SMAJAYU
PRECISION AGRICULTURE

JY305
Installation Manual

SMAJAYU(SHENZHEN)CO.LTD

Contents

Add: Room 213-214, Building 1, Mingliang Science Park, No. 88, Zhuguang North Road, Taoyuan
Street, Nanshan District, Shenzhen, China,518055 Tel: +86-075586276295

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SMAJAYU PRECISION AGRICULTURE

1、 Overview

This manual mainly introduces the inventory, installation, etc. of the JY305 system.

2、 Equipment List

This section mainly introduces the list and component functions of the JY305 system.

2.1、 List

Table 2-1

Serial number	Name	Qty	Picture
1	Tablet	1	
2	RAM bracket	1	
3	EMS5 motor	1	
4	spline	1	
5	Steering wheel	1	

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6	Motor bracket	1	
7	Bracket screw pack	1	
8	Screw pack	1	
9	R71 GNSS receiver	1	
10	Mounting plate	1	
11	R71 power supply line	1	
12	Camera	1	
13	Camera extension cable	1	
14	Manual switch	1	
15	Manual switch cable	1	
16	Wheel Gyro	1	

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17	Car radio antenna	1	
18	Gyro cable	1	
19	Gyro mounting plate	1	
20	Main cable	1	
21	Switch	1	
22	Power extension cord	1	
23	Lining	1	
24	Packing box	1	

2.2、Introduction to main components

（1）Tablet

In Table 2-1, accessories (1, 2, 8, 20, 21) are the main accessories for flat panel installation. The tablet is the brain of the entire system, responsible for data calculation, interface display, user operations, and issuance of control instructions.

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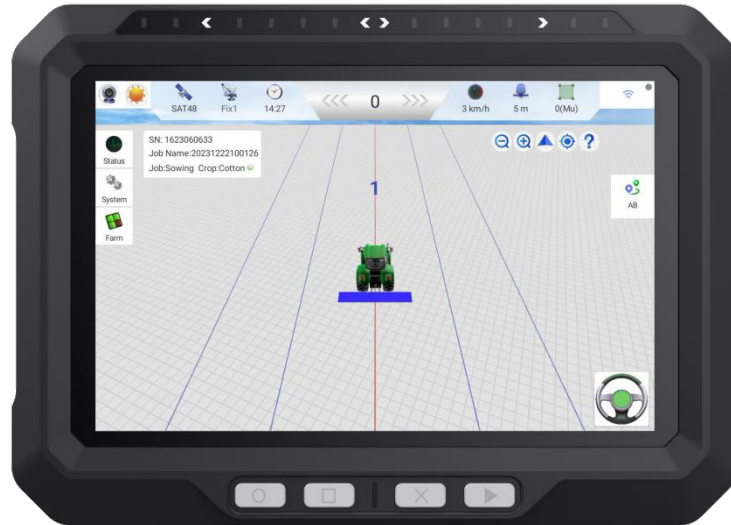
Figure 2-1

(2) EMS5 motor

In Table 2-1, accessories (3, 4, 5, 6, 7, 8) are the main accessories for motor installation. The motor is mainly responsible for receiving the modification instructions issued by the tablet when the equipment deviates from the predetermined path, and then controlling the steering system of the equipment to make corrections.

Figure 2-2

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（3）R71 antenna

In Table 2-1, accessories (9, 10, 11) are the main accessories for R71 antenna installation. R71 is responsible for receiving satellite data and transmitting the data to the board in the display terminal, which is used to calculate the position, speed, heading and other data of the device.

Figure 2-3

（4）Camera

In Table 2-1, accessories (12, 13) are the main accessories for camera installation. The camera mainly captures images of the working area in real time and displays them on the 10 inch tablet.

Figure 2-4

（5）Wheel sensor

In Table 2-1, accessories (16, 18, 19) are the main accessories for wheel sensor installation. The wheel sensor is mainly installed on the steering wheel to obtain the steering angle of the wheel.

Figure 2-5

3、Equipment installation

This section mainly explains the installation of the main components of the JY305 system.

3.1、Tablet installation

The tablet is installed in the cab via a RAM bracket where it is convenient for customers to operate. RAM brackets are generally fixed in two ways: self-tapping screws and U-shaped clamps.

Note: It is preferred to use a U-shaped card to install the flat panel. If you use self-tapping to install the flat panel, you must obtain

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the customer's consent before installation.

