

HEADLINE

HL-1200 Series SERVICE MANUAL



TecNet International Inc.
11535 West 83rd Terrace ▪ Lenexa, Kansas ▪ 66214
Telephone: 913-859-9515 ▪ Fax: 913-859-9550
Website: www.tecnetusa.com ▪ Email: tecnet@tecnetusa.com

HEADLINE

TABLE OF CONTENTS

TECHNICAL SPECIFICATIONS	3
A. GENERAL	3
B. TRANSMITTER	3
C. RECEIVER	3
INTRODUCTION	4
DESCRIPTION OF UNIT	4
THEORY OF OPERATION	5
A. INTRODUCTION	5
B. CIRCUIT DESCRIPTIONS	6
ALIGNMENT PROCEDURE	8
A. MEASUREMENT CONDITION	8
B. TEST EQUIPMENT / TOOLS REQUIRED	8
C. DISSASSEMBLING THE UNIT	9
D. BEFORE YOU BEGIN	9
E. TRANSMITTER ADJUSTMENTS	9
F. RECEIVER SQUELCH ADJUSTMENTS (TUNE MODE)	10
G. ALIGNMENT POINTS DIAGRAM	11
HL-1210 VOLTAGE CHART	12
HL-1220 VOLTAGE CHART	22
EXPLODED VIEW	32
EXPLODED VIEW PART LIST	33
HL-1210 ELECTRICAL PARTS	34
HL-1220 ELECTRICAL PARTS	39
PCB LAYOUTS FOR HL1210	44
PCB LAYOUTS FOR HL1220	48
BLOCK DIAGRAM	52
SCHEMATICS	53

HEADLINE

TECHNICAL SPECIFICATIONS

Model Number: HL-1200 Series

A. GENERAL

- 1) Frequency Range: VHF 136MHz ~ 174MHz, UHF 450MHz ~ 490MHz
- 2) Modulation Type: 8.5KOF3E (FM)
- 3) Channel capacity: 199 channels
- 4) Channel spacing: 12.5 KHz
- 5) Power Supply: DC 7.5V, Ni-Mh or Li-ion(Optional) Rechargeable Pack
- 6) Current Drain: High Transmitter (2W) -- < 1.8A (Ni-Mh or Li-ion(Optional) Rechargeable Pack)
Low Transmitter (1W) --- < 1.4A (Ni-Mh or Li-ion(Optional) Rechargeable Pack)
Receiver (1.0W) ----- < 200mA
- 7) Battery Life: 10/14 hrs (Ni-Mh, 1350 mA, Rechargeable Pack)
(at 5%-5%-90% transmit-receive-standby cycles)
- 8) Operating Temperature: -30°C to + 60°C
- 9) Dimension: 105(H) x 50(W) x 35(D) mm, Ni-Mh / 105(H) x 50(W) x 30(D) mm, Li-ion
- 10) Weight (W/Batteries): 290g (1350mAh, Ni-Mh) / 232g (1700mAh, Li-ion)

B. TRANSMITTER

- 1) Power Output: High (2W), Low (1W)
- 2) Frequency Stability: Better than +/- 5ppm within operating temperature
- 3) Hum & Harmonic: -40dB (with 300Hz to 3KHz audio filter)
- 4) Spurious & Harmonics: -65dBc
- 5) Audio Distortion: Less than 5% (1KHz tone 6 0% modulation)
- 6) Audio Response @6dB/oct: +1 /- 3dB (pre-emphasized)

C. RECEIVER

- 1) Sensitivity (12dB SINAD) : 0.25uV (-119dBm SINAD)
- 2) Selectivity : -65dB
- 3) Inter-modulation: -65dB
- 4) Spurious and image rejection: -70dB
- 5) Maximum Audio Output: More than 1W (15% distortion)
- 6) Audio Distortion: less than 5%

HEADLINE

INTRODUCTION

HL Series is a micro size FM transceiver operating between 136~174MHz, and 450~490MHz. With an output power of 2 Watts, the radio is capable of communicating up to 5 miles.

Like other TecNet quality products, HL Series carries a 24 months limited warranty. Please call our technical or customer service representatives at (913) 859-9515 when you need help, or visit us on the Web at www.tecnetusa.com or E-mail us at tecnet@tecnetusa.com.

DESCRIPTION OF UNIT



HEADLINE

A. On /off Switch and Volume Control

Turn the transceiver on by rotating the switch clockwise past the detent. Volume is increased by rotating the control further clockwise.

B. Channel Select Button

Select the desired channel by pressing either the Up or Down button. Pressing and holding a button for more than 1 second makes the channel selection scroll.

C. Speaker

D. Whip Antenna. (^/4)

E. Tx / Rx Indicator LED (3 colors)

Red	On	Transmitting
	Blinking	Low battery
Green	On	Receiving, monitoring
	Blinking	Different sub-tone when receiving
Orange	On	Initializing programming and cloning

F. Accessory and Programming Jack

G. PTT(Push To Talk) Button

Hold down to transmit, release to receive.

H. Function Button

Refer to “OPERATION” page 7.

I. Monitor Button

Press to monitor. Holding down for over 2 seconds keeps monitoring function on, and press shortly again or PTT Button to stop.

J. Internal Microphone

THEORY OF OPERATION

A. INTRODUCTION

HL Series is a micro size 199 channel portable FM transceiver constructed with a microprocessor controlled, temperature compensated Phase Locked Loop (PLL) frequency synthesizer. The radio features a double conversion receiver and a direct FM transmitter modulator. A special integrated circuit provides support to sub-audible signaling (CTCSS & DCS) , 2 /5Tone and most of the receiving parts are switched off periodically in the power save mode to reduce battery current drain during standby.

HEADLINE

B. CIRCUIT DESCRIPTIONS

Phase-Lock Loop (PLL) Circuit

* Reference OSC(VCTCXO)

The reference oscillator consists of X401 with a frequency of 14.4MHz. The reference oscillator frequency is stabilized by temperature and drives a divider to produce a comparison frequency.

This comparison frequency is selected by decoding the first three bits of the data input from the microprocessor.

* Programmable divider

The programmable divider in IC401 consists of a two-modulus prescaler with a 7bit control register followed by an 11-bit internal programmable divider. The overall division ratio is selected by a single 19-bit word located on the serial data bus.

* Phase Comparator

A digital-type phase comparator in IC401 with output (pin 5) and an open drain lock detect output (pin 14) compares divided VCO frequency with the comparison frequency. It generates a correction voltage that is applied to a low-pass filter consisting of R406, C407 and R403, R405, C405, C406 then sent to the VCO circuit.

* VCO Circuit

The transmit/receive frequency is directly generated by the Colpitts oscillation circuit contains Q302, Q303. The oscillation frequency is variable by applying the VCO control voltage to variable capacitors D301, D305(TX) and D311(RX). To switch between the transmit and receive frequencies, Q305, Q306 turn on, and Q302 (VCO for transmission) oscillates when the T/R pin is High.

Transmitter

* MIC AMP Circuit

Voice signal from the microphone are applied to amplifier IC602 through SP_JK JACK1.

IC602 contains a low-pass filter that has a 6dB/oct response between 300Hz and 3 kHz and eliminates harmonics above 3 kHz. The pre-emphasized audio signal is applied to VR301 from IC606 pin 23 to adjust maximum frequency deviation.

* VCO AND Amplifier

The VCO signal output is amplified by Q301 and then fed to power module Q201 from Q205, Q203, Q202

HEADLINE

* TX Power Amplifier Circuit

Q201 is provided approximately 7.5V DC power source.

RF power output is adjusted by D/A converter IC803.

Signals from Q201 are supplied through antenna switch D101 to a low-pass filter made up of L101~L103 and C101-C107, then applied to Antenna Connector.

Receiver

* ANT Switching Circuit

Signals from antenna connector are fed to the antenna switching circuit through the low pass filter consisting of L101~L103, L105 and C101-C107. In receive mode, D101 is turned off, isolates the antenna from the transmitter circuit and matching circuitry, so that the incoming signals are fed to the front-end through L105.

* Front-end Amplifier Circuit

The signals from the switching circuit are fed to the RF amplifier Q101 through a band pass filter made up of molded coil, varactor diode and capacitor.

* First Mixer Circuit

The amplified signals are fed to Gate 1 of the first mixer Q105 through C128.

First local oscillator signal is supplied to Gate 2 of Q105 from the VCO through C128 to convert the RF signals into 43.655MHz first IF signal.

* IF Circuit

The first IF signals from Q105 are fed to the matched pair crystal filter XF1, then IF signals are amplified in Q103. And those signals are fed to U1 which is composed of the second local oscillator, second mixer, limiter amplifier, quadrature detector and active filter circuit. The second local oscillator at 43.2MHz with X401 and is fed to the second mixer with the first IF signals to convert into 455kHz second IF signals.

The second IF signals leave through pin 3, and are fed to external ceramic filters F101 which has excellent selectivity, then fed to U101 (pin 5) again to be amplified and detected. The detected AF signals are output from pin 9.

Audio and Squelch Circuit

The detected audio signals are put through a 6dB/oct de-emphasis circuit made up of C162 and R153. The signal is then applied to audio power amplifier IC603 through audio signal processor IC606 (Out pin 16 through pin 14) and the volume control SW601 to obtain enough power to drive the speaker.

HEADLINE

Part of the recovered noise signal is fed to the integrated operational amplifier inside U1, which, with AMP (Q110), R147,C165,C166 makes up an low pass filter . The Audio signal processor reaches the integrated DC amplifier in Q110 which has hysteresis to prevent jitter. The sensitivity of squelch is adjusted by A/D of IC801.

ALIGNMENT PROCEDURE

A. MEASUREMENT CONDITION

The following sections describes the alignment procedure for HL Series LMR transceiver under the following reference environment conditions:

Temperature: 25°C

Relative Humidity: 65%

Power Supply Voltage: 7.5VDC +/- 5%

B. TEST EQUIPMENT / TOOLS REQUIRED

The following list of equipment is recommended for use in setting up the radio properly. Please ensure the test equipment are calibrated according to the manufacturer's instructions:

Frequency counter more than 400MHz +/-100Hz tolerance, high input impedance and high sensitivity

FM Signal generator, 1GHz with adjustable frequency, FM deviation, and RF output attenuators. 50Ω Output impedance.

Oscilloscope, high input impedance.

16Ω 1 Watt resistor as loudspeaker load

Audio Signal Generator, 10Hz to 20KHz, 600Ω impedance with attenuators.

RF Watt meter, with 50Ω 10 Watt termination resistor (Or RF Voltmeter with 50Ω termination and external 50Ω attenuators)

Regulated Power Supply 7.5VDC 3A output

Digital A-V-O Multi-meter

SINAD Meter

External Speaker Mic. plug (or special audio test jig)

Interconnection test cable for RF and Control PCB

Circuit Diagram for HL Series

PCB layout diagram for HL Series

Tuning tools for RF/IF transformer and the VR potentiometers

HEADLINE

C. DISSASSEMBLING THE UNIT

1. Remove the antenna.
2. Remove the battery by pressing down on both locking tabs while pulling away from the radio.
3. Remove the volume knob by pulling it off.
4. Remove the accessory dust cover.
5. Remove the 2 screws on the back cover.
6. Remove the radio from the front cover by gently tapping the bottom of the radio on a table top. The unit should be held at a 45 degree angle.
7. Unplug the speaker wiring harness from the main PCB.

D. BEFORE YOU BEGIN

Many of the adjustments are controlled by software and can be accessed by using “Tune Mode”. First set the beeps to “on” by using the function key. To access “Tune Mode” you must power the unit on while holding the (Up+Down+ Function) keys. Release the buttons when all the segments are displayed. The display should now read, [001F-xx]. Each alignment requiring “Tune Mode” will be designated. In most instances it is best to program a channel for carrier squelch and no tones on transmit, unless otherwise noted.

E. TRANSMITTER ADJUSTMENTS

Model : HL1210, HL1220

Crystal frequency

On receiving mode, check Crystal output is at 14.4MHz

Transmitter Frequency

Connect RF Power meter to ANT1, Activate PTT to transmit on

173.975MHz(HL1210/HL1250), 469.975MHz(HL1250), 489.975MHz(HL1220). Adjust VR401 for +/- 200Hz frequency error.

Transmitter Output Power (Tune mode)

Connect a Watt meter to the radio.

Press the function button “” until [001P-xx] is displayed. Whereas, 001 is the Ch. Number and “P” means RF Power. This is the adjustment menu for low power on channel 1.

Press PTT and then use the “up/down” keys to tune.

Once tuned, press the monitor button to save the setting.

Next press the function button “” to set the high power. Note: the “H” icon should be on while the display still reads [001P-xx].

Press PTT and using the “up/down” keys tune for high power.

Press monitor to save the setting.

Turn the unit off then back on for final testing.

HEADLINE

Transmitter Sub-Audible Tone Deviation

Set radio to transmit on Carrier frequency, with CDCSS code 023 and no audio modulation. Adjust RV601 for 0.45KHz deviation.

