CHCNAV NX612 USER MANUAL

Precision Agriculture | Oct 2024

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Preface

1.1 Copyright

1.1.1 Copyright 2023-2024

1.1.2 Trademarks

1.2 Safety Warning

When using the CHCNAV NX612 GNSS Auto Steering System, please observe the following safety warnings:

Before using the system, carefully read and understand the operating instructions in the user manual to ensure proper use of the system.

During system operation, strictly follow local traffic regulations and safety standards to ensure safe operation in safe environments and conditions.

Regularly check the condition and performance of the system and equipment when using the system to ensure normal operation and high-precision navigation performance.

Maintain concentration and alertness during system operation, avoid fatigue and distraction, and prevent accidents.

Avoid using the system in hazardous areas such as steep or cliff edges, water puddles, or muddy ground to prevent personal injury or equipment damage.

Stop using the system immediately and contact the system manufacturer or supplier for technical support and maintenance services when the system experiences abnormality or failure.

Protect the equipment from physical damage or weather factors when operating the system to ensure long-term stability and reliability.

Observe the relevant maintenance and upkeep requirements of the system and equipment during operation to prolong the life of the equipment and ensure normal operation.

Pay attention to the safety of the surrounding environment and other personnel when using the system to avoid accidents and stop the machine promptly to handle any abnormal situations.

The above is for reference only, and specific safety warning content may vary slightly depending on the device model and local regulations and standards. When using the CHCNAV NX612 GNSS Auto Steering System, please carefully read and observe the relevant safety warnings and usage instructions to ensure the safety and normal operation of the system.

1.3 Introduction

The CHCNAV NX612 user manual describes how to install and use the CHCNAV® NX612 system. In this manual, “the system” refers to the NX612 agricultural system unless otherwise stated. Even if you have used other agricultural products before, CHCNAV recommends that you spend some time reading this manual to learn about the special features of this product.

1.4 Technical Support

If you have a problem and cannot find the information you need in this manual or CHCNAV website www.chcnav.com or contact your local CHCNAV dealer from which you purchased the system(s).

If you need to contact CHCNAV technical support, please contact us by email support@chcnav.com

1.5 Disclaimer

Before using the system, please make sure that you have read and understood this User Guide, as well as the safety information. CHCNAV holds no responsibility for the wrong operation by users and for the losses incurred by the wrong understanding about this User Guide. However, CHCNAV reserves the rights to update and optimize the contents in this guide regularly. Please contact your local CHCNAV dealer for new information.

1.6 Your Comments

Your feedback about this user guide will help us to improve it in future revision. Please email your comments to support@chcnav.com

2 Product Overview

2.1 Introduction

The NX612 is an automated steering system that easily retrofits many types of tractors with a compact, up-to-date and all-in-one solution at a price each farm can afford. It provides significant productivity gains, works in all visibility conditions and reduces operator fatigue.

2.2 Main Components

Receiver: It is typically a Global Navigation Satellite System (GNSS) receiver, used to receive satellite signals to determine the accurate position, direction, and speed of the vehicle. It forms the foundation for autosteering system by providing precise information about the current location of the vehicle.

Electric steering wheel: Consists of a steering motor and a steering wheel. and provides steering control of the vehicle. The motor is primarily used to control the movement of the vehicle with steering. The autonomous driving system utilizes the motor to execute commands generated by path planning and navigation algorithms, ensuring the safe movement of the vehicle along predefined trajectories.

Tablet: The tablet serves as the user interface for interacting with the autonomous driving system. Farmers or operators can use the tablet device to set paths, monitor job status, and configure the system. The tablet is also employed for real-time monitoring of the vehicle's operation.

Camera: Placed in the rear of the vehicle to provide real-time images. Cameras have multiple uses in autonomous driving. They can be employed for obstacle detection, helping the machinery avoid collisions or damage to crops.

These components work together to enable the autonomous driving system to perform various tasks in the field, enhancing the efficiency and precision of agricultural production.

3 Installation

3.1 Product Package

All components are into one box.

List of main components:

Device name	Model	Image	Quantity
Electric steering wheel	CES-T		1
Receiver	PA-5		1
Tablet	CB-H12		1
Camera	X-MC011A		1
Ball holder			2
Double socket arm			1
Standard bracket			1

T-bracket			1
T mount kit (A&B)		 B A	1
Integrated main cable			1
Handle ball			1
Radio Antenna			1

3.2 Installation Steps

3.2.1 Steering system inspection

Before installation, please check whether the vehicle steering gear is normal, whether the dead zone (steering clearance) is appropriate.

