

Service Manual



**Complete Service Information
for
STP-105B VHF Portable
and
STP-404(A)(B) UHF Portable**



OUR THANKS TO YOU

PREFACE

Thank you for purchasing the Midland Syn-Tech III P25 Portable Radio. Properly used, this product will provide you many years of reliable service.

To get the most out of your purchase, be sure to carefully read this manual and keep it on hand for later reference when needed.



Before servicing your radio, please read this entire manual.

CUSTOMER ASSISTANCE

If you require further assistance, please contact your local Midland dealer.

FOR WARRANTY, PRODUCT SERVICE AND ACCESSORY INFORMATION

Please contact your local Midland dealer or distributor.



Do not attempt to service any internal parts yourself.
This radio should be opened by authorized personnel only.
Otherwise, the warranty **VOIDS**.

Your radio is packed and labeled according to commercial packaging standards.

SYN-Tech III P25 Portable Radio is designed and manufactured for Midland Radio Corporation.

PATENT AND COPYRIGHT STATEMENTS



The AMBE+2™ voice coding Technology embodied in this product is protected by intellectual property rights including patent rights, copyrights and trade secrets of Digital Voice Systems, Inc. This voice coding Technology is licensed solely for use within this Communications Equipment. The user of this Technology is explicitly prohibited from attempting to extract, remove, decompile, reverse engineer or disassemble the Object Code, or in any other way convert the Object Code into a human readable form. U.S. Patents Nos. #5,870,405, #5,826,222, #5,754,974, #5,701,390, #5,715,365, #5,649,050, #5,630,011, #5,581,656, #5,517,511, #5,491,772, #5,247,579, #5,226,084, and #5,195,166

IMPORTANT SAFETY INFORMATION**GENERAL PRECAUTIONS**

Use only MIDLAND authorized accessories. (Antennas, batteries, chargers, belt clips, speaker/microphone sets, tactical headsets etc.).

Using unauthorized accessories may result in personal injury or cause damage to the radio.

Charger is for indoor use only. Avoid direct sunlight and extreme heat sources. Use in a dry cool place at max 40°C.

**CAUTION**

Changes or modifications to radio may void its compliance with government laws/rules and make it illegal to use.

Avoid using the radio at temperatures below -22°F or above 140°F.

Avoid storing the radio at temperatures below -40°F or above 185°F.

The charger is to be used for charging purposes only. It is not to be used during transmit.

Red light on the front of charger will change to green indicating the radio is fully charged.

For the initial charge, leave your radio in the charger for 4 to 6 hours.

**WARNINGS**

Your MIDLAND SYN-Tech III P25 Portable Radio generates electromagnetic RF energy when transmitting. Ensure that you, and those around you, are not exposed to excessive amounts of that energy (beyond recommended allowable limits for occupational use):

ALWAYS hold the radio, especially the antenna, at least 5 cm (2 inches) away from yourself when transmitting.

**WARNINGS ABOUT BATTERY**

Do not place battery into fire.

Damaged battery may release dangerous chemical gasses. **DO NOT** breathe the fumes.

Misuse of battery may cause fire and/or explosion.

Do not disassemble battery pack. Battery cells contain electrolyte liquid which is damaging to skin and clothes.

Do not short circuit + and – poles of battery pack. Short circuit between poles with metal object may cause permanent damage to battery and may cause a fire.

Battery packs that have completed their life cycle must be disposed of properly.

If explosive gasses exist, do not remove or change battery. Movement of battery contacts may cause spark, resulting in an explosion.



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1 DEFINITIONS, ABBREVIATIONS AND ACRONYMS

1.1 DEFINITIONS

Channel	:	The frequency or frequency pair which is used for transmission and/or receiving of electrical or electromagnetic signals.
Channel Spacing	:	Distance between center frequencies of two neighboring channels.
Protocol	:	Required rules sequence to be able to carry out a definite communication function.
Site	:	Location that contains one or more Repeater Radios, Assistant Units and equipment groups that supply a determined coverage area. It has connection to other Sites and/or Control Units.
Squelch	:	A radio circuit that mutes the loudspeaker when no valid transmitted signal is detected.

1.2 ABBREVIATIONS AND ACRONYMS

A	:	Ampere
AES	:	Advanced Encryption Standard
APCO	:	The Association of Public-Safety Communications Officials
BER	:	Bit Error Rate
BPF	:	Band Pass Filter
C4FM	:	Continuous 4-Level Frequency Modulation
CD	:	Carrier Detect
CDCSS	:	Continuous Digital Coded Squelch System
CS	:	Chip Select
CTCSS	:	Continuous Tone Controlled Squelch System
dB	:	Decibel
dBm	:	Decibel Milliwatt
DC	:	Direct Current
DES	:	Data Encryption Standard
DSP	:	Digital Signal Processing
DSR	:	Data Set Ready
DTMF	:	Dual Tone Multi Frequency
DTR	:	Data Terminal Ready
EEPROM	:	Electrically Erasable Programmable Read Only Memory
EPROM	:	Electronically Programmable Read Only Memory
ESD	:	ElectroStatic Discharge

FFSK	:	Fast Frequency Shift Keying
FM	:	Frequency Modulated
FPC	:	Flexible Printed Circuit
GPS	:	Global Positioning System
HPI	:	Host Port Interface
Hz	:	Hertz
IC	:	Integrated Circuit
IEC	:	International Electrotechnical Commission
IF	:	Intermediate Frequency
IMBE	:	Improved Multi-Band Excitation
kb/s	:	Kilobit per second
kg	:	Kilogram
LCD	:	Liquid Crystal Display
LNA	:	Low Noise Amplifier
LO	:	Local Oscillator
MCU	:	Microcontroller Unit
MHz	:	Mega Hertz
MIL-STD	:	Military Standards
mm	:	Millimeter
OFB	:	Output Feedback
PC	:	Personal Computer
PCB	:	Printed Circuit Board
ppm	:	Parts Per Million
RF	:	Radio Frequency
RSSI	:	Received Signal Strength Indicator
Rx	:	Receive
SINAD	:	Signal Noise And Distortion
SPI	:	Serial Peripheral Interface
TCXO	:	Temperature Controlled Crystal Oscillator
Tx	:	Transmit
UHF	:	Ultra High Frequency
V	:	Volt
VCO	:	Voltage Controlled Oscillator



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VHC	:	Vehicular
VHF	:	Very High Frequency
VOGAD	:	Voice Operated Gain Adjusting Device
VSWR	:	Voltage Standing Wave Ratio
W	:	Watt
WACN	:	Wide Area Communication Network

2 INTRODUCTION

2.1 GENERAL FEATURES

Midland Syn-Tech III P25 portable radios have the following features:

- 136-174 MHz VHF
- 380-470 MHz UHF(A)
- 450-512 MHz UHF(B)
- Mixed analog and digital mode operation
- Easy installation
- Low maintenance
- Tri-color LCD display
- Full keypad
- High quality audio
- User friendly interface
- Extensive user prompts, alerts and warnings
- Flexible accessory connections
- Microprocessor controlled
- DSP based audio
- Flash memory
- Synthesized frequency control
- Extensive use of surface mount technology
- PC controlled testing and alignment
- CTCSS/CDCSS sub-audible signaling
- 2-Tone / 5-Tone analog signaling
- Analog DTMF encoding
- Conforms with TIA/EIA-603-A standard in analog mode
- Conforms with APCO25 TIA/EIA-102-CAAB standard in digital mode
- Conforms with MIL-STD-810E standards

2.2 TECHNICAL SPECIFICATIONS

Table 2-1: Syn-Tech III P25 Portable Radio General Specifications

Modulation	16K0F3E, 11K0F3E, 11K0F1D, 11K0F2D, 11K0F1E
Data Rate	P25 : 9.6kb/s
Symbol Rate	P25 : 4.8kb/s
Protocol	Project 25-CAI : 4.4kb/s IMBE
Channel Capacity	255 zones / 999 channels
Operating Voltage Range	7.5V _{DC} ± 20% (6.0-9.0V _{DC})
St-by Current Drain (Backlight off)	≤ 25mA with power save ≤ 75mA without power save
RX Current Drain	≤ 240mA
TX Current Drain	≤ 1800mA
Display	64x128 pixel LCD
Keypad	18 back lit
Dimensions without battery (HxWxL)	6" x 2.375" x 1.375" (152 x 60 x 35mm)
Weight with antenna and battery	7.5oz (212.6g)

Table 2-2: Batteries for Syn-Tech III P25 Portable Radios

Battery Type	Type Number	Dimensions (HxWxL)	Weight	Capacity	Battery Life*
High Capacity Li-Ion	ACC-1800	4.45" x 2.065" x 0.63" (113 x 53 x 16 mm)	4.3oz (135g)	1800mAh	5-5-90 Duty ≥ 18 h w/ PS ≥ 12 h w/o PS
Clamshell for alkaline batteries	90-1015				10-10-80 Duty ≥ 12 hrs @ 2 W

Table 2-3: Syn-Tech III P25 Portable Radio Environmental Specifications

Operating Temperature Range	-22°F / +140° (-30°C / +60°C)
Storage Temperature Range	-40°F / +185° (-40°C / +85°C)
Humidity	95% @ 122°F (50°C)
ESD	IEC 801- 2KV
Water and Dust Protection	IP65, MIL-STD

* Measured in the digital mode per TIA 102.CAAA under nominal conditions at 5.0 W RF output power.

Table 2-4: Syn-Tech III P25 Portable Radio Receiver Specifications

	VHF	UHF
Frequency Range	136-174MHz	380-470MHz 450-512MHz
Frequency Separation	Full Band split	
Channel Spacing	12.5 / 25 kHz	
Frequency Step	2.5 / 3.125kHz	
Rated Audio Output Power *	500mW / 8Ω	
Frequency Stability * (-30°C / +60°C; 25°C ref)	± 2.5ppm	± 1.5ppm
Analog Sensitivity * 12 dB SINAD	≤ -119dBm	≤ -118dBm
Digital Sensitivity ** 5% BER	≤ -119dBm	≤ -117dBm
1% BER	≤ -117dBm	≤ -116dBm
Adjacent Channel Rejection Analog 25 kHz channel *	≥ 73dB	≥ 70dB
Analog 12.5 kHz channel *	≥ 63dB	≥ 60dB
Digital 12.5 kHz channel **	≥ 63dB	≥ 60dB
Intermodulation Rejection *	≥ 73dB	
Spurious Response Rejection*	≥ 73dB	
Hum and Noise Ratio Analog 25 kHz channel *	≥ 48dB	≥ 42dB
Analog 12.5 kHz channel *	≥ 42dB	≥ 36dB
Digital 12.5kHz channel **	≥ 50dB	≥ 50dB
Audio Distortion *	≤ 3%	

* Measured in the analog mode per EIA-603 under nominal conditions.

** Measured in the digital mode per TIA-102.CAAA under nominal conditions.

Table 2-5: Syn-Tech III P25 Portable Radio Transmitter Specifications

	VHF	UHF
Frequency Range	136-174MHz	380-470MHz 450-512MHz
Frequency Separation	Full Band split	
Channel Spacing	12.5 / 25 kHz	
Frequency Step	2.5 / 3.125kHz	
Rated RF Output Power *	0.2-5 W	0.2-5 W
Frequency Stability * (-30°C / +60°C; 25°C ref)	± 2.5ppm	± 1.5ppm
Modulation Limiting * Analog 25 kHz channel Analog 12.5 kHz channel	± 5.0kHz ± 2.5kHz	
C4FM Modulation Fidelity ** RMS Error C4FM Deviation	≤ 2.5% 1800 ±100Hz	
Spurious Emissions * (Conducted and Radiated)	≤ -70dBc	
Audio Frequency Response * (6dB/Octave Pre-emphasis from 300 to 3000Hz)	+1, -3dB	
Hum and Noise Ratio Analog 25kHz channel * Analog 12.5kHz channel *	≥ 52dB ≥ 46dB	≥ 46dB ≥ 40dB
Audio Distortion *	≤ 2%	

* Measured in the analog mode per EIA-603 under nominal conditions.

** Measured in the digital mode per TIA-102.CAAA under nominal conditions.

3 DESCRIPTION OF THE RADIO

3.1 CONNECTION DIAGRAM

Midland Syn-Tech III P25 Portable Radio Connection Diagram is given below.

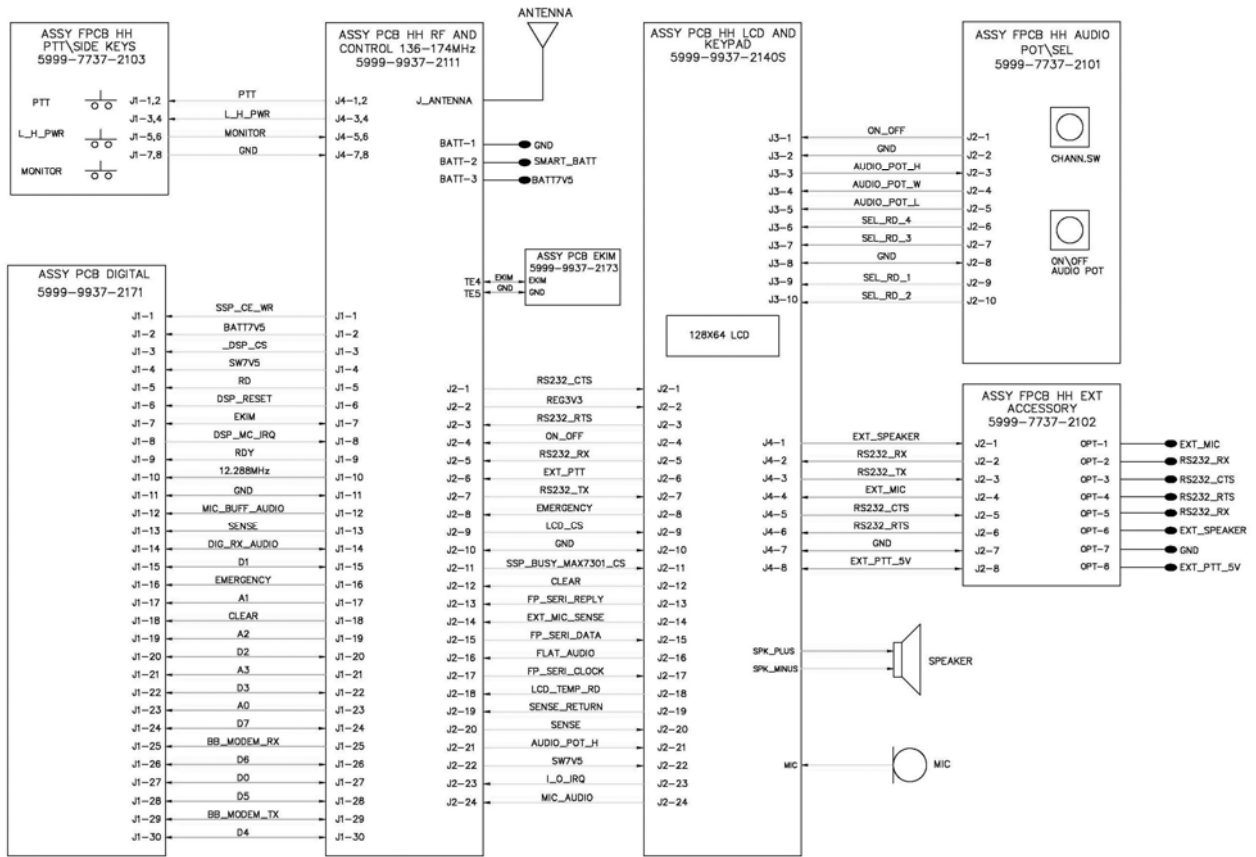


Figure 3-1: Midland Syn-Tech III P25 Portable Radio Connection Diagram



ASSY FPCB HH PTT\SIDE KEYS, ASSY FPCB HH AUDIO POT\SEL KEYS and ASSY FPCB HH EXT ACCESSORY are parts of the ASSY FRONT PANEL STM Series P25 Portable MIDLAND (P/N: 5999-9037-2140).

3.2 Operating Principles

3.2.1 RF and Control PCB

The RF and Control Board is designed to be used in Syn-Tech III P25 Portable Radio. It consists of Receiver Circuits, Transmitter Circuits, Voltage Controlled Oscillator Circuits, Frequency Synthesizer Circuits, Control Circuits and Audio Frequency Circuits. The board is supplied by 7.5 V_{DC} voltage.

The RF and Control Board carries out receive and transmission functions at the VHF frequency band, 136-174 MHz, the UHF(A) frequency band, 380-470 MHz, or the UHF(B) frequency band, 450-512 MHz. In receive mode the FM/C4FM modulated RF signal from antenna at selected channel frequency is decoded. The base band signal is sent to the Keypad and Display Board as audio or data to be monitored. In transmit mode the base band signal (audio or data) is transformed into an FM modulated RF signal on selected channel frequency and transmitted to the antenna to be broadcast.

The stand-by mode is used to extend battery life by limiting current. Only the circuits necessary to detect a signal are active. The circuits operate 5 ms active and 100 ms stand-by in analog mode and 5 ms active and 25 ms stand-by in digital mode.

3.2.1.1 Receiver Circuits

Receiver circuits have a dual conversion super heterodyne structure. They consist of RF pre input circuits, first mixer, bi-directional intermediate frequency duplexer, first amplifier of the first intermediate frequency, 4 pole first intermediate frequency crystal filter, second amplifier of first intermediate frequency, second mixer, 4 or 6 pole second intermediate frequency ceramic filter, second intermediate frequency amplifier limiter and FM decoder circuits.

The RF signal from the antenna first passes through the pre input circuits. The RF signal passes through a low pass harmonic filter, T/R switch and band pass filter or tuned notch filter. The UHF radio's notch filter frequency is tuned by the BPF_ADJUST voltage. This 1-4 volt swing tunes the notch from 290-380 MHz.

The RF signal is then amplified about 15 dB by the low noise pre-amplifier and then filtered by a tuned band pass filter. The 1-4 Volt BPF_TUNE (BPF_ADJUST) adjusts the filter's center frequency to the channel frequency, F_{chan} .

The 45 MHz first IF frequency is obtained by mixing the RF signal with the first local oscillator signal, $F_{\text{chan}} - 45$ MHz. The first IF frequency is filtered amplified and then filtered by the 4 pole crystal filter. The crystal filter has a 3 dB bandwidth of ± 6 KHz. The output of the crystal filter is then amplified by another first IF amplifier and input to the second mixer within the demodulator IC.

The 450 KHz second IF frequency is obtained by mixing the signal with the 44.550 MHz second local oscillator signal. The 44.550 MHz second local oscillator signal is obtained as the third harmonic of the 14.85 MHz TCXO. The 450 KHz second IF frequency is filtered by the wide (4 pole, ± 7.5 KHz 6 dB bandwidth) or narrow (6 pole, ± 2 KHz 6 dB bandwidth) ceramic filters then sent into the limiter. The amplifier clipper signal is passed to the fm decoder and the audio + noise signal is output from the demodulator IC and is sent to an 8 KHz low pass filter to obtain the RX_AUDIO signal and to the noise filter to get the NOISE_DET_OUT signal.

The NOISE_DET_OUT signal is compared to the SQUELCH_POWER_TUNE (S_G_ADJUST) voltage to obtain the SQUELCH signal which is sent to the MCU. Additionally, the RSSI signal from the demodulator IC is sent to the MCU.

3.2.1.2 Transmitter Circuits

The transmitter circuit's primary function is to amplify the signal from the voltage controlled oscillator, and transmit it to the antenna between 0.2 W - 5 W output power ranges. The transmitter circuits consist of driver amplifier, power amplifier, receiver-transmitter switch, harmonic filter and power control units.

The 17-18 dBm level signal from the transmitter VCO is amplified by the driver amplifier, TR502, then by the power amplifier, TR501. The signal from the power amplifier is sent to the antenna through the

receiver-transmitter switch and the 7 pole harmonic filter. Harmonics are suppressed more than 45 dB by the filter.

The power control circuits monitor the current drawn by the driver and power amplifier by the voltage drop across R503 (R506). This voltage is compared to the SQUELCH_POWER_TUNE (S_G_ADJUST) and the difference signal is applied to the transistors' gates to regulate the output power.

3.2.1.3 VCO Circuits

The Voltage Controlled Oscillator (VCO) circuits are designed separately as a receiver VCO (RX VCO) and a transmitter VCO (TX VCO). The TX VCO circuit operates at the channel frequency, 136-174 MHz (380-470 MHz). Since the first IF is selected as 45 MHz, the RX VCO circuit operates at $F_{\text{chan}} + 45 \text{ MHz}$, 181-219 MHz ($F_{\text{chan}} - 45 \text{ MHz}$, 335-425 MHz).

The Colpits oscillators are supplied approximately 3.5V which is filtered from the REG5V source. The 3.5V is switched on by the RX_ON or TX_5V (sourced from TX_ON) signal such that only one oscillator is running.

When RX_ON switches to 3V the RX VCO circuits begin to operate. The oscillating signal is amplified by TR301 and low pass filtered to suppress unwanted signals. The signal is applied to the LO terminal of the first mixer and the R_VCO signal is also fed back to the synthesizer IC. The synthesizer IC controls the RX VCO frequency by changing RX_VCO_TUNE (CONTROL) until the desired frequency is achieved, $F_{\text{chan}} + 45 \text{ MHz}$ ($F_{\text{chan}} - 45 \text{ MHz}$).

When TX_ON switches to 3V the TX VCO circuits begin to operate. The oscillating signal is amplified by TD402 and TD401. The signal is now the proper amplitude and is applied to the amplifier circuits. The T_VCO signal is also fed back to the synthesizer IC. The synthesizer IC controls the TX VCO by changing TX_VCO_TUNE (CONTROL) until the desired frequency is achieved, F_{chan} .

3.2.1.4 Synthesizer Circuits

The synthesizer circuits are composed of the Temperature Controlled Crystal Oscillator (TCXO), dual PLL synthesizer integrated circuit, loop filter, 5V and 3V voltage regulators. The frequency synthesizer includes a phase detector, a current mode charge pump, as well as a programmable reference divider and a feedback dual modulus frequency divider.

The VCO frequency is established by dividing the crystal reference signal down via the reference divider to obtain a frequency that sets the comparison frequency to 2.5 kHz or 3.125 kHz depending on whether the VCO frequency is a multiple of 2.5 kHz or 3.125 kHz. This reference signal is then presented to the input of a phase/frequency detector and compared with the divided VCO signal, which was obtained by dividing the VCO frequency down by way of the feedback counter.

The phase/frequency detector measures the phase error between the reference signal and the divided VCO signal and outputs control signals that are directly proportional to the phase error. The charge pump then pumps charge into or out of the loop filter based on the magnitude and direction of the phase error. The loop filter converts the charge into a stable control voltage for VCO. The phase/frequency detector's function is to adjust the voltage presented to the VCO until the feedback signal's frequency and phase match that of the reference signal. When this "phase-locked" condition exists, the VCO frequency will be N times that of the comparison frequency, where N is the feedback divider ratio.

The loop filter is optimized for fast locking low VCO noise, such that typical lock times are 10ms and 20ms for receiver and transmitter synthesizers, respectively, at full range frequency jumps.

A two-point modulation technique is used to obtain a flat modulation response ($\pm 0.2\text{dB}$ amplitude ripple at 0-3kHz AF range). The TX_AUDIO_1 and TX_AUDIO_2 signals, which are applied to TXVCO and TCXO simultaneously, are compensated by means of digital potentiometers to maintain the flat modulation response across the RF range.

