

## TELSON INFORMATION & COMMUNICATION CO., LTD.

TEL : 82-2-851-2780 ~ 5(EXT210)  
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## THEORY OF OPERATION

**(MODEL:UBZ-AM14)**

### I . FREQUENCY GENERATION

The frequency generation circuit is composed of the synthesizer IC 401 and the VCO. The block diagram illustrates the interconnect and support circuitry used in the design. Refer to the schematic for reference designator.

The supply for the synthesizer is regulated 4.0 volts which also serves the rest of the radio. In addition to the VCO, The synthesizer must interface with the logic and AF filter circuitry. Programming for the synthesizer is accomplished through the clock, data and strobe signals (pin 59, 58 and 57) from the microprocessor IC701.

A serial data is sent whenever the synthesizer is programmed. While unlock is indicated by a low voltage on this pin. The audio signal from the AF filter is modulated by D401 of VCO.

#### PLL FREQUENCY SYNTHESIZER

The U401(PLL IC) includes all the functions such as the phase comparator, the programmable divider, the lock detector, and reference oscillator.

The synthesizer uses a 21.25 MHz crystal (X401) to provide the reference frequency for the system.

The loop filter, composed of R404, R405, C403, C412, C413, C4121 provides the necessary DC steering voltage for the VCO as well as filtering of spurious signals from the phase detector. The pre-scaler for the PLL is internal to U401 with the value determined by the frequency band of operation.

The 21.25 MHz crystal (X401) is the temperature compensation circuit to maintain the frequency within the allowable error range even on -20°C.

#### V C O

The VCO, in conjunction with the synthesizer (IC401), oscillates 467.5125 MHz to 467.675 MHz in the transmit mode and 446.1125 MHz to 446.275 MHz in the receive mode. The VCO consists of the colpitts oscillator of the Q403. A sample of the RF signal from the enabled oscillator is routed from Q402, C427, through to the pre-scaler input (IC401 pin 1). After frequency comparison in the synthesizer, a resultant control voltage is received at the VCO. This voltage is a DC voltage between 1.0 and 4.5

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volts when the PLL is locked on frequency.

In the receive mode, the RF signal through Q402 is the local oscillator RF injection and it is applied to the first mixer at Q203.

In the transmit mode, the RF signal at Q402 is run to the input of the pre-drive transistor (Q104 base). This RF signal is the Tx RF injection. Also in transmit mode, The audio signal to be frequency modulated onto the carrier is received by the transmit VCO modulation circuitry at audio in.

During reception, a relative low frequency should be oscillate compared to transmission. Therefor, the D402 is adversely biased by the Q401, and as a result, the C415-416 which is added in serial to the resonance circuit of the VCO is removed to oscillate the desired reception frequency.

### II . RECEIVER

The receiver of the UHF consists of 4 major blocks each: the Front-end ,the Mixer , the First IF and the second IF/Demodulator IC.

#### FRONT - END

The UHF Front-end contains two separate circuits ; the RF Amplifier and SAW Filter. The RF Amplifier, consist of two transistor Q201 and Q202 is the cascade in all-bipolar form which is also referred to as common - emitter-common - base (CE-CB) connection. This Amplifier has approximately 20dB gain owing to high output impedance , a noise figure of approximately 3dB and is supplied by the receive 4.0V line.

The SAW Filter is BPF of high stability and reliability with good performance and is fixed-tuned design to eliminate the need for tuning and to provide narrow-band operation. The 3dB bandwidth is approximately 6MHz, centered on 465MHz with an insertion loss of approximately 4dB.

The net-gain from the Front-end selection is approximately 20dB in the center of the band, falling to approximately 4dB at band edges, with a center band noise figure of approximately 5.5dB.

#### MIXER

The Mixer operates with a local oscillator drive level minimum -4dBm. The mixer provides excellent isolation between the ports and operates over a large bandwidth. The received signal is mixed down to 21.7MHz, the frequency of the first IF.

#### FIRST IF

The first IF consists of a 21.7MHz crystal filter and amplifier. The crystal filter provides second image protection and intermodulation protection with approximately 3.75kHz

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bandwidth(3dB) for 12.5kHz models. The IF Amplifier, Q301, provides approximately 10dB of gain at 21.7MHz.

