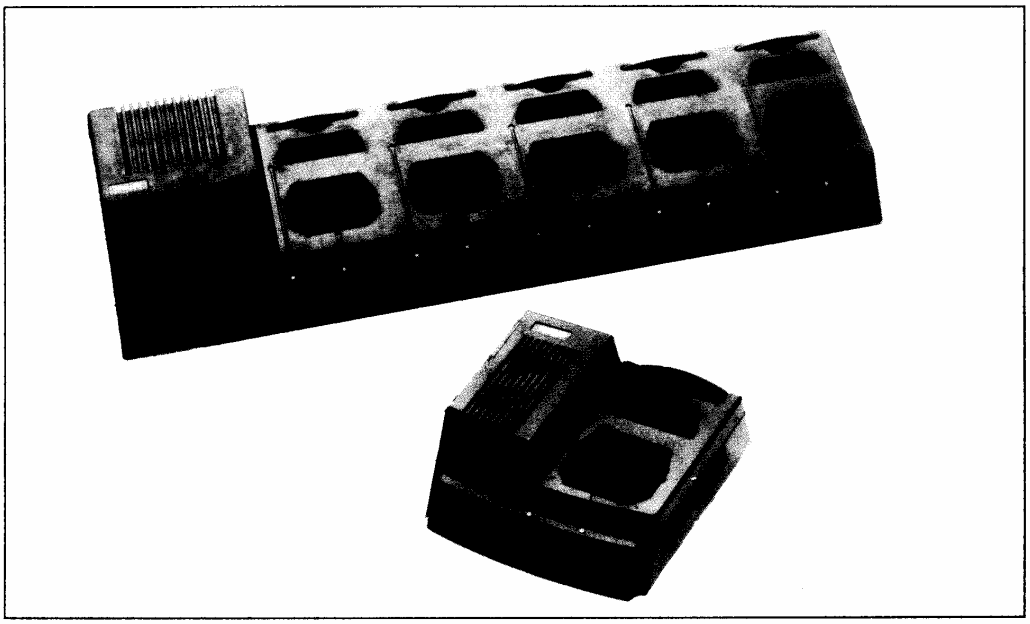
Highest component numbers.							
C	L	R	Tr	D	IC	M	ICT
33	14	19	0	1	0	0	25

VHF

FIG. 6.15 RADIO PCB INTERCONNECTION CIRCUIT DIAGRAM

APPENDIX A
BATTERY CHARGERS

PRX7001 - Desk-top Charger
PRX7005 - Multi-unit Charger



INTRODUCTION

WARNING

This equipment is designed to meet relevant safety requirements.

If it is necessary to replace any safety-conscious component (refer to components marked Δ in the Parts List) the quoted item MUST be fitted. Ensure that all insulators or covers are fitted after servicing. Check that all warning labels are in place.

If any re-wiring of the mains input supply cables is necessary, the specified type must be used and alterations to the routeing or connections must *not* be made.

Desk-top Charger

The PRX7001 battery charger is a desk-top battery charger for use with PRP70 Series transceiver batteries. It has two charging pockets; the front pocket can accept a transceiver with battery or a battery on its own; the rear pocket can accept batteries only. If both pockets are occupied and the battery in the front pocket is being fast charged, the battery in the rear pocket will receive a trickle charge until the battery in the front pocket is charged.

Operation of the transceiver whilst in the charger, is permitted. Fast charge is inhibited during transmission but resumes at the end of the transmission. If the battery completed a charge cycle but, due to the transceiver being in use the battery voltage falls below a preset level, fast charge recommences.

Multi-unit Charger

The PRX7005 battery charger is a multi-unit charger for use with PRP70 Series transceiver batteries. It can charge up to five batteries attached to transceivers together with up to five batteries on their own. The charging pockets are arranged in five pairs, the front pockets can accept transceivers with batteries or batteries alone and the rear pockets can accept batteries only. If both pockets of a pocket pair are occupied and the battery in the front pocket is being fast charged, the battery in the rear pocket will receive a trickle charge until the battery in the front pocket is charged.

Operation of the transceiver whilst in the charger, is not intended.

SPECIFICATION

Charge time

	PRX7001 (all pockets)	PRX7005 (front pocket)	PRX7005 (rear pocket)
- lightweight battery	60 minutes typical	75 minutes typical	90 minutes typical
- standard battery	60 minutes typical	65 minutes typical	120 minutes typical
- high capacity battery	80 minutes typical	100 minutes typical	180 minutes typical

Note: At higher ambient temperatures, these times may be exceeded slightly.

Charge rate	- trickle			50mA
	- fast	-	lightweight battery	630mA(maximum)
		-	standard battery	900mA(maximum)
		-	high capacity battery	900mA(maximum).

Note: In the case of the Multi-unit Charger the charge rate varies with temperature.

Indicators	- red	-	battery inserted but not charged
	- green	-	charge complete
	- unlit	-	no battery inserted or bad connection between battery and charger.

AC supply 115V, 220V or 240V ±10%; 50-60Hz.

Note: If the transformer tappings are changed to allow a different AC supply voltage to be used, the appropriate surge arrestor (VDR31 or VDR41) must be fitted.

Operating temperature	trickle	-	-10°C to +55°C.
	fast	-	-10°C to +35°C.

Note: If the battery is outside the temperature range 0°C to 40°C, fast charge is inhibited.

INSTALLATION

General

WARNING

Check the equipment label on the underside of the charger. If the double insulated symbol ' ⧈ ' is not present the equipment is NOT double insulated. It must be earthed when connected to an AC supply.

Ensure unrestricted air flow to the ventilation holes in the base and the cover of the charger.

Note: It is recommended that the Multi-unit Charger is mounted on the wall brackets supplied.

The charger is despatched from the factory with the transformer primary set for the voltage marked on the base-plate. If it is necessary to change the AC supply voltage, the transformer primary tapping connections need altering. Disconnect the charger from the AC supply before removing the cover. Fig. A.4 shows the connections required for the different AC supply voltages.

Multi-unit Charger

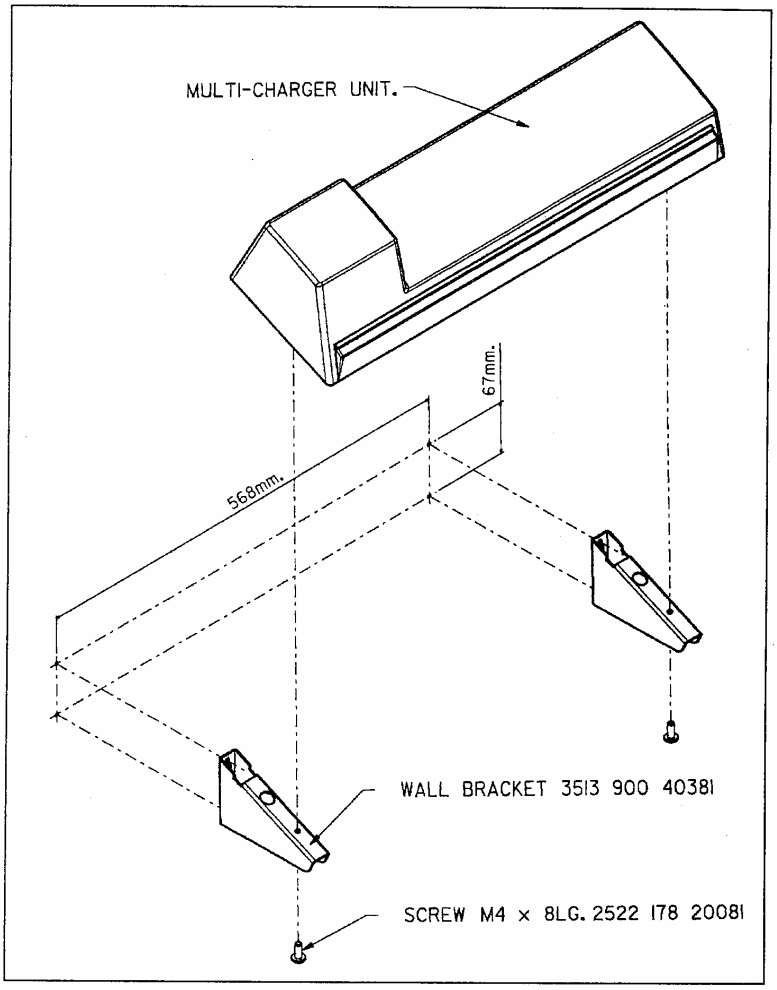


Fig. A.1 Multi-unit charger Wall Mounting Diagram.

(1) Select required location on suitable vertical surface (the weight of the Multi-unit charger with all pockets in use is up to 10kg) and mark the position of the four wall bracket fixing holes to the dimensions shown in Fig. A1.

(2) Drill suitable size holes for fixing screws (not supplied). The recommended sizes for fixing screws are:-

(a) for wood or (with appropriate wall plugs) masonry - No.10 x 1,5" (minimum length);

(b) for metal - M5 machine screws with suitably tapped holes (or nuts if the rear of the vertical surface is accessible) or No.10 self-tapping screws.

(3) Secure the wall brackets in position using the four screws.

(4) Locate the Multi-unit charger on the wall brackets by inserting the two rear feet of the Multi-unit charger into the holes in the wall brackets.

(5) Secure the Multi-unit charger to the wall brackets by inserting the two M4 screws supplied into the threaded hole positioned centrally between the feet at each end of the Multi-unit charger.

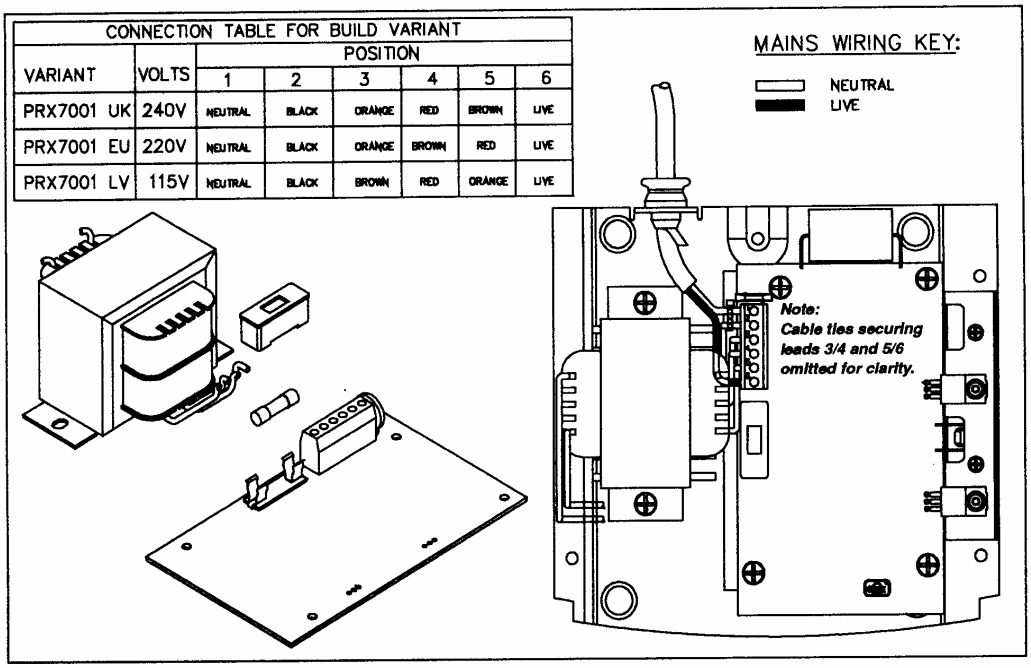


Fig. A.2 Desk-top Charger AC Wiring

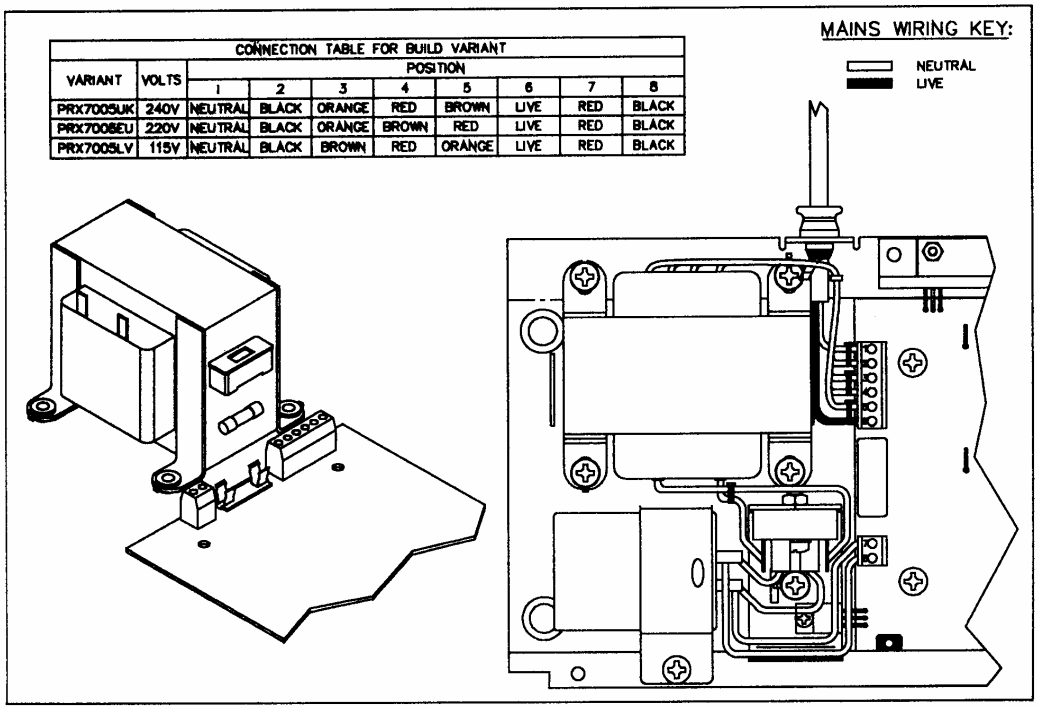


Fig. A.3 Multi-unit Charger AC Wiring

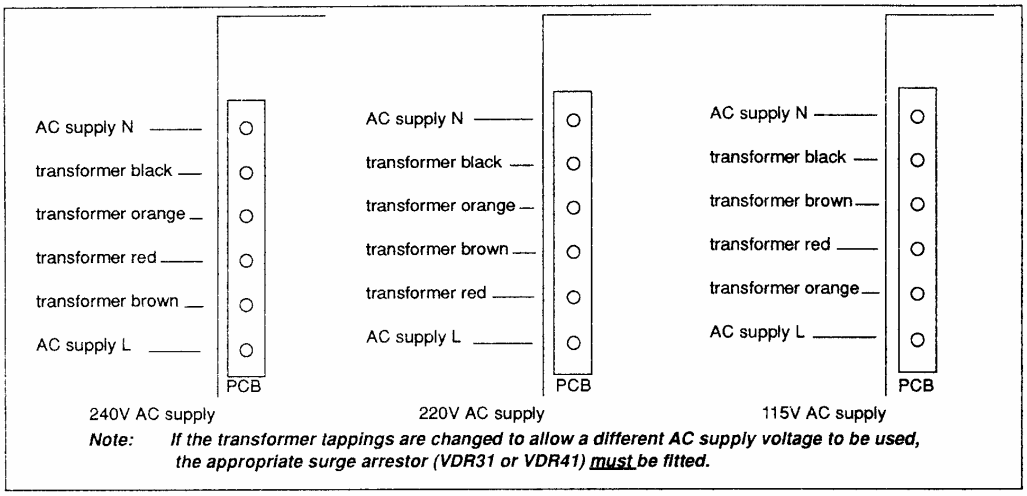


Fig. A.4 Transformer Primary Tappings

OPERATION

Transceiver with battery

The front pocket is used for charging a transceiver with battery. The adaptor is not required and should be stowed in the slot behind the rear pocket.

To charge the transceiver, insert it, with the display towards the front of the charger, into the front pocket. The right hand indicator will emit red light. If the battery temperature and voltage are within the permitted ranges, fast charge will commence: otherwise, the battery will be trickle charged until the temperature and voltage are within the permitted ranges. When the battery has received the correct amount of charge, fast charging will cease, trickle charging will commence and the indicator will emit green light.

Battery Alone

Batteries may be charged in the front and rear pockets. If the front pocket is used, the adaptor must be inserted into the grooves in the pocket.

To charge a battery, insert it into the pocket with the charger contacts of the battery towards the rear of the charger. If there is a battery or transceiver with battery in the front pocket, and its condition is such that fast charging is permitted (temperature and voltage), any battery in the rear pocket will receive a trickle charge only. If the front pocket is empty, has completed a charge cycle or is prevented from fast charging because the battery is outside the permitted temperature and voltage limits, the battery in the rear pocket will be fast charged if its voltage and temperature are within the permitted limits.

SERVICE

Cleaning of charging contacts

To maintain efficient operation, ensure that the charging contacts on both the charger and the battery are clean. Wipe dirty contacts with a clean damp cloth. Do not use industrial cleaning liquids as these may react with the plastic of the charger or battery. Do not use abrasives as their use may remove the contact plating.

CIRCUIT DESCRIPTION

The circuit is described with reference to the desk-top charger. The multi-unit charger is the same as the desk-top charger except for having a higher rated power supply and five pairs of charging pockets.

Power Supply

In the following description the circuit references given are for the desk-top charger, those in brackets are the equivalent circuit references for the multi-unit charger, where different.

The incoming mains is transformed down to 14V rms by transformer T1. This is rectified by D301-D304 (D401) to provide the unregulated supply for battery charging. IC301 (IC401) produces a regulated supply for the generation of reference voltages. R303 (R403) sets the regulated supply to 10V.

Fast charge current source

IC101a, TR108 and TR111, together with their associated components, form the current source. The voltage across R135 (and the other resistors in parallel with it) is monitored by IC101a and made proportional to the voltage across R127 (the constant of proportionality is set by the resistors R128, R130, R132 and R134). This voltage is defined by the potential divider chain R124-127. For battery capacities greater than 600mAh, the voltage across R127 is 3,4V. For lower capacity batteries, TR107 conducts to reduce the voltage across R127 to 2,45V (Voltages measured at 25°C).

When fast charge is complete, or not allowed, transistor TR105 is turned on to disable the current source.

Sensing circuits

The following sensing circuits are included:-

1	Transmit disable (main pocket only)	If fast charging is occurring, it is disabled if a complete transceiver connected to the charger has its transmitter enabled. At the end of transmission fast charging is allowed to resume.
2	End-of-charge (main pocket only)	When a battery temperature of 45°C is reached under fast charge conditions, the fast charging is disabled. Trickle charging continues.
3	Hot battery	When a battery is first inserted into the charger its temperature is measured; if it is in excess of 40°C fast charge is inhibited until the temperature falls to below 40°C.
4	Cold battery	When a battery is first inserted into the charger its temperature is measured; if it is below 0°C fast charge is inhibited until the temperature rises to above 0°C.
5	Low battery	When a battery is first inserted into the charger its voltage is measured (under trickle charge conditions). If this voltage is less than 3V, fast charge is inhibited. If the voltage rises above 3V during trickle charge, fast charge starts provided the temperature conditions are met.
6	No battery	In the absence of a battery, fast charge is disabled. At mains switch-on, the `no battery' condition is simulated even when a battery is already inserted into the pocket. This is accomplished by C125, R153, IC104d and D113.
7	Over voltage	At low battery temperatures the battery voltage rises when under charge. The over-voltage circuit prevents battery damage due to the application of excessive voltage.
8	Restart fast (main pocket only)	If, following the end of a charge sequence, the battery voltage falls to 7V, fast charge is enabled.
9	Battery capacity	If the battery capacity is below 900mAh, the fast charge current is reduced to prevent battery damage.

Charging

If there is no battery in the charger, flip-flops IC105a and b and the timer, IC108, are reset.

If a battery inserted into the charger is too hot or of too low voltage, fast charge is inhibited by V.T.RANGE.1 being low. This forces Q/ of IC105a high which enables TR105, via IC101b, to disable the fast charge current source. If, or when, neither of these conditions apply, IC105 latches into the fast charge state; Q/ IC105a low. If the battery is too cold, fast charging is inhibited by COLD\.1 being low ensuring that IC101b is high.

If, while fast charging a transceiver, the transmitter is enabled, fast charge is suspended until the transmission ends. The transmitter may be enabled any number of times during fast charge.

When the transceiver transmits, the transceiver forces BAT.TEMP low; IC102a uses this to enable transistor TR105 via D116, TR103,IC106a, D111 and IC101b. Eventually the 'end-of-charge' temperature limit will be attained and the charge sequence ended via flip-flop IC106a. Trickle charge ensues and the LED emits green light (`ready'). The transceiver (if present) is alerted to this new state by BAT.TEMP.1 being pulled low for approximately 2s (TR109 and IC107).

To reduce the chance of contact resistance causing incorrect fast charge termination, the temperature of the battery is measured during repetitive breaks in the fast charge current. These breaks are set by TIMER/.1.

Changes in the temperature of the desk-top charger are compensated for by thermistor R181(R182).

IC101c allows the battery temperature to be monitored while maintaining 5V at BAT.TEMP. Maintaining this voltage is necessary when charging a battery with a transceiver.

If, after the end of the charge sequence, the battery voltage falls below 7V, a new charge sequence begins. This may happen when a transceiver is charged. After the battery is charged, the charge current falls to the trickle value (set by R136). The receive current is greater than this and so the battery is gradually discharged (even if the transmitter is not used) although the LED emits green light. If the voltage falls below 7V, the LED emits red light and charging recommences.

Warning lights

Each charging pocket has a dual light emitting diode (LED) which can emit green or red light.

GREEN	The battery in the pocket has completed a charge sequence.
RED	The battery in the pocket has not completed a charge sequence and is being charged.
UNLIT	No battery inserted or bad connection between battery and charger.

