SRP8000 SERIES
VHF/UHF PORTABLE RADIO

SERVICE MANUAL

TP0332/2

Introduction

Simoco Europe Ltd is a leading manufacturer of professional mobile radio communications with more than fifty years experience of designing, manufacturing, installing and maintaining their product range.

With an enviable pedigree, Simoco Europe Ltd leads the field for innovation and quality; is fully committed in design, development and enhancing standards which included POCSAG and MPT1327. Simoco is deeply involved in TETRA digital technology; pioneering its development since 1990.

Simoco's products are backed by a world-wide capability in system planning, installation and commissioning, plus an after-sales service organisation second to none.

The 'Simoco' name is synonymous with outstanding technological innovation, achievement and quality for mobile radio communications systems world-wide that is wholly dedicated to Customer satisfaction.

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 the correct 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

NICAD batteries are used with this equipment. They must not be short-circuited or incinerated. They must be disposed of safely in accordance with the battery manufacturers' instructions.

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AMENDMENT LIST

Changes made to the equipment described in this publication are published as amendments which are dated and consecutively numbered.

Reprints will incorporate all amendments, and applicable change notes and service bulletins to date and entries to this effect will be recorded on the amendment list below.

Each page affected by amendment action will bear the amendment number as a suffix to the reference number, eg. TP0123/1AM4 indicates that the page has been corrected by amendment number 4.

The text content of the page that has been affected by the amendment will be indicated by a marker in the outside margin, starting on the first line and ending on the last line of text affected. This paragraph is marked as an example.

Amendment packs, where applicable, can be obtained from the Order Desk.

Should it become necessary to raise the issue of a publication, the amendment numbering will recommence with No. 1.

Amendment No	Date	Initials	Remarks
	July 1998 July 1998		Change Notes up to 25 June 98 actioned in this issue. Service Bulletins up to 17 July 98 actioned in this issue.

ERRORS AND OMISSIONS

The usefulness of this publication depends upon its accuracy. Whilst every endeavour has been made to eliminate errors, some may exist. It is requested therefore that any errors or omissions noted be advised as follows:

Please quote:

(1) Title of publication
(2) TP Ref No
(3) Last amendment No. received.
(4) Page and/or Figure No. in error.

Please send to:

Simoco Europe Ltd,
Technical Publications Department,
P.O. Box 24,
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England.

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Service Concept

The SRP8000 series has been designed to provide low cost trunked and non trunked analogue, portable transceivers, using common core electronics, software and interfacing. Once a customer has purchased this equipment, Simoco Europe Ltd. can follow this by providing a ongoing, high level of customer support together with a competitive and professional servicing activity.

There are three levels of service available, namely:

Level	Activity	Recommended Spares	Recommended Test equipment
1	Replacement of complete transceiver/battery/antenna/fuses Reprogramming	Transceivers, Batteries, Antennas, Fuses Ancillaries	Multimeter, P.C., Radio software Programmer
2	Replacement of MMI PCB or mechanical component replacement, cosmetic repair.	Listed in Level 2 Spares Schedule	As above + service aids and test equipment
3	Repair by PCB or major component replacement, Cosmetic repair. Repair of Radio PCB to component level in CRU.	Listed in Level 2 Spares Schedule. Radio PCB components only available to CRU.	As above + service aids and test equipment

Warranty

The normal 12 month warranty will apply to all radios and ancillaries.

Service

The Field Service Level for the SRP8000 portable is Level 2, MMI PCB replacement.

Refer to Section 5 for the parts listing. Items marked with an asterisk '*' are non-repairable and non-returnable to the CRU.

- **Service Level 1**

All ancillary items are Level 1 service.
These items should be replaced if faulty. They are non-repairable and non-returnable to the CRU.

- **Service Level 2**

MMI PCB (only) and case part replacement, will be only be carried out in field repair workshops, or in the Central Repair Unit (CRU) if required.

- **Service Level 3**

Radio PCB component level repair will ONLY be carried out in the CRU. For this, the COMPLETE radio MUST be returned to the CRU.
The CRU will not accept individual Radio PCB's that have been removed from a radio.

Turn around time for Level 3 repair will be 48 hours maximum from customer back to customer.

SERVICE BULLETINS

Service Bulletins will be issued as necessary to inform Branch Offices of any matter affecting the serviceability of the equipment in the field.

SRP8000 SERIES
VHF/UHF PORTABLE RADIO

SECTION 1 - GENERAL INFORMATION

INTRODUCTION

Figure 1.1 The SRP8010, SRP8020/21 and SRP8030/31 Portable Radios

The SRP8000 Series is an advanced portable radio for use in hand-held and body-worn applications. It provides two main types of signalling operation:

Conventional operation (SRP8010, SRP8020 and SRP8030) offering CTCSS and DTMF signalling and channel scanning.

Trunked operation (SRP8021 and SRP8031) supporting operation on MPT1327 based trunking systems.

There are five variants of the SRP8000 Series radio:

Basic	SRP8010	With PTT switch, On/Off/Volume control knob, channel change key, one other programmable key* and four LEDs to indicate the channel in use. * When one channel only is programmed, two programmable keys are available.
Simple	SRP8020	With PTT and Alarm switches, On/Off/Volume control knob, two other keys, an LCD display and four keys associated with the display.
	SRP8021	A trunked version of the SRP8020.
Complex	SRP8030	The same controls as the Simple variant with an additional 12-key numeric keypad.
	SRP8031	A trunked version of the SRP8030.

All variants have a single interface for use with external ancillaries and tools. A coaxial RF connector is provided for the antenna connection.

Operation of the SRP8000 Series is controlled by settings of the various software parameters. These operating parameters are stored as data in Flash EPROM and these data may be programmed into the radio using an external data programmer, allowing the SRP8000 Series to be customized to the requirements of a particular user.

The SRP8000 Series can use customization data in a user memory plug (UMP), update its customization data from a UMP, or copy its customization data to a UMP,

The radio 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 be charged whilst still attached to the equipment, allowing the radio to remain in operation.

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 to 88MHz AB 138 to 174MHz U0 440 to 470MHz R1 335 to 375MHz Tk 403 to 450MHz (Rx), 403 to 440MHz (Tx).
Number of Channels	SRP8010 four SRP8020 64 SRP8030 100.
Channel Spacing	12,5, 20 or 25kHz (depending on variant).
Power Supply	7,2V (nominal) 1600mAh re-chargeable nickel cadmium battery.
Typical Battery Endurance	5% Transmit, 5% Receive, 90% Standby - 8 hours 20 minutes 5% Transmit, 20% Receive, 75% Standby - 8 hours.

Note: These battery endurance figures are for economized versions with no signalling or encryption options.

Frequency Stability	VHF ±2 ppm over full temperature range. UHF (20/25kHz) ±2 ppm over full temperature range. UHF (12,5kHz) ±2 ppm over full temperature range.
Overall Dimensions	Height : 143mm Width : 58mm Depth : 42mm.
Weight	Radio : 320g Battery pack : 250g Total : 570g.
Environmental Protection	IEC 54.
Electromagnetic Compatibility (EMC)	Conforms with draft European Directive on EMC.

Receiver

Switching Bandwidth	Full band coverage without degradation.
Sensitivity	Speech Better than 0,3µV (VHF), 0,35µV (UHF) for 12dB SINAD (unweighted) Data Better than 0,4µV (VHF), 0,5µV (VHF) for 1% bit error rate.
Adjacent Channel Selectivity	Speech and DataBetter than 60dB for 12,5kHz Better than 70dB for 20/25kHz.
Intermodulation	Better than 65dB.
Spurious Response Attenuation	Better than 70dB.
Audio Output	500mW into 16 ohms at less than 5% distortion.

Transmitter

Switching Bandwidth	Full band coverage without degradation.
Power Output (into 50 ohms)	4W (E0, Tk and U0 Bands). 5W (AB and R1 Bands).
Modulation Distortion	Typically 5% with 60% modulation at 1kHz, better than 10% at temperature extremes.
Spurious Emission	Better than –36dBm (9kHz to 1GHz) Better than –30 dBm (1 to 4GHz).
Deviation	±2,5kHz for 12,5kHz channel spacing ±4kHz for 20kHz channel spacing ±5kHz for 25kHz channel spacing.

Note: All measurements to ETS 300086.

Signalling	Selective Calling	EEA* CCIR* SVEI* DZVEI* SZVEI*
	* Both ST500 and CML tone sets.	
	CTCSS - 39 tone EIA	
	DTMF.	

ASSOCIATED EQUIPMENTS

Part Number	Description	
0000 138 10002	Battery 1,6Ah - Std	
0000 138 10003	Battery 1,6Ah - FM.	Available Autumn 1998
0000 138 20002	Trickle Charger PSU (UK)	
0000 138 20003	Trickle Charger PSU (US)	
0000 138 20004	Trickle Charger PSU (EU).	
0000 138 20009	Battery Charger Pocket (2-way)	
0000 138 20017	Battery Charger Pocket (Single-way)	

ANCILLARY ITEMS

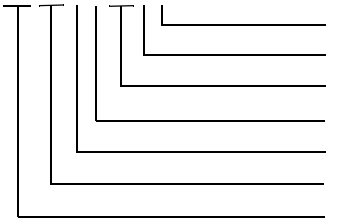
Part Number	Description	
0000 242 10001	Lapel Loudspeaker/Microphone	
0000 242 10002	Headset, complete	
0000 321 60001	Programming Lead	
0000 445 90007	Carrying Case, Leather	
0000 445 90008	Holster Assembly, complete (includes belt clip and stud)	
0000 405 90005	Lanyard	
0000 138 10002	User Memory Plug (UMP)	
0000 138 20005	Desk Charger PSU - 110V	
0000 138 20006	Desk Charger PSU - 230V	
0000 138 20010	Multi-charger 6-way PSU - UK	
0000 138 20011	Multi-charger 6-way PSU - EU	
0000 138 20012	Multi-charger 10-way PSU - UK	
0000 138 20013	Multi-charger 10-way PSU - EU	
0000 138 20014	Single charger PSU - EU	
0000 138 20015	Single charger PSU - UK	
0000 138 20016	Single charger PSU - US	
0000 138 20018	PRP70 Charger Pocket Adaptor	
0000 268 90002	Antenna Adaptor	
PA-PROG	Programmer Kit	
PA-VEHA	Vehicle Mount Attachment	(not yet available)

EQUIPMENT VARIATION

The SRP8000 Series portable radio is ordered using a ten character product code as defined in Table 1.1.

For example:

PCU0XC01E1



Packed Items - Portable radio, user guide plus 1,6Ahr battery
Antenna - 430 to 472MHz ¼ wave whip
Market - Standard production
Signalling Type - Conventional
Channel Spacing - 12,5 / 20 / 25kHz
Frequency Band - 440 to 470MHz
Product Type - Portable Complex

Product Code Character	Parameter	Chars.	Definition	Chars.	Definition
1 **2**	Product Type	PB = PS =	Portable Basic Portable Simple	PC = PA =	Portable Complex Portable Ancillaries
3 **4**	Frequency Band	E0 = Tk =	68 to 88MHz 403 to 440MHz (Tx) 403 to 450MHz (Rx)	U0 = AB R1 =	440 to 470MHz 138 to 174MHz 335 to 375MHz
5	Channel Spacing	S =	12,5kHz	X =	12,5 / 20 / 25 kHz
6	Signalling Type	C = G =	Conventional Gong An (China)	T =	Trunked
7 **8**	Markets	01 = 02 = 03 = 06 = 07 = 10 = 11 =	Standard Production France Germany Denmark Sweden Norway Switzerland	12 = 13 = 14 = 18 = 23 = 25 = 27 = SA =	Finland Holland Italy Spain Australia Austria Belgium South East Asia
9	Antenna	0 = 1 = 2 = 3 = 4 = 5 = 6 = 7 =	NOT SUPPLIED 67 to 88MHz uncut 67 to 74MHz Helical 74 to 81MHz Helical 81 to 88MHz Helical 138 to 148MHz Helical 146 to 156MHz Helical 154 to 164MHz Helical	8 = C = D = E = F = G = H =	162 to 174MHz Helical 138 to 237MHz uncut 400 to 440MHz ¼wave Whip 430 to 472MHz ¼wave Whip 335 to 375MHz Helical 400 to 440MHz Helical 430 to 472MHz Helical
10	Packed Items	0 = 1 = 2 =	Radio plus user guide only Portable Radio, user guide and 1,6Ah battery Portable Radio, user guide and factory mutual battery		

Table 1.1 Product Code Definitions

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 1.2 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							
		ST-500			CML				SZVEI
		CCIR/ EEA Type 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	2400
'1' TONE	1	1124	1060	970	1124	1124	1060	970	1060
'2' TONE	2	1197	1160	1060	1197	1197	1160	1060	1160
'3' TONE	3	1275	1270	1160	1275	1275	1270	1160	1270
'4' TONE	4	1358	1400	1270	1358	1358	1400	1270	1400
'5' TONE	5	1446	1530	1400	1446	1446	1530	1400	1530
'6' TONE	6	1540	1670	1530	1540	1540	1670	1530	1670
'7' TONE	7	1640	1830	1670	1640	1640	1830	1670	1830
'8' TONE	8	1747	2000	1830	1747	1747	2000	1830	2000
'9' TONE	9	1860	2200	2000	1860	1860	2200	2000	2200
GROUP TONE	A	1055	970	825	2400	1055	2800	2600	886
TONE B	B	-	-	-	930	930	810	-	-
ALARM TONE	C	2400	2800	2600	2247	2247	970	886	740
TONE D	D	-	-	-	991	991	886	810	680*
REPEAT	E	2110	2600	2400	2110	2110	2600	2400	970
TONE NO TONE	F	-	-	-	-	-	-	-	-

Table 1.3 Selcall Tone Frequencies (All frequencies in Hz)

SRP8000 SERIES
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SECTION 2 - COMMISSIONING

UNPACKING

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

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

COMMISSIONING

**NICAD batteries are used with this equipment.
They must not be short-circuited or incinerated.
They must be disposed of safely in accordance
with the battery manufacturers' instructions.**

Warning Label

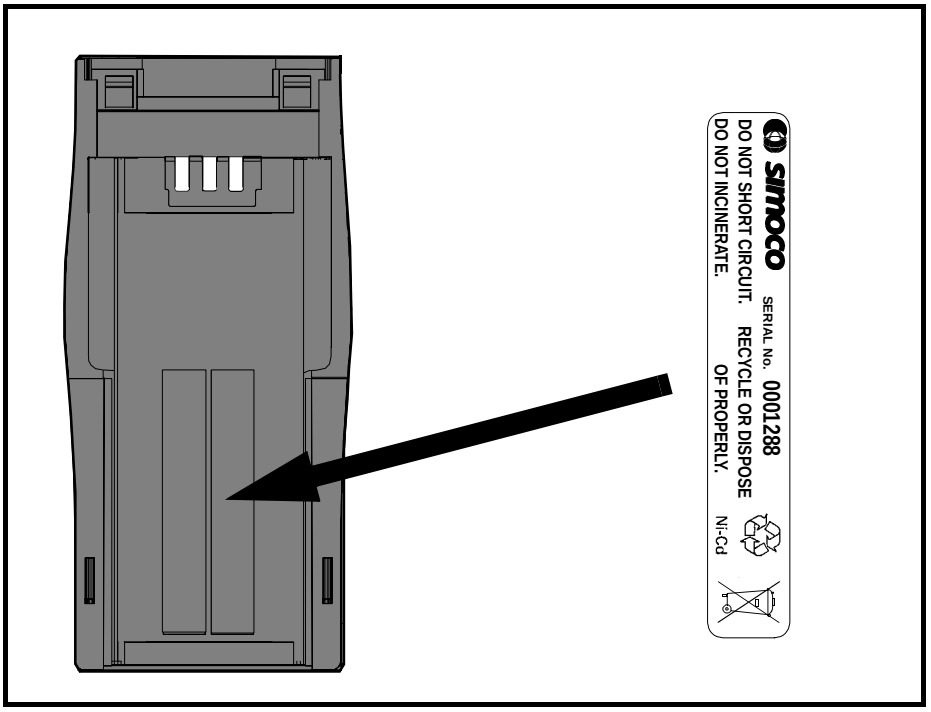

Figure 2.1 Battery Warning Label

Each battery carries a label giving simple warning 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 complete charge/discharge cycles may be required.
(2) If required, fit the wrist lanyard.
(3) Fit the antenna.
(4) Fit the battery.

Charging the Battery

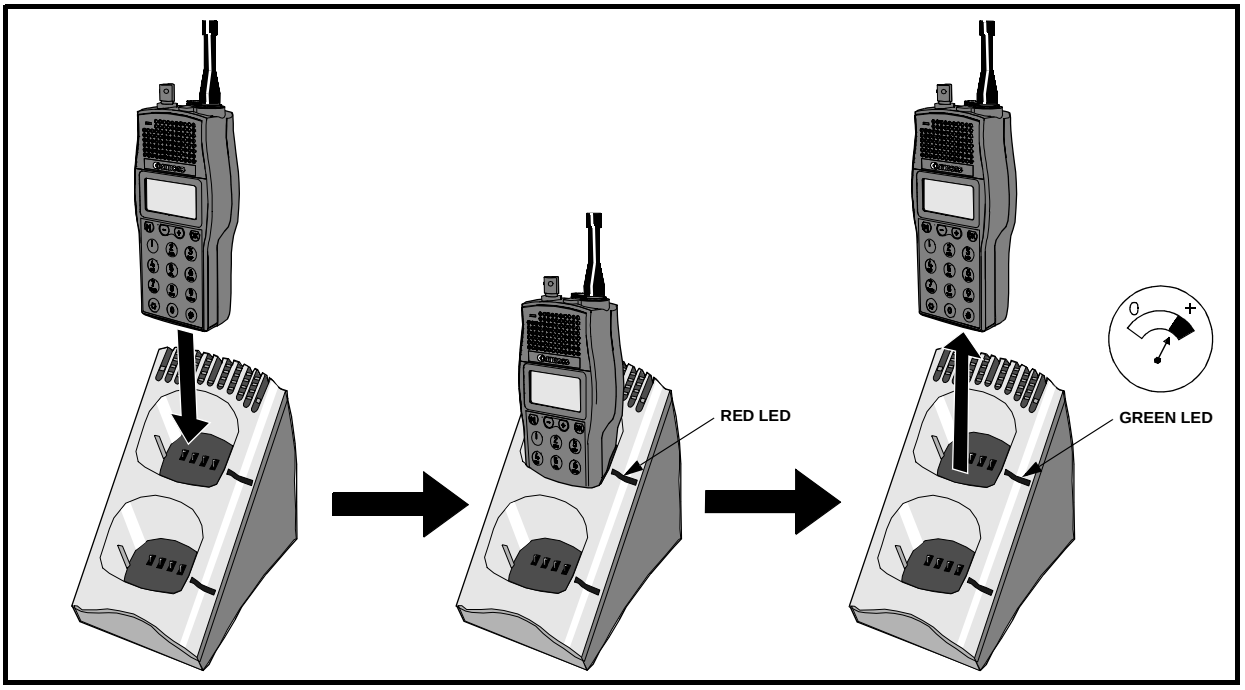

Figure 2.2 Battery Charging Sequence

The SRP8000 Series Portable Radio is supplied with batteries in their discharged state. **Before using the radio, it is necessary to charge the battery using one of the approved battery chargers**. This takes approximately one hour, after which the red LED changes to green.

Fitting the Antenna

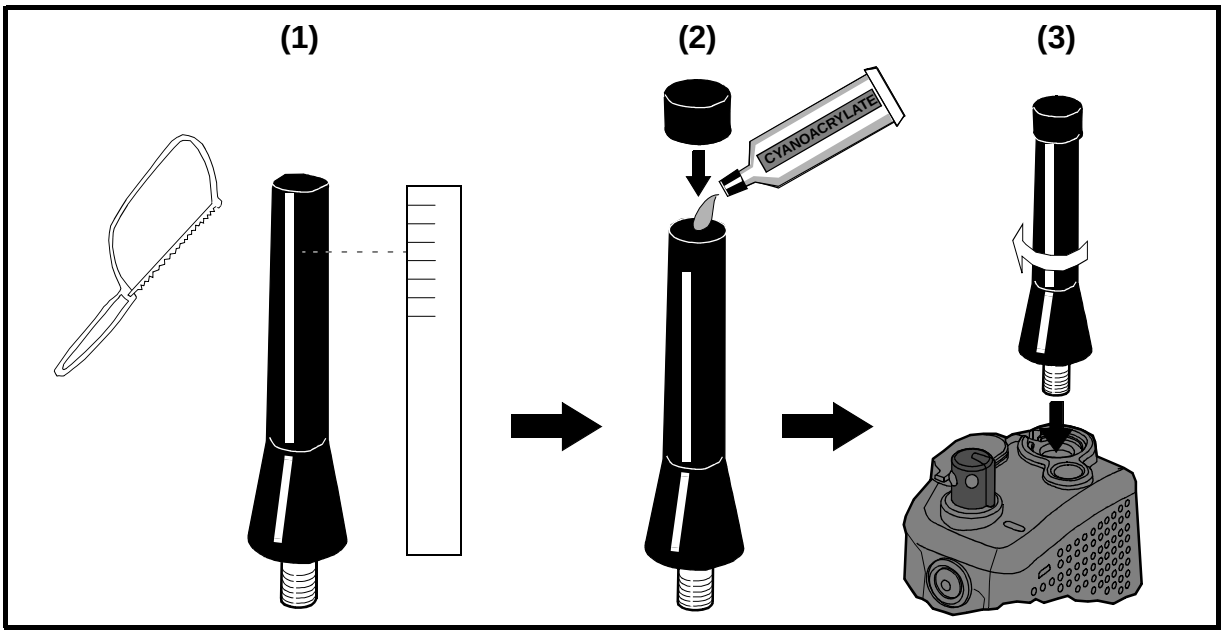

Figure 2.3 Fitting the Antenna

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

The antenna supplied with the radio is the correct length for the frequency band ordered and must be fitted to the mounting boss at the top of the radio (refer to Figure 2.3 step 3).

As an option, an uncut antenna may be supplied which will cover a wide frequency band. In this case, the antenna must be cut to the transmitter centre frequency of the frequency band to be used. Proceed as follows:

(1) Using a suitable hacksaw or cutters, cut the antenna to the length required for the transmitter centre frequency on which the radio is to be used, as shown on the cutting chart supplied (refer to Figure 2.3).
(2) Fit the antenna end-cap provided, securing with cyanoacrylate adhesive.
(3) Fit the antenna.

Note: Where the antenna cutting chart shows a cut length that is longer than the uncut length of the antenna supplied, then the antenna should be left uncut.

Fitting the Wrist Lanyard

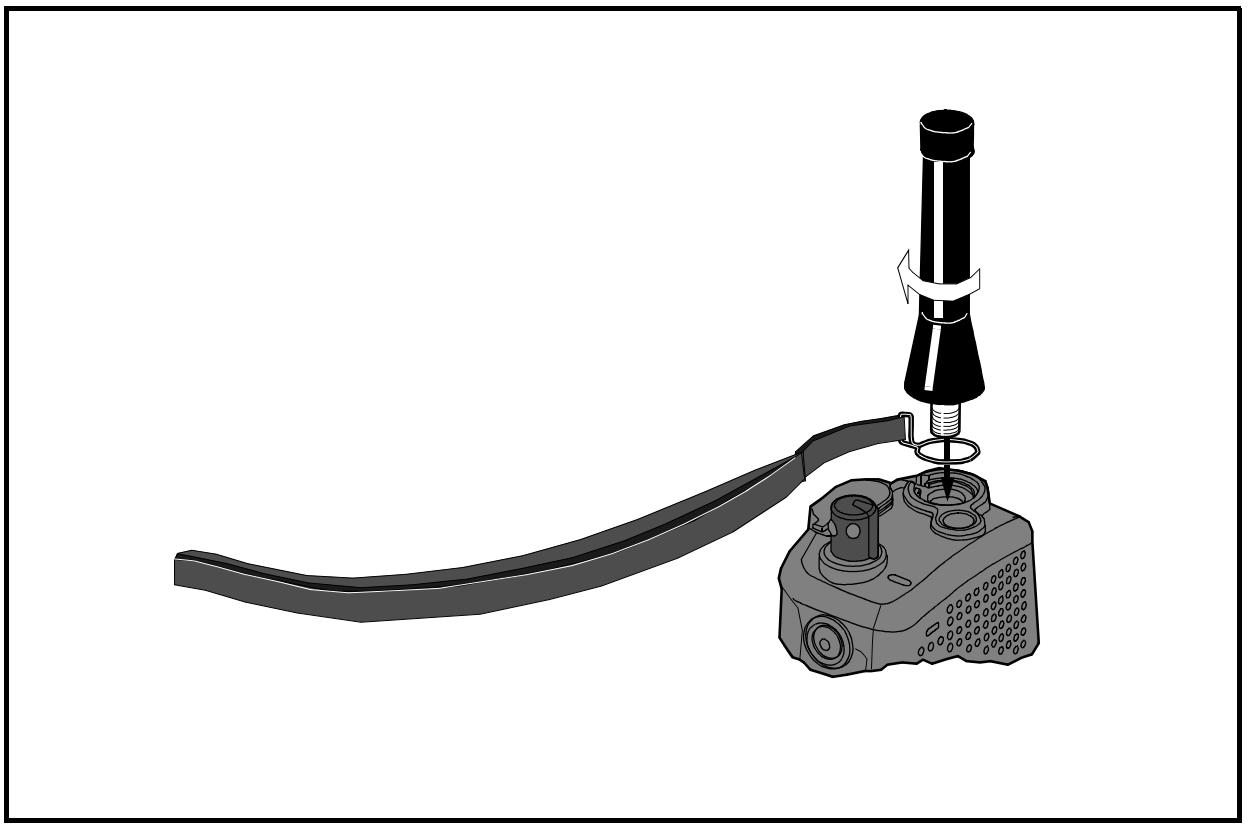

Figure 2.4 Fitting the Wrist Lanyard

If purchased, the optional wrist lanyard is fitted as follows:

(1) Remove the antenna (if already fitted).
(2) Locate and hold the metal ring onto the antenna boss.
(3) Refit the antenna through the metal ring.

Fitting a Battery

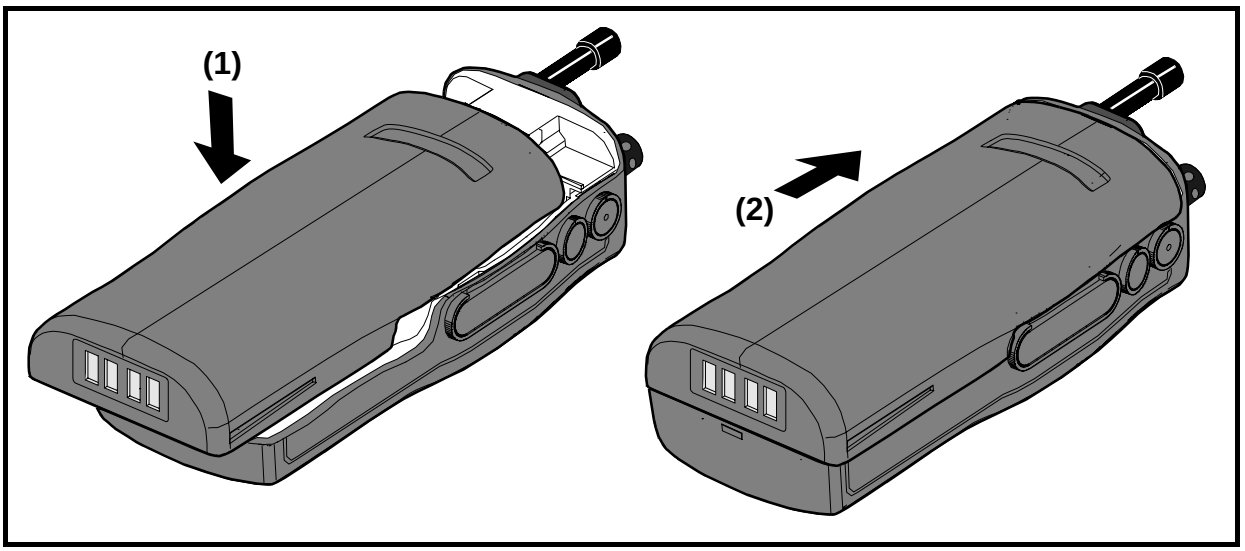

Figure 2.5 Fitting a Battery

(1) Locate the battery on the back of the radio with approximately 10mm of the nickel plated metal casting showing.
(2) Slide the battery up the radio. When the battery is fully in position, the catch will locate and lock. (Refer to **Remove the Battery** on page 4.1 for instructions on removing the battery).

LCD DISPLAY

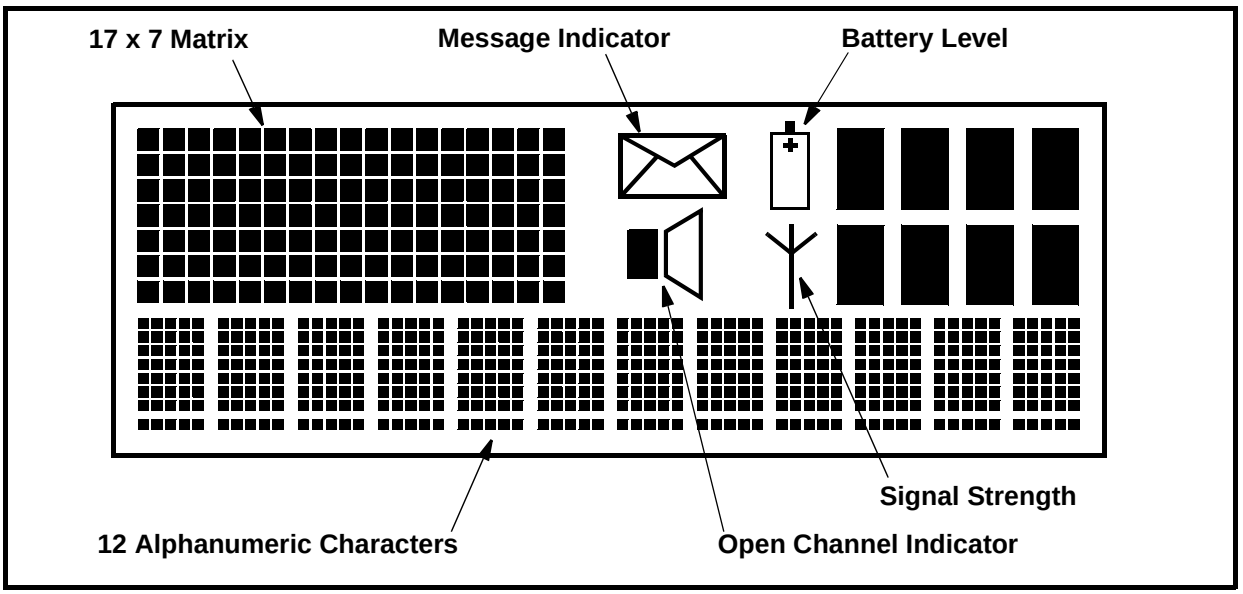

Figure 2.6 LCD Display

The SRP8010 variant does not have an LCD display.

An example of the LCD display is shown in Figure 2.6. The following paragraphs detail the normal configuration of symbols. Refer to the appropriate Operating Instructions for the use of flags on particular radios.

17 x 7 Matrix

This section is used to indicate the condition, eg. channel number or error messages, etc. - refer to Figure 2.7.

Alphanumeric Characters

Displays error messages (explaining the icon) and user prompts - refer to Figure 2.7.

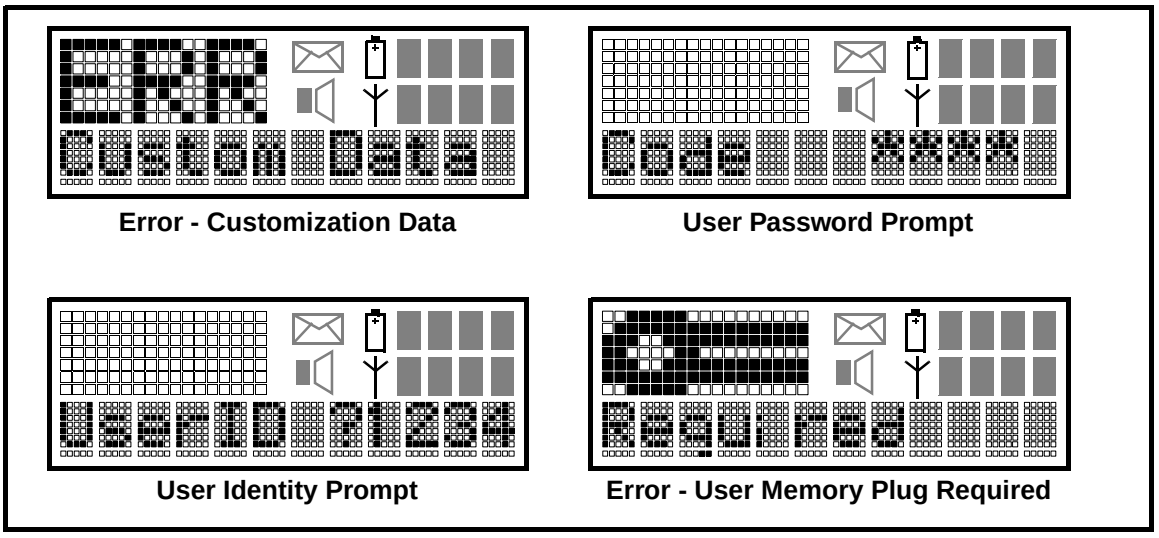

Figure 2.7 LCD Display Examples

Message

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

Battery Level

The battery level symbol ▯ ▮▮▮▮ indicates the state of the battery. A fully charged battery will result in all four segments of the bar graph being displayed; only one segment will be displayed when the battery is almost discharged

Loudspeaker

The loudspeaker symbol 🔈 is displayed to indicate an open channel (if programmed).

Signal Strength

This is a four stage bar graph ᛉ ▮▮▮▮ which indicates the strength of the received signal. When no signal is present none of the segments are displayed; when a very strong signal is present then all segments are displayed.

FUNCTION KEYS

The key layout and the key functions are described in the relevant SRP8000 Series User Guide.

NUMERIC KEYPAD

The keypad layout and key functions are described in the relevant SRP8000 Series User Guide.