Dead zone < 20°	Available range
20°<Dead zone < 70°	Available to install NX612 but necessary to modify the dead zone to 10~30 degrees.
Dead zone > 70°	Repair the vehicle first.

3.2.2 Original steering wheel removal

a) Remove the protective cover of the original steering wheel;

b) Stabilize the steering wheel, use the sleeve tool to loosen the original vehicle spline screws, and remove the original vehicle spline screws;

c) Pull out the steering wheel forcefully. If it is difficult to remove, it is necessary to strike the spline shaft to loosen it with a hammer and to be careful to avoid the steering wheel damage, or use of high quality puller tool to avoid damage on original steering wheel and shaft

3.2.3 Steering wheel installation

a) If the sleeve can fit the spline, please remove the protective cover of the steering wheel, place the sleeve in it, and fix the sleeve with M5*11 phillips screws (6 pcs);

b) Install T bracket or standard bracket on the motor with M5*16 hexagon screws (2 pcs);

c) Fix the T mount kit to the shaft with M8*60 hexagon screws (2 pcs);

d) Insert T bracket through T mount kit;

e) Hold the steering wheel and tighten the spline screws with tools;

f) Screw the T bracket to the T mount kit tightly with M10 nuts (2 pcs);

g) Finally shake the steering wheel, check whether it's tight, and check again whether the steering clearance is too large.

3.2.4 Receiver installation

a) The receiver needs to be installed on the central axis of the vehicle roof as possible, and the installation direction should be parallel to the vehicle as possible;

b) After confirm the installation position, wipe the roof clean and make sure the bracket installation is spotless;

c) Adjust the receiver bracket to make sure the receiver is placed horizontally, also the receiver arrow must face forward.

3.2.5 Tablet installation

The tablet installation requires the ball base to be installed in locations as suggested shown in the picture, and avoid damaging to the original vehicle cables. Usually there are two kinds of installation methods to fix the mounting bracket.

a. Drill more than 3 dovetail screws on the A-pillar or B-pillar to fix the ball base then install tablet with RAM bracket.

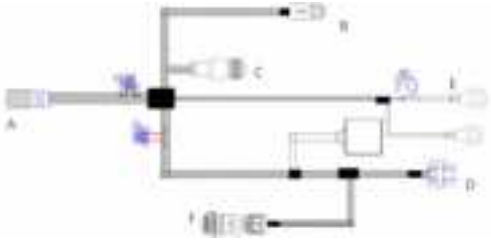
b. Fix the ball base with U bolt on the tractor crossbar and adjust it according to the driver's habits.

c) After complete the installation, it is available to adjust the tablet to a suitable position;

3.2.6 Camera installation

The camera can be installed anywhere (within the wire harness length range).

3.2.7 Cables connection

Name	Cable diagram	Connection
Integrated main cable		A → Receiver B → Motor C → Wheel angle sensor cable (Optional) D → Tablet Port E → Battery F → Camera G: Rocker switch

a) Wiring precautions

• When wiring, first confirm the location of the threading holes, and thread the wiring harnesses outside through the threading holes in sequence;

• When wiring, first arrange the outer wiring harnesses, then arrange the wiring harnesses in the cab;

• When wiring, pay attention to avoid high temperature, oily, sharp and abrasive areas, fans, exhaust pipes and other nearby areas;

• When wiring, keep a certain length to avoid over-tightening and loosening; the wiring harnesses layout should be smooth and cannot be twisted;

• When wiring, leave enough length in case of wheel turning to right/left all the way because the wheel angle sensor will rotate together with steer wheel;

• After wiring, cut off the extra length of cable ties. After complete the installation, please store the original vehicle accessories properly and clean up the garbage.

b) Electrical connection method and precautions

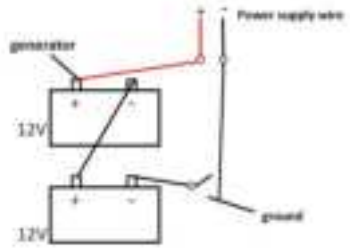
• Before connect to receiver, display, and steering wheel connectors, please connect to battery first to avoid damage caused by direct power-on or multiple power-offs;