The TCXO provides the 14.850 MHz reference frequency used by the synthesizer and also the third harmonic 44.550 MHz second LO frequency used by the demodulator.

3.2.1.5 Control Circuits

The control circuits contain the M16C/64 series M62724 microprocessor. The microprocessor has a 384K byte flash memory. The microprocessor uses 12.288 MHz crystal as clock. It divides this frequency by two and uses 6.144 MHz as an internal clock. It uses 8 bit data bus structure for external memory access. There is a 20K byte internal RAM in the microprocessor. A 128K byte external RAM is used as main RAM. It can be upgraded to 256K byte if it is required. 4M byte EEPROM (Data Flash) is used.

3.2.1.6 Audio Circuits

The audio circuits are composed of mainly the CMX881 integrated circuit. This integrated circuit is a DSP based mixed signal audio processing circuit. This circuit also processes the CTCSS, DTMF and FFSK signals. It can run CTCSS and SelCall decode processes synchronously. It requires an 18.432MHz clock signal. A 6.144MHz signal is generated from the microprocessor. Its 3rd Harmonic is received via filter to get 18.432MHz clock signal. The CMX881 is a half-duplex integrated circuit, so it can not perform receive and transmit functions simultaneously. Because the radio is also half-duplex this substructure is sufficient.

The RX_AUDIO signal from the receiver circuits is filtered and de-emphasized within the CMX881. The output of the CMX881 is the AUDIO signal which is sent to volume control and on to the audio amplifier.

The MIC_AUDIO signal from the microphone element is pre-emphasized within the CMX881. The CM881 also processes the mic audio through the VOGAD circuit, and then the limiter circuit. The mic audio is sent to the modulator as the TX_AUDIO1 and TX_AUDIO2 signals. The modulation levels and flatness are adjusted by the tuned amplifiers between the output of the CMX881 and the TX_AUDIO1 and TX_AUDIO2 signals.

3.2.2 Display and Keypad PCB

The display and keypad board is the user interface for SYN-Tech III P25 Portable Radio. The radio is controlled by the On/Off-volume knob, channel switch and keypad, which are connected to the board by a flexible connection. Data and warnings are shown by LEDs and the LCD Display. The radio's connection to external equipment is achieved via the option connector which is connected to the board by a flexible connection. In receive mode, the processed audio signal coming from the RF and Control board is amplified and sent to the speaker. In transmit mode, the audio signal coming from the microphone is amplified and routed to the RF and Control Board. The RF and Control Board is connected to the Display and Keypad board by KN2.

3.2.3 DSP PCB

The digital board circuits are controlled by the DSP, TD1. There are two A/D-D/A (Analog/Digital–Digital/Analog) converter integrated circuits on board. While analog to digital or digital to analog conversions of audio signals are performed by one of these integrated circuits, analog to digital or digital to analog conversions of digital modulation signals are performed by the other one. Supply circuits and circuits that generate a clock signal are also located on the board.

The interface with the microcontroller is through the HPI, which is a special parallel port of the DSP. The DSP has three synchronous serial ports. The DSP communicates with the baseband Modem A/D–D/A converter through first serial port, and with the audio A/D –D/A converter through the second serial port. In the following sections, these interfaces will be explained.

The DSP multiplies the 12.288MHz clock signal by three with the on-chip PLL, so the DSP clock rate becomes 36.864MHz. For the purpose of power saving, the DSP switches to the stand-by mode while not operating. The wake up interrupt is sent by the MCU.

3.2.3.1 DSP–MCU Interface

The DSP is connected to the MCU by connector, KN1 and runs under the control of the MCU. The DSP–MCU interface is realized through HPI-8 8-bit parallel interface of C54xDSP family. Both the DSP and MCU can access the RAM area on DSP by HPI-8 interface. There are 8-bit bi-directional data bus and control signals on interface. The data length used in interface is 16-bit, access is granted at two phases from 8-bit port based on A0 signal indicating first or second byte. HPI-8 combines the two bytes and then places it to DSP RAM as 16-bit.

The MCU communicates with DSP by means of the HPI-8 address and data registers. The HPI-8 data register in the DSP, includes bits controlling communication protocol. The HPI-8 communication substructure does not run when DSP is in reset mode. Unless the DSP clock is activated, it remains in the reset mode. The HPI-8 starts to operate when DSP exits reset mode. The HPI-8 accesses of MCU are synchronous with the DSP clock signal. If the DSP and MCU attempt to access the same address, access by the MCU has priority, and the DSP waits for one clock cycle.

Data communication on HPI-8 interface is made through 8-bit data bus (HD0-7). A1 and A2 control signals select which register of HPI-8 will be accessed. Since the DSP has 16-bit structure, all HPI-8 accesses should be in two bytes. The MCU indicates whether it transfers first or second byte with the A0 signal.

The DSP-MCU communication has two main functions; to load (boot) the DSP when turned on and to provide messaging during running. These functions are explained below.

In order to run a program on DSP, the program must be loaded to the DSP's RAM. This process is called booting the DSP. The "bootloader" program is located in DSP ROM. After reset the program transfers the DSP code, from a source other than itself, to program memory of the DSP. The DSP boot process in the radio is made through the HPI.

When the DSP sends a message, it writes the message code, message length and message content onto "HPI_BUFFER" area and interrupts MCU via DSP_MC-IRQ line. The MCU reads the message from the address specified when it receives the "interrupt" from the DSP_MC_IRQ output of the DSP.

3.2.3.2 DSP – Baseband Modem A/D – D/A Converter Circuits

The C4FM signal used in digital modulation is generated by IC2. This integrated circuit is an A/D–D/A converter using sigma–delta modulation method. Operating clock frequency is 12.288MHz. Communication with DSP is made through the first synchronous serial port. The synchronous serial port clock frequency is 6.144MHz. The required clock signal is generated by IC2.

Digital data, which is coming from the DSP consisting of 16 bit data sampled at 48kHz, is converted into analog in transmit mode. So, the C4FM baseband signal is obtained. Bit rate is 9600 bps and 10 times over-sampling is used.

In receive mode, the baseband signal coming from RF and Control board is transferred to IC2 through J1 and digitally sampled at 48kHz with 16 bit resolution by IC2 is sent to the DSP through the serial port.

When the DSP is in idle mode, IC2 is kept at reset to consume less power. It is taken out of reset mode through programming by means of the synchronous serial port for receive/transmit mode.

IC2 is operating as A/D converter (receive mode) or D/A converter (transmit mode) in radio units.

3.2.3.3 DSP – Audio A/D – D/A Converter Circuits

The DSP communicates with audio band A/D–D/A Converter IC3 through a second serial port. IC3 synchronous serial port frequency is 2.048MHz and it is obtained by dividing 12.288MHz operating clock signal by six with internal divider within IC3. Sampling frequency is 8kHz, resolution is 16 bit and linear quantization is used.

IC3 samples the audio signal coming from MIC_BUFFER_AUDIO line in control board, in transmit mode and sends the audio data to the DSP for digital processing. In receive mode, it sends the processed audio data, which is coming from the DSP to control board through DIG_RX_AUDIO line by converting them into analog signals. When not required, IC3 is left at reset mode to consume less power.

In these radios, IC3 is operated in receive and transmit modes.

3.2.3.4 Power Circuits (IC4, IC5, IC6)

Step down converter, IC5, is adjusted so as to obtain the 3V3 DC voltage from DC power input coming at 4.5–24V interval which changes for different type of radios. The 3V3 signal is input to IC4 and IC6 linear regulator integrated circuits. The 2.5V which IC2 and IC3 A/D–D/A converter integrated circuits require, is obtained from IC4. The 1.5V core voltage of the DSP, is obtained from IC6.

Table 3-1: KN1, RF and Control PCB to DSP PCB Signals

POSITION	DEFINITION	FUNCTION
KN1-1	SSP_CE_WR	Microprocessor WRITE signal
KN1-2	BAT7V5	Unswitched, direct battery voltage
KN1-3	DSP_CS	Select microprocessor's DSP data
KN1-4	SW7V5	Switched battery voltage
KN1-5	RD	Microprocessor RD signal
KN1-6	DSP_RESET	RESET signal from microprocessor to digital board
KN1-7	CIK	One bite communication signal that goes to CIK module
KN1-8	DSP_MC_IRQ	Interrupt data that comes to microprocessor from digital board
KN1-9	RDY	Microprocessor RDY signal
KN1-10	12.288MHz	12.288MHz clock signal
KN1-11	GND	Ground
KN1-12	DIG_TX_AUDIO	Audio signal that will be transmitted after coded
KN1-13	SENSE	Sense data
KN1-14	SK_RX_AUDIO	Decoded audio signal
KN1-15	D1	Microprocessor parallel data signal
KN1-16	EMERGENCY	Emergency call signal
KN1-17	A1	Microprocessor address signal
KN1-18	CLEAR	Clear signal data received from keypad
KN1-19	A2	Microprocessor address signal
KN1-20	D2	Microprocessor parallel data signal
KN1-21	A3	Microprocessor address signal
KN1-22	D3	Microprocessor parallel data signal
KN1-23	A0	Microprocessor address signal
KN1-24	D7	Microprocessor parallel data signal
KN1-25	BB_MODEM_RX	Base band signal received from receiver
KN1-26	D6	Microprocessor parallel data signal
KN1-27	D0	Microprocessor parallel data signal
KN1-28	D5	Microprocessor parallel data signal
KN1-29	BB_MODEM_TX	Base band signal that goes to transmitter
KN1-30	D4	Microprocessor parallel data signal

Table 3-2: KN2, RF and Control PCB to Display and Keypad PCB Signals

POSITION	DEFINITION	FUNCTION
KN2-1	RS232_CTS	RS232 CTS signal
KN2-2	REG3V3	Regulated 3V3 voltage that supplies front panel
KN2-3	RS232_RTS	RS232 RTS signal
KN2-4	ON_OFF	Data received from front panel On_Off Switch
KN2-5	RS232_RX	RS232 receive data
KN2-6	EXT_PTT	External Push To Talk data
KN2-7	RS232_TX	RS232 transmission signal
KN2-8	EMERGENCY	Emergency call data
KN2-9	LCD_CS_LCD	Select data that goes to front panel
KN2-10	GND	Ground
KN2-11	SSP_BUSY_MAX7301_CS	Multiplexer at the front panel select data
KN2-12	CLEAR	Clear key data
KN2-13	FRONT_SERI_REPLY	Serial data received from multiplexer at the front panel
KN2-14	EXT_MIC_SENSE	Senses when an external microphone is attached
KN2-15	FRONT_SERI_DATA	Serial data that goes to front panel
KN2-16	FLAT_AUDIO	Audio signal received from front panel for test/adjustment
KN2-17	FP_SERI_CLOCK	Serial data signal that goes to the front panel
KN2-18	LCD_TEMP_RD	Analog LCD temperature data
KN2-19	SENSE_RETURN	Sense return signal
KN2-20	SENSE	Sense signal
KN2-21	AUDIO_POT_H	Receive audio signal that goes to audio pot
KN2-22	SW7V5	Switched 7.5V battery voltage
KN2-23	I_O_IRQ	Interrupt data received from front panel
KN2-24	MIC_AUDIO	Microphone audio signal received from front panel

4 ADJUSTMENT

4.1 DEFINITIONS AND ABBREVIATIONS

Additional definitions and abbreviations used are:

f_A : The lowest operating (user) frequency or adjacent channel

f_U : The highest operating (user) frequency or adjacent channel

f_O : $(f_A + f_U)/2$ or adjacent channel

f_S : Spurious Signal Frequencies; Spurious Receiving Suppression test. These are the Spurious Signal Frequencies, which are given in Table 4-1.

Table 4-1: Spurious Signal Frequencies

Test Frequency	f_S : Spurious Signal Frequencies (MHz)				
f_A	$2f_A/3+45$	$f_A + 90$	$f_A + 30$	$f_A + 22.5$	$f_A + 0.9$

4.2 ADJUSTMENT CONDITIONS

Adjustments are applied under standard conditions.

4.3 ADJUSTMENT SETUP

Adjustment setup is shown in Figure 4-1.

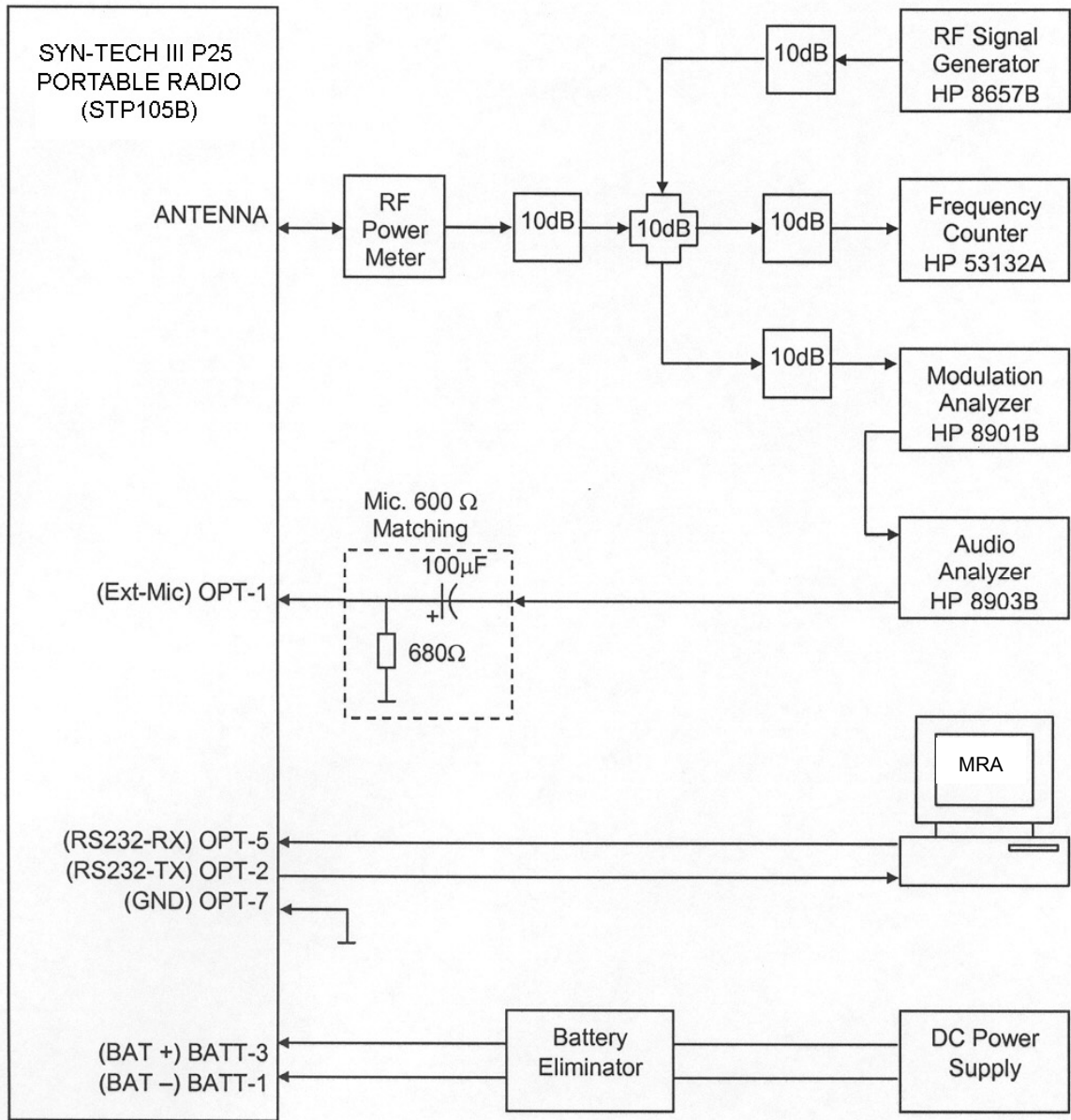


Figure 4-1: Adjustment Setup

4.4 ADJUSTMENT PROCEDURES

- a. Connect the equipment as illustrated. (Figure 4.1)
- b. Set the Power Supply output voltage to 7.5V and current limit to 2A.
- c. Set the RF Signal Generator output to its minimum level.
- d. Set the Audio Analyzer output impedance to 600Ω and amplitude to 0V_{rms}.
- e. Set the Modulation Analyzer to measure +/--peak deviation. Set the audio bandwidth for ≤ 5Hz to ≥ 15 kHz. Turn the de-emphasis function off.
- f. Run MRA.exe on the PC.
- g. Click on the Read Radio icon and enter the “Radio Adj.” menu.
- h. Adjustments specified in steps 4.4.1 - 4.4.10 should be applied consecutively.
- i. Adjustments specified in steps 4.4.1 - 4.4.10 should be applied to all models unless otherwise specified.
- j. If “Analog Frequency Adjustment” is changed, then “C4FM Receive Level Adjustment” has to be repeated.
- k. If “Modulation Flatness Adjustment” or “Modulation Limiting Adjustment” is changed, then the successive modulation and deviation adjustments have to be repeated.

NOTE: The alternative test equipments, which can be used in the adjustment set-up, should be compatible to those specified in EIA-603-B and/or TIA-102.CAAA-B standards.

4.4.1 RF Output Power Adjustment

- a. Enter “RF Output Power Adjustment” window and click “Transmit”.
- b. Adjust RF Output Power Parameter to obtain the measured power levels to be equal to the selected power levels for each selected frequency.

4.4.2 Analog Frequency Adjustment 25 kHz

- a. Enter “Analog Frequency Adjustment 25kHz” window and click “Transmit”.
- b. Adjust until the frequency error is less than 10Hz on the test frequency.

4.4.3 Digital Frequency Adjustment

- a. Enter “Digital Frequency Adjustment” window and click “Transmit”.
- b. Adjust until the frequency error is less than 10Hz on the test frequency.

4.4.4 Modulation Flatness Adjustment

- a. Enter “Modulation Flatness Adjustment” window, select the lower test frequency and click “Transmit”.
- b. Set the audio signal frequency to 20Hz and adjust the audio signal level to obtain 3000Hz deviation on Modulation Analyzer. The audio signal level should be $250 \pm 50 \text{mV}_{\text{rms}}$ at the OPT-1 (Ext-Mic) input of the radio.
- c. Set the audio signal frequency to 20Hz, click “MOD-2” and set the measured audio signal level on Audio Analyzer as 0.0dB reference.
- d. Set the audio signal frequency to 2000Hz, click “MOD-1” and adjust MOD-1 parameter to obtain $0.0 \pm 0.05 \text{dB}$ audio signal level on Audio Analyzer.

- e. Repeat the steps "c" and "d".
- f. Select the medium test frequency.
- g. Set the audio signal frequency to 20Hz, click "MOD-2" and adjust MOD-2 parameter to obtain 0.0 ± 0.05 dB audio signal level on Audio Analyzer.
- h. Set the audio signal frequency to 2000Hz, click "MOD-1" and adjust MOD-1 parameter to obtain 0.0 ± 0.05 dB audio signal level on Audio Analyzer.
- i. Repeat the steps "g" and "h".
- j. Select the higher test frequency and repeat the steps "g" and "h".
- k. Repeat the step "j".

4.4.5 Modulation Limiting Adjustment

- a. Enter "Modulation Limiting Adjustment" window and click "Transmit".
- b. Set the audio signal frequency to 1 kHz and level to 2 times of the level in step 4.4.4 "b" at OPT-1 input.
- c. Adjust Modulation Limiting until deviation is $\pm 4600 \pm 50$ Hz.

4.4.6 FM Deviation Adjustment

- a. Enter "FM Deviation Adjustment" window and click "Transmit".
- b. Set the audio signal frequency to 1 kHz and level to $100\text{mV}_{\text{rms}}$ at OPT-1 (Ext. Mic) input.
- c. Adjust FM Deviation parameter until deviation is $\pm 4400 \pm 50$ Hz.
- d. Set the audio signal amplitude to 0mV_{rms} .

4.4.7 C4FM Deviation Adjustment

- a. Enter "C4FM Deviation Adjustment" window and click "Transmit".
- b. Adjust C4FM Deviation until deviation is 2800 ± 30 Hz.

4.4.8 Squelch Adjustment

- a. Enter "Squelch Adjustment" window.
- b. Set the RF signal frequency to the test frequency, modulation frequency to 1 kHz, deviation to 3 kHz and adjust the RF signal level for 10dB SINAD. The RF level input at the antenna should be less than -119dBm .
- c. Adjust the Squelch setting until the RX LED is off, and then to the position where RX LED is just on or click "AUTOMATIC" for the automatic adjustment.
- d. Adjust the RF signal level in 0.2dB increments from RX LED ON condition to the position where RX LED is just off and record the RF input level at the antenna as Squelch Closing Level.
- e. Adjust the RF signal level in 0.2dB increments from RX LED OFF condition to the position where RX LED is just on and record the RF input level at the antenna as Squelch Opening Level.
- f. Squelch Opening Level should be less than -119dBm , the ratio between Squelch Opening Level and Squelch Closing Level should be $2.5 \pm 1.0\text{dB}$ and SINAD at Squelch Opening Level should be $10 \pm 2\text{dB}$.

4.4.9 RSSI Adjustment

- a. Enter "RSSI Adjustment" window.
- b. Set the RF signal frequency to the test frequency **without** modulation.
- c. Set the RF signal level at the antenna input to the selected levels on RSSI Adjustment window and click "READ RSSI".
- d. Displayed RSSI values should be "@ -114 dBm: 170 ±15, @ -102 dBm: 230 ±15".

4.4.10 C4FM Receive Level Adjustment

- a. Enter "C4FM Receive Level Adjustment" window.
- b. Set the RF signal frequency to the test frequency, modulation frequency to 1200Hz, deviation to 940Hz and RF signal level to -47dBm referred at the antenna input and click "READ RECEIVE LEVEL".
- c. The Displayed DC voltage level should be $0.95 \pm 0.1 V_{DC}$ and the AC voltage level should be $140 \pm 15 mV_{pp}$.

