

## Trunked Radio

In a trunked radio network, a large number of workgroups can share fewer channels because the trunking equipment dynamically allocates an available channel when users key their radio.

Large organizations that establish their own dedicated radio network typically select a trunked radio scheme because of advanced features, private calls, wide-area dispatch, economical infrastructure, and more efficient use of radio spectrum.

Trunked radio system operators cover a spectrum of companies from operations that serve a local region to international companies competing with cellular service.

Zetron's trunked radio products provide uniquely flexible solutions to meet the demand for cost-effective trunked radio communications supporting most commonly used trunking formats.

## MPT 1327 Infrastructure

### **Why Trunked Radio Systems?**

In a trunked network, radios share multiple channels, with queuing and channel assignment being handled dynamically by the system infrastructure. When the radio user places a call, the trunked radio system automatically allocates an available free channel. The result is increased quality of service and reduced infrastructure and operating costs.

In contrast, in a conventional (non-trunked) radio system a group of radios share one fixed channel or frequency. If that channel is in use by one user in the workgroup, service is not available to others. Often the radio channel is idle, which is a poor utilization of a valuable resource.

Because the trunked radio system automatically and dynamically allocates a small number of radio channels among a large number of radio users, it offers greater airtime efficiency in multi-channel systems.

### **Why MPT 1327 Trunked Radio?**

Since 1988, when the British Ministry of Post and Telecommunications (MPT) defined the MPT 1327 protocol as an open protocol and an international standard, it has become the most widely used trunked radio protocol in the world.

MPT 1327 trunking is ideally suited for providing individual or group calls, and offers fast call set up time along with a wide range of advanced features and functionality to support field units. Examples of such features include emergency and priority call management, status messaging, dynamic regrouping of users, and data/text messaging.

User applications requiring the use of MDT (mobile data terminals), in-vehicle printers, and GPS-based AVL (automated vehicle location) systems can find these value-added peripherals and software available from vendors taking advantage of the open (non-proprietary) standard interfaces supported by MPT 1327.

MPT 1327 uses the "message trunking" scheme and is ideal for either individual or group calling. In message trunking a speech channel is assigned and dedicated for the duration of a call. Every subscriber radio is allocated a unique ESN (Electronic Serial Number) which can be individually verified to give a high degree of system control and subscriber management.

MPT 1327 uses a digital control channel with analog voice channels. The digital control channel provides a data gateway that allows supporting enhanced features including security and subscriber verification, mobile data communications, system administration, and seamless multi-site roaming. No other protocol allows this kind of versatility in the economy of scale inherent in MPT 1327.

### **Why Zetron?**

For over a decade Zetron has been recognized as a leading supplier of trunked radio system infrastructure. Our expertise with trunked radio includes TETRA, MPT 1327, LTR, EDACS, OpenSky, and iDEN. Our trunked radio family of products includes mission critical communication systems, dispatch consoles, trunking controllers, and desktop controllers.

Zetron's expertise in trunked radio has been demonstrated for over two decades in thousands of channels installed in trunked radio systems worldwide.

Zetron is a market leader in MPT 1327 Trunked Radio Systems because our unique infrastructure design incorporates the full flexibility and feature-set of the MPT 1327 protocol, regardless of the size of system.

A modular architecture approach allows each trunked radio system to be built with the capacity, capability, and economy required for virtually any application. The benefit and economy of this approach is realized in systems that must start small but need the capability to grow without the expense and waste of infrastructure replacement typical of competitor's upgrade paths.

The building blocks of a Zetron MPT 1327 Trunked Radio System are summarized below; for detailed information, go to [MPT 1327 System Components](#).

### **Trunking Controllers**

Zetron's Model 807 and 827 Trunking Controllers are the central components that perform essential logic, signaling and management functions within a MPT 1327 trunking system. These include subscriber validation, network resource allocation, connection to PSTN or PABX networks, and management functions for system and subscriber security. All controllers share a common backplane that combines digitized PCM audio and RS-485 data for internal switching and call management - without the necessity of dedicated (permanently connected) PC network management terminals and external switching peripherals.

