

External Radio Operation Manual (30W) DDTHPB Series External Radio

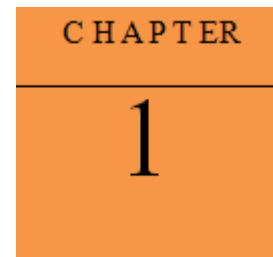


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Product Introduction



Introduction of this chapter:

Introduction

Product Feature

Safety Regulations

The Product Model and Specifications Definition

Open the box to inspection

Introduction

DDTHPB series external radio is a almost perfect and professional RTK radio, the design of DDTHPB Radio which takes full consideration of GNSS RTK requirement for field work .

Product Feature

Protective Buffer Device

The RTK field surveying always move around, operators may temporarily place the unit on the ground, the equipment may also slipped from the hands of the operator. Drop the machine at any angle, the protective buffer devices can reduce the harm to the machine.

Protection to Power Reverse Connect

The thorough power supply protection system will escape the harm to device when you get a reverse connect

116 Channels

100 fixed frequency channels and 16 programmable frequency channels, which are more suitable for project site requirement, because there's radio interference in the air everywhere, more than 100 fixed frequency channels are available, so it is not necessary for

you to programme it.

Lighter Designed

The mainframe is consist of five (5)-surface integrated cavity, each side with heat dissipation function. Radiator is designed according to the principle of air convection, the machine has a strong heat dissipation function, which can meet large data communication requirements for multi-satellite RTK.

The radio weight is 1.33KG, which is the lightest external radio among all radio manufacturer.

Programmable Battery Discharging

We can monitor the battery voltage in real time, when battery voltage is too lower, the radio will stop the data transmission, avoid the damage to battery. You can programme the limited voltage to stop transmission, and it is more customizable.

19200bps Baudrate, Extend the Battery Operation Time

9600/19200bps baudrates are optional, it will take half of the time by 19200bps baudrate, which can greatly save system power consumption and extend the battery operation time. Accordingly, it is more convenient for user to take a smaller and lighter battery .

4 Optional Transmitting Power (5W/10W/20/30W adjustable)

You can setup the transmitting power through the panel (5W/10W/20/30W) , choose low transmitting power within short working distance, and choose high transmitting power in long working distance.

Reliable and Stable Data Transmission

Equiped with advanced technologies to reduce the transmission error rate significantly and improve data link stability.

Display of Power

Display channel number and the power at the same time. Operator can know whether the the channel is available and decide which channel should be used. Use the available channel will be helpful to improve the stability of data transmission and extend the RTK working distance.

Safety Regulations

1. It can create and transmit electromagnetic energy when you use the radio, for safety, please refer to the safety rules before use.

warning :Long time of radiation will do harm to people's health, and when the radio is transmit the data, wireless radio energy near antenna is too strong, in order to reduce the harm to people, we advise 2 meters beyond from the antenna.

2. Electric spark will lead to an explosion or fire, please don't use the equipment in any potential explosion atmospheric environment or occasion.

3. Please pay attention: In any place marked notice as "Please close the wireless communications devices" please follow it to avoid electromagnetic interference and the problems caused by the electromagnetic compatibility.

Such as hospital, and other health-care facilities, gas station or airport etc., If you use those equipment around these place, it is possible to interfere equipment, and it will be not working or dangerous, please use the radio under the instruction.

The Product Model and Specifications Definition

According to different requirement of different user, DDTHPB series wireless data radio is including DDTHPB-46005 series transmit external radio and DDTHPB-46005D transceiver external radio two different functional products

Open the Box and Inspection

The configuration should depend on the demands of user, please refer to the last configuration list.

Suggestion:

1. Check the package first.
2. Open the box carefully, to make sure whether the list and the configuration are the same.
3. If you find any loss or broken of accessories, please connect the sale.
4. Please read the manual carefully before operation.