Transmitter Deviation Limit

Set radio to transmit on Carrier frequency. At the external microphone input, inject 1KHz tone at -20dBm. Adjust RV301 for 2.0KHz deviation.

Receiver Circuit Adjustment

FM Demodulator Adjustment (Tune Mode)

Connect the RF Signal Generator to ANT1, Set generator to frequency at -47dBm (50Ω) output with 1KHz tone modulation at 1.5KHz deviation. In Tune Mode go to [001F-xx]. Use the “up/down” buttons to create a uniform sine wave with the least amount of distortion. Press monitor to save the setting.

F. RECEIVER SQUELCH ADJUSTMENTS (TUNE MODE)

Connect an RF generator and set it to the receive frequency of channel 1, or the channel from which you went into tune mode.

Press the function button “” until [001S-xx] and the “H” icon are displayed. Whereas, 001 is the Ch. Number and “S” means Squelch. This is the adjustment menu for squelch threshold.

Generate from the service monitor and check the squelch open point. Press the “up/down” keys to tune. The lower the number, the tighter the squelch becomes. Typical squelch threshold is from 9 – 12dB Sinad or around 0.25uV.

Once tuned, press the monitor button to save the setting.

Next press the function button “” until the display shows [001S-xx] and no “H” icon. This is the squelch close point.

Reduce the signal generator from squelch threshold about 2-3dB. Press the “up/down” keys to tune. Tune until the radio audio mutes.

Press monitor to save the setting.

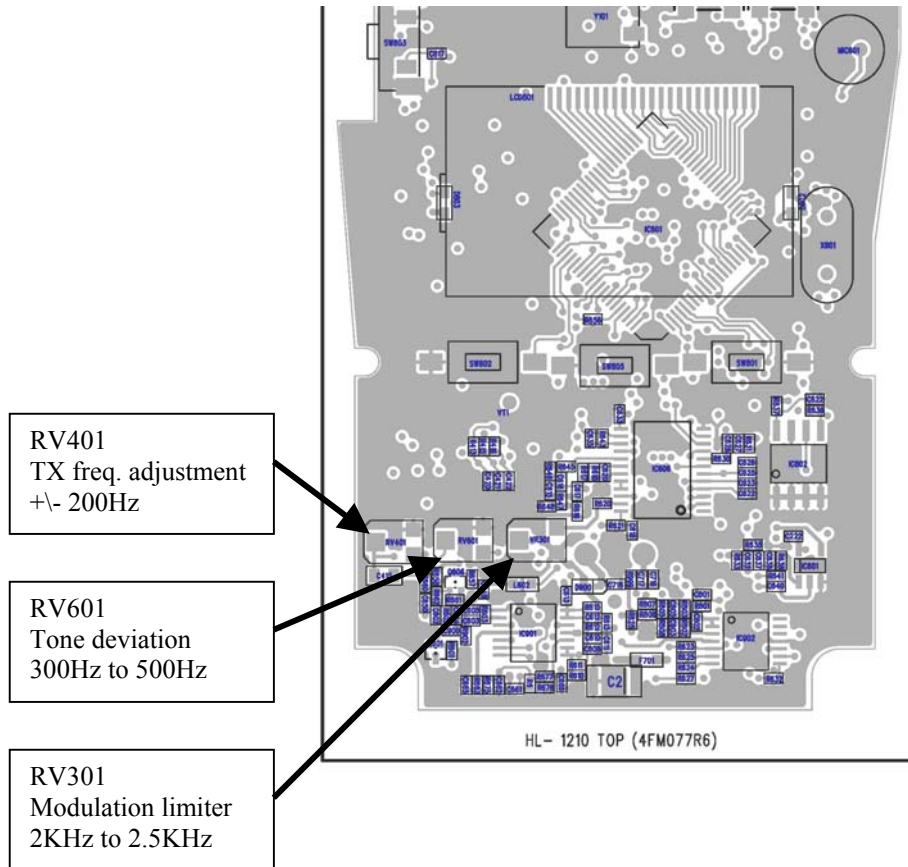
Turn the unit off then back on for final testing.

At tune mode

- The “001 F – A0” means 1ch, Front-end (RX sens.), A0 hex Value(Up/Down)
- The “001 S – 00” means 1ch, Squelch(Close), 00 hex Value(Up/Down)
- The “001 S – 00 , H ” means 1ch, Opening Squelch, 00 hex Value(Up/Down)
- The “001 P – 60 ” means 1ch, RF Low Power, 60 hex Value(Up/Down)
- The “001 S – 88 , H” means 1ch, RF High Power, 88 hex Value(Up/Down)
- Channel change Method:  key + Up key or  key + Down key

HEADLINE

G. ALIGNMENT POINTS DIAGRAM



HEADLINE

HL-1210 VOLTAGE CHART

PART NAME	PIN NUMBER	RX	TX
2SC5006 (Q101)	1.EMITTER	0	0
	2.BASE	0.8 V	0
	3.COLLECTOR	4 V	0
2SC5006 (Q102)	1.EMITTER	1 V	0
	2.BASE	1.5 V	0
	3.COLLECTOR	3.5 V	0
2SC5006 (Q105)	1.EMITTER	0	0
	2.BASE	0.6 V	0
	3.COLLECTOR	1.8 V	0
3SK240 (Q103)	1.GATE1	0	0
	2.GATE2	0	0
	3.DRAIN	4.6 V	0
	4.SOURCE	0.8 V	0
KRC404E (Q108)	1.EMITTER	0	0
	2.BASE	5 V	5 V
	3.COLLECTOR	0	0
KTC4075E (Q110)	1.EMITTER	0	0
	2.BASE	0.8 V	0
	3.COLLECTOR	4 V	0
KRC404E (Q112)	1.EMITTER	0	0
	2.BASE	0	0
	3.COLLECTOR	4 V	0
2SK3079A (Q201)	1.GATE	0	1.2 V
	2.DRAIN	7.4 V	7 V
	3.SOURCE	0	0
2SK4226-R24 (Q300)	1.EMITTER	0	0
	2.BASE	0	0
	3.COLLECTOR	0	3 V

HEADLINE

PART NAME	PIN NUMBER	RX	TX
2SC5006 (Q205)	1.EMITTER	0	0
	2.BASE	0	0.6 V
	3.COLLECTOR	0	3.4 V
2SC5006 (Q301)	1.EMITTER	0	0
	2.BASE	0.6 V	0.6 V
	3.COLLECTOR	3.8 V	3.6 V
2SC5006 (Q302)	1.EMITTER	0.8 V	0
	2.BASE	1.4 V	0
	3.COLLECTOR	4 V	4 V
2SC5006 (Q303)	1.EMITTER	0	0.6
	2.BASE	0	1.2 V
	3.COLLECTOR	5 V	5 V
KRC404E (Q305)	1.EMITTER	0	0
	2.BASE	0	2.8 V
	3.COLLECTOR	3.2 V	0
KRC404E (Q306)	1.EMITTER	0	0
	2.BASE	2 V	0
	3.COLLECTOR	0	2.8 V
KRC404E (Q502)	1.EMITTER	0	0
	2.BASE	2 V	0
	3.COLLECTOR	0	1.2 V
KRC404E (Q601)	1.EMITTER	0	0
	2.BASE	4.8 V	4.8 V
	3.COLLECTOR	0	0
KRA307E (Q602)	1.EMITTER	5 V	5 V
	2.BASE	5 V	5 V
	3.COLLECTOR	0	2 V
KRC404E (Q603)	1.EMITTER	0	0
	2.BASE	0	0
	3.COLLECTOR	5 V	0

HEADLINE

PART NAME	PIN NUMBER	RX	TX
KRA301E (Q605)	1.EMITTER	5 V	5 V
	2.BASE	5 V	5 V
	3.COLLECTOR	0	0
KTC4075E (Q606)	1.EMITTER	0	0
	2.BASE	0.5 V	0.5 V
	3.COLLECTOR	0	0
KRA226S (Q607)	1.EMITTER	8 V	8 V
	2.BASE	8 V	0
	3.COLLECTOR	0.4 V	8 V
KRC404E (Q608)	1.EMITTER	0	0
	2.BASE	0	5 V
	3.COLLECTOR	8 V	0
KRA305E (Q701)	1.EMITTER	5 V	5 V
	2.BASE	5 V	0
	3.COLLECTOR	0	3.6 V
KRA305E (Q702)	1.EMITTER	5 V	5 V
	2.BASE	0	5 V
	3.COLLECTOR	5 V	0
KRA305E (Q703)	1.EMITTER	5 V	5 V
	2.BASE	5 V	0
	3.COLLECTOR	0	5 V
KRA301E (Q801)	1.EMITTER	0	0
	2.BASE	6 V	5.8 V
	3.COLLECTOR	6 V	5.8 V
KRA301E (Q802)	1.EMITTER	6.6 V	1.6 V
	2.BASE	6.6 V	0
	3.COLLECTOR	0	0
KRA301E (Q803)	1.EMITTER	6.4 V	6.2 V
	2.BASE	6.4 V	6.2 V
	3.COLLECTOR	0	0

HEADLINE

PART NAME	PIN NUMBER	RX	TX
HD64738024W (IC801)	1	5V	4.98V
	2	1.6Mv	1.6mV
	3	5.25V	5.25V
	4	4.96V	4.96V
	5	4.96V	4.94V
	6	0	0
	7	1.4V	1.4V
	8	0	0
HD64738024W (IC801)	9	2.1V	2.1V
	10	2.0V	2.0V
	11	0	0
	12	3.4V	3.4V
	13	2.4V	2.4V
	14	2.4V	2.4V
	15	2.4V	2.4V
	16	2.4V	2.4V
	17	2.4V	2.4V
	18	2.4V	2.4V
	19	2.4V	2.4V
	20	2.4V	2.4V
	21	2.4V	2.4V
	22	2.4V	2.4V
	23	2.4V	2.4V
	24	2.4V	2.4V
	25	2.4V	2.4V
	26	2.4V	2.4V
	27	2.4V	2.4V
	28	2.4V	2.4V
	29	2.4V	2.4V
	30	2.4V	2.4V
	31	2.4V	2.4V

HEADLINE

	PIN NUMBER	RX	TX
	32	2.4V	2.4V
	33	4.96V	4.96V
	34	4.94V	4.82V
	35	4.97V	4.94V
	36	4.94V	1.7mV
	37	4.93V	4.96V
	38	4	4.93V
	39	4.93V	4.91V
	40	4.91V	4.88V
	41	34.8mV	34.8mV
	42	1.1mV	1.8mV
	43	1.1mV	1.8mV
	44	1.1mV	1.8mV
	45	2.4V	2.4V
	46	2.4V	2.4V
	47	2.4V	2.4V
	48	2.4V	2.4V
	49	1.6V	1.6
	50	3.2V	3.2V
	51	4.97V	4.97V
	52	4.98V	4.96V
	53	0	0
	54	2.4mV	5.9V
	55	6.24V	3.8Mv
	56	6V	6V
	57	13.7mV	4.97V
	58	4.99V	15.6mV
		5.4V	17.2Mv
HD64738024W (IC801)	60	1.4V	0.5V
	61	4.97V	4.96V
	62	4.96V	4.93V

HEADLINE

	PIN NUMBER	RX	TX
	63	4.96V	3.5mV
	64	4.96V	4.94V
	65	4.96V	4.96V
	66	4.96V	4.96V
	67	4.96V	90mV
	68	4.97V	4.96V
	69	4.97V	4.97V
	70	4.99V	4.98V
	71	4.97V	4.97V
	72	4.98V	4.98V
	73	3.7V	1.0V
	74	250mV	0
	75	0.5V	0.3mV
	76	1.1V	1.1V
	77	-	-
	78	4.9V	4.9V
	79	-	-
		5V	23.8mV
FX828D5 (IC606)	1	4 V	4 V
	2	3.4 V	3.4 V
	3	5 V	5 V
	4	5 V	5 V
	5	5 V	5 V
	6	5 V	5 V
	7	5 V	5 V
	8	5 V	5 V
	9	0	0
	10	2.2 V	2.2 V
	11	2 V	2 V
	12	0	0
	13	2.2 V	2.2 V

HEADLINE

	PIN NUMBER	RX	TX
	14	2.2 V	2.2 V
	15	2.2 V	2.2 V
	16	2 V	2 V
	17	0.4 V	0.4 V
	18	2.2 V	2.2 V
	19	2.2 V	2.2 V
	20	2.2 V	2.2 V
	21	2.2 V	2.2 V
	22	2.2 V	2.2 V
	23	2.2 V	2.2 V
		5 V	5 V
NJM2902 (IC901)	1	0	2 V
	2	0	2 V
	3	0	2 V
	4	5 V	5 V
	5	0	2 V
	6	0	2 V
NJM2902 (IC901)	7	0	2 V
	8	0.8 V	2 V
	9	0.8 V	2 V
	10	0.8 V	2 V
	11	0	0
	12	0.8 V	2 V
	13	0.8 V	2 V
	14	0.8 V	2 V
NJM2902 (IC902)	1	2.4 V	2.2 V
	2	2.4 V	2.2 V
	3	2.4 V	2.2 V
	4	5 V	5 V
	5	2.4 V	2.2 V
	6	2.4 V	2.2 V