Tablet assembly diagram:
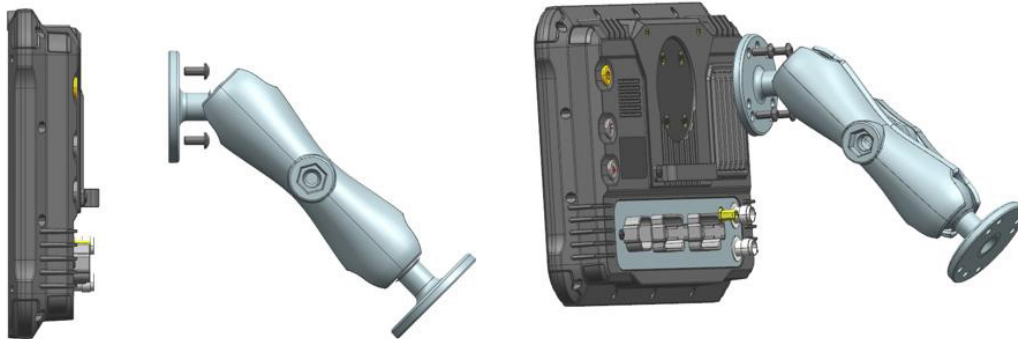
Figure 3-1

Self-tapping screw installation renderings:

Figure 3-2

U-shaped clip installation renderings

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Figure 3-3

3.2、Motor installation

The motor is fixed to the steering column of the equipment through the splines and mounting brackets corresponding to the vehicle model.

（1）Remove the steering column retaining screws and remove the original equipment steering wheel.

（2）Preliminary judgment and measurement of new cars.

Adapting splines: First count the number of teeth to determine how many teeth there are. Note: Count several times and don't count incorrectly. Measure as shown in the picture. The vernier

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caliper should be flat and not tilted. (Contact relevant technology after measuring the value)

（3）Motor assembly diagram.
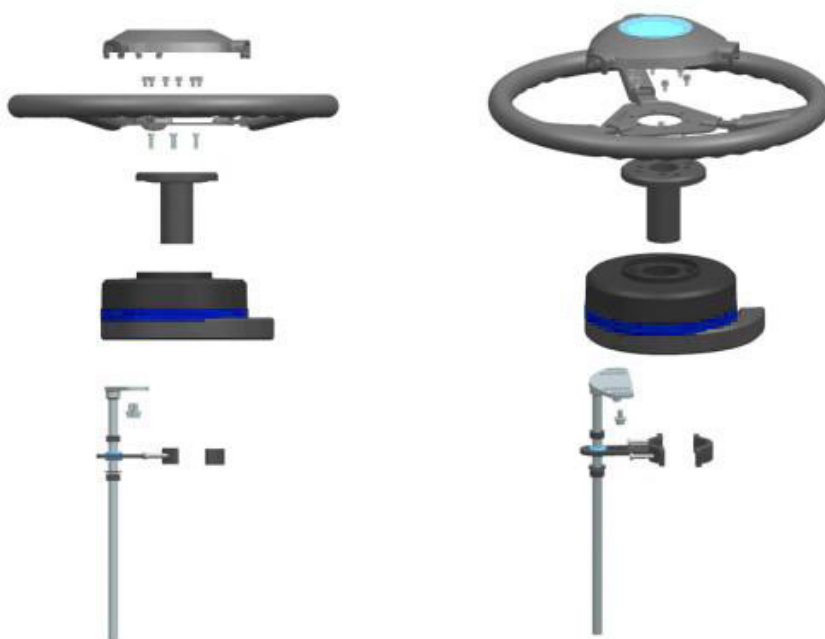
（3）Motor installation renderings

Note: First fix the steering column nut, then fix the motor bracket.

3.3、Antenna installation

The R71 is fixed on the roof via a mounting plate and 3M glue. The radio antenna (optional) is connected to the R71's external TNC connector (labeled RADIO).

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(1) R71 assembly diagram:

（2）R71 actual installation diagram：
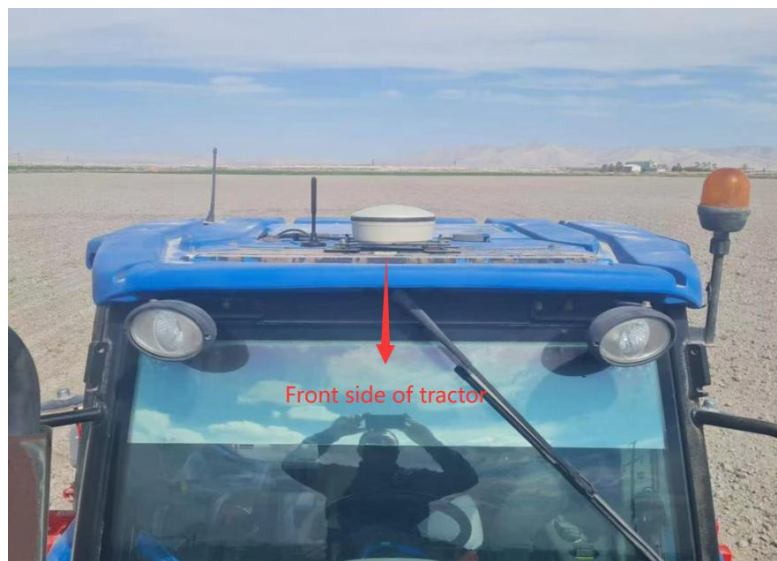
Note: R71 needs to be installed centrally, and the joint side needs to face the rear of the tractor.

Radio antenna installation diagram:

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Note: The radio antenna can be installed at a suitable location on the roof of the car.

3.4、Camera installation

The camera is generally installed at the back and top of the tractor cab of the equipment. When installing, pay attention to adjusting the appropriate angle so that the driver can better observe the rear working conditions.

(1) Actual installation diagram:

3.5、Wheel sensor installation

The wheel sensor is fixed to the steering wheel through the

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mounting plate. The sensor rotates coaxially to obtain the rotation angle. Therefore, part of the sensor is installed in a rotatable place and part is installed in a fixed position.

Taking a four-wheel tractor as an example, the installation method is as follows:

(1) Wheel sensor installation renderings:
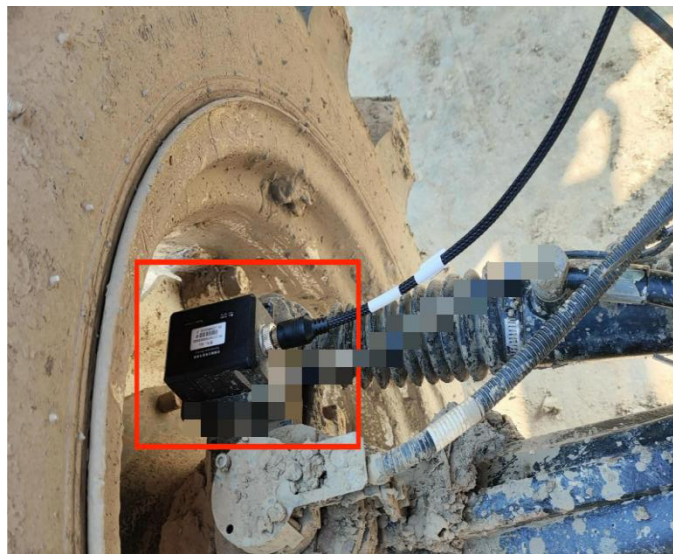
Note: Install to horizontal position.

➢ After installation is complete, slowly turn the steering wheel to check whether the wheel sensor affects the rotation of the wheel.