Radio Introduction

CHAPTER

2

Radio Introduction

Introduction of this chapter

Appearance Structure Introduction

Radiator

Clasp

Display and Operation Panel

Protective Cover

Antenna Port

Serial Port

Power Port

Appearance Structure Introduction



1 Radiator 2 Clasp 3 Display and operation panel 4 Protective cover 5 Antenna port
6 Serial data port 7 power port

Radiator

The machine will create a lot of heat when working, radiator can dissipate heat.

Warning: covering the radiator is forbidden, because it will cause poor dissipation, damage equipment, create danger.

Clasp

Use to hold the radio on a tripod.

Display and Operation Panel

It displays radio working situation, data transmission and radio setting.

Protective Cover

It can effectively reduce radio damage when the machine was suffering from the knock, crash, drop, and other illegal actions.

Antenna Port

TNC radio frequency coaxial cable connectors are used for connecting antenna or cable, output impedance is 50 ohm.

Serial Port

You can communicate with other device through this serial port (E.g. base station) and offer power supply to other device (E.g. base station) .



Interface type: Asynchronous

us serial communication RS232

standard

Plug specification: LEMO EGA.0B.305

Pin 1----- Ground connection;

Pin 2 ----- Ground connection;

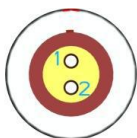
Pin 3 ----- Help power output;

Pin 4 ----- RXD data cable;

Pin 5 ----- TXD data cable.

Power Port

Offering power supply by this port

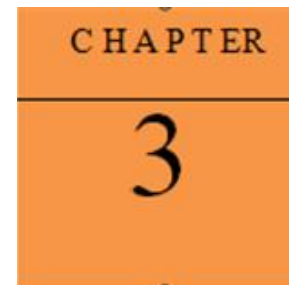


Plug specification: LEMO EGG 1B 302

Pin 1----- External power supply positive pole;

Pin 2 ----- External power supply negative pole

Basic Operation



Introduction of this chapter:

Introduction of Keys and Indicators

Turn-on

Turn-off

Check the power supply voltage

Available channels selection

Channel settings

Power Switching

Turn off the display of delay time

Baudrate setting

Direct data transmission function

Transceiver Function

Use As Data Repeater

Power supply

Power Supply for Other Device

Low Battery Voltage and Automatically Shut Down



- 1.D1 Field intensity/ power supply voltage indicator D1
2. D2 Double figure nixietube display D2
3. D3 Transceiver indicator light D3
4. D4 Power supply/ alarm indicator light D4
5. Button K5 (Power button)
6. Button K4 (Channel increasing button)
7. Button K3 (Channel decreasing button)
8. Button K2 (Power supply capacity checking button)
9. Button K1 (Function button)
10. Indicated light D5

Introduction of Keys and Indicators

Field Intensity / Power Voltage Indicator D1

D1 is 4 level light beam displayer, used to display field intensity or the power supply voltage.

Field Intensity Display Meaning:

No light stream shine, means field intensity is less than -113dBm;

1 level light stream, means field intensity is -113dBm-- -109dBm;

2 level light stream shine, means field intensity is -109dBm--
-105dBm;

3 level light stream shine, means field intensity is -105dBm--
-101dBm;

4 level light stream shine, means field intensity is beyond
-101dBm.

Meaning of Power Voltage Display:

No light stream light, means power supply voltage is less than
11.6V;

1 level light stream light, means power supply voltage is
11.6V--12.0V;

2 level light stream light, means power supply voltage
is12.0V--12.5V;

3 level light stream light, means power supply voltage is
12.5V--13.0V;

4 level light stream light, means power supply voltage is
13.0V—15.0V.

Display of Double Digits Nixietube D2

Display working channel, power supply voltage or saving electricity interval time

Display of Working Channel

0-99 is fixed frequency channel (100 Channels), the users can not change these frequency, the transmit and receive frequency is the same, details please refer to the frequency list in attachment one(100 fixed frequency channels list)

A0-AF are 16 frequency programmable channels, user can setup transmit and receive frequency within the permission working frequency. You can setup different frequency for transmit and receive frequency, for details setting, please refer to “Frequency program and readout” section.

