



DPMR TWO-WAY RADIO

Instruction Manual

FM-416/416S

FCC Statement

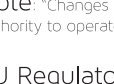
This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 90 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates and can radiate radio frequency 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.

Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.



Restricted to occupational use to satisfy FCC RF exposure limits. See user manual for operating requirements.

Note: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

EU Regulatory Conformance

As certified by the authorized laboratory, the product is in compliance with the essential requirements and other relevant provisions of the Directive 2014/53/EU. Please note that the above information is applicable to EU countries only.

Compliance with RF Exposure Standards

Your Guangdong Shangrila Networking Technology Co., Ltd 2-way radio is designed and tested to comply with a number of national and international standards and guidelines (listed below) for human exposure to radio frequency electromagnetic energy. This radio complies with the IEEE and ICNIRP exposure limits for occupational/controlled RF exposure environment at operating duty factors of up to 50% transmitting and is authorized by the FCC for occupational use only. In terms of measuring RF energy for compliance with the FCC exposure guidelines, your radio radiates measurable RF energy only while it is transmitting (during talking), not when it is receiving (listening) or in standby mode. Note: The approved batteries supplied with this radio are rated for a 5.5-60 duty factor (5% talk-5% listen - 90% standby), even though this radio complies with the FCC occupational RF exposure limits and may operate at duty factors of up to 50 % talk.

Your Guangdong Shangrila Networking Technology Co., Ltd 2-way radio complies with the following RF energy exposure standards and guidelines:

- United States Federal Communications Commission, Code of Federal Regulations, 47 CFR §§ 1.1307, 1.1310, 2.1001 and 2.1003
- American National Standards Institute (ANSI) Institute of Electrical and Electronic Engineers (IEEE) C95.1-1992
- Institute of Electrical and Electronic Engineers (IEEE) C95.1-1999 Edition

Operating Instructions:

- Transmits no more than the rated duty factor of 50 % of the time. To transmit (talk), push the Push-To-Talk (PTT) button. To receive calls, release the PTT button. Transmitting 50 % of the time, or less, is important because this radio generates measurable RF energy exposure only when transmitting (in terms of measuring for standards compliance).
- Hold the radio in a vertical position in front of face with the microphone (and the other parts of the radio, including the antenna) at least one inch (2.5 cm) away from the nose. Keeping the radio at the proper distance is important because RF exposures decrease with distance from the antenna. Antenna should be kept away from eyes.
- When worn on the body, always place the radio in a Guangdong Shangrila Networking Technology Co., Ltd approved clip, holder, holster, case, or body harness for this product. Using approved body-worn accessories is important because the use of Guangdong Shangrila Networking Technology Co., Ltd or other manufacturer's non-approved accessories may result in exposure levels, which exceed the FCC's occupational/controlled environment RF exposure limits.
- If you are not using a body-worn accessory and are not using the radio in the intended use position in front of the face, then ensure the antenna and the radio are kept at least 2.5 cm (one inch) from the body when transmitting. Keeping the radio at the proper distance is important because RF exposures decrease with increasing distance from the antenna.
- Use only Guangdong Shangrila Networking Technology Co., Ltd approved supplied or replacement antennas, batteries, and accessories. Use of non-manufacturer-name approved antennas, batteries, and accessories may exceed the FCC RF exposure guidelines.

Notice to user

1. Copyright

SainSonic and our authorized partners own the intellectual property of all the parts of this product (include accessories). Any design and materials may not be modified, copied, extracted or translated without the authorization of SainSonic or its authorized parties. Due to the update or modification of the product, SainSonic owns the right to change the specifications of software and hardware described in this manual without further notice. Specifications and information contained in this manual are for reference only.

2. Safety Information

Compliance with RF Exposure Standards

Your radio is designed and tested to comply with a number of national and international standards and guidelines (listed below) regarding human exposure to radio frequency electromagnetic energy. This radio complies with the IEEE and ICNIRP exposure limits for occupational/controlled RF exposure environment at operating duty factors of up to 50% transmitting. In terms of measuring RF energy for compliance with the IEEE and ICNIRP exposure limits, your radio radiates measurable RF energy only while it is transmitting (during talking), not when it is receiving (listening) or in standby mode.