A telco interface option card can be installed inside each Model 827 and configured for either PSTN/PABX interconnect, or as a 4-Wire audio port for networking. The most significant advantage of Zetron's architecture solution is the ability to link multiple trunking sites together to build a networked radio system without the requirement for a central switch or digital back-haul (linking). The foundation for networking Zetron trunking sites is based upon the inexpensive and readily-available 4-wire circuit. This is usually provided in the form of a leased telephone line or point-to-point microwave circuit. This is an important consideration when estimating ROI (return on investment) and future scalability to ensure system performance while keeping customers satisfied and your investment profitable.

### **Four-Port Inter-site Link**

For larger networks with more roaming call traffic, the Model 844 Four-Port Inter-site Link handles networking communications between sites so the installed telco interface ports on Model 827 Controllers can be dedicated to telephone interconnect if so desired. The Model 844 is also a cost saver and more economical than purchasing four individual telco interface options. They also allow for the easy configuration of "pass-through" sites for call routing. The Model 844 makes plug & play networking straightforward and more affordable for some system topologies. Multiple Inter-Site Link units may be installed per site and share the same PCM audio and data backplane common to the trunking stack.

### **Peripheral Equipment Interface**

The Model 427 Peripheral Equipment Interface provides a line connected system level interface between a Zetron MPT 1327 trunking system and the "outside world". It allows direct connection of peripheral equipment (hardware and software) supporting the open, non-proprietary MAP 27 (Mobile Access Protocol for MPT 1327) protocol. Zetron's concept of providing an open system level interface based on MAP 27 is unique within the industry. Examples of equipment include Zetron's PC based dispatch consoles and desktop-sized controllers - allowing a human interface to provide efficient fleet, system and individual subscriber management.

### **Trunked Radio Dispatch Consoles**

For workgroups that require central command and control for routine or emergency communications services, Zetron's offer two PC-based solutions: Integrator RD and the ZIMPT MPT Line Dispatcher. Both allow an operator to control and access multiple radio channels and telephone lines and to support individuals and groups of radio users.

Integrator RD uses dedicated hardware and supports multiple operator positions and multiple trunking protocols as well as conventional operation.

ZIMPT is a Windows® software application that transforms a personal computer into a capable mouse and menu-driven dispatcher. Functions include monitoring of multiple conversations, dynamic regrouping, priority over-ride, and visibility of all active calls. An intuitive graphical user interface, presented on a standard or optional touch screen monitor, supports data messaging, call logging, and address book listings.

### **Switchless Architecture**

In contrast with most competing trunking system architecture, Zetron's integrated switching architecture means that embedded logic, audio digitization, data routing (all the elements of call processing), are built into each Model 827 controller dispensing with the requirement of an expensive external switch. This 'switchless' architecture makes Zetron's solution suitable for applications with just a few channels to those requiring wide area coverage.

The trunked repeater site consists of a compact 1U-high Model 827 controller for each base station. The controllers are linked by a combined high-speed PCM audio and RS-485 data bus - through which system information and digitized speech is distributed. Even with PSTN interconnection and multi-site networking, no centralized digital switching equipment is required. This further extending the benefits of the 'switchless' modular approach made possible by high-speed processing and large data storage capabilities inherent in the Zetron Model 827.

The 'switchless' architecture of Zetron's MPT 1327 Trunked Radio has significant advantages for the system builder and operator:

- **System Resilience.** No single module can cause system failure, as loss of a Model 827 controller or base station just degrades the service by that one channel.
- **Cost Effective.** The system builder does not need to purchase or "upgrade" to installing a central controller. This is often a significant expense particularly overlooked in competitor's architecture when designing even small multi-site systems.
- **Modular Expansion.** Just adding a Model 827 controller with each additional RF channel ensures simple system upgrades. Automatic database cloning occurs when additional controllers are added or replaced.

#### **Telephone (PSTN or PABX) Interconnection**

Zetron recognizes that common usage of trunked radio communications involves mobile-to-PSTN traffic as well as mobile-to-mobile. Interconnect capability can therefore be added to every controller, giving all radio channels simultaneous access to or from a PBX or public telephone network. An internal slot on the Model 827 accepts an optional Telco Card that provides a very capable interface that is highly adaptable to accommodate most commonly encountered ring types on 2-wire and 4-wire circuits. Up to 64 seconds of user-recorded voice prompts assist users with system access and dialing subscribers. A built-in management modem allows using PSTN for call-in database upload rather than dedicated a separate modem and line for system management. Call detail records support customer billing for interconnect time.

