Tectalk

SERVICE MANUAL
2-WAY PORTABLE
HANDHELD
PMR 446 RADIO

Nov. 07. 2001

ALAN Electronics GmbH

CONTENT

1. GENERAL

1.1 GENERAL

This equipment, Tectalk is called 2 way portable handheld radios.
The frequency range is 446.00625 to 446.09375MHz, UHF operating channels for Europe-wide used 2 way portable radios according to PMR-446 Standard.

1.2 CHARACTERISTIC

a) All active device in this radio is composed of semiconductor and high density IC.
b) To design this radio in compact and weight approximately 140g including battery.
C) CPU of this equipment is HD4048812B from HITACHI.
d) It's power can operate by use of alcaline 4 cell (1.5V AAA) battery.

1.3 COMPOSITION

This radio is composed of following.
a) Transmitter (W/Antenna)
b) Belt clip

2. SPECIFICATION

2.1 GENERAL SPECIFICATIONS

a) Frequency Range : 446.00625 to 446.09375 MHz
b) Output Impedance : 50 Ohms Unbalanced
c) Modulation Type : 8K50F3E
d) Communication Mode : Simplex
e) Channel Capacity : 8 channel
f) Channel spacing : 12.5 KHz
g) Power : 6.0V(ALCA 1.5V x 4AAA)
h) Battery Life : ALCA.1000mAh >   about 35hours
            NI-MH 600mAh >   about 22hours
        (TX 5% ,RX 5% ,Standby 90%)
i) Operating Temperature : -20°C to +55°C
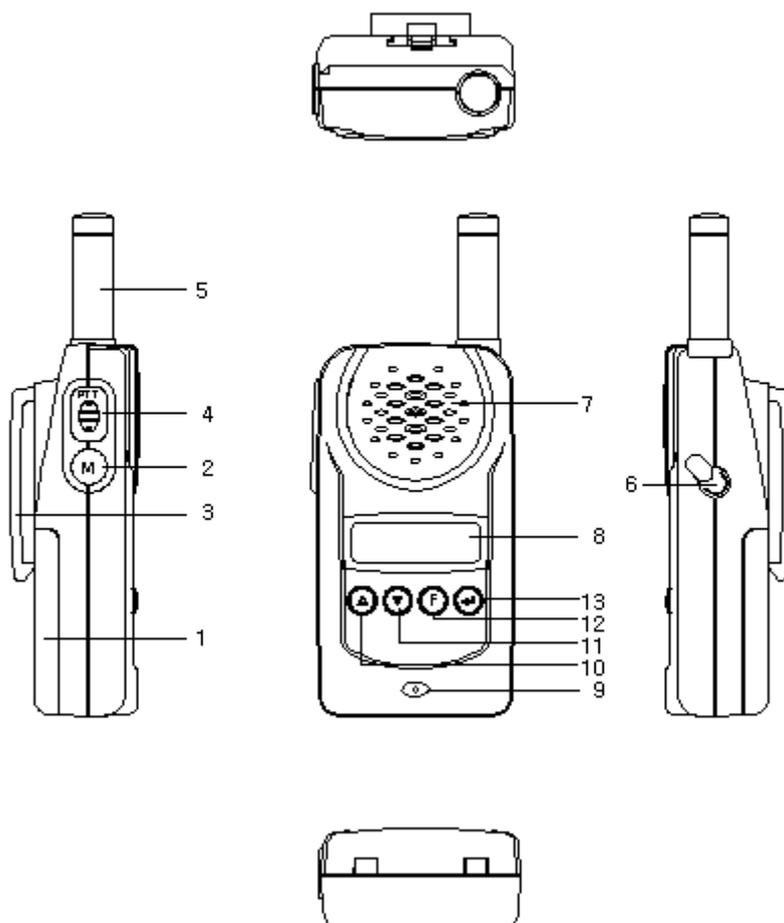j) Dimension : 95.5(H)x 50(W)x 26(D)mm
k) Weight : 120g(with Battery)

2.2 ELECTRICAL SPECIFICATION

a) TRANSMITTER

1) Output power : Max. 0.5W
2) Frequency Stability : +/- 5PPM (-20°C to+55 °C)
3) Modulation Method : FM
4) Oscillation Method : PLL SYNTHESIZER
5) Max. Frequency Modulation : < +/- 2.5 KHz (with tone)

6) Cooling Method : air-cooling Method
7) Spurious Emission TX : < -36dBm
8) FM Hum/Noise : > 40dB(1kHz 60% modulation)
9) Distortion : < 5% (1kHz 60% modulation)
10) Tx Audio Response : 6dB /OCT +/- 3dB PRE-EMPHASIS(300Hz to 2.5kHz)

b) RECEIVER
1) Receive Method : Double Super Heterodyne
2) Receive Sensitivity : -118dBm up (20dB SINAD W/CCITT)
3) Squelch Sensitivity : -120 to -130dBm (Audio on/off point)
4) Bandwidth : > 8.5KHz
5) Adjacent channel rejection : > 55dB
6) Local Frequency Stability : +/- 5PPM (-20°C to +55°C)
7) Spurious Response Rejection : > 65dB
8) Audio output : 200mW(8 Ohms load THD 10%)
9) Distortion : < 5% (1kHz 60% Modulation)
10) RX Audio Response : 6dB/OCT +/- 10dB DE-EMPHASIS(300Hz to 2.5kHz)
11) S/N Ratio : > 40dB(1kHz 60% modulation)

12) IF :   1'st IF = 21.7MHz
                                 2'nd IF =   450kHz
13) Local Frequency :   1st Local Frequency = fc - 21.7MHz
                                 2nd Local Frequency = 21.25MHz

3. OPERATION

3.1 Drawing of the radio

FUNCTIONS AND CONTROLS

1) Battery Door
2) Monitor Button
3) Detachable Belt Clip
4) Push-To-Talk (PTT) Button
5) Antenna
6) External Mic / Speaker
7) Built-in Speaker
8) LCD Panel
9) Built-in Microphone
10) Up Button & Volume Control

11) Down Button & Volume Control
12) Function Button
13) Power On/Off & Enter Button

3.2 ICONS on LCD
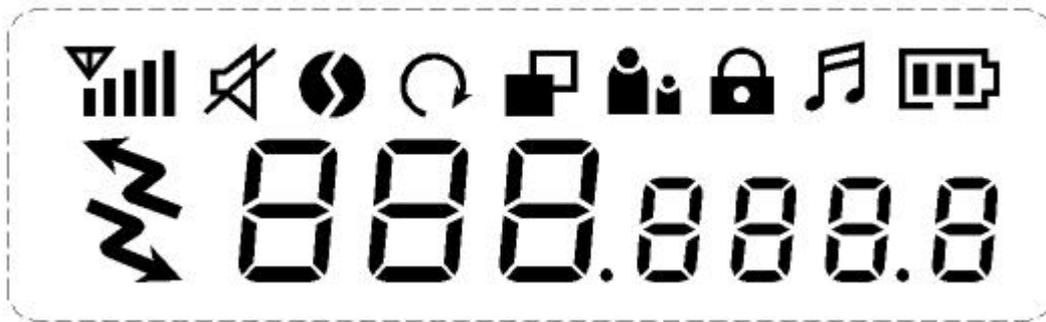
1) RSSI (Receiving Signal Strength Indicator) or TX Bar Icon
Indicates the receiving signal strength during transmission and it can be indicated the number of bar according to the strength of receiving signal.   It (TX Bar) is not transformed.

2) Monitor Indicator
Appears when the monitor button is used.

3) CTCSS Indicator
Blinks when the correct CTCSS tone is entered.

4) Auto Channel Scan Indicator
Appears in the auto scan mode or when the auto scan mode is activated.