Your radio complies with the following of RF energy exposure standards and guidelines:

- Institute of Electrical and Electronic Engineers (IEEE) C95.1-1992
- Institute of Electrical and Electronic Engineers (IEEE) C95.1-1999 Edition
- International Commission on Non-Ionizing Radiation Protection (ICNIRP) 1998

Use the internal battery, charger or charger supplied or sold by SainSonic only, or otherwise it may cause damage to the product. If you want to purchase or replace the accessories, please contact your local dealer or SainSonic for confirmation.

◆ Area restrictions

To avoid the problems caused by electromagnetic interference or compatibility, turn off the radio in any facilities where posted notices instruct you to do so, such as hospital and other health care facilities. Turn off the radio when on board an aircraft, if instructed to do so.

1. In the vehicle with an air bag, do not place the radio in the area over an air bag or in the air bag deployment area.
2. Turn off the radio before entering any area with a potentially explosive atmosphere or blasting caps.
3. Do not operate the radio, disassemble or change the battery in the potentially flammable and explosive atmosphere (such as gas station, coal gas station, etc.).
4. Do not place the radio under the direct sunlight or near the area with heating devices.
5. Do not place the radio in the area with great dust, moisture or drips, or on the unstable surface.

◆ Operating Attention

Antenna

Do not use any portable radio that has a damaged antenna. If a damaged antenna comes into contact with your skin, a minor burn can result.

◆ Operating Instructions to control RF Exposure

To decrease your exposure and ensure compliance with the occupational/controlled environment exposure limits, please always adhere to the following procedures:

1. Transmits no more than the rated duty factor of 50% of the time. To transmit, press the PTT button, and to receive the call, release the PTT button.
2. Keep your radio in a vertical position in front of the face with the microphone 5cm away from your mouth while transmit.
3. Please keep the antenna 2.5cm away from you body while transmitting, even when you wear it with belt clip on your body.
4. Do not transmit when the radio is not equipped with an antenna. Transmitting without an antenna may damage to the product.

◆ Use the designated accessories

Use the internal battery, charger or charger supplied or sold by SainSonic only, or otherwise it may cause damage to the product. If you want to purchase or replace the accessories, please contact your local dealer or SainSonic for confirmation.

◆ Area restrictions

To avoid the problems caused by electromagnetic interference or compatibility, turn off the radio in any facilities where posted notices instruct you to do so, such as hospital and other health care facilities. Turn off the radio when on board an aircraft, if instructed to do so.

1. In the vehicle with an air bag, do not place the radio in the area over an air bag or in the air bag deployment area.
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◆ Operating Attention

Antenna

Do not use any portable radio that has a damaged antenna. If a damaged antenna comes into contact with your skin, a minor burn can result.

Batteries

All batteries can cause property damage and/or bodily injury, such as burns, if a conductive material such as jewelry, keys, or beaded chains touches exposed terminals. The conductive material may complete an electrical circuit (short circuit) and become quite hot. Excessive care in handling any charged battery, particularly when placing it inside a pocket, purse, or other container with metal objects. To reduce the potentially damage, do not expose the battery in the fire, or disassemble and extrude the battery.

To realize the best performance of the battery, change the battery once a year.

Maintenance

Do not disassemble the radio by yourself. This product can only be maintained by the professional technicians. Contact us or your local dealer for help if you want to re-develop or modify the radio.

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1. Unpacking and checking

Unpack the radio carefully. We recommend that you check the radio and the supplied accessories listed in the following table before discarding the packing material. If any damage or loss occurred during shipment, please contact your dealer without delay.

ITEM	QUANTITY
Radio Unit	1
Antenna	1
Battery	1
Belt Clip	1
Charger	1
Power Adapter	1
Hand Strap	1
Instruction Manual	1

2. Preparing Your Radio for Use

2.1 Charging the Battery

Plug the power adapter into an applicable AC outlet and connect the power adapter to the battery charger. The green LED lights will be on.

Insert the battery or the radio into the charger slot. Make sure the battery is well connected with the charger. Then the red LED lights will be on, and it indicates that the charging starts. When the LED light shows green, it indicates the battery has been fully charged.

Charging Notice

- ⚠ The radio's battery is not fully charged before shipment. Before the initial use, please charge the battery. Charging/discharging twice or triple can let the battery capacity in the best status. When the battery is in low power, it needs to be charged or changed to another battery.
- ⚠ Do not recharge the battery if it has been fully charged or the radio is not in the low battery alarm state; otherwise, it shortens the battery's life time and performance.