ALIGNMENT METHOD

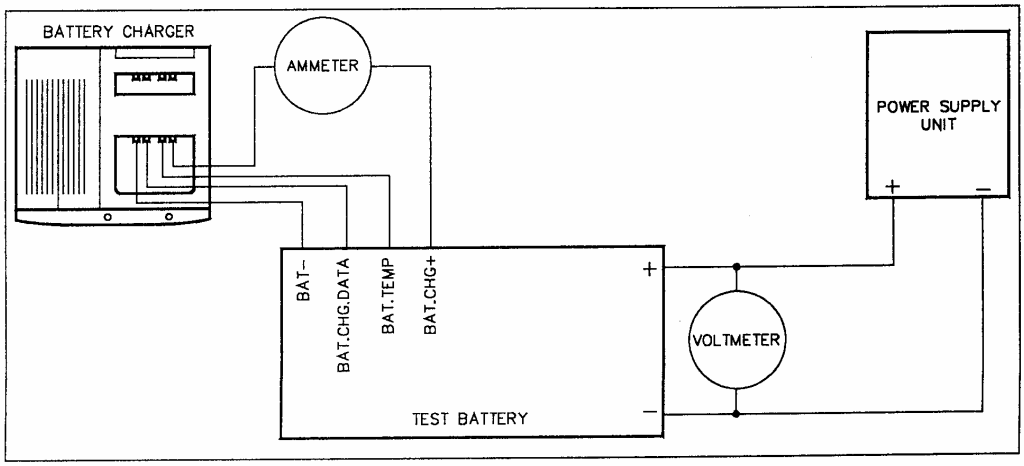


Fig. A.5 Alignment Test Connections

(1) Connect the equipment as shown in Fig. A.5.

(2) Remove the top cover from the charger.

(3) Connect either (a) AC supply, at the correct voltage, to the unit
or (b) 20V DC across the output of the bridge rectifier, D301-4 (desk-top charger), D401 (multi-unit charger).

(4) Connect a voltmeter, accurate to better than 1%, (impedance not critical) across capacitor C303.

(5) Adjust potentiometer, R303 (desk-top charger), (R403 multi-unit charger), to obtain a voltmeter reading of 10V ±0,01V).

TEST PROCEDURE

Functional tests can be performed with the cover in position if the charger is powered from the AC supply. When the charger is fast charging, the charge current will pulsate. The current can be read with adequate accuracy using an AVO model 8 type of meter. A digital meter may indicate randomly and care will be needed if an automatic test system is used. If boards are tested on their own, apply 17V DC across C303(C403).

The fast charge current varies according to which pocket is being charged and whether the charger is a desk-top or a multi-unit charger. The fast charge currents are given in Table A.1.

Note: (i) When testing the Multi-unit Charger, the ambient temperature must be 25°C ±2°C.

(ii) Testing the Multi-unit Charger must be carried out within ten minutes of switching on the AC supply.

Charger	Front pocket current, A		Rear pocket current, A	
	High	Low	High	Low
PRX7001 PRX7005	w = 0,9 ±0,1 w = 1,0 ±0,1	x = 0,63 ±0,1 x = 0,7 ±0,1	y = 0,9 ±0,1 y = 0,45 ±0,1	z = 0,63 ±0,1 z = 0,45 ±0,1

Table A.1 Fast Charge Currents

To simulate different battery types and temperatures, a test battery is needed. Details of this are given in this appendix.

(1) Connect an AC supply, at the correct voltage, to the unit

(2) With no test battery fitted, check that the LED emits green light.

(3) Select the low charge rate, 'LOW', room temperature, '20°C', transmitter off, 'Tx OFF' and 3V ±0,2V on the power supply. Insert the test battery. Check that the LED emits red light and that the ammeter indicates 70mA ±10mA.

(4) Set the temperature switch to '42°C' and then the power supply to 5V ±0,2V. Check that the ammeter indicates 65mA ±10mA.

(5) Set the temperature switch to '20°C'. Check that the LED emits red light and that the ammeter indicates 'w' or 'y' (see Table A.1). Note that this current is subject to short interuptions and so the meter reading will pulsate. If these pulsations are not present, this test has failed. Select the low charge rate.

(6) On the test battery, select the high charge rate, 'HIGH', check that the ammeter indicates 1A ±0,1A. Select the low charge rate.

(7) Increase the power supply voltage to 11V ±0,2V and check that the ammeter indicates 35mA ±10mA. Decrease the power supply setting to 9V ±0,2V.

(8) Main pocket only:-
On the test battery, select transmitter on, 'Tx ON', check that the LED still emits red light but that the ammeter indicates 45mA ±10mA. Select transmitter off, 'Tx OFF', check the ammeter indicates 'x' or 'z' (see Table A.1).

(9) On the test battery, select low temperature, '-5°C', check that the LED still emits red light but that the ammeter indicates 45mA ±10mA.

(10) On the test battery, select end-of-charge, 'END', check that the LED emits green light, that the ammeter indicates 45mA ±10mA and that, when testing the main pocket, the end-of-charge LED on the test battery is lit for about 2s.

(11) On the test battery, select room temperature, '20°C', check that the LED emits green light and that the ammeter indicates 45mA ±10mA.

(12) Main pocket only:-
Decrease the setting on the power supply to 6,5V and check that the LED emits red light and that the ammeter indicates 'x' or 'z' (see Table A.1).

(13) Repeat the above tests for all other pockets.

(14) Insert a test battery into the main pocket and set to '20°C', 'Tx off' and the power supply to 5V ±0,2V. Insert a test battery, with the same settings as the test battery in the main pocket, into the associated secondary pocket, check that the main pocket charges at 'x' or 'z' (see Table A.1) and the secondary pocket at 55mA ±10mA. Both LED's must emit red light.

Special Tools Required

The following is a list of special tools required for dismantling and re-assembling the desk charger.

Tool	Part No.	Torque	Where Used
Pozi Drive Bit Size No. 1		5,7kgf-cm	Heatsink Screws
Pozi Drive Bit Size No. 2		5,7kgf-cm	PCB Screws, Transistor Screws, Cover Screws
Grommet Tool	Heyco 0022		

TEST BATTERY

Note: ***The Test Battery must be locally manufactured . The relevant information to achieve this is detailed below.***

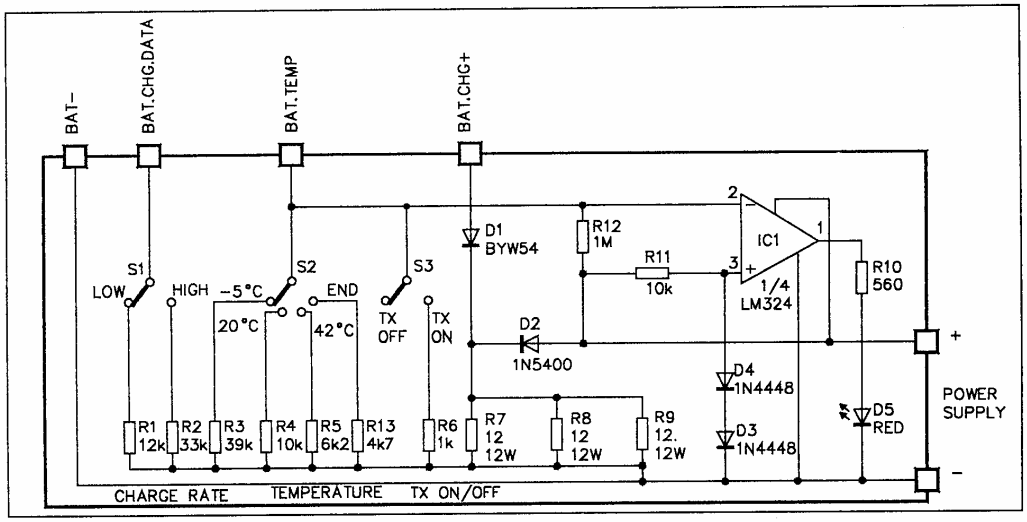


Fig. A.6 Test Battery Circuit

Fig. A.6 shows the circuit diagram of the test battery. Connection to the charger will be via a modified battery box or suitable connectors.

Test Battery Components

RESISTORS (See Fig. A6 for values)

R1,2,6,11,12	±5%; 0,1W
R3,-5,13	±2%; 0,1W
R7-9	12W
R10	±5%; 0,5W

DIODES

D1	BYW54	D3,4	1N4448
D2	1N5400	D5	any red LED

INTEGRATED CIRCUIT

IC1	LM324	connect inverting input and output pins of unused sections together and connect the non-inverting inputs to ground.

SWITCHES

S1,3	1P2W
S2	1P4W break-before-make

PARTS LIST

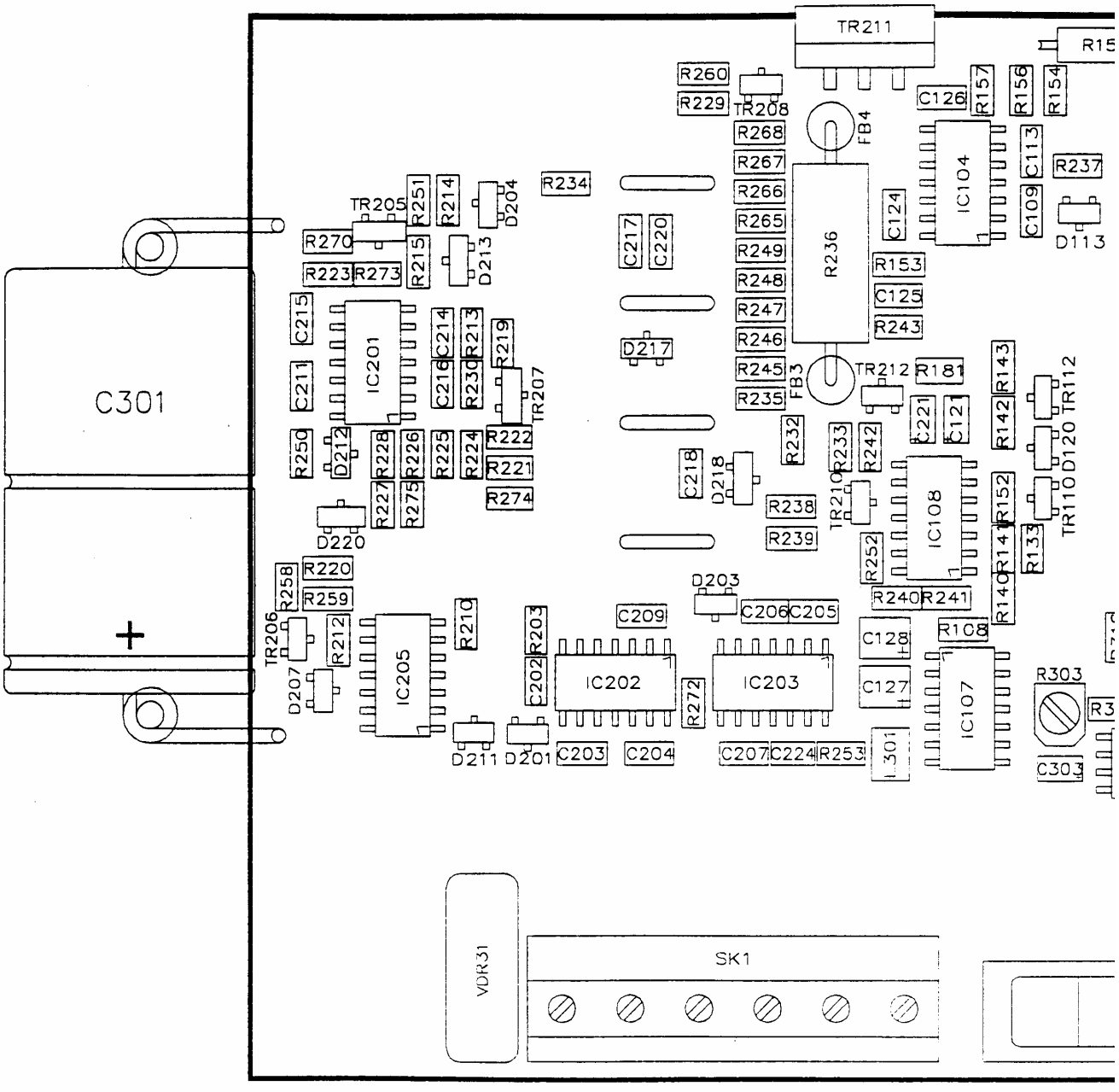
Cct. Ref	Description	Part No.	Remarks
Semiconductors and IC's			
IC101-104	IC SMD LM324-HDL	5322 209 83125	
IC105,106	IC SMD 4013BT-HDL	5322 209 14477	
IC107	IC SMD HEF4047BT	5322 209 11989	
IC108	IC SMD NE556D Dual Timer	4822 209 30425	
IC201-203	IC SMD LM324-HDL	5322 209 83125	
IC205	IC SMD 4013BT-HDL	5322 209 14477	Desk-top charger only
IC301	IC SMD LM317L REG	5322 209 31207	Desk-top charger only
IC401	IC SMD LM317T REG	4822 209 80591	Multi-unit charger only
TR102,103	Transistor SMD BCW32	5322 130 41719	
TR104	Transistor SMD BCW30	5322 130 44335	
TR105	Transistor SMD BCW32	5322 130 41719	
TR107	Transistor SMD BCW32	5322 130 41719	
TR108	Transistor SMD BCW30	5322 130 44335	
TR109,110	Transistor SMD BCW32	5322 130 41719	
TR111	Transistor BD202F PWR NPN	5322 130 63013	
TR112	Transistor SMD BCW32	5322 130 41719	
TR203	Transistor SMD BCW32	5322 130 41719	
TR204	Transistor SMD BCW30	5322 130 44335	
TR205,206	Transistor SMD BCW32	5322 130 41719	
TR207	Transistor SMD BCW32	5322 130 41719	Desk-top charger only
TR208	Transistor SMD BCW30	5322 130 44335	
TR210	Transistor SMD BCW32	5322 130 41719	
TR211	Transistor BD202F PWR NPN	5322 130 63013	
TR212	Transistor SMD BCW32	5322 130 41719	
D101	Diode SMD BAW56	5322 130 30691	
D103	Diode SMD BAW56	5322 130 30691	Desk-top charger only
D104	Diode SMD BAV70	5322 130 34331	
D106	Diode SMD BAS16	5322 130 31928	
D107	Diode SMD BAS16	5322 130 31928	Multi-unit charger only
D108	LED VRBG3349S Red/Green	5322 130 82994	
D109	Diode SMD BAS16	5322 130 31928	
D111	Diode SMD BAV70	5322 130 34331	
D113-115	Diode SMD BAW56	5322 130 30691	
D116	Diode SMD BAS16	5322 130 31928	Desk-top charger only
D117,118	Diode SMD BZX84C15	5322 130 33662	
D119	Diode SMD BZX84C6V8	3513 992 20011	Multi-unit charger only
D120	Diode SMD BAS16	5322 130 31928	
D201	Diode SMD BAW56	5322 130 30691	
D203	Diode SMD BAW56	5322 130 30691	
D204	Diode SMD BAV70	5322 130 34331	
D207	Diode SMD BAS16	5322 130 31928	Desk-top charger only
D207	Diode SMD BAV70	5322 130 34331	Multi-unit charger only
D208	LED VRBG3349S Red/Green	9322 130 82994	
D209	Diode SMD BAS16	5322 130 31928	Desk-top charger only
D211	Diode SMD BAV70	5322 130 34331	
D213	Diode SMD BAS16	5322 130 31928	
D214	Diode SMD BAW56	5322 130 30691	
D216	Diode SMD BAS16	5322 130 31928	Multi-unit charger only
D217,218	Diode SMD BZX84C15	5322 130 33662	
D220	Diode SMD BAS16	5322 130 31928	
D301-304	Diode 1N5400 GP	5322 130 81829	Desk-top charger only
D401	Diode 26MB40A	5322 130 81893	Multi-unit charger only
Resistors			
R101	1k ±2% 0,1W SMD	5322 116 82537	Desk-top charger only
R103	10k ±2% 0,1W SMD	4822 051 20103	
R104	56k ±2% 0,1W SMD	4822 051 20563	
R105	3k9 ±2% 0,1W SMD	4822 051 20392	
R106	56k ±2% 0,1W SMD	4822 051 20563	
R107	10k ±2% 0,1W SMD	4822 051 20103	

Cct. Ref	Description				Part No.	Remarks
Resistors (Cont'd)						
R108	1M	±2%	0,1W	SMD	4822 051 20105	
R109	680	±2%	0,1W	SMD	4822 051 20681	
R110,111	56k	±2%	0,1W	SMD	4822 051 20563	
R112	100k	±2%	0,1W	SMD	5322 116 82542	
R113	18k	±2%	0,1W	SMD	4822 051 20183	Desk-top charger only
R114,115	56k	±2%	0,1W	SMD	4822 051 20563	
R117	1k	±2%	0,1W	SMD	5322 116 82357	Desk-top charger only
R117	10k	±2%	0,1W	SMD	4822 051 20103	Multi-unit charger only
R118	1k5	±2%	0,1W	SMD	4822 051 20152	Desk-top charger only
R118	10k	±5%	0,1W	SMD	4822 051 20103	Multi-unit charger only
R119	56k	±2%	0,1W	SMD	4822 051 20563	
R120	8k2	±2%	0,1W	SMD	5322 116 82587	
R121	10k	±2%	0,1W	SMD	4822 051 20103	Desk-top charger only
R121	22k	±2%	0,1W	SMD	5322 116 82541	Multi-unit charger only
R122	10k	±2%	0,1W	SMD	4822 051 20103	Desk-top charger only
R122	56k	±2%	0,1W	SMD	4822 051 20563	Multi-unit charger only
R123	8k2	±2%	0,1W	SMD	5322 116 82587	
R124	5k6	±2%	0,1W	SMD	4822 051 20562	
R125	10k	±2%	0,1W	SMD	4822 051 20103	
R126	3k9	±2%	0,1W	SMD	4822 051 20392	Desk-top charger only
R126	22k	±2%	0,1W	SMD	5322 116 82541	Multi-unit charger only
R127	3k9	±2%	0,1W	SMD	4822 051 20392	Desk-top charger only
R127	18k	±2%	0,1W	SMD	4822 051 20183	Multi-unit charger only
R128	68k	±2%	0,1W	SMD	4822 051 20683	
R129	3k9	±2%	0,1W	SMD	4822 051 20392	
R130	68k	±2%	0,1W	SMD	4822 051 20683	
R131	56k	±2%	0,1W	SMD	4822 051 20563	
R132	10k	±2%	0,1W	SMD	4822 051 20103	
R133	18k	±2%	0,1W	SMD	4822 051 20183	
R134	10k	±2%	0,1W	SMD	4822 051 20103	
R135	4Ω7	±2%	0,1W	SMD	4822 051 20478	
R136	220	±5%	2,5W	WW	4822 053 30221	
R137	18k	±2%	0,1W	SMD	4822 051 20183	
R138,139	10k	±2%	0,1W	SMD	4822 051 20103	
R140	1M	±2%	0,1W	SMD	4822 051 20105	
R141	56k	±2%	0,1W	SMD	4822 051 20563	
R142	27k	±2%	0,1W	SMD	4822 051 20273	
R143	10k	±2%	0,1W	SMD	4822 051 20103	
R145-149	4Ω7	±2%	0,1W	SMD	4822 051 20478	
R150-152	56k	±2%	0,1W	SMD	4822 051 20563	
R153	1M	±2%	0,1W	SMD	4822 051 20105	
R154	10k	±2%	0,1W	SMD	4822 051 20103	
R155	10k	±3%	Thermistor		5322 116 30431	
R156	10k	±2%	0,1W	SMD	4822 051 20103	
R157	1k8	±2%	0,1W	SMD	4822 051 20182	Desk-top charger only
R157	1k	±2%	0,1W	SMD	5322 116 82537	Multi-unit charger only
R160	1k	±2%	0,1W	SMD	5322 116 82537	Desk-top charger only
R161	56k	±2%	0,1W	SMD	4822 051 20563	
R162-164	3k9	±2%	0,1W	SMD	4822 051 20392	
R165-167	4Ω7	±2%	0,1W	SMD	4822 051 20478	
R168	4Ω7	±2%	0,1W	SMD	4822 051 20478	Multi-unit charger only
R169	680	±2%	0,1W	SMD	4822 051 20681	
R170	39k	±2%	0,1W	SMD	4822 051 20393	
R172	68k	±2%	0,1W	SMD	4822 051 20683	
R173,174	100k	±2%	0,1W	SMD	5322 116 82542	
R175	1k	±2%	0,1W	SMD	5322 116 82537	Desk-top charger only
R176,177	1k5	±2%	0,1W	SMD	4822 051 20152	Desk-top charger only
R178	1k	±2%	0,1W	SMD	5322 116 82537	Desk-top charger only
R179	1k	±2%	0,1W	SMD	5322 116 82537	Desk-top charger only
R180	0	±5%	0,25W	Jumper	4822 051 10008	Multi-unit charger only
R180	1k5	±2%	0,1W	SMD	4822 051 20152	Desk-top charger only
R180	0	±5%	0,25W	Jumper	4822 051 10008	Multi-unit charger only

