



HLD-100U2/V2 SERVICE MANUAL

(Preliminary)



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PARTS LIST.....ERROR! BOOKMARK NOT DEFINED.



INTRODUCTION

The HEADLINE HLD-100 Series of Rf Link Modules from HEADLINE utilizes the latest technology in its design and manufacturing.

Both the UHF and VHF models are PLL (Phase Lock Loop Synthesizer)/microprocessor controlled and offer 1 to 5 Watts of transmit power with 16 channel capability. Capable of baud rates from 1200 to 9600, AC and / or DC audio coupling. GMSK and FSK modulation are standard in these fully programmable wide bandwidth RF Link Module units.

The radio is programmed using a Personal Computer with Windows based software, a power supply and a programming cable. This allows the radio to be tailored to meet the requirements of the individual user and the System(s) it is operating within.

FEATURES

- Busy Channel Lockout
- 16 Channels
- TX Time-out
- Power Save
- 1/5 Watt Programmable Output
- 12.5 / 25 kHz Programmable Channel Spacing

Busy Channel Lockout

The Busy Channel Lockout feature, when enabled, disables the transmitter when the receiving channel is busy and the user attempts to transmit.

16 Channels

The HLD-100U2 Series radio can store up to 16 channels within the same band.

TX Time-Out

The TX Time-Out feature, when enabled, limits the amount of time the user can continuously transmit. This time can be set in increments of 10 seconds from 10 seconds to 990 seconds.

Power Save

The Power Save feature is used when an external battery is used as the power source. When Power Save is enabled, the receiver "ON" and "OFF" time can be programmed into the radio and allows the operator to set the length of time the receiver is asleep.

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SPECIFICATIONS

GENERAL

Equipment Type.....Data radio

Band..... UHF

Channel Spacings..... 25kHz, 12.5kHz programmable

RF Output Power..... 5/1 watt

Modulation Type..... F3D, D3E

Intermediate Frequency..... 45.1MHz & 455KHz

Number of Channels..... 16

Frequency Source..... Synthesizer

Power Supply..... Power Supply (12 VDC Nominal Voltage)

Temperature Range

Storage..... from -40° to + 80°

Operating..... from -30° to + 60°

Current Consumption

Standby (Muted)..... < 65mA

Transmit 5 Watts RF Power..... < 2.0A

Transmit 1 Watts RF Power..... < 1.0A

Frequency Bands

UHF	U2	440.000 – 470.000 MHz	440.000 – 470.000 MHz
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TRANSMITTER

Carrier Power.....	Nom.	Max	Min
Hi.....	5W	< 6W	> 4.5W

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Low.....	1W	< 1.5W	> 0.8W
Sustained Transmission.....	Nominal conditions		
	Time :	5	10 30
Sec.	Power :	>90%	>85% >80%
Frequency.....	< 0.5 kHz Nominal condition for VHF		
	< 0.75 kHz Nominal condition		
for UHF	± 3.0 ppm Extreme condition		
for UHF	± 5.0 ppm Extreme condition		
for VHF			
Frequency Deviation			
25 kHz Channel Spacing.....	Peak ± 5.0 , Min. ± 3.8		
12.5 kHz Channel Spacing.....	Peak ± 2.5 , Min. ± 1.9		
Audio Frequency Response.....	Within $\pm 1/-3$ dB of 6dB octave		
	@ 300 Hz to 2.55 kHz for 12.5		
kHz C. S			
	@ 300 Hz to 3.0 kHz for 25 kHz		
C. S			
Adjacent Channel Power			
25 kHz.....	< 70 dBc @ Nominal Condition		
	< 65 dBc @ Extreme Condition		
12.5 kHz.....	< 60 dBc @ Nominal Condition		
	< 55 dBc @ Extreme Condition		
Conducted Spurious Emission.....	< -57 dBc		
Modulation Sensitivity.....	100mV RMS @60% Peak Dev.		
Hum & Noise :			
25 kHz Channel Spacing.....	> 40 dB		
12.5 kHz Channel Spacing.....	> 34 dB		

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Modulation Symmetry..... < 10% Peak Dev @ 1kHz input for nominal dev +20dB

Load Stability..... No osc at $\geq 10:1$ VSWR all phase angles and suitable antenna

No destroy at $\geq 20:1$ all phase angle

Peak Deviation Range Adjustment @ kHz, Nom. Dev +20dB :

25 kHz Channel Spacing..... > Min. 3.5, Max. 6.0

12.5 kHz Channel Spacing..... > Min. 1.5, Max. 4.0

RECEIVER

Sensitivity (12dB Sinad), UHF<-117 dBm, VHF<-118dBm @ Nom. Condition

UHF<-115 dBm, VHF<-116dBm @ Extreme

Condition

Amplitude Characteristic..... < ± 3 dB

Adjacent Channel Selectivity :

25 kHz Channel Spacing..... > 60dB @ Nom., > 55dB @ Extreme Condition

12.5 kHz Channel Spacing..... > 50dB @ Nom., > 45dB @ Extreme Condition

Spurious Response Rejection..... 70dB (100kHz-4 GHz)

Image Response..... > 70dB

IF Response..... > 70dB

Others..... > 70dB

Intermodulation Response Rejection :

± 25 kHz / 50 kHz..... 65 dB

± 50 kHz / 100 kHz..... 65 dB

Conducted Spurious Emission @ Nominal Conditions :

9 kHz - 1 GHz..... > -57 dBm

1 GHz - 4 GHz..... > -47 dBm

Rx Spurious Emissions (Radiated) @ Nominal Conditions

9 kHz - 1 GHz..... > -57 dBm

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1 GHz – 12.75 GHz..... > -47 dBm

AF Distortion..... 5% @ Nom., < 10% @ Extreme condition

Rx Hum & Noise :

25.0 kHz CP..... < 40 dB No PSOPH

12.5 kHz CP..... < 40 dB with PSOPH

Receiver Response Time..... < 16 mS

Squelch Opening Range..... RF level for 6 to 14 dB Sinad

Squelch Closing Range (Hysteresis):..... 0-6 dB Sinad @ Nominal Condition

Squelch Decay Time :

Rf Level at Threshold..... < 40mS

Rf Level at Threshold + 20dB..... < 30mS

Squelch Decay Time..... 5 mS Min., 20mS Max.

Antenna Socket Input Match..... > 10dB Return Loss

L.O. Frequency Temperature Stability..... 1st <5 ppm, 2nd <15 ppm from -30° to 60°

L.O. Frequency Aging Rate..... ±2ppm/year

REFERENCE CRYSTAL

Frequency..... 14.4 MHz

Holder Type..... HC-18

Temperature Characteristic..... ±5.0 ppm from -30° to 60°

Aging Rate..... < 2 ppm /year in 1st year
< 1 ppm/ year thereafter

Lock time..... < 10mS

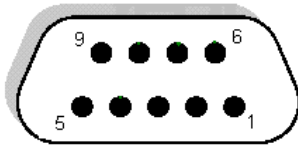
HEADLINE

TX to RX..... < 20 (No Power Saving)

RX to TX..... < 20

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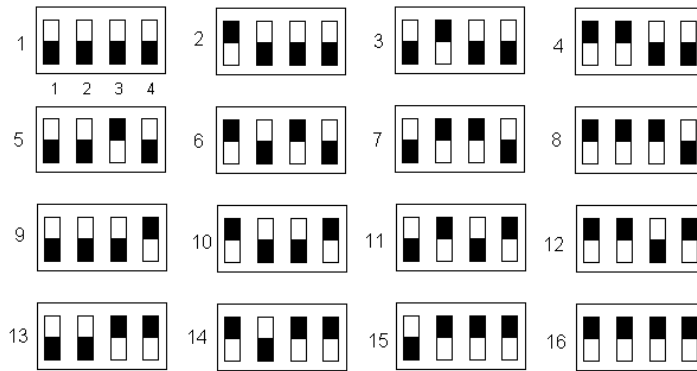
DB9 PINOUT



1. Data In: Data input for transmit. Typical input 100mV
2. Data Out: Received data output. Typical output 250mV ~ 300mV
3. PTT: Push to talk. Active low. Grounding this pin will cause the radio to transmit.
4. Ground: Serves as ground for power supply and inputs/outputs.
5. B+: 9V ~18V DC
6. CD: Carrier Detect. Active low. Switches from 5V to 0V when carrier is received.
If CTCSS/DCS is programmed, the tone/code must be present for active low.
7. Mic In: Microphone input. Typical input 15mV. Use with high impedance microphone.
8. Switch: Used for radio programming. A low places the radio in program mode.
9. Speaker: Speaker output. 1/2W output to drive a speaker in audio applications.

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CHANNEL SELECTION CHART



THEORY OF OPERATION

INTRODUCTION

The UHF radios are comprised of two PCB's (an RF PCB and digital PCB). These boards are connected with an 20pin female and male connector. The digital board is interfaced with external data equipment through the 9pin d-sub male connector, which controls the radio and data receiving and sending.

DIGITAL CIRCUITS

The Digital circuit contains the CPU, the channel select switch, and associated digital circuits.

TX-SIGNAL CIRCUIT

The TX data signal comes from Pin 2 of Con 2, and goes through IC1-C. The TX-signal is amplified by IC503-C,D.

The TX-signal is filtered by IC509-B,C which is a 4'th order low pass filter, the output of IC509-B is then fed to the RF board for TX modulation.

RX-SIGNAL CIRCUIT

The RX- data signal comes from the RF board. Which is connected with pin 20 of Con 1. The RX- signal is amplified by IC507 switched by IC1-A and adjusted by R12. The amplified signal goes to pin 10 of Con 2.

RSSI DETECTOR

From the RF board, the RSSI (Received Signal Strength

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Indicator) signal flows to IC510-A through R129. The pulse is injected from pin 1 of IC510-A every 1 mS and C147 is discharged. It is then charged by R133. The RSSI signal is simultaneously input to pin 3 of IC510-A and those signals are compared. The compared signal is output from IC510-A. Pin 1 of IC510-A and the CPU detects the pulse width. The pulse width is varied by RSSI DC voltage, therefore, the carrier detection is controlled by the CPU.

EEPROM

RX / TX channel and RSSI detection level as well as other data from the programmer are stored in the EEPROM. The data stored is retained without power supplied. This is a non-volatile memory. The EEPROM may have information re-programmed or erased. IC502 is an EEPROM with 2048(8X256) capacity and data is written and read serially.

CHANNEL SELECTOR

One of 16 channels may be selected using the Dip Switch (SW2). SW2 encodes the channel number, selected into 4-bit binary code. The binary code plus one equals the channel number. The binary code is decoded by the CPU enabling the appropriate RX or TX frequency and associated data to be selected from the EEPROM.

DC TO DC CONVERTER

The main DC power is injected to the DC to DC converter. The DC to DC converter regulates the various input power supply voltage and outputs a constant voltage of 7.8 Volts. It is a source for all of the RF and digital circuits.

The DC to DC converter is formed by IC801, Q801, Q802, L801,802 and R804,11. IC801 is a switch mode DC to DC Converter IC. Input DC various appears as a voltage various through R804,11. IC801 detects the voltage and controls the switching pulse. As the switching pulses, Q801 and Q802 switches the input DC of various supply voltages and generates the constant DC of supply voltage.

RF CIRCUITS

TRANSMITTER

The transmitter is comprised of:

1. Buffer
2. P.A..Module
3. Low Pass Filter
4. Antenna Switch
5. A.P.C.Circuits

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BUFFER

VCO output level is -6dBm and amplified to +10dBm (UHF). The buffer consists of Q5,22 for isolation and gain.

P. A MODULE

The P.A.PART contains Q22,26,27. Three stage amplifier Q22 amplifies the TX signal from +10dBm to 100mW. Q26 is amplified to 0.5W. Q27 amplifies to 5W and then matched to 50 Ohms using the L. C. network, thereby reducing the harmonics by -30dB.

ANTENNA SWITCH

When transmitting, the diodes D21,22 and D23,24 are forward biased enabling the RF signal passage to the antenna. D6 is shorted to ground inhibiting the RF signal to front end. In receive the diodes D21,22 and D23,24 are reversed biased passing the signal from the antenna through L1 and C173 to the front end without signal loss.

RF CIRCUITS PLL SYNTHESIZER 14.4MHz TCXO

The TCXO contains the 3-stage thermistor network compensation and crystal oscillator and modulation ports. Compensation is ± 5 PPM or less from -30c to +60c.

PLL IC DUAL MODULES PRESCALER

Input frequency of 14.4 MHz to IC6 MB15203SL pin 1 is

Divided to 6.25kHz or 5kHz by the reference counter, and then supplied to the comparator. RF signal input from VCO is divided to 1/64 at the prescaler in IC6, divided by A and N counter in IC6 to determine frequency steps, and then supplied to the comparator. PLL comparison frequency is 6.25/5kHz.