#### **Programmable and Stand-Alone**

Zetron trunking systems are supported with comprehensive programming software, allowing system builders to customize each system to their requirements. The user-friendly software is available in either DOS or Windows versions, and enables the administrator to program system parameters, add and delete subscribers, review call records, and perform diagnostic tests, either at the site or remotely over a telephone link. Each controller retains subscriber database and system parameters in non-volatile memory for true stand-alone operation. Programming changes are made off-line on the system manager PC and connection to the system is made only to upload or download information. Only one upload per site is needed as all controllers in the stack are automatically cloned across their shared data bus from a single upload.

#### **Management, Monitoring, and Administration**

SiteWatch is a Windows-based software application that allows enhanced command, control and monitoring capability of a Zetron MPT 1327 trunking system when connected via an installed Model 427 Peripheral Equipment Interface. Ideal for trunking system owners, operators, technicians and administrators, SiteWatch not only provides a "looking glass" to observe overall system performance, but doubles as a powerful maintenance tool for subscriber, site, call and alarm management. From a Windows graphical user interface most common voice, status and data calls can be sent and received. More powerful features and functions such as dynamic regrouping, ESN validation and radio availability checking can also be performed.

- System utility functions include traffic and control channel management, alarm management, and call queue management.
- Subscriber management functions include user address book, system priority and class of service control, radio availability, ESN checking, enabling and disabling subscribers, and radio parameter interrogation.
- Call management includes call type (voice, data, status, etc) management, subscriber identity name tagging, text message entry and display, call diversion setup, global call monitoring.
- Group call monitoring of subscriber identity on PTT - identify each member participating in group calls with every transmission.

## Features of Zetron's MPT 1327 Trunked Radio System

- Compliant with MPT 1327 and MPT 1343 international trunking standards
- Switchless architecture - no site switch required even for telephone interconnect
- Powerful system management and programming software gives access to wide range of features
- Advanced telephone features including operator recorded voice prompts, compatibility with pulse, DTMF or mixed networks, programmable call restrictions
- Automatic hybrid telephone line balancing
- Registration and full ESN checking
- EMC/CE compliant
- Flash upgradable firmware/software standard

### **Benefits**

- Radio subscriber equipment available from multiple vendors
- Inherent value-added services such as data, status and text messaging
- Extremely reliable system resilience
- Modular expansion path
- Cost-effective, particularly for small systems
- System customization and flexibility
- Ease of use for telephone users
- Open, non-proprietary system level interface
- Compatibility with worldwide telephone networks
- Efficient operator management
- Easy system set up and maintenance
- Resilient to varying audio or PSTN line quality
- High system security addressed radio cloning, stolen radios and theft of service

### **Capacity**

- 24 radio channels as per MPT 1327
- 32 sites or more per region with multiple inter-linked regions for wide-area networks
- 32 telephone lines
- 5000 ~ 10,000 subscribers, 2000 group identities, 500 fleets
- 99 classes of service and 2000 autodial tables
- 3 queues for traffic channel, telco port and busy ident

### **Call Processing - Voice**

- Individual Calls: Radio to radio - availability of called radio is checked
- Group Calls: Radio to group - availability of called radios is not checked. Late entry mode and calling party amalgamation are supported. Broadcast and conference group calls are also supported
- Telephone Calls: Radio to telephone - short and long PABX, PSTN and abbreviated dialing with 15 numbers from 1 of 2,000 tables. Telephone to radios - individual or group with direct, fleet/number or full MPT dialing
- Priority Calls: Applicable to individual, group or telephone calls. Optional queue acceleration
- Emergency Calls: Applicable to individual, group or telephone calls. Optional queue acceleration and/or pre-emptive call clearing. Pre-emptive clearing for called party
- System-wide calls: Pre-emptive clearing of existing calls and access inhibit