Cct. Ref	Description				Part No.	Remarks
Resistors (Cont'd)						
R181	100k	±2%	0,1W	SMD	5322 116 30431	
R182	10k	±3%	Thermistor		5322 116 30431	Multi-unit charger only
R203	10k	±2%	0,1W	SMD	4822 051 20103	
R204	56k	±2%	0,1W	SMD	4822 051 20563	
R205	3k9	±2%	0,1W	SMD	4822 051 20392	Desk-top charger only
R207	10k	±2%	0,1W	SMD	4822 051 20103	
R209	680	±2%	0,1W	SMD	4822 051 20681	
R210,211	56k	±2%	0,1W	SMD	4822 051 20563	
R212	100k	±2%	0,1W	SMD	5322 116 82542	
R213	18k	±2%	0,1W	SMD	4822 051 20183	Desk-top charger only
R213	56k	±2%	0,1W	SMD	4822 051 20563	Multi-unit charger only
R214,215	56k	±2%	0,1W	SMD	4822 051 20563	
R219	56k	±2%	0,1W	SMD	4822 051 20563	Desk-top charger only
R220	8k2	±2%	0,1W	SMD	5322 116 82587	
R221,222	10k	±2%	0,1W	SMD	4822 051 20103	Desk-top charger only
R223	8k2	±2%	0,1W	SMD	5322 116 82587	
R224	5k6	±2%	0,1W	SMD	4822 051 20562	
R225	10k	±2%	0,1W	SMD	4822 051 20103	
R226	3k9	±2%	0,1W	SMD	4822 051 20392	Desk-top charger only
R227	3k9	±2%	0,1W	SMD	4822 051 20392	Desk-top charger only
R227	1k2	±2%	0,1W	SMD	4822 051 20122	Multi-unit charger only
R228	68k	±2%	0,1W	SMD	4822 051 20683	
R229	3k9	±2%	0,1W	SMD	4822 051 20392	Desk-top charger only
R230	68k	±2%	0,1W	SMD	4822 051 20683	
R232	10k	±2%	0,1W	SMD	4822 051 20103	
R233	18k	±2%	0,1W	SMD	4822 051 20183	
R234	10k	±2%	0,1W	SMD	4822 051 20103	
R235	4Ω7	±2%	0,1W	SMD	4822 051 20478	
R236	220	±5%	2,5W	WW	4822 053 30221	
R237	18k	±2%	0,1W	SMD	4822 051 20183	
R238,239	10k	±2%	0,1W	SMD	4822 051 20103	
R240	1M	±2%	0,1W	SMD	4822 051 20105	
R241	56k	±2%	0,1W	SMD	4822 051 20563	
R242	27k	±2%	0,1W	SMD	4822 051 20273	
R243	10k	±2%	0,1W	SMD	4822 051 20103	
R245-249	4Ω7	±2%	0,1W	SMD	4822 051 20478	
R250-253	56k	±2%	0,1W	SMD	4822 051 20563	
R258	56k	±2%	0,1W	SMD	4822 051 20563	
R259	10k	±2%	0,1W	SMD	4822 051 20103	
R260	1k	±2%	0,1W	SMD	5322 116 82537	Desk-top charger only
R261	56k	±2%	0,1W	SMD	4822 051 20563	
R262-264	3k9	±2%	0,1W	SMD	4822 051 20392	Desk-top charger only
R265-267	4Ω7	±2%	0,1W	SMD	4822 051 20478	
R268	4Ω7	±2%	0,1W	SMD	4822 051 20478	Multi-unit charger only
R269	680	±2%	0,1W	SMD	4822 051 20681	
R270	39k	±2%	0,1W	SMD	4822 051 20393	
R272	68k	±2%	0,1W	SMD	4822 051 20683	
R273,274	100k	±2%	0,1W	SMD	5322 116 82542	
R301	1k	±2%	0,1W	SMD	5322 116 82537	Desk-top charger only
R302	4k7	±2%	0,1W	SMD	5322 116 82586	Desk-top charger only
R303	5k	±25%	lin	Pot, cermet	5322 100 20856	Desk-top charger only
R304	1k	±2%	0,1W	SMD	5322 116 82537	Desk-top charger only
R305	150	±2%	0,1W	SMD	4822 051 10151	Desk-top charger only
R306	680	±2%	0,1W	SMD	4822 051 20681	Desk-top charger only
R308	560	±2%	0,1W	SMD	5322 116 82582	Desk-top charger only
R310	1k5	±2%	0,1W	SMD	4822 051 20152	Desk-top charger only
R311	1k	±2%	0,1W	SMD	5322 116 82537	Desk-top charger only
R314	1k	±2%	0,1W	SMD	5322 116 82537	Desk-top charger only
R315	150	±2%	0,1W	SMD	4822 051 10151	Desk-top charger only
R316	1k5	±2%	0,1W	SMD	4822 051 20152	Desk-top charger only
R318	680	±2%	0,1W	SMD	4822 051 20681	Desk-top charger only

Cct. Ref	Description				Part No.	Remarks
Resistors (Cont'd)						
R320,321	1k	±2%	0,1W	SMD	5322 116 82537	Desk-top charger only
R323	220	±2%	0,1W	SMD	4822 051 20221	Desk-top charger only
R401	1k	±2%	0,1W	SMD	5322 116 82537	Multi-unit charger only
R402	4k7	±2%	0,1W	SMD	5322 116 82586	Multi-unit charger only
R403	5k	±25%	lin	Pot, cermet	5322 100 20856	Multi-unit charger only
R404	820	±2%	0,1W	SMD	4822 051 20821	Multi-unit charger only
R405	330	±2%	0,1W	SMD	4822 051 20331	Multi-unit charger only
R406	820	±2%	0,1W	SMD	4822 051 20821	Multi-unit charger only
R408	560	±2%	0,1W	SMD	5322 116 82582	Multi-unit charger only
R410	1k5	±2%	0,1W	SMD	4822 051 20152	Multi-unit charger only
R411	1k	±2%	0,1W	SMD	5322 116 82537	Multi-unit charger only
R414	1k	±2%	0,1W	SMD	5322 116 82537	Multi-unit charger only
R415	150	±2%	0,1W	SMD	4822 051 10151	Multi-unit charger only
R416	1k5	±2%	0,1W	SMD	4822 051 20152	Multi-unit charger only
R418	680	±2%	0,1W	SMD	4822 051 20681	Multi-unit charger only
R420,421	1k	±2%	0,1W	SMD	5322 116 82537	Multi-unit charger only
R423	150	±2%	0,1W	SMD	4822 051 10151	Multi-unit charger only
Capacitors						
C104	100p	±5%	50V	SMD	5322 122 32531	Desk-top charger only
C110	68n	±20%	16V	SMD	5322 126 12129	
C112	3µ3	±10%	16V	SMD	5322 124 11275	Multi-unit charger only
C115,116	100p	±5%	50V	SMD	5322 122 32531	Desk-top charger only
C117,118	1n	±10%	50V	SMD	5322 122 34123	
C120	1n	±10%	50V	SMD	5322 122 34123	
C121	1	±10%	16V	SMD	5322 124 11275	
C123	1n	±10%	50V	SMD	5322 122 34123	
C124	100p	±5%	50V	SMD	5322 122 32531	Desk-top charger only
C125	68n	±20%	16V	SMD	5322 126 12129	
C127,128	3µ3	±10%	16V	SMD	5322 124 11275	Desk-top charger only
C215,216	100p	±5%	50V	SMD	5322 122 32531	Desk-top charger only
C217 ,218	1n	±10%	50V	SMD	5322 122 34123	
C220	1n	±10%	50V	SMD	5322 122 34123	
C221	1	±10%	16V	SMD	5322 124 11275	
C223	1n	±10%	50V	SMD	5322 122 34123	
C301	3300	±10%	25V	elec	5322 124 21988	Desk-top charger only
C302	68n	±20%	16V	SMD	5322 126 12129	Desk-top charger only
C303	1	±10%	16V	SMD	5322 124 11275	Desk-top charger only
C401	15000	$^{+30\%}/_{-10\%}$	25V	elec	5322 124 21422	Multi-unit charger only
C402	68n	±20%	16V	SMD	5322 126 12129	Multi-unit charger only
C403	1	±10%	16V	SMD	5322 124 11275	Multi-unit charger only
Miscellaneous						
FB1-4	Bead, insulating				5322 325 30052	
	Bush, insulating				5322 532 61163	Multi-unit charger only
Δ	Cable, 2 x 1,0 PVC/PVC Black				3513 993 12502	2m, For AC supply (USA) (115V)
Δ	Cable tie, 100mm				5322 321 60168	
	Clamp, cap				5322 520 20636	Multi-unit charger only
	Contact, battery				5322 290 81501	Desk-top charger only
	Contact, battery				5322 290 81612	Multi-unit charger only
	Cover, moulding				3513 901 10622	Multi-unit charger only
	Cover, top				5322 447 40937	Desk-top charger only
	Divider, moulding				5322 466 93268	
	Divider, moulding				3513 901 50091	Desk-top charger only
	Foot, rubber				5322 462 41919	
Δ F31	Fuse, F 500mA				5322 253 30272	Desk-top charger only
Δ F41	Fuse, F 2A				4822 070 32002	Multi-unit charger only
Δ	Fuse cover L2226				5322 462 41918	
Δ	Fuseholder, PCB mtg.				5322 405 91392	

Cct. Ref	Description	Part No.	Remarks
Miscellaneous (Cont'd)			
	Grommet, black SR-5N-5	5322 325 80496	
	Heatsink	5322 255 41256	Desk-top charger only
	Heatsink, rect	5322 255 41258	Multi-unit charger only
	Holder, LED	5322 256 91893	
L101	Inductor, 15nH, ±10%, SMD	5322 157 63888	Multi-unit charger only
L301	Inductor, 15nH, ±10%, SMD	5322 157 63888	Desk-top charger only
	Insulator	5322 290 61079	
	Label, rear cover	5322 455 21758	
Δ	Label, safety/warning	5322 455 21525	
Δ	Label, 2-core AC supply	3513 903 40141	
	Nut, st, hex, M2,5 Zn	4822 505 11003	
	Nut, st, hex, M4 Zn	4822 505 10825	Multi-unit charger only
	Pad, foam - Rx PCB	5322 466 62018	
	Plate, base	5322 466 93107	Desk-top charger only
	Plate, base	3513 905 30682	Multi-unit charger only
Δ	Plug, AC supply, moulded 3-pin	3513 505 04021	For AC supply (UK)
Δ	Plug, AC supply, moulded	2422 070 98032	For AC supply (Europe)
VDR31	Resistor, volt dep. 250V 2500A	5322 116 21209	Desk-top charger, 220/240V operation
VDR31	Resistor, volt dep. 130V 2500A	2322 594 51316	Desk-top charger, 115V operation
VDR41	Resistor, volt dep. 250V 2500A	5322 116 21209	Multi-unit charger, 220/240V operation
VDR41	Resistor, volt dep. 130V 2500A	2322 594 51316	Multi-unit charger, 115V operation
	Screw, pan, pozi, M2,5 x 6mm Zn	2522 178 21038	
	Screw, pan, pozi, M4 x 6mm Zn	4822 502 13408	
	Screw, pan, pozi, M4 x 16mm Zn	5322 502 12654	Multi-unit charger only
	Screw, st, pan, pozi, M4 x 8mm	4822 502 13409	Multi-unit charger only
	Terminal block, 2-way	5322 290 81498	
Δ	Terminal block, 6-way	5322 290 81499	
Δ T31	Transformer, AC supply 14V 1,9A	5322 148 81246	Desk-top charger only
Δ T41	Transformer, AC supply 14V 9,5A	5322 146 31215	Multi-unit charger only
	Washer, insulating	4822 255 40173	Multi-unit charger only
	Washer, st, form A, M2,5	4822 532 10215	
	Washer, st, M4, plain Zn	2522 600 80926	Multi-unit charger only



App A/2

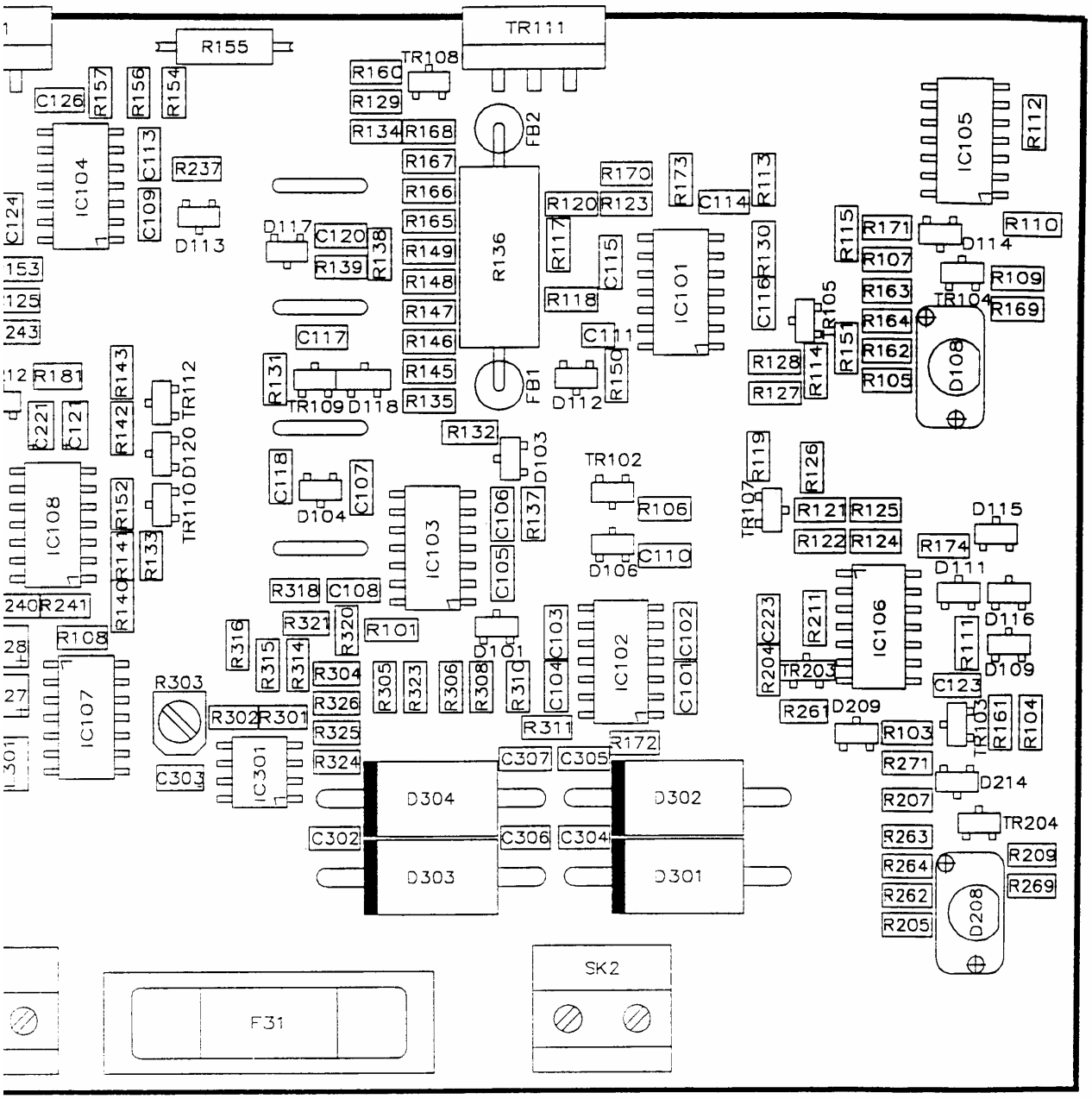
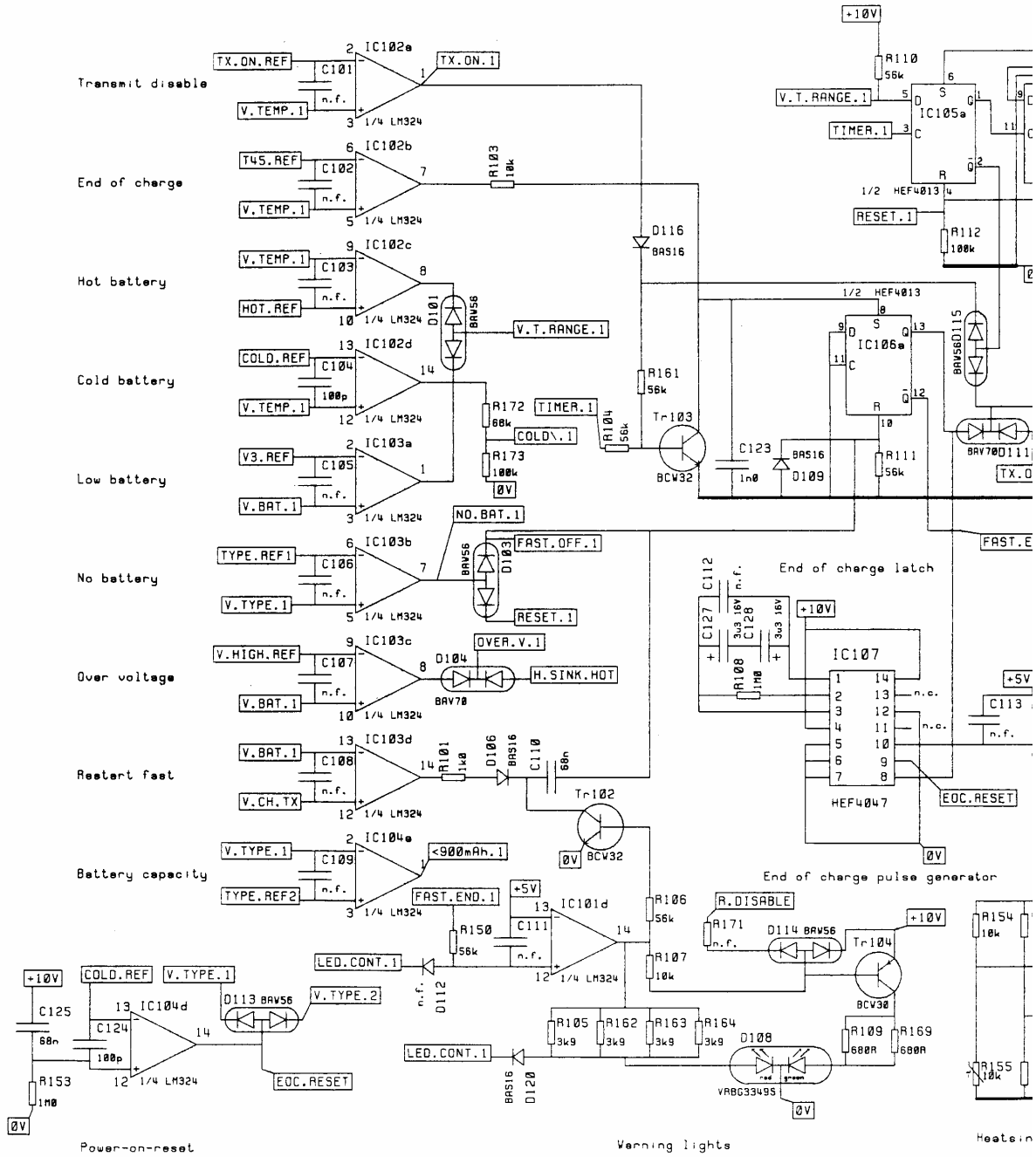
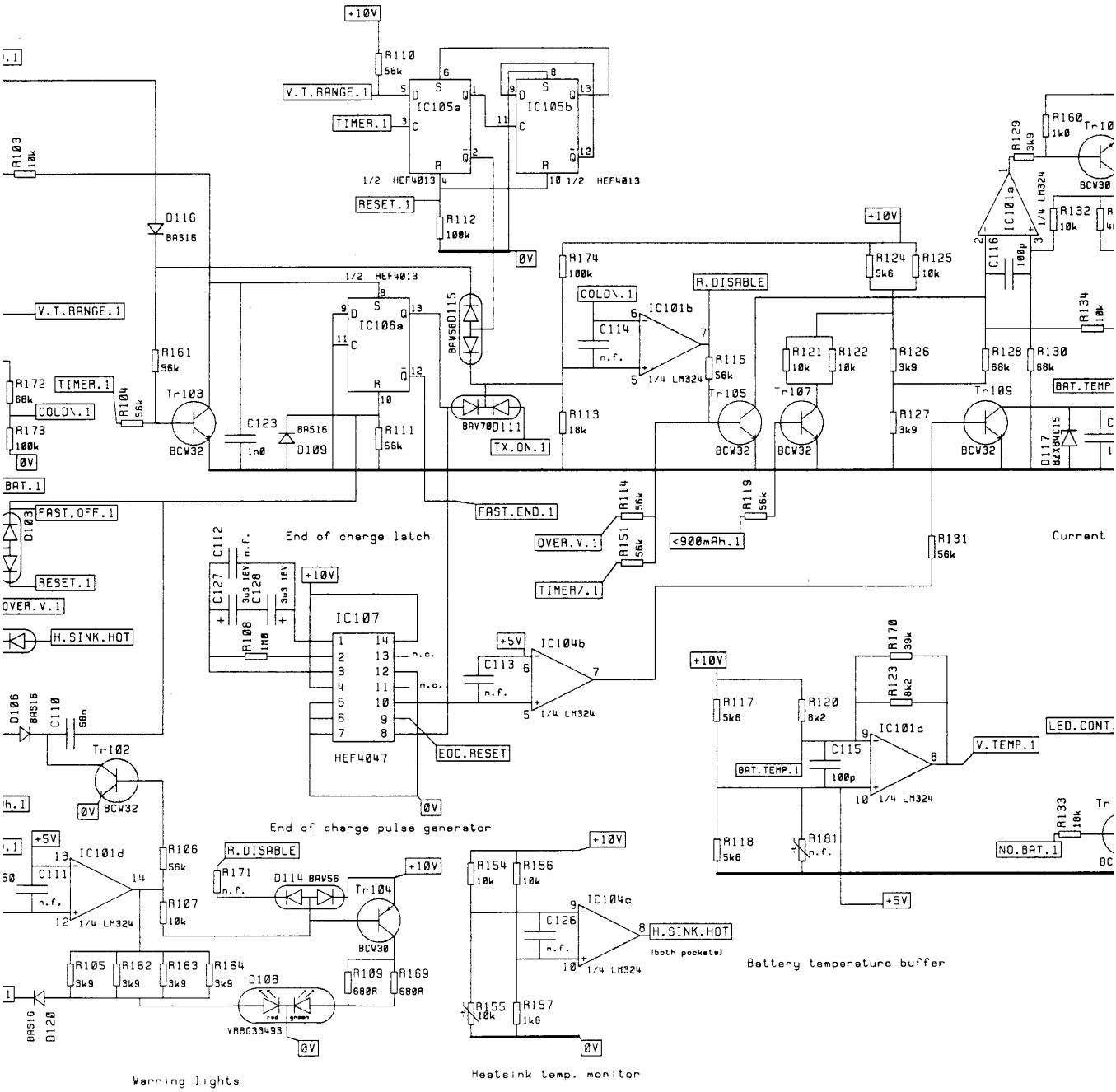