The A and N counter is programmed to obtain the desired frequency by serial data in the CPU. In the comparator, the phase difference between reference and VCO signal is compared. When the phase of the reference frequency is leading, Fv is the output, but when VCO frequency is leading, Fr is the output. When $F_v = F_r$, phase detector out is a very small pulse. 64/65 modulus prescaler is comprised in IC6:

LEVEL SHIFTER & CHARGE PUMP

The charge pump is used for changing output signals Fr,Fv at PLL IC from 0-5v to 0-12v necessary for controlling the VCO.

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REFERENCE FREQUENCY LPF

The Loop Filter contains R56,57,58, C59,60,61,62. LPF settling time is 12mS with 1kHz frequency. This also reduces the residual side-band noise for the best signal-to-noise ratio.

DC TO DC CONVERTER

The DC to DC converter convert the 5v to supply the necessary voltage for wide range frequency in the VCO.

VCO

The VCO consist of an RX VCO and a TX VCO. It is switched TX/RX by the power source. It is configured as a colpits oscillator and connected to the buffer as a cascade bias in order to save power. The varicap diode D301,303 are low-resistance elements and produce a change in frequency with a change in reverse bias voltage(0-5v). L308/L303 are resonant coils, which changes the control voltage by the tuning core. D302 modulation diode, modulates the audio signal. C317 compensates for the non-linearity of the VCO due to modulation diode, and maintains a constant modulation regardless of frequency.

RECEIVER

FRONT-END

The receive signal is routed backward through the low pass filter, then onward to Pin 1 of the Receiver Front End Module to a bandpass filter consisting of (UHF C173 through C171, L2 through L3) is coupled to the base of Q19 which serves as an RF amplifier. Diode D23,24 serves as protection from static RF overload from nearby transmitters. The output of Q19 is then coupled to a second bandpass filter consisting of (C165 through C15 and L14 through L16). The output of Pin 6 is then coupled to the doubly balanced mixer D709. The receiver front end module is factory pre-tuned and requires no adjustment. Repair is effected by replacement of the entire module of the proper banded module. These are UHF 440MHz to 470MHz.

FIRST MIXER

D709, L720 and L723 are double balanced mixers which provide the 45.1MHz intermediate frequency output. The filtered frequency from the front end module is coupled to L720. The 45.1MHz 1F output is matched to the input of the 2-pole monolithic filter by L727,728, C24 and C25. The crystal filter provides a bandwidth of ± 7.2 kHz from the operating frequency providing a high degree of spurious and intermodulation protection.

HEADLINE

Additionally, a 90MHz trap (XF1,2) is also placed at the filter output to provide additional attenuation of the second order IMD. The output of the filter is impedance matched by R161 to the base of the post of filter IF amplifier Q17.

SECOND OSCILLATOR MIXER LIMITER AND FM DETECTOR

The output of the post filter amplifier, Q17, is coupled via C30 to the input of IC3(TA31136FN). IC3 is a monolithic single conversion FM transceiver, containing a mixer, the second local oscillator, limiter and quadrature detector. Crystal XT1 44.645MHz is used to provide resultant 455kHz signal from the output of the second mixer. The mixer output is then routed to CF1,2(455F,455H). These ceramic filters provide the adjacent channel selectivity of 25kHz bandwidth.

RSSI (RECEIVER SIGNAL STRENGTH INDICATOR)

The RSSI signal is output from IC3 on pin 12. As the receiver signals the output, DC voltage is varied as much as receiver signal strength.

ALIGNMENT INSTRUCTIONS

The unique design of the HLD-100 series allows you to perform adjustments without removing the PCB's or using extender boards. Holes through the digital board allow easy access to the RF board. Tuning is also more efficient because the unit is intact and the alignment won't change when the lid is screwed on.

A test jig should be used when making adjustments to the radio. See the DB9 Pinout diagram on page 10 for more information.

EQUIPMENT NEEDED

- RF power meter
- 50 ohms dummy load (non-inductive)
- RF attenuator (50 ohms non-inductive)
- Oscilloscope
- Audio generator
- DC power supply (12V)
- Spectrum analyzer
- Frequency counter
- Modulation meter (FM)

VCO Adjustments

Step	Setting	Connection	Adjuster	Adjuster for
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1	RX VCO voltage adjustment Frequency: CH1 (440.0000MHz) Mic: Receive Function: None Volume: Optional Squelch: Optional	Dc voltmeter to VCO Test point (Figure 1)	L308	1.0 V DC
2	TX VCO voltage Frequency: CH1 (440.0000MHz) Mic: Transmit (Unmodulated) Function: None Volume: Optional Squelch: Optional	Dc voltmeter VCO Test point1 (Figure 1)	L303	1.0 V DC

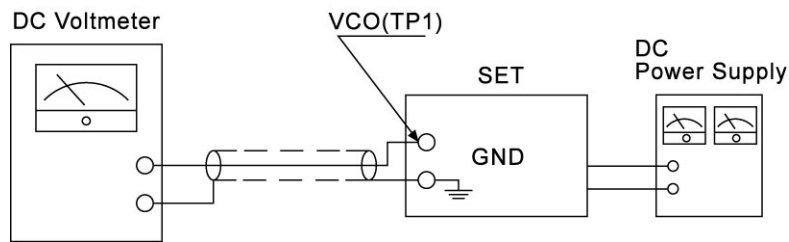


FIGURE 1

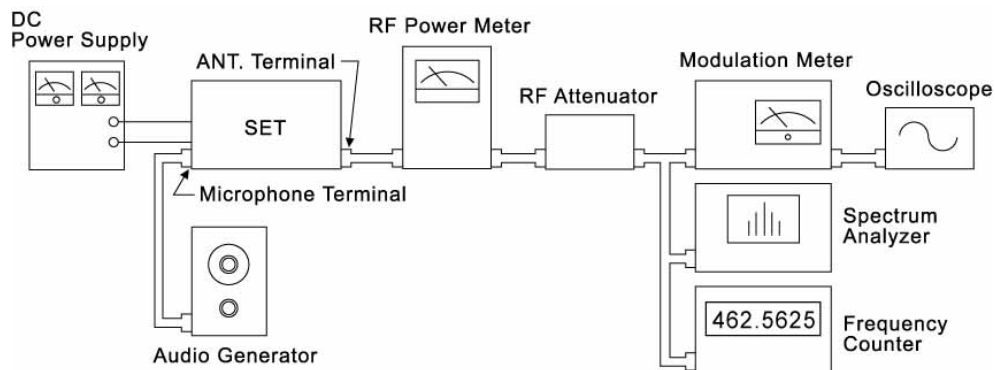


FIGURE 2



TX ADJUSTMENTS

1. Pulling pin 3 low on the DB9 will allow the radio to transmit. To adjust the high/low TX power, the radio must be programmed with at least one channel set to high power and one channel set to low power. First set the radio to a high power channel and align RV4 to 5W. Next set the radio to a low power channel and adjust RV3 to 1W. Double check the power and readjust RV3 and RV4 if necessary. Note: PTT will have to be released when changing channels.
2. Adjust R14 if CTCSS or DCS is used. For narrow band it should be within the range of 250Hz to 500Hz. If programmed for wide band adjust it within the range of 500Hz to 1000Hz. See Figure 2 for equipment setup.
3. Adjusting RV123 will set the limiter for total system deviation. Wide band should be within the range of 4KHZ and 5KHz. Narrow band should be within the range of 2KHz and 2.5KHz.
4. To adjust the transmit frequency adjust RV5 to be within +/- 300HZ of the carrier frequency.
5. The balance adjustment can be set several different ways depending on the application. When used in data applications it is used to square up the waveform. If used in voice applications adjust RV1 so that the level of the CTCSS at 67Hz is the same as the level at 250Hz. When adjusting for DCS use it to square the waveform. In data applications a high level 400Hz can be used to square the waveform.

RX ADJUSTMENTS

1. Setup the equipment as shown below. Use the audio out of Pin 9 of the DB9 for the following adjustments. Set the generator output to +/- 3kHz with a 1 kHz tone. Set the radio to a wide band channel. Refer to figure 3 for equipment setup.
2. Squelch typically opens from 8dB to 12dB Sinad. Adjust RV2 to tighten or loosen the squelch. In audio applications the squelch will mute the speaker audio. In data applications the squelch is always open and the adjustment sets the Carrier Detect line.
3. R12 adjusts the speaker volume.

HEADLINE

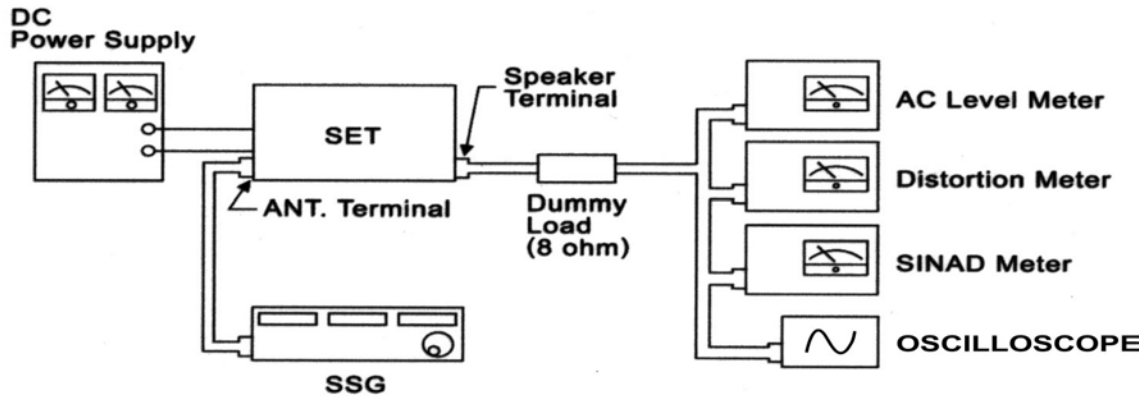
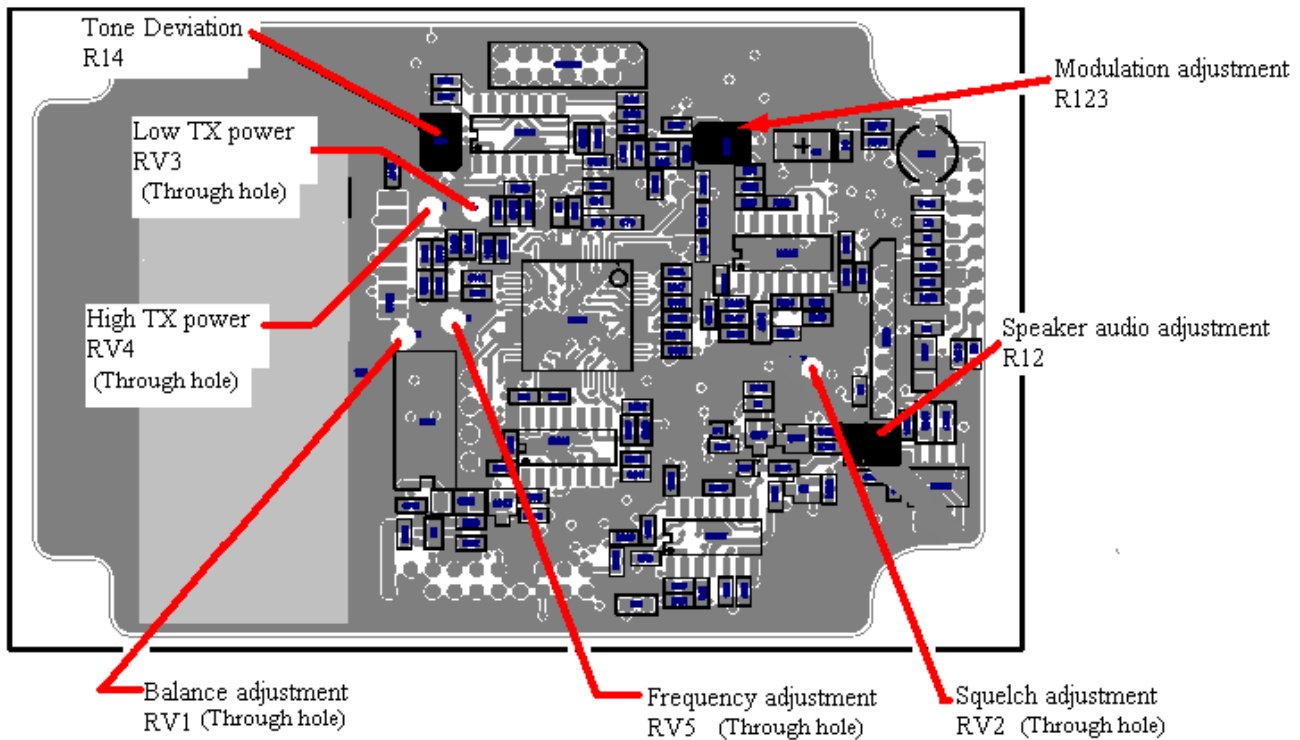


