

Full GNSS Band Repeater Kit

GNSSRK-M-DV

Installation and User Guide



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Quality Commitment

All products have been strictly inspected, all are qualified products.

We promise one-year guaranty and 5-year available.

Under warranty, products gone wrong which be identified not be human factor, can be replaced free or repaired. Freight be charged by GEMS.

Return Policy

Our product and its packaging have LOGO and Serial-number, you should not tear up them, as we will depend on them to deal with the return product.

1. System characteristics

- ✧ **System signal:** GPS/GLONASS/Beidou/Galileo/IRNSS/QZSS/SBAS/NAVIC/OmniStar
- ✧ **Frequency range of the antenna:**1556~1623MHz and 1164~1288 MHz;
- ✧ **Frequency range of the amplifier:**1150~1650 MHz;
- ✧ **Digital gain adjustment:** 0-30dB, LED digital display;
- ✧ **Serial command control;**
- ✧ **Input and output port power setting;**
- ✧ **Coverage Range:**

GNSSRK-M-DV: A single antenna radiates a radius of 5-20 meters;
The addition of the line amplifier GA40 to the front and end of the system can extend the radiation range.

2. System installation steps and schematics

Installation steps

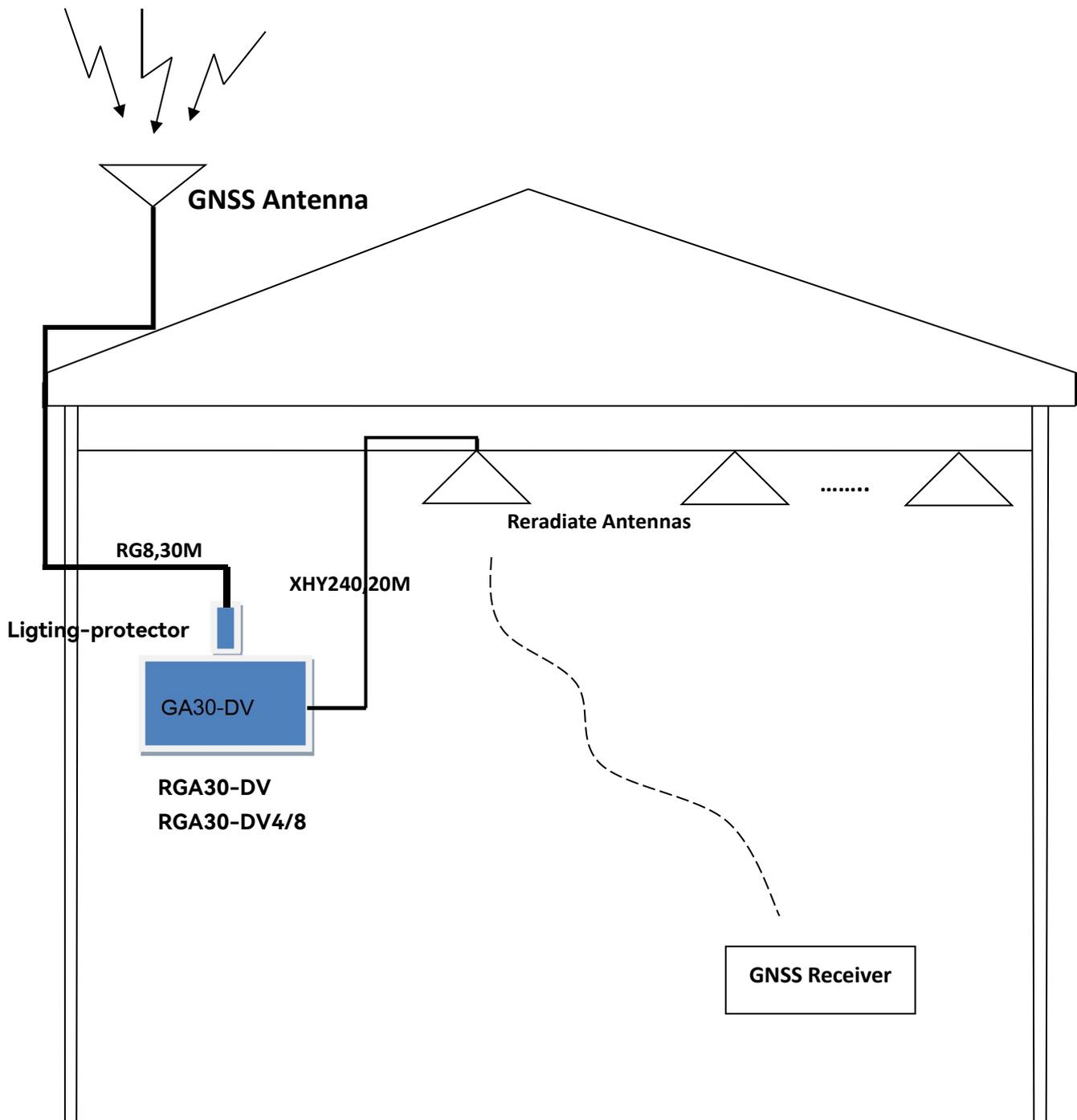
1. Receiving antenna S440 mounted on the roof;
2. Cable assembly RG8 fixed along the out wall, one terminator connects S440, the another to protector at the appropriate place. In some special environment, select PE or PVC material plastic pipe to protect the cable assembly is quite sensible;
3. Lightning arrester and digital stepper amplifier fixed to the ceiling or table top of the room;
4. Cable assembly XHY240 is fixed along the ceiling of the operating place;
5. Antenna GRA10 be fixed on the ceiling .

