



V1.4

HIGH ACCURACY DIGITAL DISPLAY 3D COMPASS

RION SDC620B

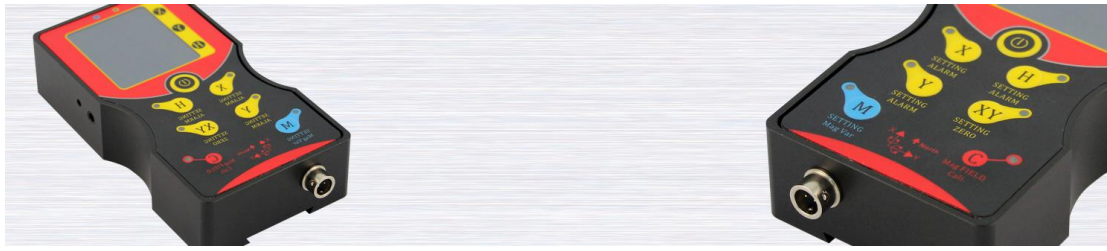
Technical Manual



PRODUCTION IMPLEMENTATION STANDARD REFERENCE

- Enterprise quality system standard : ISO9001:2008 standard (certification number: 128101)
- Inclination sensor production standard: GB/T 191 SJ 20873-2003 General specification for inclinometer and level
- Dip Sensor Metrology Calibration Standard: JJF1119-2004 Electronic Level Calibration Specification
- Gyro acceleration test standard: QJ 2318-92 gyro accelerometer test method
- Software Development Reference Standard: GJB 2786A-2009
- Product environmental test test standard: GJB150
- Electromagnetic anti-interference test standard: GB/T 17626
- Revision time: 2020-12-16
- Note: Product functions, parameters, appearance, etc. will be adjusted with the upgrade of the technology. Please contact the pre-sales business of the company for confirmation when purchasing.

SDA620B HIGH ACCURACY DIGITAL DISPLAY 3D COMPASS NORTH FINDER



► GENERAL DESCRIPTION

SDC620B is a new type 3D full-posture compass north finder which launched by our company to the satellite search industry , using USA fluxgate technology and advanced hard iron and soft iron calibration algorithm, to make it still can provide the high accurate heading information in tilt 360 ° status , still can accurately show the direction angle when tilt 360deg to identify the relative heading position . SDC620B belongs handheld digital instrument and can remote transmit the 3D data to a computer, through RION PC software to proceed with synchronous monitoring and saving data(this function is optional).The products integrated design pitch, roll and heading alarm functions, such as setting the heading angle with 0 degrees alarm point, when products go to 0 degrees position will drive buzzer alarm, humane alert the operator to use. Can also set the magnetic declination and calibrate the magnetic field functions etc. through manual button .

SDC620B display unit using the industrial wide temperature digital blue tube, built-in high-capacity rechargeable battery, the battery life can up to over 10,000 times (when low power with the alarm function), can use 220V pluggable charging, convenient and quick.

► FEATURES

- ★ Heading accuracy: 0.3°~05°
- ★ Heading measuring range:360°
- ★ Wide temperature range: -20℃~+80℃
- ★ IP65 protection class
- ★ With soft、hard magnetic field calibration
- ★ RS232、RS485 Serial data synchronization output (optional)
- ★ Diversified combination mode(external connection 3D compass are optional)
- ★ Industrial digital tube display ,wide temperature, night vision
- ★ Handheld、dovetail groove installation integrated design
- ★ With hard magnetic ,soft magnetic and angle compensation
- ★ Relative 、absolute Zero setting
- ★ Tilt angle accuracy : 0.1°
- ★ Size: L113×W20×H20mm
- ★ 8 hours work continuously endurance
- ★ Low power charging alarm function

► APPLICATION

- ★ Satellite antenna search satellite
- ★ GPS integrated navigation
- ★ Pile Driver Angle real-time monitoring
- ★ Geomancy surveying and mapping
- ★ Marine navigation surveying and mapping
- ★ Antenna servo control
- ★ Map for plotter
- ★ Oceanography measurement instruments

