

GEMS NAVIGATION LIMITED

GNSSRK-M-DV

- Four-system satellite signal indoor coverage solution
- Installation and user guide



WWW.GEMSNAV.COM

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GNSSRK-M-DV

✧ **System signal:**

- ✧ **GPS:L1,L2,L5;**
- ✧ **Glonass:G1,G2;**
- ✧ **Galileo:E1,E2,E5a,E5b;**
- ✧ **Beidou2:B1,B2,B3.**

✧ **System gain: 0-30dB, digital display step adjustable ;**

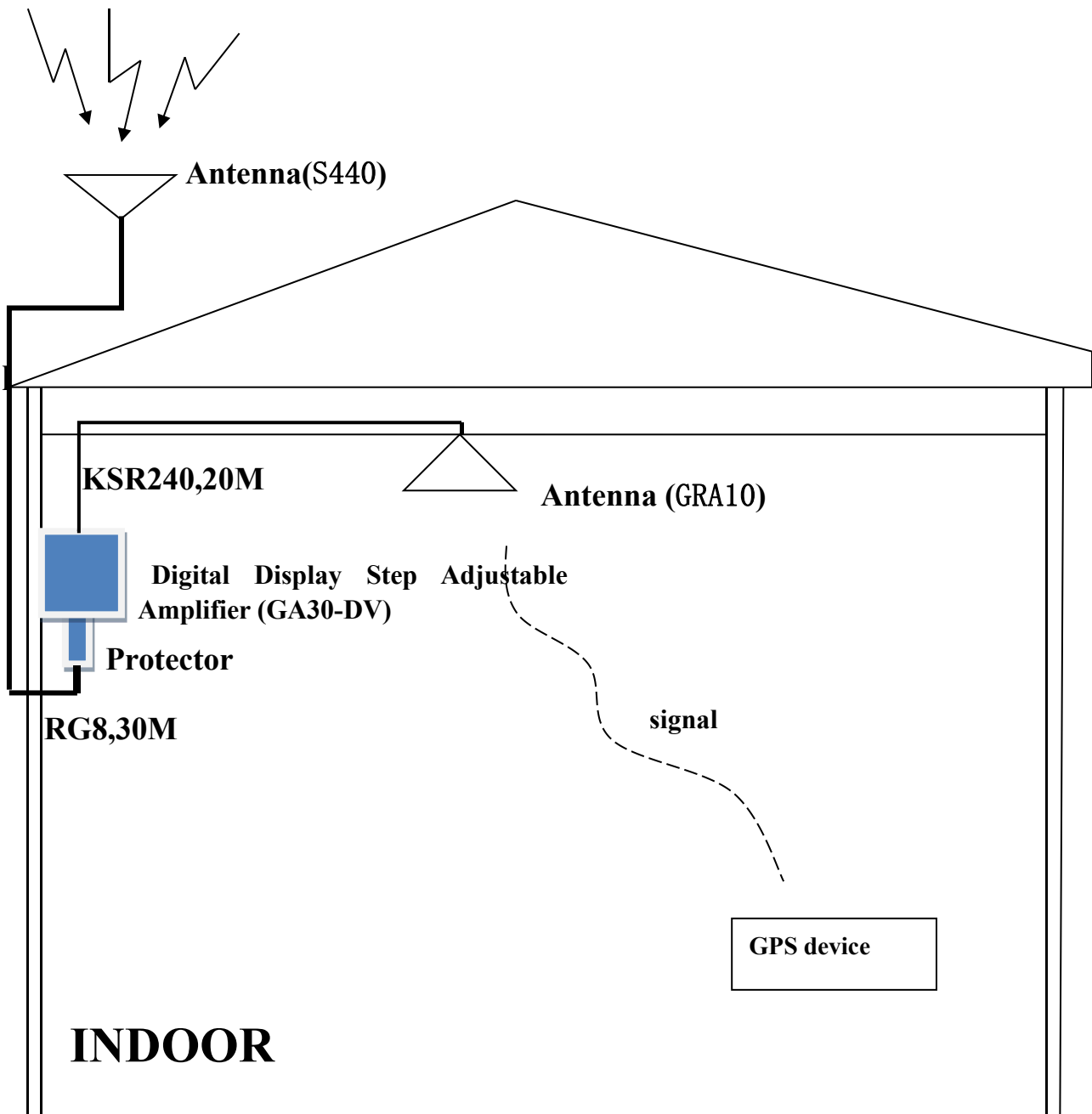
✧ **Digital gain: LED digital display, clearly shows the current amplifier gain;**