5 TROUBLESHOOTING

Syn-Tech III P25 Portable Radio Error Messages are given in Table 5-1:

Table 5-1: Syn-Tech III P25 Portable Radio Error Messages

ERROR MESSAGE	CAUSE	SOLUTION
ERROR 201	Is displayed when an error has been found in the external RAM.	Change the RF & Control Board
ERROR 202	Is displayed when an error has been found in the audio processor	Reload firmware
ERROR 203	Unknown hardware version	Return to factory
ERROR 302	Is displayed if the microcontroller cannot connect with the DSP hardware.	Check if the digital board is firmly fitted on the RF & Control Board
ERROR 303	Is displayed when a CRC error has been found in the DSP software.	Firmware must be reloaded.
ERROR 304	Is displayed when an error has been found during DSP RAM control.	Change the digital board.
ERROR 305	Wrong DSP software may have been loaded	Firmware must be reloaded.
ERROR 306	Wrong DSP software may have been loaded.	Firmware must be reloaded.
ERROR 309	Means that there is problem in the base band codec on the DSP board.	Change the digital board.
ERROR 310	Means that there is problem with the audio codec on the DSP board.	Change the digital board.
ERROR 311	Means that there is problem with the base band codec or audio codec on the DSP board.	Change the digital board.
ERROR 312	Unsuitable DSP firmware	Reload firmware
ERROR 313	No TX audio detected by DSP	Replace DSP
ERROR 502	Is displayed if the DSP software hasn't been installed.	Firmware must be reloaded

Syn-Tech III P25 Portable Radio Alert Messages are given in Table 5-2:

Table 5-2: Syn-Tech III P25 Portable Radio Alert Messages

RADIO DISPLAY	EXPLANATION
Battery Messages	
BATTERY LOW! PLEASE RECHARGE	If the battery voltage is below the first warning level, this message appears once per minute.
BATTERY OUT WAITING FOR RECHARGE	This alert is given if the battery is discharged and hasn't been placed into the charger. If the battery is placed into the charger, but charging hasn't started; "Please Wait" warning appears.
PLEASE TURN OFF! DEEP DISCHARGE	If the battery is in deep discharge. The radio should be turned off.
BATTERY LOW TX POWER OFF	It is displayed when the battery voltage is to low for transmission.
DISCHARGE BATTERY WITH CHARGER	If the battery's deep discharge level has been reached; this message appears on the display.
Warning messages	
ZONE NOT PROGRAMMED	If an un-programmed zone is entered; this message appears in the display.
NO TRANSMIT FREQUENCY	If the user attempts to transmit on the channel in which a transmission frequency is not programmed; this message appears in the display.
INVALID GROUP	If the user enters an invalid group number; this message appears in the display.
INDEX FULL	If the user tries to add a record to an index that is full, this message appears in the display.
CLONING FAILED, No Connection Established!	Check the cloning cable, and connections
CLONING FAILED Unit is Not Cloneable	Radio must be programmed as cloneable.
CLONING FAILED Clone ID Does Not Match!	Clone ID of the radios must be same for cloning.
CLONING FAILED Different WACN&SystemID!	WACN& System ID of the radios must be same for cloning.
CLONING FAILED Different Software Type!	Radio's firmware must be compatible with each other for cloning.

Syn-Tech III P25 Portable Radio 'Problem-Solution' Table is given in Table 5-3:

Table 5-3: Syn-Tech III P25 Portable Radio 'Problem-Solution' Table

PROBLEM	POSSIBLE CAUSE(s)	SOLUTION(s)
No display on LCD when radio is turned on	Battery is exhausted. Battery is not installed properly.	Recharge the battery. Remove battery and re-install correctly to contact points.
No sound from Loudspeaker	Volume level is too low or Squelch level is adjusted too high.	Re-adjust volume and/or squelch level.
No response to key press	Key lock is on.	Unlock the keypad by pressing Key lock button.
No answer to calls	Out of range of other stations or signal is blocked by terrain.	Switch to H(High) output power or Move closer until you have a "line-of-sight" to the other station.
Charger LED glows red and rarely green	Charging process is almost finished.	Leave the radio in the charger to complete charging.
Charger LED glows orange	Communication error between charger and the battery.	Replace the battery with a new MIDLAND authorized battery..
Charger LED glows blinking red	Battery temperature is too high for fast charging.	Charger starts fast charging automatically when the battery block temperature falls.
Charger LED glows red and green alternately	Radio is placed and removed from the charger within 2-10sec.	Place the radio into the charger to start discharging the battery.
Charger LED glows blinking orange	Faulty battery	Replace the battery with a new MIDLAND authorized battery.



SYN-TECH III P25 PORTABLE RADIO
SERVICE MANUAL

NOTES

6 ILLUSTRATED PART LISTS

After changing the RF and Control Board (p/n: 5999-9937-2114PB), all the tests explained in section 4.4 must be performed on the radio.

After disassembly and reassembly of the radio, the following functional tests and controls must be done while radio is powered on:

- Keypad, channel knob, on/off volume knob tests.
- Send and Receive tests.
 - Send Test: Listening for voice on the other radio.
 - Receive Test: Listening for voice from loudspeaker.
 - Transmit / receive LED Control. (*LED must be turned on*)
- PTT and Side button control tests. (Side buttons are enabled/disabled in MRP_P25.)
- Optional Accessories Jack Control. Connect your radio to the PC with programming cable and check the communication using MRA.exe program. (The Serial Port under the "Settings" Menu must be set to "data" to connect with your computer.)

Syn-Tech III P25 Portable Radio Illustrated Parts Lists are given in this section.

Please use part numbers for ordering.

6.1 SYN-TECH III P25 PORTABLE MAIN ASSEMBLIES

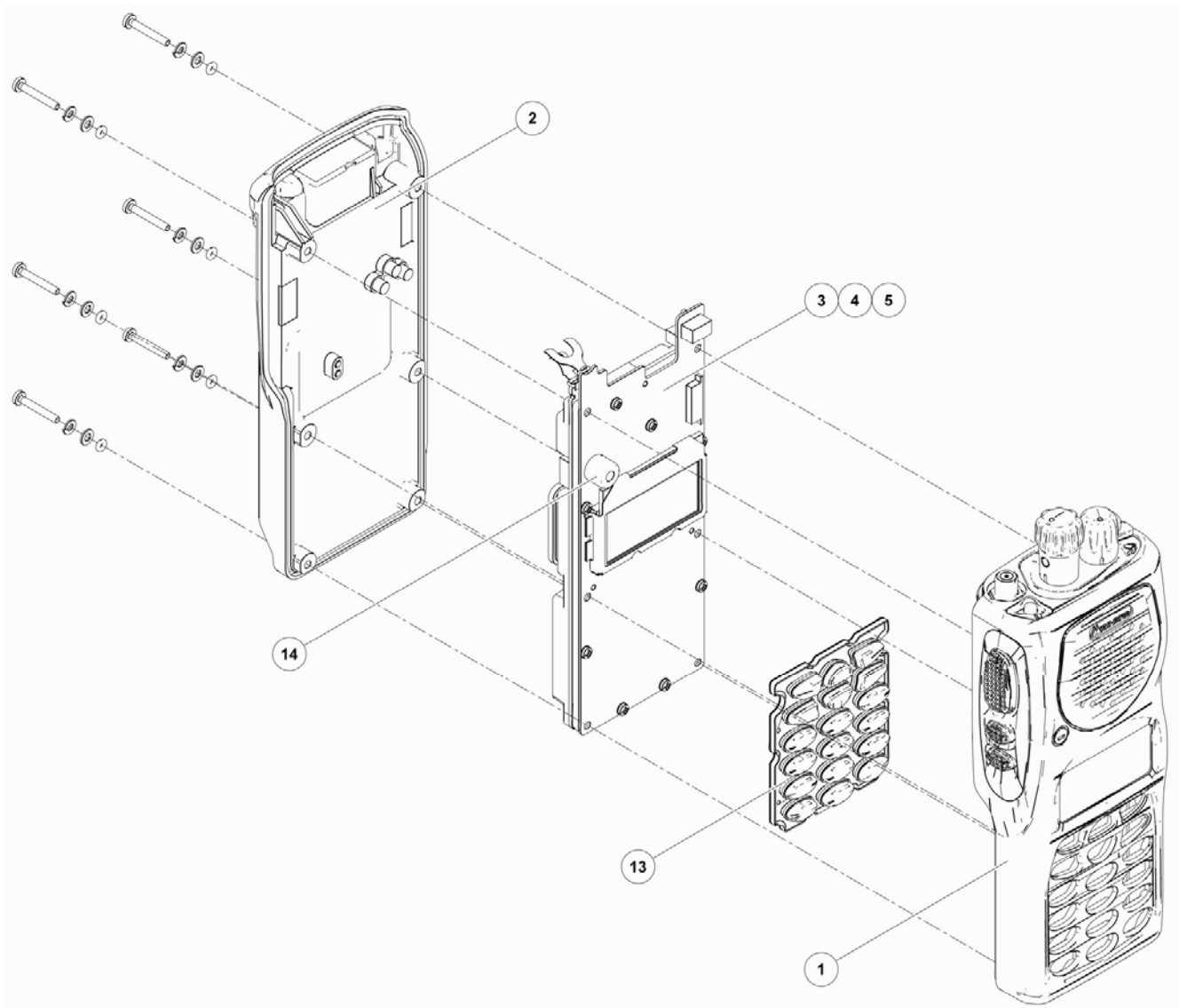


Figure 6-1: Main Assemblies Location Diagram

Table 6-1: Main Assemblies Parts List

ITEM NO	DESCRIPTION	QTY	P/N
1	ASSY FRONT PANEL HR 4700 BLACK MIDLAND	1	5999-9037-2140
2	ASSY REAR PANEL HR 4700 WITHOUT CIK	1	5999-9037-2112
3	ASSY PCB HR VHF RF AND CONTROL 136-174MHz	1	5999-9937-2111
3	ASSY PCB HR UHF RF AND CONTROL 380-470MHz	1	
3	ASSY PCB HR UHF RF AND CONTROL 450-512MHz	1	
4	ASSY PCB HR DISPLAY AND KEYPAD ASSY GN	1	5999-9937-2142
5	ASSY PCB DSP TK BDK	1	5999-9937-2171
13	KEYPAD ASSY 4400	1	6015-0534-1001
14	GASKET SI MICROPHONE Q7.6X5.5	1	6008-0534-1003
	SCREW STL ST/SOX M2X14	6	5307-1272-0214
	WASHER SPRING STL ST/SOX 2X4.4X0.5	8	5312-1072-0206
	WASHER THIN STL ST/SOX 2X4.5X0.5	6	5312-0072-0207

Reference Figure 6-1.

6.2 SYN-TECH III P25 PORTABLE RADIO PCB ASSEMBLIES

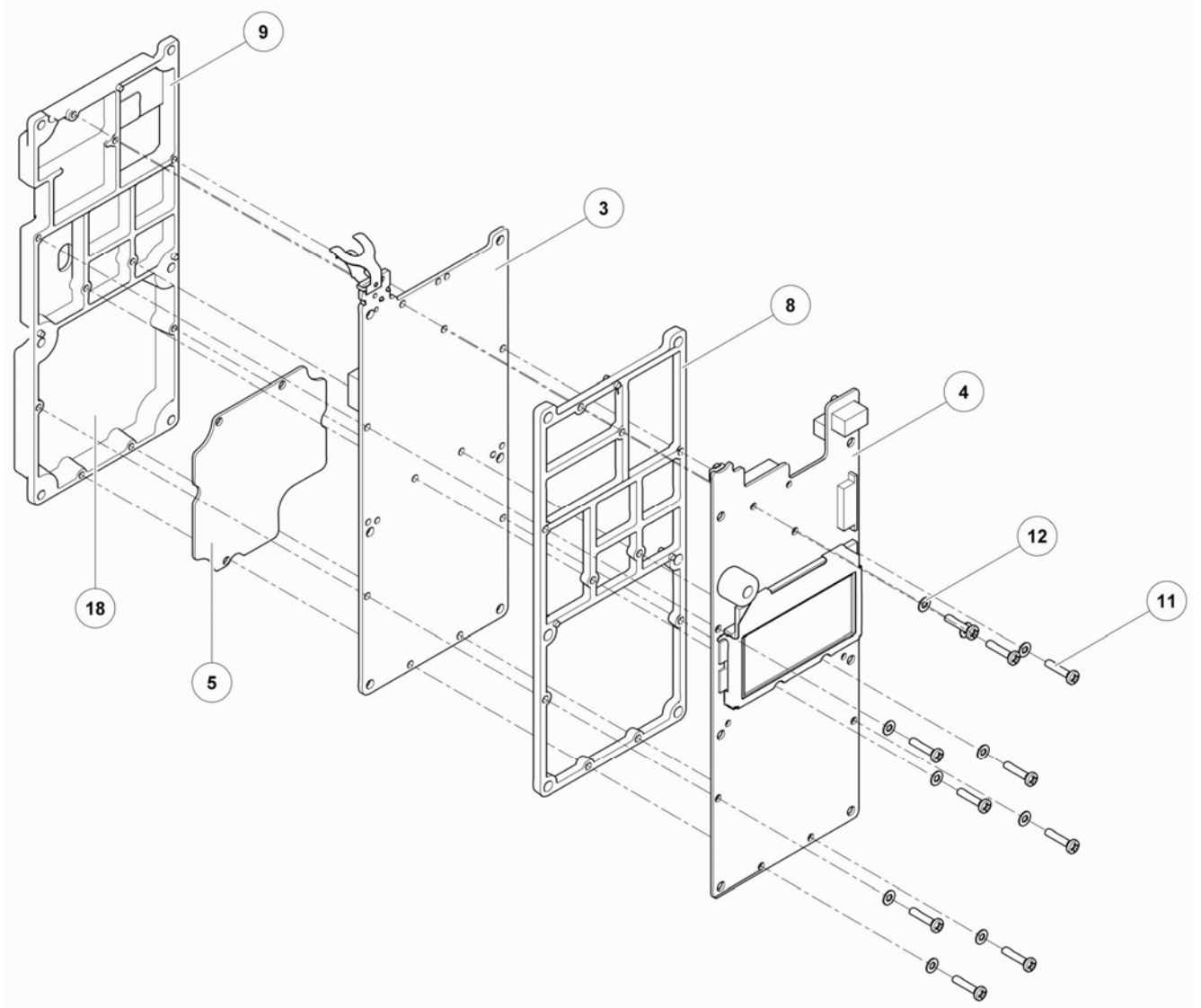


Figure 6-2: PCB Assemblies Location Diagram

Table 6-2: PCB Assemblies Parts List

ITEM NO	DESCRIPTION	QTY	P/N
3	ASSY PCB HR VHF RF AND CONTROL 136-174MHz	1	5999-9937-2111
3	ASSY PCB HR UHF RF AND CONTROL 380-470MHz	1	5999-9937-2116
3	ASSY PCB HR UHF RF AND CONTROL 450-512MHz	1	
4	ASSY PCB HR DISPLAY AND KEYPAD GN	1	5999-9937-2142
5	ASSY PCB DSP	1	5999-9937-2171
8	SPACER AL RF HR4700 PROCESSED	1	6003-4037-2002
9	COVER AL RF HR4700 PROCESSED	1	6003-4037-2001
11	DA STL ST M1.6X8	10	5307-1206-9408
12	WASHER SPRING STL 1.8X3.4X0.25	10	6005-0534-1001
18	PLATE PORON 20X20X5	1	6009-3337-3002

Reference Figure 6-2.

6.3 SYN-TECH III P25 PORTABLE RADIO REAR PANEL ASSEMBLY

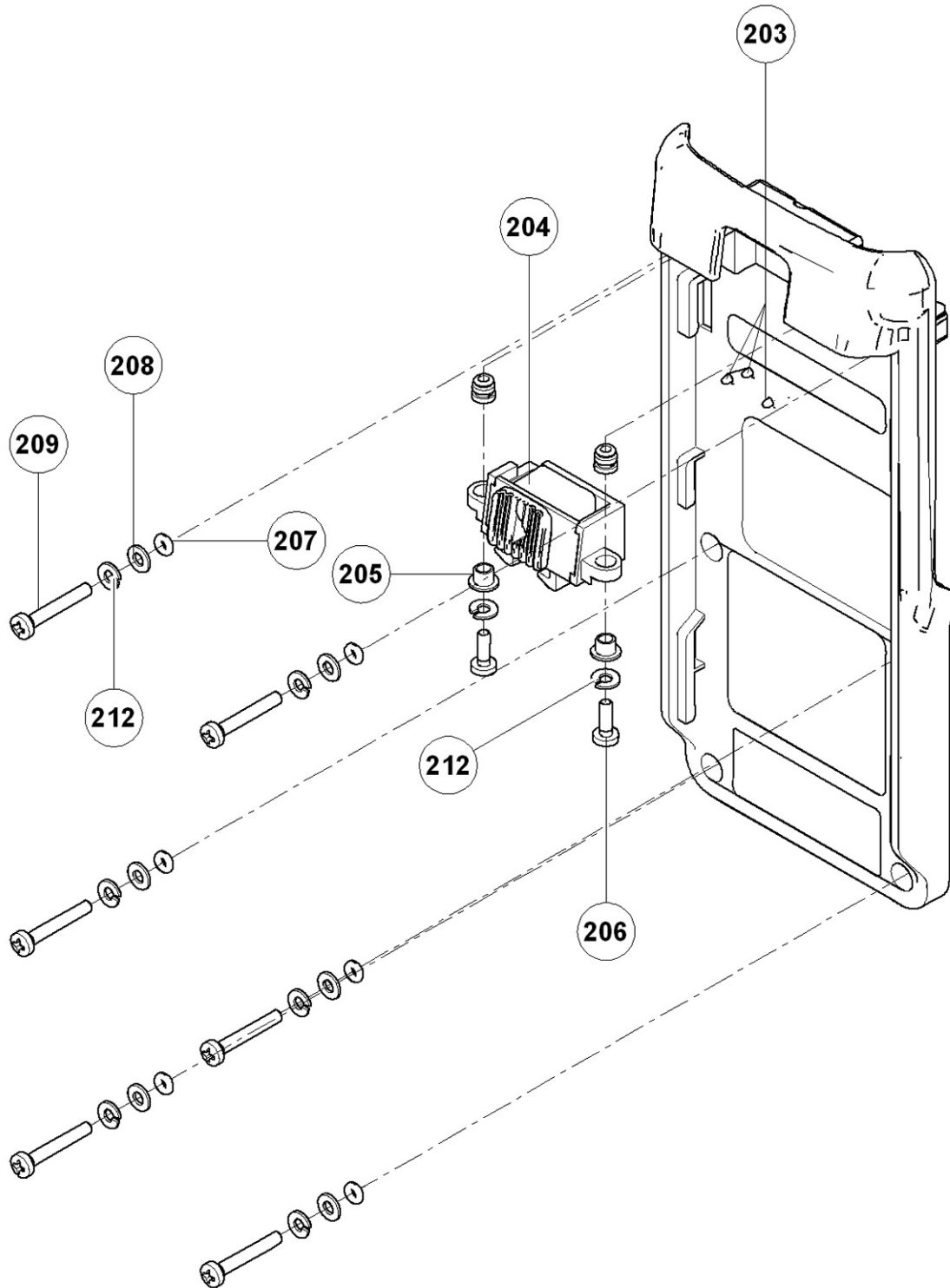


Figure 6-3: Rear Panel Assembly Location Diagram

Table 6-3: Rear Panel Assembly Parts List

ITEM NO	DESCRIPTION	QTY	P/N
203	BATTERY CONTACT SPL-04J-087	3	6160-3034-5001
204	ASSY LATCH SWI 4400	1	6030-0534-1004
205	BEARING Q4.7X2.80	2	6040-0534-1006
206	SCREW STLST/SOX M2X6	2	5307-1272-0206
207	O-RING SI Ø1.3x2.7x1.2	6	6008-0534-1004
208	WASHER THIN STLST/SOX 2X4.5X0.5	6	5312-0072-0207
209	SCREW STLST/SOX M2X14	6	5307-1272-0214
212	WASHER SPRING STLST/SOX 2X4.4X0.5	8	5312-1072-0206

Reference Figure 6-3.

6.4 SYN-TECH III P25 PORTABLE RADIO FRONT PANEL ASSEMBLY

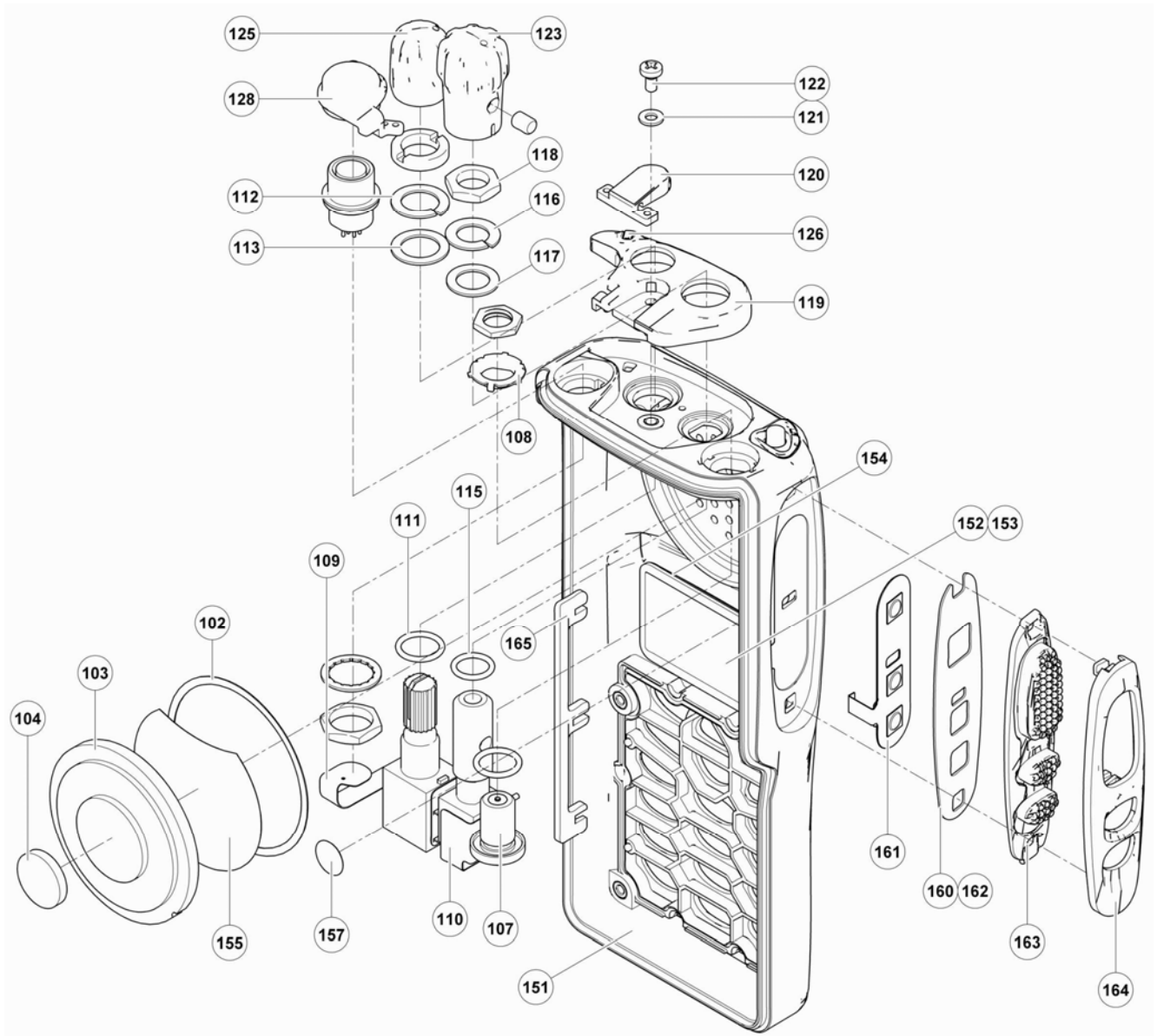


Figure 6-4: Front Panel Assembly Location Diagram

Table 6-4: Front Panel Assembly Parts List

ITEM NO	DESCRIPTION	QTY	PART NUMBER
102	BAND LOUDSPEAKER 36 MM	1	6009-0534-1028
103	LOUDSPEAKER MYLAR M36A575-16BIP2J	1	5965-3090-0013
104	PORON 11X2	1	6009-0730-6004
107	CONN RECEPT SMA MODIFIED BHEAD	1	5936-3440-2270
108	WASHER D ANTENNA CONN 4400	1	6005-0534-1009
109	ASSY EPCB HHR OPTION INTERCONNECTION	1	5999-7737-2102
110	ASSY EPCB HHR POT/SWI INTERCONNECTION	1	5999-7737-2101
111	O-RING NBR Q6.00X1.00	1	6008-0500-0033
112	WASHER SPRING STLST 6.1X10X0.50	1	6005-0534-1006
113	WASHER STLST 9.6-6.2X0.5	1	6005-0534-1008
115	O-RING NBR Q7.00X1.00	1	6008-0500-0032
116	WASHER SPRING STLST/ SOX 7.2X10.6X0.50	1	6005-0534-1002
117	WASHER STLST 10.6-7.2X0.5	1	6005-0534-1007
118	SMN PR M7 WITH SPLIT	1	6005-0534-1014
119	COVER TOP HHR 4700	1	9906-4037-3023
120	COVER SCREW M2 SI HHR 4700	1	6009-4037-2006
121	WASHER SPRING STL/ST/SOX 2X4.4X0.5	1	5312-1072-0206
122	SCREW STL/ST SOX M2X4	1	5307-1272-0204
123	KNOB VOLUME SWITCH I7.0 WITH PAINT	1	6009-0534-1034
125	ASSY KNOB CHANEL WITH SCR 4700 MID	1	6030-4037-3082
126	PM PC LED ILLUM HHR 4700	1	6009-4037-3010
128	OPTION CON COVER SI HHR 4700	1	6009-4037-3058
151	ASSY FRONT PANEL HHR 4700 BLK	1	6030-4037-3055
152	BAND LCD 39.6X21	1	6009-0534-1003
153	DISPLAY PC LCD 4400	1	6009-0534-1004
154	FOAM LCD PROTECT 4400	1	6009-0534-1006
155	CLOTH PROTECT LOUDSP 4700	1	6012-4037-3002
157	CLOTH PROTECT MIC	1	6012-0534-1001
160	BAND PTT 2 HHR 4700	1	6009-4037-2009
161	ASSY EPCB HHR SIDE KEY INTERCONNECTION 2.55N	1	5999-7737-2103
162	BAND PTT HHR 4700	1	6009-4037-3008
163	ASSY KEY SI PTT HHR 4700 MID.	1	6030-4037-2006
164	COVER PC PTT 4400	1	6009-0534-1023
165	ATTACHMENT PC PTT	1	6009-0534-1008

Reference Figure 6-4.