## Call Processing - Data

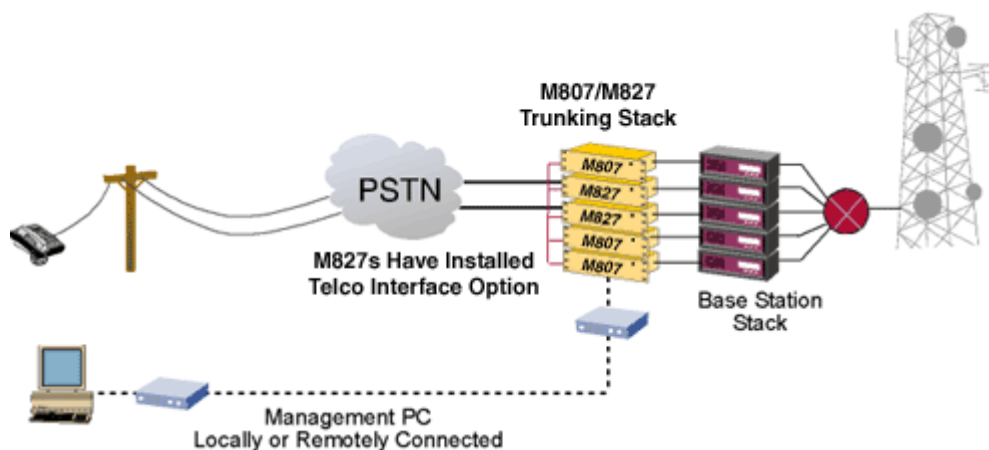
- Status Calls: Also known as SDM1's. These provide a 5 bit data transaction that is user-configurable. Many radios allow the assignment of a text message to a particular status number to be sent over the control channel.
- Short Data Messaging: Also known as SDM's or SDM2's, these provide a 184 bit data transaction over the control channel. This gives cellular SMS-type service to radio subscribers.
- Extended Data Messaging (EDM's): Also known as Multi Segment Transactions (MST's), these enable a single data message equivalent to 16 SDM2's to be sent over the control channel. Utilized for dynamic re-grouping in some radio types.
- Non-Prescribed Data (NPD): Also known as Long Data Messaging (LDM) or "D"-bit data, this allows transmission of large volumes of free-format data on a traffic channel.

## Operational Features

- Control Channel Modes: Fixed, cyclic, burst, dedicated and non-dedicated (revert to traffic operation). Variable time delay equalization for DSP-based base stations
- Queuing: Busy radio, channel and phone line queuing. Dynamic call time based on queue depth
- Group Call Processing: Late entry mode for radios that are late joining a site with an applicable call in progress. Calling party amalgamation when requesting currently active call
- Reconfigured Priority: Separate 4-level priority configurable per-subscriber controlling queue entry point and time of day and week day/weekend access
- Call Diversion: Self-initiated and third party call diversion is supported. Incoming speech or status calls are diverted to another individual subscriber or group based upon either a busy or no-answer condition of the called party. Speech calls can also be diverted to a PSTN or PABX extension. Ahoy-P : Checks radio availability on traffic channels for subscribers included in a multi-site group call. Sites with radio subscribers not automatically responding to
- Ahoy-P interrogation are withdrawn to make system resources available for other calls.

## System Configuration and Maintenance

- Fallback Operation: Automatic reallocation of control channel in the event of base station failure.
- Full functionality, including ESN checking, retained down to a single channel
- Live Monitoring: Real-time display of current call activity on all radio channels and telephone lines is provided
- Call Logging: Full subscriber call detail recording is supported with a shared capacity of up to 7,000 records per channel available
- Alarm Reporting: Continuous monitoring of external and internal alarms is available with pre-configured action and status message notification in the event of alarms
- Remote Access: Full configuration and programming facilities are accessible remotely via the telephone interface using built-in or external modem
- Third Party Software: Billing and Statistics Package



## Switchless Multisite Network

Multi-Site gives the capability to build wide-area regional trunking networks that support up to 32 sites and up to 10,000 subscriber radio units. System operators can interlink existing or new sites, providing a smooth upgrade path from single-site to roaming multi-site service. This means that a network can be expanded gradually with traffic demand without requiring a large initial investment. The integral switching inherent in Model 827-based sites means not only a variety of network topologies can be supported, but also that a high level of resilience is available. All standard speech call types are supported including multi-site group calls.

