



# NX200 Navigator Precision AG Solution

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The word "Geodesical" in a light blue, sans-serif font, with a light blue orbital ring around the letter "G".

Shanghai HuaCe Navigation Technology Ltd.

-  **Company Introduction**
-  **AG Precision Product Profile**
-  **NX200 composition and Features**
-  **Introduction of NX200 Each Module**
-  **Complementing Plan of Installation**
-  **Product application case**
-  **Cooperation Program**

## Overlook

### Rapid Growth in 2016

- Revenue, CNY 600 million, 43.39% growth (USD 1 = CNY 6.8)
- Profit is good by well operation
- R&D achievements, 10% investment, 200 engineers
- Management system keep improving
- Big improvements of Staff capabilities by keeping training

Sales

Solutions

Management

Policy



## Company Introduction

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# CHC

Focus on High Precision Solution for **13** Years  
Geodesical

China First Surveying GNSSS OEM Board with Proprietary Intellectual Property Rights

China First Large Scale Deformation Monitoring System Application in Bridge

Chinese First GNSS Equipment to the South Pole

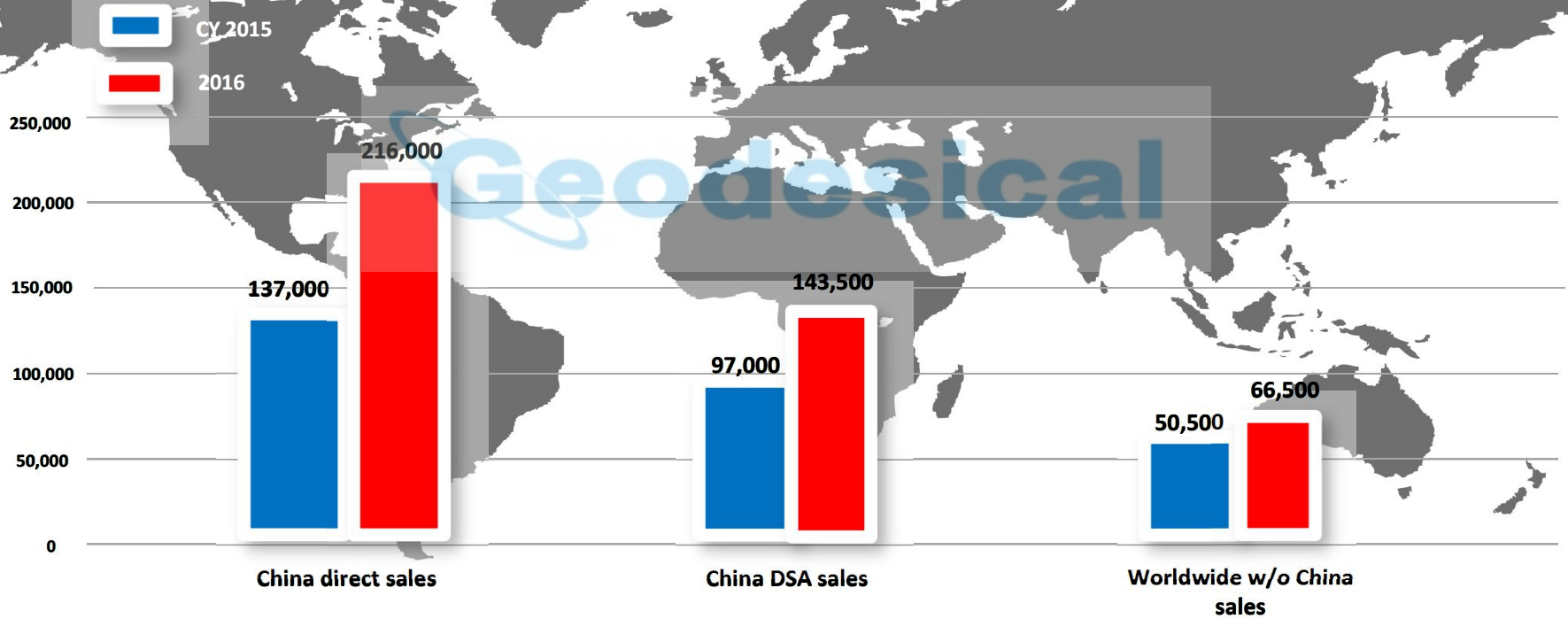
China First Piling Positioning System, Horizontal Accuracy Break the World Record

## R&D Innovation

- 200+ R&D; 50+ with Master and Doctor Degree
- Encourage technology innovation, Annual R&D investment is more than 10% of sales volume
- Strong Matrix Management: Product planning, R&D IPD management, R&D performance management

M&S

### Sales Review – Contribution of Sales Platforms



Patents



R & D Center

223

Intellectual  
Property Rights



**64** Software Copyright

**159** Patents ( **95** invention patents )



Honor



R & D Center

A large red number "59" is centered within a thin black circular border. A faint, light blue watermark with the word "Geodesical" and a globe icon is overlaid on the right side of the circle.