FIGURE 3

ALIGNMENT POINTS DIAGRAM

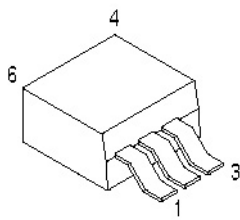


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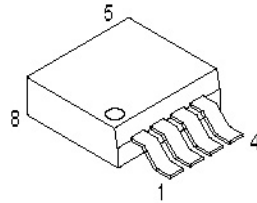
Semiconductor Lead Identification

INTERGRATED CIRCUITS

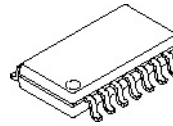
IC5 TK71750



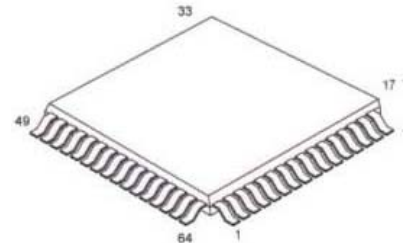
IC508 TDA7233D
IC510 KIA358



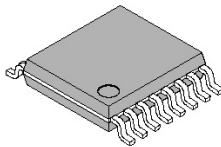
IC3 TA31136FN



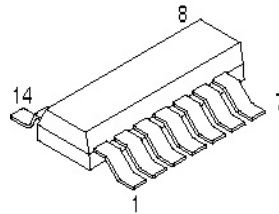
IC501 TMP86CM49UG



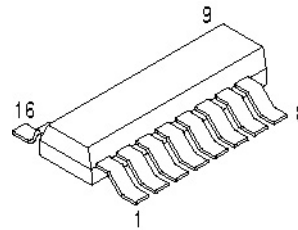
IC6 MB15E03SL



IC503 KIA324
IC1 MC14066BD

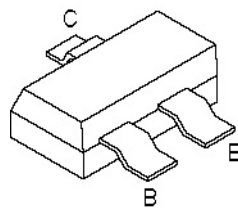


IC801 LTC1435CS

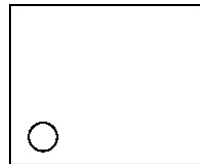


TRANSISTORS

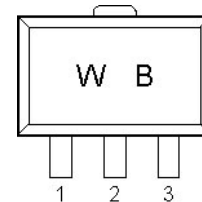
2SC4226
2SC5085
KRC404
KTC4080Y
KRA305



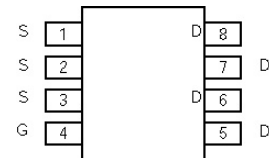
Q27 TRRD07



Q26 2SK3475



Q801/802 SI9410



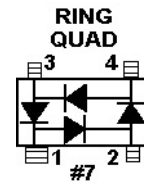
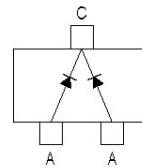
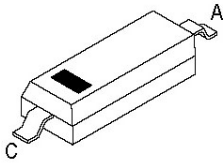
HEADLINE

DIODES

ISV 270 / KDZ 5.6V
HVC 131 / KDS 114S

KDS 120

D709
HSMS-281787



VOLTAGE CHARTS

- IC (DIGITAL BOARD)

(CH:1, RX : SQ OFF / UNIT : VOLT)

IC	PIN NO	RX	TX		IC	PIN NO	RX	TX
IC1 MC14066BD	1	AUDIO				8	2	2
	2	0.2	0.2			9	0	2
	3	0	0			10	2	2
	4	0	0			11	0	0
	5	4.9	4.9			12	0	0
	6	0	5			13	4.4	0
	7	0	0			14	5	5
IC	PIN NO	RX	TX		IC	PIN NO	RX	TX
IC4 KIA324	1	1.7	1.7			8	1.7	1.7
	2	1.7	1.7			9	1.7	1.7
	3	1.7	1.7			10	1.6	1.6
	4	5	5			11	0	0
	5	1.5	1.5			12	1.2	1.2
	6	1.7	1.7			13	1.7	1.7
	7	1.7	1.7			14	1.7	1.7
IC	PIN NO	RX	TX		IC	PIN NO	RX	TX
IC501 CPU TMP86CM-49UG	1	0	0			33	NC	NC
	2	2	2			34	NC	NC
	3	2.2	2.2			35	4.7	4.7
	4	0	0			36	0	0
	5	5	5			37	0	0
	6	4.7	4.7			38	4.8	4.8

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7	2.4	2.4		39	4.8	0
8	4.6	4.6		40	4.7	4.7
9	4.7	0		41	4.3	0
10	0	0		42	4.3	4.3
11	0.9	0.9		43	0	4.9
12	3.2	5		44	4.7	4.7
13	4.8	0		45	0	0
14	4.8	0		46	0	0
15	4.8	0		47	0	0
16	0.1	5		48	4.9	4.9
17	4.9	4.9		49	0	0
18	4.9	4.9		50	4.9	4.9
19	4.9	4.9		51	0	0
20	NC	NC		52	4.7	4.7
21	0.3	0		53	4.7	4.7
22	0	0.6		54	0	0
23	4.6	4.6		55	4.6	4.6
24	NC	NC		56	4.9	4.9
25	5	5		57	0	0
26	NC	NC		58	4.4	4.4
27	NC	NC		59	4	4
28	4.7	4.7		60	0	0
29	0	0		61	4.7	4.7
30	0	0		62	NC	NC
31	0	0		63	NC	NC
32	NC	NC		64	NC	NC

IC	PIN NO	RX	TX		IC	PIN NO	RX	TX
IC502 24LC16B	1	GND	GND			5	4.7	4.7
	2	GND	GND			6	4.7	4.7
	3	GND	GND			7	4.7	4.7
	4	GND	GND			8	5	5
IC	PIN NO	RX	TX		IC	PIN NO	RX	TX
IC503 TK71750	1	2	2			8	2	2
	2	2	2			9	2	2
	3	1.8	1.8			10	1.9	1.9
	4	5	5			11	GND	GND
	5	1.8	1.8			12	1.8	1.8
	6	2	2			13	2	2
	7	2	2			14	2	2
IC	PIN NO	RX	TX		IC	PIN NO	RX	TX
IC505 KIA324	1	0	0			8	0	0
	2	0	0			9	0	0
	3	0	0			10	1.5	1.5
	4	0	0			11	0	0
	5	0	0			12	0	0

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HEADLINE

	6	0	0			13	0	0
	7	0	0			14	0	0
IC	PIN NO	RX	TX		IC	PIN NO	RX	TX
IC507 KIA324	1	2	2			8	2	2
	2	2	2			9	2	2
	3	1.3	1.3			10	2	2
	4	5	5			11	GND	GND
	5	1.3	1.3			12	1.8	1.8
	6	2	2			13	2	2
	7	2	2			14	2	2
IC	PIN NO	RX	TX		IC	PIN NO	RX	TX
IC508 TDA7233D	1	0	0			5	3.6	3.6
	2	0	0.8			6	1.3	1.6
	3	0	0			7	5	1.6
	4	8	8			8	0	0
IC	PIN NO	RX	TX		IC	PIN NO	RX	TX
IC509 KIA 324	1	1.5	1.5			8	2	2
	2	1.5	1.5			9	2	2
	3	1	1			10	1.7	1.7
	4	5	5			11	GND	GND
	5	1.7	1.7			12	1.1	1.1
	6	2	2			13	1.5	1.5
	7	2	2			14	1.5	1.5
IC	PIN NO	RX	TX		IC	PIN NO	RX	TX
IC510 KIA358	1	0.4	0.4			5	1.52	1.52
	2	0.3	0.3			6	1.52	1.52
	3	0.2	0.2			7	2.1	2.1
	4	0	0			8	5	5

IC	PIN NO	RX	TX		IC	PIN NO	RX	TX
IC801 LTC1435CS	1	0.6	0.6			9	8	8
	2	2.4	2.4			10	0	0
	3	0.6	0.6			11	0	0.3
	4	8	8			12	8	8
	5	GND	GND			13	12	12
	6	1.2	1.2			14	8	8
	7	8	8			15	15.5	15.5
	8	8	8			16	9.6	9.6

- IC (RF BOARD)

(CH:1, RX : SQ OFF / UNIT : VOLT)

IC	PIN NO	RX	TX		IC	PIN NO	RX	TX
----	--------	----	----	--	----	--------	----	----

HEADLINE

IC2 KIA 358	1	1.5	1.5			5	2	2
	2	1.5	1.5			6	2	2
	3	1.5	1.5			7	2	2
	4	0	0			8	5	5
IC	PIN NO	RX	TX		IC	PIN NO	RX	TX
IC3 TA31136FN	1	4.6	0			9	0.6	0.6
	2	4	0			10	4.7	4.7
	3	3.6	0			11	3.9	3.9
	4	4.7	4.7			12	0.3	0.3
	5	4.3	4.3			13	0	0
	6	4.3	0			14	0.3	0.3
	7	0.7	0			15	0	0
	8	0.6	0			16	1	0
IC	PIN NO	RX	TX		IC	PIN NO	RX	TX
IC4 KID358	1	0	3.9			5	1.5	1.5
	2	0	0.9			6	1.5	1.6
	3	0	0.8			7	0	2.9
	4	0	0.8			8	0	4.9
IC	PIN NO	RX	TX		IC	PIN NO	RX	TX
IC5 TK71750	1	8	8			4	1.2	1.2
	2	0	0			5	0	0
	3	7.2	7.2			6	5	5
IC	PIN NO	RX	TX		IC	PIN NO	RX	TX
IC6 MB15E03SL	1	1.2	1.2			9	0	0
	2	NC	NC			10	0	0
	3	8	8			11	0	0
	4	2.9	2.9			12	3	3
	5	4.4	5.2			13	NC	NC
	6	GND	GND			14	3V	3V
	7	1.9	1.9			15	NC	NC
	8	1.9	1.9			16	NC	NC

TRANSISTOR (DIGITAL BOARD)

TRANSISTOR NO	TRANSMIT			RECEIVER		
	B	C	E	B	C	E
Q8	4.9	0.2	0	4.9	5	0
Q9	4.9	0	GND	0	4.5	GND
Q12	5	0	5	5	0	5
Q502	4.9	0	4.9	4.9	0	4.9

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Q503	0	4.7	0	0	4.7	0
Q504	4.9	0	GND	4.9	0	GND
Q506	4.8	0	GND	0	0.8	GND
Q510	4.9	0	4.9	4.9	0	4.9
Q513	4.6	1.9	2	4.6	1.9	2

TRANSISTOR (RF BOARD)

TRANSISTOR NO	TRANSMIT			RECEIVER		
	B	C	E	B	C	E
Q1	2.9	0	GND	2.9	0	GND
Q2	0	0	GND	0.8	3	GND
Q3	2.7	0	GND	0	2.8	GND
Q4	0	2.7	GND	4.9	0	GND
Q5	0.7	4.1	GND	0	0	GND
Q6	0	5	5	0.1	5	5
Q7	0.1	5	4.9	0.1	5	4.9
Q11	4.9	0	4.9	0	4.9	4.9
Q13	0	4.8	4.9	5	0	4.9
Q14	4.6	0	GND	4.6	0	GND
Q16	4.6	0	GND	4.6	0	GND
Q17	0.7	1.6	GND	0	0	GND
Q19	0.7	4.1	GND	0	0	GND
Q20	0	0	GND	0	0.8	GND
Q22	0.8	8	GND	0.8	5.7	GND
Q26	0	8	GND	2.8	7.8	GND
Q27	0	8	GND	2.1	7.7	GND
Q304	4.8	0	GND	0	2.7	GND
Q305	0	2.9	GND	2.7	0	GND

