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User Manual

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UM220-INS NF

GNSS Integrated Navigation Positioning Module

Revision History

Version	Revision History	Date
Ver. 1.0	Initial Edition	Jun. 2018
Ver. 1.0.2	Alpha release version	OCT.2018
Ver. 1.0.4	Beta release version	May.2019
Ver. 1.0.6	Beta release version: Align with the Chinese version	Aug. 2019
R1.1	Merge the contents of the guide manual in chapter 4.6 Chapter 6.2: add the shelf life	Sep. 2019

Disclaimer

Foreword

This document offers you information in the features of the hardware, the installation, specification and use of Unicore UM220-INS NF product.

Readers it applies to

This document is applied to the technicians who know GNSS Receiver to some extent but not to the general readers.

Structure of the file

This document includes the followings:

Introduction: Briefly explaining the functions, performances and installing of the product

Installation: Contains the list of the product package and the details of product installation

Technical Specification: Offering technical specifications of the product

Hardware Specification: Offering all the information of hardware interface of the product

Mechanical Features: Offering UM220-INS NF dimensions, layout, and top views.

Contents

1 Introduction

1.1 Overview

UM220-INS NF is a BDS/GPS+MEMS dual-system module designed for In-dash automotive navigation and high-end navigation, based on Unicore low power GNSS SoC- Firebird(UC6226). With its built-in 6 axis MEMS, and the support of BDS+GPS, UM220-INS NF can output GNSS+MEMS inertial positioning result, most suitable for applications requiring high accuracy, high reliability, and high continuity positioning.

Figure 1-1 UM220-INS NF Module

Variant	PN	Specification			System*					Interface		Data Update Rate*
		Industry Grade	Positioning chip for automotive applications	Full module for automotive applications	GPS	BDS*	GLONASS*	GALILEO	QZSS	UART1	UART2	
UM220-INS NL*	2310408000012	●			●	●	●	●	●	●	●	1Hz
UM220-INS NF	2310408000014		●		●	●				●	●	1HZ

- The BDS system cannot run in parallel with the GLONASS system
- UM220-INS NL products will be released in the future
- The default data update rate of the module is 1HZ, which can be configured into 5HZ and 10HZ
- The internal positioning chip of UM220-INS NF conforms to AEC-Q100 standard, and the full module of UM220-INS NQ conforms to AEC-Q104 standard
- UM220-INS NF will support QZSS in the future

1.2 Key Features

Power				
Voltage	+2.8V~3.6V VDC			
Power Consumption[1]	105mW			
RF Input				
Frequency	1559～1577MHz			
Input VSWR	≤1.5			
Input impedance	50Ω			
Antenna gain	15～30dB			
Physical Characters				
Dimension	16.0*12.2*2.6mm			
Environment				
Operating Temperature	-40℃ ~ +85℃			
Storage Temperature	-45℃ ~ +90℃			
Input/ Output Data Interface				
UART	UART*2, LVTTL. Acceptable Baud Rate: 4800~115200bps, 9600bps by default			
GNSS Performance				
Frequency	BDS B1: 1561.098MHz GPS L1 : 1575.42MHz			
TTFF (Time to First Fix)	Cold Start: 30s Hot Start: 1s Reacquisition: 1s			
Positioning Accuracy(RMS)	2.0m CEP			
Velocity Accuracy (RMS)	0.1m/s			
Update Rate	1Hz/5Hz/10Hz			
Sensitivity		GN	BDS	GPS
	Tracking	-161dBm	-159dBm	-161dBm
	Acquisition	-147dBm	-144dBm	-147dBm
	Hot	-154dBm	-149dBm	-154dBm
	Reacquisition	-156dBm	-156dBm	-156dBm
Data Output[2]	NMEA 0183, Unicore Protocol			
1PPS(RMS)[3]	20ns			

[1] Continuous positioning, typical values
[2] User configurable. See **Unicore UM220-INS NF Protocol Specification Ver.1.0.3 or updated version** for more details.
[3] Statistical values within one hour, not recommended for timing application

1.3 Interfaces

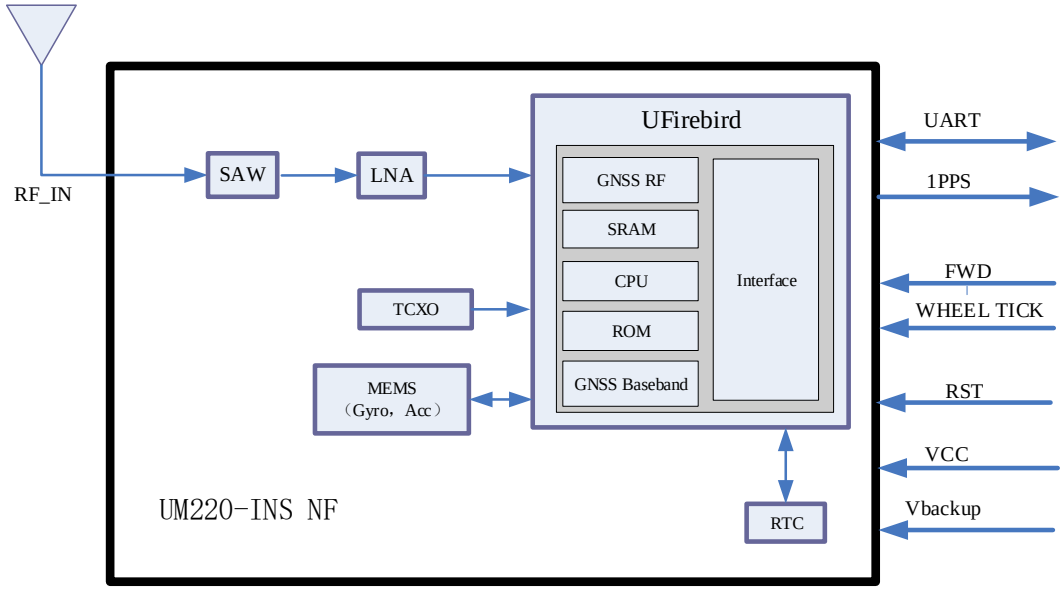


Figure 1-2 Structure

UART

UM220-INS NF module support 2 configurable UART ports, the signal input/output level is LVTTL. The default baud rate is 9600bps, and is adjustable, can be configured up to 115200bps.