HEADLINE

	PIN NUMBER	RX	TX
	7	2.4 V	2.2 V
	8	2.4 V	2.2 V
	9	2.4 V	2.2 V
	10	2.4 V	2.2 V
	11	0	0
	12	0.4 V	0.4 V
	13	0.4 V	0.4 V
		4 V	4 V
TA31136FN (IC101)	1	5 V	291mV
	2	4.5 V	253mV
	3	3.5 V	216mV
	4	5 V	291mV
	5	4.5 V	291mV
	6	4.5 V	291mV
	7	0.8 V	0
	8	0.6 V	0
	9	2V	0.6 V
	10	5V	0.4V
	11	4 V	0
	12	1.2 V	0
	13	0.4V	0.4V
	14	1.4 V	0
	15	0	0
	16	1 V	0
TA75W01FU (IC501)	1	0	0.2 V
	2	5.4 V	5.4 V
	3	5.4 V	5 V
	4	0	0
	5	0	0.2 V
	6	0	0.2 V
	7	0	1.4 V

HEADLINE

	PIN NUMBER	RX	TX
		8 V	8 V
M62334FP (IC803)	1	0	0
	2	2.2 V	0
	3	0	0
	4	0	0
	5	0	0
M62334FP (IC803)	6	5 V	5 V
	7	5 V	5 V
	8	5V	5 V
AT23AC32A (IC802)	1	0	0
	2	0	0
	3	0	0
	4	0	0
	5	5 V	5 V
	6	5 V	5 V
	7	0	0
	8	5V	5V
TAD7233D (IC603)	1	0	0
	2	0	0
	3	0	0
	4	0.4 V	7.2 V
	5	1 V	3.6 V
	6	0.2 V	1.4 V
	7	1 V	0.6 V
	8	0	0
MB15E03SL (IC401)	1	2.2 V	1.6 V
	2	2.4 V	2.4 V
	3	5 V	5 V
	4	4 V	4 V
	5	1.6 V	2 V
	6	0	0

HEADLINE

	PIN NUMBER	RX	TX
	7	3.4V	3 V
	8	3.2V	3 V
	9	0	0
	10	0	0
	11	0	0
	12	4.8 V	4.8 V
	13	4 V	4 V
	14	4 V	4 V
	15	0	0
		0	0
TC4S66F (IC601)	1	5 V	5 V
	2	5 V	5 V
	3	0	0
	4	0.4 V	3 V
	5	5 V	5 V

HEADLINE

HL-1220 VOLTAGE CHART

PART NAME	PIN NUMBER	RX	TX
2SC5006 (Q101)	1.EMITTER	0	0
	2.BASE	0.8 V	0
	3.COLLECTOR	3 V	0
2SC5006 (Q102)	1.EMITTER	0	0
	2.BASE	0.6 V	0
	3.COLLECTOR	3.5 V	0
2SC5006 (Q103)	1.EMITTER	0	0
	2.BASE	0.6 V	0
	3.COLLECTOR	2 V	0
3SK240 (Q105)	1.GATE1	0	0
	2.GATE2	0	0
	3.DRAIN	4.6 V	0
	4.SOURCE	0.6 V	0
KTC4075E (Q110)	1.EMITTER	0	0
	2.BASE	0.8 V	0
	3.COLLECTOR	4 V	0
2SK3079A (Q201)	1.GATE	0	1.2 V
	2.DRAIN	8 V	7.5 V
	3.SOURCE	0	0
2SK4226-R24 (Q203)	1.EMITTER	0	0
	2.BASE	0	0.4 V
	3.COLLECTOR	0	4 V
2SC5006 (Q205)	1.EMITTER	0	0
	2.BASE	0	0.8 V
	3.COLLECTOR	0	4 V
2SC5006 (Q301)	1.EMITTER	0	0
	2.BASE	0.6 V	0.6 V
	3.COLLECTOR	5 V	5 V

HEADLINE

PART NAME	PIN NUMBER	RX	TX
2SC5006 (Q302)	1.EMITTER	0	0.6 V
	2.BASE	0	1.2 V
	3.COLLECTOR	4.5 V	4.5 V
2SC5006 (Q303)	1.EMITTER	0.6 V	0
	2.BASE	1.2 V	0
	3.COLLECTOR	4.4 V	4.5 V
KRC404E (Q305)	1.EMITTER	0	0
	2.BASE	0	2.6 V
	3.COLLECTOR	3 V	0
KRC404E (Q306)	1.EMITTER	0	0
	2.BASE	2 V	0
	3.COLLECTOR	0	2.6 V
KRC404E (Q502)	1.EMITTER	0	0
	2.BASE	2 V	0
	3.COLLECTOR	0	1.4 V
KRC404E (Q601)	1.EMITTER	0	0
	2.BASE	5 V	5 V
	3.COLLECTOR	0	0
KRA307E (Q602)	1.EMITTER	5 V	5 V
	2.BASE	5 V	5 V
	3.COLLECTOR	0.2 V	3 V
KRC404E (Q603)	1.EMITTER	0	0
	2.BASE	0	0
	3.COLLECTOR	5 V	0
KRA301E (Q605)	1.EMITTER	5 V	5 V
	2.BASE	5 V	5 V
	3.COLLECTOR	0	0
KTC4075E (Q606)	1.EMITTER	0	0
	2.BASE	0.5 V	0.5 V
	3.COLLECTOR	0.2 V	0.2 V

HEADLINE

PART NAME	PIN NUMBER	RX	TX
KRA226S (Q607)	1.EMITTER	8 V	8 V
	2.BASE	8 V	0
	3.COLLECTOR	0.4 V	8 V
KRC404E (Q608)	1.EMITTER	0	0
	2.BASE	0	5 V
	3.COLLECTOR	8 V	0
KRA305E (Q701)	1.EMITTER	5 V	5 V
	2.BASE	5 V	0
	3.COLLECTOR	0	4.5 V
KRA305E (Q702)	1.EMITTER	5 V	5 V
	2.BASE	0	5 V
	3.COLLECTOR	5 V	0
KRA305E (Q703)	1.EMITTER	5 V	5 V
	2.BASE	5 V	0
	3.COLLECTOR	0	5 V
KRA301E (Q801)	1.EMITTER	6.6 V	6.4 V
	2.BASE	6.6 V	6.4 V
	3.COLLECTOR	0	0
KRA301E (Q802)	1.EMITTER	6.6 V	1.6 V
	2.BASE	6.6 V	0
	3.COLLECTOR	0	0
KRA301E (Q803)	1.EMITTER	4 V	6.2 V
	2.BASE	6.4 V	6.2 V
	3.COLLECTOR	0	0
HD64738024W (IC801)	1	5V	4.98V
	2	1.6Mv	1.6mV
	3	5.25V	5.25V
	4	4.96V	4.96V
	5	4.96V	4.94V
	6	0	0
	7	1.4V	1.4V

HEADLINE

	PIN NUMBER	RX	TX
	8	0	0
	9	2.1V	2.1V
	10	2.0V	2.0V
	11	0	0
	12	3.4V	3.4V
	13	2.4V	2.4V
	14	2.4V	2.4V
		2.4V	2.4V
HD64738024W (IC801)	16	2.4V	2.4V
	17	2.4V	2.4V
	18	2.4V	2.4V
	19	2.4V	2.4V
	20	2.4V	2.4V
	21	2.4V	2.4V
	22	2.4V	2.4V
	23	2.4V	2.4V
	24	2.4V	2.4V
	25	2.4V	2.4V
	26	2.4V	2.4V
	27	2.4V	2.4V
	28	2.4V	2.4V
	29	2.4V	2.4V
	30	2.4V	2.4V
	31	2.4V	2.4V
	32	2.4V	2.4V
	33	4.96V	4.96V
	34	4.94V	4.82V
	35	4.97V	4.94V
	36	4.94V	1.7mV
	37	4.93V	4.96V
	38	4	4.93V

HEADLINE

	PIN NUMBER	RX	TX
	39	4.93V	4.91V
	40	4.91V	4.88V
	41	34.8mV	34.8mV
	42	1.1mV	1.8mV
	43	1.1mV	1.8mV
	44	1.1mV	1.8mV
	45	2.4V	2.4V
	46	2.4V	2.4V
	47	2.4V	2.4V
	48	2.4V	2.4V
	49	1.6V	1.6
	50	3.2V	3.2V
	51	4.97V	4.97V
	52	4.98V	4.96V
	53	0	0
	54	2.4mV	5.9V
	55	6.24V	3.8Mv
	56	6V	6V
	57	13.7mV	4.97V
	58	4.99V	15.6mV
	59	5.4V	17.2Mv
	60	1.4V	0.5V
	61	4.97V	4.96V
	62	4.96V	4.93V
	63	4.96V	3.5mV
	64	4.96V	4.94V
	65	4.96V	4.96V
		4.96V	4.96V
HD64738024W (IC801)	67	4.96V	90mV
	68	4.97V	4.96V
	69	4.97V	4.97V

HEADLINE

	PIN NUMBER	RX	TX
	70	4.99V	4.98V
	71	4.97V	4.97V
	72	4.98V	4.98V
	73	3.7V	1.0V
	74	250mV	0
	75	0.5V	0.3mV
	76	1.1V	1.1V
	77	-	-
	78	4.9V	4.9V
	79	-	-
		5V	23.8mV
FX828D5 (U606)	1	4 V	4 V
	2	3.4 V	3.4 V
	3	5 V	5 V
	4	5 V	5 V
	5	5 V	5 V
	6	5 V	5 V
	7	5 V	5 V
	8	5 V	5 V
	9	0	0
	10	2.2 V	2.2 V
	11	2 V	2 V
	12	0	0
	13	2.2 V	2.2 V
	14	2.2 V	2.2 V
	15	2.2 V	2.2 V
	16	2 V	2 V
	17	0.4 V	0.4 V
	18	2.2 V	2.2 V
	19	2.2 V	2.2 V
	20	2.2 V	2.2 V

HEADLINE

	PIN NUMBER	RX	TX
	21	2.2 V	2.2 V
	22	2.2 V	2.2 V
	23	2.2 V	2.2 V
		5 V	5 V
NJM2902 (IC602)	1	0	2 V
	2	0	2 V
	3	0	2 V
	4	5 V	5 V
	5	0	2 V
	6	0	2 V
	7	0	2 V
	8	0.8 V	2 V
	9	0.8 V	2 V
	10	0.8 V	2 V
	11	0	0
	12	0.8 V	2 V
	13	0.8 V	2 V
	14	0.8 V	2 V
NJM2902 (IC605)	1	2.2 V	2.2 V
	2	2.2 V	2.2 V
	3	2.2 V	2.2 V
	4	5 V	5 V
	5	2.2 V	2.2 V
	6	2.2 V	2.2 V
	7	2.2 V	2.2 V
	8	2.2 V	2.2 V
	9	2.2 V	2.2 V
	10	2.2 V	2.2 V
	11	0	0
	12	0.2 V	0.4 V
	13	0.2 V	0.4 V

HEADLINE

	PIN NUMBER	RX	TX
		4 V	4 V
TA31136FN (IC101)	1	5 V	291mV
	2	4.5 V	253mV
	3	3.5 V	216mV
	4	5 V	291mV
	5	4.5 V	291mV
	6	4.5 V	291mV
	7	0.8 V	0
	8	0.6 V	0
	9	1.8 V	0
	10	5V	0.4V
	11	4 V	0
	12	1 V	0
	13	0.4V	0.4V
	14	1.2 V	0
	15	0	0
	16	1 V	0
TA75W01FU (IC501)	1	0	0.2 V
	2	5.4 V	5.4 V
	3	5.4 V	5 V
	4	0	0
	5	0	0.2 V
	6	0	0.2 V
	7	0	1.4 V
	8	8 V	8 V
M62334FP (IC803)	1	0	0
	2	2.2 V	0
	3	0	0
	4	0	0
	5	0	0
	6	5 V	5 V