5) Dual Watch Scan Indicator
Appears in dual watch scan mode or when the dual watch scan mode is activated.

6) Key Lock Indicator
Blinks in auto lock selection mode or when the key lock is activated.

7) VOX Indicator
Blinks in VOX selection mode or appears when VOX is activated.

8) Battery Level Indicator
Battery Level Meter indicates the remaining battery strength.
Blinking when the Battery charge strength is Low-cell only and then red LED Blinking at every 5sec.
When the TOT Penalty is Warning Beeping at initial activation and not Transmit at 10sec.

9) Tx Indicator
Appears when a signal is being transmitted.

10) Rx Indicator
Appears when a signal is being received.

11) Large Segment Display
Indicates the channel number in use at the normal mode.
When the Function Button is pressed, it Displays the function menu in sequence :
CH / ctc / SC / dW / VO / Vdt / ALo / CAL / tON / tAL / bEP

12) Small Segment Display
Displays the **CTCSS** tone option at the normal mode.
CTCSS option is displayed in Hz.
Displays the **SUBMENU** of each **MENU** in the function mode.
> (e.g. **CH 1 to 8** / ctc: **1 to 38**, **OFF / SC**: **up, dn**, **OFF / dW**: **1 to 8, OFF** /
> **VO: High, Mid, Low, OFF** / Vdt: **5sec, 3sec, 2sec, 1sec** / Alo: **OFF, Auto** /
> **CAL** number: **1 to 7**, **OFF / tON: no, Freq / tAL: On,OFF / bEP: On,OFF**)

3.3 Key Function

3.3-1 ENTER BUTTON (#13)

1) Short Touch - Power On

   - Press this button (#13) briefly to turn the unit on.
     A short confirming melody will play.

2) Long Touch - Power Off

   Press this button (#13) for longer than 1.5 seconds to turn the
   unit off.

   Press it to confirm the required option for respective functions
   during function edit mode.

3.3-2 FUNCTION BUTTON (#12)

1) Short Touch

   - Press this button briefly to enter function edit mode in standby
     mode.

2) Long Touch

   - Press for longer than 1.5 seconds to activate the KEY LOCK in the
     standby mode.

     Please note all buttons will be disabled except the Monitor
     Button (#2) and PTT Button (#4) will remain fully operational.

3.3-3 UP BUTTON (#10)

1) Short Touch

- In the standby mode, press this button briefly to move to the next higher main volume level.
  In the function edit mode, press briefly to shift from the current option in each submenu to the next option in the same submenu.

2) Long Touch

- Pressing this button for more than 1.5 seconds will allow you to navigate at a more rapid rate through different volume level in the standby mode or through different menus in the function edit mode.
  mode.

3.3-4 DOWN BUTTON (#11)

1) Short Touch

- In the standby mode, press this button briefly to move to the previous lower main volume level.
  In the function edit mode, press briefly to shift from the current option in each submenu to the previous option in the same submenu.

2) Long Touch

- Pressing this button for more than 1.5 seconds will allow you to navigate at a more rapid rate through different volume level in the standby mode or through different menus in the function edit mode.

3.3-5 PUSH-TO-TALK (PTT) BUTTON (#4)

- Press it firmly and speak into the Built-in Microphone (#9) to transmit. The red Tx LED Indicator at the right side of the LCD Panel (#8) will light.

- Release it to revert to standby mode.   When an incoming call is received, the green Rx LED Indicator on the left side of the LCD Panel(#8) will light.

- 2-Way Call Ringer:
  Press the PTT Button twice quickly to call another party on the same channel. The word CALL and the Tx icon will appear in the display. The user selected call ringer melody will play.

3.3-6 MONITOR BUTTON (#2)

- Press it to check activity on the current channel before you try to transmit.

 - Adjust the Volume Control (#10, #11) if necessary.

- When you press the Monitor Button, the LCD Panel (#8) will be illuminated with an amber color back-light and both the Tx and Rx LED indicators will light.

- It can be activated by pressing Monitor ,up/down ,enter and function key.

- If you press the Monitor Button during the function edit mode, you will return to standby mode directly.

- To setup Auto Monitoring ,press Monitor key for three seconds.

3.3-7 EXTERNAL MIC/SPEAKER (#6)

- This jack accepts an optional headset/microphone for totally handsfree operation.
  Please refer to the enclosed Accessory Order Form to order accessories.
  See also section regarding VOX SELECTION MODE.

3.4 Setting and Operation

3.4-1 BASIC CHANNEL SELECTION

In order to communicate with other sets,both you and the receiving party
Must be on the same channel.
The set has 8channels (1-8) as indicated by the large digits in the LCD
Display Panel (#8). Before, trying to transmit on the selected channel,you
should press the Monitor Button (#2) to check the activity on that channel.

If someone is already on the selected channel, you should try another channel
that is clear.
To change the basic channel,
  - In the standby mode, press the Up Button (#10) briefly to move to
    the next higher main channel number.
  - Press the Down Button (#11) briefly to move to the next lower
    main channel number.

3.4-2 CTCSS (Coded Tone Controlled Squelch System) SUB-CHANNEL SELECTION MODE

This feature allows you to utilize a less used channel range (01-38) within
a main channel.   This enables you to communicate with another party on the

same main channel using the same subcode.This helps to avoid congestion on the main channel and filters out unwanted noise and static.
There are 38 CTCSS subchannels for each main channel.
To change the CTCSS subchannel,

- Press the Function Button (#12) until the word cTc appears in the LCD Panel (#8).
- Press the Up Button (#10) or the Down Button (#11) to choose the desired subchannel to use. The corresponding subcode frequency will be displayed in the lower right corner.
- Press the Enter Button (#13) to confirm your selection.

NOTE: To communicate with other PMR units, they must be switched to the same channel and CTCSS subcode.
To communicate with other PMR units that do not have subcodes, switch your unit to the same channel with the subcode set to OFF.

3.4-3 AUTO CHANNEL SCAN MODE

This feature allows you to scan for an active channel and communicate with the party transmitting.
 To access the Auto Channel Scan menu,
- Press the Function Button (#12) until the auto channel icon blinks
   and SC appears in the LCD Panel (#8).
- Press the Up Button (#10) or the Down Button (#11) to choose scanning up or
   down from the current channel number.
- Press the Enter Button(#13) to confirm your selection.
- The unit will begin scanning for an active main channel. It is able to
   transmit by scan start channel during scanning.

- When the scan release , the unit will be standby in scan start channel during
   Scanning.

- Press briefly the Monitor Button , It allows you to skip over current channel
   on the scan list. On the other hand press long the Monitor Button , It allows
   you to delete current channel on the scan list.

- To turn off the auto channel scan feature in the standby mode, simply press
   the Function Button(#12) once.

3.4-4 DUAL WATCH SCAN MODE

This feature allows you to monitor two different channels at the same time.
If you pre-set any priority channel other than the current channel in use, the pre-set channel will be scanned every 0.5 second and signals you when a call is received.
To access the Dual Watch Scan menu,
   - Press the Function Button (#12) until the dual watch icon blinks and dW

appears in the LCD Panel (#8).
- Press the Up Button (#10) or the Down Button (#11) to select the desired
   channel number you wish to closely monitor.
- Press the Enter Button (#13) to confirm your selection.
- To turn off the dual watch feature in the standby mode, simply press the
   Function Button (#12) once.

3.4-5 VOX SELECTION MODE

The Voice Activated Transmission (VOX) function allows your voice to activate
transmission automatically when the Communicator is used with the optional
handsfree mic/headset (refer to enclosed Accessory Order Form).   It also allows
handsfree use when a mic/headset is not being used without having to use the PTT
Button (#4).
 To access the VOX Selection menu,
   - Press the Function Button (#12) until the VOX icon blinks and VOX appears in the
      LCD Panel (#8).
   - Press the Up Button (#10) or the Down Button (#11) to select from high,mid,
      low or off. High, mid or low setting determines VOX response sensitivity.
   - Press the Enter Button (#13) to confirm your selection.
   - To turn off the VOX feature, enter the VOX selection mode and then select
      Off.