LED

A tri-colour LED is used to indicate the status of the radio.

Status	LED
Transceiver initializing at switch-on	Steady Red
Error State	Steady Red
Recoverable Switch-on Error	Red for 2 seconds
Switch-on (no error)	Green for 2 seconds
Transmit	Steady Red
Busy	Flashing Yellow (0,5s on, 0,5s off)
Called	Flashing Green (0,5s on, 0,5s off)
Low Battery	Flashing Red (0,5s on, 0,5s off)
Transmitting with Low Battery	Flashing Red (0,2s on, 0,2s off)

Table 2.1 Tri-colour LED Indications

Channel LEDs (SRP8010 only)

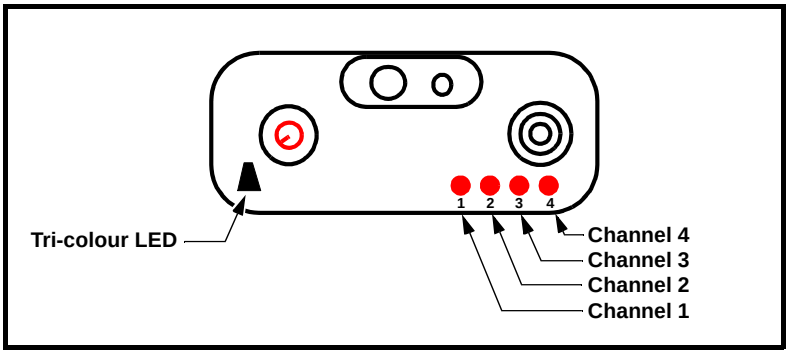

Figure 2.8 SRP8010 LEDs

The four channel LEDs indicate the SRP8010 receive and transmit modes (refer to Table 2.2).

Status	Channel LED Indication
Receive mode but no signal	The appropriate LED flashes.
Receive mode with signal	The appropriate LED is on continuously.
Transmit mode	The appropriate LED is on continuously.

Table 2.2 SRP8010 Channel LED Indications

AUDIBLE ALERTS

Various tones are available to alert the user to the radio's call and error states.

Alert	Tone/Tones
Valid Key Press 'Key Click' (if enabled)	1800Hz for 0,05s.
Invalid Key Press (if enabled)	400Hz for 0,15s.
Battery Low (if enabled)	400Hz, 0,2s on, 0,1s off, 0,2s on - repeated five times every minute until battery on charge, or replaced.
Transmit Time-out Warning	1800Hz, 0,1s on, 0,9s off, repeated until Transmit Time-out.
Call Alert type 1	771Hz, 0,15s on, 0,3s off, repeated for up to four seconds or until a key is pressed.
Call Alert Type 2	771Hz for 0,5s.
UK Ringing Tone	771Hz, 0,4s on, 0,2s off, 0,4s on, 0,2s off, repeated every 3 seconds until a key is pressed.
European Ringing Tone	771Hz, 0,4s on, 0,2s off, repeated until a key is pressed.
Group Call	1200Hz, 0,2s on, 0,1s off, 0,2s on.
Urgent Call	1200Hz, 0,2s on, 0,1s off, 0,2s on, 0,1s off, 0,2s on, 0,5s off repeated five times or until a key is pressed.
Transmit Inhibit	1800Hz, 0,375s on, 0375s off, repeated once.
Remote Reset	1200Hz for 0,05s.
Error Lock (Synthesizer cannot lock)	400Hz, 150ms on, 150ms off, repeated five times.

Table 2.3 Alert Tones

CUSTOMIZATION DATA

The SRP8000 Series functionality depends on the customization data which has been loaded. An SRP8000 series radio may be supplied with a 'Factory Default', or customer specific customization data.

An SRP8000 Series Programmer may be used to customize a radio.

Details are given in the SRP8000 Series Data Programmer User Guide (TP1858).

SRP8000 SERIES
VHF/UHF PORTABLE RADIO
SECTION 3 - TECHNICAL DESCRIPTION

INTRODUCTION

The SRP8000 Series is a range of advanced portable radios using the latest modern technology to achieve a very high performance in a small size. Internally the radio consists of:

(a) Radio PCB A multi-layer assembly with components mounted both sides.
(b) MMI PCB Man-Machine-Interface containing the keyboard and display.

RADIO PCB DESCRIPTION

A 'Top Level' circuit diagram (with a block for each function), and individual circuit diagrams for each of these function blocks, are located in Section 6. Each circuit diagram has two-digit component circuit references prefixed with a single digit, unique to that particular circuit (eg. C41, on the PSU circuit diagram, has a prefix of 5 so that its circuit reference becomes C541 - see below). The main 'Top Level' circuit diagram references are two-digit without a prefix).

The PCB assembly contains the following functional blocks:

Circuit Block	Figure Number	Circuit Reference Prefix
Power supply	6.7	5
Receiver	6.8	2 and 3
Transmitter	6.9	1
Frequency generation	6.10	4
Control	6.11	6
Baseband	6.12	7
Smart interface	6.13	8.

Overall Block Schematic Diagram

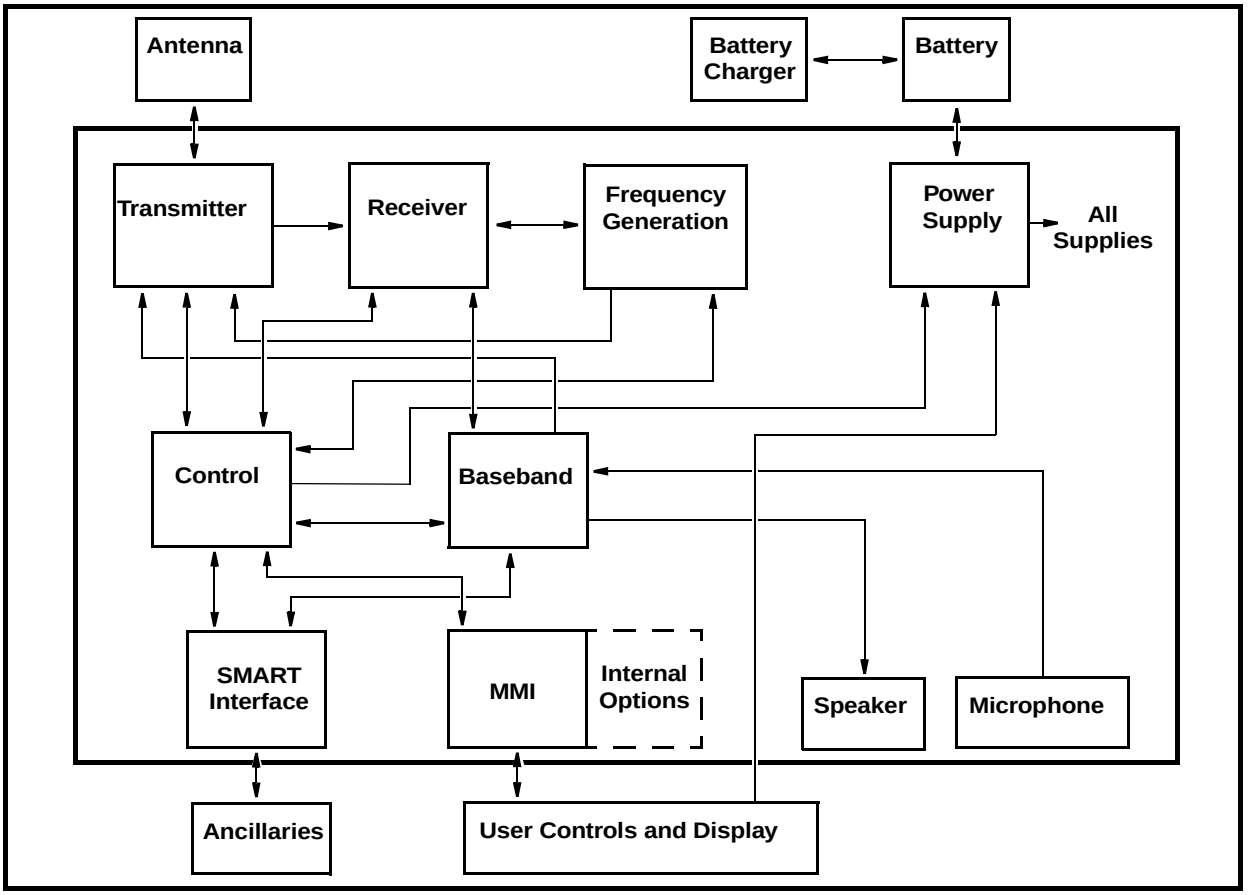

Figure 3.1 Overall Block Schematic Diagram

POWER SUPPLIES AND ON/OFF CONTROL

The main power supply for the radio is the 7,2V battery which is connected directly to the PCB via the battery contacts on the rear of the radio. The power supply has five separate regulators supplying power to the following blocks (see Figure 3.2):

VCO PSU	+5,6V	Frequency generation.
RF PSU	+5V	Transmitter and Receiver and switched supply to Tx and Rx.
AF PSU	+5,2V	Audio and MMI.
Control PSU	+5V	Supply, reference, reset to control and baseband.
Rx/VCO Bias PSU	–12V	VCO bias to Frequency generation/Rx Filter Bias.

The power supply distribution system for the radio is illustrated in Figure 3.2 on page 3.3.

Turning On

When the radio is turned on by the rotary control, a positive pulse is applied to the CONT input of the RF_PSU regulator IC501 via C538. This pulse turns on the RF_PSU regulator output. The RF_PSU rail in turn enables the CONT_PSU, VCO_PSU and AF_PSU supplies and also powers the on/off latch formed by TR526/TR527. This transistor latch keeps the RF_PSU supply on by holding PSU_ON high even after the initial switch-on pulse via C538 has died away.

Once the processor starts running, it issues a periodic watchdog pulse on WDOG#RXD0. This pumps up the voltage on the gate of TR529 to +5V via the charge pump formed by C541, D505 and C540. Thus, the continued presence of watchdog pulses keeps TR529 on and, hence, TR528 off. The on/off transistor latch TR526/TR527 is thus left untouched by the watchdog circuit and stays this way until the watchdog pulses stop. This is described in the next section “Turning Off”.

Turning Off

Although powering off is initiated by turning the rotary control, the actual power shutdown is controlled by software. This is to allow time for the software to finish any tasks it may be performing. When the radio is turned off by the rotary control, the processor is informed of the request to turn the radio off by means of the OFF signal. The processor then completes any outstanding tasks such as saving current radio status or saving UMP data before it shuts down the power supplies by halting the generation of the watchdog pulses on WDOG#RXD0.

In the absence of watchdog pulses, the voltage on the gate of TR529 decays to 0V and turns off TR529. This turns on TR528 which changes the state of the on/off transistor latch TR526/TR527. This forces PSU_ON low and turns off the RF_PSU regulator IC501. All the other regulators are then turned off as they are enabled by RF_PSU.

Reset Circuit

The reset circuit, consisting of IC504_A, IC504_B and associated components, continuously monitors the control supply voltage CONT_PSU and generates a reset whenever this supply drops below a minimum acceptable level for the control circuits to continue running. When the supply returns above this voltage, the reset is released and the processor restarts as if turned on by the rotary control.

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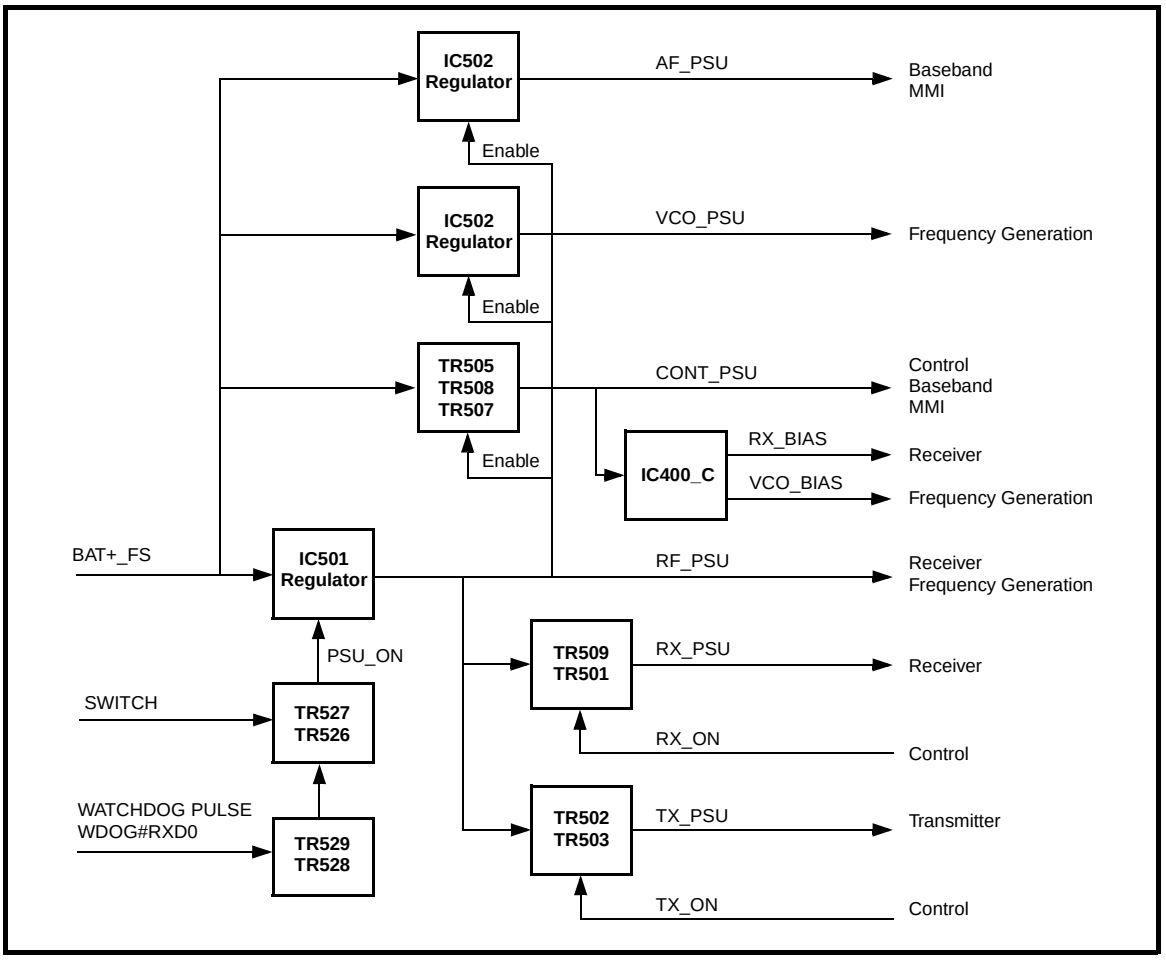

Figure 3.2 Power Supply Distribution

RECEIVER

Antenna Filter

Figure 3.3 on page 3.5 is a block diagram of the receiver and the circuit diagram is shown in Figure 6.8.

The antenna low pass filter (L104 to RX_ANT on Figure 6.9) isolates the receiver input during transmissions (D100 forward biased) whilst maintaining a low loss connection from the antenna in the receive state.

First Tracking Filter

The first tracking band-pass filter limits the unwanted signals that can enter the receive path. This filter also provides the attenuation required for image rejection and protection against IF spurious response.

The filter is a conventional two section capacitively top coupled design, each section being tuned by varicap diodes (D205 to D208 and D215 to D216). The required tune voltages are derived from an IIC (Inter-Integrated Circuit bus) DAC (IC605), RX_TUNE1 and a DC level with a small amount of pulse width modulation (RX_TUNE2). Both the DAC and the pulse width modulator have eight bit resolution. Alignment of the filter is achieved by the control circuits recording the tune voltages required to peak the filter's response at the top, middle and bottom of the frequency band. The control circuitry uses quadratic interpolation to predict the required operating point for all intermediate frequencies.

RF Amplifier

The RF amplifier (TR200 and associated components) is the first gain stage of the receiver and is important in defining the overall performance of the receiver. The amplifier noise factor is less than 2dB and gain is sufficient to overcome the losses of subsequent stages.

Second Tracking Filter

The second tracking filter, (varicap diodes D201 to D204, D217 to D218 and associated components) supplies the remaining filtering required to meet image rejection and IF spurious response. The required tuning voltages are derived from the Control section via RX_TUNE3, RX_TUNE4 inputs and op amps IC200_B and IC200_C. RX_TUNE3 is controlled by a DAC and RX_TUNE4 by a pulse width modulator.

The filter is of the same design as the first tracking filter.

First Mixer

The first mixer (D200 - T200) is a single balanced design implemented with a wound balun. The local oscillator frequency is either 21,4MHz (E0 band) or 45MHz (AB and K bands) above the first IF frequency or 45MHz below the first IF frequency (R1, Tk and U0 bands). The mixer requires 3dBm drive from the local oscillator to achieve the required performance.

First IF Filters and IF Amplifier

The IF crystal filter (F200_A and F200_B) consists of two packages each providing two poles of filtering. The IF amplifier (TR201) is placed between the mixer and filters. The choice of IF frequency is band dependent as is the low/high side injection. This is summarized in Table 3.1.

Band	Injection	IF Frequency
E0	High	21,4MHz
AB and K	High	45MHz
R1, Tk, U0	Low	45MHz

Table 3.1 First IF Frequency for each Band

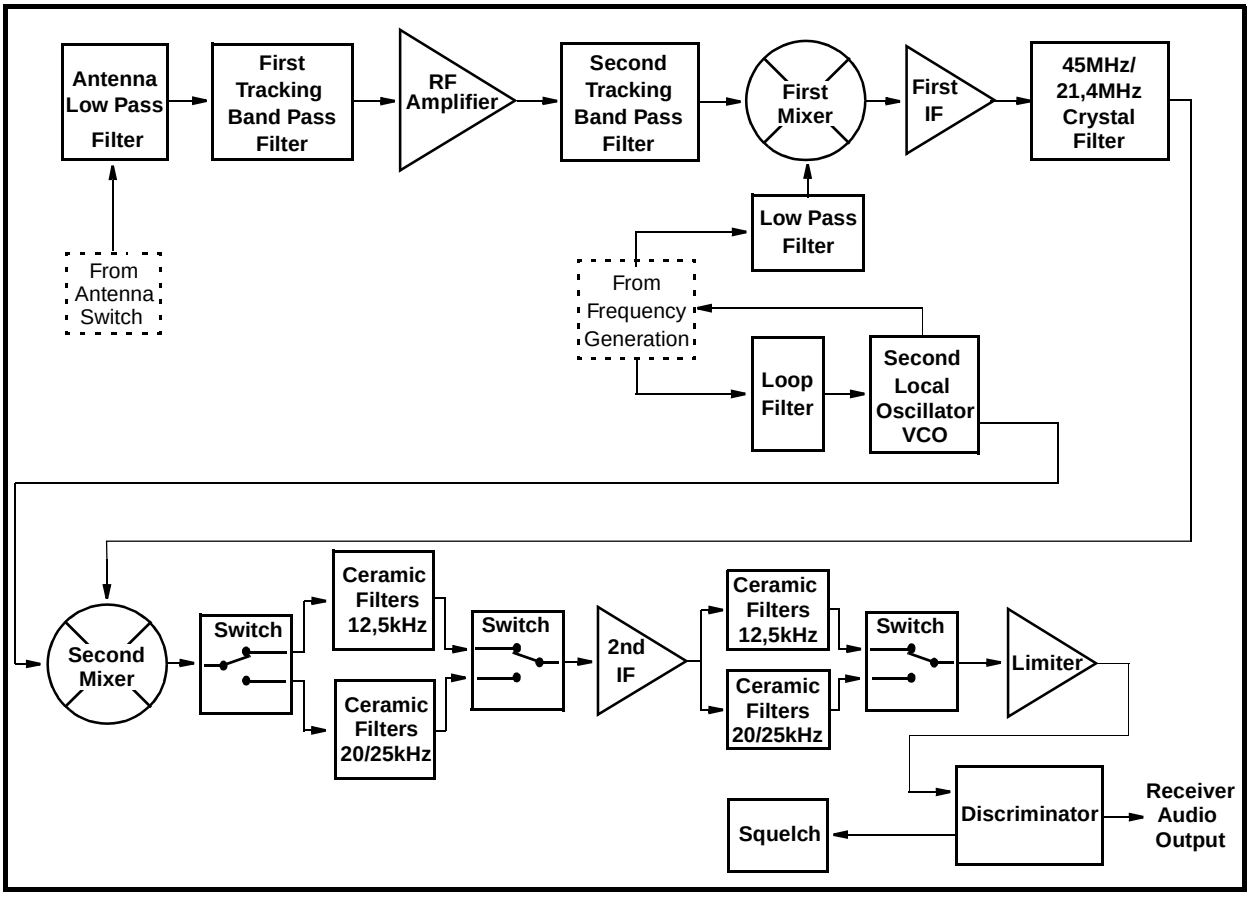

Figure 3.3 Receiver Block Diagram

Second Mixer, Second IF Amplifier and Ceramic Filters

The second IF amplifier is implemented around an SA615 integrated circuit (IC201). The second local oscillator is provided by a separate VCO (TR209 and associated components), tuned by D219/D220, and whose frequency is 455kHz above or below the first IF frequency. The choice is made automatically for each channel to avoid harmonics of the second local oscillator interfering with the required signal.

Dual channel spacing is achieved by using analogue switches, IC208, IC203, IC204 (20/25kHz channel spacing) and IC209, IC205, IC206 (12,5kHz channel spacing) to select the required ceramic filters. The switching arrangement is shown in Figure 3.3. The ceramic filters, F203, F202 (20/25kHz) and F205, F206 (12,5kHz) are supplied through a 6dB splitter and a 4dB pad giving a total loss of 12dB (typical filter loss is 2dB) for RSSI (Receive Signal Strength Indication) linearity.

In the single channel spacing variant, some of the switches are replaced by capacitors C324, C279 and C280.

Squelch

Squelch is derived from IC201 and fed to active filter (IC202_A and associated components) which acts as a band-pass filter at approximately 20kHz. Noise picked up at 20kHz is amplified by IC202_B and rectified by D213. This DC level is compared by IC207, with a DC level on TX_PWR_SQ_SET, from a DAC (in IC701). This SQUELCH signal is fed back to the control section.

TRANSMITTER

The transmitter block diagram is shown Figure 3.4 and the circuit diagram in Figure 6.9.

The transmitter consists of a PA module taking its input from the frequency generation block, and feeding an antenna filter and switch. The transmit power is set by processor control of a DAC in the baseband chip IC701. Feedback is not provided to the processor. The processor monitors the battery voltage and the PA temperature, adjusting the transmitter output accordingly.

Frequency generator output, already modulated, is pre-amplified by TR411 and then attenuated by R469, R472 and R473 (in the frequency generation section) before being fed to the power amplifier (signal TX_RF), providing isolation between the VCO (TR413 and associated components) and the PA, preventing excessive transient adjacent channel power.

The power control (IC406_B, TR101, TR102 and TR104) varies the power to ensure a smooth ramp up and down and to set a steady state power level. The PA_ON input, when low, prevents the PA from operating.

The antenna changeover switch routes the antenna to either the transmitter or receiver as required. On receive, the pin diodes D100 and D101, transistors TR100 and TR103 and LED100 are off and the antenna is connected to the receiver via the loop RX_ANT, C101, L107/L101/C103, L104, C110 and ANT. On transmit, a DC level is applied to TR100 turning it on enabling PIN diodes D100 and D101. Control signal PA_ON is applied to TR103 which conducts giving a DC path, the PIN diode, D100, is on and the red LED, LED100, illuminates.

L102, L103, L104 and associated capacitors form a low pass filter.

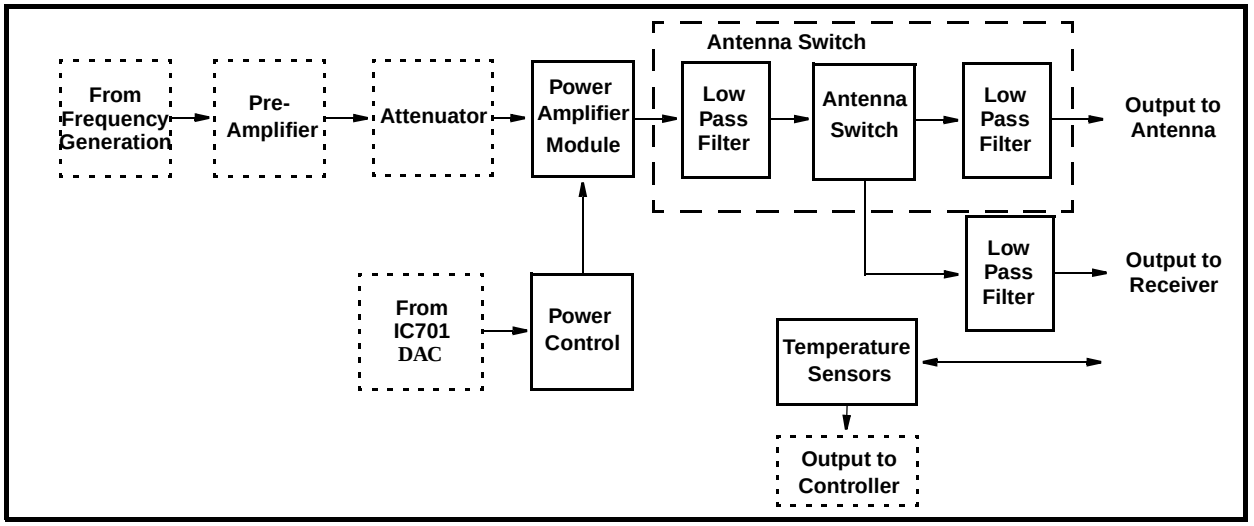

Figure 3.4 Transmitter Block Diagram

FREQUENCY GENERATION

The frequency generation block diagram is shown in Figure 3.5 on page 3.7 and the circuit diagram in Figure 6.10.

The two receiver local oscillator frequencies and the transmitter frequency are generated by voltage controlled oscillators (VCOs) phase locked to a temperature compensated crystal oscillator (TCXO). The receiver second local oscillator is shown in Figure 6.8.

The TCXO, XL400, operates at 14,4MHz and is divided down by a programmable divider (IC403) The output frequencies are shown in Table 3.2 on page 3.7. The module has provision for electronic and mechanical frequency adjustment. The electronic adjustment is provided via an eight-bit DAC and corrects for frequency shifts due to ageing. Mechanical adjustment is not normally required.

The synthesizer phase detector output is applied to the VCO varicap tuning input (LOOP_FILTER) via a passive low-pass loop filter (R428, R429, R441, C412, C415, C416 and C485).

The circuit is unusual in that the other ends of the VCO varicaps are connected to a negative voltage (VCAP_BIAS) controlled by a digital to analogue converter. This allows a varicap tuning voltage far in excess of the output swing of the phase comparator voltages.

LOOP_FILTER and VCAP_BIAS, are compared and the difference between them determines the VCO frequency. Oscillator tuning is by varicap diodes D402 to D405 (receive oscillator) and D407 to D411 (transmit oscillator). Separate wideband VCOs (Rx first local oscillator - TR409, and Tx oscillator - TR413), but a common buffer amplifier (TR410, TR414) are used on all bands. Switching between the receiver LO and the transmitter oscillator is achieved by TR415 and TR412. A cascode amplifier is used to isolate both VCOs from their respective loads. The Rx oscillator tuned circuit uses M400 in UHF applications and L416 in VHF applications.

The buffered VCO output is applied to the frequency synthesizer, IC401, on both receive and transmit, and to a PIN diode switch (D422, D423). The latter switches the signal to the first mixer (as LO1_RX) on receive or to an additional buffer amplifier, TR411, on transmit.

The negative voltage generator (TR402/3, TR405/6 and TR407/8) must generate very little noise if the VCO performance is not to be degraded. This is achieved by applying the amplified and inverted DAC output to a filter, D424, R414, C405 and C409.

IC400_B, D and A are used to switch the clock and data inputs for the synthesizer on and off.

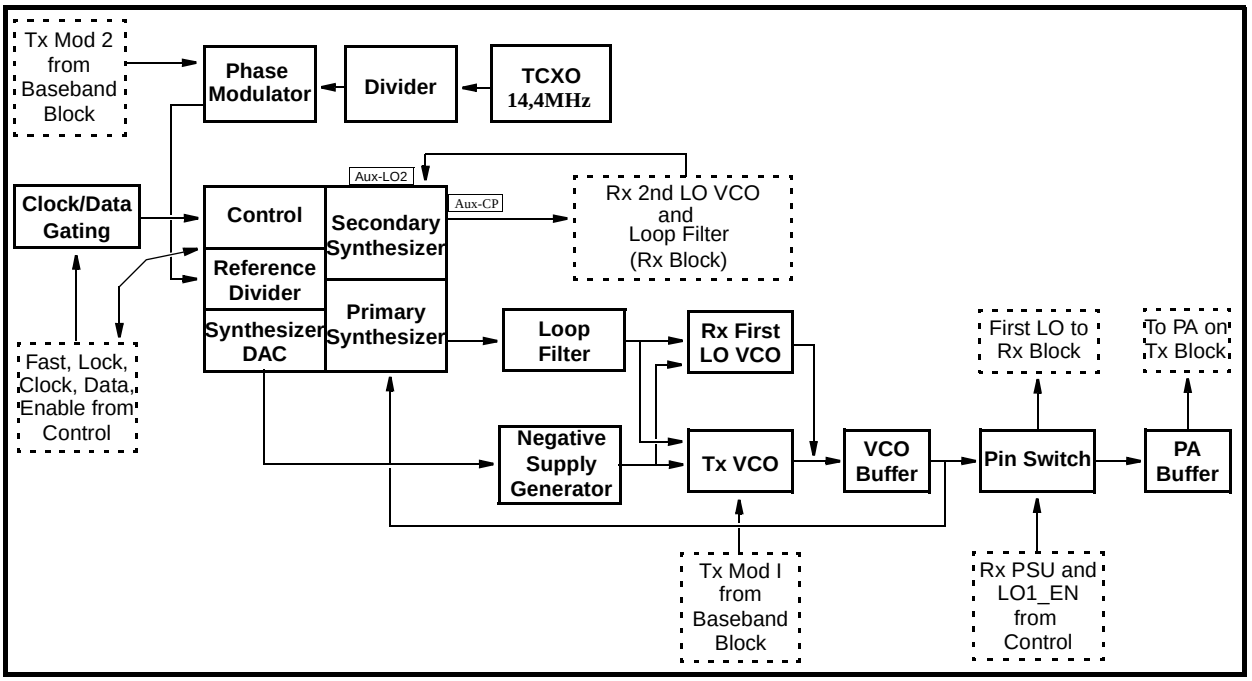

Figure 3.5 Frequency Generation Block Diagram

Two point modulation is used to achieve a flat, wide audio response, fast frequency switching and low power in adjacent channels. Modulation of the synthesizer reference frequency is achieved by phase modulation of the TCXO output. Since the phase modulator has a limited range and a greater phase excursion is required at lower transmit frequencies, one of three TCXO to phase modulator division ratios is used. TR423, TR420 and TR421 form a ramp generator. TR424 to TR426 form a Schmitt trigger to which the ramp is applied. In the absence of modulation, the output of the Schmitt trigger approximates to a square wave.

When modulation is applied, the Schmitt trigger switches at a point on the ramp that is related to the amplitude of the modulating signal. Due to the frequency shaping produced by IC406_A, the synthesizer IC receives a reference signal with frequency modulation (within the frequency range required).

Band	Phase Modulator Frequency
E	100kHz
AB and K	200kHz
U, T and R1	400kHz

Table 3.2 Phase Modulator Frequency

The synthesizer, IC401, contains two synthesizer circuits. The second circuit is used for the generation of the receiver second local oscillator (output control signal AUX_CP). This removes the need for the alignment of this oscillator because the frequency is locked to the TCXO and allows its frequency to be varied to avoid potential interference. The second local oscillator is switched off during transmissions. The second local oscillator frequency is applied to the synthesizer as AUX_LO2.

CONTROL PROCESSOR SYSTEM

The heart of the control processor system consists of the following:

(3) H8/3002 Processor (IC600)
(4) 32KByte Static RAM (IC601)
(5) 512KByte Flash EPROM (IC602)
(6) MAX512CSD Triple 10-bit DAC (IC605).

The processor controls and monitors the radio functions by a variety of types of digital and analogue interfaces. The digital interfaces used are as follows:

(1) Direct control from processor port pins (General Control)
(2) Memory mapped peripheral via an 8-bit data bus (MMI LCD Controller Chip)
(3) IIC serial bus (IC701 Baseband chip and Options)
(4) 3-wire Serial Bus (IC605 Triple DAC, IC401 Synthesizer)
(5) Combined RS232 and IIC Serial Bus (Smart Interface).

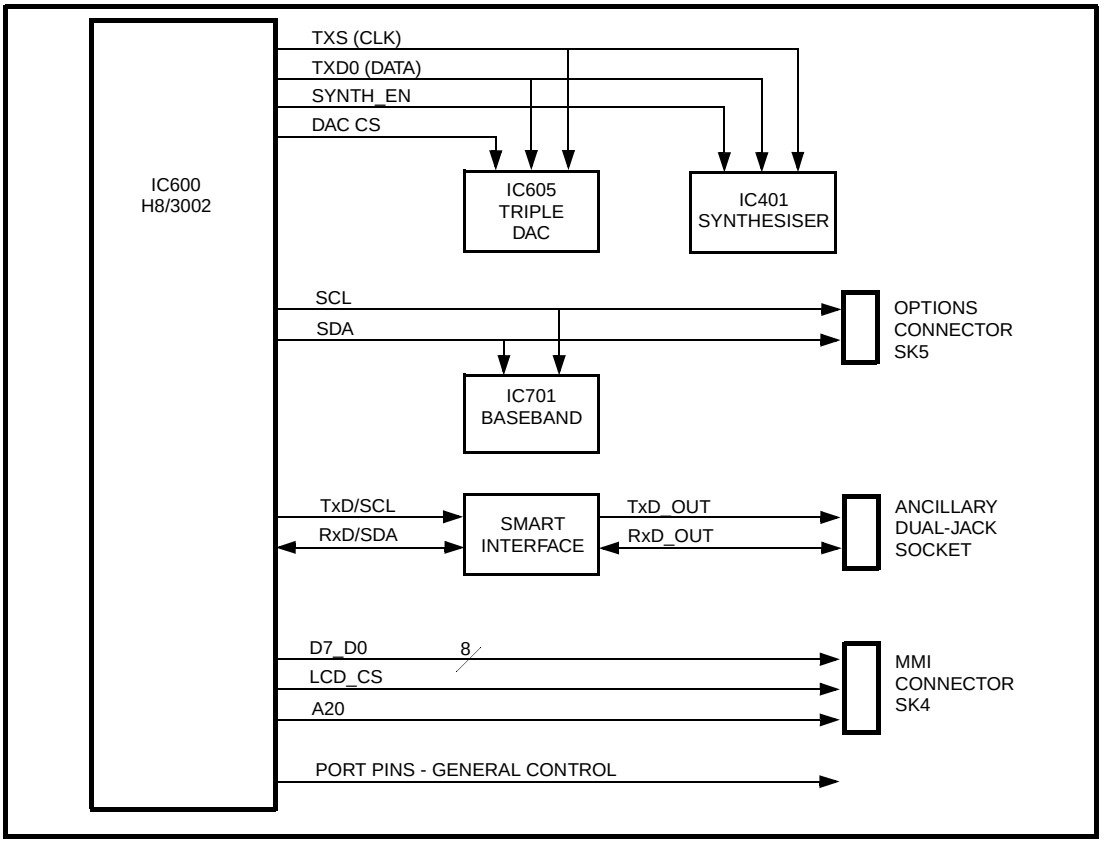

Figure 3.6 Various Types of Digital Interfaces

The direct processor port pin control signals that interface to various blocks are shown in Figure 3.7.

