

TR07M Integrated Monitoring Receiver Product Manual

GNSS Products

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If you require any assistance, please contact us:

QUECTEL IOT TECHNOLOGIES PTE. LTD.

6 RAFFLES QUAY #14-06 SINGAPORE 048580

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About the Document

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1 Introduction

The TR07M is a multi-system, multi-frequency, integrated GNSS monitoring station device. The device adopts a low-power, integrated design for easy deployment and is widely applicable to safety monitoring fields such as dams, geological hazards, mines, and slopes, providing high-precision three-axis surface displacement information around the clock. The device can also be used as a reference station in fields such as transportation and lawn mowing.

1.1. Key Features

1. **All-in-one Design:** Combines GNSS module, cellular module, Sub-GHz module, Wi-Fi module, and integrated GNSS/cellular/Wi-Fi antennas.
2. **Industrial Ruggedness:** Shock-resistant, impact-proof, drop-resistant, lightning-protected, UV-resistant, and rated IP67 for dust/water ingress protection.
3. **Rapid Deployment:** Simplified installation process minimizes wiring errors and enhances stability.
4. **End-to-Cloud Service:** Enables remote configuration, diagnostics, and troubleshooting, reducing field maintenance.

1.2. Physical Appearance

The integrated monitoring receiver includes:

- One RJ45 Ethernet port
- One TNC connector
- One 7-pin LEMO connector
- One Nano-SIM card slot
- Three LED status indicators



Figure 1: TR07M Integrated Monitoring Receiver (Front View)



Figure 2: TR07M Integrated Monitoring Receiver (Bottom View)

1.3. Technical Specifications

Table 1: Technical Specifications

Category		Specification	
GNSS	Supported Systems/Frequencies	GPS	L1 C/A, L2C, L5
		GLONASS	L1, L2
		Galileo	E1, E5a, E5b, E6
		BDS	B1I, B1C, B2a, B2b, B3I
		QZSS	L1 C/A, L2C, L5
		NavIC	L5
	Cloud Processing Accuracy	Horizontal	$\pm(2.5 \text{ mm} + 0.5 \times 10^{-6} \times D)$
		Vertical	$\pm(5 \text{ mm} + 0.5 \times 10^{-6} \times D)$
	Edge Processing Accuracy	Horizontal	$\pm(2.5 \text{ mm} + 0.5 \times 10^{-6} \times D)$
		Vertical	$\pm(5 \text{ mm} + 0.5 \times 10^{-6} \times D)$
MEMS	Accelerometer	Range	$\pm 2000 \text{ mg}$
		Resolution	1 mg
	Inclinometer	Range	$\pm 90^\circ$
		Resolution	0.01°
Wireless Communication	Cellular	LTE-FDD: B1/2/3/4/5/7/8/12/13/18/19/20/25/26/28/66 LTE-TDD: B34/38/39/40/41 WCDMA: B1/2/4/5/6/8/19 GSM/EDGE: B2/3/5/8	
	Wi-Fi	$\leq 10 \text{ m range}$	
	Sub-GHz	$\leq 500 \text{ m range}$	
Wired Communication	Ethernet RJ45	IEEE 802.3	
	RS-485	Debug console; Modbus RTU support planned	
	RS-232	NMEA 0183, RTCM 3.x protocols support	
Electrical	Power Input	DC 9–36 V (Typical: 12 V)	

Characteristics		In base station mode, data is transmitted only via Sub-GHz.	In monitoring station mode, data is transmitted only via Sub-GHz.
	Power Consumption	1.3 W @ 12 V	1.4 W @ 12 V
Interfaces	LEDs	Red (Power), Blue (Satellite), Orange (Cellular)	
	SIM Slot	Nano-SIM	
	Connectors	LEMO (Power/RS-232/RS-485), TNC (Sub-GHz antenna), RJ45	
Cable	Length	2 m by default (customizable)	
Storage		64 GiB	
Physical	Dimensions	Ø220 × 149 mm	
	Weight	2.1 kg	
Environmental Adaptability	Operating Temperature	-40 °C to +70 °C	
	Storage Temperature	-40 °C to +85 °C	
	Humidity	0–95 % RH	
	ESD Protection	Whole-device ESD: contact discharge ±8 kV, air discharge ±15 kV	
	Protection Rating	IP67	

NOTE

1. In accuracy specifications, the D represents the distance between the measured points.
2. If a self-purchased power adapter is used, the power input must be DC 9–36 V, power ≥ 24 W (12 V/2 A or 24 V/1 A).