• In the process of connecting the power cord to the battery, first connect to the positive electrode then to the negative electrode;

• Pay attention to the use of the wrench when connecting the positive electrode, and it is strictly forbidden to bonding (when the wrench contacts the positive electrode of the battery, the other end of the wrench is strictly prohibited from touching any conductive items, especially the metal parts of the original vehicle);

• 12V / 24V battery, when using the original battery power supply, please connect the positive wire to the positive electrode and the negative wire to the negative electrode;

• 12V / 24V battery, when additional battery is connected in series, connect the positive wire to the positive electrode and the negative wire to the negative electrode of the other battery, as shown in the diagram below.



4 Quick Guide

4.1 Power On

Press the orange button once, and the system will boot.

Note: Pls do not turn the steering wheel when turning on the system because the motor will initialize internally.

4.2 Software registration

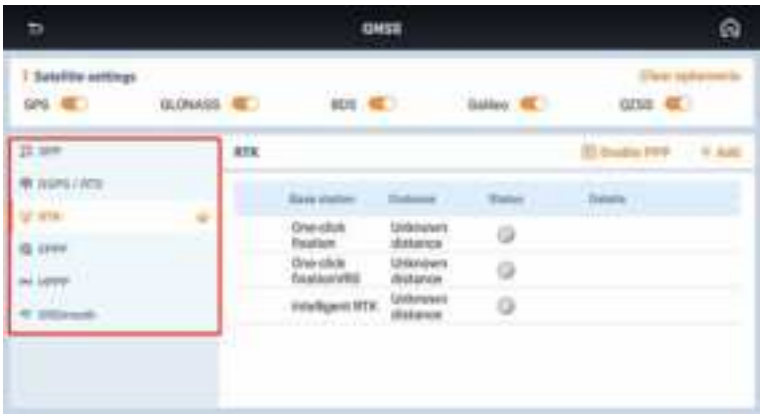
Head to [Settings center -> System settings -> Register] to check whether the software is registered. It is necessary to register **Software registration**, **RTK**, and **Auto steering** at least. Please contact our technicians when it shows that they are **Not activated**.

4.3 GNSS Mode

4.3.1 GNSS

Go to [Settings center -> Agricultural management -> GNSS]

4.3.2 Select RTK



4.3.3 Status bar

Then check the status bar. Only when they are all gray, the system is ready to use.

4.4 Vehicle

4.4.1 New vehicle

Head to [Settings center -> Agriculture management -> Vehicle -> New] to create a new vehicle.

A: Add a new vehicle.

B: Quickly search the vehicle by keywords when there are many vehicles.

C: Click to apply the vehicle.

D: Edit the parameters of the vehicle.

E: Delete the vehicle. The vehicle can not be deleted when it is not selected. The last vehicle cannot be deleted.

F: Click to export the vehicle by the share code.

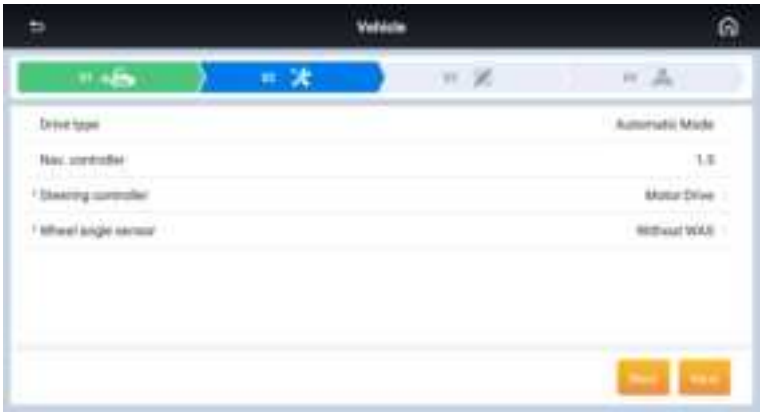
4.4.2 Vehicle info

Select your tractor type(including Front Steer, Rear Steer, Tracked, Articulated, Transplanter) and set vehicle brand, model and name. (Note: Ultra-low speed mode with supporting minimum 0.1km/h speed.)