Display of Power supply voltage

- b.0 means L1 0 level, power supply voltage is less than 11.6V;
- b.1 means L1 1 level, power supply voltage is 11.6V--12.0V;
- b.2 means L1 2 level, power supply voltage is 12.0V--12.5V;
- b.3 means L1 3 level, power supply voltage is 12.5V--13.0V;
- b.4 means L1 4 level, power supply voltage is 13.0V--13.5V;
- b.5 means L1 5 level, power supply voltage is 13.5V—14.0V;

b.6 means L1 6 level, power supply voltage is 14.0V—14.5V;

b.7 means L1 7 level, power supply voltage is 14.5V—15.0V;

Close Display of Delay Time

When the GNSS RTK work together with external radio, To reduce battery consumption, if there's no operation for external radio button in a certain time, the radio will turn off field intensity/power supply voltage indicator D1 and double tube nixietube display D2 automatically. D1 and D2 will redisplay when you press the button again

Transceiver Indicator Light D3

Used to indicate receiving and transmitting working situation.

Red light on means the equipment is transmitting data, blue light on means the equipment is receiving data.

Power Supply/Alarm Indicator Light D4

Used to indicate power supply and working situation

Red light on: the power supply is connecting, and entering into working condition.

Red light flashes rapidly (near 3 times per second) : equipment enters into parameter setting mode

Red light flashes slowly (near 1 times per second) : power supply voltage is less than 11.6 V . When the equipment is used by external battery, red light flashes slowly means charging reminding, remind the user there's no power for battery, please change another battery.

Blue light on, wireless data transmission baudrate is 9600bps;

Blue light off, wireless data transmission baudrate is 19200bps.

Button K5 (Power Button)

In power-off condition, press this button for 1 second to turn on the radio.

In power-on condition, press this button for 2 seconds to turn off the radio.

Button K4 (Channel Increasing Button)

Increase the channel

The channel number will increase by 1 after each pressing, circulate by 00-99-A0-AF-00, press this button for 1 second to increase the channel.

K4 also be used as a parameter setting button.

Press K4 button to turn on radio, the red light flashes quickly

(about 3 times / sec), enter the parameter setting mode to setup radio parameters. Setup operation method, please refer to “Radio parameter setting and readout” section in page 15.

Button K3 (Channel Decreasing Button)

Decrease the channels

The channel number will decrease by 1 for each pressing, circulating by 00-99-A0-AF-00, press this button for 1 second to decrease the channel. Regarding to the channel frequency, please refer to “Display working channel” section

Button K2 (Power Capacity Checking Button)

When the radio is powered by external battery, long-press this button can view the battery power capacity real time.

Hold the button, the display D1 indicates power supply voltage, release the button to display the received field intensity signal.

Level display distinguishment please refer to “Field intensity/ the power supply voltage indicator D1”

Button K1 (Function Button)

Press K1 for 1s, then the radio transmitting power will switch from

5W、10W、20W、30W, and different power will indicate as different flash light.

Indicated Light D5

Indicate current working transmitting power

Level 1: 5W, the light indicate red and blue color

Level 2: 10W, the light indicate red color

Level3: 20W, the light indicate blue color

Level 4: 30W, the light indicate no color

Turn-on

After connect the power, press (ON/OFF) for 1 second to start

To protect the radio, when the power supply is higher than 15.5V, this radio can't pow-on.

Turn-off

Press (ON/OFF) for 2 seconds to turn-off the radio.

When the voltage is lower than 10.0 V, radio will turn off automatically (This function will protect the radio battery, when the battery is over discharged)

Check the Power Supply Voltage

When the radio is power-on, press K2 to see the power supply

voltage (When the radio is using external battery, press K2 to view the remaining battery power), voltage level, please refer to “Display power supply voltage”.

Notice: When the power supply voltage is below 11.6V, the indicator LED will slowly flash (about 1 times/ second). If power supply by external battery ,power indicator LED flashes slowly (about 1 times/ second) ,it means the battery power is almost exhausted, recommend to charge the battery. Only the well-rained or relevant expertise can do this port connector’s soldering.

