Maintenance Manual

KPC 300/400
Portable Radio

ERICSSON

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NOTICE!

This manual covers Ericsson and General Electric products manufactured and sold by Ericsson Inc.

NOTE

Repairs to this equipment should be made only by an authorized service technician or facility designated by the supplier. Any repairs, alterations or substitution of recommended parts made by the user to this equipment not approved by the manufacturer could void the user's authority to operate the equipment in addition to the manufacturer's warranty.

NOTICE!

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SPECIFICATIONS

General Specifications

Input Voltage:
7.5 VDC (nominal)
Vibration:
5 G (per U.S. Forest Service)
Shock:
One (1) meter drop (per EIA)
Dimensions (typical) H x W x D
Less knobs and antenna
With high capacity battery:
137x66x43 mm
(5.4”x2.6”x1.7”)
With extra high capacity battery:
150x66x43 mm
(5.9”x2.6”x1.7”)
Weight
Radio (Less battery):
235g (8.3oz)
Radio and high capacity battery:
451g (15.9oz)
Radio and extra high capacity battery:
484g (17.0oz)
Batteries
High capacity:
Dimension (H x W x D)
93x64x22 mm
(3.7”x2.5”x0.9”)
Weight
203g (7.2oz)
Extra high capacity:
Dimension (H x W x D)
106x64x34.5mm
(4.2”x2.5”x1.35”)
Weight
248g (8.6oz)
Ambient Temperature Range:
-30°C to +60°C
Relative Humidity:
95% at +50°C
Altitude

Operational:	5,000 m (16,400 ft)
In Transit:	15,240 m (50,000 ft)

Transmitter

Frequency Range (MHz):	150.8-174
Rated RF Power (Watts):	5/1
Frequency Stability (-30°C to +60°C; +25 Ref):	±0.0005%
Modulation/Deviation (kHz):	±2.5 / ±5
FM Hum And Noise (Companion Receiver) (dB):	-40
Audio Response:	Meets TIA/EIA-603, Par 5.2.6 (6dB/octave pre-emphasis from 300 to 3000 Hz)
Spurious And Harmonics (dB):	-65
Frequency Separation (MHz):	Full Bandwidth
Audio Distortion:	<5 % at rated audio @ 1000 Hz for entire range

Receiver

	VHF
Frequency Range (MHz):	150.8-174
Channel Spacing (kHz):	12.5 / 25 / 30
Sensitivity 12 dB SINAD (µV):	0.35
Selectivity	
@ 12.5 kHz (dB):	60
@ 25/30 kHz (dB):	68
Intermodulation 12.5/25 kHz (dB):	-60/-65
Spurious And Image Rejection (dB):	-68
Rated Audio Output	500 mW @ 5% maximum distortion

Environmental

STANDARD	**U.S. Military Spec 810E Methods & Procedures**
Low Pressure	500.3/1,2
High Temperature	501.3/1,2
Operational 501.3/2	
Low Temperature	502.3/1,2
Temperature Shock	503.3/1
Solar Radiation	505.3/2
Blowing Rain	506.3/1
Humidity	507.3/2
Salt fog	509.3/1
Blowing dust	510.3/1
Vibration	514.4/1, *Category* 1,10
Shock	516.4/1
Transit drop	516.4/4
Drop	Section 5.3.5, *ANSI/TIA/EIA-603*

Regulatory Data

Frequency Range MHz	**FCC Type Acceptance No.**	**DOC Cert. Number**
150.8-174	AXATR-349-A2	287 195 123

GENERAL

The KPC-300/400 Portable Radio Unit operates in the conventional 150 to 174 MHz frequency band. There are two versions, Scan and System, with the System Version having a DTMF keypad. Up to sixteen (16) RF channels may be pre-programmed into the radio using a personal computer. Power output on each channel can be programmed for either high power (5 watts) or low power (1 watt). The power output on each channel can be toggled between high or low depended upon the pre-programmed setting with High/Low button on the left side panel.

Each radio is capable of operation in 12.5 kHz or 25 kHz channel spacing systems. System deviation for 12.5 kHz channel spacing is 2.5 kHz and 5 kHz for 25 kHz channel spacing.

Figure 1 - Scan Radio

The KPC-300 radio contains three (3) buttons on the front panel. The KPC-400 contains three (3) buttons along with a twelve (12) button DTMF pad on the front panel. The scan function allows monitoring of any or all channels. Any channel may be scanned with or without a priority level. One channel can be programmed for Priority 1 (**P1**) and another for Priority 2 (**P2**), with any or all remaining channels programmed as non-priority channels (**S**). There is also Emergency mode transmission capability. A LCD display provides status display of the radio functions along with the display of the selected channel number.

The Universal Device Connector (UDC), located on the side of the radio, provides connections for external audio accessories. This connector also allows the radio system personnel to connect programming equipment and program the per-channel and overall radio features.

Figure 2 - System Radio

Figure 3 - Back, Left And Top Panel Views

CONTROLS

The radio controls consist of an ON/OFF/VOLUME control, PTT button, MONITOR button, Channel Select switch, EMERgency button and a High/Low button.

ON/OFF/VOLUME Turns radio on and off and adjusts audio listening level.

When the radio is turned on, it will resume operation at the last operating state (channel, etc.) and the power-up alert tones will be sounded. Three (3) beeps indicate the radio is in the normal (receive mode); four (4) beeps indicates the radio is scanning. The operating status of the radio will be displayed in the Liquid Crystal Display (LCD) window.

PTT BUTTON Pressing the **PTT** button on the side of the radio will key the radio transmitter.

If the radio is not scanning, it will transmit on the selected (displayed) channel. If the radio is scanning when the **PTT** button is pressed, the radio may be programmed to transmit on the selected channel or on the current receive scan channel if the **PTT** is pressed during the scan hang time.

If the selected channel is programmed with Type 99 Tone Decode enabled, pressing the **PTT** button will disable Type 99 Tone Decode by switching the radio from the Selective Call mode to the Monitor mode. The **PTT** button must be released and then pressed a second time to key the radio.

MONITOR The Monitor button has several functions. Its operation will vary depending upon programming.

When the Monitor button is pressed and held down, all transmissions will be heard after three (3) seconds have passed, even if Channel Guard protected. This permits channel monitoring before transmitting. If the button is held for more than three (3) seconds, Channel Guard decode will toggle ON or OFF (if it is programmed on the selected channel).

The Monitor button is also used to reset the radio after a Type 99 call is received. Quickly press and release the button to reset the radio to receive the next Type 99 call.

CHANNEL SELECT A rotary switch permits selection of channels. Rotating the switch clockwise increases the channels and counterclockwise decreases the channels. The channel is visible by looking at the channel switch from the top or viewing the LCD display.

EMERgency Pressing for at least one (1) second will transmit the emergency ANI code on the selected channel or pre-programmed channel.

H/L Selects the transmit power output by toggling from high-low or low-high.

Three (3) buttons below the LCD display are used to control a variety of operations when used alone and to control scan operations when used in conjunction with the SCAN button.

SCAN Toggles the scan feature on and off.

Used in conjunction with the SCAN button to add channels to the scan list or increase the channel's priority status.

Used in conjunction with the SCAN button to erase the selected channel from the scan list.

DTMF Keypad (KPC-400 only) Permits operator to make telephone interconnect calls on radio systems equipped with this option.

The top row of buttons (1, 2 ABC, 3 DEF) provide access to up to three pre-programmed telephone interconnect numbers (see **Telephone Interconnect Calls** section).

INDICATORS

The Liquid Crystal Display (LCD) indicates the channel number. In addition there are seven (7) status indicators (flags) which show scan status, Type 99 Tone Decode status, transmit High/Low power status and Channel Guard status.

The LCD backlighting will turn on anytime a control button is pressed. It will remain on for five (5) seconds after the button is released. If a control button is pressed while the backlight is on, the backlight remains on for another five (5) seconds. Backlighting may be programmed to remain off at all times.

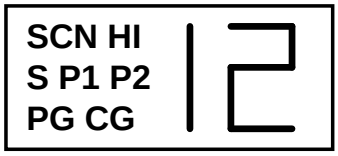


Figure 4 - Liquid Crystal Display (LCD)

CHANNEL

12 — The selected channel number is displayed in the LCD window.. When data is written into or read from the radio a **P** is displayed.

STATUS

TX LED — Red light on steady - transmitter is active or keyed.
Red light blinking - low battery voltage, recharge or replace battery.
Yellow on steady - channel busy indication, radio has detected a carrier on selected channel.

SCN — This status indicator turns on when the scan function of the radio has been enabled.

S — When this indicator is on, the selected channel is a non-priority scan channel.

P1 — When this indicator is on, the selected channel is a Priority 1 scan channel.

P2 — When this indicator is on, the selected channel is a Priority 2 scan channel.

PG — When this indicator is on, the selected channel is programmed as a paging channel (Type 99 Tone Decode). The indicator will blink when the selected channel is placed in the monitor mode or the reception of a call.

CG — When this indicator is on, Channel Guard is enabled on the selected channel. The indicator will go out when the selected channel is placed in the monitor mode.

HI — When this indicator is on, the selected channel is enabled for transmit high power.

OPERATION

Detail operating procedures are found in Operator's Manual AE/LZT 123 1898.

THEORY OF OPERATION

Refer to the Block Diagram during the following explanations.

TRANSMITTER

The transmitter consists of an exciter Q201, PA module U201, auto power control (APC) U202 with Q202 and Q203, directional coupler Z201 and associated components. The local signal input of approximately 0 dBm to the transmitter is provided by the synthesizer to the exciter. An amplifier provides 17 dB of gain to produce +17 dBm (50 mW) of drive level to the PA module. During the receive mode, a band switch diode, D202, attenuates the receive first local oscillator signal at the exciter input to reduce LO leakage at the antenna connector. The PA module is a 3-stage amplifier that provides a minimum RF power output of 7.0 watts at a battery voltage of 7.2 VDC. The RF power output is fed through the directional coupler Z201 to the antenna. A shottkey diode D201 converts the detected RF signal in the directional coupler to a DC voltage to feed the auto power control circuitry.

Low Pass Filter

The low pass filter Z101 and pi low pass filter, consisting of L121, C171 and C172, are provided to prevent excessive transmitter harmonics during the transmit function.

Tx/rx Antenna Switch

The TX/RX antenna switch, consisting of D101, D102 and associated circuitry, provides the switching of RF output to the antenna and the receive signal to the receiver. During the receive function, the diodes are cut off, isolating the transmit circuit from the antenna. During the transmit function, +5 volts is supplied to both diodes, turning them on and feeding the RF output from the transmitter PA module through the low pass filters via D101 to the antenna. The RF output is suppressed at the receiver RF front end filter by D102.

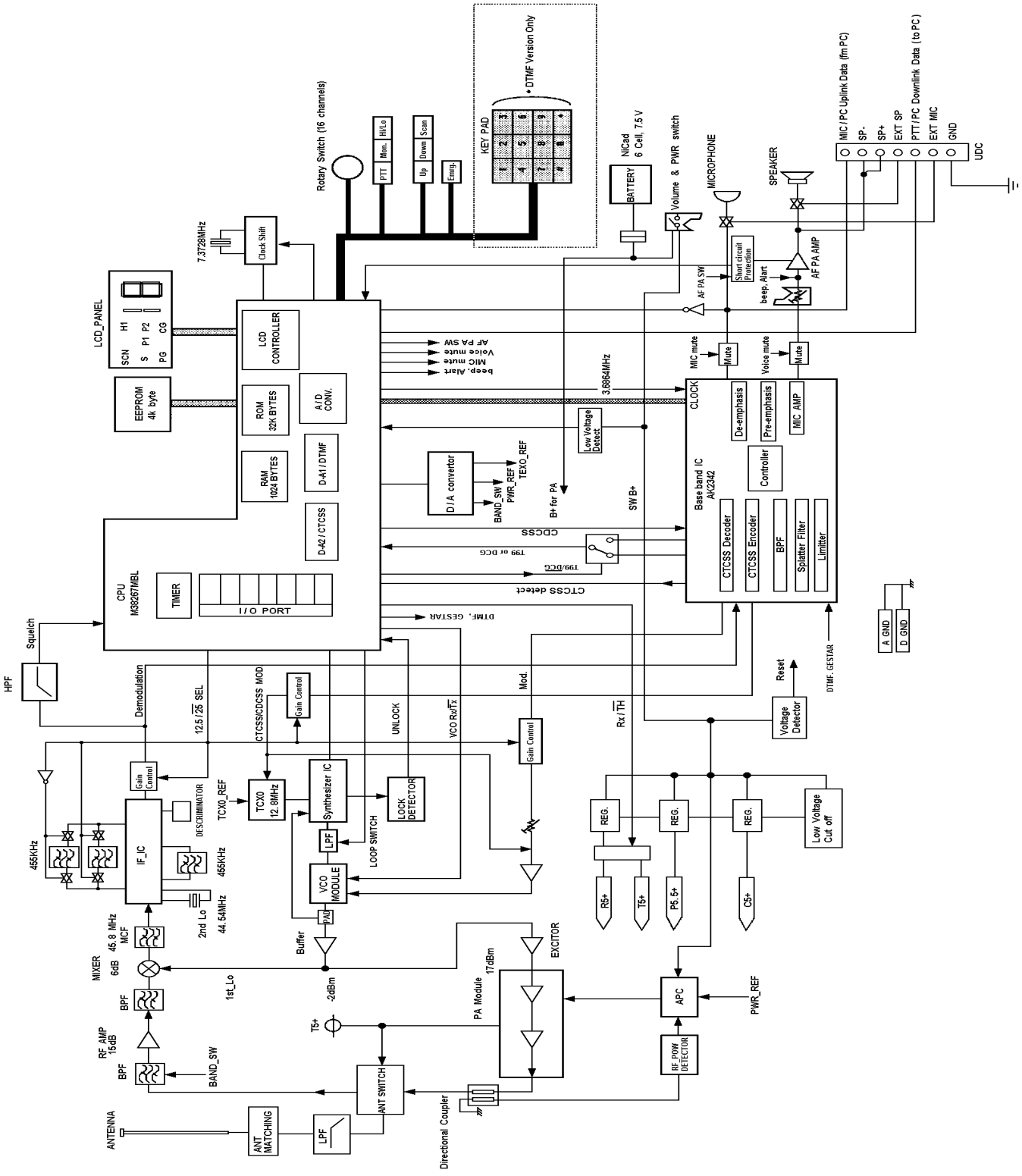


Figure 5 - Block Diagram

Rf Power Control

The DC voltage detected by the directional coupler Z201 is supplied to comparator U202 where it is compared with the power reference voltage PWR_REF. This comparison voltage controls the bias voltage to the PA module by drive transistor Q202, and the output power is stabilized by the auto power control circuitry. PWR_REF is provided by the central processing unit (CPU) from information programmed into the EEPROM. The PWR_REF voltage consists of six reference voltages: low frequency, middle frequency and high frequency band in both the high and low power modes. This power control provides the flatness of the RF output under varied temperature, voltage supply and frequency bandwidth conditions.