### **Multi-Site Features**

- Switchless Architecture - no regional switch required for inter-site connection.
- Shared non-volatile subscriber database - no dedicated, always-connected PC needed for subscriber management
- Double (secondary) site registration - prevents contention of mobiles within access range of overlapping sites
- Model 827's Internally installed telco interface option cards can be configured for inter-site linking
- Inter-site Link Model 844 provides increased inter-site capacity
- Continuous inter-site link monitoring evaluates audio circuit condition and automatically removes faulty links from service and restores them when repaired

### **Benefits**

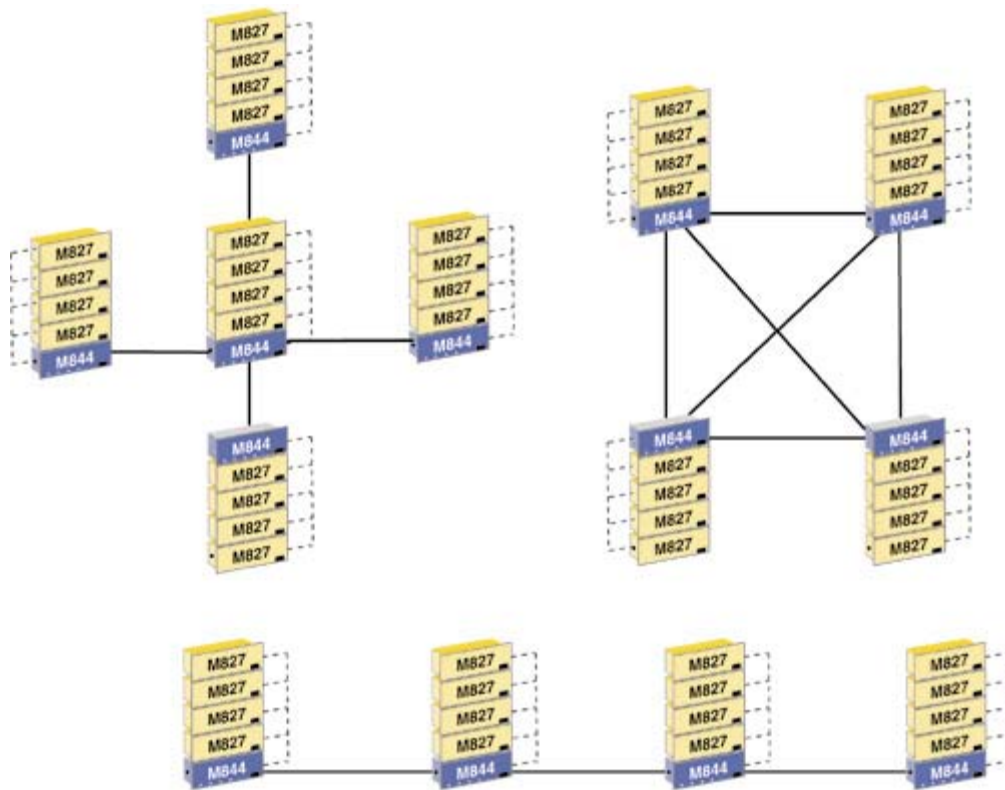
- Modular expansion path from single site systems
- No single point of failure
- Cost-effective for faster return on investment
- Wide range of network architectures can be supported
- Telephone access for users on sites without direct PSTN connection
- Efficient call set-up
- Increased system control for each mobile on a per site basis
- Minimal call setup time
- Low initial investment for multi-site operation
- Improved quality of service and network availability

## Network Architecture

Each trunking site is linked to the next through at least one dedicated audio circuit, using a telco interface option (card) configured for 4-wire (leased circuit) or 4-wire plus E&M (microwave link) operation.

The internally switched architecture of the Zetron Trunking Controllers means that dispatch or PSTN interconnect traffic on any channel of any site can be routed to and from an interface at any other site as needed to complete a call. Additionally, these links pass all registration and call set up transactions. In systems expecting high usage of links for inter-site speech traffic (roaming calls), an optional dedicated data link can be added (but not required) between sites to enhance registration and call set up.

Flexibility of network topology allows systems to be designed to suit varying traffic densities, geography, or situations where linked access to a site may be limited. Any combination of ring, star, or mesh type networks can be supported. Distributed switching enables inter-site links to be located according to traffic density, without the need for a large centralized switch.