COM1 is the primary serial port, which supports data transfer and firmware upgrade function. During design in, **please ensure that COM1 is connected to a PC or an external processor for firmware upgrades.**

For routine starts of the module, please keep COM1 ‘s input pin at a constant high or constant low level 1 second after the reset signal goes high.

COM2 only supports data transmission, and can’t be used for firmware upgrade purpose, reserved for future use.

Odometer (FWD/WHEELTICK)

The UM220-INS NF module has an odometer input interface that includes FWD and WHEELTICK, which are useful for improving the module’s location accuracy.

MEMS

UM220-INS NF integrated sis axis MEMS on board, 3 axis gyro and 3 axis accelerator. MEMS provide vehicle dynamic changing info and UM220-INS NF combine them with GNSS calculation and output the inertial positioning result directly. This combination ensures the positioning experience for users, much more continuous than the pure GNSS module, especially under GNSS signal loss scenario such as tunnels and underground parking.

1PPS

UM220-INS NF outputs 1 PPS with adjustable pulse width and polarity.
1PPS is not for timing application.

nReset

Low voltage valid (low voltage last for less than 2 millisecond is required).

2 Testing

2.1 ESD Handling Precautions

UM220-INS NF Modules are Electrostatic Sensitive Devices (ESD) and require special precautions when handling.

- Follow the steps in section 2.2 in the correct order
- Electrostatic discharge (ESD) may cause damage to the device. All operations mentioned in this chapter shall be carried out in an antistatic workbench, using both wearing an antistatic wrist strap and a conductive foam pad. If antistatic workbench is not available, wear an antistatic wrist strap and connect the other end to a metal frame to play a role in anti-static
- Hold the edge of the module, not in direct contact with the components
- Please check carefully whether the module has obviously loose or damaged components. If you have questions, please contact us or your local dealer.

Figure 2-1 shows the typical installation of UM220-INS NF EVK suites.

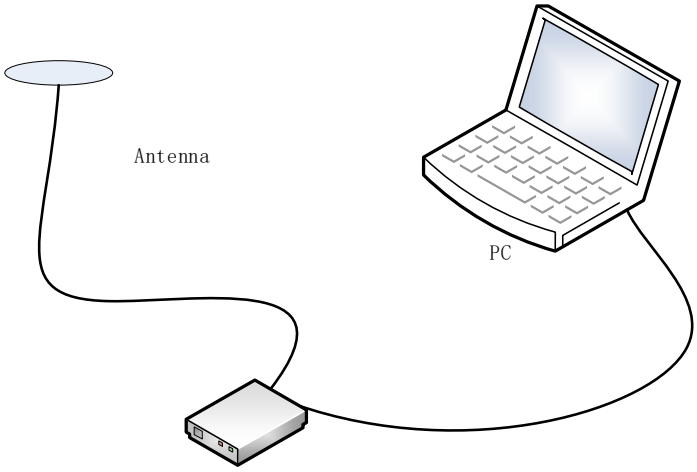


Figure 2-1 Typical Installation of UM220-INS NF EVK

Please check the contents of the package carefully after receiving the package of UM220-INS NF.

- UM220-INS NF EVK suite (with AC Adapter)
- UM220-INS NF User manual

- uSTAR application package
- Qualified antenna, support GPS L1 and BDS B1
- Antenna connection cable
- Direct serial cable and USB
- PC or Laptop with serial ports (Windows 2000/XP/Win7）

> ☞ *Please keep the box and anti-static plastic bags for storage and handling*

2.2 Hardware Installation

After the above preparation is complete, follow the steps below to install:
Step 1: Make sure to make full anti-static measures, such as anti-static wrist strap, grounding the workbench;
Step 2: Open the UM220-INS NF evaluation kit;
Step 3: Select the GNSS antenna with appropriate gain, fix it in the non-block area, using the appropriate cable to connect the antenna with UM220 EVK;
Step 4: Connect the PC to the EVK serial port through direct serial cable;
Step 5: Power supply for UM220-INS initialization;
Step 6: Open the uSTAR software on the PC;
Step 7: Controlled the receiver through uSTAR to display constellations view, log messages, and receiver status.