RECEIVER

The receiver has a dual conversion circuitry consisting of a receiver front end, RF amplifier Q101, 1st mixer Q102, 1st IF 45 MHz Monolithic Crystal Filter (MCF) Z102, IF amplifier/limiter/discriminator U101, 2nd IF 455 kHz ceramic filters Z107, Z104, Z105 and ceramic discriminator Z106. Receiver IF selectivity for 25 or 12.5 kHz channel spacing is determined by selecting the 455 kHz ceramic filter Z104 for 25 kHz spacing or Z105 for 12.5 kHz spacing.

The demodulated receive audio at the AF OUT port of U101 is adjusted by Q104, R113 and R114 to produce a constant demodulated audio level input into the Audio Speech Processor (ASP) regardless of the receiver channel spacing mode, 12.5 or 25 kHz. The receive audio gain controlled by Q104, R113 and R114 is increased by 6 dB when the receiver is switched from 25 kHz to 12.5 kHz channel spacing. Received audio signals and beep tones are amplified by audio frequency power amplifier U407 to achieve the rated 0.5 W audio output power to speaker SP1.

Short circuit protection for U407 consists of U416 and Q416. When AF PA AMP outputs, SP+ and SP-, are shorted together or shorted to ground, an excessive current will be sourced through transistor Q407 which is the pass transistor that provides bias to U407. This voltage drop across pass transistor Q407 will be compared in differential amplifier U416 and fed to voltage level translator Q416 which sends the excessive current status state information to the CPU. The CPU then sends a signal to Q407, turning it off and removing bias from U407. The software in the CPU assumes the short circuit is an intermittent short and resets for the excessive current state approximately six (6) seconds later. If the excessive current state still exists, the CPU again turns Q407 off. After five retries, the CPU assumes the short circuit is not intermittent and keeps Q407 turned off. The short circuit condition must be removed before the radio is turned off and then back on to reset the CPU.

Receiver Front End And Mixer

The receive signal is fed from the antenna to a bandpass filter, a RF amplifier and an additional bandpass filter to remove the 1st IF image (F_{rx} +90 MHz) and 1st IF/2 (+22.5 MHz) and other out-of-band spurious responses. Total gain is approximately 8 dB with the first IF image rejection more than 78 dB.

To achieve the required RF bandpass filtering characteristics across the frequency band, the first front end filter is electronically turned by changes in the BAND_SW voltage which is fed to varactor diode D104. This voltage is generated by the D/A converter U421 from the CPU input. The frequency band is divided into three sub-split bands, one at the low end, one in the middle and one at the upper end of the band. The CPU determines which sub-split the desired receive frequency is in and provides the appropriate digital input to U421 to generate the correct BAND_SW signal for RF passband tuning.

The receive signal is applied to dual gate GaAsFET mixer Q102 and mixed with the 0 dBm local oscillator injection from the synthesizer section to produce the 45 MHz first IF signal.

45 Hhz Filter

The mixer output is connected to the matching circuit and provided to the four pole 45 MHz MCF Z102. The 45 MHz crystal filter reduces the second IF image response (F_{rx} -910 kHz) to meet spurious response specification. The output of Z102 is applied to the 2nd mixer in the IF IC U101 through the matching circuitry.

U101 consists of the second mixer, two IF amplifiers/limiters, a quadrature detector and a noise filter amplifier. The second mixer downconverts the first IF 45 MHz signal to the second IF frequency of 455 kHz. Crystal resonator Y101 and associated components provide a 44.545 MHz second IF local oscillator signal. Y101 operated in the third overtone mode.

The second mixer output is applied to the 455 kHz ceramic filter Z107 and then to the first IF amplifier/limiter. The first IF amplifier/limiter output is provide to either 455 kHz ceramic filter Z104 (for 25 kHz channel space mode) or Z105 (for 12.5 kHz channel space mode). These filters are switched by analog switches U102, U103, U107 and U108 depending on the desired channel spacing mode. Ceramic discriminator Z106 and internal quadrature detector provide the demodulated audio output signal at AF OUT. The demodulated audio signal, filtered with an internal low pass filter (fc ≅47 kHz) is then routed to the baseband audio signal processor U401 and a noise squelch circuit.

The noise squelch circuit consists of slow and fast squelch time constants and an additional high pass filter (fc ≅4.0 kHz). The slow squelch time constant is around 70 ms and is provided to U404-2. The fast squelch time constant is around 8 ms and is provided to U404-3. During scanning mode, only the fast squelch is monitored by the CPU. In all other modes, the slow squelch is monitored.

Synthesizer

The synthesizer circuit generates all transmit and receive RF frequencies. This circuit consists of synthesizer IC U302, temperature compensated crystal oscillator (TCXO) U303, voltage controlled oscillator (VCO) U301 and associated loop filter circuitry.

The VCO operates at the transmitter frequency during transmit function and 45 MHz above the receive frequency during the receive function. The synthesizer is controlled by the CPU. Frequency stability is maintained by the TCXO module.

A portion of the VCO output is applied to the synthesizer IC and divided by 65/64 dual modulus prescaler, which is set by pulse swallow counter A and programmable counter B to provide a 5 kHz or 6.25 kHz output for comparison with a reference signal. The reference signal is derived from the 12.8 MHz TCXO module. The synthesizer IC divides the 12.8 MHz signal down to the 5 or 6.25 kHz signal. (The KPC-300/400 PC Programming Software will only permit synthesis of transmit or receive frequencies that are integer multiples of 5 or 6.25 kHz. Other frequencies cannot be input into the radio's personality. The synthesizer's default phase lock frequency is 5.0 kHz. If the frequency to be synthesized is not an integer multiple of 5 kHz, the synthesizer's phase lock frequency will be 6.25 kHz.) An unlock detector is used to prevent transmission when the frequency synthesizer is unlocked.

Audio modulation from the Audio Signal Processor (ASP) IC U401 is applied to the VCO modulation input via amplifier U402 and the TCXO modulation input via amplifier U402. The gain of U402 is adjusted dependent upon the channel spacing mode of the radio. In the 25 kHz channel space mode, U418 is open-circuited, removing R453 from being in parallel with R411. In the 12.5 kHz channel space mode, U418 is short-circuited, placing R453 in parallel with R411 and reducing the transmitter audio gain by a factor of two. (This establishes the 5 kHz maximum frequency deviation for 25 kHz channel spacing and the 2.5 kHz maximum frequency deviation for 12.5 kHz channel spacing.) VR403 and VR402 are adjustable to provide a constant modulation flatness for voice audio and Channel Guard (CG) and Digital Channel Guard (DCG) sub-audible modulation.

MOSFET transistor Q316 is turned on during the transmit mode to change the loop gain in order to get lower modulation frequency response. A ripple filter, consisting of Q312, C312 and R331, provides a filtered 4.7 VDC to the VCO to improve the phase noise characteristic of the receiver local injection signal for enhanced receiver performance for adjacent channel selectivity, intermodulation and FM hum and noise.

Audio Logic

The audio logic section consists of CPU U404, Audio Signal Processor (ASP) IC U401, EEPROM U406 and associated components. The CPU controls all radio operations. The EEPROM contains the personality data and the alignment data.

CPU

The CPU contains the LCD controller, LED controls, 32k bytes of ROM, 1k byte of RAM, an 8-channel A/D converter and a 2-channel D/A converter. The CPU generates DTMF tones, alert tones, beep tones, GE-STAR (ANI) codes and Digital Channel Guard (DCG) encode codewords. The DCG encode codeword from the CPU is applied to a low pass filter in the ASP IC U401 and summed with the voice signal at U402. Received DCG codewords and Type 99 tones from the ASP U401 are supplied and decoded by the CPU.

AUDIO SIGNAL PROCESSOR U401

The ASP IC U401 contains the CG encoder and decoder, pre-emphasis audio shaping filters, de-emphasis audio shaping filters, limiter, post-limiter filter (i.e., splatter filter) and various Switched Capacitor Filters (SCF). U401 generates CG tones controlled by the CPU. CG and DCG sub-audible modulation signals are summed with the voice audio signal at op-amp U402 and supplied to the VCO and TCXO modulation inputs.

The demodulated audio signal from IF IC U101 can provide voice signal information, CG tones, DCG codewords and Type 99 two-tone sequential information. CG tones are filtered by a tone filter and decoded in the ASP. DCG codewords are filtered by the tone filter and input to multiplexer U417. Type 99 tones are filtered by a bandpass filter and also input to U417. Multiplexer U417 selects either the DCG or Type 99 signals, outputs the signal to a comparator to "square" the signal to a TTL level digital waveform and then, sends the digitized signal to the CPU for detection.

Before the transmit voice audio signal is inputted to the ASP, it can be optionally mixed with DTMF or GE-STAR (ANI) encode signals. These baseband signals are pre-emphasized, bandpass filtered, hard limited, run through a post-limiter filter (splatter filter) and then summed at op-amp U402 with CG tones or DCG codewords.

CLOCK SHIFT

The CPU uses a nominal 7.3728 MHz clock frequency, which is divided down to 3.6864 MHz to become the clock frequency input provided to the ASP IC U401. Harmonics of this clock frequency can potentially interfere with the performance of the transmitter and receiver, producing self-quieting "beat" notes at specific receiver frequencies or producing an audio whine at specific transmitter frequencies. A clock shift can be programmed for each channel's receive and/or transmit frequency to move the potentially interfering harmonics of the microprocessor clock frequency. The microprocessor clock frequency is shifted more than +100 ppm, effectively moving potentially interfering clock harmonics off-channel.

POWER SUPPLY

The battery voltage, provided by six nickel cadmium cells, is a nominal 7.5 volts. This voltage is provided to the series regulators via a 4 amp fuse F401. The regulated supply provides +5 volts for the logic section, the analog section, receiver and transmitter sections. The +5.5 volts for the PLL frequency synthesizer section is also provided.

RADIO PROGRAMMING

PC PROGRAMMING

The KPC-300/400 Portable Radio is programmed using an IBM compatible personal computer equipped with a RS-232 serial port. Adapter TQ-3370 provides the RS-232 serial interface and the cable between the PC and the adapter box. Programming Cable RPM 113 2472/1 provides the connection from the adapter box to the radio's Universal Device Connector (UDC). The programming software is AE/LZY 213 761.

PROGRAMMABLE FEATURES

The following features are programmable on a per-channel basis:

- Receive Frequency
- Transmit Frequency
- Channel Busy Lock-Out
- Carrier Control Timer (CCT)
- Squelch Tail Elimination (STE)
- Fixed Priority 1 Scan Channel
- Channel Guard Encode/Decode (Tone or Digital)
- Type 99 Tone Decode
- Automatic Number Identification (ANI)
- Telephone Interconnect DTMF Keypad Enable (KPC-400 only)

The following features are programmable on an overall radio basis:

- Display Backlighting
- Alert Tones
- Emergency Channel
- Three (3) Auto-Dial Telephone Numbers (KPC-400 only)

CHANNEL BUSY LOCK-OUT

If channel busy lock-out has been programmed on the selected channel, the transmit function will be inhibited when the operator presses the **PTT** button while the radio detects a carrier on the channel unless the carrier is modulated with the corresponding Channel Guard tone or code for that selected channel. The radio will immediately begin transmitting when the carrier disappears. Channel busy lock-out continues to function if Channel Guard decode is disabled with the **MONITOR** button. The channel-busy feature is programmable on a per-channel basis. Type 99 cannot be programmed on a channel with channel busy lock-out.