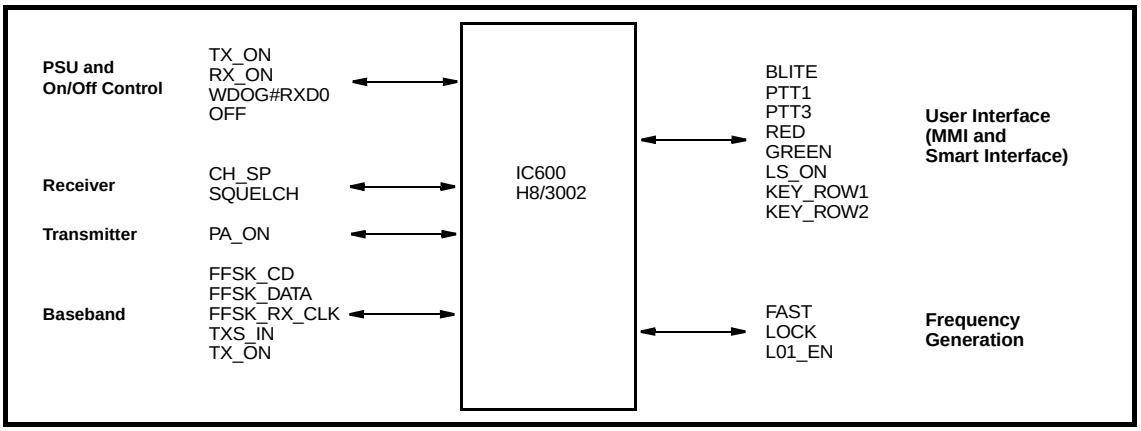

Figure 3.7 Direct Processor Port Interface Signals

The analogue control interfaces are as follows:

(1) The processor generates and controls various analogue voltages for receiver and transmitter purposes. IC605 is a triple 10-bit DAC which the processor controls via a 3-wire serial bus. Two of the DAC outputs are used for receiver front-end tuning (RX_TUNE1, RX_TUNE3) and the third for TCXO XL400 frequency trimming.
(2) The processor has two pulse width modulator (PWM) outputs which are used as additional analogue control voltages. These are RX_TUNE2 and RX_TUNE4 for receiver front-end tuning.
The processor has several ADC inputs for monitoring analogue voltages. These are used for:
(a) Monitoring battery voltage (VBAT) for indicating battery status on the LCD display and detecting low battery voltage condition
(b) Reading the position of the rotary control ROT_CTRL1 for setting loudspeaker volume
(c) Reading RSSI level from the discriminator IC201 in receive mode and the transmitter temperature monitored by the thermistor R247 in transmit mode. These two voltages share the same processor input RSSI_TX_TEMP.

BASEBAND AUDIO AND SIGNALLING

All of the baseband audio and signalling functions are carried out by the baseband chip IC701 (SC11372CQ). The device operates in half-duplex mode and many of the analogue paths are common between receive and transmit modes of operation. The device is controlled via the IIC serial bus lines SCL and SDA.

Clock Generation

All the microprocessor and signalling timing is derived from the crystal oscillator formed by TR700, XL700 and associated components. The oscillator runs at 11,0592MHz ±80ppm. The oscillator runs at its normal frequency when both the transmitter and receiver supplies are enabled by the processor. In this case RX_ON and TX_ON are both high and TR702 is conducting. The oscillator operates at a 'pulled' frequency when only the receiver supply is enabled. In this case TX_ON is low and TR702 is off. The transmit supply is inhibited from being turned on when the receiver is on and allows the 'pulling' feature to be used.

The oscillator output from TR700 drives the XIN pin on the baseband chip IC701. The baseband derives all of its internal signalling clocks from this input clock and also generates a buffered clock CLK for the processor on the CLKOUT pin. The processor clock frequency is also 11,0592MHz.

Receive Audio Path

Refer to Figure 3.8 on page 3.11.

The discriminator audio signal RX_AF from IC201 enters the baseband chip on the RX_IN pin. The internal path in receive mode is shown in Figure 3.8 on page 3.11. The path consists of:

(1) A stage of amplification (GC2)
(2) De-emphasis filter (F1)
(3) 300Hz High-pass CTCSS Filter (F5)
(4) 3kHz Low-pass Filter (F8)
(5) Audio Volume Control (GC7, GC10, GC11).

Signalling detection is described in a later section.

Transmit Audio Path

Audio from the smart interface and the internal microphone enter the baseband chip on MIC1_IN and MIC2_IN respectively. The internal path in transmit mode through to the TX modulator is shown in Figure 3.9 on page 3.11 and consists of:

(1) MIC1_IN/MIC2_IN Audio Source Selection
(2) Amplification Stage (GC0)
(3) Pre-emphasis Filter (F6)
(4) Automatic Level Control (ALC)
(5) 300Hz High-pass Filter (F5)
(6) Limiter
(7) 3kHz Low-pass Filter (F8)
(8) Transmit Modulation Level Control (GC7, GC8, GC9).

Signalling generation is described in the following section.

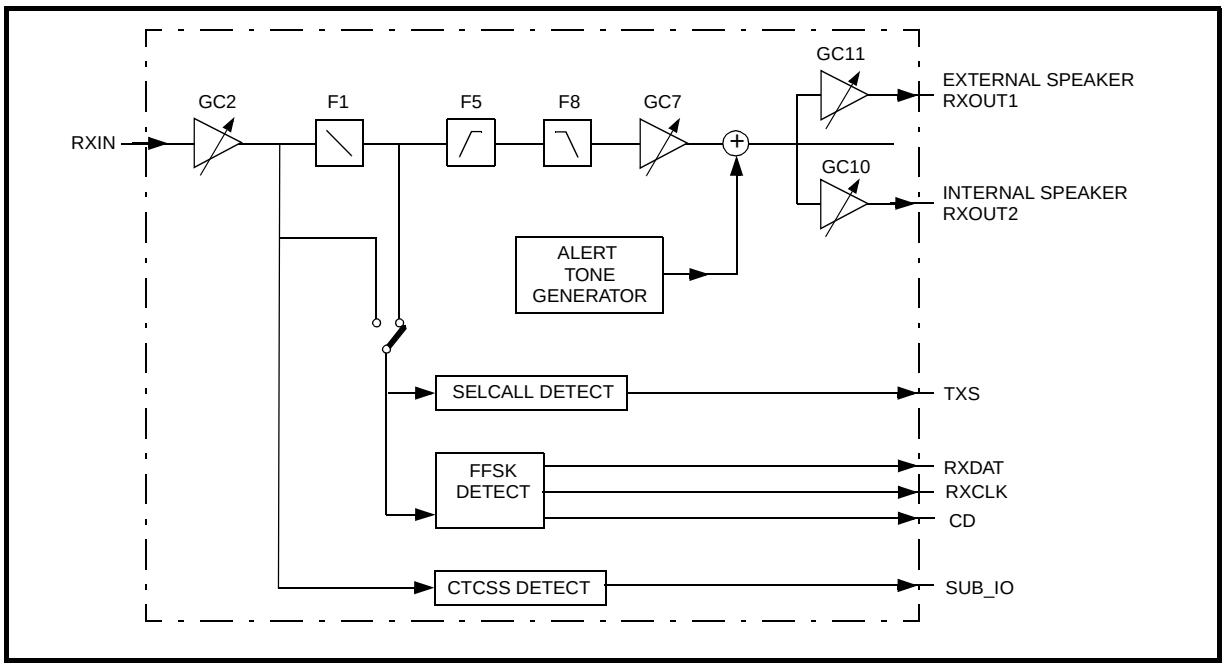

Figure 3.8 Baseband Receive Audio Path

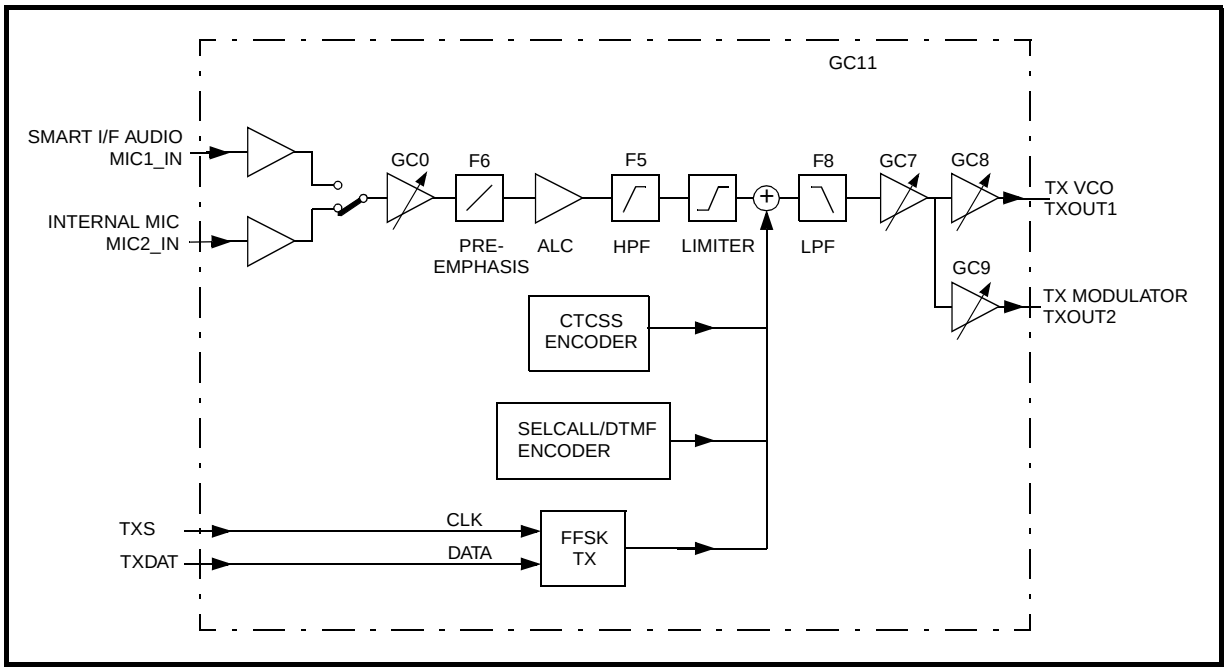

Figure 3.9 Baseband Transmit Audio Path

Signalling Facilities

The baseband chip has facilities for CTCSS, SELCALL, DTMF and FFSK signalling. The way in which these signalling modes are controlled and how to they relate to the receive and transmit audio paths is described in the following sections. Figure 3.8 is referred to for receive signalling and Figure 3.9 for transmit signalling.

- CTCSS

The baseband chip has a CTCSS encoder which is programmed by the processor with the appropriate frequency via the IIC serial bus lines SCL and SDA. The CTCSS tone is summed into the internal transmit path before the 3kHz high-pass filter F8.

The CTCSS detector works from the signal before the de-emphasis filter F1. The detector consists of a narrow bandpass filter followed by a comparator that generates a zero-crossing signal at the SUB_IO pin. The processor continuously monitors the time interval between the zero-crossing events and decides whether the correct CTCSS frequency is present.

- Selcall/DTMF

The baseband chip has two tone generators which are used for SELCALL and DTMF tone generation. The tone generators are programmed by the processor with the appropriate frequency via the IIC serial bus lines SCL and SDA. The tones are summed into the internal transmit path before the 3kHz high-pass filter F8.

There is no DTMF decode capability in the baseband chip.

The SELCALL decoder works from the signal after the de-emphasis filter F1. The detector consists of a broad bandpass filter (450Hz to 3kHz) followed by a comparator that generates a zero-crossing signal at the TXS pin. The processor continuously monitors the time interval between the zero-crossing events and decides which SELCALL tone is present.

- FFSK

In transmit mode the processor supplies the transmit FFSK clock on the TXS pin and the transmit FFSK data on the TXDAT pin from which the FFSK signal is generated. The FFSK signal summed in to the transmit audio path before the 3kHz low-pass filter F8.

The FFSK decoder works on the signal from either before or after the de-emphasis filter F1 depending on the FFSK system used. The decoder consists of analogue filtering, carrier detect, clock and data recovery circuitry. The chip provides the processor with a carrier detect signal (CD), a receive clock (RXCLK) and receive data (RXDAT). The chip carries out no interpretation of the FFSK data; this is left up to the processor to decode.

- DTMF Encoding

DTMF Encoding is achieved using the baseband chip tone generators.

USER INTERFACE

The radio user controls and display facilities that exist on the three product variants is listed in Table 3.3 below.

	SRP8010	SRP8020	SRP8030
Microphone	✔	✔	✔
Loudspeaker	✔	✔	✔
Dual Stereo Jack SMART Interface Connector	✔	✔	✔
Multi-coloured Status Indicator	✔	✔	✔
Rotary Volume and On/Off Control	✔	✔	✔
3 side switches	✔	✔	✔
1 top switch	✕	✔	✔
LCD Display	✕	✔	✔
4 Functions keys	✕	✔	✔
12 key DTMF keypad	✕	✕	✔

Table 3.3 User Controls and Display Facilities on the SRP8010, 8020 and 8030

These user controls and display facilities are distributed between the top flexi assembly, the loudspeaker/mic flexi assembly, the MMI board and the radio board as shown in Figure 3.10.

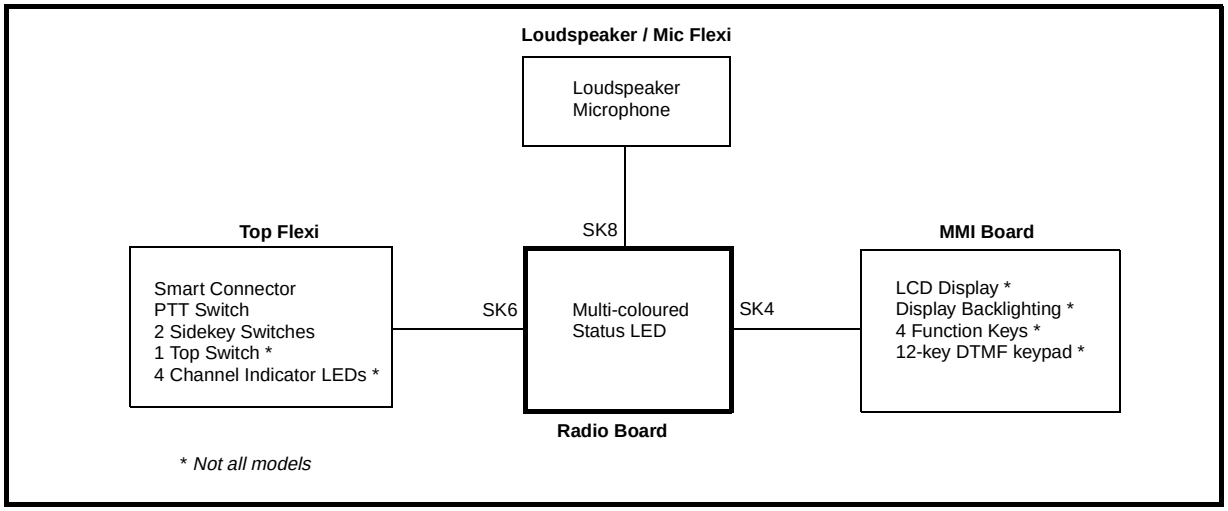

Figure 3.10 User Controls and Display Facilities Overview

Smart Interface

The Smart Interface consists of a dual stereo jack socket which provides the following external interface signals for the connection of ancillaries:

(1) A pair of bridged audio loudspeaker outputs (EXT_LSA, EXT_LSB).
(2) A combined accessory detect and audio input line (MIC1).
(3) A combined RS232 input and a bi-directional IIC data line (RXD1_IN).
(4) A combined RS232 output and IIC clock output line (TXD1_OUT).
(5) A radio ground.

The way in which the smart interface signals relate to the rest of the radio and a typical ancillary, such as a lapel speaker/microphone, is illustrated in Figure 3.11 on page 3.14.

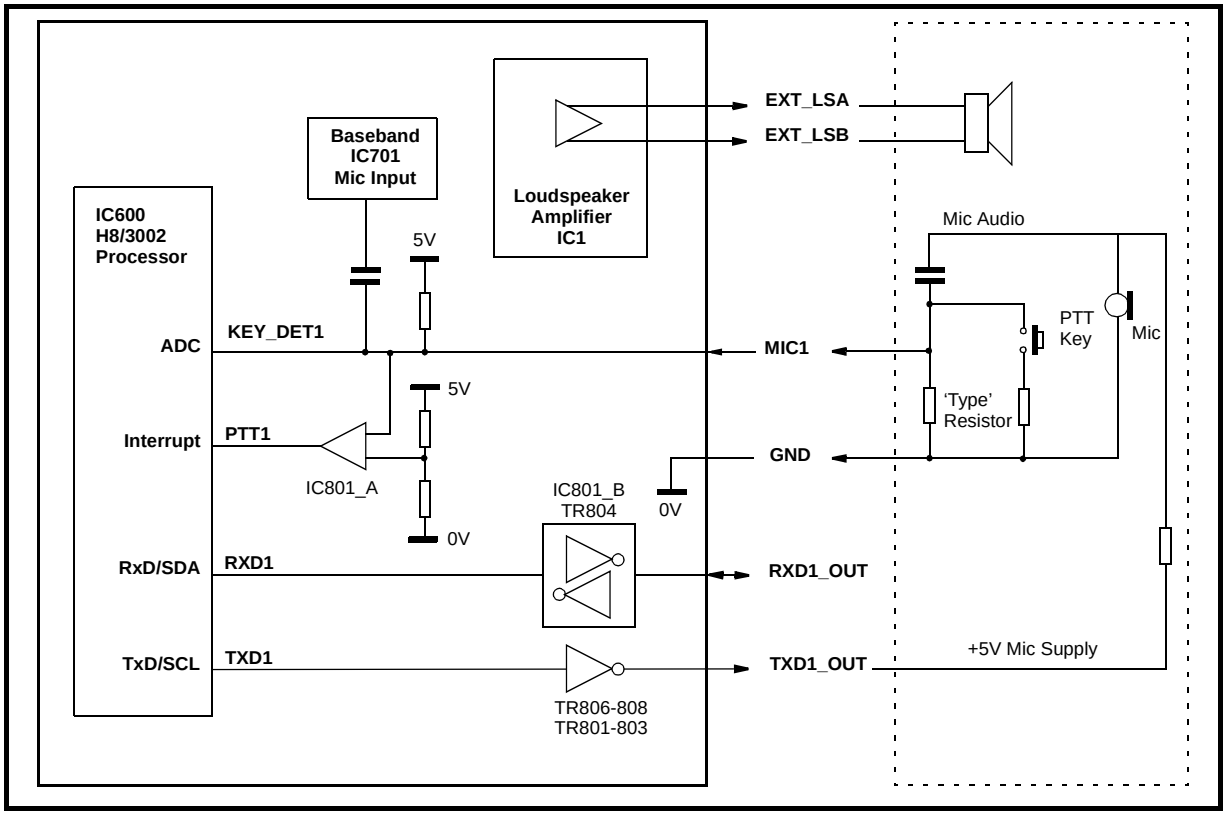

Figure 3.11 Smart Interface Block Diagram

Connection	Signal Name	Use	Signal Type	Direction
2,5mm Ring	EXT_LS1 A	Balanced speaker drive	Nominal mid-supply	To ancillary
2,5mm Sleeve	EXT_LS1 B	Balanced speaker drive	Nominal mid-supply	To ancillary
2,5mm Tip	MIC1	Multi-function, audio in, ancillary type voltage and key press voltage	0V to 5V	To radio
3,5mm Ring	TXD1_OUT	RS232 TxD or IIC SCL or 5V supply output (50mA maximum.)	0V to 5V	To ancillary
3,5mm Tip	RXD1_IN	RS232 RxD or IIC SDA or trickle charge input	0V to 5V 0V or –12V Space) RS232 5V or +12V Mark)	Bi-directional
3,5mm Sleeve	0VA	Ground	0V	To ancillary

Table 3.4 Ancillary Connector Signal Names and Usage

- **EXT_LSA, EXT_LSB**

The bridged audio loudspeaker outputs are capable of delivering 500mW into a 16Ω load.

- **MIC1**

The combined accessory detect and audio input line MIC1 allows the radio to detect what type of ancillary is connected and the ancillary status (such as key presses). Each ancillary has a 'type' resistor that sets up a unique voltage on this accessory detect line which is monitored by the comparator formed by IC801_A and its associated components. The exception to this is the User Memory Plug (UMP) which does not have a type resistor but is detected via the IIC lines. The processor reads the accessory detect voltage via KEY_DET1. If the accessory detect voltage is below the threshold set by R823, R824 and R825, a processor interrupt is generated on PTT1. The ancillary may superimpose audio on to the d.c. level on MIC1 which gets routed to the baseband chip IC701. The input to the accessory detect comparator IC801_A is filtered by R803/C802 to prevent any speech signal on the accessory detect line affecting the accessory detection process.

RS232/IIC Serial Communications

The combined RS232 and IIC lines allow serial communication with external RS232 devices such as the SRP8000 programmer, or external IIC devices such as a User Memory Plug.

The RXD1_IN line can accept an RS232 input signal which is typically ±10V in amplitude or an IIC data input signal which is 0 to +5V in amplitude. Either type of input signal is inverted and converted to a 0 to +2,5V signal on RXD1 by TR804 and passed to the processor.

The RXD1_IN line can also be used as an open-collector output for IIC data. In this case, the processor drives the RXD1 port pin as an output which gets inverted by comparator IC801_B. When RXD1 is driven high, the comparator pulls RXD1_IN low via D801. When RXD1 is driven low, the comparator output turns off allowing R814 to pull the RXD1_IN output to +5V. TR804 plays no part when RXD1 is used as an output.

The processor UART transmit signal TXD1 is inverted and converted to a 0 to +5V RS232 signal by TR806 to TR808 and TR801 to TR803. Although the RS232 specification technically requires a minimum voltage swing of ±5V, in practice modern RS232 receivers work on a 0 to +5V input voltage swing. An external device may be powered from the smart interface TXD1_OUT line when this output is set to +5V. The output is current limited to 50mA by TR802 and R808 with R808 sensing the output current drawn.

The TXD1_OUT line can also be used as an IIC clock driver. The operation of the driver is no different from the RS232 case.

The RXD1_IN line can also be used to trickle charge the radio battery when a voltage greater than the battery voltage is applied.

Loudspeaker / Microphone Flexi Connector

Signal Name	Use	Signal Type	Direction
MIC2	Microphone input	Nominally 3V DC	To baseband
0VA	Battery ground	0V	To flexi
INT_LS2A INT_LS2B	Internal speaker Balanced audio	3,5V nominal	To flexi

Table 3.5 Loudspeaker/Microphone Connector Signal Names and Usage

PTT and Side Key Press Detection

PTT, Sidekey 1, Sidekey 2, Alarm and MMI keypad key presses are detected by use of the processor interrupt line PTT3 and the processor ADC input KEY_DET3.

Normally, with no key pressed, KEY_DET3 voltage sits at 0V due to the 10kΩ pull-down resistor R15. Pressing any key takes the KEY_DET3 voltage above the reference set by resistors R13 and R16. Comparator IC207_A then generates a PTT3 processor interrupt which informs the processor that a key has been pressed. Each key is arranged to generate a different KEY_DET3 voltage which is how the processor determines which key is pressed.

The KEY_DET3 voltage generated by the different keys is as follows:

(1) If the PTT is pressed, KEY_DET3 voltage will still be at 0V

(2) If SIDE_KEY1 or SIDE_KEY2 is pressed, each side key generates a unique KEY_DET3 voltage by virtue of resistors in series with each key (R12, R11, R81) in combination with R15

(3) If the ALARM key is pressed, analogue switch IC3 forces KEY_DET3 voltage to the same voltage as the AF_PSU.

The MMI keypad keys generate unique KEY_DET3 voltages. This is described in the section below on the “MMI Display and Keypad”.

MMI Display and Keypad (not fitted on SRP8010)

Signal Name	Use	Signal Type
DATA (0:7)	Eight lines, processor data	0V or 5V
A(20)	Low duty cycle, display address selection	0V or 5V
BLITE	Backlight enable	0V OFF, 5V ON
nLCD_CS	Display enable	0V or 5V, active low
nKEY_ROW 1-2	Local keypad enables	0V or 5V, active low
KEY_DET3	Voltage proportional to keypress	0V to 5V
AF_PSU	Supply	5V nominal
0VA	Ground	0V
nWR	Write line (for future use)	0V write, 5V read

Table 3.6 MMI Connector Signal Names and Usage

Processor Interface to LCD Display

The LCD display is driven by LCD driver chip IC901. The driver chip interfaces to the processor via an 8-bit data bus with the write cycle being controlled by LCD_CS and the LCD register select line controlled by processor address line A20. The processor is only able to write to the LCD driver.

Keypad Press Detection

Electronically, the keypad keys are arranged in a matrix of 3 rows and 7 columns. The rows are driven directly by two processor port signals KEY_ROW1 and KEY_ROW2 which are normally in the low state. Transistors TR910-916 generate a unique voltage on KEY_DET3 for each column. Any key in the same column generates the same voltage. For example, if key “1” (S903) is pressed TR913 turns on and sets up a voltage on KEY_DET3 according to the value of R932, R971 on the MMI board and R15 on the main radio board. This generates a processor interrupt on PTT3. The processor then goes through a process of deactivating the keypad rows selectively until it deduces which row the key press is in. The KEY_DET3 voltage which initiated the interrupt identifies which column the key press is in.

Four function keys are located below the display:

Legend	Function
M	Activate menu
–	Scroll down through channels (or menu, if active)
+	Scroll up through channels (or menu, if active)
OK	Confirm choice or action (ie. Enter).

The SRP8030 has 12 additional keys (supported by the daughter board) arranged as a DTMF keypad.

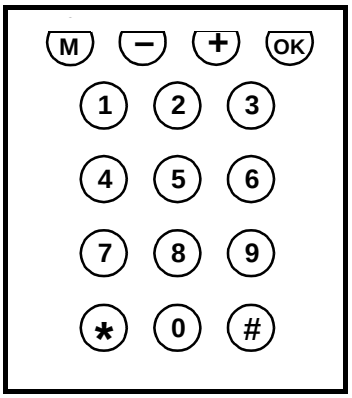

Figure 3.12 Keypad and Function Keys

Backlighting

The LCD and keypad backlighting LEDs, D904 to D918, are turned on by the processor port signal, BLITE, via driver TR909.

TRICKLE CHARGER

The trickle charger uses a positive input on the RxD pin of the smart interface to power a current limited source feeding the battery, limiting the current to approximately 130mA. The charger is enabled by the thermistor in the battery pack, so it is inhibited if a battery pack is not fitted (this is necessary to prevent a voltage at the battery connector which could damage the radio when no battery is present).

The charger can also be inhibited by the processor to permit an RS232 (or IIC) device to drive the RxD input correctly. This is achieved using the processor pin driving the green LED.

BATTERY CONNECTIONS

Battery Connections to Radio

The battery connections are three spring loaded pins mounted on the radio PCB. These pins protrude through the metal casting to make contact with contact pads on the battery. The function of these pads on the battery are listed in Table 3.7.

Signal Name	Use	Signal Type	Direction
+VE	Battery Positive Terminal	5V to 11V (during fast charge)	To radio (from radio during charge)
–VE	Battery Negative Terminal	Radio Ground	To radio
TEMP	To disable fast charging when pulled low.	Open drain, active low	From radio

Table 3.7 Battery Connections to Radio

Battery Connections to Charger

These connections are located on the base of the battery.

Signal Name	Use	Signal Type	Direction
+VE	Current limiting in reverse direction to prevent excessive discharge	9V to 11V	From Charger
–VE	Battery Negative Terminal	0V	From Charger
TEMP	Voltage which decreases with an increase in cell temperature.	0 to +5V	To Charger
BAT_TYPE	Battery type resistor	47k Resistor to –VE	To Charger

Table 3.8 Battery Connections to Charger

SRP8000 SERIES
VHF/UHF PORTABLE RADIO

SECTION 4 - SERVICING

CAUTION

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

(4) Device leads should always be in contact with a conductive material to avoid the build-up of static charges.
(5) Soldering iron tips, tools and metal parts of test equipment used in servicing must be grounded.
(6) To avoid transient voltage spikes, devices must not be inserted into, nor removed from, circuits with power applied.
(7) Signals must NOT be applied to integrated circuits in the absence of power supplies to the devices.
(8) Use conductive foam on work surfaces.

DIS-ASSEMBLY

Remove the Battery

(Refer to Figure 4.1)
(1) Depress the spring-loaded battery latch to release the battery.
(2) Slide the battery down the radio to disengage the retaining lugs.
(3) Lift the battery away from the radio.

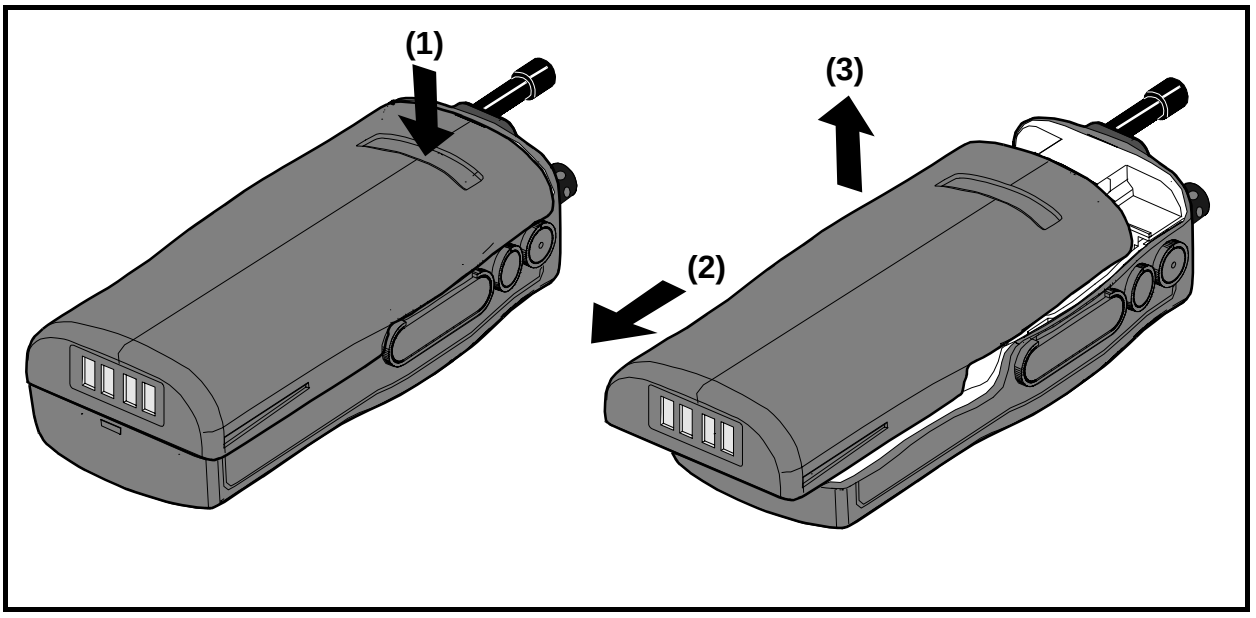

Figure 4.1 Removing the Battery

Remove the Antenna and On/Off/Volume Control Knob

(1) Unscrew and remove the antenna.
(2) Remove the lanyard ring (if fitted).
(3) The On/Off/Volume control knob is a friction fit. Pull the knob from its spindle.
(4) Remove the smart interface cover from the smart interface jacks and the antenna boss.

Remove the Metal Frame Assembly

(Refer to Figure 4.2)

(1) Use a small, flat bladed screwdriver to release the cast metal frame assembly from the bottom of the front casing. This action releases the radio PCB from the MMI PCB.

(2) Gently ease the frame assembly out of the front casing taking care not to damage the two flexi-circuits (lift the bottom of the frame so that it just clears the plastic casing, then gently slide the frame away from the top of the casing until it is released from the casing).

Caution: The loudspeaker / microphone flexi-circuit connects the radio PCB (attached to the metal frame) and the loudspeaker / microphone assembly (attached to the front casing). The flexi-circuit must be released from the connector on the radio PCB before the frame can be lifted clear of the front casing.

(a) Slide out the locking drawer of connector, SK81, (on the radio PCB) to release the flexi-circuit. Use a very small bladed screwdriver.

(b) Remove the flexi-circuit from connector, SK81.

(3) Lift the frame away from the front casing. At this stage the radio PCB and metal screen are still attached to the frame.

