Cooperative Vehicle Infrastructure (V2X) Specific

Roadside Unit WB-R30B

User Guide

Catalog

1 Product Introduction

WB-R30B roadside unit equipment is based on 5.855~5.925GHz DSRC cooperative vehicle technology (V2V, V2I, V2X). It provides DSRC (IEEE802.11p), Bluetooth/Wi-Fi, Bluetooth, Ethernet and CAN communication functions and mainly used in cooperative intelligent traffic, vehicle safety and autonomous driving. WB-R30B is a class C device according to Table 9 of ASTM E2213-03 and is for private application.

WB-R30B enables vehicles to talk to each other in real time. It will provide supports for Connected Vehicles, Cooperative ITS and Autonomous Vehicles. It supports applications such as cooperative traffic light, intelligent traffic infrastructure, etc.

1.1 Product parameter

item	parameter
protocol	✓ IEEE 802.11p ✓ IEEE 1609.2-4 ✓ SAE J2735
DSRC parameters	✓ Dual antennas ✓ Working frequency: 5.855GHz-5.925GHz ✓ Max communication rage 800m ✓ Latency: less than 10ms in average (with 4096bits payload) ✓ Data rate:3M, 4.5M, 6M, 9M, 12M, 18M, 24M, 27Mbps ✓ Channel bandwidth 10M (Channel No. 172~184) ✓ Channel switch time <4ms ✓ Support multi-channel synchronization ✓ Support switch between control channel and service channel in real time
security	✓ Support message signing and verification ✓ Support message encryption and decryptio
Typical application	✓ Support WSMP and IP application ✓ Multi-application support ✓ Support multi-priority ✓ Support wave data and control data transmission ✓ Support remote log-in application ✓ Provide user development kit WB-SDK1.0

Peripheral interface	✓ V2X:DSRC ✓ External interface:RS232,RJ45,Wi-Fi,Bluetooth ✓ GPS/BeiDou module
Working environment	✓ Working temperature: -30℃～+50℃ ✓ Storage temperature: -40℃～+85℃ ✓ Working humidity: 10%～95%
Appearance and size	✓ Silver pressure-proof, water-proof, dust-proof metal shell ✓ size: 280mm(L)*245mm(W)*90mm(H)

2 Product installation

2.1 Product accessories

WB-R30B road-side equipment hardware includes main frame, power cord, POE Ethernet wire, serial wire, DSRC antenna, GNSSantenna, 4G antenna (optional) and Wi-Fi/BTantenna. Before power on, user should distinguish different accessories to prevent possible damage.