SDA620B HIGH ACCURACY DIGITAL DISPLAY 3D COMPASS NORTH FINDER

► ELECTRICAL CHARACTERISTICS

SDC620B

Technical Data

		Technical Data
Compass heading parameter	Heading accuracy	0.3°~0.5°
	Measuring range	360°
	Resolution	0.1°
	Repeatability	0.1°
Compass tilt parameter	X Pitch accuracy	0.1°<15° (Measuring range)
		0.2°<30° (Measuring range)
		0.3°<60° (Measuring range)
		0.4°<360° (Measuring range)
	X Pitch tilt range	±180°
	Y Roll accuracy	0.1°<15° (Measuring range)
		0.2°<30° (Measuring range)
		0.3°<60° (Measuring range)
0.4°<85° (Measuring range)		
Y Roll tilt range	±85°	
Resolution	0.1°	
Calibration	Hard iron calibration	Yes
	Soft iron calibration	Yes
Physical features	Dimension	L125mmxW67mmxH28mm
	Weight	285g
	RS-232 data output optional	Industrial pluggable connector 5 pins
Interface features	Start delay	<50MS
	Maximum sampling rate	20Hz/s
	Communication rate	2400 to 19200baud
	Output format	Binary high performance protocol
Power	Voltage support	Built-in 3.7V rechargeable lithium battery
		External DC12V power supply (optional)
	Current(Maximum)	40mA
	Ideal mode	20mA
	Sleep Mode	TBD
Environment	Operating range	-20℃~+80℃
	Storage temperature	-40℃~+100℃
	Resistance shock performance	3000g

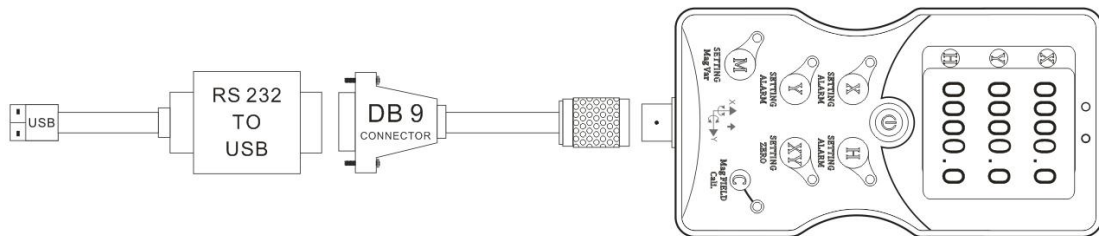
SDA620B HIGH ACCURACY DIGITAL DISPLAY 3D COMPASS NORTH FINDER

► ORDERING INFORMATION

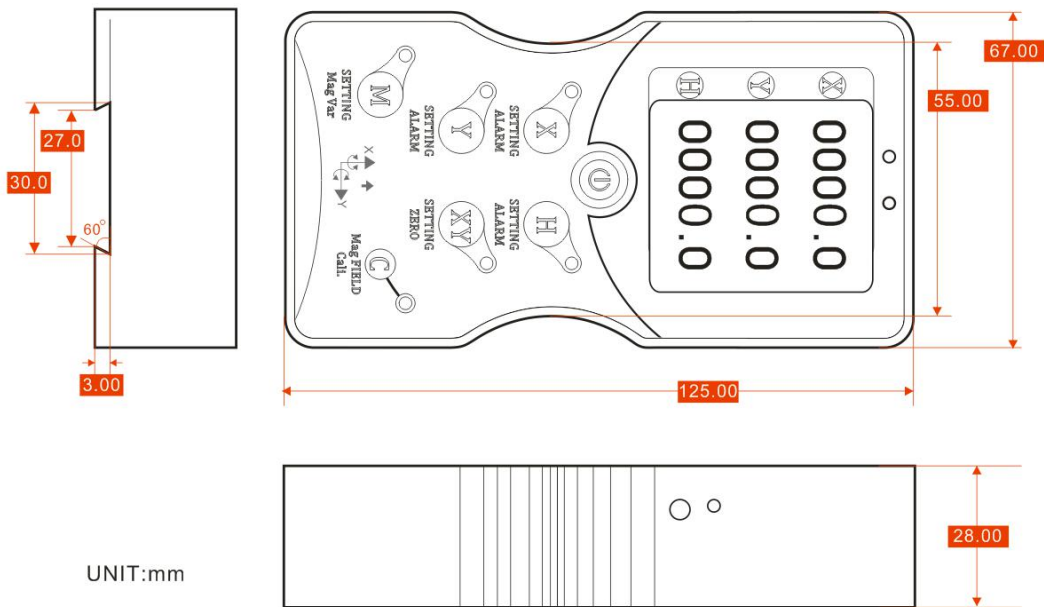
Item No.	Order Description
SDC620B-XXX	Description:
XXX: 232	RS232 Serial data output function (Standard with 1.5M cable)
XXX: 485	RS485 Serial data output function (Standard with 1.5M cable)
E.g: SDC620B-232	Standard SDC620B 3D compass north finder / RS232 Serial data output function
SDC620C	Order Description
SDC620C: means the instrument not integrated the measuring compass inside, only with display and key functions , must be remote connected with another one supporting compass through a cable for using , only limited to RION compass for supporting .	