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3.6、Cable connection

The cable connection diagram is as follows

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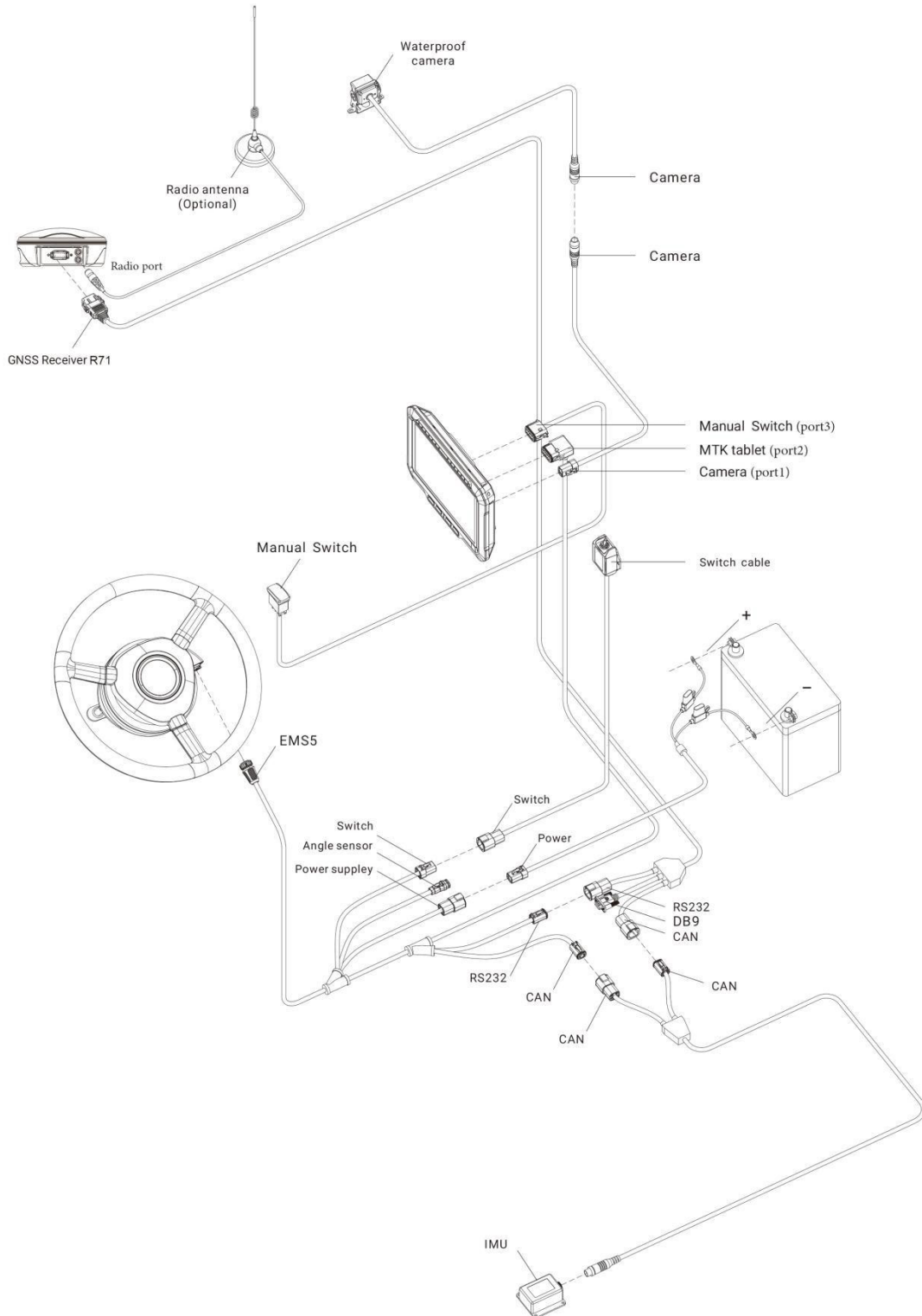
4、Remarks

This section mainly introduces the specifications of hardware

devices and the pin definitions of cables.

4.1、Tablet specifications

◆Technical Features

1、Powerful, stable and reliable car-grade processor，CPU：
MT8768CA；

2、Conforms to IP67 technical specification；

3、Equipped with super 8-core processor, main frequency 2GHz,
onboard 2GB memory, 16GB storage；

4、Canbus、Serial、LTE；USB

5、Wide voltage input, 6-36VDC；

6、Dual SIM；

7、10.1-inch capacitive touch screen, support 10-finger touch,
resolution 1280*800P, brightness 750nits；

8、The system uses Android 12.0；

9、Optical target design, status information at a glance；

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◆Technical Parameters

Electrical Parameters	Power Consumption：≤12.0W Supply Voltage：DC 6～36V
Physical Properties	Operating Temperature：-20℃～+60℃ Storage Temperature：-40℃～+70℃ Resolution：1280*800P Screen Size：10.1 inch Weight： 1.5Kg Degree of Protection： IP67
Communication Interface：	RS232*2 RS485*1 CAN*2 USB2.0*1 DI*2，DO*2 12VDCOUT*1 Analog camera input *4

◆GNSS Parameters

Frequency：	BDS B1I/B2I/B3I

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	GPS L1C/A/L2P (Y)/L2C/L5 Galileo E1/E5a/E5b GLONASS G1/G2 、QZSS L1/L2/L5
Channel：	1408 channels，base on NebulasII
RTK(RMS)：	Horizontal：0.8cm+1ppm Vertical：1.5cm+1ppm
Orientation Accuracy (RMS)：	0.1 degrees/1m baseline
Speed Accuracy (RMS)：	0.03m/s
Differential Data：	RTCM 3.X
Data Format :	NMEA-0183
Initialization Time：	<5s(typical value)
Initialization Reliability：	>99.9%
Time to First Fix：	<25s
Data Update Rate：	20Hz
Roll Accuracy：	0.2 degrees/1m baseline