Following shows WB-R30B front and back interfaces. Of which RS232 interface contains two serial and one 48V power interface.
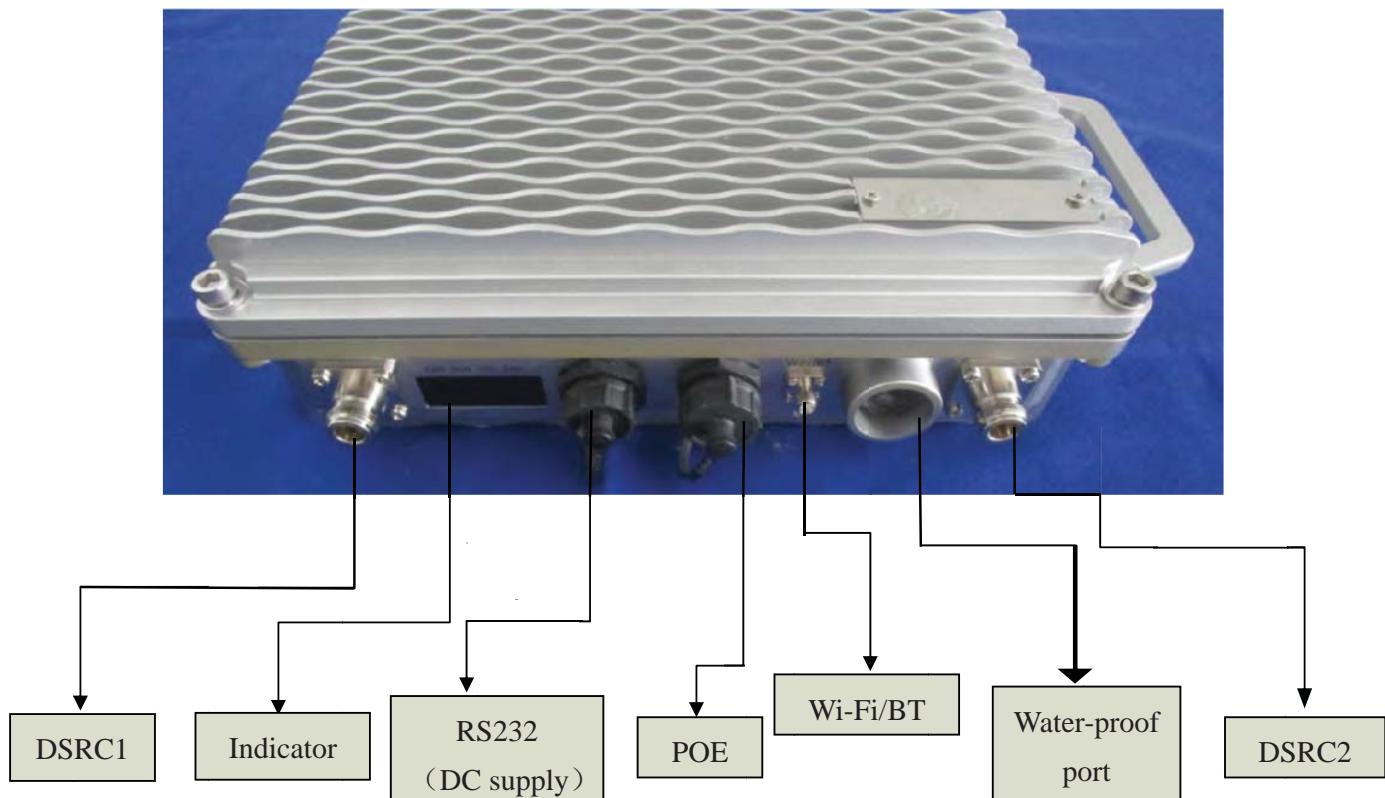
Figure2-1 WB-R30Bfront