HEADLINE

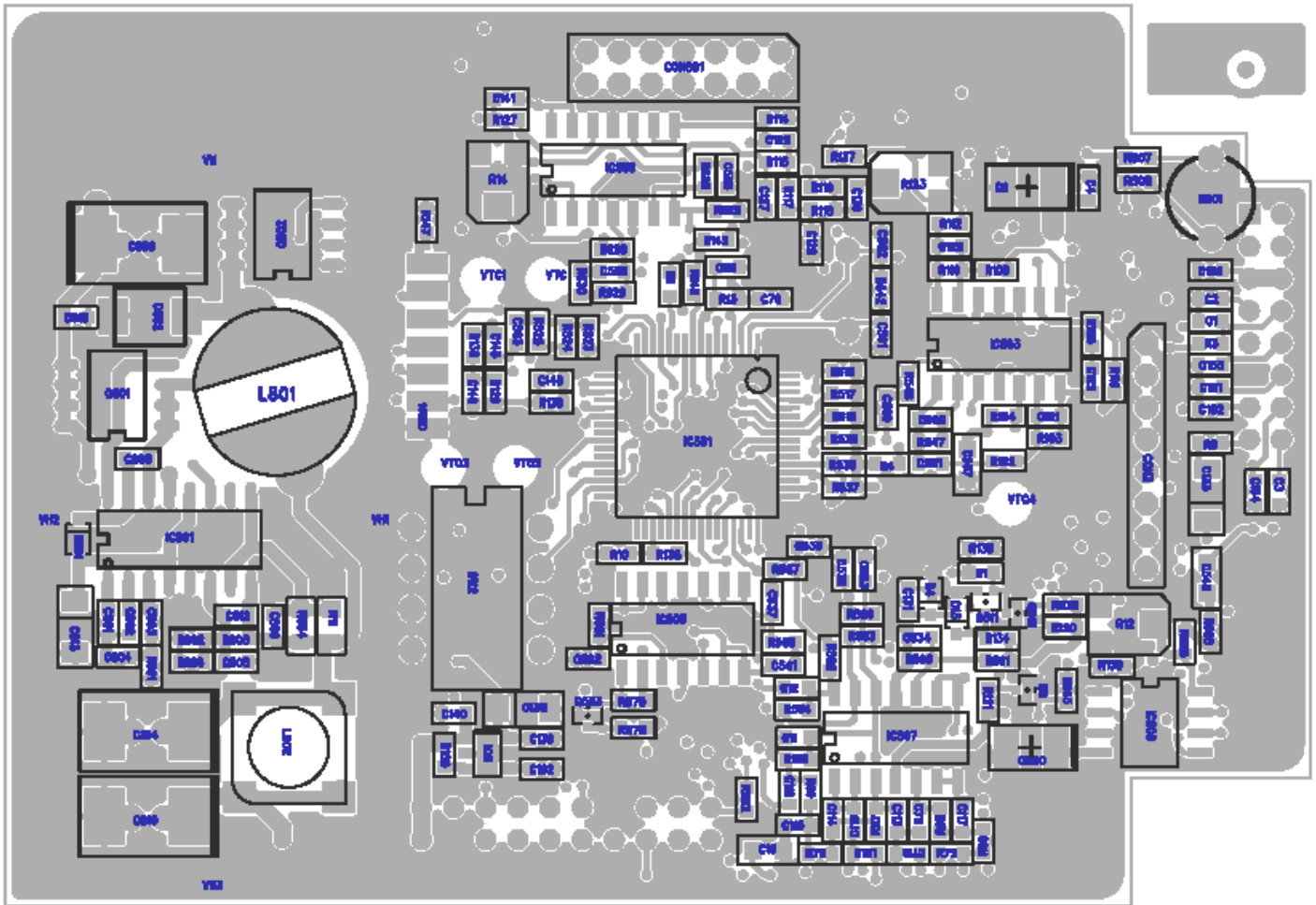
TROUBLESHOOTING

SYMPTOMS	CAUSES	COUNTERMEASURES
Unit does not work	1. Incomplete connection 2. Defective DC/DC VCC 3. 5v voltage source 4. PLL error 5. Filtering error 6. EEPROM fail	1. Check CON1 connection 2. Check IC801 3. IC8 (5v $\pm$0.2v) 4. Check TCX0/VCO/PLL IC 5. Check LPF 6. Re-programming
Bad RX Sensitivity (-10 to -60dB)	1. Defective ANT Switch 2. Defective Front-End 3. Defective dBm0 4. IF IC 5. VCC level drop 6. Change of 1st local frequency	1. Check D22, 24 2. Check Q19 3. Check D709, L720, 723 4. Replace IC3 5. RX VCO level .2dBm 6. Re-Tune TCX0
Defective RX	1. VCO frequency change of level drop 2. Defective voltage source0	1. Replace RX VCO 2. Defective IF IC (IC3) 3. IC3, Q7, Q13
PLL Error	1. Defective 14.4MHz TCX0 2. Voltage source for RX VCP/TX VCO 3. Defective PLL IC	1. Replace TCX0 2. Check RX VCO/TX VCO 3. Replace IC6
Low TX Power	1. APC	1. Re-adjust RV3
No TX Power	1. Tx Buffer 2. Power Module 3. APC control	1. Check Q2, 22 2. Check RX VCO/TX VCO 3. Replace IC4
No Modulation	1. SW IC & Mic Amp IC	1. Check IC509
No Programming	1. Short protector VCC	1. Defective programming lead