✧ **This is single point solution, covers 5-20 meters at radius(by increasing the amplifier according to methods and under field conditions, building height and other certain conditions reach a radius of 20 meters).**

Note: Single point means one antenna be used to transmit GPS /GLONASS /Beidou2 /Galileo....signal.

System Schematic

GPS/GLONASS/Beidou2/Galileo...signal



1. GPS/GLONASS/Beidou2/Galileo Antenna(S440) be installed on roof of the building;

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. Protector and Digital Display Step Adjustable Amplifier are fixed on ceiling or on the table;
4. Cable assembly KSR240 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 adjust, change and overhaul more easily.

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.

We haven't recruit agencies, sales and after service be took charged by GEMS. Please pay attention.

Service phone:[86-755-29644311](tel:86-755-29644311) or email to: sales@gemsnav.com, We will response in 24 hours.

1. Functional Description

- ✧ GNSSRK-M-DV is a repeater operates by receiving GPS/GLONASS/Beidou2/Galileo... satellite signals with an antenna located outside the building and re-radiating the signals into the indoor area or covered space where satellite signal cannot reach.

- ✧ GNSSRK-M-DV is a single point GPS/GLONASS/Beidou2/Galileo... repeater, one transmitting antenna transmit GPS/GLONASS/Beidou2/Galileo signal. This solution offer adjustable test signal to receiver.

If need extend the system, you can add assemblies and sending antennas, so as to cover satellite signal indoor large area and more rooms or buildings.

Other documents, log in website: : www.gemsnav.com ,or contact:sales@gemsnav.com,