HEADLINE

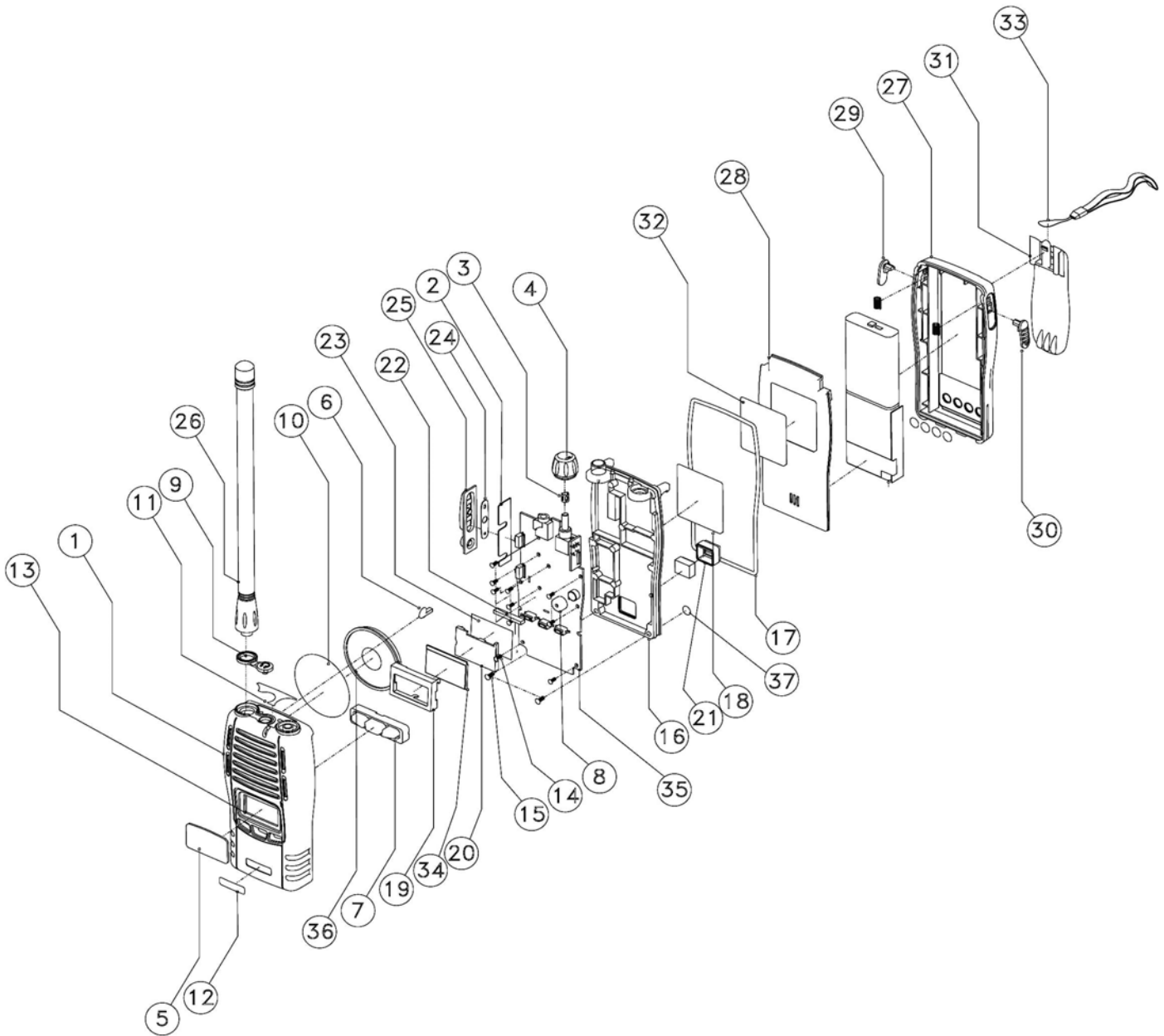
	PIN NUMBER	RX	TX
	7	5 V	5 V
		5V	5 V
AT23AC32A (IC802)	1	0	0
	2	0	0
	3	0	0
	4	0	0
	5	5 V	5 V
	6	5 V	5 V
	7	0	0
	8	5V	5V
TAD7233D (IC603)	1	0	0
	2	0	0
	3	0	0
	4	0.4 V	7.2 V
	5	1 V	3.6 V
	6	0.2 V	1.2 V
	7	1 V	0.6 V
	8	0	0
MB15E03SL (IC401)	1	2 V	1.6 V
	2	2.4 V	2.4 V
	3	5 V	5 V
	4	4 V	4 V
	5	1.6 V	2 V
	6	0	0
	7	3 V	3 V
	8	3 V	3 V
	9	0	0
	10	0	0
	11	0	0
	12	4.8 V	4.8 V
	13	4 V	4 V

HEADLINE

	PIN NUMBER	RX	TX
	14	4 V	4 V
	15	0	0
		0	0
TC4S66F (IC601)	1	5 V	5 V
	2	5 V	5 V
	3	0	0
	4	0.4 V	3 V
	5	5 V	5 V

HEADLINE

EXPLODED VIEW



HEADLINE

EXPLODED VIEW PART LIST

ASSEMBLIES
LMR-00006-UCA, FRONT COVER ASSEMBLY INCLUDES #1, 5, 6, 10, 11, 12, 13, AND 36
HB-21HB, BATTERY PACK INCLUDES #27, 28, 29, 30, AND 32

REF. #	PART NO.	PART NAME	QTY.
1	SEE ASSEMBLIES	UPPER COVER	1
2	740-00005-AA	PTT PLATE	1
3	780-00020-AA	LOCKING SPRING	1
4	830-00088-AA	VOLUME KNOB	1
5	850-00054-AA	LENS	1
6	860-00030-AA	INDICATOR	1
7	880-00083-AA	KEY PAD	1
80	880-00085-AA	MIC CAP	1
9	880-00116-AA	EAR CAP	1
10	901-00017-AA	FELT SPK	1
11	911-00023-AA	TOP PLATE	1
12	911-00024-AA	FRONT PLATE	1
13	920-00075-AA	DOUBLE SIDE TAPE HOLE	1
14	611-00003-AA	SCREW	10
15	643-00003-AA	SCREW	2
16	700-00005-AB	MAIN FRAME	1
17	881-00036-AA	GASKET MAIN	1
18	990-00450-AB	NAME LABEL	1
19	770-00064-AA	LCD HOUSING	1
20	860-00031-AA	REFLECTOR	1
21	881-00037-AA	GASKET POWER	1
22	882-00021-AA	ZEBRA	1
23	920-00070-AA	WHITE SHEET	1
24	740-00006-AA	PTT INSERT	1
25	880-00082-AA	PTT BUTTON	1
26A	ZAC-450WS-CA	UHF ANTENNA	1
26B	ZAC-222HS-CA	VHF ANTENNA	1
27	SEE ASSEMBLIES	BATT UPPER COVER	1
28	SEE ASSEMBLIES	BATT BOTTOM COVER	1
29	SEE ASSEMBLIES	LOCK BUTTON L	1
30	SEE ASSEMBLIES	LOCK BUTTON R	1
31	870-00031-AA	BELT CLIP	1
32	SEE ASSEMBLIES	BATT NAME LABEL	1
33	902-00003-AA	HAND STRAP	1
34	ALD-10720-SA	LCD	1
35	PFM-00078-AD	MAIN PCB	1
36	ZSP-40AE2-MA	SPEAKER	1
37	990-00313-AA	PASS STICKER	1

HEADLINE

HL-1210 ELECTRICAL PARTS

Part Number	Part Name	Description	Qty.	Reference
ALC-1204W-SA	LED DUAL CHIP	BRBG1204W-TR	1	D805
AMC-1113F-SB	LED LAMP CHIP	UG1113F-TR	2	D802,803
B16-120NJ-TA	COIL CHIP	12nH HK1608-120NJ	1	L117
B16-121NJ-TA	COIL CHIP	120nH HK1608-121NJ	1	L301
B16-181NJ-TA	COIL CHIP	180nH HK1608-181NJ	2	L108,211
B16-221NJ-TA	COIL CHIP	220nH HK1608-221NJ	3	L302,308,L201
B16-270NJ-TA	COIL CHIP	27nH HK1608-270NJ	1	L118
B16-390NJ-TA	COIL CHIP	39nH HK1608-390NJ	1	L206
B16-470NJ-TA	COIL CHIP	47nH HK1608-470NJ	3	L210,L212,L116
BBA-121VS-SA	CHIP BEAD	SBY100505T-121Y-S	1	R901
BBA-320VS-SA	CHIP BEAD	PBY201209T-320Y-S	1	L501
BBA-451VS-SA	CHIP BEAD	SBK160808T-451Y-S	2	L601,602
BSC-3010C-SA	COIL SPRING	E2L 0.3x1.0x3TL	1	L202
BSC-3516F-SA	COIL SPRING	E2L 0.35x1.6x6TL	1	L304
BSC-H020B-SA	COIL SPRING	E2L 0.45x0.7x2TN	1	L203
BSC-H07TB-SA	COIL SPRING	E2L 3.0x1.7x7TL	6	L101,102,103,105,205,307
BWC-560GN-AA	COIL WOUND	0805AS-560G	2	L110,111
BWC-680GN-AA	COIL WOUND	0805AS-680G	2	L106,107
BWC-681JN-AA	COIL WOUND	0805AS-681J	1	L123
BWC-821JN-AA	COIL WOUND	0805AS-821J	3	L120,305,306
BWN-121JN-AA	COIL WOUND	0603AS-121J	1	L113
C10-005HC-MA	CHIP CERAMIC 1005	GRP15551H0R5CZ01E CAP1005	1	C313
C10-010HC-MA	CHIP CERAMIC 1005	GRP15551H1R0CZ01E CAP1005	1	C316
C10-020HC-MA	CHIP CERAMIC 1005	GRP15551H2R0CZ01E CAP1005	3	C116,908,907
C10-040HC-MA	CHIP CERAMIC 1005	GRP15551H4R0CZ01E CAP1005	5	C112,130,325,306,136
C10-050HC-MA	CHIP CERAMIC 1005	GRP15551H5R0CZ01E CAP1005	2	C125,126
C10-060HD-MA	CHIP CERAMIC 1005	GRP15551H6R0DZ01E CAP1005	3	C143,318,158
C10-070HD-MA	CHIP CERAMIC 1005	GRP15551H7R0DZ01E CAP1005	1	C205
C10-080HD-MA	CHIP CERAMIC 1005	GRP15551H8R0DZ01E CAP1005	1	C323 [C10-102HK-MA] C410,200,651,652,658,662,667,R605,C16 1,646
C10-100HJ-MA	CHIP CERAMIC 1005	GRP15551H100JZ01E CAP1005	17	C150,152,206,230 [C10-102HK-MA] C703,705~707,715,717,810,811,815~818, 820,821,146
C10-102HK-MA	CHIP CERAMIC 1005	GRP155R71H102KA01E CAP1005	48	C111,118,120,132,133,153,170,173,178,1 81,201,227,231,236,301,308,311,412,502, 615,645

HEADLINE

Part Number	Part Name	Description	Qty.	Reference
C10-103EK-MA	CHIP CERAMIC 1005	GRP155R71E103KA01E CAP1005	18	C142,148,156,160,162,188,402,416,418,6 13,617,643,656,C657,670,822,801,805
C10-104CZ-MA	CHIP CERAMIC 1005	GRP155F51C104ZA01E CAP1005	27	C123,164,166,167,180,191,222,233,310,4 17,503,508,618,627,630,633,602,661
C10-105CZ-MA	CHIP CERAMIC 1005	GRP155F50J105ZA01E CAP1005	6	C403,640,653,813,660,804 [138-104- C6] C641,650,665,673,701,712,808,812,616
C10-150HJ-MA	CHIP CERAMIC 1005	GRP15551H150JZ01E CAP1005	8	C110,122,303,320,106,R131,C155,185
C10-180HJ-MA	CHIP CERAMIC 1005	GRP15551H180JZ01E CAP1005	3	C101,147,228
C10-182HK-MA	CHIP CERAMIC 1005	GRP155R71H182KA01E CAP1005	1	C175
C10-220HJ-MA	CHIP CERAMIC 1005	GRP15551H220JZ01E CAP1005	5	C216,226,806,807,151
C10-221HJ-MA	CHIP CERAMIC 1005	GRP155R71H221JA01E CAP1005	6	C622,623,625,626,635,655
C10-222HK-MA	CHIP CERAMIC 1005	GRP155R71H222KA01E CAP1005	1	C637
C10-224AZ-MA	CHIP CERAMIC 1005	GRP155R61A224KE01E CAP1005	1	C716
C10-270HJ-MA	CHIP CERAMIC 1005	GRP15551H270JZ01E CAP1005	3	C321,C1,225
C10-330HJ-MA	CHIP CERAMIC 1005	GRP15551H330JZ01E CAP1005	3	C621,212,213
C10-331HJ-MA	CHIP CERAMIC 1005	GRP155R71H331KA01E CAP1005	5	C601,666,611,176,177
C10-333AK-MA	CHIP CERAMIC 1005	GRP155R71A333KA01E CAP1005	1	C638
C10-390HJ-MA	CHIP CERAMIC 1005	GRP15551H390JZ01E CAP1005	3	C102,105,305
Part Number	Part Name	Description	Qty.	Reference
C10-471HK-MA	CHIP CERAMIC 1005	GRP155R71H471KA01E CAP1005	14	C107,145,238,307,C413,420,421,422,501, 505,507,C510,647,648
C10-472HK-MA	CHIP CERAMIC 1005	GRP155R71H472KA01E CAP1005	1	C600
C10-473AK-MA	CHIP CERAMIC 1005	GRP155R71A473KA01E CAP1005	4	C190,C802,C405,406
C10-560HJ-MA	CHIP CERAMIC 1005	GRP15551H560JZ01E CAP1005	2	C202,R407
C10-561HK-MA	CHIP CERAMIC 1005	GRP155R71H561KA01E CAP1005	1	C803
C10-562EK-MA	CHIP CERAMIC 1005	GRP155R71E562KA01E CAP1005	4	C607,612,608,628