◆**Interface Definition**

PORT1

1	CAMERA12V
2	GND
3	CAMERAIN3
4	CAMERAIN2
5	CAMERAIN1
6	CAMERAIN4

PORT2

1	RS232A-TX
2	RS232A-RX
3	B+
4	ACC
5	B-
6	GND
7	RS232B-RX
8	CAN1-L
9	CAN1-H
10	INPUT-GPIO
11	RS232B-TX
12	GND

PORT3

1	RS485A
2	RS485B
3	
4	DC12V-OUT
5	CAN2-L
6	CAN2-H
7	N/RJ45TX+
8	N/RJ45TX-
9	12VOUT1/RJ45RX+
10	12VOUT2/RJ45RX-
11	GPIOIN2
12	GND

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◆**Appearance Design**

4.2、EMS specifications

◆EMS5

EMS5 steering drive unit is a self-developed fifth-generation steering control motor for autonomous driving. It adopts an integrated design of drive and control. It has a compact and beautiful appearance, high torque, small size, light weight and high precision. It has been widely used in Smajayu navigation automatic driving system.

◆Technical Features

●Low noise and low heat generation during operation

●The motor needs no maintenance

● IP65 dustproof and waterproof, suitable for harsh

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agricultural working environment

●Integral design of drive and control, beautiful appearance, reducing cable connection

◆Technical Parameters

Electrical Parameters	● Motor Voltage Supply Range: DC6-35V ●Rated Current: 10A, ●Locked-rotor Current: 25A ●Rated Voltage: 12V ●Logic Power Supply Range: no ●Communication Protocol: ModBUS ● Encoder Interface (protocol): parallel, no protocol ●Encoder Maximum Output Frequency: 200KHZ
Physical Properties	●Size: Diameter: 182mm Height:61mm ●Weight: 2.9KG ● Storage Temperature: -45—150 degrees Celsius ● Working Temperature: -40—105 degrees Celsius ● Appearance Material: aluminum alloy ●Rated Speed: 100rpm; ●Rated Torque: 4n.m ●Maximum Torque : 9n.m ●Guaranteed Speed for Continuous Operation: 100rpm ● Maximum Empty Stroke Error: without reducer, no empty stroke error
Data Interface：	●RS232 ●AD conversion ●CAN

◆Interface definition

Pin definition		
SN	Function code	Function Description
1	232-RXD	232 communication RXD
2	232-TXD	232 communication TXD
3	232-GND	232 communication GND
4	PRO	Burn mode
5	SENSOR OUT	External angle sensor Output
6	SENSOR OV	External angle sensor GND
7	SENSOR+5V	External angle sensor VCC
9	CAN-L	CAN
10	CAN-H	CAN
+	+12V	Power supply positive pole
-	-	Power supply negative pole