Or call the technical service: 86-755-29644311。

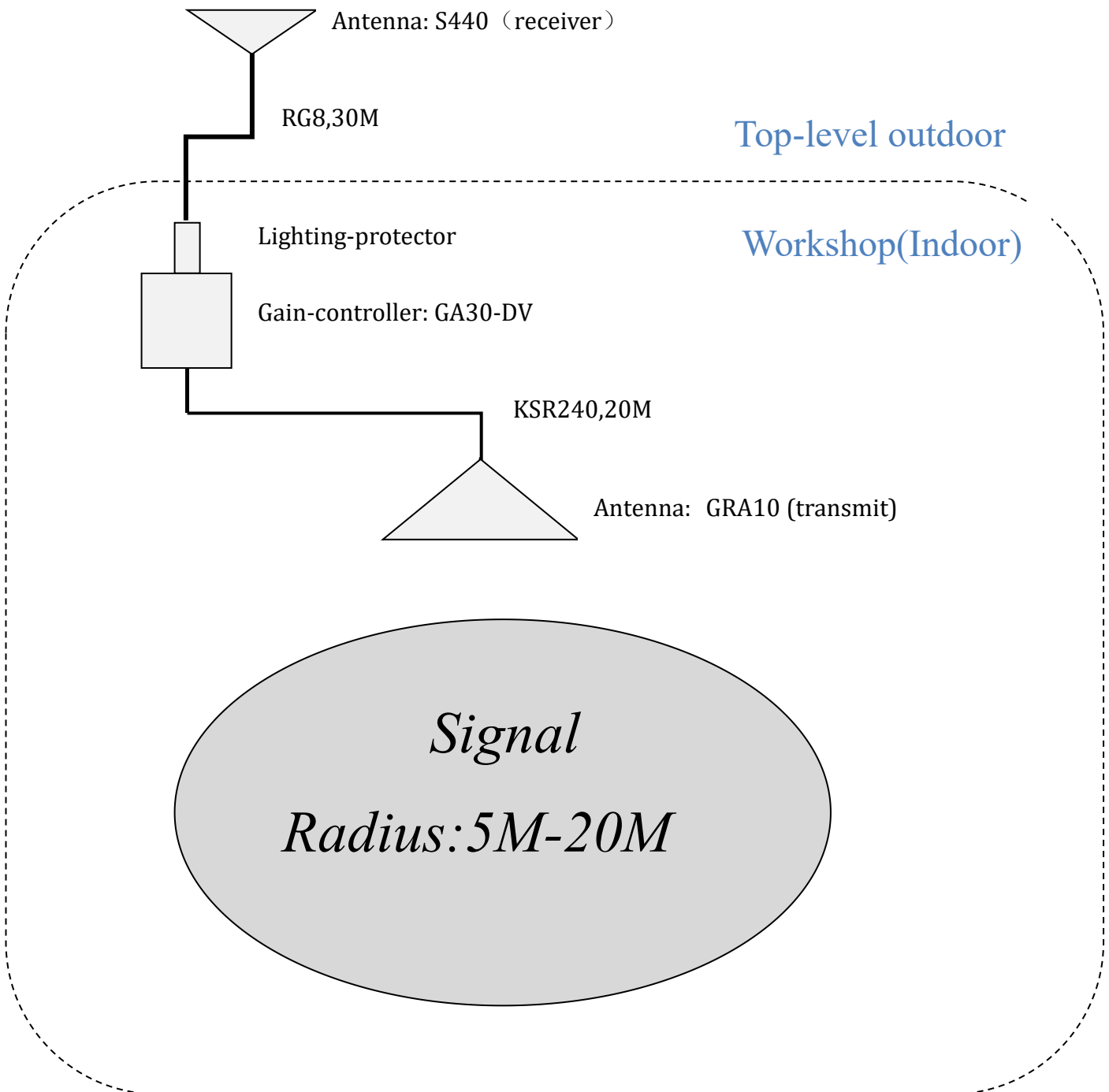
2. Typical Application

- ✧ For GPS/Beidou2/Glonass /Galileo products testing
For testing the cell- phone with GPS/Beidou2/Glonass/Galileo , PND, car navigators, tracker, survey products, etc.
- ✧ For the purpose of GPS/ Beidou2/Glonass/Galileo signal covering
Car parks, lab, aviation manufacturing hangar, trade shows, Emergency-, safety vehicles, public transportation etc.

3. Standard Configurations:

- ✧ **Gain Controller:GA30-DV,1 ea;**
- ✧ **Receiving Antenna: S440,1 ea;**
- ✧ **Cable Assembly:RG8,30M, 1ea;**
- ✧ **Cable Assembly:KSR240,20M,1 ea;**
- ✧ **Sending Antenna: GRA10,1 ea.**
- ✧ **Ligting-protector:1 ea;**

4. Topological (Under standard configuration)



5. Kits include

5.1 Digital Display Step Adjustable Amplifier GA30-DV

5.1.1 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 For 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.



5.1.2 Specification

Electrical Specifications, Operating Temperature -40 to 85° C

Parameter	Conditions	Min	Typ	Max	Units
Freq. Range	In- Output ports, 50Ω	1164		1616	MHz
In &Out Imped	In, all output ports		50		Ω
Gain			0~30		
1207MHz	In- Output ports -45dBm Input Level	(0~30)±1.5	0~30	(0~30)±1.5	dB
1227MHz		(0~30)±1.5	0~30	(0~30)±1.5	
1561MHz		(0~30)±1.5	0~30	(0~30)±1.5	
1575MHz		(0~30)±1.5	0~30	(0~30)±1.5	
1609MHz		(0~30)±1.5	0~30	(0~30)±1.5	
Input SWR				2.5:1	-
Output SWR				2.5:1	-
Noise Figure				3	dB
Gain Flatness				3	dB
Amp. Balance				0.5	dB
Phase Balance				1.0	deg
Group Delay Flatness				1	ns
Current	Pass DC, No Powered configuration, DC input on Out Port			250	mA
Max RF Input	Max RF input without damage			0	dBm