HEADLINE

Part Number	Part Name	Description	Qty.	Reference
C10-680HJ-MA	CHIP CERAMIC 1005	GRP15551H680JZ01E CAP1005	1	C203
C10-820HJ-MA	CHIP CERAMIC 1005	GRP15551H820JZ01E CAP1005	1	C168
C20-225ZJ-MA	CHIP CERAMIC 1212	2.2uF GRM21BF51C225ZA01L CAP 2012	2	C631,192
C20-475ZJ-MA	CHIP CERAMIC 1212	4.7uF GRM21BF51C475ZA01L CAP 2012	12	C163,171,237,401,415,671,C672,702,708, 663,713,302
CTC-010AM-FA	CHIP TANTALUM	1uF 16V TLM1C105ASSB A	1	C636
CTC-047AM-FA	CHIP TANTALUM	4.7uF 16V TSM1C475ASSB A	1	C407
CTC-100AM-FA	CHIP TANTALUM	10uF 16V TLM1C106ASSB A	1	C232
CTC-101CM-FB	CHIP TANTALUM	100uF 16V TLM1C107CSSB C	1	C675
CTC-220ZM-FA	CHIP TANTALUM	22uF 16V TLM1C226TSSR B	1	C2
CTC-470CN-FA	CHIP TANTALUM	47uF 16V TLM1C476CSSB C	1	C668
DBC-S114E-BA	DIODE BAND S/W CHIP	KDS114E	2	D122,202
DIC-H131E-HA	DIODE Si CHIP	HVC131TRF	2	D101,102
DIC-S121E-AA	DIODE Si CHIP	KDS121E	1	D801
DRC-SMA14-KA	DIODE RECTIFIER	(SMAB14) TN4001,SMD	1	D701
DSC-S7000-AA	DIODE S/W	SDS7000EF	2	D103,118
DVC-0273U-AA	DIODE VARICAP CHIP	KDV273RTK	9	D301,302,303,305,306,307,308,310,311
DVC-154CS-AA	DIODE VARICAP CHIP	KDV154	8	D105,106,107,108,110,111,112,113
DZC-5115E-AA	DIODE ZENER CHIP	KDZ5.1EV USM	1	D201
DZC-9115E-AA	DIODE ZENER CHIP	KDZ9.1EV-RTK	1	D900
FCC-455G3-TA	FILTER CERAMIC	ELFC455G	1	F101
FMC-436CP-FA	CRYSTAL MCF	43.655MHz, 1D43613GQ2	1	XF101
IAA-7233D-SA	IC AUDIO AMP	TDA7233D	1	IC603
IAP-828D5-CA	IC AUDIO PROCSSOR	FX828D5	1	IC606
ICP-3802W-TA	IC CPU, OTP	HD64738024W	1	IC801
IDA-62334-MA	IC D/A SMD	M62334FP	1	IC803
IEE-24C32-MA	IC EEPROM SMD	24LC32A-5.0V	1	IC802
IFI-31136-TA	IC IF SMD	TA31136FN	1	IC101
IMX-3SK24-TA	TRANSISTOR	3SK240	1	Q103
IOA-2902V-JA	IC AMP SSOP	NJM2902V	2	IC901,902
IOA-75W01-DA	IC OP AMP SMD	TA75W01FU	1	IC501
IPL-1503C-UA	IC PLL	MB15E03SL	1	IC401
IRG-250CS-TA	IC REGULATOR	TK11250CS	1	IC701
ISW-4S66F-TA	IC ANALOG-SW	TC4S66F	2	IC602,601
NCH-02HC1-GA	CONNECTER HEADER	1.25 WAFER-2P (SMD)	1	J601

HEADLINE

Part Number	Part Name	Description	Qty.	Reference
PFM-00077-AE	PCB MAIN (HL-10V2)	2/2 GOLD 47.57x119.6x1.2t	1	
R10-000AJ-AA	FILM CHIP RESISTOR	0 RC1005 J 000 CS	14	R601,638,C141,603,C604,R500,800,302,C187,L208,R645,210,C217,218
R10-100AJ-AA	FILM CHIP RESISTOR	10 RC1005 J 100 CS	5	R216,401,408,682,R2
R10-101AJ-AA	FILM CHIP RESISTOR	100 RC1005 J 101 CS	3	R105,118,301
R10-102AJ-AA	FILM CHIP RESISTOR	1K RC1005 J 102 CS	3	R515,403,405
R10-103AJ-AA	FILM CHIP RESISTOR	10K RC1005 J 103 CS	17	R111,112,303,307,308,R315,316,321,411,412,512,656,657,662,811,305,999
R10-104AJ-AA	FILM CHIP RESISTOR	100K RC1005 J 104 CS	11	R102,103,106,107,310,311,R646,647,651,815,312
R10-105AJ-AA	FILM CHIP RESISTOR	1M RC1005 J 105 CS	1	R513
R10-122AJ-AA	FILM CHIP RESISTOR	1.2K RC1005 J 122 CS	1	R672
R10-124AJ-AA	FILM CHIP RESISTOR	120K RC1005 J 124 CS	1	R150
R10-152AJ-AA	FILM CHIP RESISTOR	1.5K RC1005 J 152 CS	1	R206
R10-153AJ-AA	FILM CHIP RESISTOR	15K RC1005 J 153 CS	1	R680
R10-154AF-BA	FILM CHIP RESISTOR	150K RMC 1/16S, 154, FTP	2	R701,702
R10-154AJ-AA	FILM CHIP RESISTOR	150K RC1005 J 154 CS	7	R121,147,322,607,618,661,606
R10-182AJ-AA	FILM CHIP RESISTOR	1.8K RC1005 J 182 CS	1	R145
R10-183AJ-AA	FILM CHIP RESISTOR	18K RC1005 J 183 CS	1	R625
R10-184AF-BA	FILM CHIP RESISTOR	180K RMC 1/16S, 184, FTP	3	R503,506,510
R10-184AJ-AA	FILM CHIP RESISTOR	180K RC1005 J 184 CS	1	R652
R10-220AJ-AA	FILM CHIP RESISTOR	22 RC1005 J 220 CS	7	R621,683,817,820,835,837,222
R10-221AJ-AA	FILM CHIP RESISTOR	220 RC1005 J 221 CS	5	R115,120,122,201,826
R10-222AJ-AA	FILM CHIP RESISTOR	2.2K RC1005 J 222 CS	7	R110,220,602,663,665,807,410
R10-223AJ-AA	FILM CHIP RESISTOR	22K RC1005 J 223 CS	6	R511,642,806,808,812,641
R10-224AF-BA	FILM CHIP RESISTOR	220K RMC 1/16S, 224, FTP	4	R501,502,507,508
R10-224AJ-AA	FILM CHIP RESISTOR	220K RC1005 J 224 CS	2	R631,648
R10-270AJ-AA	FILM CHIP RESISTOR	27 RC1005 J 270 CS	2	R153,158
R10-271AJ-AA	FILM CHIP RESISTOR	270 RC1005 J 271 CS	3	R113,828,402
R10-273AJ-AA	FILM CHIP RESISTOR	27K RC1005 J 273 CS	3	R803,1,636
R10-274AJ-AA	FILM CHIP RESISTOR	270K RC1005 J 274 CS	2	R655,677
R10-331AJ-AA	FILM CHIP RESISTOR	330 RC1005 J 331 CS	4	R221,223,306,317
R10-332AJ-AA	FILM CHIP RESISTOR	3.3K RC1005 J 332 CS	4	R123,218,318,155
R10-333AJ-AA	FILM CHIP RESISTOR	33K RC1005 J 333 CS	5	R205,632,637,676,151
R10-334AJ-AA	FILM CHIP RESISTOR	330K RC1005 J 334 CS	2	R146,R6
R10-392AJ-AA	FILM CHIP RESISTOR	3.9K RC1005 J 392 CS	2	R802,156
R10-393AJ-AA	FILM CHIP RESISTOR	39K RC1005 J 393 CS	4	R608,612,613,626
R10-470AJ-AA	FILM CHIP RESISTOR	47 RC1005 J 470 CS	2	R140,320
R10-471AJ-AA	FILM CHIP RESISTOR	470 RC1005 J 471 CS	3	R117,827,406
R10-472AJ-AA	FILM CHIP RESISTOR	4.7K RC1005 J 472 CS	10	R610,615,616,630,670,R801,810,671,C606,R4
R10-473AJ-AA	FILM CHIP RESISTOR	47K RC1005 J 473 CS	25	R104,143,622,623,635,653,666~668,675,703,813,818,821~823,825,830,831~833,836,900,7,643

HEADLINE

Part Number	Part Name	Description	Qty.	Reference
R10-474AJ-AA	FILM CHIP RESISTOR	470K RC1005 J 474 CS	1	R816
R10-475AJ-AA	FILM CHIP RESISTOR	4.7M RC1005 J 475 CS	1	R678
R10-560AJ-AA	FILM CHIP RESISTOR	56 RC1005 J 560 CS	1	R203
R10-562AJ-AA	FILM CHIP RESISTOR	5.6K RC1005 J 562 CS	2	R157,620
R10-563AJ-AA	FILM CHIP RESISTOR	56K RC1005 J 563 CS	1	R141
R10-564AJ-AA	FILM CHIP RESISTOR	560K RC1005 J 564 CS	1	R603
R10-681AJ-AA	FILM CHIP RESISTOR	680 RC1005 J 681 CS	3	R413,415,416
R10-682AJ-AA	FILM CHIP RESISTOR	6.8K RC1005 J 682 CS	4	R627,681,217,3
R10-683AJ-AA	FILM CHIP RESISTOR	68K RC1005 J 683 CS	2	R617,624
R10-684AJ-AA	FILM CHIP RESISTOR	680K RC1005 J 684 CS	2	R660,633
R10-822AJ-AA	FILM CHIP RESISTOR	8.2K RC1005 J 822 CS	3	R611,658,805
R25-901FF-BA	FILM CHIP RESISTOR	0.1 RMC 1S, 2512 1% FTP	1	R505
RSC-224ZN-JA	CHIP SEMI RESISTOR	220KB 868-9007C-31	3	RV301,401,601
RTC-103ZJ-JA	CHIP THERMISTOR	ECTH160808 103J3435HT	1	R142
STA-101HC-SA	TACT S/W SMD	SKTS-1101NS	3	SW801,802,805
STA-106VC-SA	TACT S/W SMD	SKTS-1106VSA	2	SW803,806
TRA-C404E-AA	TRANSISTOR BRT	KRC404E	9	Q112,305,306,502,601,603,608,700,108
TRC-226YU-NA	TRANSISTOR	2SC4226-R24	1	Q300
TRC-3079M-DA	TRANSISTOR MOS FET	2SK3079A	1	Q201
TRC-4075G-AA	TRANSISTOR	KTC4075E/GR	2	Q110,606
TRC-5006E-TA	TRANSISTOR	2SC5006(R24)	7	Q101,102,205,301,302,303,105
TRR-A226S-AA	TRANSISTOR BRT	KRA226S	1	Q607
TRR-A301E-AA	TRANSISTOR	KRA301E	4	Q605,801,802,803
TRR-A305E-AA	TRANSISTOR BRT	KRA305E	3	Q701,702,703
TRR-A307E-AA	TRANSISTOR	KRA307E	1	Q602
XED-455TA-KB	CERAMIC DISCRIMINATOR	JTBB455C24,SMD	1	Y101
XTC-1440I-PA	VCTCXO	HKE3059A-14.4M-ETD14B-00109C	1	X401
ZFZ-C2Q3A-WA	FUSE SMD	C2Q3A	1	F701

