

# KENWOOD

## TRUNKING 2.5

SINGLE-SITE / MULTI-SITE / IP-CONTROLLED



# AN ADVANCED SOLUTION

## Dynamic Trunking Without Dedicated Channels

# Trunking 2.5 – Scalable, Smart,

Trunking 2.5 is KENWOOD's next-generation TDMA Digital Trunking solution, engineered for customers who demand more flexibility from shared frequency systems without sacrificing reliability or performance. Designed to dynamically allocate two simultaneous talk paths per 12.5 kHz channel using TDMA, Trunking 2.5 enables seamless voice and data communications across single-site or multi-site configurations.





# and Spectrum-Efficient

Unlike traditional trunking systems that require dedicated control channels, Trunking 2.5 introduces intelligent control channel hibernation and rotation, maximizing frequency efficiency in environments where spectrum availability is limited. Whether for education, healthcare, manufacturing, or hospitality, Trunking 2.5 delivers:

- Efficient use of non-exclusive frequencies
- Scalable deployment, up to 16 sites with 8 repeaters each\*
- Advanced dispatching and location services
- Built-in redundancy and system fallback capabilities
- FCC Type 1 and Type 2 monitoring

Trunking 2.5 is supported in the NX-3000 and NX-5000 series of flexible and multi-protocol radios offering a dependable and future-ready path to expanding your enterprise-grade communications.

*(\*Enhanced roaming for hibernating multi-site systems is a future release for 2026)*

# Built Hardware for Scalable Trunking

To deliver a truly flexible trunked radio solution, Trunking 2.5 is built on a foundation of intelligent, IP-based hardware. At the core are two key components: the TKR-2500 repeater, which provides the RF infrastructure and embedded control logic for single-site systems, and the KTI-2500 system controller, which extends functionality to support larger, multi-site networks with advanced features like SIP telephony, over-the-air programming, and GPS tracking.

Both components are engineered for high reliability, straightforward installation, and seamless remote management, offering a clean architecture that eliminates the need for sync cabling and enables growth without complexity. Whether you're starting with a single site or planning for regional expansion, Trunking 2.5 hardware scales with your needs.

## TKR-2500 Repeater

The TKR-2500 is the foundation of every Trunking 2.5 system. It combines high RF performance with an embedded controller, making it ideal for single-site deployments with up to six repeaters. Each unit supports voice, GPS, and fallback logic, and is easily managed over IP.

Models:

**TKR-2500VM: 136–174 MHz, 50W**

**TKR-2500UM: 470–520 MHz, 40W**

**TKR-2500UM2: 400–470 MHz, 40W**

- Embedded controller for up to 6 repeaters
- Continuous duty cycle
- RX Sensitivity: -122 dBm
- Selectivity: 85 dB (VHF), 83 dB (UHF)
- Intermodulation Rejection: 80 dB
- Blocking: 113 dB
- Web browser configuration
- Remote monitoring via IP



## KTI-2500 System Controller

The KTI-2500 is required for systems with more than 6 repeaters or for multi-site deployments. It enables advanced features like G.711 SIP voice, alternate GPS slot, OTAP, redundancy, and multi-site control.

Key features:

- Controls up to 16 sites
- Manages 8 repeaters per site (48 channels maximum)
- Web GUI for configuration
- OTAP (Over-the-Air Programming)
- SIP telephony integration
- GPS slot for fast location polling
- DES encryption
- SNMP, RADIUS, LDAP integration

Includes:

- 1 license each for AIS Console + SIP Phone
- High Availability License for redundancy (KWD-2500HAK)



# Built Hardware for Scalable Trunking

## From Single-Site Simplicity to Multi-Site Expansion

Trunking 2.5 supports multiple system designs, from small single-site operations to regional multi-site networks. Whether using embedded controllers or centralized management, every setup leverages IP-based communication and requires no sync cabling. System growth is seamless and flexible.