5.2 Antenna

5.2.1 Receiving antenna: S440



Function: receive satellite signals below:

- ✧ GPS: L1, L2, L5;
- ✧ Glonass: G1, G2;
- ✧ Galileo: E1, E2, E5a, E5b;
- ✧ Beidou2: B1, B2, B3;

Specifications:

Frequency [MHz]	1556~1623/1164~1288
Impedance	50Ω
Gain [dBi]	40±2(LNA include)
Polarization	right-hand circular polarized (RHCP)
Axial ratio [dB]	< 3
Elevation Coverage	360°
output (VSWR)	≤2.0
Maximum gain	5.5dBi

LNA Specifications:

Gain(dB)	40±2
Noise figure(dB)	≤2dB
Gain flatness (dB)	±2 dB
Out(VSWR)	≤2.0
Input (VSWR)	≤2.0
Pout at 1dB gain compression point	≥0dBm
Voltage	DC 3 – 12V
DC Current(mA)	DC ≤45mA

Mechanical characteristic:

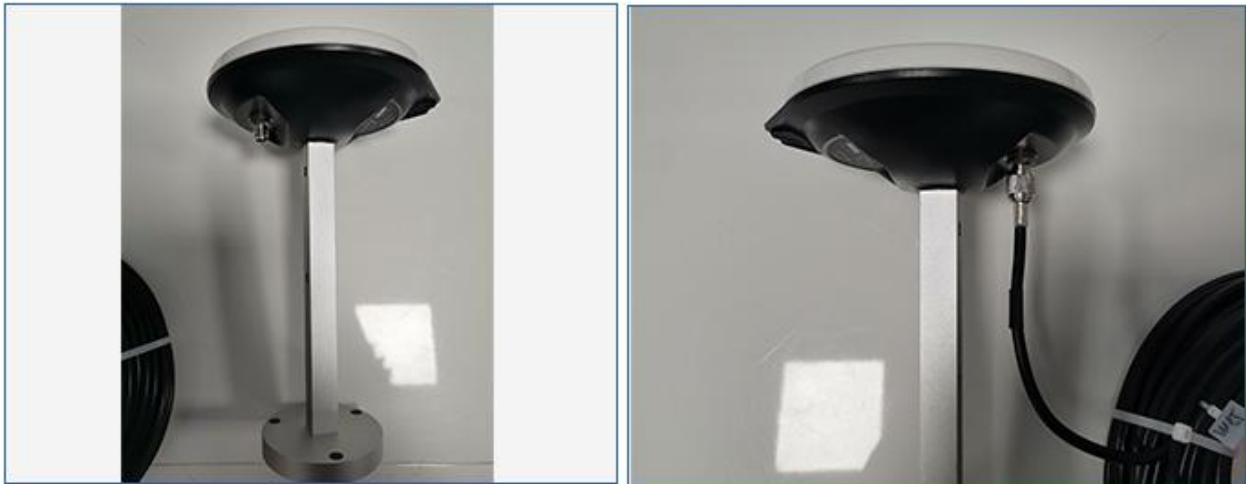
Dimension	Φ 174 x 63
Connector	TNC-C-K
Operation temperature[°C]	~40+85
Reposition temperature[°C]	~55+85
Humidity	95% non-condensin

Installation of GNSS antenna S440

Antenna spacing: > 5M; The transceiver antenna shall not be placed upside down unless otherwise specified in the instruction manual.