Note: The external lead plug is as follows

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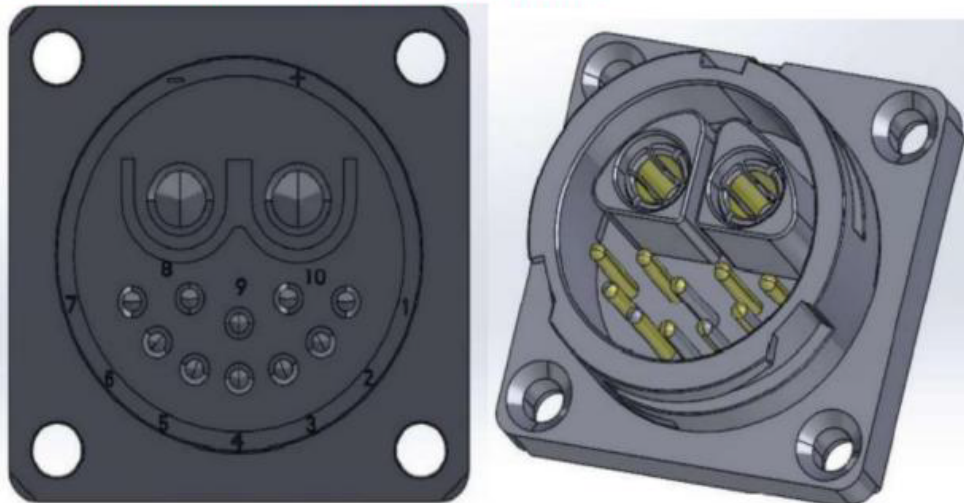
◆Dimensions
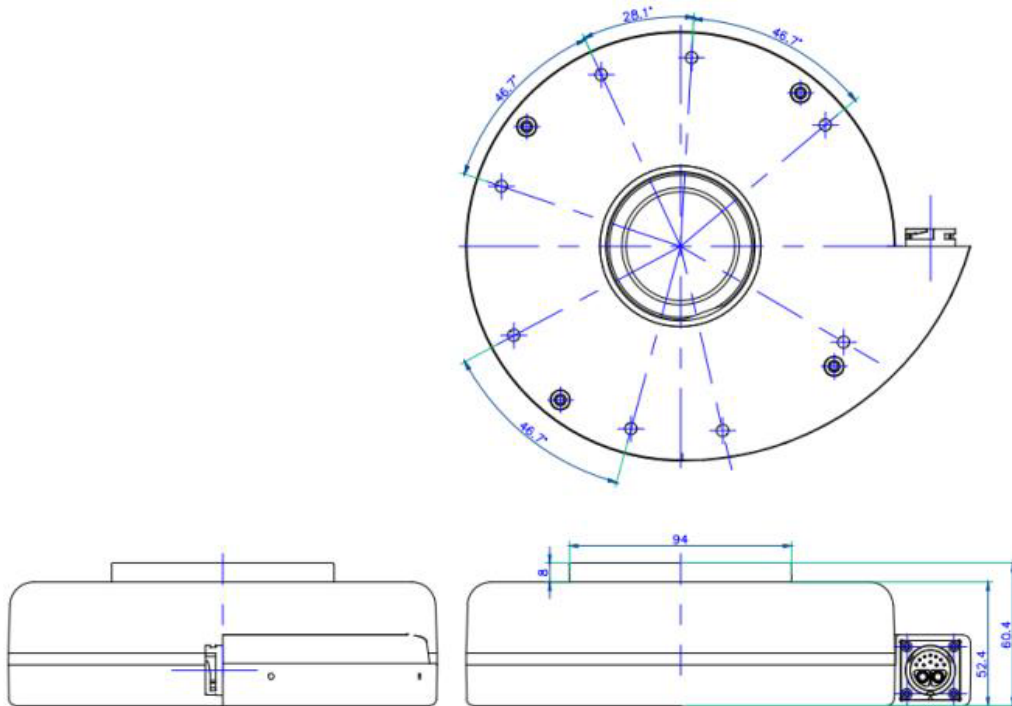
4.3、R71 specifications

◆R71 Integrated Beidou/GNSS Receiver

R71 integrated BeiDou/GNSS receiver is a new multi-functional high-precision GNSS receiver independently developed. It has built-in dual- antenna BeiDou/GNSS high-precision board, radio communication module, inertial navigation combined module, 4G module, etc. It is suitable for many application scenarios such as precision agriculture, construction machinery, and intelligent driving.

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◆Technical Features

- High precision and low power consumption, using Beidou, GPS, GLONASS, Galileo, QZSS and other systems to ensure positioning accuracy in a variety of complex environments;

- Compatible with a variety of Beidou/GNSS high-precision positioning and orientation boards, which can realize single Beidou solution;

- Built-in wireless communication module, various communication protocols, such as transparent transmission, TRIMTALK protocol, etc., are seamlessly compatible with GNSS radios of various manufacturers;

- Wide voltage power supply, voltage range 6 ~ 36 V DC, with positive and negative polarity reverse protection;

- Support remote system upgrade operation to reduce user maintenance costs;

- Integrated design, easy installation, standard IP67 waterproof and dustproof design;

- Integrated inertial navigation module to ensure accuracy in all terrains;

- Adopt professional DEUTSCH communication interface.

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◆Technical Parameter

Signal Tracking

BDS: B1I, B2I, B3I

GPS: L1C/A, L2P (Y)/L2C, L5

GLONASS: L1, L2

Galileo: E1, E5a, E5b

QZSS: L1, L2, L5

Cold start time: < 30 s

Initialization time: < 5 s (typ.)

