unicore UM220-INS Series Multi-GNSS Integrated Navigation and Positioning Module User Manual

Contents

unicore UM220-INS Series Multi-GNSS Integrated Navigation and Positioning Module

Overview

The UNICORECOMM UM220-INS is a multi-GNSS integrated navigation and positioning module that supports multiple positioning modes, including joint positioning and standalone positioning. The module has a compact design and supports various GNSS systems, including GPS, BDS, GLONASS, Galileo, and QZSS. The following sections provide detailed information on the product features and how to use the module.

Key Features

- Power Voltage: +3.0V~3.6V VDC
- Power Consumption: 90mW
- RF Input Frequency: 1559~1605MHz
- Input VSWR: 2.5
- Input Impedance: 50
- Antenna Gain: 15~30dB
- Physical Characters Dimension: 16.0mm*12.2mm*2.6mm
- Operating Temperature: -40 ~ +85
- Storage Temperature: -45 ~ +90
- Input/Output Data Interface: UART*2, LVTTL. Baud Rate: 4800~460800bps
- Positioning Accuracy: GPS+GLO+GA 2m

Installation

The UM220-INS module can be installed on any device that requires GNSS positioning. The module requires a power supply of +3.0V~3.6V VDC.

Operation

To operate the UM220-INS module, follow the steps below:

1. Connect the module to the device.
2. Power on the device.
3. The module will start automatically and begin positioning.
4. The default data update rate of the module is 1Hz, which can be configured into 10Hz. The output data format is in NMEA 0183.
5. If hot start is not used, connect V_BCKP to VCC.
   Note: The BDS system cannot run in parallel with the GLONASS system. QZSS and SBAS are only available when GPS is enabled.

Revision History

Version	Revision History	Date
R1	Initial Edition	Feb. 2020
R1.1	SNRSTAT: update the description of InstallState	Jun. 2020
R1.2	2.2 Key Features: add and refine the specification	Aug. 2020
R1.3	Add parameters in section 2.2 5.1: add module usage notes	Oct. 2020
R1.4	Add the description of SMT stencil	Jun. 2021
R1.5	Update power supply VCC and V_BCKP	Aug. 2021
R1.6	Add the Note in Section 5.2	Nov. 2021
R1.7	If hot start is not used, connect V_BCKP to VCC. GNSS chip qualified a ccording to AEC-Q100. Revise the VSWR in section 2.2	Nov. 2022

Disclaimer
The contents of this document are subject to revision without notice due to continued progress in methodology, design and manufacturing, and do not represent a commitment on the part of Unicore Communications, Inc. The information contained within this manual is believed to be true and correct at the time of publication.

Product Overview

Scope
This document describes the information of the hardware, installation, specification and the use of UNICORECOMM UM220-INS series products.

Audience
This document is intended to present an overview of UNICORECOMM UM220-INS series products. The audience is expected to possess the expertise on GNSS receivers.

Introduction

Product Description

UM220-INS series products (including UM220-INS NL, UM220-INS NF) are GNSS+MEMS dual-system modules designed for automotive navigation based on UNICORECOMM low power GNSS SoC – UFirebird (UC6226). With the built-in six axis MEMS, and the support of multi-system joint positioning or single-system standalone positioning, UM220-INS series product can output GNSS+MEMS inertial positioning result continuously even in tunnels and underground garages.

The GNSS chip in the UM220-INS module is qualified according to AEC-Q100, and the production process complies with IATF 16949.

Figure 2-1 UM220-INS Series Modules (left side: UM220-INS NL, right side: UM220-INS NF)

UM220-INS Series Modules User Manual

Variant	Grade		System*					Interface		Data Update Rate*
	Professional	Automotive	GPS	BDS*	GLONASS*	Galileo	QZSS	UART1	UART2	
UM220-INS NL	●		●	●	●	●	●	●	●	1Hz
UM220-INS NF		●	●	●	●	●	●	●	●	1Hz

UM220-INS series modules support multiple positioning modes including joint positioning and standalone positioning:

- GPS L1+SBAS+QZSS
- GPS+GLONASS+Galileo+SBAS+QZSS
- GPS+BDS+Galileo+SBAS+QZSS (default mode)
- BDS

QZSS and SBAS are only available when GPS is enabled

1. The BDS system cannot run in parallel with the GLONASS system.
2. The default data update rate of the module is 1Hz, which can be configured into 10Hz.

Key Features

Power	
Voltage	+3.0V~3.6V VDC
Power Consumption1	90mW
RF Input	
Frequency	1559~1605MHz
Input VSWR	≤2.5
Input Impedance	50Ω
Antenna Gain	15~30dB
Physical Characters	
Dimension	16.0mm*12.2mm*2.6mm
Environment	