3 Technical Specifications

3.1 Electrical Specifications

Absolute Maximum Ratings

Item	Pin	Min	Max	Unit	Description
Power Supply (VCC)	Vcc	-0.5	3.6	V	Main power
Backup Voltage	V_BCKP	-0.5	3.6	V	Backup power supply for RTC
Digital IO (RXD1，RXD2) [4]	Vin	-0.5	3.6	VV	
VCC Ripple (Rated Max.)	Vrpp	0	50	mVpp	
RF_IN	RF_IN	-	+3	dBm	Max input power of antenna
Storage Temperature	Tstg	-45	90	°C	
SMT Reflow Temperature	T_{SLDR}	-	+260	°C	
Maximum ESD stress	VESD(HBM)		2000	V	All pins,HBM

3.2 Operation Condition

Item	Pin	Min.	Typical Value	Max.	Unit	Condition
Power Supply (VCC)	Vcc	2.8	3.3	3.6	V	
Ripple Voltage	Vp-p			50	mV	
Peak current	Iccp			54	mA	Vcc = 3.0 V
Tracking average current	I_{ACQ}	27	31	34	mA	Vcc = 3.0V
LOW Level Input Voltage	V_{IL}	-0.3		0.2*Vcc	V	
High Level Input Voltage	V_{IH}	0.7*Vcc		Vcc+0.3	V	
LOW Level Output Voltage	V_{OL}	0		0.4	V	Iout = -2 mA
High Level Output Voltage	V_{OH}	Vcc–0.4		Vcc	V	Iout = 2 mA
Antenna Gain[5]	G_{ANT}	15	20	30	dB	
Noise Figure	NF		1.5		dB	
Operating Temperature	T_{OPR}	-40		85	°C	

[4] Including nRESET，TIMEPULSE，WHEELTICK，TXD2，RXD2，FWD，TXD1，RXD1

[5] The antenna gain range refers to the gain range of the preamplifier before RF_IN of the module.

3.3 Dimensions

Table 3-1 Dimensions

Symbol	Min（mm）	Type（mm）	Max（mm）
A	15.9	16.0	16.5
B	12.05	12.2	12.35
C	2.4	2.6	2.8
D	0.9	1.0	1.3
E	1.0	1.1	1.2
F	2.9	3.0	3.1
G	0.9	1.0	1.3
H	0.9	1.0	1.1
K	0.7	0.8	0.9
N	0.4	0.5	0.6
M	0.8	0.9	1.0

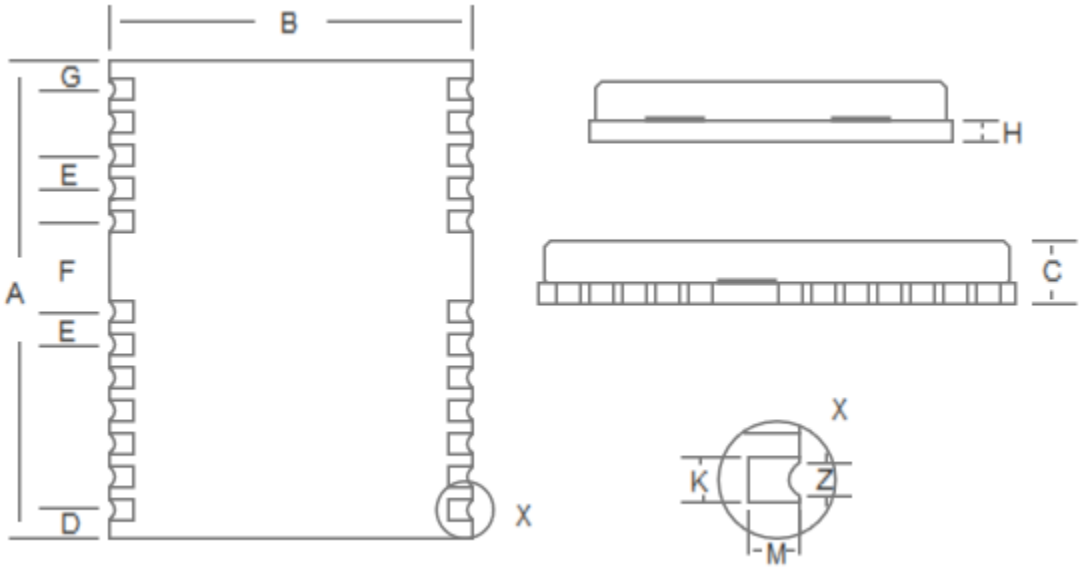


Figure 3-1Mechanical Layout

3.4 Pin Definition (Top View)

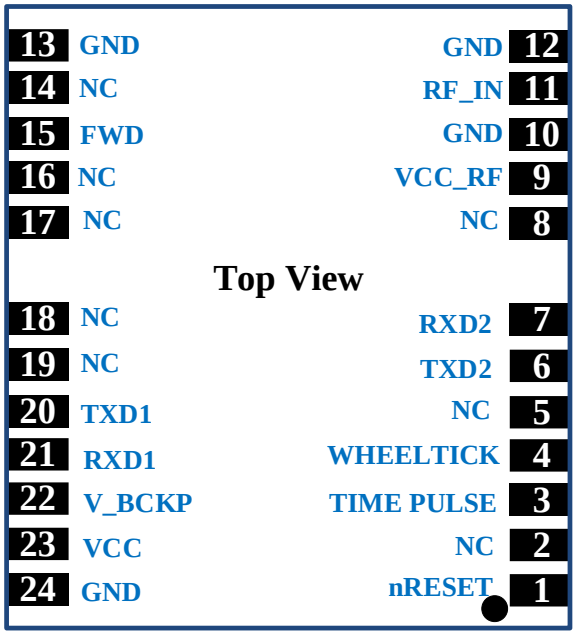


Figure 3-2 Top View

Pin No.	Name	I/O	Electrical Level	Description
1	nRESET	I	LVTTL	For reset 1=normal 0=reset
2	NC	—	—	Reserve
3	TIMEPULSE	O	LVTTL	Time pulse(1PPS)
4	WHEELTICK	I	LVTTL	Odometer speed pulse Incorrect signals of the odometer will lead to serious problems in the use of the product. Please make sure the signal is correct.
5	NC	—	—	Reserve
6	TXD2	O	LVTTL	UART 2-TX
7	RXD2	I	LVTTL	UART 2-RX
8	NC	—	—	Reserve
9	VCC_RF[6]	O		Output Voltage RF section
10	GND	—	—	Ground
11	RF_IN	I	—	GNSS signal input (BD2 B1+GPS L1)
12	GND	—	—	Ground
13	GND	—	—	Ground
14	NC	—	—	Reserve
15	FWD	I	LVTTL	Odometer forward

[6] The maximum output current for VCC_RF is 60 mA, with current limiting protection function. However, long-term short circuit will still cause irreparable damage to the module.