CHANNEL GUARD

Channel Guard (CG) provides a means of restricting calls to specific radios through the use of Continuous Tone Coded Squelch System (CTCSS) tone frequencies ranging from 67.0 Hz to 210.7 Hz. Digital Channel Guard (DCG) also can provide a means of restricting calls through the use of 83 standard Continuous Digital Coded Squelch System (CDCSS) codes. Each channel may be programmed for encode/decode, encode only, decode only or for no CG or DCG. Both tone frequencies and digital codes may be used. The tones and codes are listed in Tables 1 and 2.

SQUELCH TAIL ELIMINATION (STE)

STE is used with tone and Digital Channel Guard to eliminate squelch tails. The STE burst is transmitted when the microphone PTT is released. The receiving radio decodes the burst and mutes the receiver audio for 250 ms. This mute time allows the transmission to end and to eliminate the squelch tail. The radio looks for STE on the received signal when the microphone is either on or off-hook. STE is enabled for transmit and/or receive through PC programming.

AUTOMATIC NUMBER IDENTIFICATION (ANI)

Automatic Number Identification is a 320 ms burst of code (GE-STAR) that is generated at the beginning of each transmission to identify the radio unit to the dispatcher. If programmed, a beep is sounded at the end of ANI transmission to indicate when conversation can begin as the microphone is disabled until the ANI transmission is completed.

Systems with CG require that ANI be delayed long enough for the system to respond before ANI can be decoded. A programmable delay is provided to meet this requirement. For example, a delay of 350 ms requires the operator to wait for 670 ms after pressing the PTT before conversation can be started. If desired, the ANI message can be programmed to be sent at the end of a transmission.

Table 1 - Standard Tone Frequencies (Hz)

67.0	71.9	74.4	77.0	79.7	82.5	85.4	88.5	91.5	94.8	97.4
100.0	103.5	107.2	110.9	114.8	118.8	123.0	127.3	131.8	136.5	141.3
146.2	151.4	156.7	162.2	167.9	173.8	179.9	186.2	192.8	203.5	210.7

1. Do not use 179.9 Hz or 118.8 Hz in areas served by 60 Hz power distribution systems (or 100.0 Hz or 151.4 Hz in areas supplied with 50 Hz power). Hum modulation of co-channel stations may "false" Channel Guard decoders.
2. Do not use adjacent Channel Guard tone frequencies in systems employing multiple Channel Guard tones. Avoid same-areas co-channel use of adjacent Channel Guard tones whenever possible. As stated in TIA/EIA-603, there is a possibility of decoder falsing.
3. To minimize receiver turn-on time delay, especially in system using Channel Guard repeaters or receiver voting, choose the highest usable Channel Guard tone frequency. Do not use tones below 100 Hz when it is necessary to meet the receiver response time requirements as specified in TIA/EIA-603.

Table 2 - Digital Channel Guard Codes

PRIMARY CODE	EQUIVALENT CODE	PRIMARY CODE	EQUIVALENT CODE	PRIMARY CODE	EQUIVALENT CODE
023	340 766	251	236 704 742	632	123 657
025		261	227 567	565	307 362
026	566	263	213 736	654	163 460 607
031	374 643	265	171 426	662	363 436 443 444
032		271	427 510 762	664	344 471 715
043	355	306	147 303 761	703	150 256
047	375 707	311	330 456 561	712	136 502
051	520 771	315	321 673	723	235 611 671
054	405 675	331	372 507	731	447 473 474 744
065	301	343	324 570	732	164 207
071	603 717 746	346	616 635 724	734	066
072	470 701	351	353 435	743	312 515 663
073	640	364	130 641	754	076 203
074	360 721	365	107	**036**	137
114	327 615	371	217 453 530	**053**	
115	534 674	411	117 756	**122**	535
116	060 737	412	127 441 711	**145**	525
125	173	413	133 620	**212**	253
131	572 702	423	234 563 621 713	**225**	536
132	605 634 714	431	262 316 730	**246**	542 653
134	273	432	276 326	**252**	661
143	333	445	222 457 575	**255**	425
152	366 415	464	237 642 772	**266**	655
155	233 660	465	056 656	**274**	652
156	517 741	466	144 666	**325**	550 626
162	416 553	503	157 322	**332**	433 552
165	354	506	224 313 574	**356**	521
172	057	516	067 720	**446**	467 511 672
174	142 270	532	161 345	**452**	524 765
205	135 610	546	317 614 751	**454**	513 545 564
223	350 475 750	606	153 630	**455**	533 551
226	104 557	612	254 314 706	**462**	472 623 725
243	267 342	624	075 501	**523**	647 726
244	176 417	627	037 560	**526**	562 645
245	370 554	631	231 504 636 745		

NOTE:
Primary codes in bold are unique Ericsson codes.

CARRIER CONTROL TIMER

This feature, programmable on a per-channel basis, prevents unnecessary channel traffic and radio damage if the transmit timer limit is exceeded. If the programmed timer times-out during a transmission, the radio will beep and stop transmitting. The beeping tone will continue until the operator releases the **PTT** button. Releasing the **PTT** button resets the timer.

TYPE 99 TONE DECODE

The radio is programmable to power-up in either selective (Type 99) or monitor mode for channels programmed for Type 99 decode.

When selective mode is chosen, the radio operates as a tone and voice receiver and allows only those calls that are tone coded for the radio to be heard. Selecting monitor mode allows all calls with the correct Channel Guard (if programmed) on the channel to be heard.

In either mode, when a correct T99 and Channel Guard (if programmed and enabled) have been decoded, a series of intermittent beeps will be heard to alert the operator of an incoming call. The **PG** status flag will blink in the display to indicate that a call has been received. If the selective mode was chosen, the radio switches automatically to monitor mode.

At the end of the message, if selective mode is desired, press and release the **MONITOR** button to reset the Type 99 tone signalling function. The **PG** status flag will cease blinking.

While in selective mode, the radio can be put in monitor mode by pressing and releasing the **PTT**. A series of beeps is sounded whle the **PTT** is pressed to indicate that no transmission has occured and the monitor mode has been selected as indicated by with the blinking of the **PG** status flag. A second press of the **PTT** will result in normal transmission.

The radio is programmable to decode any Ericsson or Motorola decode combinations from any one of two T99 tone tables on a per-channel basis. Transmit and/or receive Channel Guard can be programmed to any channel with Type 99.

Type 99 receive Channel Guard (if programmed) can be disabled by pressing the **MONITOR** button for more than three (3) seconds.

NOTE

Resetting Type 99 from monitor to selective mode does not affect Channel Guard switch setting.

If a Type 99 channel is in the scan list and scan is enabled, Type 99 tones are ignored. Scanning is provided on a carrier and Channel Guard basis only.

TELEPHONE INTERCONNECT (DTMF) (KPC-400 ONLY)

The operator may make telephone interconnection calls on radio systems equipped for this option. Specific procedures for placing these calls are determined by the operating system.

There are two methods to make telephone interconnect calls. One method uses the top three keys (1 ,2 ABC ,3 DEF) to send one of three pre-programmed numbers. The other method is to use the keypad (0 -9 WXY) to manually enter the telephone number.

The keypad is not active until the **PTT** button is pressed. Therefore, the **PTT** button must be pressed at all times when operating any button on the DTMF keypad. Communications takes place in a simplex mode. You cannot talk and listen at the same time. The **PTT** button must be pressed each time you wish to talk and, released when you wish to listen.

SCAN

The scan feature permits monitoring of up to 16 receive channels. The scanned channels can be any frequency within the frequency band limits of the radio and can be Channel Guard protected (tone or digital).

Any channel can be scanned with or without a priority level. One channel can be programmed for Priority 1 (P1), another for Priority 2 (P2) or any or all remaining channels programmed as Non-Priority (S). The radio can be pre-programmed to permit an operator front panel selectable scan list, a fixed Priority 1 channel or a selected Priority 1 channel using the channel select switch.

Scan Vocabulary

The following terms are frequently used in scan operation description.

- Simple Scan - describes the condition when scan is enabled and there is no activity on any channel in the scan list.
- Priority Scan - describes the condition when scan is enabled and the priority scan channel is sampled during the scanning of the channels on the scan list.
- Channel Guard Scan - describes the condition when scan is enabled and tone or digital Channel Guard must also be detected before locking on any channel.
- Selected Channel - indicates that this is the last channel that the operator selected with the channel select switch. This channel is displayed unless scan is enabled and activity is detected on another channel being scanned.

- Receive Channel - indicates the channel that has been detected and identified with the correct carrier and Channel Guard (if enabled). The receive channel number will be shown in the display.
- Scan List - indicates an internal list either pre-programmed or programmed from the front panel that includes each channel status that will be scanned when the scan mode is enabled.
- Non-Scan Channel - indicates a channel that is not in the scan list and will not be scanned when scan is enabled.
- Non-Priority Channel - indicates that this channel is on the scan list. Activity on this channel will be interrupted by activity on either the Priority 1 or Priority 2 channel.
- Priority 2 Channel - indicates that this channel is also on the scan list. Activity on this channel will interrupt any activity on any non-priority channel. However, activity on this channel will be interrupted only by activity on the Priority 1 channel (if on scan list).
- Priority 1 Channel - indicates that this channel is also on the scan list. Activity on this channel will interrupt and supercede any other channel activity.
- Channel Activity - indicates the presence of a correct carrier with correct Channel Guard (if programmed).
- Hang Time - describes the time interval (pre-programmable) that a channel remains locked to a frequency although no channel activity is present. This condition arises after channel activity has stopped or the **PTT** button has been released.
- Fixed Priority 1 Channel - indicates that the channel has been pre-programmed as the Priority 1 scan channel and cannot be changed by the operator.
- Selected Priority 1 Channel - indicates that the channel selected by the channel select switch will be the Priority 1 scan channel. The operator can still select the Non-Priority and Priority 2 channels.

Pre-Scan Operation

A scan list must be created before scan operation can be used. The scan list can be created in several ways. The radio will not go into the scan mode when no channel are programmed or in a scan list.

- Fixed Programmable - the scan list is pre-programmed using the PC programming softwaare and cannot be changed by the operator.
- Front Panel Programmable - the scan list is created by the operator using the front panel controls.
- Selected Channel Programmable - the operator creates the scan list for all Non-Priority and Priority 2 channels. The Priority 1 channel is selected by the channel select switch. This is also pre-programmable using the PC programming software.

ALERT TONES

Alert tones or “beeps” are sounded when a button is pressed and when the operating status of the radio changes. All alert tones may be programmed to be remain off.

POWER-UP SELF-TEST

Each time the radio is turned on, it will perform power-up self-test. All display segments will turn on, and after successful completion of the test, the radio will change to the last operating state (channel, etc.) and sound three (3) or four (4) beeps. Three (3) beeps sound if the radio is operating in the normal (not scan) state. Four (4) beeps will sound if the radio is scanning. The status will be indicated in the LCD. If the radio fails the self-test, no beeps will be sounded.

CARRIER CONTROL TIMER

This feature, programmable on a per-channel basis, prevents unnecessary channel traffic and radio damage if the transmit timer limit is exceeded. If the programmed timer times-out during a transmission, the radio will beep and stop transmitting. The beeping tone will continue until the operator releases the **PTT** button. Releasing the **PTT** button resets the timer.

CHANNEL BUSY LOCK-OUT

If channel busy lock-out has been programmed on the selected channel, the transmit function will be inhibited when the operator presses the **PTT** button while the radio detects a carrier on the channel unless the carrier is modulated with the corresponding Channel Guard tone or code for that selected channel. The radio will immediately begin transmitting when the carrier disappears. Channel busy lock-out continues to function if Channel Guard decode is disabled with the **MONITOR** button. The channel-busy feature is programmable on a per-channel basis.

TYPE 99 ALERT TONE

The Type 99 alert tone, indicating a receive Type 99 call, may be enabled or disabled by programming. If the programmed tone sequence is detected, the radio will beep two (2) times. If the alert tone is disabled, no alert tone will be present when a Type 99 call is received.

ANI ALERT TONE

The Automatic Number Identification (ANI) alert tone beep can be enabled or disabled by programming. If the alert tone is enabled, a beep will sound after the **PTT** is pressed to indicate to the operator to begin voice transmission. Some communication systems require a time delay before voice transmission begins. If the alert tone is disabled, no beep will sound.

SCAN ALERT TONE

The radio will sound a beep when the SCAN button is pressed.

PRIORITY-ONE (P1) SCAN

If the Priority 1 alert tone is enabled by programming and the radio receives a signal on the Priority 1 channel when scanning, the radio will sound a beep.

RADIO/CHANNEL FAILURE

The simultaneous flashing of the LCD display and the sounding of beeps indicates the synthesizer is unable to correctly lock on the selected channel. At this time the radio changes to a mute condition and no audio is heard from the speaker when receiving and the transmit is inhibited if the **PTT** button is pressed. Select another channel, change the battery pack or have the radio repaired.

SCAN OPERATING MODES

Simple SCAN

Once SCAN is activated, the radio will perform a Simple SCAN routine. This routine is performed when there is no activity on any of the channels that are in the Scan list.

The scanning list at right, is an example of the routine performed when there are more than four (4) channels in the Scan list.	**np6...np5...np4...np3...P1...P2...np2...np1...np6...np5...P1...P2...np4...np3...np2...np1...P1...P2, etc.**

(The abbreviation "np" indicates a non-priority channel, and P1 and P2 indicate Priority 1 and Priority 2, respectively.)