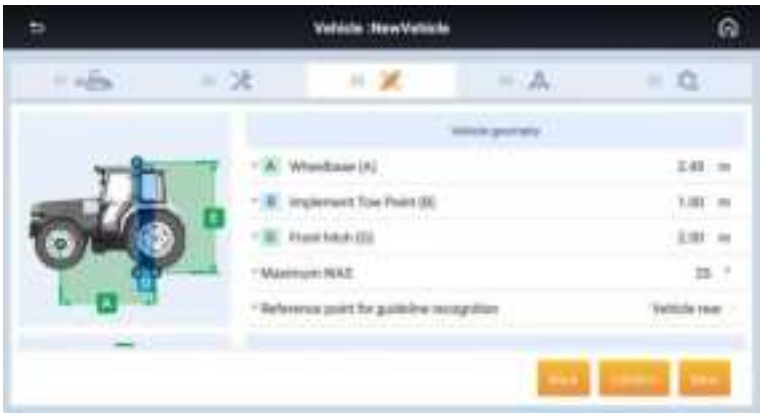
4.4.3 Steering controller and Wheel angle sensor

Select Steering controller from Hydraulic Drive(PWM), Motor Drive, and CANBUS.

Select Wheel angle sensor from Potentiometer, GAsensor Device, and Without WAS. For instance, this tractor selects Motor Drive and Without WAS.



4.4.4 Vehicle parameters



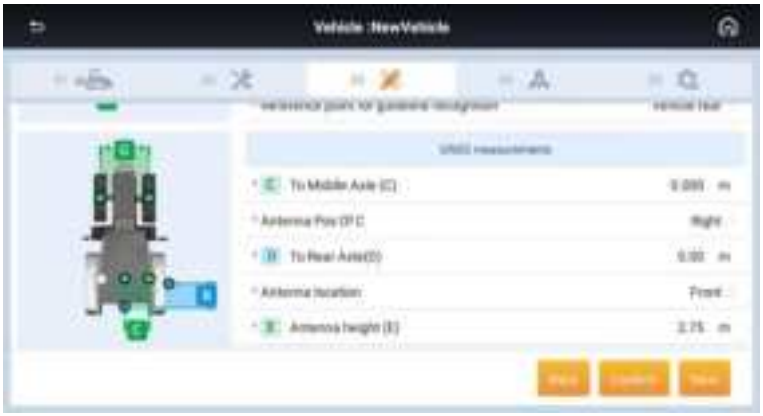
Wheelbase(A): Measure the distance between front wheel rotation axis and rear wheel rotation axis. Note that the tape measure needs to be parallel to the ground.

Implement Tow Point(B): Use the default value of 0 and it will be used in the futural development.

Front hitch(G): Measure the distance between the two front wheels.

Maximum WAS: The default is 25, which represents the maximum angle the vehicle can turn.

Reference point for guideline recognition: It is available to select between Vehicle head and Vehicle rear.



To Middle Axle(C): If the receiver is not mounted on the central axis, measure the distance from the receiver to the central axis. If it is on the central axis, enter 0. In reality it is always better enter 0 and do the rest in assembly error calibration.

Antenna Pos of C: Fill in according to the receiver position.

To Rear Axle(D): Measure the horizontal distance from the antenna center to the rear wheel center. (It is convenient and accurate to project the antenna center and the rear wheel center onto the ground, then measure it.)

Antenna location: The relative position between the antenna center(the position of the antenna center should be referred to the blue indicator) and the rear axis. Select **Front** if the antenna is in front of the rear axis, select **Rear** if the antenna is behind the rear axis.

Antenna height(E): Measure the vertical height from the antenna center to the ground.

4.4.5 Steering Calibration

1. The calibration requires an open, flat and hard ground about 10*30 meters.

2. Keep the tractor run at 2km/h and click [Start]. During the process, the steering wheel will turn automatically.

3. When the screen shows “Waiting for calibrating…”, around 2 minutes later, the calibration will be successful.

4.4.6 Installation error calibration

1. Stop the vehicle at a proper position close to the current guideline, and click start to check the result.

2. Drive the vehicle forward at the speed of 2km/h, stop when the distance displayed at the bottom of the screen is greater than 30 meters, and click the next button.

