



**INS 4533 R10 High-precision fiber
optic integrated navigation system**

Technical Manual

V1.0



APPLICATIONS

- Optoelectronic pod, the stability of the antenna system
- Attitude/azimuth reference system, multi-beam attitude sensing
- Railroad track inspection vehicle, UAV, unmanned ship navigation and control
- Space stable platform, intelligent navigation and control of coal excavator and mining excavator

DESCRIPTION

INS 4533 10 is a high-performance and high-precision fiber-optic integrated navigation system developed by AIT for aviation surveying and mapping, unmanned aerial vehicles, sea-based and road-based fields. Built-in three-axis fiber optic gyroscope, three-axis accelerometer, optional three-axis magnetic sensor, high-precision air pressure sensor, including a BD/GPS/GLONASS three-mode receiver. It can measure the speed, position, and attitude of the carrier, and output the compensated angular rate, acceleration,

magnetic field, air pressure, temperature and other information.

INS 4533 R10 is equipped with a brand-new integrated navigation sensor fusion algorithm engine, optimized for multi-path interference, which can well meet the needs of long-term, high-precision, and high-reliability navigation applications in urban and field complex environments. The product supports multiple external sensors such as GNSS/odometer/DVL/barometric altimeter, and has excellent scalability. By using multi-sensor data fusion technology to combine inertial measurement with satellite navigation, odometer information and other information, the system can be regional adaptability and robustness have been greatly improved.

INS 4533 R10 integrated navigation system uses tight coupling technology to closely combine high-precision, professional-grade, multi-channel, dual-antenna single-frequency carrier phase and pseudo-range GPS receivers with high-precision optical fiber inertial measurement units. It has small size, light weight, and Features such as high performance.



SPECIFICATIONS

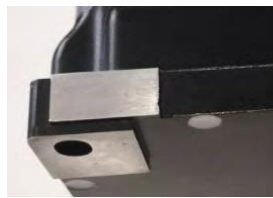
Table 1.

Parameter	Typ.	Unit/Note
North Seeking Accuracy	$\leq 0.5^{\circ}$ Secant Latitude	(deg)
Heading accuracy	≤ 0.05 (RMS, single antenna dynamic alignment)	(deg)
Attitude accuracy	≤ 0.05	(deg)
Position accuracy	Satellite combination ≤ 1.5 m (single-point positioning, RMS)	M
	DVL combination 1% x D (D is distance travelled)	M
	Odometer combination 0.3% x D (D is distance travelled)	M
Speed accuracy	≤ 0.03 m/s (satellite combination, RMS)	(km)
Start-up time	≤ 5 S	
Alignment time	$\leq 1-2$ min (dual antenna satellite assist)	min
Data refresh rate	0.1-100	(Hz)
Gyroscope range	$\pm 1000^{\circ}$	/s
Zero bias stability	$\leq 0.05^{\circ}$	/h
Accelerometer range	± 30 g	g
Zero bias stability	≤ 50 ug	ug
Supply voltage	18-36V(DC)	
Operating temperature	-40℃~65℃	℃
Storage temperature	-50℃~80℃	
Physical dimensions	145×121.5×125(mm)	
Shock vibration	Meet GJB150.16A-2009,	
Power consumption	≤ 20 W	
Material	Aluminium alloy	
Weight	≤ 2.6 kg	Kg
Interface form	1×RS232, 2×RS422, 1×PPS, 1×CAN, 1×RJ45	