FIG. A.7 DESK-TOP CHARGER PCB LAYOUT DIAGRAM



App A/2



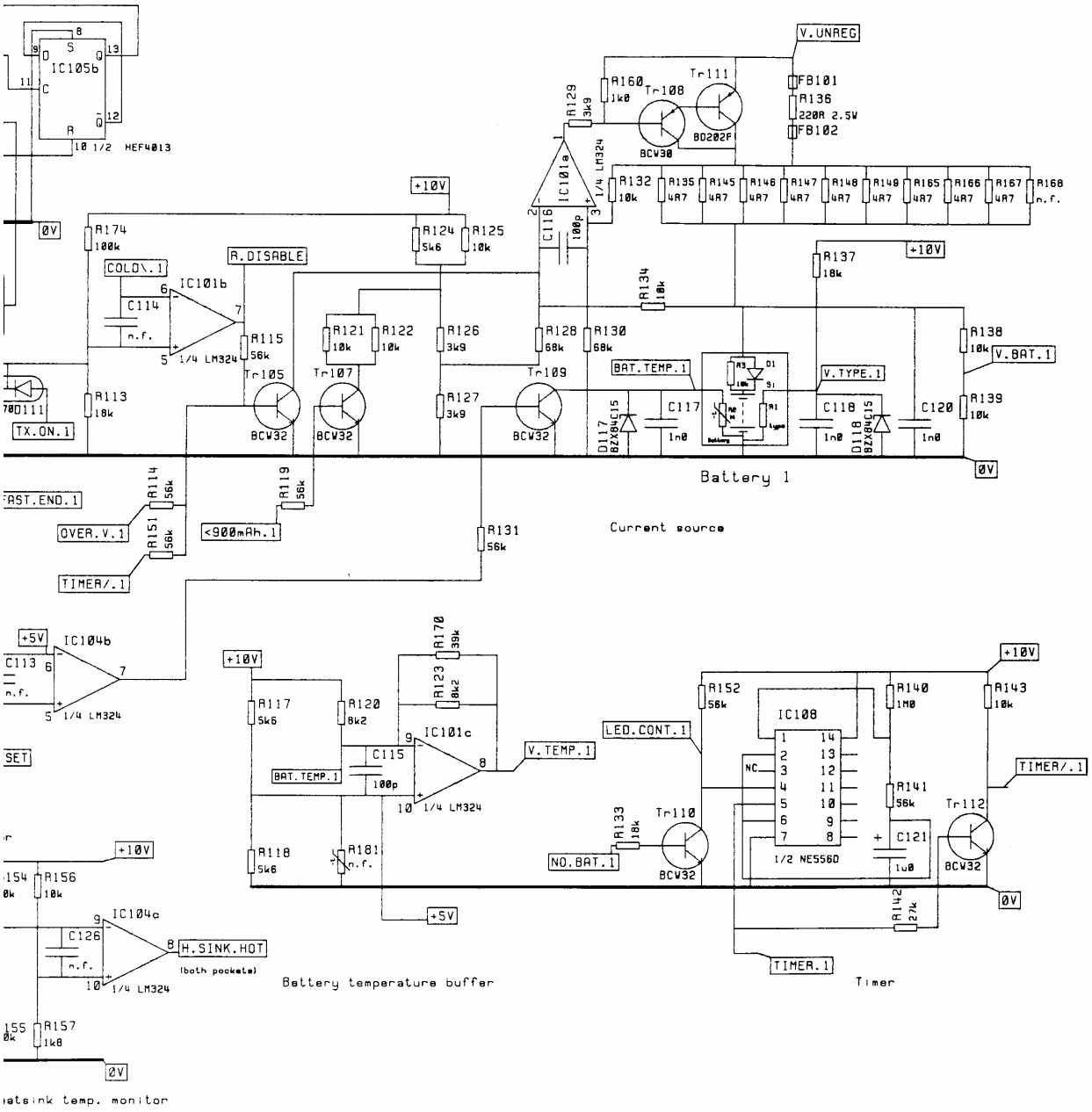
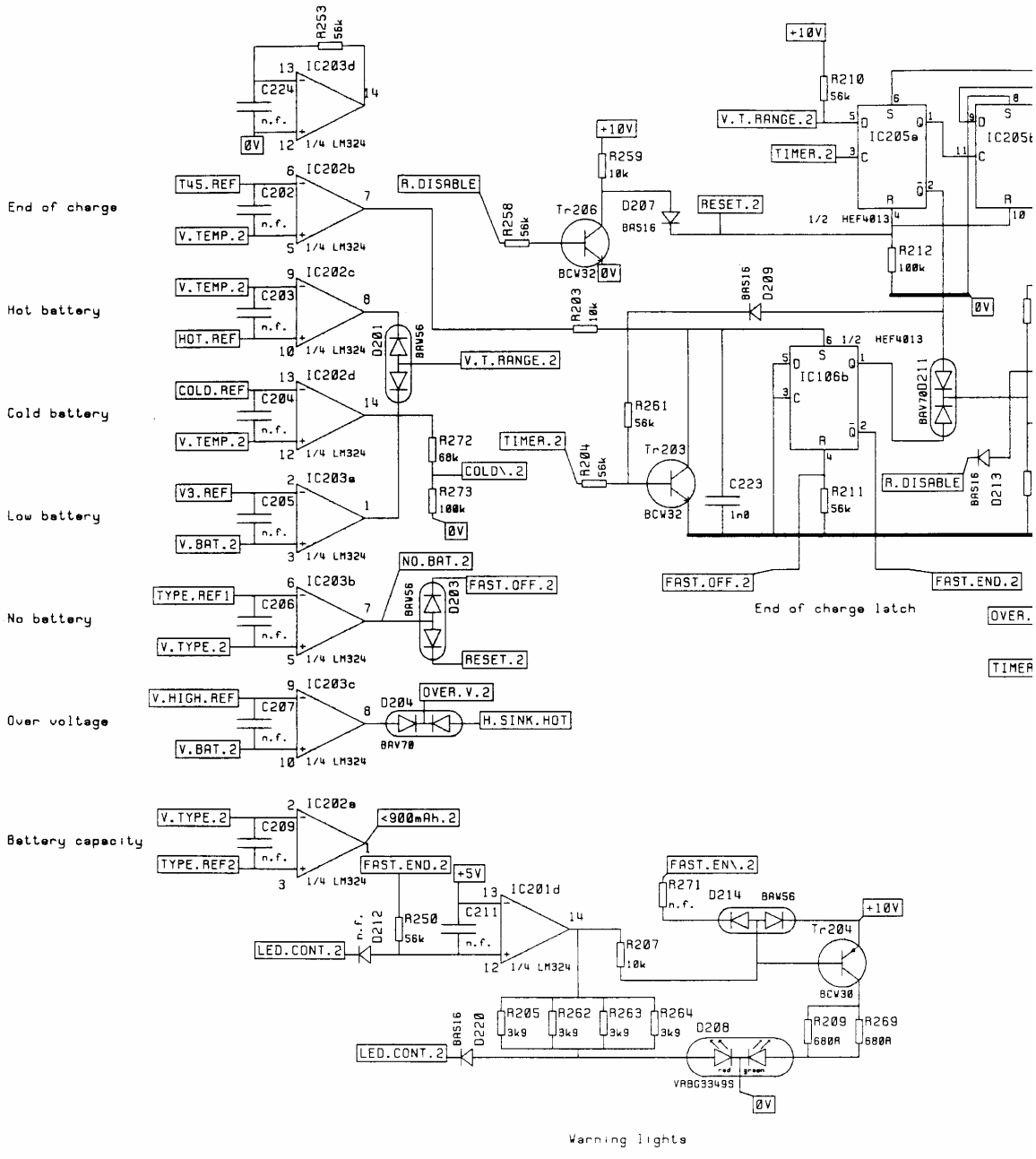
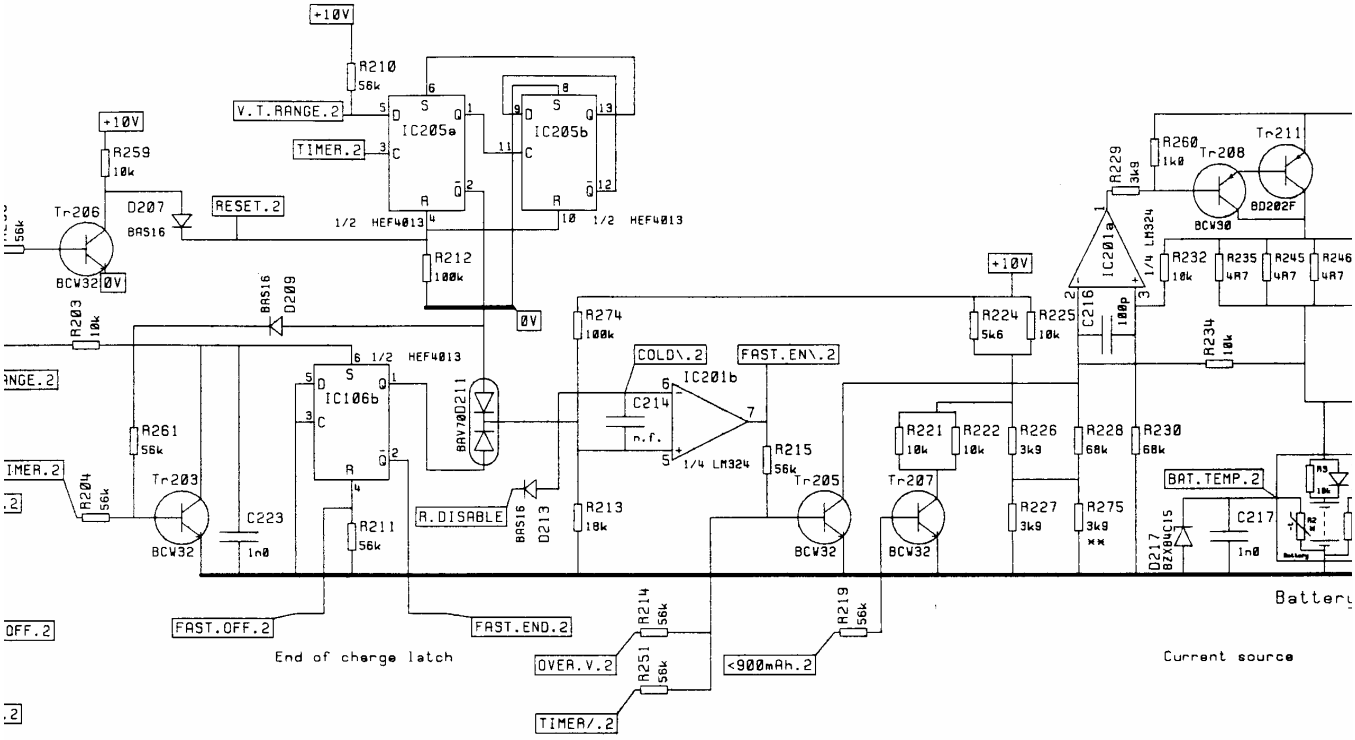
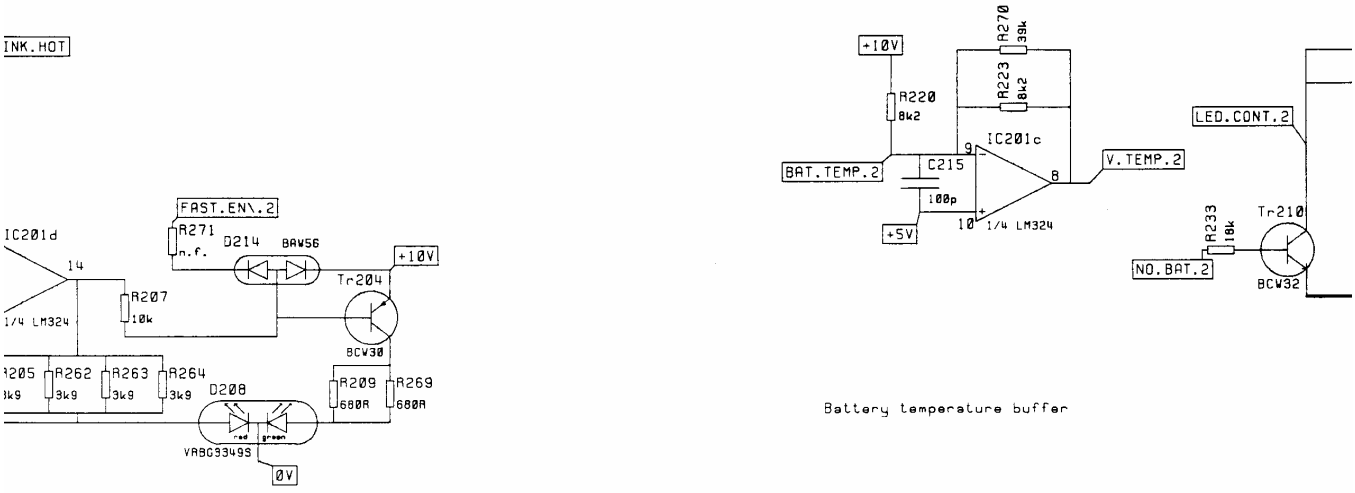


FIG. A.8 DESK-TOP CHARGER PCB MAIN POCKET CIRCUIT DIAGRAM



App A/2





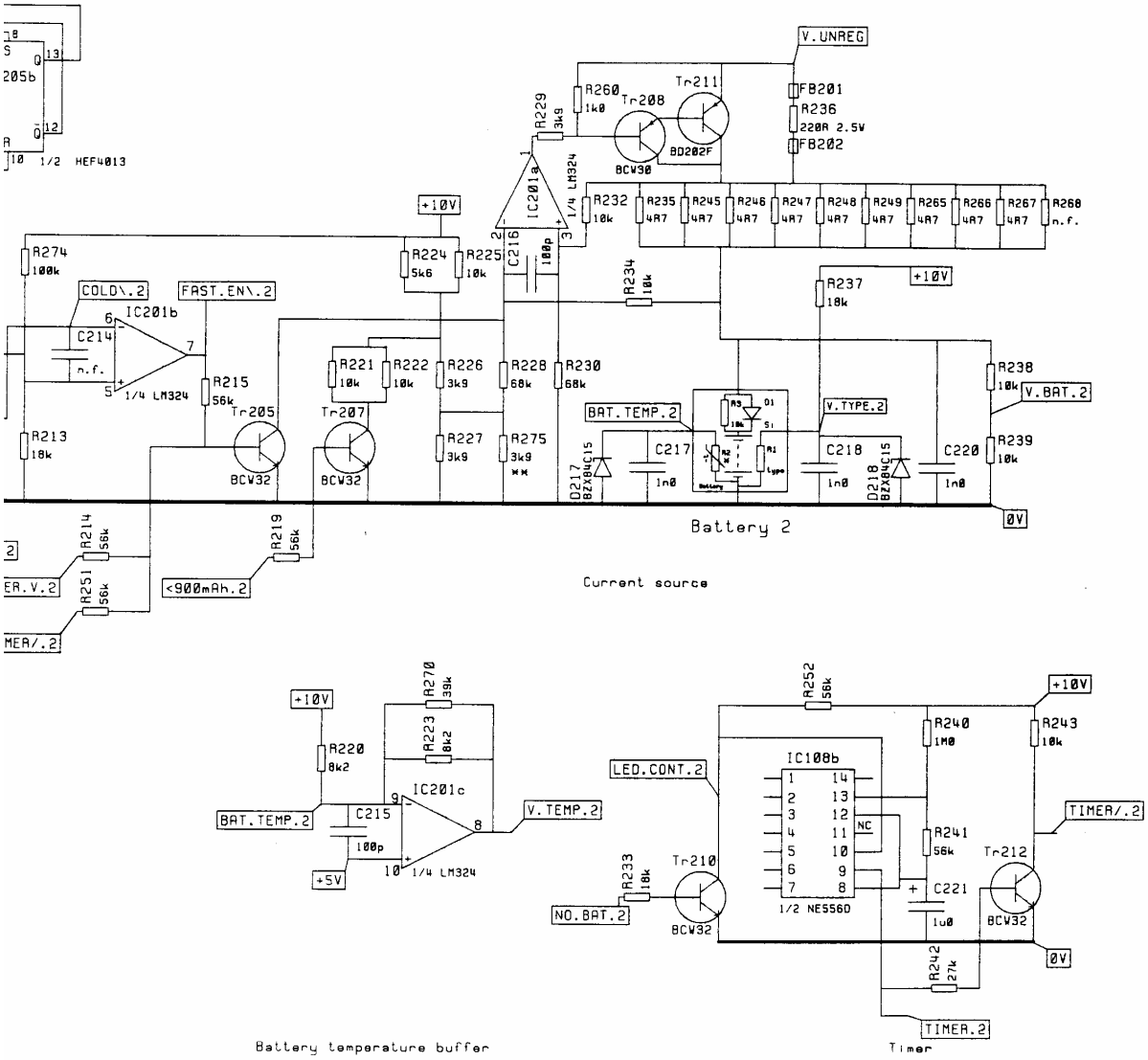


FIG. A.9 DESK-TOP CHARGER PCB SECONDARY POCKET CIRCUIT DIAGRAM

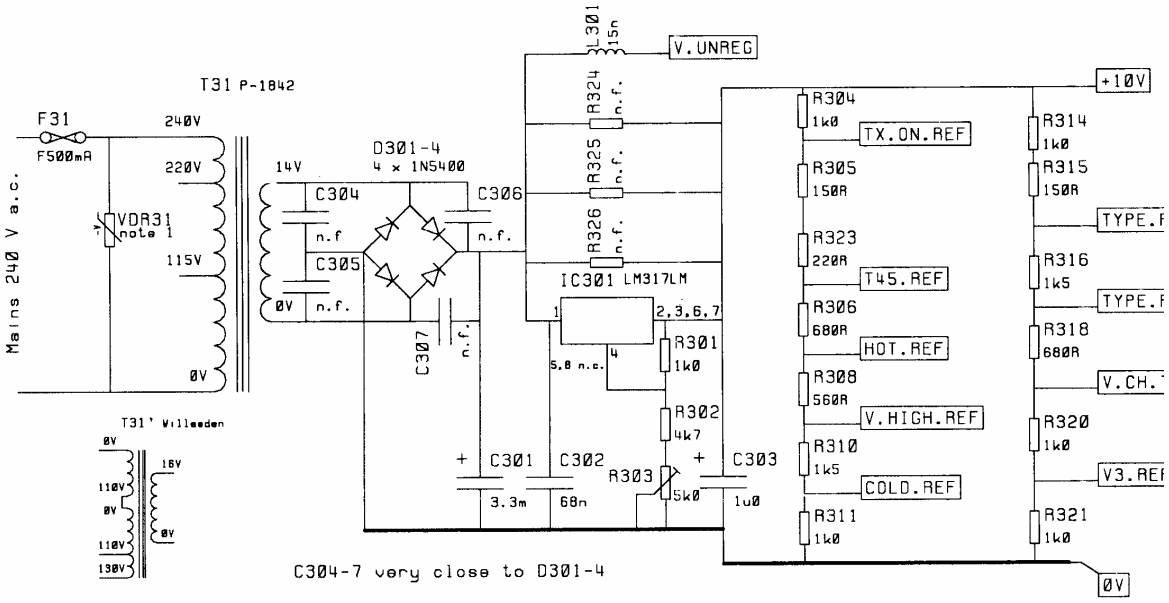
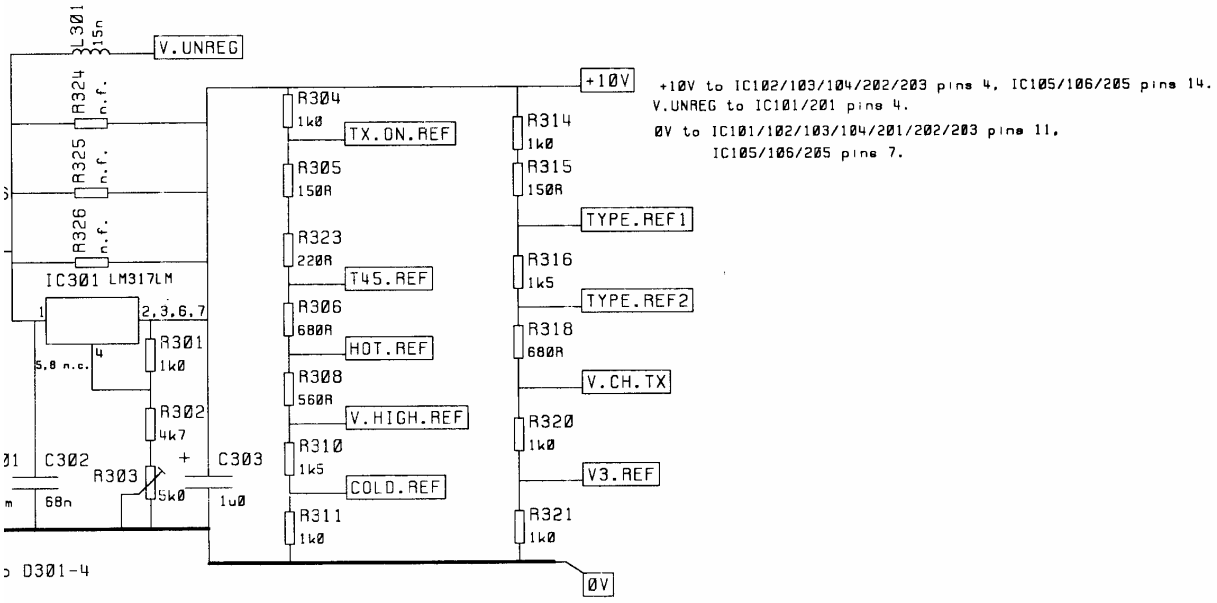