3.4-6 VOX RECOVERY TIME SELECTION MODE

This allows the response characteristics of the VOX function to be precisely
adjusted to suit individual needs.
To access the VOX Recovery Time Selection menu,
   - Press the Function Button (#12) until Vdt appears in the LCD Panel (#8) with
       the VOX icon blinking.
   - Press the Up Button (#10) or the Down Button (#11) to select from 5,3,2,or
       1 second setting. This setting determines the delay time between transmitt
       -ing and receiving.
   - Press the Enter Button (#13) to confirm your selection.
   - Please note you may need to try different VOX time settings to determine
       the best value to suit your speaking habit.
   - To turn off the VOX feature, enter the VOX selection mode and then select
       Off.

3.4-7 AUTO KEY LOCK SELECTION MODE

This feature prevents accidental channel change and disturbance to the preferred
Settings of the Communicator.   Auto Key Lock temporarily disables the UP,DOWN
And Enter Buttons.
To access the Auto Key Lock Selection menu,
   - Press the Function Button (#12) until the auto lock icon blinks and Alo
       appears in the LCD panel (#8).

- Press the Up Button (#10) or Down Button (#11) to select the Auto option.
- Press the ENTER key to confirm your selection.
- If you do not press any key for more than 15 seconds in the standby mode, all respective keys will automatically be locked.
- To turn the auto key lock on or off in standby mode, simply press and hold the Function Button (#12) for more than 1.5 seconds.
- To quickly activate the Auto Key Lock, hold the Function Button (#12) for more than 1.5 seconds.

3.4-8 CALL RINGER MELODY SELECTION MODE

This feature provides 7 user selectable call ringer melodies to alert you of a calling party.
To select your favorite Call Ringer melody,
- Press the Function Button (#12) until the call icon blinks and CAL appears in the LCD panel (#8).
- Press the Up Button (#10) or Down Button (#11) to preview the 7 available melodies.
- Press the ENTER key to confirm your selection.
- By using PTT key, the mode will be changed from calling to transmit mode, stopping current calling.
- If you set this function to call off, call function is disabled in this Mode.

3.4-9 TONE DISPLAY SELECTION MODE

This feature allows you to select the preferred display format for the CTCSS code setting.
If frequency "**FrEq**" was chosen, then the display in the CTCSS will be shown as frequency. However, if the number "**no**." was chosen,then the code number will be displayed in CTCSS function.
- Press Function Button (#12) until "**tON**" appears in the large display.
- Press Up(#10) or Down(#11) to change the format.
- Press Enter(#13) to confirm your selection.
  Otherwise, the displayed state is automatically accepted if no key is pressed after 5 Seconds.

3.4-10 SQUELCH TAIL SELECTION MODE

This feature allows you to set option mode of squelch tail elimination.
- Press Function Button (#12) at the CTCSS display option mode,you can select On or Off with Up(#10) or Down(#11) button.
- When you press Enter Button (#13) or not press any key in 5seconds, it returns back Stand-by mode with back beep sound after installation squelch tail elimination option its setting.
- Transmit Roger tone 400ms after PTT release.

3.4-11 BEEP TONE SELECTION MODE

This feature allows you to program beeping or not beeping with key selection.
To set key beep mode, press the function key at the squelch tail ON /OFF mode
at the same time operate beeping according to the tone of key beep.

- You can select On or Off with Up or Down key.
- When you press Enter button (#13) or no press any key in 5seconds.
  it returns back Stand-by mode with back beep sound after
  installation key beep option its setting.
- To turn on the button beeps features, select Beep On.
- To turn off the button beeps features, if you want quiet radio
 operation select Beep Off.

4. ADJUSTMENT

4.1 Frequency synthesizer (PLL)
a) After connecting the power meter and dummy load (to internal 50 Ohms connection point), join the antenna connection cable with above equipment.
b) Check the voltage between TP & GND in digital voltmeter.
c) Then set the low channel of set the lowest frequency.
c) After pressed PTT key of set, trim VC1 for adjusting the lowest frequency Frequency of TX channel to DC 1.5V in the voltage of TP1.
d) After releasing the PTT key, And then   check if the highest frequency of Rx channel is within DC 0.6 ~ 2.3V in the voltage of TP.

4.2 TRANSMITTER

a) Connect EUT & measure equipment according to block diagram below.
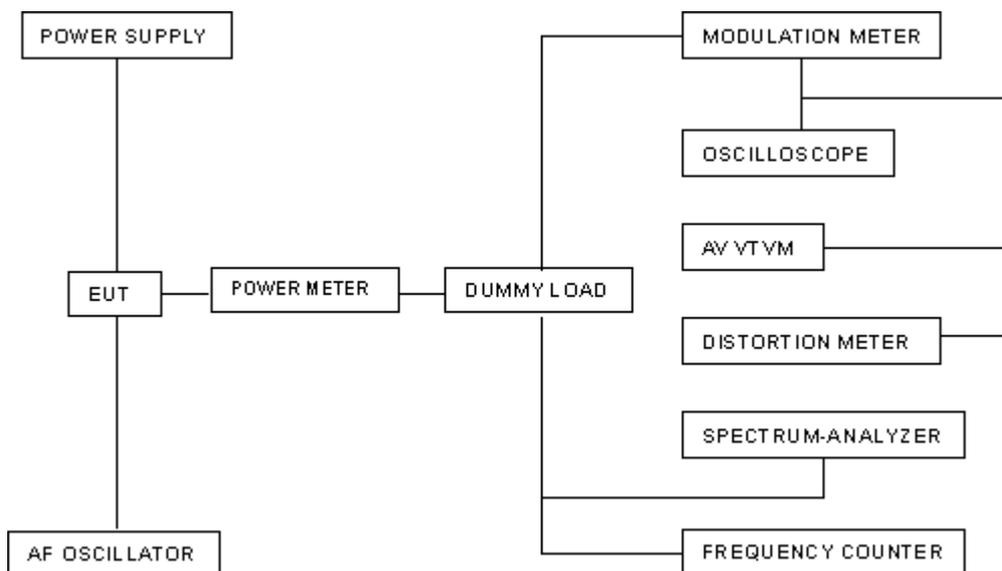
b) Connect DC 6.0V, voltage preset to EUT.
  c) Connect "power meter" & "dummy load (50 Ohms)".
  d) Adjust Tx frequency according to trimming trimmer VC2.
  e) Connect AF oscillator to mic terminal for conform modulation degree.
  f) Adjust the frequency of AF oscillator to 1kHz and adjust AF level
      should be 60mV.
  g) Checking oscilloscope and modulation meter. max.
      frequency deviation should be in +/ -2.5 KHz.

4.3 TRANSMITTER TEST
  a) Output Power Test
      Power(6.0V DC) should be Max.500mW.
  b) Audio Response
      Connect AF oscillator to Mic terminal and then firm the audio level
      that doesn't distortion the wave of oscilloscope in the frequency
      range, 300Hz to 3kHz. Check the audio level for 300Hz to 3kHz based on
      frequency standard, 1kHz.
  c) Modulation Degree Test
    1) Connect AF oscillator to the MIC terminal and then adjust the level to
        To 60mV
    2) Measure the oscilloscope wave and he point needle of modulation meter
        After pressing PTT key.
    3) Sweep gradually the frequency of AF oscilloscope from 300Hz to 3KHz.
        3kHz.
    4) At this time, the point needle of modulation meter should be in
        +/- 2.5 KHz.
   d) Spectrum Test
    1) Antenna is 50 Ohms and attenuator degree should be 20dB more.
    2) observe the spectrum with pressing PTT key.
        The harmonics should be less -36dBm than carrier.