1.4. Interfaces

1.4.1. Product Interfaces

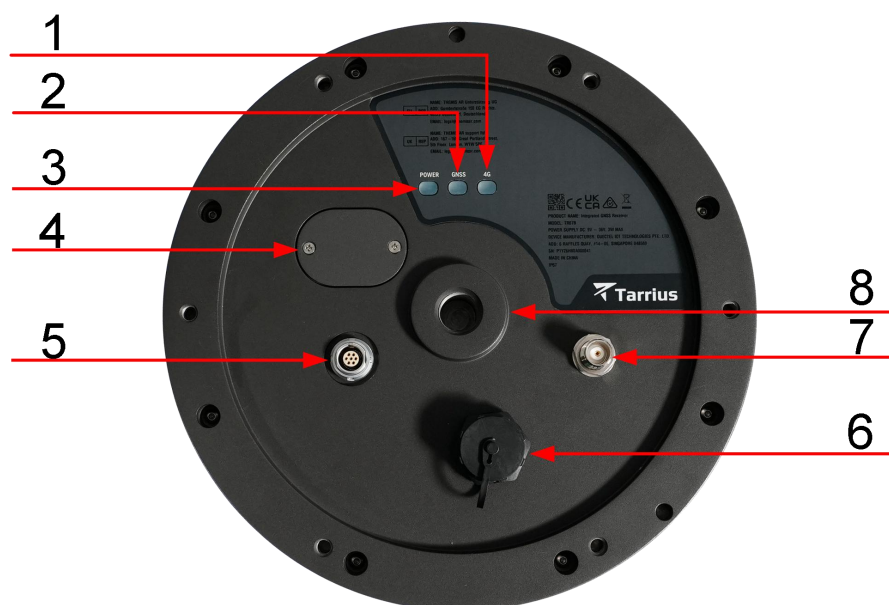


Figure 3: Product Interfaces

Table 2: Product Interfaces

Function	No.	Name	Description
Signal Indication	1	Cellular status indicator	● On: Network registration successful. ● Off: Network registration failed.
	2	Satellite status indicator	● Satellite lock: Flashes N times every 3 s (0.4 s interval, N = satellite count), then turns off for 2 s. ● No signal: Flashes every 5 s. Note: Within a 5-second cycle, the blue satellite indicator light will flash at most 8 times. If there are more than 8 satellites, it will still only flash 8 times (the upper limit) and cannot indicate the actual number of satellites.
	3	Power status indicator	● On: Base station. ● Flashing: Monitoring station. ● Off: Power-on failure.
Insert SIM card	4	SIM card slot	Connect the Nano-SIM card.
Power supply and communication	5	LEMO	Connect to external power supply and RS-232 and RS-485 interfaces.

Ethernet communication	6	Ethernet RJ45	Connect the network cable.
Connect to Sub-GHz antenna	7	TNC	Connect the external Sub-GHz antenna.
Mounting	8	Mounting hole	Mounting hole size: Ø16 × 21 mm.

1.4.2. Device-Side LEMO Connector

Device-side LEMO connector

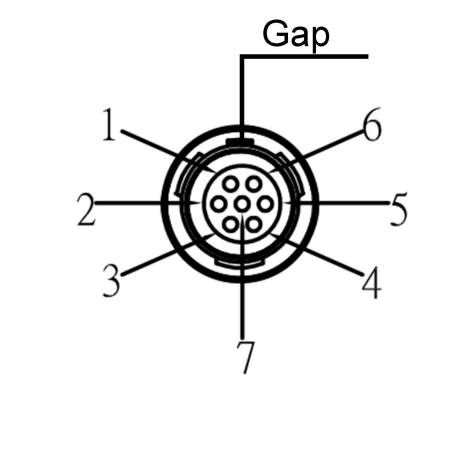


Figure 4: Device-Side LEMO Connector

Table 3: Pin Description

Function	No.	Name	Description	DC Characteristics
Communication Interface	1	RS-232_RXD	Used for wired communication.	VIL < 0.8 V
	2	RS-232_TXD		VIH > 2V
Debug	3	RS-485_B	Device debug console (Modbus RTU support planned).	Differential voltage = 3V Common-mode voltage = 3V
	4	RS-485_A		
Power	5, 7	GND	Ground	0V
	6	DC_IN	Power Input	DC 9–36 V (Typical: 12 V)