HEADLINE

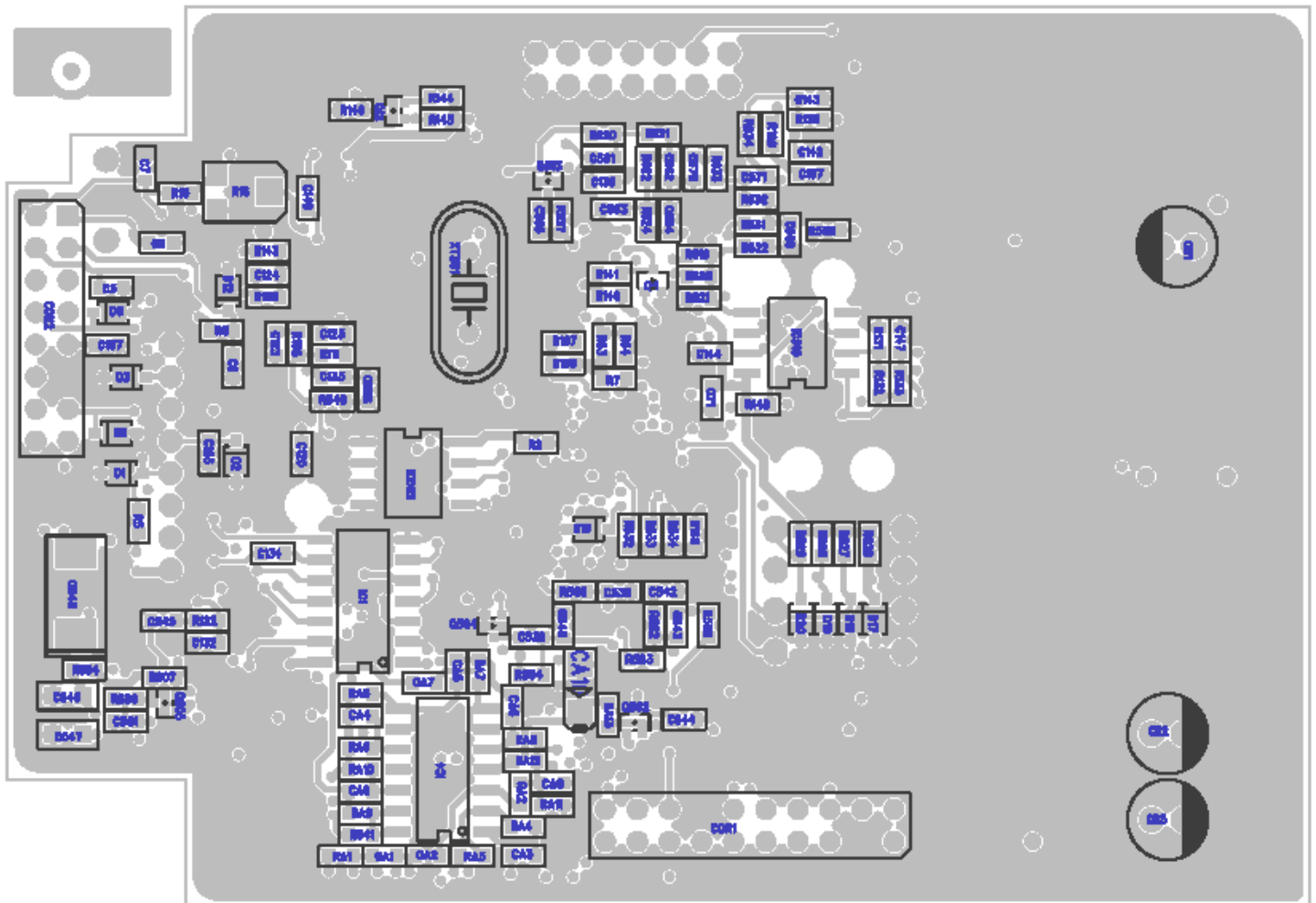
BOARD LAYOUTS

Digital Board Top



HEADLINE

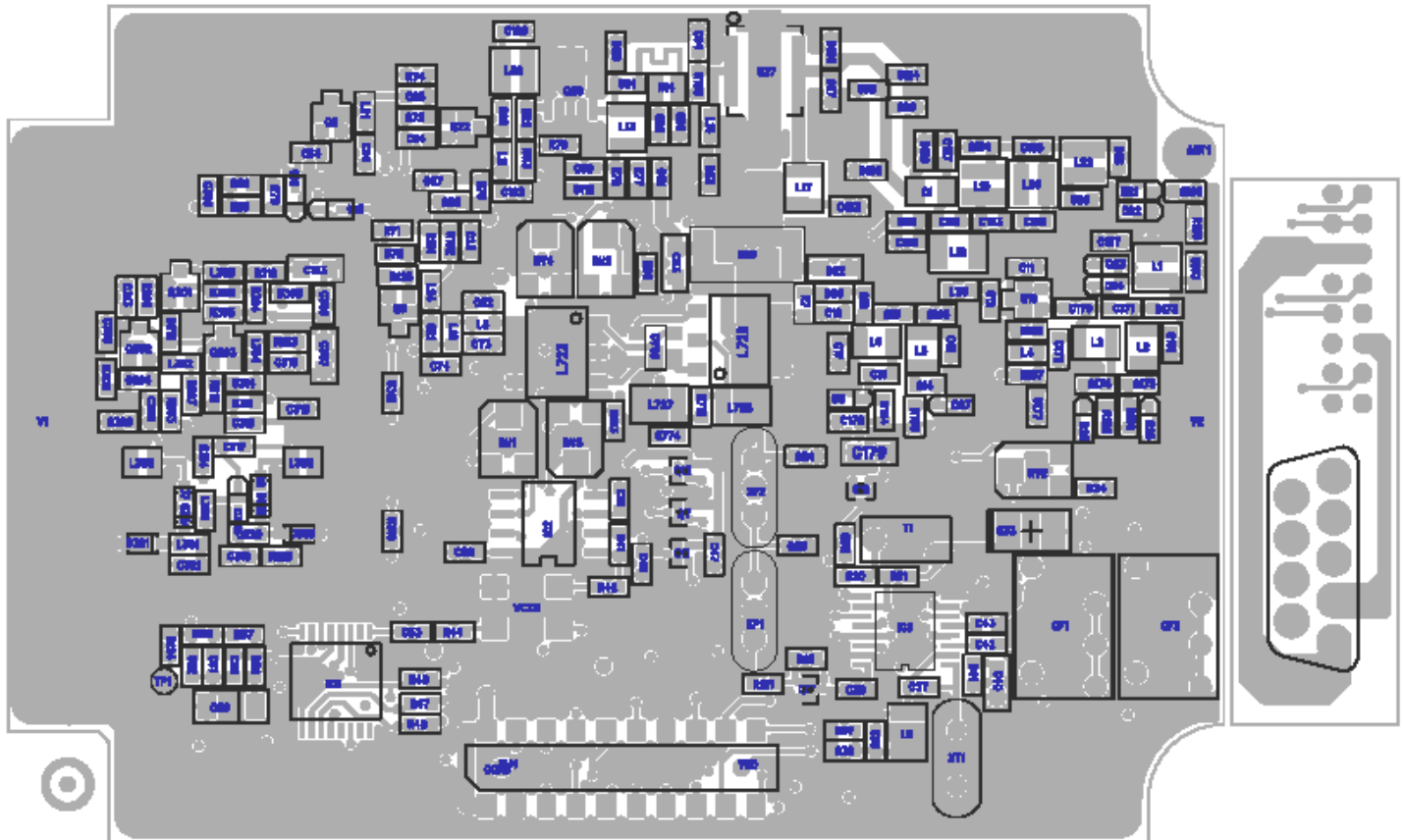
Digital Board Bottom



HEADLINE

RF Board Top

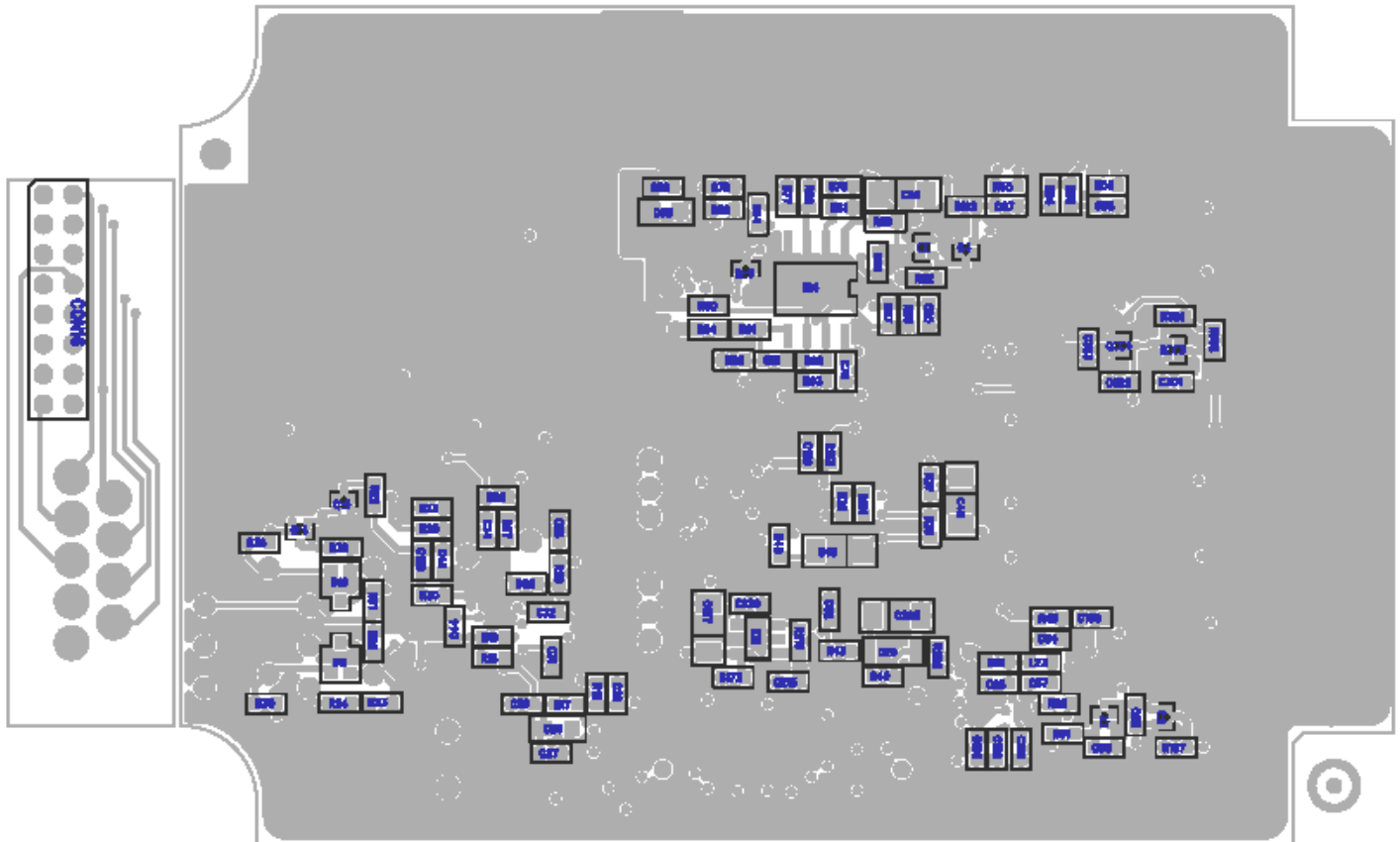
* HLD-100U2 RF TOP (PFM00125DA)



HEADLINE

RF Board Bottom

* HLD-100U2 RF BOTTOM (PFM00125DA)





UHF PARTS LIST

PART NO	PART NAME	DESCRIPTION	Q'TY	LOCATION
01-BCA	BOTTOM COVER ASSY			
690-00005-AA	POST	No.4 5x7 NI-PLATING	2.000	
810-00352-AA	BOTTOM COVER	ALUMINUM 12 SILVER SPRAY	1.000	
881-00045-AA	O-RING	SILICONE RUBBER BLACK PIE1.0	1.000	
881-00046-AA	RUBBER WASHER	SILICONE RUBBER BLACK T=1.0 PIE13.0	1.000	
881-00047-AA	RUBBER FOR PWR	SILICONE RUBBER BLACK T=1.0 31.9x13.6	1.000	
990-00621-AA	NAME LABEL	POLYESTER STICKER T=0.09	1.000	
NCS-01HD1-TC	CONNECTER SOCKET ANT	TC-BNC-RB CONNCETOR	1.000	
DTR-00001-DPM	DT PCB MANUAL ASSY			
AMN-00001-AA	LED,GN/RD,3mm,LEAD	LTL-1BEHJ 3mm,GN/RD	1.000	D501
NCH-20VD2-KA	PIN HEADER	K8MD55E-G20-3525	1.000	CON1
NCS-08VD1-KA	CONNECTER SOCKET	K8FS45D-G08	1.000	CON3
NCS-14VD2-KA	CONNECTER SOCKET	K8FD45D-G14	1.000	CON501
NCS-16VD2-KA	CONNECTER SOCKET	K8FD45D-G16	1.000	CON2
SDP-KSD04-1A	SWITCH DIP	KSD04H	1.000	SW2
XCN-4000A-HA	CRYSTAL	HC-49/S 4.000MHz	1.000	XT501
DTR-00001-DPS	DT PCB SMD ASSY			
BTC-012UH-FA	COIL INDUCTOR	CK104-120K 12uH	1.000	L801
BTC-3R3UH-FA	COIL INDUCTOR	SKSI6D28-3R3N 3.3uH	1.000	L802
C16-101ZJ-AB	CHIP CERAMIC 1608	100pF CL10C101JB8NNNC	2.000	C805,812
C16-102ZK-AB	CHIP CERAMIC 1608	0.001UF CL10C102KB8NNNC	14.000	C1~3,5~8,151~155,157,806
C16-103ZK-AB	CHIP CERAMIC 1608	0.01uF CL10C103KB8NNNC	8.000	C4,143,156,562,565,566,569,581
C16-104ZK-AB	CHIP CERAMIC 1608	0.1uF CL10C104K08NNNC	32.000	C12,69~71,116,119,120,122,123,125,130,135,139,140,144,147~149,162,503,508,534,535,541,544,545,561,568,802,808,810,CA8
C16-105ZZ-AB	CHIP CERAMIC 1608	1uF CL10F105ZP8NNNC	6.000	C11,134,509,583,592,CA10
C16-123ZK-AB	CHIP CERAMIC 1608	0.012uF CL10B123KB8NNNC	1.000	C129
C16-153ZK-AB	CHIP CERAMIC 1608	0.015uF CL10B153KA8NNNC	3.000	C539,CA3,5
C16-221ZJ-AB	CHIP CERAMIC 1608	220pF CL10C221JB8NNNC	2.000	C124,126
C16-222ZK-AB	CHIP CERAMIC 1608	0.0022uF CL10B222KB8NNNC	2.000	C538,542
C16-223ZK-AB	CHIP CERAMIC 1608	0.022uF CL10B223KB8NNNC	8.000	C131,536,CA1,2,4,6,7,9
C16-224ZZ-AB	CHIP CERAMIC 1608	0.22uF CL10F224ZO8NNNC	3.000	C543,551,582
C16-240ZJ-AB	CHIP CERAMIC 1608	24pF CL10C240JB8NNNC	3.000	C501,502,801
C16-273ZK-AA	CHIP CERAMIC 1608	0.027uF CL10B273KA8NNNC	2.000	C114,117
C16-331ZK-AB	CHIP CERAMIC 1608	330pF CL10B331KB8NNNC	1.000	C803
C16-332ZK-AA	CHIP CERAMIC 1608	0.0033uF CL10B332KA8NNNC	1.000	C540
C16-333ZK-AB	CHIP CERAMIC 1608	0.033uF CL10B333KA8NNNC	2.000	C128,563
C16-470ZJ-AB	CHIP CERAMIC 1608	47pF CL10C470JB8NNNC	2.000	C121,506
C16-472ZK-AB	CHIP CERAMIC 1608	0.0047uF CL10B472KB8NNNC	4.000	C115,118,145,146
C16-473ZK-AB	CHIP CERAMIC 1608	0.047uF CL10B473KA8NNNC	1.000	C132
C16-510ZK-AB	CHIP CERAMIC 1608	51PF CL10C510KB8NNNC	1.000	C804

HEADLINE

PART NO	PART NAME	DESCRIPTION	Q'TY	LOCATION
C16-561ZK-AB	CHIP CERAMIC 1608	560PF CL10B561KA8NNNC	6.000	C72,113,127,142,564,570
C16-563ZK-AA	CHIP CERAMIC 1608	0.056uF CL10B563KB8NNNC	2.000	C141,571
C16-683ZK-AA	CHIP CERAMIC 1608	0.068uF CL10B683KB8NNNC	1.000	C537
C20-475ZZ-AB	CHIP CERAMIC 2012	4.7uF CL21F475ZPFNNNE	4.000	C10,546,547,567
CTC-047ZM-AB	CHIP TANTALUM	4.7uF 10V TCSCS1A475MAAR	1.000	C813
CTC-100ZM-AB	CHIP TANTALUM	10uF 16V TCSCS1C106MAAR	2.000	C133,138
CTC-101ZM-AA	CHIP TANTALUM	100uF 16V TCSVN1C107MDAR	2.000	C814,815
CTC-101ZM-AB	CHIP TANTALUM	100uF 4V TCSVN0G107MCAR	1.000	C548
CTC-220ZM-AA	CHIP TANTALUM	22uF 16V TCSVN1C226MBAR	2.000	C9,550
CTC-330ZM-AA	CHIP TANTALUM	33uF 25V TCSVN1E336MDAR	1.000	C809
DRC-SMA14-KA	DIODE RECTIFIER	(SMAB14) TN4001,SMD	1.000	D802
DSC-S160S-AA	DIODE	KDS160	1.000	D801
DZC-5615U-AA	DIODE ZENER CHIP	KDZ 5.6V	13.000	D1~5,9,12,13,16~20
IAA-7233D-SA	IC AUDIO AMP	TDA7233D	1.000	IC508
ICP-8649U-AA	IC CPU	TMP86FS49AUG	1.000	IC501
IDD-1435C-SA	IC (DC/DC CONVERTER)	LTC1435CS	1.000	IC801
IEE-24C16-HA	IC EEPROM	HT24LC16	1.000	IC502
IOA-324DA-EA	IC OP AMP	IL324D	5.000	IC4,503,505,507,509
IOA-358DA-EA	IC OP AMP	IL358D	1.000	IC510
IRG-2882F-JA	LOW DROP VOLTAGE REGULATOR	NJM2882F	1.000	IC8
ISW-4066C-IA	IC SW	IW4066BD	1.000	IC1
PFM-0136A-BD	PCB MAIN (DATA RADIO-DT)	1.6(T) 2/2 GOLD	1.000	
R16-000AJ-BA	FILM CHIP RESISTOR	0 1/16W 5% T 1608	8.000	R3,5,112,168,139,149,641,RA1
R16-100AJ-AA	FILM CHIP RESISTOR	10 RC1608 J 100 CS	2.000	R628,RA13
R16-101AJ-AA	FILM CHIP RESISTOR	100 RC1608 J 101 CS	1.000	R639
R16-102AJ-AA	FILM CHIP RESISTOR	1K RC1608 J 102 CS	4.000	R1,2,606,144
R16-103AJ-AA	FILM CHIP RESISTOR	10K RC1608 J 103 CS	9.000	R143,506,516,517,518,580,801,120,RA4
R16-104AJ-AA	FILM CHIP RESISTOR	100K RC1608 J 104 CS	24.000	R634,631,620,589,588,586,521,534,549,563,141,142,135,121,119,111,109,108,106,105,104,13,593,RA8
R16-105AJ-AA	FILM CHIP RESISTOR	1M RC1608 J 105 CS	1.000	R542
R16-123AJ-AA	FILM CHIP RESISTOR	12K RC1608 J 123 CS	1.000	R522
R16-152AJ-AA	FILM CHIP RESISTOR	1.5K RC1608 J 152 CS	1.000	RA9
R16-153AJ-AA	FILM CHIP RESISTOR	15K RC1608 J 153 CS	3.000	R629,RA2,12
R16-154AJ-AA	FILM CHIP RESISTOR	150K RC1608 J 154 CS	1.000	R587
R16-183AJ-AA	FILM CHIP RESISTOR	18K RC1608 J 183 CS	1.000	R806
R16-184AJ-AA	FILM CHIP RESISTOR	180K RC1608 J 184 CS	2.000	R130,103
R16-204AJ-AA	FILM CHIP RESISTOR	200K RC1608 J 204 CS	1.000	R131
R16-221AJ-AA	FILM CHIP RESISTOR	220 RC1608 J 221 CS	2.000	R8,9
R16-222AJ-AA	FILM CHIP RESISTOR	2.2K RC1608 J 222 CS	2.000	R625,114
R16-223AJ-AA	FILM CHIP RESISTOR	22K RC1608 J 223 CS	5.000	R126,524,525,548,590

