



# Tectalk

## SERVICE MANUAL

### 2-WAY PORTABLE HANDHELD PMR 446 RADIO

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ALAN Electronics GmbH

# CONTENT

1. GENERAL
  - 1.1 General
  - 1.2 Characteristic
  - 1.3 Composition
2. SPECIFICATION
  - 2.1 General Specification
  - 2.2 Electrical Specification
3. OPERATION
  - 3.1 Key Name
  - 3.2 ICONS on LCD
  - 3.3 Key Functions
  - 3.4 Setting and Operation
4. ADJUSTMENT
  - 4.1 Frequency synthesizer
  - 4.2 Transmitter
  - 4.3 Transmitter Test
  - 4.4 Receiver
  - 4.5 Receiver Test
  - 4.6 Symptoms, check point & Correction
5. DESCRIPTION OF RADIO CIRCUIT
  - 5.1 Frequency Synthesizer
  - 5.2 Receiver
  - 5.3 Transmitter
6. BLOCK DIAGRAM
7. SCHEMATIC
8. COMPONENT PARTLIST
9. ASSEMBLY DRAWING AND PHOTOGRAPH
10. CHANNEL DATA (With Sub-channel data)

# 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 alkaline 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)

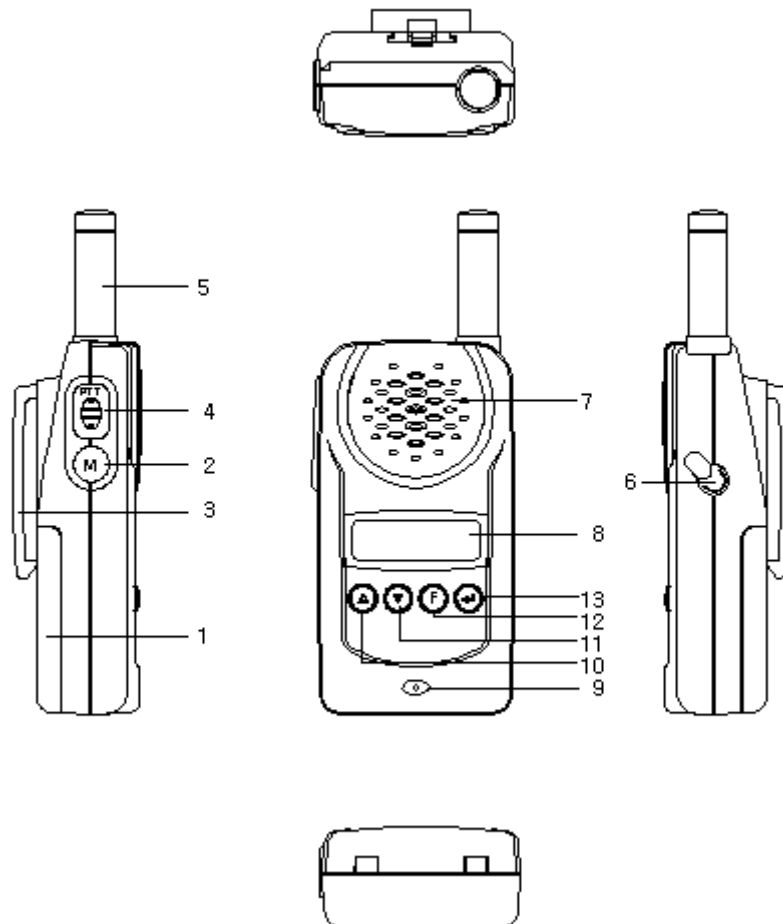
- 6) Cooling Method : air-cooling Method
- 7) Spurious Emission TX : < -36dBm
- 8) FM Hum/Noise : > 40dB(1kHz 60% modulation)
- 9) Distortion : < 5% (1kHz 60% modulation)
- 10) Tx Audio Response : 6dB /OCT +/- 3dB PRE-EMPHASIS(300Hz to 2.5kHz)