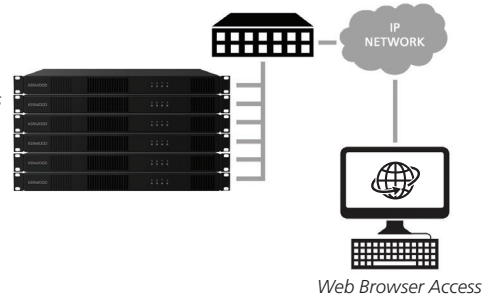
### Single-Site System (Embedded Controller)

- Up to 6 TKR-2500 repeaters
- 12 talk paths (2 per repeater)
- No external controller required
- Web-based configuration and monitoring

Perfect for campuses, hospitals, and small industrial sites

Up to 6 TKR-2500  
Repeaters 12 Timeslots

Embedded System  
Controller in the  
TKR-2500 Repeater



### Single-Site System with KTI-2500

- Up to 8 TKR-2500 repeaters
- 16 talk paths
- Expanded advanced features:
  - SIP
  - GPS alternate slot
  - OTAP
  - Redundancy

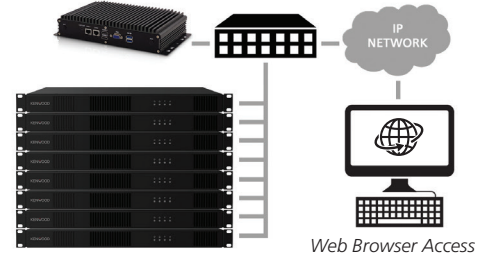
Ideal for sites with heavier traffic or integrated dispatching needs



SNMP Monitoring Dispatch Console Logging Recorder GPS

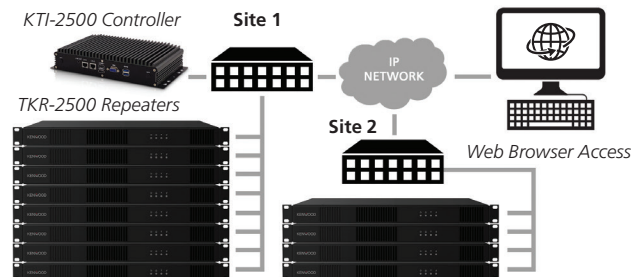
KTI-2500 Controller

Up to 8 TKR-2500  
Repeaters 16 Timeslots



### Multi-Site System

- Up to 16 sites
- 8 repeaters per site (48 channels max)
- All sites linked via IP (no sync cables)
- Controller can be centralized or remote
- Supports data services, monitoring, redundancy



A multi-site system consists of a single controller, up to 16 sites and up to 8 repeaters per site. 48 physical channels maximum per network.

# Logical Channel Types In Trunking 2.5

## Efficient Slot-Based Resource Allocation

In Trunking 2.5, each “channel” refers to a logical time slot on a 12.5 kHz TDMA frequency. These time slots are dynamically assigned by the system to handle voice, data, GPS, and signaling traffic. Understanding the three logical channel types helps illustrate how the system maximizes efficiency, especially when using non-exclusive spectrum.

### Control Channel

Handles signaling between the network and subscriber radios. The control channel identifies the system, processes call requests, and coordinates traffic assignments.

- Manages talk group setup and teardown
- Used for registration, affiliation, and call grant signaling
- Can be dynamically rotated or hibernated to preserve spectrum



### Traffic Channel

Used for actual payload, including voice, GPS data, and short messages.

- Carries user communications (voice and data)
- Supports packet data, AVL (Automatic Vehicle Location), and emergency alerts
- Dynamically assigned per call/session



### Alternate GPS Channel (with KTI-2500 only)

Dedicated slot for high-speed polling of GPS location data.