The scanning list at right, is an example of the routine performed when there are less than four (4) channels in the Scan list.	**np3...np2...np1...P1...P2...np3...np2...np1...P1...P2, etc.**

The above scanning orders assume that Priority 1 and Priority 2 channels exist. If they have not been assigned, their positions in the scanning order are eliminated.

NOTE

Priority channels will continue being scanned during hang time.

PTT — Pressing the PTT switch causes the radio to transmit on the selected channel frequency and to stop the scanning routine. A programmable hang time (0.3 to 5.0 seconds) will start as soon as the **PTT** switch is released. Scanning will resume at the end of the hang time. The hang time is a PC programmable option and can be enabled or disabled.

Channel Change — Any channel change will change the selected channel and show it in the display window. A channel change will also stop the scanning routine for a fixed, 2-second hang time. If no activity is detected on this new selected channel during this 2-second hang time, scanning will resume.

Priority SCAN

As soon as any activity is detected on a channel, the radio will change the scanning mode from Simple SCAN to Priority SCAN. The new receive channel will appear in the LCD window.

If the receive channel is a Non-Priority channel, both Priority 1 and Priority 2 channels will be sampled (scanned) every 500 milli-seconds in the order indicated at the right.	**P1...P1...P2...P1...P1...P2...P1...P1...P2, etc.**

- If a Priority 1 channel has not been established, the radio will only break away to sample the Priority 2 channel every 1.0 second.
- If a Priority 1 channel has been established but not a Priority 2 channel, the radio will break away to sample the Priority 1 channel every 500 milliseconds.
- If neither a Priority 1 or Priority 2 channel has been established, the radio will lock on this channel until activity on this channel goes away.
- When the receive channel is a Priority 2 channel, the radio only samples Priority 1 channel every 500 milliseconds.
- When the receive channel is a Priority 1 channel, no other channels will be scanned.

Once activity on the receive channel has ended, a programmable hang time (0.3 to 5.0 seconds) is started. Scanning will resume at the end of the hang time if there is no activity on that channel. The selected channel will appear now on the display. Note that Priority channels will continue being scanned during hang time.

To alert the operator of an incoming call on the Priority 1 channel, an option is available to sound a beep upon receiving this Priority 1 channel.

Scanning for Channel Guard

The scanning for Channel Guard option may be selected if, in addition to carrier activity alone, a correct Channel Guard is also required to lock on a channel when scanning. This option is selected on an individual radio basis.

Scanning Priority channels with the wrong Channel Guard will change the scanning rate as follows:

Priority 1 with wrong Channel Guard: The radio will change its Priority 1 sample rate from 0.5 seconds (.5 seconds) to 2.5 seconds, but it will still sample the Priority 2 channel every 1.0 second.

Priority 2 with wrong Channel guard: The radio will change its Priority 2 sample rate from 1.0 second to 5.0 seconds, but will continue to sample the Priority 1 channel every 500 milliseconds (.5 seconds).

PTT — The operator has two PC programmable options to select from in regard to what channel to transmit on. The operator can choose to transmit on the selected channel or on the receive channel. The transmit channel will be shown on the display. Releasing the PTT switch will unkey the transmitter and start the programmable hang time (0.3 to 5.0 seconds), if enabled. Scanning will resume again at the end of the hang time unless there is activity on that channel.

Channel Change — Any channel change will change the selected channel. The receive channel, if any, will stop being displayed/heard and replaced by the new selected channel. The scanning routine is temporarily stopped for a fixed 2 seconds and will resume again if there is no activity on the selected channel.

NOTE

Priority channels will continue being scanned during hang time.

TONE PROGRAMMING

An IBM-compatible personal computer using MS-DOS and a Programmer Interface Box plus the proper programming software is used to program the Type 99 tones, Channel Guard tones, and Channel Guard digital code. The Programmer Interface Box is connected between the UDC on the side of the radio and the back of the personal computer. Refer to Programming Guide for details.

Two sets of Type 99 tones can be programmed in the radio. Any channel can be programmed to decode any call or all calls based on any one of the two tone sets. Individual, group, and super group paging can be used. Motorola formats are also acceptable.

PG is displayed on the LCD when that channel has been programmed to receive Type 99 calls. Both receive and transmit Channel Guard may also be programmed to any channel with Type 99 tone.

An Intermittent beep is sounded to alert the operator of an incoming Type 99 call.

Upon receiving a call, the radio will open the audio and flash the **PG** indicator until it is reset by momentarily pressing the MONITOR button.

NOTE

If a Type 99 channel is in the Scan list and SCAN is enabled, Type 99 tones are ignored. Scanning is done on a Carrier and Channel Guard basis only.

The optional Type 99 programming provides individual, group, and super group call decode. The Motorola-formatted, two-tone, sequential signalling schemes can also be decoded.

In Type 99 tone systems, calls will not be heard from the receiver until the proper two tones are detected. When the second tone is decoded and recognized as correct, an alert tone sounds during the remaining portion of the second tone. The receiver audio path opens and remains open to receive messages until the decoder is reset. The **PG** indicator will also flash to show a call has been received.

The radio can be programmed with up to two separate tables of tones. Either the Ericsson Type 99 format or the Motorola format can be assigned to each tone table. The tone decoder (individual, group, and super group for Ericsson format or individual, group, and quick call for the Motorola format) can be enabled individually for each channel. Once enabled, one of the two tone tables can be selected for each channel.

The Group Call format allows communication with all radios in a group. The Super Group Call (in Ericsson Tone systems) or Quick Call (in Motorola tone systems) allows communications between all radios in a system.

TYPE 99 FORMAT

Tone frequencies in the Ericsson tone system fall within the range of 517.5 to 997.5 Hz.

In the tone format, the first tone can be from Tone Group A (for individual or group calls) or from Tone Group C (for super group calls). The second tone may be from Tone Group B (for individual calls) or from Tone Group D (for group or super group calls). The tone format is illustrated as follows.

INDIVIDUAL CALL FORMAT	<...1.0 SEC...> 20% TONE A	<...200 MS...> 25% GAP	<..1.0 SEC..> +300%,-0% TONE B
GROUP CALL FORMAT	<...1.0 SEC...> 20% TONE A	<...200 MS...> 25% GAP	<..1.0 SEC..> +300%, -0% TONE D
SUPER GROUP CALL FORMAT	<...1.0 SEC...> 20% TONE C	<...200 MS...> 25% GAP	<..1.0 SEC..> +300%, -0% TONE D

For example, assume the paging number to be 123; the first digit of the paging number is a "1." Look in Table 3 and read down the column labeled "100's Digit" to a "1." Read horizontally across the column labeled "10's Digit." The Tone Group is B. The second digit of the paging number is a "2." The tone number is B2. Look in Table 4 and down the column labeled "Tone Designator" to find B2. Read horizontally across the column labeled "Tone Frequency." The first tone frequency is 787.5 Hz.

To determine the second tone frequency, look in Table 3 and, as before, find the first digit of the paging number ("1").

The second Tone Group is A. The third digit of the paging number is a "3" and the Tone Designator is A3. In Table 4, read down the column labeled "Tone Designator" and find A3. Read horizontally across the column labeled "Tone Frequency." The second tone frequency is 802.5 Hz.

For different paging numbers, locate the first digit in the "100's Digit" column and determine the tone frequencies as described in the example.

Tone D is the diagonal tone used (in Ericsson systems only) when the first and second tone frequencies are the same. The standard frequency for Tone D is 742.5 Hz, but may be programmed with any tone frequency.

Table 3 - Ericsson Tone Groups

100's Digit	10's Digit For First Tone	1's Digit For Second Tone
0	A	A
1	B	A
2	B	B
3	A	B
4	C	C
5	C	A
6	C	B
7	A	C
8	B	C
9	NOT USED	

MOTOROLA FORMAT

Tone frequencies in the Motorola tone system are within the range of 288.5 to 1433.4 Hz. In the Motorola tone format, the first tone may be one of three tones: A for Individual Call, B for Quick Call, and C for Group Call. The second or final tone is B in all cases.

NOTE

The radio is able to recognize the A, B, and C tones. Individual, Group, and Quick Call formats may be used simultaneously.

The Motorola tone format is illustrated as follows:

INDIVIDUAL CALL FORMAT	<..1.0 SEC..> (Minimum) TONE A	<..NONE..> (Minimum) GAP	<..3.0 SEC..> TONE B
GROUP CALL FORMAT	<..1.0 SEC..> (Minimum) TONE C	<..NONE..> (Minimum) GAP	<..3.0 SEC..> TONE B
SUPER GROUP CALL FORMAT	<.....8 SEC.....> TONE B		

Individual Call

Tables 5 and 7 may also be used to determine the tone frequencies. The first digit of the code determines the tone group used in the code (see Table 5). Then Table 6 is used to determine the actual tone frequencies. For a code of 124, the tone groups used are shown in Table 5. Tone A and Tone B are both located in Tone Group 1 and Tone B is tone number 4. Refer to the following examples for additional information.

Example 1 - Code 098:

The digit "0" in Table 5 (First Digit of Code) shows the Tone A is in Tone Group 4 and Tone B is in Tone Group 2 (see Table 5).

Tone number 9 in Tone Group 4 is 524.6 Hz.

Tone number 8 in Tone Group 2 is 879.0 Hz.

Example 2 - Code 265:

The digit "2" in Table 5 shows that both Tone A and Tone B are in Tone Group 2.

Tone number 6 in Tone Group 2 is 788.5 Hz.

Tone number 5 in Tone Group 2 is 746.8 Hz.

Group Call (Quick Call Format)

In Group Call applications, the tone group is determined by Table 7, while the frequency is determined by Table 6. Refer to the following examples.

Example 1- Group Call Code 07 (also code 27 and 37):

The digit "0" in Table 7 shows that Tone B is in Tone Group 2 along with 20 to 29 and 30 to 39. Tone number 7 in Tone Group 2 is 832.5 Hz (see Table 6).

NOTE

Group Call code numbers range from 00 to 99. However, there are several Group Calls with the same Tone B frequency. This limits the total number of Group Calls to 40.

Example 2 - Group Call 98 (also 48 and 88):

The digit "9" in Table 7 shows that Tone B is in Tone Group 4 along with 40 to 49 and 80 to 89. Tone number 8 in Tone Group 4 is 496.8 Hz.

Table 4 - Ericsson Tone Generator Frequencies

TONE GROUP	TONE DESIGNATOR	TONE FREQUENCY (Hz)
A	A0	682.5
	A1	592.5
	A2	757.5
	A3	802.5
	A4	847.5
	A5	892.5
	A6	937.5
	A7	547.5
	A8	727.5
	A9	637.5
B	B0	652.5
	B1	607.5
	B2	787.5
	B3	832.5
	B4	877.5
	B5	922.5
	B6	967.5
	B7	517.5
	B8	562.5
	B9	697.5
C	C0	667.5
	C1	712.5
	C2	772.5
	C3	817.5
	C4	862.5
	C5	907.5
	C6	952.5
	C7	532.5
	C8	577.5
	C9	622.5
DIAGONAL TONE		742.5

Table 5 - Motorola Type Code Numbers

First Digit of Code	Tone Group from which Tone A is Selected	Tone Group from which Tone B is Selected
1	1	1
2	2	2
3	1	2
4	4	4
5	5	5
6	2	1
7	4	5
8	5	4
9	2	4
0	4	2
A	3	3

Table 7 - Motorola Group Call Tone Groups (TG)

GROUP CALL CODE NUMBER	TONE GROUP (TONE B)
00-09	TG2
10-19	TG1
20-29	TG2
30-39	TG2
40-49	TG4
50-59	TG5
60-69	TG1
70-79	TG5
80-89	TG4
90-99	TG4

Table 6 - Motorola Type Code Numbers

TONE NO.	TONE GROUP 1 (Hz)	TONE GROUP 2 (Hz)	TONE GROUP 3 (Hz)	TONE GROUP 4 (Hz)	TONE GROUP 5 (Hz)	TONE GROUP 6 (Hz)
1	349.0	600.9	288.5	339.6	584.8	1153.4
2	368.5	634.5	296.5	358.6	617.4	1185.2
3	389.0	669.9	304.7	378.6	651.9	1217.8
4	410.8	707.3	313.0	399.8	688.3	1251.4
5	433.7	746.8	953.7	422.1	726.8	1285.8
6	457.9	788.5	979.9	445.7	767.4	1321.2
7	483.5	832.5	1006.9	470.5	810.2	1357.6
8	510.5	879.0	1034.7	496.8	855.5	1395.0
9	539.0	928.1	1063.2	524.6	903.2	1433.4
0	330.5	569.1	1092.4	321.7	553.9	1122.5

ALIGNMENT

This section describes the alignment procedure for the radio. This procedure should be used whenever a board or component is replaced or the operation of the radio is in doubt.. Almost all alignment and checks can be accomplished through the Universal Device Connector (UDC) using the maintenance section of the PC Programming Software. The setting of the transmitter deviation requires the removal of the front case of the radio to adjust VR402 and/or VR403.