2.2 Attaching the Battery

If the belt clip is attached, press down the belt clip first; match the two grooves on the battery to that of on the radio back. Then press down the bottom of the battery until it locks.

Removing: Press down the battery latch and push backwards until it separates from the radio.

2.3 Install the Antenna

Hold the base of the antenna and turn the antenna clockwise until the connector on the top of the radio unit secure.

Removing: Hold the antenna anti-clockwise and remove it.

2.4 Install the Belt Clip

Match the holes on the belt clip to that of on the radio; fasten it with two M2.5*6.5 screws.

To remove the belt clip, loosen the two screws.

2.5 Attach the External Earphone

Open the cover for external equipment, and then insert the earphone plug into the jacks on the radio.

2.6 Power on/off the Radio

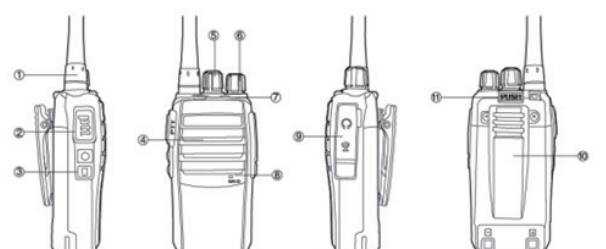
With the radio turned off, turn the On/Off/Volume Knob clockwise until you hear a click to turn on the radio; when the radio turns on, turn the On/Off/Volume Knob counterclockwise until you hear a click to turn off the radio.

2.7 Adjust the Volume

Rotate the Volume knob to adjust the volume.

3. Identify Radio Controls

3.1 Radio Controls



1. Antenna

2. PTT Button
Press the button to make a call.

3. PF Button (programmable)
This button can be programmed with different functions through the programming software, the functions of which refer to Section of Programmable button.

4. Speaker
To output voice.

5. Channel Knob
Rotate it to select channel 1-16.

6. On/Off/Volume Knob
Turn it clockwise to turn on the radio, Turn it counterclockwise until you hear a click to turn off the radio. With the radio turned on, turn it to increase/decrease the volume.

7. LED Indicator
LED indicator lights in red when it transmits signal, LED indicator lights in green when it receives signal, LED indicator flashes red when the battery voltage is low.

8. Microphone
To input voice.

9. Connector for External Equipment
Remove the cover to plug in the external speaker, microphone or other external equipments.

10. Belt Clip

11. Battery Latch

4.

3.2 Programmable Buttons

In order to facilitate your usage, you can program the following buttons as function shortcut keys through the programming software:

Name	Operation	Functions
PTT button	Long/short press	See below

Note:
Short press: press the key and release it soon;
Long press: press and hold the key for at least 2s.

Functions programmable:

- None: No feature will be assigned.
- Power Level Adjust: Toggles transmit power level between high and low.
- Monitor: If the current analog channel is configured with CTCSS/DCSS, the CTCSS/DCSS will be canceled and the radio switches to carrier squelch mode when press the key, which means if the carrier received matches with the frequency of the current channel, the radio sounds. Press the key again to return to the default setting.
- Emergency Alarm On: Allows the user to set up an emergency call to seek help under the emergency condition.
- Emergency Alarm Off: Allows the user to terminate an outgoing emergency call.
- Squelch on/off: Turns on/off the squelch function. The weak signal can be received on the analog channel.
- Squelch Level Adjust: Allows the user to set the Squelch Level. The higher squelch level is selected, the harder to receive weak signals, but the more rarely disturbed by the noise.
- Scan: Turns on/off scanning function to search the communication activity on other channels.
- Whisper: Turns on/off whisper function. If this function is enabled, the receiver can hear the voice from the transmitter clearly even the voice is very low.

3.3 LED Indicators

The LED indicator shows the operational status of your radio.

Blinking Red—Radio is transmitting at low battery condition or during scan

Solid Red—Radio is transmitting

Solid Green—Radio is receiving.

Blind Orange—Radio is during the hang time or during receiving of emergency.

Solid Orange—The radio is killed or the channel is unprogrammed.

5.

4. Basic Functions

4.1 Selecting a channel

Under the Home Screen, turn the Channel knob to select a channel.

4.2 Making a call

On a digital channel, when the radio receives a call, you can answer the call by pressing the PTT Button within Call Hold Time; if the time expires, you need to redial. The Call Hold Time can be set by programming software.