Available Channels Selection

For a variety of radio channel interference, please “use Available channels selection” function by following methods:

1. Before the data transmission, switches to one channel for monitoring:
2. When the field intensity signal indicator D1 flashing, or always on for more than one level, means this channel is occupied. (Exist the interference or has been occupied);
3. When the field intensity signal indicator D1 light flashing is long-term off, means that the channel is available (No interference or

not occupied by other radio equipment).

Choose the available channel to transmit and receive data will be helpful to improve the reliability for data transmission, and increase the communication distance.

You had better not to the use the not idle channel, select the non-idle channel to transmit and receive data, may lead to the radio communication problem or short communication distance; also maybe it will Interfere other wireless communication equipment using the same channel at the same time, which will make trouble.

Please ensure communication frequency link is using the same channel (When using Channel A0-AF 16, you should ensure that the communication link is the same frequency

Channel Settings

Use K4 (Increase) key, K3 (Decrease) button to setup radio

Channel, please refer to button K4, button K3 section.

Power Switching

Hold K1 for 1 sec, the radio power will change from 5W、 10W、 20W、 30W, at the meantime, the power LED will flash to indicate. When the data link distance is short, we advice you to use low power to save power, on the contrary, select high.

Turn off the Display of Delay Time

Press K3 button and K4 button at the same time to turn on ,enter the saving power function setting mode, double-digit digital display D2 will shows C0 --- C9,press K4 (plus) and K3 (minus) button to turn off the display delay time setting, please refer to “Close display delay time” section .

Please restart the radio after setting to enter into the working mode.

Baudrate Setting

Press K4 (channel increase button)to turn on, power/ alarm indicator D4 red light flashes quickly (about 3 times / sec), enter the parameter setting mode, press the K2 button (Power checking button), then press K4(channel increase button) to set baudrate, power /alarm indicator D4 blue light indicates the current baudrate:

Blue light on, indicates that the baudrate is 9600bps;

Blue lights off, indicates that the baudrate is 19200bps.

Please restart the radio after setting to enter the working mode.

Direct Data Transmission Function

Connect the radio 5pins port by communication cable:

Transmit station: Once the communication cable serial port detect the data, it will enter into the transmission function immediately.

Transceiver radio: Once the communication cable serial port detect the data, it will enter into the transmission function immediately.

Transceiver Function

Transceiver functions is the unique features for DDTHPB series DDTHPB-46005D portable wireless data transceiver.

Connect the radio 5pins port by communication cable:

Transmit station: Once the communication cable serial port detect the data, it will enter into the transmission function immediately.

The data will convert through serial port when the communication

cable serial port receive the data

Transmit or receive frequency can setup to the same or different.

Use as Data Repeater

When receiving, D3 flash with blue, when repeating, D3 flash with red.

Power Supply

Power Supply by External Battery

Please use the 12V battery, battery capacity is recommended for more than 12AH.

Warning: 1. When the radio transmit with high power, it needs high capacity supply current, the operation time will be too short if the capacity is too low.

2. When you use the external battery, please protect the battery pole, if there's some metal conductor on the electrode, it may cause battery short-circuit or create the high heat of battery even worse burning.

Stable Power Supply for Radio

Voltage range will be DC11.5V-14.5V, the current will be not less than 10A, recommended to use a linear regulated power supply within DC12V-12.8V.

Power Cable

If you use external battery to supply the power, please use the radio's standard configuration cable. This cable will improve the transmit power and extend battery life and using efficiency.

Only the well-trained or relevant expertise can do this port connector's soldering.

The power cable is generally not too long, a single wire cross-sectional area can not be less than 1.5 cm^2

When the radio transmit the data, it needs high capacity supply current, too long cable or too small cross-sectional area cable will have a greater cable losses, decrease the transmit power and shorted battery life .

Power Supply for Other Device

This radio can provide the power supply to other device (such as

base station, etc.) by serial port, the maximum output current is about 500mA.

The output voltage value is the radio's power supply voltage.