### 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 =  $f_c - 21.7\text{MHz}$
  - 2nd Local Frequency = 21.25MHz

### 3. OPERATION

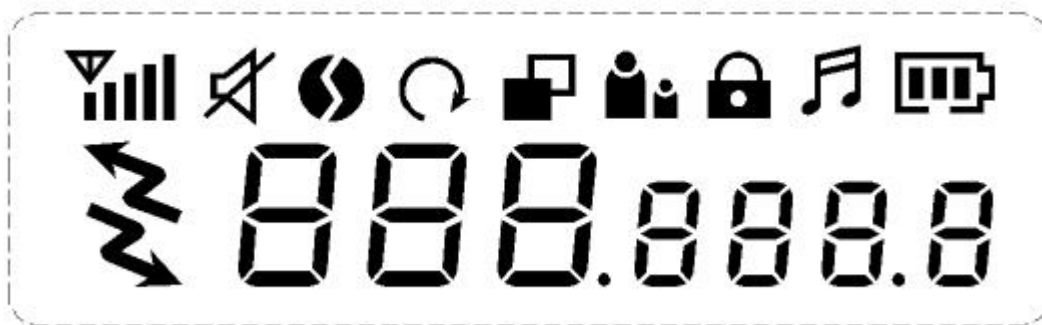
#### 3.1 Drawing of the radio



#### FUNCTIONS AND CONTROLS

- |                                |                                  |
|--------------------------------|----------------------------------|
| 1) Battery Door                | 11) Down Button & Volume Control |
| 2) Monitor Button              | 12) Function Button              |
| 3) Detachable Belt Clip        | 13) Power On/Off & Enter Button  |
| 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 |                                  |

## 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.

### **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 transmitting 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.

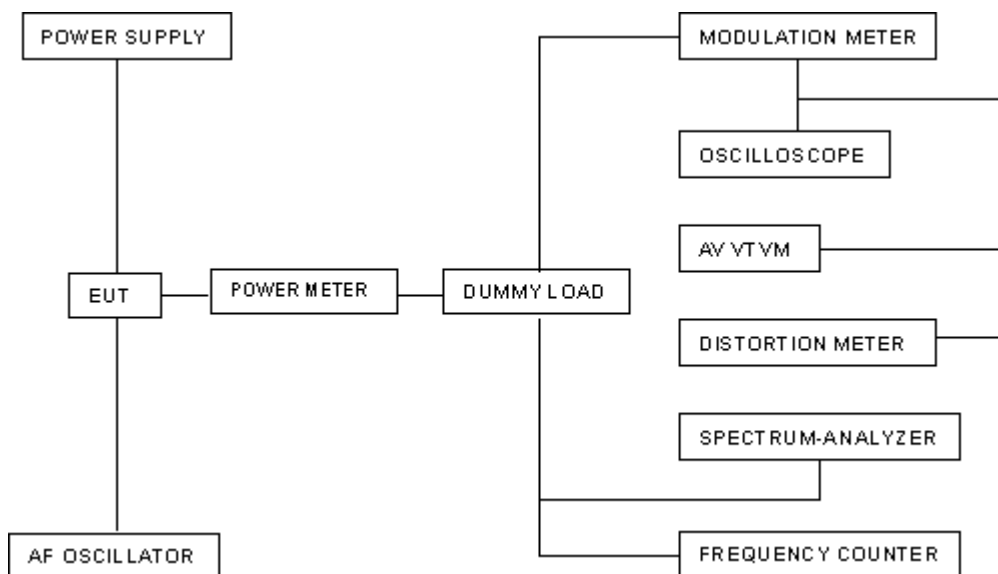
## 4. ADJUSTMENT

### 4.1 Frequency synthesizer (PLL)

- After connecting the power meter and dummy load ( to internal 50 Ohms connection point), join the antenna connection cable with above equipment.
- Check the voltage between TP & GND in digital voltmeter.
- Then set the low channel of set the lowest frequency.
- 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.
- 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

- Connect EUT & measure equipment according to block diagram below.



