



# GPS / GNSS Over Fiber In-Building Distribution System

## Indoor GPS Signal Extension - Master Unit, Remote Unit, and Distribution Kit

Designed to extend reliable GPS and GNSS coverage into indoor, underground, and shielded areas where normal satellite reception is weak, blocked, or unavailable.



| Part Number  | Description                                | Use  |
|--------------|--|--|
| F-GNSS-TX    | GPS/GNSS FiberLink Master Unit             | 1RU rack-mount master unit with 8 SFP branch ports                     |
| F-GNSS-RX    | GPS/GNSS FiberLink Remote Unit             | Indoor / ceiling remote unit with OPT1 and OPT2 cascade SFP ports      |
| F-GNSS-TX/RX | GPS/GNSS FiberLink Indoor Distribution Kit | Master Unit and Remote Unit configuration for indoor GNSS distribution |

Company: Thor Fiber / Thor Broadcast | Website: [www.thorbroadcast.com](http://www.thorbroadcast.com) | Email: [sales@thorfiber.com](mailto:sales@thorfiber.com) | Phone: 800-521-8467

# Product Overview

The Thor Fiber GPS / GNSS Over Fiber In-Building Distribution System receives satellite positioning signals from an outdoor GNSS antenna and distributes synchronized GNSS service over fiber optic cable to indoor remote antenna units. It is intended for buildings and underground areas where concrete, steel, shielding, tunnels, basements, and large structures block normal GNSS reception.

The system is based on one central Master Unit (MU) and multiple Remote Units (RUs). The MU distributes the GPS/GNSS signal through SFP optical links. The RU units rebroadcast the signal locally so GNSS-enabled devices can receive positioning and timing information indoors.

## Key Benefits

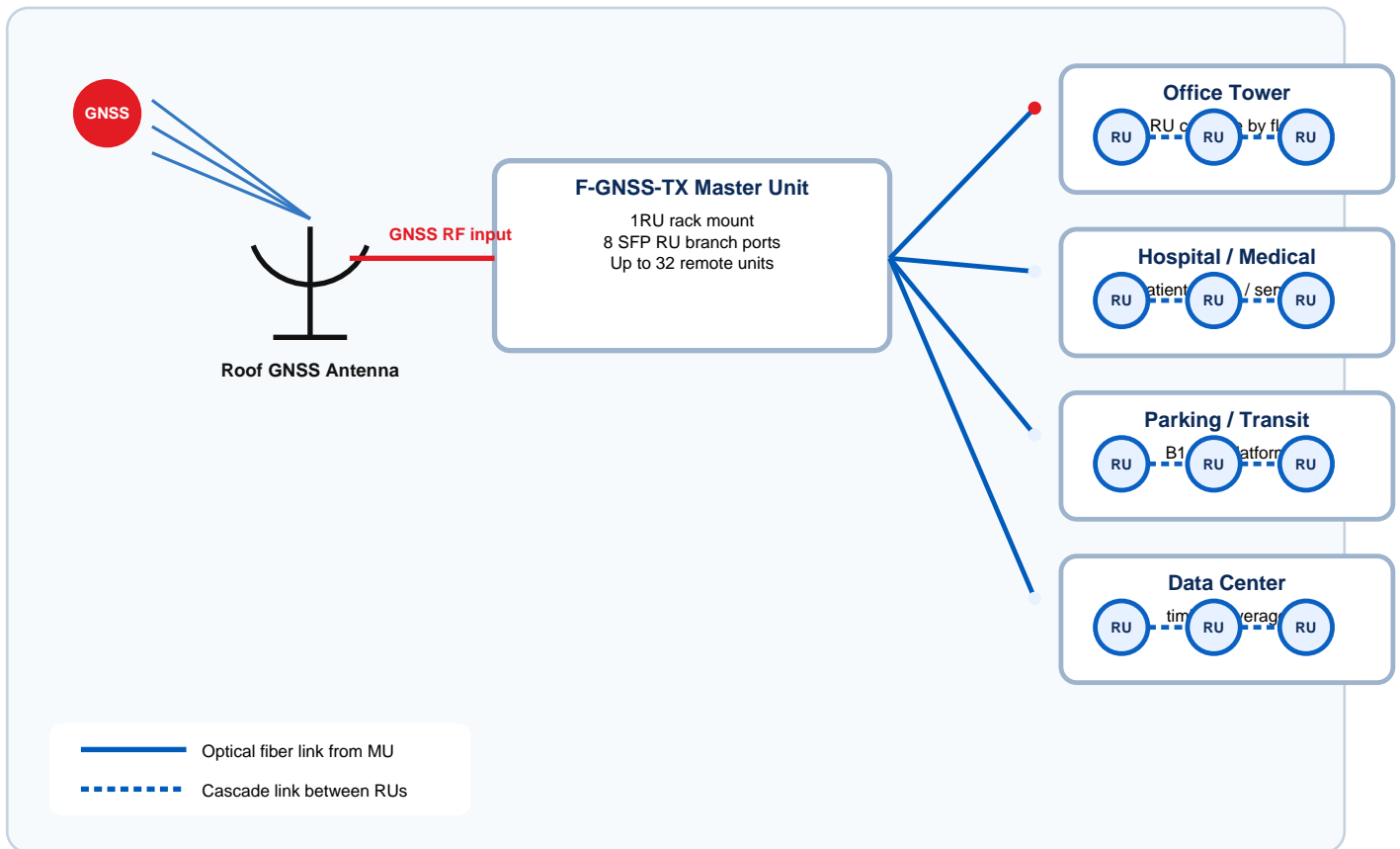
| Benefit                                     | Description  |
|---|--|
| <b>Indoor and underground GNSS coverage</b> | Extends GPS/GNSS availability into facilities, tunnels, parking levels, basements, and indoor service zones. |
| <b>L1 and L5 service bands</b>              | Supports modern GNSS service bands used for positioning and timing applications.                             |
| <b>Fiber distribution</b>                   | Long-distance, low-loss optical transport with electrical isolation and EMI immunity.                        |
| <b>Up to 10 km optical distance</b>         | Designed for large buildings, campuses, and distributed facilities over single-mode fiber.                   |
| <b>Up to 32 remote units</b>                | One Master Unit can support up to 32 RU remote antenna units using 8 branches and cascade expansion.         |
| <b>Cascade topology</b>                     | RUs can be cascaded across floors, corridors, rooms, parking levels, and building zones.                     |