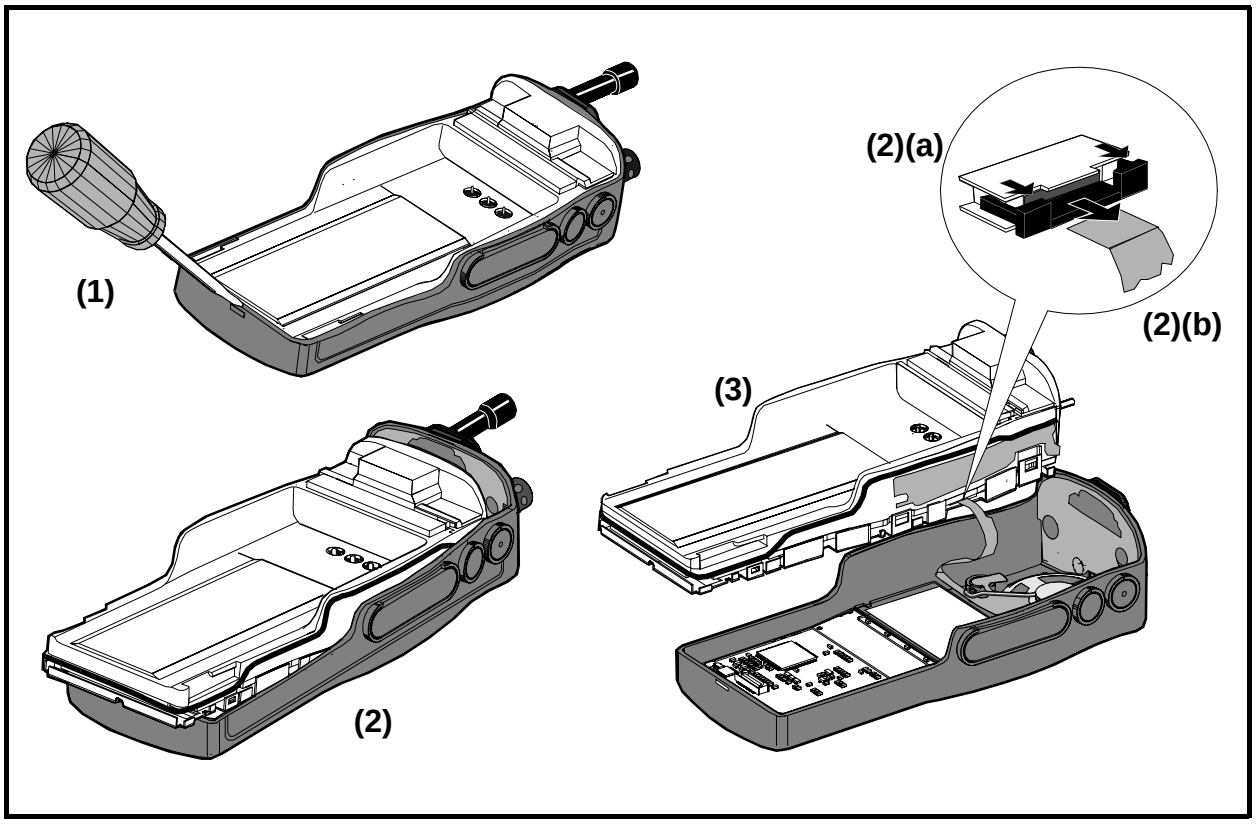

Figure 4.2 Removing the Metal Frame Assembly

Remove the Metal Screen from the Radio PCB and Frame Assembly

(Refer to Figure 4.3)

(1) Use a small, flat bladed screwdriver to release the seven spring tabs on the metal screen.

Note: Releasing three spring tabs on one side and the one at the top of the metal screen should be sufficient to remove the metal screen

(2) Lift the metal screen away from the radio PCB and frame assembly.

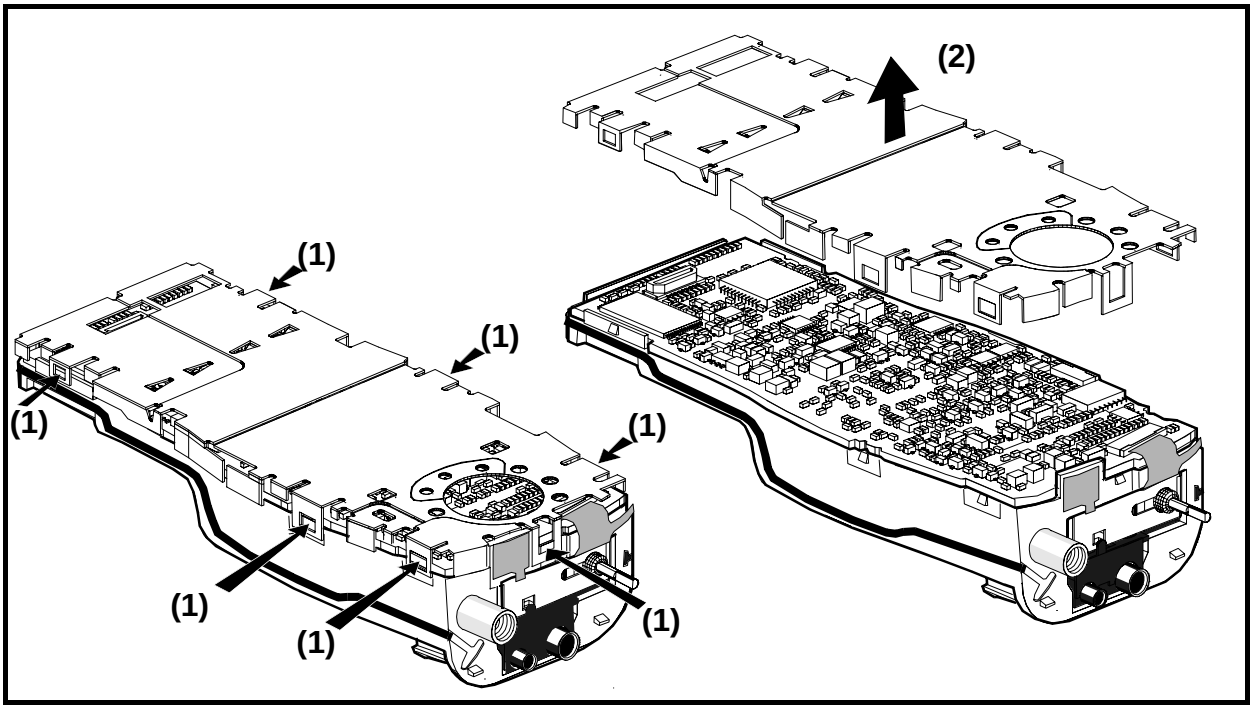

Figure 4.3 Removing the Metal Screen

Remove the Radio PCB

(Refer to Figure 4.4)

(1) Release the remaining flexi-circuit from the radio PCB as follows:
- (a) Slide out the locking drawer of the PCB connector, SK6, (on the radio PCB). Use a very small flat bladed screwdriver.
- (b) Remove the flexi-circuit from the connector, SK6.

(2) The PCB is held in place by a leaf spring near the top of the unit (on the hidden side of the PCB).
- (a) Release the PCB from the frame by gentle leverage, with a small flat bladed screwdriver, at the slots provided either side of the frame.
- (b) Withdraw the PCB from the frame taking great care not to damage the PCB or flexi-circuit.

Caution: The PA module is a tight fit in the frame and may require easing at alternate edges of the PCB to remove it. DO NOT attempt to remove the PCB by levering anywhere other than at the slots provided - (2)(a) Figure 4.4.

- (c) Store the PCB in a safe place until required.

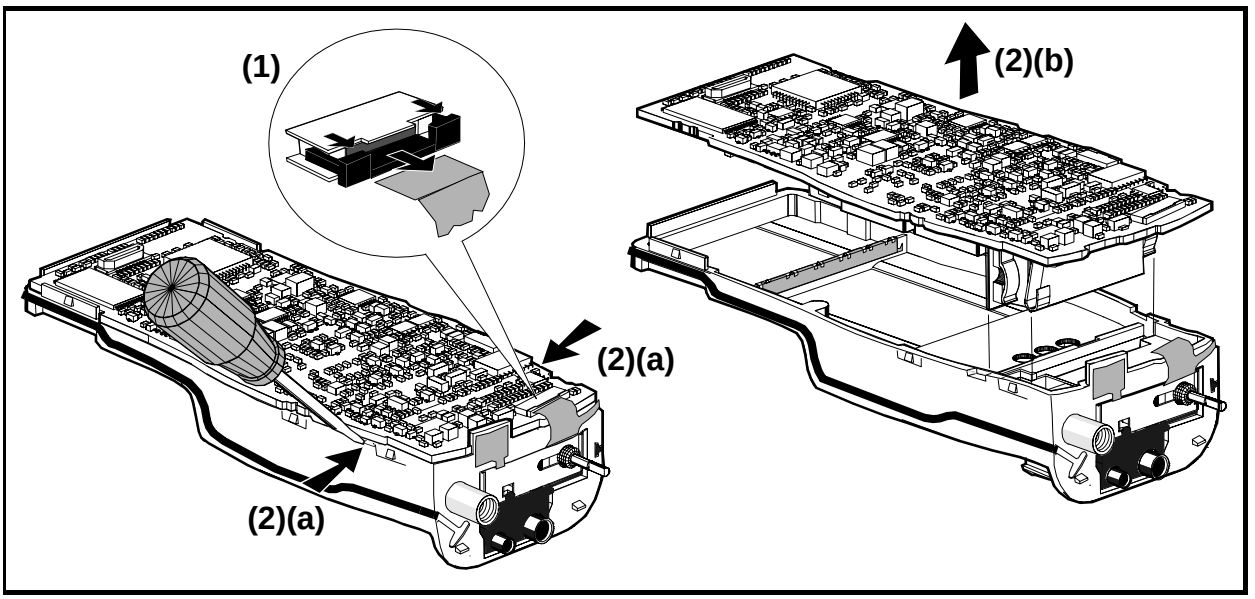

Figure 4.4 Removing the Radio PCB

Remove the Speaker and Microphone

(Refer to Figure 4.5)

(1) Remove the speaker retaining clip.

(2) Lift the speaker / microphone assembly away from the front casing taking care not to damage the flexi-circuit.

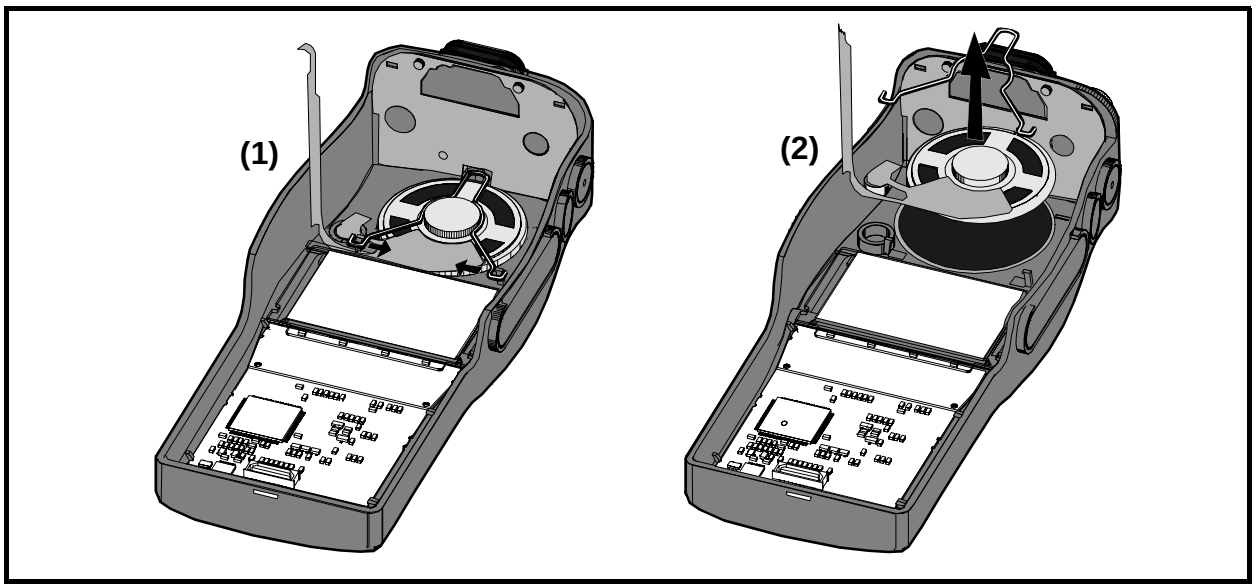

Figure 4.5 Removing the Speaker / Microphone Assembly

Remove the MMI PCB

(Refer to Figure 4.6)

The MMI PCB is held in place by four plastic lugs on the front casing.

(1) Using a small flat bladed screwdriver, exert slight sideways and upwards pressure on the edge of the PCB (close to one of the top retaining lugs) whilst exerting slight outward deflection of the casing side walls (A). This will release the PCB from the retaining lugs.

(2) Lift the MMI PCB and LCD display assembly away from the front casing.

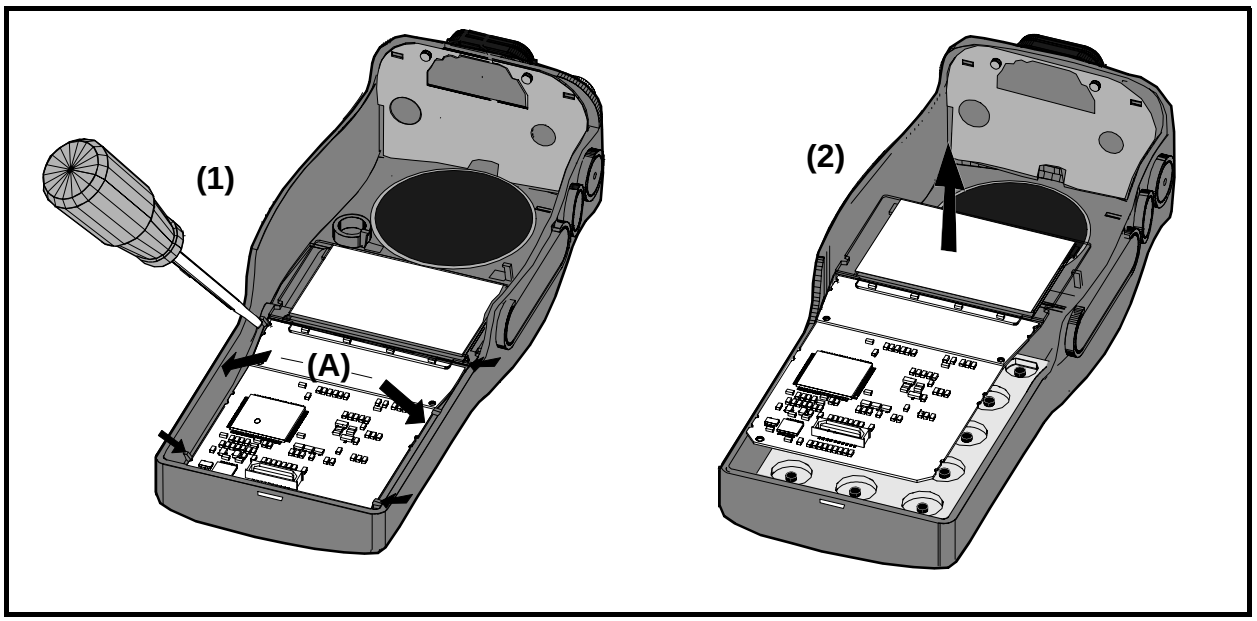

Figure 4.6 Removing the MMI PCB

Remove the Switch Mat

The switch mat was held in place by the MMI PCB. Lift the switch mat clear of the casing.

RE-ASSEMBLY

Re-assembly is the reverse of dis-assembly. However:

(1) Examine the various seals before re-assembly and replace with new items if necessary.
(2) Slight outward deflection of the case walls will ease re-assembly of the MMI PCB behind the retaining lugs.
(3) Care must be taken when reconnecting the flexi-circuits to ensure that they are correctly aligned before pressing home the locking drawers on the connectors.
(4) Ensure that the metal screen is fitted to the PCB / frame assembly before the assembly is fitted to the casing.
(5) To prevent damage to the frame seal, use a thin, flat piece of plastic (or other material) in a 'shoehorn' action between the bottom inside of the front case and the frame / PCB assembly as the assembly is pushed home. Carefully remove the piece of plastic (or other material) after the frame / PCB assembly has been fitted to the front case.

TEST INFORMATION, EQUIPMENT AND DATA

Test Information

(1) All RF generator levels are the potential difference from a 50 ohm source.
(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 one minute transmission in any five 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 radio under test shall be made via the test interface unit (TIU). RF connections are to be made via less than 10cm of low loss coaxial cable.
(7) Tests are to be carried out in the order specified.
(8) The receiver rated audio output is 500mW into 16 ohms with less than 5% distortion at 350mW.
(9) Signalling option checks should be carried out where appropriate only.
(10) Psophometrically weighted SINAD measurements are denoted SINADp.

CALIBRATION

Refer to the On-line help and the Alignment tool user instructions - **APPENDIX D**.

Test Equipment

The following is a list of test equipment recommended for carrying out functional tests, setting-up and fault location. Alternative types may be used provided that they are known to have at least equivalent parameters and that corrections are made for any differences in parameters.

Test Set	Parameters		Suitable Type
Power Supply	Output voltage Output current Current limiting Voltage sensing	5,5V to 9V 3A minimum Adjustable to approximately 0,5A and 3A or greater Connected to the sense terminals of the TIU.	Coutant LB500 Thurlby PL154
* Modulation Meter		-	Marconi 2305 Racal 9008A
* RF Power Meter		-	Marconi 6960 Racal 9102 Bird equivalent
* RF Signal Generator	±5kHz deviation		Marconi 2019/2022 Farnell SG 1000
Ammeter	Accuracy Range	±2% 100mA fsd; 3A fsd	AVO Model 8
* Frequency Counter	Accuracy Readout accuracy Frequency Input impedance	0,1ppm or better 10Hz 470MHz or greater 50Ω	Racal 9917
* AF Generator	Frequency accuracy Level accuracy Waveform Output amplitude	±5% ±2% Sine 5V pk to pk max into 600 ohms	Levell TG152
* Distortion Analyser/ Millivolt Meter	-	-	HP333A Lyons Instruments D10B
Oscilloscope	-	-	Philips PM2308

* These items can be replaced by a radio test set combining all their functions,
for eg, Marconi MI2955
Wavetek 4032
or equivalent.

ALIGNING THE RADIO USING THE ALIGNMENT TOOL

See Appendix D for details on installing the alignment tool and the use of the associated test equipment.

Note: The alignment tool includes comprehensive on-line help text describing how to align the Radio.

Receiver Tests

- **Sennsitivity**

  0,3µV (0,35µV U0 and Tk bands) for 12dB SINAD unweighted.

- **Supply Input Power**

Standby	-	75 to 150mA
Receive at rated audio	-	250 to 350mA.

- **Distortion at Rated Audio Power**

  Less than 5%.

- **Squelch Function**

  Open at 0,3µV (0,35µV U0 and Tk bands).
  Closed with RF input reduced 5dB.

Transmitter Tests

- **RF Output Power**

5W	-	AB and R1 bands.
4W	-	E0, U0 and Tk bands.

- **Supply Input Current**

1,0 to 2,5A	-	E0 band
1,0 to 2,8A	-	AB band
1,0 to 2,2A	-	Tk band
1,0 to 2,4A	-	U0 band
1,4 to 2,1A	-	R1 band.

- **Frequency Error**

  ±200Hz at +25°C. ***Note: Transmitting will cause the internal temperature of the radio to rise. Keep transmission time to a minimum before and during this test.***

- **Peak System Deviation**

  70% to 95% of 1,5kHz (12,5kHz channel spacing), 2,4kHz (20kHz channel spacing), 3kHz (25kHz channel spacing).

- **Total Harmonic Distortion**

  Less than 10%.

CTCSS Option Tests

These are internal functions of the Sitel SC11372CQ device (IC701) and are controlled by the radio software. If a problem exists, check the customization using the programmer.

Selcall Option Test

This is an internal function of the Sitel SC11372CQ device (IC701) and is controlled by the radio software. If a problem exists, check the customization using the programmer.

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SECTION 5 - PARTS LIST

Antennae and Batteries

Description	Part No.	Remarks
Antenna Helical, E3 Band (67-74MHz)	0000 303 90004	
Antenna Helical, E4 Band (74-81MHz)	0000 303 90005	
Antenna Helical, E5 Band (81-88MHz)	0000 303 90006	
Antenna Uncut (67-88MHz)	0000 303 90007	
Antenna Helical, B3 Band (138-148MHz)	0000 303 90008	
Antenna Helical, AJ Band (146-156MHz	0000 303 90009	
Antenna Helical, AK Band (154-164MHz)	0000 303 90011	
Antenna Helical, AL Band (162-174MHz)	0000 303 90012	
Antenna Uncut (138-273MHz)	0000 303 90016	
Antenna Helical Tk Band (403-440MHz)	0000 303 90017	
Antenna Helical U0 Band (430-472MHz)	0000 303 90018	
Antenna Whip Tk Band (403-440MHz)	0000 303 90019	
Antenna Whip U0 Band (430-472MHz)	0000 303 90021	
Antenna Helical R1 Band (350-370MHz)	0000 303 90022	
Battery, NiCad Standard	0000 138 10002	*
Battery, NiCad Factory Mutual	0000 138 10003	* Available Autumn 1998

Ancillaries

Description	Part No.	Remarks
Antenna Adaptor	0000 268 90002	
Battery Charger Pocket (2-way)	0000 138 20009	*
Battery Charger Pocket (Single-way)	0000 138 20017	*
Belt Clip, Quick Release	5322 405 90895	*
Carrying Case, Leather	0000 445 90007	*
Desk Charger PSU - 110V	0000 138 20005	*
Desk Charger PSU - 230V	0000 138 20006	*
Dummy Battery assembly	0000 138 10004	*
Headset complete	0000 242 10002	*
Holster Assembly complete	0000 445 90008	*
Lanyard	0000 405 90005	*
Lapel LS/Mic, complete	0000 242 10001	*
Multi-charger 6-way PSU - UK	0000 138 20010	*
Multi-charger 6-way PSU - EU	0000 138 20011	*
Multi-charger 10-way PSU - UK	0000 138 20012	*
Multi-charger 10-way PSU - EU	0000 138 20013	*
Programming Lead	0000 321 60001	*
PRP70 Charger Pocket Adaptor	0000 138 20018	*
Radio Test Interface Unit	0000 693 20001	*
Single Pocket Charger - EU	0000 138 20014	*
Single Pocket Charger - UK	0000 138 20015	*
Single Pocket Charger - US	0000 138 20016	*
Trickle Charger - UK	0000 138 20002	*
Trickle Charger - US	0000 138 20003	*
Trickle Charger - EU	0000 138 20004	*

Description	Part No.	Remarks
User Memory Plug (UMP)	0000 138 10002	
Vehicle Charger	PA-VEHA	

Note: Ancillary items marked with an asterisk ' * ' are non repairable and are NOT to be returned to the Central Repair Unit.

Tranceiver Parts

Description	Part No.	Remarks
Actuator Side Key "A"	0000 276 10001	
Actuator Side Key "B"	0000 276 10002	
Actuator PTT	0000 276 10003	
Case Front Assy - SRP8010	0000 447 40053	
Case Front Assy - SRP8020/21	0000 447 40041	
Case Front Assy - SRP8030/31	0000 447 40039	
Contact Antenna-ground	0000 290 80004	
Contact Antenna	0000 290 80005	
Flexi-circuit Mic/spkr	0000 216 80028	
Flexi-circuit Top Complete	0000 216 80622	SRP8010 only
Flexi-circuit Top Control	0000 216 80027	
Frame Assy	0000 447 40042	
Gasket LCD	0000 532 40001	
Insulator Jack Socket	0000 325 10001	
Insulator L/S	0000 325 10002	
Loudspeaker 16Ω	0000 240 90003	
Mat Switch Complex	0000 466 90003	
Mat Switch Simple	0000 466 90002	
Mic Electret	5322 242 10544	
MMI Pcb Assy Complete	0000 216 80026	
Pad Adhesive LCD	0000 325 80001	
Pad Adhesive Lightguide	0000 325 80003	
Pad Foam	0000 325 80004	
Retainer Mic	0000 405 90008	
Reflector LCD	0000 466 90004	
Seal Actuator	0000 466 90005	
Seal Frame	0000 466 90007	
Seal L/S	0000 466 90006	
Seal Top	0000 466 90010	SRP8010 only
Seal Top	0000 466 90008	
Seal Twin Jack Skt (Bung)	0000 466 90009	
Socket Jack Twin	0000 268 90001	
Support Switch	0000 414 60005	
Switch Rotary	0000 276 10004	
Volume Knob Assy	0000 414 60004	
Window LCD	0000 310 40001	

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SECTION 6 - DIAGRAMS

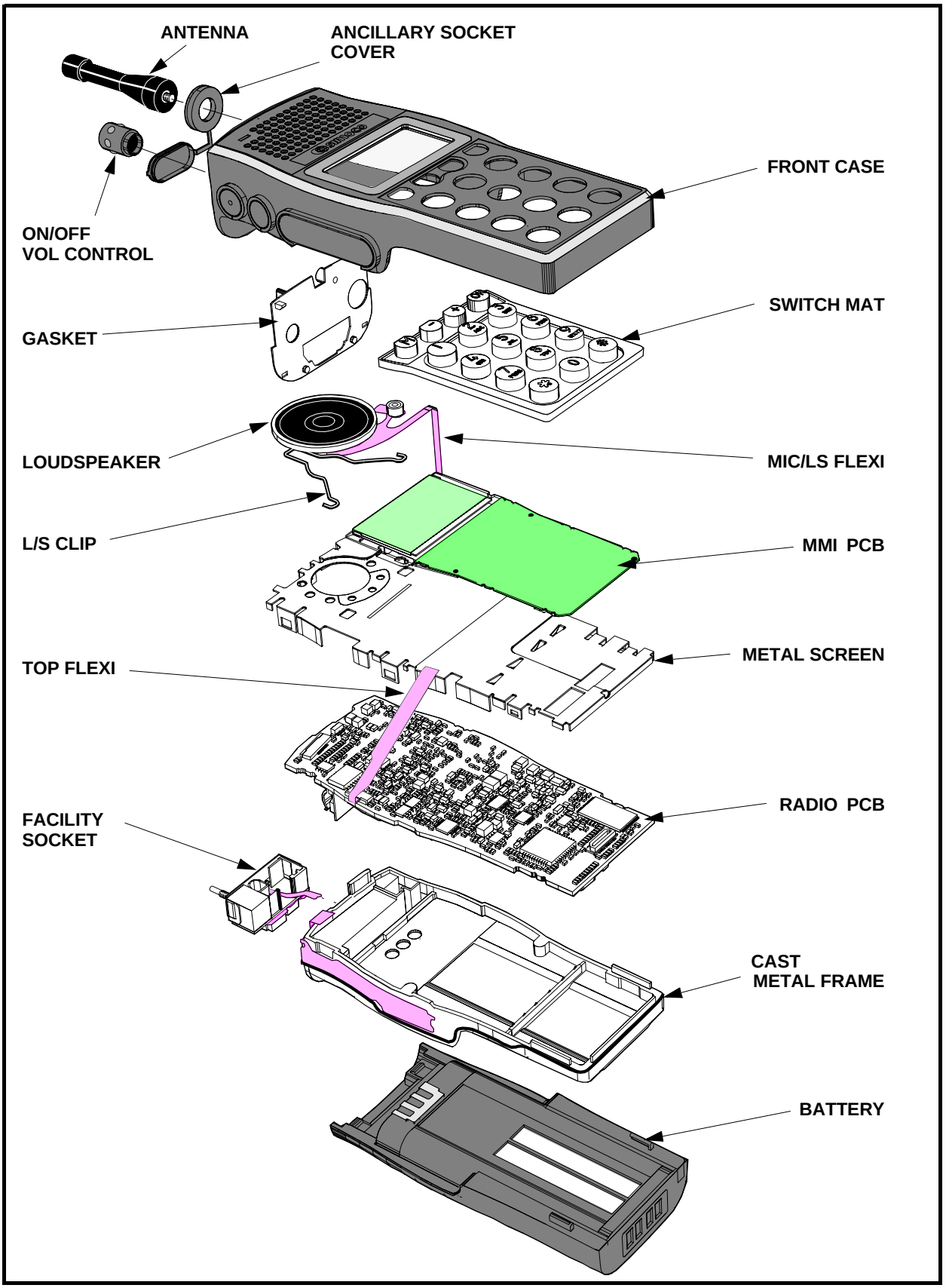
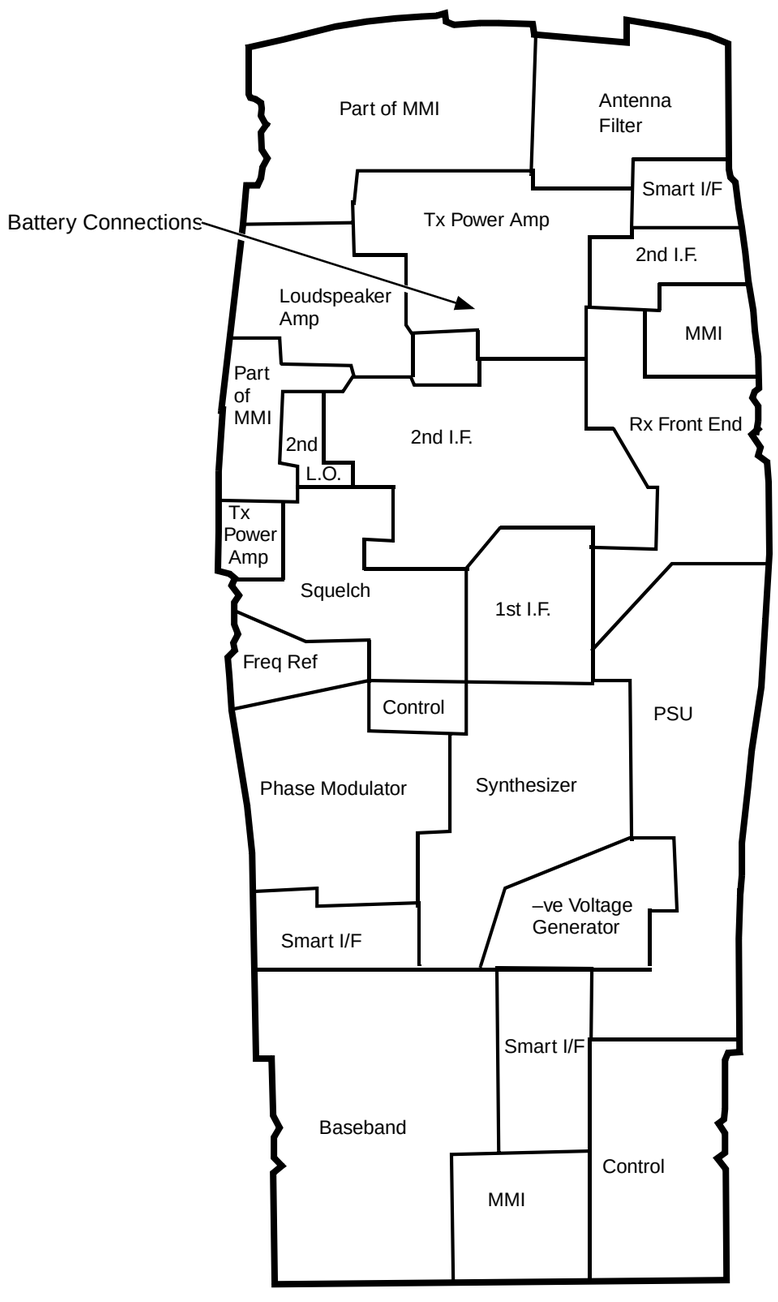
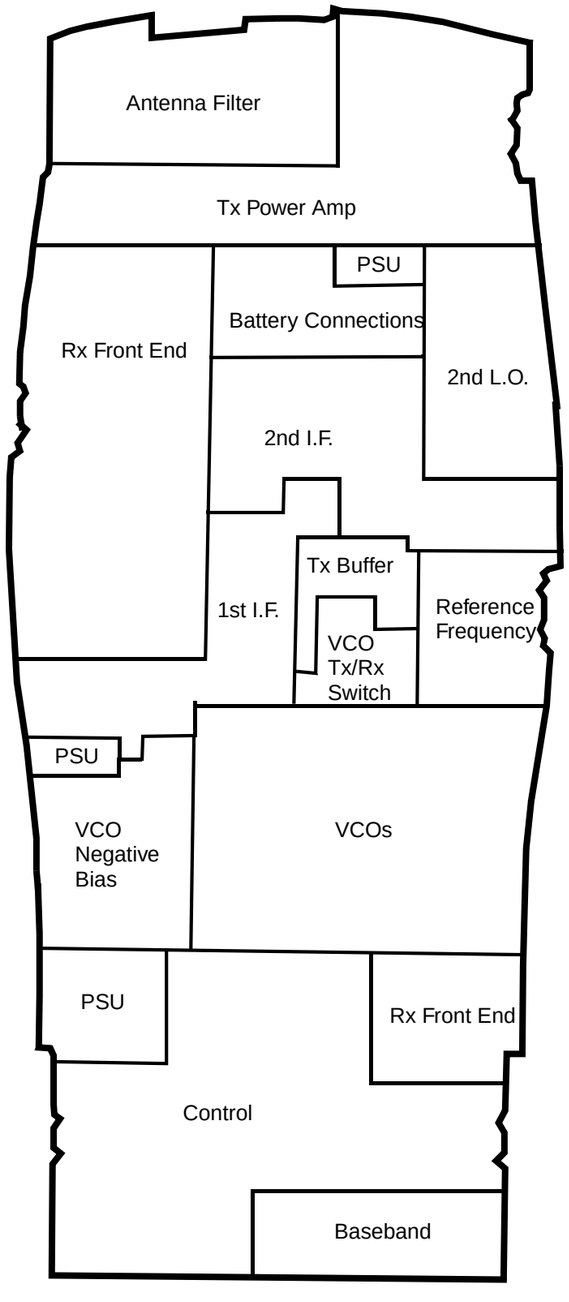