HEADLINE

PART NO	PART NAME	DESCRIPTION	Q'TY	LOCATION
R16-224AJ-AA	FILM CHIP RESISTOR	220K RC1608 J 224 CS	4.000	R128,547,581,632
R16-272AJ-AA	FILM CHIP RESISTOR	2.7K RC1608 J 272 CS	1.000	R102
R16-273AJ-AA	FILM CHIP RESISTOR	27K RC1608 J 273 CS	6.000	R117,519,582,622,532,RA6
R16-333AJ-AA	FILM CHIP RESISTOR	33K RC1608 J 333 CS	4.000	R583,584,591,7
R16-334AJ-AA	FILM CHIP RESISTOR	330K RC1608 J 334 CS	2.000	R100,101
R16-363AJ-AA	FILM CHIP RESISTOR	36K RC1608 J 363 CS	1.000	R802
R16-392AJ-AA	FILM CHIP RESISTOR	3.9K RC1608 J 392 CS	3.000	R115,627,624
R16-393AJ-AA	FILM CHIP RESISTOR	39K RC1608 J 393 CS	3.000	R633,127,585
R16-394AJ-AA	FILM CHIP RESISTOR	390K RC1608 J 394 CS	1.000	RA10
R16-471AJ-AA	FILM CHIP RESISTOR	470 RC1608 J 471 CS	2.000	R507,508
R16-472AJ-AA	FILM CHIP RESISTOR	4.7K RC1608 J 472 CS	5.000	R133,626,122,116,RA7
R16-473AJ-AA	FILM CHIP RESISTOR	47K RC1608 J 473 CS	17.000	R4,10,63,129,134,145,150,166, 167,526~529,537~539,578
R16-474AJ-AA	FILM CHIP RESISTOR	470K RC1608 J 474 CS	1.000	R594
R16-475AJ-AA	FILM CHIP RESISTOR	4.7M RC1608 J 475 CS	2.000	R579,604
R16-512AJ-AA	FILM CHIP RESISTOR	5.1K RC1608 J 512 CS	2.000	R66,76
R16-513AJ-AA	FILM CHIP RESISTOR	51K RC1608 J 513 CS	3.000	R132,136,533
R16-562AJ-AA	FILM CHIP RESISTOR	5.6K RC1608 J 562 CS	3.000	R65,67,RA3
R16-563AJ-AA	FILM CHIP RESISTOR	56K RC1608 J 563 CS	3.000	R110,520,523
R16-682AJ-AA	FILM CHIP RESISTOR	6.8K RC1608 J 682 CS	1.000	RA5
R16-683AF-AA	FILM CHIP RESISTOR	68K RC1608 F 683 1%	1.000	R805
R16-822AJ-AA	FILM CHIP RESISTOR	8.2K RC1608 J 822 CS	5.000	R118,99,621,72,RA11
R16-823AJ-AA	FILM CHIP RESISTOR	82K RC1608 J 823 CS	1.000	R6
R20-047BF-BA	FILM CHIP RESISTOR	0.047 1/8W 1% 2012	2.000	R804,11
RSC-103ZN-JA	CHIP SEMI RESISTOR	TMC3KJ-B10K-TR	2.000	R14,123
RSC-223ZN-JA	CHIP SEMI RESISTOR	TMC3KJ-B22K-TR	1.000	R12
TRA-C404E-AA	TRANSISTOR BRT	KRC404E	5.000	Q8,9,503,504,506
TRC-9410S-VA	TRANSISTOR MOS FET	SI9410BDY	2.000	Q801,802
TRR-A301E-AA	TRANSISTOR	KRA301E	1.000	Q12
TRR-A304E-AA	TRANSISTOR BRT	KRA304E	1.000	Q510
TRR-A305E-AA	TRANSISTOR BRT	KRA305E	2.000	Q502,513
DTR-00001-MPA	MAIN PCB MECHANICAL			
614-00003-AA	SCREW	(+)MACHINE(BH) M3.0x4 Zn-PLATING	4.000	
614-00011-AA	SCREW	MACHINE SCREW (BH)M3X14.0 NI-PLATING	4.000	
690-00001-AA	POST	M3 POST L=10.0 SUS	3.000	
690-00002-AA	POST	M3 POST L=6.0 SUS	2.000	
760-00005-AA	HEAT SINK	SPTE T=1.0 45.0x10.0	1.000	
770-00044-BA	SHEET SILVER	AL FOIL 6X6 T=0.15	2.000	
770-00103-AA	PWR SHIELD CAN	SPTE T=0.3 43.8x21.0	1.000	
770-00104-AA	VCO CAN	SPTE T=0.3 18.2x22.7	1.000	
920-00109-AA	COPPER PLATE	13X6 T=0.08	1.000	
DTR-00001-PKA	PACKING ASSY			
931-00200-DA	POLY BAG	P.E 100x200 T=0.05	1.000	

TecNet International Inc.

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11535 West 83rd Terrace ▪ Lenexa, Kansas ▪ 66214

Telephone: 913-859-9515 ▪ Fax: 913-859-9550

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HEADLINE

PART NO	PART NAME	DESCRIPTION	Q'TY	LOCATION
950-00260-AA	OWNERS MANUAL	70 WOOD FREE PAPER	1.000	
970-00128-AA	GIFT BOX	450SC MANILA PAPER	1.000	
971-00039-AA	TRAY BOX	SW1S 142.0(W)x75.0(D)x42.5(H) T=2.0	1.000	
980-00349-AA	OUT BOX	DW1S 375(W)x284(D)x164(H) T=7.5	.025	
990-00622-AA	CHANNEL SELECTION LABEL	ART PAPER STICKER	1.000	
990-00660-AB	SERIAL NUMBER LABEL	ART PAPER STICKER 20 x 7 mm	2.000	
DTR-00001-RPM	RF PCB MANUAL ASSY			
FCN-4464A-HB	CRYSTAL	44.645MHz UM-4	1.000	XT1
FCN-455A5-CA	FILTER CERAMIC	LTM455HTW	1.000	CF2
FCN-455E5-CA	FILTER CERAMIC	LTM455FW	1.000	CF1
FXN-451AP-HA	CRYSTAL MCF	45.1M15B 4POLE	2.000	XF1,2
WI3-8A030-DA	COXIAL CABLE	RG178 (AWG38 30mm)	1.000	
XED-455TH-BA	CERAMIC DISCRIMINATOR	CDBM455C24	1.000	T1
DTR-00001-RPS	RF PCB SMD ASSY			
B16-022UK-AA	COIL CHIP	2.2uH CIL10J2R2KNC	3.000	L23,301,306
B16-101NK-AA	COIL CHIP	100nH CIH10T-100NK	1.000	L4
B16-150NK-AB	COIL CHIP	15nH CIH10T-15NK	1.000	L11
B16-180NK-AB	COIL CHIP	18nH CIH10T-18NK	4.000	L8,10,21,305
B16-221NK-AB	COIL CHIP	220nH CIH10T-220NK	3.000	L16,302,304
B16-270NK-AB	COIL CHIP	27nH CIH10T-27NK	1.000	L25
B16-330NK-AB	COIL CHIP	33nH CIH10T-33NK	1.000	L24
BAC-0R7UH-FA	COIL BALUN	CK0602-0.7uH	2.000	L720,723
BSC-3010C-AA	COIL SPRING	E2L 0.3x1.0x3TL	1.000	L303
BSC-3010D-AA	COIL SPRING	0.3x1.0x4TL (SMD)	1.000	L308
BSC-3010E-AA	COIL SPRING	E2L 0.3x1.0x5TL	2.000	L89,19
BSC-3010G-AA	COIL SPRING	0.3x1.0x7TL (SMD)	4.000	L2,3,5,6
BSC-3012E-AA	COIL SPRING	E2L 0.3x1.2x5TL	3.000	L1,20,22
BSC-3013G-AA	COIL SPRING	E2L 0.3x1.3x7TL	2.000	L13,17
BWN-105JN-AA	COIL WOUND	0805AS-105J	1.000	L9
BWN-151JN-AA	COIL WOUND	0805AS-151J	1.000	L727
BWN-471JN-AA	COIL WOUND	0805AS-471J	1.000	L18
BWN-561JN-AA	COIL WOUND	0805AS-561J	1.000	L728
C16-005ZC-DA	CHIP CERAMIC 1608	0.5pF GRM1885C1HR50CZ01D	2.000	C317,320
C16-010ZC-DA	CHIP CERAMIC 1608	1pF GRM1885C1H1R0CZ01D	1.000	C107
C16-015ZC-DA	CHIP CERAMIC 1608	1.5pF GRM1885C1H1R5CZ01D	2.000	C66,319
C16-020ZC-DA	CHIP CERAMIC 1608	2pF GRM1885C1H2R0CZ01D	1.000	C310
C16-030ZC-DA	CHIP CERAMIC 1608	3pF GRM1885C1H3R0CZ01D	3.000	C65,110,300
C16-040ZC-DA	CHIP CERAMIC 1608	4pF GRM1885C1H4R0CZ01D	5.000	C100,103,106,318,25
C16-050ZC-DA	CHIP CERAMIC 1608	5pF GRM1885C1H5R0CZ01D	6.000	C64,86,104,303,316,171
C16-060ZC-DA	CHIP CERAMIC 1608	6pF GRM1885C1H6R0CZ01D	6.000	C173,19,75,161,312,15
C16-070ZC-DA	CHIP CERAMIC 1608	7PF GRM1885C1H7R0CZ01D	4.000	C13,20,53,166
C16-080ZS-DA	CHIP CERAMIC 1608	8PF GRM1885C1H8R0DZ01D	1.000	C309
C16-090ZS-DA	CHIP CERAMIC 1608	9PF GRM1885C1H9R0DZ01D	2.000	C21,85
C16-100ZD-DA	CHIP CERAMIC 1608	10pF GRM1885C1H100JA01D	2.000	C325,120
PART NO	PART NAME	DESCRIPTION	Q'TY	LOCATION

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C16-101ZD-DA	CHIP CERAMIC 1608	100pF GRM1885C1H101JA01D	3.000	C158~160
C16-102ZD-DA	CHIP CERAMIC 1608	1000pF GRM188R71H102KA01D	4.000	C38,90,108,168
C16-103ZH-DA	CHIP CERAMIC 1608	0.01uF GRM188R71H103KA01D	17.000	C12,23,26,27,29,30,52,55,56,58, 61,62,78,84,87,177,178
C16-104ZH-DA	CHIP CERAMIC 1608	0.1uF GRM188F51E104ZA01D	19.000	C41~44,50,54,67,68,76,77,112, 172,215,220,301,322,180~182
C16-105ZJ-DA	CHIP CERAMIC 1608	1uF GRM188F51A105ZA01D	2.000	C111,323
C16-120ZJ-DA	CHIP CERAMIC 1608	12PF GRM1885C1H120JA01D	6.000	C14,16,304,314,324,174
C16-150ZD-DA	CHIP CERAMIC 1608	15pF GRM1885C1H150JA01D	5.000	C24,99,165,305,315
C16-151ZD-DA	CHIP CERAMIC 1608	150pF GRM1885C1H151JA01D	1.000	C91
C16-180ZJ-DA	CHIP CERAMIC 1608	18PF GRM1885C1H180JA01D	4.000	C73,74,170,175
C16-200ZJ-DA	CHIP CERAMIC 1608	20PF GRM1885C1H200JA01D	2.000	C97,150
C16-220ZJ-DA	CHIP CERAMIC 1608	22PF GRM1885C1H220JA01D	1.000	C1
C16-222ZK-DA	CHIP CERAMIC 1608	0.0022uF GRM188R71H222KA01D	2.000	C34,35
C16-223ZK-DA	CHIP CERAMIC 1608	0.022uF GRM188R71E223KA01D	2.000	C31,60
C16-224ZK-DA	CHIP CERAMIC 1608	0.22uF GRM188R71C224KA01D	1.000	C811
C16-330ZJ-DA	CHIP CERAMIC 1608	33PF GRM188RC1H330JA01D	2.000	C18,37
C16-331ZK-DA	CHIP CERAMIC 1608	330PF GRM188R7H331KA01D	2.000	C45,109
C16-390ZJ-MA	CHIP CERAMIC 1608	39PF GRM185C1H390JA01D	1.000	C93
C16-471ZH-DA	CHIP CERAMIC 1608	470pF GRM1885C1H471JA01D	11.000	C51,57,79,81,88,96,102, 183,306,308,321
C16-472ZK-DA	CHIP CERAMIC 1608	0.0047uF GRM188R71H472KA01D	1.000	C36
C16-560ZJ-DA	CHIP CERAMIC 1608	56PF GRM1885C1H560JA01D	1.000	C39
C16-680ZJ-DA	CHIP CERAMIC 1608	68PF GRM1885C1H680JA01D	2.000	C101,774
C16-820ZJ-DA	CHIP CERAMIC 1608	82PF GRM1885C1H820JA01D	1.000	C32
C20-475ZJ-MA	CHIP CERAMIC 2012	4.7uF GRM21BF51C475ZA01L CAP 2012	8.000	C28,40,82,83,95,163,307,179
CTC-022ZM-AC	CHIP TANTALUM	0.22uF 16V TCSVN1C224MAAR	1.000	C59
CTC-100ZM-AB	CHIP TANTALUM	10uF 16V TCSCS1C106MAAR	5.000	C48,49,63,137,265
CTC-220ZM-AA	CHIP TANTALUM	22uF 16V TCSVN1C226MBAR	1.000	C33
DBC-S114E-BA	DIODE BAND S/W CHIP	KDS114E	2.000	D14,15
DHC-2817S-HA	DIODE SCHOTTY	HSMS-2817-TR1G	1.000	D709
DIC-H131E-HA	DIODE Si CHIP	HVC131TRF	4.000	D21~24
DIC-S120E-AA	DIODE Si CHIP	KDS120E	2.000	D10,11
DVC-154CE-AA	DIODE VARICAP CHIP	KDV154E	5.000	D6,302,25,26,27
DVC-SV270-TA	DIODE VIRICAP CHIP	1SV270	2.000	D301,303
DZC-2020L-HA	DIODE ZENER CHIP	HZK2ALL	1.000	D29
IFI-31136-TA	IC IF SMD	TA31136FN	1.000	IC3
IOA-358DA-EA	IC OP AMP	IL358D	2.000	IC2,4
IPL-1503C-UA	IC PLL	MB15E03SL	1.000	IC6
IRG-2882F-JA	LOW DROP VOLTAGE REGULATOR	NJM2882F	1.000	IC5
NCS-20VC2-KA	CONNECTER SOCKET	K8FD45S-G20Y	1.000	CON5
PFM-0125A-DA	PCB MAIN	1.6(T) 2/2 GOLD	1.000	
R16-000AJ-BA	FILM CHIP RESISTOR	0 1/16W 5% T 1608	8.000	R7,14,150,24,39,42,77,78
R16-100AJ-AA	FILM CHIP RESISTOR	10 RC1608 J 100 CS	5.000	R18,43,44,45,262
PART NO	PART NAME	DESCRIPTION	Q'TY	LOCATION
R16-101AJ-AA	FILM CHIP RESISTOR	100 RC1608 J 101 CS	8.000	R22,55,61,75,83,304,310,157