Operating Temperature		-40℃ ~ +85℃				
Storage Temperature		-45℃ ~ +90℃				
Input/ Output Data Interface						
UART		UART*2, LVTTL. Baud Rate: 4800~460800bps				
GNSS Performance						
Frequency		BDS B1: 1561.098MHz GPS L1: 1575.42MHz GLONASS L1: 1602+0.5625*k (MHz) Galileo E1: 1575.42MHz				
TTFF (Time to First Fix)		**GPS+GLO+GA**		**GPS+BD+GA**		
	Cold Start Hot Start Reacquisition AGNSS	30s 1s 1s 5s		30s 1s 1s 5s		
Positioning Accu		**GPS+GLO+GA**		**GPS+BD+GA**		

racy2		2m		2m		
Velocity Accuracy (RMS)		**GPS+GLO+GA**		**GPS+BD+GA**		
		0.02m/s		0.01m/s		
Sensitivity		**GPS+GLO +GA**	**GPS+BD +GA**	**BD**	**GPS**	**GLO**
	Tracking	-161dBm	-161dBm	-159dBm	-161dBm	-158dBm
	Acquisition	-147dBm	-147dBm	-144dBm	-147dBm	-142dBm
	Hot Start	-154dBm	-154dBm	-149dBm	-154dBm	-148dBm
	Reacquisition	-157dBm	-157dBm	-156dBm	-157dBm	-153dBm
DR Position Error		typ. 3 % of distance travelled with the GNSS outage				
Frequency of Time Pulse Signal		1Hz				
Maximum Navigation Rate (Measurement Rate)		10Hz				
Navigation Latency		100ms nominal				

Maximum Sensor Measurement Message Output Rate	10Hz
Accuracy of Time Pulse Signal	RMS 30ns (GPS+BD) 99% 50ns (GPS+BD)
Data Output3	NMEA 0183, Unicore Protocol
Operational Limits	Dynamics ≤ 4g Altitude 50000m Velocity 515m/s

Interfaces

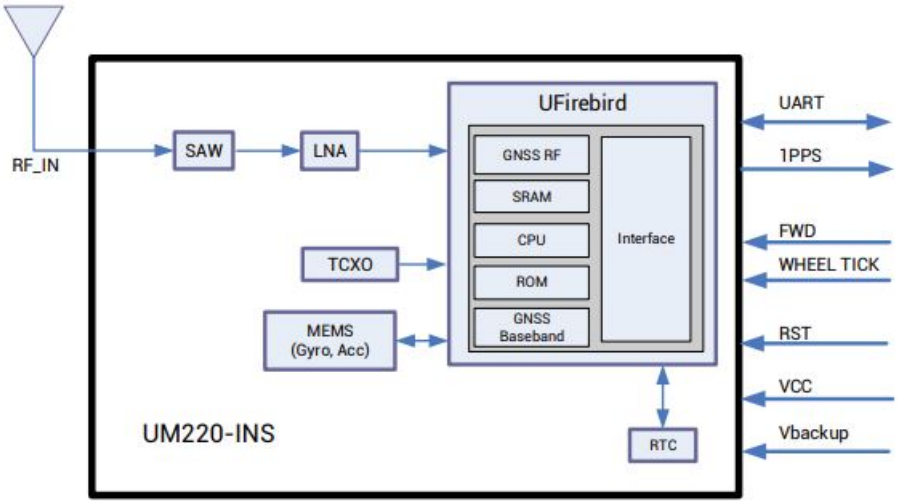


Figure 2-2 UM220-INS Series Modules Block Diagram

UART
UM220-INS series modules support two configurable UART ports. COM1 is the main serial port, which supports data transfer and firmware upgrade function, the signal input/output is LVTTL. The default baud rate is 115200bps, and can be configured up to 460800bps. Ensure that COM1 is connected to a PC or an external processor for firmware upgrades.
COM2 is limited to support data transmission, and can't be used for firmware upgrade.

Odometer (FWD/WHEELTICK)
UM220-INS series modules have an odometer input interface including FWD and WHEELTICK, which are useful for improving the module's location accuracy.

MEMS
UM220-INS series modules integrate six-axis MEMS, three-axis gyro and three-axis accelerator on board. MEMS provides information on carrier attitude and speed changes, which are combined with GNSS to perform a combined navigation calculation. This combination ensures much more continuous and uninterrupted positioning than standalone GNSS, especially in the conditions with poor signal.

1PPS
UM220-INS series modules output 1 PPS with adjustable pulse width and polarity. 1PPS is not for timing application.

nReset
Low voltage valid, and the active time is required to last at least 10ms

System Installation

Prerequisites
UM220-INS series modules are Electrostatic Sensitive Devices (ESD) and must be installed with special precautions when handling. Improper operation can result in a damage to components.

- Perform the steps in section 3.2 in the correct order.
- Electrostatic discharge (ESD) may cause a damage to the device. All operations mentioned in this chapter should be performed on an antistatic workbench, using an antistatic wristband and a conductive foam pad. If the 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, and DO NOT touch any components of the module.

- Please check carefully whether the module is obviously loose or damaged. Please contact us or the local dealer for any problems.

Figure 3-1 shows the typical installation of UM220-INS series modules with EVK suites.

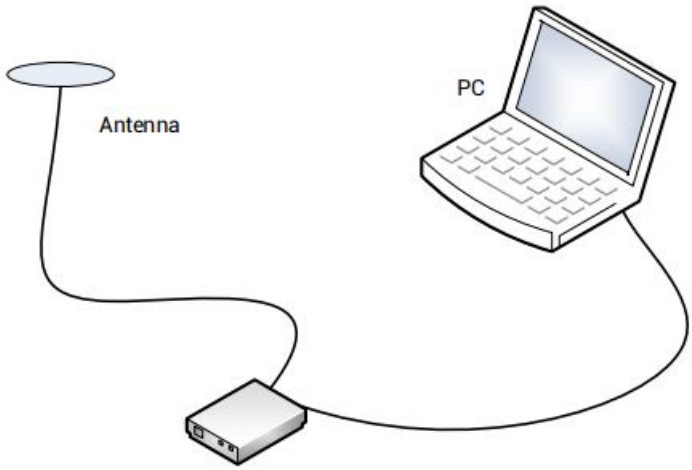


Figure 3-1 Typical Installation of UM220-INS Series Modules

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

- UM220-INS EVK suite (with AC Adapter)
- UM220-INS Series Module User Manual
- UNICORECOMM uSTAR application package
- Qualified antenna supporting GPS L1 and BDS B1/GLONASS L1
- Direct serial cable and USB
- PC or Laptop with serial ports (Windows 7 and above