FIG. A.10 DESK-TOP CHARGER PCB
POWER SUPPLY AND REFERENCES
CIRCUIT DIAGRAM



HARGER PCB
PLY AND REFERENCES
GRAM

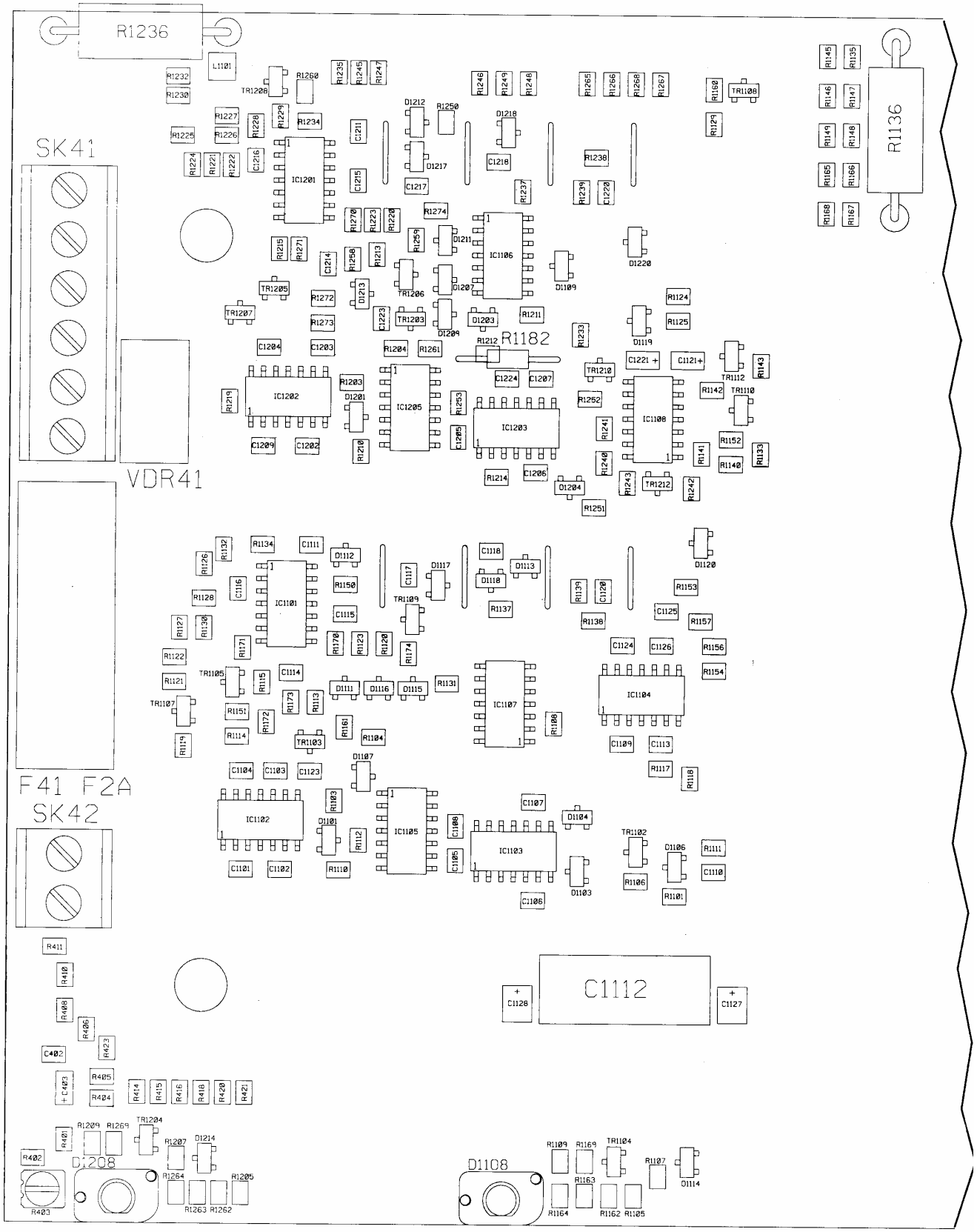
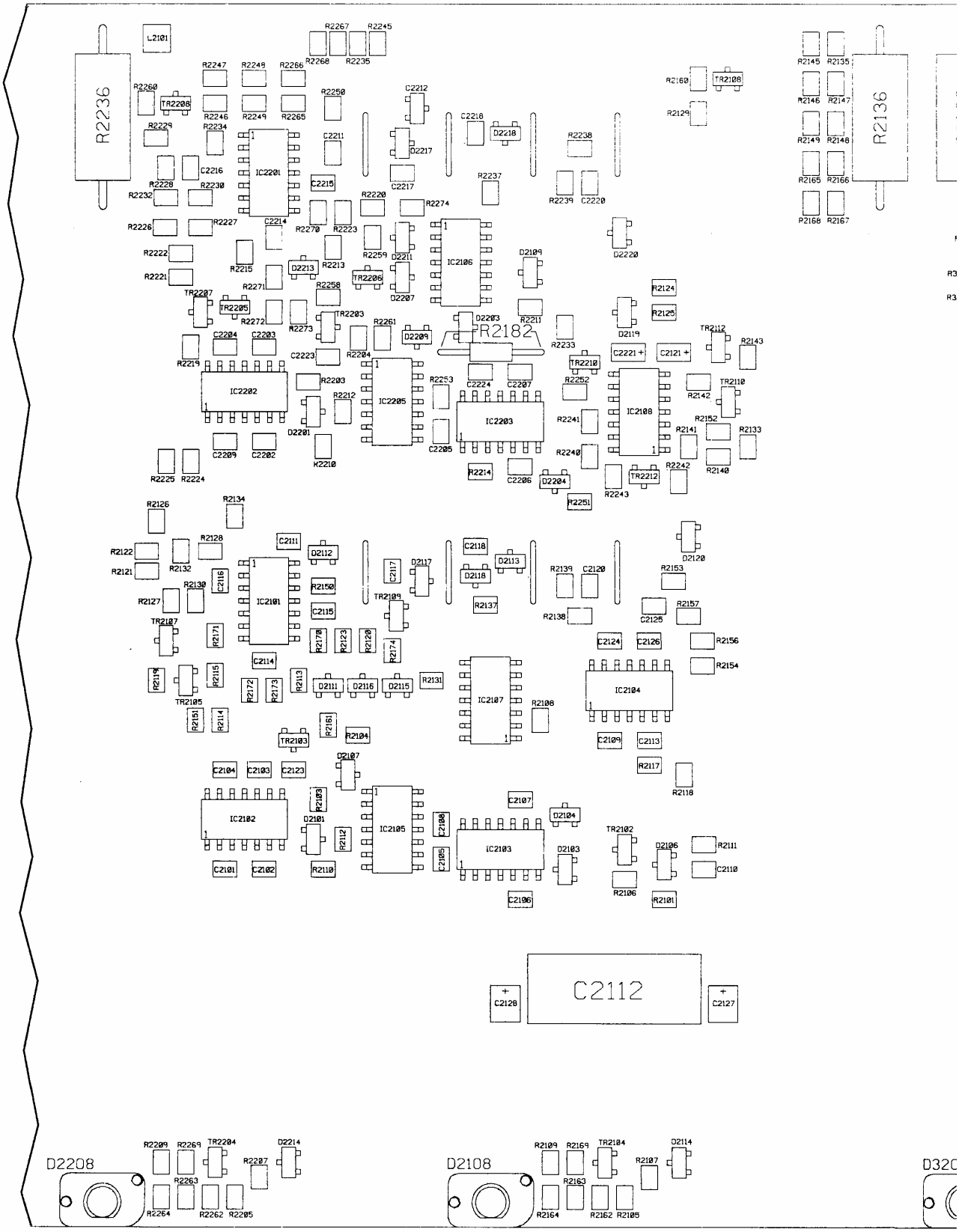


FIG. A.11 MULTI-UNIT CHARGER PCB POWER SUPPLY AND FIRST POCKET LAYOUT DIAGRAM



App A/1

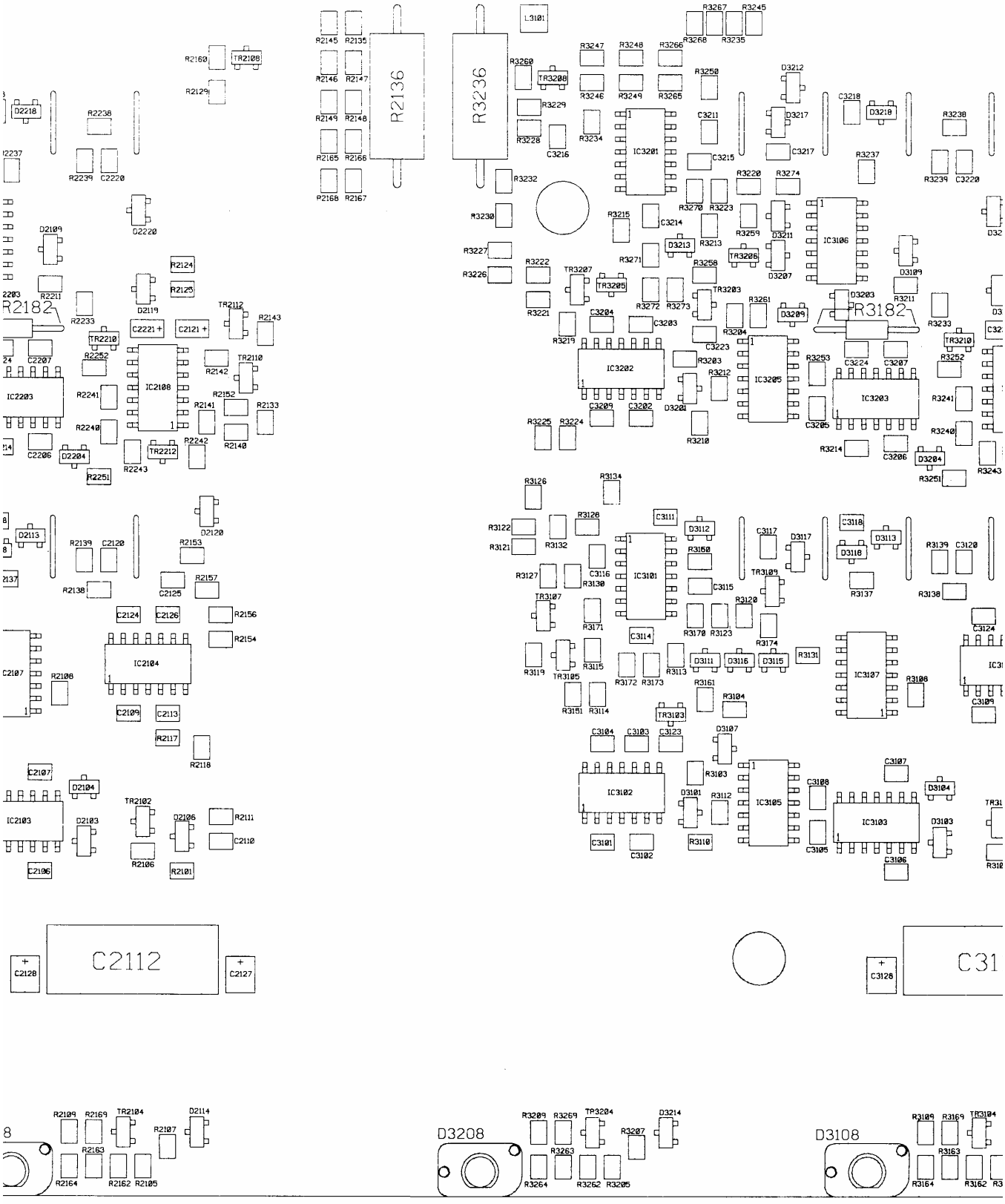


FIG. A.12 MULTI-UNIT CHARGER PCB SECOND AND THIRD POCKETS LAYOUT DIAGRAM

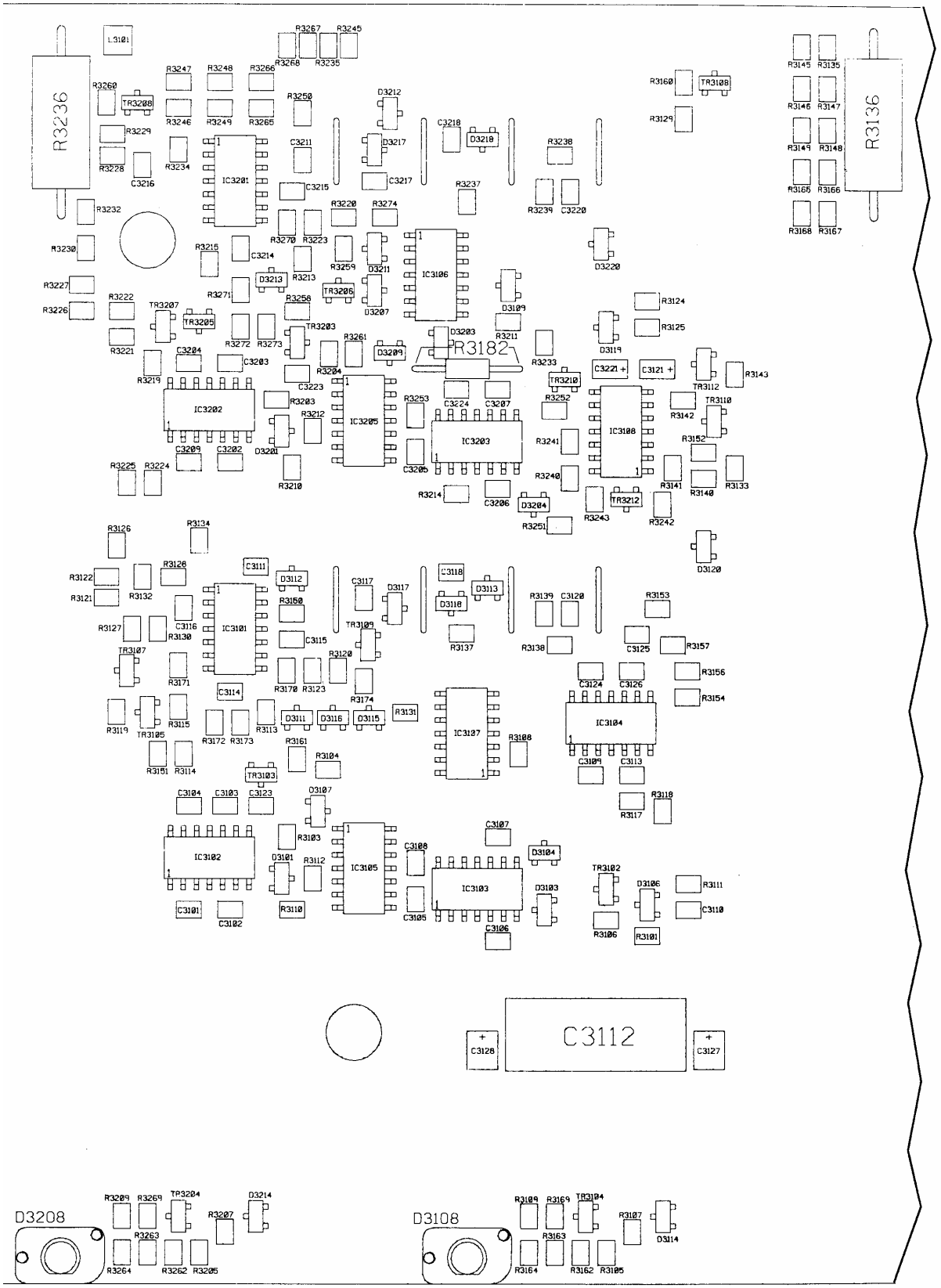
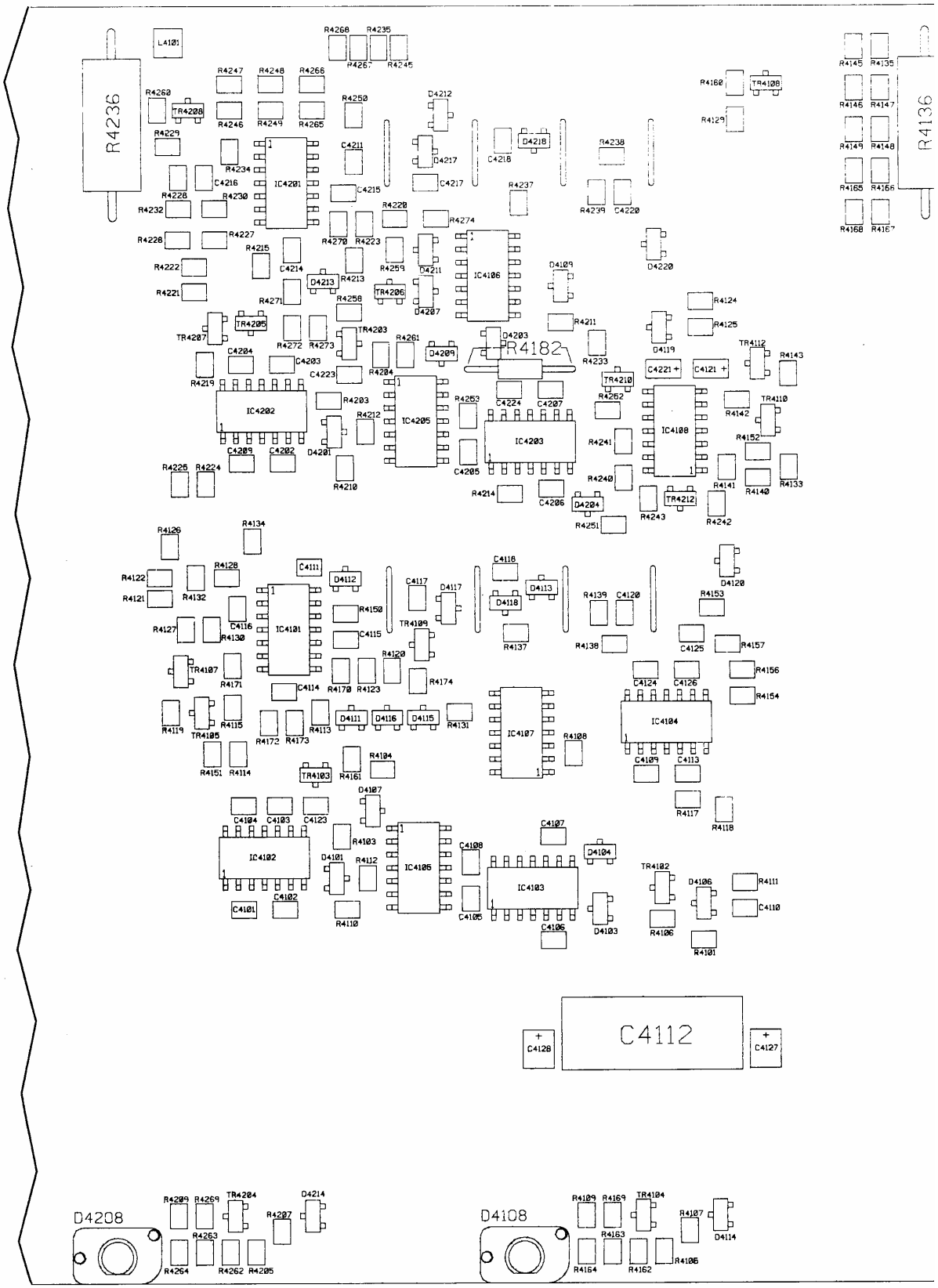