6.5 SYN-TECH III P25 PORTABLE RADIO DISPLAY AND KEYPAD PCB ASSEMBLY

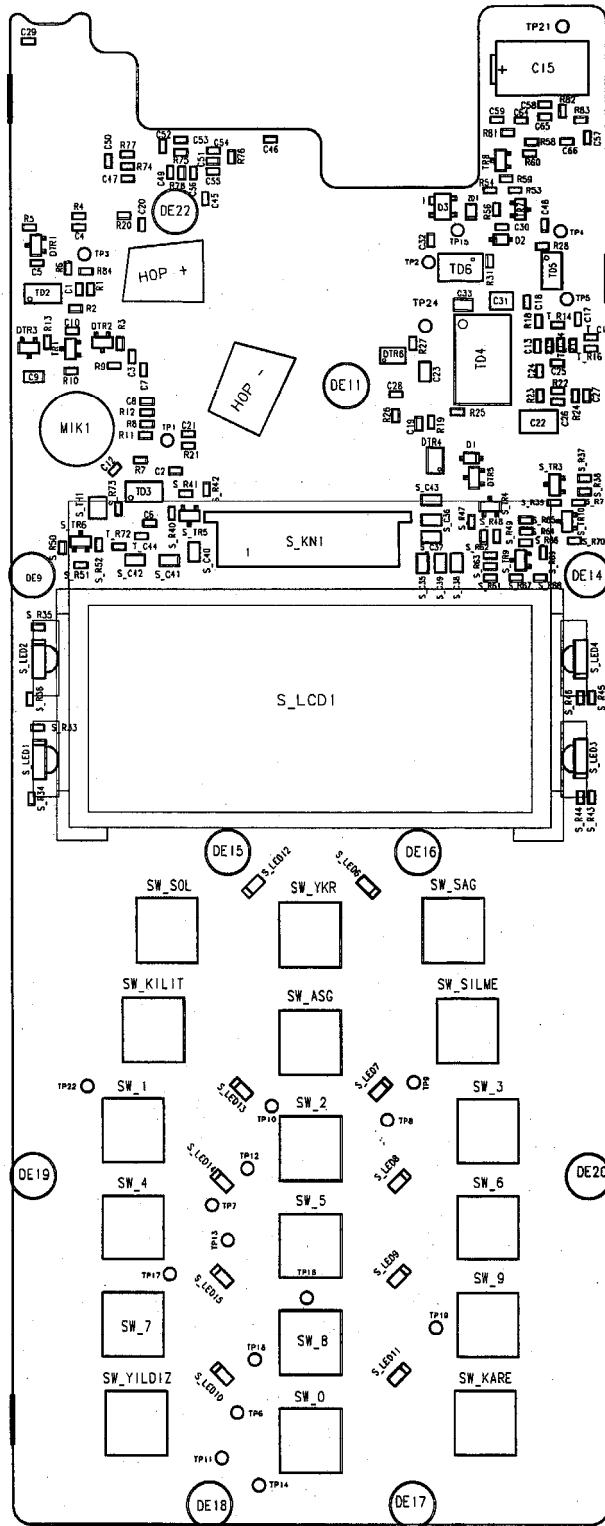


Figure 6-5: Display and Keypad PCB Assembly Top Side

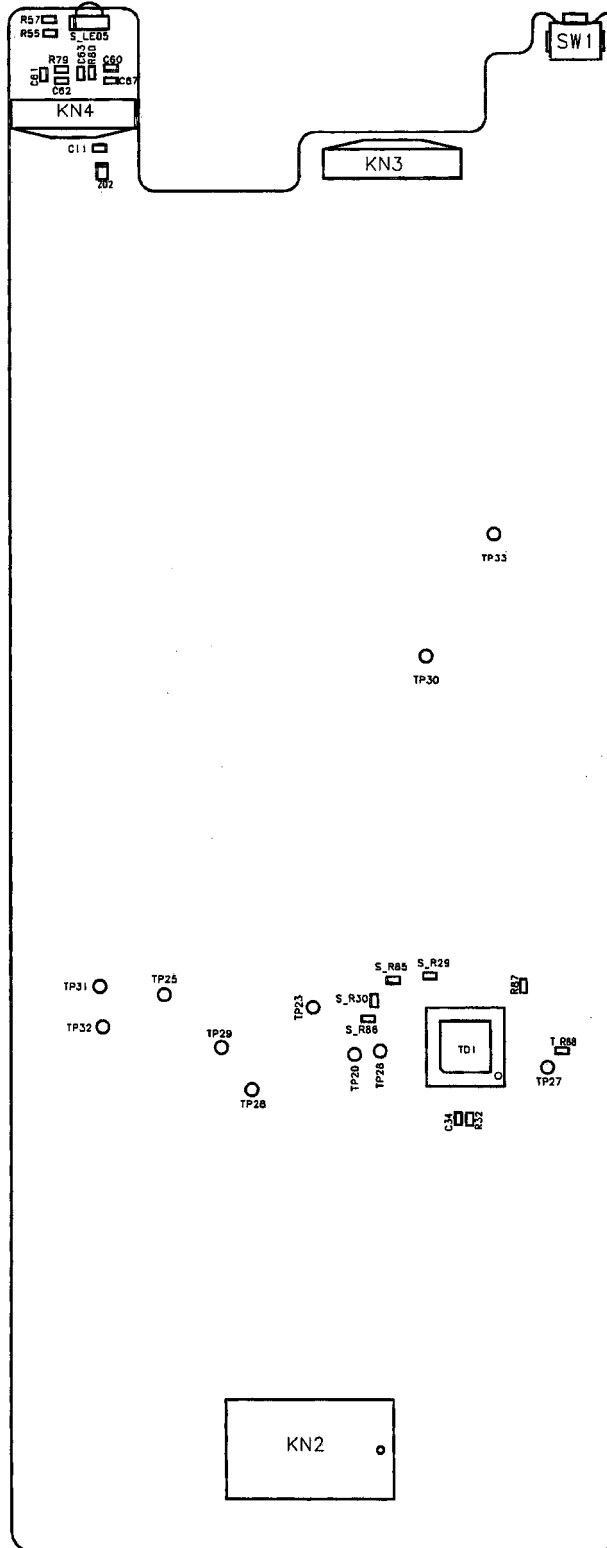


Figure 6-6: Display and Keypad PCB Assembly Bottom Side

Table 6-5: Display and Keypad PCB Parts List

ITEM	DESCRIPTION	QTY	P/N
	<i>ASSY PCB DISPLAY AND KEYPAD GN</i>	1	<i>5999-9937-2142</i>
	FRAME LCD HHR 4700	1	6040-4037-3034
C1, 7, 12, 24, 25, 28, 29, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 62, 63, 64, 65, 66, 67	CAP SER SMD 100P 5% 50V 0402	24	5910-0361-0116
C13, 26	CAP SER SMD 47P 5% 50V 0402	2	5910-0364-7125
C15	CAP CHIP TA 220uF 20% 10V	1	5910-2532-2053
C22	CAP X5R 1206 4U7 10% 16V	1	5910-0444-7070
C2, 3, 4, 5, 6, 10, 17, 18, 19, 20, 21, 27, 32, 34	CAP X5R 0402 100N 10% 10V	14	5910-0431-0080
C31	CAP SER SMD 1U 10% 16V 0805	1	5910-0441-0070
C35, 36, 37, 38, 39, 40, 41, 42, 43	CAP X5R 0603 1U 10% 10V	9	5910-0431-0070
C8, 11, 30, 45, 57, 58, 59, 60, 61	CAP X7R 0402 1N 10% 50V	9	5910-0461-0101
C9, 23, 33	CAP X5R 0603 1U 10% 10V	3	5910-0431-0070
D1, 2	DIODE SCH SOD523 SMD I	2	5961-6031-7940
D3	DIODE SCH SOT343 SMD I	1	5961-6031-3830
DTR1, 2	TR PNP SWI SMD I	2	5961-5730-0011
DTR3, 5	TR NPN SWI SMD I	2	5961-5730-0008
DTR4	TR PNP/NPN SWI SMD I	1	5961-5730-0002
DTR6	TR NPN/NPN SWI SMD I	1	5961-5730-0005
KN1	CONN FPC 0.5MM ZIF SFV20 SMD	1	5936-2602-0080
KN3	CONN FFC/FPC 10P VERTICAL 52559-	1	5936-2601-0361
KN4	CONN FFC/FPC 8P VERTICAL 52559-0890	1	5936-2600-8361
LCD1	128X64 DOT MATRIX LCD MODULE	1	5961-6501-2864
LED1, 2, 3, 4	LED TWO COLOR SMD ZMOSG56W	4	5961-6330-5600
LED5	LED GN-OR 3X1.5MM HT-210USD/UYG	1	5961-6330-2102
LED6, 7, 8, 9, 10, 11, 12, 13, 14, 15	LED YL SMD 10MCD-20MA I	10	5961-6333-1000
MIK1	MICROPHONE ELECTRET CAPSULE	1	5965-2370-0003
R1, 4, 5, 12, 26, 27, 28, 31	RESISTOR TFMR SMD 100K 5% 1/16W	8	5905-4056-1004
R10, 17, 24, 32	RESISTOR TFMR SMD 47K 5% 1/16W	4	5905-4056-4703
R11, 55, 57, 58, 79, 80, 81, 82, 84, 87	RESISTOR TFMR SMD 100R 5% 0.063W	10	5905-4056-1001
R15, 22	RESISTOR TFMR SMD 470K 5% 1/16W	2	5905-4056-4704
R18, 19, 20, 21, 23	RESISTOR TFMR SMD 2R2 5% 0.063W	5	5905-4056-2208
R2, 3, 6, 7, 13, 53, 54, 59, 60	RESISTOR TFMR SMD 10K 5% 1/16W	9	5905-4056-1003
R25, 56, 74	RESISTOR TFMR SMD 220R 5% 0.063W	3	5905-4056-2201
R29, 30	RESISTOR TFMR SMD 0R 5% 0.063W	2	5905-4056-0000
R33, 34, 35, 36, 43, 44, 45, 46, 66	RESISTOR TFMR SMD 47R 5% 0.063W	9	5905-4056-4709
R37, 40, 49, 52, 61, 62, 63, 64, 65	RESISTOR TFMR SMD 100R 5% 0.063W	9	5905-4056-1001
R38, 41, 48, 51, 73	RESISTOR TFMR SMD 47K 5% 1/16W	5	5905-4056-4703
R39, 42, 47, 50	RESISTOR TFMR SMD 22K 5% 0.063W	4	5905-4056-2203
R67, 68, 69, 70	RESISTOR TFMR SMD 10K 5% 1/16W	4	5905-4056-1003
R71	RESISTOR TFMR SMD 82R 5% 0.063W	1	5905-4056-8209
R75, 76, 77, 78	RESISTOR TFMR SMD 1K 5% 1/16W	4	5905-4056-1002
R8, 9	RESISTOR TFMR SMD 4K7 5% 1/16W	2	5905-4056-4702

ITEM	DESCRIPTION	QTY	P/N
R83	RESISTOR TFMR SMD 0R 5% 0.063W	1	5905-4056-0000
SW1	SWITCH TACT SMD	1	5931-9989-9900
TD1	IC MAX7301AGL I/O QFN40 I	1	5961-5430-7301
TD2	IC OAM LMV321 SOT23-5 I	1	5961-5404-3210
TD3, 5	IC ASW SPDT SOT23-6 I	2	5962-5400-0001
TD4	AMPLIFIER 2X0.7W SSOP20 TDA8547I	1	5961-5430-8547
TD6	IC LVR TK112 SOT-23 5V	1	5961-5430-1250
TH1	THERMISTOR NTC SMD 47K	1	5905-5020-0473
TR1, 7, 8	TR NPN GNL BC847BT SOT416	3	5961-5521-0847
TR3, 4, 5, 6, 9, 10	TR NPN GNL BC847BT SOT416	6	5961-5521-0847
ZD1, 2	DIODE ZNR SMD I	2	5961-1375-0010

Reference Figure 6-5 and Figure 6-6.

6.6 SYN-TECH III P25 PORTABLE RADIO DSP PCB ASSEMBLY

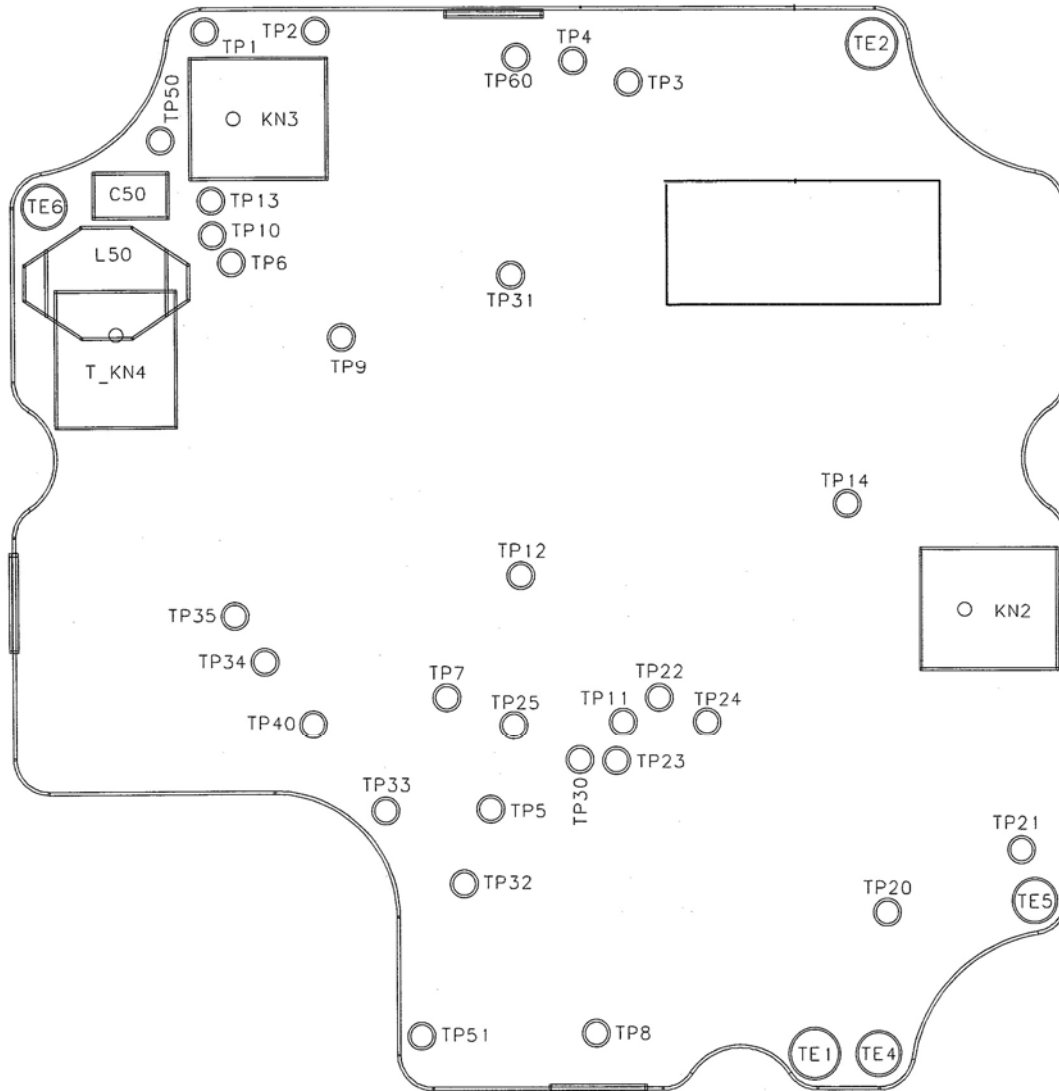


Figure 6-7: DSP PCB Assembly bottom side

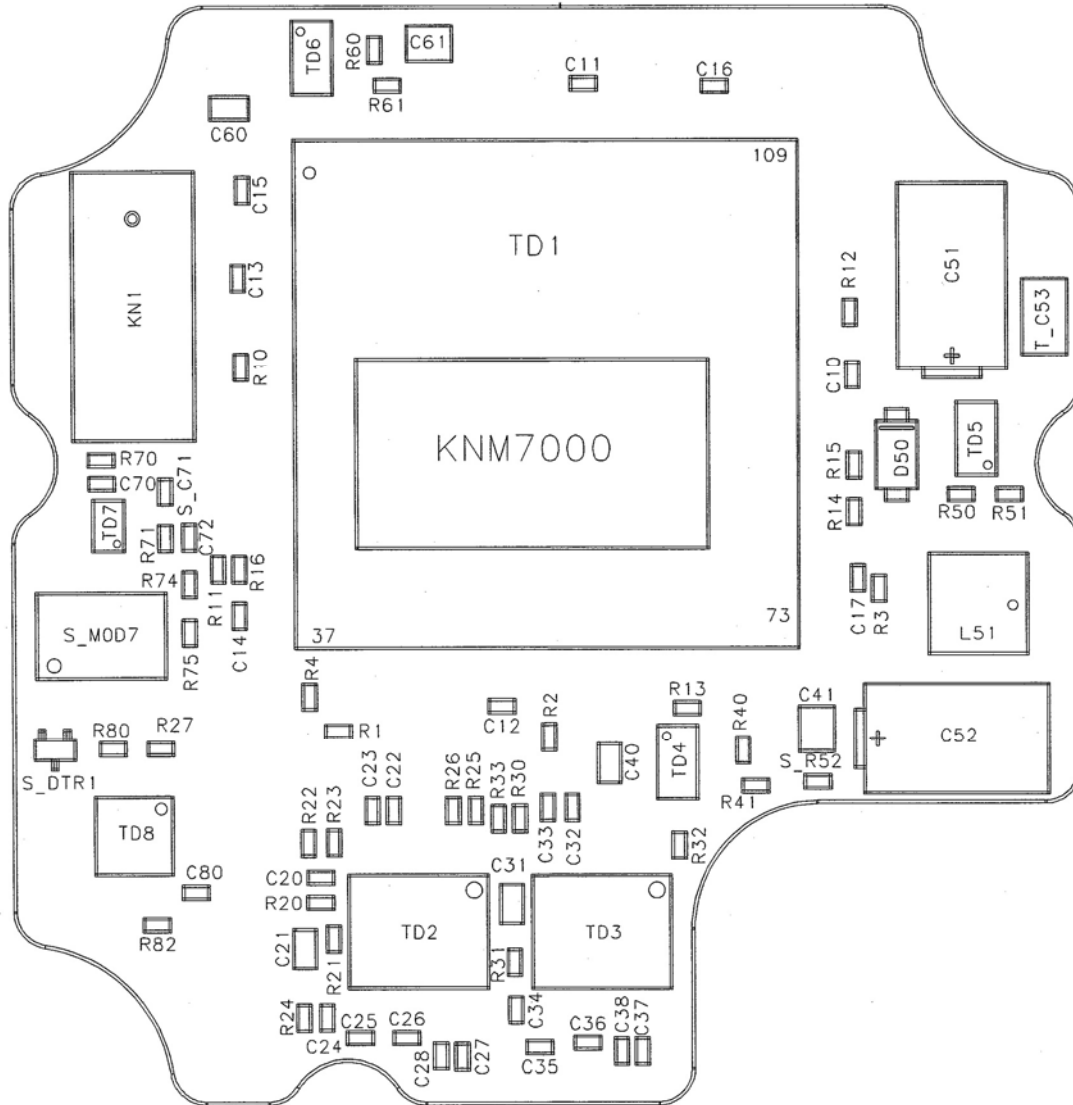


Figure 6-8: DSP PCB Assembly Top Side

Table 6-6: DSP PCB Parts List

ITEM	DESCRIPTION	QTY	P/N
	<i>ASSY PCB DSP</i>		<i>5999-9937-2171</i>
C50	CAP X5R 1206 10U %10 10V	1	5910-0431-0060
KN2, 3	SOCKET 10P AXK5F10545J	2	5936-2401-0320
L50	COIL POW SHI 220U 20-% 16(90)	1	5952-7000-9943
TE1, 2	TERMINAL PIN 3985-TLG	2	5941-2273-0000
TE4, 5, 6	TERMINAL PIN 4737-1TL	3	5941-2273-0001
C10, 11, 12, 13, 14, 15, 16, 17, 22, 24	CAP X5R 0402 100N 10% 10V	10	5910-0431-0080
C20	CAP CER SMD 47P 5% 50V 0402	1	5910-0364-7125
C23, 25, 33, 35, 72	CAP CER SMD NPO 220pF 5% 50V	5	5910-0362-2116
C41, 61	CAP X5R 0805 4U7 10% 10V	3	5910-0434-7070
C26, 27, 28, 32, 36, 37, 38, 70, 80	CAP X5R 0402 100N 10% 10V	9	5910-0431-0080
C21, 31, 40, 60	CAP X5R 0603 1U 10% 10V	4	5910-0431-0070
C34	CAP X7R 0402 10N 10% 25V	1	5910-0451-0090
C51	CAP PTAN V 33U 20% 16V 070	1	5910-2543-3066
C52	CAP PTAN V 150U 20% 6.3V 040	1	5910-2521-5056
D50	DIODE SCH SMD I	1	5961-6030-0011
DTR1	TR NPN SWI SMD I	1	5961-5730-0006
KN1	SOCKET 30P AXK5F30545J	1	5936-2403-0320
L51	COIL CHOCK 22U 20 % ELL5GM220M	1	5952-7106-2201
MOD7	OSC TCXO 5x3.2MM 12M288 2.5PPM	1	5955-2600-0164
R10, 11, 13, 16, 60	RESISTOR TFMR SMD 10K 5% 1/16W	5	5905-4056-1003
R12, 27, 40, 41, 75	RESISTOR TFMR SMD 100K 1% 1/16W	5	5905-4074-1004
R14, 15, 21, 33, 74	RESISTOR TFMR SMD 4K7 5% 1/16W	3	5905-4056-4702
R20	RESISTOR TFMR SMD 221K 1% 1/16W	1	5905-4074-2214
R22	RESISTOR TFMR SMD 150K 1% 1/16W	1	5905-4074-1504
R23	RESISTOR TFMR 0402 301K 1% 1/16W 50V	1	5905-4074-3014
R24, 25, 26, 32, 70	RESISTOR TFMR SMD 100R 5% 0.063W	5	5905-4056-1001
R30, 31, 82	RESISTOR TFMR SMD 1K 5% 1/16W	3	5905-4056-1002
R50	RESISTOR TFMR SMD 22.1K 1% 1/16W	1	5905-4074-2213
R51	RESISTOR TFMR 0402 36K5 1% 1/16W 50V	1	5905-4074-3653
R61, 80	RESISTOR TFMR SMD 47K5 1% 1/16W	2	5905-4074-4753
R71	RESISTOR TFMR SMD 1M 5% 0.063W	1	5905-4056-1005
TD1	IC DSP TMS320VC5416 TQFP144I	1	5961-5130-5416
TD2, 3	IC CDC AD74111YRU TSSOP16 I	2	5961-5458-4111
TD4, 6	IC REG ADJ. AS3815 SOT23-5	2	5961-5401-0011
TD5	IC CONV STEP-DOWN MAX1837SOT23	1	5961-5430-1837
TD7	IC SAY LOGIC 74AHC1G04 SC70-5	1	5961-3221-0004
TD8	IC OAM LMV358 MSOP8 I	1	5961-5404-3581

Reference Figure 6-7 and Figure 6-8.