1.4.3. Cable-Side Interface Definition

Cable side

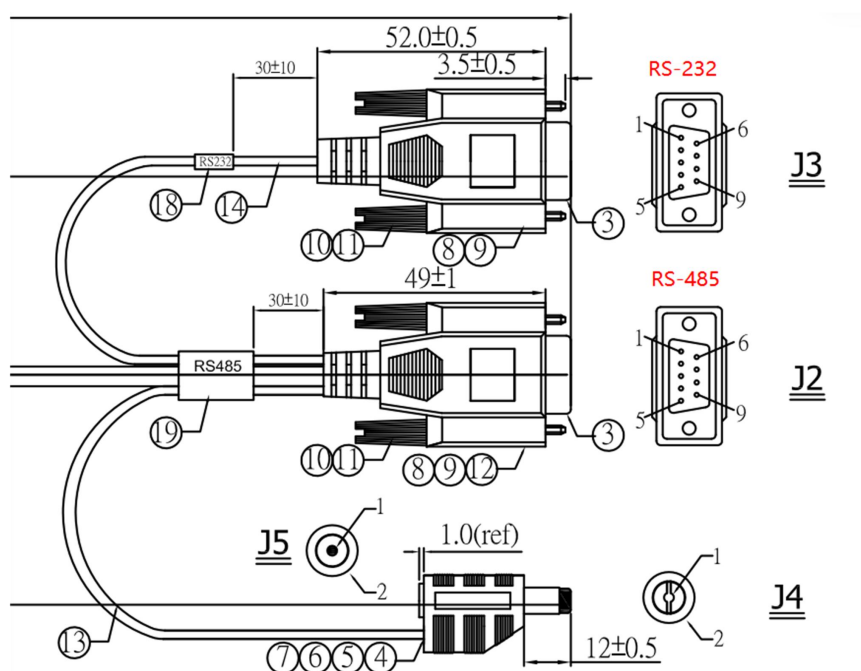


Table 4: Cable-Side Interface Definition4

Function	No.	Name	Description	DC Characteristics	Remark
RS-232	2	RS-232_TXD			
	3	RS-232_RXD	DB9 female connector.	See section 1.4.2.	J3
	5	GND			
RS-485	1	RS-485_A	DB9 female connector.	See section 1.4.2.	J2
	2	RS-485_B			
DC connector	-	DC 2.5 × 5.5 mm male connector.	-	-	J4
	-	DC 2.5 × 5.5 mm female connector.	-	-	J5

2 Remote Management

Multiple device management methods are provided:

- Cellular-Based Management: When cellular functionality is enabled, the device automatically connects to the IoT platform upon startup.
- Wi-Fi-Based Management: When Wi-Fi functionality is enabled, users can connect to the device's Wi-Fi hotspot.

2.1. Cellular-Based Management (IoT Platform)

Users can manage connected integrated GNSS receivers via the IoT monitoring platform. This platform enhances digital operational efficiency by providing centralized device management capabilities.

Access Method:

1. Use a PC browser to navigate to: <https://eueam.acceleronix.io>.
2. Enter account credentials to log in.

IoT Platform Introduction:

- Dashboard: Visualizes aggregated device data and geographical distribution.
- Device Management:
 - View real-time device status.
 - Issue control commands (e.g., configure operational modes).
- Organization Management: Administer internal accounts and permissions.