FIG. A.12 MULTI-UNIT CHARGER PCB SECOND AND THIRD POCKETS LAYOUT DIAGRAM



App A/1

FIG. A.13 MULTI-UNIT CHARGER PCB FOURTH AND FIFTH POCKETS LAYOUT DIAGRAM

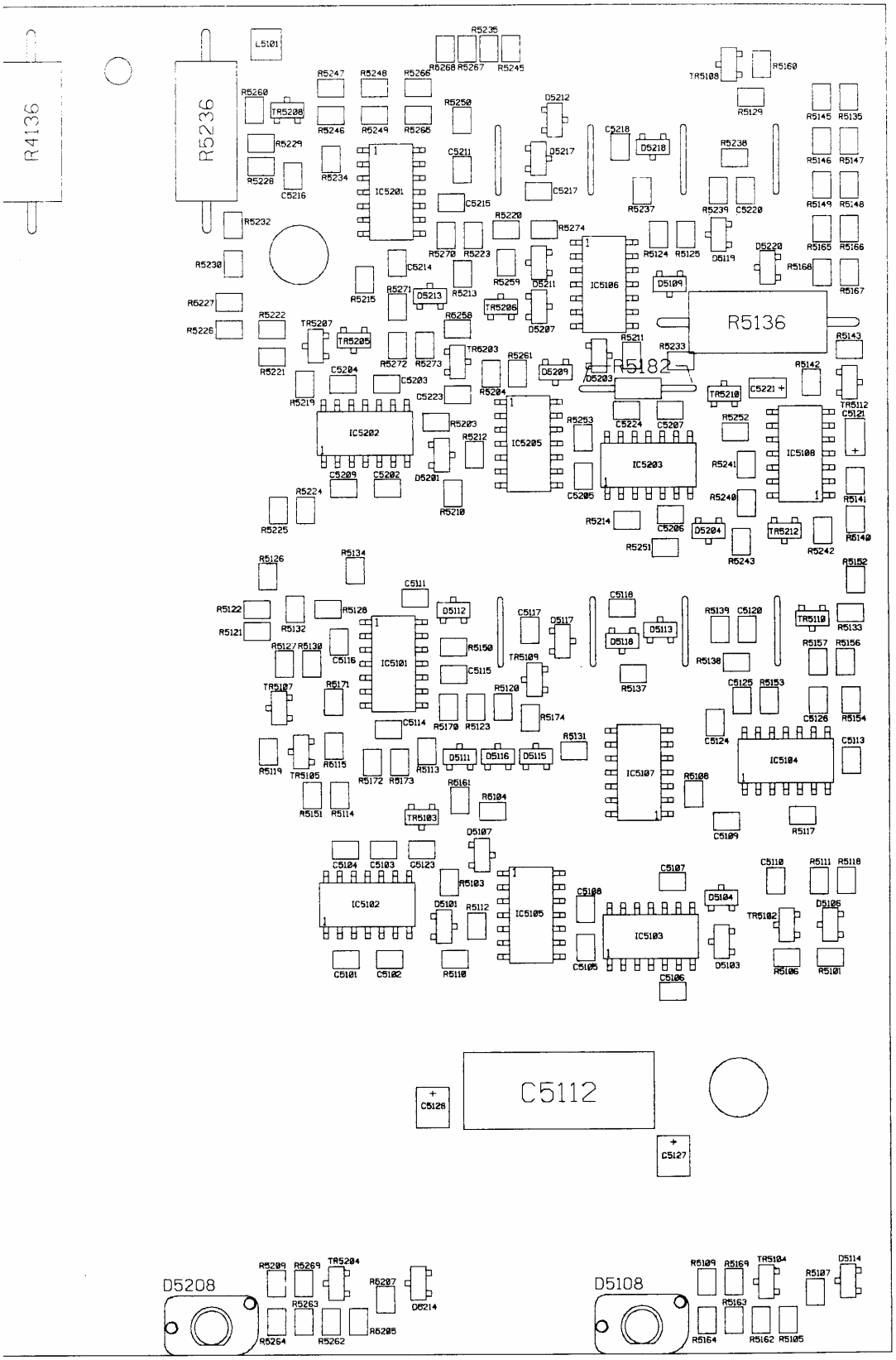
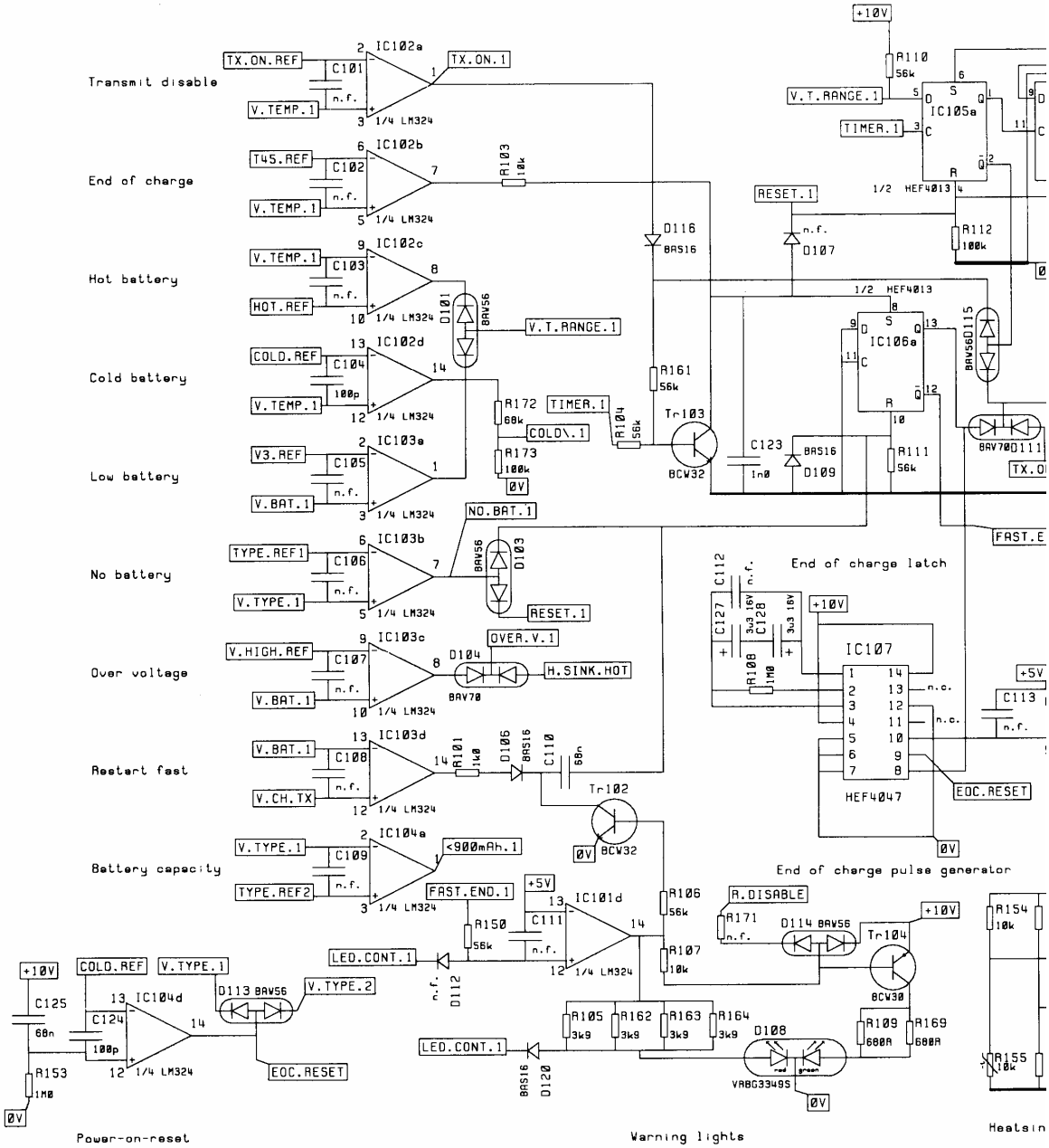
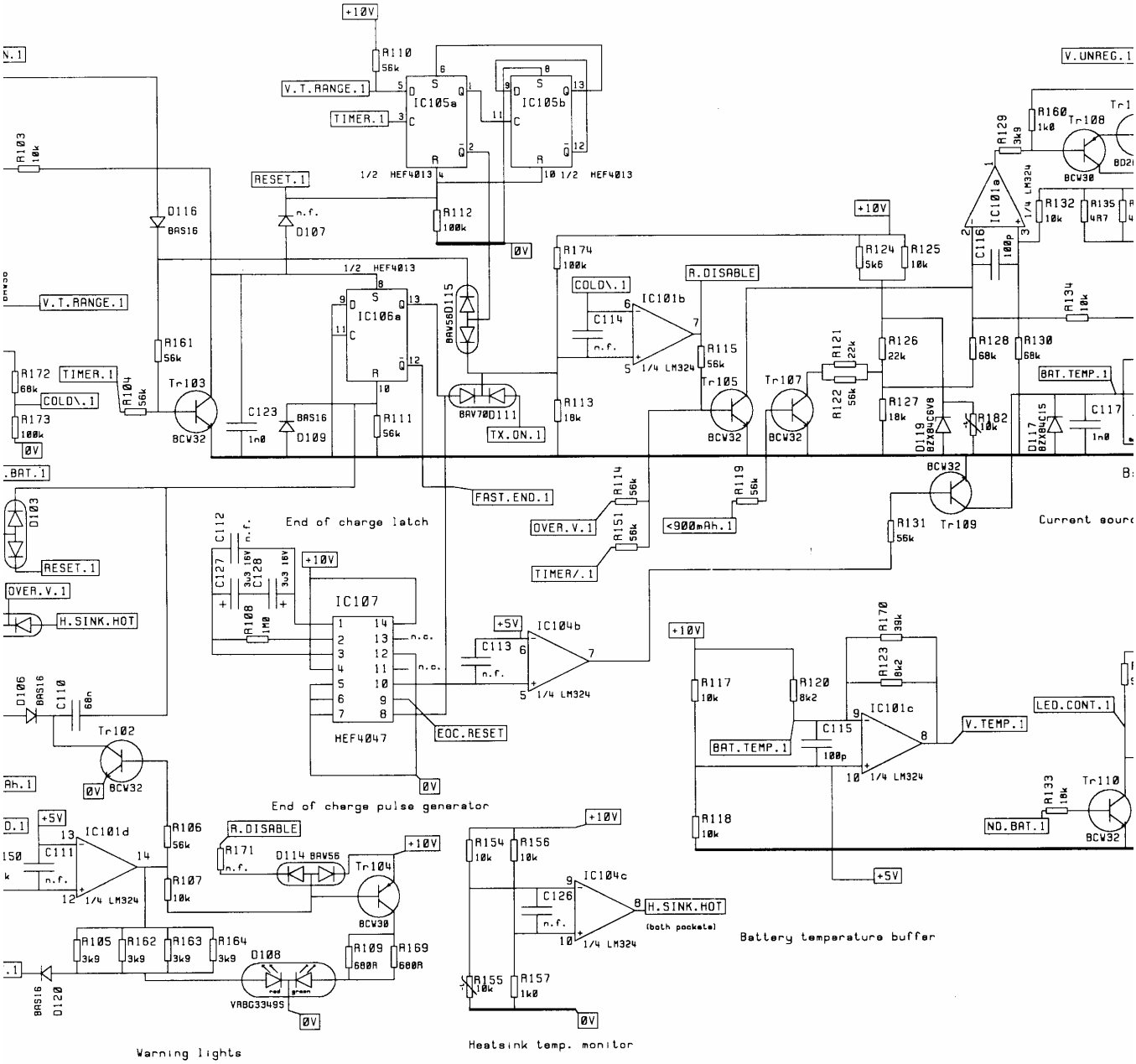
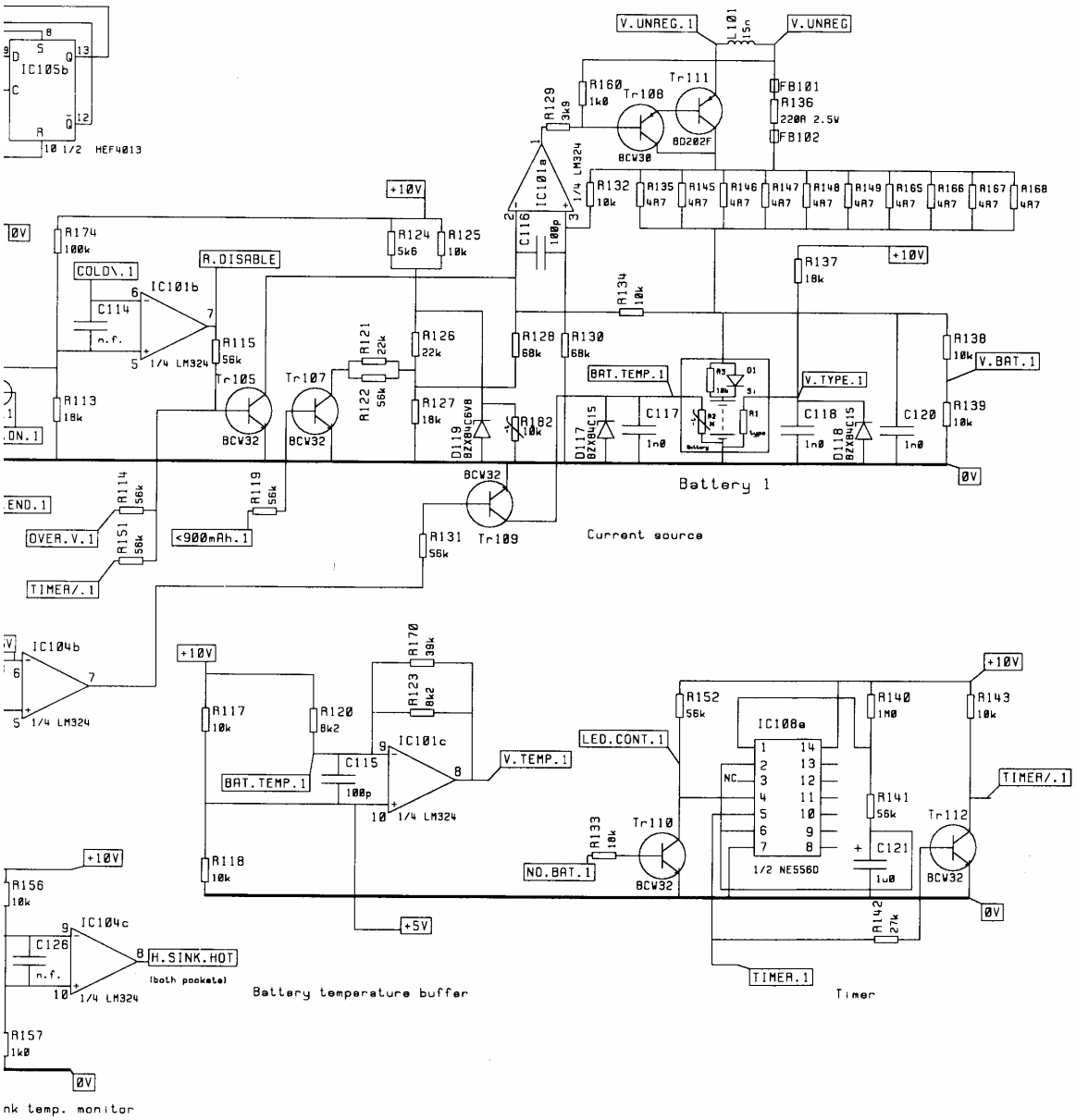


FIG. A.13 MULTI-UNIT CHARGER PCB FOURTH AND FIFTH POCKETS LAYOUT DIAGRAM



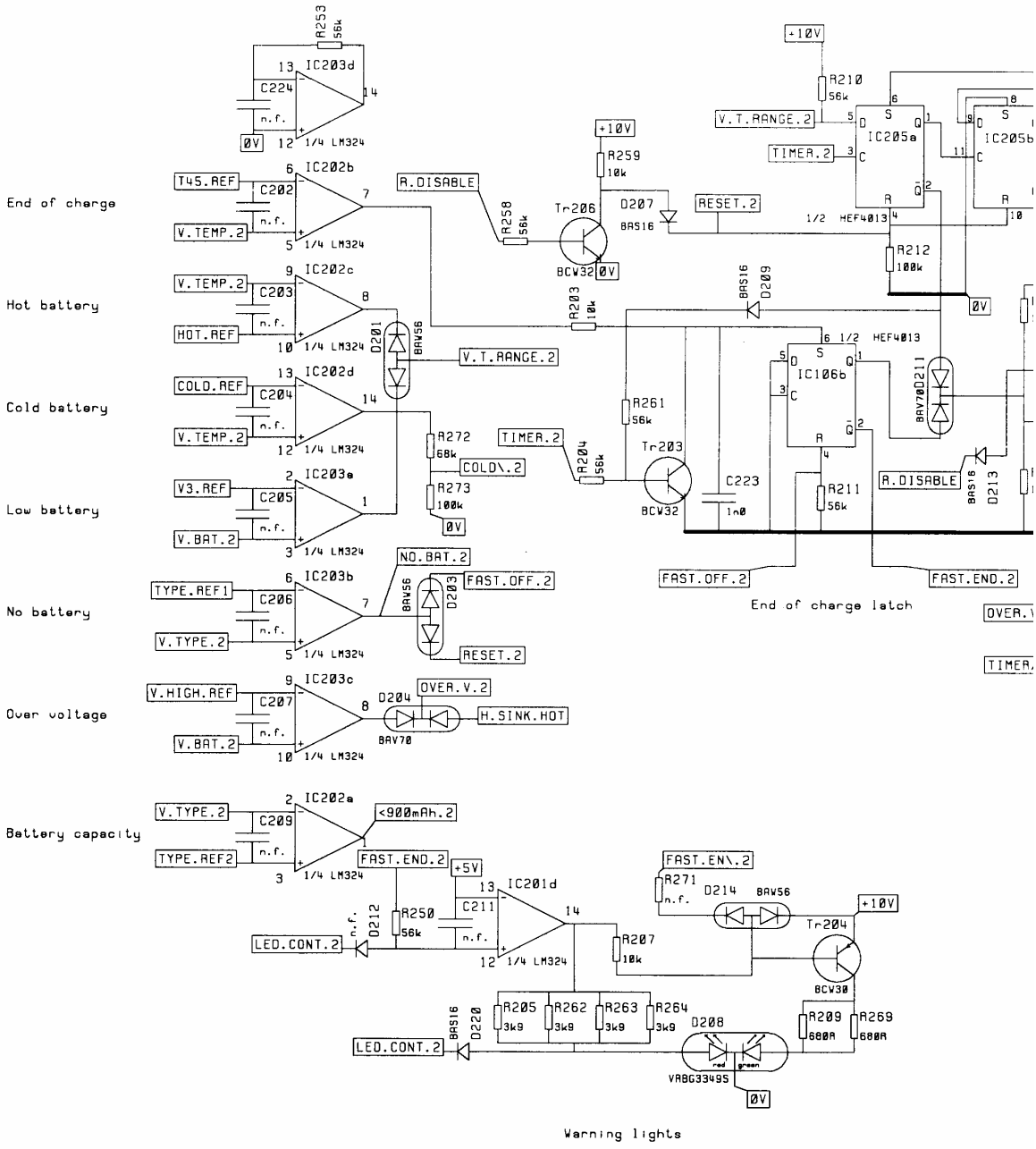


Note that the multi-unit charger includes five main & five secondary po
these pocket pairs are identified by 1000, 2000 etc., e.g., C1101, C210

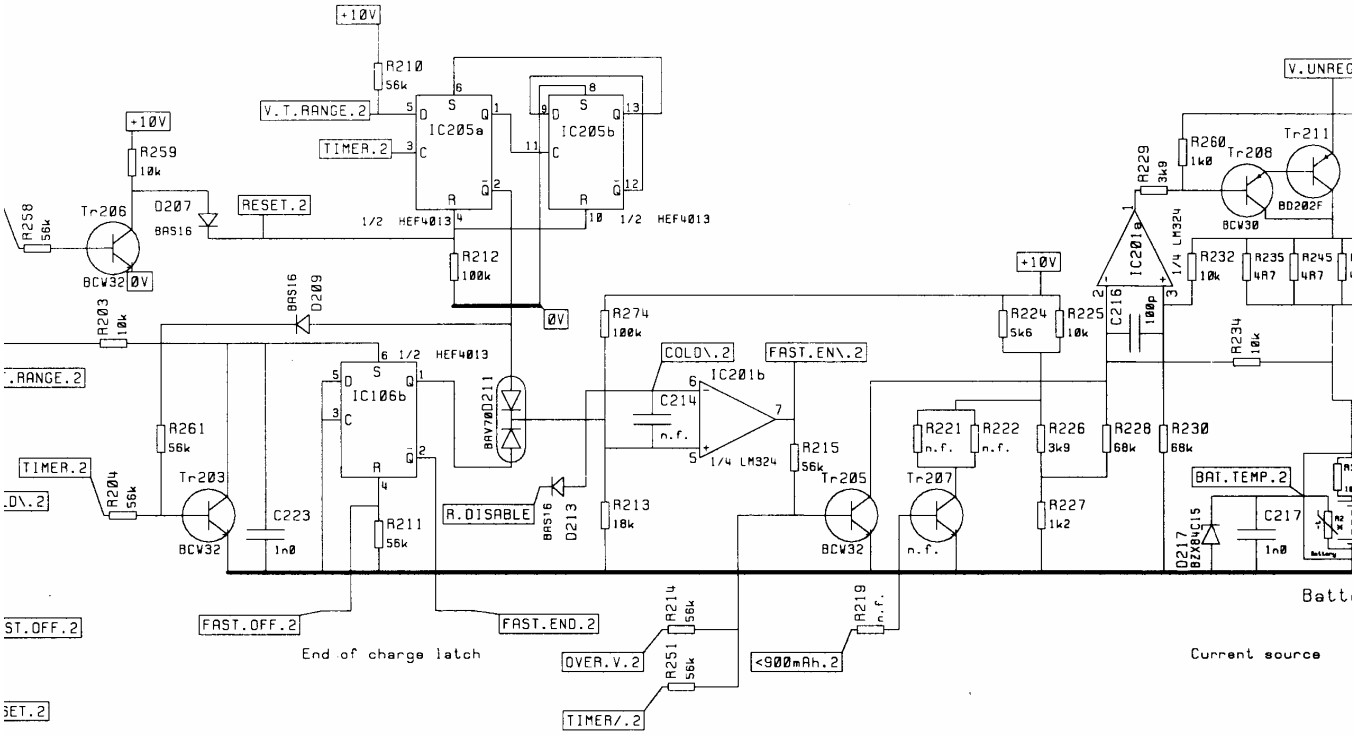


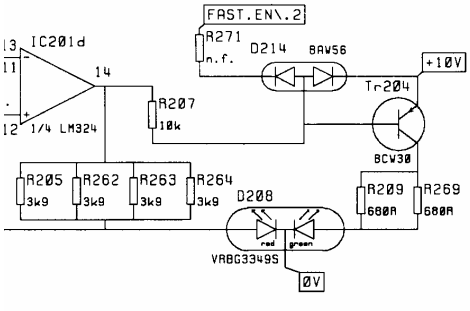
it the multi-unit charger includes five main & five secondary pockets. The component numbers for
ocket pairs are identified by 1000, 2000 etc., e.g., C1101, C2101.