The optional internal telco interface option for the Model 827 trunking controller can be configured for either inter-site linking or PSTN/PABX (interconnect) functionality. In multi-site networks where some sites need one or several telco ports to be dedicated for PSTN interconnect operation, the Model 844 Four-Port Inter-site Link is an efficient and economical alternative to using individual telco cards. Each Model 844 provides four (4) telephone ports for multi-site linking - allowing the telco cards to be reserved or dedicated for PSTN access, as needed. Several Model 844 units can be "stacked" into the system, particularly where pass-through links are present. This allows emulating and taking advantage of centralized topology without the need for and cost of a central switch.

### Mobile Roaming and Registration

With Zetron Multi-Site, radio subscribers are able to move freely from site to site, retaining service as they do so - 'seamless roaming'. The process of logging on to a new site is commonly called 'registration'. In Multi-Site systems, the registration process determines whether the mobile is allowed service, and what call capability is made available to each subscriber.

Other systems often provide limited multi-site access control, typically fixing site access control in the mobile during installation. This method is both inflexible (mobiles must be reprogrammed every time their service area is increased or sites added to the network) and insecure (mobile users can be reprogram their own radios to illegally gain access - theft of service).

With Zetron, the concept of single site access control is extended to multiple sites allowing the system operator to determine which mobiles gain access on a site-by-site basis. This provides instant control of mobile access by the operator and improves flexibility of the tariff structure.

For multi-site operation, call routing is centered upon the Network Information Table held in the database of each site. This gives information concerning which links to use for the onward routing of data, for call set up, registration, etc. and for establishing speech paths between sites.

When a radio call is placed, the calling site uses this table to establish connection with the called subscriber's registered sites. Emergency calls are set up in a similar way, and channels and links may be seized from a lower priority call in order to complete the emergency call. Group calls across multiple sites are supported and may be pre-configured to include 6 sites or more. For calls between telephone and mobile, the telephone line and called mobile or group need not be on the same site - for 'least cost routing' to a site within toll-free or local calling area.

### Inter-Site Call Records

All information for call detail records is sent to the calling subscriber's home site for storage and subsequent retrieval. Additionally, all sites involved in a transaction retain limited transaction records for diagnostics purposes.

### **Network Resilience**

During idle periods, the system regularly monitors the availability of inter-site links and withdraws them from service if there is a failure to communicate in either direction. This ensures that the highest quality of service is available to subscribers at all times.

In the event that a link between two sites is completely missing, and a site becomes totally isolated from the rest of the network, it is still capable of fully operating as a single site.

## **Model 807 MPT 1327 Single Site Controller**



### **MPT 1327 Single Site Controller**

The MPT 1327 trunked mobile radio standard is internationally recognized for public and private radio systems. Zetron's Model 807 Trunking Controller implements this standard in an economical, entry-level controller package designed for single-site dispatch applications. Its modular design approach ensures a cost-effective system with the facility to add telephone interconnect at the site by connecting to a Model 827 controller fitted with the telephone interface option.

Review the recent article on MPT 1327 networks in *South African Wireless*.

## **Product Features and Configuration**

- Economical entry-level solution for single-site only dispatch applications
- Fully MPT 1327/1343 compliant
- Modular "plug and play" structure enables an economical building block approach to site development with expansion capability of up to 24 channels at a single site
- Individual Subscriber Validation plus Electronic Serial Number (ESN) checking
- Windows-based configuration software provides easy configuration setup and maintenance
- from a single local or remote connection
- External sense and internal alarm input monitoring
- Four levels of user defined call priority in addition to the three MPT 1327 standard levels
- Emergency calls can be set to demand resources by pre-emptive clearing of existing calls.

## Model 827 MPT 1327 Trunking Controller



### **MPT 1327 Dispatch & Interconnect**

The Model 827 MPT Trunking Controller is a uniquely flexible building block which forms the basis of a fully-featured MPT 1327 system infrastructure. The switchless architecture of the Model 827 means that systems as small as 1 or 2 channels can be expanded in a modular fashion into a wide area, multisite network.

In addition to full MPT functionality, a system built around the Model 827 also offers extensive telephone interconnect capabilities including user-recordable voice prompts. Use of distributed processing ensures a high degree of system resilience for both single and multisite networks, minimizing downtime in the event of base station or link failure.