- Supports up to 1,000 location responses per minute
- Offloads location reporting from standard traffic channels
- Requires alternate GPS slot functionality via KTI-2500 controller



*Each TKR-2500 supports two TDMA time slots per RF channel. Channel types are dynamically allocated and managed by the controller to maintain continuous system efficiency.*

# Operation On Shared Frequencies

## Control Channel Hibernation & Rotation Explained

Operating on shared spectrum presents unique challenges, especially when dedicated frequencies are unavailable. Trunking 2.5 is designed to work within these constraints using two intelligent strategies: Control Channel Hibernation and Control Channel Rotation. These features minimize the effects of interference, comply with FCC requirements, and ensure fair use of non-exclusive channels.

**Ensures Operational Integrity on Public or Lightly Licensed Bands**

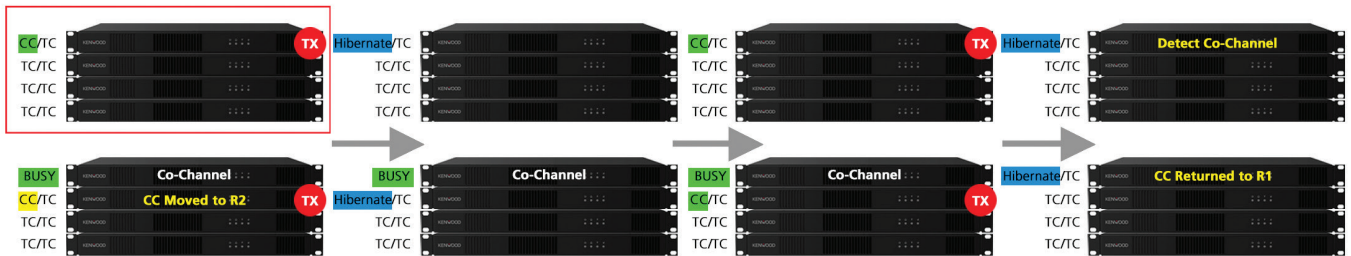
*A hospital campus using shared spectrum doesn't risk system failure due to neighboring systems. If a co-channel signal is detected, for example, from a construction crew nearby using the same frequency, Trunking 2.5's control channel temporarily disables that channel and automatically reassigns traffic, maintaining reliable communication without interference.*

## Control Channel Hibernation

In hibernation mode, the control channel enters a "sleep" state when not in use. It periodically wakes to provide synchronization. If a co-channel transmission is detected (from another user on the same frequency), the system disables the channel temporarily to avoid interference.

This method helps reduce idle channel activity, free up resources for other users, and minimize interference with nearby systems.

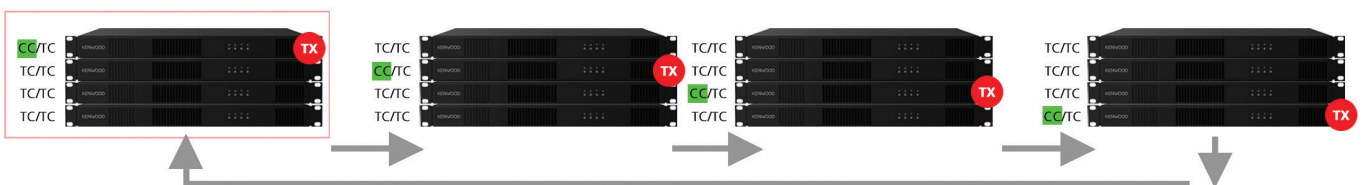
- Efficient in low-traffic environments
- Improves coexistence on public/shared bands



## Control Channel Rotation

In rotation mode, the control channel cycles through different available channels or time slots in a predictable interval. By continuously rotating the control slot, the system ensures that no single channel is monopolized and that the trunking function remains resilient and evenly distributed.