FIG. A.14 MULTI-UNIT CHARGER PCB MAIN POCKET CIRCUIT DIAGRAM

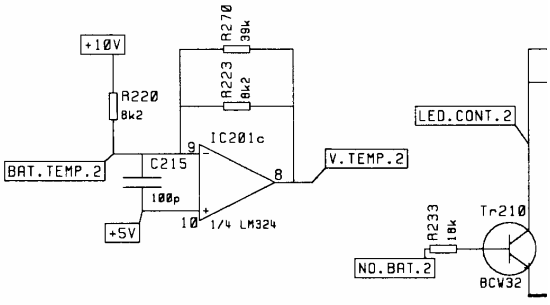


Note t
these



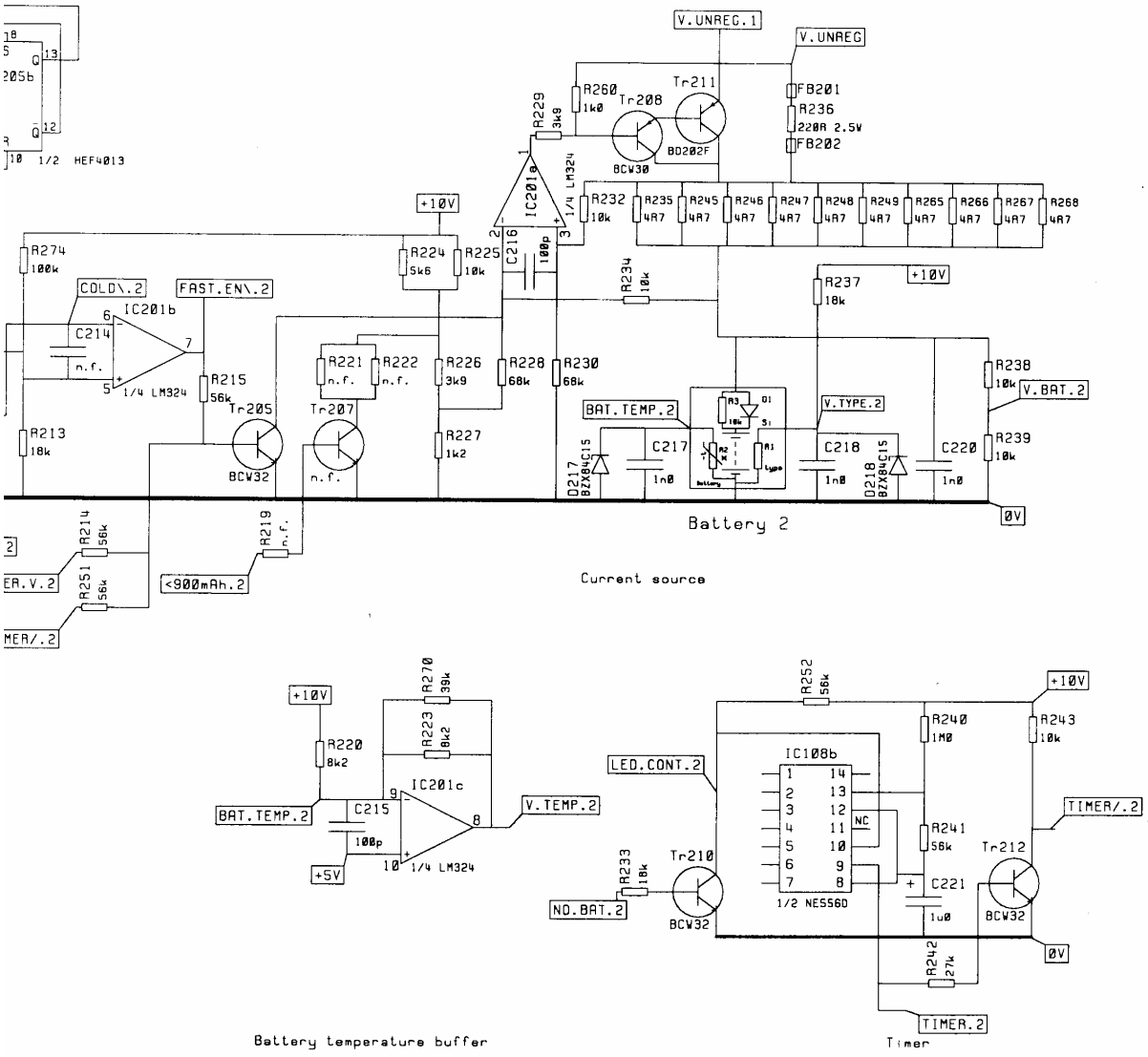


Warning lights



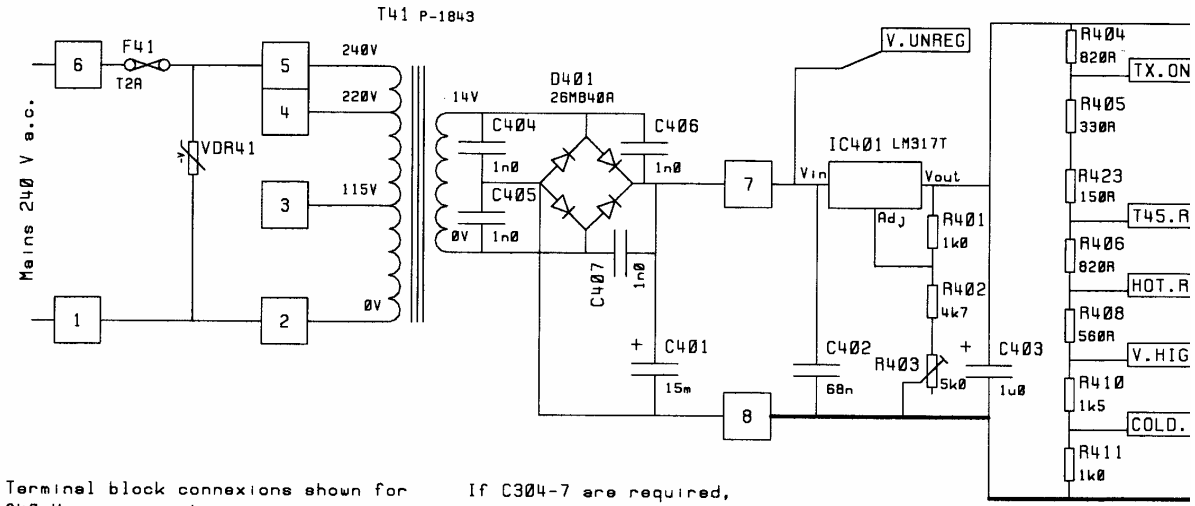
Battery temperature buffer

Note that the multi-unit charger includes five main & five secondary
these pocket pairs are identified by 1000, 2000 etc., e.g., C1101, C21



› that the multi-unit charger includes five main & five secondary pockets. The component numbers for
›e pocket pairs are identified by 1000, 2000 etc., e.g., C1101, C2101.

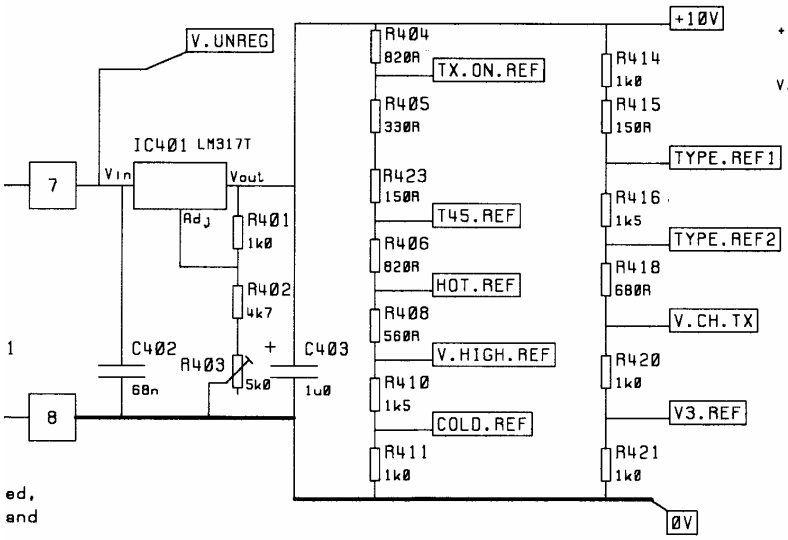
FIG. A.15 MULTI-UNIT CHARGER PCB SECONDARY POCKET CIRCUIT DIAGRAM



Terminal block connexions shown for 240 V a.c. operation.

If C304-7 are required, they will be leaded and mounted between the bridge rectifier tags.

FIG. A.16 MULTI-UNIT CHARGER PCB POWER SUPPLY AND REFERENCES CIRCUIT DIAGRAM



+10V to IC102/103/104/202/203 pins 4.
IC105/106/205 pins 14.

V.UNREG to IC101/201 pins 4.

0V to IC101/102/103/104/201/202/203 pins 11.
IC105/106/205 pins 7.

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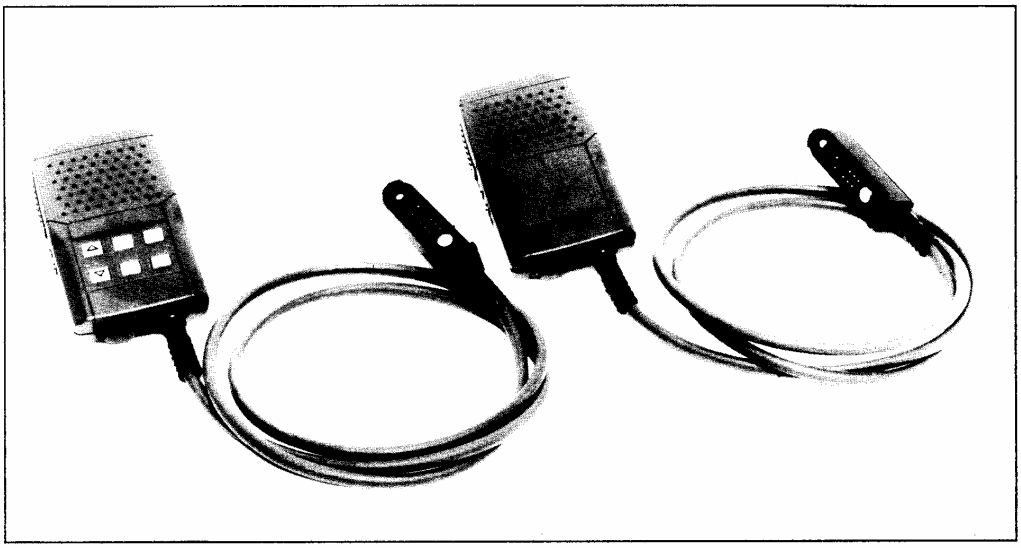
APPENDIX B
LOUDSPEAKER/MICROPHONE



INTRODUCTION

The Loudspeaker/Microphone is available in two forms, standard and keypad versions. The standard version provides remote microphone, PTT, antenna and switchable loudspeaker facilities; the keypad version provides the same facilities with the addition of remote keypad functions.

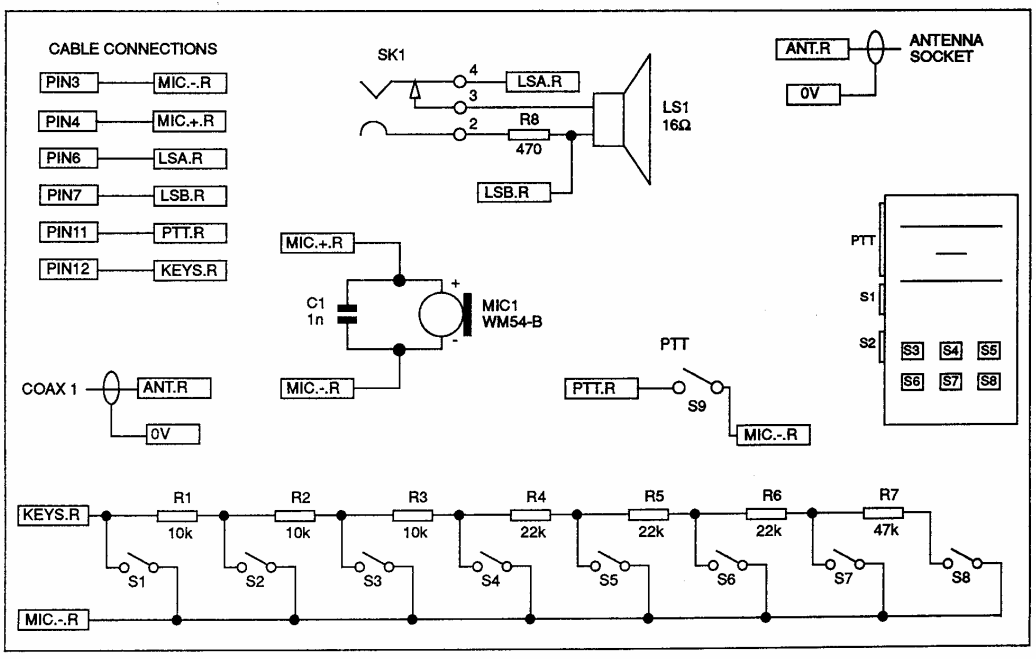


Fig. B1 Circuit Diagram of Keypad Version

TEST PROCEDURE

(1) Attach the Loudspeaker/Microphone unit to a suitable transceiver.

(2) Ensure that the loudspeaker functions correctly.

(3) Press the PTT on the Loudspeaker/Microphone unit and check that the transmitter keys and that the microphone operates.

(4) Check that the remote antenna is operational.

(5) Check that the keys on the Loudspeaker/Microphone unit are operational.

(6) Detach the Loudspeaker/Microphone unit from the transceiver.

Note: ***The selection of the remote loudspeaker and antenna, the function of the keys on the unit and the operation of the PTT are software programmable using a Programmer. These features must be programmed to check the Loudspeaker/Microphone unit operates.***

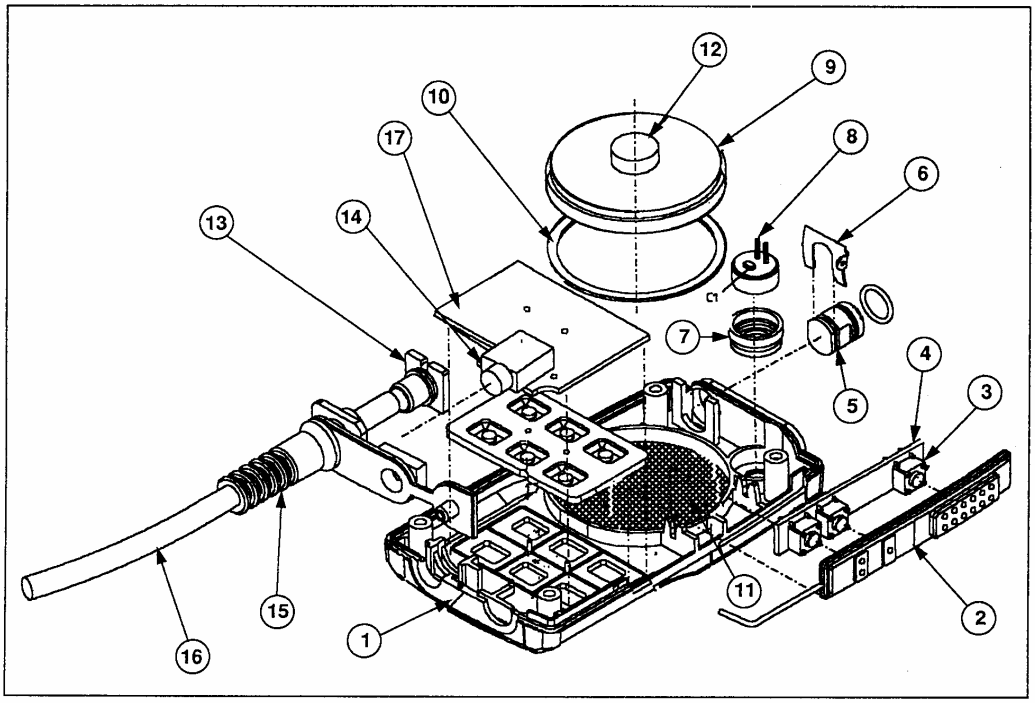


Fig. B.2 Keypad Version Exploded View

Special Tools Required

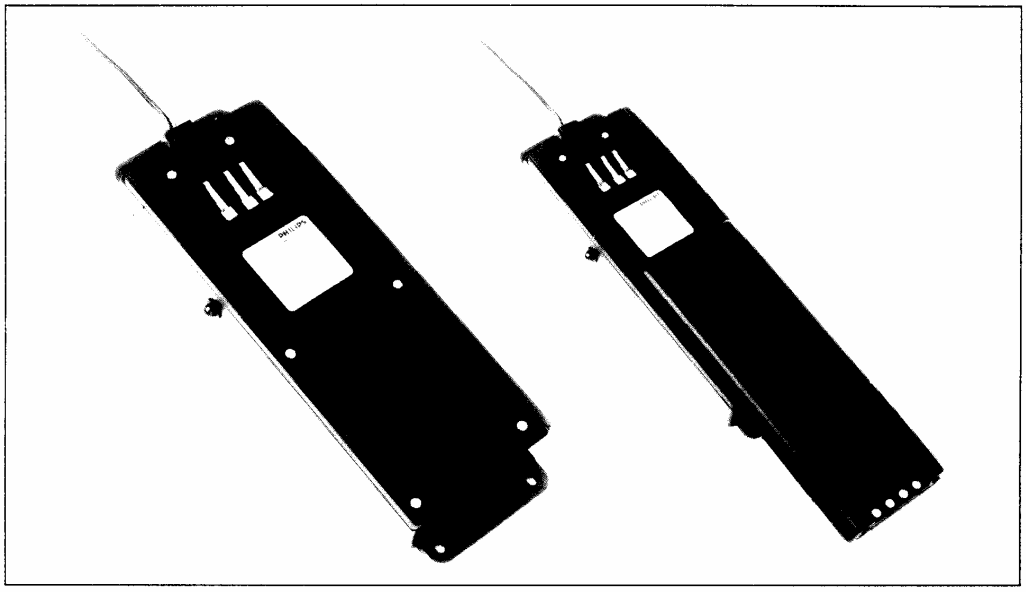
The following special tool is required for dismantling and re-assembling the Loudspeaker/ Microphone.

Tool	Torque
Pozi Drive Bit Size No. 0	3,4kgf-cm

PARTS LIST

Cct.Ref	Description	Part No.	Remarks
Electrical			
C1	Capacitor, 1n ±10% 50V SMD	5322 122 34123	
R1	Resistor, 10k ±2% 0,1W SMD	4822 051 20103	
R2,3	Resistor, 10k ±2% 0,1W SMD	4822 051 20103	Keypad version only
R4-6	Resistor, 22k ±2% 0,1W SMD	5322 116 82541	Keypad version only
R7	Resistor, 47k ±2% 0,1W SMD	4822 051 10473	Keypad version only
R8	Resistor, 470 ±2% 0,1W SMD	4822 051 20471	
LS1	Loudspeaker ADO1985/Y15	4822 240 30554	Item 9
MIC1	Microphone Electret WM-54-BT	5322 242 30253	Item 8
	PCB, Keypad	5322 446 93106	Item 17, Keypad version only
	PCB Switch	5322 219 82584	Item 4
	Plug, 8 Way Facility	5322 268 90466	Item 16
SK1	Socket, Jack S-G8039	5322 268 90467	Item 14
S1,2,9	Switch Diaphragm to Spec	5322 276 12744	Item 3
Mechanical			
	Block, Cable	5322 290 81496	Item 13
	Boot, Microphone	5322 418 40909	Item 7
	Clip,	5322 405 91507	
	Clamp, Rotation	5322 405 91508	
	Cloth, Speaker	5322 445 51044	Item 11
	Connector, Antenna	5322 268 90468	Item 5
	Contact, Antenna	5322 290 81497	Item 6
	Cover, Back	5322 447 40536	
	Cover, Front, Non-Keypad	5322 447 40933	
	Cover, Front, Keypad	5322 447 40955	Item 1
	Gasket, Silicon	3513 902 10111	
	Grommet,	5322 325 80495	Item 15
	Pad, foam	5322 466 92803	Item 12
	Pad, foam	5322 466 61914	
	Pin, pivot	5322 520 20741	
	Plate, Backing	5322 466 93103	
	Plate, Grounding	5322 466 93105	
	Plate, Mounting	5322 466 93104	
	Pressel, PTT	5322 405 91509	Item 2
	Ring, `O'	5322 530 51269	
	Ring, `O' Rubber	5322 530 51187	
	Rivet, to Drawing	5322 905 60361	
	Screw, St PSM, THR, FM, M2,5 x 8mm	5322 502 30591	
	Seal, Speaker	5322 466 62178	Item 10
	Spring, Torsion	5322 492 42597	
	Washer, St, Form A, M3	4822 532 10917	

APPENDIX C
PRX7002 VEHICLE CHARGING UNIT (VCU)
FOR STANDARD AND HIGH CAPACITY BATTERY PACKS



INTRODUCTION

The Vehicle Charging Unit (VCU) provides an in-vehicle, timed, medium rate charging facility for standard and high capacity battery packs. The unit may be mounted in a variety of convenient situations in a vehicle, such as a glove compartment, under a parcel shelf, or in the boot. Operation is from a standard 12V car battery. The VCU may be connected directly to the vehicle battery as it consumes less than 5mA when a battery is not fitted.

The VCU may also be used with other 250mA,11-16V DC, power supplies thus allowing an emergency charging facility from a solar panel, wind generator or bench DC power unit.

INSTALLATION

The VCU should be securely mounted in the vehicle, using the self-tapping screws provided. Connect the DC power cables to the vehicle supply with the red lead to the positive terminal and the black lead to the negative terminal of the battery. Alternatively the VCU may be connected via a vehicle cigar lighter socket using a cigar lighter plug, available from most motor vehicle suppliers. Ensure that the plug is correctly wired, observing the supply polarity, or the unit will not function. The power lead must be fitted with a 1A fuse.