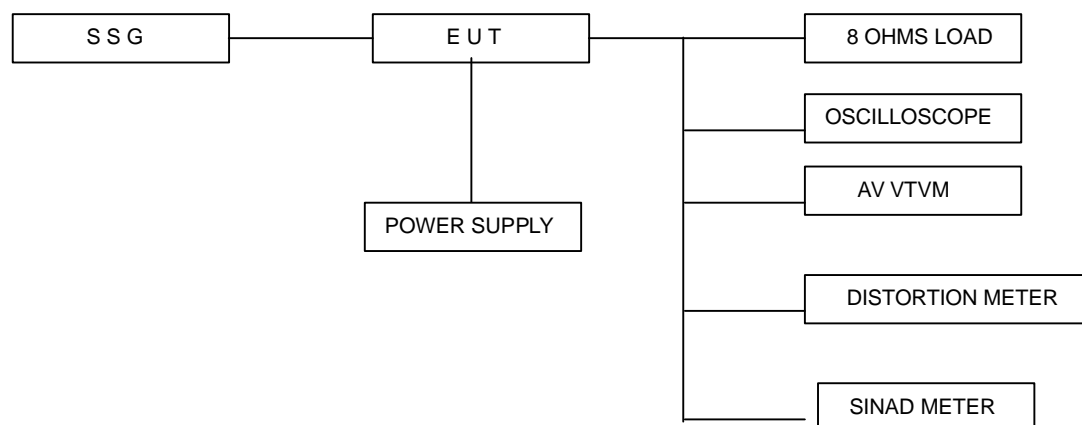
- b) Connect DC 6.0V, voltage preset to EUT.
- c) Connect "power meter" & "dummy load (50 Ohms)".
- d) Adjust Tx frequency according to trimming trimmer VC2.
- e) Connect AF oscillator to mic terminal for conform modulation degree.
- f) Adjust the frequency of AF oscillator to 1kHz and adjust AF level should be 60mV.
- g) Checking oscilloscope and modulation meter. max. frequency deviation should be in  $\pm 2.5$  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  $\pm 2.5$  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 Reference 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<sup>st</sup> IF than Rx frequency. It is called low side injection. Second IF is 450kHz. 2<sup>nd</sup> local oscillator frequency 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 matching 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 oscillator mixed.

It develops 1<sup>st</sup> 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 2<sup>nd</sup> local frequency frequency enter to pin 1.