4.4 RECEIVER
  a) Preparation
    1) Adjust the power supply to DC 6.0V
    2) Adjust Voltage level to 0.7Vrms (8 Ohms load) after power on.
  b) Connection method
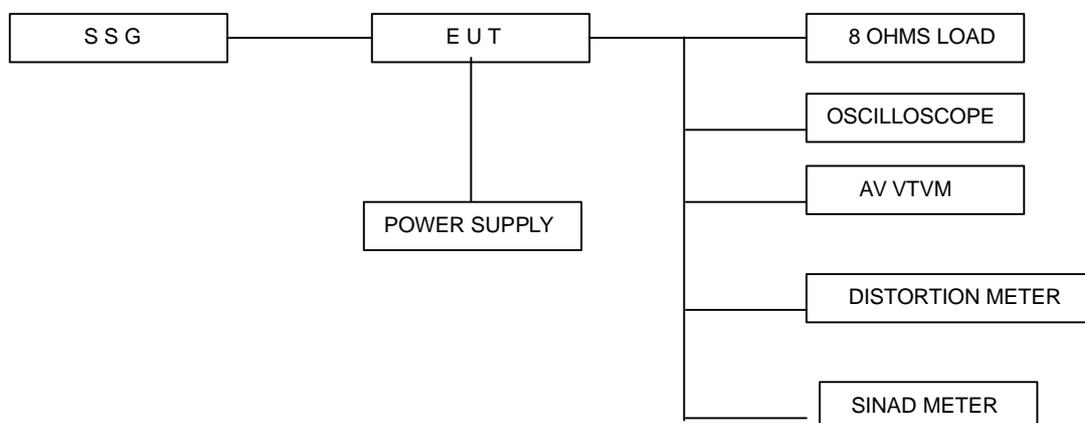
C) Conform of Rx sensitivity
1) Adjust SSG to channel frequency.
2) Adjust modulation frequency, 1kHz to modulation degree, 1.5KHz.
4) After adjusting the frequency of SSG to channel frequency, RF level sets to -47dBm.

d) Conform of Squelch sensitivity
1) Set the standard channel.
2) In squelch mode, SQ volume RV1 must be turned counterclockwise.
3) After adjusting SSG to channel frequency, the adjusting SSG to level.
-120dBm set is audio on, -130dBm set is audio off.

4.5 RECEIVER TEST
a) Rx sensitivity test(field strength)
SSG should be adjusted to 20dB of SINAD's point need seeing wave of oscilloscope as SSG sets in 1kHz with 1.5KHz frequency deviation.
At this time, normal RF level is < -118dBm.

b) Audio Distortion Test
1) SSG should be adjusted like way of point a) and RF level sets to –47dBm.
2) Adjust to 0.7Vrms(8 Ohms load) seeing Audio wave.

3) Read the needle of distortion meter(normal condition would be less than 5% distortion.)

c) Squelch Test
After RF level of SSG should be set to the least level, RF level should be gradually increased until speaker makes audio sound.
At this point, check RF level(Check Audio on : -120dBm, Audio off : -130dBm)

4.6 Symptoms, Check point & Correction

a) Diagnosis method
1) Check each switch to work well.
2) Check voltage of battery.
3) Problem develops from transmitter or receiver?

b) Troubleshooting
1) Transmitter
-Power key is on condition but does not work.
Battery could completely discharge.
Battery cell twist..
Touch problem come between Battery and Radio.

- Fail to transmit
      Run out of battery or charge problem.
      Fault of PTT key.
      Fault of Q4, Q5.

  - Transmitter works but frequency is unmatched
      Out of order in frequency synthesizer.
      Out of order in X-tal(X2).

  - Audio does not sound(Tx power and Tx frequency are normal)
      Problem of microphone or Mic connector.
      IC U7 problem.

  - Tx is set when switch is on.
      Tx switch problem

2) RECEIVER
      - Rx does not work
        Speaker line open problem or connector problem.
        Receiver power circuit problem.
        Audio amplifier Base band IC U4 problem.
      - Only noise sound
        U12 problem.
        VCO problem.
      - Rx sensitivity is weak
        Antenna mounting problem.
        Front-End circuit problem.
        Local oscillation frequency deviation.
        SF1 saw filter fail.
        VCO problem.
      - Squelch does not work
        U12 problem.
        Control logic problem.

5. DESCRIPTION OF RADIO CIRCUIT

5.1 Frequency synthesizer
      Frequency synthesizer consists of VCO, PLL IC(built in PRESCALER) and loop
      filter.

  a) VCO
      VCO is composed of ONE VCO. Oscillation circuit takes colpitts circuit using
      variable Diode. And VCO is composed of D1, Q8, Q9,C81,C75,VC1,L1,C74,C76.
      VCO control voltage through loop filter adjusts frequency and Microphone
      signal through Modulation terminal makes modulation.

b) PLL IC

   PLL IC is adjustable IC to produce the wished frequency which VCO provides
   through loop filter.
   It has internal counter using 21.25MHz reference frequency to make 6.25KHz
   as reference Signal.
   VCO frequency from prescaled input is divided signal is compared with Refer-
   ence signal phase in phase comparator.
   Built-in charger pump changes voltage (until two signals are in phase) and
   charged voltage supplies VCO through loop filter to produce the desired
   frequency.
   Frequency data associated with channel goes to PLL IC by CPU through CLOCK,
   DATA. PLL IC enables by strobe line of CPU.

c) Loop Filter

   Loop filter is composed of R48,R49,C84,C85 and changes pulse from pin14 to
   DC. and eliminates harmonic component in pulse.
   It helps VCO oscillate clearly as DC voltage is supplied into varicap.

5.2 RECEIVER

   This is composed of Dual Conversion Super Heterodyne. First IF is 21.7MHz.
   Local oscillator frequency is lower in 1'st IF than Rx frequency. It is
   called low side injection. Second IF is 450kHz. 2nd local oscillator frequ-
   ency comes to 21.25MHz.

a) Rx/Tx Conversion Circuit

   Rx signal goes to Rx/Tx conversion circuit through FIXED antenna connector,
   low pass filter(L5,L6,L7,L18,C42,C43,C45,C46,C47) and receiver resonance
   circuit composed of L8,C1. When transmitting,voltage through R25,L12,D6
   supplies,D7 of receive input is short and Tx is on condition. When PIN diode
   off in condition of Rx,L8 and C1 resonate serially and make impedance match-
   ing at receiver bandpass filter. (SF1).

b) Front End

   Front-End has Q1 to provide a high sensitivity and low noise feature.
   It employs Saw filter as band pass filter to eliminate image frequency and
   to produce enough pass band by Q1 input and output.

c) Mixer

   Mixer has one base BFQ 67W(Q2) to feature high low noise quality.
   It has RF signal through L7, L8, SF1,SF2 and Q1 RF signal from Local oscill-
   ator mixed.
   It develops 1'st IF ,21.7MHz. 1st IF goes to 1st IF amplifier Q3(KTC4080)
   base through   X-tal filter XF1.
   IF of mixing signals is selected and taken into X-tal filter.
   Output impedance of mixer is direct matched with input impedance of X-tal
   filter.