TEST EQUIPMENT

The following test equipment is recommended for radio alignment:

- Communications Monitor (HP8920B or equivalent)
- DC Voltmeter (1 megohm input impedance)
- DC Power Supply (7.5 volts at 5 amp)
- IBM or compatible personal computer
- PC Programming Software
- Programming Adapter Box TQ-3370 with Interface Cable
- Radio Programming Cable
- DC Power Adapter
- DC Power Cable
- RF Coaxial Cable (50 ohms)

Initial Setup

NOTE

If transmitter modulation does not require adjustment, begin with Step 5.

1. Remove the channel select and volume knobs. Then remove top cover and front case from radio.
2. Attach DC power adapter to radio and set voltage on power supply for 7.5 volts.
3. Connect Programming Adapter TQ-3370, interface cable and radio programming cable between computer and radio UDC.
4. Connect radio to Communications Monitor.
5. Turn on radio and note that all LCD segments light.
6. Program the default personality file into the radio using the PC Programming Software.
7. Execute radio programming software and program three (3) test channels as follows:

Channel 1	150.825 MHz
Channel 2	162.025 MHz
Channel 3	173.975 MHz

CPU Clock Adjustment C445

1. Set communications monitor for Antenna Input mode.
2. Ensure that CPU clock shift is turned off for receive.
3. Monitor on Communications Monitor the 7.3728 MHz radiation leakage using any type of antenna.
4. Adjust trimer capacitor C445 to obtain 7.3728 MHz 50 Hz.
5. Enable CPU clock shift and confirm that clock shifts approximately +800 Hz.

RF Output Power

1. Select radio channel 1 and key the radio under low power mode.
2. If necessary, change default value to obtain the required low power output.
3. Set the radio for high power mode.
4. If necessary, change default value to obtain the required high power output.
5. Repeat the above steps using channel 2 and 3.

Transmitter Modulation

NOTE

The front cover of the radio must be removed to gain access to modulation controls VR402 and VR403.

1. Apply a 1 kHz tone at standard input level (14 mV) to the transmitter audio input.
2. Adjust modulation control VR403 to obtain 3.0 kHz deviation without Channel Guard.
3. Apply a 1 kHz tone at the standard input level (+20 dB) to the transmitter audio input.
4. Adjust LIMITER CONTROL value to obtain 3.75 kHz deviation without Channel Guard.
5. Enable Channel Guard encode and insure that total deviation is 4.5 kHz at 25 kHz channel spacing.
6. Repeat Steps 1 thru 5 using channels 2 and 3.
7. Set the radio for channel 2 at 25 kHz channel spacing.
8. Enable middle CG tone without audio input.
9. Adjust VR402 to obtain 0.75 kHz deviation.
10. Check lowest and highest CG done for 0.6 to 0.9 kHz deviation.
11. Enable DCG code 627 and check that deviation is 0.6 to 0.9 kHz.

Squelch Level

1. Select radio channel 2 at 25 kHz channel spacing.
2. Increase the receiver input signal level to produce 8 dB SINAD.
3. Decrease the default Squelch_Open_MID (Squelch High) value until squelch opens.
4. Decrease the input signal level by 3 dB.

5. Decrease the default Squelch_Close_MID (Squelch Low) value until squelch closes.
6. Repeat Steps 2 thru 5 at 12.5 kHz channel spacing.
7. Select radio channel 1 at 25 kHz channel spacing.
8. Adjust Squelch _Offset_Low value until squelch opens at 8 dB SINAD. Adjustment range should be very small. When value is increased at 0.02 steps (values will be 0.02, 0.06, etc.), squelch open level goes down. When value is decreased at 0.02 steps (values will be 4.98, 4.94, etc.), squelch open level goes high.
9. Select radio channel 1 at 12.5 kHz channel spacing.
10. Adjust Squelch_Offset_Low value the same as Step 8.
11. Select radio channel 3 at 25 kHz channel spacing.
12. Adjust Squelch_Offset_High value the same as Step 8.
13. Select radio channel 3 at 12.5 kHz channel spacing.
14. Adjust Squelch_Offset_High value the same as Step 8.

TCXO

1. Connect Communications Monitor to radio.
2. Key the radio and monitor the transmitter frequency stability.
3. Adjust TCXO reference voltage using the PC Programming Software to get required transmitter frequency (typical voltage should be 2.20V, adjustable range is between 2.00 and 2.40 V).

BATTERY INFORMATION

CHARGE BEFORE USING

Insert the radio into the slot on the charger and ensure that the ON/OFF/VOLUME control is in the OFF position. Connect charger to a 120 VAC outlet. Charge the battery for the first time at least 14 hours but no longer than 48 hours. Over-charging may reduce battery life.

RECHARGING THE BATTERY

Recharge the battery when you experience difficultity in receiving or sending a message. Also the battery may need recharging when the red TX indicator is blinking.

Chargers are available with nominal charge times of one to 14 hours. Combinations include single and multiposition chargers. When charging a battery pack that is attached to a radio, always turn the radio OFF to ensure a full charge. For specific instructions, refer to the applicable charger Operator's Manual. Charging in non-Ericsson equipment may lead to battery damage and void the battery warranty.

Batteries which have been stored (charged or discharged) will generally not be capable of full capacity until the batteries have been fully cycled two or three times. (Charging the battery in an Ericsson rapid charger and then discharging the battery pack with the radio until low battery is indicated is considered one cycle.)

INSTALLING THE BATTERY PACK

1. Ensure the ON/OFF/VOLUME control knob is in the OFF (detent) position.
2. Align the battery pack tabs with the battery mounting plate slots on the back of the radio (see Figure 6).
3. Insert the tabs into the slots, push down and slide the battery toward the battery latch until the battery latch clicks into place.

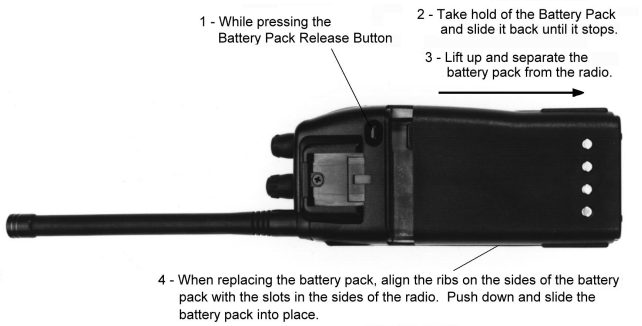


Figure 6 - Installing And Removing The Battery Pack

REMOVING THE BATTERY PACK

1. Ensure the ON/OFF/VOLUME control know is in the OFF (detent) positon.
2. Press the battery release button to release the battery.
3. Remove the battery pack by sliding it back until it stops. Then lift up and away until it separates from the radio.

BATTERY CARE & MAINTENANCE

- Your charger is intended for indoor use only. Keep the charger and/or wall cube dry. **Do Not** use in or near water.
- **Never** let the battery contacts touch metal objects that could short-circuit the contacts. For example, keys or coins in your pocket.
- **Do Not** disassemble a battery.
- **Do Not** dispose of a battery in a fire.
- Use only the supplied or specified battery and charger.
- Periodically condition your battery for improved battery capacity and performance.

BATTERY RECYCLING

The product you have purchased contains a rechargable battery. The battery is recyclable. At the end of its useful life under various state and local laws, it may be illegal to dispose of this battery into the municipal waste stream. Check with your local solid waste officials for details concerning recycling options or proper disposal in your area. Call Toll Free 1-800-8-BATTERY for information and/or procedures for returning rechargeable batteries in your state.

OPERATING TIPS

Antenna location and condition is important when operating a portable radio. Operating the radio in low areas or terrain, under power lines or bridges, inside of a vehicle or in a metal or steel framed building can severely reduce the range of the unit. Mountains and buildings can also reduce the range of the unit.

In areas where transmission or reception is poor, some improvement may be obtained by ensuring that the antenna is vertical. Moving a few yards in another direction or moving to a higher elevation may also improve communications. Vehicular operation can be aided with the use of an externally mounted antenna.

Battery condition is another important factor in the trouble free operation of a portable radio. Always properly charge the batteries.

EFFICIENT RADIO OPERATION

Hold the portable radio approximately three inches from your mouth and speak into the microphone at a normal voice level.

Keep the antenna in a vertical position when receiving or transmitting a message.

Do not hold the antenna when receiving a message and, especially, do **not** hold when transmissing a message.

ANTENNA CARE AND REPLACEMENT

Do not use the portable radio with a damaged or missing antenna. A minor burn may result if a damaged antenna comes into contact with the skin. Replace a damaged antenna immediately. A missing antenna could damage your portable radio.

Use only the supplied or approved antenna. Unauthorized antennas, modifications or attachments could damage the radio unit and may violate FCC regulations.

ELECTRONIC DEVICES

RF energy from your portable radio may affect some electronic equipment. Most modern electronic equipment in cars, hospitals, homes, etc. are shielded from RF energy. However, in areas that instruct you to turn off two-way radio equipment, always observe the rules. If in doubt, turn it off.

AIRCRAFT

Always turn off your portable radio before boarding any aircraft.

- **Use it on the ground only with crew permission**
- **Do not use it in the air**

BLASTING AREAS

To avoid interfering with blasting operations, turn your radio OFF when in a "blasting area" or in areas posted "turn off two-way radio". Remote control RF devices are used by some construction crews to set off explosives.

POTENTIALLY EXPLOSIVE ATMOSPHERES

Areas with potentially explosive atmosphere are often, but not always, clearly marked. These may be fueling areas, such as gas stations, fuel or chemical transfer or storage facilities, and areas where the air contains chemicals or particles, such as grain, dust or metal powders.

Sparks in such areas could cause an explosion or fire resulting in bodily injury or even death.

Turn OFF your radio when in any area with a potentially explosive atmosphere. It is rare, but not impossible that the radio or its accessories could generate sparks.

ACCESSORIES

The following accessories are available for use with the KPC-300/400 radio units:

• VHF Antenna	KRE 101 1219/1, /2 or /3
• UHF Antenna	KRE 101 1219/10, /12 or /13
• Rechargable Battery Pack	BKB 191 202
• Rechargable Battery Pack	BKB 191 203
• Belt Clip	KRY 101 1232/2
• Speaker/Microphone	KRY 101 1617/31
• Rapid Charger Base with sleeve	BML 161 59/1 BML 161 51/005
• Swivel Mount with Belt Clip	KRY 101 1609/A1
• Leather Case w/Belt Loop	KRY 101 1622/1
• Leather Case w/swivel & Belt Loop	KRY 101 1622/A2

SWIVEL MOUNT REMOVAL AND REPLACEMENT

To remove the swivel mount, slide a flat blade screwdriver underneath the spring retainer and twist. While twisting, slide the swivel mount out from under the holder.

To replace the swivel mount, place the end of the swivel in the grooves of the holder on the back of the radio and slide the mount up until it snaps into place.

MAINTENANCE

It is highly recommended that no repairs to this unit be attempted. All defective units should be returned to Ericsson Inc. for repair and/or replacement. See *Portable Radio Limited Warranty* paragraph for additional information. Parts List, component drawings and schematic diagram are provided for reference only.

PORTABLE RADIO LIMITED WARRANTY

What does your warranty cover?

- Any defect in material or workmanship.

For how long after the original purchase?

- One (1) year.

What will we do?

- Provide you with a new or, at our option, a reconditioned unit.
- The exchange unit is warranted for the remainder of your product's original one (1) year warranty period.

How do you make a warranty claim?

- Properly pack your unit. Include any cables and other parts and accessories which were originally provided with the product. We recommend using the original carton and packing materials.
- Include in the package your name and address, a description of the defect and a copy of the sales receipt or other evidence of date of original purchase.
- Ship the unit standard UPS or equivalent to:
  Ericsson Inc.
  Private Radio Systems
  KPC-300/400 Warranty Service
  Mountain View Road
  Lynchburg, Virginia 24502
- Pay any charges billed to you by the KPC-300/400 Warranty Service for service not covered by the warranty.
- A new or reconditioned unit will be shipped to you prepaid freight.

What does your warranty **not** cover?

- Customer instruction. Your Operator's Manual provides information regarding operating instructions and user controls. For additional information, ask your dealer.
- Installation and set-up service adjustments.
- Damage from misuse or neglect.
- Batteries.
- Products which have been modified or incorporated into other products.
- Products purchased or serviced outside the USA.