The antenna shall be protected by the arrester

Antenna waterproof specification:



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

(2) In the process of winding, stretch the self-adhesive tape to twice the length, and use 60cm waterproof tape for each joint, requiring three layers of winding. The direction of winding should be tightened to the direction of the feed-head to avoid loosening the connection feed-head during winding.

(3) Layer by layer winding, and then reverse direction layer by layer winding, the upper layer covering the next layer about 1/3, so as to prevent rain leakage, and finally reverse direction layer by layer winding, a total of three layers, layer by layer winding waterproof tape, do not cut off the tape in the process of winding. The length of tape winding should exceed the feed head by about 20 mm.



(4) The installed antenna feeder connectors, GPS antenna feeder connectors, and other independent exposed cable connectors should be waterproof in strict accordance with the "1+3+3" treatment (wrapping method of 1 layer insulation tape +3 layer waterproof tape +3 layer insulation tape).

(5) The clinker pipe can also be added to cover the cable part, and the cable joint part can be placed into water.

Waterproof bending

(1) Before the feeder enters the equipment room from the outside, if the feeder is higher than the lower edge of the feeder window, waterproof bend must be made at the outdoor feeder window. The lowest point of each feeder after waterproof bend must be 10 cm lower than the lower edge of the feeder window

(2) Before feeding the feeder into the equipment room, if the feeder is lower than the lower edge of the feeder window, waterproof bend is not required.

5.2.2 Transmitting antenna: GRA10



Function: Transmit satellite signal

- ✧ GPS:L1, L2, L5;
- ✧ Glonass:G1, G2;
- ✧ Galileo:E1, E2, E5a, E5b;
- ✧ Beidou2:B1, B2, B3.

Specifications:

Frequency [MHz]	1150~1800
Input impedance	50Ω
Polarization type	Vertical polarization
Horizontal coverage angle	360°
Input (VSWR)	≤1.45
Gain	3.0dBi

Mechanical characteristic:

Dimension	Φ 186 x 125
Weight	400g
Color	Glossy white
Material	UV-Protected ABS
Connector	SMA Female(TNC,N,BNC,,, optional)
Operating temperature	-40°C -+60°C
Storage temperature	-45°C -+70°C

Installation antenna GRA10

(1) Fix antennas onto the ceiling or concrete beam; generally in the center of the area requiring GPS signal coverage;

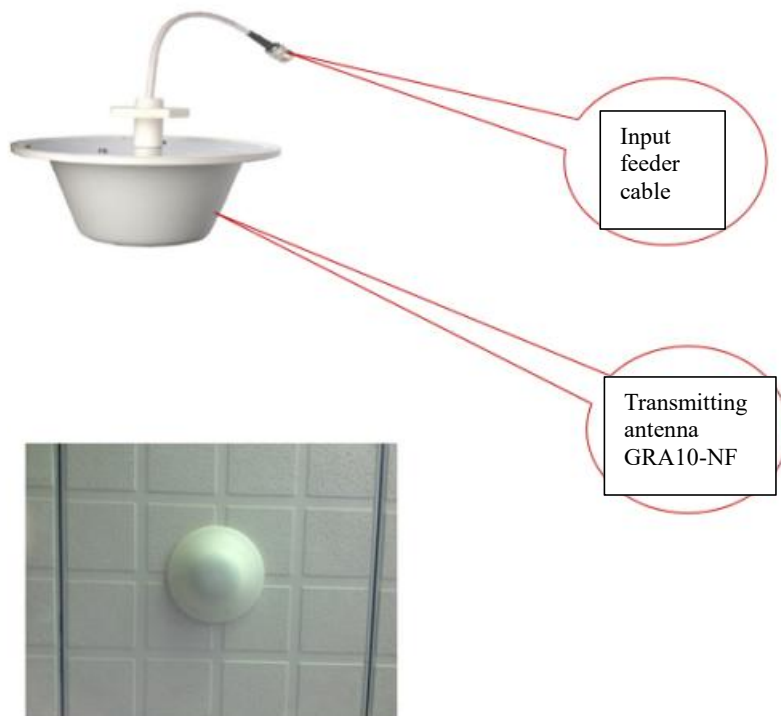
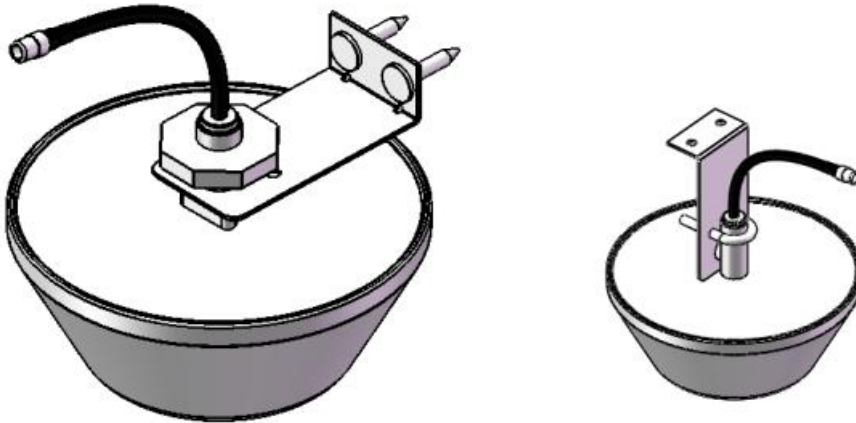