HEADLINE

HL-1220 ELECTRICAL PARTS

Part Number	Part Name	Description	Qty	Reference
ALC-1204W-SA	LED DUAL CHIP	BRBG1204W-TR	1	D805
AMC-1113F-SB	LED LAMP CHIP	UG1113F-TR	2	D802,803
B16-068NK-TA	COIL CHIP	6.8nH HK1608-6N8S	2	L205,C1
B16-181NJ-TA	COIL CHIP	180nH HK1608-181NJ	1	L108
B16-220NJ-TA	COIL CHIP	22nH HK1608-22NJ	1	L210
B16-221NJ-TA	COIL CHIP	220nH HK1608-221NJ	3	L201,302,308
B16-270NJ-TA	COIL CHIP	27nH HK1608-270NJ	3	L118,211,301
B16-470NJ-TA	COIL CHIP	47nH HK1608-470NJ	1	L116
BBA-320VS-SA	CHIP BEAD	PBY201209T-320Y-S	1	L501
BBA-451VS-SA	CHIP BEAD	SBK160808T-451Y-S	2	L601,602
BSC-2811F-SA	COIL SPRING	E2L 0.28x1.1x6TL	4	L101,102,103,105
BSC-3009B-SA	COIL SPRING	E2L 0.3x0.9x2TL	2	L204,209
BSC-3010C-SA	COIL SPRING	E2L 0.3x1.0x3TL	1	L303
BSC-3010E-SA	COIL SPRING	E2L 0.3x1.0x5TL	4	L106,107,111,112
BSC-3011C-SA	COIL SPRING	E2L 0.3x1.1x3TL	1	L202
BSC-3013G-SA	COIL SPRING	E2L 0.3x1.3x7TL	2	L203,207
BSC-3209C-SA	COIL SPRING	E2L 0.32x0.9x3TL	1	L307
BWC-681JN-AA	COIL WOUND	0805AS-681J	3	L305,306,190
BWC-821JN-AA	COIL WOUND	0805AS-821J	1	L120
C10-010HC-MA	CHIP CERAMIC 1005	GRP15551H1R0CZ01E CAP1005	1	C103
C10-020HC-MA	CHIP CERAMIC 1005	GRP15551H2R0CZ01E CAP1005	1	C313
C10-030HC-MA	CHIP CERAMIC 1005	GRP15551H3R0CZ01E CAP1005	5	C151,323,115,133,228
C10-040HC-MA	CHIP CERAMIC 1005	GRP15551H4R0CZ01E CAP1005	6	C111,113,125,126,150,225
C10-050HC-MA	CHIP CERAMIC 1005	GRP15551H5R0CZ01E CAP1005	3	C306,101,107
C10-060HD-MA	CHIP CERAMIC 1005	GRP15551H6R0DZ01E CAP1005	2	C112,141
C10-070HD-MA	CHIP CERAMIC 1005	GRP15551H7R0DZ01E CAP1005	1	C318
C10-080HD-MA	CHIP CERAMIC 1005	GRP15551H8R0DZ01E CAP1005	6	C116,205,C320,233,321,132
C10-090HD-MA	CHIP CERAMIC 1005	GRP15551H9R0DZ01E CAP1005	2	C304,309
C10-100HJ-MA	CHIP CERAMIC 1005	GRP15551H100JZ01E CAP1005	8	C303,128,325,305,1,105,106,214
C10-101HJ-MA	CHIP CERAMIC 1005	GRP15551H101JZ01E CAP1005	2	C412,201 [138-102-C6] C121,136,146, 217,410,606,316,658
C10-102HK-MA	CHIP CERAMIC 1005	GRP155R71H102KA01 E CAP1005	34	C163,160,167,190,615,652,662,667, 810,811,502,645,646,703,705~707,7 15,717,718,815~818,820,821

HEADLINE

Part Number	Part Name	Description	Qty.	Reference
C10-103EK-MA	CHIP CERAMIC 1005	GRP155R71E103KA01E CAP1005	23	C122,138,142,145,148,402,416,418, 118,127,177,613,670,656,657,643,82 2,117,227,2,801,805,617
C10-104CZ-MA	CHIP CERAMIC 1005	GRP155F51C104ZA01E CAP1005	30	C207,308,311,403,417,156,157,164, 168,181,602,618,627,630,633,641,66 1,665,673,701,808
C10-105CZ-MA	CHIP CERAMIC 1005	GRP155F50J105ZA01E CAP1005	5	C640,653,813,660,804 [138- 104-C6] 812,310,221,508,405,406,616,650,71 2
C10-120HJ-MA	CHIP CERAMIC 1005	GRP155R71H120JA01E CAP1005	1	C123
C10-150HJ-MA	CHIP CERAMIC 1005	GRP15551H150JZ01E CAP1005	4	C137,191,206,R119
C10-153CK-MA	CHIP CERAMIC 1005	GRP155R71C153KA01 E CAP1005	1	C608
C10-180HJ-MA	CHIP CERAMIC 1005	GRP15551H180JZ01E CAP1005	2	C231,5
C10-182HK-MA	CHIP CERAMIC 1005	GRP155R71H182KA01 E CAP1005	1	C162
C10-220HJ-MA	CHIP CERAMIC 1005	GRP15551H220JZ01E CAP1005	3	C806,807,153
C10-221HJ-MA	CHIP CERAMIC 1005	GRP155R71H221JA01E CAP1005	10	C622,623,625,626,635,655,102,420, 421,422
C10-222HK-MA	CHIP CERAMIC 1005	GRP155R71H222KA01 E CAP1005	1	C637
C10-223CK-MA	CHIP CERAMIC 1005	GRP155R71C223KA01 E CAP1005	2	C216,220
C10-224AZ-MA	CHIP CERAMIC 1005	GRP155R61A224KE01E CAP1005	2	C716,4
C10-330HJ-MA	CHIP CERAMIC 1005	GRP15551H330JZ01E CAP1005	3	C120,621,6
C10-331HJ-MA	CHIP CERAMIC 1005	GRP155R71H331KA01 E CAP1005	5	C601,611,666,165,166
C10-333AK-MA	CHIP CERAMIC 1005	GRP155R71A333KA01E CAP1005	1	C638
C10-470HJ-MA	CHIP CERAMIC 1005	GRP15551H470JZ01E CAP1005	3	C104,204,215
C10-471HK-MA	CHIP CERAMIC 1005	GRP155R71H471KA01 E CAP1005	13	C230,413,647,648,651,202,208,226, 301,307,501,505,507
C10-472HK-MA	CHIP CERAMIC 1005	GRP155R71H472KA01 E CAP1005	1	C174
C10-473AK-MA	CHIP CERAMIC 1005	GRP155R71A473KA01E CAP1005	2	C178,802
C10-560HJ-MA	CHIP CERAMIC 1005	GRP15551H560JZ01E CAP1005	2	C212,R407
C10-561HK-MA	CHIP CERAMIC 1005	GRP155R71H561KA01 E CAP1005	4	C232,510,211,803
C10-562EK-MA	CHIP CERAMIC 1005	GRP155R71E562KA01E CAP1005	3	C607,612,628
C10-820HJ-MA	CHIP CERAMIC 1005	GRP15551H820JZ01E CAP1005	1	C158
C20-225ZJ-MA	CHIP CERAMIC 2012	2.2uF GRM21BF51A225ZA01L CAP 2012	2	C631,180
C20-475ZJ-MA	CHIP CERAMIC 2012	4.7uF GRM21BF51C475ZA01 L CAP 2012	12	C143,210,302,161,401,415,671,672, 702,708,713,663

HEADLINE

Part Number	Part Name	Description	Qty.	Reference
CTC-010AM-FA	CHIP TANTALUM	1uF 16V TLM1C105ASSB A	1	C636
CTC-047AM-FA	CHIP TANTALUM	4.7uF 16V TSM1C475ASSB A	1	C407
CTC-101CM-FB	CHIP TANTALUM	100uF 16V TLM1C107CSSB C	1	C675
CTC-220ZM-FA	CHIP TANTALUM	22uF 16V TLMIC226TSSR B	1	C800
CTC-470CN-FA	CHIP TANTALUM	47uF 16V TLM1C476CSSB C	1	C668
DBC-S114E-BA	DIODE BAND S/W CHIP	KDS114E	2	D110,202
DIC-H131E-HA	DIODE Si CHIP	HVC131TRF	2	D102,101
DIC-S121E-AA	DIODE Si CHIP	KDS121E	1	D801
DRC-SMA14-KA	DIODE RECTIFIER	(SMAB14) TN4001,SMD	1	D701
DSC-S7000-AA	DIODE S/W	SDS7000EF	2	D106,111
DVC-0273U-AA	DIODE VARICAP CHIP	KDV273RTK	1	D308
DVC-154CS-AA	DIODE VARICAP CHIP	KDV154	4	D103,105,107,108
DVC-SV270-TA	DIODE VIRICAP CHIP	1SV270TF	3	D305,306,311
DZC-5115E-AA	DIODE ZENER CHIP	KDZ5.1EV USM	1	D201
DZC-9115E-AA	DIODE ZENER CHIP	KDZ9.1EV-RTK	1	D4
FCC-455G3-TA	FILTER CERAMIC	ELFC455G	1	F101
FMC-436CP-FA	CRYSTAL MCF	43.655MHz, 1D43613GQ2	1	XF1,2
IAA-7233D-SA	IC AUDIO AMP	TDA7233D	1	IC603
IAP-828D5-CA	IC AUDIO PROCSSOR	FX828D5	1	U606
ICP-3802W-TA	IC CPU, OTP	HD64738024W	1	IC801
IDA-62334-MA	IC D/A SMD	M62334FP	1	IC803
IEE-24C32-MA	IC EEPROM SMD	24LC32A-5.0V	1	IC802
IFI-31136-TA	IC IF SMD	TA31136FN	1	U1
IMX-3SK24-TA	TRANSISTOR	3SK240	1	Q105
IOA-2902V-JA	IC AMP SSOP	NJM2902V	2	IC602,605
IOA-75W01-DA	IC OP AMP SMD	TA75W01FU	1	IC501
IPL-1503C-UA	IC PLL	MB15E03SL	1	IC401
IRG-250CS-TA	IC REGULATOR	TK11250CS	1	IC701
ISW-4S66F-TA	IC ANALOG-SW	TC4S66F	2	IC601,607
NCH-02HC1-GA	CONNECTER HEADER	1.25WAFER-2P (SMD)	1	J2
PFM-00078-AE	PCB MAIN	47.57x119.6x1.2(T) 2/2 GOLD	1	
R10-000AJ-AA	FILM CHIP RESISTOR	0 RC1005 J 000 CS	11	R126,601,L117,C219,603,604,187,R 4,5,638,645
R10-100AJ-AA	FILM CHIP RESISTOR	10 RC1005 J 100 CS	2	R682,401
R10-101AJ-AA	FILM CHIP RESISTOR	100 RC1005 J 101 CS	5	R116,302,320,209,110
R10-102AJ-AA	FILM CHIP RESISTOR	1K RC1005 J 102 CS	7	R515,403,405,413,415,416,207
R10-103AJ-AA	FILM CHIP RESISTOR	10K RC1005 J 103 CS	18	R305,306,308,310,315,316,321,512, 656,657,662,811,411,412,217,220,12 8,7