Parts List

SYMBOL	PART#	DESCRIPTION
C100		Chip Capacitor 1000P
C101		Chip Capacitor 1000P
C102		Chip Capacitor 15P
C103		Chip Capacitor 15P
C104		Chip Capacitor 1000P
C105		Chip Capacitor 27P
C106		Chip Capacitor 47P
C107		Chip Capacitor 39P
C108		Chip Capacitor 22P
C109		Chip Capacitor 15P
C110		Chip Capacitor 3P
C111		Chip Capacitor 5P
C112		Chip Capacitor 5P
C117		Chip Capacitor 15P
C118		Chip Capacitor 47P
C119		Chip Capacitor 22P
C120		Chip Capacitor 0.01μF 50V
C122		Chip Capacitor 6P
C124		Chip Capacitor 0.01μF 50 V
C126		Chip Capacitor 0.01μF 50V
C127		Chip Tantalum 4.7μF 10V,A
C128		Chip Capacitor 0.1μ 25V
C129		Chip Capacitor 1000P
C131		Chip Capacitor 1P 50V
C132		Chip Capacitor 0.01μF 50V
C133		Chip Tantalum 4.7μF 10V,A
C134		Chip Capacitor 0.01μF50V
C135		Chip Capacitor 0.1μ 25V
C136		Chip Capacitor 15P SH 50V
C137		Chip Capacitor 8P
C138		Chip Capacitor 0.1μ 25V
C139		Chip Capacitor 110P CH 50V
C140		Chip Tantalum 4.7μF 10V,A
C141		Chip Capacitor 0.1μF 25V
C142		Chip Capacitor 1000p B 25V
C151		Chip Capacitor 220P CH 50V
C152		Chip Tantalum 4.7μF 10V,A
C153		Chip Capacitor 1μ 16V
C156		Chip Tantalum 4.7μF 10V,A
C157		Chip Capacitor 0.1μF 25V
C159		Chip Capacitor 1000P
C160		Chip Capacitor 0.01μF50V
C161		Chip Capacitor 0.1μF 25V
C171		Chip Capacitor 12P 50V
C172		Chip Capacitor 12P 50V
C180		Chip Capacitor 0.1μF 25V
C181		Chip Capacitor 0.1μF 25V
C182		Chip Capacator 4P
C183		Chip Capacitor 2P

*** Only in KPC-400**

SYMBOL	PART#	DESCRIPTION
C185		Chip Capacitor 220P CH 50V
C186		Chip Tantalum 0.1μF 25V
C187		Chip Tantalum 0.22μF 35V
C188		Chip Capacitor 680P CH 50V
C189		Chip Capacitor 5P 50V
C190		Chip Capacitor 1000P
C201		Chip Capacitor 0.01μF50V
C202		Chip Tantalum 10μF 16V
C203		Chip Capacitor 1000P
C205		Chip Capacitor 1000P
C206		Chip Capacitor 1000P
C207		Chip Capacitor 12P CH 50V
C208		Chip Capacitor 2P
C210		Chip Capacitor 47P
C211		Chip Capacitor 0.1μF 25V
C212		Chip Capacitor 1μF 16V
C213		Chip Capacitor 0.1μF 25V
C214		Chip Tantalum 4.7μF 10V,A
C215		Chip Capacitor 1000P
C216		Chip Capacitor 1000P
C218		Chip Capacitor 1000P
C220		Chip Capacitor 1000P
C221		Chip Capacitor 1μF 16V
C231		Chip Capacitor 0.01μF50V
C232		Chip Capacitor 0.01μF50V
C233		Chip Capacitor 1000P
C301		Chip Capacitor 0.1μF 25V
C302		Chip Capacitor 33P
C303		Chip Capacitor 12P 50V
C304		Chip Capacitor 18P
C305		Chip Capacitor 0.01μF 50V
C306		Chip Capacitor 1000P
C307		Chip Capacitor 0.01μF 50V
C308		Chip Capacitor 1000P
C309		Chip Capacitor 0.01μF50V
C311		Chip Tantalum 1μF 16V
C312		Chip Tantalum 10μF 10V,A
C313		Chip Capacitor 100P
C314		Chip Capacitor 0.01μF50V
C316		Plastic Film Capacitors 0.047μF 16V
C317		Chip Tantalum 3.3μF 16V
C318		Chip Capacitor 0.22μ 35V
C323		Chip Tantalum 4.7μF 10V,A
C324		Chip Capacitor 1000P
C325		Chip Capacitor 0.1μF 25V
C326		Chip Capacitor 0.1μF 25V
C327		Chip Capacitor 0.1μF 25V
C331		Chip Capacitor 0.01μF50V
C332		Chip Capacitor 12P CH 50V
C335		Chip Capacitor 18P
C336		Chip Capacitor 12P

*** Only in KPC-400**

SYMBOL	PART#	DESCRIPTION
C337		Chip Capacitor 0.1µF 25V
C401		Chip Capacitor 220P CH 50V
C413		Chip Capacitor 1µF 16V
C415		Chip Tantalum 4.7µF 10V,A
C416		Chip Capacitor 100P
C417		Chip Tantalum 4.7µF 10V,A
C418		Chip Capacitor 150P CH 50V
C419		Chip Capacitor 1000p B 25V
C420		Chip Capacitor 680P CH 25V
C421		Chip Capacitor 100P
C422		Chip Capacitor 1µF 16V
C423		Chip Capacitor 150P CH 50V
C425		Chip Capacitor 0.01µF50V
C426		Chip Capacitor 1µF 16V
C427		Chip Capacitor 1µF 16V
C428		Chip Capacitor 0.022µF 25V
C429		Chip Capacitor 220P 50V
C430		Chip Capacitor 100P
C431		Chip Capacitor 1µF 16CV
C434		Chip Capacitor 0.1µF 25V
C440		Chip Capacitor 0.1µF 25V
C441		Chip Tantalum 4.7µF 10V,A
C442		Chip Capacitor 10P
C443		Chip Capacitor 3P
C444		Chip Capacitor 47P
C445		Trimmer Chip Capacitor 20PF
C446		Chip Capacitor 0.1µF 25V
C448		Chip Capacitor 1000P
C449		Chip Capacitor 1000P
C450		Chip Capacitor 1000P
C451		Chip Capacitor 1000P
C452		Chip Capacitor 1000P
C453		Chip Capacitor 1µF 16V
C454		Chip Tantalum 10µF 16V
C455		Chip Capacitor 0.1µF 25V
C456		Chip Capacitor 0.1µF 25V
C457		Chip Tantalum 10µF 16V
C458		Chip Capacitor 0.01µF 50V
C459		Chip Capacitor 4700P 50V
C460		Chip Capacitor 0.01µF 50V
C461		Chip Capacitor 0.01µF50V
C462		Chip Capacitor 0.1µF 25V
C463		Chip Capacitor 0.1µF 25V
C464		Chip Capacitor 1000P
C465		Chip Capacitor 1µF 16V
C466		Chip Tantalum 10µF 16V
C467		Chip Capacitor 0.01µF 50V
C468		Chip Tantalum 10µF 10V,A
C469		Chip Tantalum 10µF 10V,A

*** Only in KPC-400**

SYMBOL	PART#	DESCRIPTION
C470		Chip Tantalum 4.7µF 10V,A
C471		Chip Capacitor 0.01µF50V
C472		Chip Capacitor 0.01µF50V
C473		Chip Tantalum 4.7µF 10V,A
C474		Chip Capacitor 1000P
C476		Chip Capacitor 1000P
C480		Chip Capacitor 1000P
C481		Chip Capacitor 1000P
C482		Chip Capacitor 1000P
C483		Chip Capacitor 1000P
C484		Chip Capacitor 1000P
C485		Chip Capacitor 1000P
C486		Chip Capacitor 1000P
*C487		Chip Capacitor 1000P
*C488		Chip Capacitor 1000P
*C489		Chip Capacitor 1000P
*C490		Chip Capacitor 1000P
*C491		Chip Capacitor 1000P
*C492		Chip Capacitor 1000P
*C493		Chip Capacitor 1000P
C494		Chip Capacitor 1000P
C495		Chip Capacitor 1000P
C496		Chip Capacitor 1000P
C497		Chip Capacitor 1000P
C498		Chip Tantalum 10µF 10V,A
C499		Chip Capacitor 0.1µ 25V
C500		Chip Tantalum 4.7µF 10V,A
C513		Chip Capacitor 1µF 16V
C514		Chip Capacitor 1000P
C515		Chip Capacitor 1000P
C516		Chip Capacitor 1000P
C517		Chip Capacitor 0.1µF 25V
C518		Chip Tantalum 4.7µF 10V,A
C519		Chip Capacitor 0.01µF50V
C521		Chip Capacitor 100P
C522		Chip Capacitor 1µF 16V
C523		Chip Capacitor 1000P
C524		Chip Capacitor 1000P
C525		Chip Capacitor 1000P
D101		RF Switching PIN Diode 10W
D102		RF Switching PIN Diode 10W
D104		Varactor diode
D201		Shottky Barier Diode Dual
D202		Band Switch Diode
D401		LED SMT Green
D402		LED SMT Green
D403		Band Switch Diode
D406		LED SMT Yellow & Red
D408		Zener Diode 11V 150mW
D409		LED SMT Green
D410		LED SMT Green
F401		Chip Fuse 4A
J101		Antenna Connector

*** Only in KPC-400**

SYMBOL	PART#	DESCRIPTION
J103		Co-Axial Connector female
J401		SMT/ZIF Type Flexible PCB Connector 10pin
J402		SMT/ZIF Type Flexible PCB Connector 24pin
J403		SMT/ZIF Type Flexible PCB Connector 10pin
J404		FPC 0.8 Horizontal Connector 11 pin
J408		UDC Connector 6pin (Trial 15pcs)
*J409		FPC 0.8 Horizontal Connector 8 pin
L101		Chip Inductor 47nH
L102		Chip Inductor 56nH
L103		Chip Inductor 56nH
L104		Chip Inductor 56nH
L105		Chip Inductor 56nH
L106		Chip Inductor 100nH
L107		Chip Inductor 56 nH
L109		Chip Inductor 68 nH
L110		82nH chip Inductor
L111		Chip Inductor, 1.5µH
L112		Chip Shielded Inductor, 2520, 1.2µH
L113		Chip Inductor 1µH J
L114		Chip Inductor 1µH J
L115		Chip Inductor 56 nH
L116		Chip Inductor 56 nH
L117		Chip Inductor 56nH J
L118		Chip Inductor 56nH K
L119		Chip Inductor 27µ J
L120		High Q Chip Inductor 15.3nH
L121		High Q Chip Inductor 49.8nH
L201		Chip Inductor 560nH K
L203		Chip Inductor 56nH K
L301		Chip Inductor 47nH K
L303		Chip Inductor 68nH K
L315		Chip Inductor 33nH J
L316		Chip Inductor 180SnH J
MC1		MIC UNIT w/o water proof seal
P102		Co-Axial Connector Cable 60mm, male
P401		Battery Connector 2pin (Trial 15pcs)
P402		Main Flex Circuit
P403		UDC Flex Circuit
P404		Front Housing Flex Circuit
P407		INTER CONNECTOR
*P409		DTMF Flex Circuit
Q101		RF Transistor LNA
Q102		MMIC Mixer Dual gate
Q104		Digital Transistor NPN30mA
Q105		Digital Transistor NPN30mA
Q201		TRANSISTOR, 2SC3357T
Q202		General Purpose Transistor
Q203		General TRANSISTOR
Q205		Digital Transistor NPN30mA
Q301		RF Transistor LNA

*** Only in KPC-400**

SYMBOL	PART#	DESCRIPTION
Q302		TRANSISTOR 2SA1586
Q312		General TRANSISTOR
Q316		MOS FET 2.5 ohm@5V
Q404		Digital Transistor NPN30mA
Q407		Digital TR Power management 500mA
Q408		Digital Transistor NPN30mA
Q409		Digital Transistor NPN30mA
Q410		Digital Transistor NPN30mA
Q411		Digital Transistor NPN30mA
Q412		Digital TR Power management 500mA
Q413		General Purpose Transistor
Q414		Digital TR DTA143XKA DTC144EKA
Q415		Digital Transistor NPN30mA
Q416		Digital Transistor NPN30mA
R101		Chip Resistor 3K 1/16W
R103		Chip Resistor 6.8K 1/16W
R104		Chip Resistor 1K 1/16W
R106		Chip Resistor 1K 1/16W
R107		Chip Resistor 100 1/16W
R108		Chip Resistor 18 1/16W
R111		Chip Resistor 3.6K 1/16W
R113		Chip Resistor 15K 1/16W
R114		Chip Resistor 10K 1/16W
R115		Chip Resistor 300k 1/16W
R116		Chip Resistor 15K 1/16W
R119		Chip Resistor 56K 1/16W
R120		Chip Resistor 5.1k 1/16W
R121		Chip Resistor 100K 1/16W
R122		Chip Resistor 22K 1/16W
R123		Chip Resistor 3.3K 1/16W
R125		Chip Resistor 100K 1/16W
R132		Chip Resistor 430K 1/16W
R133		Chip Resistor 10K 1/16W
R134		Chip Resistor 22K 1/16W
R167		Chip Resistor 430K 1/16W
R168		Chip Resistor 12K 1/16W
R201		Chip Resistor 82 1/16W
R202		Chip Resistor 18 1/16W
R203		Chip Resistor 10 1/16W
R204		Chip Resistor 620K 1/16W
R205		Chip Resistor 130 1/16W
R207		Chip Resistor 1K 1/16W
R208		Chip Resistor 470 1/16W
R209		Chip Resistor 1.5K 1/16W
R210		Chip Resistor 470K 1/16W
R211		Chip Resistor 240k 1/16W
R212		Chip Resistor 220K 1/16W
R213		Chip Resistor 10K 1/16W
R214		Chip Resistor 10K 1/16W
R215		Chip Resistor 2k 1/16W
R216		Chip Resistor 2.2K 1/16W
R301		Chip Resistor 100 1/16W