► SDC620B SUPPORTING SELECTION

If the optional with data output function, our company will provide a connection cable that convert DB 9 to USB , you can connect it directly to your computer (see below chart)



► SIZE



UNIT:mm

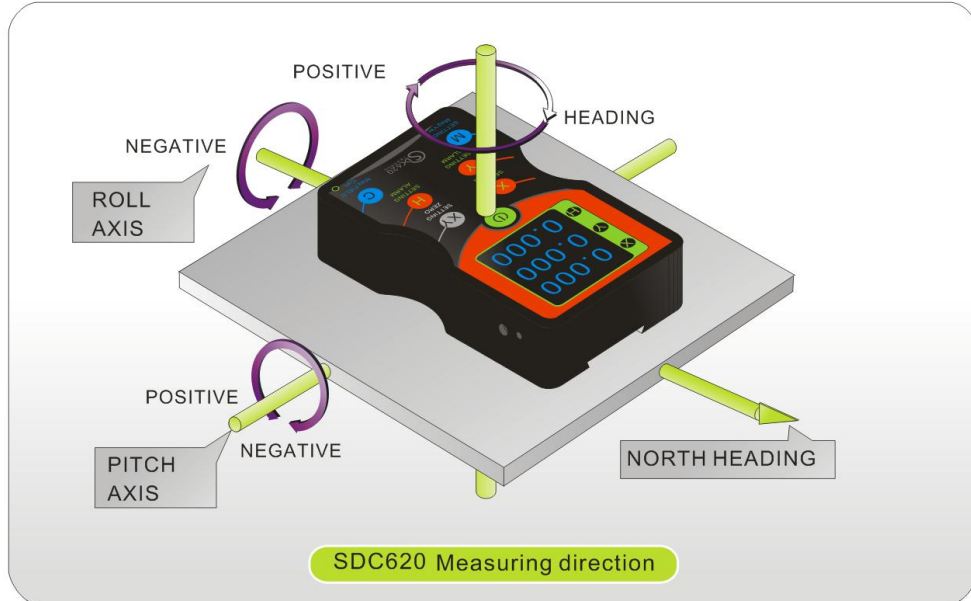
SIZE:125*67*28mm

SDA620B HIGH ACCURACY DIGITAL DISPLAY 3D COMPASS NORTH FINDER

► SDC620B MEASURING DIRECTIONS&FIX

The SDC620B 3D electronic compass azimuth is using geomagnetic principle, so it is very important to select a minimum magnetic interference environment for installation position. Please place and install the SDC620B away from the iron, magnets, engines and other magnetic objects as much possible as you can. Need control over 40CM distance(different magnetic interfere with the compass in different distance) as possible as you can even there are these magnetic medium around .

The optimal heading accuracy of SDC620B can reach 0.3°~0.5°, this undergo a rigorous validation indisputable, the most scientific test method is equally crucial. The test method we recommend is: Please install the HCM505B electronic compass to a vertical and erect aluminum pole (non-magnetic material), then proceed with heading accuracy measurement (of course the rotating rod perpendicular to the rotating platform, as much as possible to avoid large external magnetic field interference). Doing so can reduce the compass turning radius, to scientifically improve the measurement accuracy.



► PRODUCT FUNCTIONS DESCRIPTION



○Tilt sensor ○Electric Compass ○Digital Inclinator ○Accelerometer ○Gyro ○North Finder ○INS&IMU