59

Awards

Product Golden Award in the 17th Industrial Exhibition  
Shanghai Technology Progress Award for BDS CORS  
Shanghai Technology Progress Award for Land Surveying GNSS Dual Frequency  
System Key Technology  
Innovation Award for the 6th China Satellite Navigation Conference  
Satellite Navigation and Positioning of Outstanding Engineering and Product  
Award  
Satellite Navigation and Positioning Science and Technology Progress Award  
2015 Satellite Navigation and Positioning Excellent Engineering and Product  
Award  
First Prize of the First Application of the First Beidou Navigation  
China Surveying and Mapping Geographic Information Society "Independent  
Innovation Product Award"

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Cooperation  
R & D Center

10+

Cooperation  
with Institute



**Deformation  
Monitoring**

**OEM Board  
Applicatino**

**Precision  
AGriculture**

**Machine  
Control**

**153**

**UAV**

**GIS**

**Industrial Solutions**  
No. 1 in industrial Applications

**Mobile  
Mapping**

**Marine  
Surverying**

**CORS based on  
Beidou System**

**Land Surveying**



## AG Precision Product Profile

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CHC navigation begin to independent R&D Precision AG Navigation System since 2013, and successfully achieved NX100, NX200 AG auto-driving system, NX80 light bar system, farm land leveling system and AG dispatching system.



AG auto-driving system : NX200、 NX100、 NX80

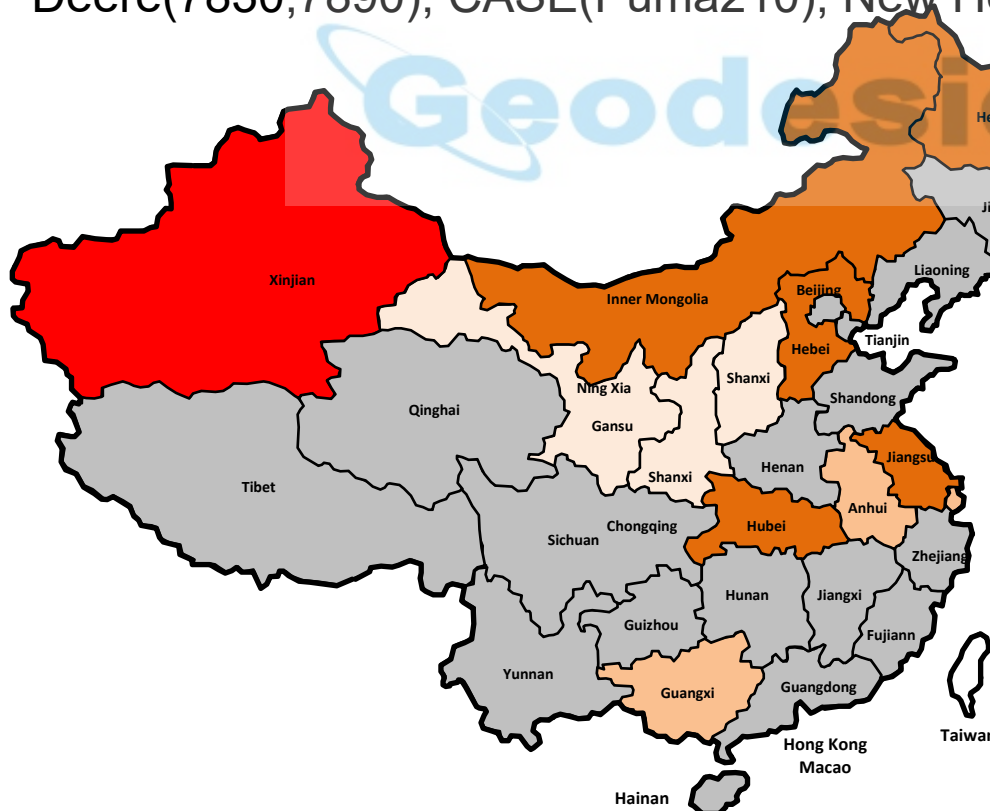
Light bar guidance system : NX80

Farm land leveling system : TD63

AG dispatching system solution

# AG Precision Product Profile

NX100、NX200 already come into chinese domestic, Southeast Asia, West Europe and North American markets. So far, we install more than thousand itema , mainly belong to after installation. Meanwhile, our products have high cmopatibility of different tractors brands such as John Deere(7830,7890), CASE(Puma210), New Holland(2104) and VALTRA.