*** Only in KPC-400**

SYMBOL	PART#	DESCRIPTION
R302		Chip Resistor 82K 1/16W
R303		Chip Resistor 51 1/16W
R304		Chip Resistor 100 1/16W
R305		Chip Resistor 68 1/16W
R306		Chip Resistor 100 1/16W
R308		Chip Resistor 51 1/16W
R310		Chip Resistor 0 1/16W
R311		Chip Resistor 2K 1/16W
R312		Chip Resistor 150 1/16W
R315		Chip Resistor 33K 1/16W
R316		Chip Resistor 9.1k 1/16W
R317		Chip Resistor 100K 1/16W
R320		Chip Resistor 5.6K 1/16W
R321		Chip Resistor 1K 1/16W
R331		Chip Resistor 3k 1/16W
R333		Chip Resistor 51 1/16W
R411		Chip Resistor 220K 1/16W
R414		Chip Resistor 22K 1/16W
R415		Chip Resistor 18K 1/16W
R416		Chip Resistor 220K 1/16W
R417		Chip Resistor 30k 1/16W
R418		Chip Resistor 1M 1/16W
R419		Chip Resistor 5.6K 1/16W
R420		Chip Resistor 33K 1/16W
R421		Chip Resistor 1M 1/16W
R422		Chip Resistor 100K 1/16W
R423		Chip Resistor 22K 1/16W
R424		Chip Resistor 22K 1/16W
R426		Chip Resistor 220K 1/16W
R429		Chip Resistor 15K 1/16W
R430		Chip Resistor 47K 1/16W
R432		Chip Resistor 68K 1/16W
R433		Chip Resistor 7.5k 1/16W
R434		Chip Resistor 1M 1/16W
R435		Chip Resistor 100K 1/16W
R436		Chip Resistor 10K 1/16W
R437		Chip Resistor 2.7K 1/16W
R438		Chip Resistor 56K 1/16W
R439		Chip Resistor 100K 1/16W
R443		Chip Resistor 330K 1/16W
R444		Chip Resistor 33K 1/16W
R445		Chip Resistor 100K 1/16W
R446		Chip Resistor 47K 1/16W
R447		Chip Resistor 36K 1/16W
R448		Chip Resistor 56K 1/16W
R449		Chip Resistor 15K 1/16W
R450		Chip Resistor 100K 1/16W
R451		Chip Resistor 240K 1/16W
R452		Chip Resistor 68K 1/16W
R453		Chip Resistor 220K 1/16W
R460		Chip Resistor 56K 1/16W
R461		Chip Resistor 100K 1/16W
R462		Chip Resistor 100K 1/16W

*** Only in KPC-400**

SYMBOL	PART#	DESCRIPTION
R463		Chip Resistor 100K 1/16W
R464		Chip Resistor 1K 1/16W
R465		Chip Resistor 470 1/16W
R466		Chip Resistor 470 1/16W
R467		Chip Resistor 470 1/16W
R468		Chip Resistor 2k 1/16W
R469		Chip Resistor 2k 1/16W
R470		Chip Resistor 470 1/16W
R471		Chip Resistor 47K 1/16W
R472		Chip Resistor 47K 1/16W
R473		Chip Resistor 3.3K 1/16W
R474		Chip Resistor 1K 1/16W
R475		Chip Resistor 1K 1/16W
R476		Chip Resistor 1.8K 1/16W
R477		Chip Resistor 4.7K 1/16W
R478		Chip Resistor 2.7K 1/16W
R479		Chip Resistor 10 1/16W
R480		Chip Resistor 10 1/16W
R481		Chip Resistor 470K 1/16W
R482		Chip Resistor 10K 1/16W
R483		Chip Resistor 470K 1/16W
R484		Chip Resistor 47K 1/16W
R485		Chip Resistor 10K 1/16W
R486		Chip Resistor 10K 1/16W
R489		Chip Resistor 15K 1/16W
R490		Chip Resistor 22K 1/16W
R491		Chip Resistor 560 1/16W
R492		Chip Resistor 270k 1/16W
R493		Chip Resistor 200k 1/16W
R496		Chip Resistor 3.9 1/16W
R497		Chip Resistor 470 1/16W
R499		Chip Resistor 3.3K 1/16W
R500		Chip Resistor 56K 1/16W
R501		Chip Resistor 56K 1/16W
R502		Chip Resistor 62k F +/-200 .063W
R503		Chip Resistor 69.8k F +/-200 .063W
R504		Chip Resistor 220k F +/-200 063W
R505		Chip Resistor 56K 1/16W
R506		Chip Resistor 10K 1/16W
R507		Chip Resistor 220k F +/-200 .063W
R508		Chip Resistor 47K 1/16W
R509		Chip Resistor 47K 1/16W
R510		Chip Resistor 47K 1/16W
R511		Chip Resistor 47K 1/16W
R512		Chip Resistor 47K 1/16W
R513		Chip Resistor 1M 1/16W
R521		Chip Resistor 4.7K 1/16W
R523		Chip Resistor 2.2K 1/16W
R524		Chip Resistor 470K 1/16W
R525		Chip Resistor 470K 1/16W
R526		Chip Resistor 2.2K 1/16W
R527		Chip Resistor 470 1/16W
R528		Chip Resistor 470 1/16W

*** Only in KPC-400**

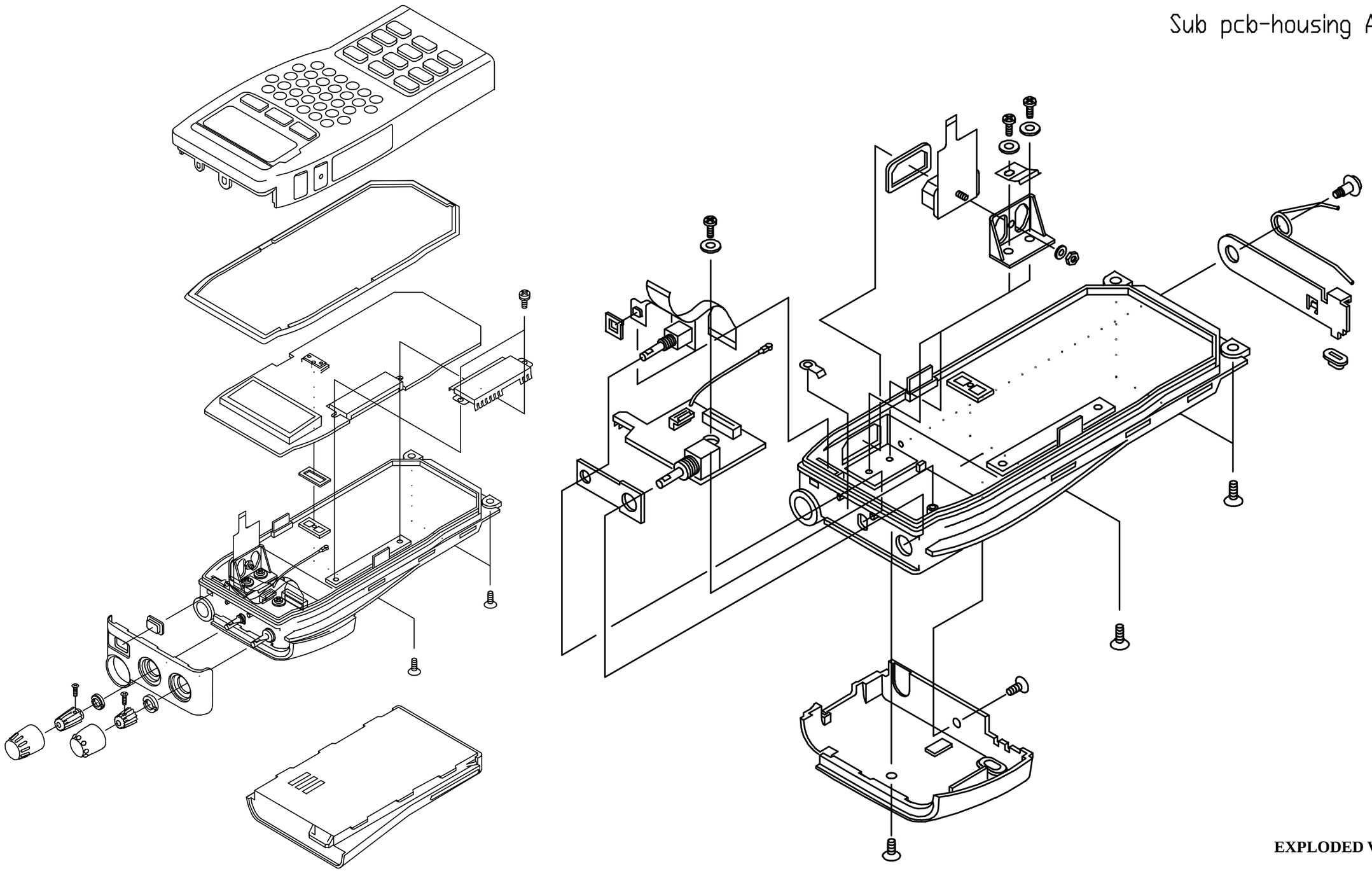
SYMBOL	PART#	DESCRIPTION
R530		Chip Resistor 100K 1/16W
R531		Chip Resistor 1M 1/16W
SP1		Speaker 24 ohm 0.5W 36mm
SW1		Rotary Switch, 16 position
*SW10		Element Key SWITCH
*SW11		Element Key SWITCH
*SW12		Element Key SWITCH
*SW13		Element Key SWITCH
*SW14		Element Key SWITCH
*SW15		Element Key SWITCH
*SW16		Element Key SWITCH
*SW17		Element Key SWITCH
*SW18		Element Key SWITCH
*SW19		Element Key SWITCH
SW2		Element Key SWITCH
*SW20		Element Key SWITCH
SW3		Element Key SWITCH
SW4		Element Key SWITCH
SW5		PTT Switch with stem
SW6		Element Key SWITCH
SW7		Element Key SWITCH
SW8		Emergency Switch with stem
*SW9		Element Key SWITCH
U101		IF IC (.65 SSOP)
U102		L-MOS Analog Switch single
U103		L-MOS Analog Switch single
U105		OP AMP LM358 compatible
U107		L-MOS Analog Switch single
U108		L-MOS Analog Switch single
U201		PA Module VHF
U202		OP AMP LM358 compatible
U301		VCO UHF-M
U302		Synthesizer IC 1.1G
U303		TCXO w/ Modulation 12.8MHz

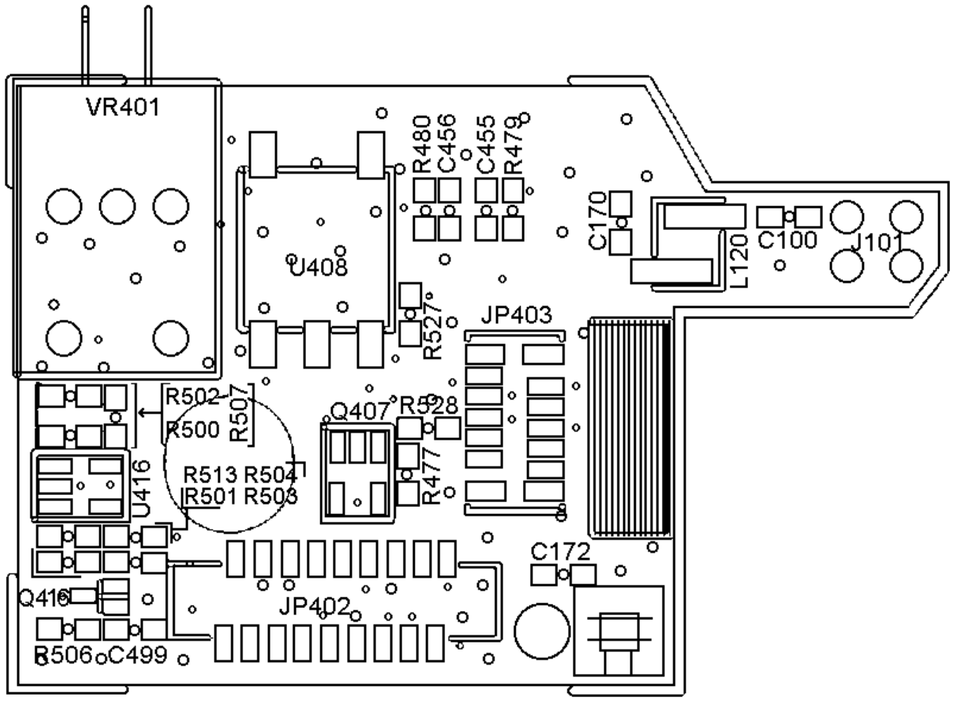
*** Only in KPC-400**

SYMBOL	PART#	DESCRIPTION
U401		CTCSS Encoder/Decoder with voice security
U402		OP AMP LM358 compatible
U403		CMOS OP-AMP
U404		CPU 8bit
U405		LCD Module
U406		EEPROM 4k bit
U407		Dual Low Voltage Power Amp. 1W BTL
U408		Photo Relay AC 300mA 2ohm max 6pin DIP
U409		L-MOS Analog Switch single
U411		Voltage Detector 5.5V
U412		Voltage Regulator 5V External Tr.
U413		5V series regulator with cont.
U414		Voltage Regulator 5.5V
U415		Voltage Detector 4.0V
U416		OP AMP LM358 compatible
U417		Analog Multiplexer
U418		L-MOS Analog Switch single
U421		D/A Converter, 8 bits
VR401		VOLUME WITH SWITCH
VR402		Chip Pot 47K
VR403		Chip Pot 47K
Y101		44.545MHz Crystal OSC SMT
Y402		HC-49/US 7.3728MHz Crystal OSC
Z101		LPF 148-174MHz 12W
Z102		Crystal Filter 45MHz +/-7.5k 70dB@-910k pair
Z104		Chip Ceramic Filter 455k 4elements
Z105		Chip Ceramic Filter 455k 4elements
Z106		Ceramic Filter 455kHz SMT
Z107		Chip Ceramic Filter 455k 4elements
Z201		Chip Coupler, 20 dB 136-178 MHz