Pin No.	Name	I/O	Electrical Level	Description
				1=forward 0=backward Incorrect signals of the odometer will lead to serious problems in the use of the product. Please make sure the signal is correct.
16	NC	—	—	Reserve
17	NC	—	—	Reserve
18	NC	—	—	Reserve
19	NC	—	—	Reserve
20	TXD1	O	LVTTL	UART 1-TX
21	RXD1	I	LVTTL	UART 1-RX
22	V_BCKP	I	1.4V~3.6V	Backup voltage supply, applicable for hot start.
23	VCC	—	2.8V~3.6 V	Supply voltage
24	GND	—	—	Ground

3.5 PCB Packaging

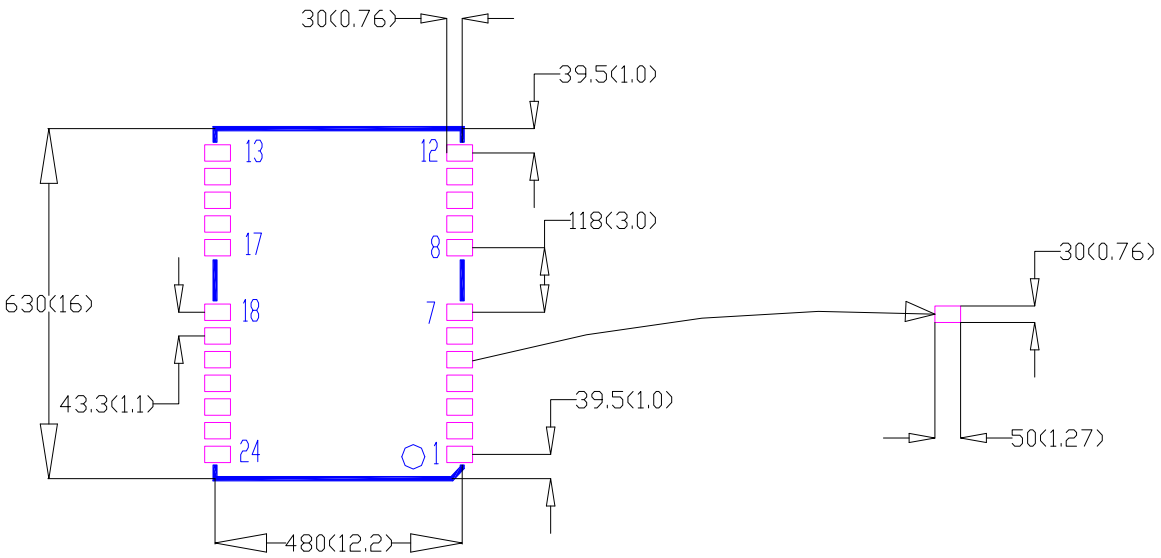


Figure 3-3 UM220-INS NF Recommended PCB Packaging（unit: mil, in brackets: mm）

☞ *In the design of PCB solder, make sure the area below the UM220-INS NF modules are fully covered with solder layer.*

4 Hardware Design

4.1 Design in Considerations

To make UM220-INS NF to work properly, you need to properly connect the following:

- Provide reliable power to the VCC pin
- Connect all the GND pins to ground
- Connect GNSS_ANT signal to the antenna, and make sure it is 50 ohm impedance matching.
- Ensure COM1 is connected to a PC or an external processor, users can use this serial port to receive position data. COM1 is also necessary for firmware upgrades

In order to obtain good performance, special concern should be paid during the design:

- Power supply: Stable and low ripple power is necessary for good performance.

  - Using LDO to ensure the purity of power supply

  - Try to place LDO close to the module in layout

  - Widening the power circuit or use copper pour surface to transmit current

  - Avoid walking through the high–power or high inductance devices such as magnetic coil

  - Make sure the peak to peak voltage ripple does not exceed 50mV

- UART interfaces: Ensure that the signals and baud rate of main equipment match UM220-INS NF module's
- Antenna interface: Make sure the antenna impedance matching, and the circuit is short and smooth, try to avoid acute angle
- Try to avoid circuits below UM220-INS NF;
- This module is a temperature sensitive device, dramatic changes in temperature will result in reduced performance, keep it as far away from the high-power high-temperature air and heating devices as possible

4.2 Antenna

The module's antenna input pin VCC_RF provides a +3V antenna feed, when an active antenna of +3.3V is adopted, it can be power supplied by directly connecting to the VCC_RF pin of UM220-INS.