Please keep the boxes and anti-static plastic bags for storage and handling

System Installation

Perform the steps below to install the module:

- 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 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 to UM220-INS EVK;
- Step 4: Connect the PC to the EVK serial port through the serial cable;
- Step 6: Open the uSTAR software on the PC;
- Step 7: Configure the receiver through uSTAR to display constellations view, log messages, and receiver status, etc.

Technical Specifications

Electrical Specifications

Absolute Maximum Ratings

Item	Min	Max	Unit	Description
Power Supply (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	-0.5	3.6	V	Voltage of the digital signal pins
RF_IN	–	+3	dBm	Max input power of antenna
Storage Temperature TSTG	-45	90	°C	Storage temperature
SMT Reflow Temperature TSLDR	–	+260	°C	Soldering temperature

Operation Condition

Item	Pin	Min.	Typical Value	Max.	Unit	Condition
Power Supply (VCC)	Vcc	3.0	3.3	3.6	V	
Ripple Voltage	Vp-p			50	mV	
Peak Current	Iccp			52	mA	Vcc=3.0 V
Tracking Average Current	IACQ	28	30	32	mA	Vcc=3.0V
LOW Level Input Voltage	VIL	-0.3		0.2*Vcc	V	
High Level Input Voltage	VIH	0.7*Vcc		Vcc+0.3	V	
LOW Level Output Voltage	VOL	0		0.4	V	Iout=-2 mA
High Level Output Voltage	VOH	Vcc–0.4		Vcc	V	Iout=2 mA
Antenna Gain5	GANT	15	20	30	dB	
Noise Figure	NF		1.9		dB	
Operating Temperature	TOPR	-40		+85	°C	

Including nRESET, TIMEPULSE, WHEELTICK, TXD2, RXD2, FWD, TXD1, RXD1
The antenna gain range refers to the gain range of the preamplifier before RF_IN of the module.

Dimensions

Symbol	Min (mm)	Typical (mm)	Max (mm)
A	15.9	16.0	16.5
B	12	12.2	12.4
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

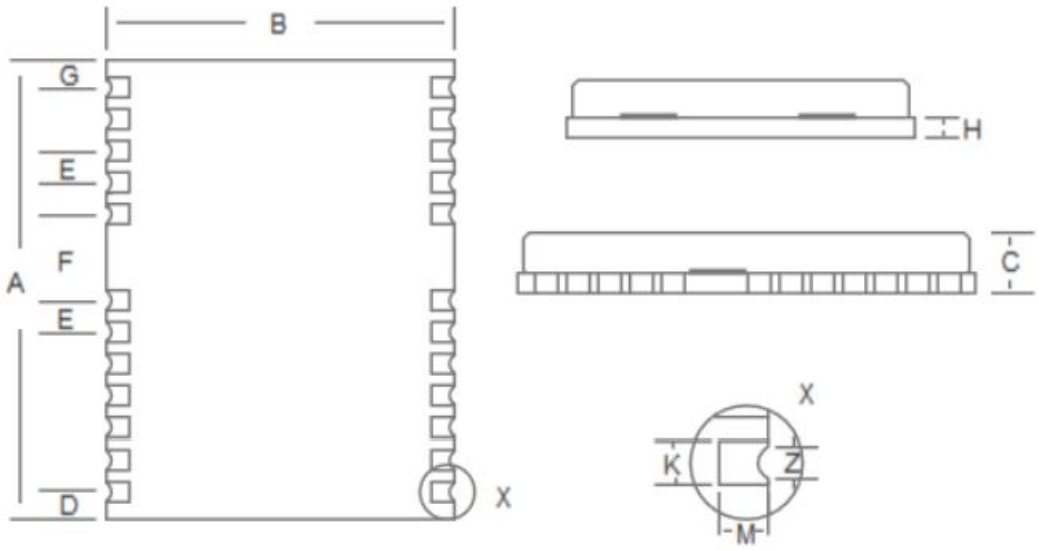


Figure 4-1 Mechanical Layout

Pin Definition (Top View)