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R16-102AJ-AA	FILM CHIP RESISTOR	1K RC1608 J 102 CS	3.000	R51,86,113
R16-103AJ-AA	FILM CHIP RESISTOR	10K RC1608 J 103 CS	23.000	R33,34,35,40,41,46,47,48,50,52,53,59,71,73,80,98,125,301,302,303,306,311,312
R16-104AJ-AA	FILM CHIP RESISTOR	100K RC1608 J 104 CS	10.000	R38,62,79,314,315,159,154,155,124,158
R16-123AJ-AA	FILM CHIP RESISTOR	12K RC1608 J 123 CS	1.000	R84
R16-153AJ-AA	FILM CHIP RESISTOR	15K RC1608 J 153 CS	2.000	R151,308
R16-154AJ-AA	FILM CHIP RESISTOR	150K RC1608 J 154 CS	1.000	R15
R16-181AJ-AA	FILM CHIP RESISTOR	180 RC1608 J 181 CS	2.000	R69,70
R16-182AJ-AA	FILM CHIP RESISTOR	1.8K RC1608 J 182 CS	2.000	R20,21
R16-220AJ-AA	FILM CHIP RESISTOR	22 RC1608 J 220 CS	3.000	R316,152,161
R16-221AJ-AA	FILM CHIP RESISTOR	220 RC1608 J 221 CS	4.000	R17,96,307,313
R16-222AJ-AA	FILM CHIP RESISTOR	2.2K RC1608 J 222 CS	2.000	R60,85
R16-223AJ-AA	FILM CHIP RESISTOR	22K RC1608 J 223 CS	6.000	R28,31,32,36,81,97
R16-225AJ-AA	FILM CHIP RESISTOR	2.2M RC1608 J 225 CS	1.000	R89
R16-272AJ-AA	FILM CHIP RESISTOR	2.7K RC1608 J 272 CS	7.000	R54,57,58,74,87,309,153
R16-274AF-AA	FILM CHIP RESISTOR	270K RC1608 F 274 1%	2.000	R90,91
R16-274AJ-AA	FILM CHIP RESISTOR	270K RC1608 J 274 CS	1.000	R25
R16-332AJ-AA	FILM CHIP RESISTOR	3.3K RC1608 J 332 CS	2.000	R16,23
R16-333AJ-AA	FILM CHIP RESISTOR	33K RC1608 J 333 CS	1.000	R82
R16-390AJ-AA	FILM CHIP RESISTOR	39 RC1608 J 390 CS	2.000	R68,94
R16-470AJ-AA	FILM CHIP RESISTOR	47 RC1608 J 470 CS	1.000	R305
R16-473AJ-AA	FILM CHIP RESISTOR	47K RC1608 J 473 CS	3.000	R19,218,160
R16-474AJ-AA	FILM CHIP RESISTOR	470K RC1608 J 474 CS	1.000	R30
R16-510AJ-AA	FILM CHIP RESISTOR	51 RC1608 J 510 CS	1.000	R719
R16-562AJ-AA	FILM CHIP RESISTOR	5.6K RC1608 J 562 CS	1.000	R163
R16-563AJ-AA	FILM CHIP RESISTOR	56K RC1608 J 563 CS	1.000	R156
R16-681AJ-AA	FILM CHIP RESISTOR	680 RC1608 J 681 CS	1.000	R29
R16-682AJ-AA	FILM CHIP RESISTOR	6.8K RC1608 J 682 CS	1.000	R56
R16-683AF-AA	FILM CHIP RESISTOR	68K RC1608 F 683 1%	2.000	R92,93
R25-901FF-BA	FILM CHIP RESISTOR	0.1 RMC 1S, 2512 1% FTP	1.000	R95
RSC-103ZN-JA	CHIP SEMI RESISTOR	TMC3KJ-B10K-TR	2.000	RV4,5
RSC-224ZN-JA	CHIP SEMI RESISTOR	TMC3KJ-B220K-TR	1.000	RV1
RSC-472ZN-JA	CHIP SEMI RESISTOR	4.7KB 868-9007C-16	1.000	RV3
RSC-503ZN-JA	CHIP SEMI RESISTOR	TMC3KJ-B50K-TR	1.000	RV2
TRA-C404E-AA	TRANSISTOR BRT	KRC404E	9.000	Q1,3,4,14,15,16,20,304,305
TRC-085YE-DA	TRANSISTOR	2SC5085-Y	5.000	Q5,19,301,302,303
TRC-226YU-NA	TRANSISTOR	2SC4226-R24	2.000	Q2,22
TRC-3475C-DA	MOS FET-TR	2SK3475	1.000	Q26
TRC-4080Y-AA	TRANSISTOR	KTC4080E	1.000	Q17
TRC-RD07M-CA	MOS FET-TR	RD07MVS1	1.000	Q27
TRR-A305E-AA	TRANSISTOR BRT	KRA305E	4.000	Q6,7,11,13
XTC-1440I-PA	VCTCXO	HKE3059A-14.4M-ETD14B-00109C	1.000	V CXO
PART NO	PART NAME	DESCRIPTION	Q'TY	LOCATION
DTR-00001-SPS	SUB PCB MANUAL ASSY			

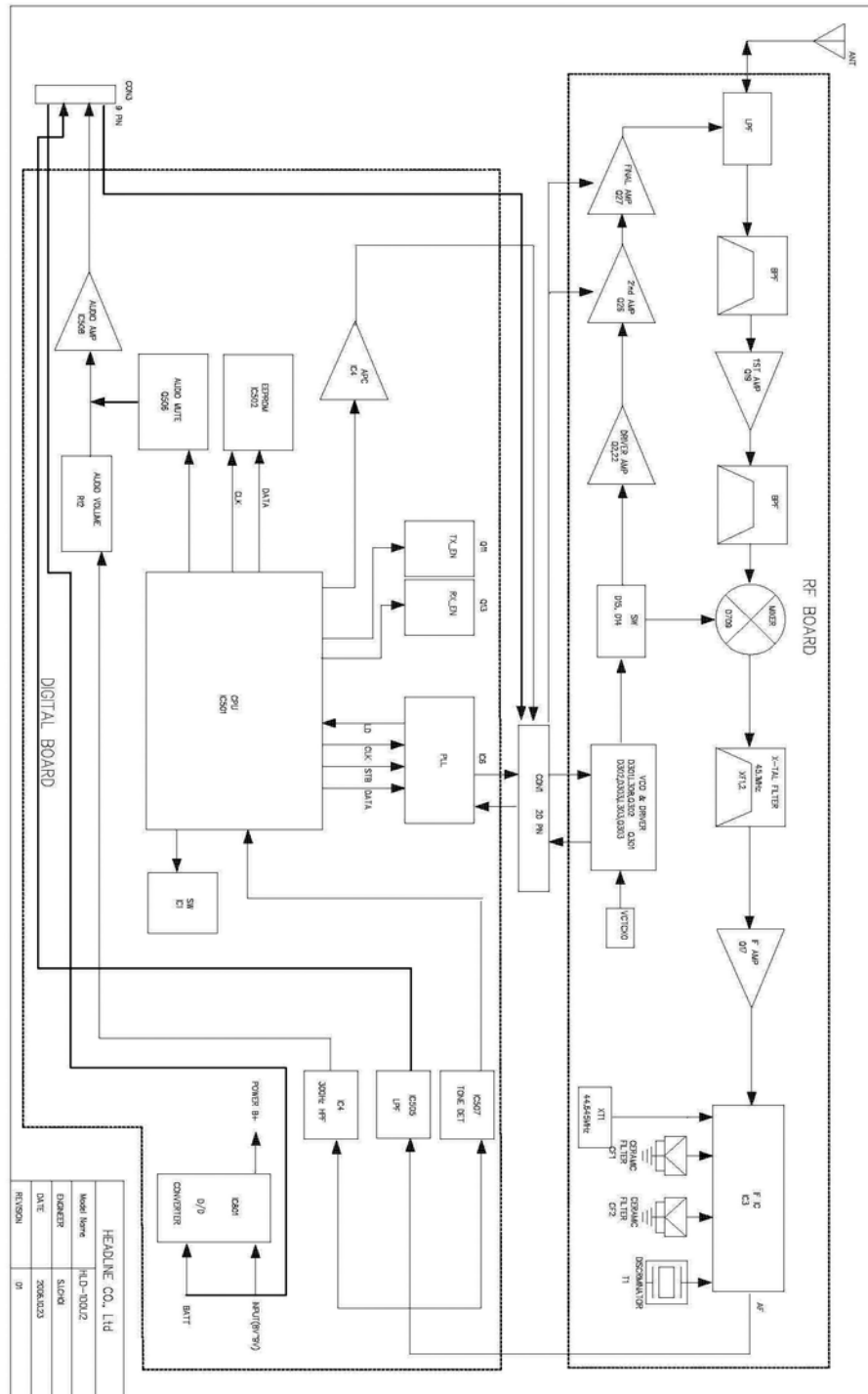
HEADLINE

NCH-16HD2-KA	PIN HEADER	K8MD28R-G16-3525	1.000	
NDS-09HD1-1A	CONNECTOR D-SUB	D-SUB 9PIN	1.000	
PFM-0125B-BA	PCB MAIN	1.6(T) 2/2 GOLD	1.000	
DTR-00001-UCA	UPPER COVER ASSY			
810-00351-AA	TOP COVER	ALUMINUM 12 SILVER SPRAY	1.000	
911-00036-AA	LED PLATE	NEXAN SHEET T=0.3 PIE7.8	1.000	