Sinkiang: 750 sets  
Inner Mongolia: 120 sets  
Heilongjiang: 100 sets  
Hebei: 80 sets  
Jiangsu: 120 sets  
Hubei: 60 sets

# NX200 composition and Features



Navigation Software  
AgNav2.0



Professional Dual antenna



NX200 Control  
Box



Angle Sensor

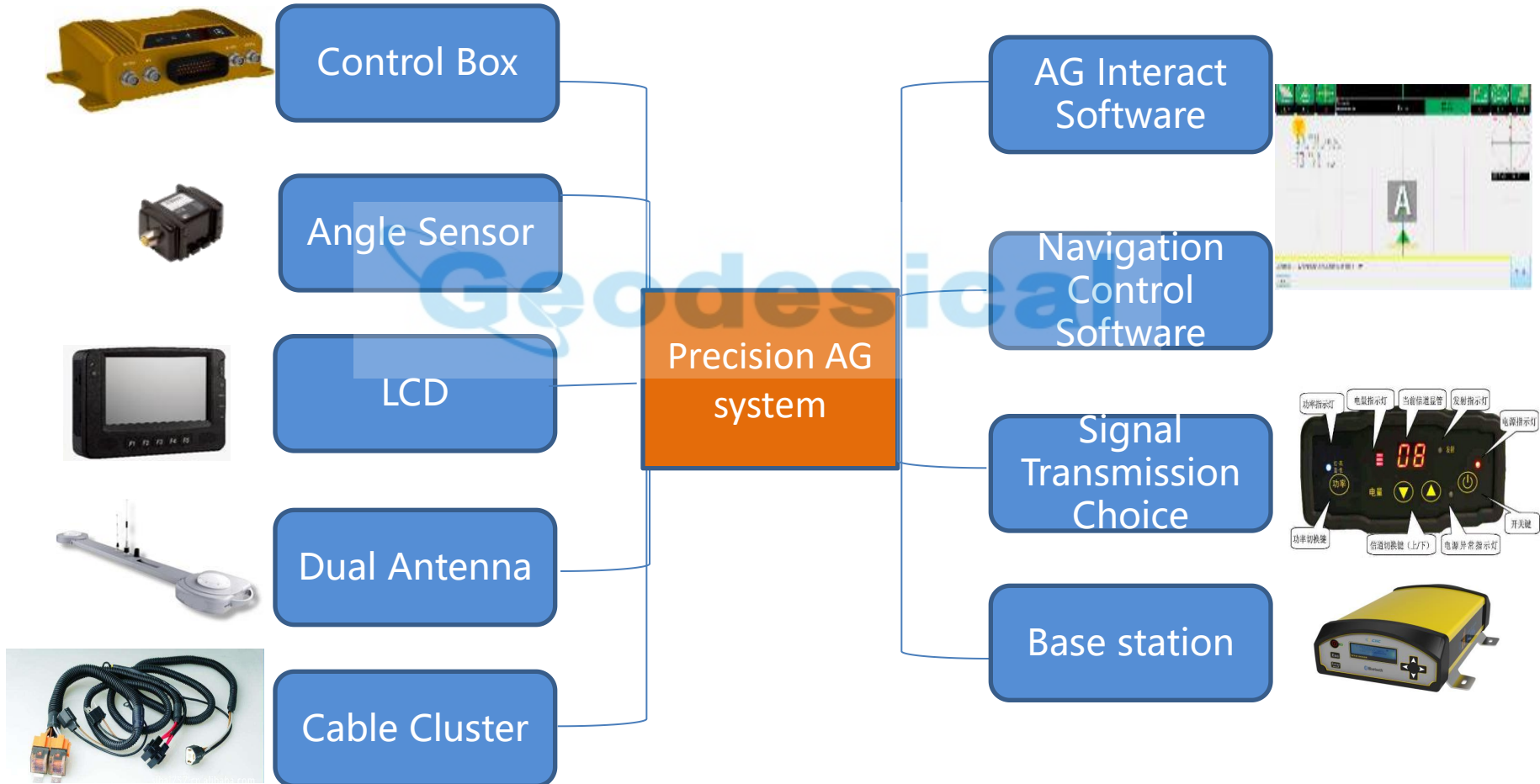


Hydraulic Module



Base station  
**1 Receiver**  
X91,X900,I80;  
**2 Split receiver**  
P3E,N71,N72  
**3 CORS Solution**