Extensive subscriber management and call detail recording facilities are available and may be remotely accessed for configuration and diagnostics purposes. With a large number of systems operating worldwide, compatibility with a range of base station and mobile/portable equipment is assured.

For single site environments Zetron also offers the [Model 807 Single Site Controller](#).

## Model 844 4-Port Intersite Link



### **Expand a Multi-Site MPT 1327 Network**

The Model 844 4-Port Intersite Link provides enhanced linking capacity to a Zetron Model 827- based MPT 1327 trunked radio system. It provides four 4-wire audio ports and four RS-232 serial data ports. The 4-wire audio and data ports provide a gateway for linking conversation audio and call setup data essential for roaming trunked network operation. Multisite operation allows mobile units to roam throughout the network without losing any system functionality. Roaming units are located and can receive calls from a telephone or another radio unit. In addition, multisite operation allows a group call to include up to six sites.

## **Product Features and Configuration**

- Integrates with the Zetron Model 827 to supports regional networks of up to 12 sites in a variety of different configurations
- Supports multiple Model 844s at each site, for up to 32 intersite links
- Provides additional storage capacity for system call detail records
- Supports internal system alarm detection and reporting
- Provides four analog speech/data ports to directly connect two or more Zetron MPT 1327 sites
- Uses 4-wire audio or 4-wire audio with E&M signaling to link multiple sites
- Supports four configurable RS-232 data linking ports for enhanced network performance

## Model 427 Peripheral Equipment Interface



To support direct connection of MAP27 peripheral equipment to Zetron's MPT1327 trunking infrastructure, the Model 427 allows up to four separate 4-wire audio connections. In addition to supporting the MAP27 data interface protocol, the Model 427 includes an extended protocol set that allows it to operate as a multi-port device and to extend the status reporting and control capabilities.

The Model 427 interfaces directly to the trunk stack (Zetron's Model 827, Model 844, and other Model 427s). In a command and control environment, the operators can perform many functions, such as voice calls, disabling users, reassigning channels, dynamic regrouping, deleting users, and management of status messages and data calls.

### **Product Features and Configuration**

- Four audio and MAP27 data links
- Open protocol for third-party peripheral development
- Programmable monitoring points
- Forty-eight programmable IDs
- Real-time monitoring of dispatcher ID
- Site status monitoring and control

## Model 452 LTR Trunking Controller



### **LTR Dispatch-Only**

The Model 452 is a high quality, LTR-compatible repeater controller that combines the functions of LTR logic, dispatch controller, subscriber validation, airtime accumulation for billing, and system management in one unit. Built-in cross-busy enables user to share a radio with a conventional repeater controller and to share the radio channel with other conventional users. Cross-busy operation can be enabled or disabled on a per channel basis.

Functions seamlessly with Model 459, allowing system-wide smart channel allocation, automatic program cloning, and one-shot data download.

### **Product Features and Configuration**

- Cross-busy operation
- Compatible with EFJohnson and Uniden data bus
- LTR logic
- Subscriber validation
- Airtime accumulation
- Remotely programmable via PC

## Model 459 LTR Trunking Controller



### **LTR Dispatch and Interconnect with Cross Busy**

The Model 459 is the top-of-the-line LTR-compatible repeater controller. It provides both dispatch and interconnect, subscriber validation, airtime accumulation, interconnect call logging, and modem capability.

Built-in cross-busy enables user to share a radio with a conventional repeater controller and to share the radio channel with other conventional users. Cross-busy operation can be enabled or disabled on a per channel basis.