Figure 6.1 Exploded View of the Portable Radio



Side 1



Side 2

Figure 6.2 Radio PCB Usage

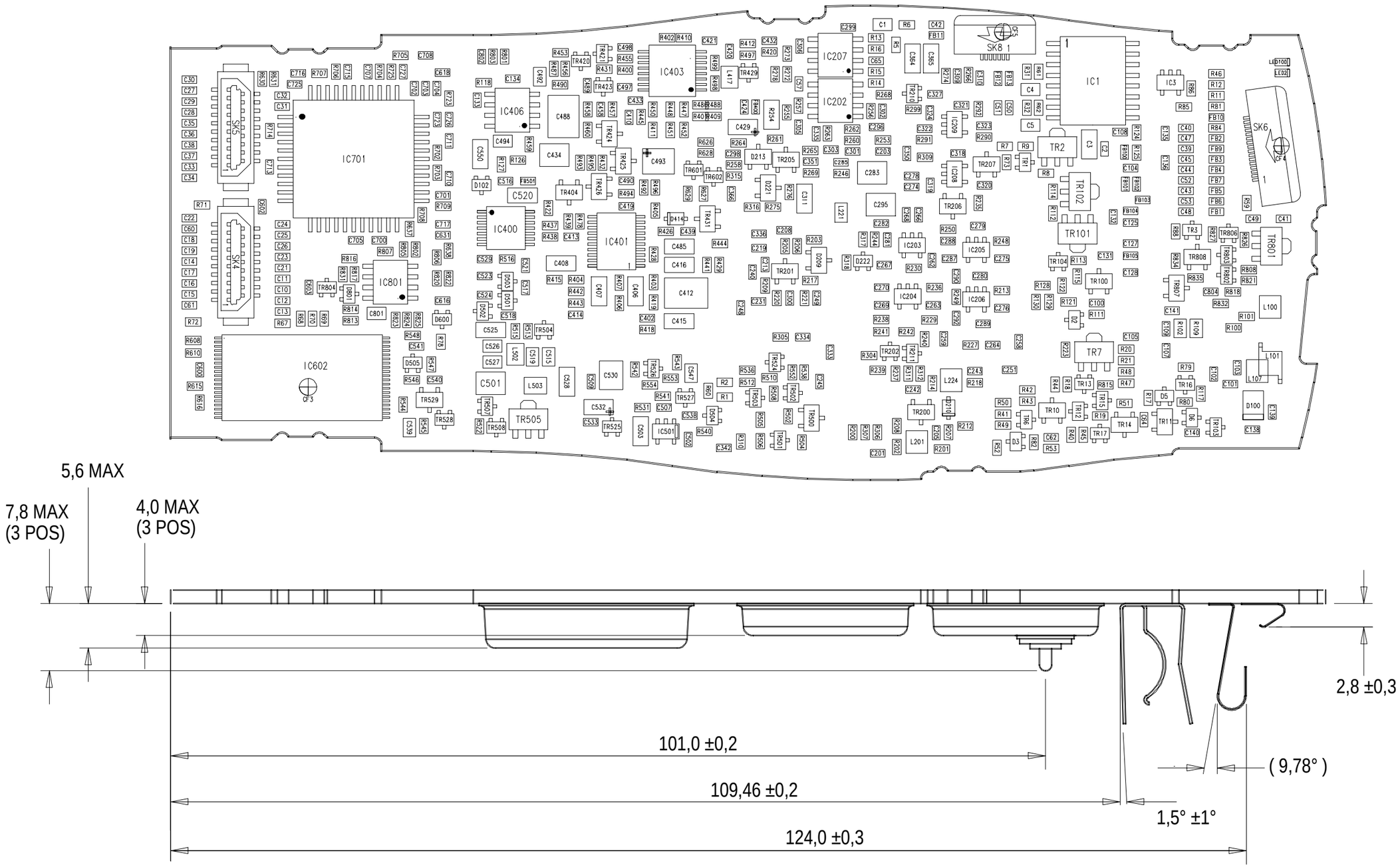
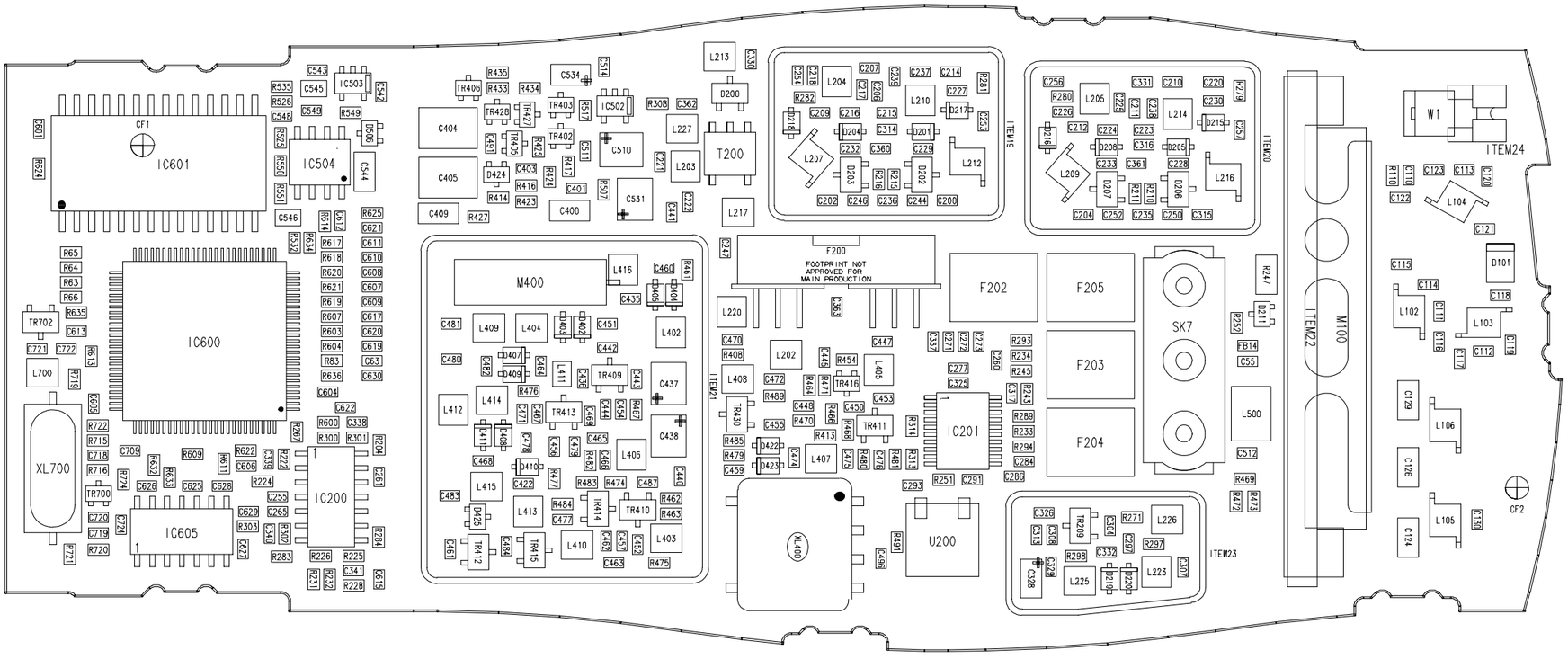


Figure 6.3 Radio PCB Component Layout Diagram - Side 1



MAIN ASSEMBLY SIDE 2 (BOTTOM)

Figure 6.4 Radio PCB Component Layout Diagram - Side 2

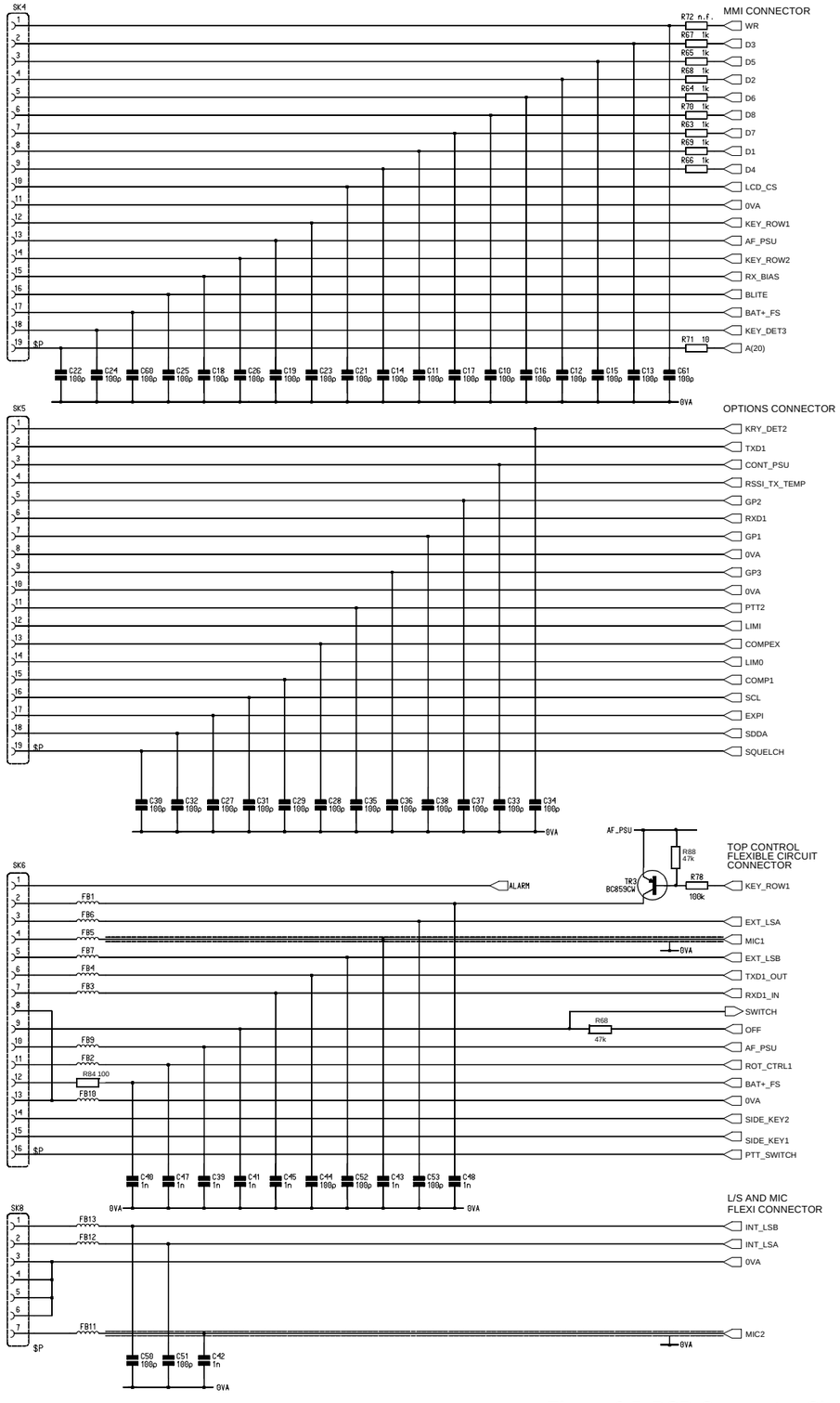


Figure 6.5 PCB Connector Circuit Diagram

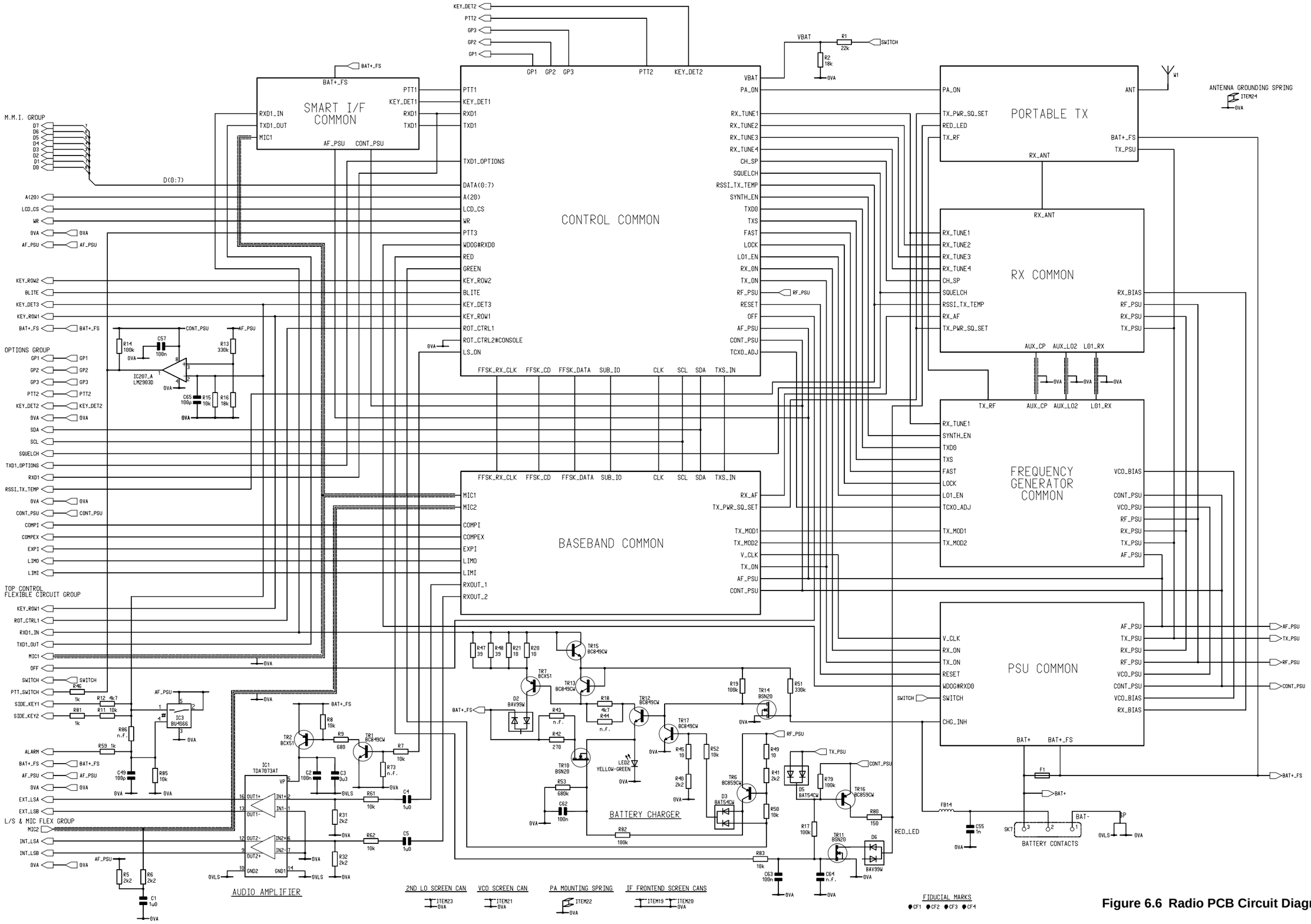
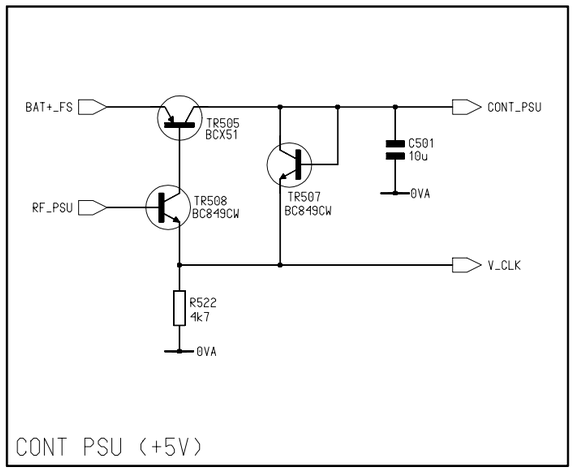
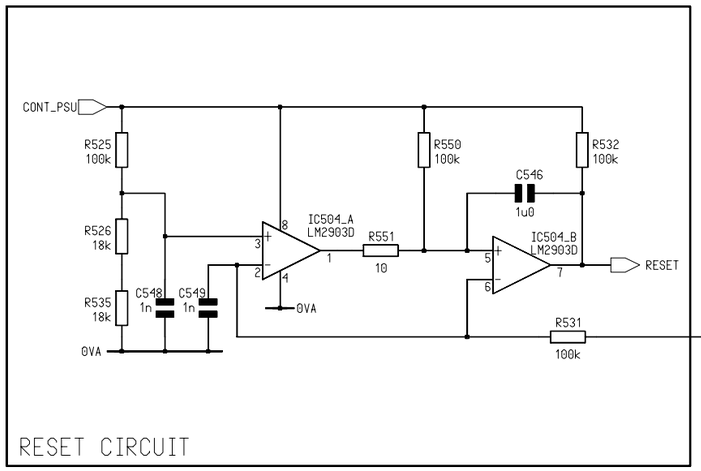
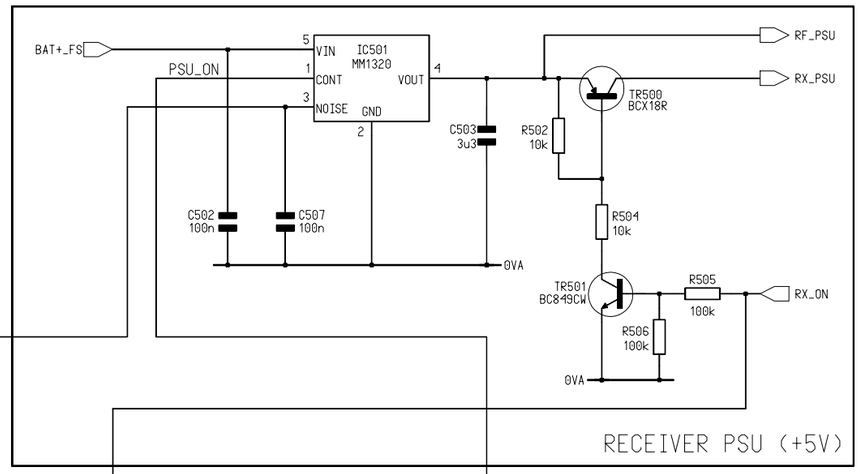
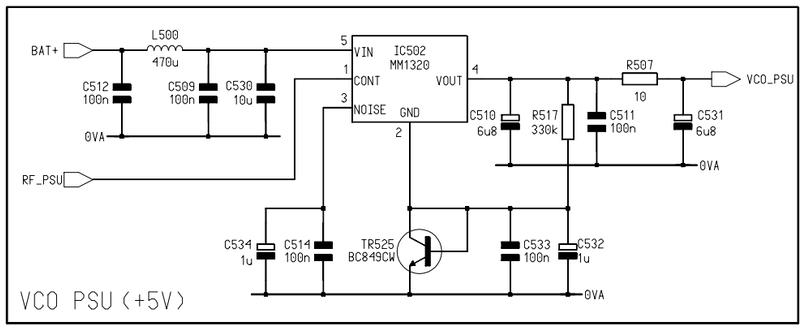


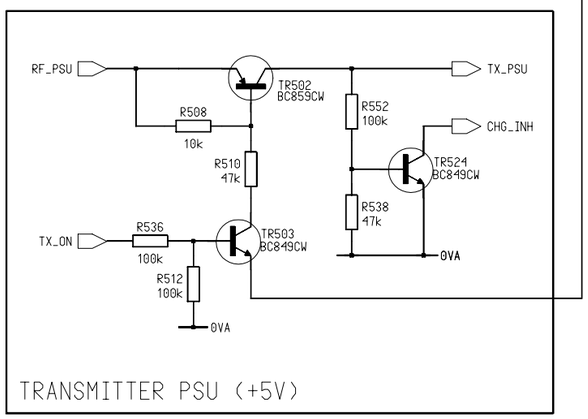
Figure 6.6 Radio PCB Circuit Diagram

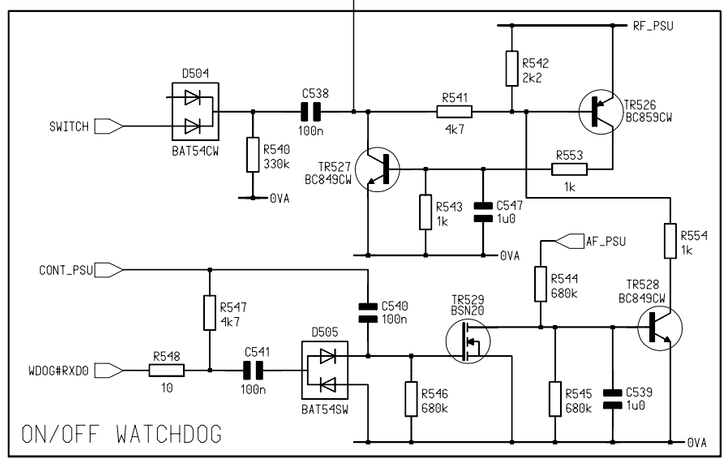


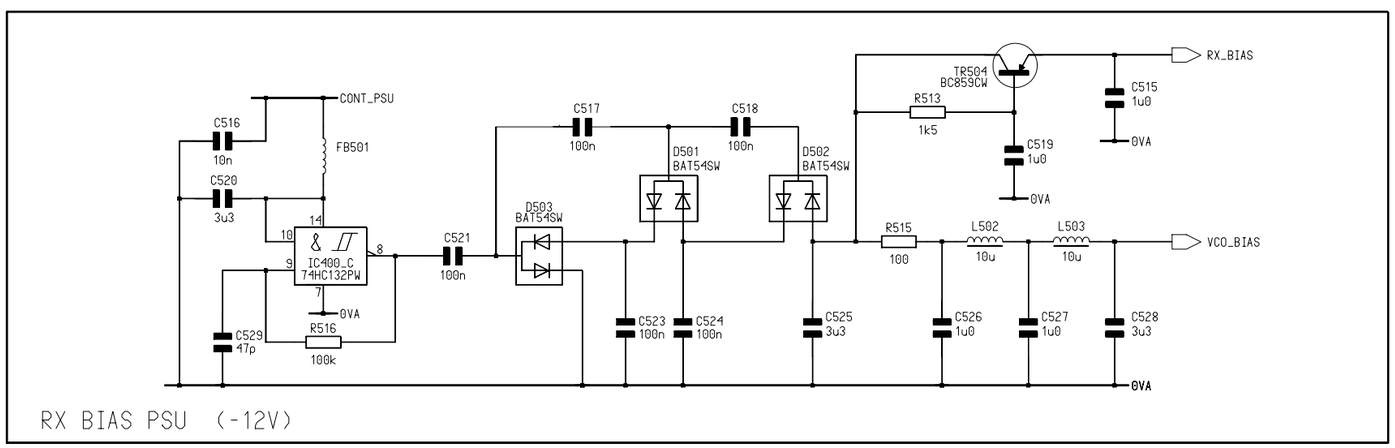












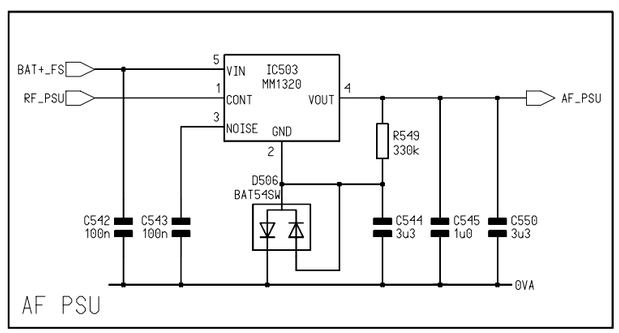


Figure 6.7 Power Supplies Circuit Diagram

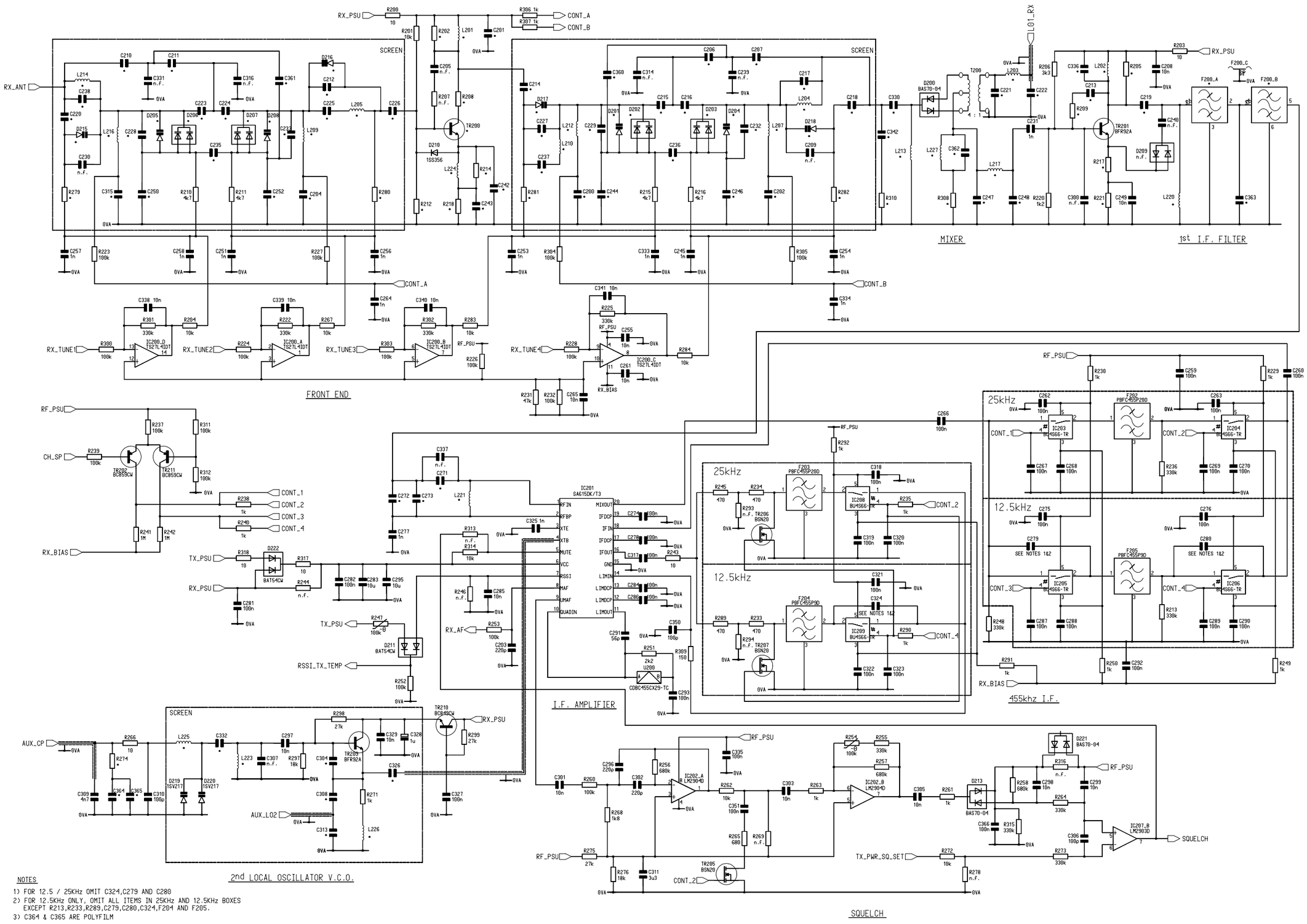
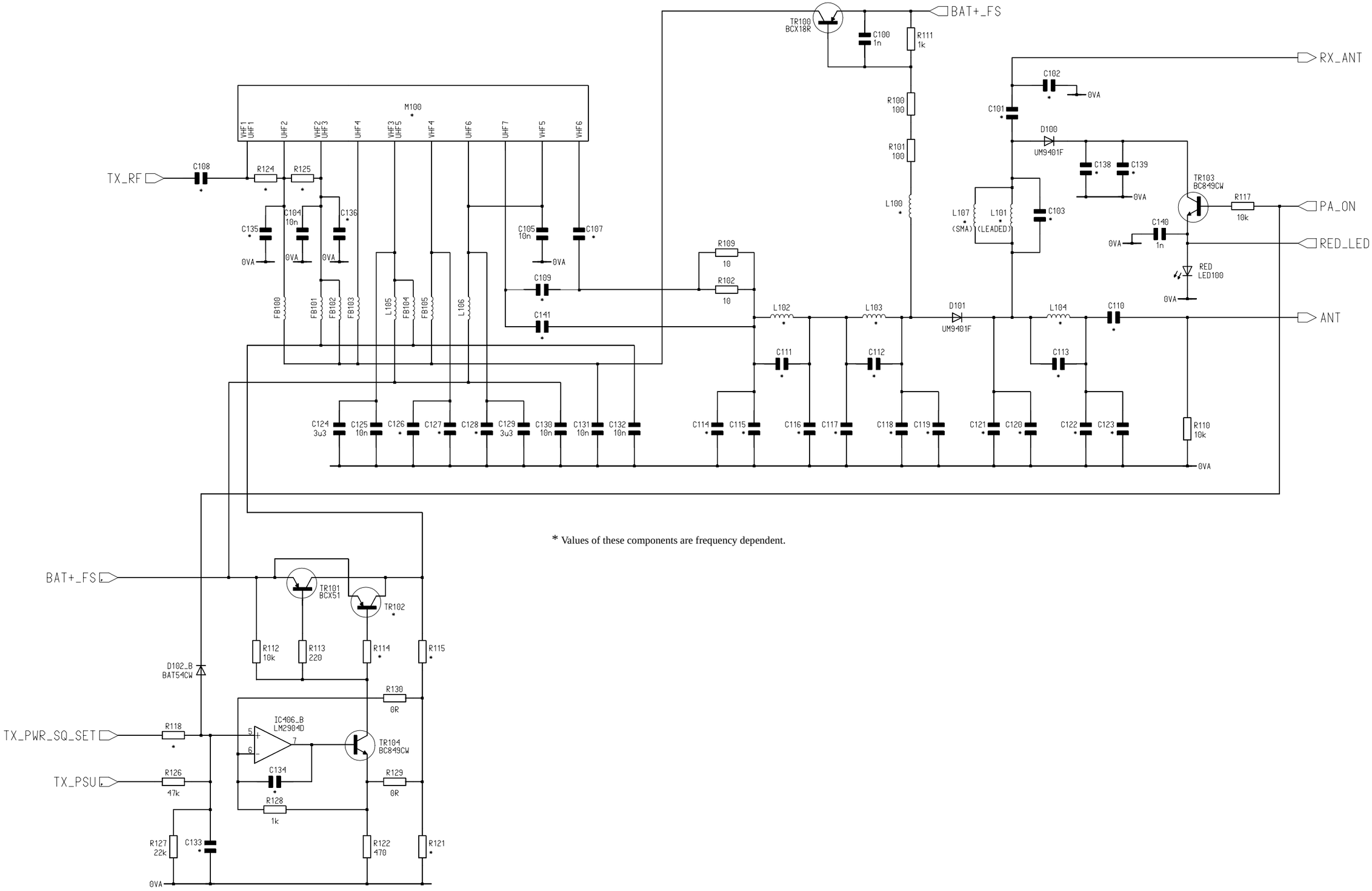


Figure 6.8 Receiver Circuit Diagram



* Values of these components are frequency dependent.