### SECOND IF/DEMODULATOR IC

The Second IF/Demodulator IC(DBL5018-V; U301) accepts the 21.7MHz IF input and mixes it with a second local oscillator signal(21.25MHz). This produces a second IF of 450kHz, which is filtered externally by a ceramic filter and passed back into the IC for amplification.

The signal is passed to a quadrature detector for demodulation and, after being filtered, is passed to the output. The IC, along with some external components, controls the squelch sensitivity, squelch tail, and hysteresis. Internal variable resistor, VR301, controls the noise squelch setting.

## III. TRANSMITTER

The UBZ-AM14 transceiver is composed of five basic circuits : a Pre-Driver, Driver, Final Amplifier, Antenna Switch and a Harmonic Filter. Refer to the block diagram and the schematic for more information.

### POWER AMPLIFIER

The Power Amplifier consists of three stages : a Pre-Diver, Driver, Power Amplifier. It requires a supply voltage of 6.0 volts, and is capable of supplying maximum 0.5W(ERP).

### ANTENNA SWITCH

The antenna switch circuit consists of two pin diodes (D101 and D201). In the transmit mode, Tx B+ is applied to the circuit to bias the diodes "on". The shunt diode (D201) shorts out the receiver port and the PI network, which operates as a quarter wave transmission line and transforms the low impedance of the shunt diode to a high impedance at the input of the harmonic filter.

In the receive mode, The diodes are both off, hence, there exists a low attenuation path between the antenna and receiver ports.

### HARMONIC FILTER

The harmonic filter consists of part of L101, L102, C102, C103, and C104. The design of the harmonic filter is 5th order chevyshev filter with 0.5dB ripple. This type filter has the advantage that it can give greater attenuation in the stop-band for a given ripple level.

# FreeTalk™ UBZ-AM14 INSTRUCTION MANUAL

## THANK YOU

We are grateful you decided to purchase KENWOOD product and welcome you to the Family Radio Service (FRS). FRS is personal, short range 2-way radio band for family & friends to keep in touch without the need for license, radio knowledge, or monthly charges. Your KENWOOD FreeTalk is called a 'transceiver', meaning 'transmitter' and 'receiver'. Your transceiver provides safety and convenience almost anywhere, indoor or outside. The distance depends on your location; you'll get maximum distance of up to approximately 2 miles in open areas, less in buildings or vehicles. KENWOOD believes you will be satisfied with this product's quality and features.

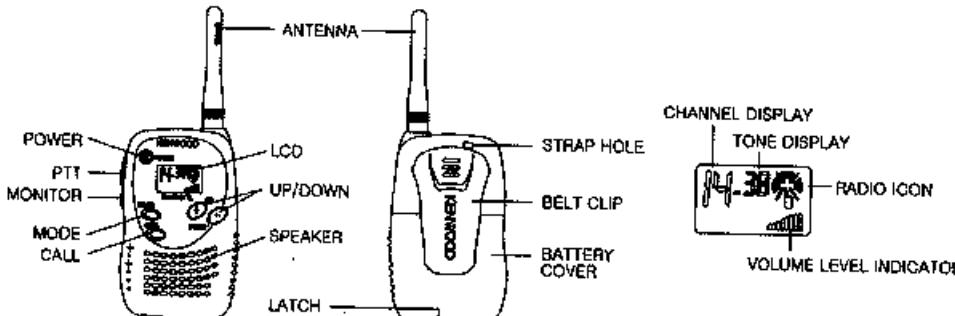
## PRECAUTIONS

- Do not modify or attempt to adjust the transceiver for any reason.
- Avoid extremes in exposure to weather, heat, and cold. This transceiver is water resistant but not waterproof.
- Do not expose the transceiver to long periods of direct sunlight, nor place the transceiver close to heating appliances.
- Do not place the transceiver in excessively dusty areas, humid areas, wet areas, nor on unstable surfaces.
- If an abnormal odor or smoke is detected coming from the transceiver, immediately switch OFF the power and remove the batteries or battery pack from the transceiver. Contact your KENWOOD dealer.