Notice: Only the well-trained or relevant expertise can do this port connector's soldering.

Low Battery Voltage and Automatically Shut Down

When the GNSS RTK work together with external radio, mostly the power supply is from external battery.

When the power LED flashes to prompt the user to charge the battery(Refer to power / alarm LED D4 section), if you continue to transmit data, working time may be very shortened, please change another battery or fully charge this battery.

To avoid damage by discharge when the battery voltage is below 11.4V (10.0V-11,5 V can be set at the software), the machine will automatically stop transmitting to protect the battery;

When the voltage is less than 10.0V, the radio automatically power-off. The voltage must be more than 10.5V, then the radio can be restart.

Project Application

CHAPTER

4

Carrying and transportation

Radio working placement

Antenna connection

Working in rain

Maintenance and cleaning

Carrying and Transportation

During the transportation, please use the original packaging .

Warning: 1.Do not carry the radio by catching the power cable, serial port cable, or antenna feeder cable, which will damage the power cable or antenna feeder cable, or hurt yourself or others.

2.Without original packaging, any fall or collision will probably damage the radio cover, please pay special attention to the carrying and transportation!

Radio Working Placement

Please use the clasp to hang on a tripod, refer to below pictures.



Warning: 1.The data transmission of radio will produce a lot of heat,

don't put the radio into a box or covering anything on radio mainframe.

2.The radio surface will be hot during the transmission ,if exposed In over 40 °C environment or strong sunlight, and the power is 20w or 30w , directly touch the surface of the radio radiator may burn yourself, please pay special attention to this.

Antenna Connection

Because the improper installation and erection of the antenna will severely affect the transmission distance, so the correct antenna connection and installation is very important.

Warning: 1. Don't use damaged or broken antenna

2. The radio standard configuration resistance is 50 ohm, please use input resistance at 50 ± 2 ohms, less than 1.5 standing wave ratio antenna and antenna feeder cable.

Working in Rain

Although the machine is waterproof, but do not suggest to put the radio in the rain. the waterproof glue within the operating panel may be aging for long time, the waterproof level will go down, the

rainwater may enter radio and damage the radio.

Rainwater may penetrate through antenna connector, power connector, serial port and damage radio.

When the user must place radio in the rain:

1. Make sure antenna and other connector are waterproof function, and ensure that rainwater will not enter into radio along the antenna or cable surface or inner core.
2. The panel should be upward to avoid the rainwater go through the antenna connector, power connector, serial port into the radio.
3. Try to shorten the time in the rain.

Notice: If the serial cable, antenna, feeder cable and connector are not waterproof, it may damage the radio.

Maintenance and Cleaning

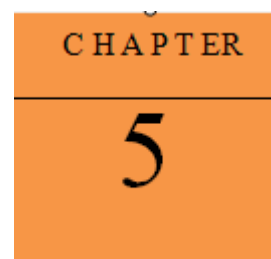
The rubber ring (pad) may be loose due to impact or man-made toggle, if loose, please fill with some glue to prevent losing parts expanding.

After long use, buttons, panel and cover may get dirty, you can use a mild detergent and damp cloth for cleaning (Do not use corrosive chemicals).

When you connect the radio, please check whether there's object things in the socket carefully, whether the pins are getting transmutative, please keep the connectors pins clean.

If there's object things in the socket or pins has been deformed, forcibly insert into the connector socket will damage the main unit.

Trouble Shooting



Common Failures and Trouble Shooting Methods

Maintenance

Optional Accessories

Common Failures and Trouble Shooting Methods

Fault	Trouble shooting
Can not power on	<p>Check the power supply polarity is correct or not, refer to the relevant sections of this manual.</p> <p>Check the external power supply voltage is above 10V and below 15.5V .</p> <p>when working, please ensure the battery has enough electrical energy within permissible voltage to avoid this problem.</p>
Radio field intensity signal LED does not flash	<p>Check whether the antenna is reliable connected or not</p> <p>The distance is too long between base and rover (eg, the base station is too far away from rover)</p>

