

Industrial-grade AI noise-cancellation Solution Integrator



**AI-VOX & Noise-Canceling Radio**

**WS2V User Manual**

Clearer | Hands-free | More Efficient

## 1. Safety Guidelines and RF Exposure

Before operating this radio, please read this manual carefully. It contains essential instructions for safe usage and RF energy awareness to ensure compliance with national and international RF exposure standards. **RF Exposure Compliance** To ensure compliance with general population or uncontrolled environment exposure limits, strictly adhere to the following procedures:

- **Transmit/Receive Duty Cycle:** Do not transmit (press the PTT button) for more than 50% of the total usage time. The radio generates measurable RF energy only during transmission.
- **Face-to-Face Operation:** Hold the radio in a vertical position in front of the face. Keep the microphone (and all other parts of the radio, including the antenna) at least 1 to 2 inches (2.5 to 5 cm) away from the lips.
- **Body-worn Operation:** Always use HELEN-approved belt clips, holsters, or cases. If not using a body-worn accessory, maintain a minimum distance of 1 inch (2.5 cm) between the antenna and your body during transmission.

## 2. Medical Device Safety and Restricted Environments

Handheld wireless radios can interfere with certain medical equipment and sensitive systems.

- **Pacemakers:** A minimum separation of 6 inches (15 cm) must be maintained between the radio and a pacemaker.
- Always keep the radio at least 6 inches away from the pacemaker when the radio is turned ON.
- Do not carry the radio in a breast pocket.
- Use the ear opposite the pacemaker to minimize potential interference.
- Turn the radio OFF immediately if you suspect interference is occurring.
- **Hearing Aids:** Some digital radios may interfere with certain hearing aids. Consult the manufacturer to discuss alternatives.
- **Other Medical Devices:** Consult the manufacturer of any personal medical device to determine if it is adequately shielded from RF energy. **Restricted Environments**
- **Hospitals/Clinics:** Turn off the radio where posted regulations require it to protect sensitive medical equipment.
- **Airports/Aircraft:** Radio use is strictly prohibited to avoid interference with navigational systems.
- **Explosive Atmospheres:** Turn off the radio before entering fuel areas, chemical transfer facilities, or any area containing sparks/explosive gases. Do not remove, install, or charge batteries in these zones.
- **Blasting Zones:** Turn off the radio near electrical blasting caps or in areas posted: "Turn off two-way radio."

## 3. Operational Warnings and Hardware Protection

- **Vehicle Safety:** Never place the radio on or near an airbag deployment area. An

inflating airbag can propel the radio with significant force, causing severe injury.

- **Magnetic Interference:** The speaker contains a permanent magnet. Keep the radio at least **10 cm** away from TV screens and computer monitors to prevent magnetization or image distortion.
- **Antenna Protection:** Do not use a radio with a damaged antenna. Skin contact with a damaged antenna during transmission can cause minor burns.
- **Short-Circuit Prevention:** Prevent battery terminals from contacting conductive materials such as jewelry or keys. Conductive contact can cause the battery to overheat, leading to burns or fire.

#### 4. Charger Safety Precautions

- Do not expose the charger to rain, snow, or moisture.
- Do not disassemble the charger or operate it if it has been dropped or damaged.
- Always pull by the plug rather than the cord when disconnecting to avoid damaging the internal wiring.
- **Extension Cord Wire Gauge Requirements:** The use of extension cords is discouraged. If necessary, ensure the following wire gauges:
  - Length under 30 meters: **18 AWG** wire required.
  - Length under 45 meters: **16 AWG** wire required.
- Unplug the charger before maintenance or cleaning to reduce the risk of electric shock.

#### 5. Unpacking and Checklist

Please verify that the following items are included in the package. If any item is missing or damaged, contact Wavesync for help.

Item	Quantity
AI-VOX Radio	1
Antenna	1
Battery Pack	1
Desktop Charger	1
Power Adapter	1
Belt Clip	1
Hand Strap	1
User Manual	1
Warranty Card	1

#### 6. Battery and Charging Management

**Battery Specifications** The WS2V radio is equipped with a high-capacity **1600mAh** Li-ion battery. New batteries reach optimal capacity only after 2 to 3 full charge/discharge cycles. To extend battery life, remove the battery when not in use for long periods and store in a cool, dry place below 25°C.