It supplies mixer of internal IC. Mixer output of IC through pin3 passes 450kHz ceramic filter, supplies 2<sup>nd</sup> IF amplifier and limits.

After 2<sup>nd</sup> 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 amplifies 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 eliminate 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).

The diagram is a detailed block diagram of the J-200H radio receiver, divided into two main sections: the CONTROL BOARD and the RF BOARD.

**CONTROL BOARD:**

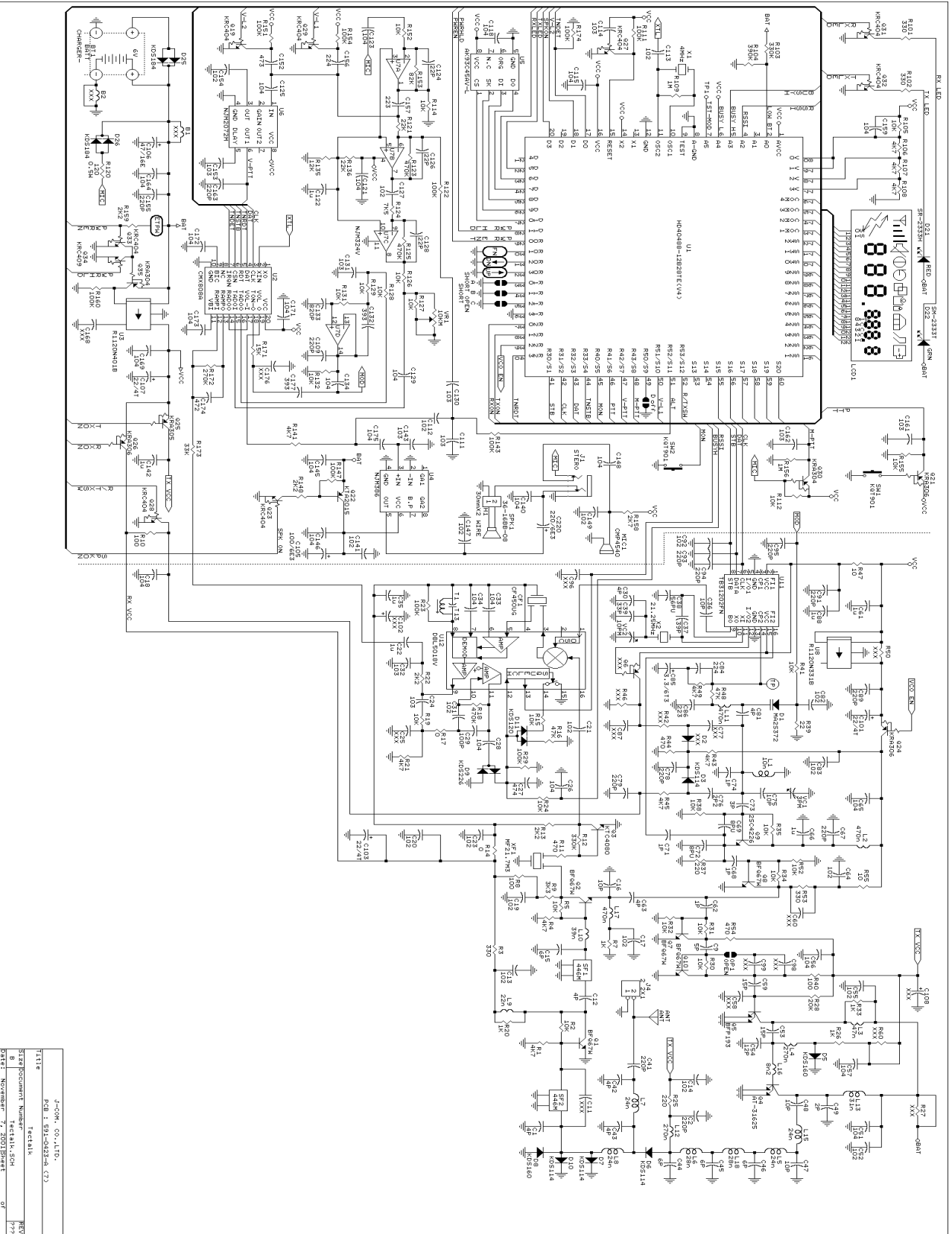
- Power and Grounding:** Includes a 6.0V battery (B1) and various power supply lines (VCC, GND, etc.).
- Microphone and Speaker:** A MIC is connected to the CPU (U1), which drives a speaker (SPK).
- Display and Controls:** A 7-segment display (SEG 18) shows frequency information. Control buttons include TEST, NO, and various options.
- Frequency Synthesis:** The CPU (U1) is connected to a PLL SYN. (U11) and a VCO (U12) to generate the required frequencies.
- Audio Processing:** The CPU (U1) is connected to an AUDIO PWR AMP, which drives the speaker.