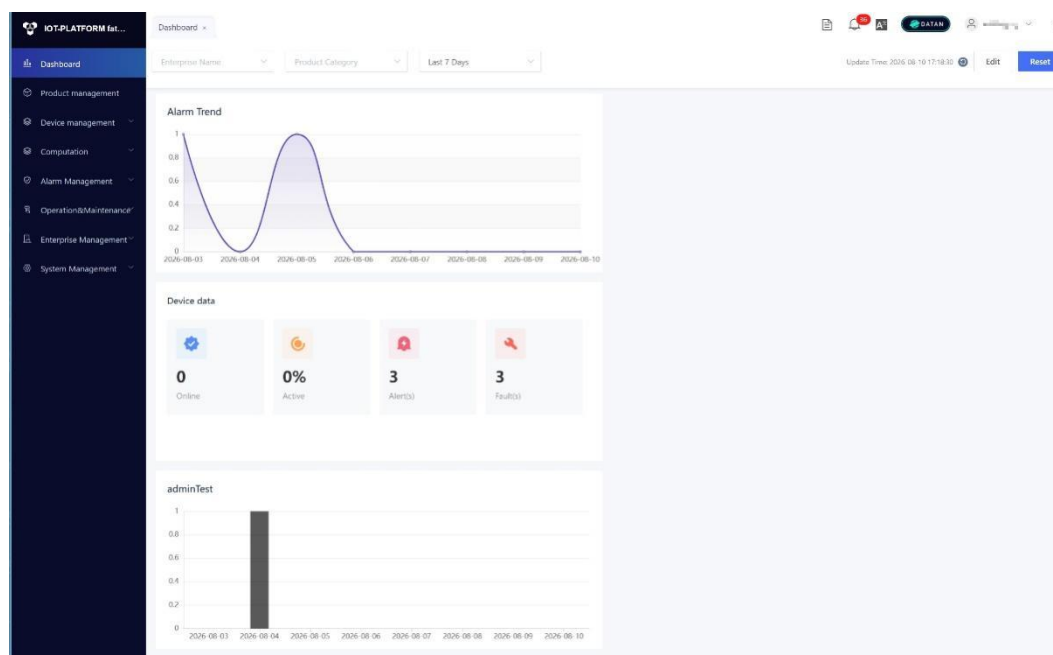


Figure 5: Dashboard

2.2. Wi-Fi-Based Management (Web UI)

Users can connect to the device's Wi-Fi hotspot for local management.

Access Method:

1. Connect to the device's Wi-Fi network.
2. Open a browser and enter the URL: <http://192.168.1.1>.
3. A login password must be configured on first access. The device reboots automatically after configuration. After rebooting, you can connect to Wi-Fi with the new password to access the Web UI directly.

Web UI Introduction:

- Device Status: Display real-time operational metrics (e.g., signal strength, satellite count).
- Configuration: Adjust parameters (e.g., communication settings).
- Diagnostics: Perform network diagnostics and hardware self-tests.
- Firmware Management: Over-the-air (OTA) update.