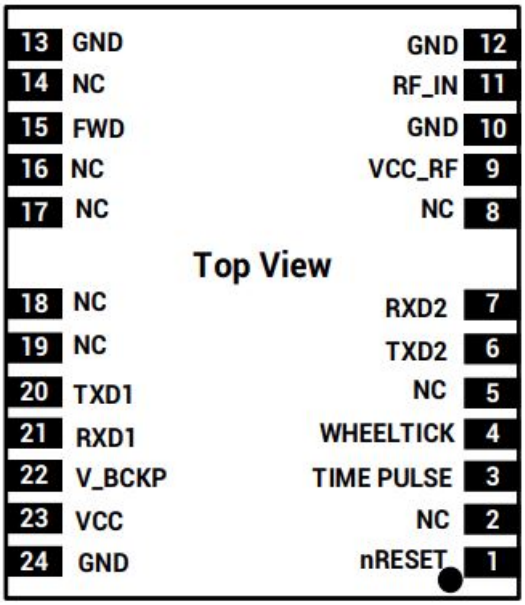


Figure 4-2 Pin Assignment

Pin No	Name	I/O	Electrical Level	Description
1	nRESET	I	LVTTL	Reset Low active, bypass if not in use
2	NC	–	–	Reserved
3	TIMEPULSE	O	LVTTL	Time pulse (1PPS)
4	WHEELTICK	I	LVTTL	Odometer speed pulse, bypass if not in use. It is str ongly recommended to use, the maximum acceptab le pulse frequency is 5KHz, and the minimum pulse width is greater than 100us. **Note: Incorrect signals of the odometer will lead to serious problems in the use of the product. Pl ease make sure the signal is correct.**
5	NC	–	–	Reserved
6	TXD2	O	LVTTL	UART 2-TX
7	RXD2	I	LVTTL	UART 2-RX
8	NC	–	–	Reserved
9	VCC_RF	O		Antenna feed output
10	GND	–	–	Ground
11	RF_IN	I	–	GNSS signal input
12	GND	–	–	Ground
13	GND	–	–	Ground
14	NC	–	–	Reserved

Pin No	Name	I/O	Electrical Level	Description
15	FWD	I	LVTTL	Odometer direction input, bypass if not in use. It is s trongly recommended to use High level=forward Low level=backward **Note: Incorrect signals of the odometer will lead to serious problems in the use of the product. Pl ease make sure the signal is correct.**
16	NC	–	–	Reserved
17	NC	–	–	Reserved
18	NC	–	–	Reserved
19	NC	–	–	Reserved
20	TXD1	O	LVTTL	UART 1-TX
21	RXD1	I	LVTTL	UART 1-RX
22	V_BCKP	I	1.65V~3.6V	Backup voltage supply, applicable for hot start. If yo u do not use the hot start function, connect V_BCKP to VCC. Do NOT connect it to ground or leave it floating.
23	VCC	–	3.0V~3.6 V	Supply voltage
24	GND	–	–	Ground

PCB Packaging

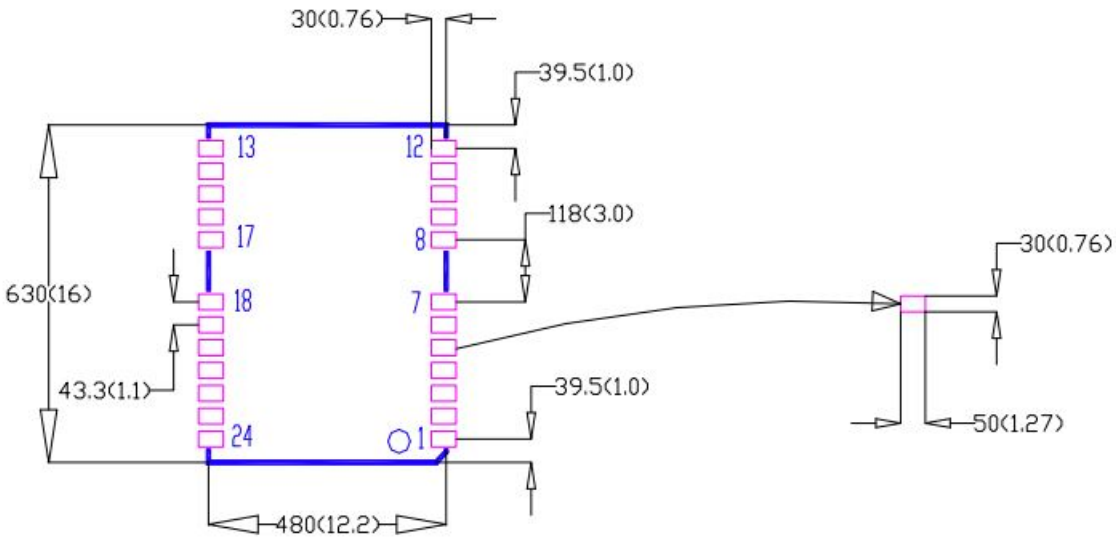


Figure 4-3 UM220-INS Series Modules Recommended PCB Packaging (unit: mil, in brackets: mm)

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

Hardware Design

Design in Considerations

It’s required to connect the following signals correctly to make UM220-INS series modules work properly.
The VCC module is of good monotonicity, and undershoot and ringing are required to be guaranteed within 5% VCC. If VCC is powered off and then rebooted, the power off time must be greater than 10ms. If VCC power supply cannot meet the above requirements, there is a probability that the UM220-INS module will not start normally.
When the module is not powered on, it is necessary to ensure that the power supply and GPIO (PPS, TX, RX, RESET) are in a high impedance state or a low level to avoid abnormal operation of the module caused by leakage.
If serial port 2 and pulse per second (1PPS) are used, a 1KΩ resistor must be connected in series at TXD2 and a 4.7KΩ resistor must be connected in series at the pulse per second (1PPS)

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

Pay attention to the following items in the design to obtain good performance

- Power supply: Stable and low ripple power is necessary for good performance.
  - Use LDO to ensure the purity of power supply.
  - Place LDO to the module as close as possible in layout.
  - Widen the power circuit wiring or use copper pour surface to transmit current.
  - Avoid walking through any 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 the main equipment are consistent with that of UM220-INS series modules.
- 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 series modules.
- This module is a temperature sensitive device, rapid temperature changes will result in reduced performance, keep it as far away from any high-power high-temperature air and heating devices as possible.