VHF PARTS LIST

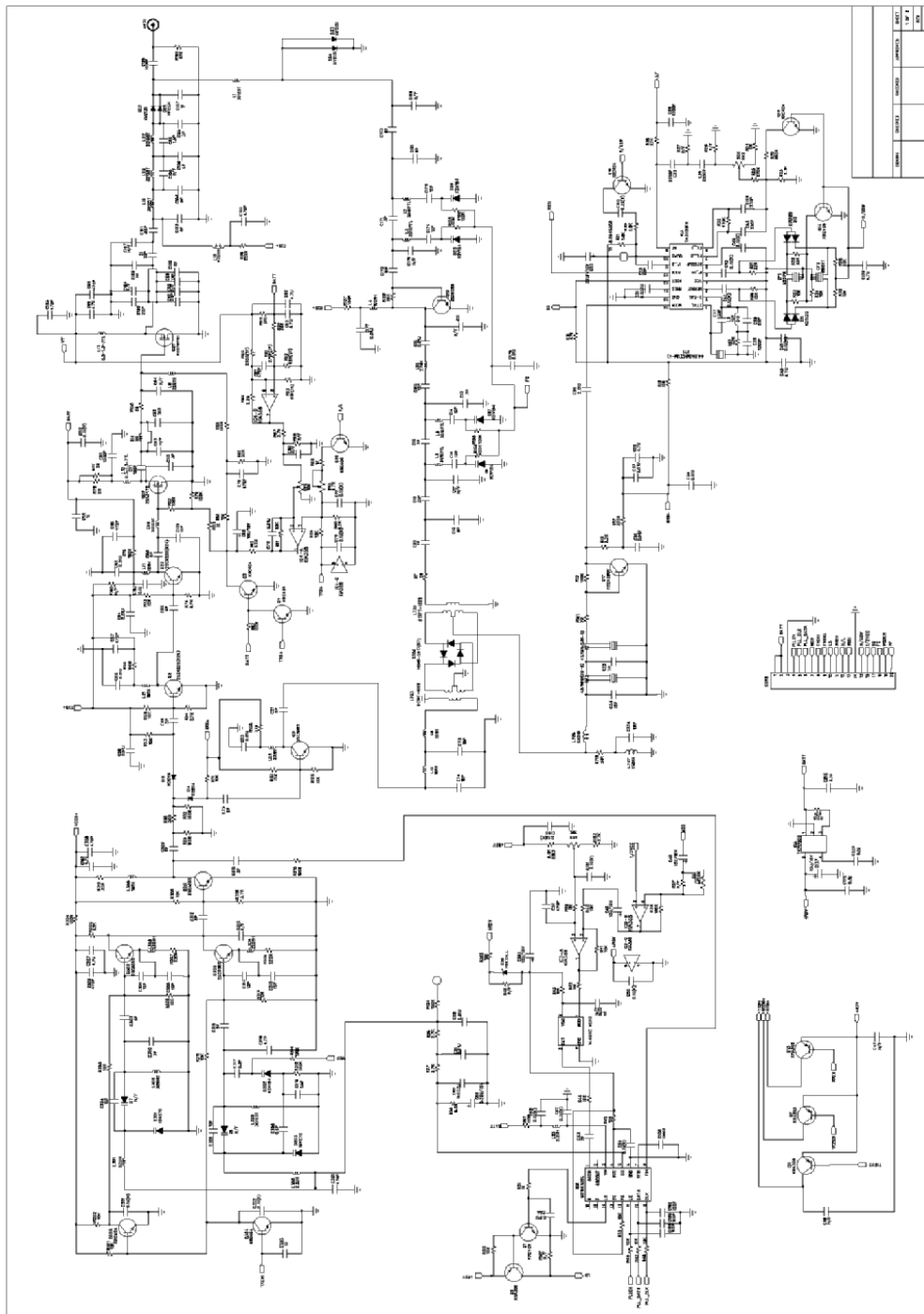
HEADLINE

BLOCK DIAGRAM

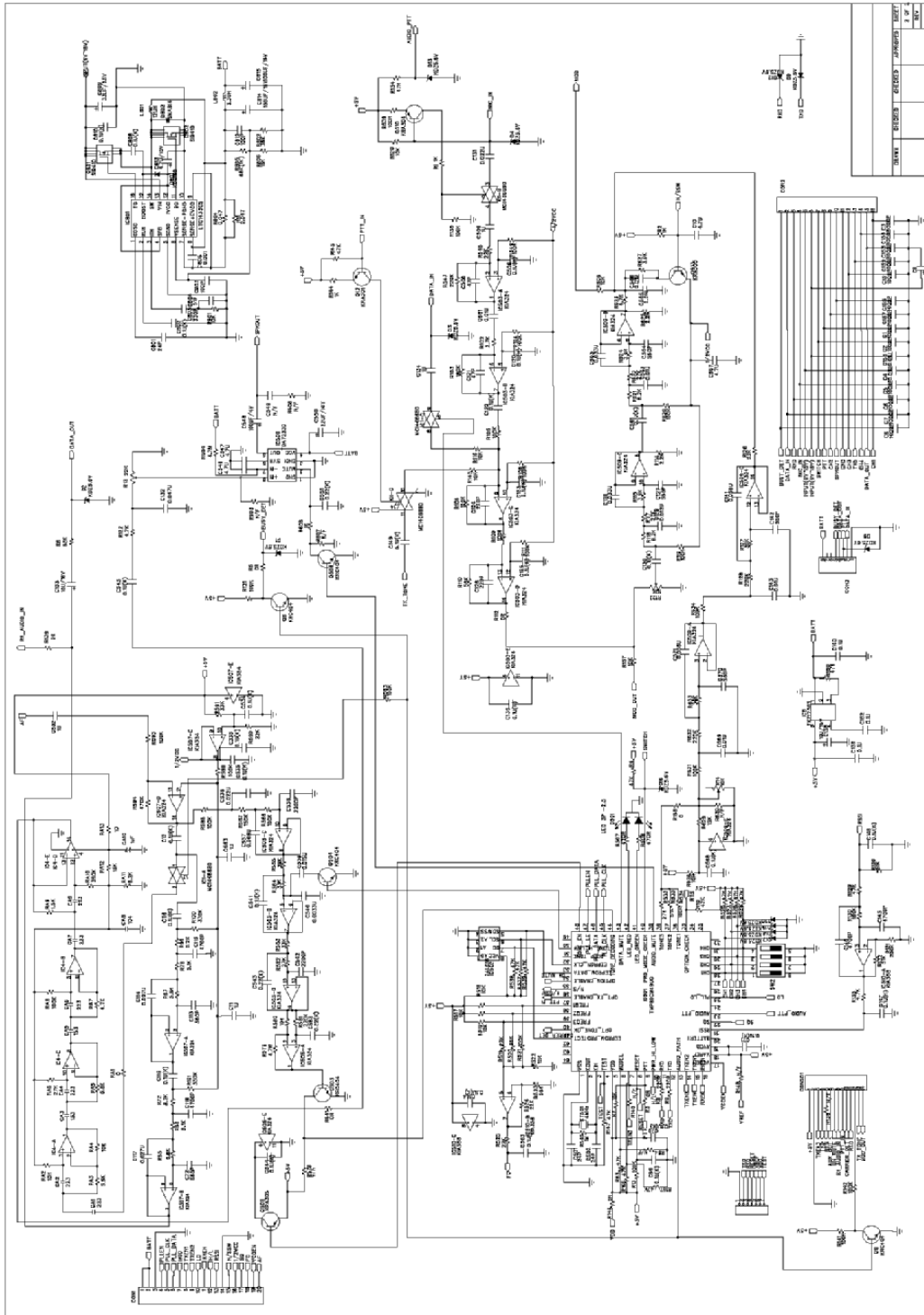


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SCHEMATICS

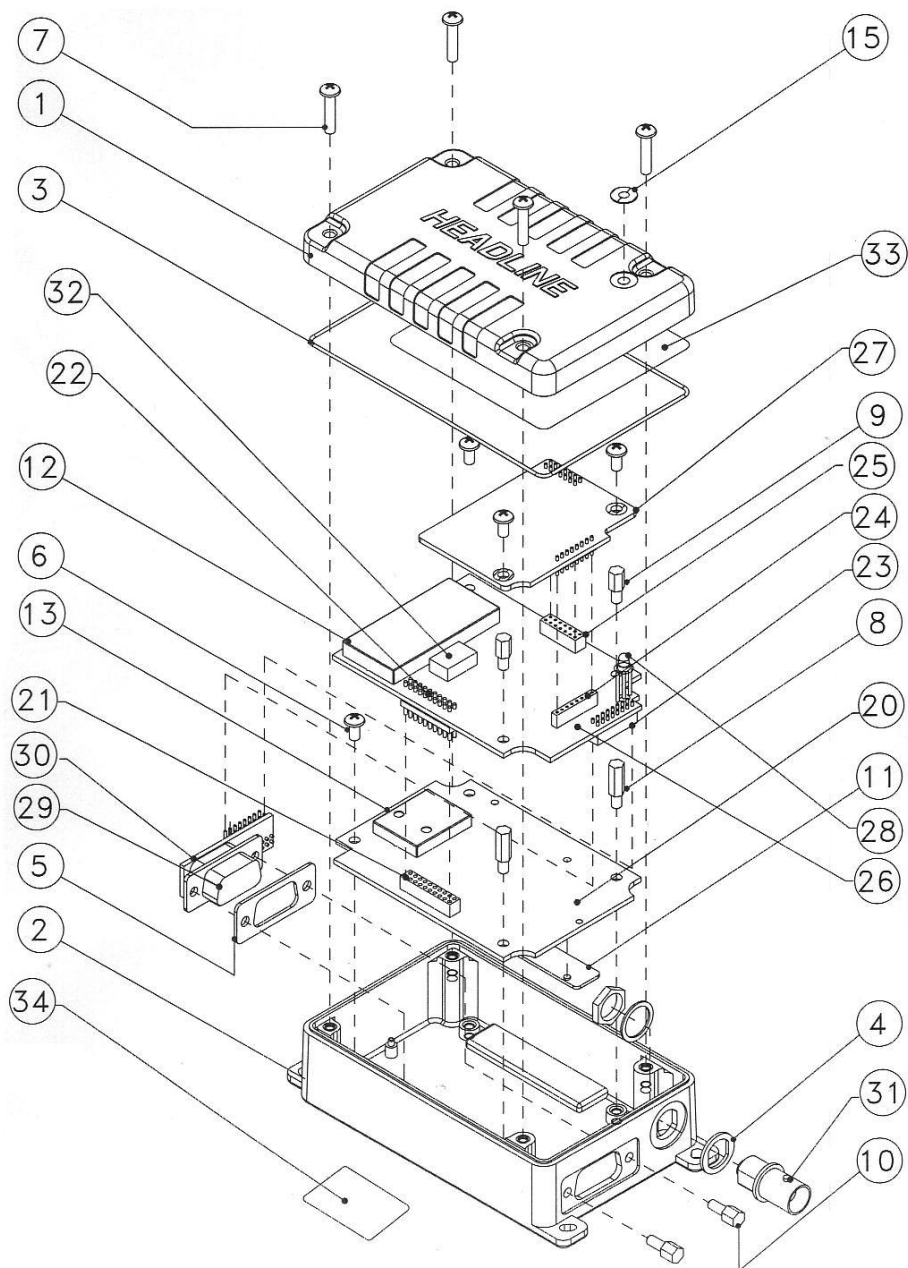


HEADLINE



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EXPLODED VIEW





EXPLODED VIEW PARTS LIST

NO	PART NO.	PART NAME	DISCRIPTION	Q'TY
1	810-00351-AA	TOP COVER	ALUMINUM 12 SILVER SPRAY	1
2	810-00352-AA	BOTTOM COVER	ALUMINUM 12 SILVER SPRAY	1
3	881-00045-AA	O-RING	SILICONE RUBBER BLACK PIE1.0	1
4	881-00046-AA	RUBBER WASHER	SILICONE RUBBER BLACK T=1.0 PIE13.0	1
5	881-00047-AA	RUBBER FOR PWR	SILICONE RUBBER BLACK T=1.0 31.9x13.6	1
6	614-00003-AA	SCREW	(+)MACHINE (BH) M3.0x4 Zn-PLATING	3
7	614-00011-AA	SCREW	MACHINE SCREW (BH)M3X14.0 NI-PLATING	4
8	690-00001-AA	POST	M3 POST L=10.0 SUS	3
9	690-00002-AA	POST	M3 POST L=6.0 SUS	2
10	690-00005-AA	POST	No.4 5x7 NI-PLATING	2
11	760-00005-AA	HEAT SINK	SPTE T=1.0 45.0x10.0	1
12	770-00103-AA	PWR SHIELD CAN	SPTE T=0.3 43.8x21.0	1
13	770-00104-AA	VCO CAN	SPTE T=0.3 18.2x22.7	1
14	660-00010-AA	WASHER	URETHANE WHITE PIE5.5XPIE3.0 T=1.0	4
15	911-00036-AA	LED PLATE	NEXAN SHEET T=0.3 PIE7.8	1
16	931-00200-DA	POLY BAG	P.E 100x200 T=0.05	1
17	970-00128-AA	GIFT BOX	450SC MANILA PAPER	1
18	971-00039-AA	TRAY BOX	SW1S 142.0 (W)x75.0 (D)x42.5 (H) T=2.0	1
19	980-00349-AA	OUT BOX	DW1S 375 (W)x284 (D)x164 (H) T=7.5	0.05
20	PFM-0125A-DA	PCB MAIN	1.6 (T) 2/2 GOLD	1
21	NCS-20VC2-KA	CONNECTER SOCKET	K8FD45S-G20Y	1
22	NCH-20VD2-KA	PIN HEADER	K8MD55E-G20-3525	1
23	NCS-16VD2-KA	CONNECTER SOCKET	K8FD45D-G16	1
24	NCS-08VD1-KA	CONNECTER SOCKET	K8FS45D-G08	1
25	NCS-14VD2-KA	CONNECTER SOCKET	K8FD45D-G14	1
26	PFM-0136A-BD	PCB MAIN (DATA RADIO-DT)	1.6 (T) 2/2 GOLD	1
27	PFS-0043A-BA	OPTION BOARD	1.6 (T) 1/1 GOLD	1
28	AMN-00001-AA	LED, GN/RD, 3mm, LEAD	LTL-1BEHJ 3mm, GN/RD	1
29	NDS-09HD1-IA	CONNECTOR D-SUB	D-SUB 9PIN	1
30	PFM-0125B-BA	PCB MAIN	1.6 (T) 2/2 GOLD	1
31	NCS-01HD1-TC	CONNECTER SOCKET ANT	TC-BNC-RB CONNNECTOR	1
32	SDP-KSD04-IA	SWITCH DIP	KSD04H	1
33	990-00622-AA	CHANNEL SELECTION LABEL	ART PAPER STICKER	1
34	990-00640-AA	NAME LABEL	POLYESTER STICKER T=0.075	1

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