OPERATION

CAUTION
Ensure that no conductive objects are allowed to rest across the terminals of the VCU. Failure to observe this precaution may result in damage to the unit.

Insert the battery pack by sliding it fully into the VCU. The red indicator on the side of the unit will illuminate indicating the correct insertion of the battery pack and the start of a timed charge. With a fully discharged battery pack it may take up to two minutes before the indicator illuminates.

The timed charge will take approximately eight hours after which time the indicator will be extinguished and the battery will be ready for use. A battery pack left in the VCU will continue to receive a trickle charge. If the vehicle is to be left unattended for long periods remove the battery pack from the unit.

To remove the battery pack, push the retaining latch downwards and slide the battery out from the VCU.

BASIC FAULT DIAGNOSIS

Should the VCU fail to operate check that:-

(a) The contacts on the unit are clean and free from dirt or grease.

(b) The unit is properly installed in the vehicle.

(c) That the in-line 1A fuse has not blown.

If the above conditions are fulfilled a fault in the unit is indicated.

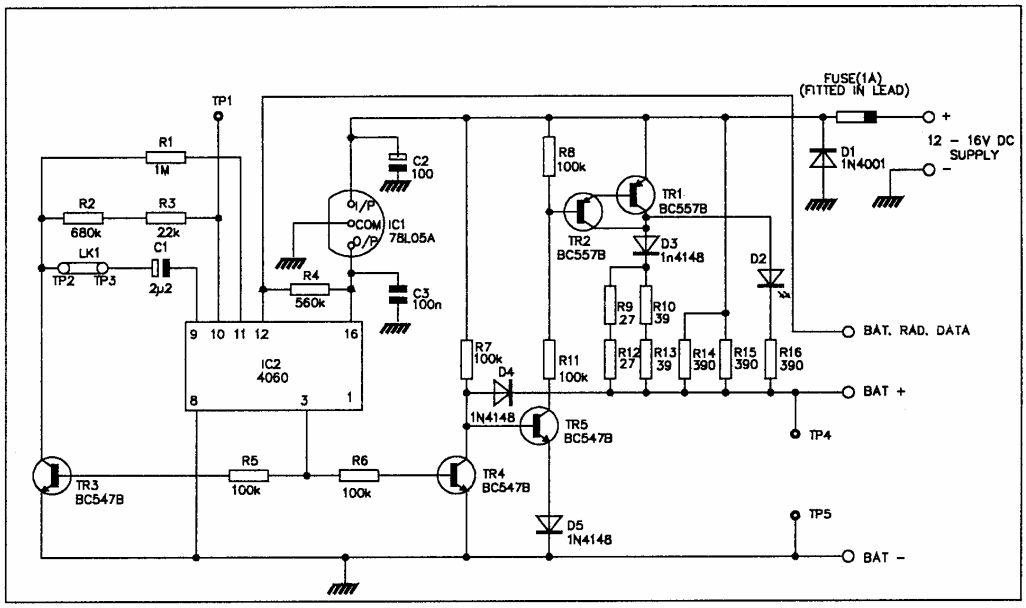


Fig. C.1 VCU Circuit Diagram

CIRCUIT DESCRIPTION

Inserting a battery pack into the VCU causes IC2 pin 12 to go 'low' initiating a timer/divider IC2, R1-3 and C1 which allows the battery pack to be charged for approximately eight hours. TR5 is switched on, turning on TR1 and 2 thus allowing the charge current to flow via R9,10,12,13 and D2/R16, as well as via trickle charge components R14 and 15. During this period LED D2 is illuminated, indicating that the battery pack is being charged.

If a totally discharged battery pack is inserted indicator LED D2 does not illuminate until the battery voltage has risen above 1,4V, this normally takes less than two minutes.

At the end of the timed period IC2 pin 3 goes 'high' inhibiting the timer clock via TR3. TR4 turns on, turning off TR5, TR1 and 2. A trickle charge current of approximately 40mA will continue to flow.

D4 and 5 prevent excessive current being drawn in the event of a short circuit across the battery charger terminals. IC1 provides a clean, regulated 5V supply to IC2. D1 and the in-line fuse provide reverse polarity protection.

USE WITH LIGHTWEIGHT BATTERY PACKS

Although not primarily designed for use with lightweight battery packs, the VCU may be modified to do so as follows:-

(1) Remove the rear cover.

(2) Carefully cut the PCB track at the point indicated by the instructions printed on the PCB (the junction of R9 and R12).

(3) Refit the rear cover.

TEST PROCEDURE

Test Equipment

Regulated DC PSU 13,8V, 0,25A(maximum)
Digital Volt Meter (DVM)
Ammeter
Stopwatch
1nF, 50V capacitor
33Ω 2,5W resistor
33k 0,125W resistor
Tinned, bare copper wire.

Method

CAUTION
In order to prevent damage to the VCU during this Test Procedure, when fitting or removing components ensure that the minimum heat is applied to the PCB and that no solder bridges are allowed to form between tracks.

(1) Remove the rear cover to gain access to the PCB track.

(2) Remove wire link LK1 and connect the 1nF capacitor between TP2 and TP3. Set the PSU to 13,8V and connect it via an ammeter to the VCU leads. Switch on the PSU and check that the current is less than 5mA.

(3) Switch off the PSU. Connect the 33Ω resistor between TP4 and TP5. Switch on the PSU and check that the current is 180-220mA and the LED is illuminated.

(4) Switch off the PSU. Connect the 33k resistor between the junction of R4/IC2 pin 12 (the wide track located between TP3 and TP5) and TP5.

Note: ***Do NOT solder components to the large pads which make the connections to the battery contacts.***

Switch on the PSU and check that the LED is extinguished after a period of 11-15 seconds. Check that, after the LED is extinguished, the current is 50-70mA.

(5) Switch off the PSU. Replace the 1nF capacitor between TP2 and TP3 with a permanent wire link (LK1). Switch on the PSU and, using the DVM, check that the time between transitions on TP1 is 2,5-3,5 seconds. Switch off the PSU and remove the 33Ω and 33k resistors.

(6) Refit the rear cover.

(7) Switch on the PSU and check that the LED is extinguished.

(8) Slide a fully or partially charged battery pack onto the VCU, ensuring that it moves freely and engages correctly, check that the LED is illuminated. Check that the current is 180-220mA.

(9) Remove the battery pack. Connect a shorting link across the positive and negative battery contacts on the VCU and check that the current is less than 80mA.

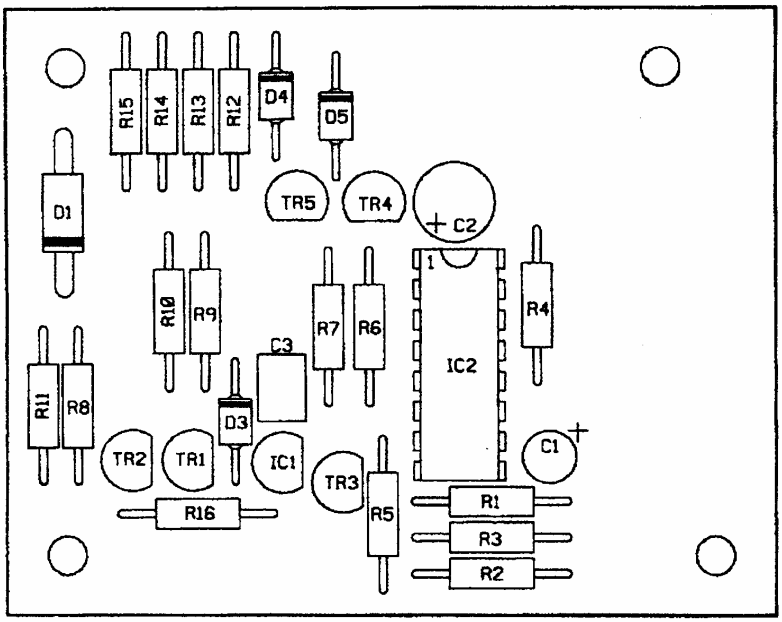


Fig. C.2 VCU Component Layout

PARTS LIST

Cct.Ref	Description				Part No.	Remarks
Semiconductors and IC's						
IC1	IC 78L05A Voltage Regulator				4822 209 72042	
IC2	IC 4060				5322 209 12184	
TR1,2	Transistor BC557B				4822 130 40959	
TR3-5	Transistor BC547B				4822 130 44568	
D1	Diode 1N4001				4822 130 31438	
D2	Diode LED, Red				3513 993 46020	
D3-5	Diode 1N4148				4822 130 30621	
Resistors						
R1	1M	±1%	0,25W	m film	3513 992 07077	
R2	680k	±1%	0,25W	m film	3513 992 07075	
R3	22k	±1%	0,25W	m film	3513 992 07051	
R4	560k	±1%	0,25W	m film	3513 992 07074	
R5-8	100k	±1%	0,25W	m film	4822 050 21004	
R9	27	±1%	0,25W	m film	3513 992 07004	
R10	39	±1%	0,25W	m film	3513 992 07006	
R11	100k	±1%	0,25W	m film	4822 050 21004	
R12	27	±1%	0,25W	m film	3513 992 07004	
R13	39	±1%	0,25W	m film	3513 992 07006	
R14-16	390	±1%	0,25W	m film	3513 992 07017	
Capacitors						
C1	2µ2	±20%	50V	elec	4822 124 22652	
C2	100		6,3V	elec	5322 124 41939	
C3	100n	±20%	50V	pes	5322 121 43489	
Miscellaneous						
	Bush, str relief 1829 black				2422 015 17467	
	Clip, LED mounting and ring				5322 405 91125	
	Contact, battery				5322 290 81491	
	Contact, battery, PCB				5322 290 81492	
	Cover				3513 901 10761	
	Cover, rear				5322 447 40932	
	Fitting				3513 901 90101	
	Fuse, 1A blade				2422 086 10503	Bagged item
	Fuseholder				5322 252 60118	Bagged item
	Label, rear cover				5322 455 21758	
	Latch actuator				3513 903 20331	
	Latch spring				5322 405 91502	
	Pad, foam-vibrator				5322 466 62017	
	Screw, pan, pozi, M3 x 3mm, Zn				2522 178 21016	
	Screw, st, PSM, THR, FM 2,5 x 8mm				5322 520 30591	
	Screw, st, s/tap, pozi, No6 x 19mm				4822 502 30096	Bagged item

APPENDIX D
FACTORY MUTUAL VARIANTS

WARNING

This equipment is certified for use in hazardous locations. Any repair must be carried out with utmost care. Substitution of components may impair intrinsic safety.

INTRODUCTION

Certain variants of the PRP70 range of transceivers are approved by the Factory Mutual Research Corporation for use in hazardous locations . These sets bear a side label referring to certification details, batteries and approved accessories. The Factory Mutual Research Corporation diamond logo is also on this label.

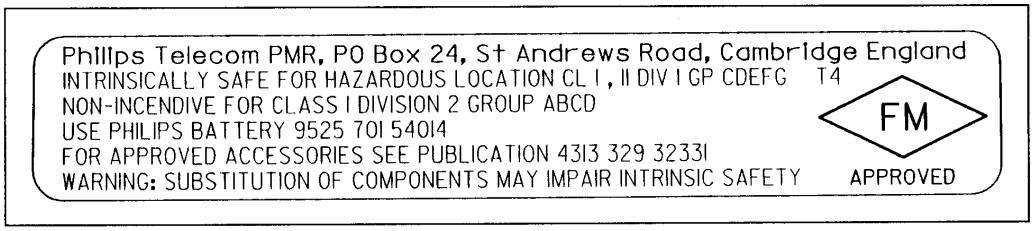


Fig. D.1 Factory Mutual Label

To ensure continued safety, the set must only be used with the Factory Mutual battery pack and the approved accessories. The Philips Part Numbers of the accessories and the Factory Mutual approved variants are listed in the Factory Mutual Information Sheet TP1813 (Technical Publication 4313 329 32331) and in this appendix.

Battery Pack

The Factory Mutual battery is clearly marked with the part number 9525 701 54014. This is the only battery certified for use with these variants. Use of any other battery will invalidate this certification.

The battery contains 1,2AHr cells and protective circuits. The protection consists of a series resistor and a self resetting fuse. The fuse is essentially a highly non-linear thermistor. Self heating of the device as a result of internal dissipation, causes the device to change from a very low resistance to high resistance if its temperature exceeds a critical value. The trip is not instantaneous, therefore, a series resistor is used to limit the current in the interval before the device trips. These components limit the available current at the battery terminals. The fuse will cool down when the fault condition is cleared and it will revert to its low resistance state thus allowing normal operation.

There are no user serviceable parts in the battery and it should be replaced if found to be faulty.

Operating Precautions

If the battery pack trips for any reason other than a deliberate or accidental short circuit of the contacts, the transceiver, battery and any other accessories must be removed from service until the cause is ascertained.

WARNING

Avoid accidental short circuiting of the battery contacts.

EQUIPMENT VARIATIONS

Part Number	Power	Case	Signalling	Ch Spacing	Band
PRP73 - Full Feature Transceiver					
9525 701 53043	L	Standard	CTCSS	V	U0
9525 701 53047	L	Keypad	CTCSS	V	U0
9525 701 53143	H	Standard	CTCSS	V	U0
9525 701 53147	H	Keypad	CTCSS	V	U0
9525 701 53063	L	Standard	CTCSS	S	U0
9525 701 53067	L	Keypad	CTCSS	S	U0
9525 701 53163	H	Standard	CTCSS	S	U0
9525 701 53167	H	Keypad	CTCSS	S	U0
9525 701 53343	H	Standard	CTCSS	V	T4
9525 701 53347	H	Keypad	CTCSS	V	T4
9525 701 53363	H	Standard	CTCSS	S	T4
9525 701 53367	H	Keypad	CTCSS	S	T4
9525 701 53243	H	Standard	CTCSS	V	TR
9525 701 53247	H	Keypad	CTCSS	V	TR
9525 701 53263	H	Standard	CTCSS	S	TR
9525 701 53267	H	Keypad	CTCSS	S	TR
9525 701 53443	L	Standard	CTCSS	V	A9
9525 701 53447	L	Keypad	CTCSS	V	A9
9525 701 53463	L	Standard	CTCSS	S	A9
9525 701 53467	L	Keypad	CTCSS	S	A9
9525 701 53543	H	Standard	CTCSS	V	A9
9525 701 53547	H	Keypad	CTCSS	V	A9
9525 701 53563	H	Standard	CTCSS	S	A9
9525 701 53567	H	Keypad	CTCSS	S	A9
9525 701 53743	H	Standard	CTCSS	V	B5
9525 701 53747	H	Keypad	CTCSS	V	B5
9525 701 53763	H	Standard	CTCSS	S	B5
9525 701 53767	H	Keypad	CTCSS	S	B5
9525 701 53943	H	Standard	CTCSS	V	E0
9525 701 53947	H	Keypad	CTCSS	V	E0
9525 701 53963	H	Standard	CTCSS	S	E0
9525 701 53967	H	Keypad	CTCSS	S	E0
PRP74 - Medium Feature Transceiver With Optional Masc Scrambler					
9525 701 81100	L	Basic	CTCSS	S	U0
9525 701 81101	H	Basic	CTCSS	S	U0
9525 701 81102	L	Basic	CTCSS	V	U0
9525 701 81103	H	Basic	CTCSS	V	U0
9525 701 81104	L	Basic	CTCSS+MASC	S	U0
9525 701 81105	H	Basic	CTCSS+MASC	S	U0
9525 701 81106	L	Basic	CTCSS+MASC	V	U0
9525 701 81107	H	Basic	CTCSS+MASC	V	U0
9525 701 81108	H	Basic	CTCSS	S	TR
9525 701 81109	H	Basic	CTCSS	V	TR
9525 701 81110	H	Basic	CTCSS+MASC	S	TR
9525 701 81111	H	Basic	CTCSS+MASC	V	TR
9525 701 81112	L	Basic	CTCSS	S	A9
9525 701 81113	H	Basic	CTCSS	S	A9
9525 701 81114	L	Basic	CTCSS	V	A9
9525 701 81115	H	Basic	CTCSS	V	A9
9525 701 81116	L	Basic	CTCSS+MASC	S	A9
9525 701 81117	H	Basic	CTCSS+MASC	S	A9
9525 701 81118	L	Basic	CTCSS+MASC	V	A9
9525 701 81119	H	Basic	CTCSS+MASC	V	A9

Part Number	Power	Case	Signalling	Ch Spacing	Band
PRP74 - Medium Feature Transceiver With Optional Masc Scrambler (Cont'd)					
9525 701 81120	H	Basic	CTCSS	S	B5
9525 701 81121	H	Basic	CTCSS	V	B5
9525 701 81122	H	Basic	CTCSS+MASC	S	B5
9525 701 81123	H	Basic	CTCSS+MASC	V	B5
9525 701 81124	H	Basic	CTCSS	S	E0
9525 701 81125	H	Basic	CTCSS	V	E0
PRP76 - Limited Feature Transceiver					
9525 701 88100	H	No Disp	CTCSS	S	U0
9525 701 88101	H	Basic	CTCSS	S	U0
9525 701 88102	H	Numeric	CTCSS	S	U0
9525 701 88103	H	No Disp	CTCSS	V	U0
9525 701 88104	H	Basic	CTCSS	V	U0
9525 701 88105	H	Numeric	CTCSS	V	U0
9525 701 88106	H	No Disp	CTCSS	S	TR
9525 701 88107	H	Basic	CTCSS	S	TR
9525 701 88108	H	Numeric	CTCSS	S	TR
9525 701 88109	H	No Disp	CTCSS	V	TR
9525 701 88110	H	Basic	CTCSS	V	TR
9525 701 88111	H	Numeric	CTCSS	V	TR
9525 701 88112	H	No Disp	CTCSS	S	A9
9525 701 88113	H	Basic	CTCSS	S	A9
9525 701 88114	H	Numeric	CTCSS	S	A9
9525 701 88115	H	No Disp	CTCSS	V	A9
9525 701 88116	H	Basic	CTCSS	V	A9
9525 701 88117	H	Numeric	CTCSS	V	A9
9525 701 88118	H	No Disp	CTCSS	S	E0
9525 701 88119	H	Basic	CTCSS	S	E0
9525 701 88120	H	Numeric	CTCSS	S	E0
9525 701 88121	H	No Disp	CTCSS	V	E0
9525 701 88122	H	Basic	CTCSS	V	E0
9525 701 88123	H	Numeric	CTCSS	V	E0

ACCESSORIES

Speaker Microphones

Standard	9525 701 54020
Enhanced	9525 701 54021

Carrying Accessories

Leather Case Std	9525 701 54030
Leather Case Key	9525 701 54035
Chest Harness	9525 701 54031
Swivel Belt Mount	9525 701 54032
Belt Clip	9525 701 54033
Wrist Lanyard	9525 701 54034
D Ring Kit	9525 701 54039

Battery

Factory Mutual Battery	9525 701 54014

Antennae

U/T Band	9525 701 54205
A/B Band	9525 701 54202
E Band	9525 701 54200

TRANSCEIVER SERVICING

Repair work is only to be attempted by competent personnel. Use only Philips approved spares as replacements. Substitution may impair Intrinsic Safety.

PARTS LIST

Modified RF PCB Assemblies are used in this product. The standard boards are **NOT** suitable. Antenna changeover relay M401 is sealed to the PCB and is therefore not a field-serviceable item. Diodes D406-409 are also part of the Factory Mutual protection and are not field serviceable.

RF PCB Assemblies

PCB Assembly RF High Power 12,5kHz U0 band Factory Mutual	5322 216 82899
PCB Assembly RF High Power 25kHz U0 band Factory Mutual	5322 216 82901
PCB Assembly RF Low Power 12,5kHz U0 band Factory Mutual	5322 216 82915
PCB Assembly RF Low Power 25kHz U0 band Factory Mutual	3513 570 09001
PCB Assembly RF High Power 12,5kHz T4 band Factory Mutual	5322 216 82902
PCB Assembly RF High Power 25kHz T4 band Factory Mutual	5322 216 82903
PCB Assembly RF High Power 12,5kHz TR band Factory Mutual	5322 216 82904
PCB Assembly RF High Power 25kHz TR band Factory Mutual	5322 216 82905
PCB Assembly RF Low Power 12,5kHz A9 band Factory Mutual	5322 216 82914
PCB Assembly RF Low Power 25kHz A9 band Factory Mutual	5322 216 82913
PCB Assembly RF High Power 12,5kHz A9 band Factory Mutual	5322 216 82906
PCB Assembly RF High Power 25kHz A9 band Factory Mutual	5322 216 82907
PCB Assembly RF High Power 12,5kHz B5 band Factory Mutual	5322 216 82911
PCB Assembly RF High Power 25kHz B5 band Factory Mutual	5322 216 82912
PCB Assembly RF High Power 12,5kHz E0 band Factory Mutual	5322 216 82908
PCB Assembly RF High Power 25kHz E0 band Factory Mutual	5322 216 82909

Control PCB Assemblies

PCB Assembly PRP73 Standard Case Factory Mutual	5322 216 82921
PCB Assembly PRP73 Keypad Case Factory Mutual	5322 216 82919
PCB Assembly PRP74 With CTCSS Factory Mutual	5322 216 82922
PCB Assembly PRP74 With CTCSS and CO MASC	3513 570 09031
PCB Assembly PRP7601 Factory Mutual	5322 216 82916
PCB Assembly PRP7602 Factory Mutual	5322 216 82917
PCB Assembly PRP7603 Factory Mutual	5322 216 82918

Miscellaneous Items

Factory Mutual Battery Pack	9525 701 54014
Factory Mutual Side Label	5322 455 21939
Factory Mutual Information Sheet TP1813	4313 329 32331

Other parts as per standard transceiver.