6.7 SYN-TECH III P25 PORTABLE RADIO VHF RF AND CONTROL PCB ASSEMBLY

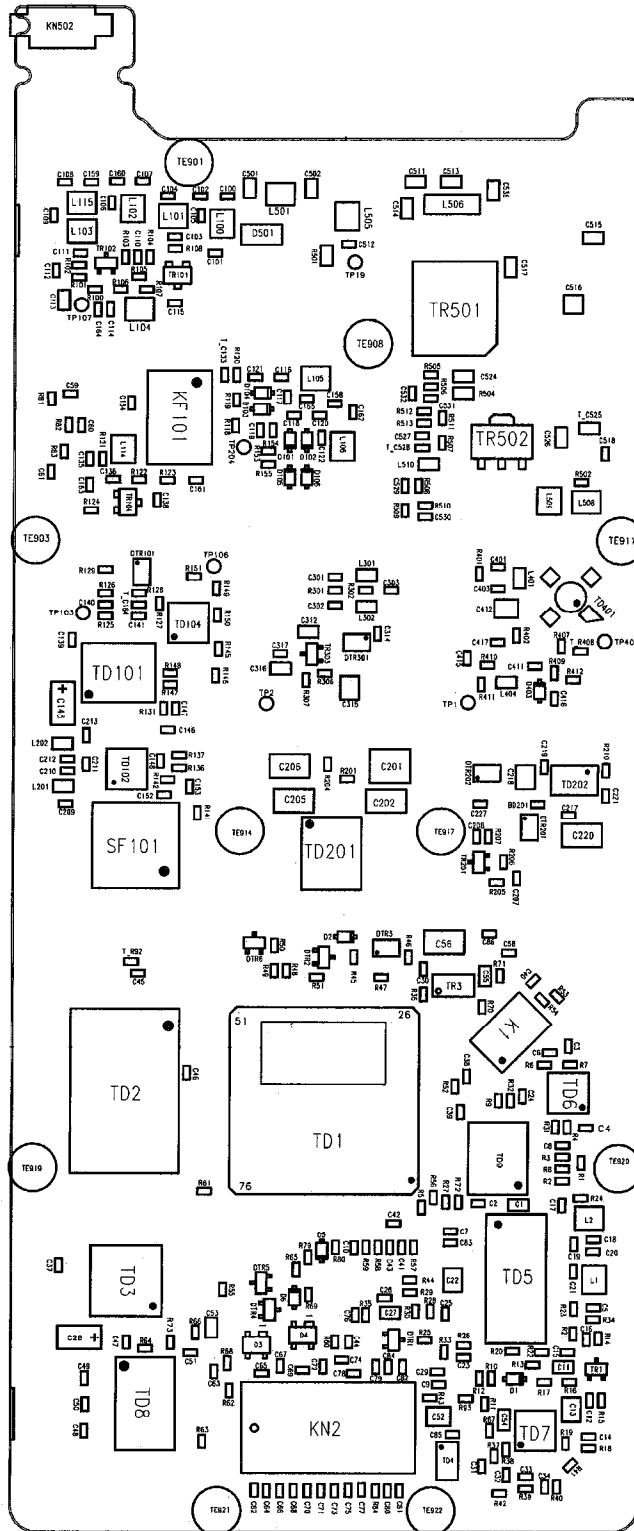


Figure 6-9: VHF RF and Control PCB Assembly Top Side

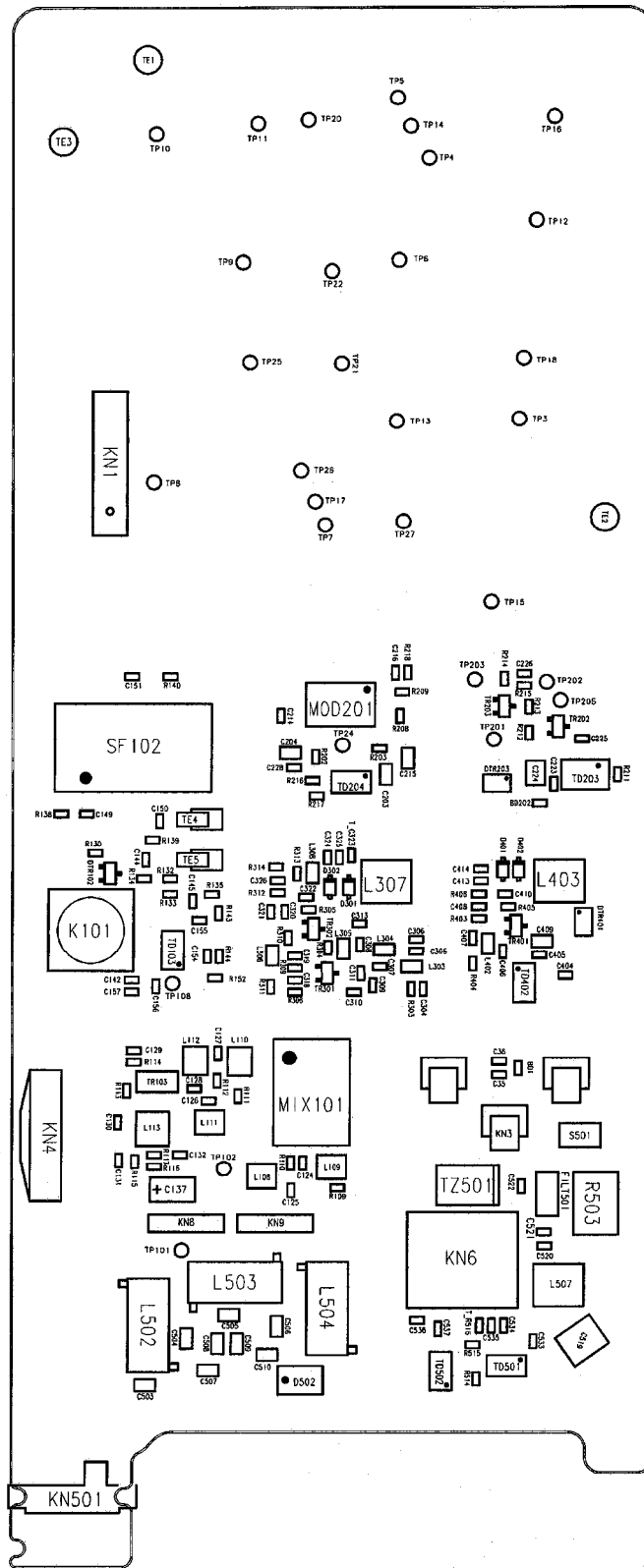


Figure 6-10: VHF RF and Control PCB Assembly Bottom Side

Table 6-7: VHF RF and Control PCB Assembly Parts List

ITEM	DESCRIPTION	QTY	P/N
	ASSY PCB VHF RF CONTROL 380-470MHZ	1	5999-9937-2111
BD1, 201, 202	FT BEAD 0402 SMD BK1005	3	5952-9900-0068
C1	CAP X5R 0603 2U2 10% 6.3V	1	5910-0422-2070
C10, 12, 21, 62, 63, 64, 65, 66, 67, 68, 69, 72, 74, 79, 80, 81, 82, 83, 84, 85, 86, 109, 110, 111, 112, 114, 119, 164, 214, 216, 217, 221, 223, 226, 227, 303, 309, 313, 314, 317, 318, 326, 403, 405, 415, 416, 417, 512, 518, 520, 521, 522, 527, 529, 530, 531, 532, 533, 534, 535, 536, 537	CAP X7R 0402 1N 10% 50V	62	5910-0461-0101
C100, 160	CAP COG 0402 50V 1% 33P	2	5910-0163-3120
C101	CAP COG 0402 50V 1% 56P	1	5910-0165-6120
C102, 106, 124, 306	CAP COG 0402 50V 1% 18P	4	5910-0161-8120
C103, 118, 411	CAP COG 0402 50V 1% 2P2	3	5910-0162-2130
C105, 301	CAP COG 0402 50V 1% 12P	2	5910-0161-2120
C108, 115, 128, 213	CAP COG 0402 50V 1% 15P	4	5910-0161-5120
C11	CAP COG 0603 1N 5% 50V	1	5910-0361-0106
C117, 122, 413	CAP COG 0402 50V 1% 82P	3	5910-0168-2120
C126, 320, 321, 322, 407, 408	CAP COG 0402 50V 1% 27P	6	5910-0162-7120
C127, 146, 147, 154, 155	CAP COG 0402 50V 1% 220P	5	5910-0162-2110
C13, 315	CAP X5R 0805 10U 10% 6.3V	2	5910-0421-0060
C134, 319	CAP COG 0402 50V 1% 6P8	2	5910-0166-8130
C137, 143	CAP TAN SMD 1U 20% 16V	2	5910-2540-1060
C139	CAP X7R 0402 4N7 10% 50V	1	5910-0464-7101
C16, 23, 33, 35, 36, 59, 60, 61, 70, 71, 73, 75, 76, 77, 401	CAP CER SMD 100P 5% 50V 0402	15	5910-0361-0116
C162, 165, 406	CAP COG 0402 50V 1% 3P3	3	5910-0163-3130
C163	CAP COG 0402 50V 1% 1P2	1	5910-0161-2130
C167	CAP X7R 0402 270P 10% 50V	1	5910-0462-7111
C18, 141	CAP COG 0402 50V 1% 100P	2	5910-0161-0110
C19, 104, 159, 116, 120, 121, 125, 158, 302	CAP COG 0402 50V 1% 22P	9	5910-0162-2120
C2, 3, 5, 6, 14, 15, 30, 32, 34, 37, 38, 41, 42, 44, 45, 46, 47, 48, 51, 58, 78, 129, 130, 131, 142, 145, 153, 156, 157, 161, 208, 219, 225, 228	CAP X5R 0402 100N 10% 10V	34	5910-0431-0080
C20	CAP COG 0402 50V 1% 120P	1	5910-0161-2110
C201	CAP FILM 1210 1.0U 20% 16V	1	5910-0541-0072
C202, 206	CAP FILM 1206 0.22U 20% 16V	2	5910-0542-2081
C205	CAP MTF SMD 0.047U 5% 16V	1	5910-0344-7090
C209	CAP COG 0402 50V 1% 5P6	1	5910-0165-6130
C211	CAP COG 0402 50V 1% 4P7	1	5910-0164-7130
C22, 218, 224, 412	CAP X5R 0805 4U710 % 10V	4	5910-0434-7070
C25	CAP CER SMD 180P 5% 50V 0402	1	5910-0361-8116
C26	CAP X5R 0402 1U 10% 10V	1	5910-0431-0071
C27, 53, 54, 55, 113, 203, 204, 215, 312, 316, 409	CAP X5R 0603 1U 10% 10V	11	5910-0431-0070
C28	CAP CHIP TA 15U 20% 6.3V	1	5910-0521-5061
C304, 308	CAP COG 0402 50V 1% 8P2	2	5910-0168-2130
C305, 307	CAP COG 0402 50V 1% 3P9	2	5910-0163-9130

ITEM	DESCRIPTION	QTY	P/N
C325, 410	CAP COG 0402 50V 1% 39P	2	5910-0163-9120
C39, 40, 135, 310, 311, 404	CAP COG 0402 50V 1% 10P	6	5910-0161-0120
C4, 17, 24, 107, 210, 212, 324, 166	CAP COG 0402 50V 1% 47P	8	5910-0164-7120
C414	CAP COG 0402 50V 1% 68P	1	5910-0166-8120
C49, 50, 140	CAP X7R 0402 22N 10% 16V	3	5910-0442-2093
C501, 507	CAP COG 0603 18P 100V 5%	2	5910-0381-8123
C502	CAP COG 0603 15P 100V 5%	1	5910-0381-5123
C503, 511	CAP X7R 0603 1N5 10% 50V	2	5910-0461-5100
C504	CAP COG 0603 2.7P 100V 5%	1	5910-0382-7131
C505, 513	CAP COG 0603 6.8P 100V 5%	2	5910-0386-8131
C506	CAP COG 0603 5.6P 100V 5%	1	5910-0385-6131
C508, 509	CAP COG 0603 22P 100V 5%	2	5910-0382-2123
C510	CAP COG 0603 12P 100V 5%	1	5910-0381-2123
C514	CAP 250V- 5% 47P SMD	1	5910-0394-7121
C515	CAP 250V- 5% 100P SMD	1	5910-0391-0111
C516	CAP NPO 5% 150P SMD ATC700A	1	5910-0081-5110
C517	CAP 250V- 5% 22P SMD	1	5910-0392-2121
C519	CAP X5R 1210 10U 20% 16V	1	5910-0541-0069
C52	CAP CER SMD 1U 10% 16V 0805	1	5910-0441-0070
C524	CAP COG 0603 220P 100V 5%	1	5910-0382-2115
C526	CAP COG 0603 68P 100V 5%	1	5910-0386-8122
C538	CAP COG 0603 8.2P 100V5 %	1	5910-0388-2131
C56, 220	CAP X5R 1206 4U7 10% 16V	2	5910-0444-7070
C57	CAP X7R 0402 330P 10% 50V	1	5910-0463-3111
C7, 9, 29, 31, 43, 132, 136, 138, 144, 148, 149, 150, 151, 152, 207	CAP X7R 0402 10N 10% 25V	15	5910-0451-0090
C8	CAP X7R 0402 470P 10% 50V	1	5910-0464-7111
D1, 2, 5, 6	DIODE SCH SOD523 SMD I	4	5961-6031-7940
D101, 102	DIODE VRC 1SV285 SMD	2	5961-6030-0285
D103, 104, 105, 106	DIODE VRC SMD	4	5962-6000-0002
D3, 4	DIODE SCH SOT343 SMD I	2	5961-6031-3830
D301, 302, 401, 402, 403	DIODE VRC 1SV282 SMD I	5	5961-6030-2820
D501	DIODE PIN HSMP-3824 SOT23	1	5961-0603-8240
D502	DIODE POW MA4P1250 SMQ	1	5961-6031-2500
DTR1, 4, 6, 102, 103	TR NPN SWI SMD I	5	5961-5730-0008
DTR2, 5	TR PNP SWI SMD I	2	5961-5730-0011
DTR202, 203, 301, 401	TR PNP/NPN SWI SMD I	4	5961-5730-0000
DTR3, 101, 201	TR PNP/NPN SWI SMD I	3	5961-5730-0002
FILT501	FILTER EMI LP T-TIPI 2200P %50	1	5915-3602-2200
K1	CRYSTAL CER FUND 12.288M 5x3.2	1	5955-1171-1201
K101	DISCR CER 450KHZ SMD CDBKB450KCAY24	1	5955-3256-1004
KF101	FILTER CRYSTAL 45MHZ 4K MFT45Q	1	5955-3088-2001
KN1	CONN 30P AXK6F30345J	1	5936-2403-0321
KN2	CONN DCDR 24P Au 00-9158-024-025-062	1	5936-2312-4870
KN4	CONN FFC/FPC 8P DKY 52559-0890	1	5936-2600-8361

ITEM	DESCRIPTION	QTY	P/N
KN501	CONTACT SPRING ANTENNA IC 4400	1	6007-0534-1001
KN502	CONTACT SPRING ANTENNA DIS 4400	1	6007-0534-1002
KN6	SHEET AL NI 8X7X3	1	6040-0534-1001
KN8, 9	GASKET SMT 25SMT-3645-09	2	6015-0234-1003
KY1, 2, 3	SPRING CONTACT BMIC-001	3	5941-4593-1038
L1, 2, 111	COIL RF SMD 470N 5%	3	5952-7308-4707
L100, 109, 110, 501	COIL RF CHIP 0805 56N 5%	4	5952-7309-5601
L101, 102, 103, 115	COIL RF CHIP 0805HQ 18N 5%	4	5952-7300-0005
L104	COIL RF SMD 100N 10%	1	5952-7310-0003
L105, 106	COIL RF CHIP 0805HQ 27N 5%	2	5952-7300-0007
L108	COIL RF SMD 0805 47N 5%	1	5952-7309-4701
L112	COIL RF CHIP 0805 680N 5%	1	5952-7308-6807
L113	COIL RF SMD 2U7 10%	1	5952-7327-0006
L114, 505	COIL RF CHIP 0805 820N 5%	2	5952-7308-8207
L201, 202	COIL RF CHIP 0603CS 220N 5%	2	5952-7308-2212
L301	COIL RF SMD 56N 5%	1	5952-7356-0008
L302	COIL RF SMD 27N 5%	1	5952-7327-0010
L303, 304	COIL RF SMD 33N 5%	2	5952-7333-0012
L305	COIL RF SMD 68N 5%	1	5952-7368-0009
L306, 308, 401, 402, 404	COIL RF SMD 220N 5%	5	5952-7322-0016
L307	COIL AIRY SMD 14N 00610503	1	5952-7304-5000
L403, 507	COIL AIRY SMD 19.2N 00610504	2	5952-7306-5000
L502, 503, 504	COIL RF SMD 43N %2	3	5952-7310-0500
L506	COIL AIRY 1606 12.55N 1606-10J	1	5952-0210-9900
L508	COIL RF SMD 120N 10%	1	5952-7312-0004
L509	COIL RF SMD 0805 33N 5%	1	5952-7309-3301
L510	COIL RF SMD 22N 5%	1	5952-7322-0012
MIX101	MIXER SMD 3dBm ADE-1L	1	5961-1530-2012
MOD201	OSCILATOR TCXO TTS14VSB-A5 14.85MHZ	1	5955-2600-0163
R1, 133, 151	RESISTOR TFMR SMD 470K 5% 1/16W	3	5905-4056-4704
R101, 214	RESISTOR TFMR SMD 15K 5% 0.063W	2	5905-4056-1503
R105, 213, 401	RESISTOR TFMR SMD 680R 5% 0.063W	3	5905-4056-6801
R106, 109, 110, 111, 112, 124, 301, 302, 307	RESISTOR TFMR SMD 47R 5% 0.063W	9	5905-4056-4709
R107	RESISTOR TFMR SMD 18K 5% 0.063W	1	5905-4056-1803
R108, 502, 509	RESISTOR TFMR SMD 5R6 5% 1/16W	3	5905-4056-5608
R113, 306	RESISTOR TFMR SMD 2K2 5% 0.063W	2	5905-4056-2202
R116	RESISTOR TFMR SMD 820R 5% 0.063W	1	5905-4056-8201
R117, 132	RESISTOR TFMR SMD 12K 5% 0.063W	2	5905-4056-1203
R118, 120	RESISTOR TFMR SMD 3K3 5% 0.063W	2	5905-4056-3302
R119, 508, 510	RESISTOR TFMR SMD 270R 5% 0.063W	3	5905-4056-2701
R127	RESISTOR TFMR SMD 1K5 1% 1/16W	1	5905-4074-1502
R128	RESISTOR TFMR SMD 1K2 5% 0.063W	1	5905-4056-1202
R13, 17, 25, 34, 46, 52, 55, 60, 63, 84, 103, 135, 145, 149, 150, 205, 207, 215, 218, 304, 305, 309, 312, 406, 412	RESISTOR TFMR SMD 10K 5% 1/16W	25	5905-4056-1003
R131	RESISTOR TFMR SMD 330K 5% 0.063W	1	5905-4056-3304

ITEM	DESCRIPTION	QTY	P/N
R14, 122, 514, 515, 143, 144, 156, 157	RESISTOR TFMR SMD 220K 5% 0.063W	8	5905-4056-2204
R147	RESISTOR TFMR SMD 390K 5% 1/16W	1	5905-4056-3904
R148	RESISTOR TFMR SMD 1M 5% 0.063W	1	5905-4056-1005
R15, 303	RESISTOR TFMR SMD 220R 5% 0.063W	2	5905-4056-2201
R159	RESISTOR TFMR SMD 0R 5% 0.063W	1	5905-4056-0000
R16, 121, 407, 70, 71	RESISTOR TFMR SMD 22K 5% 0.063W	5	5905-4056-2203
R18	RESISTOR TFMR SMD 0402 61.9K %1	1	5905-4074-6193
R2, 3, 10, 11, 12, 20, 23, 26, 28, 29, 30, 32, 33, 37, 38, 39, 40, 41, 48, 49, 50, 51, 61, 62, 64, 66, 68, 69, 79, 80, 125, 126, 136, 137, 142, 153, 154, 155, 206, 210, 211, 216, 217, 409, 158	RESISTOR TFMR SMD 100K 5% 1/16W	45	5905-4056-1004
R201	RESISTOR TFMR SMD 1K8 5% 0.063W	1	5905-4056-1802
R21	RESISTOR TFMR 0402 332K 1% 1/16W	1	5905-4074-3324
R22, 138, 139, 512, 513, 140, 141	RESISTOR TFMR SMD 6K8 5% 0.063W	7	5905-4056-6802
R24, 67, 104, 314, 411	RESISTOR TFMR SMD 2R2 5% 0.063W	5	5905-4056-2208
R27, 35, 45, 134, 204, 212	RESISTOR TFMR SMD 4K7 5% 1/16W	6	5905-4056-4702
R311	RESISTOR TFMR SMD 180R 5% 0.063W	1	5905-4056-1801
R313, 402, 410	RESISTOR TFMR SMD 22R 5% 0.063W	3	5905-4056-2209
R4, 31	RESISTOR TFMR SMD 39K 5% 0.063W	2	5905-4056-3903
R404, 507	RESISTOR TFMR SMD 150R 5% 0.063W	2	5905-4056-1501
R405	RESISTOR TFMR SMD 8K2 5% 0.063W	1	5905-4056-8202
R42, 44, 53, 100, 114, 115, 208, 308	RESISTOR TFMR SMD 100R 5% 0.063W	8	5905-4056-1001
R47, 146	RESISTOR TFMR SMD 27K 5% 0.063W	2	5905-4056-2703
R5, 36, 43, 56, 72, 81, 82, 83, 123, 209, 506, 511	RESISTOR TFMR SMD 1K 5% 1/16W	12	5905-4056-1002
R501	RESISTOR TFMR SMD 270R 5%	1	5905-4066-2701
R503	RESISTOR TFMR 1% 2010 SMD	1	5905-4154-5006
R504	RESISTOR TFMR SMD 15R1 % 0.063W	1	5905-4084-1509
R54, 57, 73, 129, 202, 203, 310, 403	RESISTOR TFMR SMD 10R 5% 0.063W	8	5905-4056-1009
R58, 102	RESISTOR TFMR SMD 47K5 1% 1/16W	2	5905-4074-4753
R59	RESISTOR TFMR SMD 221K 1% 1/16W	1	5905-4074-2214
R6, 7, 19	RESISTOR TFMR SMD 100K 1% 1/16W	3	5905-4074-1004
R65, 152	RESISTOR TFMR SMD 47K 5% 1/16W	2	5905-4056-4703
R8, 9	RESISTOR TFMR SMD 33K 5% 0.063W	2	5905-4056-3303
R93, 505	RESISTOR TFMR SMD 470R 5% 0.063W	2	5905-4056-4701
S501	FUSE SMD 3A	1	5921-0000-3100
SF101	FILTER CER 450KHz CFUKF450KE1X-R0	1	5955-3256-2002
SF102	FILTER CER 450KHZ CFWKA450KJFA	1	5955-3256-1006
TD1	IC MCU M30626FHPGP LQFP100 I	1	5961-5130-0626
TD101	IC DET SSOP16P225B TA31136 I	1	5961-5430-3113
TD102	IC ASW SPDT QFN-12 I	1	5962-5400-0005
TD103	IC OAM LMV321 SOT23-5 I	1	5961-5404-3210
TD104	IC OAM LMV358 MMX MSOP8 I	1	5961-5404-3581
TD2	IC SRA MEM TSOP32 I	1	5962-5479-0001
TD201	IC FRS LMX2335LTMX MTC16 I	1	5961-5416-2335
TD202	IC LVR TK112 SOT-23 5V	1	5961-5430-1250