HEADLINE

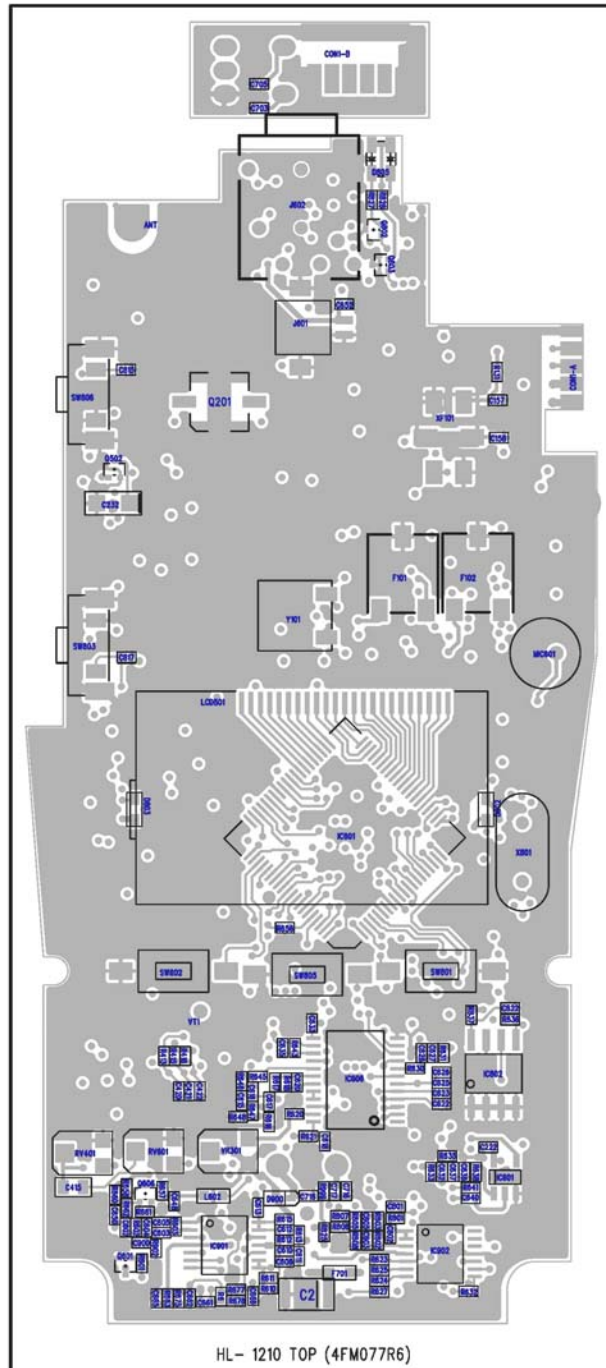
Part Number	Part Name	Description	Qty.	Reference
R10-104AJ-AA	FILM CHIP RESISTOR	100K RC1005 J 104 CS	13	R102,103,105,111,112,322,647,651,815,208,312,6,150
R10-105AJ-AA	FILM CHIP RESISTOR	1M RC1005 J 105 CS	1	R513
R10-122AJ-AA	FILM CHIP RESISTOR	1.2K RC1005 J 122 CS	1	R672
R10-123AJ-AA	FILM CHIP RESISTOR	12K RC1005 J 123 CS	2	R108,148
R10-124AJ-AA	FILM CHIP RESISTOR	120K RC1005 J 124 CS	1	R643
R10-152AJ-AA	FILM CHIP RESISTOR	1.5K RC1005 J 152 CS	1	R206
R10-153AF-YA	FILM CHIP RESISTOR	RC0402FR-07150K 1005,1%,150K	9	R701,702,502,503,506,510,501,507,508
R10-153AJ-AA	FILM CHIP RESISTOR	15K RC1005 J 153 CS	1	R680
R10-154AJ-AA	FILM CHIP RESISTOR	150K RC1005 J 154 CS	5	R607,618,661,120,606
R10-181AJ-AA	FILM CHIP RESISTOR	180 RC1005 J 181 CS	2	R221,223
R10-183AJ-AA	FILM CHIP RESISTOR	18K RC1005 J 183 CS	2	R625,1
R10-184AJ-AA	FILM CHIP RESISTOR	180K RC1005 J 184 CS	2	R652,147
R10-220AJ-AA	FILM CHIP RESISTOR	22 RC1005 J 220 CS	9	R837,212,216,621,683,817,820,835,301
R10-221AJ-AA	FILM CHIP RESISTOR	220 RC1005 J 221 CS	6	R408,118,121,201,826,202
R10-222AJ-AA	FILM CHIP RESISTOR	2.2K RC1005 J 222 CS	5	R602,663,665,807,410
R10-223AJ-AA	FILM CHIP RESISTOR	22K RC1005 J 223 CS	5	R511,806,808,812,641
R10-224AJ-AA	FILM CHIP RESISTOR	220K RC1005 J 224 CS	2	R631,648
R10-270AJ-AA	FILM CHIP RESISTOR	27 RC1005 J 270 CS	2	R158,153
R10-271AJ-AA	FILM CHIP RESISTOR	270 RC1005 J 271 CS	3	R123,828,402
R10-272AJ-AA	FILM CHIP RESISTOR	2.7K RC1005 J 272 CS	4	R155,318,145,156
R10-273AJ-AA	FILM CHIP RESISTOR	27K RC1005 J 273 CS	2	R636,803
R10-274AJ-AA	FILM CHIP RESISTOR	270K RC1005 J 274 CS	2	R655,677
R10-330AJ-AA	FILM CHIP RESISTOR	33 RC1005 J 330 CS	1	R222
R10-331AJ-AA	FILM CHIP RESISTOR	330 RC1005 J 331 CS	2	R307,317
R10-332AJ-AA	FILM CHIP RESISTOR	3.3K RC1005 J 332 CS	1	R122
R10-333AJ-AA	FILM CHIP RESISTOR	33K RC1005 J 333 CS	5	R632,637,676,205,151
R10-334AJ-AA	FILM CHIP RESISTOR	330K RC1005 J 334 CS	2	R146,673
R10-392AJ-AA	FILM CHIP RESISTOR	3.9K RC1005 J 392 CS	1	R802
R10-393AJ-AA	FILM CHIP RESISTOR	39K RC1005 J 393 CS	4	R608,612,613,626
R10-470AJ-AA	FILM CHIP RESISTOR	47 RC1005 J 470 CS	2	R140,303
R10-471AJ-AA	FILM CHIP RESISTOR	470 RC1005 J 471 CS	3	R827,115,406
R10-472AJ-AA	FILM CHIP RESISTOR	4.7K RC1005 J 472 CS	13	R610,615,616,630,670,801,810,215,218,107,605,671,2
R10-473AJ-AA	FILM CHIP RESISTOR	47K RC1005 J 473 CS	26	R143,304,622~624,635,653,666~668,675,703,813,818,821~823,825,830~833,113,114,836,642
R10-474AJ-AA	FILM CHIP RESISTOR	470K RC1005 J 474 CS	1	R816
R10-475AJ-AA	FILM CHIP RESISTOR	4.7M RC1005 J 475 CS	1	R678
R10-560AJ-AA	FILM CHIP RESISTOR	56 RC1005 J 560 CS	1	R203
R10-562AJ-AA	FILM CHIP RESISTOR	5.6K RC1005 J 562 CS	3	R620,313,157

HEADLINE

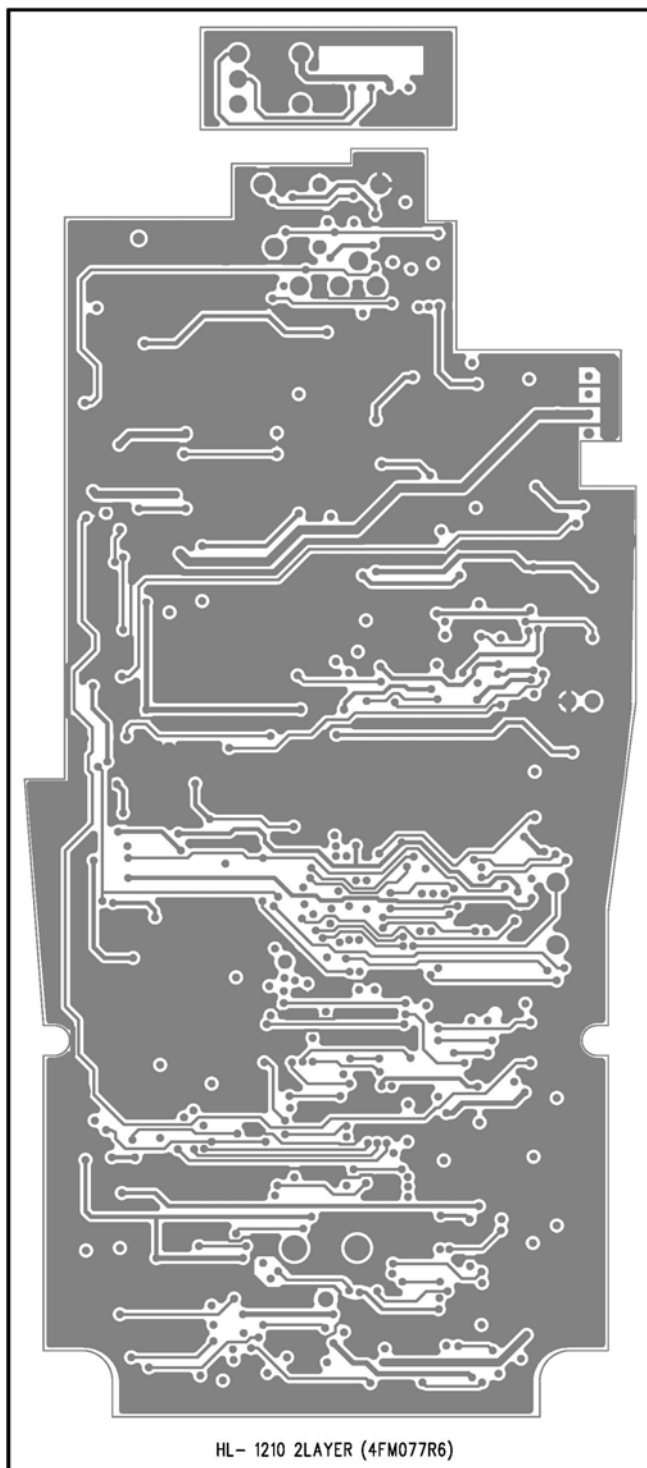
Part Number	Part Name	Description	Qty.	Reference
R10-563AJ-AA	FILM CHIP RESISTOR	56K RC1005 J 563 CS	1	R141
R10-564AJ-AA	FILM CHIP RESISTOR	560K RC1005 J 564 CS	1	R603
R10-682AJ-AA	FILM CHIP RESISTOR	6.8K RC1005 J 682 CS	3	R627,681,106
R10-683AJ-AA	FILM CHIP RESISTOR	68K RC1005 J 683 CS	2	R125,617
R10-684AJ-AA	FILM CHIP RESISTOR	680K RC1005 J 684 CS	2	R660,633
R10-822AJ-AA	FILM CHIP RESISTOR	8.2K RC1005 J 822 CS	4	R611,658,213,805
R25-901EF-YA	FILM CHIP RESISTOR	RL2512FK-07 0.1ohm,1%	1	R505
RSC-224BN-BA	CHIP SEMI RESISTOR	220KB TMC3KJB220KTR	3	RV301,401,601
RTC-103ZJ-HA	CHIP THERMISTOR	10K(1608),NTC 10K(1608),NTC	1	R142
STA-101HC-SA	TACT S/W SMD	SKTS-1101NS	3	SW801,802,805
STA-106VC-SA	TACT S/W SMD	SKTS-1106VSA	2	SW803,806
TRA-C404E-AA	TRANSISTOR BRT	KRC404E	11	Q305,306,502,601,603,608,108,1,2,1 11,112
TRC-226YU-NA	TRANSISTOR	2SC4226-R24	1	Q203
TRC-3475C-DA	MOS FET-TR	2SK3475	1	Q202
TRC-3476M-DA	MOS FET-TR	2SK3476	1	Q201
TRC-4075G-AA	TRANSISTOR	KTC4075E/GR	2	Q110,606
TRC-5006E-TA	TRANSISTOR	2SC5006(R24)	7	Q103,101,205,301,302,303,102
TRR-A226S-AA	TRANSISTOR BRT	KRA226S	1	Q607
TRR-A301E-AA	TRANSISTOR	KRA301E	4	Q605,801,802,803
TRR-A305E-AA	TRANSISTOR BRT	KRA305E	3	Q701,702,703
TRR-A307E-AA	TRANSISTOR	KRA307E	1	Q602
XED-455TA-KB	CERAMIC DISCRIMINATOR	JTBB455C24,SMD	1	Y101
XTC-1440I-PA	VCTCXO	HKE3059A-14.4M- ETD14B-00109C	1	X401
ZFZ-C2Q3A-WA	FUSE SMD	C2Q3A	1	F701