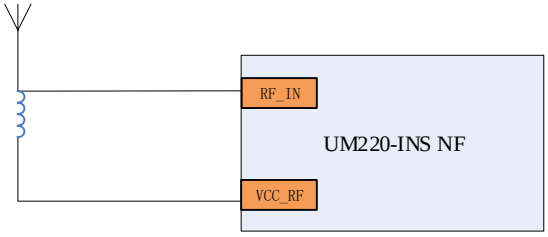


Figure 4-1 UM220-INS Active Antenna (+3V) Solution

When using VCC_RF to feed the antenna, VCC_RF is between vcc-0.3v and vcc-0.1v. Between VCC and VCC_RF ESRDC is 6Ω, so it can be carried out in accordance with the following formula VCC_RF voltage calculation.

$$VCC\_RF \approx VCC - 6\Omega \times IANT$$

When an active antenna other than +3V is adopted, it is necessary to power the antenna.

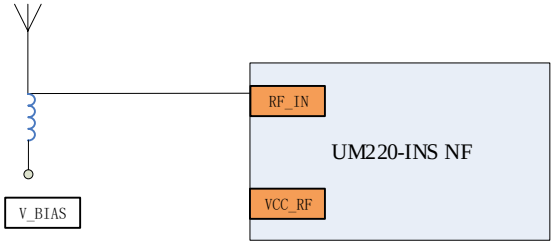


Figure 4-2 UM220-INS NF Active Antenna (Other than +3V) Solution

4.3 Serial Port

UM220-INS NF's COMS ports are of LVTTL level, for PC connection, please use a RS232 voltage level converter.

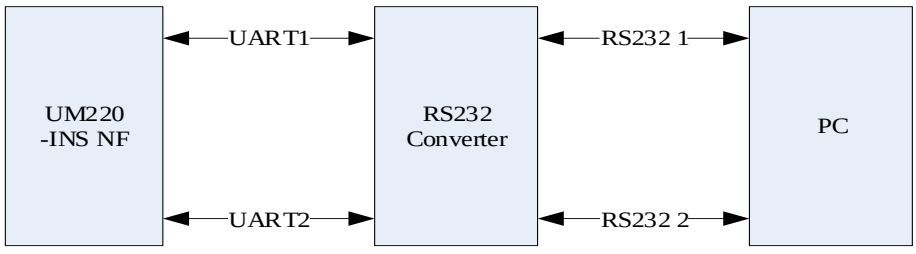


Figure 4-3 Connect COM to PC

4.4 Odometer Installation

The best installation position of the UM220-INS NF module is the centroid of the car body, and it is kept rigid connection with the car body and fixed installation. The best installation position of antenna is roof or other space that does not affect satellite signal reception. In the carbody coordinate system, the installation location of the module and the antenna must meet the following requirements;

UM220-INS NF module has direction (FWD) and velocity pulse (WHEELTICK) signals connected with odometer. If the module obtains effective direction and velocity pulse signals, it will help to improve the accuracy of module positioning trajectory.

The odometer signal of vehicles is generally 12V level, and the signal quality is poor. Therefore, vehicle odometer signals generally need signal filtering, optocoupler isolation and level conversion to provide UM220-INS NF for use.

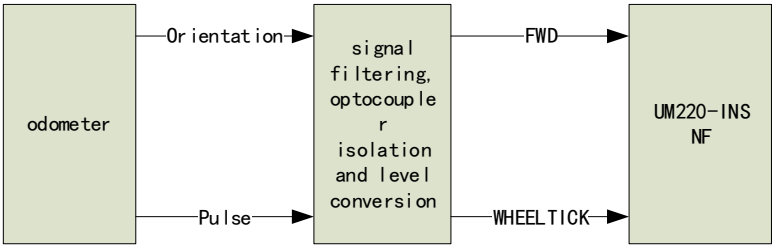


Figure 4-4 Odometer Connect

4.5 Calibration

UM220-INS NF internal inertial navigation device is an important component supporting integrated navigation, and the inertial navigation device needs to complete initialization calibration before it can work normally.

Successful completion of initialization requires the following conditions:

- Guarantee the number of visible satellites is at least 6 and CN0 to be above 30 dBm
- Park for 3 min after launching self-calibration
- Need not less than 5 times faster than 0.5m/s2
- Drive at 36 km/h or faster

After the first alignment of inertial navigation (insstatus 2), it still needs to travel for about 15 minutes in normal open environment.

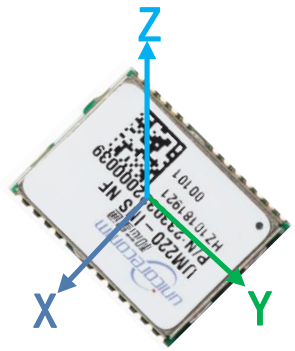


Figure 4-5 Module Coordinate System

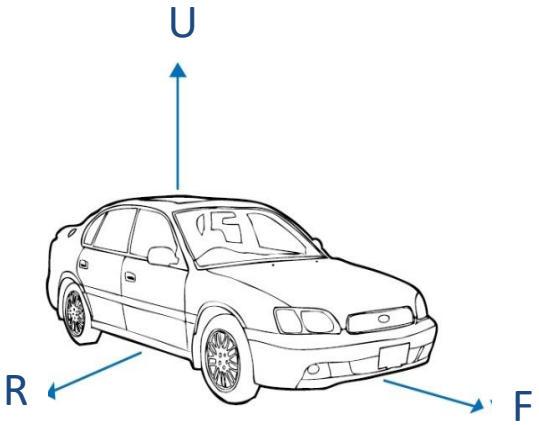


Figure 4-6 Car Coordinate System

> ☞ *The normal direction of the shielding cover is Z axis, the long axis is Y and the short axis is X.*
>
> ☞ *Modular coordinate system and vehicle coordinate system are defined as: X-axis and R-axis are parallel in the same direction, Y-axis and F-axis are parallel in the same direction, Z-axis and U-axis are parallel in the same direction*

4.6 Installation

The installation of UM220-INS NF module on the vehicle shall be fixed.