Installation

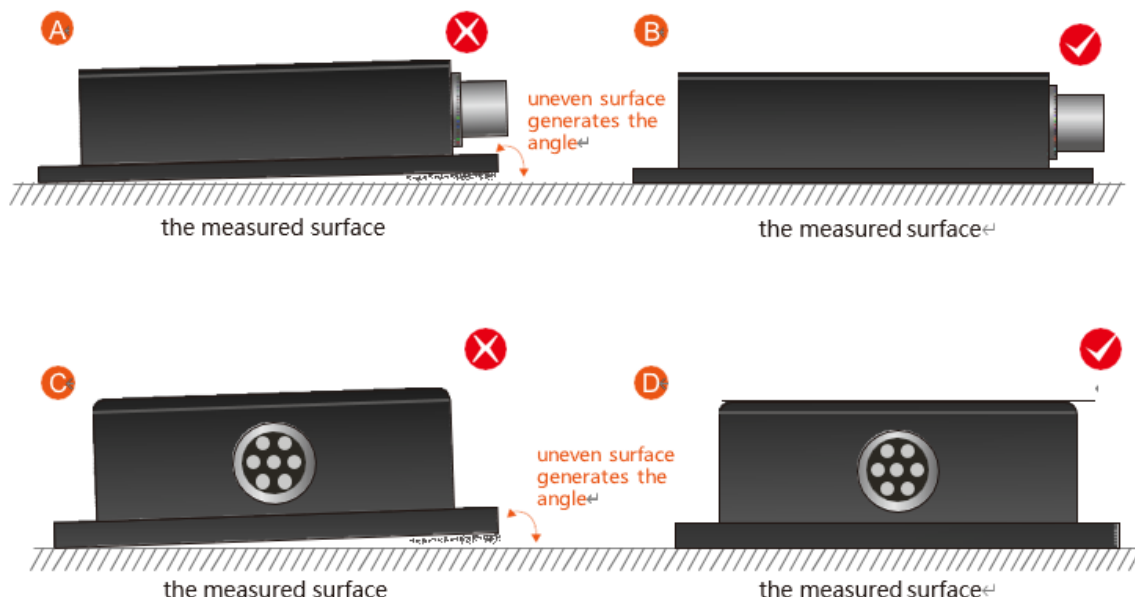
The GPS antenna we routinely select is a zero-phase measurement one, and general navigation antennas cannot be used in this product. Although some navigation antennas can also be directional, the accuracy will be greatly reduced and errors may also result. If the user replaces an antenna that is not configured or designated by the company, the system will not work properly or other consequences will occur, and the company is not responsible for this.

The correct installation method can avoid measurement errors. The integrated navigation system uses CNC grinding to machine the bottom surface and the measuring surface to make an absolutely smooth surface for easy installation. The following points should be done during installation:



First of all, you must ensure that your equipment has two absolutely smooth planes, and the two planes are absolutely perpendicular, and coincide with the body coordinate system as much as possible to reduce installation errors.

Secondly, while installing the product, the bottom surface of the integrated navigation system coincides with the bottom surface of the aircraft body. Gently push the integrated navigation system to make the combined navigation system and the aircraft surface overlap to ensure that the two surfaces are in close contact with each other. The angle shown is generated, and the correct installation method is shown in Figure B and Figure D.





Finally, after the integrated navigation system is closely attached to the body, use screws to ensure tight fixation, smooth contact, stable rotation, and avoid measurement errors due to acceleration and vibration. Remember that at this time, the screw only serves as a fixing function, not a positioning function. The screw hole of the integrated navigation system is processed into an oval shape for easy adjustment.

Electrical connection

XCE12F3Z1D1 The connector interfaces are defined in the following table

No.	Definition	Remarks:
1	VCC+	Power supply (18-36V)
2	GND	
3		N/A

XE24F26Z1D1 The connector interfaces are defined in the following table

No.	Definition	Remarks:
1	RS422 _ T+	RS422 COM1
3	RS422 _ T-	
5	RS422 _ R+	
7	RS422 _ R-	
9	RS422 _ T+	Reserve
11	RS422 _ T-	
13	RS422 _ R+	
15	RS422 _ R-	
Other		N/A

DIMENSIONS

Outline Dimensions: L145×W121.5 ×H125 mm

Top View	Side View
Bottom View	Unit: mm (Inch)