##### Charging Instructions

1. Connect the power adapter to an AC outlet and the charger base.

2. Turn off the radio and insert it (or the battery alone) into the charger.
3. Ensure the battery contacts are firmly touching the charger terminals.
4. The LED indicator turns green when fully charged.

### Low Battery Warning

When the voltage drops below the preset limit, the LED will flash red and a voice prompt will sound every 30 seconds.

- **English Prompt:** "Check the Battery"
- **Chinese Prompt:** "请充电" (Configurable via software)

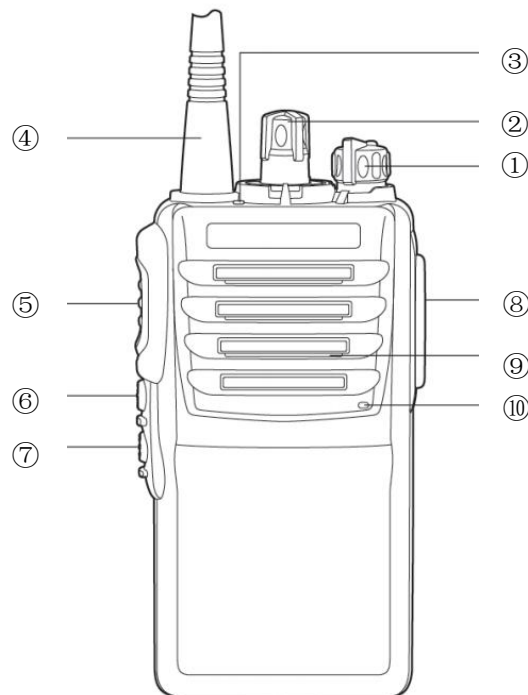
### LED Status Table

Status	LED Indicator
Charging / Transmit	Solid Red
Fully Charged/Under Monitoring	Solid Green
Low Battery	Flashing Red
Channel Busy	Flashing Green

## 7. Hardware Installation Guide

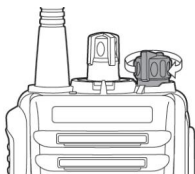
- **Battery Installation:** Align the protrusions at the bottom of the battery with the positioning holes at the bottom of the radio chassis. Press the battery down until the top buckle locks firmly into place.
- **Battery Removal:** Power off the radio. Push the battery buckle at the top of the radio upwards to release the latch, then pull the battery away from the chassis.
- **Antenna Installation:** Thread the antenna onto the connector on top of the radio. Rotate it clockwise until tightly secured.
- **Belt Clip Installation:** Align the belt clip with the screw holes on the back of the radio chassis. Secure the clip using the two provided screws. Do not over-tighten.
- **Hand Strap:** Thread the braided hand strap through the hole located at the top corner of the device.

## 8. Getting Acquainted: Controls and Interface

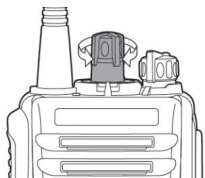


1. **Power/Volume Knob:** Rotate clockwise to power on and increase volume; counter-clockwise to decrease volume and power off.
2. **Channel Selector:** Rotate to select between channels 1-16.
3. **LED Indicator:** Red (TX); Green (RX); Yellow/Orange (Selective Call).
4. **Antenna:** High-gain rubber interface for signal transmission.
5. **PTT (Push-to-Talk) Button:** Press and hold to transmit; release to receive.
6. **Side Key1(Programmable):** Default to voice broadcast of the current channel/Monitor.
7. **Side Key 2 (Programmable):** Default to AI Noise Reduction / AI-VOX toggle
8. **SP/MIC Jack:** External interface for earphones and PC programming.
9. **Speaker:** High-fidelity audio output.
10. **Microphone:** Primary audio input for speech.

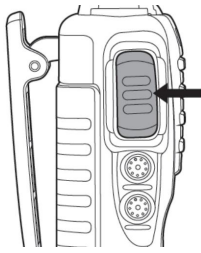
## 9. Basic Operations



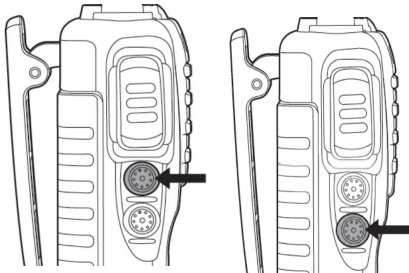
- **Power On/Off:** Turn the Power/Volume knob clockwise until a "click" is heard.
- **Adjusting Volume:** Rotate the Volume knob to the desired level.