Figure2-2 WB-R30B back

| DSRCantenna | WIFIantenna | GNSSantenna | 4G antenna |
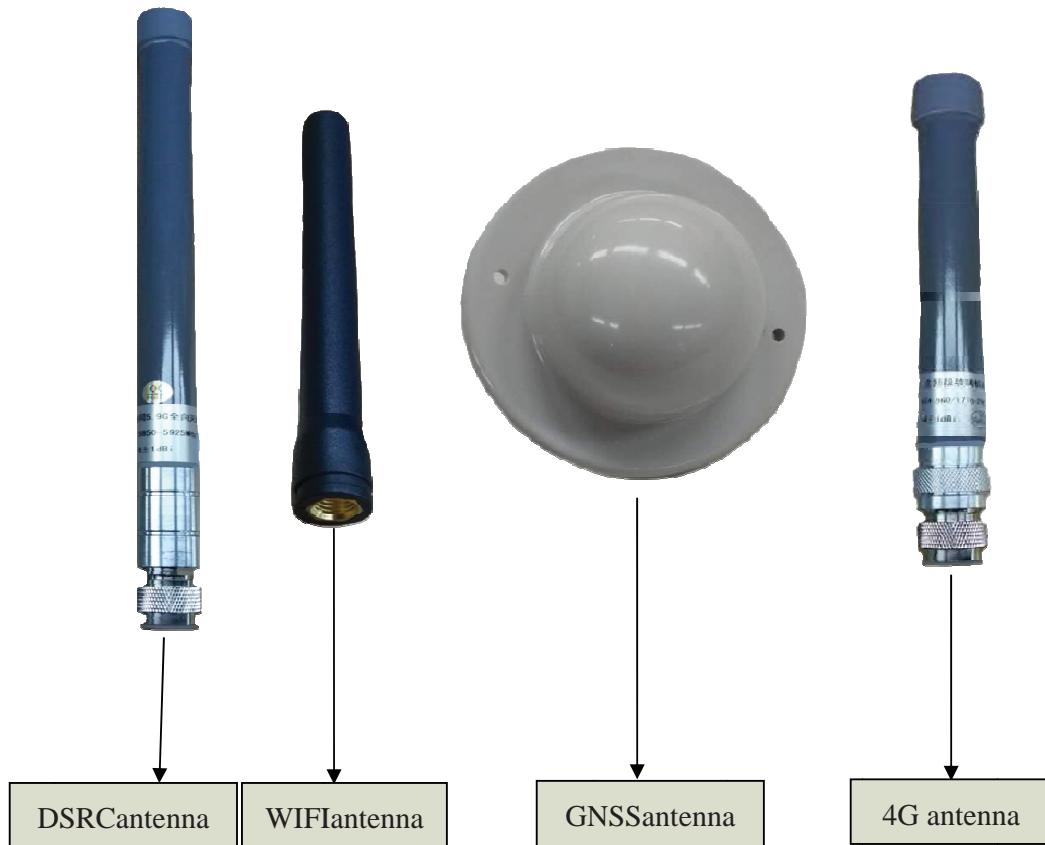
Figure2-3WB-R30Bantenna

Figure 2-4 shows WB-R30B wires. There are 15 meters 12-pin serial port& DC power and

10 meters POE, among which in 12-pin, serial 2 used in debug, serial 1 is functional port. For the

pair orange power wire, positive is green and brown is negative.
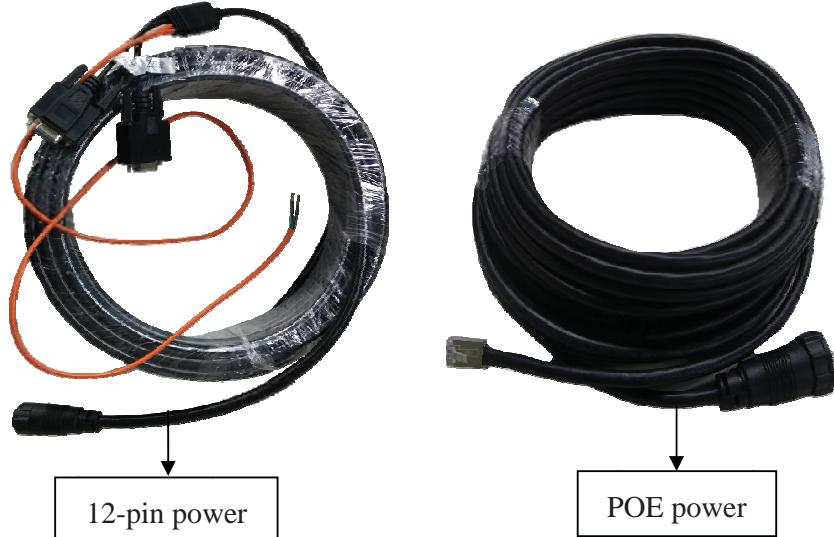
Figure 2-4WB-R30B wires

2.2 Login WB-R30B

2.2.1 Device installation

Accessories contain power cable, data cable and antennas. There are two types of power cable, one is DC power cord within 12-pin power cord (Note: green for the positive, brown negative), one is the POE power cord and this is optional. The data cable includes DEBUG serial port and function serial port of 12-pin power cable, and 8-pin cable (If POE power supply mode is selected, POE also supports network cable function; if DC power supply mode is selected, network need to prepare separately). Antennas include two DSRC antenna, WIFI / BT antenna and GNSS antenna, 4G antennais optional. Device is installed correctly as shown in Figure 2-5.