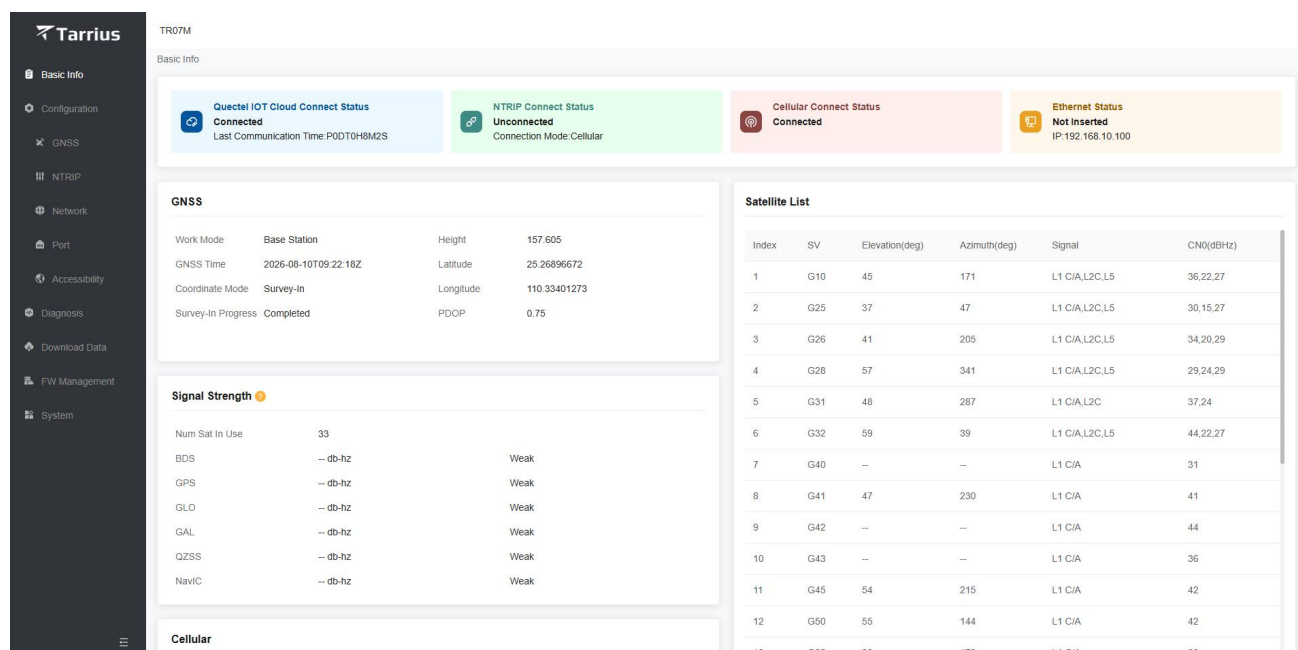


Figure 6: Web UI

3 Field Installation Guide

3.1. Site Selection Criteria

- **Stability:** Install on geodetically stable ground (minimal deformation risk).
- **GNSS Visibility:** Open sky view; avoid obstructions.
- **Signal Path:** Clear line of sight (LOS) between the base station and each monitoring station.
- **Cellular Signal:** Ensure stable cellular signal for reliable data transmission.
- **EMI Mitigation:** Keep away from power stations and strong RF sources.
- **Multipath Avoidance:** Keep reflective surfaces (e.g., buildings, water) at least 50 m away.
- **Solar Power (if used):** The solar panel should face the equator (true south in the Northern Hemisphere, true north in the Southern Hemisphere) and be tilted at an angle approximately equal to the site latitude to maximize daily sun exposure. Ensure the panel is free from shading by nearby obstacles throughout the day.

3.2. Installation Procedure

Refer to *TR07M Integrated Monitoring Receiver Installation and Commissioning Guide*.

4 Troubleshooting

Table 5: Troubleshooting

No.	Symptom	Solution
1	All LEDs are off	Verify power supply (9–36 V DC); check cable continuity.
2	Blue LED flashes every 5 s	Ensure clear sky view; relocate if obstructions exist.
3	Orange LED is off	Confirm Nano-SIM activation (data plan required); validate cellular coverage.

5 Appendix Reference

Table 6: Terms and Abbreviations

Abbreviation	Description
BDS	BeiDou Navigation Satellite System
EMI	Electromagnetic Interference
ESD	Electrostatic Discharge
Galileo	Galileo Satellite Navigation System (EU)
GLONASS	Global Navigation Satellite System (Russia)
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GSM/EDGE	Global System for Mobile Communications Enhanced Data Rates for GSM Evolution
HTTPS	Hypertext Transfer Protocol Secure
IoT	Internet of Things
LED	Light Emitting Diode
LTE-FDD	Long Term Evolution Frequency Division Duplex
LTE-TDD	Long Term Evolution Time Division Duplex
LOS	Line Of Sight
MEMS	Micro-Electro-Mechanical Systems
NavIC	Navigation with Indian Constellation
NTRIP	Networked Transport of RTCM via Internet Protocol
QZSS	Quasi-Zenith Satellite System

Abbreviation	Description
RH	Relative Humidity
RTCM	Radio Technical Commission for Maritime Services
RTK	Real-Time Kinematic
SIM	Subscriber Identity Module
WCDMA	Wideband Code Division Multiple Access
Web UI	Web User Interface

Compliance Information

European Union (EU)

This product and applicable accessories are CE-certified and strictly comply with the following harmonized European Union (EU) directives:

- Radio Equipment Directive (RED) 2014/53/EU: Compliance for wireless/RF devices (e.g., Wi-Fi, Bluetooth).
- Restriction of Hazardous Substances Directive (RoHS) 2011/65/EU: Restrictions on hazardous substances (e.g., lead, mercury).
- Waste Electrical and Electronic Equipment Directive (WEEE) 2012/19/EU: Obligations for e-waste recycling.
- Registration, Evaluation, Authorisation, and Restriction of Chemicals (REACH): Chemical substance regulations.

Declaration of conformity

This product complies with the radio interference requirements of the European community. Hereby, Quectel Wireless Solutions Co., Ltd. declares that the product is in compliance with the essential requirements and other relevant provisions of RE Directive 2014/53/EU. You can find the Declaration of Conformity on www.tarrius.com

North America

United States:

- FCC Part 15 (CFR 47): EMI/EMC compliance for digital/radio frequency devices.

1. This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference.

(2) This device must accept any interference received, including interference that may cause undesired operation.

2. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note: This equipment has been tested and found to comply with the limits for a class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help.

The device has been evaluated to meet general RF exposure requirement. This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and your body.

Canada:

- ISED RSS Standards: RF compliance (e.g., RSS-247 for Wi-Fi devices).

This device contains licence exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence exempt RSS(s). Operation is subject to the following two conditions:

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2. This device must accept any interference, including interference that may cause undesired operation of the device.

The device has been evaluated to meet general RF exposure requirement. This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and your body.

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Le dispositif a été évalué pour répondre aux exigences générales d'exposition aux ondes radiofréquences. Cet équipement doit être installé et utilisé avec une distance minimale de 20cm entre le radiateur et votre corps.