4.3 Receiving a call

When the radio receives signal on the current channel, the LED lights in green; if it is the digital channel, the radio output the voice when receiving a call with your own Radio ID, your Group Call or All Call ID on this channel. If it is the analog channel, the radio output voice when receiving the call with CTCSS/DCSS that is the same with CTCSS/DCSS set up on your selected channel, or there is no CTCSS on the current channel.

4.4 Answering a call

On a digital channel, when the radio receives a call, you can answer the call by pressing the PTT Button within Call Hold Time; if the time expires, you need to redial. The Call Hold Time can be set by programming software.

On an analog channel, when the radio receives a call, press the PTT Button to answer the call directly.

5. Advanced Functions

5.1 Time-out Timer

This function forbids you from occupying the channel for a long time. If the continuous transmitting time exceeds the setting time by the programming software, the radio sends out a warning tone and stops transmitting. Release the PTT Button to stop the warning tone. After a period of time, which is set by programming software, you can transmit again. And if the radio is programmed with pre-alert function by the programming software, the radio will send out an alert before the time out timer expires.

6.

5.2 Scan

Scan function helps you to receive calls from other channels, so as to supervise the activities of the personnel. During scanning, the radio checks every channel in the scan list and stops on the channel which a signal is detected. The scanning mode is carrier-control, which has been preset by your dealer.

Carrier-control scan

During scan, the radio checks and stops on a busy channel. Then the radio continues scanning until the channel is idle for a while (this time is set by the programming software, which is named as Scan Hold Time). Scan revert channel

While scanning, press the PTT Button to make the radio transmit on a default channel. This channel can be programmed by the programming software.

5.3 Radio kill/revive

This function allows one radio to be killed or revived. The radio to be killed cannot make or receive calls. The radio can only revive through programming software. The means of sending emergency alarm are decided by the following parameters: Alarm Type, which defines the audio and visual reaction when the radio sends an alarm; Alarm Mode, which defines the content sent to the other members when the radio sends an alarm. The above parameters can be programmed by programming software.

To turn off the Emergency Alarm, press the programmed "Emergency Alarm Off" shortcut key.

Alarm Type:

- ◆ None: No alarm function (Default setting); you cannot send an emergency alarm.
- ◆ Siren Only: The radio only emits siren locally.
- ◆ Regular: The radio provides audio and visual indication that it is in Emergency mode and can receive the signal from others.
- ◆ Secret: No audio and visual indication. And the radio cannot receive the signal from others.
- ◆ Secret with voice to follow: No audio and visual indication. But the radio can receive the signal from others.

Alarm Mode:

- ◆ Emergency Alarm: The radio sends out an emergency alarm, and then exits the emergency alarm status automatically.
- ◆ Emergency Alarm w/ Call: An emergency alarm is sent, after which an emergency call can be transmitted by pressing the PTT button.
- ◆ Emergency Alarm w/ Voice to Follow: The radio sends out an emergency alarm, and then sends out background tone periodically and automatically through emergency call.

7.

Note:

Emergency Alarm: The radio sends out a signal to alert other member.

Emergency Call: A priority call on channel, so as to make sure the successful communication under emergency condition.

5.5 Digital voice encryption

Minimum support 32 groups of voice encryption keys, can effective anti-eavesdropping guarantee private calls.

Through the programming software to configure the same set of encryption keys in a digital channel of the same frequency, can effectively guarantee the safety call. The machine with different encryption keys can not hear the call even after access.

Colour code encryption

A special function for digital channel to prevent a monitoring. The call both sides must have the same colour code. The radio provides 64 groups of colour codes, it can be set through the programming software.

5.6 Call System

Single call/Group call/Full call

To make a call at standby mode, press PTT button can call the preset contact at the current digital channel. As a receiver, you have to do nothing but can receive the call, and so you call press the PTT button to call back. To receive a corresponding call the contact must add to the contact member list.

Note: You can preset a contact at every digital channel through the programming software. the contact can be Single call/Group call/Full call contact.