Matching of filter satisfies pass bandwidth of filter, ripple elimination
with in pass band, and attenuation characteristic of stop band.
X-tal filter is composed of two pole monolithic X-tal filter,
8kHz of IF bandwidth R11 is used as impedance matching with 1'st IF Amp Q3.

d) IF AMP and Detection
1'st IF AMP Q3 supplies IF(U12) mixer input pin16 through output resistor
R13 and C21 to need gain in insertion loss of X-tal filter and last stage
circuit. Multi-use IF IC makes up of mixer IF AMP. Pin1 2nd local frequency
frequency enter to pin 1.
It supplies mixer of internal IC. Mixer output of IC through pin3 passes
450kHz ceramic filter, supplies 2nd IF amplifier and limits.
After 2nd IF AMP has a process of enough gain and AM rejection,it comes to
quadrature detection. Demodulated audio signal by T1(Quad Coil) is amplified
and comes out to pin9.
Detected audio signal through R22, VR1 and input in audio amp.IC U4 through
C22.

e) Squelch Circuit
Noise component of detected outputs has amplification squelch threshold is
controlled by Resistor R18,C31,R15.

f) Audio Amplifier
Demodulated audio signal enters to pin2 of U4. After above signal amplies in
U4 pin5 through C220. It comes out to pin5 Then, It reaches at speaker.

5.3 Transmitter

When Tx develops with pressing PTT switch, VCO output amplifies through Q4,
Q5 transmits by antenna through low pass filter.
Tx RF signal produced from Tx VCO is amplified by DRIVER Q5 through C53 and
entered Q4 POWER TR input terminal with final amplification.
After this stage, the signal is emitted at antenna through 50 Ohms matching
circuit to low pass filter (L5,L6,L7,L18,C42,C43,C44,C45,C46,C47) to elimin-
ate harmonic.

5.3-1 Audio Modulation and Audio Amplification

Audio signal produced by external or internal microphone,limits amplification
by IC U7.. It enters to VCO through low pass filter and U2.
Max. Frequency modulation deviation is adjusted by VR1 keeps noise and audio
from entering to VCO at time of TX.
Audio modulation and Audio Amplification has characteristic of 6dB/OCT pre-
emphasis by U7(NJM324V).
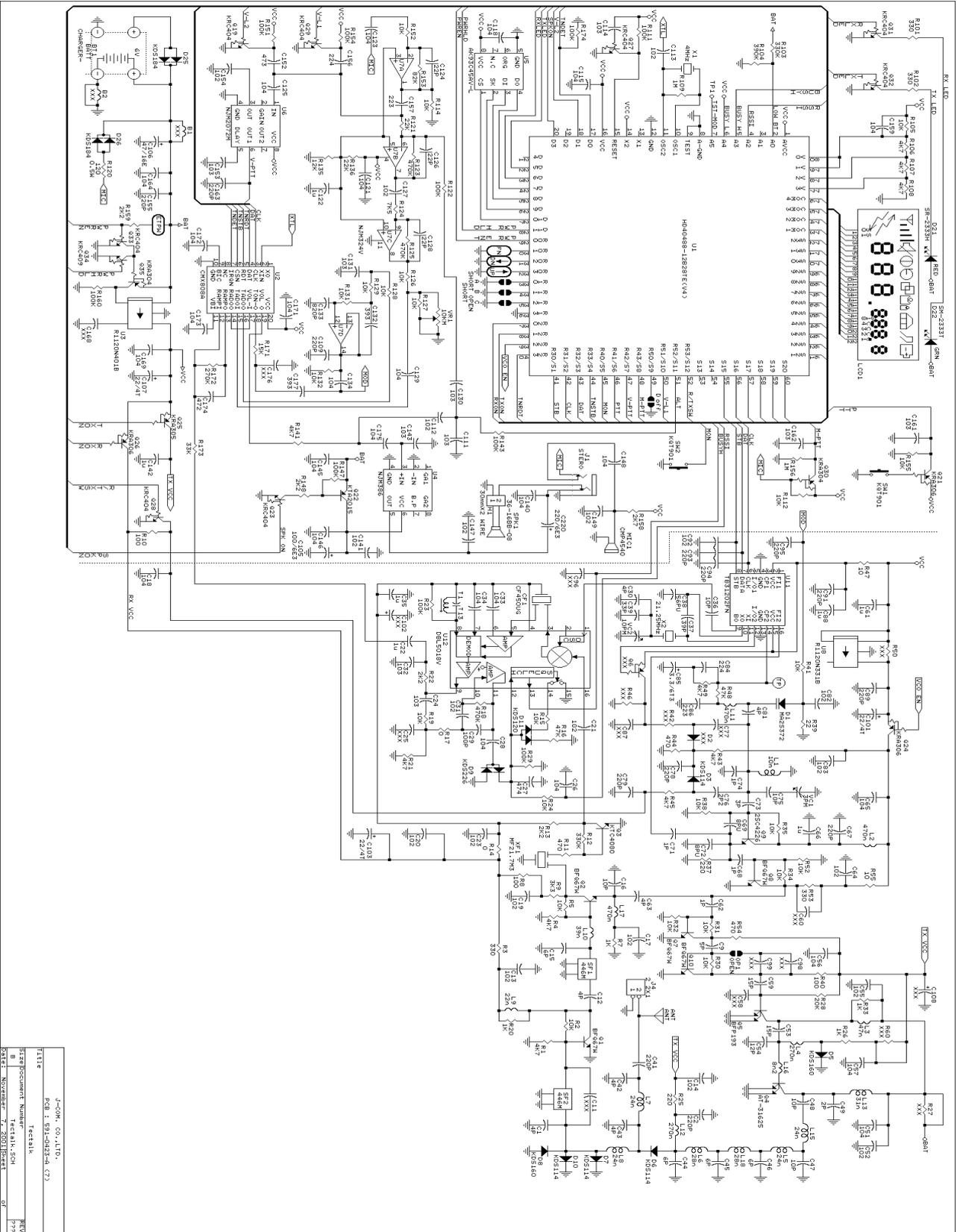
6. BLOCK DIAGRAM

7. SCHEMATIC

REF. MAP

J-COM

591-0423-A-7
2001.01.09

JDH-FC37
PCB

1 2 3 4

VALUE MAP

J-COM
591-0423-A-7
2001.01.09

JQH-FC37 PCB

HD40488 -12B28TE(V4)