RTK initialization reliability : > 99.9 %

Recapture : < 1 s

Accuracy Index

Single point positioning:

Plane: 1. 5m

Elevation: 2. 5m

RTK Accuracy :

Flat: $\pm(8 + 1.0 \times 10{-6} \times D)$ mm Note 1

Elevation: $\pm(15 + 1.0 \times 10{-6} \times D)$ mm

Speed accuracy: 0.03m/s

GNSS heading accuracy: (0.2/R)° , R is the baseline distance, in meters

GNSS roll or pitch accuracy: (0.4/R)° , R is the baseline distance in meters

Gyro GNSS fusion heading accuracy: 0.5 °

Angular velocity measurement range: ± 400 ° /s

Acceleration range: ± 8g

Data update rate: 1～100Hz

Electrical Parameters

Power consumption: ≤ 6.0W

Supply voltage: 6 to 36 V DC

Physical Properties

Working temperature: -45 ℃～ +75 ℃

Storage temperature: -55 ℃～ +85 ℃

Size: 195.9mm×84mm

Indicator light: 1 power light, 1 differential signal light, 1 satellite light

Protection class: IP6 7

Shock and vibration: 2m drop resistance

Weight: 1.05Kg

Data Interface：

Data output: NMEA-0183, binary code

Data refresh rate: 1～20Hz optional

Baud rate: 9600 ～ 406800

Deutsch connector : including 1 power supply, 1 USB , 2 RS232 , 1 C AN

Differential format: RTCM3.X

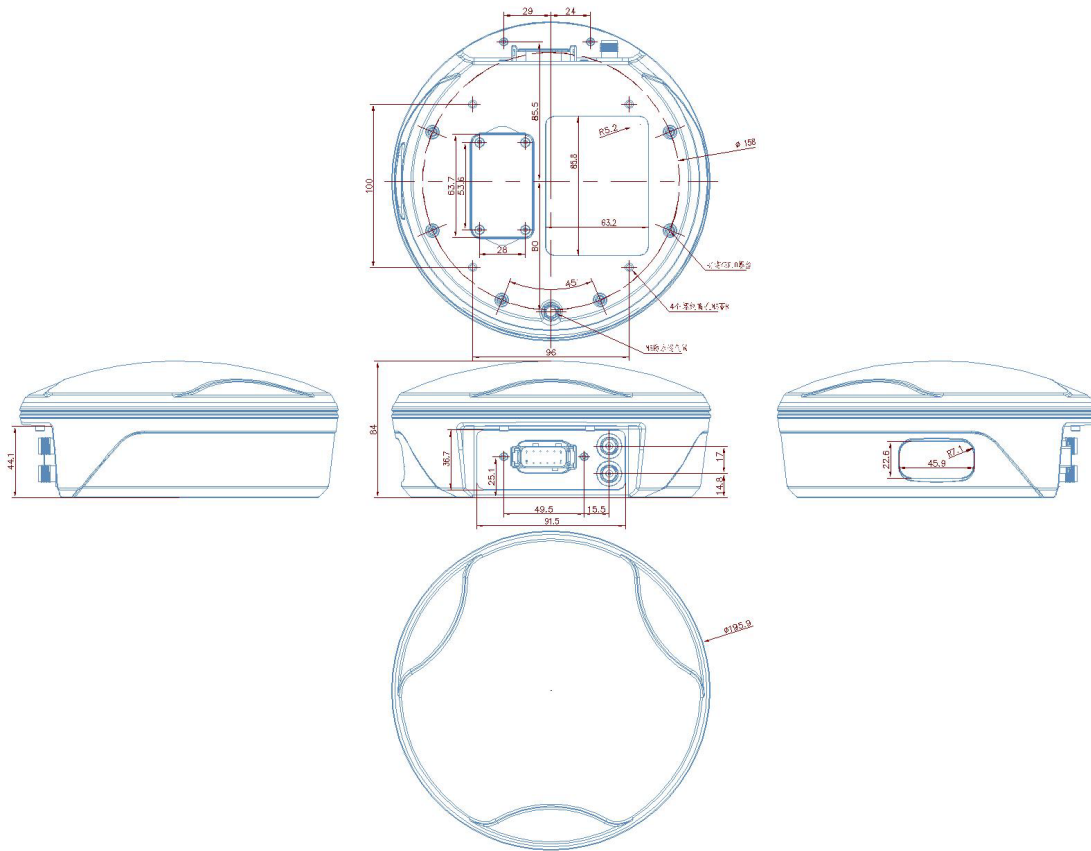Communication: Full Netcom 4G module, UHF radio communication module

Data link antenna : 1

GNSS antenna interface : 1

◆Interface Definition

DEUTSCH HEAD PIN SEQUENCE	definition	port
1	TX	COM RS232
2	RX	
3	D +	USB
4	D -	
5	POW	6～36V DC
6	POW	
7	GND	
8	GND	
9	CL	CAN
10	CH	
11	RX	CONFIG RS232
12	TX	