## GENERAL FEATURES

- 14 CHANNELS
- 32 STEP DIGITAL UP/DOWN VOLUME CONTROL WITH 8 LEVEL DISPLAY WITH BEEP
- 500mW POWER OUTPUT
- BATTERY SAVER FUNCTION
- LOW BATTERY WARNING BEEP
- CHANNEL SELECT UP/DOWN BUTTON WITH BEEP
- CALL TONE TRANSMIT FUNCTION
- AUDIBLE LOW BATTERY WARNING BEEP
- UP TO 2 MILES COMMUNICATIONS RANGE
- 30 HOURS OPERATION WITH ALKALINE CELLS (RATIO OF TRANSMISSION, RECEPTION AND STAND-BY PERIODS IS 1:1:8)

## CONTROL DIAGRAM



## INSTALLING / REMOVING BATTERY

This transceiver requires 4 AAA batteries. Use high quality alkaline batteries to enjoy longer periods of battery life. An audible warning beep is generated when battery level is very low. Reception is still enabled, but battery replacement is required.

1. Release the battery cover LATCH, then remove the battery cover.
2. Insert (or remove) the 4 AAA batteries.
3. Observe battery polarity indicated in the battery compartment.
4. Align the battery cover, then lock it using the LATCH.

## OPERATION

### POWER ON/OFF

Press and hold the POWER key for (0.5) seconds to power on / off. At the power on, Back-light displays for (4) seconds

### RECEPTION

Press the UP (Down) key to increase (decrease) the volume. The unit features 32 steps digital volume control. The speaker sounds when correct signal (same channel) is received.

- You have to select the same channel as your party.
- Press and hold the UP (Down) key to continuously change.

### TRANSMISSION

Press the PTT key for transmission. Speak slowly and clearly in a normal tone of voice about 2-3 inches away from the microphone. TX icon appears on the LCD during transmission. Release the PTT key to return to receive / stand-by mode.

### CALL

Press and release the CALL key to transmit an audible Call Tone. The unit rings for 1200 milliseconds. The unit automatically returns to receive / stand-by mode when the Call transmission is over.

### CHANNEL SELECTION

The channel digits blink when the MENU key is pressed. Press the UP (DOWN) key to increase channels (or decrease). To select a channel and return to receive / stand-by mode press MENU, PTT, CALL or MONITOR key and no key entries for (4) seconds.

- Press and hold the UP (Down) key to continuously change.
- At Power On/Off, the selected channel will not be changed.

### FREQUENCY CHART

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
1	462.5625	6	462.6875	11	467.5375
2	462.5875	7	462.7125	12	467.6625
3	462.6125	8	467.5625	13	467.6875
4	462.6375	9	467.5875	14	467.7125
5	462.6625	10	467.6125		

### TONE SELECT

After press the MENU key twice and press the UP/DOWN key to select the desired Tone. Press the UP/DOWN key to return to the Repeat Mode for more than (0.2) seconds. At press and hold the UP/DOWN key, channel will be changed automatically and will check the Channel Busy. To select a channel and return to receive / stand-by mode press MENU, PTT, CALL or MONITOR key and no key entries for (4) seconds. At power On/Off, the selected tone will not be changed.

## CTCSS TONE NUMBER & FREQUENCY

No.	Freq.(Hz)	No.	Freq.(Hz)	No.	Freq.(Hz)	No.	Freq.(Hz)
1	67	11	97.4	21	136.5	31	192.8
2	71.9	12	100	22	141.3	32	203.5
3	74.4	13	103.5	23	146.2	33	210.7
4	77	14	107.2	24	151.4	34	218.1
5	79.7	15	110.9	25	156.7	35	225.7
6	82.5	16	114.8	26	162.2	36	233.6
7	85.4	17	118.8	27	167.9	37	241.8
8	88.5	18	123	28	173.8	38	250.3
9	91.5	19	127.3	29	179.9		
10	94.8	20	131.8	30	186.2		

## VOLUME CONTROL

Press the UP/DOWN key to increase(to decrease) the volume level from 1 to 32(from 32 to 1)

- Press the UP/DOWN key to return to Repeat Mode for more than (0.2) seconds.
- When power On/Off, the volume level will be not changed.
- The volume level will be changed to original level during replacing a battery.