- **Selecting Channels:** Rotate the Channel Selector to your assigned group frequency.



- **Transmitting:** Hold the radio 2- 5 cm from your face. Press and hold the **PTT** button and speak clearly into the microphone. The LED will glow Red.
- **Receiving:** Release the **PTT** button to listen for incoming signals. The LED will glow Green when a signal is detected.



- **Side Key1/Side Key2:** By default, **Side Key 1** is set for Channel Annunciation, and **Side Key 2** serves as the toggle for AI Noise Cancellation/AI-VOX. These are programmable keys that can be reassigned to other functions as needed (please refer to Section 11, 'Advanced Features and Side Key Programming' for details).

## 10. Exclusive Features: AI-VOX and Howling Suppression

The WS2V model utilizes advanced Deep Neural Network processing to ensure clear communication in high-noise industrial environments.

### AI-VOX:

Superior to conventional VOX: While noise often triggers conventional VOX and causes clipped speech, AI-VOX responds only to human voices. This eliminates false triggers and ensures seamless communication from the very first word.

It is specially designed for noise/windy scenarios where both hands are occupied and holding a walkie-talkie is not feasible. such as for electrical maintenance personnel or rock climbers, etc..

When the VOX feature is not required, please deactivate it to reduce power consumption.

**AI Noise Reduction:** Unlike traditional noise-canceling methods that simply subtract constant background frequencies, the WS2V uses a **Deep Neural Network (DNN)** to process audio "like a human."

1. **DNN Training:** The AI has been trained on over 500 million speech samples to accurately distinguish between background noise and human voice.
2. **Performance:** It effectively filters out machinery, wind, and traffic noise even in extreme environments.
3. **Close-Range Howling Suppression** Feedback loops often cause high-pitched "howling" when multiple radios are operated in close proximity. The 228 includes specialized circuitry to suppress these feedback loops.
4. **Operational Note:** The AI noise reduction feature can be toggled on or off using the programmable side keys to suit different acoustic environments.

## 11. Advanced Features and Side Key Programming

**Programmable Keys** Side Key 1 and Side Key 2 can be configured via programming software (supported by Wavesync) for the following:

- **Channel Announcement:** Press **Side Key 1** (default setting) to trigger a voice

prompt indicating the current channel.

- **Monitor (MON):** Press and hold **Side Key 1** (default setting) to monitor. The LED indicator on the top of the radio will light up green.
- **AI Noise Cancellation (On/Off):** Press **Side Key 2** (default setting) to toggle the AI noise cancellation feature on or off.
- **AI-VOX (On/Off):** Press and hold **Side Key 2** (default setting) to toggle the VOX feature on or off.
- **Squelch Off:** Press (or press and hold) the designated programmable key to disable the noise and audio squelch controls. Press (or press and hold) the key again to resume normal noise and audio squelch controls.
- **Squelch (SQL) Level Setting:** This feature allows for the automatic adjustment of the squelch level. Press the designated programmable key to toggle the squelch threshold between "High" and "Low".
- **Low Power:** Press (or press and hold) the designated programmable key to set the radio transmitter to "Low Power" mode, which helps extend battery life. In difficult communication terrains, use the designated key to revert to "High Power" mode. When the transmitter is in "Low Power" mode, the LED indicator will light up green.
- **Scan:** The scan function is used to monitor multiple pre-configured channels on the radio. During scanning, the radio checks each channel for a signal. If a signal is detected on a specific channel, the radio will pause on that channel.
  - **Activate Scan:** Press (or press and hold) the designated programmable key. The scanner will search the channels for active signals; it will pause scanning whenever it detects someone speaking on a channel. When the scan function is enabled, the top LED indicator will light up green.
  - **Stop Scan:** Press (or press and hold) the designated programmable key. The radio will return to the channel indicated by the channel selector knob.
- **Lone Worker:** Press and hold the designated programmable key to toggle the Lone Worker function between "On" and "Off". Once the Lone Worker timer expires, the radio will emit a 30-second warning tone every 1 second. If the user does not press the PTT switch to reset the timer, the radio will switch to emergency handling mode.

When personnel are operating alone in remote or high-risk areas, the 'Lone Worker' feature serves as a vital life-saving safety function, ensuring worker safety through periodic key-press check-ins.

## 12. Factory Defaults and PC Programmin

The radio settings can be customized by connecting the device to a computer via the SP/MIC jack using a programming cable. The following are the factory default settings. If you require any adjustments or custom programming, please contact WaveSync for assistance.