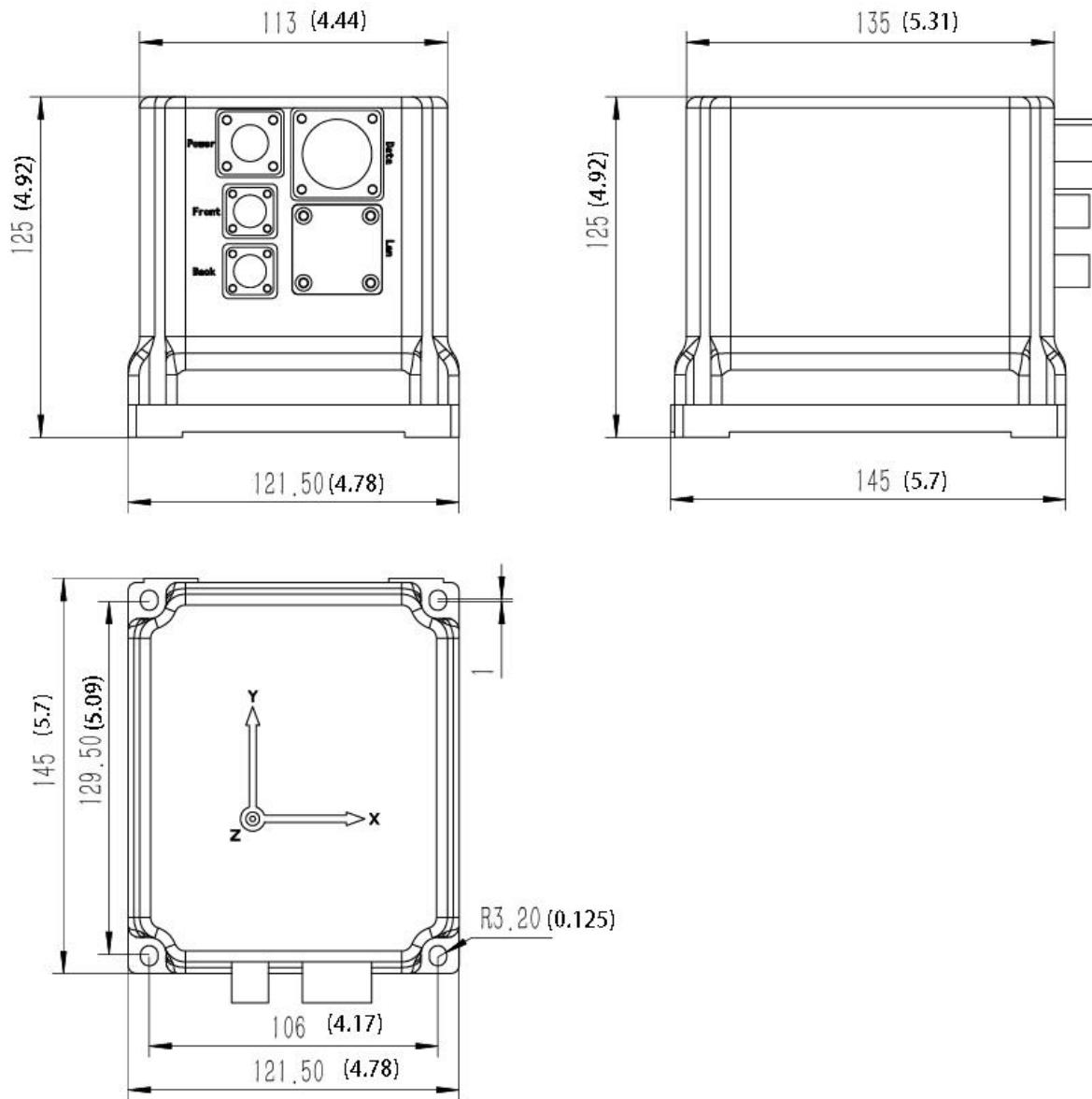


Figure 1. Outline Dimensions

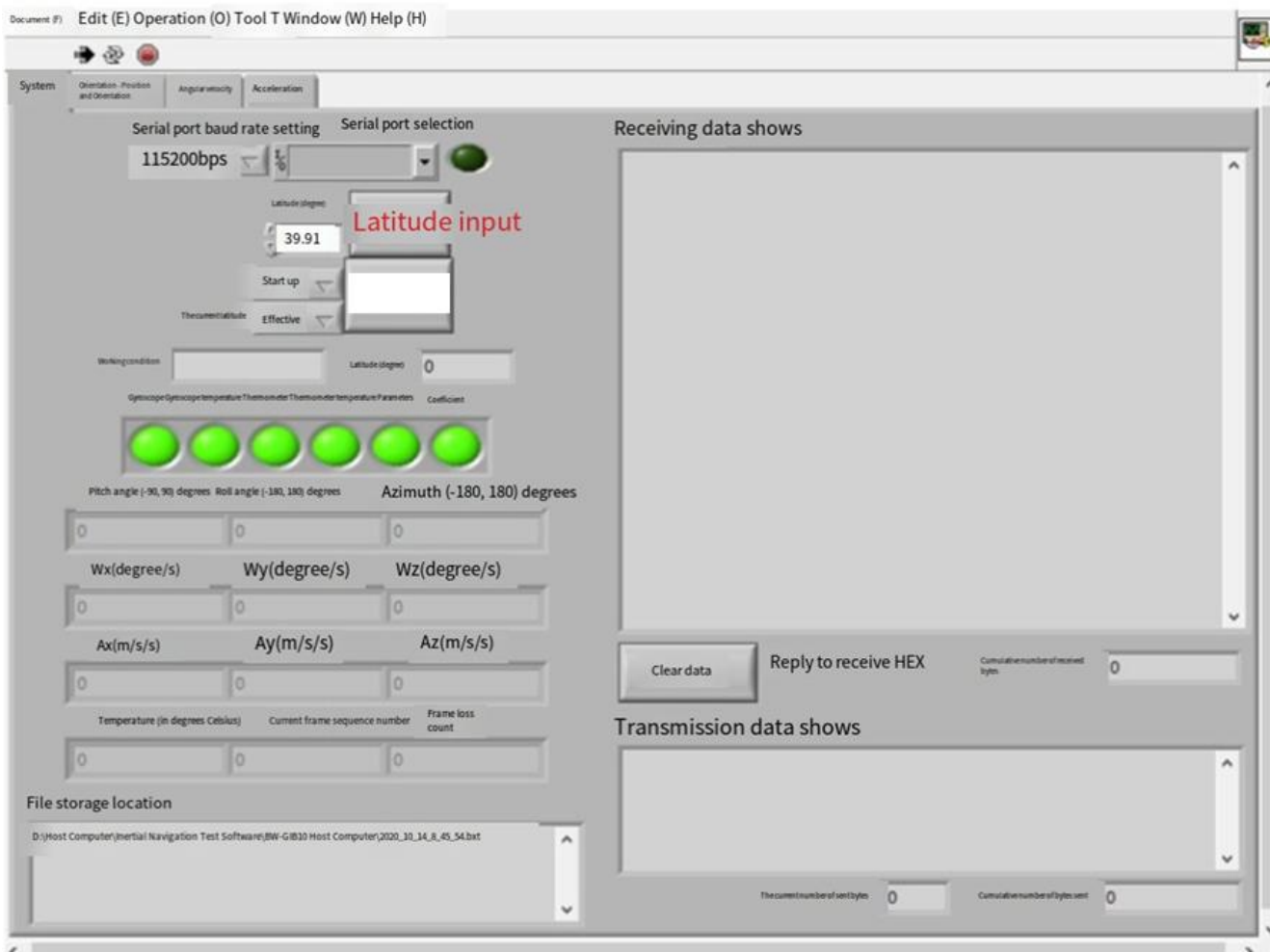
Note: No dimension tolerance is specified according to grade C of GB/T1804-2000.



Debugging software

Steps for usage:

- ① Ensure that the inertial navigation is absolutely stationary, correctly connect the serial port hardware of the integrated navigation, and connect the power supply.
- ② Select computer serial port and baud rate, next click connects serial port.
- ③ Enter the correct geographic latitude, click Inertial Navigation Start → Command Enter, and the working state on the screen shows static alignment. After the working state becomes INS navigation, the inertial navigation enters the working state and can be used at this time.



Executive standard

- National Standard for Static Calibration Specifications for Dual-Axis Inclination Sensors (Draft)
- GB/T 191 SJ 20873-2003 General Specification for Inclinometers and Levels