4.6.1 Installation Instructions

The UM220-INS NF module must be fixedly connected with the vehicle to prevent any offsets or vibrations between the module and the vehicle. UM220-INS NF cannot be installed in the suspension part of the vehicle (with elastic part). When the vehicle is moving, any position offset relative to the vehicle-based coordinates will cause devastating damage to stop the UM220-INS NF module from working normally, especially the direction offset.

4.6.2 Installation Angle Definition

The vehicle coordinate is RFU, and the module coordinate is xyz, as shown in figure 4-6 and figure 4-7. AngleR, angleF, and angleU of the module installation angle are defined as below:

1. Overlap the initial state of the two coordinates of RFU and xyz
2. Rotate γ angle of the module along the z axis
3. Rotate α angle of the module along the new x axis
4. Rotate β angle of the module along the new y axis
5. The module is now in the same state as the actual installation, with that, angleR=α，angleF=β，angleU=γ

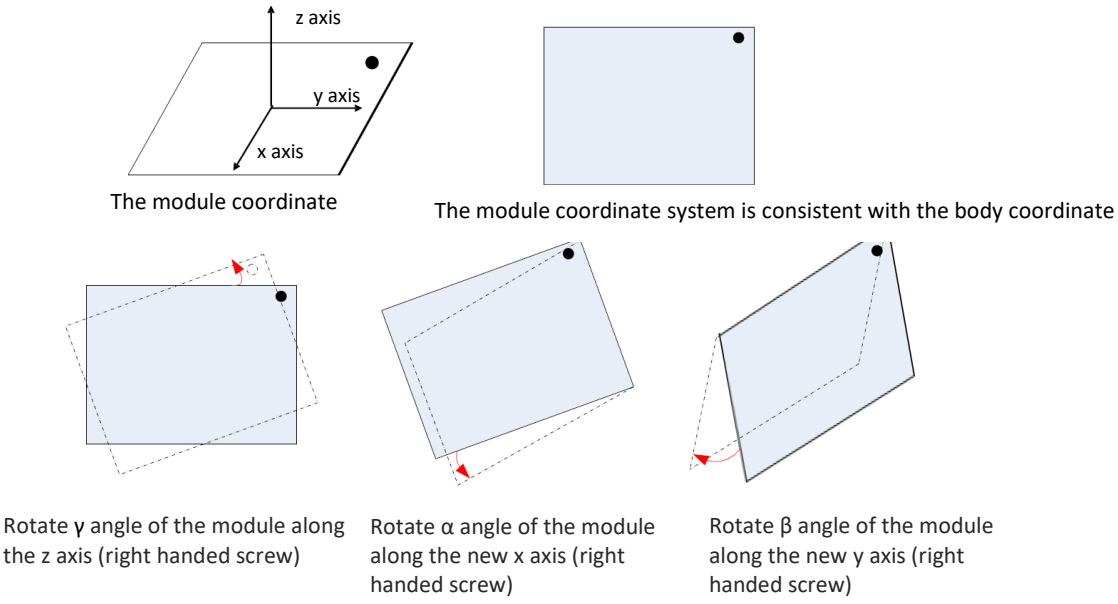


Figure 4-7 The Module Coordinate System (RFU)

4.6.3 Free Installation and Self-Calibration

- **Free Installation** (Default Mode)

UM220-INS NF integrates a three-axis gyroscope and a triaxial accelerometer, and a complex self-calibration algorithm is designed to support the free installation of the module with respect to any installation angle of the body coordinate system, such as the full horizontal installation, tilted angle installation and flip installation.

- **Self-Calibration**

After the installation of the UM220-INS NF module, the self-calibration is required to ensure the accuracy of the module output. In the process of the self-calibration, the module estimates installation status parameters and sensor parameters. The module is in full

satellite navigation mode before the self-calibration is completed, and is in satellite navigation and inertial navigation compact combination Mode after the self-calibration is completed.

- Conditions of Completing Self-Calibration

  - A three-minute stop after the self-calibration is triggered;
  - Good satellite visibility is guaranteed in the self-calibration process (the number of visible satellites is not less than six, and Cn0 is above 30);
  - It's required to drive at the acceleration greater than 0.5m/s squared for no less than 5 times under the premise of normal driving. The longer the acceleration time is, the faster the calibration will be;
  - Keep the forward driving speed is above 36 km/hour under the premise of normal driving. The longer the driving time is, the faster the calibration will be.

After the first alignment of inertial navigation (insstatus 3), it is still necessary to drive for about 15 minutes in the normal open environment to train the inertial navigation device adequately. For example, the navigation precision may be slightly worse if the inertial navigation device enters the complex environment such as the tunnel and garage immediately after the first alignment.

The normal use of the module only requires a self-calibration process.

- **Related Message Protocol Description**

1. CFGROTAT

Message format: $ CFGROTAT,angleR, angleF, angleU, mode
Description: Set or output the installation angle configurations of the module with respect to the vehicle coordinate system
Parameters:
◆ angleR, angleF and angleU, refer to the 4.6.2 for details with the unit of 0.01°
◆ mode, which stands for the installation angle configuration mode:
0 – General installation mode, the input value of the installation angle is relatively coarse (within 10deg)
2 – Automatic installation mode, no installation angle is required.