Figure2-5full installation

2.2.2serial port log in

Take serial port accessing tool Xshell5 for example, the steps of serial port accessing are as follows:

1) Open Xshell5, select "new" connection;

2) Choose "SERIAL" as protocol incatalog;

1) Configure parameters in SERIAL panel.

2) Click "Connect", choose accept and save key. Then type in user name: **root** and password: **victgen** to complete connection.

2.2.3Wi-Fi log in

For setting up Wi-Fi connection, please check chapter four, section two.

Use Xshell5 to access device, the configuration steps are as follows:

1) Open the Xshell5, select "new" connection;

3) 2) Select SSH as protocol, set host address to 192.168.110.1, port number uses the default port number 22

4) Click "OK", choose accept and save key. Then type in user name: **root** and password: **victgen** to complete connection.

3 WB-R30BAutomatic Start-up Items

Check script /etc/init.d/S90init-stuff for WB-R30B startup items, here will explain how to configure and edit each programwhich will run at the start of device.

1.To reviewscript S90init-stuff: vi/etc/init.d/S90init-stuff, as shown in figure 3-1:

Figure 3-1 Automatic Start Scripts

2. Script content is as follows:

- gpsd.sh -- GPSD configuration script, through which user can configure GPSD serial port and baud rate, the gpsd baud rate is 115200.
- run_reset4g.sh -- 4G module reset script, which to ensure that 4G module can work correctly.
- run_wireless.sh -- Load Wi-Fi driver module, after running this script, device will act as an AP, waiting wireless terminal to access by Wi-Fi.
- run_ap.sh -- Hostapd configuration script, through whichuser can set IP address pool for client devices.
- run_bt.sh -- Bluetooth module loading script, after running this script,Bluetooth function is switch on.
- huawei_909_dial.sh -- 4G module loading script, after running this script,4Gfunction is switch on.
- start_wave.sh -- WAVE service module loading script, after running this script,DSRCfunction is switch on.
- rtl3d 192.168.110.1 224.0.0.1 -- Read local GNSS message, and send as multicast message tomulticast group address 224.0.0.1 on Wi-Fi interface address 192.168.110.1.

4、 WB-R30BSoftware Use Guidance

4.1Device Network Interface Introduction

After login system, input command "ifconfig" to view device network interface information, as shown in figure 4-1:

```
[root@genvict ~]# ifconfig
eth0      Link encap:Ethernet  HWaddr 22:D7:FA:8D:76:82
          inet addr:192.169.5.200  Bcast:192.169.5.255  Mask:255.255.255.0
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:1289 errors:0 dropped:0 overruns:0 frame:0
          TX packets:1289 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:182075 (177.8 KiB)  TX bytes:182075 (177.8 KiB)

usb1      Link encap:Ethernet  HWaddr 02:1E:10:1F:00:00
          inet addr:10.144.119.118  Bcast:10.144.119.119  Mask:255.255.255.252
          inet6 addr: fe80::1e:10ff:fe1f:0/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:2 errors:0 dropped:0 overruns:0 frame:0
          TX packets:8 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:636 (636.0 B)  TX bytes:1152 (1.1 KiB)

wave0     Link encap:Ethernet  HWaddr 32:FD:14:7B:B6:E6
          inet6 addr: fe80::30fd:14ff:fe7b:b6e6/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

wlan0     Link encap:Ethernet  HWaddr F4:B8:5E:27:B1:B7
          inet addr:192.168.110.1  Bcast:192.168.110.255  Mask:255.255.255.0
          inet6 addr: fe80::f6b8:5eff:fe27:b1b7/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:649 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:201192 (196.4 KiB)

[root@genvict ~]# 
```

Figure 4-1 Network Interface Info

Through "ifconfig"command, there are five network interfaces on the device, namely eth0, lo, usb1, wave0 and wlan0. Eth0 is Ethernet interface, lo is local loopback interface, usb1 is 4G network interface, wave0 is DSRC communication interface and wlan0 is Wi-Fi interface. Please note that if4G module or SIM card is not plugged in, usb1 interface won't appear.