Antenna

If UM220-INS series modules use a +3V active antenna, it is recommended to use VCC_RF pin to feed the antenna through the feeding inductor.

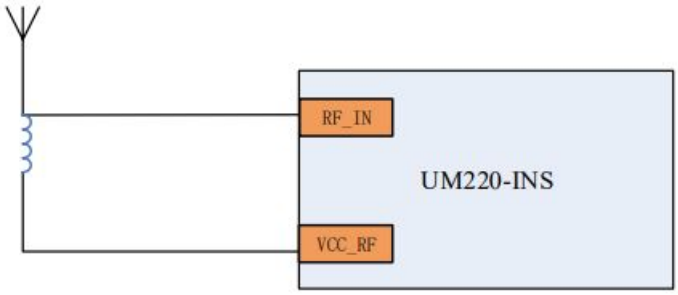


Figure 5-1 UM220-INS Active Antenna (+3V) Solution

Note: If the user has a high requirement for ESD (> ± 2000 V), the user should consider other method to feed the antenna rather than using the VCC_RF pin. In this case, it is recommended to choose a power supply chip with high ESD protection level. Gas discharge tube, varistor, TVS tube and other high-power protective devices may also be used in the power supply circuit to further protect the module from ESD damage or other Electrical Over-Stress (EOS).
If the UM220-INS series modules use an active antenna other than +3V, the bias voltage V_BIAS required by the antenna is used to power the antenna through the feeding inductor.

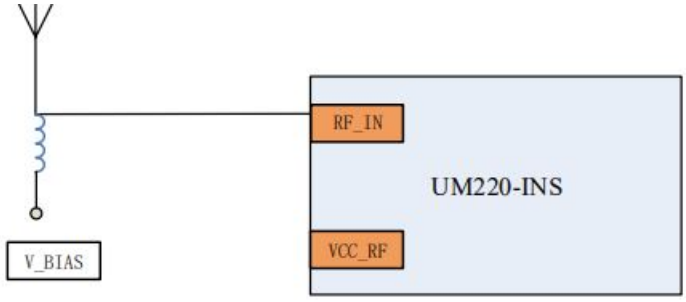


Figure 5-2 UM220-INS NF Active Antenna (Other than +3V) Solution

If the UM220-INS series modules use a passive antenna, connect the antenna to the RF_IN directly, and VCC_RF can be left floating. It should be noted that compared to active antennas, the use of passive antennas may cause GNSS performance degradation.

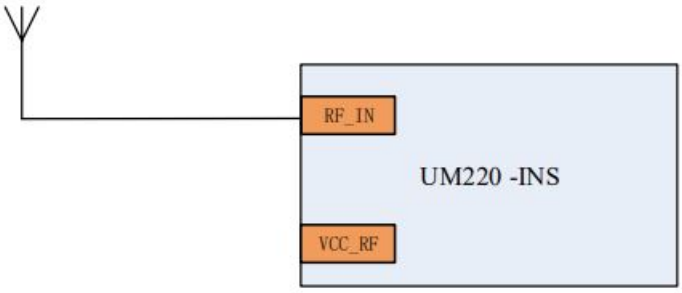


Figure 5-3 UM220-INS Passive Antenna Solution

Serial Port
The serial ports of UM220-INS series modules are of LVTTL level, use a RS232 converter for the PC connection.

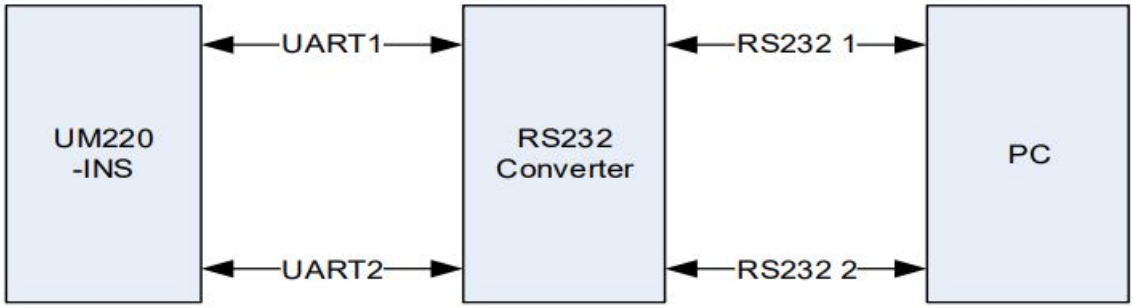


Figure 5-4 Connect COM to PC

Odometer Connection

UM220-INS series modules support direction (FWD) and velocity pulse (WHEELTICK) signals connecting with odometer. The accuracy of module positioning trajectory could be enhanced if the module obtains effective direction and velocity pulse signals.