## Typical Applications

|   |  |
|---|--|
| <ul style="list-style-type: none"> <li>• Underground parking and indoor vehicle navigation</li> </ul>                         | <ul style="list-style-type: none"> <li>• Public safety, emergency response, and first responder coordination</li> </ul>                  |
| <ul style="list-style-type: none"> <li>• Warehouses, logistics centers, loading docks, and campus fleet visibility</li> </ul> | <ul style="list-style-type: none"> <li>• Smart buildings, smart city infrastructure, and location-based services</li> </ul>              |
| <ul style="list-style-type: none"> <li>• Data centers, finance, telecom, broadcast, and critical timing systems</li> </ul>    | <ul style="list-style-type: none"> <li>• Hospitals, airports, transportation terminals, malls, tunnels, and secure facilities</li> </ul> |

# System Architecture and Signal Flow

A typical installation includes a roof-mounted outdoor GNSS receiving antenna, a 1RU rack-mount F-GNSS-TX Master Unit in the equipment room, single-mode fiber optic links, and multiple F-GNSS-RX Remote Units installed in indoor service areas.



## Installation Method

| Step | Description   |
|------|---|
| 1    | Install a GNSS antenna on the roof or another outdoor location with clear sky visibility.   |
| 2    | Connect the antenna signal to the F-GNSS-TX Master Unit in the equipment room.              |
| 3    | Run single-mode fiber from the Master Unit SFP ports to the indoor Remote Units.            |
| 4    | Use cascade links between Remote Units when one branch must cover multiple floors or zones. |
| 5    | Place each F-GNSS-RX Remote Unit in the area where indoor GNSS coverage is required.        |

# Technical Specifications

## F-GNSS-TX - GPS/GNSS FiberLink Master Unit

| Item                   | Specification          | Remark                         |
|------------------------|------------------------|--------------------------------|
| Service Band           | L1, L5                 | GPS/GNSS service bands         |
| Receive Signal Channel | 24 channels total      | L1 and L5 total                |
| Doppler Range          | < +/- 5 kHz            | GNSS receiver processing range |
| Position Error         | <= 3 m                 | Typical system specification   |
| Transmission Distance  | <= 10 km               | Single-mode fiber              |
| Physical Interface     | SFP, 8 ports           | RU branch interface            |
| Maximum RU Connections | 32 RU                  | 8 branch / 4 cascade           |
| Mechanical Size        | 1U, 19 inch rack mount | Equipment rack installation    |