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SDA620B HIGH ACCURACY DIGITAL DISPLAY 3D COMPASS NORTH FINDER

- 1) Charging indicate light: The light will be on during charging process ,it will be off when charge fully.
- 2) Low power warning light: when the indicate light flickers, the battery do not have enough power, likely could keep for another 30 minutes working.
- 3) Power ON/OFF (press for 2 seconds to power on or off the machine) .
- 4) Heading alarm value setting : Press key H for 3 seconds, the X, Y out, only H display, and the first digit would flicker, then press H again to set the first digital value, after choose the needed figure, wait for 3 seconds, then the second digit will flicker, then repeat above steps to set second digit to fourth digit. Do not operate it for 10 seconds, then it will save the set alarm value and the H light will be on.
If want to cancel the alarm value, press H for 3 seconds, the H light will be off, then it is canceled.
Set X and Y alarm angle is the same way.
- 5) Relative tilt SETTING ZERO: press X Y for 3 seconds, the indicate light on, then in tilt relative measure mode, and press for 3 seconds, the indicate light out, then in absolute measure mode.
- 6)The Mag FIELD Cali. button: the magnetic interference Calibration Key , this key functions is only for use when connected to a 3D compass sensor . Press the Mag FIELD Cali. button for 6 seconds to enter the calibration mode, meanwhile the corresponding LED light flash once every 0.5 seconds , means the user can start rotating the magnetic compass module to take points . The chosen points(0-50) will be displayed in H area , the instrument calibrate 24 points, after finish 24 sampling, the instrument waits for 10 seconds , the instrument will automatically save and return to the main interface. (Calibration & taking points steps please refer to C1 description)
- 7) heading value display
- 8) Y axis value display
- 9) X axis value display
- 10) Buzzer
- 11) X axis alarm set
- 12) Y axis alarm set
- 13) magnetic inclination set: press M for 3 seconds to enter set, X, Y out, only H indicate light on, it flicker from symbol -, the setting way is the same as set alarm angle, after set, the magnetic inclination LED light will be on, then current heading angle include the set magnetic inclination value. Press M for 3 seconds to cancel previous magnetic inclination set.
- 14) dovetail groove: for installation
- 15) reset button: when device crash, could probe it to power off.
- 16) recharging hole: use original charger from our company, could connect to 220v AC power supply.
Charge for 3 hours to full and work for 18 hours.

► **SDC620B CALIBRATION METHODS**

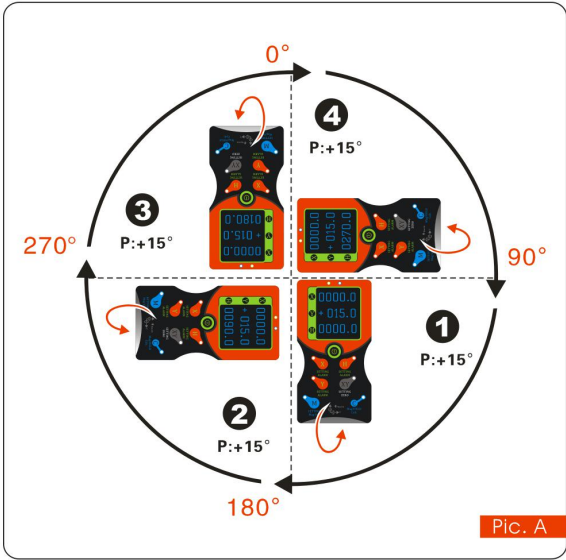
Calibration lemmas:

- 1) The accuracy of testing compass can not reach the requirements;
- 2) compass installation environment have magnetic interference, the interference is fixed, and the interference magnetic field and compass installation will not happen again in distance changes (example: compass to be installed above an iron material, because the iron will have magnetic interference, at this time then need to rotate and calibrate the iron and compass, and the iron and compass will not be separated when using , once they are separated then need to recalibrate. If the iron size is not fixed, or with a compass distance change is not fixed, the interference can not be calibrated,only can install it in a very far away , safe distance control in above 30cm).
- 3)Before starting the calibration, please remove the interference sources on your body , such as watch, belt, cell phone ,etc.;
- 4)Try to find an open environment as possible as you can for calibration then improve the accuracy .

- 1) Normal power on SDC620B device;
- 2) Manually press the "CALI." for 6 seconds to hear the sound of "drops" ,H angle value will flash 0000.0 to enter calibration mode;
- 3) After entering the calibration mode, SDC620B calibration requirements corresponding operation, with reference to the manual C1 calibration instructions for calibration;

Note: When you start the calibration and take points, move the compass to the following location, please note that these points are not absolute heading orientation, but with reference to the first point sampling heading orientation relative orientation change value. That is, you do not need to know which position the real North Pole is in.Further for example, the 90degree rotation and 15 degrees pitch only one reference value, to allow a certain sampling angle value error, unnecessarily strictly require very precise. Take at least below12 points calibration.