- Ideal for moderate/high traffic
- Avoids long-term blocking of any single frequency



## Dual-Mode Flexibility

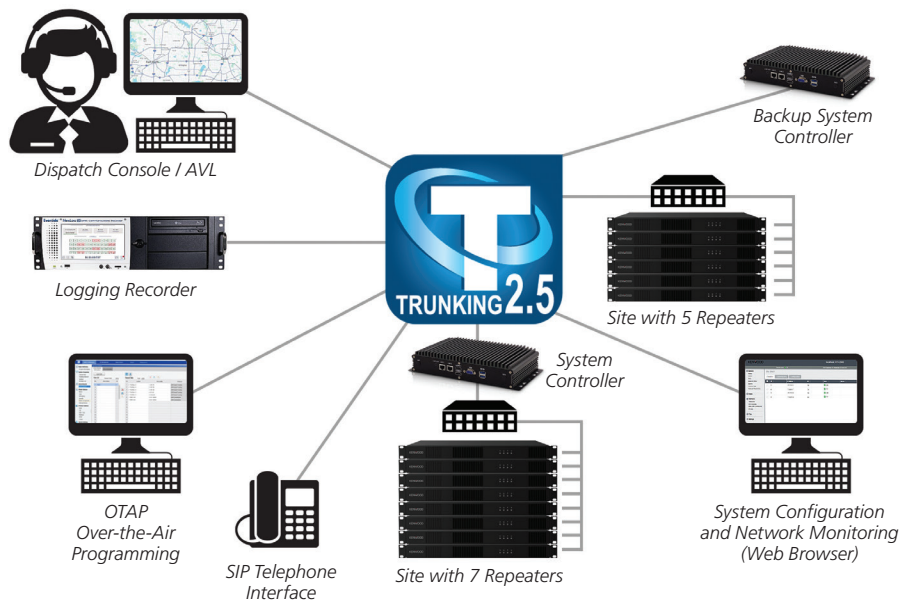
Trunking 2.5 allows the use of hibernation, or rotation. They can also be run at the same time.

This gives system administrators the tools to optimize for their specific regulatory, operational, or traffic conditions.

# Network Features & Flexibility

## Built-In Intelligence for Seamless Performance

Trunking 2.5 is more than just a flexible trunked voice solution, it's a modern IP-based communications platform. From dynamic site linking to SIP phone integration and remote programming, Trunking 2.5 enables advanced functionality typically reserved for larger Tier III systems, but with easier deployment and less infrastructure.



In the diagram above, we highlight two sites: one configured with seven repeaters and the other with five repeaters. Through its advanced IP network infrastructure, Trunking 2.5 enables seamless integration with essential communication tools and services, including:

### IP-Based Architecture

Every connection is managed via Ethernet, no sync cables, no analog timing requirements.

- Scales from small single-site systems to large regional networks
- Simplified installation and cabling
- Remote management and diagnostics over LAN/WAN
- Compatible with commercial network gear (routers/switches)

### OTAP (Over-the-Air Programming)

With the KTI-2500 controller, radios can be reprogrammed remotely.

- Reduces downtime and service costs
- Update talk groups, features, or over the air
- Requires optional IP mobility router

### SIP Telephony Integration

Use a SIP desk phone as part of your radio network.

- Make/receive calls between radios and phones
- Great for dispatchers, supervisors, and fixed locations
- Enables call bridging between radio and VoIP networks
- Includes 1 SIP license with KTI-2500 controller

### Data & GPS Support

Packet data is supported natively, including GPS for AVL (Automatic Vehicle Location).

- GPS polling via dedicated Alternate Channel (KTI-2500 required)
- High-speed location updates: up to 1,000 locations/minute
- Ideal for fleet tracking, delivery, or safety use cases

# System Redundancy & Fallback

## Redundant Control and Automatic Fallback Modes

Trunking 2.5 was designed with fail-safes and fallback modes to ensure that communication doesn't stop, even if the network does. Controller redundancy and automatic fail-over options allow the system to recover quickly from faults, disconnections, or controller loss.

### High Availability Mode (Optional)

KTI-2500 controllers can be paired in a mirrored configuration for redundancy.