According to the actual environment, you can adjust positions of some parts, which can make you the adjustment, change and overhaul more easily.

Installation Diagram



Satellite signals



3. Description

The GNSSRK-M-XXXX series GNSS repeater kit is to direct outdoor full-band navigation satellite signals to places where indoor or other satellite signals cannot reach, and complete various test work that should have been completed outdoors indoors.

4. Typical Application

✧ For testing

For testing the cell- phone, PND, car navigators, tracker, survey products, etc.

✧ For the purpose of GNSS signal covering

Car parks, lab, aviation manufacturing hangar, trade shows, Emergency-, safety vehicles, public transportation etc.

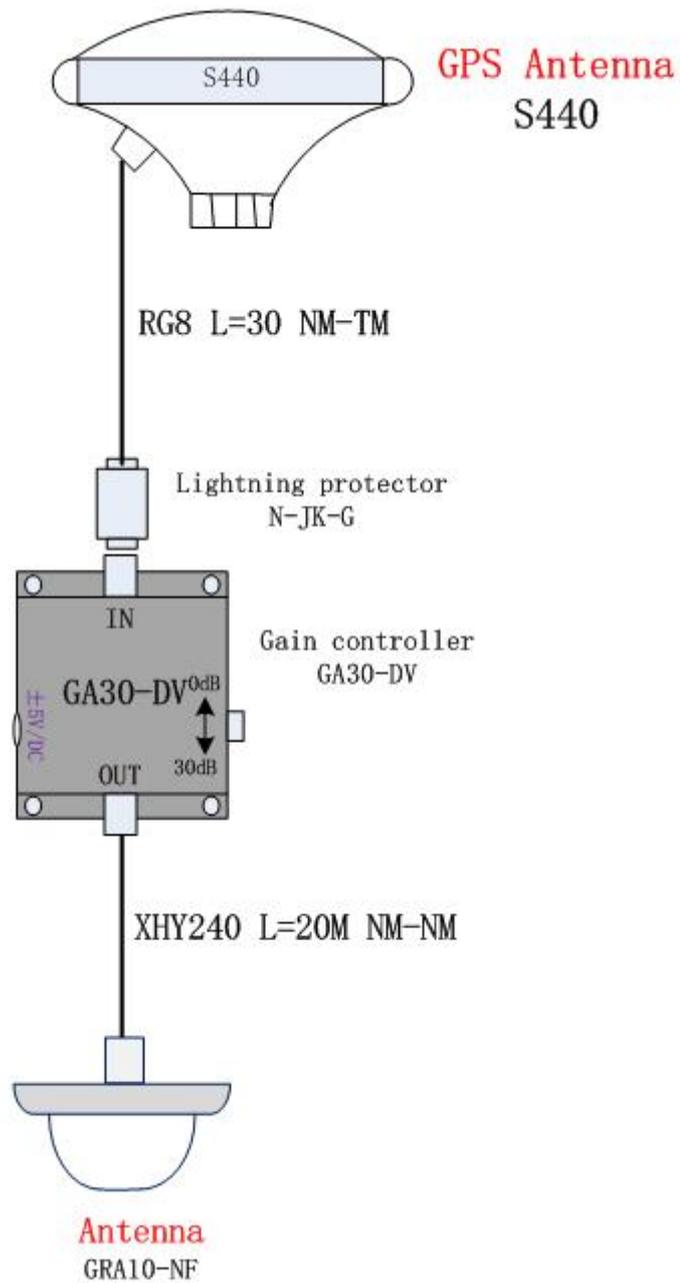
5. Equipment List

● GNSSRK-M-DV:

- ✧ Gain Controller:GA30-DV,1 ea;
- ✧ Receiving Antenna: S440,1 ea;
- ✧ Cable Assembly:RG8(KSR400/LMR400),30M, 1ea;
- ✧ Cable Assembly:XHY240(KSR400/LMR400),20M,1 ea;
- ✧ Sending Antenna: GRA10,1 ea.
- ✧ Ligting-protector:1 ea;

RF coaxial cable assembly can make more choices according to the actual needs of customers, please contact our company's sales for support.

6. System Connection Diagram



7. System Components

7.1 Digital Display Step Adjustable Amplifier RGA30-DV

7.1.1 Function:

Used to adjust system gain, 0-30 dB adjustable, you can control when needed. The input and output can be set to energize 5V DC or not energized.

With AC220/12V power adapter, supply power to system and itself.

- ① ② are GA30-DV input and output.
- ③ Power port
- ④ For the gain adjustment button, you can adjust the gain size, you can adjust the controller gain increase or decrease. (Through the GAIN button to adjust. UP to the big, down to small.)
- ⑤ For the input and output power state setting, IN for the input, Out for the output, PDC that power, BDC that does not power.
- ⑥ For the digital display, showing the current gain value of the amplifier, and the voltage of the input and output ports.



7.1.2 Specification

Parameter	Condition	Mini	Std	Max	Unit
Frequency Range	In ,Out, 50Ω	1150		1650	MHz
Impedance	In ,Out		50		Ω
Gain	Digital Step Adjustable		0~30		dB
Input VSWR				2.0:1	-
Output VSWR				2.0:1	-
Noise Figure				3	dB
Gain Flatness				3	dB
Delay Flatness			1		ns
Power Input	12V DC Adaptor		12		VDC
Current	Pass DC, No Powered configuration, DC input on Out Port			250	mA
1dB Compression				-4	dBm
Max RF Power				0	dBm
Nun. Of input			1		↑
Nun. Of Output			1		
Max RF Input	Maximum lossless RF input			0	dBm
Working Temperature		-40°		85°	

7.1.3 The amplifier Installation

As Shown at Left:

Typical installation scenarios for the GA30-DV product line are wall-mounted or sometimes on a tabletop.