NJM 324V
NJM 2072M
NJM 386M

CMX808A

AK93C-45AV-L

ASHORT-12B28TE

DBL5018V

TB31202-FN

MA2S372

CF450U-G

AT-JY2506-050-1

KQT901 MON
KQT901 PTT

R-1120N-401B
R-1120N-331B

KDT160
KOS160

1 2 3 4
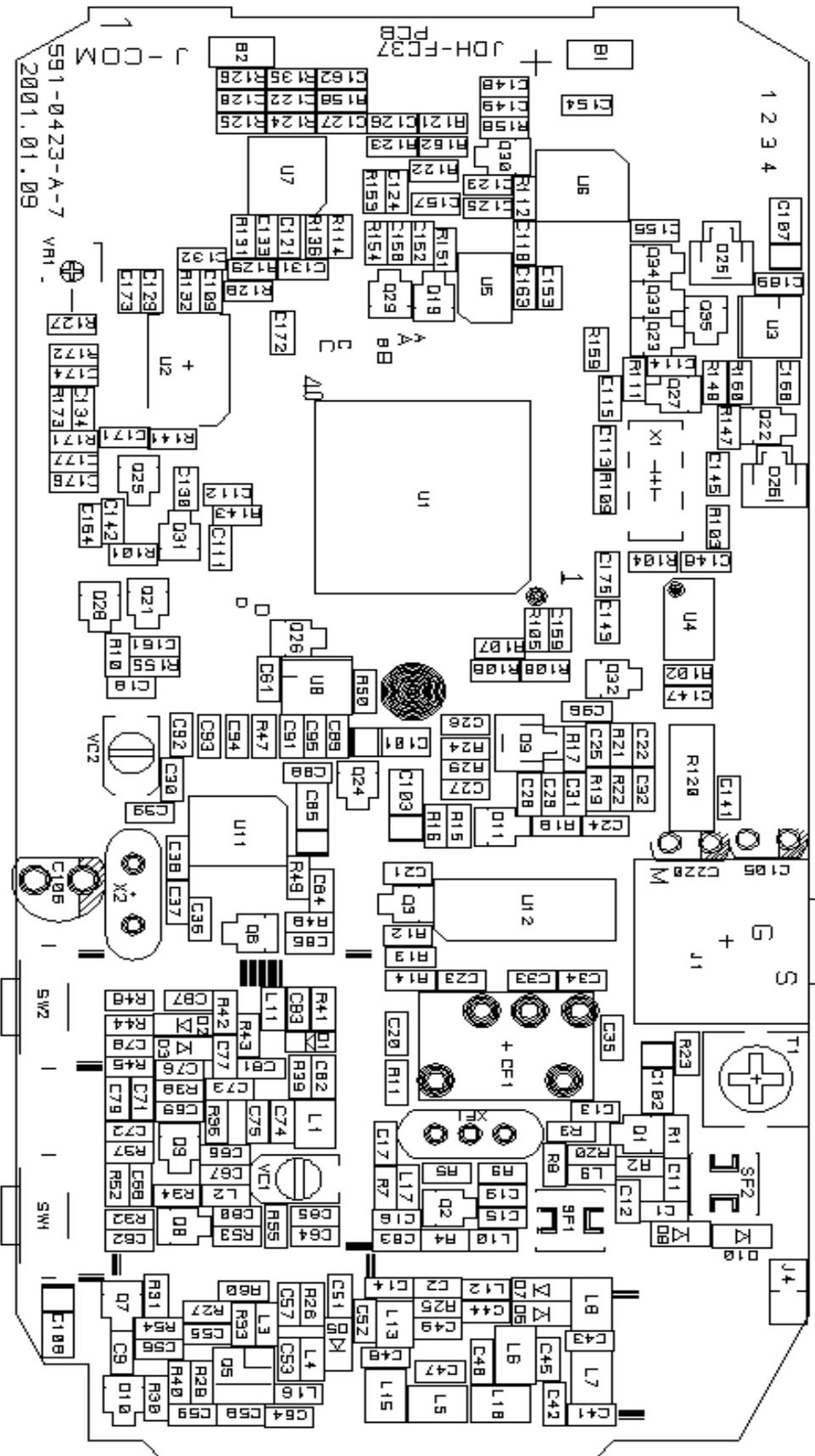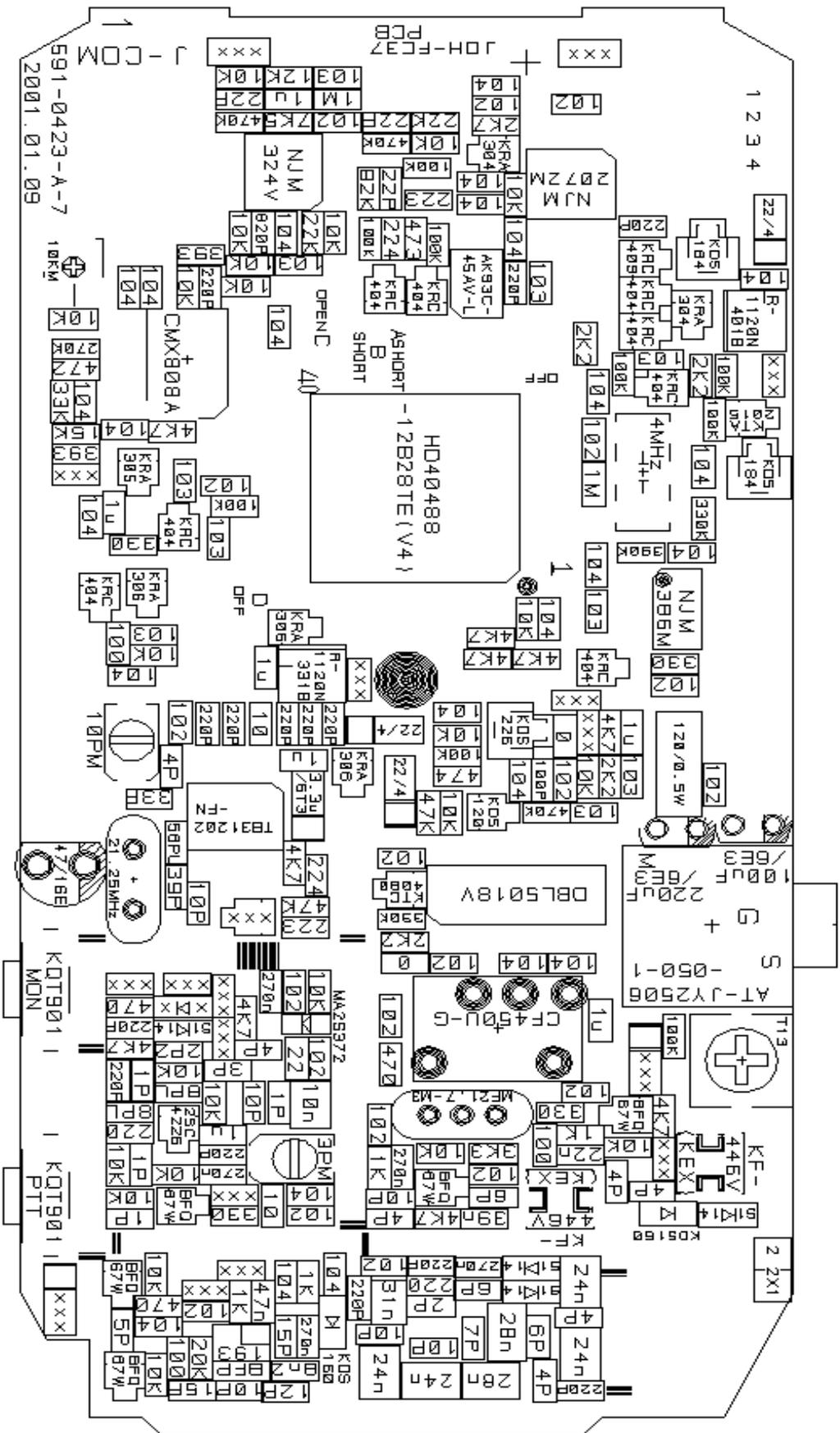
BOTTOM SIDE REF./VALUE MAP
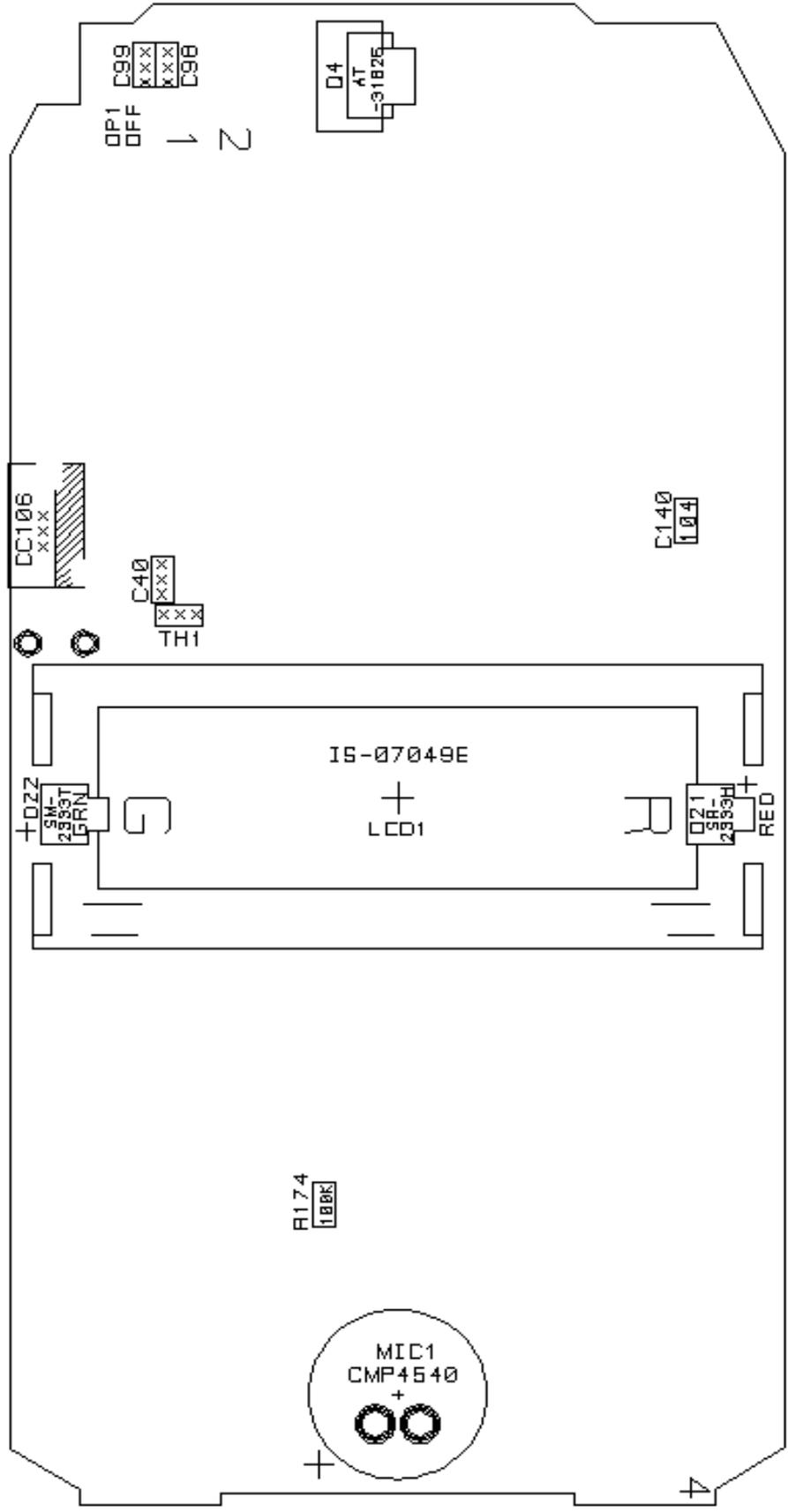
OP1
OFF
1
2