Fig.1 Transmitting antennas are installed onto indoor ceiling, generally in the center of signal interval, as shown in the figure;

Installation instruction: Drill a hole with the diameter about 20mm at the appropriate position on the ceiling, fix antennas onto the ceiling using assorted fastening nut. The ceiling thickness shall not exceed 200mm.

(2) This product is delivered with fixed support and fixed by reference to the illustration.



5.3 Cable Assembly

We apply two cable assembly, RG8,30M and KSR240,20M. Please log in www.gemsnav.com, enter RG8 or KSR240, then you can see the two cable's technical specification.



RG8, 30M

5.3.1 RG8(KSR 400)

RG8,30M is usually used for connecting antenna S440 and lightning-protector. You can calculate the length according to your actual environment.

Connector N Male-T Male.

The attenuation value is 0.2 dB/m; Thus, you can assess the system, or contact with our sales to select proper configuration.

Tel:86-755-29644311

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Email:sales@gemsnav.com

5.3.2 KSR 240

KSR240,20M is usually used to connect GA30-DV and GRA10.

The attenuation value 0.4dB/M.

Connector: N Male-NMale.

5.3.3 Select Connector

Connectors are industrial standard component, below are selectable:



SMA Connectors (Male - Female)



BNC Connectors
(Male & Female)



N Connectors (Male - Female)



TNC Connectors (Male & Female)

6 Installation to Protector and Gain Controller



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;

Fix Gain controller:

You can fix according to the 4 holes location.

Notice: This device includes a power adapter, we suggest to fix it near to the power socket.

Notice for installing protector:

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.

7. System power-supply control



System power-supply be supplied by Gain controller GA30-DV.

After finishing the system installation, power on to the adaptor of GA30-DV, outdoor antenna and GA30-DV were on, system get to work.

8. Typical faults and solutions

Four- system satellite repeater GNSSRK-M-DV fault location and remove:

First: Check the adaptor of GA30-DV, whether it connects to the power supply and power-up to GA30-DV . You can test the voltage between input axis and shell, if it's about 5V, power supply was ok, GA30-DV was also works ok. Or else, check the power socket to assure the contact was ok.

Second: If it's 5V at the input of Gain Controller, 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.

9. Model Naming Rules

GNSSRK-M-DV

Part Number:

Standard:

S440, GA30-DV, with 220/12V Power adapter

Power Options:

Blank (Standard) – With 220/12V Power adapter

10. 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	1249	1266	1268	1278	1290	1335	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								
Glionass(Russia) G1,G2										G2+/-7																			G1+/-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---->															

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