Figure 6.9 Transmitter Circuit Diagram

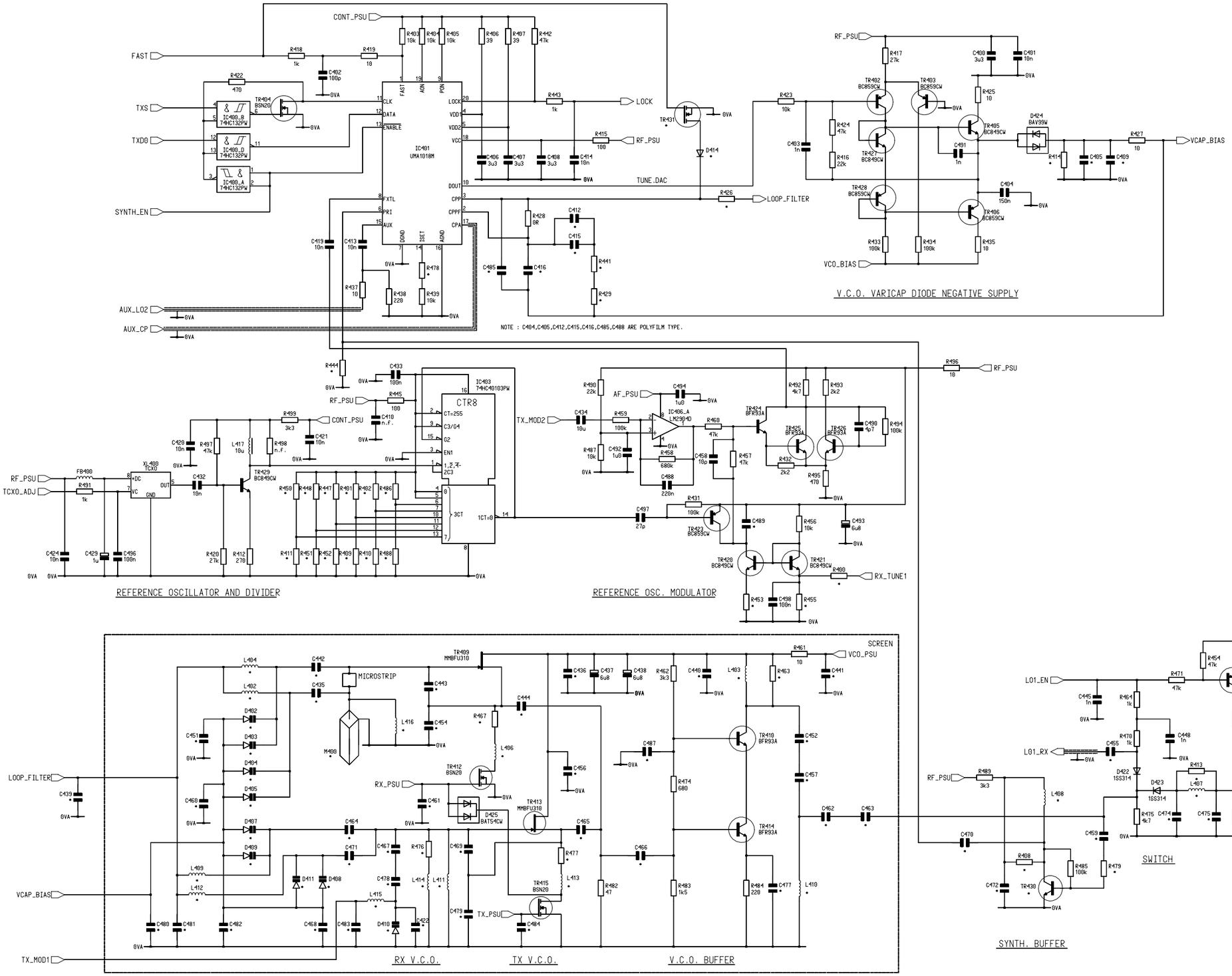


Figure 6.10 Frequency Generation Circuit Diagram

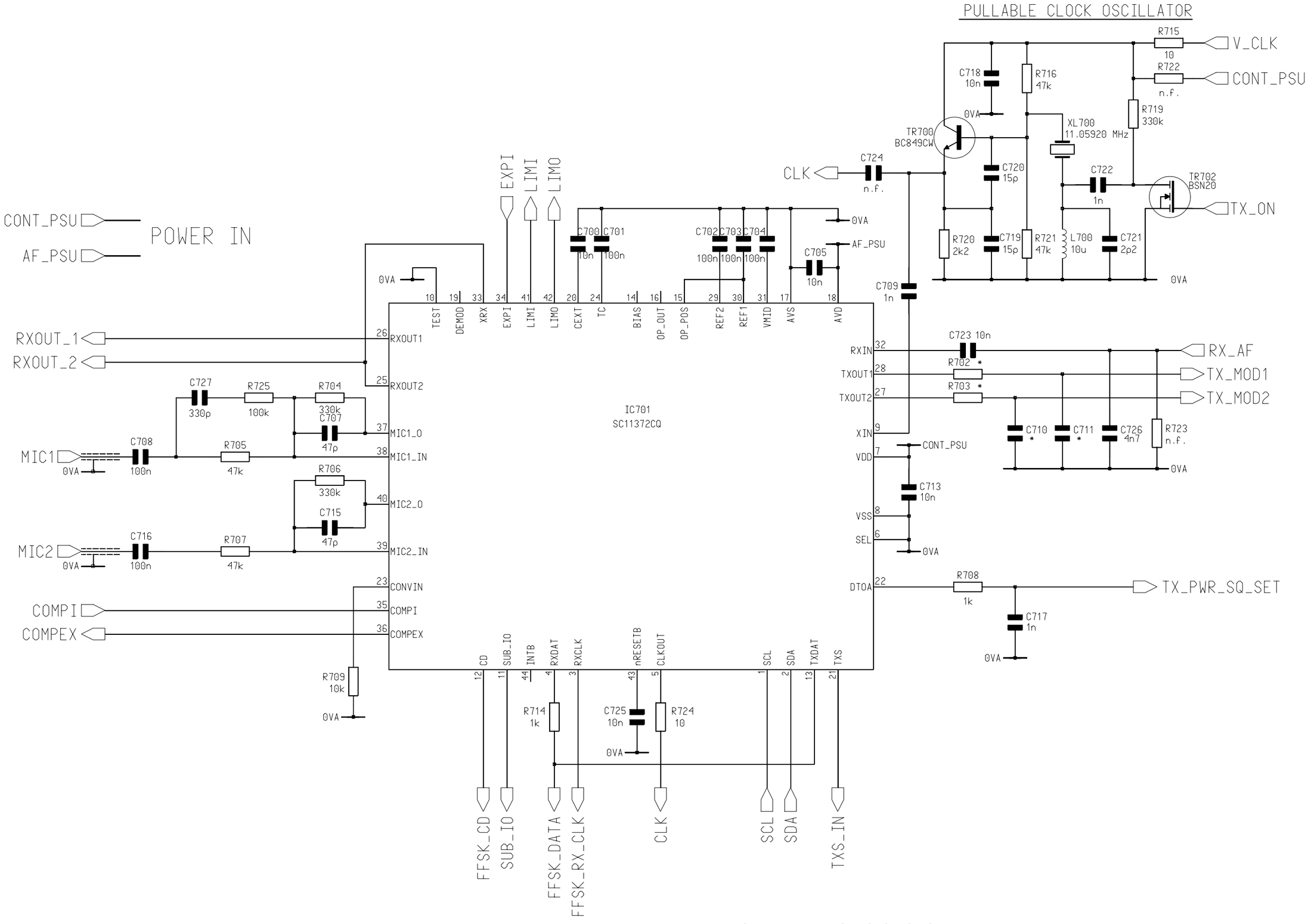


Figure 6.11 Baseband Circuit Diagram

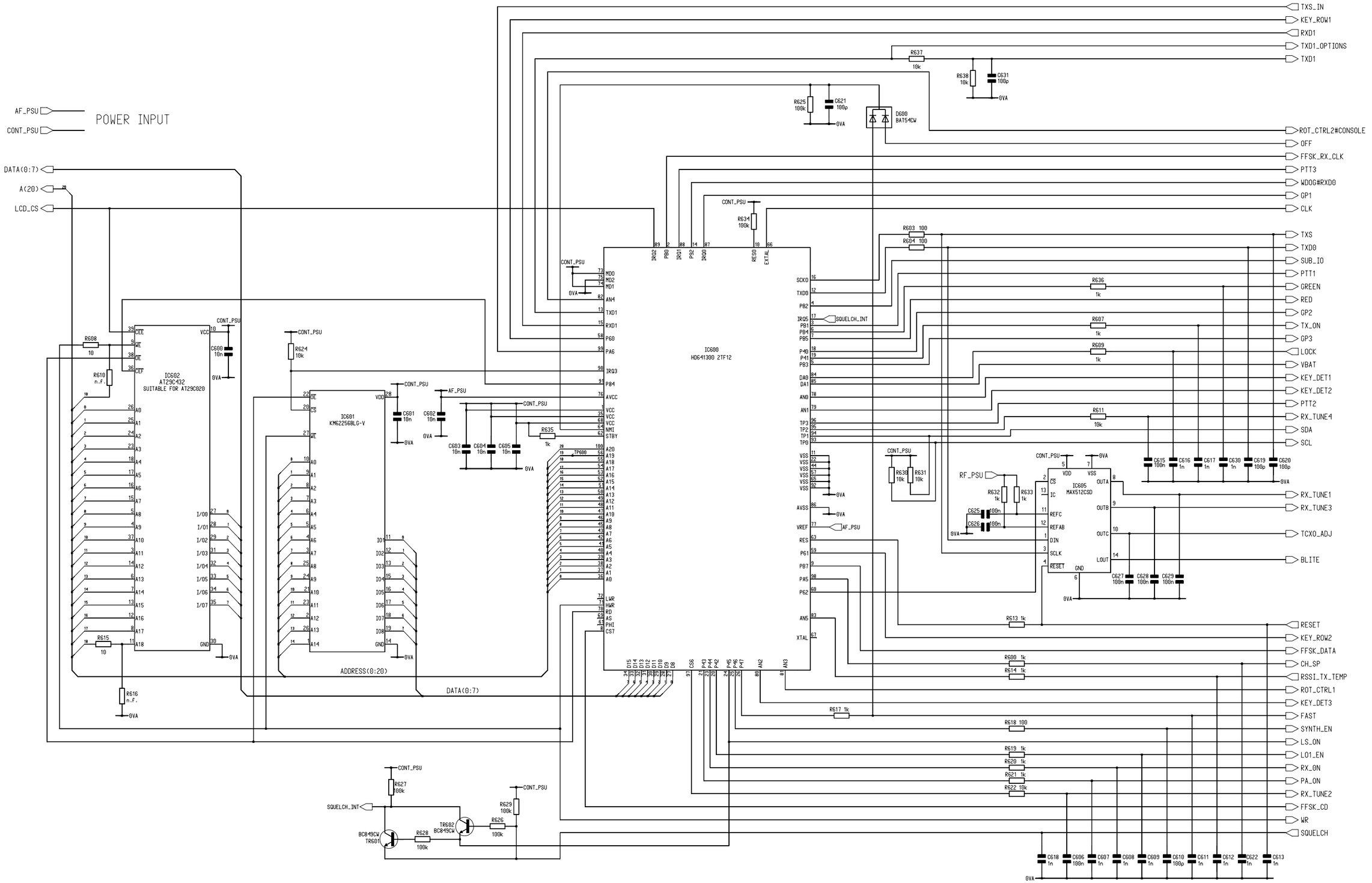
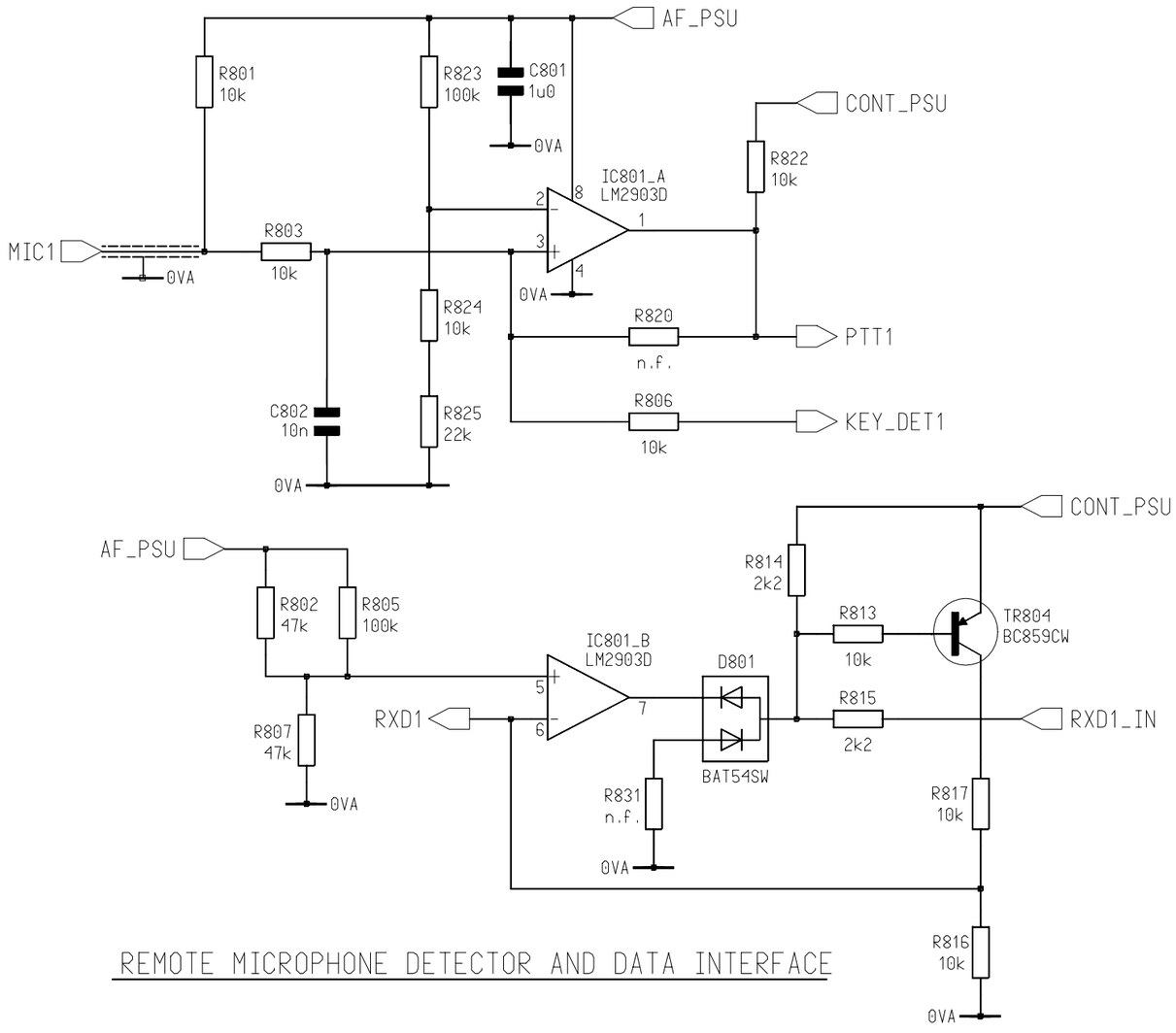
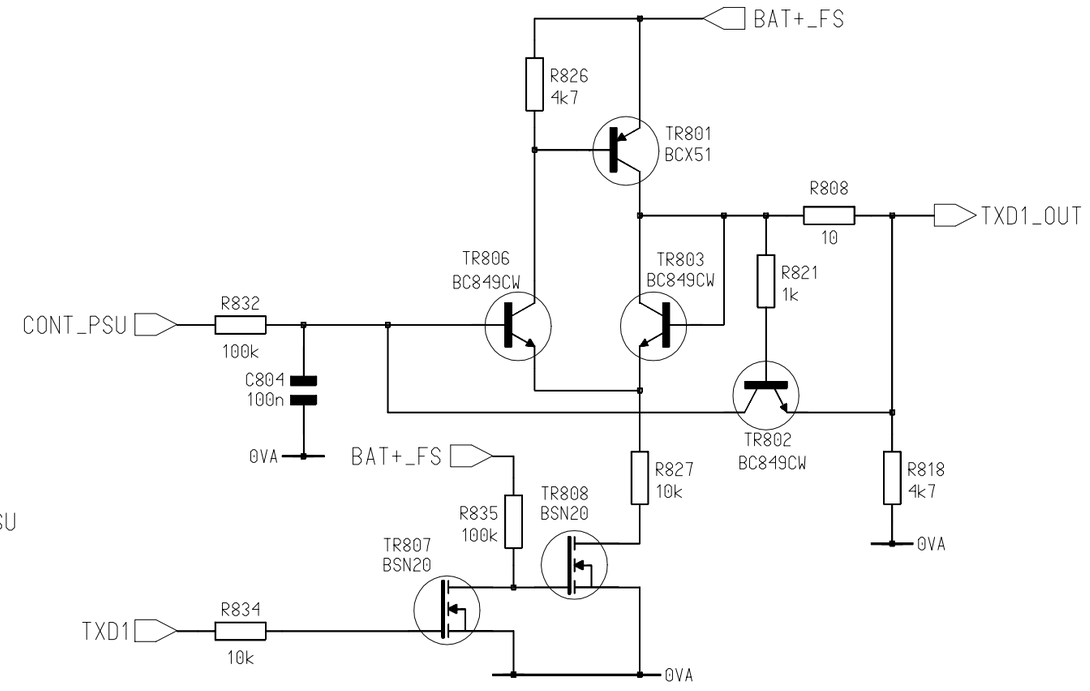


Figure 6.12 Control Circuit Diagram



REMOTE MICROPHONE DETECTOR AND DATA INTERFACE



DATA/CLOCK OUTPUT INTERFACE AND CURRENT LIMITED D.C. SUPPLY

Figure 6.13 SMART Interface Circuit Diagram

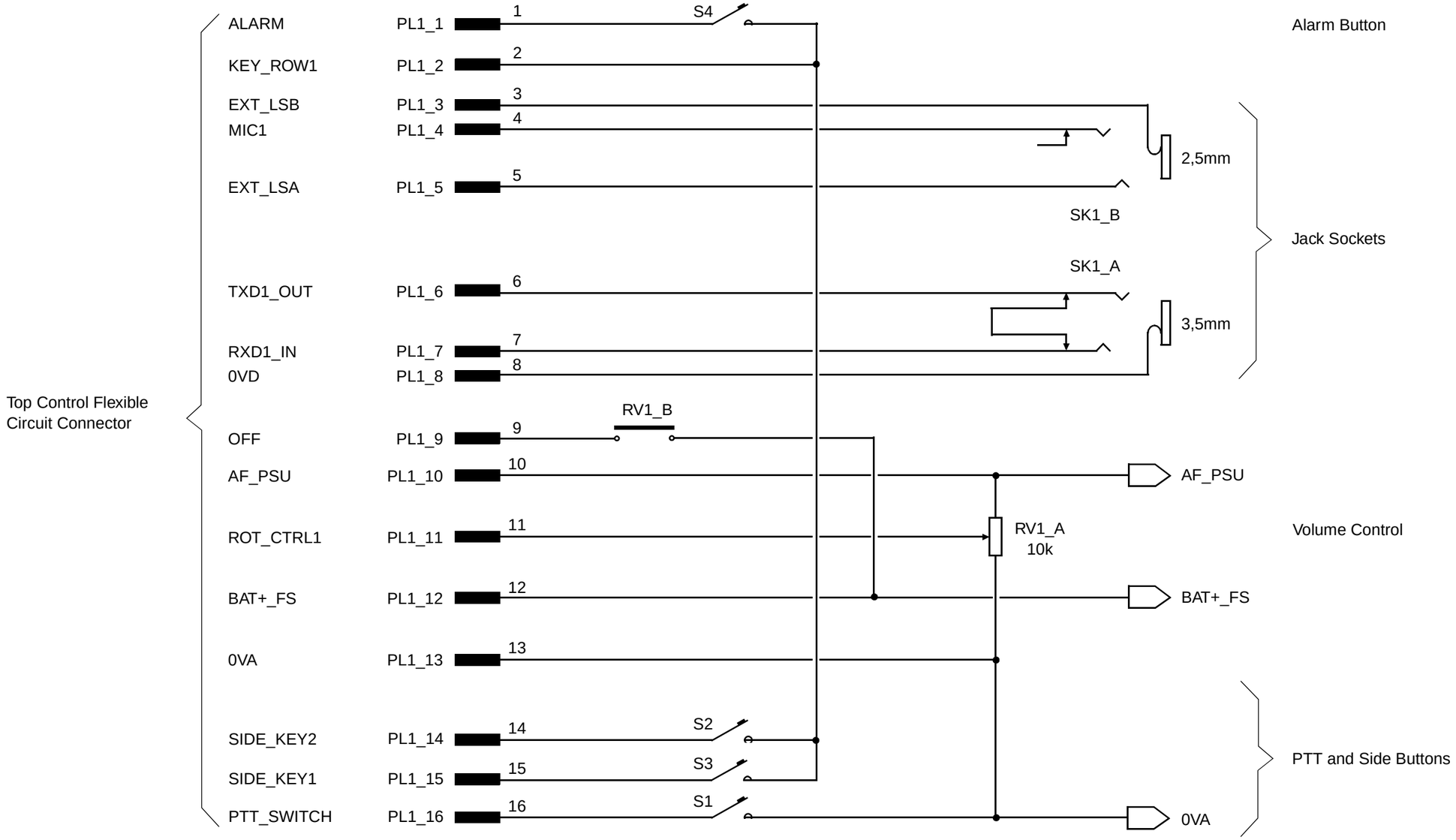
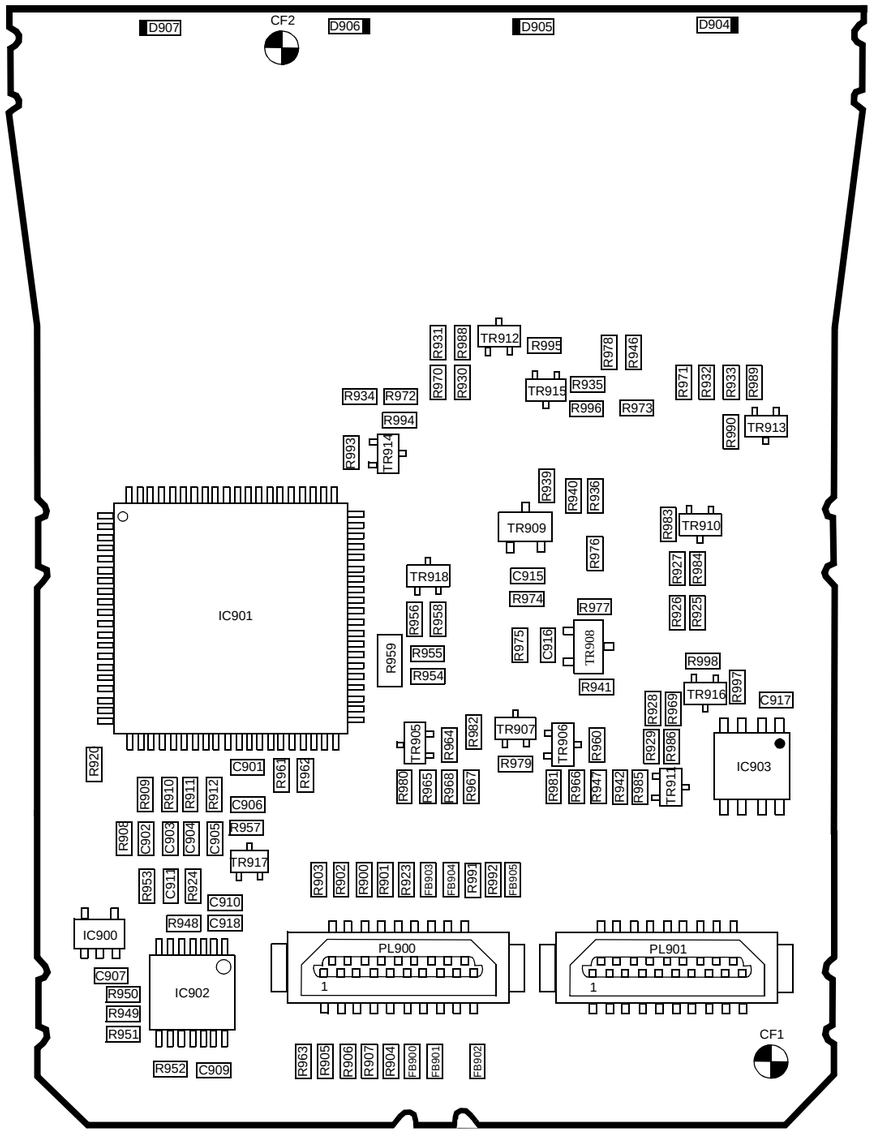
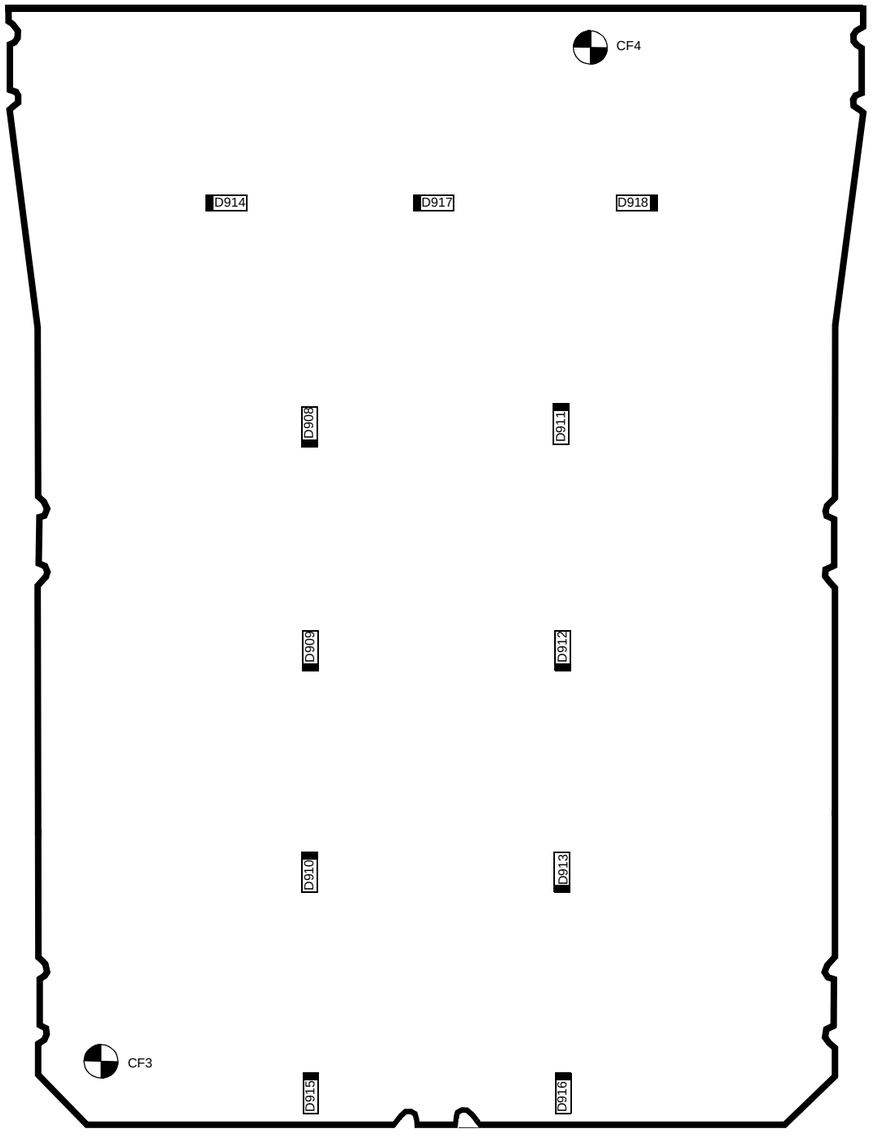


Figure 6.14 Top Control Flexi Circuit Diagram



Side 1



Side 2

Figure 6.15 MMI PCB Component Layout Diagrams

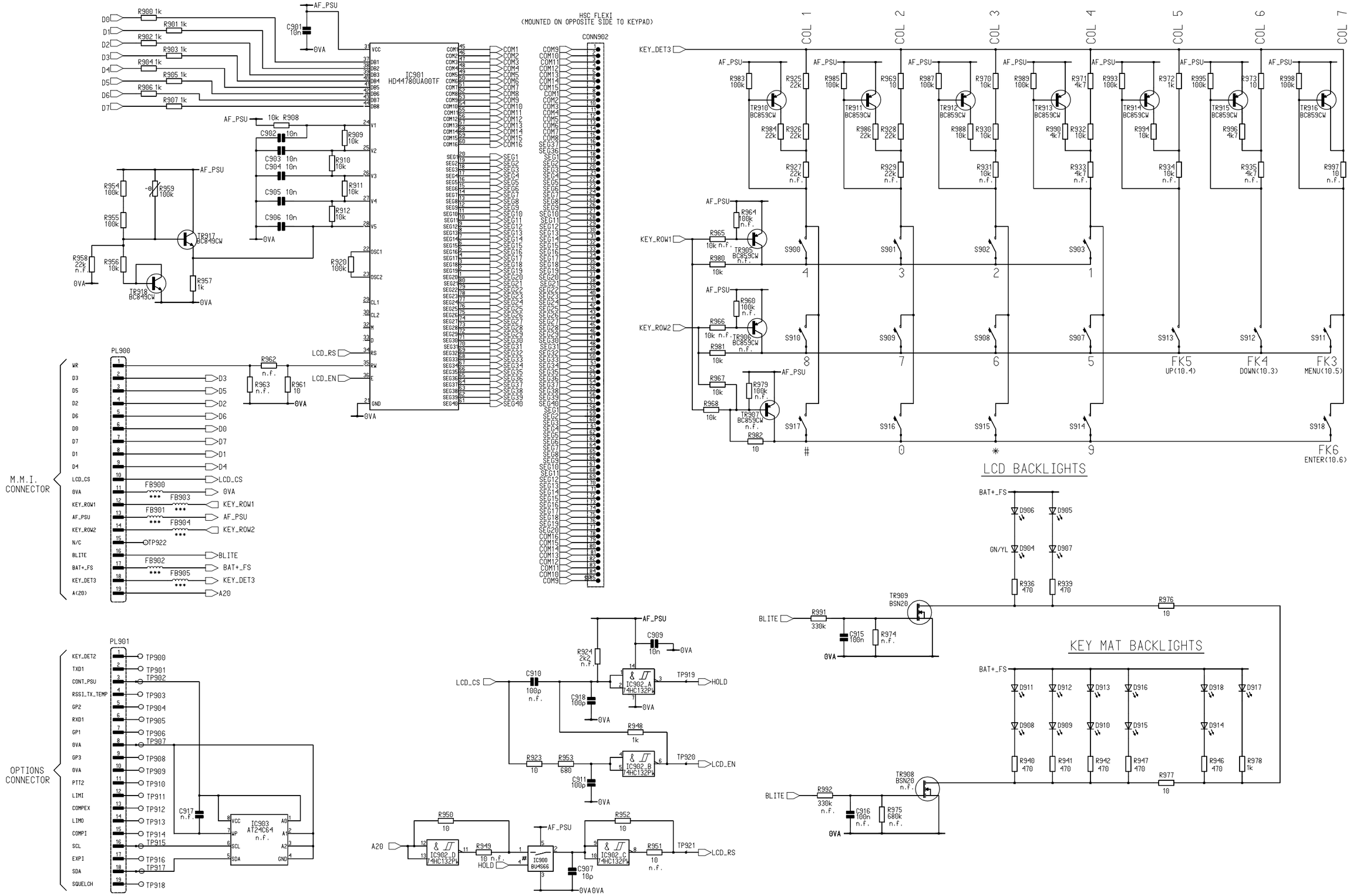


Figure 6.16 MMI PCB Circuit Diagram

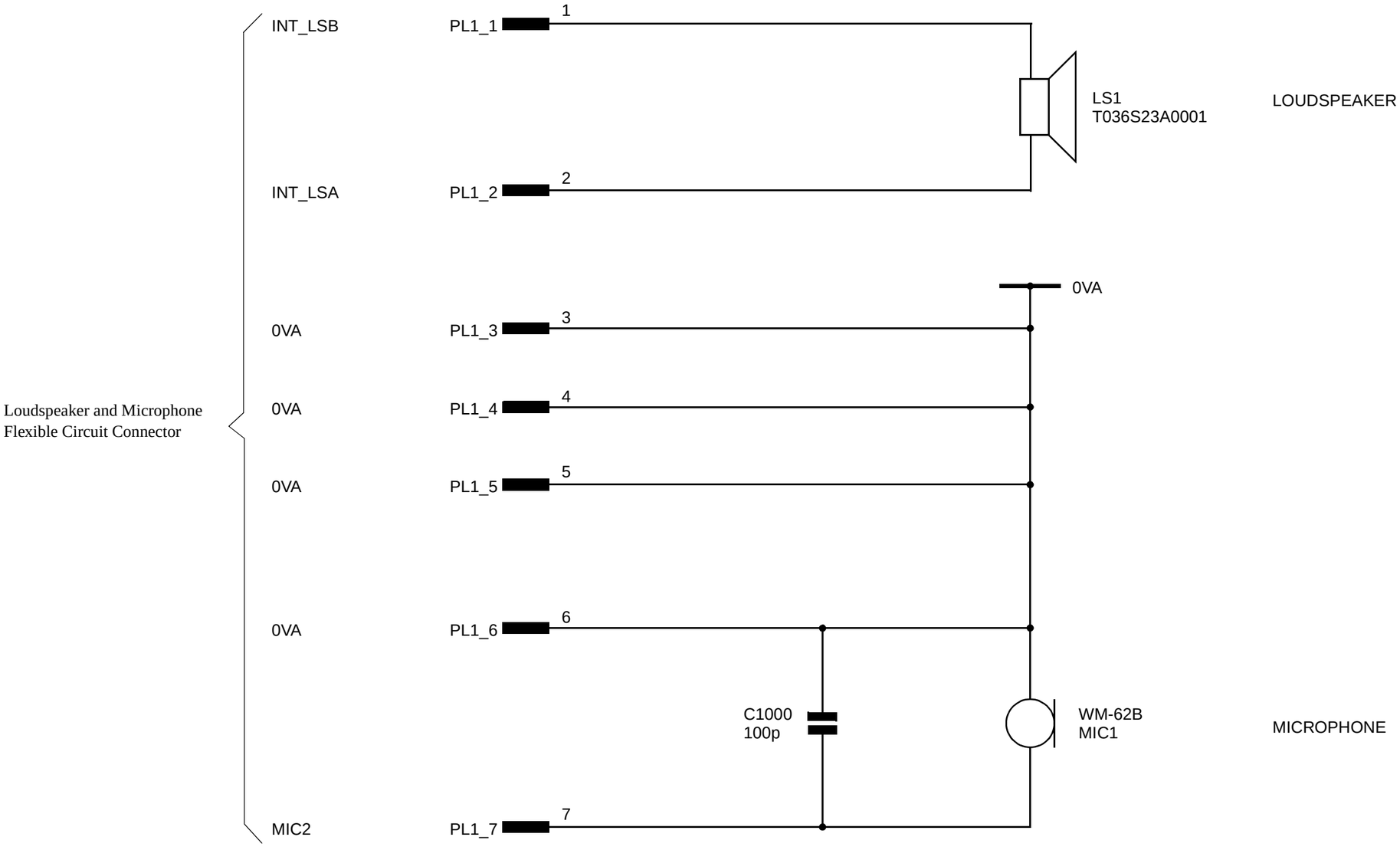


Figure 6.17 Loudspeaker / Microphone Flexi Circuit Diagram

SRP8000 SERIES
VHF/UHF PORTABLE RADIO
APPENDIX A - BATTERY CHARGERS

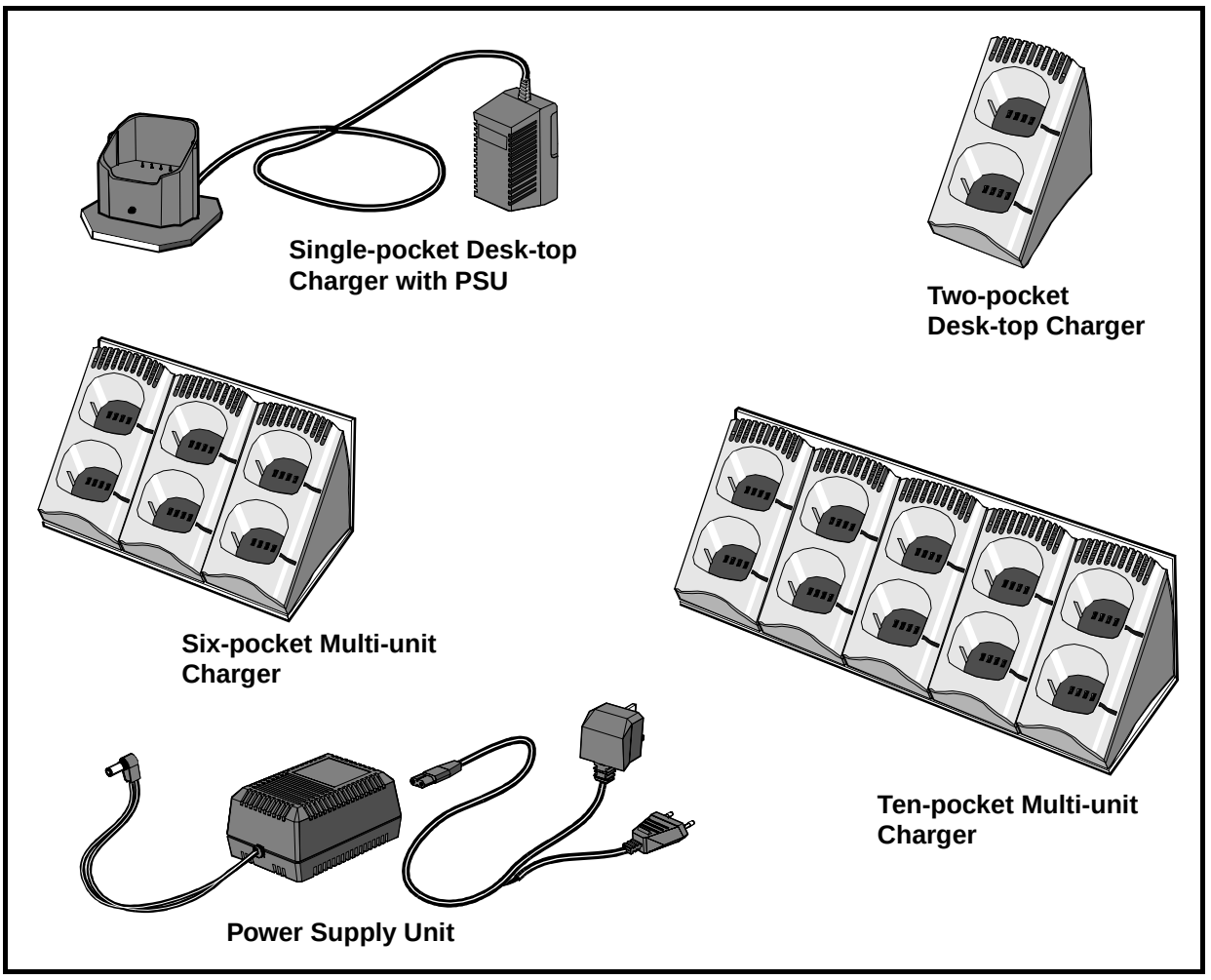


Figure A.1 Desk-top and Multi-unit Battery Chargers

INTRODUCTION

WARNING

This equipment is designed to meet relevant safety requirements.