# NX200 composition and Features



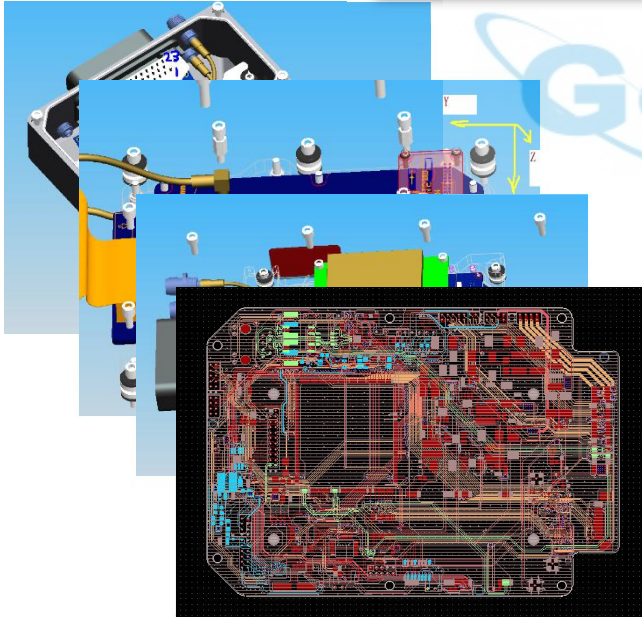
- ◆ Completely independent intellectual property rights
- ◆ Compatible GPS, GLONASS, BDS, Galileo
- ◆ Adopt parallel hydraulic valve control steering system
- ◆ Dual antenna design, High accuracy (2.5cm Lateral Deviation)
- ◆ gyro-angle sensor for optional, easy to install
- ◆ Work line can support: AB line, Equidistant curve, Adaptive curve, Circular curve, Z-line
- ◆ Support online data upload
- ◆ compatible different brand tractors (Open, Close centered system )

## 1 Control Box

### Core Component



NX200



- ◆ GNSS high accurate board
- ◆ ARM Processor
- ◆ IMU Module
- ◆ PLC Controller
- ◆ Radio Module
- ◆ GPRS/3G/4G Module



## 1 Control Box——Intellectual property



NX200

### Key Technologies:

- ① High accuracy, cost effective GNSS/INS Integrated Positioning technology
- ② INS Initialization Alignment Technology based on single GNSS antenna
- ③ GNSS RTK/RTX positioning technology
- ④ Based on AG optimize navigating control technology
- ⑤ Based on adaptive fuzzy control auto-reversing technology

### the relevant patents have reached 14 items

- 1 Method of Realizing Agricultural Machinery Location Based on Satellite Navigation and Pos;
- 2 Strapdown IMU initialization alignment method
- 3 Detection of Vehicle Heading Angle Based on MEMS Sensor
- 4 Access and configuration of GNSS receivers via web pages
- 5 Automatic Vehicle Navigation Based on Adaptive Filtering Algorithm method
- 6 Remote Control GNSS Receiver Based on Mobile Terminal
- 7 Full posture angle update based on Nine-axis MEMS sensor
- 8 Strapdown IMU and control method applied in AG
- 9 Inertial Navigation Initial Alignment Method
- 10 Calibration Method of Low Cost Inertial Coordinate System and vehicle Coordinate System
- 11 High precision calibration method based on low cost attitude measurement system
- 12 Tractor autonomous navigation hydraulic control valve
- 13 Low - cost agricultural full attitude angle calculation and updating device
- 14 GNSS INS Vehicle Steady Attitude Method based on single antenna

## 1 Control Box—Parameters

Work Temperature:  $-40^{\circ}\text{C} - +70^{\circ}\text{C}$

Dimension: 180mm\*120mm\*50mm

SNR: L1 at least two groups are greater than 46, L2 greater than 36

Performance:

· **Linear Autopilot Deviation**

$\leq \pm 2.5\text{cm}$  (Agricultural machinery Speed  $\leq 1.5\text{m/s}$ )

$\leq \pm 4\text{cm}$  (Agricultural machinery Speed  $\leq 2.5\text{m/s}$ )

· **Curve Autopilot Deviation**

$\leq \pm 10\text{cm}$  (Agricultural machinery Speed  $\leq 2.5\text{m/s}$ )

· **Straight Line Spacing Deviation:**

$\leq \pm 2.5\text{cm}$  (Agricultural machinery Speed  $\leq 1.5\text{m/s}$ )

$\leq \pm 4\text{cm}$  (Agricultural machinery Speed  $\leq 2.5\text{m/s}$ )

### System

- Operating System: Linux2.3.6.3

### Positioning Information

- Output frequency for positioning:  $< 20\text{Hz}$
- Initialization time:  $< 10\text{s}$
- Initialization Reliability:  $> 99.9\%$
- Difference Format: CMR, CMR+, SCMRX, RTCM2.1, RTCM2.2, RTCM2.3, RTCM3.0, RTCM3.1, RTCM3.2
- Output Format: NMEA0183 (GGA, GSV, GST, VTG)
- RTK Plane Precision:  $\pm 8\text{mm} + 1\text{ppm}$
- RTK Elevation accuracy:  $\pm 15\text{mm} + 1\text{ppm}$
- Velocity accuracy: Plane  $0.007\text{m/s RMS}$   
Vertical  $0.020\text{m/s RMS}$

### Differential Communications:

- Internal Radio: Protocol Support: CHC/TT450S/Transparent
- Pilot Mode: Auto or manual
- 3G/GPRS Network communication: Support

### Physical

- Voltage for External power: 9~36 V
- Work time: Continuous working time 7\*24h
- Operating temperature:  $-40^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$
- Storage temperature:  $-50^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

### Performance

- The vehicle velocity range: 0-36km/h
- Linear Autopilot Deviation:  
 $\leq \pm 2.5\text{cm}$  (Agricultural machinery Speed  $\leq 1.5\text{m/s}$ )  
 $\leq \pm 4\text{cm}$  (Agricultural machinery Speed  $\leq 2.5\text{m/s}$ )
- Curve Autopilot Deviation:  
 $\leq \pm 10\text{cm}$  (Agricultural machinery Speed  $\leq 2.5\text{m/s}$ )

## 1 Control Box——Installation

**NX100**

**NX200**

Request items	Description
Angle error of controller installation	Horizontal installation error between control box and tractor should less than $\pm 3^\circ$
Coordinate axis correspondence	Two interfaces of the control box should be keep parallel with tractor
Quantity of fixed bolt hole	4,M6
fixed bolt hole size	100*195mm
Wiring harness hole	Main cable diameter is 25mm, antenna, radio cable daimeter is 5mm

## 2 Angle Sensor

It is the important component link that tractor can feedback signal input of front accurate angle

There are two methods for angle sensor installed before the specific implementation

- *The first generation, Capacitive rod type*
- *The second generation, Gyroscope Angle Sensor Based on MEMS Technology*



## 2 Pull lever angle sensor

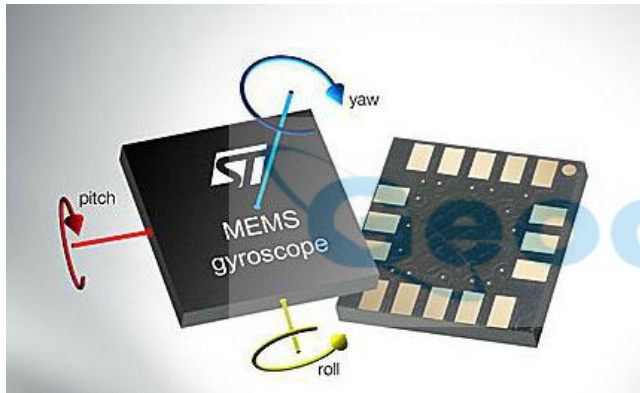
Principle: Based on front wheel rotation through pulling pull rod angle sensor for medial axis rotation, and then detect the variation of the internal capacitance of the sensor, the capacitance value convert to voltage value and achieve the front wheel data collection by ADC sampling and conversion.