7.2 Antenna

7.2.1 Roof Antenna S440



Full GNSS Band: GPS/GLONASS/Beidou/Galileo/IRNSS/QZSS/SBAS/NAVIC/OmniStar

- ✧ GPS:L1,L2,L5;
- ✧ Glonass:G1,G2;
- ✧ Galileo:E1,E2,E5a,E5b;
- ✧ Beidou2:B1,B2,B3;
- ✧ IRNSS/QZSS/SBAS/NAVIC/OmniStar;

Electrical parameter:

Frequency [MHz]	1555~1623/1164~1288
Impedance	50Ω
Gain [dBi]	40±2(LNA included)
Polarization	right-hand circular polarized (RHCP)
Axial ratio [dB]	≤3
Elevation Coverage	360°
Input (VSWR)	≤2.0
Antenna element gain	5.5dBi

Low Noise Amplifier: Specifications:

Frequency [MHz]	1556~1623/1164~1288
Gain (dB)	40±2
Flatness in bandwidth (dB)	±2 dB
Noise Figure (dB)	≤2 dB
Output (VSWR)	≤2.0
Input (VSWR)	≤2.0
DC Voltage	DC 3.3—12V
DC Current	DC ≤45mA
Differential transmission delay	5ns

Mechanical characteristic:

Size [mm]	Ø165×68.8
Connecting	TNC-C-K
Operation Temperature [°C]	-40~+85
Reposition Temperature [°C]	-55~+85
Humidity [%]	95% non-condensin

7.2.2 GNSS antenna S440 installation

(1) Antenna spacing: >5M; transmitting and receiving antennas cannot be placed upside down except as specified in the manual.

(2) the antenna should be in the lightning arrester protection

(3) Antenna waterproof specification:



① The feeder joints need to be wound with waterproof self-adhesive tape, starting with the lower part of the joint connection and filling the low-lying part with the tape.

② Stretch the self-adhesive tape to twice its length during the winding process, and use 60cm long waterproof tape for each connector, requiring three layers of winding. The winding direction should be the same as the tightening direction of the feeder head to avoid loosening of the feeder head during the winding process.

③ layer by layer winding, and then reverse the direction of winding layer by layer, the upper layer covers the next layer of about one-third, so as to prevent rainwater leakage, and finally reverse the direction of winding layer by layer, winding a total of three layers, layer by layer winding waterproof tape, winding process do not cut off the tape. Tape winding length to exceed the feed head about 20 mm.



④ Installed antenna feeder joints, GPS antenna feeder joints, and other independent exposed cable joints, should be strictly in accordance with the "1 + 3 + 3" treatment (1 layer of insulation tape + 3 layers of waterproof tape + 3 layers of insulation tape wrapping) waterproof.

⑤ can also increase the clinker tube to cover the cable part, placing the cable joint part of the water.

4) Waterproof bend

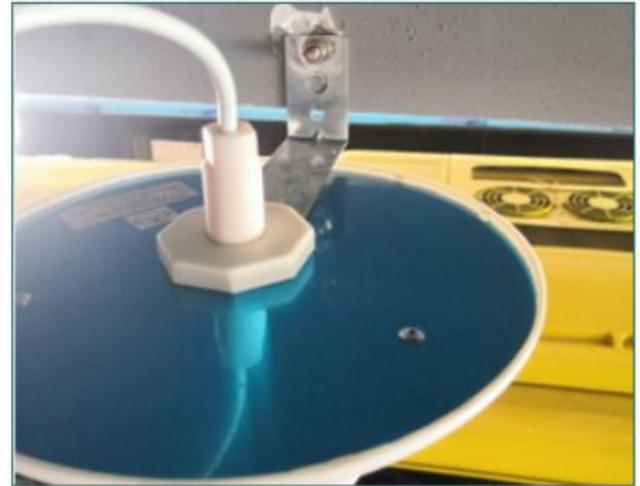
① feeder line from outdoor into the room, if the feeder line is higher than the lower edge of the feeder window, must be made at the outdoor feeder window - waterproof bend, the lowest point of each feeder line after waterproof bend must be lower than the lower edge of the feeder window 10 cm

② If the feeder line is lower than the lower edge of the feeder window before entering the room, it is not necessary to make a waterproof bend.