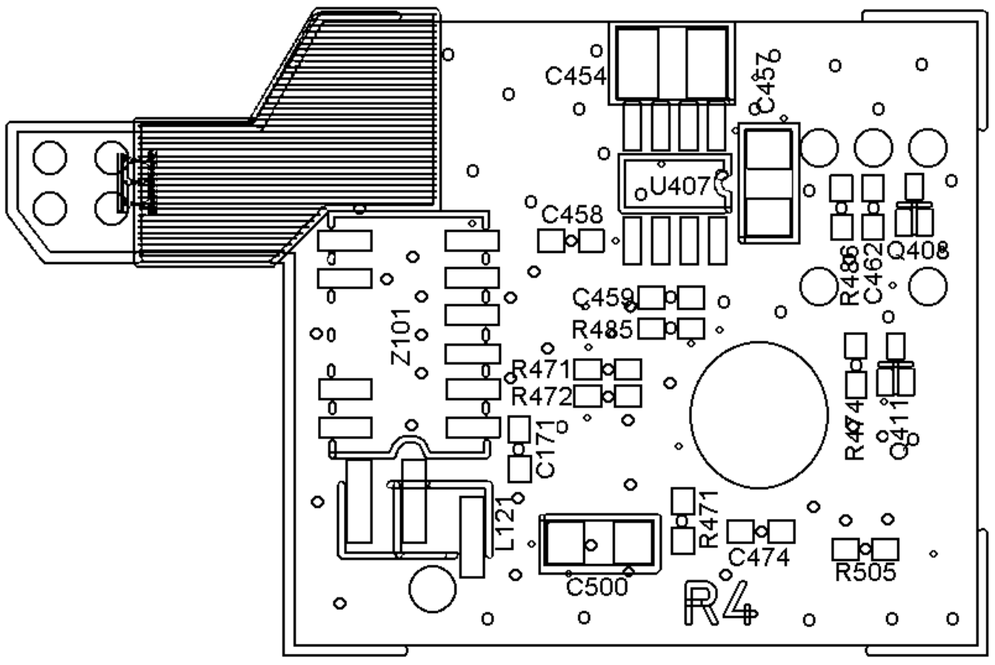
*** Only in KPC-400**

Sub pcb-housing Assy



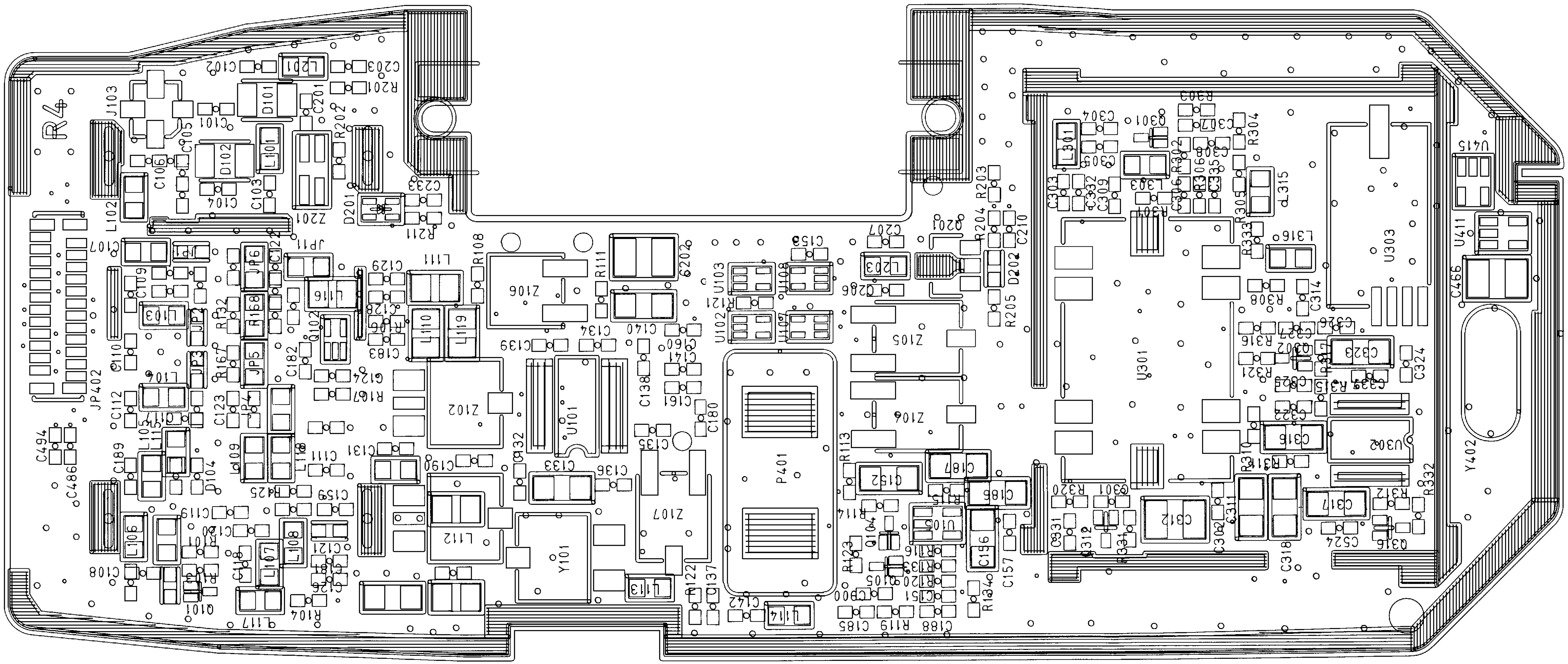


TOP



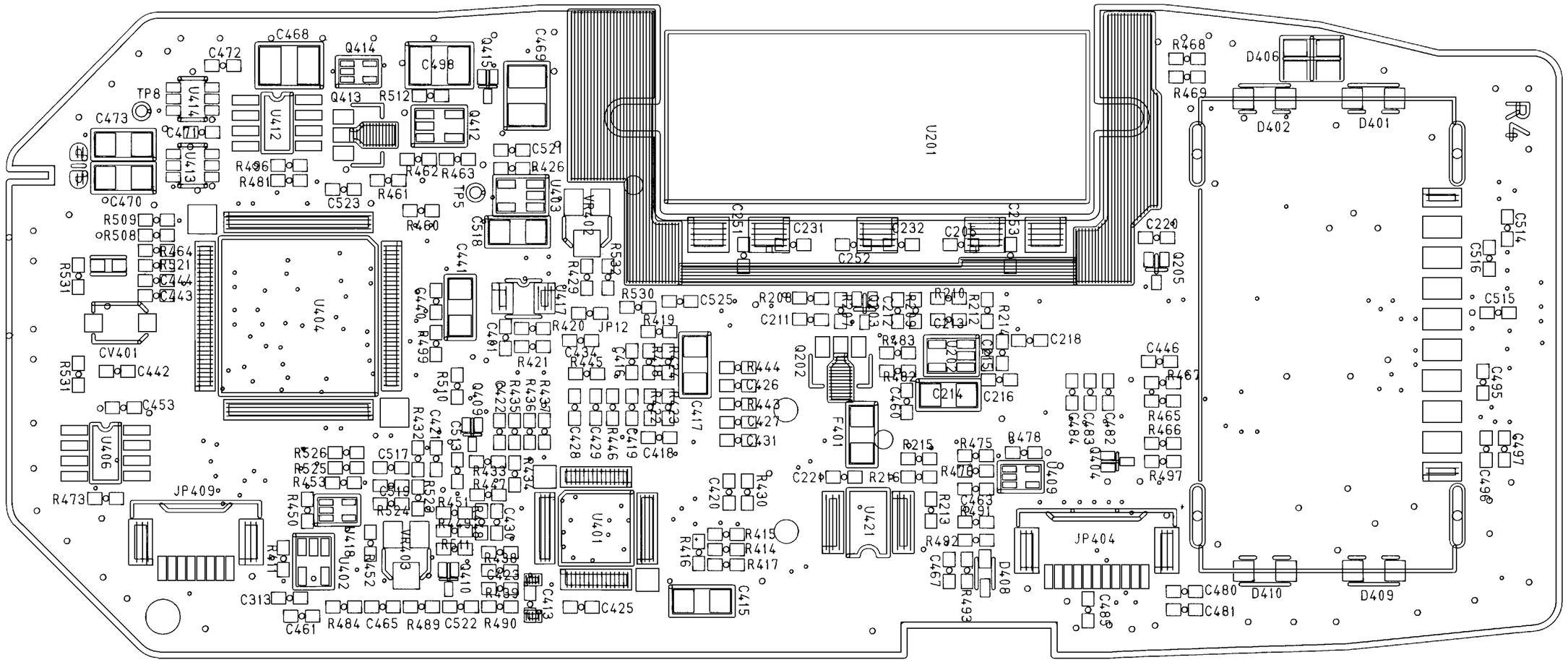
BOTTOM

SUB BOARD



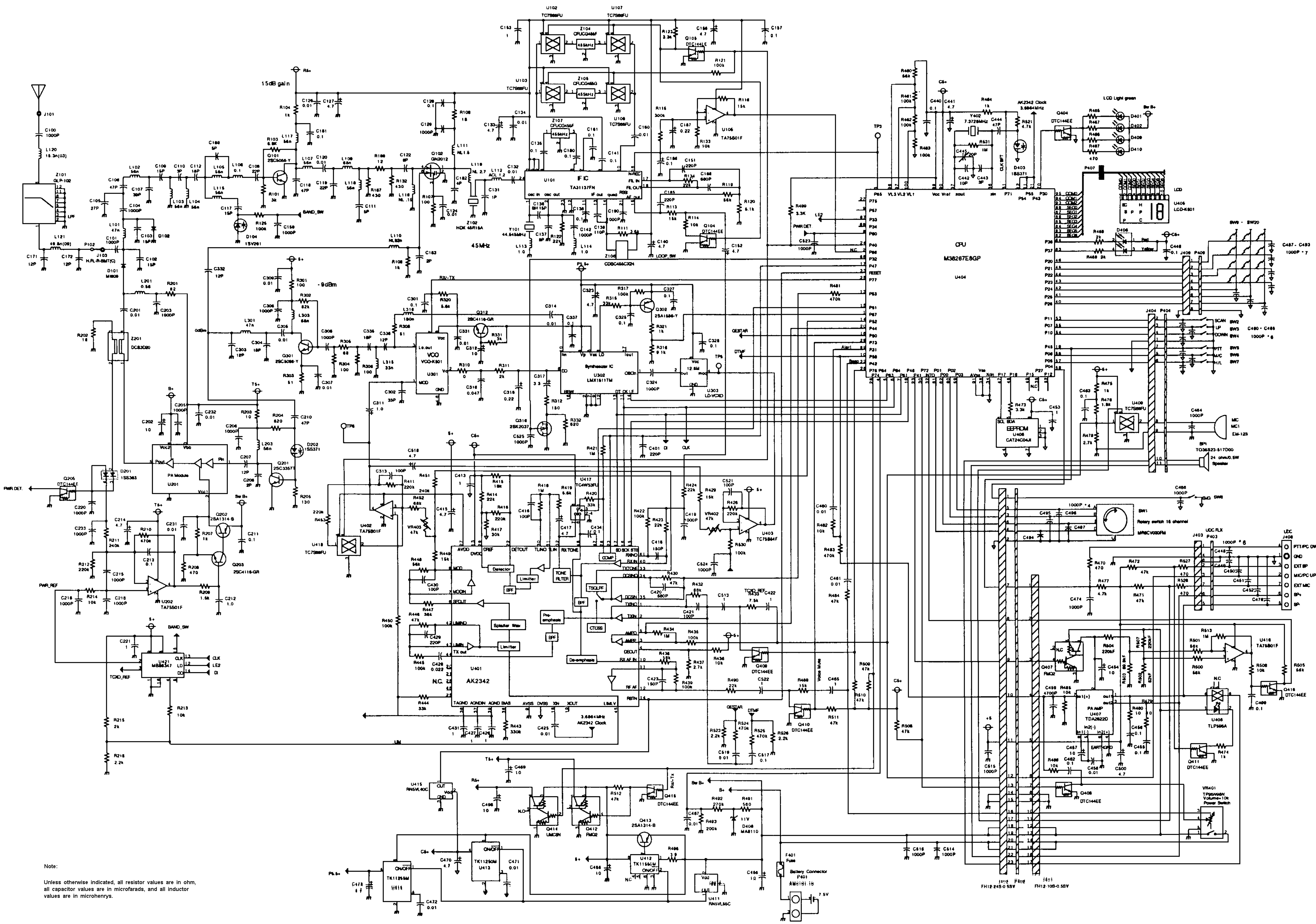
TOP

MAIN BOARD



BOTTOM

MAIN BOARD



Note:

Unless otherwise indicated, all resistor values are in ohm, all capacitor values are in microfarads, and all inductor values are in microhenrys.

VHF

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