### Installation requirements

- The angle sensor has a reading when Angle sensor is under the effective range
- L1 and L2, L3 and L4 must Keep parallel while straighten the tractor head

## 2 Gyroscope Angle Sensor



- Easy to install, only simply fix this module on a rotating shaft of the front wheel based on gyroscope program
- Tractor structure basically do not need to change, only need to reserved install place When the tractor is shipped from the factory

## 3 LCD Display

Two OS platforms( Windows & Android), three LCD display for optional. Customers can customize the design according to their specific needs.



## 4 Dual antenna installation solution

- We can make mounting bracket for fixing antenna
- Integral/Split installation: tractor roof is more than 1.2m



GNSS Antenna

Geodesical



Dual antenna mounting bracket



## 5 Harness

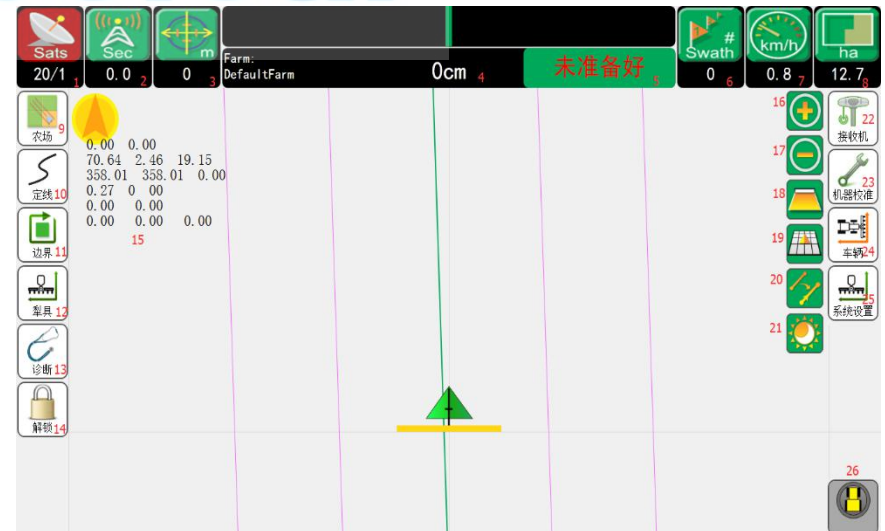


Arrangement of wire must pay more attention the requirements:

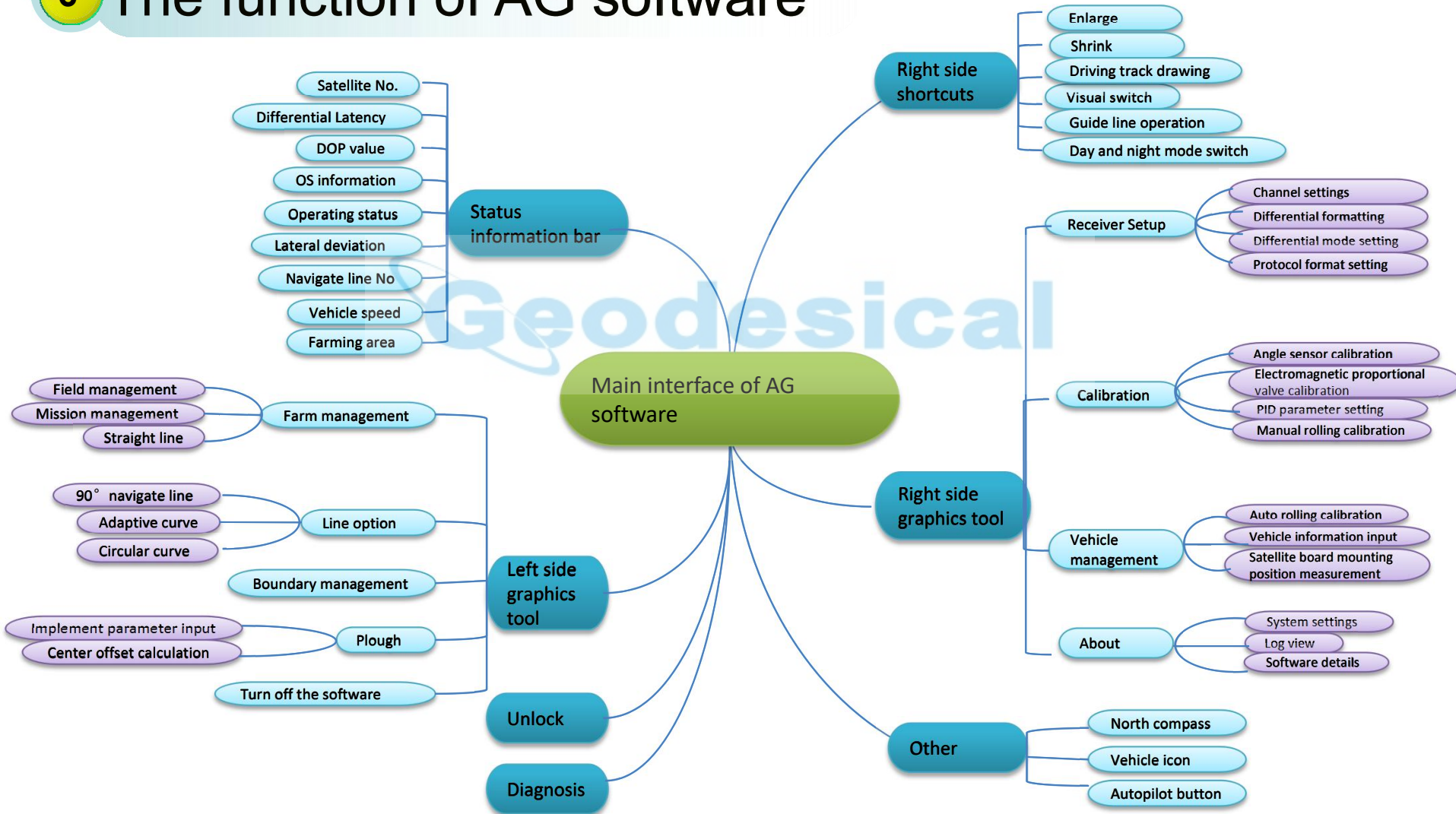
- The harness avoids contact with the rotating or friction parts to prevent wear of the harness
- Angle sensor harness should avoid the wheel and angle sensor rod contact place;