7.3 Re-radiate Antenna GRA10

Fix the antenna to the ceiling, or to a concrete beam; usually in the center of the area where GPS signal coverage is required;



This product factory with fixed bracket, you can refer to the diagram to fix
Electrical parameters **Mechanical parameters**

Frequency [GHz]	1.15-1.7
Input impedance	50Ω
Polarization method	Vertical polarization
Horizontal coverage angle	360°
Output standing wave (VSWR)	≤1.45
Maximum power	50W

Lightning protection	DC Grounding
Input Interface	NK/SMAK
Size	Φ186X85mm
Antenna cover material	ABS, UV protection
Antenna Color	white
Operating temperature	-40~+60°C
Ultimate temperature	-55~+70°C

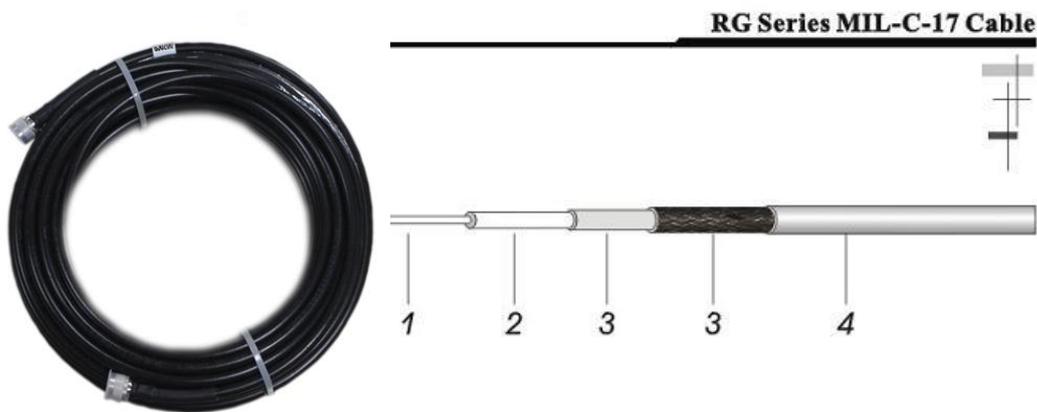


7.4 Cable Assembly

7.4.1 RG8

RG8,30M is usually used for connecting Receiver antenna S440 and lighting-protector. You can calculate the length according to your actual environment, also 60m or 90 be selected.

The connectors are N Male-N Male.



	Material	Diameter(mm)
1. Inner Conductor	Bare Copper	2.74
2. Dielectric	Physical Foan Polyethylene	7.24
3. Outer Conductor	Bonded Aluminum Foil +Tinned Copper Braed	8.13
4. Jacket	PE	10.29

Electrical Characteristics

Capacitance(pF/m)	78.4
Impedance(ohm)	50
Velocity(%)	85
Shielding Effectiveness(>dB)	90
Max. Oper. Voltage(VMS)	4000
Operating Temp. (°C)	-40 to 80

Attenuation

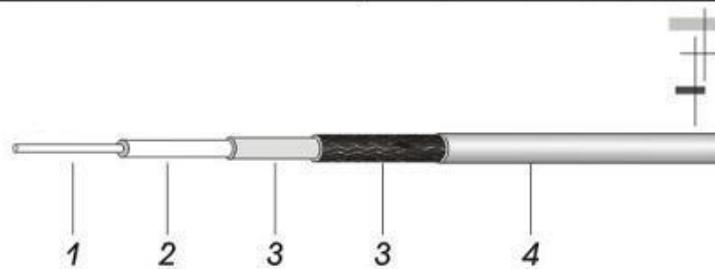
Frequency(MHz)	Attenuation(≥ dB/100m)
30	2.2
50	2.9
150	5.0
220	6.1
450	8.9
900	12.8
1500	16.8
1800	18.6
2000	19.6
2500	22.2
5800	35.5

7.4.2 XHY240

The cable assembly XHY240 is the cable that connects the amplifier RGA30-XXX to the antenna GRA10.