	<p>Antenna connector is poor contact or antenna damage</p>
	<p>Large obstruction between the receiver distance (between base and rover stations)</p>
	<p>Check whether the channels are the same between external radio and rover.</p>
	<p>When you use A0-AF channel, whether the external radio frequency and rover frequency is the same?</p>
<p>No transmission</p>	<p>Check whether the power supply voltage is too low (such as battery capacity). Whether prohibit transmitting automatically?</p>

	<p>Check whether the communication between base and rover is ok. Check the signal when you transmit the data.</p>
<p>Blue LED flash, transmit red LED does not flash</p>	<p>Antenna connector is poor contact or antenna is broken.</p>
	<p>The antenna connection is bad, or the antenna is broken</p>
	<p>Large obstruction between the receiver distance (between base and rover stations)</p>
<p>LED is off</p>	<p>Whether there's signal interference, try to switch another channel.</p>
	<p>Check whether the setting is in power saving mode. press K3 and K4 key at the same time to power on, set the power-saving features to C0 to solve the problem.</p>

Maintenance

The external radio products warranty is one year dated from shipment AWB date, warranty maintenance only covers device's native quality problems under the proper operation.

When you send the external radio back to factory, please indicate the serial number and description of the problem, contact your dealer or manufacturer directly.

This Warranty does not cover the following cases, even if it happened during the warranty period, for this case, it will cause external charge

1. Improper packing or improper transportation to damage the equipment.
2. Anti-drop by accident or collision cause the equipment or protective rubber external shell damage.
3. Long exposure in the sun to cause the external shell color fade.
4. Operate the equipment panel with hard object or mixed with small particles of sand or dirt to damage the panel.
5. Pull and plug the port connectors frequently, leading TNS antenna connector aging.
6. The antenna feeder cable is too long to match with the equipment, damage the equipment.

7. Penetrate water to damage the equipment.
8. Caused by lightning or greater than 8KV super electrostatic discharge to damage the equipment.
9. Antenna connector adapter broken.
10. Damage the equipment by external power supply which exceeds the limitation prescribed in this manual.
11. The warranty do not include additional “artificial reasons including customer’s misuse, anti-drop by accident, water penetration”

Optional Accessories

1. Bracket-mounted high-gain antenna
2. Low loss antenna feeder cable
3. Antenna connector converter
4. External power supply cable B (Applies for the external power supply for battery)
5. External power supply cable R (Applies for external power supply)
6. 12V20AH maintenance-free external batteries
7. DC Power Supply

Attachment One: 100 Channels Fixed Frequency List

Note: 460M Frequency channel (MHz) is standard configuration, and 230M/445M Frequency channel (MHz) is optional configuration.

Attachment One

Channel number	460M Frequency channel (MHz)	230M Frequency channel (MHz)	445M Frequency channel (MHz)
0	459.225	230.625	445.025
1	459.325	230.725	445.125
2	459.425	230.825	445.225
3	459.525	230.925	445.325
4	459.625	231.025	445.425
5	459.725	231.125	445.525
6	459.825	231.225	445.625
7	459.925	231.325	445.725
8	460.025	231.425	445.825
9	460.125	231.525	445.925
10	460.225	231.625	446.025
11	460.325	231.725	446.125
12	460.425	231.825	446.225
13	460.525	231.925	446.325
14	460.625	232.025	446.425
15	460.725	232.125	446.525
16	460.825	232.225	446.625
17	460.925	232.325	446.725
18	461.025	232.425	446.825
19	461.125	232.525	446.925
20	461.225	232.625	447.025
21	461.275	232.675	447.075
22	461.325	232.725	447.125
23	461.375	232.775	447.175
24	461.425	232.825	447.225
25	461.475	232.875	447.275
26	461.525	232.925	447.325

HI-TARGET

27	461.575	232.975	447.375
28	461.625	233.025	447.425
29	461.675	233.075	447.475
30	461.725	233.125	447.525
31	461.775	233.175	447.575
32	461.825	233.225	447.625
33	461.875	233.275	447.675
34	461.925	233.325	447.725
35	461.975	233.375	447.775
36	462.025	233.425	447.825
37	462.075	233.475	447.875
38	462.125	233.525	447.925
39	462.175	233.575	447.975