If it is necessary to replace any safety-conscious component, 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.

The Desk-top and multi-unit chargers are battery chargers for use with the SP8000 Series radio batteries. The Desk-top charger comprises a single-pocket unit (or a dual-pocket unit) and a power supply unit which connect together. There are two versions of the multi-unit charger, similar to the two-pocket desk-top unit, but with a higher rated PSU and three or five dual-pocket units mounted side by side.

The trickle charger is described in Appendix E.

The chargers can accept:

Single Pocket Desk-top Charger	One battery. One radio with battery fitted.
Two pocket Desk-top Charger	Two batteries. Two radios with batteries fitted. One radio with battery fitted and one battery.

	Six Pocket	**Ten Pocket**
Multi-unit Charger	Six batteries. Six radios with batteries fitted. Any combination of radio with battery fitted and battery only up to a maximum of six units.	Ten batteries. Ten radios with batteries fitted. Any combination of radio with battery fitted and battery only up to a maximum of ten units.

All pockets can fast charge simultaneously.

Operation of the radio whilst in the charger, is permitted. Charging is suspended during transmission and resumes at the end of a transmission.

Trickle charging, at the maximum rate allowed by the battery, will be carried out whenever a battery is inserted into the charger and fast charging is either complete or not initiated.

SPECIFICATION

Charge Time

Standard battery	60 minutes (nominal).

Charge Rate

- Trickle	160mA.
- Fast	1600mA.

Indicators

Two pocket charger and multi-unit chargers:

- Amber	Power (one per pocket).
- Green	Battery ready - Charging cycle complete (one per pocket).
- Red	Charging in progress (one per pocket).

Single pocket charger:

- Red on	Fast
- Red flashing	Trickle
- Red off	No battery

AC Supply	230V AC at 50Hz ±10%.
DC Supply	10,8V DC to 15,6V DC.
Output Voltage	10,5V DC Maximum.
Operating Temperature	–10°C to +60°C.

Note: If the battery is outside temperature range 10°C to 40°C, fast charge is inhibited.

INSTALLATION

General

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

OPERATION

Each pocket of all charger units will accept a battery without radio, or a radio complete with battery.

Radio with Battery

To charge a battery connected to a radio, insert the radio into a charger pocket with the front of the radio towards the front of the charger. The LED for that pocket will change from amber (Power) to red (charging in progress). 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 charge will cease, trickle charge will commence and the LED indicator will change to green (battery ready).

Battery Alone

To charge a battery, insert it into the rear of a charger pocket with the three battery/radio contacts towards the front of the charger. The LED for that pocket will change from amber (Power) to red (charging in progress). 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 charge will cease, trickle charge will commence and the LED indicator will change to green (battery ready).

SERVICE

Cleaning of Charging Contacts

To maintain efficient operation, ensure that the charging contacts on both the charger and 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 battery or charger. Do not use abrasives as their use may remove the contact plating.

Sensing Circuits

The following sensing circuits are included:

(1)	Transmit disable	If fast charge is occurring, it is disabled if a radio connected to the charger has its transmitter enabled. When the transmission terminates, the fast charging resumes.
(2)	End-of-charge	During fast charge, the cell temperature is monitored and when a positive rate of change above a defined level is detected, fast charge is terminated.
(3)	Hot battery	When a battery is inserted into a charging pocket, the battery temperature is measured; if the temperature is in excess of 40°C fast charge is inhibited until the battery temperature falls to below 30°C.
(4)	Cold battery	When a battery is inserted into a charging pocket, the battery temperature is measured; if the temperature is below 10°C fast charge is inhibited until the battery temperature rises to above 10°C.
(5)	Low battery	If the battery voltage is below 6V, re-form charging (320mA) commences and continues until 6V is reached.
(6)	No battery	If a battery is not inserted into a charging pocket, the LED for that pocket is amber (provided power to the charger is on).
(7)	Over voltage	During fast charge, when 10,5V is reached, the charging current is reduced to prevent 10,5V being exceeded.

LED Indications (except single unit charger)

Each charging pocket has a tri-colour LED to indicate the charger/battery status:

Colour	Indication	Status
Amber	Power indicator	Power on
Green	Battery ready	Charging complete
Red	Battery not ready	Charging

Fault indication	LED flashing, and colour, indicates fault:
Invalid battery type	Flashing amber
Battery too hot	Flashing red
Battery too cold	Flashing green
Cell short circuit.	Flashing red/green.

The flash rate is 800ms ON, 800ms OFF.

PARTS LIST

Description	**Part No.**	**Remarks**
Desk Charger PSU - 110V	0000 138 20005	
Desk Charger PSU - 230V	0000 138 20006	
Battery Charger Pocket (2-way)	0000 138 20009	
Battery Charger Pocket (single way)	0000 138 20017	
PRP70 Charger Pocket Adaptor	0000 138 20018	See Appendix I
Multi-charger 6-way PSU - UK	0000 138 20010	
Multi-charger 6-way PSU - EU	0000 138 20011	
Multi-charger 10-way PSU - UK	0000 138 20012	
Multi-charger 10-way PSU - EU	0000 138 20013	
Single Pocket Charger - EU	0000 138 20014	
Single Pocket Charger - UK	0000 138 20015	
Single Pocket Charger - US	0000 138 20016	

SRP8000 SERIES VHF/UHF PORTABLE RADIO
APPENDIX B - LAPEL SPEAKER / MICROPHONE

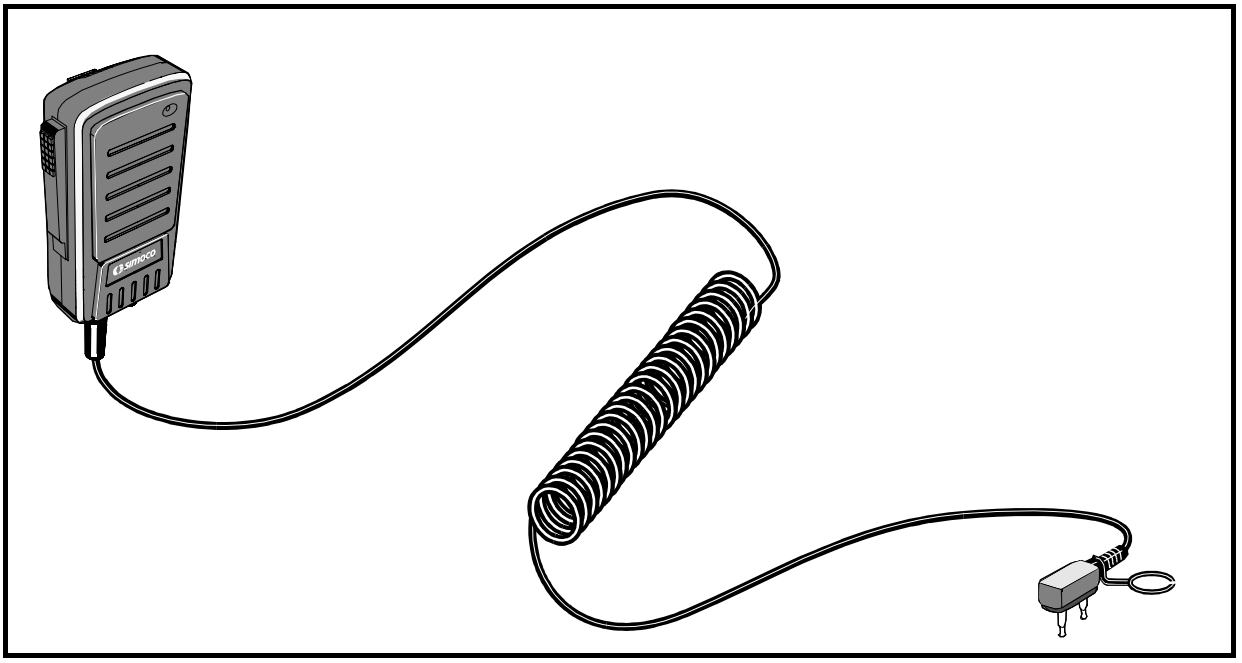


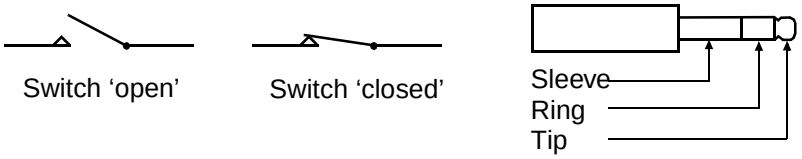
Figure B.1 Lapel Loudspeaker / Microphone

INTRODUCTION

The lapel loudspeaker / microphone is a robust, lightweight, unit with an integral press-to-talk (PTT) switch and a headset socket. The unit connects to the portable radio via a 1,5m ‘curly’ cable with a 2,5mm (J1) and 3,5mm (J2) stereo jack plugs mounted in a single moulding.

Terminology

In the following text, switch states and jack connections are defined as follows:



SPECIFICATION

Microphone

Maximum circuit current	10mA.
Type	Electret.
Impedance	2kΩ (nominal).
Sensitivity	–64dB ±4dB at 1kHz (0dB = 1V / µbar).
Sensitivity variation relative to 1kHz over frequency range 300 Hz to 4kHz.	Less than +10dB, –2dB.
PTT switch	Push to transmit.
DC voltage overshoot during switching periods	Within 2% of nominal voltage.
PTT ‘click’ suppress circuit:	
DC voltage establishment time for active PTT	Less than 5ms to reach 95% of the nominal PTT voltage.
DC voltage established time for PTT release	50ms ±20% to reach 95% of the nominal PTT release voltage.

Loudspeaker

Impedance	16Ω ±2Ω.
Power rating	0,3W nominal, 0,5W maximum.
Headset socket	3,5mm - loudspeaker disconnected when jack inserted.

Environmental

Operating temperature range	–20°C to +55°C.
Storage temperature range	–40°C to +80°C.

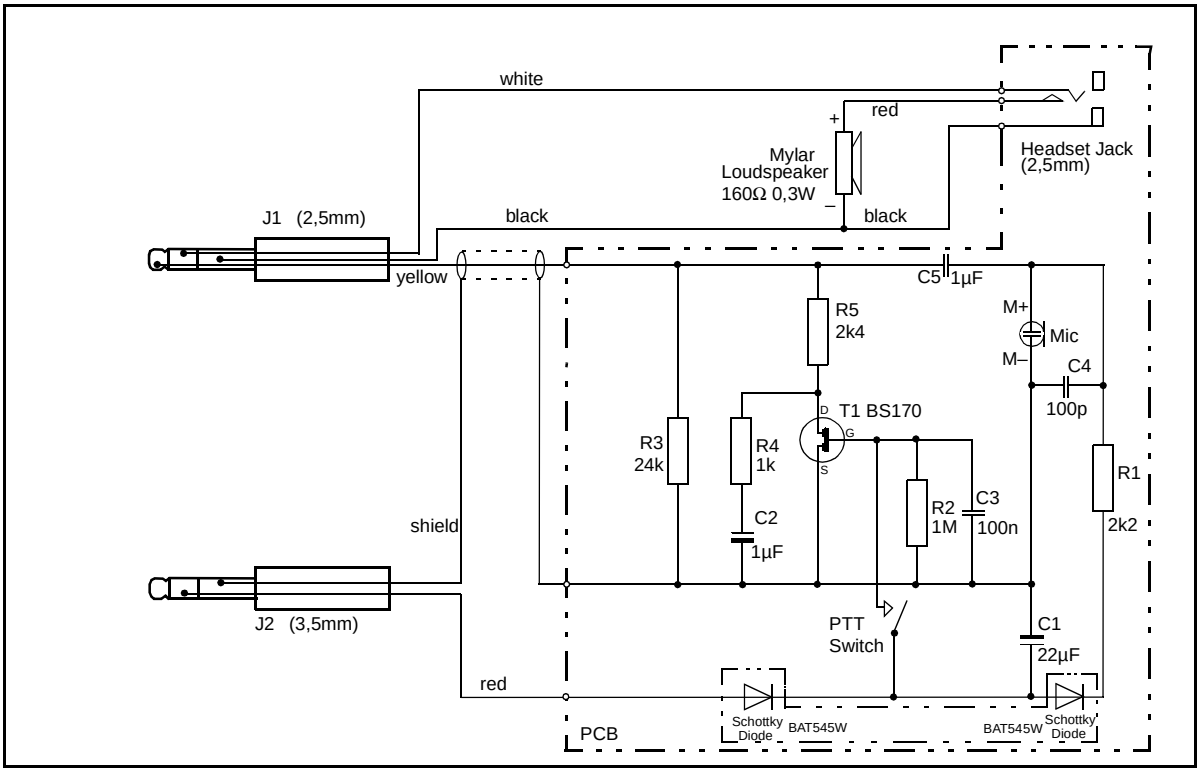


Figure B.2 Lapel Speaker / Microphone Circuit Diagram

OPERATION

Ancillary Type

R3 defines the ancillary as a Lapel Speaker / Microphone.

Microphone

The microphone connects to the radio via the tip of the 2,5mm stereo jack (J1) and is powered via the ring and sleeve of the 3,5mm stereo jack (J2) on the cord assembly.

When the Lapel Speaker / Microphone is connected to the radio, the radio's microphone is switched out of circuit.

Operation of the PTT switch brings into circuit the electret microphone, which is powered from a rectified and filtered DC supply from the radio. R5 is used to generate a PTT interrupt to the radio.

Speech is superimposed onto this voltage on using the microphone with the PTT switch pressed.

Loudspeaker

The loudspeaker connects to the radio via the ring and sleeve of the 2,5mm stereo jack (J1) on the cord assembly.

When the Lapel Speaker / Microphone is connected to the radio, receive audio is routed to the ancillary loudspeaker and not to the radio's.

The Lapel Speaker / Microphone supports the use of a remote headset.

PARTS LIST

Description	Part No.	Remarks
Lapel LS/Mic, complete	0000 242 10001	

SRP8000 SERIES VHF/UHF PORTABLE RADIO
APPENDIX C - HEADSET

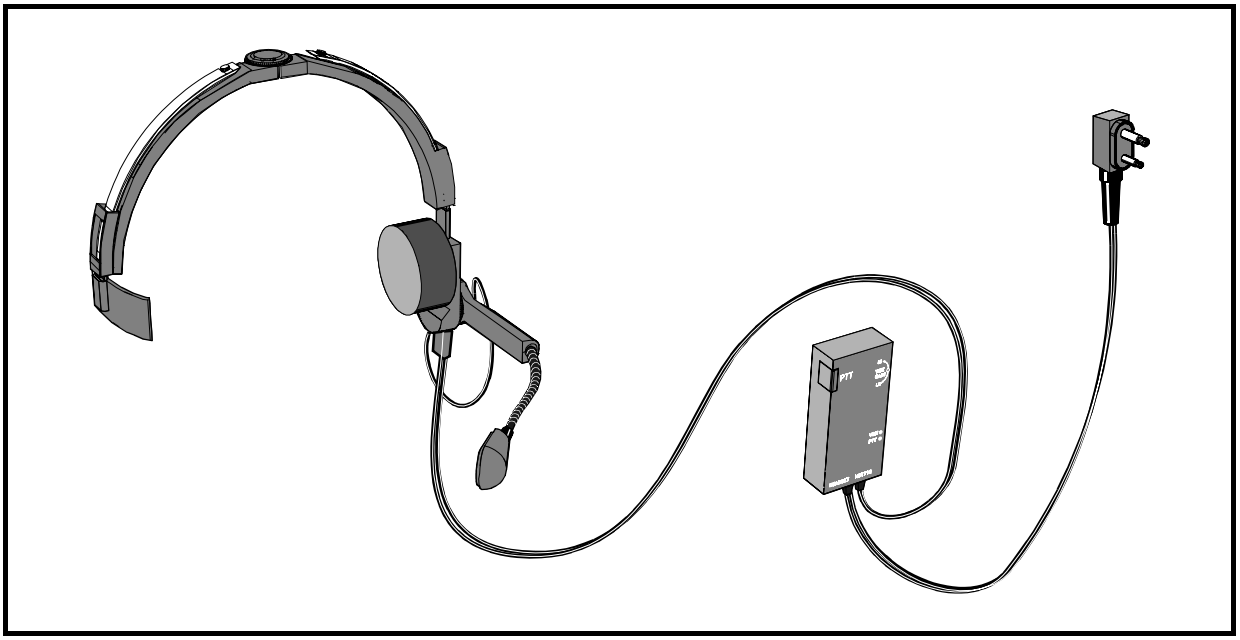


Figure C.1 Headset

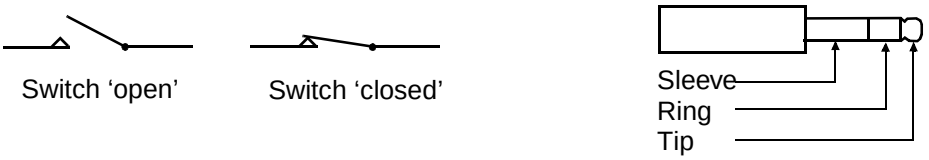
INTRODUCTION

The headset supported by the SRP8000 series portable radio is a single earpiece headset with boom microphone, in-line PTT switch and a VOX PTT function.

The headset is connected to the portable radio via a 1,5m straight cable with a 2,5mm (J1) and 3,5mm (J2) stereo jack plugs mounted in a single moulding.

Terminology

In the following text, switch states and jack connections are defined as follows:



SPECIFICATION

Microphone

Maximum circuit current	10mA.
Type	Electret.
Impedance	2,2kΩ.
Sensitivity	–58dB ±3dB at 1kHz (0dB = 1V / µbar).
Sensitivity variation relative to 1kHz over frequency range 300 Hz to 4kHz.	Less than +10dB, –2dB.
PTT switch	Push to transmit.
DC voltage overshoot during switching periods	Within 2% of nominal voltage.
PTT 'click' suppress circuit:	
DC voltage establishment time for active PTT	Less than 5ms to reach 95% of the nominal PTT voltage.
DC voltage established time for PTT release	50ms ±20% to reach 95% of the nominal PTT release voltage.

Earpiece

Impedance	16Ω ±2Ω.
Power rating	3mW continuous per earpiece, 10mW maximum.

Environmental

Operating temperature range	–10°C to +55°C.
Storage temperature range	–40°C to +80°C.

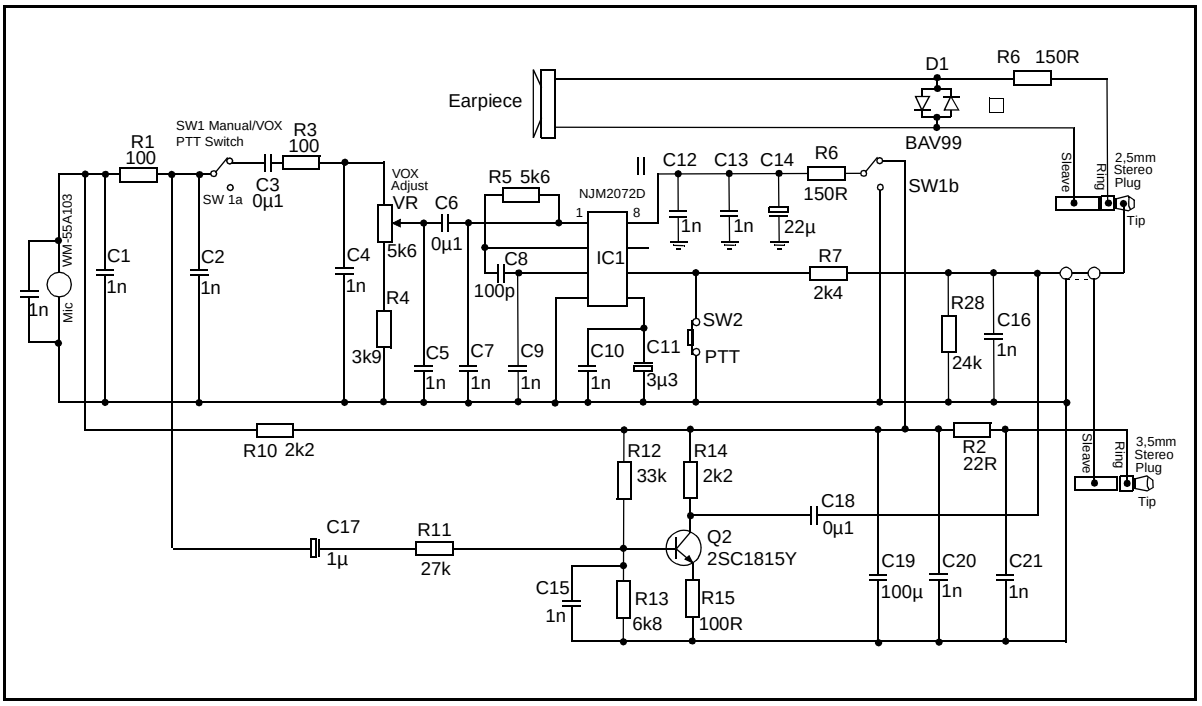


Figure C.2 Headset Circuit Diagram

OPERATION

Ancillary Type

R28 defines the ancillary as a Headset.

Microphone

The microphone connects to the radio via the tip of the 2,5mm stereo jack (J1) and is powered via the ring and sleeve of the 3,5mm stereo jack (J2) on the cord assembly.

When the Headset is connected to the radio, the radio's microphone is switched out of circuit.

Operation of the PTT switch brings into circuit the electret microphone, which is powered from a rectified and filtered DC supply from the radio. R7 is used to generate a PTT interrupt to the radio.

Speech is superimposed onto this voltage on using the microphone with the PTT switch pressed.

Earpiece

The earpiece connects to the radio via the ring and sleeve of the 2,5mm stereo jack (J1) on the cord assembly.

When the Headset is connected to the radio, receive audio is routed to the ancillary earpiece and not the radio loudspeaker.

PARTS LIST

Description	Part No.	Remarks
Headset, complete	0000 242 10002	

SRP8000 SERIES VHF/UHF PORTABLE RADIO
APPENDIX D - ALIGNMENT TOOL

INTRODUCTION

Purpose of this Section

This section will help with the installation of the SRP8000 Series Alignment Tool. It lists the equipment required and how to set-up the PC to get optimum performance from the Alignment Tool. It also describes how to get started in connecting and aligning a radio.

Purpose of Alignment Tool

The Simoco SRP8000 Series Alignment Tool is used to align the RF circuitry within a SRP8000 Series radio. It may also be used to modify a radio's hardware code (in the event that the radio's hardware has been upgraded).

The Alignment Tool **cannot** be used for the alignment of radios other than SRP8000 Series radios.

Components Associated with Alignment Tool

To use the alignment tool, a programming lead (0000 321 60001) and a radio test interface unit (0000 693 20001) are required.

In addition, the Alignment Tool operations require various items of test equipment; these are listed on page 4.6 **Test Equipment** in this Service Manual.

Alignment Tool Requirements

To install and use the Alignment Tool it is necessary to have compatible hardware and software.

Hardware Requirement

The computer that the Alignment Tool is to be installed on, must meet certain requirement criteria. These criteria are classified as follows:

- ✔ Compulsory requirement; must have this to install and use Alignment Tool.
- ≥ Recommended minimum requirement; this is the minimum specification to achieve 'useable' performance and may be upgraded to achieve better performance.
- ≈ Optional requirement; provides defined options in using the Alignment Tool.

Specification Aspect	Criteria	Category	Comment
Computer	IBM™ compatible PC	✔	
Processor	486, 33MHz clock speed	≥	Absolute minimum = 386, 20MHz
RAM	8Mb	≥	Absolute minimum = 4Mb
Hard Disk Space	10Mb free	✔	
Floppy Disk Drive	3,5", 1.44Mb	✔	Required for installation
Display Resolution	At least 640 x 480	✔	
Graphics Mode	At least VGA	✔	CGA and XGA not compatible
Display Type	Colour	✔	Mono display: some fields may be unreadable
Serial Ports	At least one	✔	Necessary for interaction with radio
Other Ports	Additional serial port	≈	Necessary if using a mouse (see Mouse)
Mouse	Mouse connected	≈	Provides alternate method of access to screen functions.

Table D.16 Hardware Requirements

Note: Whilst the criteria in Table D.1 are a useful guide, it is recommended that the Alignment Tool should be installed on the highest specification PC available, for optimum performance.

Software Requirements

The PC must have an operating system that is compatible with the Alignment Tool. Compatible operating systems are Microsoft Windows™ version 3.1 or Windows 95.

Notes: (i) The Alignment Tool will not run on Windows NT™ .

(ii) It is not possible to install or use the Alignment Tool without one of these compatible Windows systems running.

INSTALLING THE ALIGNMENT TOOL

To install the Alignment Tool as follows:

Preparation

These steps should be followed as a precursor for installation:

(1) Start Windows.

(2) Ensure that there is at least 10 Mb of space free on the hard disk on which the Alignment Tool is to be installed.

(3) The Alignment Tool installation process will be halted if there is less than 10 Mb hard disk space free. This is the case even if the installation is being done for the second time and some of the files copied during installation are already present (in this event the Alignment Tool will actually use less than 10Mb but it must still 'see' at least 10 Mb free).

Note: If you are running a hard disk compression program, such as DoubleSpace ™ or Stacker ™ , the installation program has already made allowance for this when checking for free space.

(4) Close **all** applications except Program Manager, - this includes any applications that may be visible as a minimized icon or a toolbar, eg. MS Office.
To confirm that all other applications are closed: run the Windows Task List [either by double clicking on the Windows background or by pressing the <CTRL> + <ESC> keys together] and select End Task for all tasks other than Program Manager.
If you prefer to run applications using File Manager, this may be left open.

Once these actions are complete, Alignment Tool installation may commence.

Installation

After preparation for installation is completed, the installation can proceed as follows:

(1) Insert Disk 1 of the installation disks into the floppy disk drive.

(2) From the **File** menu of Program Manager, choose **Run**.
A 'Run' dialogue box will appear.

(3) In the dialogues command line box type:
a:\setup.exe (assuming your 3,5 floppy disk drive is allocated drive letter 'a').

After a short delay, a Setup progress indicator will appear and eventually the screen will display a Welcome dialogue. This reminds you that all other applications should be closed down before continuing (see **- Preparation** above) and details applicable copyright and reproduction rights (for full details of these restrictions, see the Licence Agreement that is part of the Service Aid kit).

(4) Select **Next** to Continue. The next step is selecting the installation directory.

(5) Choose the directory where the Alignment Tool files are to be installed.
The default directory is **C:\SP80ALIG**.
(a) To accept the default, select **Next**.
(b) To install in a different directory, select **Browse** and select or type the path of the desired directory. If the directory entered does not exist, the option will be given to create it.
(c) When the Destination Directory shows the desired directory location, select **Next**.

Note: If there is not enough disk space for the installation, this is flagged and sufficient disk space (see Preparation on page D.2) must be freed or a different hard disk specified before installation can continue.

Installation will now commence with a progress indicator in the centre of the screen showing overall progress in copying Alignment Tool files into the specified directory.

In addition, there are three indicators on the left hand side as shown in Figure D.1.

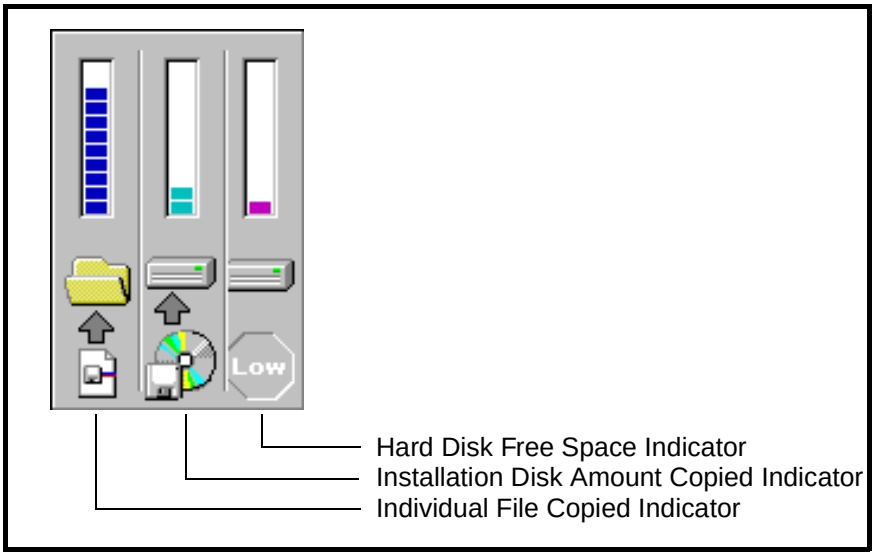


Figure D.1 Installation Progress Indicators

Individual File Copied Indicator	-	This shows the progress made in copying a particular file to the target directory.
Installation Disk Amount Copied Indicator	-	This shows how much of the current installation disk has been copied to the target directory. When this has reached its maximum, insert the next installation disk at the prompt.
Hard Disk Free Space Indicator	-	This shows the free space available on the PC's hard disk; even if this shows Low, a complete installation will still occur (installation would not have been allowed to get to this stage if there was not enough disk space).

Note: Installation may be cancelled at any time by selecting the Cancel button, although this is not recommended as it may leave the installation in a midway state.

(6) Insert the next disk when prompted and select **OK** on the dialogue that appears. Installation will continue, with these prompts, until the last disk is inserted.

(7) Once the overall progress indicator has reached 100%, the installation will update certain Windows system files; **please wait** whilst these files are updated - **do not** attempt to interrupt this process as the installation will be left in an unstable state.
A Restart Windows dialogue will eventually appear.

(8) Select the appropriate option from the Restart dialogue and select the **OK** button. The options are as follows:

(a) **Yes, I want to restart Windows now** - If the alignment tool is to be used immediately.

(b) **No, I will restart my computer later** - If the Alignment Tool is not required immediately. Note that the tool should not be used until the computer has been re-started.

When Windows is restarted, a Program Group named 'SRP80 series Tools' is displayed containing a Program Item 'SRP80 series Alignment Tool'. This group may already contain the SRP8000 Series Programmer (if previously installed).

Installation Warnings

Warnings that could occur during installation are shown in Table D.2.

Warning	Stage Occurring	Action to Take
Lack of Disk Space	After installation drive and directory have been selected	Free at least 10Mb of hard disk space before continuing with installation
File In Use	When installation or Windows System files are being updated	Close any Windows applications that are running, except Program Manager.

Table D.17 Installation Warnings

Initialization File

The initialization file, ***mapalign.ini***, initializes certain settings at start-up:

(1) The PC's Serial Port used for communications with Radio [Default is COM1].

(2) Baud rate at which communication with Radio take place through the serial link [Default is 19200]

These settings can be modified using the Alignment tool via **Environment** in the **Options** menu. See **Contents** in the **Help** menu for further information (see section Using On-line Help).

GETTING STARTED

Once the Alignment Tool has been installed, it can be run.

Starting the Alignment Tool

To start the Alignment Tool:

(1) Start Windows

(2) Activate the item 'SRP80 Series Alignment Tool' in the SRP80 Series Tools program group (do this by double clicking on the icon).
A dialogue is displayed showing the Part and Version Number of the Alignment Tool. After a delay, the Alignment Tool application window is displayed.

Errors on Starting the Alignment Tool

When the Alignment Tool is started the following types of error messages may be displayed:

Error Message	Cause	Action to Take
Could not find initialization file	The file ***mapalign.ini*** was not found in the directory of the Alignment Tool application. It may have been renamed or moved to another directory.	No action required. A new, default ****.ini*** file is created automatically in the directory of the Alignment Tool application.
Initialization file contains invalid settings	The setting values in mapalign.ini were not recognized.	Acknowledge the information dialogue showing details of invalid settings– default.ini file settings will then be used for that session. Correct the settings in ***mapalign.ini***.
Display not compatible	The display resolution is less than the minimum 640 x 480 pixels (width x height).	Change the display driver to a resolution of at least 640 x 480 (see **Display Settings** on page D.6).

Table D.18 Starting Errors

Multiple Instances

Only one copy of the Alignment Tool can be run at any one time.

If an attempt is made to start the Alignment Tool whilst the Alignment Tool is already running, the current Alignment Tool Application window is displayed.

It is possible to run the SRP8000 Series Programmer at the same time as the Alignment Tool; however, if both tools have the same serial communication port defined, one of these tools may lock out the serial port preventing its use by the other tool.

Alignment Tool Application Window

The size and colour of the application window depend upon the PC's display settings. These settings are set up from outside the Alignment Tool and are explained in section **Display Settings**.