**RF BOARD:**

- Antenna and RF Stages:** The ANTENNA is connected to the RF BOARD, which includes a 1st IF FILTER (U13), a 2nd IF FILTER (U14), a 1st IF IC (U15), a 2nd IF IC (U16), a 1st IF AMP (U17), a 2nd IF AMP (U18), and a 1st IF ATT (U19).
- Frequency Synthesis:** The RF BOARD includes a PLL SYN. (U11) and a VCO (U12) to generate the required frequencies.
- Audio Processing:** The RF BOARD includes an AUDIO PWR AMP, which drives the speaker.

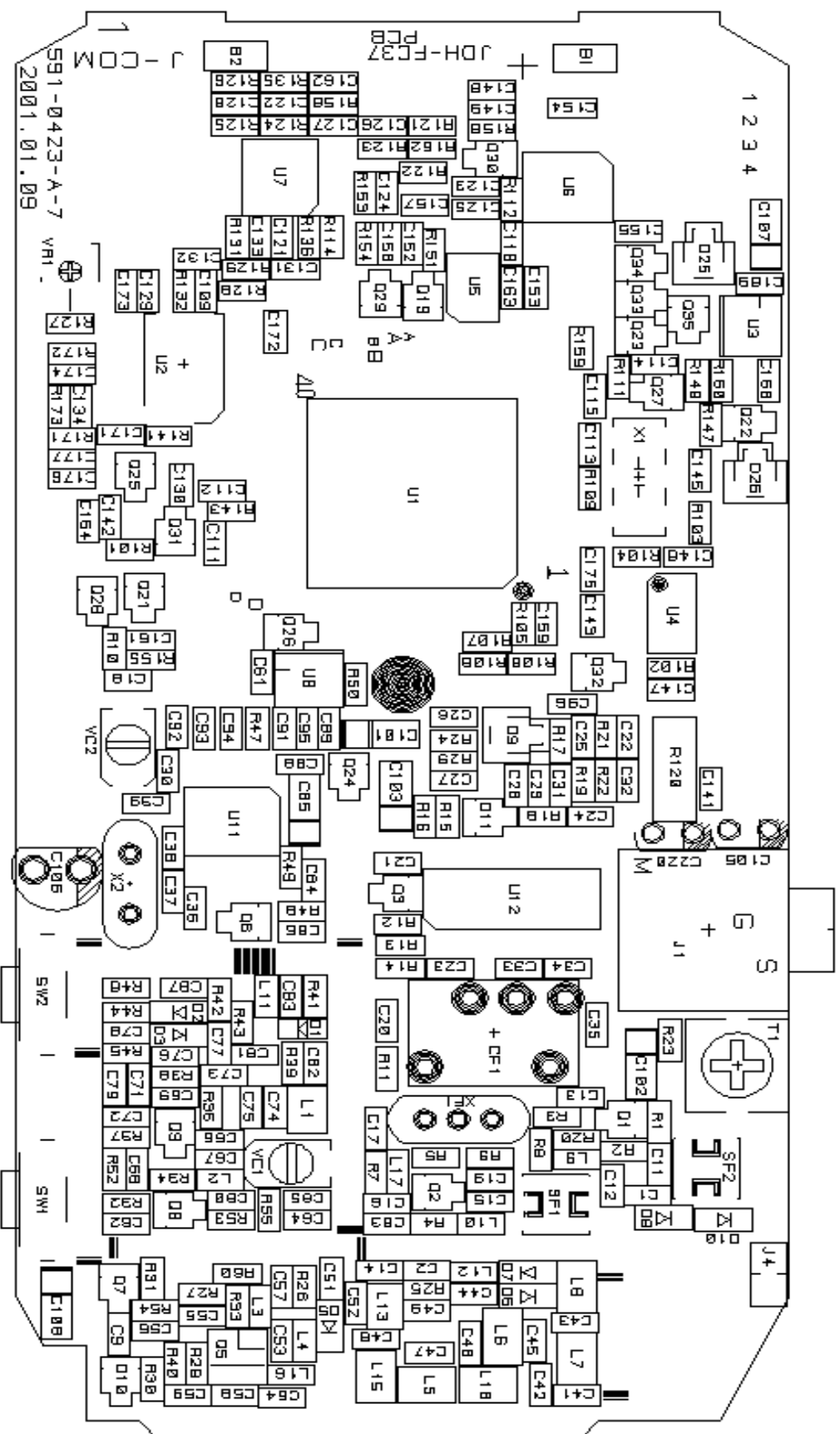
The diagram shows the signal flow from the antenna through the RF stages to the audio output. The CPU (U1) is the central control unit, managing the frequency synthesis and audio processing.