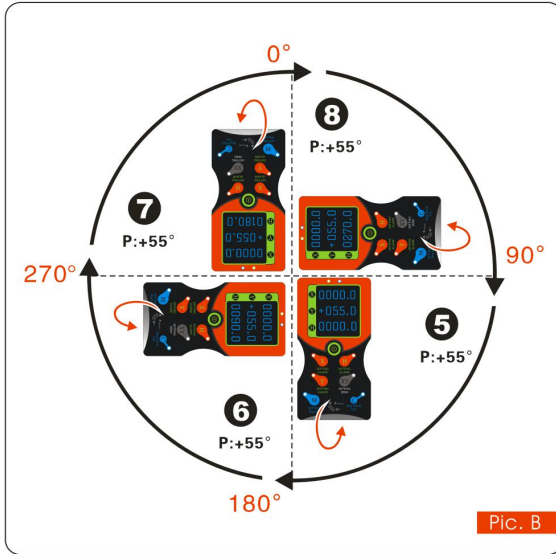
The calibration steps are as follows:



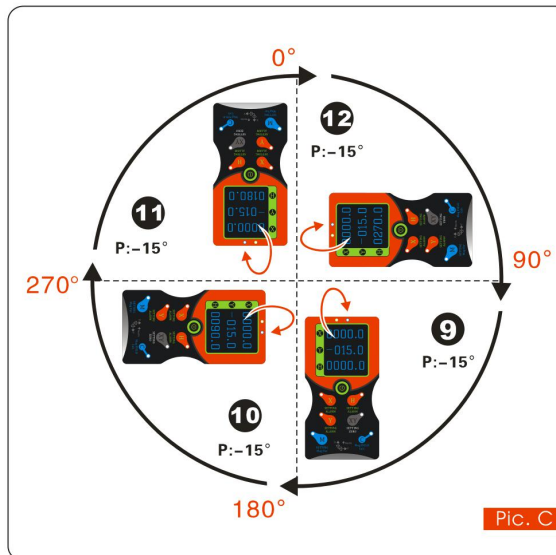
The standard starting point can be anyone azimuth of 360 °, as long as each change angle to keep the basic level about 90 ° to change (do not require too precise). Example as left Pic.A: starting point for H = 0 °, R = 0 °, P = +15 ° (firstly calibrate the pitch value P) please keep this posture for 2 to 3 seconds don't move, the system will take the first point . After took the first point, again rotate 90 ° horizontally, please keep this posture for 2 to 3 seconds don't move, the system will take the second point. After took the second point, again rotate 90 ° horizontally, please keep this posture for 2

to 3 seconds don't move, the system will take the third point. After took the third point, again rotate 90 ° horizontally, please keep this posture for 2 to 3 seconds don't move, the system will take the fourth point.

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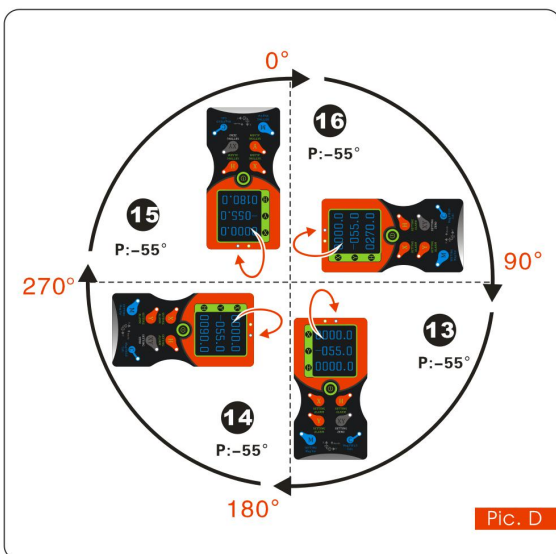


After took the fourth point, H and R are the same, and then increase + P angle value. Refer to the left Pic.B: starting point H = 0 °, R = 0 °, P = +55 °, please keep this posture for 2-3 seconds don't move, the system will take the fifth point. After took the fifth point, again rotate 90 °horizontally, please keep this posture for 2 to 3 seconds don't move, the system will take the sixth point. After took the sixth point, again rotate 90 °horizontally, please keep this posture for 2 to 3 seconds don't move, the system will take the seventh point. After took the seventh point, again rotate 90°horizontally, please keep this posture for 2 to 3 seconds don't move, the system will take the eighth point.