- One primary and one secondary controller
- Automatic failover upon detection of fault
- Seamless continuity of system operation
- Requires KWD-2500HAK license



### Fallback to Single Site Mode

If the IP link between sites fails, each site continues to operate locally.

- Maintains site-specific voice and data services
- Automatically reverts to full networked mode once connection is restored
- Ideal for wide-area or multi-building campuses

### Control Channel Reassignment

If a control channel fails or is disabled (e.g., interference), the system moves it.

- Uses control channel rotation feature
- Can automatically reassign to backup slot
- Ensures system stays online and traffic continues

*All system state and health can be monitored remotely using the KTI-2500's built-in web interface, as well as SNMP keeping you ahead of failures before they happen.*

# Trusted Across Industries

## Flexible for Any Environment, Scalable for Any Operation

Whether you're managing a multi-building hospital, coordinating logistics in a factory, or overseeing security at a stadium, Trunking 2.5 adapts to your communication needs. Its dynamic channel management and IP-based architecture make it ideal for operations where reliability and efficiency are non-negotiable.

### Education

Large campuses and multi-building districts benefit from single or multi-site coverage with seamless roaming.

- Instant communication between administration, security, and facilities
- Centralized dispatch with GPS tracking
- Works on shared public safety spectrum



### Healthcare

From emergency coordination to day-to-day operations, Trunking 2.5 ensures uptime.

- Resilient fallback in case of network interruption
- Integration with SIP phones at nursing stations
- OTAP ensures radios stay updated with zero downtime



### Manufacturing & Logistics

Covers warehouses, plants, and distribution hubs, all from one system.

- Monitor safety protocols and team movement via GPS
- Combine voice + data to streamline operations
- Supports control channel rotation in congested RF areas



### Hospitality & Event Venues

Lightweight, license-friendly systems that still deliver advanced capability.

- Coordinate front desk, security, and maintenance
- Works well with business band frequencies
- OTAP (Over-the-Air Programming) reduces support calls



# KENWOOD Radio Compatibility

## Reliable Handsets for a Reliable Network

Trunking 2.5 is fully supported by KENWOOD's NX-5000 and NX-3000 series radios. These models also support multiple protocols and advanced features to provide the best option for interoperability across different system types, and the durability required for demanding environments. When paired with a licensed KTI-2500 controller, they unlock the full power of dynamic control channel operation, GPS tracking, over-the-air programming, and more.

### NX-3000 Series

Flexible mid-tier solution for most commercial and enterprise applications.

NEXEDGE® **NXDN™**   **FleetSync™** **DMR**  
 **Bluetooth®** **GPS** 

- VHF (136–174 MHz), UHF (400–520 MHz)
- Available with or without display/keypad
- Built-in GPS (select models)
- Requires KWD-3501TR Digital Trunking license (*Optional indoor location*)
- Fully compatible with control channel hibernation/rotation, OTAP, GPS tracking



### NX-5000 Series

Premium multi-protocol radios for enterprise and mission-critical applications.

NEXEDGE® **NXDN™**   **FleetSync™** **DMR**   
 **Bluetooth®** **GPS** 

- VHF (136–174 MHz), UHF (400–520 MHz)
- AES/DES encryption options for secure comms
- Built-in Bluetooth®, GPS, and microSD standard
- Multi-deck/multi-head configuration flexibility
- Full-color display
- KWD-5300CV DMR license included (*Optional indoor location*)
- Compatible with OTAP, GPS, and SIP features via KTI-2500



*Intrinsically Safe (IS) options are available. Refer to our price pages for information.*



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**JVCKENWOOD USA Corporation**  
Communications Sector Headquarters  
1440 Corporate Drive | Irving, TX 75038

Order Administration/Distribution  
4001 Worsham Ave. | Long Beach, CA 90808

[www.kenwood.com/usa](http://www.kenwood.com/usa)