# 7. SCHEMATIC



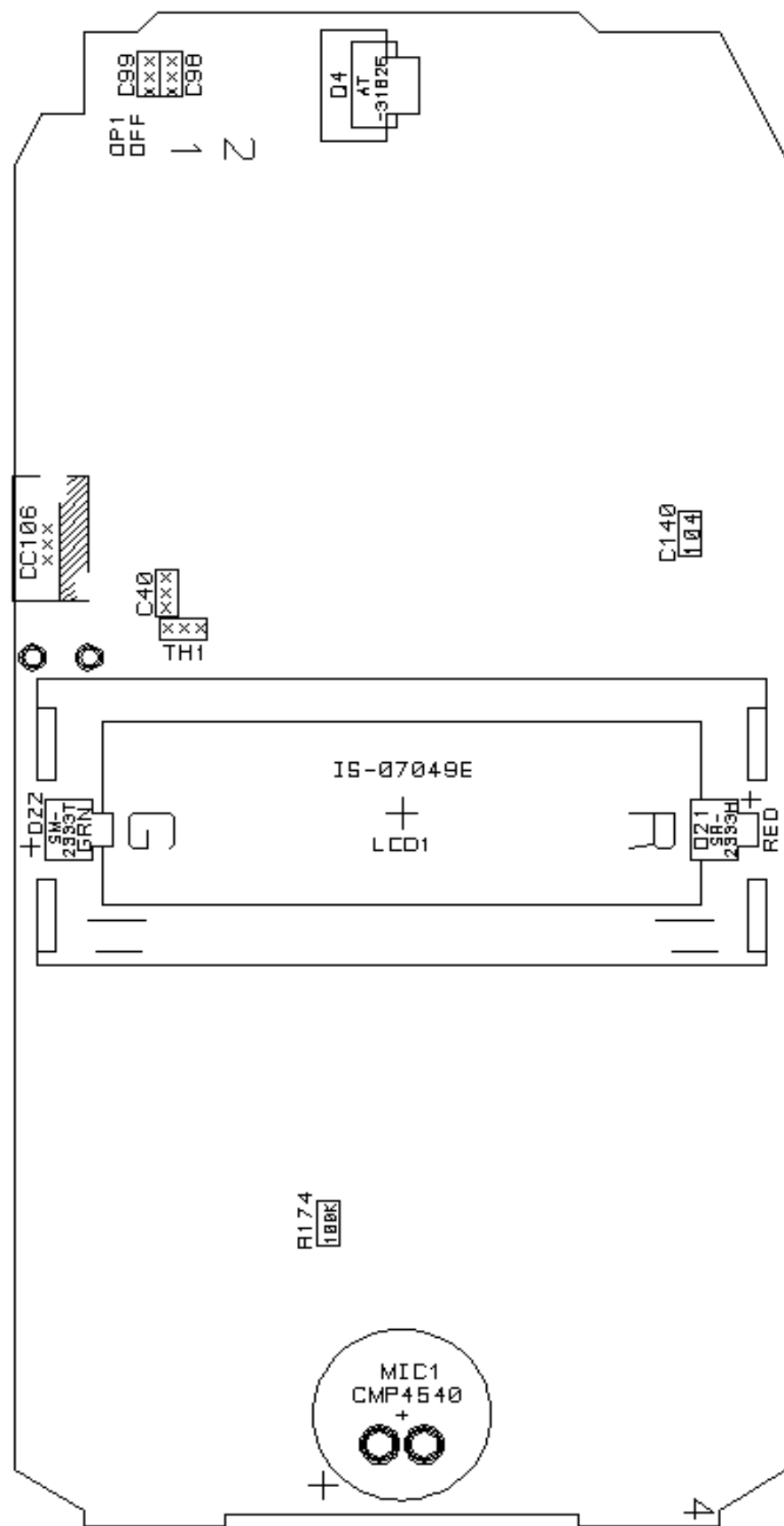
J-004, CO., LTD.
PCB 1: 591-042-04 (7)
1: 64314
Size of Component Number:
1: 64314, 504
8: 1: 64314, 504
9: 1: 64314, 504
10: 1: 64314, 504
11: 1: 64314, 504
12: 1: 64314, 504
13: 1: 64314, 504
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99: 1: 64314, 504
100: 1: 64314, 504

## REF. MAP





# BOTTOM SIDE REF. /VALUE MAP



## 8. COMPONENT PARTLIST

Tectalk  
Tectalk.SCH  
Bill Of Materials

November 8, 2001

Revised: November 7, 2001  
Revision: ???  
9:18:20

Page 1

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, 1u C142	
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