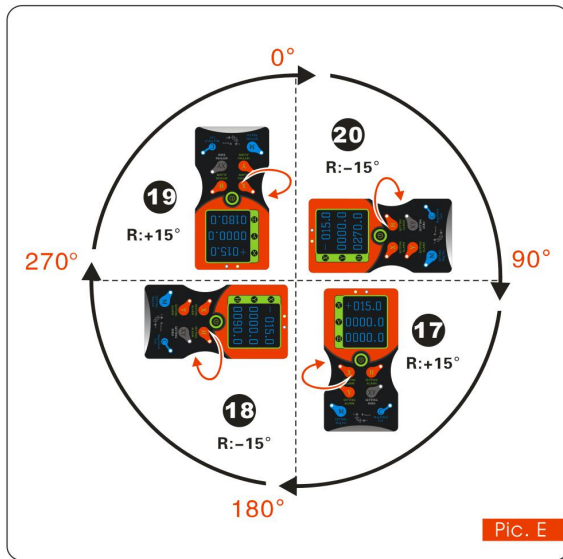
After took the eighth point, H and R are the same, then calibrate -P angle. Refer to the left Pic.C: starting point H=0°, R=0°, P=-15°, please keep this posture for 2-3 seconds don't move, the system will take the ninth point. After took the ninth point, again rotate 90 °horizontally, please keep this posture for 2 to 3 seconds don't move, the system will take the tenth point. After took the tenth point, again rotate 90 °horizontally, please keep this posture for 2 to 3 seconds don't move, the system will take the eleventh point. After took the eleventh point, again rotate 90 °horizontally, please keep this posture for 2 to 3 seconds

don't move, the system will take the twelfth point.



After took the twelfth point, H and R are the same, then increase -P angle value. Refer to the left Pic.D: starting point H=0°, R=0°, P=-55°, please keep this posture for 2-3 seconds don't move, the system will take the thirteenth point. After took the thirteenth point, again rotate 90 °horizontally, please keep this posture for 2 to 3 seconds don't move, the system will take fourteenth point. After took the fourteenth point, again rotate 90 °horizontally, please keep this posture for 2 to 3 seconds don't move, the system will take the fifteenth point. After took the fifteenth

point, again rotate 90 °horizontally, please keep this posture for 2 to 3 seconds don't move, the system will take the sixteenth point.



After took the sixteenth point then finished P calibration, then calibrate R,R(Roll value)can calibrate alternately .

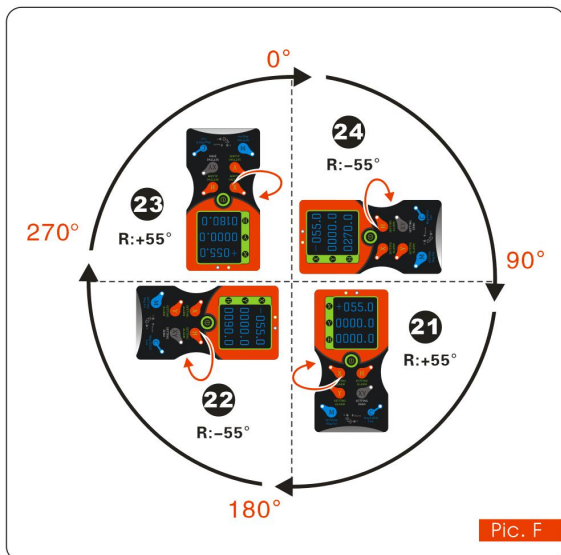
Refer to the left Pic.E: starting point H=0°, R=+15°, P=0°,please keep this posture for 2-3 seconds don't move, the system will take the seventeenth point.

After took the seventeenth point, again rotate 90°horizontally, alternate the negative Roll value R=-15°, please keep this posture for 2 to 3 seconds don't move, the system will take the eighteenth point.

After took the eighteenth point, again rotate 90°horizontally, alternate the positive Roll

value R=+15°,please keep this posture for 2 to 3 seconds don't move, the system will take the nineteenth point.

After took the nineteenth point, again rotate 90 °horizontally,alternate the negative Roll value R=-15°, please keep this posture for 2 to 3 seconds don't move, the system will take the twentieth point.



After the 20th point is taken, the R (roll value) is added for calibration. Refer to the left picture: starting point H=0°, R=+55°, P=0° Please keep this attitude for 2~3 seconds without moving, the system will pick the 21st point.

After the 21st point is taken, it is rotated 90° horizontally, and the negative roll value R=-55° is changed. This attitude is kept for 2 to 3 seconds.