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

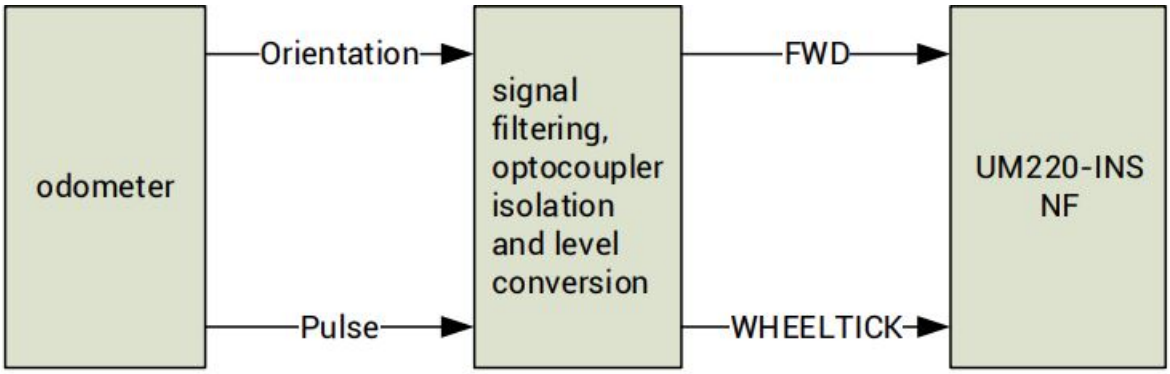


Figure 5-5 Odometer Connection

System Coordinates

The coordinates of UM220-INS series modules must be consistent with that of the vehicles, otherwise you must perform the related configuration following the CFGROTAT command in the corresponding protocol manual.

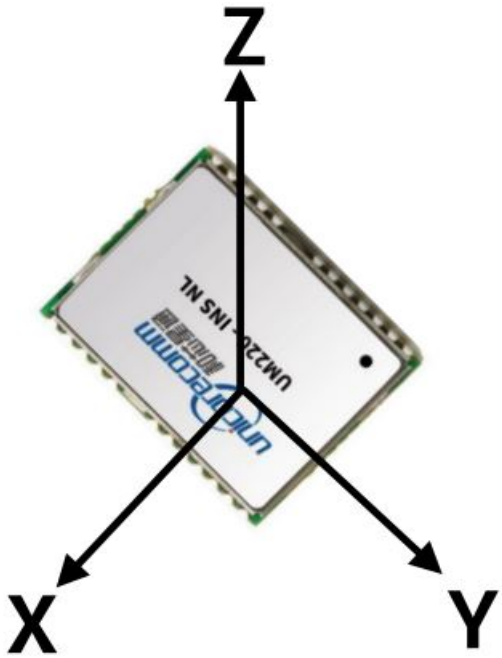


Figure 5-6 Module Coordinate System

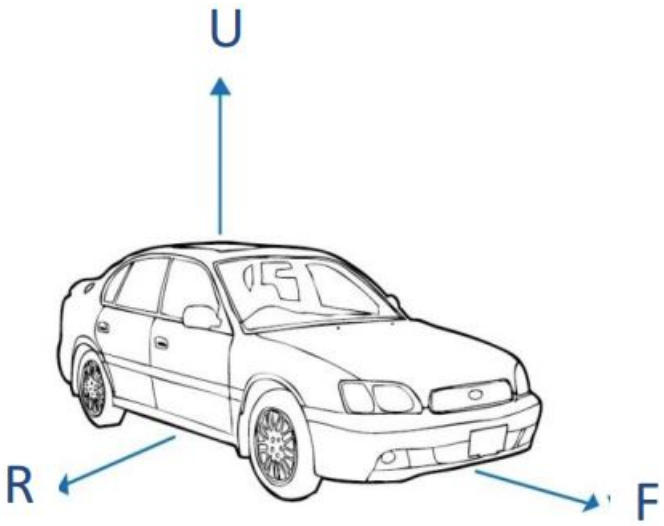


Figure 5-7 Car Coordinate System

1. The normal direction of the shield is Z axis, the long axis is Y and the short axis is X.
2. The coordinate of the module must be consistent with the vehicle's, which means: X-axis and R-axis are parallel in the same direction, Y-axis and F-axis are parallel in the same direction, and Z-axis and U-axis are parallel in the same direction.

Installation of the Module

UM220-INS series modules must be rigidly connected to the vehicle body and firmly fixed.

1. The antenna should be installed with the front facing up as much as possible and firmly fixed; ensure that the elevation angle of the environment where the antenna is located is greater than 15 ° and the space is unobstructed.
2. In the environment where the antenna is located, there is no strong interference source within the frequency of

1568± 20MHz.

Installation Instructions
The UM220-INS series modules must be firmly connected to the vehicle to prevent any offsets or vibrations between the module and the vehicle. UM220-INS series modules should not be installed in the suspension part of the vehicle (with elastic part). When the vehicle is moving, any change of the vehicle coordinate system will seriously affect the UM220-INS module and prevent it from working normally.