### Factory Defaults

- **Squelch Level:** 2
- **Time-Out Timer (TOT):** 60 Seconds

- **Output Power:** High ( $\leq 5W$ )
- **Voice Prompt:** English (or Chinese)

### 13. Technical Specifications

General Specifications	Data
Frequency Range	UHF 400 - 470 MHz
Channel Capacity	16
Power Output	$\leq 5W$
Operating Voltage	DC 7.4V
Battery Capacity	1600mAh (Li-ion)
Antenna Impedance	50 $\Omega$
Operating Temperature	-25°C to +55°C
Weight	Approx. 232g (including battery/antenna)
Dimensions	113 x 55 x 32 mm (excluding antenna)

### 14. Troubleshooting

Problem	Possible Solution
No Power	Battery may be exhausted; please recharge. Ensure the battery is correctly locked into the chassis and the buckle is secure.
Short Battery Life	The battery lifespan may have ended; replace with a new 1600mAh pack. Avoid leaving the radio in the charger after the green LED illuminates.
Communication Failure	Verify you are on the correct channel. Check that your QT/DQT (CTCSS/DCS) settings match the rest of your group.
Interference/Other Voices	The channel is being used by another party. Change the QT/DQT settings for all radios in your group.
Background noise is heavily transmitted, and voice clarity is poor.	The AI Noise Cancellation feature may be disabled. Press [Side Key 2] (default setting) to activate it. This will effectively suppress external noise and enhance target voice clarity.
The radio does not automatically transmit when speaking (Hands-free not working).	The AI-VOX feature is currently turned off. Press and hold [Side Key 2] (default setting) to enable AI-VOX, allowing the radio to be triggered exclusively by the human voice.
Battery drains faster than expected during operational shifts.	The VOX function might be constantly active. To conserve battery life and minimize current draw, ensure the AI-VOX function is turned off (press and hold [Side Key 2]) when not required.

### 15. Appendix and Compliance

The WS2V supports **38 Groups of CTCSS** and **83 Groups of DCS** (Normal and

Inverted modes) to provide interference-free communication.

*Table 1: CTCSS Frequencies (38 Groups)*

67.0	88.5	114.8	151.4	177.3
69.3	91.5	118.8	156.7	179.9
71.9	94.8	123.0	159.8	183.5
74.4	97.4	127.3	162.2	186.2
77.0	100.0	131.8	165.5	189.9
79.7	103.5	136.5	167.9	192.8
82.5	107.2	141.3	171.3	
85.4	110.9	146.2	173.8	

*Table 2: DCS Codes (83 Groups, Normal and Inverted)*

D017N	D017I	D116N	D116I	D226N	D226I	D332N	D332I
D023N	D023I	D122N	D122I	D243N	D243I	D343N	D343I
D025N	D025I	D125N	D125I	D244N	D244I	D345N	D345I
D026N	D026I	D131N	D131I	D245N	D245I	D346N	D346I
D031N	D031I	D132N	D132I	D246N	D246I	D351N	D351I
D032N	D032I	D134N	D134I	D251N	D251I	D356N	D356I
D036N	D036I	D135N	D135I	D252N	D252I	D364N	D364I
D043N	D043I	D143N	D143I	D254N	D254I	D365N	D365I
D047N	D047I	D145N	D145I	D255N	D255I	D371N	D371I
D050N	D050I	D152N	D152I	D261N	D261I	D411N	D411I
D051N	D051I	D155N	D155I	D263N	D263I	D412N	D412I
D053N	D053I	D156N	D156I	D265N	D265I	D413N	D413I
D054N	D054I	D162N	D162I	D266N	D266I	D423N	D423I
D055N	D055I	D165N	D165I	D271N	D271I	D425N	D425I
D065N	D065I	D172N	D172I	D274N	D274I	D431N	D431I
D071N	D071I	D174N	D174I	D305N	D305I	D432N	D432I
D072N	D072I	D205N	D205I	D306N	D306I	D445N	D445I
D073N	D073I	D212N	D212I	D311N	D311I	D446N	D446I
D074N	D074I	D217N	D217I	D315N	D315I	D452N	D452I
D114N	D114I	D223N	D223I	D325N	D325I	D454N	D454I
D115N	D115I	D225N	D225I	D331N	D331I		



AI Out Noise, Sync In Clarity.