Low Loss Cable



Construction Specification

	Material	Diameter(mm)
1. Inner Conductor	Solid Copper	1.42
2. Dielectric	Physical Foam Polyethylene	3.81
3. Outer Conductor	Bonded Aluminum Foil + Tinned Copper Braid	4.52
4. Jacket	Black PVC or Polyethylene	6.10

Electrical Characteristics

Capacitance(pF/m)	79.4
Impedance(ohm)	50
Velocity(%)	84
Inner Conductor DC Resistance(Ω /km)	10.50
Outer Conductor DC Resistance(Ω /km)	12.76
Shielding Effectiveness(dB)	>90
VSWR \leq (Return loss \geq dB)	
5-3000MHz	1.20 (20)
800-1000MHz	1.10 (26)
1700-2000MHz	1.15 (23)
2000-2400MHz	1.15 (23)

Mechanical and Environmental Characteristics

Min. Bend Radius(mm)	30
Storage Temp.($^{\circ}$ C)	-40to+80
Installation Temp.($^{\circ}$ C)	-40to+80
Operating Temp.($^{\circ}$ C)	-40to+80

Attenuation and Avg. Power(20 $^{\circ}$ C)

Frequency(MHz)	Attenuation(\pm dB/100m)	Avg. Power(KW)
30	4.40	1.30
50	5.70	1.00
150	9.90	0.58
220	12.00	0.48
450	17.30	0.33
900	24.80	0.23
1500	32.40	0.18
1800	35.60	0.16
2000	37.70	0.15
2500	42.40	0.13
3000	46.50	0.12
5800	66.80	0.09

7.5 Direction Of Installation



As Shown at Left:

- ① Cable assembly: connect to receiving antenna, S440;
- ② Protector;
- ③ Earth connection;
- ④ Gain controller:GA30-DV;
- ⑤ Input of Gain controller, not reverse;
- ⑥ Output of Gain controller, not reverse;
- ⑦ Cable assembly: connect to transmitting antenna, GRA10.
- ⑧ Power pack;.

7.5.1 Installation of Lightning Arrester Precautions

Earth resistance is assured less than 10Ω;

One end of the lightning-protection line should connect to grounding ears, the other one is welded to the nearest building to assure grounding

8 Typical Faults and Solutions

GNSS repeater/GPS booster/GPS signal amplifier GNSSRK-M-RDV fault location and remove:

First: To determine whether the RGA30-DV power supply connected, through the RGA30-DV digital display can be observed to lose whether there is voltage output, such as digital display shows a

voltage of about 5V, indicating normal power supply, RGA30-DV work properly. Otherwise, check the power outlet for good contact.

Second: If the digital stepper is adjustable, the input port of the amplifier has a voltage of 5V, you need to check whether the fixing is steady between GRA10 and the cable.

Third: If the below two step were ok, please check the outdoor antenna S440 .You can, check the voltage between axis of the cable connector and the outer shielding layer to make sure it's 5V.If no voltage, the circuit has fault, please contact our technical support. If 5V,the antenna S440 can be suspected.(In fact, this case hasn't appear in our engineering projects.

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9 Frequency Reference Table

Global/Compass Navigation Satellite Systems(GNSS/CNSS)	5					2					6/3			6			1															
Frequency (MHz)	1164	1176	1188	1192	1207	1215	1219	1227	1239	1245	1252	1259	1266	1268	1278	1290	1535	1540	1545	1550	1558	1558	1561	1563	1575	1587	1592	1602	1609	1616	2491	
GPS(USA) L1,L2,L2C,L5	L5+/-12					L2/L2C+/-12										L6+/-5							L1+/-12									
Glonass(Russia) G1,G2										G2+/-7																						
Galileo(Europian) L1,E1,E2,E5(E5a,E5b),E6	E5+/-15		E5a+/-12		E5b+/-12								E6+/-12		L6+/-5				E2			L1+/-17			E1							
Compass (Beidou 2,China)				B2+/-10									B3+/-10								B1+/-2											
Beidou 1 (China, Tx(LHCP)/Rx(RHCP))																														L	S	
IRNSS (India)		L5+/-15																				L1+/-12								S+/-15		
OmniStar																O+/-14---->																