Installation Angle Definition
The vehicle coordinate is RFU, and the module coordinate is xyz, as shown in figure 5-5 and figure 5-6. AngleR, angleF, and angleU of the module's installation angle are defined as below:

1. Coincide the initial state of RFU coordinate with that of xyz coordinate
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

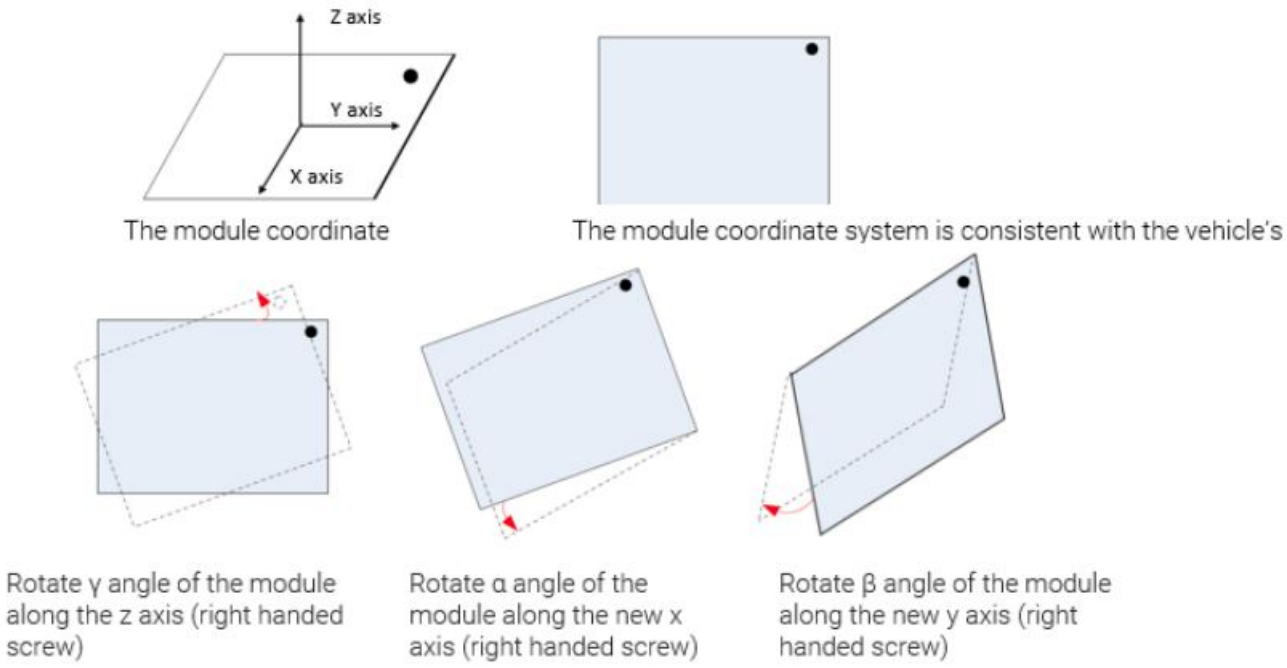


Figure 5-8 Module Coordinate System (RFU)

Installation Options of the Module

- **Free Installation (Default Mode)**
  UM220-INS series modules integrate a three-axis gyroscope and a three-axis accelerometer, with a built-in self-calibration algorithm, which supports the free installation of the module with respect to any installation angle of the vehicle coordinate system, such as, the completely horizontal installation, inclined installation at a certain angle, and flip installation.
- **Fixed Installation**
  According to the installation angle definition, the accurate installation angle is manually configured into the module. This installation method takes a short calibration time. When configuring the installation angle manually, the maximum angle error is limited to ± 5 degrees.

Reference Messages

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 5.6.2 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 and 0 for fixed installation;
2. Input the actual installation angles including angleR, angleF, and angleU into the module. After the configuration is completed, save the configuration to the flash through the CFGSAVE command, otherwise it needs to be identified again at the next boot.
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.

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 scale factor calibration is completed
- **InstallState**
  - IMU device failure, unable to estimate the installation angle
  - In the progress of the calibration
  - The current quality of satellite information is insufficient and better satellite conditions are required
  - The current maneuver conditions of the carrier are insufficient and it’s required to be accelerated

    - The current speed of the carrier is too low and it’s required to be increased.
- **Mapstat**
    - No serial port is configured to enter MAP information
    - No MAP messages are received by the serial port or the sent MAP message is timeout
    - MAP information is received but not applied to the composite navigation
    - MAP information is received and applied to the composite navigation
- **Fully Free Installation Test**
    - Install the module completely freely
    - Input the command $CFGROTAT,0,0,0,2 (no configuration is required for the factory mode)
    - Input the command $CFGSAVE (no configuration is required for the factory mode)
    - The process of self-calibration should satisfy above conditions of parking,satellite quality and maneuver, and etc. Confirm whether the self-calibration is completed through the $SNRSTAT output, and when the insstatus becomes 3, the self-calibration is completed.
    - Make sure the self-calibration is completed and then enter the road with poor satellite quality.
    - If the function of hot start in the basement is needed, Vbackup requires to be powered continuously;

Module Calibration and Notice

Self-Calibration
After the installation of the UM220-INS series modules, 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

- The self-calibration is triggered after power on, stop for more than three minutes;
- Good satellite visibility is required during the process of the self-calibration (the number of visible satellites is not less than six, and CN0 is above 30dB), the better the satellite observation quality is, the faster the calibration will be.
- It’s required to make 90-degree turn maneuvers for more than five times while the vehicle is running normally.
- Keep the forward driving speed above 36 km/h under the premise of normal driving. The more times of acceleration (it’s recommended to drive at the acceleration greater than 0.5m/s squared for no less than 10 times) and 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 a complex environment such as a tunnel and garage immediately after the first alignment.

Note

- The normal use of the module only requires only one self-calibration process.
- After the INS module is calibrated, it can be moved only after the power is completely cut off, including the main VCC and the backup V_BACKUP.

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 (for example, the module is blown off by a hot air gun), which may lead to module damage.