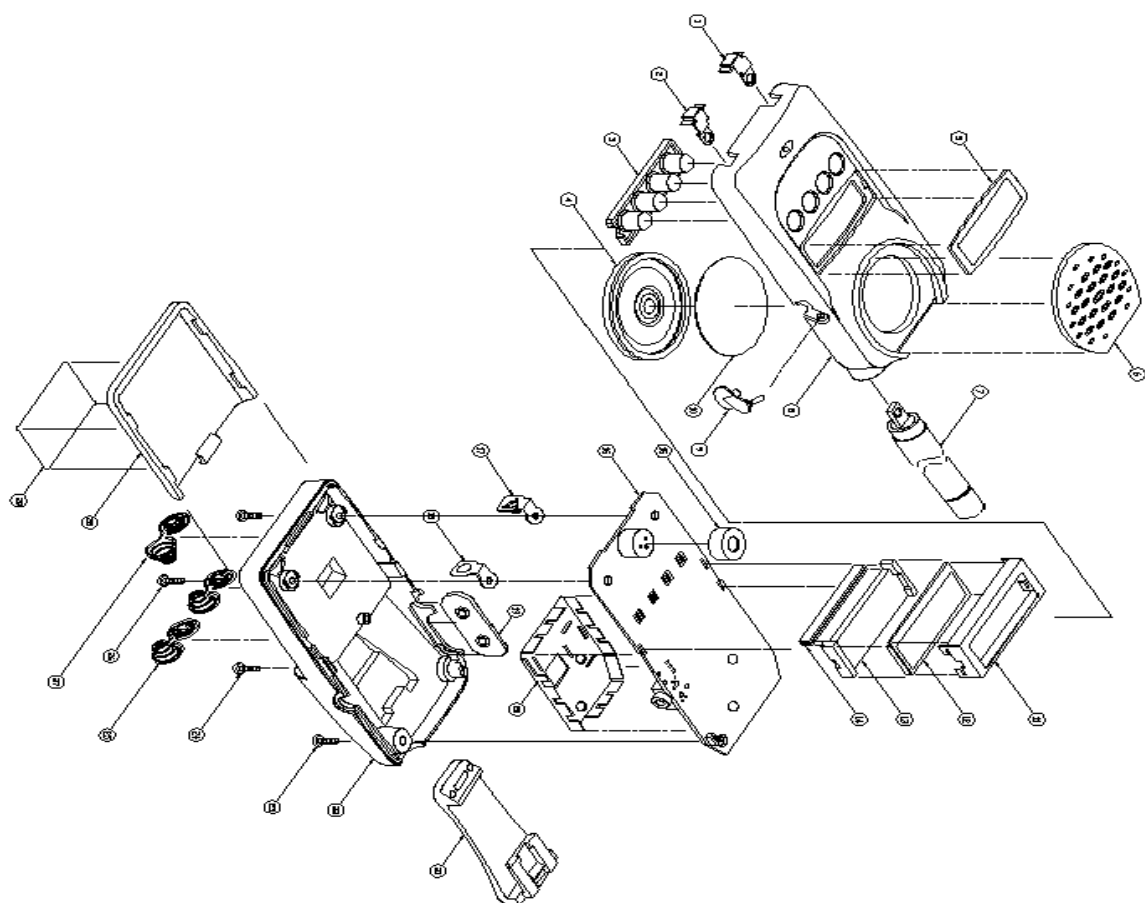
22	1	C76	2P2
23	2	C84,C156	224
24	1	C85	3.3/6T3
25	2	C86,C157	223
26	3	C101,C103,C107	22/4T
27	2	OP1,C	OPEN
28	1	C105	100/6E3
29	1	C106	47/16E
30	3	C124,C126,C128	22P
31	2	C132,C177	393
32	1	C133	820P
33	1	C152	473
34	1	C174	472
35	1	C220	220/6E3
36	1	CF1	CF450UG
37	2	JJ7,CHARGER-	-
38	4	D3,D6,D7,D10	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
23	706-003-A	LABEL SHEET	POLYESTER FILM 318X635	1	
29	706-006-A	COVER BATTERY	ABS	1	
27	706-008-A	CONTACT SPRING-3	POWDERED PLATING	1	
25	706-002-A	SCREW WASHING	BR. NEDMS. N-PLATING 2.00	2	
26	706-004-A	CONTACT SPRING-4	POWDERED PLATING	2	
24	706-003-A	SCREW TAPPING	M4. 20MM. N-PLATING	1	
22	706-001-A	SCREW WASHING	PA6666/66/66/66-PLATING	1	
21	706-005-A	BACK COVER	ABS	1	
20	706-002-A	VELT CLIP	POLYURETHANE	1	
19	706-009-A	SHIELD TOP	SPTE. 0.12	1	
18	706-009-A	SHIELD PTT	SILICON. 0.6-0.77 BLACK	1	
17	706-003-A	CONTACT BATTERY	PBS. 40S. N-PLATING	1	
16	706-009-A	CONTACT BATT. 2	PBS. 10.5MMX. 20.5MM-PLATING	1	
15	706-008-A	PCB MAIN	FR-4 TLD	1	
14	706-008-A	BUSHING MIC.	SILICON. 0.6-0.77 BLACK	1	
13	706-008-A	WATER CONNECTOR	SILICON. 0.6-0.77 BLACK	1	
12	706-007-A	REFLECTOR LED	PMMA	1	
11	706-006-A	LED	315-450. 402	1	
10	706-007-A	BROT LED	315-450. 402	1	
9	706-007-A	FEEL SPEAKER	HOLELON. 0.03MM	1	
8	706-006-A	COVER JACK	PVC 0.4-0.77 BLACK	1	
7	706-006-A	FRONT COVER	ABS 280	1	
6	706-006-A	ANTENNA	ABS 280	1	
5	706-006-A	KEY COVER	ABS. 280	1	
4	706-006-A	WINDOW LCD	PC-PLATE. 440. 280. 280	1	
3	706-006-A	SPEAKER	SILICON	1	
2	706-006-A	CONTACT R	PBS. 40S. N-PLATING	1	
1	706-006-A	CONTACT L	PBS. 40S. N-PLATING	1	

## 10. CHANNEL DATA (With Sub-channel data)

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

## 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		