The Alignment Tool window is designed to operate at its start-up size. There is no advantage to be gained from maximising or increasing the initial size of the Alignment Tool application window – no more data will be shown. Reducing the size of the window can cause certain fields to be hidden.

The Alignment Tool will always start up in its default size for the current resolution regardless of any resizing done during the last session.

USING THE ALIGNMENT TOOL

Once the Alignment Tool has been started, it is ready to be used. The first step is to connect the radio to be aligned, to the PC.

Connecting a Radio

A link must be established between the radio and the Alignment Tool using the programming lead and the Test Interface Unit (TIU). To connect the radio:

(1) Plug the 9 way socket, on the programming lead, into a serial port on the PC. Some serial ports may be 25 way; in this case an adapter is required (not supplied).
(2) Plug the programming lead's twin jack plug into the twin jack socket, marked 'ALIGNMENT', on the TIU box.
(3) Ensure the following switches are set to the correct position:
    (a) ANCIL SIM / ALIGNMENT - set to ALIGNMENT
    (b) AMMETER - set to the up position
(4) Connect the twin jack plug, on the lead from the TIU, into the twin jack socket on the top of the radio.
(5) Connect the dummy battery to the radio (the dummy battery will be used to calibrate the battery voltage - one of the first alignment operations).
(6) Connect the TIU's power supply and switch on.
(7) Switch on the radio.
(8) Check that the serial port connected is that shown in the 'Setup Environment' dialogue – access this via **Environment...** in the **Options** menu.

The Alignment Tool should now be able to establish communications with the radio. If a link can not be established, a Communications Failure dialogue will appear – possible reasons for this are outlined in **Help Contents** (see **Using On-line Help** below).

Aligning the Radio

Once the Alignment Tool has been started and a link established with the radio, alignment of the radio can proceed.

For information and instructions on the various steps involved in aligning the radio, please use the on-line Help.

Using On-line Help

Whilst the Alignment Tool is running, on-line Help text is available.

To access the Help:

(1) Select the **Help** menu.
(2) Select **Contents**.

A Help window is displayed showing a list of topics for which Help is available. It may be necessary to scroll down the window to see the desired topic.

To navigate the on-line Help using the keyboard, use the Tab key to move between highlighted topics. If you are unsure of the meaning of a term, select the Glossary key to display a list of terms.

More assistance on using on-line Help may be accessed through the item **How to Use Help** on the Help window's **Help** menu.

Certain Help topics can also be accessed in a context sensitive manner. These topics are:

Modifying the Hardware Code.
Displaying Analogue Measurements.
Setting Environment Options.

To access these topics directly during the relevant operation - press the <F1> key; this will bring up the Help topic for that operation.

Quitting the Alignment Tool

The Alignment Tool application may be terminated using any of the methods for closing a Windows application including:

From the **File** menu, select **Exit**.
Double click on the Alignment Tool's control menu box (or click once and select **Close**) situated on the window's extreme top left hand corner.
Press the <ALT> and <F4> keys simultaneously whilst in the application window
End the task 'SRP80 Series Alignment Tool' through the task list.

Once the Alignment Tool application has been closed, any memory resource that it was using is automatically freed for other applications to use.

Possible Errors on Quitting

If exiting of the Alignment Tool is attempted when the radio had been prepared for alignment but not restored to its initial state, then a warned of this situation is displayed. Choose one of the following options:

Restore the radio before exiting
Exit without restoring the radio
Abort the exit

The Alignment Tool will carry out the action chosen.

BACKGROUND SETTINGS

Certain settings on the PC will affect the operation of the Alignment Tool. These are outlined below.

Display settings

The size of the Alignment Tool application window will depend upon the current resolution of the display.

To determine the current resolution of the display, go to **Program Manager** and select **Windows Setup** (normally in the **Main** program group). The Display heading usually shows the current display settings in the format:

W x H x C (Font)

where W = Width Resolution (in pixels)
H = Height Resolution (in pixels)
C = Colour - Number of colours supported
Font = Small or Large Fonts

The minimum resolution supported by the Alignment Tool is 640 x 480. At this resolution, the Alignment Tool application window will fill most of the screen; at higher resolutions the application window will be displayed as a smaller window.

The Alignment Tool will be shown adequately at any 'Number of Colours' setting from 16 colours upwards. The graphics mode of the display driver should either be: VGA or Super VGA (SVGA) type; it should not be CGA or XGA.

To change the display settings using the Windows Setup window:

(1) From the **Options** menu, choose **Change System Settings**.

(2) In the dialogue that appears, select a Display option and select the <OK> button. This change will normally require Windows to be restarted.

- Colour Scheme

The colours displayed by the Alignment Tool are governed to a certain extent by the Colour scheme selected in Windows.

To determine the current colour scheme:

(1) Activate the **Control Panel** (normally in **Main** program group).

(2) Select **Colour**. A dialogue will appear showing the current colour scheme.

(3) For best results, with the Alignment Tool, select **Windows Default**.

(4) Select the **OK** button on the Colour dialogue. Any change to the colour scheme will now take effect.

Memory Optimization

This section is relevant to users of PC's with less than 16Mb of RAM (if the PC has 16Mb of RAM or more, memory optimization is less relevant).

If slow performance or 'Out of Memory' errors, are being experienced whilst using the Alignment Tool, this could be due to inefficient use of Windows memory. The efficient use of memory in Windows depends upon a number of settings. These are mainly associated with Virtual Memory and the set-up of any Disk Cache.

For more information on Virtual Memory:

(1) Activate the **Control Panel**.

(2) Select **Enhanced**.

(3) Select the **Virtual Memory** button.

- Optimizing the Disk Cache

If the PC has a disk cache, such as SMARTDrive™ or NCache™, set-up, this should be optimized for Alignment Tool use.

The following are the recommended settings for loading SMARTDrive (the loading of SMARTDrive can normally be found in the *autoexec.bat* file, in the root directory):

c:\dos\smartdrv.exe 2048 128 /X

Where: 2048 = **InitCacheSize** - this is the size (in Kb) of the cache when SMARTDrive starts (when Windows is not running).

128 = **WinCacheSize** - this is the smallest size to which SMARTDrive will reduce the cache when Windows is running.

The difference in values between **InitCacheSize** and **WinCacheSize** will be the amount of extra memory that is freed up for Windows to use, that is, with the above settings 1,92Mb RAM will be made available from Disk Cache, when entering Windows.

For more information on SMARTDrive: go to a DOS prompt and type:

Help SMARTDRV

TECHNICAL SUPPORT

Help Desk and Upgrades

If there are questions or problems, regarding the Alignment Tool, that cannot be answered using the On-line Help (see **Using On-line Help** on page D.5), support is available from Simoco Europe Ltd. Information on how to obtain the latest upgrades of Alignment Tool software is available also.

The Telephone Number to call can be displayed as follows:

(1) Start the Alignment Tool.

(2) From the **Help** menu, select **Technical Support....**

A Technical Support dialogue is displayed showing the telephone number to call.

Note: Before calling please note the following information (it may be required):

(3) From the **Help** menu, select **About Alignment Tool...** and note the Alignment Tool's Part and Version Number.
(4) If a radio is connected to the PC, then from the **HWCode** menu, select **Modify** and note the hardware code of the connected radio.
(5) For a particular problem - note the exact conditions under which the problem occurred.

Feedback

If there are any comments regarding the Alignment Tool software, On-line Help or this section of the Service manual, it is requested that they are passed to the following address:

SRP8000 Series Product Support
Simoco Europe Ltd
P O Box 24
St Andrews Road
Cambridge, CB4 1DP
U.K.

GLOSSARY

Cache	An area of memory used to store the most recently accessed data. As a general rule: a larger cache will result in faster access (and hence improved performance).
Control Menu	The menu that appears when the top left square in a window is clicked upon.
On-line Help	An interactive information system used to provide on screen help on Alignment Tool operations. It can be accessed, once the Alignment Tool has been installed, through the **Help** menu.
PC	IBM Compatible Personal Computer.
Task List	A facility of Windows that enables the viewing and ending (amongst other actions) of current tasks being run in Windows. It is accessible by double clicking on the Windows background (the 'wallpaper') or by pressing the <CTRL> and <ESC> keys simultaneously.
TIU	Test Interface Unit; used to connect the Alignment Tool PC to the radio being aligned.
Virtual Memory	A facility that enables Windows to increase the amount of RAM that is available to it by using some of the hard disk storage as if it was RAM.

PARTS LIST

Description	**Part No.**	**Remarks**
Alignment Tool	PA-ALGT	
Programming Lead	0000 321 60001	Part of Service Aid Kit
Radio Test Interface Unit	0000 693 20001	Part of Service Aid Kit

SRP8000 SERIES VHF/UHF PORTABLE RADIO
APPENDIX E - POWER SUPPLY FOR TRICKLE CHARGE

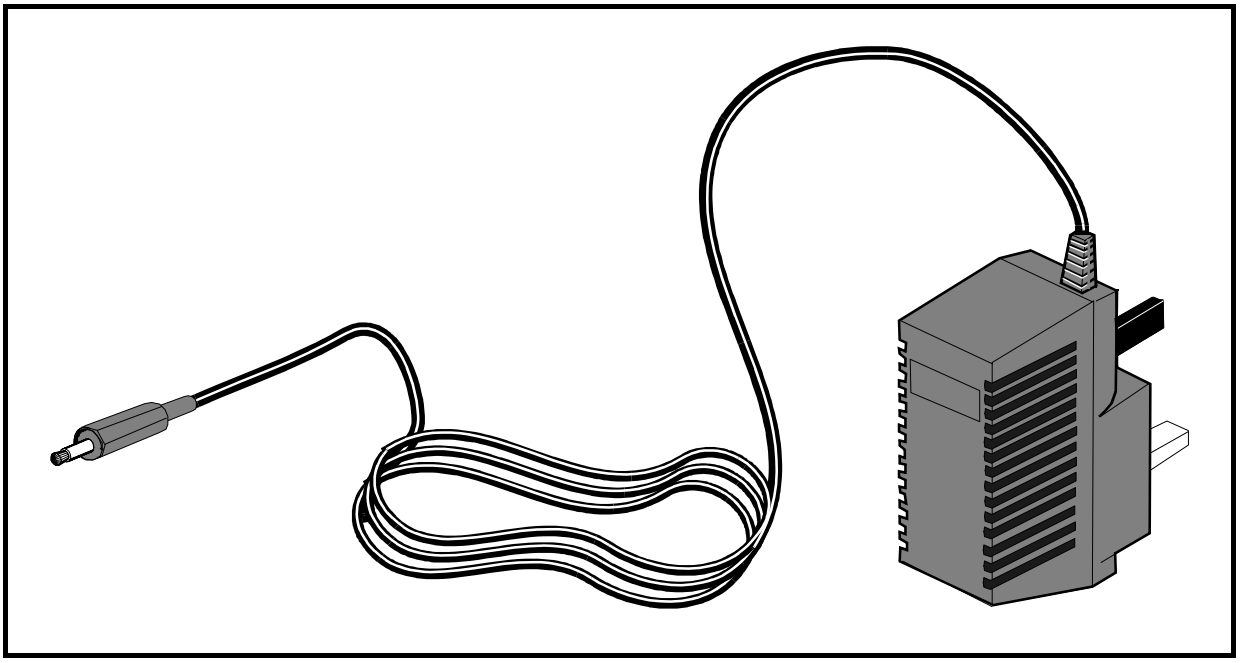


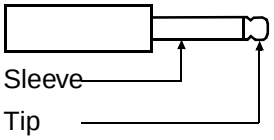
Figure E.1 Trickle Charge Power Supply

INTRODUCTION

The SRP8000 series trickle charge power supply is an AC mains powered module with a two metre charging lead terminating in a 3,5mm mono jack plug. The mains power plug is an integral part of the module. The battery is charged via the ancillaries connector on the portable radio.

Terminology

In the following text, jack connections are defined as follows:



SPECIFICATION

Electrical

Supply Voltage	:	230V ±10% UK and EU versions. 110V AC ±10% US version.
Supply Frequency	:	50Hz nominal UK and EU versions. 60Hz nominal US version.
Output Voltage	:	12V DC ±5% for a load in the range 0 to 120mA
Output Current Limit	:	150 to 200mA
Charge Time	:	20 hours (approximately). This time will increase if the radio is switched on or a higher capacity battery is fitted.

Indicators

There are no indicators on the trickle charger power supply.

Mechanical

Weight	:	Less than 300g.		
Supply Input Connections	:	UK	-	13A 3-pin with plastic earth pin.
		EU	-	Euro 2-pin.
		US	-	US 2-pin.
Charging Connections	:	Positive	-	Tip of 3,5mm jack plug.
		Negative	-	Sleeve of 3,5mm jack plug.

Environmental

Storage Temperature	:	–30° to +85° C.
Operational Temperature	:	0° to 50° C.

OPERATION

CAUTION

A radio that is switched-off should NOT be left on trickle charge for more than 24 hours.

CAUTION

Do NOT attempt to charge a battery when the battery temperature is below 0° C.

To charge a battery (fitted to a portable radio):

(6) Connect the 3,5mm jack plug of the charger to the 3,5mm socket on the top of the radio.

(7) Connect the charger module to the mains power outlet.

(8) Switch on the mains power (if switched).

The battery commences charging.

Note: The radio does not have to be switched on to charge the battery.

The trickle charge power supply uses a positive input on the RxD pin of the Smart interface (on the portable radio) to power a current limited source feeding the battery, limiting the current to approximately 130mA. This circuit is enabled by the thermistor in the battery pack, so it is inhibited if a battery pack is not fitted (this is necessary to prevent a voltage at the battery connector which could damage the radio when no battery is present).

All functions of the portable radio may be used while connected to the power supply. However, charging is inhibited while transmitting.

PARTS LIST

Description	Part No.	Remarks
Trickle Charger - UK	0000 138 20002	
Trickle Charger - US	0000 138 20003	
Trickle Charger - EU	0000 138 20004	

SRP8000 SERIES VHF/UHF PORTABLE RADIO
APPENDIX F - PROGRAMMING LEAD

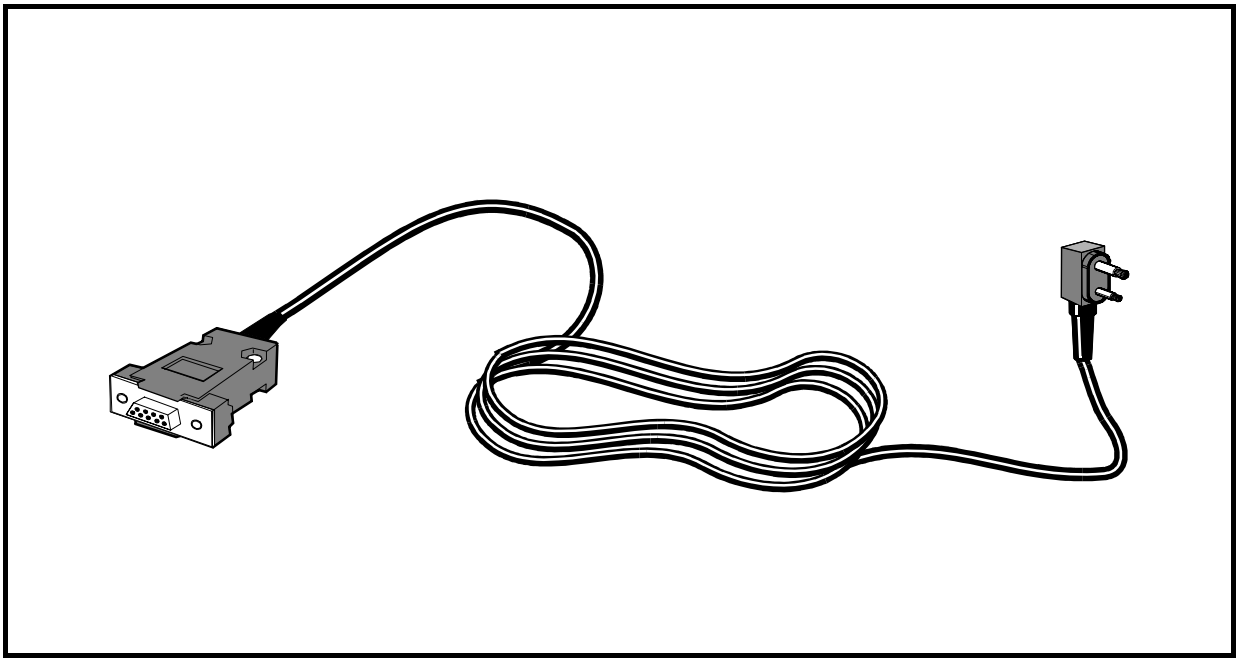


Figure F.1 Programming Lead

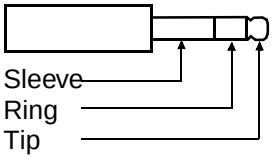
INTRODUCTION

The SRP8000 series portable radios are programmed via a PC serial port. A connecting cable (programming lead) is required. The PC end terminates in a 9-pin 'D' Type female connector and the radio end terminates in a 3,5mm and a 2,5mm stereo jack housed in a common moulding.

The lead is not screened and, as a result, it is unlikely to operate successfully when the radio is transmitting.

Terminology

In the following text, jack connections are defined as follows:



SPECIFICATION

Mechanical

Length	:	1,5m.
Connectors	:	9-way 'D' Type, female, straight.
		3,5mm stereo jack) housed in
		2,5mm stereo jack) common moulding.

Environmental

Storage Temperature	:	–40° to +80° C.
Operational Temperature	:	20° to 55° C.

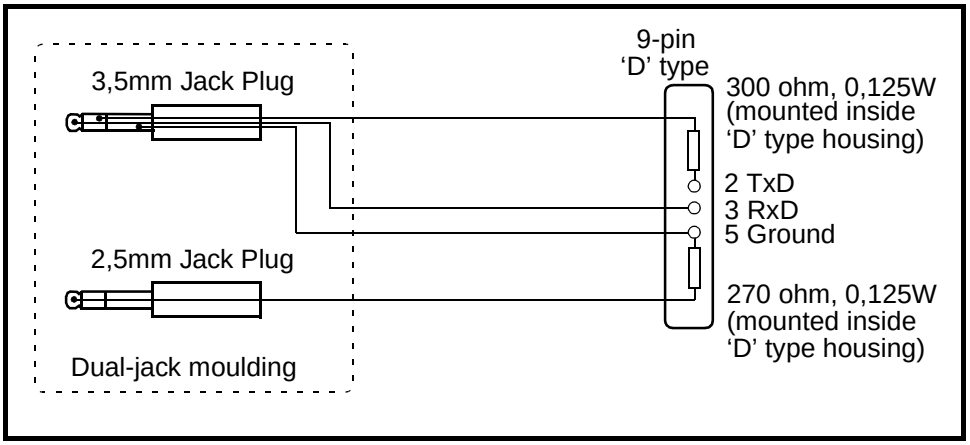


Figure F.2 Programming Lead Circuit

PARTS LIST

Description	**Part No.**	**Remarks**
Programming Lead	0000 321 60001	

SRP8000 SERIES VHF/UHF PORTABLE RADIO
APPENDIX G - USER MEMORY PLUG

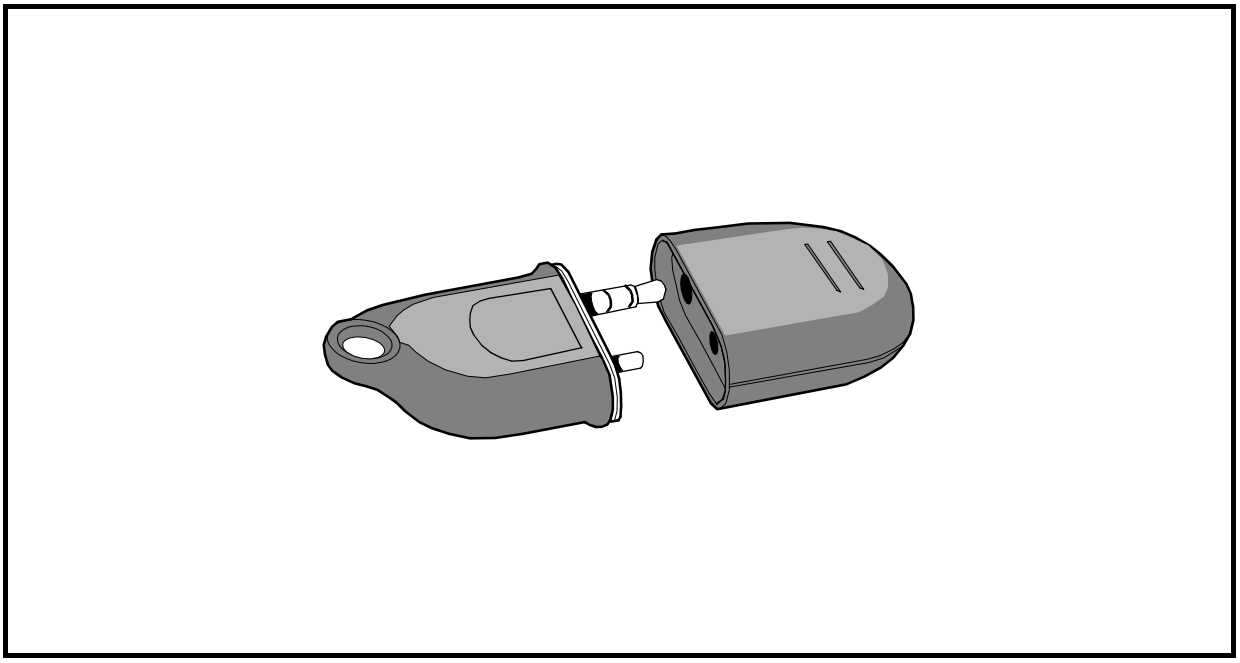


Figure G.1 User Memory Plug

INTRODUCTION

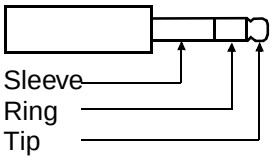
The User Memory Plug (UMP) is used to transfer a radio customization from the radio to the UMP (store customization data), and from the UMP to the radio (update or reload customization).

The UMP is a small robust module containing one IC, one capacitor, one resistor and three diodes. Connection to the radio is via the ancillary sockets using a 3,5mm stereo jack plug and a 2,5mm dummy jack plug in a common housing.

The UMP may be left permanently attached to the radio.

Terminology

In the following text, jack connections are defined as follows:



SPECIFICATION

Mechanical

Connectors	:	3,5mm stereo jack)	housed in
		2,5mm dummy jack)	common moulding.

Environmental

Storage Temperature	:	–40° to +80° C.
Operational Temperature	:	20° to 55° C.

DESCRIPTION

The UMP provides 8Kb x 8 of non-volatile memory, accessed by the IIC bus. The memory address is A0 (Hex)

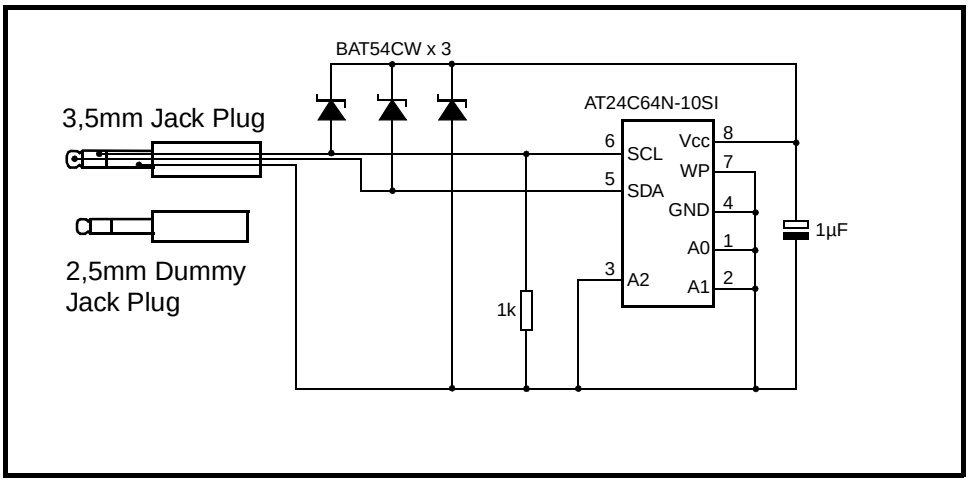


Figure G.2 User Memory Plug Circuit

PARTS LIST

Description	**Part No.**	**Remarks**
User Memory Plug	0000 138 10002	

SRP8000 SERIES VHF/UHF PORTABLE RADIO
APPENDIX H - VEHICLE MOUNT ATTACHMENT

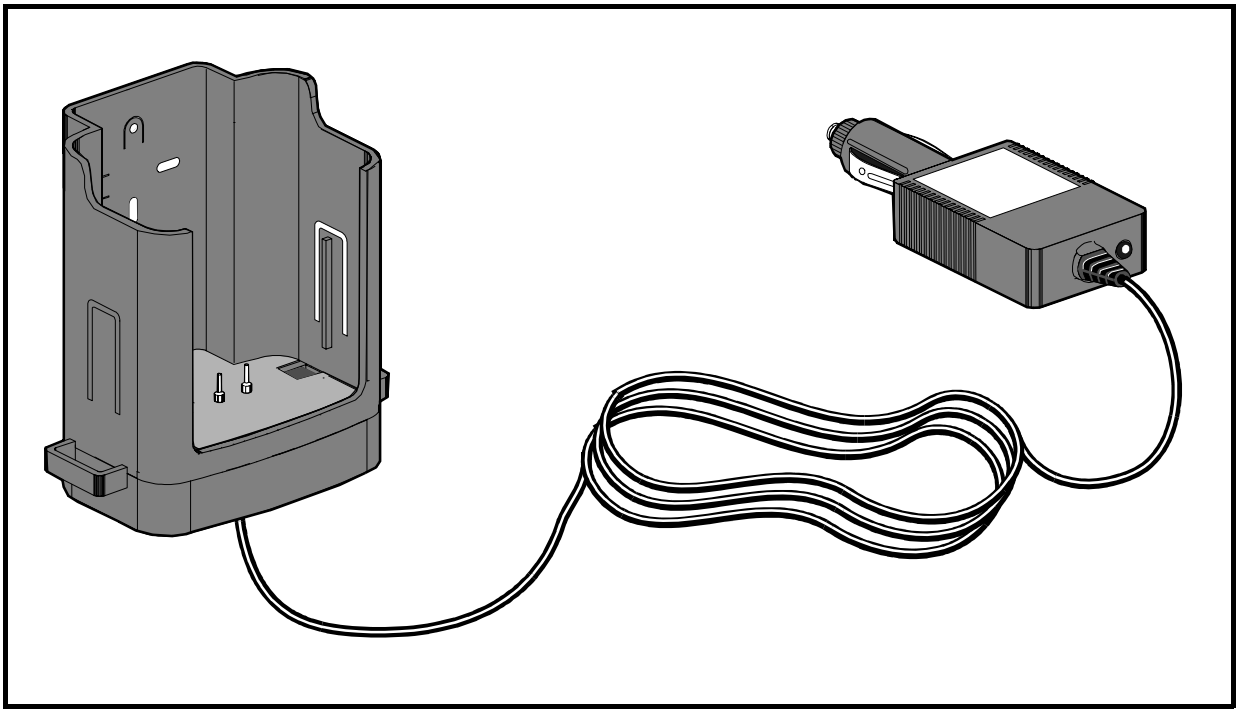


Figure H.1 Vehicle Mount Attachment

INTRODUCTION

The Vehicle Mount Attachment is used to allow the SRP8000 series portable radio to be used in a vehicle and powered / trickle charged from the vehicle battery.

The vehicle mount attachment consists of a moulding (holster) and a one metre long power lead. One end of the power lead is permanently wired to the holster and the other (free) end is terminated in a vehicle cigar lighter plug (DIN ISO4165) containing a 9V regulator.

SPECIFICATION

Mechanical

Connector	:	Vehicle cigar lighter plug (DIN ISO 4165) fitted with 9V regulator.
Power lead length:		1 m.

Environmental

Storage Temperature	:	–40° to +80° C.
Operational Temperature	:	20° to 55° C.

Electrical

Supply Voltage:	12V DC (nominal).
Power out:	7,2V DC (nominal).

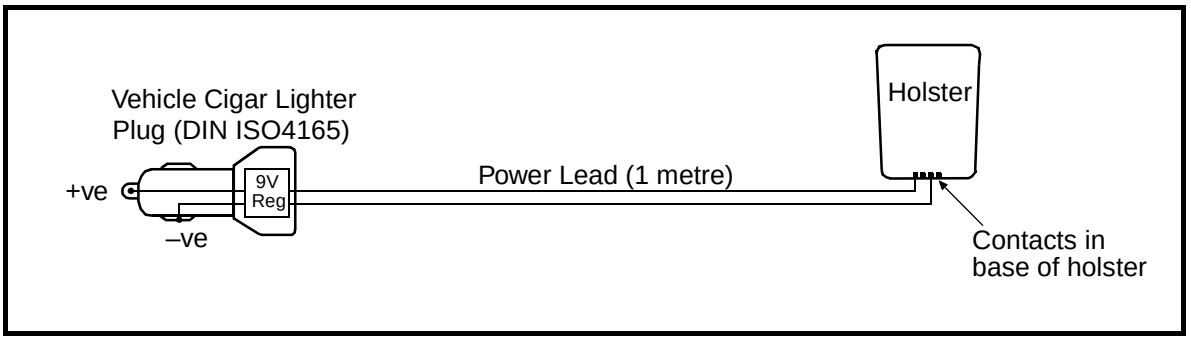


Figure H.2 Vehicle Mount Attachment Circuit

CAUTION

A radio that is switched-off should NOT be left on trickle charge for more than 24 hours.

CAUTION

Do NOT attempt to charge a battery when the battery temperature is below 0° C.

INSTALLATION

(1) Secure the holster to a convenient position in the vehicle.

(2) Insert the vehicle mount attachment plug into the vehicle cigar lighter socket.

PARTS LIST

Description	**Part No.**	**Remarks**
Vehicle Mount Attachment	PA-VEHA	Not yet available

SRP8000 SERIES VHF/UHF PORTABLE RADIO
APPENDIX I - PRP70 CHARGER POCKET ADAPTOR

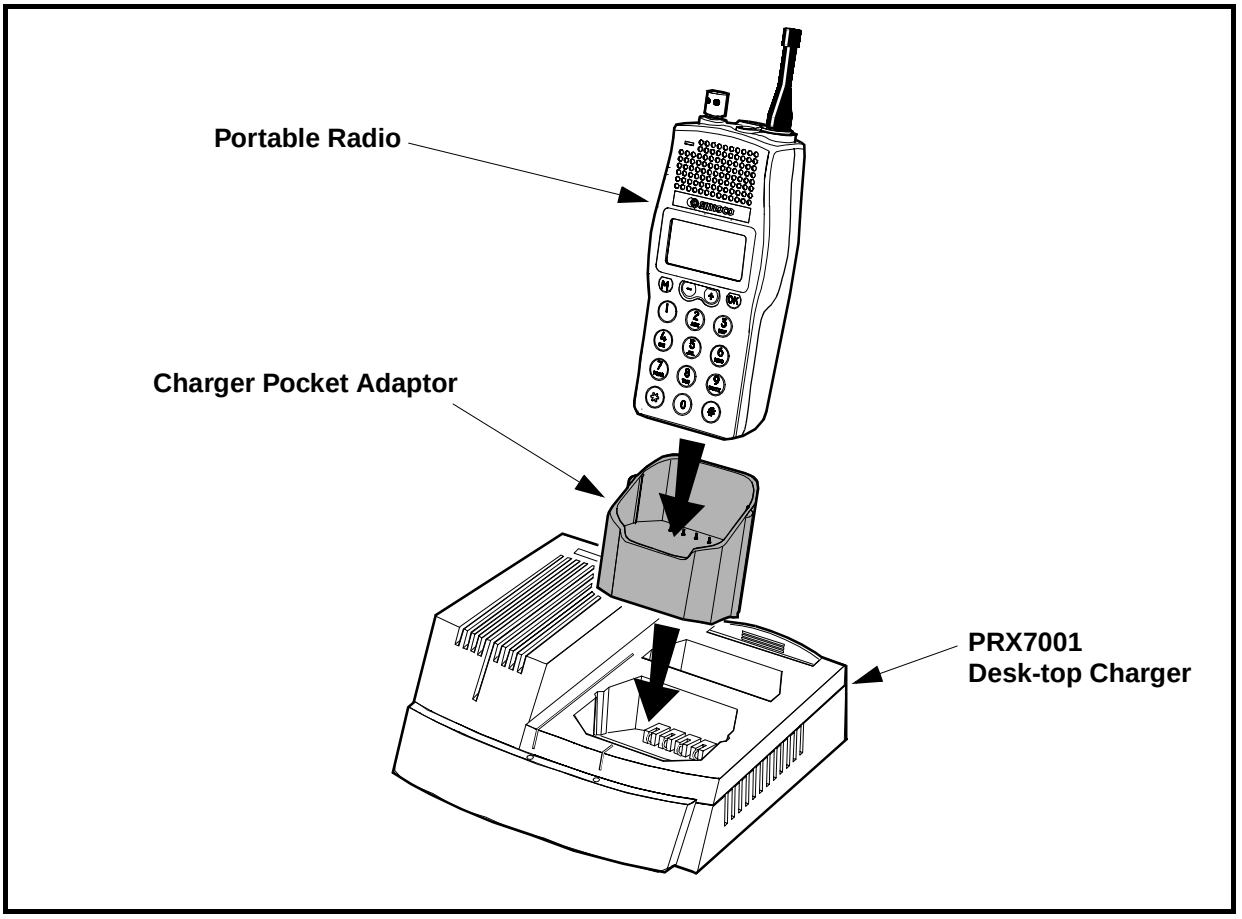


Figure I.1 PRP70 Charger Pocket Adaptor

INTRODUCTION

Using the PRP70 Charger Pocket Adaptor, batteries can be charged in PRX7001 or PRX7005 battery chargers. Refer to the PRX7001/7005 charger manual for charging details.

Note: When using a PRX7001 or PRX7005 battery charger, the charging time will be in excess of 3 hours.

PARTS LIST

Description	Part No.	Remarks
PRP70 Charger Pocket Adaptor	0000 138 20018	