ITEM	DESCRIPTION	QTY	P/N
TD203	IC LVR TK112 SOT-23L C	1	5961-5430-1233
TD204, 501	IC OAM SOT23-5 IF	2	5961-5404-7111
TD3	IC FLS AT45DB161D-SU 8S2 I	1	5961-5134-5041
TD4	IC LVR MIC5206 SOT23-5 I	1	5961-5478-5206
TD401	IC AMP SGA-5486Z 5V SMD I	1	5961-5430-5486
TD402	IC RFA TA4004F SSOP5-P IF	1	5961-5430-9400
TD5	IC CMX881E1 TSSOP(E1)28 I	1	5961-5430-0881
TD502	IC AMP SOT23-5 MAX4372TEUK-T I	1	5961-5434-3720
TD6, 7	IC OAM LMV358 MSOP8 I	2	5962-5404-0001
TD8	IC TRS 2DRV/2RCV TSSOP20 I	1	5962-5400-0003
TD9	IC DPT DS1803E-100/T&R TSSOP14	1	5961-5430-1803
TE1, 2, 3	TERMINAL PIN 3985-TLG	3	5941-2273-0000
TE4, 5	SPRING CONTACT SINGLE (0098-0380-03)	2	6007-3337-3001
TR1, 203, 303	TR NPN GNL BC847BT SOT416	3	5961-5521-0847
TR101, 104	TR NPN UHF BFR93AW SOT323	2	5961-5523-1934
TR102, 201, 202	TR PNP GNL BC857BT SOT416	3	5961-5521-0857
TR103	TR JFN VHF BF512 SOT23	1	5961-5523-0512
TR3	TR MOSFET P-CHANNEL TSOP6 I	1	5961-5730-3443
TR301, 302, 401	TR NPN SMD 2SC5195 I	3	5961-5730-5195
TR501	TR MFN RFG MRF1511T1 M	1	5961-5730-1511
TR502	TR RFG 520MHz RD01MUS1 SOT89	1	5961-5730-0110
TZ501	VOLTAGE LIMITER 10V	1	5961-1310-0013

Reference Figure 6-9 and Figure 6-10.

6.8 SYN-TECH III P25 PORTABLE RADIO UHF RF AND CONTROL PCB ASSEMBLY

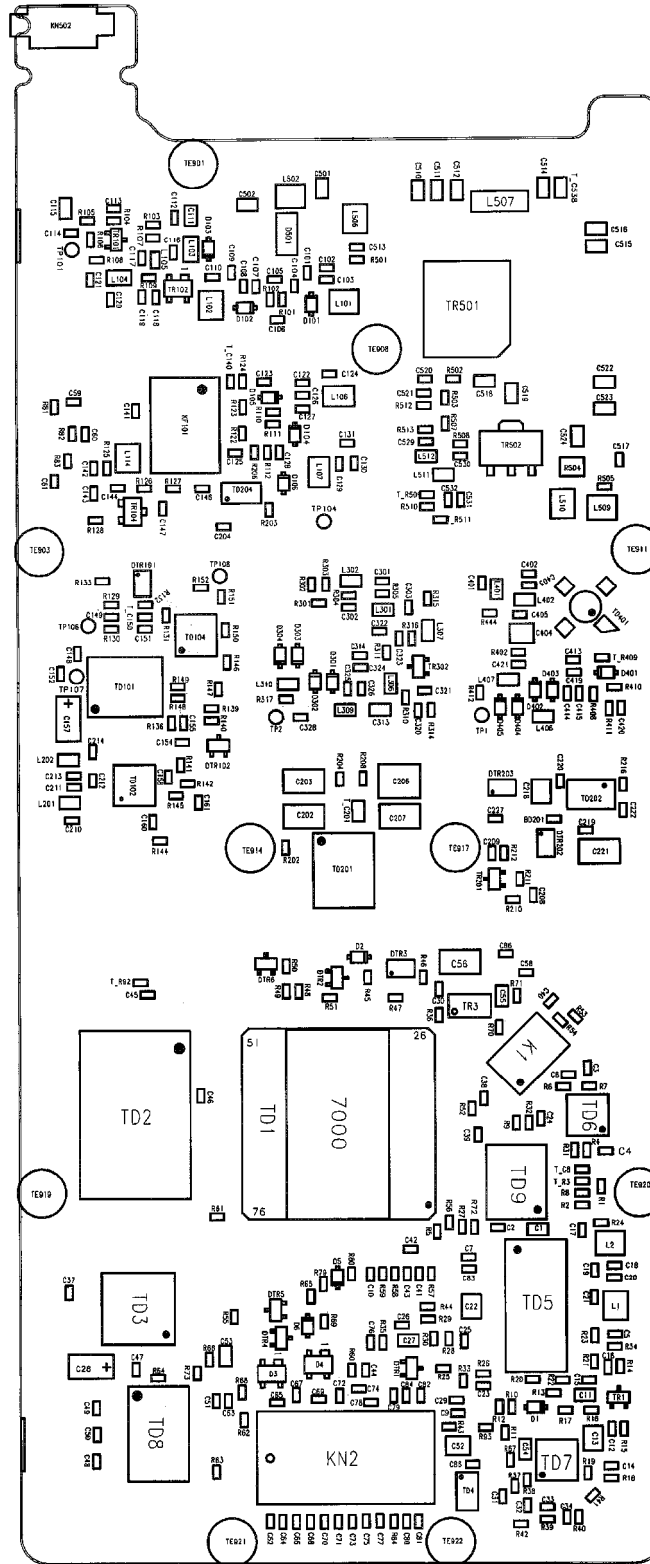


Figure 6-11: UHF RF and Control PCB Assembly Top Side

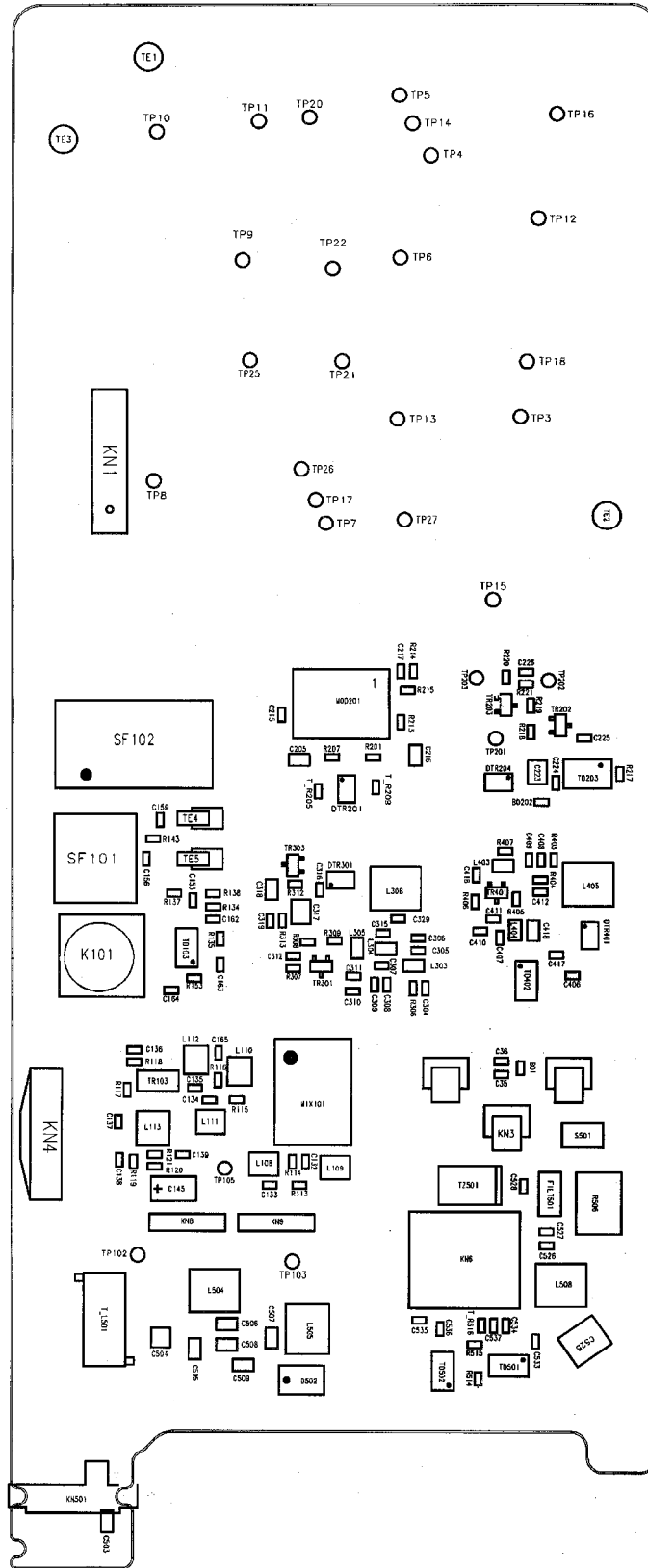


Figure 6-12: UHF RF and Control PCB Assembly Bottom Side

Table 6-8: UHF RF and Control PCB Assembly Parts List

ITEM	DESCRIPTION	QTY	P/N
	ASSY PCB UHF RF CONTROL 380-470MHZ	1	5999-9937-2116
BD1, 201, 202	FERRITE BEAD 0402 SMD BK1005	3	5952-9900-0068
C1	CAP X5R 0603 2U2 %10 6.3V	1	5910-0422-2070
C10, 12, 21, 62, 63, 64, 65, 66, 67, 68, 69, 72, 74, 79, 81, 83, 84, 85, 86, 162, 533, 420	CAP X7R 0402 1N %10 50V	22	5910-0461-0101
C102, 109, 110, 301	CAP COG 0402 50V %1 12P	4	5910-0161-2120
C103, 105, 108, 124, 141, 531, 324	CAP COG 0402 50V %1 6P8	7	5910-0166-8130
C104, 107	CAP COG 0402 50V %1 150P	2	5910-0161-5110
C106, 112, 113, 114, 116, 120, 121, 125, 513, 517, 520, 521, 526, 527, 528, 529, 530, 532, 534, 535, 536, 537	CAP X7R 0402 470P %10 50V	22	5910-0464-7111
C11	CAP COG 0603 1N %5 50V	1	5910-0361-0106
C111, 115	CAP CER SMD 1U %+80-20 10V	2	5910-0930-1070
C117, 413, 419, 407	CAP COG 0402 50V %1 1P	4	5910-0161-0130
C118, 212	CAP COG 0402 50V %1 4P7	2	5910-0164-7130
C122, 123, 130, 131, 132, 210, 302, 304, 308, 412, 401	CAP COG 0402 50V %1 5P6	11	5910-0165-6130
C126, 128	CAP COG 0402 50V %1 33P	2	5910-0163-3120
C127, 310	CAP COG 0402 50V %1 2P7	2	5910-0162-7130
C129, 133, 306, 402	CAP COG 0402 50V %1 8P2	4	5910-0168-2130
C13, 317	CAP X5R 0805 10U %10 6.3V	2	5910-0421-0060
C134	CAP COG 0402 50V %1 27P	1	5910-0162-7120
C135, 214	CAP COG 0402 50V %1 15P	2	5910-0161-5120
C143, 314	CAP COG 0402 50V %1 1P2	2	5910-0161-2130
C145, 157	CAP TAN SMD 1U %20 16V	2	5910-2540-1060
C148	CAP X7R 0402 4N7 %10 50V	1	5910-0464-7101
C154, 155, 165	CAP COG 0402 50V %1 220P	3	5910-0162-2110
C16, 23, 33, 35, 36, 59, 60, 61, 70, 71, 73, 75, 76, 77, 215, 217, 219, 222, 224, 226, 227, 312, 315	CAP CER SMD 100P %5 50V 0402	33	5910-0361-0116
C18, 80, 82, 151, 101	CAP COG 0402 50V %1 100P	5	5910-0161-0110
C19, 323, 411	CAP COG 0402 50V %1 22P	3	5910-0162-2120
C2, 3, 5, 6, 14, 15, 30, 32, 34, 37, 38, 41, 42, 44, 45, 46, 47, 48, 51, 58, 78, 136, 137, 138, 146, 152, 153, 161, 164, 204, 209, 220, 225, 320, 408	CAP X5R 0402 100N %10 10V	35	5910-0431-0080
C20	CAP COG 0402 50V %1 120P	1	5910-0161-2110
C202, 207	CAP FILM 0805 0.1U %20 16V	2	5910-0541-0081
C203, 206	CAP FILM 1206 0.47U %20 16V	2	5910-0544-7081
C22, 218, 223, 404	CAP X5R 0805 4U7 %10 10V	4	5910-0434-7070
C25, 163	CAP CER SMD 180P %5 50V 0402	2	5910-0361-8116
C26	CAP X5R 0402 1U %10 10V	1	5910-0431-0071
C27, 53, 54, 55, 205, 216, 313, 318, 418	CAP X5R 0603 1U %10 10V	9	5910-0431-0070
C28	CAP CHIP TA 15U %20 6.3V	1	5910-0521-5061
C303, 309, 403	CAP COG 0402 50V %1 39P	3	5910-0163-9120
C305	CAP COG 0402 50V %1 2P2	1	5910-0162-2130
C307	CAP COG 0402 50V %1 3P9	1	5910-0163-9130
C322, 325, 326, 410	CAP COG 0402 50V %1 18P	4	5910-0161-8120
C329	CAP COG 0402 50V %1 3P3	1	5910-0163-3130
C39, 40, 142, 119, 311, 414, 415	CAP COG 0402 50V %1 10P	7	5910-0161-0120
C4, 17, 24, 211, 213	CAP COG 0402 50V %1 47P	5	5910-0164-7120
C49, 50, 149	CAP X7R 0402 22N %10 16V	3	5910-0442-2093

ITEM	DESCRIPTION	QTY	P/N
C501, 516	CAP COG 0603 8.2P 100V %5	2	5910-0388-2131
C502	CAP COG 0603 6.8P 100V %5	1	5910-0386-8131
C503, 507	CAP COG 0603 1.8P 100V %5	2	5910-0381-8131
C504	CAP NPO %5 150P SMD ATC700A	1	5910-0081-5110
C505	CAP COG 0603 2.7P 100V %5	1	5910-0382-7131
C506	CAP COG 0603 3.3P 100V %5	1	5910-0383-3131
C508, 522	CAP COG 0603 10P 100V %5	2	5910-0381-0122
C509	CAP COG 0603 4.7P 100V %5	1	5910-0384-7131
C510	CAP COG 0603 2.2P 100V %5(90)	1	5910-0382-2131
C511	CAP 250V- 5% 100P SMD	1	5910-0391-0111
C512	CAP 250V- 5% 10P SMD	1	5910-0391-0121
C514	CAP 250V- 5% 12P SMD	1	5910-0391-2121
C515	CAP 250V %1 39P SMD ATC600S390FT250XT	1	5910-0193-9121
C518	CAP COG 0603 680P %5 50V	1	5910-0366-8119
C519	CAP COG 0603 27P %5 50V	1	5910-0362-7124
C52	CAP CER SMD 1U %10 16V 0805	1	5910-0441-0070
C523	CAP COG 0603 27P 100V %5	1	5910-0382-7123
C524	CAP COG 0603 33P 100V %5	1	5910-0383-3123
C525	CAP X5R 1210 10U %20 16V	1	5910-0541-0069
C56, 221	CAP X5R 1206 4U7 %10 16V	2	5910-0444-7070
C7, 9, 29, 31, 43, 139, 144, 147, 156, 158, 159, 160, 208	CAP X7R 0402 10N %10 25V	13	5910-0451-0090
D1, 2, 5, 6	DIODE SCH SOD523 SMD I	4	5961-6031-7940
D101, 102, 105, 106, 301, 302, 303, 304, 401, 402, 403, 404, 405	DIODE VRC 1SV305 SMD	13	5961-6030-3050
D103	DIODE SCH RF SOD523 SMD	1	5961-6030-2728
D104	DIODE VRK 1SV285 SMD	1	5961-6030-0285
D3, 4	DIODE SCH SOT343 SMD I	2	5961-6031-3830
D501	DIODE PIN HSMP-3824 SOT23	1	5961-0603-8240
D502	DIODE POWER MA4P1250 SMO	1	5961-6031-2500
DTR1, 4, 6, 102	TR NPN SWT SMD I	4	5961-5730-0008
DTR2, 5	TR PNP SWT SMD I	2	5961-5730-0011
DTR201, 202, 203, 204, 301, 401	TR PNP/NPN SWT SMD I	6	5961-5730-0000
DTR3, 101	TR PNP/NPN SWT SMD I	2	5961-5730-0002
FILT501	FILTER EMI LP T-TYPE 2200P %50	1	5915-3602-2200
K1	XTAL CER FUND 12.288M 5x3.2	1	5955-1171-1201
K101	DISCR CER 450KHZ SMD CDBKB450KCAY24	1	5955-3256-1004
KF101	FILTER XTAL 45MHZ 4K MFT45Q	1	5955-3088-2001
KN1	CONN 30P AXK6F30345J	1	5936-2403-0321
KN2	CONN DKDR 24P Au 00-9158-024-025-062	1	5936-2312-4870
KN3	SPRING CONTACT LOUDSPEAKER	1	6007-0234-1003
KN4	CONN FFC/FPC 8P DKY 52559-0890	1	5936-2600-8361
KN501	CONTACT SPRING ANTENNA INT 4400	1	6007-0534-1001
KN502	CONTACT SPRING ANTENNA EXT 4400	1	6007-0534-1002
KN6	PLATE AL NI 8X7X3	1	6040-0534-1001
KN8, KN9	GASKET SMT 25SMT-3645-09	2	6015-0234-1003
L1, 2, 111	COIL RF SMD 470N %5	3	5952-7308-4707
L101, 102	COIL RF SMD 12N %5	2	5952-7300-0003
L103	COIL RF CHIP 0603CS 100N %5 w	1	5952-7308-1009
L104	COIL RF CHIP 0603CS 22N %5 w	1	5952-7309-2204
L105	COIL CHIP 0402CS-68NXJLW %5	1	5952-7909-6801

ITEM	DESCRIPTION	QTY	P/N
L106, 107	COIL HVA SMD 0906-5GLC %2	2	5952-0905-9901
L108	COIL RF SMD 0805 15N %5	1	5952-7309-1501
L109	COIL RF SMD 0805 22N %5	1	5952-7309-2201
L110	COIL RF CHIP 0805 56N %5	1	5952-7309-5601
L112	COIL RF CHIP 0805 680N %5	1	5952-7308-6807
L113	COIL RF SMD 2U7 %10	1	5952-7327-0006
L114	COIL RF CHIP 0805 820N %5	1	5952-7308-8207
L201, 202, 306, 307, 309, 310, 402, 403, 404, 406, 407	COIL RF SMD 220N %5	11	5952-7322-0016
L301	COIL RF SMD 27N %5	1	5952-7327-0010
L302, 304, 512, 401	COIL RF SMD 12N %5	4	5952-7312-0010
L303	COIL RF SMD 18N %5	1	5952-7318-0013
L305	COIL RF SMD 33N %5	1	5952-7333-0012
L308, 405	COIL AIR SMD 9N 00610502	2	5952-7303-5000
L502	COIL RF CHIP 18N %20	1	5952-7318-0003
L504, 505	COIL AIR SMD 14N 00610503	2	5952-7304-5000
L506	COIL RF CHIP 390N %10	1	5952-7339-0016
L507	COIL AIRY 1606 7.15N1606-7J	1	5952-0207-9900
L508	COIL AIR SMD 19.2N 00610504	1	5952-7306-5000
L509	COIL RF SMD 33N %20	1	5952-7333-0004
L510	COIL RF SMD 15N %20	1	5952-7315-0003
L511	COIL RF SMD 15N %5	1	5952-7315-0011
MIX101	MIXER SMD 3dBm ADE-1L	1	5961-1530-2012
MOD201	OSCILLATOR VCTCXO 14.85MHz TTS11VSB SMD	1	5955-2603-0061
R1, 152	RESISTOR KFMR SMD 470K %5 1/16W	2	5905-4056-4704
R105, 125, 220	RESISTOR KFMR SMD 15K %5 0.063W	3	5905-4056-1503
R108, 113, 114 R115, 116, 128, 304, 305	RESISTOR KFMR SMD 47R %5 0.063W	8	5905-4056-4709
R109	RESISTOR KFMR SMD 22R %5 0.063W	1	5905-4056-2209
R117, 204, 208	RESISTOR KFMR SMD 2K2 %5 0.063W	3	5905-4056-2202
R120, 302, 303, 444	RESISTOR KFMR SMD 820R %5 0.063W	4	5905-4056-8201
R121, 139	RESISTOR KFMR SMD 12K %5 0.063W	2	5905-4056-1203
R122, 124	RESISTOR KFMR SMD 3K3 %5 0.063W	2	5905-4056-3302
R123	RESISTOR KFMR SMD 270R %5 0.063W	1	5905-4056-2701
R13, 17, 25, 34, 46, 52, 55, 60, 63, 84, 103, 138, 146, 150, 151, 210, 212, 214, 221, 308, 309, 513, 408, 411	RESISTOR KFMR SMD 10K %5 1/16W	24	5905-4056-1003
R131	RESISTOR KFMR SMD 1K5 %1 1/16W	1	5905-4074-1502
R132, 310, 312, 404	RESISTOR KFMR SMD 1K2 %5 0.063W	4	5905-4056-1202
R136	RESISTOR KFMR SMD 330K %5 0.063W	1	5905-4056-3304
R137	RESISTOR KFMR SMD 680K %5 0.063W	1	5905-4056-6804
R14, 126, 514, 515	RESISTOR KFMR SMD 220K %5 0.063W	4	5905-4056-2204
R148	RESISTOR KFMR SMD 390K %5 1/16W	1	5905-4056-3904
R149	RESISTOR KFMR SMD 1M %5 0.063W	1	5905-4056-1005
R15, 306	RESISTOR KFMR SMD 220R %5 0.063W	2	5905-4056-2201
R16, 70, 71	RESISTOR KFMR SMD 22K %5 0.063W	3	5905-4056-2203
R18	RESISTOR KFMR SMD 0402 61.9K %1	1	5905-4074-6193
R19	RESISTOR KFMR SMD 100K %1 1/16W	1	5905-4074-1004
R2, 32	RESISTOR KFMR SMD 270K %5 0.063W	2	5905-4056-2704
R21	RESISTOR KFMR 0402 332K %1 1/16W	1	5905-4074-3324
R219	RESISTOR KFMR SMD 680R %5 0.063W	1	5905-4056-6801
R22, 143, 144	RESISTOR KFMR SMD 6K8 %5 0.063W	3	5905-4056-6802
R24, 67, 202, 317, 412, 215	RESISTOR KFMR SMD 2R2 %5 0.063W	6	5905-4056-2208