Package

Product Labeling

Package Description

The UM220-INS series modules use carrier tape and reel (suitable for mainstream surface mount equipment), packaged in vacuum-sealed aluminum foil antistatic bags, with a desiccant inside to prevent moisture. 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.

Figure 7-1 Module Package

Item	Description
Module	500pics/reel
Reel Size	Tray: 13″ External Diameter: 330mm, Internal Diameter: 100mm, Width: 24mm Thickness: 2.0mm
Carrier Tape	Space between: 20mm

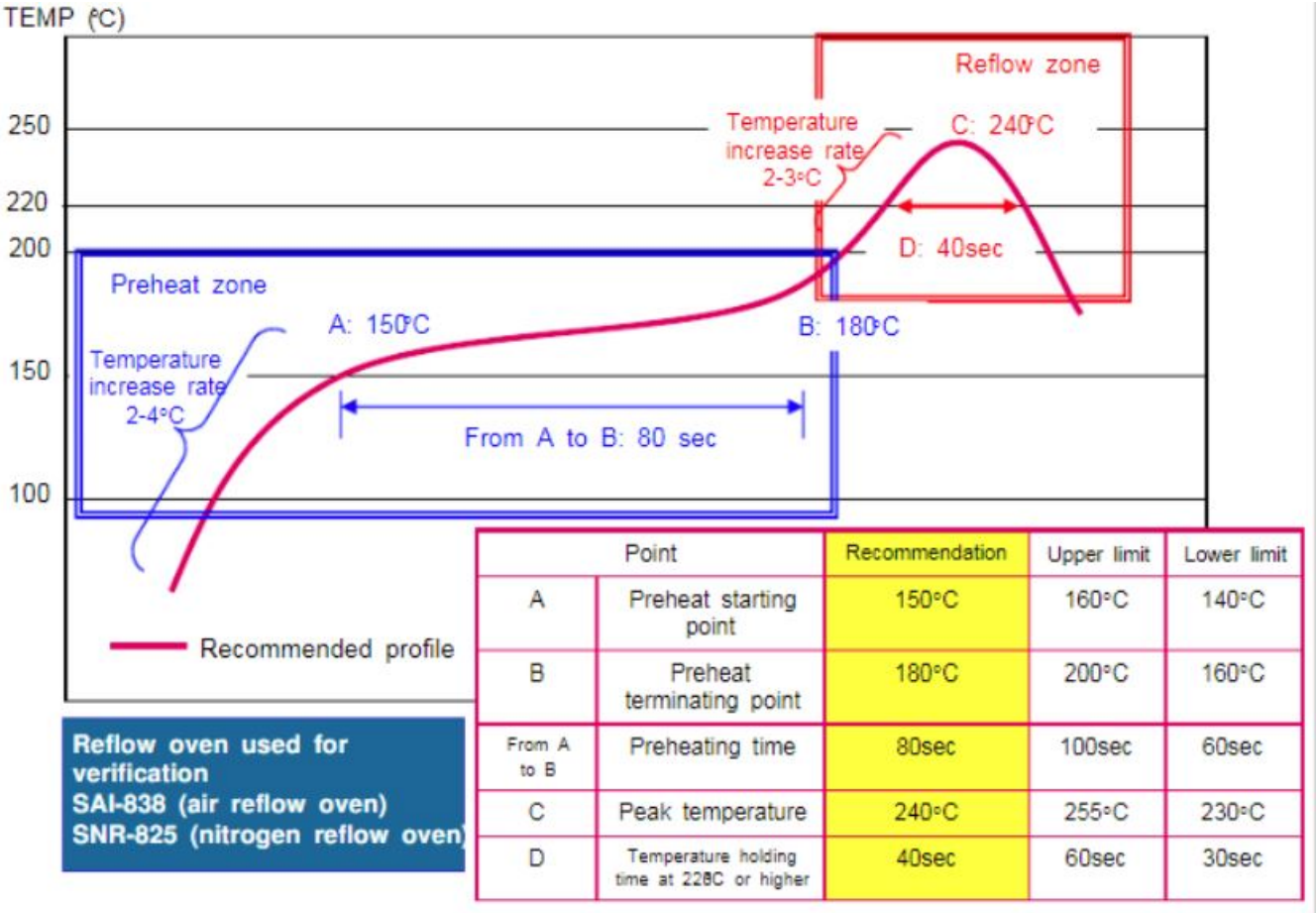
UM220-INS series modules are rated at MSL level 3, refer to the relevant IPC/JEDEC standards for baking requirements. Please access to the website www.jedec.org to download for details.
The shelf life of UM220-INS series modules is one year.

Clean

DO NOT use alcohol or other organic solvents to clean, or it may lead to flux residues into the shielding shell, causing mildew and other problems.

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 9-1 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 9-1 Reflow Soldering Line

Note: The apertures in the stencil need to meet the customer's own design requirements and inspection specifications, and the thickness of the stencil should be above 0.15mm, and 0.18mm is recommended.

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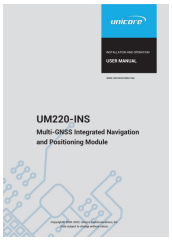
Documents / Resources

	unicore UM220-INS Series Multi-GNSS Integrated Navigation and Positioning Module [pdf] User Manual UM220-INS Series Multi-GNSS Integrated Navigation and Positioning Module, UM220-INS Series, Multi-GNSS Integrated Navigation and Positioning Module, Navigation and Positioning Module, Positioning Module

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