Remark:
1. Choose 2 for free installation mode
2. If the free installation mode is specified by the user, the input angler, angleF, and angleU is meaningless.
3. Any configuration on the INS will cause the INS module to be re-initialized during normal operation or after power-off and restart, and the previously completed or ongoing calibration operations will be reset;

2. SNRSTAT

Message format: $SNRSTAT,insstatus,odostatus, InstallState, Mapstat
Description: Output initial status (applicable for both fixed installation mode and free installation mode)
Parameters:
◆ insstatus: Initial status of INS
-1: IMU device failure
0: Disabled
1: initialized

2: The installation angle is known
3: Initialization is completed
◆ odostatus: Odometer initialization status
-1: Odometer device failure
0: Disabled
1: Initialize the scale factor
2: The scale factor initialization is completed
3: The calibration of the scale factor is completed
◆ InstallState：
0: In the progress of the calibration
1: The current quality of satellite information is insufficient and requires better satellite conditions
2: The current maneuver conditions of the carrier is insufficient and requires to be accelerated
3: The current speed of the carrier is too low and it's required to be increased.
◆ Mapstat：
-1 No serial port is configured to enter MAP information
0 No MAP message is received by the serial port or the sent MAP message is timeout
1 MAP information is received but not applied to the composite navigation
2 MAP information is received and applied to the composite navigation

- **The T**est **M**ethod of the **O**mni-**D**irectional **F**ree **Installation M**ode

1. Fully free installation of the module
2. Input the command $CFGROTAT,0,0,0,2 (no configuration is required for the factory mode)
3. Input the command $ CFGSAVE(no configuration is required for the factory mode)
4. The process of self-calibration should satisfy above conditions of parking, satellite quality and maneuver, and etc. Observe the $SNRSTAT output to confirm whether the self-calibration is completed, and when the insstatus becomes 3, the self-calibration is completed.
5. Confirm that the self-calibration is completed and then enter the road with poor satellite quality.
6. If the function of hot start in the basement is needed, Vbackup requires to be powered continuously;

4.6.4 Fixed Installation and Self-Calibration

- Fixed Installation

According to the installation Angle definition rule, the accurate installation Angle is manually configured into the module. This installation method takes a short calibration time.

- **Related Message Protocol Description**

1. CFGROTAT
Message format: $ CFGROTAT,angleR, angleF, angleU, mode

Description: Set or output the installation angle configurations of the module with respect to the vehicle coordinate system
Parameters:
◆ angleR, angleF, and angleU refer to the 4.6.2 for details with the unit of 0.01°

◆ mode, which stands for the installation angle configuration mode:
0 – General installation mode, the input value of the installation angle is relatively coarse (within 10deg)
2 – Automatic installation mode, no installation angle is required.

Remark:
1. Choose 0 for fixed installation mode, the user can input the actual installation angle with angleR, angleF and angleU into the module. After the configuration is finished, save them in the Flash through the CFGSAVE command, a re-identification is required at the next boot if no save configuration is proceeded.
2. Any configuration on the INS will cause the INS module to be re-initialized during normal operation or after power-off and restart, and the previously completed or ongoing calibration operations will be reset;

- **Conditions of Completing Self-Calibration**

  - A three-minute stop after the self-calibration is triggered;
  - Good satellite visibility is guaranteed in the self-calibration process (the number of visible satellites is not less than six, and Cn0 is above 30);
  - Keep the forward driving speed is above 36 km/hour.

  After the first alignment of inertial navigation (insstatus = 3), it is still necessary to drive for about 15 minutes in the normal open environment to train the inertial navigation device adequately. For example, the navigation precision may be slightly worse if the inertial navigation device enters the complex environment such as the tunnel and garage immediately after the first alignment.

☞ *Antenna installation should be kept facing up and fixed; Ensure that the ambient elevation angle of the antenna is greater than 15° without shielding.*

☞ *There is no strong interference source in the 1568±20MHZ frequency of the antenna.*

4.7 MEMS

UM220-INS NF built-in MEMS is an important component to support integrated navigation, including gyro and accelerometer. MEMS must complete initial calibration before normal operation. Please refer to UM220-INS NF installation instruction manual for detailed instructions.

Successful completion of an initialization requires the following conditions:

- Stop 3 minutes after calibration
- Ensure good satellite visibility during auto calibration (no less than 6 visible satellite and CN0 above 30dB)
- Under the premise of normal driving, no less than 5 times of acceleration greater than 0.5m/s² are required. The longer the acceleration time is, the faster the calibration will be.

When the module is in auto installation mode, the acceleration requirement is necessary. If in fixed installation mode, this step can be omitted. For details, please refer to UM220-INS NF user guidance manual.

- Under the premise of normal driving, the forward driving speed is kept above 36 km/hour. The longer the driving time is, the faster the calibration will be.

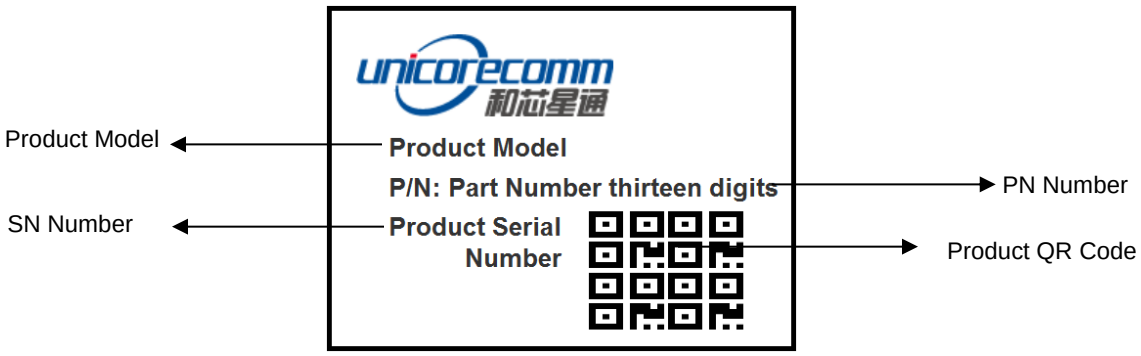
After the first alignment of inertial navigation (insstatus quality is 3), it is still required to drive for about 15 minutes in the normal open environment, so as to train the inertial navigation devices sufficiently. If the inertial navigation device enters the tunnel, garage and other complex environments immediately after the first alignment, the navigation accuracy may be slightly poor.