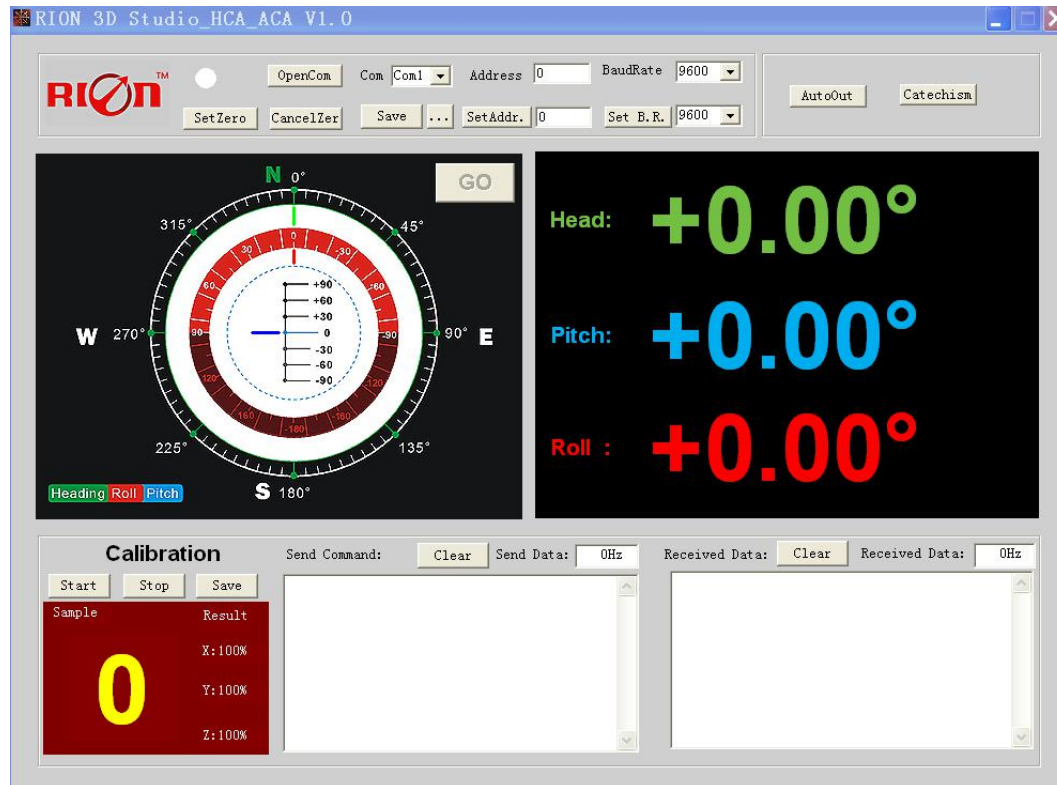
After took the twenty second point, again rotate 90°horizontally, alternate the positive Roll value R=+55°,please keep this posture for 2 to 3 seconds don't move, the system will take the twenty third point.

After took the twenty third point, again rotate 90 °horizontally,alternate the negative Roll value R=-55°, please keep this posture for 2 to 3 seconds don't move, the system will take the twenty fourth point.

Sending stop command---compass response---Re-sending save command---compass response save successfully.

► **RION'S 3D SOFTWARE**

You can download the RION angle debugging software from RION's official website for the preliminary angle debugging, also you Can download public version of the comassistant software on line for using.



Open/Close: Open and close COM port;

Com: Select the the device corresponding to the COM port

Address: Fill in the sensor current address code, the factory default is 00

Set Address: Set the sensor address code input box on the right to enter the desired address code, click Set Addr button

Save Data: Save the data, click here data can be synchronized Save angle data, the file is stored by default in the C: ---- COMDATA file

Set Zero: Set relative zero, the sensor current angle is 00.00 degrees

Cancel Zero: Unset the relative zero, to restore the sensor to the factory absolute zero;

Baud Rate: Select the sense baud rate , the factory default is 9600;

Set Baud Rate: Set the sensor baud rate, on the right of the selection box to select corresponding baud rate then click SetB.R. button;

Auto Output: Switch the sensor to automatically output mode, in the automatic output mode can be filled with different output frequency in Hz;

Catechism: The sensor switch to answer pattern, such as choosing the answer type, must input "send command "(command, please refer to the specification) on the left of "Send Command" input box, but also can fill in the transmit frequency in the Send Data, the unit Hz;

Mag. Dec.: Magnetic declination setting, in the right box directly enter the local magnetic declination, click "Mag.Dec." Button to confirm .