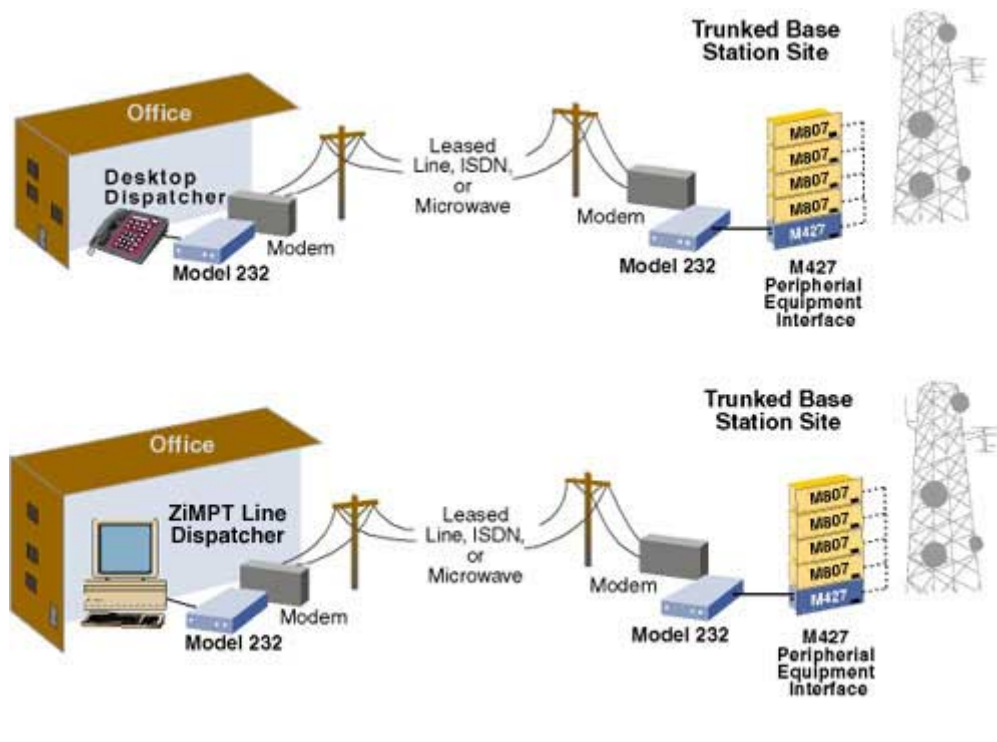
The Model 459 supports connection to a central PC to retrieve airtime billing records, to monitor real-time traffic, and to collect repeater loading statistics.

## **Product Features and Configuration**

- Compatible with EFJohnson and Uniden data bus
- Controls traffic so dispatch throughput is not compromised
- Any "available" channel can be dynamically allocated for interconnect or dispatch
- Compatible with two-wire, 4-wire E, MF-signaling, Type I telephone lines
- Multi-site networking
- Most commonly used at 450 Mhz
- Records up to six different voice messages
- AutoNet site-to-site networking
- Selective Calling connects two half-duplex interconnect users over a single channel

**Remote Line Dispatcher Overview** In many cases dispatch command and control of trunked communications is performed remotely from the physical radio site. Zetron provides a robust system level interface with the Model 427 Peripheral Equipment Interface - simplifying dispatcher interface requirements to basic 4-wire (Tx & Rx) audio along with a serial data circuit.

For dispatcher positions co-located at the trunking site, a direct physical connection (of limited length) can be made to one or multiple dispatcher ports on the Model 427. For longer distances leased 4-wire telephone, ISDN or microwave circuits can be used. Zetron also offers an innovative solution with the Model 232 Voice/Data multiplexer. When a pair of these are combined with dial-up modems or ISDN terminal adapters, the audio and data connections required for each dispatcher port are combined into a single circuit for greater efficiency and reduced lease costs.



## LTR Controllers

Model	M452	M459
Radio Dispatch	Yes	Yes
Telephone Interconnect	-	Yes
Subscriber Validation	Yes	Yes
Airtime Accumulation	Yes	Yes
Interconnect Call Logging	-	Yes
Built-in Cross-Busy	Yes	Yes
Multi-Site Networking	-	-

### Model 452 Dispatch Trunking Controller

The Model 452 is a deluxe LTR-compatible repeater controller that combines the functions of LTR logic, dispatch controller, subscriber validation, airtime accumulation for billing, and system management in one unit. With an external modem, the Model 452 supports connection to a central PC to retrieve billing records, to monitor real time traffic, and to collect repeater loading statistics.

### Model 459 Interconnect Trunking Controller

The Model 459 provides dispatch and telephone interconnect, subscriber validation, airtime accumulation, interconnect call logging, and modem capability. With an internal modem, the Model 459 supports connection to a central PC to retrieve airtime billing records, to monitor real time traffic, and to collect repeater loading statistics. Built-in cross-busy enables users to share a channel. Cross-busy operation can be enabled or disabled on a per channel basis.



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