4.2Wi-Fi Use Guidance

Type in command "ifconfig" to view device network interface information, as shown in figure 4-2:

Figure 4-2 Wi-Fi Interface

The default interface for Wi-Fi is wlan0and default IP address is 192.168.110.1, this is the AP address forother devices to connect to. User can change this IP address by editing corresponding configuration file. See the next section for detail.

4.2.1 Change Wi-Fi broadcast ssid and password

Initial WiFissid is: genvict-v2x and password is: cdgvmymm. This can be changed by modify hostapd.conf under directory /etc.

Figure 4-3modifyWiFissid

WiFi password can be modified by setting "wap_passphrase" value:

Figure 4-4modify   WiFipassword

4.2.2Modify Wi-Fi IP Address and Assign IP Address Pool

Use vi to open /etc/udhcpd.conf, find "start" and "end" items.

```
# Sample udhcpd configuration file (/etc/udhcpd.conf)
# Values shown are defaults

# The start and end of the IP lease block
start           192.168.110.110
end             192.168.110.120

# The interface that udhcpd will use
#interface      eth0
interface       wlan0
```

Figure 4-5Wi-Fi Assign IP Address Pool

Changethe start and end configuration in green spot to modify the address pool of AP.The default IP addresses for client is in 192.168.110.0 segment, totally 10 addresses (From 192.168.110.110 to 192.168.110.120). Note that if you want to modify default address, please make sure that "opt router" item in udhcpd.conf has the same address segment as AP address segment, shown in figure 4-2-2 highlighted in green.

```
# Examples:
opt     dns     8.8.8.8 8.8.4.4 #public google dns servers
option  subnet  255.255.255.0
opt     router  192.168.110.1
#opt    wins    192.168.10.10
#option dns     129.219.13.81   # appended to above DNS servers for a total of 3
#option domain  local
option  lease   864000          # default: 10 days
# Arbitrary option in hex form:
option  0x08    01020304        # option 8: "cookie server IP addr: 1.2.3.4"
```

Figure 4-6Wi-Fi IP Address Detailed Info

4.3 Ethernet Use Guidance

4.3.1ManuallyConfigure Ethernet Interface IP Address

Connect WB-R30B to PC via Ethernet cable, log in and input"ifconfig eth0 up" and"ifconfig eth0 192.169.5.200 netmask 255.255.255.0". Then eth0 IP address can be seen, as shown in figure 4-3. Note thatWB-R30B and PC must configure in the same network segment.

```
[root@genvict etc]# ifconfig
eth0      Link encap:Ethernet  HWaddr 22:D7:FA:8D:76:82
          inet addr:192.169.5.200  Bcast:192.169.5.255  Mask:255.255.255.0
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)
```

Figure 4-7ManuallyConfigure Ethernet Interface

4.3.2AutomaticallyAcquire Ethernet Interface IP Address

Connect WB-R30B to router via Ethernet cable, input "udhcpc -i eth0", then WB-R30B's Ethernet interface can obtain IP address automatically, as shown in figure 4-8

```
[root@genvict /]# udhcpc -i eth0
udhcpc (v1.22.1) started
Sending discover...
Sending select for 192.169.5.72...
Lease of 192.169.5.72 obtained, lease time 86400
deleting routers
adding dns 192.169.5.1
[root@genvict /]#
```

Figure 4-8AutomaticallyAcquire IP Address

4.4 4G Network Interface Use Guidance

Usb1 is the 4G network interface.WB-R30B obtained IP address 10.144.119.118from server. The existence of this address stands that the device is capable of accessing to Internet, as shown in figure 4-9.

```
usb1      Link encap:Ethernet  HWaddr 02:1E:10:1F:00:00
          inet addr:10.144.119.118  Bcast:10.144.119.119  Mask:255.255.255.252
          inet6 addr: fe80::1e:10ff:fe1f:0/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:2 errors:0 dropped:0 overruns:0 frame:0
          TX packets:8 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:636 (636.0 B)  TX bytes:1152 (1.1 KiB)
```