## F-GNSS-RX - GPS/GNSS FiberLink Remote Unit

| Item                       | Specification                | Remark                           |
|----------------------------|------------------------------|----------------------------------|
| Service Band               | L1, L5                       | GPS/GNSS service bands           |
| Service Channel            | <= L1: 8 ch / L5: 8 ch       | Remote unit channel support      |
| System Power               | <= 0 dBm                     | RF rebroadcast system power      |
| Power Control Range        | 40 dB                        | Adjustable output control range  |
| Power Control Step         | 0.5 dB                       | Fine output level adjustment     |
| Delay Control Range / Step | 0 to 120 microseconds / 8 ns | Delay compensation control       |
| Connection Structure       | Connected, end-to-end        | Remote distribution structure    |
| Physical Interface         | SFP, 2 ports                 | Includes cascade port            |
| Cascade Data               | 4-hop                        | Cascade expansion support        |
| Antenna Gain               | L1: -3 dBic / L5: 1 dBic     | Integrated antenna specification |
| Mechanical Size            | 200 x 200 x 50 mm            | Ceiling / indoor mount           |

## Model Selection and Ordering Information

| Thor Part Number    | Product                                    | Description   |
|---------------------|--|---|
| <b>F-GNSS-TX</b>    | GPS/GNSS FiberLink Master Unit             | Central 1RU rack-mount master unit for receiving outdoor GNSS input and distributing the signal to remote units over optical SFP links. |
| <b>F-GNSS-RX</b>    | GPS/GNSS FiberLink Remote Unit             | Indoor remote antenna unit for local GNSS rebroadcast. Includes SFP optical input and cascade SFP port for multi-zone deployment.       |
| <b>F-GNSS-TX/RX</b> | GPS/GNSS FiberLink Indoor Distribution Kit | System kit configuration including Master Unit and Remote Unit options for indoor GNSS distribution projects.                           |

### Why Use Fiber for GPS / GNSS Distribution?

Fiber optic cable is ideal for distributing GNSS signals inside large facilities because it provides long-distance transmission, low loss, electrical isolation, and immunity to electromagnetic interference. Unlike coaxial cable, fiber can carry signals over long distances without the same level of RF loss, making it suitable for buildings, campuses, tunnels, underground parking, and multi-level facilities.

### Design Notes

| Design Area                      | Recommendation  |
|----------------------------------|---|
| <b>Outdoor antenna placement</b> | Install the GNSS receiving antenna where it has clear visibility to the sky.  |
| <b>Fiber type</b>                | Use single-mode fiber for the optical links between MU and RU locations.  |
| <b>Coverage planning</b>         | Place RUs by zone. Typical zones include parking levels, corridors, floors, rooms, loading docks, tunnels, and equipment areas. |
| <b>Expansion method</b>          | Use MU branch ports for main distribution and RU cascade ports for additional local zones.                                      |
| <b>Commissioning</b>             | Verify optical link, sync, alarm, and coverage status during installation.  |

### Contact Thor Fiber

Thor Fiber / Thor Broadcast, 2421 W 205th St, Torrance, CA 90501  
 Website: [www.thorbroadcast.com](http://www.thorbroadcast.com)  
 Sales Email: [sales@thorfiber.com](mailto:sales@thorfiber.com)  
 Phone: 800-521-8467

# Application Overview

The system is suitable for emergency response, underground parking navigation, fleet and logistics, smart city services, timing and synchronization, finance and data centers, defense/security, aviation, marine support, and other facilities where reliable GNSS availability is required indoors.

## GNSS Applications

Reliable GPS and GNSS Signal Distribution for Modern Facilities

1

**Emergency Response**

Improve location awareness for first responders and critical coordination inside large facilities.

2

**Underground and Parking Navigation**

Extend GNSS availability for tunnels, parking garages, and below-grade transportation areas.

3

**Fleet and Logistics**

Support vehicle tracking, dispatch visibility, and route optimization across campuses and distribution centers.

4

**Smart City Services**

Enable mapping, mobility, and location-based digital services in dense urban environments.

5

**Timing and Synchronization**

Deliver accurate GNSS timing references for telecom, broadcast, and network infrastructure.

6

**Finance and Data Centers**

Support precise timing and secure location services for financial systems and mission-critical operations.

7

**Defense and Security**

Improve resilient positioning and timing support for secure facilities and protected operations.

8

**Aviation and Marine Support**

Assist navigation, monitoring, and coordination for ports, airports, and transport hubs.

**Reliable Coverage**  
Consistent GNSS signals where you need them.

**Operational Efficiency**  
Improve visibility, coordination and decision making.

**Secure Infrastructure**  
Protect critical systems with stable timing.

**Precise Timing**  
Accurate time sync for mission-critical systems.

|                     |  |
|---------------------|--|
| <b>PART NUMBERS</b> |  |
| F-GNSS-TX           | - GPS/GNSS FiberLink Master Unit             |
| F-GNSS-RX           | - GPS/GNSS FiberLink Remote Unit             |
| F-GNSS-TX/RX        | - GPS/GNSS FiberLink Indoor Distribution Kit |

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