## MONITOR KEY

1. Monitor On/Off
2. Continuous Monitor Mode On/Off

- Normal Monitor Mode

During pressing the Monitor key, Audio is On and RX Icon appears on the LCD. Release the key to return to Stand-by Mode and Audio will be muted.

- Continuous Monitor Mode

Press the Monitor key for more than (3) seconds, Monitor Mode will be operated with Single Beep (RX Icon appears on the LCD)

## BACK LIGHT ON/OFF

When any key is pressed, the LCD will be illuminated.

The lamp will be out after (5) seconds.

## BATTERY SAVER

After (4) seconds elapse with no key entries, no call received, and no transmission, Battery Saver automatically functions. It repeats switching ON and OFF the power to the receiver at certain ratios to maximize battery life. You cannot switch OFF this function.

## SPECIFICATIONS

Frequency range	462.5625 – 467.125 MHz (14 Channels)
Supply voltage (rated voltage)	6.0 V
Transmit output power	500mW
Dimensions (W x H D, projection not included)	00.0 X 000.0 x 00.0 mm (0.00 x 0.00 x 0.00 inches)
Weight (with 4 AAA batteries)	Approx. 000g (0.0 oz.)

## NOTICES TO USER

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

One or more of the following statements may be applicable:

### FCC WARNING

*This equipment generates or uses radio frequency energy. Changes or modifications to this equipment may cause harmful interference unless the modifications are expressly approved in the instruction manual. The user could lose the authority to operate this equipment if an unauthorized change or modification is made.*

### INFORMATION TO THE DIGITAL DEVICE USER REQUIRED BY THE FCC

*This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules.*

*These limits are designed to provide reasonable protection against harmful interference in a residential installation.*

*This equipment generates, uses and can generate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that the interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:*

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer for technical assistance.

# KENWOOD

## LIMITED WARRANTY STATEMENT

Kenwood Communications Corporation ("KENWOOD") warrants this product for ninety (90) days on parts and labor, measured from the date of purchase by the first end user. This Warranty is enforceable only by the first end user.

Except as specified below, this warranty covers all defects in material and workmanship in this product. The following are not covered by the Warranty:

1. Damage, deterioration or failure resulting from:
  - A. Accident, misuse, abuse, neglect, product modification or failure to follow Instructions contained in your Owner's Manual.
  - B. Repair or attempted repair by anyone not authorized by KENWOOD.
  - C. Installation of parts that do not conform to the quality or specifications of the original parts.
2. Damage or loss occurring during shipment (claims must be presented to the carrier).
3. Any unit which is not new when sold to the first end user or upon which the serial number has been defaced, modified or removed.

Your KENWOOD transceiver must be returned to the original place of purchase for warranty service. Whenever the product is presented for warranty service, you must supply a sales receipt or other evidence of the date of purchase. Kenwood reserves the right to repair or replace the product with a new or reconditioned product.

Unless considered unlawful or unenforceable under applicable law:

- A. ALL IMPLIED WARRANTIES WITH RESPECT TO KENWOOD TRANSCEIVER, INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, HEREBY ARE EXCLUDED.
- B. KENWOOD'S LIABILITY UNDER THIS WARRANTY SHALL BE LIMITED TO THE REPAIR OR REPLACEMENT, AT KENWOOD'S OPTION, OF ANY DEFECTIVE PRODUCT, AND SHALL NOT INCLUDE DAMAGES OF ANY KIND, WHETHER INCIDENTAL, CONSEQUENTIAL OR OTHERWISE.

This Warranty is enforceable only in the United States of America.

If a problem develops during or after the Limited Warranty Period, or if you have any questions regarding the operation of the product, you should contact your KENWOOD Authorized Dealer or Authorized Service Center. If the problem or your question is not handled to your satisfaction, please contact our Customer Relations Department at 1-800-KENWOOD (USA only).

For customers outside U.S.A. or Canada who purchase this product, please contact your local Authorized Dealer.

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**USA ONLY**