C99
C98

D4
AT
-31B25

CC106
xxx

C40
xxx
xxx
TH1

C140
104

D22
SM-
2333T
GRN
G

IS-07049E

+
LCD1

D21
SR-
2333H
RED
R

R174
100K

MIC1
CMP4540
+

+

4

8. COMPONENT PARTLIST

Item	Quantity	Reference	Part
1	1	ANT	ANT
2	1	C9	5P
3	7	C1,C12,C30,C42,C43,C63, C81	4P
4	21	C13,C14,C17,C19,C20,C21, C23,C31,C52,C55,C64,C82, C83,C92,C112,C113,C127, C141,C147,C149,C154	102
5	13	C2,C41,C67,C78,C79,C89, C91,C93,C94,C95,C109, C155,C163	220P
6	4	C15,C44,C45,C46	6P
7	5	C16,C36,C47,C48,C75	10P
8	27	C18,C26,C28,C33,C34,C51, C56,C57,C65,C115,C118, C121,C123,C125,C129,C134, C140,C145,C146,C148,C159, C164,C169,C171,C172,C173, C175	104
9	7	C22,C35,C61,C66,C88,C122, C142	1u
10	10	C24,C32,C111,C114,C130, C131,C143,C153,C161,C162	103
11	1	C27	474
12	1	C29	100P
13	1	C37	39P
14	1	C38	56PU
15	1	C39	33P
16	1	C49	2P
17	2	C53,C59	15P
18	1	C54	12P
19	4	C62,C68,C71,C74	1P
20	2	C69,C72	8PU
21	1	C73	3P

22	1	C76	2P2
23	2	C84,C156	224
24	1	C85	3.3/6T3
25	2	C86,C157	223
26	3	C101,C103,C107	22/4T
27	2	OP1,C	OPEN
28	1	C105	100/6E3
29	1	C106	47/16E
30	3	C124,C126,C128	22P
31	2	C132,C177	393
32	1	C133	820P
33	1	C152	473
34	1	C174	472
35	1	C220	220/6E3
36	1	CF1	CF450UG
37	2	JJ7,CHARGER-	-
38	4	D3,D6,D7,D10	KDS114
39	2	D5,D8	KDS160
40	1	D22	SM-2333T,GRN
41	1	D	off
42	1	D1	MA2S372
43	1	D9	KDS226
44	1	D11	KDS120
45	1	D21	SR-2333H,RED
46	2	D25,D26	KDS184
47	1	E7	XX3P
48	1	H1	30mmX2 WIRE
49	1	J1	STERO
50	1	J4	2 2X1
51	1	L1	10n,(E2-320904T-R)
52	3	L2,L11,L17	470n,(FI-B1608)
53	1	L3	47n,(CI-B1608)

54	2	L4,L12	270n,(FI-B1608)
55	4	L5,L7,L8,L15	24n,(E2-281106T-R)
56	2	L6,L18	28n,(E2-281106T-R)
57	1	L9	22n,(CI-B1608)
58	1	L10	39n,(CI-B1608)
59	1	L13	31n,(E2-281106T-R)
60	1	L16	8n2,(CI-B1608)
61	1	LCD1	TTR3264DPFDHN
62	1	MIC1	CMP4540
63	1	Q3	KTC4080
64	1	Q4	AT-31625
65	1	Q5	BFP193
66	5	Q1,Q2,Q7,Q8,Q10	BFQ67W
67	8	Q19,Q23,Q27,Q28,Q29,Q31,Q32,Q33	KRC404
68	1	Q9	2SC4226
69	3	Q21,Q24,Q26	KRA306
70	1	Q22	KTA2015
71	1	Q25	KRA305
72	2	Q30,Q35	KRA304
73	1	Q34	KRC409
74	4	R3,R53,R101,R102	330
75	10	R1,R4,R21,R43,R45,R49,R106,R107,R108,R141	4K7
76	4	R7,R20,R26,R33	1K
77	3	R8,R10,R40	100
78	24	R2,R5,R15,R19,R24,R30,R31,R32,R34,R35,R38,R41,R52,R105,R112,R114,R126,R127,R128,R129,R131,R132,R152,R155	10K
79	1	R9	3K3
80	3	R11,R44,R54	470
81	4	R13,R22,R148,R159	2K2
82	2	R14,R17	0

83	2	R16,R48	47K
84	3	R18,R123,R125	470K
85	10	R23,R29,R111,R122,R143, R147,R151,R154,R160,R174	100K
86	2	R25,R37	220
87	1	R28	20K
88	1	R39	22
89	2	R47,R55	10
90	2	R12,R103	330K
91	1	R104	390K
92	2	R109,R156	1M
93	1	R120	120,0.5W
94	2	R121,R136	22K
95	1	R124	7K5
96	1	R135	12K
97	1	R153	82K
98	1	R158	2K7
99	1	R171	15K
100	1	R172	270K
101	1	R173	33K
102	2	SF1,SF2	446M
103	1	SPK1	36-16BB-08
104	2	SW1,SW2	KQT901
105	1	T1	T13
106	1	TP	TP
107	1	U1	HD40488-12B28TE(V4)
108	1	U2	CMX808A
109	1	U3	R1120N401B
110	1	U4	NJM386
111	1	U5	AK93C45AV-L
112	1	U6	NJM2072M
113	1	U7	NJM324V