No.	Problems	Causes and Solutions
1	The radio cannot be switched on, no display after being switched on.	A. The power switch is in failure. B. The battery is out of power, please recharge or change it.
2	The voice is low.	A. Check speaker close to the microphone. B. Check the battery is 1.4V/2.0V. C. Check the "Volume" level to increase the volume to the radio.
3	Cannot transmit	A. The frequencies of both users are not the same. Please check the same frequency channel again. B. The CTCSS/DCSS signals of both users are not the same. Please reset it. C. The radio is out of effective communication range.

8.

7.Specification

General	
Frequency Range	400-470MHz
Channel Capacity	16
Channel Spacing	6.25KHz/12.5KHz
Operating Temperature	-25℃ ~ +55℃
Operating Voltage	3.7V DC ±20%
Battery	1,500mAh Li-ion
Frequency Stability	±2.5 ppm
Dimension (with battery)	116mm x54mmx30mm
Weight (with battery and antenna)	243g
Transmitter	
RF Power Output	2W
Frequency Modulation	11KHz F3E (Analog) 4FSK (Digital)
Antenna Impedance	50Ω
Modulation Limiting	±2.5KHz
Radiated Spurious Emission	-36dBm < 1GHz ~-30dBm > 1GHz
FM Noise	40dB @ 12.5KHz
Modulation Distortion	< 3%
Receiver	
Reference Sensitivity	0.25μV @12.5KHz
Adjacent Channel Selectivity	60dB @ 12.5KHz
Intermodulation	60 dB
Spurious Response Rejection	60 dB

9.

Rated Audio Output	0.25W
S/N	45/40
Rated Audio Distortion	< 3%

Note: Specification will be revised without notice due to technical improvement. Thank you.

Guarantee

Model Number: _____

Serial Number: _____

Purchasing Date: _____

Dealer: _____ E-mail: _____

User's Name: _____ E-mail: _____

Address: _____ Post Code: _____

Remarks:

1. This guarantee card to be kept by the user, no replenishment if lost.
2. This guarantee card to be filled & chopped by the dealer, or it is invalid.
3. Donorship by the dealer, or it is invalid to confirm the serial number on the guarantee cards is same as that on the machine.
4. One-year guarantee, charger, battery, antenna and the belt clip are not under guarantee.

10.

1. Unpacking and checking

Unpack the radio carefully. We recommend that you check the radio and the supplied accessories listed in the following table before discarding the packing material. If any damage or loss occurred during shipment, please contact your dealer without delay.

ITEM	QUANTITY
Radio Unit	1
Antenna	1
Battery	1
Belt Clip	1
Charger	1
Power Adapter	1
Hand Strap	1
Instruction Manual	1

2. Preparing Your Radio for Use

2.1 Charging the Battery

Plug the power adapter into an applicable AC outlet and connect the power adapter to the battery charger. The green LED lights will be on.

Insert the battery or the radio into the charger slot. Make sure the battery is well connected with the charger. Then the red LED lights will be on, and it indicates that the charging starts. When the LED light shows green, it indicates the battery has been fully charged.

Charging Notice

- ⚠ The radio's battery is not fully charged before shipment. Before the initial use, please charge the battery. Charging/discharging twice or triple can let the battery capacity in the best status. When the battery is in low power, it needs to be charged or changed to another battery.
- ⚠ Do not recharge the battery if it has been fully charged or the radio is not in the low battery alarm state; otherwise, it shortens the battery's life time and performance.



Always here to help you

RoHs

CE1313

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2.2 Attaching the Battery

If the belt clip is attached, press down the belt clip first; match the two grooves on the battery to that of on the radio back. Then press down the bottom of the battery until it locks.

Removing: Press down the battery latch and push backwards until it separates from the radio.

2.3 Install the Antenna

Hold the base of the antenna and turn the antenna clockwise until the connector on the top of the radio unit secure.

Removing: Hold the antenna anti-clockwise and remove it.

2.4 Install the Belt Clip

Match the holes on the belt clip to that of on the radio; fasten it with two M2.5*6.5 screws.

To remove the belt clip, loosen the two screws.

2.5 Attach the External Earphone

Open the cover for external equipment, and then insert the earphone plug into the jacks on the radio.

2.6 Power on/off the Radio

With the radio turned off, turn the On/Off/Volume Knob clockwise until you hear a click to turn on the radio; when the radio turns on, turn the On/Off/Volume Knob counterclockwise until you hear a click to turn off the radio.

2.7 Adjust the Volume

Rotate the Volume knob to adjust the volume.

3. Identify Radio Controls

3.1 Radio Controls