Channel number	460M Frequency channel (MHz)	230M Frequency channel (MHz)	445M Frequency channel (MHz)
40	462.225	233.625	448.025
41	462.275	233.675	448.075
42	462.325	233.725	448.125
43	462.375	233.775	448.175
44	462.425	233.825	448.225
45	462.475	233.875	448.275
46	462.525	233.925	448.325
47	462.575	233.975	448.375
48	462.625	234.025	448.425
49	462.675	234.075	448.475
50	462.725	234.125	448.525
51	462.775	234.175	448.575
52	462.825	234.225	448.625
53	462.875	234.275	448.675
54	462.925	234.325	448.725
55	462.975	234.375	448.775
56	463.025	234.425	448.825
57	463.075	234.475	448.875
58	463.125	234.525	448.925
59	463.175	234.575	448.975
60	459.175	230.575	444.975
61	459.125	230.525	444.925
62	459.075	230.475	444.875
63	459.025	230.425	444.825
64	458.975	230.375	444.775
65	458.925	230.325	444.725
66	458.875	230.275	444.675

HI-TARGET

67	458.825	230.225	444.625
68	458.775	230.175	444.575
69	458.725	230.125	444.525
70	458.675	230.075	444.475
71	458.625	230.025	444.425
72	458.575	229.975	444.375
73	458.525	229.925	444.325
74	458.475	229.875	444.275
75	458.425	229.825	444.225
76	458.375	229.775	444.175
77	458.325	229.725	444.125
78	458.275	229.675	444.075
79	458.225	229.625	444.025

Channel number	460M Frequency channel (MHz)	230M Frequency channel (MHz)	445M Frequency channel (MHz)
80	458.175	229.575	443.975
81	458.125	229.525	443.925
82	458.075	229.475	443.875
83	458.025	229.425	443.825
84	457.975	229.375	443.775
85	457.925	229.325	443.725
86	457.875	229.275	443.675
87	457.825	229.225	443.625
88	457.775	229.175	443.575
89	457.725	229.125	443.525
90	457.675	229.075	443.475
91	457.625	229.025	443.425
92	457.575	228.975	443.375
93	457.525	228.925	443.325
94	457.475	228.875	443.275
95	457.425	228.825	443.225
96	457.375	228.775	443.175
97	457.325	228.725	443.125
98	457.275	228.675	443.075
99	457.225	228.625	443.025

Attachment Two: 16 Channels Frequency Modifiability Factory Default Setting Frequency List

Note: The transmit and receive frequency is different for default setting

Channel number	460M Frequency channel (MHz)		230M Frequency channel (MHz)		445M Frequency channel (MHz)	
	Receive	Transmit	Receive	Transmit	Receive	Transmit
A0	459.325	459.225	230.725	230.625	445.125	445.025
A1	459.425	459.325	230.825	230.725	445.225	445.125
A2	459.525	459.425	230.925	230.825	445.325	445.225
A3	459.625	459.525	231.025	230.925	445.425	445.325
A4	459.725	459.625	231.125	231.025	445.525	445.425
A5	459.825	459.725	231.225	231.125	445.625	445.525
A6	459.925	459.825	231.325	231.225	445.725	445.625
A7	460.025	459.925	231.425	231.325	445.825	445.725
A8	460.125	460.025	231.525	231.425	445.925	445.825
A9	460.225	460.125	231.625	231.525	446.025	445.925
AA	460.325	460.225	231.725	231.625	446.125	446.025
AB	460.425	460.325	231.825	231.725	446.225	446.125
AC	460.525	460.425	231.925	231.825	446.325	446.225
AD	460.625	460.525	232.025	231.925	446.425	446.325
AE	460.725	460.625	232.125	232.025	446.525	446.425
AF	459.225	460.725	230.625	232.125	445.025	446.525