ITEM	DESCRIPTION	QTY	P/N
R27, 35, 45, 140, 218	RESISTOR KFMR SMD 4K7 %5 1/16W	5	5905-4056-4702
R301, 316, 406, 510	RESISTOR KFMR SMD 5R6 %5 1/16W	4	5905-4056-5608
R311, 405	RESISTOR KFMR SMD 56R %5 0.063W	2	5905-4056-5609
R313	RESISTOR KFMR SMD 18R %5 0.063W	1	5905-4056-1809
R4, 31	RESISTOR KFMR SMD 120K %5 0.063W	2	5905-4056-1204
R402	RESISTOR KF SMD 27R %50.063W	1	5905-4056-2709
R407	RESISTOR KFMR SMD 120R %5 0.063W	1	5905-4056-1201
R410	RESISTOR KFMR SMD 150K %5 0.063W	1	5905-4056-1504
R42, 44, 53, 106, 118, 119, 213, 307, 315	RESISTOR KFMR SMD 100R %5 0.063W	9	5905-4056-1001
R47, 147	RESISTOR KFMR SMD 27K %5 0.063W	2	5905-4056-2703
R5, 36, 43, 56, 72, 81, 82, 83, 127, 314, 403, 502, 503, 507, 508	RESISTOR KFMR SMD 1K %5 1/16W	15	5905-4056-1002
R501	RESISTOR KFMR SMD 390R %5 0.063W	1	5905-4056-3901
R504	RESISTOR SMD 150R %5 0.063W	1	5905-4026-0151
R506	RESISTOR KFMR %1 2010 SMD	1	5905-4154-5006
R512	RESISTOR KFMR SMD 8K2 %5 0.063W	1	5905-4056-8202
R54, 57, 73, 133, 201, 207, 505	RESISTOR KFMR SMD 10R %5 0.063W	7	5905-4056-1009
R58, 104	RESISTOR KFMR SMD 47K5 %1 1/16W	2	5905-4074-4753
R59	RESISTOR KFMR SMD 221K %1 1/16W	1	5905-4074-2214
R6, 7, 10, 11, 12, 20, 23, 26, 28, 29, 30, 33, 37, 38, 39, 40, 41, 48, 49, 50, 51, 61, 62, 64, 66, 68, 69, 79, 80, 101, 102, 110, 111, 112, 129, 130, 141, 142, 145, 203, 206, 211, 216, 217, 134, 135	RESISTOR KFMR SMD 100K %5 1/16W	46	5905-4056-1004
R65, 153	RESISTOR KFMR SMD 47K %5 1/16W	2	5905-4056-4703
R8, 9	RESISTOR KFMR SMD 33K %5 0.063W	2	5905-4056-3303
R93, 107	RESISTOR KFMR SMD 470R %5 0.063W	2	5905-4056-4701
S501	FUSE SMD 3A	1	5921-0000-3100
SF101	FILTER CER 450KHz CFUKF450KE1X-R0	1	5955-3256-2002
SF102	FILTER CER 450KHZ CFWKA450KJFA	1	5955-3256-1006
TD1	IC MCU M30626FJPGP LQFP100 I	1	5962-5100-0002
TD101	IC DET SSOP16P225B TA31136 I	1	5961-5430-3113
TD102	IC ASW SPDT QFN-12 I	1	5962-5400-0005
TD103	IC OAM LMV321 SOT23-5 I	1	5961-5404-3210
TD104	IC OAM LMV358 MMX MSOP8 I	1	5961-5404-3581
TD2	ICRA MEM TSOP32 I	1	5962-5479-0001
TD201	ICRS LMX2335LTMX MTC16 I	1	5961-5416-2335
TD202	ICVR TK112 SOT-23 5V	1	5961-5430-1250
TD203	ICVR TK112 SOT-23L C	1	5961-5430-1233
TD204	IC LOW POWER OP-AMP	1	LMC7101AIM5
TD3	IC FLS AT45DB161D-SU 8S2 I	1	5961-5134-5041
TD4	IC LVR MIC5206 SOT23-5 I	1	5961-5478-5206
TD401	IC AMP SGA-5486Z 5V SMD I	1	5961-5430-5486
TD402	IC RFA TA4004F SSOP5-P IF	1	5961-5430-9400
TD5	IC CMX881E1 TSSOP(E1)28 I	1	5961-5430-0881
TD501	IC OAM SOT23-5 IF	1	5961-5404-7111
TD502	IC AMP SOT23-5 MAX4372TEUK-T I	1	5961-5434-3720
TD6, 7	IC OAM LMV358 MSOP8 I	2	5962-5404-0001
TD8	IC TRS 2DRV/2RCV TSSOP20 I	1	5962-5400-0003
TD9	IC DPT DS1803E-100/T&R TSSOP14	1	5961-5430-1803
TE1, 2, 3	TERMINAL PIN 3985-TLG	3	5941-2273-0000
TE4, 5	SPRING CONTACT UNIQ (0098-0380-03)	2	6007-3337-3001
TR1, 203, 303	TR NPN GNR BC847BT SOT416	3	5961-5521-0847
TR101, 201, 202	TR PNP GNR BC857BT SOT416	3	5961-5521-0857



SYN-TECH III P25 PORTABLE RADIO
SERVICE MANUAL

ITEM	DESCRIPTION	QTY	P/N
TR102	TR NPN SMD 9GHZ BFG540W I	1	5961-5730-5400
TR103	TR JFN VHF BF512 SOT23	1	5961-5523-0512
TR104	TR NPN UHF BFR93AW SOT323	1	5961-5523-1934
TR3	TR MOSFET P-CHANNEL TSOP6 I	1	5961-5730-3443
TR301, 302, 401	TR NPN SMD 2SC5195 I	3	5961-5730-5195
TR501	TR MFN RFG MRF1517T1 M	1	5961-5730-1517
TR502	TR RFG 520MHz RD01MUS1 SOT89	1	5961-5730-0110
TZ501	VOLTAGE LIMITER 10V	1	5961-1310-0013

Reference Figure 6-11 and Figure 6-12.

7 DISASSEMBLY AND REASSEMBLY

WARNING



Electro Static Discharge (ESD)

- * TO FEEL -3500V or higher
- *TO HEAR -4500 V or higher,
- *TO SEE SPARK -5000V or higher is necessary.

This equipment has ESD sensitive parts; hence the following precautions are necessary during disassembly and assembly.

Some electronic parts may be damaged because of Electro Static Discharge (ESD).

Voltages, lower than the values given above, may cause damage on parts.

Disassembly and assembly should be done at tables that have ESD protective covering material and proper grounding.

Personnel that perform disassembly and assembly procedure should wear an ESD protected smock.

A grounding strap should always be worn.

Grounding strap make connection to ground to prevent a static load.

Before starting any disassembly or assembly procedure, a grounding strap should be worn and its connection should be verified. The grounding strap should be removed only when you have left the protected area.

Assemblies and parts should be removed from their protection bags only at ESD protected areas.

Boards are protected from ESD in ESD protected bags. If the bag is open, the ESD protection is not effective. Bags should be closed even if they contain a damaged board. This allows good components on the damaged board to be protected.

Insulator materials should be far away from the ESD protected area. Electronic material can be damaged because of the static load of some insulators. All plastic, nylon, foam and similar material should be kept out of the ESD protected area.

Certain types of clothing can hold static load.

7.1 REQUIRED EQUIPMENT

Screwdriver

Tweezers

7.2 USAGE

This procedure for the radio is for disassembly only; reverse the order of the steps to reassemble the radio. Important notes and warnings are given regarding reassembly.

The parts location diagrams in the parts lists may help with the disassembly/reassembly procedure.

7.3 DISASSEMBLING THE RADIO

The Syn-Tech III P25 Portable Radio consists of a front panel, rear panel and accessory boards between them. The radio is secured together by screws and washers accessible in rear panel assembly. The required screws and washers are described below:

DESCRIPTION	QTY	P/N
SCREW STL ST/SOX M2X14	6	5307-1272-0214
WASHER THIN STL ST/SOX 2X4.5X0.5	6	5312-0072-0207
WASHER SPRING STL ST/SOX 2X4.4X0.5	6	5312-1072-0206
O-RING SI Ø1.3x2.7x1.2	6	6008-0534-1004

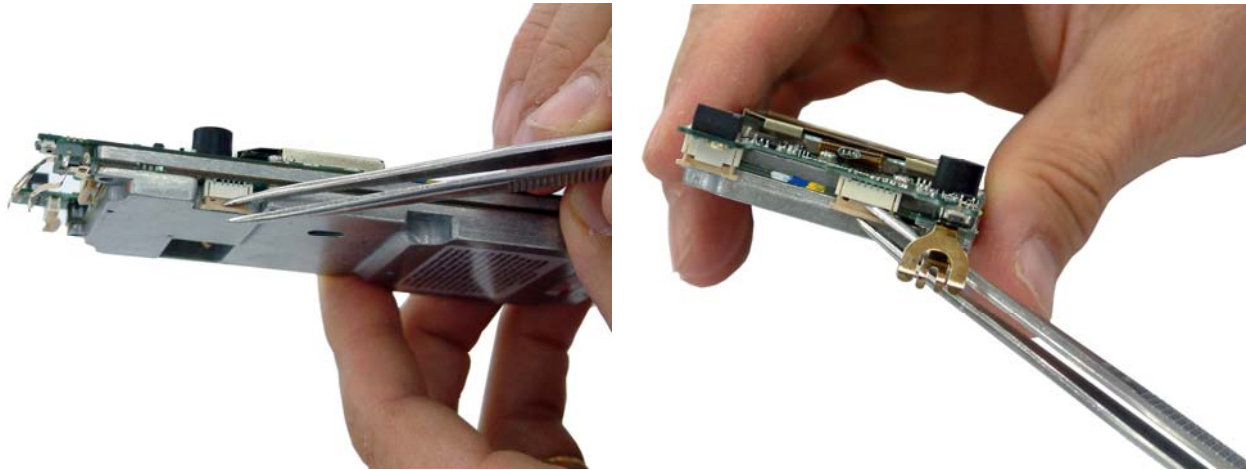
The screws at the rear panel are removed as shown below.



After the screws are removed, the front and rear panels are separated as shown below.



The connection of the accessory boards to the front panel is made by three flexible ribbon cables. The flexible ribbon cables are attached to three connectors on the front panel. These connectors should be opened to disconnect the ribbon cables.



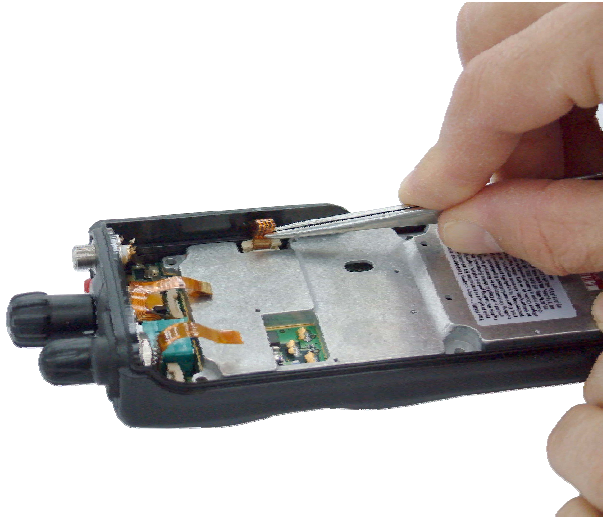
Connectors are shown in the pictures above. Carefully lift up on top part (darker) of the connector. If the connector is separated more than 1.3mm (0.05 in), the connector may be damaged. Separate the radio chassis from the front cover.



While assembling the radio, after flexible circuits are replaced, the dark part must be pressed towards the connector to secure the connection. The final view is shown below.



As shown in the picture below, flexible circuits are separated from the connectors using tweezers.



There is a connection point on the main board that connects the RF and Control Board to the antenna connector. This part must make contact with the antenna connector (in the front panel) during assembly as shown below.



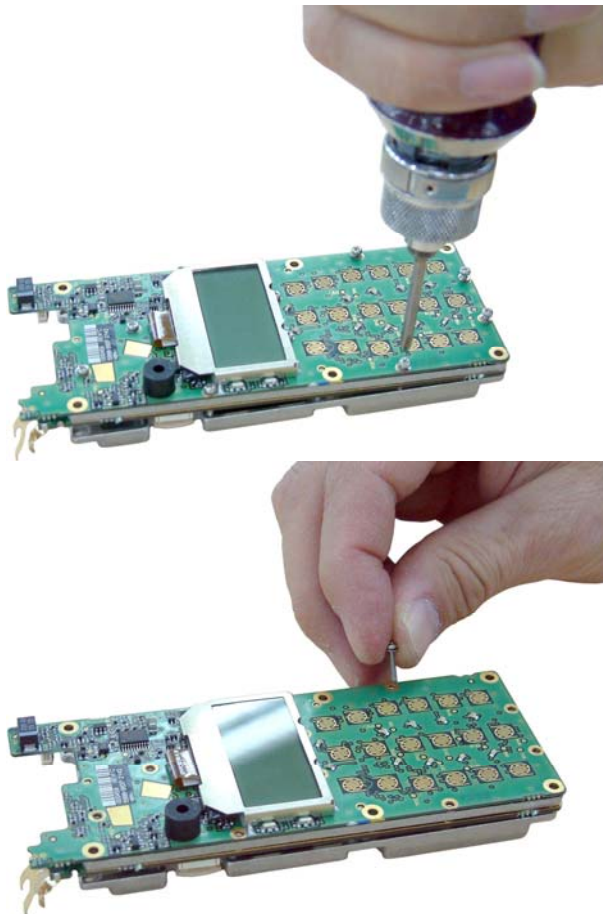
The PCB assembly is now free from its connections and can be separated from the front panel.

7.4 DISASSEMBLING THE PCB ASSEMBLY

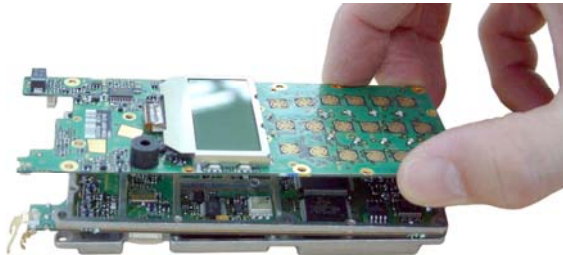
The PCB assembly is secured together with the screws and washers described below.

DESCRIPTIONS	QTY	P/N
SCREW STL ST M1.6X8	10	5307-1206-9408
WASHER SPRING STL ST 1.8X3.4X0.25	10	6005-0534-1001

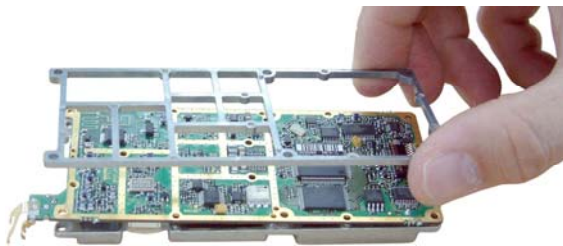
The screws and washers are removed from the PCB assembly as shown below.



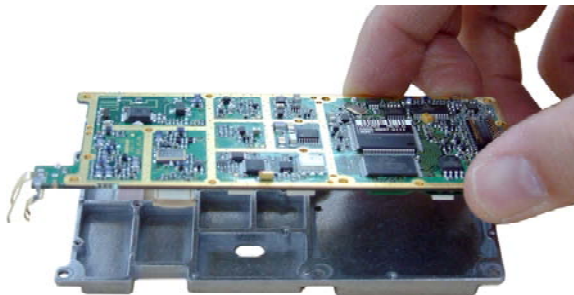
Pictures and part numbers of the PCBs are given below. They are listed according to the disassembly order.



Disassemble the Display and Keypad Board
(P/N: 5999-9937-2142)



Disassemble the spacer (P/N: 6003-4037-2002)

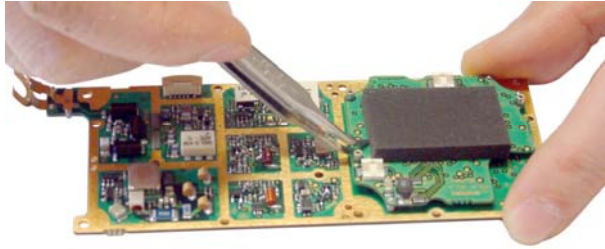


Disassemble the RF and Control Board (136-174MHz P/N: 5999-9937-2111) (380-470MHz P/N: 5999-9937-2116)

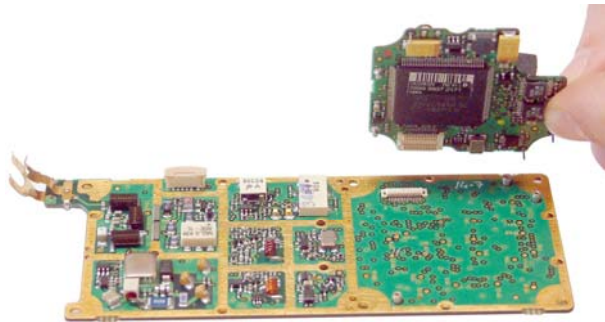
The DSP Board (P/N: 5999-9937-2171) is under the RF and Control Board.



The RF and Control Board are separated from the RF shields to access the DSP Board. The DSP Board is separated from RF and Control Board by using tweezers to lift it.



Separated view of the two boards is shown below.



After removing all the boards, an aluminum cover (P/N: 6003-4037-2001) remains as shown below. The reassembly procedure of PCB assembly must be started with this part.



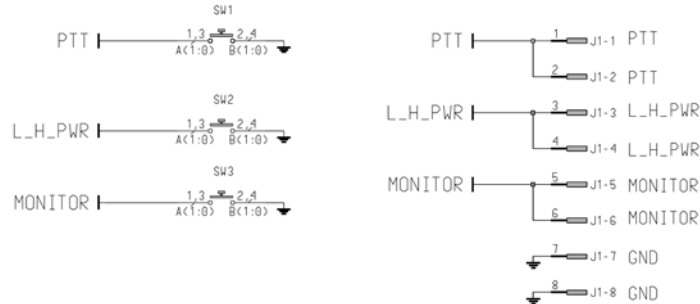
After disassembly, the heat sink compound on the chassis must be inspected. If needed, clean the heat sink compound from the chassis and place new heat sink compound on to the surface. Pay particular attention to point where TX final contacts the chassis.

8 SCHEMATIC DIAGRAMS

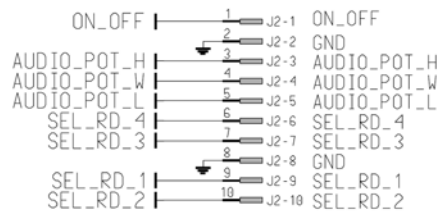
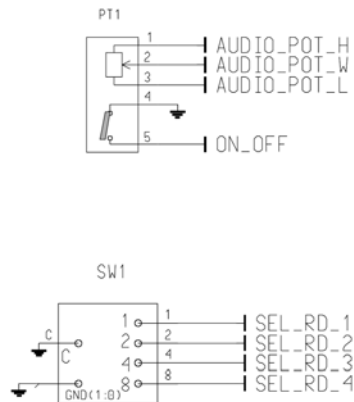
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8.1 RADIO CONNECTOR PINOUT _____	8-2
8.1.1 Side control	
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8.5 CONTROL SCHEMATIC _____	8-6
8.6 DSP SCHEMATIC _____	8-7
8.7 LCD AND KEYPAD SCHEMATIC _____	8-8