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◆Dimensions

4.4、Gyro specifications

Data Interface：

● CAN,RS232

technical parameter

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gyroscope	scope	remarks
Measuring range (° / s)	±125	
Temperature drift compensation (° / s)	±0.8	-40℃+125℃
Short-term bias stability (° / h)	<2	
Sensitivity LSB / (° / s)	50	
sensitivity error	±2.5	-40℃+125℃
Linear error (° / s)	±0.5	
Angular random walk (° / h)	<0.4	
Amplitude Response (Hz)	10	10 HZ filter, -3dB frequency
	60	The 60 HZ filter, -3dB frequency
accelerated speed	scope	remarks
Measurement range: X, Y, Z (g)	±2	gaging spindle XYZ
Temperature drift compensation (mg)	±16	-40℃+125℃
Sensitivity of LSB / g °/LSB	Between ± 3°	5886 0.010
Sensitivity temperature offset of	±1	-40℃+125℃

(%)		
The sensitivity error is (%)	±1	
Integrated noise (mgRMS)	1.2	RMS 60hz Filter
Horizontal-axis sensitivity (%)	±0.5	Each axis

◆Interface Definition
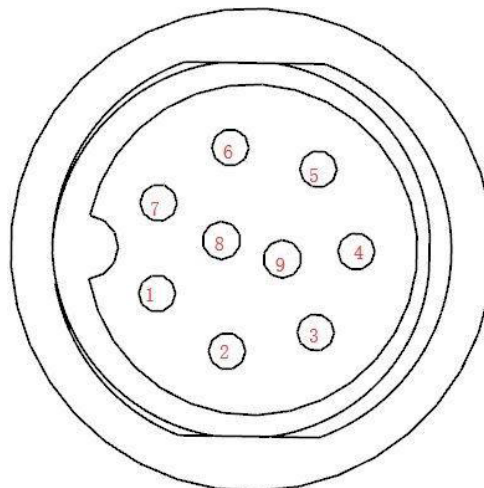
1   foot   power supply, DC 6~36V;

2   feet   power supply ground, GND; 3,4 feet- - -NC;

3   feet   RS232RX;

4   feet   RS232TX;

5   feet   NC;

6   feet   CANH

7   feet   CANL

◆ outline dimension

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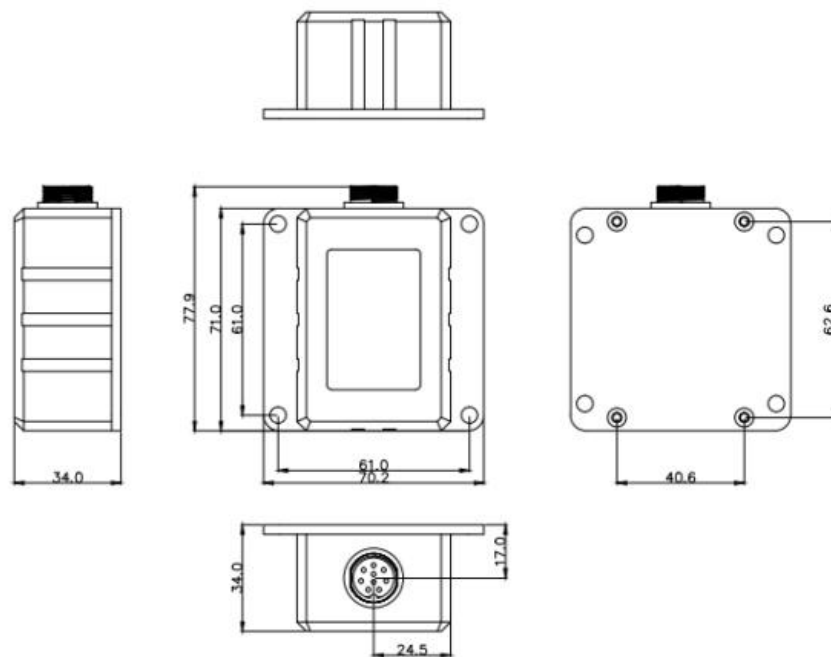
About Us

SMAJAYU was built in 2009, 10years+ experienced the technology changes from traditional devices to smart equipments. Intelligent agriculture empowered SMAJAYU new mission to support Agriculture development.

High-precision and affordable RTK GNSS system boosts the farming technology adoption across all-size farms. Integrated with GPS accuracy technology, SMAJAYU agriculture guidance and auto-steer ensure centimeters precision farming.

The main goals of SMAJAYU intelligent agriculture is optimizing farmer's work, reducing input costs and increasing farm income, promoting farm environment, increasing farm production.

✉ Eml: support@smajayu.com & tech@smajayu.com

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