Figure 4-94G Network Interface

4.5System Upgrading Introduction

4.5.1Upgrading File Preparation

First of all, prepare the upgrade file such as kernel;copy upgrading file to any path of the device. To do this, user can use Linux SCP command under Linux or SSH, WinSCPunder Windows. Now takingWinSCP as an example, the access configuration steps are as follows:

1) Open the WinSCP, configuration interface will appear;

1)   2) SelectSCP as protocol, use 192.168.2.100 as host name, default 22 as port number, "root" as user name and "victgen" as password.Click "login" to complete access. (If host key related security warning appears, select "update".)

After accessing using WinSCP shown in Figure4-5-1, with PC's file directory on the left and WB-R30B file directory on the right.Then user can do file operations. As user has root privilege, please be cautious when applying operations.
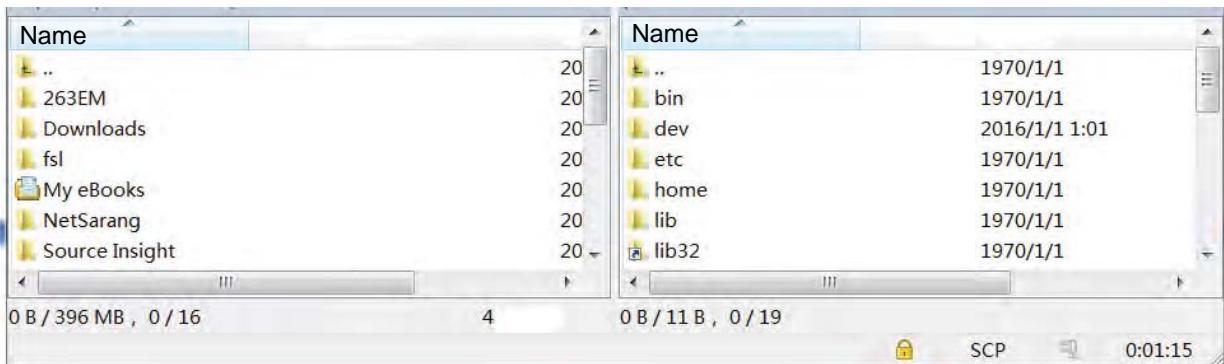

Figure 4-11 WinSCP Operation Interface

4.5.2Parameter Introduction

Viewsys_update.sh under /opt/scripts directory, this script supports four kinds of upgrading, including DTB, Uboot, Kernel and FS. User can use command line to upgrade. (For example,./sys_update.sh -x /xxx/xxxxxx.xxx)

1)   -x to distinguish four types of upgrading files:
● -d stands for DTB upgrading

```
[root@genvict scripts]# ./sys_update.sh -f /home/test/rootfs.tar
```

● -u stands for Uboot upgrading

```
[root@genvict scripts]# ./sys_update.sh -u /home/test/uboot
```

● -k stands for Linux Kernel upgrading

```
[root@genvict scripts]# ./sys_update.sh -k /home/test/uImage
```

● -f stands for Filesystem upgrading

```
[root@genvict scripts]# ./sys_update.sh -f /home/test/rootfs.tar
```

● -d、-u、-k、-f can be used in any combination, this means that not only one type upgrading file,

but multiple combination files can be used for upgrading. For example,-u, -k, -d, and -f using at the same time means the device needs to upgrade using DTB, Uboot, Kernel and FS files at the same time. Note that parameters are all lowercase letters.

2) /xxx/xxxmeans that upgrade file can locate in any path.

3) xxx.xxxstands for upgrading file name, this name can be user defined and has no format requirements.

Warning

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the 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.

Note: 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.

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment .

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

This equipment should be installed and operated with minimum distance 20cm between the radiator& your body.

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