HEADLINE

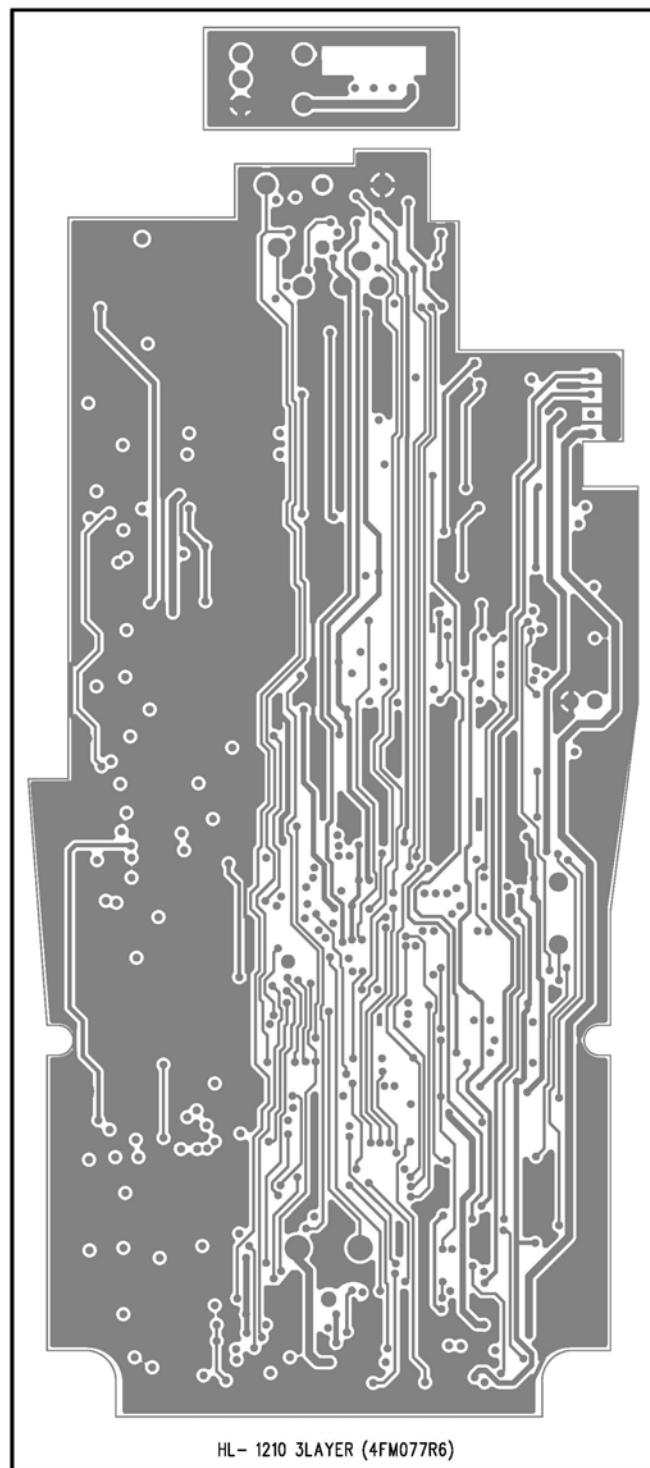
PCB LAYOUTS FOR HL1210



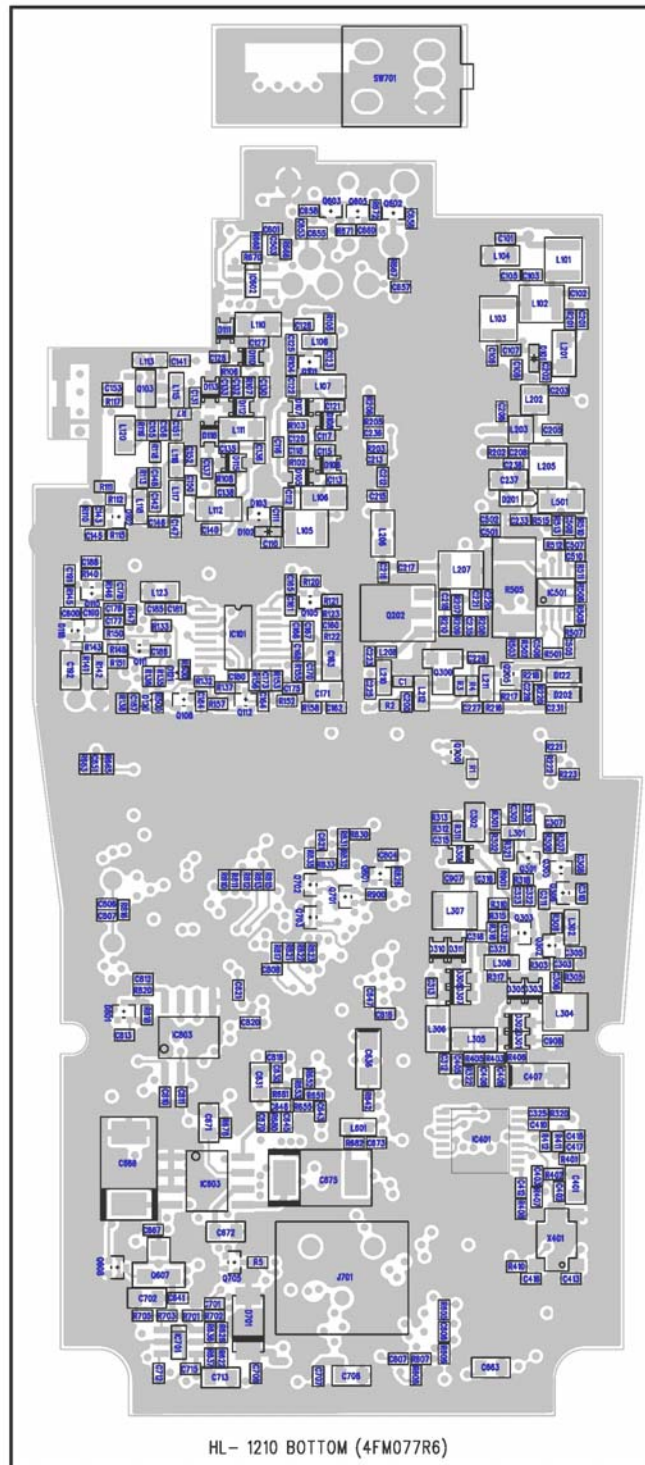
HEADLINE



HEADLINE



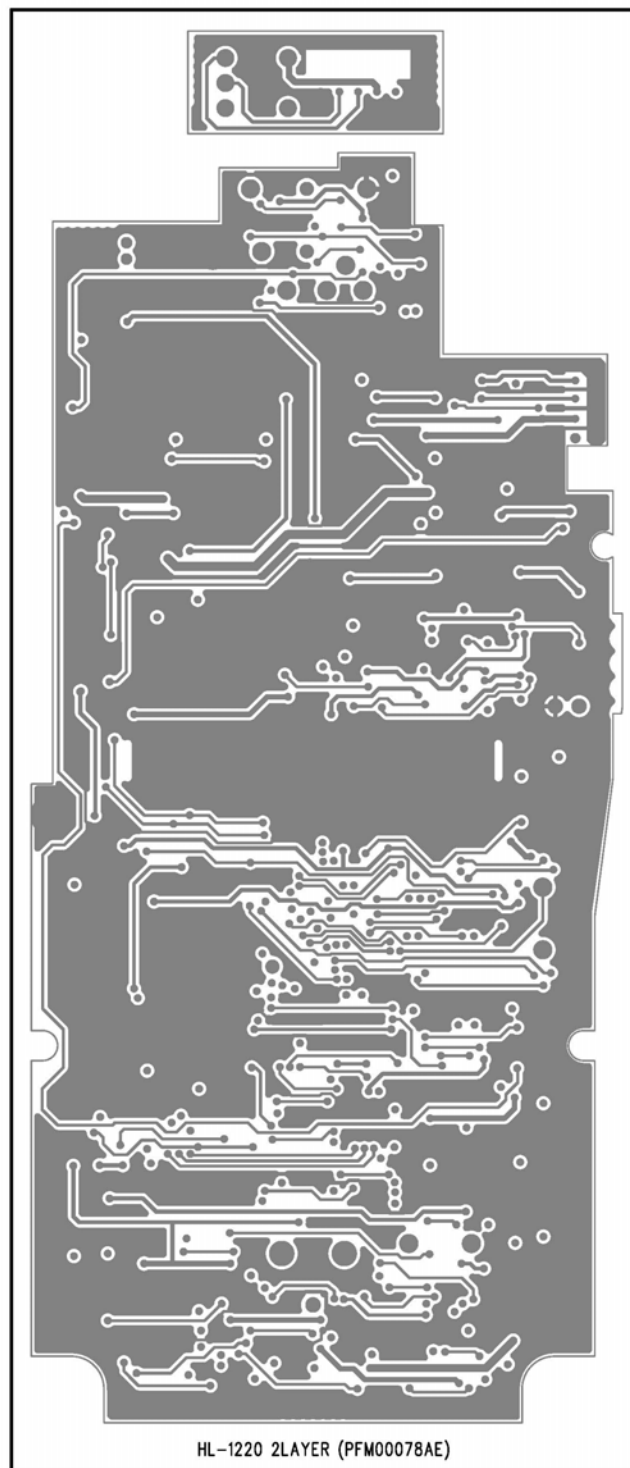
HEADLINE



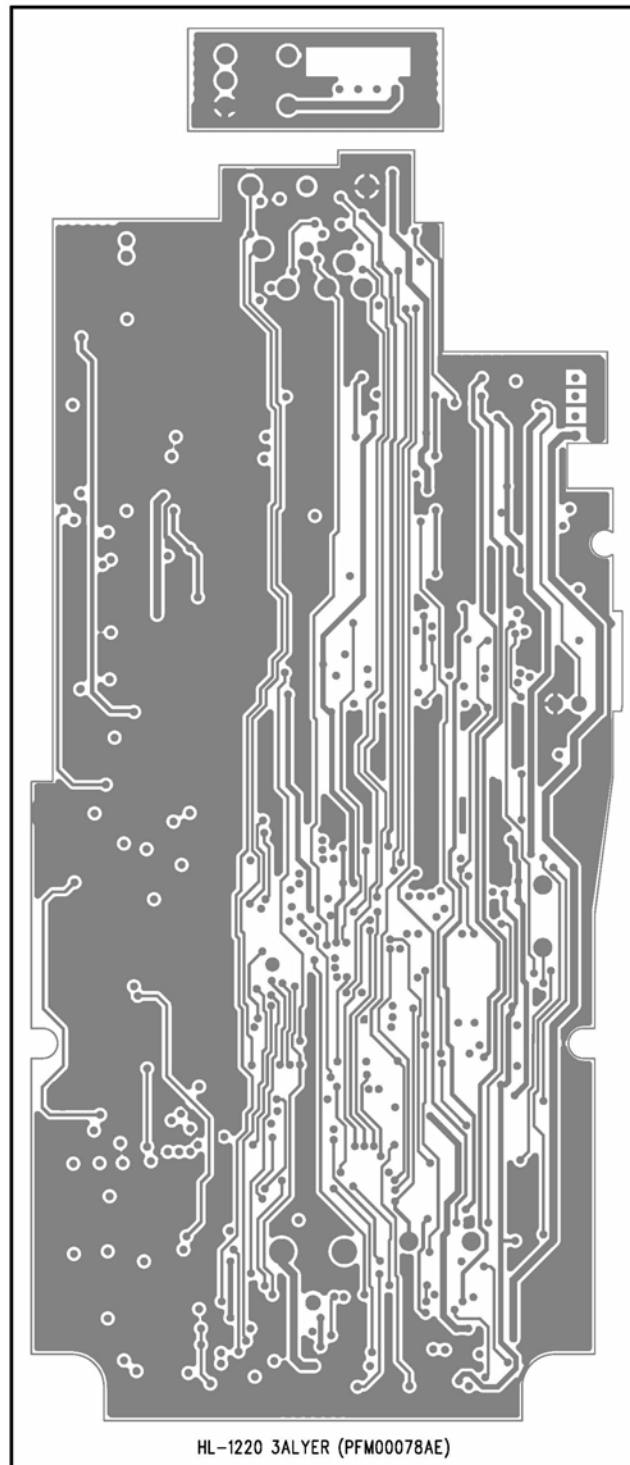
PCB LAYOUTS FOR HL1220



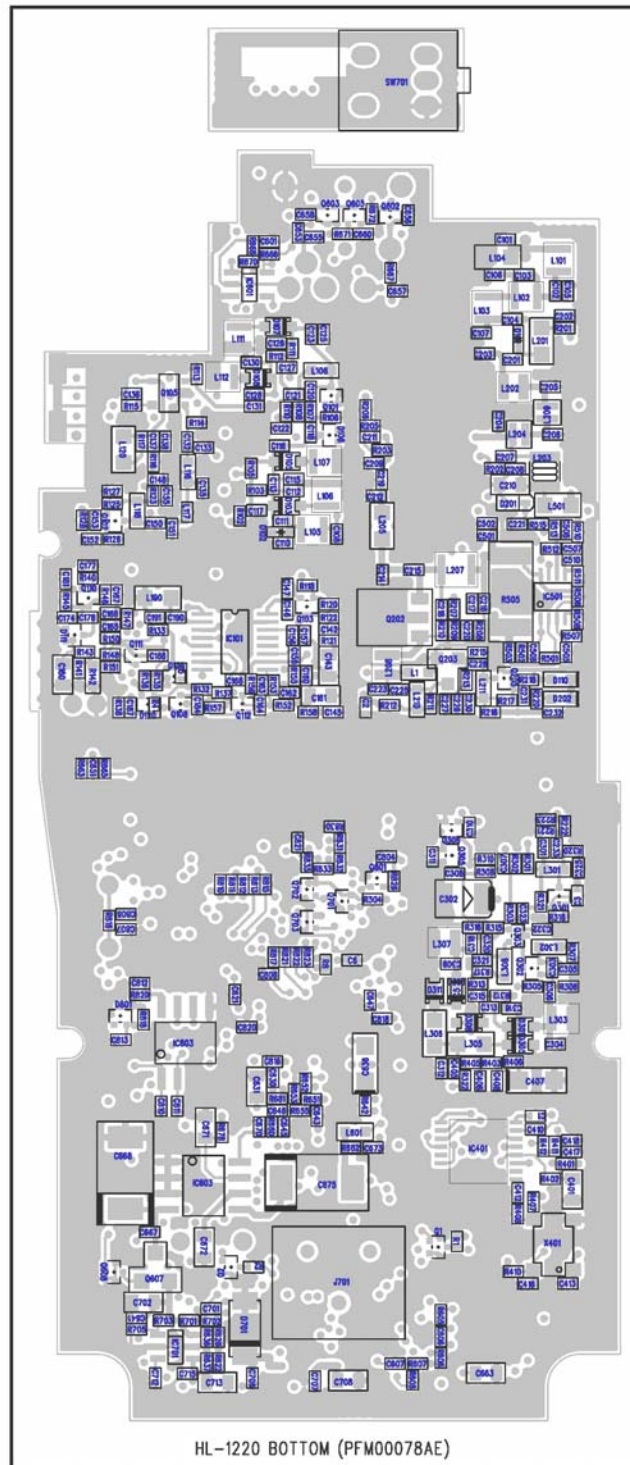
HEADLINE



HEADLINE



HEADLINE



HEADLINE

SCHEMATICS