114	1	U8	R1120N331B
115	1	U11	TB31202FN
116	1	U12	DBL5018V
117	1	VC1	3PM
118	1	VC2	10PM
119	1	VR1	10KM
120	1	X1	4MHz
121	1	X2	21.25MHz
122	1	XF1	MF21.7M3

9. ASSEMBLY DRAWING AND PHOTOGRAPH
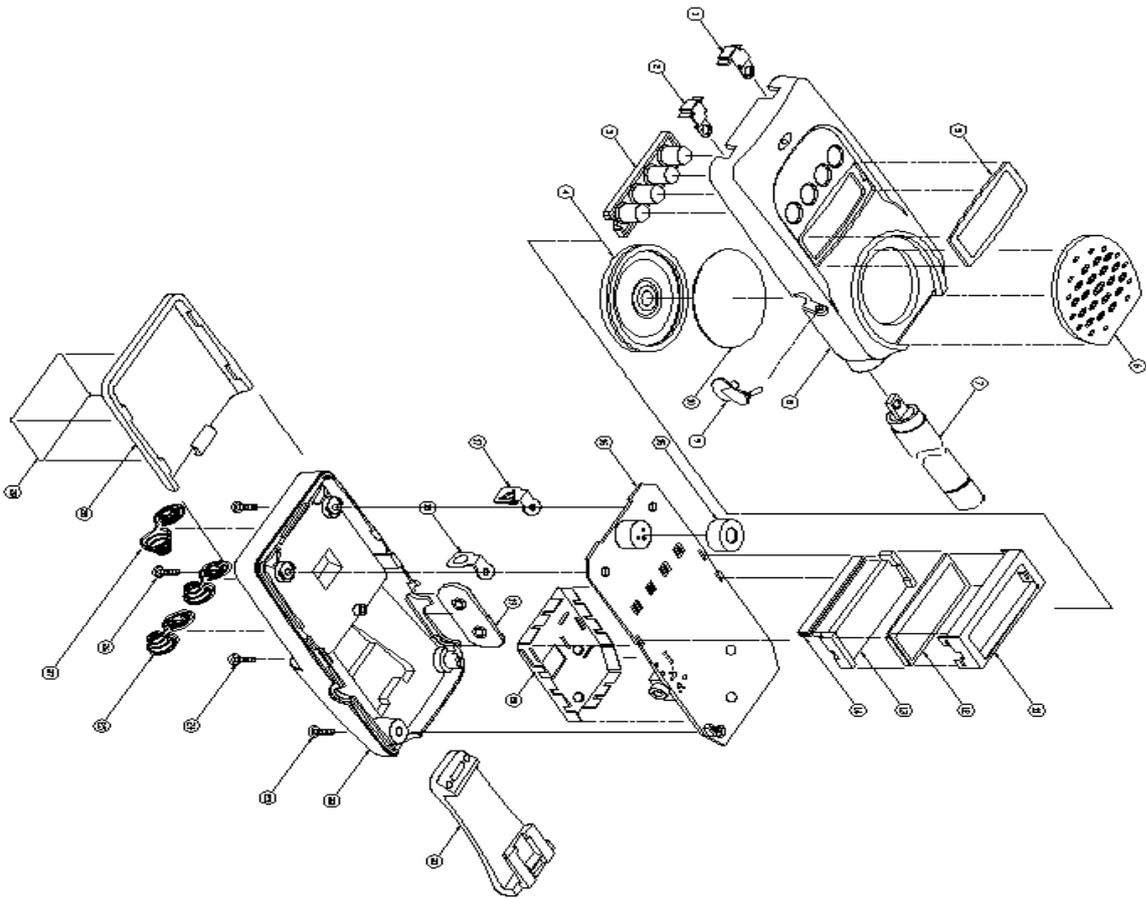
NO.	PART NO.	PART NAME	DESCRIPTION	QTY	REMARKS
29	705-0019-A	LABEL SPEC	POLYESTER FILM,3150X59.8	1	
28	701-0046-A	COVER BATTERY	ABS	1	
27	709-0002-A	CONTACT SPRING-B	PVCK6N0.5Ni-PLATING	1	
26	704-0012-A	SCREW MACHINE	BH, M2.6X6, Ni-PLATING(N3X3.0)	2	
25	709-0014-A	CONTACT SPRING-A	PVCK6N0.5Ni-PLATING	2	
24	705-0013-A	SCREW TAPPING	TH, M2X6.0, Ni-PLATING	1	
23	705-0012-A	SCREW MACHINE	M2.6X8.0BO.5/V+P/Ni-PLATING	1	
22	701-0045-A	BACK COVER	ABS	1	
21	701-0014-A	BELT CLIP	POLYCARBONATE	1	
20	702-0023-A	SHIELD TOP	SPTE t0.3	1	
19	702-0023-A	SHIELD TOP	SILICONE, (t=07)/BLACK	1	
18	707-0019-A	KNOB PTT	PBS, t0.3, Ni-PLATING	1	
17	707-0018-A	CONTACT BATT 'S'	PBS,t0.3/HRSV/Ni-PLATING	1	
16		PCB MAIN	FR-4 t1.0	1	
15	707-0201-A	BUSHING MIC	SILICONE, (t=07)/BLACK	1	
14	709-0010-A	INTER CONNECTOR	SILICONE, H3.6X13MX12D	1	
13	707-0009-A	REFRECTOR LCD	PMMA	1	
12		LCD		1	
11	707-0015-A	BRKT LCD	STS-430, t0.3	1	
10	704-0007-A	FELT SPEAKER	HOMELON, ONSIDE ADHESIVE	1	
9	707-0016-A	COVER JACK	PVC(t)=0/BLACK	1	
8	707-0010-A	FRONT COVER	ABS/ABO	1	
7		ANTENNA		1	
6		DECO COVER	ABS, Spray	1	
5	707-0008-A	WINDOW LCD	PC-PLATE, t0.6, BOSS TAPE	1	
4		SPEAKER		1	
3		RUBBER KEY	SILICONE	1	
2	702-0020-A	CONTACT 'B'	PBS, t0.3, Ni-PLATING	1	
1	702-0013-A	CONTACT 'A'	PBS, t0.3, Ni-PLATING	1	

10. CHANNEL DATA (With Sub-channel data)

CH	TX FREQ (MHz)
1	446.00625
2	446.01875
3	446.03125
4	446.04375
5	446.05625
6	446.06875
7	446.08125
8	446.09375

CTCSS (Continuous Tone Coded Squelch System)   Frequency List

Sub Channel	Tone Frequency	Sub Channel	Tone Frequency
1	67.0 Hz	21	136.5 Hz
2	71.9 Hz	22	141.3 Hz
3	74.4 Hz	23	146.2 Hz
4	77.0 Hz	24	151.4 Hz
5	79.7 Hz	25	156.7 Hz
6	82.5 Hz	26	162.2 Hz
7	85.4 Hz	27	167.9 Hz
8	88.5 Hz	28	173.8 Hz
9	91.5 Hz	29	179.9 Hz
10	94.8 Hz	30	186.2 Hz
11	97.4 Hz	31	192.8 Hz
12	100.0 Hz	32	203.5 Hz
13	103.5 Hz	33	210.7 Hz
14	107.2 Hz	34	218.1 Hz
15	110.9 Hz	35	225.7 Hz
16	114.8 Hz	36	233.6 Hz
17	118.8 Hz	37	241.8 Hz
18	123.0 Hz	38	250.3 Hz
19	127.3 Hz		
20	131.8 Hz		