## 6 AG navigation software

Navigation software is a product that interacts directly with the user. It has the functions of navigation route planning, equipment parameter input, calibration and parcel information management. The current navigation software based on Windows version and is being designed to develop Android version.



## 6 The function of AG software



## 7 Communications program

There are two differential methods which are through the fixed base station to send the radio data for receive the differential signals;through the CORS(3G,4G network) base station for obtaining differential signal.

- ◆ **Radio:** one base one rover
- ◆ **Network:** CORS,virtual base station

### Radio mode:

#### ➤ Internal radio

Advantage: configure convenient

#### ➤ External radio(DL6)

Advantage: Wide signal arrangement

、 high stabilization



Software setting interface

## 8 Base station

**Base station**    **1 Integrated Receiver** X91,X900,I80;    **2 Split receiver** P3E,N71,N72

**Broadcast differential data by:**

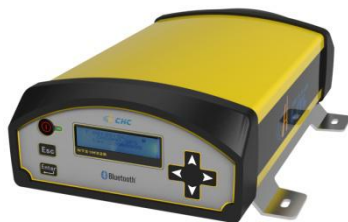
- **Internal/External radio module**
- **GPRS/3G/4G Network communication**



## 8 Base station

### N72 Key Features

- LCD display and configuration buttons
- Smart data logging processing
- 32GB memory embedded and 1TB+ USB storage supported
- Wi-Fi as well as Ethernet and Bluetooth
- Web interface for remote configuration and update
- 15h battery life



**N72**

- 1. Rugged metal design with LCD control panel for quick and easy configuration.
- 2. Embedded with Trimble BD970 technology, N72 supports full constellation for outstanding GNSS performance.
- 3. Based on linux platform, N72 has a mass internal memory of 32GB and supports more than 1TB external memory expansion.
- 4. High-capacity integrated battery, supports up to 15 hours power supply for continuous data recording in emergency.
- 5. Flexible webpage configuration, easy FTP push and remote data download. HRC is CHC compressed format raw data.
- 6. Supporting multiple connections, such as WIFI, Bluetooth, LAN, Serial Port and USB.