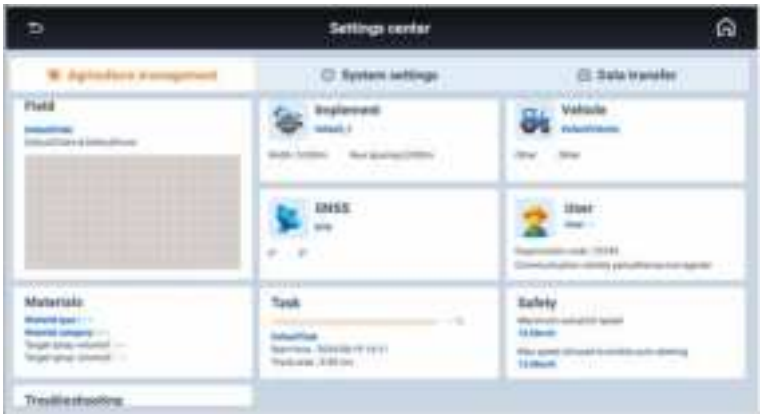
3. Manually drive forward for about 10 meters, then tum around, Stop the vehicle on the line in front, and click the next button.

4. Drive the vehicle forward at a speed of 2km/h again, stop when the display is less than 1 meter from the starting point, and click the End button. Wait for the system to automatically complete the calculation.

4.5 Implement

4.5.1 New implement

Go to [Setting center -> Agricultural management -> Implement -> New] to add a new implement



A: Add a new implement.

B: Quickly search the implement by keywords when there are many implements.

C: Click to apply the implement.

D: Edit the parameters of the implement.

E: Delete the implement. The implement can not be deleted when it is not selected. The last implement cannot be deleted.

F: Click to export the implement by the share code.

4.5.2 Implement selection

In this interface, the customer can select Task type including General, Spraying, Ridge building, Planting, Spreading, Harvest, Scatter sowing, Water and fertilizer, and Tilling, enter the implement name, and select the implement mounting method.

4.5.3 Implement parameters

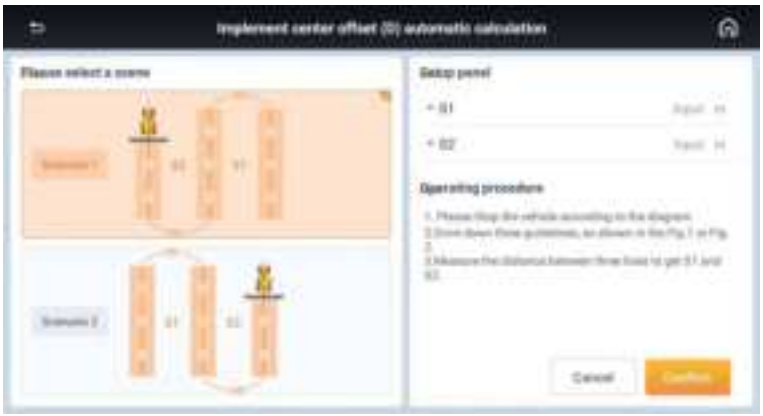
Implement width: The width of the implement, and the default value is 5m.

Row Spacing: The distance between two rows, and the default value is 0m.

Hitch Point: The distance from hitch point to implement, and the default value is 1.5m. The current algorithm do not use this value, so it has no practical significance.

Implement center offset: The offset from implement center to vehicle center.

If there is a row spacing issue with skip or overlap, it is necessary to click **Calculate** to make offset calculation.



There are two methods to choose. Follow the instruction to complete the procedure.

4.6 Field

4.6.1 New field

Go to [Settings center -> Field -> Create] to create a new field.

A: Field overview. It is available to zoom in and zoom out as well as to choose the map type.

B: Quickly search the field by keywords when there are many fields.

C: Click to create a new field.

D: Select to display fields by distance or time.

E: Click to export the field by the share code.

F: Enter the field details interface.

G: Edit the field name.

H: Delete the field. The field can only be deleted when it is not selected. The last field cannot be deleted.

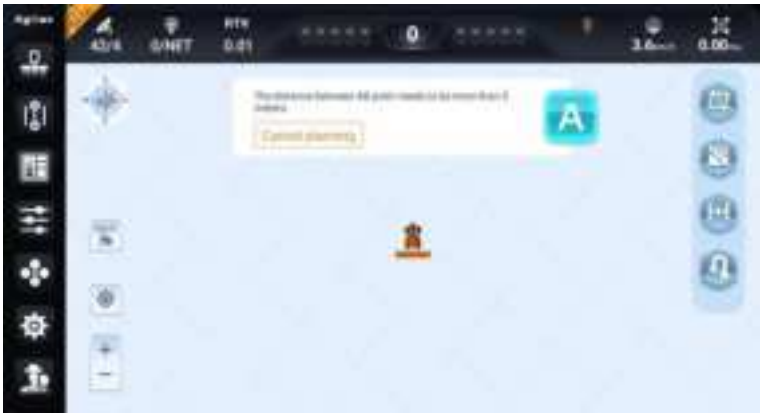
I: Apply the field.