Calibration: compass calibration forum

Start: Start calibration

Stop: Stop the calibration (Click this button, keep the compass shaking state to avoid incorrect calibration of the acquisition)

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Save: stop calibration and save data. (Specific calibration method please refer to this specification calibration description)

Note: after install the RION's debugging software, if can not open, please operate by the following steps (please appear to the administrator status to operate):

- 1) Copy these three files mscomm.srg、mscomm32.ocx、mscomm32.dep from the folder to C:/Windows/system32 path below。
- 2) Click "Start" –"run" --regsvr32 mscomm32.ocx, You are prompted to install successful dialog。

▶ PRODUCT PROTOCOL

DATA FRAME FORMAT: (8 bits data, 1 bit stop, No check, Default baud rate 9600)

Identifier (1byte)	Date Length (1byte)	Address code (1byte)	Command word (1byte)	Date domain	Check sum (1byte)
68					

Identifier: Fixed68H

Data length: From data length to check sum (including check sum) length

Address code: Accumulating module address, Default :00

Date domain will be changed according to the content and length of command word

Check sum: Data length、Address code、Command word and data domain sum, No carry.

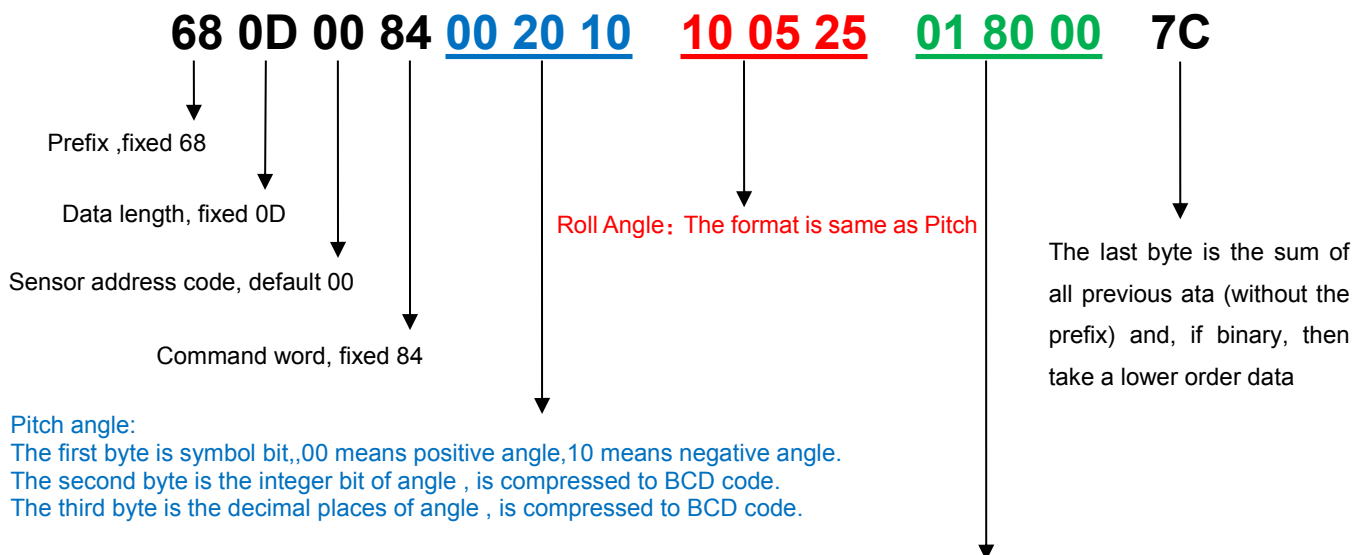
▶ RION INCLINOMETER DATA FORMAT DEFINITION(RION COMPASS DATA FORMAT)

1. Data format:

Baud rate: (9600 , 8 data bits, 1 stop bit, no verification)

2. Angle output format:

E.g: Pitch: +020.10 ° Roll: -005.25° Heading:180.00°



Pitch angle:

The first byte is symbol bit, 00 means positive angle, 10 means negative angle.

The second byte is the integer bit of angle , is compressed to BCD code.

The third byte is the decimal places of angle , is compressed to BCD code.

Heading angle :

The low byte of the first byte is the hundred bit integer of azimuth, High byte indicates positive and negative sign, "0" is positive, and azimuth no negative sign;

The second byte is the single bit and ten bit integer bit of azimuth, which is the compressed BCD code;

The third byte is the decimal place of the angle, which is the compressed BCD code.



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