5 Disassembly

When it is necessary to remove the module, it is recommended to melt the soldering tin of the pins on both sides of the module with an electric soldering iron and remove the module with tweezers. Do not use other means to remove the module (such as hot air gun blowing module), may lead to module damage.

6 Package

6.1 Product Label Description



6.2 Package Description

The UM220-INS NF module is packaged in vacuum sealed aluminum foil anti-static bag with desiccant and moisture-proof agent. When using reflow welding process to weld modules, please strictly comply with IPC standard to conduct humidity control on modules. As packaging materials such as carrier belt can only withstand the temperature of 65 degrees Celsius, modules shall be removed from the packaging during baking. A small number of samples (usually by hand welding) are shipped in an electrostatic bag, since manual welding does not need to consider the problem of

humidity, so no additional moisture protection.

Figure 6-1 Module Package

Item	description
Module	500pics/reel
Reel size	workpiece tray： 13" external diameter 330mm, internal diameter 100mm, wide 24mm, thickness 2.0mm
Carrier tape	Space between： 20mm

UM220-INS NF humidity sensitive level for module is 3, before the patch, please do 10 hours of 125℃ baking, in order to reduce risk, especially the bulk packing.

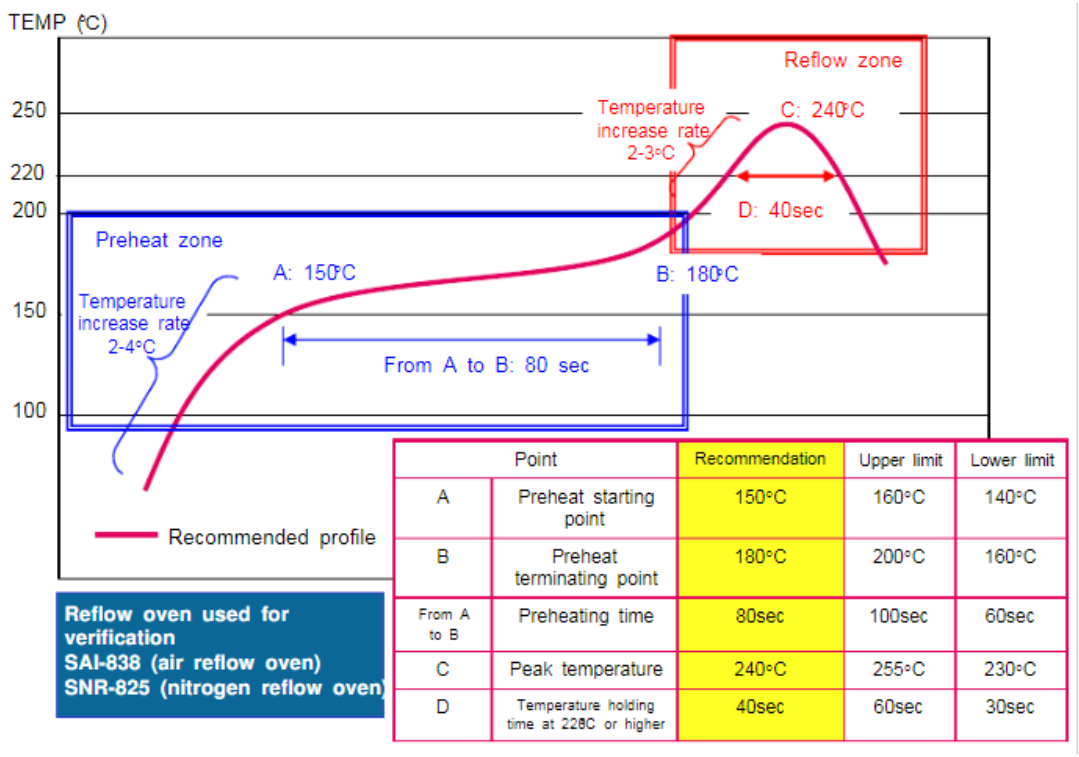
The shelf life of UM220-INS NF is one year.

7 Clean

Do not use alcohol or other organic solvents to clean, it may lead to fluk residues into the shielding shell, causing mildew and other problems.

8 Reflow Soldering

In order to avoid device falling off, the module should be placed on the top of the main board during welding. Reflow soldering temperature curve is recommended as shown in figure 8-1 below (M705-GRN360 is recommended for solder paste). Note: the module can only be welded once.



Point		Recommendation	Upper limit	Lower limit
A	Preheat starting point	150°C	160°C	140°C
B	Preheat terminating point	180°C	200°C	160°C
From A to B	Preheating time	80sec	100sec	60sec
C	Peak temperature	240°C	255°C	230°C
D	Temperature holding time at 228C or higher	40sec	60sec	30sec

Figure 8-1 Reflow Soldering Line

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