8.1 RADIO CONNECTOR PINOUT

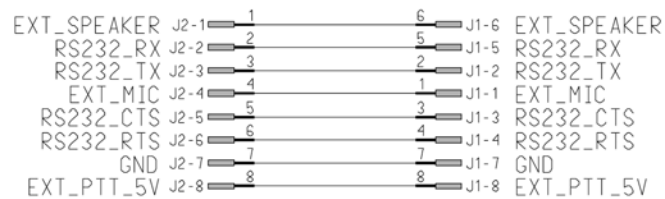
8.1.1 Side Control

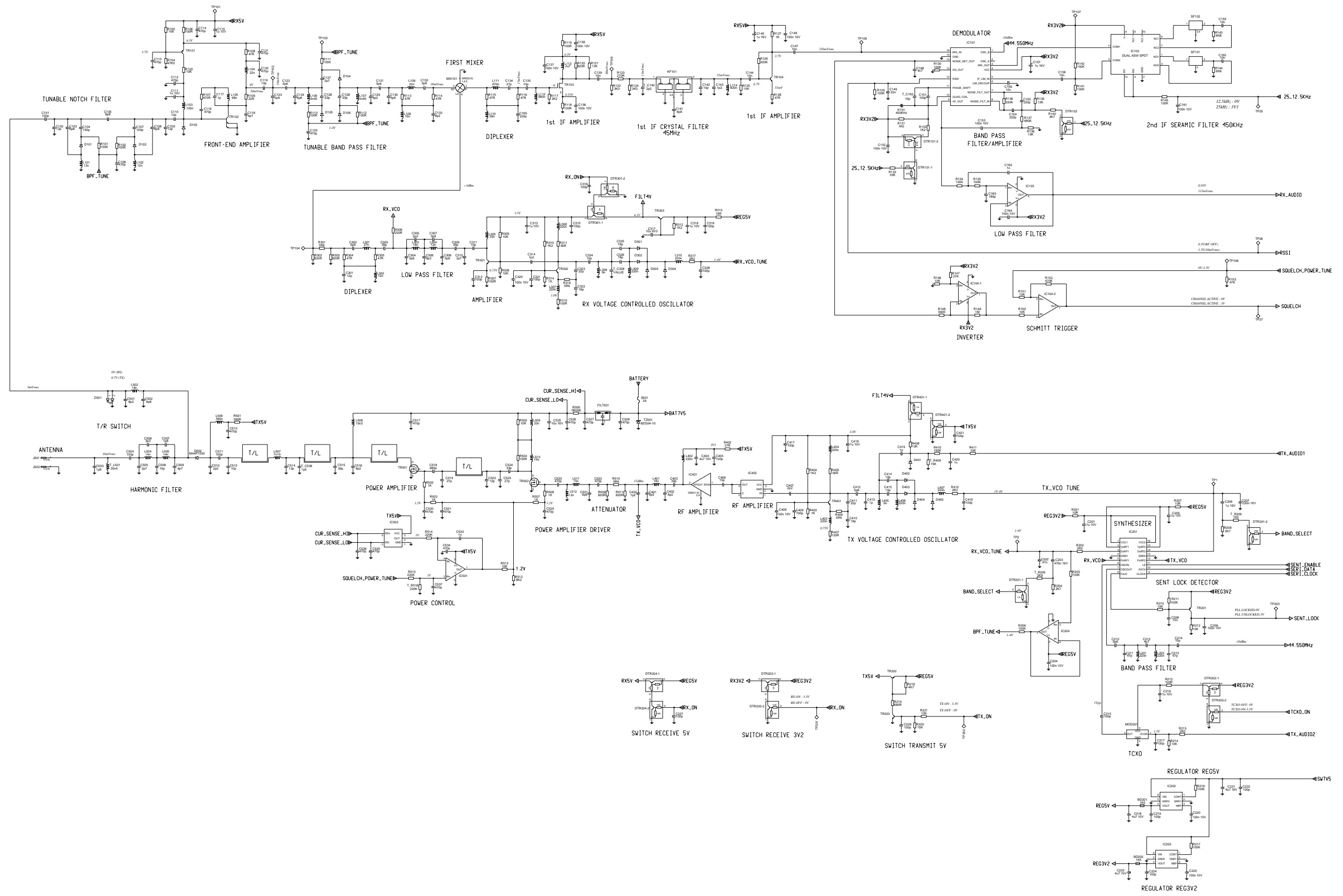


8.1.2 Audio Control

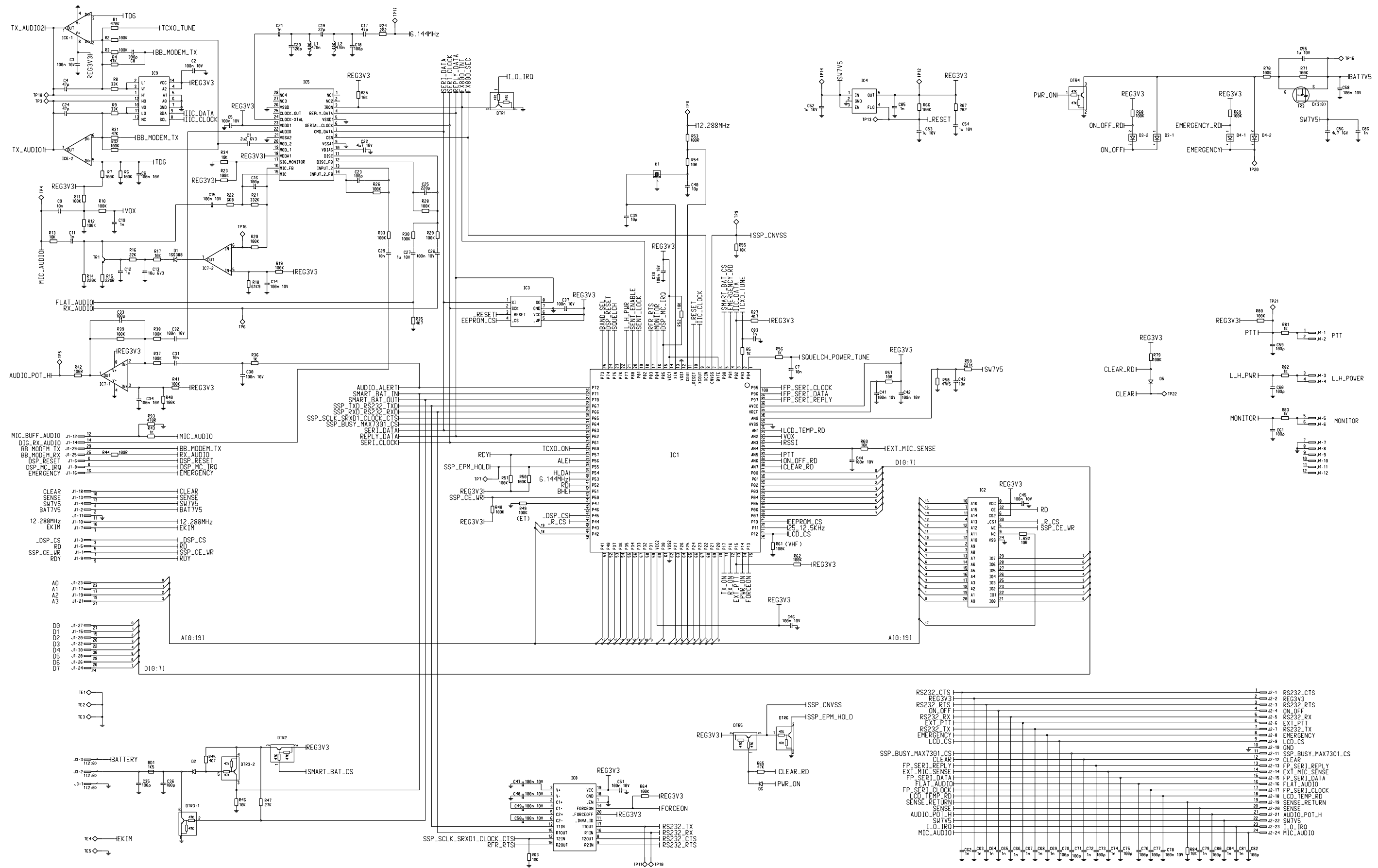


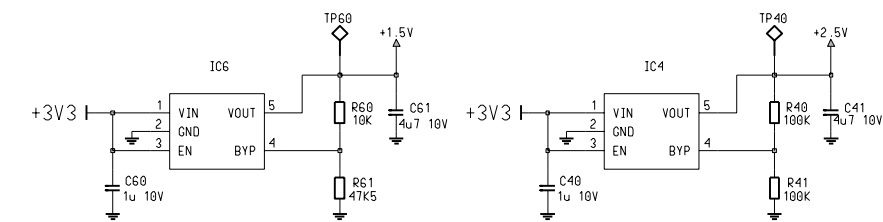
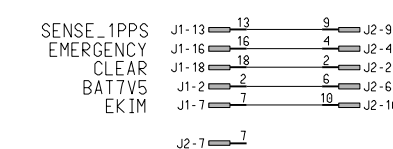
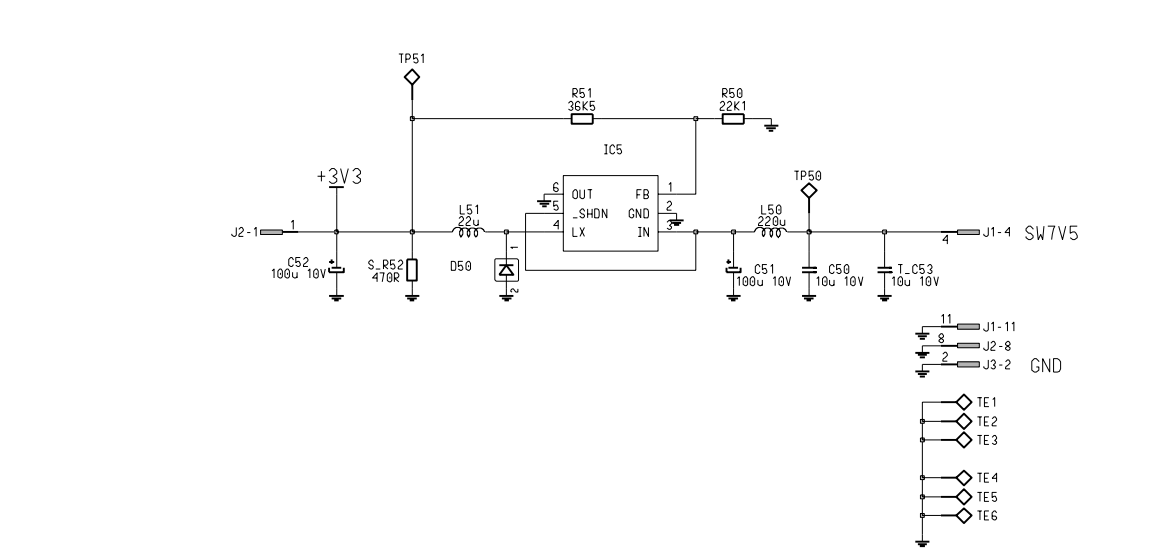
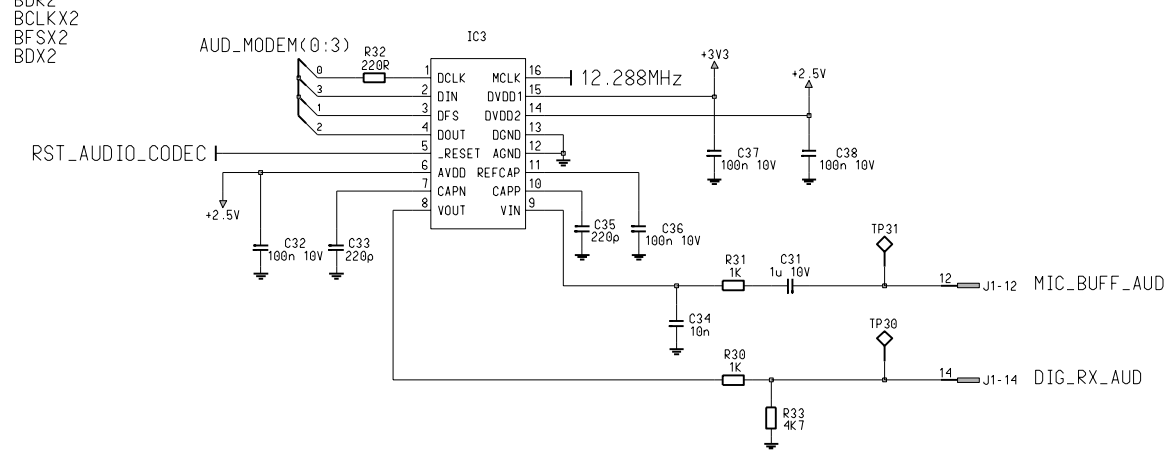
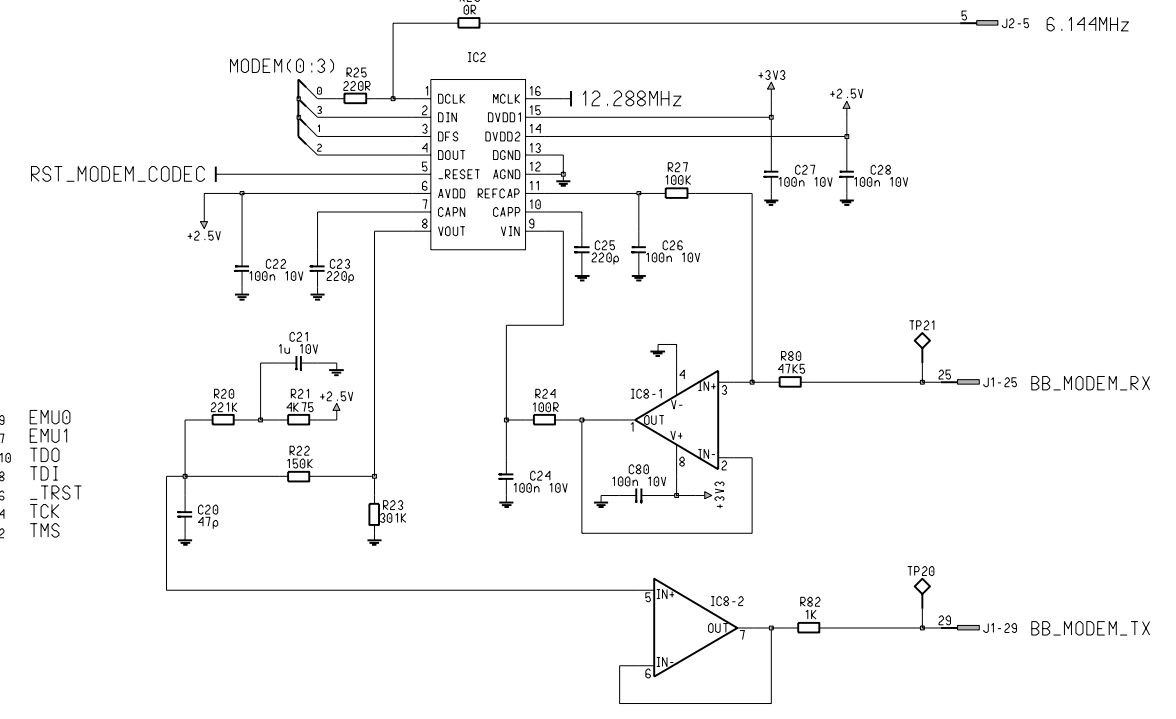
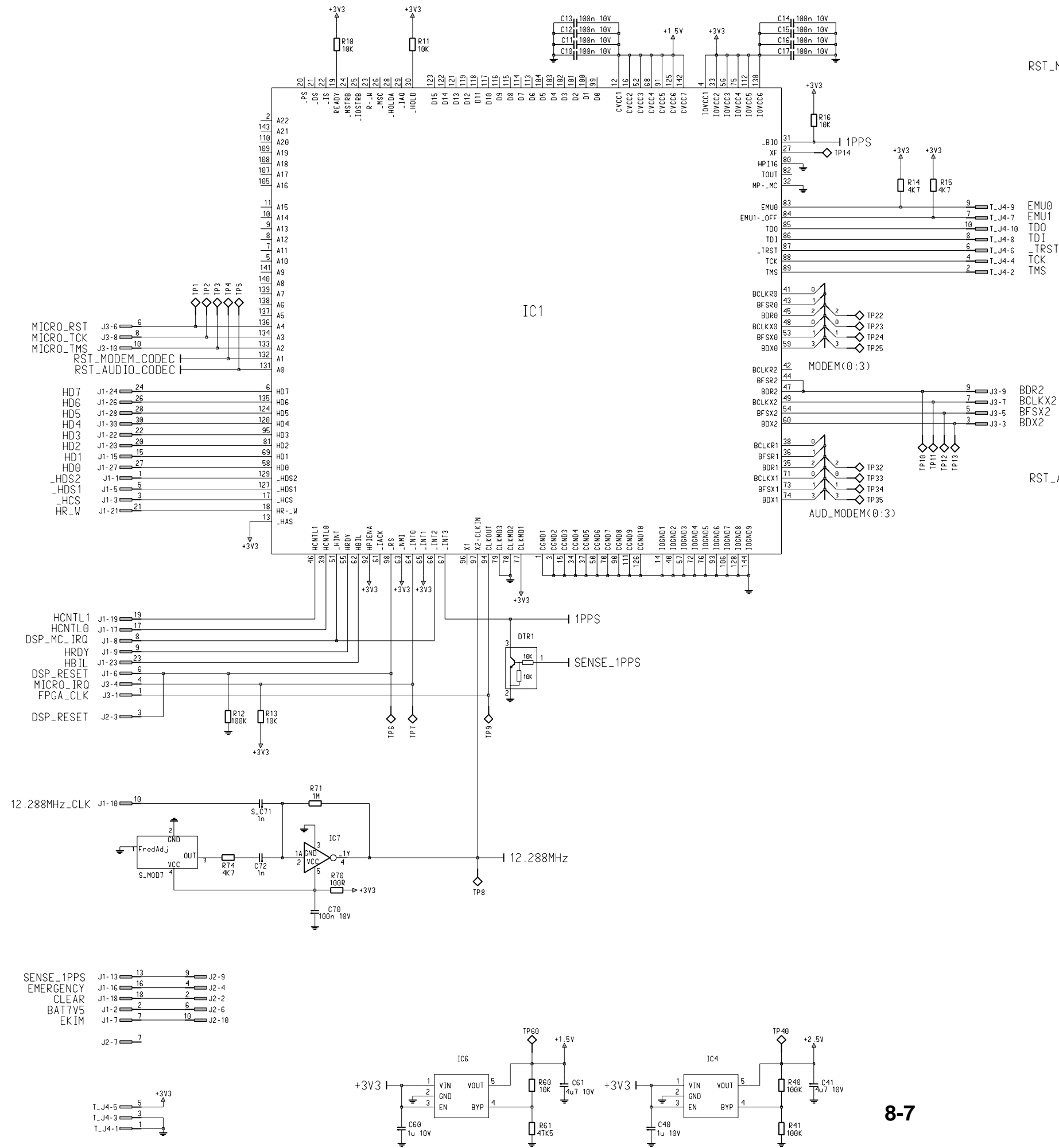
8.1.3 External Accessory

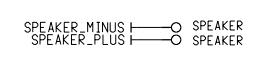
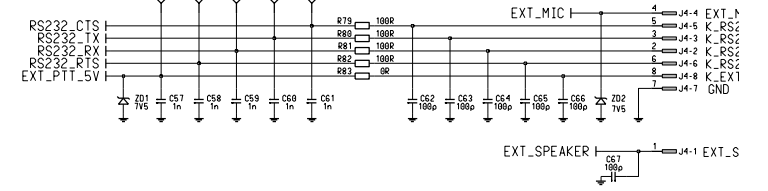
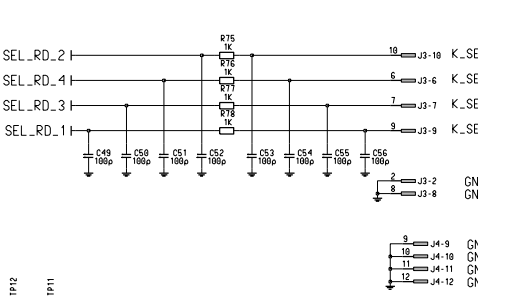
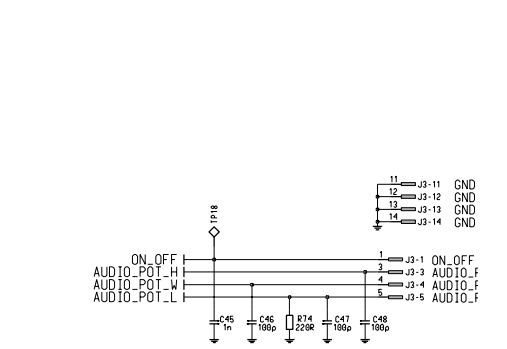
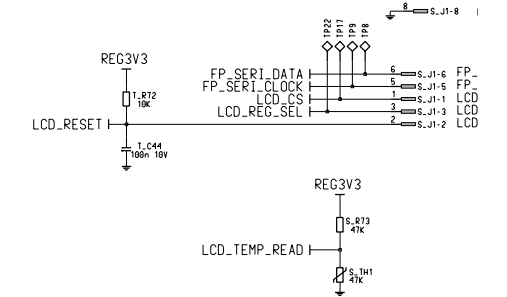
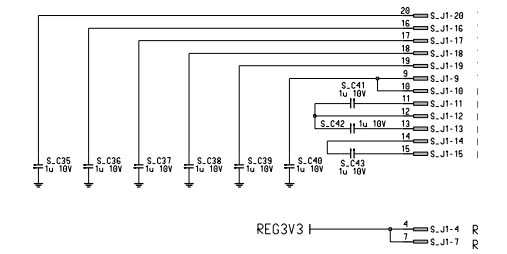
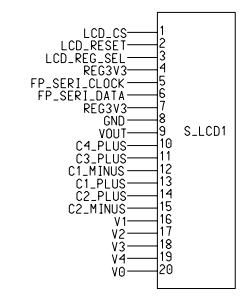
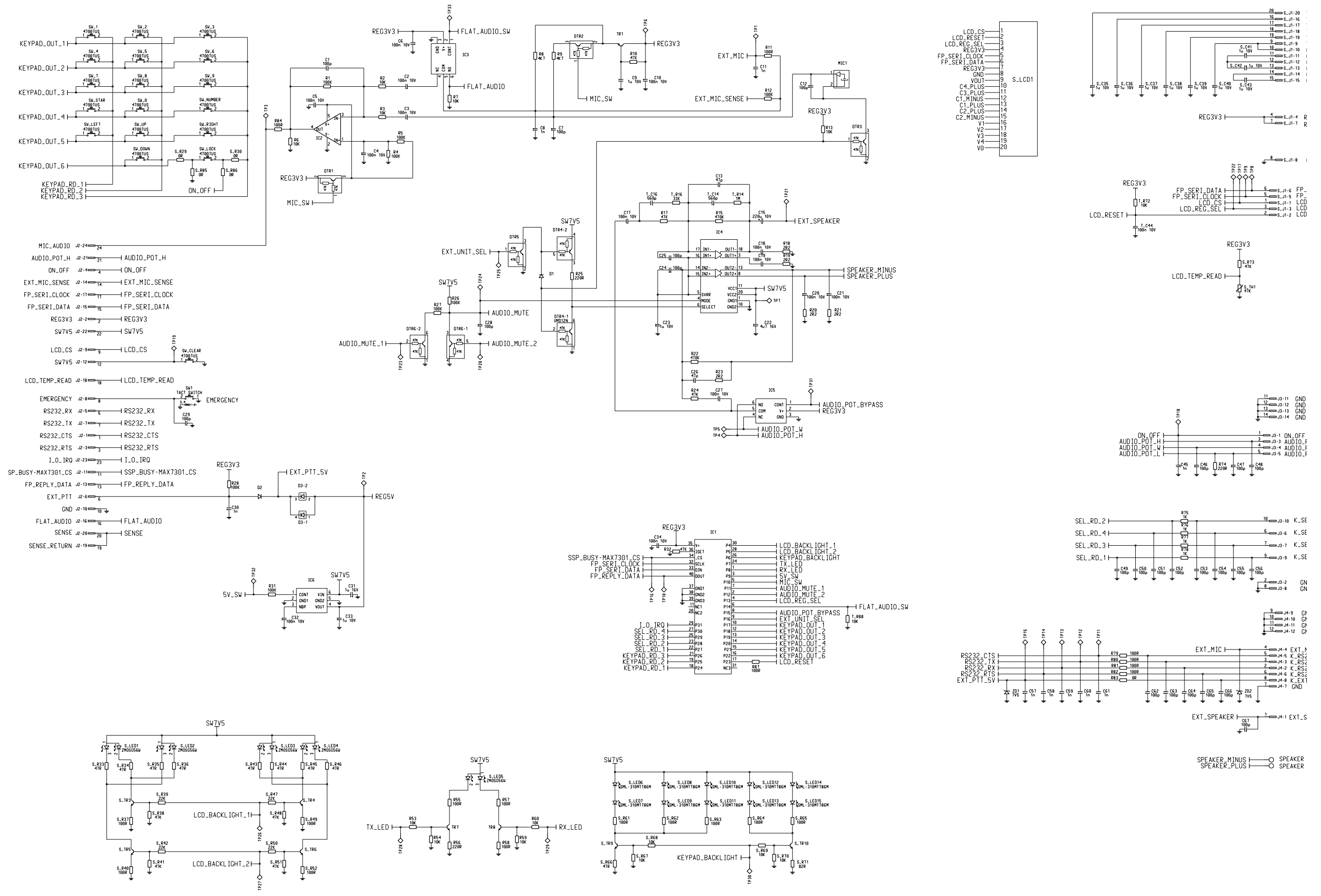




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