4.7 Guideline

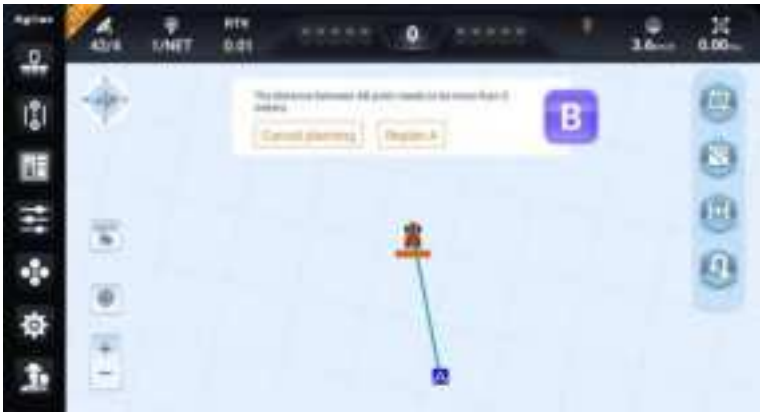
Return to the main interface. Click the second icon from top to bottom on the left side.

4.7.1 AB line

1. Click A in the current location.



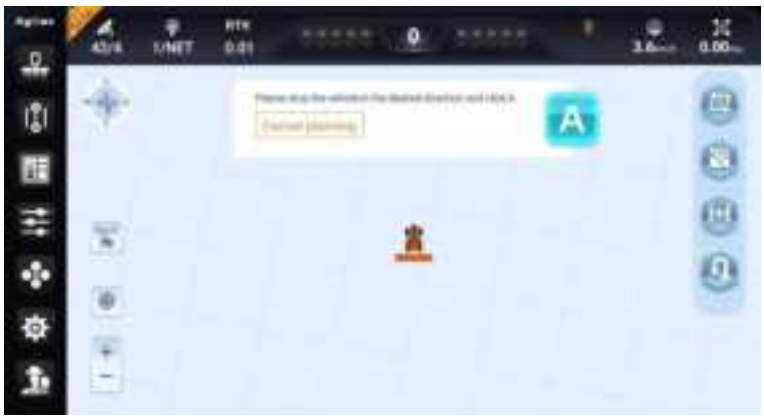
2. Drive to another end of the field and click B.



3. New AB line is created successfully.

4.7.2 A+ line

1. Click A in the current location.



2. New A+ line is created successfully.

4.7.3 Free curve

1. Click A to start the curve line.

2. Click Pause to create the straight line.

3. Click Continue to continue creating the curve line.

4. Click B to finish the Free curve creation.

5. New Free curve is created successfully.

4.8 Starting Autopilot

Click  to start autopilot after completing the above steps.

4.9 Turn Off

Press the orange button, the system is switched off.

5 Maintenance

1. To ensure the normal operation and service life of the equipment, please maintain the equipment under the instruction of the manual.
2. Please do not disassemble the main components of the system. If necessary, please contact the CHCNAV after-sales service support@chcnav.com.
3. Please use device under the instruction of user guide.
4. Regularly check each screw, wiring harness and connector of the system, such as controller fixing screws, angle sensor fixing screws, data cable connectors, etc.
5. Keep the motor clean.
6. Maintain the environment in which the motor is used. Please do not wrap materials such as cotton cloth and dustproof film on the motor.
7. Before starting the work, check whether the transmission device is flexible; whether the concentricity of the coupling is standard; the flexibility of the gear transmission.

FCC Warning:
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 radiate 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 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 into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Caution: Any changes or modifications to this device not explicitly approved by manufacturer could void your authority to operate this equipment.
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.
The device has been evaluated to meet general RF exposure requirement.
This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.
This equipment should be installed and operated with minimum distance 40cm between the radiator & your body.

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