# Introduction of NX200 Each Module

## 8 Base station



**Convenient  
High integration  
Cost effective**

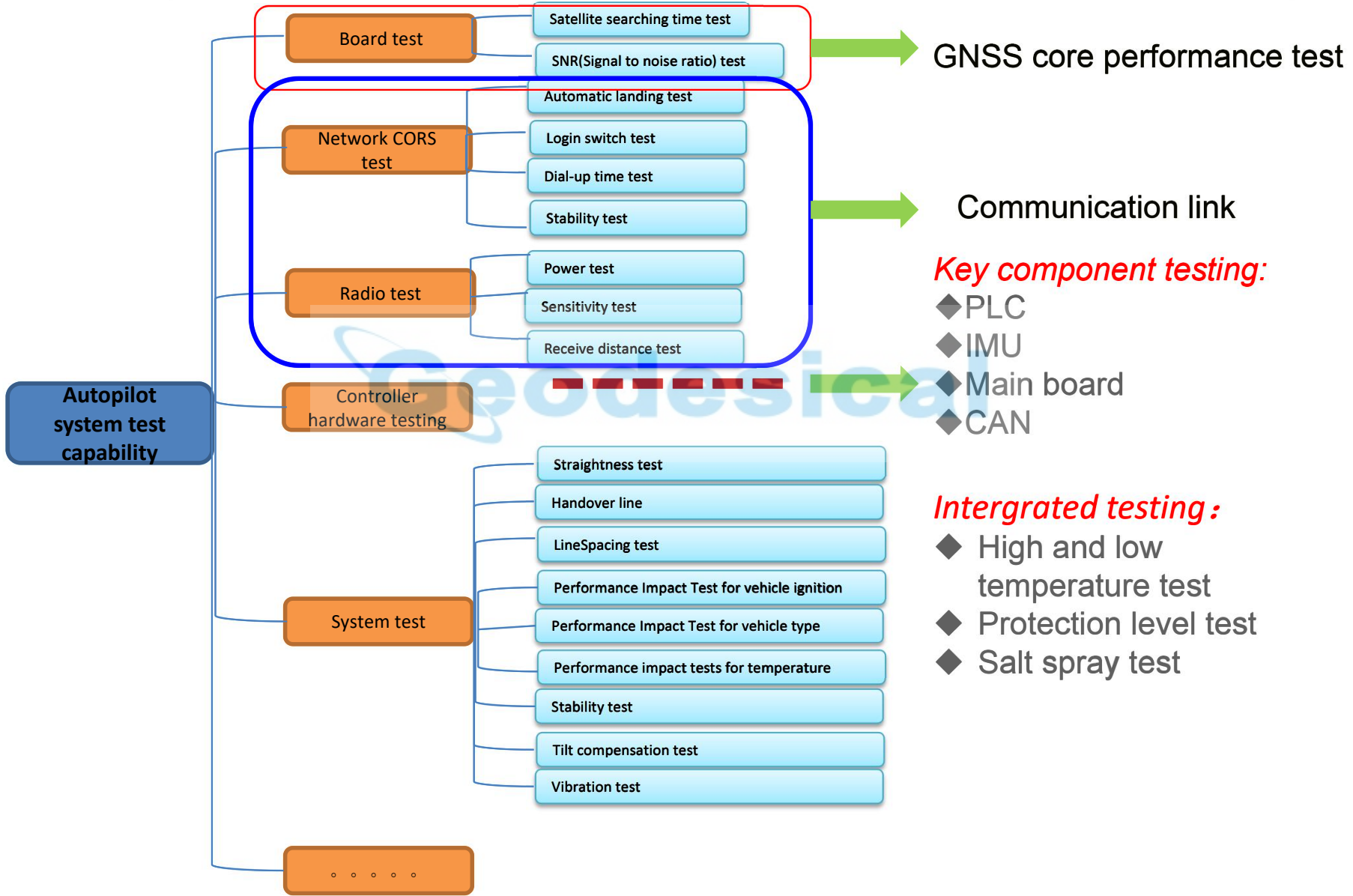


**top ten products of  
Geographic information  
independent innovation**



**Satellite navigation and  
positioning excellent project  
& Products top award**

# Product testing





# Thank you!

谢谢/ 감사합니다/ спасибо/ Merci/ Terima kasih Gracias/ စ ဝ  
ပ ရ န / Dank u/ Salammat Do/ Cảm ơn bạn اركش/ Pakka pér/ م  
مركشت / Kiitos/ ந ண் றி / Děkuji/ ဧ ဝ ဝ ပ ို ခ ဟ ' ဘ  
၂ / та бүхэнд баярлалаа ကျ ဝး ဇူ ဝး တင် ပါ သည် /  
Teşekkür ederim/ köszönöm ...